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

June 29, 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: Edwards Power Plant Ash Pond; IEPA ID # W1438050005-01

Dear Mr. LeCrone:

In accordance with 35 I.A.C. § 845.200, Illinois Power Resource Generating, LLC (IPRG) is submitting a construction permit application for the Edwards Power Plant Ash Pond (IEPA ID # W1438050005-01). 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 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:
W1438050005

CCR Permit Number:
N/A

Facility Name:
Edwards 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 Resources Generating, LLC - Edwards 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 7800 South Cilco Lane		
	County name Peoria	County code (if known)	
	City or town Bartonsville	State IL	Zip Code 61607
1.6	Name of Owner/Operator		
	Illinois Power Resources Generating, LLC		

Facility, Operator, and Owner Info

1.7 Owner/Operator Contact Information

Name (first and last)	Title	Phone Number
Phil Morris	Senior Director - Environmental	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	State	Zip Code
Collinsville	IL	62234

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

Legal Description

2.1 Legal Description of the facility boundary

See Attachment A.

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/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.

W1438050005-01 (see Attachment A)	☑	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 E. Vodopivec	6/20/2022

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

Bureau of Water ID Number:
W1438050005

CCR Permit Number:
N/A

Facility Name:
Edwards 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.
	Illinois Power Resources Generating, LLC - Edwards Power Plant
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)).
	See Appendix A.
1.4	State the purpose for which the CCR surface impoundment is being used.
	See Appendix B.
1.5	How long has the CCR surface impoundment been in operation?
	See Appendix B.
1.6	List the types of CCR that have been placed in the CCR surface impoundment.
	See Appendix C.

Design and Construction Plans (Continued)

1.7	List the name of the watershed within which the CCR surface impoundment is located.	
	See Appendix E.	
1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
	See Appendix E.	
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.			
	See Appendix C.			
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.			
	See Section 2.2			
2.4	The rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.			
	See Section 2.2	GPD	See Section 2.2	dTn
2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.			
	See Section 2.2			
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?	
		5	
	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.

CONSTRUCTION PERMIT APPLICATION

EDWARDS POWER STATION
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

June 2022

PREPARED FOR:

Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

PREPARED BY:

IngenAE, LLC
502 Earth City Expressway, Suite 120
Earth City, MO 63045

Project Number: VST002-D22-001-01

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1. Legal Description 1
1.2. Previous Assessments 1
2. CONSTRUCTION PERMIT 2
2.1. History of Construction 2
2.2. Narrative Description of Facility 2
2.3. Site Maps 3
2.4. Narrative Description of Proposed Construction 4
2.5. Plans and Specifications 5
2.6. Groundwater Monitoring Program 5
2.7. Certification 6
2.8. Public Meeting Information 7
2.9. Closure Construction 7
3. ADDITIONAL INFORMATION 9
4. REFERENCE 10

TABLE OF CONTENTS

APPENDICES

Appendix A Legal Description

Appendix B History of Construction

Appendix C Types of CCR and Chemical Constituents

Appendix D Map Package

Appendix E Hydrogeologic Site Characterization

Appendix F Closure Priority Categorization

Appendix G Groundwater Modeling

Appendix H Final Closure Plan

Appendix I Groundwater Monitoring Plan

Appendix J Post-Closure Care Plan

Appendix K Public Meetings Information

Appendix L Training Program Statement

1. INTRODUCTION

Illinois Power Resource Generating, LLC (IPRG) owns and operates the Ash Pond at Edwards Power Plant in Peoria County, Illinois. Edwards Power Plant is a coal-fired power plant and is located at 7800 South Cilco Lane in Bartonville, Peoria County, Illinois. IPRG is submitting this Part 845 Construction Permit Application for the Ash Pond 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 the Ash Pond.

1.1. Legal Description

Section 845.210(c): All permit applications must contain a legal description of the facility boundary and a description of the boundaries of all units included in the facility.

Legal Description of the facility is provided in **Appendix A**.

1.2. Previous Assessments

Section 845.210(d): Previous Assessments, Investigations Plans, and Programs

The Edwards Power Plant is currently active and the Ash Pond will continue receiving CCR until the expected date of closure on December 31, 2022. The Ash Pond was initially regulated by the 40 C.F.R. Part 257, herein referred to as the CCR Rule [1] and subsequently regulated by Part 845. Multiple previous initial and periodic assessments, investigation plans, and programs were completed for the Ash Pond to satisfy the requirements of both the CCR Rule and Part 845; some of which are referred to within this report.

Section 845.210(d)(1): The Agency may approve the use of any hydrogeologic site investigation or characterization, groundwater monitoring well or system, or groundwater monitoring plan, bearing the seal and signature of an Illinois Licensed Professional Geologist or Licensed Professional Engineer, completed before April 21, 2021 to satisfy the requirements of this Part.

The hydrogeologic site characterization is provided in **Appendix E**, the groundwater modeling is provided in **Appendix G**, and the groundwater monitoring plan is provided in **Appendix I** of this report.

Section 845.210(d)(4): For inactive closed CCR surface impoundments, the owner or operator of the CCR surface impoundment may use a post-closure care plan previously approved by the Agency.

The CCR surface impoundment is active and not closed. Edwards Power Plant is set to cease operation December 31, 2022.

2. CONSTRUCTION PERMIT

2.1. History of Construction

Section 845.220(a)(1): Design and Construction Plans (Construction History)

The History of Construction report for the Ash Pond and subsequent update letter is provided in **Appendix B**.

2.2. Narrative Description of Facility

Section 845.220(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, to the following information:

The Facility Narrative Description details are described in the following sections.

Section 845.220(a)(2)(A): The types of CCR expected in the CCR impoundment, including a chemical analysis of each type of expected CCR;

The types of CCR expected in the Ash Pond and analysis of the chemical constituents found within the CCR in the Ash Pond is provided in **Appendix C**.

Section 845.220(a)(2)(B): An estimate of the maximum capacity of each surface impoundment in gallons or cubic yards;

The Ash Pond currently contains approximately 4,135,000 CY of CCR. This estimate is based on the comparison between the existing surface contours surveyed on December 1, 2020, and the bottom contours of the CCR. Edwards Power Plant is scheduled to close no later than December 31, 2022, and before closure, additional CCR will be placed in the surface impoundment. Between the survey conducted in December 2020 and the expected date of plant closure in December 2022, an additional 46,000 CY of CCR is expected to be placed in the Ash Pond. Furthermore, approximately 210,000 CY of ash is currently in the surface impoundment embankments and will be placed inside the surface impoundment upon closure (see **Section 2.4**), resulting in a maximum CCR capacity of approximately 4,391,000 CY.

Section 845.220(a)(2)(C): The rate at which CCR and non-CCR waste streams currently enter the CCR surface impoundment in gallons per day and dry tons;

According to Section 2.4 of the 2021 USEPA CCR Rule Periodic Certification Report, dated October 11, 2021, by Geosyntec [6], 126,383 CY of CCR was placed in the Ash Pond between July 2015 and December 2020. This corresponds to approximately 23,000 CY per year. Therefore, for the two-year period between the survey conducted in December 2020 and the expected date of plant closure in December 2022, an additional 46,000 CY of CCR is expected to be placed in the Ash Pond. The 46,000 CY results in approximately 24,850 tons, assuming a unit weight of 1,080 lb/cy, of CCR and non-CCR expected to be placed in the Ash Pond between December 2020 and December 2022.

Section 845.220(a)(2)(D): The estimated length of time the CCR surface impoundment will receive CCR and non-CCR waste streams; and

The Ash Pond will continue to receive CCR and non-CCR waste streams until the scheduled closure no later than December 31, 2022.

Section 845.220(a)(2)(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.

An On-Site Transportation Plan is provided for the Ash Pond in **Appendix D** that includes all on-site access roads and the surrounding roadways.

2.3. Site Maps

Section 845.220(a)(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 7 ½ minute series (topographic), or on another map whose scale clearly shows the following information:

A. The facility boundaries and all adjacent property, extending at least 1000 meters (3280 feet) beyond the boundary of the facility;

B. All surface water;

C. The prevailing wind direction;

D. The limits of all 100-year floodplains;

E. All-natural areas designated as the dedicated Illinois nature Preserve under the Illinois Natural Areas Preservation Act [525 ILCS30];

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

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].

A Site Location Map showing the information required in Section 845.220(a)(3) is provided for the Ash Pond in **Appendix D**. The Site Location Map consists of the most recent USGS topographic map which contains the facility and at least 1,000 meters of the surrounding area. Information included on the site location map meets the requirements for a Flood Hazard Map, Topographic Vicinity Map, Designated Nature Map, Designated Historic and Archeological Site Map, and Identified Critical Habitat Map.

The data in the Site Location Map was collected by performing a comprehensive search of the Illinois Department of Natural Resources (IDNR) natural heritage database [2] for natural and protected areas within 1,000 meters of the Ash Pond. Within Peoria County, a total of 20 of these sites were identified from the Illinois Natural Areas Inventory and a total of 12 were identified from the Illinois Nature Preserves list. Within adjacent Tazewell County, a total of 20 of these sites were identified from the Illinois Natural Areas Inventory and a total of 17 were identified from the Illinois Nature Preserves list. None of the natural areas of preserves fall within 1,000 meters of the Ash Pond.

The IDNR natural heritage database also includes a list of Endangered Species by County [3] and notes that a total of 14 threatened species and 9 endangered species are located within Peoria County. In

adjacent Tazewell County, a total of 16 threatened and 14 endangered species are listed. A review of the U.S. Fish and Wildlife Service (USFWS) Threatened & Endangered Species Active Critical Habitat Report [4] identified no critical habitats within Peoria County or adjacent Tazewell County. Therefore, there are no critical habitats within 1,000 meters of the Site.

A search of the IDNR Historic and Architectural Resources Geographic Information System (HARGIS) database [5] for historical sites within 1,000 meters of the Site located no results.

The 100-year floodplain limits were obtained from the Edwards Power Plant Operating Permit Application: Floodplain Compliance for 35 I.A.C. 845.340(c) done by Burns & McDonnell dated October 20, 2021. The full report is provided in **Appendix D.**

Section 845.220(a)(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:

A. The entire facility, including any proposed and all existing CCR impoundment locations;

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;

C. All existing and proposed groundwater monitoring wells; and

*D. All main service corridors, transportation routes and access roads to the facilit*y.

The Site Plan Map showing the information required in Section 845.220(a)(4) is provided for the Ash Pond in **Appendix D**.

2.4. Narrative Description of Proposed Construction

Section 845.220(a)(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.

The proposed modification to the Ash Pond will include closing the Ash Pond by leaving CCR in-place and covering it with a final cover system. The process will include removal of free liquids; relocation of approximately 1,130,000 cubic yards of CCR from the northwest section and the highpoints in the middle sections of the ash pond to the south end, and approximately 210,000 CY form the rail line embankment; the decontamination of the CCR relocation area in the northwest; construction of an earthen berm on the northwest section of the ash pond to contain the relocated ash; the removal of the existing rail line, ballast and ash embankments; removal of onsite existing structures; grading of the CCR subgrade; installation of the designed final cover system; installation of stormwater structures; and seeding and fertilization of the final protective layer.

As part of the closure effort, if closure in place is approved, a new photovoltaic (PV) solar power facility will be installed on top of the closed ash pond with a rated power of approximately 19 megawatts AC (MWac) and an installed power of approximately 25 megawatts DC (MWdc). Interconnection of the solar facility will occur at the existing Edwards substation.

Additional information on the proposed construction and modification to the Ash Pond is included within the Final Closure Plan provided in **Appendix H.**

2.5. Plans and Specifications

Section 845.220(a)(6): Plans and specifications fully describing the design, nature, function and interrelationship of each individual component of the facility.

Permit-level design plans are included within the Final Closure Plan provided for the Ash Pond in **Appendix H** and were prepared in accordance with Section 845.220(a)(6). The permit-level design plans are consistent with the narrative description provided in Section 845.220(A)(5).

2.6. Groundwater Monitoring Program

Section 845.220(a)(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:

The Groundwater Monitoring Program details are described within this section and the referenced attachments.

Section 845.220(a)(7)(A): A hydrogeologic site investigation meeting the requirements of Section 845.620, if applicable;

Hydrogeological site investigations for the Ash Pond are provided in **Appendix E**.

Section 845.220(a)(7)(B): Design and construction plans of a groundwater monitoring system meeting the requirement of Section 845.630; and

Design and construction plans of a groundwater monitoring system as required by Section 845.630 are provided in **Appendix I**.

Section 845.220(a)(7)(C): A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data (see Sections 845.640 and 845.650).

A groundwater sampling and analysis program that meets the requirements of Section 845.640 and 845.650 is provided in **Appendix I.**

2.7. Certification

Section 845.220(a)(8): The signature and seal of a qualified professional engineer.

I, 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 construction permit application has been prepared in accordance with the accepted practice of engineering.

Brian J. Horvath

Printed Name

Signature Date

062-052525 IL 11/30/23

Registration Number State Expiration Date

Affix Seal

2.8. Public Meeting Information

Section 845.220(a)(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.

Certification that the public notification and public meetings have been completed as required by Section 845.620 is provided as **Appendix K.**

2.9. Closure Construction

Section 845.220(d): Closure Construction. In addition to 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:

The Closure Construction details are described in the following sections.

Section 845.220(d)(1): Closure prioritization category, if applicable (see Section 845.700(g));

A CCR Surface Impoundment Category Designation and Justification letter was submitted to IEPA on May 19, 2021. The Ash Pond was designated as Category 5- Existing CCR surface impoundments that have exceedances of the groundwater protection standards in Section 845.600. This letter is provided in **Appendix F**.

Section 845.220(d)(2): Final closure plan (see Section 845.720(b)), including the closure alternative analysis required by Section 845.710;

The Final Closure Plan as required by Section 845.720(b) and the Alternatives Analysis as required by Section 845.210 are provided in **Appendix H**.

Section 845.220(d)(3): Groundwater modeling, including:

A. The results of groundwater contaminant transport modeling and calculations and 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;

D. Capture zone modeling if applicable; and

E. Any necessary licenses and software needed to review and access both the model and the data contained within the model.

Groundwater modeling as required by Section 845.220(d)(3) is provided in **Appendix G.**

Section 845.220(d)(4): Proposed schedule to complete closure; and

The proposed schedule to complete closure is included within the Final Closure Plan provided in **Appendix H**.

Section 845.220(d)(5): Post-closure care plan specified in Section 845.780(d), if applicable.

The Post Closure Care Plan required by Section 845.220(d)(5) is provided in **Appendix J**.

3. ADDITIONAL INFORMATION

Certification that IPRG will utilize contractors, subcontractors, and installers who are participants in an approved training program, in accordance with 415 Illinois Complied Statutes (ILCS) 5/22.59(b)(4), is provided in **Appendix L**.

4. REFERENCE

[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," 2015.

[2] Illinois Department of Natural Resources, "IDNR Natural Heritage Database," [Online]. Available: https://www2.illinois.gov/sites/naturalheritage/DataResearch/Pages/Access-Our-Data.aspx. [Accessed 3 March 2022].

[3] Illinois Department of Natural Resources, "Illinois Threatened and Endangered Species by County," September 2021. [Online]. Available: https://www2.illinois.gov/sites/naturalheritage/DataResearch/Documents/etcountylist_feb2022.pdf. [Accessed 3 March 2022].

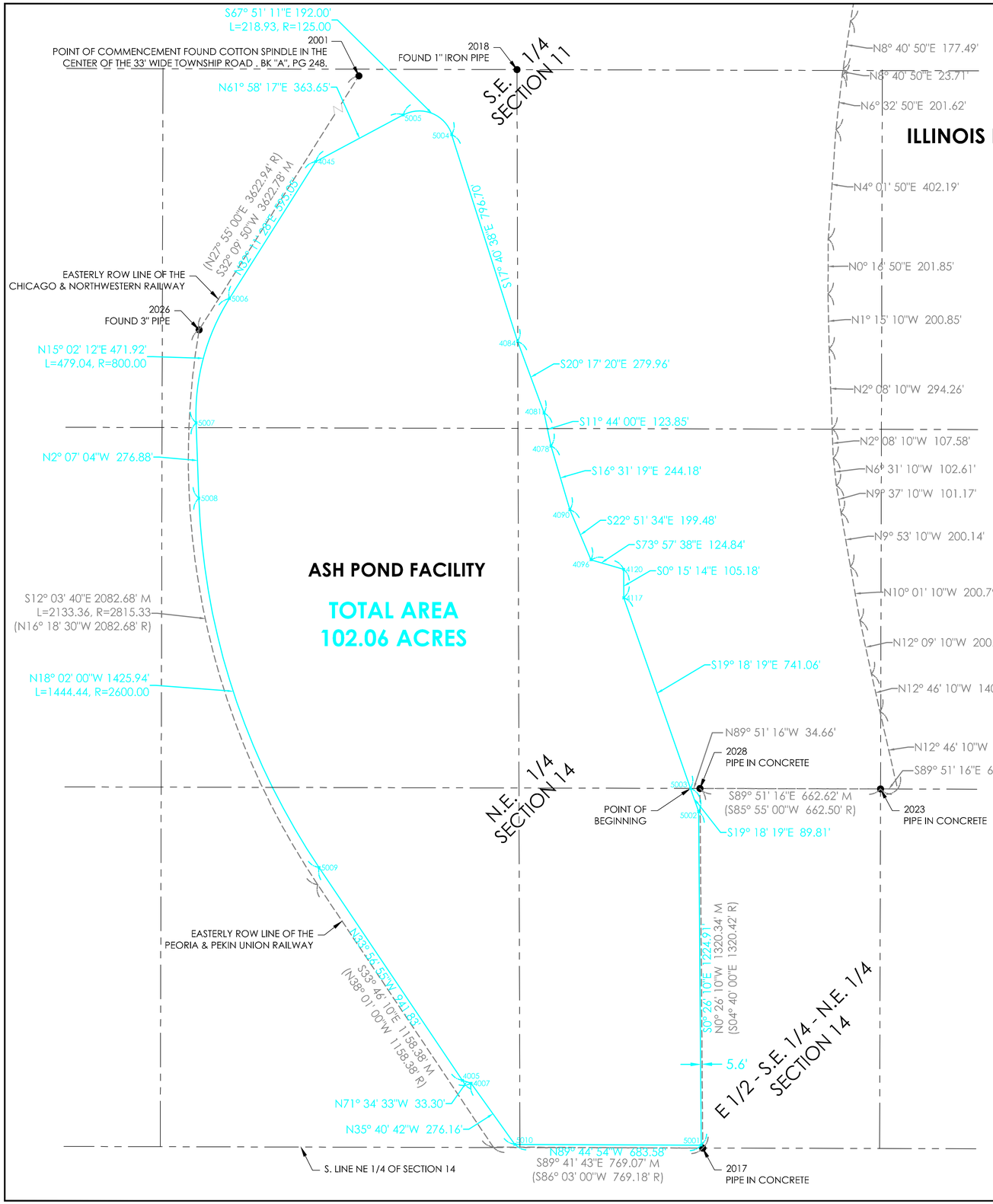
[4] U.S. Fish & Wildlife Service, "USFWS Threatened & Endangered Species Active Critical Habitat Report," [Online]. Available: https://ecos.fws.gov/ecp/report/table/critical-habitat.html. [Accessed 3 March 2022].

[5] Illinois Department of Natural Resources, "IDNR Historic Preservation Division HARGIS," [Online]. Available: https://www2.illinois.gov/dnrhistoric/Preserve/Pages/HARGIS.aspx. [Accessed 3 March 2022].

[6] Geosyntec Consultants, "2021 USEPA CCR Rule Periodic Certification Report §257.73(a)(2),(c),(d),(e) and §257.82, Ash Pond, Edwards Power Plant, Edwards, Illinois," Chesterfield, Missouri, October 11, 2021.

Appendix A

Legal Description



Luminant

ILLINOIS POWER RESOURCES GENERATING, LLC.
EDWARDS POWER PLANT

Land Description of the Edwards Power Plant

Ash Pond Facility

102.06 Acres

Part of the Southeast Quarter of Section 11 and part of the Northeast Quarter of Section 14 in Township 7 North, Range 7 East of the Fourth Principal Meridian, Hollis Township, Peoria County, Illinois being more particularly described as follows:

Commencing at the found Cotton Spindle, in the pavement at the centerline of the 33 feet wide Township Road through the East Half of Section 11 established by an agreement filed for record on November 14, 1891 and recorded in Book "A" on page 248 in the Records of the Town of Hollis, at the intersection of said centerline of the township road with the Easterly Right of Way line of the Chicago and Northwestern Railway; thence South 32 degrees 09 minutes 50 seconds West along the said Right of Way line of the Chicago and Northwestern Railway a distance of 3622.78 to a 3 inch iron pipe on the Easterly Right of Way line of the Peoria and Pekin Union Railway; thence along said Right of Way line being a curve to the left having a radius of 2815.33 feet a curve length of 2133.36 a chord bearing South 12 degrees 03 minutes 40 seconds East a chord distance of 2082.68 feet to the point of tangency; thence South 33 degrees 46 minutes 10 seconds East continuing along said easterly Right of Way line a distance of 1158.38 feet to a point on the South line of the Northeast Quarter of Section 14; thence South 89 degrees 41 minutes 43 seconds East along said South line a distance of 769.07 feet to an iron pipe in concrete at the Southwest corner of the East Half of the Southeast Quarter of the Northeast Quarter of Section 14; thence North 0 degrees 26 minutes 10 seconds West a distance of 1320.34 feet to the iron pipe in concrete at the Northwest corner of the East Half of the Southeast Quarter of the Northeast Quarter of Section 14 from which bears an iron pipe in concrete at the Northeast corner of the East Half of the Southeast Quarter of the Northeast Quarter of Section 14 bearing South 89 degrees 51 minutes 16 seconds East a distance of 662.62 feet; thence from said iron pipe in concrete at the Northwest corner of the East Half of the Southeast Quarter of the northeast Quarter of Section 14 bearing North 89 degrees 51 minutes 16 seconds West a distance of 34.66 feet to the Point of Beginning of the tract described herein; thence South 19 degrees 18 minutes 19 seconds East a distance of 89.81 feet; thence South 0 degrees 26 minutes 10 seconds East a distance of 1224.91 feet; thence North 89 degrees 44 minutes 54 seconds West a distance of 683.58 feet; thence North 35 degrees 40 minutes 42 seconds West a distance of 276.16 feet; thence North 71 degrees 34 minutes 33 seconds West a distance of 33.30 feet; thence North 33 degrees 56 minutes 55 seconds West a distance of 941.83 feet; thence along a curve to the right having a radius of 2600.00 feet a curve length of 1444.44 feet a chord bearing North 18 degrees 02 minutes 00 seconds West a chord distance of 1425.94 feet; thence North 2 degrees 07 minutes 04 seconds West a distance of 276.88 feet; thence along a curve to the right having a radius of 800.00 feet a curve length of 479.04 feet a chord bearing North 15 degrees 02 minutes 12 seconds East a chord distance of 471.92 feet; thence North 32 degrees 11 minutes 28 seconds East a distance of 595.05 feet; thence North 61 degrees 58 minutes 17 seconds East a distance 363.65 feet; thence along a curve to the right having a radius of 125.00 feet a curve length of 218.93 feet a chord bearing South 67 degrees 51 minutes 11 seconds East a chord distance of 192.00 feet; thence South 17 degrees 40 minutes 38 seconds East a distance of 796.70 feet; thence South 20 degrees 17 minutes 20 seconds East a distance of 279.96 feet; thence South 11 degrees 44 minutes 00 seconds East a distance of 123.85 feet; thence South 16 degrees 31 minutes 19 seconds East a distance of 244.18 feet; thence South 22 degrees 51 minutes 34 seconds East a distance of 199.48 feet; thence South 73 degrees 57 minutes 38 seconds East a distance of 124.84 feet; thence South 0 degrees 15 minutes 14 seconds East a distance of 105.18 feet; thence South 19 degrees 18 minutes 19 seconds East a distance of 741.06 feet to the Point of Beginning and containing 102.06 Acres.

N

0' 200' 400'

LEGEND
- SECTION LINE
- PROPERTY BOUNDARY (BY OTHERS)
- CCR FACILITY BOUNDARY
- FOUND SURVEY MARKER AS NOTED
- M MEASURED DIMENSION
- R RECORD (DEED) DIMENSION

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 30, 2021. SURVEY COORDINATES, BEARINGS & DISTANCES ARE REFERENCED TO ILLINOIS WEST 1202 STATE PLANE COORDINATE SYSTEM NAD 1983.

CONTROL MONUMENTATION				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
2001	1434266.26	2436353.57	448.07	COTTON SPINDLE IN ROAD
2017	1428195.82	2436273.01	437.88	PIPE IN CONCRETE
2018	1432154.95	2435591.37	439.92	FOUND 1 IN PIPE
2023	1429514.44	2436925.58	440.94	PIPE IN CONCRETE
2026	1431199.56	2434424.87	435.77	FOUND 3 IN PIPE
2028	1429516.12	2436262.96	438.18	PIPE IN CONCRETE

CCR FACILITY BOUNDARY CORNERS		
POINT NO.	NORTHING	EASTING
4005	1428444.42	2435391.09
4007	1428433.90	2435422.68
4045	1431817.61	2434852.90
4078	1430773.19	2435715.92
4081	1430894.45	2435690.74
4084	1431157.04	2435593.66
4090	1430539.09	2435785.36
4096	1430355.27	2435862.86
4117	1430215.60	2435983.30
4120	1430320.78	2435982.84
5001	1428203.71	2436262.44
5002	1429431.45	2436257.99
5003	1429516.21	2436228.30
5004	1431916.11	2435351.74
5005	1431988.50	2435173.90
5006	1431314.04	2434535.89
5007	1430858.28	2434413.46
5008	1430581.59	2434423.69
5009	1429225.70	2434865.12
5010	1428209.57	2435583.74

SURVEYOR CERTIFICATE:
THIS IS TO CERTIFY THAT WE, INGENAE, LLC, HAVE AT THE REQUEST OF AND FOR THE EXCLUSIVE USE OF THE OWNERS, PERFORMED A SURVEY OF THE TRACT AS SHOWN HEREON AND THAT THIS IS A TRUE REPRESENTATION OF THAT SURVEY. THIS PLAT AND THE SURVEY FROM WHICH IT IS BASED WERE DONE IN ACCORDANCE WITH THE "MINIMUM STANDARDS OF PRACTICE" FOR LAND SURVEYING IN THE STATE OF ILLINOIS.

INGENAE, LLC
PROFESSIONAL DESIGN FIRM
LICENSE NO. 184.007588-0010

STATE OF ILLINOIS
MICHAEL J. GRAMINSKI
035-2901
LAND SURVEYOR
Sept 10, 2021

MICHAEL J. GRAMINSKI — DATE
I.P.L.S. NO. 035.002901
EXPIRES: 11/30/2022

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:	Date:
1	
2	
3	
4	
5	
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7	
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9	
10	
11	
12	
13	

Luminant

Project Name & Location:

EDWARDS
POWER PLANT

7800 S. CILCO LN.
BARTONVILLE, IL 61607

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www.ingenae.com

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Drawing Name:

CCR FACILITY BOUNDARY EXHIBIT

Date:	Project No.
9/21/2021	
Type: SITE	Drawing No. 1
Drawn By: CB	
Approved By: MG	
Scale: AS NOTED	

Luminant

ILLINOIS POWER RESOURCES GENERATING, LLC.
EDWARDS POWER PLANT

0' 200' 400'

LEGEND
- SECTION LINE
- PROPERTY BOUNDARY (BY OTHERS)
- CCR FACILITY BOUNDARY
- ● FOUND SURVEY MARKER AS NOTED
- M MEASURED DIMENSION
- R RECORD (DEED) DIMENSION

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.

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:		Date:
1		
2		
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Luminant

Project Name & Location:

EDWARDS
POWER PLANT

7800 S. CILCO LN.
BARTONVILLE, IL 61607

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Drawing Name:

CCR FACILITY BOUNDARY EXHIBIT

Date:	Project No.
9/21/2021	
Type: SITE	Drawing No. 2
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

Appendix B

History of Construction

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 Resources Generation, LLC
7800 South Cilco Lane
Bartonville, Illinois 61607

Subject: Periodic History of Construction Report Update Letter
USEPA Final CCR Rule, 40 CFR §257.73(c)
Edwards Power Plant
Bartonville, Illinois

Geosyntec Consultants (Geosyntec) has prepared this Letter at the request of Illinois Power Resources Generation (IPRG) to document updates to the Initial History of Construction (HoC) report for the Edwards Power Plant (EPP), also known as the Edwards Power Station (EPS). 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 EPP, which included the existing CCR surface impoundment, the Ash Pond (AP), was prepared and subsequently posted to IPRG'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).

IRPG retained Geosyntec to review the Initial HoC report, review reasonably and readily available information for the AP generated since the Initial HoC report was prepared, and perform a site visit to EPP 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 the AP and EPP, as they pertain the requirements of §257.73(c)(1)(i)-(xii)

UPDATES TO HISTORY OF CONSTRUCTION REPORT

Geosyntec's evaluation for the EPP AP determined that no known significant changes requiring updates to the information in the Initial HoC report pertaining to pertaining to §257.73(c)(1)(ii-viii) of the CCR Rule had occurred since the Initial HoC report had been developed.

However, Geosyntec's evaluation determined that significant changes at the EPP AP pertaining to §257.73(c)(1) (i),(ix)-(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.

Ash Pond

The AP is in operation since 1960. As of the date of this report, the AP has been present for approximately 61 years.

CCR placed in the AP has been used to store and dispose sluiced bottom ash and fly ash and to clarify water, including non-CCR station process wastewaters, prior to discharge in accordance with the station's NPDES permit [1].

§ 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.

The state identification number (ID) for the AP have been assigned by the Illinois Environmental Protection Agency (IEPA). The ID is listed in **Table 1**.

Table 1 – IEPA ID Numbers

CCR Surface Impoundment	State ID
Ash Pond	W1438050005-01

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

Updated area-capacity curves were prepared for the Process Water Pond and the Clarification Pond for the AP in 2021. These curves are provided in **Figures 1** and **2**.

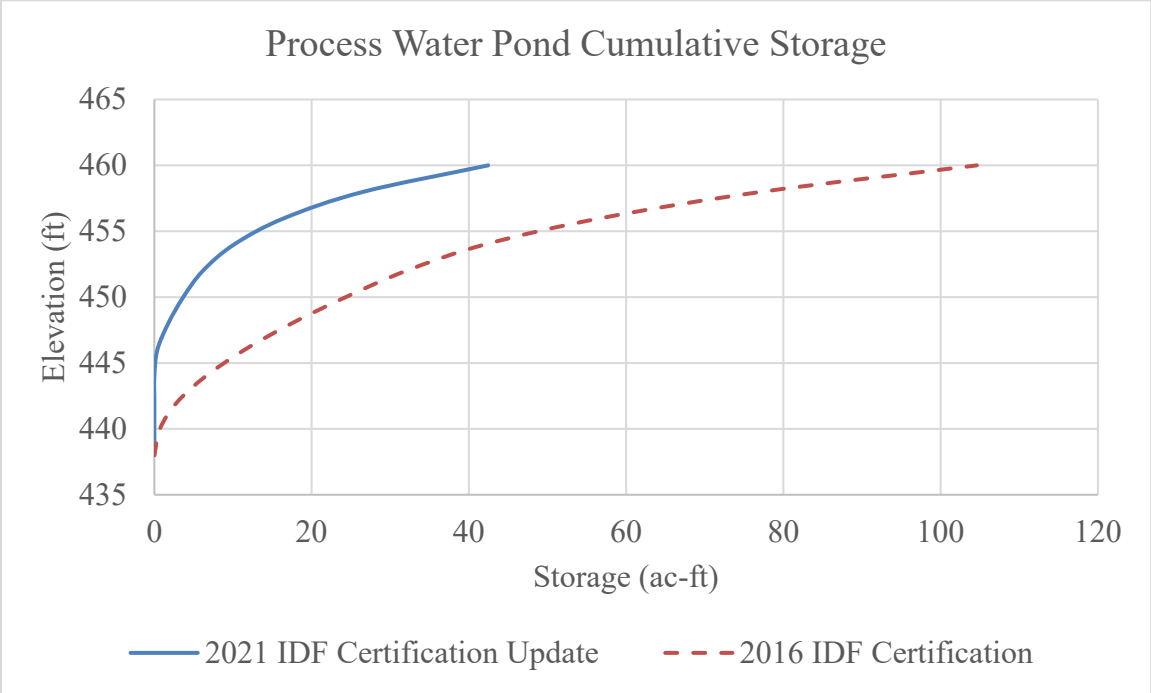


Figure 1 – Area-Capacity Curve for Ash Pond – Process Water Pond

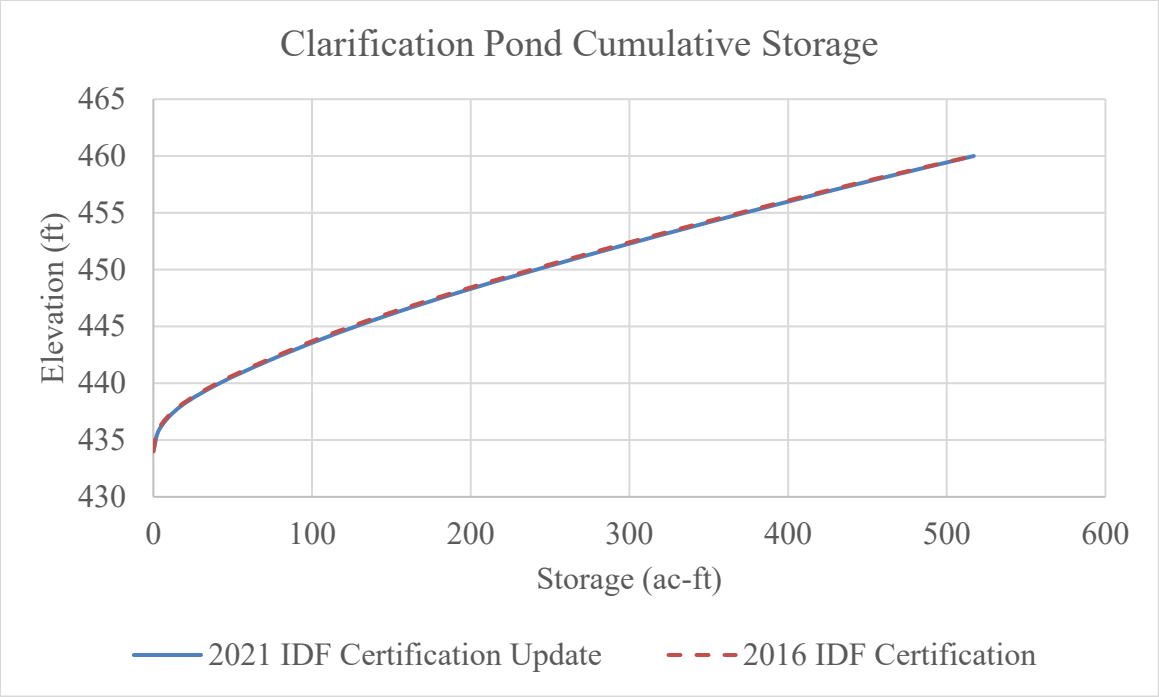


Figure 2 – Area-Capacity Curve for Ash Pond – Clarification Pond

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

Updated discharge capacity calculations for the existing spillways were prepared in 2021 using HydroCAD 10 modeling software. The calculations indicate that the AP has sufficient storage capacity and will not overtop the embankments during the 1,000 year 24-hour rainfall event. The results of the calculations are provided in **Table 2**.

Table 2 – Results of Updated Discharge Capacity Calculations

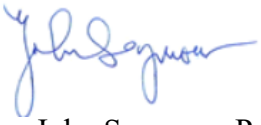
	Process Water Pond	Clarification Pond
Approximate Berm Minimum Elevation[1], ft	458.8	459.6
Approximate Emergency Spillway Elevation[1], ft	Not Applicable	Not Applicable
Starting Water Surface Elevation[1] (SWSE), ft	450.4	447.3
Peak Water Surface Elevation[1] (PWSE), ft	458.6	457.5
Time to Peak, hr	9.3	24.6
Surface Area[2], ac	7.3	29.2
Storage[3], ac-ft	27.2	265.3
Notes:		

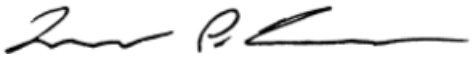
[1]Elevations are based on the NAVD88 datum
[2]Surface area is defined as the water surface area at the PWSE
[2]Storage is defined as the volume between the SWSE and PWSE

CLOSING

This letter has been prepared to document Geosyntec's evaluation of changes that have occurred at the AP at the EPP 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,





John Seymour, P.E.
Senior Principal

Lucas P. Carr, P.E.
Senior Engineer

REFERENCES

[1] AECOM, "History of Construction, USEPA 40 CFR § 257.73(c), Edwards Power Station, Bartonville, IL," 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.

AECOM

October 2016

Illinois Power Resources Generating, LLC
7800 South Cilco Lane
Bartonville, IL 61607

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

On behalf of Illinois Power Resources Generating, LLC, AECOM has prepared the following history of construction for the Ash Pond at the Edwards 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, operation and maintenance information, etc. for Ash Pond at the Edwards 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 Resources Generating, LLC

Address: 1500 Eastport Plaza Drive
Collinsville, IL 62234

CCR Units: Ash Pond

The Ash Pond does 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 location of the Ash Pond has 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 Ash Pond is being used to store and dispose of sluiced bottom ash and fly ash and to clarify water, including non-CCR station process wastewaters, prior to discharge in accordance with the station's NPDES permit.

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

The Ash Pond and the Edwards Power Station are located in the Illinois River Watershed with a 12-digit Hydrologic Unit Code (HUC) of 071300030304 and a drainage area of 8,3821 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 materials consist of native alluvial clay underlain by bedrock. The physical properties of the native alluvial clay are described as lean clay with zones of fat clay. The consistency of the clay varies from soft to stiff. The bedrock is classified as weathered to slightly weathered shale. An available summary of the engineering properties of the foundation and abutment materials is presented in **Table 1** below. The engineering properties are based on previous geotechnical explorations and laboratory testing.

Table 1. Summary of Foundation and Abutment Material Engineering Properties

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Native Clay Crust	120	200	27.5	1250	0
Native Clay 1	117	100	26	650	0
Native Clay 2	105	200	26	700	0
Native Clay 3	105	200	26	900	0
Bedrock - Shale	140	1000	36	1000	36

The Ash Pond is an enclosed impoundment with embankments and does not have abutments.

§ 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.

The Ash Pond original embankments were constructed with soils excavated from within the limits of the proposed pond. Physical properties for the original embankment construction are described as lean clay with trace sand and shells. The consistency of the original embankment material varies from soft to stiff, with a general consistency of stiff. The original embankment was later modified for construction of a new rail loop. The modifications were constructed by adding new material to widen the downstream side of the embankment and occasionally raising the crest elevation of the embankment by as much as 12 feet. Physical characteristics for the new embankment material are described as fly ash, classified as silt to poorly-graded silty sand with gravel. The consistency of the new embankment material varies from soft to very stiff, with a general consistency of stiff to very stiff. Construction of the new rail loop also cut off the southern portion of the pond by the construction of a new dike across the interior of the pond. The new dike material consists of medium dense, fine to coarse, crushed stone gravel with sand, classified as poorly graded gravel. The cut off area to the south was filled in with ash and capped by topsoil. An available summary of the engineering properties of the 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

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Old Embankment 1	125	200	28	2500	0
Old Embankment 2	125	100	29	1250	0
New Embankment	115	200	30	2500	0
New Embankment (Crushed Stone - Sandy Gravel)	120	0	32	0	32

The method of site preparation of the Ash Pond is not reasonably and readily available.

The approximate dates of construction of each successive stage of construction of the Ash Pond are provided in **Table 3** below.

Table 3. Approximate dates of construction of each successive stage of construction.

Date	Event
1960	Construction of the original embankments
2004	Construction of the rail loop that modified the original embankments and cut-off the southern portion of the Ash 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 the Ash Pond are listed in **Table 4** below. Items marked as "Not Available" are items not found during a review of the reasonably and readily available record documentation.

Table 4. List of drawings containing items pertaining to the information requested in § 257.73(c)(1)(vii).

	Ash Pond
Dimensional plan view (all zones)	C175-G1906-3 to 4 03057-PL, 03057-1
Dimensional cross sections	C175-G1906-4, 03057-1X
Foundation Improvements	Not Applicable
Drainage Provisions	Not Applicable
Spillways and Outlets	C175-G1921-1 to 3
Diversion Ditches	Not Found
Instrument Locations	Plate 2, Figure 2A
Slope Protection	Not Available
Normal Operating Pool Elevation	Not Available
Maximum Pool Elevation	Not Available
Approximate Maximum Depth of CCR in 2016	71 feet

All drawings referenced in **Table 4** above can be found in **Appendix B and Appendix C**.

A 6-inch diameter sanitary sewer force main was also identified and is buried at a shallow depth within the Ash Pond. Drawings of the sanitary sewer force main are presented in **Appendix B**.

Based on the review of the drawings listed above, no natural or manmade features that could adversely affect operation of the CCR unit 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 the Ash Pond consist of open-standpipe piezometers. The purpose of the piezometers is to measure the pore water pressures within the embankment. One (1) open-standpipe piezometer (B-2) was installed in 2010 and the location is presented on Plate 2 in **Appendix C**. Four (4) open-standpipe piezometers (EDW-P001 to P004) were installed in 2015 and the locations are presented on Figure 2A in **Appendix C**.

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

Area-capacity curves for the Ash Pond are not reasonably and readily available.

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

The spillway system for the Ash Pond includes a morning glory spillway structure that consists of vertically stacked 36-inch diameter (dia.) pipe sections seated on a concrete drop inlet structure and pad. The spillway structure discharges clarified plant process water and CCR contact stormwater through a 36-inch dia. corrugated metal pipe (CMP) and into the Illinois River in accordance with the station's NPDES permit. In 2016, the Ash Pond's discharge capability was evaluated using HydroCAD 10 software modeling a 1,000-year, 24-hour rainfall event. The results of the HydroCAD analysis are presented below in **Table 5**.

There are three separate sub-basins within the Ash Pond: the Process Water Pond, the Fly Ash Pond, and the Clarification Pond. The first sub-basin is the Process Water Pond and is located at the northwestern end of the Ash Pond. The second sub-basin is the Fly Ash Pond. The third sub-basin is the Clarification Pond, which is located furthest downstream at the southern end of the Ash Pond. During normal plant operations, bottom ash is sluiced into the Ash Pond. The settling channels located within the Fly Ash Pond discharge into the Clarification Pond through internal culvert pipes. However, during the design storm, rainfall discharge through these channels exceed the capacity of the culvert pipes, and will likely overtop or wash out the small interior splitter dikes and discharge directly into the Clarification Pond. Therefore, the storage potential of the Fly Ash Pond was considered insignificant and rainfall that would normally be collected within the Fly Ash Pond was modeled to discharge directly into the Clarification Pond.

Table 5. Results of HydroCAD 10 analyses

	Ash Pond - Process Water Pond	Ash Pond - Clarification Pond
Approximate Minimum Berm Elevation[1] (ft)	458.8	459.6
Approximate Emergency Spillway Elevation1 (ft)	N/A	N/A
Starting Pool Elevation[1] (ft)	449.5	447.2
Peak Elevation[1] (ft)	457.8	457.4
Time to Peak (hr)	14.4	48.0
Surface Area (ac)	11.4	28.9
Storage [2] (ac-ft)	52.6	265.0

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 the Ash Pond are not reasonably and readily available.

The provisions for surveillance, maintenance, and repair of the Ash Pond are located in *Edwards Power Station; Operation and Maintenance Manual for Ash Ponds and Levees* (presented in **Appendix D**). The operations and maintenance plan for the Ash Pond is currently being revised by Illinois Power Resources Generating, LLC.

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

In early 2009, a minor surficial movement was observed along the northern end of the downstream slope of the west embankment. After the slide was repaired, a second surficial movement occurred in the same area in late 2009. In early 2010, the second movement was repaired with covered stone and the water level in the Process Water Pond area was lowered by approximately 3.5 feet. Annual inspections since 2011 have not identified an issue in the repaired areas. Photos of the 2009 surficial movement area are presented in **Appendix E**.

There is no record or knowledge of any other structural instability of the Ash Pond at Edwards Power Station.

AECOM

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
Project Manager

Victor Modeer, P.E., D.GE
Senior Project Manager

REFERENCES

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.

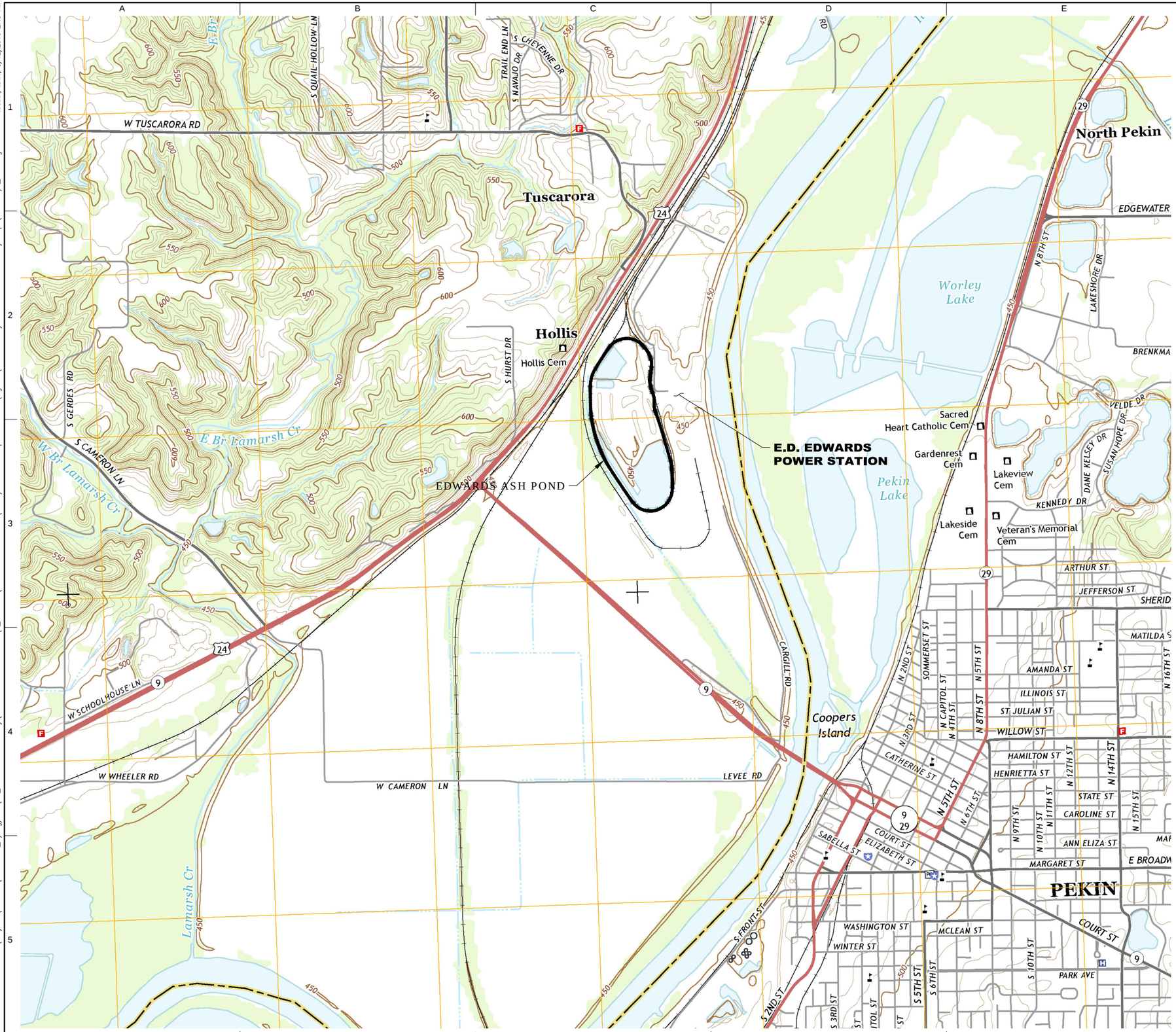
United States Geological Survey (USGS). (2016). The National Map Viewer. http://viewer.nationalmap.gov/viewer/. USGS data first accessed in March of 2016.

APPENDICES

Appendix A: History of Construction Vicinity Map
Appendix B: Edwards Power Station Drawings
Appendix C: Edwards Power Station Piezometer Locations
Appendix D: Operation and Maintenance Manual for Ash Ponds and Levees
Appendix E: Photos of 2009 Surficial Movement

AECOM

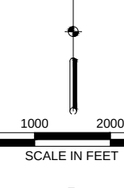
Appendix A: History of Construction Vicinity Map



LEGEND

CCR UNITS

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



QUADRANGLE LOCATION

N

0 1000 2000 3000

SCALE IN FEET

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

ILLINOIS POWER RESOURCES, GENERATING, L.L.C.

7800 South Cilco Ln.,
Bartonville, Illinois

HISTORY OF CONSTRUCTION

EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

	DATE	BY
ISSUED FOR BIDDING		
ISSUED FOR CONSTRUCTION		

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" = 1000'
ACAD VER:	2014

SHEET TITLE

HISTORY OF CONSTRUCTION VICINITY MAP

01

DRAWING PATH: P:\Projects\Geotech\60428794_DynegyCCR\13_Construction History\04 Technical Production\7_Edwards\Reference Documents\Vicinity Location Map References\Figures\C-01 History of Construction Vicinity Map (Edwards) _MJN.dwg NANAK, MATT, 8/12/2016 2:43 PM

Appendix B: Edwards Power Station Drawings

1. “Plant Site Fill, Stage 3 – Final Arrgt.”, Drawing No. C175-G1906-3, Revision F, 1 July, 1960, Commonwealth Associates Inc.
2. “Plant Site Fill, Stage 1 Continuation – Final Arrgt.”, Drawing No. C175-G1906-4, Revision C, 4 March, 1958, Commonwealth Associates Inc.
3. “Construction Thru Levee, Ash Pond Drainage Duct”, Drawing No. C175-G1921-1, Revision C, 26 March, 1975, Commonwealth Associates Inc.
4. “Construction Thru Levee, Ash Pond Drainage Duct Details”, Drawing No. C175-G1921-2, Revision D, 15 February, 1960, Commonwealth Associates Inc.
5. “Construction Thru Levee, Ash Pond Drainage Duct, Cofferdam & Other Details.”, Drawing No. C175-G1921-3, Revision B, 15 June, 1959, Commonwealth Associates Inc.
6. “Proposed 150 Car Loop Track, General Plan”, Drawing No. 03057-PL, Revision 1, 20 November, 2003, Design Nine, Inc.
7. “Proposed 150 Car Loop Track, Plan/Profile - Loop/Wye Track Loop Sta. 0+00 to Sta. 29+00”, Drawing No. 03057-1 (Sheet 6), Revision 2, 3 December, 2003, Design Nine, Inc.
8. “Proposed 150 Car Loop Track, Plan/Profile - Loop Track Sta. 29+00 to Sta. 60+00”, Drawing No. 03057-1 (Sheet 7), Revision 1, 20 November, 2003, Design Nine, Inc.
9. “Proposed 150 Car Loop Track, Plan/Profile - Loop Track Sta. 60+00 to Sta. 91+00”, Drawing No. 03057-1 (Sheet 8), Revision 2, 3 December, 2003, Design Nine, Inc.
10. “Proposed 150 Car Loop Track, Plan/Profile - Loop Track Sta. 91+00 to Sta. 101+22.23”, Drawing No. 03057-1 (Sheet 9), Revision 2, 3 December, 2003, Design Nine, Inc.
11. “Proposed 150 Car Loop Track, Detail of Merchants Track Area”, Drawing No. 03057-1 (Sheet 10), Revision 2, 3 December, 2003, Design Nine, Inc.
12. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 0+00 to Sta. 7+20.79”, Drawing No. 03057-1X (Sheet 11), Revision 2, 3 December, 2003, Design Nine, Inc.
13. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 8+00 to Sta. 13+00”, Drawing No. 03057-1X (Sheet 12), Revision 1, 20 November, 2003, Design Nine, Inc.
14. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 14+00 to Sta. 20+00”, Drawing No. 03057-1X (Sheet 13), Revision 2, 3 December, 2003, Design Nine, Inc.
15. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 21+03.74 to Sta. 27+00”, Drawing No. 03057-1X (Sheet 14), Revision 2, 3 December, 2003, Design Nine, Inc.
16. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 27+52 to Sta. 34+00”, Drawing No. 03057-1X (Sheet 15), Revision 2, 3 December, 2003, Design Nine, Inc.
17. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 35+00 to Sta. 42+00”, Drawing No. 03057-1X (Sheet 16), Revision 1, 20 November, 2003, Design Nine, Inc.
18. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 42+95.47 to Sta. 50+00”, Drawing No. 03057-1X (Sheet 17), Revision 1, 20 November, 2003, Design Nine, Inc.
19. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 50+42.36 to Sta. 57+00”, Drawing No. 03057-1X (Sheet 18), Revision 2, 3 December, 2003, Design Nine, Inc.
20. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 58+00 to Sta. 64+49.7”, Drawing No. 03057-1X (Sheet 19), Revision 2, 3 December, 2003, Design Nine, Inc.

Appendix B: Edwards Power Station Drawings (continued)

21. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 65+00 to Sta. 70+00”, Drawing No. 03057-1X (Sheet 20), Revision 2, 3 December, 2003, Design Nine, Inc.
22. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 80+79.67 to Sta. 87+37.4”, Drawing No. 03057-1X (Sheet 21), Revision 1, 20 November, 2003, Design Nine, Inc.
23. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 87+77.4 to Sta. 94+00”, Drawing No. 03057-1X (Sheet 22), Revision 2, 3 December, 2003, Design Nine, Inc.
24. “Proposed 150 Car Loop Track, Cross Sections - Loop Track Sta. 94+65.41 to Sta. 99+00”, Drawing No. 03057-1X (Sheet 23), Revision 2, 3 December, 2003, Design Nine, Inc.
25. “Proposed 150 Car Loop Track, Cross Sections - Wye Track Sta. 94+00 to Sta. 99+00”, Drawing No. 03057-1X (Sheet 24), Revision 2, 3 December, 2003, Design Nine, Inc.
26. “Proposed 150 Car Loop Track, Cross Sections - Runaround Track Sta. 1+23.8 to Sta. 6+86.72”, Drawing No. 03057-1X (Sheet 25), Revision 2, 3 December, 2003, Design Nine, Inc.

NOTE
ABANDON EXISTING DITCH
REROUTE NEW DITCH

DRAINAGE DITCH

BORROW PIT AREA

6 TANDEM TOWERS. SEE CHF 223

EL. 482.0±

6 TOWERS

SECTION LINE

1/8 LINE

STARTING POINT

DRAIN

SEE SHEET #1

SEE G-1913 SH. 2

COAL RECEIVING HOPPER

ASH STORAGE FOR APPROX. 1.7 YEARS. (166,500± CU. YDS.)

516'-0

97'-6

550'-0

SUBSTATION

FUTURE

BASE LINE E.S.W.

475'-0

625'-0

296'-0

166'-0

BASE LINE N.I.S.

H.S. TANK 1

BOILER HOUSE

TURBINE HOUSE

STACK

STAGE 3

163'-0

215'-0

220'-0

Sec. 14 Sec. 11
Sec. 13 Sec. 12

SECTION LINE

CHANNEL LINE

PERMIT LINE

100' EASEMENT

200' EASEMENT

CREST OF LEVEE

PROPERTY LINE

Proposed Route for Gulf Oil Co. Sewer Lines. To Connect into Drain at Outlet End of C.I.L.Co. Culvert.

culvert

D:12"

D:24"

W.L.

435 436 437 438 439 440

NOTES

ALL SLOPES INDICATED ARE TO THE RATIO OF:
"1" HORIZONTAL TO "1" VERTICAL FOR EXCAVATIONS.
"2" HORIZONTAL TO "1" VERTICAL FOR FILLS - PERMANENT SLOPES.
"1" (APPROX.) HORIZONTAL TO "1" VERTICAL FOR FILLS - TEMPORARY SLOPES.
TEMPORARY SLOPES NOTED.

FILL REQ'D. * 137,200 C.Y.
EL. 438' TO EL. 462'

* EXCLUDING ASH STORAGE DIKES AND ROADWAY ENTRANCE AT THE N.W. COR. OF PROPERTY.

UNIT 1

REV.	DATE	DESCRIPTION	BY	APPROVED
F	7/1/60	Roadway Entrance Changed at N. West Cor. N. Property added.	H.S.F.	H.S.F.
E	8/19/59	ADDED FILL AT TRANSMISSION TOWER	W.E.R.	H.S.F.
D	11/15/58	Pile Reqmts & Necessary, 165'-0 (10'-0 Dia. Added) - Ash Storage Levee Relocated) - Fill Around Boiler House Revised.	R.G.D.	H.S.F.
C	12/2/58	Relocated Fill @ N.E. Corner / Added 100'-0 Min. Dimension	R.G.D.	H.S.F.
B	12/2/58	Added Additional Ash Storage Ash Storage Drain - Removed Roadway By Levee - Revised Coal Handling Area.	R.G.D.	H.S.F.
A	7/14/58	Added Ash Retaining Dike - Relocated Fill @ N.E. Corner	R.G.D.	H.S.F.

DESIGN AND DRAWING APPROVED — DATE 8-27-57
H.S.F. — DATE 10-2-57
H.S. Fenwick, Reg. P.E. — DATE 10-2-57
APPROVED A.R.S. Schulweis — DATE 5-6-58

OWNER AND LOCATION
E.D. EDWARDS STATION
CENTRAL ILLINOIS LIGHT CO.
PEORIA, ILLINOIS

PREPARED UNDER RESPONSIBLE SUPERVISION OF
H. S. FENWICK
MICHIGAN PROFESSIONAL REGISTRATION NO. 2954
ILLINOIS STRUCTURAL REGISTRATION NO. 81-2416
AT OFFICES OF
COMMONWEALTH ASSOCIATES INC.
209 E. WASHINGTON AVE., JACKSON, MICH.

TITLE
PLANT SITE FILL
STAGE 3 — FINAL ARR'G'T.

SCALE 1"=100'-0 — DRAWING NO. C175-G1906 — REV. F — SHEET 3

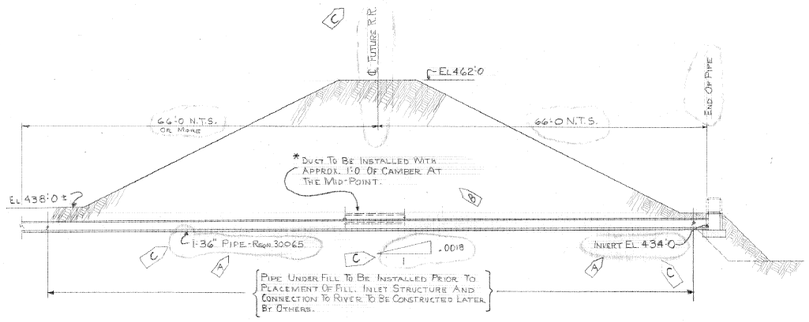
2-20-118-1

PRINTS SENT — AP — 10-27-59

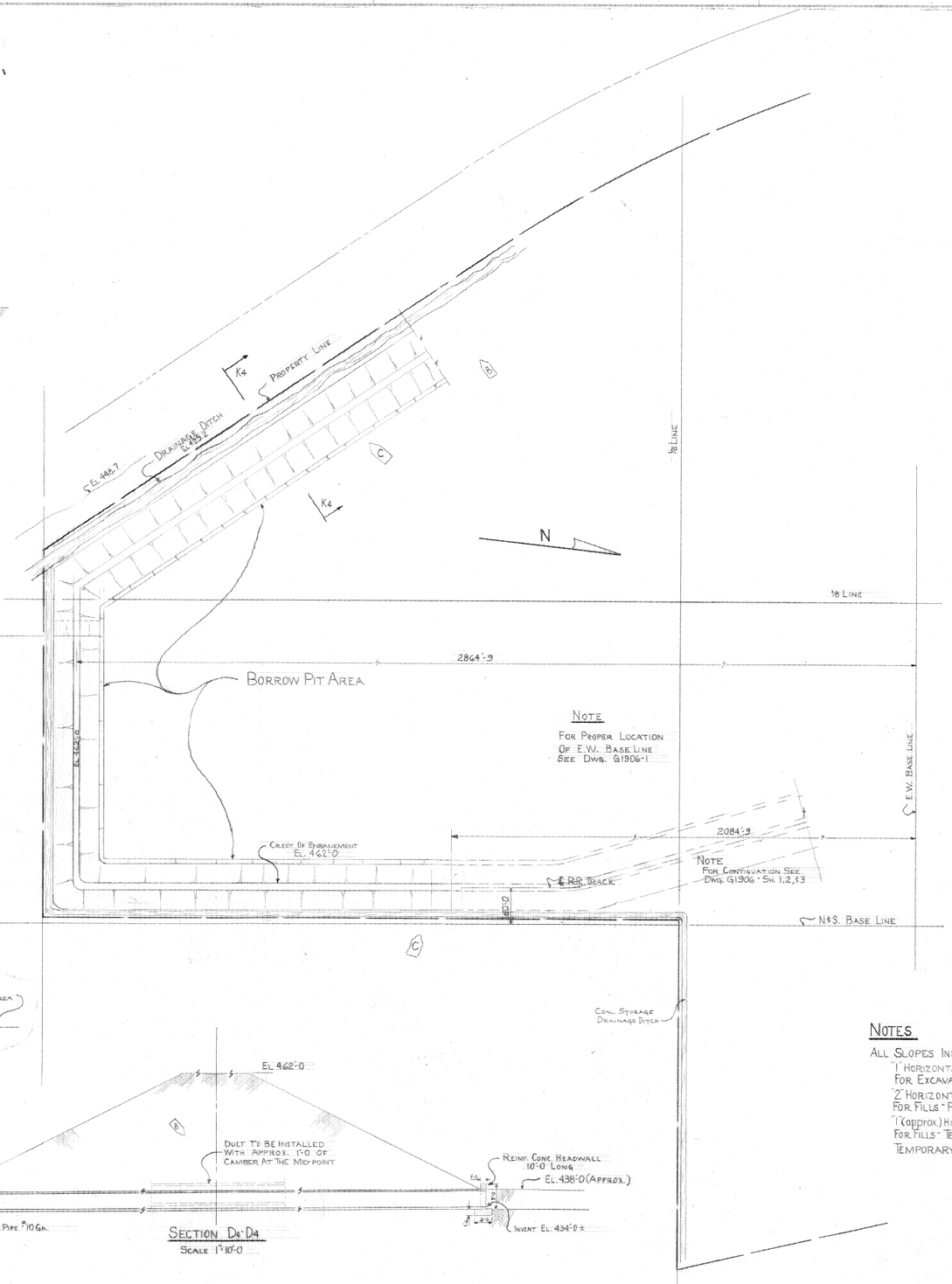
O.K. TO FILE

Cargill & Bolton, Chicago

* FIELD INCREASE IF EXPERIENCE INDICATES THAT A GREATER SETTLEMENT MAY OCCUR.

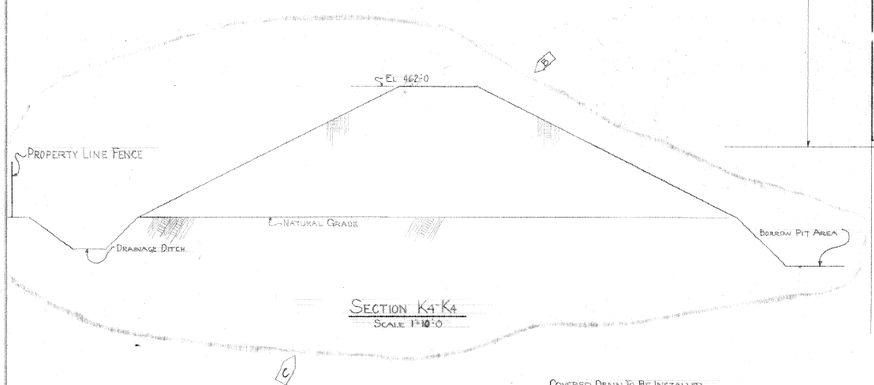


SECTION G4-G4
SCALE 1"=10'-0

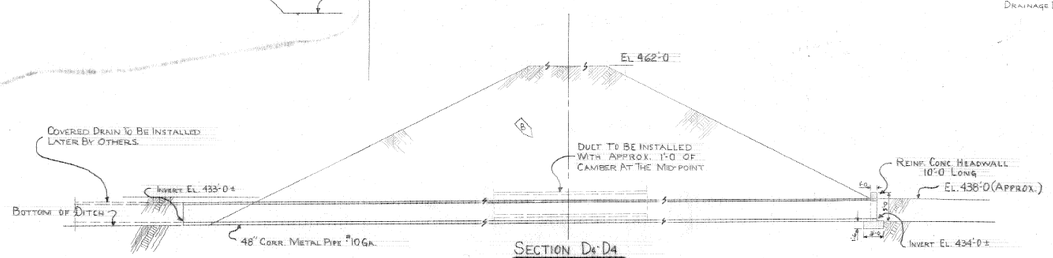


NOTE
FOR PROPER LOCATION OF E.W. BASE LINE SEE DWG. G1906-1

NOTE
FOR CONTINUATION SEE DWG. G1906 - SH. 1,2,&3



SECTION K4-K4
SCALE 1"=10'-0



SECTION D4-D4
SCALE 1"=10'-0

NOTES

ALL SLOPES INDICATED ARE TO THE RATIO OF:
"1" HORIZONTAL TO "1" VERTICAL FOR EXCAVATIONS.
"2" HORIZONTAL TO "1" VERTICAL FOR FILLS - PERMANENT SLOPES.
"1" (APPROX.) HORIZONTAL TO "1" VERTICAL FOR FILLS - TEMPORARY SLOPES.
TEMPORARY SLOPES NOTED.

UNIT 1

REV.	DATE	DESCRIPTION	BY	APPROVED
C	3-4-58	REVISED SECTION K1-K4 & G4-G4, REVISED ATH PIPE ON PLAN ADDED FOR STORAGE DRAINAGE DITCH	R.G. DUNN	H.S.F.
B.	10-31-57	REVISED SECTION K1-K4 - ADDED CAMBER NOTES - REVISED PLAN #K4-K4	R.G. DUNN	H.S.F.
A.	10-3-57	ADDED INVERT EL. @ SEC. G4-G4 - CHANGED PIPE MAT.	R.G. DUNN	H.S.F.

DESIGN AND DRAFTING (SEAL)
R.G. DUNN DATE 9-25-57
H.S.F. DATE 10-2-57
H.S. Fenwick, REG. P.E. DATE 10-3-57
APPROVED W.D. Schilling DATE 5-6-58

PREPARED UNDER RESPONSIBLE SUPERVISION OF
H. S. FENWICK
MICHIGAN PROFESSIONAL REGISTRATION NO. 3934
ILLINOIS STRUCTURAL REGISTRATION NO. 81-20-16
OF OFFICES OF
COMMONWEALTH ASSOCIATES INC.
2200 E. WASHINGTON AVE., JACKSON, MICH.

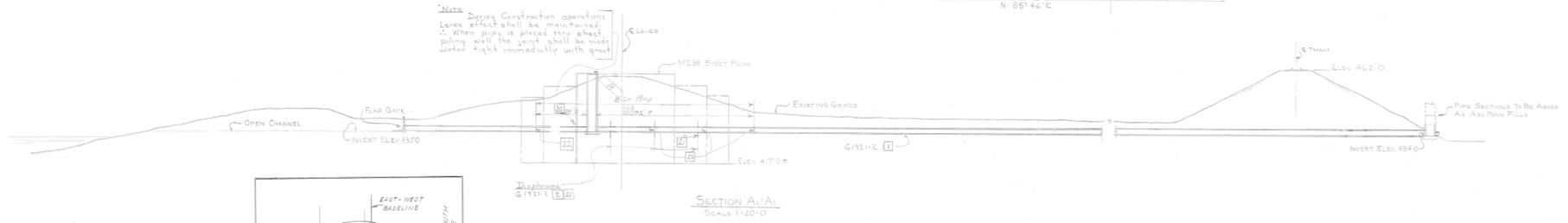
OWNER AND LOCATION
E.D. EDWARDS STATION
CENTRAL ILLINOIS LIGHT CO.
PEORIA, ILLINOIS

TITLE
PLANT SITE FILL
STAGE #1 CONTINUATION

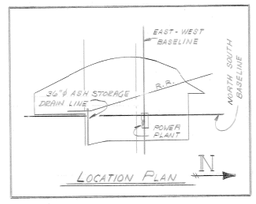
SCALE	DRAWING NO.	REV.	SHEET
1"=100'-0	C175-G1906	C	4
2-20-118-1			

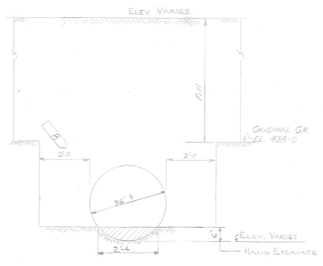
C:\Documents and Settings\ps2622\Local Settings\Temp\60038860-68AD-450E-A34C-B6CB31EF1A09\1175-g1921.sht1.dwg

NOTE: During Construction operations Levee effect shall be maintained. ∴ When pipe is placed thru sheet piling wall the joint shall be made water tight immediately with grout

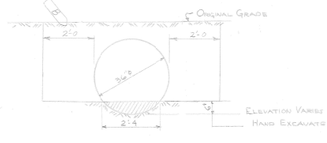


SECTION A1-A1
SCALE 1"=20'-0"





SECTION B1-B1
SCALE ½"=1'-0



SECTION C1-C1
SCALE ½"=1'-0

PIPE MATERIALS & HANDLING

1. DRAIN PIPE SHALL BE 36"ø 16GA. (CORRUGATED PIPE CULVERT CONFORMING TO FEDERAL SPECIFICATIONS QQ-C-806 FOR CULVERTS; IRON OR STEEL, ZINC COATED, TYPE I, OF PURE IRON, COPPER BEARING PURE IRON, COPPER IRON, OR COPPER MOLYBDENUM IRON; AND THE PIPE SHALL BE COATED AS FOLLOWS:

   THE PIPE SHALL BE COATED ON THE INSIDE & OUTSIDE WITH ASBESTOS FIBERS & A BITUMINOUS MATERIAL SIMILAR AND EQUAL TO THAT USED ON "FREE FLOW" DRAINAGE PIPE MANUFACTURED BY REPUBLIC STEEL CO., YOUNGSTOWN, OHIO OR TO THAT USED ON ARMCO "SMOOTH FLO" ASBESTOS BONDED DRAINAGE PIPE MANUFACTURED BY AMERICAN ROLLING MILL CO. MIDDLETOWN, OHIO.

2. THE PIPE SHALL BE LAID ON ORIGINAL EARTH HAND EXCAVATED THE LAST 6" OF DEPTH TO FIT THE CONTOUR OF THE PIPE - TO THE ESTABLISHED GRADIENT AND ALIGNMENT, WITH HORIZONTAL SEAMS OR JOINING SECTIONS AT QUARTER POINTS; PIPE SHALL BE FULL CIRCLED, FREE FROM DENTS AND OTHER DEFECTS; AND SHALL BE CLEANED AND LOWERED INTO THE TRENCH IN SUCH MANNER AS TO AVOID UNNECESSARY HANDLING AND INJURY TO THE PIPE. CONNECTIONS BETWEEN SECTIONS OF PIPE SHALL BE CAREFULLY ADJUSTED AND CONNECTING BANDS SHALL LAP EQUAL DISTANCES ON THE SECTIONS CONNECTED. IMMEDIATELY PRIOR TO CONNECTING, THE LAPPED PORTIONS OF PIPE AND THE CONNECTING BAND SHALL BE GIVEN A 1/16-INCH COATING OF APPROVED BITUMINOUS MATERIAL SIMILAR TO THAT USED FOR COATING THE PIPE. THE BAND SHALL BE DRAWN UP TIGHT TO INSURE A WATER-TIGHT JOINT UNDER AN INTERNAL PRESSURE HEAD OF 24.5 FT. (10.63#/in²)

3. AFTER CONNECTIONS HAVE BEEN COMPLETED AND BACKFILL TAMPED INTO PLACE, ALL JOINTS SHALL BE CAULKED ON THE INSIDE WITH APPROVED BITUMINOUS MATERIAL SIMILAR TO THAT USED FOR COATING THE PIPE, SO MELTED AND APPLIED AS TO FILL THE GAP BETWEEN SECTIONS OF PIPE COMPLETELY AND SEAL THE JOINT EFFECTIVELY. AT ANY PLACE WHERE THE BITUMINOUS COATING HAS BECOME BROKEN SUFFICIENTLY TO EXPOSE THE METAL, PRIOR TO ACCEPTANCE, SUCH DEFECT SHALL BE REMEDIED BY THE APPLICATION OF A NEW COATING.

4. EACH PIPE CULVERT SHALL BE PROVIDED WITH THREE METAL DIAPHRAGMS, LOCATED SYMMETRICALLY ABOUT CENTERLINE OF PIPE AND SPACED 20 FEET ON CENTERS, TRUTHLY AND SECURELY JOINED TO THE PIPE IN SUCH MANNER AS TO PREVENT ANY SEEPAGE BETWEEN PIPE AND DIAPHRAGM. DIAPHRAGMS SHALL BE 8 FEET BY 8 FEET IN SIZE AND MADE FROM 12 GAUGE SHEETS CONFORMING TO FEDERAL SPECIFICATION: QQ-I-716 FOR "IRON AND STEEL; SHEET, BLACK AND ZINC-COATED (GALVANIZED)," TYPE III WITH CLASS C ZINC COATING; AND BASE METAL SHALL BE PURE IRON, COPPER BEARING IRON, COPPER IRON, OR COPPER MOLYBDENUM IRON, AND MADE BY THE OPEN-HEARTH PROCESS. ALL DIAPHRAGM FITTINGS SHALL BE ZINC-COATED. DIAPHRAGMS SHALL BE COATED WITH AN APPROVED BITUMINOUS MATERIAL, NOT LESS THAN 0.03 INCH IN THICKNESS, SIMILAR TO THAT USED FOR COATING THE CULVERT PIPE, AND AFTER PLACING, ALL SEAMS AND JOINTS SHALL BE THOROUGHLY CAULKED WITH SUCH MATERIAL.

5. A 36-INCH CIRCULAR CAST-IRON AUTOMATIC DRAINAGE GATE SIMILAR AND EQUAL TO CALCO MODEL NO. 5CC OF THE ARMCO CULVERT MANUFACTURERS' ASSOCIATION, OR TYTON SLUICE GATE OF THE TOLEDAN CULVERT MANUFACTURERS' ASSOCIATION, SHALL BE PROPERLY CONNECTED TO THE OUTSIDE-DISTRICT END OF EACH CULVERT PIPE. THE SECTION OF PIPE TO WHICH THE GATE IS CONNECTED SHALL BE NOT LESS THAN 20 FEET IN LENGTH. AFTER PLACING, ALL SEAMS AND JOINTS SHALL BE THOROUGHLY CAULKED WITH APPROVED BITUMINOUS MATERIAL SIMILAR TO THAT USED FOR COATING THE PIPE.

6. A 36" CAST IRON SLIDE GATE SIMILAR & EQUAL TO ARMCO DRAINAGE & METAL CO. MODEL 30-05C

EXCAVATION & BACKFILL

1. EXCAVATION OF THE LAST 6" OF MATERIAL SHALL BE HAND EXCAVATED TO FIT THE PERIPHERY OF THE PIPE.

2. BACKFILL THRU LEVEE SHALL BE AN IMPERVIOUS FILL MATERIAL COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR AT 4% ABOVE & 2% BELOW OPTIMUM MOISTURE CONTENT.

UNIT 1

REV.	DATE	DESCRIPTION	BY	APPROVED
C	5-26-78	ADDED EITENSION TO EXISTING ASH POND DRAINAGE SYSTEM PER R. SCHNEER SKETCH.	D. ALEXANDER	
B	9/14/76	ADD BCA PIPE AND TERMINUS CHANGE, INCREASE TRENCH WIDTH	L.G. MILLER	H.S.F.
A	6/7/58	ISSUED FOR CONSTRUCTION	L.G. MILLER	

DESIGNED J. WILSON; DRAWN R.G. DUNN DATE 5-7-58
TRACED L.G. MILLER DATE 6-7-58
CHECKED H.S.F. DATE 6-10-58
APPROVED DATE 6-17-58

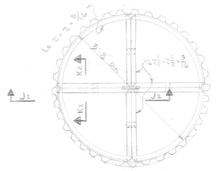
PREPARED UNDER RESPONSIBLE SUPERVISION OF H.S. FENWICK
MICHIGAN PROFESSIONAL REGISTRATION NO. 3896
ILLINOIS STRUCTURAL REGISTRATION NO. 81-2410
AT OFFICES OF COMMONWEALTH ASSOCIATES INC. 209 E. WASHINGTON AVE., JACKSON, MICH.

OWNER AND LOCATION
E.D. EDWARDS STATION
CENTRAL ILLINOIS LIGHT CO.
PEORIA, ILLINOIS

TITLE
CONSTRUCTION THRU LEVEE
ASH POND
DRAINAGE DUCT

DRAWING AS NOTED 220-118-1
DRAWING NO. C175-G1921 REV. C SHEET 1

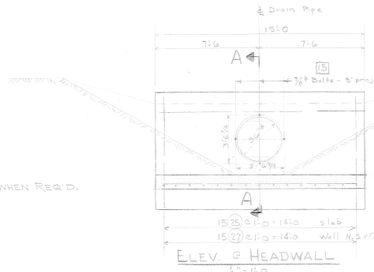
INPUT BY ... PLOT BY ... CHECKED BY ... Info Const Copy



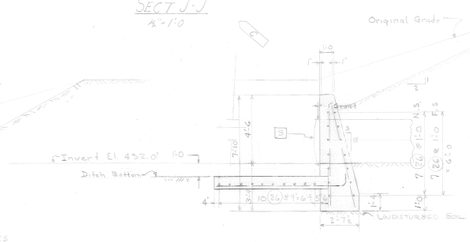
PLAN - Mk 14

NOTE
FIELD FURNISH WHEN REQ'D.

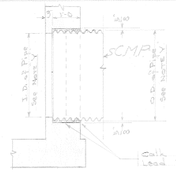
DEBRIS SKIMMER
Frame to be Heavily Galvanized.
Scale ½"=1'-0"



ELEV. ℄ HEADWALL
½"=1'-0

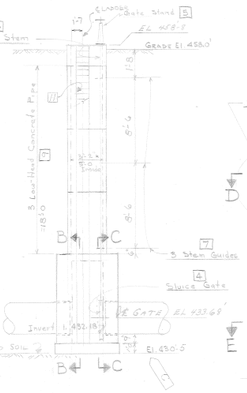


SECT A-A
½"=1'-0

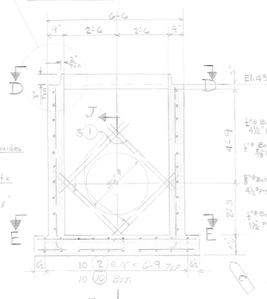


SECT J-J
½"=1'-0

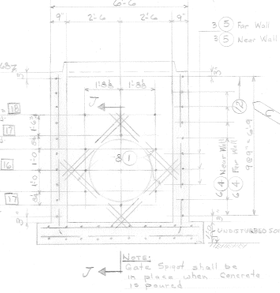
NOTE Y
Field check I.D. & O.D. of pipe before recess is formed.



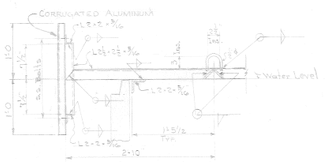
ELEV. OF SLUICE GATE PIT
LOOKING SOUTH



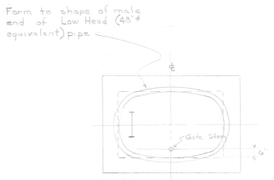
SECT B-B
½"=1'-0



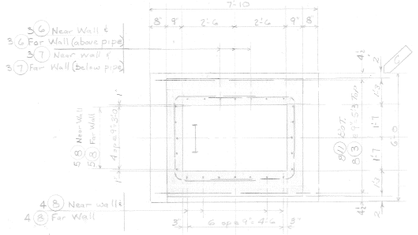
SECT CC
½"=1'-0



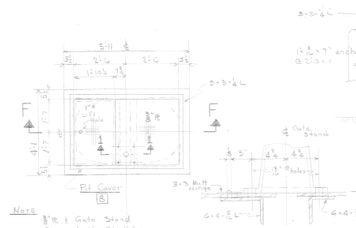
SECTION J2-J2
SCALE 1"=1'-0



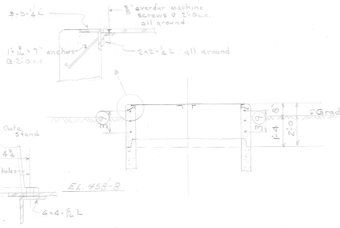
SECT D-D
½"=1'-0



SECT E-E
½"=1'-0



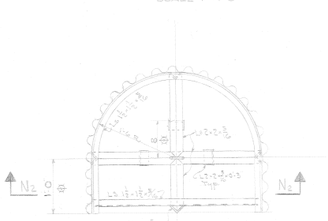
PLAN & TOP OF GATE PIT
½"=1'-0



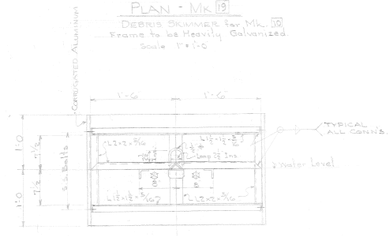
SECT 1-1

SECT F-F
½"=1'-0

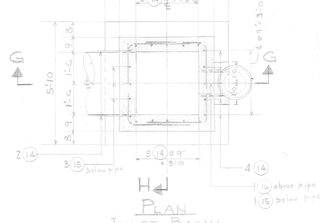
BAR SUMMARY			
SIZE	STR	BENT	WEIGHT
7	409	891	1290
6	576	94	670
4	88	178	266
TOTAL	1073	1163	2226



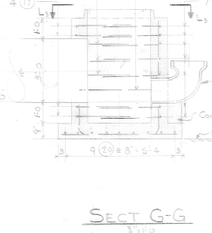
PLAN - Mk 19
DEBRIS SKIMMER for Mk. 10
Frame to be Heavily Galvanized.
Scale 1"=1'-0



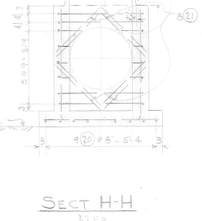
SECTION N2-N2
SCALE 1"=1'-0



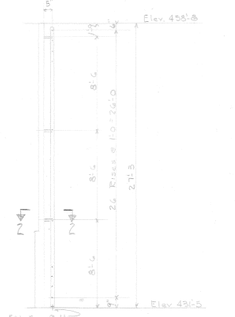
PLAN
INLET BASIN
½"=1'-0



SECT G-G
½"=1'-0

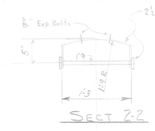


SECT H-H
½"=1'-0



ELEV. OF LADDER

NOTE X
Field check with pipe before forming.



SECT 7-7

MISC. STR. STEEL ITEMS		
ITEM	DESCRIPTION	WT.
8	P.T. FRAME & COVER	445#
11	LADDER	278#

BILL OF MISCELLANEOUS MATL.

Location	Item No.	Quan.	Description	Purch. Local	Req'n No.
G 1921-1	G1921-2 1	1085'	36"ø Corr. Metal Pipe		30065
"			Asphalt & Asbestos Lined		
"	2	2	80 sq. ft Galv. Galk.		30065
			Diaphrams		
G 1921-2	3	1	36"ø Flap Gate		30104
			Armco Model 36c or		
			Equal (Mfr. to submit Shop Dwg. for approval)		
"	4	1	Sluice Gate - 36"ø		
			Armco Model 30-05c		
			or Equal with C.I. Seating Surfaces & Spigot Back		
"	5	1	Sluice Gate Stand Armco		
			Model "CPE-2" or Equal		
"	6	1	Sluice Gate Stem 1½"ø		
			Hot Rolled Steel Class		
			with splice @ mid length		
"	7	3	Sluice Gate Stem Guides		30104
			Armco Type "I" or Equal Item		
"	8	1	Sluice Gate Pit Frame &		30088
			Cover		
"	9	3	60° Sections of		30087
			45°ø Equivalent Lo-head		
			Concrete pipe (ASTM C76 Class B)		
"	10	1	12"ø Conc. Bell & Spig. Elbow		30087
"	11	1	Ladder As Detailed		30088
G1921-3	12	LOT	Sheet Piling		30080
"	13	LOT	Waler & Bracing See List on G1921-2		30090
G1921-2	14	1	Debris Skimmer		Field Furn.
"	15	4	⅞ x12" Bolts for Anchor Bars w/Nuts		30104
"	16	6	⅞ x 12½ Anchor Bolts		30104
"	17	2	½" x 3" Anchor Bolts		30104
"	18	2	⅝ x 12" Anchor Bolts		30104
"	19	1	Debris Skimmer (Mk 10)		Field Furn.
G1921-1	G1921-2 20	96'	36" Dia. Conc. Metal Pipe		30386
			90° Asphalt & Asbestos Lined		
"	G1921-2 21	1	8'-0" x 2'-6" 12 Ga. Galv. Diaphragm		30386
"	" 22	4	Asphaltic Zinc Coat. Armco Clamped 36" Dia. Conc. Pipe Bands 2'-9" Lg. of Armco Rods (3 Sets) w/Armco Sealing Compound Per Spec. (QQ-C-326).		30386
G1921-2	23	Lot	Galvm-Tarred & Oiled		Field Furn.
"	24	Lot	Lead Wool		"

BAR LIST (Reinforcing Bars)

LOCATION	MARK	NO. REQ'D	SIZE	SHAPE	LGTH	WT.	BEND. DIAG.
Gate Pit	1	16	7	Str.	4'-9	155	
" "	2	10	"	"	5'-6	112	
" "	3	8	"	"	6'-4	109	
" "	4	12	"	Bent	11'-10	214	
" "	5	6	"	"	6'-4	78	
" "	6	6	"	Str.	5'-10	57	
" "	7	6	"	Bent	5'-3	40	
" "	8	18	"	"	9'-9	235	
" "	9	6	"	"	13'-6	165	
" "	10	10	7	Str.	6'-6	112	Field Furnish
" "	11	8	7	Str.	7'-6	182	
" "	12	2	7	Bent	11'-10	58	
Inlet Basin	14	16	4	Bent	7'-3	78	
" "	15	4	"	"	3'-3	9	
" "	16	1	"	Str.	2'-9	2	
" "	17	21	"	Bent	9'-8	71	
" "	18	2	"	"	5'-6	7	
" "	19	6	"	"	3'-4	13	
" "	20	18	"	Str.	5'-10	70	
" "	21	8	"	"	3'-0	16	
Headwall	25	16	5	Bent	6'-0	84	
"	26	24	5	Str.	14'-4	856	
"	27	30	5	Str.	7'-0	220	

NOTES:
BARS SHALL BE TAGGED WITH DRAWING No. AND MK. No. - EXAMPLE:
G-1921-1 - (1)
DRAWING No. / SHEET No. / MARK

All concrete shall attain a compression strength of 3000 #/in² after 28 days

UNIT 1

REV.	DATE	DESCRIPTION	BY	APPROVED
C	8/29/58	ADD 20/21/22; ADD (11) (12) AND INCREASE THICKNESS OF P.T. SLAB TO 12"; ADD SECT J-J	L.G.M.	H.S.F.
B	9/14/58	ITEMS 14 THRU 13 ADDED - SECTIONS L2-L2 ADDED	R.G.D.	H.S.F.
A	4/16/58	ITEMS ADDED TO 8/M	J.I. BROWN	H.S.F.
D	3/3/58	Debris Skimmers Mk 14 & Mk 19 released.	H.S.F.	H.S.F.

DRAWN BY John W. Wilcox DATE 5-22-58
CHECKED BY L.G. Minner DATE 6-7-58
H. S. Fenwick REG. P.E. DATE 6-10-58
APPROVED BY H.D. Schilling DATE 6-17-58

(SEAL)

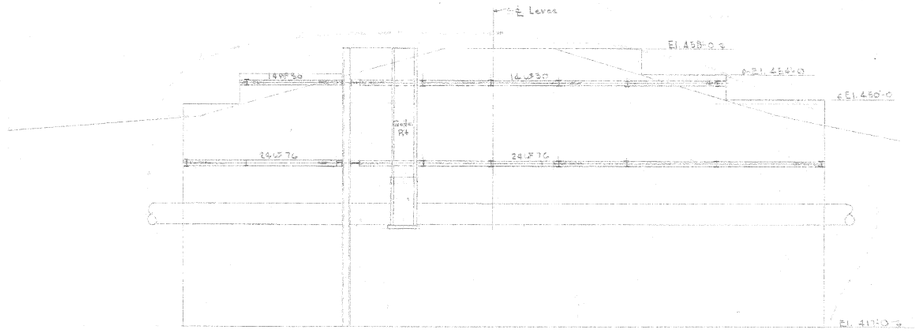
PREPARED UNDER RESPONSIBLE SUPERVISION OF
H. S. FENWICK
MICHIGAN PROFESSIONAL REGISTRATION NO. 3954
ILLINOIS STRUCTURAL REGISTRATION NO. 81-2416
AT OFFICE OF
COMMONWEALTH ASSOCIATES INC.
208 E. WASHINGTON AVE. JACKSON, MICH.

OWNER AND LOCATION
E.D. EDWARDS STATION
CENTRAL ILLINOIS LIGHT CO.
PEORIA, ILLINOIS

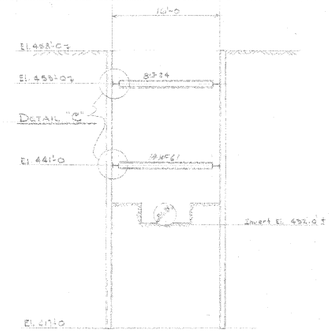
CONSTRUCTION THRU LEVER
ASH POND
DRAINAGE DUST DETAILS

SCALE 3-20-118-1
DRAWING NO. C 175-G1921
REV. D
SHEET 2

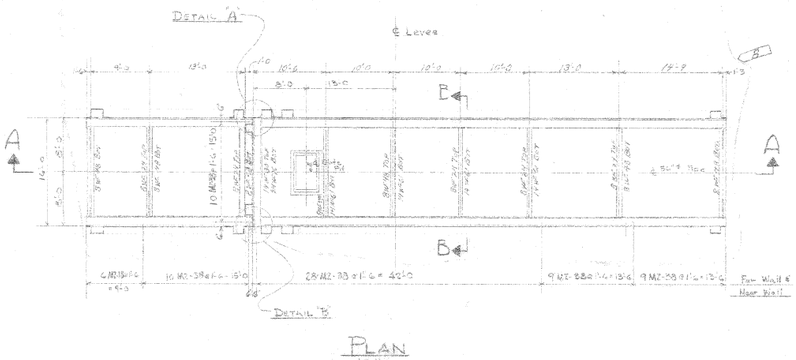
OK TO FILE



SECT A-A
3/16"=1'-0



SECT B-B
3/16"=1'-0



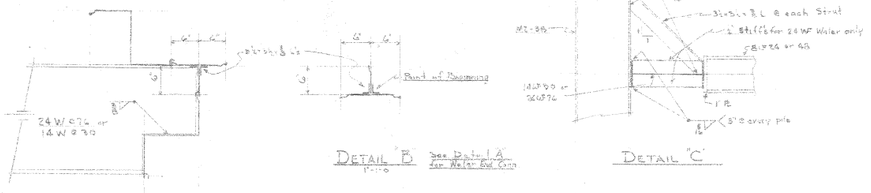
PLAN
1/16"=1'-0

SEE ITEM 18
B/M G 1821-2

MATERIALS LIST
BRACES AND WALES

1	5 PCS.	8WF24 BRACES	13'-9"	LONG
2	7 PCS.	8WF48 "	12'-1"	"
3	1 PC.	24WF76 WALE	16'-0"	"
4	4 PCS.	24WF76 "	34'-0"	"
5	2 PCS.	24WF76 "	24'-9"	"
6	1 PC.	14WF30 "	16'-0"	"
7	2 PCS.	14WF30 "	15'-0"	"
8	2 PCS.	14WF30 "	22'-0"	"
9	2 PCS.	14WF30 "	34'-0"	"
10	24 PCS.	L3½ x 3½ x ½ BRACES	2'-0"	"
	APPROX WT.	15 TONS		
11	4 PCS.	14WF61 WALE	12'-1"	LONG (SHIMS FROM SO. END CUTOFF WALL)

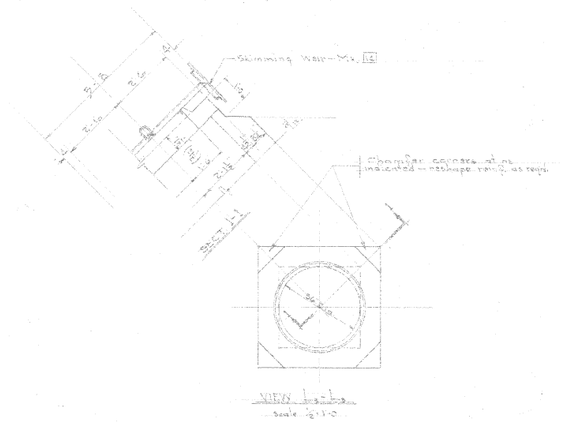
SEE DWG G1923-1 ITEM 18



DETAIL "A"
1"=1'-0

DETAIL "B" See Detail 1A for Water Exit Con
1"=1'-0

DETAIL "C"



VIEW looking
Scale 1/2"=1'-0

UNIT 1

REV.	DATE	DESCRIPTION	BY	APPROVED
B	4/4/58	Revise Strut Spacing, Add Invert Struts	L.G.M.	H.S.F.
A	4/4/58	ISSUED FOR CONSTRUCTION	L.G. Miller	H.S.F.

DESIGN AND DRAWING APPROVED BY: John W. Wilson DATE 3-28-58; CHKD A.E. MILLAR DATE 6-7-58; H.S. Fenwick P.E. DATE 6-10-58; Otto Schmeling DATE 6-17-58

SEAL

DESIGNED UNDER SUPERVISION OF: H. S. FENWICK, ILLINOIS PROFESSIONAL REGISTRATION NO. 3954, ILLINOIS STRUCTURAL REGISTRATION NO. 81-5416; AT CONSULTANT: COMMONWEALTH ASSOCIATES, INC., 209 E. WASHINGTON AVE., JACKSON, MICH.

OWNER AND LOCATION: E.D. EDWARDS STATION, CENTRAL ILLINOIS LIGHT CO, PEORIA, ILLINOIS

TITLE: CONSTRUCTION THERM. LEVEE, ASH POND DRAINAGE UNIT, CUTOFF WALL & CORNER DETAILS

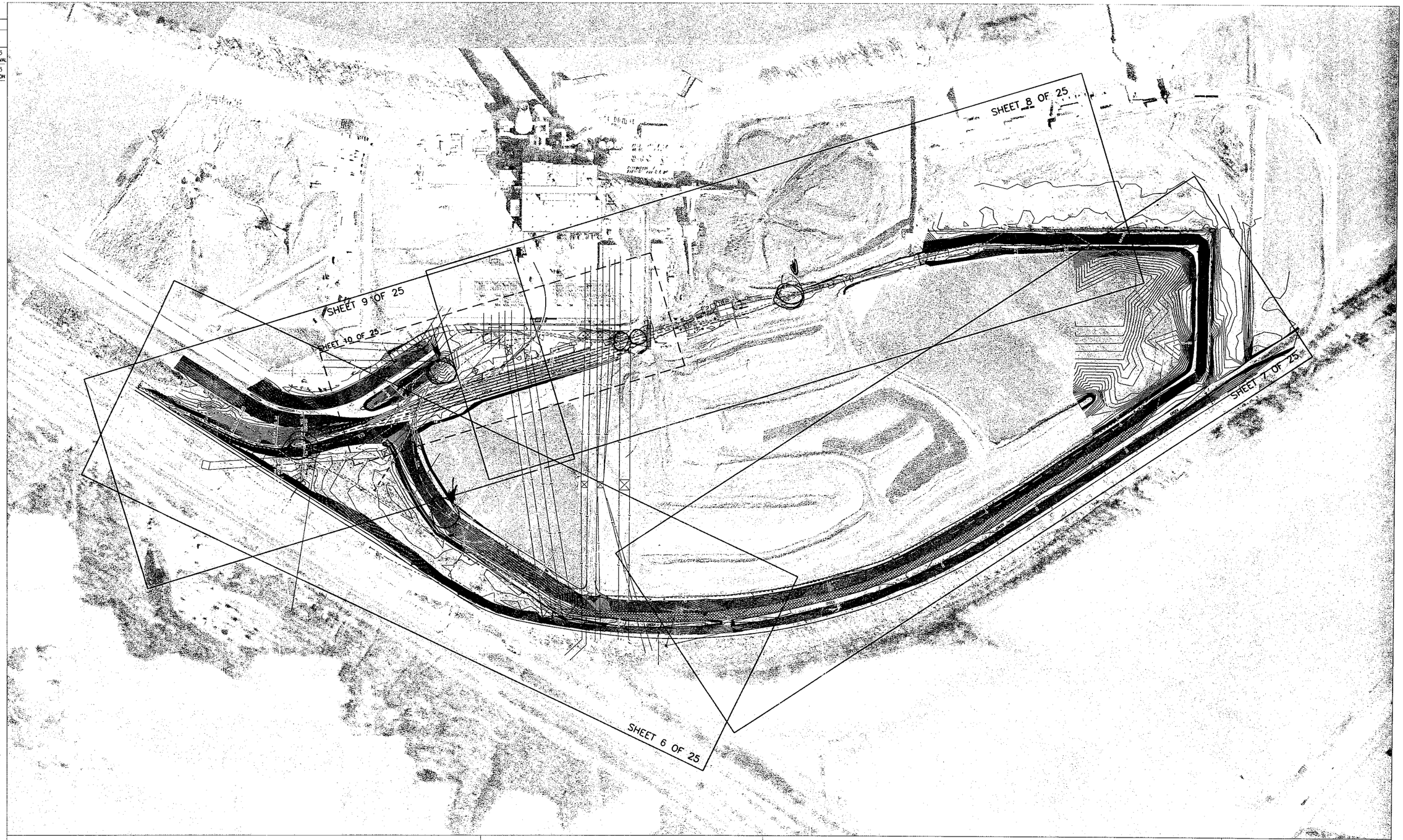
DRAWING NO. C-173-81921; REVISION B; SHEET 3

DRAWN 3-20-58-1

PRINT DIST.

REVISIONS		
REV.	W.O.	
0		11/05/03 PRELIMINARY FOR APPROVAL
1		11/20/03 ISSUED FOR CONSTRUCTION

T:\2003\AmerenIEdwards\Design-off ROW & pond\03057-1.dwg, General Plan, 12/5/2003 12:18:27 PM, SPH



LEGEND:

- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISITING POINT OF SWITCH (P.SW.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.SW.)

0 100 200 400
SCALE 1"=200'

ISSUED FOR CONSTRUCTION

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

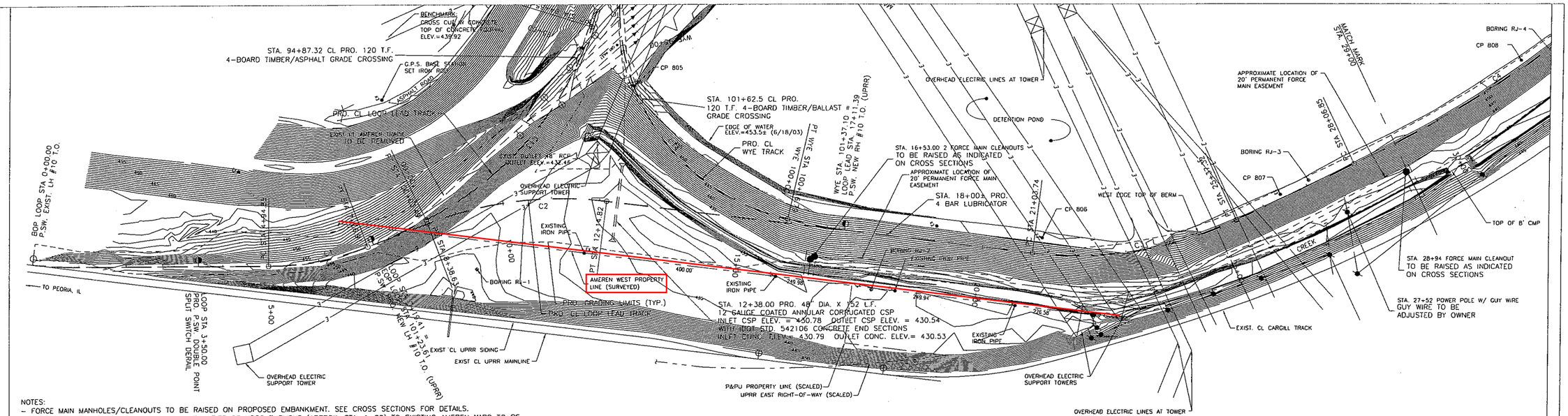
DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH	PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS		
CHKD	GTH			
SUPV.				
APPD		LOCATION		CLASS
		GENERAL PLAN		
AmerenCILCO	ST. LOUIS, MISSOURI	DRAWING NO	SHEET NO	REV.
		03057-PL	5 OF 25	1

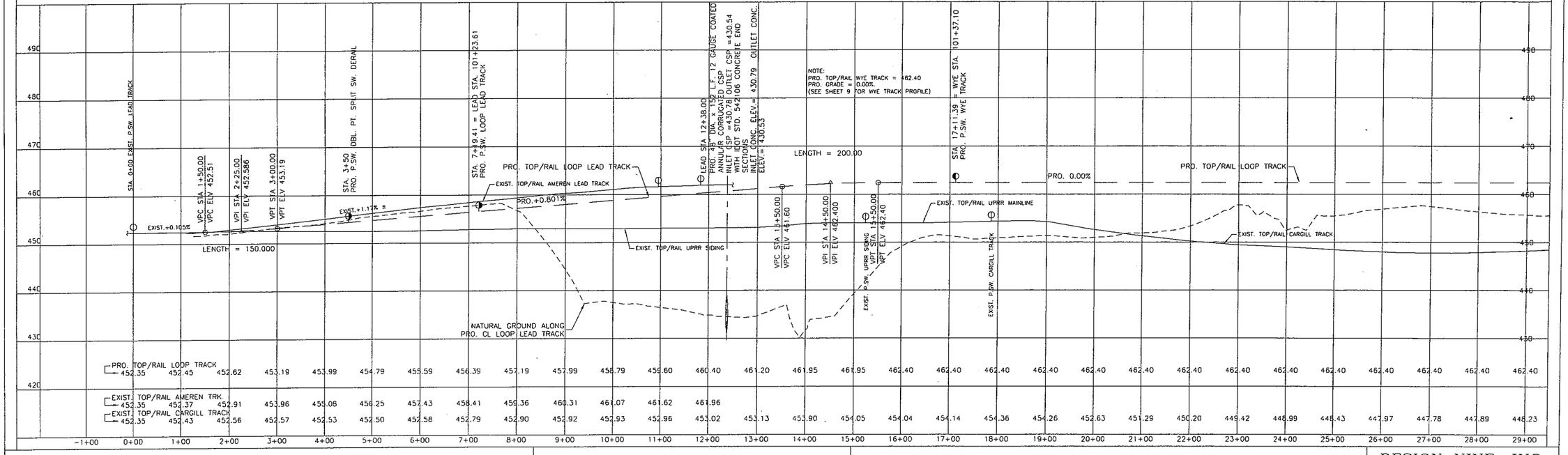
PRINT DIST.

REVISIONS		
REV.	W.O.	
0		11/05/03 PRELIMINARY FOR APPROVAL
1		11/20/03 ISSUED FOR CONSTRUCTION
2		12/03/03 ISSUED FOR CONSTRUCTION



NOTES:
- FORCE MAIN MANHOLES/CLEANOUTS TO BE RAISED ON PROPOSED EMBANKMENT. SEE CROSS SECTIONS FOR DETAILS.
- EXISTING AMEREN TRACK FROM END OF SWITCH TIES OF UPRR TURNOUT (APPROX. STA. 1+20) TO EXISTING AMEREN YARD TO BE REMOVED. GRADING PERFORMED & SUBBALLAST PLACED (SEE CROSS SECTIONS) DURING DUMP HOUSE WORK OUTAGE.
- EXISTING YARD LEAD TURNOUTS TO BE REMOVED, REHABILITATED AS REQUIRED AND REINSTALLED AT PROPOSED LOCATIONS. EXTRA TURNOUTS TO BE DISMANTLED WITH SALVAGEABLE MATERIALS STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EXISTING LEAD TRACK AND YARD TRACK TO BE REMOVED TO THE LIMITS REQUIRED BY THE PROPOSED WORK. SALVAGEABLE MATERIALS TO BE STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EMBANKMENT CONSTRUCTION DETAILED ON CROSS SECTIONS PURSUANT TO REITZ & JENS, INC.
- DESIGN TOP/RAIL TO DESIGN TOP/SUBBALLAST IS 2.21' WITH 136# RAIL.

LEAD C1	LEAD C2	LEAD C3	LEAD C4	LEAD C13	WYE C14
D = 10°00'00"	D = 7°30'00"	D = 7°30'00"	D = 2°15'00"	D = 8°30'00"	D = 12°45'00"
R = 573.69'	R = 764.49'	R = 764.49'	R = 2546.64'	R = 674.69'	R = 450.31'
Δ = 21°10'44"	Δ = 28°11'38"	Δ = 32°29'45"	Δ = 33°29'31"	Δ = 45°41'42"	Δ = 102°31'42"
T = 107.25'	T = 191.98'	T = 222.80'	T = 766.25'	T = 284.27'	T = 561.36'
Lc = 211.79'	Lc = 375.92'	L = 433.28'	Lc = 1488.53'	Lc = 537.59'	Lc = 804.14'
Lo = 212.06'	Lo = 376.19'	Lo = 433.56'	Lo = 1488.62'	Lo = 538.08'	Lo = 805.81'
E = 9.94'	E = 23.74'	E = 31.80'	E = 112.78'	E = 57.44'	E = 269.34'



LEGEND:
- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- EXISTING PROPERTY LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISITING POINT OF SWITCH (P.SW.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.SW.)

0 50 100 200
SCALE: 1"=100'

ISSUED FOR CONSTRUCTION

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.

DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS

LOCATION	PLAN/PROFILE - LOOP/WYE TRACK LOOP STA. 0+00 TO STA. 29+00	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1	SHEET NO. 6 OF 25	REV. 2

T:\2003\AmerenEdwards\Design-off ROW & pond\03057-1.dwg, Plan-Prof 100' (1), 12/5/2003 1:27:10 PM, SPH

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REVISIONS	
REV.	W.O.
0	11/05/03
PRELIMINARY FOR APPROVAL	
1	11/20/03
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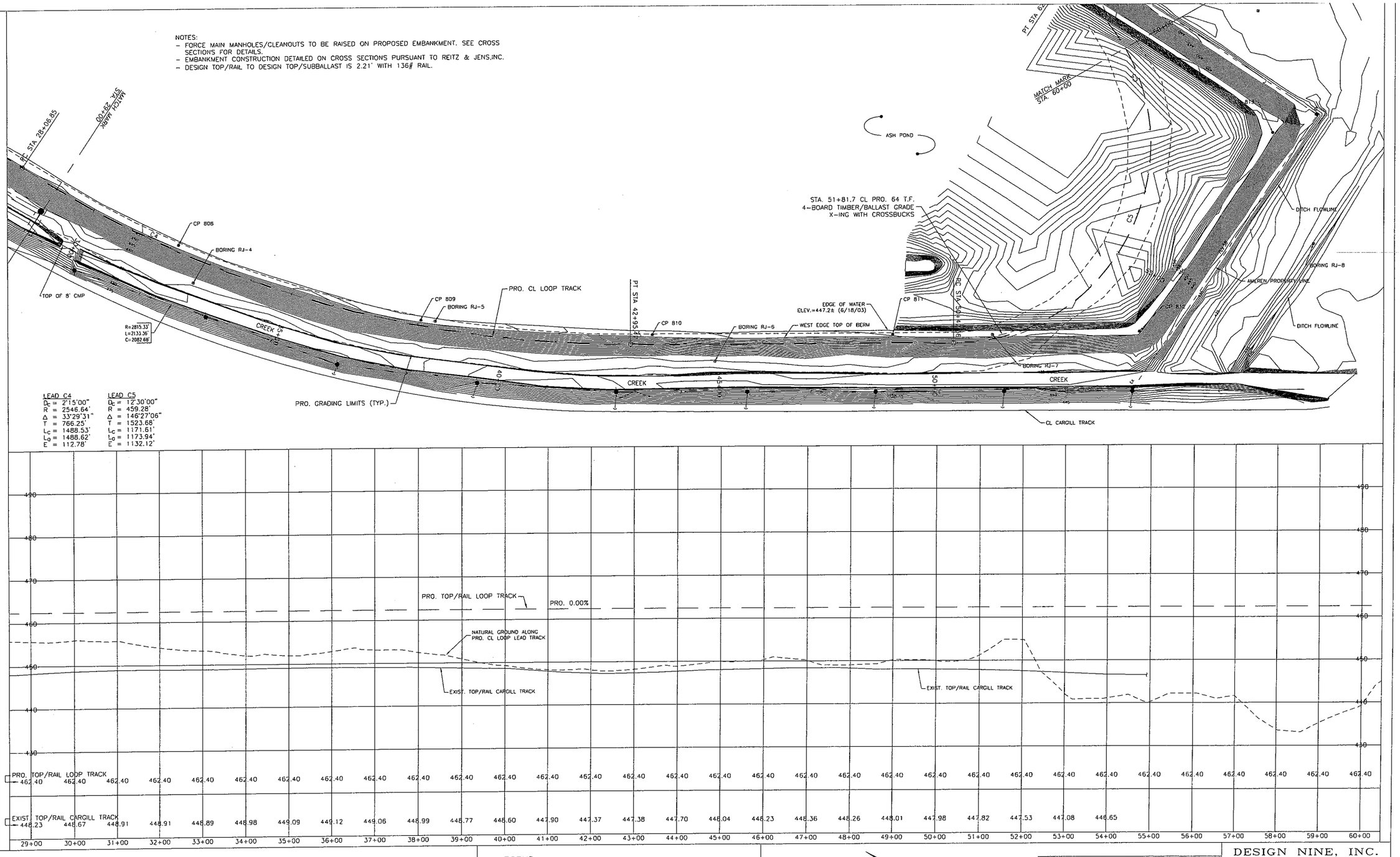
NOTES:
- FORCE MAIN MANHOLES/CLEANOUTS TO BE RAISED ON PROPOSED EMBANKMENT. SEE CROSS SECTIONS FOR DETAILS.
- EMBANKMENT CONSTRUCTION DETAILED ON CROSS SECTIONS PURSUANT TO REITZ & JENS,INC.
- DESIGN TOP/RAIL TO DESIGN TOP/SUBBALLAST IS 2.21' WITH 136# RAIL.



LEAD C4
D_C = 2°15'00"
R = 2546.64'
Δ = 33°29'31"
T = 766.25'
L_C = 1488.53'
L_d = 1488.62'
E = 112.78'

LEAD C5
D_C = 12°30'00"
R = 459.28'
Δ = 146°27'06"
T = 1523.68'
L_C = 1171.61'
L_d = 1173.94'
E = 1132.12'

LEGEND:
- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- EXISTING PROPERTY LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISISTING POINT OF SWITCH (P.SW.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.SW.)

0 50 100 200
SCALE: 1"=100'

ISSUED FOR CONSTRUCTION

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH	PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS	
CHKD.	GTH		
SUPV.			
APPD.		LOCATION	PLAN/PROFILE - LOOP TRACK STA. 29+00 TO STA. 60+00
		ST. LOUIS, MISSOURI	CLASS
AmerenCILCO		DRAWING NO. 03057-1	SHEET NO. 7 OF 25
			REV. 1

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PRINT DIST.		
REVISIONS		
REV.	W.O.	
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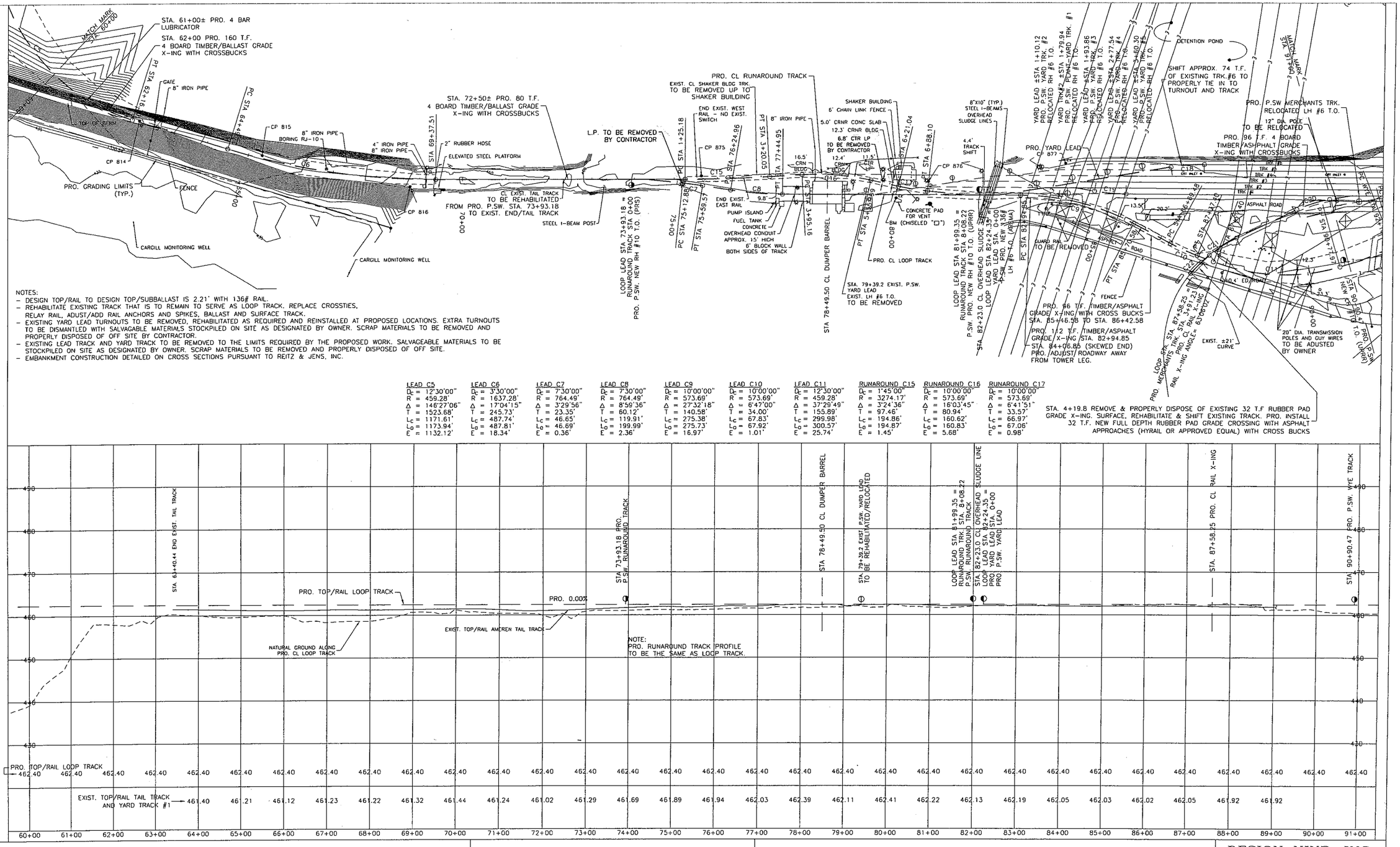
1 ISSUED FOR CONSTRUCTION	11/20/03	
2 ISSUED FOR CONSTRUCTION	12/03/03	



NOTES:
- DESIGN TOP/RAIL TO DESIGN TOP/SUBBALLAST IS 2.21' WITH 136# RAIL.
- REHABILITATE EXISTING TRACK THAT IS TO REMAIN TO SERVE AS LOOP TRACK. REPLACE CROSSTIES, RELAY RAIL, ADJUST/ADD RAIL ANCHORS AND SPIKES, BALLAST AND SURFACE TRACK.
- EXISTING YARD LEAD TURNOUTS TO BE REMOVED, REHABILITATED AS REQUIRED AND REINSTALLED AT PROPOSED LOCATIONS. EXTRA TURNOUTS TO BE DISMANTLED WITH SALVAGABLE MATERIALS STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE BY CONTRACTOR.
- EXISTING LEAD TRACK AND YARD TRACK TO BE REMOVED TO THE LIMITS REQUIRED BY THE PROPOSED WORK. SALVAGEABLE MATERIALS TO BE STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EMBANKMENT CONSTRUCTION DETAILED ON CROSS SECTIONS PURSUANT TO REITZ & JENS, INC.

LEAD C5	LEAD C6	LEAD C7	LEAD C8	LEAD C9	LEAD C10	LEAD C11	RUNAROUND C15	RUNAROUND C16	RUNAROUND C17
D_C = 12°30'00"	D_C = 3°30'00"	D_C = 7°30'00"	D_C = 7°30'00"	D_C = 10°00'00"	D_C = 10°00'00"	D_C = 12°30'00"	D_C = 145°00"	D_C = 10°00'00"	D_C = 10°00'00"
R = 459.28'	R = 1637.28'	R = 764.49'	R = 764.49'	R = 573.69'	R = 573.69'	R = 459.28'	R = 3274.17'	R = 573.69'	R = 573.69'
Δ = 146°27'06"	Δ = 17°04'15"	Δ = 3°29'56"	Δ = 8°59'36"	Δ = 27°32'18"	Δ = 6°47'00"	Δ = 37°29'49"	Δ = 3°24'36"	Δ = 16°03'45"	Δ = 6°41'51"
T = 1523.68'	T = 245.73'	T = 23.35'	T = 60.12'	T = 140.58'	T = 34.00'	T = 155.89'	T = 97.46'	T = 80.94'	T = 33.57'
L_C = 1171.61'	L_C = 487.74'	L_C = 46.65'	L_C = 119.91'	L_C = 275.38'	L_C = 67.83'	L_C = 299.98'	L_C = 194.86'	L_C = 160.62'	L_C = 66.97'
L_O = 1173.94'	L_O = 487.81'	L_O = 46.69'	L_O = 199.99'	L_O = 275.73'	L_O = 67.92'	L_O = 300.57'	L_O = 194.87'	L_O = 160.83'	L_O = 67.06'
E' = 1132.12'	E' = 18.34'	E' = 0.36'	E' = 2.36'	E' = 16.97'	E' = 1.01'	E' = 25.74'	E' = 1.45'	E' = 5.68'	E' = 0.98'

LEGEND:
- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- EXISTING PROPERTY LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISITING POINT OF SWITCH (P.S.W.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.S.W.)

0 50 100 200
SCALE: 1"=100'

ISSUED FOR CONSTRUCTION

NOTICE OF LIMITED RESPONSIBILITY
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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	-
APPD.	-

PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS

LOCATION	PLAN/PROFILE - LOOP TRACK STA. 60+00 TO STA. 91+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1	SHEET NO. 8 OF 25
AmerenCILCO		REV. 2

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REVISIONS		
REV.	W.O.	
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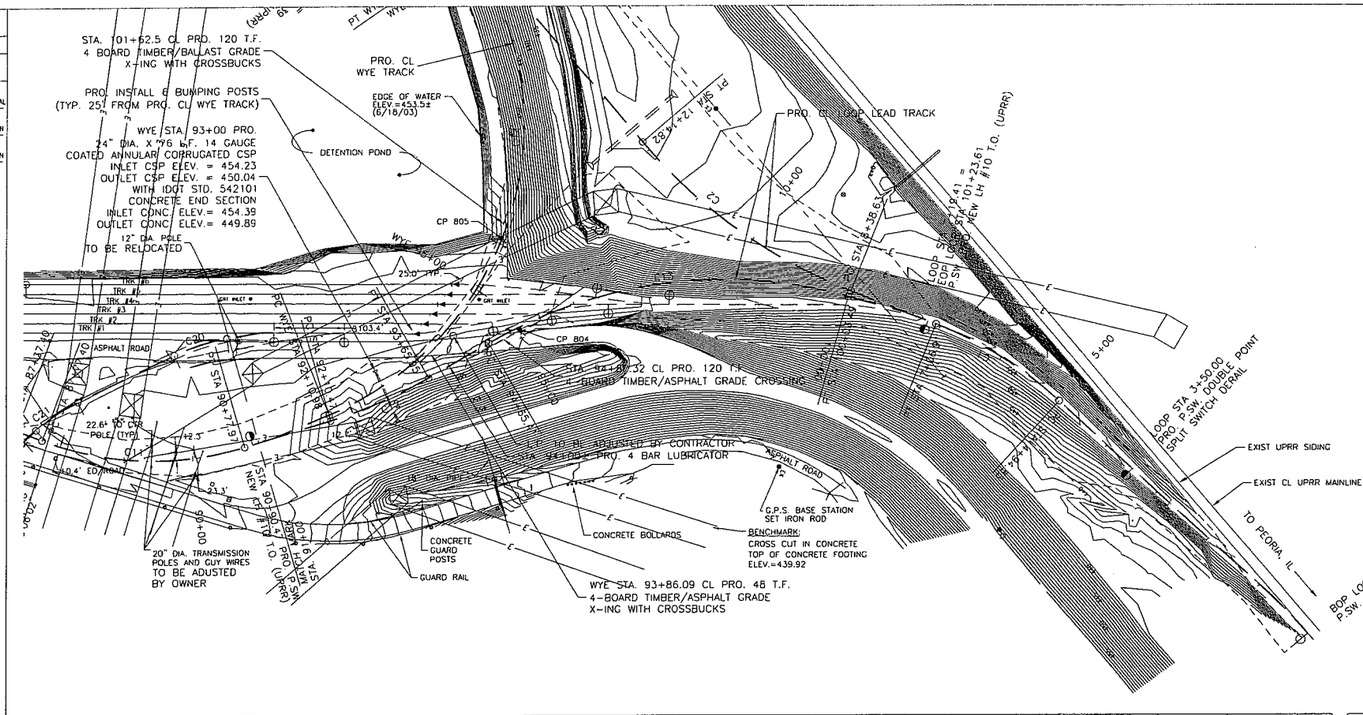
1		11/20/03 ISSUED FOR CONSTRUCTION
2		12/03/03 ISSUED FOR CONSTRUCTION



NOTES:
- EXISTING AMEREN TRACK FROM END OF SWITCH TIES OF UPRR TURNOUT (APPROX. STA. 1+20) TO EXISTING AMEREN YARD TO BE REMOVED, GRADING PERFORMED & SUBBALLAST PLACED (SEE CROSS SECTIONS) DURING DUMP HOUSE WORK OUTAGE.
- EXISTING YARD LEAD TURNOUTS TO BE REMOVED, REHABILITATED AS REQUIRED AND REINSTALLED AT PROPOSED LOCATIONS. EXTRA TURNOUTS TO BE DISMANTLED WITH SALVAGEABLE MATERIALS STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EXISTING LEAD TRACK AND YARD TRACK TO BE REMOVED TO THE LIMITS REQUIRED BY THE PROPOSED WORK. SALVAGEABLE MATERIALS TO BE STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EMBANKMENT & CONSTRUCTION DETAILED ON CROSS SECTIONS PURSUANT TO RENTZ & JENS, INC.
- DESIGN TOP/RAIL TO DESIGN TOP/SUBBALLAST IS 2.21' WITH 136# RAIL.

LEAD C1
D_C = 10°00'00"
R = 573.69'
Δ = 21°10'44"
T = 107.25'
L_C = 211.79'
L_O = 212.06'
E = 9.94'

LEAD C2
D_C = 7°30'00"
R = 764.49'
Δ = 28°11'38"
T = 191.98'
L_C = 375.92'
L_O = 376.19'
E = 23.74'

LEAD C9
D_C = 10°00'00"
R = 573.69'
Δ = 27°32'18"
T = 140.58'
L_C = 275.38'
L_O = 275.73'
E = 16.97'

LEAD C10
D_C = 10°00'00"
R = 573.69'
Δ = 6°47'00"
T = 34.00'
L_C = 67.83'
L_O = 67.92'
E = 1.01'

LEAD C11
D_C = 12°30'00"
R = 459.28'
Δ = 37°29'49"
T = 155.89'
L_C = 299.98'
L_O = 300.57'
E = 25.74'

LEAD C12
D_C = 8°45'00"
R = 655.45'
Δ = 13°35'29"
T = 78.11'
L_C = 155.33'
L_O = 155.48'
E = 4.64'

LEAD C13
D_C = 8°30'00"
R = 674.69'
Δ = 45°41'42"
T = 284.27'
L_C = 537.59'
L_O = 538.08'
E = 57.44'

WYE C14
D_C = 12°45'00"
R = 450.31'
Δ = 102°31'42"
T = 561.36'
L_C = 804.14'
L_O = 805.81'
E = 269.34'

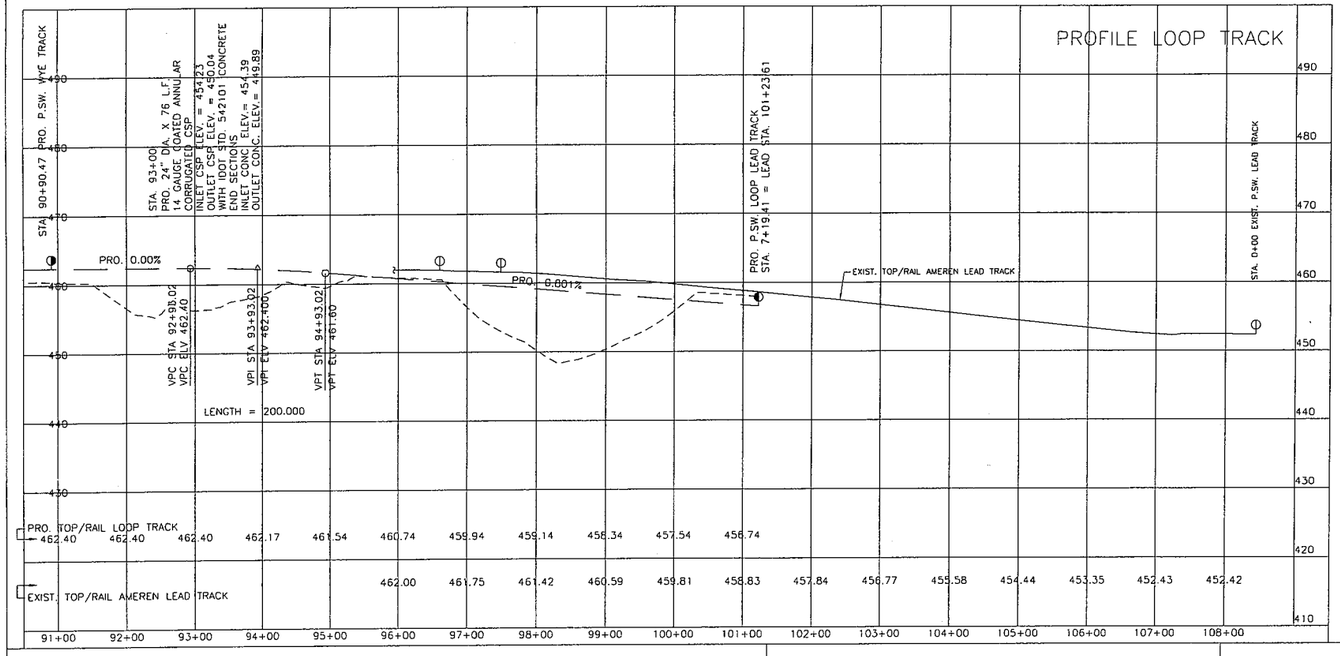
YARD C18
D_C = 12°30'00"
R = 459.28'
Δ = 9°39'05"
T = 38.77'
L_C = 77.21'
L_O = 77.37'
E = 1.63'

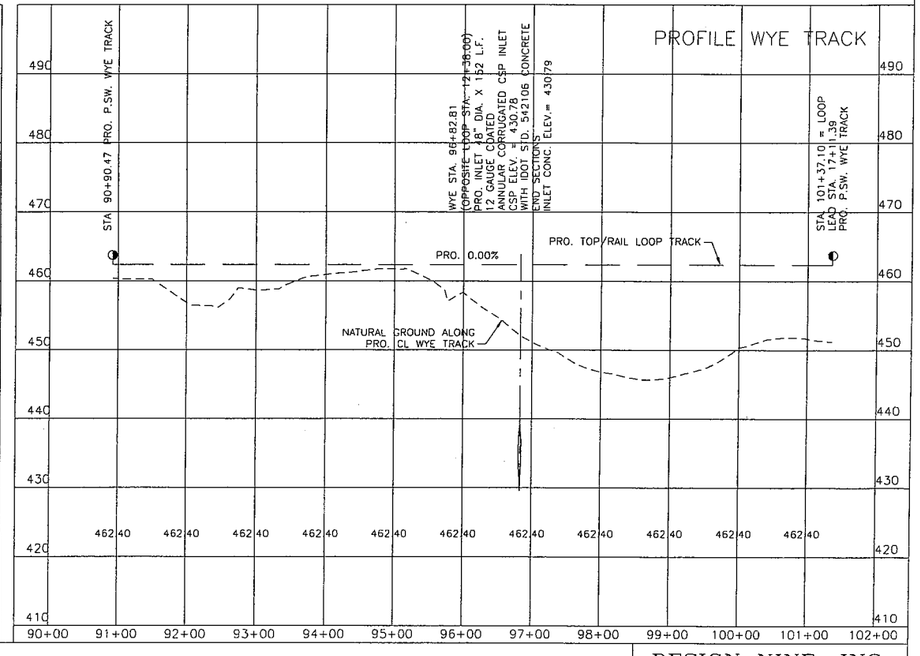
YARD C19
D_C = 12°30'00"
R = 459.28'
Δ = 9°21'00"
T = 37.56'
L_C = 74.80'
L_O = 74.95'
E = 1.53'

PLANT C20
D_C = 20°00'00"
R = 287.94'
Δ = 16°08'24"
T = 40.83'
L_C = 80.70'
L_O = 81.11'
E = 2.88'

PLANT C21
D_C = 23°00'00"
R = 250.79'
Δ = 16°46'12"
T = 36.97'
L_C = 72.91'
L_O = 73.41'
E = 2.71'

PLANT C22
D_C = 22°59'47"
R = 250.83'
Δ = 8°10'55"
T = 17.94'
L_C = 35.58'
L_O = 35.82'
E = 0.64'





LEGEND:
- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- EXISTING PROPERTY LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISITING POINT OF SWITCH (P.SW.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.SW.)

0 50 100 200
SCALE: 1"=100'

ISSUED FOR CONSTRUCTION

NOTICE OF LIMITED RESPONSIBILITY
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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	PLAN/PROFILE - LOOP/WYE TRACK LOOP STA. 91+00 TO STA. 101+22.23	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1	SHEET NO. 9 OF 25
AmerenCILCO		REV. 2

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REVISIONS		
REV.	W.O.	
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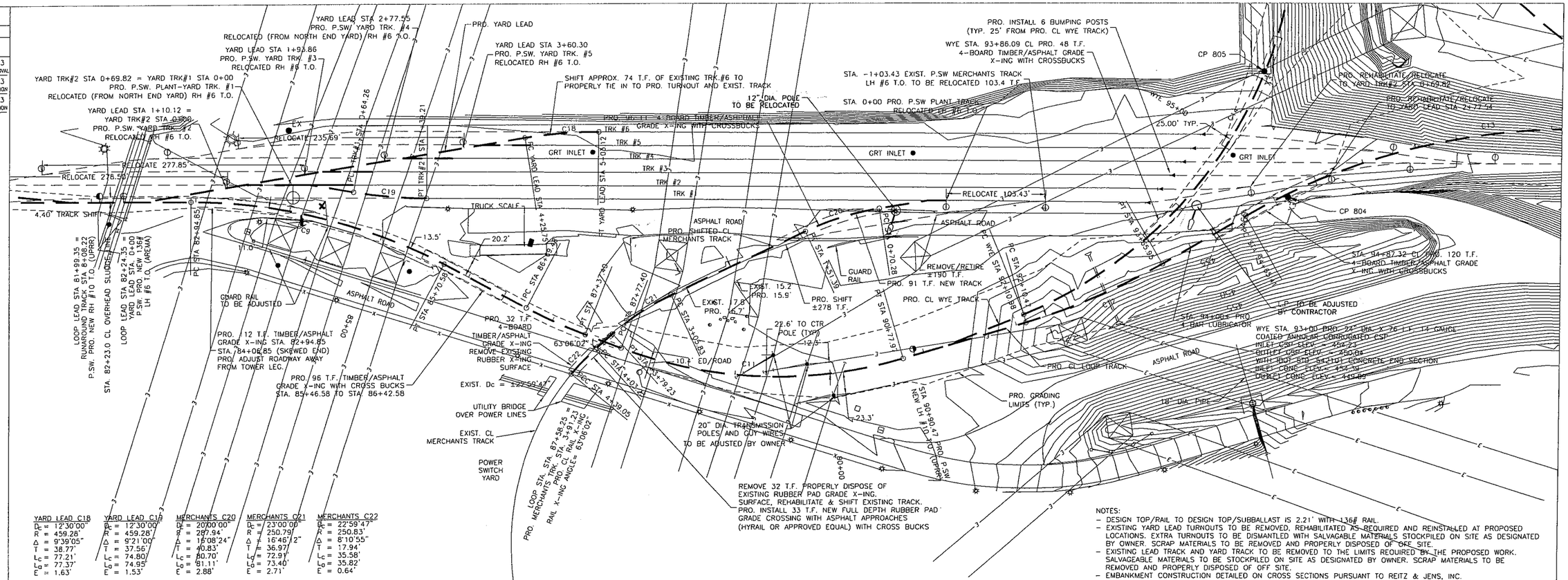
1		11/20/03 ISSUED FOR CONSTRUCTION
2		12/03/03 ISSUED FOR CONSTRUCTION



MERCHANTS TRACK PROFILE

YARD LEAD C18	YARD LEAD C19	MERCHANTS C20	MERCHANTS C21	MERCHANTS C22
D_C = 12°30'00"	D_C = 12°30'00"	D_C = 20°00'00"	D_C = 23°00'00"	D_C = 22°59'47"
R = 459.26'	R = 459.28'	R = 287.94'	R = 250.79'	R = 250.83'
Δ = 9°39'05"	Δ = 9°21'00"	Δ = 15°08'24"	Δ = 16°45'12"	Δ = 8°10'55"
T = 38.77'	T = 37.56'	T = 40.83'	T = 36.97'	T = 17.94'
L_C = 77.21'	L_C = 74.80'	L_C = 80.70'	L_C = 72.91'	L_C = 35.58'
L_O = 77.37'	L_O = 74.95'	L_O = 81.11'	L_O = 73.40'	L_O = 35.82'
E = 1.63'	E = 1.53'	E = 2.88'	E = 2.71'	E = 0.64'

NOTES:
- DESIGN TOP/RAIL TO DESIGN TOP/SUBBALLAST IS 2.21' WITH 136# RAIL.
- EXISTING YARD LEAD TURNOUTS TO BE REMOVED, REHABILITATED AS REQUIRED AND REINSTALLED AT PROPOSED LOCATIONS. EXTRA TURNOUTS TO BE DISMANTLED WITH SALVAGABLE MATERIALS STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EXISTING LEAD TRACK AND YARD TRACK TO BE REMOVED TO THE LIMITS REQUIRED BY THE PROPOSED WORK. SALVAGEABLE MATERIALS TO BE STOCKPILED ON SITE AS DESIGNATED BY OWNER. SCRAP MATERIALS TO BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.
- EMBANKMENT CONSTRUCTION DETAILED ON CROSS SECTIONS PURSUANT TO REITZ & JENS, INC.

LEGEND:

- EXISTING GROUND CONTOURS
- CL EXISTING TRACK
- EXISTING OVERHEAD POWER LINE
- EXISTING PROPERTY LINE
- CL EXISTING TRACK TO BE REMOVED
- EXISITING POINT OF SWITCH (P.SW.)
- CL PROPOSED TRACK
- PROPOSED GRADING LIMITS
- PROPOSED POINT OF SWITCH (P.SW.)

0 25 50 100
SCALE: 1"=50'

ISSUED FOR CONSTRUCTION

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ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS

LOCATION	DETAIL OF MERCHANTS TRACK AREA	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1	SHEET NO. 10 OF 25
AmerenCILCO		REV. 2

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REV.	W.O.	
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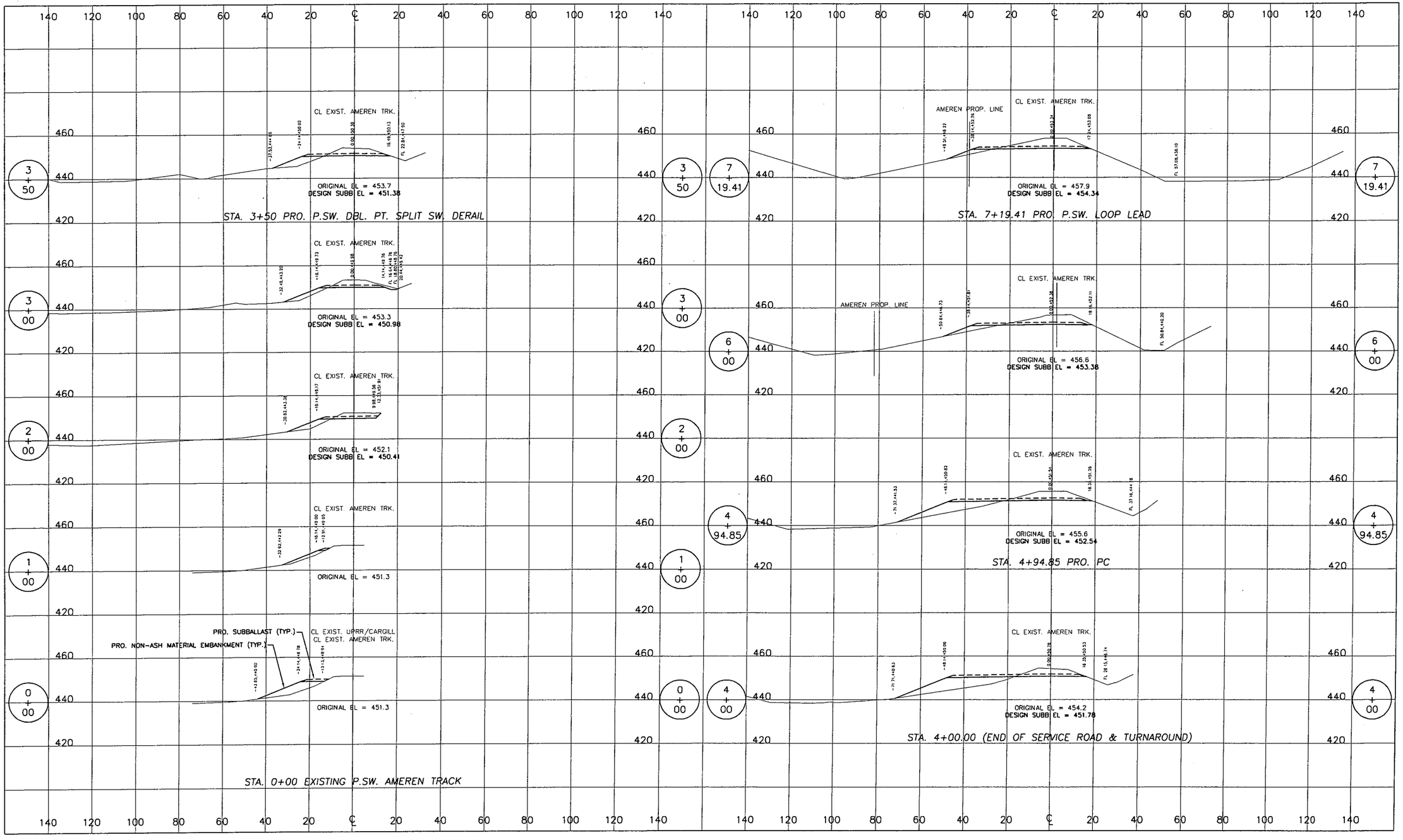
1		11/20/03 ISSUED FOR CONSTRUCTION
2		12/03/03 ISSUED FOR CONSTRUCTION



LEGEND:

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ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 0+00 TO STA. 7+20.79	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 11 OF 25
AmerenCILCO		REV. 2

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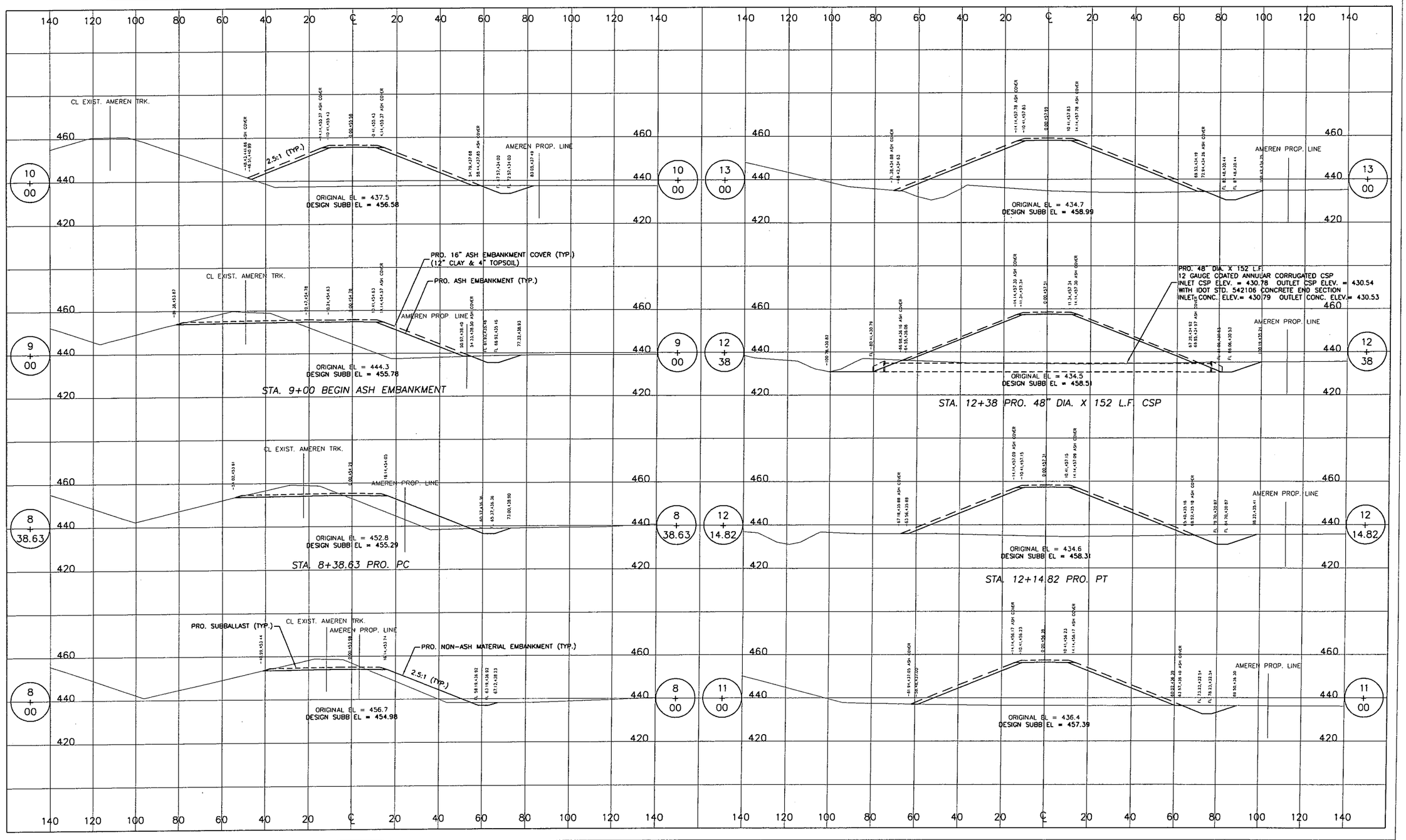

LEGEND:

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 8+00 TO STA. 13+00	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1X	SHEET NO. 12 OF 25
		REV. 1

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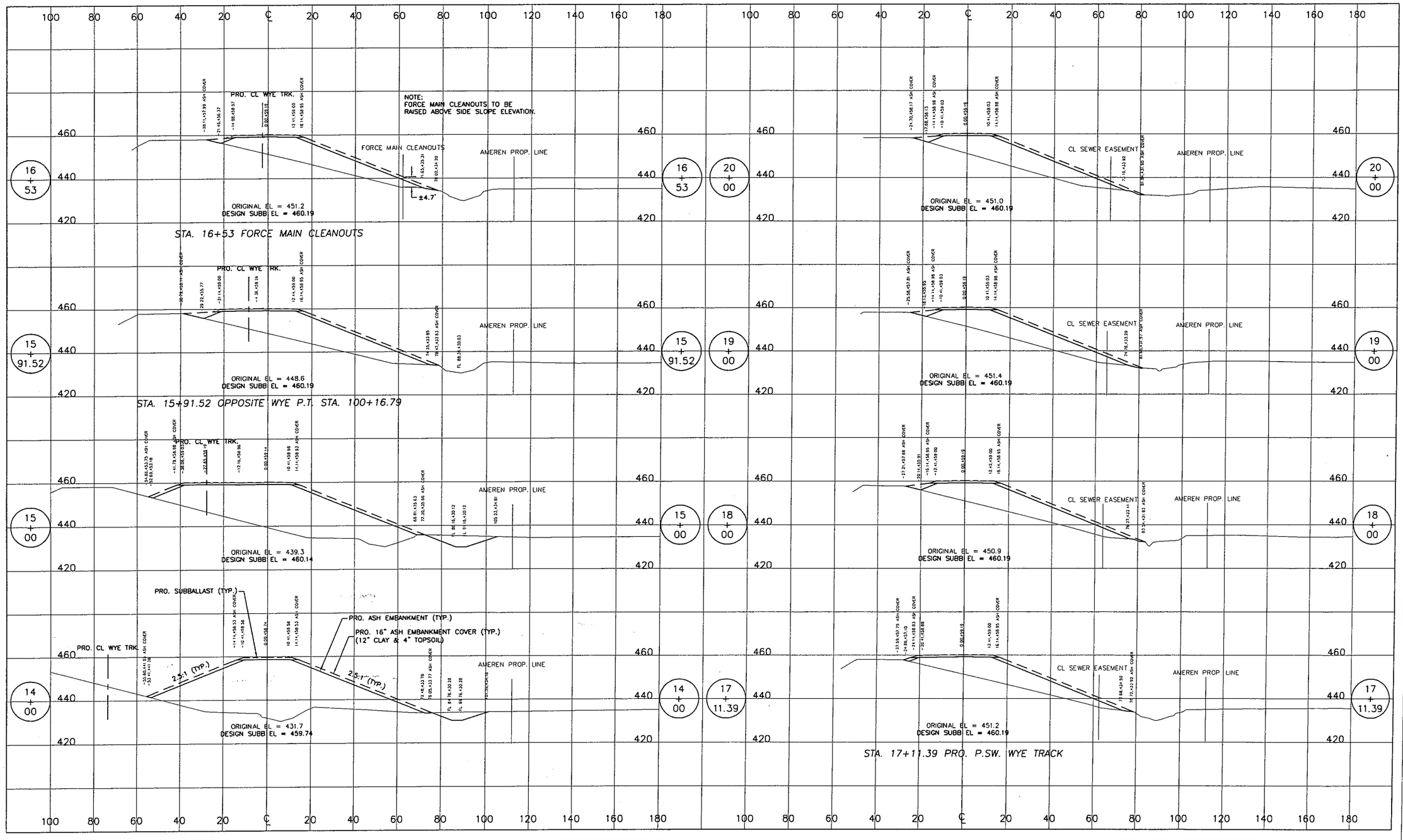
PRINT DIST.
REVISIONS
REV. | W.O. |
0 11/05/03 PRELIMINARY FOR APPROVAL
1 11/20/03 ISSUED FOR CONSTRUCTION
2 12/03/03 ISSUED FOR CONSTRUCTION



LEGEND:

ISSUED FOR CONSTRUCTION

NOTICE OF LIMITED RESPONSIBILITY

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS – LOOP TRACK STA. 14+00 TO STA. 20+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 13 OF 25
AmerenCILCO		REV. 2

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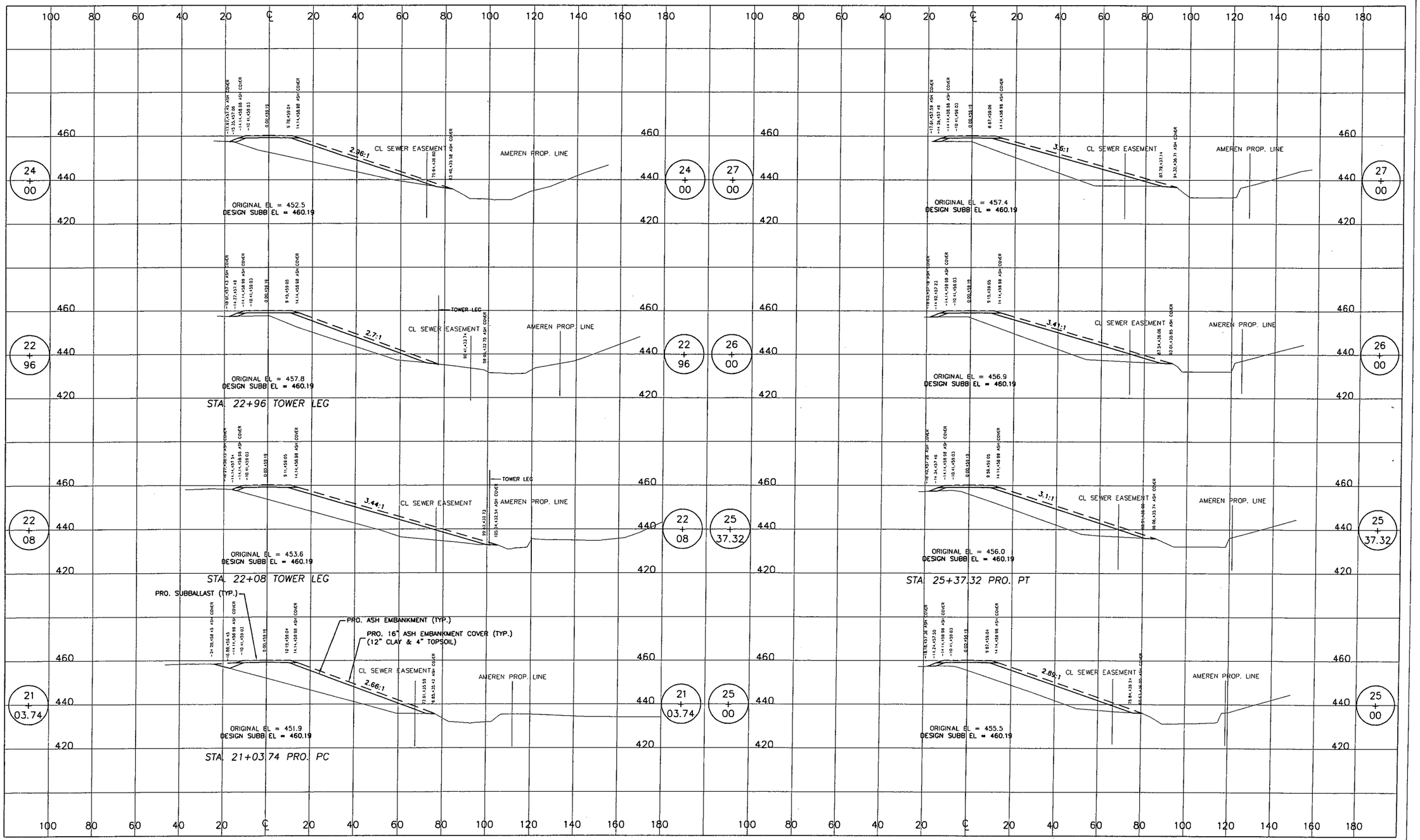

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DESIGN NINE, INC.
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ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	-
APPD.	-

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 21+03.74 TO STA. 27+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 14 OF 25
AmerenCILCO		REV. 2

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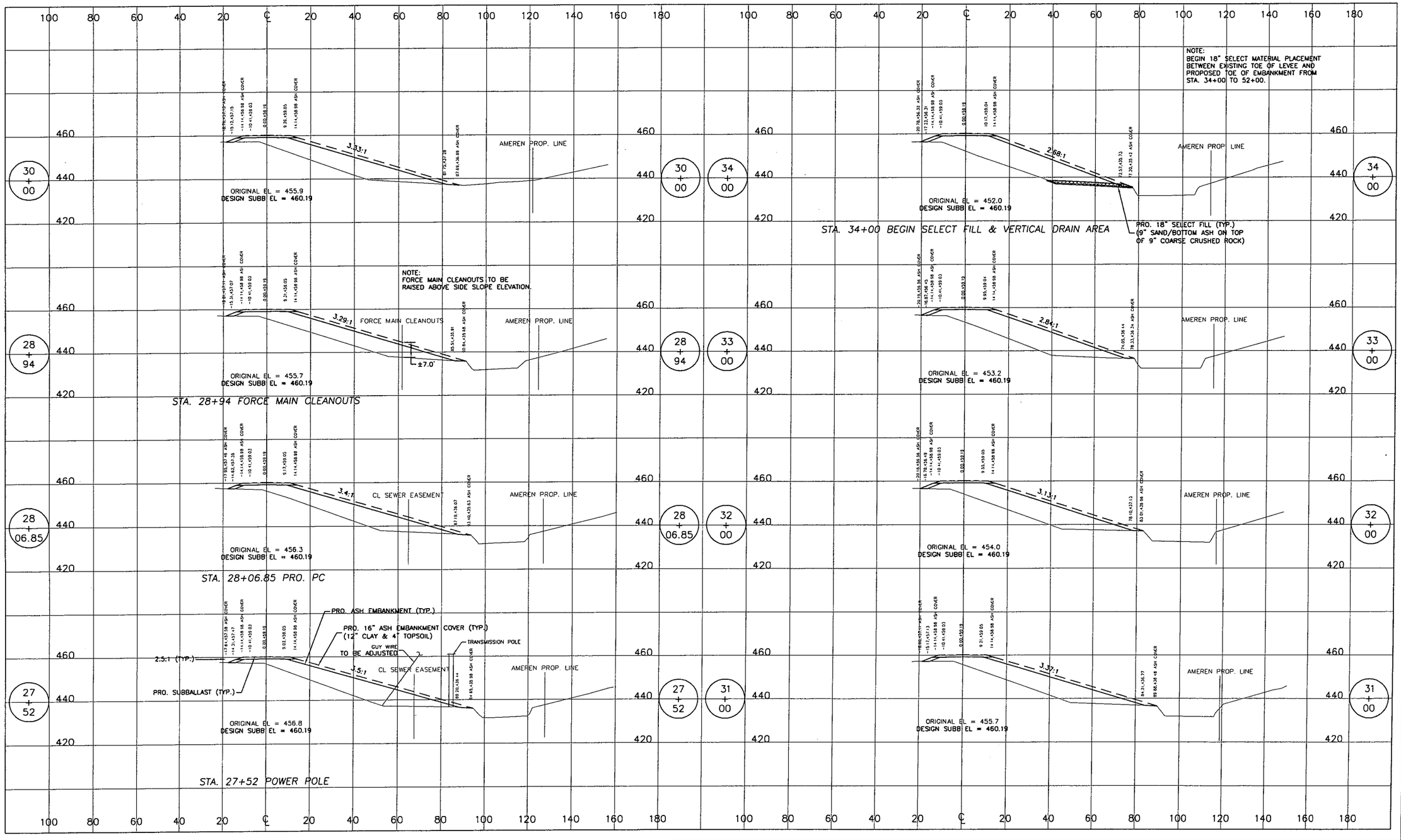

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 27+52 TO STA. 34+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 15 OF 25
AmerenCILCO		REV. 2

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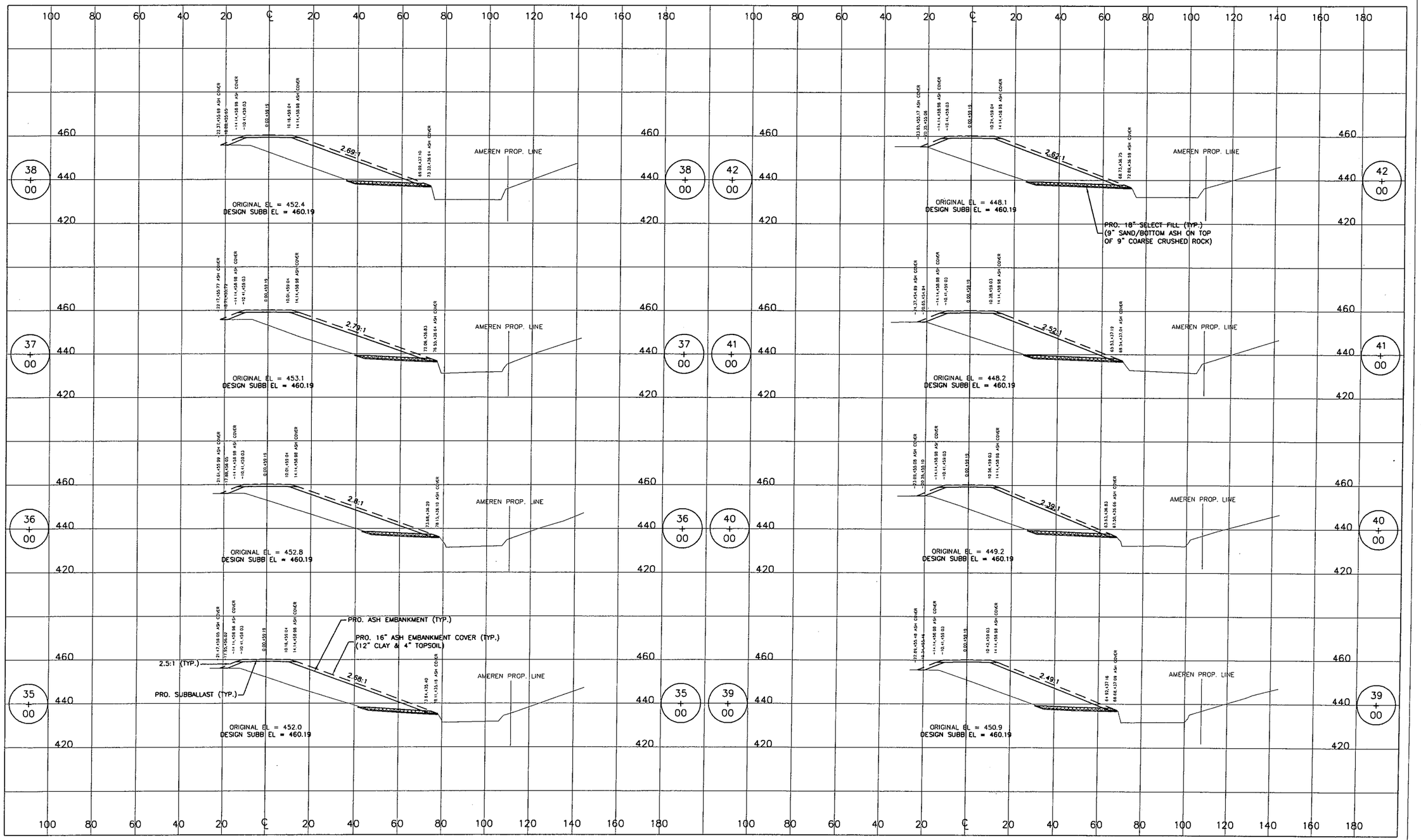

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ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS – LOOP TRACK STA. 35+00 TO STA. 42+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 16 OF 25
AmerenCILCO		REV. 1

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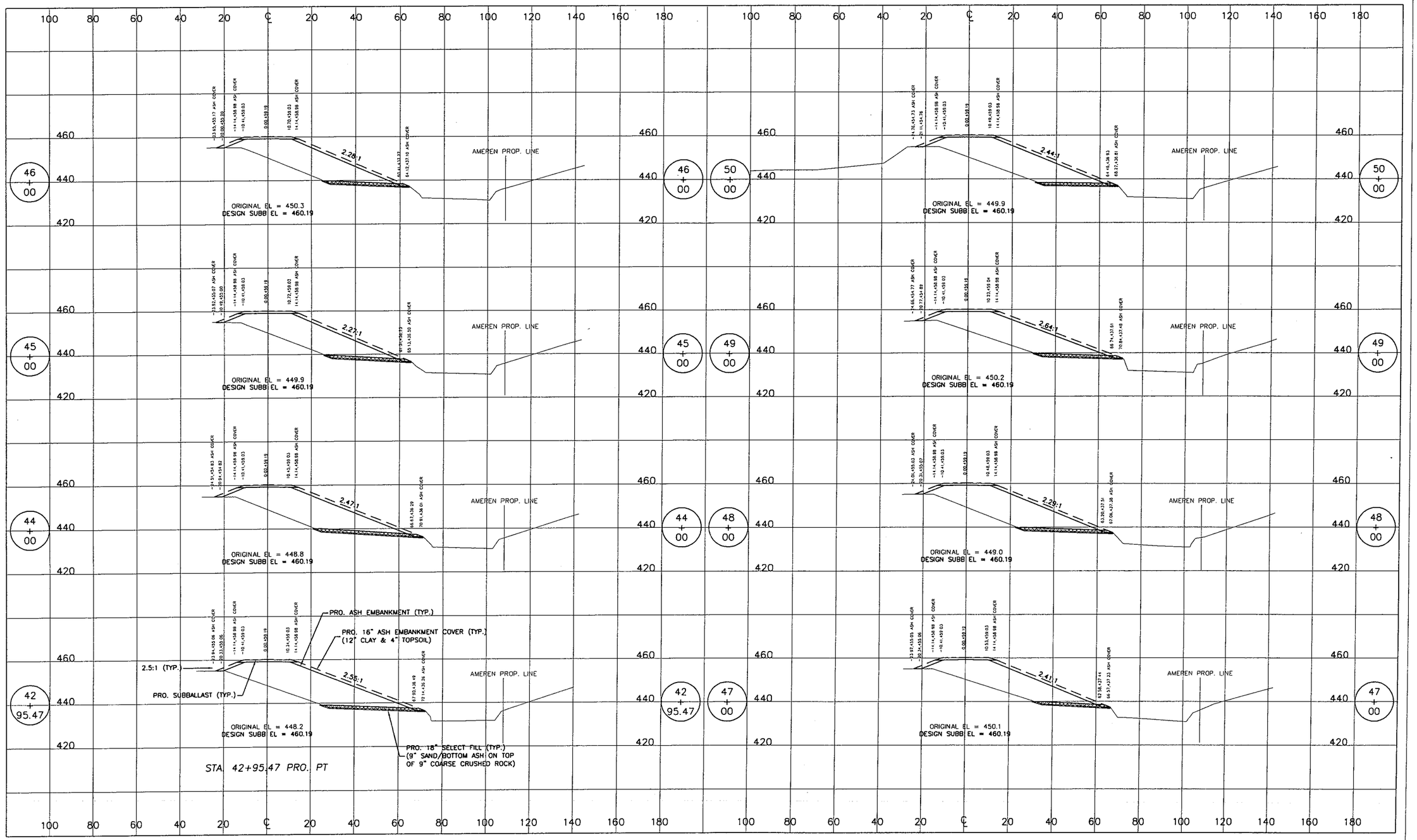

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 42+95.47 TO STA. 50+00	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1X	SHEET NO. 17 OF 25
		REV. 1

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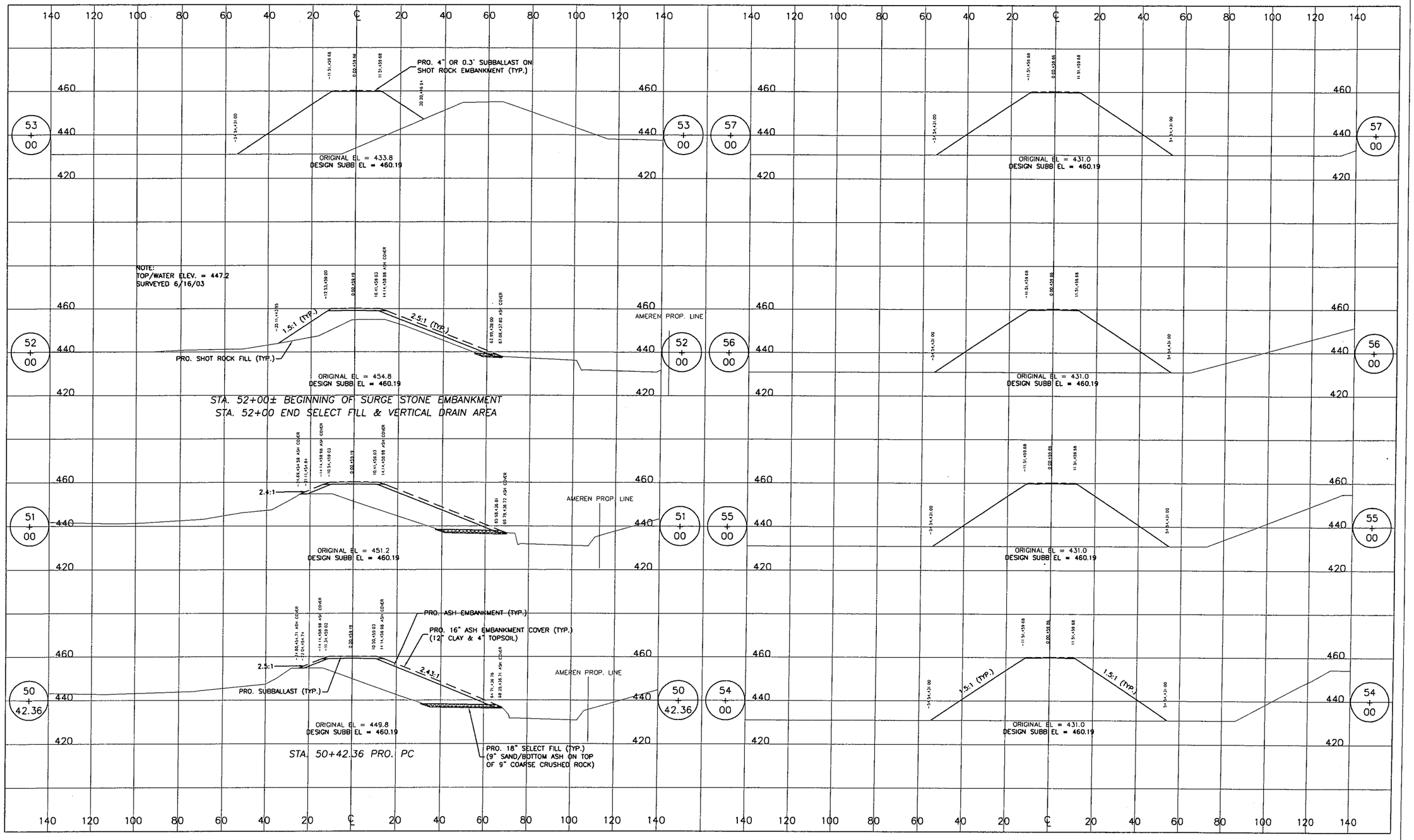

LEGEND:

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	-
APPD.	-

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 50+42.36 TO STA. 57+00	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1X	SHEET NO. 18 OF 25
		REV. 2

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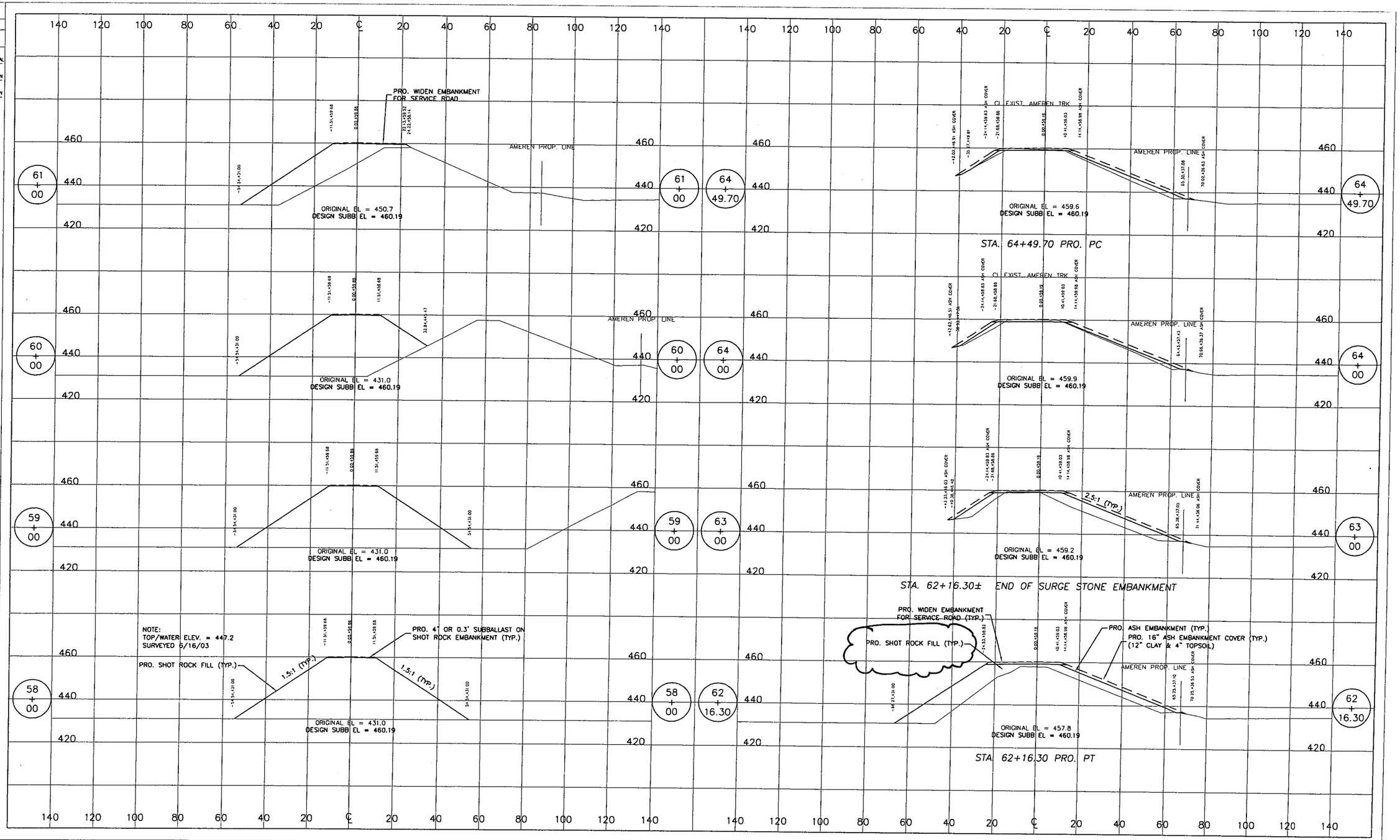

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS – LOOP TRACK STA. 58+00 TO STA. 64+49.7	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 19 OF 25
AmerenCILCO		REV. 2

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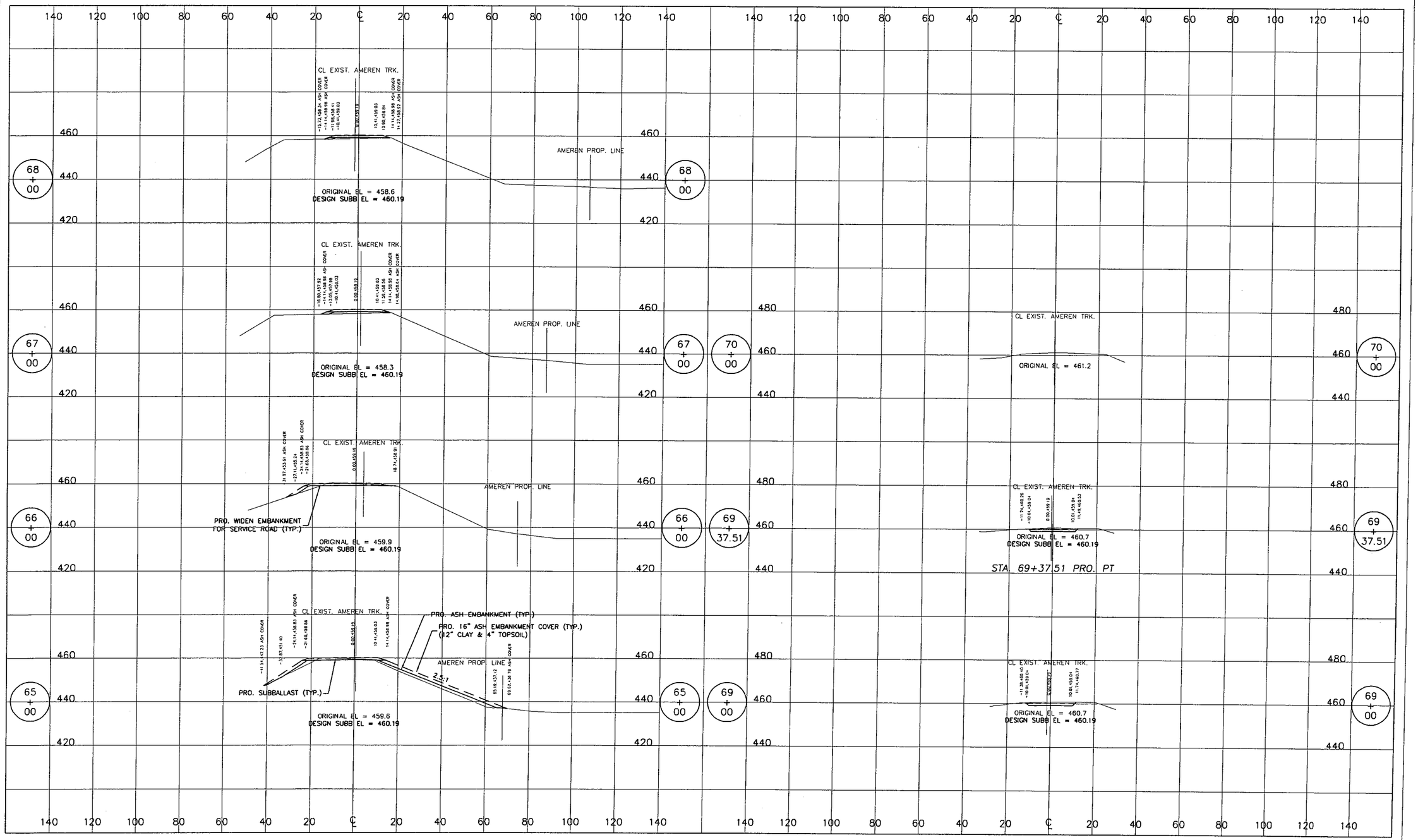

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH	PROPOSED 150 CAR LOOP TRACK FOR EDWARDS POWER PLANT BARTONVILLE, ILLINOIS		
CHKD.	GTH			
SUPV.				
APPD.		LOCATION: CROSS SECTIONS - LOOP TRACK STA. 65+00 TO STA. 70+00		CLASS
AmerenCILCO ST. LOUIS, MISSOURI		DRAWING NO. 03057-1X	SHEET NO. 20 OF 25	REV. 2

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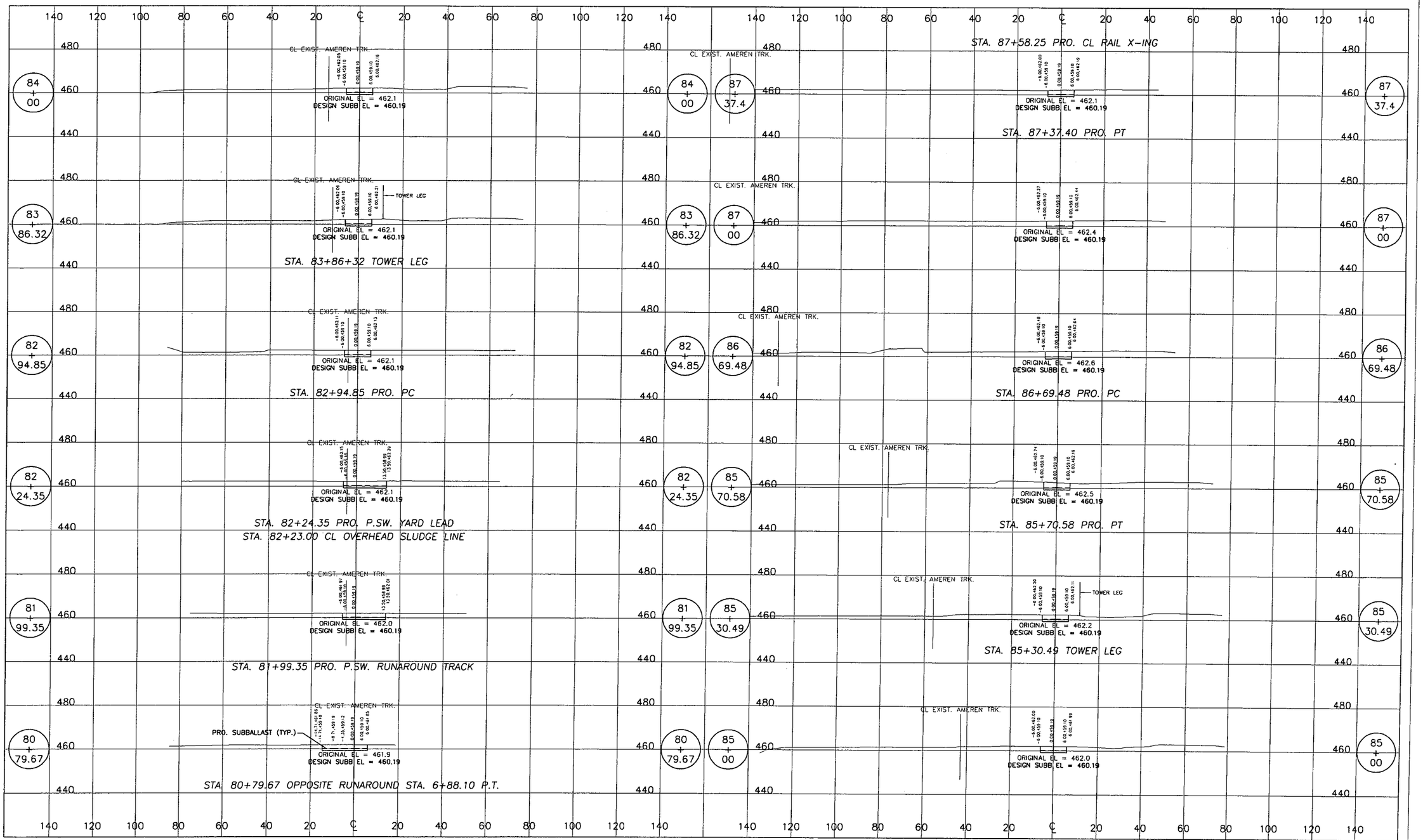

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DESIGN NINE, INC.
ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	.
APPD.	.

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 80+79.67 TO STA. 87+37.4	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 21 OF 25
AmerenCILCO		REV. 1

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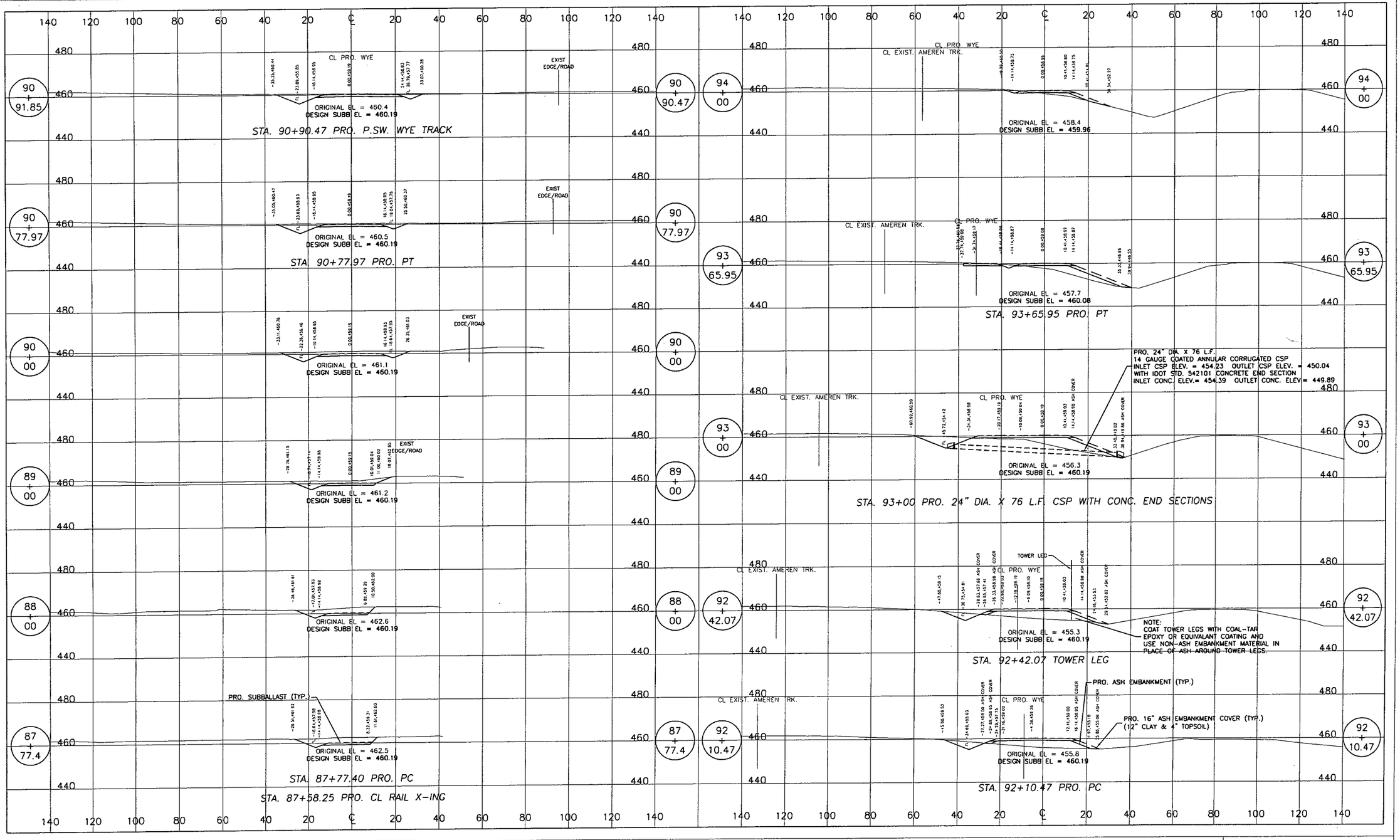

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ENGINEERING SERVICES FOR RAILROADS AND INDUSTRY
ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

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CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 87+77.4 TO STA. 94+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 22 OF 25	REV. 2

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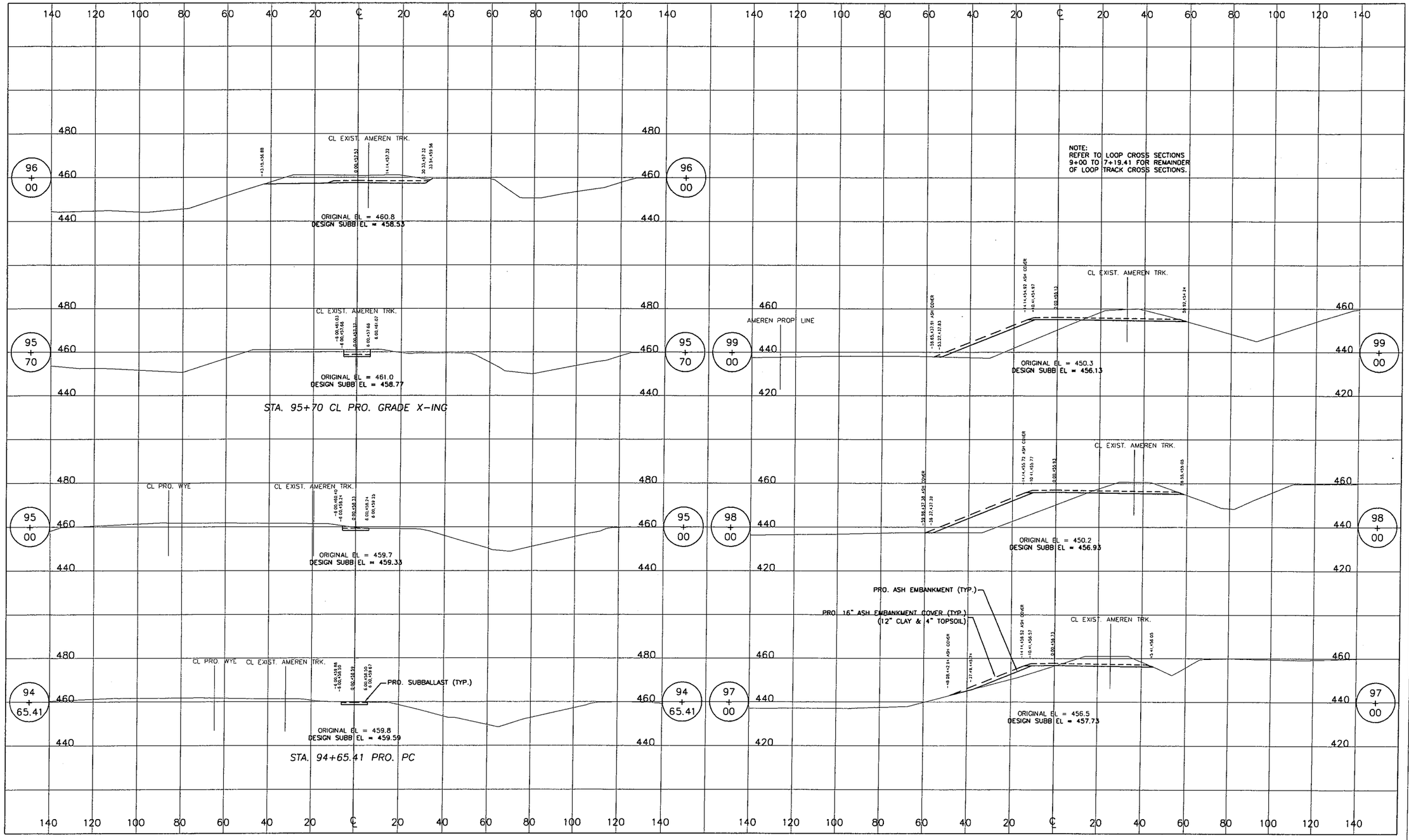

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ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - LOOP TRACK STA. 94+65.41 TO STA. 99+00	CLASS
ST. LOUIS, MISSOURI	DRAWING NO. 03057-1X	SHEET NO. 23 OF 25	REV. 2

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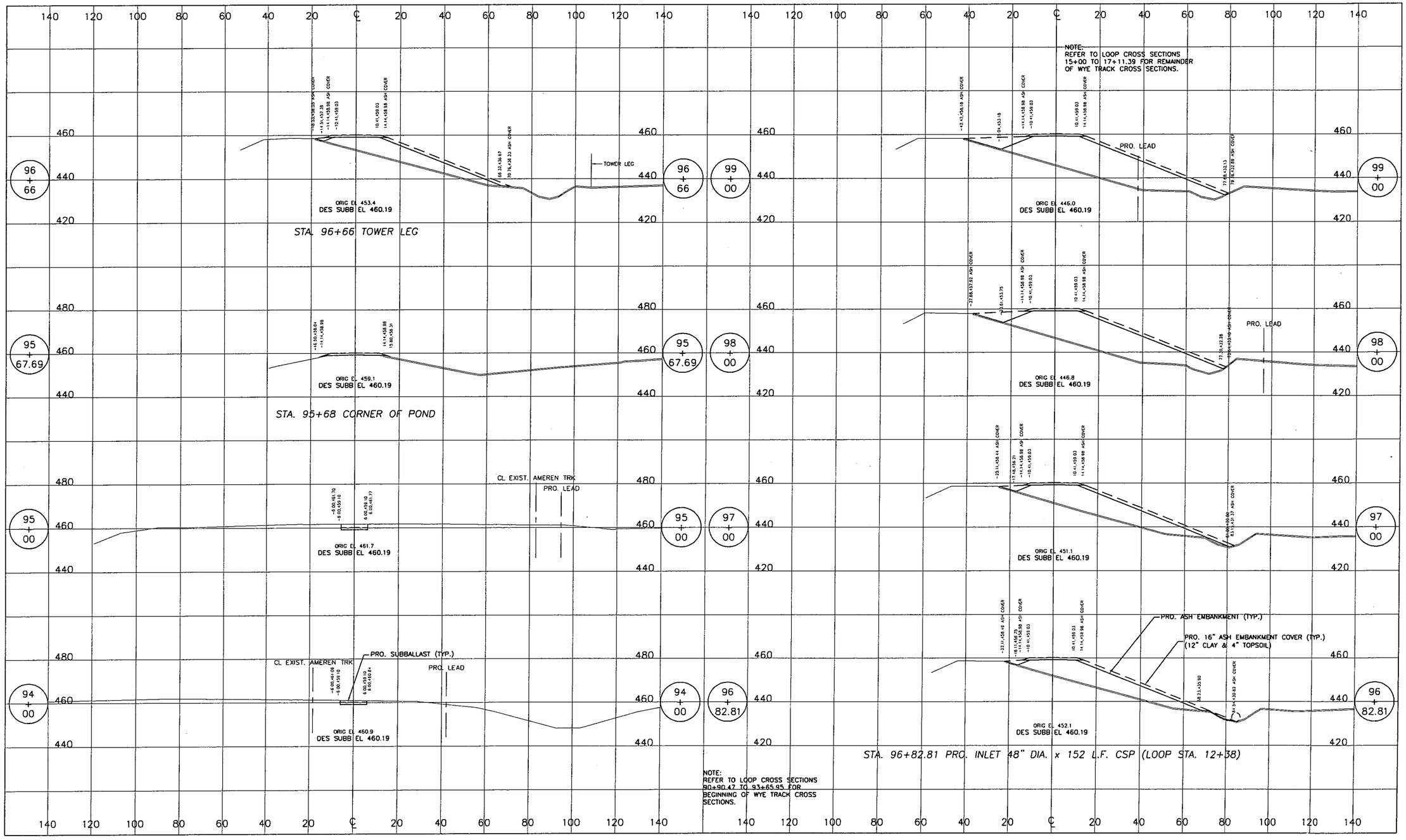

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DESIGN NINE, INC.
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ST. LOUIS, MO.

PREPARED FOR AmerenCILCO

DRAWN	SPH
CHKD.	GTH
SUPV.	-
APPD.	-

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS - WYE TRACK STA. 94+00 TO STA. 99+00	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1X	SHEET NO. 24 OF 25
		REV. 2

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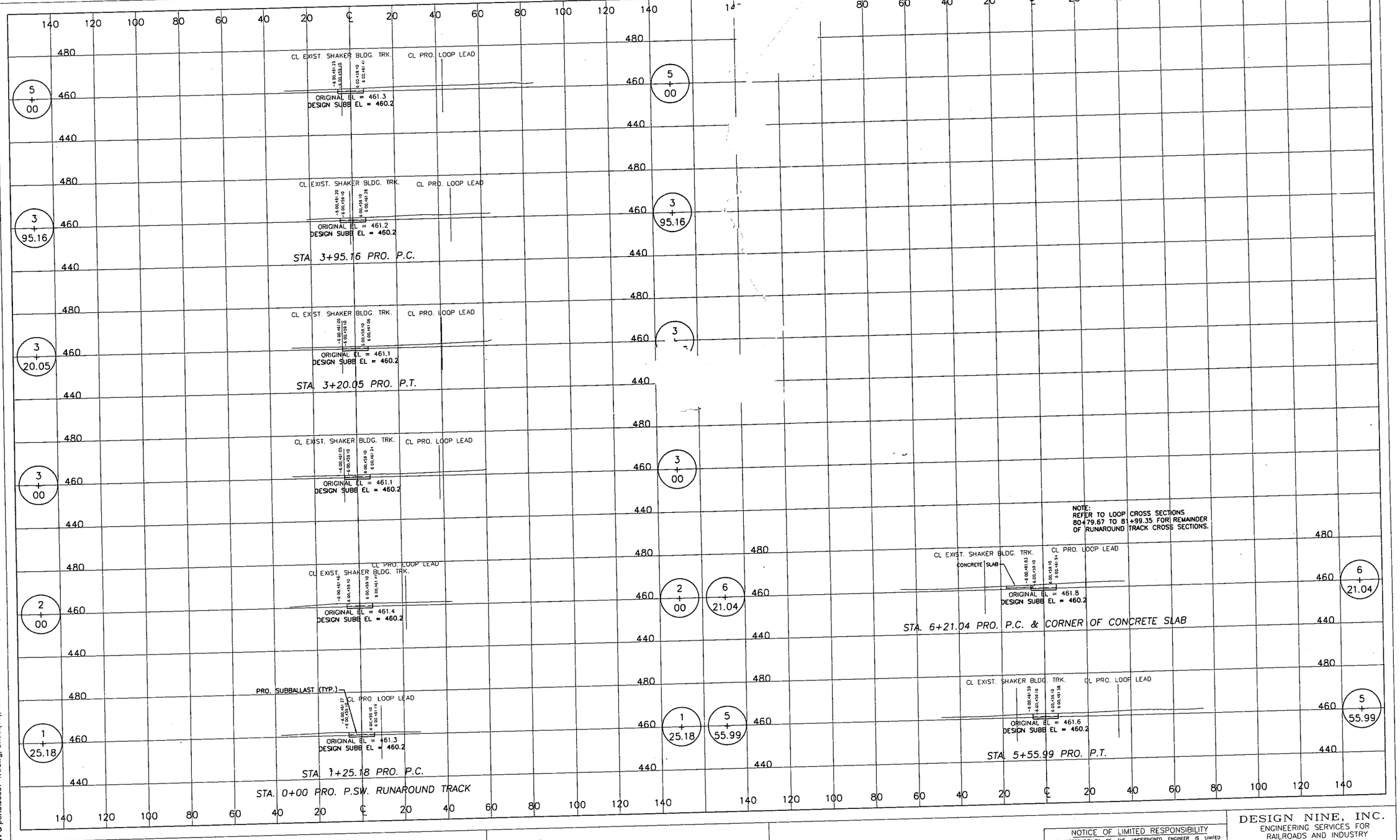

NOTE:
REFER TO LOOP CROSS SECTIONS 80+79.67 TO 81+99.35 FOR REMAINDER OF RUNAROUND TRACK CROSS SECTIONS.

LEGEND:

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DRAWN	SPH
CHKD.	GTH
SUPV.	
APPD.	

PROPOSED 150 CAR LOOP TRACK
FOR EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

LOCATION	CROSS SECTIONS -- RUNAROUND TRACK STA. 1+23.8 TO STA. 6+86.72	CLASS
ST. LOUIS, MISSOURI AmerenCILCO	DRAWING NO. 03057-1X	SHEET NO. 25 OF 25	REV. 2

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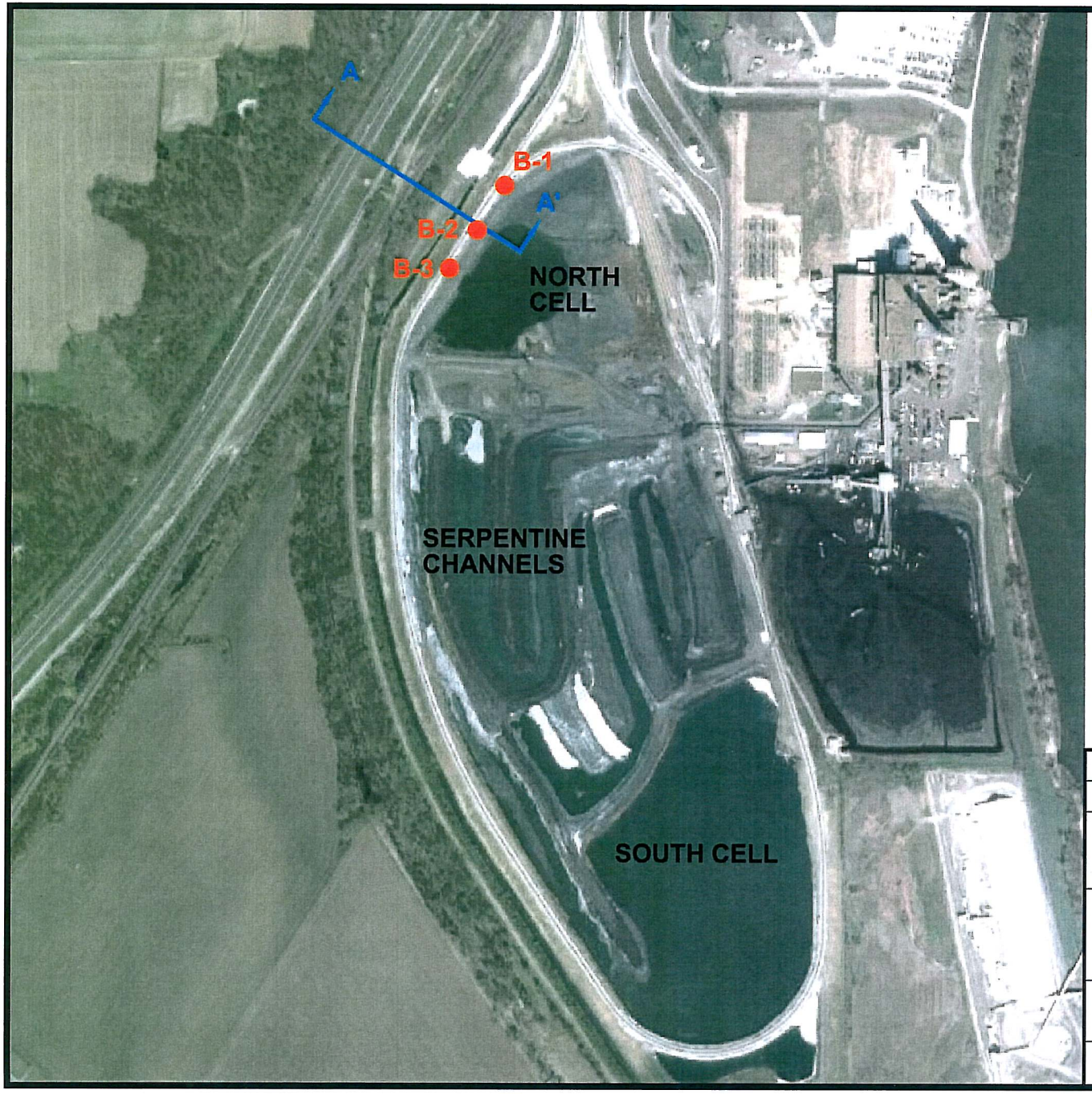
AECOM

Appendix C: Edwards Power Station Piezometer Locations



NOTES

1. Plan adapted from an aerial drawing courtesy of Google Earth, dated May 14, 2004.

LEGEND

- Boring Location
- Slope Stability Cross Section

N

0 1000 2000

SCALE IN FEET

Drawn By: SLC	Ck'd By: SA	App'vd By: DJW
Date: 11-09-10	Date: 12/2/10	Date: 1/4/11

GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

E. D. Edwards Power Station
Bartonville, 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

N

0 400

APPROXIMATE SCALE FEET

Illinois Power Resources Generating, LLC

PROJECT NO. 60440202

AECOM

DRN. BY: djd October 2015
DSGN. BY: eg
CHKD. BY: eg

Edwards Ash Pond Piezometer Locations

FIG. NO. 2A

File: P:\PROJECTS\GEOTECH\60428794_DYNEGYCCR\Q4TASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2A PIEZOMETER LOCATION PLAN (EDWARDS ASH POND).DWG Last edited: NOV. 04, 15 @ 09:32 a.m. by: david_deguire

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Appendix D: Operation and Maintenance Manual for Ash Ponds and Levees

Edwards Power Station

Operational Procedure

x-xxx-xxxx--xxx

Operation & Maintenance Manual for Ash Ponds and Levees

Effective Date: xx/xx/xxxx

Reason for Change: New Procedure

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

x
Greg Russell

Responsible Department: Edwards 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.

Table of Contents

Section		Page Number
1.0	Purpose	1
2.0	Scope	1
3.0	Responsibilities	1
4.0	Historical Information	1
5.0	Flow Regulating Structures	2
6.0	Operations Requirements	4
7.0	Maintenance Requirements	4
8.0	Maintenance Logs	5
9.0	Contact Numbers	6
10.0	References	6
11.0	Records	7

1.0 Purpose

1.1 This procedure is intended to ensure the safe and environmentally responsible operation and use of all water impoundment and levee structures at Edwards Power Station facility. The primary purpose of the Edwards Fly Ash Pond is for the storage of fly ash and treatment of fly ash sluice water to meet NPDES Permit Conditions. The primary purpose of the Pekin-Lamarsh Levee is flood prevention. This procedure then assures:

1.1.1 The embankment structures and flow regulating structures are properly operated and maintained.

1.1.2 Inspections of these structures are conducted.

1.1.3 A maintenance program will be performed.

1.1.4 Communication takes place with the Dam Safety Staff regarding the structures' condition and operation.

2.0 Scope

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

3.0 Responsibilities

3.1 On-site Technical Services – Conducts ash pond and levee embankment and structure observations and completes the inspections, reporting any undesirable conditions to the Supervising Engineer, Dam Safety.

3.2 On-site personnel – Operates the facilities as described in this Operational Procedure. Reports any conditions noted during routine activities to the shift supervisor. Coordinates scheduling of maintenance as required to maintain proper operations of the ash pond facility.

3.3 Shift Supervisor (SS) - Calls Technical Service personnel when structure concerns are reported. Make entries into the shift log book indicating the concern and actions taken.

3.4 Supervising Engineer, Dam Safety - Conducts annual detailed dam safety inspections and provides a report with findings and recommendations.

4.0 Historical Information

4.1 Plant construction started in 1959. The original ash pond was located north of Unit 1 in the area of the current switch yard. In the 1960's, the current

ash pond was opened. Original plans show the top of berm elevation to be constructed at 462'. Site surveys and geotechnical borings show the height of the berm to be 455± and the clay core at 452±. In 2004, the top berm was raised and outer embankment thickened to allow for construction of a railroad loop for coal train unloading. The south end of the pond was cut-off by the rail loop embankment and was subsequently filled in with ash, then covered with a topsoil cap. Specifications for the construction of the original ash pond berm are not available.

4.2 The Pekin-Lamarsh Levee was constructed by the Pekin & Lamarsh Drainage and Levee District. The U.S. Army Corps of Engineers inspects the levee annually and sends the reports to the levee district. The levee district requested that the ash pond outlet pipe be inspected after the Corps inspection in 2008. Due to high water in the Illinois River, the inspection was not completed until December, 2009. The inspection report is on file in the Dam Safety office. Plans of the outlet pipe construction are on file as listed in the table below.

5.0 Flow Regulating Structures

5.1 Embankments

- North Levee (Pekin-Lamarsh Levee District)
  The North Levee is approximately 1300' long with a top elevation of 458'±. This levee was built prior to construction of the plant. There are no known levee penetrations in this portion of levee. Construction of the power plant broke the continuous section of levee into two parts. At the plant, the landside area has been filled to the top of levee. Nature of the fill is not known.

- South Levee (Pekin-Lamarsh Levee District)
  The South levee is approximately 2200' long with a top elevation of 458'±. The levee was constructed prior to construction of the plant. Penetrations thru the south levee include the ash pond drainage pipe and slide gate, cooling water intake, and cooling water discharge piping. Plans for construction of the ash pond drainage pipe, cooling water discharge duct, and cooling water intake pipe/screen house are on file. We currently do not have copies of the original levee drawings on file.

- Ash Pond (Bottom Ash / Fly Ash)
  Top of ash pond berm elevation was originally designed at Elevation 462.00, but the berm was not constructed to this elevation. See attached design plans (1960) and site surveys (2003). From boring logs done in 2003, the top of clay core is approximately 452±. This top of clay elevation

varies around the embankment. In 2004, the east and south berms were modified to accommodate the rail loop. Currently, the top of rail is at elevation 462.40 with top of subgrade being 2.2' below top of rail, or 460.20.

The ash pond is divided into several components: 1.) Fly ash settling basin on the south; 2.) Serpentine channels in the center; and 3.) Bottom ash/Process water basin on the north. The basins are separated by interior dikes constructed of ash. Elevations of the interior dikes are slightly above the exterior embankments at the serpentine channels. Water level in the pond should always be kept 2 feet below the level of the clay core (452.00) in the embankment. Therefore, normal high pool elevation is 450.00. This allows for 2.9 feet of storage depth over the top of the ash pond outlet structure; or approximately 116 acre-ft storage or 37,850,000 gallons (45% of 89 acres times 2.9' deep).

5.2 Structures

- Ash Pond Outlet Structure - The water level in the pond is regulated by the pond outlet structure on the east side of the pond. Plans showing the outlet structure and walkway are on file. The pond outlet structure shall be checked regularly (at least weekly or more often if there are excessive rain events) to ensure proper pond discharge. Elevation of the top of the structure is 447.1'446.1. Elevation of the walkway is 456.4'455.4. Normal depth of flow over the drop structure is 3 to 4 inches during non-rainfall discharge. A 36-inch diameter CMP exits the outlet structure.
- Outlet Pipe Slide Gate – A 36-inch diameter cast iron slide gate regulates flow from the ash pond to the Illinois River. In flood conditions, this gate is closed to prevent flood water from backing up into the pond. The gate is located on the south end of the Pekin-Lamarsh Levee. It is a positively seating gate (flood condition). The gate is actuated by a manual wheel operator at the top of the structure. Depth of the gate is approximately 25'. Plans showing the construction details of the slide gate structure are on file.
- Outlet Pipe Flap Gate – A 36-inch diameter circular cast-iron automatic drainage flap gate is located at the end of the ash pond outlet pipe, 90 feet downstream of the slide gate. This is a general purpose flap gate to keep debris and flow from entering the outlet pipe. The flap gate is 36" diameter. Plans showing notes relating to the flap gate construction are on file.
- Bottom Ash/Process Water Culvert Pipe – This culvert regulates the level of water in north basin of the Ash Pond. This pipe is located in a berm

constructed from ash. Flowline elevations of the pipe are 449.38' inlet and 448.30' outlet.

- Fly Ash Culvert Pipes – Two culvert pipes are located near the sluice pipe outlet to deliver flow into either of two serpentine channels. Each serpentine channel is constructed of ash and used to settle-out the majority of ash prior to the flow entering the south basin. The two serpentine channels are alternated as the ash accumulates and is excavated or dredged from the channel.

6.0 Operations Requirements

Normal Operation - Plant personnel shall monitor the level of all ash pond basins within the perimeter ash pond berm on a daily basis. If levels within any of the basins exceed the prescribed maximum levels, action shall be taken immediately to remedy the situation.

Normal Operating Levels	
Ash Pond Outlet Structure	447.1'
South Pond Water Level	447.3'
North Pond Process Water Culvert Pipe	449.38
North Basin Water Level	449.5'

Illinois River Flood Stage – Plant personnel shall monitor the Illinois River level when approaching and exceeding flood stage on a daily basis. When river level equals the ash pond water level and the river is rising, the slide gate at the Pekin-LaMarsh levee should be closed. Ash pond water levels and river levels should then be monitored on a daily basis to determine when the slide gate should be opened to allow flow from the pond to the river. At no time should water from the river be allowed to flow into the pond.

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.
2. The pond level will be lowered by portable pumps. Monitor the embankment for changed conditions.

7.0 Maintenance Requirements

7.1 Maintenance Program - 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: Quarterly.

2. Vegetation: Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion form occurring. Note the height of the grass; if greater than one 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 toe or other structures. Frequency of inspection: Quarterly.
3. Pond Outlet Structure: Check for any debris or other obstructions around the concrete inlet which may block or restrict the flow of water. Check for the development of any rusty areas on the concrete, and seepage, cracking, breaking, or spalling of concrete. Check for settlement or cracking in the walkway structure. Frequency of inspection: Quarterly.
4. Outlet Pipe Slide Gate: Check the structure for development of any rusty areas on the concrete, and seepage, cracking, breaking, or spalling of concrete. Check the slide gate stem, grease the stem, and operate the slide gate through its full range of motion to ensure proper operation. Check for buildup of debris in the manhole. Frequency of inspection: Quarterly.
5. Pond/Levee Perimeter: Check the perimeter of the embankment and levee for a distance of at least 100 feet from the toe for signs of seepage or boils. Inspection frequency for levee will be determined by Dam Safety Engineer during flood events. Frequency of ash pond embankment inspection: Quarterly for ash pond embankment.
6. 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 Logs

8.1 Plant personnel shall maintain an up-to-date log of operations (water levels, gate adjustments, inlet and outlet flows, serpentine channels, etc.), visual observations, unusual occurrences, and maintenance performed. The log book shall be reviewed during the Annual Engineering Inspection. Logs shall be kept for the life of the plant.

9.0 Contact Numbers

Plant Environmental Supervisor: Mark Davis / 309-633-2861
Plant Operations Office: 309-633-2409
Plant Control Room: 309-633-2428 / 309-633-2425
Supervising Engineer Dam Safety: Steve Bluemner / 314-554-6298
Dam Safety Staff Contact: Mike Wagstaff / 314-554-6296

10.0 References

10.1 AER - DSP-004, "Dam Safety Program for Non-Illinois Department of Natural Resources (non-IDNR) Regulated Facilities"

10.2 Drawings

Drawing Number	Sheet Name	Date
C175-G1915 Rev 2 Sheet A	Corps Permit Applications (Pekin-Lamarsh Levee Penetrations)	6-30-1960
C175-G3902 Rev. Sheet 3	Edwards Plant Site Layout	2-21-1986
C175-G3903 Rev. W Sheet 1	Plant Yard Layout	7-1-1969
C175-G3902 Rev. 0 Sheet 1	Plant Site Survey and Layout	8-7-1967
C175-G1913 Rev. C Sheet 2	Yard Drainage Details	7-31-1958
C175-G1913 Rev. Sheet 3	Yard Drainage Details – Catch Basins and Manholes	4-22-1958
C175-G1906 Rev. A Sheet 5	Plant Site Fill – Depressions Infill for Yard Foundations	5-14-1958
CSK-010 Rev. 0 Sheet	Sanitary Sewer Force Main Plan	2-19-2007
03057-	Proposed 150 Car Loop Track	12-3-2003
C175-G1906 Rev. D Sheet 1	Plant Site Fill – Phase #1	5-6-1958
C175-G1906 Rev. C Sheet 4	Plant Site Fill – Phase #1	5-6-1958
C175-G1906 Rev. B Sheet 2	Plant Site Fill – Phase #2	5-6-1958
C175-G1906 Rev. F Sheet 3	Plant Site Fill – Phase #3	5-6-1958
C175-G1921 Rev. D Sheet 2	Construction Thru Levee / Ash Pond Drainage Duct Detail	6-17-1958
201032 S-1 Rev 1	Overflow Pipe Area Site Plan / Ash Pond Floating Boom Replacement	7-23-2004
201032 S-2 Rev 1	Access Bridge Steel Framing / Ash Pond Floating Boom Replacement	7-23-2004
201032 S-3 Rev 1	Ash Pond Floating Boom Replacement / Hardboom and Stiff Arm Details	7-23-2004
C175-G3077 Rev. C Sheet 2	Site Equipment & Piping Layout	9-10-1976

10.3 Easements: Executed Easement Agreement dated 7 August 1957, between Pekin & Lamarsh Drainage and Levee District and Central Illinois Light

Company, for an easement in perpetuity for the maintenance of the levee. A copy of this document resides in the Dam Safety files.

11.0 Records

	Record Type	Responsible Person	Retention Period	Location
11.1	Copies of weekly inspections	Plant Technical Services	Life of plant	Onsite Environmental Supervisor and Dam Safety Department office
11.2	Copies of Quarterly inspections	Plant Technical Services	Life of plant	Onsite Environmental Supervisor and Dam Safety Department office
11.3	Log Book	Plant Technical Services	Life of plant	Onsite Environmental Supervisor office

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Appendix E: Photos of 2009 Surficial Movement

Figure E.1: Photo of 2009 Surficial Movement

Figure E.2: Photo of 2009 Surficial Movement

Figure E.3: Photo of Surficial Movement Area after Repairs

Figure E.4: Photo of Surficial Movement Area after Repairs

Appendix C

Types of CCR and Chemical Constituents

Edwards Power Plant -- Ash Pond's Chemical Constituents

In accordance with 35 I.A.C. 845.230(d)(2)(C), IPRG is submitting available/existing analyses of "the chemical constituents of all waste streams, chemical additives and sorbent materials entering or contained in" the CCR impoundment, Ash Pond.

A list of the chemical constituents' analyses contained in the CCR surface impoundment can be found in Appendix A. As determined through antidegradation studies, this list contains chemical constituents found in the surface free liquid and the subsurface free liquids. IPRG is also including a list of chemical additives, sorbent materials and waste streams that were submitted in the facility's NPDES permit applications to IEPA within the past ten years at a minimum and/or listed in the current NPDES permit (IL0001554) in Appendix B.

Appendix A: Chemical Constituents Contained in the Ash Pond

Pollutant	Units	Surface Free Liquids Average Concentration	Subsurface Free Liquids Average Concentration
Ammonia	mg/L	< 0.275	1.71
Arsenic	mg/L	0.002	0.023
Arsenic, Dissolved	mg/L	< 0.00007	< 0.0004
Barium	mg/L	0.166	0.161
Boron	mg/L	0.332	15.5
Cadmium	mg/L	0.0002	0.0005
Cadmium, Dissolved	mg/L	0.0001	< 0.0001
Chloride	mg/L	103	100
Chromium	mg/L	0.002	0.011
Chromium (hexavalent)	mg/L	< 0.009	< 0.007
Chromium, Trivalent	mg/L	< 0.0002	< 0.0002
Copper	mg/L	0.005	0.011
Copper, Dissolved	mg/L	0.004	0.002
Cyanide	mg/L	< 0.002	< 0.002
Fluoride	mg/L	0.265	< 0.550
Fluoride, Dissolved	mg/L	0.270	< 0.340
Iron	mg/L	0.635	2.42
Iron, Dissolved	mg/L	0.016	< 0.025
Lead	mg/L	0.001	0.012
Lead, Dissolved	mg/L	0.0001	< 0.0001
Manganese	mg/L	0.021	0.026
Mercury	mg/L	0.0000045	0.0000127
Mercury, Dissolved	mg/L	< 0.0001	< 0.0001
Nickel	mg/L	0.002	0.014
Nickel, Dissolved	mg/L	0.002	0.004
Nitrate - Nitrite	mg/L	4.30	1.00
Nitrogen	mg/L	5.00	3.10
Nitrogen, Total Kjeldahl	mg/L	0.690	2.10
Oil and Grease	mg/L	< 1.20	< 1.08
pH*	SU	7.98	9.71
Phenols	mg/L	< 0.003	< 0.005
Selenium	mg/L	0.001	0.048
Silver	mg/L	< 0.00002	< 0.00005
Sulfate	mg/L	78.1	919
TDS	mg/L	517	1567
Total Hardness by 2340B	mg/L	329	501
TSS	mg/L	14.7	89.8
Zinc	mg/L	0.007	0.040
Zinc, Dissolved	mg/L	< 0.003	< 0.003

*Used https://calstormcompliance.com/ph-averaging-tool

Appendix B: List of Chemical Additives, Waste Streams and Sorbent Materials

Chemical Additives
Aqueous Ammonia
Bulab 5532 (polymer)
Bulab 8808 (antiscale)
Bulab 8862 (biocide)
Bulab 6057 (biocide)
Calcium Bromide (52%)*
Carbon Dioxide
Ferric Chloride (35%)
Hawkins Aqua Hawk 9937 (polymer)
Hydrated Lime
Hydrochloric Acid (cleaning only)
Molten Sulfur
Sodium Hydroxide (50%)
Sodium Hypochlorite
Sodium Metabisulfate
Strong Acid Cation Resin
Strong Base Anion Resin
Sulfuric Acid (93%)
Kochkleen L-11 (high pH cleaner)

* Only a very small percentage of these chemicals would enter the ash pond. A high majority of the product would be consumed in the combustion process.

Waste Streams and Sorbent Materials*
Fly Ash and Fly Ash Sluice Water
Bottom Ash, Economizer Ash pyrites sluice water
Non-chemical metal cleaning wastewater
Boiler and Turbine Room Sumps
Coal Pile Runoff
Yard Substation and Track Drains
Water treatment wastewater

*No sorbent materials

DYNEGY

Safety Data Sheet

Section 1
Identification of the Substance and of the Supplier

1.1 Product Identifier

Product Name/Identification:	ASTM Class C Fly Ash
Synonyms:	Coal Fly Ash, Pozzolan
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 damage to lungs after repeated/prolonged exposure via inhalation.* *May cause respiratory irritation.* *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.* *Wear protective gloves/protective clothing/eye protection/face protection.* *Wash thoroughly after handling.* *Do not eat drink or smoke when using this product.* *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*	*30 - 60%*	*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	*71243-67-9* *1327-36-2*	*30 - 60%*	*Single Exposure STOT, Category 3*
Iron oxide	*1309-37-1*	*1 - 10%*	*Not Classified*
Calcium oxide (CaO)	*1305-78-8*	*20 - 30%*	*Skin Irritant, Category 2* *Eye Irritant, Category 1* *Single Exposure STOT, Category 3*
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*	*1-8%*	*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*
Bromide salt (calcium)	*7789-41-5*	*See Footnote 2*	*Toxic to Reproduction, Category 2*

Footnote 1: *The percentage of respirable crystalline silica has not been determined. Therefore, a GHS classification of Carcinogen, Category 1A has been assigned.*

Footnote 2: *Analytical data are not available to demonstrate that the concentration of bromide salt is <0.1%; therefore, a GHS classification of Toxic to Reproduction, Category 2 has been assigned.*

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. Repeated exposure to dusts containing inorganic bromide salts may affect fertility and/or result in effects to the unborn child.

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 Crystalline Silica	0.05	0.05	0.025	0.05
Titanium dioxide	Total	15	2.4 (fine) 0.3 (ultrafine)	10	10
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): Not Determined	**Specific gravity or relative density:** 2.2 – 2.9
Melting point/freezing point (°C): Not applicable	**Water Solubility:** Slight
Initial boiling point/boiling range (°C): NA	**Partition coefficient: n-octane/water:** NA
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. Inorganic bromide salts have been shown to have adverse effects on reproductive parameters in some animal studies.
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 C (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

- 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
Manganese oxide-as manganese compounds	1313-13-9; Various	No	No	Yes	Yes
Phosphorus pentoxide (or phosphorus oxide)	1314-56-3	Yes	Yes	Yes	No
Potassium oxide	12136-45-7	No	Yes	No	No
Silica-crystalline (SiO2), 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.

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:

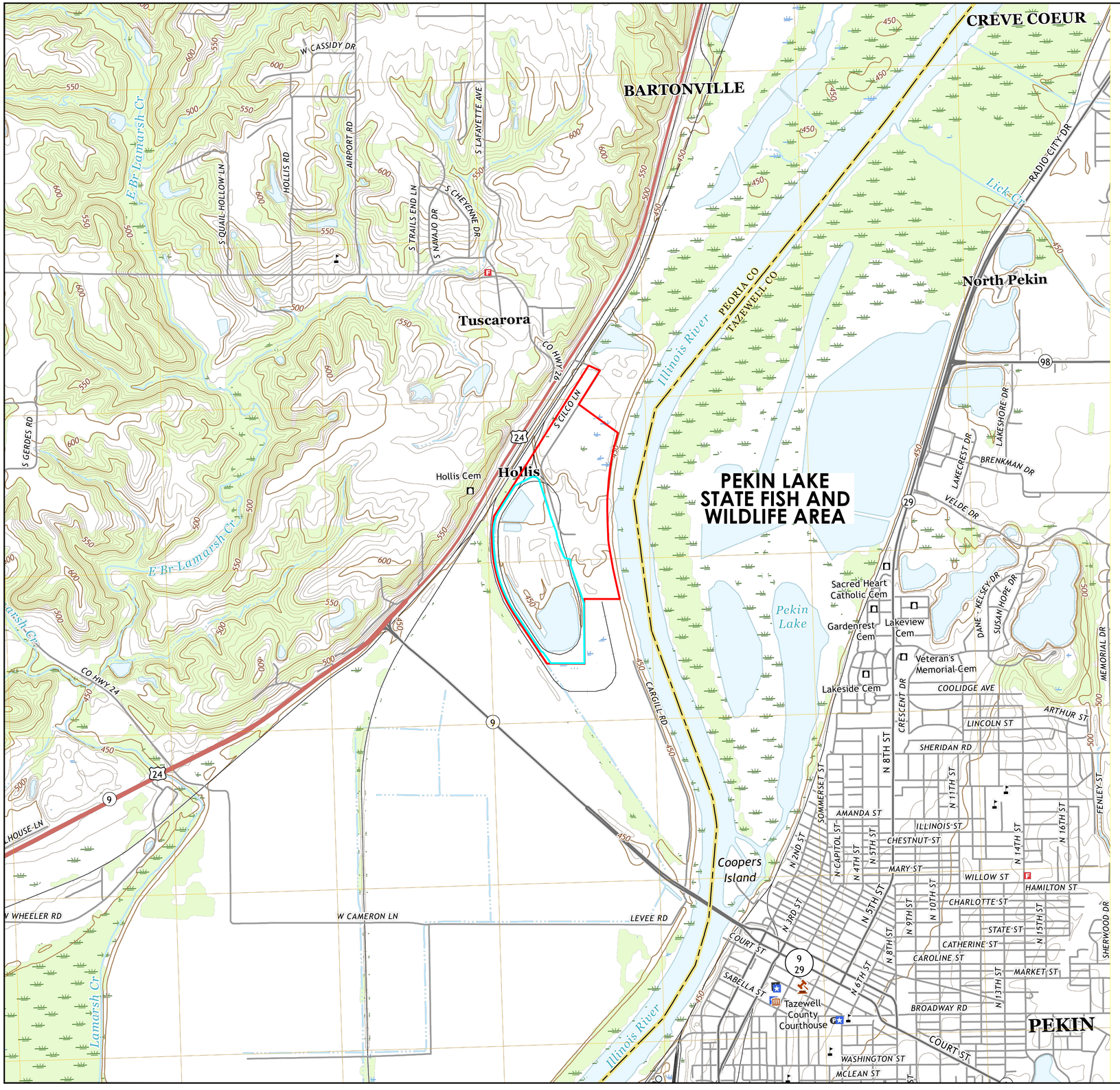
This SDS has been prepared in accordance with the Hazard Communication Rule 29 CFR 1910.1200. Information herein is based on data considered to be accurate as of date prepared. No warranty or representation, express or implied, is made as to the accuracy or completeness of this data and safety information. 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.

Appendix D

Map Package

Appendix D-1

Site Location Map



0' 1000' 2000'

ROAD CLASSIFICATION

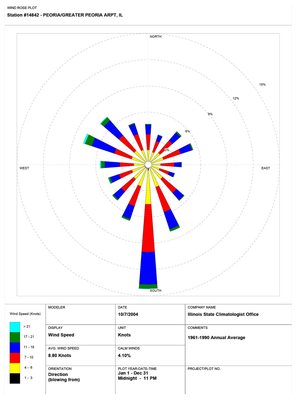
Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
State Route	

LEGEND

- APPROXIMATE IPRG BOUNDARY
- APPROXIMATE ASH POND BOUNDARY

NOTES

1. THE BASEMAP FOR THIS FIGURE INCLUDES THE 2021 USGS US 7.5-MINUTE SERIES QUADRANGLE MAP FOR PEKIN, IL.
2. NO DEDICATED ILLINOIS NATURE PRESERVES OR DESIGNATED HISTORIC AND ARCHAEOLOGICAL SITES PER THE ILLINOIS NATIONAL HISTORIC PRESERVATION ACT WERE LISTED WITHIN 1,000 METERS OF THE SITE.
3. THE IDNR NATURAL HERITAGE DATABASE THREATENED AND ENDANGERED SPECIES BY COUNTY LIST 14 STATE THREATENED AND 9 ENDANGERED SPECIES IN PEORIA COUNTY AND 16 THREATENED AND 14 ENDANGERED SPECIES IN TAZEWELL COUNTY.



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Project Name & Location:

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Appendix D-2

Site Plan Map

N

0' 250' 500'

LEGEND

- APPROXIMATE IPRG BOUNDARY
- APPROXIMATE ASH POND BOUNDARY
- ONSITE ACCESS ROADS
- GROUNDWATER MONITORING WELL

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Type: PLAN	Drawing No. D-2
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

Appendix D-3

100-YR Flood Map Documentation

Edwards Power Plant Operating Permit Application: Floodplain Compliance for 35 I.A.C. 845.340(c)

Illinois Power Resources Generating, LLC

Revision 1
10/20/2021

Edwards Power Plant Operating Permit Application: Floodplain Compliance for 35 I.A.C. 845.340(c)

prepared for

Illinois Power Resources Generating, LLC
Pekin, Illinois

Revision 1
10/20/2021

prepared by

Burns & McDonnell
Kansas City, Missouri

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INDEX AND CERTIFICATION

Illinois Power Resources Generating, LLC
Edwards Power Plant
Operating Permit Application: Floodplain Compliance for 35 I.A.C. 845.340(c)

Report Index

Chapter Number	Chapter Title	Number of Pages
1.0	Introduction	2
2.0	Data Availability	3
3.0	Hydraulic Analysis	4
4.0	Conclusion	2
5.0	References	1

Certification

I hereby certify, as a Professional Engineer in the state of Illinois, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Illinois Power Resources Generating, LLC or others without specific verification or adaptation by the Engineer. I hereby certify, for the CCR impoundment discussed herein, that demonstration regarding floodplains meets requirements of 35 I.A.C. 845.340(c).

Madison R. Gibler, P.E., IL, 062.070771

Signature: Madison R Gibler

Date of Signing: October 20, 2021

Date of License Expiration: November 30, 2021

TABLE OF CONTENTS

Page No.

1.0 INTRODUCTION 1-1
1.1 Purpose 1-1
1.2 Scope 1-1
1.3 Flooding Source 1-2

2.0 DATA AVAILABILITY 2-1
2.1 Effective Flood Insurance Rate Map 2-1
2.1.1 Flood Hazard Zones 2-1
2.1.2 Pekin and LaMarsh Levee System 2-1
2.2 Flood Insurance Studies 2-1
2.2.1 Topographic Information 2-2
2.2.2 Base Flood Elevation 2-2
2.3 Hydraulic Model 2-2

3.0 HYDRAULIC ANALYSIS 3-1
3.1 Duplicate Best Available Hydraulic Model 3-1
3.2 Corrected Best Available Hydraulic Model 3-1

4.0 CONCLUSION 4-1

5.0 REFERENCES 5-1

APPENDIX A – EXCERPT FROM 35 I.A.C. 845.340(C) 5-1

APPENDIX B – FEMA FLOOD INSURANCE RATE MAP 5-2

LIST OF TABLES

Page No.

Table 3-1: FIS and Duplicate Model BFEs 3-1
Table 3-2: Corrected Model BFE Without Floodway 3-4
Table 3-3: Corrected Model BFE With Floodway 3-4

LIST OF FIGURES

Page No.

Figure 1-1: Edwards Power Plant Existing CCR Impoundment 1-1
Figure 1-2: CCR Impoundment on FIRM 1705330175B 1-2
Figure 2-1: Illinois River Cross Sections Near Edwards Power Plant 2-3
Figure 3-1: Duplicate Model Cross Section 3-2
Figure 3-2: Corrected Model Cross Section 3-2
Figure 3-3: Duplicate Model Floodway Encroachment Cross Section 3-3
Figure 3-4: Corrected Model Floodway Encroachment Cross Section 3-3
Figure 4-1: Corrected Model Base Flood Elevation and Inundation Extents 4-1

1.0 INTRODUCTION

1.1 Purpose

Burns & McDonnell was hired by Illinois Power Resources Generating, LLC to evaluate compliance with *35 I.A.C. 845.340(c)* (2021) for the existing coal combustion residual (CCR) surface impoundment at the Edwards Power Plant in the City of Pekin, Peoria County, Illinois. The existing CCR impoundment was constructed in 1960 and is located west of the Illinois River as shown in Figure 1-1.

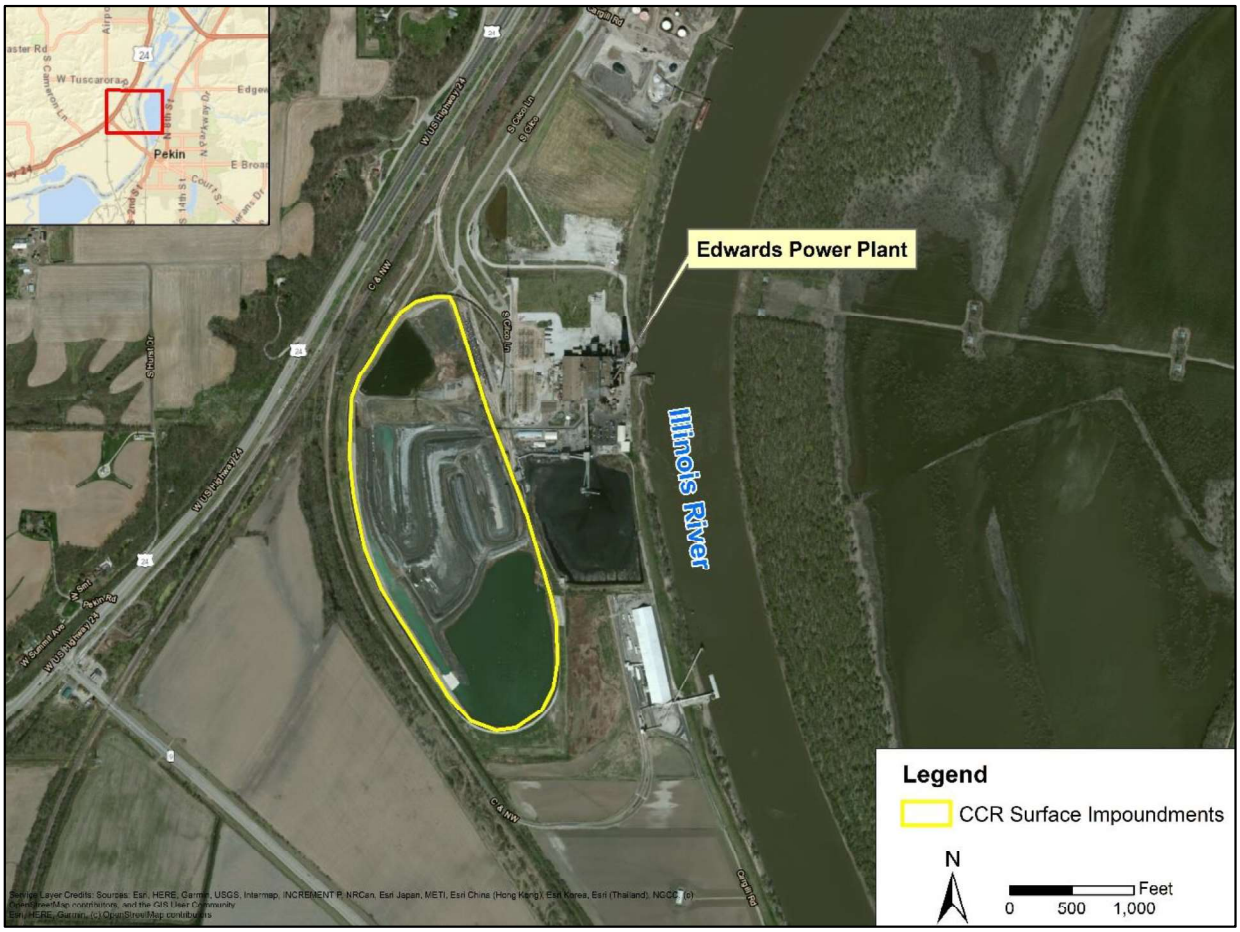

Figure 1-1: Edwards Power Plant Existing CCR Impoundment

1.2 Scope

This report summarizes the evaluation of the existing CCR surface impoundment for compliance with *35 I.A.C 845.340(c)* (2021), herein referenced to as "floodplain compliance." See Appendix A – Excerpt from 35 I.A.C. 845.340(c) for compliance requirements.

1.3 Flooding Source

The Edwards Power Plant CCR impoundment is located west of the Illinois River between river mile 154 and 155. The approximate location of the CCR impoundment delineated in "red" on Figure 1-2.

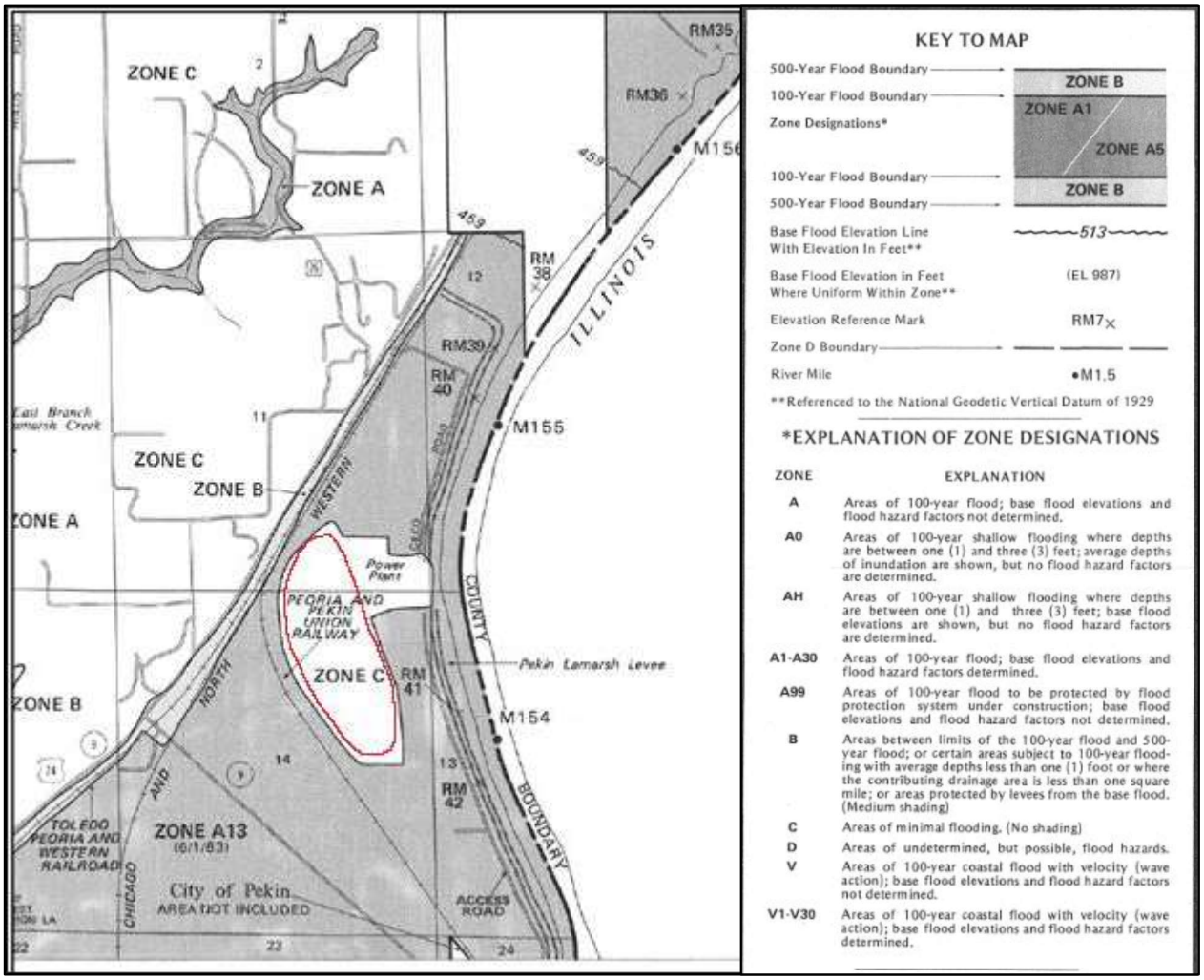

Figure 1-2: CCR Impoundment on FIRM 1705330175B

2.0 DATA AVAILABILITY

2.1 Effective Flood Insurance Rate Map

The effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Peoria County that includes the Edwards Power Plant CCR impoundment is map number 1705330175B with an effective date of June 1, 1983. See Appendix B – FEMA Flood Insurance Rate Map.

2.1.1 Flood Hazard Zones

As seen in the FIRM, both the Edwards Power Plant (power plant) and the CCR impoundment are within Zone C, area of minimal flooding. Recent FEMA resources define Zone C as the areas outside of the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2% annual chance flood, also referred to as the "500-year" flood (FEMA, 2020a). The SFHA is defined as "the area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year" (FEMA, 2020a).

2.1.2 Pekin and LaMarsh Levee System

The FIRM shows the "Pekin LaMarsh Levee" which is a non-accredited levee system (USACE, 2021). According to the National Levee Database, the Pekin and LaMarsh levee system elevation ranges from 455.17 feet to 458.17 feet North American Vertical Datum of 1988 (NAVD88). Unless otherwise noted, all elevations referenced in this report refer to NAVD88.

According to FEMA's *Guidance for Flood Risk Analysis and Mapping Levees* (FEMA, 2020b), a non-accredited levee system is a system that does not meet the National Flood Insurance Program (NFIP) regulatory requirements of 44 C.F.R. § 65.10 and are not shown on a FIRM as reducing the base flood hazard. Therefore, the effects of the levee system were not considered providing any level of flood protection for the CCR impoundment.

2.2 Flood Insurance Studies

The effective FEMA Flood Insurance Study (FIS) for Peoria County, study number 170533V000, has an effective date of December 1, 1982. However, the neighboring county on the east side of the Illinois River, Tazwell County, updated their FIS, study number 17179CV000A, in 2017. Because Tazwell County has an FIS with a later effective date than Peoria County, it was presumed that more recent floodplain data was available than what was used to develop the Peoria County FIS in 1982.

2.2.1 Topographic Information

According to the Peoria County effective FIS, cross sections were determined from field surveys, whereas topographic information for the Illinois River overbanks was derived from United States Geological Survey (USGS) 7.5 Minute Series Topographic Maps for Peoria Illinois from 1949 and photorevised in 1967 (FEMA, 1982). As no date was provided for the field surveys, it is assumed that the data was collected around the time of the FIS.

According to the Tazwell County effective FIS, the hydrologic and hydraulic analysis was based on the *Upper Mississippi River System Flow Frequency Study*, published in January 2004 (FEMA, 2017). Cross sections for the Illinois River between river mile 80.2 and 286, which includes the area near the Edwards Power Plant, were created data from 1998 aerial photography and photogrammetry as well as digital hydrographic surveys collected from 1997 or later and supplemented with United States Geological Survey (USGS) National Elevation Dataset 1/3 arc second coverage (FEMA, 2017). Because the CCR impoundment was constructed in 1960, its impacts would have been accounted for in the 2017 FIS, where data used was collected in 1997 or later (FEMA, 2017).

2.2.2 Base Flood Elevation

According to the Peoria County effective FIS floodway data table, the base flood elevation (BFE) for the cross sections at river miles 155 and 154, upstream and downstream of the CCR impoundment, is 458.6 and 458.5 feet National Geodetic Vertical Datum of 1929 (NGVD29), respectively. A conversion factor of -0.3 feet, where NAVD88 is 0.3 feet below NGVD29, was reported in the Tazwell County effective FIS and confirmed using the National Geodetic Survey Coordinate Conversion and Transformation Tool (NCAT). Using this conversion factor of -0.3 feet, the BFE for the cross sections at river miles 155 and 154 is 458.3 and 458.2 feet NAVD88, respectively. Therefore, the BFE of the CCR impoundment is assumed to be 458.3 feet.

According to the Tazwell County effective FIS floodway data table, the BFE for the cross sections at river miles 155.1, 154.6, and 154.1, is 457.7, 457.7, and 457.6 feet, respectively. Therefore, by the Tazwell County effective FIS, the BFE of the CCR impoundment is assumed to be 457.7 feet, 0.6 feet lower than the BFE from the Peoria County effective FIS.

2.3 Hydraulic Model

A copy of the hydraulic model for the Illinois River between river mile 80.35 and 157.7 was obtained from the FEMA Engineering Library on August 19, 2021, (USACE Rock Island District, 2005). The

model was developed in 2005 using HEC-RAS version 3.1.3. The 100-year water surface elevations were calibrated to the results developed from the January 2004 *Upper Mississippi River System Flow Frequency Study*. This was the model used to develop the floodway extents for the Illinois River in Tazwell County. The 2005 model of the Illinois River was considered the best available model for this analysis.

Geospatial locations of the Illinois River cross sections and river centerline were obtained from FEMA's National Flood Hazard Layer (NFHL) geographic information system (GIS) data (FEMA, 2017). Figure 2-1 provides the locations of these cross sections.

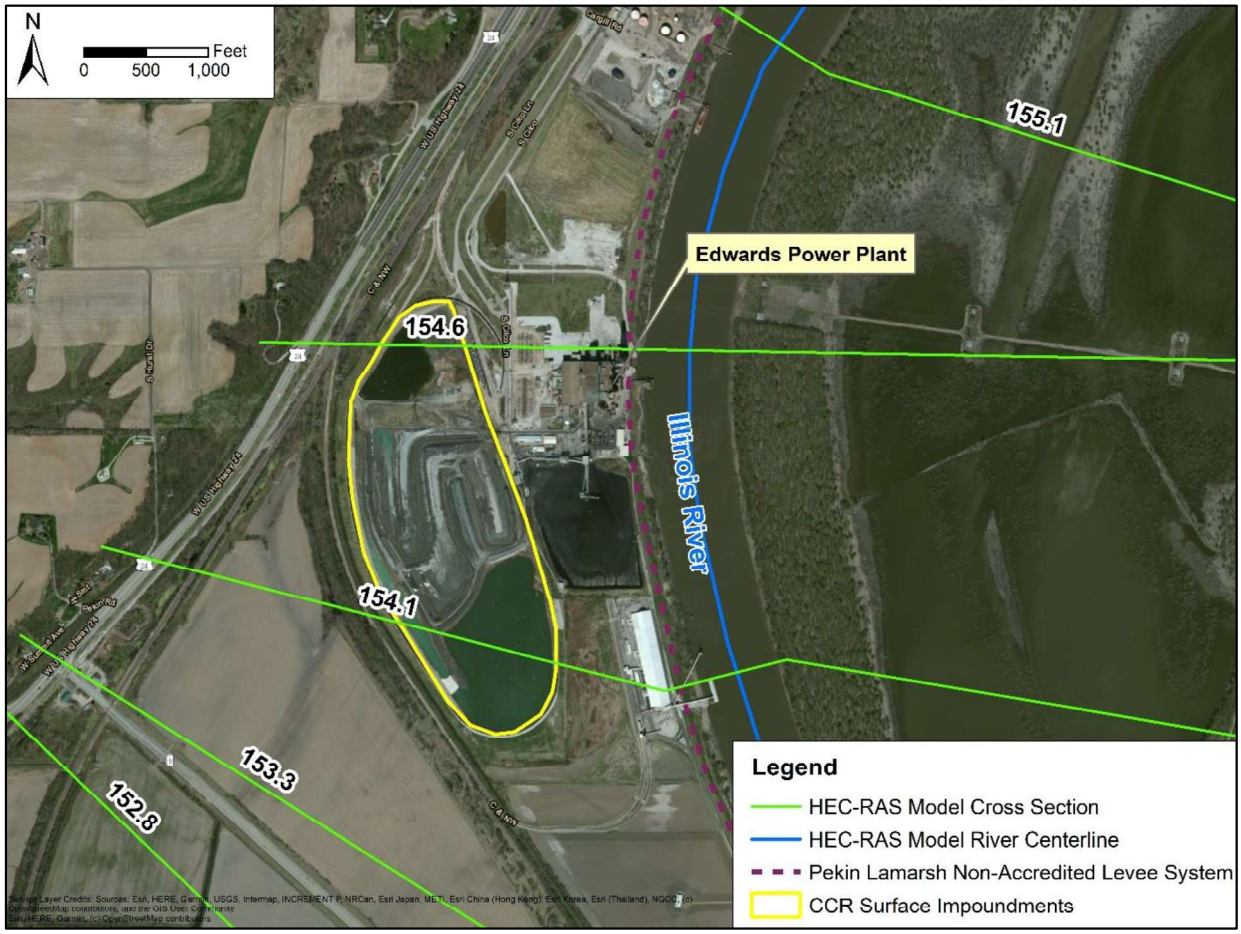

Figure 2-1: Illinois River Cross Sections Near Edwards Power Plant

3.0 HYDRAULIC ANALYSIS

Because the Peoria County effective FIRM did not depict a regulatory floodway, the 2005 model of the Illinois River was used to determine the extents of the floodway, the area that "must be reserved in order to discharge the base flood" (FEMA, 2020c).

3.1 Duplicate Best Available Hydraulic Model

According to the Tazwell County Flood Insurance Study, the model was developed in 2005 using HEC-RAS version 3.1.3. The model was converted to HEC-RAS version 6.0 and the results were within 0.2-feet of the published base flood elevations. Table 3-1 provides a comparison of the Tazwell County effective base flood elevations and modeled water surface elevations for the cross sections shown in Figure 2-1.

Table 3-1: FIS and Duplicate Model BFEs

Cross Section (River Mile)	Tazwell County FIS BFE (feet)	Duplicate Model BFE (feet)	BFE Difference[(a)] (feet)
155.1	457.7	457.6	-0.1
154.6	457.7	457.5	-0.2
154.1	457.6	457.4	-0.2
153.3	457.4	457.2	-0.2
152.8	457.3	457.1	-0.2

(a) Difference = Duplicate Model BFE – Tazwell County FIS BFE

3.2 Corrected Best Available Hydraulic Model

In the 2005 model of the Illinois River, the area landward (west) of the Pekin and LaMarsh levee system, which is located between the Illinois River (flooding source) and the CCR impoundment, is modeled as a blocked obstruction in the right overbank of the cross sections at river miles 155.6 through 149.7. These cross sections also reflect the embankment of the Pekin and LaMarsh levee system in the ground topography.

A corrected best available hydraulic model was developed by replacing the blocked obstructions representing the Pekin and LaMarsh levee system from river stations 155.6 through 149.7 with ineffective flow areas so that the model can simulate the flood hazard landward of the Pekin and LaMarsh levee system. The elevation of the right overbank ineffective flow area was set to the top elevation of the Pekin

and LaMarsh levee system based on the elevation provided in the National Levee Database GIS data download (USACE, 2021). Figure 3-1 and Figure 3-2 show a sample cross section 154.6 that compares the duplicate best available hydraulic model and corrected best available hydraulic model conditions.

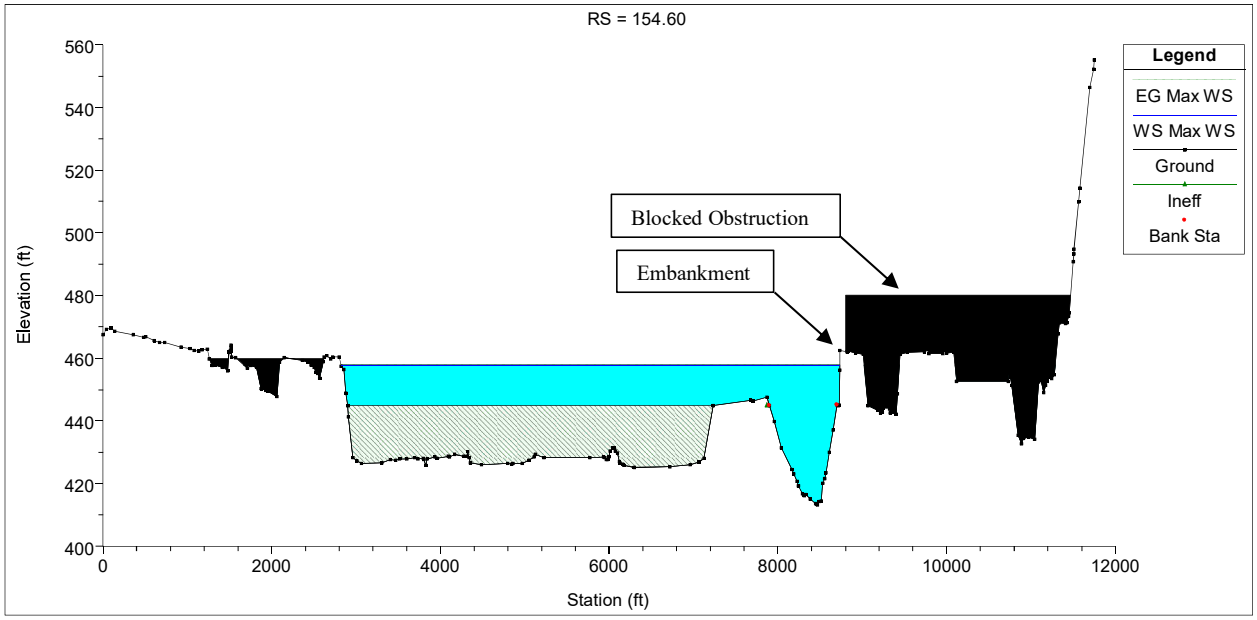

Figure 3-1: Duplicate Model Cross Section

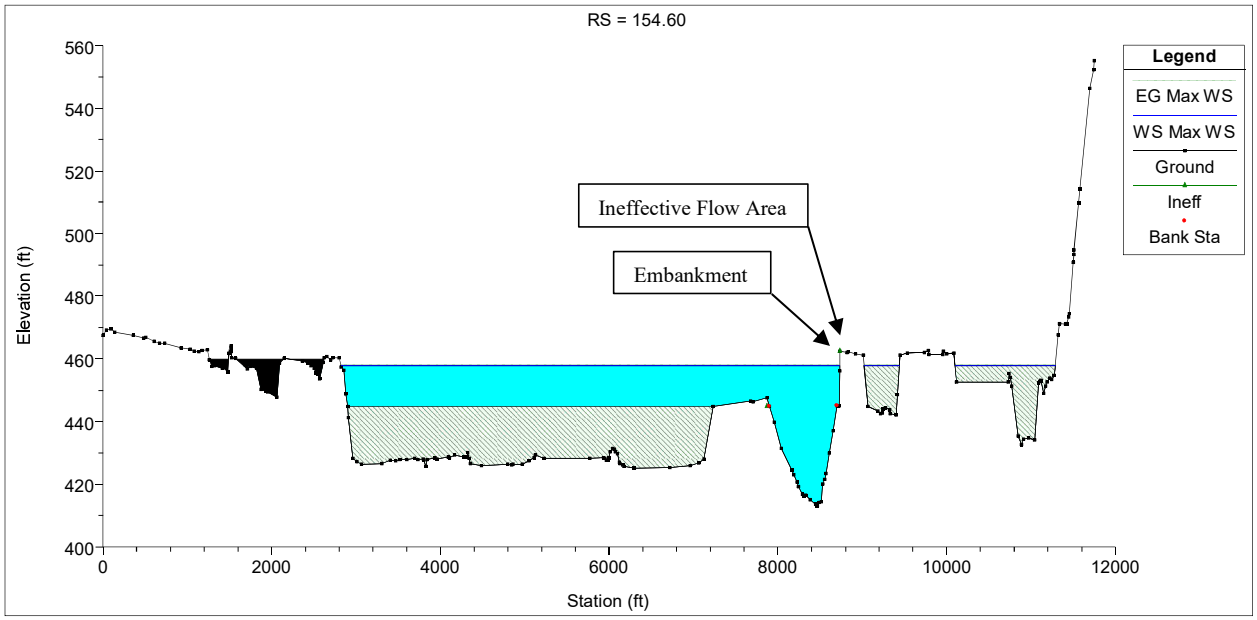

Figure 3-2: Corrected Model Cross Section

A similar analysis was performed for the 2005 floodway encroachment model, where the blocked obstructions representing the Pekin and LaMarsh levee system from river stations 155.6 through 149.7 were replaced with ineffective flow areas. The right overbank encroachment was modeled at the face of the Pekin and LaMarsh levee system embankment. Figure 3-3 and Figure 3-4 show a sample cross section 154.6 that compares the best available duplicate and corrected hydraulic model conditions.

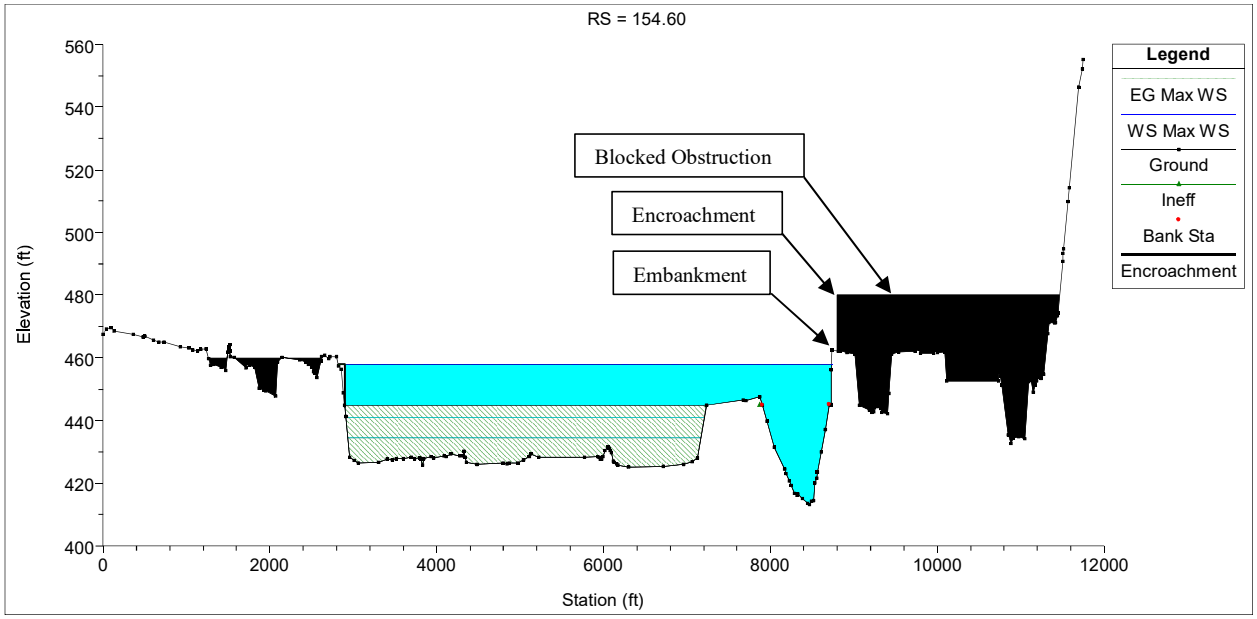

Figure 3-3: Duplicate Model Floodway Encroachment Cross Section

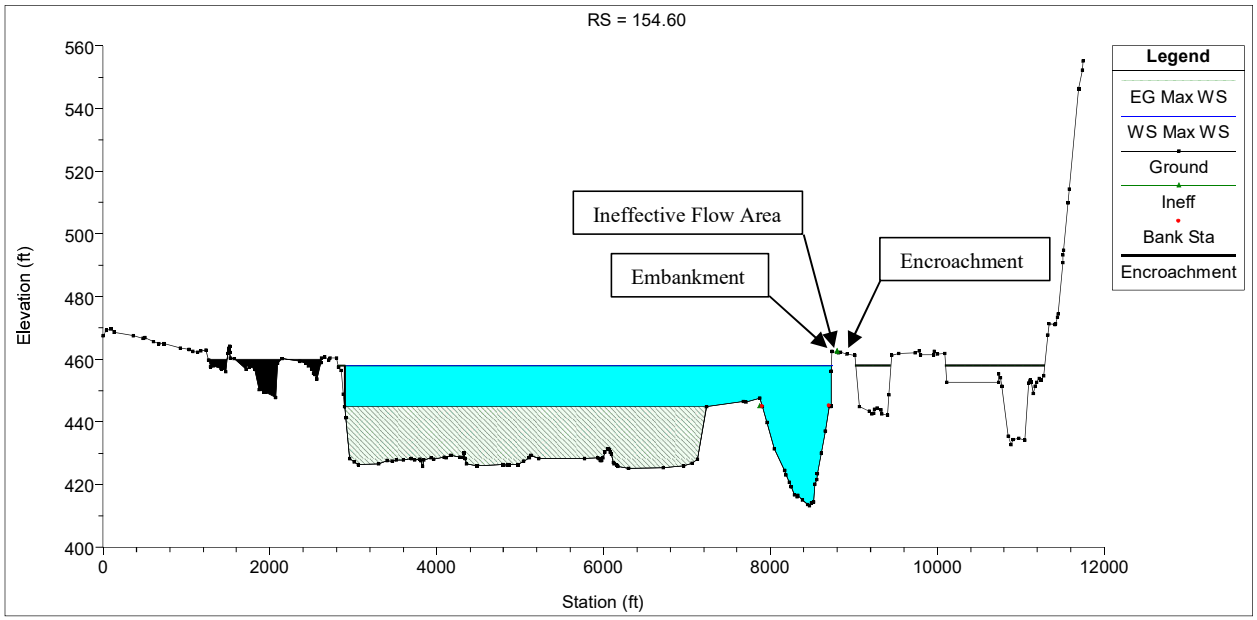

Figure 3-4: Corrected Model Floodway Encroachment Cross Section

Results comparing the corrected best available hydraulic model BFEs without floodway to the duplicate best available hydraulic model and Tazwell County effective FIS are summarized in Table 3-2. The corrected best available hydraulic model BFEs were within 0.1-feet of the duplicate best available hydraulic model BFEs and within 0.2-feet of the BFEs published in the effective FIS.

Table 3-2: Corrected Model BFE Without Floodway

Cross Section (River Station)	Tazwell County FIS BFE (feet)	Duplicate Model BFE Without Floodway (feet)	Corrected Model BFE Without Floodway (feet)	BFE Difference[(a)] (feet)	BFE Difference[(b)] (feet)
155.1	457.7	457.6	457.5	-0.2	-0.1
154.6	457.7	457.5	457.5	-0.2	0.0
154.1	457.6	457.4	457.4	-0.2	0.0
153.3	457.4	457.2	457.2	-0.2	0.0
152.8	457.3	457.1	457.1	-0.2	0.0

(a) Difference = Corrected Model BFE without Floodway – Tazwell County FIS BFE
(b) Difference = Corrected Model BFE without Floodway – Duplicate Model BFE without Floodway

Results comparing the BFE with and without floodway from the corrected best available hydraulic model are summarized in Table 3-2. According to the Tazwell County effective FIS, the State of Illinois limits the increase in BFE with floodway to 0.1-feet (FEMA, 2017). As seen from Table 3-3, the corrected best available hydraulic model with floodway encroachment meets this criterion.

Table 3-3: Corrected Model BFE With Floodway

Cross Section (River Station)	Corrected Model BFE Without Floodway (feet)	Corrected Model BFE With Floodway (feet)	BFE Difference With and Without Floodway (feet)
155.1	457.5	457.6	+0.1
154.6	457.5	457.6	+0.1
154.1	457.4	457.5	+0.1
153.3	457.2	457.3	+0.1
152.8	457.1	457.2	+0.1

4.0 CONCLUSION

Topographic/contour data at the Edwards Power Plant and CCR impoundment was obtained from the Illinois Geospatial Data Clearinghouse (Illinois Geospatial Data Clearinghouse, 2012). Based on that topographic data, the top of embankment elevation for the CCR impoundment is 459 feet. The BFE at the CCR impoundment is estimated to be 457.5 feet, interpolated from the corrected model BFEs at cross sections at river miles 155.1 and 154.6, and rounded to the nearest tenth. Figure 4-1 provides the estimated extents of the area inundated by the base flood (1% annual chance flood) from the corrected best available hydraulic model. The corrected best available hydraulic model extents of the base flood match closely to the Zone A13 extents from the Peoria County effective FIRM provided in Figure 1-2.

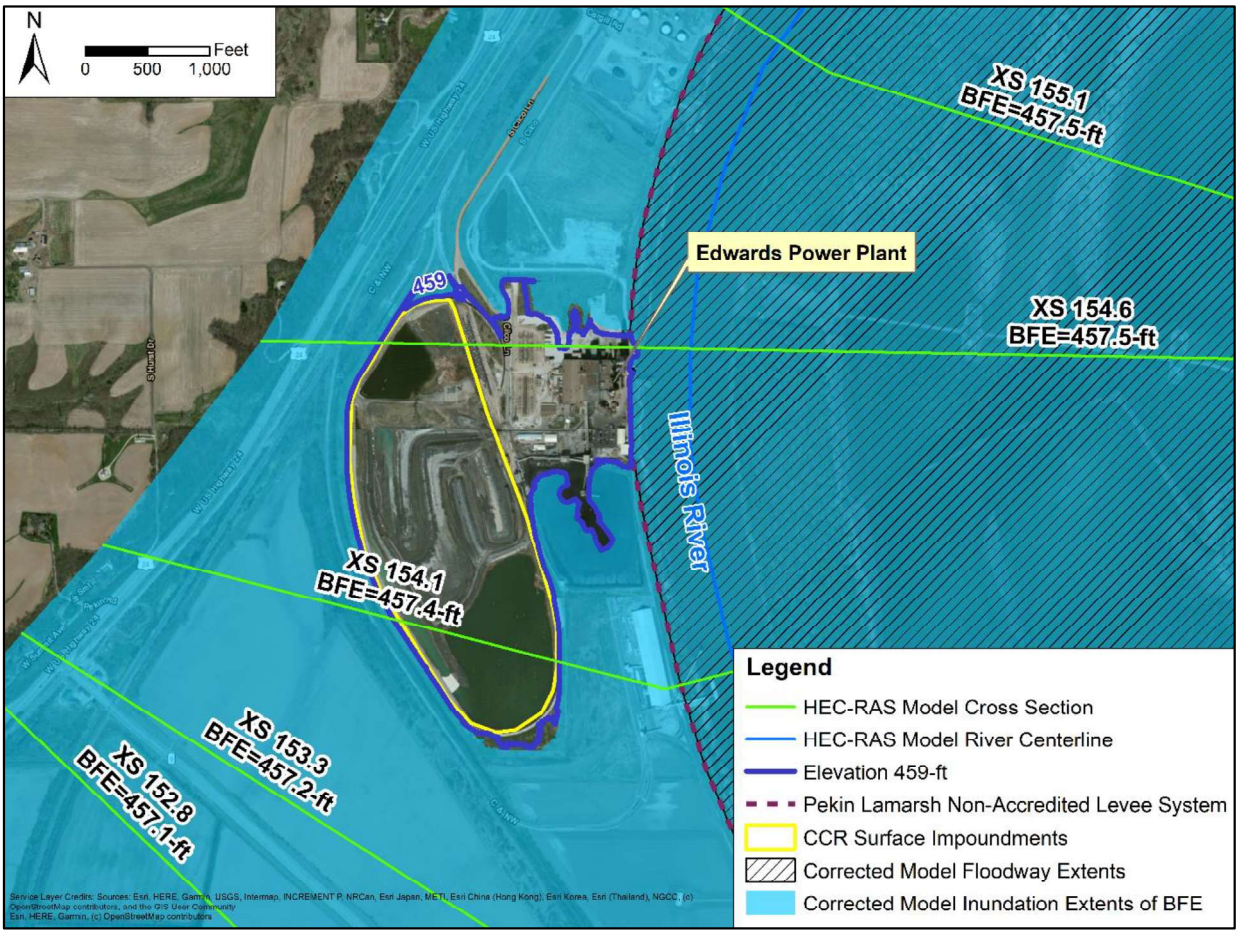

Figure 4-1: Corrected Model Base Flood Elevation and Inundation Extents

As seen in Figure 4-1, the top of embankment for the CCR surface impoundment is located outside of the area subject to inundation by the 1% annual chance flood and has a top of embankment elevation of 459 feet. This is above the corrected best available hydraulic model 1% annual chance flood elevation of 457.5 feet. Therefore, the CCR surface impoundment is not subject to inundation by the base flood.

Since the CCR surface impoundment was constructed in 1960 and the topographic information used to develop the best available hydraulic model, the model (USACE Rock Island District, 2005) used for the Tazwell County effective FIS (FEMA, 2017) was collected in 1997, the CCR surface impoundment does not restrict the flow of the base flood and does not reduce the temporary water storage capacity of the floodplain. The regulatory floodway is defined as the area that "must be reserved in order to discharge the base flood" (FEMA, 2020c). Since the CCR impoundment topography was already included in the hydraulic model that determined the regulatory floodway for Tazwell County, those floodway extents should be applicable to the other side of the Illinois River in Peoria County. Therefore, the CCR surface impoundment does not restrict this base flood discharge. Likewise, the topography of the CCR surface impoundment was included in the hydraulic model that determined the extents of the area inundated by the base flood for Tazwell County, which is the best available hydraulic model. Therefore, the CCR surface impoundment does not reduce the compensatory storage of the base flood.

Based on the analysis included herein the Edwards Power Plant existing CCR surface impoundment complies with the requirements included in *35 I.A.C. 845.340(c)* (2021).

- The CCR impoundment does not restrict the flow of the base flood because it was included in the best available hydraulic model that defined a regulatory floodway for Tazwell County on the west side of the Illinois River and should also apply to the east side of the Illinois River in Peoria County. The floodway is the area reserved to discharge the base flood.
- The CCR impoundment does not reduce the temporary water storage capacity of the 100-year floodplain because it was included in the best available hydraulic model that demonstrates the inundation area of the based flood or 1% annual chance flood is around the CCR impoundment as seen in Figure 4-1.
- The CCR impoundment is not subject to carrying away of CCR by waters of the base flood because the top of embankment elevation for the CCR impoundment is greater than the BFE as demonstrated in the corrected best available hydraulic model (See Section 3.2 Corrected Best Available Hydraulic Model).

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USACE Rock Island District. (2005, September 30). FEMA Engineering Library. *Illinois River Mile 80 - 286 Flood Computation*.

APPENDIX A – EXCERPT FROM 35 I.A.C. 845.340(C)

b) The owner or operator of the CCR surface impoundment must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of subsection (a).

c) The owner or operator of an existing CCR surface impoundment must complete the demonstration required by subsection (a) and submit the completed demonstration, along with the qualified professional engineer's certification to the Agency with the facility's initial operating permit application.

d) The owner or operator of a new CCR surface impoundment or a lateral expansion of a CCR surface impoundment must submit plans and specifications in a construction permit application that demonstrate the CCR surface impoundment will be constructed under subsection (a). Upon completion of construction, the owner or operator must obtain a certification from a qualified professional engineer that the CCR surface impoundment or lateral expansion was constructed in accordance with the requirements of subsection (a) and submit the certification to the Agency in the facility's initial operating permit application.

Section 845.340 Unstable Areas and Floodplains

a) An existing or new CCR surface impoundment, or any lateral expansion of a CCR surface impoundment, must not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted engineering practices have been incorporated into the design of the CCR surface impoundment to ensure that the integrity of the structural components of the CCR surface impoundment will not be disrupted.

b) The owner or operator must consider all the following factors, at a minimum, when determining whether an area is unstable:

1) On-site or local soil conditions, including ~~but not limited to~~ liquefaction, that may result in significant differential settling;

2) On-site or local geologic or geomorphologic features; and

3) On-site or local human-made features or events (both surface and subsurface).

c) An existing or new CCR surface impoundment, or any lateral expansion of a CCR surface impoundment, must not be located in a floodplain unless the owner or operator demonstrates that recognized and generally accepted engineering practices have been incorporated into the design of the CCR surface impoundment to ensure that the CCR surface impoundment will not restrict the flow of the base flood, reduce the temporary water storage capacity of a floodplain, or result in washout of CCR, so as to pose a hazard to human life, wildlife, or land or water resources. For this subsection (c):

1) Base flood means a flood that has a 1 percent or greater chance of recurring in any year or a flood of a magnitude equaled or exceeded once in 100 years on average within the time of historical river level records.

2) Floodplain means the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, which are inundated by the base flood.

3) Washout means the carrying away of CCR by waters of the base flood.

dе) The owner or operator of the CCR surface impoundment must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of subsections (a) and (c).

ed) The owner or operator of an existing CCR surface impoundment must complete the demonstration required by subsections (a) and (c) of this Section and submit the completed demonstration, along with a qualified professional engineer's certification, to the Agency with the facility's initial operating permit application.

fe) The owner or operator of a new CCR surface impoundment, or a lateral expansion of a CCR surface impoundment, must submit plans and specifications in a construction permit application that demonstrate the CCR surface impoundment will be constructed under subsections (a)and (c). Upon completion of construction, the owner or operator must obtain a certification from a qualified professional engineer that the CCR surface impoundment or lateral expansion was constructed in accordance with the requirements in subsections (a) and (c) and submit the certification to the Agency in the facility's initial operating permit application.

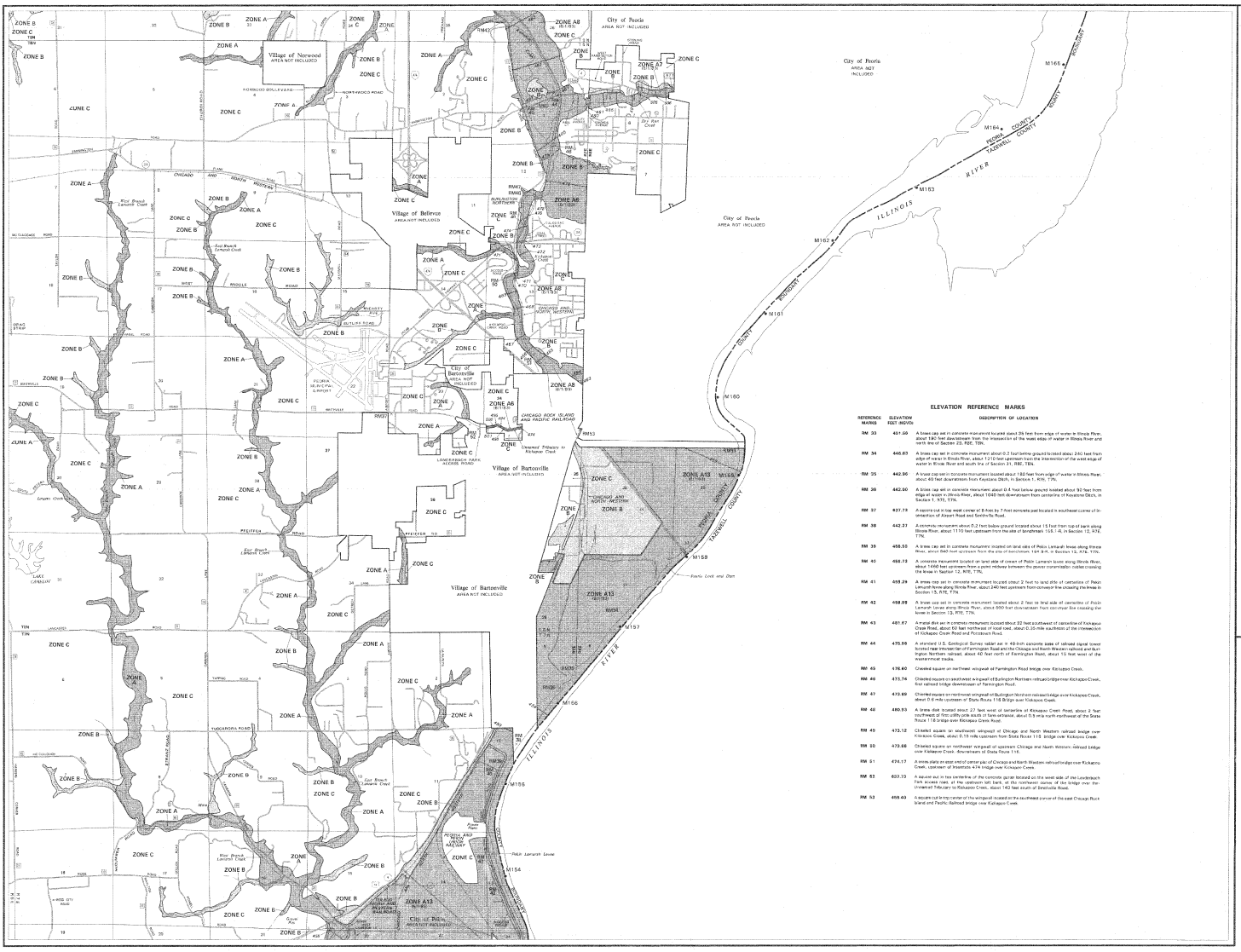
Section 845.350 Failure to Meet Location Standards

a) An owner or operator of an existing CCR surface impoundment who fails to demonstrate compliance with the requirements of this Subpart is subject to the requirements of Section 845.700.

b) An owner or operator of a new CCR surface impoundment, or any lateral expansion of a CCR surface impoundment, who fails to make the demonstration showing compliance with the requirements of this Subpart is prohibited from placing CCR in the CCR surface impoundment.

SUBPART D: DESIGN CRITERIA

Section 845.400 Liner Design Criteria for Existing CCR Surface Impoundments


Village of Norwood
AREA NOT INCLUDED
City of Peoria
AREA NOT INCLUDED
Village of Bellevue
AREA NOT INCLUDED
City of Bartonville
AREA NOT INCLUDED
Village of Bartonville
AREA NOT INCLUDED
City of Peoria
AREA NOT INCLUDED
City of Peoria
AREA NOT INCLUDED
ILLINOIS RIVER
PEORIA COUNTY / TAZEWELL COUNTY BOUNDARY
Peoria Lock and Dam
Peoria Municipal Airport
Lake Camelot
Chicago and North Western Railroad
Chicago, Rock Island and Pacific Railroad
Illinois Terminal Railroad
Illinois Central Railroad
Northmoor Road
Allen Road
Pfeiffer Road
Yuccatopia Road
Farmington Road
Kickapoo Creek
Farm Creek
Laynes Creek
Unnamed Tributary to Kickapoo Creek
Unnamed Tributary to Farm Creek
Unnamed Tributary to Kickapoo Creek
Peoria Lake
Peoria Lock and Dam
Pekin Lemarsh Levee
Langenbach Park Access Road
Chicago and Alton Railroad
Chicago, Rock Island and Pacific Railroad
Chicago and North Western Railroad
Burlington Northern Railroad
Illinois Terminal Railroad
Chicago and Illinois Midland Railroad
Chicago and Illinois Western Railroad
Peoria and Pekin Union Railway
Peoria and Pekin Union Railway
Chicago and Alton Railroad
Chicago, Rock Island and Pacific Railroad
Chicago and North Western Railroad
Chicago and Illinois Western Railroad
Chicago and Illinois Midland Railroad
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Appendix E

Hydrogeologic Site Characterization

Intended for
Illinois Power Resources Generating, LLC

Date
October 25, 2021

Project No.
1940100806-004

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

ASH POND

EDWARDS POWER PLANT

BARTONVILLE, ILLINOIS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT ASH POND

Project Name	**Edwards Power Plant Ash Pond**
Project No.	**1940100806-004**
Recipient	**Illinois Power Resources Generating, LLC**
Document Type	**Hydrogeologic Site Characterization Report**
Revision	**FINAL**
Date	**October 25, 2021**

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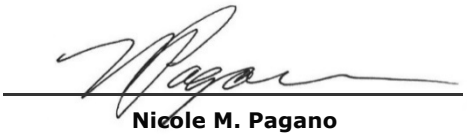

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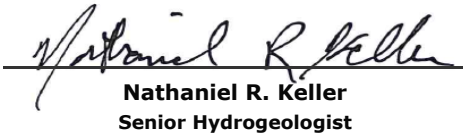

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CONTENTS

Executive Summary		**6**
1.	**Introduction**	**12**
1.1	Overview	12
1.2	Part 845 Description	12
1.3	Previous Investigations and Reports	12
1.4	Site Location and Background	13
1.5	Site History and Unit Description	13
2.	**Regional and Site Geology**	**15**
2.1	Topography	15
2.2	Regional Geomorphology	15
2.3	Soils	15
2.4	Regional Geology	15
2.4.1	Regional Unlithified Geology	15
2.4.2	Regional Bedrock Geology	16
2.4.3	Structure	16
2.4.4	Seismic Setting	17
2.4.5	Mining Activities	17
2.5	Site Geology	18
2.5.1	Site Specific Unlithified Geology	18
2.5.1.1	Fill and CCR	18
2.5.1.2	Upper Cahokia Formation	19
2.5.1.3	Lower Cahokia Formation	20
2.5.2	Bedrock	20
3.	**Regional and Local Hydrogeology**	**21**
3.1	Regional Hydrogeology	21
3.2	Site Hydrogeology	21
3.2.1	Hydrostratigraphic Units	21
3.2.2	Uppermost Aquifer	22
3.2.3	Potential Migration Pathways	22
3.2.4	Water Table Elevation and Groundwater Flow	22
3.2.4.1	Vertical Hydraulic Gradients	23
3.2.4.2	Impact of River Stage on Groundwater Flow	23
3.2.5	Hydraulic Conductivity	24
3.2.5.1	Field Hydraulic Conductivities	24
3.2.5.2	Laboratory Hydraulic Conductivities	24
3.2.6	Horizontal Groundwater Gradients and Groundwater Flow Velocity	25
3.2.7	Groundwater Classification	26
3.2.8	Methane Observed in Groundwater	26
3.3	Surface Water Hydrology	26
3.3.1	Climate	26
3.3.2	Surface Waters	27
4.	**Groundwater Quality**	**29**
4.1	Summary of Groundwater Monitoring Activities	29
4.1.1	40 C.F.R. § 257 Program Monitoring and Well Network	29
4.1.2	Part 845 Well Installation and Groundwater Monitoring	30

4.2	Groundwater Monitoring Results and Analysis	30
4.2.1	Arsenic	31
4.2.2	Barium	31
4.2.3	Beryllium	31
4.2.4	Boron	32
4.2.5	Chloride	32
4.2.6	Chromium	32
4.2.7	Cobalt	33
4.2.8	Fluoride	33
4.2.9	Lead	33
4.2.10	Lithium	33
4.2.11	pH	34
4.2.12	Radium 226 and 228 Combined	34
4.2.13	Sulfate	34
4.2.14	Thallium	34
4.2.15	Total Dissolved Solids	35
5.	**Evaluation of Potential Receptors**	**36**
5.1	Water Well Survey	36
5.2	Surface Water	36
5.3	Nature Preserves, Historic Sites, Endangered/Threatened Species	37
6.	**Conclusions**	**38**
7.	**References**	**40**

TABLES (WITHIN TEXT)

Table A	Average Monthly Temperature Extremes and Precipitation for Peoria, Illinois
Table B	40 C.F.R. § 257 Groundwater Monitoring Program Parameters
Table C	Part 845 Groundwater Monitoring Program Parameters

TABLES (ATTACHED)

Table ES-1	Part 845 Requirements Checklist
Table 2-1	Geotechnical Results
Table 2-2	Ash Analytical Results
Table 2-3	Porewater Analytical Results
Table 2-4	Soil Analytical Results
Table 3-1	Monitoring Well Locations and Construction Details
Table 3-2	Vertical Hydraulic Gradients
Table 3-3	Field Hydraulic Conductivities
Table 3-4	Horizontal Hydraulic Gradients and Groundwater Flow Velocities
Table 4-1	Groundwater Analytical Results
Table 4-2	Groundwater Field Parameters

FIGURES (IN TEXT)

Figure A	Daily Gage Height, January 1, 2018 to March 18, 2021 for USGS Gaging Station 05568500 at the Illinois River at Kingston Mines, Illinois.

FIGURES (ATTACHED)

Figure 1-1	Site Location Map
Figure 1-2	Site Map
Figure 2-1	Site Topographic Map
Figure 2-2	Soil Survey Map
Figure 2-3	Surficial Geologic Deposits
Figure 2-4	Major Structural Features of Illinois
Figure 2-5	Field Investigation Location Map
Figure 2-6	Geologic Cross-Sections A-A’
Figure 2-7	Geologic Cross-Sections B-B’
Figure 2-8	Geologic Cross Section C-C’
Figure 2-9	Bottom of Ash
Figure 2-10	Top of Bedrock
Figure 3-1	Monitoring Well Location Map
Figure 3-2	Top of Uppermost Aquifer
Figure 3-3	Uppermost Aquifer Groundwater Elevation Contours, February 9, 2021
Figure 3-4	Uppermost Aquifer Groundwater Elevation Contours, March 22, 2021

APPENDICES

Appendix A	Historic Topographic Map (1957)
Appendix B	Information Pertinent to 35 I.A.C. § 845.220(a)(3)
Appendix C	Boring Logs and Well Construction Logs
Appendix D	Geotechnical Laboratory Reports
Appendix E	Groundwater Elevations and Contour Maps
Appendix F	Hydraulic Conductivity Test Data
Appendix G	Floodplain Map

ACRONYMS AND ABBREVIATIONS

§	Section
°F	degrees Fahrenheit
35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
bgs	below ground surface
CCR	coal combustion residuals
cm/s	centimeters per second
CPT	cone penetrometer test
CSM	Conceptual Site Model
EPP	Edwards Power Plant
ESRI	Environmental Systems Research Institute
Federal CCR Rule	40 C.F.R. § 257 Subpart D
FEMA	Federal Emergency Management Agency
ft/day	feet per day
ft/ft	feet per feet
g	horizontal acceleration
GMP	Groundwater Monitoring Plan
gpm	gallons per minute
GWPS	Groundwater Protection Standard
HCR	Hydrogeologic Site Characterization Report
HUC	Hydrologic Unit Code
ID	identification
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
ILWATER	Illinois Water and Related Wells
IPRG	Illinois Power Resources Generating, LLC
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
LEL	lower explosive limit
MGD	million gallons per day
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	Number
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.
NRT/OBG	Natural Resource Technology, Inc., an OBG Company
Part 845	Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845
pCi/L	picoCuries per liter
pcf	Pound per cubic foot
PMP	Potential Migration Pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
Rapps	Rapps Engineering & Applied Science
SI	Surface Impoundment

SU	standard units
SSURGO	Soil Survey Geographic
TDS	total dissolved solids
USCS	Unified Soil Classification System
USFWS	United States Fish and Wildfire Service
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

EXECUTIVE SUMMARY

This Hydrogeologic Site Characterization Report (HCR) for the Ash Pond at Edwards Power Plant (EPP) 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 (CSM) includes hydrogeologic and groundwater quality data specific to the Ash Pond, which has been collected between 2015 and 2021. The Ash Pond is located at the Former EPP which is located in Bartonville, Illinois (**Figure 1-1**).

The EPP property is situated in an agricultural/industrial area. The EPP is bound by a salt processing facility to the north, a fertilizer processing plant and the Illinois River to the east, agricultural fields to the south, and railroad tracks and Highway 42 to the west. The Ash Pond is the only coal combustion residuals (CCR) Unit present on the EPP (Vistra identification [ID] number [No.] 301, Illinois Environmental Protection Agency [IEPA] ID No. W1438050005-01, and National Inventory of Dams [NID] No. IL50710).

Four hydrogeologic units are present at the EPP and described as follows from the surface downward:

- **CCR:** Saturated CCR consisting primarily of fly ash within the Ash Pond. CCR is present at thicknesses up to 46.5 feet and at elevations as low as 413.9 feet North American Vertical Datum of 1988 (NAVD88) in the central and northern portion of the Ash Pond**.**
- **Upper Cahokia Formation/Potential Migration Pathway (PMP):** Low permeability clays and silts of the Upper Cahokia Formation are present at the surface. This unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the Upper Cahokia Formation adjacent to the Ash Pond.
- **Uppermost Aquifer:** Thin (generally less than 4 feet), moderate permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present. In locations where higher permeability materials and coarser grained material are absent, the uppermost aquifer is interpreted as the interface between the Lower Cahokia Formation and shale bedrock.
- **Bedrock Confining Unit:** Thick, very low permeability shales and siltstones of the Carbondale and Modesto Formations. This unit was encountered at elevations ranging from approximately 400 to 422 feet NAVD88 with higher bedrock elevations occurring beneath the northern portion of the Ash Pond.

In general, the Upper Cahokia Formation consists of low permeability clays and silts, with limited occurrences of thin discontinuous sand lenses. In several locations, generally near the southern and western portions of the unit, coarser grained materials are present at the base of the Lower Cahokia Formation and/or the top of the bedrock is weathered resulting in relatively higher hydraulic conductivities. Because the interface is laterally continuous, and has relatively higher conductivity, the unlithified/lithified contact was designated as the uppermost aquifer.

Occasional sand lenses within the Upper Cahokia Formation, and clay intervals downgradient at elevations similar to the base of ash in the Ash Pond were identified as PMPs. The underlying bedrock is interpreted as the lower confining unit and has hydraulic conductivities generally an order of magnitude less than those measured in the uppermost aquifer.

Groundwater occurs within both the unlithified materials and bedrock and consistently flows east to west/southwest towards what is interpreted as a former channel of the Illinois River. Based on calculations in this HCR, horizontal gradients range from 0.0014 to 0.0041 feet per feet (ft/ft) and groundwater velocity in the uppermost aquifer ranges from 1.7×10^{-4} to 2.7×10^{-1} feet per day (ft/day) in the north-central and southern portions of the unit, respectively. Calculation of vertical gradients indicate variable results with groundwater migrating from the lower bedrock confining unit into the uppermost aquifer during the winter season (as observed in February). Upward gradients measured in February 2021 were larger in well nests nearer to the Illinois River, indicating the Illinois River may be a regional discharge zone for the bedrock near the Ash Pond.

Part 845 parameters were monitored in uppermost aquifer and PMP monitoring wells as part of groundwater quality evaluations for the 40 C.F.R. § 257 monitoring program performed between 2015 and present. These data were supplemented with installation and 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(a)(1) groundwater protection standards (GWPSs) and are considered potential exceedances:

- Arsenic – at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-13, AW-14, AW-19 and AW-20; upgradient uppermost aquifer wells AP05S and AW-08; PMP monitoring wells APW-01 and APW-04; and downgradient bedrock wells AP07D and AW-15C.
- Barium – at downgradient uppermost aquifer wells AW-10, AW-11, and AW-15; and bedrock monitoring wells AW-15C and AP07D.
- Beryllium – at downgradient uppermost aquifer wells AW-08, AW-09, AW-10, and AW-11; and bedrock monitoring well AP07D.
- Boron - at downgradient uppermost aquifer wells AW-05, AW-18, AW-19, AW-20, and AW-21; and PMP wells AP07S and AW-15S.
- Chloride – at downgradient uppermost aquifer well AW-05; PMP monitoring wells APW-01 and APW-04; and at bedrock monitoring wells AP05D and AP07D.
- Cobalt - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-14, and AW-17; PMP monitoring wells APW-01 and AW-15S; downgradient bedrock well AP07D; and upgradient well AP05S.
- Lead – at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, and AW-22; upgradient uppermost aquifer well AP05S; PMP monitoring wells APW-01 and AW-15S; and downgradient bedrock well AP07D.
- Lithium - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-15, AW-16, AW-17, and AW-18; upgradient uppermost aquifer well AP05S; downgradient bedrock wells AP07D and AW-15C; and upgradient bedrock well AP05D.
- Radium 226 and 228 combined – at downgradient uppermost aquifer wells AW-09, AW-10, AW-11, AW-15 and AW-16; upgradient uppermost aquifer well AP05S; and downgradient bedrock wells AP07D and AW-15C.
- Sulfate – at downgradient uppermost aquifer well AW-05, and downgradient PMP wells AP07S and AW-15S.

- Total Dissolved Solids (TDS) - at downgradient uppermost aquifer well AW-05; downgradient PMP wells AP07S and AW-15S, and bedrock monitoring wells AP05D, AP07D, and AW-15C.
- Chromium, fluoride, pH, and thallium were also detected at concentrations and/or measured (for pH) outside of their respective GWPSs at one or more locations during monitoring. However, the occurrences were infrequent and/or isolated and individual locations are not listed.

Concentration results for the above parameters were compared directly to 35 I.A.C. § 845.600(a)(1) GWPS 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, the statistical methodologies proposed in the groundwater monitoring plan (GMP) provided in the Operating Permit application, or alternative source demonstrations. Exceedances will be determined following IEPA approval of the GMP.

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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 Tables 3-2, 3-3 & 4-2 Figures 3-3 & 3-4
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;	Section 2.4 & 2.5 Figure 2-3
845.620(b)(7)	Structural characteristics;	Section 2.4.3 Figure 2-4
845.620(b)(8)	Geologic cross-sections;	Figures 2-6 to 2-8
845.620(b)(9)	Soil characteristics;	Section 2.3 Figure 2-2
845.620(b)(10)	Identification of confining layers;	Section 3.2.1

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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;	Sections 3.2.1 & 3.2.3
845.620(b)(12)	Groundwater quality data;	Section 4.2 Table 4-1 & Table 4-2
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 2.5 Figures 2-6 to 2-8 Appendix C
845.620(b)(14)	A map displaying any known underground mines beneath a CCR surface impoundment;	Section 2.4.5 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 2.5.1 & 3.2.5 Table 3-4 Appendix D
845.620(b)(16)	Hydraulic characteristics of the geologic layers identified as migration pathways and geologic layers that limit migration, including:	Section 3.2 Tables 3-2 to 3-4 Appendices D & F
845.620(b)(16)(A)	water table depth;	Section 3.2.4 Figures 3-3 to 3-4 Appendix E
845.620(b)(16)(B)	hydraulic conductivities;	Section 3.2.5 Table 3-3 Appendices D & F
845.620(b)(16)(C)	effective and total porosities;	Section 2.5.1 Table 2-1
845.620(b)(16)(D)	direction and velocity of groundwater flow; and	Sections 3.2.4, 3.2.5, & 3.2.6 Tables 3-2, 3-3, & 3-4 Figures 3-3 & 3-4

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Part 845 Reference	Individual Part 845 Components Reviewed for Completeness	Location of Information in HCR
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

Notes:

[O:SSW 7/13/21, U:CJC 08/16/21; C:SSW 08/16/21]

-- = 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 (SIs): 35 I.A.C. § 845 (Part 845) (IEPA, April 15, 2021), Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this HCR on behalf of EPP (**Figure 1-1**), operated by Illinois Power Resources Generating, LLC (IPRG). This report will apply specifically to the CCR Unit referred to as the Ash Pond. The Ash Pond is a 91-acre unlined CCR SI used to manage CCR and non-CCR waste streams at the EPP. This HCR includes Part 845 content requirements specific to 35 I.A.C. § 845.620(b) (Hydrogeologic Site Characterization) for the Ash Pond at EPP.

1.2 Part 845 Description

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 rule also includes financial assurance requirements for CCR SIs.

A checklist which identifies the specific requirements of 35 I.A.C. § 845.620 is included in **Table ES-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. § 845.620.

1.3 Previous Investigations and Reports

Numerous hydrogeologic investigations have been performed concerning the CCR Unit located at the EPP. 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:

- ***Natural Resource Technology, Inc., an OBG Company (NRT/OBG), October 17, 2017. Hydrogeologic Monitoring Plan – Edwards Ash Pond.*** A summary of data collected since the submittal of the *Site Characterization and Groundwater Monitoring Plan for CCP Impoundment (Rapps Engineering & Applied Science [Rapps], 2009)* including site geology and hydrogeology, aquifer properties, and monitoring network placement and rationale.
- ***Foth, September 8, 2017. Antidegradation Alternative Analysis, Dynegy Midwest Generation, LLC, Edwards Power Station, Bartonville, Illinois.*** An assessment to determine if unwatering and dewatering activities in preparation for installation of a final cover system will cause an impairment to the Illinois River.
- ***AECOM, January 12, 2016. 30% Design Data Report for Edwards Ash Pond Coal Combustion Residuals units at the E.D. Edwards Power Station.*** A geotechnical

program consisting of installation of auger borings, cone penetrometer test (CPT) soundings and piezometers to obtain information for compliance with requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 Subpart D (Federal CCR Rule), design basis, and summary, in addition to preliminary construction costs and schedule.

- ***Natural Resource Technology, Inc. (NRT), March 19, 2013. Phase I Hydrogeological Assessment Report, Coal Combustion Product Impoundment, E.D. Edwards Energy Center, Peoria County IL.*** An investigation and assessment of groundwater quality from the unlined SI at the EPP. Summarizes hydrogeologic information pertinent to the site, evaluates groundwater quality data to determine whether or not operation of the impoundment had adversely affected groundwater, and determined the potential for off-site migration and whether or not there are potential groundwater receptors in the event of a release.
- ***Rapps, December 11, 2009. Site Characterization and Groundwater Monitoring Plan for CCP Impoundment, Ameren Energy Resources Generating, E.D. Edwards Plant, Peoria County, IL.*** A summary assessing the potential for constituent migration from the impoundment. Includes an assessment of subsurface hydrogeologic conditions at the site, identification of private, potable water wells, and oil and gas wells within 2,500 feet of the facility, public water supply wells within 10 miles of the facility, and plans for a groundwater monitoring network.

A GMP is being prepared for the Ash Pond in conjunction with this report and is included in the Operating Permit to which this Report is attached.

1.4 Site Location and Background

The EPP is located in Peoria County between Mapleton and Bartonville in Section 11, Township 7 North, Range 7 East (**Figure 1-1**). The EPP is located near the Illinois River adjacent to a levee and has one CCR SI, the Ash Pond, covering approximately 91 surface acres.

The EPP is situated in a predominantly agricultural area with industrial parcels bordering the property. Historically several coal mines were operated at depths of 100 to 160 feet below ground surface (bgs) in the vicinity of the EPP. The EPP property is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and fertilizer production facility to the east, and agricultural land to the south (**Figure 1-2**).

The Ash Pond was investigated in 2013, as requested by IEPA. Results of the investigation (NRT, 2013) indicated that CCR constituents had not impacted groundwater in the vicinity of the Ash Pond. However, exceedances of Class I Groundwater Standards were reported for pH, chloride, iron, manganese, TDS, and sulfate. Additional wells were installed in 2015 to comply with the Federal CCR Rule, and again in 2021 to collect additional data to meet the requirements of 35 I.A.C. § 845.620.

1.5 Site History and Unit Description

The EPP began power generation in 1960 and the original Ash Pond embankments were placed into service at that time. In 2004, modifications to the rail loop surrounding the Ash Pond increased the elevations of the embankments and reduced the footprint of the active impoundment (AECOM, 2016b). CCR material remains between the rail loop and the berm at the south end of the Ash Pond. High power transmission lines bisect the Ash Pond and two

sub-basins, referred to as the North and South Ponds, were established. The sub-basins are hydraulically connected and CCR placement is continuous throughout the Ash Pond.

The Ash Pond has a surface area of approximately 91 acres with berms up to 27 feet higher than the surrounding land surface. This pond currently discharges to the Illinois River through Outfall 001 included in the facility National Pollutant Discharge Elimination System (NPDES) permit, IL0001970. The primary treatment method for the pond water is settlement via reduced velocity whereby solids settle out in various flow channels and in the main South Pond. The permitted total average daily flow is 5.24 million gallons per day (MGD) (Foth, 2017).

2. REGIONAL AND SITE GEOLOGY

2.1 Topography

The EPP and embankments surrounding the Ash Pond are located at an elevation of approximately 460 feet NAVD88 (**Figure 2-1**). Topographic maps drawn prior to construction indicate the areas of the Ash Pond were generally between 435 and 440 feet National Geodetic Vertical Datum (NGVD29), except for a historic drainage feature or former river channel located in the western portion of the Ash Pond, which has an elevation of approximately 430 feet NGVD29 (**Appendix A**). The areas surrounding the EPP are generally at an elevation of around 435 to 440 feet NVGD29. West of the Ash Pond (across Highway 24), the elevation increases to approximately 600 feet NGVD29, where bedrock outcrops or is present near the surface at the edge of the former historic Illinois River valley.

2.2 Regional Geomorphology

The Ash Pond lies at the eastern edge of the Galesburg 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 Galesburg Plain includes the western portion of the Illinoian drift sheet in western Illinois, with most streams flowing from a central upland region westward into the Mississippi River and eastward and southward into the Illinois River. Drainage systems are well developed, and the larger valleys tend to be steep walled, alluviated, and terraced (Rapps, 2009; NRT, 2013).

2.3 Soils

Surficial soils at the Ash Pond are shown on **Figure 2-2** and based on Peoria County soil survey data available in the Soil Survey Geographic (SSURGO) by the United States Department of Agriculture's Natural Resources Conservation Service provided by Environmental Systems Research Institute (ESRI) web hosted layer. Soils surrounding the Ash Pond, not including the Urban Land (#533) within the limits of the EPP, are identified as: Orthents (loamy, hilly/undulating) along the entire Ash Pond boundary; Beaucoup silty clay loam (0 to 2 percent slopes, rarely flooded) and Titus silty clay (0 to 2 percent slopes, rarely flooded) north and south of the Ash Pond within agricultural land; Lawson silt loam (0 to 2 percent slopes, frequently flooded) east of the Illinois River; Sarpy loamy fine sand (0 to 2 percent slopes, frequently flooded, long duration) east of the Ash Pond and adjacent to the Illinois River.

2.4 Regional Geology

2.4.1 Regional Unlithified Geology

The Ash Pond is located in the Illinois Valley where the general sequence of unlithified Quaternary deposits consists of poorly sorted sand, silt, and clay of the Cahokia Formation. The upper part of the Cahokia Formation consists of overbank silts and clays, while the coarser-textured lower portion is mainly sandy channel and lateral accretion deposits. The Cahokia Formation is present along all Illinois streams, although locally absent where active stream erosion is occurring. In major valleys, it commonly overlies the well-sorted deposits of the Henry Formation (Willman and Frye, 1970). The Cahokia Formation is generally greater than 20 feet thick in the study area (NRT, 2017). Regional surficial deposits, which were mapped on a

regional scale, shown on **Figure 2-3** indicate Radnor Till may be present near the topographic bluffs discussed in Section 2.1.

Underlying the Cahokia Formation is glacial outwash belonging to the Henry and Banner Formations. The sands of the Henry and Banner Formations fill the deepest parts of the Illinois Valley, and are generally 75 to 150 feet thick in the area. The Sankoty Sand Member of the Banner Formation rests directly on bedrock and fills the deepest part of the Illinois Valley in the area. Its thickness varies from about 50 to 150 feet due to erosion and irregularities on the bedrock surface (Burch and Kelly, 1993). The Sankoty Sand is the most extensive aquifer in the region and is characterized by coarse- to medium-grained sand with an abundance of quartz grains, of which 25 percent or more are pink, rounded, and polished. Gravel is present in some beds but is not common (Willman and Frye, 1970).

2.4.2 Regional Bedrock Geology

The unlithified deposits are underlain by Pennsylvanian age bedrock, much of which is shale, of the Carbondale and Modesto Formations (Kolata, 2005; Willman et al., 1967). The Carbondale Formation, named for Carbondale, Jackson County, near the outcrop belt of the formation, includes all strata from the base of the Colchester (No. 2) Coal Member to the top of the Danville (No. 7) Coal Member. It overlies the Spoon Formation and varies in thickness from less than 150 feet in western and northeastern Illinois to more than 400 feet in southern Illinois. The Carbondale Formation consists of sandstones, shales, limestones, and coals. The sandstones occur in elongate, channel facies up to about 100 feet thick, are typically subgraywackes, and are more argillaceous than older Pennsylvanian sandstones in Illinois. Gray shales make up the greatest part of the formation, with the thicker gray shales representing delta front or prodelta deposits. Gray to dark-gray, argillaceous limestones are widespread and normally fossiliferous. The coals include the principal economic coals of Illinois, the Danville (No. 7), the Herrin (No. 6), the Springfield-Harrisburg (No. 5), and the Colchester (No. 2).

The Modesto Formation, named for Modesto, Macoupin County, near the type locality, overlies the Carbondale Formation and includes all strata from the top of Danville (No. 7) Coal to the base of the Shoal Creek Limestone Member or the LaSalle Limestone Member. Its thickness varies from less than 125 feet along the LaSalle Anticlinal Belt in east-central Illinois to over 450 feet in southern Illinois, averaging approximately 350 feet. The Modesto Formation consists of sediments similar to those found in the underlying Carbondale Formation, but the coals are thinner and less extensive, the limestones tend to be thicker and less argillaceous, and several red claystones and shales are associated with the open-marine limestones. Gray shales constitute a major part of the Modesto Formation and individual beds tend to be extremely thick.

The elevation of the bedrock surface in the study area ranges from approximately 400 to 450 feet above mean sea level (Herzog et al., 1994). Well logs indicate that the depth to bedrock ranges from more than 50 feet in the Illinois Valley to less than 20 feet in the adjacent uplands, and the lithology of the uppermost bedrock is mainly shale.

2.4.3 Structure

The major geologic structural features around Illinois are shown on **Figure 2-4**. The Ash Pond is located within a stable region of the continent within the north-central portion of the Illinois Basin. In accordance with 40 C.F.R. § 257.62(a), an analysis was completed to identify fault areas. The results indicate the following: "The nearest known mapped faults are four unnamed

faults associated with the Troy Grove Dome, which are located approximately 63 miles northeast and the timeframe of the most recent activity on the fault is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Site" (Haley & Aldrich, Inc., 2018).

2.4.4 Seismic Setting

As required in 35 I.A.C. § 845.330, existing and new CCR SIs and lateral expansions of existing landfills must not be located in seismic impact areas, unless owners or operators demonstrate that the unit is designed to resist the maximum horizontal acceleration (g) in lithified earth material. The definition of a seismic impact zone per 40 C.F.R. § 257.63 is "areas having a 10 percent or greater probability that the maximum expected horizontal acceleration in hard rock, expressed as a percentage of the earth's gravitational pull, will exceed 0.10 g in 50 years." Based on the data illustrated on the 2014 United States Geological Survey (USGS) Hazard Map, the vicinity of the EPP exhibits a potential horizontal acceleration of 0.06 g with a 98 percent probability of not being exceeded in 50 years. The Ash Pond is therefore not within a seismic impact area, as currently defined in 35 I.A.C. § 845.330. This assessment was completed during evaluation of the Ash Pond with respect to 40 C.F.R. § 257.63 (Haley & Aldrich, Inc., 2018).

2.4.5 Mining Activities

A survey to identify historic mining activities was conducted for a 1,000-meter radius around the Ash Pond and is provided in **Appendix B**. Based on the directory of coal mines for Putnam County (Illinois State Geological Survey [ISGS], 2019), the nearest coal mines in the vicinity of the Ash Pond are immediately adjacent to the western berm of the Ash Pond. These subsurface mines, identified as #828 (located adjacent to western property boundary), #6673 (located approximately 0.1 miles northwest of the Ash Pond), and #3021 (located approximately 0.6 miles north of the Ash Pond), are abandoned underground shaft mines that used the longwall method of mining, essentially removing all of the coal. Orchard Mine (#828), was owned and operated by the Third Vein Coal Company between 1890 and 1909. The coal seam at this location ranged from 32 to 42 inches in thickness, and was mined at depths of approximately 100 to 160 feet bgs. The lateral extent of the mine (with uncertainty limits) extends to the western edge of the Ash Pond (**Figure 1-2** and **Appendix B**). The Petri Mine (#6673) was owned and operated by George Petri Coal Company between 1919 and 1933. The coal seam at this location was on average 4.67 feet thick and located at a depth of approximately 112 feet. The Hollis Mine (#3021) was owned and operated by Robert Rogers between 1933 and 1940. The coal seam at this location was on average 3 feet thick. The source map for this mine indicated some type of fault was present (perhaps a channel) that separated the east and west portions of the mine.

The primary coal mined in this region was the Springfield Coal Seam. The Springfield Coal Seam is located within the central portion of the Carbondale Formation. The Springfield Coal Seam crops out along the margins of the Illinois Basin and reaches a maximum depth in Illinois of about 1,300 feet bgs.

An oil and gas well survey was also conducted in 2021 for a 1,000-meter radius around the Ash Pond. Based on records obtained from ISGS, there are no oil or gas wells located within a 1,000-meter radius of the EPP property. A gas storage field with multiple abandoned and active storage wells is located approximately six miles west of the Ash Pond. Additionally, two wells of unknown

status and one stratigraphic test well are located outside of the 1,000-meter radius to the southeast of the Ash Pond.

2.5 Site Geology

A field investigation was 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 2-5**.

2.5.1 Site Specific Unlithified Geology

The stratigraphy within and immediately surrounding the Ash Pond consists of fill material and CCR underlain by unlithified river alluvium of the Cahokia Formation. The Cahokia Formation (consisting of clay/silt and sandy or gravelly materials in contact with the bedrock) has been separated into two units for this discussion: the upper unit, consisting of predominantly clay/silt, and the lower unit, consisting of sandy and/or gravelly material observed near the top of bedrock. Boring logs, monitoring well and piezometer construction forms obtained from investigations at the Ash Pond are provided in **Appendix C**.

Cross-sections illustrating the subsurface materials encountered at the Ash Pond are included in **Figures 2-6** through **2-8**.

2.5.1.1 Fill and CCR

Fill, predominantly coal ash (fly ash, bottom ash, and slag) within the Ash Pond, and materials within constructed berms and railroad embankments, are present around the Ash Pond. Ash is present within the Ash Pond at thicknesses up to approximately 46.5 feet as measured in XPW02, and ash is generally between 30.5 and 43 feet thick as observed in XPW01, XPW01A, XPW03, EDW-B002, EDW-B003 and EDW-B014 (**Figure 2-9** and **Appendix C**). The Ash Pond overlies the Upper Cahokia Formation, and the lowest base of ash elevation of 413.9 feet NAVD88 was observed in the center of the Ash Pond while the highest base of ash elevation was observed along the berms around 450 feet NAVD88 (**Figure 2-9** and **Appendix C)**.

Geotechnical analysis results from six samples collected from ash at soil borings XPW01, XPW01A and XPW02, yielded Unified Soil Classification System (USCS) soil classifications of silt, elastic silt, and silty sand. Previous geotechnical analyses of samples collected from within the ash at the Ash Pond did not provide USCS soil classifications, however, the percent composition of gravel, sand, and fines (silt and clay) were consistent with the most recent samples collected. Sample locations are shown on **Figure 2-5** and the geotechnical results of ash samples collected in 2021 are summarized in **Table 2-1** and the geotechnical laboratory report is provided in **Appendix D**. Geotechnical results from XPW01, XPW01A and XPW02 indicated the following:

- The average moisture content was 40.5 percent and ranged from 33.4 to 45.1 percent.
- The average total porosity (calculated) was 52 percent and ranged from 47 to 55 percent.
- The average dry density was 71.3 pounds per cubic foot (pcf) and ranged from 67.5 to 77.1 pcf.
- The average specific gravity was 2.38 and ranged from 2.335 to 2.414.
- The average grain size distribution was 0.2 percent gravel, 29.9 percent sand, and 69.9 percent fines (silt and clay).

Solid samples were collected from XPW01, XPW01A, XPW02 and XPW03 in 2021. The results of chemical analysis of solid samples collected from ash within the Ash Pond are summarized in **Table 2-2**.

Leachate wells were installed near the base of ash at locations XPW01A, XPW02 and XPW03 in 2021, and porewater samples were collected. The analytical results of porewater samples collected from within the Ash Pond are summarized in **Table 2-3**.

2.5.1.2 Upper Cahokia Formation

The Upper Cahokia Formation located in the vicinity of the Ash Pond is generally classified as lean or fat clay with traces of sand and gravel, although the unit is siltier in the southern portion of the Ash Pond as observed in boring locations AW-08, AW-09, AW-10, and AW-11 (**Figure 2-9** and **Figure 2-10**). Thickness of the Upper Cahokia Formation ranged from 5 feet (as observed in EDW-B014, located in the northern portion of the Ash Pond) to approximately 40 feet (as measured in AW-08). Beneath the Ash Pond, the thickness of the Upper Cahokia Formation is variable. A minimum of five feet of clay was observed between the base of ash and the top of bedrock at EDW-B014 and clay is approximately 10 feet thick in other centrally located borings as observed in EDW-B002, EDW-B003, EDW-B005, and XPW01 (**Figure 2-9** and **Figure 2-10**). Near the berms where the fill deposits are thinner, the Upper Cahokia can exceed 40 feet in thickness as observed at EDW-B012 (**Appendix C**).

Discontinuous sandy lenses have been observed within the Upper Cahokia as indicated by a sand/silty sand lens encountered in EDW-B001 (**Figure 2-10**) and AP07S/D, with a thickness of up to 5 feet, but was not observed in any surrounding borings, indicating it is not laterally continuous. A clayey sand lens was observed in AW-22, with a thickness of 1.6 feet, but was not observed in any surrounding borings, indicating it is not laterally continuous. Portions of the Upper Cahokia Formation may have been removed from within the footprint of the Ash Pond either through erosion or during construction of the berms surrounding the pond as indicated by bottom of ash elevations that are lower than preconstruction topography; however, this unit has been encountered in all borings installed below the footprint of the Ash Pond.

Sample locations are shown on **Figure 2-5** and the geotechnical results collected from the Upper Cahokia Formation in 2021 are summarized in **Table 2-1** and the geotechnical laboratory report is provided in **Appendix D**. Geotechnical results from the Upper Cahokia Formation are consistent with the results from previous investigations (Haley & Aldrich, Inc., 2018; and AECOM, 2016a, **Appendix D**), with the exception of grain size as detailed below.

- Moisture content of the samples ranged from 23.2 to 35.1 percent, with an average of 27.9 percent. These observations are at the lower end of the range observed during previous investigations (Haley & Aldrich, Inc., 2018) that indicate a range of 33.1 to 57.9 percent, with an average of 42.1 percent.
- The average total porosity (calculated) was 45 percent, with a range between 42 and 50 percent.
- The average dry density was 91.9 pcf and ranged from 83.9 to 101.3 pcf. These observations are consistent with previous investigations (Haley & Aldrich, Inc., 2018) which indicated an average dry density of 84.45 pcf and range between 67.4 and 101.7 pcf.
- The average specific gravity was 2.69 with a range of 2.661 to 2.700.

- The average grain size distribution was 0 percent gravel, 24.4 percent sand, and 75.6 percent silt and clay. Previous investigations identified the following grain size distribution: 0 percent gravel, 1.75 percent sand, and 98.25 percent silt and clay. The difference in grain size distribution is attributed to sandy intervals that were sampled in 2021 which included a clayey sand, and shallow clay with a higher sand percentage.

Soil samples obtained from the Upper Cahokia Formation were also analyzed for chemical parameters. The results of soil samples collected from the Upper Cahokia Formation are summarized in **Table 2-4**.

2.5.1.3 Lower Cahokia Formation

Several borings encountered thin sandy or gravelly units overlying the bedrock (*i.e.,* EDW-B009 [4 feet], EDW-B010 [1 foot], AW-11 [1 foot] and AW-12 [3 feet]; **Appendix C**), which for this discussion is referred to as the Lower Cahokia Formation. Borings with greater thicknesses (>1 foot) are generally located in the south portion of the Ash Pond. Based on these observations, the coarser grained material of Lower Cahokia Formation is limited in extent and generally only present outside the center of a bedrock valley (discussed in the next section).

The composition of the Lower Cahokia Formation varies across the Ash Pond and was classified as well-graded gravel, clayey gravel, silty sand, and poorly graded sand. Boring locations identified for collection of geotechnical and chemical parameters in 2021 were not able to collect samples due to the size of the gravel, or did not encounter the coarser grained materials of the Lower Cahokia Formation and no samples were collected. Therefore, no geotechnical or chemical results are available for the Lower Cahokia Formation.

2.5.2 Bedrock

The unlithified deposits are underlain by Pennsylvanian age bedrock, much of which is shale, of the Carbondale and Modesto Formations. The elevation of the top of bedrock (**Figure 2-10**) is highest north of the Ash Pond at AW-21 (422.88 feet NAVD88) and declines in elevation to the east toward AW08 (404.5 feet NAVD88) and south toward AW-16 (400.92 feet NAVD88). The top of rock was described as shale, siltstone, and shaley limestone based on borings which were advanced to bedrock. Deep borings AP07D and AP05D, installed in 2017, encountered thin layers of sandstone within the shale and siltstone (**Appendix C**).

The cross-sections (**Figures 2-6** through **2-8**) indicate the presence of a bedrock valley/depression in the west and southwest portion of the pond. Based on the distribution of coarser grained materials of the Lower Cahokia Formation, it appears that the materials are likely present in limited areas on the southern side of the bedrock valley. No geotechnical or solid samples were collected within the bedrock. Boring locations are shown on **Figure 2-5.**

3. REGIONAL AND LOCAL HYDROGEOLOGY

3.1 Regional Hydrogeology

Berg, Kempton, and Cartwright (1984) classified the area as AX (alluvium, a mixture of gravel, sand, silt, and clay along streams, variable in composition and thickness). Aquifers in the Illinois Valley generally fall into two broad categories: (1) unlithified sediments that are glacial or alluvial in origin and contain mostly sand and gravel deposits interbedded with clay and silt, and (2) bedrock aquifers like sandstone and fractured limestone, which vary widely in permeability. The principal aquifer in the area is the sand and gravel outwash deposits of the Banner and Henry Formations in the Illinois Valley. Well logs indicate that high-capacity wells with yields up to 1,000 gallons per minute (gpm) have been developed in this aquifer. These high yield formations have not been observed with any continuity in the vicinity of the Ash Pond. Groundwater wells in the adjacent uplands are either shallow wells in thin sand and gravel lenses which occur within the Glasford Formation diamicton or drilled into the underlying bedrock.

The general pattern of groundwater movement is generally toward the Illinois River, which represents a discharge boundary and receives ground water from both sides. Consequently, the ground-water system plays a role in maintaining baseflow in the Illinois River. Smaller flow systems exist, but the main impetus of flow-direction is toward the river (Burch and Kelley, 1993).

3.2 Site Hydrogeology

Prior to 2015, there were four monitoring wells (APW-01 through APW-04) located around the Ash Pond for monitoring groundwater. In 2015 and 2017, additional wells and piezometers were installed within and around the Ash Pond to meet requirements of 40 C.F.R. § 257. In 2021, additional wells were installed to provide information to meet the requirements of Part 845. A summary of monitoring well locations and construction details are included in **Table 3-1** and depicted on **Figure 3-1**.

3.2.1 Hydrostratigraphic Units

Four distinct water-bearing layers have been identified at the Ash Pond based on stratigraphic relationships and common hydrogeologic properties which are summarized below and discussed in subsequent sections.

- **CCR:** CCR consisting primarily of fly ash within the Ash Pond. CCR is present from the surface (approximately 450 to 460 feet) to a minimum elevation of approximately 414 feet. Water elevations measured in piezometers screened within the Ash Pond indicate the phreatic surface ranges from approximately 450 to 455 feet which is higher than surrounding monitoring wells (**Appendix E**).
- **Upper Cahokia Formation/PMP:** Low permeability clays and silts of the Upper Cahokia Formation. This unit also includes discontinuous lenses of sand, sandy clay to clayey sand, and sandy silt where they occur within the clay and silt. Isolated sand lenses of limited thickness were encountered in three borings located in the northern portion of the site. The saturated and unconfined sandy lenses within the Upper Cahokia Formation and clay and silt screened near the adjacent base of ash in the southern portion of the property (where bedrock is at a lower elevation) have been identified as PMPs.

- **Uppermost Aquifer:** Thin (generally less than 4 feet), moderate permeability sand, silty sand, and clayey gravel units which includes the unconfined clays and silts of the Upper Cahokia Formation, where saturated, and the thin, moderate permeability sands and gravels of the Lower Cahokia Formation, which at some locations also includes the bedrock interface. More permeable materials are generally located in the southern portion of the site. The top of the uppermost aquifer is presented in **Figure 3-2**.
- **Bedrock Confining Unit:** Thick, very low permeability shales and siltstones of the Carbondale and Modesto Formations that are the base of the uppermost aquifer. The bedrock elevation varies between approximately 422 and 400 feet on site, with varying degrees of weathering observed during drilling.

3.2.2 Uppermost Aquifer

The uppermost aquifer includes saturated portions of the Cahokia Formation (both upper and lower) in the vicinity of the Site. Higher permeability materials are generally present at the interface between the unlithified materials and the underlying bedrock. Groundwater monitoring for the uppermost aquifer is focused on this zone because it is continuous, moderate permeability, and likely to indicate potential impacts from the Ash Pond. The top of uppermost aquifer (**Figure 3-2**) was evaluated with respect to the location restrictions in 2018 (Haley & Aldrich, Inc., 2018).

3.2.3 Potential Migration Pathways

The Upper Cahokia Formation consists of low permeability clays and silts, with limited occurrences of thin discontinuous sand lenses. Isolated sand lenses of limited extent within the Upper Cahokia Formation, and clay intervals downgradient of the Ash Pond at elevations similar to the base of ash and above the unlithified/lithified interface, were identified as PMPs. Monitoring wells AP-06, APW-02 through APW-04, P002, AW-15S (clay and silts of the upper Cahokia Formation) and AP07S (discontinuous sand lens) are considered to be screened within PMPs and utilized for this discussion.

3.2.4 Water Table Elevation and Groundwater Flow

Groundwater in the uppermost aquifer generally flows from east to west in the central portion of the Ash Pond towards what is interpreted as a former channel of the Illinois River, and south/southeast at the south end of the Ash Pond (**Figures 3-3** and **3-4**). In the northernmost portion of the Ash Pond there is a minor northwest and northern component of flow in both the uppermost aquifer and PMP. Groundwater elevations vary seasonally, generally less than 5 feet, while across the site they range between approximately 430 and 450 feet, although flow directions are generally consistent. Groundwater contour maps are located in **Appendix E**.

Groundwater elevations in PMP wells range from approximately 455 feet NAVD88 (APW-02) to 430 feet NAVD88 (AW-15S) with flow generally from the east to the south and northwest (**Figures 3-3** and **3-4**) similar to that observed in the uppermost aquifer. Groundwater elevations measured at APW02 are similar to CCR piezometers and the location of the well (within the berm of the unit) may be affected by water elevations in the active Ash Pond. Given the elevations of groundwater detected in these unconfined wells and the lowest elevation of ash (414 feet NAVD88), portions of the Ash Pond are likely in contact with groundwater.

Groundwater elevations within the bedrock were not contoured because the wells are screened at different elevations and within different lithologic materials in this confining unit. However, comparison of elevations in bedrock wells shows flow directions may be consistent with shallower flow systems.

3.2.4.1 Vertical Hydraulic Gradients

Vertical hydraulic gradients were calculated using available groundwater elevation data from February to July 2021 at nested well locations within the Upper Cahokia Formation/PMPs, uppermost aquifer, and bedrock. Vertical hydraulic gradients are presented in **Table 3-2**. The results of the vertical hydraulic gradient calculations for these hydrostratigraphic units are summarized below:

- Within CCR unit:
  - Gradients calculated between AP08 (CCR) and XPW02 (CCR) in the northern portion of the Ash Pond were upward for all events in February through July 2021.
  - Gradients calculated between AP09 (CCR) and XPW03 (CCR) in the central portion of the Ash Pond were downward for all events in February through July 2021.
- Bedrock confining unit to uppermost aquifer:
  - Gradients calculated between AW-15 (uppermost aquifer) and AW-15C (bedrock) indicate variable directions, with upward gradients measured during four events and flat to slightly downward gradients measured in four events.
  - In monitoring wells AP-05S (uppermost aquifer) and AP-05D (bedrock), gradients were upward in February 2021, and downward in March through July 2021. The Illinois River was measured at an elevated level during April and May and measured gradients are likely a result of the river elevation.
- Uppermost aquifer to Upper Cahokia Formation/PMPs:
  - Gradients between AW-15 (uppermost aquifer) and AW-15S (PMP) were upward for all events in February through July 2021.
  - Gradients between APW-03 (PMP) and AW-10 (uppermost aquifer) were upward for all events in March through July 2021.
  - Gradients between APW-04 (PMP) and AW-13 (uppermost aquifer) were upward for all events in February through July 2021.

Although gradients were downward at times between the uppermost aquifer and bedrock surface and the deep bedrock wells, it is expected that groundwater within the bedrock aquifer discharges to the Illinois River during time periods with lower river elevations or in locations south of the site, which is consistent with flow directions in the uppermost aquifer.

3.2.4.2 Impact of River Stage on Groundwater Flow

Based on groundwater elevations and flow maps it does not appear groundwater from the uppermost aquifer consistently flows into the Illinois River adjacent to the EPP property (**Figures 3-3** and **3-4**). However, the River is likely a regional discharge area for the unlithified materials and bedrock although not along the section of the EPP property. Vertical gradients observed in 2021, indicate that water within the bedrock periodically migrates vertically into the Illinois River.

3.2.5 Hydraulic Conductivity

3.2.5.1 Field Hydraulic Conductivities

Field hydraulic conductivity tests were performed in monitoring wells screened within all hydrostratigraphic units in 2021. The test analyses and results are summarized in **Table 3-3**, and analyses are included in **Appendix F**.

Field hydraulic conductivity tests from wells screened within the ash (XPW01A, XPW02 and XPW03) resulted in a geometric mean horizontal hydraulic conductivity of 6.8×10^{-4} cm/s. Previous field hydraulic conductivity tests performed in 2017 (NRT/OBG, 2017) from wells screened within the ash (AP08 and AP09) resulted in a geometric mean of 2.7×10^{-3} cm/s (AP08) and 1.44×10^{-3} cm/s (AP09). Overall, the geometric mean horizontal hydraulic conductivity of the CCR material is 1.4×10^{-3} cm/s.

In the uppermost aquifer wells (AW-12, AW-15, AW-16, AW-17, AW-18, AW-19, AW-20, AW-21, and AW-22) analysis of hydraulic conductivity tests resulted in a geometric mean horizontal conductivity of 1.6×10^{-4} cm/s. Previous field hydraulic conductivity tests (NRT/OBG, 2017) in wells screened within the uppermost aquifer (APW-01, AP05S, AW-05, AW-06, AW-08, AW-09, AW-10 and AW-11) resulted in a geometric mean horizontal hydraulic conductivity of 2.1×10^{-4} cm/s (**Appendix F**). Overall, the geometric mean horizontal hydraulic conductivity for all uppermost aquifer wells is 1.7×10^{-4} cm/s.

Field hydraulic conductivity tests performed in Upper Cahokia monitoring well AW-15S in 2021 resulted in a hydraulic conductivity of 3.2×10^{-3} cm/s, which is an order of magnitude higher than previous results (AP06 and AP07S; NRT/OBG 2017) of approximately 5×10^{-4} cm/s (**Appendix F**). Overall, the geometric mean horizontal hydraulic conductivity for the PMP wells is 9.2×10^{-4} cm/s.

Previous field hydraulic conductivity tests (NRT/OBG, 2017) performed in bedrock wells AP07D and AP05D resulted in horizontal hydraulic conductivities that ranged 1.1×10^{-7} to 3.49×10^{-7} cm/s. A field hydraulic conductivity test from bedrock well AW-15C resulted in a horizontal hydraulic conductivity of 8.2×10^{-4} cm/s. AW-15C is located in the southern portion of the Site within the top 15 feet of shale bedrock. The hydraulic conductivity measured at this location indicates that the surficial bedrock is likely weathered at this location while it is more competent in the northern portions of the Site and at greater depths. The overall geometric mean hydraulic conductivity calculated from AP05D, AP07D, and AW-15C results in a horizontal hydraulic conductivity of 3.2×10^{-6} cm/s which is likely more representative of the bedrock underlying the Site.

3.2.5.2 Laboratory Hydraulic Conductivities

Ten samples were collected for laboratory vertical hydraulic conductivity analysis (ASTM D 5084) during the 2021 field investigation from the hydrostratigraphic units described in Section 3.2.1.1 of this HCR. The results of the 2021 analyses are tabulated in **Table 2-1**, sample locations are shown on **Figure 2-5**, and laboratory reports are provided in **Appendix D**. The results of the 2021 vertical hydraulic conductivity analysis, as well as data available from previous investigations, for these hydrostratigraphic units are summarized below:

- **CCR:** Six samples collected in 2021 from ash borings XPW01, XPW01A, XPW02, and XPW03. Vertical permeability test results in the ash indicated a geometric mean vertical hydraulic

conductivity of 9.3 x 10^{-6} cm/s. Historical results from two samples collected by AECOM (2016a) from ash borings EDW-B002 and EDW-B003 indicated a geometric mean vertical hydraulic conductivity of 7.9 x 10^{-5} cm/s (NRT, 2017).

- **Upper Cahokia Formation/PMP:** Four samples were collected in 2021 from soil borings AW-13A, AW-15, AW-20, and AW-22 for geotechnical testing. Falling head permeability tests results in the Upper Cahokia Formation from these locations indicated a geometric mean vertical hydraulic conductivity of 6.4 x 10^{-8} cm/s. This result is consistent with results of historical samples collected by Haley & Aldrich, Inc. (2018) and AECOM (2016a) which indicated a geometric mean vertical hydraulic conductivity of 7.3 x 10^{-8} cm/s.
- **Lower Cahokia Formation and Bedrock:** Samples were either unable to be collected or analyzed due to their composition.

3.2.6 Horizontal Groundwater Gradients and Groundwater Flow Velocity

Groundwater in the uppermost aquifer generally flows from east to west in the central portion of the Ash Pond towards what is interpreted as a former channel of the Illinois River, and south/southeast at the south end of the Ash Pond. In the northernmost portion of the Ash Pond there is a minor northwest and northern component of flow in both the uppermost aquifer and PMP. Groundwater elevations and flow directions near the Ash Pond are illustrated in 2021 contour maps (**Figures 3-3** and **3-4**). There is little seasonal variation in groundwater flow direction in the unlithified materials regardless of the river elevation as illustrated in **Figures 3-3** and **3-4** (additional contour maps are included in **Appendix E**). Groundwater elevation contours begin to turn toward the river in the southern portion of the site indicating that the uppermost aquifer may discharge to the river south of the site. Horizontal hydraulic gradients were calculated for the uppermost aquifer and PMP, and are summarized in **Table 3-4**.

Horizontal hydraulic gradients calculated for the uppermost aquifer between February and July 2021 range from 0.001 to 0.004 ft/ft. The horizontal hydraulic gradient for the uppermost aquifer is slightly steeper as it nears the sand and gravel in the southwest portion of the Ash Pond, with an average horizontal hydraulic gradient of 0.004 ft/ft (between wells AW-10 and AW-15), in comparison to the central portion of the Ash Pond with an average horizontal hydraulic gradient of 0.002 ft/ft (**Table 3-4**). The steepening gradient towards the southwest portion of the Ash Pond are consistent with previously the reported gradient trends (NRT/OBG, 2017).

Horizontal hydraulic gradients calculated for the PMP between February and July 2021 between wells APW-03 and APW-04 range from 0.003 to 0.004 ft/ft, with an average horizontal hydraulic gradient of 0.003 ft/ft (**Table 3-4**).

The average of hydraulic gradients between wells and an average effective porosity as derived from geotechnical test data obtained from soil borings completed in 2021 were used to calculate uppermost aquifer and PMP groundwater velocities.

Groundwater velocities in the uppermost aquifer determined in the center portion of the Ash Pond (between AW-08 and AW-06) ranged from approximately 1.7 x 10^{-4} to 4.0 x 10^{-4} ft/day in 2021 with an average of 2.5 x 10^{-4} ft/day. Groundwater velocities determined in the southern portion of the Ash Pond between AW-10 and AW-15 were consistent, ranging from 0.25 to 0.27 ft/day, with an average of 0.26 ft/day (**Table 3-4**). The higher velocities observed in the southern portion of the Ash Pond are a result of coarse-grained materials present there.

Groundwater velocities in the PMP determined in the southeastern portion of the Ash Pond (between APW-03 and APW-04) ranged from 0.35 to 0.53 ft/day, with an average of 0.43 ft/ day (**Table 3-4**).

3.2.7 Groundwater Classification

Per 35 I.A.C. § 620.210, groundwater within the uppermost aquifer at the Ash Pond meets the definition of a Class I – Potable Resource Groundwater based on the following criteria:

- Groundwater in the uppermost aquifer extends 10 feet or more below the land surface.
- Hydraulic conductivity exceeds the 1 x 10^{-4} cm/s criterion (**Table 3-3**).

Field hydraulic conductivity tests performed on the unlithified geologic materials that include moderate permeability sand, silty sand, and clayey gravel units which includes the Lower Cahokia Formation and the bedrock interface) and lithified materials (shales and siltstones of the Carbondale and Modesto Formations) at the EPP had geometric mean hydraulic conductivities exceeding 1 x 10^{-4} cm/s. Based on this information groundwater is classified as Class I – Potable Resource Groundwater.

3.2.8 Methane Observed in Groundwater

Methane, a decomposition product of organic materials, is a colorless, odorless, flammable gas. Methane is known to be present in aquifers throughout Illinois, due to both natural and anthropogenic processes (coal mining). Methane may accumulate in the borehole, well, protective casing or in the general work area near a well or boring. During field activities in 2021, methane was detected above 10 percent of the lower explosive limit (LEL) at borehole monitoring well locations AW-13, AW-14, AW-15, AW-15C, AW-16, AW-17, AW-22, and P002. Levels quickly dissipated after venting the monitoring wells to the atmosphere. A methane monitoring plan was established for the safe completion of field activities, including groundwater sampling at EPP. Anyone completing soil borings or approaching any monitoring well at EPP must follow a methane monitoring plan to manage and mitigate potential hazards associated with the presence of methane gas in groundwater.

3.3 Surface Water Hydrology

3.3.1 Climate

The climate in Bartonville is humid and annual precipitation generally exceeds evapotranspiration. Illinois State Water Survey (ISWS) records from 1989 through 2020 at Peoria, Illinois, which is located northeast of the EPP, indicates precipitation averages 35.3 inches per year. Monthly precipitation averages higher than 3 inches from April through August, and 1 to 3 inches in September through March. On average 16 inches of precipitation occur as snowfall.

As shown below in **Table A** below, ISWS temperature records show average maximum daily temperatures for 1989 to 2020 ranging from above 70 degrees Fahrenheit (°F) in May through September and minimum average daily temperatures that are below freezing December through March.

Table A. Average Monthly Temperature Extremes and Precipitation for Peoria, Illinois.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Maximum Temperature (ºF)	33.3	37.6	49.9	62.5	72.6	81.3	84.4	82.5	76.9	64.5	50.1	37.2	61.2
Minimum Temperature (ºF)	18.3	21.5	31.6	41.8	52.2	61.7	65.4	63.2	55.4	44.1	33.3	22.7	42.7
Precipitation (inches)	1.71	1.60	2.08	3.42	3.93	3.18	3.02	3.10	2.97	2.64	2.35	1.84	35.3
https://www.isws.illinois.edu/warm/stationmeta.asp?site=ICC&from=wx													

3.3.2 Surface Waters

The predominant surface water body in the region is the Illinois River and associated lowland backwater lakes. The Illinois River is located directly adjacent to and upgradient from the Ash Pond. A USGS stream gage (#05568500) for the Illinois River at Kingston Mines, Illinois is located 8.7 miles south and west (downstream) of the EPP. The gage datum elevation is 428 feet NGVD29. Daily gage heights for the period of January 1, 2018 to March 18, 2021 are shown in **Figure A** below. The gage height of 3 feet, representing approximate baseflow, occurs at an elevation of about 431 feet NGVD29. Bordering the east perimeter of the Ash Pond, the river has a normal baseflow elevation of about 431 feet NGVD29.

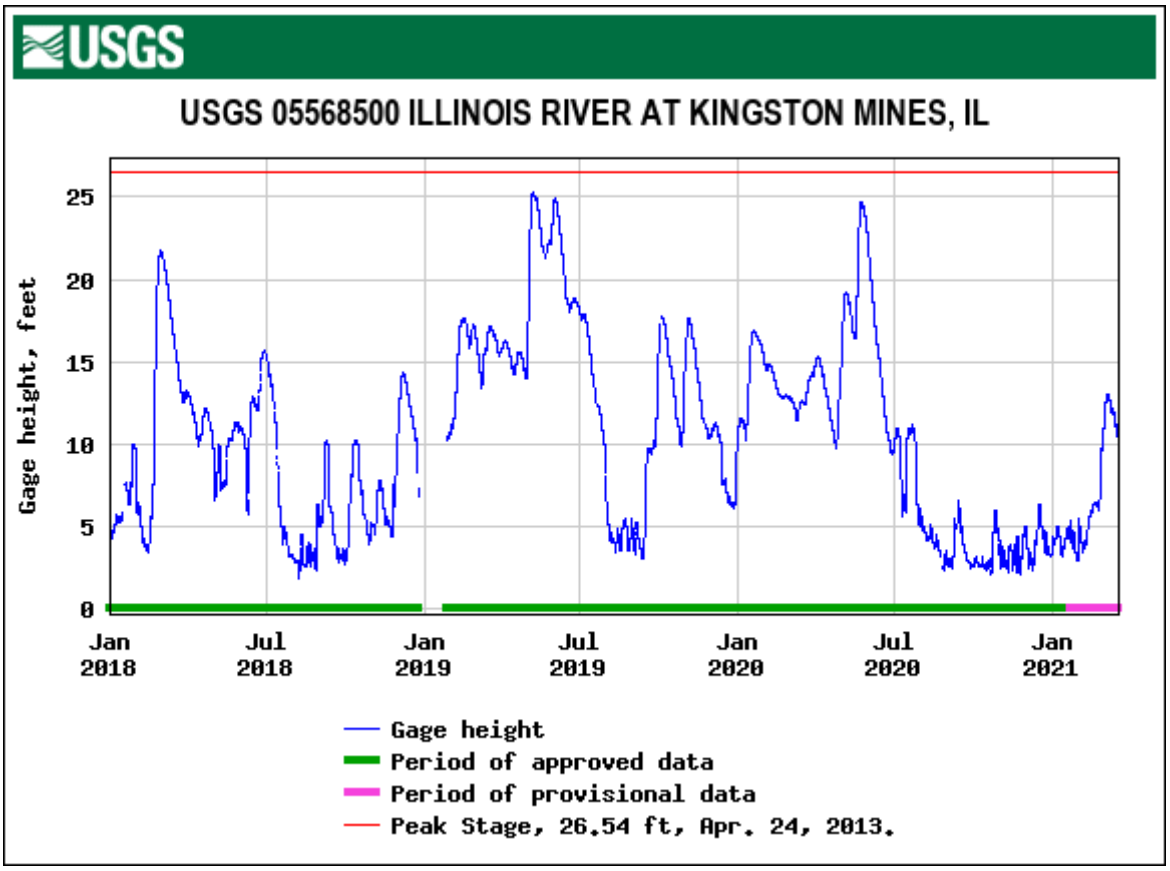

Figure A. Daily Gage Height, January 1, 2018 to March 18, 2021 for USGS Gaging Station 05568500 at the Illinois River at Kingston Mines, Illinois.

A map of surface waters in the vicinity of the Ash Pond is presented in **Appendix B**. The headwaters for the East Branch of Lamarsh Creek are located approximately 0.45 miles northwest of the Ash Pond. The East Branch of the Lamarsh Creek flows southwest to the Lamarsh Creek and ultimately to the Illinois River. Other surface waters in the vicinity include Worley Lake and Pekin Lake, both of which are located across the Illinois River at approximately 0.5 miles from the Ash Pond.

A Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map is not available for Peoria County. A historic (1983) floodplain map indicates that the Ash Pond is located within a Zone C floodplain, and the area surrounding the Ash Pond is within a Zone A13 floodplain (**Appendix G**). Additional information is provided in **Section 5.2**.

4. GROUNDWATER QUALITY

4.1 Summary of Groundwater Monitoring Activities

Between 2010 and 2012, groundwater samples were collected from a subset of wells (APW-01 through APW-04) to assess groundwater quality in the vicinity of the Ash Pond. That assessment included collection of groundwater samples, dissolved analyses of potential indicators of CCR impacts, and comparison to 35 I.A.C. § 620 Groundwater Quality Standards. Results from that assessment indicated no impacts were present from the Ash Pond and the information was reported to IEPA in the *Phase I Hydrogeological Assessment Report* (NRT, 2013). The 2010 to 2012 results are not included in this report.

In 2015 and 2016, 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 proposed Part 845 monitoring programs is included in the evaluation of groundwater quality at the Ash Pond.

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 (AP05S and AW-08) and six compliance wells (AW-06, AW-09, AW-10, and AW-11). 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. The CCR Monitoring Well Network locations are shown on **Figure 3-1**.

Assessment monitoring of these wells was established 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 the Ash Pond. Results are discussed in **Section 4.2**.

Groundwater samples are collected and analyzed for the field and laboratory parameters from Appendix III and Appendix IV of 40 C.F.R. § 257 as summarized in **Table B** below.

Table B. 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	Lead	Selenium
Arsenic	Chromium	Lithium	Thallium
Barium	Cobalt	Molybdenum	Radium 226 and 228 combined
Beryllium			

[1]Dissolved oxygen, temperature, specific conductance, oxidation/reduction potential, and turbidity are recorded during sample collection

4.1.2 Part 845 Well Installation and Groundwater Monitoring

In 2021, 23 additional monitoring wells (AP05D, AP05S, AP07D, AP07S, APW-02, APW-03, APW-04, AW-05, AW-08, AW-12, AW-13, AW-14, AW-15, AW-15C, AW-15S, AW-16, AW-17, AW-18, AW-19, AW-20, AW-21, AW-22, P002) were installed along the perimeter of the Ash Pond 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). Additionally, three leachate monitoring wells (XPW01A, XPW02, and XPW03) were installed within the Ash Pond to characterize CCR materials and leachate. These locations and samples were discussed in **Section 2.5.1**. The boring logs, well construction forms, and related monitoring well forms for the well network are included in **Appendix C** of this HCR. The well locations are shown on **Figure 3-1**.

Prospective monitoring wells sampled for eight rounds between February and August 2021 and the test results were used to develop this HCR and assess well locations for inclusion in the Part 845 monitoring well network.

Groundwater samples were analyzed for 35 I.A.C. § 845.600 parameters summarized in **Table C** below. Part 845 groundwater monitoring results are included below in **Section 4.2**. A summary of groundwater analytical results is presented in **Table 4-1**.

Table C. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
pH	Turbidity	Groundwater Elevation	
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 40 C.F.R. § 257 network monitoring wells between 2015 and 2021 and from the wells installed in 2021 were evaluated with respect to standards included in 35 I.A.C. § 845.600(a)(1). The groundwater analytical results are summarized in **Table 4-1** and discussed in the subsections below and groundwater field parameters are included in **Table**

4-2. Results indicate that the parameters discussed in the following sections were greater than the applicable 35 I.A.C. § 845.600(a)(1) standards and are considered potential exceedances[1].

4.2.1 Arsenic

Arsenic was detected at concentrations greater than the GWPS (0.010 milligrams per liter [mg/L]) in eleven uppermost aquifer wells: downgradient wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-13, AW-14, AW-19 and AW-20 and upgradient wells AP05S and AW-08. Concentrations ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.097 mg/L and have shown temporal variability with concentrations greater than and less than the GWPS at all wells. The median concentration of arsenic in these uppermost aquifer wells was 0.01 mg/L.

PMP wells APW-01 and APW-04 had arsenic concentrations greater than the GWPS during sampling events in 2021. Concentrations of arsenic in these wells range from 0.0054 to 0.025 mg/L with a median concentration of 0.0127 mg/L.

Bedrock well AP07D had arsenic concentrations greater than the GWPS during three of six events in 2021. The concentrations at AP07D ranged from 0.0044 to 0.057 mg/L and results are consistent with variability seen in other parameters. The median concentration of arsenic in bedrock well AP07D was 0.0209 mg/L. Bedrock well AW-15C had arsenic concentrations greater than the GWPS during one event in 2021 at 0.011 mg/L.

4.2.2 Barium

Barium was detected at concentrations greater than the GWPS (2.0 mg/L) in three uppermost aquifer wells (AW-10, AW-11, and AW-15). These wells are located around the southern portion of the Ash Pond, in the locations where the bedrock is at lower elevation and concentrations are variable. AW-10 and AW-11 have not exceeded the standard since 2018, and AW-15 only exceeded the standard once in 2021 shortly after installation of the well. Barium concentrations have declined at AW-15 following the initial sampling.

No PMP wells had barium concentrations greater than the GWPS.

Bedrock well AW-15C had barium concentrations greater than the GWPS during all events sampled in 2021 with a median barium concentration of 3.3 mg/L. Bedrock well AP07D had concentrations greater than the GWPS during 50 percent of events sampled in 2021 and fluctuated significantly, ranging from 0.31 to 8.6 mg/L between sampling events. The median barium concentration in bedrock well AP07D was 1.95 mg/L.

4.2.3 Beryllium

Beryllium was detected at concentrations greater than the GWPS (0.004 mg/L) in four uppermost aquifer wells (AW-08, AW-09, AW-10, and AW-11). Three of the uppermost aquifer wells (AW-08, AW-09, and AW-10) have not had beryllium concentrations greater than the GWPS since 2016, and AW-11 has not had beryllium concentrations greater than the GWPS since 2018.

[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.

No PMP wells have had beryllium concentrations greater than the GWPS.

Bedrock well AP07D had beryllium concentrations greater than the GWPS during three events in 2021. The beryllium concentrations at AP07D ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.017 mg/L with a median concentration of 0.0057 mg/L.

4.2.4 Boron

Boron is a primary indicator parameter for CCR leachate impacts on groundwater quality. Boron was detected at concentrations greater than the GWPS (2 mg/L) in five uppermost aquifer wells (AW-05, AW-18, AW-19, AW-20 and AW-21). At AW-18, concentrations of boron are variable with results both greater than and less than the GWPS, with the most recent results generally less than the GWPS. Uppermost aquifer wells AW-05, AW-19, AW-20, and AW-21 have consistently had concentrations greater than the GWPS during all sampling events in 2021. These wells are located on the west-northwest and north side of the Ash Pond. Concentrations in these wells range from 0.41 to 12 mg/L, with the most elevated boron concentrations occurring in AW-21.

Two PMP wells located north and southwest of the Ash Pond (AP07S screened in a sand lens and AW-15S screened in clay near the base of the Ash Pond), reported boron concentrations greater than the GWPS during all sampling events in 2021. Concentrations of boron in these wells range from 5.4 to 12 mg/L. Based on the eight rounds collected in 2021, boron concentrations in AW-15S and AP07S appear to be consistently within this range. No other wells screened within PMPs have had boron concentrations greater than the GWPS.

Concentrations of boron in bedrock wells (AP05D, AP07D, and AW-15C) range from 0.6 to 1.8 mg/L which are consistent with concentrations detected in the Peoria region (Burch and Kelley, 1993).

4.2.5 Chloride

Chloride was detected at concentrations greater than the GWPS (200 mg/L) in one uppermost aquifer well (AW-05). Concentrations of chloride in this well have declined, similar to boron and sulfate, and groundwater from AW-05 has not exceeded the standard since 2017.

In samples from PMP well APW-04, three of five samples collected in 2021 had concentrations greater than the GWPS with concentrations increasing between sampling events. The median concentration of chloride in APW-04 was 220 mg/L. This well is located near the southeast corner of the unit. One sample collected 2021 from PMP well APW-01, located northeast and upgradient of the unit, had a concentration greater than the GWPS.

Bedrock wells AP05D (background) and AP07D have consistently reported chloride concentrations above the standard in all sampling events in 2021. Concentrations in these wells range from 230 to 830 mg/L, which are generally greater than those measured in the Ash Pond. Concentrations are similar to those detected in groundwater in the Peoria region (Burch and Kelley, 1993).

4.2.6 Chromium

Chromium was detected at concentrations greater than the GWPS (0.1 mg/L) in three uppermost aquifer wells (AW-09, AW-10, and AW-11). The three uppermost aquifer wells have only had chromium concentrations greater than the GWPS once each with the last occurrence in 2018 (AW-11).

No PMP wells have had chromium concentrations greater than the GWPS.

Bedrock well AP07D has had chromium concentrations greater than the GWPS during three events in 2021. The concentrations ranged from non-detect (at a reporting limit of 0.004 mg/L) to 0.59 mg/L and the median concentration of chromium in bedrock well AP07D was 0.175 mg/L. The variability of chromium is consistent with other parameters at this location.

4.2.7 Cobalt

Cobalt was detected at concentrations greater than the GWPS (0.006 mg/L) in seven downgradient uppermost aquifer wells (AW-05, AW-06, AW-09, AW-10, AW-11, AW-14 and AW-17). Cobalt was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well AP05S. In general, the frequency of cobalt concentrations greater than the GWPS has declined in these wells.

Cobalt was detected at concentrations greater than the GWPS in PMP well APW-01 during two sampling events in 2021. PMP well AW-15S reported cobalt concentrations greater than the GWPS only during the initial event following installation in 2021.

Bedrock well AP07D had cobalt concentrations greater than the GWPS during five of six sampling events in 2021. The concentrations ranged from non-detect (at a reporting limit of 0.002 mg/L) to 0.290 mg/L, with similar variability to other parameters. The median concentration of cobalt at bedrock well AP07D was 0.104 mg/L.

4.2.8 Fluoride

Fluoride was detected at concentrations greater than the GWPS (4.0 mg/L) during two of eight sampling events in 2021 at downgradient uppermost aquifer well AW-18.

No PMP wells had fluoride concentrations greater than the GWPS.

No bedrock wells had fluoride concentrations greater than the GWPS.

4.2.9 Lead

Lead was detected at concentrations greater than the GWPS (0.0075 mg/L) in six uppermost aquifer wells (AW-05, AW-06, AW-09, AW-10, AW-11, and AW-22). Lead was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well AP05S.

Lead was detected at concentrations greater than the GWPS in PMP well APW-01 during one sampling event in 2021. PMP well AW-15S had lead concentrations greater than the GWPS during the initial event following installation in 2021.

Bedrock well AP07D has had lead concentrations greater than the GWPS during five events in 2021. The concentrations ranged from non-detect (with a reporting limit of 0.001 mg/L) to 0.270 mg/L; the median concentration of lead in bedrock well AP07D was 0.09 mg/L. The variability of lead concentrations is consistent with other parameters at this location.

4.2.10 Lithium

Lithium was detected at concentrations greater than the GWPS (0.04 mg/L) in nine downgradient uppermost aquifer wells (AW05, AW-06, AW-09, AW-10, AW-11, AW-15, AW-16, AW-17, and AW-18). Lithium was also detected greater than the GWPS in upgradient uppermost aquifer AP05S.

No PMP wells have had lithium concentrations greater than the GWPS.

Bedrock wells AP05D, AP07D, and AW-15C have consistently reported lithium concentrations greater than the GWPS in all sampling events in 2021. Lithium concentrations ranged from 0.045 to 0.72 mg/L with a median concentration of 0.065 mg/L.

4.2.11 pH

pH was measured below the lower GWPS of 6.5 standard units (SU) in upgradient uppermost aquifer well AP05S and seven downgradient uppermost aquifer wells (AW-08, AW-12, AW-16, AW-17, AW-18, AW-19, and AW-20), during one sampling event in 2021.

pH was also measured below the lower GWPS in PMP wells AP07S, APW-03, and P002 during the same sampling event.

No bedrock wells had pH measurements outside of the range between the lower and upper (9.0 SU) GWPS.

4.2.12 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 five uppermost aquifer wells (AW-09, AW-10, AW-11, AW-15, and AW-16). Uppermost aquifer wells AW-09, AW-10, and AW-11 have not had radium 226 and 228 combined concentrations greater than the GWPS since 2018. Uppermost aquifer well AW-15 has had radium 226 and 228 combined concentrations greater than the GWPS during two events in 2021 with a median concentration of 4.14 pCi/L. Uppermost aquifer well AW-16 had radium 226 and 228 combined concentrations greater than the GWPS five times in 2021 with a median concentration of 5.63 pCi/L. Upgradient uppermost aquifer well AP05S had radium 226 and 228 combined concentrations greater than the GWPS three times in 2021 with a median concentration of 2.68 pCi/L.

No PMP wells have had radium 226 and 228 combined concentrations greater than the GWPS.

Bedrock wells AP07D and AW-15C have had radium 226 and 228 combined concentrations greater than the GWPS during three events in 2021. The concentrations ranged from 0.268 to 23 pCi/L with median concentrations of 8.22 pCi/L (AP07D) and 5.09 pCi/L (AW-15C).

4.2.13 Sulfate

Sulfate is also a primary indicator parameter of CCR leachate impacts on groundwater quality. Sulfate was detected at concentrations greater than the GWPS (400 mg/L) in uppermost aquifer well AW-05 during one event in July 2017.

PMP wells AP07S and AW-15S have had sulfate concentrations greater than the GWPS during multiple events in 2021. The concentrations ranged from 150 to 570 mg/L with a median concentration of 480 mg/L.

No bedrock wells had sulfate concentrations greater than the GWPS.

4.2.14 Thallium

Thallium was detected at concentrations greater than the GWPS (0.002 mg/L) at uppermost aquifer well AW-10 during one sampling event in 2016.

No PMP wells have had thallium concentrations greater than the GWPS.

Thallium was detected at concentrations greater than the GWPS in bedrock well AP07D during one sampling event in 2021.

4.2.15 Total Dissolved Solids

Total Dissolved Solids (TDS) was detected at concentrations greater than the GWPS (1,200 mg/L) at uppermost aquifer well AW-05 during four sampling events from 2016 to 2017 with a median concentration of 1,100 mg/L.

TDS was detected at similar concentrations greater than the GWPS in PMP wells AP07S and AW-15S during multiple sampling events in 2021.

TDS was detected at concentrations greater than the GWPS in bedrock wells AP05D, AP07D, and AW-15C. Concentrations ranged from 820 mg/L to 2,600 mg/L with a median concentration of 1,200 mg/L.

5. EVALUATION OF POTENTIAL RECEPTORS

5.1 Water Well Survey

A potable water well inventory was completed in 2021 utilizing federal and state databases to assess nearby pumping wells, drinking water receptors, and other uses of water in the vicinity of the Ash Pond. The following sources of information were queried to identify well locations, drinking water receptors, and other uses of water within 1,000 meters of the Ash Pond boundary:

- ISGS Illinois Water and Related Wells (ILWATER) Map[1]

Based on records obtained from the ISGS ILWATER, there are 14 wells located outside of the EPP property within 1,000 meters of the Ash Pond (**Appendix B**). These included seven engineering test wells, three industrial-commercial wells, three farm/domestic wells, and one monitoring well. Three of the 14 identified offsite water wells are downgradient of the Ash Pond, two of which are identified as water wells, and one is identified as plugged and abandoned. No potable wells were identified downgradient of the Ash Pond. Primary uses are industrial applications, monitoring, and engineering test wells.

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 the Ash Pond (**Appendix B**). The predominant surface water body in the region is the Illinois River and associated lowland backwater lakes. The Illinois River is located approximately 900 feet to the east and upgradient from the Ash Pond. As discussed in **Section 3.3.2**, a USGS stream gage (#05568500) for the Illinois River at Kingston Mines, Illinois is located 8.7 miles south and west (downstream) of the EPP. The gage datum elevation is 428 feet NGVD29. Daily gage heights for the period of January 1, 2018 to March 18, 2021 are shown on **Figure A** in **Section 3.3.2**. The gage height of 3 feet, representing approximate baseflow, occurs at an elevation of about 431 feet NGVD29.

The headwaters for the East Branch of Lamarsh Creek are located approximately 0.45 miles northwest of the Ash Pond. The East Branch of the Lamarsh Creek flows southwest to the Lamarsh Creek and ultimately to the Illinois River. Other surface waters in the vicinity include Worley Lake and Pekin Lake, both of which are located across the Illinois River at a distance of approximately 0.5 miles from the Ash Pond.

Additional surface waters indicated in the USFWS Wetland Mapper and USGS National Map include several freshwater forested/shrub wetlands located generally to the north, west and southeast of the EPP, several freshwater ponds ranging in size from 0.2 acres to approximately 3.7 acres and located generally to the north and west of the Ash Pond, and two freshwater emergent wetlands located to the northeast of the EPP. A map of wetlands and surface waters in the vicinity of the Ash Pond is presented in **Appendix B**.

[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/

The USGS National Map places the EPP within the Pekin Lake-Illinois River subwatershed (Hydrologic Unit Code [HUC] 071300030304), which is part of the Lamarsh Creek-Illinois River watershed (HUC 0713000303) and located within the larger Lower Illinois-Lake Chautauqua subbasin (HUC 07130003).

A FEMA Flood Insurance Rate Map is not available for Peoria County. A historic (1983) floodplain map indicates that the Ash Pond is located within a Zone C floodplain, and the area surrounding the Ash Pond is within a Zone A13 floodplain (**Appendix G**). The map shows that the area immediately surrounding the Ash Pond is defined as Zone A, indicating a 100-year flood boundary, 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 search of the Illinois Department of Natural Resources (IDNR) Natural Heritage Database[4] for natural areas and protected areas within 1,000 meters of the Ash Pond was performed. No natural or protected areas were identified within 1,000 meters of the Ash Pond (**Appendix B**).

The IDNR Natural Heritage Database Threatened and Endangered Species by County[5] lists 24 threatened and endangered species as located within Peoria County, including nine endangered and 15 threatened species. Habitats for endangered or threatened species are identified at the county level only (**Appendix B**).

Additionally, a search of the IDNR Historic Preservation Division[6] database for historic sites in the vicinity of the Ash Pond yielded no results within 1,000 meters of the Ash Pond (**Appendix B**). 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 the Ash Pond.

[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
[6] IDNR Historic Preservation Division: https://www2.illinois.gov/dnrhistoric/Pages/default.aspx
[7] ISAS: https://www.isas.illinois.edu/

6. CONCLUSIONS

Hydrogeologic characterization of the EPP was originally developed as part of the Site Characterization and Groundwater Monitoring Plan for Coal Combustion Product (CCP) Impoundment, Ameren Energy Resources Generating, E.D. Edwards Plant, Peoria County, IL (Rapps, 2009) and most recently updated for 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 the Ash Pond (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 the Ash Pond was compared to the Part 845 Standards.

The results of the hydrogeologic and groundwater quality evaluation are:

- There are three principal types of unlithified materials above the bedrock in the vicinity of the Ash Pond, these include the following in descending order: Fill, predominantly coal ash (fly ash, bottom ash, and slag) within the Ash Pond, and materials within constructed berms and railroad embankments, are present around the Ash Pond; Upper Cahokia Formation (fine-grained deposits of the Cahokia Formation ranging in thickness at the Ash Pond from 5 to 40 feet); and Lower Cahokia Formation (course-grained deposits of the Cahokia Formation consisting of sands and gravels ranging in thickness at the Ash Pond from 1 to 4 feet). Depth to bedrock at the Ash Pond ranges from approximately 20 feet at AW-05 in the north to 58 feet at AW-16 in the southwest.
- Four distinct water bearing layers have been identified at the Ash Pond based on stratigraphic relationships and common hydrogeologic characteristics, these include the following in descending order: Ash Unit (saturated CCR consisting primarily of fly ash within the ash pond, and having a geometric mean horizontal hydraulic conductivity of 1.4×10^{-3} cm/s); Upper Cahokia Formation/PMP (low permeability clays and silts of the Upper Cahokia Formation and discontinuous lenses of sand that have been identified as PMPs); uppermost aquifer (thin, generally less than 4 feet thick sand, silty sand, and clayey gravel units which includes the Lower Cahokia Formation and the bedrock interface with a geometric mean horizontal hydraulic conductivity of 1.7×10^{-4} cm/s); Bedrock Confining Unit (generally low permeability shales and siltstones with interbedded sandstone) with a geometric mean horizontal hydraulic conductivity of 3.2×10^{-6} cm/s.
- Groundwater within the uppermost aquifer flows predominantly to the west and south, with a minor component to the north. Groundwater flow occurs primarily in the more permeable zones within the Lower Cahokia Formation.
- Groundwater velocities in the uppermost aquifer determined in the center portion of the Ash Pond (between AW-08 and AW-06) ranged from approximately 1.7×10^{-4} to 4.0×10^{-4} ft/day in 2021 with an average of 2.5×10^{-4} ft/day. Groundwater velocities determined in the southern portion of the Ash Pond between AW-10 and AW-15 were consistent with an average of 0.26 ft/day. The higher velocities observed in the southern portion of the Ash Pond are a result of coarse-grained materials present there.

- As determined by the detailed geologic information provided, and the hydrogeologic and groundwater quality data, groundwater within the uppermost aquifer at the Ash Pond is classified as Class I – Potable Resource Groundwater.
- Potential exceedances of 35 I.A.C. § 845.600 GWPSs were detected in monitoring wells at the Ash Pond are summarized as follows:
  - Arsenic – at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-13, AW-14, AW-19 and AW-20; upgradient uppermost aquifer wells AP05S and AW-08; PMP monitoring wells APW-01 and APW-04; and downgradient bedrock wells AP07D and AW-15C.
  - Barium – at downgradient uppermost aquifer wells AW-10, AW-11, and AW-15; and bedrock monitoring wells AW-15C and AP07D.
  - Beryllium – at downgradient uppermost aquifer wells AW-08, AW-09, AW-10, and AW-11; and bedrock monitoring well AP07D.
  - Boron - at downgradient uppermost aquifer wells AW-05, AW-18, AW-19, AW-20, and AW-21; and PMP wells AP07S and AW-15S.
  - Chloride – at downgradient uppermost aquifer well AW-05; PMP monitoring wells APW-01 and APW-04; and at bedrock monitoring wells AP05D and AP07D.
  - Cobalt - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-14, and AW-17; PMP monitoring wells APW-01 and AW-15S; downgradient bedrock well AP07D; and upgradient well AP05S.
  - Lead – at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, and AW-22; upgradient uppermost aquifer well AP05S; PMP monitoring wells APW-01 and AW-15S; and downgradient bedrock well AP07D.
  - Lithium - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-15, AW-16, AW-17, and AW-18; upgradient uppermost aquifer well AP05S; downgradient bedrock wells AP07D and AW-15C; and upgradient bedrock well AP05D.
  - Radium 226 and 228 combined – at downgradient uppermost aquifer wells AW-09, AW-10, AW-11, AW-15 and AW-16; upgradient uppermost aquifer well AP05S; and downgradient bedrock wells AP07D and AW-15C.
  - Sulfate – at downgradient uppermost aquifer well AW-05, and downgradient PMP wells AP07S and AW-15S.
  - TDS - at downgradient uppermost aquifer well AW-05; downgradient PMP wells AP07S and AW-15S, and bedrock monitoring wells AP05D, AP07D, and AW-15C.
  - Chromium, fluoride, pH, and thallium were also detected at concentrations and/or measured (for pH) outside of their respective GWPSs at one or more locations during monitoring. However, the occurrences were infrequent and/or isolated and individual locations are not listed.

This HCR satisfies Part 845 content requirements specific to 35 I.A.C. § 845.620(b) (Hydrogeologic Site Characterization) for the Ash Pond at the EPP.

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TABLES

TABLE 2-1. GEOTECHNICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Total Porosity [1]	Vertical Hydraulic Conductivity (cm/s)	LL	PL	PI	Laboratory USCS	Gravel (%)	Sand (%)	Fines (%)
CCR															
XPW01 (20-22)	XPW01	20	22	43.7	69.8	2.381	53%	1.18E-05	51	53	NP	SM	0	68.9	31.1
XPW01A (41-41.5)	XPW01A	41	41.5	35.1	71.7	2.378	52%	6.77E-06	60	43	17	MH	0	13.7	86.3
XPW02 (10-12)	XPW02	10	12	45.1	67.5	2.414	55%	1.20E-05	52	47	5	MH	0.5	28.1	71.4
XPW02 (22-24)	XPW02	22	24	33.4	77.1	2.335	47%	2.08E-06	38	30	8	ML	0	4.1	95.9
XPW02 (45.5-46.5)	XPW02	45.5	46.5	41.7	73.5	2.397	51%	1.00E-05	39	33	6	ML	0.1	37.4	62.5
XPW03 (10-12)	XPW03	10	12	43.8	68	2.388	54%	3.29E-05	36	29	7	ML	0.4	27.2	72.4
Upper Cahokia Formation															
AW-13A (5-7)	AW-13A	5	7	25.2	96.5	2.661	42%	4.72E-08	30	14	16	CL	0	30.3	69.7
AW-15 (20-22)	AW-15	20	22	27.9	85.8	2.694	49%	2.87E-08	57	19	38	CH	0	2.0	98
AW-20 (15-17)	AW-20	15	17	35.1	83.9	2.690	50%	7.23E-08	47	18	29	CL	0	7.8	92.2
AW-22 (30-32)	AW-22	30	32	23.2	101.3	2.700	40%	1.74E-07	22	13	9	SC	0	57.4	42.6

[O:LTA 7/13/21, U: SSW 08/13/21; C:CJC 08/16/21; U: LDC 09/16/21; C: SSW 09/16/21]

Notes:

[1] Porosity calculated as relationship of bulk density to particle density ($n = 100[1- (p_b/p_d)]$)
bgs = below ground surface
% = Percent
CCR = coal combustion residuals
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
MH = Elastic Silt
ML = Silt
SC = Clayey Sand
SM = Silty Sand
SP = Poorly Graded-Sand

TABLE 2-2. ASH ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)	Chromium (mg/kg)	Cobalt (mg/kg)	Lead (mg/kg)	Lithium (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)
XPW01	17-19	01/08/2021	<6.6	24	840	4	170	7.5	67	11	90	47	<0.44	25	4.9	<2.2
XPW01A	40.5-42.5	01/08/2021	<7	22	190	4.7	700	11	37	4.7	93	<12	<0.46	11	4	<2.3
XPW02	24-25	01/09/2021	20	72	160	6.8	400	2.3	60	19	76	20	<0.32	7	5.5	<1.6
XPW02	43-45	01/09/2021	8.9	42	94	8.3	840	8.5	84	19	140	<91	<0.36	14	6.5	2.1
XPW03	13-15	01/09/2021	<5.5	8	1300	2.2	500	<1.8	27	6.1	14	33	<0.37	3.2	2.2	<1.8
XPW03	35-37	01/09/2021	<7	37	600	5.8	970	20	65	8	130	20	<0.47	11	3.6	<2.3

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
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
XPW01A	02/11/2021	0.0032	0.069	0.04	<0.001	18	0.0023	39	93	<0.004	<0.002	<0.25	0.0087	0.64	<0.0002	4	12.0	0.256	0.014	210	<0.001
XPW01A	03/04/2021	<0.003	0.082	0.031	<0.001	15	0.0017	39	83	<0.004	<0.002	<0.25	<0.001	0.57	<0.0002	5	11.4	0.275	0.01	210	<0.001
XPW01A	03/23/2021	<0.003	0.072	0.028	<0.001	15	0.0015	36	91	<0.004	<0.002	<0.25	<0.001	0.61	<0.0002	4.6	11.2	0.261	0.0089	210	<0.001
XPW01A	04/12/2021	<0.003	0.088	0.029	<0.001	16	0.0014	38	93	<0.004	<0.002	<0.25	0.0011	0.64	<0.0002	4.3	11.9	0.233	0.011	220	<0.001
XPW01A	05/04/2021	0.0042	0.079	0.034	<0.001	17	0.0011	51	47	<0.004	<0.002	<0.25	<0.001	0.67	<0.0002	3.8	11.9	0.425	0.011	210	<0.001
XPW01A	07/21/2021	<0.003	0.096	0.032	<0.001	19	0.0012	52	96	<0.004	<0.002	<0.25	<0.001	0.72	<0.0002	3.3	11.8	0.604	0.0095	230	<0.001
XPW02	02/11/2021	<0.003	0.13	0.022	<0.001	15	0.0013	40	110	<0.004	<0.002	0.3	0.0043	0.34	0.00021	2.9	12.2	0.548	0.13	800	<0.001
XPW02	03/03/2021	<0.003	0.16	0.017	<0.001	14	0.0011	37	110	<0.004	<0.002	0.294	<0.001	0.33	0.00022	3.2	11.9	0.179	0.14	840	<0.001
XPW02	03/23/2021	<0.003	0.15	0.017	<0.001	16	<0.001	37	120	<0.004	<0.002	0.313	<0.001	0.32	<0.0002	2.8	11.6	0.101	0.14	890	<0.001
XPW02	04/12/2021	<0.003	0.18	0.015	<0.001	13	<0.001	27	110	<0.004	<0.002	0.324	<0.001	0.34	0.00021	2.9	12.2	0.464	0.15	880	<0.001
XPW02	05/04/2021	<0.003	0.18	0.022	<0.001	15	<0.001	29	120	<0.004	<0.002	0.361	<0.001	0.3	<0.0002	3.3	12.2	0.133	0.15	950	<0.001
XPW02	07/22/2021	<0.003	0.2	0.018	<0.001	14	0.001	28	130	<0.004	<0.002	0.412	<0.001	0.32	<0.0002	3	12.1	0.427	0.17	970	<0.001
XPW03	02/11/2021	<0.003	0.026	0.071	<0.001	5.4	0.0013	50	96	<0.004	<0.002	0.265	<0.001	0.18	<0.0002	3.1	11.9	0.194	0.024	270	<0.001
XPW03	03/03/2021	<0.003	0.028	0.066	<0.001	4.9	0.0012	53	91	<0.004	<0.002	0.27	<0.001	0.16	<0.0002	3.6	11.7	0.349	0.024	280	<0.001
XPW03	03/23/2021	<0.003	0.027	0.063	<0.001	5.3	0.0011	49	250	<0.004	<0.002	0.275	<0.001	0.18	<0.0002	3.1	11.2	0.065	0.024	300	<0.001
XPW03	04/12/2021	<0.003	0.027	0.067	<0.001	5	0.0011	51	93	<0.004	<0.002	<0.25	<0.001	0.17	<0.0002	3.6	12.0	0.208	0.023	290	<0.001
XPW03	05/04/2021	<0.003	0.027	0.07	<0.001	5.5	0.0012	52	86	<0.004	<0.002	<0.25	<0.001	0.16	<0.0002	3.8	12.0	0.213	0.023	280	<0.001
XPW03	07/22/2021	<0.003	0.025	0.065	<0.001	7	0.0011	52	94	<0.004	<0.002	0.284	<0.001	0.17	<0.0002	3.3	11.7	0.211	0.021	270	<0.001

Notes:
Field readings are reported with as many significant figures as provided by analytical laboratory.
< = 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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RAMBOLL

TABLE 2-4. SOIL ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)	Chromium (mg/kg)	Cobalt (mg/kg)	Lead (mg/kg)	Lithium (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)
AW-15	Upper Cahokia Formation	33-35	01/08/2021	<4.7	4.9	170	<1.6	22	<1.6	31	12	15	37	<0.31	<1.6	<1.6	<1.6
AW-20	Upper Cahokia Formation	17-19	01/10/2021	<3.9	3.2	150	<1.3	16	<1.3	21	11	14	22	<0.26	1.5	1.4	<1.3
AW-22	Upper Cahokia Formation	32-34	01/08/2021	<3.7	4	83	<1.2	21	<1.2	28	10	12	25	<0.25	<1.2	<1.2	<1.2
AW-22	Upper Cahokia Formation	45-47	01/08/2021	<4.6	7.2	230	<1.5	39	<1.5	42	14	18	36	<0.31	<1.5	<3.1	<1.5

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
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AP05S	UA	11/29/2016	443.53	443.53	Top of PVC	441.13	32.87	37.64	408.26	403.49	38.06	403.10	4.8	2	40.598807	-89.66191
AP05D	BCU	12/05/2016	443.45	443.45	Top of PVC	441.23	47.09	56.69	394.14	384.54	57.17	382.90	9.6	2	40.598796	-89.661901
AP06	UCF	11/30/2016	442.17	442.17	Top of PVC	439.53	19.93	24.72	419.60	414.81	25.00	414.50	4.8	2	40.601038	-89.662759
AP07S	UCF	12/02/2016	461.08	461.08	Top of PVC	458.31	29.95	34.74	428.36	423.57	35.00	423.30	4.8	2	40.59793	-89.666919
AP07D	BCU	12/08/2016	460.89	460.89	Top of PVC	458.42	55.01	64.59	403.41	393.83	65.00	393.40	9.6	2	40.597941	-89.666926
AP08	CCR	12/06/2016	460.60	460.60	Top of PVC	458.10	9.99	19.58	448.11	438.52	19.98	438.10	9.6	2	40.594578	-89.668728
AP09	CCR	12/07/2016	460.22	460.22	Top of PVC	457.24	9.79	19.39	447.45	437.85	19.80	437.40	9.6	2	40.59149	-89.666303
APW-01	UCF	07/27/2010	441.07	441.07	Top of PVC	437.83	7.60	18.00	430.23	419.83	18.00	419.30	10.4	2	40.600127	-89.66512
APW-02	UCF	07/20/2010	464.92	464.92	Top of PVC	461.72	39.60	50.00	422.12	411.72	50.00	411.70	10.4	2	40.594228	-89.665642
APW-03	UCF	07/19/2010	444.37	444.37	Top of PVC	441.22	19.60	30.00	421.62	411.22	30.00	411.20	10.4	2	40.591259	-89.663843
APW-04	UCF	07/27/2010	439.66	439.66	Top of PVC	437.19	9.60	20.00	427.59	417.19	20.00	417.20	10.4	2	40.587909	-89.663726
AW-01[1]	PMP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AW-05	UA	07/22/2015	--	443.37	Top of Disk	440.55	15.87	20.47	424.68	420.08	21.10	419.50	4.6	2	40.598645	-89.666407
AW-06	UA	08/03/2015	--	461.57	Top of Disk	459.19	36.60	41.09	422.59	418.10	41.69	416.90	4.5	2	40.594237	-89.670051
AW-08	UA	07/21/2015	--	462.54	Top of Disk	460.66	47.55	57.19	413.11	403.47	57.70	403.00	9.6	2	40.593964	-89.661996
AW-09	UA	08/03/2015	--	461.45	Top of Disk	458.32	47.14	51.62	411.18	406.70	52.23	406.10	4.5	2	40.590422	-89.668777
AW-10	UA	07/23/2015	--	439.93	Top of Disk	437.64	27.62	32.23	410.02	405.41	32.74	404.90	4.6	2	40.590733	-89.663826
AW-11	UA	07/28/2015	--	439.87	Top of Disk	437.16	24.21	28.81	412.95	408.35	29.31	407.20	4.6	2	40.587261	-89.663781
AW-12	UA	01/07/2021	443.80	443.80	Top of PVC	441.16	26.00	31.00	415.16	410.16	31.00	406.20	5	2	40.591071	-89.661333
AW-13	UA	01/09/2021	441.26	441.26	Top of PVC	438.67	25.00	30.00	413.67	408.67	30.00	408.70	5	2	40.588378	-89.663714
AW-14	UA	01/08/2021	439.40	439.40	Top of PVC	436.83	24.00	29.00	412.83	407.83	29.00	401.80	5	2	40.58729	-89.665621
AW-15	UA	01/08/2021	441.51	441.51	Top of PVC	438.95	33.00	38.00	405.95	400.95	38.00	399.00	5	2	40.587964	-89.666822
AW-15C	BCU	01/08/2021	440.02	440.02	Top of PVC	437.62	43.00	48.00	394.62	389.62	48.00	337.60	5	2	40.588	-89.666882

TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AW-15S	UCF	01/08/2021	440.71	440.71	Top of PVC	437.92	8.00	18.00	429.92	419.92	18.00	417.90	10	2	40.587955	-89.666841
AW-16	UA	01/08/2021	461.79	461.79	Top of PVC	459.45	55.00	60.00	404.45	399.45	60.00	396.50	5	2	40.589457	-89.667799
AW-17	UA	01/08/2021	462.10	462.10	Top of PVC	459.69	51.00	56.00	408.69	403.69	56.00	402.70	5	2	40.591698	-89.669404
AW-18	UA	01/09/2021	462.65	462.65	Top of PVC	460.28	46.00	51.00	414.28	409.28	51.00	405.30	5	2	40.593044	-89.669822
AW-19	UA	01/09/2021	460.74	460.74	Top of PVC	458.53	35.00	40.00	423.53	418.53	40.00	415.50	5	2	40.595434	-89.66972
AW-20	UA	01/10/2021	461.48	461.48	Top of PVC	459.08	36.50	41.50	422.58	417.58	41.50	416.10	5	2	40.596469	-89.66891
AW-21	UA	01/10/2021	460.61	460.61	Top of PVC	458.28	32.00	37.00	426.28	421.28	37.00	420.30	5	2	40.597294	-89.667734
AW-22	UA	01/08/2021	463.19	463.19	Top of PVC	460.30	44.00	49.00	416.30	411.30	49.00	410.30	5	2	40.596836	-89.666783
P002	UCF	--	460.39	460.39	Top of PVC	458.70	30.60	35.60	--	--	35.90	--	5	2	40.596235	-89.669084
XPW01A	CCR	01/09/2021	464.16	464.16	Top of PVC	460.99	33.00	43.00	427.99	417.99	43.00	418.00	10	2	40.596306	-89.667345
XPW02	CCR	01/09/2021	473.79	473.79	Top of PVC	471.16	36.00	46.00	435.16	425.16	46.00	424.20	10	2	40.594351	-89.668312
XPW03	CCR	01/10/2021	466.04	466.04	Top of PVC	462.62	27.00	37.00	435.62	425.62	37.00	422.60	10	2	40.591416	-89.666188
SG-01	SW	--	--	--	--	--	--	--	--	--	--	--	--	--	40.596075	-89.661625

Notes:
1 Well location is planned, well construction details not available.
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
-- = data not available
BCU = bedrock confining unit
BGS = below ground surface
CCR = Coal Combustion Residual
ft = foot or feet
HSU = Hydrostratigraphic Unit
PMP = potential migration pathway
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer
UCF = Upper Cahokia Formation

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TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Date	AP08 Groundwater Elevation (ft NAVD88) CCR-shallow	XPW02 Groundwater Elevation (ft NAVD88) CCR-deep	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
2/9/2021	452.60	452.97	-0.37	13.16	-0.03	up
3/2/2021	452.85	453.17	-0.32	13.16	-0.02	up
3/22/2021	453.59	454.08	-0.49	13.16	-0.04	up
4/12/2021	453.16	453.73	-0.57	13.16	-0.04	up
5/4/2021	452.70	453.23	-0.53	13.16	-0.04	up
6/15/2021	452.40	452.90	-0.50	13.16	-0.04	up
6/28/2021	452.92	453.47	-0.55	13.16	-0.04	up
7/21/2021	452.97	453.67	-0.70	13.16	-0.05	up
			Middle of screen elevation AP08			443.32
			Middle of screen elevation XPW02			430.16

Date	AP09 Groundwater Elevation (ft NAVD88) CCR-shallow	XPW03 Groundwater Elevation (ft NAVD88) CCR-deep	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
2/9/2021	451.96	450.74	1.22	12.03	0.10	down
3/2/2021	451.95	450.72	1.23	12.03	0.10	down
3/22/2021	451.95	450.77	1.18	12.03	0.10	down
4/12/2021	451.86	450.62	1.24	12.03	0.10	down
5/4/2021	452.12	450.84	1.28	12.03	0.11	down
6/15/2021	451.61	450.38	1.23	12.03	0.10	down
6/28/2021	452.09	450.86	1.23	12.03	0.10	down
7/21/2021	452.19	451.03	1.16	12.03	0.10	down
			Middle of screen elevation AP09			442.65
			Middle of screen elevation XPW03			430.62

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Date	AW-15 Groundwater Elevation (ft NAVD88)	AW-15C Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	BCU				
2/9/2021	433.03	433.32	-0.29	11.33	-0.03	up
3/2/2021	433.50	433.50	0.00	11.33	0.00	flat
3/22/2021	433.68	433.66	0.02	11.33	0.00	down
4/12/2021	433.76	433.80	-0.04	11.33	0.00	up
5/4/2021	433.69	433.71	-0.02	11.33	0.00	up
6/15/2021	433.65	433.63	0.02	11.33	0.00	down
6/28/2021	433.59	433.58	0.01	11.33	0.00	flat
7/21/2021	433.65	433.67	-0.02	11.33	0.00	up
			Middle of screen elevation AW-15			403.45
			Middle of screen elevation AW-15C			392.12

Date	AW-15S Groundwater Elevation (ft NAVD88)	AW-15 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UCF/PMP	UA				
2/9/2021	431.91	433.03	-1.12	21.47	-0.05	up
3/2/2021	431.19	433.50	-2.31	21.47	-0.11	up
3/22/2021	431.33	433.68	-2.35	21.47	-0.11	up
4/12/2021	431.13	433.76	-2.63	21.47	-0.12	up
5/4/2021	429.82	433.69	-3.87	26.37	-0.15	up
6/15/2021	431.00	433.65	-2.65	21.47	-0.12	up
6/28/2021	429.86	433.59	-3.73	26.41	-0.14	up
7/21/2021	431.25	433.65	-2.40	21.47	-0.11	up
			Middle of screen elevation AW-15S			424.92
			Middle of screen elevation AW-15			403.45

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Date	AP05S Groundwater Elevation (ft NAVD88)	AP05D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	BCU				
2/9/2021	437.61	439.14	-1.53	16.54	-0.09	up
3/2/2021	437.93	435.81	2.12	16.54	0.13	down
3/22/2021	438.43	433.33	5.10	16.54	0.31	down
4/12/2021	438.59	431.96	6.63	16.54	0.40	down
5/4/2021	438.43	432.29	6.14	16.54	0.37	down
6/15/2021	438.30	435.02	3.28	16.54	0.20	down
6/28/2021	438.24	433.14	5.10	16.54	0.31	down
7/21/2021	438.67	437.15	1.52	16.54	0.09	down
			Middle of screen elevation AP-05S			405.88
			Middle of screen elevation AP-05D			389.34

Date	APW-03 Groundwater Elevation (ft NAVD88)	AW-10 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UCF/PMP	UA				
2/9/2021	436.78	- - -	- - -	- - -	- - -	- - -
3/2/2021	436.47	438.84	-2.37	8.70	-0.27	up
3/22/2021	436.75	438.84	-2.09	8.70	-0.24	up
4/12/2021	436.25	438.85	-2.60	8.70	-0.30	up
5/4/2021	436.06	438.80	-2.74	8.70	-0.31	up
6/15/2021	435.64	438.62	-2.98	8.70	-0.34	up
6/28/2021	436.22	438.61	-2.39	8.70	-0.27	up
7/21/2021	436.13	438.60	-2.47	8.70	-0.28	up
			Middle of screen elevation APW-03			416.42
			Middle of screen elevation AW-10			407.72

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Date	APW-04 Groundwater Elevation (ft NAVD88)	AW-13 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UCF/PMP	UA				
2/9/2021	432.44	435.52	-3.08	11.22	-0.27	up
3/2/2021	432.74	435.84	-3.10	11.22	-0.28	up
3/22/2021	432.75	435.86	-3.11	11.22	-0.28	up
4/12/2021	432.91	435.92	-3.01	11.22	-0.27	up
5/4/2021	432.40	435.83	-3.43	11.22	-0.31	up
6/15/2021	431.79	435.56	-3.77	11.22	-0.34	up
6/28/2021	431.21	435.40	-4.19	11.22	-0.37	up
7/21/2021	432.13	435.98	-3.85	11.22	-0.34	up
			Middle of screen elevation APW-04			422.39
			Middle of screen elevation AW-13			411.17

[O:SSW 7/13/21, U: SSW 08/13/21; C:CJC 08/16/21; U:SSW 9/22/21]

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
BCU = bedrock confining unit
dh = head change
dl = distance change
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988
UCF/PMP = Upper Cahokia Formation/potential migration pathway
UA = uppermost aquifer

TABLE 3-3. FIELD HYDRAULIC CONDUCTIVITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length [1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Number of Field Tests	Test Analyzed [3]	Hydraulic Conductivity (cm/s)	Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
Uppermost Aquifer												
AW-12	U	410.16	5	(GW)s	Solid	Bouwer-Rice	6	RH-2	1.5E-02	4.7E-07	1.5E-02	1.6E-04
AW-15	D	400.95	5	CL/BR [2]	Solid	Cooper-Bredehoeft-Papadopulos	6	RH-3	7.5E-03			
AW-16	D	399.45	5	CL/ML/BR [2]	Solid	Cooper-Bredehoeft-Papadopulos	4	RH-1	7.7E-04			
AW-17	D	403.69	5	CL/ML/BR	Solid	Bouwer-Rice	1	FH-1	4.7E-07			
AW-18	D	409.28	5	CL/ML/BR	Solid	Bouwer-Rice	1	RH-1	7.3E-07			
AW-19	D	418.53	5	CL/ML	Solid	Cooper-Bredehoeft-Papadopulos	1	RH-1	4.1E-05			
AW-20	D	417.58	5	CL/ML/BR [2]	Solid	Cooper-Bredehoeft-Papadopulos	1	RH-1	2.5E-03			
AW-21	D	421.28	5	CL/ML/BR [2]	Solid	Cooper-Bredehoeft-Papadopulos	2	RH-2	2.5E-04			
AW-22	D	411.30	5	CL/BR [2]	Solid	Cooper-Bredehoeft-Papadopulos	2	RH-2	1.1E-04			
Potential Migration Pathway												
AW-15S	D	419.92	10	ML/CL	Solid	Bouwer-Rice	3	RH-1	3.2E-03	3.2E-03	3.2E-03	3.2E-03
Bedrock												
AW-15C	D	389.62	5	BR	Solid	Cooper-Bredehoeft-Papadopulos	6	RH-2	8.2E-04	8.2E-04	8.2E-04	8.2E-04
Ash Pond												
XPW01A	CCR	417.99	10	s(ML)	Solid	Cooper-Bredehoeft-Papadopulos	4	FH-1	3.2E-04	3.2E-04	1.8E-03	6.8E-04
XPW02	CCR	425.16	10	s(ML)	Solid	Kansas Geological Survey	5	RH-2	1.8E-03			
XPW03	CCR	425.62	10	(SP-SM)g	Solid	Cooper-Bredehoeft-Papadopulos	4	RH-1	5.5E-04			

[O:SSW 7/13/21, U: SSW 08/13/21; C:CJC 08/16/21; U:CJC 08/16/21]

Notes:

[1] All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.
[2] Boring log indicates well is screened in weathered shale bedrock.
[3] Test response data (elapsed time and corresponding changes in water levels) were plotted as normalized displacement to evaluate similarity among repeat test data within each well. A single test was selected for analysis at each well based on the quality of the test data (*i.e.,* smooth recovery curve) and coincidence of repeat test data.

cm/s = centimeters per second
BR = bedrock
CCR = coal combustion residuals
CL - lean clay
D = downgradient
FH-1 = Falling Head 1 Test
ft = foot/feet
ML = silt
NA = Not Applicable
NAVD88 = North American Vertical Datum of 1988
RH-1 = Rising Head 1 Test
RH-2 = Rising Head 2 Test
RH-3 = Rising Head 3 Test
SP-SM = poorly graded silty sand

RAMBOLL

TABLE 3-4. HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

$V = K i / n_e$ V = Groundwater Velocity
K = Hydraulic Conductivity [1]
i = hydraulic gradient
n_e = Effective Porosity [2]

Central Portion of CCR Unit (AW-08 to AW-06): Uppermost Aquifer

Distance between Wells (ft): 2213
Hydraulic Conductivity (ft/day): 0.02
Effective Porosity (%): 13 Assumes: silt/clay

Date	AW-08 Elevation (ft NAVD88)	AW-06 Elevation (ft NAVD88)	Change in Elevation (ft)	Horizontal Gradient (ft/ft)	Velocity (ft/day)
2/9/2021	438.28	434.40	3.88	0.002	2.1E-04
3/2/2021	437.77	434.62	3.15	0.001	1.7E-04
3/22/2021	439.27	434.70	4.57	0.002	2.5E-04
4/12/2021	440.09	434.85	5.24	0.002	2.9E-04
5/4/2021	439.47	434.48	4.99	0.002	2.7E-04
6/15/2021	440.14	434.26	5.88	0.003	3.2E-04
6/28/2021	439.41	434.60	4.81	0.002	2.6E-04
7/21/2021	441.74	434.40	7.34	0.003	4.0E-04
			Average	0.002	2.5E-04

Southern Portion of CCR Unit (AW-10 to AW-15): Uppermost Aquifer

Distance between Wells (ft): 1300
Hydraulic Conductivity (ft/day): 10.7
Effective Porosity (%): 16 Assumes: gravel/ clay

Date	AW-10 Elevation (ft NAVD88)	AW-15 Elevation (ft NAVD88)	Change in Elevation (ft)	Horizontal Gradient (ft/ft)	Velocity (ft/day)
2/9/2021	--	433.03	--	--	--
3/2/2021	438.84	433.50	5.34	0.004	0.27
3/22/2021	438.84	433.68	5.16	0.004	0.27
4/12/2021	438.85	433.76	5.09	0.004	0.26
5/4/2021	438.80	433.69	5.11	0.004	0.26
6/15/2021	438.62	433.65	4.97	0.004	0.26
6/28/2021	438.61	433.59	5.02	0.004	0.26
7/21/2021	438.60	433.65	4.95	0.004	0.25
			Average	0.004	0.26

TABLE 3-4. HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITIES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, ILLINOIS

Southeastern Portion of CCR Unit (APW-03 to APW-04): Potential Migration Pathway

Distance between Wells (ft): 1220

Hydraulic Conductivity (ft/day): 9.1

Effective Porosity (%): 7 Assumes: clay

Date	APW-03 Elevation (ft NAVD88)	APW-04 Elevation (ft NAVD88)	Change in Elevation (ft)	Horizontal Gradient (ft/ft)	Velocity (ft/day)
2/9/2021	436.78	432.44	4.34	0.004	0.46
3/2/2021	436.47	432.74	3.73	0.003	0.40
3/22/2021	436.75	432.75	4.00	0.003	0.42
4/12/2021	436.25	432.91	3.34	0.003	0.35
5/4/2021	436.06	432.40	3.66	0.003	0.39
6/15/2021	435.64	431.79	3.85	0.003	0.41
6/28/2021	436.22	431.21	5.01	0.004	0.53
7/21/2021	436.13	432.13	4.00	0.003	0.42
			Average	0.003	0.43

[O:SSW 7/13/21, U: CJC 08/13/21; NRK 8/16/21; C:CJC 08/17/21]

Notes:

[1] Hydraulic conductivity values used above are average of the individual wells or average of the hydrostratigraphic unit as derived from slug tests completed in March and April 2021 by Ramboll and published in the 2017 Hydrogeologic Monitoring Plan - Edwards Ash Pond (OBG/NRT, 2017).

[2]Effective porosity used in these calculations was derived from an average between estimated values of 0.20 for silt material, 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 Laboratoryof the U.S. Geological Survey, U.S. Geological Survey Water-Supply Paper 1839-D, 42p. and Heath, R.C., 1983. Basicground-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

-- = data not available

% = percent

ft = foot/feet

ft/day = feet per day

ft/ft = feet per foot

NAVD88 = North American Vertical Datum of 1988

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AP05S	01/18/2017	0.0041	0.003	0.54	<0.001	0.36	<0.001	110	44	<0.004	0.0025	<0.25	0.001	0.04	<0.0002	0.019	6.9	1.05	<0.001	38	<0.001	860
AP05S	05/10/2017	<0.003	0.0041	0.54	<0.001	0.34	<0.001	110	42	<0.004	<0.002	<0.25	<0.001	0.038	<0.0002	0.015	7.1	1.32	<0.001	32	<0.001	810
AP05S	06/07/2017	<0.003	0.0055	0.59	<0.001	0.34	<0.001	110	42	<0.004	<0.002	<0.25	<0.001	0.034	<0.0002	0.015	6.8	1.43	<0.001	29	<0.001	500
AP05S	06/22/2017	<0.003	0.0063	0.65	<0.001	0.32	<0.001	110	42	<0.004	<0.002	<0.25	<0.001	0.036	<0.0002	0.015	7.2	1.89	<0.001	26	<0.001	880
AP05S	07/21/2017	<0.003	0.0077	0.69	<0.001	0.27	<0.001	120	41	<0.004	<0.002	<0.25	<0.001	0.035	<0.0002	0.014	6.9	1.75	<0.001	23	<0.001	840
AP05S	07/31/2017	<0.003	0.0074	0.77	<0.001	0.29	<0.001	130	44	<0.004	<0.002	<0.25	<0.001	0.038	<0.0002	0.012	7.0	1.38	<0.001	19	<0.001	750
AP05S	08/07/2017	<0.003	0.0077	0.77	<0.001	0.3	<0.001	120	41	<0.004	<0.002	<0.25	<0.001	0.035	<0.0002	0.011	7.0	2.2	<0.001	17	<0.001	840
AP05S	08/23/2017	<0.003	0.0072	0.79	<0.001	0.31	<0.001	98	43	<0.004	<0.002	<0.25	<0.001	0.044	<0.0002	0.0076	6.9	2.63	<0.001	12	<0.001	820
AP05S	11/02/2017	--	--	--	--	0.37	--	100	39	--	--	<0.25	--	--	--	--	7.2	--	--	10	--	820
AP05S	05/07/2018	<0.003	0.0028	0.46	<0.001	0.29	<0.001	94	42	<0.004	<0.002	<0.25	<0.001	0.032	<0.0002	0.0038	7.2	--	<0.001	8.1	<0.001	860
AP05S	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.68	--	--	--	--
AP05S	07/27/2018	--	0.0047	0.7	<0.001	0.33	--	110	41	<0.004	<0.002	<0.25	<0.001	0.025	--	0.0029	7.1	3.19	<0.001	6.2	--	940
AP05S	08/27/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.0	--	--	--	--	--
AP05S	02/27/2019	<0.003	0.0046	0.87	<0.001	0.29	<0.001	91	40	<0.004	<0.002	<0.25	<0.001	0.02	<0.0002	0.0014	7.1	2.3	<0.001	4	<0.001	880
AP05S	08/06/2019	--	0.0067	1.1	<0.001	0.24	--	110	37	<0.004	<0.002	<0.25	<0.001	0.031	--	<0.001	7.1	3	<0.001	<1	--	900
AP05S	02/27/2020	<0.003	0.0088	1.4	<0.001	0.31	<0.001	170	40	0.028	0.013	<0.25	0.0099	0.059	<0.0002	0.0026	6.7	2.85	0.0016	<1	<0.001	840
AP05S	09/01/2020	--	0.003	1.2	<0.001	0.38	--	110	41	0.0076	0.004	<0.25	0.0033	0.036	--	<0.001	6.9	3.16	<0.001	<1	--	760
AP05S	02/10/2021	<0.003	0.0016	0.56	<0.001	0.26	<0.00089	110	38	<0.004	<0.002	<0.25	<0.001	0.028	<0.0002	<0.001	6.9	0.773	<0.001	1.2	<0.001	790
AP05S	02/23/2021	<0.003	0.0059	1.3	<0.001	0.39	<0.001	120	47	0.02	0.0083	<0.25	0.0091	0.044	<0.0002	0.002	6.8	2.9	<0.001	<1	<0.001	530
AP05S	03/08/2021	<0.003	0.0022	1.1	<0.001	0.39	<0.001	110	45	0.0043	0.0028	<0.25	0.0016	0.039	<0.0002	0.004	6.8	2.7	<0.001	<1	<0.001	670
AP05S	03/24/2021	<0.003	0.0024	1	<0.001	0.31	<0.001	110	45	0.0045	0.0029	<0.25	0.0018	0.033	<0.0002	<0.001	6.3	4.48	<0.001	2.2	<0.001	850
AP05S	04/13/2021	<0.003	0.0026	1.2	<0.001	0.34	<0.001	99	42	0.007	0.0041	<0.25	0.0027	0.04	<0.0002	<0.001	7.0	2.66	<0.001	5	<0.001	830

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AP05S	05/07/2021	<0.003	0.0044	1.2	<0.001	0.36	<0.001	120	43	0.019	0.0071	<0.25	0.0074	0.037	<0.0002	0.0013	6.8	3.38	<0.001	2.7	<0.001	950
AP05S	06/16/2021	<0.003	0.01	1.7	0.0014	0.35	0.0011	170	47	0.043	0.024	<0.25	0.03	0.068	<0.0002	0.0029	6.9	9.64	0.003	1.8	<0.001	620
AP05S	06/29/2021	<0.003	0.0066	1.3	<0.001	0.36	<0.001	120	56	0.021	0.013	<0.25	0.015	0.065	<0.0002	0.002	6.9	8.25	<0.001	1.6	<0.001	550
AP05S	07/22/2021	<0.003	0.012	1.4	0.0019	0.42	0.0011	160	44	0.048	0.028	<0.25	0.033	0.071	<0.0002	0.0034	7.0	6.09	0.0032	2.5	<0.001	950
AP05D	02/10/2021	<0.003	<0.001	0.44	<0.001	1.1	<0.00089	22	230	<0.004	<0.002	0.562	<0.001	0.065	0.0014	0.017	7.7	1.21	<0.001	40	<0.001	1100
AP05D	03/08/2021	<0.003	0.0017	0.82	<0.001	1.3	<0.001	28	260	<0.004	<0.002	0.415	<0.001	0.073	<0.0002	0.017	7.2	1.19	<0.001	32	<0.001	1200
AP05D	03/24/2021	<0.003	0.0012	0.43	<0.001	1	<0.001	21	240	<0.004	<0.002	<0.25	<0.001	0.063	<0.0002	0.016	7.6	0.997	<0.001	43	<0.001	1000
AP05D	04/15/2021	<0.003	0.0018	1.6	<0.001	1.7	<0.001	33	410	<0.004	<0.002	0.557	<0.001	0.13	<0.0002	0.0029	7.4	2.75	<0.001	1.6	<0.001	2600
AP05D	05/07/2021	<0.003	0.0035	1.3	<0.001	1.6	<0.001	30	510	0.02	0.0028	0.683	0.0024	0.077	<0.0002	0.0057	7.7	3.75	<0.001	1.3	<0.001	1900
AP07S	02/10/2021	<0.003	<0.001	0.064	<0.001	5.8	<0.00089	120	80	<0.004	0.003	0.524	<0.001	<0.02	0.00021	<0.001	6.8	0.123	<0.001	160	<0.001	610
AP07S	03/04/2021	<0.003	<0.001	0.08	<0.001	6.2	<0.001	130	74	0.0054	0.0045	0.347	0.002	<0.01	<0.0002	0.0017	6.7	1.22	<0.001	150	<0.001	620
AP07S	03/24/2021	<0.003	<0.001	0.065	<0.001	5.8	<0.001	120	79	<0.004	0.0027	0.39	<0.001	<0.02	<0.0002	<0.001	6.2	0.207	<0.001	160	<0.001	770
AP07S	04/13/2021	<0.003	<0.001	0.14	<0.001	7.3	<0.001	230	190	<0.004	0.0027	<0.25	0.0011	<0.02	<0.0002	0.001	6.8	0.336	<0.001	430	<0.001	1200
AP07S	05/05/2021	<0.003	<0.001	0.15	<0.001	8.3	<0.001	260	110	0.096	0.0036	<0.25	0.0018	<0.02	<0.0002	0.0023	6.6	1.2	<0.001	420	<0.001	1400
AP07S	06/16/2021	<0.003	<0.001	0.12	<0.001	7.4	<0.001	280	120	<0.004	0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.6	1.82	<0.001	440	<0.001	1400
AP07S	06/28/2021	<0.003	<0.001	0.12	<0.001	10	<0.001	280	130	<0.004	0.0021	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	1.85	<0.001	410	<0.001	1500
AP07S	07/22/2021	<0.003	<0.001	0.13	<0.001	12	<0.001	260	130	<0.004	0.0023	<0.25	<0.001	<0.02	<0.0002	<0.001	6.6	1.4	<0.001	480	<0.001	1600
AP07D	02/10/2021	<0.003	0.0049	0.31	<0.001	1.3	<0.00089	16	500	<0.004	<0.002	1	<0.001	0.053	<0.0002	0.011	8.2	0.268	<0.001	130	<0.001	1400
AP07D	03/08/2021	<0.003	0.036	2.6	0.0096	1.4	0.0025	90	550	0.29	0.18	1.07	0.15	0.41	0.00033	0.01	7.8	12.2	0.012	96	<0.001	1500
AP07D	03/24/2021	<0.003	0.033	4.1	0.01	1.2	0.0023	78	830	0.34	0.22	1.21	0.17	0.49	0.00029	0.0092	7.5	19.4	0.014	51	0.0012	850
AP07D	04/13/2021	<0.003	0.0088	1.3	0.0018	1.3	<0.001	18	710	0.059	0.028	1.27	0.03	0.15	<0.0002	0.015	7.8	4.24	0.0018	54	<0.001	2000
AP07D	05/05/2021	<0.003	0.057	8.6	0.017	1.4	0.004	58	820	0.59	0.29	1.32	0.27	0.72	0.00054	0.015	7.9	23	0.019	47	0.0026	820

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AP07D	07/22/2021	<0.003	0.0044	1.2	0.0012	1.8	<0.001	18	700	0.034	0.018	0.984	0.014	0.12	<0.0002	0.0087	7.5	1.68	0.0098	100	<0.001	2300
APW-01	06/17/2021	<0.003	0.025	0.12	<0.001	0.69	<0.001	190	210	0.012	0.0053	0.294	0.0063	0.028	<0.0002	0.0025	6.9	1.62	<0.001	300	<0.001	1000
APW-01	06/29/2021	<0.003	0.023	0.19	<0.001	0.71	0.0014	180	160	0.024	0.013	0.322	0.019	0.032	<0.0002	0.0023	6.8	4.15	0.0017	280	<0.001	780
APW-01	07/22/2021	<0.003	0.018	0.13	<0.001	0.84	<0.001	180	160	0.013	0.0065	<0.25	0.0075	<0.02	<0.0002	0.0024	6.9	1.73	0.0011	300	<0.001	1100
APW-02	02/10/2021	<0.003	<0.001	0.15	<0.001	0.047	<0.001	100	12	<0.004	<0.002	0.36	<0.001	<0.02	<0.0002	<0.001	7.0	0.207	<0.001	1.4	<0.001	400
APW-02	03/03/2021	<0.003	<0.001	0.17	<0.001	0.074	<0.001	120	10	<0.004	<0.002	0.277	<0.001	<0.02	<0.0002	<0.001	7.0	0.836	<0.001	1.4	<0.001	510
APW-02	03/24/2021	<0.003	<0.001	0.17	<0.001	0.048	<0.001	120	12	<0.004	<0.002	0.3	<0.001	<0.02	<0.0002	<0.001	6.5	0.578	<0.001	5.7	<0.001	480
APW-02	04/13/2021	<0.003	0.0012	0.19	<0.001	0.11	<0.001	130	9.7	0.0068	0.0043	<0.25	0.0012	<0.02	<0.0002	<0.001	6.9	0.0707	<0.001	11	0.0019	440
APW-02	05/06/2021	<0.003	<0.001	0.16	<0.001	0.13	<0.001	120	13	0.023	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	0.365	<0.001	10	<0.001	580
APW-03	02/10/2021	<0.003	<0.001	0.26	<0.001	0.15	<0.001	160	27	<0.004	<0.002	0.34	<0.001	<0.02	<0.0002	<0.001	6.8	0.37	<0.001	<1	<0.001	720
APW-03	03/04/2021	<0.003	<0.001	0.3	<0.001	0.13	<0.001	180	28	<0.004	<0.002	<0.25	<0.001	0.018	<0.0002	<0.001	6.6	1.1	<0.001	2	<0.001	850
APW-03	03/24/2021	<0.003	<0.001	0.3	<0.001	0.13	<0.001	170	28	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.4	0.756	<0.001	3.5	<0.001	880
APW-03	04/13/2021	<0.003	0.0011	0.35	<0.001	0.14	<0.001	200	28	<0.004	<0.002	<0.25	0.0015	<0.02	<0.0002	<0.001	6.8	0.547	<0.001	7.1	<0.001	860
APW-03	05/07/2021	<0.003	0.0011	0.34	<0.001	0.14	<0.001	200	33	0.0082	<0.002	<0.25	0.0012	<0.02	<0.0002	<0.001	6.8	1.38	<0.001	8.7	<0.001	950
APW-04	02/10/2021	<0.003	0.0089	0.34	<0.001	0.56	<0.001	160	170	<0.004	<0.002	0.422	<0.001	<0.02	<0.0002	0.0034	6.9	0.551	<0.001	20	<0.001	740
APW-04	03/04/2021	<0.003	0.0094	0.38	<0.001	0.6	<0.001	180	180	<0.004	<0.002	0.256	<0.001	0.012	<0.0002	0.0046	6.8	1.18	<0.001	32	<0.001	630
APW-04	03/22/2021	<0.003	0.0064	0.33	<0.001	0.63	<0.001	180	230	0.0044	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0015	6.9	0.748	<0.001	42	<0.001	850
APW-04	04/13/2021	<0.003	0.016	0.5	<0.001	0.54	<0.001	180	220	0.012	0.0035	<0.25	0.0037	<0.02	<0.0002	0.0049	6.8	3.85	<0.001	43	<0.001	860
APW-04	05/07/2021	<0.003	0.0054	0.33	<0.001	0.69	<0.001	200	350	0.0072	<0.002	0.252	<0.001	<0.02	<0.0002	0.0014	6.8	0.553	<0.001	58	<0.001	1100
AW-05	11/09/2015	<0.003	0.0053	0.19	<0.001	1.8	<0.001	180	280	0.0099	0.0047	<0.25	0.0024	0.03	<0.0002	0.0023	6.7	0.35	0.0012	290	<0.001	1100
AW-05	02/17/2016	<0.003	0.013	0.28	<0.001	1.7	<0.001	180	180	0.026	0.013	0.326	0.011	0.046	<0.0002	0.0028	6.8	3.51	0.0013	280	<0.001	1000
AW-05	05/17/2016	<0.003	0.028	0.41	<0.001	1.6	<0.001	210	290	0.03	0.019	0.325	0.018	0.047	<0.0002	0.0035	6.7	0.602	0.0014	270	<0.001	1100

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-05	07/21/2016	<0.003	0.007	0.26	<0.0005	2.7	<0.001	190	570	0.017	0.0091	0.427	0.0069	0.038	<0.0002	0.0023	6.9	1.31	0.0011	380	<0.001	1700
AW-05	11/10/2016	<0.003	0.0035	0.14	<0.001	2.8	<0.001	200	300	<0.004	0.0022	0.278	<0.001	0.021	<0.0002	0.0012	7.1	1.01	<0.001	330	<0.001	1300
AW-05	01/17/2017	<0.003	0.0025	0.13	<0.001	1.5	<0.001	160	130	<0.004	<0.002	<0.25	<0.001	0.018	<0.0002	0.0021	7.1	2.06	<0.001	270	<0.001	1000
AW-05	05/08/2017	0.003	0.013	0.39	0.0016	1.4	0.0015	180	140	0.04	0.029	<0.25	0.023	0.07	<0.0002	0.0038	7.2	2.13	0.0037	280	<0.001	1100
AW-05	07/19/2017	<0.003	0.029	0.63	0.003	5.9	0.0023	260	420	0.088	0.054	<0.25	0.046	0.12	<0.0002	0.0041	7.1	1.07	0.004	470	<0.001	1300
AW-05	11/01/2017	--	--	--	--	7.6	--	260	650	--	--	<0.25	--	--	--	--	7.2	--	--	370	--	1600
AW-05	02/27/2020	<0.003	0.032	0.4	0.001	1.8	<0.001	170	81	0.04	0.018	0.284	0.014	0.053	<0.0002	0.004	7.0	0.809	0.0017	270	<0.001	910
AW-05	06/17/2021	<0.003	0.0039	0.12	<0.001	2.6	<0.001	160	110	<0.004	0.0025	0.371	<0.001	0.024	<0.0002	0.0022	7.0	0.801	<0.001	330	<0.001	970
AW-05	06/28/2021	<0.003	0.0035	0.11	<0.001	3.1	<0.001	170	69	<0.004	<0.002	0.308	<0.001	<0.02	<0.0002	0.0018	7.0	0.14	<0.001	290	<0.001	910
AW-05	07/22/2021	<0.003	0.0032	0.11	<0.001	2.9	<0.001	150	67	<0.004	<0.002	0.272	<0.001	<0.02	<0.0002	0.002	7.1	3.77	<0.001	300	<0.001	1100
AW-06	11/10/2015	<0.003	0.0034	0.29	<0.001	0.31	<0.001	110	61	0.014	0.006	<0.25	0.006	0.035	<0.0002	0.0034	7.0	2.54	0.001	36	<0.001	560
AW-06	02/17/2016	<0.003	0.0018	0.2	<0.001	0.29	<0.001	72	75	0.0071	0.0024	0.441	0.0023	0.029	<0.0002	0.0038	7.2	2.62	<0.001	40	<0.001	650
AW-06	05/18/2016	<0.003	0.0014	0.18	<0.001	0.17	<0.001	110	43	<0.004	<0.002	0.465	<0.001	0.017	<0.0002	0.0044	7.2	1.21	<0.001	41	<0.001	490
AW-06	07/22/2016	<0.003	0.0082	0.32	0.00085	0.21	<0.001	120	50	0.026	0.014	0.414	0.014	0.042	0.0018	0.0052	7.1	2.08	0.0022	42	<0.001	540
AW-06	11/11/2016	<0.003	0.0045	0.25	<0.001	0.16	<0.001	110	45	0.024	0.0068	0.429	0.0064	0.03	<0.0002	0.0064	7.2	0.498	<0.001	39	<0.001	530
AW-06	01/17/2017	<0.003	0.0036	0.19	<0.001	0.17	<0.001	100	39	0.0084	0.0028	0.351	0.0063	0.02	<0.0002	0.0066	7.2	0.372	<0.001	39	<0.001	540
AW-06	05/09/2017	<0.003	0.0014	0.16	<0.001	0.18	<0.001	110	37	<0.004	<0.002	0.415	0.0012	0.018	<0.0002	0.0095	7.2	0.399	<0.001	38	<0.001	560
AW-06	07/20/2017	<0.003	0.032	0.46	0.0011	0.19	<0.001	140	34	0.033	0.019	0.314	0.019	0.049	<0.0002	0.0086	7.3	0.813	0.0023	34	<0.001	480
AW-06	11/02/2017	--	--	--	--	0.18	--	100	32	--	--	0.405	--	--	--	--	7.1	--	--	32	--	500
AW-06	05/05/2018	<0.003	0.037	0.45	0.0014	0.17	<0.001	120	37	0.034	0.018	0.286	0.019	0.048	<0.0002	0.008	7.2	--	0.0028	29	<0.001	430
AW-06	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.09	--	--	--	--
AW-06	08/24/2018	--	0.0048	0.18	<0.001	0.14	--	110	35	<0.004	<0.002	0.366	0.0018	<0.01	--	0.0057	7.9	1.98	<0.001	31	--	540

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-06	02/27/2019	<0.003	0.0046	0.18	<0.001	0.13	<0.001	110	35	<0.004	<0.002	0.28	0.0013	<0.01	<0.0002	0.0051	7.3	0.357	<0.001	29	<0.001	580
AW-06	08/06/2019	--	0.02	0.35	<0.001	0.093	--	120	33	0.024	0.01	0.393	0.011	0.035	--	0.0055	7.2	1.82	0.002	29	--	580
AW-06	02/27/2020	<0.003	0.0053	0.21	<0.001	0.12	<0.001	110	33	0.0068	<0.002	0.413	0.0016	0.02	<0.0002	0.0049	7.0	0.242	<0.001	23	<0.001	500
AW-06	08/31/2020	--	0.0024	0.15	<0.001	0.12	--	100	34	<0.004	<0.002	0.372	<0.001	<0.02	--	0.0046	7.3	0.945	<0.001	25	--	540
AW-06	02/23/2021	<0.003	0.026	0.4	<0.001	0.13	<0.001	130	36	0.026	0.014	0.355	0.014	0.033	<0.0002	0.0063	7.1	1.97	0.0014	27	<0.001	390
AW-08	11/09/2015	<0.003	0.0011	0.15	<0.001	0.16	<0.001	140	19	<0.004	0.0038	<0.25	<0.001	0.025	<0.0002	0.0028	6.6	1.12	0.0012	80	<0.001	740
AW-08	02/17/2016	<0.003	0.0014	0.16	<0.001	0.17	<0.001	150	20	<0.004	0.0034	0.324	<0.001	0.025	<0.0002	0.0027	6.8	1.27	<0.001	61	<0.001	660
AW-08	05/17/2016	<0.003	0.0056	0.19	0.014	0.21	<0.001	160	18	<0.004	0.0053	0.376	<0.001	0.019	<0.0002	0.0044	6.8	0.454	<0.001	59	<0.001	680
AW-08	07/21/2016	<0.003	0.0018	0.13	<0.0005	0.14	<0.001	100	23	<0.004	0.002	0.34	<0.001	0.019	<0.0002	0.004	7.0	0.357	<0.001	55	<0.001	680
AW-08	11/10/2016	<0.003	0.011	0.2	<0.001	0.15	<0.001	160	20	<0.004	0.0034	0.346	<0.001	0.016	<0.0002	0.0085	7.1	0.433	<0.001	46	<0.001	710
AW-08	01/17/2017	<0.003	0.0012	0.15	<0.001	0.13	<0.001	110	20	<0.004	0.003	<0.25	<0.001	0.02	<0.0002	0.0032	7.2	0.408	<0.001	64	<0.001	640
AW-08	05/08/2017	<0.003	0.017	0.21	<0.001	0.11	<0.001	160	16	<0.004	<0.002	0.331	<0.001	0.014	<0.0002	0.0072	7.1	0.975	<0.001	23	<0.001	780
AW-08	07/19/2017	<0.003	0.016	0.22	<0.001	0.085	<0.001	160	16	<0.004	<0.002	<0.25	<0.001	0.014	<0.0002	0.0062	7.3	0.394	<0.001	19	<0.001	640
AW-08	11/01/2017	--	--	--	--	0.14	--	150	16	--	--	0.334	--	--	--	--	7.1	--	--	11	--	680
AW-08	05/05/2018	<0.003	0.027	0.24	<0.001	0.096	<0.001	130	18	<0.004	<0.002	0.338	<0.001	0.014	<0.0002	0.0044	7.1	--	<0.001	7.5	<0.001	640
AW-08	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.422	--	--	--	--
AW-08	07/27/2018	--	0.02	0.19	<0.001	0.13	--	130	17	<0.004	<0.002	0.313	<0.001	<0.01	--	0.0043	7.2	0.807	<0.001	6	--	600
AW-08	08/27/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.1	--	--	--	--	--
AW-08	02/27/2019	<0.003	0.019	0.22	<0.001	0.12	<0.001	140	17	<0.004	<0.002	0.27	<0.001	<0.01	<0.0002	0.0049	7.1	0.402	<0.001	9.6	<0.001	670
AW-08	08/06/2019	--	0.0074	0.18	<0.001	0.1	--	130	19	<0.004	<0.002	0.287	<0.001	0.017	--	0.0037	7.3	3.95	<0.001	20	--	700
AW-08	02/27/2020	<0.003	0.019	0.23	<0.001	0.11	<0.001	140	16	<0.004	<0.002	0.3	<0.001	<0.02	<0.0002	0.0051	6.9	0.933	<0.001	<1	<0.001	680
AW-08	09/01/2020	--	0.0086	0.17	<0.001	0.17	--	130	16	<0.004	<0.002	0.278	<0.001	<0.02	--	0.0023	7.1	0.124	<0.001	2.3	--	660

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-08	02/10/2021	<0.003	0.0081	0.16	<0.001	0.12	<0.001	130	17	<0.004	<0.002	0.291	<0.001	<0.02	<0.0002	0.0015	7.1	0.158	<0.001	<1	<0.001	550
AW-08	02/23/2021	<0.003	0.018	0.28	<0.001	0.12	<0.001	150	5.2	0.0095	0.0041	0.318	0.0044	<0.02	<0.0002	0.0033	6.9	1.82	<0.001	<1	<0.001	410
AW-08	03/05/2021	<0.003	0.0065	0.18	<0.001	0.17	<0.001	140	16	<0.004	<0.002	0.263	<0.001	<0.02	<0.0002	0.0051	6.9	0.291	<0.001	3.2	<0.001	670
AW-08	03/24/2021	<0.003	0.0063	0.16	<0.001	0.099	<0.001	130	20	<0.004	<0.002	0.34	<0.001	<0.02	<0.0002	0.0056	6.3	0.251	<0.001	3.9	<0.001	620
AW-08	04/13/2021	<0.003	0.024	0.33	<0.001	0.19	<0.001	150	14	0.008	0.0025	<0.25	0.0024	<0.02	<0.0002	0.0027	6.8	0.416	<0.001	<1	<0.001	680
AW-08	05/07/2021	<0.003	0.014	0.24	<0.001	0.12	<0.001	150	14	<0.004	<0.002	0.297	<0.001	<0.02	<0.0002	0.0025	7.0	0.0155	<0.001	1.5	<0.001	680
AW-08	06/16/2021	<0.003	0.024	0.27	<0.001	0.18	<0.001	150	15	<0.004	<0.002	0.269	<0.001	<0.02	<0.0002	0.0041	7.0	0.139	<0.001	<1	<0.001	640
AW-08	06/28/2021	<0.003	0.018	0.24	<0.001	0.13	<0.001	150	17	<0.004	<0.002	0.396	<0.001	<0.02	<0.0002	0.0017	7.0	0.568	<0.001	1.5	<0.001	480
AW-08	07/21/2021	<0.003	0.02	0.26	<0.001	0.11	<0.001	140	14	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0014	6.9	0.589	<0.001	<1	<0.001	730
AW-09	11/10/2015	<0.003	0.018	0.62	0.0029	0.79	<0.001	170	31	0.075	0.04	<0.25	0.038	0.11	<0.0002	0.014	6.8	7.71	0.0067	28	<0.001	700
AW-09	02/17/2016	<0.003	0.046	1.1	0.007	0.86	0.0028	210	31	0.2	0.093	0.313	0.11	0.26	0.00026	0.02	6.6	5.97	0.0091	23	0.0016	700
AW-09	05/17/2016	<0.003	<0.001	0.15	<0.001	1.3	<0.001	120	32	<0.004	0.0023	0.338	<0.001	0.022	<0.0002	0.015	6.5	0.464	<0.001	37	<0.001	640
AW-09	07/22/2016	<0.003	0.025	0.57	0.0025	0.51	0.0012	180	32	0.073	0.043	0.342	0.036	0.11	<0.0002	0.024	6.6	3.46	0.0036	19	<0.001	660
AW-09	11/11/2016	<0.003	0.02	0.39	<0.001	0.38	<0.001	140	29	0.03	0.017	0.334	0.0097	0.04	<0.0002	0.026	6.7	2.23	0.0013	8.6	<0.001	790
AW-09	01/17/2017	<0.003	<0.001	0.18	<0.001	0.84	<0.001	120	32	<0.004	0.0029	<0.25	<0.001	0.022	<0.0002	0.012	6.9	0.729	<0.001	28	<0.001	710
AW-09	05/09/2017	<0.003	0.0049	0.22	<0.001	0.49	<0.001	140	28	<0.004	0.0051	0.281	<0.001	0.022	<0.0002	0.02	7.1	0	<0.001	13	<0.001	760
AW-09	07/20/2017	<0.003	0.031	0.57	0.0013	0.31	<0.001	160	28	0.039	0.024	<0.25	0.024	0.06	<0.0002	0.028	6.9	1.86	0.002	1.6	<0.001	700
AW-09	11/02/2017	--	--	--	--	0.9	--	110	32	--	--	0.279	--	--	--	--	7.0	--	--	29	--	690
AW-09	05/05/2018	<0.003	0.036	0.37	<0.001	0.29	<0.001	130	26	0.015	0.01	0.294	0.0076	0.029	<0.0002	0.037	7.0	--	0.0015	<1	<0.001	670
AW-09	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.633	--	--	--	--
AW-09	08/24/2018	--	<0.001	0.18	<0.001	0.72	--	120	36	<0.004	0.0034	0.334	<0.001	0.011	--	0.015	7.0	0.466	<0.001	26	--	720
AW-09	02/27/2019	<0.003	0.0019	0.22	<0.001	0.52	<0.001	120	29	<0.004	0.0036	0.25	<0.001	0.013	<0.0002	0.016	7.0	0.771	<0.001	12	<0.001	780

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-09	08/06/2019	--	0.026	0.54	<0.001	0.2	--	140	27	0.017	0.011	<0.25	0.011	0.036	--	0.015	7.2	1.94	0.0012	<1	--	770
AW-09	02/27/2020	<0.003	0.017	0.46	<0.001	0.24	<0.001	130	24	0.0092	0.0051	<0.25	0.0035	0.023	<0.0002	0.012	6.9	1.51	<0.001	<1	<0.001	740
AW-09	08/31/2020	--	0.02	0.46	<0.001	0.26	--	120	26	0.0089	0.0059	<0.25	0.0044	0.022	--	0.016	6.9	1.43	<0.001	<1	--	760
AW-09	02/23/2021	<0.003	0.017	0.46	<0.001	0.28	<0.001	140	8.1	0.022	0.013	<0.25	0.013	0.034	<0.0002	0.018	6.9	1.01	0.0011	<1	<0.001	470
AW-10	11/09/2015	<0.003	0.01	0.98	<0.001	0.42	<0.001	140	94	0.015	0.0083	<0.25	0.0054	0.073	<0.0002	0.0017	6.6	3.83	0.0013	2.8	<0.001	1100
AW-10	02/18/2016	<0.003	0.097	6.3	0.015	0.56	0.0031	280	99	0.45	0.25	<0.25	0.27	0.85	0.00033	0.0094	7.0	7.06	0.016	1.2	0.0023	1200
AW-10	05/18/2016	<0.003	0.04	3.4	0.0011	0.53	<0.001	170	83	0.056	0.034	0.324	0.035	0.11	<0.0002	0.0028	7.1	5.73	0.0021	<1	<0.001	1100
AW-10	07/21/2016	<0.003	0.01	1	<0.0005	0.46	<0.001	130	100	0.015	0.0097	<0.25	0.0074	0.08	<0.0002	0.0016	7.1	6.07	0.001	<1	<0.001	1100
AW-10	11/11/2016	<0.003	0.018	1.4	0.0012	0.44	<0.001	140	92	0.038	0.026	<0.25	0.022	0.12	<0.0002	0.0029	7.1	3.57	0.0025	<1	<0.001	1100
AW-10	01/17/2017	<0.003	0.0023	0.58	<0.001	0.44	<0.001	110	85	<0.004	0.0022	<0.25	<0.001	0.056	<0.0002	0.0023	7.1	1.23	<0.001	1.8	<0.001	1100
AW-10	05/10/2017	<0.003	0.0032	0.66	<0.001	0.49	<0.001	120	89	<0.004	0.0027	<0.25	<0.001	0.057	<0.0002	0.0032	6.9	1.12	<0.001	4.1	<0.001	1200
AW-10	07/20/2017	<0.003	0.0052	0.67	<0.001	0.43	<0.001	130	84	0.0042	0.0033	<0.25	0.0018	0.052	<0.0002	0.0043	7.0	0.875	<0.001	<1	<0.001	980
AW-10	11/02/2017	--	--	--	--	0.54	--	100	85	--	--	<0.25	--	--	--	--	7.2	--	--	2.8	--	1000
AW-10	05/07/2018	<0.003	0.0089	0.88	<0.001	0.42	<0.001	110	85	<0.004	0.0031	<0.25	0.001	0.042	<0.0002	0.002	7.3	--	<0.001	<1	<0.001	1000
AW-10	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.4	--	--	--	--
AW-10	07/27/2018	--	0.018	1.4	0.0022	0.48	--	170	88	0.063	0.036	<0.25	0.035	0.11	--	0.003	7.2	8.03	0.0035	<1	--	1100
AW-10	08/27/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.1	--	--	--	--	--
AW-10	02/27/2019	<0.003	0.012	0.93	<0.001	0.47	<0.001	130	85	<0.004	0.0037	<0.25	0.0024	0.04	<0.0002	0.028	7.2	1.79	<0.001	<1	<0.001	1100
AW-10	08/06/2019	--	0.019	1.5	0.0014	0.5	--	160	100	0.05	0.026	<0.25	0.026	0.12	--	0.0022	7.3	4.08	0.0033	<1	--	1200
AW-10	02/27/2020	<0.003	0.011	1.2	<0.001	0.46	<0.001	140	83	0.023	0.0098	<0.25	0.0092	0.065	<0.0002	0.0012	6.8	2.19	0.0012	<1	<0.001	1200
AW-10	08/31/2020	--	0.014	1.3	<0.001	0.54	--	140	88	0.0095	0.0062	<0.25	0.0051	0.051	--	<0.001	6.8	3.43	<0.001	<1	--	1200
AW-10	02/23/2021	<0.003	0.01	1	<0.001	0.55	<0.001	130	110	0.0051	0.0037	<0.25	0.0024	0.047	<0.0002	<0.001	6.9	3.1	<0.001	<1	<0.001	680

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-10	03/23/2021	<0.003	0.0095	0.98	<0.001	0.5	<0.001	130	96	<0.004	0.0022	<0.25	0.0011	0.04	<0.0002	<0.001	6.8	1.77	<0.001	<1	<0.001	1100
AW-11	11/09/2015	<0.003	0.011	1.2	<0.001	0.23	<0.001	170	33	0.029	0.011	<0.25	0.0099	0.067	<0.0002	0.0043	6.5	2.78	0.0019	1.4	<0.001	870
AW-11	02/18/2016	<0.003	0.014	1.6	0.0013	0.24	<0.001	210	36	0.044	0.023	0.29	0.026	0.078	<0.0002	0.0066	6.9	3.2	0.0021	2	<0.001	900
AW-11	05/18/2016	<0.003	0.0053	0.83	<0.001	0.25	<0.001	170	31	0.0095	0.0067	0.38	0.0049	0.033	<0.0002	0.0065	7.0	0.558	<0.001	1.8	<0.001	860
AW-11	07/22/2016	<0.003	0.0054	0.84	<0.0005	0.22	<0.001	160	36	0.0042	0.0034	<0.25	0.0019	0.033	<0.0002	0.0037	7.0	2.69	<0.001	1.9	<0.001	880
AW-11	11/11/2016	<0.003	0.021	2	0.0027	0.25	0.0014	220	33	0.095	0.044	<0.25	0.049	0.14	<0.0002	0.0088	7.1	2.69	0.0061	<1	<0.001	880
AW-11	01/17/2017	<0.003	0.0042	0.56	<0.001	0.22	0.0015	150	35	0.0063	0.0038	<0.25	0.0015	0.031	<0.0002	0.01	7.2	0.394	0.0012	2.2	<0.001	920
AW-11	05/09/2017	<0.003	0.014	1.4	0.0012	0.23	<0.001	210	34	0.031	0.023	<0.25	0.024	0.08	<0.0002	0.0073	7.0	5.75	0.003	4.9	<0.001	940
AW-11	07/20/2017	<0.003	0.025	2.5	0.0028	0.23	0.0017	240	30	0.091	0.046	<0.25	0.05	0.14	<0.0002	0.0077	7.2	4.47	0.0042	<1	<0.001	920
AW-11	11/02/2017	--	--	--	--	0.23	--	140	33	--	--	<0.25	--	--	--	--	7.2	--	--	3.2	--	920
AW-11	05/07/2018	<0.003	0.011	0.73	<0.001	0.21	<0.001	140	30	<0.004	0.0029	<0.25	<0.001	0.021	<0.0002	0.0064	7.2	--	<0.001	<1	<0.001	880
AW-11	05/29/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.75	--	--	--	--
AW-11	08/27/2018	--	0.029	3	0.0046	0.3	--	290	31	0.15	0.07	0.27	0.08	0.16	--	0.0099	7.2	7.6	0.0083	1.1	--	980
AW-11	02/27/2019	<0.003	0.013	0.76	<0.001	0.22	<0.001	160	30	<0.004	0.0031	<0.25	0.0012	0.017	<0.0002	0.0053	7.2	2.33	<0.001	<1	<0.001	970
AW-11	08/06/2019	--	0.018	0.88	<0.001	0.18	--	160	30	<0.004	0.0023	<0.25	<0.001	0.031	--	0.0046	7.2	1.69	<0.001	<1	--	980
AW-11	02/27/2020	<0.003	0.013	1.3	<0.001	0.22	<0.001	170	30	0.0081	0.0041	<0.25	0.0033	0.029	<0.0002	0.0028	6.7	3.68	<0.001	<1	<0.001	970
AW-11	08/31/2020	--	0.011	0.77	<0.001	0.21	--	150	29	<0.004	0.0024	<0.25	<0.001	0.025	--	0.0021	6.9	1.52	<0.001	<1	--	970
AW-11	02/23/2021	<0.003	0.011	0.98	<0.001	0.25	<0.001	160	33	<0.004	0.0023	<0.25	0.0011	0.024	<0.0002	0.0016	7.0	2.46	<0.001	<1	<0.001	510
AW-12	02/11/2021	<0.003	0.0021	1.4	<0.001	0.27	<0.001	130	43	<0.004	<0.002	0.37	<0.001	0.036	<0.0002	0.023	6.8	1.62	0.0013	2.8	<0.001	770
AW-12	03/04/2021	<0.003	0.0026	1.5	<0.001	0.24	<0.001	120	41	<0.004	<0.002	<0.25	<0.001	0.028	<0.0002	0.0048	6.8	0.828	<0.001	<1	<0.001	780
AW-12	03/24/2021	<0.003	0.0025	1.4	<0.001	0.21	<0.001	120	45	<0.004	<0.002	2.14	<0.001	0.026	<0.0002	0.0037	6.4	0.846	<0.001	<1	<0.001	830
AW-12	04/12/2021	<0.003	0.0068	1.5	<0.001	0.23	<0.001	130	39	<0.004	<0.002	2.78	0.0012	0.031	<0.0002	0.0048	7.0	1.87	<0.001	1.2	<0.001	810

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-12	05/07/2021	<0.003	0.0038	1.5	<0.001	0.26	<0.001	140	34	0.0072	<0.002	1.62	<0.001	0.025	<0.0002	0.004	7.0	1.24	<0.001	<1	<0.001	840
AW-13	02/11/2021	<0.003	0.013	1.5	<0.001	0.3	<0.001	140	80	0.0046	0.0041	<0.25	0.0034	0.033	<0.0002	0.0028	6.9	3.05	<0.001	3.2	<0.001	920
AW-13	03/04/2021	<0.003	0.0098	1.2	<0.001	0.29	<0.001	140	74	0.0077	0.0024	<0.25	0.0013	0.03	<0.0002	0.0015	6.7	3.02	<0.001	2	<0.001	1000
AW-13	03/23/2021	<0.003	0.012	1.3	<0.001	0.28	<0.001	140	89	<0.004	0.002	<0.25	0.0012	0.029	<0.0002	<0.001	6.7	2.98	<0.001	1.4	<0.001	1000
AW-13	04/12/2021	<0.003	0.014	1.3	<0.001	0.27	<0.001	140	81	<0.004	0.0021	<0.25	<0.001	0.036	<0.0002	0.0014	6.8	1.39	<0.001	<1	<0.001	1000
AW-13	05/07/2021	<0.003	0.014	1.4	<0.001	0.3	<0.001	150	86	<0.004	<0.002	<0.25	<0.001	0.03	<0.0002	<0.001	6.8	3.14	<0.001	<1	<0.001	1100
AW-14	02/11/2021	<0.003	0.0064	0.63	<0.001	0.21	<0.001	170	28	0.009	0.011	<0.25	0.0061	0.027	<0.0002	0.046	7.0	2.69	0.0016	54	<0.001	950
AW-14	03/04/2021	<0.003	0.011	0.59	<0.001	0.19	<0.001	170	26	<0.004	0.0058	<0.25	<0.001	0.023	<0.0002	0.022	6.9	2.67	<0.001	26	<0.001	960
AW-14	03/22/2021	<0.003	0.011	0.63	<0.001	0.18	<0.001	170	37	<0.004	0.0043	<0.25	<0.001	0.02	<0.0002	0.0044	6.9	2.38	<0.001	10	<0.001	1000
AW-14	04/12/2021	0.0045	0.01	0.7	<0.001	0.17	<0.001	170	24	<0.004	0.0041	<0.25	0.0022	0.025	<0.0002	0.0037	6.8	2.36	<0.001	3	<0.001	1100
AW-14	05/06/2021	<0.003	0.0096	0.75	<0.001	0.19	<0.001	180	25	<0.004	0.0029	1.21	<0.001	<0.02	<0.0002	<0.001	6.8	1.99	<0.001	<1	<0.001	1000
AW-14	06/28/2021	<0.003	0.009	0.76	<0.001	0.17	<0.001	180	26	<0.004	0.0029	1.37	<0.001	0.029	<0.0002	<0.001	6.8	3.66	<0.001	1.7	<0.001	760
AW-14	07/21/2021	<0.003	0.0085	0.75	<0.001	0.17	<0.001	170	25	<0.004	0.0025	<0.25	<0.001	<0.02	<0.0002	<0.001	6.7	1.94	<0.001	<1	<0.001	1100
AW-15	02/12/2021	<0.003	0.0023	2.1	<0.001	0.57	<0.001	130	49	<0.004	<0.002	<0.25	<0.001	0.049	<0.0002	0.001	6.8	2.96	<0.001	1	<0.001	1100
AW-15	03/05/2021	<0.003	0.0037	2	<0.001	0.43	<0.001	140	43	<0.004	0.0023	<0.25	<0.001	0.041	<0.0002	<0.001	6.7	5.14	<0.001	<1	<0.001	980
AW-15	03/22/2021	<0.003	0.0041	1.7	<0.001	0.47	<0.001	140	51	<0.004	<0.002	<0.25	<0.001	0.039	<0.0002	<0.001	6.8	6.89	<0.001	<1	<0.001	990
AW-15	05/06/2021	<0.003	0.0058	1.8	<0.001	0.43	<0.001	140	41	<0.004	<0.002	0.881	<0.001	0.033	<0.0002	<0.001	6.6	4.14	<0.001	<1	<0.001	1000
AW-15	06/17/2021	<0.003	0.0063	1.4	<0.001	0.3	<0.001	140	38	<0.004	<0.002	0.706	<0.001	0.041	<0.0002	0.0031	--	1.49	<0.001	<1	<0.001	780
AW-15C	02/12/2021	<0.003	0.0059	3.1	<0.001	0.81	<0.001	99	92	0.0048	0.0032	<0.25	0.0026	0.06	<0.0002	0.0088	7.0	4.84	<0.001	3.1	<0.001	1200
AW-15C	03/04/2021	<0.003	0.0038	3.6	<0.001	0.73	<0.001	110	55	<0.004	0.0025	<0.25	0.0011	0.058	<0.0002	0.0082	6.8	7.49	<0.001	<1	<0.001	1700
AW-15C	03/22/2021	<0.003	0.0035	3.2	<0.001	0.6	<0.001	110	59	<0.004	0.0021	<0.25	0.0012	0.056	<0.0002	0.0014	6.7	7.52	<0.001	<1	<0.001	1100
AW-15C	04/13/2021	0.0033	0.011	2.9	<0.001	0.68	<0.001	92	110	0.0044	0.0026	<0.25	0.0029	0.062	<0.0002	0.0059	7.0	5.25	<0.001	1.9	<0.001	1200

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-15C	05/06/2021	<0.003	0.0056	3.4	<0.001	0.63	<0.001	110	63	<0.004	<0.002	1.55	<0.001	0.047	<0.0002	0.0016	6.8	4.68	<0.001	<1	<0.001	1000
AW-15C	07/21/2021	<0.003	0.0064	3.6	<0.001	0.69	<0.001	99	72	<0.004	<0.002	0.407	<0.001	0.045	<0.0002	0.0011	6.8	4.92	<0.001	<1	<0.001	1100
AW-15S	02/12/2021	<0.003	0.0043	0.22	0.0011	5.5	<0.001	250	50	0.022	0.011	0.302	0.014	0.032	<0.0002	0.0042	7.0	0.74	0.0024	480	<0.001	1300
AW-15S	03/04/2021	<0.003	0.001	0.11	<0.001	5.4	<0.001	270	47	<0.004	<0.002	0.27	<0.001	<0.02	<0.0002	0.0043	7.1	1.08	0.0013	510	<0.001	1200
AW-15S	03/22/2021	<0.003	0.001	0.1	<0.001	6.2	<0.001	260	42	<0.004	<0.002	0.25	0.0014	<0.02	<0.0002	0.0033	6.9	0.236	0.0015	520	<0.001	1300
AW-15S	04/26/2021	<0.003	<0.001	0.1	<0.001	5.4	<0.001	270	41	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0034	7.0	--	0.0013	550	<0.001	1400
AW-15S	05/06/2021	<0.003	<0.001	0.098	<0.001	5.8	<0.001	270	40	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0034	6.7	0.532	0.0012	540	<0.001	1300
AW-15S	06/17/2021	<0.003	<0.001	0.093	<0.001	5.7	<0.001	270	37	<0.004	<0.002	0.336	<0.001	0.021	<0.0002	0.0031	6.7	0.229	<0.001	550	<0.001	1300
AW-15S	06/29/2021	<0.003	<0.001	0.097	<0.001	5.4	<0.001	260	39	<0.004	<0.002	0.255	<0.001	<0.02	<0.0002	0.0033	6.9	0.582	<0.001	560	<0.001	1200
AW-15S	07/21/2021	<0.003	0.0015	0.11	<0.001	6.1	<0.001	260	38	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.003	6.6	1.09	<0.001	570	<0.001	1400
AW-16	02/11/2021	<0.003	0.0013	1.4	<0.001	0.52	<0.001	130	59	<0.004	<0.002	<0.25	<0.001	0.045	<0.0002	<0.001	6.8	5.73	<0.001	<1	<0.001	1100
AW-16	03/03/2021	<0.003	0.0015	1.4	<0.001	0.54	<0.001	140	53	<0.004	<0.002	<0.25	<0.001	0.045	<0.0002	<0.001	6.8	7.02	<0.001	<1	<0.001	1100
AW-16	03/24/2021	<0.003	<0.001	1.3	<0.001	0.49	<0.001	130	53	<0.004	<0.002	<0.25	<0.001	0.046	<0.0002	<0.001	6.4	7.46	<0.001	<1	<0.001	1000
AW-16	04/23/2021	<0.003	0.0016	1.2	<0.001	0.45	<0.001	140	55	<0.004	<0.002	<0.25	<0.001	0.036	<0.0002	<0.001	6.8	4.69	<0.001	<1	<0.001	1000
AW-16	05/05/2021	<0.003	0.0016	1.3	<0.001	0.5	<0.001	140	53	<0.004	<0.002	<0.25	<0.001	0.039	<0.0002	<0.001	6.7	5.52	<0.001	<1	<0.001	1200
AW-16	06/24/2021	<0.003	0.0018	1.2	<0.001	0.54	<0.001	150	49	<0.004	<0.002	<0.25	<0.001	0.1	<0.0002	<0.001	6.6	4.41	<0.001	<1	<0.001	1200
AW-16	06/29/2021	<0.003	0.002	1.1	<0.001	0.51	<0.001	140	54	<0.004	<0.002	<0.25	<0.001	0.043	<0.0002	<0.001	6.8	5.84	<0.001	<1	<0.001	1100
AW-16	07/21/2021	<0.003	0.002	1.2	<0.001	0.56	<0.001	130	56	<0.004	<0.002	<0.25	<0.001	0.036	<0.0002	<0.001	6.8	4.77	<0.001	<1	<0.001	1200
AW-17	02/11/2021	<0.003	0.0064	1.2	<0.001	0.48	<0.001	100	56	0.0053	0.0046	<0.25	0.0031	0.071	<0.0002	0.0024	7.0	2.91	<0.001	<1	<0.001	850
AW-17	03/03/2021	<0.003	0.0079	1.2	<0.001	0.44	<0.001	120	52	0.0094	0.0065	<0.25	0.0048	0.057	<0.0002	0.003	6.8	3.57	<0.001	<1	<0.001	970
AW-17	03/23/2021	<0.003	0.0052	1.1	<0.001	0.43	<0.001	100	60	<0.004	0.0022	0.787	<0.001	0.043	<0.0002	0.0014	6.2	2.41	<0.001	<1	<0.001	950
AW-17	04/23/2021	<0.003	0.0054	1	<0.001	0.4	<0.001	110	57	<0.004	0.0024	<0.25	<0.001	0.041	<0.0002	0.0017	6.9	2.33	<0.001	<1	<0.001	700

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-17	05/05/2021	<0.003	0.0053	1.1	<0.001	0.44	<0.001	110	55	<0.004	0.0021	<0.25	<0.001	0.04	<0.0002	0.0012	6.8	3.1	<0.001	<1	<0.001	860
AW-17	06/24/2021	<0.003	0.0052	1	<0.001	0.46	<0.001	110	59	<0.004	0.0023	<0.25	<0.001	0.094	<0.0002	<0.001	6.6	2.85	<0.001	<1	<0.001	950
AW-17	06/29/2021	<0.003	0.0058	1.1	<0.001	0.44	<0.001	110	55	0.0053	0.0049	<0.25	0.0039	0.064	<0.0002	0.0015	6.9	2.8	<0.001	<1	<0.001	720
AW-17	07/21/2021	<0.003	0.0051	1.2	<0.001	0.48	<0.001	100	56	<0.004	0.0023	<0.25	<0.001	0.039	<0.0002	0.0016	7.0	2.98	<0.001	<1	<0.001	1000
AW-18	02/11/2021	<0.003	0.0037	0.6	<0.001	2.7	<0.001	110	69	<0.004	0.0028	0.345	<0.001	0.11	<0.0002	0.022	7.0	2.68	<0.001	23	<0.001	740
AW-18	03/03/2021	<0.003	0.0095	1	<0.001	1	<0.001	140	75	<0.004	0.0024	2.88	<0.001	0.13	<0.0002	0.022	7.0	4.7	<0.001	6.5	<0.001	900
AW-18	03/23/2021	<0.003	0.0059	0.59	<0.001	3	<0.001	110	64	<0.004	<0.002	4.04	<0.001	0.062	<0.0002	0.027	6.4	2.82	<0.001	28	<0.001	750
AW-18	04/13/2021	<0.003	0.005	0.85	<0.001	1.6	<0.001	110	80	<0.004	<0.002	3.41	<0.001	0.067	<0.0002	0.011	6.9	1.29	<0.001	12	<0.001	860
AW-18	05/05/2021	<0.003	0.0055	0.97	<0.001	0.96	<0.001	140	81	<0.004	<0.002	10.2	<0.001	0.055	<0.0002	0.0071	6.9	2.23	<0.001	4	<0.001	910
AW-18	06/23/2021	<0.003	0.0051	1	<0.001	1.2	<0.001	140	88	<0.004	<0.002	<0.25	<0.001	0.093	<0.0002	0.0044	6.9	2.86	0.0037	3.2	<0.001	870
AW-18	06/29/2021	<0.003	0.0031	1.4	<0.001	0.41	<0.001	130	74	<0.004	<0.002	<0.25	<0.001	0.07	<0.0002	0.0051	6.9	3.42	<0.001	12	<0.001	710
AW-18	07/21/2021	<0.003	0.0033	1.1	<0.001	1.3	<0.001	120	85	<0.004	<0.002	0.251	<0.001	0.039	<0.0002	0.0033	7.0	2.34	<0.001	4.6	<0.001	930
AW-19	02/11/2021	<0.003	0.016	0.23	<0.001	2.9	<0.001	110	81	0.0073	0.0038	0.455	0.0047	0.033	<0.0002	0.0097	7.0	0.483	<0.001	28	<0.001	510
AW-19	03/03/2021	<0.003	0.02	0.24	<0.001	2.7	<0.001	120	80	0.0076	0.0039	0.329	0.0036	0.025	<0.0002	0.0052	7.1	0.795	<0.001	26	<0.001	650
AW-19	03/23/2021	<0.003	0.014	0.2	<0.001	2.6	<0.001	110	88	<0.004	<0.002	0.346	0.0016	<0.02	<0.0002	0.0034	6.4	0.129	<0.001	29	<0.001	590
AW-19	04/12/2021	<0.003	0.016	0.18	<0.001	2.5	<0.001	110	77	<0.004	<0.002	0.318	0.0013	<0.02	<0.0002	0.004	6.9	0.492	<0.001	29	<0.001	570
AW-19	05/05/2021	<0.003	0.015	0.18	<0.001	2.6	<0.001	120	86	<0.004	<0.002	0.414	<0.001	<0.02	<0.0002	0.0043	7.1	0.882	<0.001	33	<0.001	530
AW-19	06/23/2021	<0.003	0.016	0.18	<0.001	2.5	<0.001	120	88	<0.004	<0.002	0.289	<0.001	0.023	<0.0002	0.0036	7.0	0.658	<0.001	37	<0.001	580
AW-19	06/29/2021	<0.003	0.0075	0.19	<0.001	2.6	<0.001	110	80	<0.004	<0.002	0.276	<0.001	0.021	<0.0002	0.0035	7.1	2.15	<0.001	36	<0.001	550
AW-19	07/21/2021	<0.003	0.0092	0.18	<0.001	2.8	<0.001	110	86	<0.004	<0.002	0.342	<0.001	<0.02	<0.0002	0.0033	7.2	0.458	<0.001	38	<0.001	670
AW-20	02/11/2021	<0.003	0.012	0.15	<0.001	2.3	<0.001	150	90	0.0055	0.0034	0.394	0.0042	0.027	<0.0002	0.0028	6.8	0.606	<0.001	48	<0.001	790
AW-20	03/03/2021	<0.003	0.013	0.13	<0.001	2.2	<0.001	170	89	<0.004	0.002	0.286	<0.001	<0.02	<0.0002	0.0028	6.9	0.515	<0.001	45	<0.001	830

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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
AW-20	03/23/2021	<0.003	0.011	0.13	<0.001	2.3	<0.001	160	89	<0.004	<0.002	0.275	<0.001	<0.02	<0.0002	0.0025	6.4	1.38	<0.001	43	<0.001	800
AW-20	04/12/2021	<0.003	0.012	0.13	<0.001	2.1	<0.001	160	87	<0.004	<0.002	0.321	<0.001	0.021	<0.0002	0.0022	6.9	1.17	<0.001	39	<0.001	730
AW-20	05/05/2021	<0.003	0.012	0.14	<0.001	2.2	<0.001	160	93	<0.004	<0.002	0.313	<0.001	<0.02	<0.0002	0.0026	6.9	0.448	<0.001	41	<0.001	730
AW-21	02/11/2021	<0.003	<0.001	0.079	<0.001	12	<0.001	110	100	<0.004	<0.002	0.646	<0.001	<0.02	<0.0002	0.019	7.2	0.645	<0.001	250	<0.001	650
AW-21	03/03/2021	<0.003	0.0011	0.063	<0.001	11	<0.001	120	96	<0.004	<0.002	0.474	<0.001	<0.02	<0.0002	0.024	7.2	0.493	<0.001	240	<0.001	710
AW-21	03/23/2021	<0.003	0.0011	0.08	<0.001	12	<0.001	110	99	<0.004	<0.002	0.399	<0.001	<0.02	<0.0002	0.018	6.7	0.223	<0.001	250	<0.001	650
AW-21	04/12/2021	<0.003	0.0016	0.085	<0.001	11	<0.001	110	100	<0.004	<0.002	0.416	0.0012	<0.02	<0.0002	0.021	7.2	0.83	<0.001	41	<0.001	630
AW-21	05/05/2021	<0.003	0.0011	0.067	<0.001	11	<0.001	120	96	<0.004	<0.002	0.526	<0.001	<0.02	<0.0002	0.02	7.2	0.237	<0.001	230	<0.001	710
AW-21	06/23/2021	<0.003	0.0022	0.062	<0.001	12	<0.001	120	93	<0.004	<0.002	0.372	<0.001	<0.02	<0.0002	0.015	7.2	1.08	<0.001	250	<0.001	700
AW-21	06/29/2021	<0.003	0.0013	0.075	<0.001	11	<0.001	110	95	<0.004	<0.002	0.409	<0.001	<0.02	<0.0002	0.016	7.2	0.645	<0.001	250	<0.001	640
AW-21	07/21/2021	<0.003	0.0015	0.075	<0.001	12	<0.001	110	100	<0.004	<0.002	0.275	<0.001	<0.02	<0.0002	0.016	7.3	1	<0.001	260	<0.001	800
AW-22	02/12/2021	<0.003	0.0043	0.76	<0.001	0.32	<0.001	78	40	<0.004	<0.002	<0.25	<0.001	0.023	<0.0002	0.0015	7.0	1.55	<0.001	<1	<0.001	540
AW-22	03/03/2021	<0.003	0.0029	0.8	<0.001	0.23	<0.001	82	39	<0.004	<0.002	<0.25	<0.001	0.022	<0.0002	0.0013	6.9	1	<0.001	<1	<0.001	570
AW-22	03/23/2021	<0.003	0.0016	0.73	<0.001	0.23	<0.001	77	39	<0.004	<0.002	0.374	<0.001	0.022	<0.0002	0.0017	6.5	1.12	<0.001	<1	<0.001	540
AW-22	04/23/2021	<0.003	0.0032	0.99	<0.001	0.33	<0.001	110	42	0.0041	<0.002	<0.25	0.0081	<0.02	<0.0002	0.0021	6.9	2.37	0.0011	<1	<0.001	500
AW-22	05/05/2021	<0.003	0.0017	0.8	<0.001	0.38	<0.001	80	40	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.9	2.13	<0.001	<1	<0.001	530
P002	02/12/2021	<0.003	0.0046	0.11	<0.001	1.4	<0.001	170	78	<0.004	0.0042	0.344	<0.001	<0.02	<0.0002	0.0016	6.6	0.166	<0.001	1.1	<0.001	730
P002	03/03/2021	<0.003	0.0071	0.1	<0.001	1.1	<0.001	180	70	<0.004	0.0042	0.297	<0.001	<0.02	<0.0002	0.0017	6.8	0.4	<0.001	1.2	<0.001	810
P002	03/23/2021	<0.003	0.0062	0.096	<0.001	1.2	<0.001	170	71	<0.004	0.0041	0.363	<0.001	<0.02	<0.0002	0.0017	6.3	0.195	<0.001	1.2	<0.001	830
P002	04/13/2021	<0.003	0.0084	0.097	<0.001	1.2	<0.001	170	74	<0.004	0.0044	0.337	<0.001	<0.02	<0.0002	0.0017	6.8	0.124	<0.001	<1	<0.001	790
P002	05/04/2021	<0.003	0.0079	0.1	<0.001	1.2	<0.001	180	69	<0.004	0.0045	0.335	<0.001	<0.02	<0.0002	0.002	6.8	0.0443	<0.001	<1	<0.001	860

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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

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
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AP05D	02/10/2021	0.33	126	7.7	2032	8.4	3.9
AP05D	03/08/2021	0.20	-67.3	7.2	2821	14.9	27.5
AP05D	03/24/2021	6.13	-54	7.6	1882	13.7	0
AP05D	04/15/2021	0.43	-97.9	7.4	3148	10.1	36.6
AP05D	05/07/2021	1.50	-106	7.7	3722	17.4	323
AP05S	01/18/2017	0	95	6.9	1095	12.1	96
AP05S	05/10/2017	0	105	7.1	1035	14.6	73.9
AP05S	06/07/2017	0	103	6.8	989	15.4	63.9
AP05S	06/22/2017	0	105	7.2	1017	18.3	68.7
AP05S	07/21/2017	0	89	6.9	1030	19.8	61.8
AP05S	07/31/2017	0	70	7.0	1011	15.6	94
AP05S	08/07/2017	0	95	7.0	1040	15.4	82.8
AP05S	08/23/2017	0	96	6.9	1002	15.7	98.1
AP05S	11/02/2017	0	79	7.2	1120	12.8	95.8
AP05S	05/07/2018	0	94	7.2	1040	13.7	85.4
AP05S	07/27/2018	0	79	7.1	1010	15.1	95.3
AP05S	08/27/2018	0	95	7.0	1112	15.3	99.1
AP05S	02/27/2019	0	89	7.1	1270	11.9	99
AP05S	08/06/2019	0	80	7.1	1010	16.9	1000
AP05S	02/27/2020	0.20	-102	6.7	1711	8.6	518
AP05S	09/01/2020	0.14	-118	6.9	1664	18.6	466
AP05S	02/10/2021	0.19	8.3	6.9	1648	6.5	15
AP05S	02/23/2021	0.50	-120	6.8	1499	15.1	1410
AP05S	03/08/2021	0.11	-85.9	6.8	1821	13.9	447
AP05S	03/24/2021	0.17	-26.3	6.3	1561	12.5	276
AP05S	04/13/2021	0.06	-138	7.0	1496	13.9	380
AP05S	05/07/2021	0.72	-112	6.8	1651	15.1	271
AP05S	06/16/2021	0.12	-201	6.9	1753	27.2	2780
AP05S	06/29/2021	0.30	-152	6.9	1736	20.7	2500
AP05S	07/22/2021	0.20	-122	7.0	1721	26.6	1450
AP07D	02/10/2021	6.63	128	8.2	3028	8.8	21.1
AP07D	03/08/2021	7.44	30.9	7.8	3453	16.4	6830
AP07D	03/24/2021	5.54	9.5	7.5	3509	14.3	13900
AP07D	04/13/2021	0.26	-129	7.8	3621	19.0	1620
AP07D	05/05/2021	0	-168	7.9	3209	22.8	635
AP07D	07/22/2021	3.60	47.4	7.5	3002	17.8	1930
AP07S	02/10/2021	0.76	80.3	6.8	1193	9.2	16.2
AP07S	03/04/2021	0.69	79.5	6.7	1118	12.1	12
AP07S	03/24/2021	0.43	26.4	6.2	1084	13.6	0
AP07S	04/13/2021	0.60	29.9	6.8	1792	15.4	146
AP07S	05/05/2021	0.61	20.9	6.6	1875	17.9	1240
AP07S	06/16/2021	1.60	21.8	6.5	1986	36.0	27.5
AP07S	06/28/2021	2.20	55.8	6.8	2034	16.7	34.3
AP07S	07/22/2021	1.20	16.5	6.6	2473	17.7	591

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
APW-01	06/17/2021	0.63	-103	6.9	1450	37.3	2000
APW-01	06/29/2021	24.00	-95.6	6.8	10540	19.9	3560
APW-01	07/22/2021	0.09	-135	6.9	1648	16.6	3280
APW-02	02/10/2021	0.22	-104	7.0	1042	9.0	1.24
APW-02	03/03/2021	0.17	-76.8	7.0	1046	14.0	34.3
APW-02	03/24/2021	0.30	-41.6	6.5	992.8	12.8	249
APW-02	04/13/2021	1.50	-93.7	6.9	989	12.6	123
APW-02	05/06/2021	0.67	-118	6.8	943	16.5	71.1
APW-03	02/10/2021	0.14	-111	6.8	1574	10.9	106
APW-03	03/04/2021	0.19	-52.9	6.6	1637	12.5	67.3
APW-03	03/24/2021	0.23	-51.7	6.4	1628	13.4	0
APW-03	04/13/2021	0.23	-128	6.8	1696	21.7	732
APW-03	05/07/2021	0.98	-106	6.8	1641	27.2	595
APW-04	02/10/2021	0.18	-89.8	6.9	1636	7.5	141
APW-04	03/04/2021	0.21	-55	6.8	1596	10.2	131
APW-04	03/22/2021	0.21	-50.9	6.9	1458	11.3	514
APW-04	04/13/2021	0.26	-123	6.8	1706	18.7	1300
APW-04	05/07/2021	0.19	-125	6.8	1805	21.5	114
AW-05	11/09/2015	0	-9	6.7	2210	15.8	268
AW-05	02/17/2016	0	-17	6.8	1980	12.5	286
AW-05	05/17/2016	0	-30	6.7	1736	13.7	238
AW-05	07/21/2016	0	-54	6.9	1662	18.3	237
AW-05	11/10/2016	0	-48	7.1	1340	13.9	190
AW-05	01/17/2017	0	-56	7.1	1288	14.2	190
AW-05	05/08/2017	0	-63	7.2	1229	14.8	164
AW-05	07/19/2017	0	-74	7.1	1230	19.9	217
AW-05	11/01/2017	0	-50	7.2	1250	13.4	206
AW-05	02/27/2020	3.80	51.4	7.0	1273	9.7	922
AW-05	06/17/2021	0.64	-42.2	7.0	1433	17.4	186
AW-05	06/28/2021	0.80	6.8	7.0	1430	19.5	39.2
AW-05	07/22/2021	0.73	-35.6	7.1	1351	19.5	19
AW-06	11/10/2015	0	78	7.0	1140	14.0	1000
AW-06	02/17/2016	0	80	7.2	1110	11.8	1000
AW-06	05/18/2016	0	108	7.2	1024	12.7	1000
AW-06	07/22/2016	0	95	7.1	1035	15.0	1000
AW-06	11/11/2016	0	83	7.2	995	14.0	1000
AW-06	01/17/2017	0	95	7.2	1030	14.6	1000
AW-06	05/09/2017	0	80	7.2	963	14.5	1000
AW-06	07/20/2017	0	89	7.3	1080	18.8	1000
AW-06	11/02/2017	0	111	7.1	1100	13.4	1000
AW-06	05/05/2018	0	74	7.2	1010	14.0	1000
AW-06	08/24/2018	0	96	7.9	1049	15.1	98.1
AW-06	02/27/2019	0	65	7.3	860	11.5	91.4
AW-06	08/06/2019	0	111	7.2	1031	17.2	1000

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AW-06	02/27/2020	2.40	16.2	7.0	985	12.4	119
AW-06	08/31/2020	5.40	-42.6	7.3	924	19.2	36
AW-06	02/23/2021	2.00	-30.1	7.1	1008	12.0	1650
AW-08	11/09/2015	0	21	6.6	1380	16.8	0
AW-08	02/17/2016	0	67	6.8	1290	12.3	104
AW-08	05/17/2016	0	48	6.8	1244	13.3	112
AW-08	07/21/2016	0	78	7.0	1275	15.7	102
AW-08	11/10/2016	0	74	7.1	1149	14.2	78
AW-08	01/17/2017	0	67	7.2	1105	15.3	75
AW-08	05/08/2017	0	74	7.1	1002	15.4	78.4
AW-08	07/19/2017	0	68	7.3	1010	21.4	76.5
AW-08	11/01/2017	0	74	7.1	1120	13.0	80.4
AW-08	05/05/2018	0	65	7.1	1080	13.7	93.1
AW-08	07/27/2018	0	72	7.2	1120	15.0	75.6
AW-08	08/27/2018	0	70	7.1	1088	15.3	81.6
AW-08	02/27/2019	0	73	7.1	1162	12.0	99.2
AW-08	08/06/2019	0	73	7.3	1160	17.2	88.7
AW-08	02/27/2020	0.23	-140	6.9	1303	12.1	33.5
AW-08	09/01/2020	0.07	-149	7.1	1280	19.3	3.3
AW-08	02/10/2021	0.26	-104	7.1	1328	11.8	2.51
AW-08	02/23/2021	0.46	-144	6.9	1405	15.2	1310
AW-08	03/05/2021	0.33	-64	6.9	1253	14.2	3.75
AW-08	03/24/2021	0.28	-83.6	6.3	1320	15.8	1.32
AW-08	04/13/2021	0.64	-154	6.8	1453	17.5	500
AW-08	05/07/2021	1.70	-156	7.0	1372	17.6	59.8
AW-08	06/16/2021	3.50	-152	7.0	1386	23.1	87.9
AW-08	06/28/2021	7.90	-98.8	7.0	1246	23.8	133
AW-08	07/21/2021	0	-126	6.9	764	23.2	16.9
AW-09	11/10/2015	0.67	87	6.8	1280	13.6	1000
AW-09	02/17/2016	0	115	6.6	1240	12.0	1000
AW-09	05/17/2016	0	82	6.5	1268	13.2	1000
AW-09	07/22/2016	0	67	6.6	1242	15.4	1000
AW-09	11/11/2016	0	39	6.7	1148	14.4	1000
AW-09	01/17/2017	0	57	6.9	1162	14.2	1000
AW-09	05/09/2017	0	68	7.1	1046	15.0	1000
AW-09	07/20/2017	0	64	6.9	1150	19.5	1000
AW-09	11/02/2017	0	59	7.0	1060	13.1	1000
AW-09	05/05/2018	0	55	7.0	1100	13.9	1000
AW-09	08/24/2018	0	59	7.0	1128	14.6	95
AW-09	02/27/2019	0	55	7.0	1055	11.8	1000
AW-09	08/06/2019	0	73	7.2	1324	16.9	1000
AW-09	02/27/2020	1.00	-114	6.9	1490	12.3	135
AW-09	08/31/2020	1.80	-115	6.9	1477	19.2	352
AW-09	02/23/2021	1.10	-123	6.9	1515	12.5	485

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AW-10	11/09/2015	4.47	-38	6.6	2240	14.5	583
AW-10	02/18/2016	0.17	-24	7.0	2020	11.2	1000
AW-10	05/18/2016	0	-20	7.1	2230	13.6	1000
AW-10	07/21/2016	0	-56	7.1	1985	14.9	1000
AW-10	11/11/2016	0	-65	7.1	1784	13.8	1000
AW-10	01/17/2017	0	-67	7.1	1682	14.7	1000
AW-10	05/10/2017	0	-65	6.9	1607	15.0	1000
AW-10	07/20/2017	0	-78	7.0	1740	18.0	1000
AW-10	11/02/2017	0	-70	7.2	1560	13.7	1000
AW-10	05/07/2018	0	-62	7.3	1740	12.7	1000
AW-10	07/27/2018	0	-71	7.2	1460	15.1	1000
AW-10	08/27/2018	0	-57	7.1	1603	15.1	1000
AW-10	02/27/2019	0	-67	7.2	1624	11.9	1000
AW-10	08/06/2019	0	-72	7.3	1420	17.1	1000
AW-10	02/27/2020	0.04	-127	6.8	2169	8.3	863
AW-10	08/31/2020	0.05	-135	6.8	2167	21.3	375
AW-10	02/23/2021	0	-138	6.9	2234	10.3	740
AW-10	03/23/2021	0.13	-55.7	6.8	2222	10.8	1610
AW-11	11/09/2015	5.27	-12	6.5	1900	13.2	844
AW-11	02/18/2016	0	61	6.9	1860	11.9	1000
AW-11	05/18/2016	0	40	7.0	1625	13.4	1000
AW-11	07/22/2016	0	55	7.0	1534	15.3	1000
AW-11	11/11/2016	0	64	7.1	1441	14.3	1000
AW-11	01/17/2017	0	66	7.2	1539	15.1	1000
AW-11	05/09/2017	0	61	7.0	1625	14.6	1000
AW-11	07/20/2017	0	58	7.2	1530	21.8	1000
AW-11	11/02/2017	0	72	7.2	1390	12.8	1000
AW-11	05/07/2018	0	71	7.2	1540	14.1	1000
AW-11	08/27/2018	0	71	7.2	1460	15.1	1000
AW-11	02/27/2019	0	72	7.2	1240	12.0	1000
AW-11	08/06/2019	0	74	7.2	1307	17.0	1000
AW-11	02/27/2020	0	-152	6.7	1780	7.8	2400
AW-11	08/31/2020	0.01	-163	6.9	1805	23.7	170
AW-11	02/23/2021	0	-140	7.0	1799	9.7	582
AW-12	02/11/2021	0.10	-114	6.8	1592	12.9	531
AW-12	03/04/2021	0.07	-65.1	6.8	1487	13.7	6.58
AW-12	03/24/2021	0.09	-57.8	6.4	1469	13.6	48.1
AW-12	04/12/2021	0.09	-89.6	7.0	1476	15.4	139
AW-12	05/07/2021	0.91	-128	7.0	1154	17.0	3.07
AW-13	02/11/2021	0.15	-90.2	6.9	2016	8.7	134
AW-13	03/04/2021	0.05	-28.8	6.7	1891	10.4	46.9
AW-13	03/23/2021	0.09	-48.2	6.7	1778	10.4	112
AW-13	04/12/2021	0.14	-86	6.8	1897	12.0	1200
AW-13	05/07/2021	0.08	-96.5	6.8	1700	15.1	30.1

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AW-14	02/11/2021	0.21	-85.8	7.0	2138	10.0	473
AW-14	03/04/2021	0.08	-80.7	6.9	1895	11.2	85.8
AW-14	03/22/2021	0.08	-79.4	6.9	1841	11.8	88.8
AW-14	04/12/2021	0.10	-127	6.8	1874	13.3	67.7
AW-14	05/06/2021	0.83	-146	6.8	1891	14.2	67
AW-14	06/28/2021	0.06	-150	6.8	1851	17.0	30.6
AW-14	07/21/2021	0	-131	6.6	1940	25.5	40.4
AW-15	02/12/2021	0.20	-81.8	6.8	1824	11.0	24.4
AW-15	03/05/2021	0.16	-47.7	6.7	1756	12.6	78.3
AW-15	03/22/2021	0.60	-51.5	6.8	27.6	14.4	383
AW-15	05/06/2021	0.53	-118	6.6	1936	14.4	30.6
AW-15C	02/12/2021	0.16	-84.2	7.0	1495	7.9	155
AW-15C	03/04/2021	0.10	-76.4	6.8	1281	12.3	111
AW-15C	03/22/2021	0.08	-36.5	6.7	1216	13.0	782
AW-15C	04/13/2021	0.01	-53.6	7.0	2127	13.9	0.67
AW-15C	05/06/2021	0.72	-99.3	6.8	1824	13.4	33.2
AW-15C	07/21/2021	0	-85	6.8	2360	23.0	30.1
AW-15S	02/12/2021	1.79	62.9	7.0	1609	7.7	702
AW-15S	03/04/2021	0.67	-3.5	7.1	1707	10.0	24.8
AW-15S	03/22/2021	0.52	50.1	6.9	1773	12.6	73.1
AW-15S	04/26/2021	1.10	7.1	7.0	1966	13.2	0.89
AW-15S	05/06/2021	0.89	64.5	6.7	1801	12.8	38.4
AW-15S	06/17/2021	0.47	-47.1	6.6	1812	15.7	32.1
AW-15S	06/29/2021	0.24	117	6.9	1795	18.5	23.3
AW-15S	07/21/2021	0	-5	6.6	1960	20.2	326
AW-16	02/11/2021	0.28	-69.5	6.8	2465	12.8	0
AW-16	03/03/2021	0.13	-63.7	6.8	455.1	13.6	146
AW-16	03/24/2021	0.14	-40.7	6.4	140.3	13.8	0
AW-16	04/23/2021	0.52	-99.4	6.8	1574	14.1	3.19
AW-16	05/05/2021	0.08	-107	6.7	1638	15.8	312
AW-16	06/24/2021	2.00	-100	6.6	2040	17.2	0
AW-16	06/29/2021	0.01	-108	6.8	2242	19.0	18.8
AW-16	07/21/2021	0.16	-136	6.8	1949	16.8	38.9
AW-17	02/11/2021	0.25	-104	7.0	2079	11.1	182
AW-17	03/03/2021	0.20	-86.3	6.8	1922	12.7	462
AW-17	03/23/2021	0.18	-35.6	6.2	1476	13.4	11.3
AW-17	04/23/2021	0.23	-136	6.9	1778	13.6	110
AW-17	05/05/2021	0.13	-133	6.8	1723	14.8	79.6
AW-17	06/24/2021	2.60	-96	6.6	1960	17.0	44.1
AW-17	06/29/2021	0.03	-130	6.9	1825	18.4	751
AW-17	07/21/2021	0.40	-157	7.0	1795	17.0	245
AW-18	02/11/2021	0.36	-70.8	7.0	1684	9.3	101
AW-18	03/03/2021	0.25	-113	7.0	1996	13.2	217
AW-18	03/23/2021	0.15	-69.4	6.4	1466	13.4	330

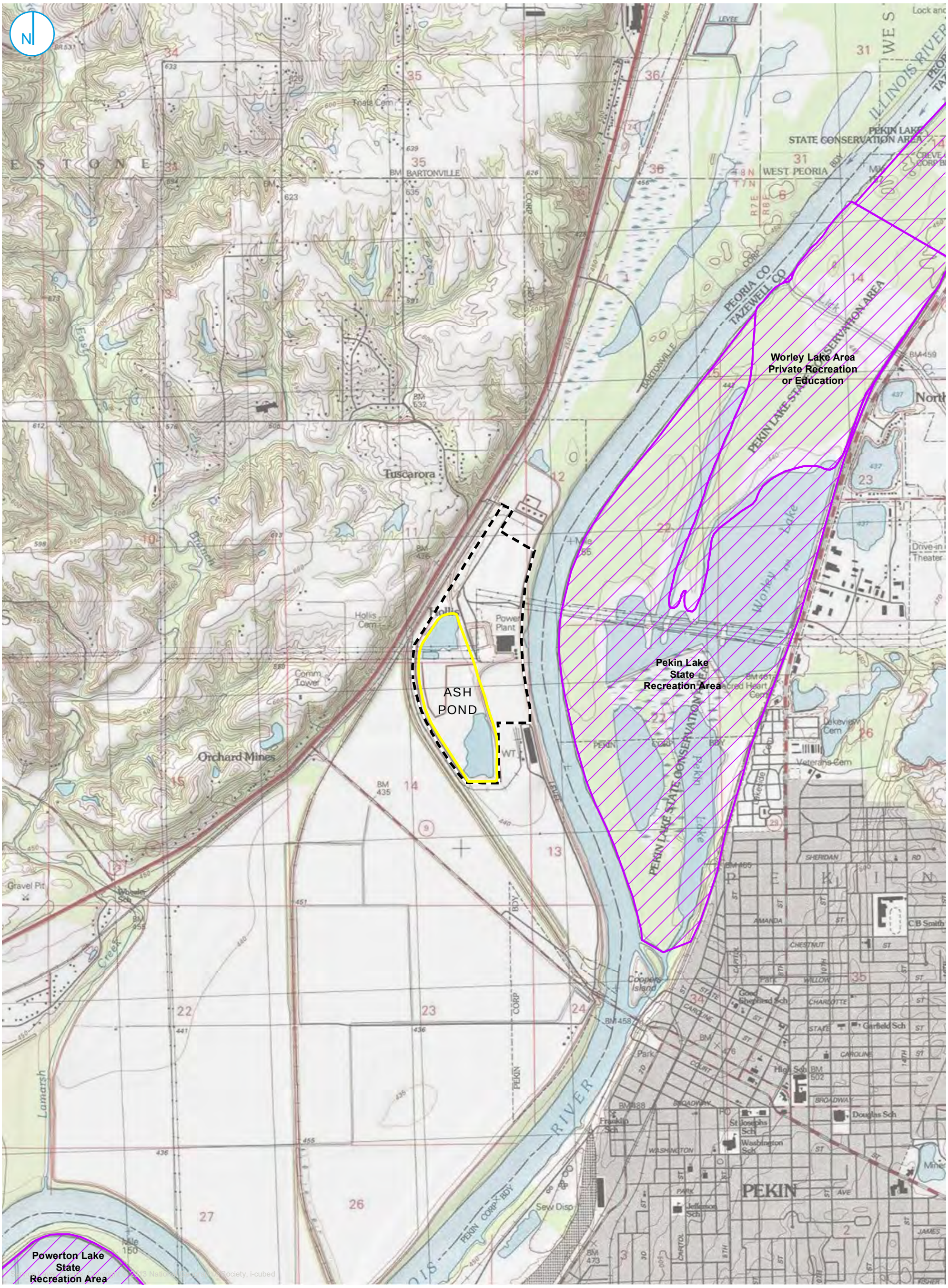
TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
AW-18	04/13/2021	0.32	-136	6.9	1884	14.9	81.4
AW-18	05/05/2021	0.11	-164	6.9	1830	15.5	48.4
AW-18	06/23/2021	0.12	-142	6.9	1815	17.2	8.23
AW-18	06/29/2021	0.14	-144	6.9	1887	20.6	20.1
AW-18	07/21/2021	0.02	-149	7.0	1870	17.3	60
AW-19	02/11/2021	0.34	-55.5	7.0	1220	11.0	397
AW-19	03/03/2021	0.52	-37.9	7.1	827.2	13.7	445
AW-19	03/23/2021	0.26	9.6	6.4	1125	13.7	97.7
AW-19	04/12/2021	1.40	-59.5	6.9	985	16.5	20.7
AW-19	05/05/2021	0.91	-90.4	7.1	1038	15.5	111
AW-19	06/23/2021	0.87	-61.9	7.0	206	17.8	0.95
AW-19	06/29/2021	0.85	-79.1	7.1	1131	17.8	14.7
AW-19	07/21/2021	0.44	-111	7.2	1119	16.6	18.9
AW-20	02/11/2021	0.25	-52.9	6.8	1570	12.4	144
AW-20	03/03/2021	0.12	-41.5	6.9	1390	14.3	51.9
AW-20	03/23/2021	0.19	-1.2	6.4	1420	14.1	21.9
AW-20	04/12/2021	1.30	-62.2	6.9	1334	16.1	4.52
AW-20	05/05/2021	0.70	-93.2	6.9	1369	16.5	37.8
AW-21	02/11/2021	1.09	-92.6	7.2	1133	10.2	17.8
AW-21	03/03/2021	0.28	-38.5	7.2	1134	14.0	0
AW-21	03/23/2021	0.30	1.6	6.7	1068	13.7	11.1
AW-21	04/12/2021	1.90	-18.3	7.2	1003	16.1	17.4
AW-21	05/05/2021	0.55	-40.6	7.2	1052	15.7	37.7
AW-21	06/23/2021	0.93	-26.5	7.2	1068	16.0	33.7
AW-21	06/29/2021	0.85	-36.9	7.2	1053	16.7	14.9
AW-21	07/21/2021	1.90	9.5	7.3	1081	20.8	39.9
AW-22	02/12/2021	1.00	-73.7	7.0	1048	2.9	47.3
AW-22	03/03/2021	0.09	-89.6	6.9	248.4	14.1	5950
AW-22	03/23/2021	0.08	-51.3	6.5	778.3	13.4	0
AW-22	04/23/2021	0.59	-99.3	6.9	1108	13.4	4.17
AW-22	05/05/2021	0.19	-122	6.9	916	15.6	292
P002	02/12/2021	0.64	-30.8	6.6	1384	8.8	25.8
P002	03/03/2021	0.25	-4.6	6.8	1348	14.5	19.9
P002	03/23/2021	0.39	21.5	6.3	1504	13.6	6.77
P002	04/13/2021	0.86	-50.1	6.8	1509	14.1	18.1
P002	05/04/2021	0.89	-55.7	6.8	1141	14.3	20.7

Notes:
Field readings are reported with as many significant figures as provided by analytical laboratory.
cm = centimeter
deg. C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
NTU = nephelometric turbidity units
SU = standard units

generated 10/05/2021, 3:57:37 PM CDT

FIGURES



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
PROTECTED AREA

SITE LOCATION MAP

FIGURE 1-1

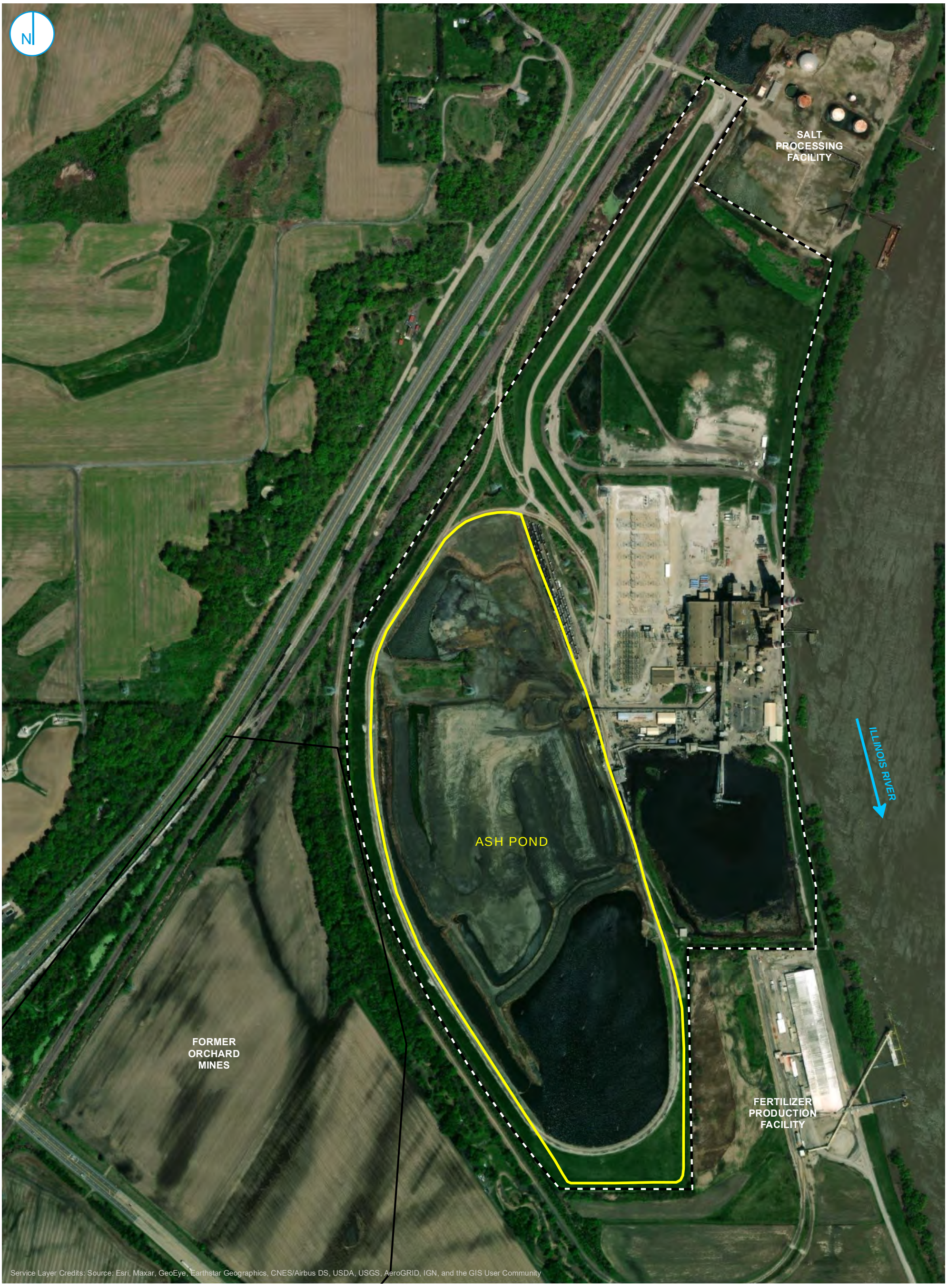
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 8/12/2021 | DESIGNER: STOLZSD

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Edwards\Figure 1-2_Site Map.mxd



PART 845 REGULATED UNIT (SUBJECT UNIT)
FORMER ORCHARD MINES AREA
PROPERTY BOUNDARY

0 250 500 Feet

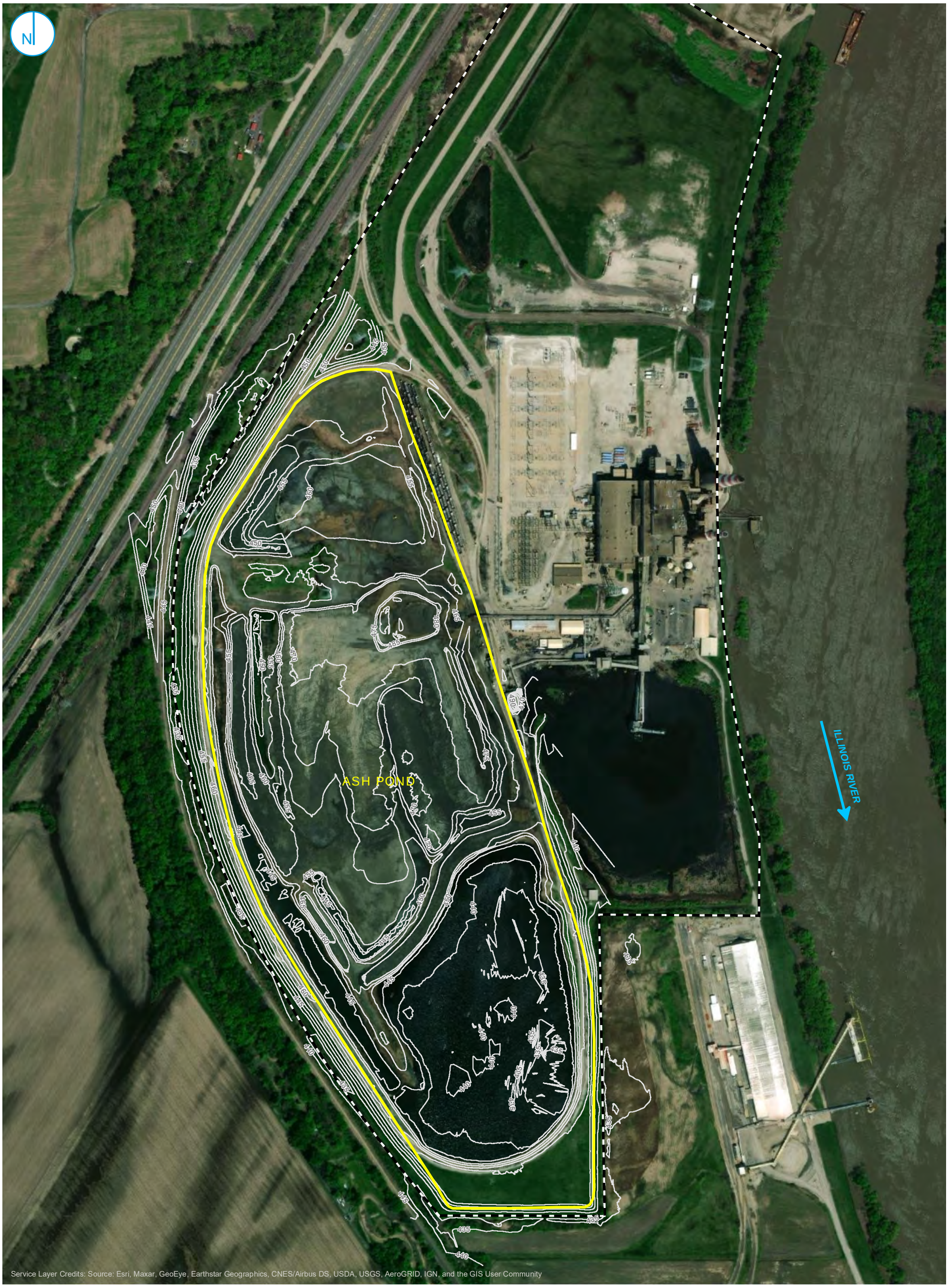
SITE MAP

FIGURE 1-2

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



5FT TOPOGRAPHIC CONTOUR
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

SOURCE
INGENAE SURVEY, 2021

SITE TOPOGRAPHIC MAP

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

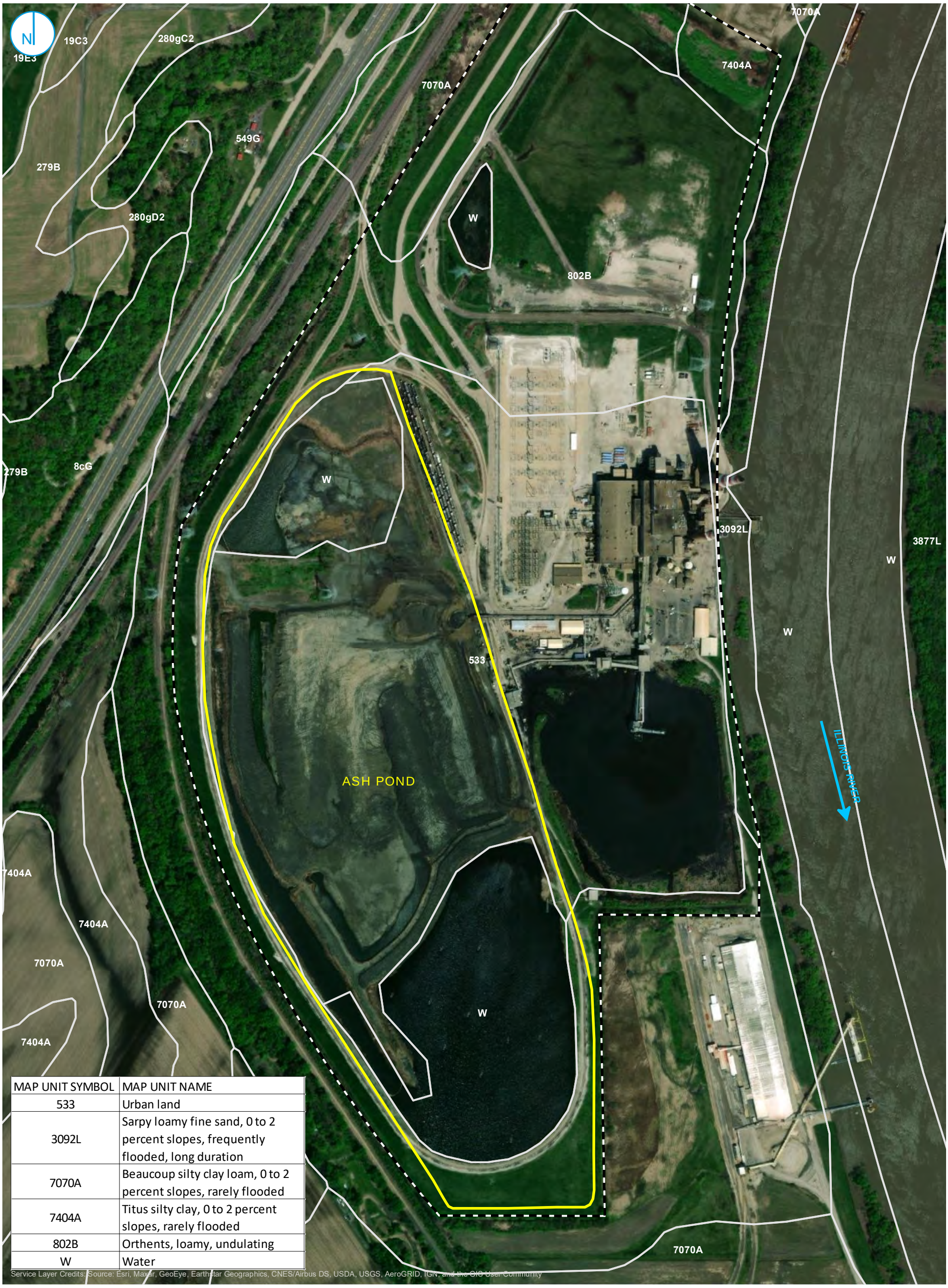
FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 8/12/2021 | DESIGNER: STOLZSD

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Edwards\Figure 2-2_Soil Survey.mxd



MAP UNIT SYMBOL	MAP UNIT NAME
533	Urban land
3092L	Sarpy loamy fine sand, 0 to 2 percent slopes, frequently flooded, long duration
7070A	Beaucoup silty clay loam, 0 to 2 percent slopes, rarely flooded
7404A	Titus silty clay, 0 to 2 percent slopes, rarely flooded
802B	Orthents, loamy, undulating
W	Water

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NRCS SOIL SURVEY MAP UNIT BOUNDARY

PART 845 REGULATED UNIT (SUBJECT UNIT)

PROPERTY BOUNDARY

0 200 400 Feet

SOURCE
NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

SOIL SURVEY MAP

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

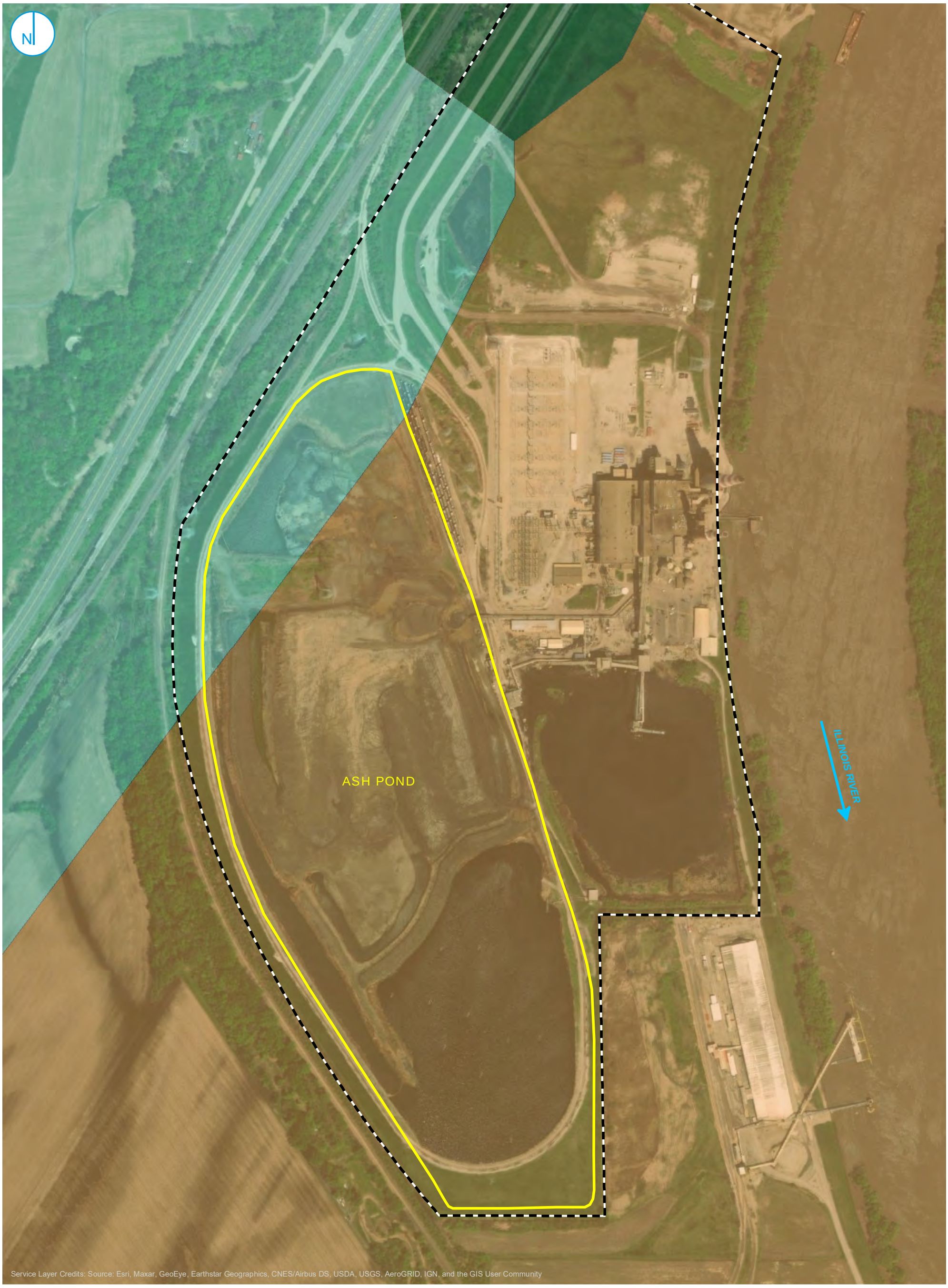
FIGURE 2-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 8/12/2021 | DESIGNER: STOLZSD

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Edwards\Figure 2-3_Surficial Geologic Deposits.mxd



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
CAHOKIA ALLUVIUM (INCLUDES ALLUVIAL FAN FACIES)
NOT A QUATERNARY DEPOSIT
RADNOR TILL MEMBER

0 200 400 Feet

SOURCE:
ILLINOIS STATE GEOLOGICAL SURVEY (ISGS)

SURFICIAL GEOLOGIC DEPOSITS

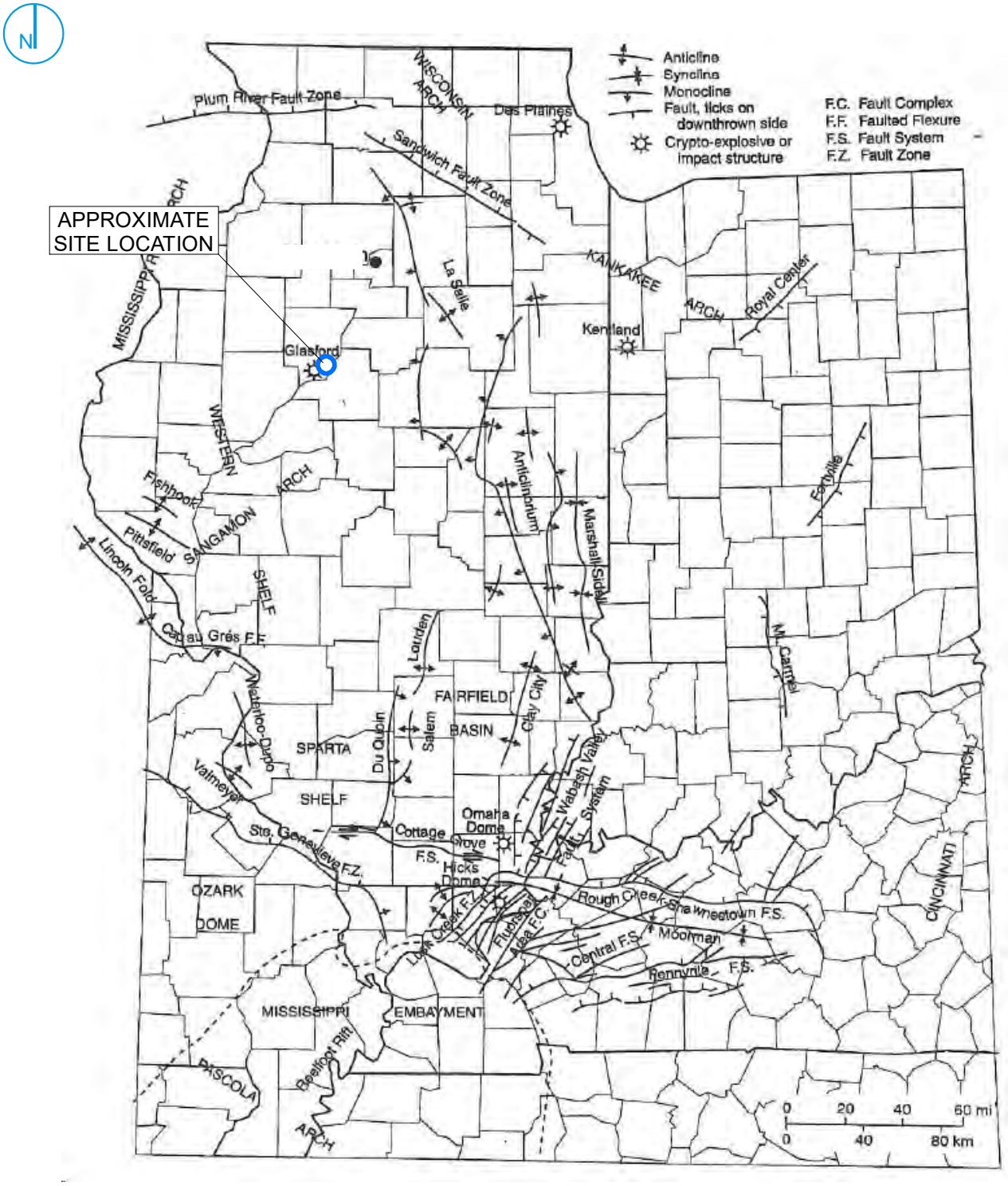
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22285\MXD\845_Operating_Permit\Edwards\Figure 2-4_Major Structural Features of Illinois.mxd
PROJECT: 169000XXXX | DATED: 8/12/2021 | DESIGNER: STOLZSD



SOURCE NOTE: MODIFIED FROM "NELSON, W.J. 1995, STRUCTURAL FEATURES IN ILLINOIS, ILLINOIS STATE GEOLOGICAL SURVEY, BULLETIN 100, CHAMPAIGN, ILLINOIS."

Service Layer Credits:

MAJOR STRUCTURAL FEATURES OF ILLINOIS

FIGURE 2-4

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

FIELD INVESTIGATION LOCATIONS

FIGURE 2-5

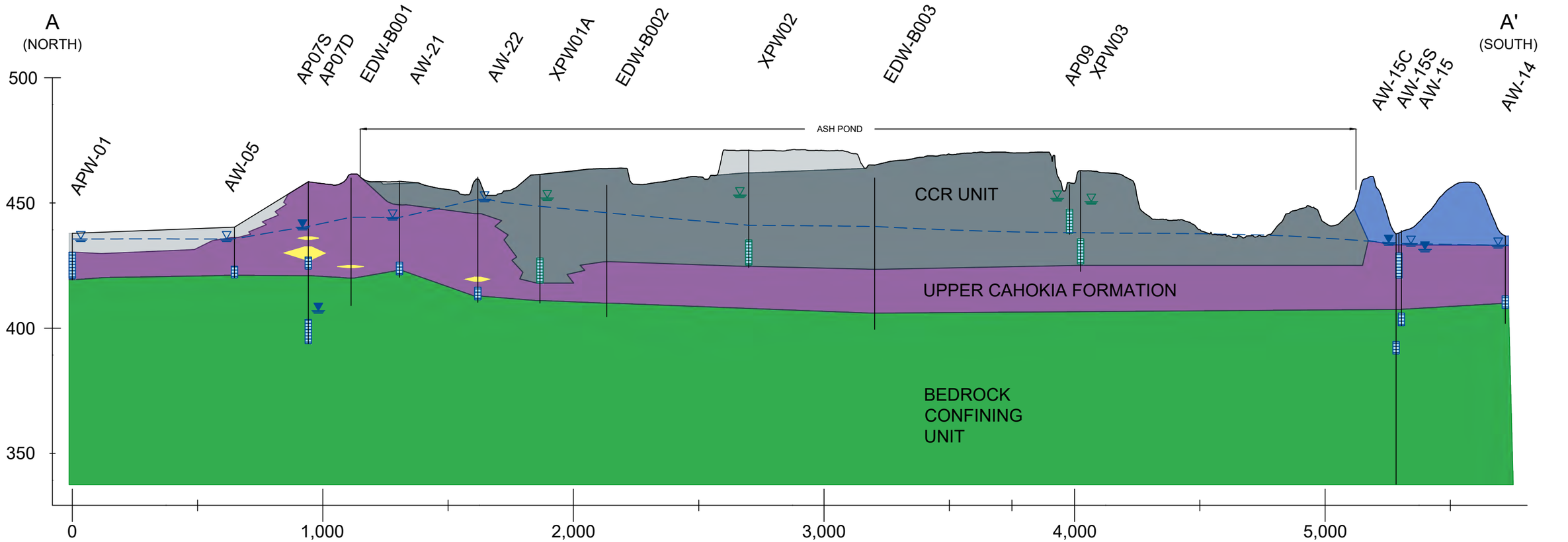
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

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. Vertical Datum: NAVD88
5. Groundwater elevations measured on April 12, 2021.



LEGEND

- COAL COMBUSTION RESIDUALS, CCRs
- FILL
- CLAY (CL/CH)
- SILT (ML)
- SAND (SP/SM/SW)
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPER AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- BEDROCK GROUNDWATER / OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

40' 0 400'

GEOLOGIC CROSS SECTION A-A'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-6

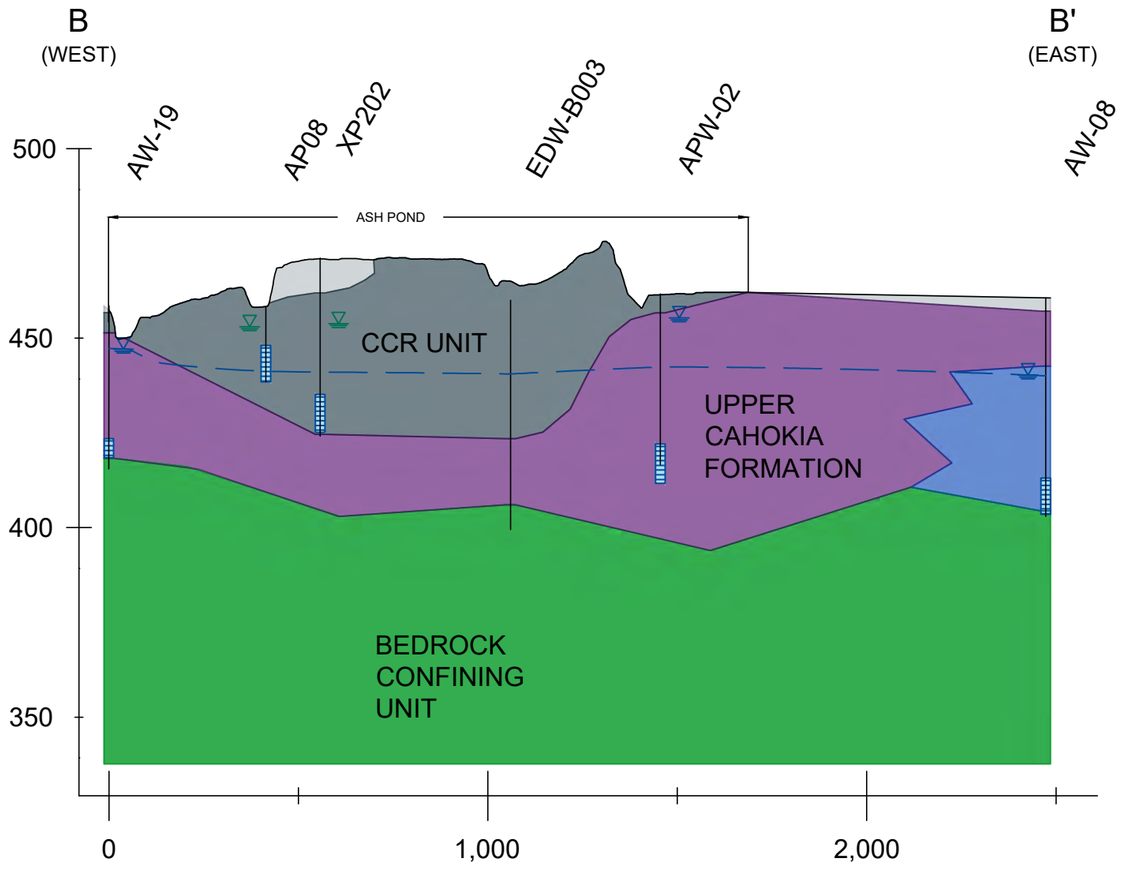
RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 1kyrm006 | DATE PLOTTED: 6/7/2021 | Dan Wilson | C:\Users\dwilson\Documents\~CCR GW\Deliverables\Part 845 Operating Permits\Sites\Edwards\Hydrogeo\Figures\Working Files\CAD\Cross Sections\Edwards Cross Sections.dwg

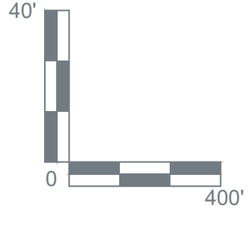
NOTES

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. Vertical Datum: NAVD88
5. Groundwater elevations measured on April 12, 2021.



LEGEND

- COAL COMBUSTION RESIDUALS, CCRs
- FILL
- CLAY (CL/CH)
- SILT (ML)
- SAND (SP/SM/SW)
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPER AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- BEDROCK GROUNDWATER / OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)



GEOLOGIC CROSS SECTION B-B'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-7

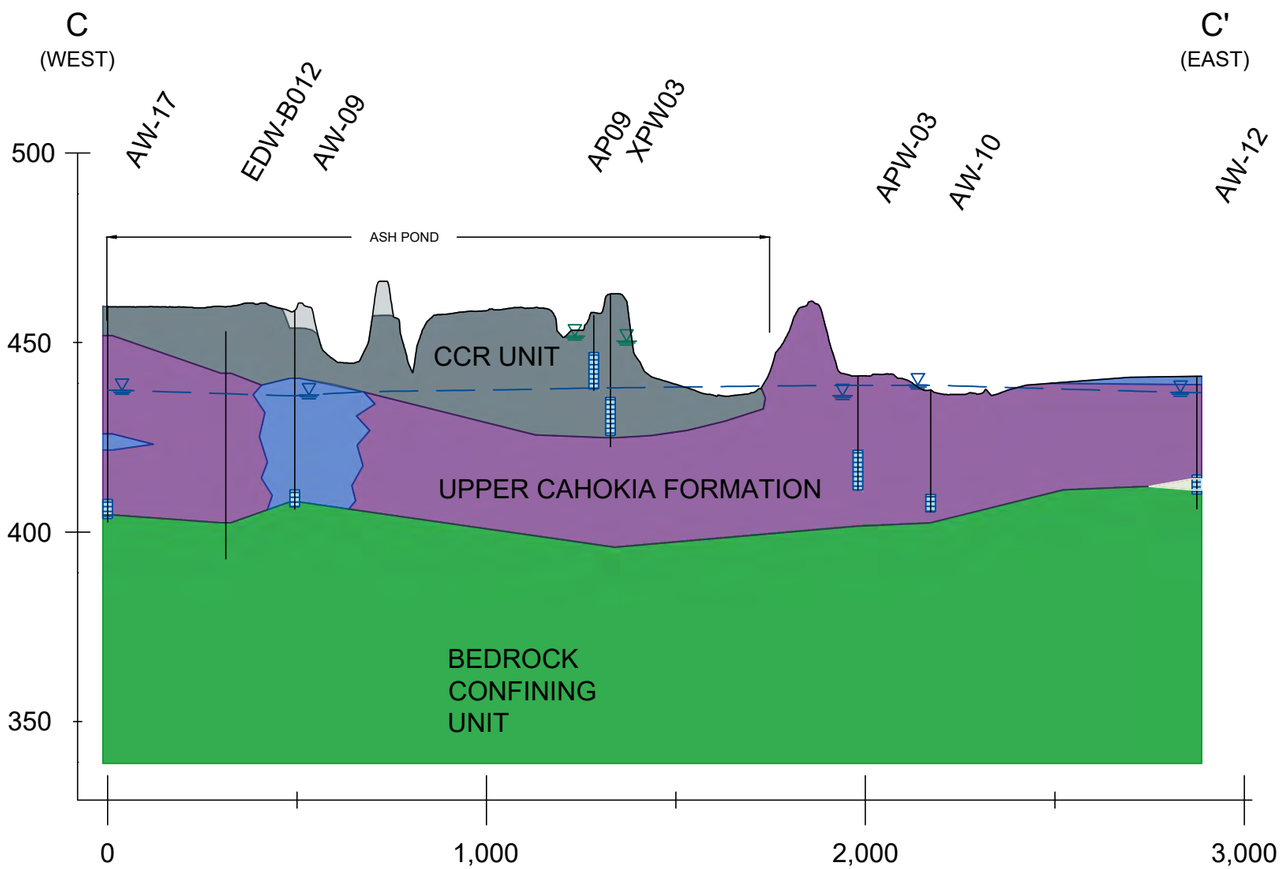
RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 1...\Documents\-CCR GW\Deliverables\Part 845 Operating Permits\Sites\Edwards\Hydrogeo\Figures\Working Files\CAD\Cross Sections\Edwards Cross Sections.dwg

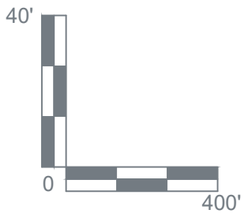
NOTES

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. Vertical Datum: NAVD88
5. Groundwater elevations measured on April 12, 2021.



LEGEND

- COAL COMBUSTION RESIDUALS, CCRs
- FILL
- CLAY (CL/CH)
- SILT (ML)
- GRAVEL (GP/GW)
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPER AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- BEDROCK GROUNDWATER / OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)



GEOLOGIC CROSS SECTION C-C'

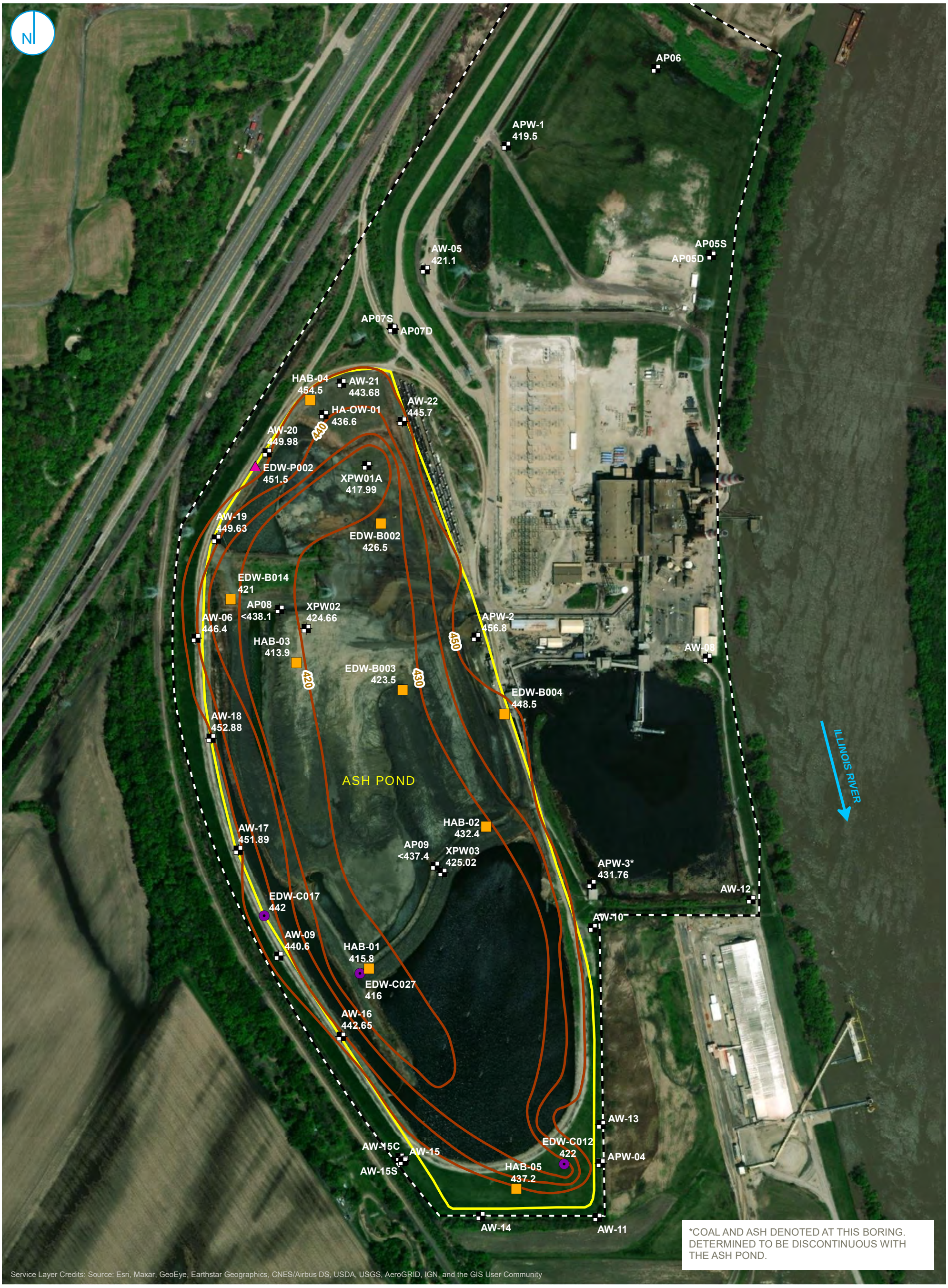
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-8

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 1300006 | DATE: 6/29/2021 | DRAWN BY: BCarlson | CHECKED BY: KMcLaughlin
C:\Users\bcarlson\Ramboll\Americas Documents\CCR GW\Deliverables\Part 845 Operating Permits\Sites\Edwards\Hydrogeo\Figures\Working Files\CAD\Cross Sections\Edwards Cross Sections.dwg



BORING
MONITORING WELL LOCATION
CPT
PIEZOMETER
BOTTOM OF ASH ELEVATION CONTOUR
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

NOTE:
ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

BOTTOM OF ASH

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-9

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

N

AP06
<414.5

APW-1
419.6

AW-05
421.1

AP05D
404.2

AP07D
419.6

EDW-B001
420

HAB-04
<441.8

AW-21
422.88

AW-22
412.80

HA-OW-01
<421.1

AW-20
418.28

XPW01A
410.99

EDW-B002
410

AW-19
418.33

EDW-B014
415.5

XPW02
<424.16

AW-06
419.7

HAB-03
406.9

APW-2
<411.8

AW-08
404.5

EDW-B004
405

AW-18
410.48

ASH POND

HAB-02
<419.9

AW-17
404.59

XPW03
<422.62

APW-3
<411.2

AW-12
411.16

AW-10
406.9

AW-09
406

HAB-01
399

AW-16
400.95

AW-13
409.67

AW-15C
407.42

APW-4
<453.3

HAB-05
<417.7

AW-14
409.83

AW-11
408.3

420
416
412
408
406
404
410

ILLINOIS RIVER

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BORINGS
MONITORING WELL
BEDROCK ELEVATION CONTOUR (1-FT INTERVAL)
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400
Feet

NOTE:
ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

TOP OF BEDROCK

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

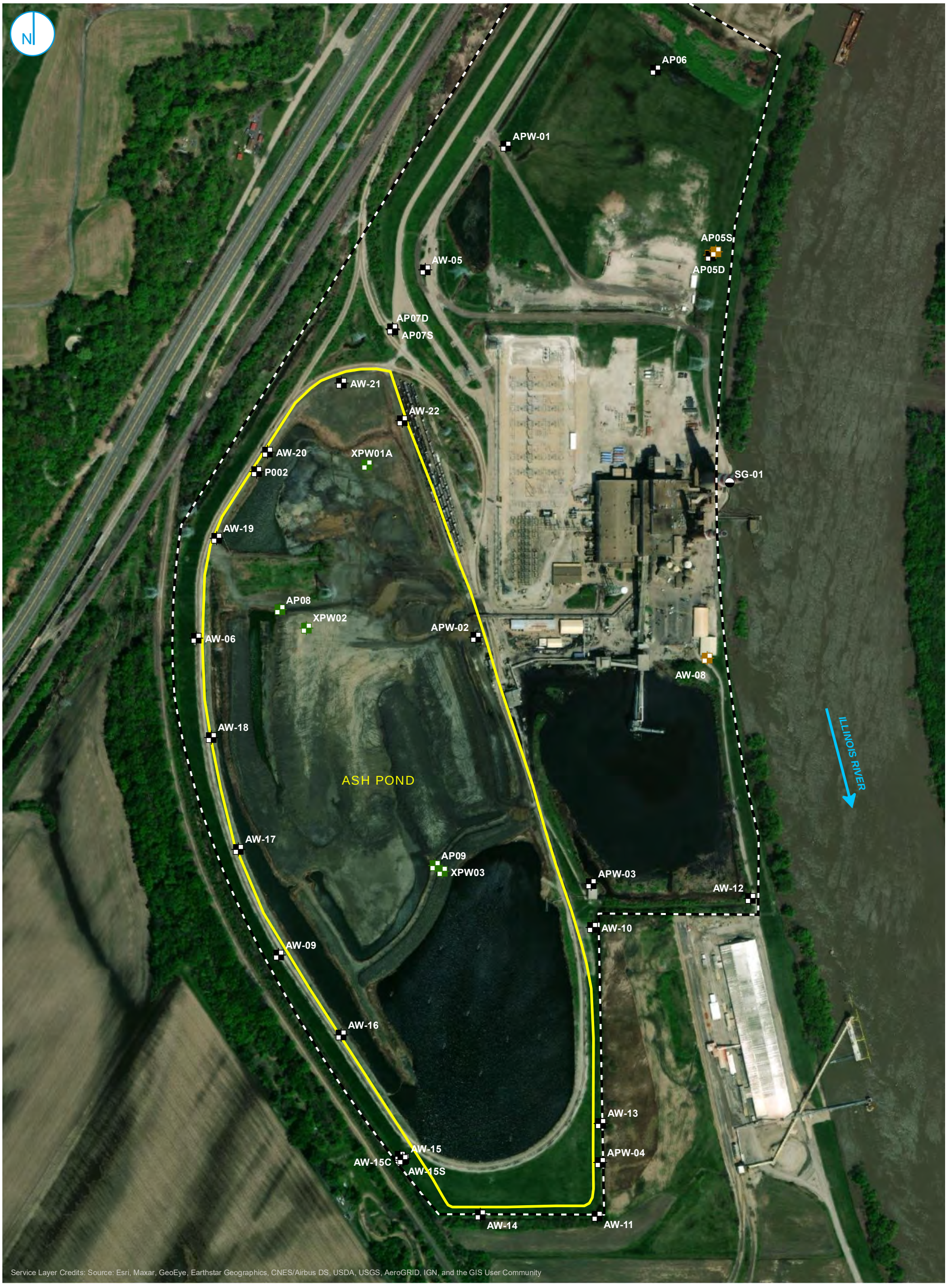
FIGURE 2-10

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 9/28/2021 | DESIGNER: STOLZSD

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Edwards\Figure 3-1_Monitoring Well Location Map.mxd



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

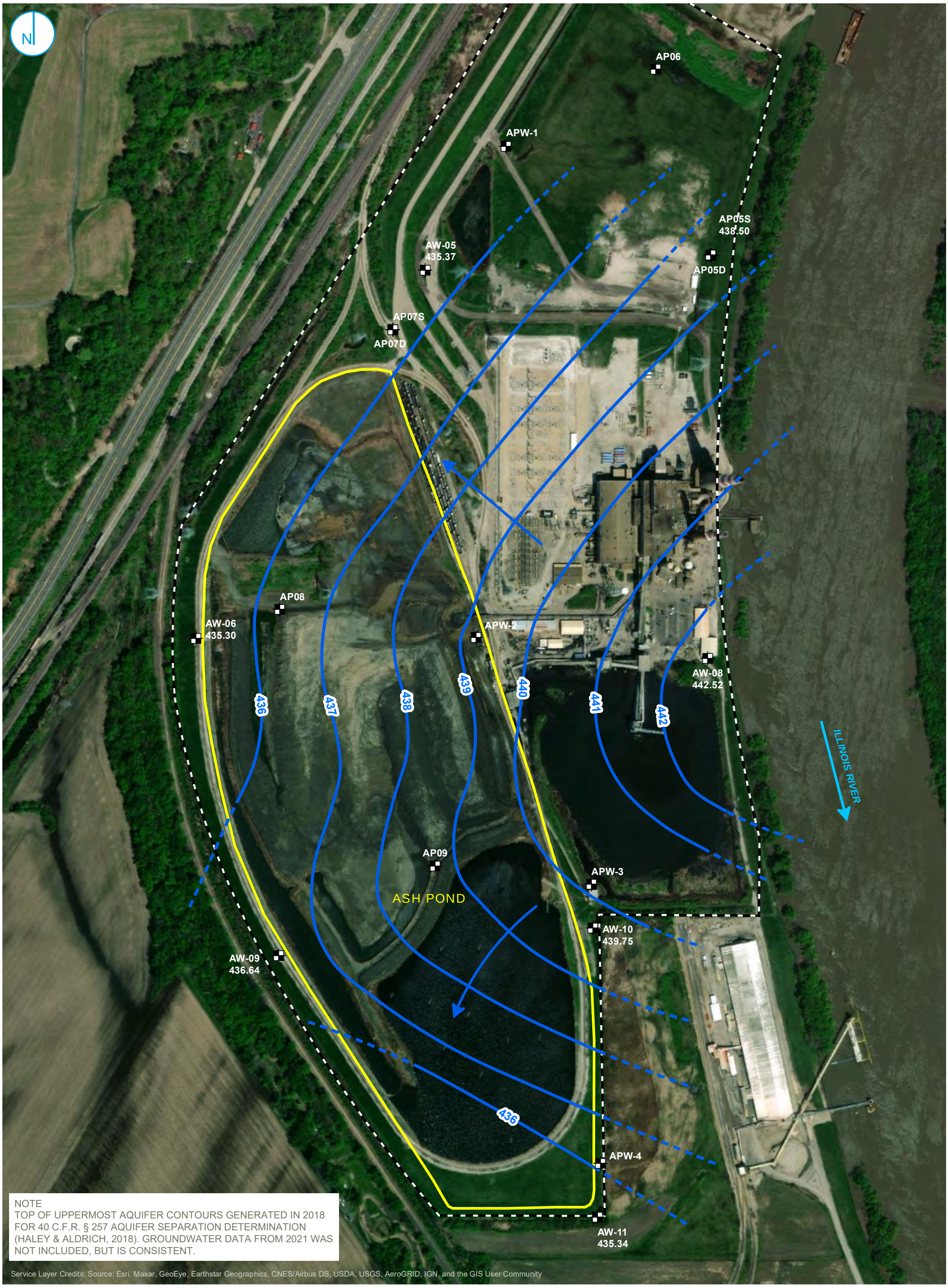
MONITORING WELL LOCATION MAP

FIGURE 3-1

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



MONITORING WELL
INTERPRETED TOP OF UPPERMOST AQUIFER (95TH PERCENTILE GROUNDWATER ELEVATION CONTOURS, 2017)
INFERRED TOP OF UPPERMOST AQUIFER CONTOUR
GROUNDWATER FLOW DIRECTION
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

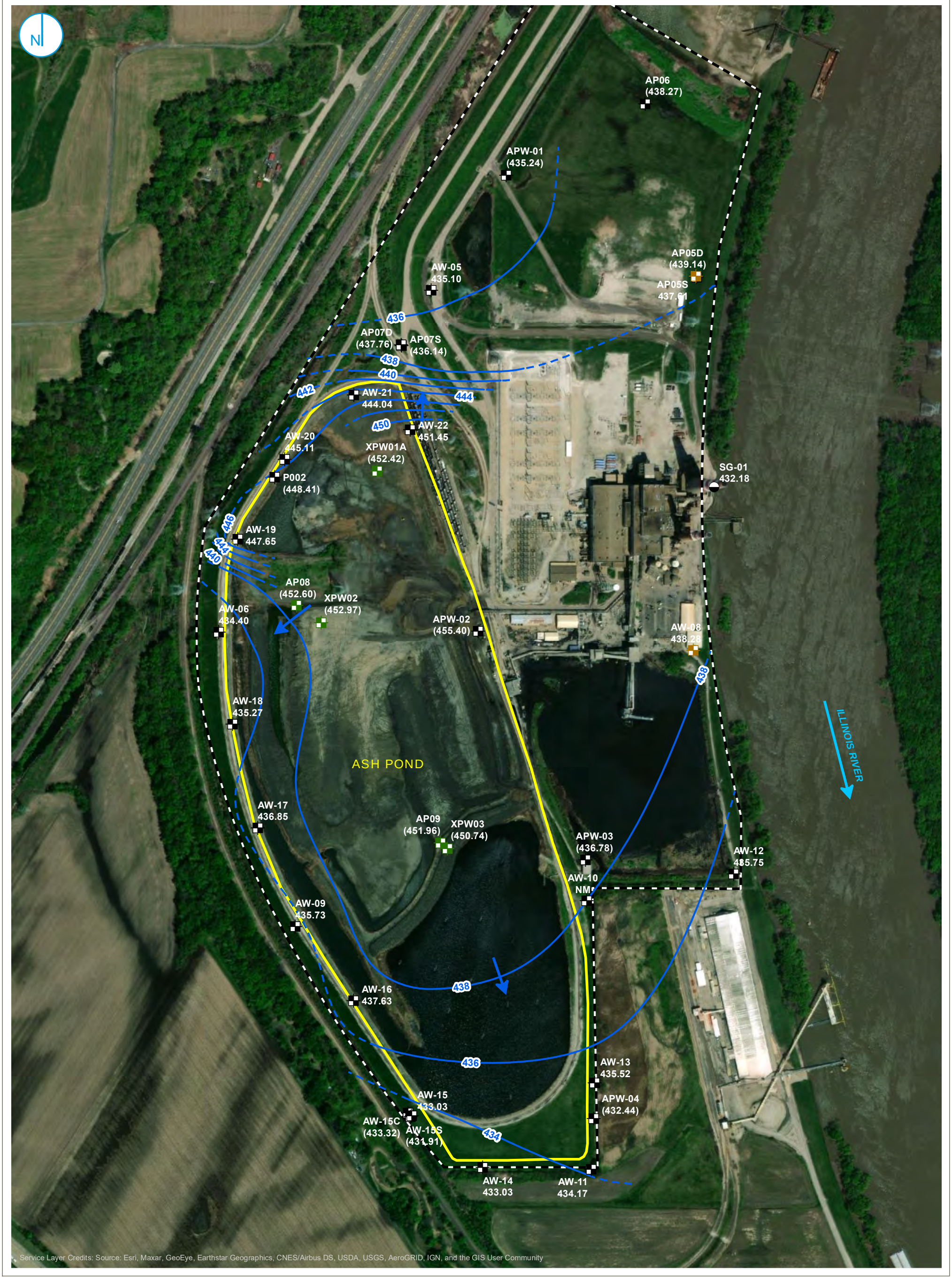
TOP OF UPPERMOST AQUIFER

FIGURE 3-2

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 212.5 425 Feet

NOTES
1. PARENTHESIS INDICATES WELL NOT USED FOR CONTOURING
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988

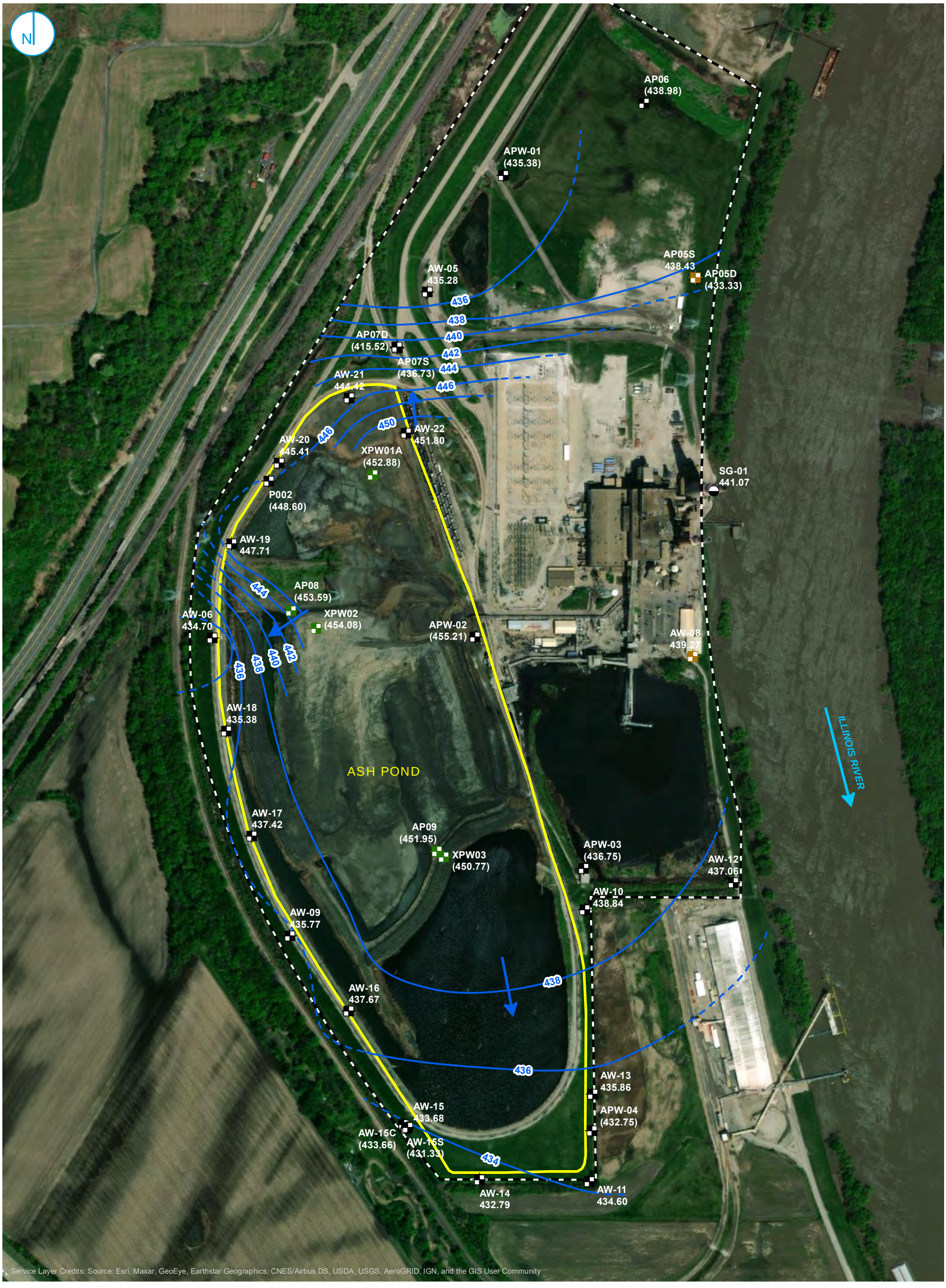
UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS FEBRUARY 9, 2021

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 3-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 212.5 425 Feet

NOTES
1. PARENTHESIS INDICATES WELL NOT USED FOR CONTOURING
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS MARCH 22, 2021

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

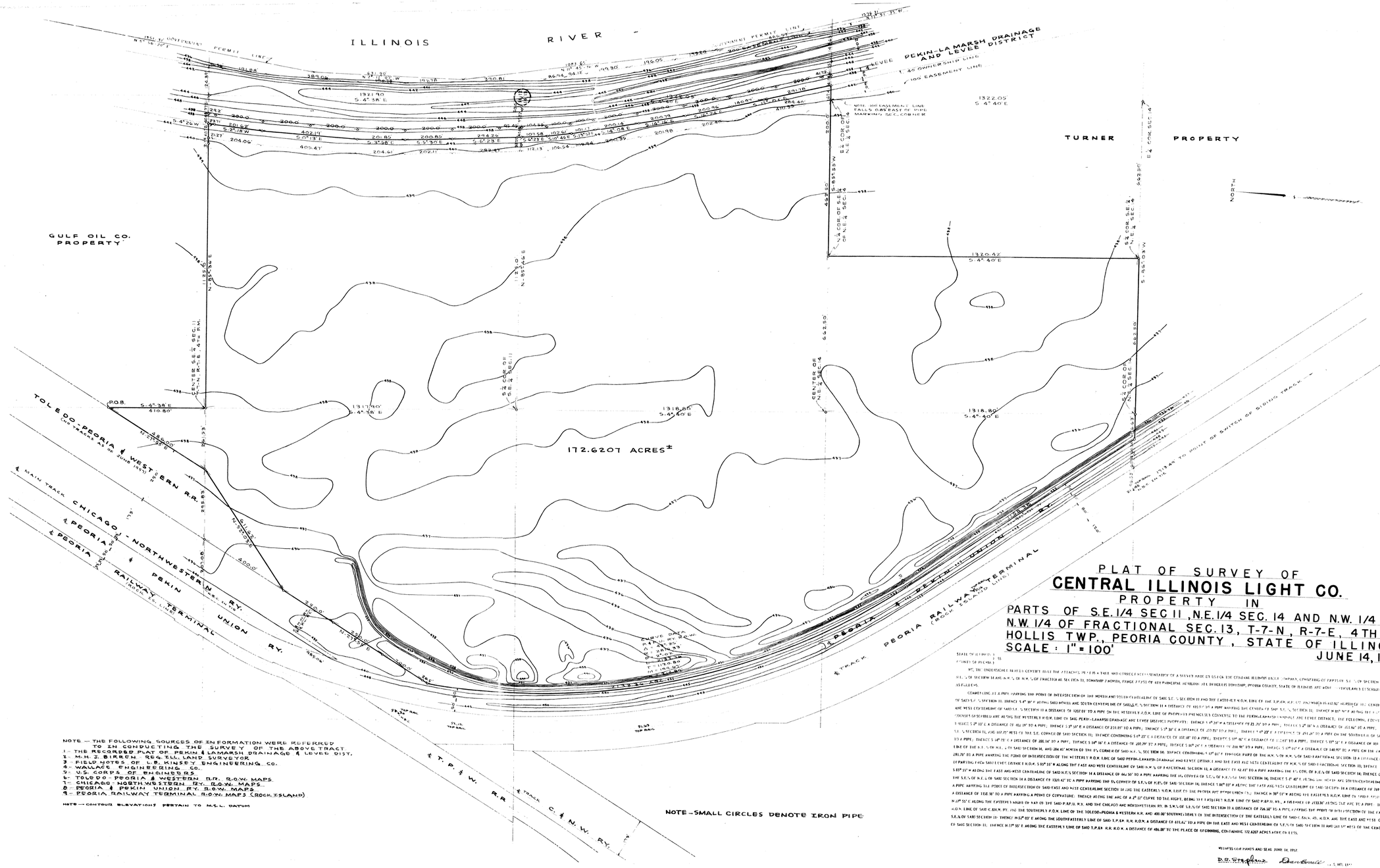
FIGURE 3-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

APPENDIX A
HISTORIC TOPOGRAPHIC MAP (1957)



NOTE — THE FOLLOWING SOURCES OF INFORMATION WERE REFERRED TO IN CONDUCTING THE SURVEY OF THE ABOVE TRACT.
1 - THE RECORDED PLAT OF PEKIN & LAMARSH DRAINAGE & LEVEE DIST.
2 - M.H. J. BIRREN REG. ILL. LAND SURVEYOR
3 - FIELD NOTES OF L.B. KINSEY ENGINEERING CO.
4 - WALLACE ENGINEERING CO.
5 - U.S. CORPS OF ENGINEERS
6 - TOLEDO - PEORIA & WESTERN R.R. R.O.W. MAPS
7 - CHICAGO - NORTH WESTERN RY. R.O.W. MAPS
8 - PEORIA & PEKIN UNION RY. R.O.W. MAPS
9 - PEORIA RAILWAY TERMINAL R.O.W. MAPS (ROCK ISLAND)

NOTE — CONTOUR ELEVATIONS PERTAIN TO M.S.L. DATUM

NOTE - SMALL CIRCLES DENOTE IRON PIPE

PLAT OF SURVEY OF
CENTRAL ILLINOIS LIGHT CO.
PROPERTY IN
PARTS OF S.E.1/4 SEC 11, N.E.1/4 SEC. 14 AND N.W. 1/4 OF N.W. 1/4 OF FRACTIONAL SEC. 13, T-7-N, R-7-E, 4TH P.M. HOLLIS TWP., PEORIA COUNTY, STATE OF ILLINOIS
SCALE : 1" = 100'
JUNE 14, 1957

STATE OF ILLINOIS }
COUNTY OF PEORIA } SS

WE, THE UNDERSIGNED, HEREBY CERTIFY THAT THE ATTACHED PLAT IS A TRUE AND CORRECT REPRESENTATIVE OF A SURVEY MADE BY US FOR THE CENTRAL ILLINOIS LIGHT COMPANY, CONSISTING OF PARTS OF S.E.1/4 OF SECTION 11, N.E.1/4 OF SEC. 14 AND N.W.1/4 OF N.W.1/4 OF FRACTIONAL SECTION 13, TOWNSHIP 7 NORTH, RANGE 7 EAST OF 4TH PRINCIPAL MERIDIAN, HELL BERGER'S TOWNSHIP, PEORIA COUNTY, STATE OF ILLINOIS AND THAT THE PLAT CORRECTLY DESCRIBES SAID PREMISES AS FOLLOWS.

COMMENCING AT A PIPE MARKING THE POINT OF INTERSECTION OF THE NORTH AND SOUTH CENTERLINE OF SAID SEC. 11 AND THE EASTERLY R.O.W. LINE OF THE T.P.&W. R.R. AND WHICH IS 410.80' NORTH OF THE CENTER OF SAID S.E.1/4 SECTION 11; THENCE S 4° 38' E ALONG SAID NORTH AND SOUTH CENTERLINE OF SAID SEC. 11 A DISTANCE OF 410.80' TO A PIPE MARKING THE CENTER OF SAID SEC. 11 AND WEST CENTERLINE OF SAID SEC. 14 SECTION 14 A DISTANCE OF 1317.90' TO A PIPE ON THE WESTERLY R.O.W. LINE OF PROPERTY PREVIOUSLY CONVEYED TO THE PEKIN-LAMARSH DRAINAGE AND LEVEE DISTRICT; THE FOLLOWING COURSES AND DISTANCES ARE ALONG THE WESTERLY R.O.W. LINE OF SAID PEKIN-LAMARSH DRAINAGE AND LEVEE DISTRICT PROPERTY: THENCE S 4° 38' E A DISTANCE OF 852.39' TO A PIPE; THENCE S 3° 30' E A DISTANCE OF 2135.85' TO A PIPE; THENCE S 5° 30' E A DISTANCE OF 1170.80' TO A PIPE; THENCE S 4° 38' E A DISTANCE OF 1318.85' TO A PIPE ON THE SOUTH LINE OF SAID SEC. 11, SAID POINT BEING 1322.05' WEST OF THE S.E. CORNER OF SAID SECTION 11; THENCE CONTINUING S 4° 38' E A DISTANCE OF 1322.05' TO A PIPE; THENCE S 5° 30' E A DISTANCE OF 1170.80' TO A PIPE; THENCE S 3° 30' E A DISTANCE OF 2135.85' TO A PIPE; THENCE S 4° 38' E A DISTANCE OF 852.39' TO A PIPE; THENCE S 4° 58' E A DISTANCE OF 200.39' TO A PIPE; THENCE S 5° 18' E A DISTANCE OF 200.74' TO A PIPE; THENCE S 5° 39' E A DISTANCE OF 200.96' TO A PIPE; THENCE S 5° 52' E A DISTANCE OF 200.39' TO A PIPE; THENCE S 6° 08' E A DISTANCE OF 200.20' TO A PIPE; THENCE S 6° 26' E A DISTANCE OF 200.39' TO A PIPE; THENCE S 6° 39' E A DISTANCE OF 200.59' TO A PIPE; THENCE S 6° 51' E A DISTANCE OF 200.79' TO A PIPE; THENCE S 7° 05' E A DISTANCE OF 200.98' TO A PIPE; THENCE S 7° 18' E A DISTANCE OF 201.18' TO A PIPE; THENCE S 7° 32' E A DISTANCE OF 201.37' TO A PIPE; THENCE S 7° 45' E A DISTANCE OF 201.57' TO A PIPE; THENCE S 7° 58' E A DISTANCE OF 201.76' TO A PIPE; THENCE S 8° 12' E A DISTANCE OF 201.96' TO A PIPE; THENCE S 8° 25' E A DISTANCE OF 202.15' TO A PIPE; THENCE S 8° 38' E A DISTANCE OF 202.35' TO A PIPE; THENCE S 8° 52' E A DISTANCE OF 202.54' TO A PIPE; THENCE S 9° 05' E A DISTANCE OF 202.74' TO A PIPE; THENCE S 9° 19' E A DISTANCE OF 202.93' TO A PIPE; THENCE S 9° 32' E A DISTANCE OF 203.13' TO A PIPE; THENCE S 9° 46' E A DISTANCE OF 203.32' TO A PIPE; THENCE S 10° 00' E A DISTANCE OF 203.52' TO A PIPE; THENCE S 10° 13' E A DISTANCE OF 203.71' TO A PIPE; THENCE S 10° 27' E A DISTANCE OF 203.91' TO A PIPE; THENCE S 10° 40' E A DISTANCE OF 204.10' TO A PIPE; THENCE S 10° 54' E A DISTANCE OF 204.30' TO A PIPE; THENCE S 11° 07' E A DISTANCE OF 204.49' TO A PIPE; THENCE S 11° 21' E A DISTANCE OF 204.69' TO A PIPE; THENCE S 11° 34' E A DISTANCE OF 204.88' TO A PIPE; THENCE S 11° 48' E A DISTANCE OF 205.08' TO A PIPE; THENCE S 12° 01' E A DISTANCE OF 205.27' TO A PIPE; THENCE S 12° 15' E A DISTANCE OF 205.47' TO A PIPE; THENCE S 12° 28' E A DISTANCE OF 205.66' TO A PIPE; THENCE S 12° 42' E A DISTANCE OF 205.86' TO A PIPE; THENCE S 12° 55' E A DISTANCE OF 206.05' TO A PIPE; THENCE S 13° 09' E A DISTANCE OF 206.25' TO A PIPE; THENCE S 13° 22' E A DISTANCE OF 206.44' TO A PIPE; THENCE S 13° 36' E A DISTANCE OF 206.64' TO A PIPE; THENCE S 13° 49' E A DISTANCE OF 206.83' TO A PIPE; THENCE S 14° 03' E A DISTANCE OF 207.03' TO A PIPE; THENCE S 14° 16' E A DISTANCE OF 207.22' TO A PIPE; THENCE S 14° 30' E A DISTANCE OF 207.42' TO A PIPE; THENCE S 14° 43' E A DISTANCE OF 207.61' TO A PIPE; THENCE S 14° 57' E A DISTANCE OF 207.81' TO A PIPE; THENCE S 15° 10' E A DISTANCE OF 208.00' TO A PIPE; THENCE S 15° 24' E A DISTANCE OF 208.20' TO A PIPE; THENCE S 15° 37' E A DISTANCE OF 208.39' TO A PIPE; THENCE S 15° 51' E A DISTANCE OF 208.59' TO A PIPE; THENCE S 16° 04' E A DISTANCE OF 208.78' TO A PIPE; THENCE S 16° 18' E A DISTANCE OF 208.98' TO A PIPE; THENCE S 16° 31' E A DISTANCE OF 209.17' TO A PIPE; THENCE S 16° 45' E A DISTANCE OF 209.37' TO A PIPE; THENCE S 16° 58' E A DISTANCE OF 209.56' TO A PIPE; THENCE S 17° 12' E A DISTANCE OF 209.76' TO A PIPE; THENCE S 17° 25' E A DISTANCE OF 209.95' TO A PIPE; 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THENCE S 76° 09' E A DISTANCE OF 260.85' TO A PIPE; THENCE S 76° 22' E A DISTANCE OF 261.04' TO A PIPE; THENCE S 76° 36' E A DISTANCE OF 261.24' TO A PIPE; THENCE S 76° 49' E A DISTANCE OF 261.43' TO A PIPE; THENCE S 77° 03' E A DISTANCE OF 261.63' TO A PIPE; THENCE S 77° 16' E A DISTANCE OF 261.82' TO A PIPE; THENCE S 77° 30' E A DISTANCE OF 262.02' TO A PIPE; THENCE S 77° 43' E A DISTANCE OF 262.21' TO A PIPE; THENCE S 77° 57' E A DISTANCE OF 262.41' TO A PIPE; THENCE S 78° 10' E A DISTANCE OF 262.60' TO A PIPE; THENCE S 78° 24' E A DISTANCE OF 262.80' TO A PIPE; THENCE S 78° 37' E A DISTANCE OF 262.99' TO A PIPE; THENCE S 78° 51' E A DISTANCE OF 263.19' TO A PIPE; THENCE S 79° 04' E A DISTANCE OF 263.38' TO A PIPE; THENCE S 79° 18' E A DISTANCE OF 263.58' TO A PIPE; THENCE S 79° 31' E A DISTANCE OF 263.77' TO A PIPE; THENCE S 79° 45' E A DISTANCE OF 263.97' TO A PIPE; THENCE S 79° 58' E A DISTANCE OF 264.16' TO A PIPE; THENCE S 80° 12' E A DISTANCE OF 264.36' TO A PIPE; THENCE S 80° 25' E A DISTANCE OF 264.55' TO A PIPE; THENCE S 80° 39' E A DISTANCE OF 264.75' TO A PIPE; THENCE S 80° 52' E A DISTANCE OF 264.94' TO A PIPE; THENCE S 81° 06' E A DISTANCE OF 265.14' TO A PIPE; THENCE S 81° 19' E A DISTANCE OF 265.33' TO A PIPE; THENCE S 81° 33' E A DISTANCE OF 265.53' TO A PIPE; THENCE S 81° 46' E A DISTANCE OF 265.72' TO A PIPE; THENCE S 82° 00' E A DISTANCE OF 265.92' TO A PIPE; THENCE S 82° 13' E A DISTANCE OF 266.11' TO A PIPE; THENCE S 82° 27' E A DISTANCE OF 266.31' TO A PIPE; THENCE S 82° 40' E A DISTANCE OF 266.50' TO A PIPE; THENCE S 82° 54' E A DISTANCE OF 266.70' TO A PIPE; THENCE S 83° 07' E A DISTANCE OF 266.89' TO A PIPE; THENCE S 83° 21' E A DISTANCE OF 267.09' TO A PIPE; THENCE S 83° 34' E A DISTANCE OF 267.28' TO A PIPE; THENCE S 83° 48' E A DISTANCE OF 267.48' TO A PIPE; THENCE S 84° 01' E A DISTANCE OF 267.67' TO A PIPE; THENCE S 84° 15' E A DISTANCE OF 267.87' TO A PIPE; THENCE S 84° 28' E A DISTANCE OF 268.06' TO A PIPE; THENCE S 84° 42' E A DISTANCE OF 268.26' TO A PIPE; THENCE S 84° 55' E A DISTANCE OF 268.45' TO A PIPE; THENCE S 85° 09' E A DISTANCE OF 268.65' TO A PIPE; THENCE S 85° 22' E A DISTANCE OF 268.84' TO A PIPE; THENCE S 85° 36' E A DISTANCE OF 269.04' TO A PIPE; THENCE S 85° 49' E A DISTANCE OF 269.23' TO A PIPE; THENCE S 86° 03' E A DISTANCE OF 269.43' TO A PIPE; THENCE S 86° 16' E A DISTANCE OF 269.62' TO A PIPE; THENCE S 86° 30' E A DISTANCE OF 269.82' TO A PIPE; THENCE S 86° 43' E A DISTANCE OF 270.01' TO A PIPE; THENCE S 86° 57' E A DISTANCE OF 270.21' TO A PIPE; THENCE S 87° 10' E A DISTANCE OF 270.40' TO A PIPE; THENCE S 87° 24' E A DISTANCE OF 270.60' TO A PIPE; THENCE S 87° 37' E A DISTANCE OF 270.79' TO A PIPE; THENCE S 87° 51' E A DISTANCE OF 270.99' TO A PIPE; THENCE S 88° 04' E A DISTANCE OF 271.18' TO A PIPE; THENCE S 88° 18' E A DISTANCE OF 271.38' TO A PIPE; THENCE S 88° 31' E A DISTANCE OF 271.57' TO A PIPE; THENCE S 88° 45' E A DISTANCE OF 271.77' TO A PIPE; THENCE S 88° 58' E A DISTANCE OF 271.96' TO A PIPE; THENCE S 89° 12' E A DISTANCE OF 272.16' TO A PIPE; THENCE S 89° 25' E A DISTANCE OF 272.35' TO A PIPE; THENCE S 89° 39' E A DISTANCE OF 272.55' TO A PIPE; THENCE S 89° 52' E A DISTANCE OF 272.74' TO A PIPE; THENCE S 90° 06' E A DISTANCE OF 272.94' TO A PIPE; THENCE S 90° 19' E A DISTANCE OF 273.13' TO A PIPE; THENCE S 90° 33' E A DISTANCE OF 273.33' TO A PIPE; THENCE S 90° 46' E A DISTANCE OF 273.52' TO A PIPE; THENCE S 91° 00' E A DISTANCE OF 273.72' TO A PIPE; THENCE S 91° 13' E A DISTANCE OF 273.91' TO A PIPE; THENCE S 91° 27' E A DISTANCE OF 274.11' TO A PIPE; THENCE S 91° 40' E A DISTANCE OF 274.30' TO A PIPE; THENCE S 91° 54' E A DISTANCE OF 274.50' TO A PIPE; THENCE S 92° 07' E A DISTANCE OF 274.69' TO A PIPE; THENCE S 92° 21' E A DISTANCE OF 274.89' TO A PIPE; THENCE S 92° 34' E A DISTANCE OF 275.08' TO A PIPE; THENCE S 92° 48' E A DISTANCE OF 275.28' TO A PIPE; THENCE S 93° 01' E A DISTANCE OF 275.47' TO A PIPE; THENCE S 93° 15' E A DISTANCE OF 275.67' TO A PIPE; THENCE S 93° 28' E A DISTANCE OF 275.86' TO A PIPE; THENCE S 93° 42' E A DISTANCE OF 276.06' TO A PIPE; THENCE S 93° 55' E A DISTANCE OF 276.25' TO A PIPE; THENCE S 94° 09' E A DISTANCE OF 276.45' TO A PIPE; THENCE S 94° 22' E A DISTANCE OF 276.64' TO A PIPE; THENCE S 94° 36' E A DISTANCE OF 276.84' TO A PIPE; THENCE S 94° 49' E A DISTANCE OF 277.03' TO A PIPE; THENCE S 95° 03' E A DISTANCE OF 277.23' TO A PIPE; THENCE S 95° 16' E A DISTANCE OF 277.42' TO A PIPE; THENCE S 95° 30' E A

APPENDIX B
INFORMATION PERTINENT TO 35 I.A.C. § 845.220(a)(3)

SUMMARY OF POTENTIAL RECEPTORS WITHIN 1,000 METERS

DESKTOP STUDY

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, IL

Category	Number of Receptors Identified Within 1,000 Meters	Number of Receptors Identified Downgradient of Unit	Notes
Mines	3	0	
Wells	14	3	No potable wells identified downgradient. Primary uses are industrial applications, monitoring and engineering test wells.
Surface Water Features	21	17	
Historic Sites	0	---	
Natural Sites	0	---	
Threatened or Endangered Species	24	---	Data provided only at a county level.
Oil Fields	0	3	Two wells of unknown status and one stratigraphic test well upgradient from unit.

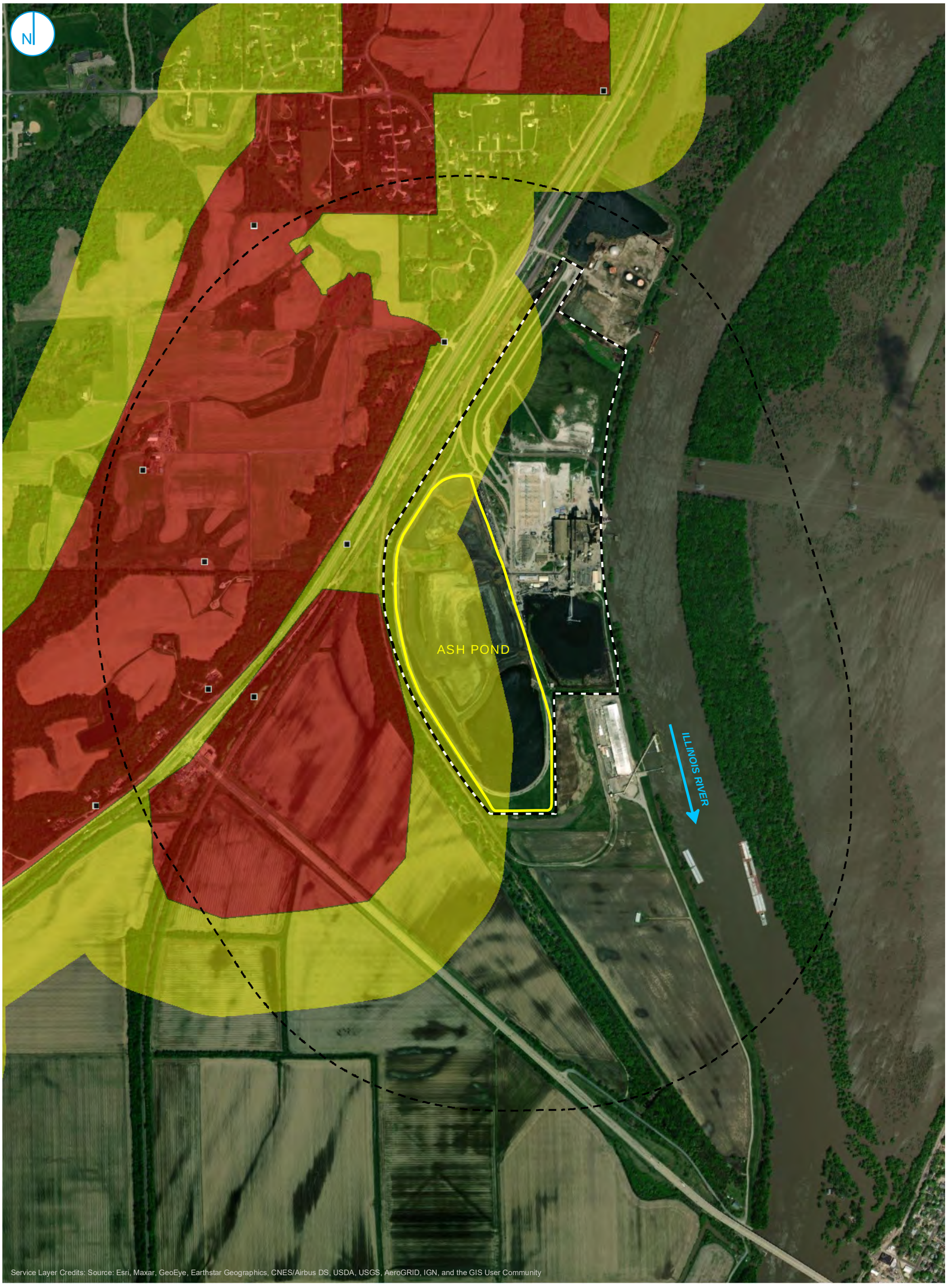
[O: CJC 03/26/21; C: LDC 09/16/21]

Notes:

--- = none

RAMBOLL

MINING ACTIVITIES



- COAL MINE SHAFT
- UNDERGROUND COAL MINE
- UNDERGROUND MINE BUFFER REGION
- PART 845 REGULATED UNIT (SUBJECT UNIT)
- 1000 METER UNIT BUFFER
- PROPERTY BOUNDARY

0 500 1,000 Feet

SOURCES: ISGS - ILMINES

ACTIVE AND ABANDONED COAL MINES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE B-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

MINES WITHIN 1,000 METERS

DESKTOP STUDY

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, IL

Mine ID	Mine Name	Distance from Unit (meters)	Physical Orientation to Unit	Hydraulic Orientation to Unit	Range of Active Dates	Mine Type	Coal Unit Mined	Mine Depth Top (ft BGS)	Mine Depth Bottom (ft BGS)	Final Extent Map Available	Notes
828	Third Vein Coal Co., Orchard Mine	0	U	Downgradient	1890-1909	Underground/Longwall	Springfield/Colchester	100	165	Y	Gas noted from roof of Colchester coal.
6673	George Petri Coal Co., Petri Mine	161	NW	Downgradient	1919-1933	Underground	Springfield	112	--	Y	None
3021	Robert Rogers, Hollis Mine	966	N	Downgradient	1933-1940	Main Slope	Springfield	--	--	Y	Fault noted (possible channel)

[O: CJC 03/26/21; C: LDC 09/16/21]

Notes:

BGS = below ground surface
ft = feet
ID = identification number
N = north
NW = northwest
U = underlying

WATER WELL SURVEY

- DRY
- ENGINEERING
- WATER
- N/A
- PART 845 REGULATED UNIT (SUBJECT UNIT)
- 1000 METER UNIT BUFFER
- PROPERTY BOUNDARY

0 500 1,000 Feet

SOURCE
IL WELLS

DRINKING WATER INTAKES, PUMPS, AND OTHER WATER USES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE B-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

WELLS WITHIN 1,000 METERS
DESKTOP STUDY
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, IL

Well Number	Date Constructed	Ground Elevation (ft NAVD88)	Screen Top Depth (FT BGS)	Screen Bottom Depth (ft BGS)	Screen Length (ft)	Screen Diameter (inches)	Well Depth (ft BGS)	Total Boring Depth (ft BGS)	Latitude (DD)	Longitude (DD)	Hydraulic Position Designation (B/Sd/U/D)	Notes
121792344300	11/19/1998	450	108	118	10	2	118	118	40.58296	-89.655159	U	
121433424000	8/16/2001	---	---	---	---	---	---	20	40.588081	-89.664793	U	
121432480200	9/30/1971	454	---	---	---	---	---	95	40.588073	-89.660552	U	
121432356000	---	---	---	---	---	---	---	60	40.605076	-89.661192	Sd	
121432525900	9/29/1971	---	---	---	---	---	---	51	40.587184	-89.659272	U	
121432526000	9/30/1971	445	---	---	---	---	---	96	40.587184	-89.659272	U	
121432526100	10/31/1971	436	---	---	---	---	---	96	40.587184	-89.659272	U	
121432526200	10/31/1971	437	---	---	---	---	---	92	40.587184	-89.659272	U	
121432526300	10/31/1971	437	---	---	---	---	---	92	40.587184	-89.659272	U	
121432526400	10/31/1971	436	---	---	---	---	---	35	40.587184	-89.659272	U	
121430133300	4/4/1968	---	---	---	---	---	---	30	40.590234	-89.662127	U	
121432221000	8/18/1978	570	---	---	---	---	---	65	40.600805	-89.667324	D	
121433566000	12/11/2017	---	---	---	---	---	---	98	40.586327	-89.679076	D	
121433566500	12/13/2017	---	80	300	220	4	300	300	40.586327	-89.679076	D	

[O: CJC 03/26/21; C: LDC 09/16/21]

Notes:
--- = no data
B = background
BGS = below ground surface
D = downgradient
DD = decimal degrees
ft = foot/feet
LCU = lower confining unit
NAVD88 = North American Vertical Datum of 1988, GEOID 12A
Sd= sidegradient
U = upgradient

ILLINOIS STATE GEOLOGICAL SURVEY

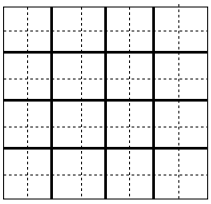
Water Well	Top	Bottom
s.s. #55311	0	0
black dirt	0	10
grit gravel yellowish	10	12
dark tough clay black	12	30
Total Depth		**30**

Casing: 24" CONCRETE(TOP/BOTTOM) from 0' to 0'
Water from Gilbert gravel at 0' to 0'.

Remarks: tracing done by Dept. of Pub. Health
Driller's Log filed
Sample set # 55311 (1' - 25')
Owner Address: P.O. Box 876 Pekin, IL
Location source: Location from the driller

Permit Date: January 1, 1968 **Permit #:** NF3700

COMPANY Hampton, E. T.
FARM Cargo Carriers
DATE DRILLED April 5, 1968 **NO.**
ELEVATION 0 **COUNTY NO.** 01333
LOCATION 200'S 250'W NE/c SE NE
LATITUDE 40.590234 **LONGITUDE** -89.662127
COUNTY **Peoria** **API 121430133300** **14 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
clay	0	30
rock	30	65
Total Depth		**65**

Casing: 24" ID CEMENT from 11' to 51'

Water from rock at 37' to 38'.

Static level 37' below casing top which is 1' above GL

Driller's Log filed

Owner Address: 911 Chestnut St. Pekin, IL

Location source: Location from permit

Permit Date: August 8, 1978 **Permit #:** 77945

COMPANY Shaver, D.

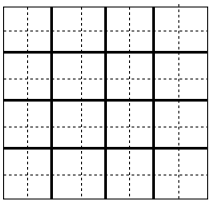
FARM Frazier, Sam

DATE DRILLED August 19, 1978 **NO.**

ELEVATION 570GL **COUNTY NO.** 22210

LOCATION NE NW SE

LATITUDE 40.600805 **LONGITUDE** -89.667324



COUNTY **Peoria** **API 121432221000** **11 - 7N - 7E**

ILLINOIS STATE GEOLOGICAL SURVEY

Industrial Water Well	Top	Bottom
clay,sand & gravel	0	3
clay-sticky,black	3	10
clay-softer	10	15
clay-dark	15	29
sandstone-gray,soft	29	35
limestone	35	36
shale-gray	36	37
limestone-shale	37	43
shale-softer	43	60
Total Depth		**60**

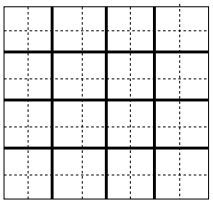
Size hole below casing: 0"

Remarks: no water

Owner Address: 7022 S. Cilco Lane Bartonville, IL
Location source: Location from permit

Permit Date: September 17, 1987 **Permit #:** 135221

COMPANY Sauder, Steven E.
FARM Clark Oil & Refining
DATE DRILLED **NO.**
ELEVATION 0 **COUNTY NO.** 23560
LOCATION 100'N line, 50'W line of NW SW NW
LATITUDE 40.605076 **LONGITUDE** -89.661192
COUNTY **Peoria** **API** **121432356000** **12 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
C #9411 (Spls. 1-11)	0	0
Total Depth		**95**

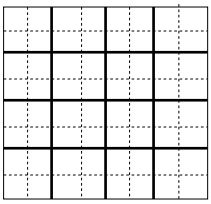
Remarks: Rec'd. 3/73

Core #C 9411 (0' - 0') Received: March 1, 1973

Owner Address: ,
Add'l loc. info: FALSE
Elev updated - ABL

Permit Date: **Permit #:**

COMPANY owner
FARM Bridge FA R25&75,Il.River
DATE DRILLED October 1, 1971 **NO.** 6-prelim
ELEVATION 454GL **COUNTY NO.** 24802
LOCATION SE SW NW
LATITUDE 40.588073 **LONGITUDE** -89.660552
COUNTY **Peoria** **API 121432480200** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		51

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River at Pekin

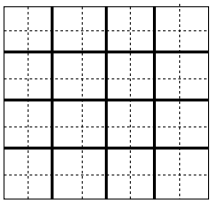
DATE DRILLED September 30, 1971 **NO.** 4-prelim

ELEVATION 450GL **COUNTY NO.** 25259

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432525900** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		96

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River @ Pekin

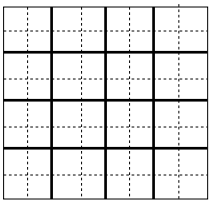
DATE DRILLED October 1, 1971 **NO.** 5-prelim

ELEVATION 445GL **COUNTY NO.** 25260

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432526000** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		96

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River @ Pekin

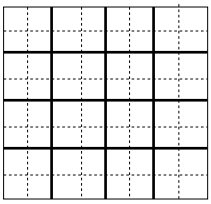
DATE DRILLED November 1, 1971 **NO.** 7-prelim

ELEVATION 436GL **COUNTY NO.** 25261

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432526100** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		92

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River @ Pekin

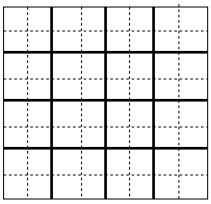
DATE DRILLED November 1, 1971 **NO.** 8-prelim

ELEVATION 437GL **COUNTY NO.** 25262

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432526200** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		92

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River @ Pekin

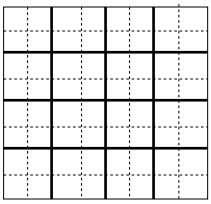
DATE DRILLED November 1, 1971 **NO.** 9-prelim

ELEVATION 437GL **COUNTY NO.** 25263

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432526300** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
Total Depth		35

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM Bridge over Illinois River @ Pekin

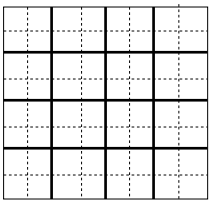
DATE DRILLED November 1, 1971 **NO.** STH-1

ELEVATION 436GL **COUNTY NO.** 25264

LOCATION

LATITUDE 40.587184 **LONGITUDE** -89.659272

COUNTY **Peoria** **API** **121432526400** **13 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Semi-Private Water Well	Top	Bottom
clay	0	20
Total Depth		**20**

Casing: 6" SDR 21 from -1' to 11'
36" CONCRETE WELL TILE from 11' to 20'

Grout: HOLE PLUG from 10 to 11.

Grout: PEA GRAVEL from 11 to 20.

Water from clay at 4' to 20'.

Owner Address: 8710 S. Cargill Rd. Pekin, IL

Address of well: same as above

Location source: Location from permit

Permit Date: July 2, 2001 **Permit #:**

COMPANY Greenfield, Edward K.

FARM Cargill Fertilizer

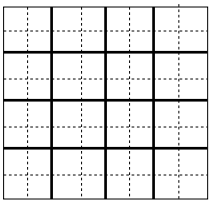
DATE DRILLED August 17, 2001 **NO.**

ELEVATION 0 **COUNTY NO.** 34240

LOCATION SW SE NE

LATITUDE 40.588081 **LONGITUDE** -89.664793

COUNTY **Peoria** **API 121433424000** **14 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
topsoil	0	2
brown clay	2	9
tan clay	9	14
gray clay	14	34
gravel	34	35
light gray shale	35	79
dark gray shale	79	98
Total Depth		**98**

Grout: BENTONITE from 0 to 98.

Water from DRY HOLE at ' to '.

Owner Address: PO Box 876 Pekin, IL

Address of well: 8710 S. Cargill Rd.
Peoria, IL

Location source: Location from permit

Permit Date: October 2, 2017 **Permit #:** 143-025

COMPANY Layten, James

FARM The Mosaic Company

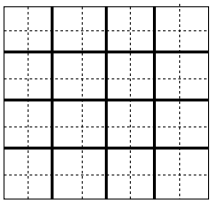
DATE DRILLED December 12, 2017 **NO.** -1

ELEVATION **COUNTY NO.** 35660

LOCATION NW NW SW

LATITUDE 40.586327 **LONGITUDE** -89.679076

COUNTY **Peoria** **API** **121433566000** **14 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well for Commercial Operation	Top	Bottom
topsoil	0	2
brown clay	2	7
tan clay	7	16
gray clay	16	38
gravel	38	39
light gray shale	39	76
dark gray shale	76	88
hard gray shale	88	149
white shale	149	209
black shale	209	229
sandstone	229	246
light gray shale	246	265
shale w/ seams of sandstone	265	300
Total Depth		**300**

Casing: 6" SDR 21 from -3' to 88'
4" SCH 40 SLOTTED from 80' to 300'

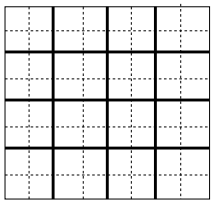
Grout: BENSEAL from 6 to 300.

Water from sandstone & shale at 80' to 300'.
Static level 5' below casing top which is 3' above GL
Pumping level 105' when pumping at 5 gpm for hours
Permanent pump installed at 140'
on February 12, 2018, with a capacity of 5 gpm
Remarks: Driller's Estimated Well Yield 5 gpm

Owner Address: PO Box 876 Pekin, IL
Address of well: 8710 S. Cargill Rd.
Peoria, IL 61607
Location source: Location from permit

Permit Date: October 2, 2017 **Permit #:** 143-025

COMPANY Layten, James
FARM The Mosaic Company
DATE DRILLED December 14, 2017 **NO.** 2
ELEVATION **COUNTY NO.** 35665
LOCATION NW NW SW
LATITUDE 40.586327 **LONGITUDE** -89.679076
COUNTY **Peoria** **API** **121433566500** **14 - 7N - 7E**



ILLINOIS STATE GEOLOGICAL SURVEY

Monitoring	Top	Bottom
silty clayey fine sand	0	14
lake clay with sand stringers	14	23
sand & gravel (coarsens downward)	23	118
Total Depth		**118**

Casing: 2" PVC from 0' to 108'
2" PVC SCREEN from 108' to 118'
Screen: 10' of 2" diameter .01 slot
Grout: NEAT CEMENT from 0 to 19.

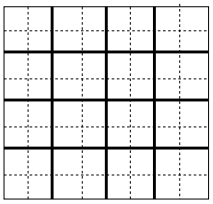
Water from at 22' to '.
Static level 22' below casing top which is 0' above GL

Remarks: bedrock not encountered

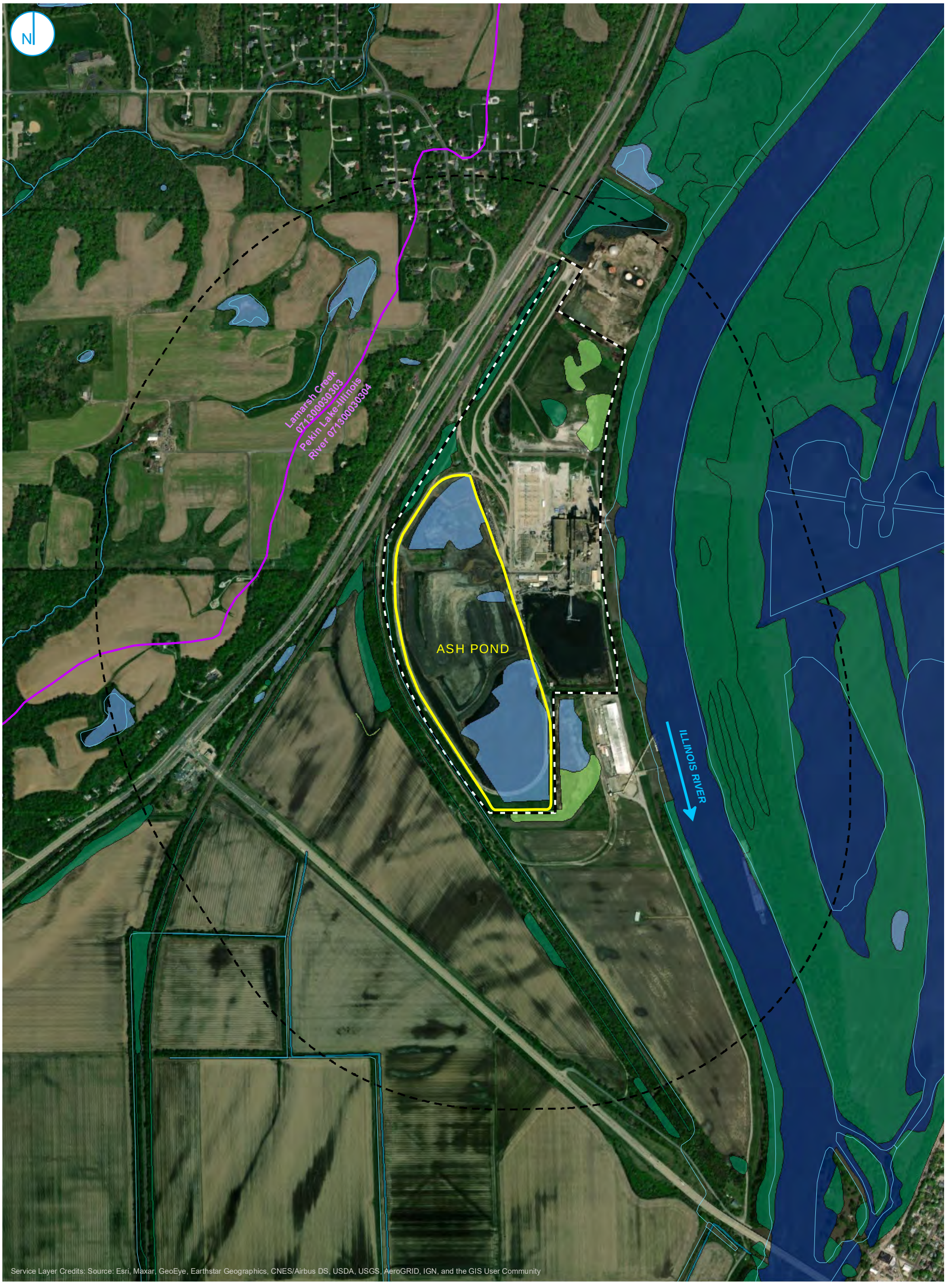
Owner Address: ,
Address of well: Conservation Rd.
Add'l loc. info: FALSE
Tim Soldwedel Lake
Location source: Location from the driller

Permit Date: **Permit #:** none

COMPANY Wright's Drilling
FARM State of Illinois
DATE DRILLED November 20, 1998 **NO.** TH-3
ELEVATION 450 **COUNTY NO.** 23443
LOCATION SW SW SW
LATITUDE 40.58296 **LONGITUDE** -89.655159
COUNTY **Tazewell** **API** **121792344300** **27 - 25N - 5W**



SURFACE WATERS



SURFACE WATERBODY
WATERSHED BOUNDARY (HUC 12)
PART 845 REGULATED UNIT (SUBJECT UNIT)
1000 METER UNIT BUFFER
PROPERTY BOUNDARY

0 500 1,000 Feet

NATIONAL WETLANDS INVENTORY
FRESHWATER EMERGENT WETLAND
FRESHWATER FORESTED/SHRUB WETLAND
FRESHWATER POND
LAKE
OTHER
RIVERINE

SOURCES: USGS, USFWS

SURFACE WATERBODIES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE B-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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SURFACE WATER FEATURES WITHIN 1,000 METERS
DESKTOP STUDY
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, IL

HUC	Surface Water ID	Distance from Unit (meters)	Physical Orientation to Unit	Hydraulic Orientation to Unit	Classification Code	Size (acres)	Notes
--	Freshwater Emergent Wetland 2	381	NE	Downgradient	PEM1C	3.02	--
--	Freshwater Emergent Wetland 3	442	NE	Downgradient	PEM1C	3.24	--
--	Freshwater Forested/Shrub Wetland 1	43	NW	Downgradient	PFO1A	4.35	--
--	Freshwater Forested/Shrub Wetland 10	817	N	Downgradient	PFO1C	5.81	--
--	Freshwater Forested/Shrub Wetland 2	64	W	Downgradient	PFO1Ax	3.42	--
--	Freshwater Forested/Shrub Wetland 3	244	N	Downgradient	PFO1C	4.60	--
--	Freshwater Forested/Shrub Wetland 4	128	W	Downgradient	PFO1A	1.29	--
--	Freshwater Forested/Shrub Wetland 5	104	W	Downgradient	PFO1C	3.86	--
--	Freshwater Forested/Shrub Wetland 6	485	W	Downgradient	PFO1C	0.09	--
--	Freshwater Forested/Shrub Wetland 7	314	SE	Upgradient	PFO1C	1.68	--
--	Freshwater Forested/Shrub Wetland 8	320	NE	Downgradient	PFO1C	1.31	--
--	Freshwater Forested/Shrub Wetland 9	272	N	Downgradient	PFO1C	4.61	--
--	Freshwater Pond	201	W	Downgradient	PUBFx	0.4	--
--	Freshwater Pond	351	W	Downgradient	PUBGx	0.61	--
--	Freshwater Pond	534	W	Downgradient	PUBGx	0.22	--
--	Freshwater Pond	631	N	Downgradient	PUBGh	3.72	--
--	Freshwater Pond	799	NW	Downgradient	PUBGh	3.18	--
--	Freshwater Pond	966	W	Downgradient	PUBGh	3.51	--
07130003	Lake (Illinois River)	335	E	Upgradient	--	16,202.80	Staff gauge installed 8.7 river miles downstream of site. USGS 05568500 ILLINOIS RIVER AT KINGSTON MINES, IL
--	Pekin Lake	805	E	Upgradient	--	64.00	--
--	Worley Lake	805	E	Upgradient	--	64.00	--

[O: CJC 03/26/21; C: LDC 09/16/21]

Notes:
-- = not applicable
E = east
HUC = Hydrologic Unit Code
N = north
NE = northeast
NW = northwest
SE = southeast
USGS = United States Geological Survey
W = west

ENDANGERED / THREATENED SPECIES

PEORIA COUNTY THREATENED AND ENDANGERED SPECIES

DESKTOP STUDY

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, IL

Scientific Name	Common Name	Status	Number of Occurances	Last Observed
Acipenser fulvescens	Lake Sturgeon	LE	3	6/22/2016
Agalinis skinneriana	Pale False Foxglove	LT	1	7/13/2011
Apalone mutica	Smooth Softshell	LT	2	9/18/2007
Boltonia decurrens	Decurrent False Aster	LT	5	9/13/2019
Bombus affinis	Rusty Patched Bumble Bee	LE	6	7/19/2016
Corallorhiza maculata	Spotted Coral-root Orchid	LE	1	6/1/2007
Cypripedium parviflorum	Small Yellow Lady's Slipper	LE	1	4/28/2012
Elliptio crassidens	Elephant-ear	LE	1	8/19/2012
Filipendula rubra	Queen-of-the-prairie	LT	1	8/5/2011
Fundulus dispar	Starhead Topminnow	LT	1	7/5/1989
Ixobrychus exilis	Least Bittern	LT	1	6/19/2004
Lanius ludovicianus	Loggerhead Shrike	LE	1	7/27/2006
Lepomis miniatus	Redspotted Sunfish	LT	1	10/28/2010
Lepomis symmetricus	Bantam Sunfish	LT	1	10/14/1998
Monarda clinopodia	White Bergamot	LT	1	7/13/1964
Myotis septentrionalis	Northern Long-eared Myotis	LT	2	6/7/2016
Myotis sodalis	Indiana Bat	LE	1	8/9/2017
Pandion haliaetus	Osprey	LT	4	5/1/2020
Poliocitellus franklinii	Franklin's Ground Squirrel	LT	1	7/19/2017
Quadrula metanevra	Monkeyface	LT	2	6/26/2012
Rallus elegans	King Rail	LE	1	5/26/1988
Reginaia ebenus	Ebonyshell	LE	1	8/4/2012
Speyeria idalia	Regal Fritillary	LT	1	7/14/1961
Viburnum molle	Arrowwood	LT	2	7/1/2017

[O: CJC 03/26/21; C: LDC 09/16/21]

Notes:

-- = not provided/cannot be determined

LE = listed endangered

LT = listed threatened

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APPENDIX C
BORING LOGS AND WELL CONSTRUCTION LOGS

2021 RAMBOLL BORING LOGS

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-12

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/7/2021	1/7/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-12	Feet (NAVD88)	441.16 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,429,585.53 N, 2,436,922.88 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 27.828"

Long -89° 39' 40.8"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	72 72		0	0 - 2.2' **SILT:** ML, very dark grayish brown (10YR 3/2), roots (5-10%), clay (0-5%), sand (0-5%), gravel (0-5%), moist.	ML									CS= Core Sample
			2											
			3	2.2 - 6.2' **SILTY CLAY:** CL/ML, very dark grayish brown (10YR 3/2), sand (0-5%), stiff, medium plasticity, moist.	CL/ML				1.5					
			4						1					
			5						1					
2 CS	48 48		6	6' - 6.2' layer of gravelly clay, wet.					0.75					
			7	6.2 - 10.4' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1), sand (0-5%), gravel (0-5%), organic material (0-5%), firm to stiff, medium plasticity, moist to wet.	CL/ML				0.75					
			8						1					
			9						1					
3 CS	120 84		10											
			11	10.4 - 18.4' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling (0-5%), sand (0-5%), gravel (0-5%), stiff, medium plasticity, moist.	CL				1					
			12											
			13						1					
			14	14' dark yellowish brown (10YR 4/4) mottling (30-45%).					1					
			15											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature SH Wb

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number AW-12 Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
4 CS	120 120		16	10.4 - 18.4' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling (0-5%), sand (0-5%), gravel (0-5%), stiff, medium plasticity, moist. *(continued)*	CL				1					
			17						1					
			18											
			19	18.4 - 23.8' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1), sand (0-5%), organic material (0-5%), gravel (0-5%), very soft to soft, medium plasticity, moist.										
5 CS	120 120		20						0.25					
			21		CL/ML									
			22						0.25					
			23						0.5					
			24	23.8 - 27' **SILTY CLAY:** CL/ML, gray (10YR 6/1), sand (0-5%), shells (0-5%), firm to stiff, medium plasticity, moist.					1					
			25		CL/ML				1					
			26						1					
			27	27 - 30' **WELL-GRADED GRAVEL WITH SAND:** (GW)s, dark gray (10YR 4/1), fine to coarse gravel, wet.					0.5					
			28		(GW)s									
			29											
6 CS	60 60		30	30 - 35' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 5/1).										
			31											
			32		BDX (SH)									
			33											
			34											
			35	35' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-13

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/9/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-13	Feet (NAVD88)	438.67 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,600.70 N, 2,436,267.19 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 18.134"

Long -89° 39' 49.372"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	240 135		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0 - 0.9' **FILL, SILT WITH GRAVEL:** (ML)g, brown (10YR 4/3), clay (5-15%), sand (5-15%), no dilatancy, low toughness, non-plastic, wet. 0.9 - 2.6' **SILT:** ML, dark brown (10YR 3/3) to dark olive brown (2.5Y 3/3), clay (15-30%), sand (5-15%), yellowish brown (10YR 5/4) sand seams, no dilatancy, medium toughness, low plasticity. 2.6 - 5.5' **LEAN CLAY WITH SAND:** (CL)s, yellowish brown (10YR 5/4), dark gray (10YR 4/1) mottling (5-15%), silt (5-15%), no to slow dilatancy, low toughness, low to medium plasticity. 5.5 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), yellowish brown (10YR 5/4) mottling (0-5%), silt (15-30%), no dilatancy, low toughness, medium plasticity. 7.8' wet.	(FILL) (ML)g ML (CL)s CL									CS= Core Sample

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel / Fax
	Ramboll 234 W. Florida Street, Milwaukee,WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

Boring Number AW-13 Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			16	5.5 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), yellowish brown (10YR 5/4) mottling (0-5%), silt (15-30%), no dilatancy, low toughness, medium plasticity. *(continued)*	CL									
			17											
			18											
			19	19' very dark gray (5Y 3/1), shells (0-5%), organic material (0-5%).										
2 CS	60 60		20	20 - 23.6' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1), yellowish brown (10YR 5/4) mottling (0-5%), shells (0-5%), organic material (0-5%), no dilatancy, low toughness, low plasticity.	CL/ML									
			21											
			22											
			23											
			24	23.6 - 27.3' **SILT:** ML, dark gray (10YR 4/1), clay (15-30%), no dilatancy, low toughness, low plasticity.	ML									
3 CS	60 60		25											
			26											
			27											
			28	27.3 - 29' **Weathered SHALE Bedrock** BDX (SH), gray (5Y 6/1) to greenish gray (GLEY 1 6/1).	BDX (SH)									
			29	29 - 30' **SHALE:** BDX (SH), gray (5Y 6/1).	BDX (SH)									
			30	30' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-13A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/9/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
	Feet (NAVD88)	Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane N, E E/W
1/4 of 1/4 of Section , T 7 N, R 7 E
Lat ° ' "
Long ° ' "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 51		0.5 1.0 1.5	0 - 1.9' **FILL, SILT WITH GRAVEL:** (ML)g, brown (10YR 4/3), clay (5-15%), sand (5-15%), no dilatancy, low toughness, non-plastic, moist.	(FILL) (ML)g									CS= Core Sample
			2.0 2.5	1.9 - 2.7' **FILL, POORLY-GRADED GRAVEL:** GP, dark olive brown (2.5Y 3/3), fine gravel, sand (5-15%), silt (0-5%), dry.	(FILL) GP									
			3.0 3.5 4.0 4.5	2.7 - 5' **SILT:** ML, dark brown (10YR 3/3) to dark olive brown (2.5Y 3/3), clay (15-30%), sand (5-15%), yellowish brown (10YR 5/4) sand seams, no dilatancy, medium toughness, low plasticity, moist.	ML									
2 SH	24 24		5.0 5.5 6.0 6.5	5 - 7' **LEAN CLAY:** CL.	CL					25.2	30	16	69.7	SH= Shelby Tube sample
			7.0	7' End of Boring.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-14

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/8/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-14	Feet (NAVD88)	436.83 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,201.15 N, 2,435,739.93 E E/W

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 14.215"

Long -89° 39' 56.236"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 2.2' **SILT WITH SAND:** (ML)s, very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2), gravel (5-15%), roots (0-5%), no dilatancy, low toughness, non-plastic, moist to wet.	(ML)s									CS= Core Sample
			2											
			3	2.2 - 3.7' **SILT:** ML, dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2) mottling (15-30%), yellowish brown (10YR 5/6) mottling (0-5%), clay (15-30%), sand (0-5%), stiff, no dilatancy, low toughness, low plasticity, moist.	ML				1.5					
			4											
			5	3.7 - 27' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (5-30%), shells (0-5%), organic material (0-5%).					0.25					
			6											
			7						0.25					
			8											
			9											
			10		CL									
2 CS	120 101		11											
			12											
			13											
			14											
			15											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number AW-14 Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			16	3.7 - 27' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (5-30%), shells (0-5%), organic material (0-5%). *(continued)*										
			17											
			18	18' organic material (5-15%).										
			19											
3 CS	60 60		20	20' slow dilatancy.										
			21		CL									
			22											
			23											
			24											
4 CS	120 84		25											
			26											
			27	27 - 28' **Weathered SHALE Bedrock** BDX (SH), dark grayish brown (10YR 4/2), clay (15-30%), shells (0-5%), gravel (0-5%).	BDX (SH)									
			28	28 - 35' **SHALE:** BDX (SH), dark gray (10YR 4/1) to gray (10YR 6/1), dry.										
			29											
			30											
			31		BDX (SH)									
			32											
			33											
			34											
			35	35' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-15

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/8/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-15	Feet (NAVD88)	438.95 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,445.04 N, 2,435,405.11 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 16.644"

Long -89° 40' 0.557"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	240 167		0 1 2 3 4 5 6 7 8 9 10 11 12 13	0 - 0.6' **POORLY-GRADED SAND:** SP, dark grayish brown (10YR 4/2), fine to medium sand, gravel (5-15%), silt (5-15%), roots (0-5%), moist. 0.6 - 13.5' **SILT:** ML, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/6) to dark brown (7.5YR 3/4) mottling (15-30%), clay (15-30%), sand (5-15%), shells (0-5%), no dilatancy, medium toughness, low plasticity, moist, blocky. 11' dark yellowish brown (10YR 4/6) to dark brown (7.5YR 3/4) mottling (5-15%).	SP ML									CS= Core Sample

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number AW-15 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			14	13.5 - 14' **LEAN CLAY:** CL, dark gray (10YR 4/1) to (5Y 4/1), silt (15-30%), sand (0-5%), shells (0-5%), no to slow dilatancy, low toughness, medium plasticity, moist.	CL									
			15	14 - 17' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1) to (5Y 4/1), sand (0-5%), shells (0-5%), no to slow dilatancy, low toughness, medium plasticity, wet.	CL/ML									
			16											
			17	17 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1) to (5Y 4/1), silt (15-30%), sand (0-5%), shells (0-5%), no to slow dilatancy, low toughness, medium plasticity, wet.	CL									
			18											
			19	19.5' moist.										
2 SH	24 24		20	20 - 22' **FAT CLAY:** CH.	CH					27.9	57	38	98	SH= Shelby Tube sample
			21											
3 CS	156 156		22	22 - 35.8' **LEAN CLAY:** CL, dark gray (10YR 4/1) to (5Y 4/1), silt (15-30%), sand (0-5%), shells (0-5%), no to slow dilatancy, low toughness, medium plasticity, moist.	CL									
			23											
			24											
			25											
			26											
			27	26.5' organic material (0-5%).										
			28	28' - 29' organic material (5-15%).										
			29											
			30											
			31											
			32											
			33											
			34	34' piece of wood 1" long.										
			35											
4 CS	60 60		36											

Boring Number AW-15 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			37	35.8 - 36.9' **Weathered SHALE Bedrock** BDX (SH), dark gray (10YR 4/1) to gray (10YR 6/1). *(continued)*	BDX (SH)									
			38	36.9 - 40' **SHALE:** BDX (SH), gray (10YR 6/1), dry.	BDX (SH)									
			39											
			40	40' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-15C

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/7/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-15C	Feet (NAVD88)	437.62 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,458.08 N, 2,435,388.24 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 16.774"

Long -89° 40' 0.775"

Local Grid Location: Feet ☐N ☐S ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		0	0 - 4.4' **CLAYEY SILT** ML/CL, grayish brown (10YR 5/2), brown (10YR 4/3) mottling (0-5%), roots (0-5%), gravel (0-5%), stiff, no to slow dilatancy, low toughness, low plasticity, moist.					1.5					CS= Core Sample
			1											
			2	1.8' brown (10YR 4/3) mottling (15-20%), strong brown (7.5YR 5/6) mottling (0-5%).	ML/CL									
			3						1.5					
			4											
			5	4.4 - 8' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), grayish brown (10YR 5/2) mottling (0-15%), dark yellowish brown (10YR 4/6) mottling (0-5%), no to slow dilatancy, low toughness, medium plasticity, moist, light gray (7.5YR 7/1) sand seams (0-5%) with strong brown (7.5YR 4/6) mottling, 1/16" thick light gray (7.5YR 7/1) sand seams (0-5%), strong brown (7.5YR 4/6) mottling, 1/16" diameter.	CL				1.5					
			6											
			7	7.5' organic material (0-15%), shells (0-5%).					2.5					
			8	8 - 30.2' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), dark gray (10YR 4/1) (5-15%), yellowish brown (10YR 5/8) mottling (5-15%), sand (5-15%), organic material (0-15%), shells (0-5%).										
			9	9.5' no sand, gray (10YR 4/1) mottling (0-5%).					0.75					
2 CS	120 120		10		CL/ML									
			11						0.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204

Tel: (414) 837-3607
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Boring Number AW-15C

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	8 - 30.2' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), dark gray (10YR 4/1) (5-15%), yellowish brown (10YR 5/8) mottling (5-15%), sand (5-15%), organic material (0-15%), shells (0-5%). *(continued)*					0.25					
			14											
			15						0.25					
			16											
			17	17.2' - 19' organic material (5-15%).					0.25					
			18											
			19						0.25					
3 CS	120 116		20	20' organic material (0-5%), no mottling.										
			21		CL/ML				0.25					
			22	21.4' light brownish gray (10YR 6/2) mottling (0-5%), silt seams <1/16".										
			23						0.25					
			24											
			25						0.25					
			26											
			27						0.25					
			28											
			29						0.25					
4 CS	120 113		30	30.2 - 40' **Weathered SHALE Bedrock** BDX (SH), gray (2.5Y 5/1), highly decomposed, dry.										
			31		BDX (SH)									
			32											

Boring Number AW-15C

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	30.2 - 40' **Weathered SHALE Bedrock** BDX (SH), gray (2.5Y 5/1), highly decomposed, dry. *(continued)*										
			34											
			35											
			36		BDX (SH)									
			37	36.6' dark grayish brown (10YR 4/2) to gray (5Y 6/1).										
			38											
			39											
5 CS	60 46		40	40 - 100' **SHALE:** BDX (SH), dark grayish brown (10YR 4/2) to gray (5Y 6/1).										
			41											
			42											
			43											
			44											
6 CS	84 84		45											
			46		BDX (SH)									
			47											
			48											
			49											
			50											
			51											
			52											

Boring Number AW-15C

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
7 CS	240 211		53	40 - 100' **SHALE:** BDX (SH), dark grayish brown (10YR 4/2) to gray (5Y 6/1). *(continued)* 52' greenish gray (GLEY 1 5/1) to gray (5Y 6/1) laminations.										
			54											
			55											
			56											
			57											
			58	57.2 - 57.3' light brownish gray (10YR 6/2) concretion.										
			59											
			60											
			61											
			62		BDX (SH)									
			63											
			64											
			65											
			66											
			67											
			68											
			69											
			70	69.5 - 69.6' light brownish gray (10YR 6/2) concretion.										
			71											
			72											

Boring Number AW-15C

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
8 CS	240 48		73	40 - 100' **SHALE:** BDX (SH), dark grayish brown (10YR 4/2) to gray (5Y 6/1). *(continued)*										
			74											
			75											
			76											
			77											
			78											
			79											
			80											
			81											
			82	82' dark greenish gray (GLEY 1 4/1).	BDX (SH)									
			83											
			84											
			85											
			86											
			87											
			88											
			89											
			90											
			91											
			92											

Boring Number AW-15C

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
9 CS	96 46		93	40 - 100' **SHALE:** BDX (SH), dark grayish brown (10YR 4/2) to gray (5Y 6/1). *(continued)*	BDX (SH)									
			94											
			95											
			96											
			97											
			98											
			99											
			100	100' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-15S

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dave Gordon Cascade Drilling	1/8/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-15S	Feet (NAVD88)	437.92 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,441.60 N, 2,435,399.83 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 16.61"

Long -89° 40' 0.626"

Local Grid Location: Feet ☐N ☐S ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	240 200		0 - 12	**SILT:** ML, dark grayish brown (10YR 4/2), brown (10YR 4/3) mottling (5-15%), clay (15-30%), roots (0-5%), wood (0-5%), sand (0-5%), very soft to very stiff, slow to no dilatancy, low toughness, low plasticity, moist.	ML				0.5 0.25 0.5 3 1.5					CS= Core Sample
			10	10' dark gray (10YR 4/1), dark grayish brown (10YR 4/2) mottling (30-45%), dark brown (7.5YR 3/3) mottling (0-5%).										
			11	11' dark grayish brown (10YR 4/2), wood (5-15%).										
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number AW-15S

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			12	12 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1) to (5Y 4/1), shells (0-5%), organic material (0-5%), soft, slow dilatancy, low toughness, medium plasticity, moist to wet.	CL				0.5					
			13											
			14	14' moist.										
			15											
			16											
			17											
			18											
			19											
			20	20' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-16

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/7/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-16	Feet (NAVD88)	459.45 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,428,987.30 N, 2,435,130.53 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 22.018"

Long -89° 40' 4.077"

Local Grid Location: ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 / 57		0 - 1 - 2 - 3 - 4 - 5	0 - 5' **FILL, SILT WITH SAND:** (ML)s, grayish brown (10YR 5/2), ash (5-10%), gravel (0-5%), stiff, slow dilatancy, low toughness, non-plastic, moist to dry.	(FILL) (ML)s				1.25					7-inch override casing set at 20 feet below ground surface
2 CS	60 / 60		5 - 6 - 7 - 8 - 9 - 10	5 - 16.8' ASH, very dark gray (10YR 3/1), silt to sand sized grains, slag-like material (0-5%), subangular to subrounded, loose, dry to moist.	(FILL) ASH									CS= Core Sample
3 CS	120 / 92		10 - 11 - 12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel / Fax
	Ramboll 234 W. Florida Street, Milwaukee,WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

Boring Number AW-16 Page 2 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	5 - 16.8' ASH, very dark gray (10YR 3/1), silt to sand sized grains, slag-like material (0-5%), subangular to subrounded, loose, dry to moist. *(continued)*	(FILL) ASH									
			14											
			15											
			16											
			17	16.8 - 58.5' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), sand (0-5%), gravel (0-5%), stiff to firm, slow dilatancy, low to medium toughness, medium plasticity, moist.					1.25					
			18											
			19						2.25					
4 CS	120 88		20											
			21						0.75					
			22	22.1' dark gray (10YR 4/1), organic material (0-5%).										
			23						0.75					
			24		CL/ML									
			25						2					
			26											
			27						1.75					
			28											
			29						2.5					
5 CS	60 40		30											
			31						1.5					
			32											

Boring Number AW-16 Page 3 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	16.8 - 58.5' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), sand (0-5%), gravel (0-5%), stiff to firm, slow dilatancy, low to medium toughness, medium plasticity, moist. *(continued)*					1.5					
			34	34' brown (7.5YR 4/4) mottling, stiff.										
6 CS	60 60		35						1.75					
			36											
			37						1.5					
			38	38' dark grayish green (5GY 4/2), no mottling.										
			39						1.25					
7 CS	60 60		40											
			41						1.25					
			42		CL/ML									
			43						1.5					
			44											
8 CS	60 60		45	45' organic material (5-10%).					1.25					
			46											
			47						1					
			48											
			49						1					
9 CS	60 58		50											
			51						0.75					
			52											

Boring Number AW-16 Page 4 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			53	16.8 - 58.5' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), sand (0-5%), gravel (0-5%), stiff to firm, slow dilatancy, low to medium toughness, medium plasticity, moist. *(continued)*					0.75					
			54											
10 CS	60 60		55		CL/ML				0.75					
			56											
			57						0.75					
			58											
			59	58.5 - 60' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 5/1).	BDX (SH)				0.5					
11 CS	36 36		60	60 - 63' **SHALE:** BDX (SH), black (10YR 2/1).										
			61		BDX (SH)									
			62											
			63	63' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-17

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/8/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-17	Feet (NAVD88)	459.69 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,429,801.14 N, 2,434,680.17 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 30.085"

Long -89° 40' 9.855"

Local Grid Location: Feet ☐N ☐S ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 60		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5	0 - 4.7' ASH, grayish brown (10YR 5/2), sand to gravel sized grains, subangular to subrounded medium to fine-grained sand, silt (5-10%), loose, moist.	(FILL) ASH									7-inch override casing set at 20 feet below ground surface
2 CS	120 65		5.0 5.5 6.0	4.7 - 6.3' **FILL, SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), sand (5-10%), very soft, rapid dilatancy, low toughness, medium to low plasticity, moist to wet.	(FILL) CL/ML				0.25					CS= Core Sample
			6.5 7.0 7.5	6.3 - 7.8' ASH, grayish brown (10YR 5/2), sand to gravel sized grains, subangular to subrounded medium to coarse-grained sand, loose moist.	(FILL) ASH				2.25					
			8.0 8.5 9.0 9.5 10.0	7.8 - 33.7' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (25-30%), organic material (0-10%), shells (0-5%), sand (0-5%), stiff to very stiff, slow dilatancy, low toughness, medium plasticity, moist.	CL/ML				2.5					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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234 W. Florida Street, Milwaukee,WI 53204
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Boring Number AW-17 Page 2 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			10.5	7.8 - 33.7' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (25-30%), organic material (0-10%), shells (0-5%), sand (0-5%), stiff to very stiff, slow dilatancy, low toughness, medium plasticity, moist. *(continued)*										
			11.0						2					
			11.5											
			12.0											
			12.5	12.2' -12.3 strong brown (7.5YR 4/6) layer of oxidation.										
			13.0						2.25					
			13.5											
			14.0											
			14.5											
3 CS	120 114		15.0	14.7' gray (10YR 5/1), no mottling, silt seams <1/16" thick (0-5%), firm, moist.					1.5					
			15.5											
			16.0											
			16.5											
			17.0						1.5					
			17.5											
			18.0											
			18.5		CL/ML									
			19.0						1					
			19.5											
			20.0	20' brown (7.5YR 4/4) mottling (10-15%).										
			20.5											
			21.0						0.75					
			21.5											
			22.0											
			22.5											
			23.0						0.75					
			23.5											
			24.0											
			24.5											
4 CS	60 60		25.0						0.75					
			25.5											
			26.0											
			26.5											

Boring Number AW-17 Page 3 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			27.0	7.8 - 33.7' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling (25-30%), organic material (0-10%), shells (0-5%), sand (0-5%), stiff to very stiff, slow dilatancy, low toughness, medium plasticity, moist. *(continued)* 26.8' - 27.6' dark gray (10YR 4/1), organic material (10-15%), very stiff.					3.25					
			27.5											
			28.0											
			28.5											
			29.0						2.5					
			29.5											
5 CS	60 60		30.0		CL/ML									
			30.5											
			31.0						1.25					
			31.5											
			32.0											
			32.5											
			33.0						1.25					
			33.5											
			34.0	33.7 - 38' **CLAYEY SILT** ML/CL, yellowish brown (10YR 5/4), gray (10YR 6/1) mottling (5-15%), organic material (5-10%), sand (0-5%), firm, slow dilatancy, low toughness, low plasticity, moist.										
			34.5											
			35.0						0.75					
6 CS	60 58		35.5											
			36.0		ML/CL									
			36.5											
			37.0						0.75					
			37.5											
			38.0	38 - 55.1' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1) to gray (10YR 5/1), shells (0-5%), organic material (0-5%), firm, slow dilatancy, low toughness, medium plasticity, moist.										
			38.5											
			39.0						0.75					
			39.5											
			40.0											
7 CS	120 109		40.5		CL/ML									
			41.0						0.75					
			41.5											
			42.0											
			42.5											
			43.0						0.75					

Boring Number AW-17

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			43.5	38 - 55.1' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1) to gray (10YR 5/1), shells (0-5%), organic material (0-5%), firm, slow dilatancy, low toughness, medium plasticity, moist. *(continued)*										
			44.0											
			44.5											
			45.0						0.75					
			45.5											
			46.0											
			46.5											
			47.0						0.75					
			47.5											
			48.0											
			48.5	48.2' organic material (5-10%).										
			49.0		CL/ML				0.75					
			49.5											
8 CS	84 70		50.0											
			50.5											
			51.0						0.75					
			51.5											
			52.0											
			52.5											
			53.0						0.75					
			53.5											
			54.0						0.75					
			54.5											
			55.0	54.7' - 55.1' gravel (0-5%).										
			55.5	55.1 - 57' **SHALE:** BDX (SH), gray (10YR 6/1), dry.	BDX (SH)									
			56.0											
			56.5											
			57.0	57' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-18

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/8/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-18	Feet (NAVD88)	460.28 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,430,290.97 N, 2,434,561.45 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 34.932"

Long -89° 40' 11.358"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 56		0	0 - 1.4' **FILL, POORLY-GRADED SAND WITH GRAVEL:** (SP)g, brown (10YR 4/3), subrounded to rounded, medium sand, loose, moist.	(FILL) (SP)g									7-inch override casing set at 10 feet below ground surface
			1											
			2	1.4 - 7.4' ASH, very dark gray (10YR 3/1), silt sized grains, moist to wet.										
			3											
			4		(FILL) ASH									
2 CS	60 56		5											CS= Core Sample
			6											
			7	6.8' sand and gravel (10-15%).					2.5					
			8	7.4 - 34.2' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling, (10-20%), shells (0-5%), organic material (0-5%), firm to very stiff, slow dilatancy, low toughness, medium plasticity, moist.									
			9						2.25					
3 CS	120 73		10		CL/ML									
			11						1.75					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204

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Fax: (414) 837-3608

Boring Number AW-18 Page 2 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	7.4 - 34.2' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling, (10-20%), shells (0-5%), organic material (0-5%), firm to very stiff, slow dilatancy, low toughness, medium plasticity, moist. *(continued)*					1.75					
			14											
			15						1.75					
			16											
			17						1.5					
			18											
			19						1.75					
4 CS	120 77		20											
			21						0.75					
			22		CL/ML									
			23						0.75					
			24											
			25						0.75					
			26											
			27						0.75					
			28											
			29						0.5					
5 CS	60 51		30											
			31						0.75					
			32	31.4' organic material (5-10%).										

Boring Number AW-18 Page 3 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	7.4 - 34.2' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), brown (7.5YR 4/4) mottling, (10-20%), shells (0-5%), organic material (0-5%), firm to very stiff, slow dilatancy, low toughness, medium plasticity, moist. *(continued)*	CL/ML				2.5					
			34											
6 CS	60 46		35	34.2 - 39.4' **CLAYEY SILT** ML/CL, gray (10YR 5/1), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), firm to very stiff, slow dilatancy, low toughness, low plasticity, moist.					2.5					
			36											
			37		ML/CL				1.25					
			38											
			39						0.75					
7 CS	60 58		40	39.4 - 49.8' **SILTY CLAY:** CL/ML, dark gray (10YR 4/1), organic material (5-10%), shells (0-5%), firm, slow dilatancy, low toughness, medium plasticity, moist.										
			41						0.75					
			42											
			43						0.75					
			44											
8 CS	60 60		45		CL/ML				0.75					
			46											
			47						0.75					
			48											
			49						0.75					
9 CS	60 60		50	49.8 - 55' **SHALE:** BDX (SH), gray (10YR 6/1), dry.										
			51		BDX (SH)									
			52											

Boring Number AW-18 Page 4 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53	49.8 - 55' **SHALE:** BDX (SH), gray (10YR 6/1), dry. *(continued)*	BDX (SH)									
			54											
			55	55' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-19

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/9/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-19	Feet (NAVD88)	458.53 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,431,161.80 N, 2,434,584.70 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 43.536"

Long -89° 40' 10.993"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 111		0	0 - 1.8' **FILL, POORLY-GRADED SAND WITH GRAVEL:** (SP)g, brown (10YR 5/3), subrounded to subangular, coarse to medium sand, loose, moist.	(FILL) (SP)g									7-inch override casing set at 10 feet below ground surface
			1											
			2	1.8 - 7.1' ASH, very dark gray (10YR 3/1), silt sized grains, soft, moist to wet.										
			3						0.25					
			4		(FILL) ASH									
			5						0.25					CS= Core Sample
			6											
			7	7.1 - 23.6' **SILTY CLAY:** CL/ML, gray (10YR 5/1), yellowish brown (10YR 5/6) mottling (5-10%), shells (0-5%), organic material (0-5%), very stiff, slow dilatancy, medium toughness, high plasticity, moist.					0.25					
			8											
			9						2.5					
2 CS	60 47		10		CL/ML									
			11						2.25					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
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Boring Number AW-19 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	7.1 - 23.6' **SILTY CLAY:** CL/ML, gray (10YR 5/1), yellowish brown (10YR 5/6) mottling (5-10%), shells (0-5%), organic material (0-5%), very stiff, slow dilatancy, medium toughness, high plasticity, moist. *(continued)*					2.5					
			14											
3 CS	60 43		15						2.25					
			16											
			17						2.25					
			18		CL/ML									
			19						2					
4 CS	60 46		20											
			21						2.5					
			22											
			23						2.25					
			24	23.6 - 35' **FAT CLAY:** CH, dark gray (10YR 4/1), very dark gray (10YR 3/1) and yellowish brown (10YR 5/6) mottling (5-10%), organic material (0-5%), shells (0-5%), gravel (0-5%), stiff, slow dilatancy, medium toughness, medium to high plasticity, moist.										
5 CS	60 39		25						2.5					
			26											
			27						2.5					
			28		CH									
			29						2.5					
6 CS	60 41		30											
			31						2.25					
			32											

Boring Number AW-19 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	23.6 - 35' **FAT CLAY:** CH, dark gray (10YR 4/1), very dark gray (10YR 3/1) and yellowish brown (10YR 5/6) mottling (5-10%), organic material (0-5%), shells (0-5%), gravel (0-5%), stiff, slow dilatancy, medium toughness, medium to high plasticity, moist. *(continued)*	CH				2.5					
			34											
7 CS	60 60		35	35 - 40.2' **SILTY CLAY:** CL/ML, light brownish gray (10YR 6/2) to grayish brown (10YR 5/2), gravel (0-5%), sand (0-5%), soft, slow dilatancy, low toughness, medium plasticity, moist to wet.					0.5					
			36											
			37		CL/ML				0.5					
			38											
			39						0.25					
			40											
8 CS	36 36		41	40.2 - 41.5' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 6/1) to light yellowish brown (10YR 6/4).	BDX (SH)									
			42	41.5 - 43' **SHALE:** BDX (SH), gray (10YR 6/1).	BDX (SH)									
			43	43' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-20

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/10/2021	1/10/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-20	Feet (NAVD88)	459.08 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,431,539.96 N, 2,434,807.43 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 47.26"

Long -89° 40' 8.078"

Local Grid Location: ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 47		0	0 - 0.5' **FILL, POORLY-GRADED SAND WITH GRAVEL:** (SP)g, grayish brown (10YR 5/2), subrounded to subangular, coarse to medium sand, loose, wet.	(FILL) (SP)g									7-inch override casing set at 10 feet below ground surface
			1	0.5 - 6.2' ASH, very dark gray (10YR 3/1), silt sized grains, loose, moist.										
			2											
			3		(FILL) ASH									
			4											
2 CS	60 54		5											CS= Core Sample
			6											
			7	6.2 - 8.9' ASH, very dark gray (10YR 3/1), sand to gravel sized grains, subangular to angular, clinkers (0-5%), slag-like material (0-5%), moist.	(FILL) ASH									
			8											
			9	8.9 - 15' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (5-15%), sand (0-5%), gravel (0-5%), stiff, slow to no dilatancy, low to medium toughness, medium to high plasticity, moist.				1.5					
3 CS	60 60		10		CL/ML									
			11					1.25						
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel / Fax
	Ramboll 234 W. Florida Street, Milwaukee,WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

Boring Number AW-20 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	8.9 - 15' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (5-15%), sand (0-5%), gravel (0-5%), stiff, slow to no dilatancy, low to medium toughness, medium to high plasticity, moist. *(continued)*	CL/ML			1.25						
			14											
4 SH	24 24		15	15 - 17' **LEAN CLAY:** CL.				1.25		35.1	47	29	92.2	SH= Shelby Tube
			16		CL									
5 CS	96 96		17	17 - 19.6' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (5-15%), sand (0-5%), gravel (0-5%), stiff, slow to no dilatancy, low to medium toughness, medium to high plasticity, moist.				1.25						
			18		CL/ML									
			19					0.75						
			20	19.6 - 40.8' **SILTY CLAY:** CL/ML, gray (10YR 5/1), shells (0-5%), sand (0-5%), organic material (0-5%), firm to stiff, slow dilatancy, low toughness, medium to high plasticity, moist.										
			21					0.75						
			22											
			23					0.75						
			24	23.8' - 30' dark gray (10YR 4/1), organic material (10-15%), stiff.										
6 CS	60 57		25					2.25						
			26		CL/ML									
			27					2.25						
			28											
			29					0.75						
7 CS	60 60		30											
			31					0.75						
			32											

Boring Number AW-20 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	19.6 - 40.8' **SILTY CLAY:** CL/ML, gray (10YR 5/1), shells (0-5%), sand (0-5%), organic material (0-5%), firm to stiff, slow dilatancy, low toughness, medium to high plasticity, moist. *(continued)*				1.25						
			34	33.2' gray (10YR 5/1), brown (7.5YR 4/4) mottling (10-20%), gravel (0-5%), medium toughness, high plasticity.										
8 CS	60 60		35					1						
			36		CL/ML									
			37					0.75						
			38											
			39					0.75						
9 CS	36 36		40	39.7' - 39.9' interbedded sand seams with silt and clay laminations, moist. 40' grayish brown (10YR 5/2).										
			41	40.8 - 43' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 6/1) to yellowish brown (10YR 5/6).	BDX (SH)									
			42											
			43	43' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-21

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Adam Jochimsen Cascade Drilling	1/10/2021	1/10/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-21	Feet (NAVD88)	458.28 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,431,842.41 N, 2,435,132.32 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 50.23"

Long -89° 40' 3.844"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 / 49		0	0 - 0.5' **FILL, CLAYEY SILT** ML/CL, dark brown (10YR 3/3), loose, moist.	(FILL) ML/CL				0.25					7-inch override casing set at 10 feet below ground surface
			1	0.5 - 9.1' ASH, dark gray (10YR 4/1) to very dark gray (10YR 3/1), silt sized grains, soft, moist.										
			2											
			3						0.25					
			4											
2 CS	60 / 60		5		(FILL) ASH				0.25					CS= Core Sample
			6											
			7						0.25					
			8											
			9						2					
3 CS	60 / 49		10	9.1 - 35.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2) to gray (10YR 5/1), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), sand (0-5%), gravel (0-5%), stiff to very stiff, slow dilatancy, medium to low toughness, medium to high plasticity, moist.										
			11						1.25					
			12		CL/ML									
			13						1.75					
			14											
			15	14.3' - 15' dark gray (10YR 4/1), organic material (5-10%), high plasticity, moist.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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Boring Number AW-21 Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
4 CS	60 47		16	9.1 - 35.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2) to gray (10YR 5/1), brown (7.5YR 4/4) mottling (15-20%), shells (0-5%), sand (0-5%), gravel (0-5%), stiff to very stiff, slow dilatancy, medium to low toughness, medium to high plasticity, moist. *(continued)*					1.25					
			17						1.75					
			18											
			19						1.25					
5 CS	60 50		20											
			21						0.5					
			22											
			23						2.25					
			24											
6 CS	60 54		25		CL/ML				3					
			26											
			27						1.25					
			28											
			29						1.75					
7 CS	60 60		30	29.8' - 31.5' dark gray (10YR 4/1), organic material (5-10%).										
			31						1.25					
			32	31.5' grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (10-15%).										
			33						0.75					
			34											
8 CS	36 36		35						1					
			36	35.4 - 38' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 6/1) to brownish yellow (10YR 6/6).	BDX (SH)									
			37											
			38	38' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		AW-22

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/7/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
AW-22	Feet (NAVD88)	460.30 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,431,677.07 N, 2,435,397.38 E E/W

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 48.582"

Long -89° 40' 0.42"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 60		0	0 - 1.6' **FILL, SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), gravel (0-5%), sand (0-5%), stiff to very stiff, low plasticity, moist.	(FILL) CL/ML				2.5					7-inch override casing set at 20 feet below ground surface
			2	1.6 - 14.6' ASH, dark gray (10YR 4/1), silt sized grians, sand (0-5%), moist to wet.					1.5					
2 CS	60 28		5	5.5' brown (10YR 5/3), gravel (15-25%).	(FILL) ASH									CS= Core Sample
3 CS	120 84		10	10' very dark gray (10YR 3/1), sand (0-5%) wet.										
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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Boring Number AW-22 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13	1.6 - 14.6' ASH, dark gray (10YR 4/1), silt sized grians, sand (0-5%), moist to wet. *(continued)*	(FILL) ASH									
			14											
			15	14.6 - 30' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), gravel (0-5%), stiff to very stiff, low to medium plasticity, moist.					2.5					
			16						3					
			17						3					
			18											
			19											
4 CS	120 120		20											
			21						1					
			22		CL				1					
			23						1.5					
			24	24' yellowish brown (10YR 5/4), stiff, medium plasticity, moist.					1.5					
			25											
			26						1					
			27						1					
			28						1.5					
			29						1					
5 SH	24 24		30	30 - 32' **CLAYEY SAND:** SC.						23.2	22	9	42.6	SH= Shelby Tube sample
			31		SC									
			32											

Boring Number AW-22 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
6 CS	96 96		33	32 - 34' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown mottling (0-5%), sand (0-5%), organic material (0-5%), very soft, medium to high plasticity, moist.	CL/ML				0.25					
			34	34 - 40' **SILTY CLAY:** to **LEAN CLAY:** CL/ML, dark gray (10YR 4/1), sand (0-5%), very soft to soft, medium plasticity, moist.					0.25					
			35	34.8' - 35' layer of silt, wet.					0.5					
			36						0.5					
			37	36.8' - 37.2' layer of silt, wet.	CL/ML				1					
			38	38' - 38.4' layer of fine sand, wet.					0.5					
			39	39.1' - 39.5 layer of fine sand, wet.					0.5					
7 CS	60 60		40	40 - 41.6' **CLAYEY SAND:** SC, dark gray (10YR 4/1), fine sand, shells (5-10%), wet.	SC				0.25					
			41											
			42	41.6 - 45' **LEAN CLAY:** CL, dark gray (10YR 4/1), shells (0-5%), soft, medium plasticity, moist.					0.5					
			43		CL				0.5					
			44						0.5					
8 CS	60 60		45	45 - 47.5' **LEAN CLAY:** CL, very dark grayish brown (10YR 3/2), sand (0-5%), shells (0-5%), stiff, medium plasticity, moist.					1.5					
			46		CL				1					
			47											
			48	47.5 - 50' **Weathered SHALE Bedrock** BDX (SH), gray (10YR 5/1).										
			49		BDX (SH)									
			50	50' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		XPW01

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/8/2021	1/8/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
	Feet (NAVD88)	Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane N, E E/W
1/4 of 1/4 of Section , T 7 N, R 7 E
Lat ° ' "
Long ° ' "
Local Grid Location ☐N ☐S Feet ☐E ☐W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 60		0	0 - 7.8' ASH, dark gray (10YR 4/1), silt to sand and gravel sized grains, moist.										CS= Core Sample
			3	3' grayish brown (10YR 5/2).	(FILL) ASH									
2 CS	60 60		5	5.8' dark gray (10YR 4/1).										
			8	7.8 - 10' **FILL, LEAN CLAY WITH GRAVEL:** (CL)g, brown (10YR 5/3), brick (0-5%), sand (0-5%), low plasticity, moist.	(FILL) (CL)g				2					
3 CS	60 60		10	10 - 12.8' ASH, dark gray (10YR 4/1), silt to sand and gravel sized grains, brick (15-25%), moist to wet.	(FILL) ASH									
			13	12.8 - 15' ASH, dark gray (10YR 4/1), silt to sand sized grains, wet.	(FILL) ASH									
			15											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature SH WL

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Boring Number XPW01 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
4 SH	24 0		15	15 - 17' ASH, No Recovery.	(FILL) ASH									SH= Shelby Tube sample
			16											
5 CS	36 36		17	17 - 19' ASH, dark gray (10YR 4/1), silt sized grains, sand (0-5%), wet.	(FILL) ASH									
			18											
			19	19 - 20' ASH, dark gray (10YR 4/1), silt to sand sized grains, gravel (0-5%), wet.	(FILL) ASH									
6 SH	24 24		20	20 - 22' ASH, sand to silt sized grains.	(FILL) ASH					43.7	51		31.1	
			21											
7 CS	36 36		22	22 - 25' ASH, very dark gray (10YR 3/1) to black (10YR 2/1), silt to sand sized grains, slag-like material (15-25%).	(FILL) ASH									
			23											
			24											
8 CS	60 0		25	25 - 30' ASH, No Recovery.	(FILL) ASH									
			26											
			27											
			28											
			29											
9 CS	60 0		30	30 - 35' ASH, No Recovery.	(FILL) ASH									
			31											
			32											
			33											
			34											
10 CS	60 0		35	35 - 40' ASH, No Recovery.	(FILL) ASH									
			36											
			37											
			38											
			39											
			40											

Boring Number XPW01 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
11 CS	60 60		41	40 - 43' ASH, dark gray (10YR 4/1) to black (10YR 2/1), silt to sand sized grains, wet.	(FILL) ASH									
			42											
			43	43 - 50' **FAT CLAY:** CH, dark grayish brown (10YR 4/2), organic material (0-5%), sand (0-5%), soft to stiff, high plasticity, moist.					0.5					
			44						0.5					
12 CS	72 72		45											
			46						0.5					
			47		CH				0.5					
			48						0.5					
			49						0.5					
			50	50 - 51' **Weathered SHALE Bedrock** BDX (SH).	BDX (SH)				0.5					
			51	51' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		XPW01A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/8/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
XPW01A	Feet (NAVD88)	460.99 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,431,483.28 N, 2,435,242.39 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 46.676"

Long -89° 40' 2.443"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0 - 7.8' ASH, Blind drill to 35 feet below ground surface (ft bgs). See XPW01 boring log for detailed lithologies.	(FILL) ASH									
			2											
			3											
			4											
			5											
			6											
			7											
			8	7.8 - 10' **FILL, LEAN CLAY WITH GRAVEL:** (CL)g.	(FILL) (CL)g									
			9											
			10	10 - 12.8' ASH.	(FILL) ASH									
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature SH WL

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Boring Number XPW01A

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	10 - 12.8' ASH. *(continued)*	(FILL) ASH									
			14	12.8 - 15' ASH.	(FILL) ASH									
			15	15 - 17' ASH.	(FILL) ASH									
			16	17 - 19' ASH.	(FILL) ASH									
			17	19 - 20' ASH.	(FILL) ASH									
			18	20 - 22' ASH.	(FILL) ASH									
			19	22 - 25' ASH.	(FILL) ASH									
			20	25 - 30' ASH.	(FILL) ASH									
			21	30 - 35' ASH.	(FILL) ASH									
			22											
			23											
			24											
			25											
			26											
			27											
			28											
			29											
			30											
			31											
			32											

Boring Number XPW01A

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			30	30 - 35' ASH. *(continued)*	(FILL) ASH									
			33											
			34											
1 NR	60 0		35	35 - 40' ASH, No Recovery.	(FILL) ASH									NR= No Recovery
			36											
			37											
			38											
			39											
2 MC	24 24		40	40 - 42' ASH, silt sized grains.	(FILL) ASH					35.1	60	17	86.3	MC= Modified California sample
			41											
			42	42 - 43' s(ML), Blind drill to 43 ft bgs. See XPW01 boring log for detailed lithologies.	(FILL) s(ML)									
			43	43' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		XPW02

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/9/2021	1/9/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
XPW02	Feet (NAVD88)	471.16 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,430,769.44 N, 2,434,978.01 E E/Ⓦ

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 39.636"

Long -89° 40' 5.923"

Local Grid Location: Feet ☐N ☐S ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 60		0	**0 - 9.2' FILL, SANDY SILT WITH GRAVEL:** s(ML)g, grayish brown (10YR 5/2), moist.	(FILL) s(ML)g									CS= Core Sample
2 CS	60 60		5											
			9	9.2 - 10' ASH, very dark gray (10YR 3/1), silt sized grains, sand (0-5%), slag-like material (0-5%), moist.	(FILL) ASH									
3 SH	24 24		10	10 - 12' ASH, silt sized grains.	(FILL) ASH					45.1	52	5	71.4	SH= Shelby Tube sample
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature SH WL

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Boring Number XPW02 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
4 CS	36 36		12	12 - 12.8' **FILL, SANDY SILT WITH GRAVEL:** s(ML)g, grayish brown (10YR 5/2), moist.	(FILL) s(ML)g									
			13	12.8 - 20' ASH, very dark gray (10YR 3/1), silt sized grains, sand (0-5%), slag-like material (0-5%), moist.										
			14											
5 CS	60 60		15											
			16		(FILL) ASH									
			17											
			18											
			19											
6 SH	24 0		20	20 - 22' ASH, No Recovery.										
			21		(FILL) ASH									
7 MC	24 24		22	22 - 35' ASH, very dark gray (10YR 3/1), silt sized grains, sand (0-5%), slag-like material (0-5%), wet.						33.4	38	8	95.9	MC= Modified California sample
			23											
8 CS	72 72		24											
			25											
			26											
			27		(FILL) ASH									
			28											
			29											
9 CS	60 60		30											
			31											
			32											

Boring Number XPW02 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			33	22 - 35' ASH, very dark gray (10YR 3/1), silt sized grains, sand (0-5%), slag-like material (0-5%), wet. *(continued)*	(FILL) ASH									
			34											
10 MC	24 0		35	35 - 37' ASH, No Recovery.	(FILL) ASH									
			36											
11 MC	24 0		37	37 - 39' ASH, No Recovery.	(FILL) ASH									
			38											
12 CS	12 0		39	39 - 40' ASH, No Recovery.	(FILL) ASH									
13 CS	60 60		40	40 - 46.5' ASH, very dark gray (10YR 3/1), silt to sand sized grains, wet.										
			41											
			42											
			43		(FILL) ASH									
			44											
14 MC	24 18		45							41.7	39	6	62.5	Clay encountered in last 6 inches of sample liner.
			46											
			47	46.5 - 47' **LEAN CLAY:** CL.	CL									
				47' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Edwards Power Station		XPW03

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Russ Gordon Cascade Drilling	1/9/2021	1/10/2021	Mini Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
XPW03	Feet (NAVD88)	462.62 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 1,429,703.68 N, 2,435,574.02 E E/W

1/4 of 1/4 of Section , T 7 N, R 7 E

Lat 40° 35' 29.072" Long -89° 39' 58.275"

Local Grid Location: Feet ☐N ☐S ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Peoria	IL	Peoria

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 60		0	0 - 10' ASH, dark gray (10YR 4/1), silt to sand sized grains, gravel (0-5%), moist.										CS= Core Sample
			1											
			2											
			3											
			4											
2 CS	60 60		5	4.7' very dark gray (10YR 3/1).	(FILL) ASH									
			6											
			7											
			8											
			9											
3 MC	24 24		10	10 - 12' ASH, silt sized grains.						43.8	36	7	72.4	MC= Modified California sample
			11		(FILL) ASH									
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature SH WL

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Boring Number XPW03 Page 2 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
4 CS	36 36		12	12 - 15' ASH, very dark gray (10YR 3/1), silt to sand sized grains, gravel (0-5%), loose, wet.	(FILL) ASH									
5 CS	60 60		15	15 - 28' ASH, dark gray (10YR 4/1), sand to silt sized grians, loose, wet.	(FILL) ASH									
6 CS	60 60		20											
7 CS	60 60		25											
8 CS	60 34		28	28 - 37.6' ASH, dark gray (10YR 4/1), sand to silt and gravel sized grains, coal (15-25%), loose, wet.	(FILL) ASH									
			30											
			32											

Boring Number XPW03 Page 3 of 3

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
9 CS	60 60		33 34 35 36 37	28 - 37.6' ASH, dark gray (10YR 4/1), sand to silt and gravel sized grains, coal (15-25%), loose, wet. *(continued)*	(FILL) ASH									
			38 39 40	37.6 - 40' **FAT CLAY:** CH, dark gray (10YR 4/1), soft, high plasticity, moist.	CH				0.5					
				40' End of Boring.										

2021 RAMBOLL WELL CONSTRUCTION LOGS

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-12
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 27.8" Long. -89° 39' 40.8" or	
Facility ID	St. Plane 1,429,586 ft. N, 2,436,923 ft. E. E/Ⓦ	Date Well Installed: 01/07/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Russ Gordon / Cascade Drilling
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation 444.31 ft. (NAVD88)

B. Well casing, top elevation 443.80 ft. (NAVD88)

C. Land surface elevation 441.2 ft. (NAVD88)

D. Surface seal, bottom 439.2 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☒ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 419.2 ft. (NAVD88) or 22.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 417.2 ft. (NAVD88) or 24.0 ft.

H. Screen joint, top 415.2 ft. (NAVD88) or 26.0 ft.

I. Well bottom 410.2 ft. (NAVD88) or 31.0 ft.

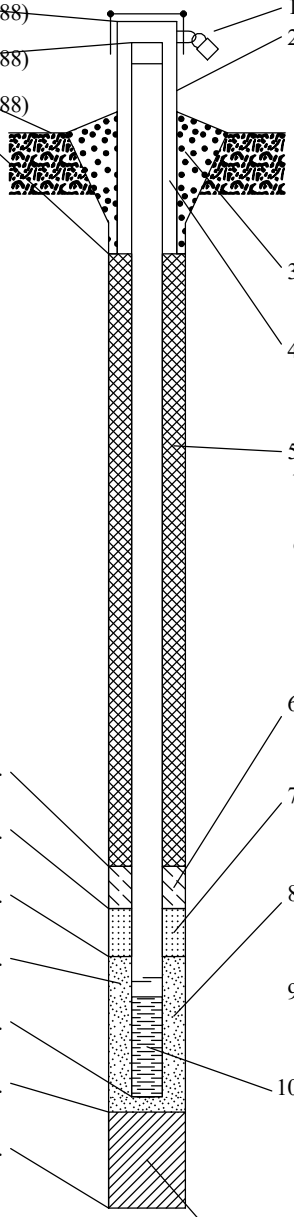
J. Filter pack, bottom 409.7 ft. (NAVD88) or 31.5 ft.

K. Borehole, bottom 406.2 ft. (NAVD88) or 35.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 3.491 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.233 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ Formation Materials Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature: SA WL

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-13
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 18.1" Long. -89° 39' 49.4" or	
Facility ID	St. Plane 1,428,601 ft. N, 2,436,267 ft. E. E/Ⓦ	Date Well Installed: 01/09/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Dave Gordon
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ Cascade Drilling

A. Protective pipe, top elevation 441.67 ft. (NAVD88)

B. Well casing, top elevation 441.26 ft. (NAVD88)

C. Land surface elevation 438.7 ft. (NAVD88)

D. Surface seal, bottom 436.7 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐
Hollow Stem Auger ☐
Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐
Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 418.7 ft. (NAVD88) or 20.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 415.7 ft. (NAVD88) or 23.0 ft.

H. Screen joint, top 413.7 ft. (NAVD88) or 25.0 ft.

I. Well bottom 408.7 ft. (NAVD88) or 30.0 ft.

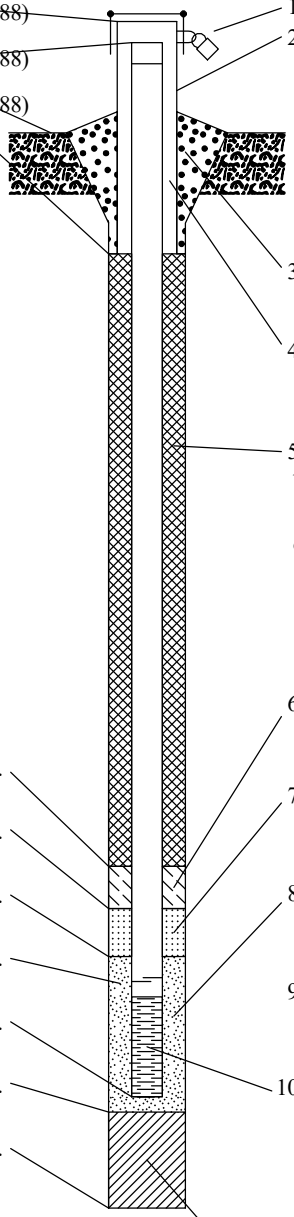
J. Filter pack, bottom 408.7 ft. (NAVD88) or 30.0 ft.

K. Borehole, bottom 408.7 ft. (NAVD88) or 30.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 3.142 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.222 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒
Flush threaded PVC schedule 80 ☐
Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature: SH WL

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station

Facility License, Permit or Monitoring No.:

Facility ID:

Type of Well: Well Code 72/dp

Distance from Waste/Source: ft.

State: IL

Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat. 40° 35' 14.2" Long. -89° 39' 56.2" or

St. Plane 1,428,201 ft. N, 2,435,740 ft. E. E/Ⓦ

Section Location of Waste/Source: ☒ E ☐ W

____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number:

Well Name: AW-14

Date Well Installed: 01/08/2021

Well Installed By: (Person's Name and Firm)

Dave Gordon

Cascade Drilling

A. Protective pipe, top elevation 439.99 ft. (NAVD88)

B. Well casing, top elevation 439.40 ft. (NAVD88)

C. Land surface elevation 436.8 ft. (NAVD88)

D. Surface seal, bottom 434.8 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 418.8 ft. (NAVD88) or 18.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 415.3 ft. (NAVD88) or 21.5 ft.

H. Screen joint, top 412.8 ft. (NAVD88) or 24.0 ft.

I. Well bottom 407.8 ft. (NAVD88) or 29.0 ft.

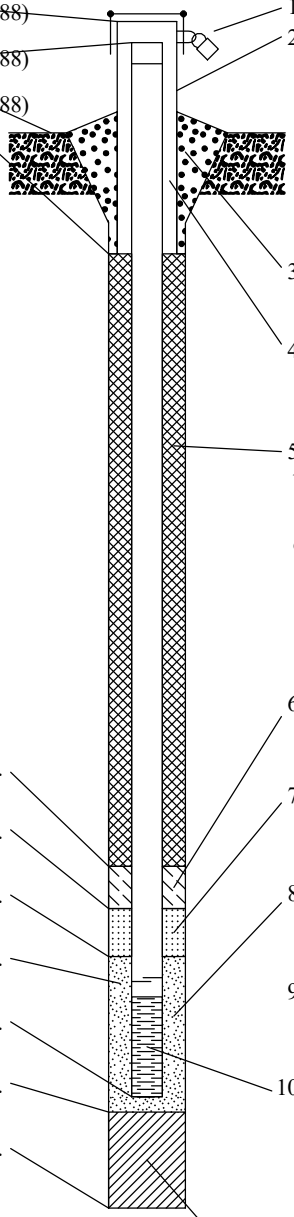
J. Filter pack, bottom 405.8 ft. (NAVD88) or 31.0 ft.

K. Borehole, bottom 401.8 ft. (NAVD88) or 35.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 2.793 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.571 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ Bentonite Chips Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 5/19/2021

Signature

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station

Facility License, Permit or Monitoring No.:

Facility ID:

Type of Well: Well Code 72/dp

Distance from Waste/Source: ft.

State: IL

Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat. 40° 35' 16.6" Long. -89° 40' 0.6" or

St. Plane 1,428,445 ft. N, 2,435,405 ft. E. E/Ⓦ

Section Location of Waste/Source: ☒ E ☐ W

____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number:

Well Name: AW-15

Date Well Installed: 01/08/2021

Well Installed By: (Person's Name and Firm)

Dave Gordon

Cascade Drilling

A. Protective pipe, top elevation 442.02 ft. (NAVD88)

B. Well casing, top elevation 441.51 ft. (NAVD88)

C. Land surface elevation 439.0 ft. (NAVD88)

D. Surface seal, bottom 437.0 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 411.0 ft. (NAVD88) or 28.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 408.0 ft. (NAVD88) or 31.0 ft.

H. Screen joint, top 406.0 ft. (NAVD88) or 33.0 ft.

I. Well bottom 401.0 ft. (NAVD88) or 38.0 ft.

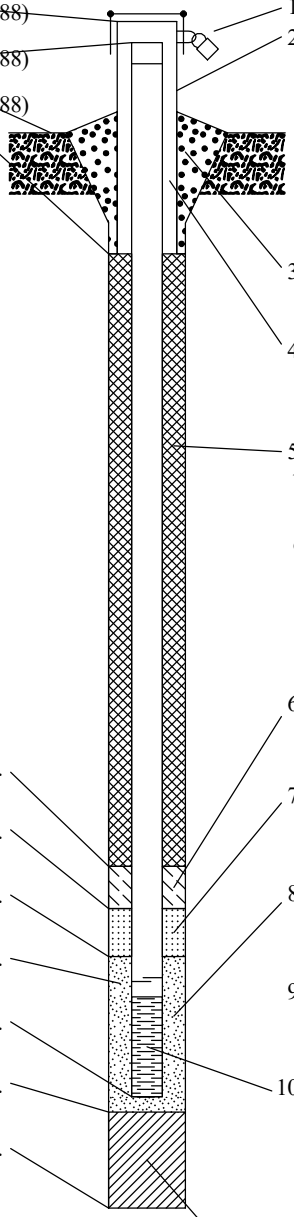
J. Filter pack, bottom 399.0 ft. (NAVD88) or 40.0 ft.

K. Borehole, bottom 399.0 ft. (NAVD88) or 40.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 4.538 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. K & E Well Gravel #7
b. Volume added 1.571 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 5/19/2021

Signature

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-15C
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 16.8" Long. -89° 40' 0.8" or	
Facility ID	St. Plane 1,428,458 ft. N, 2,435,388 ft. E. E/Ⓦ	Date Well Installed: 01/08/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Dave Gordon
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ Cascade Drilling

A. Protective pipe, top elevation 440.67 ft. (NAVD88)

B. Well casing, top elevation 440.02 ft. (NAVD88)

C. Land surface elevation 437.6 ft. (NAVD88)

D. Surface seal, bottom 435.6 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐
Hollow Stem Auger ☐
Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐
Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 400.6 ft. (NAVD88) or 37.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 396.6 ft. (NAVD88) or 41.0 ft.

H. Screen joint, top 394.6 ft. (NAVD88) or 43.0 ft.

I. Well bottom 389.6 ft. (NAVD88) or 48.0 ft.

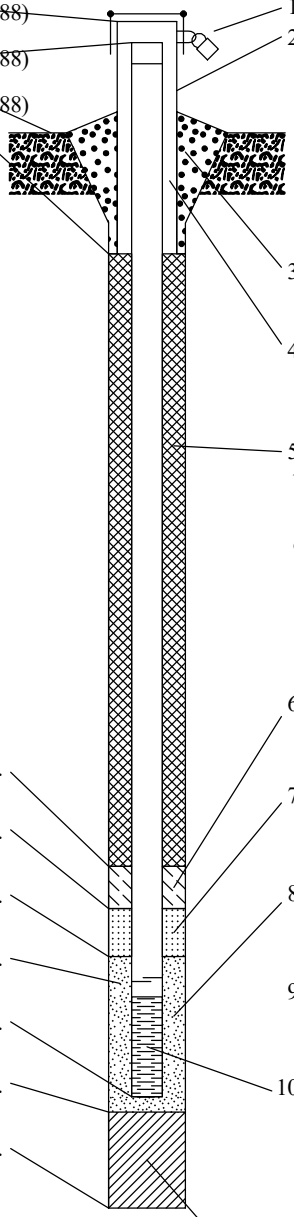
J. Filter pack, bottom 385.6 ft. (NAVD88) or 52.0 ft.

K. Borehole, bottom 337.6 ft. (NAVD88) or 100.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒
Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐
Concrete ☒
Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐
Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 6.109 Ft^3 volume added for any of the above
f. How installed: Tremie ☐
Tremie pumped ☒
Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. K & E Well Gravel #7
b. Volume added 0.873 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒
Flush threaded PVC schedule 80 ☐
Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒
Continuous slot ☐
Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐
Bentonite Grout Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station

Facility License, Permit or Monitoring No.:

Facility ID:

Type of Well: Well Code 71/dw

Distance from Waste/Source: ft. | State: IL

Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat. 40° 35' 16.6" Long. -89° 40' 0.6" or

St. Plane 1,428,442 ft. N, 2,435,400 ft. E. E/Ⓦ

Section Location of Waste/Source: ☒ E ☐ W

____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number:

Well Name: AW-15S

Date Well Installed: 01/08/2021

Well Installed By: (Person's Name and Firm): Dave Gordon, Cascade Drilling

A. Protective pipe, top elevation 441.29 ft. (NAVD88)

B. Well casing, top elevation 440.71 ft. (NAVD88)

C. Land surface elevation 437.9 ft. (NAVD88)

D. Surface seal, bottom 436.9 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required): Potable Water from Site - City of Peoria

E. Bentonite seal, top 436.9 ft. (NAVD88) or 1.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 431.9 ft. (NAVD88) or 6.0 ft.

H. Screen joint, top 429.9 ft. (NAVD88) or 8.0 ft.

I. Well bottom 419.9 ft. (NAVD88) or 18.0 ft.

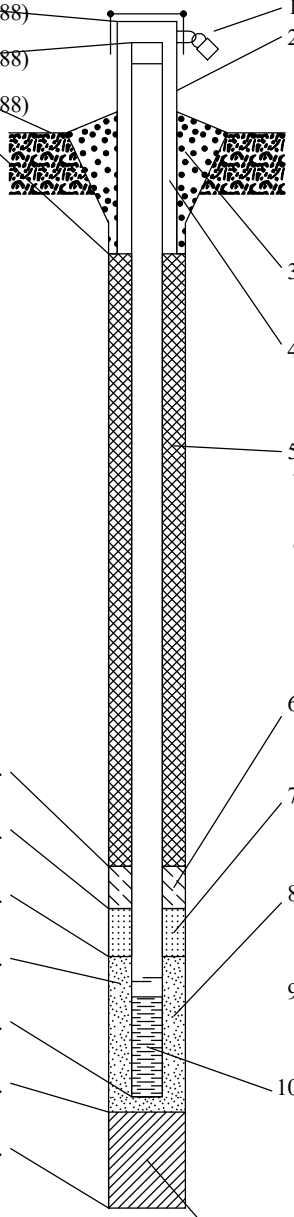
J. Filter pack, bottom 417.9 ft. (NAVD88) or 20.0 ft.

K. Borehole, bottom 417.9 ft. (NAVD88) or 20.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 0.873 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 2.443 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 5/19/2021

Signature

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-16
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 22.0" Long. -89° 40' 4.1" or	
Facility ID	St. Plane 1,428,987 ft. N, 2,435,131 ft. E. E/Ⓦ	Date Well Installed: 01/07/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ Cascade Drilling

A. Protective pipe, top elevation 462.46 ft. (NAVD88)

B. Well casing, top elevation 461.79 ft. (NAVD88)

C. Land surface elevation 459.5 ft. (NAVD88)

D. Surface seal, bottom 457.5 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 409.5 ft. (NAVD88) or 50.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 407.0 ft. (NAVD88) or 52.5 ft.

H. Screen joint, top 404.5 ft. (NAVD88) or 55.0 ft.

I. Well bottom 399.5 ft. (NAVD88) or 60.0 ft.

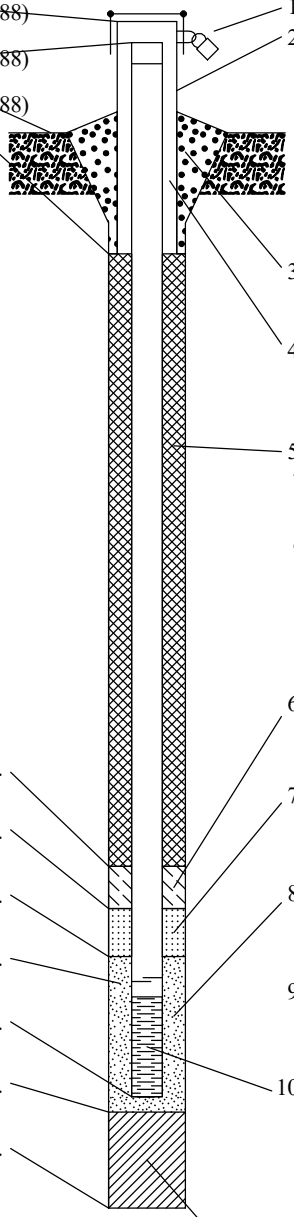
J. Filter pack, bottom 396.5 ft. (NAVD88) or 63.0 ft.

K. Borehole, bottom 396.5 ft. (NAVD88) or 63.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 8.378 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. K & E Well Gravel #7
b. Volume added 1.833 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-17
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 30.1" Long. -89° 40' 9.9" or	
Facility ID	St. Plane 1,429,801 ft. N, 2,434,680 ft. E. E/Ⓦ	Date Well Installed: 01/08/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / Cascade Drilling

A. Protective pipe, top elevation 462.76 ft. (NAVD88)

B. Well casing, top elevation 462.10 ft. (NAVD88)

C. Land surface elevation 459.7 ft. (NAVD88)

D. Surface seal, bottom 457.7 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 412.7 ft. (NAVD88) or 47.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 410.7 ft. (NAVD88) or 49.0 ft.

H. Screen joint, top 408.7 ft. (NAVD88) or 51.0 ft.

I. Well bottom 403.7 ft. (NAVD88) or 56.0 ft.

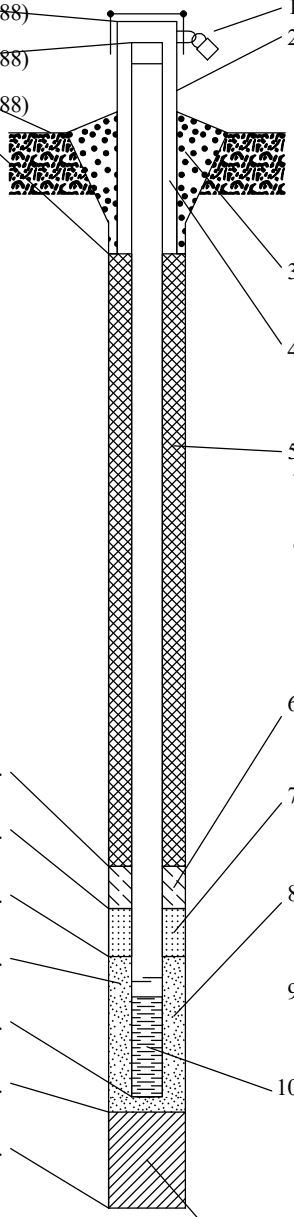
J. Filter pack, bottom 403.7 ft. (NAVD88) or 56.0 ft.

K. Borehole, bottom 402.7 ft. (NAVD88) or 57.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 7.854 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. K & E Well Gravel #7
b. Volume added 1.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-18
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 34.9" Long. -89° 40' 11.4" or	
Facility ID	St. Plane 1,430,291 ft. N, 2,434,561 ft. E. E/Ⓦ	Date Well Installed: 01/09/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen / Cascade Drilling
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation 463.32 ft. (NAVD88)

B. Well casing, top elevation 462.65 ft. (NAVD88)

C. Land surface elevation 460.3 ft. (NAVD88)

D. Surface seal, bottom 458.3 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 418.3 ft. (NAVD88) or 42.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 416.3 ft. (NAVD88) or 44.0 ft.

H. Screen joint, top 414.3 ft. (NAVD88) or 46.0 ft.

I. Well bottom 409.3 ft. (NAVD88) or 51.0 ft.

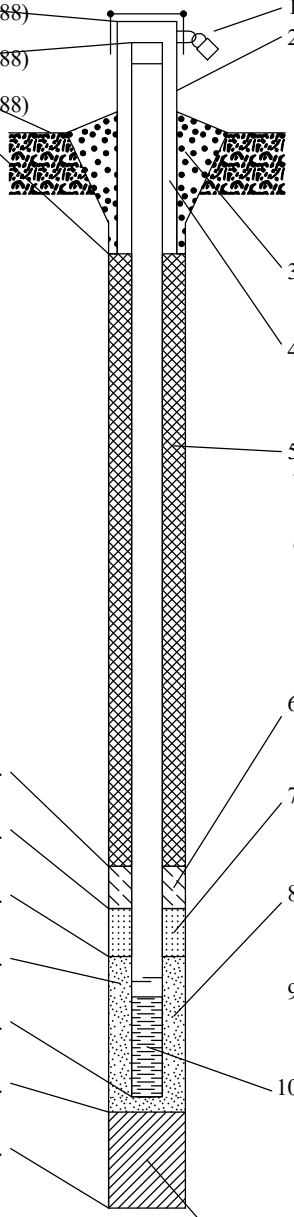
J. Filter pack, bottom 409.3 ft. (NAVD88) or 51.0 ft.

K. Borehole, bottom 405.3 ft. (NAVD88) or 55.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 6.981 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.134 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll, 234 W. Florida Street, Milwaukee,WI 53204 Tel: (414) 837-3607 Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-19
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 43.5" Long. -89° 40' 11.0" or	
Facility ID	St. Plane 1,431,162 ft. N, 2,434,585 ft. E. E/Ⓦ	Date Well Installed: 01/09/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / Cascade Drilling

A. Protective pipe, top elevation 461.14 ft. (NAVD88)

B. Well casing, top elevation 460.74 ft. (NAVD88)

C. Land surface elevation 458.5 ft. (NAVD88)

D. Surface seal, bottom 456.5 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 427.5 ft. (NAVD88) or 31.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 425.5 ft. (NAVD88) or 33.0 ft.

H. Screen joint, top 423.5 ft. (NAVD88) or 35.0 ft.

I. Well bottom 418.5 ft. (NAVD88) or 40.0 ft.

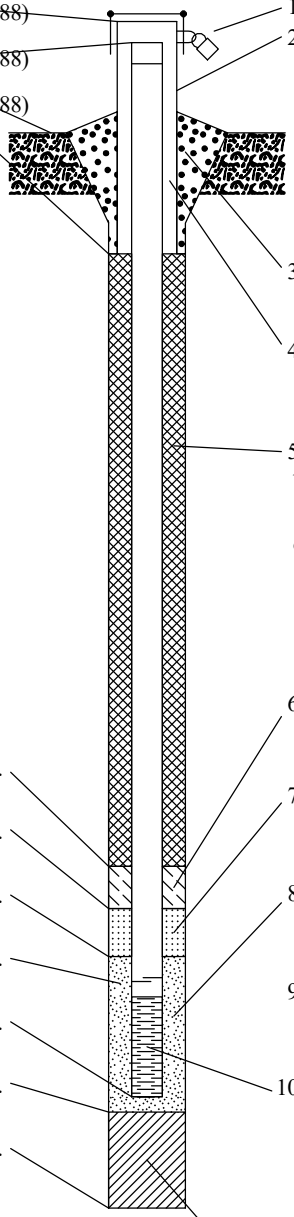
J. Filter pack, bottom 418.5 ft. (NAVD88) or 40.0 ft.

K. Borehole, bottom 415.5 ft. (NAVD88) or 43.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 5.061 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.156 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-20
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 47.3" Long. -89° 40' 8.1" or	
Facility ID	St. Plane 1,431,540 ft. N, 2,434,807 ft. E. E/Ⓦ	Date Well Installed: 01/10/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen / Cascade Drilling
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation 461.57 ft. (NAVD88)

B. Well casing, top elevation 461.48 ft. (NAVD88)

C. Land surface elevation 459.1 ft. (NAVD88)

D. Surface seal, bottom 457.1 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 427.1 ft. (NAVD88) or 32.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 425.1 ft. (NAVD88) or 34.0 ft.

H. Screen joint, top 422.6 ft. (NAVD88) or 36.5 ft.

I. Well bottom 417.6 ft. (NAVD88) or 41.5 ft.

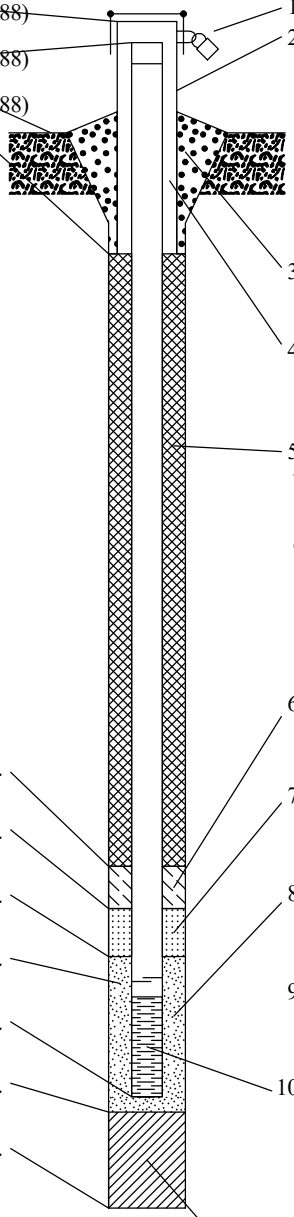
J. Filter pack, bottom 417.6 ft. (NAVD88) or 41.5 ft.

K. Borehole, bottom 416.1 ft. (NAVD88) or 43.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 5.236 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.276 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll, 234 W. Florida Street, Milwaukee,WI 53204 Tel: (414) 837-3607 Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-21
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 50.2" Long. -89° 40' 3.8" or	
Facility ID	St. Plane 1,431,842 ft. N, 2,435,132 ft. E. E/Ⓦ	Date Well Installed: 01/10/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Adam Jochimsen
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / Cascade Drilling

A. Protective pipe, top elevation 460.84 ft. (NAVD88)

B. Well casing, top elevation 460.61 ft. (NAVD88)

C. Land surface elevation 458.3 ft. (NAVD88)

D. Surface seal, bottom 456.3 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 430.3 ft. (NAVD88) or 28.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 428.3 ft. (NAVD88) or 30.0 ft.

H. Screen joint, top 426.3 ft. (NAVD88) or 32.0 ft.

I. Well bottom 421.3 ft. (NAVD88) or 37.0 ft.

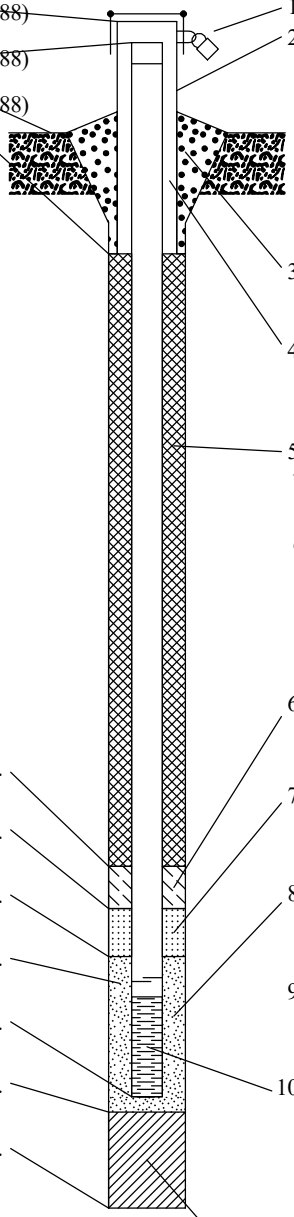
J. Filter pack, bottom 421.3 ft. (NAVD88) or 37.0 ft.

K. Borehole, bottom 420.3 ft. (NAVD88) or 38.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 4.538 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.2 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature ____ Firm Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AW-22
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 48.6" Long. -89° 40' 0.4" or	
Facility ID	St. Plane 1,431,677 ft. N, 2,435,397 ft. E. E/Ⓦ	Date Well Installed: 01/08/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Russ Gordon
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ Cascade Drilling

A. Protective pipe, top elevation 463.90 ft. (NAVD88)

B. Well casing, top elevation 463.19 ft. (NAVD88)

C. Land surface elevation 460.3 ft. (NAVD88)

D. Surface seal, bottom 458.3 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐
Hollow Stem Auger ☐
Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐
Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 420.3 ft. (NAVD88) or 40.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 418.3 ft. (NAVD88) or 42.0 ft.

H. Screen joint, top 416.3 ft. (NAVD88) or 44.0 ft.

I. Well bottom 411.3 ft. (NAVD88) or 49.0 ft.

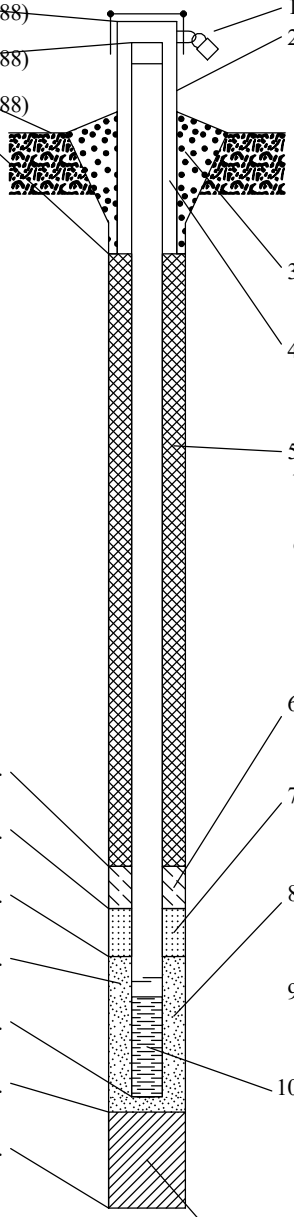
J. Filter pack, bottom 411.3 ft. (NAVD88) or 49.0 ft.

K. Borehole, bottom 410.3 ft. (NAVD88) or 50.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 6.632 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 1.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒
Flush threaded PVC schedule 80 ☐
Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature: SH WL

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: XPW01A
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 46.7" Long. -89° 40' 2.4" or	
Facility ID	St. Plane 1,431,483 ft. N, 2,435,242 ft. E. E/Ⓦ	Date Well Installed: 01/09/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Russ Gordon
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ Cascade Drilling

A. Protective pipe, top elevation 464.42 ft. (NAVD88)

B. Well casing, top elevation 464.16 ft. (NAVD88)

C. Land surface elevation 461.0 ft. (NAVD88)

D. Surface seal, bottom 459.0 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 432.0 ft. (NAVD88) or 29.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 430.0 ft. (NAVD88) or 31.0 ft.

H. Screen joint, top 428.0 ft. (NAVD88) or 33.0 ft.

I. Well bottom 418.0 ft. (NAVD88) or 43.0 ft.

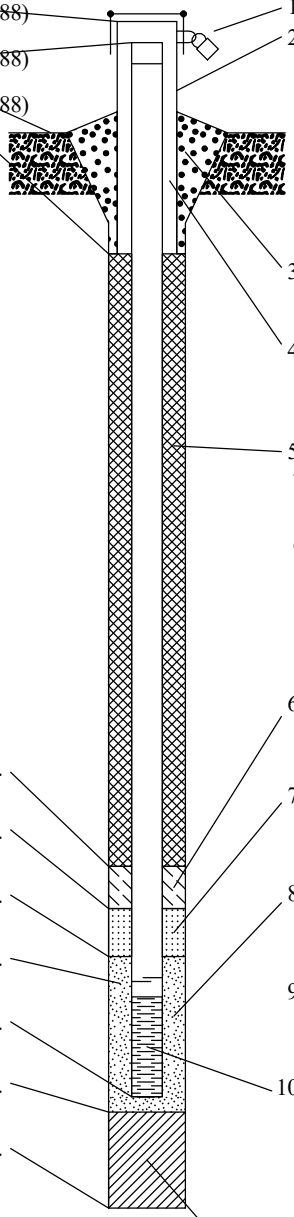
J. Filter pack, bottom 418.0 ft. (NAVD88) or 43.0 ft.

K. Borehole, bottom 418.0 ft. (NAVD88) or 43.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 4.712 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 2.094 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature: SH WL

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: XPW02
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 40° 35' 39.6" Long. -89° 40' 5.9" or	
Facility ID	St. Plane 1,430,769 ft. N, 2,434,978 ft. E. E/Ⓦ	Date Well Installed: 01/09/2021
Type of Well: Well Code 72/dp	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Russ Gordon
Distance from Waste/Source ft. / State: IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / Cascade Drilling

A. Protective pipe, top elevation 474.46 ft. (NAVD88)

B. Well casing, top elevation 473.79 ft. (NAVD88)

C. Land surface elevation 471.2 ft. (NAVD88)

D. Surface seal, bottom 469.2 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐
Hollow Stem Auger ☐
Mini Sonic — Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐
Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 439.2 ft. (NAVD88) or 32.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 437.2 ft. (NAVD88) or 34.0 ft.

H. Screen joint, top 435.2 ft. (NAVD88) or 36.0 ft.

I. Well bottom 425.2 ft. (NAVD88) or 46.0 ft.

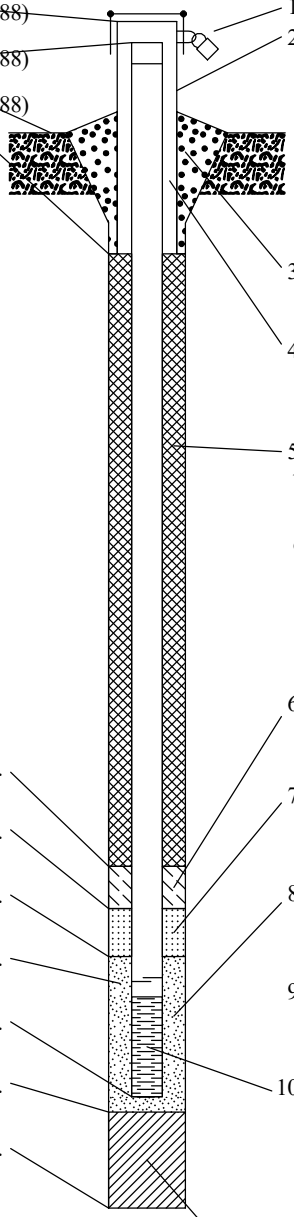
J. Filter pack, bottom 425.2 ft. (NAVD88) or 46.0 ft.

K. Borehole, bottom 424.2 ft. (NAVD88) or 47.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ / Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards
3. Surface seal: Bentonite ☐ / Concrete ☒ / Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ / Sand — Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 5.236 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ / Tremie pumped ☒ / Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 2.073 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ / Flush threaded PVC schedule 80 ☐ / Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒ / Continuous slot ☐ / Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ / Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 5/19/2021

Signature: SH WL

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Edwards Power Station

Facility License, Permit or Monitoring No.:

Facility ID:

Type of Well: Well Code 72/dp

Distance from Waste/Source: ft.

State: IL

Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat. 40° 35' 29.1" Long. -89° 39' 58.3" or

St. Plane 1,429,704 ft. N, 2,435,574 ft. E. E/Ⓦ

Section Location of Waste/Source: ☒ E ☐ W

____ 1/4 of ____ 1/4 of Sec. ____, T. 7 N, R. 7

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number:

Well Name: XPW03

Date Well Installed: 01/10/2021

Well Installed By: (Person's Name and Firm)

Russ Gordon

Cascade Drilling

A. Protective pipe, top elevation 466.56 ft. (NAVD88)

B. Well casing, top elevation 466.04 ft. (NAVD88)

C. Land surface elevation 462.6 ft. (NAVD88)

D. Surface seal, bottom 460.6 ft. (NAVD88) or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐
Hollow Stem Auger ☐
Mini Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐
Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):
Potable Water from Site - City of Peoria

E. Bentonite seal, top 439.6 ft. (NAVD88) or 23.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 437.6 ft. (NAVD88) or 25.0 ft.

H. Screen joint, top 435.6 ft. (NAVD88) or 27.0 ft.

I. Well bottom 425.6 ft. (NAVD88) or 37.0 ft.

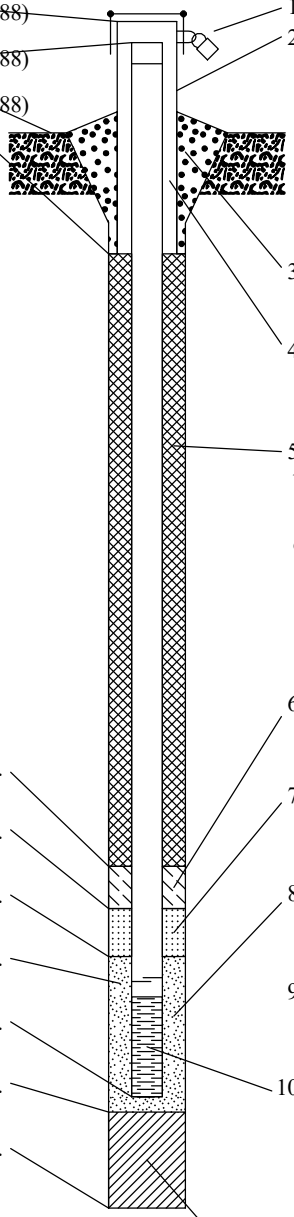
J. Filter pack, bottom 425.6 ft. (NAVD88) or 37.0 ft.

K. Borehole, bottom 422.6 ft. (NAVD88) or 40.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒
Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Bollards

3. Surface seal: Bentonite ☐
Concrete ☒
Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐
Sand Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☐
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
c. 9.6 Lbs/gal mud weight . . . Bentonite slurry ☒
d. ____ % Bentonite . . . Bentonite-cement grout ☐
e. 3.665 Ft^3 volume added for any of the above
f. How installed: Tremie ☐
Tremie pumped ☒
Gravity ☐

6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Not Applicable
b. Volume added 0 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. P.W. Gillibrand, Industrial Sand
b. Volume added 2.029 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒
Flush threaded PVC schedule 80 ☐
Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ☒
Continuous slot ☐
Other ☐
b. Manufacturer Johnson Screens
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☐
Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

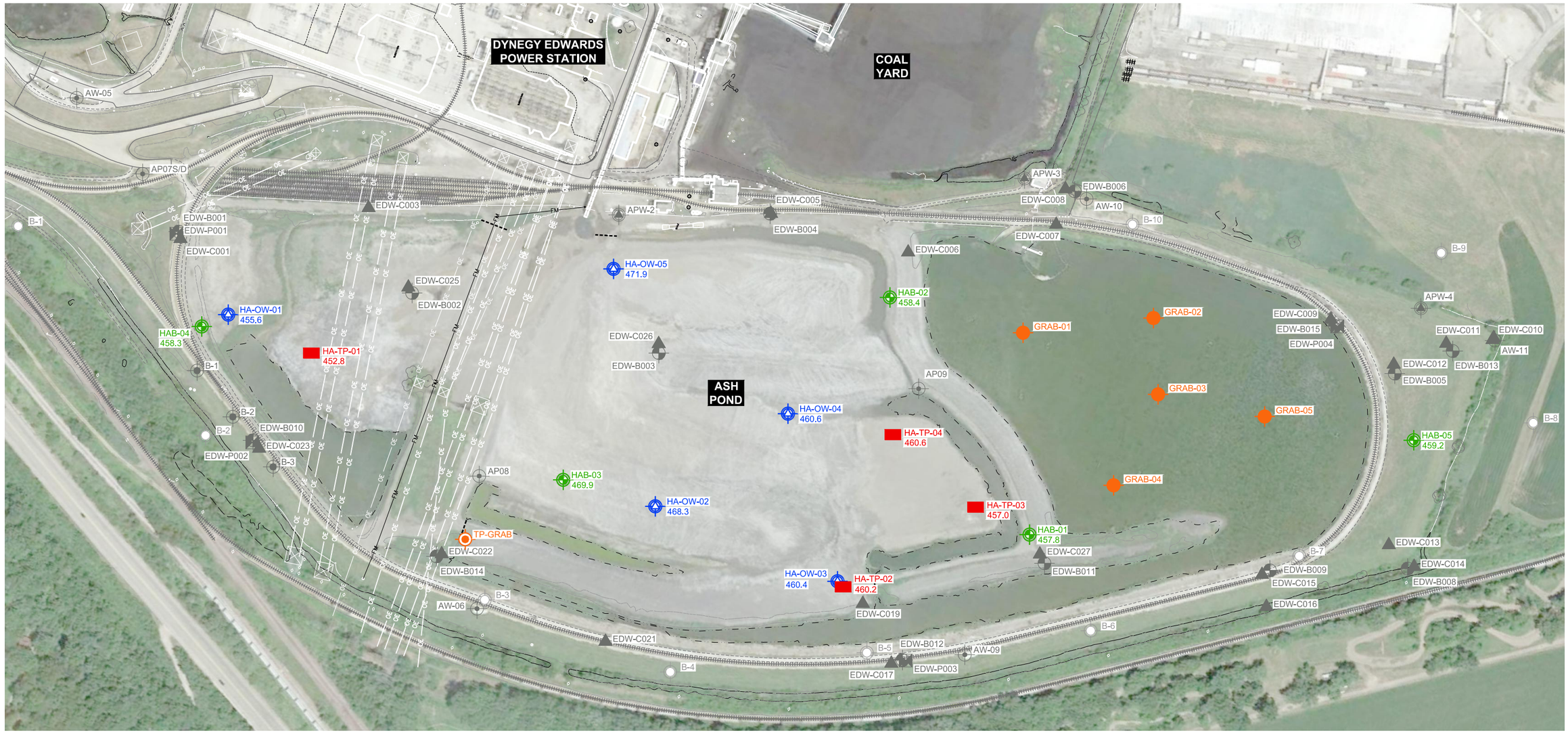
Date Modified: 5/19/2021

Signature

Firm: Ramboll
234 W. Florida Street, Milwaukee,WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

PRE-2021 BORING LOGS



LEGEND

- HAB-04 458.3 — DESIGNATION, LOCATION, AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY STRATA EARTH SERVICES, LLC. OF PALATINE, ILLINOIS DURING THE PERIOD 27 NOVEMBER 2017 TO 8 DECEMBER 2018.
- HA-OW-01 455.6 — DESIGNATION, LOCATION, AND GROUND SURFACE ELEVATION OF OBSERVATION WELLS INSTALLED BY STRATA EARTH SERVICES, LLC. OF PALATINE, ILLINOIS DURING THE PERIOD 7 DECEMBER 2017 TO 8 DECEMBER 2018.
- GRAB-04 — DESIGNATION AND APPROXIMATE LOCATION OF OF GRAB SAMPLES COLLECTED BY STRATA EARTH SERVICES, LLC. OF PALATINE, ILLINOIS ON 4 DECEMBER 2017.
- TP-GRAB — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT GRAB SAMPLES COLLECTED BY HALEY & ALDRICH ON 19 JANUARY 2018.
- HA-TP-01 452.8 — DESIGNATION, LOCATION, AND GROUND SURFACE ELEVATION OF TEST PITS PERFORMED AND GRAB SAMPLES COLLECTED BY HEADWATERS, INC. OF SOUTH JORDAN, UTAH DURING THE PERIOD 12 DECEMBER 2017 TO 13 DECEMBER 2017.
- EDW-B014 — DESIGNATION AND APPROXIMATE LOCATIONOF TEST BORINGS PERFORMED BY STRATA EARTH SERVICES, INC. OF PALATINE, ILLINOIS FOR AECOM DURING THE PERIOD 3 TO 13 SEPTEMBER AND 5 NOVEMBER 2015.
- EDW-C021 — DESIGNATION AND APPROXIMATE LOCATION OF CONE PENETROMETERS SOUNDING PERFORMED BY CONETEC, INC. OF NEW BERLIN, NEW JERSEY DURING THE PERIOD 19 TO 29 AUGUST 2015.
- EDW-P002 — DESIGNATION AND APPROXIMATE LOCATIONOF PIEZOMETERS INSTALLED BY STRATA EARTH SERVICES, INC. OF PALATINE, ILLINOIS FOR AECOM DURING THE PERIOD 4 SEPTEMBER AND 4 TO 5 NOVEMBER 2015.
- B-3 — DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY GEOTECHNOLOGY, INC. OF COLLINSVILLE, ILLINOIS ON 19 JULY 2010.
- APW-2 — EXISTING GEOTECHNOLOGY 2010 MONITORING WELL.
- AW-06 — EXISTING HANSON 2015 MONITORING WELL.
- B-4 — DESIGNATION AND APPROXIMATE LOCATION OF HISTORIC TEST BORINGS PERFORMED BY REITZ & JENS IN 2003.

NOTES

1. BACKGROUND IMAGE PROVIDED BY GOOGLE EARTH PRO, DATED 16 JUNE 2016.
2. ELEVATIONS INDICATED IN THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM. HORIZONTAL DATUM IS NAD83 ILLINOIS STATE PLANE WEST ZONE, US FOOT.
3. TECHNICAL MONITORING OF SUBSURFACE EXPLORATIONS SHOWN IN GREEN, BLUE, RED, AND ORANGE WAS PERFORMED BY HALEY & ALDRICH DURING THE PERIOD 27 NOVEMBER TO 13 DECEMBER 2017.
4. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF EXPLORATIONS WERE DETERMINED IN THE FIELD BY OPTICAL SURVEY BY MAURER-STUTZ, INC. OF PEORIA, ILLINOIS.

N

0 300 600
SCALE IN FEET

HALEY ALDRICH

DYNEGY EDWARDS POWER STATION
7800 SOUTH CILCO LANE
BARTONVILLE, ILLINOIS

DRAFT

SUBSURFACE EXPLORATION LOCATIONS PLAN

SCALE: AS SHOWN
FEBRUARY 2018

FIGURE 2

VARI, KATALIN Printed: 2/8/2018 12:00 PM Layout: ...
G:\129319-DYNEGY POND CLOSURES\CAD\FIGURES\GEOTEC\129319_003_FIG-2_EXPL LOC.DWG

HALEY ALDRICH

TEST BORING REPORT DRAFT

Boring No. HAB-01

Project: Edwards Power Station, Bartonville, Illinois
Client: Dynegy
Contractor: Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 3
Start 30 November 2017
Finish 30 November 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 457.8
Datum NGVD 88
Location N 1,429,282.52 E 2,435,251.74

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Augers to 17 ft
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																
	8 8 8	S1 10	3.5 5.0		ML	Medium dense gray to black SILT (ML), no structure, moist, PP=0.5 tons/ft^2						100				
5						-FLY ASH-										
	1 WOH 1 WOH	S2, S3 24	7.5 9.5		ML	Similar to S1, except very loose, wet, and tan bedding						100				
					ML	Very loose tan SILT (ML), no structure, wet, PP=0.5 tons/ft^2						100				
10	P U S H	U1 10	10.0 12.0		ML	Similar to S3						100				
	2 1 2	S4 20	13.5 15.0		ML	Very loose gray to black SILT with sand (ML), some gray/sandy bedding, wet, becoming silt at bottom 8.0 in.					15	85				
15	P U S H	U2 17.5	15.0 17.0		ML	Similar to S4						100				
						Note: Switched to rotary drilling with water at 17.0 ft.										
	WOH WOH WOH	S5, S6 24	18.5 20.5		ML	Very loose gray to black SILT (ML), 1.0 in. bed tan silt at 19.5 ft, wet, PP=0 tons/ft^2, tan from 19.8 ft to 20.5 ft						100				
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
11/30/17		0	7.5	9.5	5.5

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	58.8
Rock Cored (ft)	-
Samples	14S, 5U

Boring No. HAB-01

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	WOH															
	WOR WOR WOH	S7 24	23.5 25.0		ML	Very loose gray to black SILT (ML), no structure, wet, PP=0 tons/ft ^{2}						100				
						-FLY ASH-										
25	P U S H	U3 24	25.0 27.0		ML	Similar to S7					1	99				
	WOH WOH 1 WOH	S8 24	28.5 30.5		ML	Similar to S7, except contains sandy pockets					5	95				
30																
	1 WOH WOH WOH	S9 24	33.5 35.5		ML	Very loose gray to black SILT (ML), no structure, wet, PP=0 tons/ft ^{2}						100				
35																
	WOR WOR WOR	S10 24	38.5 40.0		ML	Similar to S9, except with some light gray to tan bedding						100				
40				415.8 42.0		Note: Driller estimated strata change at 42.0 ft.										
	WOR WOH WOH 1	S11 24	43.5 45.5		OH	Very soft olive-brown organic SILT (OH), varved, moist to wet, trace organic material and shell fragments						100		M	H	H
45	P U S H	U4 24	45.5 47.5		OH	Similar to S11				1	3	96				
						-ALLUVIAL DEPOSITS-										
	WOH 2 2 2	S12 24	47.5 49.5		OH	Similar to S11, except soft						100				

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-01
File No. 129319-003
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	WOR WOH WOH 3	S13 24	49.5 51.5		OH	Similar to S11 -ALLUVIAL DEPOSITS-						100				
				406.3 51.5												
	P U S H	U5 24	51.5 53.5		CH	Olive-brown fat CLAY (CH), wet					1	99				
55																
				400.8 57.0												
	68/3.5	S14 2.5	58.5 58.8	399.0 58.8	CL	Hard gray lean CLAY (CL), laminated, dry to moist -WEATHERED BEDROCK- BOTTOM OF EXPLORATION AT 58.8 FT Note: PP=Pocket Penetrometer.						100		H	M	L

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HAB-01

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT DRAFT

Boring No. HAB-02

Project	Edwards Power Station, Bartonville, Illinois
Client	Dynegy
Contractor	Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 2
Start 30 November 2017
Finish 01 December 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 458.4
Datum NGVD 88
Location
N 1,429,903.58
E 2,435,764.03

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Augers to 17 ft
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																
	3 2 3	S1 16	3.5 5.0		ML	Loose gray to black SILT (ML), no structure, moist, PP=0.5 tons/ft ^{2}						100				
5						-FLY ASH-										
	2 1 1	S2 18	8.5 10.0		ML	Similar to S1, except very loose and wet, PP=0 tons/ft ^{2}						100				
10						Note: Final hammer blow caused sampler to penetrate 18.0 in.										
	P U S H	U1 0	11.0 13.0			No recovery, shelby tube.										
	1 WOH WOH	S3 4	13.5 15.0		ML	Similar to S1, except very loose and wet with cinders and traces of sand				5	5	90				
15	P U S H	U2 0	15.0 17.0			No recovery, shelby tube.										
						Note: Switch to rotary drilling with water at 17.0 ft.										
	1 WOH WOH	S4 24	18.5 20.5		ML	Very loose gray SILT (ML), 1.0 in. tan bed at 19.5 ft, wet, trace sand pockets, PP=0 tons/ft ^{2}					5	95				
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
11/30/17		0	8.5	10.0	5.0

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	38.5
Rock Cored (ft)	-
Samples	8S, 5U

Boring No. HAB-02

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-02
File No. 129319-003
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	WOH															
	P U S H	U3 24	20.5 22.5		ML	Similar to S4 -FLY ASH-					5	95				
	1 WOH WOH WOH	S5 14	23.5 25.5		ML	Similar to S4						100				
25				432.4 26.0		Note: Driller noted change in drilling at 26.0 ft. -ALLUVIAL DEPOSITS-										
	WOH WOH WOH 2	S6 24	28.5 30.5		CH	Very soft olive-gray to gray-brown fat CLAY (CH), varved, moist to wet, trace organics and shell fragments						100		M	H	H
30	P U S H	U4 18	30.5 32.5		CH	Similar to S6						100				
	WOH 2 2 3	S7 24	32.5 34.5		CH	Soft olive-gray to gray-brown fat CLAY (CH), varved, some red-brown mottling, moist to wet, trace organics and shell fragments, PP=0.25 tons/ft ^{2}						100		M	H	H
	WOH WOH 3 2	S8 24	34.5 36.5		CH	Similar to S7						100				
35	P U S H	U5 24	36.5 38.5		CH	Similar to S7						100				
				419.9 38.5		BOTTOM OF EXPLORATION AT 38.5 FT Note: PP=Pocket Penetrometer.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HAB-02

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HALEY ALDRICH

TEST BORING REPORT DRAFT

Boring No. HAB-03

Project	Edwards Power Station, Bartonville, Illinois
Client	Dynegy
Contractor	Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 5
Start 27 November 2017
Finish 29 November 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 469.9
Datum NGVD 88

Location
N 1,430,619.71
E 2,434,935.46

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Augers to 17.5 ft
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																
	1 1 2	S1 18	3.5 5.0		ML	Very loose light brown SILT with sand (ML), moist					20	80				
5						-FLY ASH-										
10	1 WOH 1	S2 18	10.5 12.0		ML	Similar to S1, except contains tan to light brown mottling, PP=0.5 tons/ft ^{2}					20	80				
	P U S H	U1 15	12.0		ML	Very loose light brown SILT with sand (ML), moist, contains tan to light brown mottling					20	80				
15	12 16 17	S3 16	14.0 15.5		ML	Dense dark brown and black SILT (ML), dry, PP=3 tons/ft ^{2}					5	95				
	P U S H	U2 24	15.5 17.5		ML	Similar to S3					5	95				
						Note: Switched to rotary drilling with water at 17.5 ft.										
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
11/27/17		0	41	43	40
11/30/17			0		15

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	118.0
Rock Cored (ft)	-
Samples	3S, 4U

Boring No. HAB-03

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-03
File No. 129319-003
Sheet No. 2 of 5

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20																
	1 WOH WOH 2	S4 24	23.0 25.0		ML	Very loose gray to black SILT (ML) -FLY ASH-					5	95				
25	1 WOH 5 7	S5 24	25.0 27.0		ML	Similar to S4, except loose					5	95				
	2 4 4 4	S6 13	27.0 29.0	443.4 26.5	SP- SM	Loose gray to black poorly graded SAND with silt (SP-SM), mps 4 mm -BOTTOM ASH-		10	10	10	60	10				
30	1 1 2 2	S7, S8 17	29.0 31.0	440.9 29.0	SP- SM	Very loose gray to black poorly graded SAND with silt (SP-SM), mps 4 mm, contains cinders, contains 12.0 in. thick layer of fly ash from 30.0 ft to 31.0 ft			60	20	10	10				
	1 1 3 6	S9 17	31.0 33.0	438.9 31.0	SP	Very loose to loose gray to black poorly graded SAND (SP), mps 5 mm		5	60	15	15	5				
	2 2 4 5	S0 23	33.0 35.0		SP	Loose gray to black poorly graded SAND (SP), mps 3 mm		15	75	5	5					
35	2 4 6 18	S11 18	35.0 37.0		SP	Loose gray to black poorly graded SAND (SP), some cementation, contains cinders			20	60	20					
	26 26 19 36	S12 15	37.0 39.0		SP	Dense gray to black poorly graded SAND (SP), mps 3 mm Note: Drilling fluid additive added at 37.0 ft.			5	5	75	5				
40	19 17 40 35	S13 18	39.0 41.0		SP	Similar to S12, except hard with greater cinder content and some cementation, PP=3 tons/ft ^{2}			5	5	75	5				
	10 6 6 4	S14 18	41.0 43.0	427.9 42.0	SP	Similar to S12, except medium dense			5	5	75	5				
	WOH WOH WOH WOH	S15 11	43.0 45.0		ML ML	Medium dense gray-brown SILT (ML), at 42.0 ft -FLY ASH- Very loose gray-brown SILT (ML), PP=0 tons/ft ^{2}					5 5	95 95				
45	WOR WOR 1 2	S16 21	45.0 47.0		ML	Similar to S15					10	90				
	1 WOH 1 2	S17 23	47.0 49.0		ML	Similar to S15, except with interbedded black poorly graded medium SAND					5	95				
	1	S18	49.0		ML	Similar to S15, except with interbedded black poorly graded SAND and					5	95				

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-003TB.GPJ 12 Feb 18

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	WOH WOH 2	24	51.0			contains cinders, mps 10 mm										
	1 1 2 3	S19 23	51.0 53.0		ML	Very loose gray-brown SILT with sand (ML), contains cinders -FLY ASH-					20	80				
	WOH 1 WOH WOH	S20 24	53.0 55.0		ML	Similar to S19					20	80				
55	P U S H	U3 24	55.0 57.0		ML	Top 1.0 ft similar to S19					20	80				
				413.9 56.0	CH	Bottom 1.0 ft gray fat CLAY (CH), wet					1	99				
	WOH 4 4 4	S21 24	57.0 59.0		CH	Medium stiff gray fat CLAY (CH), varved, tan to brown mottling, moist to wet, trace organics, PP=0.75 tons/ft ^{2} -ALLUVIAL DEPOSITS-						100				
	12 6 8 16	S22 24	59.0 61.0		CH	Similar to S21, except stiff						100				
60				409.4 60.5												
	P U S H	U4 16	61.0 62.5		CL	Olive-gray lean CLAY with gravel (CL), mps 25 mm, moist, PP=1.5 tons/ft ^{2}	12	13	4	5	6	60		H	M	H
				406.9 63.0												
	53 75/2"	S23 8	63.0 64.1		CH	Hard olive-gray fat CLAY (CH), laminated, moist to dry, PP=>4.5 tons/ft ^{2} -DECOMPOSED ROCK-						100		H	M	H
65																
	12 26 74	S24 10	68.5 70.0		CL	Similar to S23						100				
70																
	75/3"	S25 3	73.5 73.8		CL	Hard olive gray lean CLAY (CL), laminated, moist to dry, PP=>4.5 tons/ft ^{2}						100		H	M	H
75																
	75/3"	S26 3	78.5		CL	Similar to S25						100				

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-03
File No. 129319-003
Sheet No. 4 of 5

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
			78.8													
80																
	60/3.5"	S27 3.5	83.5 83.8		CL	Similar to S25						100				
85						-DECOMPOSED ROCK-										
	60/3.5"	S28 3	88.5 88.8		CL	Similar to S25						100				
90																
	60/3.5"	S29 3	93.5 93.8		CL	Similar to S25						100				
95																
	68/4"	S30 10	98.5 99.3		CL	Similar to S25						100				
100																
	60/4"	S31 3	103.5 103.8		CL	Similar to S25						100				
105																
	70/4"	S32	108.5									100				

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HAB-03

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-003TB.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-03
File No. 129319-003
Sheet No. 5 of 5

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
		3	108.8		CL	Similar to S25										
110						-DECOMPOSED ROCK-										
						Note: Driller notes hard drilling at 112.0 ft										
	100/1"	S33 0	113.5 113.6			No recovery. Note: Spoon refusal at depth 113.6 ft.										
115																
				351.9 118.0		BOTTOM OF EXPLORATION AT 118.0 ft Note: PP=Pocket Penetrometer.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HAB-03

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT DRAFT

Boring No. HAB-04

Project: Edwards Power Station, Bartonville, Illinois
Client: Dynegy
Contractor: Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 1
Start 05 December 2017
Finish 05 December 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 458.3
Datum NGVD 88
Location N 1,431,767.36 E 2,434,995.09

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Auger
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						-FLY ASH-										
	10 9 7 7	S1, S2 24	2.0 4.0	454.5 3.8	ML	Medium dense gray to black SILT (ML), no structure, moist, PP=3.5 tons/ft ^{2}						100				
5	P U S H	U1 21	4.0 6.0		CH	Stiff brown fat CLAY (CH), varved, some red-brown mottling, moist, PP=2.5 tons/ft ^{2}				1	2	97		M	H	H
						-ALLUVIAL DEPOSITS-										
10	1 3 3 3	S3 20	8.5 10.5		CH	Medium stiff olive-gray fat CLAY (CH), varved, red-brown mottling, moist, PP=0.75 tons/ft ^{2}						100		M	H	H
	1 2 2 3	S4 24	10.5 12.5		CH	Soft olive-gray fat CLAY (CH), varved, brown mottling, moist, trace organics and shell pockets, sand at 12.4 ft, PP=0.5 tons/ft ^{2}					5	95		M	H	H
	P U S H	U2 24	12.5 14.5		CH	Similar to S4					5	95				
15	3 5 7 4	S5 24	14.5 16.5		CH	Stiff olive-brown to olive-gray fat CLAY (CH), varved, moist, trace organics, PP=1.0 tons/ft ^{2}						100		H	H	H
				441.8 16.5		BOTTOM OF EXPLORATION AT 16.5 FT Note: PP=Pocket Penetrometer.										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/5/17		0	14.5	16.5	DRY

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	16.5
Rock Cored (ft)	-
Samples	5S, 2U

Boring No. HAB-04

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

TEST BORING REPORT DRAFT

Boring No. HAB-05

Project	Edwards Power Station, Bartonville, Illinois
Client	Dynegy
Contractor	Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 2
Start 04 December 2017
Finish 06 December 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 459.2
Datum NGVD 88
Location N 1,428,320.25 E 2,435,895.55

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Auger
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	3 5 7 11	S1 22	0.0 2.0		ML	Medium dense brown SILT with sand (ML), mps 5 mm, no structure, moist, contains roots and organics, PP=1.0 tons/ft ^{2}					10	90				
						-FILL-										
	5 17 56	S2 18	3.5 5.0	455.0 4.2	ML	Similar to S1, except very dense					10	90				
					ML	Very dense gray to black SILT (ML), PP=3.0 tons/ft ^{2}					10	90				
5	3 34 45	S3, S4 18	5.0 6.5	453.2 6.0	ML	Very dense to hard brown SILT with sand (ML), no structure, moist					10	90				
	13 15 20 16	S5 *	6.5 8.5		ML	Dense to very dense gray to black SILT (ML), no structure, dry to moist, PP=2.0 tons/ft ^{2}					5	95				
						-FLY ASH-										
	P U S H	U1 14	8.5 10.5		ML	Similar to S4					5	95				
10	P U S H	U2 15	10.5 12.5		ML	Similar to S4					5	95				
				447.7 11.5	SP- SM	Gray to black poorly graded SAND with silt (SP-SM), mps 5 mm, no structure, wet, PP=0.0 tons/ft ^{2}			10	10	70	10				
						-BOTTOM ASH-										
	1 1 1 1 1	S6 12	13.5 15.5		SP- SM	Very loose gray to black poorly graded SAND with silt (SP-SM), mps 5 mm, no structure, wet, PP=0.0 tons/ft ^{2}			10	10	70	10				
15																
				440.7 18.5	SP	Very loose gray to black poorly graded SAND (SP) mps 6 mm, no structure, wet, PP=0.0 tons/ft ^{2}			10	20	70					
	1 1 WOH	S7 20	18.5 20.5													
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/4/17		0	13.5	15.5	15

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	41.5
Rock Cored (ft)	-
Samples	15S, 4U

Boring No. HAB-05

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HAB-05
File No. 129319-003
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	1															
				437.2 22.0		Note: Driller noted resistance change at 22.0 ft										
						-FILL-										
	5 9 12 13	S8 12	23.5 25.5		CH	Very stiff olive-brown to gray-brown fat CLAY (CH), no structure, moist, PP=1.5-2.0 tons/ft ^{2}						100		H	H	H
25	1 1 2 3	S9 6	25.5 27.5		CH	Similar to S8, except soft and light brown, PP=1.0 tons/ft ^{2}						100				
	2 3 4 5	S10 6	27.5 29.5		CH	Similar to S8, except medium stiff and light brown with gray mottling						100				
30	2 2 2 3	S11 20	29.5 31.5		CH	Very soft to soft light brown fat CLAY (CH), gray-brown mottling, moist, PP=0.5 tons/ft ^{2}						100		M	H	H
	1 2 3 3	S12, S13 24	31.5 33.5	427.2 32.0	CH	Similar to S11, except medium stiff						100				
					CH	Medium stiff olive-gray fat CLAY (CH), varved, moist, trace organics, PP=1.25 tons/ft ^{2}						100				
						-ALLUVIAL DEPOSITS-										
35	1 2 2 3	S14 22	33.5 35.5		CH	Soft olive-gray fat CLAY (CH), varved, moist, trace organics						100		M	H	H
	P U S H	U3 24	35.5 37.5		CH	Similar to S14					1	99				
	2 2 3 3	S15 22	37.5 39.5		CH	Similar to S14, except medium stiff with shell fragments, PP=1.0 tons/ft ^{2}						100				
40	P U S H	U4 24	39.5 41.5		CH	Similar to S14						100				
				417.7 41.5		BOTTOM OF EXPLORATION AT 41.5 FT										
						Note: PP=Pocket Penetrometer.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HAB-05

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT DRAFT

Boring No. HA-OW-01

Project	Edwards Power Station, Bartonville, Illinois
Client	Dynegy
Contractor	Strata Earth Services, LLC

File No. 129319-003
Sheet No. 1 of 2
Start 07 December 2017
Finish 08 December 2017
Driller K. Diehl
H&A Rep. C. Giusti

Elevation 455.6
Datum NGVD 88

Location
N 1,431,706.38
E 2,435,045.27

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: Detrich D-120 ATV
Inside Diameter (in.)	4	1 3/8	-	Bit Type: Roller Bit
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)	-	30	-	Casing: Auger to 30.5 ft
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																	
	2 3 3 3	S1 22	3.5 5.5			ML	Loose light brown to black SILT with sand (ML), no structure, moist, PP=1.5 tons/ft^2 -FILL-					20	80				
5																	
	WOH WOH WOH WOH	S2 24	8.5 10.5			ML	Very loose gray to black SILT (ML), no structure, wet, contains fine sand pockets, PP=0.0 tons/ft^2					5	95				
10																	
	WOH WOH WOH WOH	S3 24	10.5 12.5			ML	Similar to S2						100				
	WOH WOH 4 2	S4 24	12.5 14.5		442.1 13.5	SM	Loose gray to black silty SAND (SM), no structure, moist to wet, PP=1.0 tons/ft^2				10	70	20				
					441.1 14.5	ML	-BOTTOM ASH- Very loose gray to black SILT (ML), no structure, wet, contains fine sand pockets, PP=0.0 tons/ft^2					5	95				
15	1 1 2 2	S5 13	14.5 16.5				-FLY ASH-										
	3 1 WOH 2	S6 6	16.5 18.5			ML	Similar to S5					10	90				
	3 7 8 11	S7 12	18.5 20.5		436.6 19.0	CH	Stiff dark brown to gray fat CLAY (CH), varved, moist, contains organics, PP=3.25 tons/ft^2 -ALLUVIAL DEPOSITS-						100		H	H	H
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/7/17		0	8.5	8.5	6
12/11/17	8:00	96	18.0	18.0	4.79

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	34.5
Rock Cored (ft)	-
Samples	10S, 4U

Boring No. HA-OW-01

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

HALEY ALDRICH

TEST BORING REPORT

DRAFT

Boring No. HA-OW-01
File No. 129319-003
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20																	
	2 4 5 6	S8 11	20.5 22.5			CH	Stiff dark brown to gray fat CLAY (CH), varved, some light brown mottling, moist, contains organics, PP=1.0 tons/ft^2						100		H	H	H
							-ALLUVIAL DEPOSITS-										
	P U S H	U1 16	22.5 24.5			CH	Similar to S8						100				
					431.1												
25	2 2 3 3	S9 12	24.5 26.5		24.5	CL	Medium stiff olive-gray and yellow-brown lean CLAY (CL), mottled, moist, contains organics, PP=1.0 tons/ft^2						100		M	H	H
	P U S H	U2 10	26.5 28.5				Note: Shelby tube discarded due to low recovery.				2	2	96				
	P U S H	U3 15	28.5 30.5			CL	Similar to S9						100				
30							Note: Switched to rotary drilling with water at 30.5 ft.										
					425.1												
	WOH 2 2 4	S10 23	30.5 32.5		30.5	CH	Soft gray fat CLAY (CH), varved, moist, contains organic and shell fragments, PP=1.25 tons/ft^2						100		M	H	H
					423.1												
	P U S H	U4 23	32.5 34.5		32.5	ML	Light brown to tan sandy SILT with gravel (ML), moist		20	10	10	10	50				
					421.1												
					34.5		BOTTOM OF EXPLORATION 34.5 FT Note: PP=Pocket Penetrometer. Installed observation well in completed borehole.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-OW-01

H&A-TEST BORING-07-1 129319TB_HA-LIB09.GLB HA-TB+CORE+WELL-07-1.GDT \\HALEYALDRICH.COM\SHAREWAS_COMMON\PROJECTS\129319-DYNEGY POND CLOSURES\003\FIELDWORK\SUBSURFACE EXPLORATION LOGS\GINT\129319-0037B.GPJ 12 Feb 18

File: \\URSSTLOUIS\STLOUIS\PROJECTS\GEOTECH\DYNEGY - BALDWIN 2014\CCR\047ASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2 BORING LOCATION PLAN (EDWARDS ASH POND)_AJW_EDITS.DWG Last edited: AUG. 05, 15 @ 4:03 p.m. by: eric_glazier

EDW-C020
EDW-B007
EDW-C018
EDW-C021
EDW-B012
EDW-C017
EDW-P003
EDW-B014
EDW-C022
EDW-C024
EDW-C023
EDW-B010
EDW-P002
EDW-C019
EDWARDS
ASH POND
EDW-C001
EDW-B001
EDW-P001
EDW-C016
EDW-C027
EDW-B011
EDW-B002
EDW-C025
EDW-C002
EDW-C015
EDW-B009
EDW-C026
EDW-B003
EDW-C014
EDW-B008
EDW-C003
EDW-C013
EDW-C005
EDW-B004
EDW-C004
EDW-C012
EDW-B005
EDW-C006
EDW-C009
EDW-B015
EDW-P004
EDW-C011
EDW-B013
EDW-C007
EDW-C010
EDW-C008
EDW-B006

EXPLORATION METHOD (B=BORING, C=CPT, P=PIEZOMETER)
XXX–X###
ID NUMBER
STATION ABBREVIATION

LEGEND

- PROPOSED BORING LOCATION
- PROPOSED CPT LOCATION
- PROPOSED PIEZOMETER LOCATION
- PROPOSED CROSS SECTION LOCATION
- CCR UNIT BERM ALIGNMENT

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

Ø 400
APPROXIMATE SCALE FEET

DYNEGY, INC	PROJECT NO. 60440202
AECOM	
DRN. BY: djd July 2015 DSGN. BY: eg CHKD. BY: eg	Edwards Ash Pond Field Investigation Plan
	FIG. NO. 1

PRIVILEGED & CONFIDENTIAL - ATTORNEY CLIENT PRIVILEGED

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	AJW
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	51.0 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	460 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	2 6 8	61		Elevation (feet) 460.0 / Depth (feet) 0.0 Stiff, dry, gray mottled with brown, lean CLAY (CL).					3.0			
						457.5 / 2.5								
		SS-2	3 4 5	94		Stiff, moist, brown mottled with gray and black, lean CLAY (CL), trace shell fragments.					3.0			
455	5	SS-3	3 3 3	75		Becomes medium stiff.					1.0			
		ST-4	200 psi	100										*Pushed shelby tube from 7.0 to 9.0 feet*
450	10	SS-5	3 3 6	83		450.0 / 10.0 Stiff, moist, grayish black, lean CLAY (CL), trace organics.					1.0 1.5			
445	15	SS-6	1 3 5	78							1.25			
440	20	SS-7	1 6 7	100		440.0 / 20.0 Stiff, moist, very dark gray to grayish black with some brown, lean CLAY (CL).					1.5 2.5			
435	25	SS-8	WOH WOH 2	100		435.0 / 25.0 Very soft, wet, brown mottled with gray, sandy lean CLAY (CL).					1.0 0.5			
430	30					430.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:32:54 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	150 psi	100		Soft, wet, gray, silty lean CLAY (CL-ML).					1.25			*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS-10	2 2 4	100		425.0 / 35.0 Loose, wet, gray, silty SAND (SM), trace wood fragments. 424.2 / 35.8 Medium stiff, moist, gray, lean CLAY (CL).					0.5 1.0			
420	40	SS-11	50/3"	100		420.0 / 40.0 CLAYSTONE: Brown and gray, weathered, hard.								
415	45	SS-12	50/2"			414.0 / 46.0 SILTSTONE: Thin to medium bedding, fresh, argillaceous.								*Run 1 - Start 13:46, End 14:00*
		Run 1	16.7	36.7										
410	50					409.0 / 51.0 End of Boring at 51 ft								*Boring backfilled with Portland Cement and bentonite*
405	55													
400	60													
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:32:54 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	52.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	7 6 8	89		457.0 / 0.0 Medium dense, moist, dark brown, FLY ASH [Fill].	38.4							
455						454.5 / 2.5								
		SS-1	3 2 2	100		Loose, moist, dark gray, FLY ASH [Fill].	62.4							
	5	ST-3	150 psi	62.5			66.6		65	29				*Pushed shelby tube from 5.0 to 7.0 feet*
450						449.5 / ▽ 7.5								
		SS-4	WOR	100		Very loose, wet, black, FLY ASH [Fill].	79.0							
	10	ST-5		55			76.9	90.8 94.3 91.2	17	NP				*10.0 feet switch to mud rotary* *Pushed shelby tube from 10.0 to 12.0 feet*
445						Becomes dark gray.								
						Hard layer at tip of tube.								
	15	SS-6	1 2 3	100		Becomes loose.	52.5							
440														
	20	SS-7	12 17 2	37		437.0 / 20.0 Medium dense, wet, dark gray, FLY ASH [Fill], with cementous layers.	67.8							
435														
	25	SS-8	1 WOH WOH	100		432.0 / 25.0 Very loose, wet, dark gray, FLY ASH [Fill].	63.9							
430														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:01 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	WOR WOH WOH	100		426.5 With clay. / 30.5 Very soft, wet, brown, lean CLAY (CL), with sand.	126.1 31.1				0.5			
425														
	35	ST-10	100 psi	100		422.0 / 35.0 Very soft, gray, lean CLAY (CL), with sand, trace shells.	31.6		36	18	0.25			
420														
	40	SS-11	WOH WOH WOH	100			42.9				0.75			
415														
	45	SS-12	WOH WOH 2	100		Grades with trace organics.	57.7				0.25			
410						410.0 / 47.0 SHALE: Light gray, silt sized.								
	50	SS-13	50/3"	100			11.1							
405						404.5 / 52.5 End of Boring at 52.5 ft								*Boring backfilled with bentonite and cement fluid*
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:01 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	7 7 7	83		460.0 / 0.0 Medium dense, moist, dark gray, FLY ASH [Fill].	44.4							
		SS-2	3 2 2	100		Becomes loose.	27.3							
455	5	SS-3	1 WOH 2			455.0 / 5.0 Very soft, moist, lean CLAY (CL) with ash, sand, and organics.	37.2							
						▽ 452.5 / 7.5								
		ST-4	<100 psi	100		Ash, dark gray [Fill].	55.5							*Pushed shelby tube from 7.5 to 9.5 feet*
450	10	SS-5	WOR WOR WOR	67			50.6							*10.0 feet: Switch to mud rotary*
						447.0 / 13.0 Very dense, dark gray, moist, fine to coarse ASH with sand and gravel, slightly cemented [Fill].								*13.0 feet: Hard drilling*
445	15	SS-6	26 37 29	100			29.7							
						Becomes very loose, dark gray, fine.								
440	20	SS-7	1 1 1	100			42.1							
435	25	ST-8	100 psi	100		Grades with sand.	54.9							*Pushed shelby tube from 25.0 to 27.0 feet*
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:06 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	100 psi	100		Varved FLY ASH.	71.7	91.2 92.9 92.0						*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS-10	WOR WOR WOR	100		423.5 / 36.5	51.9 43.0							
						Very soft, moist, brown to gray, silty CLAY (CL), trace sand, shells, and organics.								
420	40	SS-11	WOH WOH WOR	100			31.6				.75			
415	45	ST-12	100 psi	100		415.0 / 45.0 Soft, moist, dark gray, fat CLAY (CH) with sand.	46.0				1.0			*Pushed shelby tube from 45.0 to 47.0 feet*
410	50	SS-13	1 2 3	100		410.0 / 50.0 Medium stiff, moist, brownish to greenish, gray, lean CLAY (CL), with sand.	55.4				1.0			
						406.0 / 54.0 SHALE, gray, weathered, silt sized.								
405	55	SS-14	11 50/5"	100			23.3 9.8							
400	60	SS-15	50/3"	100		399.5 / 60.5 End of Boring at 60.5 ft	7.1							*Boring backfilled with bentonite and cement fluid*
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:06 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003A

Sheet 1 of 1

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	9.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' East of EDW-B003 (ft NAD83)	Groundwater Level(s)	7 ft on 9/3/2015		

Depth (feet)	SAMPLES Type Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	MATERIAL DESCRIPTION Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					Offset boring to attempt shelby tube at 7.5 feet	0.0								
5														
	ST-1		0											*Pushed shelby tube from 7.5 to 9.5 feet*
						9.5								
10					End of Boring at 9.5 ft									*Boring backfilled with bentonite and cement fluid*
15														
20														
25														
30														

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:12 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0							0.0								
	SS	1	16 12 15	83		6" stone at surface.	0.5	18.9							
						Medium dense, moist, dark gray, ASH [Fill].									
	SS	2	3 2 2	100			3.5	28.5 20.1							
						Becomes dark gray to dark brown, trace silty clay, sand and gravel.									
5	SS	3	2 2 4	77								1.25			
	SS	4	2 3 4	100				21.6				2.0			
10	SS	5	2 2 2	67				21.5				2.0			*10.0 feet: Switch to mud rotary*
							12.5								
	SS	6	2 2 2	100		Soft, wet, brown mottled, silty CLAY (CL), trace sand and gravel.		25.4				1.25			
15	SS	7	2 3 3	77				25.8				1.25			
20	SS	8	WOH 2 3	89		Grades brown, with sand.		31.3				.75			
25	SS	9	2 2 3	89			26.0	23.0 19.5							
						Medium stiff, wet, brown, clayey SAND (SC).	26.5								
						Medium stiff, wet, dark gray to gray, silty CLAY (CL), trace sand.									
30							30.0								

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-10	2 7 6	89		Stiff, gray, wet, lean CLAY (CL), with sand, and organics.	19.7				4.0			
35					35.0 Stiff, wet, gray mottled, lean CLAY (CL) with sand.								
	ST-11		100			20.1				1.25			*Pushed shelby tube from 36.0 to 38.0 feet*
40	SS-12	2 3 3	89		40.0 Stiff, wet, brown mottled, lean CLAY (CL), trace sand.	30.0				1.75			
45	SS-13	2 3 5	83		45.0 Medium stiff, wet, dark gray, lean CLAY (CL).	39.5 35.1				1.25			
50	SS-14	2 2 3	100		50.0 Medium, stiff, wet, gray, lean CLAY (CL) with sand, trace shells and organics.	65.2				1.25			
55	SS-15	3 8 23				33.4 13.2							
					56.0 SHALE: Light gray, weathered.								*56.5 to 60.0 feet: Solid drilling*
60	SS-16	50/3"	100		60.0 End of Boring at 60.3 ft	8.8							*Boring backfilled with bentonite and cement fluid*
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:15 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	8 ft on 9/10/2015		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0	SS	SS-1	4 4 5	95		Medium, stiff, moist, brown, clayey SAND (SC), trace gravel, topsoil, roots and fill.	0.0	45.8				2.0			
							2.5								
	SS	SS-2	9 15 11	100		Medium dense, moist, brown, sandy SILT (ML) with gravel.		26.0							
5	SS	SS-3	2 2 2	100		Loose, moist, brown, sandy elastic SILT (MH) with clay.	5.0	50.9				1.8			
							▽ 8.0								
	SS	SS-4		100		Loose, wet, brown, sandy SILT (ML) with gravel.		37.4							
10	SS	SS-5	1 2 5	100		Medium stiff, wet, light brown and gray, clayey SAND (SC) with gravel.	10.0	44.3							*10.0 feet: Switch to mud rotary*
15	SS	SS-6	2 8 10	100		Very stiff, wet, brown, sand SILT (ML) with gravel.	15.0	41.4							
20	SS	SS-7	1 1 1	100		Soft, wet, brown, gravelly CLAY (CL), trace sand.	20.0	51.1							
25	SS	SS-8	2"	100				55.3							
						Very loose, wet, dark brown ASH [Fill].	26.5	47.6							
30	SS	SS-9		100				69.3							

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:20 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9		100			69.3							
35	SS-10	WOR WOH WOH	67		35.0 Very loose, wet, black, ASH, with organic clay [Fill].	37.3							
40	ST-11	150 psi	100		38.0 Soft, wet, gray, fat CLAY (CH), trace sand, shells, and organics.	44.8		57	35				*Pushed shelby tube from 41.0 to 43.0 feet*
45	SS-12	WOH 2 2	100		45.0 Soft, wet, dark gray and greenish gray, lean CLAY (CL), with sand, organics and shale.	88.7							
50	SS-13	11 18 44	89		49.5 SHALE: light gray, weathered.	15.9 12.8							
55					53.0 End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:21 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Date(s) Drilled	09/08/2015 to 09/08/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	37.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet) / Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0	SS	SS-1	3 4 6	94		Stiff, moist, dark brown, lean CLAY (CL) with sand and glass.	26.4				3.0			
2.5	SS	SS-2	3 3 3	67		Medium stiff, brown to dark brown lean CLAY (CL), trace sand.	30.1				1.25			
5.0	SS	SS-3	2 3 4	100		Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	24.8		48	29	2.0			
	SS	SS-4	3 4 4	100			26.0				1.5			
10	SS	SS-5	1 2 1	100		Becomes soft.	34.2				1.0			*10.0 feet: Switch to mud rotary*
13.0	ST	ST-6		100		Soft, moist, gray fat CLAY (CH) with sand and shells.	31.1		62	42	1.25			*Pushed shelby tube from 12.0 to 14.0 feet*
15.0	SS	SS-7	1 1 1	100		Soft, moist, brownish gray, lean CLAY (CL).	40.8				1.0			
20	SS	SS-8	WOH WOH 1	100		Becomes very soft, brown and gray, with sand.	43.4				0.75			
26.0	ST	ST-9		100		Very soft, moist, dark gray, organic SILT (OH).	76.0		72	35	0.75			*Pushed shelby tube from 26.0 to 28.0 feet*
30						30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:26 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-10		89		Very soft, moist, gray lean CLAY (CL) with sand, pockets of organics. 31.0	43.4 19.6				0.75			
					Very soft, moist, grayish brown, lean CLAY (CL) with sand, silt, and organics.								
					33.0 SHALE: light gray, weathered.								
35	SS-11		84			14.2							
					37.0 End of Boring at 37 ft								*Boring backfilled with bentonite and cement fluid*
40													
45													
50													
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:26 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Date(s) Drilled	09/13/2015 to 09/13/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	42.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					0.0								
	SS-1	3 4 4	100		Stiff, moist, brown, lean CLAY (CL) with sand and gravel, trace roots.	13.2				4.0			
	SS-2	3 4 6	100			19.5		42	20	4.25			
5	SS-3	2 3 5	67		Becomes medium stiff.	42.3				2.0			
					7.5								
	SS-4	1 3 2	89		Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	22.8				2.5			
10					11.0								*10.0 feet: Switch to mud rotary*
	ST-5	150 psi	85		Medium stiff, moist, brown and gray fat CLAY (CH), trace sand.	33.6		52	33	0.75			
15					15.0								
	SS-6	WOH 1 1	100		Soft, moist, dark brown, lean CLAY (CL), trace shells.	64.6				0.75			
20	SS-7	WOH WOH WOH	100		Becomes very soft.	44.4				0.75			
					24.0								
25	ST-8	150 psi			Very soft, moist, dark gray, fat CLAY (CL), trace organics.	68.9		67	36	1.0			
30					30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:32 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9	WOH WOH WOH	100		Very soft, moist, gray and brownish gray, lean CLAY (CL), trace sand.	71.4				0.5			
35	SS-10	WOH WOH WOH	100		Trace wood, organics, and shells.	56.9				0.75			
					39.0 SHALE: Light gray, slightly weathered.								
40	SS-11	66/4"	100			12.6							*40.0 to 42.5 feet: Solid drilling*
					42.5 End of Boring at 42.5 ft								*Boring backfilled with bentonite and cement fluid*
45													
50													
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:32 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	66.5 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	446 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0					446.0 / 0.0								
445		SS-1	11 13 15	100		445.5 / 0.5 Medium dense, moist, brown silty SAND (SM).					1.0 1.25			
						Very stiff, moist, gray and brown, sandy SILT (ML).								
						443.5 / 2.5								
		SS-2	2 1 1	67		Soft, dry, gray and brown sandy SILT (ML)					0.25			
						441.5 / 4.5								
	5					Concrete from 4.5 to 5.5.								
440		SS-3	5 2 5	11		440.5 / 5.5 Light brown, well graded GRAVEL (GW).								*5.5 feet: Limestone cobbles*
						438.5 / 7.5								
		SS-4	5 4 4	89		437.5 / 8.5 Stiff, dry, brownish gray, silty SAND with GRAVEL (SM).					1.0			
						Medium dense, moist, black, sandy SILT (ML).								
	10													
435						435.0 / 11.0								
		ST-5	250 psi	75		Medium stiff, moist, brownish gray, lean CLAY (CL).					1.5			*Pushed shelby tube from 11.0 to 13.0 feet* *Trace gravel in top of tube*
	15					431.0 / 15.0								
430		SS-6	1 5 5	89		Medium dense, moist, brown mottled with reddish brown, lean CLAY (CL).					2.0			
	20					426.0 / 20.0								
425		SS-7	WOH 2 4	94		Very soft to medium dense, moist to wet, gray, lean CLAY (CL) with shell and wood fragments.					1.0			
	25					421.0 / 25.0								
420		SS-8	WOH WOH 3	100		Very soft to soft, wet, gray, lean CLAY (CL) with shell fragments.					0.5 1.0			
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:38 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
415	30	SS-9	WOH 7 7	100		415.5 / 30.5 Stiff, dry, black, lean CLAY (CL), low plasticity.					1.0 1.25			
410	35	ST-10	125 psi	100		Becomes gray.					1.0			*Pushed shelby tube from 35.0 to 37.0 feet*
405	40	SS-11	WOH WOH 4	100		406.0 / 40.0 Soft, moist to wet, gray, lean CLAY (CL) with shell fragments, low to medium plasticity.					0.5			
400	45	SS-12	WOH 1 4	100							1.0			
395	50	SS-13	WOH WOH WOH	100		396.0 / 50.0 Very soft, wet, gray, SILT (ML) with shell fragments, low plasticity.					1.0			
390	55	SS-14	WOH WOH 17	100		390.0 / 56.0 Medium dense, wet, gray, fine to coarse clayey GRAVEL (GC), trace fine to coarse sand, reddish brown gravel.					3.0			
385	60	SS-15	50/3"	17		386.0 / 60.0 CLAYSTONE: Gray.								
	65	Run 1	0	0										*61.5 feet: Run 1 - Start 7:57, End 8:10*

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:39 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
380		Run 1	0	0		Elevation (feet) 379.5 / Depth (feet) 66.5								
						End of Boring at 66.5 ft								
	70													
375														
	75													
370														
	80													
365														
	85													
360														
	90													
355														
	95													
350														
	100													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:39 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Date(s) Drilled	09/04/2015 to 09/04/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459	0					459.0 / 0.0								
		SS-1	10 6 10	56		458.5 / 0.5 Medium dense, moist, brown, SAND (SP) with gravel and clay.	7.2							
						Medium dense, moist, dark gray, fine to coarse ASH [Fill].	17.4 27.9							
		SS-2	9 8 8	83			20.9 30.7							
455	5	SS-3	3 6 4	100			14.8							
						451.5 / 7.5								
		SS-4	3 3 6	78		Stiff, moist, brown lean CLAY (CL), trace sand and gravel.	22.0							
450	10					449.0 / 10.0								
		SS-5	2 3 4	78		Medium stiff, moist, brown and mottled gray, lean CLAY (CL), trace sand.	24.0							
		SS-6	2 2 3	78			28.0							*12.0 feet: Switch to mud rotary*
445	15	ST-7	250 psi	83			30.5		48	30				*Pushed shelby tube from 15.0 to 17.0 feet*
						440.0 / 19.0								
440	20					Soft, wet, gray, lean CLAY (CL), trace sand and shells.								
		SS-8	1 1 1	83			32.9							
435	25	SS-6	WOH WOH 3	89			21.4							
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:48 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	ST-10		72			30.0	117.6 118.9 118.6	40	25				*Pushed shelby tube from 30.0 to 32.0 feet*
425														
	35	SS-11	1 2 3	94		Becomes medium stiff.	28.2							
420														
	40	SS-12	6 7 50/3.5"	83		419.0 / 40.0 Medium dense, wet, brown, fine to coarse silty SAND (SP) with gravel. 418.0 / 41.0 SHALE: Light gray, weathered.	17.0							*41.0 to 43.0 feet: Hard drilling*
415														
	45	SS-13	50/3"	35		413.8 / 45.3 End of Boring at 45.25 ft	16.4							*Boring backfilled with bentonite and cement fluid*
410														
	50													
405														
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:48 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	62.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) 456.0 / Depth (feet) 0.0								
455	0	SS-1	9 12 12	89		Medium dense, moist, dark gray, ASH [Fill].	27.7							
		SS-2	8 9 14	100			16.3							
450	5	SS-3	6 9 9	94			29.4							
		SS-4	2 1 1	100		Becomes loose, wet. ▽	45.3							
445	10	SS-5		84			70.0							*10.0 feet: Switch to mud rotary*
440	15	SS-6	WOR WOR WOR WOR	100		Becomes very loose.	63.2							
435	20	SS-7		56			84.9							
430	25	SS-8	WOR WOR WOR WOR	89			74.7							
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:53 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30	SS-9	WOR WOR WOR WOR	100			73.7							
420	35	SS-10	WOR WOR WOR WOR	84			93.9							
415	40	SS-11	WOH 1 2	100		416.0 / 40.0 Soft, wet, gray, silty CLAY (CL), trace sand, shells, and organics.	47.9							
410	45	SS-12	WOR WOR WOH	94		411.0 / 45.0 Very soft, wet, gray, fat CLAY (CH), trace sand, shells, and wood.	63.3		63	42				
405	50	SS-13	WOR WOR WOH	89		406.0 / 50.0 Very soft, wet, dark gray and grayish brown, lean CLAY (CL).	62.5							
400	55	SS-14	WOR WOR WOH	100		Grades gray.	52.9							
395	60	SS-15	50/3"	100		398.0 / 58.0 SHALE: Light gray, soft.	9.1							*58.0 to 62.0 feet: Solid drilling*
	65					394.0 / 62.0 End of Boring at 62 ft								*Boring backfilled with bentonite and cement fluid*

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:53 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Date(s) Drilled	09/09/2015 to 09/09/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	453 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					453.0 / 0.0								
		SS-1	6 6 4	94		452.6 / 0.4 Limestone gravel.	23.0							
						Stiff, moist, brown sandy SILT (ML), trace clay, gravel, and topsoil.								
						450.5 / 2.5								
450		SS-2	5 4 3	78		Loose, moist, dark brown ASH [Fill].	23.8		28	2				
	5	SS-3	3 4 11	56			26.5							
445		SS-4	10 10 7	89			26.5							
	10	SS-5	2 3 4	89		With clay.	24.7 24.9							
						442.0 / 11.0 Stiff, moist, brown to gray, silty CLAY (CL), trace sand, shells, and roots.								
440		SS-6	3 3 6	94			22.0							
	15	SS-7	2 3 4	61		Becomes medium stiff.	24.3		48	29				*15.0 feet: Switch to mud rotary*
435														
	20	ST-8	100 psi	75			23.8							*Pushed shelby tube from 20.0 to 22.0 feet*
430														
	25	SS-9	3 3 3	100			23.2							
425														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:59 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-10	2 2 4	61			24.8							
420														
	35	SS-11	2 2 2	100		Becomes soft, trace sand.	28.3							
415														
	40	SS-12	WOH 2 2	100		Becomes soft, trace sand, shells, and organics.	32.2							
410														
	45	SS-13	1 2 3	100			50.2							
						406.0 / 47.0								
405		ST-14		100		Medium stiff, moist, dark gray, fat CLAY (CL).	50.8	104.4 104.9 104.0	54	34				*Pushed shelby tube from 47.0 to 49.0 feet*
						404.0 / 49.0								
	50	SS-15	3 2 4	100		Medium stiff, moist, gray and brownish gray, lean CLAY (CL), trace sand.	67.4							
400														
	55	SS-16	11 21 23	100		397.5 / 55.5 Gray broken rock, weathered.	50.5 15.3							
						396.0 / 57.0 Light gray rock, weathered.								
395														
	60	SS-17	50/2.5"	75		392.8 / 60.2 End of Boring at 60 ft	17.9							*Boring backfilled with bentonite and cement fluid*
390														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:59 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0							0.0								
	SS	1	4 4 7	44		Medium stiff, moist, dark gray to brown, CLAY (CL) with ASH [Fill].		13.6							
							2.5								
	SS	2	1 3 4	83		Medium stiff, moist, brown, silty CLAY (CL), trace sand, gravel, and roots.		17.4				2.0			
5															
	SS	3		46				24.3 20.0		49	28				
							8.0								
	SS	4	3 4 6	72		Stiff, moist, dark gray, silty CLAY (CL), trace sand.		24.3				2.0			
10	SS	5	2 4 7	83				25.4				2.0			*10.0 feet: Switch to mud rotary*
						Gray and mottled brown silty CLAY (CL), trace sand.									
15	SS	6	2 2 4	100		Becomes medium stiff, gray and mottled brown.		25.5		41	29	1.0			
20	SS	7	2 3 3	67				23.5				1.0			
25	SS	8	3 3 4	67		Becomes gray, trace organics.		27.7				1.25			
30							30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:04 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9	1 2 2	94		Medium stiff, moist, brown mottled gray, sandy CLAY (CL), trace silt and shells.	20.2				1.5			
					32.0								
	ST-10		100		Medium stiff, moist, gray and brown lean CLAY (CL) with sand.	33.3		42	19	1.25			*Pushed shelby tube from 32.0 to 34.0 feet*
35	SS-11	2 2 2	89		Becomes dark gray, trace organics.	58.0				1.0			
40	SS-12	2 2 3	100			54.5				1.25			
45	SS-13	2 2 4	100		Grades with calcium carbonate seams and shells.	66.2				1.75			
					Gravel layer 47.5 feet to 49.0 feet								
50					53.0								
					End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:05 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0					Elevation (feet) 456.0 / Depth (feet) 0.0								
455		SS-1	1 4 10	89		Medium dense, moist, dark gray, ASH [Fill].	28.2							
		SS-2	7 2 1	100		Becomes wet, gray.	40.8							
	5					▽								
450		ST-3		35										*Pushed shelby tube from 5.0 to 7.0 feet*
		SS-4	1 1 1	100		Becomes light gray.	60.2							
	10					Becomes dark gray.								*10.0 feet: Switch to mud rotary*
445		SS-5		100			78.7							*Pushed shelby tube from 10.0 to 12.0 feet*
	15					Becomes light gray.								
440		ST-6	1/12" 1/12"	100			86.5							
	20													
435		SS-7	1/12" 1/12"	100			73.1							
	25													
430		SS-8	WOR WOR WOR	100			48.7							
	30					426.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:10 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30	SS-9	WOR WOR WOR	67		Very loose, wet, black to gray, ASH with clay [Fill].	31.6							
	35					421.0 / 35.0								
420		SS-10	WOH 1 2	100		Soft, wet, gray, silty CLAY (CL), trace shells and wood.								
	40					415.5 / 40.5								
415		SS-11	2 18 34	100		SHALE: Light gray, weathered.	27.3 19.6 10.2							*42.0 to 45.0 feet: Solid drilling*
	45	SS-12	56	100		410.5 / 45.5	14.2							
410						End of Boring at 45.5 ft								*Boring backfilled with bentonite and cement fluid*
	50													
405														
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:10 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	57.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	444 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	5 4 1	72		Elevation (feet) 444.0 / Depth (feet) 0.0 443.6 / 0.4 Brown gravel. Medium stiff, moist, gray to brown, sandy CLAY (CL), trace silt.	54.7							
440		SS-2	5 9 13	50		441.5 / 2.5 Medium dense, moist, light brown to white, fine to coarse GRAVEL (GP) with sand, trace silt and limestone.	4.5							
	5	SS-3	6 10 13	39			5.4							
		SS-4	6 9 7	39			7.2							
435														
	10	SS-5	4 5 6	39			6.5							*10.0 feet: Switch to mud rotary; borehole collapsed*
		SS-6	10 3 2	11			3.6							
430														
	15	SS-7	4 4 4	39		Some coarse limestone.	8.2							
425														
	20	SS-8	10 7 9	39			7.8							
420														*23.0 to 25.0 feet: Drove casing with hammer* *23.0 to 29.0 feet: Hard drilling*
	25	SS-9	7 4 11	33			8.1							
415														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:16 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30					413.0 / 31.0								
		ST-10	300 psi	100		Medium stiff, wet, gray, sandy CLAY (CL), trace silt, shells, and organics.	20.2	122.2 121.0 119.8	24	11	2.5			*Pushed shelby tube from 31.0 to 33.0 feet*
410														
	35					409.0 / 35.0								
		SS-11	WOH 2 3	94		Medium stiff, wet, gray and dark gray lean CLAY (CL)	33.8				1.25			
						407.0 / 37.0								
		ST-12	175 psi			Soft, wet, dark gray, fat CLAY (CH).	41.0		66	43	1.0			*Pushed shelby tube from 37.0 to 39.0 feet*
405						405.0 / 39.0								
	40	SS-13	WOH 2 2	100		Soft, wet, brown and gray, lean CLAY (CL).	36.2				1.0			
400														
	45	SS-14	WOH 2 2	83		Grades with sand.	49.4				1.0			
395														
	50	SS-15	3 5 14	22		Grades without sand.	30.9				0.5			
						392.0 / 52.0								
						SHALE: Light gray, silt sized, weathered.								*52.0 feet: Solid drilling*
390														
	55	SS-16	71/6"	oK			11.0							
						387.0 / 57.0								
						End of Boring at 57 ft								*Boring backfilled with bentonite and cement fluid*
385														
	60													
380														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:16 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015A

Sheet 1 of 1

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	30.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' SW of EDW-B015 (ft NAD83)	Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					0.0 Blank power auger to 30.0 feet to confirm 29.0 feet of gravel.								*Offset 5.0 feet west of EDW-B015*
5													*5.0 to 30.0 feet: No cuttings*
													7.0 feet: Borehole collapsed; created a 14" diameter hole with no cuttings
10													
15													
20													*20.0 feet: Groundwater encountered*
25													*Auger hole collapsed and auger removed. No clay on auger.*
30					30.0 End of Boring at 30 ft								

AECOM

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:21 AM

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/28/2016
Finish: 12/05/2016
WEATHER: Sunny, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: R. Hasenyager

BOREHOLE ID: AP05D
Well ID: AP05D
Surface Elev: 441.23 ft. MSL
Completion: 58.30 ft. BGS
Station: 1,432,401.77N
2,436,749.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.25 - During drilling
▼ = 13.34 - 01/18/2017
▽ =

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
1A	13/24 54%	SS	1-4 5-5 N=9	27			0	Black (10YR3/1), moist, soft, CLAY with some silt, trace sand, and trace gravel.		440	
2A	20/24 83%	SS	3-3 4-4 N=7	109			2	Black (10YR2/1), moist, soft, SILT with few clay, trace sand, and trace gravel.		438	
3A	20/24 83%	SS	2-3 4-4 N=7	29			4	Dark yellowish brown (10YR4/4), moist, medium, CLAY with some silt and trace sand.		436	
4A	14/24 58%	SS	1-3 2-3 N=5	33			6 ▼	Gray (10YR5/1), moist, soft, CLAY with some silt and trace sand.		434	
5A	20/24 83%	SS	woh-2 2-2 N=4	40			8			432	
6A	20/24 83%	SS	1-2 2-3 N=4	33			10	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, CLAY with some silt and trace sand.		430	
7A	18/24 75%	SS	1-2 2-3 N=4	35			12 ▼	Yellowish brown (10YR5/6) with 25% Gray (10YR5/1) mottles, moist, soft, CLAY with some silt and trace sand.		428	
8A	24/24 100%	SS	woh-1 2-2 N=3	27			14	Dark yellowish brown (10YR4/4) with 10% yellowish brown (10YR5/6) mottles, moist, very soft, CLAY with some silt and trace sand.		426	
9A	22/24 92%	SS	1-1 1-2 N=2	26			16			424	
10A	24/24 100%	SS	woh-woh 1-2	28			18	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, very soft, SILT with few clay, trace sand, and trace shell fragments.		422	
							20				

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/28/2016
Finish: 12/05/2016
WEATHER: Sunny, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: R. Hasenyager

BOREHOLE ID: AP05D
Well ID: AP05D
Surface Elev: 441.23 ft. MSL
Completion: 58.30 ft. BGS
Station: 1,432,401.77N
2,436,749.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.25 - During drilling
▼ = 13.34 - 01/18/2017
▽ =

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
11A	24/24 *100%*	ss	*woh-woh* *2-2*	28						420	
12A	24/24 *100%*	ss	*woh-woh* *2-2*	34			22				
13A	24/24 *100%*	ss	*woh-woh* *1-2*	35						418	
14A	24/24 *100%*	ss	*woh-1* *2-2* N=3	47			24				
15A	23/24 *96%*	ss	*woh-woh* *1-2*	73						416	
16A	24/24 *100%*	ss	*woh-woh* *2-2*	68			26				
17A	24/24 *100%*	ss	*woh-woh* *woh-woh*	64						414	
18A	24/24 *100%*	ss	*woh-woh* *2-2*	50			28	Gray (10YR5/1), moist, very soft, CLAY with some silt, trace sand, and trace shell fragments.			
19A	15/24 *63%*	ss	*woh-1* *18-23* N=19	46						412	
19B				5			30				
										410	
							32				
										408	
							34				
										406	
							36				
										404	
							38	Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand.			
										402	
							40				

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/28/2016
Finish: 12/05/2016
WEATHER: Sunny, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: R. Hasenyager

BOREHOLE ID: AP05D
Well ID: AP05D
Surface Elev: 441.23 ft. MSL
Completion: 58.30 ft. BGS
Station: 1,432,401.77N
2,436,749.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.25 - During drilling
▼ = 13.34 - 01/18/2017
▽ =

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
20	48/53 *91%*	RC		12			42	Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand. *[Continued from previous page]*		400	
							44			398	
21	56/60 *93%*	RC						Grayish brown (10YR5/2), dry, hard, very fine- to medium-grained SANDSTONE.		396	
							46			394	
							48	Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand.		392	
22	62/60 *103%*	RC					50			390	
							52	Grayish brown (10YR5/2), dry, hard, very fine- to medium-grained SANDSTONE.		388	
							54				
23	54/57 *95%*	RC						Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand.		386	
							56	Grayish brown (10YR5/2), dry, hard, very fine- to medium-grained SANDSTONE.			
	0/14 *0%*	BD						Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand.		384	
							58				

End of Boring = 57.1 ft. BGS

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/28/2016
Finish: 11/29/2016
WEATHER: Sunny, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: R. Hasenyager

BOREHOLE ID: AP05S
Well ID: AP05S
Surface Elev: 441.13 ft. MSL
Completion: 38.06 ft. BGS
Station: 1,432,405.64N
2,436,746.64E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.25 - During drilling
▼ = 5.23 - 01/18/2017
▽ =

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) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/24 *0%*	BD					0	Black (10YR3/1), moist, soft, CLAY with some silt, trace sand, and trace gravel.		440	
	0/24 *0%*	BD					2	Black (10YR2/1), moist, soft, SILT with few clay, trace sand, and trace gravel.		438	
	0/24 *0%*	BD					4	Dark yellowish brown (10YR4/4), moist, medium, CLAY with some silt and trace sand.		436	
	0/24 *0%*	BD					6	Gray (10YR5/1), moist, soft, CLAY with some silt and trace sand.		434	
	0/24 *0%*	BD					8			432	
	0/24 *0%*	BD					10	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, CLAY with some silt and trace sand.		430	
	0/24 *0%*	BD					12	Yellowish brown (10YR5/6) with 25% Gray (10YR5/1) mottles, moist, soft, CLAY with some silt and trace sand.		428	
	0/24 *0%*	BD					14	Dark yellowish brown (10YR4/4) with 10% yellowish brown (10YR5/6) mottles, moist, very soft, CLAY with some silt and trace sand.		426	
	0/24 *0%*	BD					16			424	
	0/24 *0%*	BD					18	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, very soft, SILT with few clay, trace sand, and trace shell fragments.		422	
							20				

NOTE(S): AP05S drilled approx. 5 ft. north of AP05D.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/28/2016
Finish: 11/29/2016
WEATHER: Sunny, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: R. Hasenyager

BOREHOLE ID: AP05S
Well ID: AP05S
Surface Elev: 441.13 ft. MSL
Completion: 38.06 ft. BGS
Station: 1,432,405.64N
2,436,746.64E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.25 - During drilling
▼ = 5.23 - 01/18/2017
▽ =

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) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/24 *0%*	BD									
	0/24 *0%*	BD					22			420	
	0/24 *0%*	BD									
	0/24 *0%*	BD					24			418	
	0/24 *0%*	BD									
	0/24 *0%*	BD					26			416	
	0/24 *0%*	BD									
	0/24 *0%*	BD					28	Gray (10YR5/1), moist, very soft, CLAY with some silt, trace sand, and trace shell fragments.		414	
	0/24 *0%*	BD									
	0/24 *0%*	BD					30			412	
	0/24 *0%*	BD									
	0/24 *0%*	BD					32			410	
	0/24 *0%*	BD									
	0/24 *0%*	BD					34			408	
	0/24 *0%*	BD									
	0/24 *0%*	BD					36			406	
	0/24 *0%*	BD									
	0/24 *0%*	BD						Medium light gray (N6/1), dry, hard, SILTSTONE with little very fine-grained sand.		404	
							38				

End of Boring = 38.06 ft. BGS

NOTE(S): AP05S drilled approx. 5 ft. north of AP05D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/30/2016
Finish: 11/30/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP06
Well ID: AP06
Surface Elev: 439.53 ft. MSL
Completion: 25.00 ft. BGS
Station: 1,433,216.94N
2,436,506.21E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 2.50 - During drilling
▼ = 4.95 - 01/18/2017
▽ =

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
1A	21/24 *88%*	SS	*woh-2* *4-5* N=6	25			0	Light yellowish brown (10YR6/4), moist, medium, CLAY with some silt, trace sand and trace roots/grass.		438	
2A	20/24 *83%*	SS	*3-3* *5-6* N=8	29			2	Dark gray (10YR4/1), moist, medium, CLAY with some silt, trace sand and trace roots/grass.		436	
3A	21/24 *88%*	SS	*2-2* *3-4* N=5	28			4	Gray (10YR5/1), moist, soft, CLAY with some silt, trace sand and trace gravel.		434	
4A	21/24 *88%*	SS	*2-2* *2-3* N=4	24			6			432	
5A	22/24 *92%*	SS	*woh-1* *2-3* N=3	35			8	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, very soft, CLAY with some silt and trace sand.		430	
6A	22/24 *92%*	SS	*woh-1* *2-2* N=3	39			10			428	
7A	22/24 *92%*	SS	*woh-woh* *1-2*	31			12			426	
8A	18/24 *75%*	SS	*1-1* *2-1* N=3	30			14	Gray (10YR6/1), moist, very soft, CLAY with some silt, trace sand and trace shell fragments.		424	
9A	24/24 *100%*	SS	*woh-woh* *1-2*	31			16			422	
10A	21/24 *88%*	SS	*woh-woh* *woh-1*	32			18			420	
							20				

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 11/30/2016
Finish: 11/30/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP06
Well ID: AP06
Surface Elev: 439.53 ft. MSL
Completion: 25.00 ft. BGS
Station: 1,433,216.94N
2,436,506.21E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 2.50 - During drilling
▼ = 4.95 - 01/18/2017
▽ =

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
11A	24/24 *100%*	SS	*woh-woh woh-2*	34							
							22	Gray (10YR6/1), moist, very soft, CLAY with some silt, trace sand and trace shell fragments. *[Continued from previous page]*		418	
12A	18/24 *75%*	SS	*wor-wor wor-wor*	39						416	
13A	12/12 *100%*	SS	*woh-woh*	42			24				

End of Boring = 25.0 ft. BGS

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/01/2016
Finish: 12/08/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07D
Well ID: AP07D
Surface Elev: 458.42 ft. MSL
Completion: 65.00 ft. BGS
Station: 1,432,082.31N
2,435,355.39E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 26.00 - During drilling
▼ = 52.66 - 01/18/2017
▽ =

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
1A	13/24 54%	SS	1-4 8-9 N=12	8			0	White (10YR8/1), moist, medium dense, GRAVEL with some medium- to very coarse-grained sand. [FILL]		458	
2A	19/24 79%	SS	5-4 4-4 N=8	22			2	Pale brown (10YR6/3), moist, medium, CLAY with some silt and little very fine-grained sand.		456	
3A	18/24 75%	SS	1-3 4-7 N=7	22			4	Gray (10YR5/1) with 25% yellowish brown (10YR5/4) mottles, moist, soft, CLAY with some silt and trace very fine-grained sand.		454	
4A	7/24 29%	SS	2-3 4-4 N=7	22			6			452	
5A	24/24 100%	SS	1-3 4-4 N=7	27			8			450	
5B				34			10	Dark gray (10YR4/1), moist, soft, CLAY with some silt, trace very fine-grained sand, and trace roots.		448	
6A	24/24 100%	SS	1-2 4-4 N=6	29			12			446	
7A	24/24 100%	SS	woh-3 3-6 N=6	27			14	Gray (10YR5/1) with 30% light yellowish brown (10YR6/4) mottles, moist, soft, CLAY with some silt, trace very fine-grained sand, and trace roots.		444	
8A	24/24 100%	SS	woh-2 2-4 N=4	25			16	Gray (10YR5/1) with 30% dark gray (10YR4/1) mottles, moist, medium, CLAY with some silt, little very fine-grained sand, and trace roots.		442	
9A	23/24 96%	SS	1-3 4-5 N=7	23			18	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, CLAY with some silt and few very fine-grained sand.		440	
10A	24/24 100%	SS	1-2 3-5 N=5	24			20				

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/01/2016
Finish: 12/08/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07D
Well ID: AP07D
Surface Elev: 458.42 ft. MSL
Completion: 65.00 ft. BGS
Station: 1,432,082.31N
2,435,355.39E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 26.00 - During drilling
▼ = 52.66 - 01/18/2017
▽ =

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
11A	24/24 100%	SS	2-4 5-7 N=9	25				Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, CLAY with some silt and few very fine-grained sand. *[Continued from previous page]*		438	
							22	Light gray (10YR6/1) with 20% brownish yellow (10YR6/6) mottles, moist, medium dense, very fine- to medium-grained SAND with little clay.		436	
12A	24/24 100%	SS	2-4 8-8 N=12	26							
12B				22				Dark gray (10YR4/1), moist, stiff, CLAY with some silt, trace sand, trace organic matter.			
							24			434	
13A	24/24 100%	SS	1-2 2-2 N=4	23				Light gray (10YR6/1) with 20% light yellowish brown (10YR6/4) mottles, moist, very soft, CLAY with some silt and little very fine- to fine-grained sand.			
							▼ 26			432	
14A	20/24 83%	SS	1-1 2-2 N=3	19				Light yellowish brown (10YR6/4), wet, very loose, very fine- to medium-grained SAND with few silt and trace clay.			
							28			430	
15A	22/24 92%	SS	woh-woh 1-1	24							
							30	Gray (10YR5/1), wet, very loose, very fine- to very coarse-grained SAND with little silt and trace small gravel.		428	
16A	24/24 100%	SS	woh-1 3-2 N=4	15							
16B				34				Gray (10YR5/1) with 30% brownish yellow (10YR6/6) mottles, moist, soft, CLAY with some silt and trace sand.			
							32			426	
17A	24/24 100%	SS	woh-1 2-2 N=3	28				Gray (10YR5/1) with 30% light yellowish brown (10YR6/4) mottles, moist, soft, CLAY with some silt and trace sand.			
							34			424	
18A	24/24 100%	SS	woh-2 4-6 N=6	30				Gray (10YR5/1), moist, soft, CLAY with some silt, trace sand, and trace organic matter.			
19A				31			36			422	
19B	20/24 83%	SS	1-4 8-26 N=12	17							
							38	Gray (10YR5/1), moist, very stiff, SILT with few clay and trace sand (Weathered SILTSTONE).		420	
20A	10/10 100%	SS	21-50/4"	15							
	0/14 0%	BD						Gray (10YR5/1), dense, hard, SHALE.			
							40				

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/01/2016
Finish: 12/08/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07D
Well ID: AP07D
Surface Elev: 458.42 ft. MSL
Completion: 65.00 ft. BGS
Station: 1,432,082.31N
2,435,355.39E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 26.00 - During drilling
▼ = 52.66 - 01/18/2017
▽ =

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
21	48/56 *86%*	RC					42	Gray (10YR5/1), dense, hard, SHALE. *[Continued from previous page]*		418	
							44			416	
							46	Light Gray (10YR6/1), dry, very hard, very fine- to medium-grained SANDSTONE.		414	
22	61/60 *102%*	RC					48	Gray (10YR5/1), dense, hard, SHALE.		412	
							50	Light Gray (10YR6/1), dry, very hard, very fine- to medium-grained SANDSTONE.		410	
23	62/60 *103%*	RC					52 ▼	Gray (10YR5/1), dense, very hard, SILTSTONE.		408	
							54			406	
							56	Gray (10YR5/1), dense, very hard, SILTSTONE with white (N8/1) calcite crystals.		404	Crystals are authigenic.
24	54/60 *90%*	RC					58	Gray (10YR5/1), dense, very hard, SILTSTONE.		402	
							60			400	

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/01/2016
Finish: 12/08/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger & NX Wireline Rock Core
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07D
Well ID: AP07D
Surface Elev: 458.42 ft. MSL
Completion: 65.00 ft. BGS
Station: 1,432,082.31N
2,435,355.39E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 26.00 - During drilling
▼ = 52.66 - 01/18/2017
▽ =

SAMPLE Number	SAMPLE Recov / Total (in) *% Recovery*	SAMPLE Type	TESTING *Blows / 6 in* N - Value **RQD**	TESTING Moisture (%)	TESTING Dry Den. (lb/ft³)	TESTING *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
25	66/60 *110%*	RC					62	Gray (10YR5/1), dense, very hard, SILTSTONE. *[Continued from previous page]*		398	
										396	
							64	Brown (10YR5/3), moist, very hard, very fine- to medium-grained SANDSTONE. Gray (10YR5/1), dense, very hard, SILTSTONE. Brown (10YR5/3), moist, very hard, very fine- to medium-grained SANDSTONE. Gray (10YR5/1), dense, very hard, SILTSTONE.		394	
	0/4 *0%*	BD						**End of Boring = 65.0 feet**			

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/02/2016
Finish: 12/02/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07S
Well ID: AP07S
Surface Elev: 458.31 ft. MSL
Completion: 35.00 ft. BGS
Station: 1,432,078.08N
2,435,357.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 31.80 - During drilling
▼ = 24.57 - 01/18/2017
▽ =

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) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/24 *0%*	BD					0	White (10YR8/1), moist, medium dense, GRAVEL with some medium- to very coarse-grained sand. [FILL]		458	
	0/24 *0%*	BD					2	Pale brown (10YR6/3), moist, medium, CLAY with some silt and little very fine-grained sand.		456	
	0/24 *0%*	BD					4	Gray (10YR5/1) with 25% yellowish brown (10YR5/4) mottles, moist, soft, CLAY with some silt and trace very fine-grained sand.		454	
	0/24 *0%*	BD					6			452	
	0/24 *0%*	BD					8			450	
	0/24 *0%*	BD					10	Dark gray (10YR4/1), moist, soft, CLAY with some silt, trace very fine-grained sand, and trace roots.		448	
	0/24 *0%*	BD					12			446	
	0/24 *0%*	BD					14	Gray (10YR5/1) with 15% light yellowish brown (10YR6/4) mottles, moist, soft, CLAY with some silt, trace very fine-grained sand, and trace roots.		444	
	0/24 *0%*	BD					16	Gray (10YR5/1) with 30% dark gray (10YR4/1) mottles, moist, medium, CLAY with some silt and little very fine-grained sand.		442	
	0/24 *0%*	BD					18	Gray (10YR5/1) with 30% yellowish brown (10YR5.6) mottles, moist, soft, CLAY with some silt and few very fine-grained sand.		440	
							20				

NOTE(S): AP07S drilled approx. 5 ft. west of AP07D.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/02/2016
Finish: 12/02/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP07S
Well ID: AP07S
Surface Elev: 458.31 ft. MSL
Completion: 35.00 ft. BGS
Station: 1,432,078.08N
2,435,357.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 31.80 - During drilling
▼ = 24.57 - 01/18/2017
▽ =

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
	0/24 0%	BD						Gray (10YR5/1) with 30% yellowish brown (10YR5.6) mottles, moist, soft, CLAY with some silt and few very fine-grained sand. *[Continued from previous page]*		438	
	0/24 0%	BD					22	Light gray (10YR6/1) with 20% brownish yellow (10YR6/6) mottles, moist, medium dense, very fine- to medium-grained SAND with little clay.		436	
	0/24 0%	BD						Dark gray (10YR4/1), moist, stiff, CLAY with some silt, trace sand, trace organic matter.			
	0/24 0%	BD					24 ▼	Light gray (10YR6/1) with 20% light yellowish brown (10YR6/4) mottles, moist, very soft, very fine- to medium-grained SAND with few silt and trace clay.		434	
	0/24 0%	BD					26	Light yellowish brown (10YR6/4), wet, very loose, very fine- to medium-grained SAND with few silt and trace clay.		432	
	0/24 0%	BD					28			430	
	0/24 0%	BD					30	Gray (10YR5/1), wet, very loose, very fine- to very coarse-grained SAND with little silt and trace small gravel.		428	
	0/24 0%	BD					32 ▼	Gray (10YR5/1) with 30% brownish yellow (10YR6/6) mottles, moist, soft, very fine- to medium-grained SAND with some silt and trace clay.		426	
	0/24 0%	BD						Gray (10YR5/1) with 30% light yellowish brown (10YR6/4) mottles, moist, soft, CLAY with some silt and trace sand.			
	0/12 0%	BD					34	Gray (10YR5/1), moist, soft, CLAY with some silt, trace sand, and trace organic matter.		424	

End of Boring = 35.0 feet

NOTE(S): AP07S drilled approx. 5 ft. west of AP07D.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/06/2016
Finish: 12/06/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger
FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP08
Well ID: AP08
Surface Elev: 458.10 ft. MSL
Completion: 19.98 ft. BGS
Station: 1,430,854.31N
2,434,861.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.00 - During drilling
▼ = 8.88 - 01/18/2017
▽ =

SAMPLE Number	SAMPLE Recov / Total (in) *% Recovery*	SAMPLE Type	TESTING *Blows / 6 in* N - Value **RQD**	TESTING Moisture (%)	TESTING Dry Den. (lb/ft³)	TESTING *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					2	Light yellowish brown (10YR6/4), moist to wet, medium, FLY ASH.		456	
							4			454	
							6 ▼			452	
	0/60 *0%*	BD					8			450	
							▼				
							10			448	
							12			446	
	0/60 *0%*	BD					14			444	
							16			442	
	0/60 *0%*	BD					18			440	

End of Boring = 20.0 ft. BGS

NOTE(S): AP08 blind drilled in fly ash.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: 7800 S Cilco Ln, Bartonville, Illinois
Project: 16E0433
DATES: **Start:** 12/06/2016
Finish: 12/07/2016
WEATHER: Overcast, cool (hi-30s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-550X ATV Drill
Drilling Method: 4¼" Hollow Stem Auger

FIELD STAFF: **Driller:** C. Dutton
Helper: M. Baetje
Eng/Geo: S. Collins

BOREHOLE ID: AP09
Well ID: AP09
Surface Elev: 457.24 ft. MSL
Completion: 19.80 ft. BGS
Station: 1,429,733.15N
2,435,541.77E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin
Township: Hollis
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 6.00 - During drilling
▼ = 8.20 - 01/18/2017
▽ =

SAMPLE Number	SAMPLE Recov / Total (in) *% Recovery*	SAMPLE Type	TESTING *Blows / 6 in* N - Value **RQD**	TESTING Moisture (%)	TESTING Dry Den. (lb/ft³)	TESTING *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					2	Light yellowish brown (10YR6/4), moist to wet, medium, FLY ASH.		456	
							4			454	
							6 ▼			452	
	0/60 *0%*	BD					8 ▼			450	
							10			448	
	0/60 *0%*	BD					12			446	
							14			444	
							16			442	
	0/60 *0%*	BD					18			440	
										438	

End of Boring = 19.8 ft. BGS

NOTE(S): AP09 blind drilled in fly ash.

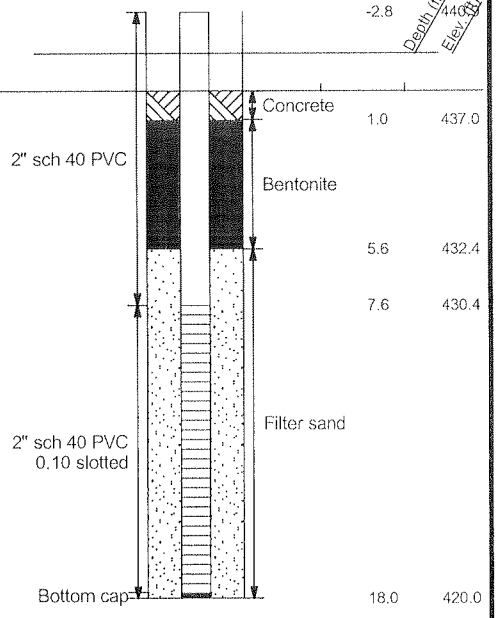
Surface Elevation: 438.02 | Completion Date: 7/27/10

Datum msl | Northing 1432880.82 | Easting 2435852.39

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL			GB1
5				GB2
	Brown, silty CLAY - CL			
10		▽		GB3
15				GB4
	Shaley LIMESTONE		10-0-0	SS5
20	Auger refusal at 18.5 feet.			
25				
30				
35				
40				

WELL DIAGRAM

Stickup
Diameter: 6 inches



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 10 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 9/17/14	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-1

Project No. J017150.01

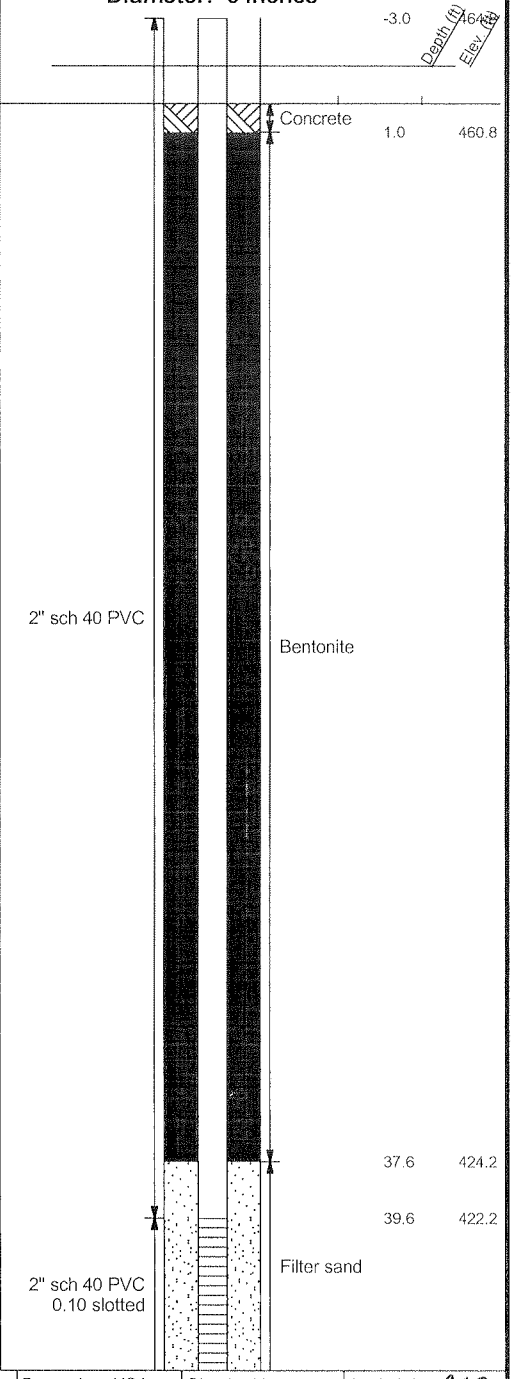
LOG OF BORING 2002 WL J017150.01 - EDWARDS.GPJ GTINC.0638301.GPJ 12/13/10

Surface Elevation: 461.80
Datum msl

Completion Date: 7/20/10
Northing: 1430732.11
Easting: 243579.28

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: ash			GB1
5	Black, silty CLAY - CL			GB2
10				GB3
15				GB4
20				GB5
25	Gray, silty CLAY - CL			GB6
30				GB7
35				GB8
40				GB9

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 38 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-2

Project No. J017150.01

LOG OF BORING 2002 WL J0171150.01 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 461.80
Datum msl

Completion Date: 7/20/10
Northing: 1430732.11
Easting: 243579.28

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	WELL DIAGRAM
	Gray, silty CLAY - CL *(continued)*			GB10	Stickup Diameter: 6 inches 2" sch 40 PVC 0.10 slotted Filter sand Bottom cap 50.0 411.8
50	Boring terminated at 50 feet.				
55					
60					
65					
70					
75					
80					
85					

GROUNDWATER DATA

ENCOUNTERED AT 38 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTC	App'vd. by: RSF
Date: 8/13/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

CONTINUATION OF
LOG OF BORING: APW-2

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 444.26

Datum msl

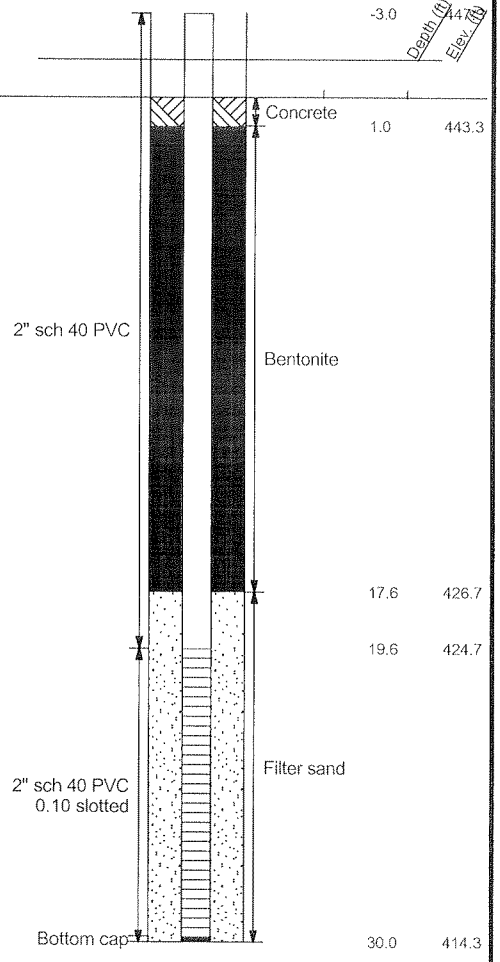
Completion Date: 7/19/10

Northing 1429652.72

Easting 2436225.53

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Black COAL and ash			GB1
5				
				GB2
10				
				GB3
	Gray and brown, silty CLAY - CL			
15				GB4
20				
				GB5
25				
				GB6
30	Boring terminated at 30 feet.			
35				
40				

WELL DIAGRAM



GROUNDWATER DATA

ENCOUNTERED AT 17 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

PH DRILLER JPC LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: SAK	App'vd. by: RSI
Date: 8/13/10	Date: 8/17/11	Date: 8/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-3

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 473.30

Datum msl

Completion Date: 7/27/10

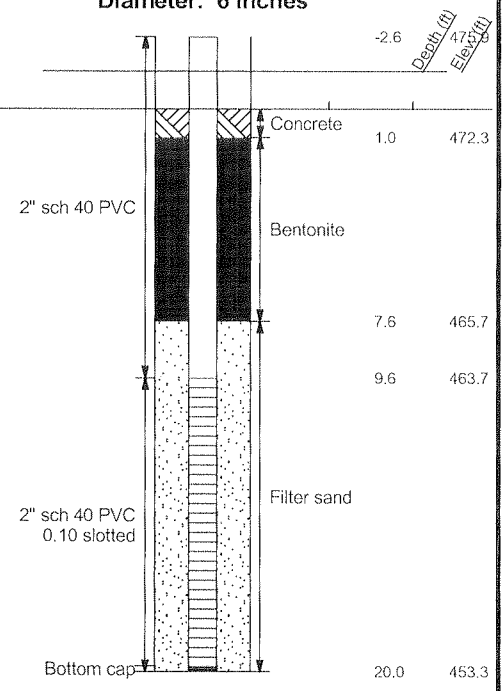
Northing 1428432.43

Easting 2436265.52

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL			GB1
	GRAVEL			GB2
5				
	Brown, silty CLAY, trace gravel - CL			GB3
10				GB4
15				GB5
20	Boring terminated at 20 feet.			
25				
30				
35				
40				

WELL DIAGRAM

Stickup
Diameter: 6 inches



GROUNDWATER DATA

ENCOUNTERED AT 7.5 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

PH DRILLER JPC LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 8/17/11	Date: 8/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-4

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/22/2015
Finish: 7/22/2015
WEATHER: Sunny, warm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-05
Well ID: AW-05
Surface Elev: 440.55 ft. MSL
Completion: 21.10 ft. BGS
Station: 1,432,339.67N
2,435,498.04E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 12.00 - during drilling
▼ = 6.62 - 7/22/15
▽ =

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
1A	16/24 *67%*	SS	*2-3* *2-7* N=5	20		*2.00*	0	Black (10YR2/1), moist, medium, SILT with few clay and trace very fine- to fine-grained sand, roots.		440	
								FILL - Dark yellowish brown (10YR4/4), moist, stiff, SILT with few clay and trace very fine- to fine-grained sand.			
2A	17/24 *71%*	SS	*5-7* *7-7* N=14	21		*2.00*	2			438	
								FILL - Very dark grayish brown (10YR3/2), moist, stiff, silty CLAY with trace very fine-grained sand.			
3A	18/24 *75%*	SS	*2-2* *2-2* N=4	23		*0.80*	4			436	
								Dark grayish brown (10YR4/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with trace fine-grained sand.			
4A	16/24 *67%*	SS	*2-2* *2-2* N=4	22		*0.30*	6 ▼			434	
								Brown (10YR5/3) with 5% gray (10YR5/1) mottles, moist, soft, CLAY with very fine- to fine-grained sand.			
5A	18/24 *75%*	SS	*2-1* *3-2* N=4	31		*1.10*	8			432	
								Gray (10YR5/1) with 15% dark yellowish brown (10YR3/4) mottles, moist, stiff, silty CLAY with trace very fine- to fine-grained sand.			
6A	22/24 *92%*	SS	*1-1* *2-2* N=3	31		*0.50*	10			430	
							12 ▼	Gray (10YR5/1) with 15% dark yellowish brown (10YR3/4) mottles, moist, soft, silty CLAY with trace very fine- to fine-grained sand.			
7A	24/24 *100%*	SS	*2-2* *1-1* N=3	52		*0.20*				428	
							14	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace coarse-grained sand.			
8-1 5-2 8-3 8-4	24/24 *100%*	SH		32		*0.80*				426	
9A	24/24 *100%*	SS	*1-2* *2-4* N=4	32		*0.30*	16			424	
								Dark gray (10YR4/1), moist, medium, silty CLAY with trace very fine-grained sand.			
10A	18/24 *75%*	SS	*1-1* *3-14* N=4	39		*0.30*	18			422	
							20	Dark gray (10YR4/1), moist, hard, weathered SHALE.			

NOTE(S): AW-05 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/22/2015
Finish: 7/22/2015
WEATHER: Sunny, warm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-05
Well ID: AW-05
Surface Elev: 440.55 ft. MSL
Completion: 21.10 ft. BGS
Station: 1,432,339.67N
2,435,498.04E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 11, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 12.00 - during drilling
▼ = 6.62 - 7/22/15
▽ =

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
	0/5 *0%*	☒ SS	*50/5"*					Dark gray (10YR4/1), moist, hard, weathered SHALE. *[Continued from previous page]*		420	

End of boring = 21.10 feet

NOTE(S): AW-05 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, hi-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-06
Well ID: AW-06
Surface Elev: 459.19 ft. MSL
Completion: 42.25 ft. BGS
Station: 1,430,727.75N
2,434,495.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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	Remarks
	24/24 100%	BD					0	GRAVEL FILL	458	sample from cuttings
2A	24/24 100%	BD		24			2	FILL - Dark gray (10YR4/1) and brown (10YR4/3), moist, medium, silty CLAY with trace medium- to coarse-grained sand.	456	
3A	14/24 58%	SS	4-6 29-23 N=35	23			4		454	
4A	21/24 88%	SS	14-18 21-26 N=39	29			6	FILL - Very dark gray (10YR3/1), moist, hard, FLY ASH.	452	
5A	20/24 83%	SS	7-7 6-4 N=13	37			8	FILL - Very dark gray (10YR3/1), moist, medium, FLY ASH.	450	
6A	18/24 75%	SS	1-1 3-3 N=4	26			10	FILL - Very dark gray (10YR3/1), moist, soft, FLY ASH.	448	
7A	17/24 71%	SS	2-3 4-5 N=7	22		1.30	12	FILL - Dark gray (10YR4/1), moist, medium, SILT and FLY ASH with few clay and trace coarse-grained sand and small gravel.	446	
8A	14/24 58%	SS	1-1 3-3 N=4	22		0.50	14		444	
9A	17/24 71%	SS	4-6 5-6 N=11	23		0.70	16	Gray (10YR5/1) and brown (10YR5/3), moist, medium, SILT with few clay and trace medium- to coarse-grained sand and roots.	442	
10A	22/24 92%	SS	2-2 3-4 N=5	21		1.30	18		440	
							20	Very dark grayish brown (10YR3/2), moist, stiff, silty CLAY with trace very fine- to fine-grained sand.		

NOTE(S): AW-06 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, hi-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-06
Well ID: AW-06
Surface Elev: 459.19 ft. MSL
Completion: 42.25 ft. BGS
Station: 1,430,727.75N
2,434,495.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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	Borehole Detail	Elevation ft. MSL	Remarks
11-1											
11-2	12/24 *50%*	SH				*0.80*					
11-3											
11-4				20			22	Dark gray (10YR4/1) with 10% dark grayish brown (10YR4/2) mottles, moist, medium, SILT with little clay and trace very fine- to fine-grained sand.		438	
12A	18/24 *75%*	SS	*3-4 6-7* N=10	22		*0.80*					
							24			436	
13A	22/24 *92%*	SS	*3-2 3-3* N=5	24		*0.50*		Dark gray (10YR4/1), moist, medium, SILT with few to little clay and trace fine- to medium-grained sand, woody material and shell fragments.		434	
14-1							26				
14-2	16/24 *67%*	SH				*0.50*				432	
14-3											
14-4				31			28	Dark gray (10YR4/1), moist, medium, SILT with little clay and trace fine- to medium-grained sand and shell fragments.			
15A	20/24 *83%*	SS	*2-3 3-3* N=6	39		*0.80*				430	
	24/24 *100%*	BD					30				
16A										428	
17-1				29			32	Gray (10YR5/1) with 35% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace fine-grained sand.			
17-2	24/24 *100%*	SH									
17-3						*1.00*				426	
17-4							34				
18A	16/24 *67%*	SS	*0-3 3-3* N=6	32		*1.20*				424	
19-1							36	Dark gray (10YR4/1), moist, stiff, silty CLAY with trace very fine-grained sand and roots.			
19-2	16/24 *67%*	SH				*0.80*				422	
19-3											
19-4				34			38	Dark gray (10YR4/1) with 5% olive brown (2.5Y4/3) mottles, moist, stiff, silty CLAY with trace fine- to coarse-grained sand and small gravel, trace roots.			
20A	20/24 *83%*	SS	*2-5 6-6* N=11	29						420	
							40	Gray (10YR4/1) with 15% olive brown (2.5Y4/3) mottles,			

NOTE(S): AW-06 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, hi-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-06
Well ID: AW-06
Surface Elev: 459.19 ft. MSL
Completion: 42.25 ft. BGS
Station: 1,430,727.75N
2,434,495.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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
21A	4/4 *100%*	☒ SS	*50/4"*	14				moist, stiff, weathered SHALE, slightly laminated.
22A	3/3 *100%*	☒ SS	*50/3"*	13			42	Dark gray (10YR4/1), moist, hard, weathered SHALE.

Borehole Detail: 418

End of boring = 42.25 feet

NOTE(S): AW-06 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/20/2015
Finish: 7/21/2015
WEATHER: Sunny, warm, hi-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-08
Well ID: AW-08
Surface Elev: 460.66 ft. MSL
Completion: 57.67 ft. BGS
Station: 1,430,641.18N
2,436,732.68E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 30.00 - during drilling
▼ = 10.58 - 7/21/15
▽ =

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
1A	16/24 67%	SS	4-3 5-7 N=8	15		3.30	0	FILL - Very dark grayish brown (10YR3/2), moist, medium, clayey SILT with trace fine- to coarse-grained sand, trace small gravel.	460
2A	16/24 67%	SS	4-3 3-4 N=6	25		3.00	2	FILL - Gray (10YR5/1), moist, medium, SILT with little clay, trace fine- to coarse-grained sand, trace small gravel.	458
3A	17/24 71%	SS	1-2 1-2 N=3	16		2.50	4	Very dark gray (10YR3/1), moist, soft, silty CLAY with trace fine-grained sand.	456
4A	19/24 79%	SS	5-6 6-6 N=12	22		1.30	6	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace fine-grained sand.	454
5A	21/24 88%	SS	1-2 2-2 N=4	28		2.30	8		452
6A	24/24 100%	SS	1-2 2-3 N=4	37		0.80	10 ▼	Dark gray (10YR4/1) with 15% dark brown (10YR3/3) mottles, moist, soft, silty CLAY with trace fine-grained sand.	450
7A	21/24 88%	SS	3-3 4-4 N=7	27		0.80	12		448
8-1 8-2 8-3	8/24 33%	SH					14	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, medium, very fine- to fine-grained sandy CLAY.	446
8-4				24		0.80	16		
9A	22/24 92%	SS	2-2 3-4 N=5	30		0.80	18	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, medium, very fine- to fine-grained sandy CLAY with trace very fine- to fine-grained sand seams (wet).	444
10A	22/24 92%	SS	2-1 2-1 N=3	42		0.30	20	Dark gray (N4/0), moist, soft, SILT with few clay and slight trace shell fragments.	442

NOTE(S): AW-08 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/20/2015
Finish: 7/21/2015
WEATHER: Sunny, warm, hi-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-08
Well ID: AW-08
Surface Elev: 460.66 ft. MSL
Completion: 57.67 ft. BGS
Station: 1,430,641.18N
2,436,732.68E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 30.00 - during drilling
▼ = 10.58 - 7/21/15
▽ =

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
11-1											
11-2	18/24 75%	SH						Dark gray (10YR4/1), moist, stiff, SILT with trace clay and trace shell fragments.		440	
11-3											
11-4				25		1.30	22				
12A	24/24 100%	SS	5-7 14-15 N=21	18		3.30		Dark gray (10YR4/1), moist, very stiff, SILT with few clay, trace medium- to coarse-grained sand, slight trace shell fragments.		438	
13A	24/24 100%	SS	2-3 4-4 N=7	32		1.50	24	Dark gray (10YR4/1), moist, stiff, SILT with few clay and slight trace very fine- to fine-grained sand.		436	
14A	24/24 100%	SS	6-7 7-8 N=14	28		1.20	26			434	
15A	22/24 92%	SS	1-2 3-3 N=5	27		1.30	28			432	
16A	24/24 100%	SS	1-2 2-2 N=4	29		1.20	▼ 30	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/4) mottles, moist, stiff, SILT with few clay and trace fine- to medium-grained sand.		430	
17A	24/24 100%	SS	3-4 6-7 N=10	29		1.60	32			428	
18A	24/24 100%	SS	2-2 2-4 N=4	32		0.80	34			426	
19A	24/24 100%	SS	4-4 5-6 N=9	28		1.00	36	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/4) mottles, moist, medium, SILT with few clay and trace very fine- to fine-grained sand.		424	
20A	24/24 100%	SS	1-1 1-2 N=2	30		0.70	38			422	
							40	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/4) mottles, moist, medium, SILT with few clay and trace very fine-grained sand.			

NOTE(S): AW-08 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/20/2015
Finish: 7/21/2015
WEATHER: Sunny, warm, hi-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-08
Well ID: AW-08
Surface Elev: 460.66 ft. MSL
Completion: 57.67 ft. BGS
Station: 1,430,641.18N
2,436,732.68E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 30.00 - during drilling
▼ = 10.58 - 7/21/15
▽ =

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
21A	24/24 100%	ss	0-0 2-2 N=2	28		0.30	42	Dark gray (10YR4/1) and dark yellowish brown (10YR4/4), moist, soft, SILT with few clay and trace very fine-grained sand.		420	
22A	24/24 100%	ss	3-2 3-3 N=5	27		0.20	44			418	
23A	24/24 100%	ss	3-3 4-4 N=7	41		0.50	46			416	
24A	24/24 100%	ss	4-5 4-4 N=9	41		0.30	48	Dark gray (10YR4/1), moist, very soft to medium, SILT with few clay and trace very fine-grained sand and shell fragments.		414	
25A	24/24 100%	ss	0-0 3-3 N=3	48		0.20	50			412	
26A	24/24 100%	ss	2-2 3-3 N=5	43		0.30	52			410	
27A	24/24 100%	ss	3-3 4-5 N=7	60		0.50	54			408	
28A	24/24 100%	ss	2-4 8-10 N=12	29		1.00	56	Gray (10YR5/1), moist, stiff, very fine-grained sandy SILT, little clay.		406	
29A	11/24 46%	ss	23-50/5"	20				Gray (10YR5/1), moist, hard, weathered SHALE.		404	

End of boring = 57.67 feet

NOTE(S): AW-08 installed in bore hole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, lo-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-09
Well ID: AW-09
Surface Elev: 458.32 ft. MSL
Completion: 52.23 ft. BGS
Station: 1,429,340.11N
2,434,856.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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	Remarks
	24/24 100%	BD					0	GRAVEL FILL	458	
							2			Sample from cuttings
2A	24/24 100%	BD		23				FILL - Dark gray (10YR4/1), very moist, SILT with few clay and gravel.	456	
							4	FILL - Yellowish brown (10YR5/4), moist, medium, silty CLAY with trace fine- to coarse-grained sand.	454	
3A	21/24 88%	SS	1-3 6-9 N=9	29		0.50		FILL - Very dark gray (10YR3/1), moist, stiff, FLY ASH.		
							6		452	
4A	19/24 79%	SS	10-13 14-15 N=27	28						
							8		450	
5A	22/24 92%	SS	5-5 5-5 N=10	36						
							10		448	
6A	18/24 75%	SS	2-3 3-2 N=6	36						
							12	FILL - Very dark gray (10YR3/1), moist, medium, FLY ASH.	446	
7A	20/24 83%	SS	3-4 7-9 N=11	32						
							14		444	
8A	21/24 88%	SS	2-3 4-4 N=7	37						
							16		442	
9A	22/24 92%	SS	3-5 4-3 N=9	38						
							18	Very dark gray (10YR3/1), moist, medium, SILT with few clay and trace very fine - to fine-grained sand.	440	
10A	15/24 63%	SS	2-2 4-4 N=6	26		1.50		Dark gray (10YR4/1) with 35% yellowish brown (10YR5/6) mottles, moist, medium, SILT with few clay, trace very fine- to fine-grained sand and organics.		
							20			

NOTE(S): AW-09 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, lo-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-09
Well ID: AW-09
Surface Elev: 458.32 ft. MSL
Completion: 52.23 ft. BGS
Station: 1,429,340.11N
2,434,856.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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	Remarks
11A	16/24 67%	SS	1-2 4-5 N=6	24		2.30	0	Grayish brown (10YR5/2), moist, medium, SILT with little clay, trace coarse-grained sand and roots.	438	
12A	18/24 75%	SS	7-9 9-9 N=18	26		1.80	22	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace fine-grained sand.	436	
13-1						1.80	24		434	
13-2	21/24 88%	SH						Very dark gray (10YR3/1), moist, stiff, SILT with few clay and trace very fine- to fine-grained sand.		
13-3						1.80				
13-4				28			26		432	
14A	19/24 79%	SS	6-6 5-6 N=11	28		0.50		Dark gray (10YR4/1) with 20% very dark grayish brown (10YR3/2) mottles, moist, medium, SILT with few clay and trace very fine- to fine-grained sand.		
15A	22/24 92%	SS	1-3 3-4 N=6	25		1.30	28		430	
16-1								Gray (10YR5/1) with 30% dark yellowish brown (10YR4/4) mottles, moist, stiff, SILT with few clay and trace very fine- to fine-grained sand, woody material and shell fragments.		
16-2	18/24 75%	SH				1.30				
16-3										
16-4				40			32		428	
17A	24/24 100%	SS	1-1 3-4 N=4	31		0.80		Gray (10YR5/1) with 30% dark yellowish brown (10YR4/4) mottles, moist, medium, SILT with few clay and trace very fine- to fine-grained sand and woody material.		
18-1						0.80	34		426	
18-2	24/24 100%	SH				0.80				
18-3						0.80				
18-4				32			36	Dark gray (10YR4/1), moist, medium, SILT with little clay and trace very fine-grained sand.	424	
19A	24/24 100%	SS	1-2 3-3 N=5	36		0.70				
20A	13/24 54%	SS	3-3 3-3 N=6	34		0.50	38	Dark gray (10YR4/1), moist, medium to stiff, SILT with little clay and trace very fine-grained sand and shell fragments.	422	
							40		420	

NOTE(S): AW-09 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/29/2015
Finish: 8/3/2015
WEATHER: Sunny, warm, lo-80s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-09
Well ID: AW-09
Surface Elev: 458.32 ft. MSL
Completion: 52.23 ft. BGS
Station: 1,429,340.11N
2,434,856.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

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	Borehole Detail	Elevation ft. MSL	Remarks
21-1											
21-2	16/24 *67%*	SH				*1.30*					
21-3											
21-4				40			42			418	
22A	20/24 *83%*	SS	*3-4* 5-5 N=9	52		*0.80*				416	
	24/24 *100%*	SS	*2-3* *3-4* N=6				44	Dark gray (10YR4/1), moist, medium to stiff, SILT with little clay and trace very fine-grained sand and shell fragments. *[Continued from previous page]*		414	
23A				81		*0.80*					
24-1							46			412	
24-2	24/24 *100%*	SH									
24-3						*1.00*					
24-4				77			48			410	
	24/24 *100%*	SS	*1-3* *3-5* N=6								
25A				41		*0.80*					
26-1	11/12 *92%*	SH				*0.50*	50			408	
26-2				13				Dark gray (10YR4/1), moist, hard, weathered SHALE.			
26A	9/12 *75%*	SS	*50-50/3"*								
27A	2/2 *100%*	SS	*50/2"*	14			52				

End of boring = 52.23 feet

NOTE(S): AW-09 installed in bore hole. Well was constructed using a pre-packed screen.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/23/2015
Finish: 7/23/2015
WEATHER: Sunny, warm, calm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-10
Well ID: AW-10
Surface Elev: 437.64 ft. MSL
Completion: 32.74 ft. BGS
Station: 1,429,461.05N
2,436,231.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 7.00 - during drilling
▼ = 6.68 - 7/23/15
▽ =

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
1A	16/24 67%	ss	6-5 5-5 N=10	25			0	Very dark grayish brown (10YR3/2), moist, very stiff, SILT with few clay and trace very fine- to fine-grained sand and roots.		436	
2A	20/24 83%	ss	2-2 2-3 N=4	30		1.50	2				
3A	15/24 63%	ss	1-1 3-3 N=4	25		2.30	4	Very dark gray (10YR3/1) with 3% dark yellowish brown (10YR4/4) mottles, moist, stiff , silty CLAY with trace very fine- to fine-grained sand.		434	
4A	16/24 67%	ss	4-3 4-3 N=7	29		1.00	6			432	
5A	19/24 79%	ss	1-1 2-2 N=3	29		0.80	8	Gray (10YR5/1) with 5% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/4) mottles, moist, medium, silty CLAY with trace fine-grained sand.		430	
6A	24/24 100%	ss	1-1 1-2 N=2	45		0.80	10			428	
7A	24/24 100%	ss	2-2 2-3 N=4	43		0.30	12	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR4/4) mottles, moist, medium, SILT with few clay and trace very fine- to fine-grained sand.		426	
8A	24/24 100%	ss	1-1 1-1 N=2	55		0.30	14	Dark gray (10YR4/1), moist, soft, SILT with few clay and trace very fine-grained sand and shell fragments.		424	
9A	24/24 100%	ss	2-2 2-3 N=4	41		0.50	16			422	
10A	24/24 100%	ss	1-1 1-1 N=2	34		0.30	18	Dark gray (10YR4/1), moist, soft, SILT with few clay and trace very fine-grained sand, shell fragments, and woody fragments.		420	
							20			418	

NOTE(S): AW-10 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/23/2015
Finish: 7/23/2015
WEATHER: Sunny, warm, calm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: AW-10
Well ID: AW-10
Surface Elev: 437.64 ft. MSL
Completion: 32.74 ft. BGS
Station: 1,429,461.05N
2,436,231.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 7.00 - during drilling
▼ = 6.68 - 7/23/15
▽ =

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
11A	24/24 100%	SS	0-0 1-1 N=1	57		0.30					
12A	24/24 100%	SS	2-1 1-2 N=2	58		0.30	22			416	
13-1							24			414	
13-2	24/24 100%	SH						Dark gray (10YR4/1), moist, soft, SILT with few clay and trace very fine-grained sand, shell fragments, and woody fragments. *[Continued from previous page]*			
13-3											
13-4				89		0.80	26			412	
14A	24/24 100%	SS	1-1 2-2 N=3	100		0.30				410	
15A	24/24 100%	SS	0-1 2-1 N=3	56		0.50	28			408	
16A	24/24 100%	SS	0-6 6-9 N=12	26		1.80	30				
17A	9/9 100%	SS	33-50/6"	18			32	Gray (10YR5/1), moist, hard, weathered SHALE.		406	

End of boring = 32.74 feet

NOTE(S): AW-10 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/24/2015
Finish: 7/28/2015
WEATHER: Sunny, warm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

BOREHOLE ID: AW-11
Well ID: AW-11
Surface Elev: 437.16 ft. MSL
Completion: 30.00 ft. BGS
Station: 1,428,196.31N
2,436,251.05E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 9.00 - during drilling
▼ = 5.77 - 7/27/15
▽ =

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
1	10/24 *42%*	SS	*3-4 4-5* N=8	23		*2.80*		FILL - Black (10YR2/1), moist, medium, CLAY with some silt and trace sand and small gravel.		436	
2	13/24 *54%*	SS	*2-2 2-2* N=4	26		*0.80*	2	Very dark gray (10YR3/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, CLAY with some silt and trace sand.		434	
3	10/24 *42%*	SS	*1-1 2-1* N=3	25		*1.30*	4	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, CLAY swith some silt and trace very fine-grained sand.		432	
4	14/24 *58%*	SS	*1-2 2-1* N=4	28		*0.50*	6 ▼	Very dark gray (10YR3/1), wet, very soft, SILT with few clay and trace very fine-grained sand.		430	
5-1							8				
5-2	24/24 *100%*	SH					▼			428	
5-3						*0.80*					
5-4				40			10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, SILT with few clay and trace very fine-grained sand.			
6	20/24 *83%*	SS	*1-1 1-1* N=2	53		*0.30*				426	
7	24/24 *100%*	SS	*2-2 2-2* N=4	66		*0.30*	12	Gray (10YR5/1), moist, soft, SILT with few clay and trace very fine-grained sand.		424	
8	24/24 *100%*	SS	*1-1 1-1* N=2	50		*0.30*	14			422	
9	24/24 *100%*	SS	*1-1 1-1* N=2	56		*0.00*	16	Gray (10YR5/1), moist, soft, SILT with few clay and trace very fine-grained sand, shell fragments and woody fragments.		420	
10	24/24 *100%*	SS	*woh-1 1-1* N=2	61		*0.50*	18			418	
							20				

NOTE(S): AW-11 installed in bore hole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Edwards Power Station
Location: Bartonville, Illinois
Project: 15E0030
DATES: **Start:** 7/24/2015
Finish: 7/28/2015
WEATHER: Sunny, warm, mid-70s

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: Diedrich D-50
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

BOREHOLE ID: AW-11
Well ID: AW-11
Surface Elev: 437.16 ft. MSL
Completion: 30.00 ft. BGS
Station: 1,428,196.31N
2,436,251.05E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Pekin Quadrangle (7½' series)
Township: Hollis Township
Section 14, **Tier** 7N; **Range** 7E

WATER LEVEL INFORMATION:
▼ = 9.00 - during drilling
▼ = 5.77 - 7/27/15
▽ =

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
11	22/24 *92%*	ss	*woh-woh* *1-1*	61		*0.20*	22			416	
12	24/24 *100%*	ss	*1-1* *1-1* N=2	86		*0.50*	24	Gray (10YR5/1), moist, soft, SILT with few clay and trace very fine-grained sand, shell fragments and woody fragments. *[Continued from previous page]*		414	
13	24/24 *100%*	ss	*1-1* *2-1* N=3	84		*0.50*	26			412	
14A	22/24 *92%*	ss	*2-3* *5-11* N=8	36		*0.50*				410	
14B				11			28	Gray (10YR5/1), wet, loose, very fine- to very coarse-grained SAND with some small to medium gravel.			
15A				83				Gray (10YR5/1), moist, soft, SILT with few clay and trace very fine-grained sand, shell fragments and woody fragments.		408	
15B	24/24 *100%*	ss	*3-39* *27-62* N=66	16				Gray (10YR5/1), wet, loose, medium- to very coarse-grained SAND.			
							30	Gray (10YR5/1), moist, hard, weathered SHALE.			

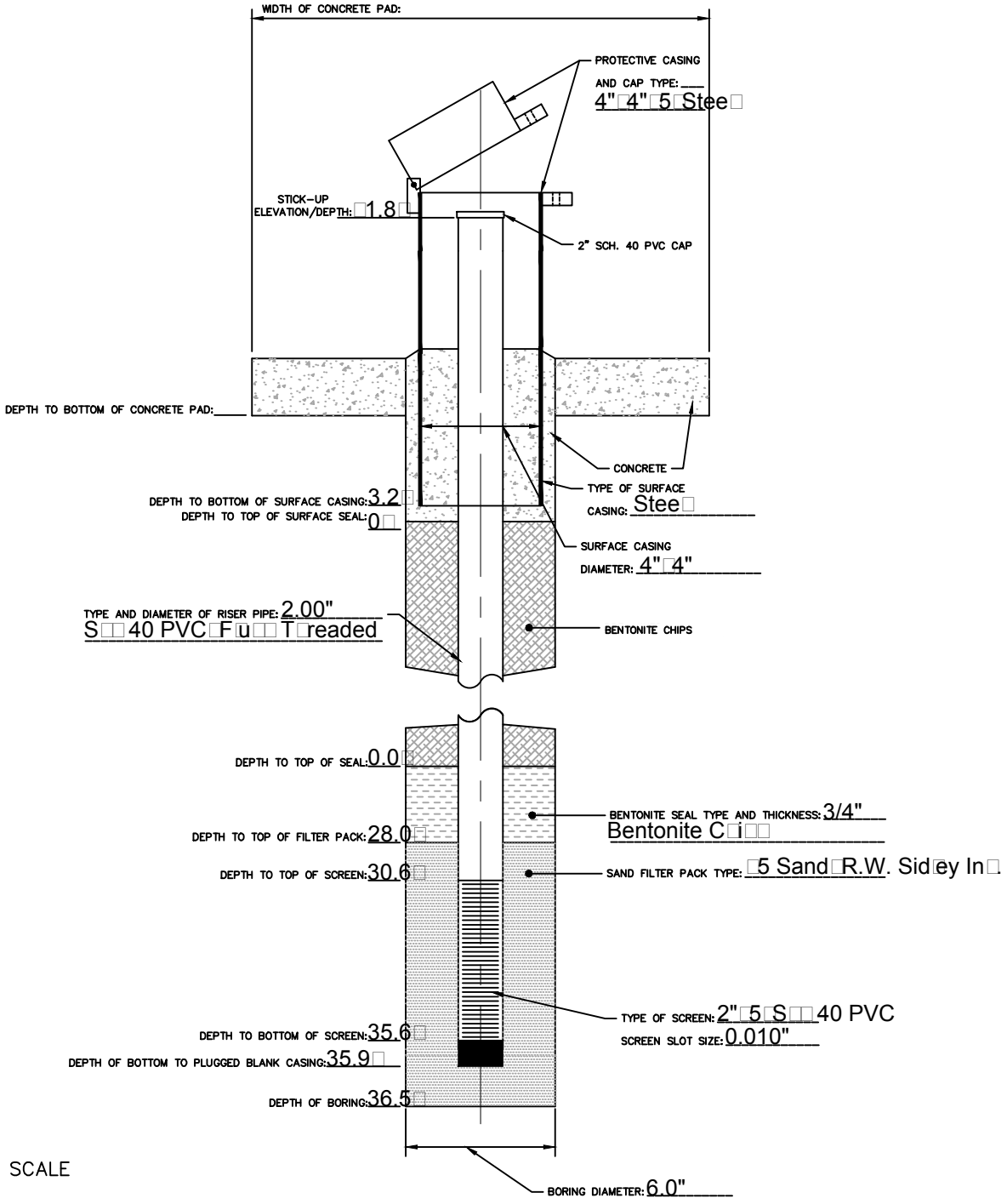
End of boring = 30.00 feet

NOTE(S): AW-11 installed in bore hole.

PRE-2021 PIEZOMETER AND WELL CONSTRUCTION LOGS

Project: Dynegy Project Location: Pe□in, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

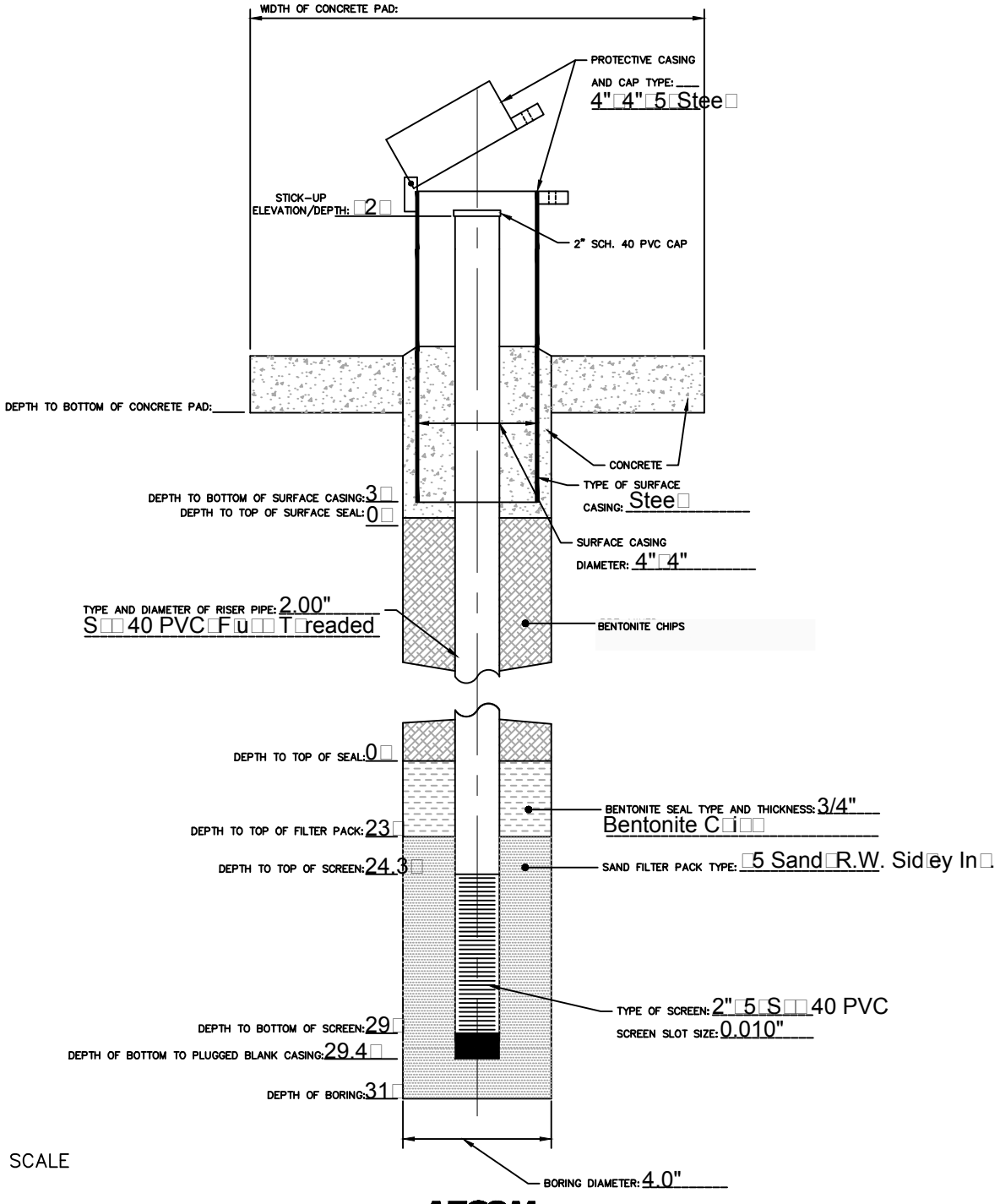
Piezometer Location	EDW-P001	Date Installed	11/05/15	Time	5:30 P.M.
Installed By	Jo□□ Ko□n	Observed By	R. We□e□a□	Total Depth	36.5□
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	30.6-35.6□	Completion Zone			
Remarks		Groundwater Level(s)	24.64□ro□ to□o□□a□in□		



AECOM

Project: Dynegy Project Location: Pe□in, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

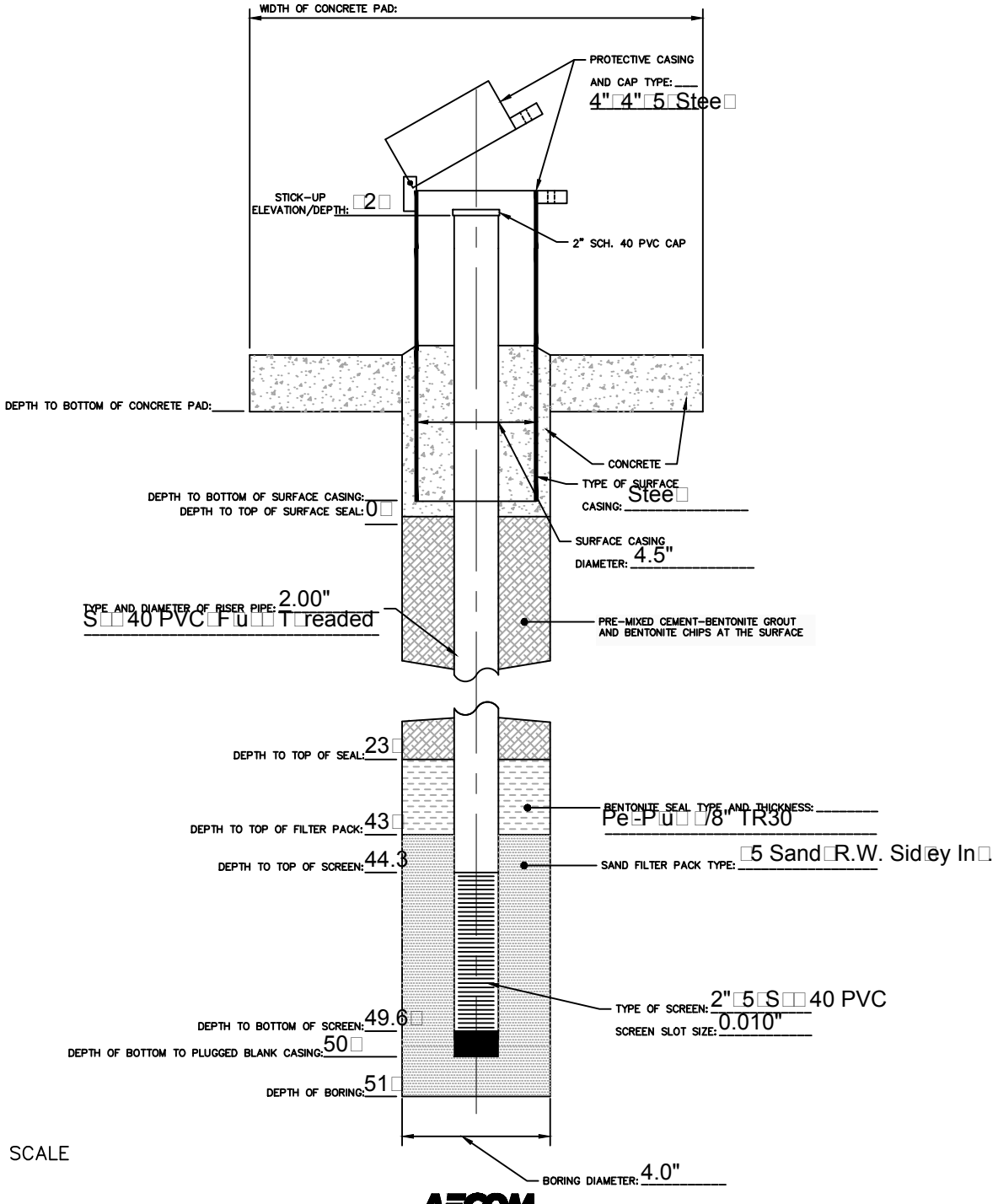
Piezometer Location	EDW-P002	Date Installed	09/04/15	Time	11:00-12:00 P.M.
Installed By	S□ott Ko□en	Observed By	N. Sei□er	Total Depth	31□
Method of Installation	4" Po□er Au□er	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	24-29□	Completion Zone			
Remarks		Groundwater Level(s)	29□A□ter Dri□in□		



AECOM

Project: Dynegy Project Location: Pe□in, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

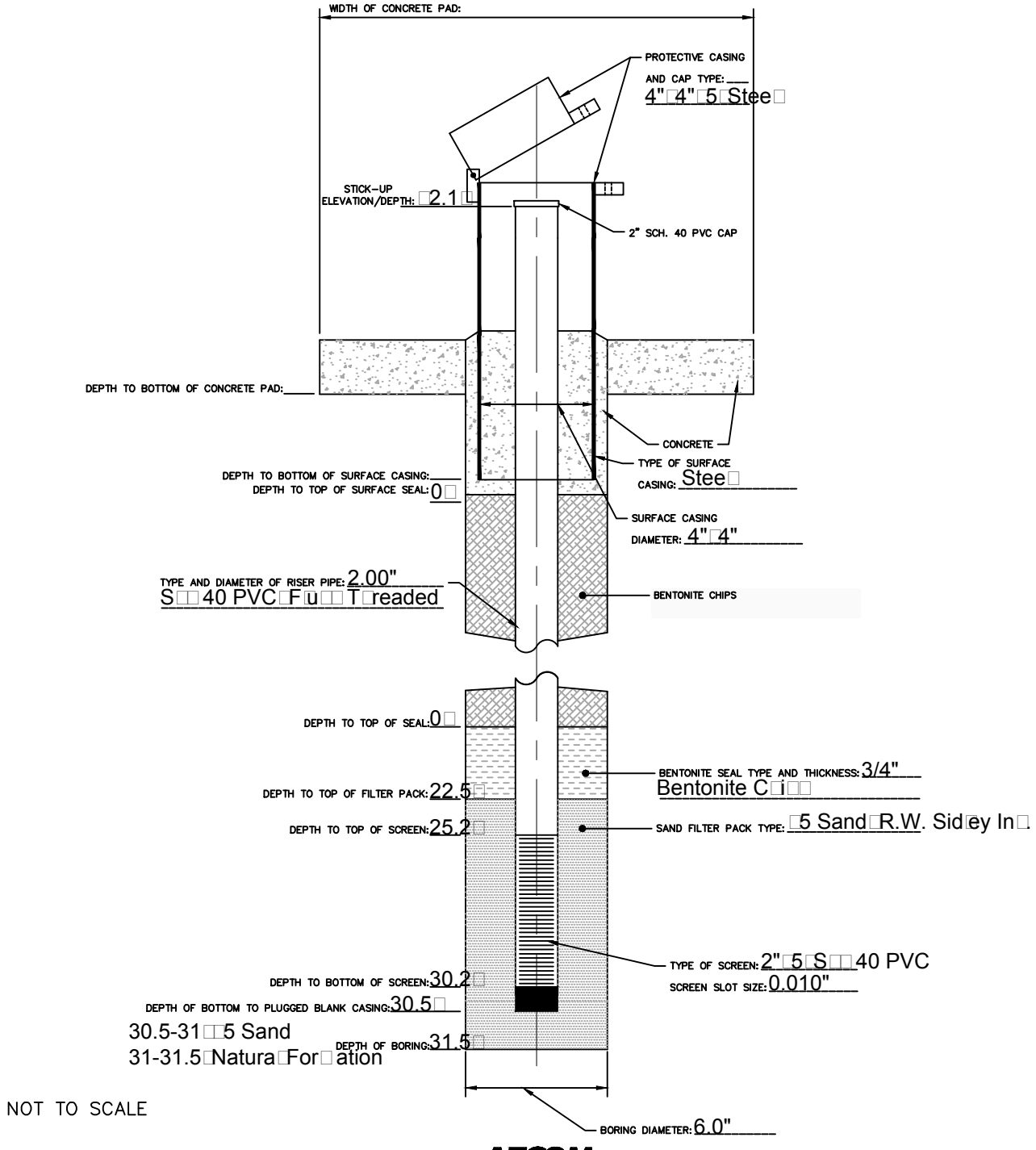
Piezometer Location	EDW-P003	Date Installed	09/04/15	Time	3:30-6:00 P.M.
Installed By	S□ott Ko□en	Observed By	N. Sei□er	Total Depth	51□
Method of Installation	3 7/8" Ro□□ Bit	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	44.3-49.6□	Completion Zone			
Remarks		Groundwater Level(s)			



AECOM

Project: Dynegy Project Location: Pe□in, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

Piezometer Location	EDW-P004	Date Installed	11/04/15	Time	12:00
Installed By	Jo□□ Ko□n	Observed By	R. We□e□a□	Total Depth	31.5□
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	25.2-30.2□	Completion Zone			
Remarks		Groundwater Level(s)	14.85 Fro□ To□o□Ca□in□		



AECOM

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP05D

Site Name: Edwards Power Station Borehole #: AP05D

State Plane Coordinate: X 2,436,749.2 Y 1,432,401.8 (or) Latitude: 40° 35' 55.667" Longitude: -89° 39' 42.842"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

Drilling Contractor: Bulldog Drilling, Inc. Driller: C. Dutton

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: NX Rock Core Drilling Fluid (Type): Water

Logged By: Rhonald W. Hasenyager Date Started: 11/28/2016 Date Finished: 12/5/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15.5 hrs.

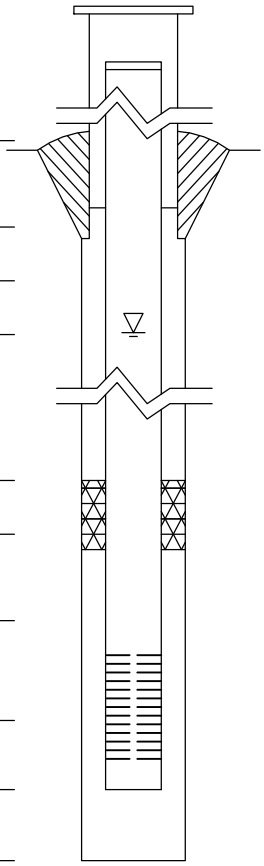
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Filter sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS) (0.01 ft.)	
443.85	-2.62	Top of Protective Casing
443.45	-2.22	Top of Riser Pipe
441.23	0.00	Ground Surface
441.23	0.00	Top of Annular Sealant
427.89	13.34	Static Water Level (After Completion) 1/18/2017
398.03	43.20	Top of Seal
395.83	45.40	Top of Sand Pack
394.14	47.09	Top of Screen
384.54	56.69	Bottom of Screen
384.06	57.17	Bottom of Well
382.93	58.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	49.32
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	9.60
Total Length of Casing	(feet)	59.39
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP05S

Site Name: Edwards Power Station Borehole #: AP05S

State Plane Coordinate: X 2,436,746.6 Y 1,432,405.6 (or) Latitude: 40° 35' 55.705" Longitude: -89° 39' 42.875"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

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): _____

Logged By: Rhonald W. Hasenyager Date Started: 11/28/2016 Date Finished: 11/29/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 55 min.

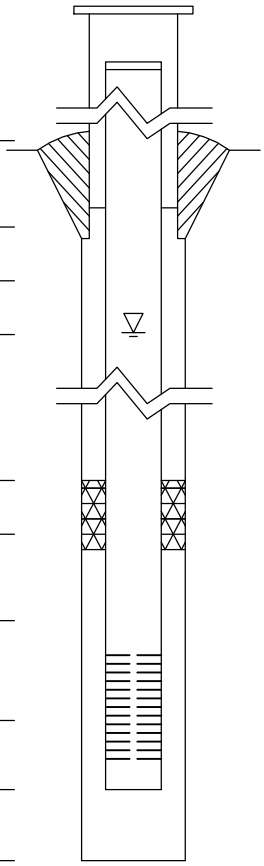
Type of Sand Pack: Quartz sand

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.)	
443.92	-2.79	Top of Protective Casing
443.53	-2.40	Top of Riser Pipe
441.13	0.00	Ground Surface
441.13	0.00	Top of Annular Sealant
435.90	5.23	Static Water Level (After Completion) 1/18/2017
411.02	30.11	Top of Seal
409.98	31.15	Top of Sand Pack
408.26	32.87	Top of Screen
403.49	37.64	Bottom of Screen
403.07	38.06	Bottom of Well
403.07	38.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	35.26
Bottom of Screen to End Cap	(feet)	0.42
Screen Length (1st slot to last slot)	(feet)	4.78
Total Length of Casing	(feet)	40.46
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP06

Site Name: Edwards Power Station Borehole #: AP06

State Plane Coordinate: X 2,436,506.2 Y 1,433,216.9 (or) Latitude: 40° 36' 3.736" Longitude: -89° 39' 45.931"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

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): _____

Logged By: Scot E. Collins Date Started: 11/30/2016 Date Finished: 11/30/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 min

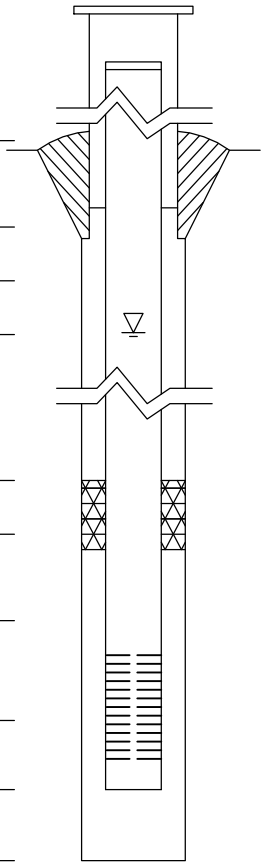
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: _____



Elevations (MSL)*	Depths (BGS) (0.01 ft.)	
442.35	-2.82	Top of Protective Casing
442.17	-2.64	Top of Riser Pipe
439.53	0.00	Ground Surface
439.53	0.00	Top of Annular Sealant
434.58	4.95	Static Water Level (After Completion) 1/18/2017
422.63	16.90	Top of Seal
421.63	17.90	Top of Sand Pack
419.60	19.93	Top of Screen
414.81	24.72	Bottom of Screen
414.53	25.00	Bottom of Well
414.53	25.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	22.57
Bottom of Screen to End Cap	(feet)	0.28
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	27.64
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP07D

Site Name: Edwards Power Station Borehole #: AP07D

State Plane Coordinate: X 2,435,355.4 Y 1,432,082.3 (or) Latitude: 40° 35' 52.589" Longitude: -89° 40' 0.934"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

Drilling Contractor: Bulldog Drilling, Inc. Driller: C. Dutton

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: NX Rock Core Drilling Fluid (Type): Water

Logged By: Scot E. Collins Date Started: 12/1/2016 Date Finished: 12/8/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 60 min.

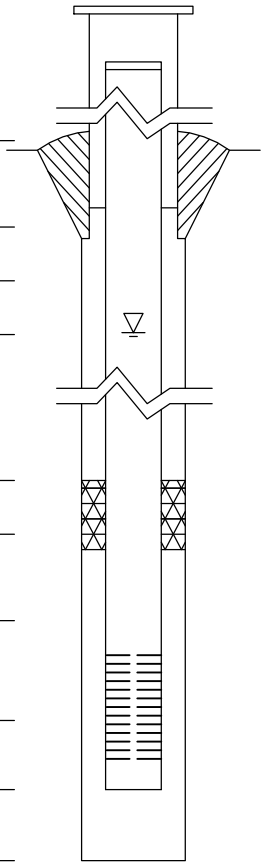
Type of Sand Pack: Quartz sand

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.)	
461.22	-2.80	Top of Protective Casing
460.89	-2.47	Top of Riser Pipe
458.42	0.00	Ground Surface
458.42	0.00	Top of Annular Sealant
405.76	52.66	Static Water Level (After Completion) 1/18/2017
418.62	39.80	Top of Seal
405.62	52.80	Top of Sand Pack
403.41	55.01	Top of Screen
393.83	64.59	Bottom of Screen
393.42	65.00	Bottom of Well
393.42	65.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	57.48
Bottom of Screen to End Cap	(feet)	0.41
Screen Length (1st slot to last slot)	(feet)	9.58
Total Length of Casing	(feet)	67.47
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP07S

Site Name: Edwards Power Station Borehole #: AP07S

State Plane Coordinate: X 2,435,357.3 Y 1,432,078.1 (or) Latitude: 40° 35' 52.547" Longitude: -89° 40' 0.909"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

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): _____

Logged By: Scot E. Collins Date Started: 12/2/2016 Date Finished: 12/2/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 33 min.

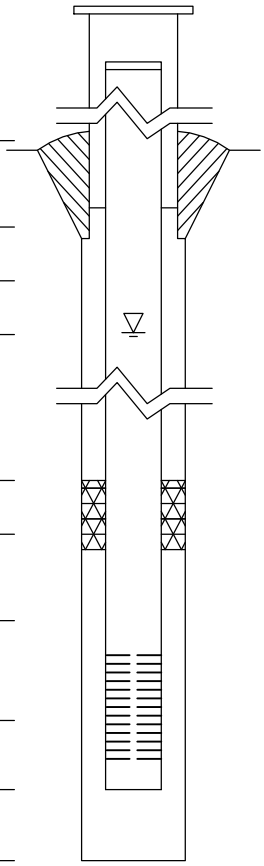
Type of Sand Pack: Quartz sand

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.)	
461.40	-3.09	Top of Protective Casing
461.08	-2.77	Top of Riser Pipe
458.31	0.00	Ground Surface
458.31	0.00	Top of Annular Sealant
433.74	24.57	Static Water Level (After Completion) 1/18/2017
431.41	26.90	Top of Seal
430.31	28.00	Top of Sand Pack
428.36	29.95	Top of Screen
423.57	34.74	Bottom of Screen
423.31	35.00	Bottom of Well
423.31	35.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	32.72
Bottom of Screen to End Cap	(feet)	0.26
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	37.77
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP08

Site Name: Edwards Power Station Borehole #: AP08

State Plane Coordinate: X 2,434,862.0 Y 1,430,854.3 (or) Latitude: 40° 35' 40.492" Longitude: -89° 40' 7.421"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

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): _____

Logged By: Scot E. Collins Date Started: 12/6/2016 Date Finished: 12/6/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

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: _____

Setting Time: _____

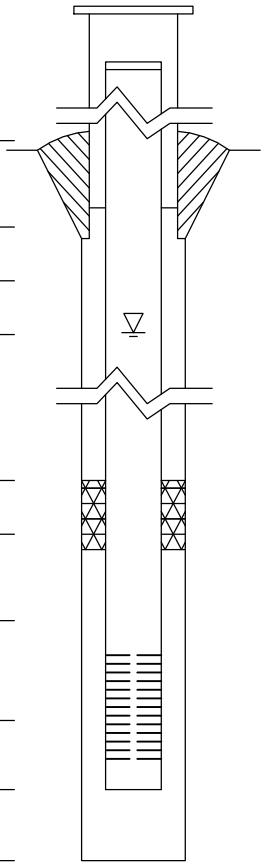
Type of Sand Pack: Quartz sand

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.)	
460.97	-2.87	Top of Protective Casing
460.60	-2.50	Top of Riser Pipe
458.10	0.00	Ground Surface
458.10	0.00	Top of Annular Sealant
449.22	8.88	Static Water Level (After Completion) 1/18/2017
n/a	n/a	Top of Seal
450.70	7.40	Top of Sand Pack
448.11	9.99	Top of Screen
438.52	19.58	Bottom of Screen
438.12	19.98	Bottom of Well
438.12	19.98	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	12.49
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	9.59
Total Length of Casing	(feet)	22.48
Screen Slot Size **	(inches)	0.010

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria Well #: AP09

Site Name: Edwards Power Station Borehole #: AP09

State Plane Coordinate: X 2,435,541.8 Y 1,429,733.2 (or) Latitude: 40° 35' 27.365" Longitude: -89° 39' 58.691"

Surveyed By: Andrew D. Canopy IL Registration #: 035-003391

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): _____

Logged By: Scot E. Collins Date Started: 12/6/2016 Date Finished: 12/7/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 1/12/2017

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Tremie

Setting Time: +24 hr

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: _____

Setting Time: _____

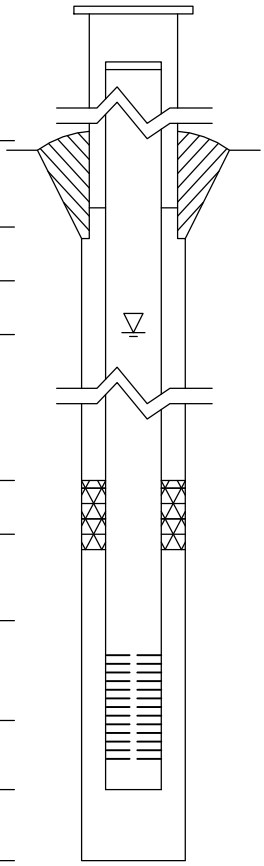
Type of Sand Pack: Quartz sand

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.)	
460.58	-3.34	Top of Protective Casing
460.22	-2.98	Top of Riser Pipe
457.24	0.00	Ground Surface
457.24	0.00	Top of Annular Sealant
449.04	8.20	Static Water Level (After Completion) 1/18/2017
n/a	n/a	Top of Seal
450.14	7.10	Top of Sand Pack
447.45	9.79	Top of Screen
437.85	19.39	Bottom of Screen
437.44	19.80	Bottom of Well
437.44	19.80	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	12.77
Bottom of Screen to End Cap	(feet)	0.41
Screen Length (1st slot to last slot)	(feet)	9.60
Total Length of Casing	(feet)	22.78
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

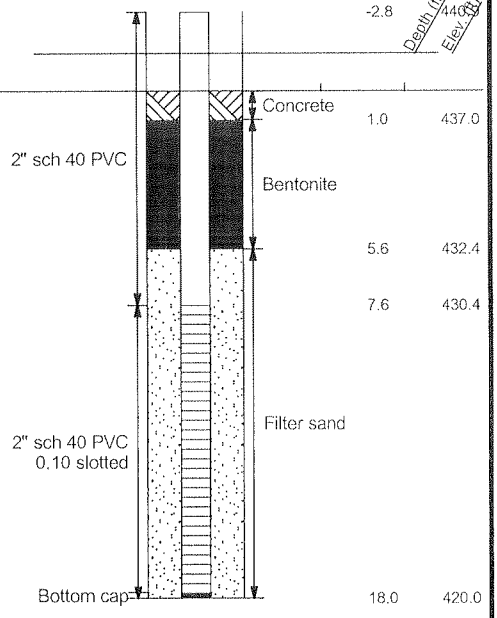
Surface Elevation: 438.02 | Completion Date: 7/27/10

Datum msl | Northing 1432880.82 | Easting 2435852.39

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL			GB1
5				GB2
	Brown, silty CLAY - CL			
10		▽		GB3
15				GB4
	Shaley LIMESTONE		10-0-0	SS5
20	Auger refusal at 18.5 feet.			
25				
30				
35				
40				

WELL DIAGRAM

Stickup
Diameter: 6 inches



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 10 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 9/17/14	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-1

Project No. J017150.01

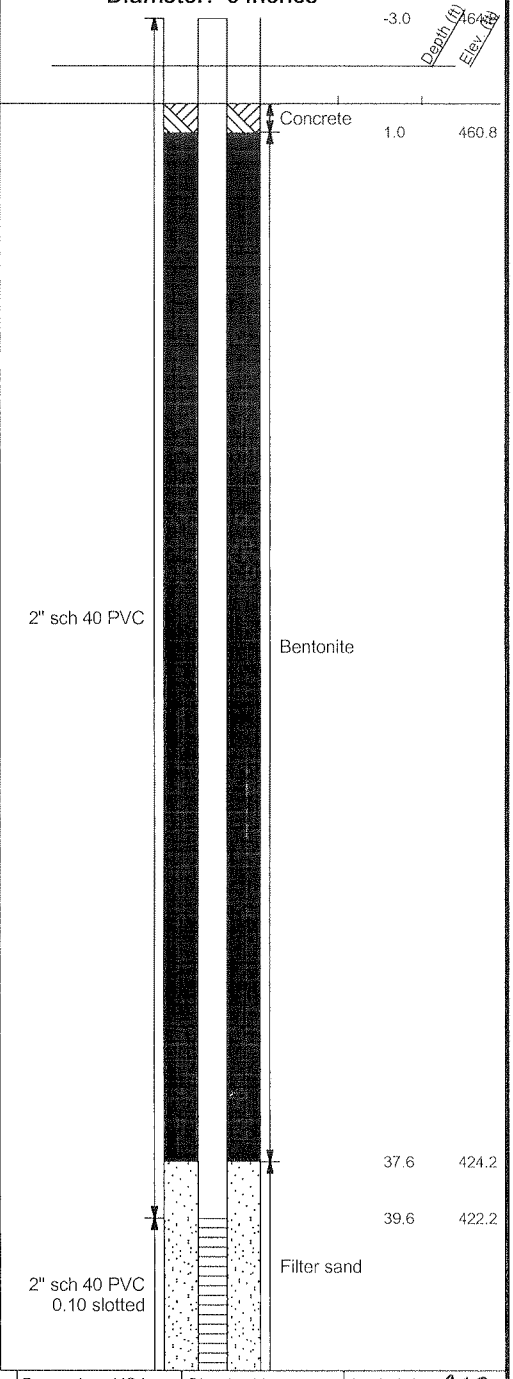
LOG OF BORING 2002 WL J017150.01 - EDWARDS.GPJ GTINC.0638301.GPJ 12/13/10

Surface Elevation: 461.80
Datum msl

Completion Date: 7/20/10
Northing: 1430732.11
Easting: 243579.28

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: ash			GB1
5	Black, silty CLAY - CL			GB2
10				GB3
15				GB4
20				GB5
25	Gray, silty CLAY - CL			GB6
30				GB7
35				GB8
40				GB9

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 38 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-2

Project No. J017150.01

LOG OF BORING 2002 WL J0171150.01 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 461.80
Datum msl

Completion Date: 7/20/10
Northing: 1430732.11
Easting: 243579.28

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	WELL DIAGRAM
	Gray, silty CLAY - CL *(continued)*			GB10	Stickup Diameter: 6 inches 2" sch 40 PVC 0.10 slotted Filter sand Bottom cap 50.0 411.8
50	Boring terminated at 50 feet.				
55					
60					
65					
70					
75					
80					
85					

GROUNDWATER DATA

ENCOUNTERED AT 38 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
PH DRILLER JPC LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTC	App'vd. by: RSF
Date: 8/13/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

CONTINUATION OF
LOG OF BORING: APW-2

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 444.26

Datum msl

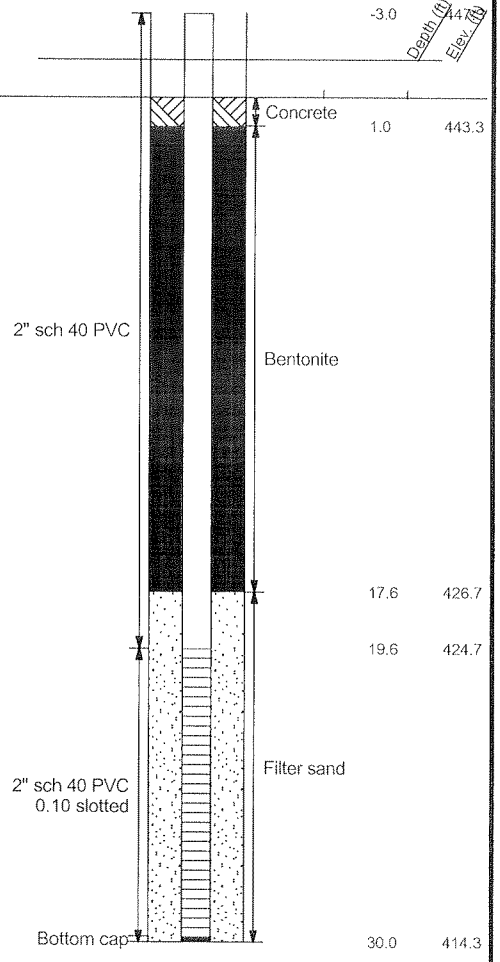
Completion Date: 7/19/10

Northing 1429652.72

Easting 2436225.53

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Black COAL and ash			GB1
5				
				GB2
10				
				GB3
	Gray and brown, silty CLAY - CL			
15				GB4
20				
				GB5
25				
				GB6
30	Boring terminated at 30 feet.			
35				
40				

WELL DIAGRAM



GROUNDWATER DATA

ENCOUNTERED AT 17 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

PH DRILLER JPC LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: SAK	App'vd. by: RSI
Date: 8/13/10	Date: 8/17/11	Date: 8/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-3

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 473.30

Datum msl

Completion Date: 7/27/10

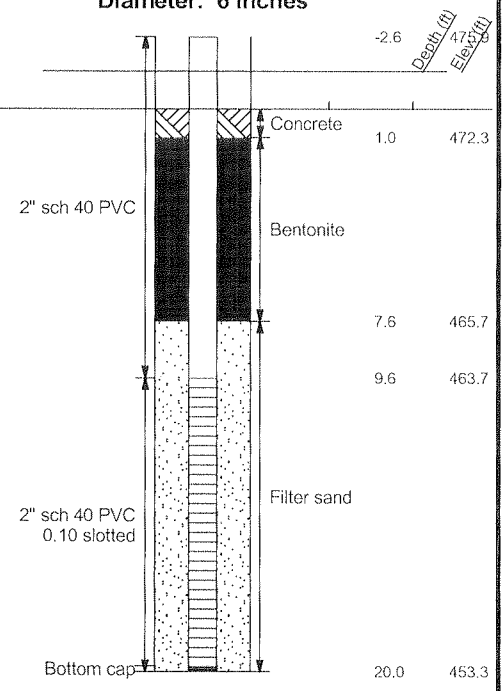
Northing 1428432.43

Easting 2436265.52

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL			GB1
	GRAVEL			GB2
5				
	Brown, silty CLAY, trace gravel - CL			GB3
10				GB4
15				GB5
20	Boring terminated at 20 feet.			
25				
30				
35				
40				

WELL DIAGRAM

Stickup
Diameter: 6 inches



GROUNDWATER DATA

ENCOUNTERED AT 7.5 FEET ▽

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

PH DRILLER JPC LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RSP
Date: 8/13/10	Date: 8/17/11	Date: 8/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Plant
Edwards, Illinois

LOG OF BORING: APW-4

Project No. J017150.01

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 - EDWARDS.GPJ GTINC 0638301.GPJ 12/13/10

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-05

Site Name: Edwards Power Station Borehole #: AW-05

State Plane Coordinate: X 2,435,498.0 Y 1,432,339.7 (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: 7/22/2015 Date Finished: 7/22/2015

Report Form Completed By: Suzanna L. Keim Date: 7/24/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hours

Type of Bentonite Seal -- [Granular] Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

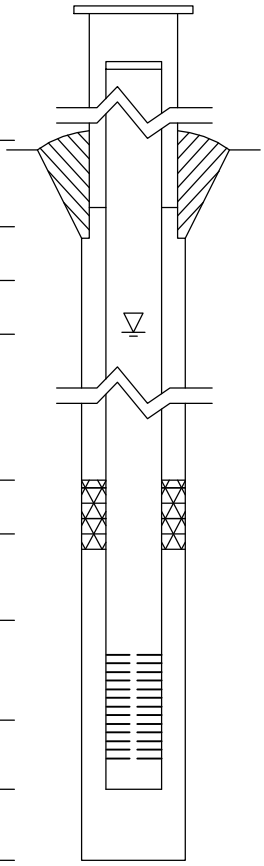
Type of Sand Pack: Quartz Sand

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.)	
443.55	-3.00	Top of Protective Casing
443.37	-2.82	Top of Riser Pipe
440.55	0.00	Ground Surface
438.05	2.50	Top of Annular Sealant
431.39	9.16	Static Water Level (After Completion) 9/23/2015
428.55	12.00	Top of Seal
426.35	14.20	Top of Sand Pack
424.68	15.87	Top of Screen
420.08	20.47	Bottom of Screen
419.45	21.10	Bottom of Well
419.45	21.10	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	0.63
Screen Length (1st slot to last slot)	(feet)	4.60
Total Length of Casing	(feet)	23.92
Screen Slot Size **	(inches)	0.010

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-06

Site Name: Edwards Power Station Borehole #: AW-06

State Plane Coordinate: X 2,434,495.3 Y 1,430,727.7 (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: 7/29/2015 Date Finished: 8/3/2015

Report Form Completed By: Suzanna L. Keim Date: 8/5/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hours

Type of Bentonite Seal -- (Granular) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 1 hour

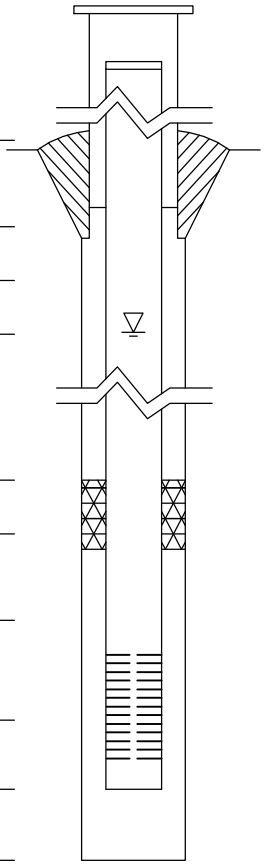
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Slough (if applicable)

Installation Method: Cave-in



Elevations (MSL)*	Depths (BGS) (0.01 ft.)	
461.79	-2.60	Top of Protective Casing
461.57	-2.38	Top of Riser Pipe
459.19	0.00	Ground Surface
457.19	2.00	Top of Annular Sealant
432.88	26.31	Static Water Level (After Completion) 9/22/2015
426.89	32.30	Top of Seal
424.69	34.50	Top of Sand Pack
422.59	36.60	Top of Screen
418.10	41.09	Bottom of Screen
417.50	41.69	Bottom of Well
416.94	42.25	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	38.98
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	44.07
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-08

Site Name: Edwards Power Station Borehole #: AW-08

State Plane Coordinate: X 2,436,732.7 Y 1,430,641.2 (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: 7/20/2015 Date Finished: 7/21/2015

Report Form Completed By: Suzanna L. Keim Date: 7/24/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hours

Type of Bentonite Seal -- [Granular] Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

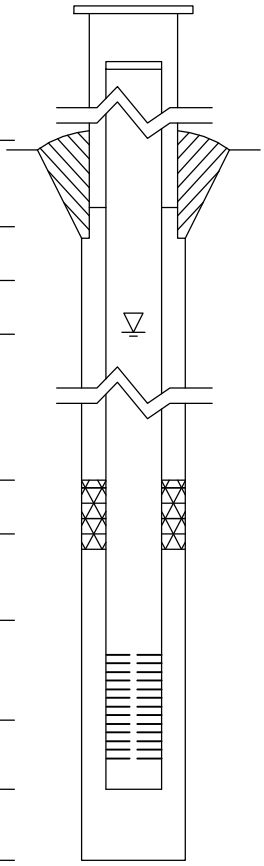
Type of Sand Pack: Quartz Sand

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.)
462.72	-2.06	Top of Protective Casing
462.54	-1.88	Top of Riser Pipe
460.66	0.00	Ground Surface
458.66	2.00	Top of Annular Sealant
441.09	19.57	Static Water Level (After Completion) 9/21/2015
416.16	44.50	Top of Seal
415.16	45.50	Top of Sand Pack
413.11	47.55	Top of Screen
403.47	57.19	Bottom of Screen
402.99	57.67	Bottom of Well
402.99	57.67	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	49.43
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	9.64
Total Length of Casing	(feet)	59.55
Screen Slot Size **	(inches)	0.010

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-09

Site Name: Edwards Power Station Borehole #: AW-09

State Plane Coordinate: X 2,434,857.0 Y 1,429,340.1 (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: 7/29/2015 Date Finished: 8/3/2015

Report Form Completed By: Suzanna L. Keim Date: 8/7/2015

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: 30 minutes

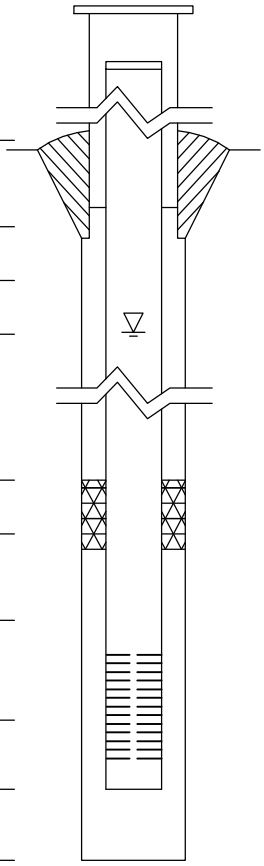
Type of Sand Pack: Quartz Sand

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.)
Top of Protective Casing	461.65	-3.33
Top of Riser Pipe	461.45	-3.13
Ground Surface	458.32	0.00
Top of Annular Sealant	455.82	2.50
Static Water Level (After Completion) 9/23/2015	432.22	26.10
Top of Seal	415.12	43.20
Top of Sand Pack	413.22	45.10
Top of Screen	411.18	47.14
Bottom of Screen	406.70	51.62
Bottom of Well	406.09	52.23
Bottom of Borehole	406.09	52.23

* Referenced to a National Geodetic Datum

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:

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)	50.27
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	55.36
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-10

Site Name: Edwards Power Station Borehole #: AW-10

State Plane Coordinate: X 2,436,231.4 Y 1,429,461.1 (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: 7/23/2015 Date Finished: 7/23/2015

Report Form Completed By: Suzanna L. Keim Date: 7/24/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hours

Type of Bentonite Seal -- [Granular] Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

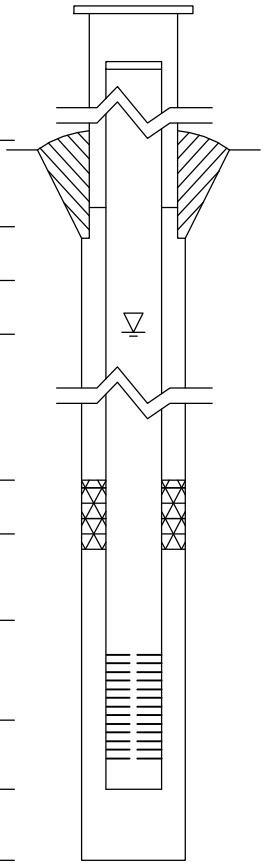
Type of Sand Pack: Quartz Sand

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.)	
440.16	-2.52	Top of Protective Casing
439.93	-2.29	Top of Riser Pipe
437.64	0.00	Ground Surface
434.64	3.00	Top of Annular Sealant
436.64	1.00	Static Water Level (After Completion) 9/22/2015
412.14	25.50	Top of Seal
411.49	26.15	Top of Sand Pack
410.02	27.62	Top of Screen
405.41	32.23	Bottom of Screen
404.90	32.74	Bottom of Well
404.90	32.74	Bottom of Borehole

* Referenced to a National Geodetic Datum

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:

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)	29.91
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.61
Total Length of Casing	(feet)	35.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: _____ County: Peoria County Well #: AW-11

Site Name: Edwards Power Station Borehole #: AW-11

State Plane Coordinate: X 2,436,251.1 Y 1,428,196.3 (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: Rhonald W. Hasenyager Date Started: 7/24/2015 Date Finished: 7/28/2015

Report Form Completed By: Suzanna L. Keim Date: 7/28/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hours

Type of Bentonite Seal -- [Granular] Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

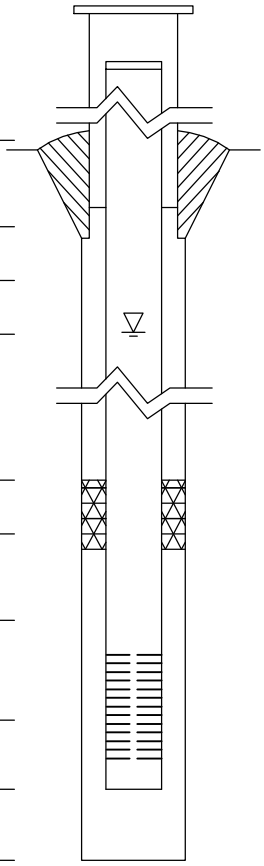
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



	Elevations (MSL)*	Depths (BGS) (0.01 ft.)
Top of Protective Casing	440.08	-2.92
Top of Riser Pipe	439.87	-2.71
Ground Surface	437.16	0.00
Top of Annular Sealant	435.16	2.00
Static Water Level (After Completion) 9/21/2015	404.91	32.25
Top of Seal	416.56	20.60
Top of Sand Pack	414.81	22.35
Top of Screen	412.95	24.21
Bottom of Screen	408.35	28.81
Bottom of Well	407.85	29.31
Bottom of Borehole	407.16	30.00

* Referenced to a National Geodetic Datum

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:

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)	26.92
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.60
Total Length of Casing	(feet)	32.02
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

APPENDIX D
GEOTECHNICAL LABORATORY REPORTS

TERRACON GEOTECHNICAL LABORATORY REPORTS

March 5, 2021
Revised: May 10, 2021

Mr. Scott Woods
Ramboll Environ U.S. Corporation
333 West Wacker Drive, Ste 2700
Chicago, IL 60606-2872

RE: Laboratory Testing Program for the Edwards Power Station Project – Terracon Project No. 11215017

Dear Mr. Woods,

We are pleased to submit our report pertaining to geotechnical laboratory testing of soil samples in reference to the Edwards Power Station Project. As instructed, Terracon performed the following tests on samples selected by Ramboll:

- Specific Gravity of Soils – ASTM D854
- Water Content of Soil and Rock – ASTM D2216
- Liquid Limit, Plastic Limit and Plasticity Index of Soils – ASTM D4318
- Hydraulic Conductivity of Saturated Porous Materials Using a Flexible-Wall Permeameter – ASTM D5084
- Laboratory Determination of Density (Unit Weight) of Soil Specimens – ASTM D7263
- Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis – ASTM D6913
- Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis – ASTM D7928

The test data included in this report, only represent the samples tested and may not reflect actual site materials and/or conditions. The scope of services provided by Terracon did not include interpretation of the laboratory test data, and therefore, we are not liable for any interpretation performed by others. If you wish us to provide you with this service, we would be happy to discuss this matter with you at your convenience. Any reproduction of this report must be done in its entirety.

We are pleased to have the opportunity to provide you with our testing services. Should you have any questions, or require additional assistance, please feel free to contact us at any time.

Sincerely,
Terracon Consultants, Inc.

William P. Quinn
Department Manager – Laboratory Services

LABORATORY TESTING SUMMARY

PROJECT NAME: Edwards Power Station

PROJECT NUMBER: 11215017

CLIENT: Confidential

Boring Number	Sample Number	Depth	Description	USCS	WC %	Dry Density (pcf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Permeability k (cm/sec)	Specific Gravity
AW-13A	0850	5.0'-7.0'	LIGHT BROWN AND GRAY SANDY LEAN CLAY	CL	25.2	96.5	0.0	30.3	42.4	27.3	30	14	16	4.72E-08	2.661
AW-15	1025	20.0'-22.0'	GRAY FAT CLAY	CH	27.9	85.8	0.0	2.0	43.8	54.2	57	19	38	2.87E-08	2.694
AW-20	0810	15.0'-17.0'	GRAY AND DARK GRAY LEAN CLAY - SAND POCKETS NOTED	CL	35.1	83.9	0.0	7.8	41.3	50.9	47	18	29	7.23E-08	2.690
AW-22	0745	30.0'-32.0'	GRAY, LIGHT GRAY AND LIGHT BROWN CLAYEY SAND	SC	23.2	101.3	0.0	57.4	27.3	15.3	22	13	9	1.74E-07	2.700
XPW-01	1210	20.0'-22.0'	DARK GRAY SILTY SAND	SM	43.7	69.8	0.0	68.9	27.2	3.9	51	53	NP	1.18E-05	2.381
XPW-01A	1530	41.0'-41.5'	DARK GRAY ELASTIC SILT	MH	35.1	71.7	0.0	13.7	64.4	21.9	60	43	17	6.77E-06	2.378
XPW-02	0845	10.0'-12.0'	DARK GRAY AND GRAYISH BROWN ELASTIC SILT WITH SAND	MH	45.1	67.5	0.5	28.1	54.6	16.8	52	47	5	1.20E-05	2.414
XPW-02	0950	22.0'-24.0'	DARK GRAY SILT	ML	33.4	77.1	0.0	4.1	84.0	11.9	38	30	8	2.08E-06	2.335
XPW-02	1245	45.0'-47.0'	GRAYISH BROWN SANDY SILT	ML	41.7	73.5	0.1	37.4	49.7	12.8	39	33	6	1.00E-05	2.397
XPW-03	1500	10.0'-12.0'	DARK GRAY SILT WITH SAND - ROOTS NOTED	ML	43.8	68.0	0.4	27.2	51.3	21.1	36	29	7	3.29E-05	2.388

Specific Gravity of Soils
ASTM D854

Terracon
Consulting Engineers & Scientists

SPECIFIC GRAVITY OF SOIL SOLIDS

ASTM D-854

AASHTO T 100

Laboratory Services Group **192 Exchange Blvd.** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

Project Number: 11215017
Project Name: Edwards Power Station
Test Date: 3/1/2021

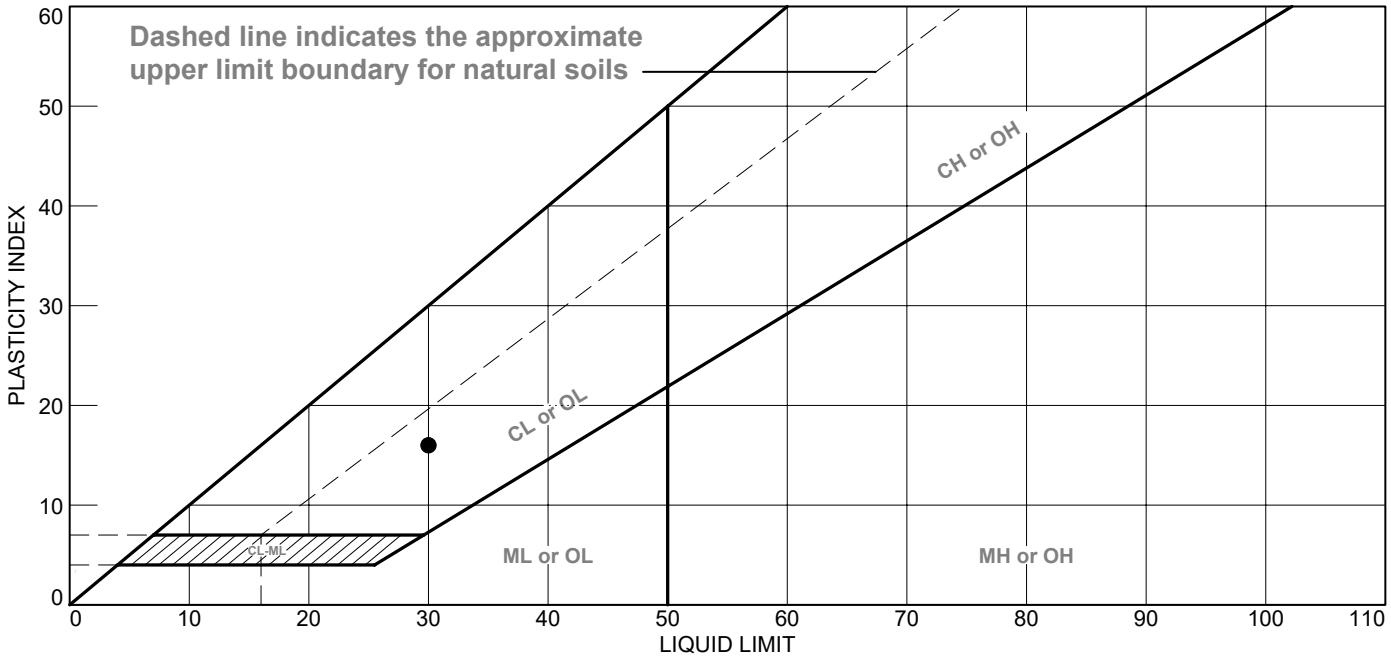
Results Summary

Boring / Sample	Sample Number	Depth (ft)		Specific Gravity (Gs)
AW-13A	0850	5.0'-7.0'		2.661
AW-15	1025	20.0'-22.0'		2.694
AW-20	0810	15.0'-17.0'		2.690
AW-22	0745	30.0'-32.0'		2.700
XPW-01	1210	20.0'-22.0'		2.381
XPW-01A	1530	41.0'-41.5'		2.378
XPW-02	0845	10.0'-12.0'		2.414
XPW-02	0950	22.0'-24.0'		2.335
XPW-02	1245	45.0'-47.0'		2.397
XPW-03	1500	10.0'-12.0'		2.388

Tested By: SJH Checked By: WPQ

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D4318

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	LIGHT BROWN AND GRAY SANDY LEAN CLAY	30	14	16	99.3	69.7	CL

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: AW-13A **Depth:** 5.0'-7.0'
Sample Number: 0850

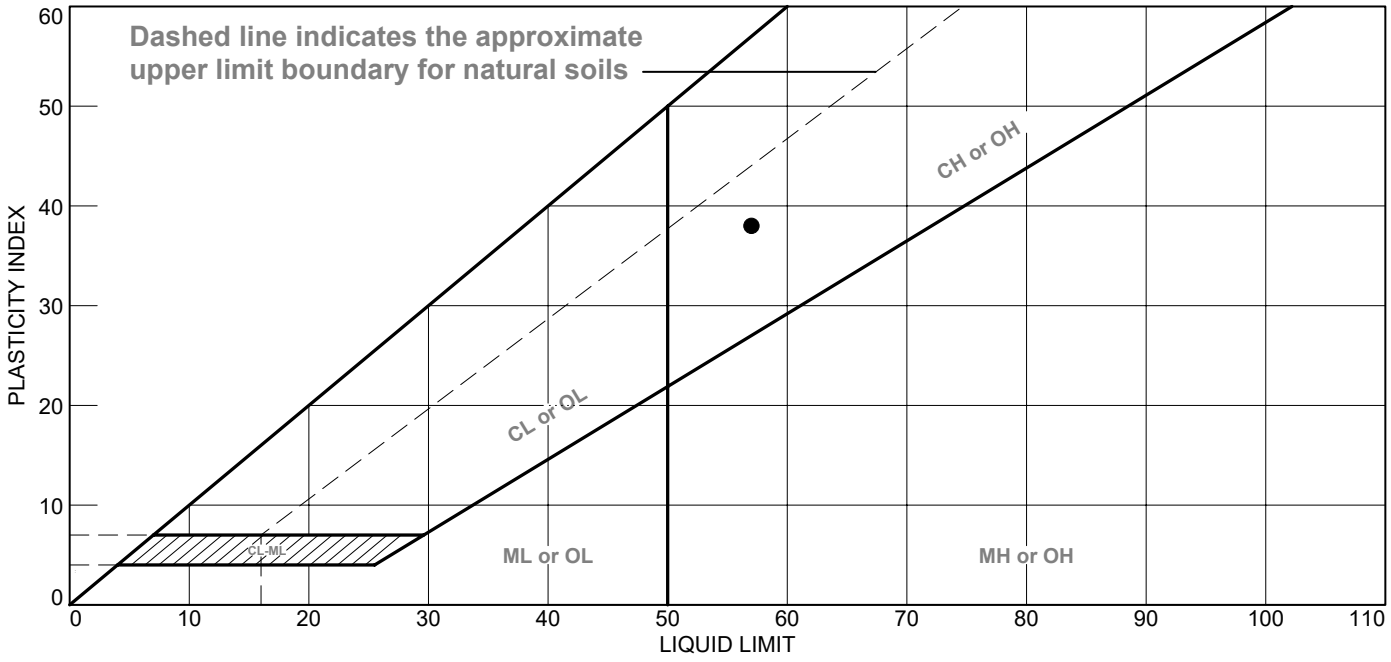
Remarks:

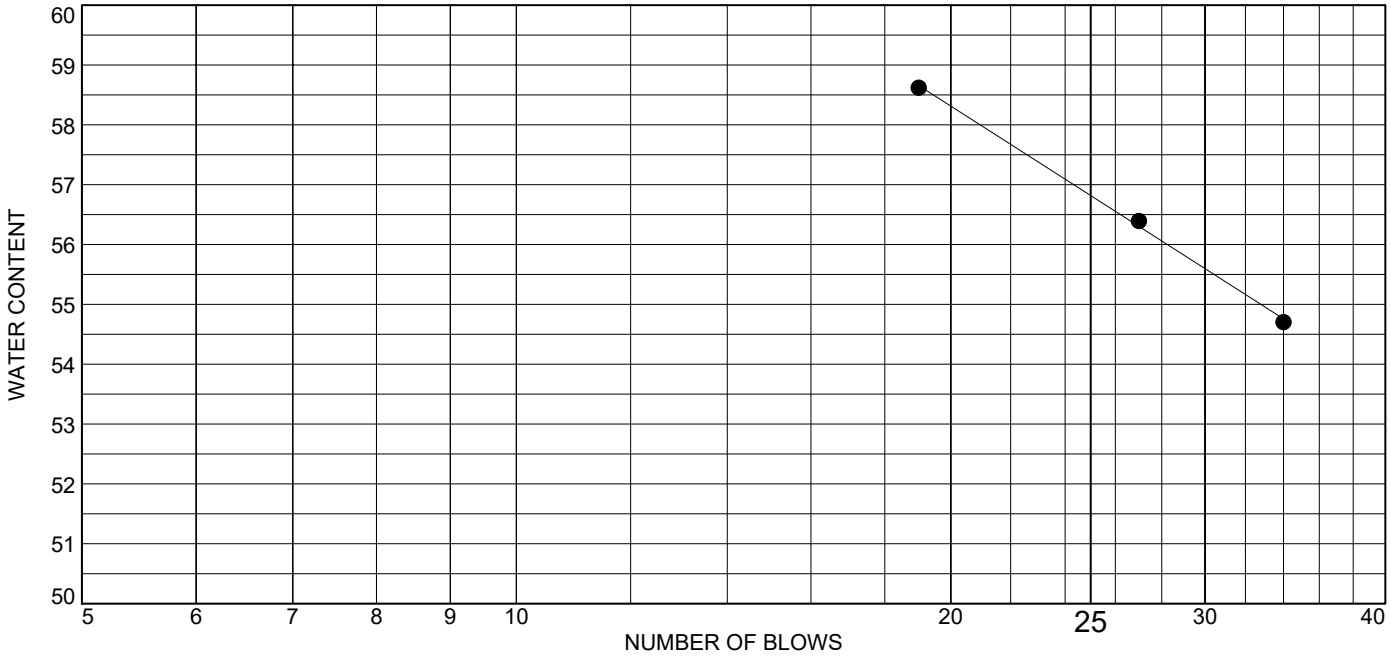
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY	57	19	38	99.5	98.0	CH

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: AW-15 **Depth:** 20.0'-22.0'
Sample Number: 1025

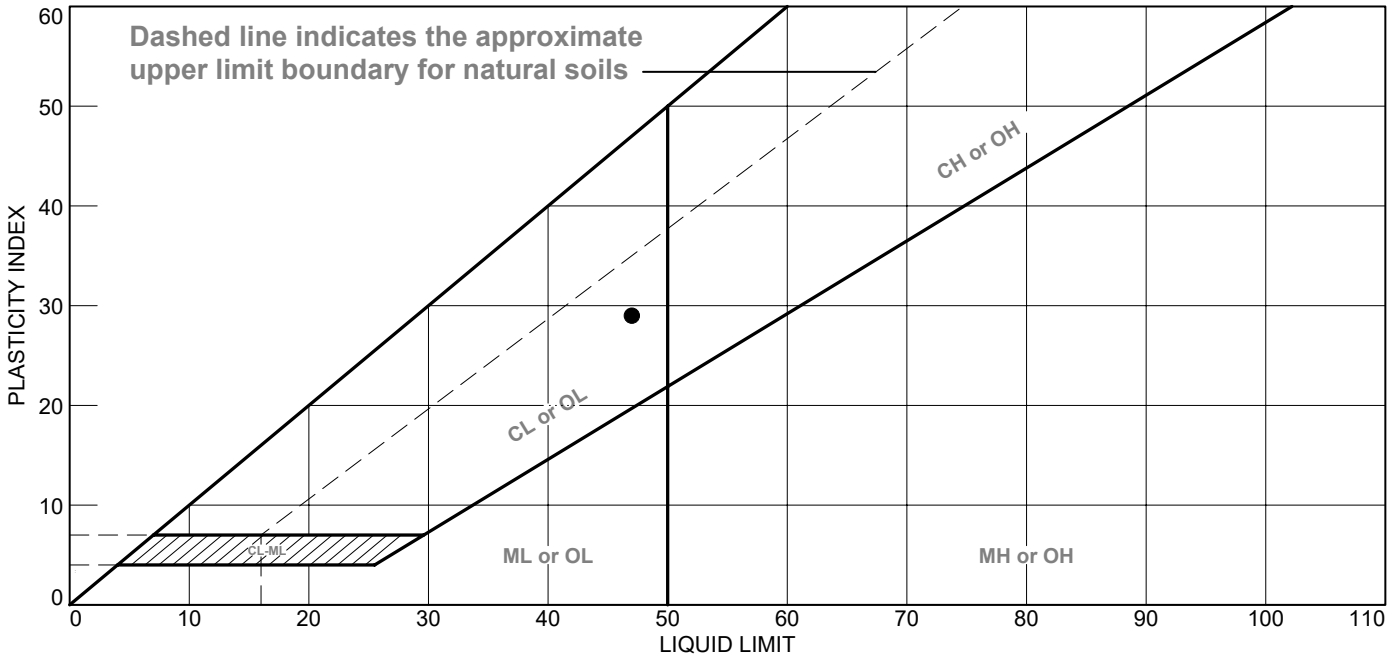
Remarks:

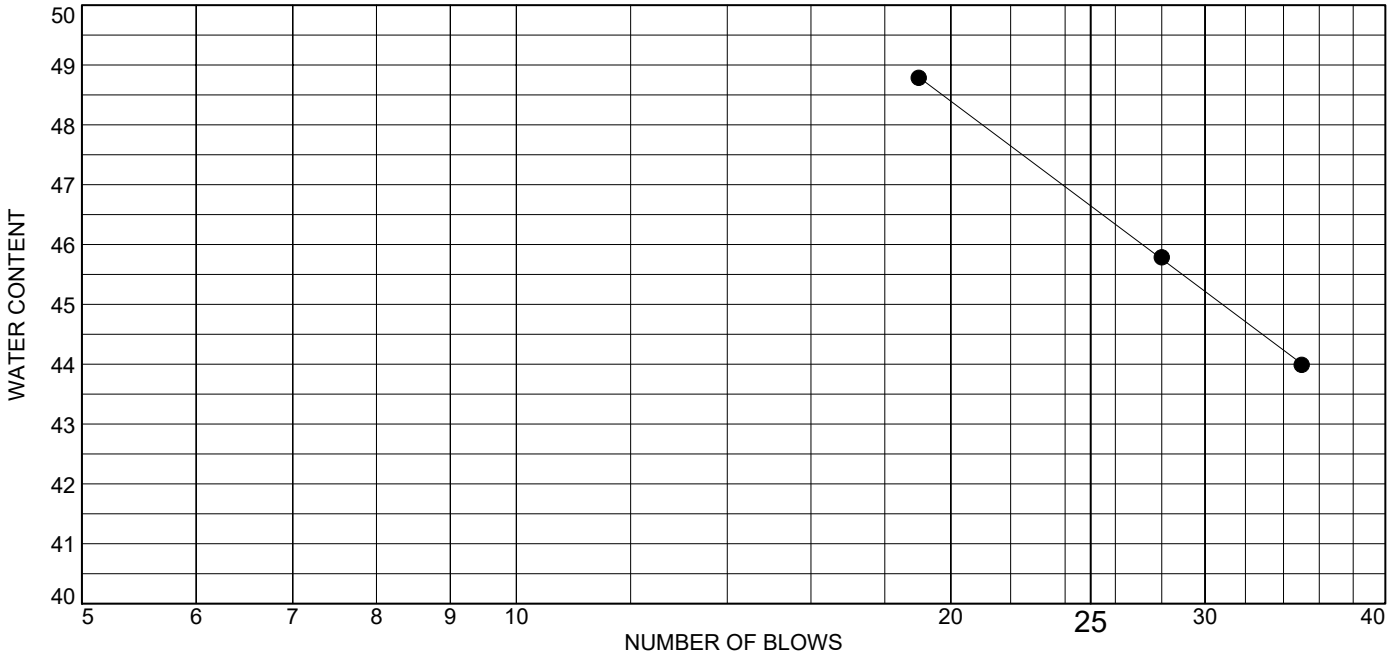
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY - SAND POCKETS NOTED	47	18	29	96.9	92.2	CL

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: AW-20 **Depth:** 15.0'-17.0'
Sample Number: 0810

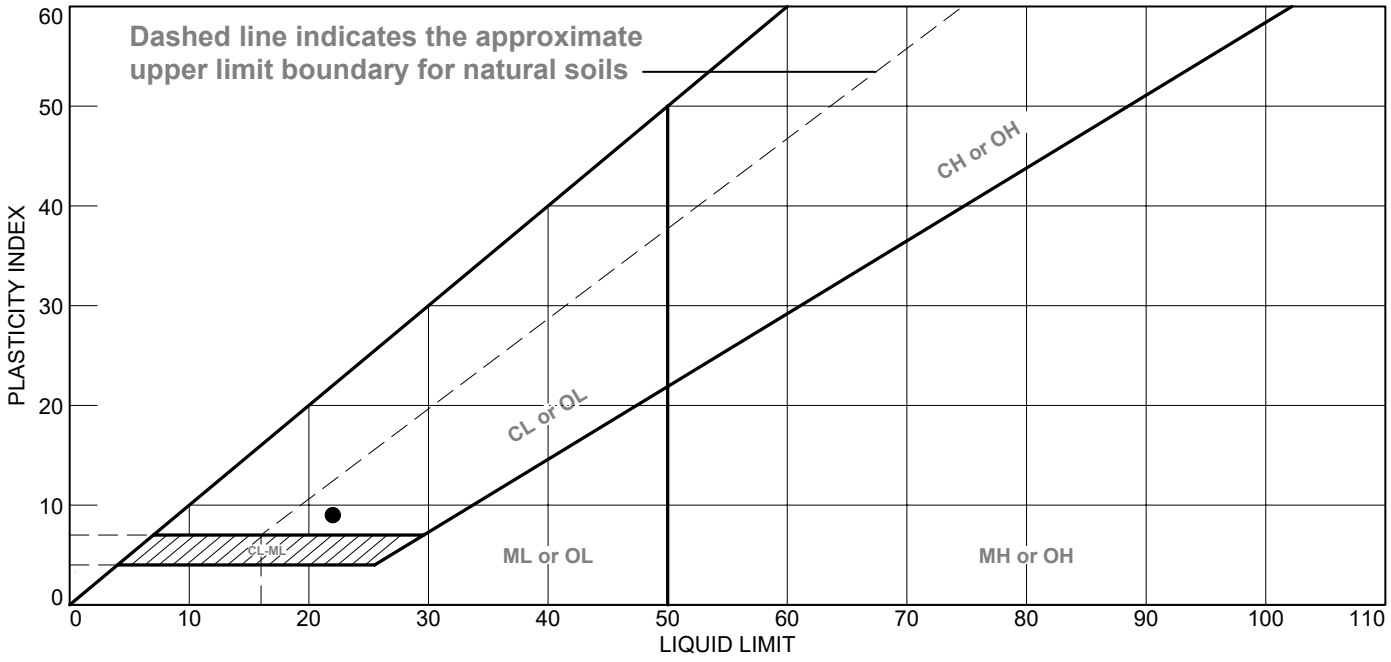
Remarks:

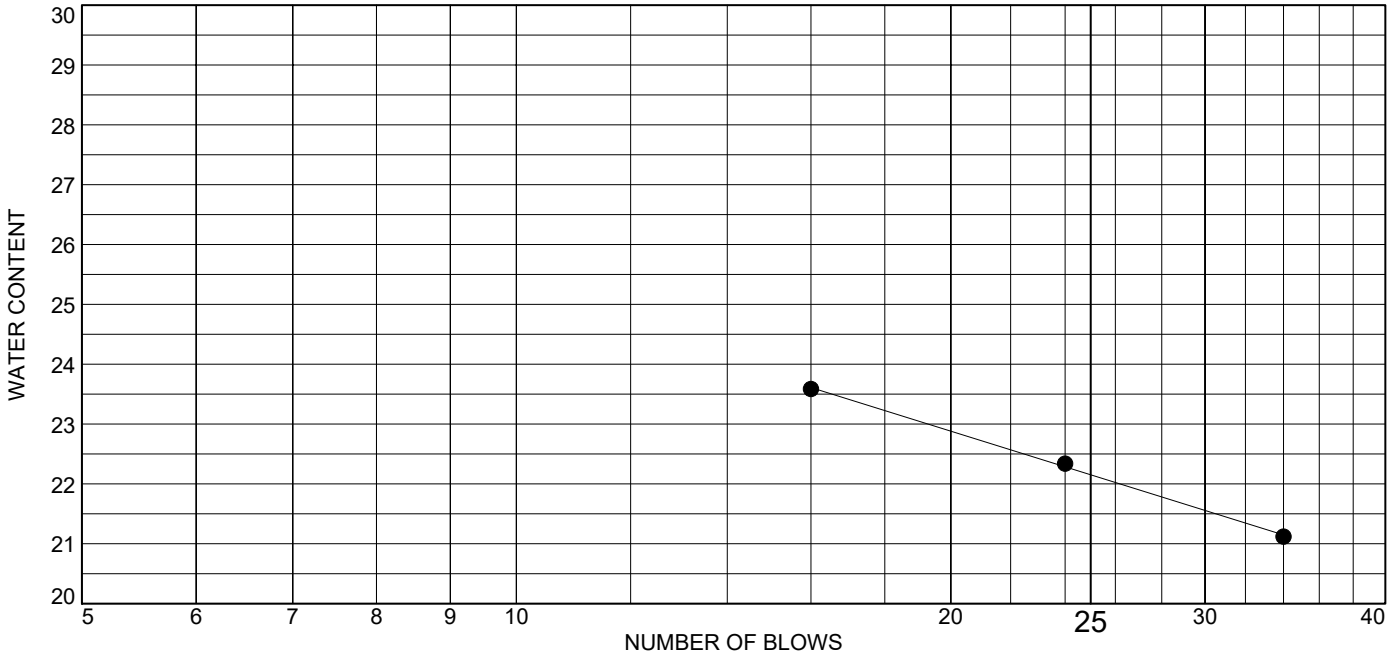
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY, LIGHT GRAY AND LIGHT BROWN CLAYEY SAND	22	13	9	98.3	42.6	SC

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: AW-22 **Depth:** 30.0'-32.0'
Sample Number: 0745

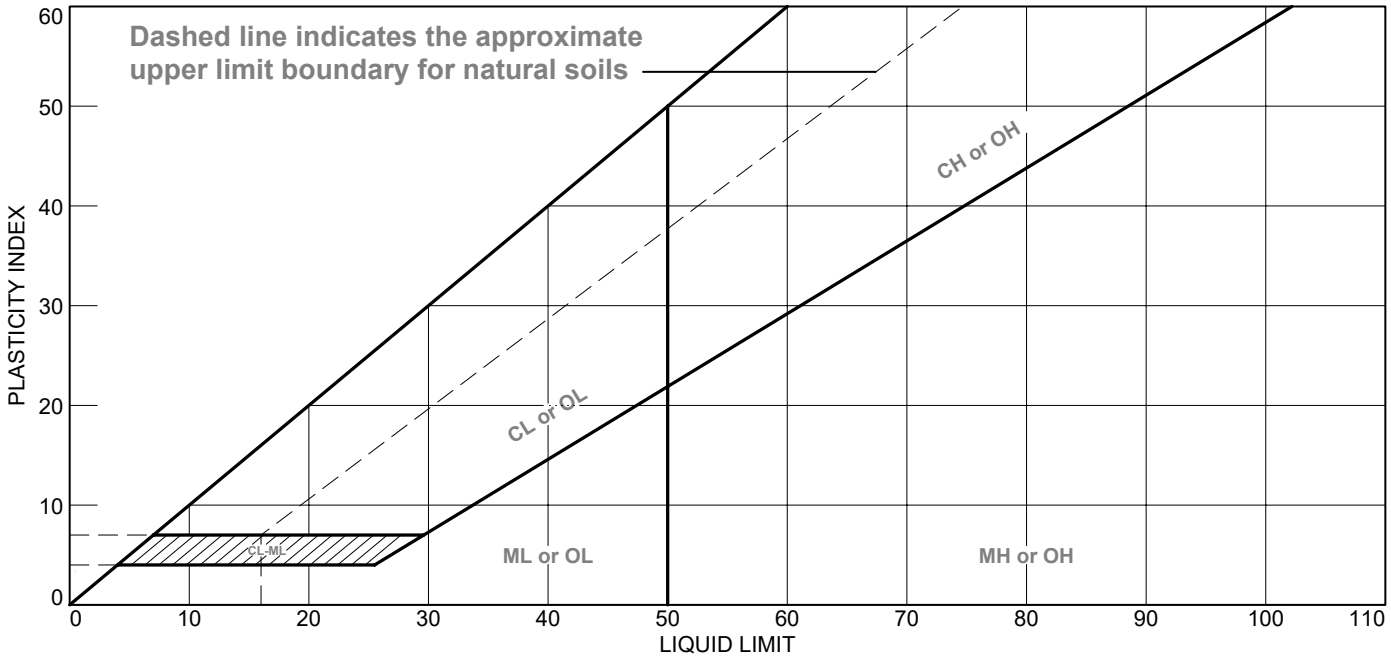
Remarks:

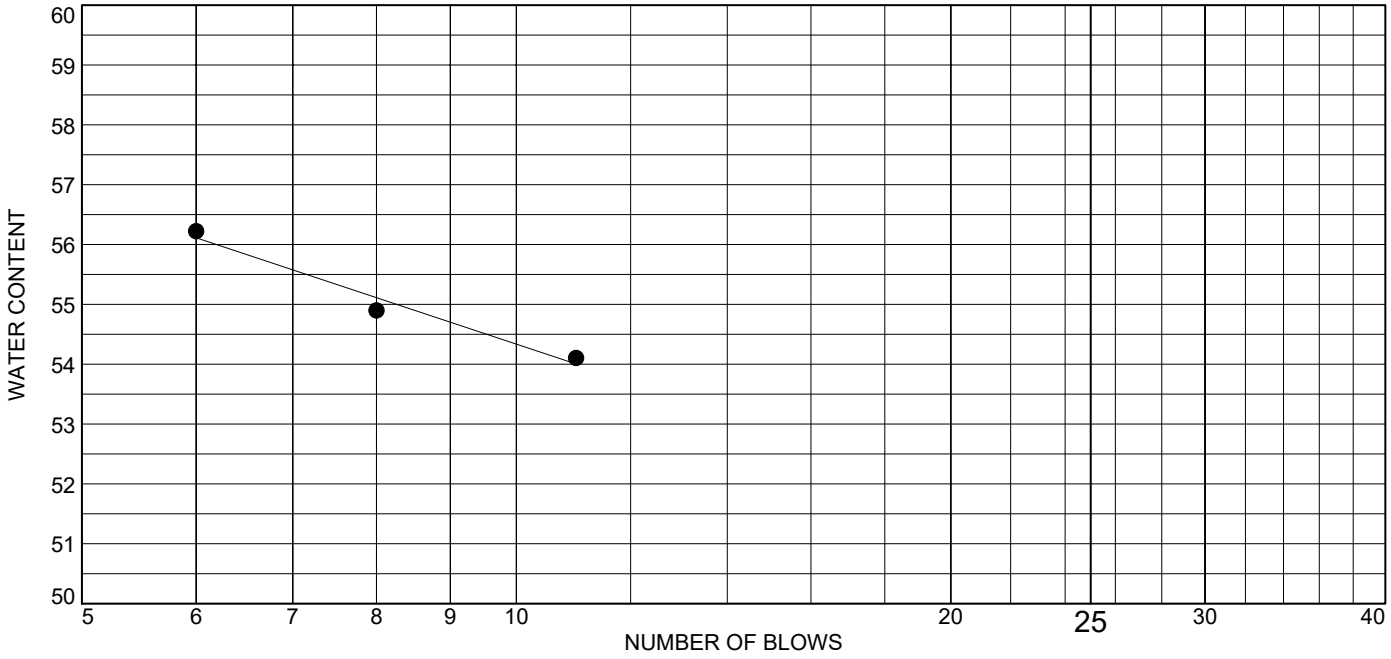
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY SILTY SAND	51	53	NP	62.1	31.1	SM

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-01 **Depth:** 20.0'-22.0'
Sample Number: 1210

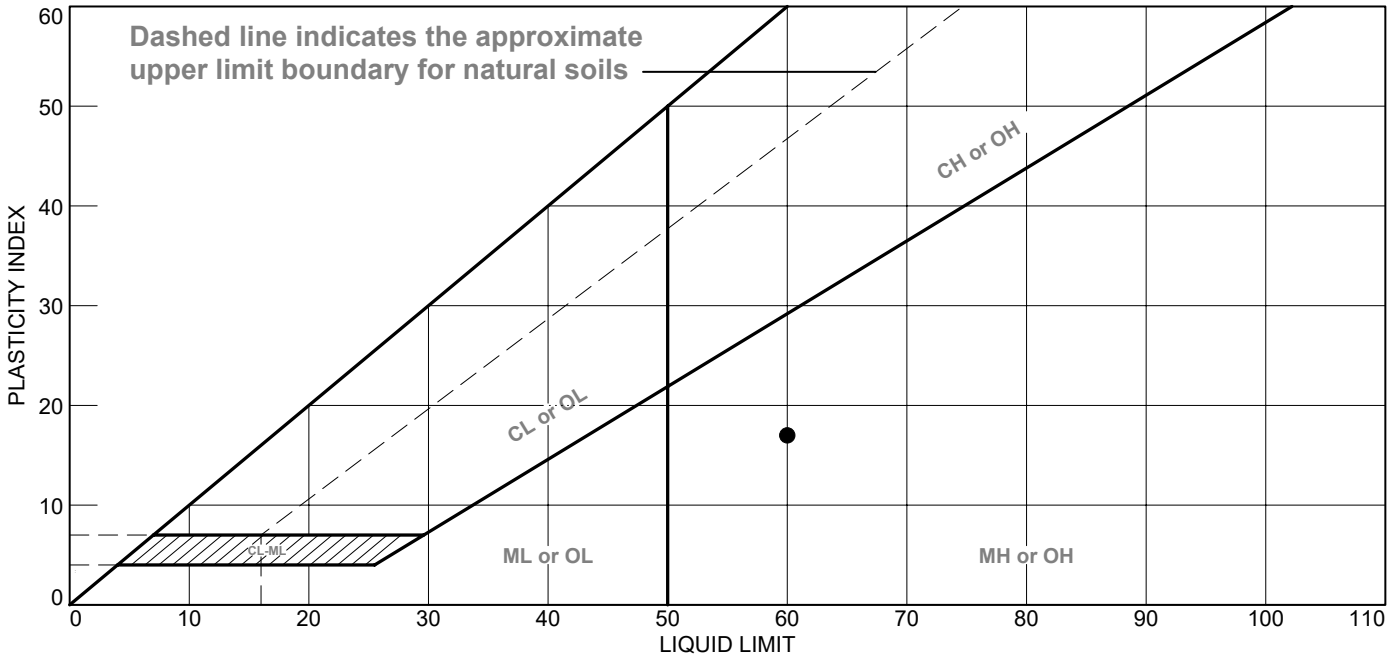
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY ELASTIC SILT	60	43	17	98.6	86.3	MH

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-01A **Depth:** 41.0'-41.5'
Sample Number: 1530

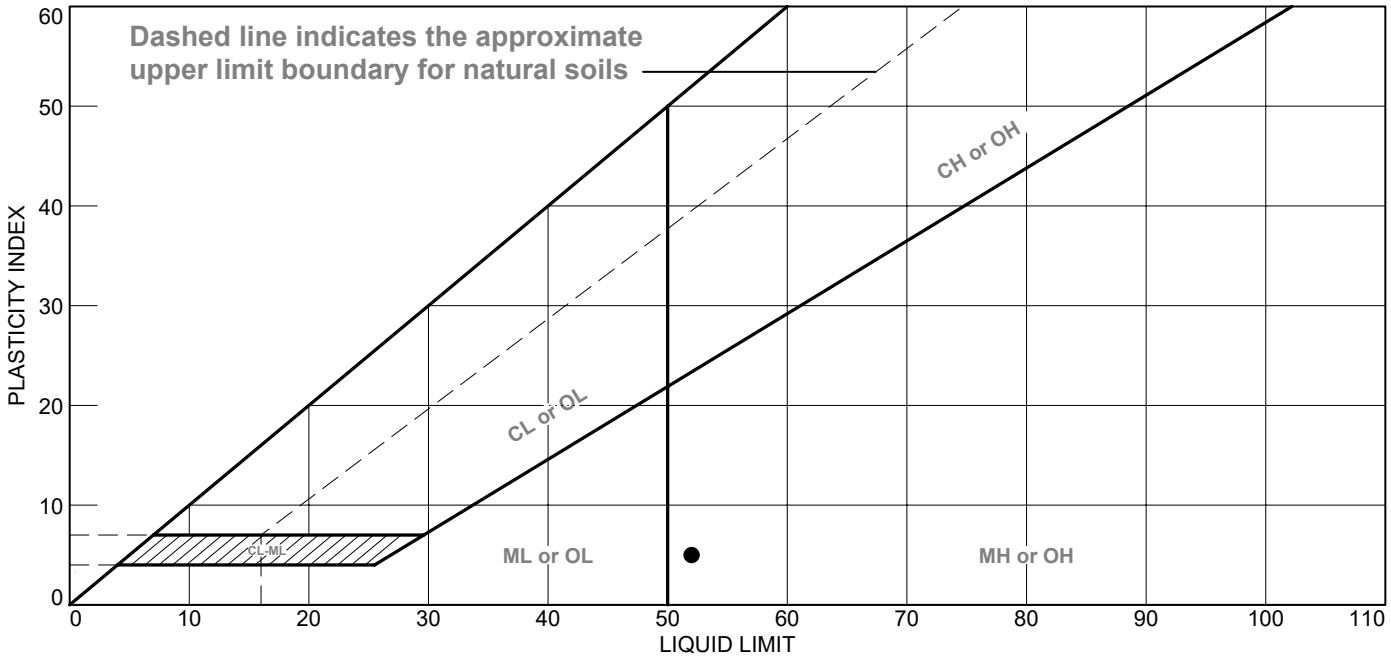
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY AND GRAYISH BROWN ELASTIC SILT WITH SAND	52	47	5	92.2	71.4	MH

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-02 **Depth:** 10.0'-12.0'
Sample Number: 0845

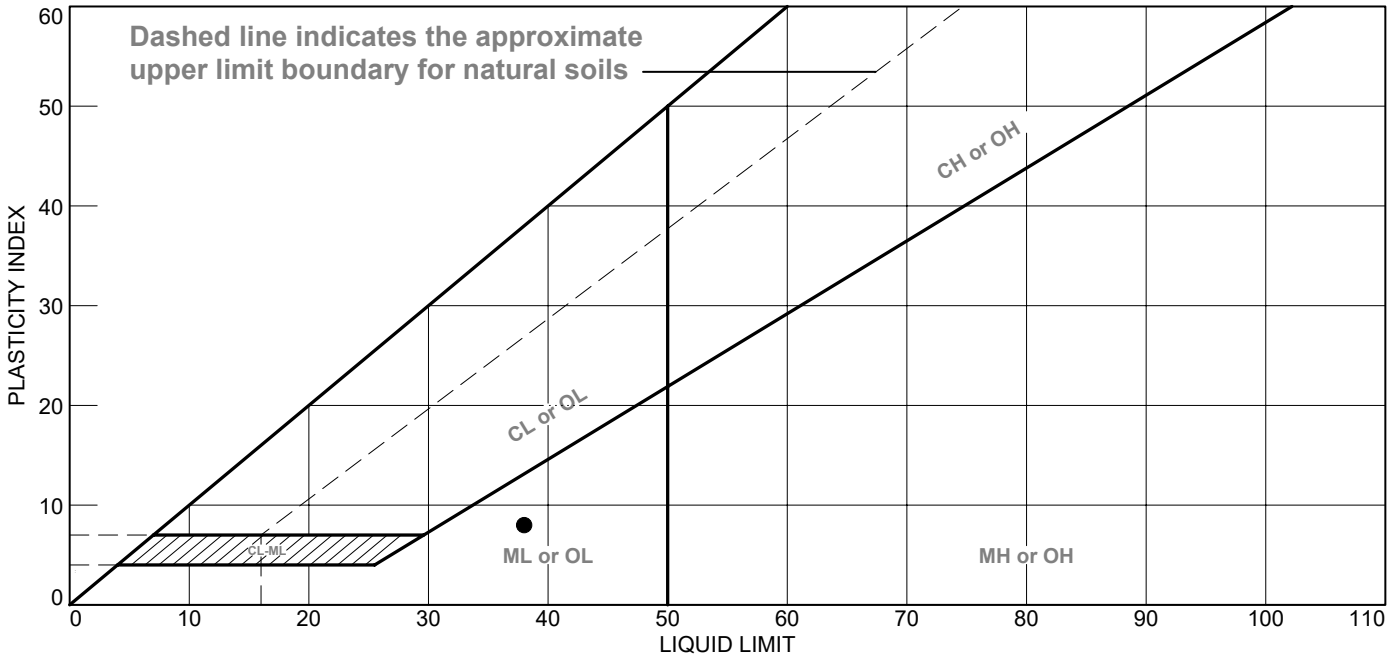
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY SILT	38	30	8	99.8	95.9	ML

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-02 **Depth:** 22.0'-24.0'
Sample Number: 0950

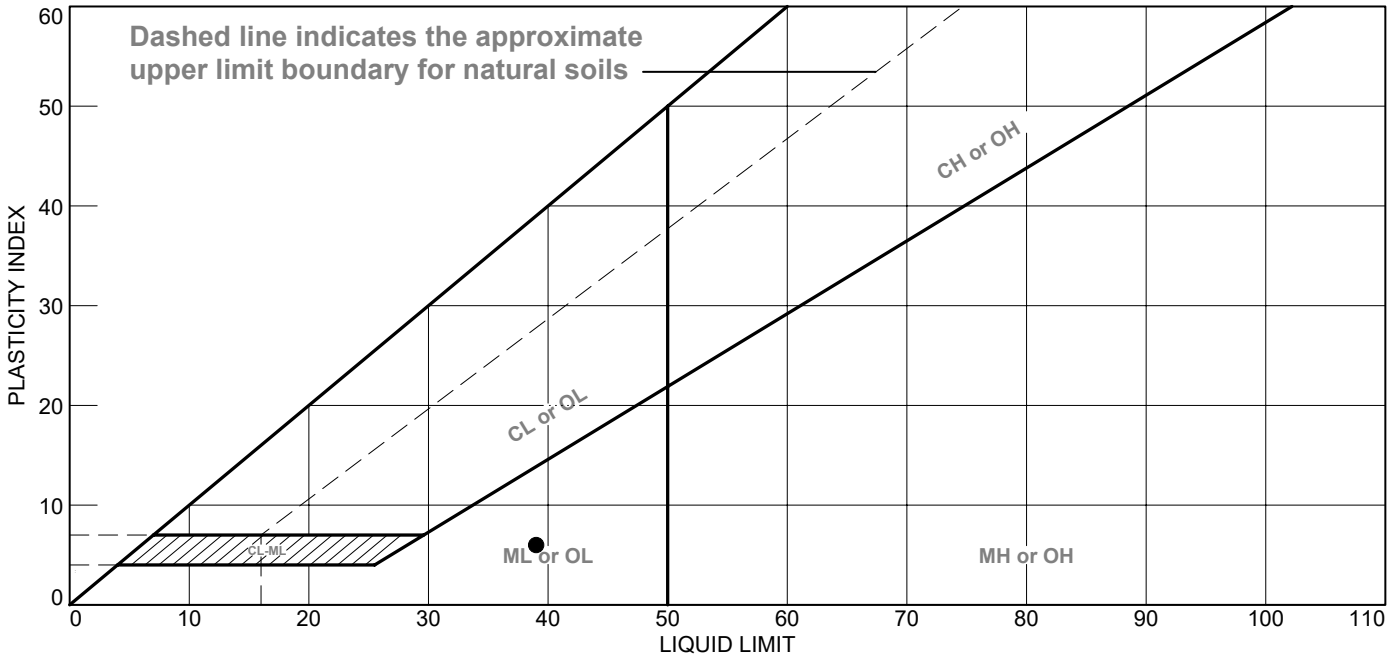
Remarks:

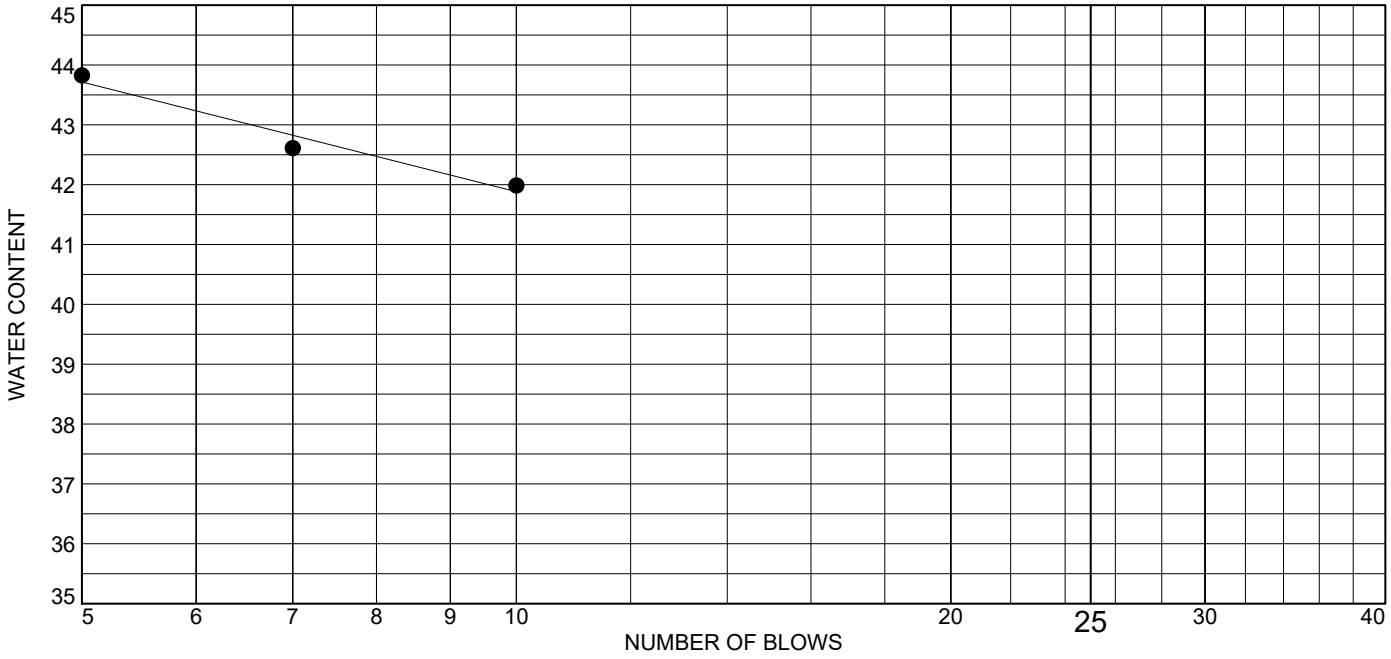
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAYISH BROWN SANDY SILT	39	33	6	90.7	62.5	ML

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-02 **Depth:** 45.0'-47.0'
Sample Number: 1245

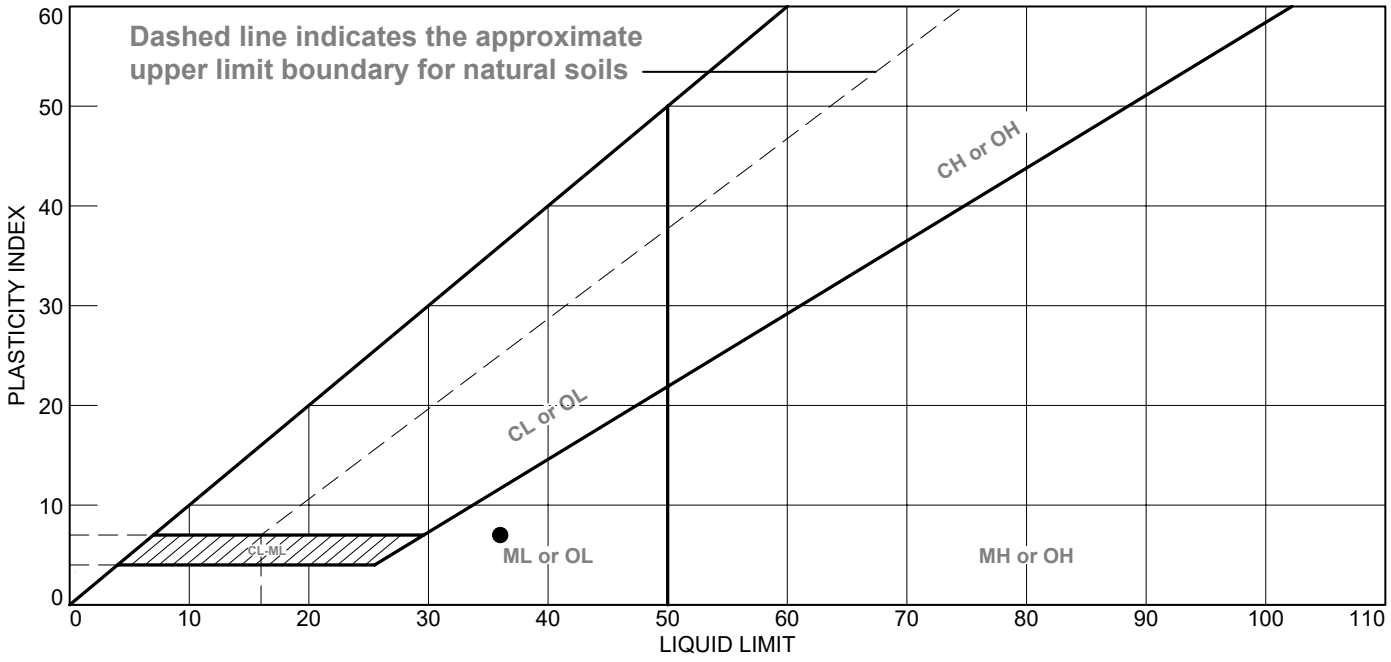
Remarks:

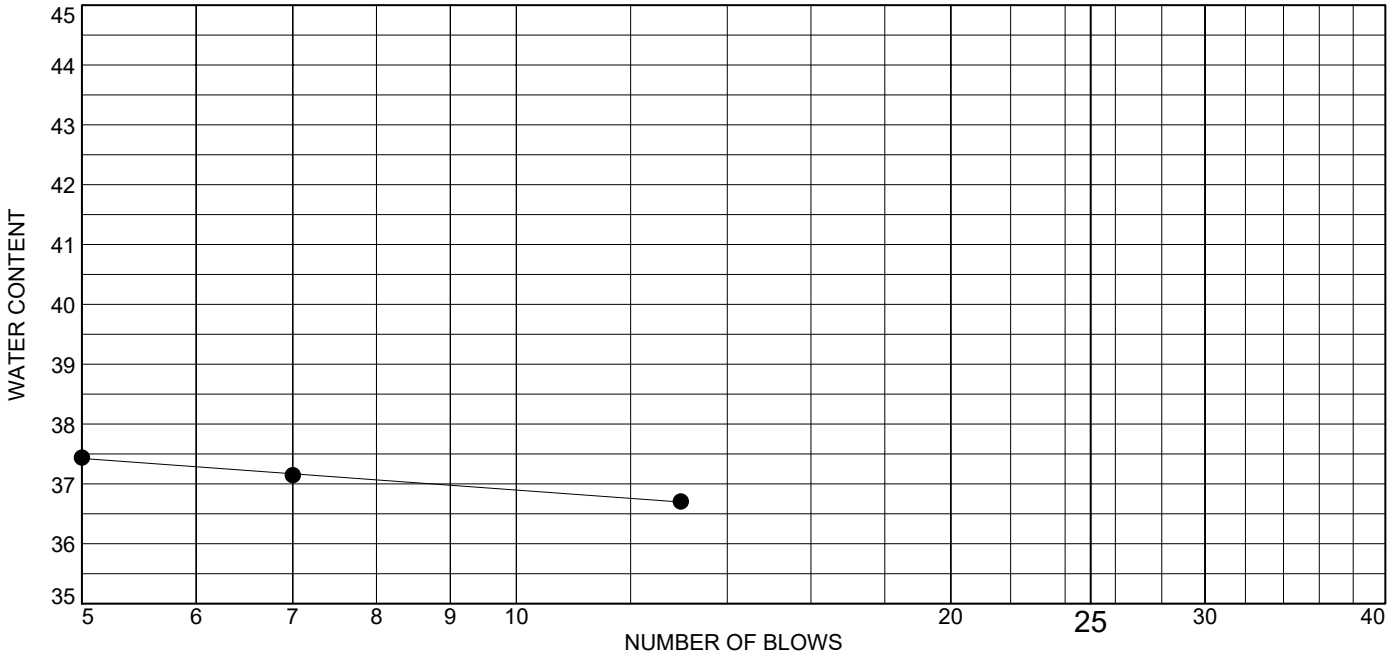
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY SILT WITH SAND - ROOTS NOTED	36	29	7	89.7	72.4	ML

Project No. 11215017 **Client:** CONFIDENTIAL

Project: EDWARDS POWER STATION

Source of Sample: XPW-03 **Depth:** 10.0'-12.0'
Sample Number: 1500

Remarks:

Terracon

Figure

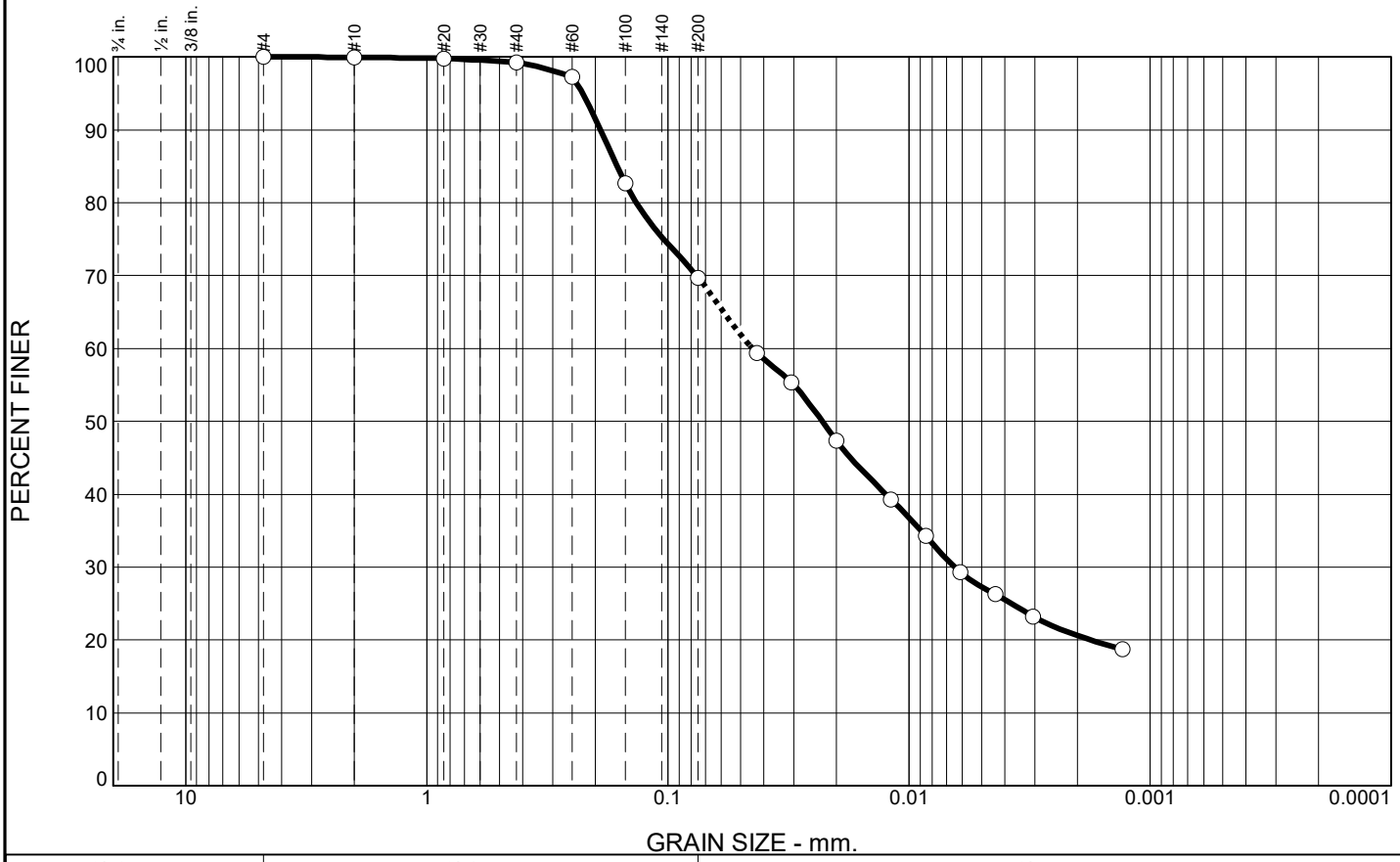
Tested By: DT **Checked By:** WPQ

Terracon

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
ASTM D6913

Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
ASTM D7928

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.7	29.6	42.4	27.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.3		
#60	97.3		
#100	82.6		
#200	69.7		
0.0427 mm.	59.4		
0.0307 mm.	55.4		
0.0200 mm.	47.3		
0.0119 mm.	39.3		
0.0085 mm.	34.3		
0.0061 mm.	29.3		
0.0044 mm.	26.3		
0.0031 mm.	23.2		
0.0013 mm.	18.7		

* (no specification provided)

Soil Description

LIGHT BROWN AND GRAY SANDY LEAN CLAY

Atterberg Limits

PL= 14 LL= 30 PI= 16

Coefficients

D_{90}= 0.1902 D_{85}= 0.1626 D_{60}= 0.0446
D_{50}= 0.0229 D_{30}= 0.0065 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

F.M.=0.20

Source of Sample: AW-13A **Depth:** 5.0'-7.0'
Sample Number: 0850

Date: 1-29-21

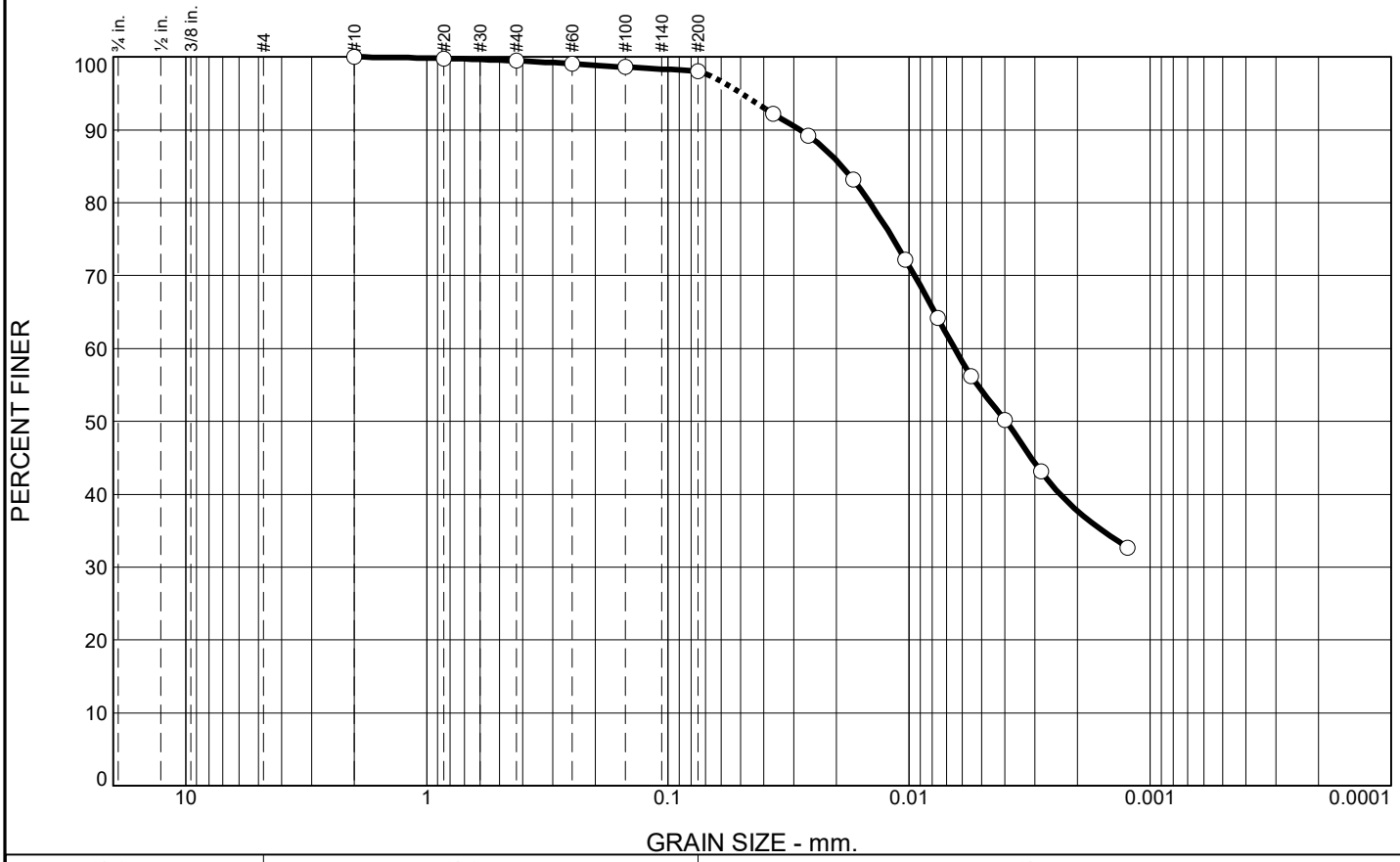
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	1.5	43.8	54.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.5		
#60	99.1		
#100	98.6		
#200	98.0		
0.0365 mm.	92.2		
0.0262 mm.	89.2		
0.0171 mm.	83.2		
0.0104 mm.	72.2		
0.0076 mm.	64.2		
0.0055 mm.	56.2		
0.0040 mm.	50.2		
0.0028 mm.	43.2		
0.0012 mm.	32.7		

* (no specification provided)

Soil Description

GRAY FAT CLAY

Atterberg Limits

PL= 19 LL= 57 PI= 38

Coefficients

D_{90}= 0.0285 D_{85}= 0.0190 D_{60}= 0.0065
D_{50}= 0.0040 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(41)

Remarks

F.M.=0.03

Source of Sample: AW-15 **Depth:** 20.0'-22.0'
Sample Number: 1025 **Date:** 1-29-21

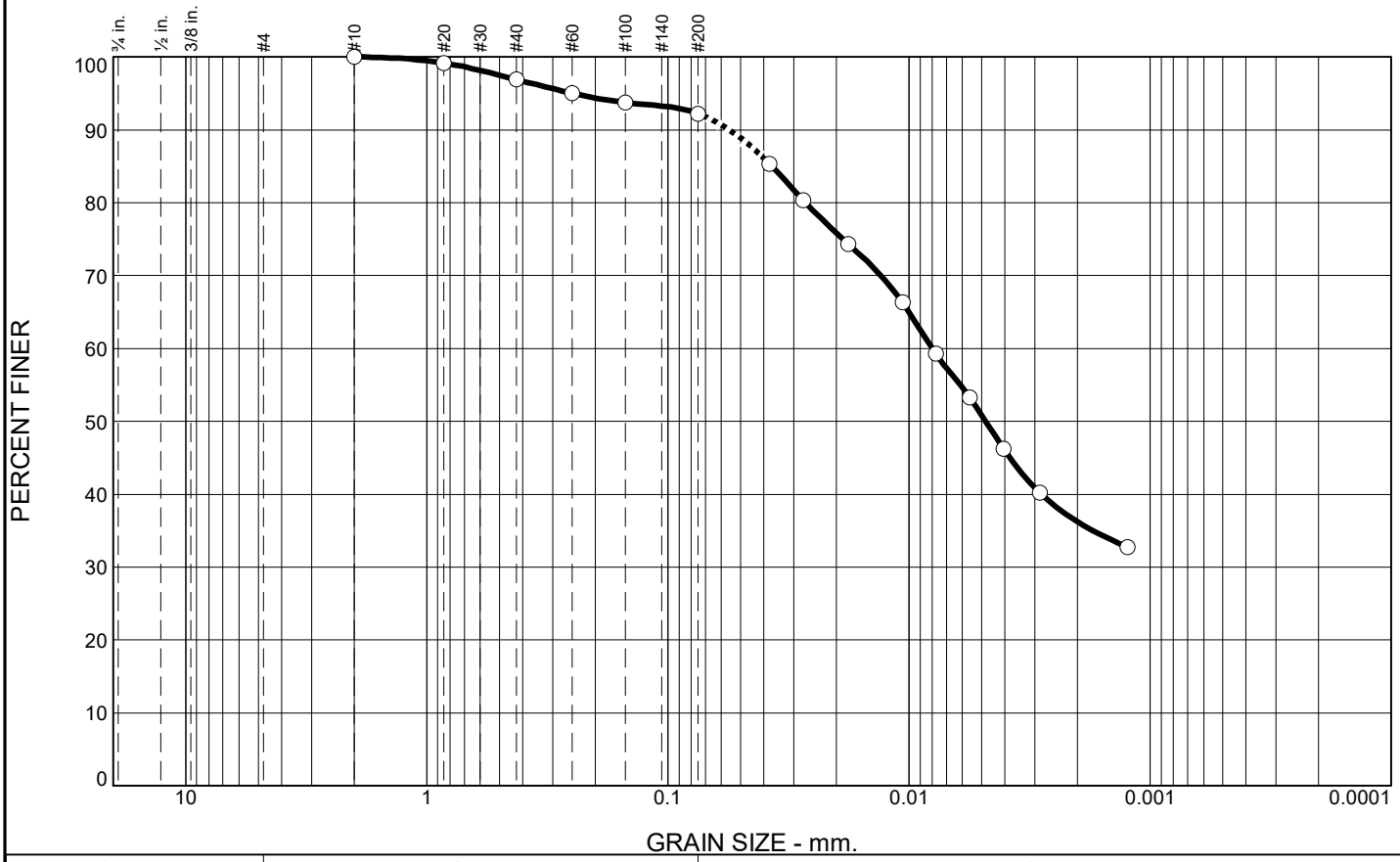
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.1	4.7	41.3	50.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.2		
#40	96.9		
#60	95.1		
#100	93.7		
#200	92.2		
0.0379 mm.	85.3		
0.0274 mm.	80.3		
0.0178 mm.	74.3		
0.0106 mm.	66.3		
0.0077 mm.	59.3		
0.0056 mm.	53.3		
0.0041 mm.	46.3		
0.0029 mm.	40.2		
0.0012 mm.	32.7		

* (no specification provided)

Soil Description

GRAY AND DARK GRAY LEAN CLAY - SAND POCKETS NOTED

Atterberg Limits

PL= 18 LL= 47 PI= 29

Coefficients

D_{90}= 0.0556 D_{85}= 0.0370 D_{60}= 0.0080
D_{50}= 0.0048 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(28)

Remarks

F.M.=0.13

Source of Sample: AW-20 **Depth:** 15.0'-17.0'
Sample Number: 0810 **Date:** 1-29-21

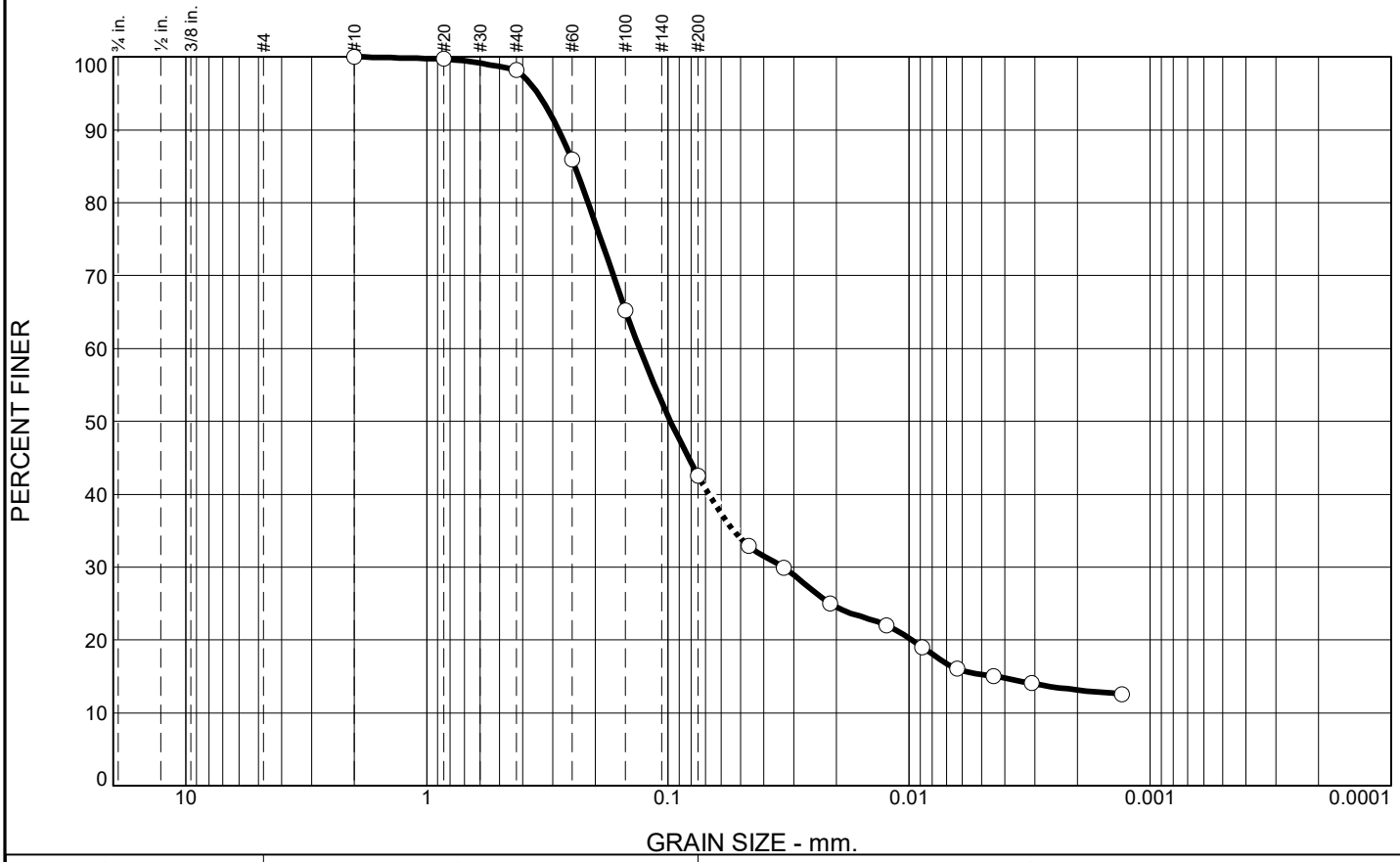
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.7	55.7	27.3	15.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	98.3		
#60	85.9		
#100	65.2		
#200	42.6		
0.0463 mm.	32.9		
0.0331 mm.	29.9		
0.0212 mm.	25.0		
0.0124 mm.	22.0		
0.0088 mm.	19.0		
0.0063 mm.	16.0		
0.0045 mm.	15.1		
0.0031 mm.	14.1		
0.0013 mm.	12.6		

* (no specification provided)

Soil Description

GRAY, LIGHT GRAY AND LIGHT BROWN CLAYEY SAND

Atterberg Limits

PL= 13 LL= 22 PI= 9

Coefficients

D_{90}= 0.2838 D_{85}= 0.2437 D_{60}= 0.1311
D_{50}= 0.0975 D_{30}= 0.0333 D_{15}= 0.0044
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

F.M.=0.44

Source of Sample: AW-22 **Depth:** 30.0'-32.0'
Sample Number: 0745

Date: 1-29-21

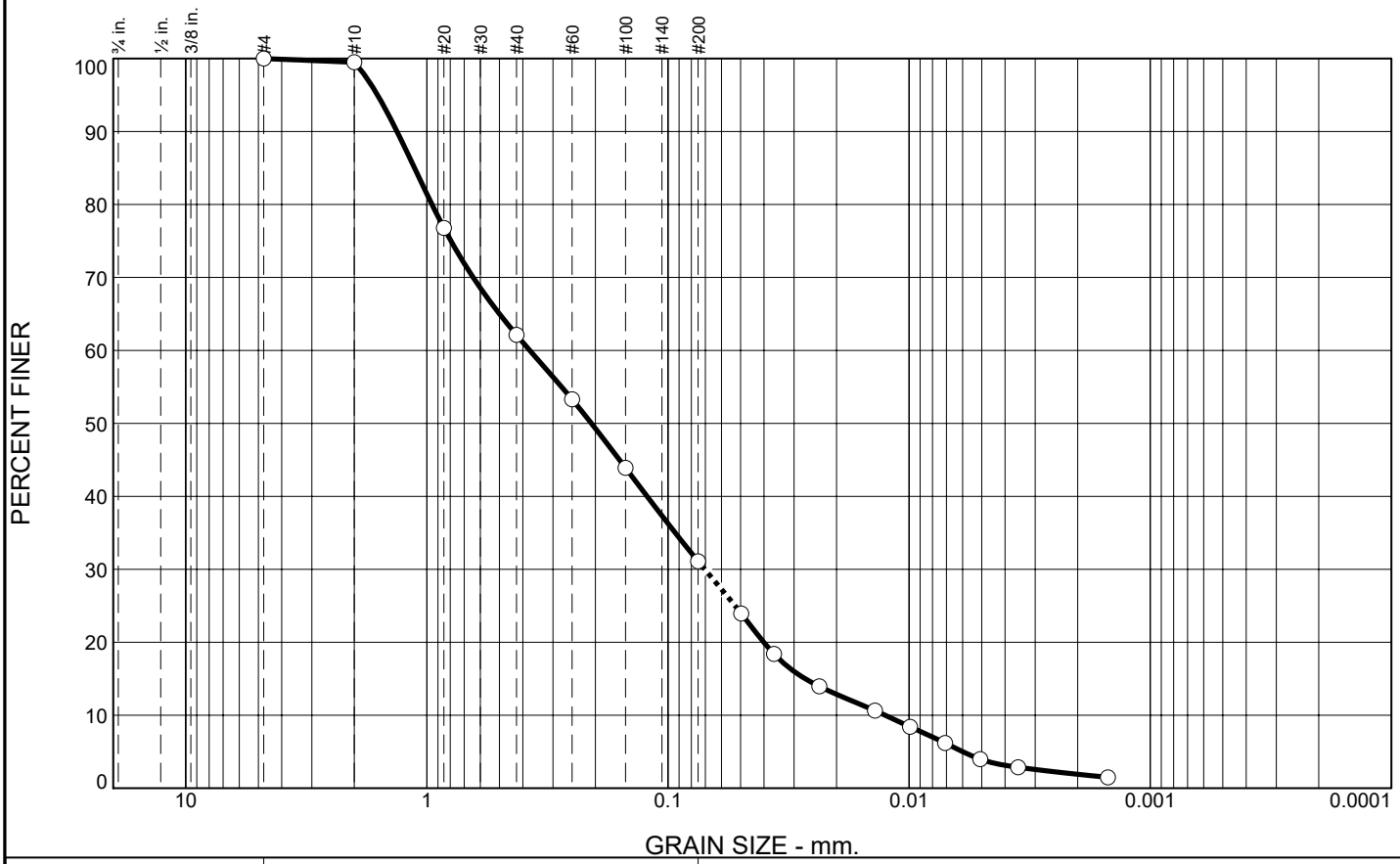
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	37.4	31.0	27.2	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	76.8		
#40	62.1		
#60	53.3		
#100	43.9		
#200	31.1		
0.0497 mm.	23.9		
0.0363 mm.	18.4		
0.0236 mm.	14.0		
0.0139 mm.	10.6		
0.0099 mm.	8.4		
0.0071 mm.	6.2		
0.0051 mm.	4.0		
0.0035 mm.	2.9		
0.0015 mm.	1.5		

* (no specification provided)

Soil Description

DARK GRAY SILTY SAND

Atterberg Limits

PL= 53 LL= 51 PI= NP

Coefficients

D_{90}= 1.3306 D_{85}= 1.1250 D_{60}= 0.3744
D_{50}= 0.2077 D_{30}= 0.0704 D_{15}= 0.0270
D_{10}= 0.0126 C_u= 29.78 C_c= 1.05

Classification

USCS= SM AASHTO= A-2-5(0)

Remarks

F.M.=1.45

Source of Sample: XPW-01 **Depth:** 20.0'-22.0'
Sample Number: 1210 **Date:** 1-29-21

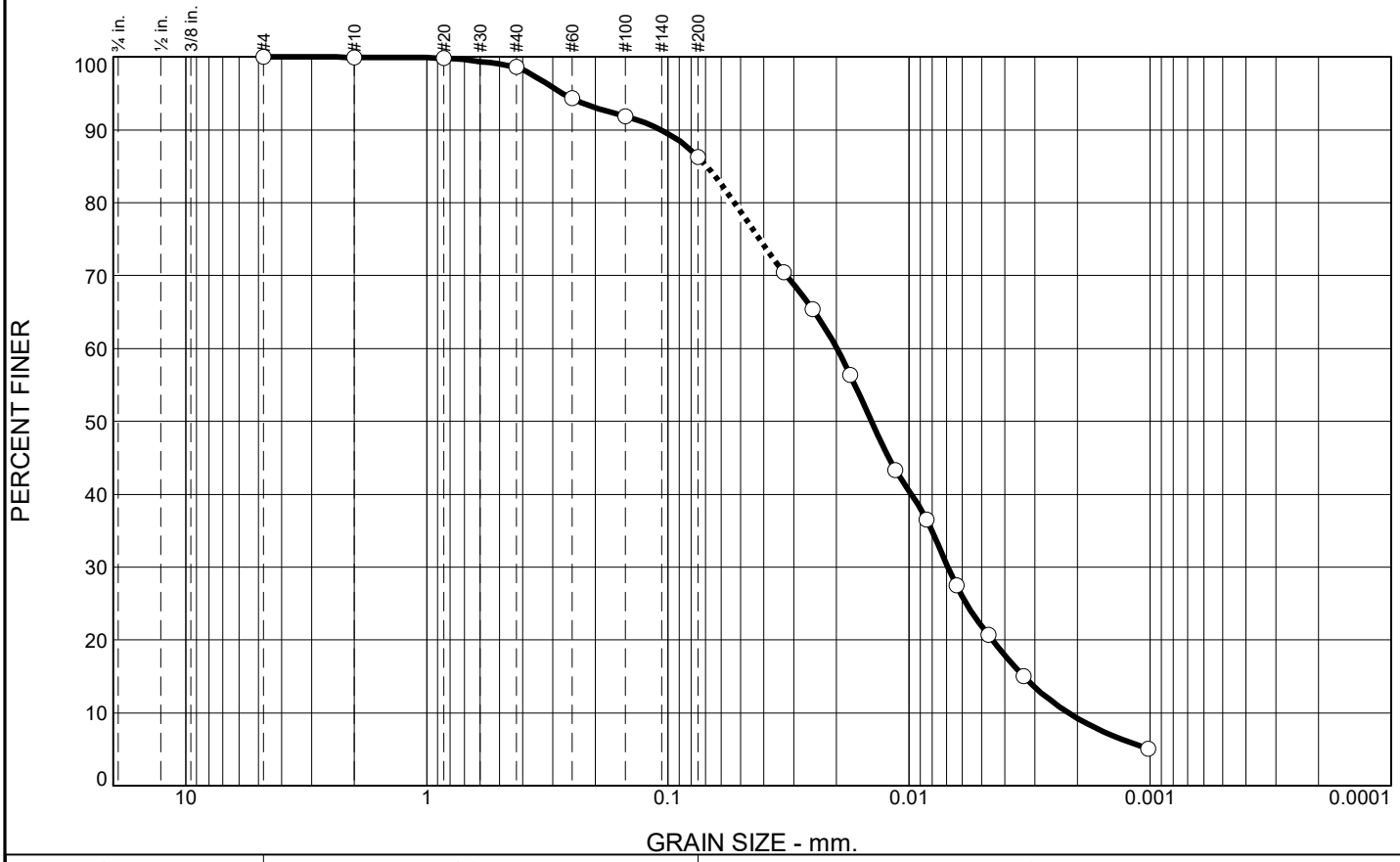
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	12.3	64.4	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	98.6		
#60	94.3		
#100	91.9		
#200	86.3		
0.0332 mm.	70.5		
0.0251 mm.	65.4		
0.0175 mm.	56.3		
0.0114 mm.	43.3		
0.0085 mm.	36.6		
0.0064 mm.	27.5		
0.0047 mm.	20.7		
0.0034 mm.	15.1		
0.0010 mm.	5.0		

* (no specification provided)

Soil Description

DARK GRAY ELASTIC SILT

Atterberg Limits

PL= 43 LL= 60 PI= 17

Coefficients

D_{90}= 0.1066 D_{85}= 0.0691 D_{60}= 0.0199
D_{50}= 0.0143 D_{30}= 0.0069 D_{15}= 0.0033
D_{10}= 0.0022 C_u= 9.15 C_c= 1.09

Classification

USCS= MH AASHTO= A-7-5(20)

Remarks

F.M.=0.13

Source of Sample: XPW-01A **Depth:** 41.0'-41.5'
Sample Number: 1530

Date: 2-18-21

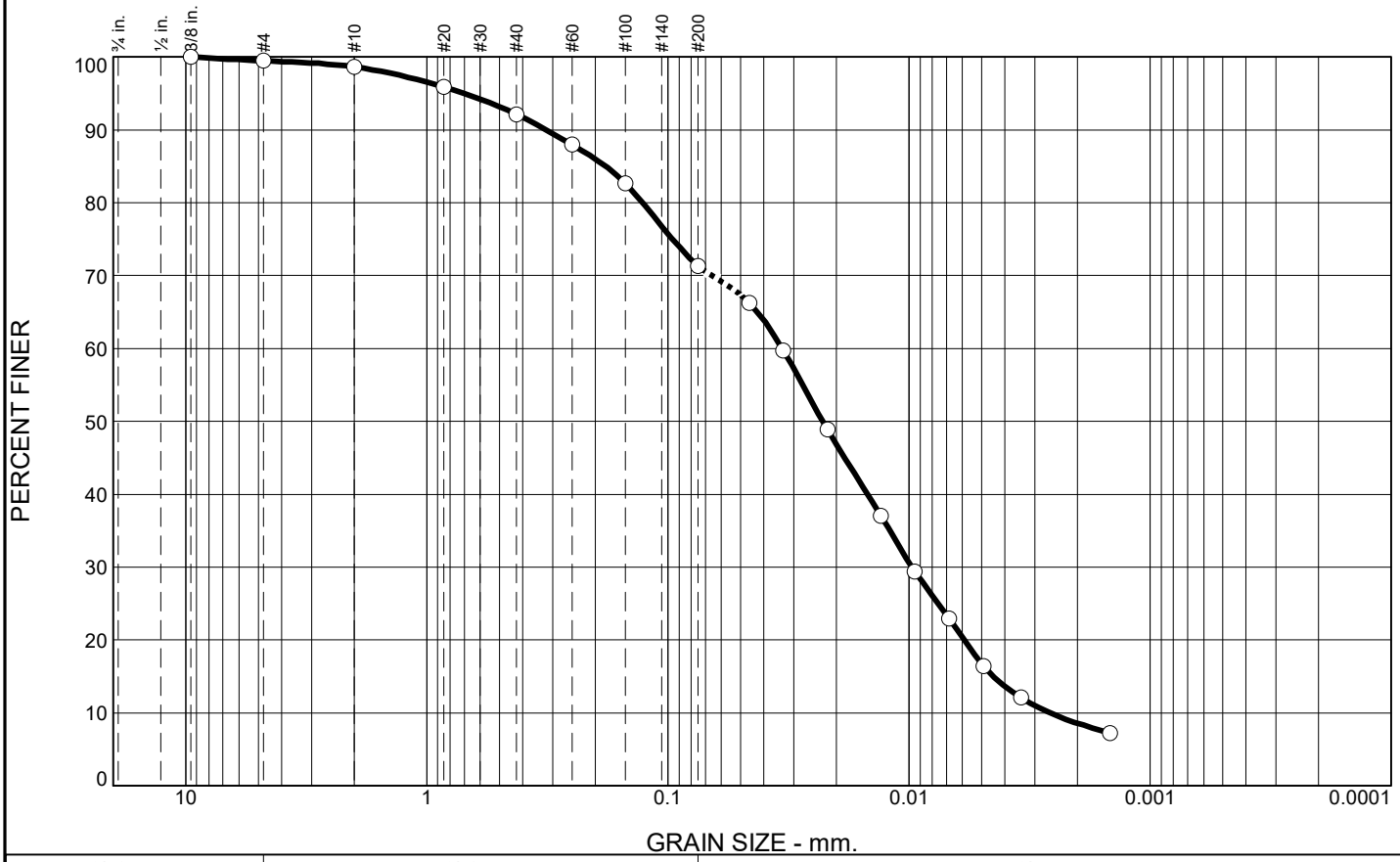
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.5	0.9	6.4	20.8	54.6	16.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.5		
#10	98.6		
#20	95.9		
#40	92.2		
#60	88.0		
#100	82.6		
#200	71.4		
0.0460 mm.	66.2		
0.0333 mm.	59.7		
0.0218 mm.	48.9		
0.0131 mm.	37.0		
0.0095 mm.	29.4		
0.0068 mm.	22.9		
0.0049 mm.	16.4		
0.0034 mm.	12.1		
0.0015 mm.	7.2		

* (no specification provided)

Soil Description

DARK GRAY AND GRAYISH BROWN ELASTIC SILT WITH SAND

Atterberg Limits

PL= 47 LL= 52 PI= 5

Coefficients

D_{90}= 0.3194 D_{85}= 0.1815 D_{60}= 0.0336
D_{50}= 0.0228 D_{30}= 0.0097 D_{15}= 0.0045
D_{10}= 0.0026 C_u= 12.95 C_c= 1.08

Classification

USCS= MH AASHTO= A-5(7)

Remarks

F.M.=0.38

Source of Sample: XPW-02 **Depth:** 10.0'-12.0'
Sample Number: 0845 **Date:** 1-29-21

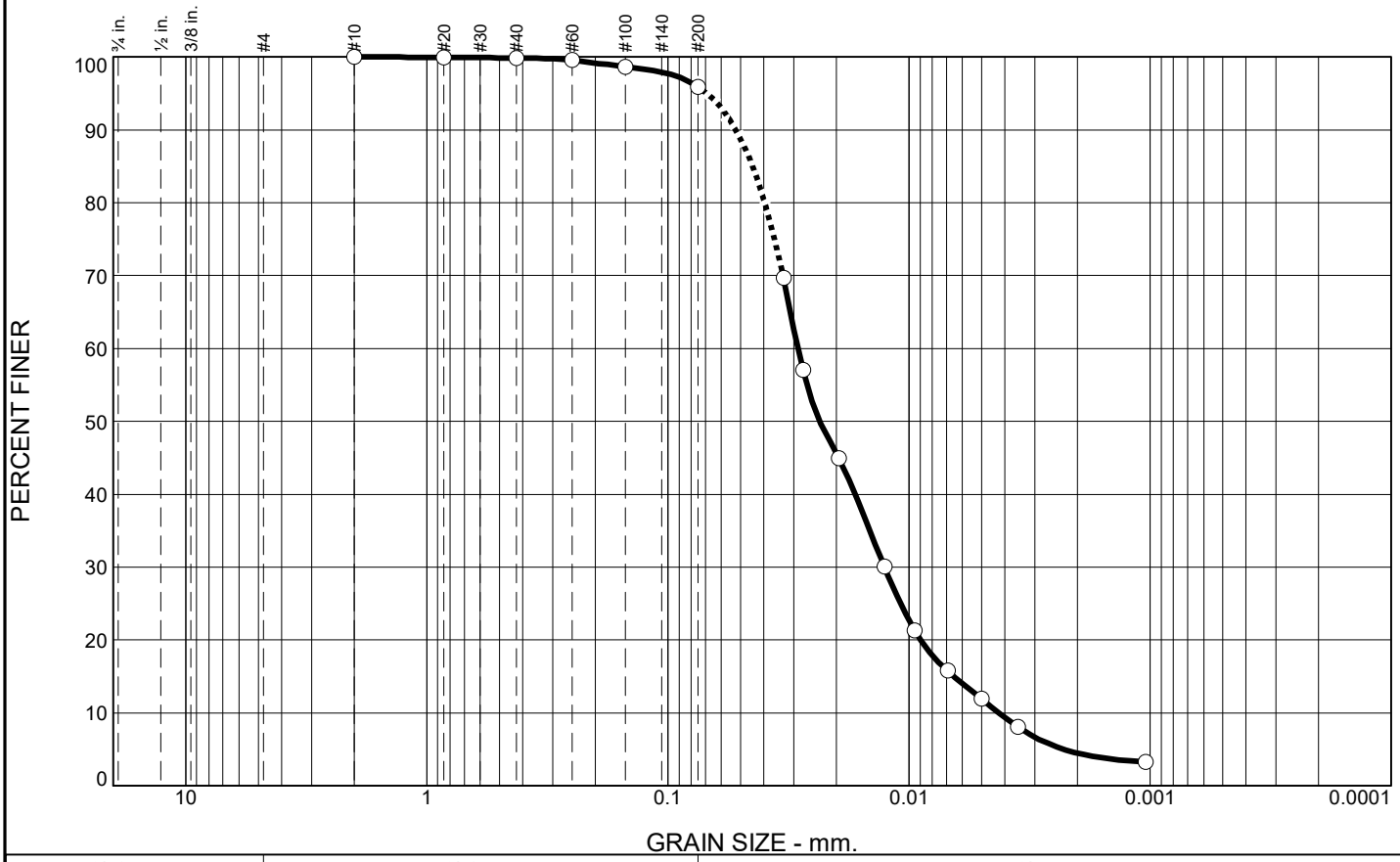
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	3.9	84.0	11.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.5		
#100	98.6		
#200	95.9		
0.0331 mm.	69.7		
0.0275 mm.	57.0		
0.0196 mm.	44.9		
0.0127 mm.	30.1		
0.0095 mm.	21.3		
0.0069 mm.	15.8		
0.0050 mm.	11.9		
0.0035 mm.	8.1		
0.0010 mm.	3.2		

* (no specification provided)

Soil Description

DARK GRAY SILT

Atterberg Limits

PL= 30 LL= 38 PI= 8

Coefficients

D_{90}= 0.0522 D_{85}= 0.0446 D_{60}= 0.0289
D_{50}= 0.0234 D_{30}= 0.0126 D_{15}= 0.0065
D_{10}= 0.0042 C_u= 6.82 C_c= 1.30

Classification

USCS= ML AASHTO= A-4(10)

Remarks

F.M.=0.02

Source of Sample: XPW-02 **Depth:** 22.0'-24.0'
Sample Number: 0950 **Date:** 2-18-21

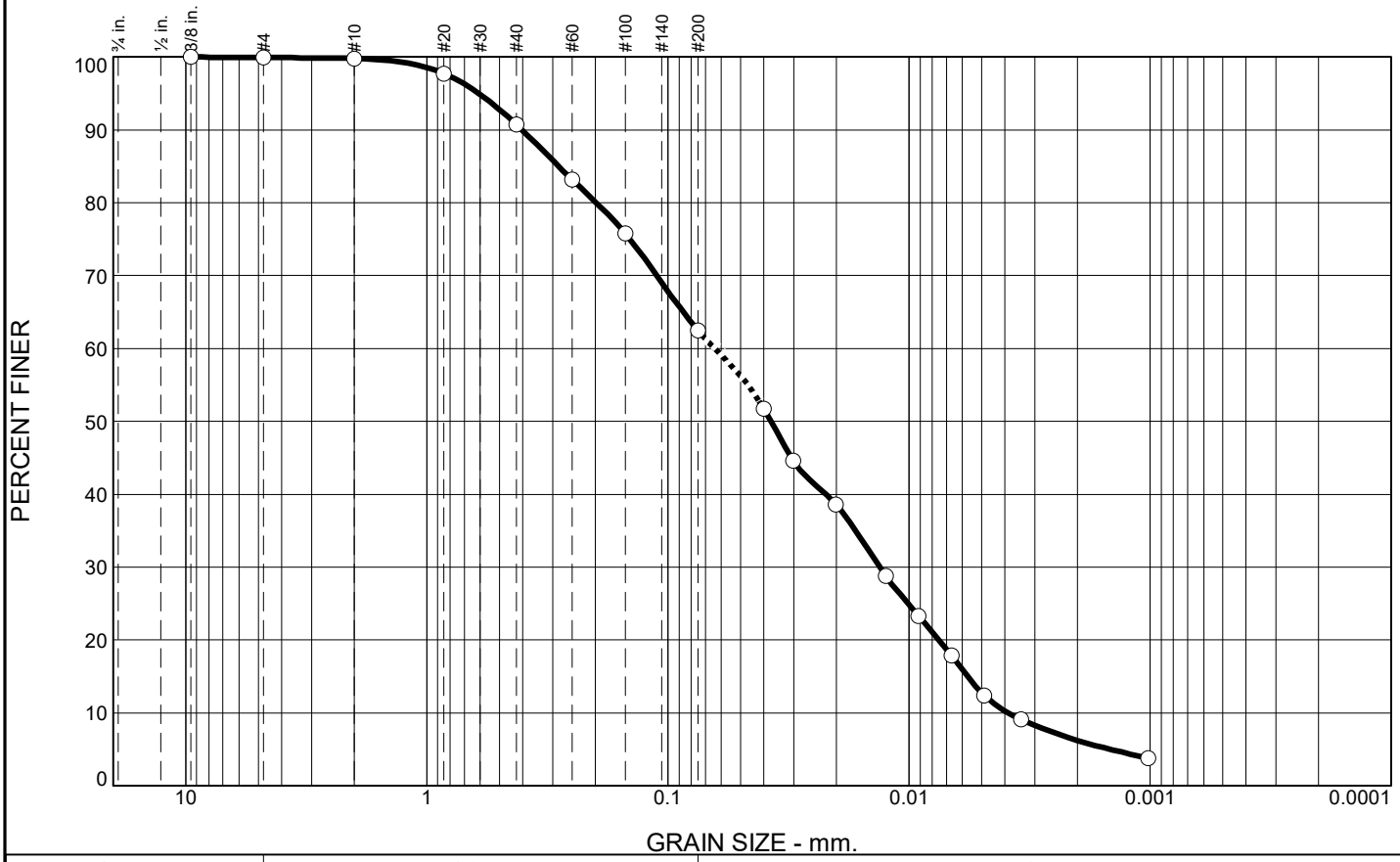
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	0.1	9.1	28.2	49.7	12.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.9		
#10	99.8		
#20	97.7		
#40	90.7		
#60	83.2		
#100	75.8		
#200	62.5		
0.0400 mm.	51.7		
0.0302 mm.	44.6		
0.0201 mm.	38.6		
0.0125 mm.	28.8		
0.0091 mm.	23.3		
0.0067 mm.	17.9		
0.0049 mm.	12.4		
0.0034 mm.	9.1		
0.0010 mm.	3.8		

* (no specification provided)

Soil Description

GRAYISH BROWN SANDY SILT

Atterberg Limits

PL= 33 LL= 39 PI= 6

Coefficients

D_{90}= 0.4022 D_{85}= 0.2838 D_{60}= 0.0640
D_{50}= 0.0374 D_{30}= 0.0132 D_{15}= 0.0057
D_{10}= 0.0039 C_u= 16.47 C_c= 0.70

Classification

USCS= ML AASHTO= A-4(3)

Remarks

F.M.=0.45

Source of Sample: XPW-02 **Depth:** 45.0'-47.0'
Sample Number: 1245 **Date:** 2-18-21

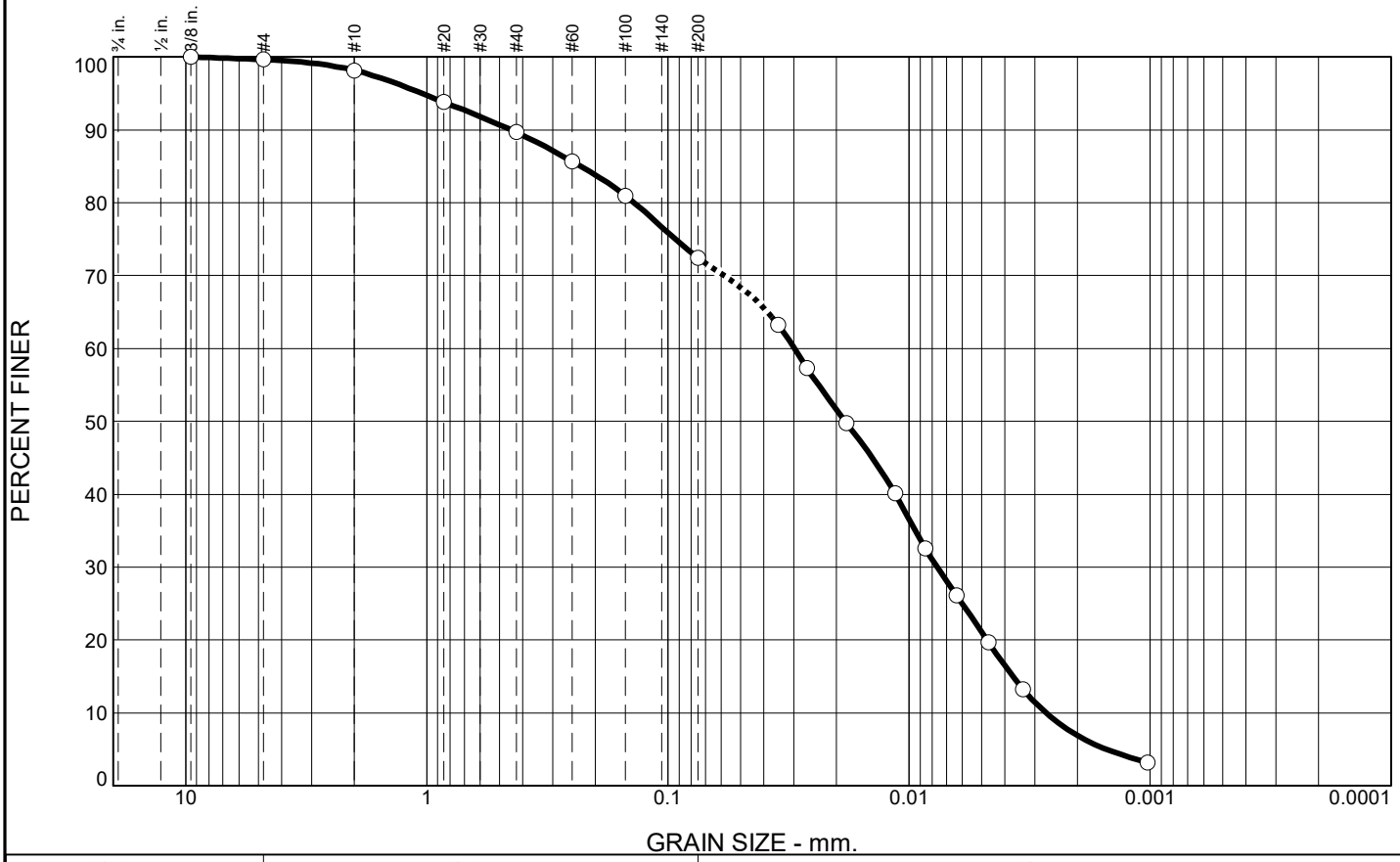
Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Particle Size Analysis of Soils ASTM D6913 and D7928



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.4	1.4	8.5	17.3	51.3	21.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#10	98.2		
#20	93.8		
#40	89.7		
#60	85.7		
#100	81.0		
#200	72.4		
0.0348 mm.	63.2		
0.0265 mm.	57.3		
0.0182 mm.	49.8		
0.0114 mm.	40.1		
0.0086 mm.	32.6		
0.0063 mm.	26.1		
0.0047 mm.	19.7		
0.0034 mm.	13.3		
0.0010 mm.	3.2		

* (no specification provided)

Soil Description

DARK GRAY SILT WITH SAND - ROOTS NOTED

Atterberg Limits

PL= 29 LL= 36 PI= 7

Coefficients

D_{90}= 0.4460 D_{85}= 0.2296 D_{60}= 0.0299
D_{50}= 0.0184 D_{30}= 0.0076 D_{15}= 0.0037
D_{10}= 0.0027 C_u= 11.07 C_c= 0.72

Classification

USCS= ML AASHTO= A-4(5)

Remarks

F.M.=0.46

Source of Sample: XPW-03 **Depth:** 10.0'-12.0'
Sample Number: 1500 **Date:** 2-18-21

Terracon

Client: CONFIDENTIAL
Project: EDWARDS POWER STATION

Project No: 11215017 **Figure**

Tested By: SJH **Checked By:** WPQ

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible-Wall Permeameter ASTM D5084

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **3/5/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. AW13A

TIME SAMPLED: 8:50

DEPTH: 5..0'-7.0'

CLASSIFICATION LIGHT BROWN AND GRAY SANDY LEAN CLAY (CL)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	96.5	97.7
WATER CONTENT (%)	25.2	25.8
DIAMETER (cm)	7.150	7.153
LENGTH (cm)	9.159	9.038
B VALUE PARAMETER:	0.95	
HYDRAULIC GRADIENT (MAXIMUM)	21.81	
PERCENT SATURATION	98.5	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 4.72E-08

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **15205262** **3/5/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. AW15A

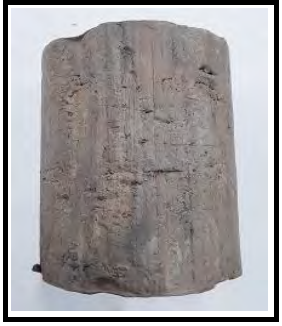
TIME SAMPLED: 10:25

DEPTH: 20.0'-22.0'

CLASSIFICATION GRAY FAT CLAY (CH)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	85.8	86.3
WATER CONTENT (%)	27.9	34.5
DIAMETER (cm)	7.218	7.169
LENGTH (cm)	8.961	9.038
B VALUE PARAMETER:	0.97	
HYDRAULIC GRADIENT (MAXIMUM)	22.29	
PERCENT SATURATION	98.3	

SPECIMEN PHOTO



(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 2.87E-08

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **15205262** **3/5/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO.	AW20
TIME SAMPLED:	N/A
DEPTH:	15.0'-17.0'
CLASSIFICATION	GRAY AND DARK GRAY LEAN CLAY - SAND POCKETS NOTED

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	83.9	86.6
WATER CONTENT (%)	35.1	34.6
DIAMETER (cm)	7.143	7.212
LENGTH (cm)	9.300	8.830
B VALUE PARAMETER:	0.96	
HYDRAULIC GRADIENT (MAXIMUM)	21.48	
PERCENT SATURATION	99.6	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 7.23E-08

Deaired water was used as the liquid permeant.

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **3/5/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. AW22

TIME SAMPLED: 7:45

DEPTH: 5..0'-7.0'

CLASSIFICATION GRAY, LIGHT GRAY AND LIGHT BROWN CLAYEY SAND (SC)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	101.3	101.9
WATER CONTENT (%)	23.2	23.9
DIAMETER (cm)	7.141	7.204
LENGTH (cm)	8.463	8.273
B VALUE PARAMETER:	0.99	
HYDRAULIC GRADIENT (MAXIMUM)	23.60	
PERCENT SATURATION	99.0	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 1.74E-07

Deaired water was used as the liquid permeant.

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Consulting Engineers & Scientists

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO.	XPW-01
TIME SAMPLED:	12:10
DEPTH:	20.0'-22.0'
CLASSIFICATION	DARK GRAY SILTY SAND

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	69.8	55.7
WATER CONTENT (%)	43.7	69.2
DIAMETER (cm)	7.272	7.183
LENGTH (cm)	6.449	8.273
B VALUE PARAMETER:	0.99	
HYDRAULIC GRADIENT (MAXIMUM)	9.17	
PERCENT SATURATION	99.3	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 1.18E-05

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO.	XPW-01A
TIME SAMPLED:	15:30
DEPTH:	40.0'-42.0'
CLASSIFICATION	DARK GRAY ELASTIC SILT

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	71.7	73.1
WATER CONTENT (%)	35.1	42.7
DIAMETER (cm)	6.082	6.072
LENGTH (cm)	10.387	10.221
B VALUE PARAMETER:	0.99	
HYDRAULIC GRADIENT (MAXIMUM)	9.08	
PERCENT SATURATION	99.0	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): **6.77E-06**

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. XPW-02

TIME SAMPLED: 8:45

DEPTH: 10.0'-12.0'

CLASSIFICATION DARK GRAY AND GRAYISH BROWN ELASTIC SILT WITH SAND

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	67.5	70.1
WATER CONTENT (%)	45.1	47.2
DIAMETER (cm)	7.220	7.150
LENGTH (cm)	8.112	7.973
B VALUE PARAMETER:	0.97	
HYDRAULIC GRADIENT (MAXIMUM)	11.62	
PERCENT SATURATION	99.5	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 1.20E-05

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. XPW-02

TIME SAMPLED: 9:50

DEPTH: 22.0'-24.0'

CLASSIFICATION DARK GRAY SILT

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	77.1	79.6
WATER CONTENT (%)	33.4	35.1
DIAMETER (cm)	6.067	6.076
LENGTH (cm)	11.969	11.556
B VALUE PARAMETER:	0.95	
HYDRAULIC GRADIENT (MAXIMUM)	7.88	
PERCENT SATURATION	99.2	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 2.08E-06

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO. XPW-02

TIME SAMPLED: 12:45

DEPTH: 45.0'-47.0'

CLASSIFICATION GRAYISH BROWN SANDY SILT

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	73.5	78.9
WATER CONTENT (%)	41.7	36.8
DIAMETER (cm)	6.073	5.993
LENGTH (cm)	9.127	8.731
B VALUE PARAMETER:	0.95	
HYDRAULIC GRADIENT (MAXIMUM)	10.33	
PERCENT SATURATION	98.9	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 1.00E-05

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 192 Exchange Blvd Glendale Heights, Illinois 60139 Ph. (630) 717-4263

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **11215017** **5/4/2021**
PROJECT NAME: **EDWARDS POWER STATION**
CLIENT: **CONFIDENTIAL**
LOCATION : **CONFIDENTIAL**

SUMMARY OF TEST RESULTS

BORING NO.	XPW-03
TIME SAMPLED:	15:00
DEPTH:	10.0'-12.0'
CLASSIFICATION	DARK GRAY SILT WITH SAND - ROOTS NOTED

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	68.0	70.7
WATER CONTENT (%)	43.8	46.0
DIAMETER (cm)	6.111	6.085
LENGTH (cm)	12.259	11.894
B VALUE PARAMETER:	0.98	
HYDRAULIC GRADIENT (MAXIMUM)	7.69	
PERCENT SATURATION	99.6	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): **3.29E-05**

Deaired water was used as the liquid permeant.

AECOM
GEOTECHNICAL REPORTS

January 12, 2016

Mr. Matt Ballance, PE
Senior Project Engineer
Dynegy Inc.
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

RE: Geotechnical Data Report for Dynegy Edwards Station; Edwards Ash Pond

Dear Mr. Ballance:

AECOM is pleased to provide this 30% Design Data Package for Edwards Ash Pond Coal Combustion Residuals (CCR) units at the E.D. Edwards Power Station (Bartonsville, IL). The Data Package includes summary tables, field exploration plan, and laboratory data.

At Edwards, the geotechnical exploratory program included the following:

- 14 auger borings
- 22 CPT soundings
- 4 standpipe piezometers

AECOM looks forward to providing continued support to Dynegy and working together on this important program. Please do not hesitate to call the undersigned, if you have any questions or comments on this 30% Design Data Package.

Sincerely,

AECOM

Jeremy M. Thomas, P.E.
Project Manager
jeremy.thomas@aecom.com

Attachments:
Tables
Table 1-1 Exploration Location Table
Table 1-2 Water Level Measurements – Piezometers

Figures
D-01 Exploration Locations
D-02 Cross Section Locations
D-03 Piezometer Locations

x

Appendices

Appendix A Boring Logs
Appendix B Piezometer Installation Logs
Appendix C CPT Sounding Logs
Appendix D Laboratory Test Results

TABLES

E. D. Edwards Station

Tabel 1-1 Exploration Location Table

Boring	Depth	Longitude	Latitude	Elevation
EDW-B001	51.0	-89.6671	40.5975	460
EDW-B002	52.5	-89.6671	40.5956	457
EDW-B003	60.5	-89.6668	40.5936	460
EDW-B004	60.3	-89.6652	40.5933	461
EDW-B005	53.0	-89.6643	40.5879	460
EDW-B006	37.0	-89.6638	40.5904	440
EDW-B008	42.5	-89.6662	40.5873	439
EDW-B009	66.5	-89.6667	40.5881	446
EDW-B010	45.3	-89.6691	40.5963	459
EDW-B011	62.0	-89.6675	40.5902	456
EDW-B012	60.0	-89.669	40.5909	453
EDW-B013	53.0	-89.664	40.5875	458
EDW-B014	45.5	-89.6695	40.5947	456
EDW-B015	57.0	-89.6643	40.5884	444
Piezometers	Depth	Longitude	Latitude	Elevation
EDW-P001	36.5	-89.6671	40.5975	460
EDW-P002	31.0	-89.6691	40.5963	459
EDW-P003	51.0	-89.669	40.5909	453
EDW-P004	31.5	-89.6643	40.5884	444
CPT	Depth	Longitude	Latitude	Elevation
EDW-C001	38.9	40.5975	-89.6671	460
EDW-C003	54.6	40.5960	-89.6663	461
EDW-C005	40.0	40.5933	-89.6652	461
EDW-C006	40.0	40.5920	-89.665	473
EDW-C007	54.8	40.5907	-89.6642	461
EDW-C008	33.6	40.5904	-89.6638	441
EDW-C009	52.2	40.5884	-89.6643	444
EDW-C010	30.0	40.5873	-89.6638	442
EDW-C011	47.1	40.5875	-89.664	358
EDW-C012	50.2	40.5879	-89.6643	460
EDW-C013	56.3	40.5875	-89.666	458
EDW-C014	38.2	40.5873	-89.6662	443
EDW-C015	40.0	40.5881	-89.6667	446
EDW-C016	36.9	40.5880	-89.6669	449
EDW-C017	55.9	40.5909	-89.669	453
EDW-C019	53.3	40.5914	-89.6685	462
EDW-C021	49.4	40.5934	-89.6699	452
EDW-C022	20.0	40.5947	-89.6695	456
EDW-C023	40.7	40.5963	-89.6691	459
EDW-C025	20.0	40.5956	-89.6671	457
EDW-C026	14.6	40.5936	-89.6668	460
EDW-C027	40.0	40.5902	-89.6675	456

E. D. Edwards Station

Table 1-2 Water Level Measurements - Piezometers

Piezometer	Ground Surface Elevation (ft)	Screen Depth Interval (ft)		Water Surface Elevation (ft)		
		Top	Bottom	10/28/2015	11/24/2015	12/17/2015
EDW-P001	461.0	30.0	35.0		436.7	438.9
EDW-P002	459.0	24.3	29.0	449.7	449.8	450.2
EDW-P003	459.6	44.3	49.6	437.3	438.7	439.1
EDW-P004	455.6	25.2	30.2		442.8	442.9

FIGURES

File: \\URSSTLOUIS\STLOUIS\PROJECTS\GEOTECH\DYNEGY - BALDWIN 2014\CCR\04TASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2 BORING LOCATION PLAN (EDWARDS ASH POND)_AJW_EDITS.DWG Last edited: AUG. 05, 15 @ 4:03 p.m. by: eric_glazier

EDW-C020
EDW-B007
EDW-C018
EDW-C021
EDW-B012
EDW-C017
EDW-P003
EDW-B014
EDW-C022
EDW-C024
EDW-C023
EDW-B010
EDW-P002
EDW-C019
EDWARDS
ASH POND
EDW-C001
EDW-B001
EDW-P001
EDW-C016
EDW-C027
EDW-B011
EDW-B002
EDW-C025
EDW-C002
EDW-C015
EDW-B009
EDW-C026
EDW-B003
EDW-C014
EDW-B008
EDW-C003
EDW-C013
EDW-C005
EDW-B004
EDW-C004
EDW-C012
EDW-B005
EDW-C006
EDW-C009
EDW-B015
EDW-P004
EDW-C011
EDW-B013
EDW-C007
EDW-C010
EDW-C008
EDW-B006

EXPLORATION METHOD (B=BORING, C=CPT, P=PIEZOMETER)
XXX–X###
ID NUMBER
STATION ABBREVIATION

LEGEND

- PROPOSED BORING LOCATION
- PROPOSED CPT LOCATION
- PROPOSED PIEZOMETER LOCATION
- PROPOSED CROSS SECTION LOCATION
- CCR UNIT BERM ALIGNMENT

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

Ø 400
APPROXIMATE SCALE FEET

DYNEGY, INC	PROJECT NO. 60440202
AECOM	
DRN. BY: djd July 2015 DSGN. BY: eg CHKD. BY: eg	Edwards Ash Pond Field Investigation Plan
	FIG. NO. 1

PRIVILEGED & CONFIDENTIAL - ATTORNEY CLIENT PRIVILEGED

APPENDIX A

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	AJW
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	51.0 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	460 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	2 6 8	61		Stiff, dry, gray mottled with brown, lean CLAY (CL).					3.0			
						457.5 / 2.5								
		SS-2	3 4 5	94		Stiff, moist, brown mottled with gray and black, lean CLAY (CL), trace shell fragments.					3.0			
455	5	SS-3	3 3 3	75		Becomes medium stiff.					1.0			
		ST-4	200 psi	100										*Pushed shelby tube from 7.0 to 9.0 feet*
450	10	SS-5	3 3 6	83		450.0 / 10.0 Stiff, moist, grayish black, lean CLAY (CL), trace organics.					1.0 1.5			
445	15	SS-6	1 3 5	78							1.25			
440	20	SS-7	1 6 7	100		440.0 / 20.0 Stiff, moist, very dark gray to grayish black with some brown, lean CLAY (CL).					1.5 2.5			
435	25	SS-8	WOH WOH 2	100		435.0 / 25.0 Very soft, wet, brown mottled with gray, sandy lean CLAY (CL).					1.0 0.5			
430	30					430.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:32:54 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	150 psi	100		Soft, wet, gray, silty lean CLAY (CL-ML).					1.25			*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS-10	2 2 4	100		425.0 / 35.0 Loose, wet, gray, silty SAND (SM), trace wood fragments. 424.2 / 35.8 Medium stiff, moist, gray, lean CLAY (CL).					0.5 1.0			
420	40	SS-11	50/3"	100		420.0 / 40.0 CLAYSTONE: Brown and gray, weathered, hard.								
415	45	SS-12	50/2"			414.0 / 46.0 SILTSTONE: Thin to medium bedding, fresh, argillaceous.								*Run 1 - Start 13:46, End 14:00*
		Run 1	16.7	36.7										
410	50					409.0 / 51.0 End of Boring at 51 ft								*Boring backfilled with Portland Cement and bentonite*
405	55													
400	60													
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:32:54 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	52.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	7 6 8	89		457.0 / 0.0 Medium dense, moist, dark brown, FLY ASH [Fill].	38.4							
455						454.5 / 2.5								
		SS-1	3 2 2	100		Loose, moist, dark gray, FLY ASH [Fill].	62.4							
	5	ST-3	150 psi	62.5			66.6		65	29				*Pushed shelby tube from 5.0 to 7.0 feet*
450						449.5 / ▽ 7.5								
		SS-4	WOR	100		Very loose, wet, black, FLY ASH [Fill].	79.0							
	10	ST-5		55			76.9	90.8 94.3 91.2	17	NP				*10.0 feet switch to mud rotary* *Pushed shelby tube from 10.0 to 12.0 feet*
445						Becomes dark gray.								
						Hard layer at tip of tube.								
	15	SS-6	1 2 3	100		Becomes loose.	52.5							
440														
	20	SS-7	12 17 2	37		437.0 / 20.0 Medium dense, wet, dark gray, FLY ASH [Fill], with cementous layers.	67.8							
435														
	25	SS-8	1 WOH WOH	100		432.0 / 25.0 Very loose, wet, dark gray, FLY ASH [Fill].	63.9							
430														
	30													

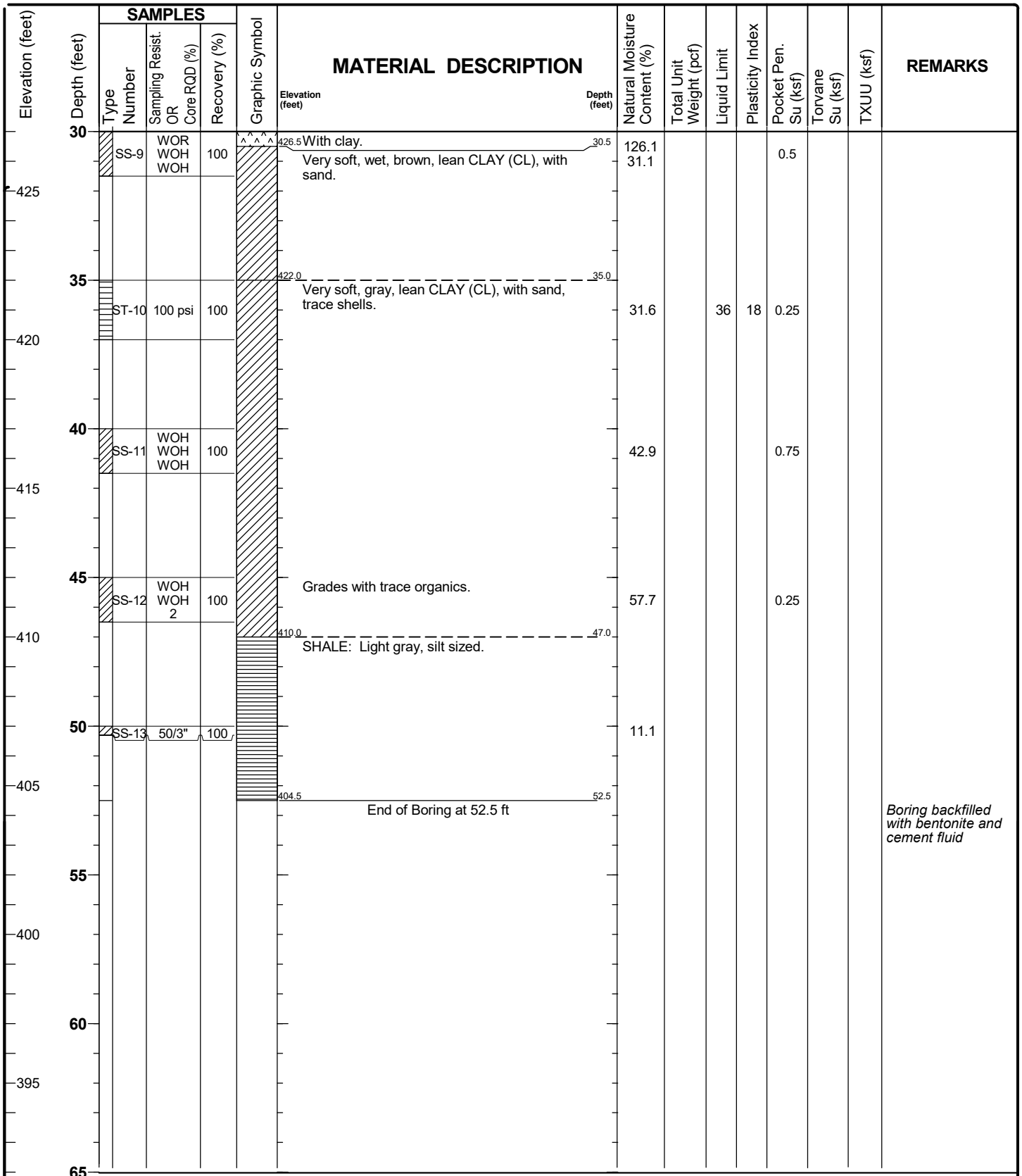
Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:01 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002



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Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	7 7 7	83		460.0 / 0.0 Medium dense, moist, dark gray, FLY ASH [Fill].	44.4							
		SS-2	3 2 2	100		Becomes loose.	27.3							
455	5	SS-3	1 WOH 2			455.0 / 5.0 Very soft, moist, lean CLAY (CL) with ash, sand, and organics.	37.2							
						▽ 452.5 / 7.5								
		ST-4	<100 psi	100		Ash, dark gray [Fill].	55.5							*Pushed shelby tube from 7.5 to 9.5 feet*
450	10	SS-5	WOR WOR WOR	67			50.6							*10.0 feet: Switch to mud rotary*
						447.0 / 13.0 Very dense, dark gray, moist, fine to coarse ASH with sand and gravel, slightly cemented [Fill].								*13.0 feet: Hard drilling*
445	15	SS-6	26 37 29	100			29.7							
						Becomes very loose, dark gray, fine.								
440	20	SS-7	1 1 1	100			42.1							
435	25	ST-8	100 psi	100		Grades with sand.	54.9							*Pushed shelby tube from 25.0 to 27.0 feet*
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:06 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	100 psi	100		Varved FLY ASH.	71.7	91.2 92.9 92.0						*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS-10	WOR WOR WOR	100		423.5 / 36.5	51.9 43.0							
						Very soft, moist, brown to gray, silty CLAY (CL), trace sand, shells, and organics.								
420	40	SS-11	WOH WOH WOR	100			31.6				.75			
415	45	ST-12	100 psi	100		415.0 / 45.0 Soft, moist, dark gray, fat CLAY (CH) with sand.	46.0				1.0			*Pushed shelby tube from 45.0 to 47.0 feet*
410	50	SS-13	1 2 3	100		410.0 / 50.0 Medium stiff, moist, brownish to greenish, gray, lean CLAY (CL), with sand.	55.4				1.0			
						406.0 / 54.0 SHALE, gray, weathered, silt sized.								
405	55	SS-14	11 50/5"	100			23.3 9.8							
400	60	SS-15	50/3"	100		399.5 / 60.5 End of Boring at 60.5 ft	7.1							*Boring backfilled with bentonite and cement fluid*
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:06 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003A

Sheet 1 of 1

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	9.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' East of EDW-B003 (ft NAD83)	Groundwater Level(s)	7 ft on 9/3/2015		

Depth (feet)	SAMPLES Type Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	MATERIAL DESCRIPTION Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					Offset boring to attempt shelby tube at 7.5 feet	0.0								
5														
	ST-1		0											*Pushed shelby tube from 7.5 to 9.5 feet*
						9.5								
10					End of Boring at 9.5 ft									*Boring backfilled with bentonite and cement fluid*
15														
20														
25														
30														

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:12 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0							0.0								
	SS	1	16 12 15	83		6" stone at surface.	0.5	18.9							
						Medium dense, moist, dark gray, ASH [Fill].									
	SS	2	3 2 2	100			3.5	28.5 20.1							
						Becomes dark gray to dark brown, trace silty clay, sand and gravel.									
5	SS	3	2 2 4	77								1.25			
	SS	4	2 3 4	100				21.6				2.0			
10	SS	5	2 2 2	67				21.5				2.0			*10.0 feet: Switch to mud rotary*
							12.5								
	SS	6	2 2 2	100		Soft, wet, brown mottled, silty CLAY (CL), trace sand and gravel.		25.4				1.25			
15	SS	7	2 3 3	77				25.8				1.25			
20	SS	8	WOH 2 3	89		Grades brown, with sand.		31.3				.75			
25	SS	9	2 2 3	89			26.0	23.0 19.5							
						Medium stiff, wet, brown, clayey SAND (SC).	26.5								
						Medium stiff, wet, dark gray to gray, silty CLAY (CL), trace sand.									
30							30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:15 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet) / Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS	10	2 7 6	89		Stiff, gray, wet, lean CLAY (CL), with sand, and organics.	19.7				4.0			
35						35.0								
	ST	11		100		Stiff, wet, gray mottled, lean CLAY (CL) with sand.	20.1				1.25			*Pushed shelby tube from 36.0 to 38.0 feet*
40	SS	12	2 3 3	89		40.0 Stiff, wet, brown mottled, lean CLAY (CL), trace sand.	30.0				1.75			
45	SS	13	2 3 5	83		45.0 Medium stiff, wet, dark gray, lean CLAY (CL).	39.5 35.1				1.25			
50	SS	14	2 2 3	100		50.0 Medium, stiff, wet, gray, lean CLAY (CL) with sand, trace shells and organics.	65.2				1.25			
55	SS	15	3 8 23			56.0 SHALE: Light gray, weathered.	33.4 13.2							*56.5 to 60.0 feet: Solid drilling*
60	SS	16	50/3"	100		60.0 End of Boring at 60.3 ft	8.8							*Boring backfilled with bentonite and cement fluid*
65														

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:15 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	8 ft on 9/10/2015		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0	SS	SS-1	4 4 5	95		Medium, stiff, moist, brown, clayey SAND (SC), trace gravel, topsoil, roots and fill.	0.0	45.8				2.0			
							2.5								
	SS	SS-2	9 15 11	100		Medium dense, moist, brown, sandy SILT (ML) with gravel.		26.0							
5	SS	SS-3	2 2 2	100		Loose, moist, brown, sandy elastic SILT (MH) with clay.	5.0	50.9				1.8			
							▽ 8.0								
	SS	SS-4		100		Loose, wet, brown, sandy SILT (ML) with gravel.		37.4							
10	SS	SS-5	1 2 5	100		Medium stiff, wet, light brown and gray, clayey SAND (SC) with gravel.	10.0	44.3							*10.0 feet: Switch to mud rotary*
15	SS	SS-6	2 8 10	100		Very stiff, wet, brown, sand SILT (ML) with gravel.	15.0	41.4							
20	SS	SS-7	1 1 1	100		Soft, wet, brown, gravelly CLAY (CL), trace sand.	20.0	51.1							
25	SS	SS-8	2"	100				55.3							
						Very loose, wet, dark brown ASH [Fill].	26.5	47.6							
30	SS	SS-9		100				69.3							

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:20 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9		100			69.3							
35	SS-10	WOR WOH WOH	67		35.0 Very loose, wet, black, ASH, with organic clay [Fill].	37.3							
40	ST-11	150 psi	100		38.0 Soft, wet, gray, fat CLAY (CH), trace sand, shells, and organics.	44.8		57	35				*Pushed shelby tube from 41.0 to 43.0 feet*
45	SS-12	WOH 2 2	100		45.0 Soft, wet, dark gray and greenish gray, lean CLAY (CL), with sand, organics and shale.	88.7							
50	SS-13	11 18 44	89		49.5 SHALE: light gray, weathered.	15.9 12.8							
55					53.0 End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:21 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Date(s) Drilled	09/08/2015 to 09/08/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	37.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet) / Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0	SS	SS-1	3 4 6	94		Stiff, moist, dark brown, lean CLAY (CL) with sand and glass.	26.4				3.0			
2.5	SS	SS-2	3 3 3	67		Medium stiff, brown to dark brown lean CLAY (CL), trace sand.	30.1				1.25			
5	SS	SS-3	2 3 4	100		Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	24.8		48	29	2.0			
	SS	SS-4	3 4 4	100			26.0				1.5			
10	SS	SS-5	1 2 1	100		Becomes soft.	34.2				1.0			*10.0 feet: Switch to mud rotary*
13.0	ST	ST-6		100		Soft, moist, gray fat CLAY (CH) with sand and shells.	31.1		62	42	1.25			*Pushed shelby tube from 12.0 to 14.0 feet*
15	SS	SS-7	1 1 1	100		Soft, moist, brownish gray, lean CLAY (CL).	40.8				1.0			
20	SS	SS-8	WOH WOH 1	100		Becomes very soft, brown and gray, with sand.	43.4				0.75			
25														
26.0	ST	ST-9		100		Very soft, moist, dark gray, organic SILT (OH).	76.0		72	35	0.75			*Pushed shelby tube from 26.0 to 28.0 feet*
30						30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:26 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-10		89		Very soft, moist, gray lean CLAY (CL) with sand, pockets of organics. — 31.0	43.4 19.6				0.75			
					Very soft, moist, grayish brown, lean CLAY (CL) with sand, silt, and organics.								
					— 33.0								
					SHALE: light gray, weathered.								
35	SS-11		84			14.2							
					— 37.0								
					End of Boring at 37 ft								*Boring backfilled with bentonite and cement fluid*
40													
45													
50													
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:26 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Date(s) Drilled	09/13/2015 to 09/13/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	42.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet) / Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					0.0								
	SS-1	3 4 4	100		Stiff, moist, brown, lean CLAY (CL) with sand and gravel, trace roots.	13.2				4.0			
	SS-2	3 4 6	100			19.5		42	20	4.25			
5	SS-3	2 3 5	67		Becomes medium stiff.	42.3				2.0			
					7.5								
	SS-4	1 3 2	89		Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	22.8				2.5			
10					11.0								*10.0 feet: Switch to mud rotary*
	ST-5	150 psi	85		Medium stiff, moist, brown and gray fat CLAY (CH), trace sand.	33.6		52	33	0.75			
15					15.0								
	SS-6	WOH 1 1	100		Soft, moist, dark brown, lean CLAY (CL), trace shells.	64.6				0.75			
20	SS-7	WOH WOH WOH	100		Becomes very soft.	44.4				0.75			
					24.0								
25	ST-8	150 psi			Very soft, moist, dark gray, fat CLAY (CL), trace organics.	68.9		67	36	1.0			
30					30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:32 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9	WOH WOH WOH	100		Very soft, moist, gray and brownish gray, lean CLAY (CL), trace sand.	71.4				0.5			
35	SS-10	WOH WOH WOH	100		Trace wood, organics, and shells.	56.9				0.75			
					39.0 SHALE: Light gray, slightly weathered.								
40	SS-11	66/4"	100			12.6							*40.0 to 42.5 feet: Solid drilling*
					42.5 End of Boring at 42.5 ft								*Boring backfilled with bentonite and cement fluid*
45													
50													
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:32 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	66.5 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	446 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0					446.0 / 0.0								
445		SS-1	11 13 15	100		445.5 / 0.5 Medium dense, moist, brown silty SAND (SM).					1.0 1.25			
						Very stiff, moist, gray and brown, sandy SILT (ML).								
						443.5 / 2.5								
		SS-2	2 1 1	67		Soft, dry, gray and brown sandy SILT (ML)					0.25			
	5					441.5 / 4.5 Concrete from 4.5 to 5.5.								
440		SS-3	5 2 5	11		440.5 / 5.5 Light brown, well graded GRAVEL (GW).								*5.5 feet: Limestone cobbles*
						438.5 / 7.5								
		SS-4	5 4 4	89		437.5 / 8.5 Stiff, dry, brownish gray, silty SAND with GRAVEL (SM).					1.0			
	10					Medium dense, moist, black, sandy SILT (ML).								
435						435.0 / 11.0								
		ST-5	250 psi	75		Medium stiff, moist, brownish gray, lean CLAY (CL).					1.5			*Pushed shelby tube from 11.0 to 13.0 feet* *Trace gravel in top of tube*
	15					431.0 / 15.0								
430		SS-6	1 5 5	89		Medium dense, moist, brown mottled with reddish brown, lean CLAY (CL).					2.0			
	20					426.0 / 20.0								
425		SS-7	WOH 2 4	94		Very soft to medium dense, moist to wet, gray, lean CLAY (CL) with shell and wood fragments.					1.0			
	25					421.0 / 25.0								
420		SS-8	WOH WOH 3	100		Very soft to soft, wet, gray, lean CLAY (CL) with shell fragments.					0.5 1.0			
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:38 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
415	30	SS-9	WOH 7 7	100		415.5 / 30.5 Stiff, dry, black, lean CLAY (CL), low plasticity.					1.0 1.25			
410	35	ST-10	125 psi	100		Becomes gray.					1.0			*Pushed shelby tube from 35.0 to 37.0 feet*
405	40	SS-11	WOH WOH 4	100		406.0 / 40.0 Soft, moist to wet, gray, lean CLAY (CL) with shell fragments, low to medium plasticity.					0.5			
400	45	SS-12	WOH 1 4	100							1.0			
395	50	SS-13	WOH WOH WOH	100		396.0 / 50.0 Very soft, wet, gray, SILT (ML) with shell fragments, low plasticity.					1.0			
390	55	SS-14	WOH WOH 17	100		390.0 / 56.0 Medium dense, wet, gray, fine to coarse clayey GRAVEL (GC), trace fine to coarse sand, reddish brown gravel.					3.0			
385	60	SS-15	50/3"	17		386.0 / 60.0 CLAYSTONE: Gray.								
	65	Run 1	0	0										*61.5 feet: Run 1 - Start 7:57, End 8:10*

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:39 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
380		Run 1	0	0		Elevation (feet) 379.5 / Depth (feet) 66.5								
						End of Boring at 66.5 ft								
	70													
375														
	75													
370														
	80													
365														
	85													
360														
	90													
355														
	95													
350														
	100													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:39 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Date(s) Drilled	09/04/2015 to 09/04/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459	0					459.0 / 0.0								
		SS-1	10 6 10	56		458.5 / 0.5 Medium dense, moist, brown, SAND (SP) with gravel and clay.	7.2							
						Medium dense, moist, dark gray, fine to coarse ASH [Fill].	17.4 27.9							
		SS-2	9 8 8	83			20.9 30.7							
455	5	SS-3	3 6 4	100			14.8							
						451.5 / 7.5								
		SS-4	3 3 6	78		Stiff, moist, brown lean CLAY (CL), trace sand and gravel.	22.0							
450	10					449.0 / 10.0								
		SS-5	2 3 4	78		Medium stiff, moist, brown and mottled gray, lean CLAY (CL), trace sand.	24.0							
		SS-6	2 2 3	78			28.0							*12.0 feet: Switch to mud rotary*
445	15	ST-7	250 psi	83			30.5		48	30				*Pushed shelby tube from 15.0 to 17.0 feet*
						440.0 / 19.0								
440	20					Soft, wet, gray, lean CLAY (CL), trace sand and shells.								
		SS-8	1 1 1	83			32.9							
435	25	SS-6	WOH WOH 3	89			21.4							
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:48 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	ST-10		72			30.0	117.6 118.9 118.6	40	25				*Pushed shelby tube from 30.0 to 32.0 feet*
425														
	35	SS-11	1 2 3	94		Becomes medium stiff.	28.2							
420														
	40	SS-12	6 7 50/3.5"	83		419.0 / 40.0 Medium dense, wet, brown, fine to coarse silty SAND (SP) with gravel. 418.0 / 41.0 SHALE: Light gray, weathered.	17.0							*41.0 to 43.0 feet: Hard drilling*
415														
	45	SS-13	50/3"	35		413.8 / 45.3 End of Boring at 45.25 ft	16.4							*Boring backfilled with bentonite and cement fluid*
410														
	50													
405														
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:48 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	62.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) 456.0 / Depth (feet) 0.0								
455	0	SS-1	9 12 12	89		Medium dense, moist, dark gray, ASH [Fill].	27.7							
		SS-2	8 9 14	100			16.3							
450	5	SS-3	6 9 9	94			29.4							
		SS-4	2 1 1	100		Becomes loose, wet. ▽	45.3							
445	10	SS-5		84			70.0							*10.0 feet: Switch to mud rotary*
440	15	SS-6	WOR WOR WOR WOR	100		Becomes very loose.	63.2							
435	20	SS-7		56			84.9							
430	25	SS-8	WOR WOR WOR WOR	89			74.7							
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:53 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30	SS-9	WOR WOR WOR WOR	100			73.7							
420	35	SS-10	WOR WOR WOR WOR	84			93.9							
415	40	SS-11	WOH 1 2	100		416.0 / 40.0 Soft, wet, gray, silty CLAY (CL), trace sand, shells, and organics.	47.9							
410	45	SS-12	WOR WOR WOH	94		411.0 / 45.0 Very soft, wet, gray, fat CLAY (CH), trace sand, shells, and wood.	63.3		63	42				
405	50	SS-13	WOR WOR WOH	89		406.0 / 50.0 Very soft, wet, dark gray and grayish brown, lean CLAY (CL).	62.5							
400	55	SS-14	WOR WOR WOH	100		Grades gray.	52.9							
						398.0 / 58.0 SHALE: Light gray, soft.								*58.0 to 62.0 feet: Solid drilling*
395	60	SS-15	50/3"	100		394.0 / 62.0 End of Boring at 62 ft	9.1							*Boring backfilled with bentonite and cement fluid*
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:53 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Sheet 1 of 2

Date(s) Drilled	09/09/2015 to 09/09/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	453 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					453.0 / 0.0								
		SS-1	6 6 4	94		452.6 / 0.4 Limestone gravel.	23.0							
						Stiff, moist, brown sandy SILT (ML), trace clay, gravel, and topsoil.								
						450.5 / 2.5								
450		SS-2	5 4 3	78		Loose, moist, dark brown ASH [Fill].	23.8		28	2				
	5	SS-3	3 4 11	56			26.5							
445		SS-4	10 10 7	89			26.5							
	10	SS-5	2 3 4	89		With clay.	24.7 24.9							
						442.0 / 11.0 Stiff, moist, brown to gray, silty CLAY (CL), trace sand, shells, and roots.								
440		SS-6	3 3 6	94			22.0							
	15	SS-7	2 3 4	61		Becomes medium stiff.	24.3		48	29				*15.0 feet: Switch to mud rotary*
435														
	20	ST-8	100 psi	75			23.8							*Pushed shelby tube from 20.0 to 22.0 feet*
430														
	25	SS-9	3 3 3	100			23.2							
425														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:59 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-10	2 2 4	61			24.8							
420														
	35	SS-11	2 2 2	100		Becomes soft, trace sand.	28.3							
415														
	40	SS-12	WOH 2 2	100		Becomes soft, trace sand, shells, and organics.	32.2							
410														
	45	SS-13	1 2 3	100			50.2							
						406.0 / 47.0								
405		ST-14		100		Medium stiff, moist, dark gray, fat CLAY (CL).	50.8	104.4 104.9 104.0	54	34				*Pushed shelby tube from 47.0 to 49.0 feet*
						404.0 / 49.0								
	50	SS-15	3 2 4	100		Medium stiff, moist, gray and brownish gray, lean CLAY (CL), trace sand.	67.4							
400														
	55	SS-16	11 21 23	100		397.5 / 55.5 Gray broken rock, weathered.	50.5 15.3							
						396.0 / 57.0 Light gray rock, weathered.								
395														
	60	SS-17	50/2.5"	75		392.8 / 60.2 End of Boring at 60 ft	17.9							*Boring backfilled with bentonite and cement fluid*
390														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:33:59 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0	SS	SS-1	4 4 7	44		Medium stiff, moist, dark gray to brown, CLAY (CL) with ASH [Fill].	0.0	13.6							
							2.5								
	SS	SS-2	1 3 4	83		Medium stiff, moist, brown, silty CLAY (CL), trace sand, gravel, and roots.		17.4				2.0			
5	SS	SS-3		46				24.3 20.0		49	28				
							8.0								
	SS	SS-4	3 4 6	72		Stiff, moist, dark gray, silty CLAY (CL), trace sand.		24.3				2.0			
10	SS	SS-5	2 4 7	83				25.4				2.0			*10.0 feet: Switch to mud rotary*
						Gray and mottled brown silty CLAY (CL), trace sand.									
15	SS	SS-6	2 2 4	100		Becomes medium stiff, gray and mottled brown.		25.5		41	29	1.0			
20	SS	SS-7	2 3 3	67				23.5				1.0			
25	SS	SS-8	3 3 4	67		Becomes gray, trace organics.		27.7				1.25			
30							30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:04 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30	SS-9	1 2 2	94		Medium stiff, moist, brown mottled gray, sandy CLAY (CL), trace silt and shells.	20.2				1.5			
					32.0								
	ST-10		100		Medium stiff, moist, gray and brown lean CLAY (CL) with sand.	33.3		42	19	1.25			*Pushed shelby tube from 32.0 to 34.0 feet*
35	SS-11	2 2 2	89		Becomes dark gray, trace organics.	58.0				1.0			
40	SS-12	2 2 3	100			54.5				1.25			
45	SS-13	2 2 4	100		Grades with calcium carbonate seams and shells.	66.2				1.75			
					Gravel layer 47.5 feet to 49.0 feet								
50					53.0								
					End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
55													
60													
65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:05 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0					Elevation (feet) 456.0 / Depth (feet) 0.0								
455		SS-1	1 4 10	89		Medium dense, moist, dark gray, ASH [Fill].	28.2							
		SS-2	7 2 1	100		Becomes wet, gray.	40.8							
	5					▽								
450		ST-3		35										*Pushed shelby tube from 5.0 to 7.0 feet*
		SS-4	1 1 1	100		Becomes light gray.	60.2							
	10					Becomes dark gray.								*10.0 feet: Switch to mud rotary*
445		SS-5		100			78.7							*Pushed shelby tube from 10.0 to 12.0 feet*
	15					Becomes light gray.								
440		ST-6	1/12" 1/12"	100			86.5							
	20													
435		SS-7	1/12" 1/12"	100			73.1							
	25													
430		SS-8	WOR WOR WOR	100			48.7							
	30					426.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:10 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30	SS-9	WOR WOR WOR	67		Very loose, wet, black to gray, ASH with clay [Fill].	31.6							
	35	SS-10	WOH 1 2	100		421.0 / 35.0 Soft, wet, gray, silty CLAY (CL), trace shells and wood.								
420	40	SS-11	2 18 34	100		415.5 / 40.5 SHALE: Light gray, weathered.	27.3 19.6 10.2							*42.0 to 45.0 feet: Solid drilling*
415	45	SS-12	56	100		410.5 / 45.5 End of Boring at 45.5 ft	14.2							*Boring backfilled with bentonite and cement fluid*
410	50													
405	55													
400	60													
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:10 AM

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Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	57.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	444 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					444.0 / 0.0								
		SS-1	5 4 1	72		443.6 / 0.4 Brown gravel.	54.7							
						Medium stiff, moist, gray to brown, sandy CLAY (CL), trace silt.								
						441.5 / 2.5								
440		SS-2	5 9 13	50		Medium dense, moist, light brown to white, fine to coarse GRAVEL (GP) with sand, trace silt and limestone.	4.5							
	5	SS-3	6 10 13	39			5.4							
		SS-4	6 9 7	39			7.2							
435														
	10	SS-5	4 5 6	39			6.5							*10.0 feet: Switch to mud rotary; borehole collapsed*
		SS-6	10 3 2	11			3.6							
430	15	SS-7	4 4 4	39		Some coarse limestone.	8.2							
425														
	20	SS-8	10 7 9	39			7.8							
420														*23.0 to 25.0 feet: Drove casing with hammer* *23.0 to 29.0 feet: Hard drilling*
	25	SS-9	7 4 11	33			8.1							
415	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:16 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30					413.0 / 31.0								
		ST-10	300 psi	100		Medium stiff, wet, gray, sandy CLAY (CL), trace silt, shells, and organics.	20.2	122.2 121.0 119.8	24	11	2.5			*Pushed shelby tube from 31.0 to 33.0 feet*
410														
	35					409.0 / 35.0								
		SS-11	WOH 2 3	94		Medium stiff, wet, gray and dark gray lean CLAY (CL)	33.8				1.25			
						407.0 / 37.0								
		ST-12	175 psi			Soft, wet, dark gray, fat CLAY (CH).	41.0		66	43	1.0			*Pushed shelby tube from 37.0 to 39.0 feet*
405						405.0 / 39.0								
	40	SS-13	WOH 2 2	100		Soft, wet, brown and gray, lean CLAY (CL).	36.2				1.0			
400														
	45	SS-14	WOH 2 2	83		Grades with sand.	49.4				1.0			
395														
	50	SS-15	3 5 14	22		Grades without sand.	30.9				0.5			
						392.0 / 52.0								
						SHALE: Light gray, silt sized, weathered.								*52.0 feet: Solid drilling*
390														
	55	SS-16	71/6"	oK			11.0							
						387.0 / 57.0								
						End of Boring at 57 ft								*Boring backfilled with bentonite and cement fluid*
385														
	60													
380														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:16 AM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015A

Sheet 1 of 1

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	AJW
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	30.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' SW of EDW-B015 (ft NAD83)	Groundwater Level(s)	ft on		

Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
0					0.0 Blank power auger to 30.0 feet to confirm 29.0 feet of gravel.								*Offset 5.0 feet west of EDW-B015*
5													*5.0 to 30.0 feet: No cuttings*
													7.0 feet: Borehole collapsed; created a 14" diameter hole with no cuttings
10													
15													
20													*20.0 feet: Groundwater encountered*
25													*Auger hole collapsed and auger removed. No clay on auger.*
30					30.0 End of Boring at 30 ft								

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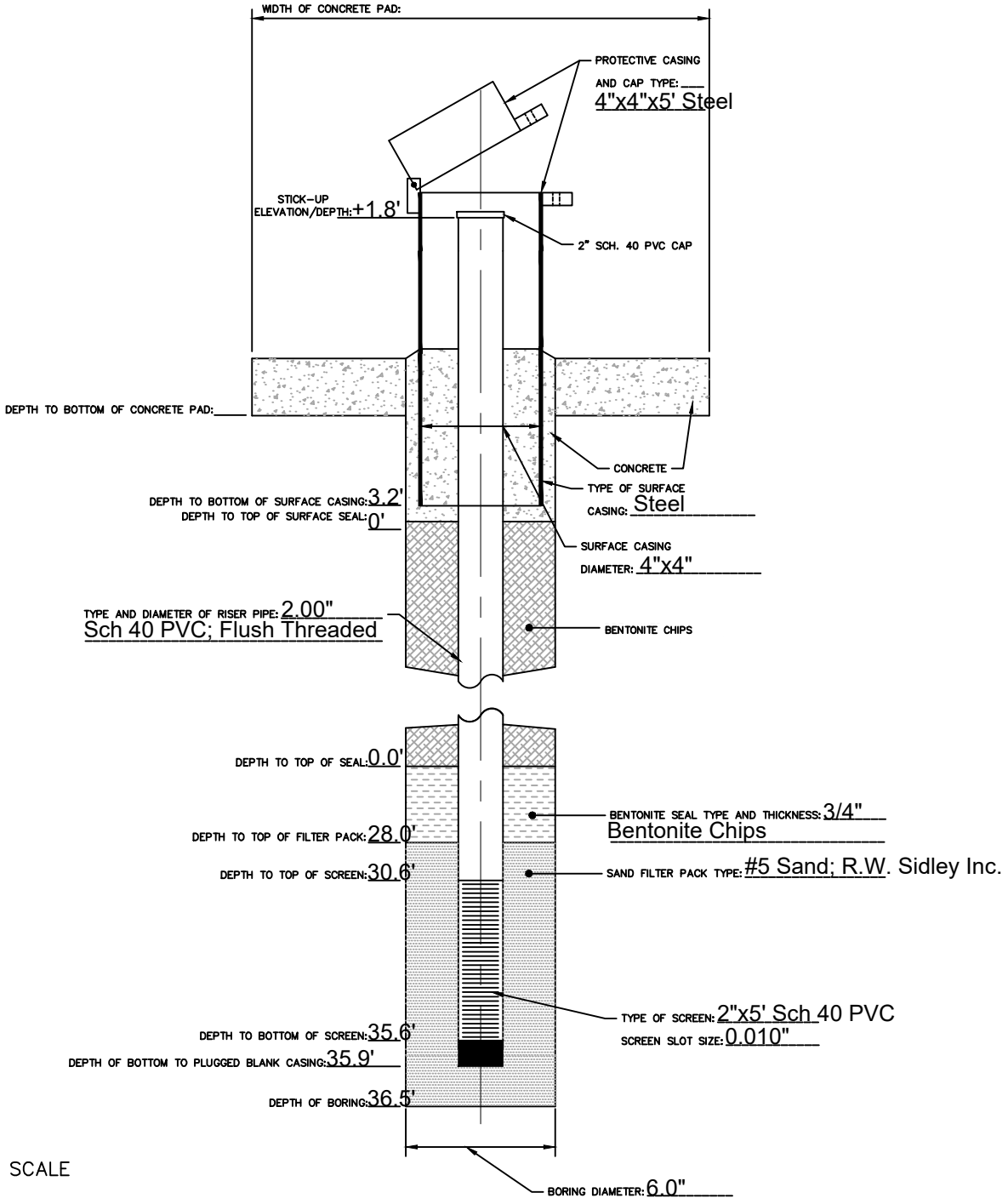
Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 12/18/2015 9:34:21 AM

APPENDIX B

Project: Dynegy Project Location: Pekin, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

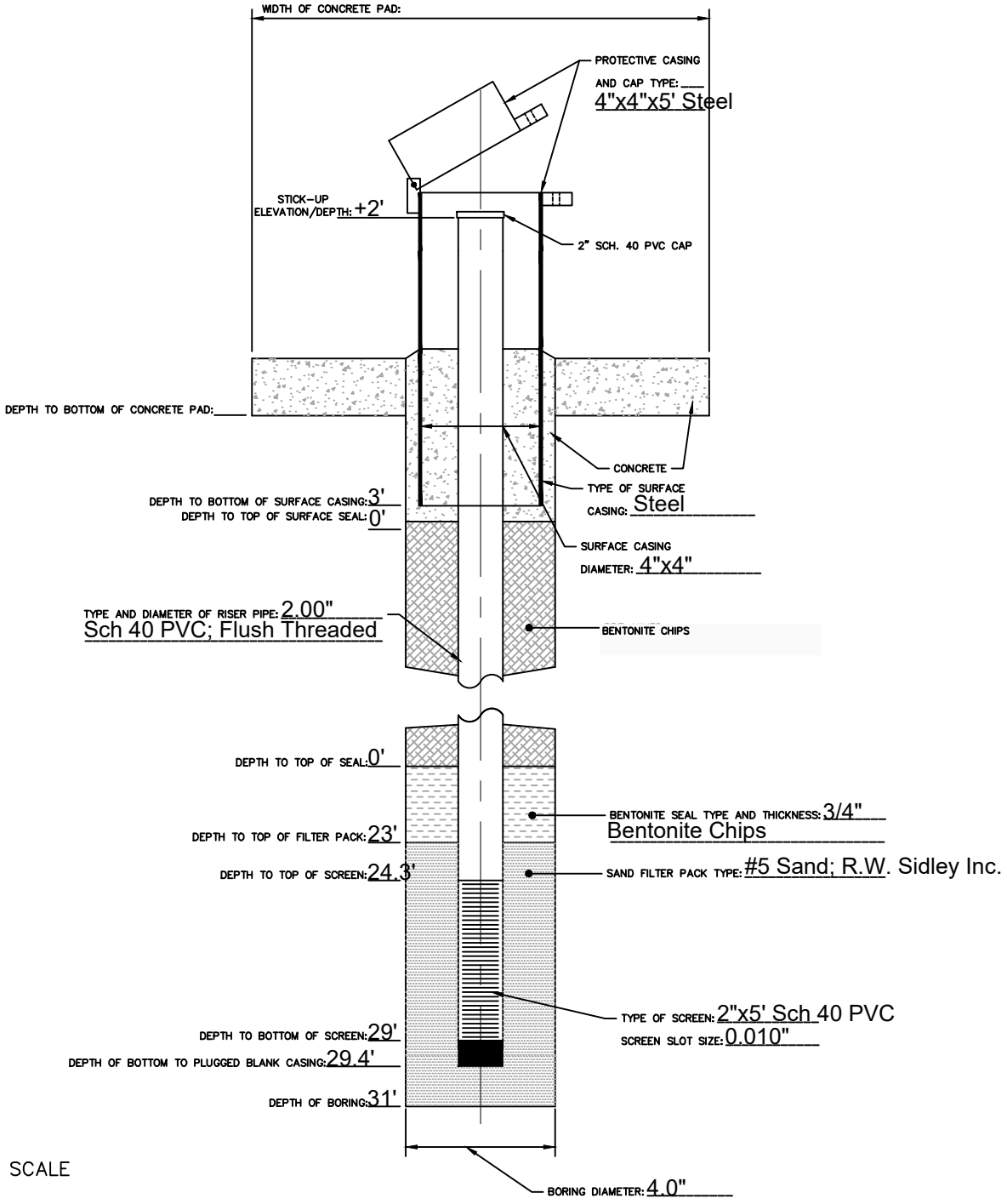
Piezometer Location	EDW-P001	Date Installed	11/05/15	Time	5:30 P.M.
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	36.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	30.6-35.6'	Completion Zone			
Remarks		Groundwater Level(s)	24.64' from top of casing		



AECOM

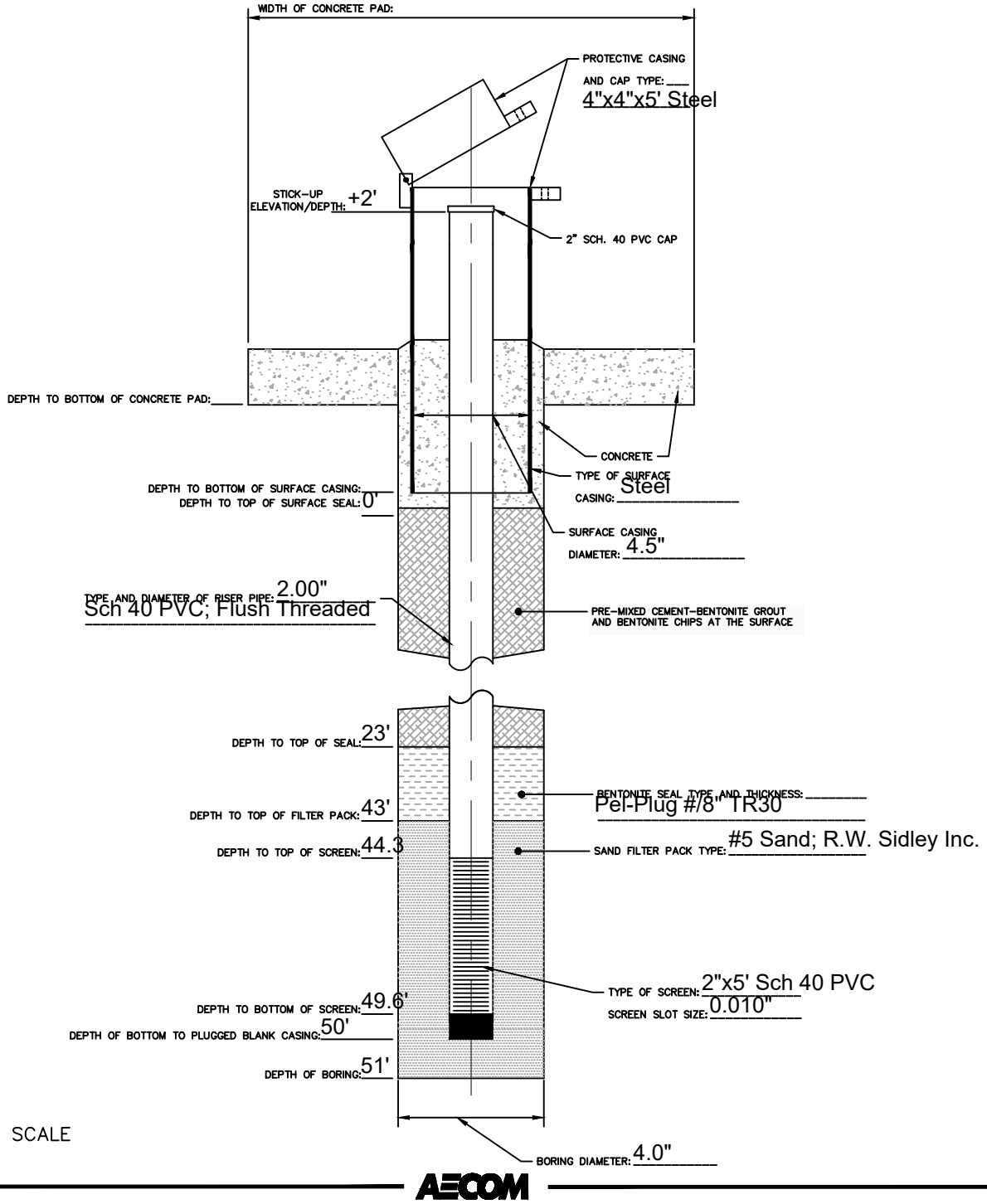
Project: Dynegy Project Location: Pekin, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

Piezometer Location	EDW-P002	Date Installed	09/04/15	Time	11:00-12:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	31'
Method of Installation	4" Power Auger	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	24-29'	Completion Zone			
Remarks		Groundwater Level(s)	29' After Drilling		



Project: Dynegy Project Location: Pekin, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

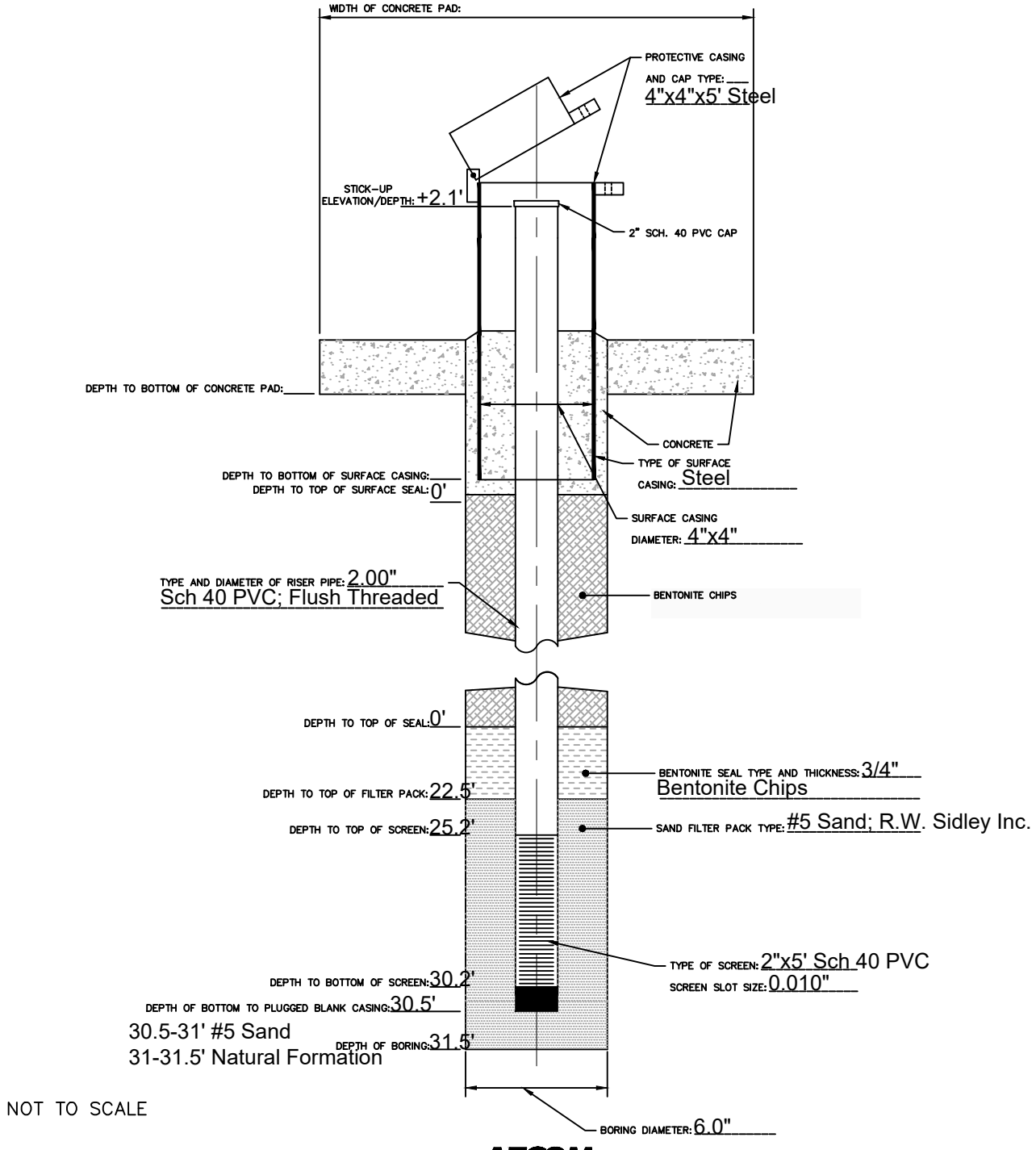
Piezometer Location	EDW-P003	Date Installed	09/04/15	Time	3:30-6:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	51'
Method of Installation	3 7/8" Rock Bit	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	44.3-49.6'	Completion Zone			
Remarks		Groundwater Level(s)			



AECOM

Project: Dynegy Project Location: Pekin, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

Piezometer Location	EDW-P004	Date Installed	11/04/15	Time	12:00
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	31.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	
Screened Interval	25.2-30.2'	Completion Zone			
Remarks		Groundwater Level(s)	14.85 From Top of Casing		



AECOM

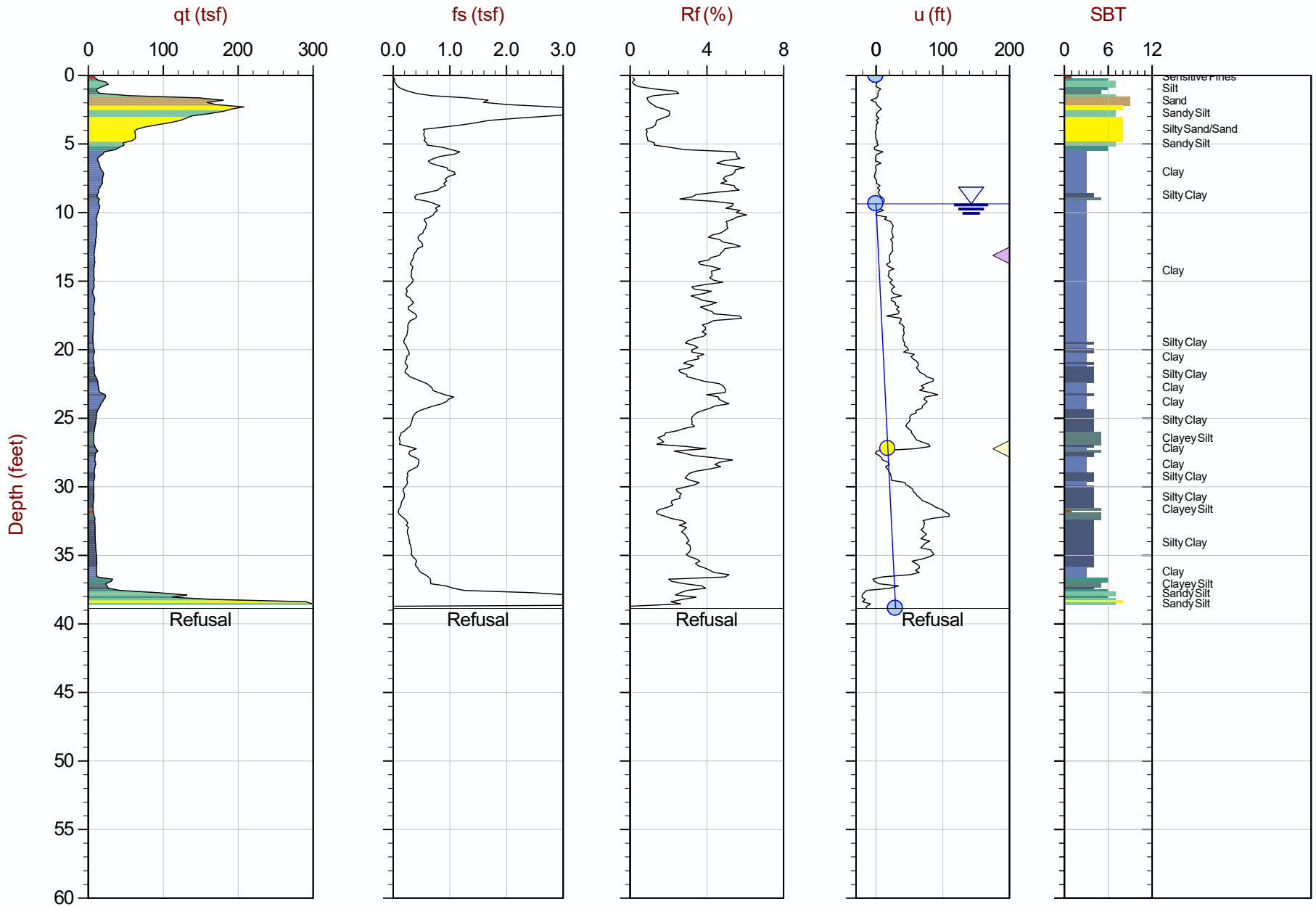
APPENDIX C

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374:T1500F15U500



Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

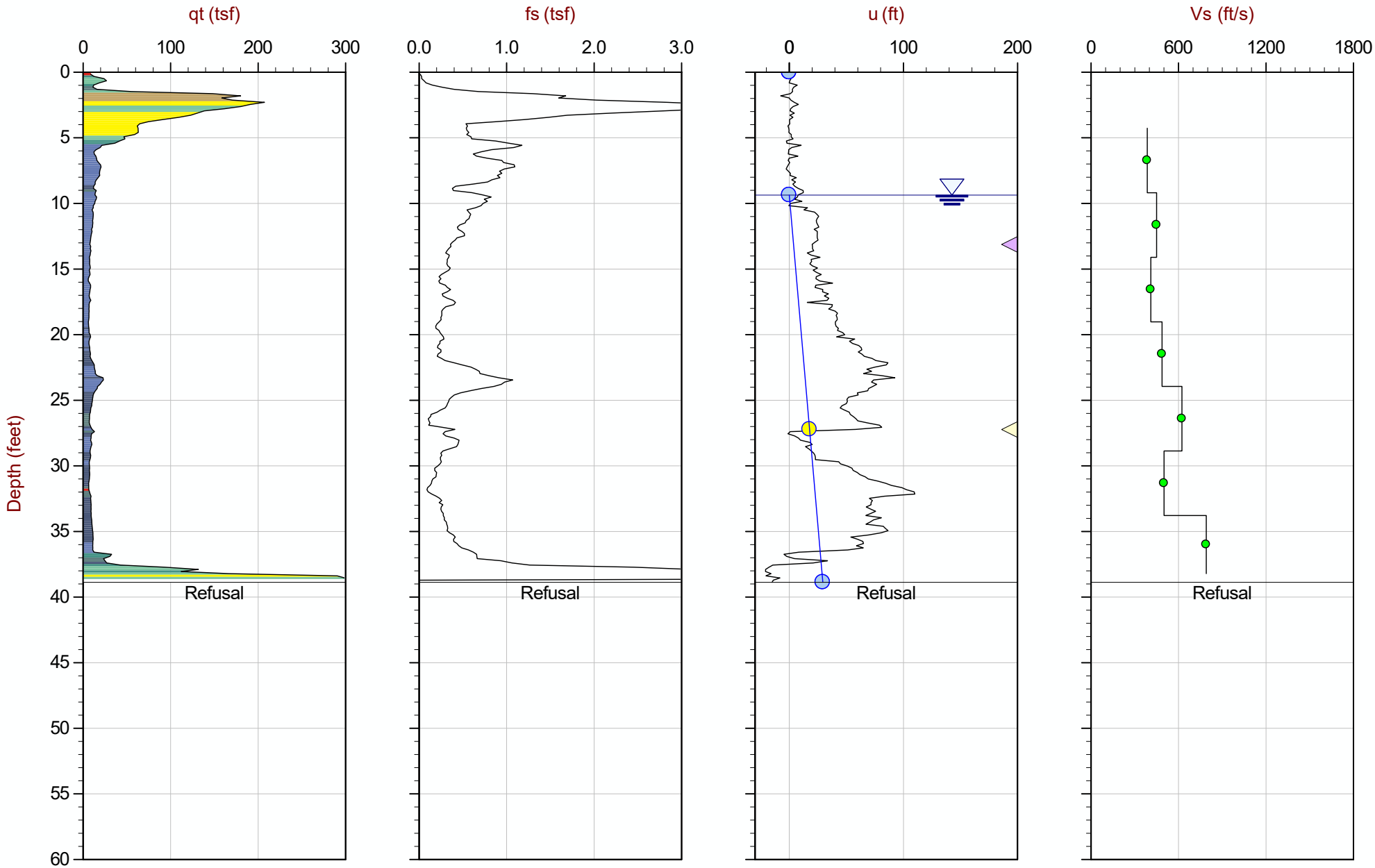
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374:T1500F15U500



Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

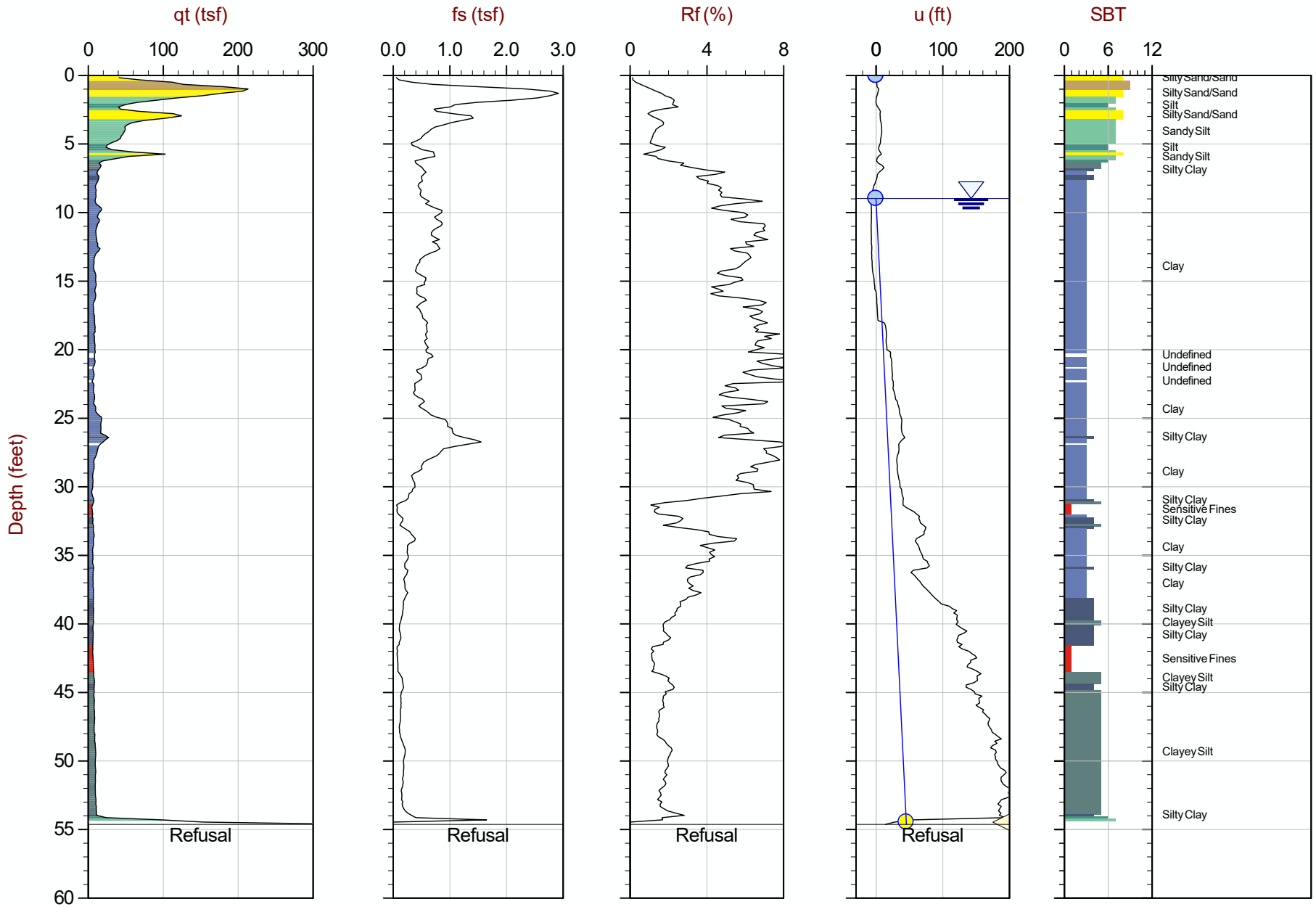
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:22
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: 340:T1500F15U500



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

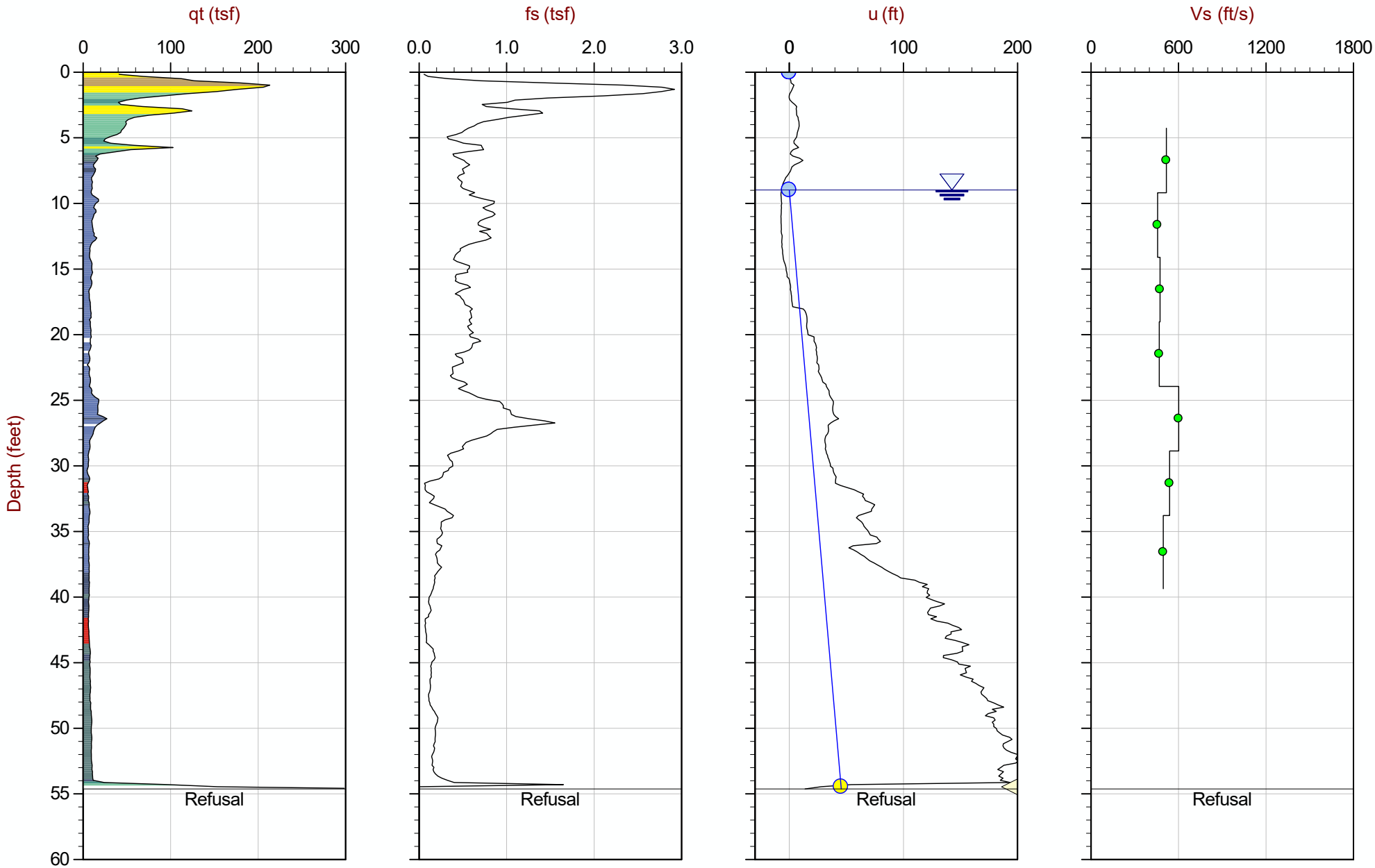
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:22
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: 340:T1500F15U500



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

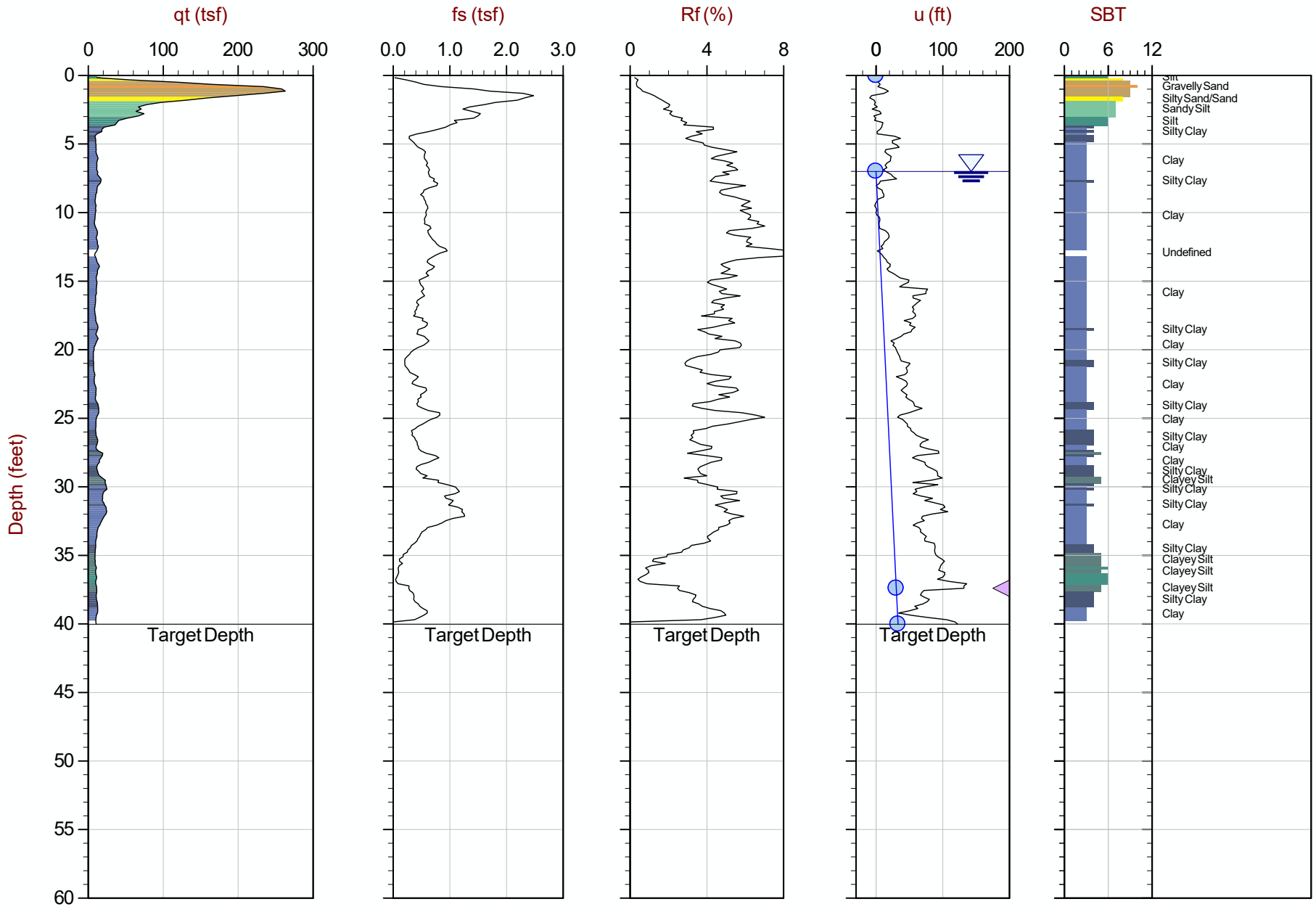
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 15:05
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C005
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP05.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497026m E: 274468m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

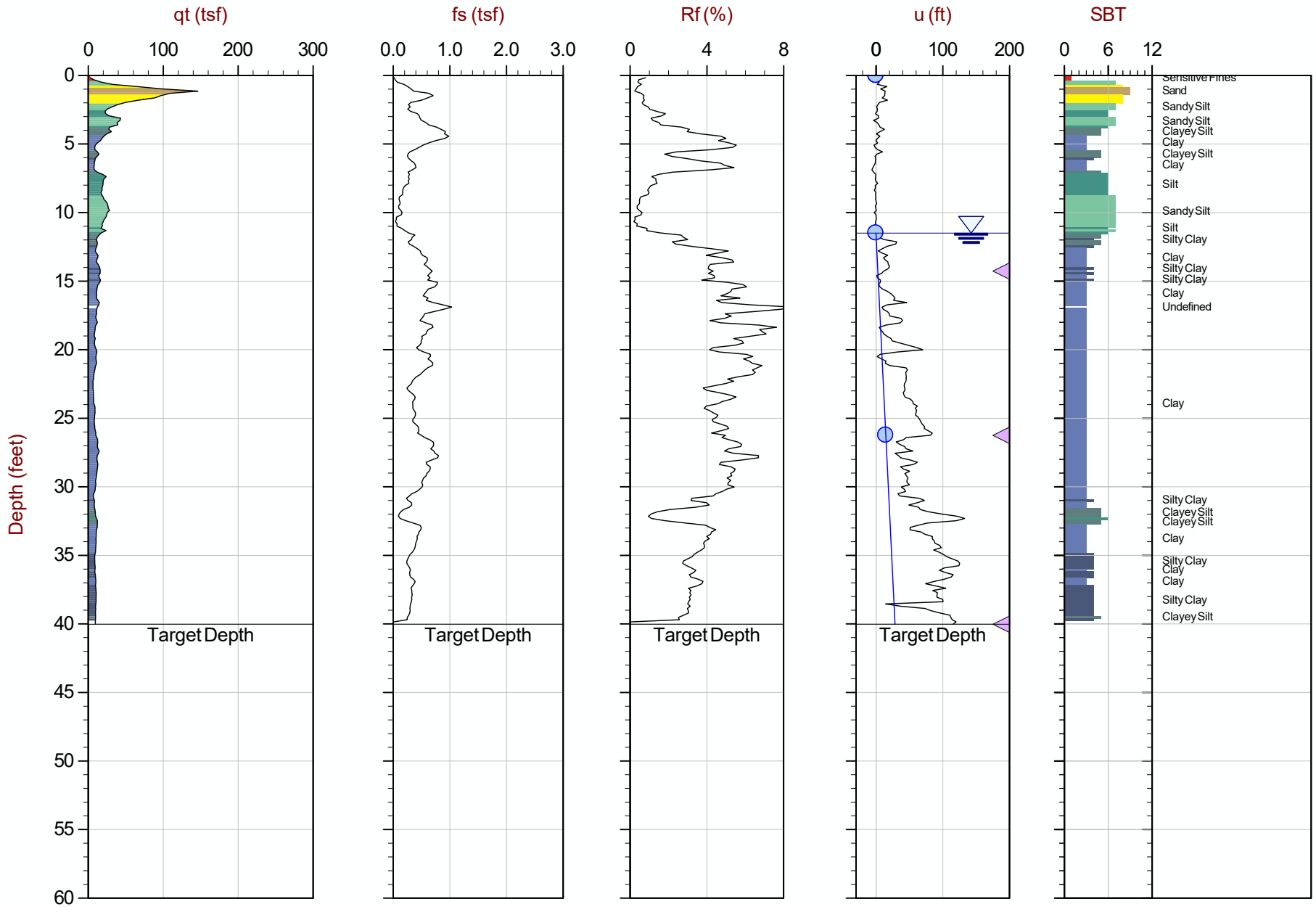
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 15:52
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP06.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496880m E: 274500m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

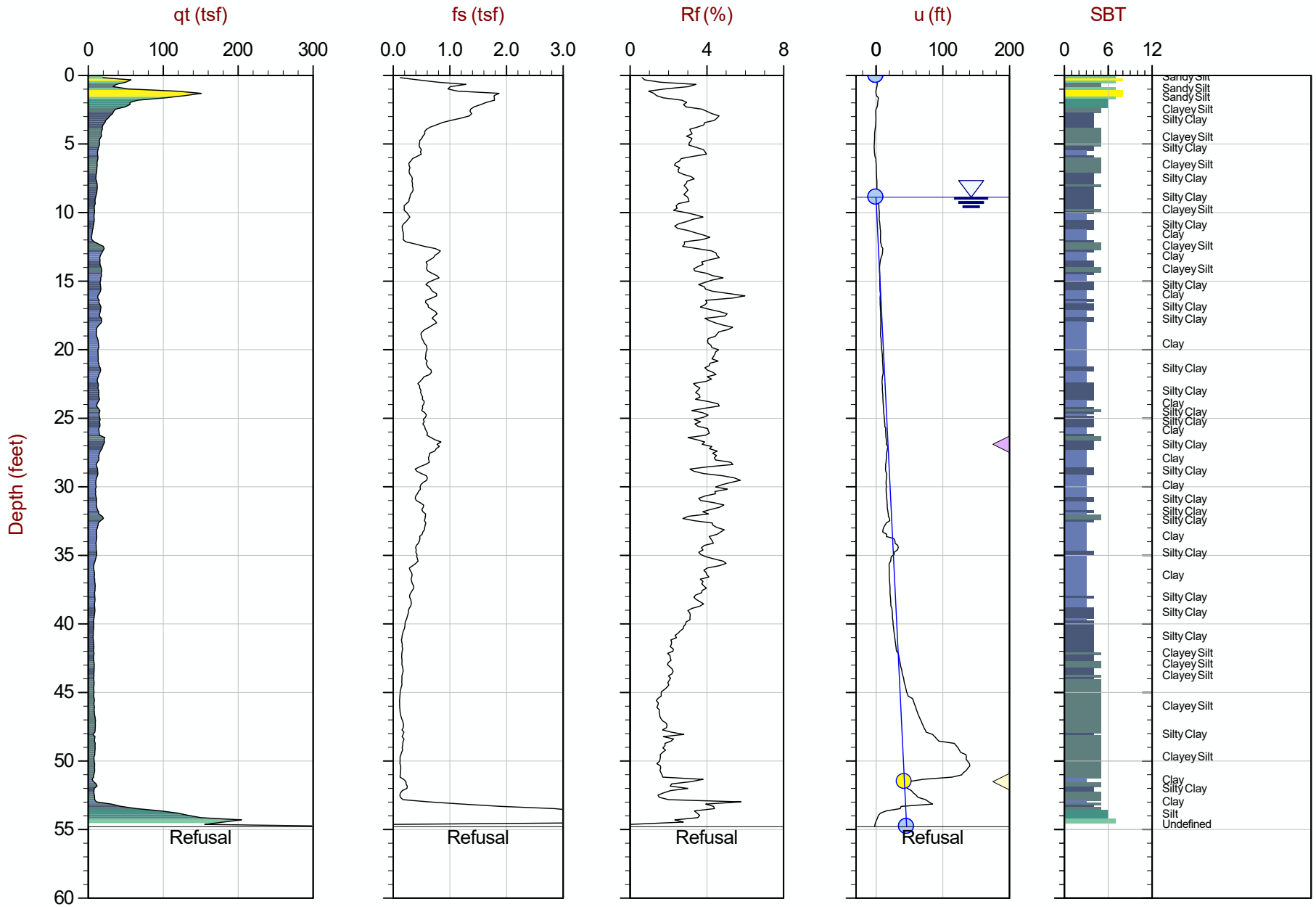
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:29:15 09:19
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: 340:T1500F15U500



Max Depth: 16.700 m / 54.79 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP07.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496736m E: 274551m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

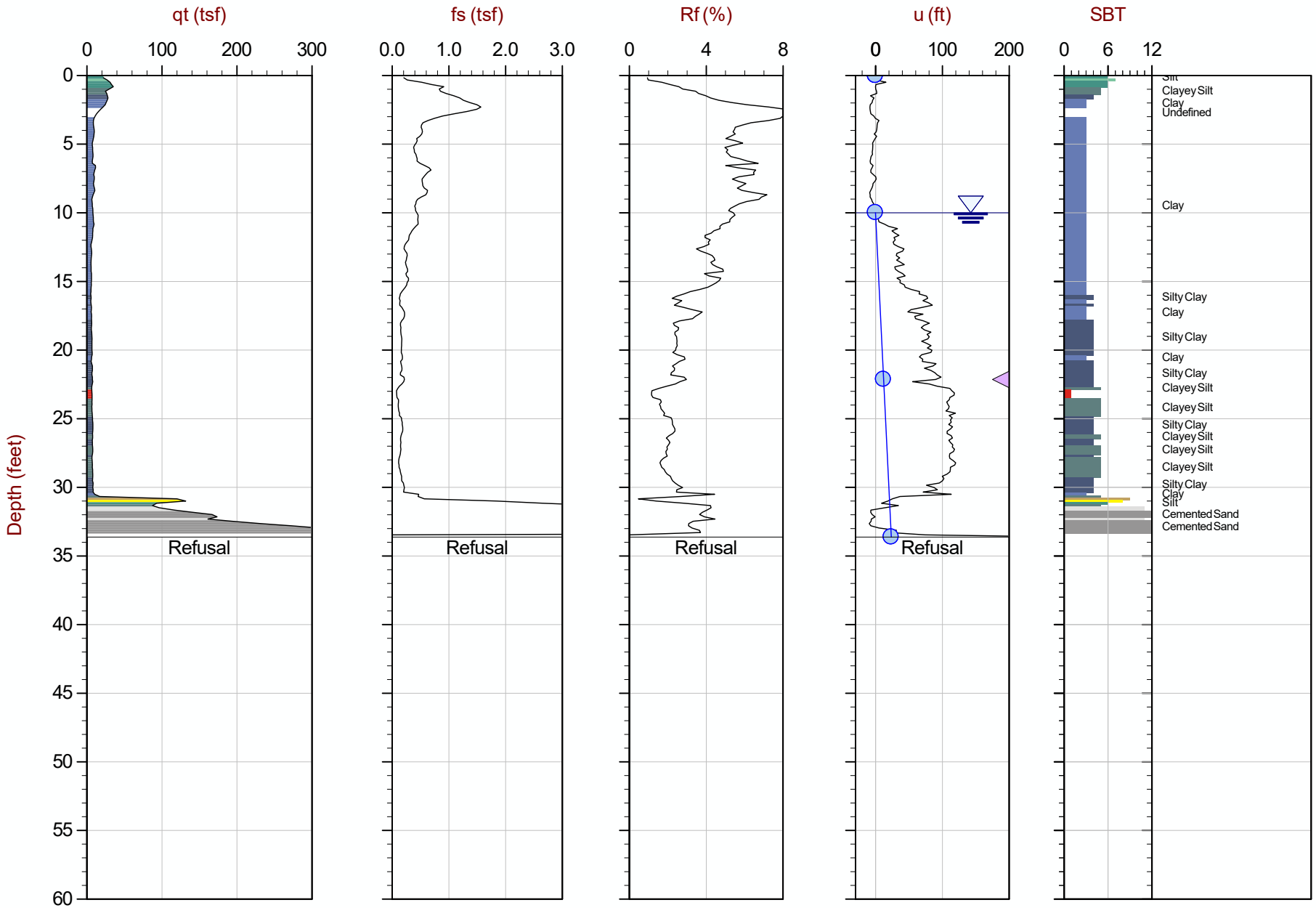
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:50
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374:T1500F15U500



Max Depth: 10.250 m / 33.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP08.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496731m E: 274576m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

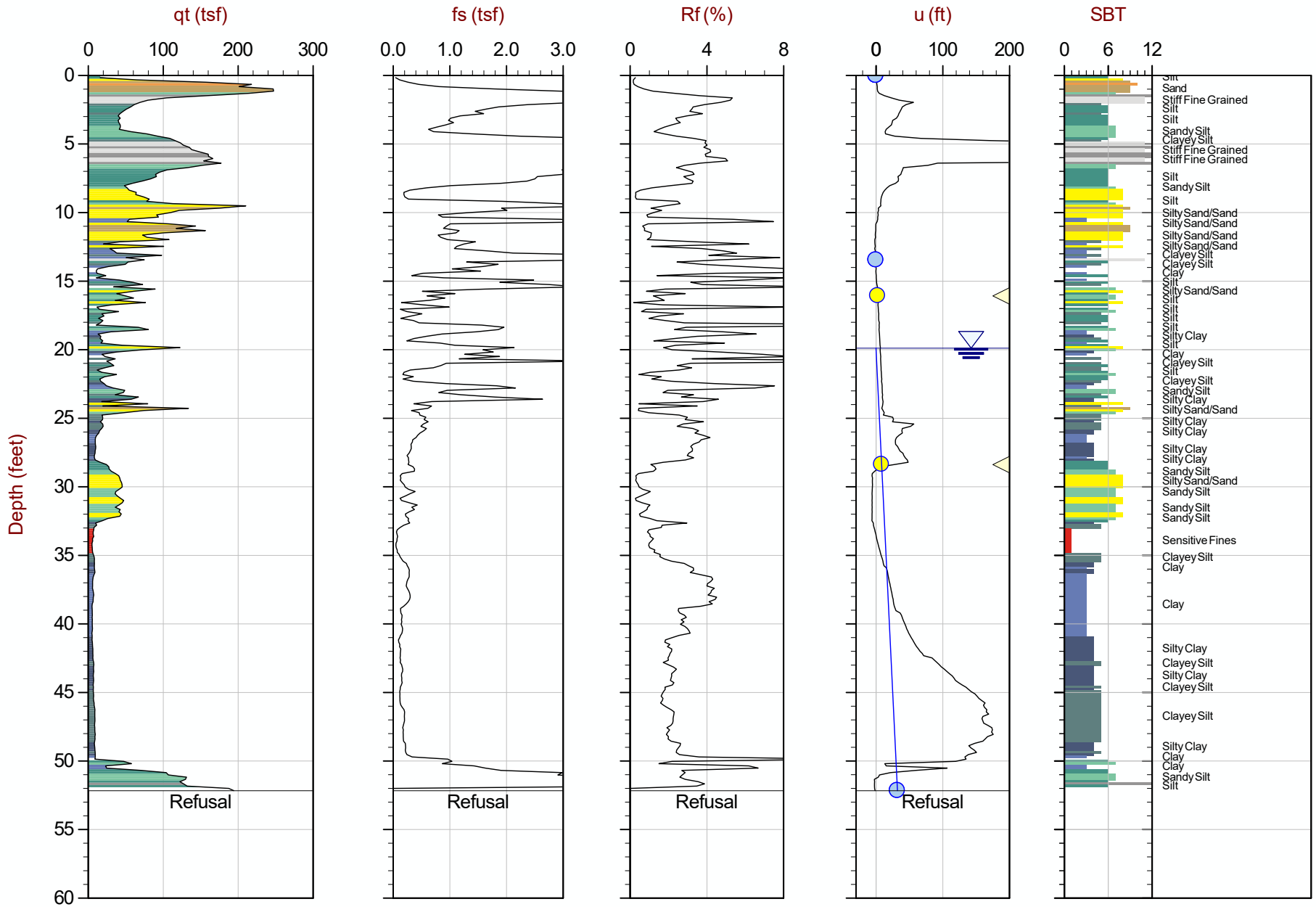
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 16:08
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: 340:T1500F15U500



Max Depth: 15.900 m / 52.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP09.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496476m E: 274538m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

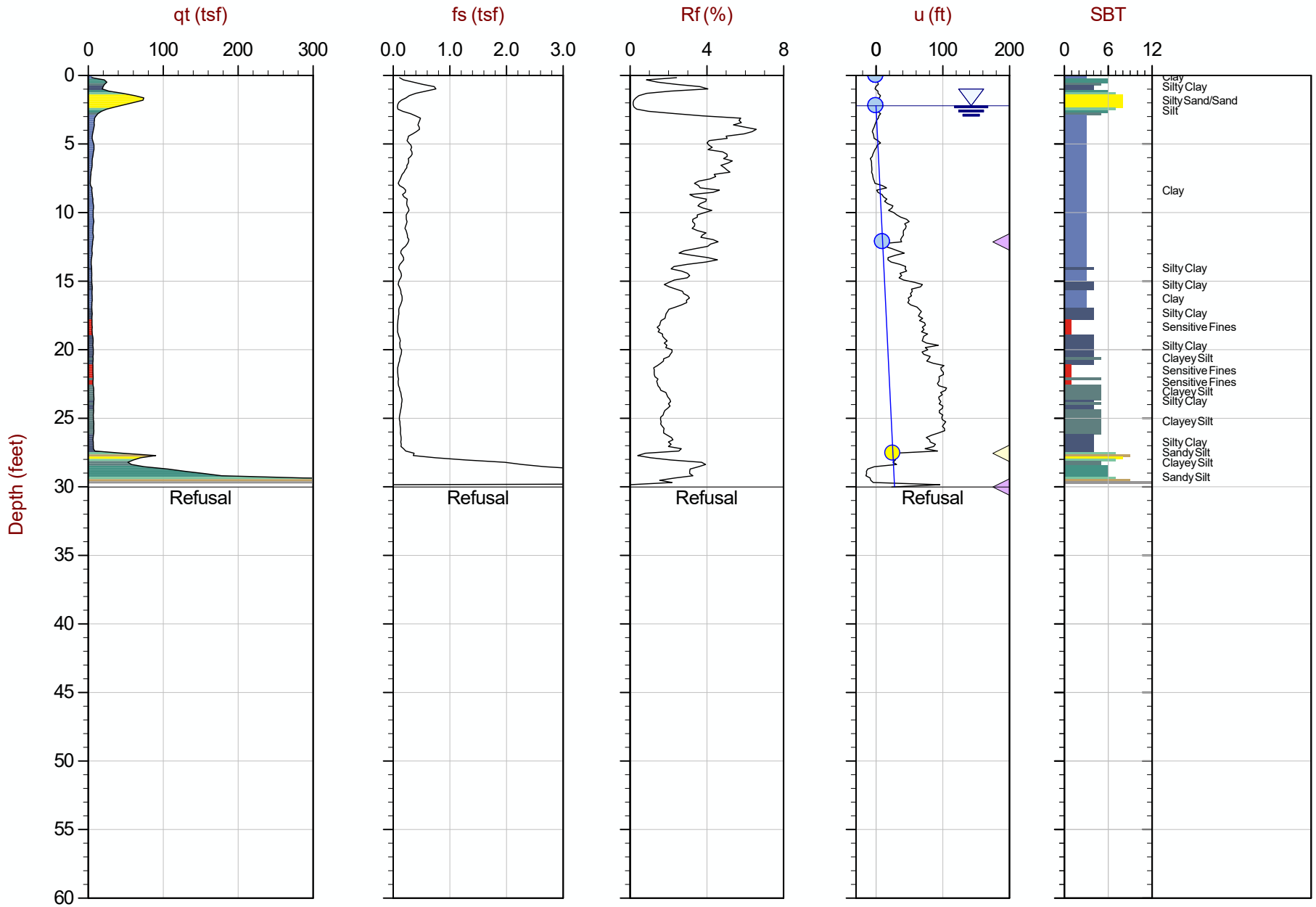
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 12:10
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374:T1500F15U500



Max Depth: 9.150 m / 30.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP10.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496351m E: 274562m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

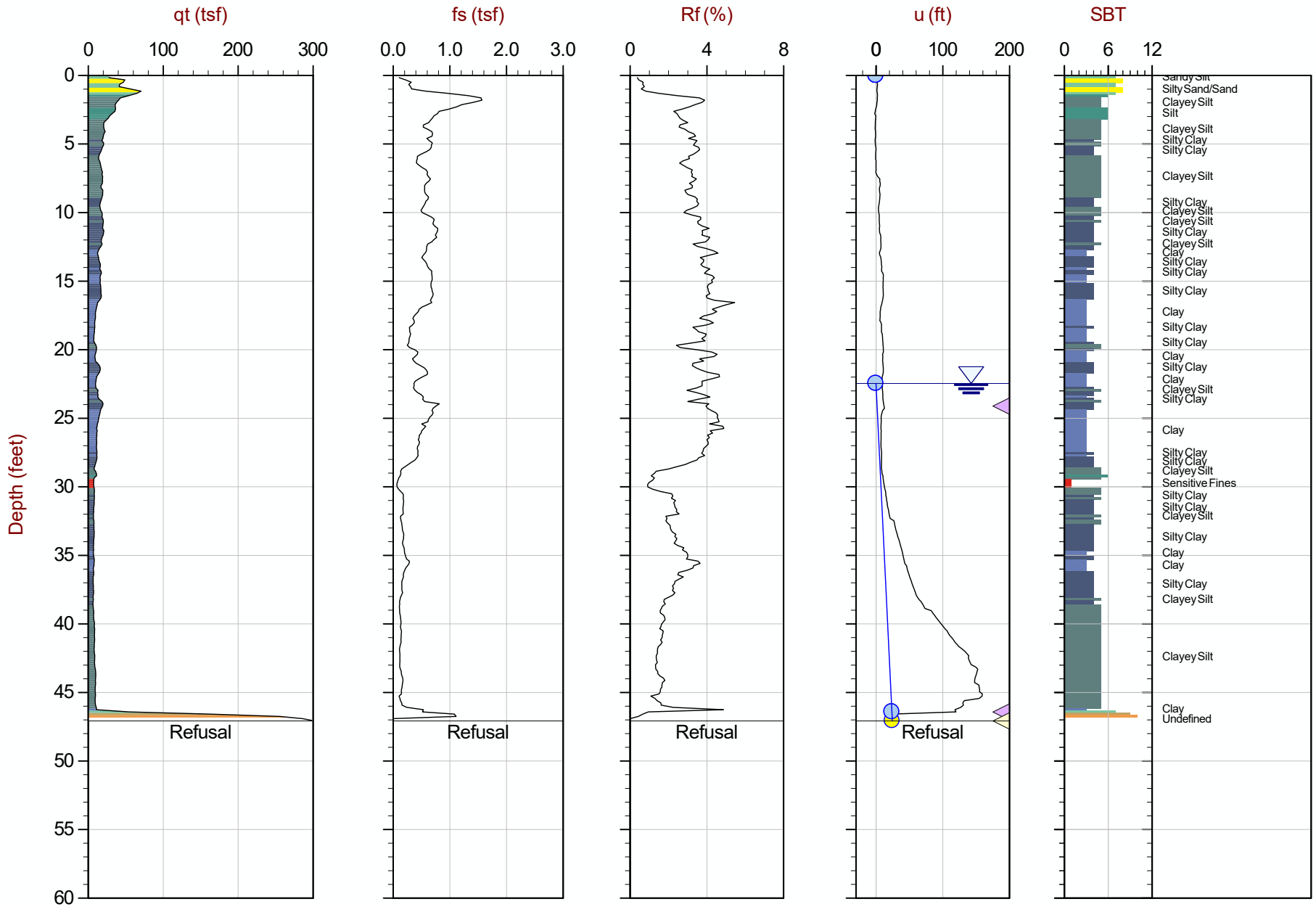
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 10:19
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: 340:T1500F15U500



Max Depth: 14.350 m / 47.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP11.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496372m E: 274553m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

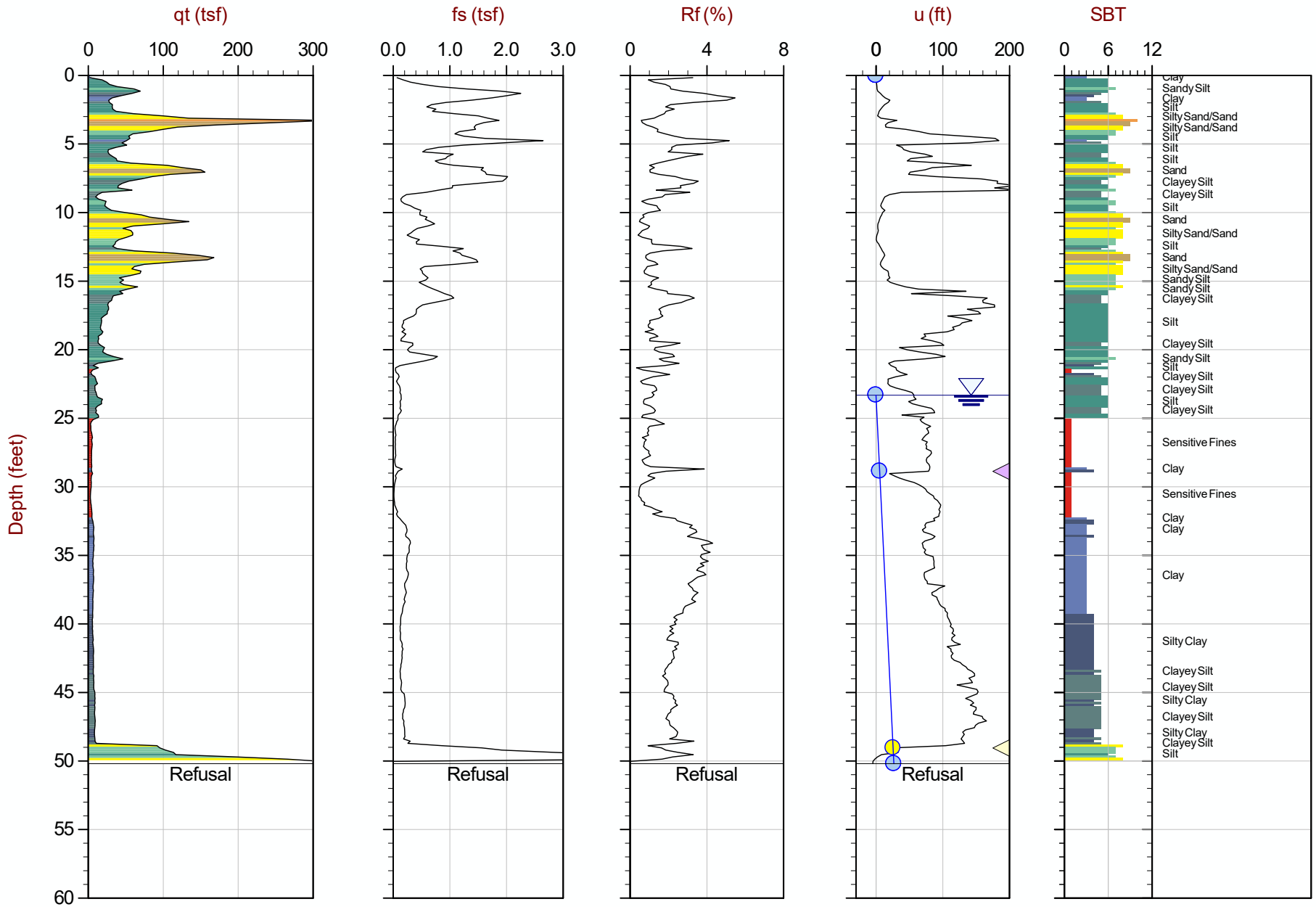
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

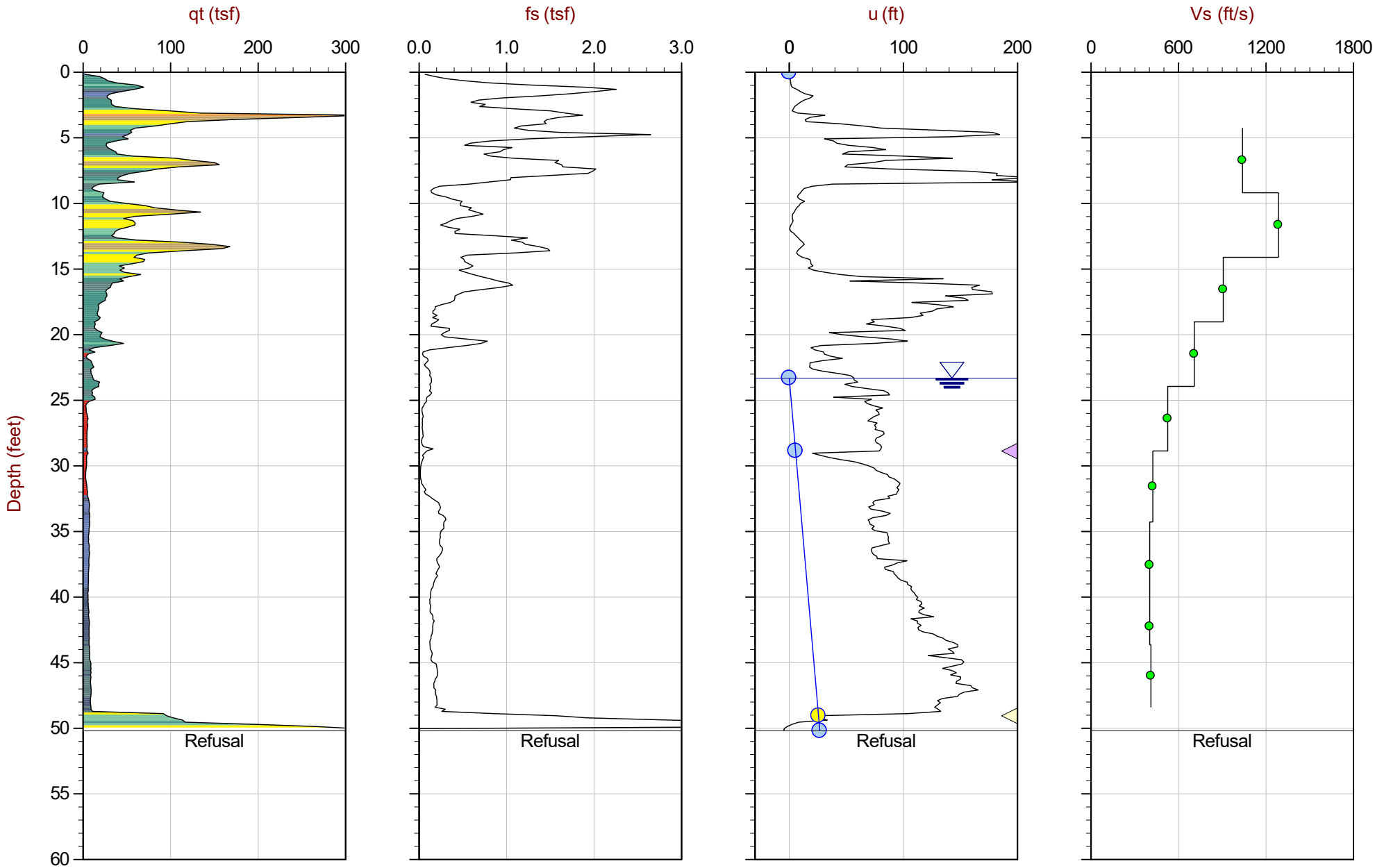
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

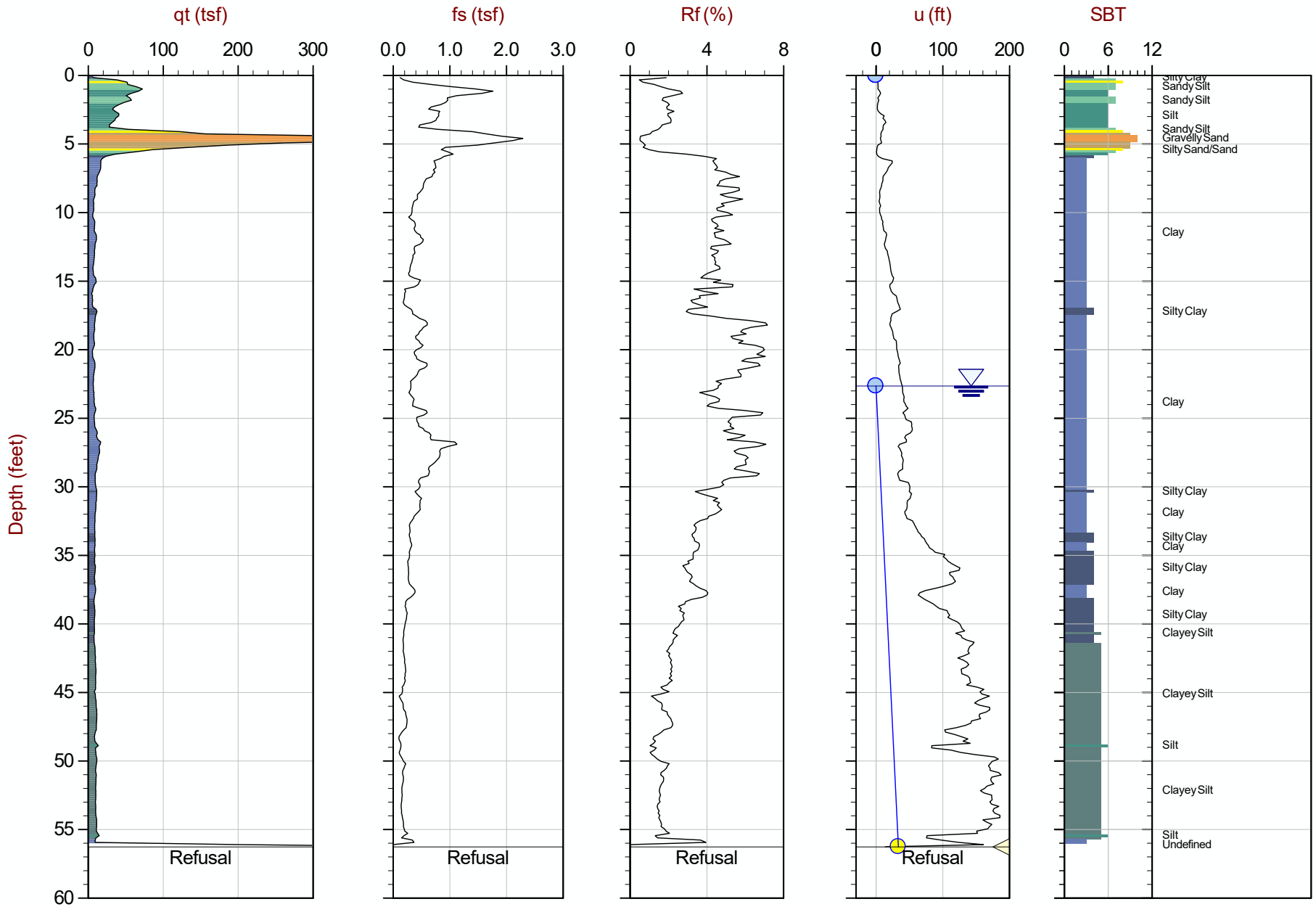
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

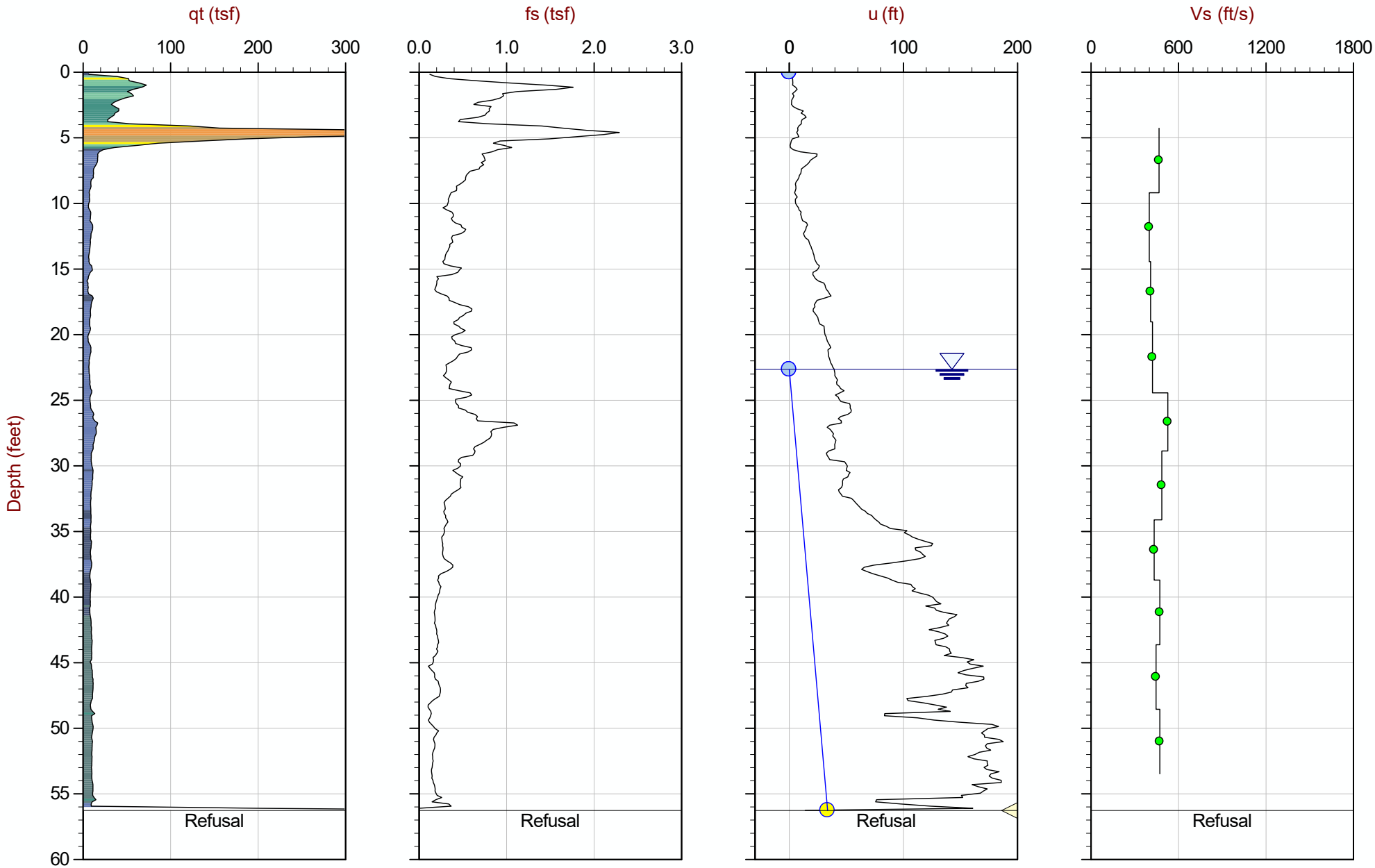
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

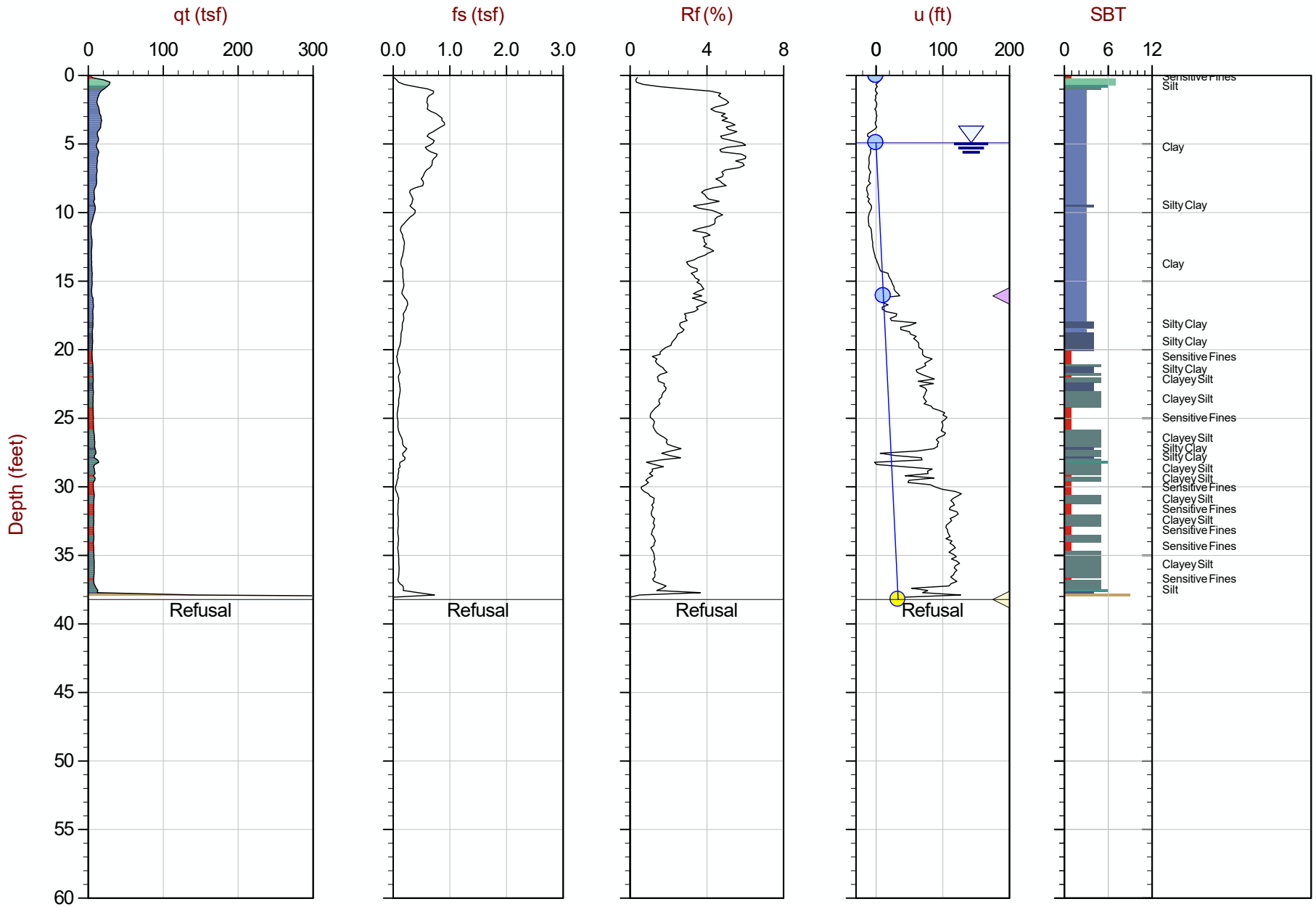
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 14:29
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374:T1500F15U500



Max Depth: 11.650 m / 38.22 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP14.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496366m E: 274362m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

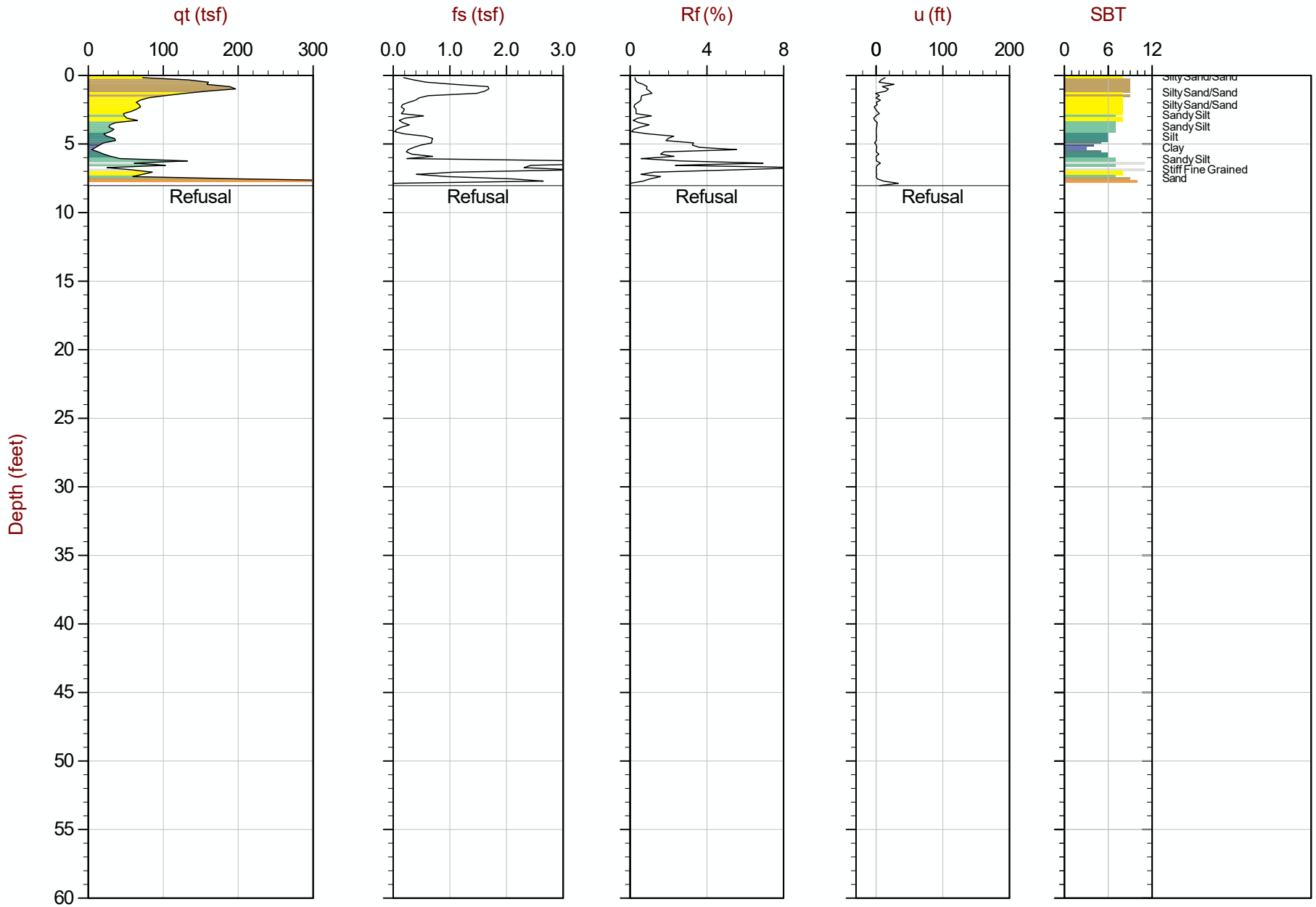
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

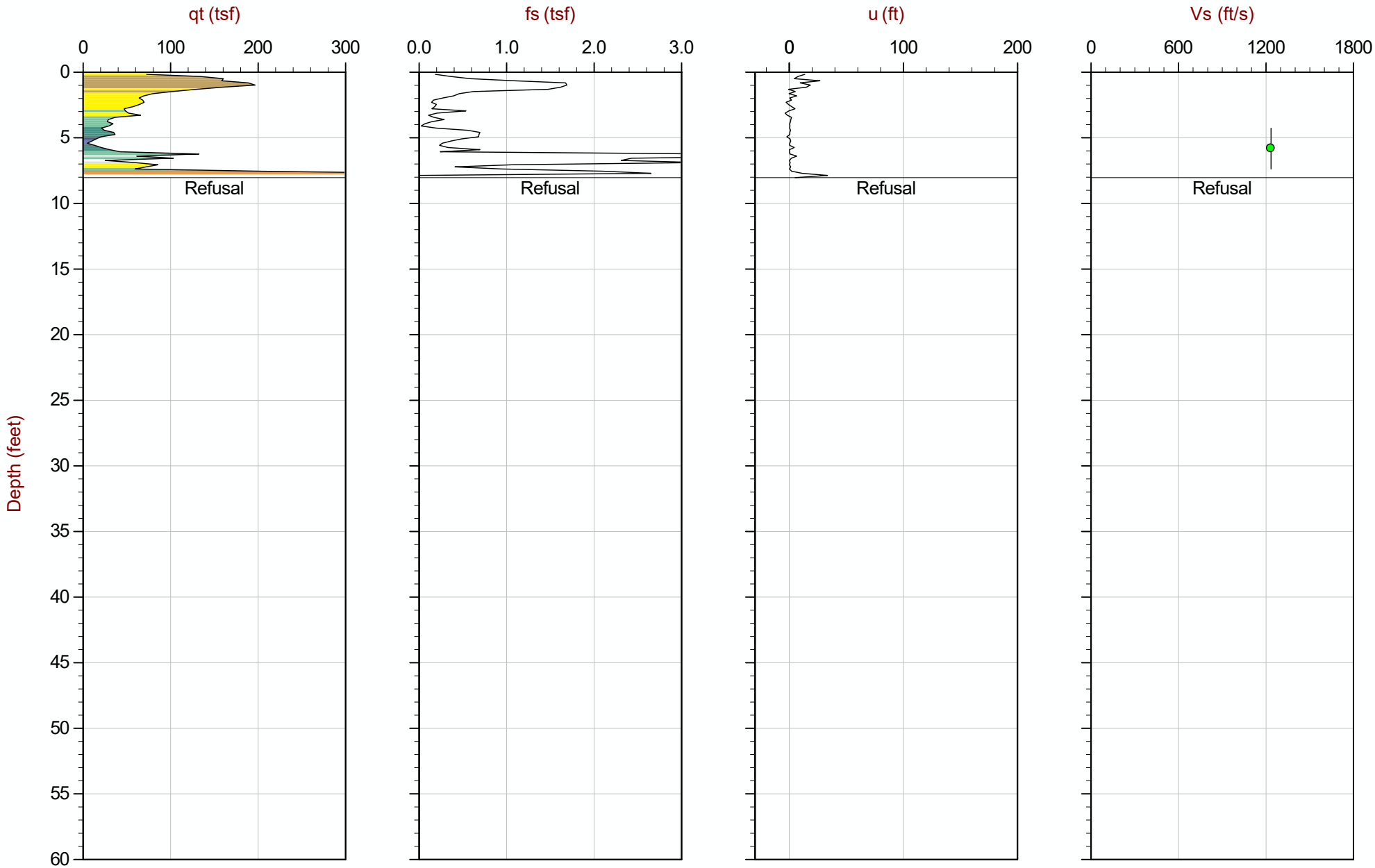
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

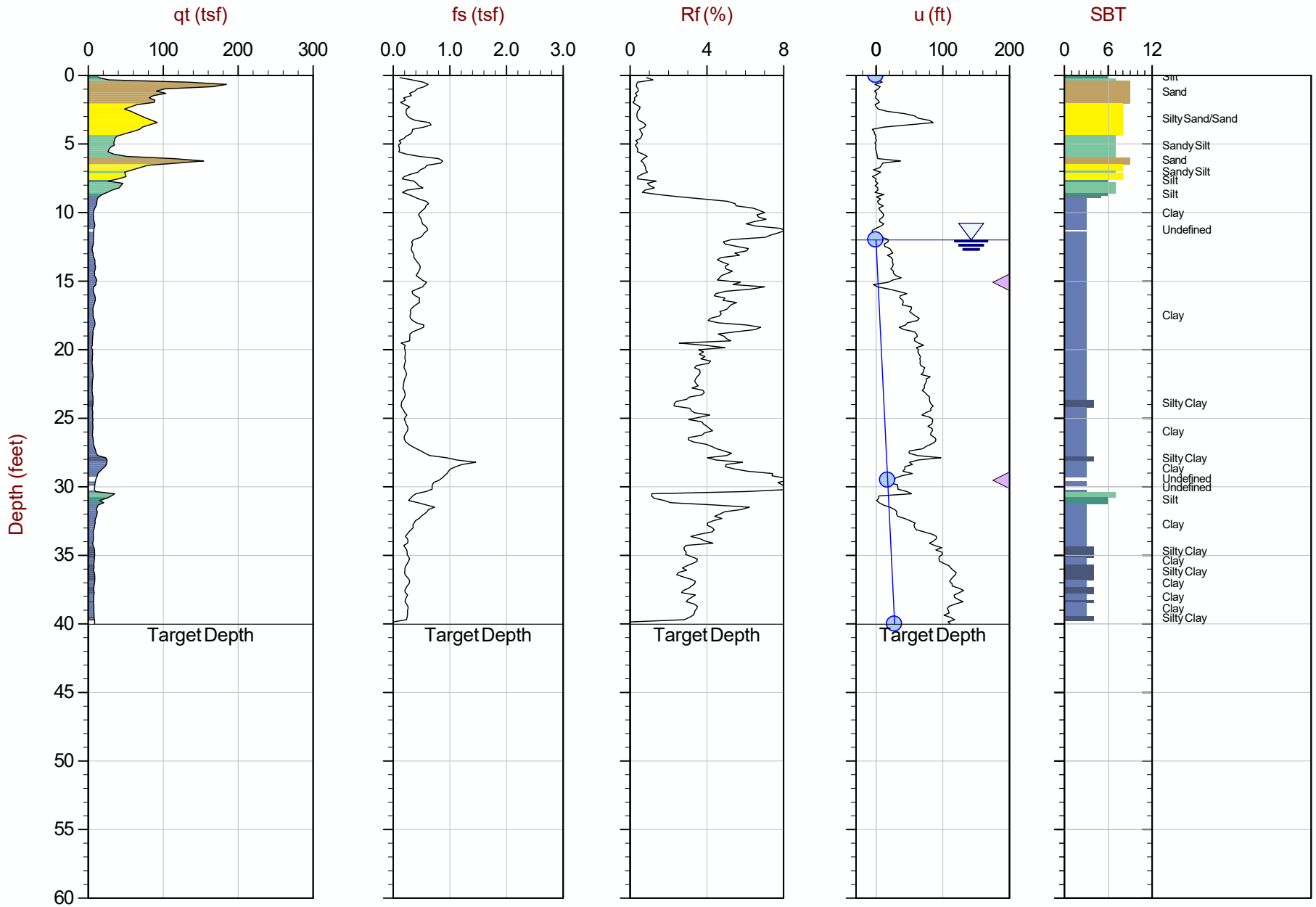
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 14:12
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

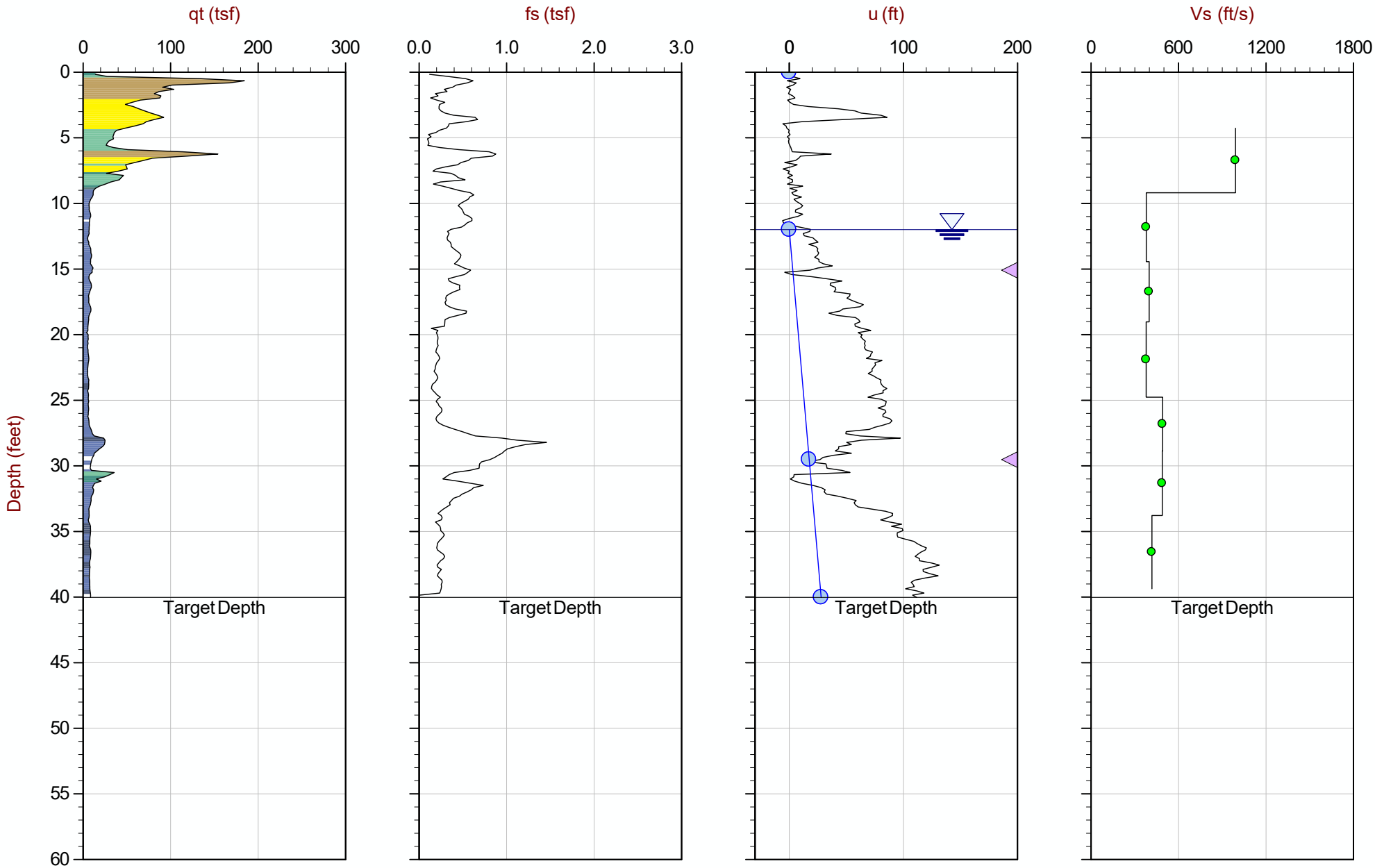
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 14:12
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

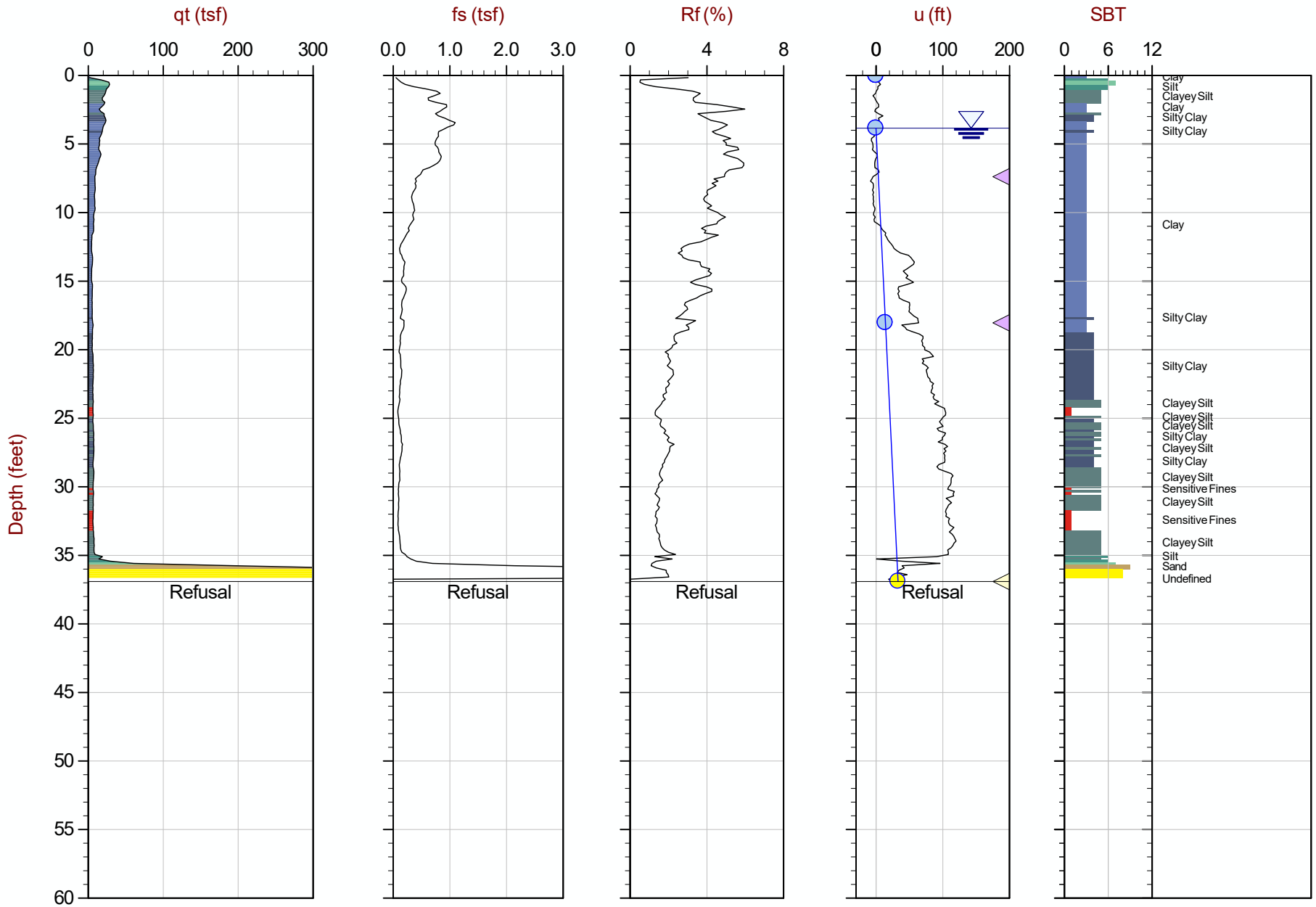
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374:T1500F15U500



Max Depth: 11.250 m / 36.91 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP16.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496442m E: 274308m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

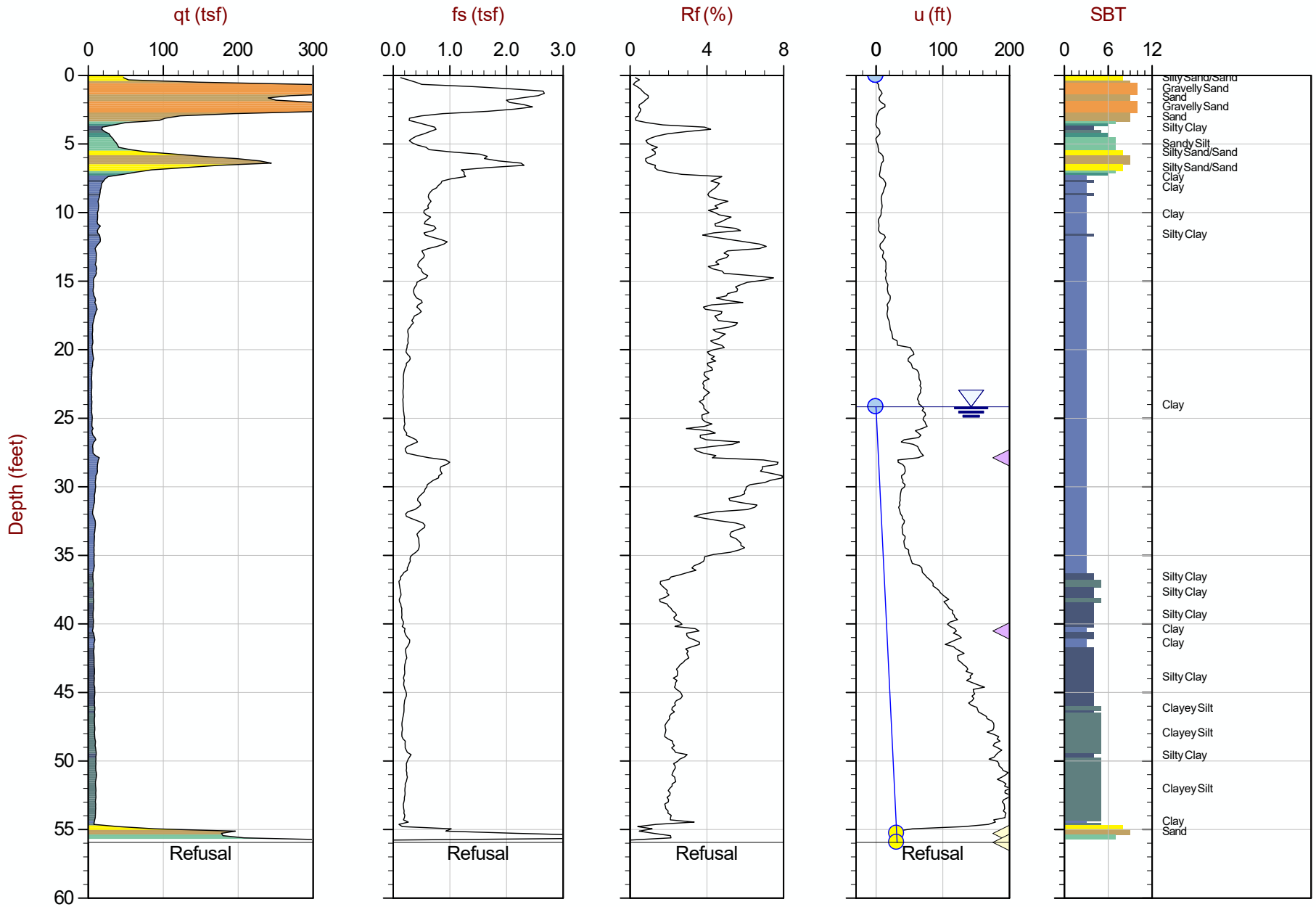
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

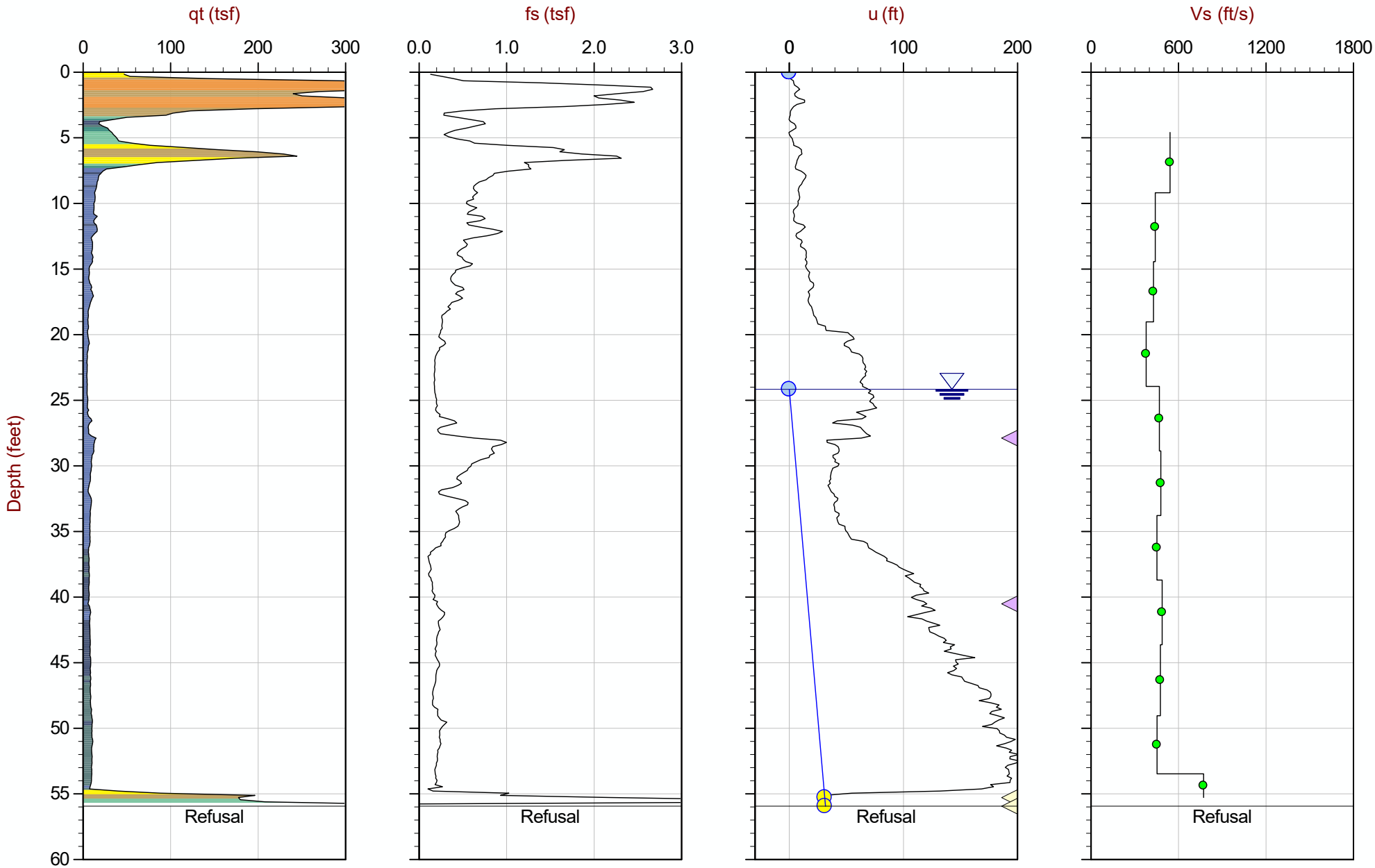
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

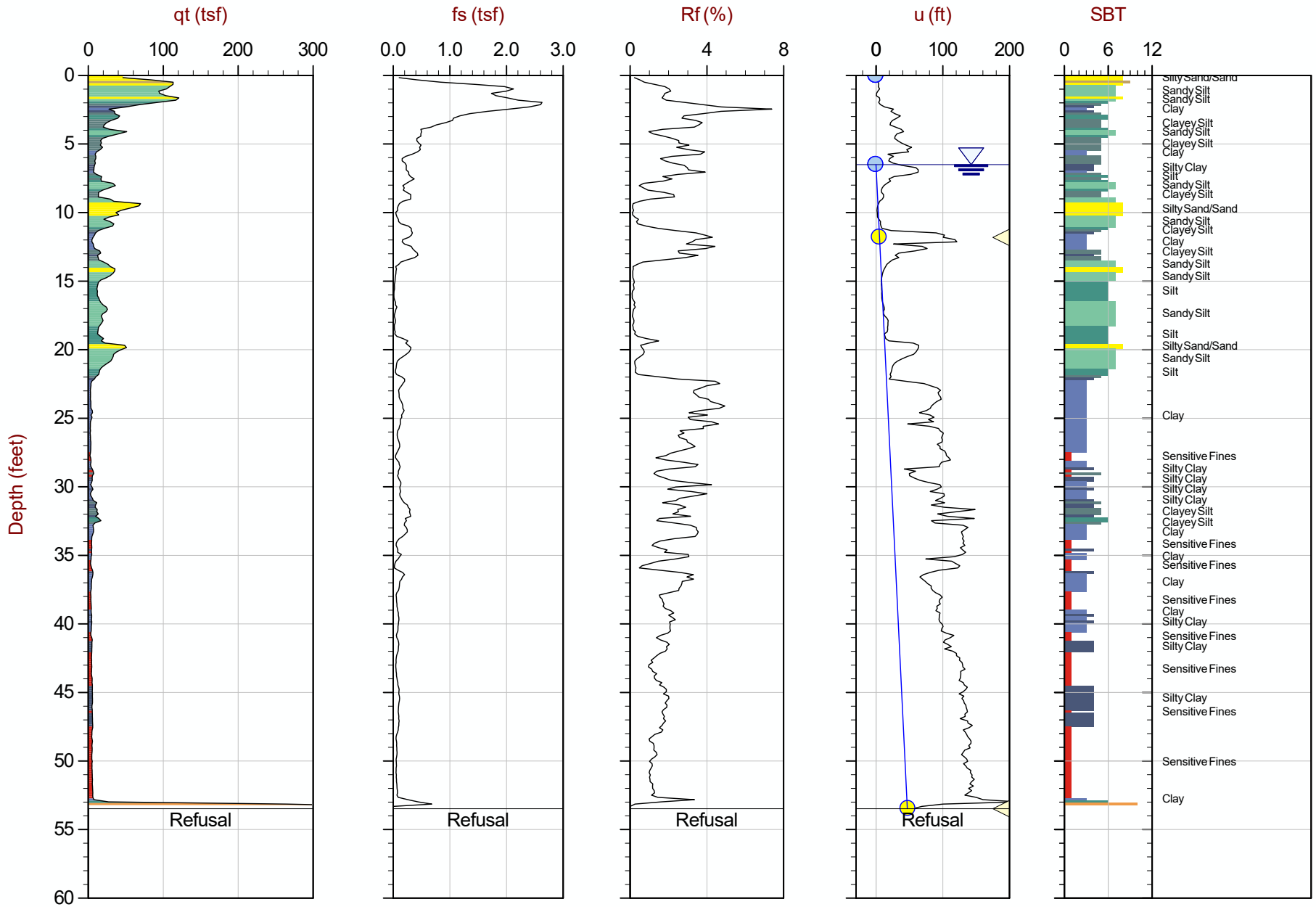
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:23
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: 340:T1500F15U500



Max Depth: 16.300 m / 53.48 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP19.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496825m E: 274184m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

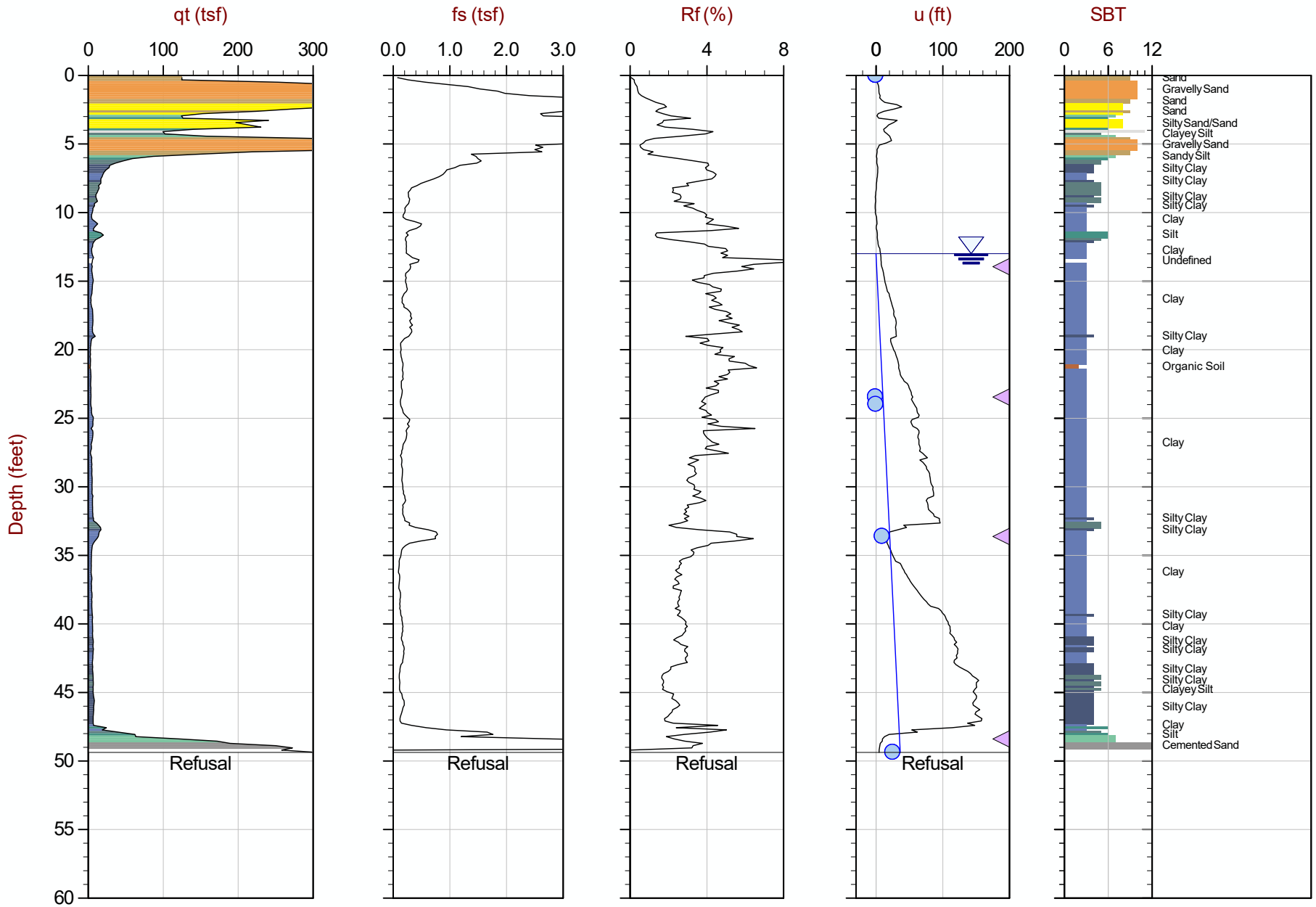
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 13:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: 340:T1500F15U500



Max Depth: 15.050 m / 49.38 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP21.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497046m E: 274071m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

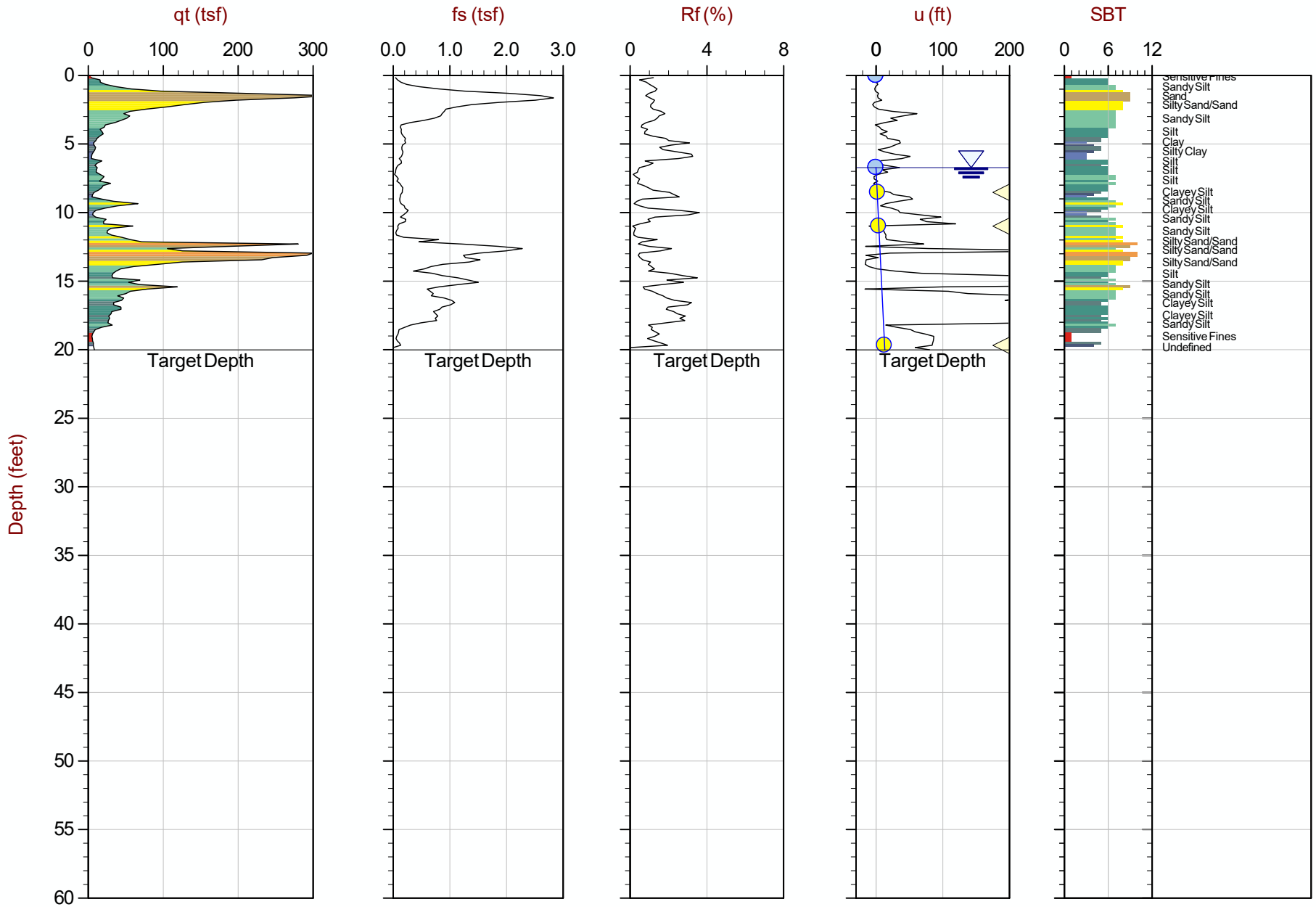
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

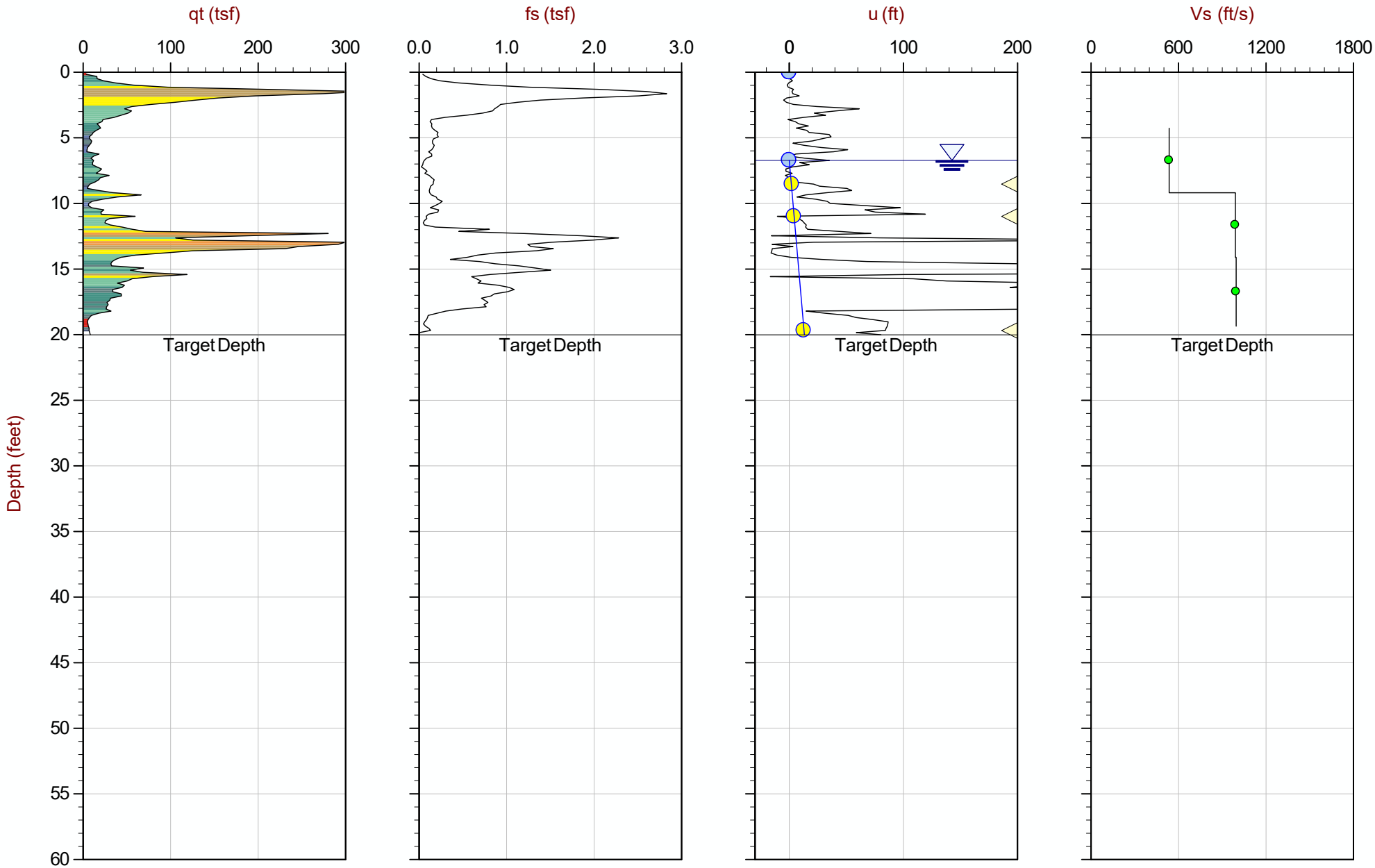
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

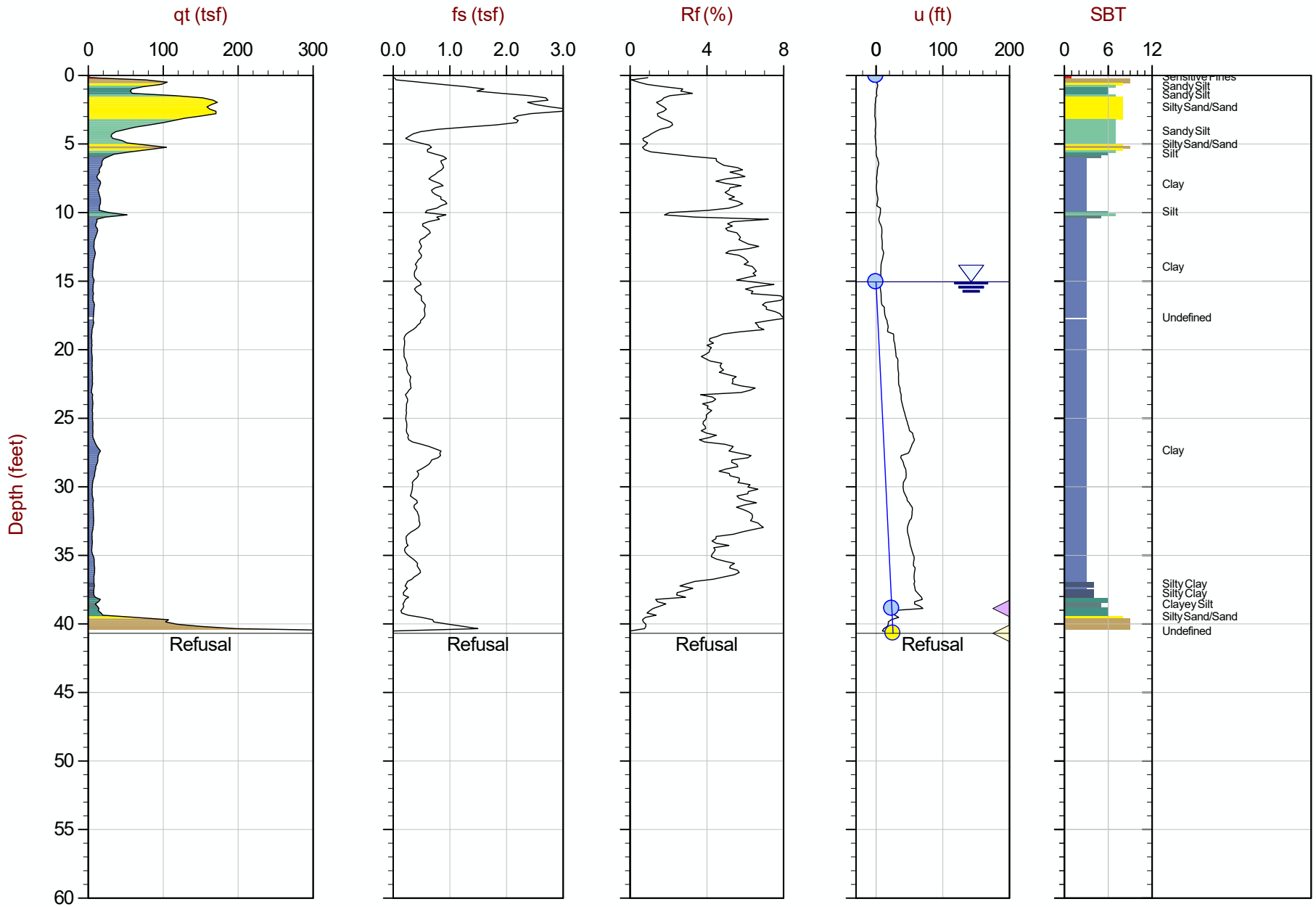
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:52
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: 340:T1500F15U500



Max Depth: 12.400 m / 40.68 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP23.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497364m E: 274147m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

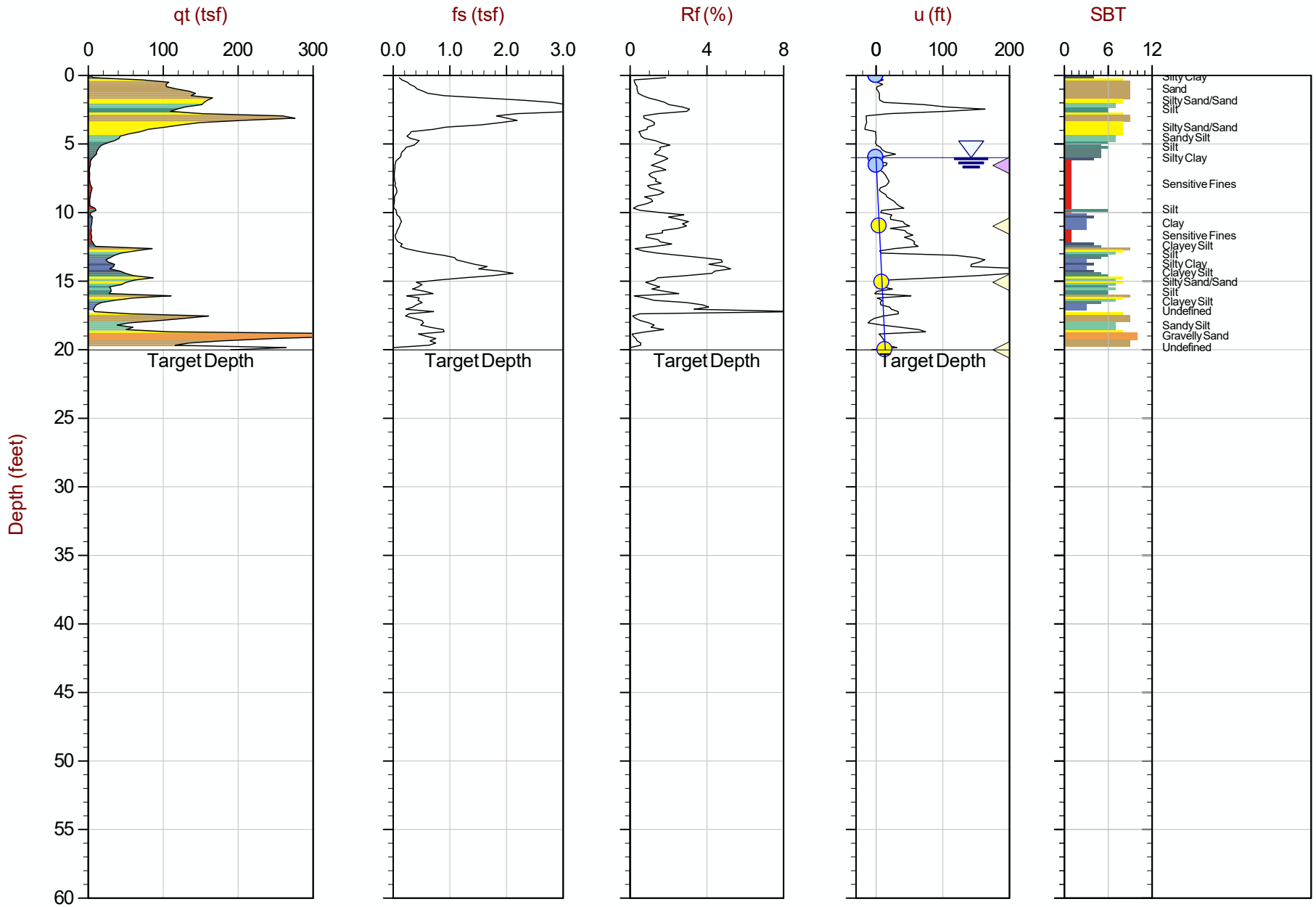
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 13:44
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP25.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497285m E: 274315m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

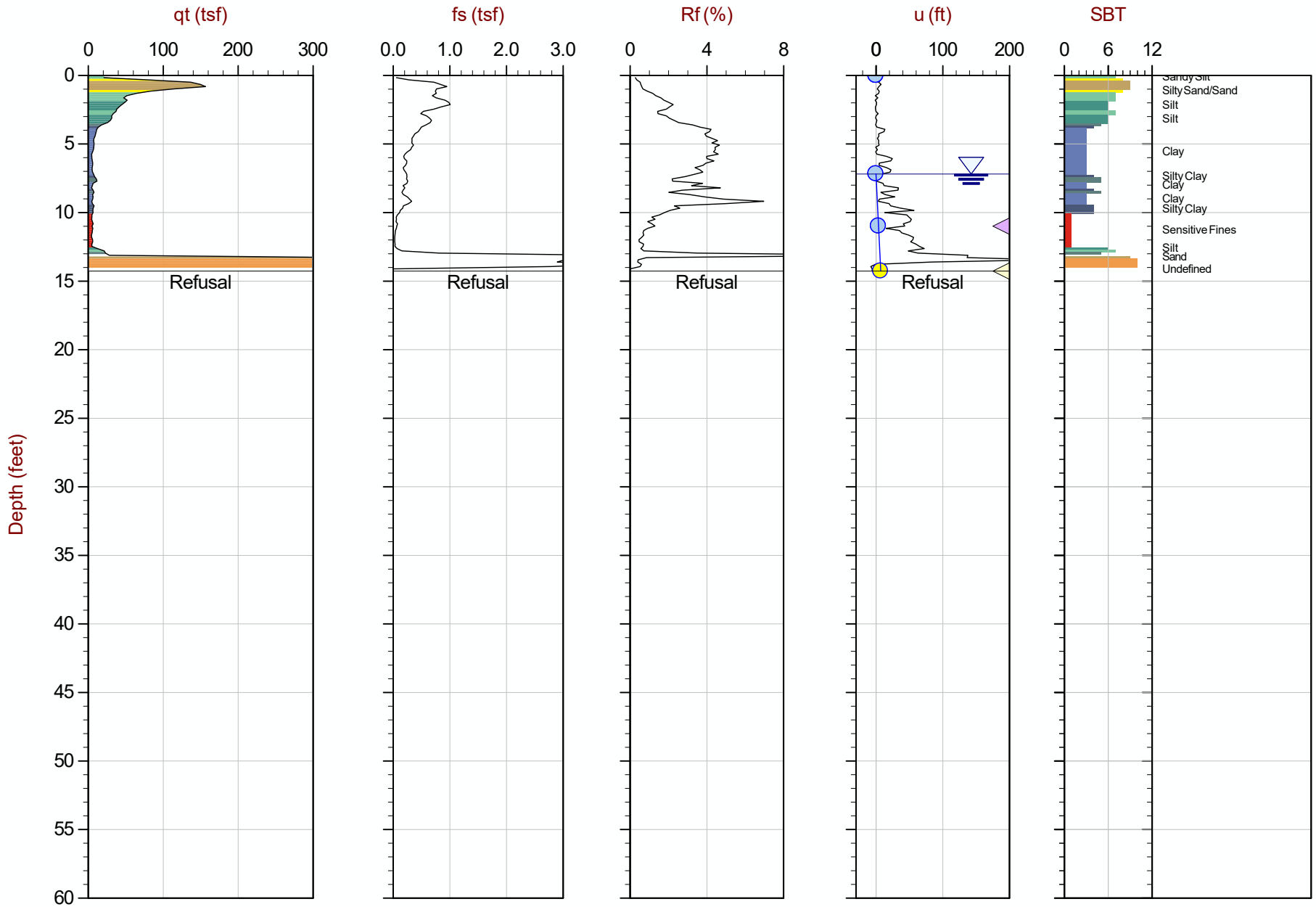
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

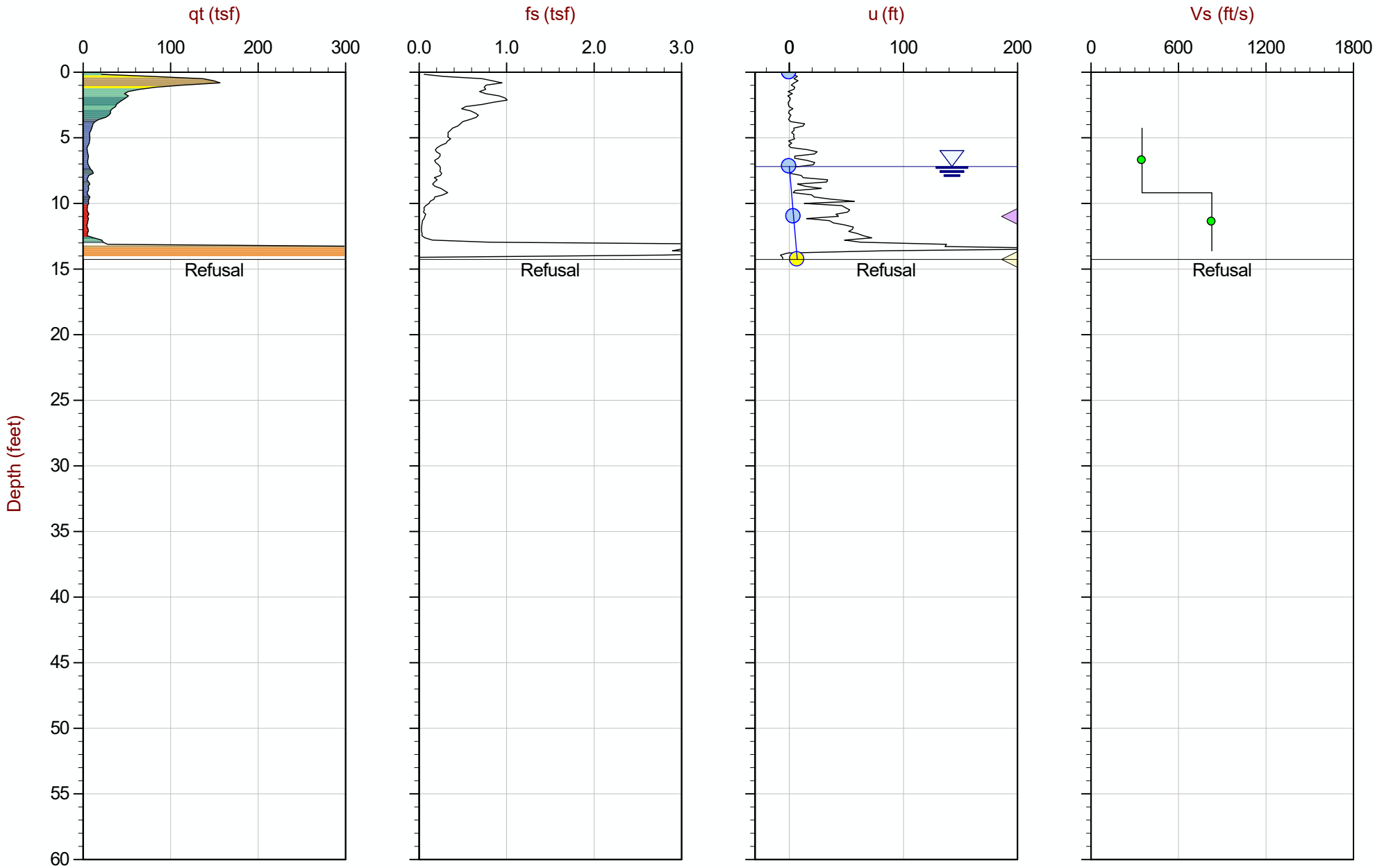
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

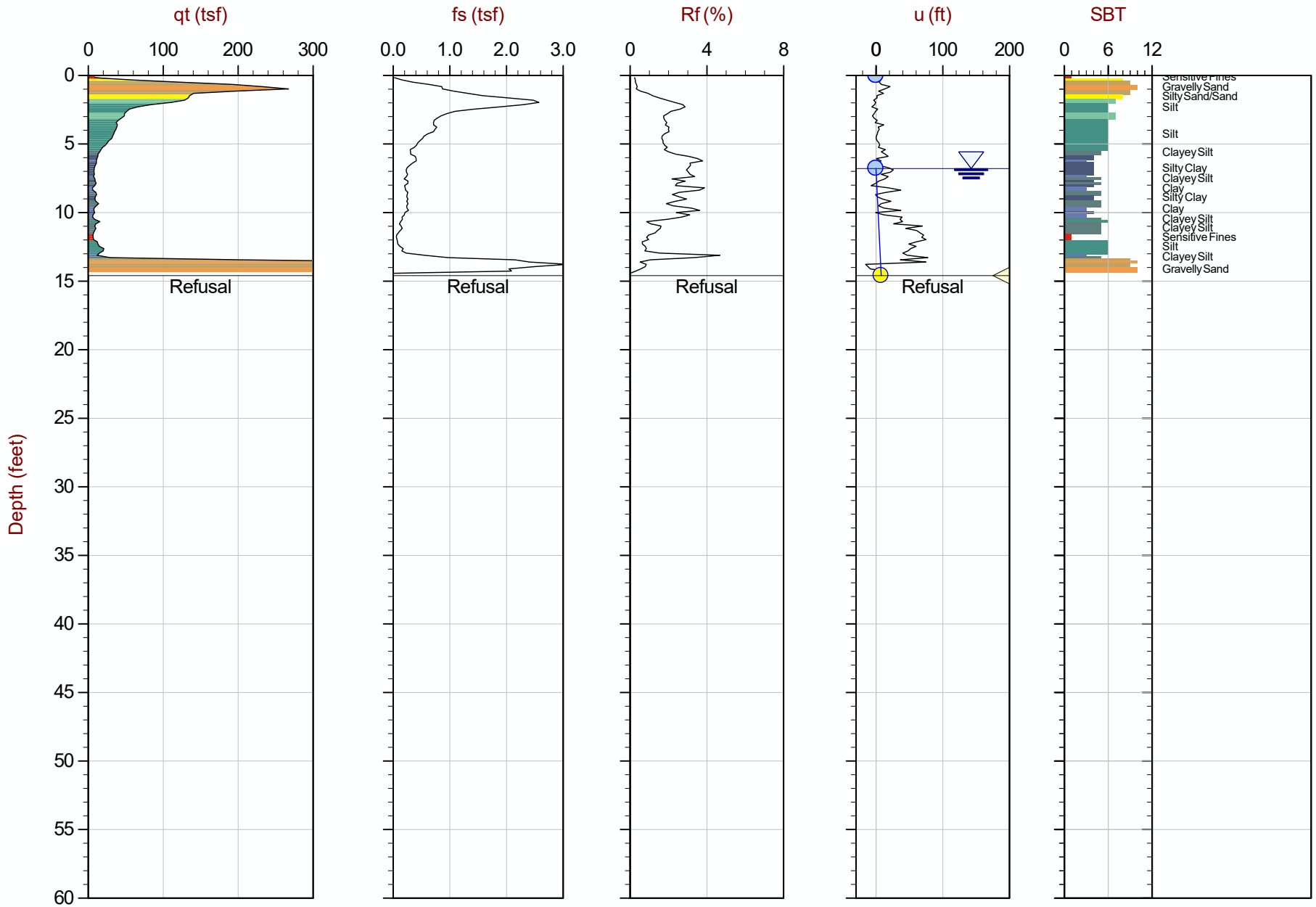
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

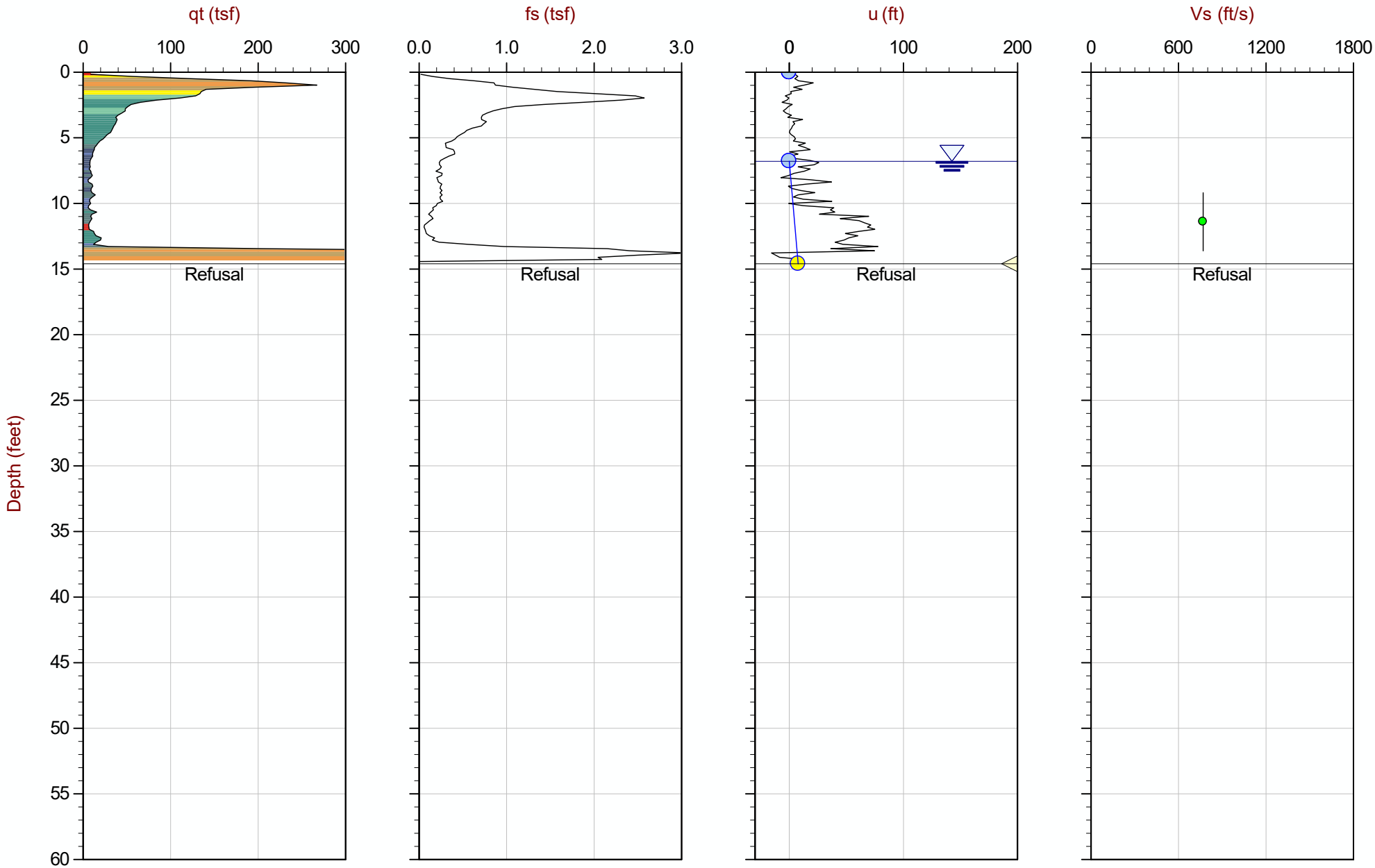
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

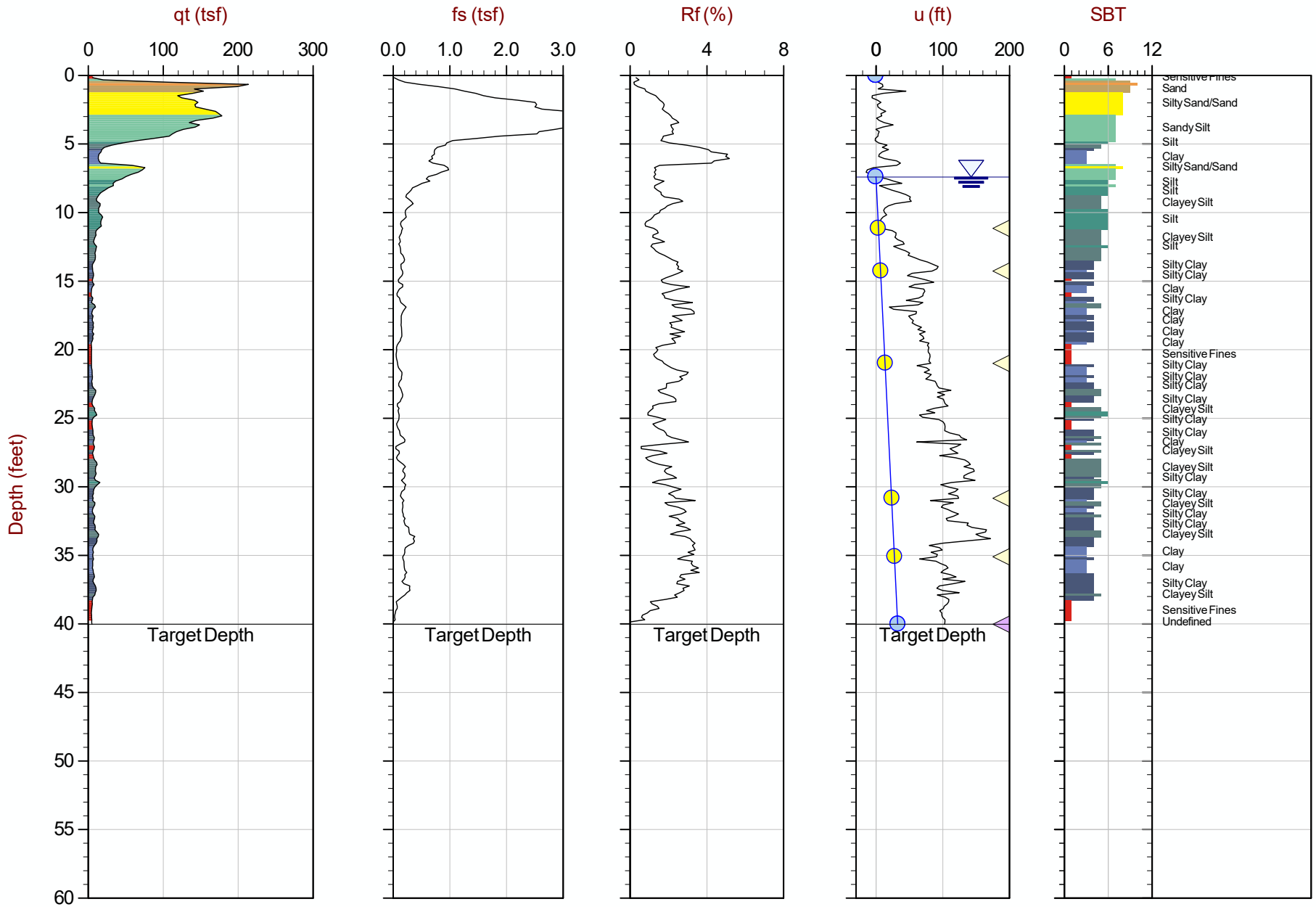
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 11:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP27.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496687m E: 274266m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

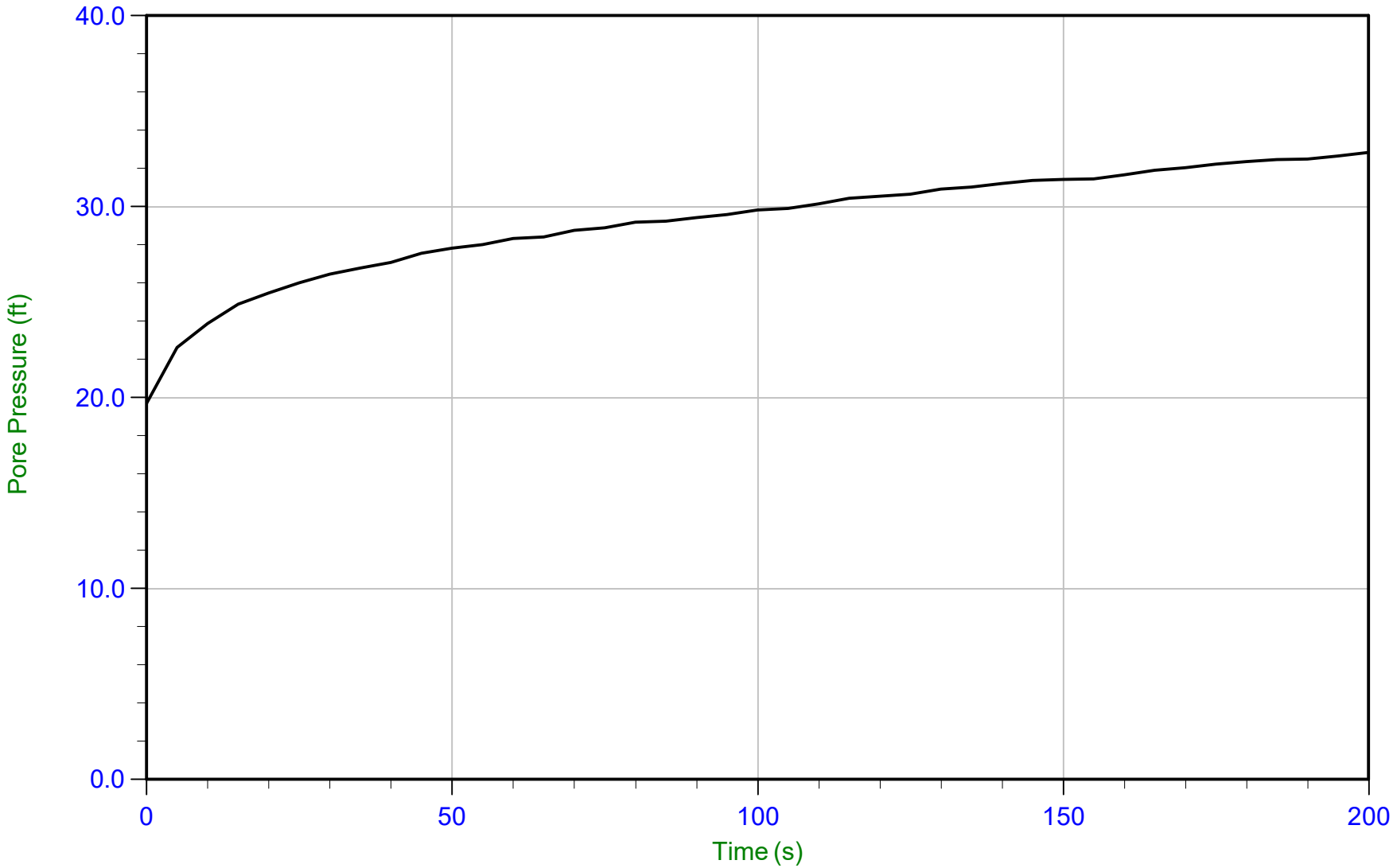
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 13:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP01.PPD
Depth: 4.000 m / 13.123 ft
Duration: 200.0 s

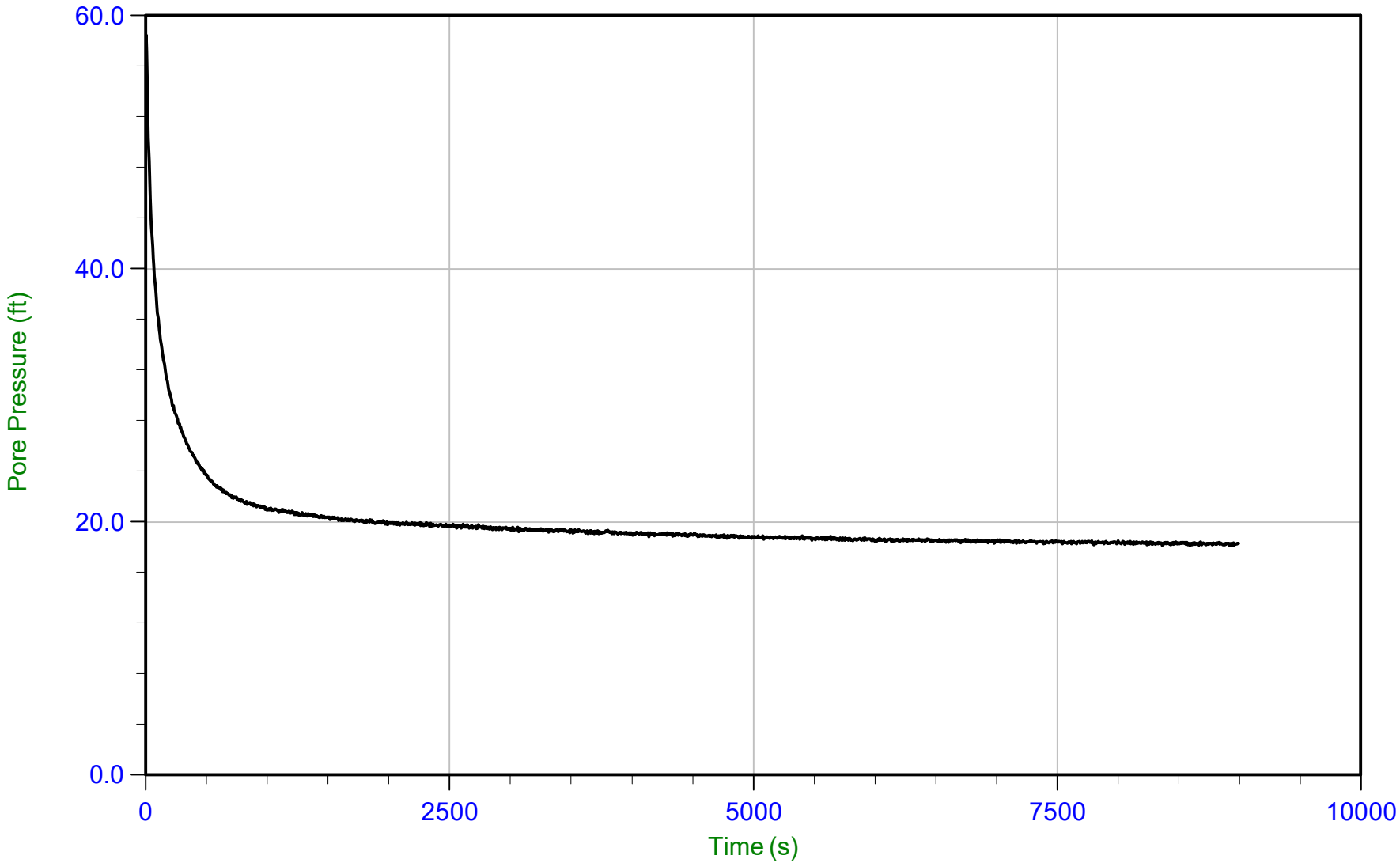
U Min: 19.7 ft
U Max: 32.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 13:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP01.PPD
Depth: 8.300 m / 27.231 ft
Duration: 9000.0 s

U Min: 18.1 ft
U Max: 58.5 ft

WT: 2.855 m / 9.367 ft
Ueq: 17.9 ft
U(50): 38.16 ft

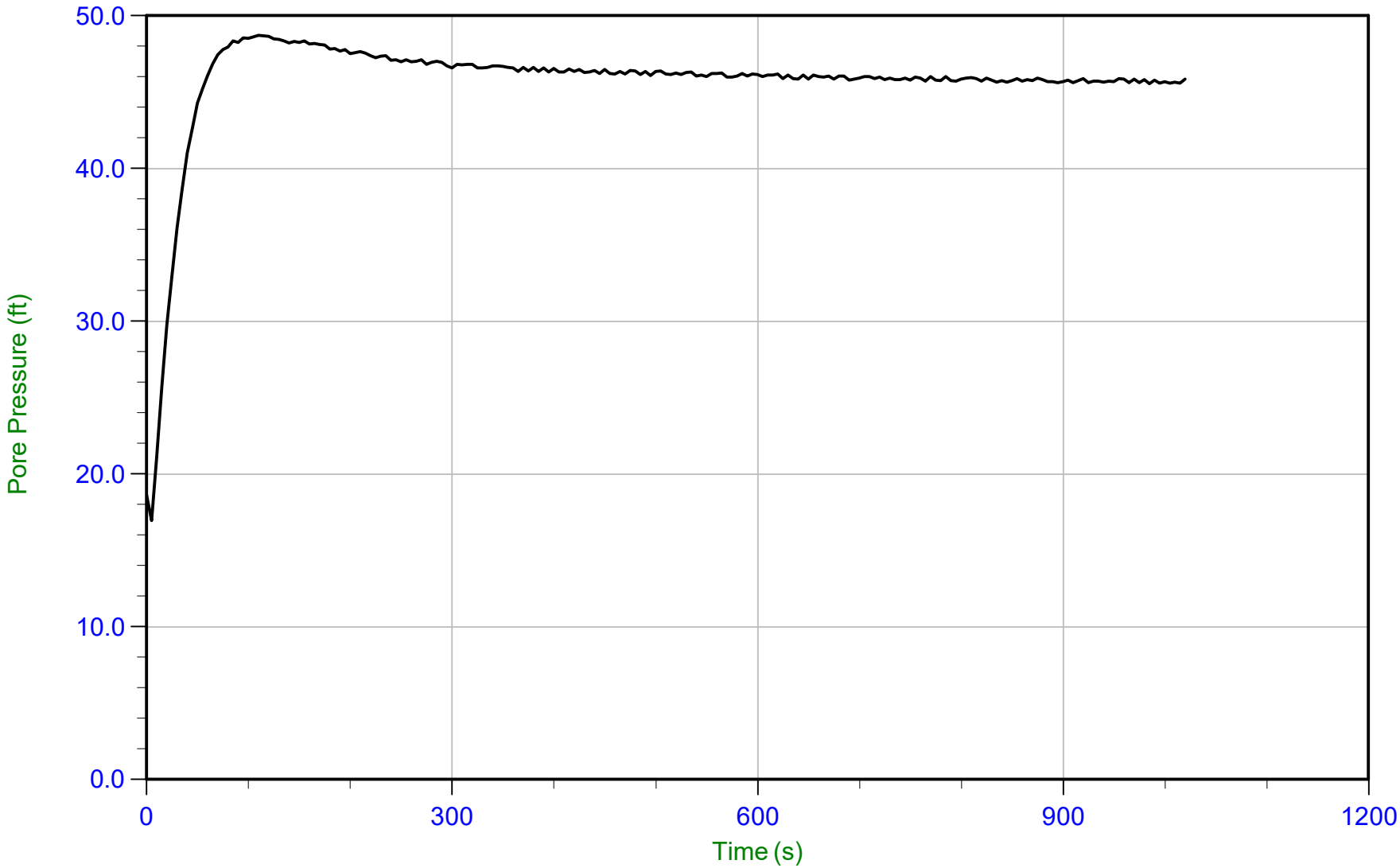
T(50): 80.8 s
Ir: 100
Ch: 8.7 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 14:27:54
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP03.PPD
Depth: 16.600 m / 54.461 ft
Duration: 1020.0 s

U Min: 16.9 ft
U Max: 48.7 ft

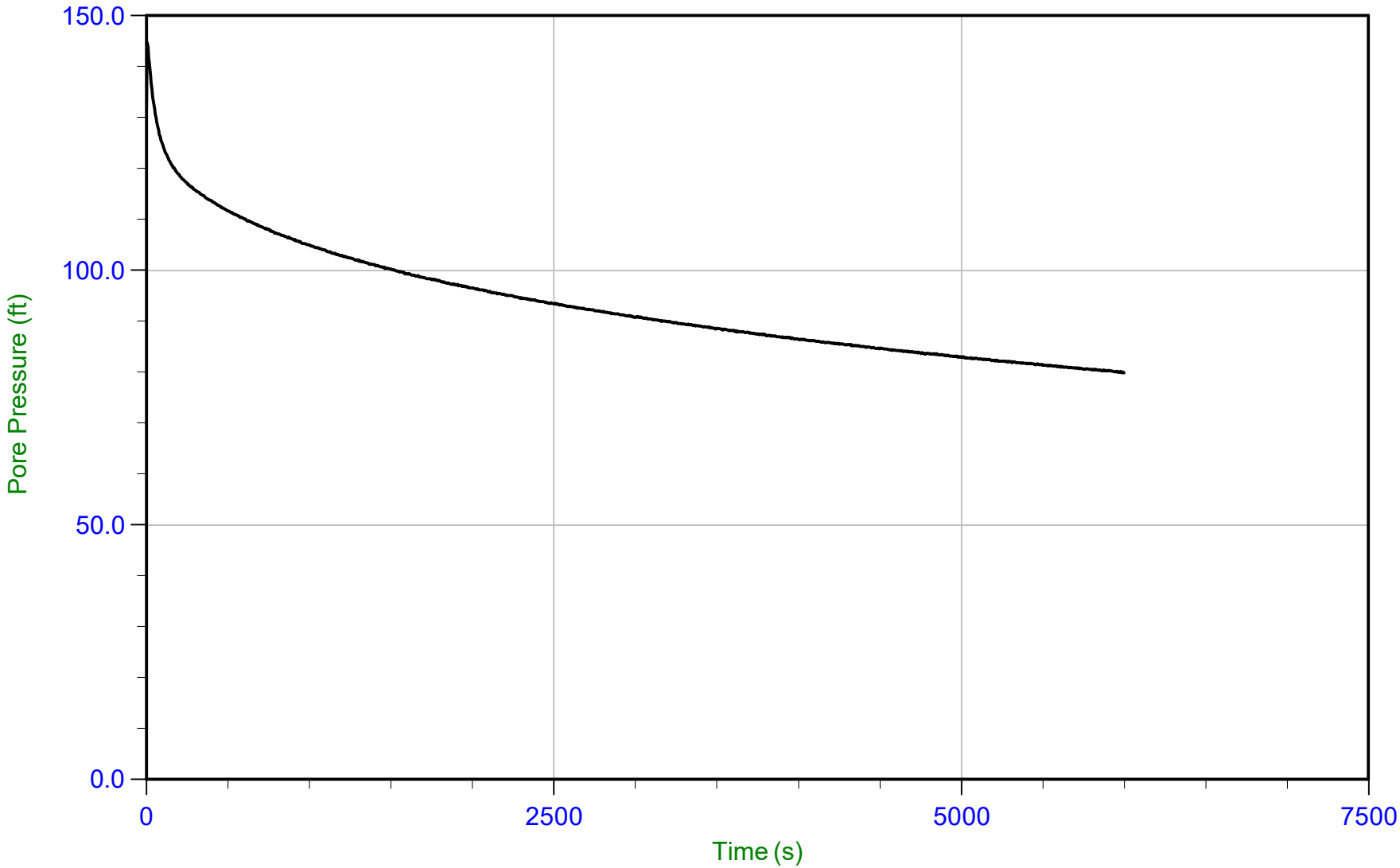
WT: 2.736 m / 8.976 ft
Ueq: 45.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 15:05:24
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C005
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP05.PPD
Depth: 11.400 m / 37.401 ft
Duration: 6000.0 s

U Min: 79.9 ft
U Max: 144.8 ft

WT: 2.134 m / 7.001 ft
Ueq: 30.4 ft
U(50): 87.59 ft

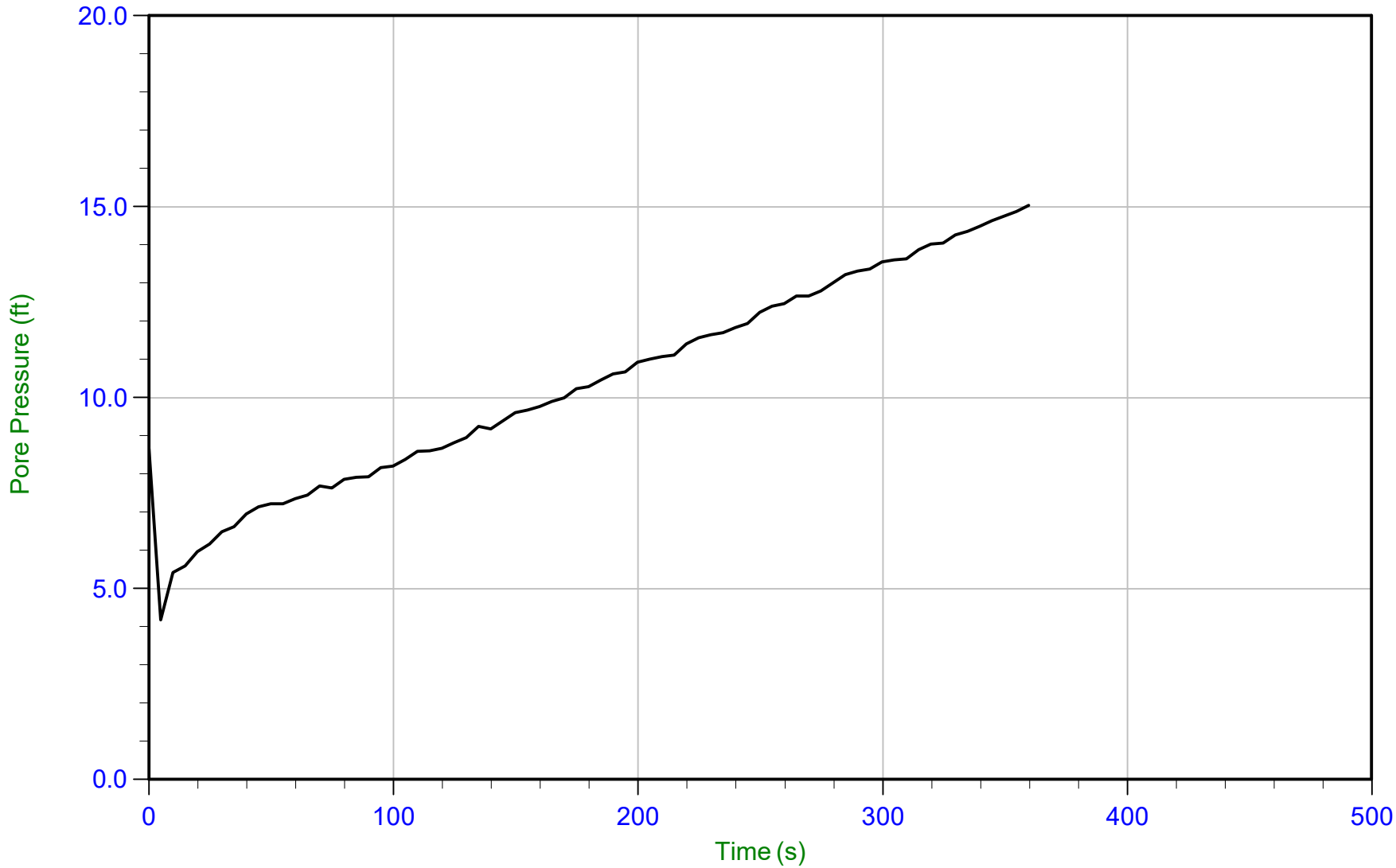
T(50): 3717.5 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 4.350 m / 14.271 ft
Duration: 360.0 s

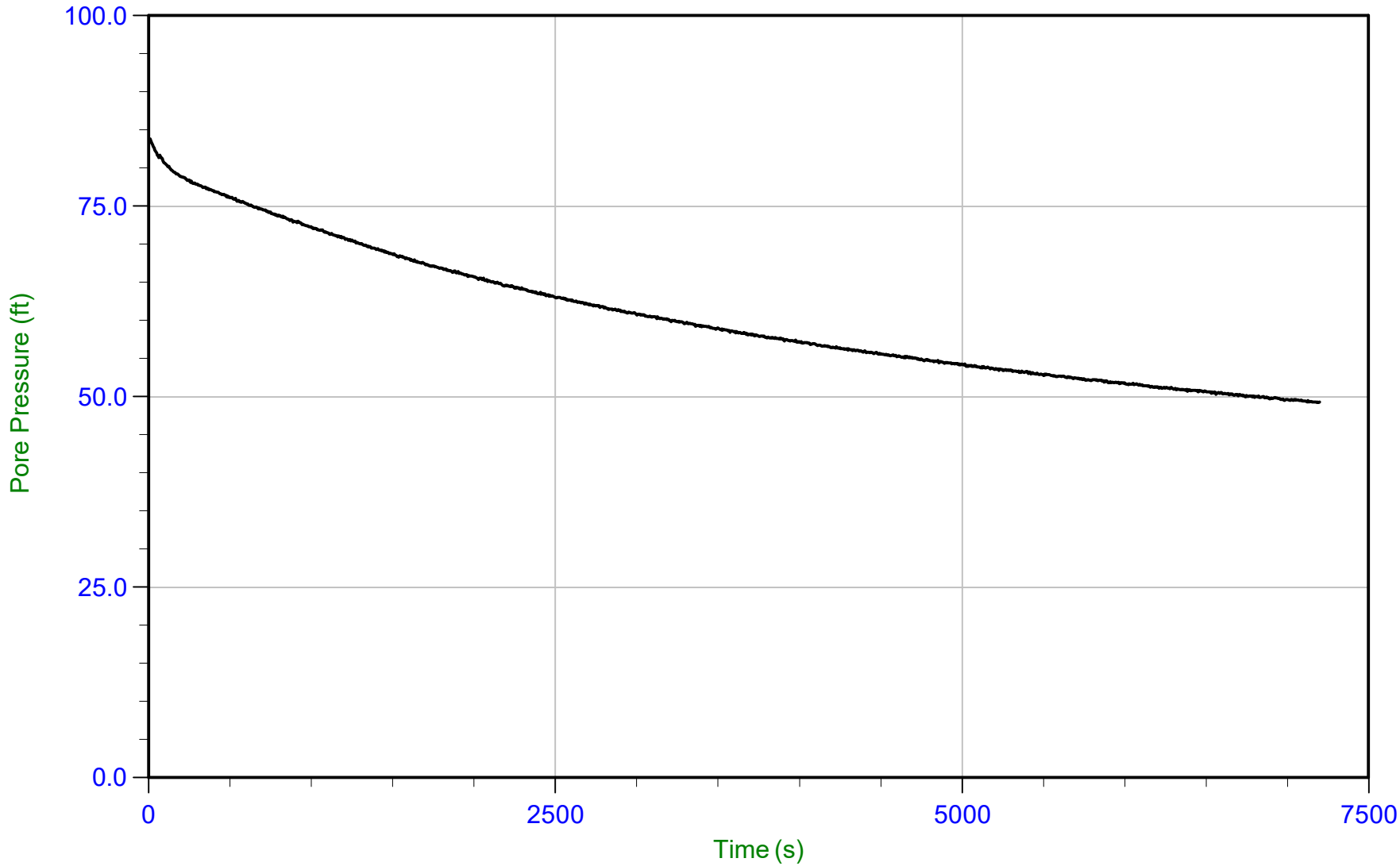
U Min: 4.2 ft
U Max: 15.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 8.000 m / 26.246 ft
Duration: 7200.0 s

U Min: 49.2 ft
U Max: 83.8 ft

WT: 3.505 m / 11.499 ft
Ueq: 14.7 ft
U(50): 49.29 ft

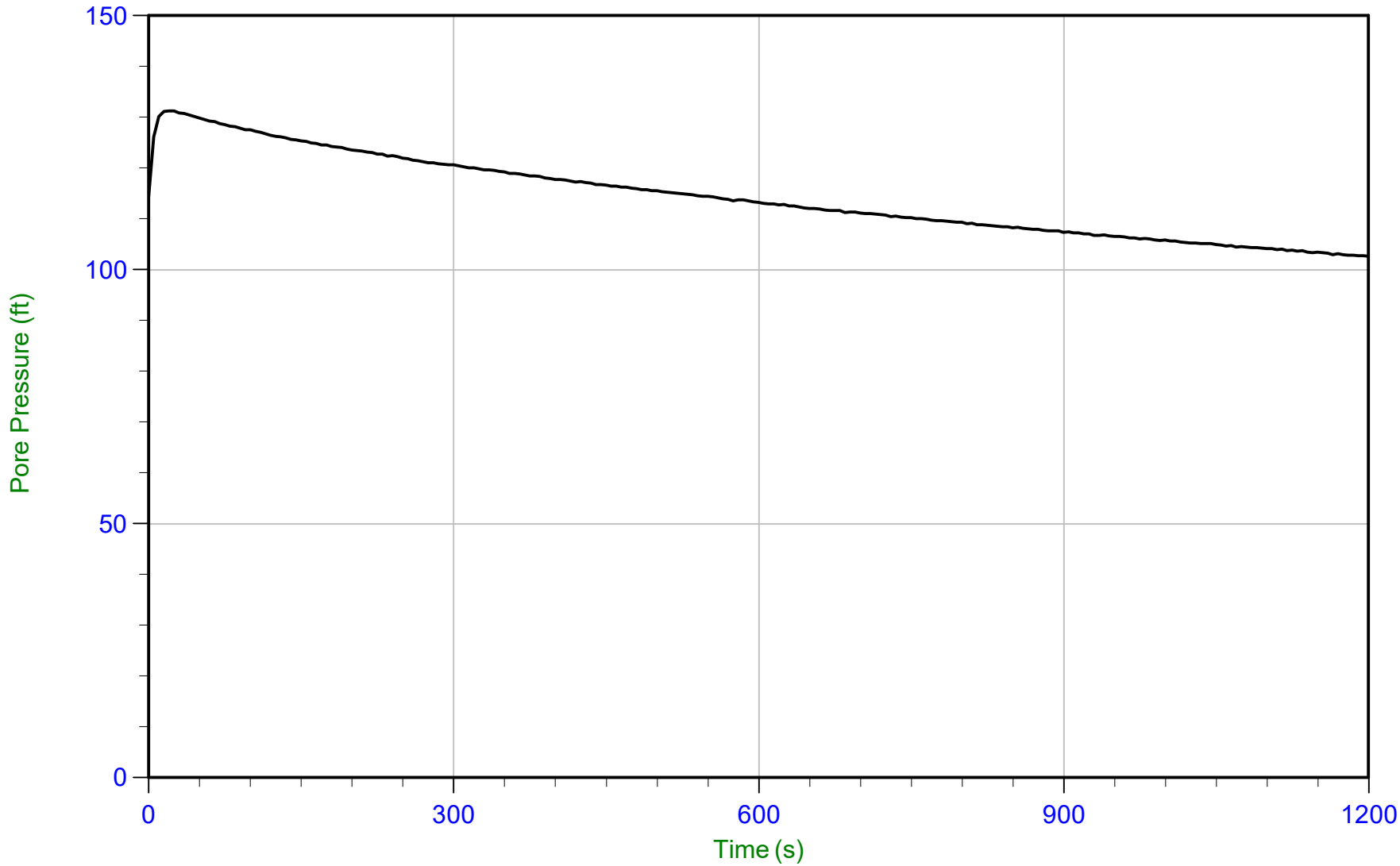
T(50): 7113.9 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1200.0 s

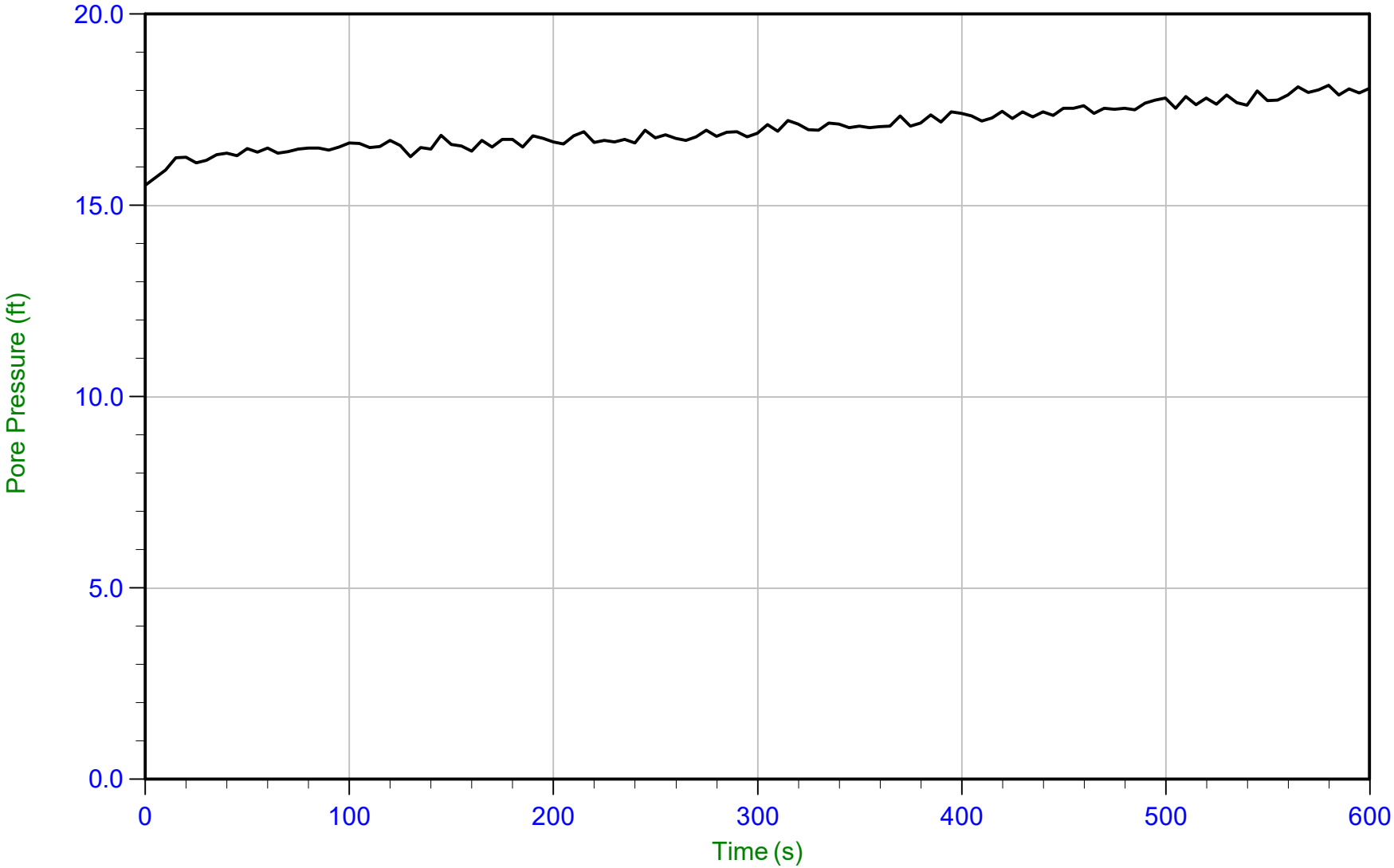
U Min: 102.7 ft
U Max: 131.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 8.200 m / 26.903 ft
Duration: 600.0 s

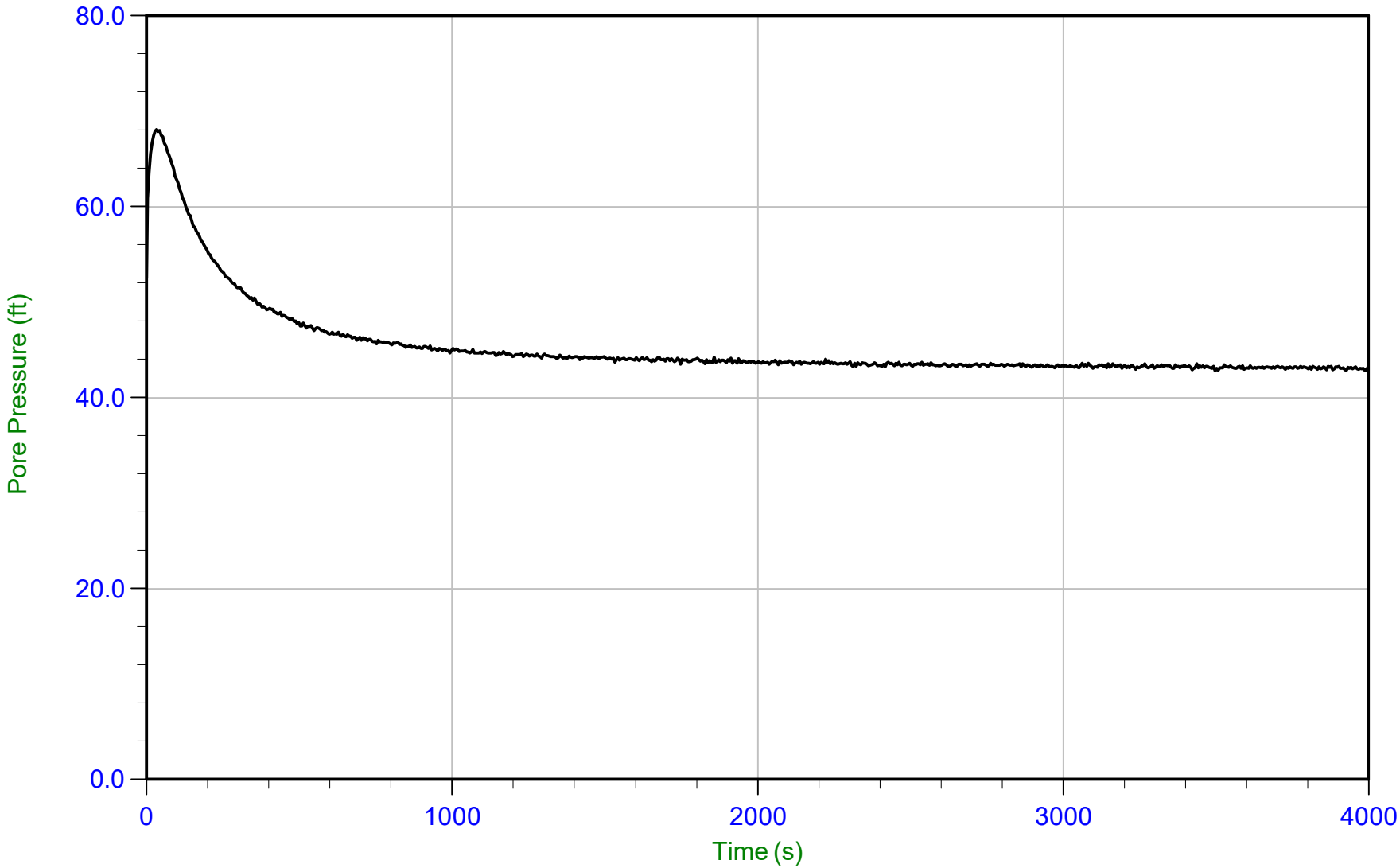
U Min: 15.5 ft
U Max: 18.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 15.700 m / 51.509 ft
Duration: 4000.0 s

U Min: 42.8 ft
U Max: 68.1 ft

WT: 2.709 m / 8.888 ft
Ueq: 42.6 ft
U(50): 55.34 ft

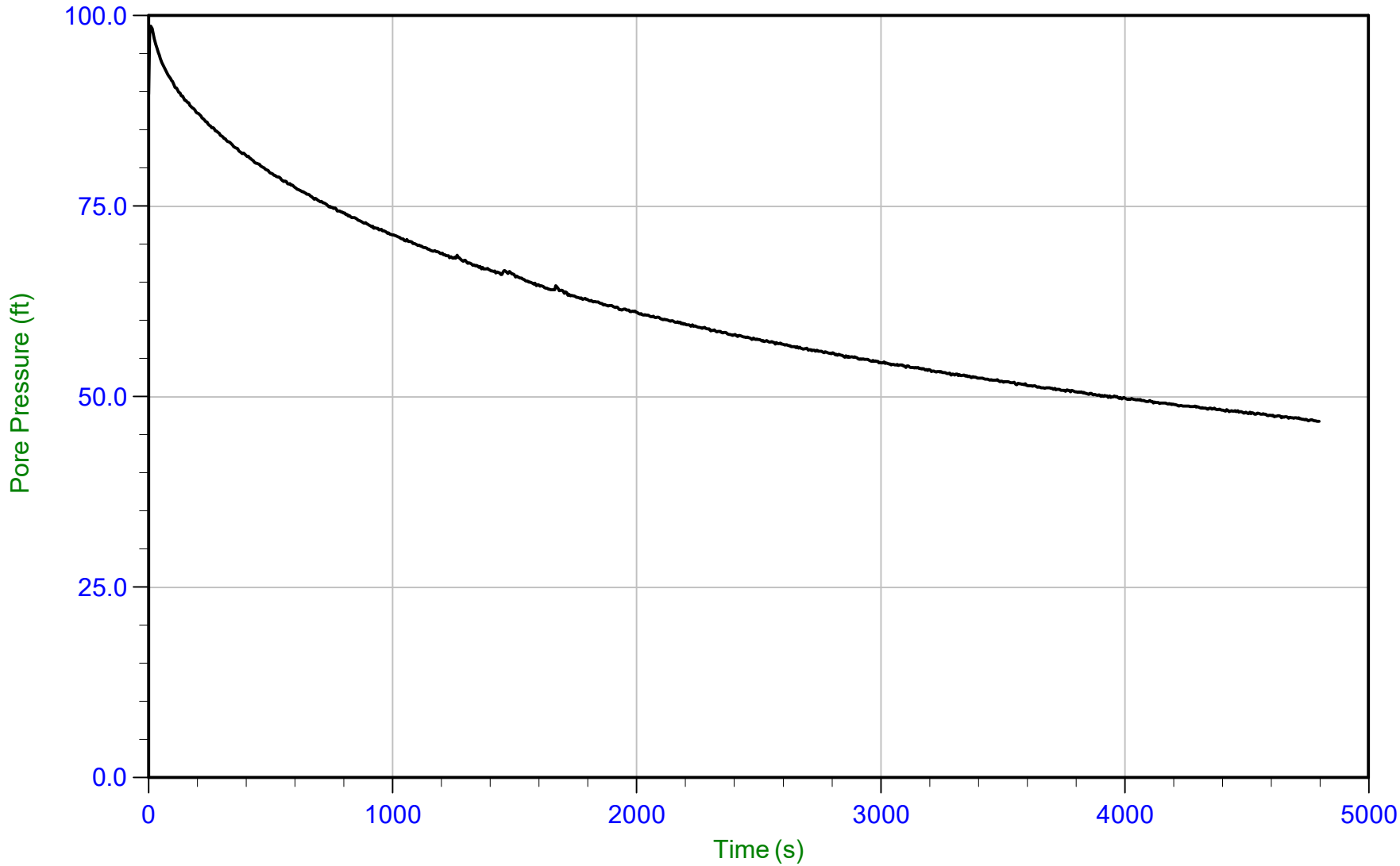
T(50): 166.2 s
Ir: 100
Ch: 4.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 6.750 m / 22.145 ft
Duration: 4800.0 s

U Min: 46.8 ft
U Max: 98.7 ft

WT: 3.048 m / 10.000 ft
Ueq: 12.1 ft
U(50): 55.40 ft

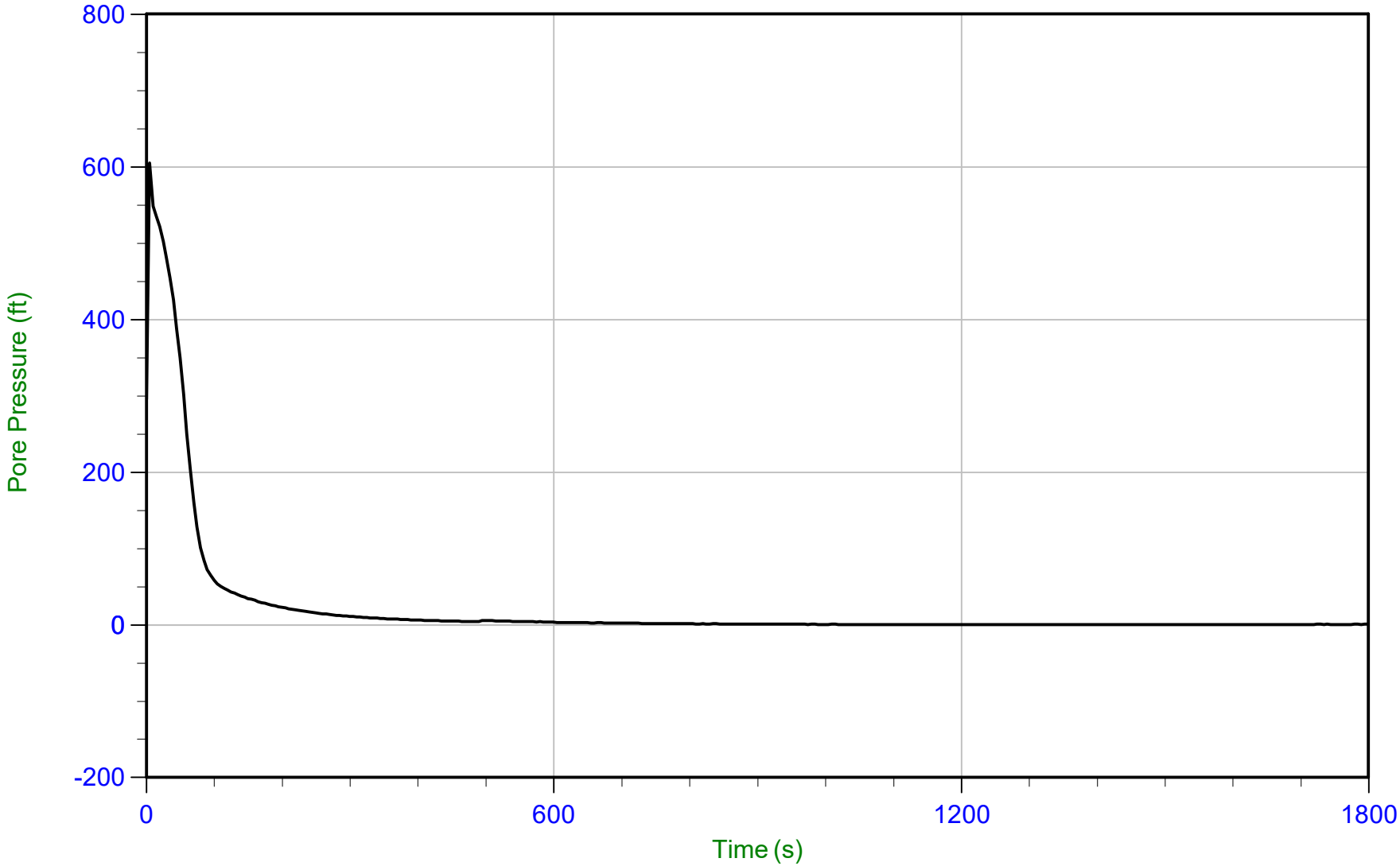
T(50): 2835.5 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 10.250 m / 33.628 ft
Duration: 1800.0 s

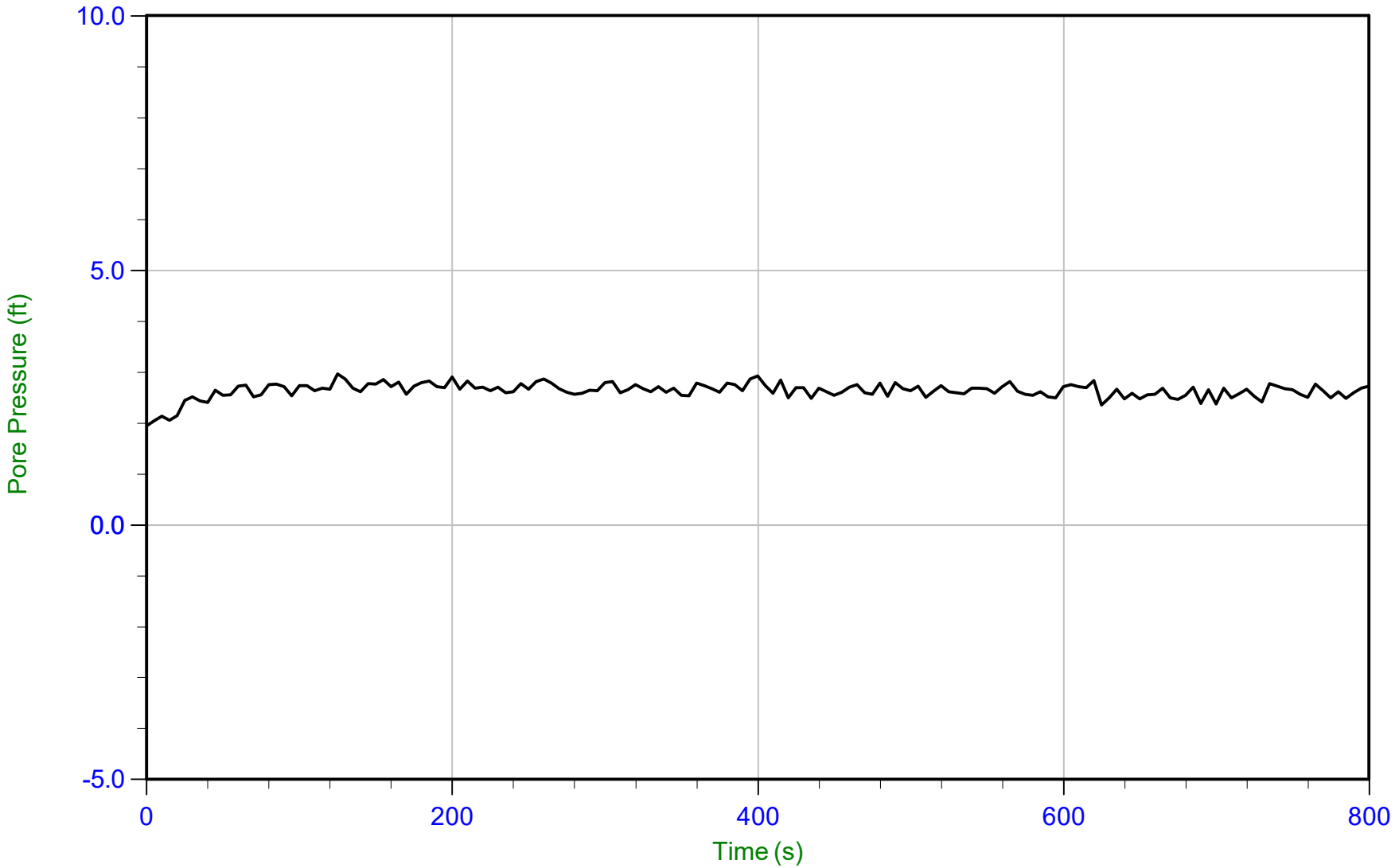
U Min: 0.1 ft
U Max: 605.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 4.900 m / 16.076 ft
Duration: 800.0 s

U Min: 1.9 ft
U Max: 3.0 ft

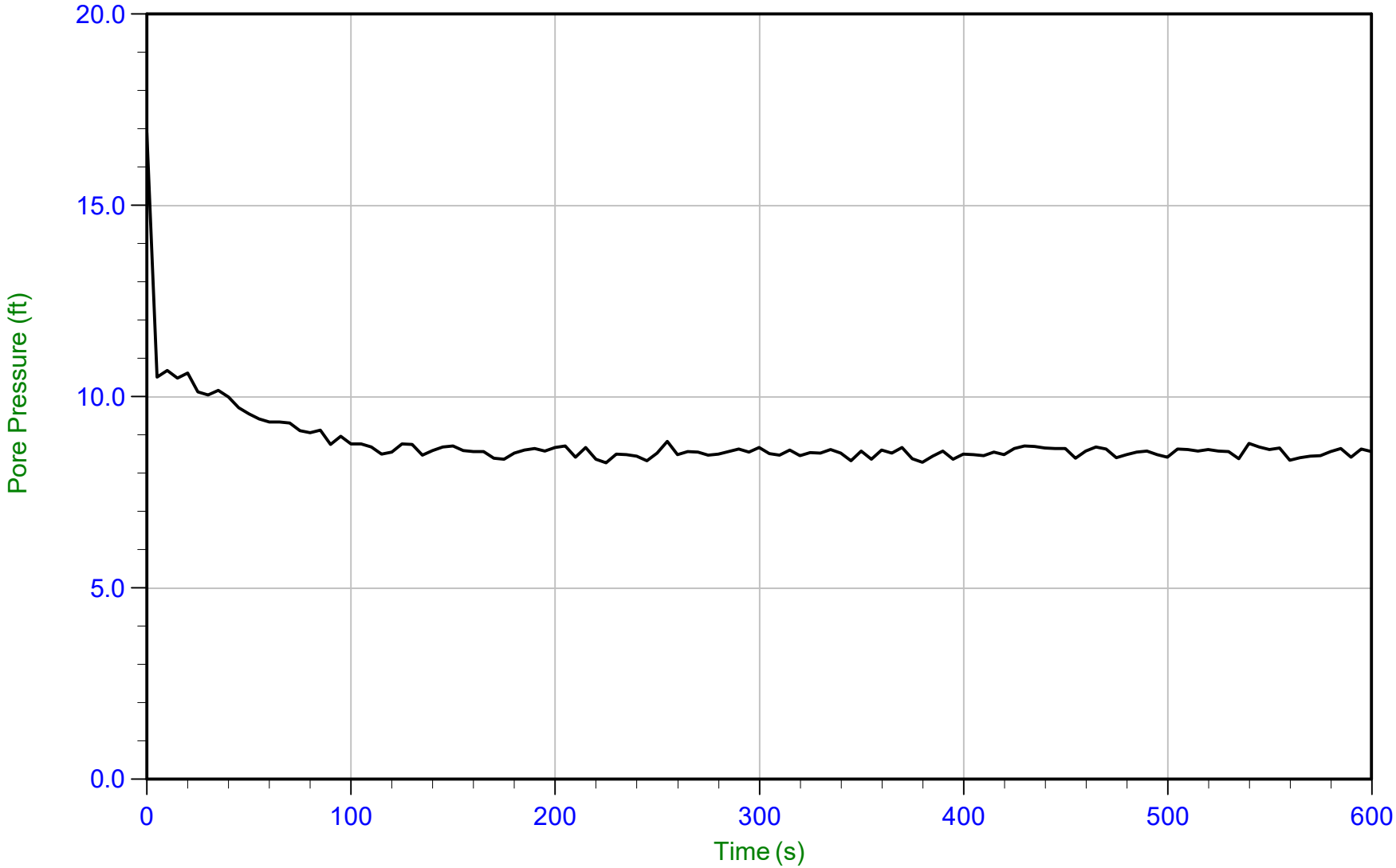
WT: 4.104 m / 13.464 ft
Ueq: 2.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 8.650 m / 28.379 ft
Duration: 600.0 s

U Min: 8.3 ft
U Max: 16.9 ft

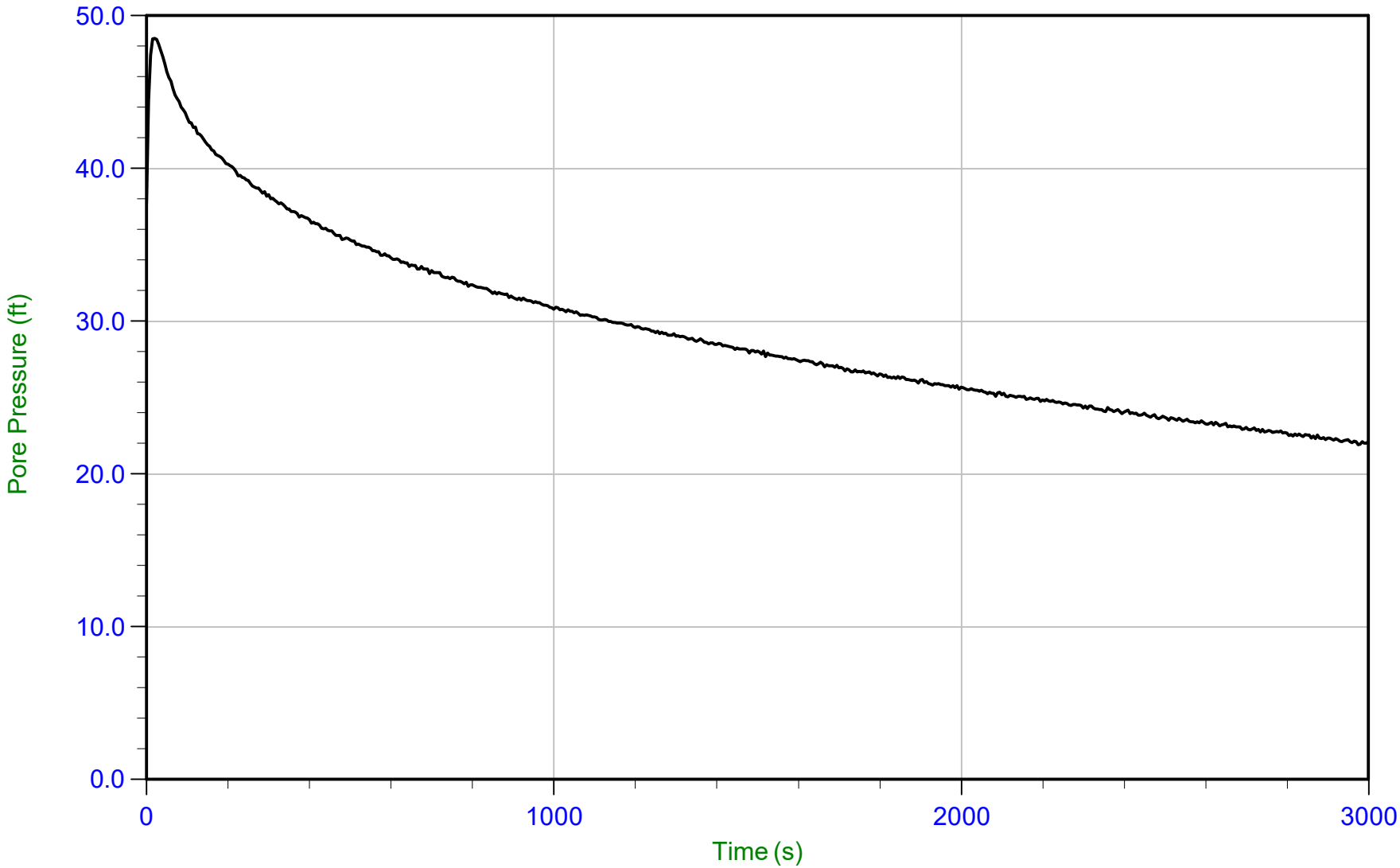
WT: 6.062 m / 19.888 ft
Ueq: 8.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 3.700 m / 12.139 ft
Duration: 3000.0 s

U Min: 21.9 ft
U Max: 48.5 ft

WT: 0.674 m / 2.211 ft
Ueq: 9.9 ft
U(50): 29.22 ft

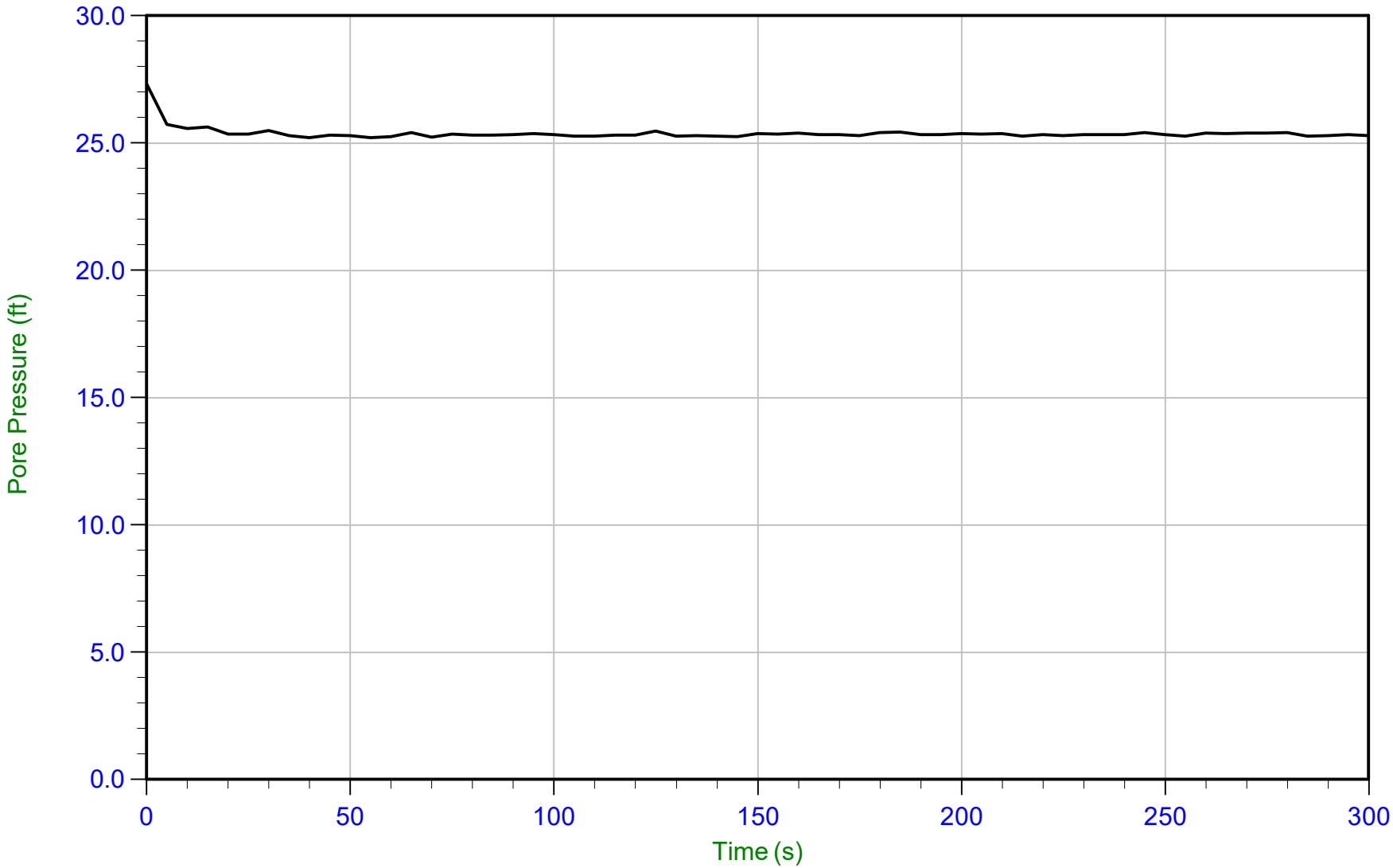
T(50): 1239.4 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 8.400 m / 27.559 ft
Duration: 300.0 s

U Min: 25.2 ft
U Max: 27.3 ft

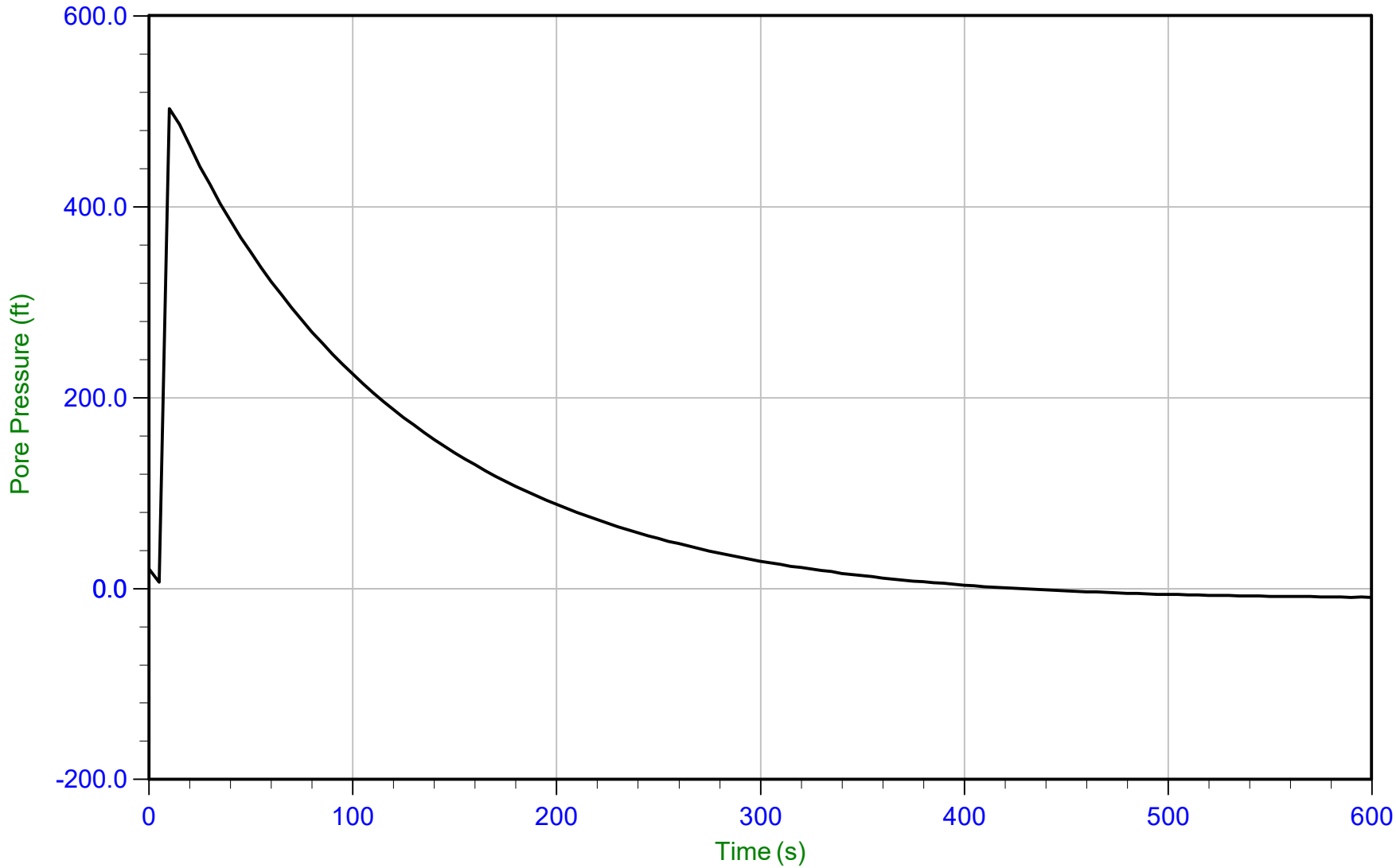
WT: 0.674 m / 2.211 ft
Ueq: 25.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 9.150 m / 30.019 ft
Duration: 600.0 s

U Min: -9.2 ft
U Max: 502.6 ft

WT: 9.150 m / 30.019 ft
Ueq: 0.0 ft
U(50): 251.28 ft

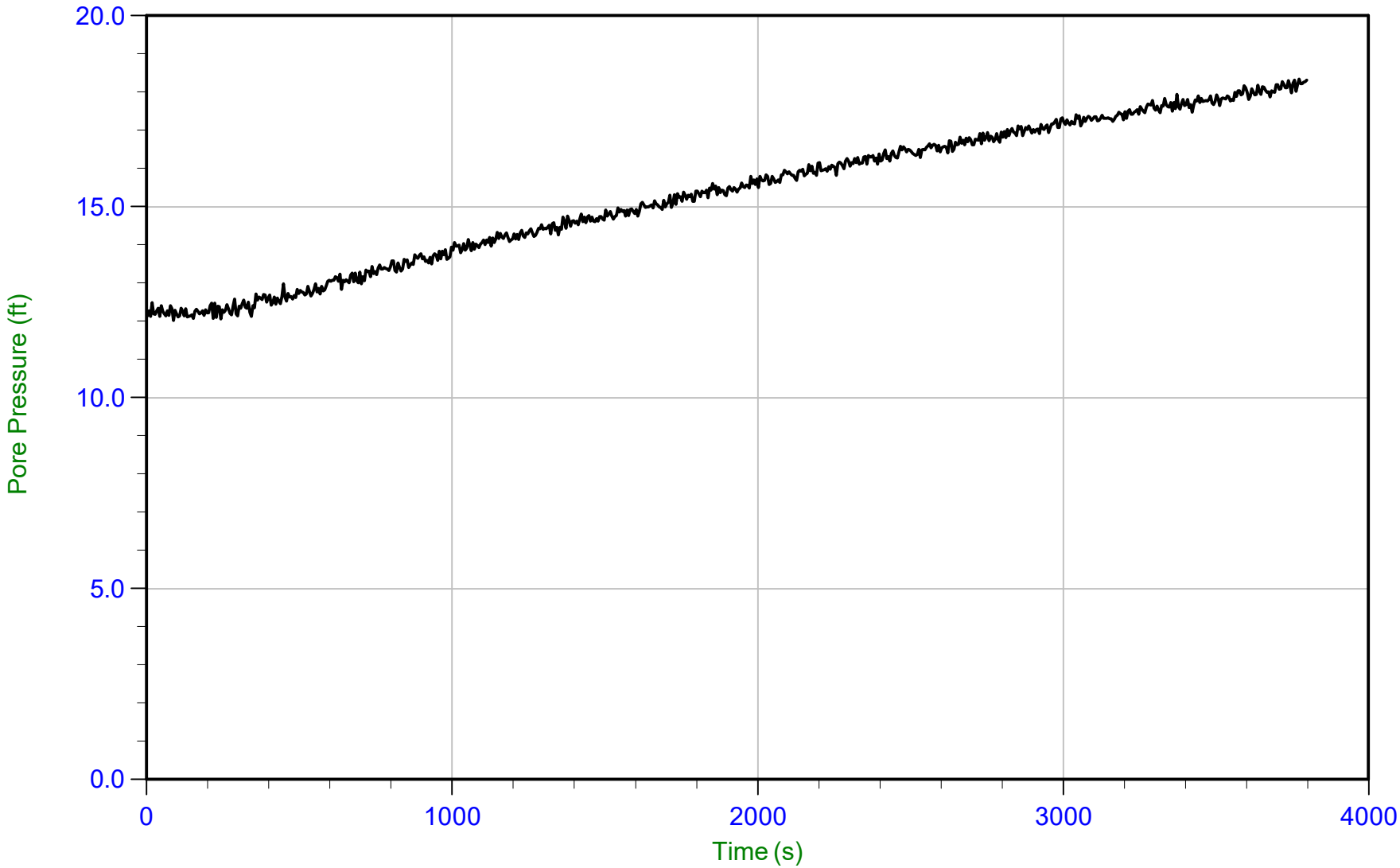
T(50): 77.5 s
Ir: 100
Ch: 9.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 7.350 m / 24.114 ft
Duration: 3800.0 s

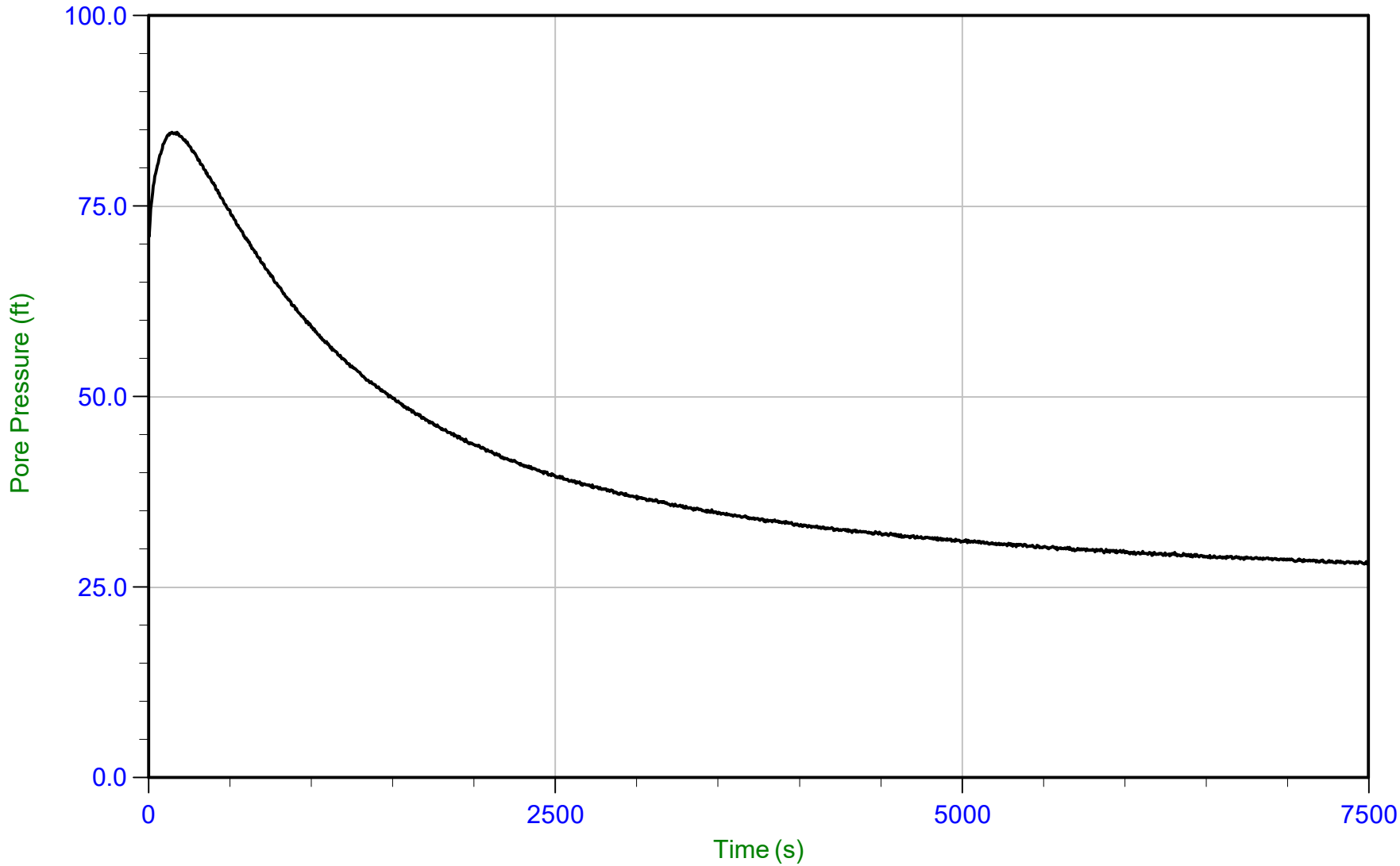
U Min: 12.0 ft
U Max: 18.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.150 m / 46.423 ft
Duration: 7500.0 s

U Min: 28.0 ft
U Max: 84.7 ft

WT: 6.848 m / 22.467 ft
Ueq: 24.0 ft
U(50): 54.34 ft

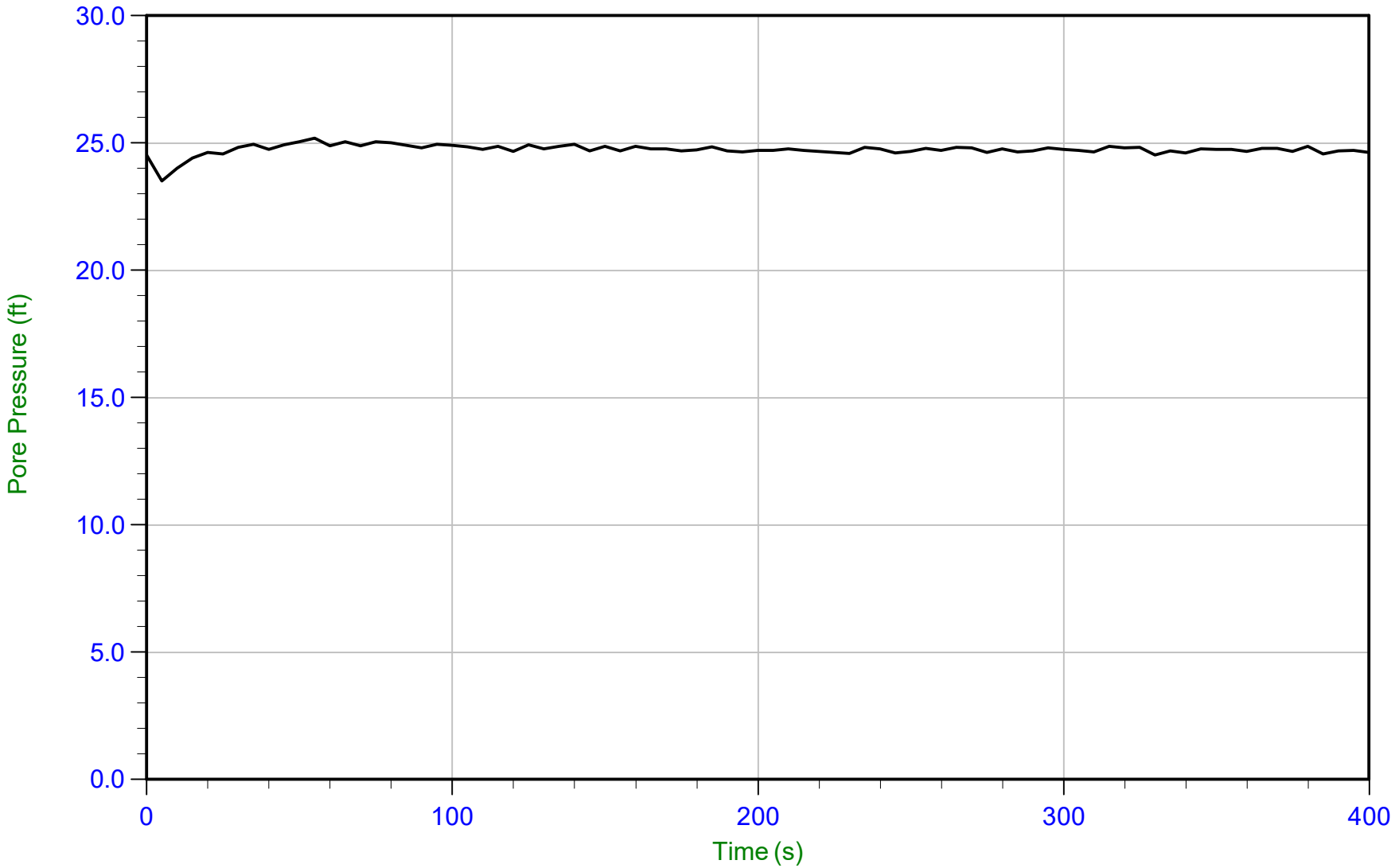
T(50): 1082.1 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.350 m / 47.079 ft
Duration: 400.0 s

U Min: 23.5 ft
U Max: 25.2 ft

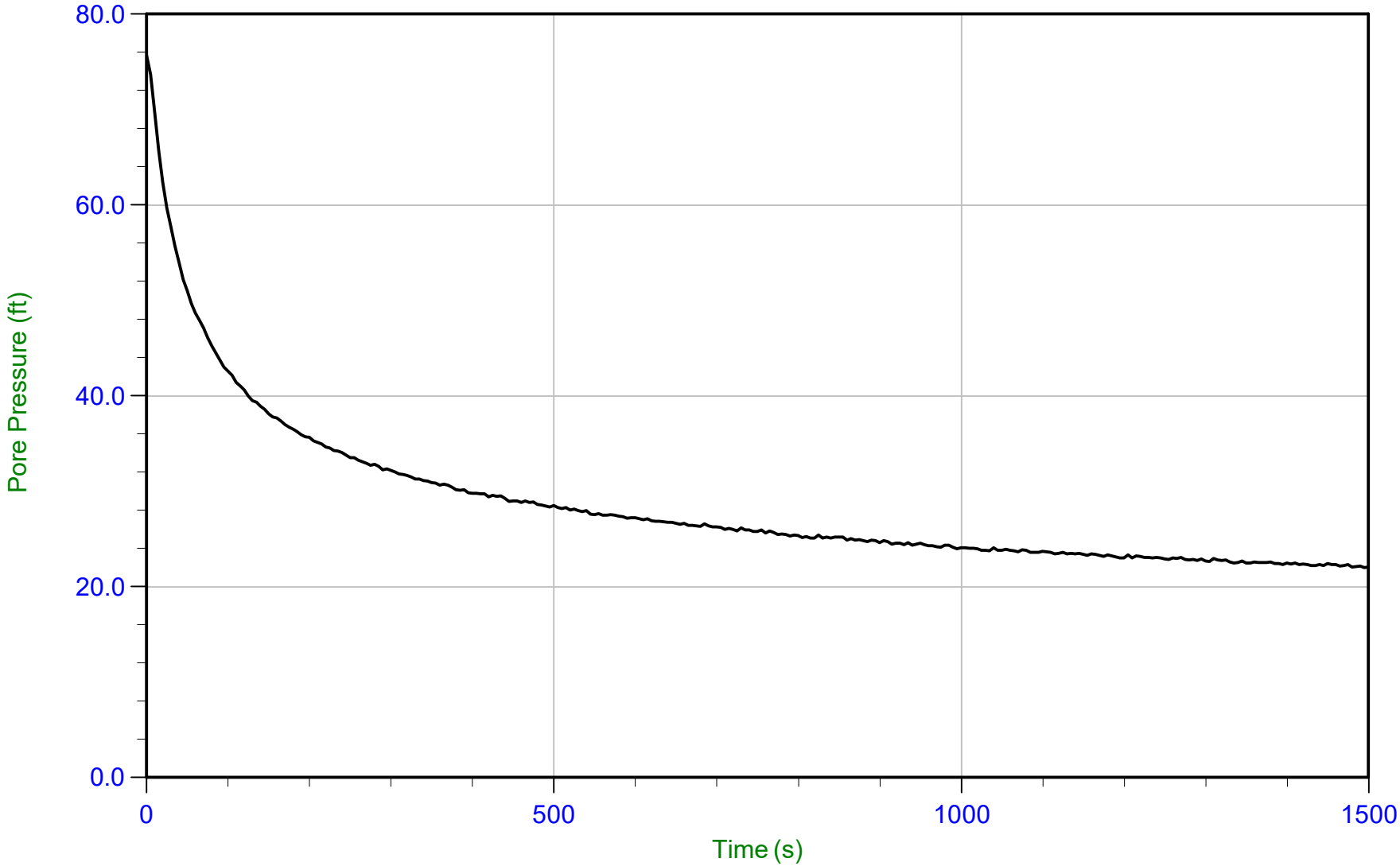
WT: 6.848 m / 22.467 ft
Ueq: 24.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 14:27:24
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP12.PPD
Depth: 8.800 m / 28.871 ft
Duration: 1500.0 s

U Min: 22.0 ft
U Max: 75.7 ft

WT: 7.108 m / 23.320 ft
Ueq: 5.6 ft
U(50): 40.63 ft

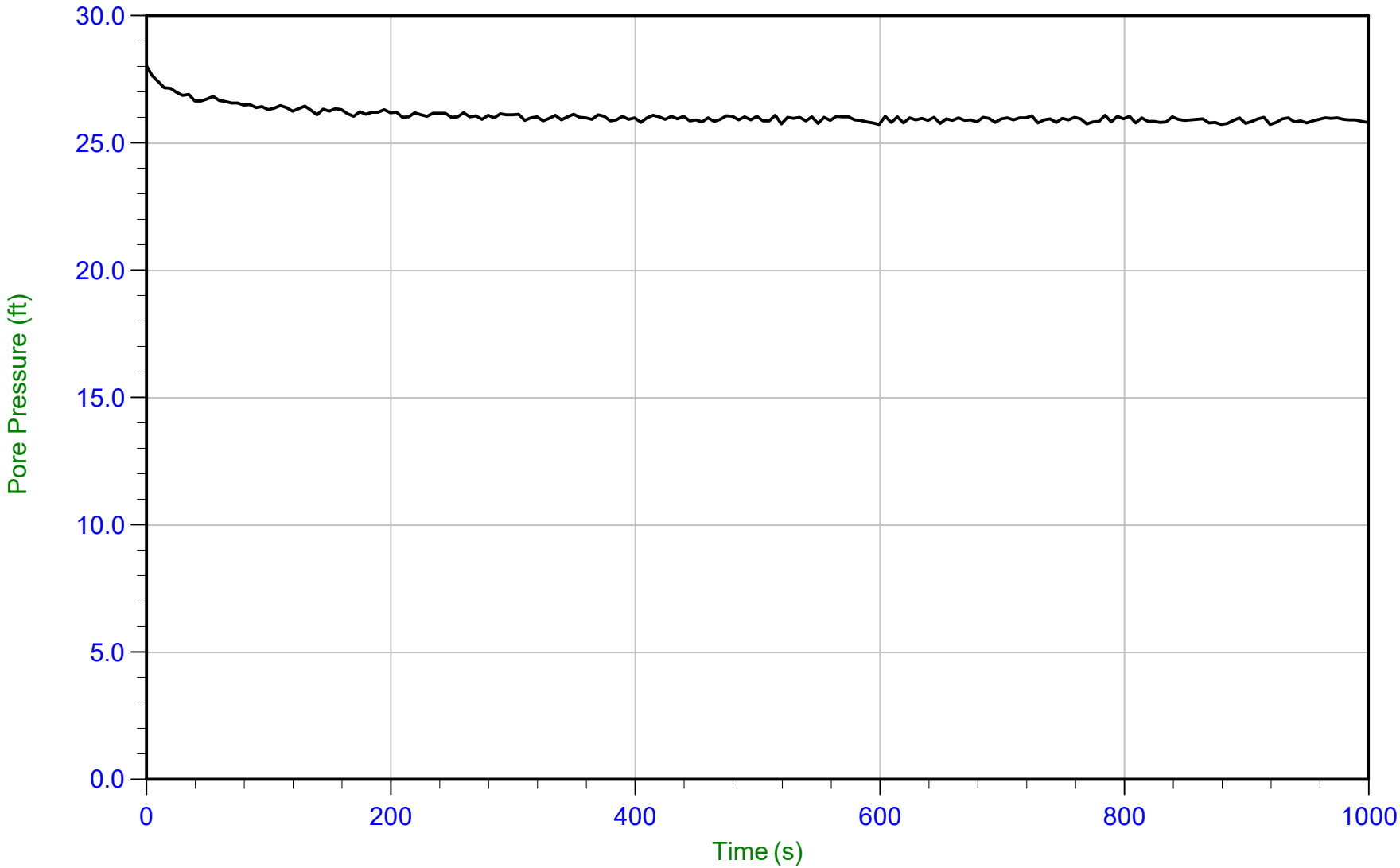
T(50): 119.8 s
Ir: 100
Ch: 5.9 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 14:27:24
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP12.PPD
Depth: 14.950 m / 49.048 ft
Duration: 1000.0 s

U Min: 25.7 ft
U Max: 28.0 ft

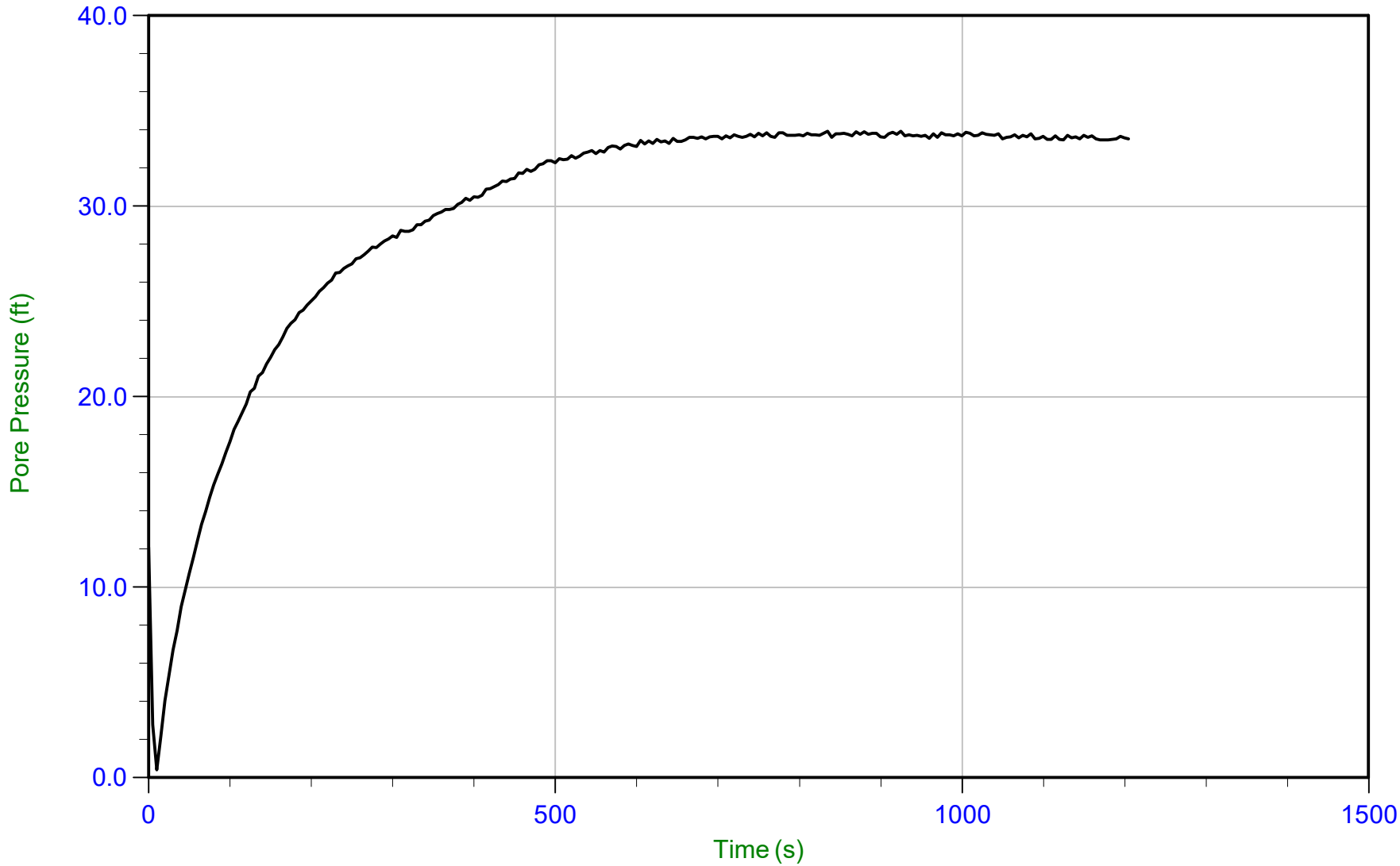
WT: 7.108 m / 23.320 ft
Ueq: 25.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:45:02
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP13.PPD
Depth: 17.150 m / 56.266 ft
Duration: 1205.0 s

U Min: 0.4 ft
U Max: 33.9 ft

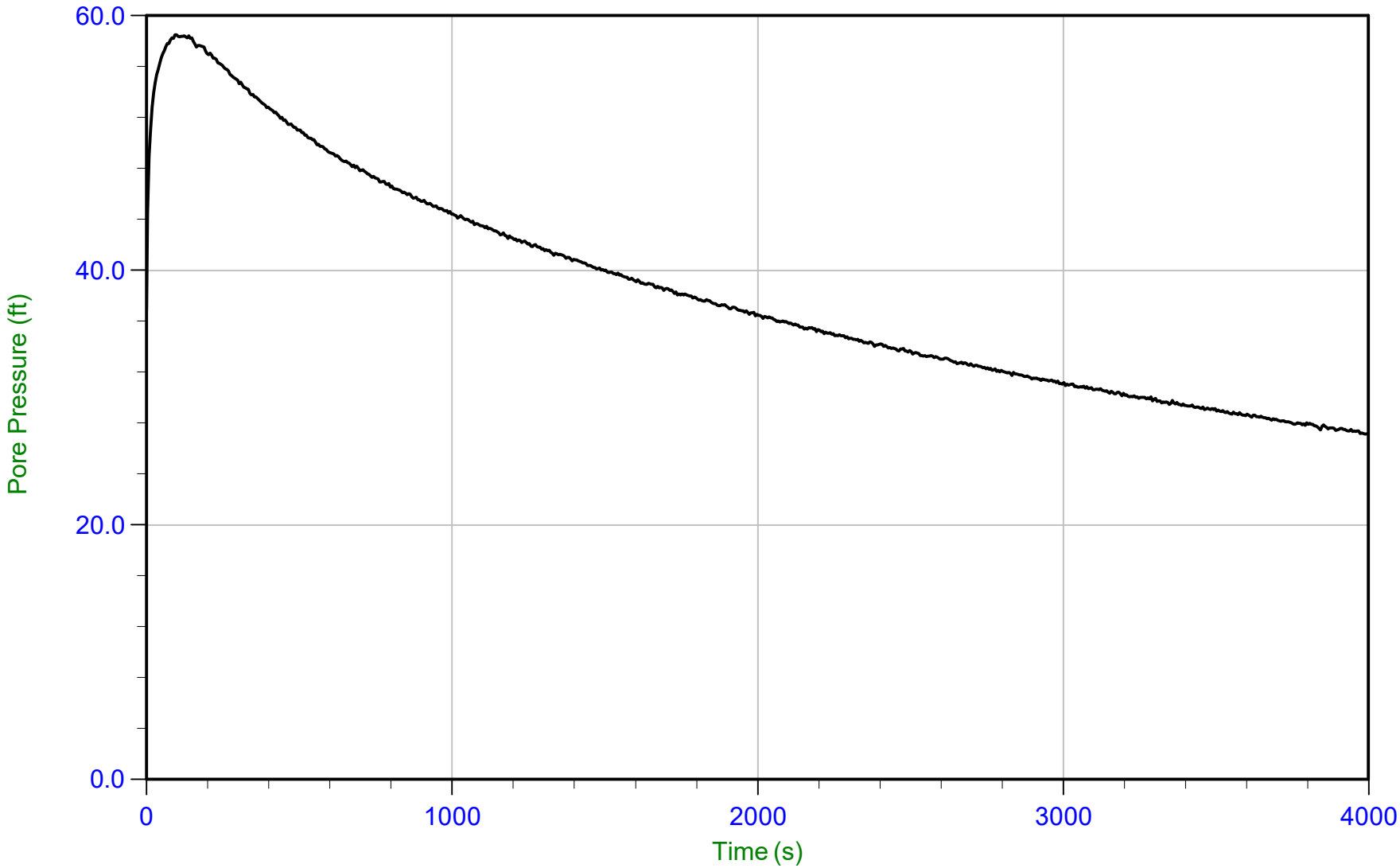
WT: 6.905 m / 22.654 ft
Ueq: 33.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 14:29:59
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP14.PPD
Depth: 4.900 m / 16.076 ft
Duration: 4000.0 s

U Min: 27.1 ft
U Max: 58.5 ft

WT: 1.498 m / 4.915 ft
Ueq: 11.2 ft
U(50): 34.84 ft

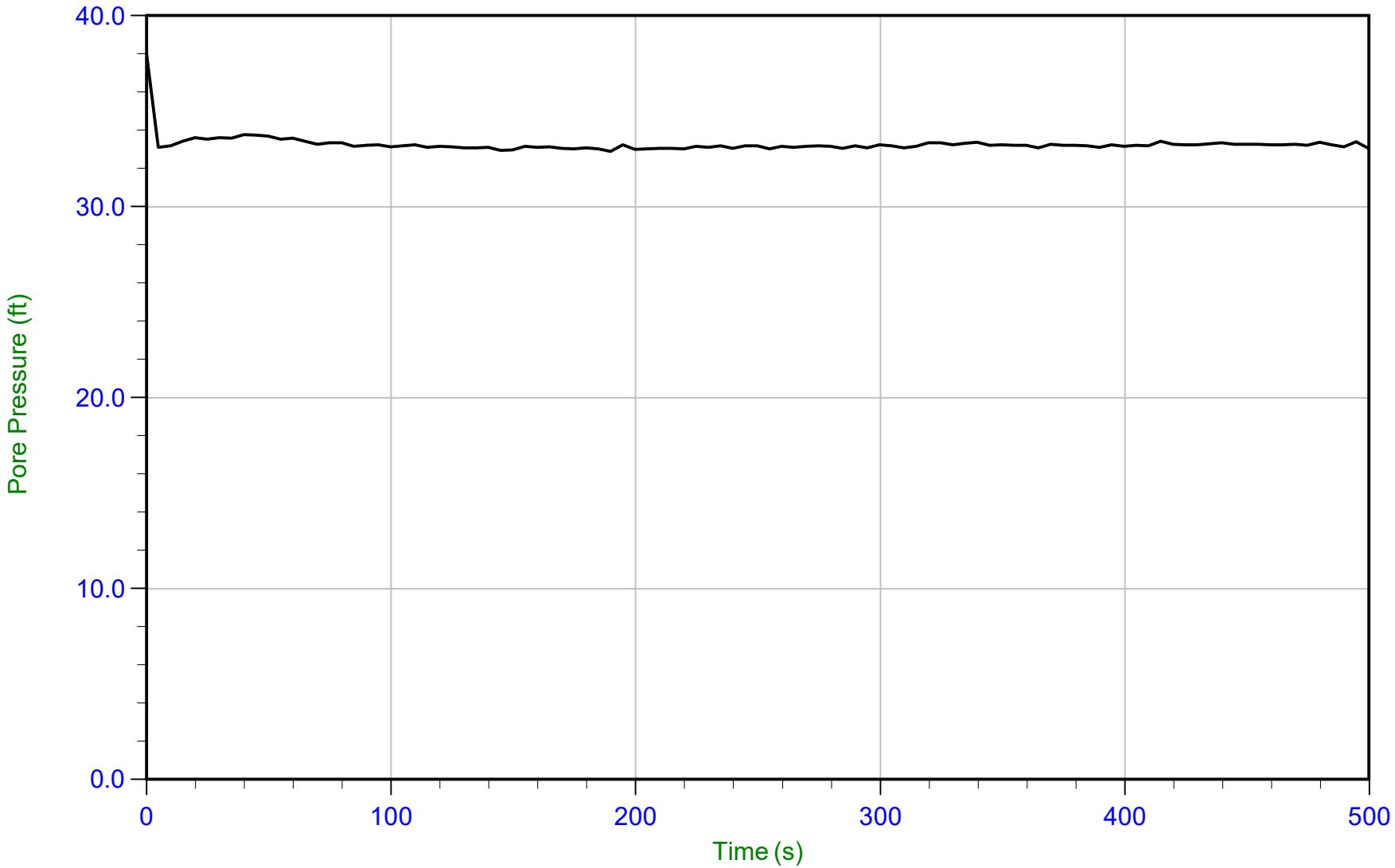
T(50): 2190.4 s
Ir: 100
Ch: 0.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 14:29:59
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP14.PPD
Depth: 11.650 m / 38.221 ft
Duration: 500.0 s

U Min: 32.9 ft
U Max: 38.0 ft

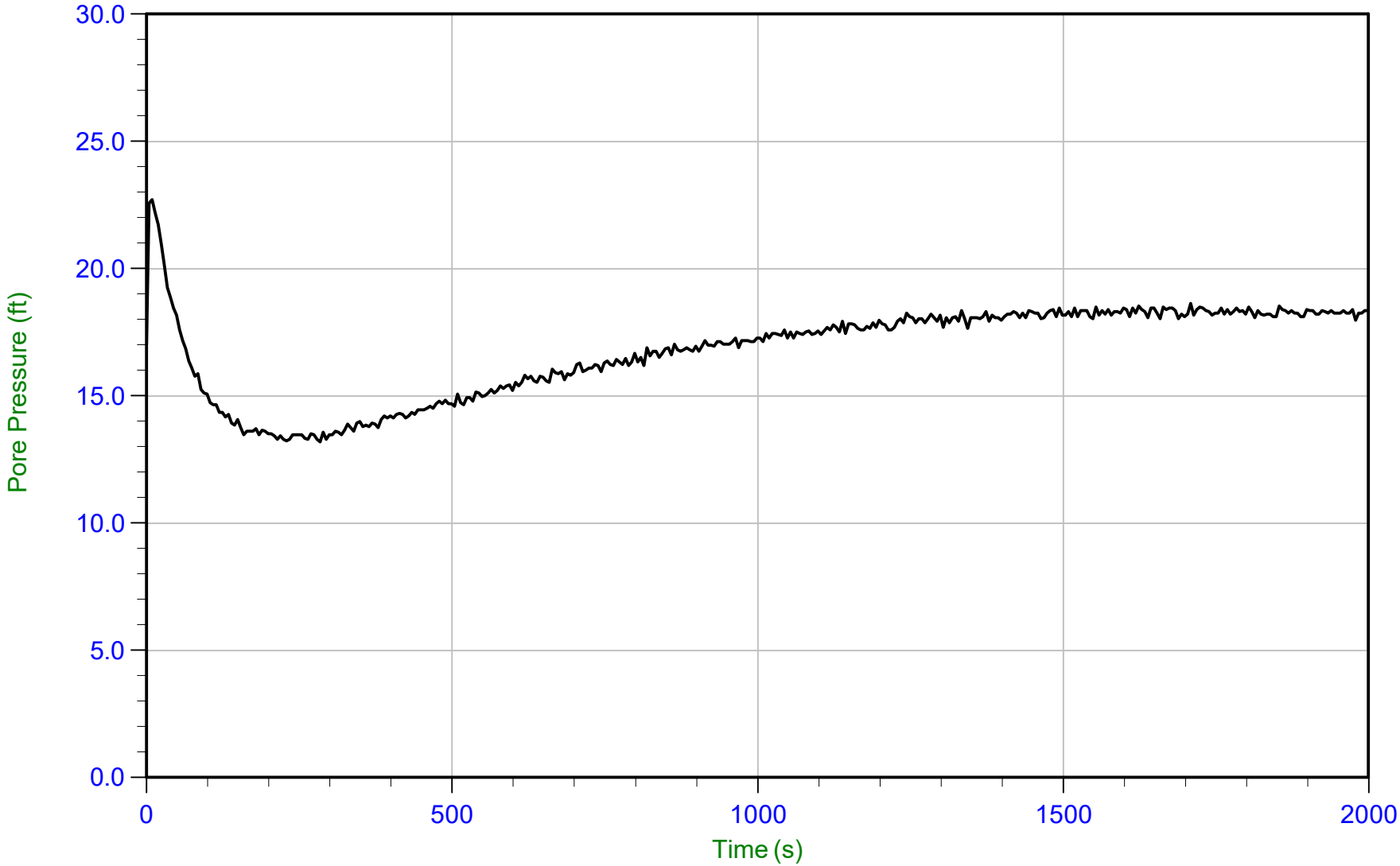
WT: 1.498 m / 4.915 ft
Ueq: 33.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 14:12:51
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP15A.PPD
Depth: 4.600 m / 15.092 ft
Duration: 2000.0 s

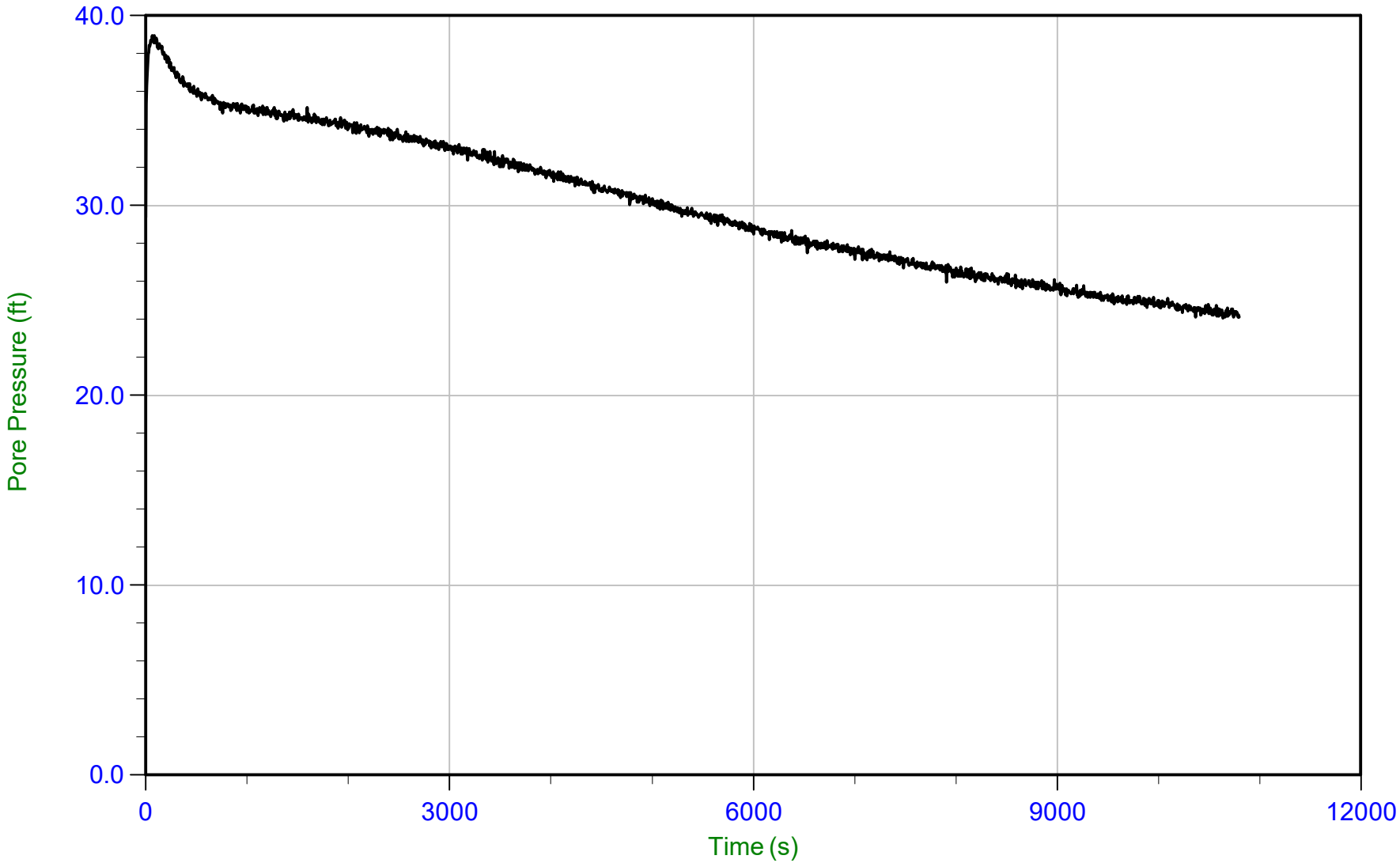
U Min: 13.2 ft
U Max: 22.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 14:12:51
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP15A.PPD
Depth: 9.000 m / 29.527 ft
Duration: 10800.0 s

U Min: 24.1 ft
U Max: 39.0 ft

WT: 3.658 m / 12.001 ft
Ueq: 17.5 ft
U(50): 28.24 ft

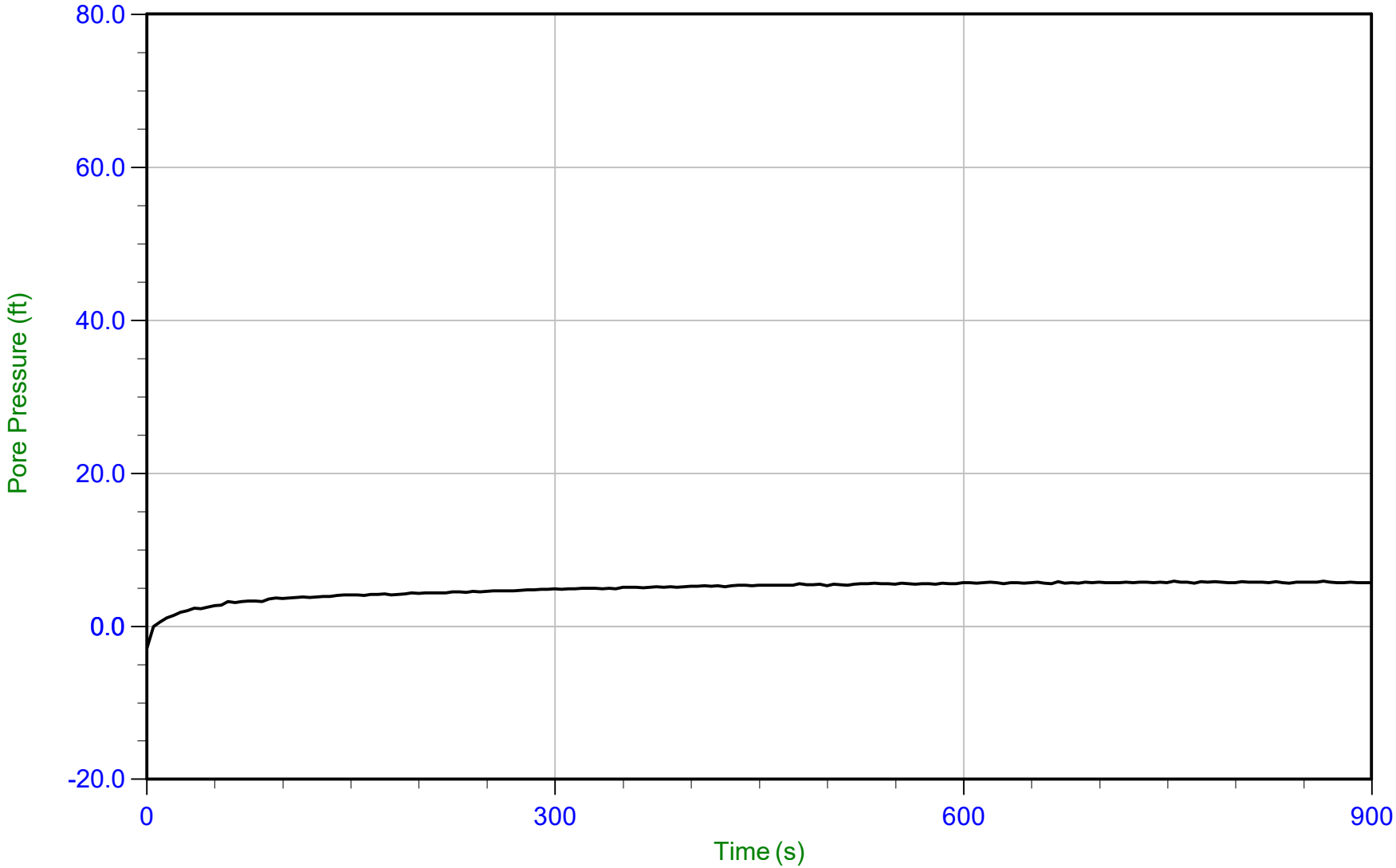
T(50): 6094.6 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 2.250 m / 7.382 ft
Duration: 900.0 s

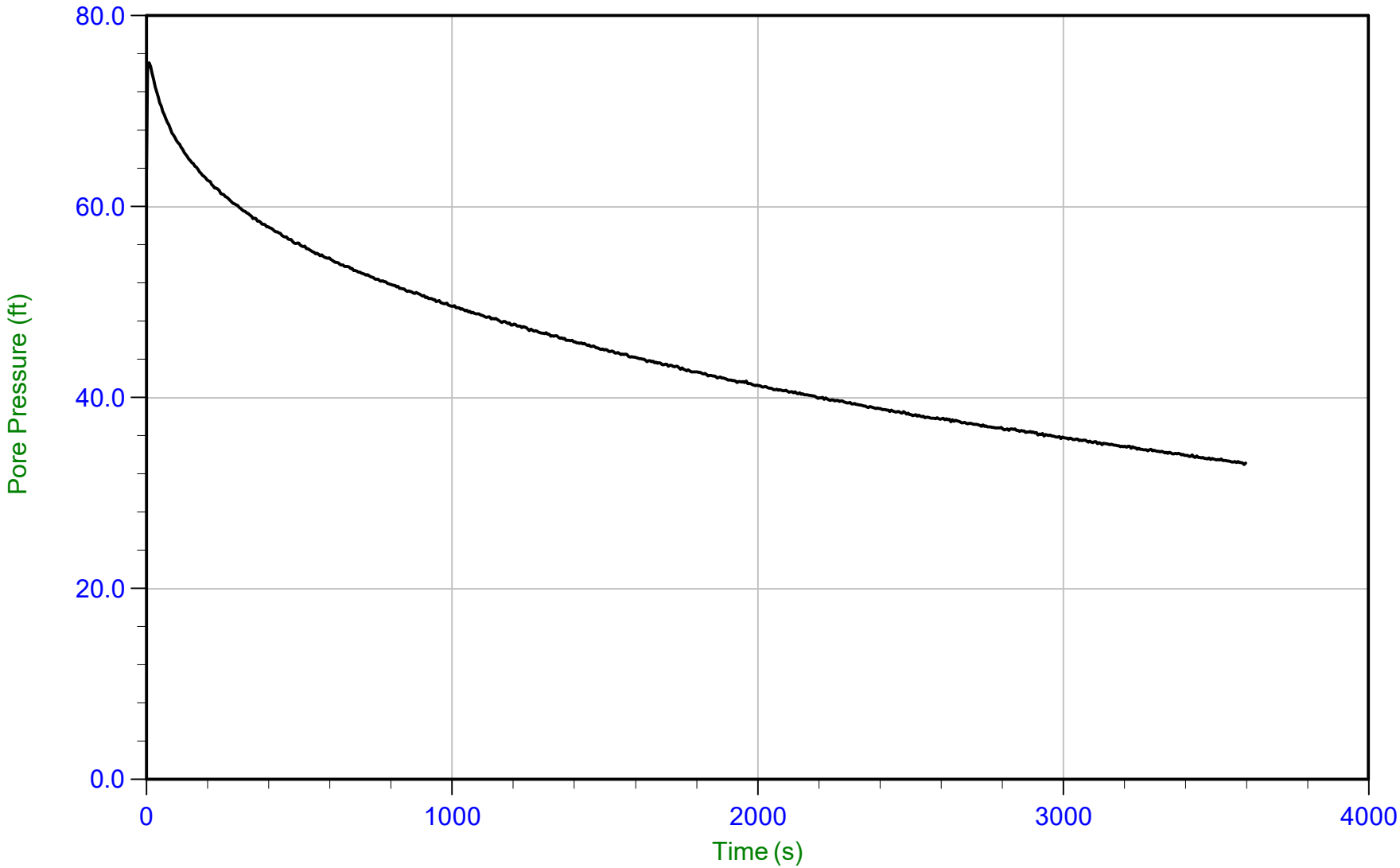
U Min: -2.9 ft
U Max: 5.9 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 5.500 m / 18.044 ft
Duration: 3600.0 s

U Min: 33.0 ft
U Max: 75.1 ft

WT: 1.173 m / 3.848 ft
Ueq: 14.2 ft
U(50): 44.64 ft

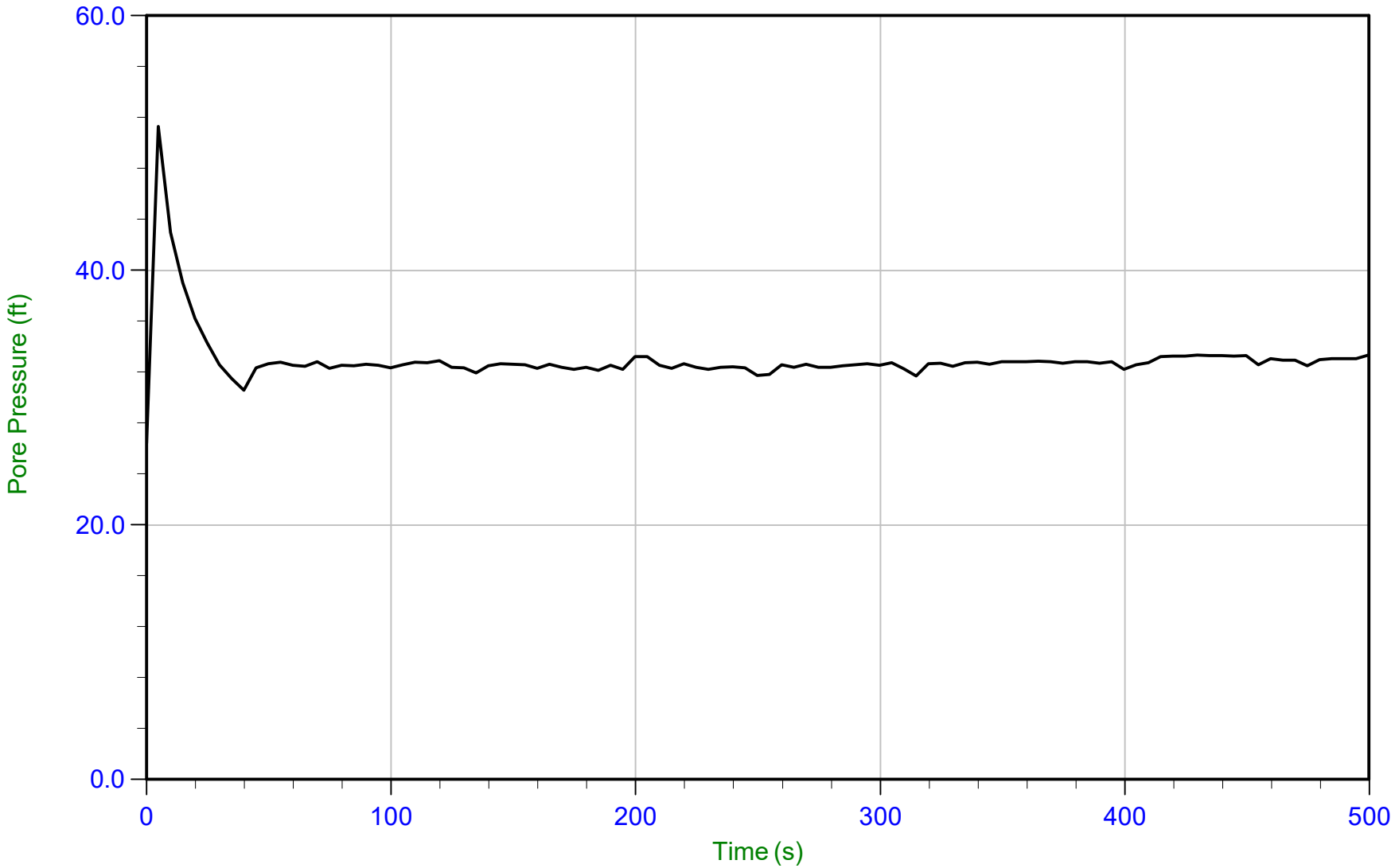
T(50): 1538.2 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 11.250 m / 36.909 ft
Duration: 500.0 s

U Min: 26.4 ft
U Max: 51.3 ft

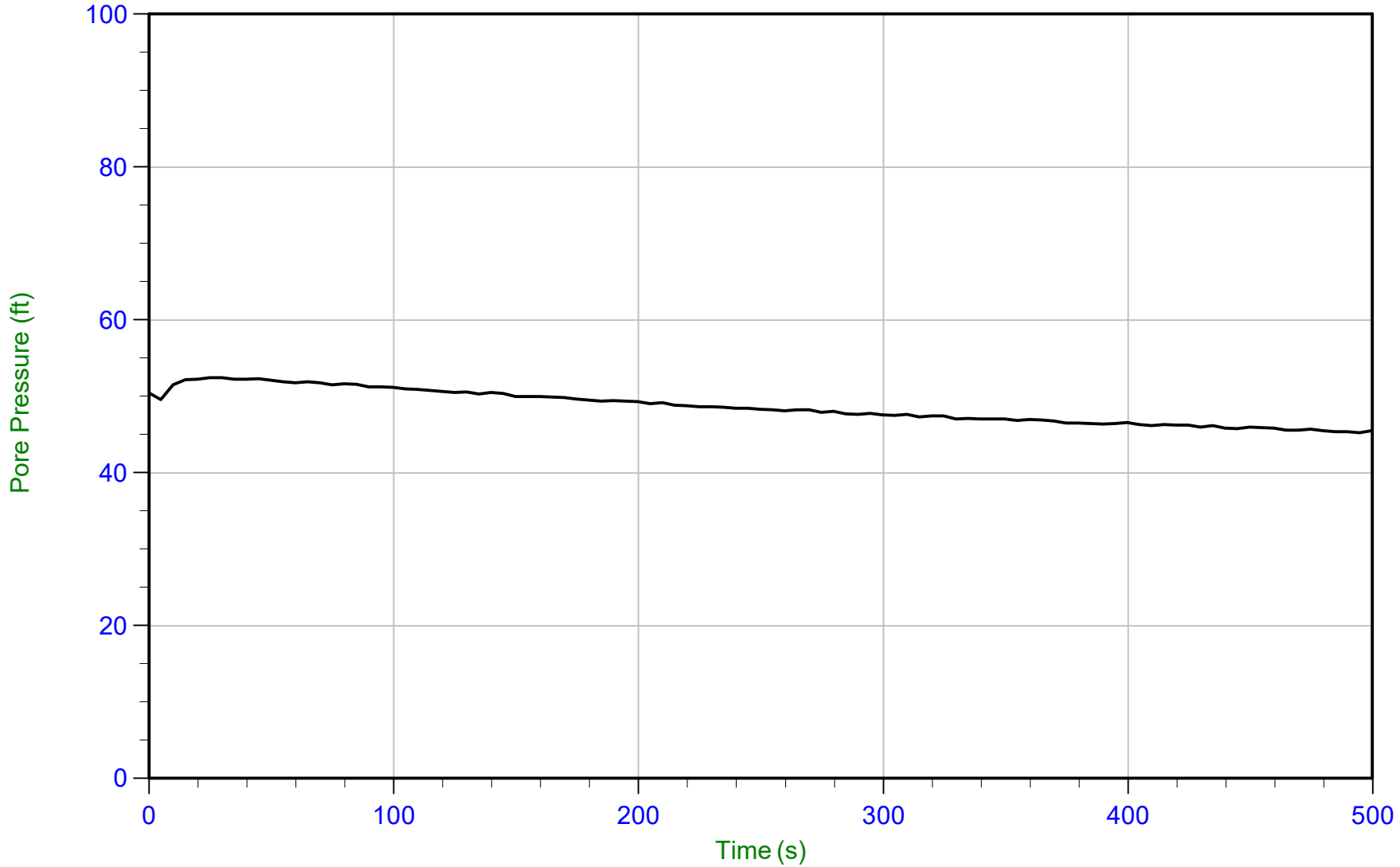
WT: 1.173 m / 3.848 ft
Ueq: 33.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 8.500 m / 27.887 ft
Duration: 500.0 s

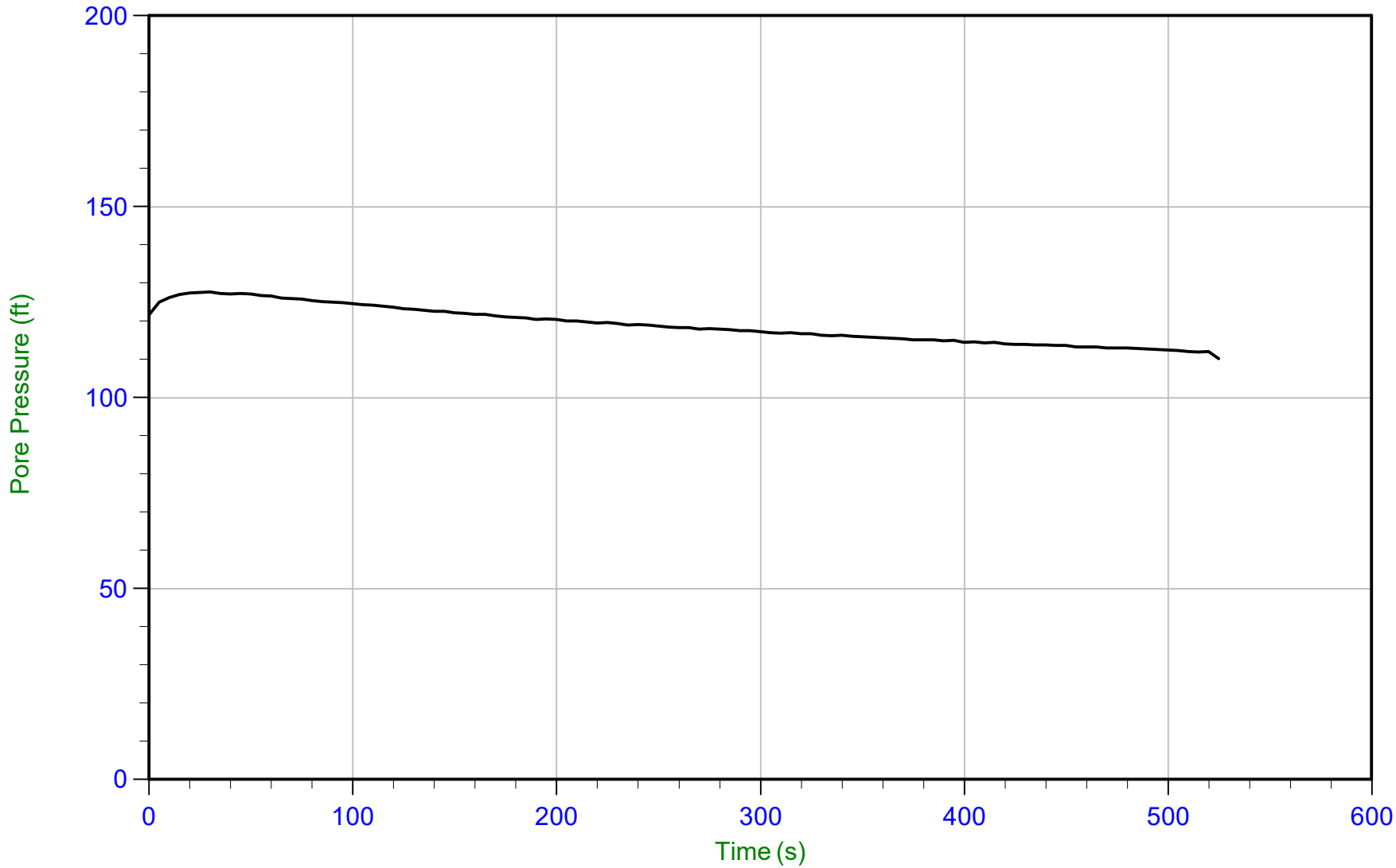
U Min: 45.3 ft
U Max: 52.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 12.350 m / 40.518 ft
Duration: 525.0 s

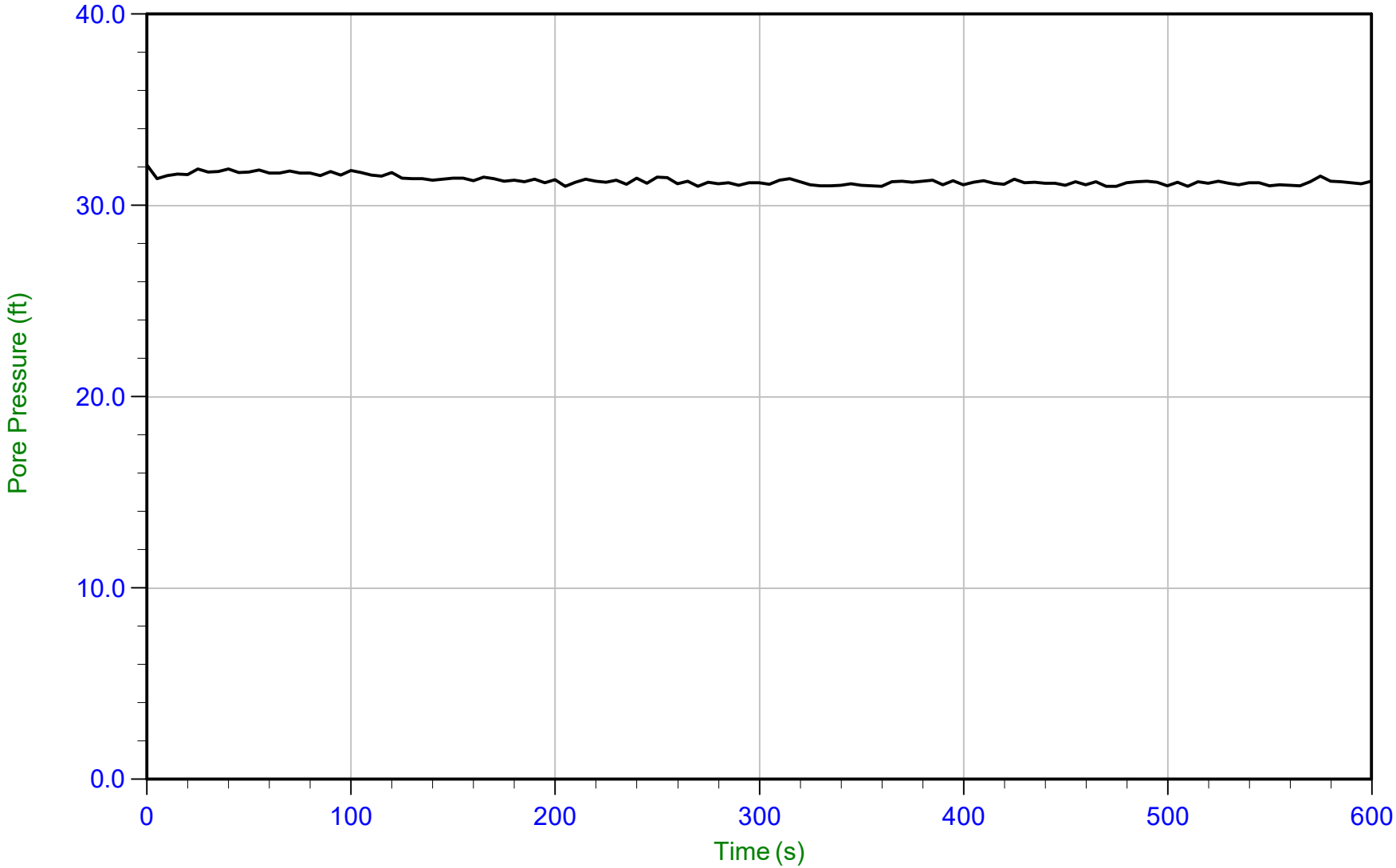
U Min: 110.3 ft
U Max: 127.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 16.850 m / 55.281 ft
Duration: 600.0 s

U Min: 31.0 ft
U Max: 32.1 ft

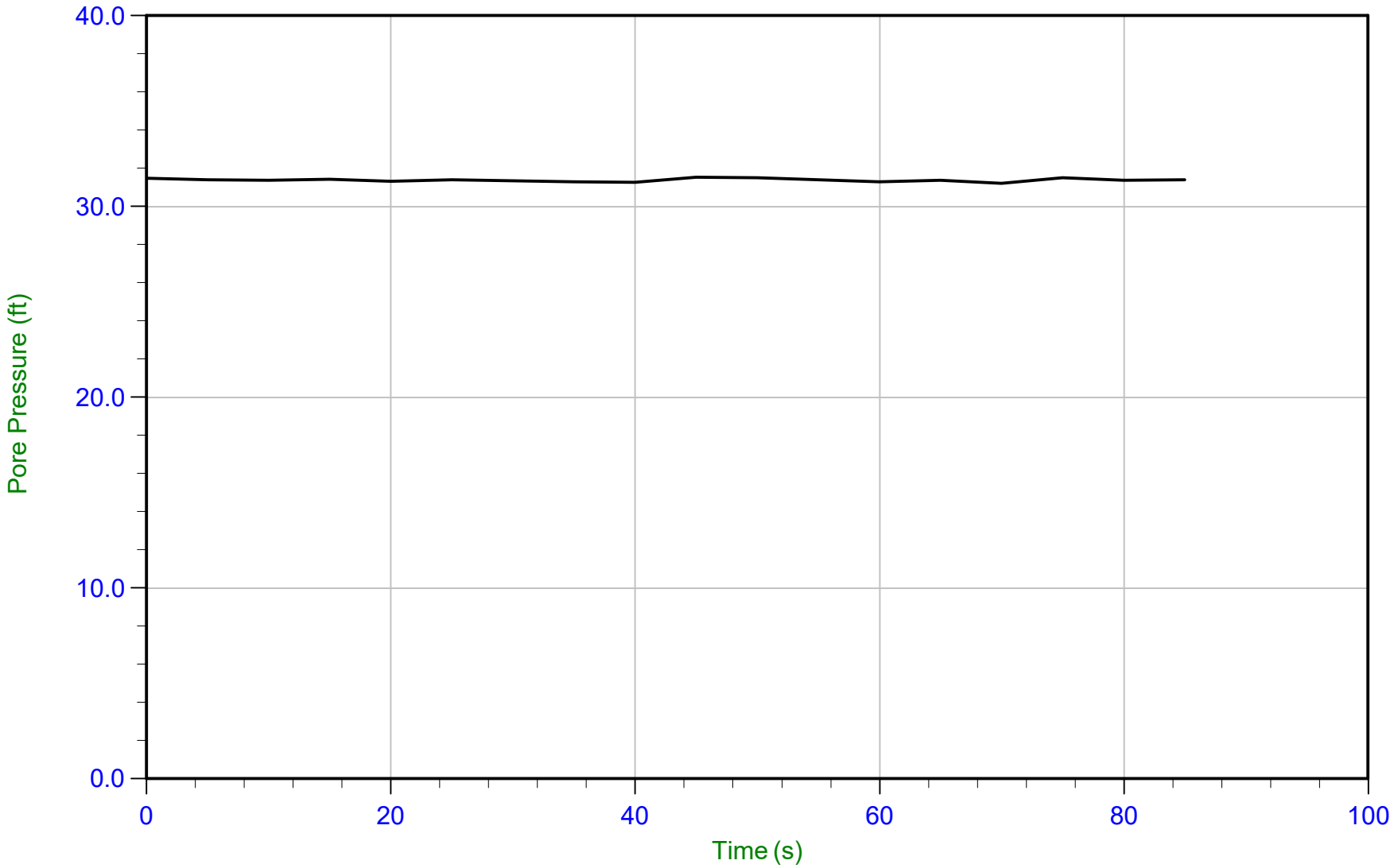
WT: 7.367 m / 24.170 ft
Ueq: 31.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 17.050 m / 55.938 ft
Duration: 85.0 s

U Min: 31.2 ft
U Max: 31.5 ft

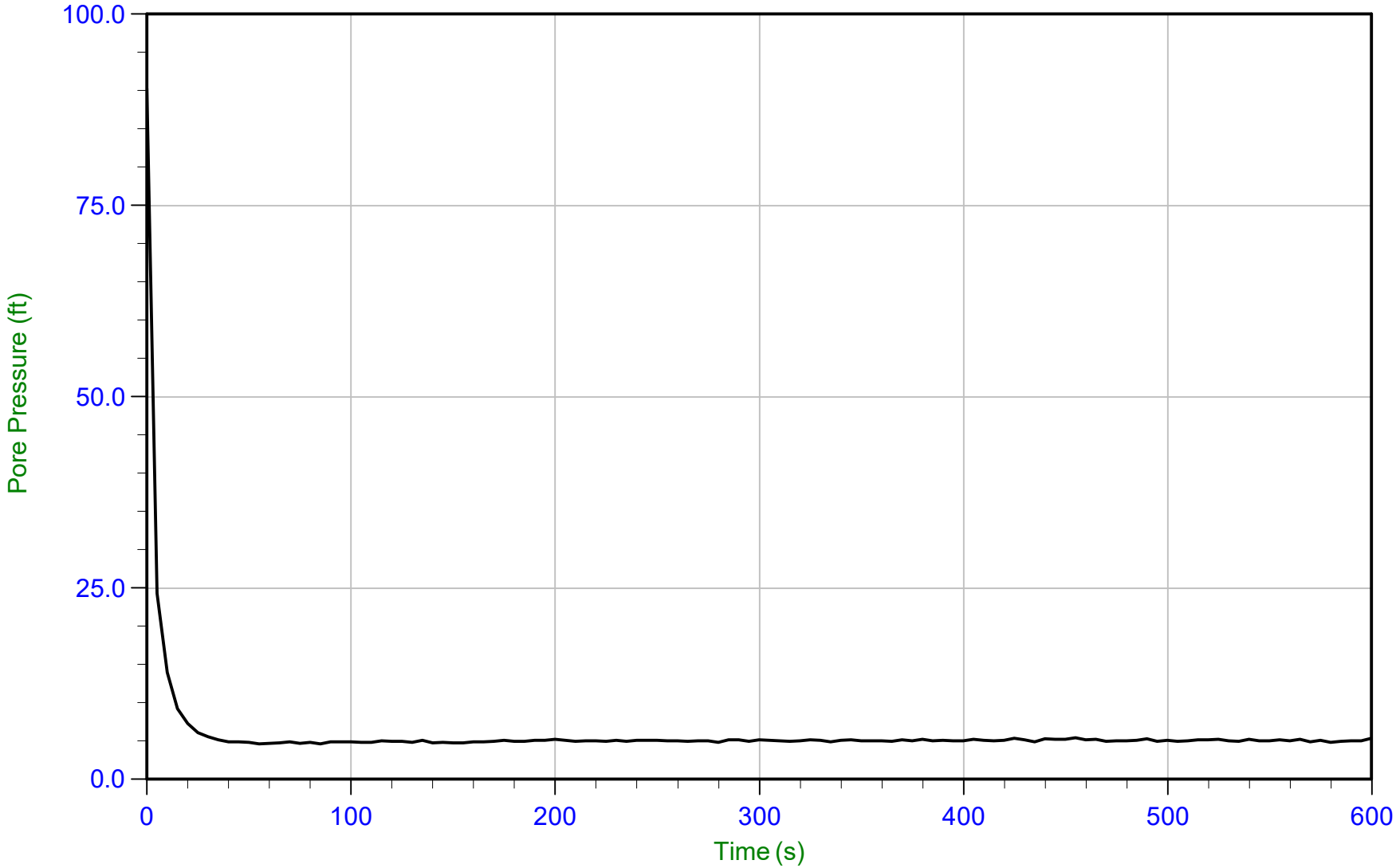
WT: 7.525 m / 24.688 ft
Ueq: 31.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:13:53
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP19.PPD
Depth: 3.600 m / 11.811 ft
Duration: 600.0 s

U Min: 4.7 ft
U Max: 90.3 ft

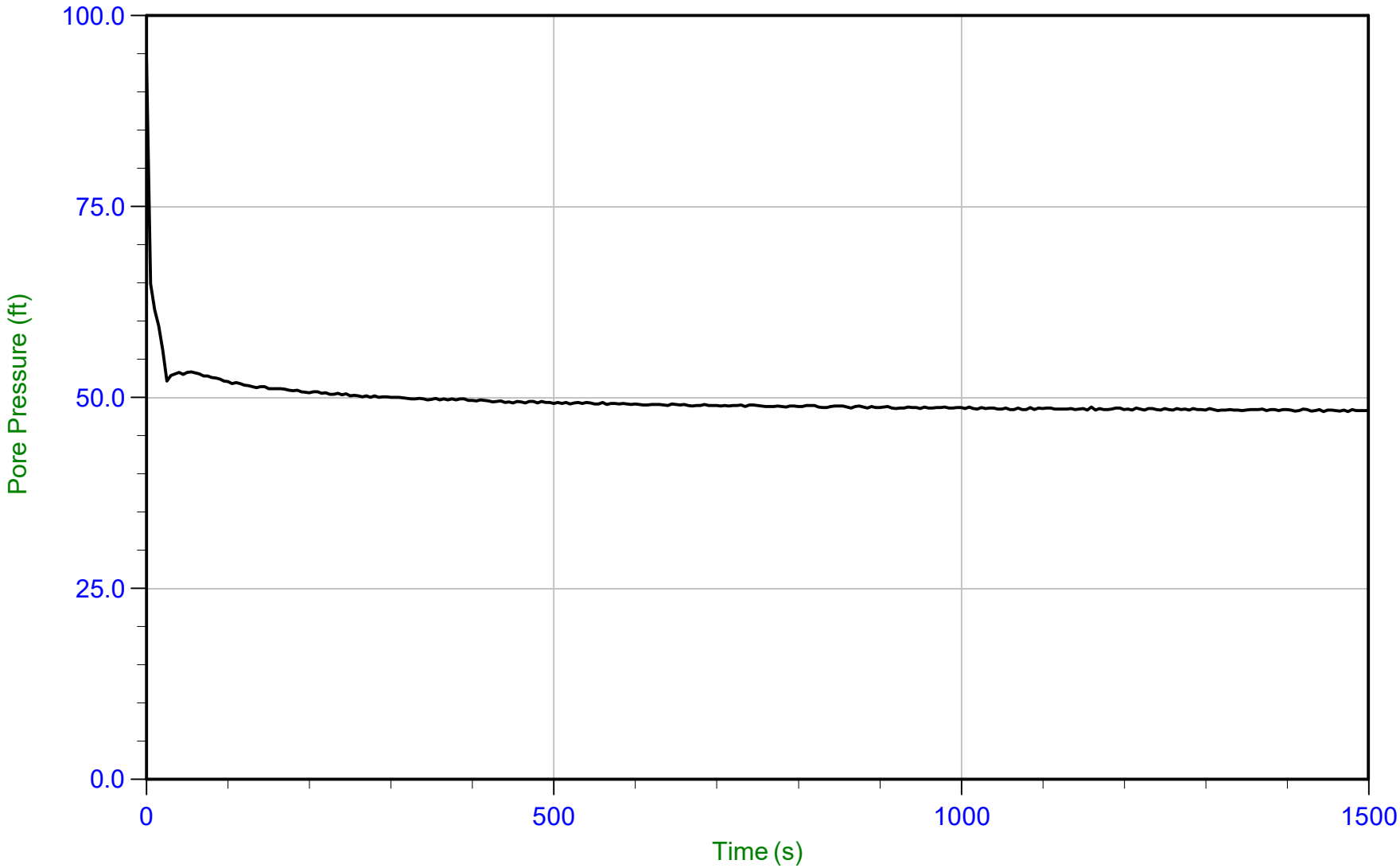
WT: 1.983 m / 6.506 ft
Ueq: 5.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:13:53
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP19.PPD
Depth: 16.300 m / 53.477 ft
Duration: 1500.0 s

U Min: 48.2 ft
U Max: 94.2 ft

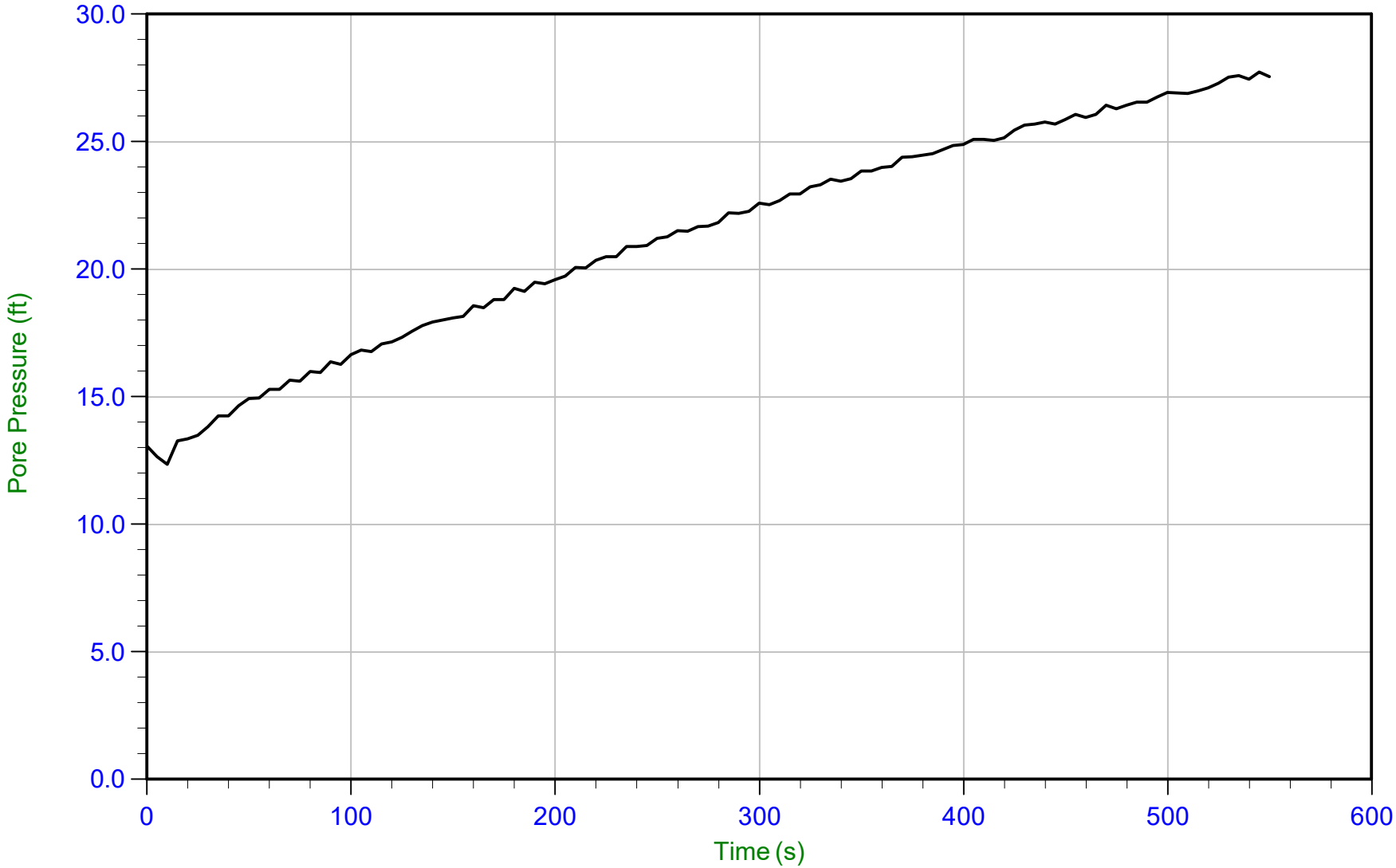
WT: 1.620 m / 5.315 ft
Ueq: 48.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 4.250 m / 13.943 ft
Duration: 550.0 s

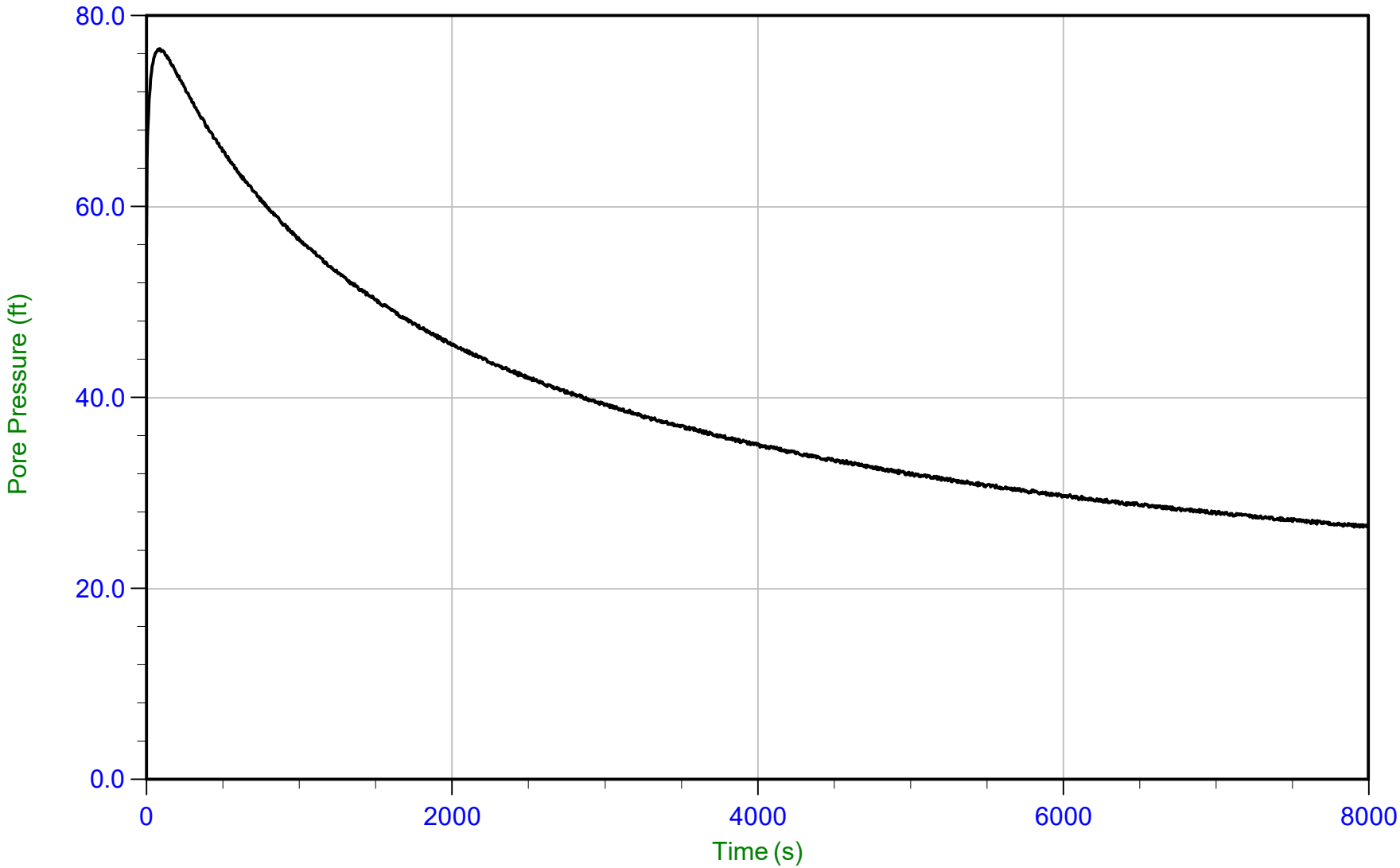
U Min: 12.4 ft
U Max: 27.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 7.150 m / 23.458 ft
Duration: 8000.0 s

U Min: 26.4 ft
U Max: 76.5 ft

WT: 3.962 m / 13.000 ft
Ueq: 10.5 ft
U(50): 43.50 ft

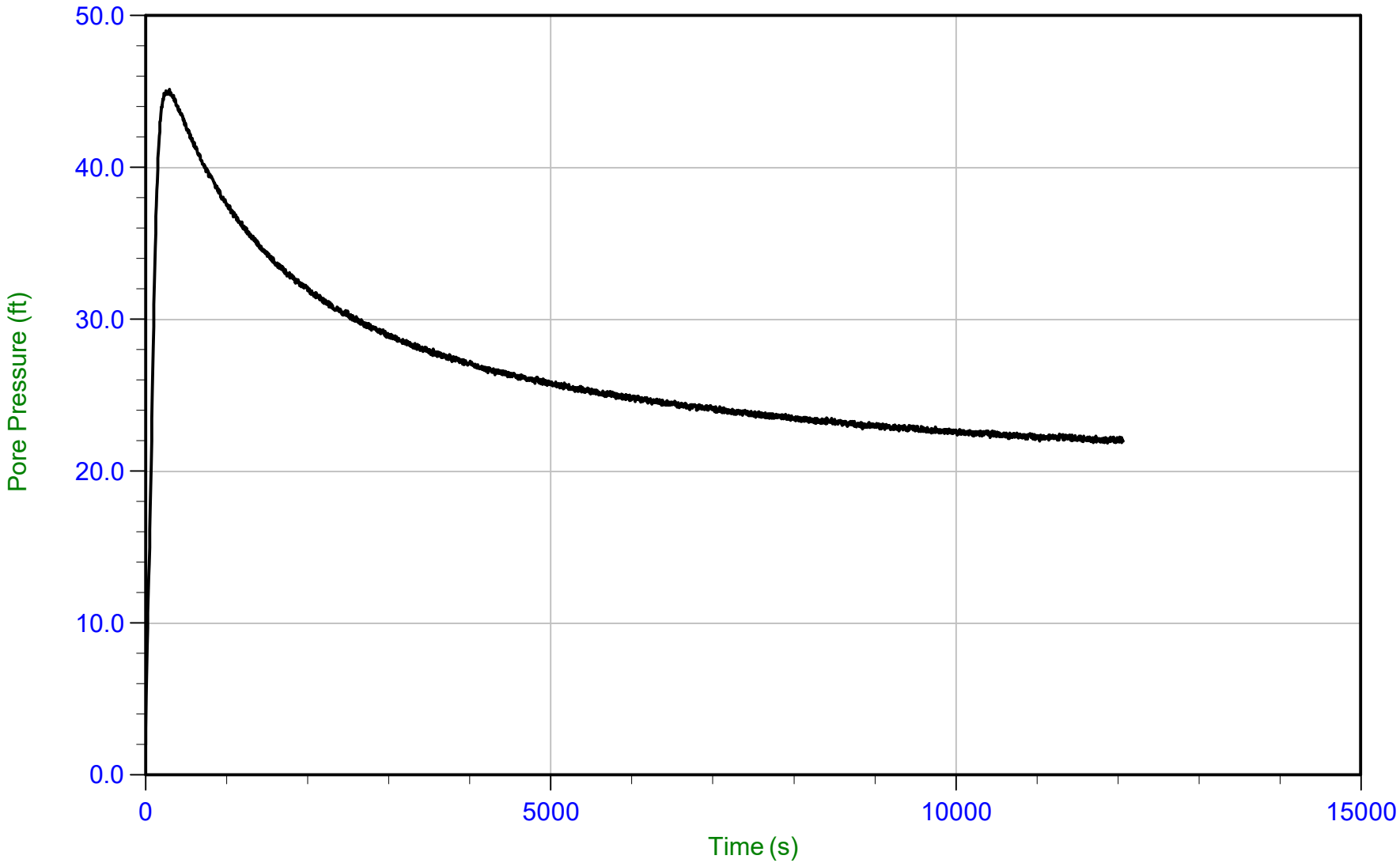
T(50): 2190.1 s
Ir: 100
Ch: 0.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 10.250 m / 33.628 ft
Duration: 12070.0 s

U Min: 2.0 ft
U Max: 45.1 ft

WT: 3.962 m / 13.000 ft
Ueq: 20.6 ft
U(50): 32.88 ft

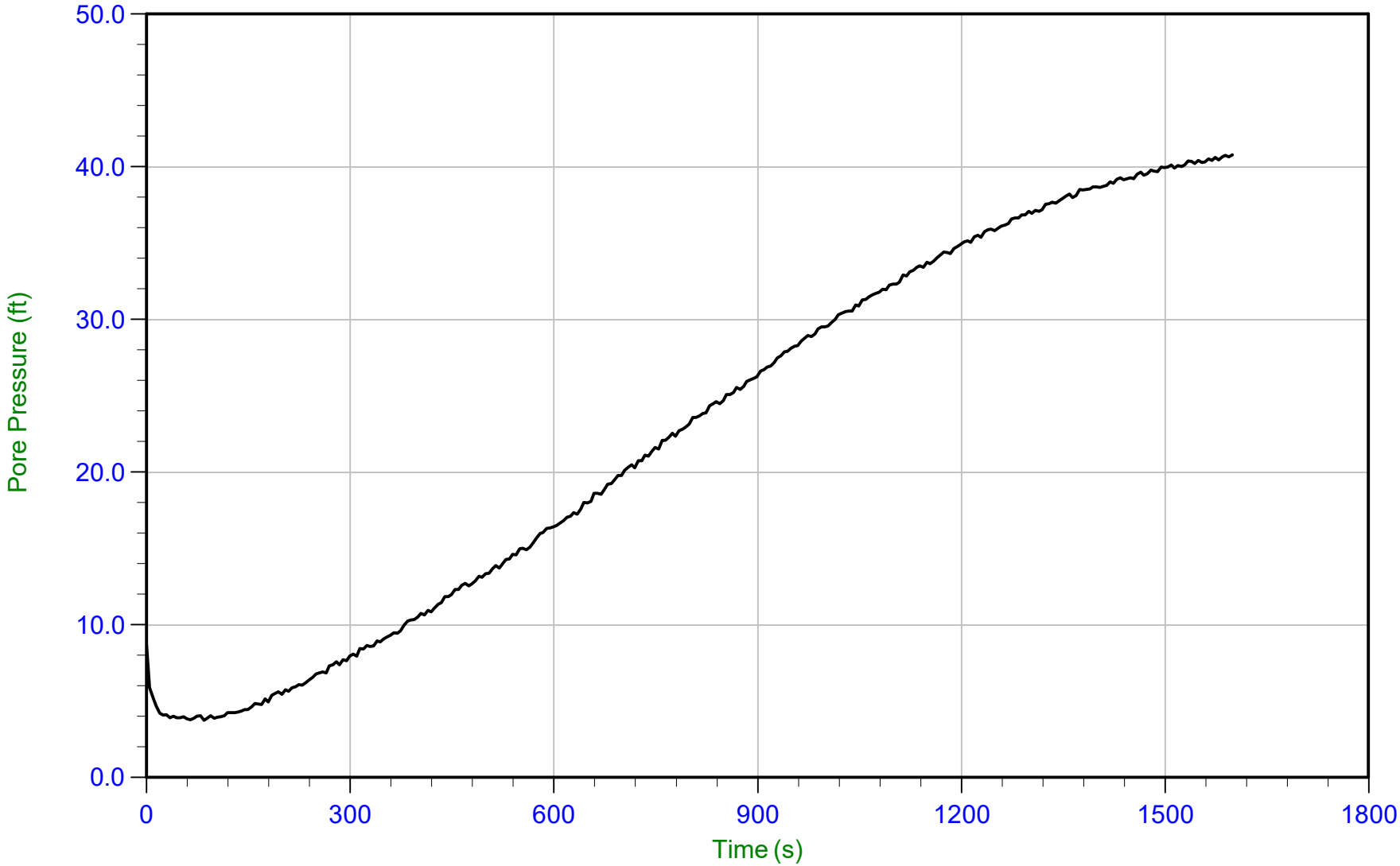
T(50): 1449.3 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 14.750 m / 48.392 ft
Duration: 1600.0 s

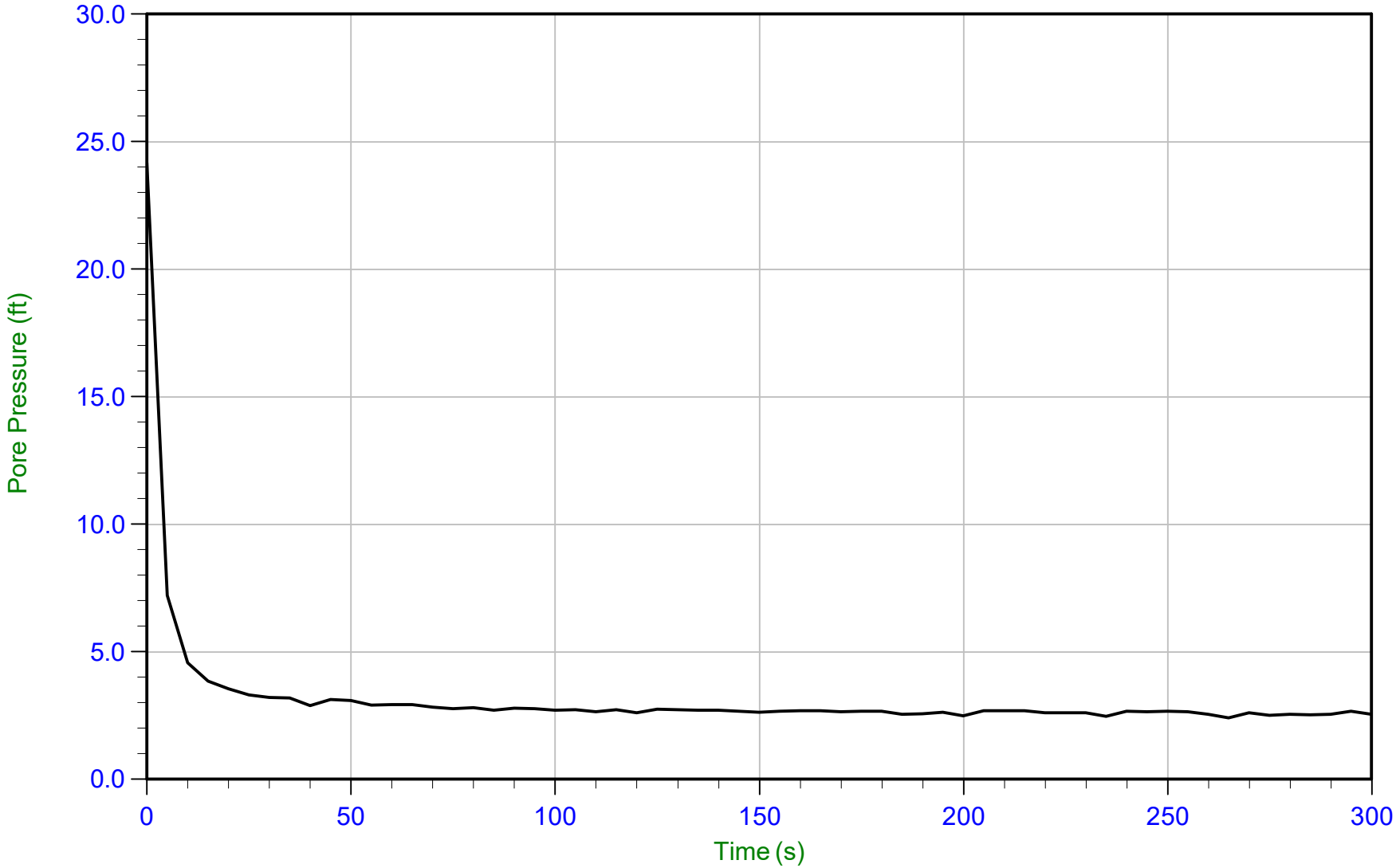
U Min: 3.8 ft
U Max: 40.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 2.600 m / 8.530 ft
Duration: 300.0 s

U Min: 2.4 ft
U Max: 24.2 ft

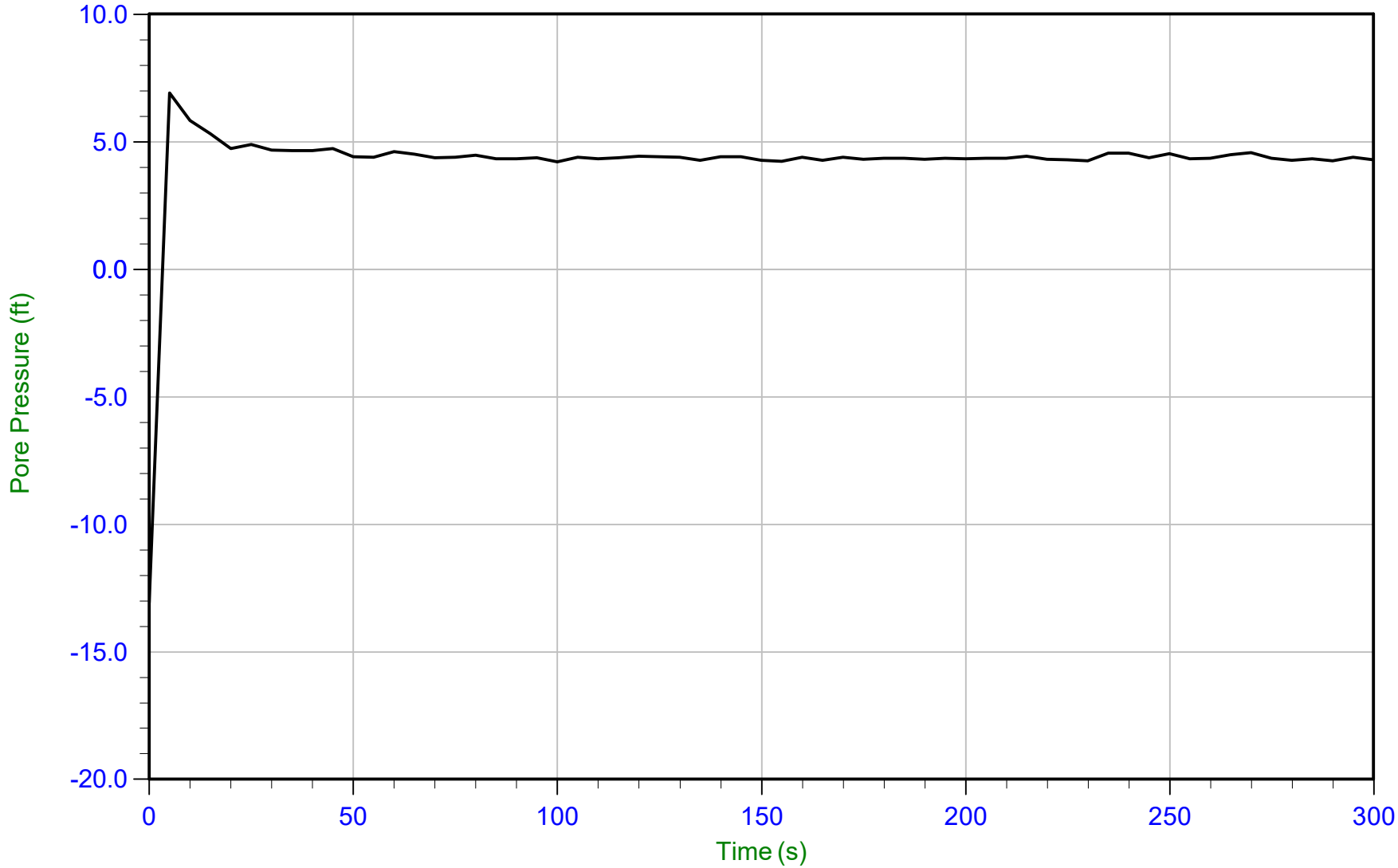
WT: 1.870 m / 6.135 ft
Ueq: 2.4 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 3.350 m / 10.991 ft
Duration: 300.0 s

U Min: -13.1 ft
U Max: 6.9 ft

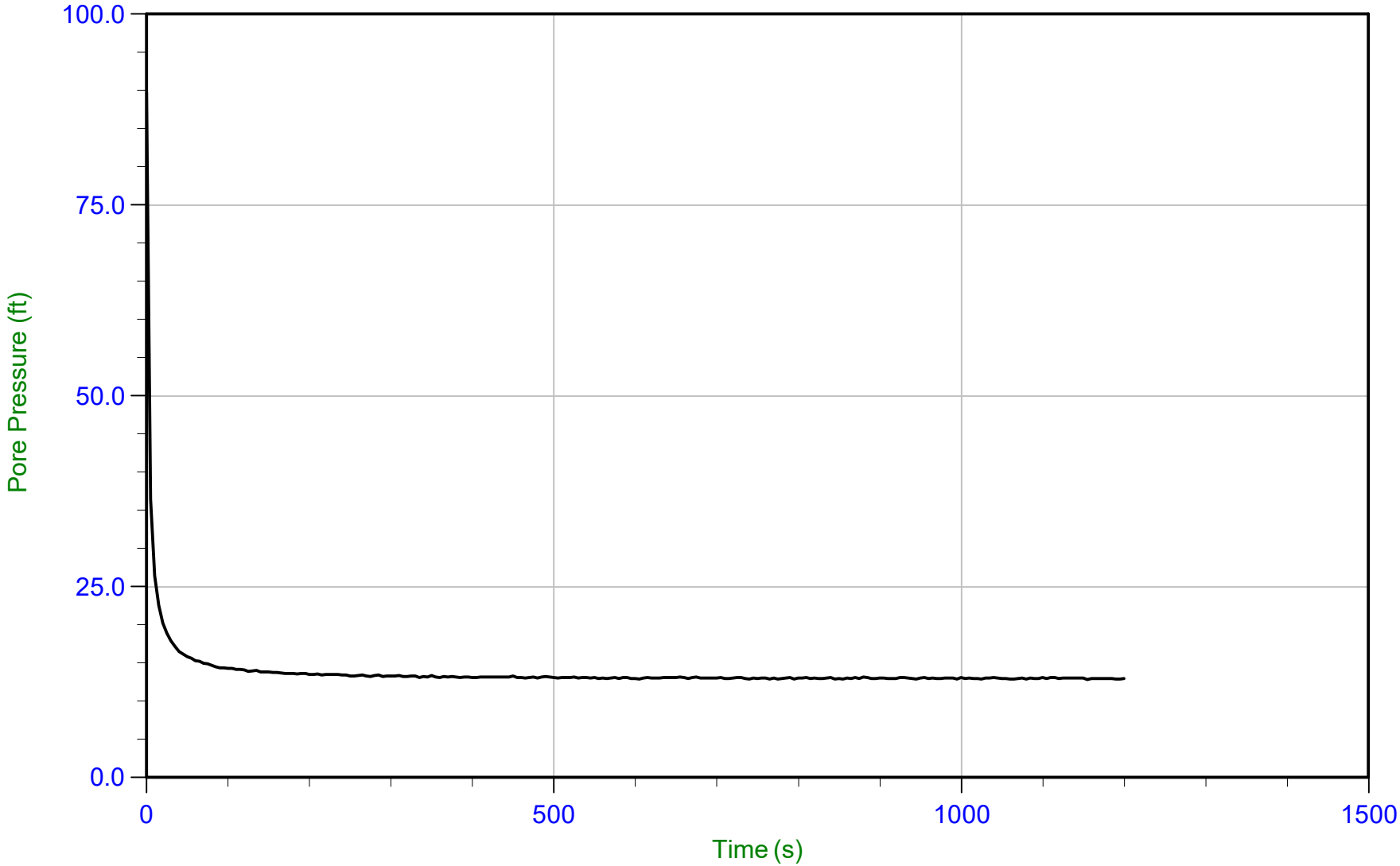
WT: 2.048 m / 6.719 ft
Ueq: 4.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 6.000 m / 19.685 ft
Duration: 1200.0 s

U Min: 12.8 ft
U Max: 89.8 ft

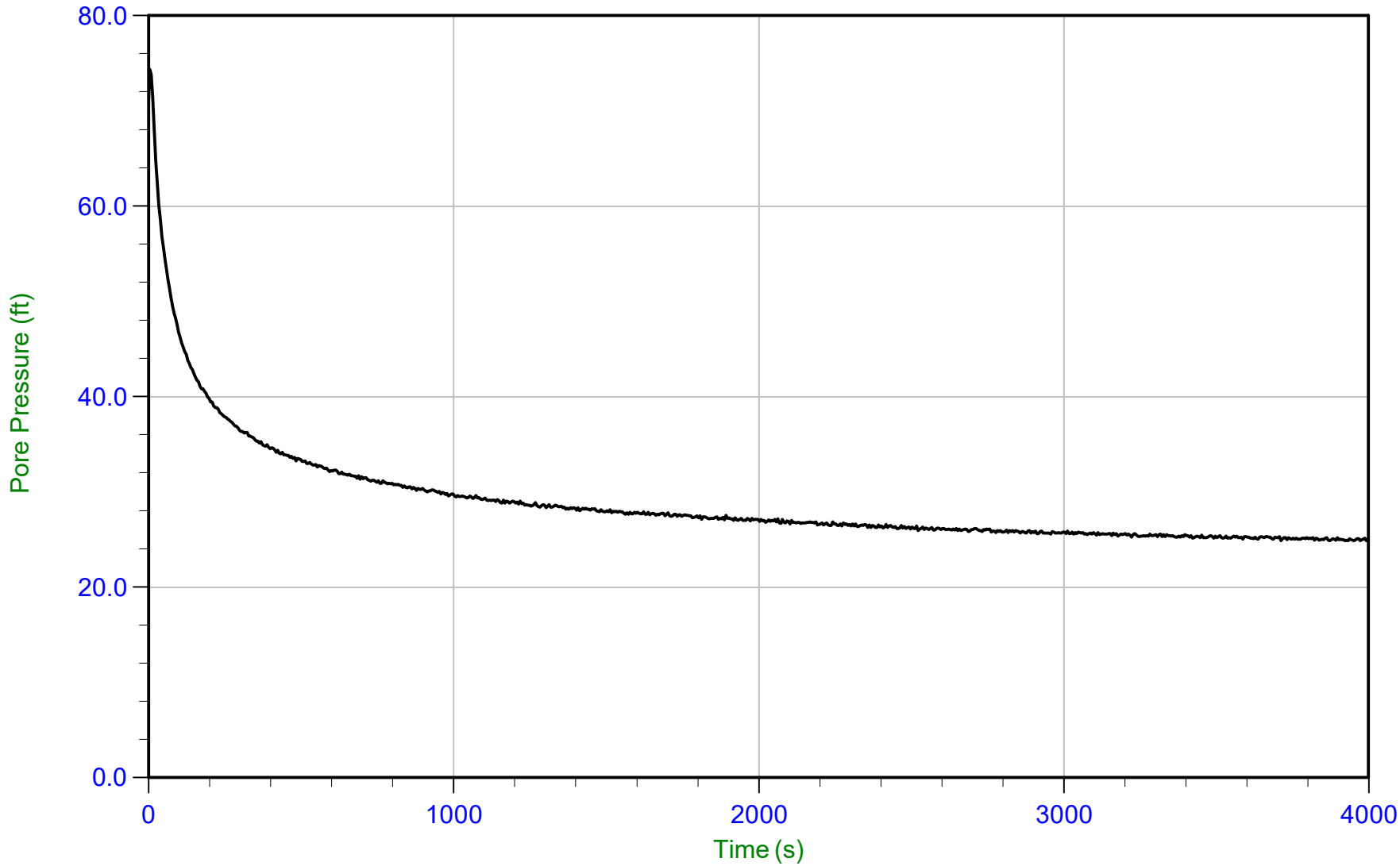
WT: 2.084 m / 6.837 ft
Ueq: 12.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 11.850 m / 38.877 ft
Duration: 4000.0 s

U Min: 24.9 ft
U Max: 74.4 ft

WT: 4.589 m / 15.056 ft
Ueq: 23.8 ft
U(50): 49.09 ft

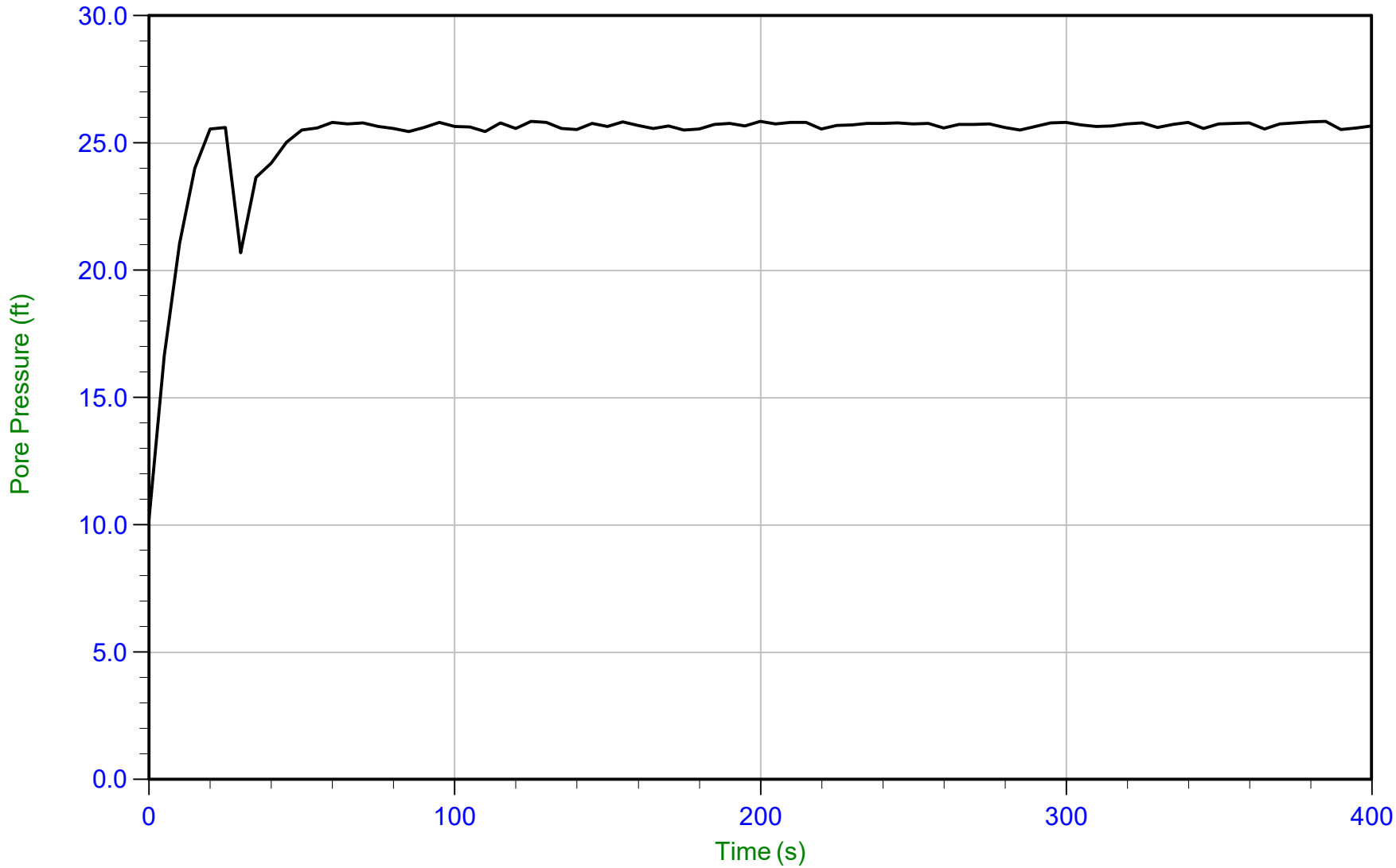
T(50): 77.9 s
Ir: 100
Ch: 9.0 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 12.400 m / 40.682 ft
Duration: 400.0 s

U Min: 10.2 ft
U Max: 25.9 ft

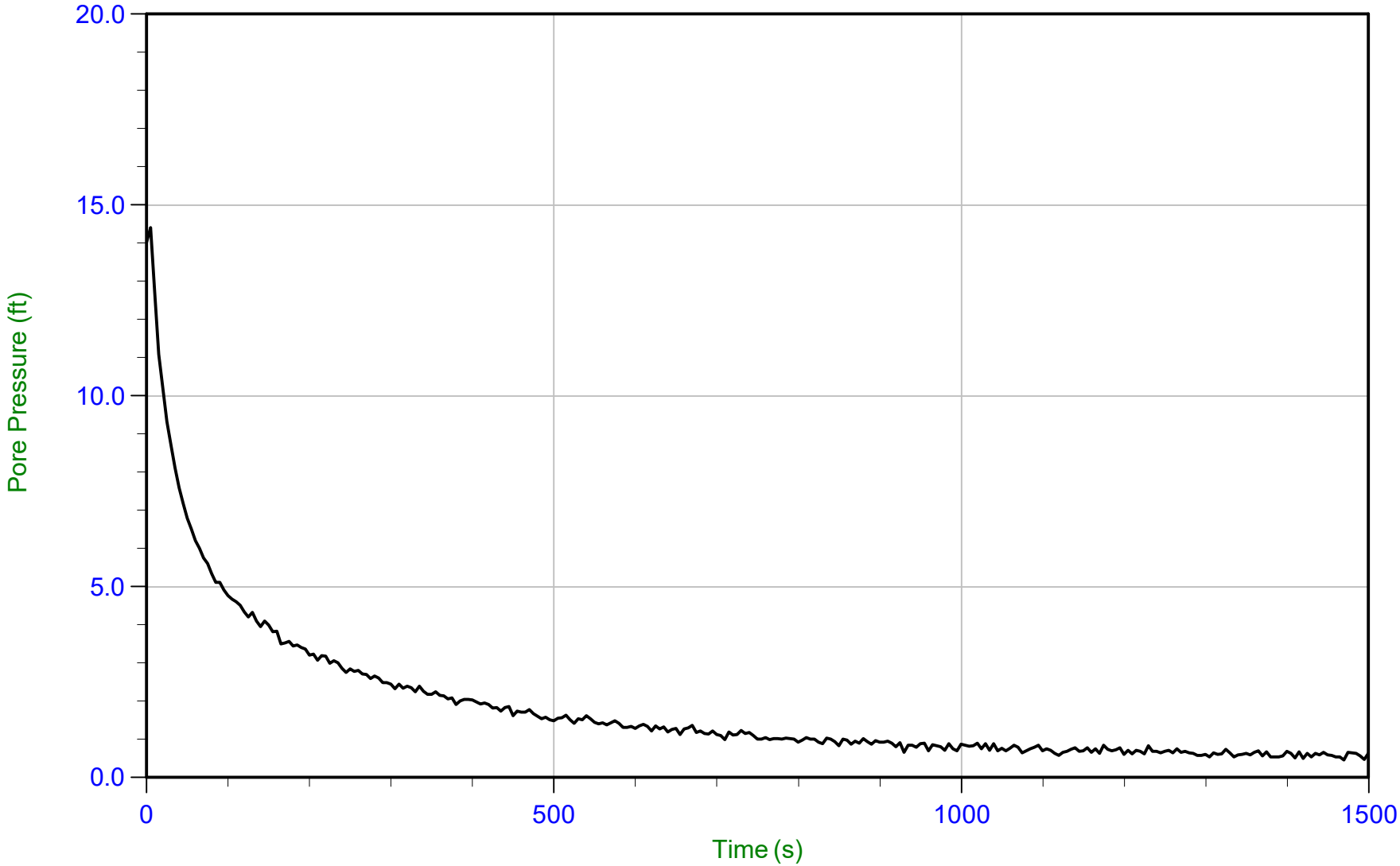
WT: 4.589 m / 15.056 ft
Ueq: 25.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 2.000 m / 6.562 ft
Duration: 1500.0 s

U Min: 0.5 ft
U Max: 14.4 ft

WT: 1.826 m / 5.991 ft
Ueq: 0.6 ft
U(50): 7.49 ft

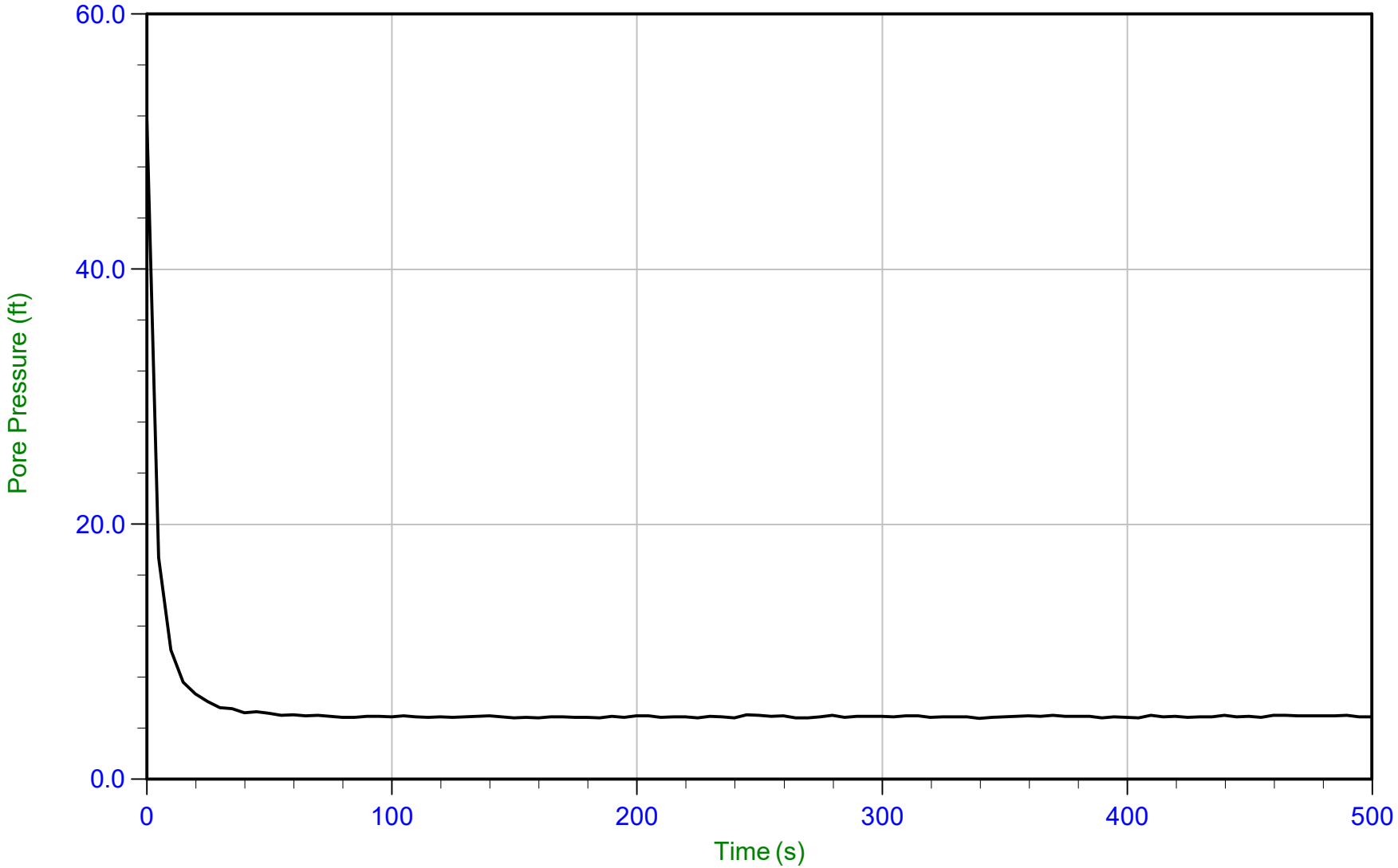
T(50): 36.3 s
Ir: 100
Ch: 19.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 3.350 m / 10.991 ft
Duration: 500.0 s

U Min: 4.8 ft
U Max: 51.7 ft

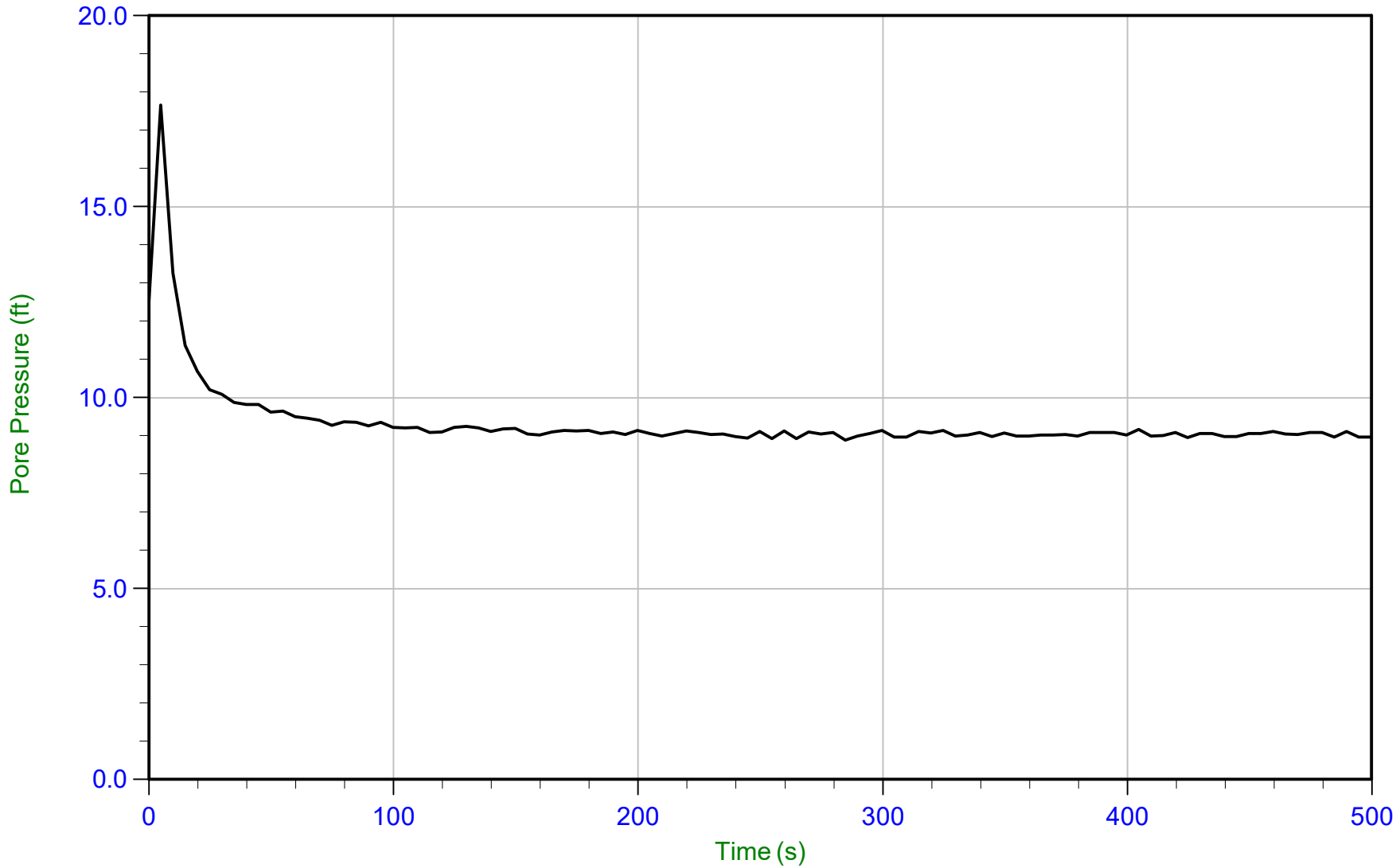
WT: 1.826 m / 5.991 ft
Ueq: 5.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 4.600 m / 15.092 ft
Duration: 500.0 s

U Min: 8.9 ft
U Max: 17.7 ft

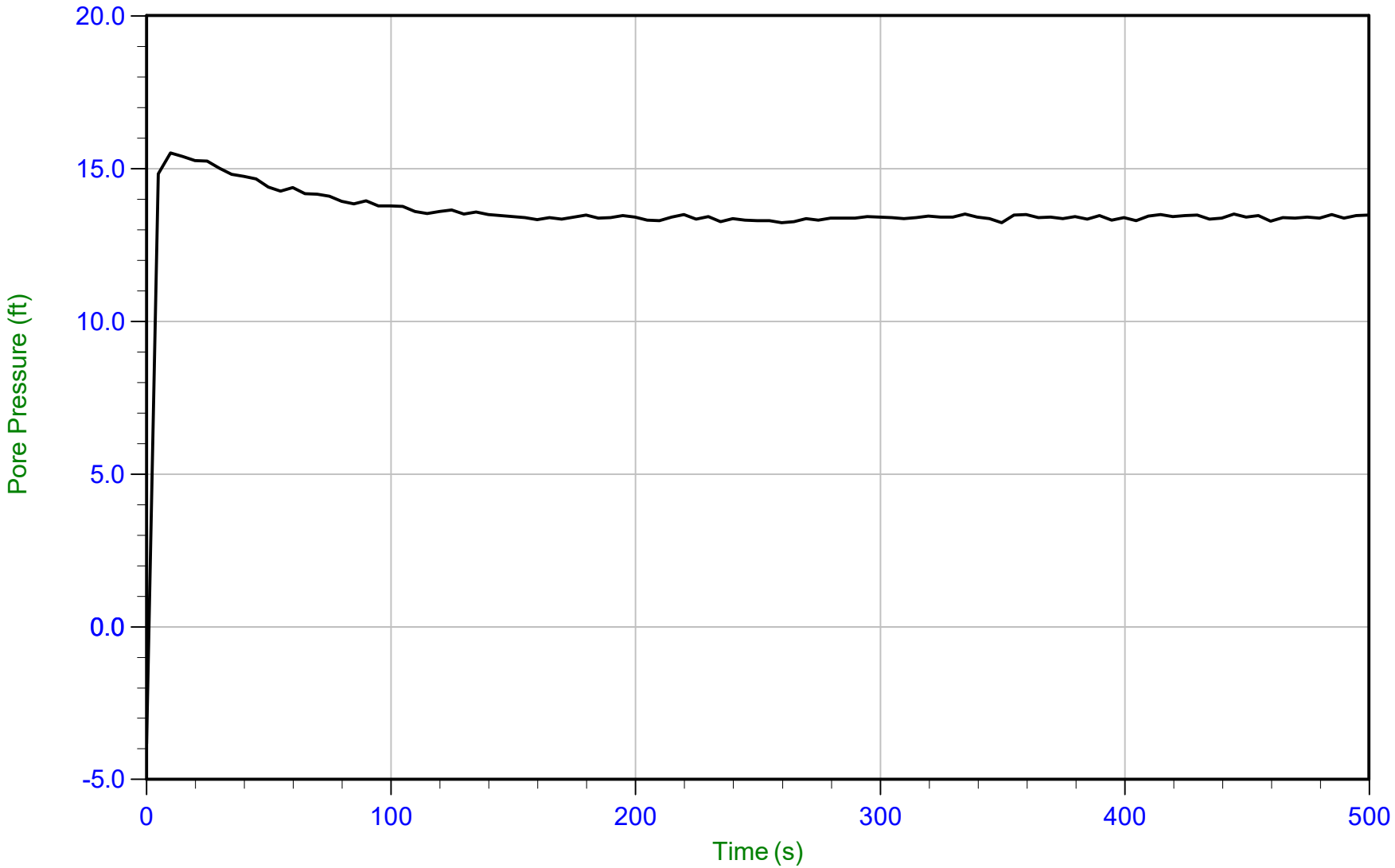
WT: 1.848 m / 6.063 ft
Ueq: 9.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 6.100 m / 20.013 ft
Duration: 500.0 s

U Min: -3.8 ft
U Max: 15.5 ft

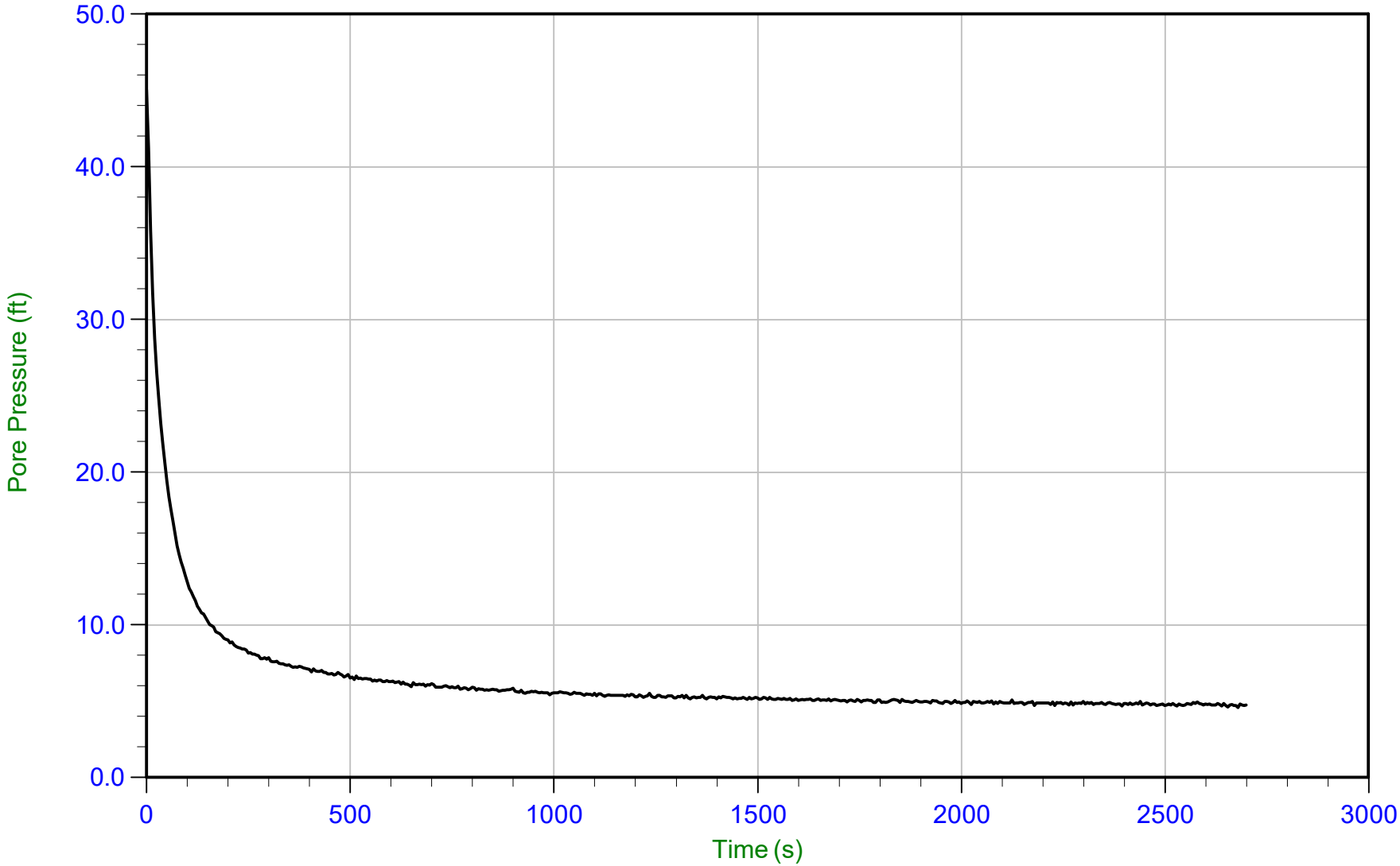
WT: 1.962 m / 6.437 ft
Ueq: 13.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 3.350 m / 10.991 ft
Duration: 2700.0 s

U Min: 4.6 ft
U Max: 45.1 ft

WT: 2.191 m / 7.188 ft
Ueq: 3.8 ft
U(50): 24.43 ft

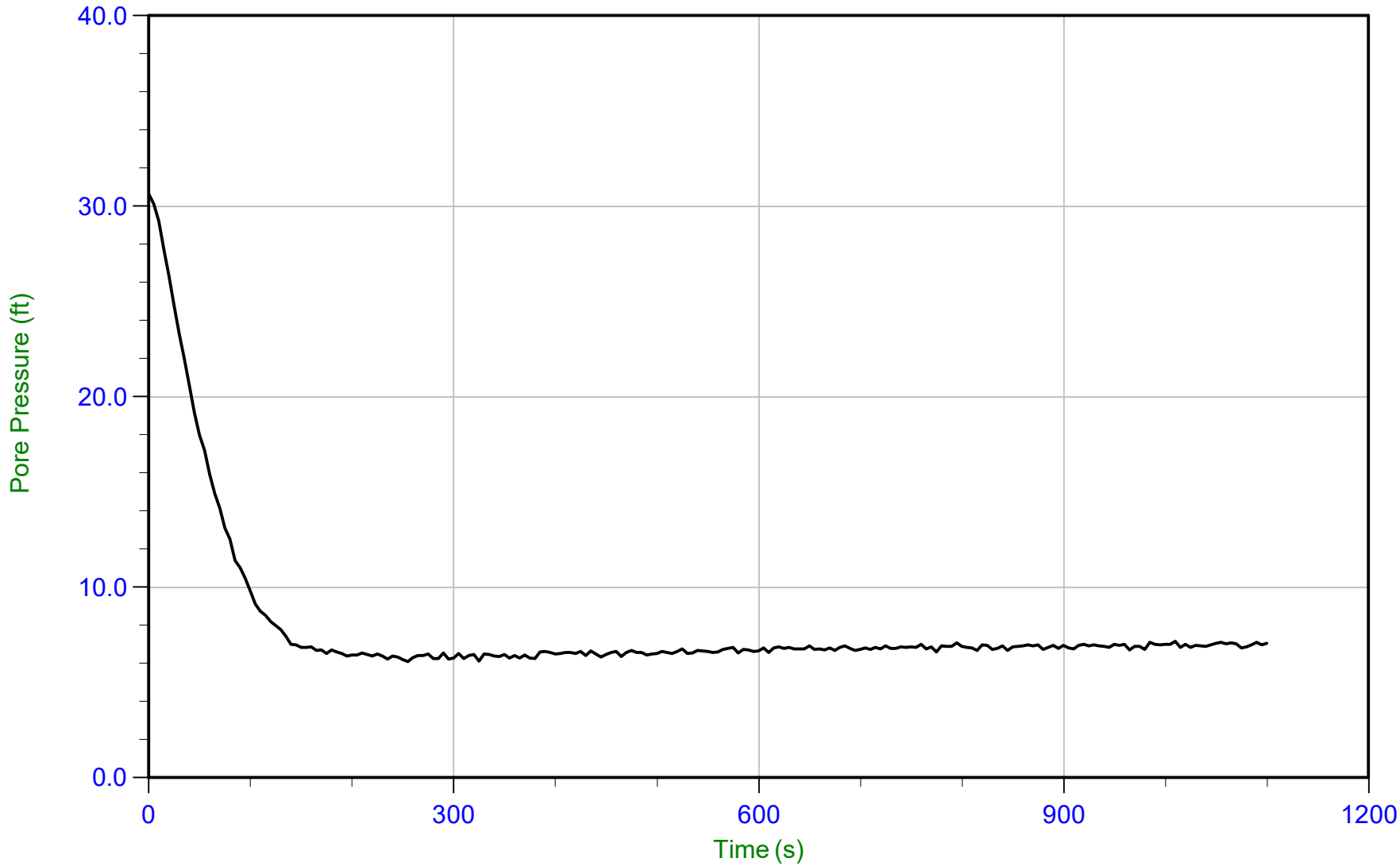
T(50): 31.2 s
Ir: 100
Ch: 22.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 4.350 m / 14.271 ft
Duration: 1100.0 s

U Min: 6.1 ft
U Max: 30.7 ft

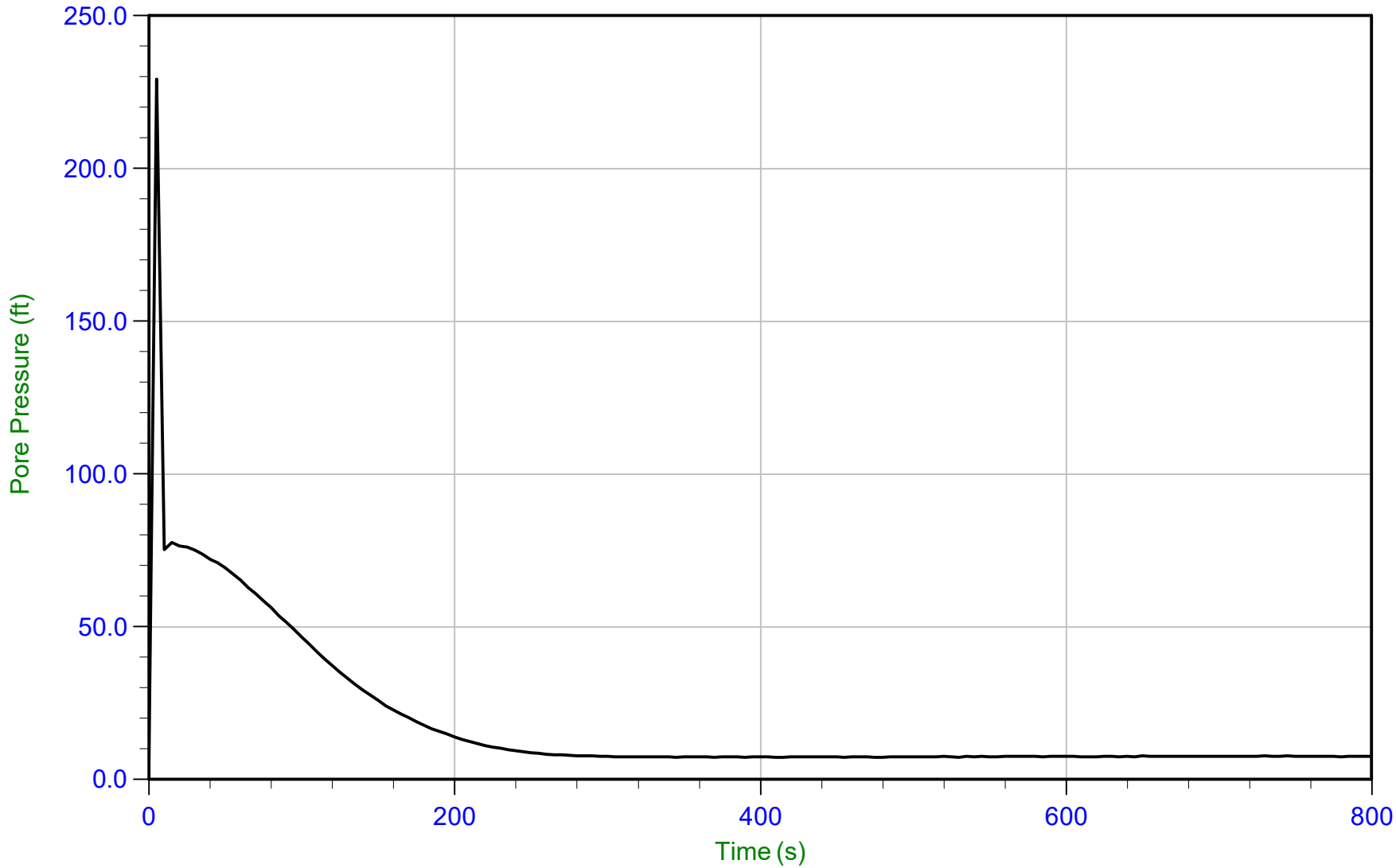
WT: 2.191 m / 7.188 ft
Ueq: 7.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 14:00:29
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26B.PPD
Depth: 4.450 m / 14.600 ft
Duration: 800.0 s

U Min: 7.3 ft
U Max: 229.3 ft

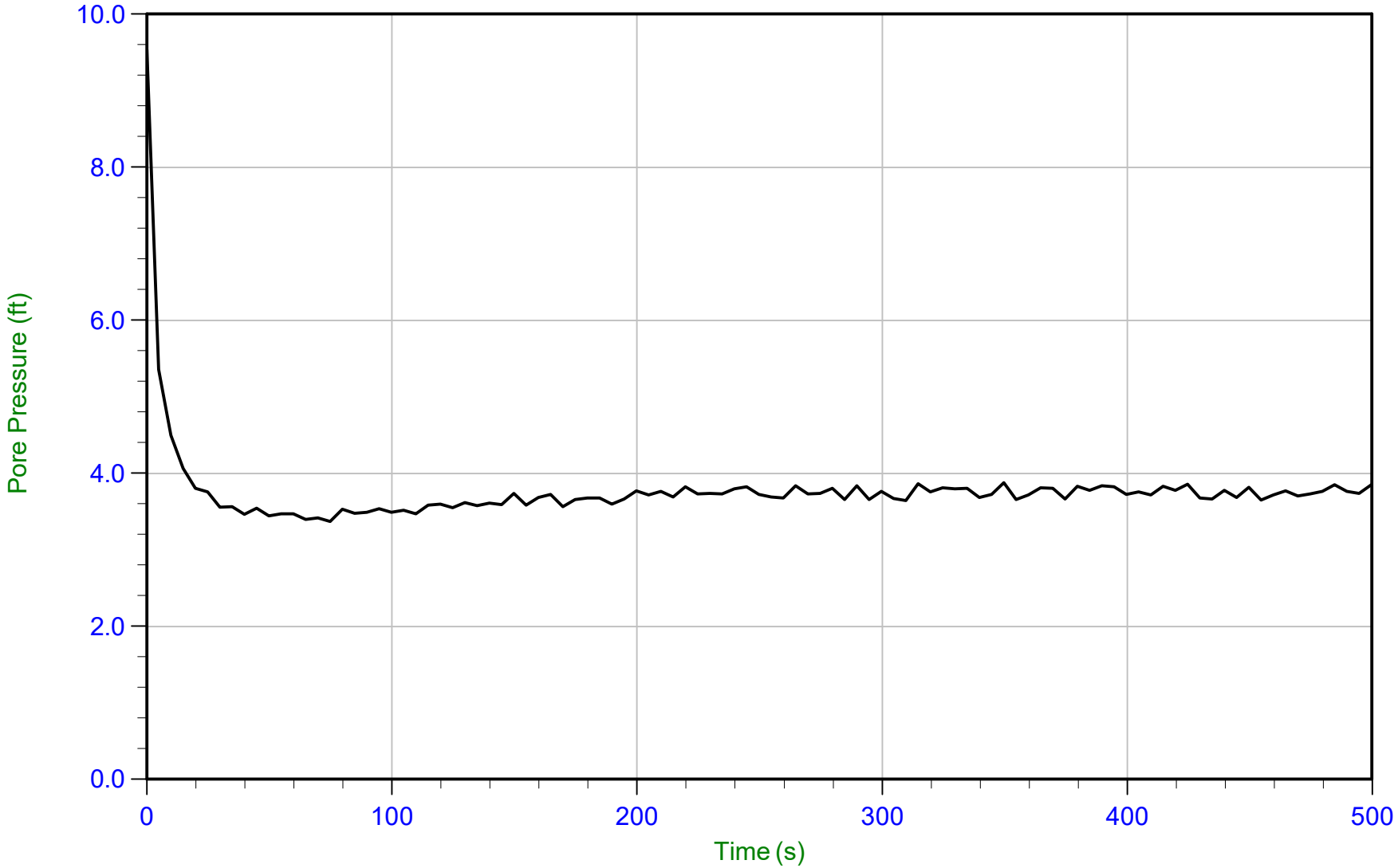
WT: 2.069 m / 6.788 ft
Ueq: 7.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 3.400 m / 11.155 ft
Duration: 500.0 s

U Min: 3.4 ft
U Max: 9.5 ft

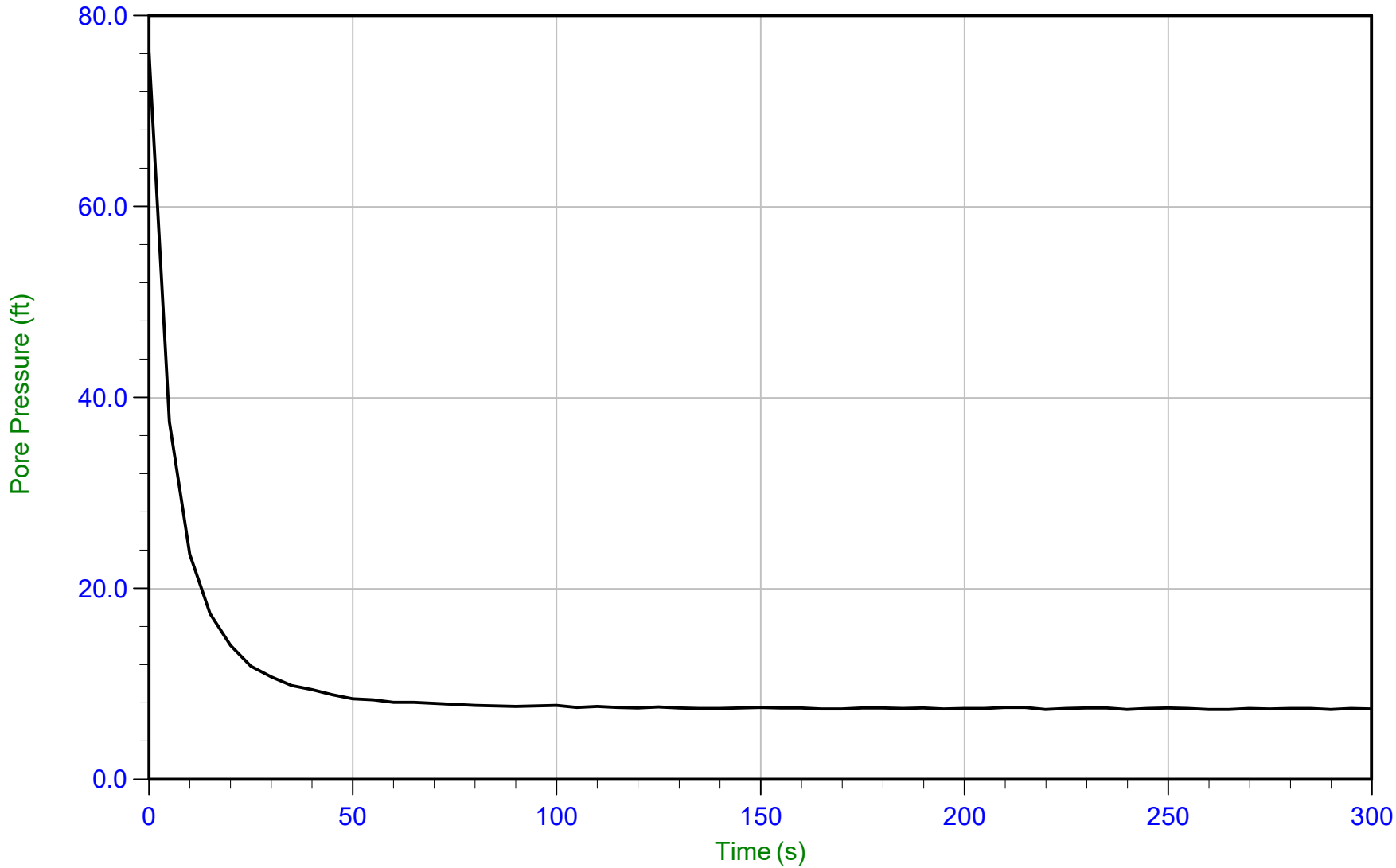
WT: 2.257 m / 7.405 ft
Ueq: 3.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

U Min: 7.3 ft
U Max: 76.2 ft

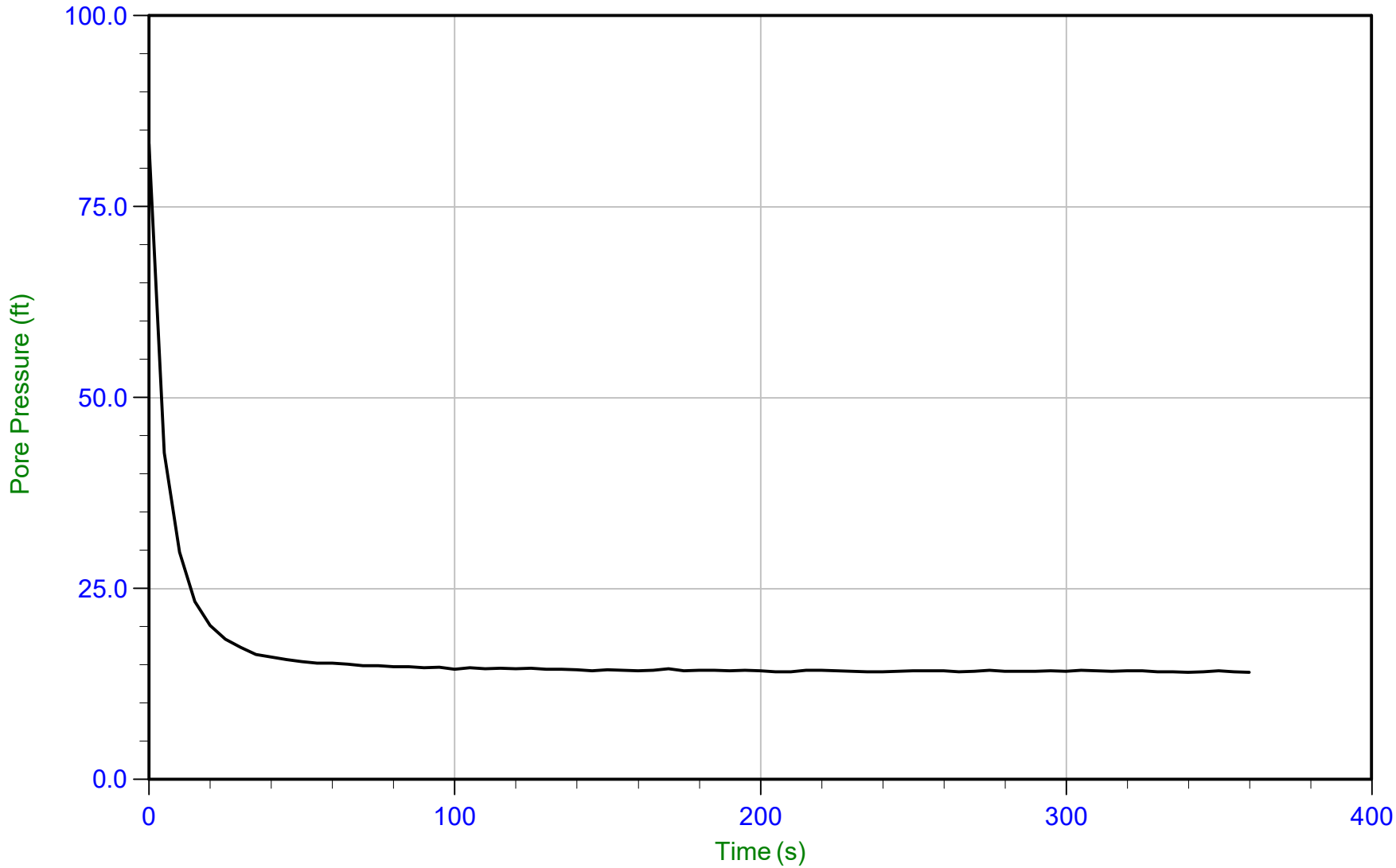
WT: 2.064 m / 6.772 ft
Ueq: 7.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 6.400 m / 20.997 ft
Duration: 360.0 s

U Min: 14.0 ft
U Max: 83.3 ft

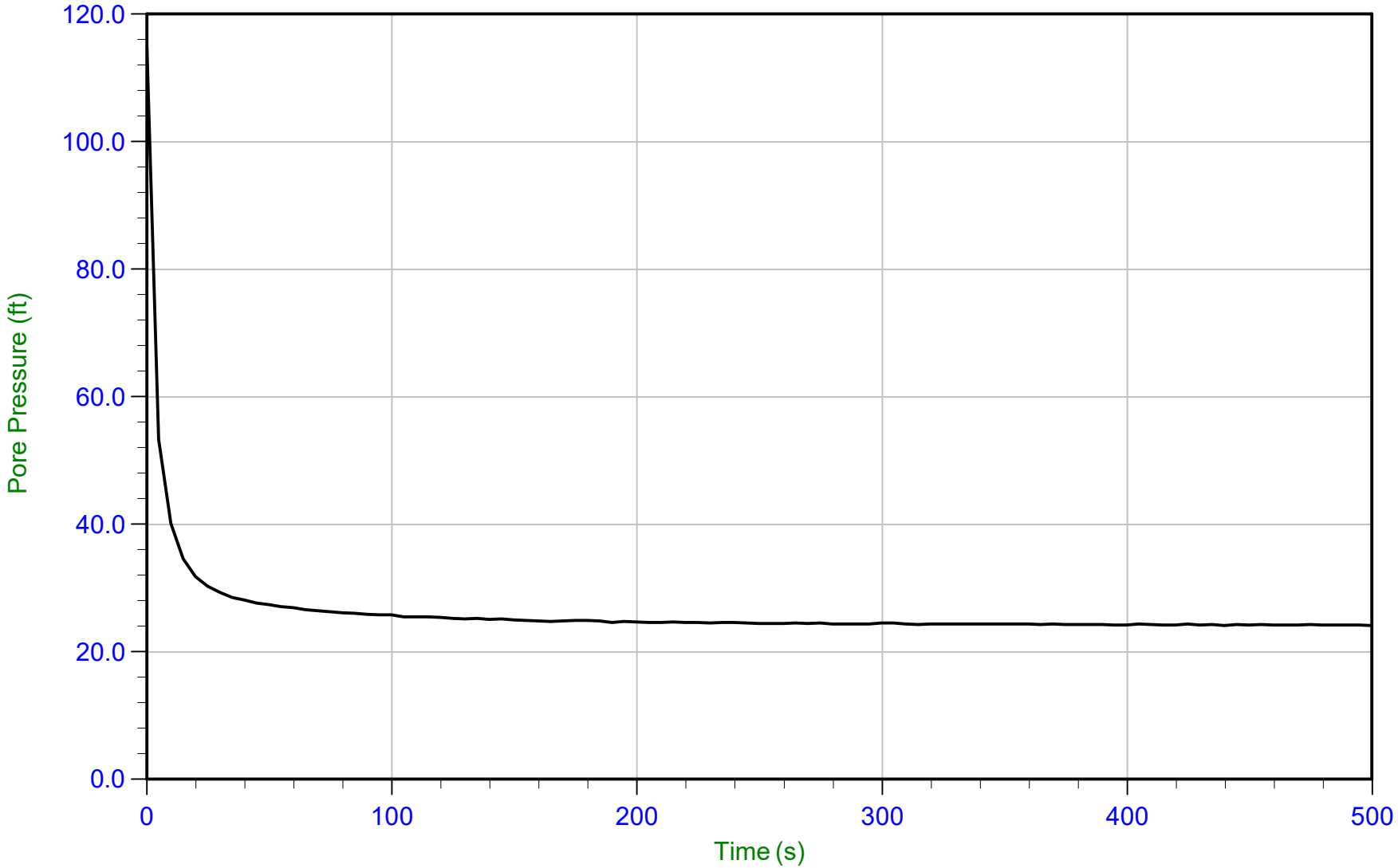
WT: 2.061 m / 6.762 ft
Ueq: 14.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 9.400 m / 30.840 ft
Duration: 500.0 s

U Min: 24.1 ft
U Max: 114.9 ft

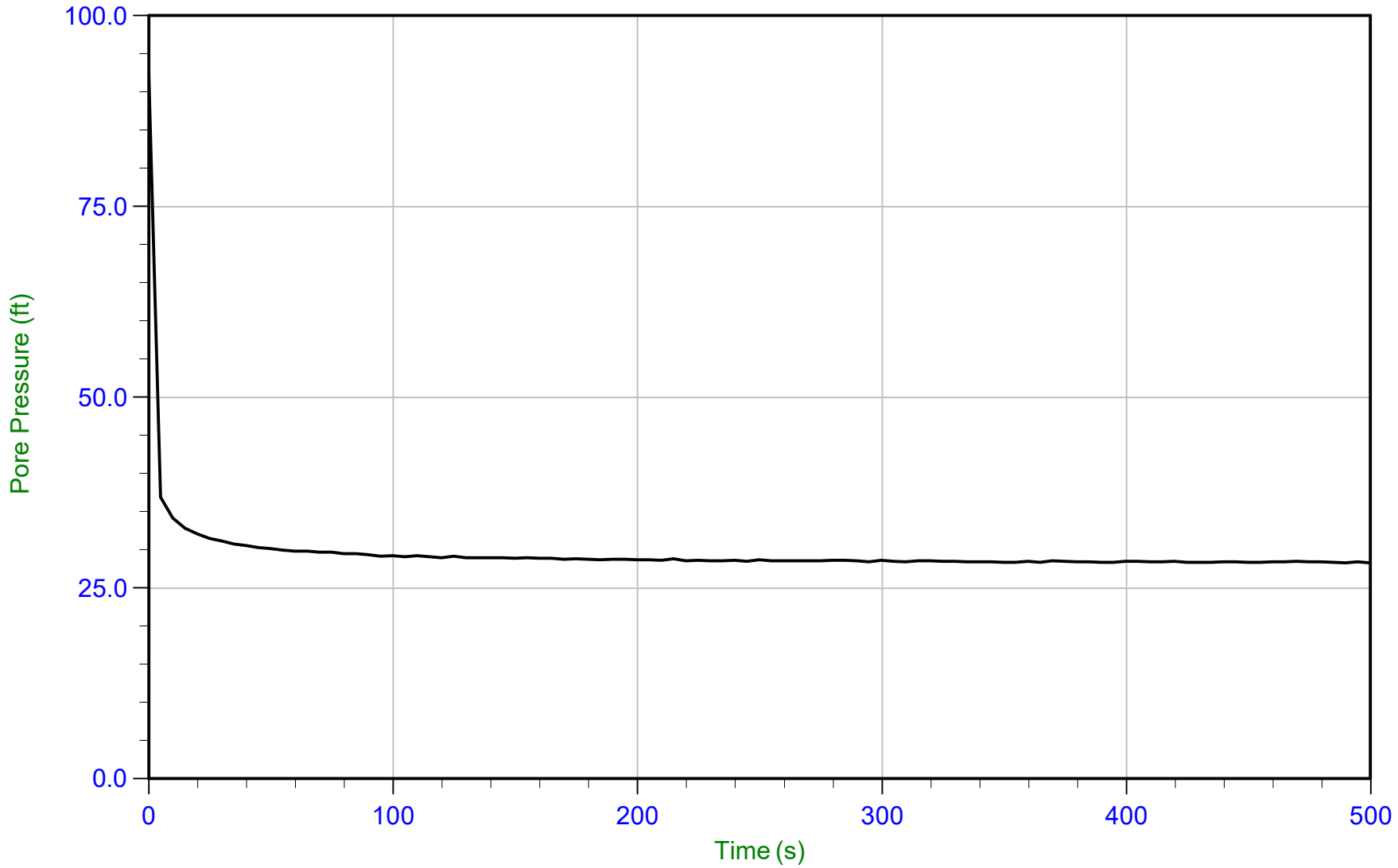
WT: 2.034 m / 6.673 ft
Ueq: 24.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 10.700 m / 35.105 ft
Duration: 500.0 s

U Min: 28.3 ft
U Max: 92.0 ft

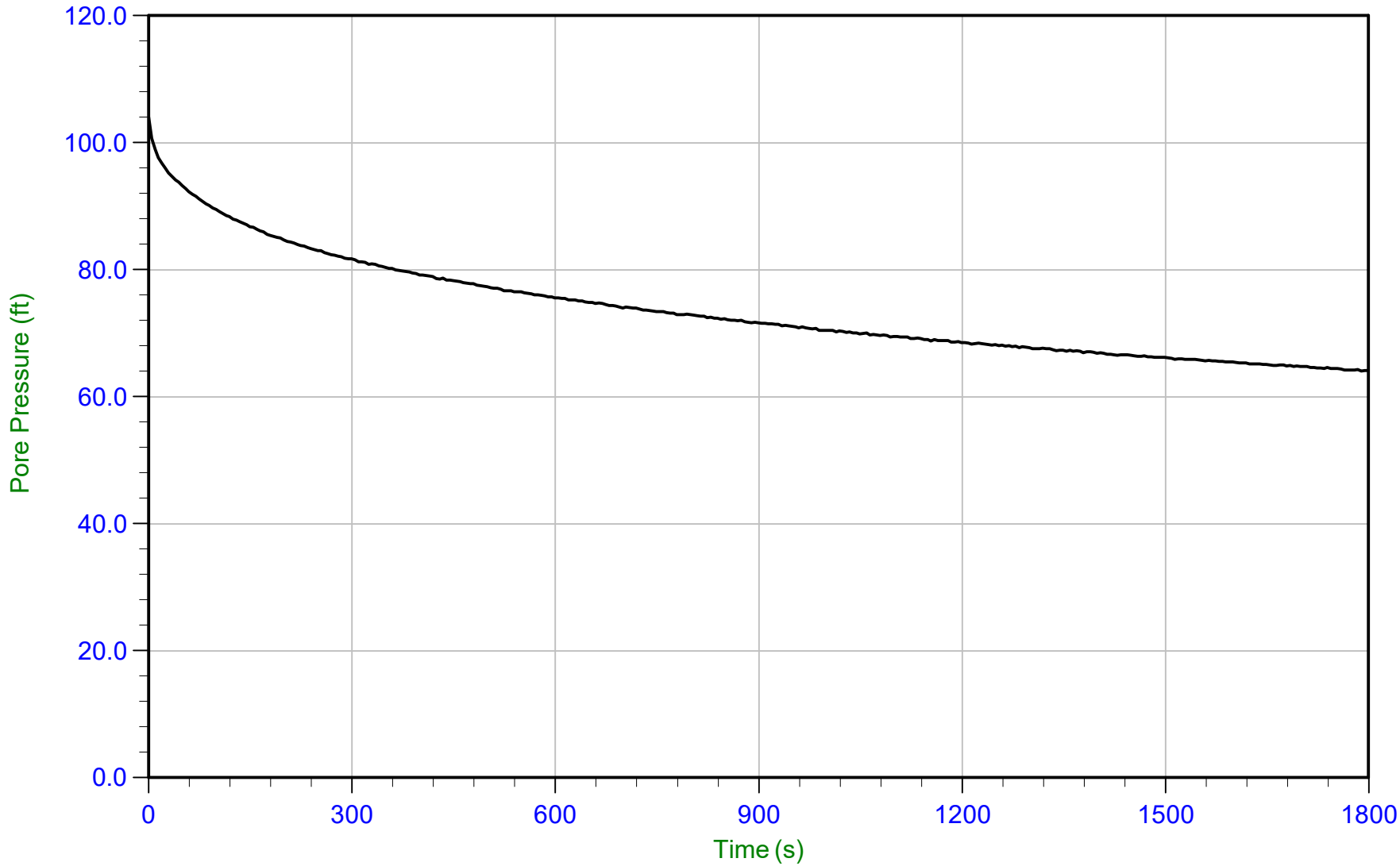
WT: 2.022 m / 6.634 ft
Ueq: 28.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1800.0 s

U Min: 64.1 ft
U Max: 104.0 ft

WT: 2.064 m / 6.772 ft
Ueq: 33.3 ft
U(50): 68.65 ft

T(50): 1184.7 s
Ir: 100
Ch: 0.6 sq cm/min

APPENDIX D

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site

PROJECT NUMBER: MR155218

CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B002	S-1	0.0'-1.5'	FILL: OLIVE BROWN TRACE BROWN SILTY SAND WITH GRAVEL	SM	38.4	4.50+								
EDW-B002	S-2	2.5'-4.0'	GRAY SANDY SILT	ML	62.4	3.50								
EDW-B002	S-3	5.0'-7.0'	GREENISH GRAY SANDY SILT	MH	66.6						65	36	29	
EDW-B002	S-4	7.5'-10.0'	DARK GRAY FLY ASH		79.0		0.0	7.4	73.1	19.5				
EDW-B002	S-5	10.0'-12.0'	GRAY TO DARK GRAY VARVED FLY ASH		76.9						17	27	NP	
EDW-B002	S-6	15.0'-16.5'	DARK GRAY FLY ASH		52.5									
EDW-B002	S-7	20.0'-21.5'	DARK GRAY FLY ASH WITH SAND AND GRAVEL		67.8									
EDW-B002	S-8	25.0'-27.0'	DARK GRAY FLY ASH		63.9									2.471
EDW-B002	S-9	30.0'-30.5'	LIGHT GRAY LEAN CLAY WITH ORGANIC POCKETS	CL	126.1	<.25								
EDW-B002	S-9A	30.5'-31.5'	BROWN TO RUST BROWN LEAN CLAY WITH SAND	CL	31.1	0.50								
EDW-B002	S-10	35.0'-37.0'	GRAY LEAN CLAY WITH SAND	CL	31.6						36	18	18	
EDW-B002	S-11	40.0'-41.5'	GRAY LEAN CLAY	CL	42.9	1.00								2.592
EDW-B002	S-12	45.0'-46.5'	GRAY TO DARK GRAY LEAN CLAY WITH SAND	CL	57.7	0.75								
EDW-B002	S-13	50.0'-50.25'	GRAY SILT WITH SAND	ML	11.1	4.50+								
EDW-B003	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH WITH SAND		44.4									2.469
EDW-B003	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH WITH SAND		27.3	2.00								
EDW-B003	S-3	5.0'-6.5'	FILL: BROWN AND BLACK LEAN CLAY WITH SAND AND ORGANICS	OL	37.2	1.00								
EDW-B003	S-4	7.5'-9.5'	FILL: DARK GRAY FLY ASH		55.5									
EDW-B003	S-5	10.0'-11.5'	FILL: DARK GRAY FLY ASH		50.6		2.3	19.8	56.3	21.6				
EDW-B003	S-6	15.0'-16.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		29.7									2.772
EDW-B003	S-7	20.0'-21.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		42.1									
EDW-B003	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH WITH SAND		54.9									
EDW-B003	S-9	30.0'-32.0'	FILL: VERY DARK GRAY VARVED FLY ASH		71.7		0.0	20.6	66.4	13.0				
EDW-B003	S-10	35.0'-36.5'	FILL: DARK GRAY FLY ASH WITH SAND		51.9									
EDW-B003	S-10A	36.5'-37.0'	GRAY LEAN CLAY WITH ORGANIC POCKETS	CL	43.0	2.25								
EDW-B003	S-11	40.0'-41.5'	GRAY TO BROWNISH GRAY LEAN CLAY WITH SAND	CL	31.6	1.25								
EDW-B003	S-12	45.0'-47.0'	DARK GRAY FAT CLAY WITH SAND	CH	46.0						51	17	34	
EDW-B003	S-13	50.0'-51.5'	BROWNISH GRAY TO GREENISH GRAY LEAN CLAY WITH SAND	CL	55.4	0.50								
EDW-B003	S-14	55.0'-55.5'	BLUISH GRAY CLAYEY SILT	ML	23.3	3.50								
EDW-B003	S-14A	55.5'-55.92'	BLUISH GRAY SILT	ML	9.8									
EDW-B003	S-15	60.0'-60.25'	BLUISH GRAY SILT	ML	7.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site | PROJECT NUMBER: MR155218 | CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B004	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		18.9	4.50+								
EDW-B004	S-2	2.5'-3.5'	FILL: DARK GRAY FLY ASH WITH SAND		28.5	4.00								
EDW-B004	S-2A	3.5'-4.0'	BROWN TO GRAY LEAN CLAY WITH SAND - FLY ASH NOTED	CL	20.1	3.25								
EDW-B004	S-3	5.0'-6.5'	BROWN AND GRAY LEAN CLAY	CL	21.6	1.75								
EDW-B004	S-4	7.5'-9.0'	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	CL	23.4	4.00	0.0	9.3	43.3	47.4	37	16	21	
EDW-B004	S-5	10.0'-11.5'	BROWN AND DARK GRAY LEAN CLAY	CL	21.5	2.25								
EDW-B004	S-6	12.5'-14.0'	BROWN AND GRAY LEAN CLAY WITH SAND	CL	25.4	1.25								
EDW-B004	S-7	15.0'-16.5'	DARK GRAY LEAN CLAY	CL	25.8	2.50								
EDW-B004	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND	CL	31.3	1.00								
EDW-B004	S-9	25.0'-26.0'	BROWN AND GRAY LEAN CLAY WITH SAND AND SAND POCKETS	CL	23.0	1.25								
EDW-B004	S-9A	26.0'-26.5'	GRAY AND BROWN CLAYEY SAND	SC	19.5	0.75								
EDW-B004	S-10	30.0'-31.5'	GRAYISH BROWN AND DARK GRAY LEAN CLAY WITH SAND - ORGANIC	CL	19.7	3.75								
EDW-B004	S-11	36.0'-38.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	CL	20.1						35	17	18	
EDW-B004	S-12	40.0'-41.5'	BROWN, RUST BROWN AND GRAY LEAN CLAY	CL	30.0	1.25								
EDW-B004	S-13	45.0'-46.0'	GRAY LEAN CLAY	CL	39.5	1.00								
EDW-B004	S-13A	46.0'-46.5'	BROWNISH GRAY LEAN CLAY WITH SAND	CL	35.1									
EDW-B004	S-14	50.0'-51.5'	GRAY LEAN CLAY WITH SAND	CL	65.2	1.75								2.617
EDW-B004	S-15	55.0'-56.5'	BROWN AND BLUISH GRAY LEAN CLAY WITH SAND	CL	33.4	1.25								
EDW-B004	S-15A	56.0'-56.5'	BLUISH GRAY SILT	ML	13.2									
EDW-B004	S-16	60.0'-60.25'	BLUISH GRAY SOFT SHALE		8.8									
EDW-B005	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN CLAYEY SAND WITH GRAVEL AND SILT	SC	45.8	4.50								
EDW-B005	S-2	2.5'-4.0'	FILL: BROWN SANDY SILT WITH GRAVEL	ML	26.0									
EDW-B005	S-3	5.0'-6.5'	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	MH	50.9	3.25					61	54	7	
EDW-B005	S-4	8.5'-10.0'	FILL: BROWN SANDY SILT WITH GRAVEL	ML	37.4	4.50+								
EDW-B005	S-5	10.0'-11.5'	FILL: LIGHT BROWN AND GRAY CLAYEY SAND WITH GRAVEL	SC	44.3									
EDW-B005	S-6	15.0'-16.5'	FILL: BROWN SANDY SILT WITH GRAVEL	ML	41.4									
EDW-B005	S-7	20.0'-21.5'	FILL: GRAY FLY ASH		51.1	1.75	3.1	21.3	51.7	23.9				
EDW-B005	S-8	25.0'-26.0'	FILL: BROWNISH GRAY CLAYEY SILT WITH SAND AND GRAVEL	ML	55.3									
EDW-B005	S-8A	26.0'-27.0'	FILL: GRAY AND BLACK ORGANIC SILT	OL	47.6						44	29	15	
EDW-B005	S-9	29.0'-31.0'	FILL: DARK GRAY FLY ASH		69.3									
EDW-B005	S-10	35.0'-36.5'	GRAY AND GRAYISH BLACK LEAN CLAY WITH SAND AND ORGANICS	CL	37.3	1.00								
EDW-B005	S-11	41.0'-43.0'	GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	44.8						57	22	35	
EDW-B005	S-12	45.0'-46.5'	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED	CL	88.7	1.00								2.521
EDW-B005	S-13	50.0'-51.0'	BLUISH GRAY CLAYEY SILT	CL-ML	15.9	4.50+								
EDW-B005	S-14	51.0'-51.5'	BLUISH GRAY SOFT SHALE		12.8									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site

PROJECT NUMBER: MR155218

CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B006	S-1	0.0'-1.5'	FILL: DARK BROWN AND DARK GRAY LEAN CLAY WITH SAND AND BRICK	CL	26.4	2.25								
EDW-B006	S-2	2.5'-5.0'	RUST BROWN AND GRAY MOTTLED LEAN CLAY	CL	30.1	1.25								
EDW-B006	S-3	5.0'-6.5'	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	CL	24.8	2.25					48	19	29	
EDW-B006	S-4	7.5'-10.0'	GRAY AND RUST BROWN MOTTLED LEAN CLAY	CL	26.0	2.50								
EDW-B006	S-5	10.0'-11.5'	BROWNISH GRAY LEAN CLAY	CL	34.2	1.25								
EDW-B006	S-6	13.0'-15.0'	GRAY FAT CLAY WITH SAND	CH	31.1						62	20	42	
EDW-B006	S-7	15.0'-16.5'	BROWNISH GRAY LEAN CLAY	CL	40.8	1.00								
EDW-B006	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND	CL	43.4	0.75								
EDW-B006	S-9	26.0'-28.0'	DARK GRAY ORGANIC SILT	OH	76.0						72	37	35	
EDW-B006	S-10	30.0'-31.0'	GRAY LEAN CLAY WITH SAND - ORGANIC POCKETS NOTED	CL	43.4	0.50								
EDW-B006	S-10A	31.0'-31.5'	BLUISH GRAY LEAN CLAY WITH SAND AND SILT	CL	19.6									
EDW-B006	S-11	35.0'-35.42'	BLUISH GRAY SILT WITH SAND	ML	14.2	3.50								
EDW-B008	S-1	0.0'-1.5'	BROWN LEAN CLAY WITH SAND AND GRAVEL	CL	13.2	4.50+								
EDW-B008	S-2	2.5'-4.0'	DARK BROWN LEAN CLAY WITH SAND	CL	19.5	3.75					42	22	20	
EDW-B008	S-3	5.0'-6.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY WITH SAND	CL	42.3	2.00								
EDW-B008	S-4	7.5'-9.0'	BROWN AND LIGHT GRAY LEAN CLAY WITH SAND	CL	22.8	2.00								
EDW-B008	S-5	11.0'-13.0'	BROWN AND GRAY FAT CLAY WITH SAND	CH	33.6						52	19	33	
EDW-B008	S-6	15.0'-16.5'	GRAY LEAN CLAY WITH SAND	CL	64.6	0.50								
EDW-B008	S-7	20.0'-21.5'	BROWN AND GRAY LEAN CLAY - SHELL NOTED	CL	44.4	0.50								
EDW-B008	S-8	24.0'-26.5'	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	68.9						67	31	36	
EDW-B008	S-9	30.0'-31.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND	CL	71.4	0.50								
EDW-B008	S-10	35.0'-36.5'	GRAY LEAN CLAY WITH SAND - WOODCHIPS, ORGANICS AND SHELL NOTED	CL	56.9	0.25								
EDW-B008	S-11	40.0'-40.33'	BLUISH GRAY SILT WITH SOFT SHALE	ML	12.6	3.00								

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site | PROJECT NUMBER: MR155218 | CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B010	S-1 TOP	0.0'-0.5'	FILL: BROWN SAND WITH GRAVEL	SP	7.2									
EDW-B010	BOTTOM	0.0'-0.5'	FILL: BROWN LEAN CLAY WITH SAND AND GRAVEL	CL	17.4	4.50+								
EDW-B010	S-1A	0.5'-1.5'	FILL: DARK GRAY FLY ASH		27.9									
EDW-B010	S-2	2.5'-3.0'	FILL: DARK GRAY FLY ASH		20.9									
EDW-B010	S-2A	3.0'-4.0'	FILL: DARK GRAY FLY ASH		30.7	4.50								
EDW-B010	S-3	5.0'-6.5'	FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED	SP	14.8		12.6	54.8	26.0	6.6				
EDW-B010	S-4	7.5'-9.0'	BROWN WITH RUST BROWN STAINS LEAN CLAY WITH SAND	CL	22.0	3.75								
EDW-B010	S-5	10.0'-11.5'	BROWN AND RUST BROWN LEAN CLAY WITH SAND	CL	24.0	2.00								
EDW-B010	S-6	12.5'-14.0'	BROWN LEAN CLAY	CL	28.0	1.25								
EDW-B010	S-7	15.0'-17.0'	BROWN AND GRAY MOTTLED LEAN CLAY	CL	30.5						48	18	30	
EDW-B010	S-8	20.0'-21.5'	GRAY LEAN CLAY	CL	32.9	0.75								
EDW-B010	S-9	25.0'-26.5'	GRAY LEAN CLAY WITH SAND	CL	21.4	0.50								
EDW-B010	S-10	30.0'-32.0'	BLUISH GRAY LEAN CLAY	CL	30.0						40	15	25	
EDW-B010	S-11	35.0'-36.5'	BROWNISH GRAY LEAN CLAY	CL	28.2	1.50								
EDW-B010	S-12	40.0'-41.0'	BROWN, RUST BROWN AND GRAY SILTY SAND WITH GRAVEL	SM	17.0									
EDW-B010	S-13	45.0'-45.25'	BLUISH GRAY CLAYEY SILT - SHALE NOTED	CL-ML	16.4	4.50								
EDW-B011	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		27.7	4.50+								
EDW-B011	S-2	2.5'-4.0'	FILL: DARK GRAY AND BLACK FLY ASH - ASPHALT NOTED		16.3	4.50+								
EDW-B011	S-3	5.0'-6.5'	FILL: GRAY FLY ASH		29.4	4.50+								
EDW-B011	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		45.3	3.00								
EDW-B011	S-5	9.0'-11.0'	FILL: VERY DARK GRAY FLY ASH		70.0		15.5	21.3	46.0	17.2				
EDW-B011	S-6	15.0'-17.0'	FILL: DARK GRAY FLY ASH		63.2									
EDW-B011	S-7	19.5'-21.5'	FILL: GRAY FLY ASH		84.9		0.2	16.7	58.0	25.1				
EDW-B011	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH - CLAY NOTED		74.7									2.691
EDW-B011	S-9	30.0'-32.0'	FILL: DARK GRAY FLY ASH		73.7									
EDW-B011	S-10	35.0'-37.0'	FILL: DARK GRAY FLY ASH		93.9									
EDW-B011	S-13	40.0'-41.5'	BROWN AND GRAY LEAN CLAY	CL	47.9	1.00								
EDW-B011	S-14	45.0'-46.5'	GRAYISH BROWN FAT CLAY WITH SAND	CH	63.3	0.50					63	21	42	
EDW-B011	S-15	50.0'-51.5'	DARK GRAY AND GRAYISH BROWN LEAN CLAY	CL	62.5	0.50								
EDW-B011	S-16	55.0'-56.5'	GRAY LEAN CLAY	CL	52.9	0.75								
EDW-B011	S-17	60.0'-60.25'	BLUISH GRAY SOFT SHALE		9.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site | PROJECT NUMBER: MR155218 | CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B012	S-1	0.0'-1.5'	FILL: BROWN SANDY SILT WITH GRAVEL	ML	23.0									
EDW-B012	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH		23.8	4.50+					28	26	2	
EDW-B012	S-3	5.0'-6.5'	FILL: DARK GRAY FLY ASH		26.5		0.0	9.6	73.7	16.7				
EDW-B012	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		26.5	4.50								
EDW-B012	S-5	10.0'-11.0'	FILL: DARK BROWN LEAN CLAY WITH SAND - FLY ASH NOTED	CL	24.7	3.75								
EDW-B012	S-5A	11.0'-11.5'	BROWN AND GRAYISH BROWN LEAN CLAY	CL	24.9	2.00								
EDW-B012	S-6	12.5'-14.0'	BROWN LEAN CLAY	CL	22.0	3.50								
EDW-B012	S-7	15.0'-16.5'	BROWN AND RUST BROWN MOTTLED LEAN CLAY	CL	24.3	3.25					48	19	29	
EDW-B012	S-8	20.0'-22.0'	BROWNISH GRAY MOTTHED LEAN CLAY WITH SAND	CL	23.8									
EDW-B012	S-9	25.0'-26.5'	BROWNISH GRAY LEAN CLAY WITH SAND	CL	23.2	1.25								
EDW-B012	S-10	30.0'-31.5'	BROWN AND GRAY LEAN CLAY	CL	24.8	1.50								
EDW-B012	S-11	35.0'-36.5'	RUST BROWN AND GRAY LEAN CLAY WITH SAND	CL	28.3	1.50								
EDW-B012	S-12	40.0'-41.5'	BLUISH GRAY AND BROWNISH GRAY LEAN CLAY	CL	32.2	1.00								
EDW-B012	S-13	45.0'-46.5'	BROWNISH GRAY LEAN CLAY	CL	50.2	1.25								
EDW-B012	S-14	47.0'-49.0'	DARK GRAY FAT CLAY	CH	50.8						54	20	34	
EDW-B012	S-15	49.0'-50.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND	CL	67.4	1.00								
EDW-B012	S-16	55.0'-55.5'	GRAY LEAN CLAY WITH SAND	CL	50.5	1.75								
EDW-B012	S-16A	55.5'-56.5'	BLUISH GRAY CLAYEY SILT	CL-ML	15.3	4.50								
EDW-B012	S-17	60.0'-60.21'	BLUISH GRAY CLAYEY SILT	CL-ML	17.9	1.50								
EDW-B013	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN LEAN CLAY WITH SAND AND GRAVEL	CL	13.6	4.50+								
EDW-B013	S-2	2.5'-4.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	CL	17.4	4.50+								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	24.3						49	21	28	
EDW-B013	S-4	8.0'-9.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY	CL	24.3	3.00								
EDW-B013	S-5	10.0'-11.5'	DARK GRAY LEAN CLAY	CL	25.4	2.25								
EDW-B013	S-6	15.0'-16.5'	DARK GRAY AND BROWNISH GRAY LEAN CLAY	CL	25.5	1.50					41	17	24	
EDW-B013	S-7	20.0'-21.5'	BROWN AND DARK GRAY LEAN CLAY	CL	23.5	1.75								
EDW-B013	S-8	25.0'-26.5'	DARK BROWNISH GRAY LEAN CLAY	CL	27.7									
EDW-B013	S-9	30.0'-31.5'	GRAY AND RUST BROWN MOTTLED SANDY LEAN CLAY	CL	20.2	0.50								
EDW-B013	S-10	32.0'-34.0'	GRAY AND BROWN LEAN CLAY WITH SAND	CL	33.3						42	23	19	
EDW-B013	S-11	34.0'-35.5'	DARK GRAY LEAN CLAY	CL	58.0	0.50								
EDW-B013	S-12	40.0'-41.5'	GRAY LEAN CLAY WITH SAND	CL	54.5	1.75								
EDW-B013	S-13	45.0'-46.5'	GRAY LEAN CLAY - CALCIUM CABONATE SEAMS AND SHELL NOTED	CL	66.2	1.25								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	20.0									

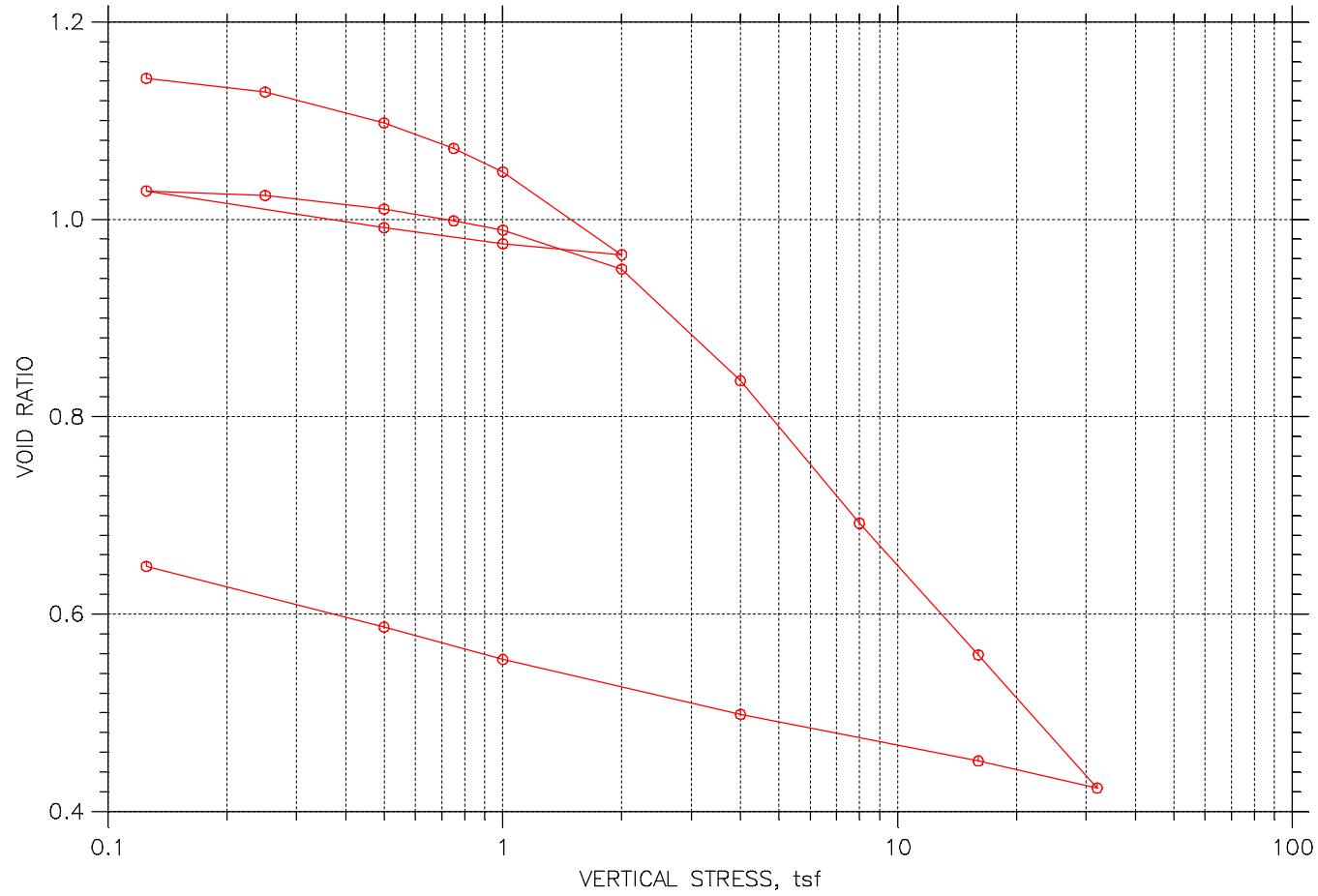
LABORATORY TESTING SUMMARY

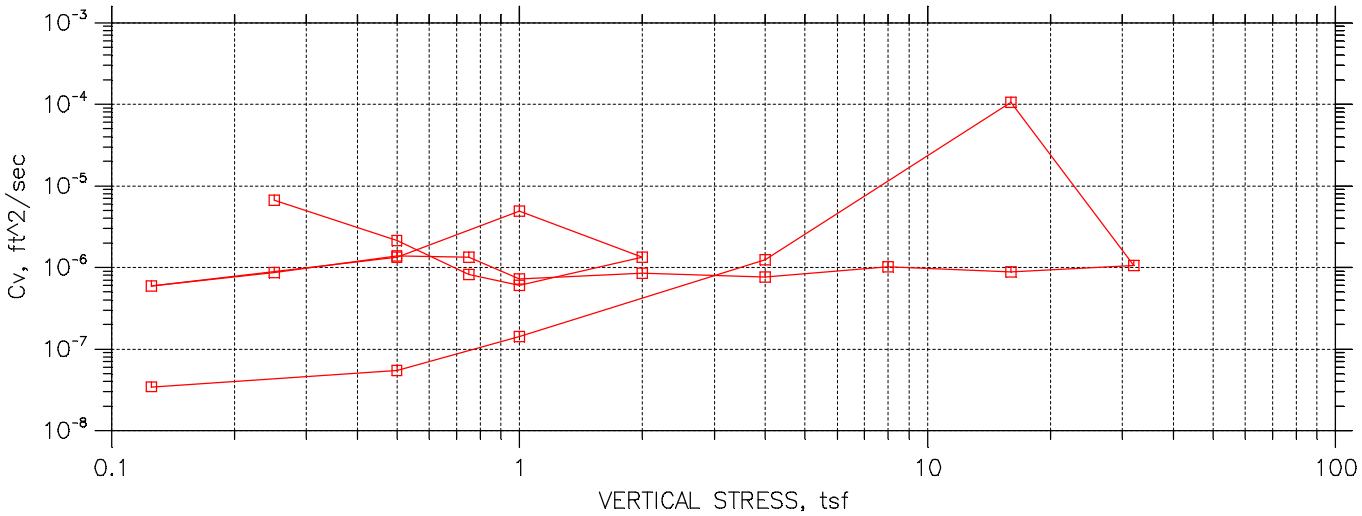
PROJECT NAME: Dynergy - Edwards Site | PROJECT NUMBER: MR155218 | CLIENT: AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B014	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		28.2	4.00								
EDW-B014	S-2	2.5'-3.5'	FILL: DARK GRAY CLAYEY SILT - FLY ASH NOTED	CL-ML	40.8	1.50								
EDW-B014	S-2A	3.5'-4.0'	FILL: GRAY CLAYEY SILT WITH SAND - FLY ASH NOTED	CL-ML	50.0									
EDW-B014	S-4	7.0'-8.5'	FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED	SM	60.2		0.0	35.1	45.4	19.5				
EDW-B014	S-6	15.0'-17.0'	FILL: GRAY AND DARK GRAY FLY ASH		78.7	3.50								
EDW-B014	S-7	20.0'-22.5'	FILL: DARK GRAY FLY ASH		86.5	1.50								2.524
EDW-B014	S-8	25.0'-26.7'	FILL: DARK GRAY FLY ASH - CLAY NOTED		73.1									
EDW-B014	S-9	30.0'-31.5'	GRAY AND DARK GRAY LEAN CLAY - ORGANIC POCKETS NOTED	CL	48.7									
EDW-B014	S-10	35.0'-36.7'	GRAY LEAN CLAY	CL	31.6	0.75								
EDW-B014	S-11	40.0'-40.5'	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	27.3	4.00								2.719
EDW-B014	S-11A	40.5'-41.0'	BLUISH GRAY AND GREENISH GRAY SILT WITH SOFT SHALE	ML	19.6	4.50+								
EDW-B014	S-11B	41.0'-41.5'	GRAY SOFT SHALE		10.2									
EDW-B014	S-12	45.0'-45.5'	GRAY SILT WITH SAND	ML	14.5	4.50								
EDW-B015	S-1	0.0'-1.5'	FILL: GRAYISH BROWN SANDY SILT	ML	54.7									
EDW-B015	S-2	2.5'-4.0'	BROWN SAND WITH GRAVEL	SP	4.5									
EDW-B015	S-3	5.0'-6.5'	BROWN SAND WITH GRAVEL	SP	5.4									
EDW-B015	S-4	7.5'-9.0'	BROWN SAND WITH GRAVEL	SP	7.2									
EDW-B015	S-5	10.0'-11.5'	BROWN SAND WITH GRAVEL	SP	6.5									
EDW-B015	S-6	13.0'-14.25'	BROWN AND GRAY GRAVEL	GP	3.6									
EDW-B015	S-7	15.0'-16.5'	LIGHT GRAY GRAVEL WITH SAND - LIMESTONE FRAGMENTS NOTED	GP	8.2									
EDW-B015	S-8	20.0'-21.5'	GRAY GRAVEL WITH SAND	GP	7.8									
EDW-B015	S-9	25.0'-26.5'	LIGHT GRAY GRAVEL WITH SAND AND SILT	GP	8.1									
EDW-B015	S-10	31.0'-33.0'	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	CL	20.2						24	13	11	
EDW-B015	S-11	35.0'-36.5'	GRAY AND DARK GRAY LEAN CLAY	CL	33.8	1.50								
EDW-B015	S-12	37.0'-39.0'	DARK GRAY FAT CLAY	CH	41.0						66	23	43	
EDW-B015	S-13	39.0'-40.5'	BROWN AND GRAY LEAN CLAY	CL	36.2	0.50								
EDW-B015	S-14	45.0'-46.5'	BROWN AND GRAY LEAN CLAY WITH SAND	CL	49.4	1.00								
EDW-B015	S-15	50.0'-51.0'	GRAY LEAN CLAY	CL	30.9	1.50								
EDW-B015	S-16	55.0'-55.5'	BLUISH GRAY SILT - SHALE NOTED	ML	11.0	4.25								

CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

Project: DYNERGY EDWARDS | Location: BARTONVILLE, IL | Project No.: MR155218
Boring No.: EDW-B003 | Tested By: HP | Checked By: BCM
Sample No.: S-12 | Test Date: 10/26/15 | Depth: 45.0'-47.0'
Test No.: EDW003S12 | Sample Type: 3.0" ST | Elevation: ----

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72 | Liquid Limit: 51 | Initial Height: 1.00 in
Initial Void Ratio: 1.15 | Plastic Limit: 24 | Specimen Diameter: 2.50 in
Final Void Ratio: 0.65 | Plasticity Index: 27

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X-14	RING	RING	X-19
Wt. Container + Wet Soil, gm	165.03	249.08	236.35	164.81
Wt. Container + Dry Soil, gm	127.13	213.35	213.35	142.68
Wt. Container, gm	44.81	111.54	111.54	44.72
Wt. Dry Soil, gm	82.32	101.81	101.81	97.96
Water Content, %	46.04	35.09	22.59	22.59
Void Ratio	---	1.15	0.65	---
Degree of Saturation, %	---	83.18	94.86	---
Dry Unit Weight, pcf	---	79.069	103.05	---

CONSOLIDATION TEST DATA

Project: DYNERGY EDWARDS
Boring No.: EDW-B003
Sample No.: S-12
Test No.: EDW003S12

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 45.0'-47.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

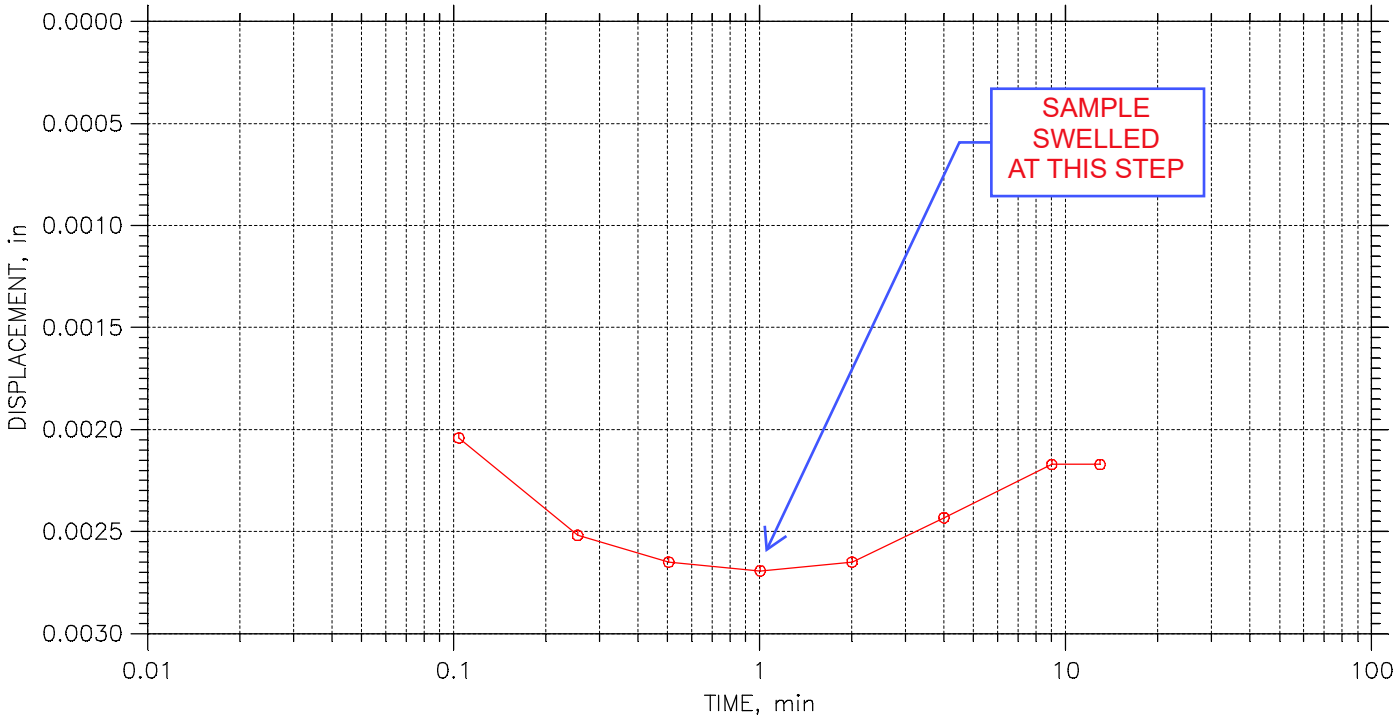
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.002172	1.143	0.22	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.008644	1.129	0.87	1.0	0.6	5.41e-006	8.79e-006	6.69e-006
3	0.5	0.02315	1.098	2.32	3.9	1.2	1.42e-006	4.45e-006	2.15e-006
4	0.75	0.03518	1.072	3.53	6.5	4.7	8.27e-007	1.15e-006	9.61e-007
5	1	0.04617	1.048	4.63	8.6	0.0	6.06e-007	0.00e+000	6.06e-007
6	2	0.08522	0.964	8.54	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
7	1	0.08005	0.975	8.02	1.0	0.0	4.94e-006	0.00e+000	4.94e-006
8	0.5	0.07245	0.992	7.26	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
9	0.125	0.05516	1.029	5.53	8.4	0.0	5.93e-007	0.00e+000	5.93e-007
10	0.25	0.05733	1.024	5.74	5.8	0.0	8.68e-007	0.00e+000	8.68e-007
11	0.5	0.06376	1.010	6.39	3.6	0.0	1.38e-006	0.00e+000	1.38e-006
12	0.75	0.06924	0.999	6.94	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
13	1	0.07358	0.989	7.37	11.4	2.0	4.29e-007	2.42e-006	7.28e-007
14	2	0.09195	0.950	9.21	8.7	2.5	5.48e-007	1.92e-006	8.53e-007
15	4	0.1446	0.836	14.49	5.8	5.7	7.57e-007	7.69e-007	7.63e-007
16	8	0.2117	0.692	21.21	3.8	3.7	1.02e-006	1.04e-006	1.03e-006
17	16	0.2736	0.559	27.42	3.8	3.6	8.62e-007	9.02e-007	8.81e-007
18	32	0.3363	0.424	33.70	2.1	3.1	1.30e-006	8.96e-007	1.06e-006
19	16	0.3237	0.451	32.43	0.0	0.0	1.05e-004	0.00e+000	1.05e-004
20	4	0.3017	0.498	30.23	2.1	0.0	1.25e-006	0.00e+000	1.25e-006
21	1	0.2758	0.554	27.64	20.3	0.0	1.42e-007	0.00e+000	1.42e-007
22	0.5	0.2611	0.586	26.16	78.7	39.4	3.86e-008	7.70e-008	5.14e-008
23	0.125	0.2322	0.648	23.27	93.5	0.0	3.45e-008	0.00e+000	3.45e-008

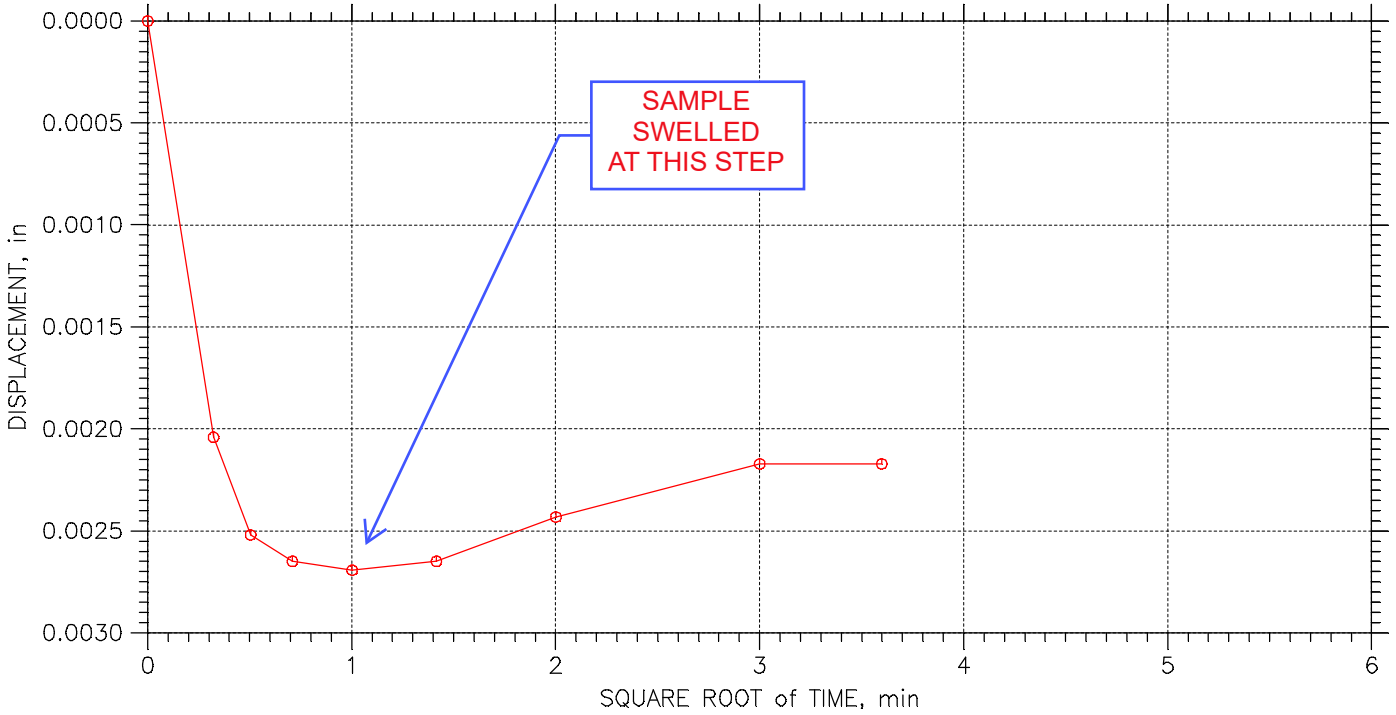
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





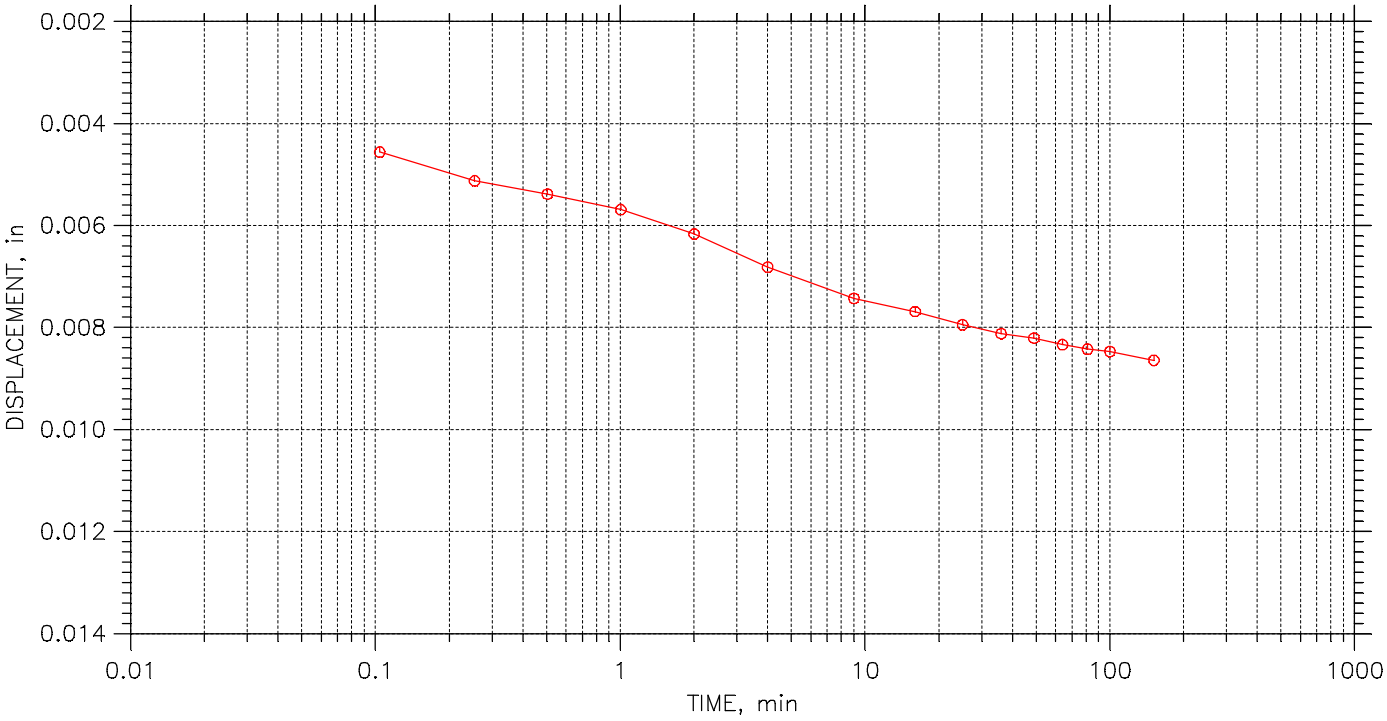
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

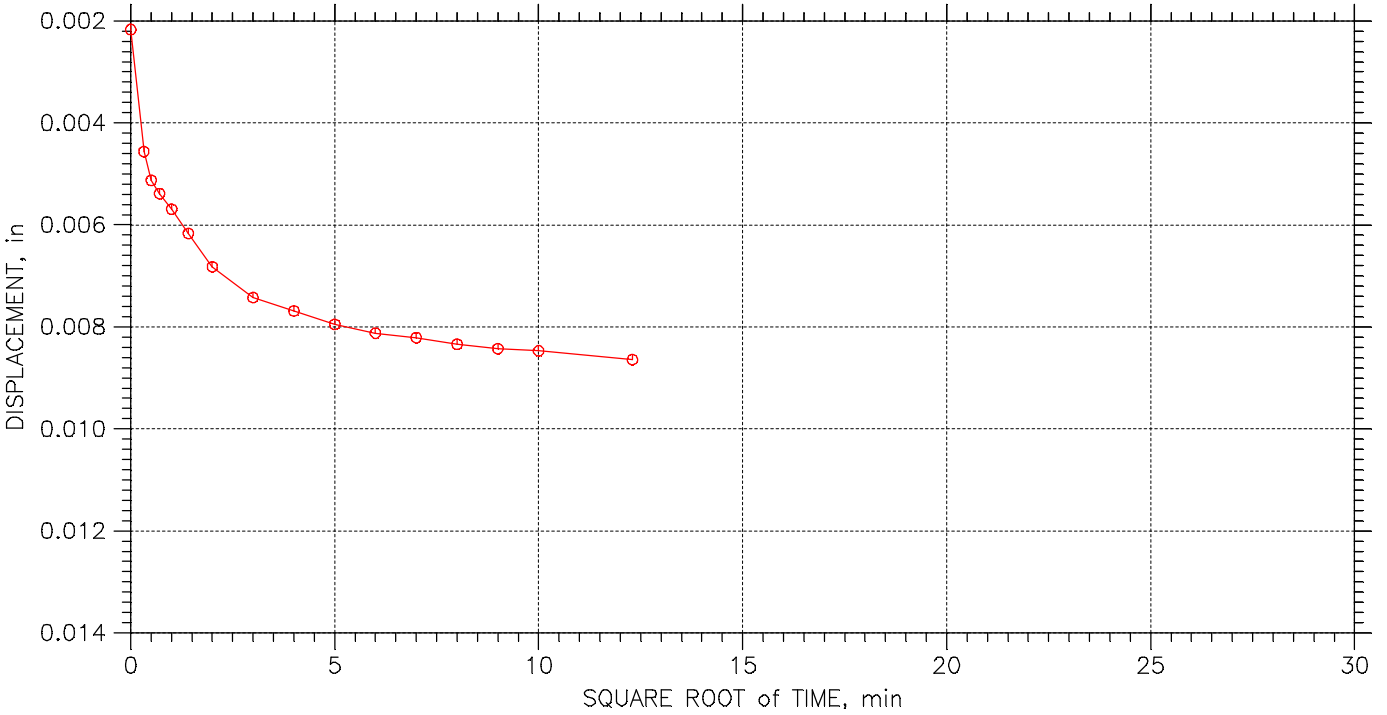
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





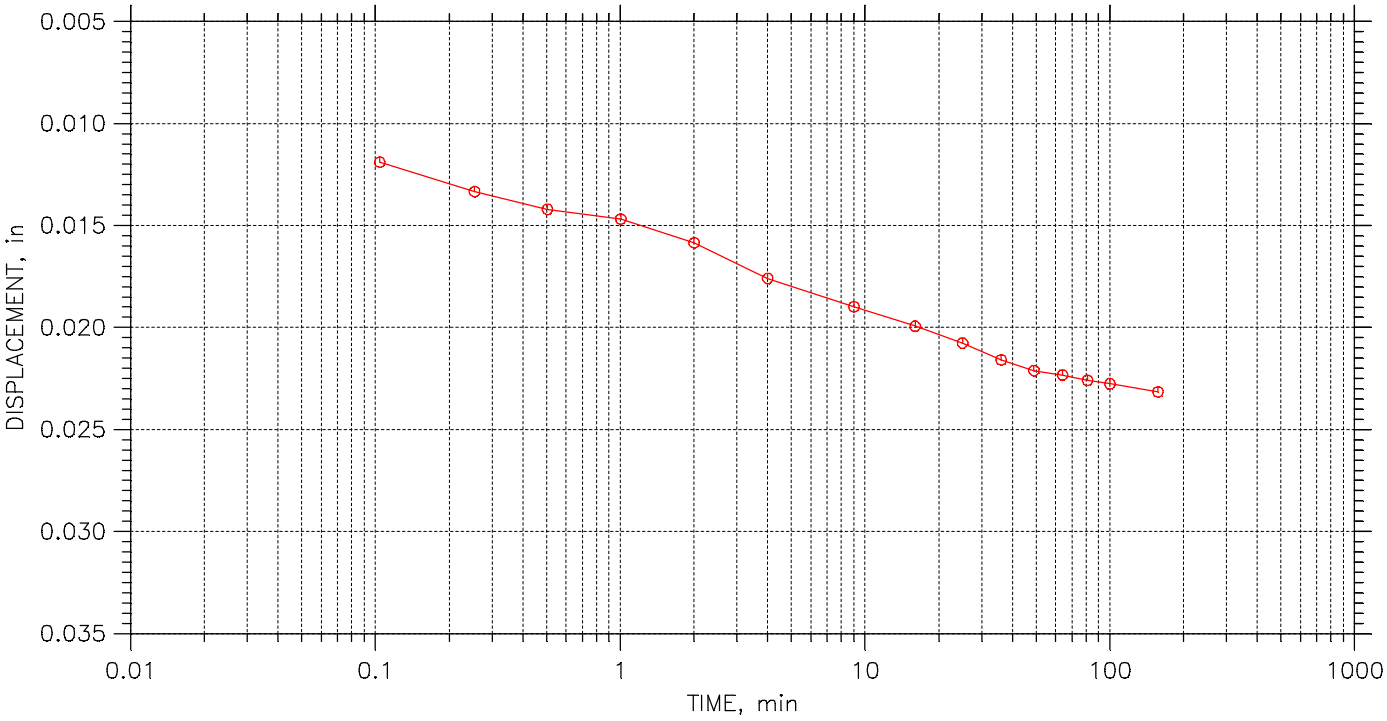
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

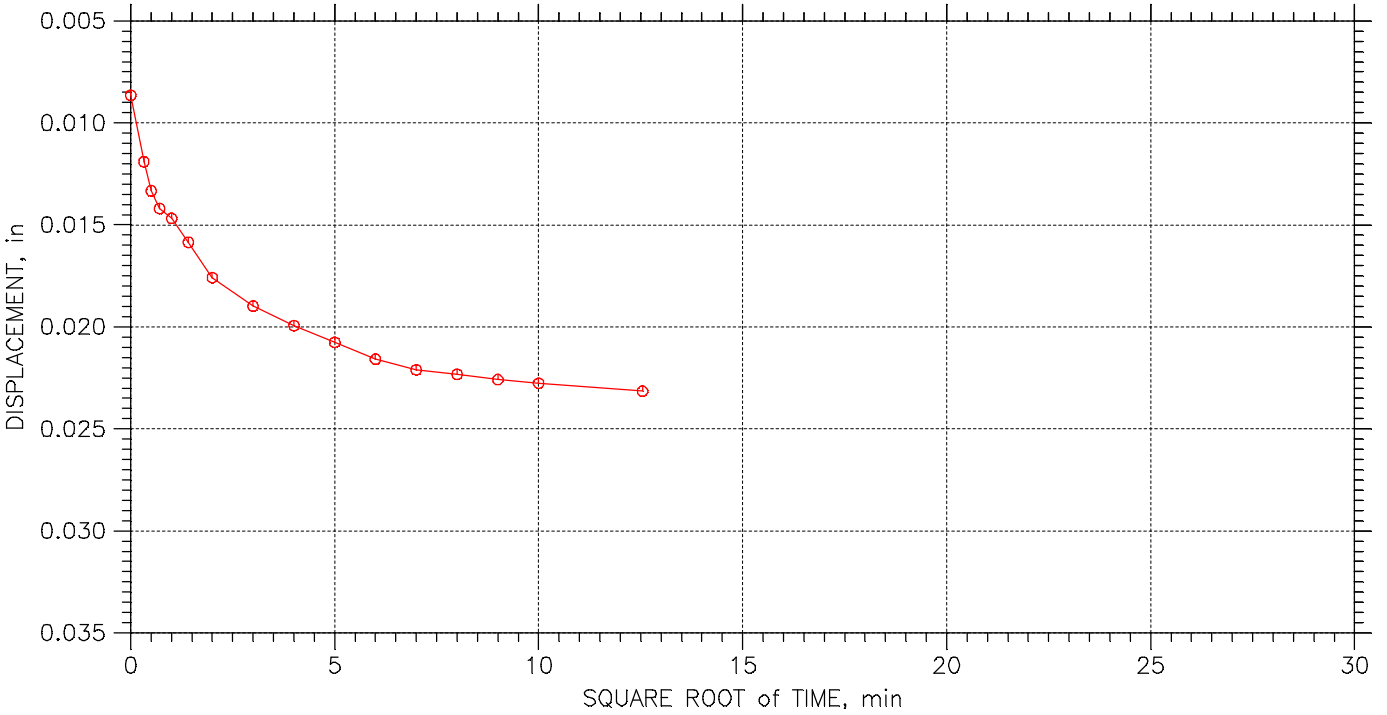
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





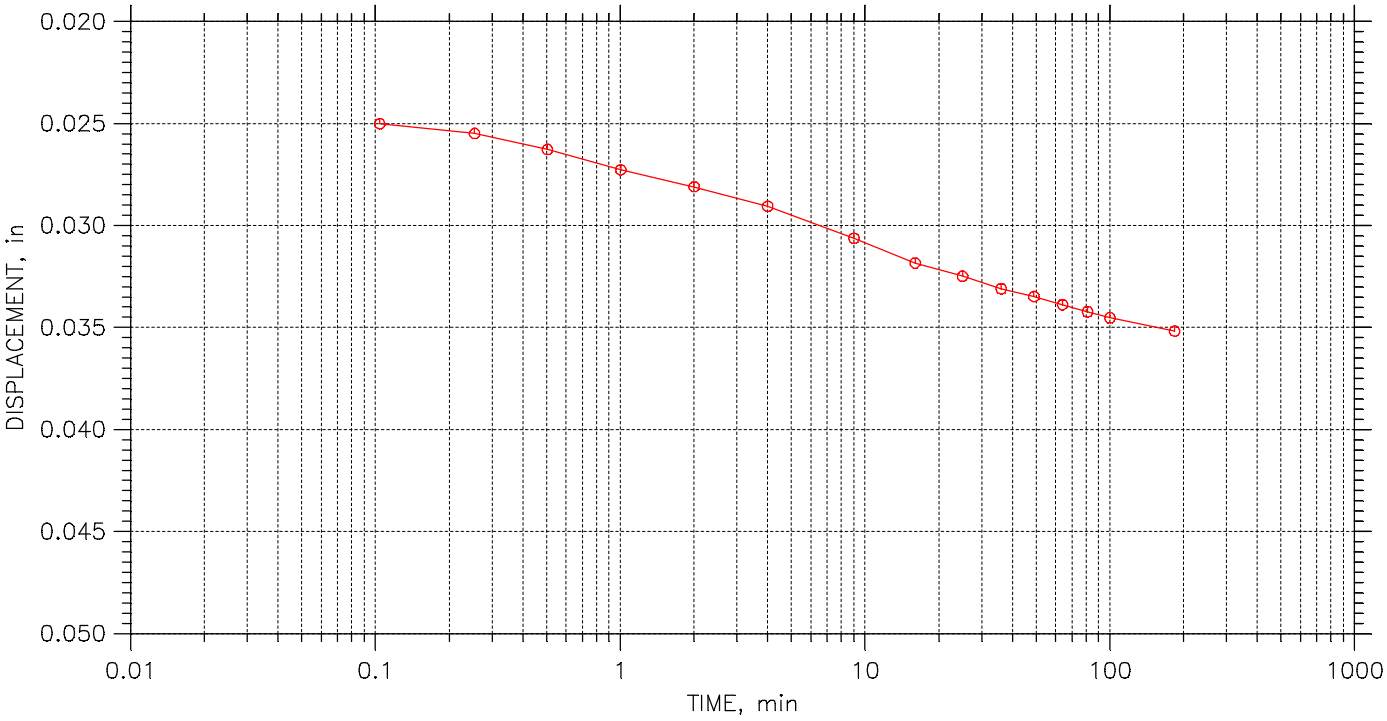
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

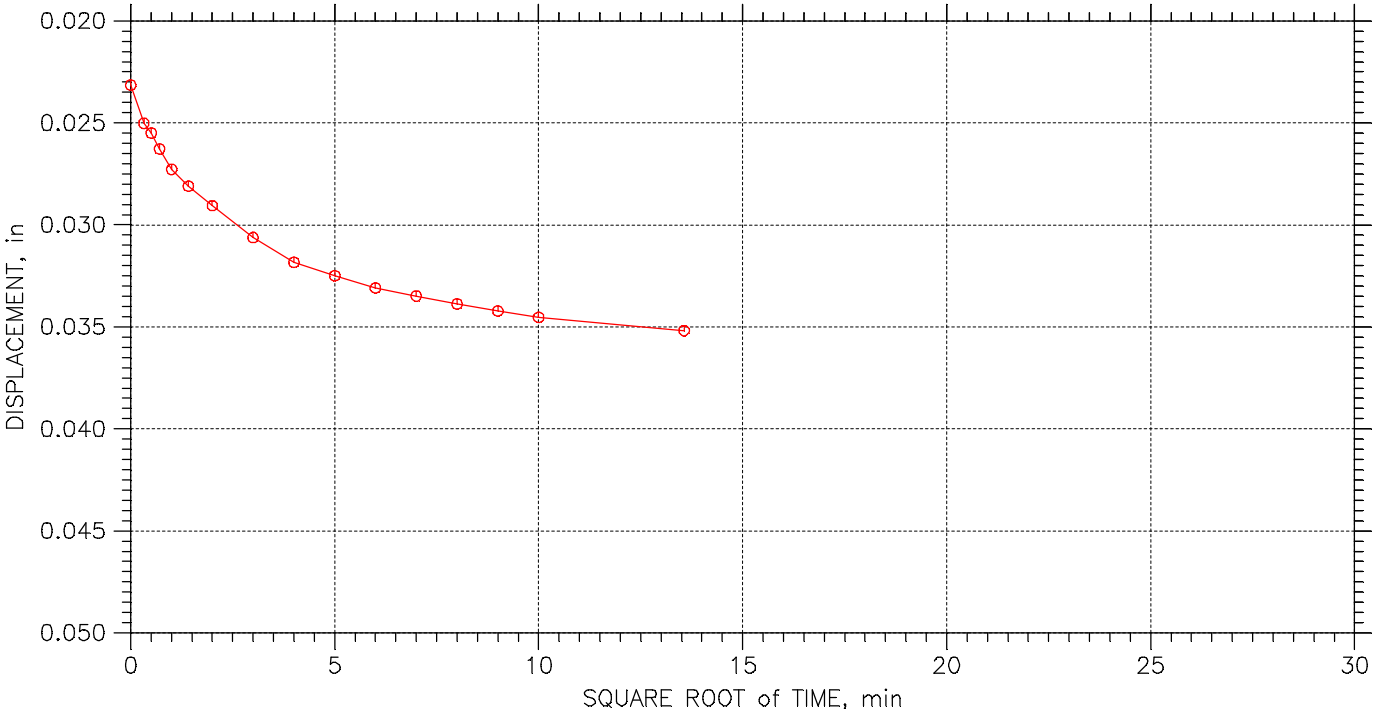
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





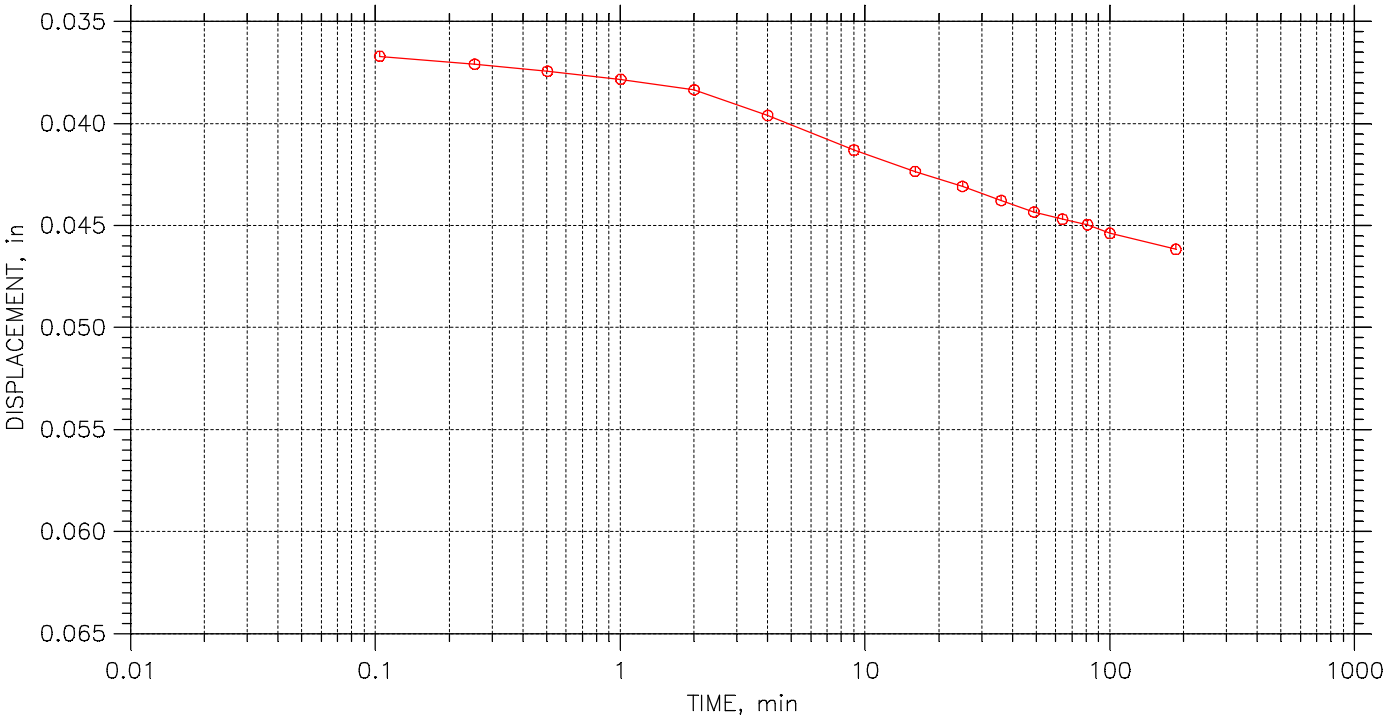
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

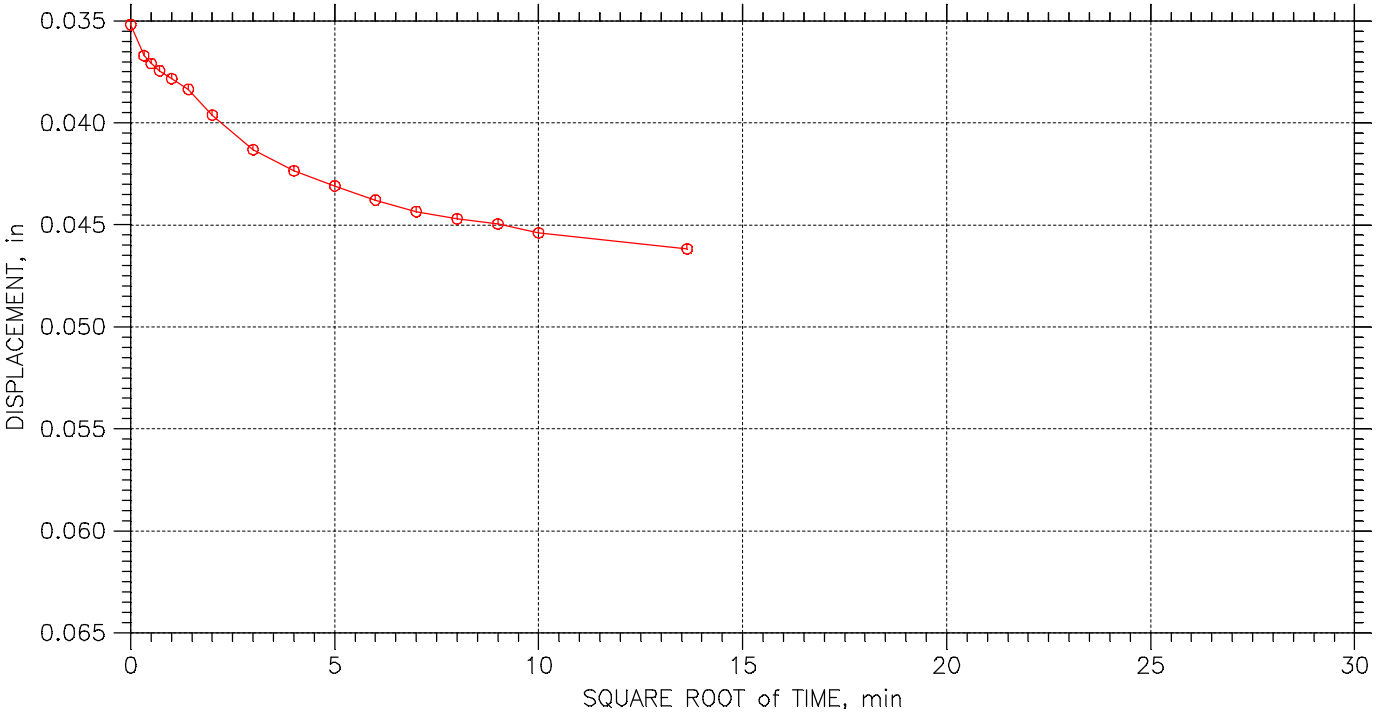
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





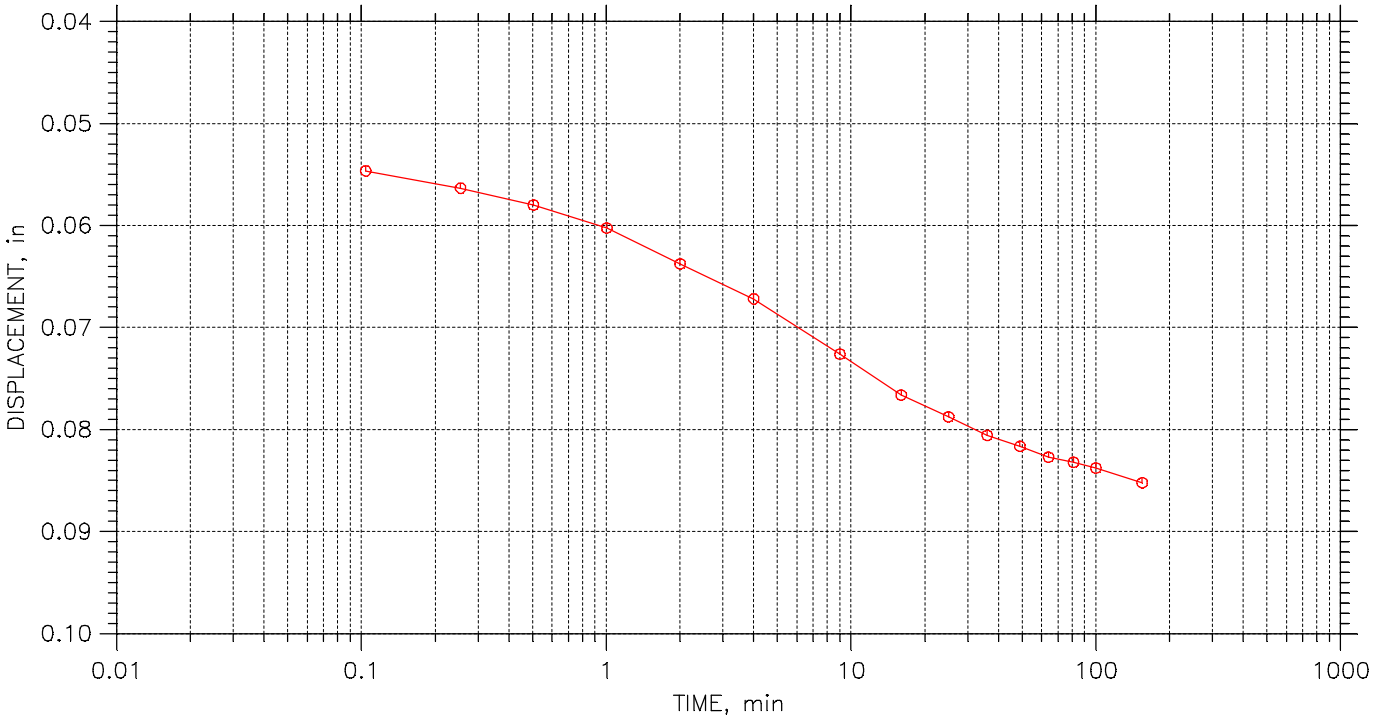
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

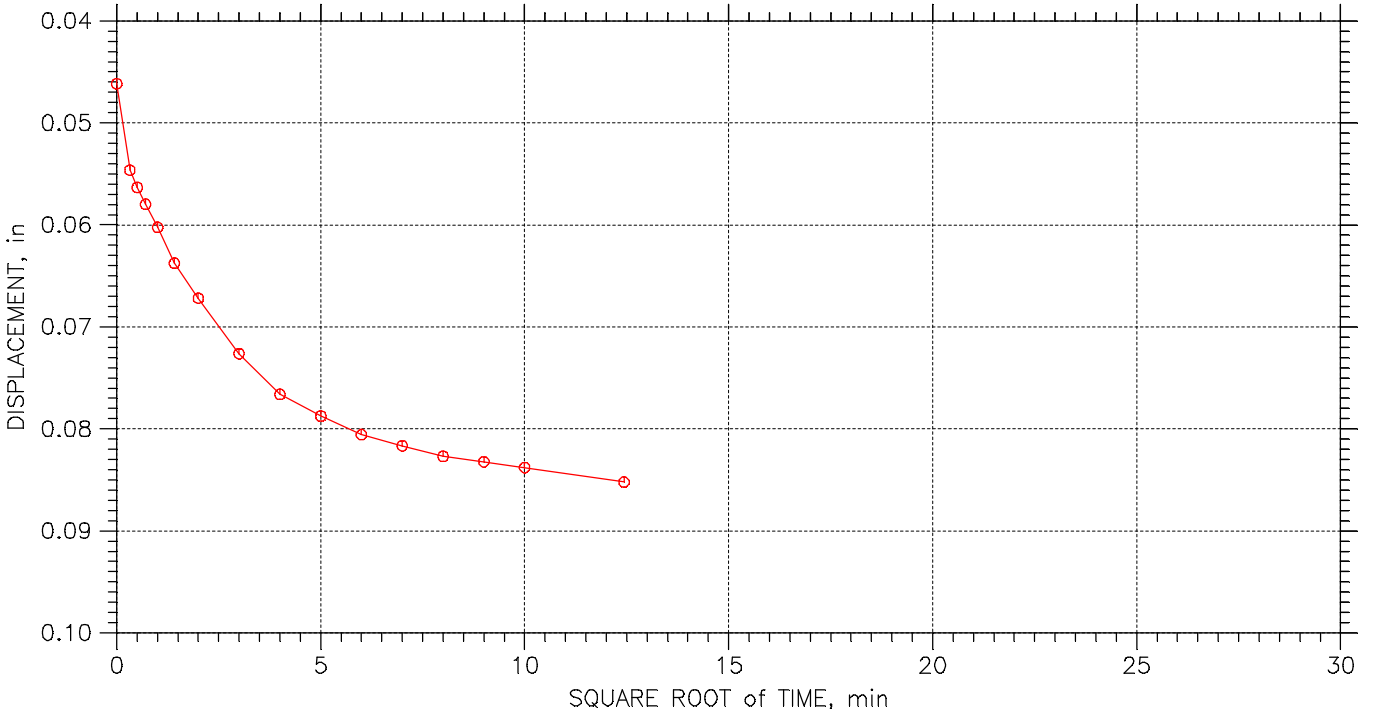
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





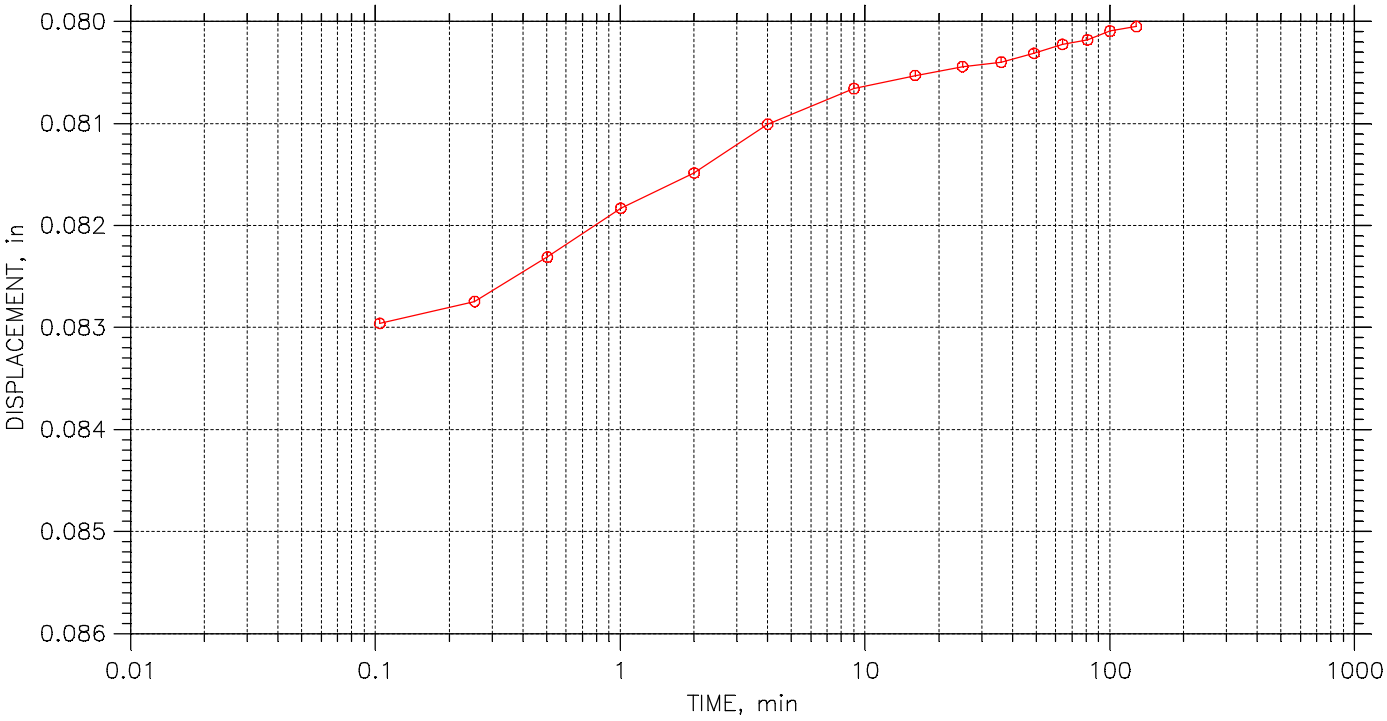
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

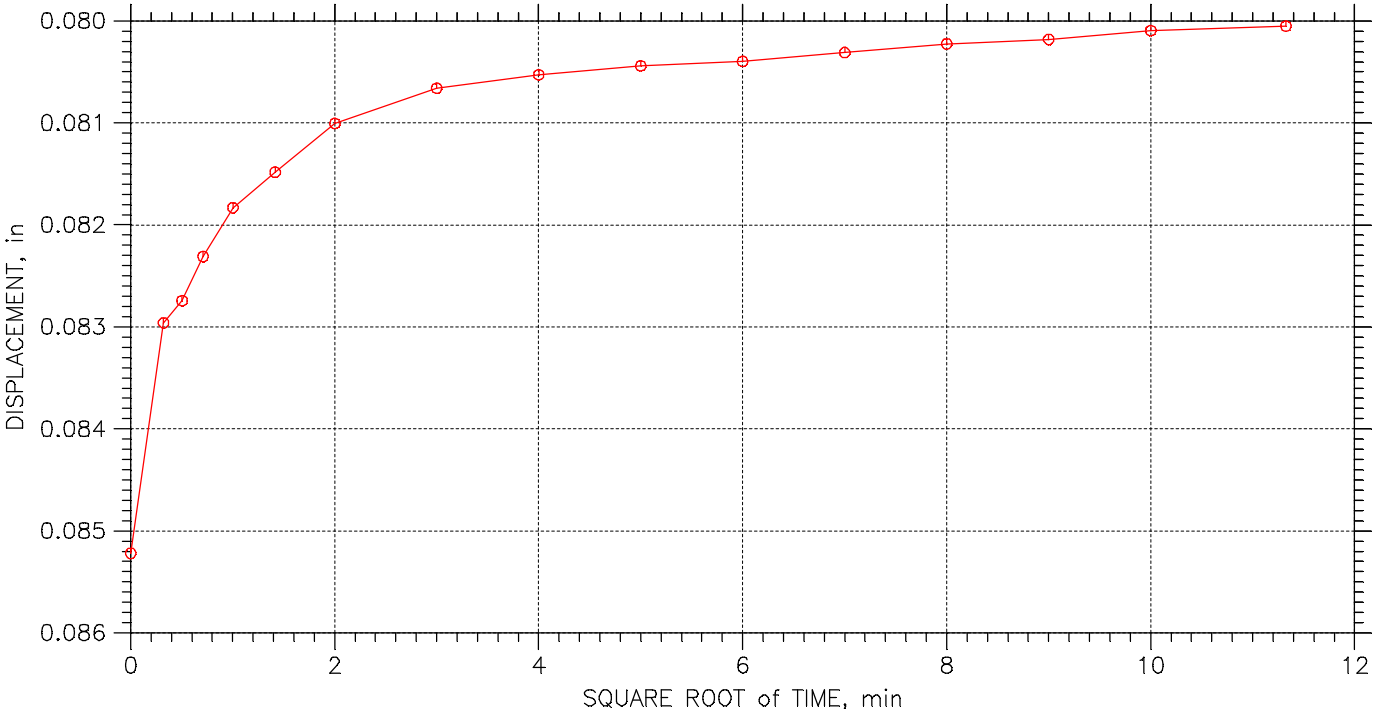
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

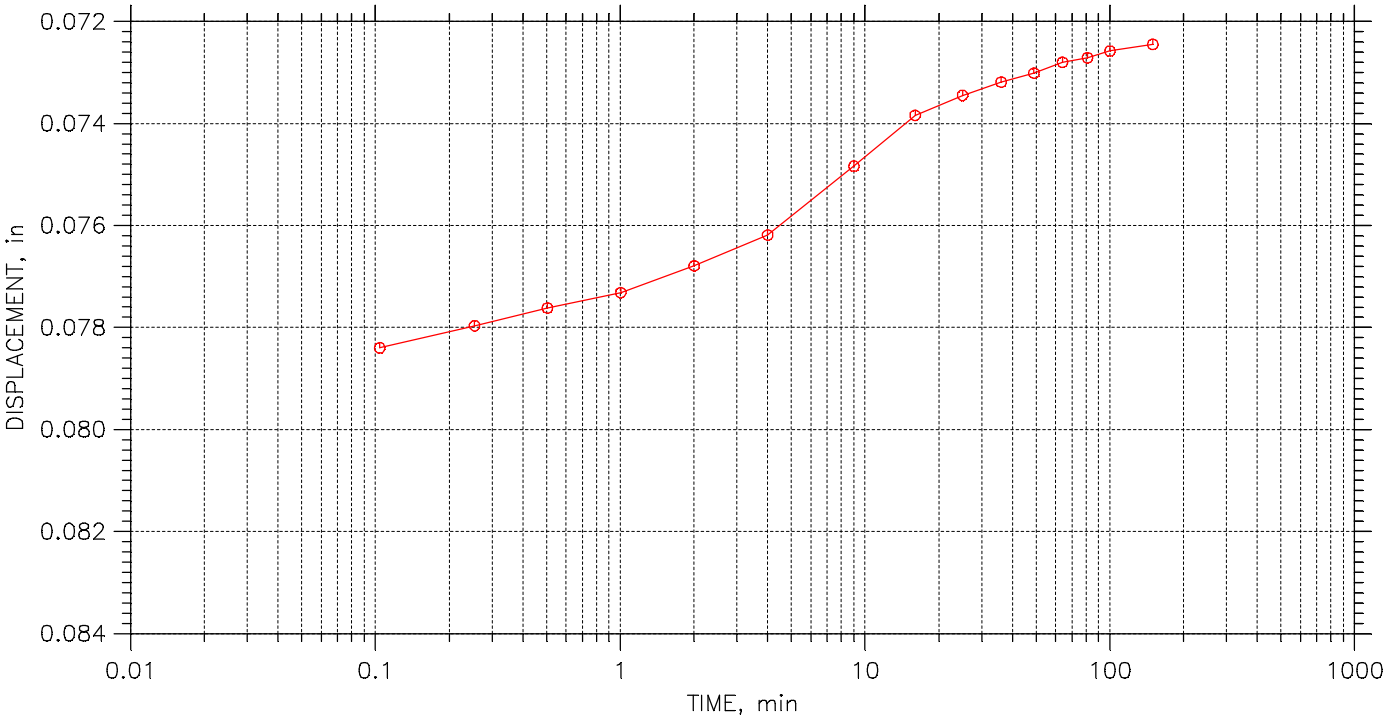
Mon, 16-NOV-2015 17:10:57

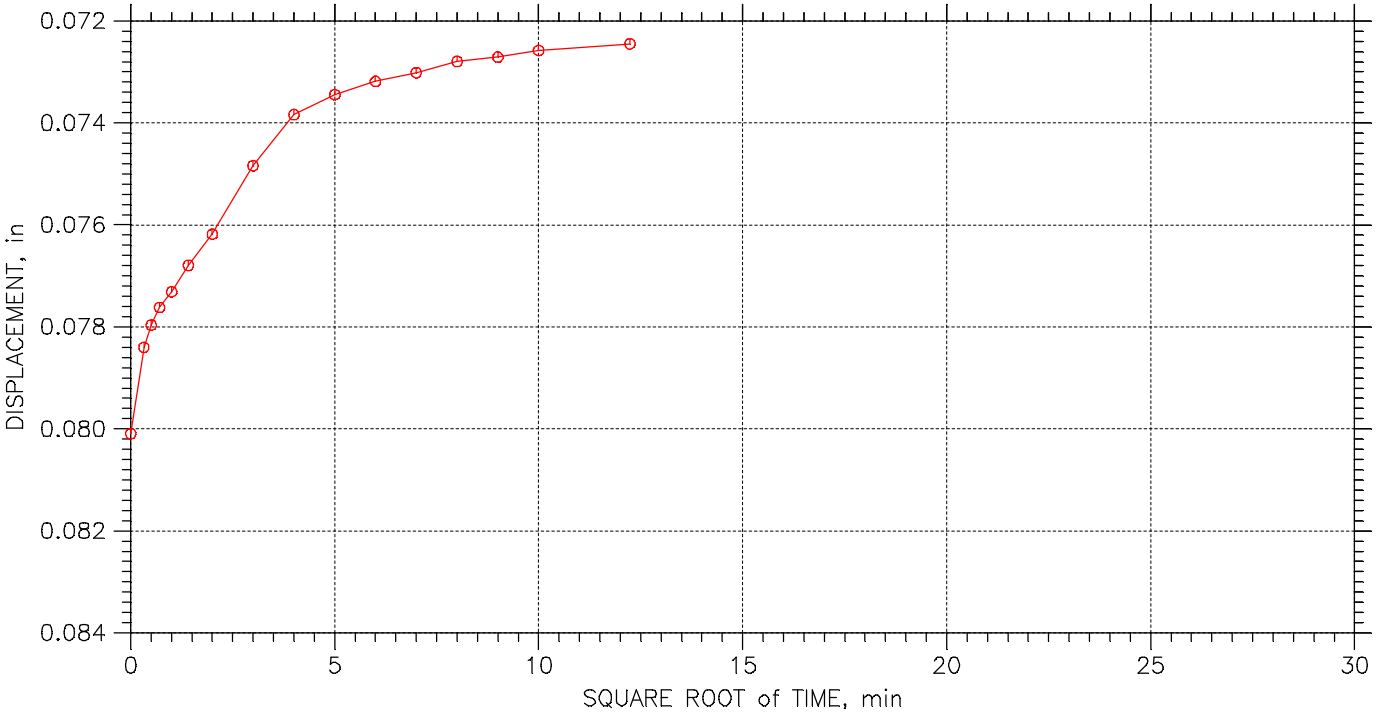
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





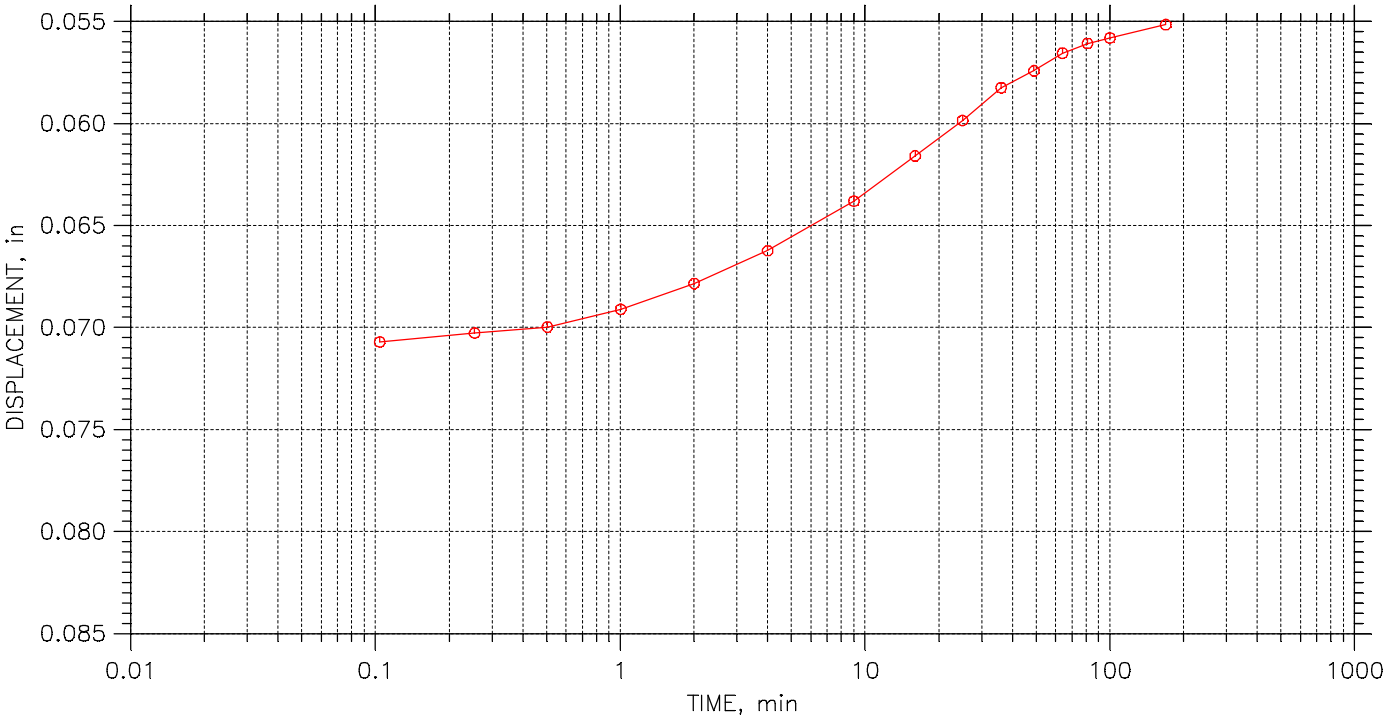
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

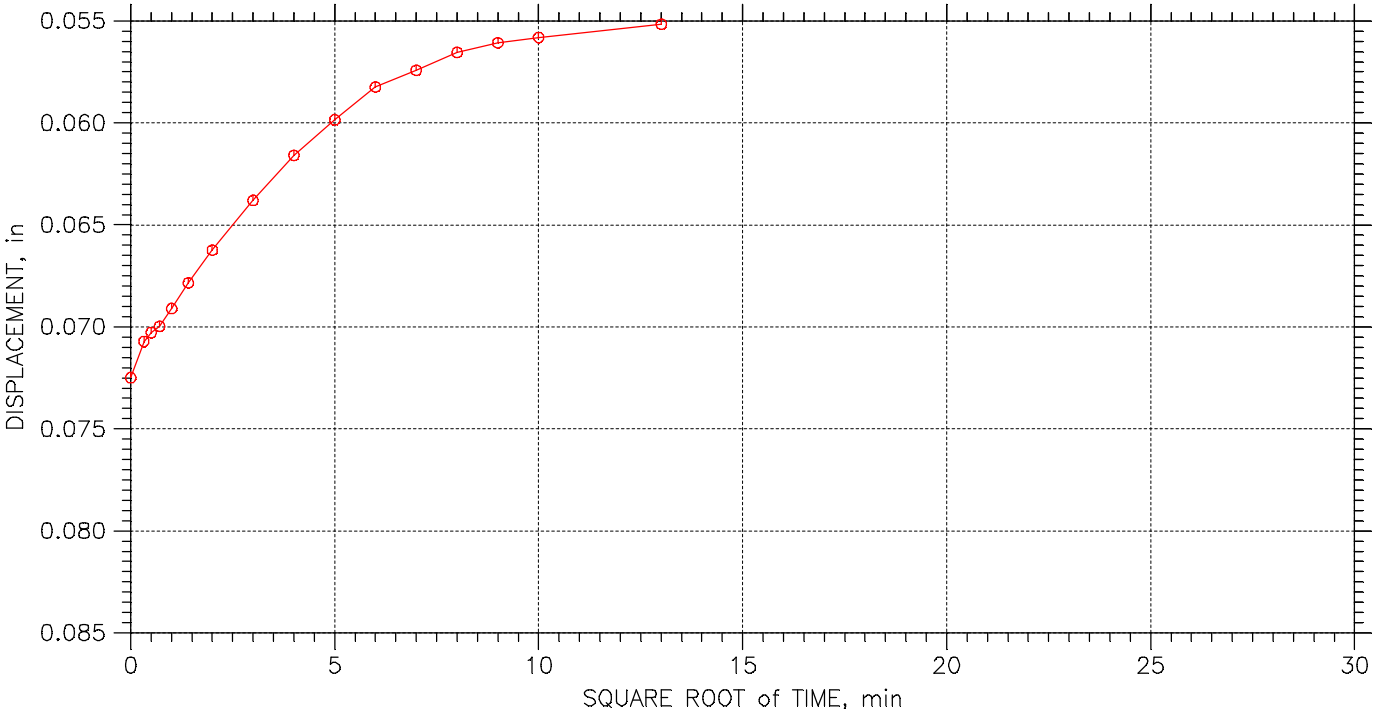
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





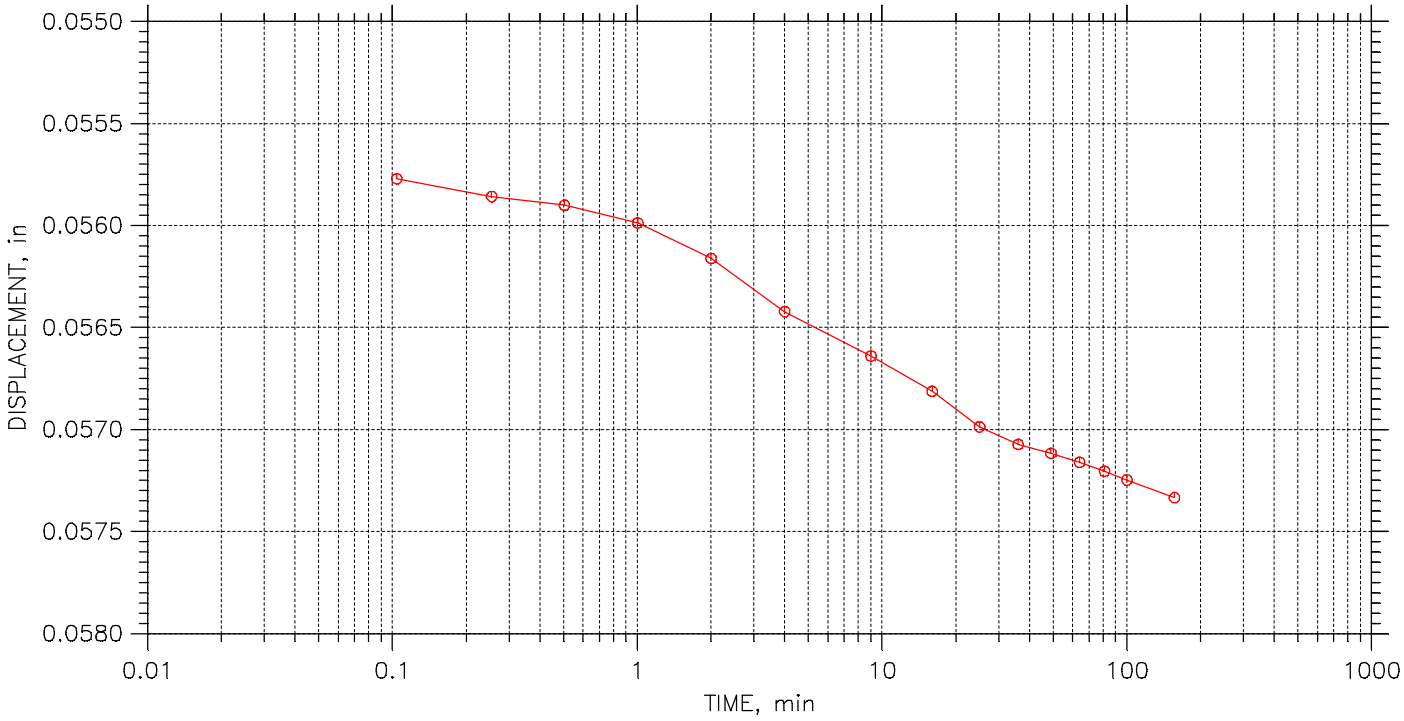
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

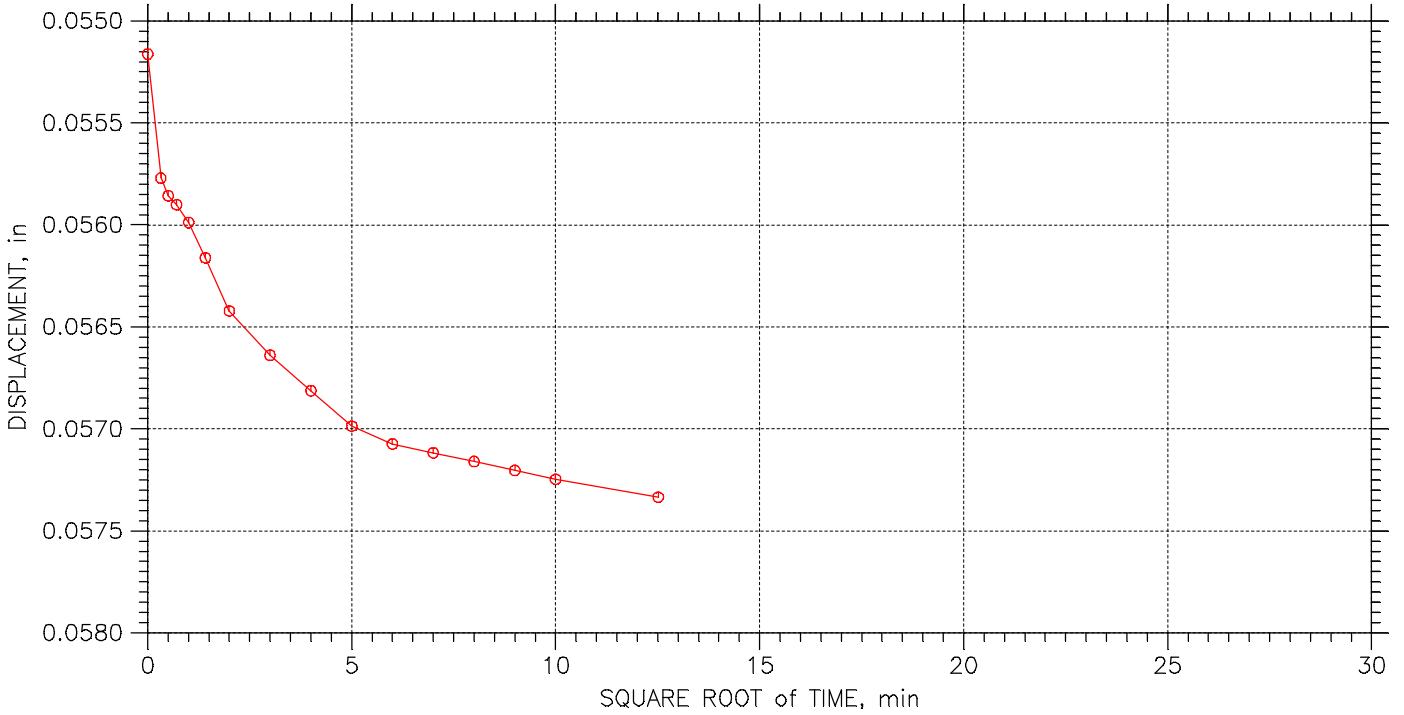
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





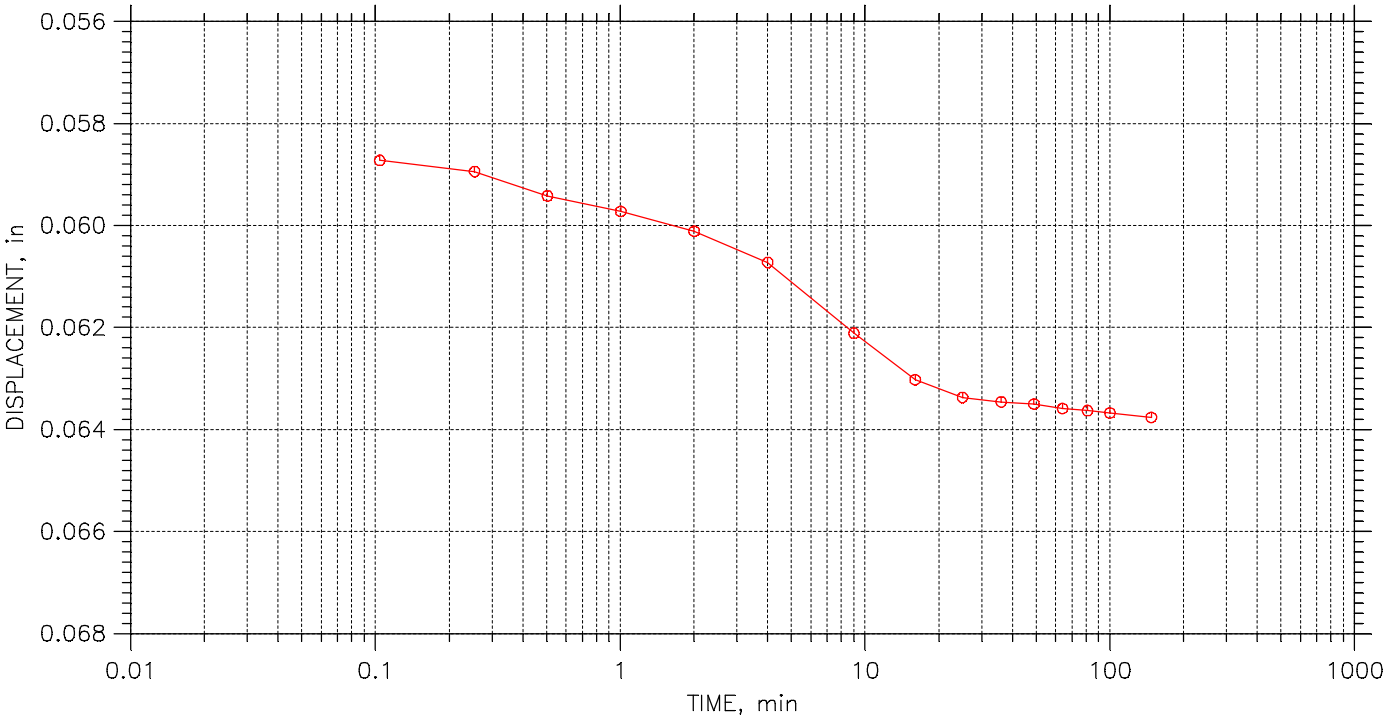
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

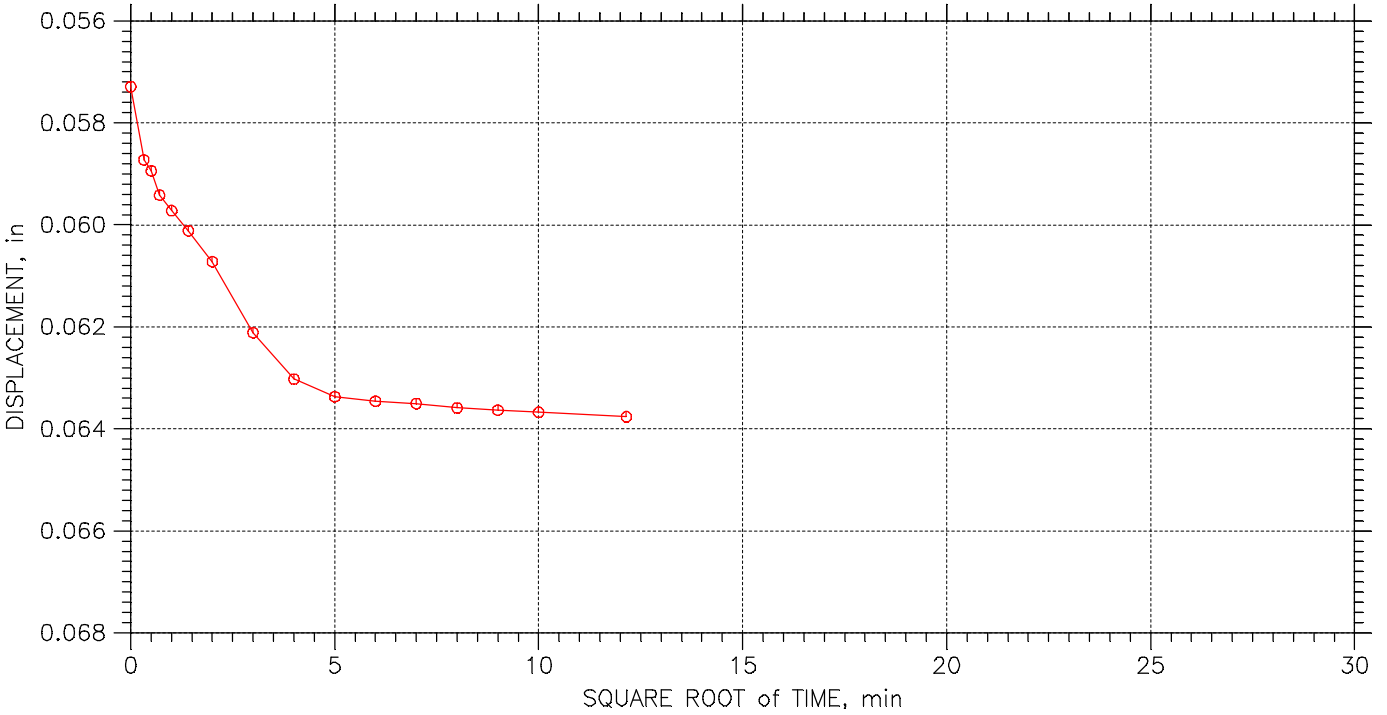
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





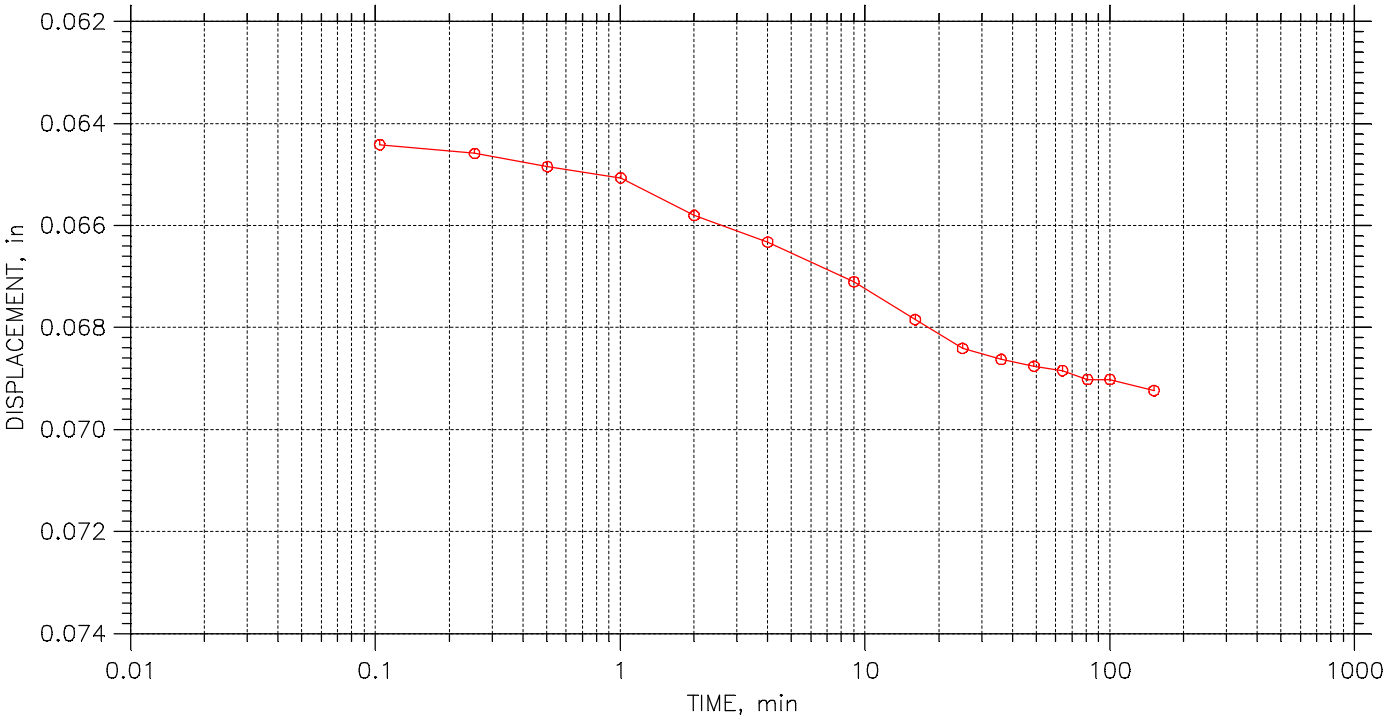
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

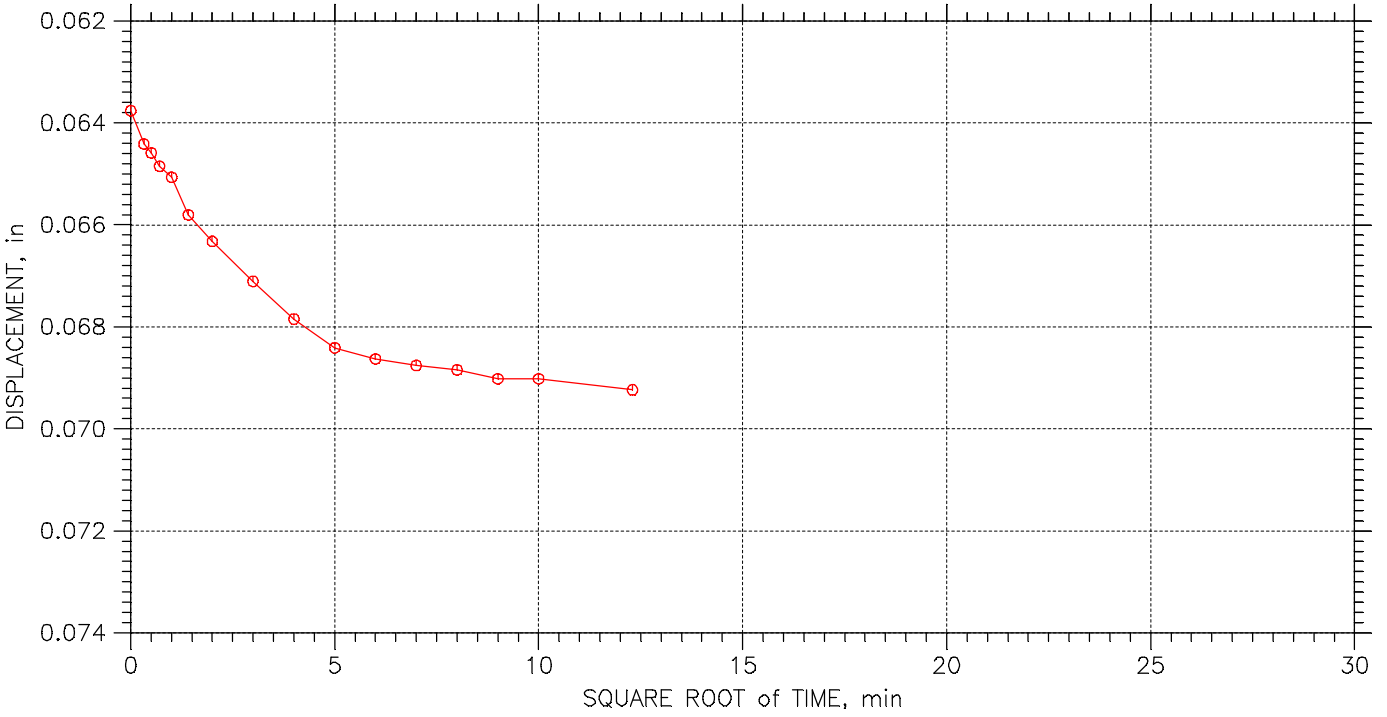
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





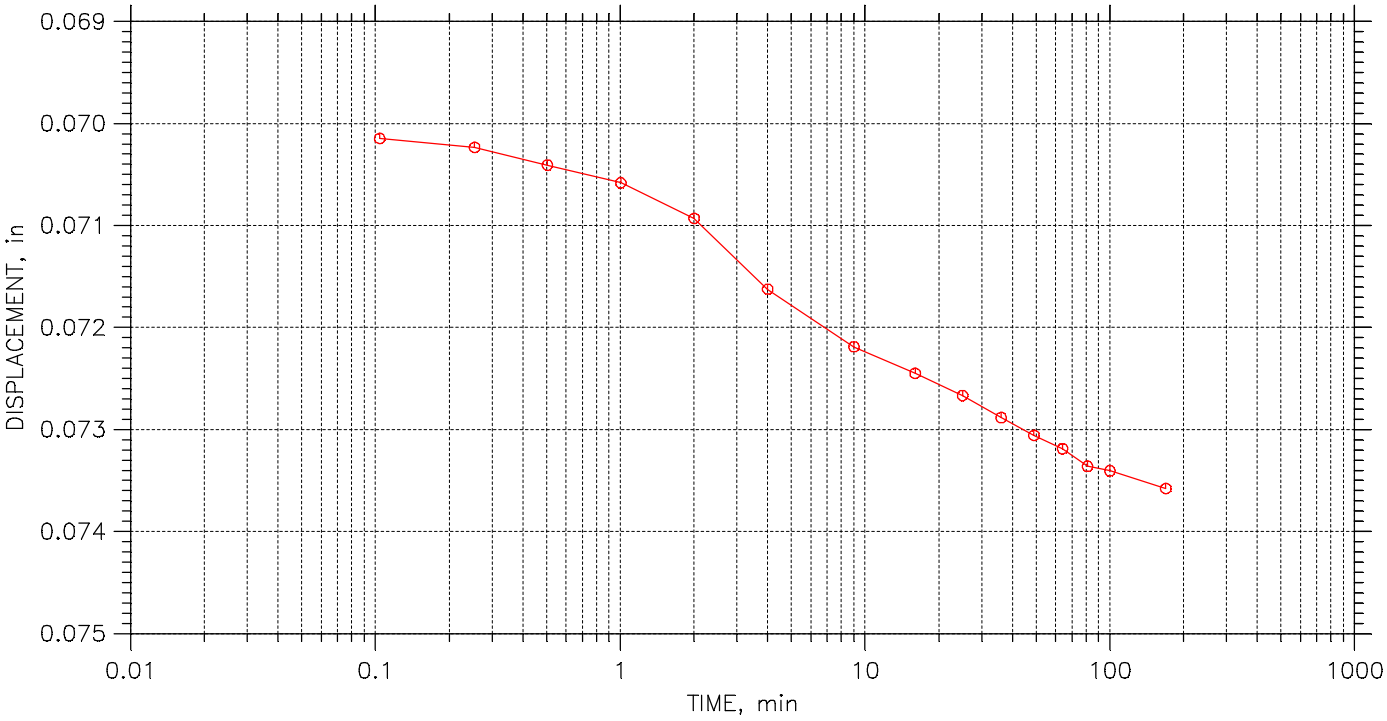
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

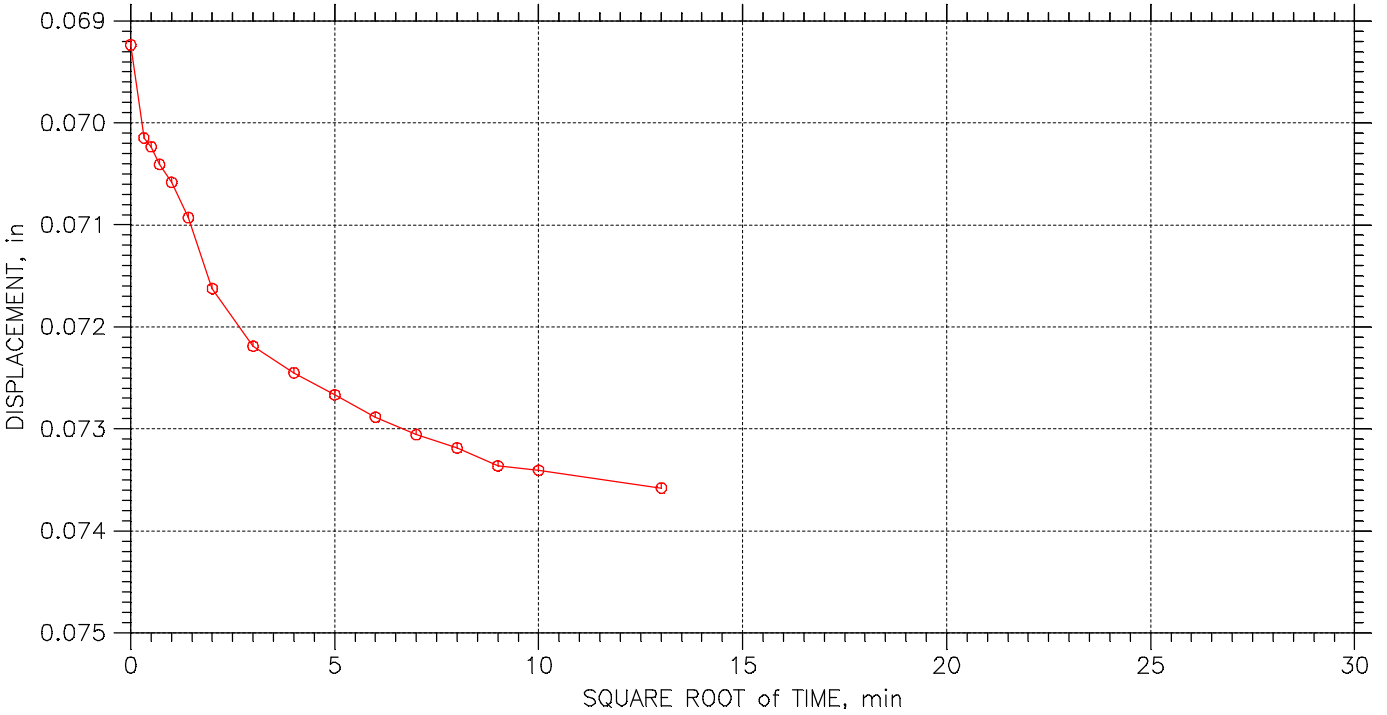
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





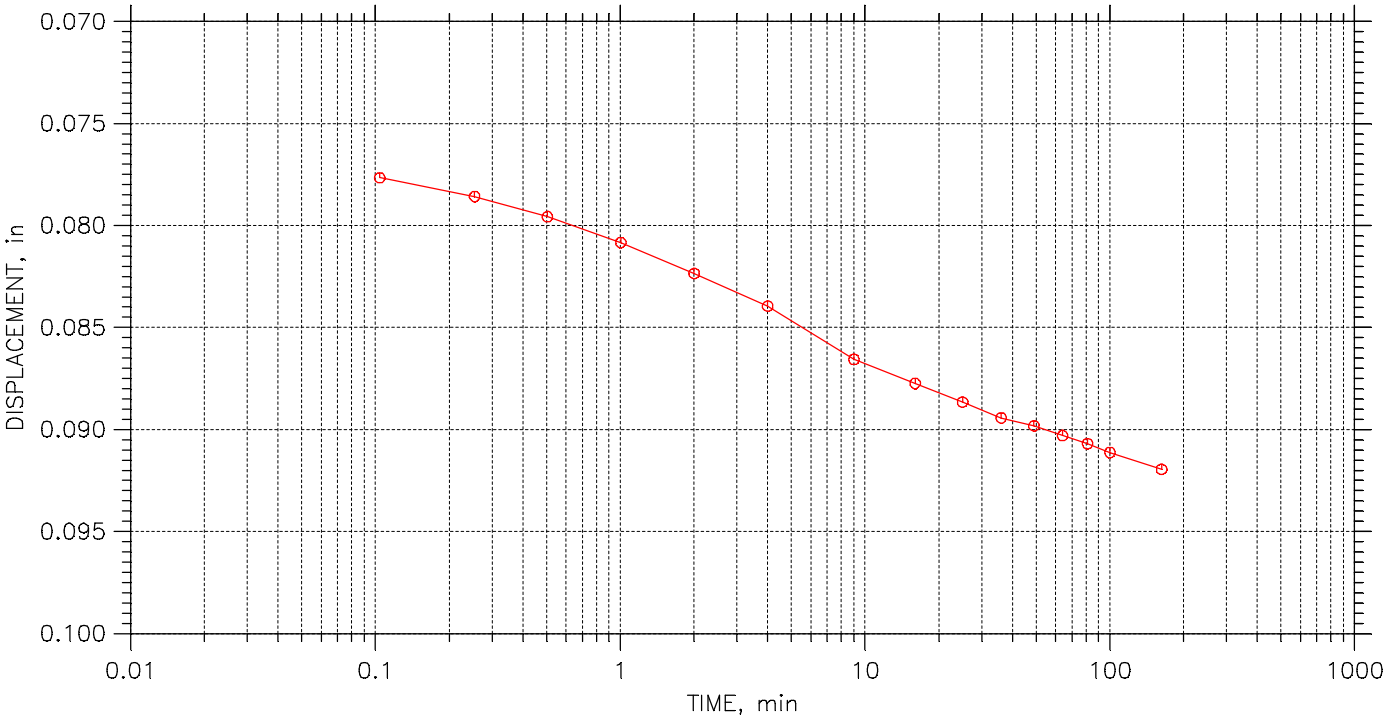
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

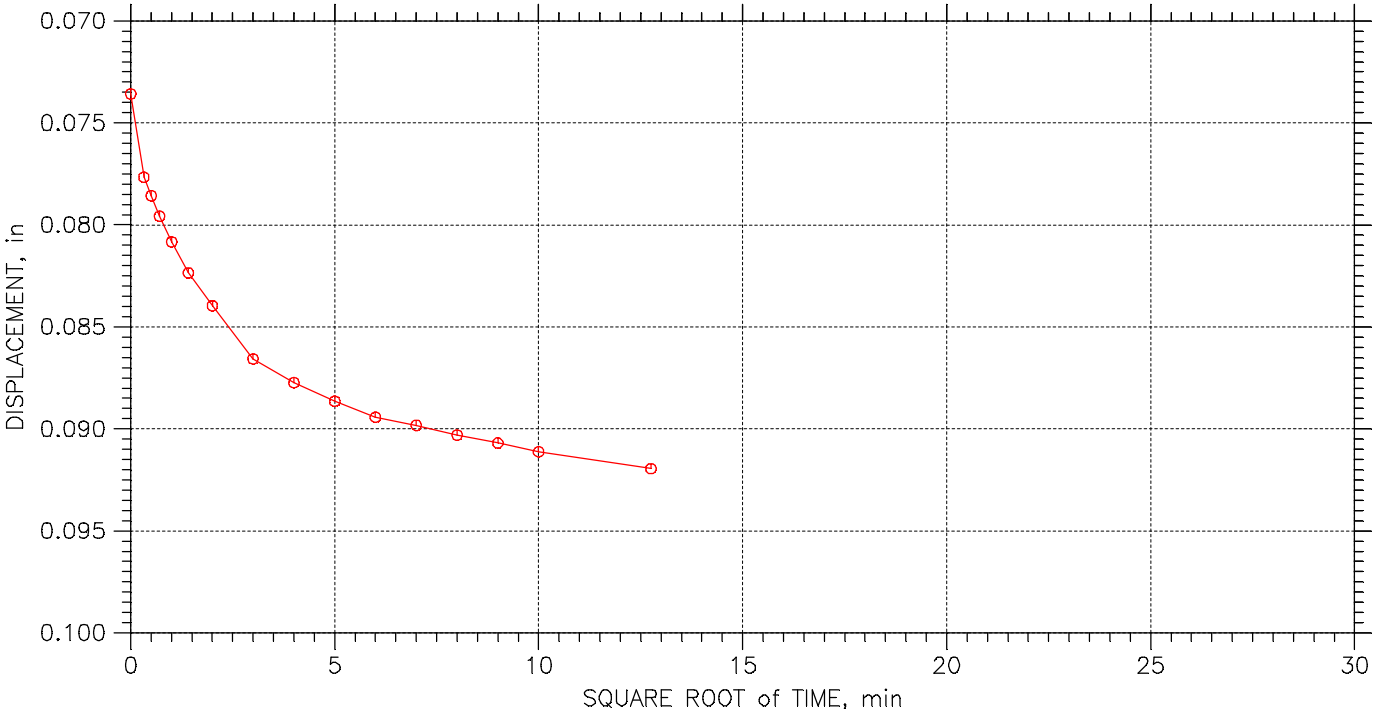
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





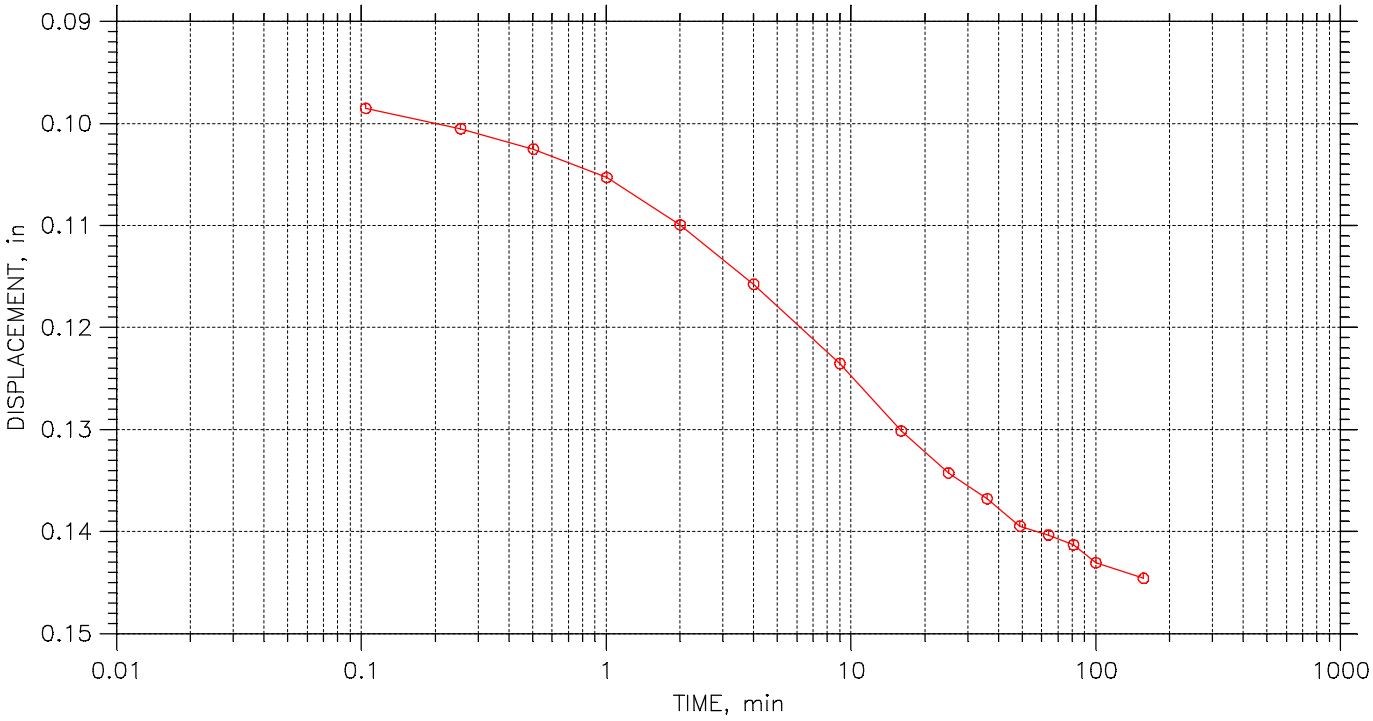
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

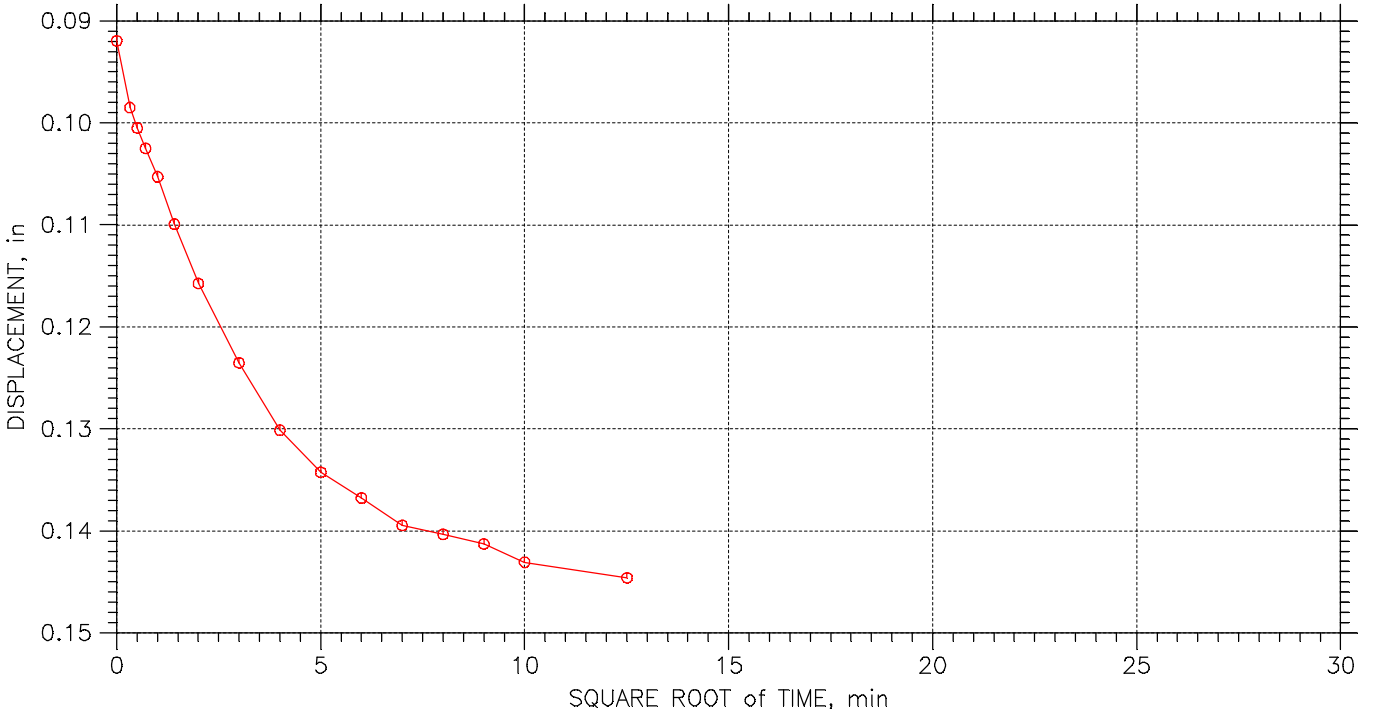
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





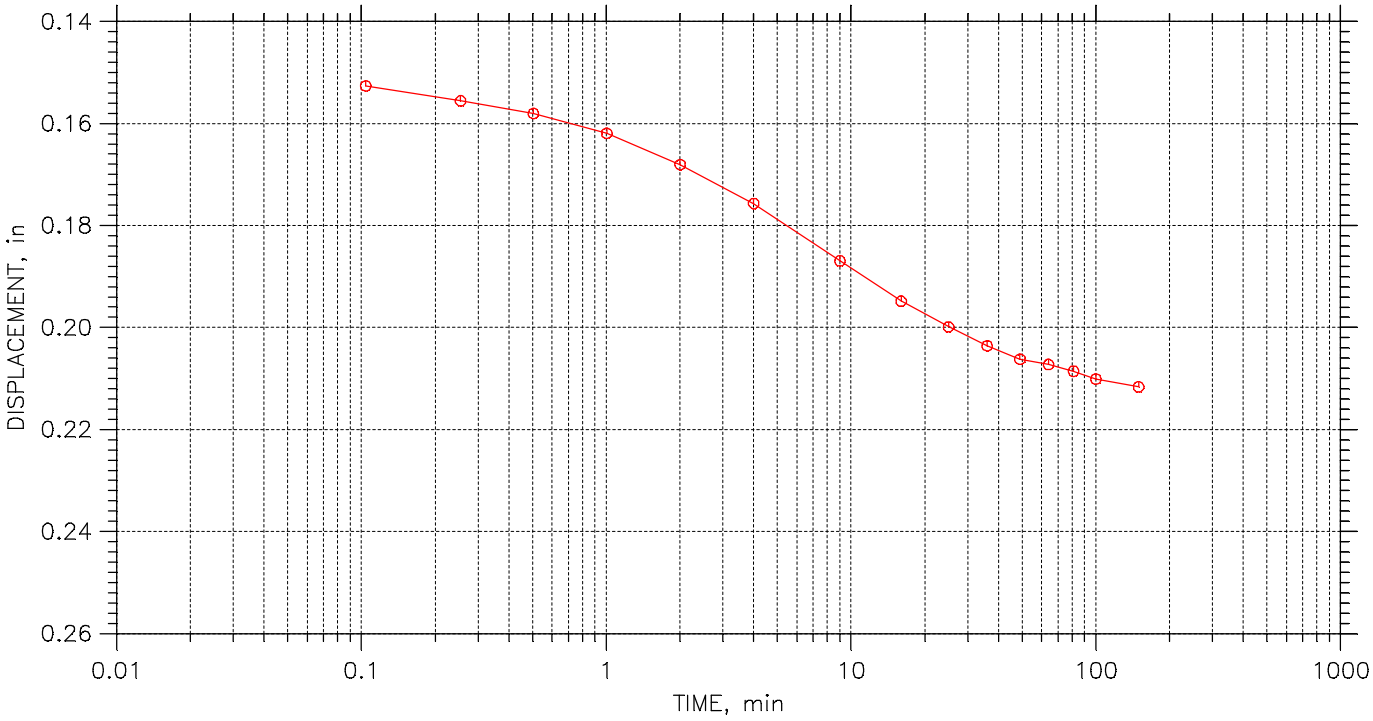
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

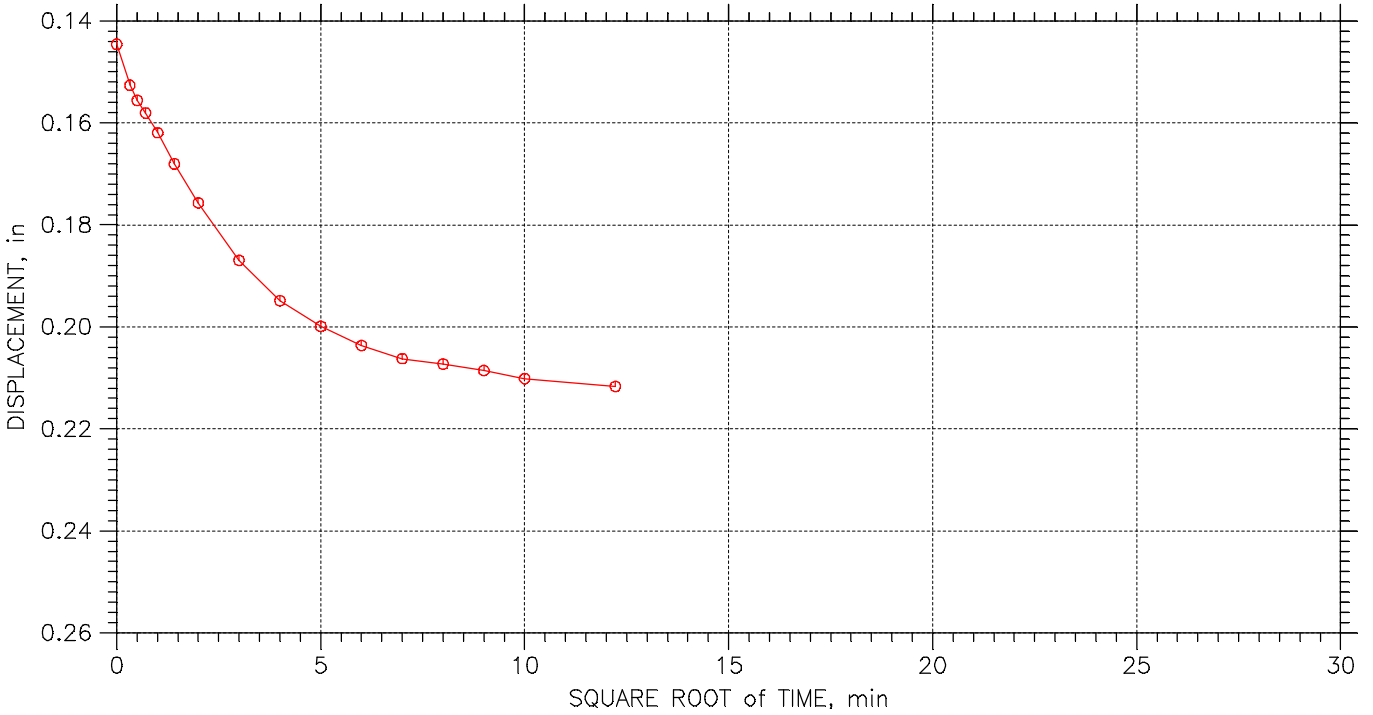
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





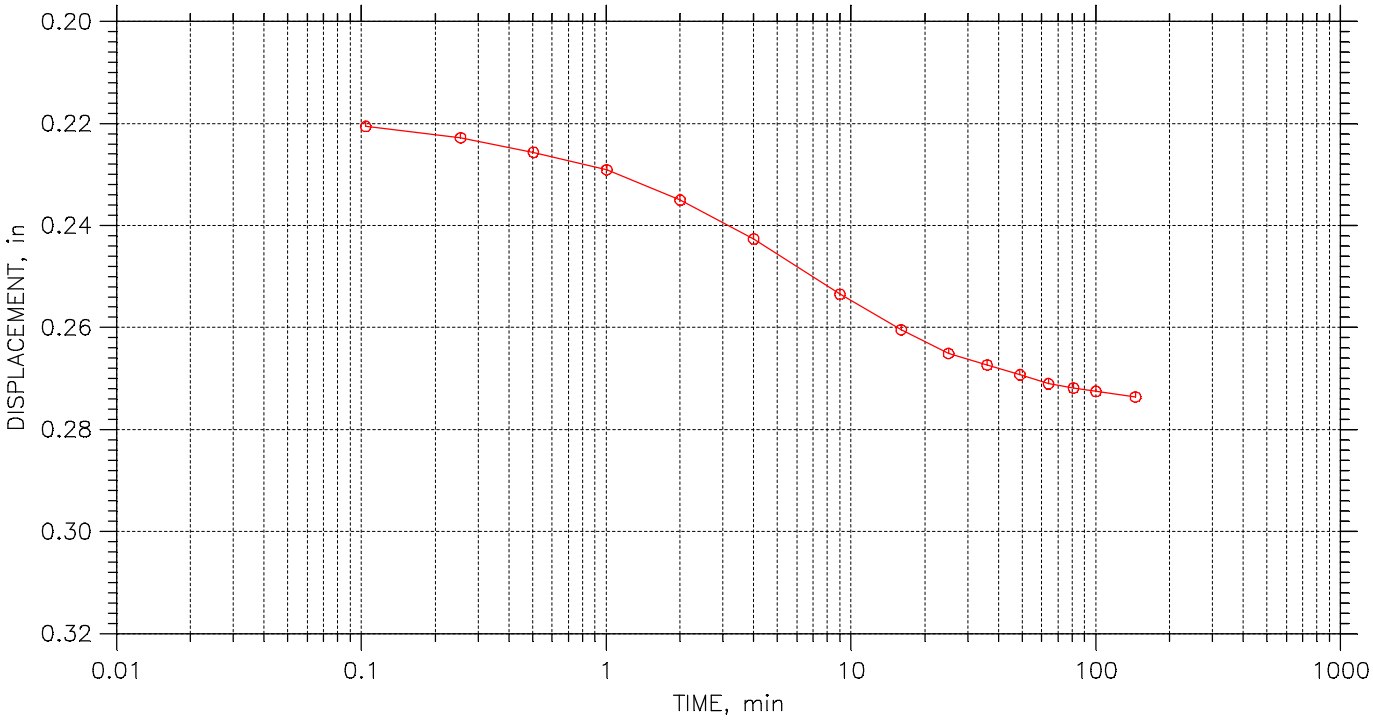
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

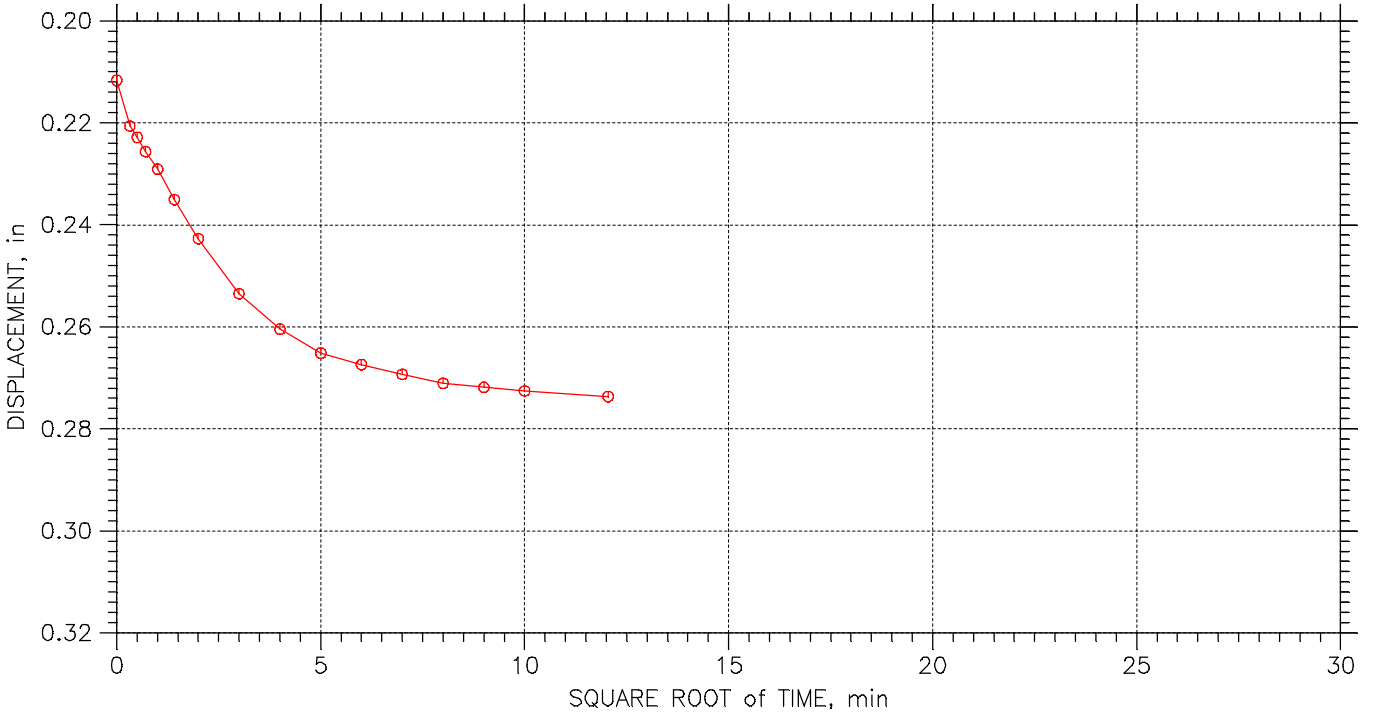
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

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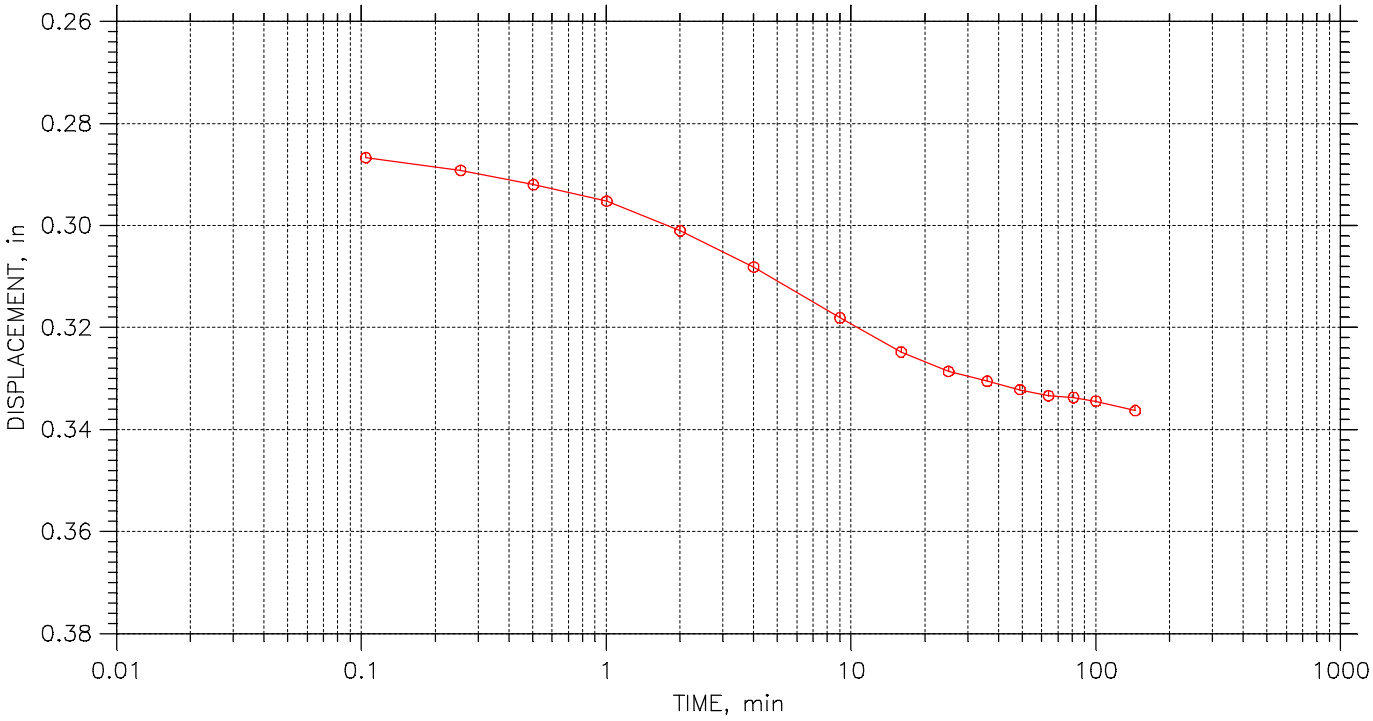
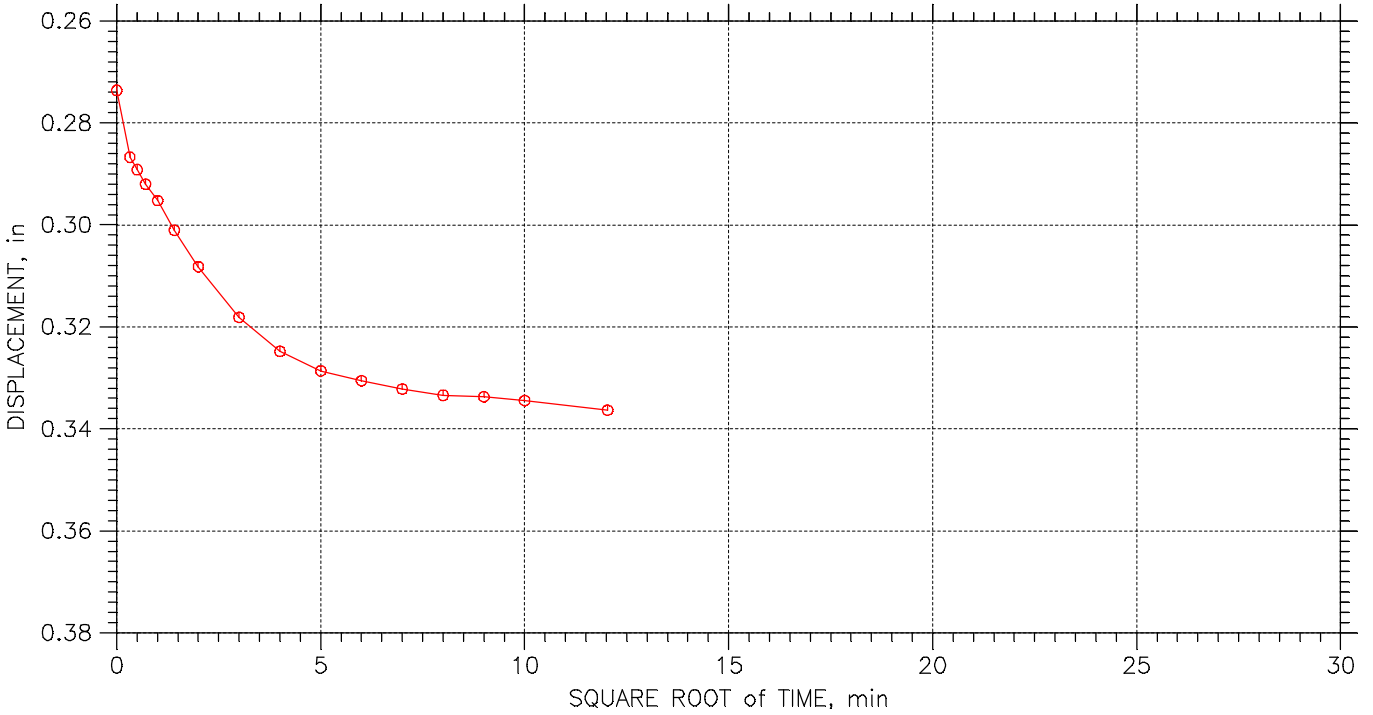
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

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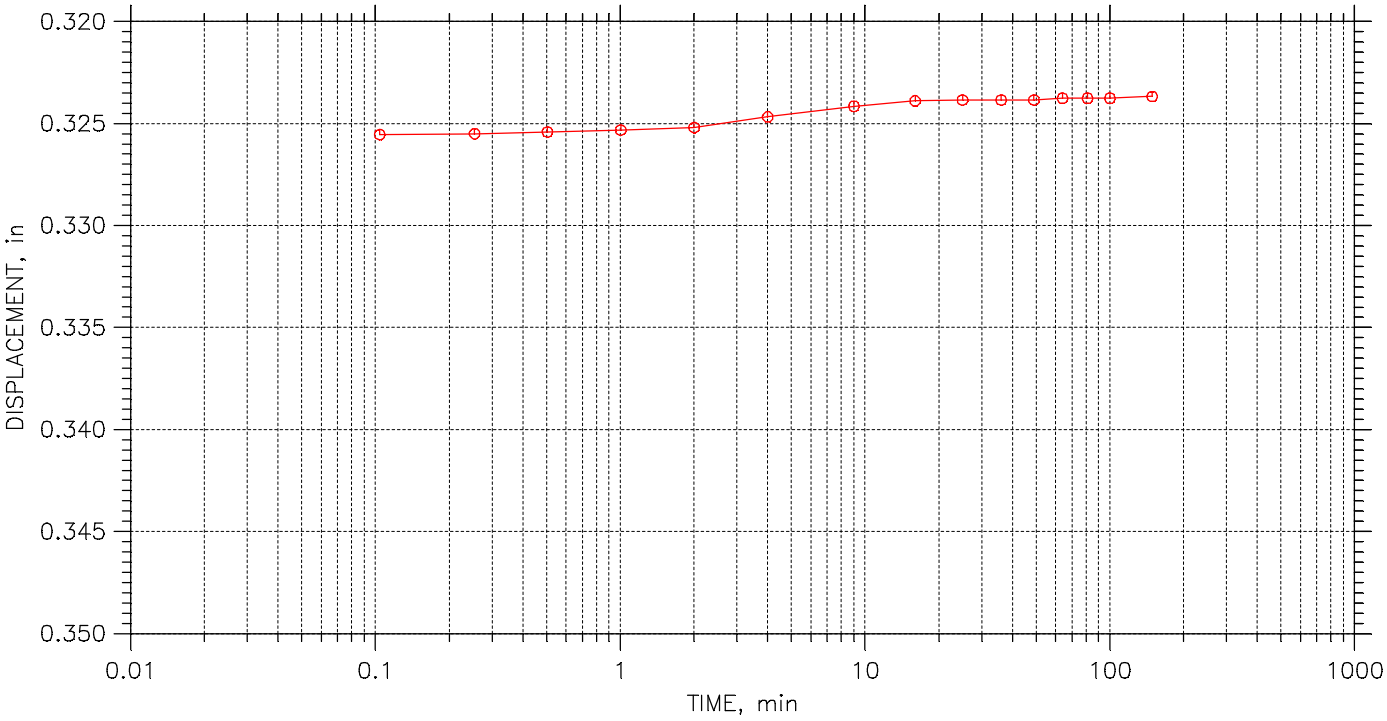
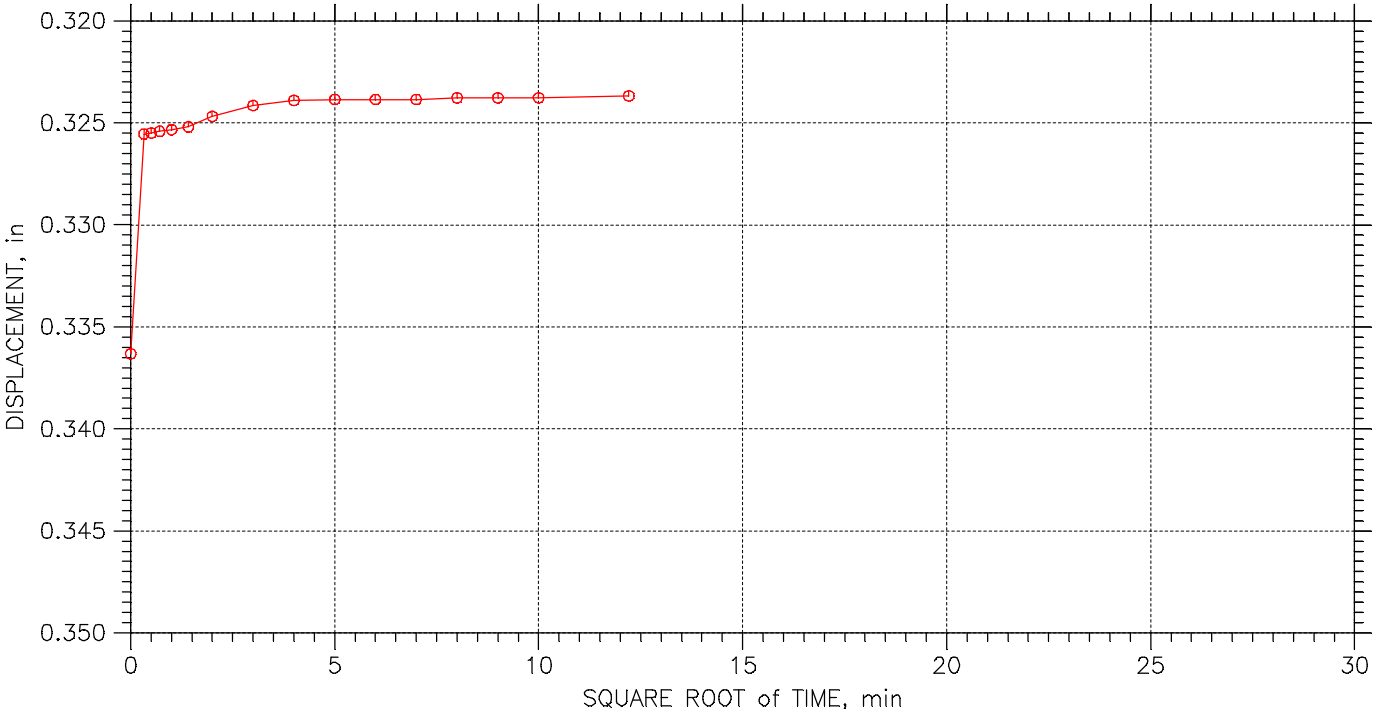
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





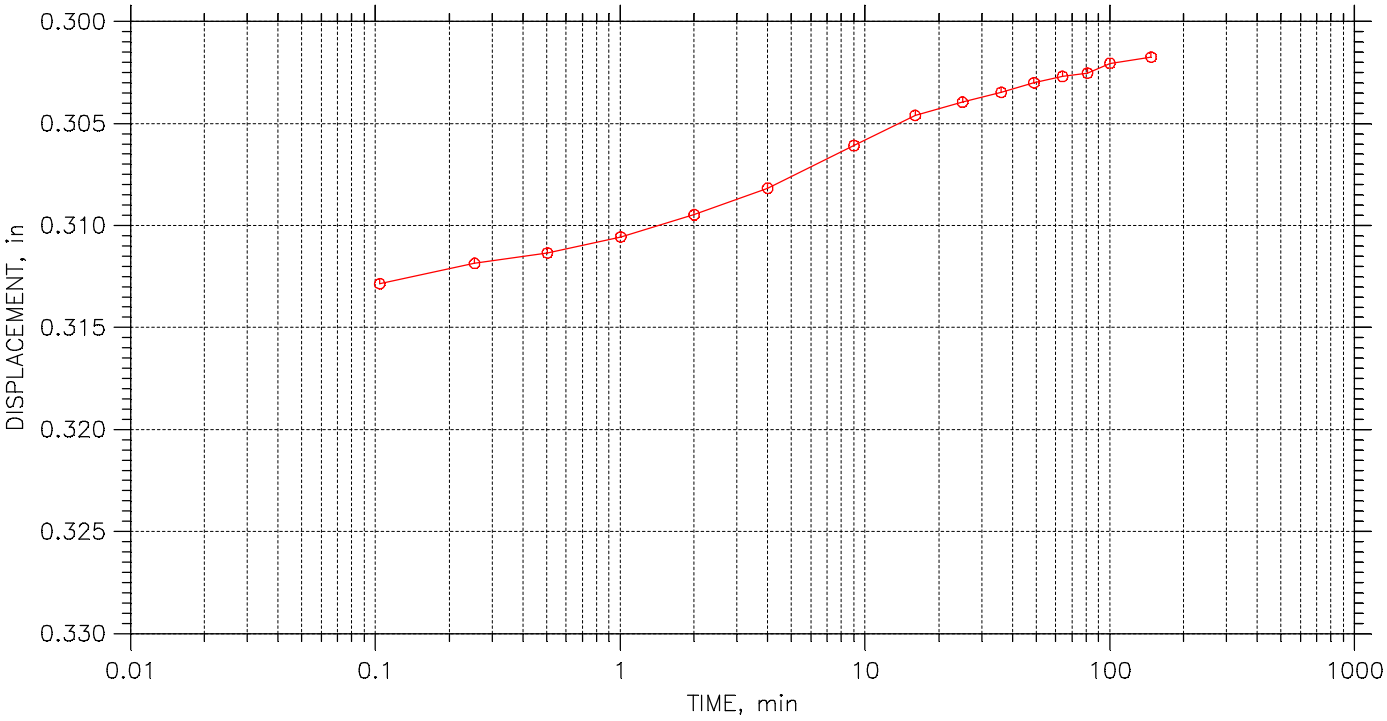
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

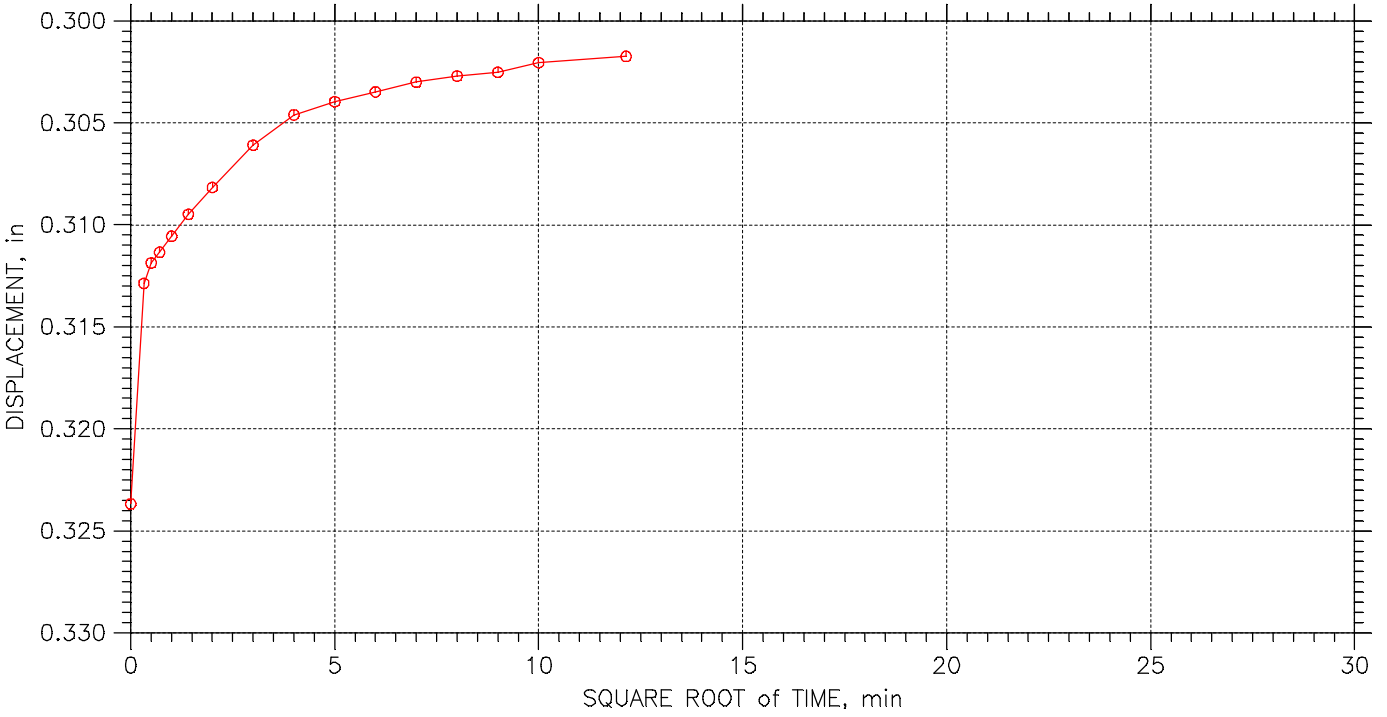
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





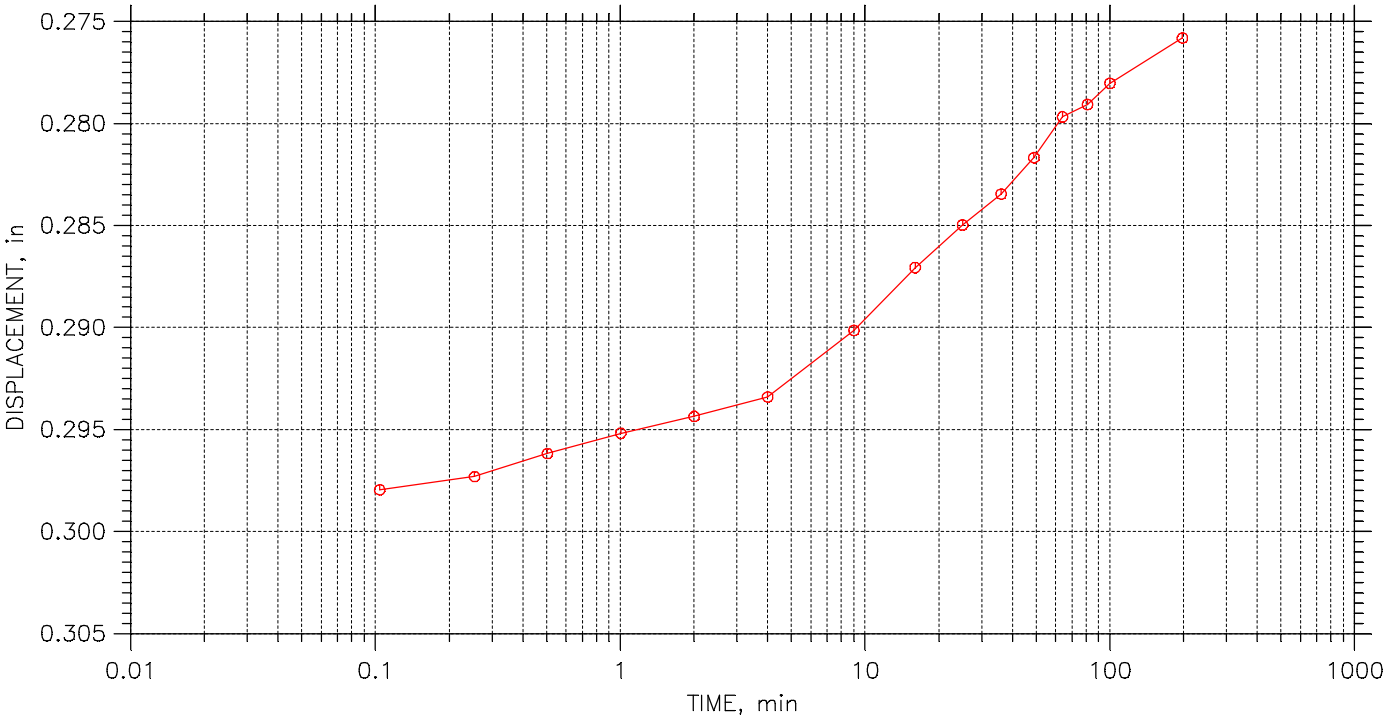
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

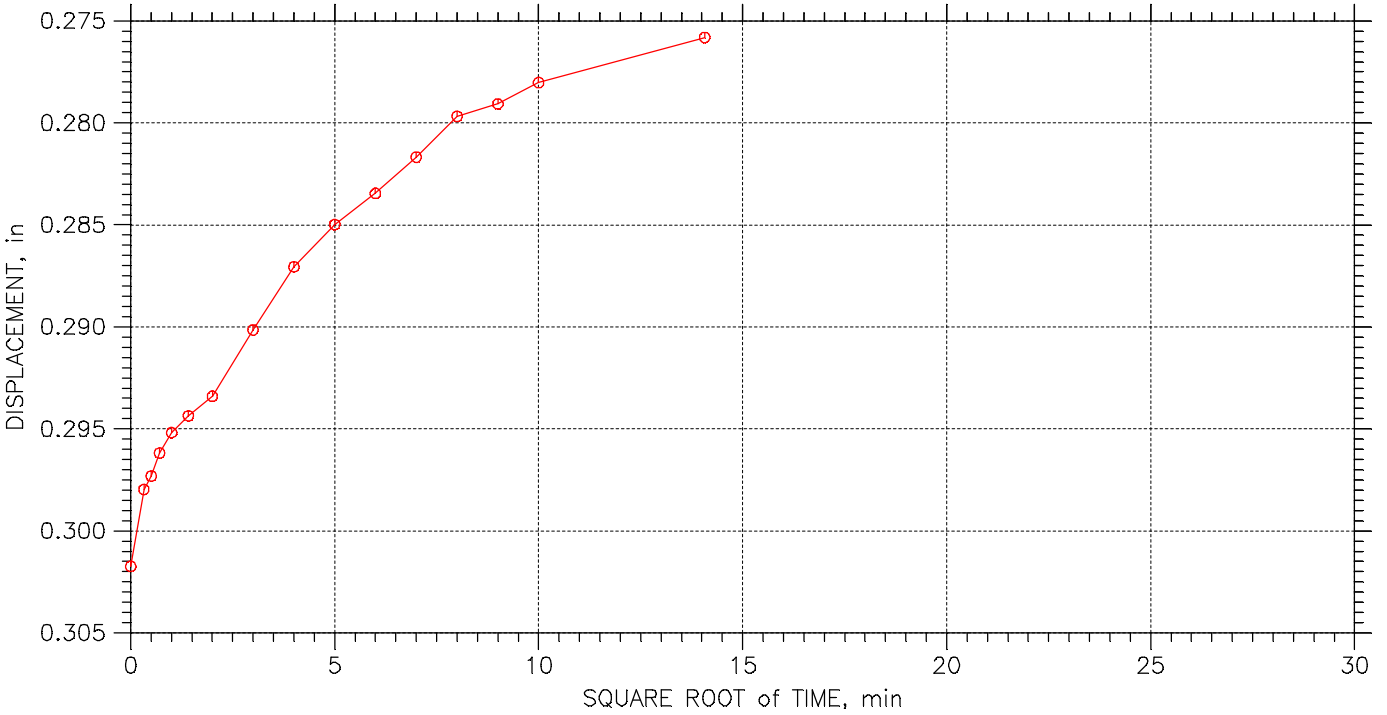
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





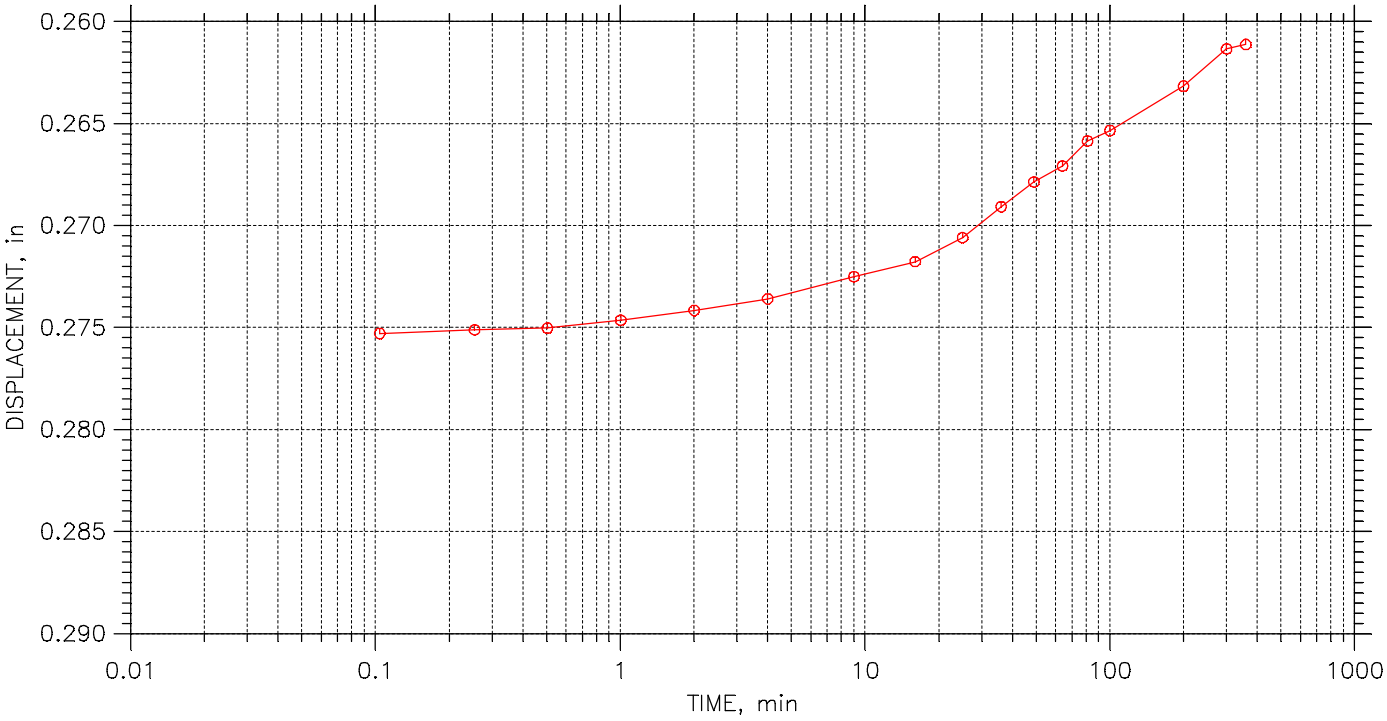
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

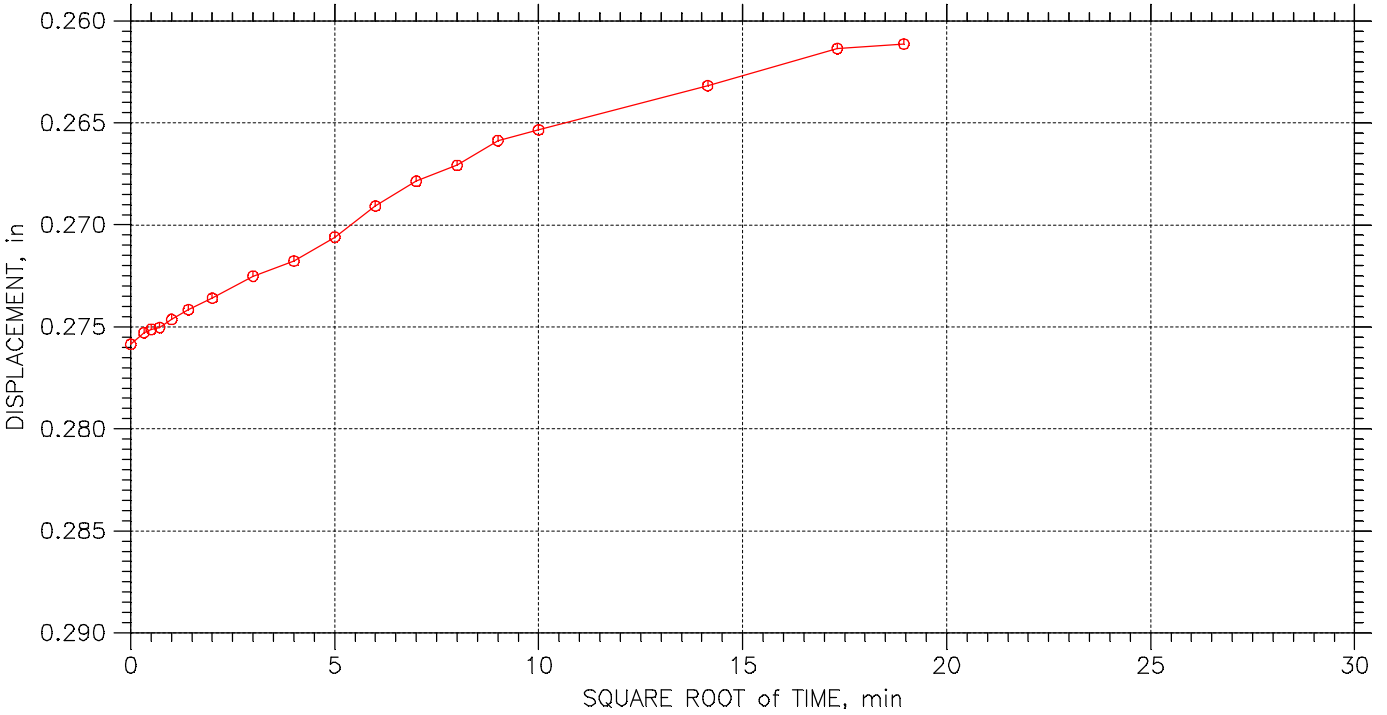
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





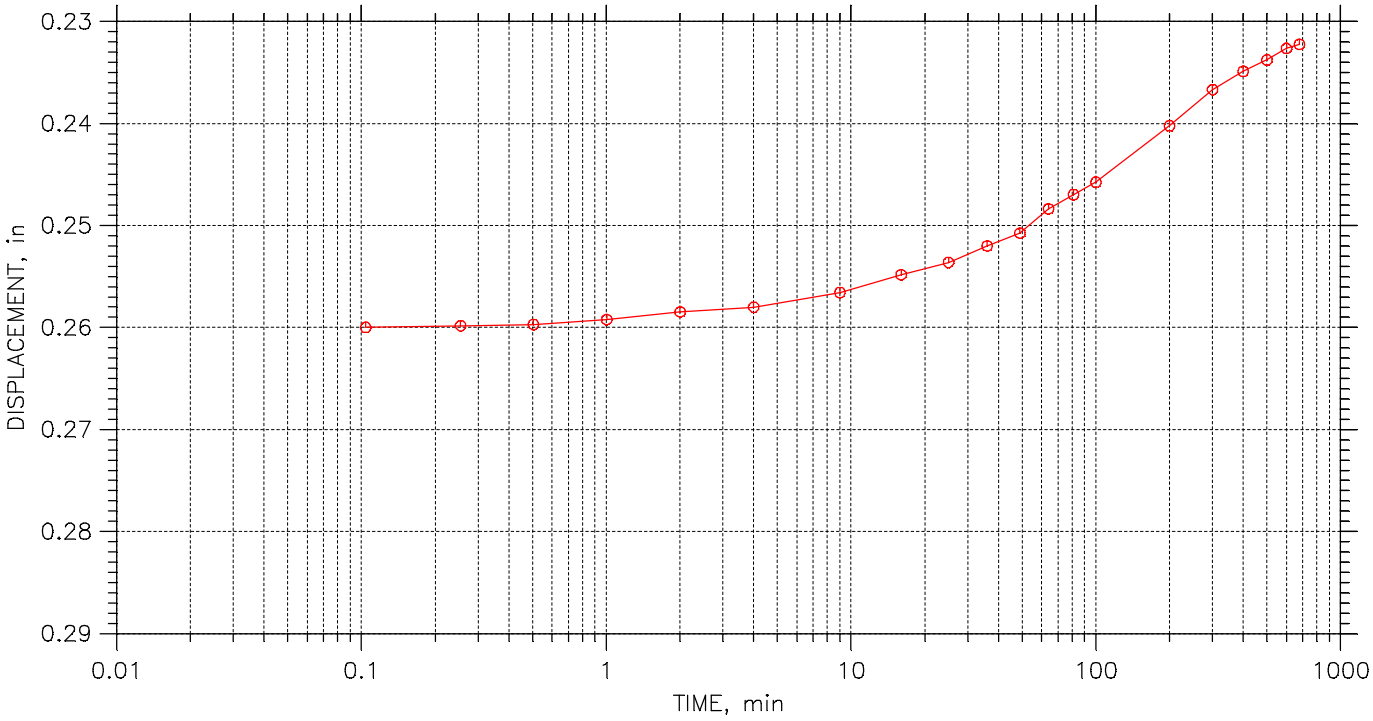
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

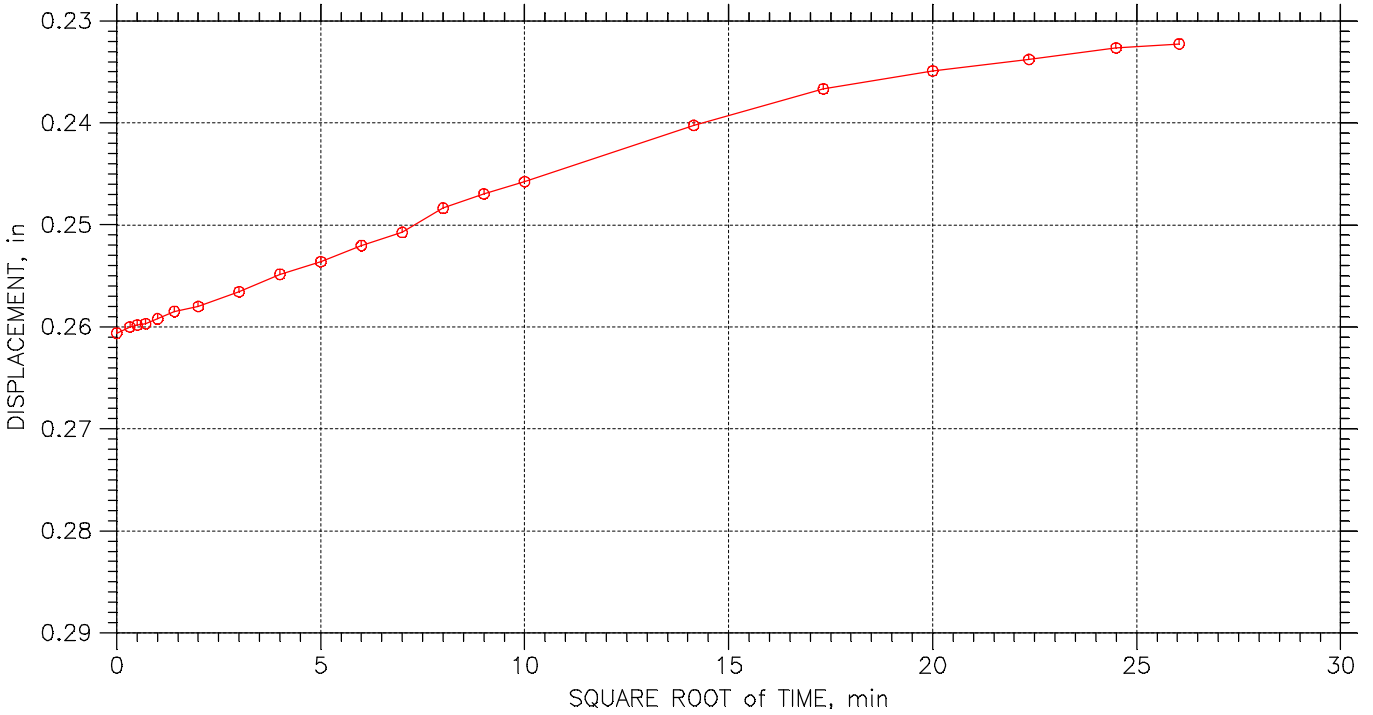
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

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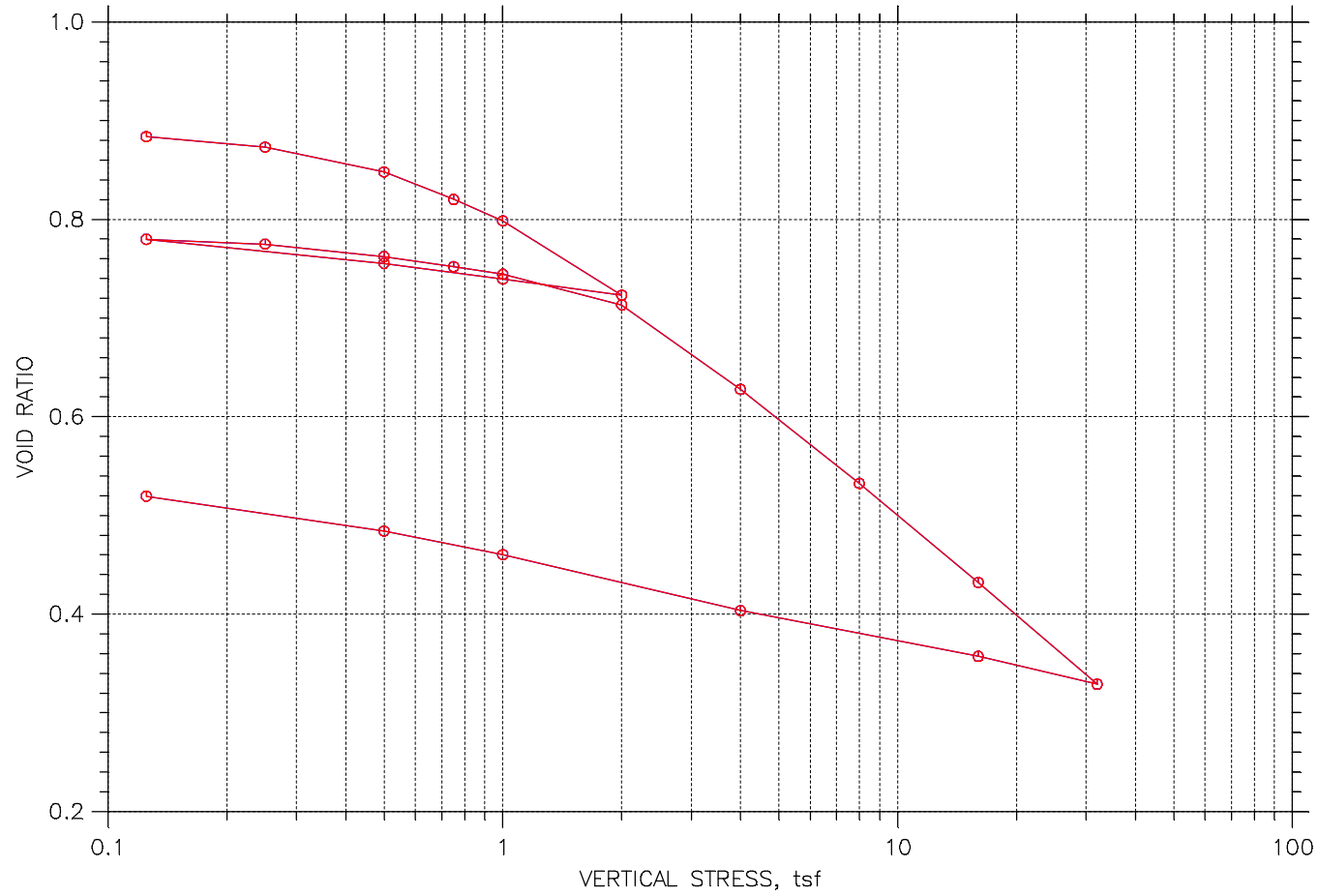
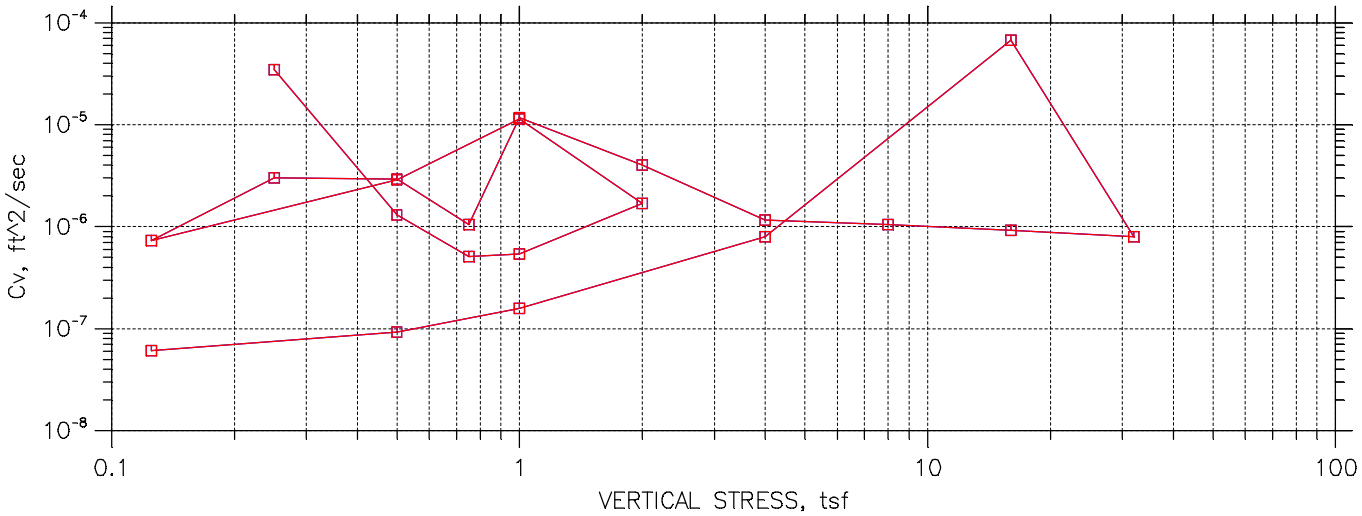
CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

Project: DYNERGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 0.91
Final Void Ratio: 0.52

Liquid Limit: 52
Plastic Limit: 19
Plasticity Index: 33

Initial Height: 0.75 in
Specimen Diameter: 2.49 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X19	RING	RING	A-8
Wt. Container + Wet Soil, gm	194.52	185.3	175.79	131.94
Wt. Container + Dry Soil, gm	156.81	159.5	159.5	115.76
Wt. Container, gm	44.78	74.3	74.3	31.14
Wt. Dry Soil, gm	112.03	85.199	85.199	84.62
Water Content, %	33.66	30.28	19.12	19.12
Void Ratio	---	0.91	0.52	---
Degree of Saturation, %	---	90.87	100.68	---
Dry Unit Weight, pcf	---	89.066	111.96	---

CONSOLIDATION TEST DATA

Project: DYNERGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

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Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

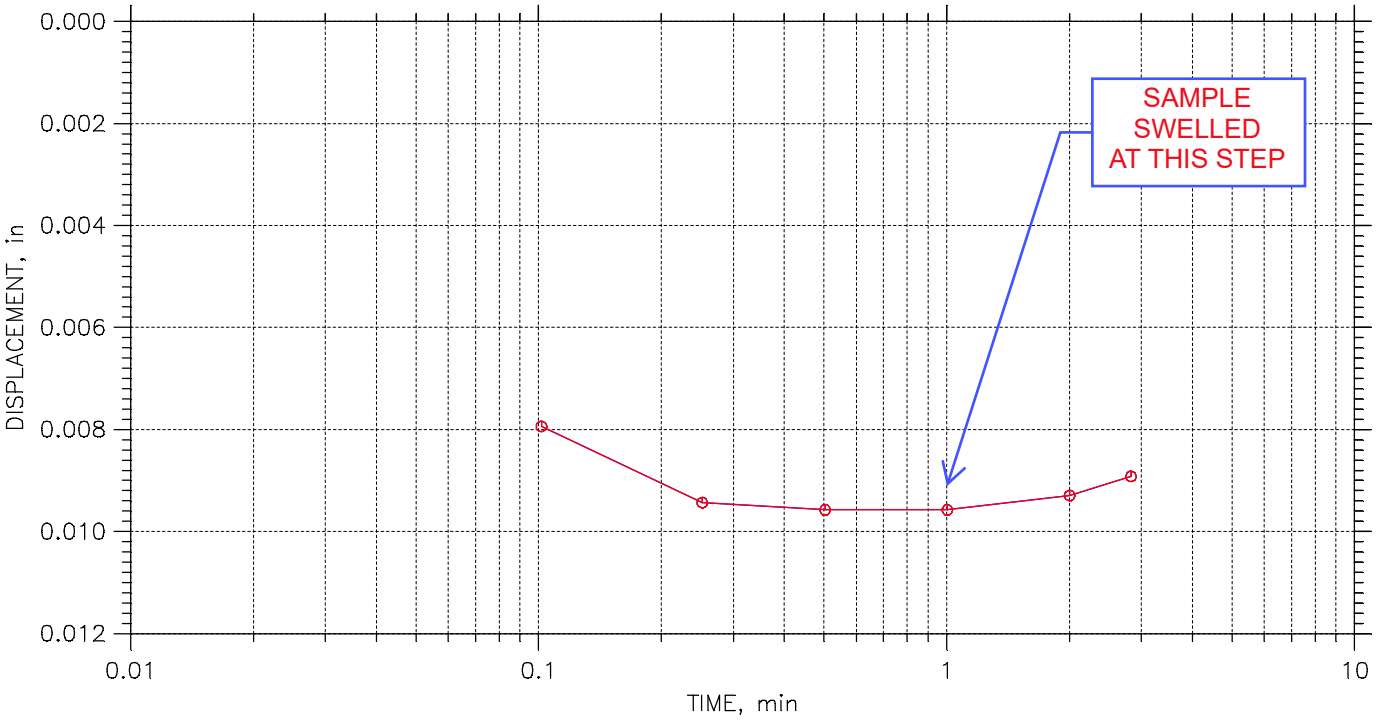
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.008922	0.884	1.19	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.01289	0.874	1.72	0.1	0.0	3.48e-005	0.00e+000	3.48e-005
3	0.5	0.02294	0.848	3.07	1.5	0.5	2.05e-006	5.95e-006	3.05e-006
4	0.75	0.03373	0.821	4.51	5.8	0.0	5.07e-007	0.00e+000	5.07e-007
5	1	0.04241	0.798	5.67	3.8	3.2	7.58e-007	8.96e-007	8.21e-007
6	2	0.07189	0.723	9.61	2.1	1.1	1.30e-006	2.41e-006	1.69e-006
7	1	0.06554	0.739	8.76	0.2	0.0	1.15e-005	0.00e+000	1.15e-005
8	0.5	0.05914	0.756	7.91	0.9	0.0	2.88e-006	0.00e+000	2.88e-006
9	0.125	0.0497	0.780	6.64	3.7	0.0	7.35e-007	0.00e+000	7.35e-007
10	0.25	0.05157	0.775	6.89	0.9	0.0	3.01e-006	0.00e+000	3.01e-006
11	0.5	0.05657	0.762	7.56	0.9	0.0	2.94e-006	0.00e+000	2.94e-006
12	0.75	0.06059	0.752	8.10	3.9	1.3	6.94e-007	2.10e-006	1.04e-006
13	1	0.06357	0.744	8.50	0.2	0.0	1.18e-005	0.00e+000	1.18e-005
14	2	0.07577	0.713	10.13	0.9	0.4	2.80e-006	7.14e-006	4.02e-006
15	4	0.1094	0.628	14.62	2.1	0.0	1.17e-006	0.00e+000	1.17e-006
16	8	0.1468	0.532	19.63	2.1	0.0	1.04e-006	0.00e+000	1.04e-006
17	16	0.1861	0.432	24.88	2.1	0.0	9.17e-007	0.00e+000	9.17e-007
18	32	0.2266	0.329	30.29	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
19	16	0.2155	0.357	28.81	0.0	0.0	6.68e-005	0.00e+000	6.68e-005
20	4	0.1974	0.403	26.38	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
21	1	0.1751	0.460	23.40	11.4	0.0	1.58e-007	0.00e+000	1.58e-007
22	0.5	0.1661	0.483	22.21	8.8	0.0	2.16e-007	0.00e+000	2.16e-007
23	0.125	0.153	0.517	20.45	32.0	0.0	6.18e-008	0.00e+000	6.18e-008

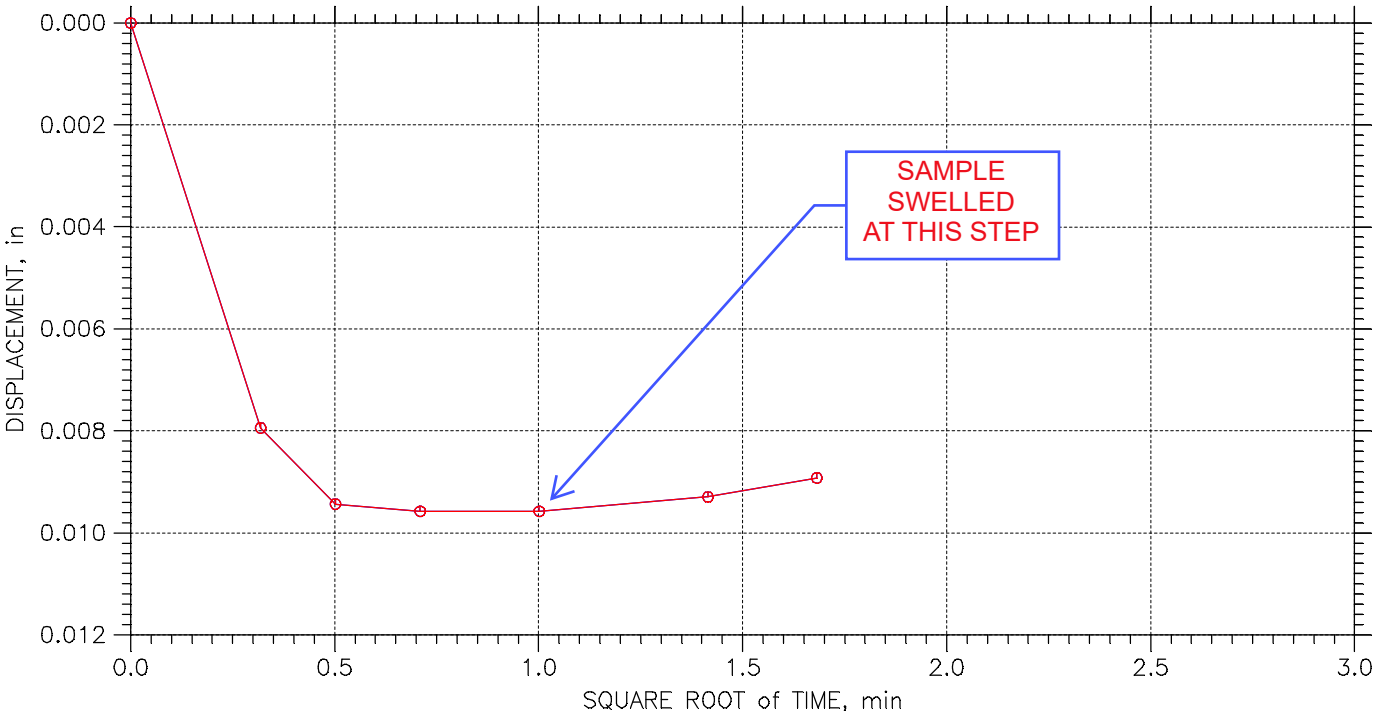
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





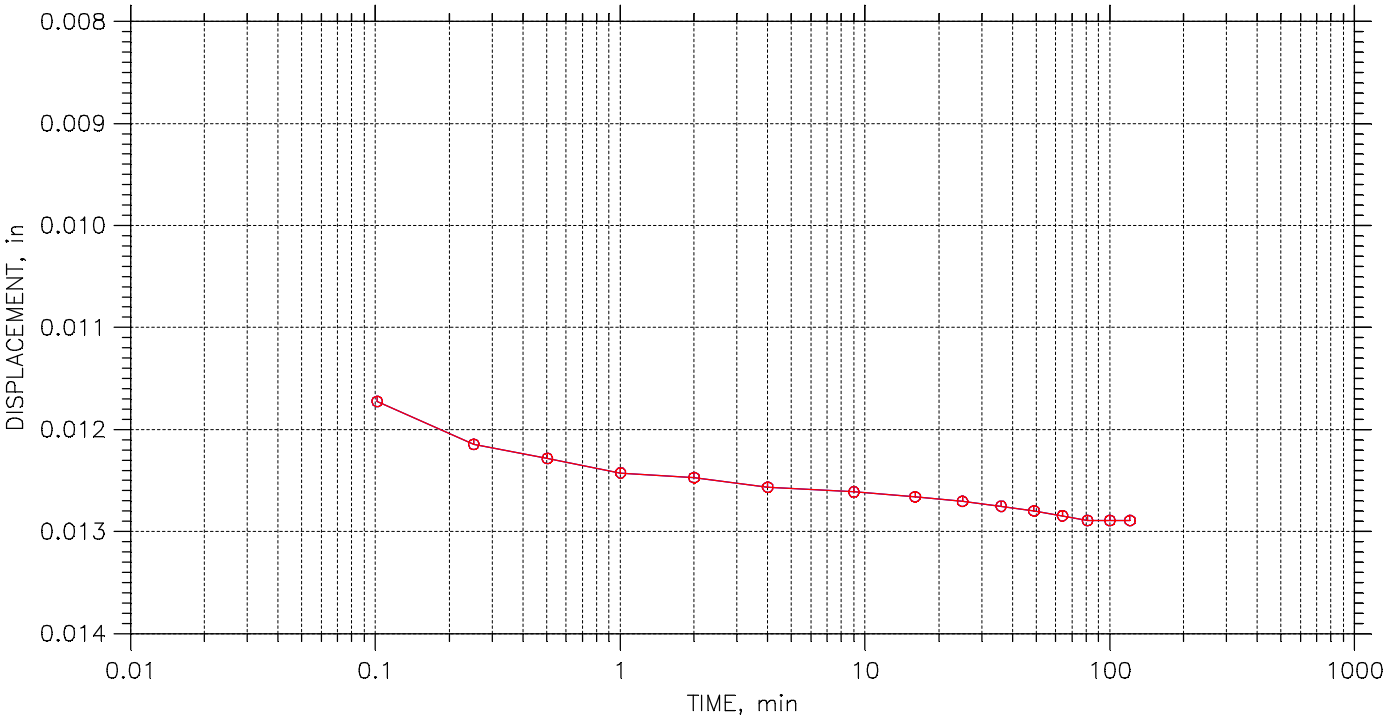
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

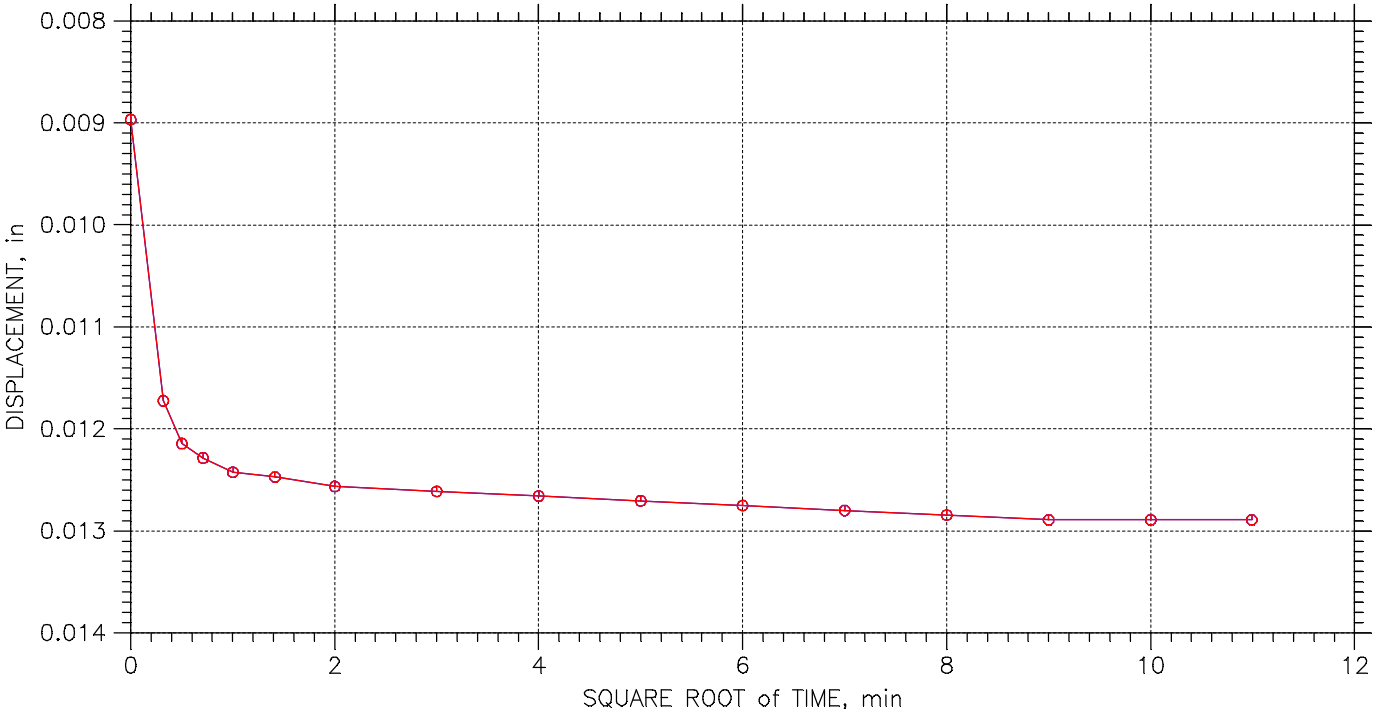
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





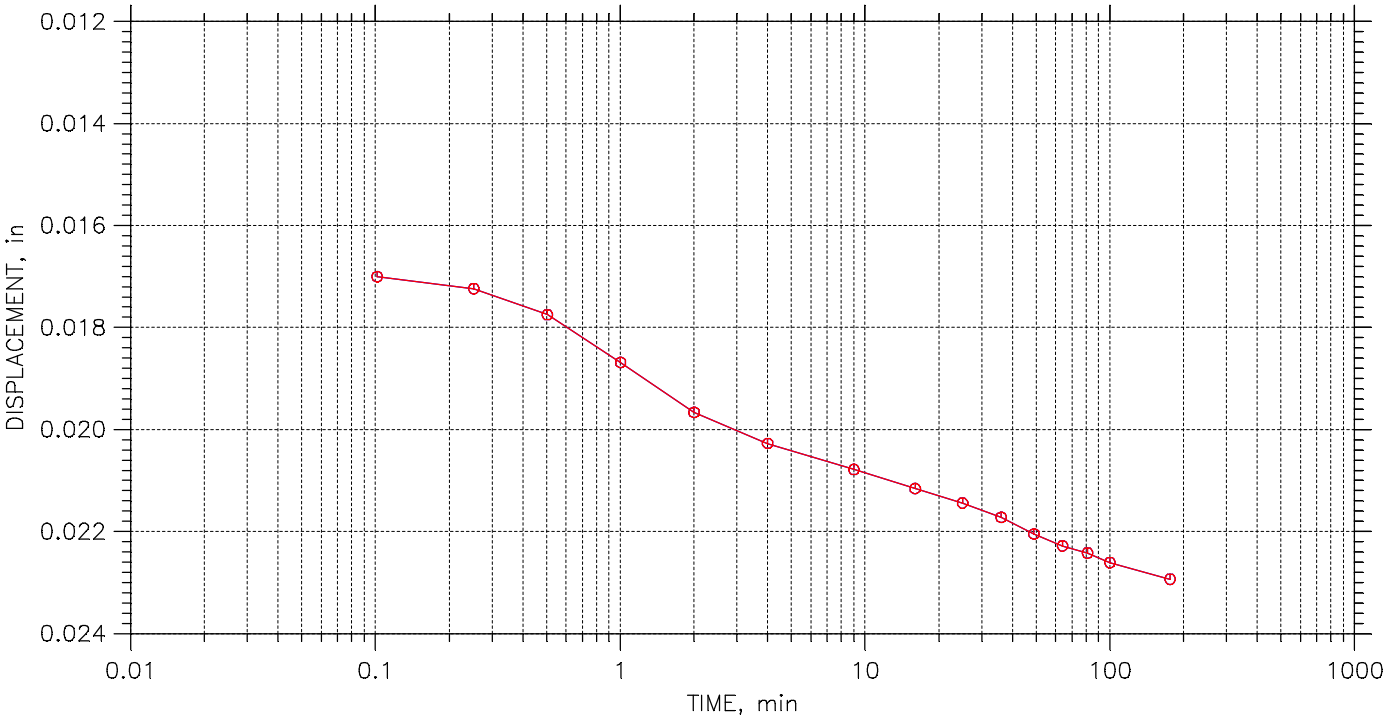
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

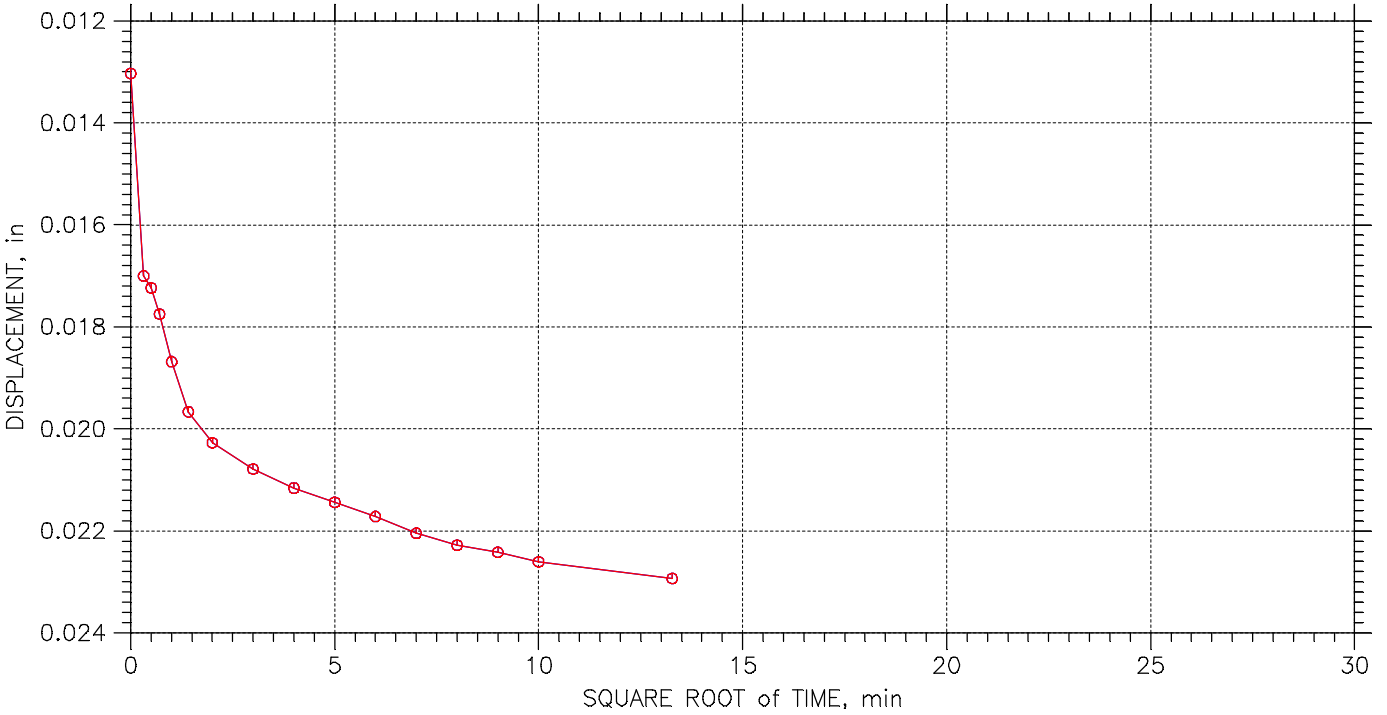
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





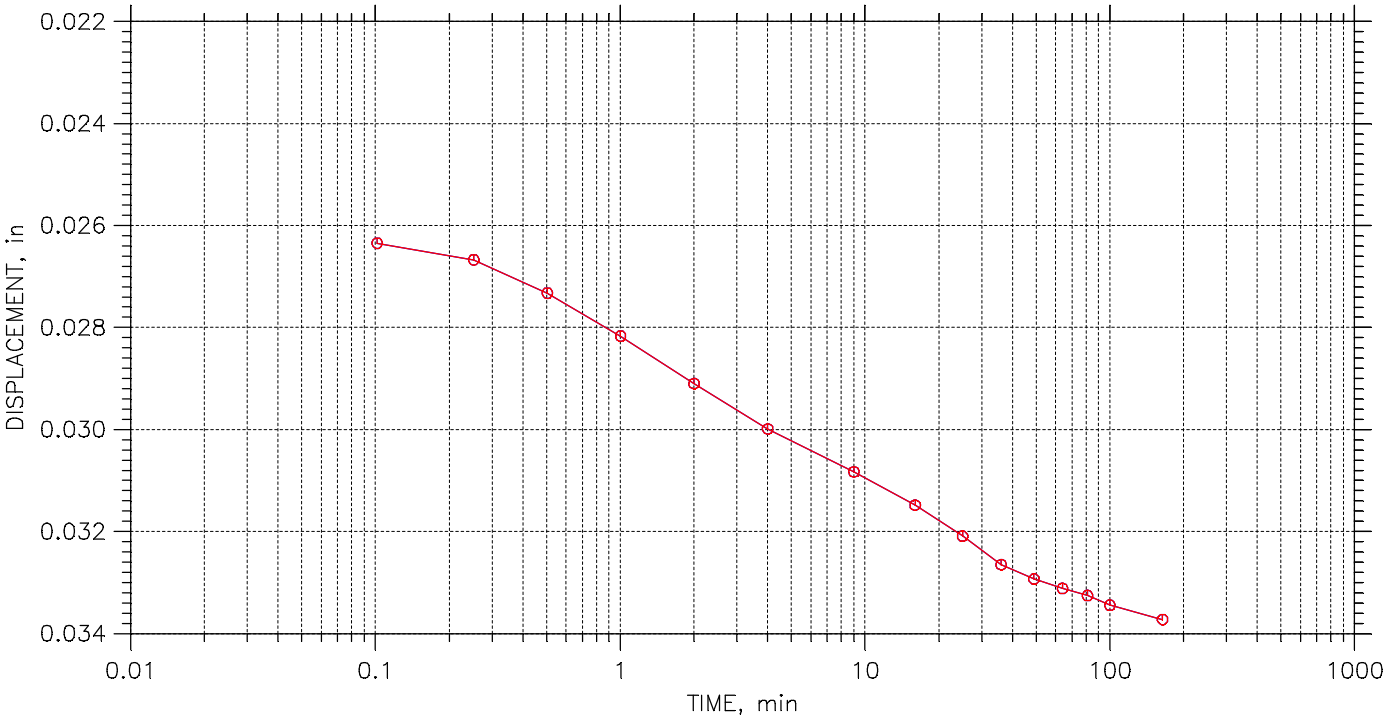
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

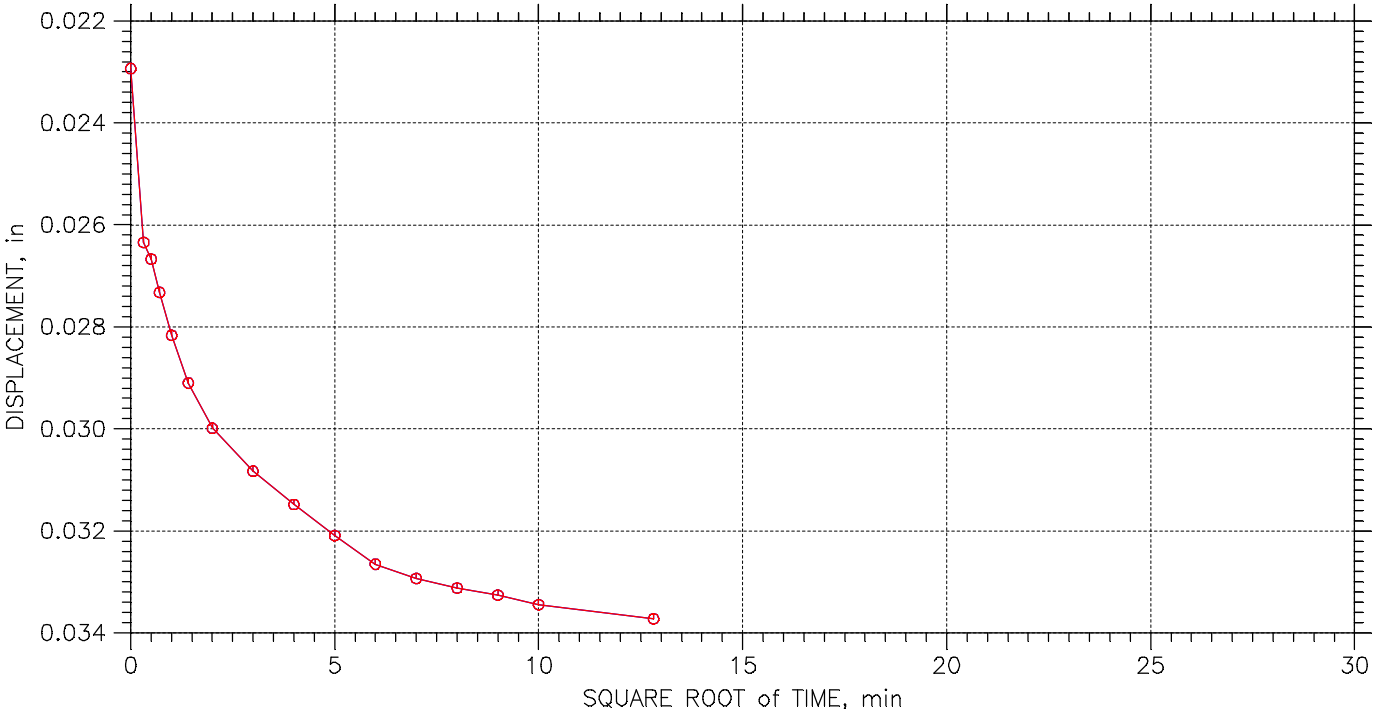
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





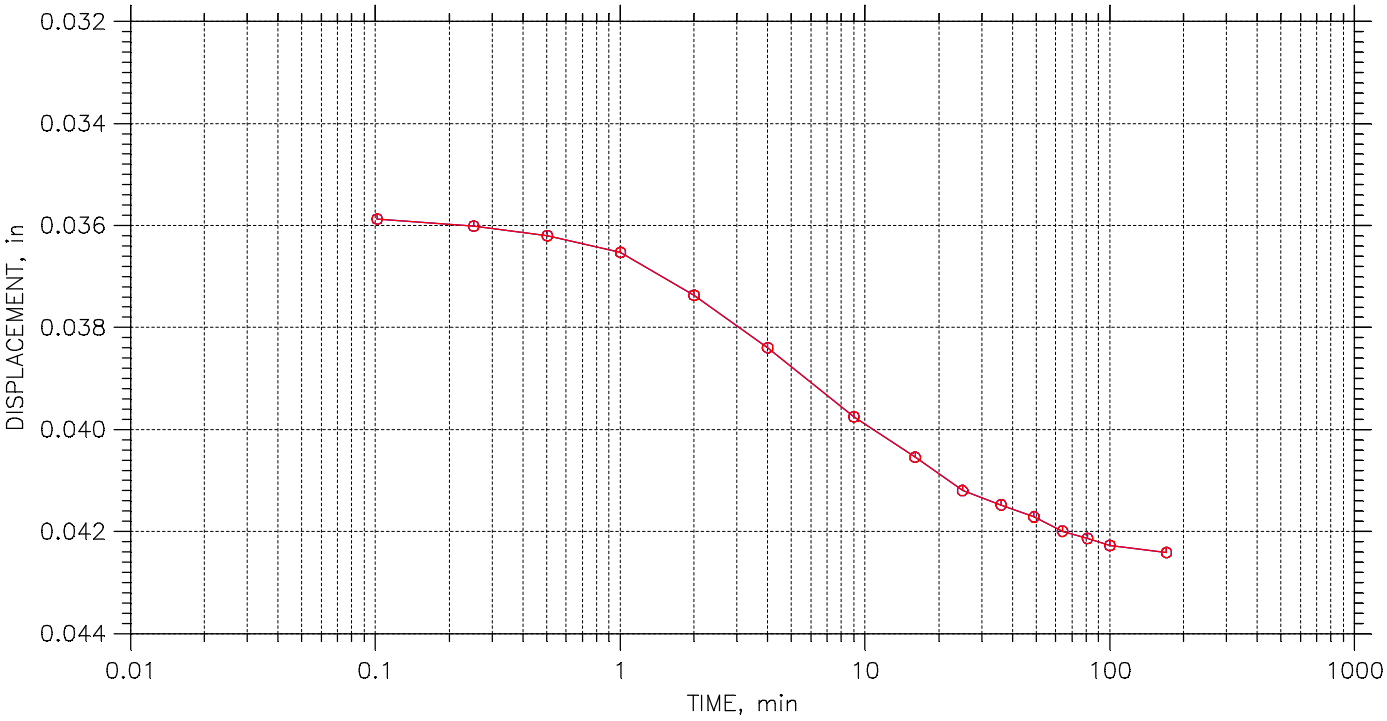
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

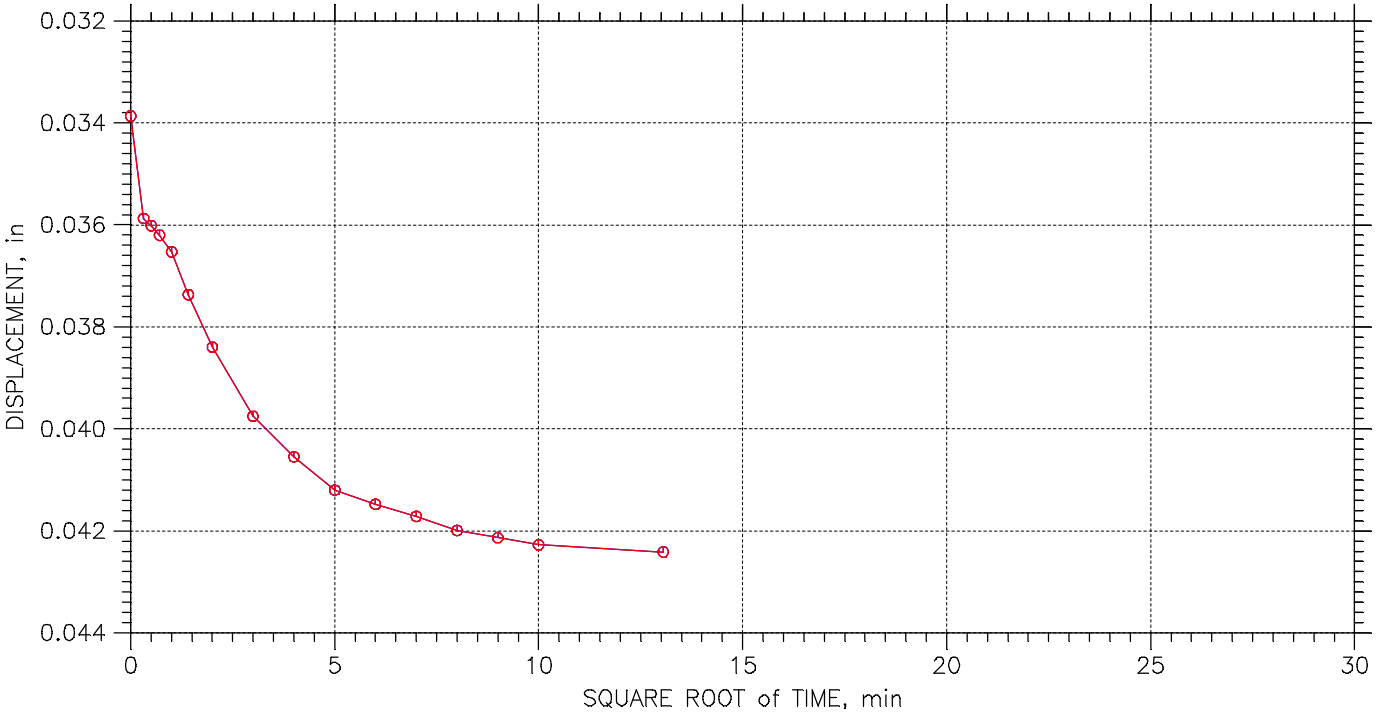
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





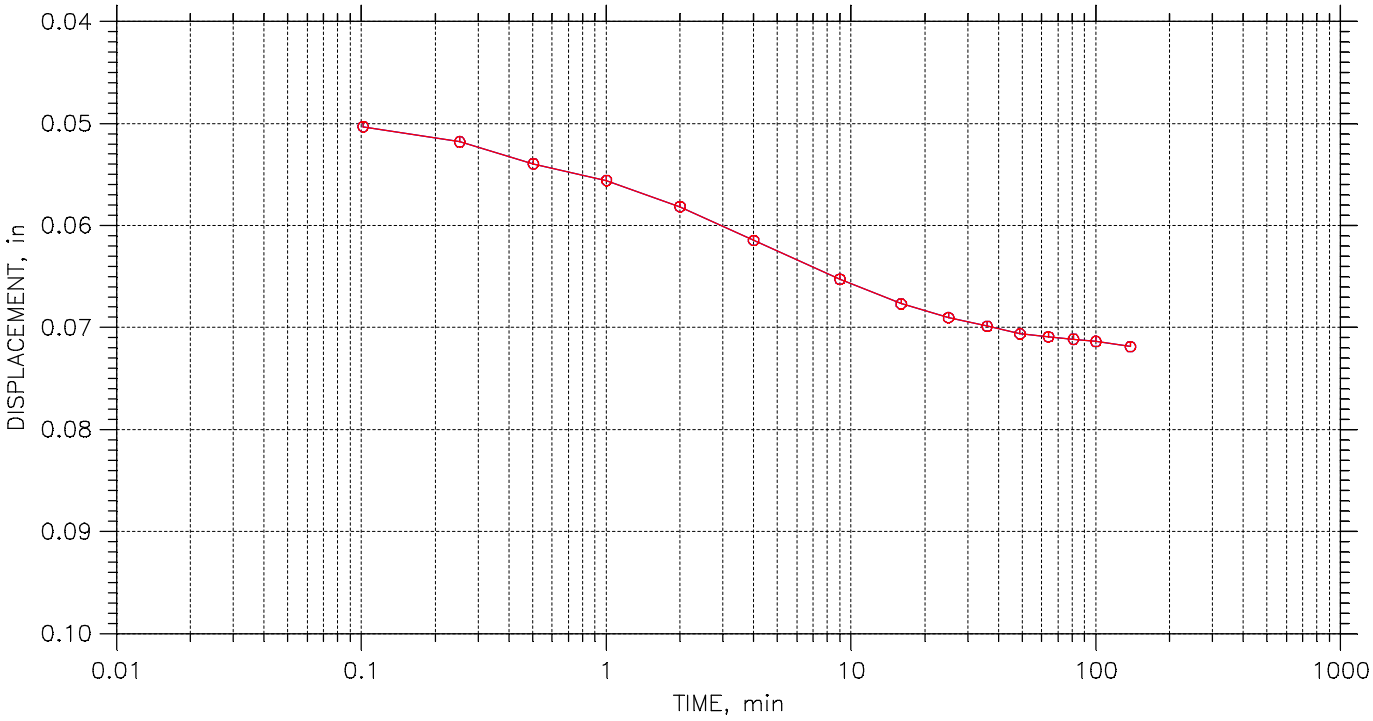
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

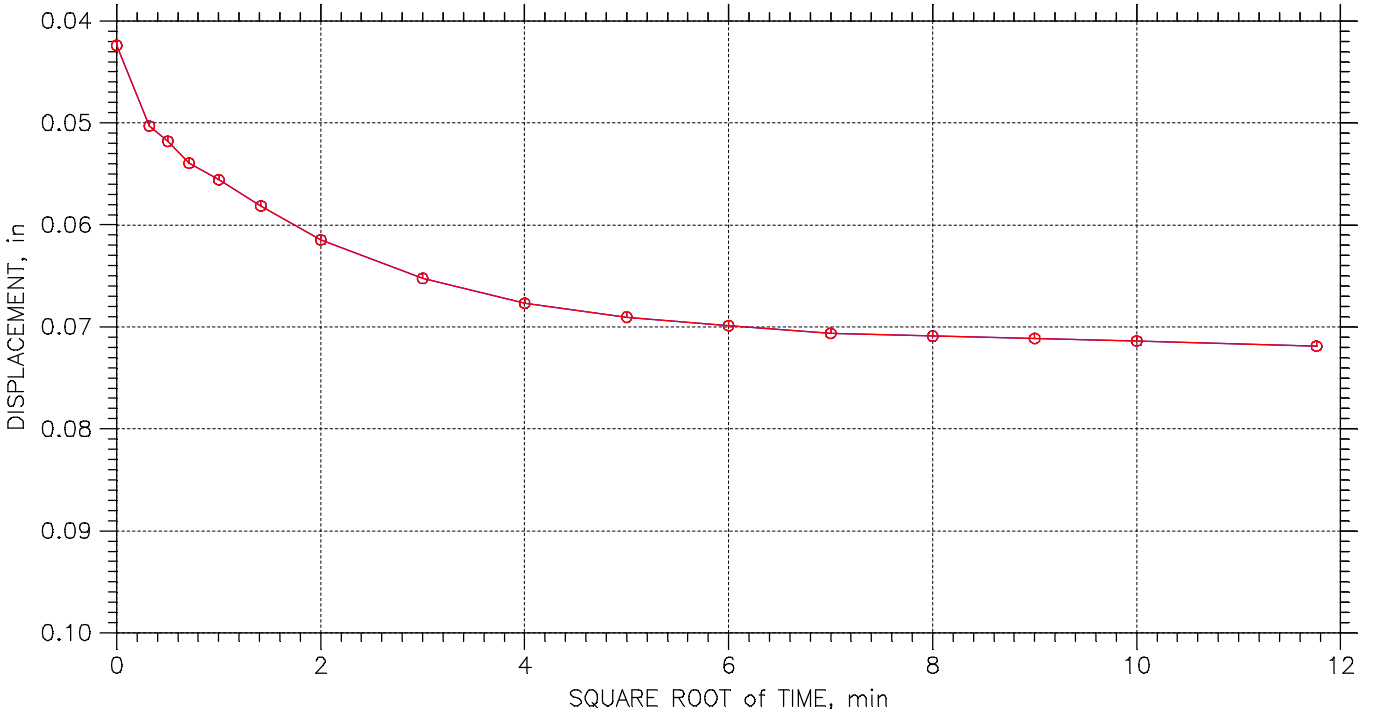
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





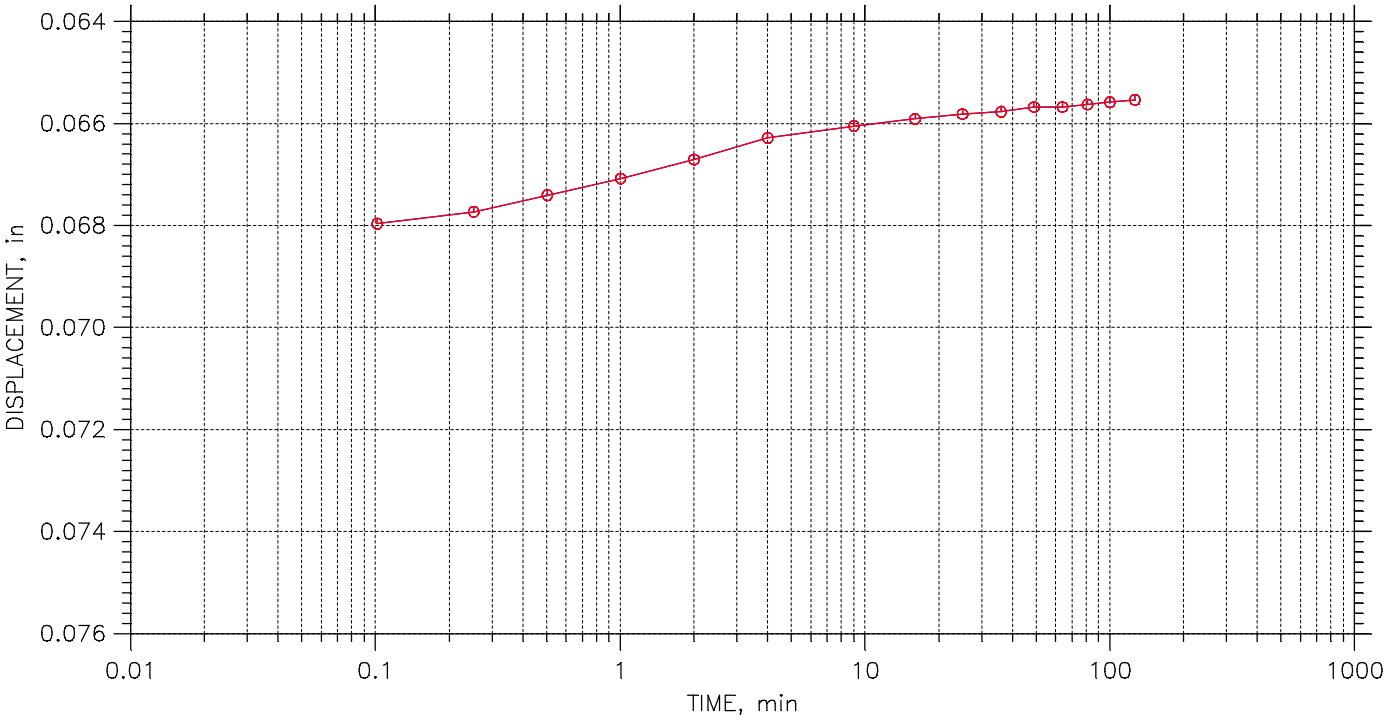
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

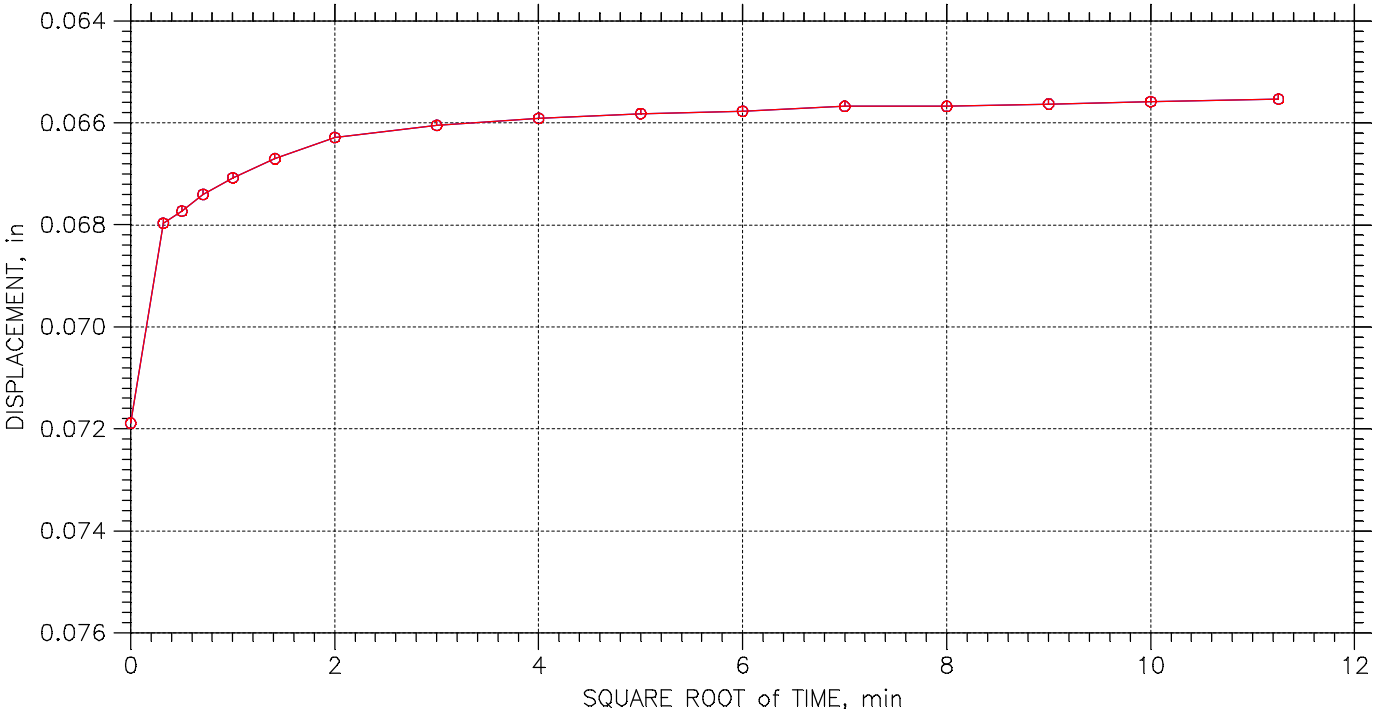
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





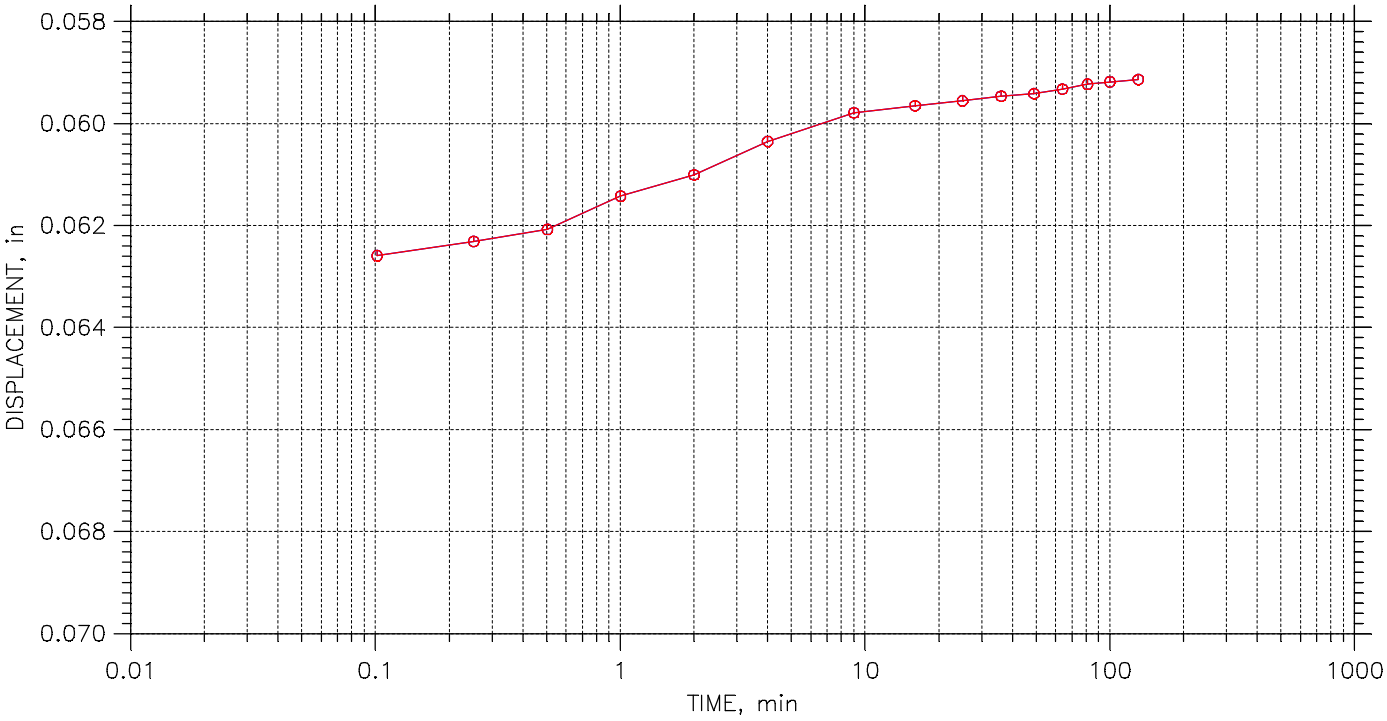
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

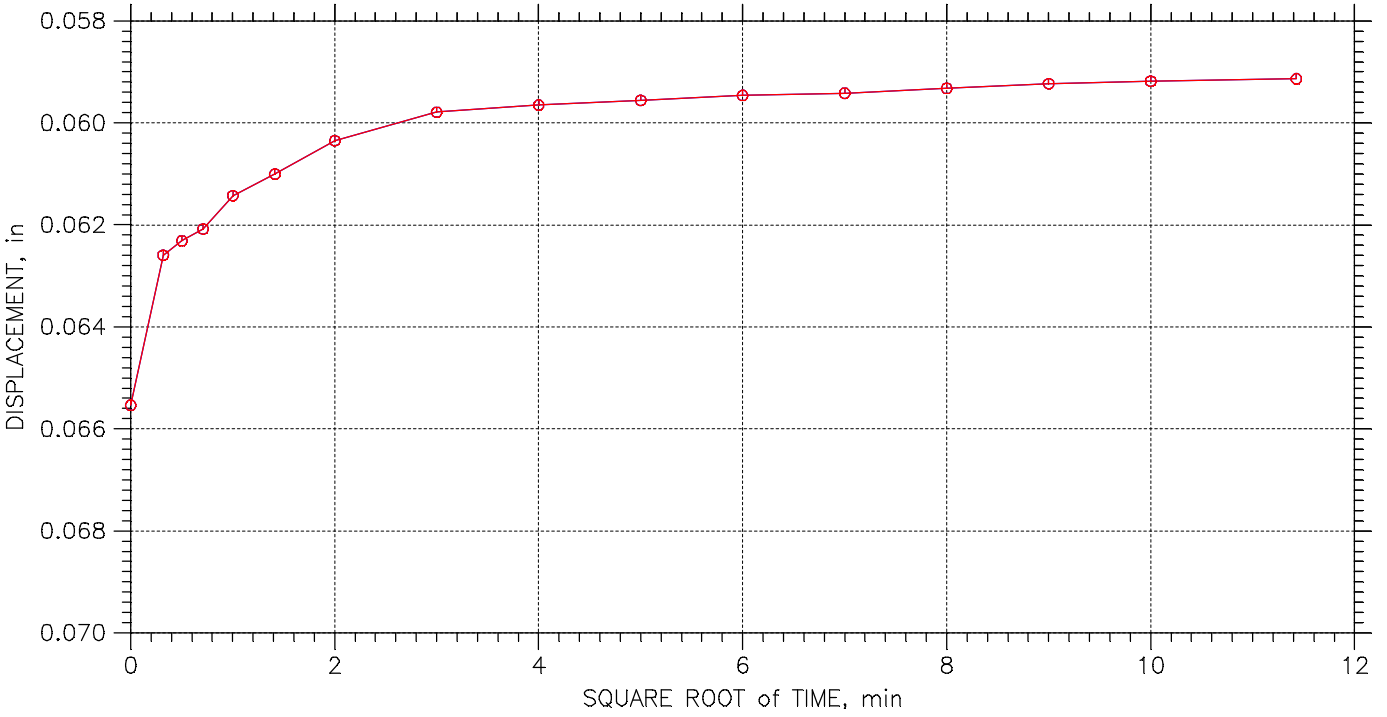
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





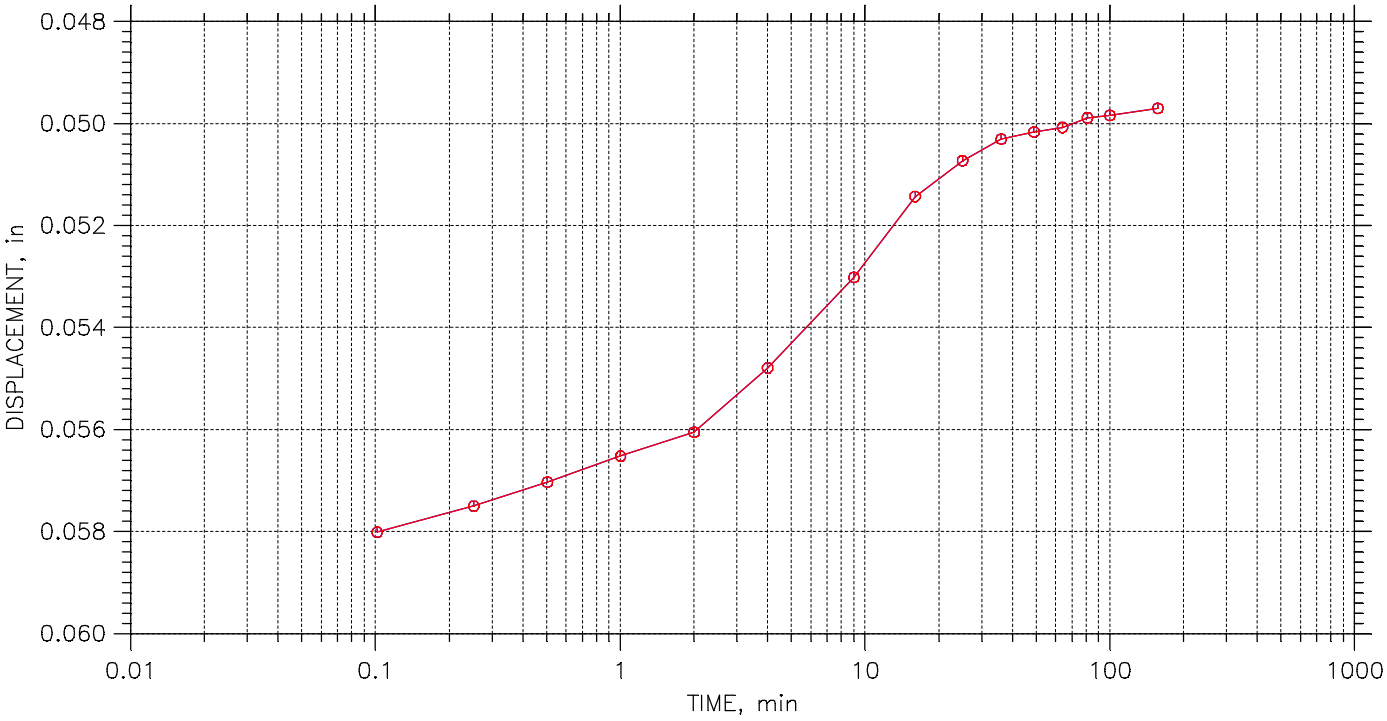
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

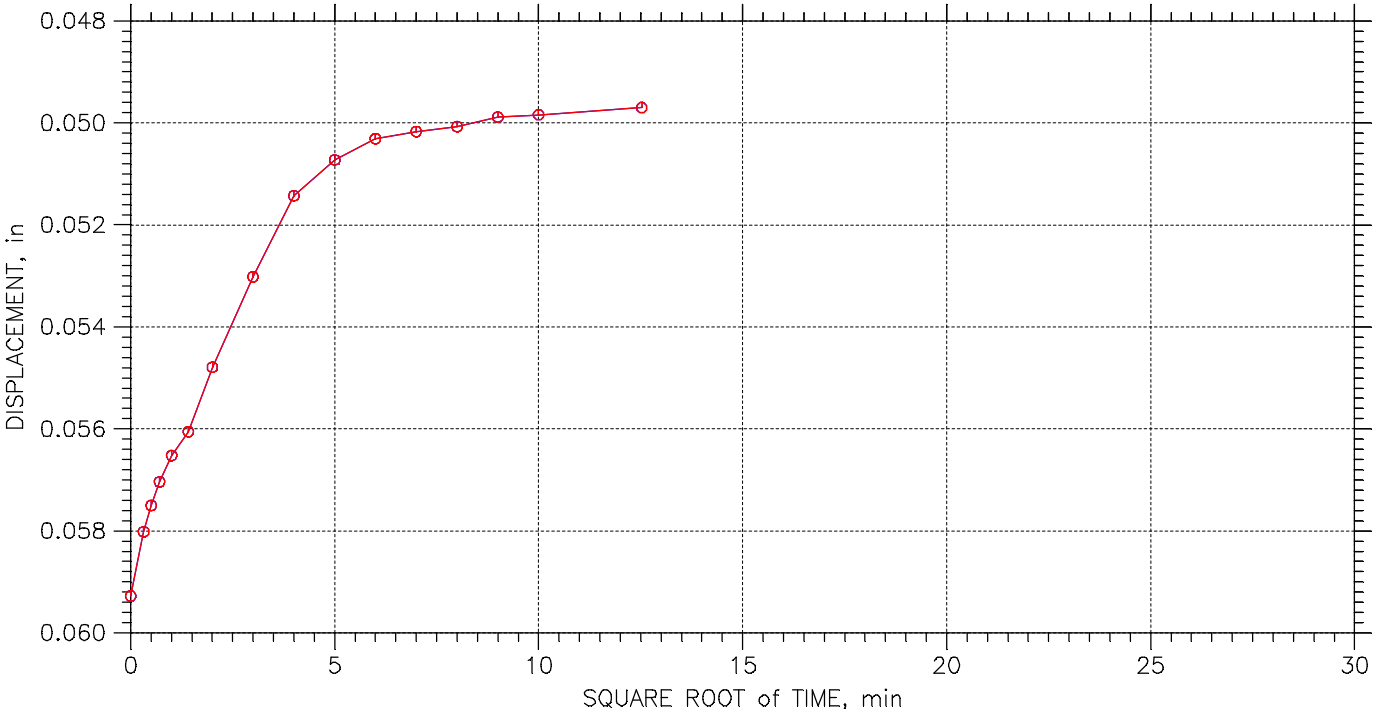
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





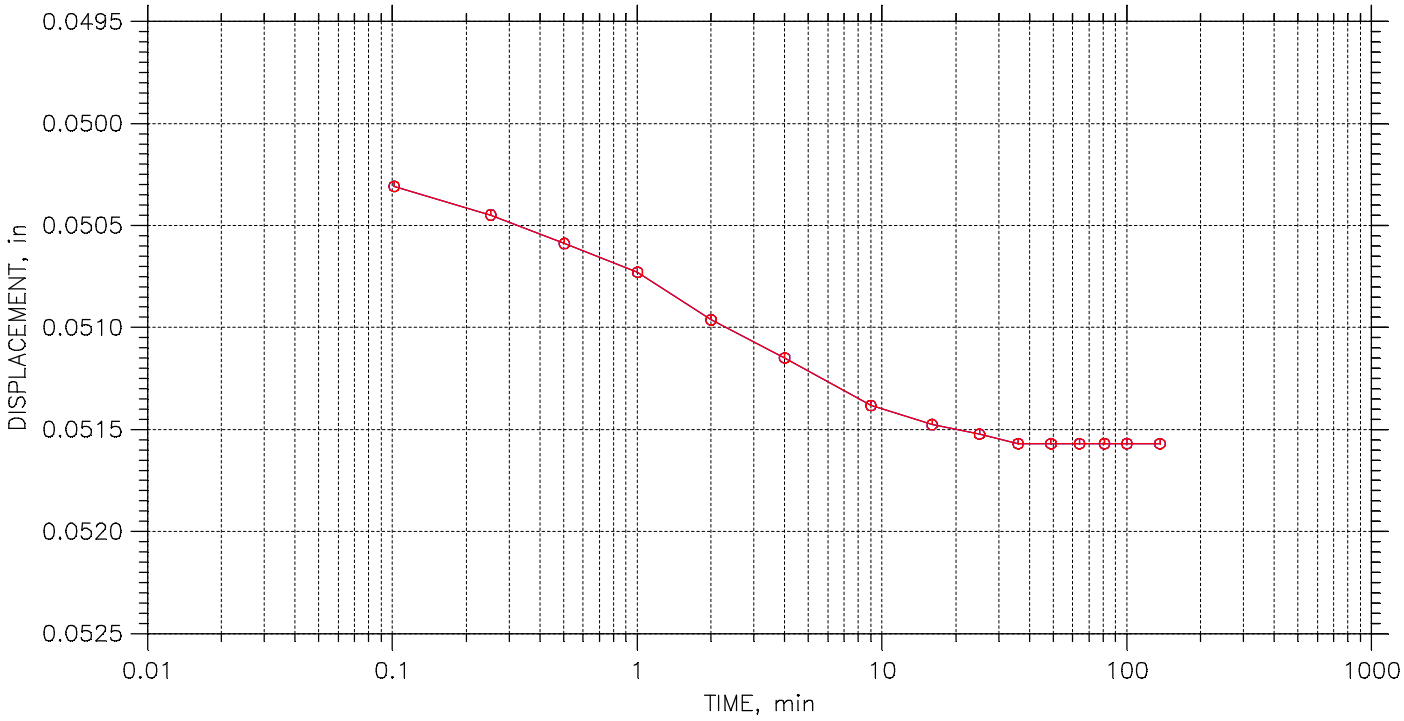
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

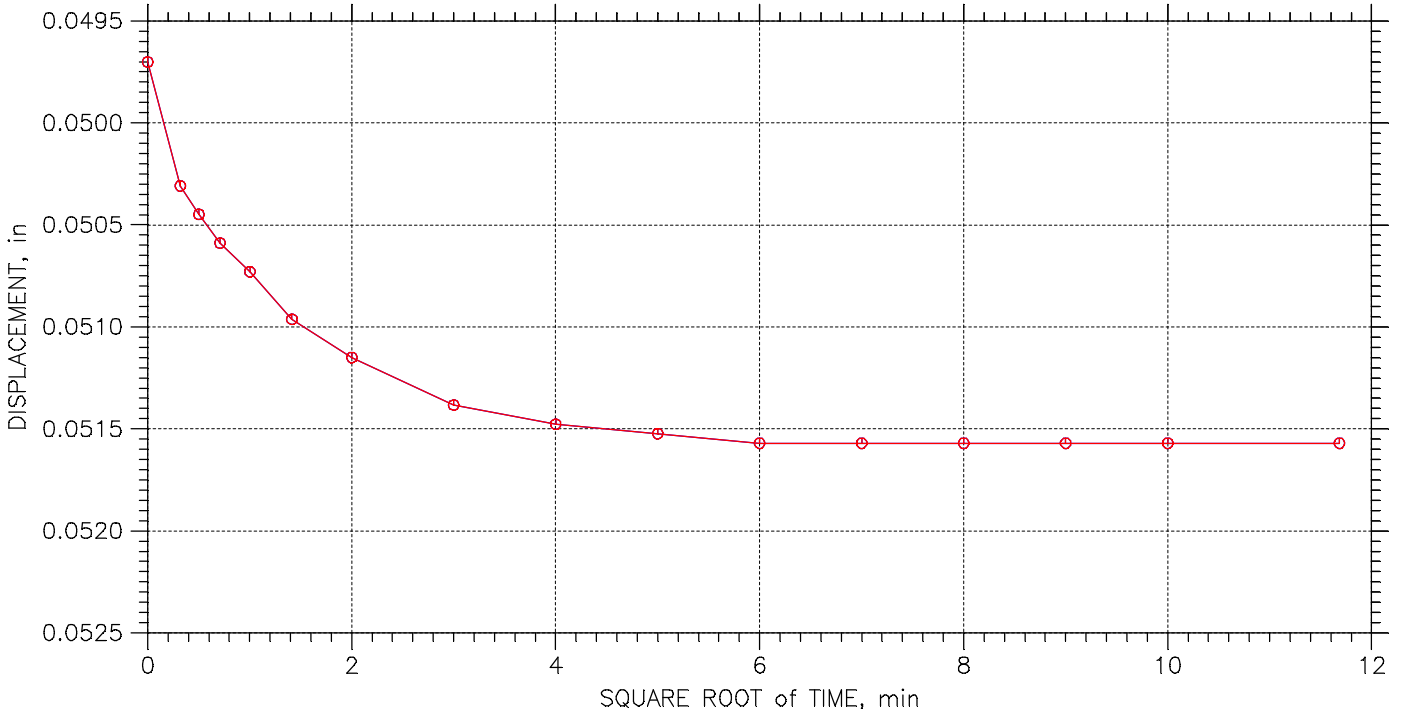
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





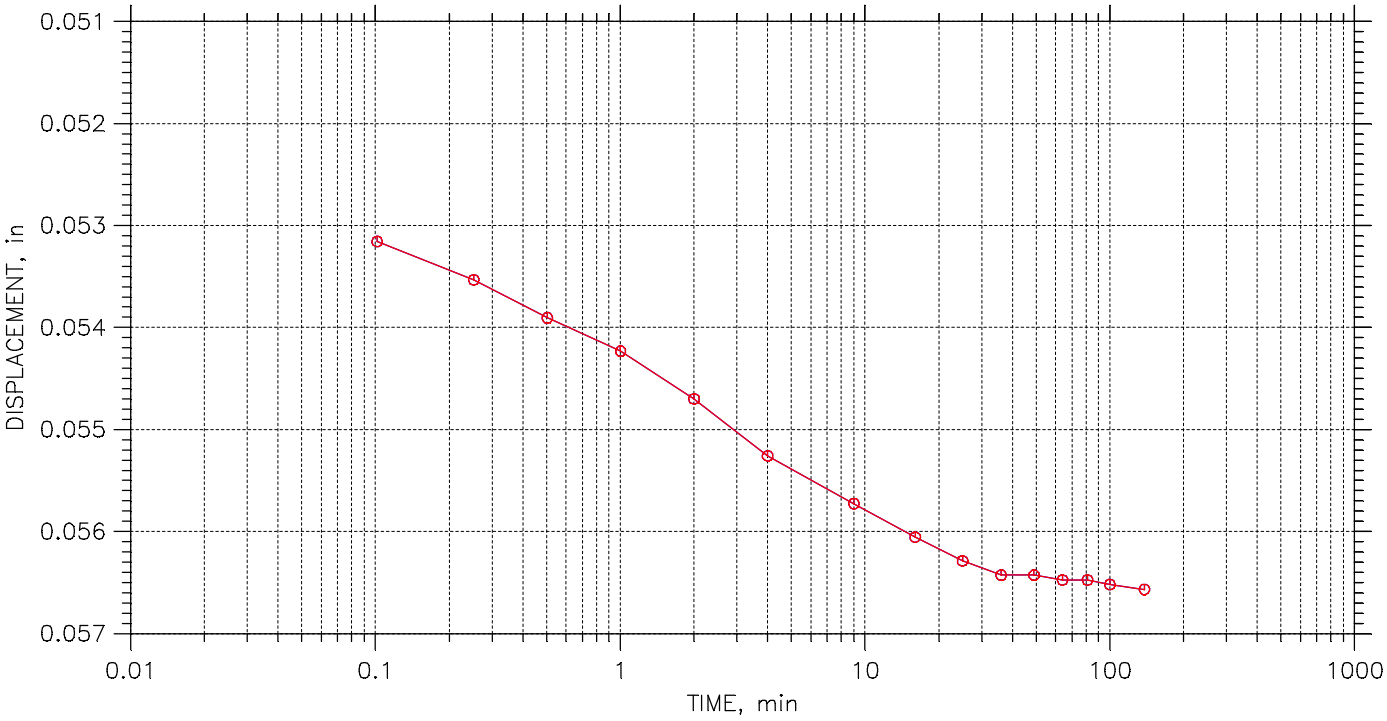
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

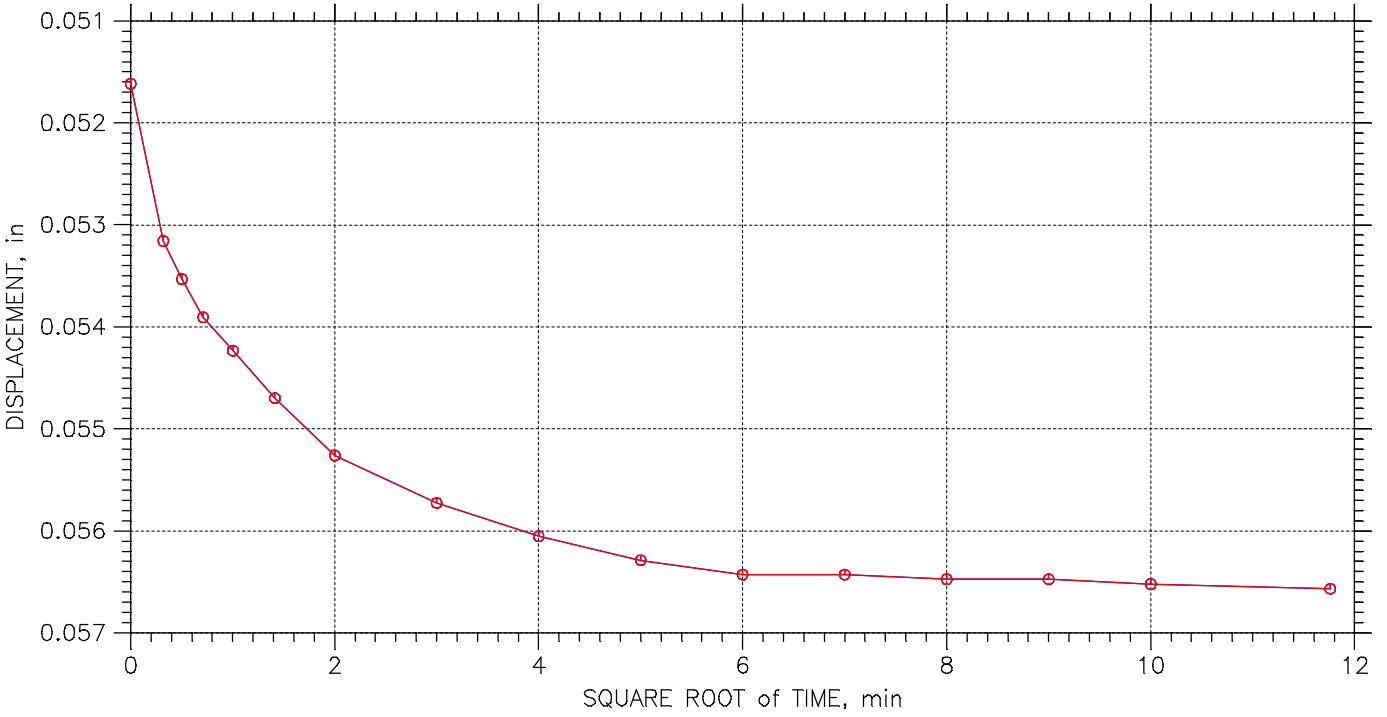
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





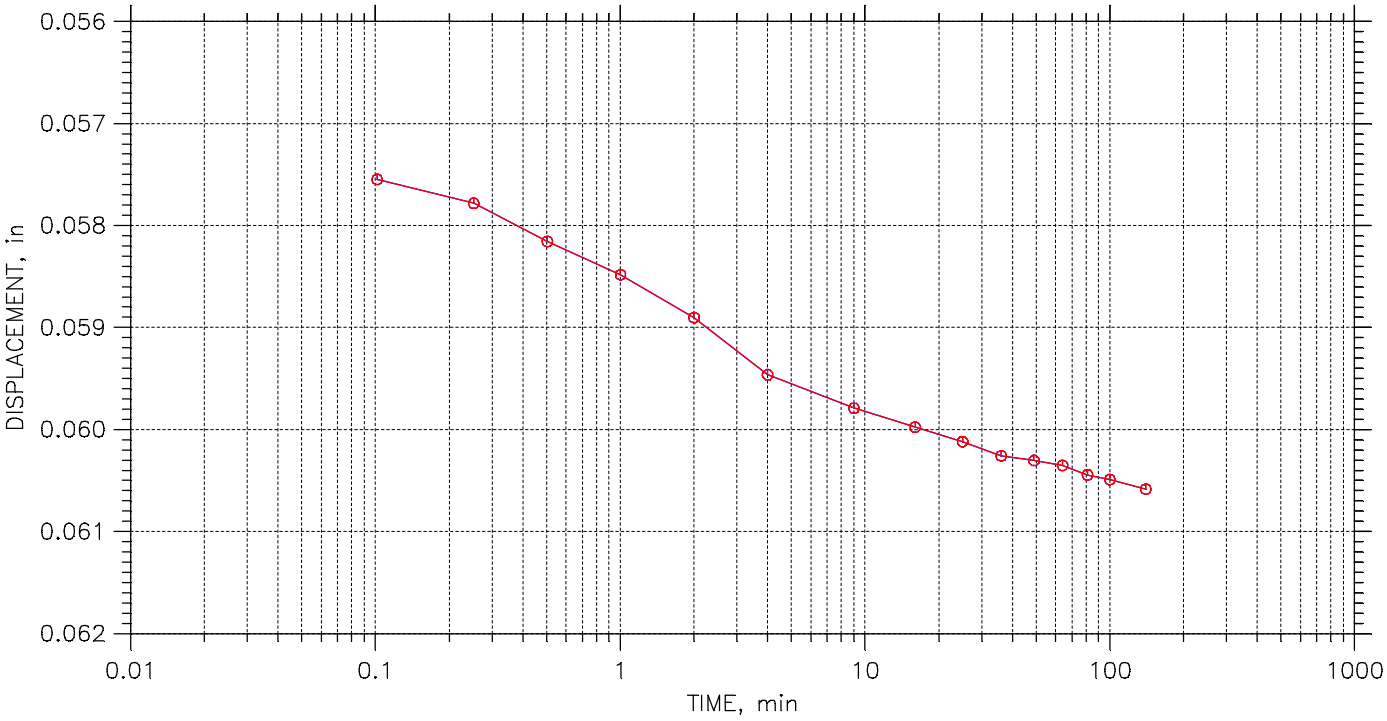
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

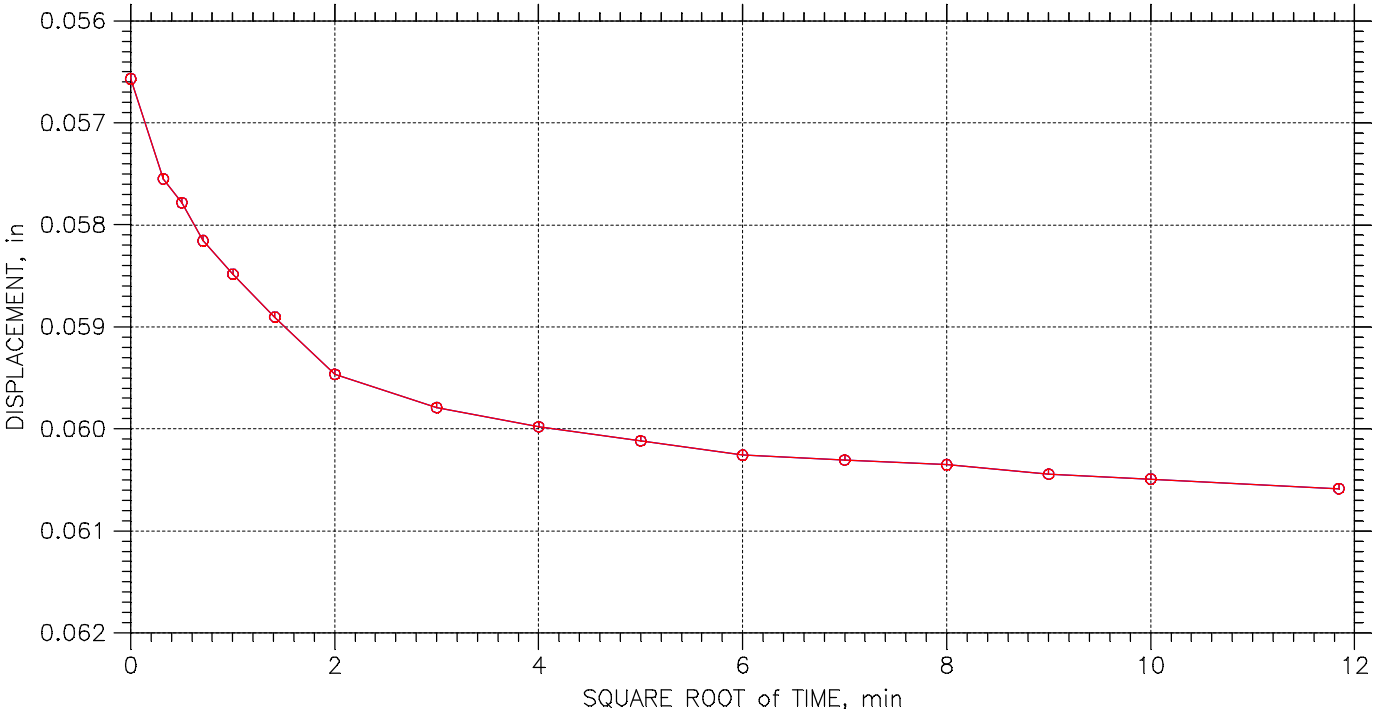
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





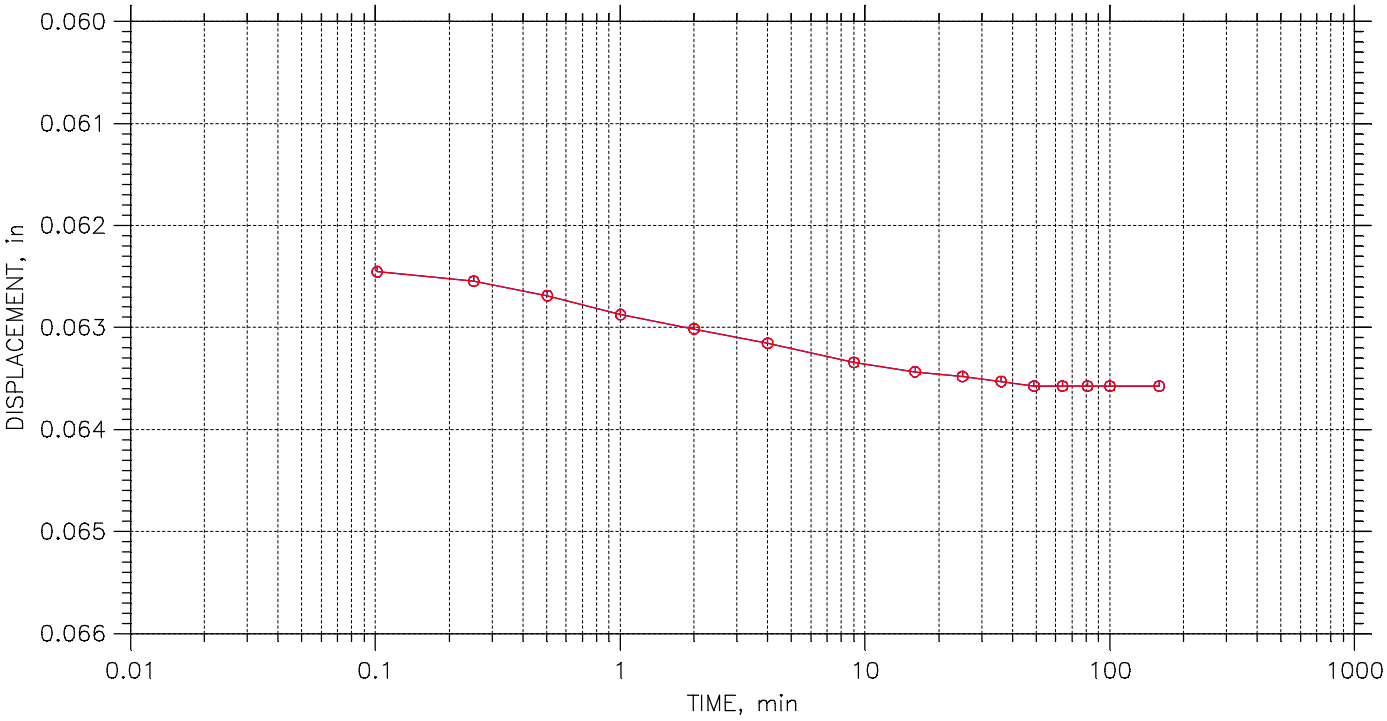
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

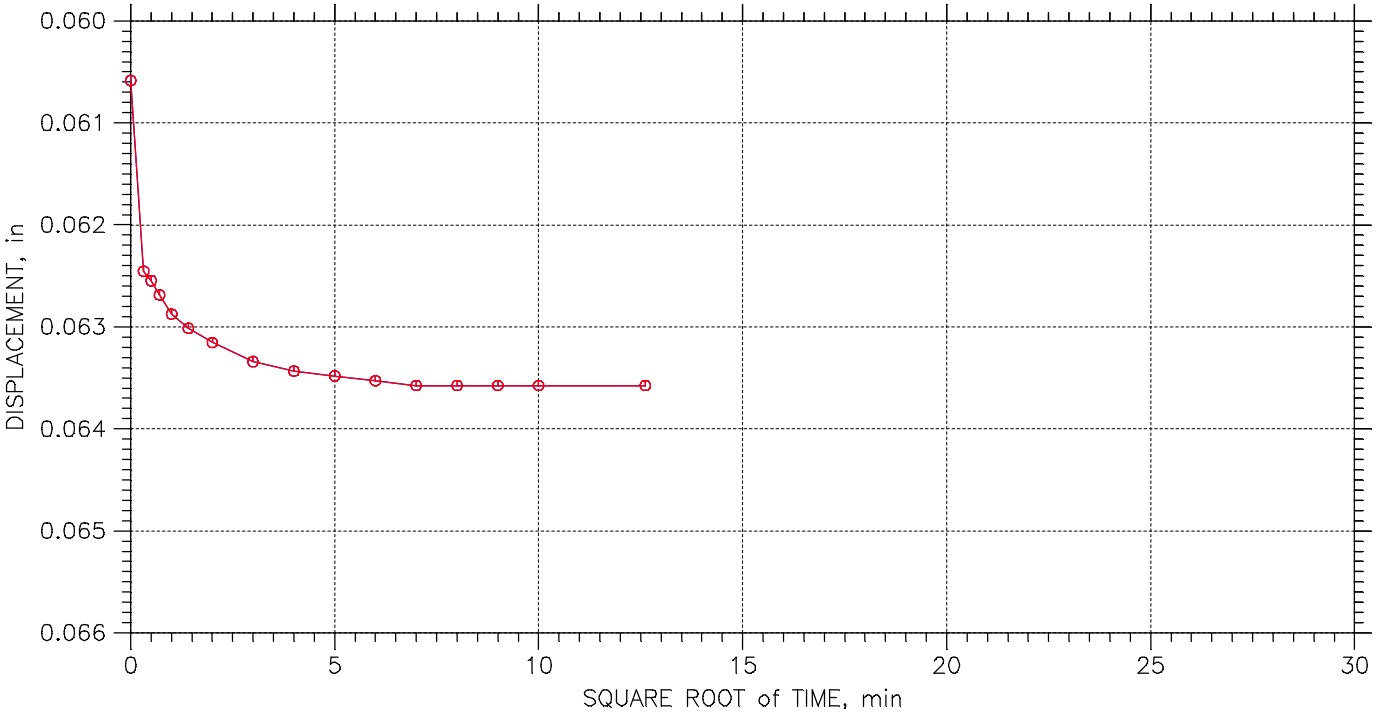
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





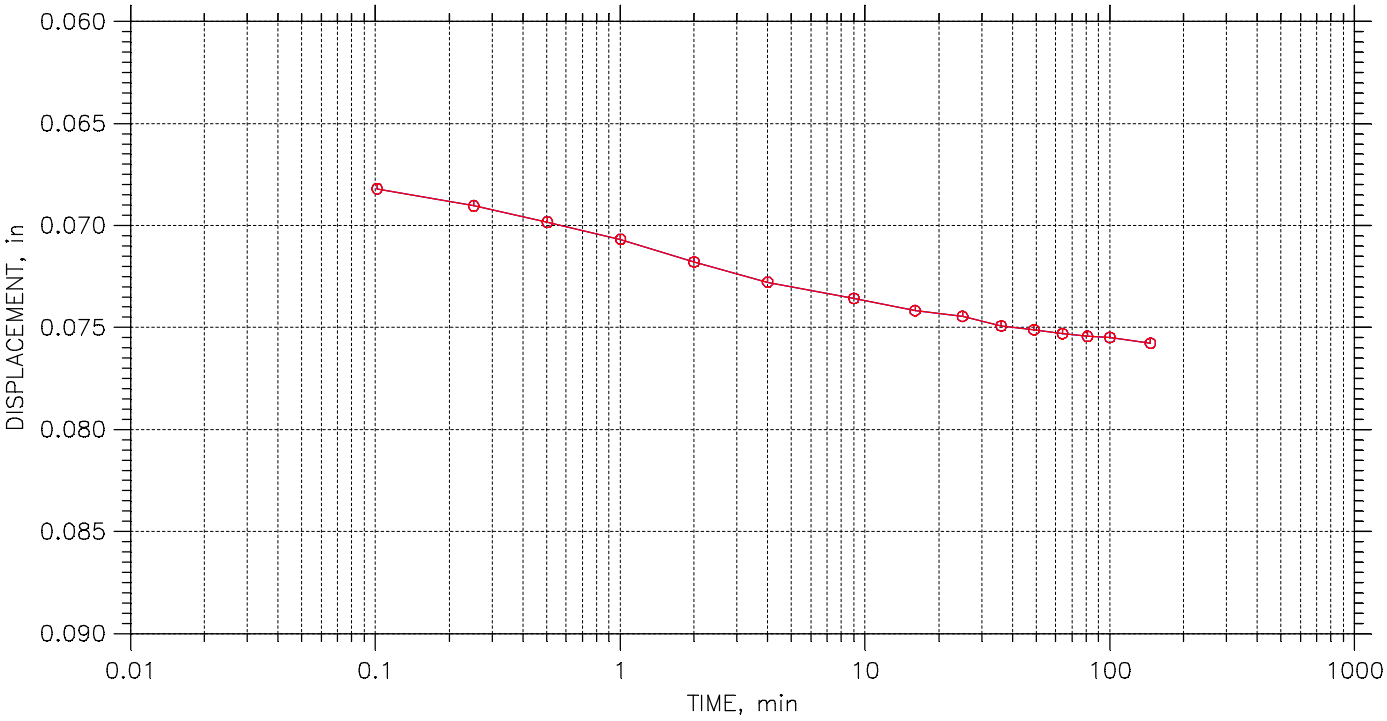
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

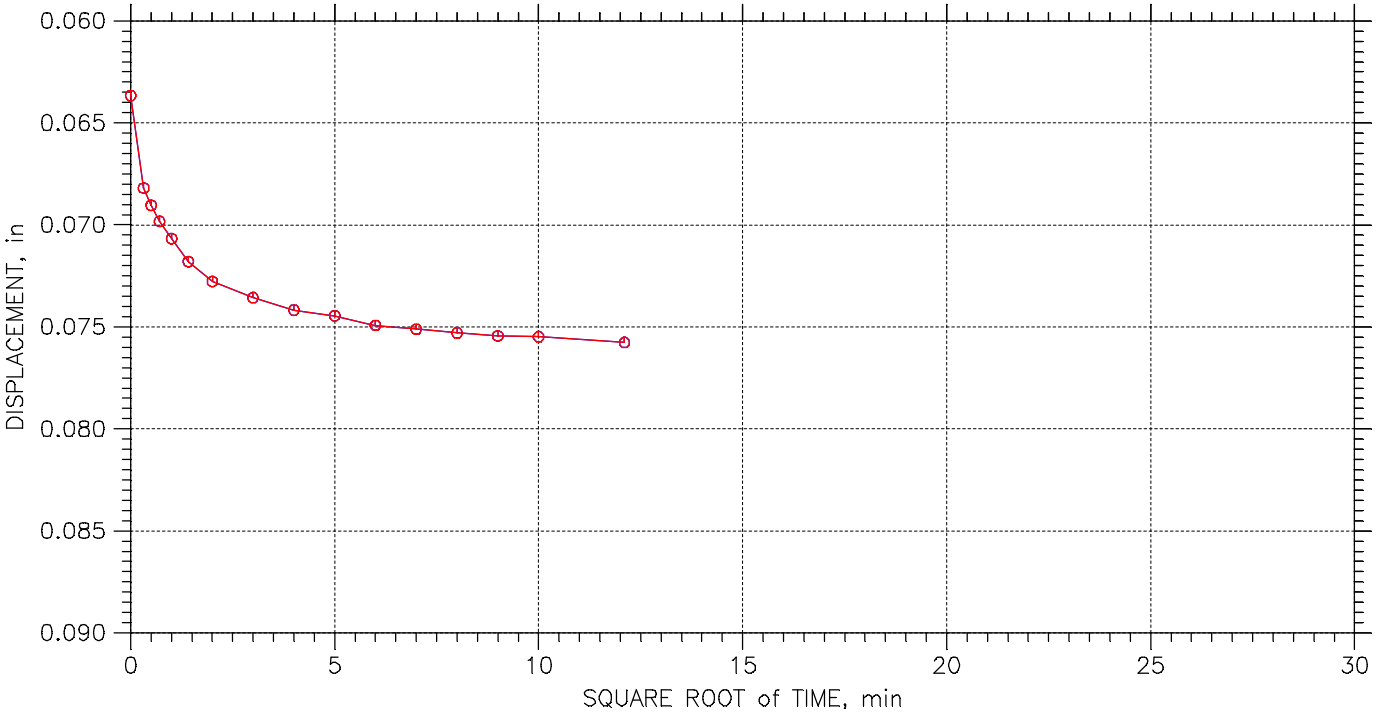
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





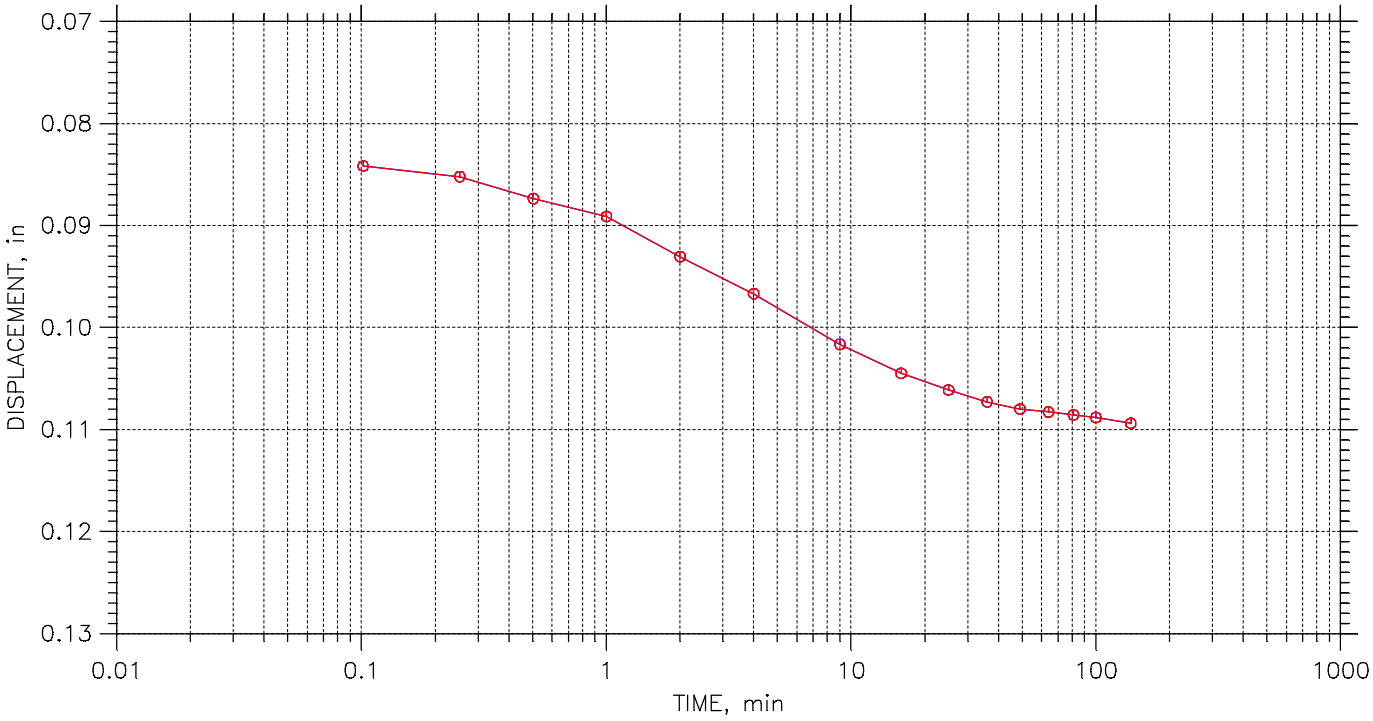
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

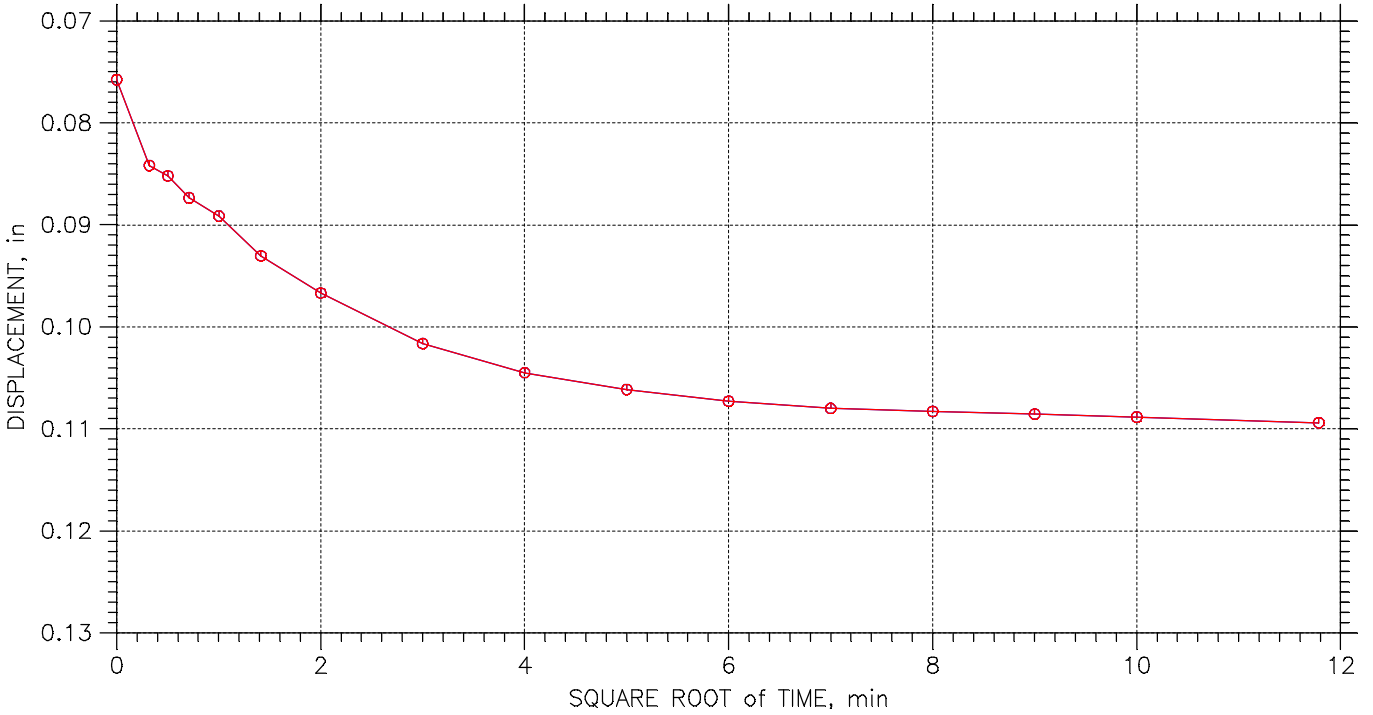
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





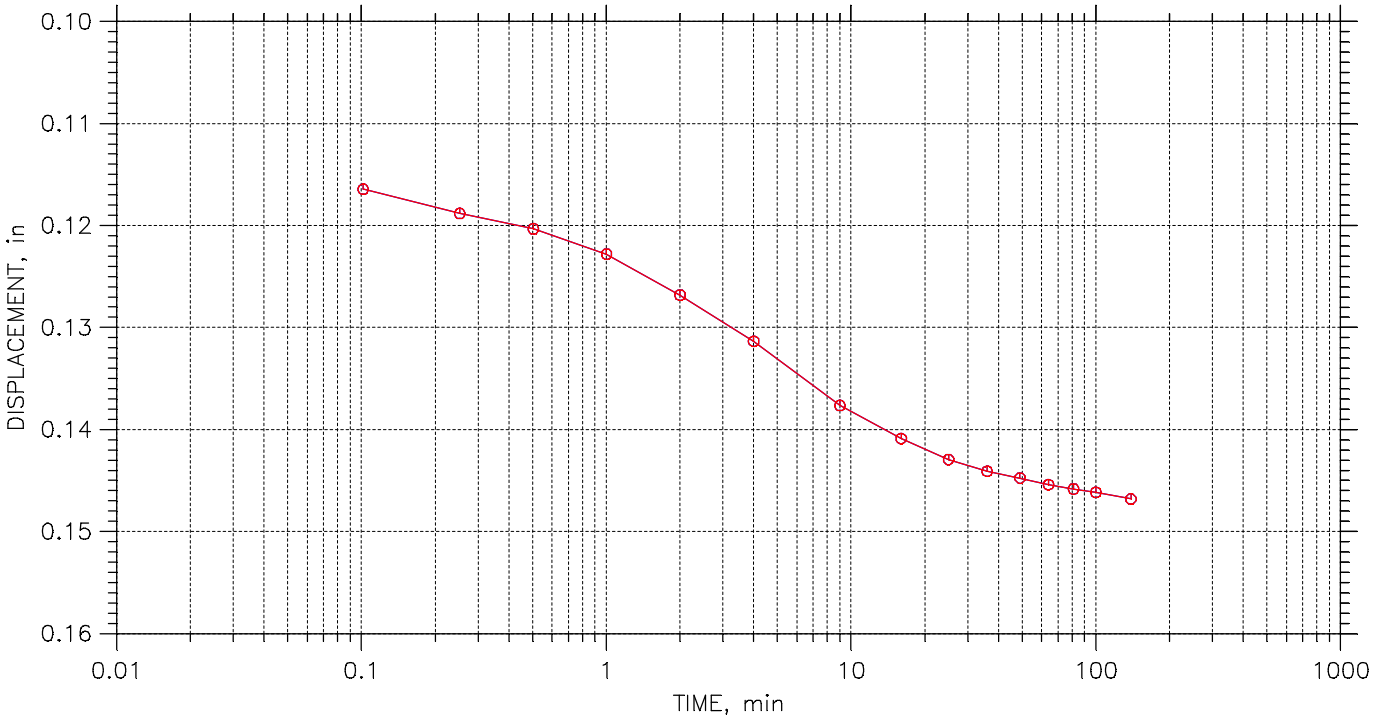
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

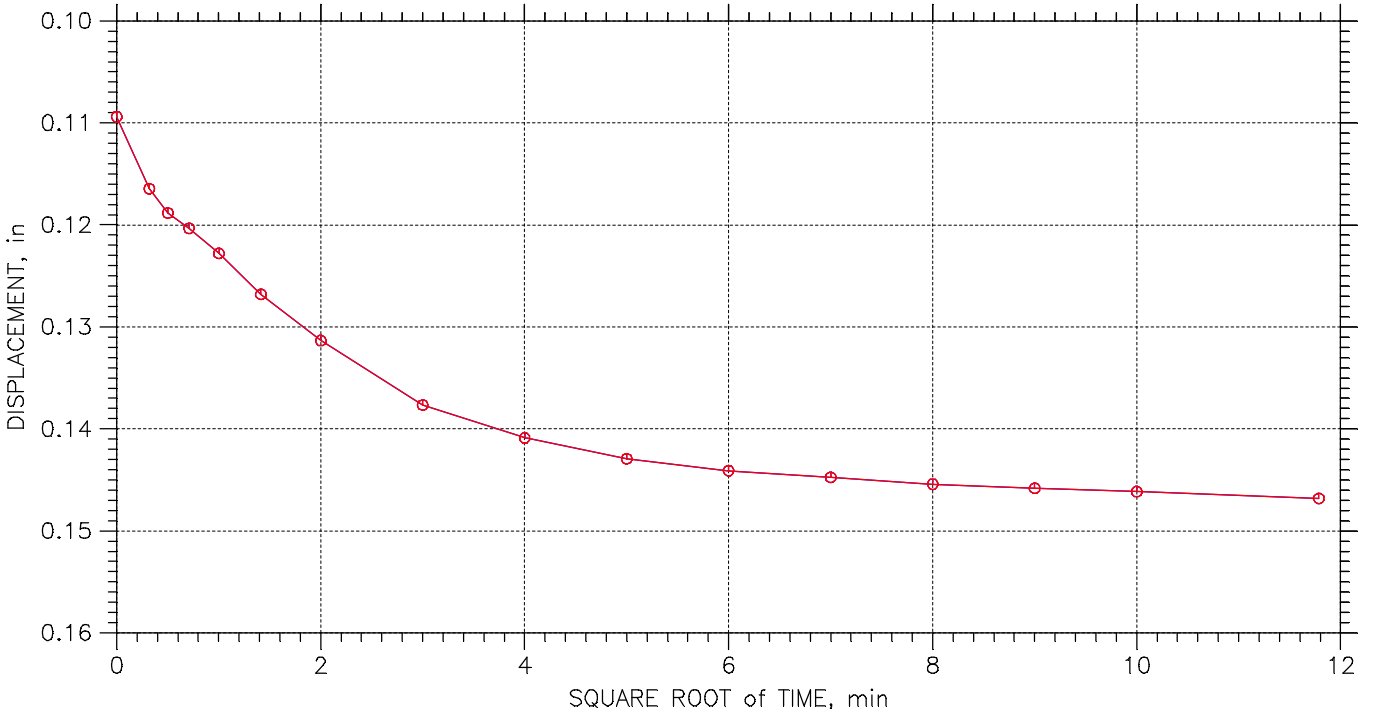
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





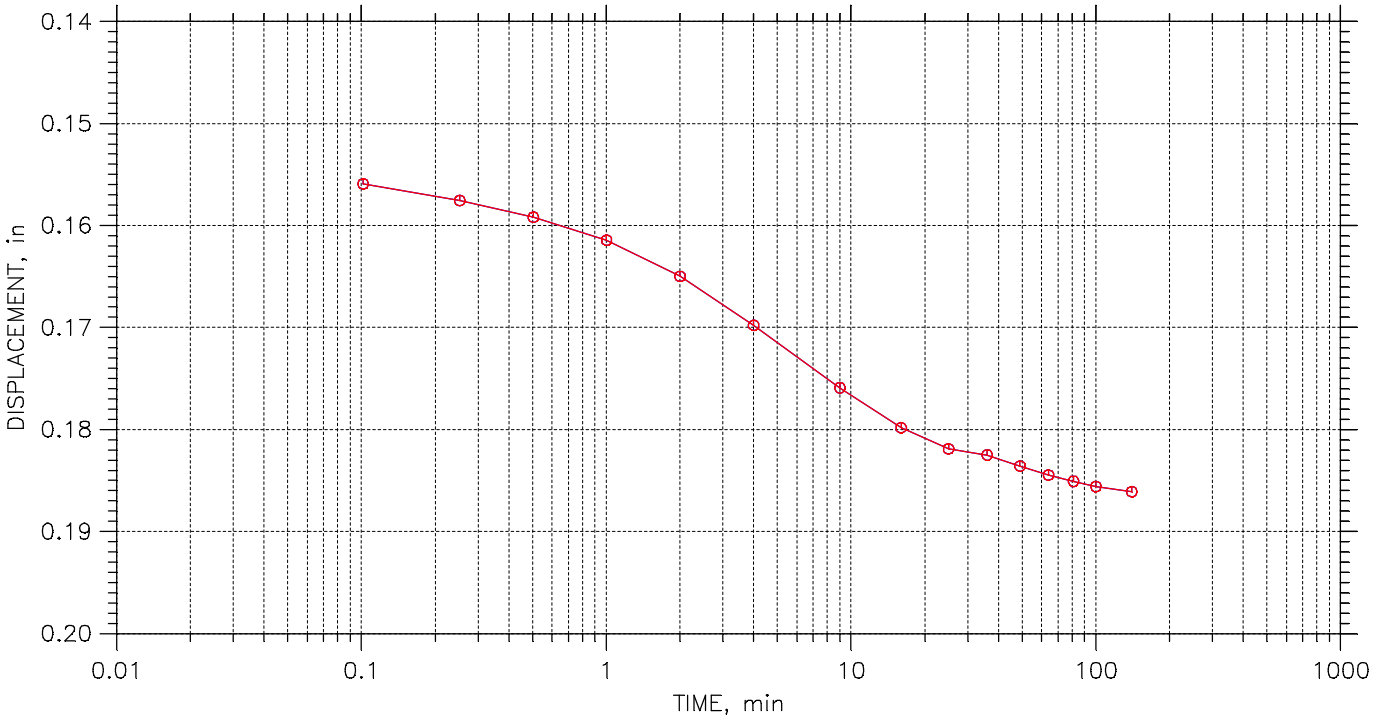
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

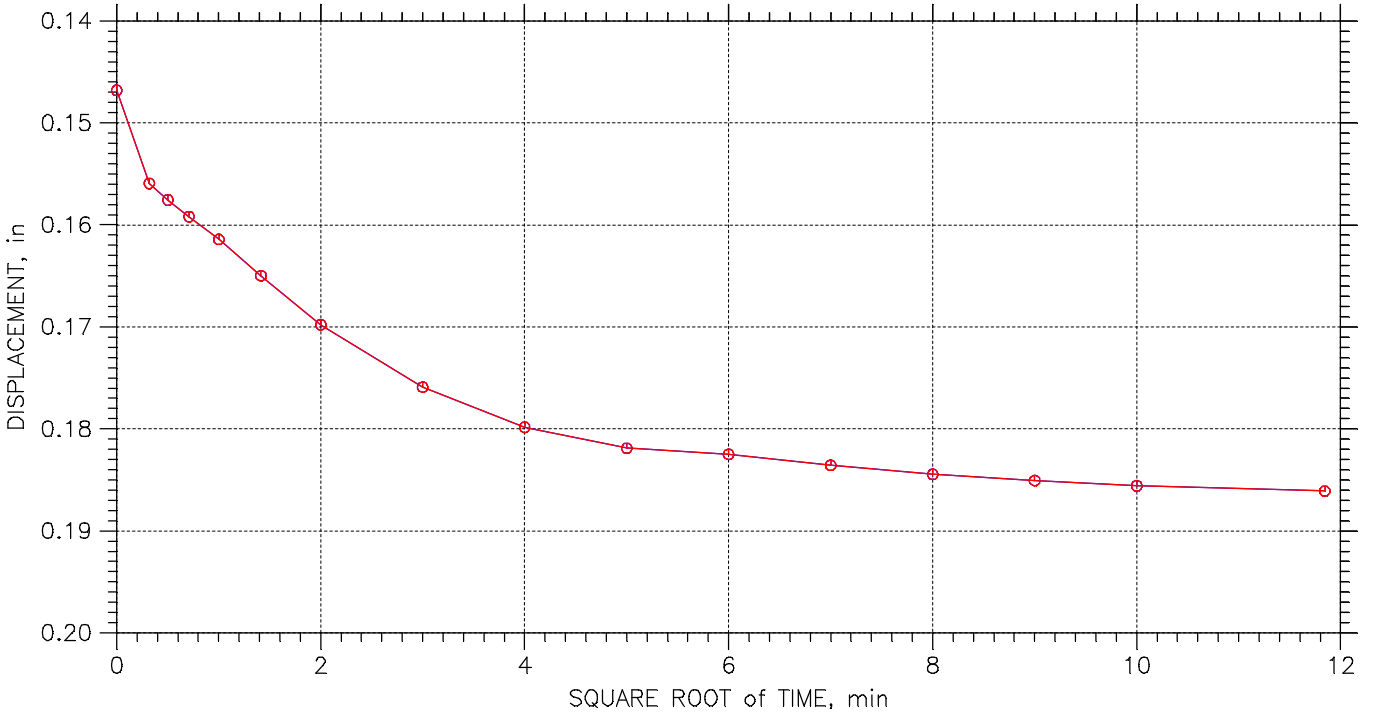
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





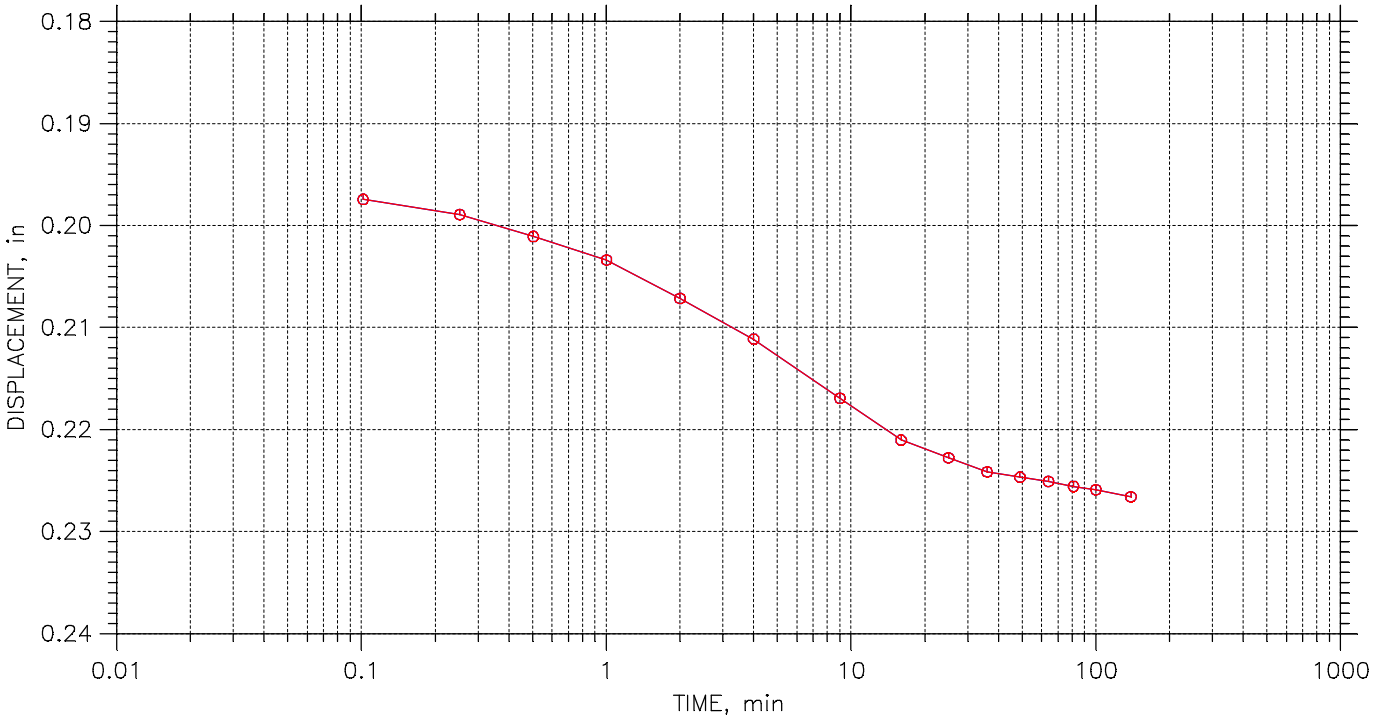
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

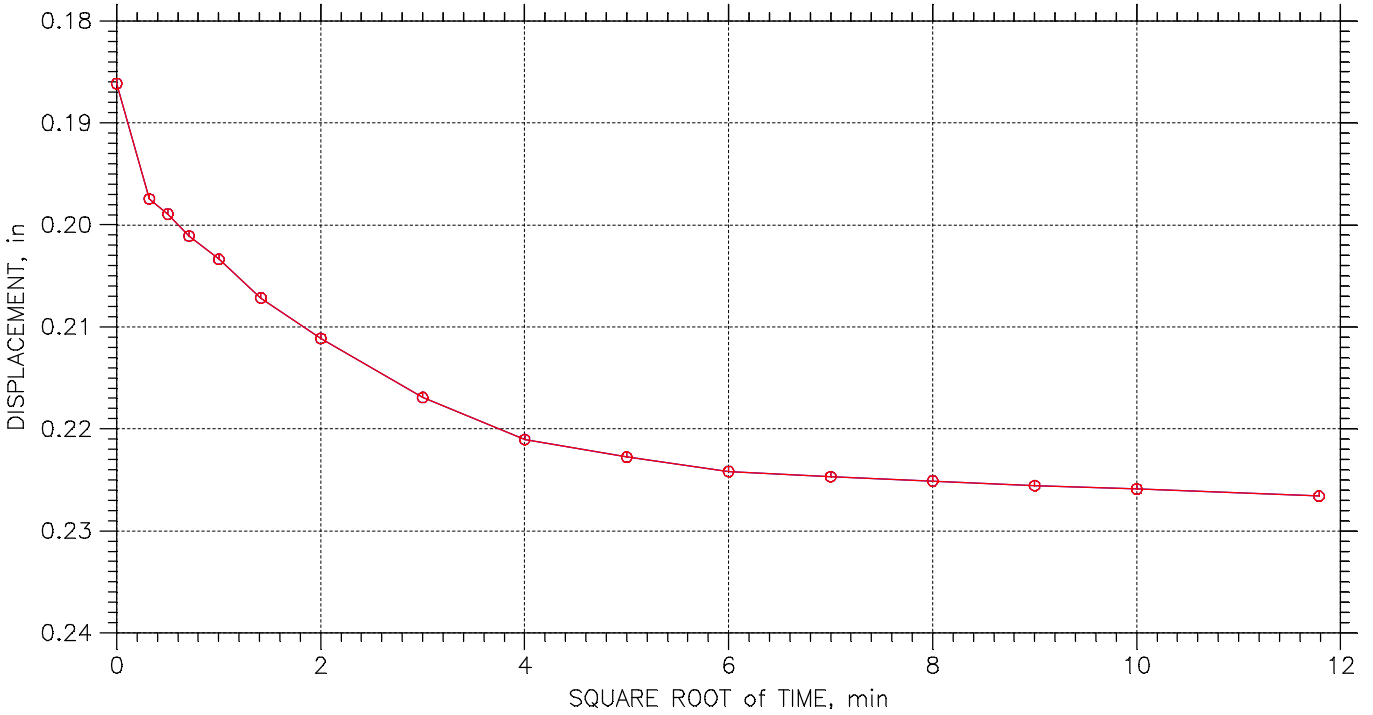
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





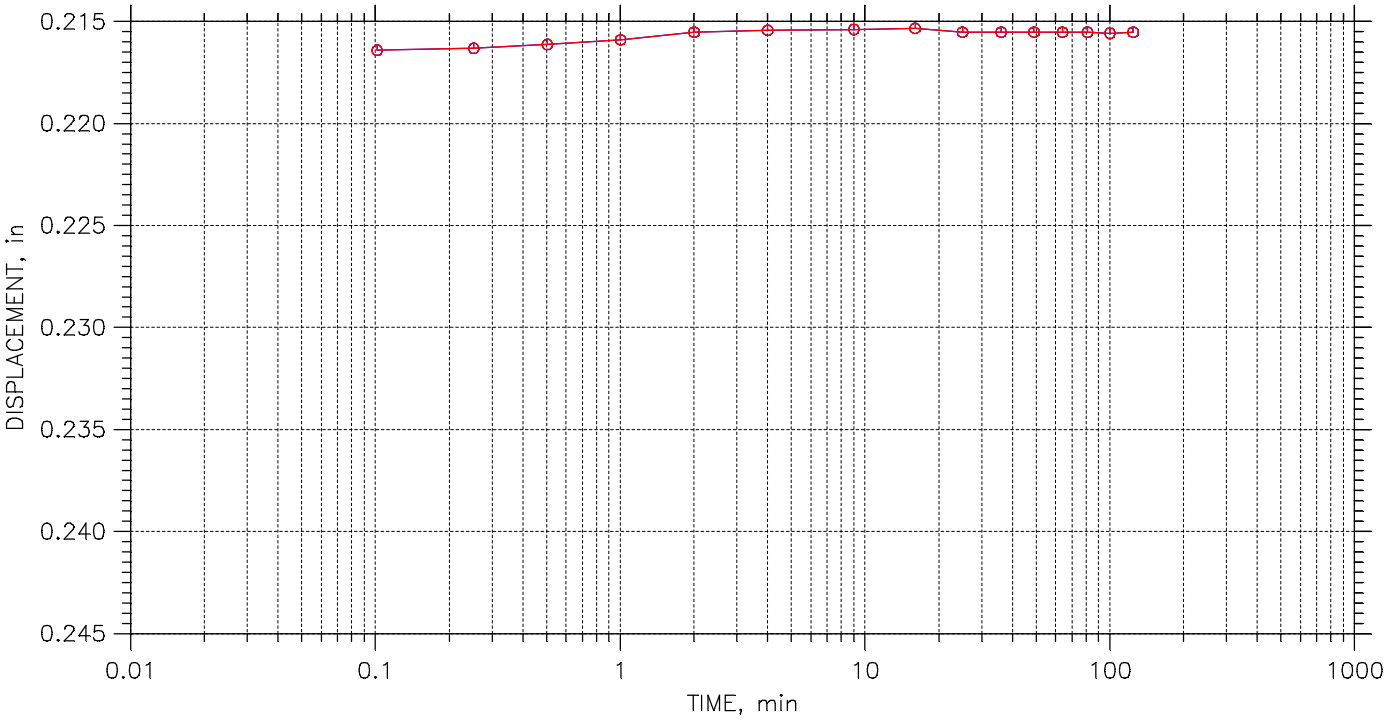
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

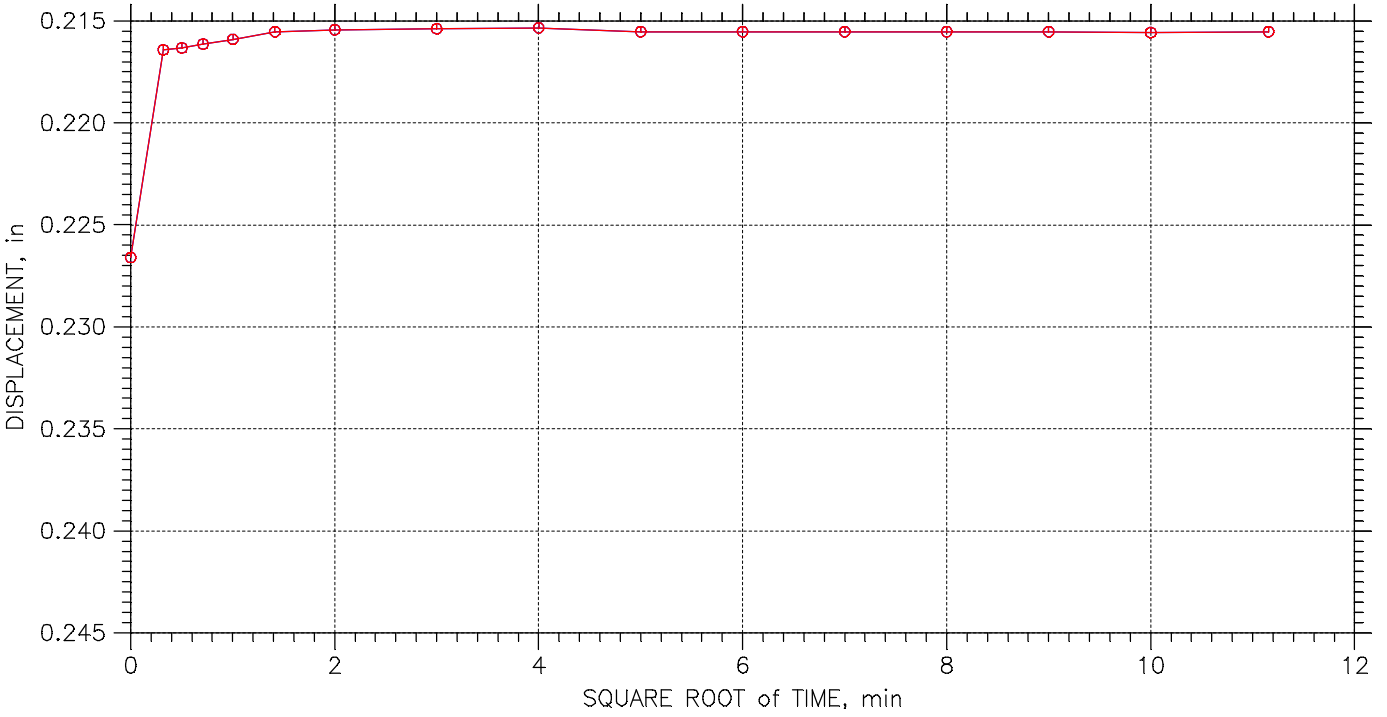
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





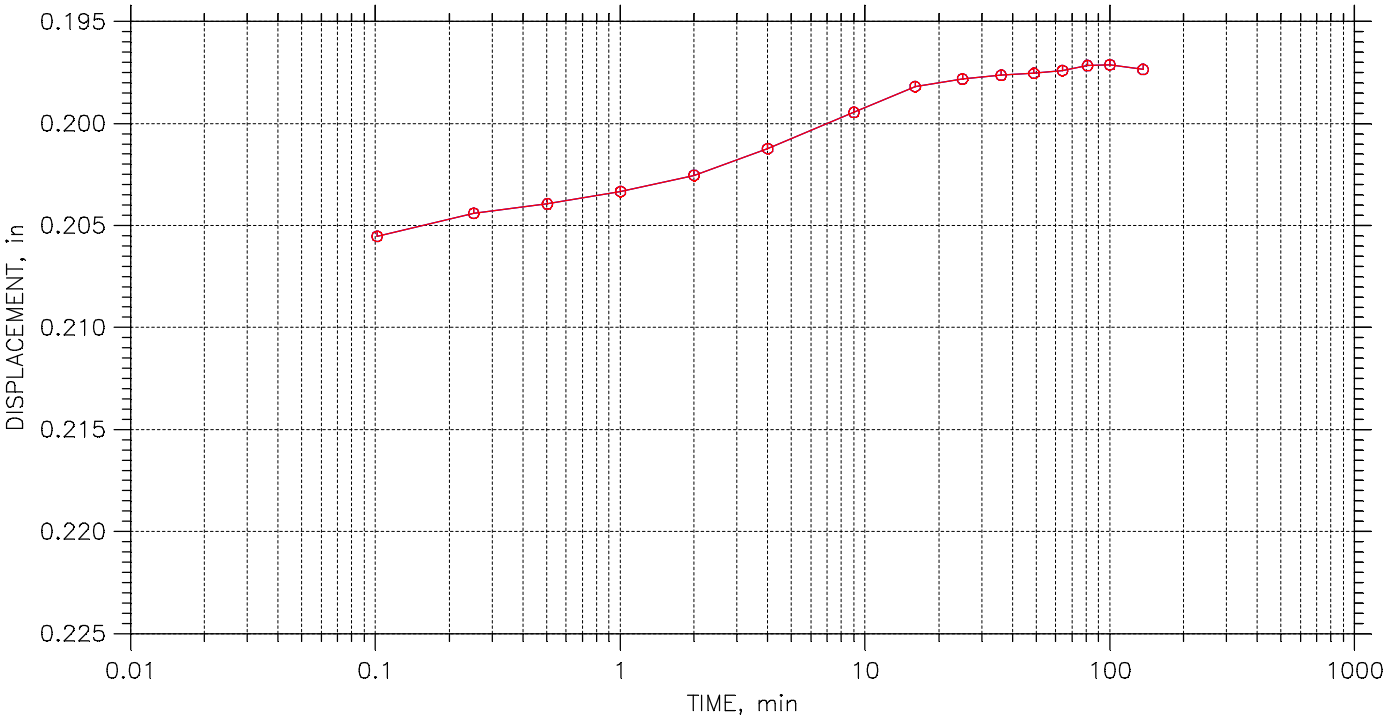
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

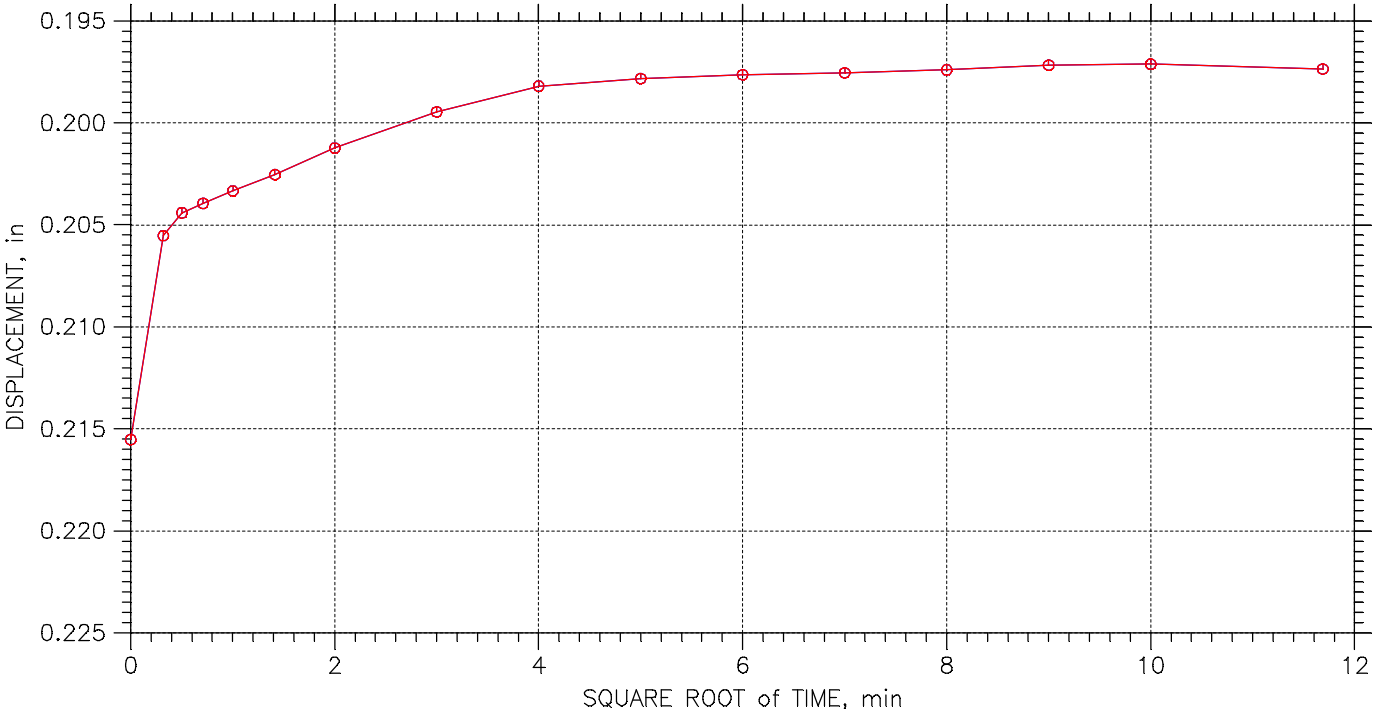
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





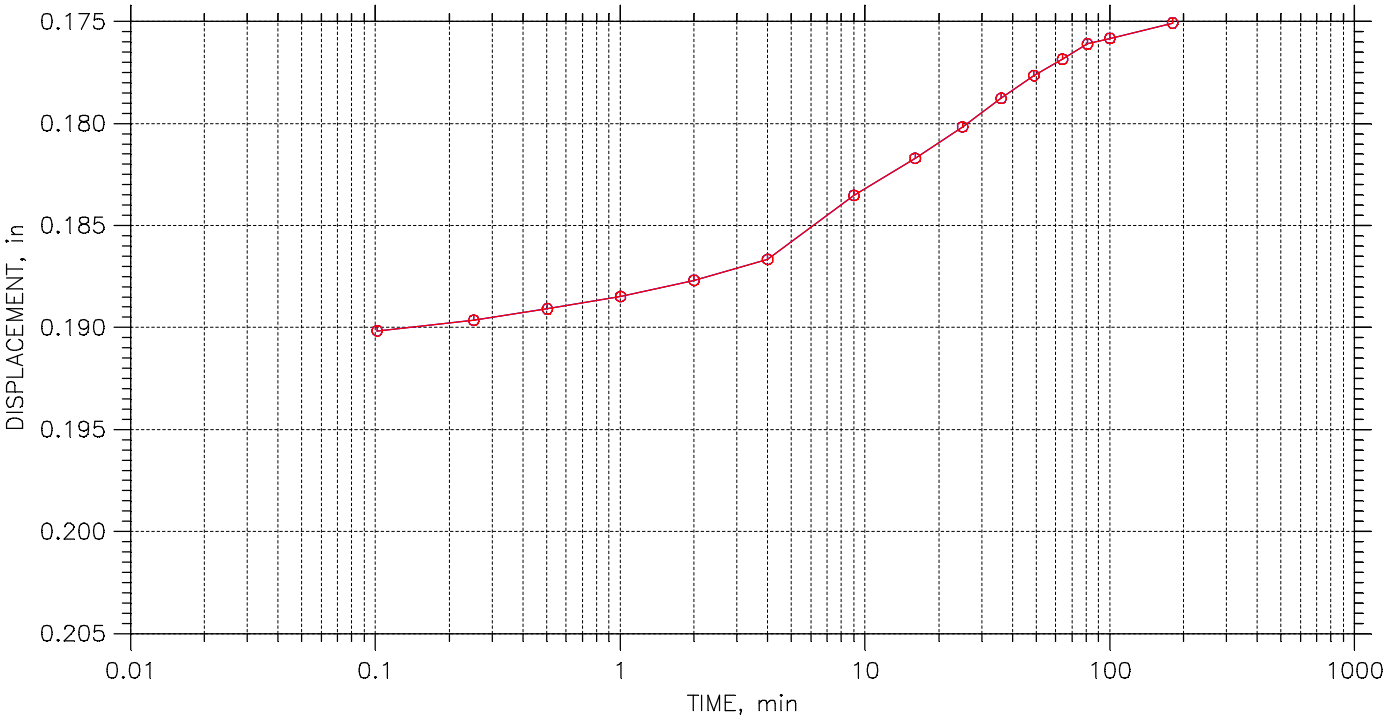
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

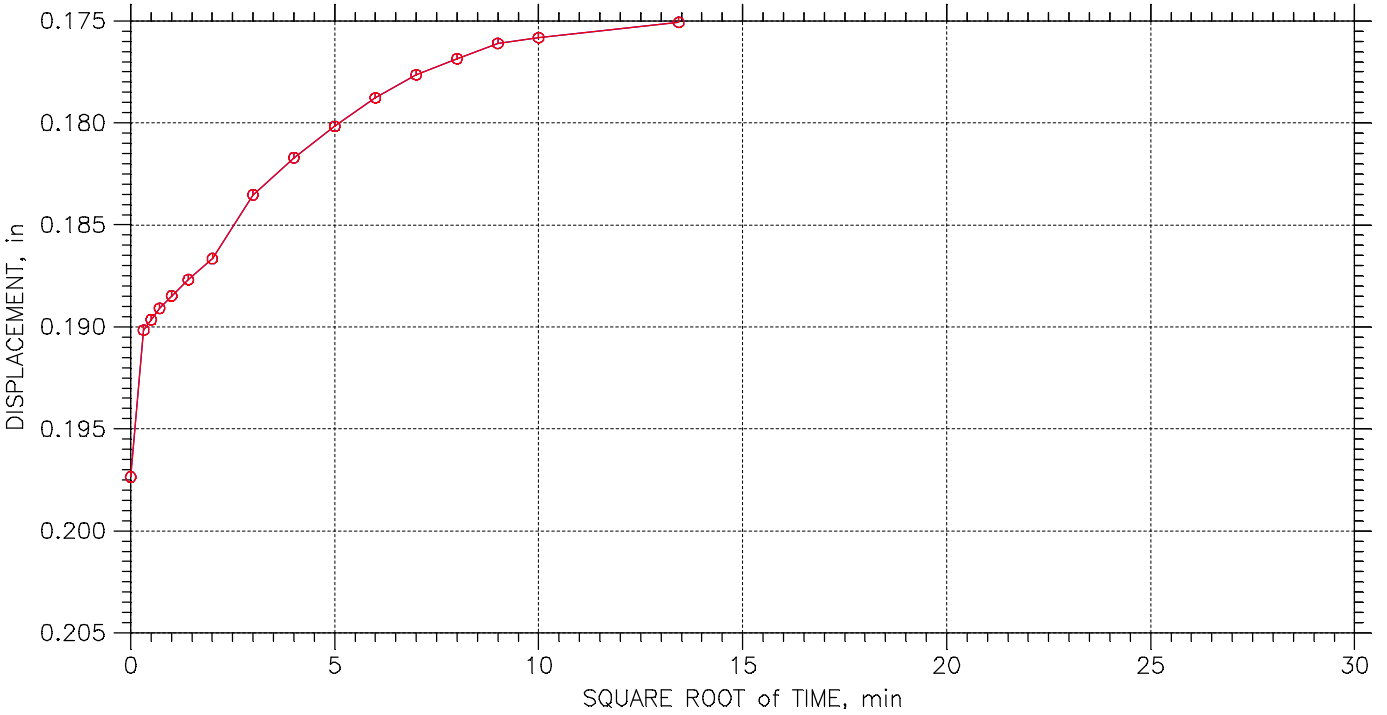
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





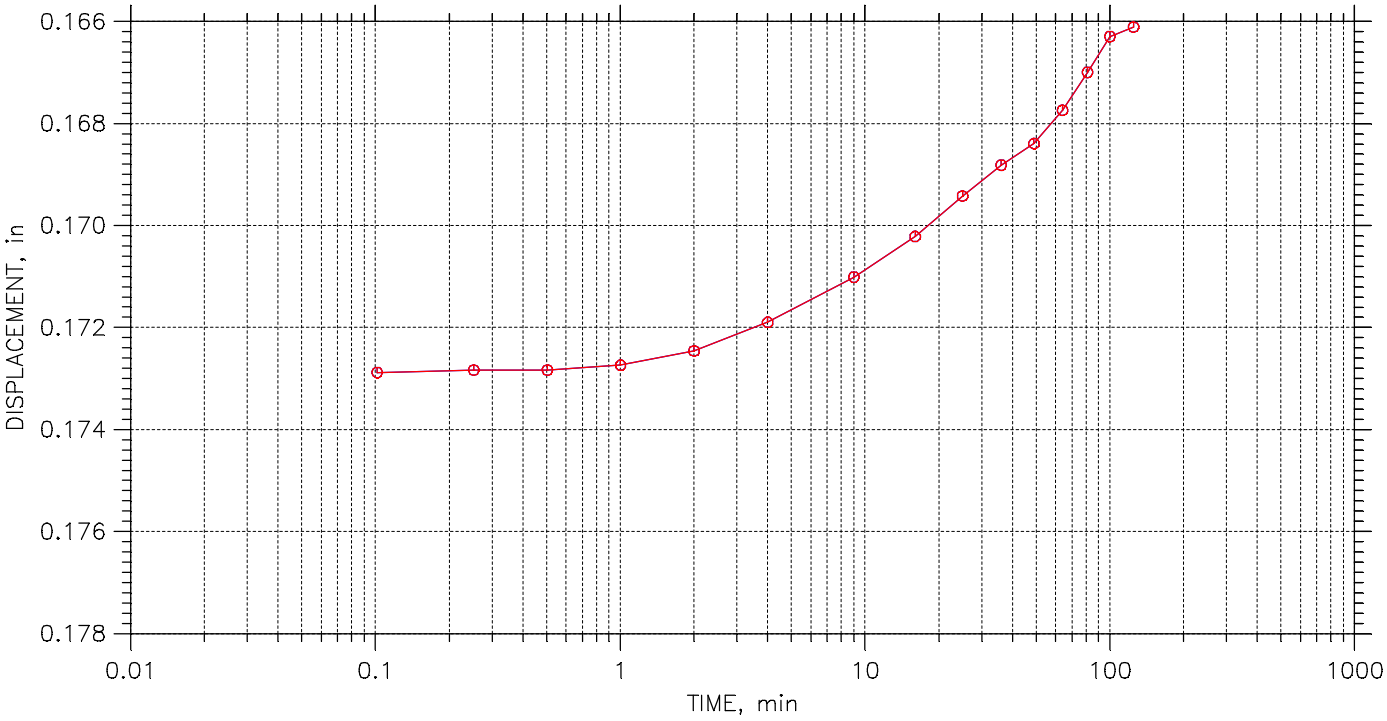
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

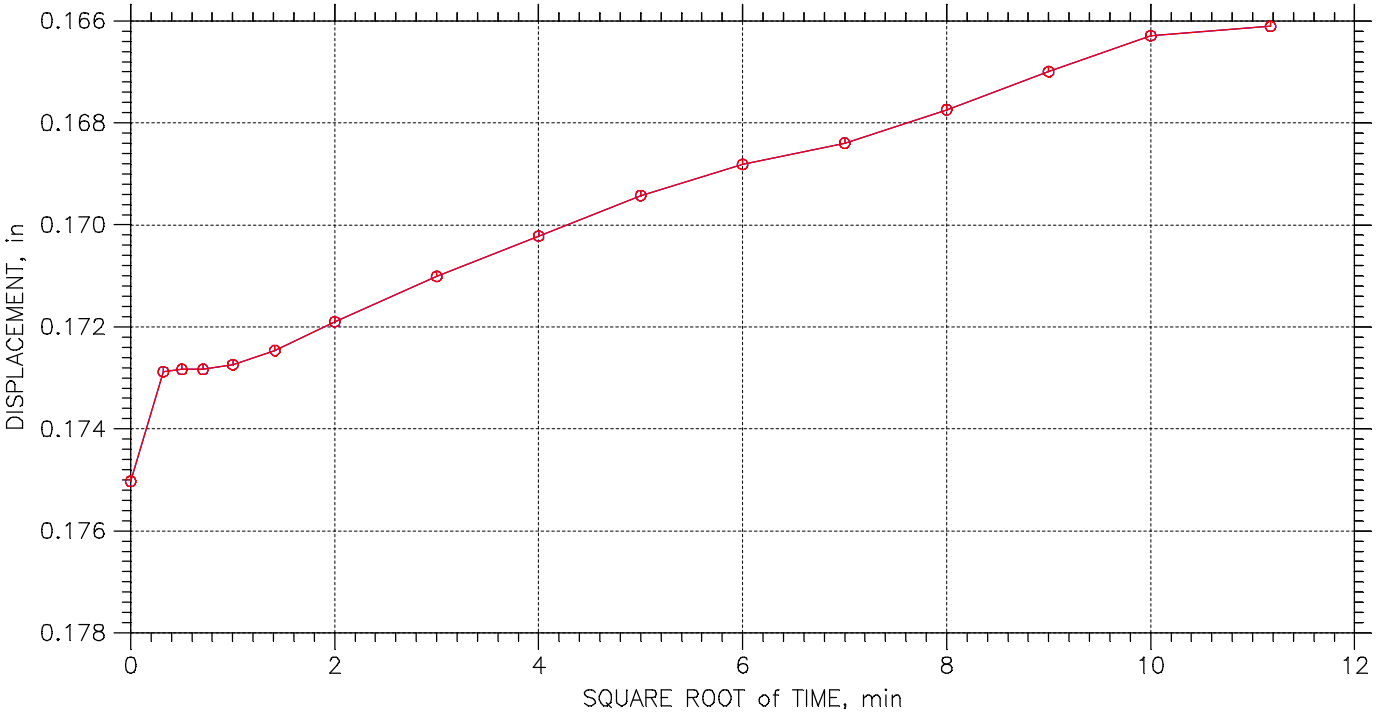
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





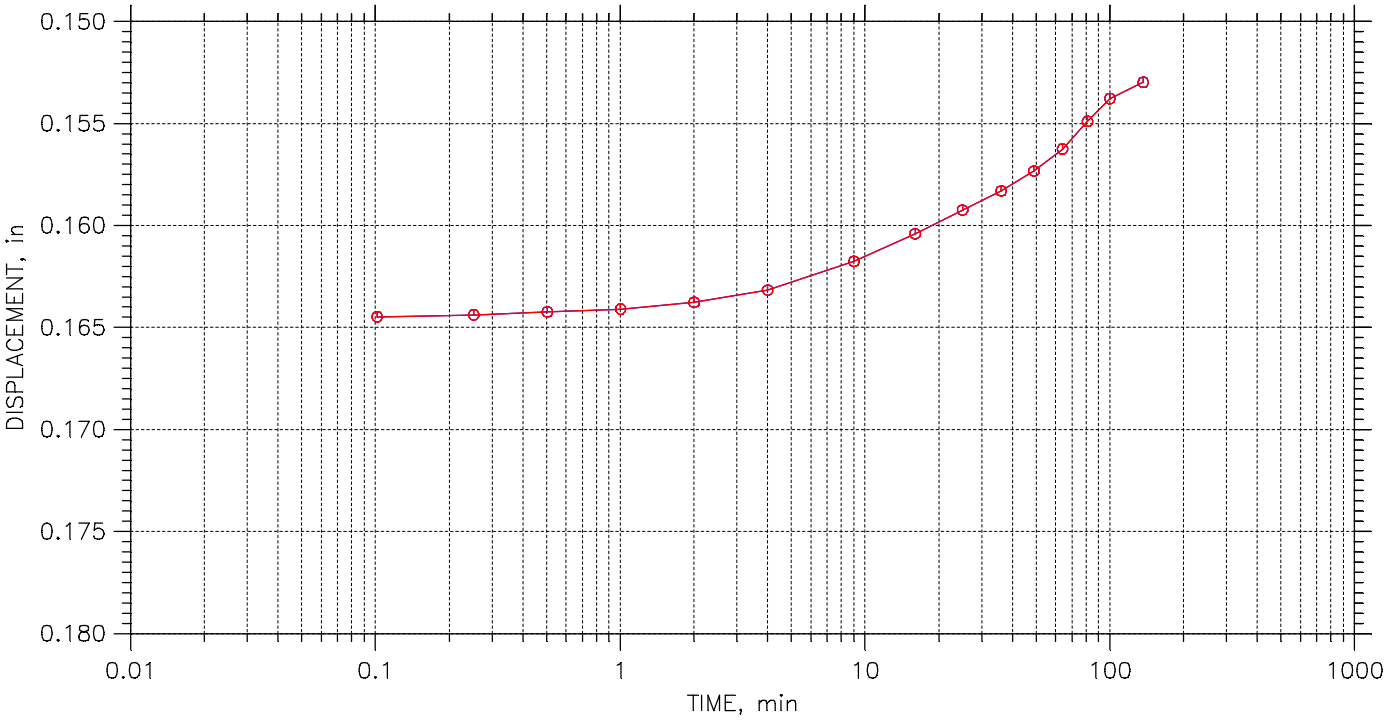
Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

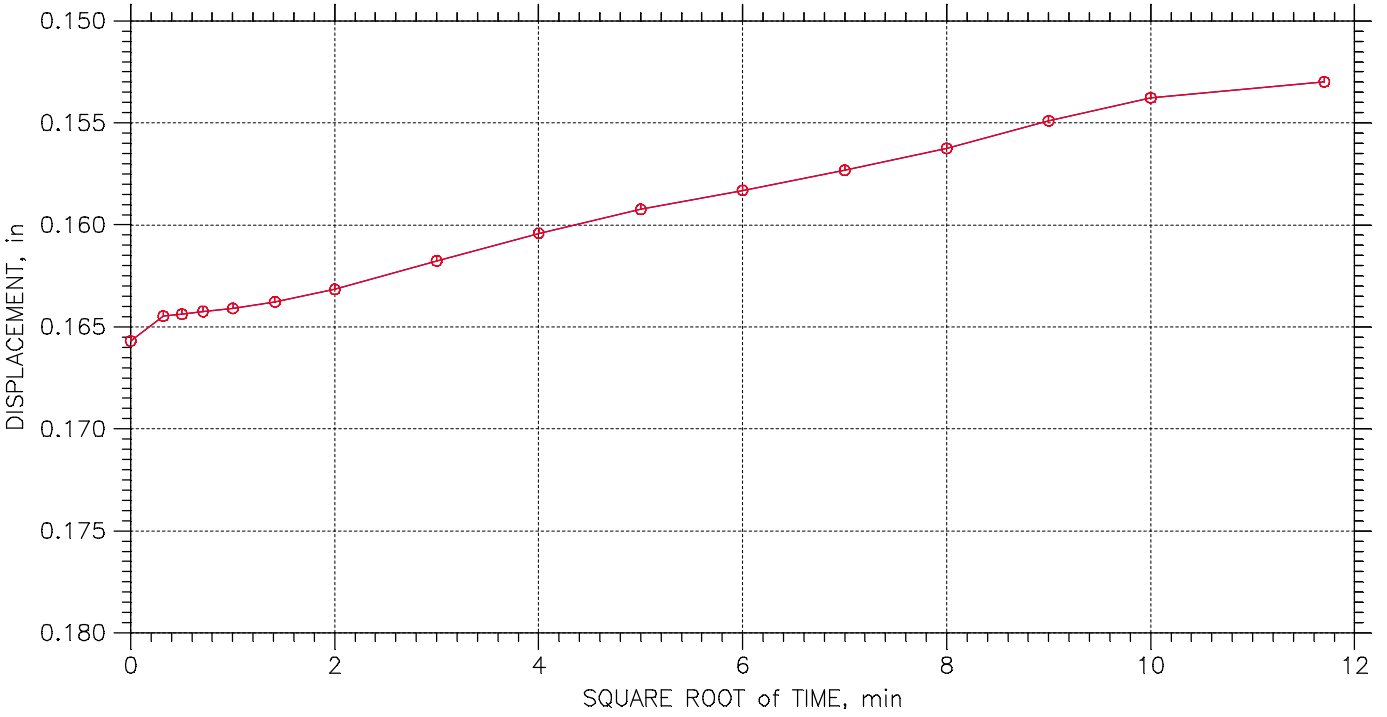
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf

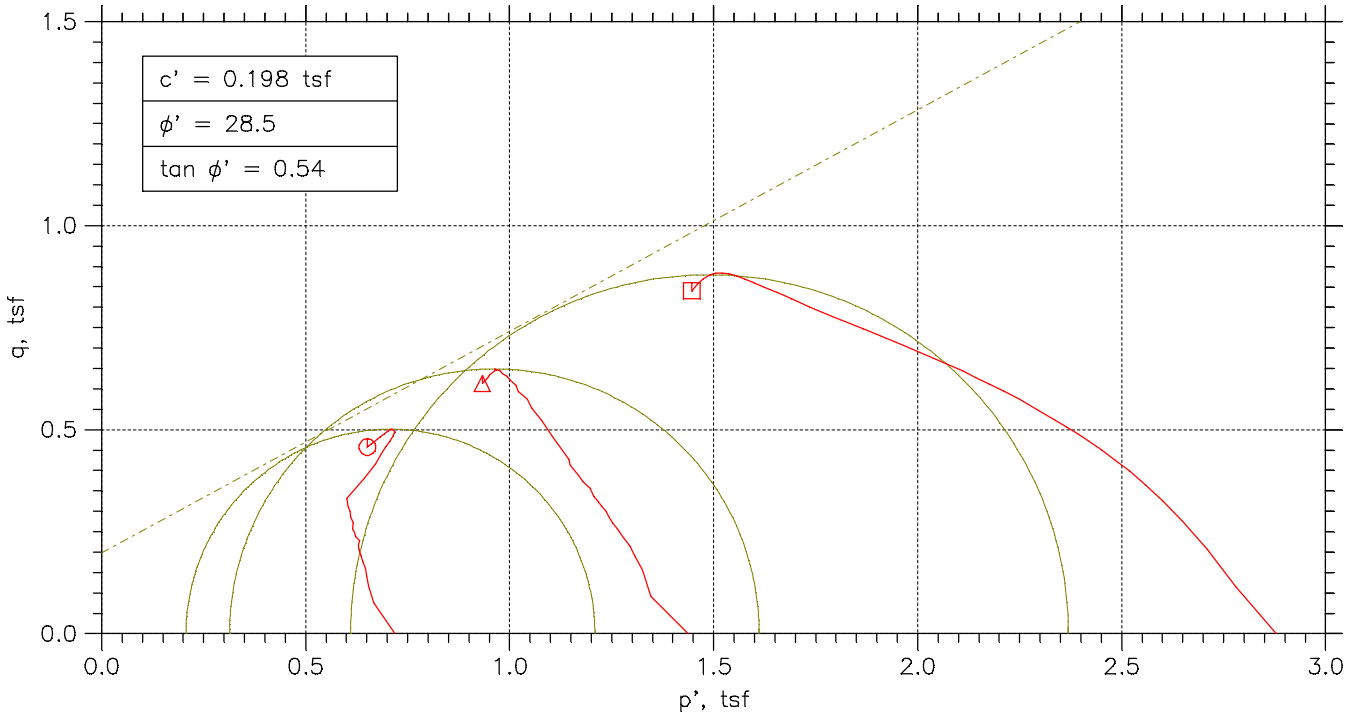


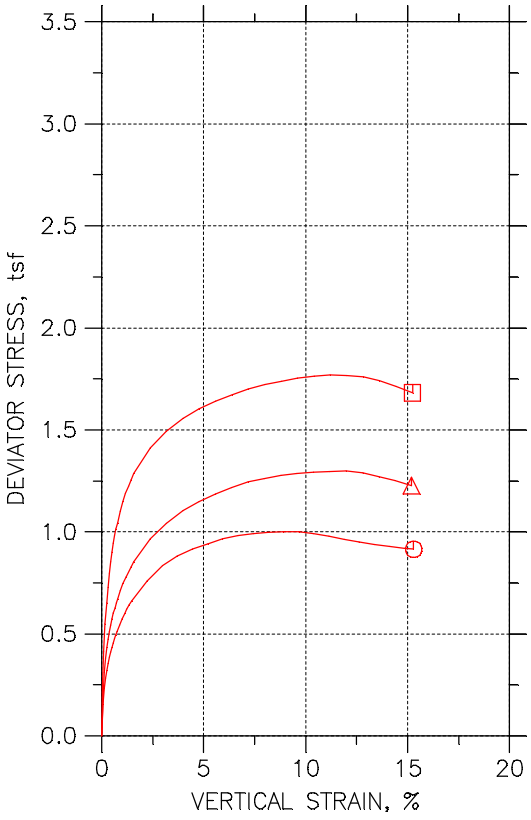


Terracon Consulting Engineers & Scientists	Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

Terracon
Consulting Engineers & Scientists





Symbol		⏲	△	⊡	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8213	2.8323	2.8173	
	Height, in	6.3035	6.2161	6.1913	
	Water Content, %	75.11	79.41	77.79	
	Dry Density, pcf	54.95	52.86	53.58	
	Saturation, %	99.96	99.73	99.68	
	Void Ratio	1.9536	2.0704	2.0291	
Before Shear	Water Content, %	68.95	65.19	53.75	
	Dry Density, pcf	58.12	60.23	67.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	1.7926	1.6948	1.3974	
	Back Press., tsf	5.0417	5.0434	5.0421	
Minor Prin. Stress, tsf		0.71831	1.4366	2.8779	
Max. Dev. Stress, tsf		1.0023	1.2984	1.7688	
Time to Failure, min		780	900	840	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.96	0.99	0.95	
Estimated Specific Gravity		2.60	2.60	2.60	
Liquid Limit		72	72	72	
Plastic Limit		37	37	37	
Plasticity Index		35	35	35	

Project: DYNERGY EDWARDS

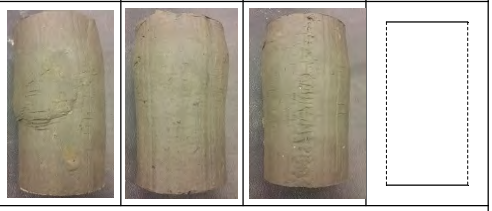
Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW006 S9

Sample Type: 3.0" ST

Failure Sketch



Description: DARK GRAY ORGANIC SILT OH SHELL NOTED

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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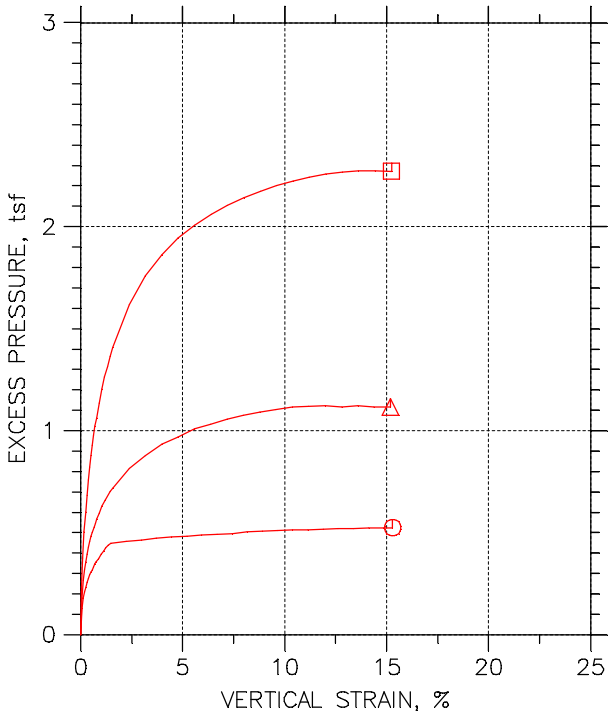

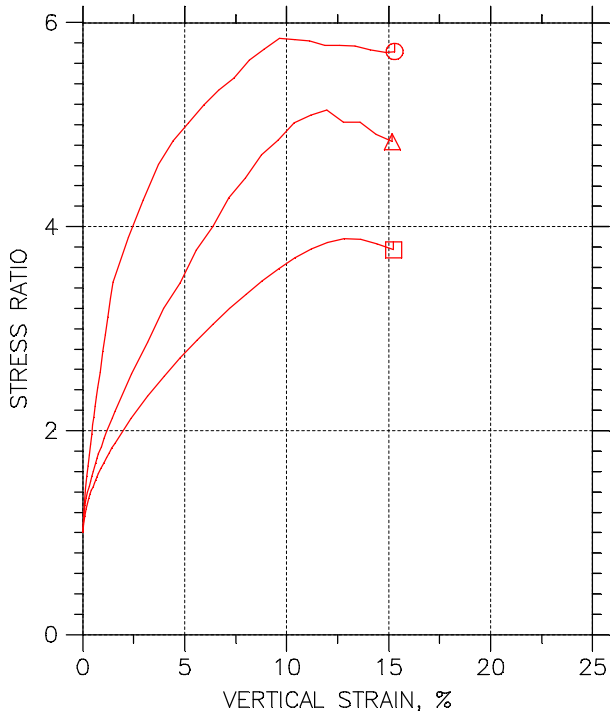

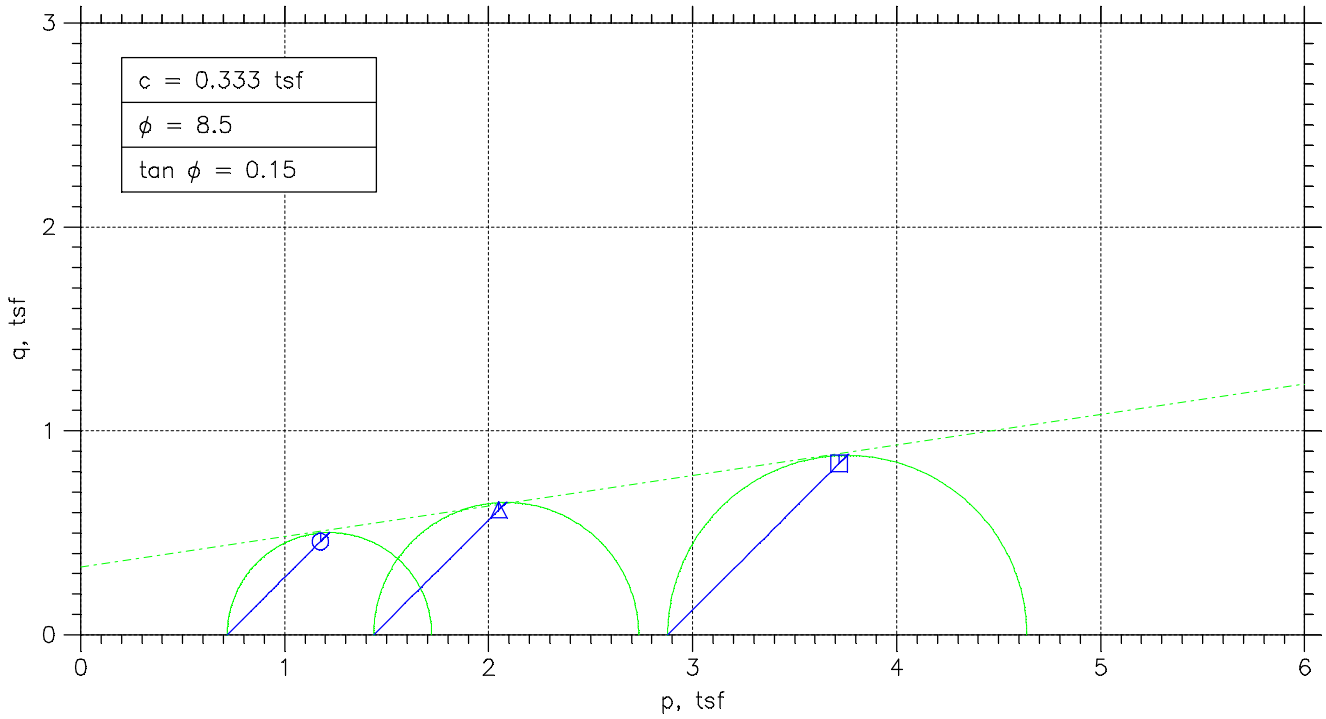

Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW006 S9	Tested By: BCM	Checked By: WPQ
Sample No.: S-9	Test Date: 10/29/15	Depth: 26.0'-28.0'
Test No.: EDW006 S9	Sample Type: 3.0" ST	Elevation: ----
Description: DARK GRAY ORGANIC SILT OH SHELL NOTED		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2514	0	0	5.0417	5.76	5.76
2	5.0001	0.062925	6.2553	13.244	0.15244	5.17	5.76	5.9124
3	10	0.12448	6.2592	20.256	0.233	5.2217	5.76	5.993
4	15	0.18877	6.2632	24.54	0.28211	5.2513	5.76	6.0421
5	20	0.2517	6.2672	27.823	0.31965	5.2728	5.76	6.0796
6	25	0.31326	6.271	30.773	0.35331	5.2966	5.76	6.1133
7	30	0.37618	6.275	33.555	0.38502	5.3169	5.76	6.145
8	35	0.43911	6.279	35.892	0.41157	5.3355	5.76	6.1716
9	40	0.4993	6.2828	37.896	0.43428	5.3483	5.76	6.1943
10	45	0.56085	6.2866	39.843	0.45632	5.3564	5.76	6.2163
11	50	0.62241	6.2905	41.568	0.47578	5.375	5.76	6.2358
12	55	0.68534	6.2945	43.405	0.49649	5.3878	5.76	6.2565
13	60	0.74689	6.2984	44.74	0.51144	5.4	5.76	6.2714
14	70	0.87137	6.3063	47.578	0.5432	5.4145	5.76	6.3032
15	80.001	0.99586	6.3143	50.305	0.57361	5.4371	5.76	6.3336
16	90.001	1.119	6.3221	52.698	0.60015	5.4511	5.76	6.3602
17	100	1.2393	6.3298	54.645	0.62158	5.4662	5.76	6.3816
18	110	1.3625	6.3377	56.704	0.64419	5.4795	5.76	6.4042
19	120	1.4856	6.3457	58.429	0.66296	5.49	5.76	6.423
20	180	2.2256	6.3937	67.5	0.76012	5.4975	5.76	6.5201
21	240	2.9766	6.4432	74.567	0.83326	5.5045	5.76	6.5933
22	300	3.7112	6.4923	79.52	0.88187	5.5155	5.76	6.6419
23	360	4.4485	6.5424	83.304	0.91676	5.5214	5.76	6.6768
24	420	5.2009	6.5943	86.308	0.94235	5.5254	5.76	6.7024
25	480	5.9368	6.6459	89.202	0.96639	5.5295	5.76	6.7264
26	540	6.6769	6.6986	91.372	0.98211	5.5335	5.76	6.7421
27	600	7.4293	6.7531	92.93	0.99081	5.5376	5.76	6.7508
28	660	8.1638	6.8071	94.322	0.99766	5.5446	5.76	6.7577
29	720	8.9039	6.8624	95.435	1.0013	5.5486	5.76	6.7613
30	780	9.6562	6.9196	96.325	1.0023	5.5533	5.76	6.7623
31	840	10.394	6.9765	96.047	0.99124	5.555	5.76	6.7512
32	900	11.131	7.0344	95.768	0.98023	5.5568	5.76	6.7402
33	960	11.883	7.0944	94.878	0.9629	5.5585	5.76	6.7229
34	1020	12.607	7.1532	94.489	0.95107	5.5608	5.76	6.7111
35	1080	13.351	7.2146	94.043	0.93853	5.5632	5.76	6.6985
36	1140	14.11	7.2784	93.876	0.92866	5.5637	5.76	6.6887
37	1200	14.841	7.3408	93.71	0.91912	5.5649	5.76	6.6791
38	1236.6	15.291	7.3798	93.765	0.91481	5.5661	5.76	6.6748

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71831	0.71831	1.000	0.71831	0
2	0.06	5.9124	5.76	0.12834	0.842	0.74242	0.58998	1.258	0.6662	0.07622
3	0.12	5.993	5.76	0.18002	0.773	0.77129	0.53829	1.433	0.65479	0.1165
4	0.19	6.0421	5.76	0.20963	0.743	0.79079	0.50868	1.555	0.64973	0.14105
5	0.25	6.0796	5.76	0.23112	0.723	0.80684	0.48719	1.656	0.64702	0.15982
6	0.31	6.1133	5.76	0.25493	0.722	0.8167	0.46338	1.762	0.64004	0.17666
7	0.38	6.145	5.76	0.27525	0.715	0.82807	0.44306	1.869	0.63556	0.19251
8	0.44	6.1716	5.76	0.29384	0.714	0.83605	0.42447	1.970	0.63026	0.20579
9	0.50	6.1943	5.76	0.30661	0.706	0.84598	0.4117	2.055	0.62884	0.21714
10	0.56	6.2163	5.76	0.31474	0.690	0.85989	0.40357	2.131	0.63173	0.22816
11	0.62	6.2358	5.76	0.33333	0.701	0.86077	0.38499	2.236	0.62288	0.23789
12	0.69	6.2565	5.76	0.3461	0.697	0.8687	0.37221	2.334	0.62045	0.24824
13	0.75	6.2714	5.76	0.3583	0.701	0.87146	0.36002	2.421	0.61574	0.25572
14	0.87	6.3032	5.76	0.37281	0.686	0.8887	0.3455	2.572	0.6171	0.2716
15	1.00	6.3336	5.76	0.39546	0.689	0.89647	0.32285	2.777	0.60966	0.28681
16	1.12	6.3602	5.76	0.4094	0.682	0.90907	0.30891	2.943	0.60899	0.30008
17	1.24	6.3816	5.76	0.4245	0.683	0.91539	0.29382	3.116	0.6046	0.31079
18	1.36	6.4042	5.76	0.43785	0.680	0.92465	0.28046	3.297	0.60255	0.3221
19	1.49	6.423	5.76	0.4483	0.676	0.93297	0.27001	3.455	0.60149	0.33148
20	2.23	6.5201	5.76	0.45585	0.600	1.0226	0.26246	3.896	0.64252	0.38006
21	2.98	6.5933	5.76	0.46282	0.555	1.0887	0.25549	4.261	0.67212	0.41663
22	3.71	6.6419	5.76	0.47386	0.537	1.1263	0.24446	4.608	0.68539	0.44094
23	4.45	6.6768	5.76	0.47966	0.523	1.1554	0.23865	4.841	0.69703	0.45838
24	5.20	6.7024	5.76	0.48373	0.513	1.1769	0.23458	5.017	0.70576	0.47118
25	5.94	6.7264	5.76	0.48779	0.505	1.1969	0.23052	5.192	0.71371	0.48319
26	6.68	6.7421	5.76	0.49186	0.501	1.2086	0.22645	5.337	0.71751	0.49106
27	7.43	6.7508	5.76	0.49592	0.501	1.2132	0.22239	5.455	0.71779	0.4954
28	8.16	6.7577	5.76	0.50289	0.504	1.2131	0.21542	5.631	0.71425	0.49883
29	8.90	6.7613	5.76	0.50696	0.506	1.2127	0.21136	5.738	0.712	0.50065
30	9.66	6.7623	5.76	0.5116	0.510	1.209	0.20671	5.849	0.70785	0.50114
31	10.39	6.7512	5.76	0.51334	0.518	1.1962	0.20497	5.836	0.70059	0.49562
32	11.13	6.7402	5.76	0.51509	0.525	1.1835	0.20323	5.823	0.69334	0.49012
33	11.88	6.7229	5.76	0.51683	0.537	1.1644	0.20148	5.779	0.68293	0.48145
34	12.61	6.7111	5.76	0.51915	0.546	1.1502	0.19916	5.775	0.6747	0.47554
35	13.35	6.6985	5.76	0.52147	0.556	1.1354	0.19684	5.768	0.6661	0.46927
36	14.11	6.6887	5.76	0.52205	0.562	1.1249	0.19626	5.732	0.66058	0.46433
37	14.84	6.6791	5.76	0.52322	0.569	1.1142	0.1951	5.711	0.65466	0.45956
38	15.29	6.6748	5.76	0.52438	0.573	1.1087	0.19393	5.717	0.65134	0.4574

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
Specimen Area: 6.30 in^2
Specimen Volume: 39.16 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0434	6.48	6.48
2	5.0002	0.053874	6.3037	16.056	0.18339	5.2253	6.48	6.6634
3	10	0.11698	6.3077	27.272	0.3113	5.3105	6.48	6.7913
4	15	0.18163	6.3118	33.307	0.37994	5.363	6.48	6.8599
5	20	0.24782	6.316	37.862	0.43162	5.4014	6.48	6.9116
6	25	0.31247	6.3201	41.506	0.47285	5.4382	6.48	6.9528
7	30	0.3802	6.3244	44.922	0.51142	5.4714	6.48	6.9914
8	35	0.44639	6.3286	47.826	0.54411	5.5006	6.48	7.0241
9	40	0.51412	6.3329	50.502	0.57417	5.5245	6.48	7.0542
10	45	0.57876	6.337	52.95	0.60161	5.5449	6.48	7.0816
11	50	0.64649	6.3413	55.228	0.62706	5.5682	6.48	7.1071
12	55	0.71268	6.3456	57.391	0.65119	5.5898	6.48	7.1312
13	60	0.77887	6.3498	59.327	0.67271	5.6102	6.48	7.1527
14	70	0.91279	6.3584	62.857	0.71177	5.6382	6.48	7.1918
15	80.001	1.0467	6.367	65.988	0.74622	5.6732	6.48	7.2262
16	90.001	1.1791	6.3755	68.778	0.77673	5.7	6.48	7.2567
17	110	1.4485	6.3929	73.504	0.82783	5.7449	6.48	7.3078
18	120	1.5824	6.4016	75.895	0.8536	5.7619	6.48	7.3336
19	180	2.3828	6.4541	86.713	0.96734	5.8598	6.48	7.4473
20	240	3.1817	6.5074	94.171	1.0419	5.9216	6.48	7.5219
21	300	3.9805	6.5615	100.66	1.1046	5.9782	6.48	7.5846
22	360	4.7763	6.6164	105.5	1.1481	6.0115	6.48	7.6281
23	420	5.5721	6.6721	109.89	1.1858	6.0517	6.48	7.6658
24	480	6.371	6.729	113.87	1.2184	6.0739	6.48	7.6984
25	540	7.1745	6.7873	117.29	1.2442	6.1013	6.48	7.7242
26	600	7.978	6.8465	119.96	1.2616	6.1176	6.48	7.7416
27	660	8.7738	6.9063	122.35	1.2756	6.1357	6.48	7.7556
28	720	9.5758	6.9675	124.58	1.2873	6.1456	6.48	7.7673
29	780	10.378	7.0299	126.17	1.2922	6.1584	6.48	7.7722
30	840	11.177	7.0931	127.76	1.2969	6.1631	6.48	7.7769
31	900	11.976	7.1575	129.07	1.2984	6.1666	6.48	7.7784
32	960	12.787	7.224	129.36	1.2893	6.1596	6.48	7.7693
33	1020	13.584	7.2907	128.62	1.2702	6.1643	6.48	7.7502
34	1080	14.381	7.3586	127.93	1.2518	6.1596	6.48	7.7318
35	1140	15.18	7.4279	126.51	1.2263	6.1602	6.48	7.7063

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
Specimen Area: 6.30 in^2
Specimen Volume: 39.16 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4366	1.4366	1.000	1.4366	0
2	0.05	6.6634	6.48	0.18195	0.992	1.4381	1.2547	1.146	1.3464	0.091693
3	0.12	6.7913	6.48	0.2671	0.858	1.4808	1.1695	1.266	1.3252	0.15565
4	0.18	6.8599	6.48	0.31958	0.841	1.497	1.117	1.340	1.307	0.18997
5	0.25	6.9116	6.48	0.35807	0.830	1.5102	1.0786	1.400	1.2944	0.21581
6	0.31	6.9528	6.48	0.39482	0.835	1.5147	1.0418	1.454	1.2782	0.23642
7	0.38	6.9914	6.48	0.42806	0.837	1.52	1.0086	1.507	1.2643	0.25571
8	0.45	7.0241	6.48	0.45722	0.840	1.5235	0.97941	1.556	1.2515	0.27206
9	0.51	7.0542	6.48	0.48113	0.838	1.5297	0.9555	1.601	1.2426	0.28708
10	0.58	7.0816	6.48	0.50154	0.834	1.5367	0.93509	1.643	1.2359	0.30081
11	0.65	7.1071	6.48	0.52487	0.837	1.5388	0.91176	1.688	1.2253	0.31353
12	0.71	7.1312	6.48	0.54644	0.839	1.5414	0.89018	1.732	1.2158	0.32559
13	0.78	7.1527	6.48	0.56685	0.843	1.5425	0.86977	1.773	1.2061	0.33635
14	0.91	7.1918	6.48	0.59485	0.836	1.5535	0.84178	1.846	1.1977	0.35589
15	1.05	7.2262	6.48	0.62984	0.844	1.553	0.80679	1.925	1.1799	0.37311
16	1.18	7.2567	6.48	0.65666	0.845	1.5567	0.77996	1.996	1.1683	0.38836
17	1.45	7.3078	6.48	0.70157	0.847	1.5629	0.73506	2.126	1.149	0.41392
18	1.58	7.3336	6.48	0.71848	0.842	1.5717	0.71814	2.189	1.1449	0.4268
19	2.38	7.4473	6.48	0.81646	0.844	1.5875	0.62017	2.560	1.1038	0.48367
20	3.18	7.5219	6.48	0.87827	0.843	1.6003	0.55835	2.866	1.0793	0.52097
21	3.98	7.5846	6.48	0.93484	0.846	1.6064	0.50178	3.201	1.0541	0.55229
22	4.78	7.6281	6.48	0.96809	0.843	1.6166	0.46854	3.450	1.0426	0.57404
23	5.57	7.6658	6.48	1.0083	0.850	1.6141	0.4283	3.769	1.0212	0.5929
24	6.37	7.6984	6.48	1.0305	0.846	1.6246	0.40614	4.000	1.0153	0.6092
25	7.17	7.7242	6.48	1.0579	0.850	1.6229	0.37873	4.285	1.0008	0.6221
26	7.98	7.7416	6.48	1.0742	0.852	1.624	0.3624	4.481	0.99318	0.63078
27	8.77	7.7556	6.48	1.0923	0.856	1.6199	0.34432	4.705	0.98212	0.63779
28	9.58	7.7673	6.48	1.1022	0.856	1.6217	0.33441	4.850	0.97807	0.64366
29	10.38	7.7722	6.48	1.115	0.863	1.6138	0.32158	5.018	0.96769	0.64611
30	11.18	7.7769	6.48	1.1197	0.863	1.6138	0.31691	5.092	0.96536	0.64845
31	11.98	7.7784	6.48	1.1232	0.865	1.6118	0.31341	5.143	0.96261	0.6492
32	12.79	7.7693	6.48	1.1162	0.866	1.6097	0.32041	5.024	0.96505	0.64464
33	13.58	7.7502	6.48	1.1209	0.882	1.5859	0.31575	5.023	0.95083	0.63509
34	14.38	7.7318	6.48	1.1162	0.892	1.5722	0.32041	4.907	0.9463	0.62588
35	15.18	7.7063	6.48	1.1168	0.911	1.5461	0.31983	4.834	0.93298	0.61315

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2339	0	0	5.0421	7.92	7.92
2	5.0041	0.048386	6.237	20.074	0.23173	5.2556	7.92	8.1517
3	10.004	0.10997	6.2408	35.922	0.41443	5.4179	7.92	8.3344
4	15	0.17448	6.2448	47.727	0.55027	5.5452	7.92	8.4703
5	20	0.239	6.2489	56.501	0.65101	5.6441	7.92	8.571
6	25	0.30498	6.253	63.345	0.72938	5.7261	7.92	8.6494
7	30	0.37096	6.2572	69.271	0.79709	5.7994	7.92	8.7171
8	35	0.43547	6.2612	74.094	0.85204	5.8628	7.92	8.772
9	40	0.50292	6.2655	78.366	0.90055	5.9192	7.92	8.8206
10	45	0.57036	6.2697	82.179	0.94372	5.971	7.92	8.8637
11	50	0.63781	6.274	85.44	0.98051	6.0187	7.92	8.9005
12	55	0.70379	6.2781	88.426	1.0141	6.0629	7.92	8.9341
13	60	0.77124	6.2824	91.274	1.0461	6.1059	7.92	8.9661
14	70	0.90613	6.291	96.097	1.0998	6.1781	7.92	9.0198
15	80	1.0381	6.2993	100.51	1.1488	6.2449	7.92	9.0688
16	90	1.173	6.3079	104.27	1.1902	6.3054	7.92	9.1102
17	100	1.3079	6.3166	107.4	1.2242	6.3572	7.92	9.1442
18	110	1.4398	6.325	110.34	1.256	6.4072	7.92	9.176
19	120	1.5747	6.3337	113.19	1.2867	6.4514	7.92	9.2067
20	180	2.3709	6.3853	125.22	1.412	6.6602	7.92	9.332
21	240	3.1832	6.4389	133.67	1.4947	6.801	7.92	9.4147
22	300	3.9838	6.4926	140.24	1.5552	6.9063	7.92	9.4752
23	360	4.7858	6.5473	145.66	1.6018	6.9854	7.92	9.5218
24	420	5.5951	6.6034	150.49	1.6408	7.0493	7.92	9.5608
25	480	6.3957	6.6599	154.71	1.6726	7.1017	7.92	9.5926
26	540	7.1948	6.7172	158.57	1.6997	7.1459	7.92	9.6197
27	600	8.0027	6.7762	162.01	1.7215	7.1825	7.92	9.6415
28	660	8.8047	6.8358	165.09	1.7389	7.2151	7.92	9.6589
29	720	9.6009	6.896	167.99	1.7539	7.2424	7.92	9.6739
30	780	10.406	6.958	170.42	1.7635	7.2651	7.92	9.6835
31	840	11.211	7.0211	172.49	1.7688	7.2843	7.92	9.6888
32	900	12.013	7.0851	173.91	1.7673	7.2989	7.92	9.6873
33	960	12.824	7.151	174.74	1.7594	7.3099	7.92	9.6794
34	1020	13.618	7.2167	174.37	1.7397	7.3151	7.92	9.6597
35	1080	14.419	7.2843	173.27	1.7126	7.3157	7.92	9.6326
36	1140	15.24	7.3548	171.71	1.6809	7.314	7.92	9.6009

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8779	2.8779	1.000	2.8779	0
2	0.05	8.1517	7.92	0.21346	0.921	2.8961	2.6644	1.087	2.7803	0.11587
3	0.11	8.3344	7.92	0.37573	0.907	2.9166	2.5021	1.166	2.7093	0.20721
4	0.17	8.4703	7.92	0.50311	0.914	2.925	2.3748	1.232	2.6499	0.27514
5	0.24	8.571	7.92	0.60199	0.925	2.9269	2.2759	1.286	2.6014	0.3255
6	0.30	8.6494	7.92	0.68399	0.938	2.9233	2.1939	1.332	2.5586	0.36469
7	0.37	8.7171	7.92	0.75728	0.950	2.9177	2.1206	1.376	2.5191	0.39854
8	0.44	8.772	7.92	0.82068	0.963	2.9092	2.0572	1.414	2.4832	0.42602
9	0.50	8.8206	7.92	0.8771	0.974	2.9013	2.0008	1.450	2.451	0.45028
10	0.57	8.8637	7.92	0.92886	0.984	2.8927	1.949	1.484	2.4209	0.47186
11	0.64	8.9005	7.92	0.97655	0.996	2.8818	1.9013	1.516	2.3916	0.49026
12	0.70	8.9341	7.92	1.0208	1.007	2.8712	1.8571	1.546	2.3642	0.50705
13	0.77	8.9661	7.92	1.0638	1.017	2.8601	1.8141	1.577	2.3371	0.52303
14	0.91	9.0198	7.92	1.1359	1.033	2.8418	1.7419	1.631	2.2919	0.54992
15	1.04	9.0688	7.92	1.2028	1.047	2.8238	1.6751	1.686	2.2494	0.57439
16	1.17	9.1102	7.92	1.2633	1.061	2.8048	1.6146	1.737	2.2097	0.5951
17	1.31	9.1442	7.92	1.3151	1.074	2.787	1.5628	1.783	2.1749	0.61209
18	1.44	9.176	7.92	1.3651	1.087	2.7688	1.5128	1.830	2.1408	0.62801
19	1.57	9.2067	7.92	1.4093	1.095	2.7552	1.4686	1.876	2.1119	0.64333
20	2.37	9.332	7.92	1.6181	1.146	2.6717	1.2598	2.121	1.9658	0.70598
21	3.18	9.4147	7.92	1.7588	1.177	2.6137	1.119	2.336	1.8664	0.74736
22	3.98	9.4752	7.92	1.8641	1.199	2.569	1.0137	2.534	1.7914	0.77761
23	4.79	9.5218	7.92	1.9432	1.213	2.5365	0.93464	2.714	1.7356	0.80092
24	5.60	9.5608	7.92	2.0072	1.223	2.5115	0.87066	2.885	1.6911	0.8204
25	6.40	9.5926	7.92	2.0595	1.231	2.4909	0.81832	3.044	1.6546	0.83629
26	7.19	9.6197	7.92	2.1037	1.238	2.4738	0.77411	3.196	1.6239	0.84983
27	8.00	9.6415	7.92	2.1404	1.243	2.4589	0.73747	3.334	1.5982	0.86073
28	8.80	9.6589	7.92	2.173	1.250	2.4438	0.7049	3.467	1.5743	0.86944
29	9.60	9.6739	7.92	2.2003	1.255	2.4315	0.67756	3.589	1.5545	0.87696
30	10.41	9.6835	7.92	2.223	1.261	2.4184	0.65488	3.693	1.5366	0.88174
31	11.21	9.6888	7.92	2.2422	1.268	2.4045	0.63569	3.783	1.5201	0.88442
32	12.01	9.6873	7.92	2.2567	1.277	2.3885	0.62115	3.845	1.5048	0.88367
33	12.82	9.6794	7.92	2.2678	1.289	2.3695	0.61009	3.884	1.4898	0.87969
34	13.62	9.6597	7.92	2.273	1.307	2.3445	0.60486	3.876	1.4747	0.86983
35	14.42	9.6326	7.92	2.2736	1.328	2.3169	0.60428	3.834	1.4606	0.85632
36	15.24	9.6009	7.92	2.2718	1.352	2.287	0.60602	3.774	1.4465	0.84046

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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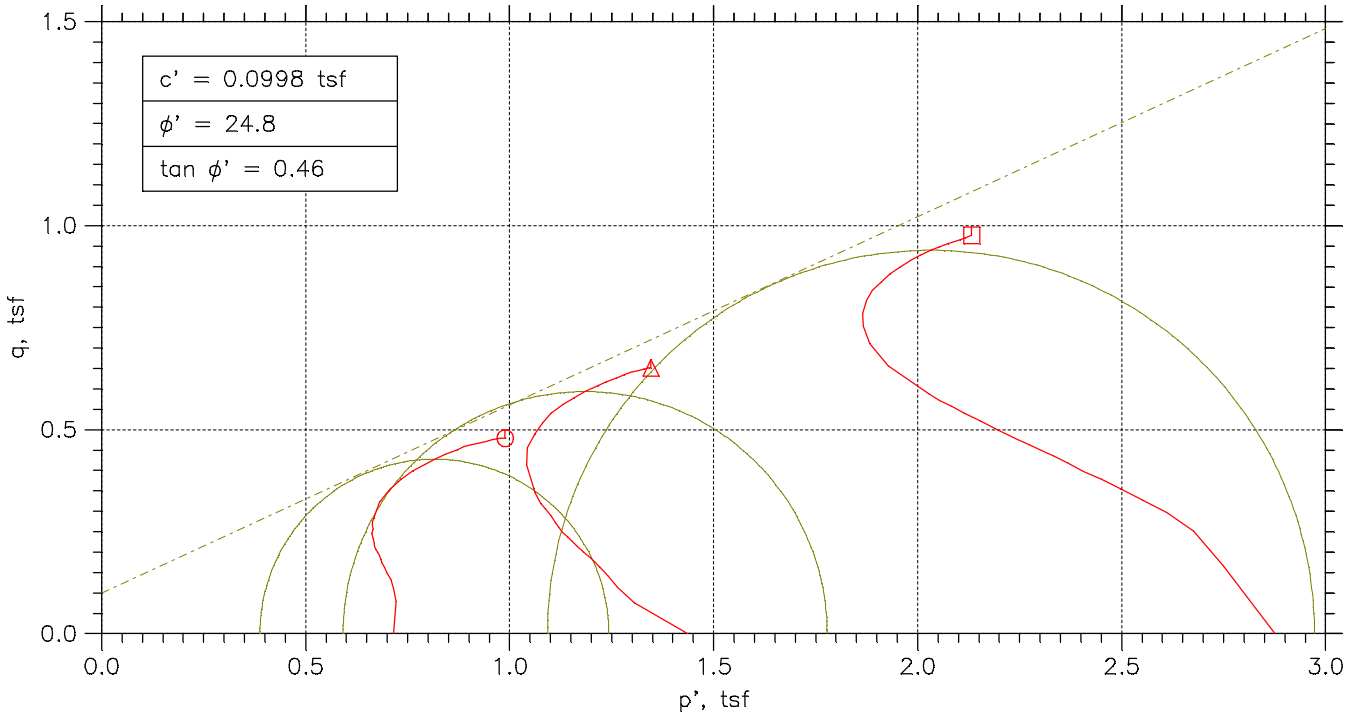

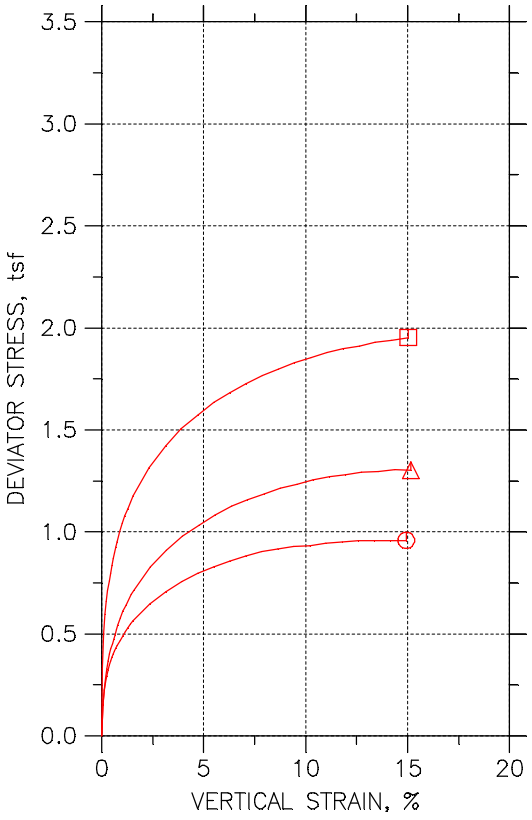

Symbol		⏲	△	⊡	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8094	2.8291	2.8406	
	Height, in	5.9575	6.2256	6.276	
	Water Content, %	27.95	28.58	25.69	
	Dry Density, pcf	95.83	93.77	96.62	
	Saturation, %	98.51	95.87	92.26	
	Void Ratio	0.77188	0.81092	0.75748	
Before Shear	Water Content, %	27.39	26.71	23.87	
	Dry Density, pcf	97.31	98.35	103.	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.74495	0.72649	0.64936	
	Back Press., tsf	5.0452	5.044	5.045	
Minor Prin. Stress, tsf		0.71483	1.436	2.875	
Max. Dev. Stress, tsf		0.95795	1.304	1.9522	
Time to Failure, min		1140	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.95	0.97	0.95	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		18	18	18	
Plasticity Index		30	30	30	

Project: DYNERGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW010 S-7

Sample Type: 3.0" ST

Failure Sketch

Description: BROWN AND GRAY MOTTLED LEAN CLAY CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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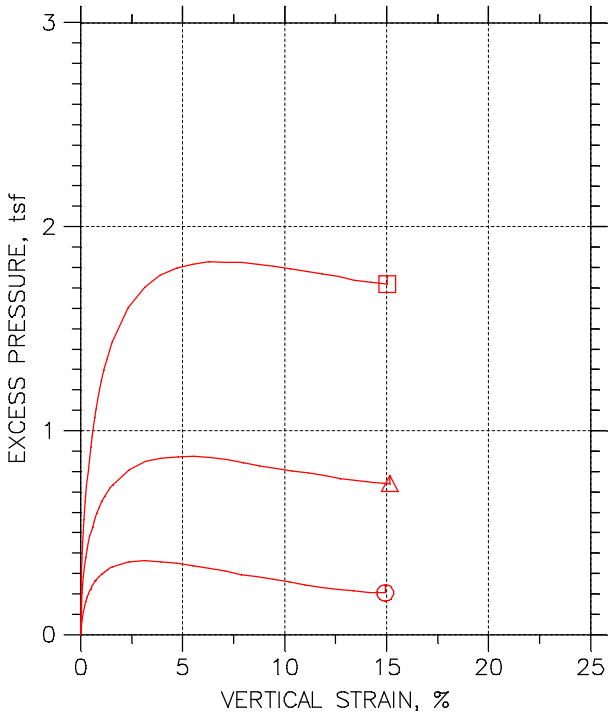

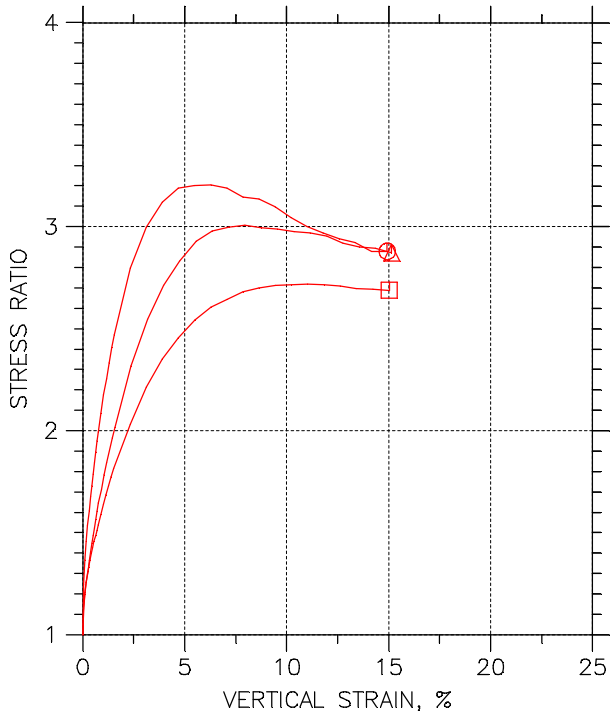

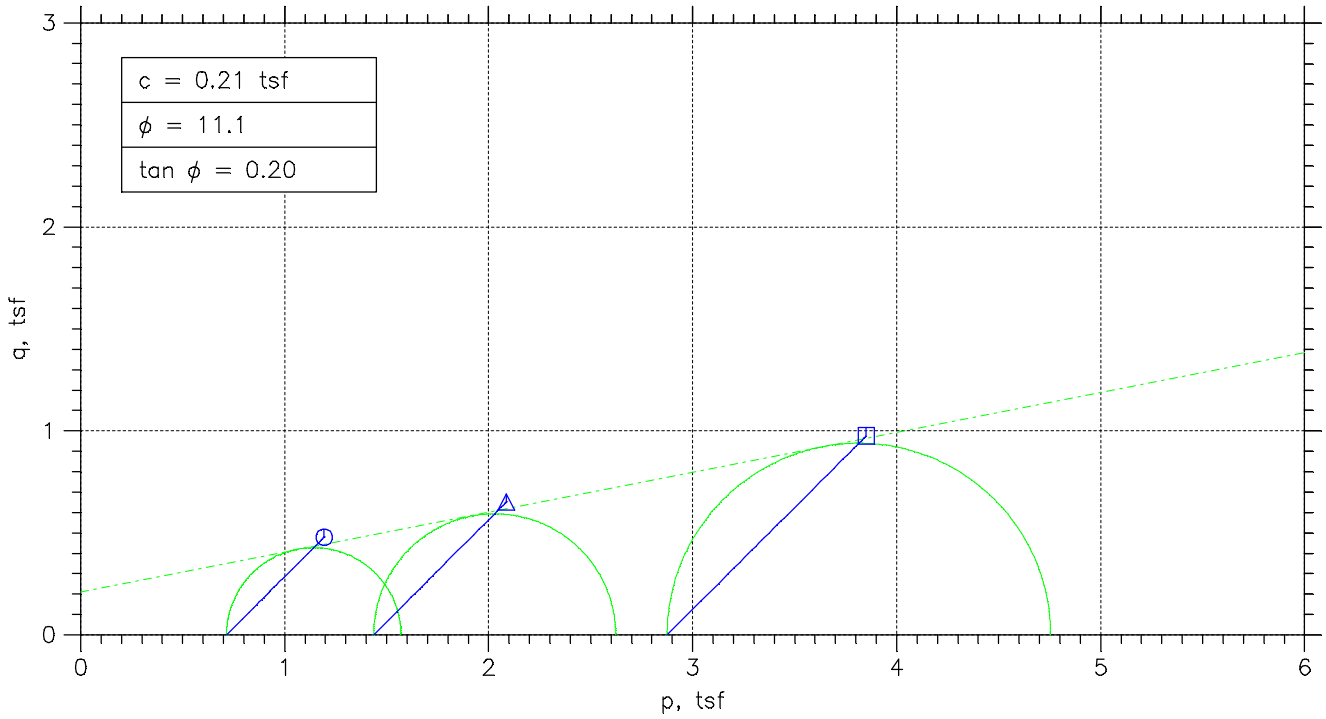

Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-010 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 10/29/15	Depth: 15.0'-17.0'
Test No.: EDW-010 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND GRAY MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.1991	0	0	5.0452	5.76	5.76
2	5.0041	0.056448	6.2027	13.621	0.15811	5.1172	5.76	5.9181
3	10.004	0.12013	6.2066	19.07	0.22122	5.1549	5.76	5.9812
4	15.004	0.18382	6.2106	22.767	0.26394	5.1834	5.76	6.0239
5	20	0.24895	6.2146	25.54	0.29589	5.2078	5.76	6.0559
6	25	0.31408	6.2187	27.923	0.3233	5.2287	5.76	6.0833
7	30	0.37922	6.2227	29.967	0.34673	5.2467	5.76	6.1067
8	35	0.4429	6.2267	31.669	0.36619	5.2595	5.76	6.1262
9	40	0.50948	6.2309	33.275	0.3845	5.2716	5.76	6.1445
10	45	0.57462	6.235	34.734	0.4011	5.285	5.76	6.1611
11	50	0.63975	6.2391	36.047	0.41599	5.296	5.76	6.176
12	55	0.70488	6.2432	37.312	0.43031	5.3065	5.76	6.1903
13	60	0.77001	6.2473	38.48	0.44348	5.314	5.76	6.2035
14	70	0.90028	6.2555	40.669	0.4681	5.3286	5.76	6.2281
15	80	1.032	6.2638	42.663	0.4904	5.3431	5.76	6.2504
16	90	1.1608	6.272	44.609	0.5121	5.3512	5.76	6.2721
17	100	1.2925	6.2803	46.263	0.53038	5.3622	5.76	6.2904
18	110	1.4213	6.2885	47.869	0.54807	5.3704	5.76	6.3081
19	120	1.5516	6.2969	49.377	0.56459	5.3762	5.76	6.3246
20	180	2.3404	6.3477	56.868	0.64504	5.4011	5.76	6.405
21	240	3.1249	6.3991	62.706	0.70554	5.407	5.76	6.4655
22	300	3.908	6.4513	67.717	0.75576	5.4035	5.76	6.5158
23	360	4.7026	6.5051	72.046	0.79743	5.3959	5.76	6.5574
24	420	5.4871	6.5591	75.549	0.82931	5.3831	5.76	6.5893
25	480	6.2774	6.6144	78.565	0.85521	5.3721	5.76	6.6152
26	540	7.0676	6.6706	81.63	0.88108	5.3576	5.76	6.6411
27	600	7.8492	6.7272	84.305	0.90231	5.3396	5.76	6.6623
28	660	8.6337	6.7849	86.446	0.91734	5.3303	5.76	6.6773
29	720	9.424	6.8441	88.197	0.92783	5.3175	5.76	6.6878
30	780	10.213	6.9043	89.462	0.93294	5.3036	5.76	6.6929
31	840	10.997	6.9651	91.213	0.94289	5.2891	5.76	6.7029
32	900	11.786	7.0274	92.818	0.95098	5.2769	5.76	6.711
33	960	12.572	7.0906	94.083	0.95535	5.2682	5.76	6.7154
34	1020	13.361	7.1551	95.105	0.95701	5.2618	5.76	6.717
35	1080	14.148	7.2208	95.981	0.95705	5.2502	5.76	6.717
36	1140	14.93	7.2871	96.953	0.95795	5.2502	5.76	6.7179

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71483	0.71483	1.000	0.71483	0
2	0.06	5.9181	5.76	0.072008	0.455	0.80093	0.64282	1.246	0.72188	0.079057
3	0.12	5.9812	5.76	0.10975	0.496	0.82629	0.60507	1.366	0.71568	0.11061
4	0.18	6.0239	5.76	0.13821	0.524	0.84056	0.57662	1.458	0.70859	0.13197
5	0.25	6.0559	5.76	0.1626	0.550	0.84812	0.55223	1.536	0.70018	0.14795
6	0.31	6.0833	5.76	0.1835	0.568	0.85462	0.53132	1.608	0.69297	0.16165
7	0.38	6.1067	5.76	0.2015	0.581	0.86005	0.51332	1.675	0.68669	0.17336
8	0.44	6.1262	5.76	0.21428	0.585	0.86674	0.50055	1.732	0.68364	0.1831
9	0.51	6.1445	5.76	0.22648	0.589	0.87285	0.48835	1.787	0.6806	0.19225
10	0.57	6.1611	5.76	0.23983	0.598	0.87609	0.475	1.844	0.67555	0.20055
11	0.64	6.176	5.76	0.25086	0.603	0.87996	0.46396	1.897	0.67196	0.208
12	0.70	6.1903	5.76	0.26132	0.607	0.88382	0.45351	1.949	0.66866	0.21515
13	0.77	6.2035	5.76	0.26887	0.606	0.88944	0.44596	1.994	0.6677	0.22174
14	0.90	6.2281	5.76	0.28338	0.605	0.89954	0.43144	2.085	0.66549	0.23405
15	1.03	6.2504	5.76	0.2979	0.607	0.90733	0.41693	2.176	0.66213	0.2452
16	1.16	6.2721	5.76	0.30603	0.598	0.9209	0.4088	2.253	0.66485	0.25605
17	1.29	6.2904	5.76	0.31707	0.598	0.92814	0.39776	2.333	0.66295	0.26519
18	1.42	6.3081	5.76	0.3252	0.593	0.9377	0.38963	2.407	0.66367	0.27403
19	1.55	6.3246	5.76	0.331	0.586	0.94841	0.38382	2.471	0.66612	0.28229
20	2.34	6.405	5.76	0.35597	0.552	1.0039	0.35885	2.797	0.68137	0.32252
21	3.12	6.4655	5.76	0.36178	0.513	1.0586	0.35305	2.998	0.70582	0.35277
22	3.91	6.5158	5.76	0.3583	0.474	1.1123	0.35653	3.120	0.73441	0.37788
23	4.70	6.5574	5.76	0.35075	0.440	1.1615	0.36408	3.190	0.7628	0.39872
24	5.49	6.5893	5.76	0.33797	0.408	1.2062	0.37686	3.201	0.79151	0.41466
25	6.28	6.6152	5.76	0.32694	0.382	1.2431	0.38789	3.205	0.8155	0.42761
26	7.07	6.6411	5.76	0.31242	0.355	1.2835	0.40241	3.190	0.84295	0.44054
27	7.85	6.6623	5.76	0.29442	0.326	1.3227	0.42041	3.146	0.87156	0.45115
28	8.63	6.6773	5.76	0.28513	0.311	1.347	0.4297	3.135	0.88837	0.45867
29	9.42	6.6878	5.76	0.27235	0.294	1.3703	0.44248	3.097	0.90639	0.46391
30	10.21	6.6929	5.76	0.25841	0.277	1.3894	0.45641	3.044	0.92288	0.46647
31	11.00	6.7029	5.76	0.2439	0.259	1.4138	0.47093	3.002	0.94238	0.47144
32	11.79	6.711	5.76	0.2317	0.244	1.4341	0.48313	2.968	0.95862	0.47549
33	12.57	6.7154	5.76	0.22299	0.233	1.4472	0.49184	2.942	0.96951	0.47768
34	13.36	6.717	5.76	0.2166	0.226	1.4552	0.49822	2.921	0.97673	0.47851
35	14.15	6.717	5.76	0.20499	0.214	1.4669	0.50984	2.877	0.98836	0.47852
36	14.93	6.7179	5.76	0.20499	0.214	1.4678	0.50984	2.879	0.98881	0.47897

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2863	0	0	5.044	6.48	6.48
2	5.0041	0.05533	6.2898	13.126	0.15025	5.2498	6.48	6.6303
3	10.004	0.11988	6.2939	19.719	0.22558	5.328	6.48	6.7056
4	15.004	0.18597	6.298	24.693	0.2823	5.381	6.48	6.7623
5	20.004	0.25206	6.3022	28.769	0.32867	5.4242	6.48	6.8087
6	25.004	0.31968	6.3065	32.245	0.36814	5.4644	6.48	6.8481
7	30.004	0.38731	6.3108	35.122	0.40071	5.4988	6.48	6.8807
8	35.004	0.45339	6.315	37.46	0.4271	5.5286	6.48	6.9071
9	40.004	0.52256	6.3193	39.617	0.45138	5.5525	6.48	6.9314
10	45.004	0.58557	6.3234	41.595	0.47362	5.5747	6.48	6.9536
11	50.004	0.65166	6.3276	43.633	0.49649	5.5991	6.48	6.9765
12	55.004	0.71775	6.3318	45.791	0.5207	5.6207	6.48	7.0007
13	60.004	0.7823	6.3359	47.769	0.54284	5.6394	6.48	7.0228
14	70.004	0.91601	6.3444	50.885	0.57747	5.6668	6.48	7.0575
15	80	1.0497	6.353	54.002	0.61202	5.6983	6.48	7.092
16	90	1.1834	6.3616	56.459	0.639	5.7228	6.48	7.119
17	110	1.4493	6.3788	61.314	0.69208	5.7642	6.48	7.1721
18	120	1.583	6.3874	63.292	0.71343	5.7776	6.48	7.1934
19	180	2.3746	6.4392	73.961	0.82699	5.8522	6.48	7.307
20	240	3.1676	6.492	82.052	0.91001	5.8919	6.48	7.39
21	300	3.9653	6.5459	89.124	0.9803	5.9077	6.48	7.4603
22	360	4.766	6.6009	94.698	1.0329	5.9158	6.48	7.5129
23	420	5.5652	6.6568	100.03	1.082	5.9193	6.48	7.562
24	480	6.366	6.7137	104.89	1.1248	5.9117	6.48	7.6048
25	540	7.1682	6.7717	108.78	1.1566	5.9012	6.48	7.6366
26	600	7.9582	6.8299	112.56	1.1866	5.8884	6.48	7.6666
27	660	8.7559	6.8896	116.22	1.2145	5.8709	6.48	7.6945
28	720	9.5582	6.9507	119.03	1.233	5.8598	6.48	7.713
29	780	10.356	7.0125	122.09	1.2535	5.8453	6.48	7.7335
30	840	11.16	7.076	124.79	1.2697	5.8353	6.48	7.7497
31	900	11.954	7.1398	127	1.2807	5.8248	6.48	7.7607
32	960	12.753	7.2052	129.22	1.2913	5.8073	6.48	7.7713
33	1020	13.56	7.2725	130.84	1.2954	5.7986	6.48	7.7754
34	1080	14.358	7.3402	132.94	1.304	5.791	6.48	7.784
35	1140	15.15	7.4087	134.02	1.3024	5.7846	6.48	7.7824

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.06	6.6303	6.48	0.20586	1.370	1.3804	1.2302	1.122	1.3053	0.075127
3	0.12	6.7056	6.48	0.28401	1.259	1.3776	1.152	1.196	1.2648	0.11279
4	0.19	6.7623	6.48	0.33708	1.194	1.3813	1.099	1.257	1.2401	0.14115
5	0.25	6.8087	6.48	0.38024	1.157	1.3845	1.0558	1.311	1.2201	0.16434
6	0.32	6.8481	6.48	0.42048	1.142	1.3837	1.0156	1.362	1.1996	0.18407
7	0.39	6.8807	6.48	0.45488	1.135	1.3819	0.98116	1.408	1.1815	0.20036
8	0.45	6.9071	6.48	0.48463	1.135	1.3785	0.95142	1.449	1.165	0.21355
9	0.52	6.9314	6.48	0.50854	1.127	1.3789	0.92751	1.487	1.1532	0.22569
10	0.59	6.9536	6.48	0.5307	1.121	1.379	0.90535	1.523	1.1422	0.23681
11	0.65	6.9765	6.48	0.55519	1.118	1.3773	0.88085	1.564	1.1291	0.24825
12	0.72	7.0007	6.48	0.57677	1.108	1.38	0.85927	1.606	1.1196	0.26035
13	0.78	7.0228	6.48	0.59543	1.097	1.3834	0.84061	1.646	1.112	0.27142
14	0.92	7.0575	6.48	0.62284	1.079	1.3907	0.8132	1.710	1.1019	0.28874
15	1.05	7.092	6.48	0.65433	1.069	1.3937	0.78171	1.783	1.0877	0.30601
16	1.18	7.119	6.48	0.67883	1.062	1.3962	0.75722	1.844	1.0767	0.3195
17	1.45	7.1721	6.48	0.72023	1.041	1.4079	0.71581	1.967	1.0619	0.34604
18	1.58	7.1934	6.48	0.73365	1.028	1.4158	0.7024	2.016	1.0591	0.35672
19	2.37	7.307	6.48	0.80829	0.977	1.4547	0.62775	2.317	1.0412	0.41349
20	3.17	7.39	6.48	0.84795	0.932	1.4981	0.58809	2.547	1.0431	0.455
21	3.97	7.4603	6.48	0.8637	0.881	1.5526	0.57235	2.713	1.0625	0.49015
22	4.77	7.5129	6.48	0.87186	0.844	1.5971	0.56418	2.831	1.0806	0.51646
23	5.57	7.562	6.48	0.87536	0.809	1.6426	0.56068	2.930	1.1017	0.54098
24	6.37	7.6048	6.48	0.86778	0.771	1.6931	0.56827	2.979	1.1307	0.56242
25	7.17	7.6366	6.48	0.85728	0.741	1.7354	0.57876	2.998	1.1571	0.57831
26	7.96	7.6666	6.48	0.84445	0.712	1.7782	0.59159	3.006	1.1849	0.5933
27	8.76	7.6945	6.48	0.82695	0.681	1.8236	0.60909	2.994	1.2163	0.60726
28	9.56	7.713	6.48	0.81587	0.662	1.8532	0.62017	2.988	1.2367	0.61651
29	10.36	7.7335	6.48	0.80129	0.639	1.8883	0.63475	2.975	1.2615	0.62676
30	11.16	7.7497	6.48	0.79138	0.623	1.9144	0.64466	2.970	1.2795	0.63487
31	11.95	7.7607	6.48	0.78088	0.610	1.9359	0.65516	2.955	1.2955	0.64037
32	12.75	7.7713	6.48	0.76339	0.591	1.9639	0.67266	2.920	1.3183	0.64564
33	13.56	7.7754	6.48	0.75464	0.583	1.9768	0.6814	2.901	1.3291	0.64768
34	14.36	7.784	6.48	0.74706	0.573	1.993	0.68899	2.893	1.341	0.65199
35	15.15	7.7824	6.48	0.74064	0.569	1.9978	0.6954	2.873	1.3466	0.6512

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3372	0	0	5.045	7.92	7.92
2	5.0034	0.036161	6.3395	29.009	0.32946	5.3353	7.92	8.2495
3	10.003	0.10125	6.3436	44.36	0.50349	5.4952	7.92	8.4235
4	15.003	0.16634	6.3477	52.512	0.59563	5.6081	7.92	8.5156
5	20.003	0.23288	6.352	58.07	0.65823	5.6994	7.92	8.5782
6	25.003	0.29942	6.3562	62.835	0.71176	5.7779	7.92	8.6318
7	30.003	0.36451	6.3604	66.964	0.75804	5.8489	7.92	8.678
8	35.003	0.43104	6.3646	70.351	0.79586	5.9111	7.92	8.7159
9	40.003	0.49758	6.3689	73.792	0.83422	5.9681	7.92	8.7542
10	45.003	0.56122	6.3729	76.915	0.86897	6.0199	7.92	8.789
11	50.003	0.62632	6.3771	79.509	0.89769	6.0658	7.92	8.8177
12	55.003	0.69141	6.3813	82.103	0.92637	6.11	7.92	8.8464
13	60.003	0.7565	6.3855	84.432	0.95202	6.1513	7.92	8.872
14	70.003	0.88523	6.3938	88.826	1.0003	6.2246	7.92	8.9203
15	80.003	1.0154	6.4022	92.637	1.0418	6.2874	7.92	8.9618
16	90.003	1.1441	6.4105	96.078	1.0791	6.3444	7.92	8.9991
17	100	1.2743	6.419	99.307	1.1139	6.3944	7.92	9.0339
18	110	1.4031	6.4273	102.17	1.1445	6.4386	7.92	9.0645
19	120	1.5318	6.4357	105.08	1.1756	6.4788	7.92	9.0956
20	180	2.3245	6.488	118.31	1.313	6.648	7.92	9.233
21	240	3.1243	6.5415	129.11	1.4211	6.7475	7.92	9.3411
22	300	3.8982	6.5942	137.9	1.5057	6.8062	7.92	9.4257
23	360	4.6923	6.6492	145.04	1.5706	6.8405	7.92	9.4906
24	420	5.4951	6.7056	152.14	1.6335	6.8615	7.92	9.5535
25	480	6.2791	6.7617	157.91	1.6814	6.8719	7.92	9.6014
26	540	7.0746	6.8196	163.31	1.7241	6.8714	7.92	9.6441
27	600	7.8702	6.8785	168.65	1.7654	6.8702	7.92	9.6854
28	660	8.6498	6.9372	173.1	1.7966	6.8621	7.92	9.7166
29	720	9.454	6.9988	177.86	1.8298	6.8516	7.92	9.7498
30	780	10.257	7.0614	181.83	1.854	6.8399	7.92	9.774
31	840	11.038	7.1234	185.96	1.8796	6.8272	7.92	9.7996
32	900	11.839	7.1882	189.4	1.8971	6.8149	7.92	9.8171
33	960	12.632	7.2534	192.47	1.9106	6.8021	7.92	9.8306
34	1020	13.412	7.3187	196.23	1.9305	6.7824	7.92	9.8505
35	1080	14.223	7.388	199.09	1.9403	6.7742	7.92	9.8603
36	1140	15.029	7.458	202.21	1.9522	6.7638	7.92	9.8722

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.875	2.875	1.000	2.875	0
2	0.04	8.2495	7.92	0.29023	0.881	2.9142	2.5847	1.127	2.7495	0.16473
3	0.10	8.4235	7.92	0.45018	0.894	2.9283	2.4248	1.208	2.6765	0.25174
4	0.17	8.5156	7.92	0.56302	0.945	2.9076	2.3119	1.258	2.6098	0.29781
5	0.23	8.5782	7.92	0.65433	0.994	2.8789	2.2206	1.296	2.5497	0.32912
6	0.30	8.6318	7.92	0.73285	1.030	2.8539	2.1421	1.332	2.498	0.35588
7	0.36	8.678	7.92	0.80381	1.060	2.8292	2.0711	1.366	2.4502	0.37902
8	0.43	8.7159	7.92	0.86604	1.088	2.8048	2.0089	1.396	2.4068	0.39793
9	0.50	8.7542	7.92	0.92304	1.106	2.7861	1.9519	1.427	2.369	0.41711
10	0.56	8.789	7.92	0.97481	1.122	2.7691	1.9001	1.457	2.3346	0.43449
11	0.63	8.8177	7.92	1.0208	1.137	2.7519	1.8542	1.484	2.303	0.44885
12	0.69	8.8464	7.92	1.065	1.150	2.7364	1.81	1.512	2.2732	0.46318
13	0.76	8.872	7.92	1.1063	1.162	2.7207	1.7687	1.538	2.2447	0.47601
14	0.89	8.9203	7.92	1.1795	1.179	2.6957	1.6954	1.590	2.1955	0.50013
15	1.02	8.9618	7.92	1.2424	1.192	2.6744	1.6326	1.638	2.1535	0.52091
16	1.14	8.9991	7.92	1.2994	1.204	2.6547	1.5756	1.685	2.1152	0.53955
17	1.27	9.0339	7.92	1.3494	1.211	2.6395	1.5256	1.730	2.0825	0.55695
18	1.40	9.0645	7.92	1.3936	1.218	2.6258	1.4814	1.773	2.0536	0.57224
19	1.53	9.0956	7.92	1.4337	1.220	2.6168	1.4412	1.816	2.029	0.58778
20	2.32	9.233	7.92	1.603	1.221	2.5849	1.272	2.032	1.9285	0.65648
21	3.12	9.3411	7.92	1.7024	1.198	2.5936	1.1725	2.212	1.8831	0.71053
22	3.90	9.4257	7.92	1.7612	1.170	2.6194	1.1138	2.352	1.8666	0.75283
23	4.69	9.4906	7.92	1.7955	1.143	2.6501	1.0795	2.455	1.8648	0.7853
24	5.50	9.5535	7.92	1.8164	1.112	2.6921	1.0585	2.543	1.8753	0.81676
25	6.28	9.6014	7.92	1.8269	1.087	2.7295	1.0481	2.604	1.8888	0.84071
26	7.07	9.6441	7.92	1.8263	1.059	2.7728	1.0486	2.644	1.9107	0.86207
27	7.87	9.6854	7.92	1.8251	1.034	2.8152	1.0498	2.682	1.9325	0.88268
28	8.65	9.7166	7.92	1.817	1.011	2.8545	1.0579	2.698	1.9562	0.89828
29	9.45	9.7498	7.92	1.8065	0.987	2.8982	1.0684	2.713	1.9833	0.91488
30	10.26	9.774	7.92	1.7949	0.968	2.9341	1.0801	2.717	2.0071	0.92701
31	11.04	9.7996	7.92	1.7821	0.948	2.9725	1.0928	2.720	2.0327	0.93981
32	11.84	9.8171	7.92	1.7699	0.933	3.0022	1.1051	2.717	2.0536	0.94857
33	12.63	9.8306	7.92	1.7571	0.920	3.0284	1.1179	2.709	2.0731	0.95528
34	13.41	9.8505	7.92	1.7373	0.900	3.0681	1.1376	2.697	2.1029	0.96525
35	14.22	9.8603	7.92	1.7292	0.891	3.086	1.1458	2.693	2.1159	0.97013
36	15.03	9.8722	7.92	1.7187	0.880	3.1084	1.1562	2.688	2.1323	0.97609

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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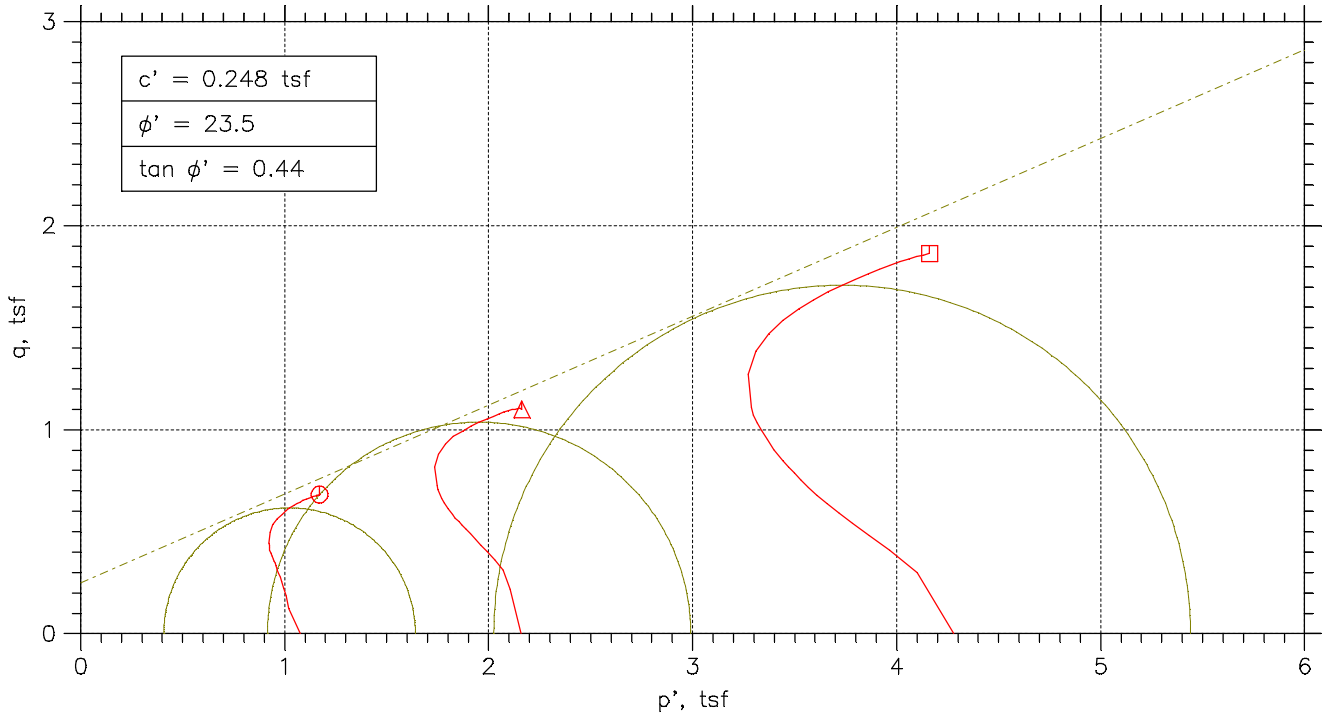

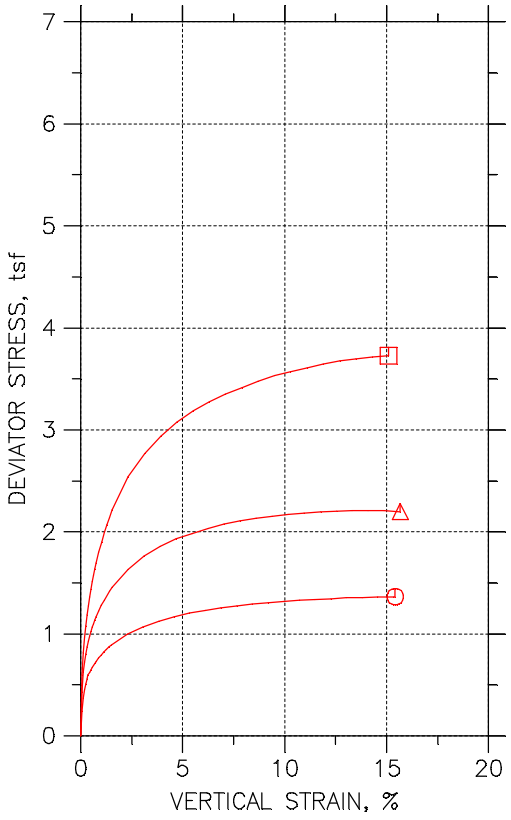

Symbol		⏲	△	⊡	
Test No.		15.0 PSI	30.0 PSI	60.0 PSI	
Initial	Diameter, in	2.8382	2.8134	2.8295	
	Height, in	6.3996	6.3425	6.2551	
	Water Content, %	31.54	29.27	28.87	
	Dry Density, pcf	87.92	91.94	94.81	
	Saturation, %	92.13	94.02	99.28	
	Void Ratio	0.93126	0.84681	0.791	
Before Shear	Water Content, %	31.86	27.59	24.62	
	Dry Density, pcf	90.97	97.01	101.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.86663	0.75044	0.66973	
	Back Press., tsf	5.0434	5.0422	5.0794	
Minor Prin. Stress, tsf		1.0766	2.1578	4.2806	
Max. Dev. Stress, tsf		1.3642	2.2082	3.7265	
Time to Failure, min		1205.9	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.97	0.98	0.96	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		19	19	19	
Plasticity Index		29	29	29	

Project: DYNERGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-012 S-7

Sample Type: 3.0" ST

Failure Sketch

Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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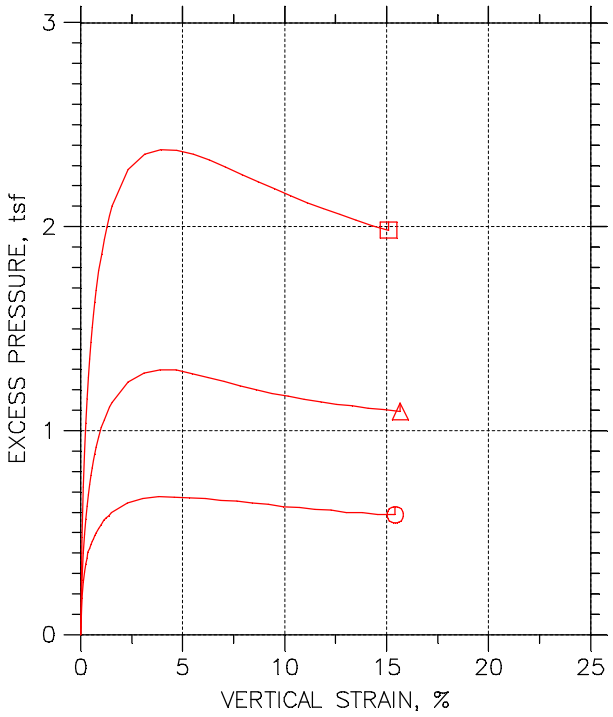

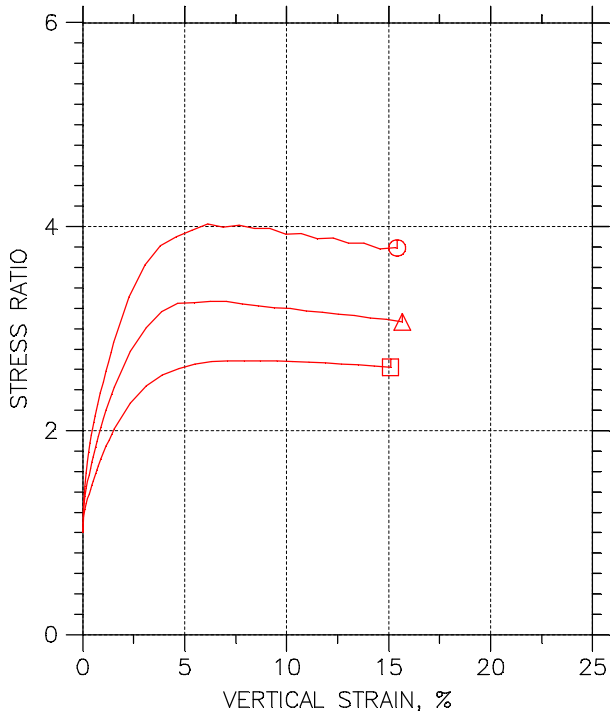

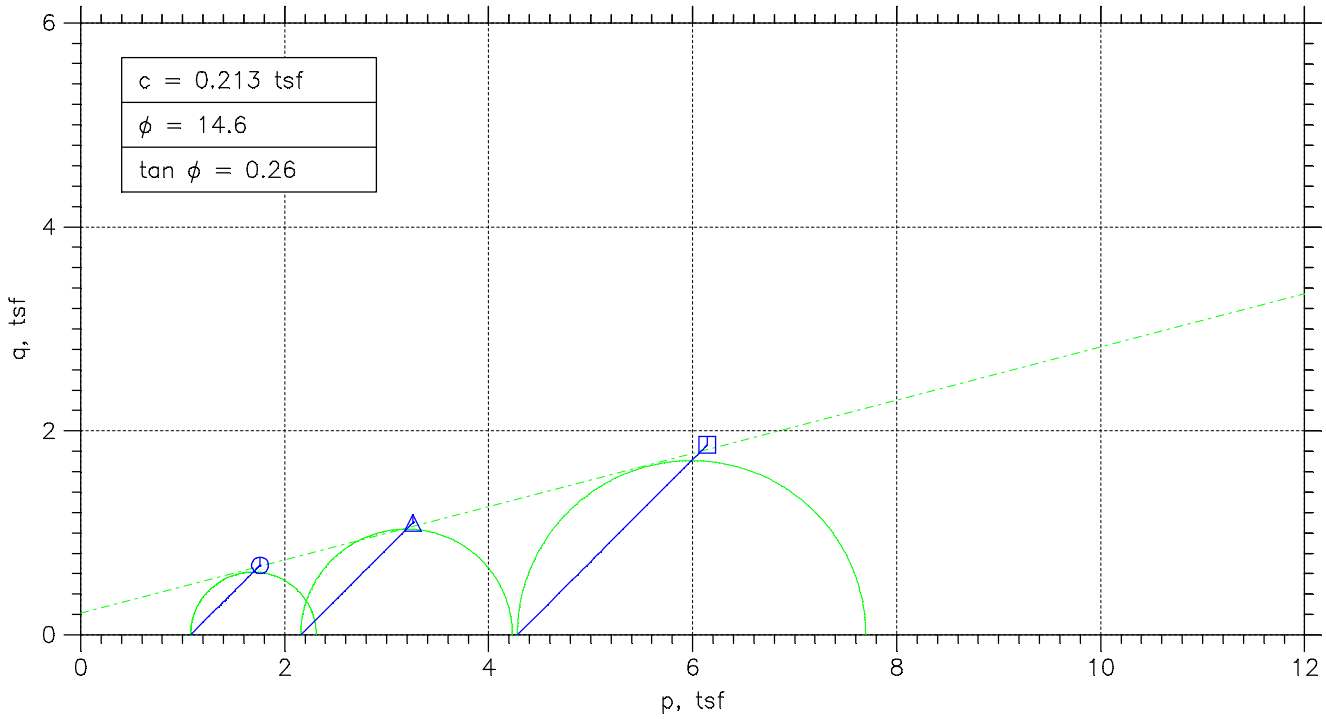

Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-012 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 11/5/15	Depth: 15.0'-17.0'
Test No.: EDW-012 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3266	0	0	5.0434	6.12	6.12
2	5.0003	0.05234	6.3299	21.743	0.24732	5.2234	6.12	6.3673
3	10	0.11458	6.3339	32.694	0.37164	5.2995	6.12	6.4916
4	15	0.17541	6.3377	39.538	0.44917	5.3506	6.12	6.5692
5	20	0.23765	6.3417	44.908	0.50986	5.3907	6.12	6.6299
6	25	0.30131	6.3458	49.067	0.55672	5.4203	6.12	6.6767
7	30	0.36214	6.3496	52.331	0.5934	5.4476	6.12	6.7134
8	35	0.42579	6.3537	54.963	0.62285	5.4673	6.12	6.7428
9	40	0.48945	6.3577	57.122	0.64689	5.4848	6.12	6.7669
10	45	0.55452	6.3619	59.175	0.66971	5.4993	6.12	6.7897
11	50.001	0.61818	6.366	61.228	0.6925	5.5132	6.12	6.8125
12	55.001	0.68183	6.3701	62.966	0.71169	5.5283	6.12	6.8317
13	60.001	0.74549	6.3741	64.545	0.72908	5.5399	6.12	6.8491
14	70.001	0.87563	6.3825	67.599	0.76257	5.5632	6.12	6.8826
15	80.001	1.0029	6.3907	70.284	0.79184	5.5829	6.12	6.9118
16	90.001	1.1303	6.399	72.863	0.81985	5.6032	6.12	6.9398
17	100	1.259	6.4073	75.18	0.84481	5.6154	6.12	6.9648
18	110	1.3863	6.4156	77.444	0.86913	5.6276	6.12	6.9891
19	120	1.5136	6.4239	79.392	0.88984	5.6427	6.12	7.0098
20	180	2.2832	6.4745	89.553	0.99588	5.6886	6.12	7.1159
21	240	3.0499	6.5257	96.923	1.0694	5.7124	6.12	7.1894
22	300	3.8194	6.5779	102.87	1.126	5.7194	6.12	7.246
23	360	4.5847	6.6306	107.72	1.1697	5.7165	6.12	7.2897
24	420	5.35	6.6842	111.77	1.2039	5.7141	6.12	7.3239
25	480	6.1238	6.7393	115.4	1.2329	5.7124	6.12	7.3529
26	540	6.8848	6.7944	118.4	1.2547	5.7014	6.12	7.3747
27	600	7.6572	6.8512	121.14	1.2731	5.6973	6.12	7.3931
28	660	8.4239	6.9086	123.83	1.2905	5.6874	6.12	7.4105
29	720	9.1878	6.9667	126.25	1.3047	5.6822	6.12	7.4247
30	780	9.9587	7.0264	128.56	1.3174	5.67	6.12	7.4374
31	840	10.721	7.0864	130.72	1.3282	5.6671	6.12	7.4482
32	900	11.496	7.1484	132.83	1.3379	5.6561	6.12	7.4579
33	960	12.266	7.2111	134.78	1.3457	5.6538	6.12	7.4657
34	1020	13.031	7.2746	136.78	1.3537	5.6433	6.12	7.4737
35	1080	13.799	7.3394	138.3	1.3568	5.6416	6.12	7.4768
36	1140	14.57	7.4057	139.88	1.36	5.6317	6.12	7.48
37	1200	15.338	7.4728	141.57	1.364	5.6317	6.12	7.484
38	1205.9	15.418	7.4798	141.73	1.3642	5.6311	6.12	7.4842

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.12	6.12	0	0.000	1.0766	1.0766	1.000	1.0766	0
2	0.05	6.3673	6.12	0.18002	0.728	1.1439	0.89655	1.276	1.0202	0.12366
3	0.11	6.4916	6.12	0.25609	0.689	1.1921	0.82048	1.453	1.0063	0.18582
4	0.18	6.5692	6.12	0.30719	0.684	1.2185	0.76938	1.584	0.99396	0.22459
5	0.24	6.6299	6.12	0.34726	0.681	1.2392	0.72931	1.699	0.98424	0.25493
6	0.30	6.6767	6.12	0.37688	0.677	1.2564	0.69969	1.796	0.97805	0.27836
7	0.36	6.7134	6.12	0.40417	0.681	1.2658	0.6724	1.883	0.9691	0.2967
8	0.43	6.7428	6.12	0.42392	0.681	1.2755	0.65265	1.954	0.96408	0.31142
9	0.49	6.7669	6.12	0.44134	0.682	1.2821	0.63523	2.018	0.95868	0.32345
10	0.55	6.7897	6.12	0.45585	0.681	1.2904	0.62072	2.079	0.95557	0.33485
11	0.62	6.8125	6.12	0.46979	0.678	1.2993	0.60678	2.141	0.95303	0.34625
12	0.68	6.8317	6.12	0.48489	0.681	1.3034	0.59168	2.203	0.94753	0.35585
13	0.75	6.8491	6.12	0.4965	0.681	1.3091	0.58007	2.257	0.94461	0.36454
14	0.88	6.8826	6.12	0.51973	0.682	1.3194	0.55684	2.369	0.93812	0.38128
15	1.00	6.9118	6.12	0.53948	0.681	1.3289	0.53709	2.474	0.93301	0.39592
16	1.13	6.9398	6.12	0.5598	0.683	1.3366	0.51677	2.586	0.92669	0.40992
17	1.26	6.9648	6.12	0.572	0.677	1.3494	0.50457	2.674	0.92698	0.42241
18	1.39	6.9891	6.12	0.58419	0.672	1.3615	0.49238	2.765	0.92694	0.43456
19	1.51	7.0098	6.12	0.59929	0.673	1.3671	0.47728	2.864	0.9222	0.44492
20	2.28	7.1159	6.12	0.64516	0.648	1.4273	0.43141	3.308	0.92935	0.49794
21	3.05	7.1894	6.12	0.66897	0.626	1.477	0.4076	3.624	0.94229	0.53469
22	3.82	7.246	6.12	0.67594	0.600	1.5266	0.40063	3.811	0.96364	0.56301
23	4.58	7.2897	6.12	0.67304	0.575	1.5732	0.40353	3.899	0.98836	0.58483
24	5.35	7.3239	6.12	0.67072	0.557	1.6098	0.40585	3.966	1.0078	0.60197
25	6.12	7.3529	6.12	0.66897	0.543	1.6405	0.4076	4.025	1.024	0.61645
26	6.88	7.3747	6.12	0.65794	0.524	1.6733	0.41863	3.997	1.046	0.62736
27	7.66	7.3931	6.12	0.65387	0.514	1.6958	0.42269	4.012	1.0592	0.63654
28	8.42	7.4105	6.12	0.644	0.499	1.7231	0.43257	3.983	1.0778	0.64524
29	9.19	7.4247	6.12	0.63878	0.490	1.7425	0.43779	3.980	1.0902	0.65237
30	9.96	7.4374	6.12	0.62658	0.476	1.7674	0.44999	3.928	1.1087	0.6587
31	10.72	7.4482	6.12	0.62368	0.470	1.7811	0.45289	3.933	1.117	0.66409
32	11.50	7.4579	6.12	0.61264	0.458	1.8018	0.46392	3.884	1.1329	0.66893
33	12.27	7.4657	6.12	0.61032	0.454	1.8119	0.46625	3.886	1.1391	0.67284
34	13.03	7.4737	6.12	0.59987	0.443	1.8304	0.4767	3.840	1.1536	0.67687
35	13.80	7.4768	6.12	0.59813	0.441	1.8352	0.47844	3.836	1.1568	0.67838
36	14.57	7.48	6.12	0.58826	0.433	1.8483	0.48831	3.785	1.1683	0.67999
37	15.34	7.484	6.12	0.58826	0.431	1.8523	0.48831	3.793	1.1703	0.68199
38	15.42	7.4842	6.12	0.58767	0.431	1.8531	0.48889	3.790	1.171	0.68212

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2165	0	0	5.0422	7.2	7.2
2	5	0.057327	6.2201	37.373	0.4326	5.3099	7.2	7.6326
3	10	0.11918	6.224	53.994	0.62462	5.4417	7.2	7.8246
4	15	0.18405	6.228	62.676	0.72458	5.5332	7.2	7.9246
5	20	0.24892	6.232	69.557	0.80361	5.6096	7.2	8.0036
6	25	0.31228	6.236	75.327	0.86972	5.6726	7.2	8.0697
7	30	0.37564	6.24	80.356	0.92719	5.728	7.2	8.1272
8	35	0.44202	6.2441	85.068	0.9809	5.7788	7.2	8.1809
9	40	0.50689	6.2482	88.985	1.0254	5.8225	7.2	8.2254
10	45	0.57025	6.2522	92.478	1.065	5.8616	7.2	8.265
11	50	0.6321	6.2561	95.602	1.1003	5.8972	7.2	8.3003
12	55	0.69697	6.2602	98.513	1.133	5.9298	7.2	8.333
13	60	0.76033	6.2642	101.53	1.167	5.9607	7.2	8.367
14	70	0.88856	6.2723	106.72	1.225	6.0115	7.2	8.425
15	80	1.0198	6.2806	111.69	1.2804	6.0569	7.2	8.4804
16	90	1.1496	6.2888	115.93	1.3273	6.0949	7.2	8.5273
17	110	1.412	6.3056	123.92	1.415	6.1573	7.2	8.615
18	120	1.5403	6.3138	127.47	1.4536	6.1806	7.2	8.6536
19	180	2.3247	6.3645	144.14	1.6307	6.2815	7.2	8.8307
20	240	3.1062	6.4158	156.9	1.7608	6.3252	7.2	8.9608
21	300	3.8877	6.468	167.01	1.8591	6.3415	7.2	9.0591
22	360	4.6691	6.521	175.01	1.9323	6.3398	7.2	9.1323
23	420	5.4611	6.5756	181.3	1.9852	6.32	7.2	9.1852
24	480	6.2516	6.6311	187.18	2.0324	6.3025	7.2	9.2324
25	540	7.0361	6.687	192.69	2.0747	6.2844	7.2	9.2747
26	600	7.8221	6.7441	197.24	2.1057	6.2616	7.2	9.3057
27	660	8.6005	6.8015	201.31	2.1311	6.2418	7.2	9.3311
28	720	9.391	6.8608	205.13	2.1527	6.2237	7.2	9.3527
29	780	10.177	6.9209	208.78	2.172	6.2109	7.2	9.372
30	840	10.96	6.9817	211.85	2.1847	6.1957	7.2	9.3847
31	900	11.752	7.0444	214.97	2.1972	6.1841	7.2	9.3972
32	960	12.536	7.1076	217.25	2.2007	6.1713	7.2	9.4007
33	1020	13.315	7.1714	219.79	2.2067	6.1631	7.2	9.4067
34	1080	14.104	7.2373	221.96	2.2082	6.1514	7.2	9.4082
35	1140	14.884	7.3036	223.76	2.2059	6.145	7.2	9.4059
36	1200	15.665	7.3713	225.14	2.199	6.1363	7.2	9.399

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	2.1578	2.1578	1.000	2.1578	0
2	0.06	7.6326	7.2	0.26768	0.619	2.3227	1.8901	1.229	2.1064	0.2163
3	0.12	7.8246	7.2	0.39948	0.640	2.3829	1.7583	1.355	2.0706	0.31231
4	0.18	7.9246	7.2	0.49104	0.678	2.3913	1.6668	1.435	2.029	0.36229
5	0.25	8.0036	7.2	0.56744	0.706	2.394	1.5904	1.505	1.9922	0.4018
6	0.31	8.0697	7.2	0.63042	0.725	2.3971	1.5274	1.569	1.9622	0.43486
7	0.38	8.1272	7.2	0.68582	0.740	2.3992	1.472	1.630	1.9356	0.4636
8	0.44	8.1809	7.2	0.73656	0.751	2.4021	1.4212	1.690	1.9117	0.49045
9	0.51	8.2254	7.2	0.7803	0.761	2.4029	1.3775	1.744	1.8902	0.5127
10	0.57	8.265	7.2	0.81937	0.769	2.4034	1.3384	1.796	1.8709	0.53249
11	0.63	8.3003	7.2	0.85495	0.777	2.4031	1.3028	1.845	1.853	0.55013
12	0.70	8.333	7.2	0.88761	0.783	2.4032	1.2702	1.892	1.8367	0.56651
13	0.76	8.367	7.2	0.91851	0.787	2.4063	1.2393	1.942	1.8228	0.58349
14	0.89	8.425	7.2	0.96925	0.791	2.4136	1.1885	2.031	1.8011	0.61251
15	1.02	8.4804	7.2	1.0147	0.792	2.4235	1.1431	2.120	1.7833	0.64022
16	1.15	8.5273	7.2	1.0526	0.793	2.4324	1.1051	2.201	1.7688	0.66363
17	1.41	8.615	7.2	1.115	0.788	2.4577	1.0427	2.357	1.7502	0.7075
18	1.54	8.6536	7.2	1.1384	0.783	2.473	1.0194	2.426	1.7462	0.7268
19	2.32	8.8307	7.2	1.2393	0.760	2.5492	0.91853	2.775	1.7339	0.81533
20	3.11	8.9608	7.2	1.283	0.729	2.6356	0.87479	3.013	1.7552	0.88039
21	3.89	9.0591	7.2	1.2993	0.699	2.7176	0.85846	3.166	1.788	0.92957
22	4.67	9.1323	7.2	1.2976	0.672	2.7925	0.86021	3.246	1.8263	0.96614
23	5.46	9.1852	7.2	1.2778	0.644	2.8652	0.88004	3.256	1.8726	0.9926
24	6.25	9.2324	7.2	1.2603	0.620	2.9299	0.89753	3.264	1.9137	1.0162
25	7.04	9.2747	7.2	1.2422	0.599	2.9903	0.91561	3.266	1.9529	1.0373
26	7.82	9.3057	7.2	1.2194	0.579	3.0441	0.93836	3.244	1.9912	1.0529
27	8.60	9.3311	7.2	1.1996	0.563	3.0893	0.95818	3.224	2.0237	1.0655
28	9.39	9.3527	7.2	1.1815	0.549	3.1289	0.97626	3.205	2.0526	1.0763
29	10.18	9.372	7.2	1.1687	0.538	3.1611	0.98909	3.196	2.0751	1.086
30	10.96	9.3847	7.2	1.1535	0.528	3.189	1.0043	3.175	2.0966	1.0924
31	11.75	9.3972	7.2	1.1419	0.520	3.2131	1.0159	3.163	2.1145	1.0986
32	12.54	9.4007	7.2	1.129	0.513	3.2295	1.0287	3.139	2.1291	1.1004
33	13.31	9.4067	7.2	1.1209	0.508	3.2436	1.0369	3.128	2.1402	1.1033
34	14.10	9.4082	7.2	1.1092	0.502	3.2567	1.0486	3.106	2.1527	1.1041
35	14.88	9.4059	7.2	1.1028	0.500	3.2608	1.055	3.091	2.1579	1.1029
36	15.67	9.399	7.2	1.0941	0.498	3.2628	1.0637	3.067	2.1633	1.0995

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2881	0	0	5.0794	9.36	9.36
2	5	0.055149	6.2915	52.036	0.59549	5.5563	9.36	9.9555
3	10	0.11755	6.2955	71.569	0.81852	5.8035	9.36	10.179
4	15	0.18141	6.2995	84.326	0.96381	5.9774	9.36	10.324
5	20	0.24672	6.3036	94.702	1.0817	6.1181	9.36	10.442
6	25	0.31203	6.3078	103.75	1.1843	6.2356	9.36	10.544
7	30	0.37733	6.3119	111.85	1.2759	6.3392	9.36	10.636
8	35	0.44119	6.3159	119.26	1.3596	6.4305	9.36	10.72
9	40	0.5065	6.3201	125.99	1.4353	6.5113	9.36	10.795
10	45	0.5718	6.3242	132.6	1.5097	6.5858	9.36	10.87
11	50	0.63566	6.3283	138.48	1.5755	6.6503	9.36	10.936
12	55	0.70097	6.3325	143.88	1.6359	6.7091	9.36	10.996
13	60	0.76628	6.3366	149.33	1.6968	6.7667	9.36	11.057
14	70	0.89544	6.3449	158.97	1.8039	6.8626	9.36	11.164
15	80	1.0261	6.3533	167.86	1.9023	6.9446	9.36	11.262
16	90	1.1567	6.3617	176.06	1.9927	7.0185	9.36	11.353
17	100	1.2873	6.3701	183	2.0684	7.0773	9.36	11.428
18	110	1.4165	6.3784	189.56	2.1398	7.1325	9.36	11.5
19	120	1.5471	6.3869	196.55	2.2157	7.1802	9.36	11.576
20	180	2.3351	6.4384	227.25	2.5413	7.3582	9.36	11.901
21	240	3.1261	6.491	249.54	2.768	7.4332	9.36	12.128
22	300	3.9156	6.5443	267.01	2.9376	7.4565	9.36	12.298
23	360	4.7123	6.599	281.56	3.0721	7.453	9.36	12.432
24	420	5.5149	6.6551	294.48	3.1859	7.4338	9.36	12.546
25	480	6.3087	6.7115	305.17	3.2739	7.4059	9.36	12.634
26	540	7.1069	6.7692	315.07	3.3513	7.3716	9.36	12.711
27	600	7.9066	6.8279	323.91	3.4156	7.3349	9.36	12.776
28	660	8.699	6.8872	332.28	3.4737	7.2994	9.36	12.834
29	720	9.5044	6.9485	340.75	3.5308	7.2645	9.36	12.891
30	780	10.304	7.0104	347.84	3.5725	7.2302	9.36	12.932
31	840	11.102	7.0734	354.51	3.6086	7.1977	9.36	12.969
32	900	11.898	7.1372	361.34	3.6452	7.1668	9.36	13.005
33	960	12.697	7.2026	367.64	3.675	7.1383	9.36	13.035
34	1020	13.49	7.2686	373.2	3.6967	7.1104	9.36	13.057
35	1080	14.297	7.337	378.28	3.7121	7.0837	9.36	13.072
36	1140	15.095	7.406	383.31	3.7265	7.0621	9.36	13.086

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	9.36	9.36	0	0.000	4.2806	4.2806	1.000	4.2806	0
2	0.06	9.9555	9.36	0.47694	0.801	4.3992	3.8037	1.157	4.1015	0.29775
3	0.12	10.179	9.36	0.72413	0.885	4.375	3.5565	1.230	3.9658	0.40926
4	0.18	10.324	9.36	0.89803	0.932	4.3464	3.3826	1.285	3.8645	0.4819
5	0.25	10.442	9.36	1.0388	0.960	4.3235	3.2419	1.334	3.7827	0.54084
6	0.31	10.544	9.36	1.1563	0.976	4.3087	3.1244	1.379	3.7165	0.59215
7	0.38	10.636	9.36	1.2598	0.987	4.2967	3.0208	1.422	3.6588	0.63796
8	0.44	10.72	9.36	1.3511	0.994	4.2891	2.9295	1.464	3.6093	0.67979
9	0.51	10.795	9.36	1.432	0.998	4.2839	2.8487	1.504	3.5663	0.71764
10	0.57	10.87	9.36	1.5064	0.998	4.2839	2.7742	1.544	3.5291	0.75483
11	0.64	10.936	9.36	1.571	0.997	4.2852	2.7097	1.581	3.4974	0.78777
12	0.70	10.996	9.36	1.6297	0.996	4.2868	2.6509	1.617	3.4689	0.81795
13	0.77	11.057	9.36	1.6873	0.994	4.2901	2.5933	1.654	3.4417	0.84839
14	0.90	11.164	9.36	1.7833	0.989	4.3013	2.4974	1.722	3.3993	0.90195
15	1.03	11.262	9.36	1.8653	0.981	4.3177	2.4154	1.788	3.3665	0.95115
16	1.16	11.353	9.36	1.9391	0.973	4.3341	2.3415	1.851	3.3378	0.99633
17	1.29	11.428	9.36	1.9979	0.966	4.3511	2.2827	1.906	3.3169	1.0342
18	1.42	11.5	9.36	2.0531	0.960	4.3673	2.2275	1.961	3.2974	1.0699
19	1.55	11.576	9.36	2.1008	0.948	4.3955	2.1798	2.016	3.2877	1.1079
20	2.34	11.901	9.36	2.2788	0.897	4.5432	2.0018	2.270	3.2725	1.2707
21	3.13	12.128	9.36	2.3539	0.850	4.6947	1.9268	2.437	3.3108	1.384
22	3.92	12.298	9.36	2.3771	0.809	4.8411	1.9035	2.543	3.3723	1.4688
23	4.71	12.432	9.36	2.3736	0.773	4.9791	1.907	2.611	3.443	1.536
24	5.51	12.546	9.36	2.3544	0.739	5.1121	1.9262	2.654	3.5192	1.593
25	6.31	12.634	9.36	2.3265	0.711	5.228	1.9541	2.675	3.5911	1.6369
26	7.11	12.711	9.36	2.2922	0.684	5.3397	1.9884	2.685	3.6641	1.6756
27	7.91	12.776	9.36	2.2556	0.660	5.4407	2.0251	2.687	3.7329	1.7078
28	8.70	12.834	9.36	2.2201	0.639	5.5342	2.0606	2.686	3.7974	1.7368
29	9.50	12.891	9.36	2.1852	0.619	5.6263	2.0955	2.685	3.8609	1.7654
30	10.30	12.932	9.36	2.1509	0.602	5.7022	2.1298	2.677	3.916	1.7862
31	11.10	12.969	9.36	2.1183	0.587	5.7709	2.1623	2.669	3.9666	1.8043
32	11.90	13.005	9.36	2.0875	0.573	5.8383	2.1932	2.662	4.0158	1.8226
33	12.70	13.035	9.36	2.059	0.560	5.8967	2.2217	2.654	4.0592	1.8375
34	13.49	13.057	9.36	2.031	0.549	5.9463	2.2496	2.643	4.098	1.8484
35	14.30	13.072	9.36	2.0043	0.540	5.9885	2.2763	2.631	4.1324	1.8561
36	15.09	13.086	9.36	1.9828	0.532	6.0243	2.2979	2.622	4.1611	1.8632

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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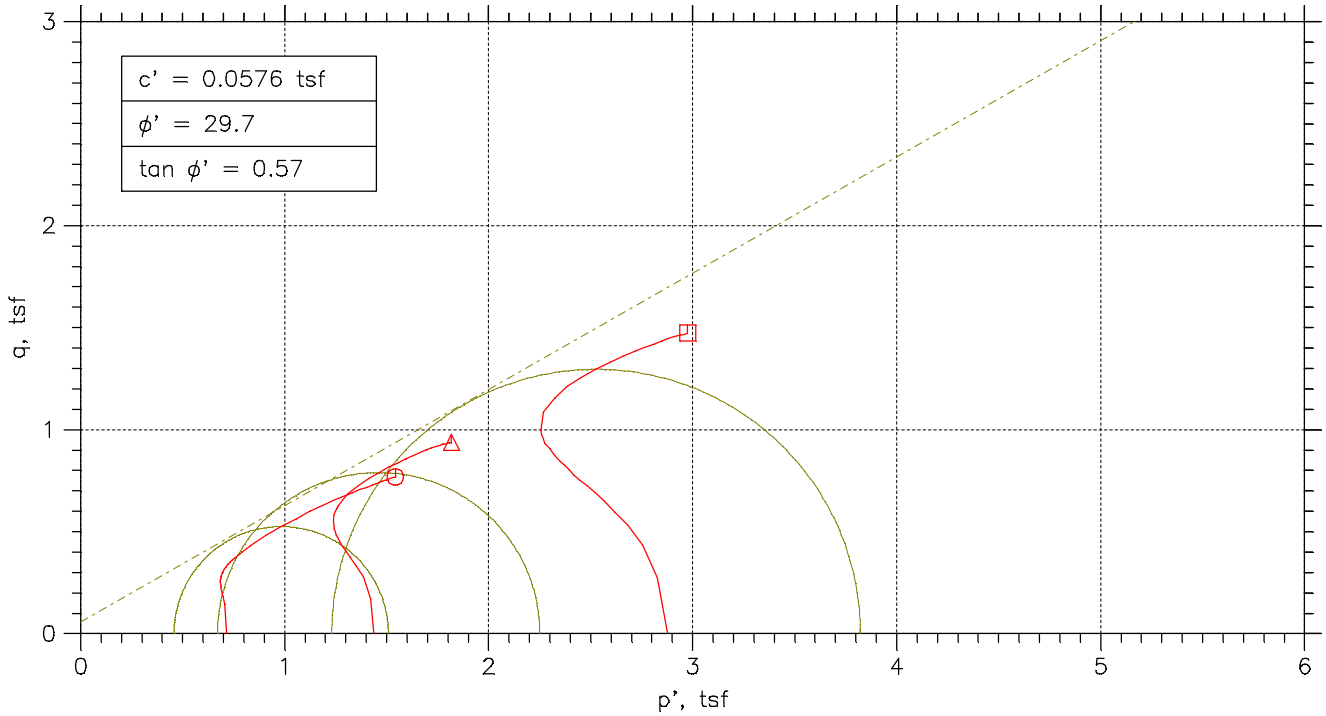

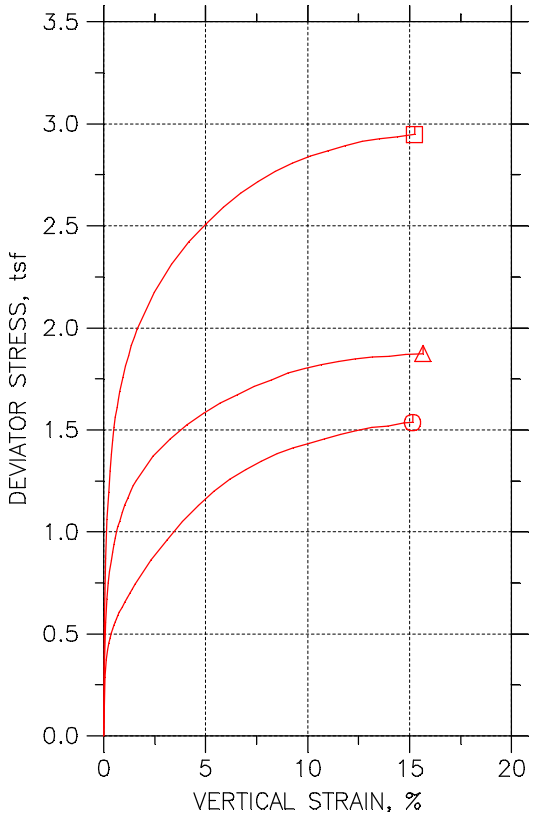

Symbol		○	△	□	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8386	2.8571	2.8543	
	Height, in	6.0421	6.0181	5.878	
	Water Content, %	19.07	19.02	18.95	
	Dry Density, pcf	111.5	111.3	111.5	
	Saturation, %	99.28	98.47	98.47	
	Void Ratio	0.52245	0.52554	0.52343	
Before Shear	Water Content, %	18.80	18.40	16.50	
	Dry Density, pcf	112.4	113.2	117.2	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.51129	0.50044	0.4489	
	Back Press., tsf	5.0445	5.044	5.0432	
Minor Prin. Stress, tsf		0.71549	1.436	2.8768	
Max. Dev. Stress, tsf		1.536	1.8745	2.9478	
Time to Failure, min		1174.7	1140	1080	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.95	0.97	0.97	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		49	49	49	
Plastic Limit		21	21	21	
Plasticity Index		28	28	28	

Project: DYNERGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-013 S3

Sample Type: 3.0" ST

Failure Sketch

Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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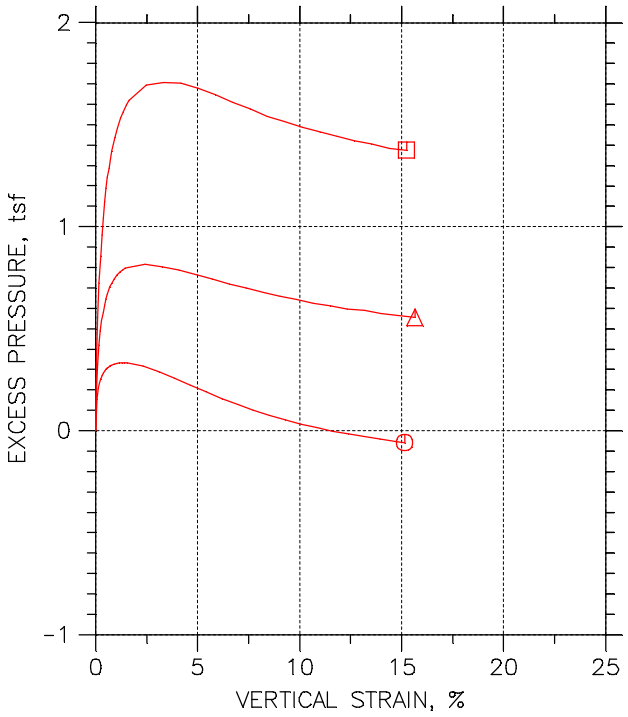

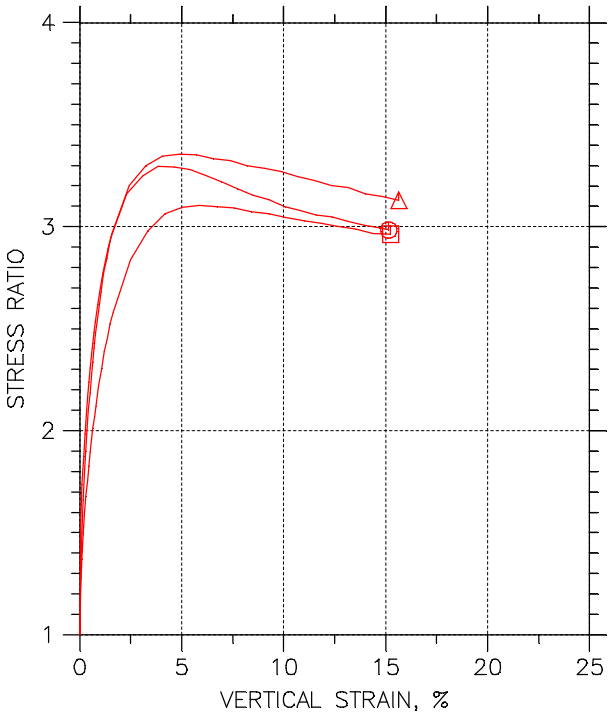

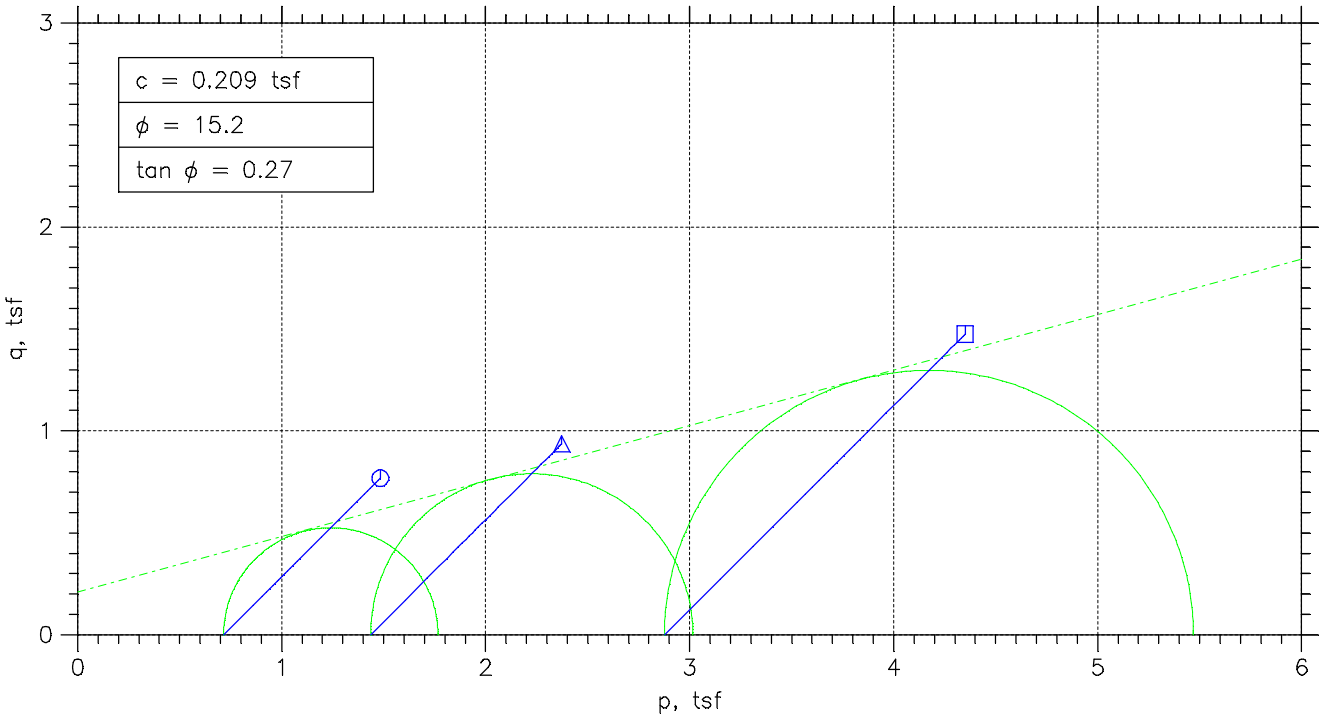

Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S3	Tested By: BCM	Checked By: WPQ
Sample No.: S-3	Test Date: 11/4/15	Depth: 6.0'-8.0'
Test No.: EDW-013 S3	Sample Type: 3.0" ST	Elevation: -----
Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3284	0	0	5.0445	5.76	5.76
2	5.0002	0.058512	6.3321	25.429	0.28914	5.1976	5.76	6.0491
3	10	0.12273	6.3362	32.957	0.3745	5.2511	5.76	6.1345
4	15	0.18695	6.3402	36.958	0.4197	5.2802	5.76	6.1797
5	20	0.25117	6.3443	39.959	0.45348	5.3	5.76	6.2135
6	25	0.31682	6.3485	42.381	0.48065	5.3139	5.76	6.2407
7	30	0.38104	6.3526	44.539	0.50481	5.3273	5.76	6.2648
8	35	0.44526	6.3567	46.277	0.52416	5.3372	5.76	6.2842
9	40	0.50948	6.3608	47.909	0.5423	5.3454	5.76	6.3023
10	45	0.5737	6.3649	49.488	0.55981	5.3512	5.76	6.3198
11	50	0.63935	6.3691	50.91	0.57551	5.3564	5.76	6.3355
12	55	0.70357	6.3732	52.278	0.5906	5.3617	5.76	6.3506
13	60	0.76922	6.3774	53.542	0.60448	5.3657	5.76	6.3645
14	70.001	0.89623	6.3856	55.911	0.63042	5.371	5.76	6.3904
15	80.001	1.0232	6.3938	58.175	0.6551	5.375	5.76	6.4151
16	90.001	1.1503	6.402	60.386	0.67913	5.3774	5.76	6.4391
17	100	1.2787	6.4104	62.387	0.70072	5.3779	5.76	6.4607
18	110	1.4043	6.4185	64.387	0.72227	5.3785	5.76	6.4823
19	120	1.5342	6.427	66.493	0.74491	5.3768	5.76	6.5049
20	180	2.3134	6.4783	77.602	0.86247	5.3611	5.76	6.6225
21	240	3.0926	6.5303	87.078	0.96008	5.3331	5.76	6.7201
22	300	3.8561	6.5822	96.028	1.0504	5.3023	5.76	6.8104
23	360	4.6339	6.6359	103.98	1.1282	5.268	5.76	6.8882
24	420	5.4102	6.6903	111.3	1.1977	5.2348	5.76	6.9577
25	480	6.1766	6.745	117.72	1.2566	5.2016	5.76	7.0166
26	540	6.9544	6.8014	123.3	1.3053	5.172	5.76	7.0653
27	600	7.7321	6.8587	128.09	1.3446	5.1446	5.76	7.1046
28	660	8.4985	6.9162	132.78	1.3822	5.1184	5.76	7.1422
29	720	9.2777	6.9756	136.88	1.4129	5.0975	5.76	7.1729
30	780	10.057	7.036	140.2	1.4347	5.0759	5.76	7.1947
31	840	10.819	7.0961	143.62	1.4572	5.0591	5.76	7.2172
32	900	11.602	7.159	146.99	1.4783	5.0416	5.76	7.2383
33	960	12.382	7.2227	150.1	1.4963	5.0288	5.76	7.2563
34	1020	13.151	7.2866	152.89	1.5107	5.0148	5.76	7.2707
35	1080	13.932	7.3527	155.15	1.5193	5.0032	5.76	7.2793
36	1140	14.706	7.4195	157.94	1.5327	4.9921	5.76	7.2927
37	1174.7	15.146	7.458	159.1	1.536	4.9857	5.76	7.296

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71549	0.71549	1.000	0.71549	0
2	0.06	6.0491	5.76	0.15304	0.529	0.85158	0.56245	1.514	0.70701	0.14457
3	0.12	6.1345	5.76	0.20658	0.552	0.88341	0.50891	1.736	0.69616	0.18725
4	0.19	6.1797	5.76	0.23567	0.562	0.89951	0.47981	1.875	0.68966	0.20985
5	0.25	6.2135	5.76	0.25546	0.563	0.91352	0.46003	1.986	0.68677	0.22674
6	0.32	6.2407	5.76	0.26942	0.561	0.92672	0.44606	2.078	0.68639	0.24033
7	0.38	6.2648	5.76	0.2828	0.560	0.93749	0.43268	2.167	0.68508	0.2524
8	0.45	6.2842	5.76	0.2927	0.558	0.94695	0.42279	2.240	0.68487	0.26208
9	0.51	6.3023	5.76	0.30084	0.555	0.95694	0.41464	2.308	0.68579	0.27115
10	0.57	6.3198	5.76	0.30666	0.548	0.96863	0.40882	2.369	0.68873	0.27991
11	0.64	6.3355	5.76	0.3119	0.542	0.9791	0.40359	2.426	0.69134	0.28776
12	0.70	6.3506	5.76	0.31714	0.537	0.98895	0.39835	2.483	0.69365	0.2953
13	0.77	6.3645	5.76	0.32121	0.531	0.99875	0.39428	2.533	0.69651	0.30224
14	0.90	6.3904	5.76	0.32645	0.518	1.0195	0.38904	2.620	0.70425	0.31521
15	1.02	6.4151	5.76	0.33052	0.505	1.0401	0.38496	2.702	0.71252	0.32755
16	1.15	6.4391	5.76	0.33285	0.490	1.0618	0.38264	2.775	0.7222	0.33956
17	1.28	6.4607	5.76	0.33343	0.476	1.0828	0.38206	2.834	0.73241	0.35036
18	1.40	6.4823	5.76	0.33401	0.462	1.1037	0.38147	2.893	0.74261	0.36113
19	1.53	6.5049	5.76	0.33227	0.446	1.1281	0.38322	2.944	0.75567	0.37245
20	2.31	6.6225	5.76	0.31656	0.367	1.2614	0.39893	3.162	0.83017	0.43124
21	3.09	6.7201	5.76	0.28862	0.301	1.3869	0.42686	3.249	0.9069	0.48004
22	3.86	6.8104	5.76	0.25778	0.245	1.5081	0.4577	3.295	0.98291	0.52521
23	4.63	6.8882	5.76	0.22345	0.198	1.6202	0.49203	3.293	1.0561	0.56408
24	5.41	6.9577	5.76	0.19028	0.159	1.7229	0.5252	3.281	1.1241	0.59887
25	6.18	7.0166	5.76	0.15711	0.125	1.815	0.55837	3.250	1.1867	0.6283
26	6.95	7.0653	5.76	0.12744	0.098	1.8933	0.58805	3.220	1.2407	0.65263
27	7.73	7.1046	5.76	0.10009	0.074	1.96	0.6154	3.185	1.2877	0.67232
28	8.50	7.1422	5.76	0.073902	0.053	2.0238	0.64158	3.154	1.3327	0.69112
29	9.28	7.1729	5.76	0.052953	0.037	2.0754	0.66253	3.133	1.369	0.70643
30	10.06	7.1947	5.76	0.031423	0.022	2.1187	0.68406	3.097	1.4014	0.71734
31	10.82	7.2172	5.76	0.014548	0.010	2.1582	0.70094	3.079	1.4296	0.72862
32	11.60	7.2383	5.76	-0.0029095	-0.002	2.1967	0.7184	3.058	1.4576	0.73916
33	12.38	7.2563	5.76	-0.015711	-0.011	2.2275	0.7312	3.046	1.4793	0.74813
34	13.15	7.2707	5.76	-0.029677	-0.020	2.2559	0.74516	3.027	1.5005	0.75534
35	13.93	7.2793	5.76	-0.041315	-0.027	2.2761	0.7568	3.008	1.5164	0.75964
36	14.71	7.2927	5.76	-0.052371	-0.034	2.3005	0.76786	2.996	1.5342	0.76634
37	15.15	7.296	5.76	-0.058772	-0.038	2.3102	0.77426	2.984	1.5422	0.76798

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.4112	0	0	5.044	6.48	6.48
2	5.0001	0.036568	6.4135	30.226	0.33933	5.2282	6.48	6.8193
3	10	0.095395	6.4173	49.495	0.55532	5.3711	6.48	7.0353
4	15	0.16217	6.4216	59.764	0.67009	5.4644	6.48	7.1501
5	20	0.22895	6.4259	66.858	0.74912	5.5321	6.48	7.2291
6	25	0.29572	6.4302	72.098	0.8073	5.5828	6.48	7.2873
7	30	0.36409	6.4346	76.704	0.85828	5.6254	6.48	7.3383
8	35	0.43405	6.4391	80.568	0.90088	5.6604	6.48	7.3809
9	40	0.50082	6.4434	83.903	0.93755	5.689	6.48	7.4175
10	45	0.57078	6.448	86.92	0.97058	5.7129	6.48	7.4506
11	50	0.63756	6.4523	89.62	1.0001	5.7309	6.48	7.4801
12	55	0.70433	6.4566	92.002	1.0259	5.7496	6.48	7.5059
13	60	0.77429	6.4612	94.384	1.0518	5.7642	6.48	7.5318
14	70	0.91261	6.4702	98.513	1.0962	5.7881	6.48	7.5762
15	80.001	1.0478	6.479	101.9	1.1324	5.8068	6.48	7.6124
16	90.001	1.1861	6.4881	105.29	1.1684	5.8219	6.48	7.6484
17	100	1.3212	6.497	108.15	1.1985	5.8301	6.48	7.6785
18	110	1.4595	6.5061	110.79	1.2261	5.8394	6.48	7.7061
19	120	1.5947	6.5151	113.28	1.2519	5.8435	6.48	7.7319
20	180	2.423	6.5704	125.03	1.3702	5.8581	6.48	7.8502
21	240	3.2498	6.6265	133.87	1.4546	5.847	6.48	7.9346
22	300	4.0702	6.6832	141.44	1.5238	5.8307	6.48	8.0038
23	360	4.8969	6.7413	147.9	1.5797	5.8091	6.48	8.0597
24	420	5.7253	6.8005	154.2	1.6326	5.7863	6.48	8.1126
25	480	6.5521	6.8607	159.44	1.6733	5.763	6.48	8.1533
26	540	7.3804	6.922	164.79	1.7141	5.742	6.48	8.1941
27	600	8.2072	6.9844	169.34	1.7457	5.7204	6.48	8.2257
28	660	9.0339	7.0479	174.05	1.7781	5.7024	6.48	8.2581
29	720	9.8591	7.1124	177.97	1.8016	5.686	6.48	8.2816
30	780	10.684	7.1781	181.41	1.8196	5.6697	6.48	8.2996
31	840	11.508	7.2449	184.64	1.835	5.6563	6.48	8.315
32	900	12.335	7.3132	187.76	1.8486	5.6406	6.48	8.3286
33	960	13.166	7.3832	190.52	1.8579	5.633	6.48	8.3379
34	1020	13.991	7.4541	192.74	1.8617	5.619	6.48	8.3417
35	1080	14.821	7.5267	195.44	1.8695	5.6096	6.48	8.3495
36	1140	15.646	7.6003	197.87	1.8745	5.5997	6.48	8.3545

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.04	6.8193	6.48	0.18429	0.543	1.5911	1.2518	1.271	1.4214	0.16966
3	0.10	7.0353	6.48	0.32717	0.589	1.6642	1.1089	1.501	1.3865	0.27766
4	0.16	7.1501	6.48	0.42048	0.627	1.6857	1.0156	1.660	1.3506	0.33504
5	0.23	7.2291	6.48	0.48812	0.652	1.697	0.94792	1.790	1.3225	0.37456
6	0.30	7.2873	6.48	0.53886	0.667	1.7045	0.89718	1.900	1.3008	0.40365
7	0.36	7.3383	6.48	0.58143	0.677	1.7129	0.85461	2.004	1.2837	0.42914
8	0.43	7.3809	6.48	0.61643	0.684	1.7205	0.81962	2.099	1.2701	0.45044
9	0.50	7.4175	6.48	0.645	0.688	1.7286	0.79104	2.185	1.2598	0.46877
10	0.57	7.4506	6.48	0.66891	0.689	1.7377	0.76713	2.265	1.2524	0.48529
11	0.64	7.4801	6.48	0.68699	0.687	1.7491	0.74905	2.335	1.2491	0.50003
12	0.70	7.5059	6.48	0.70565	0.688	1.7563	0.73039	2.405	1.2434	0.51297
13	0.77	7.5318	6.48	0.72023	0.685	1.7676	0.71581	2.469	1.2417	0.52588
14	0.91	7.5762	6.48	0.74414	0.679	1.7881	0.6919	2.584	1.24	0.54812
15	1.05	7.6124	6.48	0.7628	0.674	1.8056	0.67324	2.682	1.2394	0.5662
16	1.19	7.6484	6.48	0.77797	0.666	1.8265	0.65808	2.775	1.2423	0.58421
17	1.32	7.6785	6.48	0.78613	0.656	1.8484	0.64991	2.844	1.2492	0.59925
18	1.46	7.7061	6.48	0.79546	0.649	1.8667	0.64058	2.914	1.2536	0.61305
19	1.59	7.7319	6.48	0.79954	0.639	1.8884	0.6365	2.967	1.2625	0.62596
20	2.42	7.8502	6.48	0.81412	0.594	1.9921	0.62192	3.203	1.307	0.68508
21	3.25	7.9346	6.48	0.80304	0.552	2.0876	0.633	3.298	1.3603	0.7273
22	4.07	8.0038	6.48	0.78671	0.516	2.1731	0.64933	3.347	1.4112	0.76191
23	4.90	8.0597	6.48	0.76514	0.484	2.2506	0.67091	3.355	1.4607	0.78983
24	5.73	8.1126	6.48	0.74239	0.455	2.3262	0.69365	3.354	1.5099	0.8163
25	6.55	8.1533	6.48	0.71907	0.430	2.3903	0.71698	3.334	1.5536	0.83664
26	7.38	8.1941	6.48	0.69807	0.407	2.452	0.73797	3.323	1.595	0.85703
27	8.21	8.2257	6.48	0.67649	0.388	2.5052	0.75955	3.298	1.6324	0.87284
28	9.03	8.2581	6.48	0.65841	0.370	2.5557	0.77763	3.287	1.6667	0.88905
29	9.86	8.2816	6.48	0.64209	0.356	2.5956	0.79396	3.269	1.6948	0.90081
30	10.68	8.2996	6.48	0.62576	0.344	2.6299	0.81029	3.246	1.7201	0.90982
31	11.51	8.315	6.48	0.61234	0.334	2.6587	0.8237	3.228	1.7412	0.91748
32	12.33	8.3286	6.48	0.5966	0.323	2.688	0.83945	3.202	1.7637	0.92428
33	13.17	8.3379	6.48	0.58902	0.317	2.7049	0.84703	3.193	1.776	0.92893
34	13.99	8.3417	6.48	0.57502	0.309	2.7227	0.86102	3.162	1.7919	0.93084
35	14.82	8.3495	6.48	0.56569	0.303	2.7399	0.87036	3.148	1.8051	0.93477
36	15.65	8.3545	6.48	0.55577	0.296	2.7548	0.88027	3.129	1.8175	0.93725

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
Specimen Area: 6.40 in^2
Specimen Volume: 37.61 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3988	0	0	5.0432	7.92	7.92
2	5.0041	0.048179	6.4019	48.62	0.54682	5.3658	7.92	8.4668
3	10.004	0.10879	6.4058	77.205	0.86778	5.6	7.92	8.7878
4	15.004	0.17407	6.41	94.356	1.0599	5.7689	7.92	8.9799
5	20.004	0.23934	6.4142	106.47	1.1952	5.9005	7.92	9.1152
6	25.004	0.30772	6.4186	115.76	1.2985	6.0036	7.92	9.2185
7	30	0.37611	6.423	123.2	1.3811	6.0892	7.92	9.3011
8	35	0.44449	6.4274	129.5	1.4506	6.1649	7.92	9.3706
9	40	0.51287	6.4318	135	1.5113	6.2313	7.92	9.4313
10	45	0.58125	6.4362	139.57	1.5613	6.2855	7.92	9.4813
11	50	0.65119	6.4407	143.87	1.6083	6.3309	7.92	9.5283
12	55	0.72113	6.4453	147.8	1.6511	6.3746	7.92	9.5711
13	60	0.78951	6.4497	151.16	1.6874	6.413	7.92	9.6074
14	70	0.93094	6.4589	157.56	1.7563	6.4788	7.92	9.6763
15	80	1.0724	6.4682	162.96	1.814	6.5278	7.92	9.734
16	90	1.2138	6.4774	167.78	1.865	6.5767	7.92	9.785
17	100	1.3568	6.4868	172.3	1.9124	6.607	7.92	9.8324
18	110	1.4982	6.4961	176.23	1.9532	6.639	7.92	9.8732
19	120	1.6381	6.5054	179.9	1.9911	6.6605	7.92	9.9111
20	180	2.4804	6.5616	198.15	2.1743	6.7374	7.92	10.094
21	240	3.3274	6.619	212.42	2.3106	6.7514	7.92	10.231
22	300	4.176	6.6777	224.69	2.4227	6.7467	7.92	10.343
23	360	5.0277	6.7375	234.87	2.5099	6.7217	7.92	10.43
24	420	5.8747	6.7982	244.73	2.5919	6.6891	7.92	10.512
25	480	6.7264	6.8602	253.49	2.6604	6.6512	7.92	10.58
26	540	7.5718	6.923	261.25	2.717	6.6209	7.92	10.637
27	600	8.4204	6.9871	268.49	2.7667	6.5848	7.92	10.687
28	660	9.2674	7.0524	275.04	2.808	6.5598	7.92	10.728
29	720	10.122	7.1194	280.92	2.841	6.5301	7.92	10.761
30	780	10.979	7.1879	286.37	2.8685	6.5068	7.92	10.789
31	840	11.838	7.258	291.67	2.8934	6.4858	7.92	10.813
32	900	12.685	7.3284	296.55	2.9135	6.4643	7.92	10.834
33	960	13.532	7.4002	300.74	2.9261	6.4474	7.92	10.846
34	1020	14.391	7.4745	304.73	2.9354	6.4276	7.92	10.855
35	1080	15.24	7.5493	309.08	2.9478	6.4183	7.92	10.868

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
Specimen Area: 6.40 in^2
Specimen Volume: 37.61 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8768	2.8768	1.000	2.8768	0
2	0.05	8.4668	7.92	0.32266	0.590	3.101	2.5542	1.214	2.8276	0.27341
3	0.11	8.7878	7.92	0.55679	0.642	3.1878	2.32	1.374	2.7539	0.43389
4	0.17	8.9799	7.92	0.72569	0.685	3.211	2.1511	1.493	2.6811	0.52993
5	0.24	9.1152	7.92	0.85732	0.717	3.2147	2.0195	1.592	2.6171	0.59758
6	0.31	9.2185	7.92	0.96041	0.740	3.2149	1.9164	1.678	2.5657	0.64924
7	0.38	9.3011	7.92	1.046	0.757	3.2119	1.8308	1.754	2.5213	0.69054
8	0.44	9.3706	7.92	1.1217	0.773	3.2057	1.7551	1.827	2.4804	0.72532
9	0.51	9.4313	7.92	1.1881	0.786	3.2	1.6887	1.895	2.4443	0.75564
10	0.58	9.4813	7.92	1.2423	0.796	3.1958	1.6345	1.955	2.4152	0.78065
11	0.65	9.5283	7.92	1.2877	0.801	3.1974	1.5891	2.012	2.3932	0.80414
12	0.72	9.5711	7.92	1.3314	0.806	3.1965	1.5454	2.068	2.371	0.82554
13	0.79	9.6074	7.92	1.3698	0.812	3.1944	1.507	2.120	2.3507	0.84371
14	0.93	9.6763	7.92	1.4357	0.817	3.1975	1.4412	2.219	2.3193	0.87817
15	1.07	9.734	7.92	1.4846	0.818	3.2062	1.3922	2.303	2.2992	0.90699
16	1.21	9.785	7.92	1.5335	0.822	3.2083	1.3433	2.388	2.2758	0.93251
17	1.36	9.8324	7.92	1.5638	0.818	3.2254	1.313	2.456	2.2692	0.95619
18	1.50	9.8732	7.92	1.5958	0.817	3.2342	1.281	2.525	2.2576	0.97662
19	1.64	9.9111	7.92	1.6174	0.812	3.2506	1.2595	2.581	2.255	0.99555
20	2.48	10.094	7.92	1.6943	0.779	3.3569	1.1826	2.839	2.2697	1.0872
21	3.33	10.231	7.92	1.7082	0.739	3.4792	1.1686	2.977	2.3239	1.1553
22	4.18	10.343	7.92	1.7036	0.703	3.5959	1.1733	3.065	2.3846	1.2113
23	5.03	10.43	7.92	1.6785	0.669	3.7082	1.1983	3.095	2.4532	1.2549
24	5.87	10.512	7.92	1.6459	0.635	3.8228	1.2309	3.106	2.5269	1.296
25	6.73	10.58	7.92	1.6081	0.604	3.9292	1.2688	3.097	2.599	1.3302
26	7.57	10.637	7.92	1.5778	0.581	4.0161	1.2991	3.092	2.6576	1.3585
27	8.42	10.687	7.92	1.5417	0.557	4.1018	1.3352	3.072	2.7185	1.3833
28	9.27	10.728	7.92	1.5166	0.540	4.1682	1.3602	3.064	2.7642	1.404
29	10.12	10.761	7.92	1.4869	0.523	4.2309	1.3899	3.044	2.8104	1.4205
30	10.98	10.789	7.92	1.4636	0.510	4.2817	1.4132	3.030	2.8475	1.4343
31	11.84	10.813	7.92	1.4427	0.499	4.3276	1.4342	3.017	2.8809	1.4467
32	12.69	10.834	7.92	1.4211	0.488	4.3692	1.4557	3.001	2.9125	1.4568
33	13.53	10.846	7.92	1.4042	0.480	4.3987	1.4726	2.987	2.9357	1.463
34	14.39	10.855	7.92	1.3844	0.472	4.4278	1.4924	2.967	2.9601	1.4677
35	15.24	10.868	7.92	1.3751	0.466	4.4495	1.5017	2.963	2.9756	1.4739

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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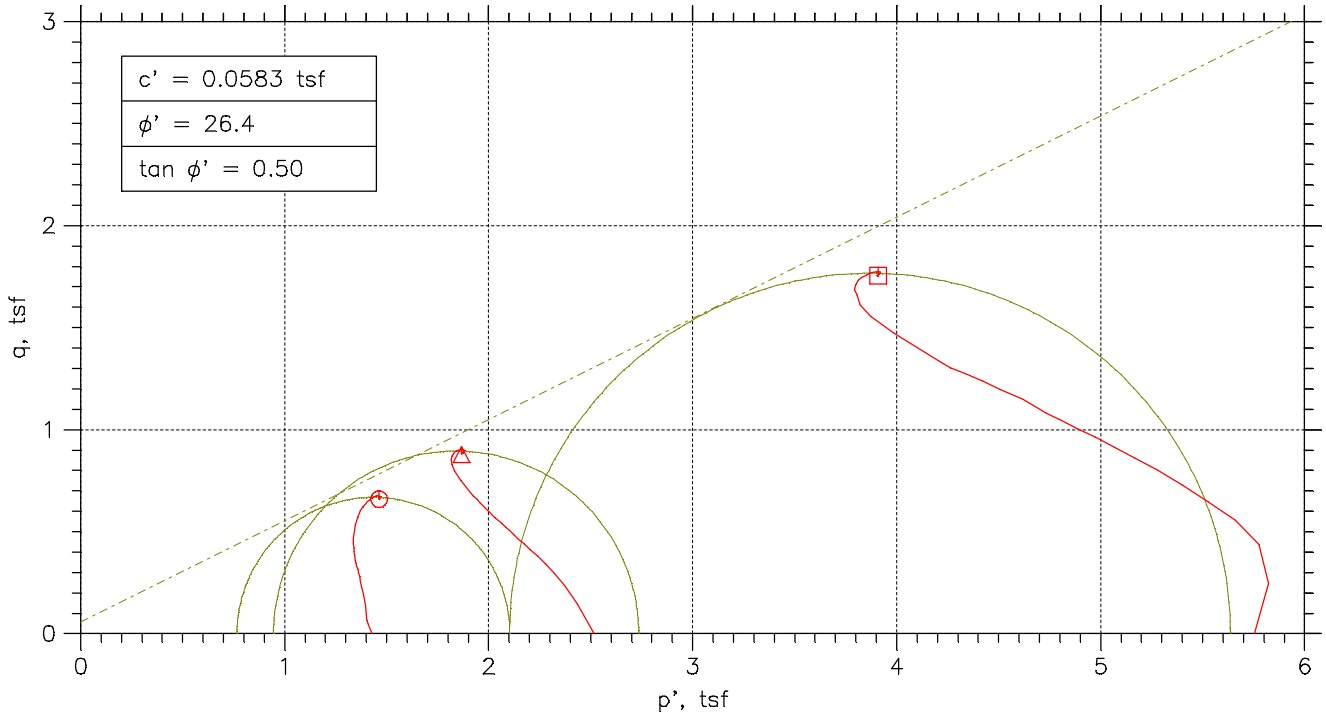

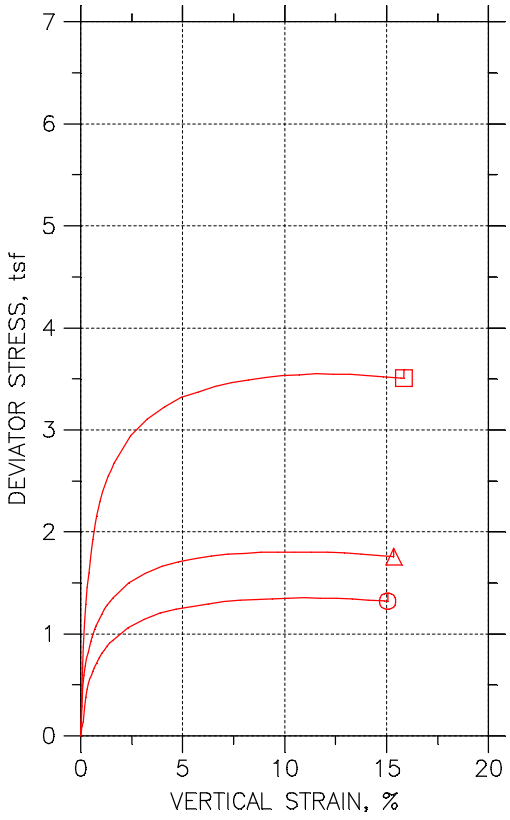

Symbol		⏲	△	◫	
Test No.		20.0 PSI	40.0 PSI	80.0 PSI	
Initial	Diameter, in	2.8323	2.8394	2.8232	
	Height, in	5.9835	6.1287	6.0461	
	Water Content, %	35.45	32.69	30.23	
	Dry Density, pcf	84.39	88.44	92.32	
	Saturation, %	95.27	96.65	97.97	
	Void Ratio	1.0122	0.91997	0.83931	
Before Shear	Water Content, %	27.91	28.32	23.10	
	Dry Density, pcf	96.52	95.92	104.3	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.75927	0.7702	0.62821	
	Back Press., tsf	5.0509	5.0422	1.4473	
Minor Prin. Stress, tsf		1.4291	2.5178	5.7527	
Max. Dev. Stress, tsf		1.3524	1.8029	3.5485	
Time to Failure, min		840	780	840	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.98	0.99	0.96	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		42	42	42	
Plastic Limit		23	23	23	
Plasticity Index		19	19	19	

Project: DYNERGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-013 S10

Sample Type: 3.0" ST

Failure Sketch

Description: GRAY AND BROWN LEAN CLAY WITH SAND CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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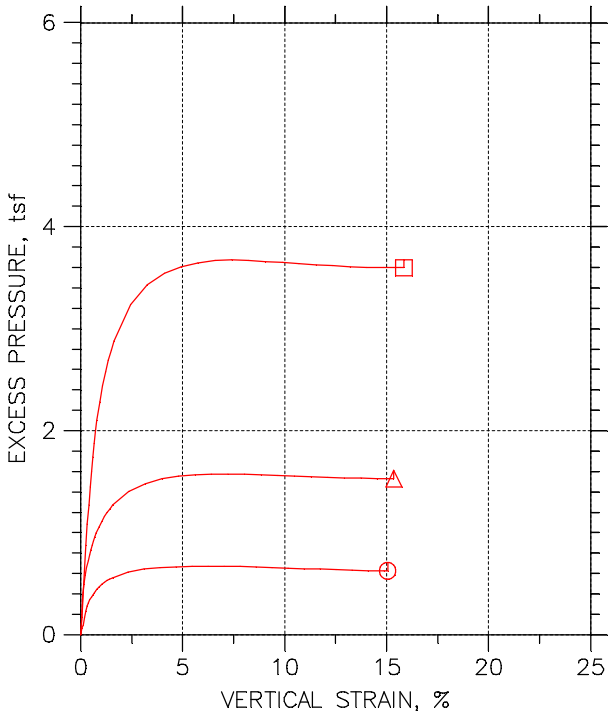

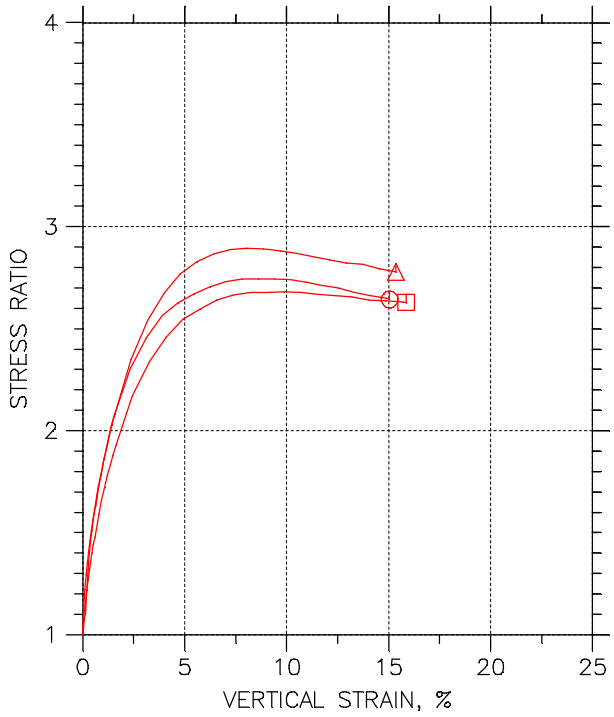

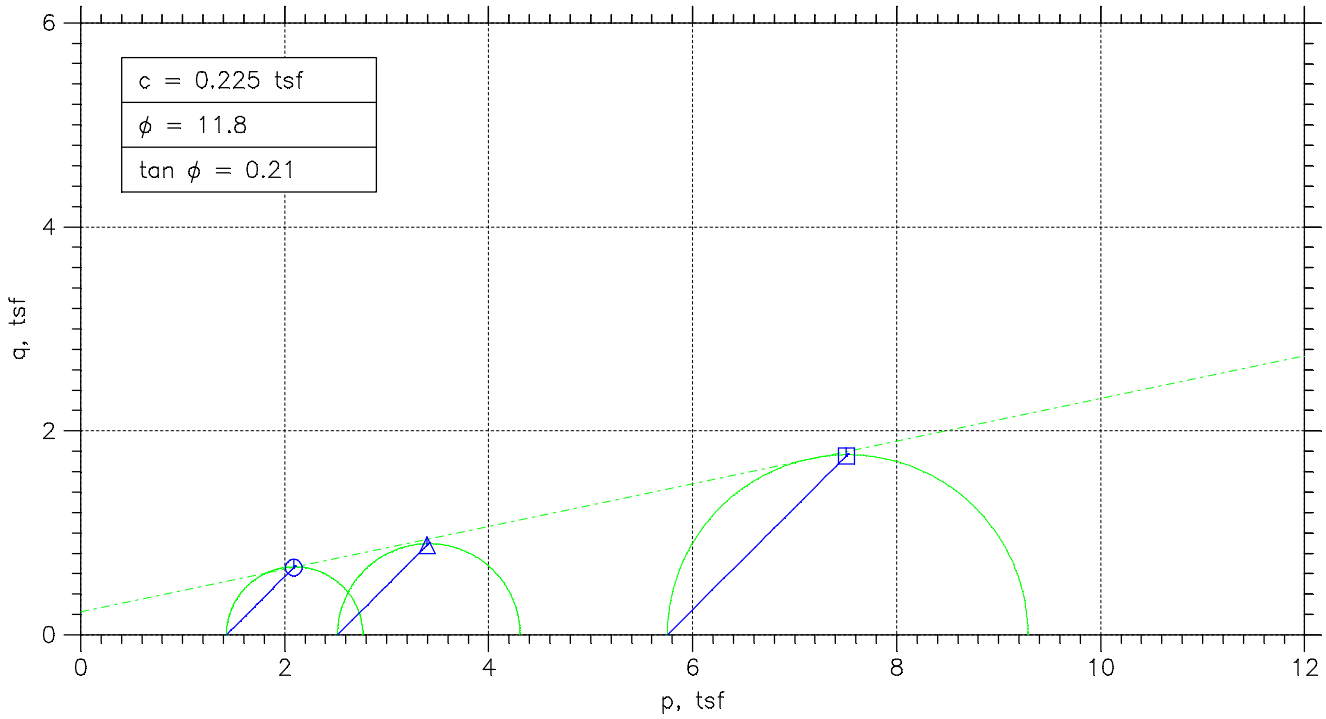

Project: DYNERGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 10/29/15	Depth: 32.0'-34.0'
Test No.: EDW-013 S10	Sample Type: 3.0" ST	Elevation: -----
Description: GRAY AND BROWN LEAN CLAY WITH SAND CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

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Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0509	6.48	6.48
2	5.0003	0.070614	6.3048	8.4452	0.096443	5.1202	6.48	6.5764
3	10	0.13546	6.3089	11.964	0.13654	5.1458	6.48	6.6165
4	15	0.19743	6.3128	24.163	0.27558	5.2208	6.48	6.7556
5	20	0.26228	6.3169	33.487	0.38169	5.2837	6.48	6.8617
6	25	0.32713	6.321	40.115	0.45693	5.3296	6.48	6.9369
7	30	0.39054	6.325	45.041	0.51272	5.364	6.48	6.9927
8	35	0.45539	6.3292	49.088	0.55842	5.3925	6.48	7.0384
9	40	0.52024	6.3333	52.665	0.59872	5.4169	6.48	7.0787
10	45	0.58653	6.3375	55.773	0.63364	5.4396	6.48	7.1136
11	50	0.6485	6.3415	58.412	0.66321	5.4594	6.48	7.1432
12	55	0.71335	6.3456	61.052	0.69272	5.4775	6.48	7.1727
13	60.001	0.7782	6.3497	63.339	0.7182	5.4932	6.48	7.1982
14	70.001	0.9079	6.3581	67.62	0.76574	5.5199	6.48	7.2457
15	80.001	1.039	6.3665	71.315	0.80652	5.5438	6.48	7.2865
16	90.001	1.1687	6.3748	74.716	0.84388	5.5636	6.48	7.3239
17	100	1.297	6.3831	77.825	0.87784	5.5816	6.48	7.3578
18	110	1.4281	6.3916	80.698	0.90905	5.5979	6.48	7.389
19	120	1.5593	6.4001	83.161	0.93555	5.6095	6.48	7.4155
20	180	2.3332	6.4508	95.243	1.063	5.6642	6.48	7.543
21	240	3.1229	6.5034	103.34	1.144	5.6945	6.48	7.624
22	300	3.904	6.5563	109.67	1.2044	5.7102	6.48	7.6844
23	360	4.6807	6.6097	114.07	1.2426	5.7172	6.48	7.7226
24	420	5.469	6.6648	117.59	1.2703	5.7201	6.48	7.7503
25	480	6.2544	6.7207	120.81	1.2943	5.7218	6.48	7.7743
26	540	7.0312	6.7768	123.8	1.3153	5.7207	6.48	7.7953
27	600	7.8223	6.835	126.21	1.3295	5.7178	6.48	7.8095
28	660	8.6063	6.8936	128.03	1.3372	5.7137	6.48	7.8172
29	720	9.3787	6.9524	129.79	1.3441	5.709	6.48	7.8241
30	780	10.17	7.0136	131.6	1.351	5.7044	6.48	7.831
31	840	10.952	7.0752	132.89	1.3524	5.6974	6.48	7.8324
32	900	11.731	7.1376	133.72	1.3488	5.6928	6.48	7.8288
33	960	12.525	7.2024	134.83	1.3478	5.6875	6.48	7.8278
34	1020	13.309	7.2675	135.53	1.3427	5.68	6.48	7.8227
35	1080	14.091	7.3337	135.65	1.3318	5.6794	6.48	7.8118
36	1140	14.882	7.4019	135.94	1.3224	5.6776	6.48	7.8024
37	1152.3	15.045	7.4161	135.89	1.3193	5.677	6.48	7.7993

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

Terracon Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4291	1.4291	1.000	1.4291	0
2	0.07	6.5764	6.48	0.069246	0.718	1.4563	1.3598	1.071	1.4081	0.048221
3	0.14	6.6165	6.48	0.09485	0.695	1.4708	1.3342	1.102	1.4025	0.068269
4	0.20	6.7556	6.48	0.16992	0.617	1.5348	1.2592	1.219	1.397	0.13779
5	0.26	6.8617	6.48	0.23276	0.610	1.578	1.1963	1.319	1.3872	0.19084
6	0.33	6.9369	6.48	0.27873	0.610	1.6073	1.1504	1.397	1.3788	0.22846
7	0.39	6.9927	6.48	0.31306	0.611	1.6287	1.116	1.459	1.3724	0.25636
8	0.46	7.0384	6.48	0.34158	0.612	1.6459	1.0875	1.513	1.3667	0.27921
9	0.52	7.0787	6.48	0.36602	0.611	1.6618	1.0631	1.563	1.3624	0.29936
10	0.59	7.1136	6.48	0.38871	0.613	1.674	1.0404	1.609	1.3572	0.31682
11	0.65	7.1432	6.48	0.4085	0.616	1.6838	1.0206	1.650	1.3522	0.3316
12	0.71	7.1727	6.48	0.42653	0.616	1.6953	1.0025	1.691	1.3489	0.34636
13	0.78	7.1982	6.48	0.44225	0.616	1.705	0.98684	1.728	1.3459	0.3591
14	0.91	7.2457	6.48	0.46901	0.612	1.7258	0.96007	1.798	1.3429	0.38287
15	1.04	7.2865	6.48	0.49287	0.611	1.7427	0.93621	1.861	1.3395	0.40326
16	1.17	7.3239	6.48	0.51266	0.608	1.7603	0.91643	1.921	1.3384	0.42194
17	1.30	7.3578	6.48	0.5307	0.605	1.7762	0.89839	1.977	1.3373	0.43892
18	1.43	7.389	6.48	0.54699	0.602	1.7911	0.8821	2.031	1.3366	0.45452
19	1.56	7.4155	6.48	0.55863	0.597	1.806	0.87046	2.075	1.3382	0.46777
20	2.33	7.543	6.48	0.61333	0.577	1.8788	0.81576	2.303	1.3473	0.53152
21	3.12	7.624	6.48	0.64358	0.563	1.9295	0.7855	2.456	1.3575	0.57202
22	3.90	7.6844	6.48	0.6593	0.547	1.9742	0.76979	2.565	1.372	0.60219
23	4.68	7.7226	6.48	0.66628	0.536	2.0054	0.76281	2.629	1.3841	0.62128
24	5.47	7.7503	6.48	0.66919	0.527	2.0302	0.7599	2.672	1.395	0.63515
25	6.25	7.7743	6.48	0.67093	0.518	2.0524	0.75815	2.707	1.4053	0.64715
26	7.03	7.7953	6.48	0.66977	0.509	2.0747	0.75931	2.732	1.417	0.65767
27	7.82	7.8095	6.48	0.66686	0.502	2.0917	0.76222	2.744	1.427	0.66474
28	8.61	7.8172	6.48	0.66279	0.496	2.1035	0.7663	2.745	1.4349	0.66858
29	9.38	7.8241	6.48	0.65813	0.490	2.115	0.77095	2.743	1.443	0.67204
30	10.17	7.831	6.48	0.65348	0.484	2.1266	0.77561	2.742	1.4511	0.67551
31	10.95	7.8324	6.48	0.64649	0.478	2.135	0.78259	2.728	1.4588	0.67619
32	11.73	7.8288	6.48	0.64184	0.476	2.1361	0.78725	2.713	1.4617	0.67442
33	12.52	7.8278	6.48	0.6366	0.472	2.1403	0.79248	2.701	1.4664	0.67392
34	13.31	7.8227	6.48	0.62904	0.468	2.1428	0.80005	2.678	1.4714	0.67137
35	14.09	7.8118	6.48	0.62845	0.472	2.1324	0.80063	2.663	1.4665	0.66588
36	14.88	7.8024	6.48	0.62671	0.474	2.1247	0.80238	2.648	1.4636	0.66118
37	15.05	7.7993	6.48	0.62613	0.475	2.1222	0.80296	2.643	1.4626	0.65963

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3319	0	0	5.0422	7.56	7.56
2	5.0001	0.049959	6.3351	25.547	0.29035	5.2708	7.56	7.8503
3	10.004	0.10929	6.3388	41.648	0.47306	5.4236	7.56	8.0331
4	15.004	0.17017	6.3427	52.381	0.59462	5.5356	7.56	8.1546
5	20.004	0.23262	6.3467	60.539	0.68679	5.6242	7.56	8.2468
6	25.004	0.29975	6.3509	67.151	0.76129	5.7006	7.56	8.3213
7	30.004	0.36533	6.3551	72.647	0.82305	5.7683	7.56	8.3831
8	35.004	0.4309	6.3593	77.585	0.87841	5.8248	7.56	8.4384
9	40.004	0.49803	6.3636	81.878	0.9264	5.8756	7.56	8.4864
10	45.004	0.56204	6.3677	85.914	0.97144	5.9211	7.56	8.5314
11	50.004	0.62761	6.3719	89.435	1.0106	5.9619	7.56	8.5706
12	55.004	0.6963	6.3763	92.698	1.0467	6.001	7.56	8.6067
13	60.004	0.76187	6.3805	95.875	1.0819	6.0371	7.56	8.6419
14	70.004	0.89614	6.3892	101.2	1.1404	6.1001	7.56	8.7004
15	80.004	1.0304	6.3978	105.97	1.1925	6.1538	7.56	8.7525
16	90.004	1.1631	6.4064	110.34	1.2401	6.201	7.56	8.8001
17	100	1.3005	6.4153	114.08	1.2803	6.2412	7.56	8.8403
18	110	1.4332	6.424	117.56	1.3176	6.2774	7.56	8.8776
19	120	1.569	6.4328	120.69	1.3509	6.3118	7.56	8.9109
20	180	2.3684	6.4855	135.2	1.501	6.4477	7.56	9.061
21	240	3.1786	6.5398	144.78	1.594	6.5241	7.56	9.154
22	300	3.9889	6.595	152.03	1.6598	6.569	7.56	9.2198
23	360	4.7976	6.651	157.53	1.7053	6.5952	7.56	9.2653
24	420	5.6095	6.7082	162	1.7387	6.6086	7.56	9.2987
25	480	6.4166	6.766	165.6	1.7622	6.6151	7.56	9.3222
26	540	7.2316	6.8255	168.65	1.779	6.6174	7.56	9.339
27	600	8.0434	6.8857	171.18	1.79	6.6145	7.56	9.35
28	660	8.8506	6.9467	173.55	1.7987	6.6092	7.56	9.3587
29	720	9.6608	7.009	175.35	1.8013	6.6022	7.56	9.3613
30	780	10.477	7.073	177.11	1.8029	6.5958	7.56	9.3629
31	840	11.286	7.1374	178.61	1.8018	6.5882	7.56	9.3618
32	900	12.099	7.2035	180.03	1.7994	6.5812	7.56	9.3594
33	960	12.914	7.2709	181.32	1.7955	6.5748	7.56	9.3555
34	1020	13.732	7.3398	181.88	1.7841	6.5766	7.56	9.3441
35	1080	14.54	7.4092	182.18	1.7703	6.5725	7.56	9.3303
36	1140	15.353	7.4804	182.61	1.7576	6.5719	7.56	9.3176

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.56	7.56	0	0.000	2.5178	2.5178	1.000	2.5178	0
2	0.05	7.8503	7.56	0.22861	0.787	2.5795	2.2892	1.127	2.4344	0.14517
3	0.11	8.0331	7.56	0.3814	0.806	2.6094	2.1364	1.221	2.3729	0.23653
4	0.17	8.1546	7.56	0.49337	0.830	2.619	2.0244	1.294	2.3217	0.29731
5	0.23	8.2468	7.56	0.58202	0.847	2.6226	1.9358	1.355	2.2792	0.34339
6	0.30	8.3213	7.56	0.65841	0.865	2.6207	1.8594	1.409	2.24	0.38064
7	0.37	8.3831	7.56	0.72606	0.882	2.6148	1.7917	1.459	2.2033	0.41153
8	0.43	8.4384	7.56	0.78263	0.891	2.6136	1.7352	1.506	2.1744	0.43921
9	0.50	8.4864	7.56	0.83337	0.900	2.6108	1.6844	1.550	2.1476	0.4632
10	0.56	8.5314	7.56	0.87886	0.905	2.6104	1.6389	1.593	2.1247	0.48572
11	0.63	8.5706	7.56	0.91968	0.910	2.6087	1.5981	1.632	2.1034	0.50529
12	0.70	8.6067	7.56	0.95875	0.916	2.6058	1.559	1.671	2.0824	0.52336
13	0.76	8.6419	7.56	0.99491	0.920	2.6048	1.5229	1.710	2.0638	0.54095
14	0.90	8.7004	7.56	1.0579	0.928	2.6003	1.4599	1.781	2.0301	0.57021
15	1.03	8.7525	7.56	1.1115	0.932	2.5988	1.4062	1.848	2.0025	0.59626
16	1.16	8.8001	7.56	1.1588	0.934	2.5991	1.359	1.913	1.9791	0.62007
17	1.30	8.8403	7.56	1.199	0.936	2.5991	1.3188	1.971	1.9589	0.64017
18	1.43	8.8776	7.56	1.2352	0.937	2.6002	1.2826	2.027	1.9414	0.65879
19	1.57	8.9109	7.56	1.2696	0.940	2.5991	1.2482	2.082	1.9236	0.67543
20	2.37	9.061	7.56	1.4055	0.936	2.6133	1.1123	2.349	1.8628	0.7505
21	3.18	9.154	7.56	1.4819	0.930	2.6299	1.0359	2.539	1.8329	0.79698
22	3.99	9.2198	7.56	1.5268	0.920	2.6508	0.99102	2.675	1.8209	0.82991
23	4.80	9.2653	7.56	1.553	0.911	2.6701	0.96477	2.768	1.8174	0.85267
24	5.61	9.2987	7.56	1.5664	0.901	2.6901	0.95136	2.828	1.8207	0.86936
25	6.42	9.3222	7.56	1.5728	0.893	2.7072	0.94495	2.865	1.8261	0.88112
26	7.23	9.339	7.56	1.5752	0.885	2.7217	0.94261	2.887	1.8321	0.88952
27	8.04	9.35	7.56	1.5723	0.878	2.7355	0.94553	2.893	1.8405	0.89498
28	8.85	9.3587	7.56	1.567	0.871	2.7495	0.95078	2.892	1.8501	0.89937
29	9.66	9.3613	7.56	1.56	0.866	2.759	0.95778	2.881	1.8584	0.90063
30	10.48	9.3629	7.56	1.5536	0.862	2.7671	0.96419	2.870	1.8656	0.90145
31	11.29	9.3618	7.56	1.546	0.858	2.7736	0.97177	2.854	1.8727	0.90089
32	12.10	9.3594	7.56	1.539	0.855	2.7782	0.97877	2.838	1.8785	0.89971
33	12.91	9.3555	7.56	1.5326	0.854	2.7807	0.98519	2.822	1.8829	0.89775
34	13.73	9.3441	7.56	1.5344	0.860	2.7675	0.98344	2.814	1.8755	0.89205
35	14.54	9.3303	7.56	1.5303	0.864	2.7578	0.98752	2.793	1.8727	0.88516
36	15.35	9.3176	7.56	1.5297	0.870	2.7457	0.9881	2.779	1.8669	0.87881

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2601	0	0	1.4473	7.2	7.2
2	5.0002	0.057416	6.2637	42.956	0.49377	1.6232	7.2	7.6938
3	10	0.12843	6.2682	75.999	0.87297	1.8591	7.2	8.073
4	15	0.19491	6.2723	96.821	1.1114	2.0973	7.2	8.3114
5	20	0.26139	6.2765	112.87	1.2948	2.3215	7.2	8.4948
6	25	0.32939	6.2808	127.24	1.4586	2.53	7.2	8.6586
7	30	0.39436	6.2849	139.93	1.6031	2.7199	7.2	8.8031
8	35	0.46084	6.2891	150.32	1.7209	2.8923	7.2	8.9209
9	40	0.52581	6.2932	159.97	1.8302	3.0478	7.2	9.0302
10	45	0.59531	6.2976	168.57	1.9273	3.1905	7.2	9.1273
11	50	0.6633	6.3019	175.7	2.0074	3.3198	7.2	9.2074
12	55	0.7313	6.3062	183.2	2.0917	3.438	7.2	9.2917
13	60	0.79929	6.3105	189.45	2.1615	3.5452	7.2	9.3615
14	70	0.9383	6.3194	201.61	2.2971	3.7298	7.2	9.4971
15	80	1.0758	6.3282	210.37	2.3936	3.8876	7.2	9.5936
16	90.001	1.2163	6.3372	218.14	2.4784	4.0228	7.2	9.6784
17	100	1.3538	6.346	224.69	2.5493	4.1375	7.2	9.7493
18	110	1.4928	6.355	230.15	2.6075	4.2388	7.2	9.8075
19	120	1.6303	6.3639	236.18	2.6721	4.3262	7.2	9.8721
20	180	2.4432	6.4169	262.25	2.9425	4.685	7.2	10.142
21	240	3.2787	6.4723	279.34	3.1075	4.8801	7.2	10.308
22	300	4.1067	6.5282	292.25	3.2232	4.9907	7.2	10.423
23	360	4.9136	6.5836	303.47	3.3188	5.0548	7.2	10.519
24	420	5.7506	6.6421	310.87	3.3698	5.0903	7.2	10.57
25	480	6.5802	6.701	318.68	3.4241	5.1136	7.2	10.624
26	540	7.4006	6.7604	325.24	3.4638	5.1206	7.2	10.664
27	600	8.2346	6.8219	330.8	3.4913	5.1171	7.2	10.691
28	660	9.0626	6.884	336.15	3.5158	5.1061	7.2	10.716
29	720	9.877	6.9462	340.92	3.5338	5.0973	7.2	10.734
30	780	10.714	7.0113	344.8	3.5408	5.088	7.2	10.741
31	840	11.542	7.0769	348.79	3.5485	5.0746	7.2	10.749
32	900	12.361	7.1431	351.99	3.5479	5.0647	7.2	10.748
33	960	13.204	7.2124	355.4	3.5478	5.0566	7.2	10.748
34	1020	14.025	7.2813	357.18	3.5319	5.0478	7.2	10.732
35	1080	14.848	7.3517	359.59	3.5217	5.0496	7.2	10.722
36	1140	15.696	7.4256	361.69	3.507	5.049	7.2	10.707
37	1151.2	15.853	7.4395	362.53	3.5086	5.0455	7.2	10.709

TRIAXIAL TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	5.7527	5.7527	1.000	5.7527	0
2	0.06	7.6938	7.2	0.17589	0.356	6.0706	5.5768	1.089	5.8237	0.24688
3	0.13	8.073	7.2	0.41177	0.472	6.2139	5.3409	1.163	5.7774	0.43648
4	0.19	8.3114	7.2	0.64998	0.585	6.2141	5.1027	1.218	5.6584	0.5557
5	0.26	8.4948	7.2	0.87421	0.675	6.1733	4.8785	1.265	5.5259	0.64739
6	0.33	8.6586	7.2	1.0827	0.742	6.1286	4.67	1.312	5.3993	0.72932
7	0.39	8.8031	7.2	1.2726	0.794	6.0832	4.4801	1.358	5.2816	0.80155
8	0.46	8.9209	7.2	1.445	0.840	6.0286	4.3077	1.399	5.1682	0.86046
9	0.53	9.0302	7.2	1.6005	0.874	5.9824	4.1522	1.441	5.0673	0.9151
10	0.60	9.1273	7.2	1.7432	0.904	5.9368	4.0095	1.481	4.9731	0.96363
11	0.66	9.2074	7.2	1.8725	0.933	5.8877	3.8802	1.517	4.8839	1.0037
12	0.73	9.2917	7.2	1.9907	0.952	5.8537	3.762	1.556	4.8078	1.0459
13	0.80	9.3615	7.2	2.0979	0.971	5.8163	3.6548	1.591	4.7356	1.0807
14	0.94	9.4971	7.2	2.2825	0.994	5.7673	3.4702	1.662	4.6187	1.1485
15	1.08	9.5936	7.2	2.4403	1.020	5.7059	3.3124	1.723	4.5091	1.1968
16	1.22	9.6784	7.2	2.5755	1.039	5.6556	3.1772	1.780	4.4164	1.2392
17	1.35	9.7493	7.2	2.6902	1.055	5.6118	3.0625	1.832	4.3371	1.2746
18	1.49	9.8075	7.2	2.7915	1.071	5.5686	2.9612	1.881	4.2649	1.3037
19	1.63	9.8721	7.2	2.8789	1.077	5.5459	2.8738	1.930	4.2098	1.336
20	2.44	10.142	7.2	3.2377	1.100	5.4575	2.515	2.170	3.9863	1.4712
21	3.28	10.308	7.2	3.4328	1.105	5.4274	2.3199	2.339	3.8737	1.5538
22	4.11	10.423	7.2	3.5434	1.099	5.4325	2.2093	2.459	3.8209	1.6116
23	4.91	10.519	7.2	3.6075	1.087	5.464	2.1452	2.547	3.8046	1.6594
24	5.75	10.57	7.2	3.643	1.081	5.4794	2.1097	2.597	3.7945	1.6849
25	6.58	10.624	7.2	3.6663	1.071	5.5105	2.0864	2.641	3.7984	1.712
26	7.40	10.664	7.2	3.6733	1.060	5.5432	2.0794	2.666	3.8113	1.7319
27	8.23	10.691	7.2	3.6698	1.051	5.5742	2.0829	2.676	3.8285	1.7457
28	9.06	10.716	7.2	3.6588	1.041	5.6097	2.0939	2.679	3.8518	1.7579
29	9.88	10.734	7.2	3.65	1.033	5.6364	2.1027	2.681	3.8695	1.7669
30	10.71	10.741	7.2	3.6407	1.028	5.6528	2.112	2.677	3.8824	1.7704
31	11.54	10.749	7.2	3.6273	1.022	5.6739	2.1254	2.670	3.8996	1.7743
32	12.36	10.748	7.2	3.6174	1.020	5.6832	2.1353	2.662	3.9092	1.774
33	13.20	10.748	7.2	3.6093	1.017	5.6913	2.1434	2.655	3.9173	1.7739
34	14.02	10.732	7.2	3.6005	1.019	5.6841	2.1522	2.641	3.9181	1.766
35	14.85	10.722	7.2	3.6023	1.023	5.6721	2.1504	2.638	3.9113	1.7609
36	15.70	10.707	7.2	3.6017	1.027	5.658	2.151	2.630	3.9045	1.7535
37	15.85	10.709	7.2	3.5982	1.026	5.6631	2.1545	2.628	3.9088	1.7543

DIRECT SHEAR TEST REPORT

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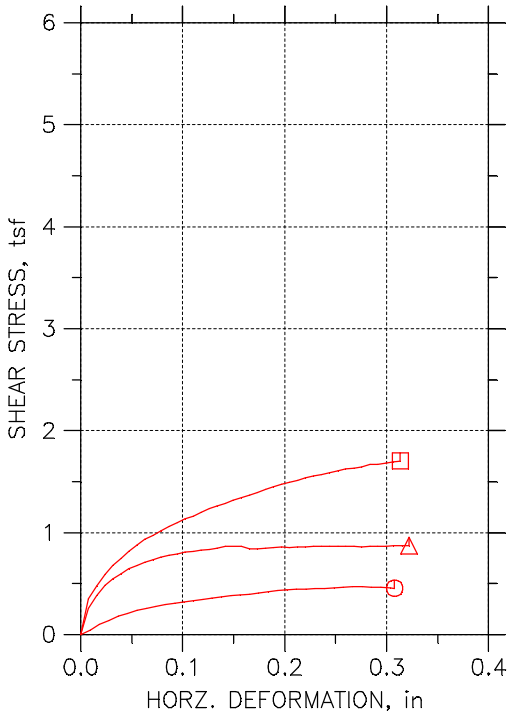

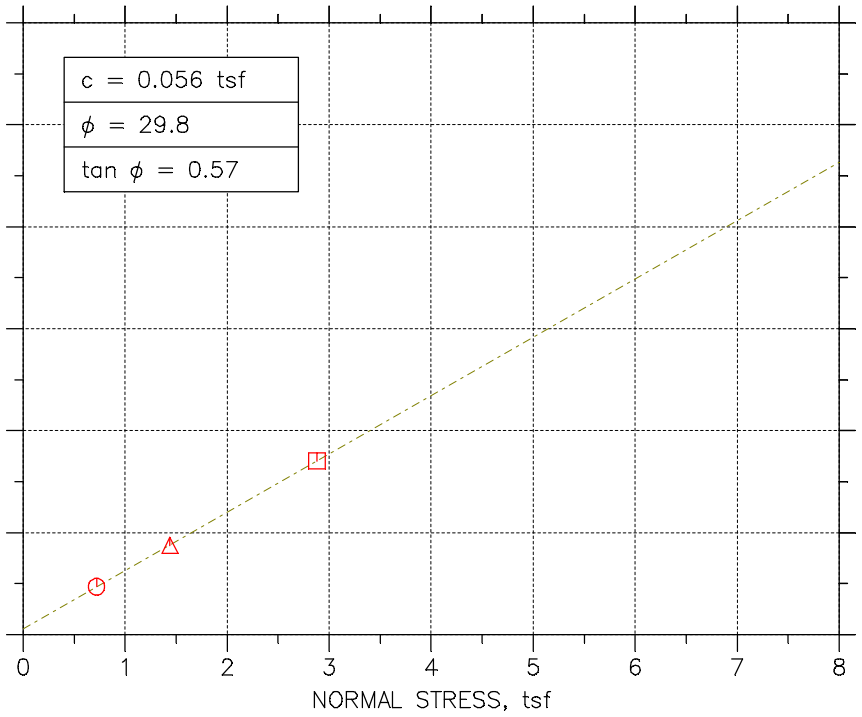

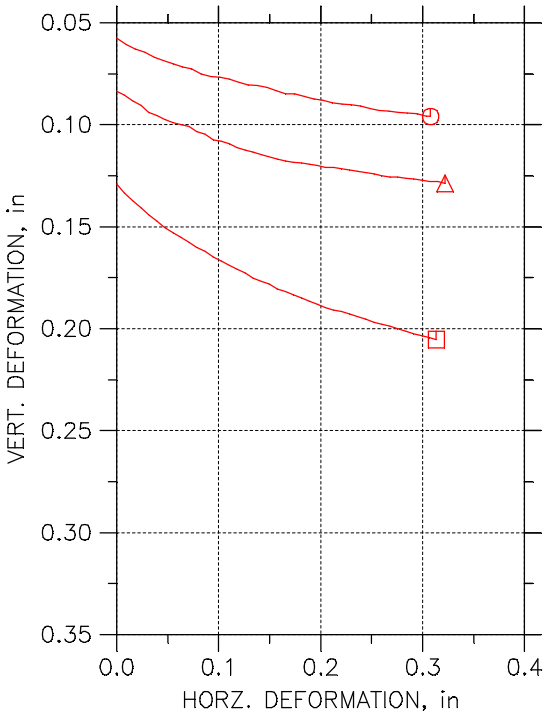

Symbol		⏲	△	⊡	
Test No.		10 PSI	20 PSI	40 PSI	
Sample No.		S-5	S-5	S-5	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.502	2.5016	2.5035	
	Area, in^2	4.9165	4.9149	4.9227	
	Height, in	1.0098	1.0087	1.0067	
	Water Content, %	75.08	66.70	67.21	
	Dry Density, pcf	51.869	56.572	54.543	
	Saturation, %	97.66	99.74	94.70	
	Void Ratio	1.7682	1.5381	1.6325	
Consol. Height, in		0.955	0.93155	0.88124	
Consol. Void Ratio		1.6179	1.344	1.3044	
Final	Water Content, %	64.90	53.10	47.20	
	Dry Density, pcf	57.319	64.848	68.523	
	Saturation, %	99.18	100.59	99.10	
	Void Ratio	1.505	1.2142	1.0954	
Normal Stress, tsf		0.71991	1.4387	2.88	
Max. Shear Stress, tsf		0.47008	0.87498	1.7039	
Ult. Shear Stress, tsf		0.45479	0.87367	1.7039	
Time to Failure, min		3678.3	1181.7	1190.6	
Disp. Rate, in/min		6.49e-005	0.000267	0.000267	
Estimated Specific Gravity		2.30	2.30	2.30	
Liquid Limit		NP	NP	NP	
Plastic Limit		NP	NP	NP	
Plasticity Index		NP	NP	NP	

Project: DYNERGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW-B002 S5	
Sample Type: 3.0" ST	
Description: GRAY TO DARK GRAY VARVED FLY ASH	
Remarks: TEST PERFORMED AS PER ASTM D3080.	

DIRECT SHEAR TEST DATA

Project: DYNERGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 10 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	0.7191	0.05749	0	0
2	156.95	0.7199	0.06058	0.04248	0.009199
3	277.29	0.7199	0.06298	0.1019	0.0184
4	393.34	0.7199	0.06449	0.1405	0.0276
5	521.67	0.7199	0.06689	0.1795	0.03679
6	638.11	0.7191	0.06852	0.2096	0.04599
7	753.57	0.7199	0.07016	0.2362	0.05519
8	865.04	0.7199	0.07168	0.2577	0.06439
9	981.73	0.7199	0.07275	0.2764	0.07359
10	1096.66	0.7199	0.07502	0.2939	0.08279
11	1214.45	0.7199	0.07628	0.3104	0.09199
12	1328.38	0.7199	0.07678	0.3228	0.1012
13	1454.83	0.7199	0.07767	0.3353	0.1104
14	1573.59	0.7199	0.0793	0.3472	0.1196
15	1688.63	0.7199	0.08044	0.3596	0.1288
16	1817.30	0.7199	0.08094	0.3721	0.138
17	1955.96	0.7199	0.08183	0.3817	0.1472
18	2070.95	0.7199	0.08321	0.3902	0.1564
19	2203.51	0.7199	0.08473	0.3965	0.1656
20	2323.62	0.7199	0.08485	0.4072	0.1748
21	2452.80	0.7199	0.08599	0.4191	0.184
22	2580.16	0.7199	0.08731	0.431	0.1932
23	2700.75	0.7199	0.08813	0.4401	0.2024
24	2823.89	0.7199	0.08933	0.4463	0.2116
25	2950.56	0.7199	0.09002	0.4486	0.2208
26	3070.17	0.7199	0.09027	0.4491	0.23
27	3194.72	0.7199	0.09078	0.4514	0.2392
28	3328.14	0.7199	0.09217	0.4588	0.2483
29	3443.95	0.7191	0.09292	0.4655	0.2575
30	3554.17	0.7191	0.09343	0.4695	0.2667
31	3678.32	0.7199	0.09393	0.4701	0.2759
32	3812.79	0.7199	0.09443	0.4678	0.2851
33	3932.15	0.7199	0.09475	0.4633	0.2943
34	4054.51	0.7199	0.09576	0.4571	0.3035
35	4102.88	0.7199	0.09601	0.4548	0.3078

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.08377	0	0
2	33.66	1.439	0.08551	0.2598	0.007876
3	62.53	1.439	0.08828	0.3842	0.01575
4	94.03	1.439	0.09063	0.4817	0.02363
5	123.61	1.439	0.09391	0.5451	0.0315
6	153.40	1.439	0.09565	0.5982	0.03938
7	184.06	1.439	0.09749	0.644	0.04725
8	213.02	1.439	0.09903	0.6793	0.05513
9	241.92	1.439	0.09985	0.7094	0.06301
10	271.68	1.439	0.101	0.7362	0.07088
11	302.17	1.439	0.1033	0.7611	0.07876
12	330.34	1.439	0.1047	0.7781	0.08663
13	360.65	1.439	0.1073	0.7886	0.09451
14	392.06	1.439	0.1082	0.8089	0.1024
15	421.40	1.439	0.1095	0.818	0.1103
16	448.87	1.439	0.1113	0.8259	0.1181
17	477.79	1.439	0.1125	0.8351	0.126
18	506.84	1.439	0.1134	0.8495	0.1339
19	537.40	1.439	0.1148	0.8632	0.1418
20	593.97	1.439	0.1167	0.8652	0.1575
21	623.57	1.439	0.1179	0.8429	0.1654
22	655.08	1.439	0.1184	0.8423	0.1733
23	684.47	1.439	0.1188	0.8481	0.1811
24	712.80	1.439	0.1195	0.8521	0.189
25	740.02	1.439	0.1199	0.8573	0.1969
26	771.65	1.439	0.1208	0.8567	0.2048
27	801.16	1.439	0.121	0.858	0.2126
28	830.38	1.439	0.1215	0.8625	0.2205
29	861.82	1.439	0.1222	0.8645	0.2284
30	891.86	1.439	0.1228	0.8665	0.2362
31	920.33	1.439	0.1234	0.8678	0.2441
32	947.61	1.439	0.124	0.8645	0.252
33	978.79	1.439	0.1249	0.8645	0.2599
34	1008.02	1.439	0.1256	0.8645	0.2677
35	1036.49	1.439	0.1257	0.8625	0.2756
36	1067.92	1.439	0.1262	0.8652	0.2835
37	1095.86	1.439	0.1267	0.8652	0.2914
38	1124.42	1.439	0.1273	0.8691	0.2992
39	1152.92	1.439	0.1277	0.8704	0.3071
40	1181.69	1.439	0.128	0.875	0.315
41	1207.99	1.439	0.1287	0.8737	0.322

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1292	0	0
2	34.66	2.879	0.1336	0.3516	0.007876
3	65.95	2.879	0.1374	0.4772	0.01575
4	98.49	2.879	0.1406	0.5912	0.02363
5	128.04	2.879	0.1442	0.6779	0.0315
6	157.00	2.879	0.1474	0.7496	0.03938
7	188.14	2.88	0.1504	0.8151	0.04725
8	217.44	2.88	0.1529	0.8772	0.05513
9	247.88	2.879	0.1551	0.9339	0.06301
10	276.45	2.879	0.1577	0.9701	0.07088
11	306.20	2.879	0.1601	1.017	0.07876
12	336.36	2.879	0.162	1.06	0.08663
13	366.50	2.879	0.1648	1.096	0.09451
14	397.75	2.879	0.1667	1.135	0.1024
15	427.67	2.88	0.169	1.161	0.1103
16	455.53	2.88	0.171	1.197	0.1181
17	485.04	2.879	0.1726	1.234	0.126
18	515.15	2.879	0.1753	1.262	0.1339
19	546.34	2.879	0.1769	1.285	0.1418
20	576.29	2.879	0.1782	1.317	0.1496
21	605.44	2.879	0.1806	1.346	0.1575
22	631.71	2.879	0.1819	1.367	0.1654
23	663.92	2.879	0.1834	1.395	0.1733
24	693.09	2.879	0.1851	1.423	0.1811
25	722.31	2.879	0.1865	1.447	0.189
26	753.49	2.88	0.1881	1.472	0.1969
27	783.68	2.879	0.1898	1.494	0.2048
28	812.56	2.879	0.1911	1.515	0.2126
29	840.21	2.879	0.1916	1.537	0.2205
30	873.07	2.879	0.1927	1.556	0.2284
31	901.78	2.88	0.194	1.57	0.2362
32	929.62	2.88	0.1952	1.589	0.2441
33	960.88	2.88	0.1967	1.608	0.252
34	990.19	2.88	0.1979	1.625	0.2599
35	1019.61	2.88	0.1986	1.632	0.2677
36	1048.80	2.879	0.1999	1.647	0.2756
37	1076.60	2.88	0.2013	1.668	0.2835
38	1109.68	2.88	0.2026	1.67	0.2914
39	1138.55	2.88	0.2036	1.681	0.2992
40	1167.91	2.879	0.2044	1.694	0.3071
41	1190.59	2.88	0.2054	1.704	0.3133

DIRECT SHEAR TEST REPORT

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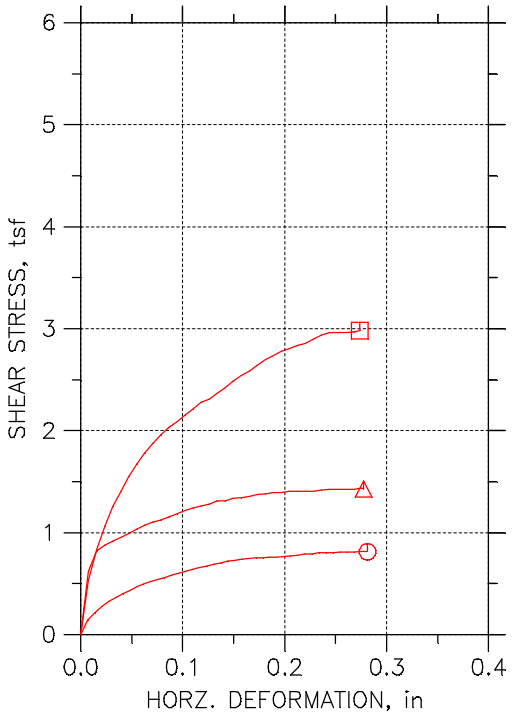

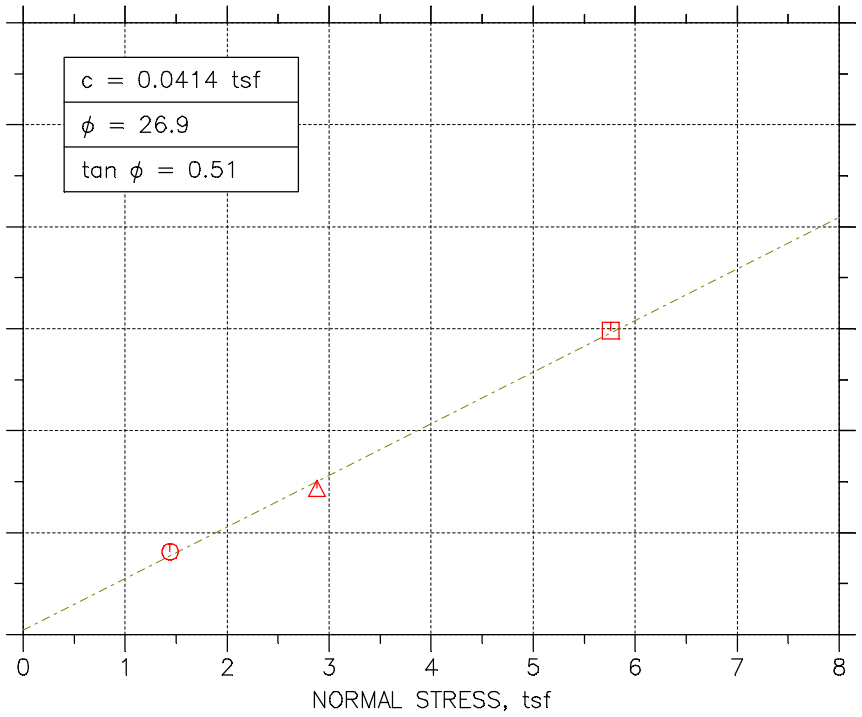

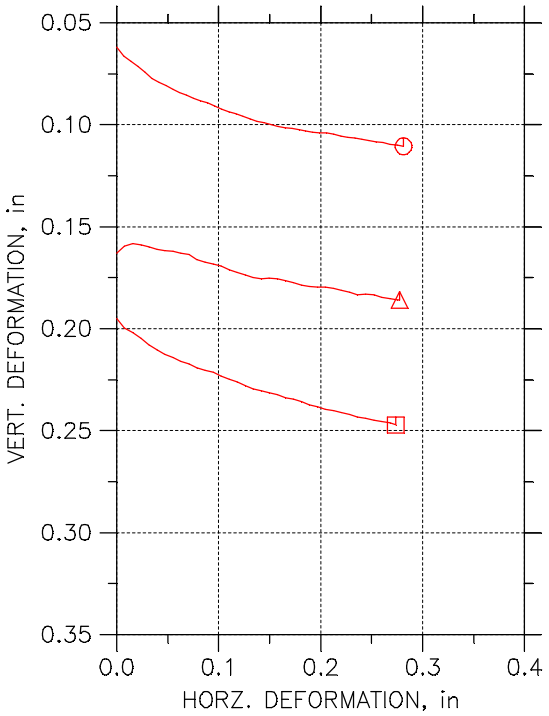

Symbol		○	△	□	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-9	S-9	S-9	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5035	2.4988	2.4921	
	Area, in^2	4.9227	4.9041	4.8779	
	Height, in	1.0067	0.98937	0.99213	
	Water Content, %	71.70	70.21	69.53	
	Dry Density, pcf	53.119	54.563	54.248	
	Saturation, %	96.83	98.97	97.11	
	Void Ratio	1.7031	1.6315	1.6468	
Consol. Height, in		0.95172	0.83719	0.8042	
Consol. Void Ratio		1.5555	1.2268	1.1454	
Final	Water Content, %	60.80	49.80	42.70	
	Dry Density, pcf	59.677	67.193	72.249	
	Saturation, %	99.46	100.75	99.47	
	Void Ratio	1.406	1.1369	0.98736	
Normal Stress, tsf		1.4396	2.8798	5.7593	
Max. Shear Stress, tsf		0.81396	1.4353	2.9807	
Ult. Shear Stress, tsf		0.81396	1.4289	2.9807	
Time to Failure, min		1202.3	4163.3	1353.2	
Disp. Rate, in/min		0.000267	6.69e-005	0.000207	
Estimated Specific Gravity		2.30	2.30	2.30	
Liquid Limit		NP	NP	NP	
Plastic Limit		NP	NP	NP	
Plasticity Index		NP	NP	NP	

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-B003 S9
Sample Type: 3.0" ST

Description: VERY DARK GRAY VARVED FLY ASH

Remarks: TEST PERFORMED AS PER ASTM D3080

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.06197	0	0
2	29.97	1.439	0.06626	0.1471	0.006868
3	57.78	1.439	0.06903	0.2144	0.01374
4	88.56	1.439	0.07142	0.2734	0.0206
5	120.00	1.439	0.0742	0.3261	0.02747
6	147.42	1.439	0.07741	0.3658	0.03434
7	177.07	1.44	0.07918	0.4002	0.04121
8	208.08	1.439	0.08094	0.4362	0.04807
9	237.87	1.439	0.08258	0.468	0.05494
10	268.15	1.44	0.08422	0.4952	0.06181
11	297.24	1.44	0.08555	0.5181	0.06868
12	327.37	1.439	0.08693	0.5374	0.07555
13	354.52	1.44	0.08832	0.5599	0.08241
14	388.81	1.439	0.08933	0.5859	0.08928
15	414.34	1.439	0.0909	0.6053	0.09615
16	443.05	1.44	0.09235	0.6214	0.103
17	475.44	1.44	0.09362	0.6428	0.1099
18	503.04	1.439	0.09456	0.6569	0.1168
19	531.73	1.44	0.09576	0.672	0.1236
20	563.76	1.44	0.09708	0.6908	0.1305
21	590.20	1.44	0.09841	0.7049	0.1374
22	620.48	1.439	0.09897	0.719	0.1442
23	648.48	1.44	0.09992	0.7268	0.1511
24	679.58	1.44	0.1007	0.7399	0.158
25	707.75	1.44	0.1014	0.7493	0.1648
26	736.66	1.44	0.1019	0.7503	0.1717
27	766.24	1.44	0.1026	0.754	0.1786
28	796.15	1.44	0.1031	0.7592	0.1854
29	823.23	1.439	0.1038	0.7618	0.1923
30	851.40	1.44	0.104	0.767	0.1991
31	883.03	1.44	0.1041	0.7727	0.206
32	911.21	1.44	0.1047	0.7764	0.2129
33	944.16	1.44	0.1056	0.7879	0.2197
34	971.55	1.44	0.1061	0.7936	0.2266
35	1000.34	1.44	0.1065	0.802	0.2335
36	1031.20	1.44	0.1073	0.803	0.2403
37	1059.90	1.439	0.1079	0.8067	0.2472
38	1088.96	1.44	0.1084	0.8113	0.2541
39	1119.26	1.44	0.1087	0.8108	0.2609
40	1145.99	1.44	0.1097	0.8098	0.2678
41	1177.16	1.44	0.1101	0.814	0.2747
42	1202.27	1.44	0.1106	0.814	0.2812

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	4.541	0.1631	0	0
2	165.26	2.88	0.1594	0.623	0.007876
3	285.62	2.88	0.1584	0.8242	0.01575
4	408.00	2.88	0.1589	0.8772	0.02363
5	528.28	2.88	0.1597	0.9172	0.0315
6	644.59	2.88	0.161	0.9573	0.03938
7	763.78	2.88	0.1618	0.994	0.04725
8	884.32	2.88	0.1622	1.033	0.05513
9	993.76	2.88	0.163	1.072	0.06301
10	1117.20	2.88	0.1637	1.102	0.07088
11	1235.24	2.88	0.166	1.124	0.07876
12	1344.93	2.88	0.1672	1.154	0.08663
13	1464.24	2.88	0.1684	1.183	0.09451
14	1587.75	2.88	0.1694	1.219	0.1024
15	1704.16	2.879	0.171	1.241	0.1103
16	1806.00	2.879	0.1724	1.26	0.1181
17	1919.53	2.88	0.1737	1.281	0.126
18	2040.50	2.88	0.1748	1.31	0.1339
19	2161.06	2.88	0.1757	1.312	0.1418
20	2270.85	2.88	0.1753	1.338	0.1496
21	2391.12	2.88	0.1755	1.346	0.1575
22	2509.07	2.88	0.1764	1.356	0.1654
23	2633.81	2.88	0.1773	1.373	0.1733
24	2755.77	2.88	0.1787	1.382	0.1811
25	2871.20	2.88	0.1792	1.392	0.189
26	2977.15	2.88	0.1795	1.392	0.1969
27	3107.25	2.88	0.1796	1.405	0.2048
28	3223.67	2.88	0.1804	1.408	0.2126
29	3336.47	2.88	0.1812	1.406	0.2205
30	3458.59	2.88	0.1821	1.403	0.2284
31	3580.72	2.88	0.1833	1.418	0.2362
32	3695.22	2.879	0.1829	1.425	0.2441
33	3803.01	2.88	0.1834	1.426	0.252
34	3924.20	2.88	0.1847	1.426	0.2599
35	4048.11	2.88	0.1853	1.428	0.2677
36	4163.33	2.88	0.1858	1.435	0.2756
37	4182.96	2.88	0.186	1.429	0.2775

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.195	0	0
2	58.95	5.759	0.1996	0.5335	0.007876
3	100.20	5.759	0.2019	0.8357	0.01575
4	140.38	5.759	0.2048	1.069	0.02363
5	178.98	5.759	0.2079	1.257	0.0315
6	214.75	5.759	0.2102	1.405	0.03938
7	256.36	5.759	0.2126	1.554	0.04725
8	295.19	5.759	0.2142	1.68	0.05513
9	332.54	5.759	0.216	1.784	0.06301
10	373.08	5.759	0.2174	1.879	0.07088
11	411.52	5.759	0.219	1.962	0.07876
12	450.22	5.759	0.2203	2.034	0.08663
13	487.04	5.759	0.2214	2.089	0.09451
14	524.30	5.759	0.2232	2.152	0.1024
15	562.81	5.759	0.2247	2.215	0.1103
16	600.83	5.759	0.2262	2.277	0.1181
17	638.96	5.759	0.2278	2.314	0.126
18	681.52	5.759	0.2295	2.365	0.1339
19	716.24	5.759	0.2303	2.426	0.1418
20	755.33	5.76	0.2315	2.489	0.1496
21	791.66	5.759	0.2324	2.542	0.1575
22	830.85	5.759	0.2338	2.587	0.1654
23	870.20	5.759	0.2346	2.643	0.1733
24	908.45	5.759	0.2356	2.697	0.1811
25	944.85	5.759	0.2372	2.738	0.189
26	983.52	5.759	0.2383	2.779	0.1969
27	1022.76	5.759	0.2395	2.809	0.2048
28	1059.45	5.759	0.2401	2.838	0.2126
29	1096.13	5.759	0.2411	2.858	0.2205
30	1136.62	5.759	0.2421	2.903	0.2284
31	1174.43	5.759	0.2433	2.936	0.2362
32	1210.69	5.759	0.244	2.961	0.2441
33	1248.49	5.759	0.2448	2.964	0.252
34	1288.45	5.759	0.2456	2.966	0.2599
35	1323.77	5.759	0.2462	2.967	0.2677
36	1353.20	5.759	0.2472	2.982	0.2737

DIRECT SHEAR TEST REPORT

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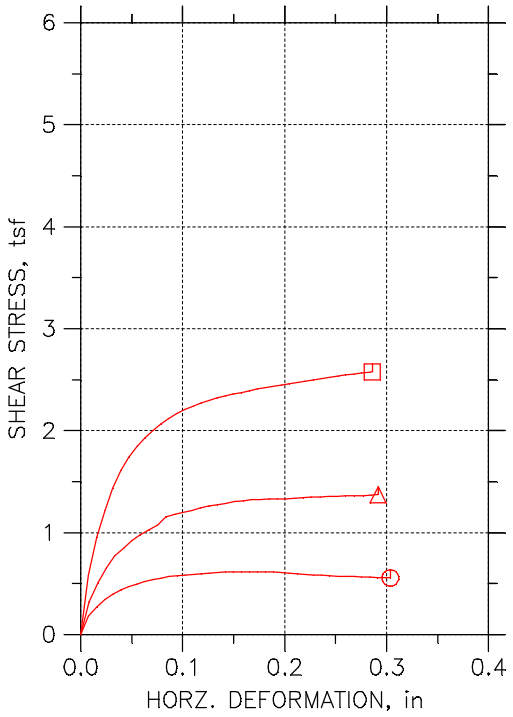

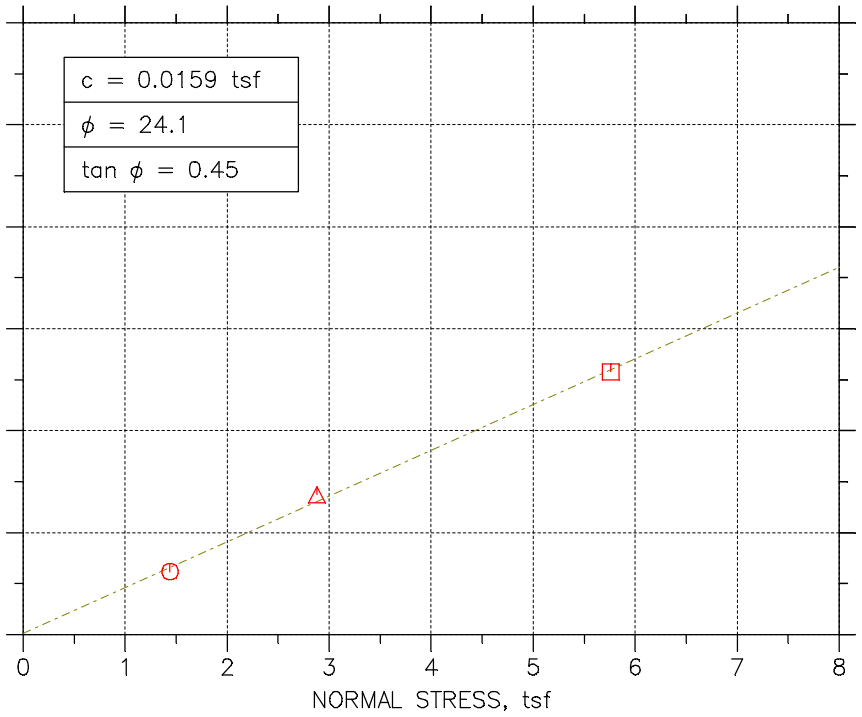

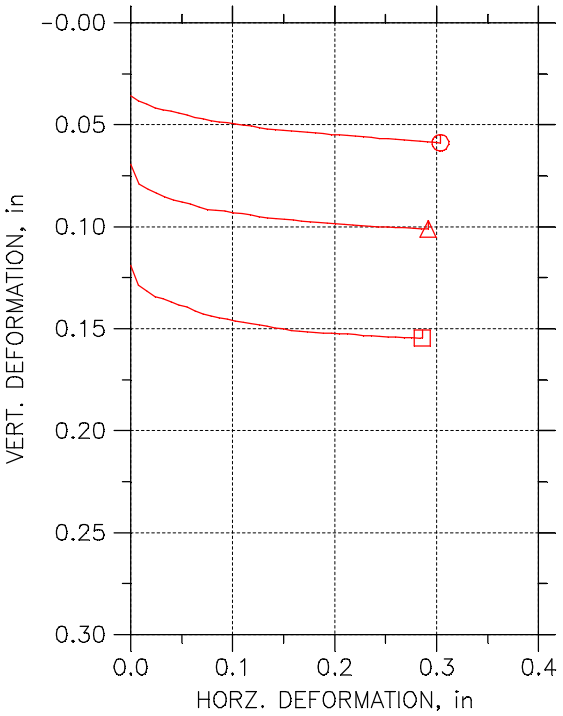

Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-10	S-10	S-10	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.4921	2.4996	2.4976	
	Area, in^2	4.8779	4.9072	4.8995	
	Height, in	0.99606	0.98583	0.98858	
	Water Content, %	29.91	28.99	29.10	
	Dry Density, pcf	90.515	92.188	91.834	
	Saturation, %	92.88	93.65	93.21	
	Void Ratio	0.87597	0.84192	0.84903	
Consol. Height, in		0.96227	0.91945	0.88312	
Consol. Void Ratio		0.81233	0.71789	0.65176	
Final	Water Content, %	28.10	23.40	19.70	
	Dry Density, pcf	96.208	102.73	108.85	
	Saturation, %	99.92	97.47	95.68	
	Void Ratio	0.76496	0.653	0.56003	
Normal Stress, tsf		1.4392	2.8795	5.7594	
Max. Shear Stress, tsf		0.61821	1.3715	2.5767	
Ult. Shear Stress, tsf		0.55697	1.3715	2.5767	
Time to Failure, min		793.54	1341	1400	
Disp. Rate, in/min		0.000207	0.000207	0.000207	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		40	40	40	
Plastic Limit		15	15	15	
Plasticity Index		25	25	25	

Project: DYNERGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW010 S10	
Sample Type: 3.0" ST	
Description: BLUISH GRAY LEAN CLAY CL	
Remarks: TEST PERFORMED AS PER ASTM D3080	

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DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.03587	0	0
2	39.39	1.439	0.03845	0.185	0.007876
3	76.42	1.439	0.0399	0.2733	0.01575
4	116.70	1.439	0.04167	0.343	0.02363
5	155.57	1.439	0.04274	0.3971	0.0315
6	194.59	1.439	0.04325	0.439	0.03938
7	231.17	1.439	0.04419	0.4699	0.04725
8	266.54	1.439	0.04514	0.4951	0.05513
9	305.27	1.439	0.0464	0.5183	0.06301
10	340.94	1.439	0.04709	0.537	0.07088
11	379.25	1.439	0.04797	0.555	0.07876
12	423.04	1.439	0.04873	0.5699	0.08663
13	457.67	1.439	0.04905	0.5782	0.09451
14	495.80	1.439	0.04968	0.586	0.1024
15	531.98	1.439	0.05012	0.5924	0.1103
16	571.20	1.439	0.05068	0.5989	0.1181
17	608.83	1.439	0.0515	0.604	0.126
18	647.29	1.439	0.05207	0.6079	0.1339
19	683.43	1.438	0.05239	0.6124	0.1418
20	721.04	1.438	0.0527	0.615	0.1496
21	758.83	1.439	0.05295	0.6169	0.1575
22	793.54	1.439	0.05327	0.6182	0.1654
23	830.97	1.439	0.05365	0.6176	0.1733
24	869.12	1.439	0.05396	0.615	0.1811
25	906.41	1.439	0.0544	0.6124	0.189
26	945.26	1.439	0.05491	0.6073	0.1969
27	982.69	1.439	0.0551	0.6021	0.2048
28	1020.06	1.439	0.05529	0.5957	0.2126
29	1059.90	1.439	0.0556	0.5905	0.2205
30	1095.28	1.439	0.05585	0.586	0.2284
31	1131.23	1.439	0.05617	0.5821	0.2362
32	1169.64	1.439	0.05674	0.5776	0.2441
33	1209.10	1.439	0.05699	0.5731	0.252
34	1244.59	1.439	0.0573	0.5718	0.2599
35	1283.36	1.439	0.05762	0.5705	0.2677
36	1319.90	1.439	0.05775	0.5679	0.2756
37	1357.90	1.439	0.05806	0.5641	0.2835
38	1393.69	1.438	0.05838	0.5615	0.2914
39	1434.20	1.44	0.05875	0.5589	0.2992
40	1455.26	1.439	0.05894	0.557	0.3036

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.06953	0	0
2	66.92	2.879	0.07899	0.3222	0.00838
3	104.04	2.88	0.0817	0.5099	0.01676
4	142.82	2.879	0.08347	0.6542	0.02514
5	185.18	2.88	0.08542	0.7741	0.03352
6	219.73	2.88	0.08681	0.8505	0.0419
7	257.69	2.88	0.08794	0.9202	0.05028
8	298.10	2.88	0.08882	0.982	0.05866
9	333.83	2.88	0.09046	1.029	0.06704
10	369.75	2.88	0.0916	1.072	0.07542
11	413.04	2.88	0.09204	1.152	0.0838
12	445.97	2.88	0.09229	1.18	0.09218
13	485.62	2.88	0.09317	1.197	0.1006
14	521.13	2.88	0.09368	1.22	0.1089
15	559.14	2.88	0.09418	1.241	0.1173
16	595.57	2.879	0.095	1.261	0.1257
17	634.46	2.88	0.09563	1.272	0.1341
18	671.61	2.88	0.0962	1.289	0.1425
19	707.68	2.88	0.09645	1.303	0.1508
20	746.34	2.88	0.0967	1.312	0.1592
21	785.27	2.879	0.09727	1.321	0.1676
22	821.12	2.88	0.09778	1.327	0.176
23	858.67	2.88	0.09796	1.33	0.1844
24	895.38	2.88	0.09834	1.334	0.1927
25	934.75	2.88	0.09866	1.333	0.2011
26	971.24	2.88	0.09891	1.337	0.2095
27	1007.72	2.88	0.09916	1.342	0.2179
28	1045.96	2.88	0.09941	1.346	0.2262
29	1084.53	2.88	0.09992	1.351	0.2346
30	1120.37	2.88	0.1001	1.354	0.243
31	1156.63	2.88	0.1002	1.357	0.2513
32	1197.77	2.88	0.1003	1.36	0.2597
33	1233.68	2.88	0.1004	1.362	0.2681
34	1272.09	2.88	0.1006	1.364	0.2765
35	1311.64	2.88	0.1009	1.369	0.2849
36	1340.99	2.88	0.1011	1.371	0.2916

DIRECT SHEAR TEST DATA

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Project: DYNERGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.1189	0	0
2	53.81	5.759	0.1286	0.586	0.007876
3	93.90	5.759	0.1315	0.9544	0.01575
4	132.06	5.759	0.1342	1.218	0.02363
5	171.21	5.759	0.1354	1.435	0.0315
6	211.15	5.759	0.1367	1.61	0.03938
7	250.46	5.759	0.1385	1.74	0.04725
8	288.21	5.759	0.1395	1.844	0.05513
9	324.71	5.759	0.1411	1.926	0.06301
10	364.16	5.759	0.1428	2.004	0.07088
11	401.96	5.759	0.1437	2.067	0.07876
12	438.83	5.759	0.1446	2.119	0.08663
13	478.24	5.759	0.1452	2.171	0.09451
14	515.94	5.759	0.1461	2.207	0.1024
15	554.42	5.759	0.1469	2.242	0.1103
16	590.30	5.759	0.1476	2.272	0.1181
17	626.52	5.759	0.1482	2.294	0.126
18	663.24	5.759	0.1488	2.321	0.1339
19	700.05	5.759	0.1496	2.34	0.1418
20	741.31	5.759	0.15	2.362	0.1496
21	780.69	5.759	0.1509	2.374	0.1575
22	817.38	5.759	0.1512	2.393	0.1654
23	854.69	5.759	0.1515	2.407	0.1733
24	892.50	5.759	0.1519	2.423	0.1811
25	930.62	5.759	0.1523	2.434	0.189
26	969.48	5.759	0.1523	2.444	0.1969
27	1008.12	5.759	0.1525	2.457	0.2048
28	1045.34	5.759	0.1527	2.471	0.2126
29	1083.92	5.759	0.1529	2.484	0.2205
30	1123.76	5.759	0.1533	2.499	0.2284
31	1160.12	5.759	0.1535	2.512	0.2362
32	1197.88	5.759	0.1537	2.526	0.2441
33	1240.24	5.759	0.1541	2.536	0.252
34	1277.15	5.759	0.1541	2.545	0.2599
35	1312.34	5.759	0.1543	2.556	0.2677
36	1351.46	5.759	0.1543	2.566	0.2756
37	1391.74	5.759	0.1546	2.576	0.2835
38	1399.98	5.759	0.1545	2.577	0.2859

DIRECT SHEAR TEST REPORT

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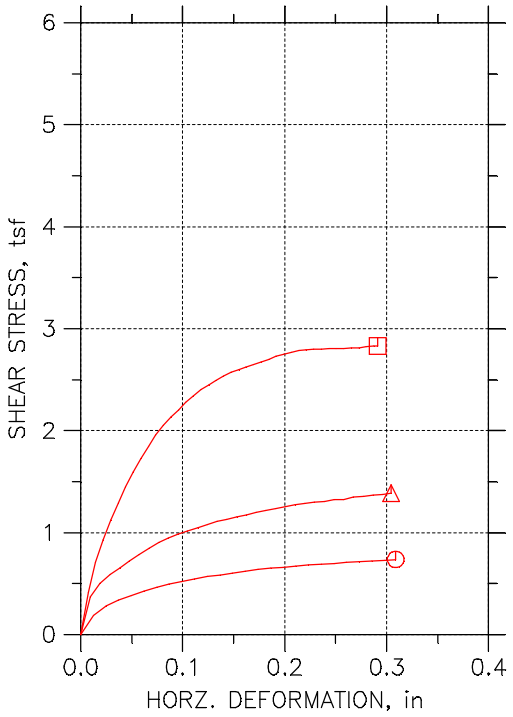

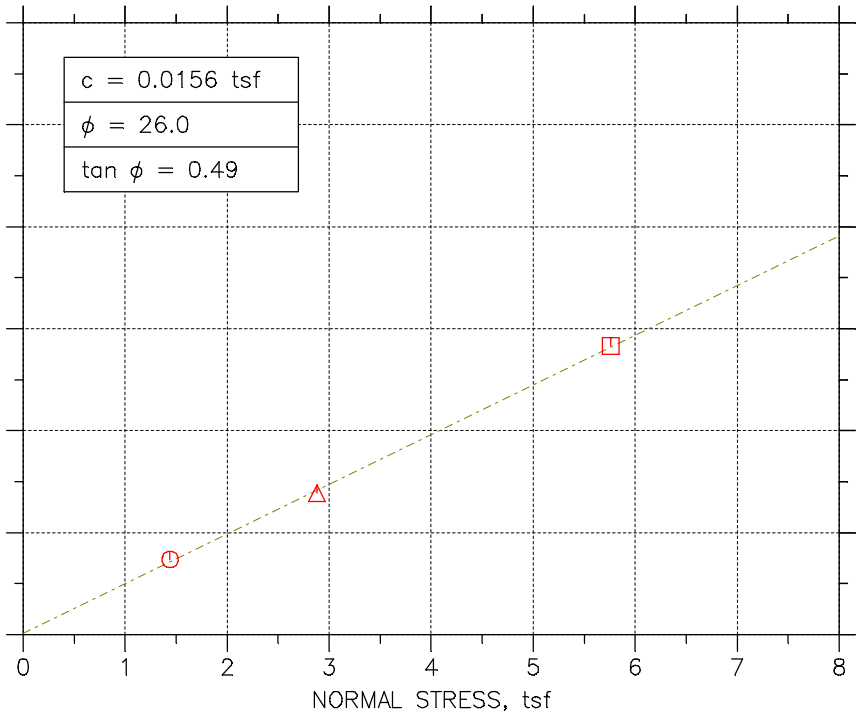

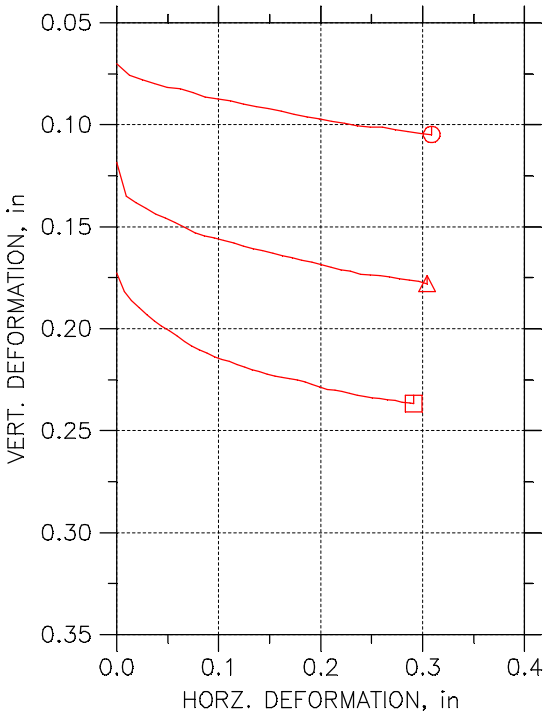

Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-14	S-14	S-14	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5087	2.5067	2.502	
	Area, in^2	4.9428	4.9351	4.9165	
	Height, in	0.99961	1.0098	0.99646	
	Water Content, %	50.80	50.19	50.11	
	Dry Density, pcf	69.233	69.813	69.282	
	Saturation, %	95.13	95.32	93.94	
	Void Ratio	1.4527	1.4323	1.4509	
Consol. Height, in		0.93203	0.8987	0.83564	
Consol. Void Ratio		1.2868	1.1646	1.0554	
Final	Water Content, %	44.10	36.30	31.60	
	Dry Density, pcf	77.344	84.748	90.862	
	Saturation, %	100.34	98.38	98.93	
	Void Ratio	1.1954	1.0036	0.86882	
Normal Stress, tsf		1.4393	2.8799	5.7593	
Max. Shear Stress, tsf		0.73733	1.3874	2.8312	
Ult. Shear Stress, tsf		0.73733	1.3874	2.8312	
Time to Failure, min		961	3164.9	1365.2	
Disp. Rate, in/min		0.000207	8.85e-005	0.000232	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		54	54	54	
Plastic Limit		20	20	20	
Plasticity Index		34	34	34	

Project: DYNERGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW012 S14	
Sample Type: 3.0" ST	
Description: DARK GRAY FAT CLAY CH SHELL NOTED	
Remarks: TEST PERFORMED AS PER ASTM D3080.	

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNERGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.07004	0	0
2	47.30	1.438	0.0759	0.1909	0.01241
3	86.02	1.439	0.07811	0.2818	0.02482
4	124.31	1.439	0.07994	0.3416	0.03724
5	160.06	1.438	0.08176	0.3855	0.04965
6	200.31	1.439	0.08246	0.4281	0.06206
7	238.78	1.438	0.08441	0.4644	0.07447
8	275.86	1.439	0.08649	0.4949	0.08688
9	314.97	1.439	0.08737	0.5229	0.09929
10	355.17	1.439	0.08832	0.5477	0.1117
11	393.92	1.439	0.08977	0.5706	0.1241
12	429.38	1.439	0.09128	0.5859	0.1365
13	468.43	1.439	0.09223	0.6056	0.1489
14	506.02	1.439	0.09336	0.6215	0.1614
15	542.62	1.439	0.09481	0.6381	0.1738
16	586.75	1.439	0.09614	0.6521	0.1862
17	618.29	1.439	0.09721	0.6616	0.1986
18	656.28	1.438	0.09828	0.6718	0.211
19	696.76	1.439	0.09935	0.682	0.2234
20	732.98	1.439	0.1005	0.6915	0.2358
21	769.67	1.439	0.1012	0.6998	0.2482
22	812.59	1.439	0.1013	0.7093	0.2606
23	848.00	1.439	0.1026	0.7151	0.2731
24	887.83	1.438	0.1033	0.724	0.2855
25	924.52	1.438	0.1043	0.731	0.2979
26	961.00	1.439	0.1048	0.7373	0.3088

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNERGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/7/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1185	0	0
2	372.53	2.88	0.1351	0.3735	0.009556
3	468.99	2.88	0.1381	0.5003	0.01911
4	564.01	2.88	0.141	0.5902	0.02867
5	651.75	2.88	0.144	0.656	0.03822
6	744.20	2.88	0.1459	0.7228	0.04778
7	835.68	2.879	0.1481	0.7865	0.05733
8	925.97	2.88	0.1505	0.8454	0.06689
9	1018.05	2.88	0.1529	0.9026	0.07645
10	1104.25	2.88	0.1545	0.9476	0.086
11	1195.15	2.88	0.1556	0.9882	0.09556
12	1289.11	2.88	0.1568	1.019	0.1051
13	1376.20	2.88	0.158	1.049	0.1147
14	1467.76	2.88	0.1596	1.082	0.1242
15	1560.82	2.88	0.1608	1.11	0.1338
16	1648.67	2.88	0.1618	1.132	0.1433
17	1734.35	2.88	0.1631	1.153	0.1529
18	1827.14	2.88	0.1642	1.177	0.1624
19	1925.93	2.88	0.1651	1.202	0.172
20	2006.92	2.88	0.1663	1.219	0.1816
21	2105.98	2.88	0.1673	1.236	0.1911
22	2191.37	2.88	0.1688	1.253	0.2007
23	2278.65	2.88	0.1698	1.274	0.2102
24	2368.36	2.88	0.1711	1.289	0.2198
25	2452.94	2.88	0.1719	1.301	0.2293
26	2544.63	2.88	0.1735	1.308	0.2389
27	2629.18	2.88	0.1737	1.323	0.2485
28	2720.25	2.88	0.1741	1.327	0.2579
29	2813.74	2.88	0.1747	1.347	0.2675
30	2902.90	2.88	0.1755	1.353	0.2771
31	2995.72	2.88	0.1763	1.367	0.2866
32	3085.70	2.879	0.177	1.376	0.2962
33	3164.86	2.88	0.178	1.387	0.3043

DIRECT SHEAR TEST DATA

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Consulting Engineers & Scientists

Project: DYNERGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/9/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.758	0.1729	0	0
2	39.55	5.758	0.1819	0.4139	0.007372
3	77.10	5.759	0.1863	0.7122	0.01474
4	112.99	5.759	0.1897	0.9304	0.02212
5	148.81	5.759	0.193	1.122	0.02949
6	184.76	5.759	0.1961	1.293	0.03686
7	219.25	5.759	0.1988	1.448	0.04423
8	256.03	5.759	0.2008	1.596	0.0516
9	290.21	5.759	0.2034	1.726	0.05897
10	325.35	5.759	0.2062	1.846	0.06635
11	362.78	5.759	0.2083	1.96	0.07372
12	397.12	5.759	0.2103	2.054	0.08109
13	429.34	5.759	0.2121	2.132	0.08846
14	462.52	5.759	0.2137	2.205	0.09583
15	499.06	5.759	0.215	2.279	0.1032
16	532.30	5.759	0.2162	2.34	0.1106
17	569.81	5.76	0.2177	2.403	0.1179
18	598.74	5.759	0.2187	2.447	0.1253
19	633.77	5.759	0.2199	2.494	0.1327
20	670.11	5.759	0.2209	2.537	0.1401
21	703.89	5.759	0.2224	2.574	0.1474
22	737.17	5.759	0.2233	2.6	0.1548
23	771.57	5.759	0.2238	2.622	0.1622
24	805.68	5.759	0.2246	2.647	0.1696
25	841.96	5.759	0.2251	2.675	0.1769
26	874.04	5.759	0.226	2.7	0.1843
27	910.30	5.759	0.2273	2.727	0.1917
28	942.84	5.759	0.2287	2.746	0.199
29	977.11	5.759	0.2297	2.769	0.2064
30	1011.86	5.759	0.2302	2.785	0.2137
31	1046.27	5.759	0.2307	2.794	0.2211
32	1078.57	5.759	0.2316	2.801	0.2285
33	1111.99	5.759	0.2326	2.8	0.2359
34	1147.40	5.759	0.2332	2.803	0.2432
35	1179.32	5.759	0.2338	2.804	0.2506
36	1216.60	5.759	0.2341	2.806	0.258
37	1246.79	5.759	0.2347	2.809	0.2653
38	1278.72	5.759	0.2353	2.814	0.2727
39	1316.44	5.759	0.236	2.823	0.2801
40	1349.92	5.759	0.2364	2.829	0.2875
41	1365.24	5.759	0.2367	2.831	0.2913

DIRECT SHEAR TEST REPORT

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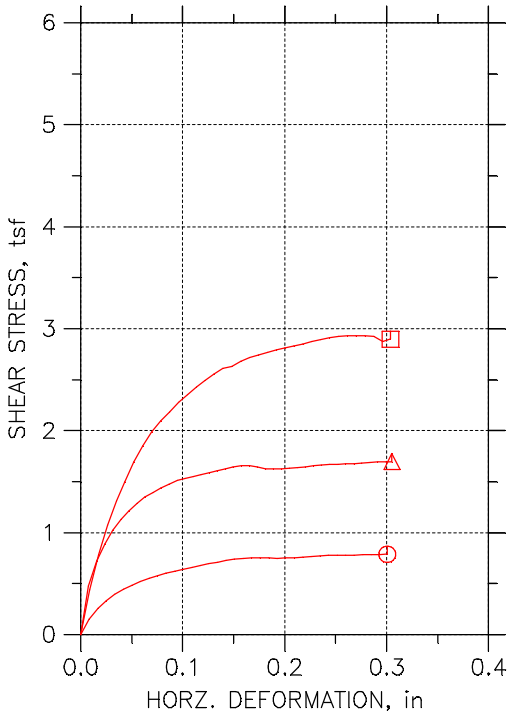

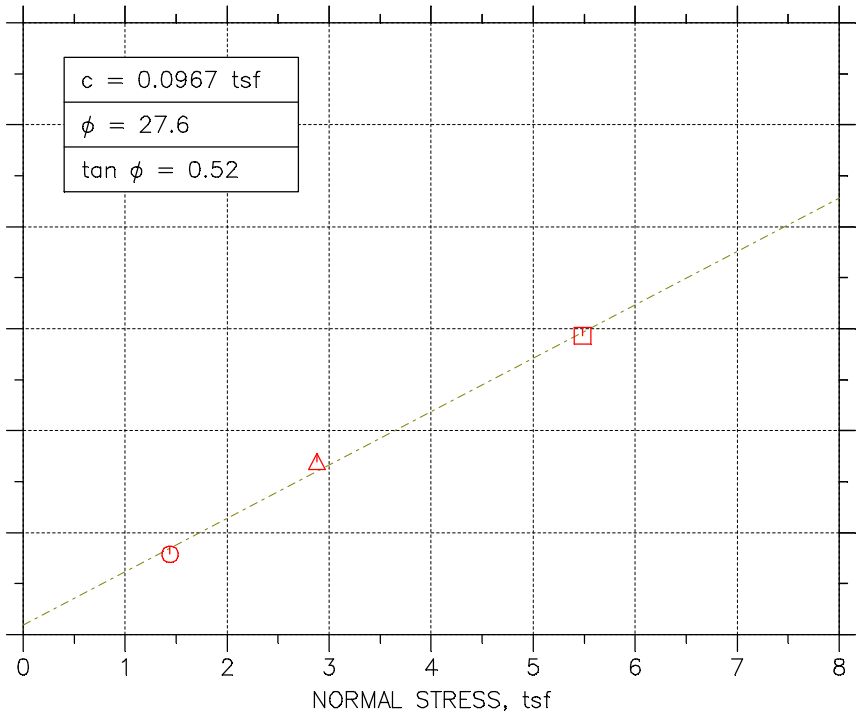

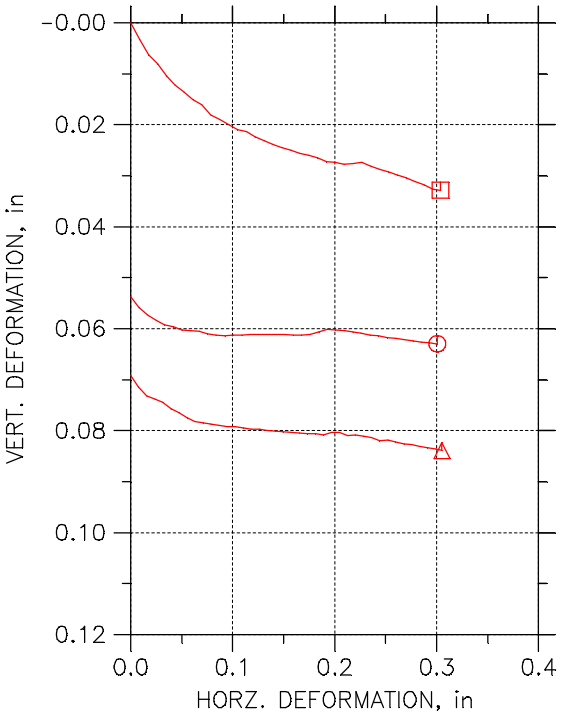

Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-10	S-10	S-10	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.498	2.5	2.5087	
	Area, in^2	4.901	4.9087	4.9431	
	Height, in	0.98898	0.99252	0.99606	
	Water Content, %	20.30	20.20	20.70	
	Dry Density, pcf	101.54	100.62	99.218	
	Saturation, %	85.50	83.10	82.20	
	Void Ratio	0.62921	0.64421	0.66738	
Consol. Height, in		0.94144	0.9279	0.99606	
Consol. Void Ratio		0.5509	0.53717	0.66738	
Final	Water Content, %	19.10	18.60	22.80	
	Dry Density, pcf	108.45	109.91	102.6	
	Saturation, %	96.32	97.56	98.66	
	Void Ratio	0.52546	0.50521	0.61241	
Normal Stress, tsf		1.4396	2.8794	5.4854	
Max. Shear Stress, tsf		0.78821	1.6963	2.9302	
Ult. Shear Stress, tsf		0.78821	1.6963	2.8965	
Time to Failure, min		1242.6	1357.2	1031.5	
Disp. Rate, in/min		0.000232	0.000232	0.000232	
Estimated Specific Gravity		2.65	2.65	2.65	
Liquid Limit		24	24	24	
Plastic Limit		13	13	13	
Plasticity Index		11	11	11	

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW015 S10
Sample Type: 3.0" ST
Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

DIRECT SHEAR TEST DATA

Project: DYNERGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.439	0.05371	0	0
2	53.95	1.44	0.05592	0.1498	0.00838
3	89.12	1.439	0.05743	0.2586	0.01676
4	121.56	1.439	0.05838	0.3313	0.02514
5	157.67	1.44	0.05919	0.3949	0.03352
6	194.41	1.44	0.05957	0.4472	0.0419
7	229.85	1.44	0.0602	0.4865	0.05028
8	262.66	1.44	0.06033	0.5204	0.05866
9	296.74	1.44	0.06052	0.5501	0.06704
10	331.66	1.44	0.06102	0.577	0.07542
11	364.35	1.44	0.06128	0.6007	0.0838
12	395.09	1.44	0.06134	0.6201	0.09218
13	431.13	1.44	0.06121	0.6417	0.1006
14	466.24	1.44	0.06121	0.6611	0.1089
15	499.12	1.44	0.06109	0.6772	0.1173
16	531.39	1.44	0.06109	0.6939	0.1257
17	565.38	1.44	0.06115	0.7106	0.1341
18	600.22	1.44	0.06115	0.7257	0.1425
19	633.76	1.44	0.06115	0.7381	0.1508
20	668.19	1.44	0.06121	0.7478	0.1592
21	702.22	1.44	0.06121	0.7543	0.1676
22	736.72	1.44	0.06115	0.7553	0.176
23	772.13	1.439	0.06058	0.7521	0.1844
24	804.93	1.44	0.06008	0.7494	0.1927
25	838.10	1.44	0.06027	0.751	0.2011
26	873.29	1.44	0.06033	0.7548	0.2095
27	907.96	1.44	0.06058	0.7613	0.2179
28	940.97	1.44	0.06083	0.7661	0.2262
29	974.96	1.44	0.06121	0.771	0.2346
30	1009.21	1.44	0.0614	0.7758	0.243
31	1042.51	1.44	0.06178	0.7769	0.2513
32	1073.94	1.439	0.06191	0.778	0.2597
33	1112.13	1.44	0.06216	0.7801	0.2681
34	1143.69	1.44	0.06241	0.7823	0.2765
35	1177.31	1.44	0.0626	0.785	0.2849
36	1213.76	1.44	0.06273	0.7861	0.2932
37	1242.60	1.44	0.06298	0.7882	0.3006

DIRECT SHEAR TEST DATA

Terracon
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Project: DYNERGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.887	0.06916	0	0
2	81.09	2.879	0.07142	0.4785	0.007876
3	117.60	2.879	0.07313	0.7219	0.01575
4	151.97	2.879	0.07376	0.8898	0.02363
5	186.66	2.879	0.07439	1.023	0.0315
6	221.15	2.879	0.07571	1.129	0.03938
7	253.83	2.879	0.07647	1.211	0.04725
8	289.37	2.879	0.07741	1.288	0.05513
9	323.30	2.879	0.07823	1.347	0.06301
10	356.53	2.879	0.07849	1.394	0.07088
11	391.02	2.879	0.07867	1.439	0.07876
12	424.56	2.879	0.07893	1.477	0.08663
13	459.98	2.879	0.07918	1.51	0.09451
14	492.86	2.879	0.07924	1.534	0.1024
15	523.80	2.879	0.07943	1.552	0.1103
16	556.72	2.879	0.07968	1.571	0.1181
17	588.93	2.879	0.07975	1.588	0.126
18	622.51	2.879	0.08	1.607	0.1339
19	657.43	2.879	0.08006	1.626	0.1418
20	692.69	2.879	0.08025	1.644	0.1496
21	724.45	2.879	0.08031	1.655	0.1575
22	759.66	2.879	0.08044	1.658	0.1654
23	791.34	2.88	0.08057	1.646	0.1733
24	825.40	2.879	0.08063	1.628	0.1811
25	858.43	2.879	0.08082	1.623	0.189
26	892.73	2.879	0.08031	1.623	0.1969
27	926.40	2.879	0.08038	1.63	0.2048
28	958.76	2.879	0.08101	1.635	0.2126
29	993.58	2.879	0.08088	1.643	0.2205
30	1027.07	2.879	0.08113	1.655	0.2284
31	1059.32	2.88	0.08132	1.662	0.2362
32	1094.50	2.879	0.08195	1.667	0.2441
33	1128.29	2.879	0.08189	1.671	0.252
34	1161.15	2.879	0.08227	1.676	0.2599
35	1194.98	2.879	0.08258	1.676	0.2677
36	1230.64	2.879	0.08271	1.684	0.2756
37	1263.56	2.879	0.08315	1.688	0.2835
38	1294.95	2.879	0.0834	1.693	0.2914
39	1331.25	2.879	0.08365	1.694	0.2992
40	1357.24	2.879	0.08391	1.696	0.3052

DIRECT SHEAR TEST DATA

Terracon Consulting Engineers & Scientists

Project: DYNERGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/12/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.485	0	0	0
2	36.40	5.485	0.003256	0.437	0.008716
3	71.32	5.485	0.006327	0.7826	0.01743
4	106.78	5.485	0.008001	1.076	0.02615
5	141.55	5.485	0.01042	1.313	0.03486
6	173.06	5.485	0.01219	1.499	0.04358
7	209.72	5.485	0.01358	1.693	0.05229
8	245.51	5.485	0.01507	1.854	0.06101
9	279.22	5.485	0.0161	1.987	0.06973
10	314.35	5.485	0.01805	2.098	0.07844
11	349.53	5.485	0.01898	2.187	0.08716
12	383.30	5.485	0.02	2.276	0.09587
13	415.59	5.485	0.02093	2.352	0.1046
14	449.70	5.485	0.0214	2.428	0.1133
15	485.17	5.485	0.02242	2.494	0.122
16	517.51	5.485	0.02317	2.551	0.1307
17	556.85	5.485	0.02382	2.612	0.1395
18	584.89	5.485	0.02447	2.627	0.1482
19	618.32	5.485	0.02503	2.678	0.1569
20	654.74	5.485	0.02568	2.719	0.1656
21	687.22	5.485	0.02596	2.742	0.1743
22	720.44	5.485	0.02652	2.766	0.183
23	755.56	5.485	0.02726	2.793	0.1917
24	788.89	5.485	0.02735	2.81	0.2005
25	823.96	5.485	0.02782	2.83	0.2092
26	856.37	5.485	0.02763	2.851	0.2179
27	893.08	5.485	0.02735	2.874	0.2266
28	925.58	5.485	0.02819	2.893	0.2353
29	960.00	5.485	0.02875	2.911	0.244
30	995.06	5.485	0.02931	2.924	0.2527
31	1031.53	5.485	0.02987	2.93	0.2614
32	1062.43	5.485	0.03042	2.929	0.2701
33	1097.75	5.486	0.03117	2.929	0.2789
34	1131.93	5.485	0.03182	2.926	0.2876
35	1165.06	5.485	0.03266	2.877	0.2963
36	1194.80	5.485	0.03284	2.897	0.3037

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNERGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO. EDW-B002

SAMPLE NO. S-5

DEPTH: 10.0'-12.0'

CLASSIFICATION GRAY TO DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	55.9	59.7
WATER CONTENT (%)	66.4	60.8
DIAMETER (cm)	7.218	7.030
LENGTH (cm)	8.678	8.558
HYDRAULIC GRADIENT (MAXIMUM)	10.87	
PERCENT SATURATION	100.0	

SAMPLE PHOTO

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 9.19E-05

Deaired water was used as the liquid permeant.

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNERGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B003
SAMPLE NO.	S-9
DEPTH:	30.0'-32.0'
CLASSIFICATION	VERY DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	53.2	59.3
WATER CONTENT (%)	71.2	61.7
DIAMETER (cm)	7.206	6.968
LENGTH (cm)	8.429	8.091
HYDRAULIC GRADIENT (MAXIMUM)	11.19	
PERCENT SATURATION	100.2	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	6.79E-05	

SAMPLE PHOTO

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNERGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B004
SAMPLE NO.	S-11
DEPTH:	36.0'-38.0'
CLASSIFICATION	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	111.1	113.9
WATER CONTENT (%)	19.3	18.0
DIAMETER (cm)	7.117	7.074
LENGTH (cm)	8.145	8.042

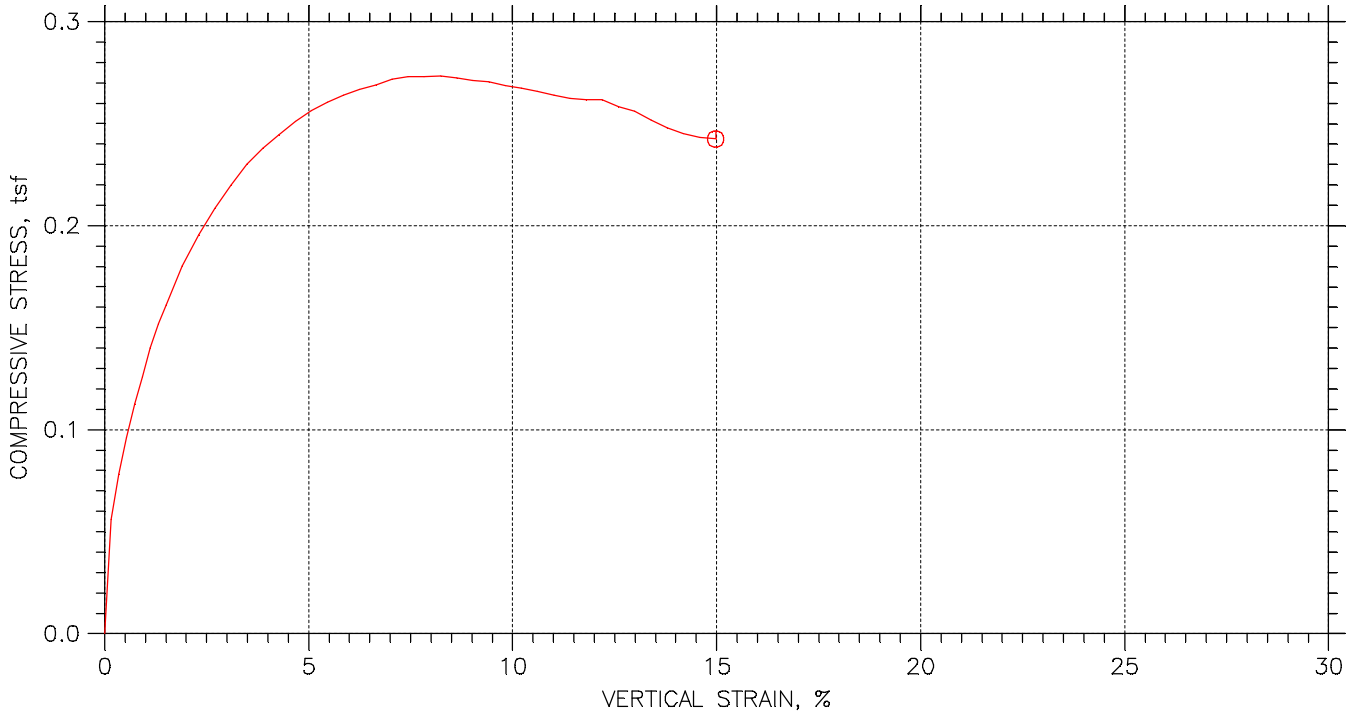
SAMPLE PHOTO

HYDRAULIC GRADIENT (MAXIMUM)	20.21	
PERCENT SATURATION	100.5	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	7.20E-07	

Deaired water was used as the liquid permeant.

UNCONFINED COMPRESSION TEST REPORT

Terracon
Consulting Engineers & Scientists



Symbol		⏲			
Test No.		EDW-002 S10			
Initial	Diameter, in	2.8118			
	Height, in	5.9587			
	Water Content, %	29.48			
	Dry Density, pcf	93.81			
	Saturation, %	98.98			
	Void Ratio	0.81002			
Unconfined Compressive Strength, tsf		0.27347			
Undrained Shear Strength, tsf		0.13673			
Time to Failure, min		10.5			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		36			
Plastic Limit		18			
Plasticity Index		18			
Failure Sketch					

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155199
Boring No.: EDW-002 S10
Sample Type: 3.0" ST
Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

UNCONFINED COMPRESSION TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-002 S10
Sample No.: S-10
Test No.: EDW-002 S10

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/17/15
Sample Type: 3.0" ST

Project No.: MR155199
Checked By: WPQ
Depth: 35.0'-37.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

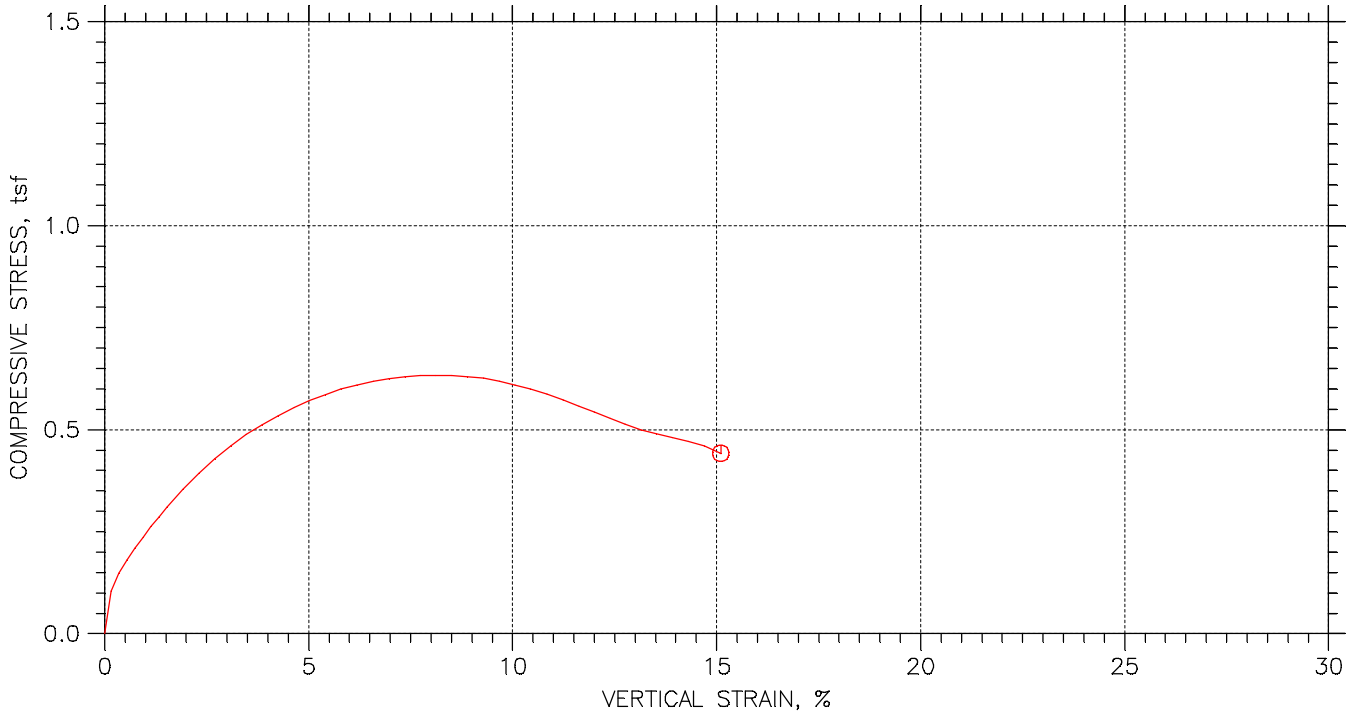
Specimen Height: 5.96 in
Specimen Area: 6.21 in^2
Specimen Volume: 37.00 in^3

Liquid Limit: 36
Plastic Limit: 18
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2096	0	0
2	0.25007	0.0091325	0.15326	4.8253	6.2191	0.055864	0.027932
3	0.50007	0.020663	0.34678	6.7659	6.2312	0.078179	0.039089
4	0.75007	0.032286	0.54184	8.3394	6.2434	0.096171	0.048086
5	1.0001	0.043725	0.73381	9.808	6.2555	0.11289	0.056444
6	1.2501	0.055348	0.92887	10.962	6.2678	0.12592	0.062961
7	1.5001	0.066879	1.1224	12.221	6.2801	0.14011	0.070054
8	1.7501	0.078318	1.3144	13.27	6.2923	0.15184	0.075919
9	2.0001	0.089941	1.5094	14.109	6.3047	0.16112	0.080561
10	2.5001	0.11346	1.9042	15.84	6.3301	0.18016	0.090082
11	3.0001	0.13708	2.3005	17.256	6.3558	0.19548	0.097739
12	3.5001	0.1606	2.6953	18.462	6.3816	0.2083	0.10415
13	4.0001	0.18413	3.09	19.564	6.4076	0.21983	0.10991
14	4.5001	0.20756	3.4833	20.56	6.4337	0.23009	0.11504
15	5.0001	0.23108	3.878	21.347	6.4601	0.23792	0.11896
16	5.5001	0.2546	4.2728	22.029	6.4867	0.24451	0.12225
17	6.0001	0.27822	4.6691	22.71	6.5137	0.25103	0.12552
18	6.5001	0.30183	5.0654	23.287	6.5409	0.25634	0.12817
19	7.0001	0.32536	5.4602	23.759	6.5682	0.26045	0.13022
20	7.5001	0.34897	5.8565	24.179	6.5959	0.26394	0.13197
21	8.0001	0.37249	6.2513	24.546	6.6236	0.26682	0.13341
22	8.5001	0.39602	6.6461	24.861	6.6517	0.2691	0.13455
23	9.0001	0.41972	7.0439	25.228	6.6801	0.27191	0.13596
24	9.5001	0.44343	7.4418	25.438	6.7088	0.273	0.1365
25	10	0.46686	7.835	25.543	6.7375	0.27296	0.13648
26	10.5	0.49039	8.2298	25.7	6.7664	0.27347	0.13673
27	11	0.51372	8.6215	25.7	6.7954	0.2723	0.13615
28	11.5	0.53734	9.0178	25.7	6.825	0.27112	0.13556
29	12	0.56114	9.4172	25.753	6.8551	0.27048	0.13524
30	12.5	0.58503	9.8182	25.7	6.8856	0.26873	0.13437
31	13	0.60874	10.216	25.7	6.9161	0.26755	0.13377
32	13.5	0.63235	10.612	25.648	6.9468	0.26582	0.13291
33	14	0.65588	11.007	25.595	6.9776	0.26411	0.13205
34	14.5	0.67912	11.397	25.543	7.0083	0.26241	0.13121
35	15	0.70274	11.794	25.595	7.0398	0.26178	0.13089
36	15.5	0.72654	12.193	25.7	7.0718	0.26166	0.13083
37	16	0.75043	12.594	25.49	7.1043	0.25834	0.12917
38	16.5	0.77414	12.992	25.385	7.1368	0.2561	0.12805
39	17	0.79784	13.39	25.071	7.1696	0.25177	0.12589
40	17.5	0.82155	13.788	24.808	7.2026	0.24799	0.124
41	18	0.84517	14.184	24.651	7.2359	0.24529	0.12264
42	18.5	0.86887	14.582	24.546	7.2696	0.24311	0.12156
43	19	0.8924	14.976	24.599	7.3034	0.2425	0.12125

UNCONFINED COMPRESSION TEST REPORT



Symbol		⏲			
Test No.		EDWB003S12			
Initial	Diameter, in	2.8343			
	Height, in	6.0811			
	Water Content, %	41.57			
	Dry Density, pcf	79.31			
	Saturation, %	99.09			
	Void Ratio	1.141			
Unconfined Compressive Strength, tsf		0.63249			
Undrained Shear Strength, tsf		0.31624			
Time to Failure, min		10.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		51			
Plastic Limit		17			
Plasticity Index		34			
Failure Sketch					

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-003 S12
Sample Type: 3.0" ST
Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

UNCONFINED COMPRESSION TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-003 S12
Sample No.: S-12
Test No.: EDWB003S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 45.0'-47.0'
Elevation: -----

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.08 in
Specimen Area: 6.31 in^2
Specimen Volume: 38.37 in^3

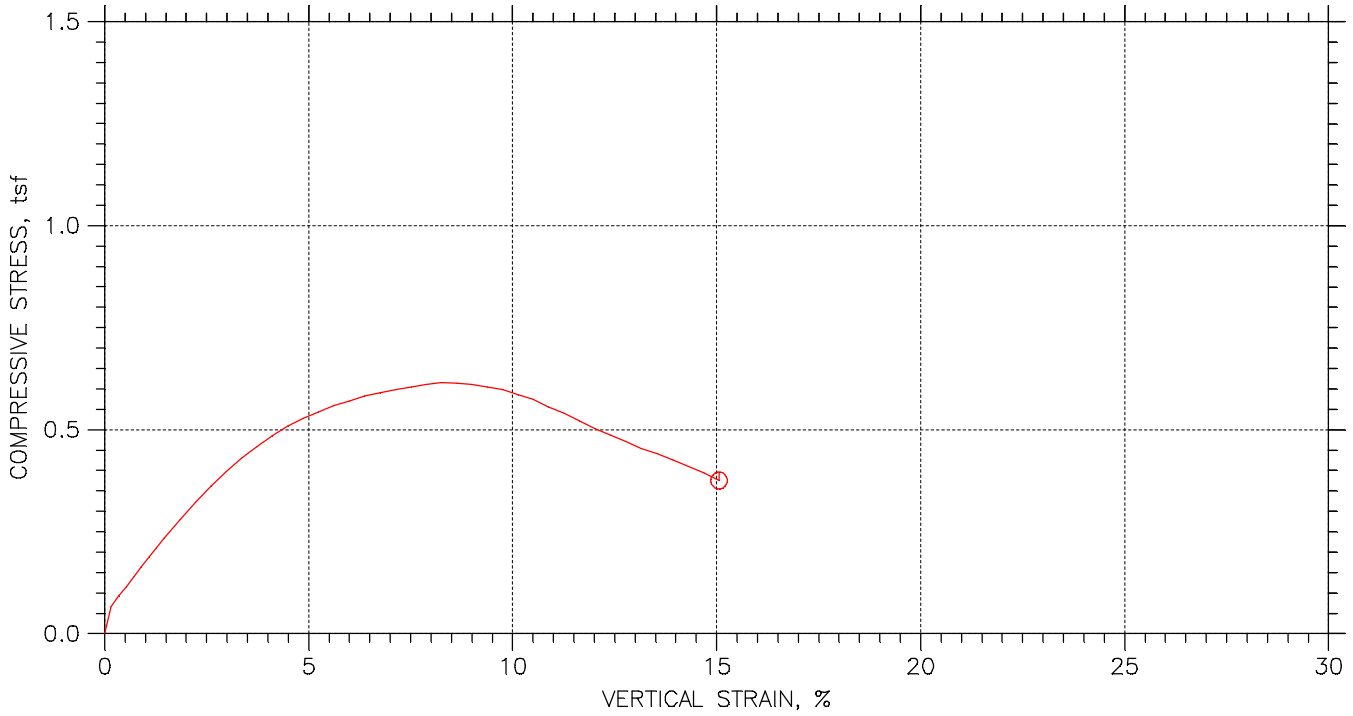
Liquid Limit: 51
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.3091	0	0
2	0.25402	0.0096859	0.15928	9.0737	6.3192	0.10339	0.051693
3	0.50402	0.021401	0.35193	13.007	6.3314	0.14792	0.07396
4	0.75402	0.033117	0.54458	15.945	6.3436	0.18097	0.090485
5	1.004	0.044924	0.73875	18.515	6.356	0.20973	0.10486
6	1.254	0.056824	0.93444	20.927	6.3686	0.23659	0.1183
7	1.504	0.068816	1.1316	23.235	6.3813	0.26216	0.13108
8	1.754	0.080808	1.3288	25.385	6.3941	0.28585	0.14293
9	2.004	0.092893	1.5276	27.536	6.407	0.30944	0.15472
10	2.504	0.11678	1.9205	31.522	6.4326	0.35282	0.17641
11	3.004	0.14058	2.3118	35.246	6.4584	0.39293	0.19646
12	3.504	0.1642	2.7002	38.55	6.4842	0.42806	0.21403
13	4.004	0.18754	3.084	41.592	6.5099	0.46002	0.23001
14	4.504	0.21115	3.4723	44.319	6.536	0.48822	0.24411
15	5.004	0.23505	3.8652	46.732	6.5628	0.5127	0.25635
16	5.504	0.25885	4.2565	48.935	6.5896	0.53468	0.26734
17	6.004	0.28246	4.6449	50.981	6.6164	0.55477	0.27739
18	6.504	0.30571	5.0272	52.764	6.643	0.57188	0.28594
19	7.004	0.32905	5.4109	54.285	6.67	0.58598	0.29299
20	7.504	0.35248	5.7962	55.753	6.6973	0.59938	0.29969
21	8.0041	0.37637	6.1891	56.96	6.7253	0.6098	0.3049
22	8.5041	0.40026	6.582	58.061	6.7536	0.61899	0.30949
23	9.0041	0.42388	6.9704	58.848	6.7818	0.62477	0.31238
24	9.5041	0.44721	7.3542	59.53	6.8099	0.6294	0.3147
25	10.004	0.47018	7.7319	60.054	6.8378	0.63235	0.31618
26	10.504	0.49343	8.1141	60.316	6.8662	0.63249	0.31624
27	11.004	0.51723	8.5055	60.526	6.8956	0.63198	0.31599
28	11.504	0.54121	8.8999	60.631	6.9255	0.63035	0.31517
29	12.004	0.56511	9.2928	60.474	6.9554	0.626	0.313
30	12.504	0.58835	9.6751	60.002	6.9849	0.6185	0.30925
31	13.004	0.61151	10.056	59.372	7.0145	0.60943	0.30471
32	13.504	0.63484	10.44	58.691	7.0445	0.59986	0.29993
33	14.004	0.65874	10.833	57.746	7.0756	0.58762	0.29381
34	14.504	0.68281	11.228	56.593	7.1071	0.57332	0.28666
35	15.004	0.70689	11.624	55.334	7.1389	0.55807	0.27904
36	15.504	0.73023	12.008	54.127	7.1701	0.54353	0.27177
37	16.004	0.7532	12.386	52.816	7.201	0.52809	0.26404
38	16.504	0.77598	12.761	51.505	7.2319	0.51278	0.25639
39	17.004	0.79904	13.14	50.456	7.2635	0.50015	0.25007
40	17.504	0.82266	13.528	49.669	7.2961	0.49015	0.24507
41	18.004	0.84637	13.918	48.987	7.3292	0.48124	0.24062
42	18.504	0.86998	14.306	48.201	7.3624	0.47138	0.23569
43	19.004	0.89341	14.692	47.257	7.3956	0.46007	0.23003
44	19.504	0.91666	15.074	45.736	7.4289	0.44326	0.22163
45	19.538	0.91823	15.1	45.631	7.4312	0.44211	0.22106

UNCONFINED COMPRESSION TEST REPORT

Terracon
Consulting Engineers & Scientists



Symbol		⏲			
Test No.		EDWB004S11			
Initial	Diameter, in	2.8217			
	Height, in	6.2535			
	Water Content, %	19.25			
	Dry Density, pcf	111.4			
	Saturation, %	99.83			
	Void Ratio	0.52451			
Unconfined Compressive Strength, tsf		0.61504			
Undrained Shear Strength, tsf		0.30752			
Time to Failure, min		11.004			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		35			
Plastic Limit		17			
Plasticity Index		18			
Failure Sketch					

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-004 S11
Sample Type: 3.0" ST
Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

UNCONFINED COMPRESSION TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-004 S11
Sample No.: S-11
Test No.: EDWB004S11

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 36.0'-38.0'
Elevation: -----

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Consulting Engineers & Scientists

Soil Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Specimen Height: 6.25 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.10 in^3

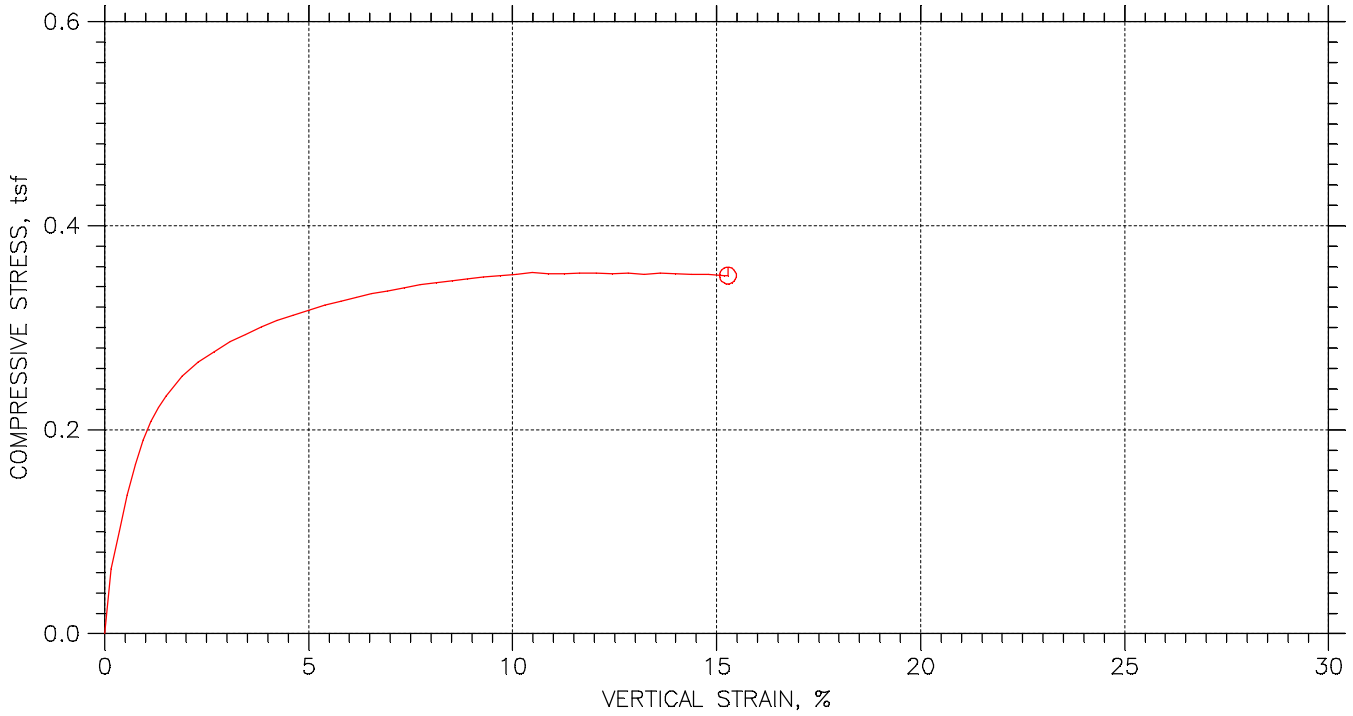
Liquid Limit: 35
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25398	0.0096859	0.15489	5.717	6.2628	0.065724	0.032862
3	0.50398	0.021494	0.3437	8.0772	6.2747	0.092683	0.046341
4	0.75398	0.033117	0.52957	10.07	6.2864	0.11534	0.057668
5	1.004	0.04474	0.71543	12.221	6.2982	0.1397	0.069852
6	1.254	0.056363	0.9013	14.319	6.31	0.16338	0.081691
7	1.504	0.068078	1.0886	16.469	6.322	0.18756	0.093782
8	1.754	0.079701	1.2745	18.567	6.3339	0.21106	0.10553
9	2.004	0.091601	1.4648	20.665	6.3461	0.23446	0.11723
10	2.504	0.1154	1.8454	24.808	6.3707	0.28038	0.14019
11	3.004	0.13929	2.2274	28.637	6.3956	0.32239	0.1612
12	3.504	0.16291	2.6051	32.256	6.4204	0.36173	0.18087
13	4.004	0.18652	2.9827	35.56	6.4454	0.39724	0.19862
14	4.504	0.20977	3.3544	38.707	6.4702	0.43074	0.21537
15	5.004	0.2332	3.7291	41.382	6.4953	0.45872	0.22936
16	5.504	0.257	4.1097	43.952	6.5211	0.48528	0.24264
17	6.004	0.2808	4.4903	46.313	6.5471	0.50931	0.25465
18	6.504	0.30442	4.8679	48.201	6.5731	0.52798	0.26399
19	7.004	0.32794	5.244	49.827	6.5992	0.54363	0.27182
20	7.504	0.35128	5.6172	51.4	6.6253	0.55859	0.27929
21	8.004	0.37462	5.9904	52.606	6.6516	0.56944	0.28472
22	8.504	0.39832	6.3696	53.97	6.6785	0.58184	0.29092
23	9.004	0.42221	6.7516	55.019	6.7059	0.59073	0.29537
24	9.504	0.44601	7.1322	55.911	6.7334	0.59785	0.29893
25	10.004	0.46945	7.5069	56.802	6.7606	0.60494	0.30247
26	10.504	0.4926	7.8771	57.537	6.7878	0.61031	0.30515
27	11.004	0.51594	8.2503	58.219	6.8154	0.61504	0.30752
28	11.504	0.53928	8.6235	58.323	6.8433	0.61364	0.30682
29	12.004	0.56298	9.0026	58.323	6.8718	0.61109	0.30555
30	12.504	0.58678	9.3832	58.009	6.9006	0.60525	0.30263
31	13.004	0.6104	9.7608	57.537	6.9295	0.59783	0.29891
32	13.504	0.63355	10.131	56.593	6.9581	0.5856	0.2928
33	14.004	0.65671	10.501	55.701	6.9868	0.574	0.287
34	14.504	0.68014	10.876	54.18	7.0162	0.55599	0.278
35	15.004	0.70394	11.257	52.869	7.0463	0.54022	0.27011
36	15.504	0.72783	11.639	51.295	7.0768	0.52188	0.26094
37	16.004	0.75163	12.019	49.669	7.1074	0.50317	0.25158
38	16.504	0.77515	12.395	48.306	7.1379	0.48726	0.24363
39	17.004	0.79867	12.772	46.889	7.1687	0.47094	0.23547
40	17.504	0.82229	13.149	45.368	7.1998	0.45369	0.22685
41	18.004	0.84655	13.537	44.319	7.2322	0.44122	0.22061
42	18.504	0.87081	13.925	43.008	7.2648	0.42625	0.21312
43	19.004	0.89489	14.31	41.592	7.2974	0.41037	0.20519
44	19.504	0.91832	14.685	40.071	7.3294	0.39363	0.19682
45	20.004	0.94157	15.057	38.393	7.3615	0.3755	0.18775

UNCONFINED COMPRESSION TEST REPORT

Terracon
Consulting Engineers & Scientists



Symbol		⏲			
Test No.		EDWB008S5			
Initial	Diameter, in	2.8047			
	Height, in	6.0665			
	Water Content, %	33.59			
	Dry Density, pcf	88.9			
	Saturation, %	100.40			
	Void Ratio	0.91009			
Unconfined Compressive Strength, tsf		0.35399			
Undrained Shear Strength, tsf		0.177			
Time to Failure, min		13.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		52			
Plastic Limit		19			
Plasticity Index		33			
Failure Sketch					

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-008 S5
Sample Type: 3.0" ST
Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Mon, 16-NOV-2015 22:08:24

UNCONFINED COMPRESSION TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 11.0'-13.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.07 in
Specimen Area: 6.18 in^2
Specimen Volume: 37.48 in^3

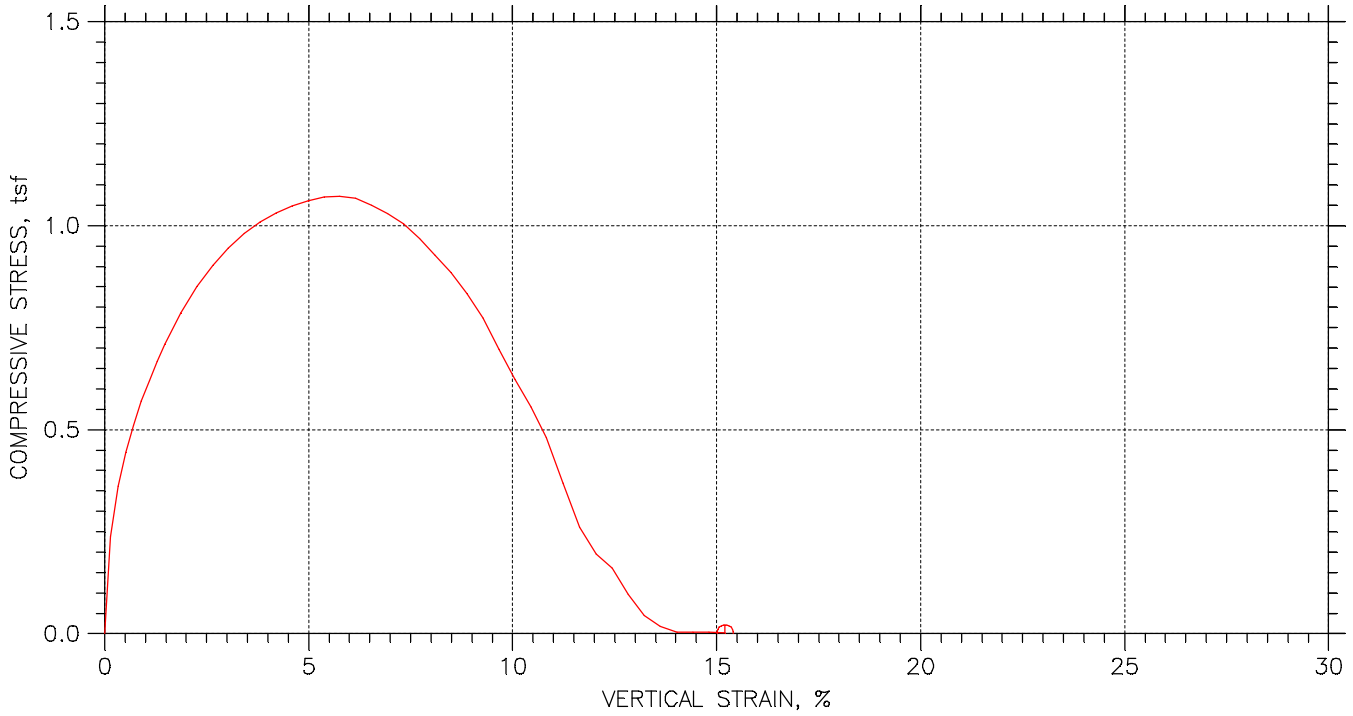
Liquid Limit: 52
Plastic Limit: 19
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.1783	0	0
2	0.254	0.0097782	0.16118	5.4547	6.1883	0.063465	0.031732
3	0.504	0.021678	0.35734	8.6541	6.2005	0.10049	0.050246
4	0.754	0.033578	0.55349	11.696	6.2127	0.13555	0.067774
5	1.004	0.045293	0.74661	14.319	6.2248	0.16562	0.082809
6	1.254	0.057009	0.93972	16.417	6.2369	0.18952	0.094758
7	1.504	0.068632	1.1313	18.042	6.249	0.20788	0.10394
8	1.754	0.080255	1.3229	19.301	6.2611	0.22195	0.11098
9	2.004	0.091878	1.5145	20.298	6.2733	0.23296	0.11648
10	2.504	0.11512	1.8977	22.081	6.2978	0.25244	0.12622
11	3.004	0.13865	2.2854	23.392	6.3228	0.26638	0.13319
12	3.504	0.16245	2.6778	24.389	6.3483	0.27661	0.1383
13	4.004	0.18615	3.0685	25.333	6.3739	0.28616	0.14308
14	4.504	0.20949	3.4533	26.067	6.3993	0.29329	0.14664
15	5.004	0.23274	3.8364	26.854	6.4248	0.30094	0.15047
16	5.504	0.25608	4.2212	27.483	6.4506	0.30676	0.15338
17	6.004	0.27969	4.6104	28.06	6.4769	0.31193	0.15596
18	6.504	0.30368	5.0058	28.637	6.5039	0.31702	0.15851
19	7.004	0.32748	5.3981	29.214	6.5309	0.32207	0.16104
20	7.504	0.35091	5.7843	29.686	6.5576	0.32594	0.16297
21	8.004	0.37406	6.166	30.158	6.5843	0.32978	0.16489
22	8.504	0.39731	6.5492	30.63	6.6113	0.33358	0.16679
23	9.004	0.42092	6.9384	30.997	6.639	0.33617	0.16808
24	9.504	0.445	7.3353	31.417	6.6674	0.33927	0.16963
25	10.004	0.46917	7.7337	31.837	6.6962	0.34232	0.17116
26	10.504	0.49315	8.1291	32.151	6.725	0.34422	0.17211
27	11.004	0.51658	8.5153	32.466	6.7534	0.34613	0.17307
28	11.504	0.53992	8.9	32.781	6.7819	0.34802	0.17401
29	12.004	0.56363	9.2908	33.095	6.8111	0.34985	0.17492
30	12.504	0.5878	9.6892	33.358	6.8412	0.35107	0.17554
31	13.004	0.61206	10.089	33.62	6.8716	0.35227	0.17613
32	13.504	0.63614	10.486	33.935	6.9021	0.35399	0.177
33	14.004	0.65966	10.874	33.987	6.9321	0.35301	0.1765
34	14.504	0.68309	11.26	34.092	6.9623	0.35256	0.17628
35	15.004	0.70661	11.648	34.354	6.9928	0.35372	0.17686
36	15.504	0.7305	12.042	34.459	7.0241	0.35322	0.17661
37	16.004	0.75467	12.44	34.564	7.0561	0.35269	0.17634
38	16.504	0.77875	12.837	34.774	7.0882	0.35322	0.17661
39	17.004	0.80255	13.229	34.826	7.1203	0.35216	0.17608
40	17.504	0.8258	13.612	35.088	7.1518	0.35325	0.17662
41	18.004	0.84923	13.999	35.193	7.184	0.35272	0.17636
42	18.504	0.87293	14.389	35.298	7.2168	0.35216	0.17608
43	19.004	0.89719	14.789	35.456	7.2506	0.35208	0.17604
44	19.504	0.92127	15.186	35.508	7.2846	0.35096	0.17548
45	19.621	0.92671	15.276	35.56	7.2923	0.35111	0.17555

UNCONFINED COMPRESSION TEST REPORT

Terracon
Consulting Engineers & Scientists



Symbol		⏲			
Test No.		EDWB015S12			
Initial	Diameter, in	2.8217			
	Height, in	6.061			
	Water Content, %	41.01			
	Dry Density, pcf	79.76			
	Saturation, %	98.82			
	Void Ratio	1.1289			
Unconfined Compressive Strength, tsf		1.0722			
Undrained Shear Strength, tsf		0.53609			
Time to Failure, min		7.5002			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		66			
Plastic Limit		23			
Plasticity Index		43			
Failure Sketch					

Project: DYNERGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-015 S12
Sample Type: 3.0" ST
Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Mon, 16-NOV-2015 22:13:27

UNCONFINED COMPRESSION TEST

Project: DYNERGY EDWARDS
Boring No.: EDW-015 S12
Sample No.: S-12
Test No.: EDWB015S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 37.0'-39.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

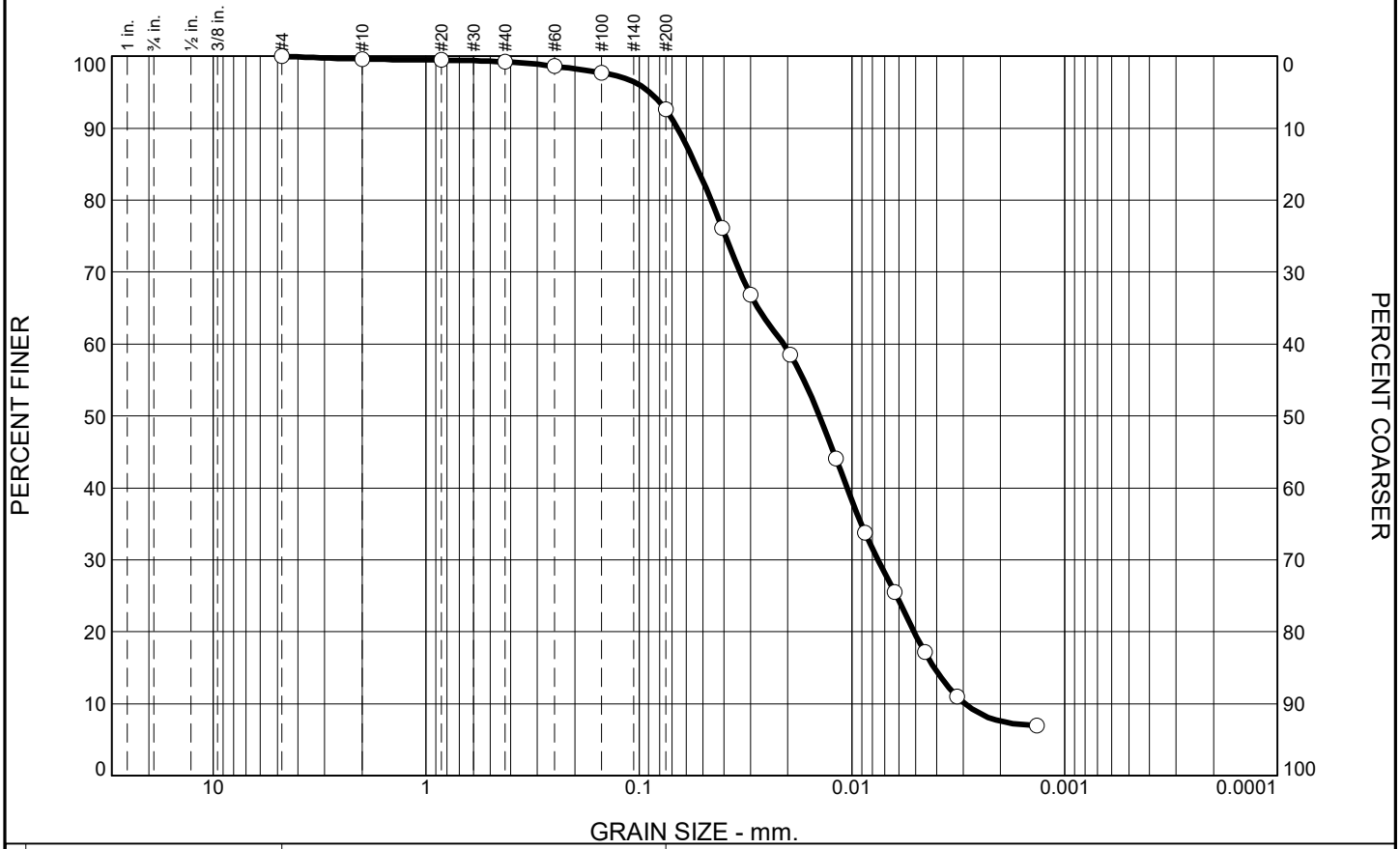
Specimen Height: 6.06 in
Specimen Area: 6.25 in^2
Specimen Volume: 37.90 in^3

Liquid Limit: 66
Plastic Limit: 23
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25015	0.0088557	0.14611	20.683	6.2623	0.2378	0.1189
3	0.50015	0.02011	0.33179	31.44	6.2739	0.3608	0.1804
4	0.75015	0.031548	0.52051	38.87	6.2858	0.44523	0.22261
5	1.0002	0.042987	0.70924	44.692	6.2978	0.51094	0.25547
6	1.2502	0.05461	0.90101	49.96	6.31	0.57006	0.28503
7	1.5002	0.066141	1.0913	54.506	6.3221	0.62075	0.31038
8	1.7502	0.077949	1.2861	58.665	6.3346	0.6668	0.3334
9	2.0002	0.089664	1.4794	62.547	6.347	0.70952	0.35476
10	2.5002	0.11346	1.872	69.644	6.3724	0.78689	0.39344
11	3.0002	0.13726	2.2647	75.633	6.398	0.85113	0.42556
12	3.5002	0.16069	2.6513	80.512	6.4234	0.90246	0.45123
13	4.0002	0.18385	3.0333	84.615	6.4487	0.94473	0.47236
14	4.5002	0.20728	3.4199	88.164	6.4745	0.98043	0.49021
15	5.0002	0.23089	3.8095	91.158	6.5008	1.0096	0.50482
16	5.5002	0.25497	4.2067	93.543	6.5277	1.0318	0.51588
17	6.0002	0.27905	4.604	95.428	6.5549	1.0482	0.5241
18	6.5002	0.30266	4.9936	96.98	6.5818	1.0609	0.53045
19	7.0002	0.32582	5.3756	98.2	6.6084	1.0699	0.53496
20	7.5002	0.34915	5.7607	98.81	6.6354	1.0722	0.53609
21	8.0002	0.37277	6.1503	98.755	6.6629	1.0672	0.53358
22	8.5002	0.39685	6.5475	97.535	6.6912	1.0495	0.52475
23	9.0002	0.42074	6.9417	96.149	6.7196	1.0302	0.51511
24	9.5002	0.44445	7.3329	94.097	6.7479	1.004	0.502
25	10	0.46769	7.7164	91.214	6.776	0.96922	0.48461
26	10.5	0.49085	8.0984	87.72	6.8042	0.92824	0.46412
27	11	0.51428	8.485	84.061	6.8329	0.88577	0.44289
28	11.5	0.53798	8.8761	79.514	6.8622	0.83428	0.41714
29	12	0.56215	9.2749	74.135	6.8924	0.77444	0.38722
30	12.5	0.58614	9.6706	67.093	6.9226	0.69782	0.34891
31	13	0.60966	10.059	60.162	6.9525	0.62304	0.31152
32	13.5	0.63291	10.442	53.897	6.9822	0.55578	0.27789
33	14	0.65652	10.832	46.854	7.0127	0.48106	0.24053
34	14.5	0.6806	11.229	36.153	7.0441	0.36953	0.18476
35	15	0.70532	11.637	25.617	7.0766	0.26064	0.13032
36	15.5	0.72986	12.042	19.296	7.1092	0.19543	0.097714
37	16	0.75366	12.435	15.969	7.1411	0.16101	0.080505
38	16.5	0.77773	12.832	9.5372	7.1736	0.095723	0.047862
39	17	0.80181	13.229	4.3805	7.2065	0.043765	0.021883
40	17.5	0.82543	13.619	1.7744	7.239	0.017648	0.0088241
41	18	0.8496	14.017	0.44359	7.2725	0.0043917	0.0021958
42	18.5	0.87404	14.421	0.38814	7.3068	0.0038247	0.0019123
43	19	0.89802	14.816	0.33269	7.3408	0.0032632	0.0016316
44	19.5	0.92164	15.206	0.16635	7.3745	0.0016241	0.00081206

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	0.4	6.6	73.1	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	99.5		
#40	99.2		
#60	98.6		
#100	97.7		
#200	92.6		

* (no specification provided)

DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0659 D_{85}= 0.0543 D_{60}= 0.0210
D_{50}= 0.0142 D_{30}= 0.0075 D_{15}= 0.0041
D_{10}= 0.0029 C_u= 7.16 C_c= 0.92

Classification

USCS= AASHTO=

Remarks

F.M.=0.05

Source of Sample: EDW-B002 **Depth:** 7.5'-10.0'
Sample Number: S-4 **Date:** 11-5-15

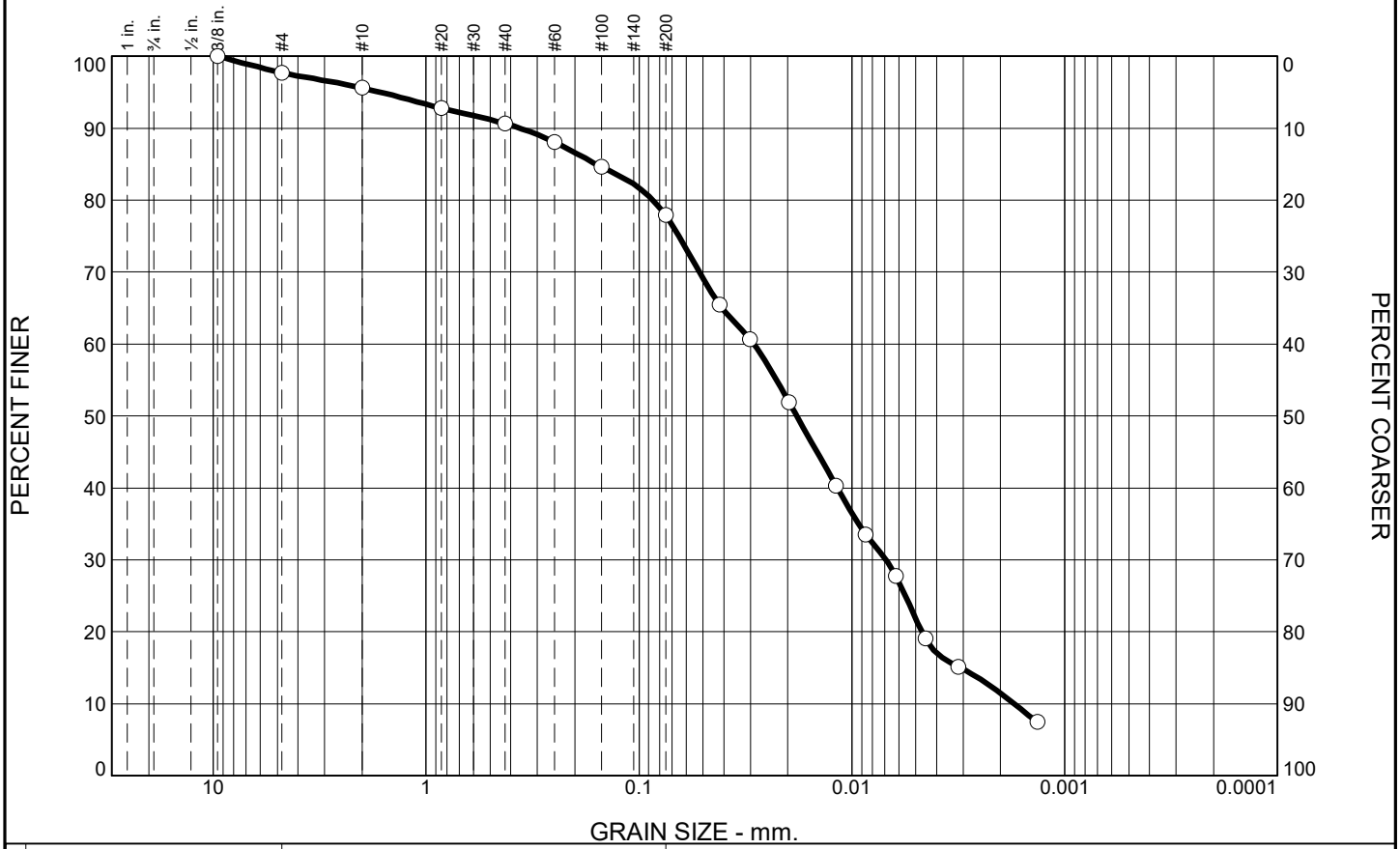
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.3	2.1	5.0	12.7	56.3	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.7		
#10	95.6		
#20	92.8		
#40	90.6		
#60	88.1		
#100	84.6		
#200	77.9		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3632 D_{85}= 0.1593 D_{60}= 0.0290
D_{50}= 0.0181 D_{30}= 0.0069 D_{15}= 0.0031
D_{10}= 0.0017 C_u= 16.81 C_c= 0.96

Classification

USCS= AASHTO=

Remarks

F.M.=0.47

Source of Sample: EDW-B003 **Depth:** 10.0'-11.5'
Sample Number: S-5 **Date:** 11-5-15

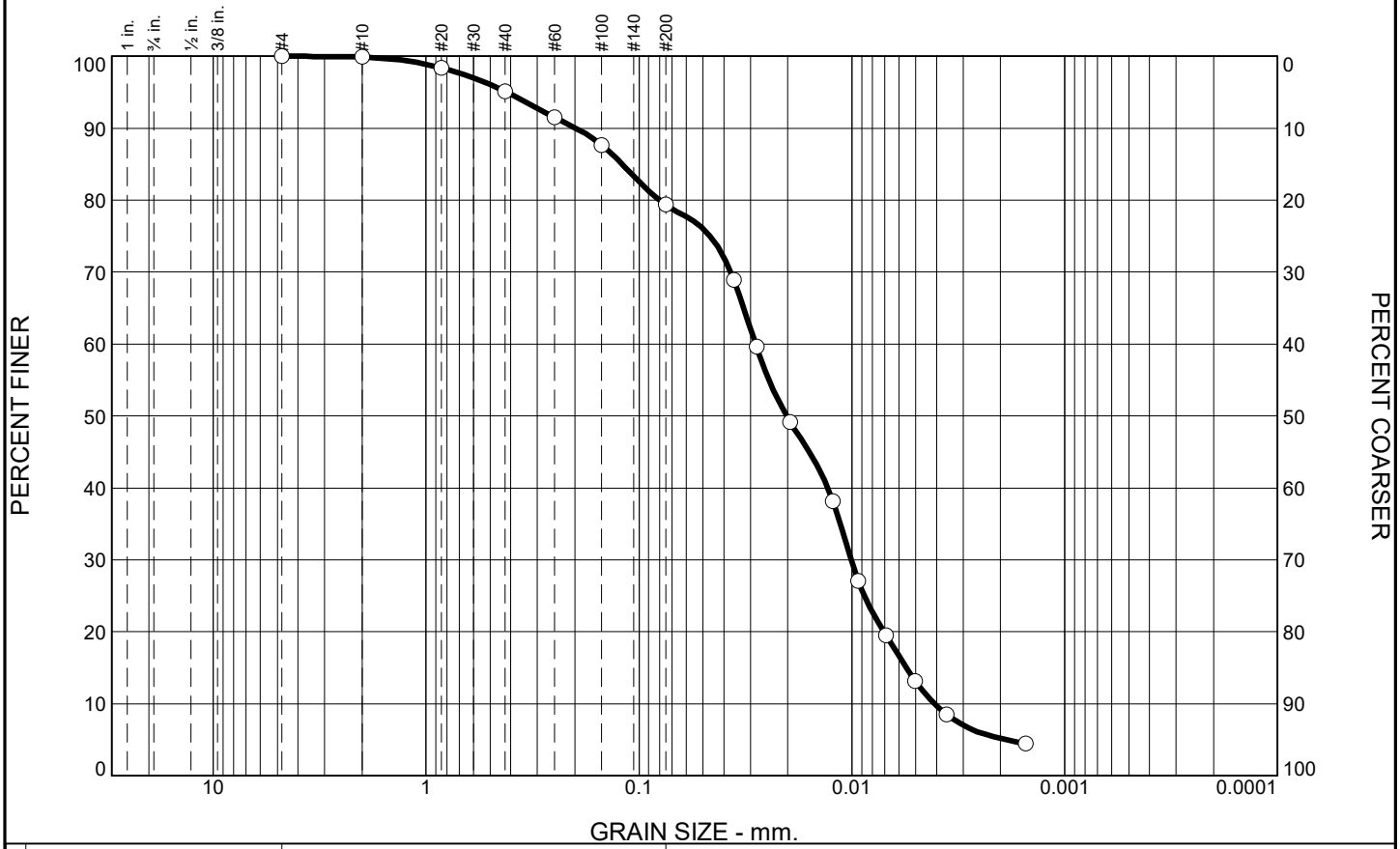
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.8	15.7	66.4	13.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.4		
#40	95.1		
#60	91.5		
#100	87.6		
#200	79.4		

* (no specification provided)

FILL: VERY DARK GRAY VARVED FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1981 D_{85}= 0.1202 D_{60}= 0.0284
D_{50}= 0.0203 D_{30}= 0.0101 D_{15}= 0.0056
D_{10}= 0.0041 C_u= 6.92 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.23

Source of Sample: EDW-B003 **Depth:** 30.0'-32.0'
Sample Number: S-9 **Date:** 11-5-15

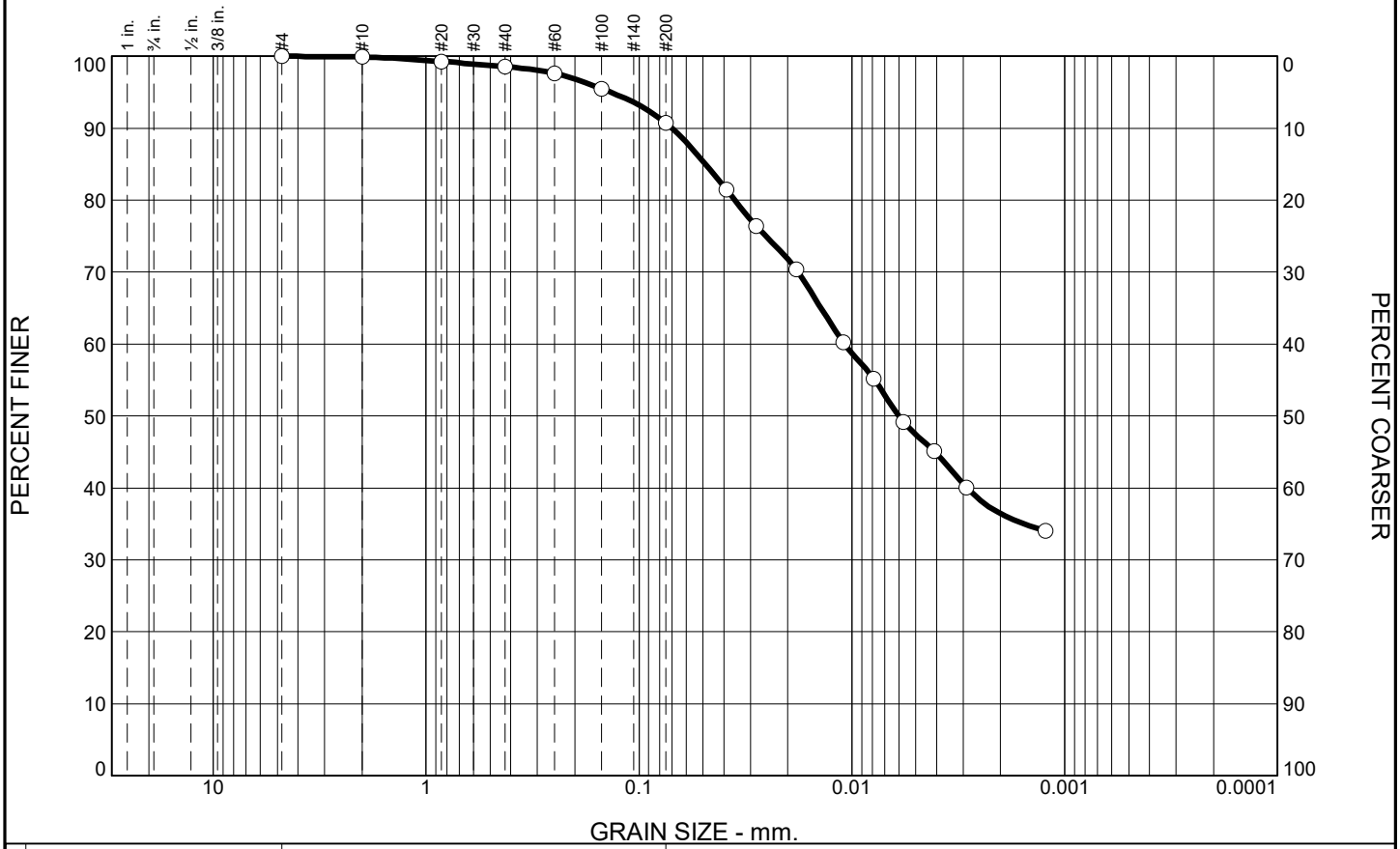
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	1.4	7.8	43.3	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.3		
#40	98.5		
#60	97.6		
#100	95.5		
#200	90.7		

* (no specification provided)

GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS

Atterberg Limits

PL= 16 LL= 37 PI= 21

Coefficients

D_{90}= 0.0702 D_{85}= 0.0486 D_{60}= 0.0108
D_{50}= 0.0060 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

F.M.=0.08

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4 **Date:** 11-5-15

Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422

% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.1	1.6	5.6	14.1	51.7	23.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	96.9		
#10	95.3		
#20	92.5		
#40	89.7		
#60	86.7		
#100	82.6		
#200	75.6		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4580 D_{85}= 0.1999 D_{60}= 0.0244
D_{50}= 0.0136 D_{30}= 0.0065 D_{15}= 0.0028
D_{10}= 0.0019 C_u= 12.93 C_c= 0.91

Classification

USCS= AASHTO=

Remarks

F.M.=0.52

Source of Sample: EDW-B005 **Depth:** 20.0'-21.5'
Sample Number: S-7 **Date:** 11-13-15

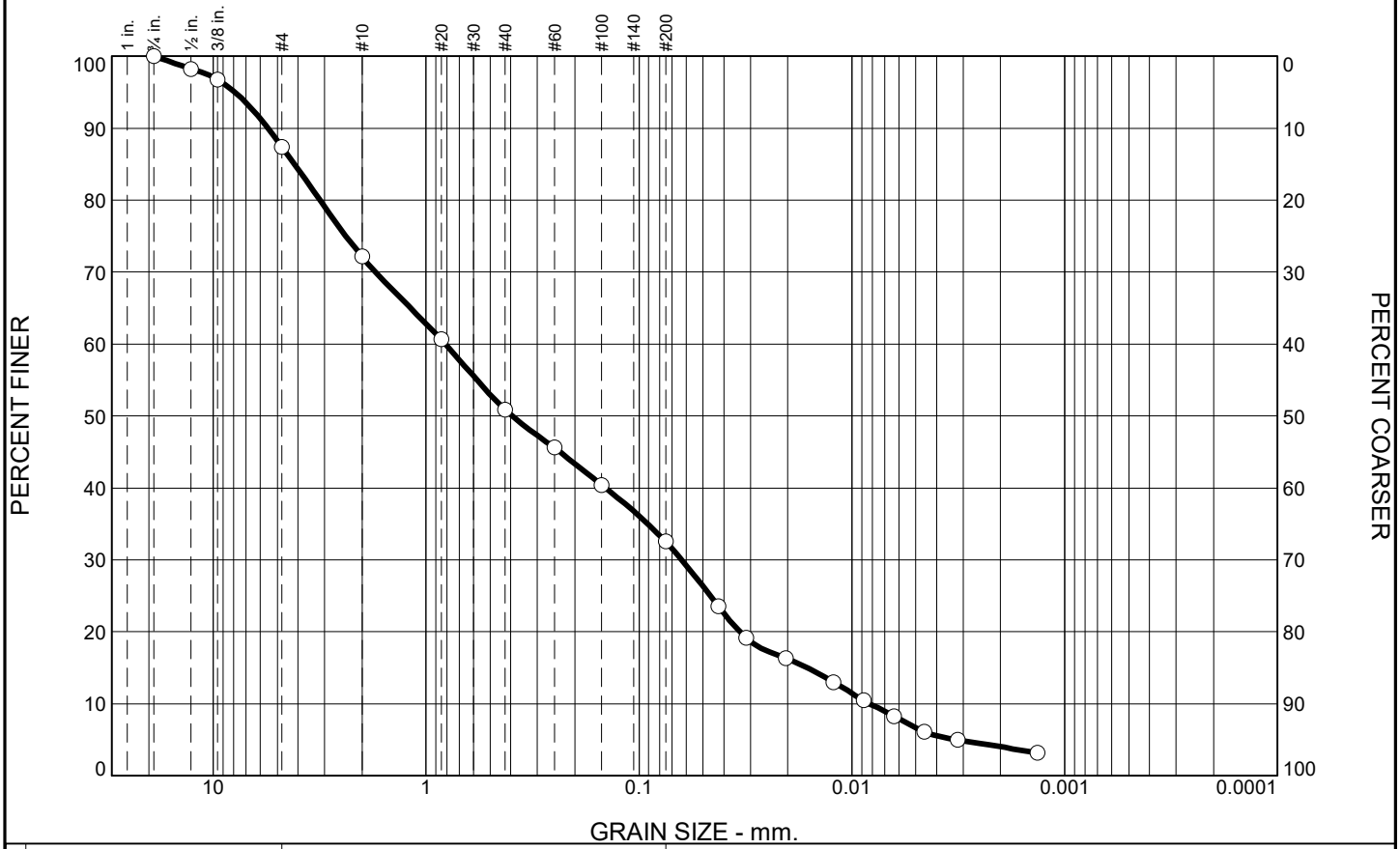
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.6	15.3	21.2	18.3	26.0	6.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	98.2		
.375	96.7		
#4	87.4		
#10	72.1		
#20	60.6		
#40	50.9		
#60	45.6		
#100	40.4		
#200	32.6		

* (no specification provided)

FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.5350 D_{85}= 4.1471 D_{60}= 0.8124
D_{50}= 0.3943 D_{30}= 0.0630 D_{15}= 0.0162
D_{10}= 0.0082 C_u= 98.50 C_c= 0.59

Classification

USCS= SP AASHTO=

Remarks

F.M.=2.33

Source of Sample: EDW-B010 **Depth:** 5.0'-6.5'
Sample Number: S-3 **Date:** 11-5-15

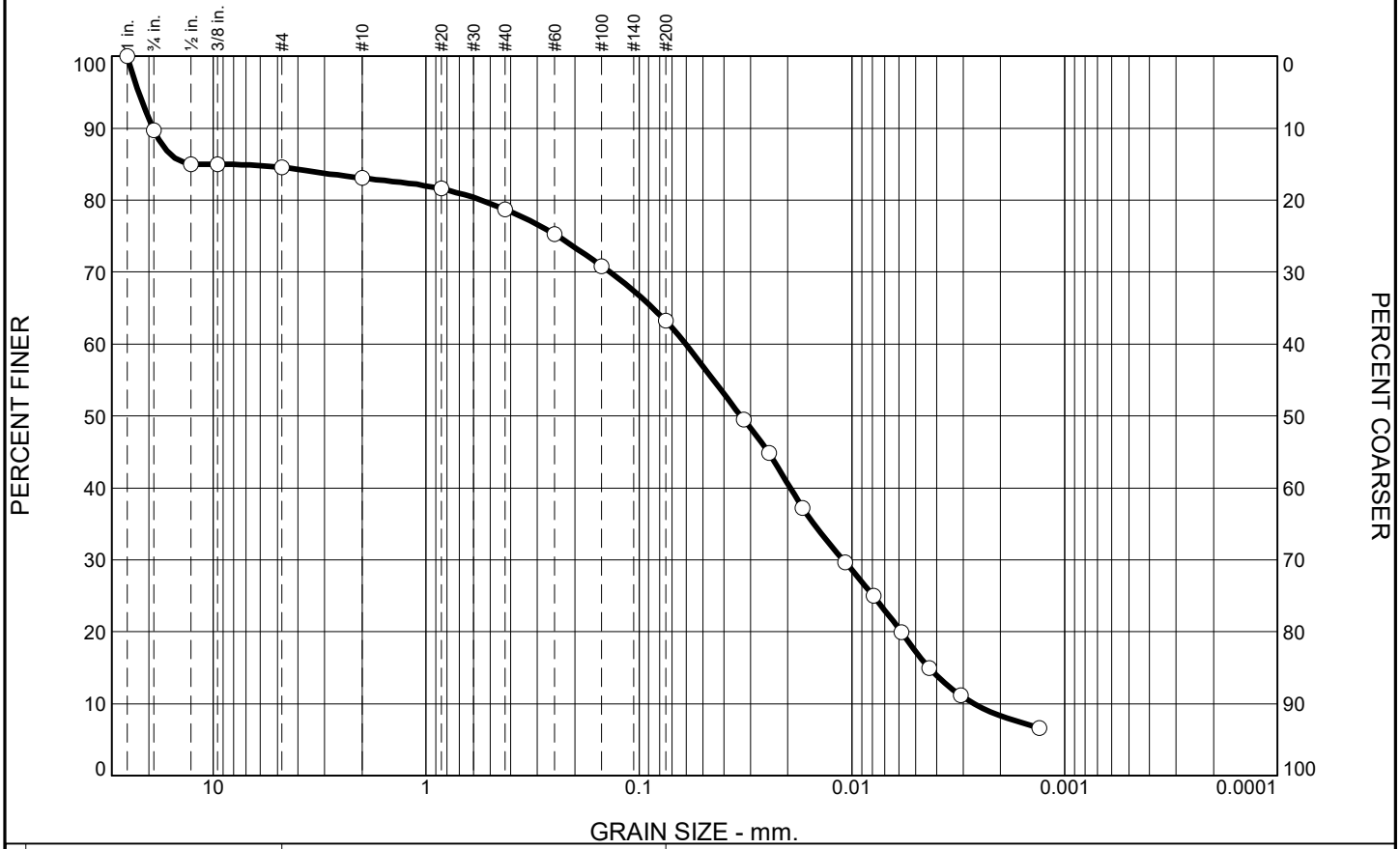
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	5.2	1.4	4.4	15.5	46.0	17.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	89.7		
.5	85.0		
.375	85.0		
#4	84.5		
#10	83.1		
#20	81.6		
#40	78.7		
#60	75.3		
#100	70.8		
#200	63.2		

* (no specification provided)

FILL: VERY DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.2789 D_{85}= 8.9744 D_{60}= 0.0604
D_{50}= 0.0333 D_{30}= 0.0110 D_{15}= 0.0043
D_{10}= 0.0027 C_u= 22.70 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

F.M.=1.47

Source of Sample: EDW-B011 **Depth:** 9.0'-11.0'
Sample Number: S-5 **Date:** 11-12-15

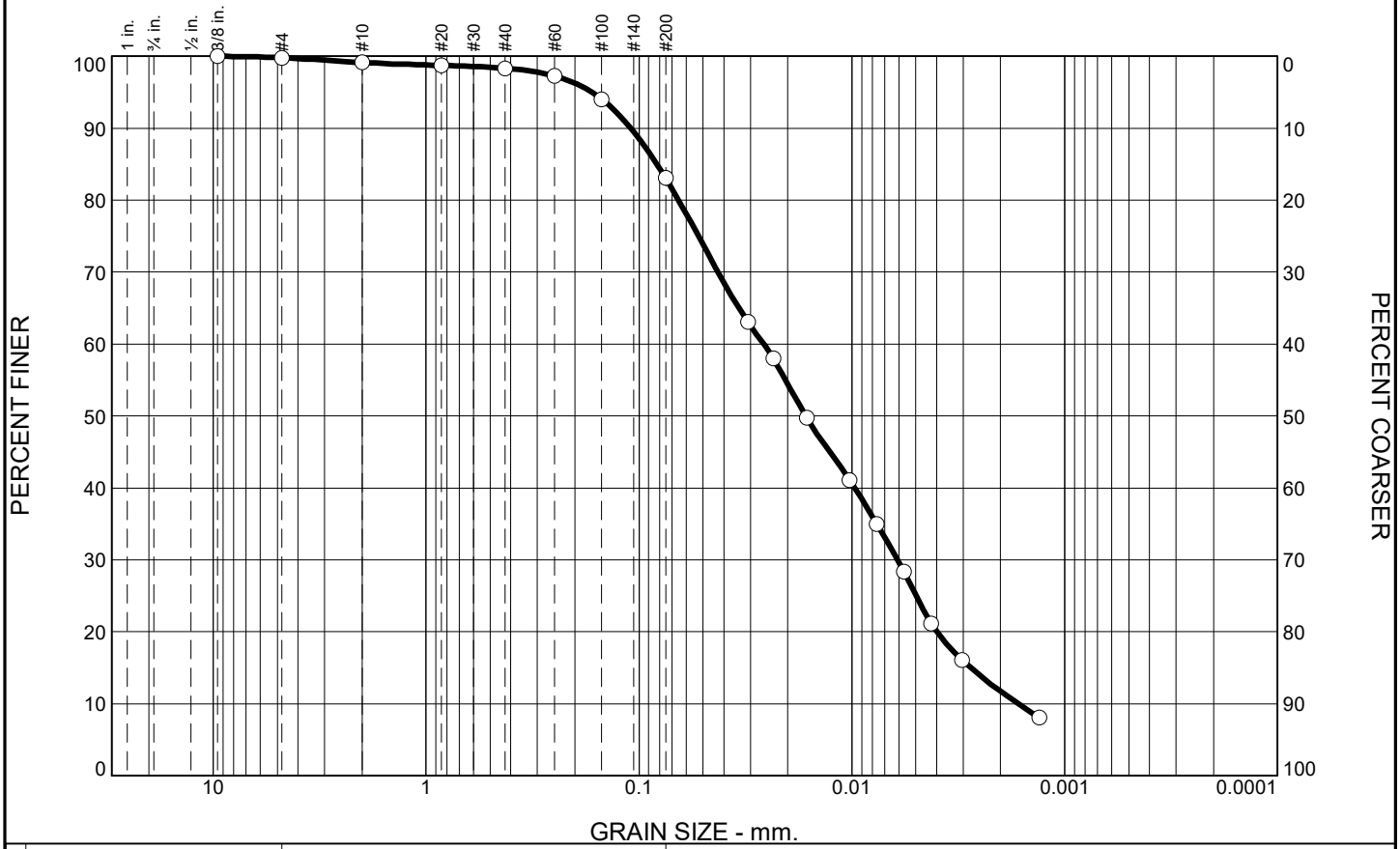
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.2	0.7	0.8	15.2	58.0	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.1		
#20	98.7		
#40	98.3		
#60	97.3		
#100	94.0		
#200	83.1		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1094 D_{85}= 0.0823 D_{60}= 0.0260
D_{50}= 0.0165 D_{30}= 0.0061 D_{15}= 0.0028
D_{10}= 0.0017 C_u= 15.75 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

Source of Sample: EDW-B011 **Depth:** 19.5'-21.5'
Sample Number: S-7 **Date:** 11-11-15

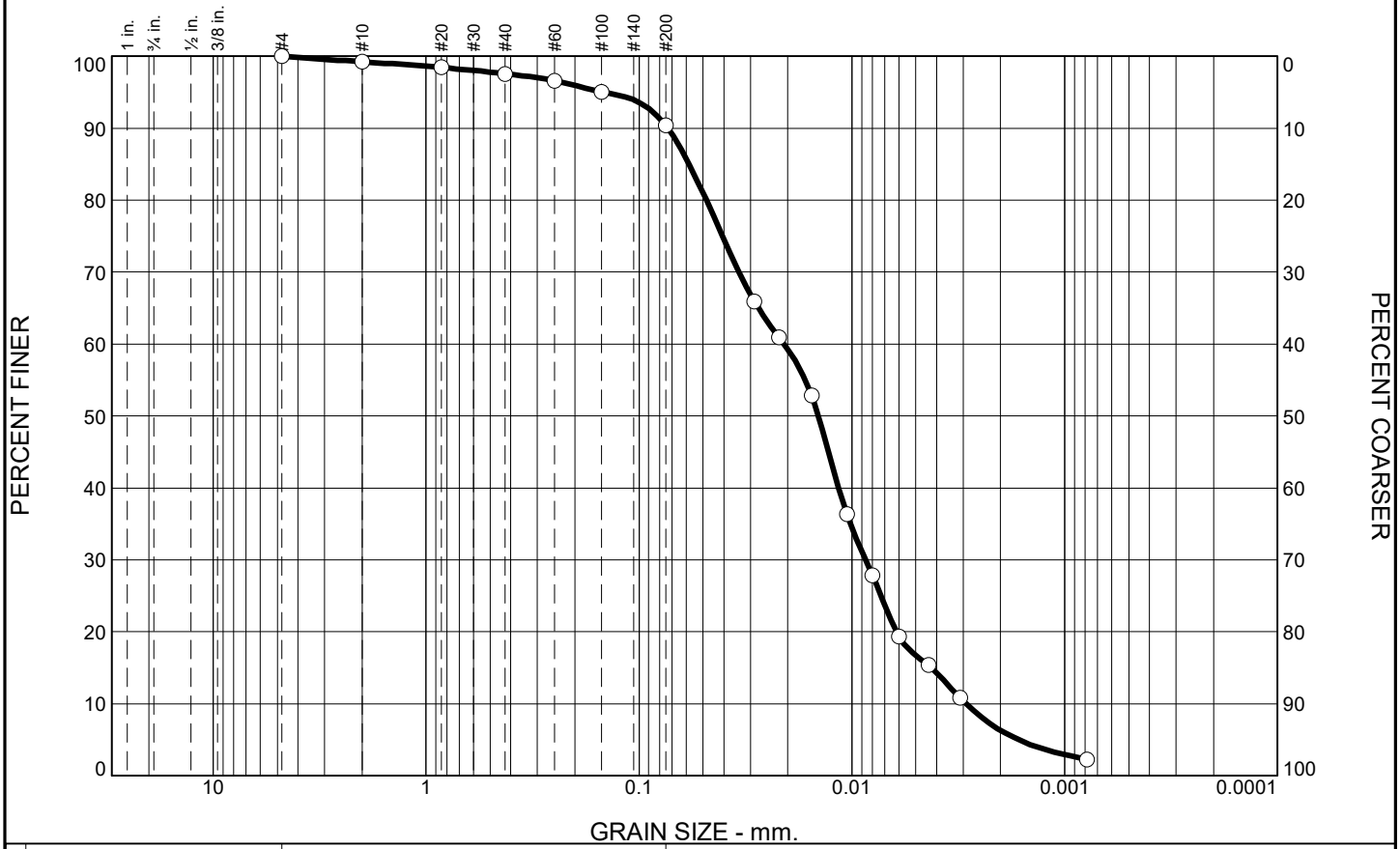
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	1.6	7.2	73.7	16.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	98.4		
#40	97.6		
#60	96.6		
#100	95.1		
#200	90.4		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0732 D_{85}= 0.0581 D_{60}= 0.0208
D_{50}= 0.0144 D_{30}= 0.0086 D_{15}= 0.0042
D_{10}= 0.0029 C_u= 7.17 C_c= 1.22

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

Source of Sample: EDW-B012 **Depth:** 5.0'-6.5'
Sample Number: S-3 **Date:** 11-13-15

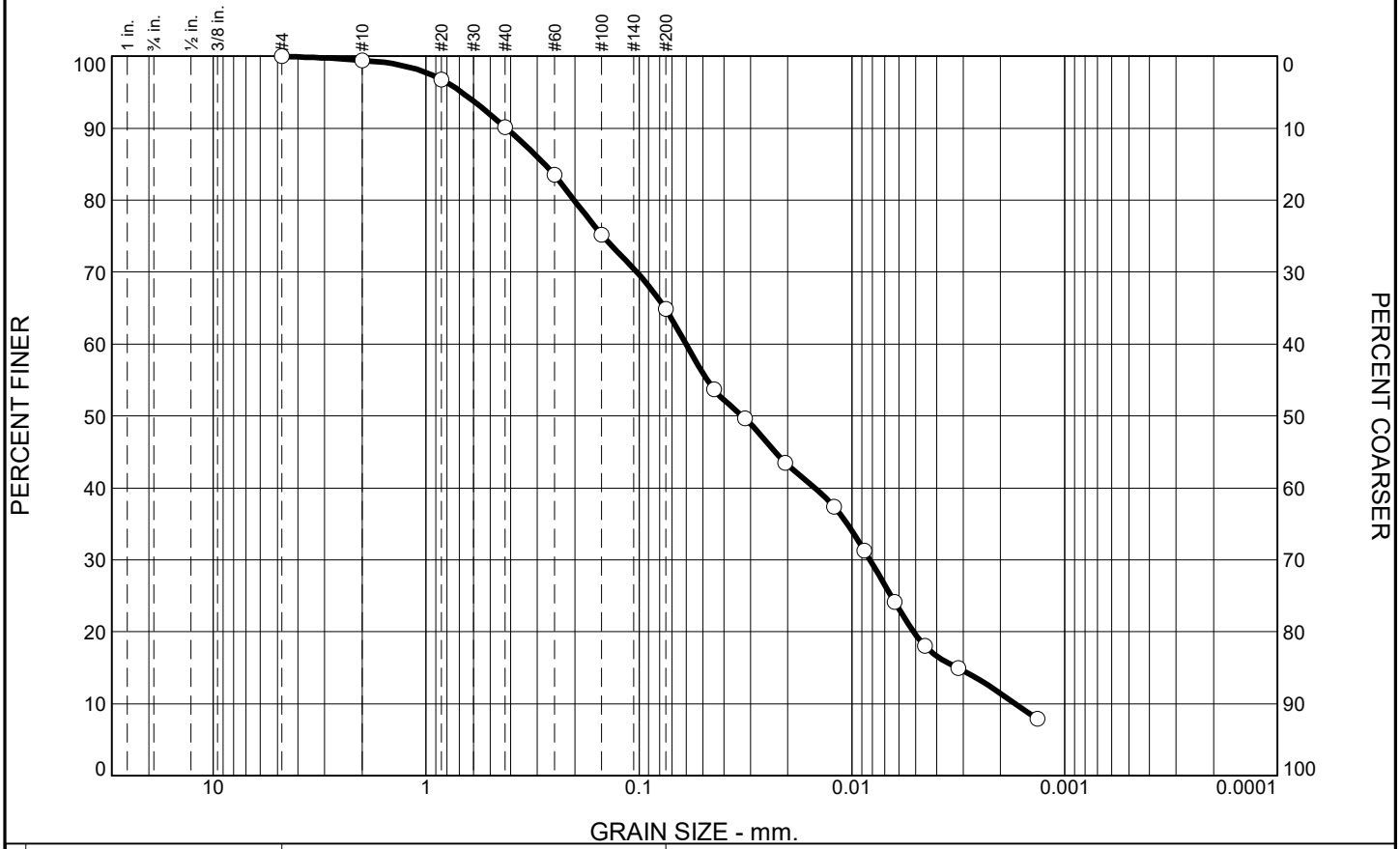
Terracon

Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	9.3	25.2	45.4	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	96.8		
#40	90.1		
#60	83.5		
#100	75.2		
#200	64.9		

* (no specification provided)

FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4213 D_{85}= 0.2775 D_{60}= 0.0602
D_{50}= 0.0328 D_{30}= 0.0082 D_{15}= 0.0032
D_{10}= 0.0017 C_u= 35.34 C_c= 0.66

Classification

USCS= SM AASHTO=

Remarks

F.M.=0.47

Source of Sample: EDW-B014 **Depth:** 7.0'-8.5'
Sample Number: S-4 **Date:** 11-5-15

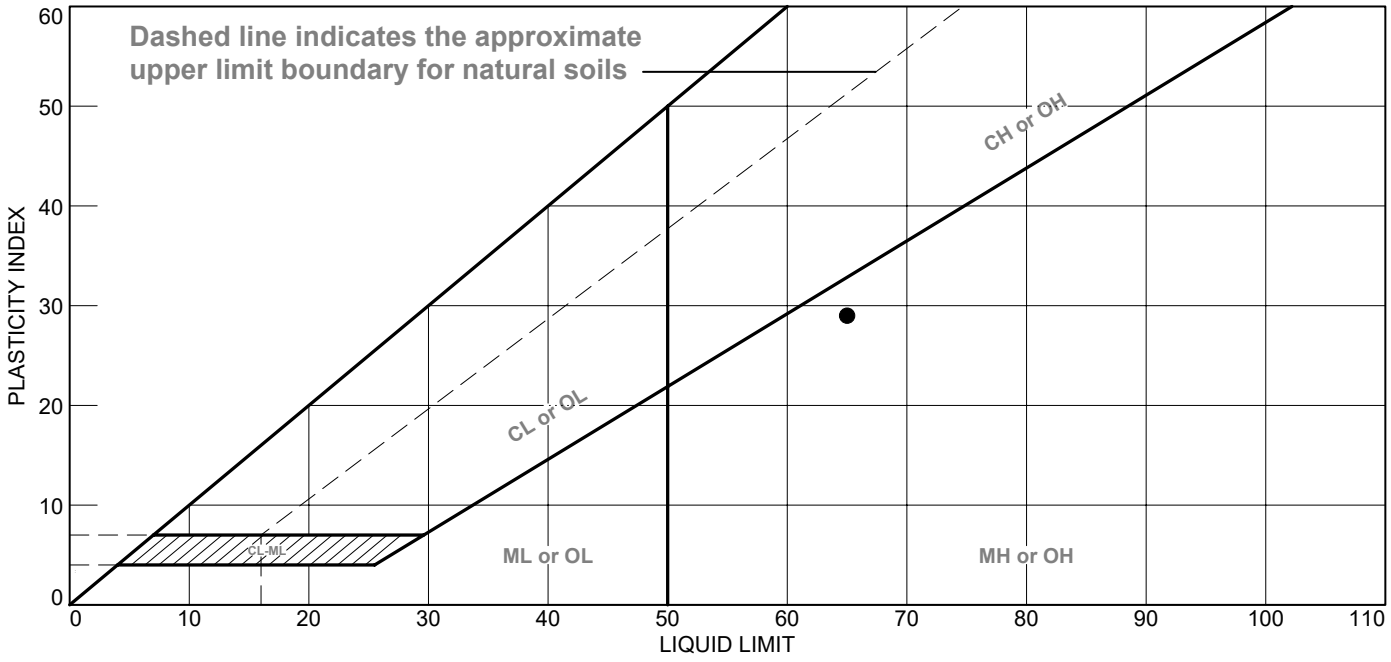
Terracon

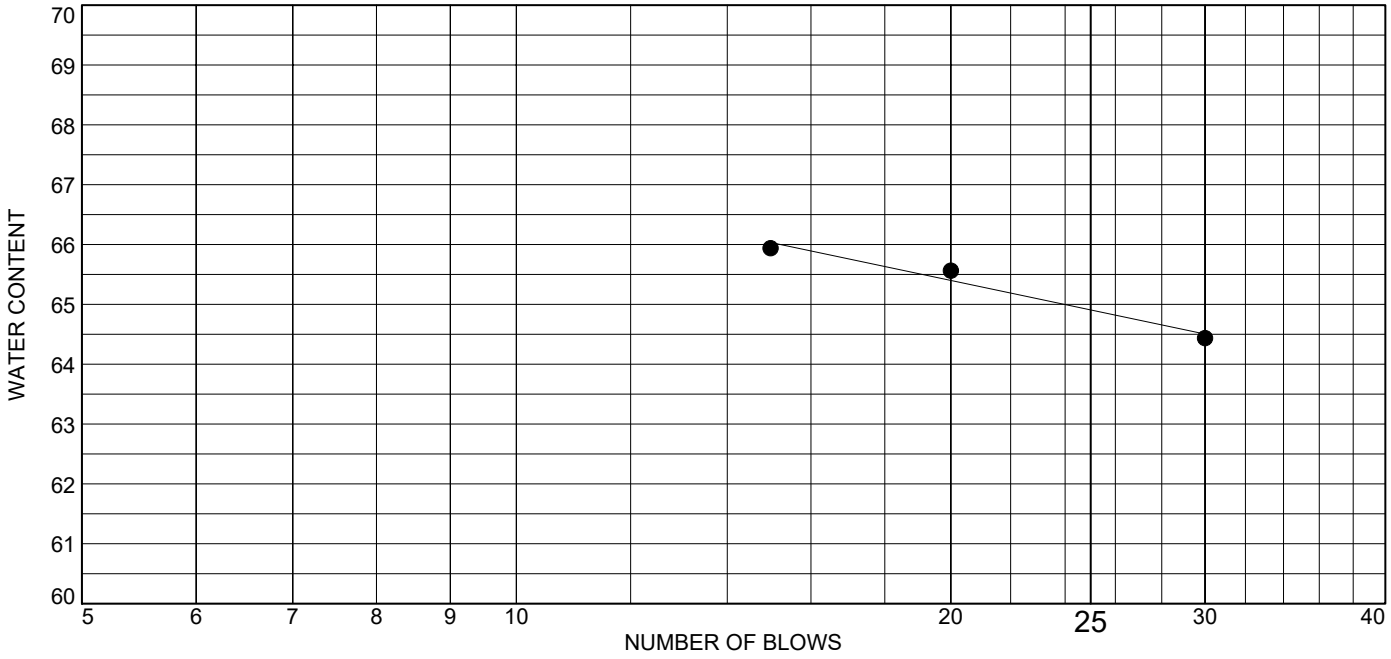
Client: DYNERGY
Project: DYNERGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GREENISH GRAY SANDY SILT	65	36	29			MH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B002 **Depth:** 5.0'-7.0'
Sample Number: S-3

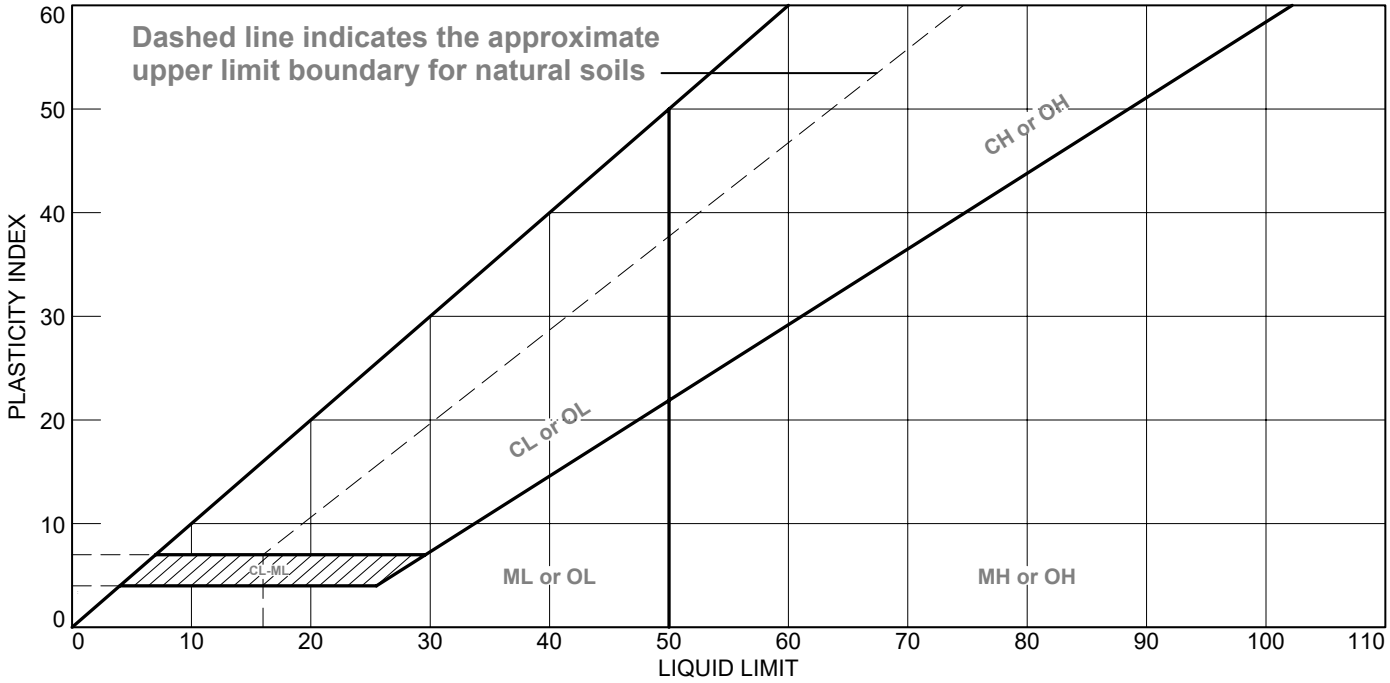
Terracon

Remarks:
● SHELL NOTED

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY TO DARK GRAY FLY ASH	17	27	NP			

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

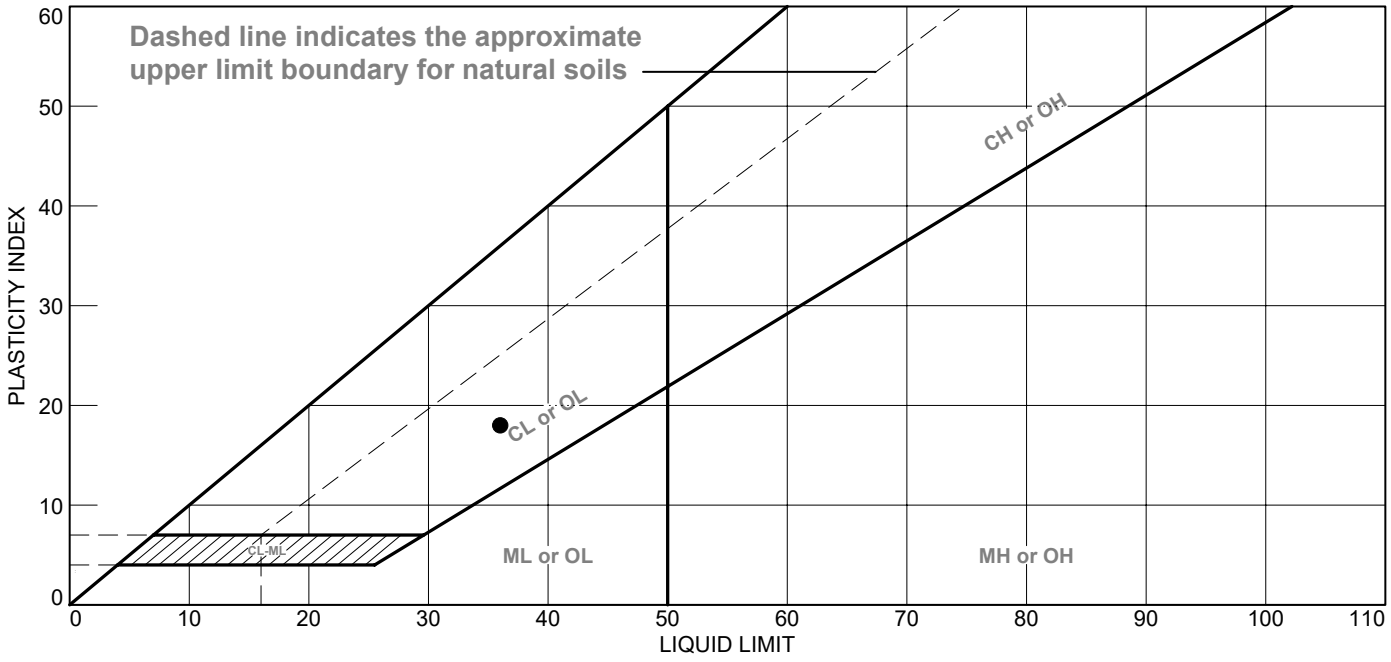
Source of Sample: EDW-B002 **Depth:** 10.0'-12.0'
Sample Number: S-5

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY LEAN CLAY WITH SAND	36	18	18			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B002 **Depth:** 35.0'-37.0'
Sample Number: S-10

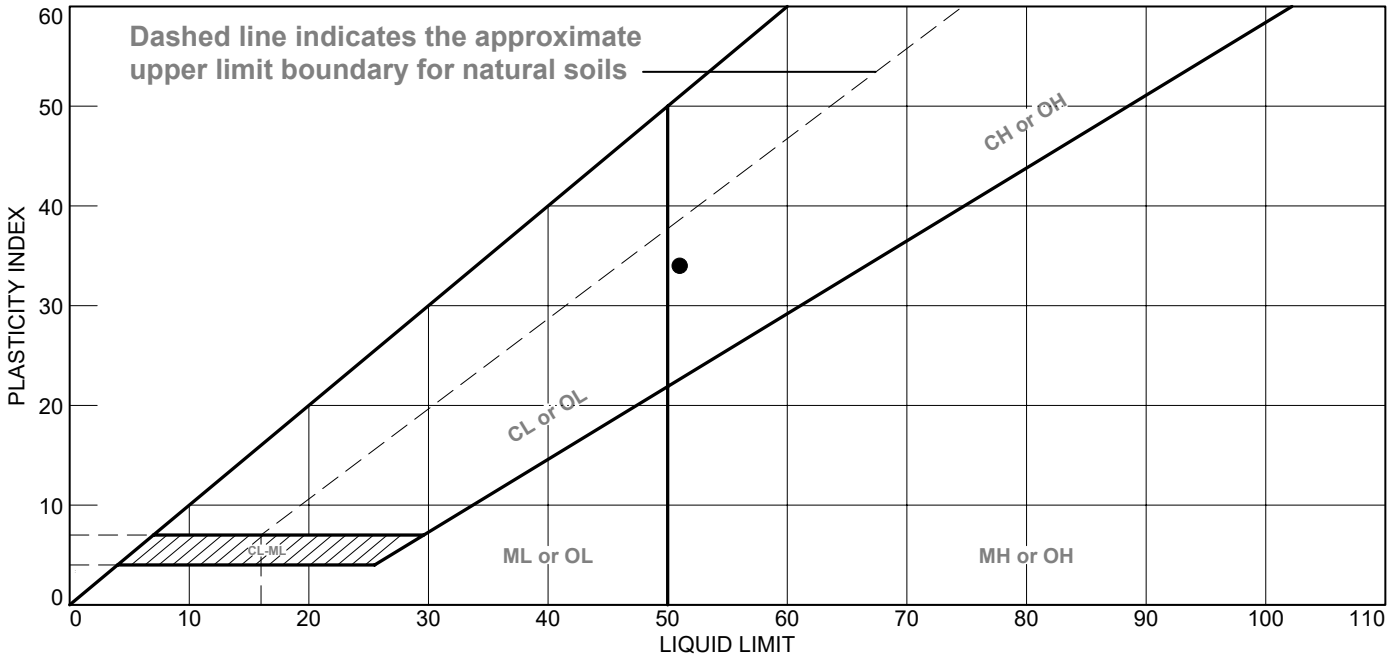
Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY WITH SAND	51	17	34			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B003 **Depth:** 45.0'-47.0'
Sample Number: S-12

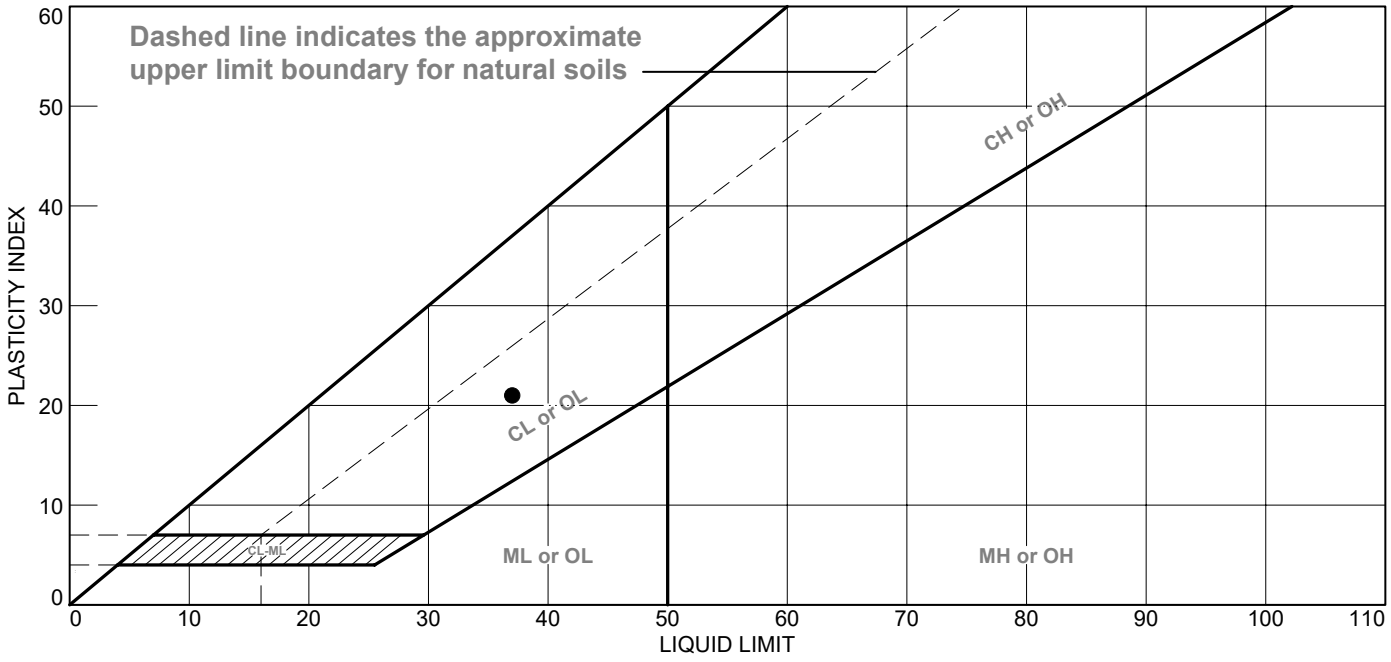
Terracon

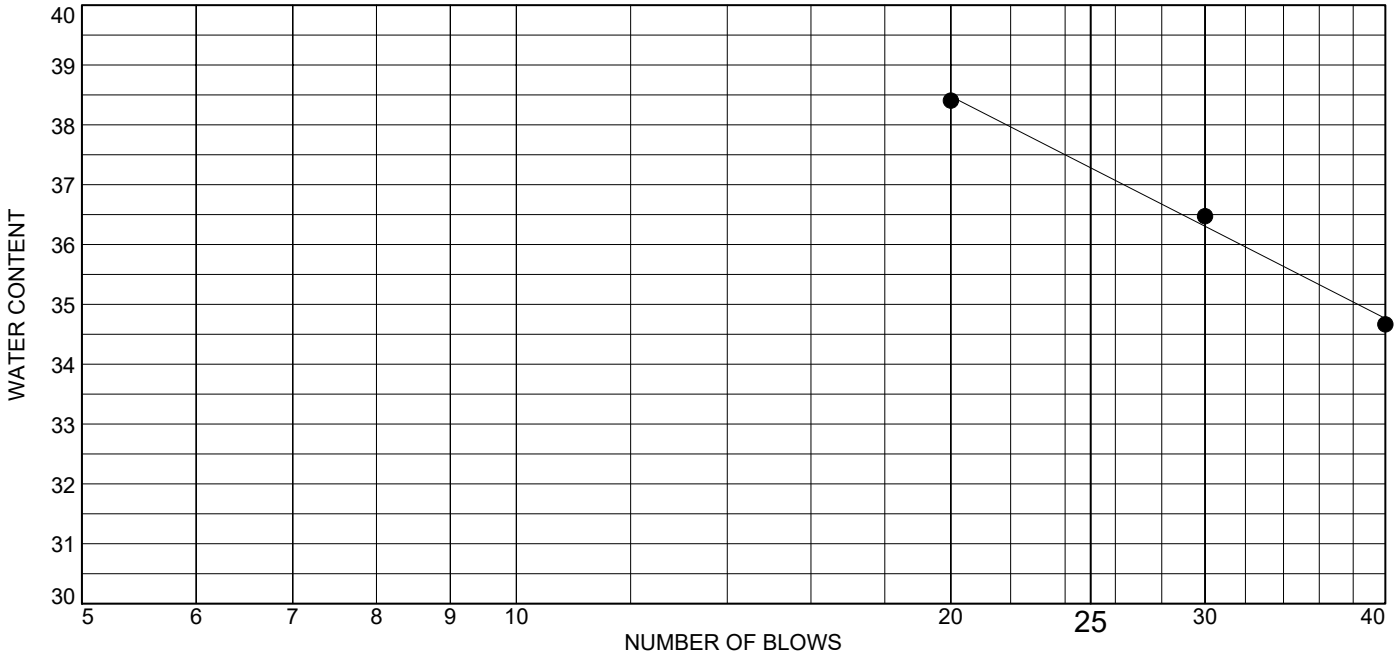
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	37	16	21	98.5	90.7	CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4

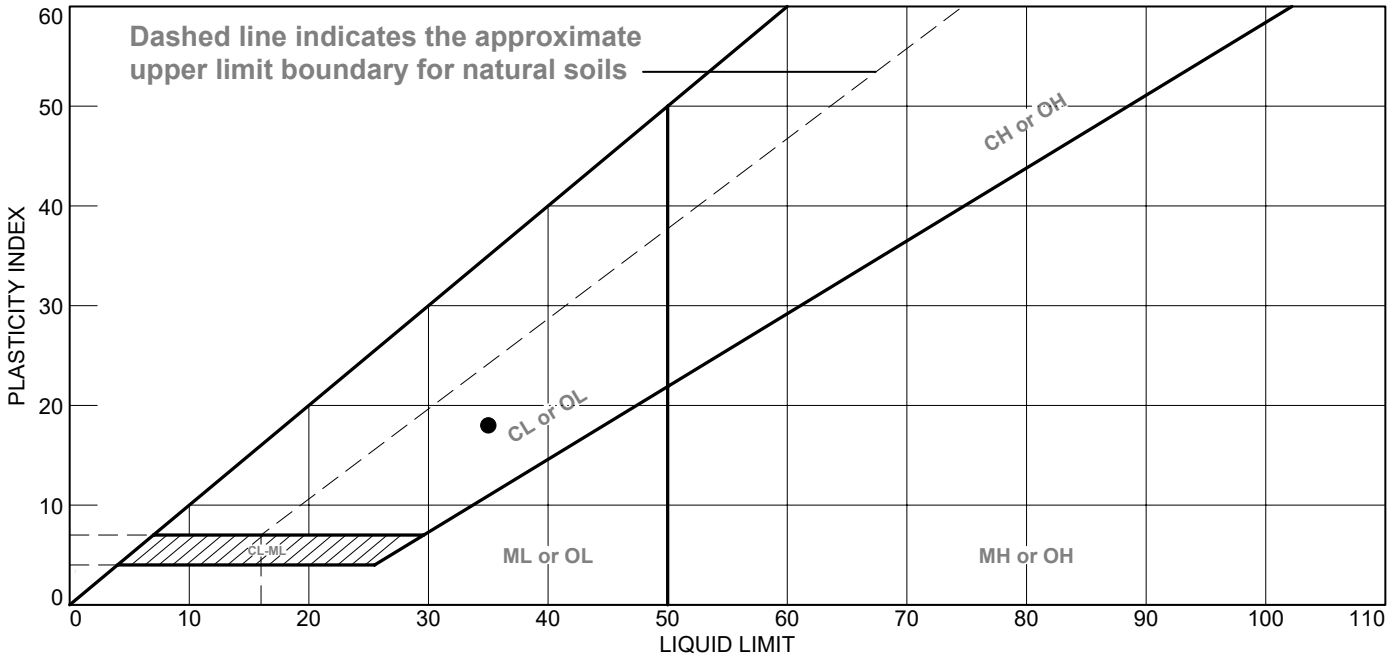
Remarks:

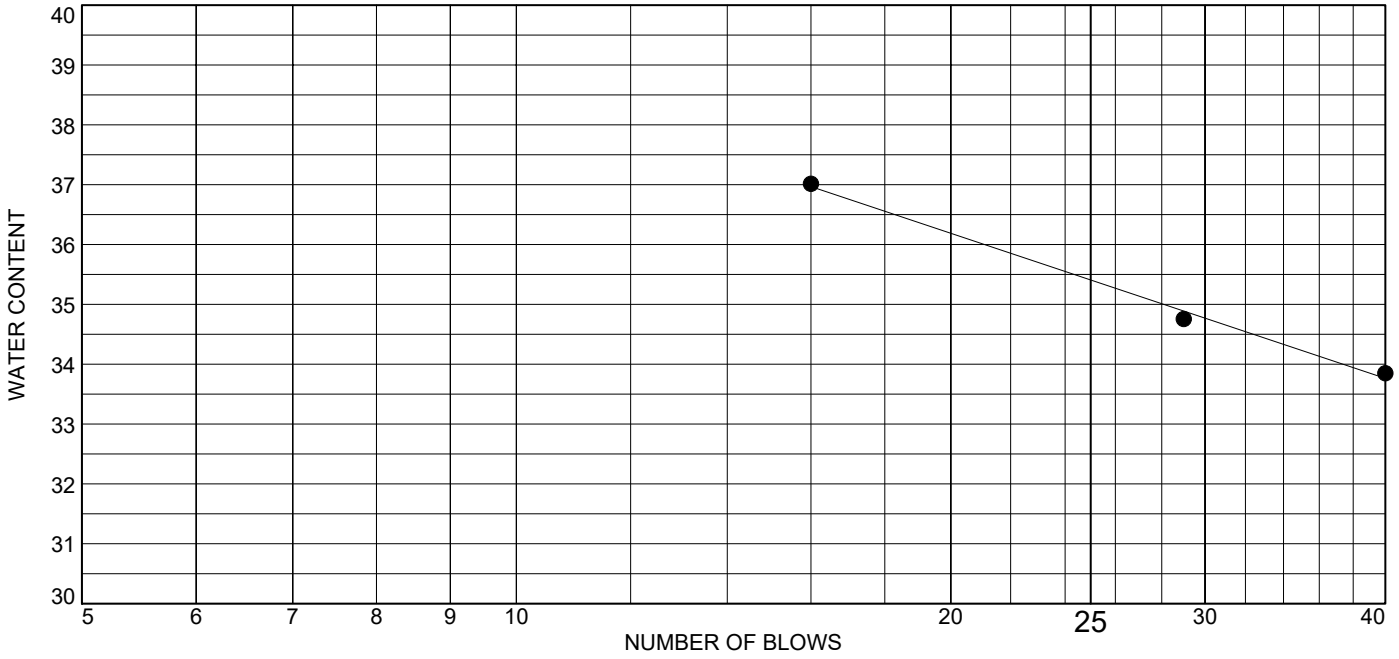
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	35	17	18			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 36.0'-38.0'
Sample Number: S-11

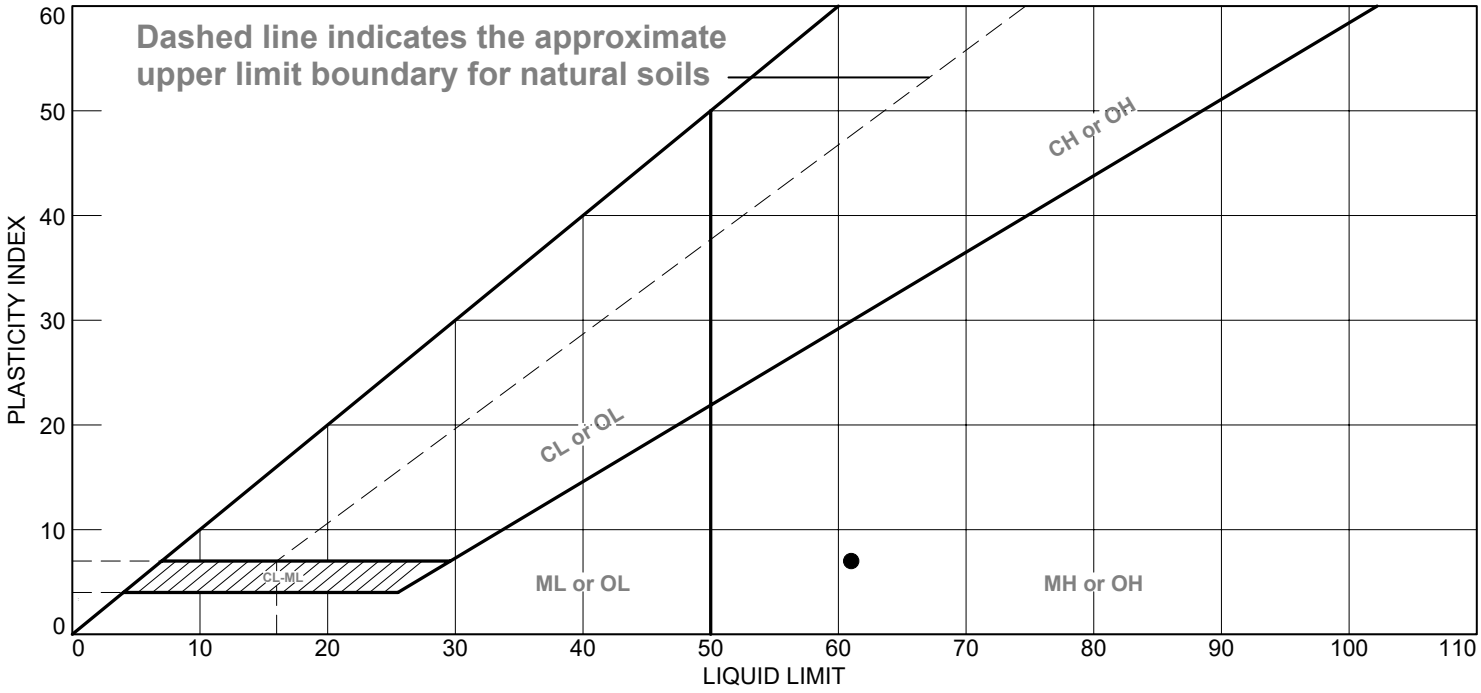
Remarks:

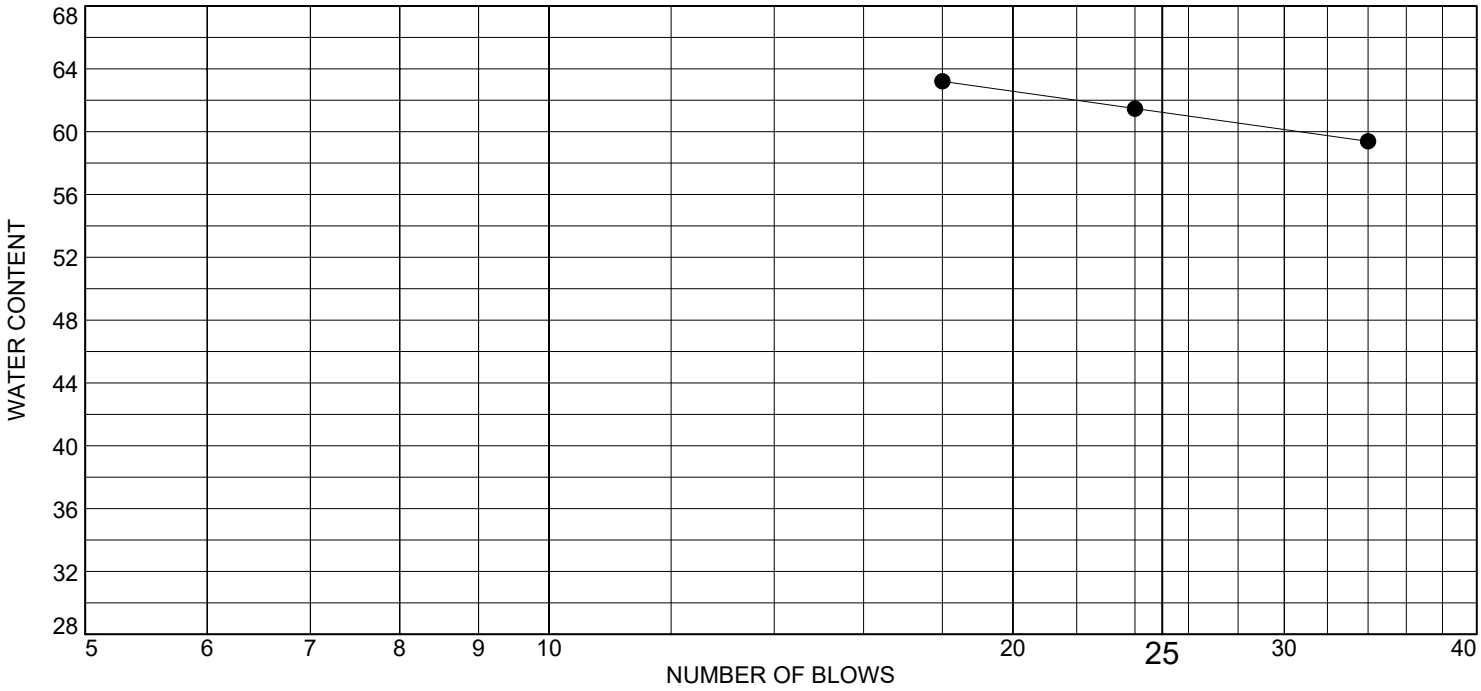
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	61	54	7			MH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 5.0'-6.5'

Sample Number: S-3

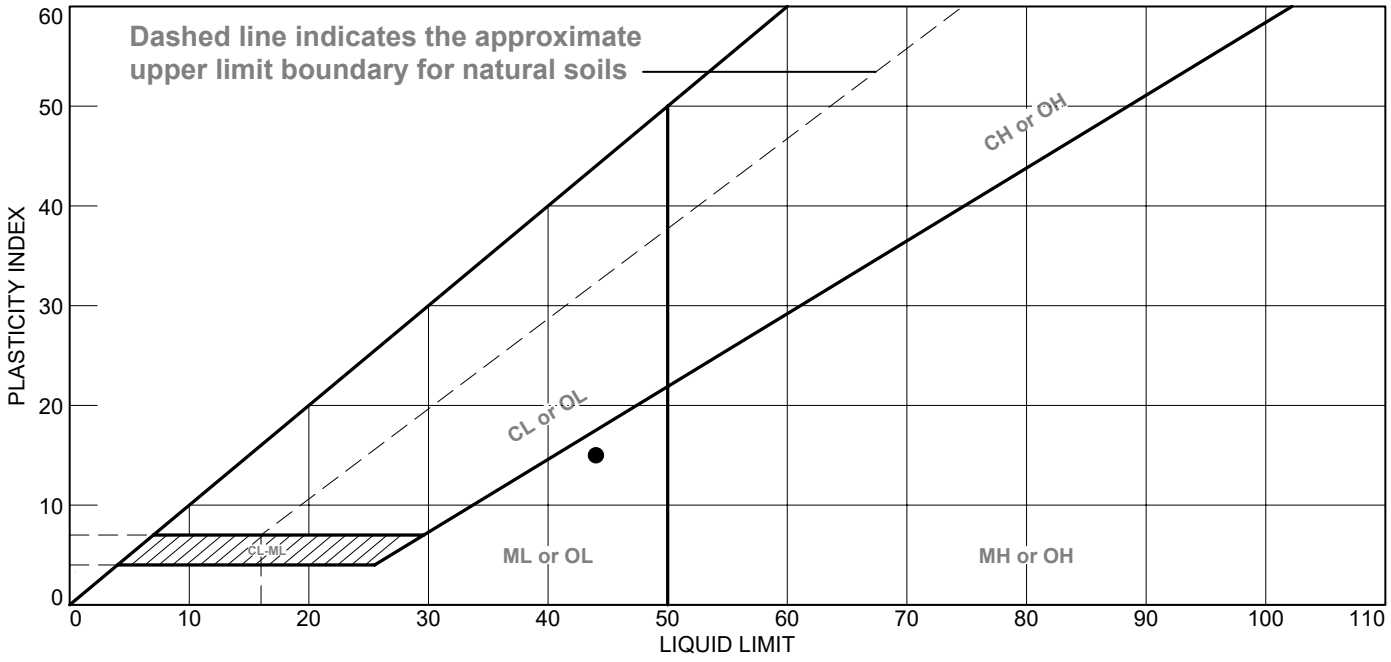
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: GRAY AND BLACK ORGANIC SILT	44	29	15			OL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 26.0'-27.0'
Sample Number: S-8A

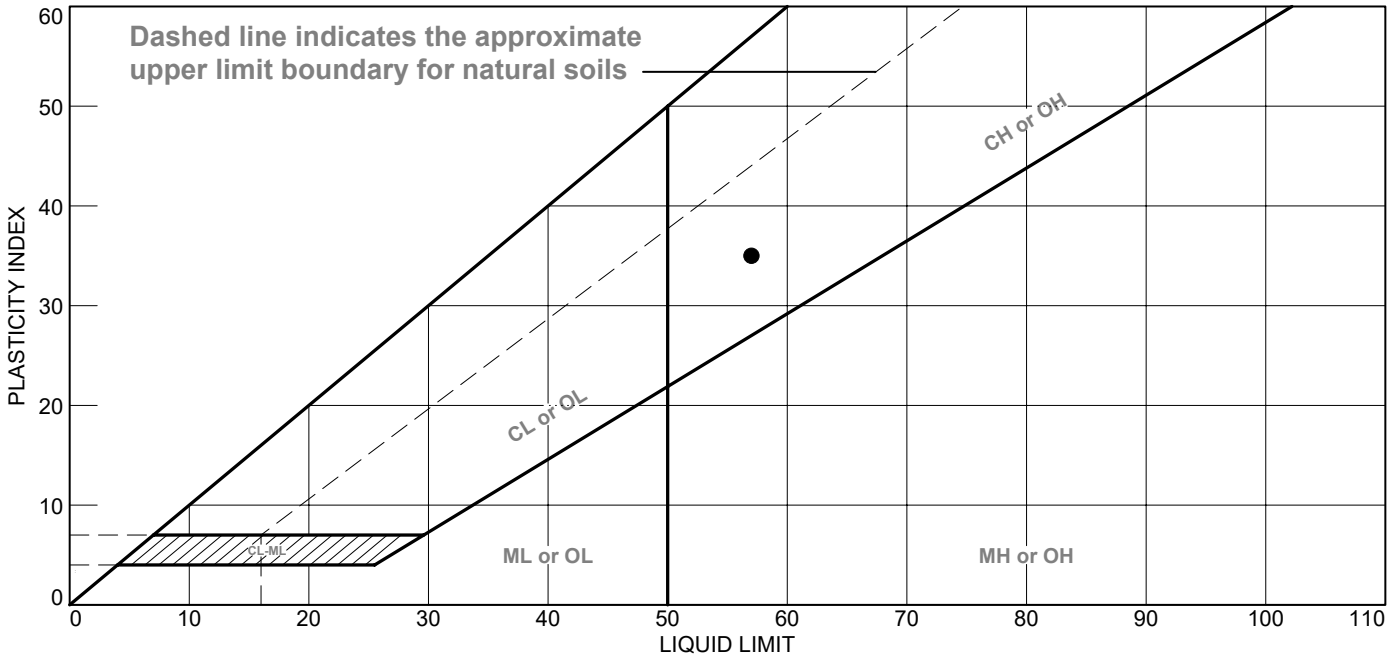
Terracon

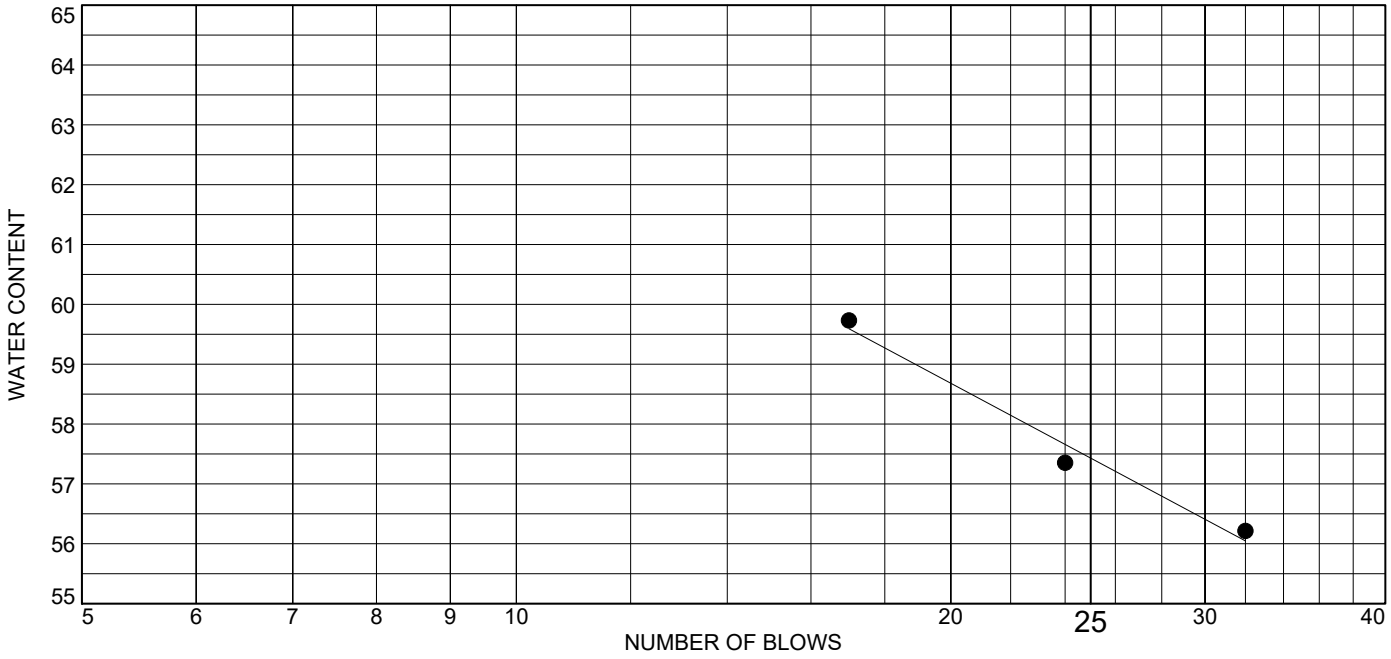
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY SHELL - ORGANICS NOTED	57	22	35			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 41.0'-43.0'
Sample Number: S-11

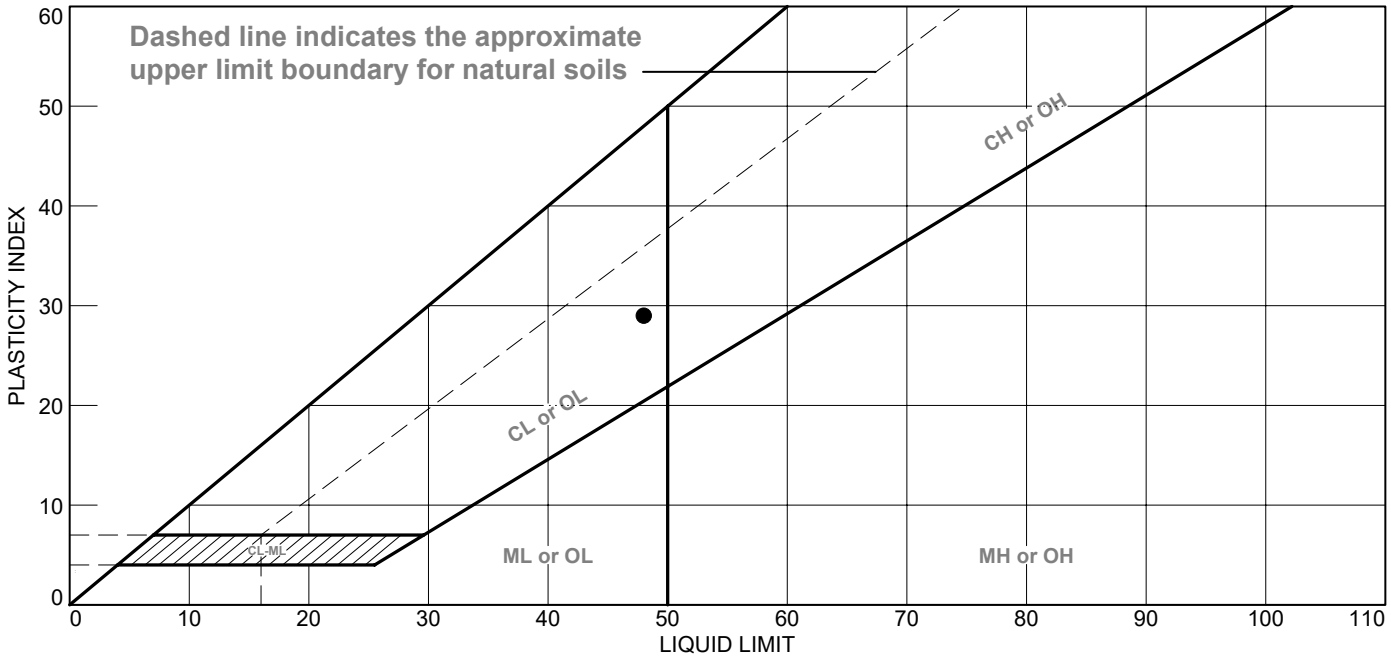
Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	48	19	29			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 5.0'-6.5'
Sample Number: S-3

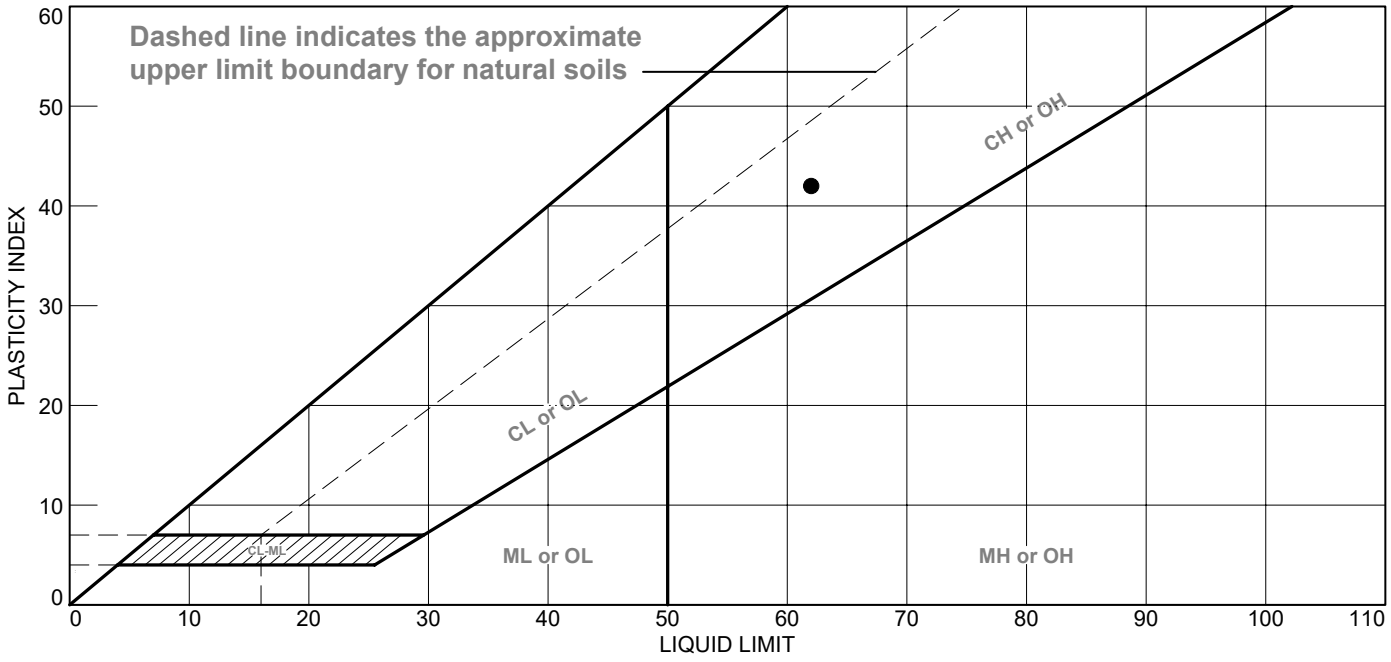
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY WITH SAND	62	20	42			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 13.0'-15.0'
Sample Number: S-6

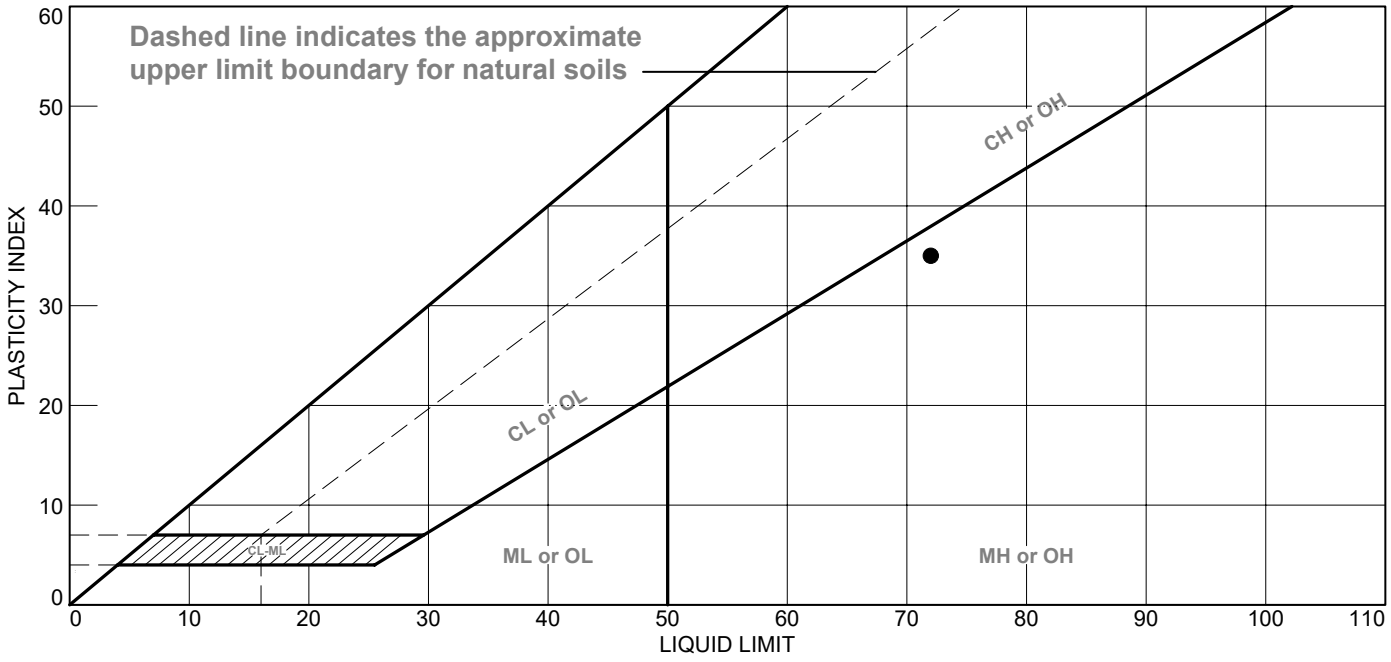
Remarks:

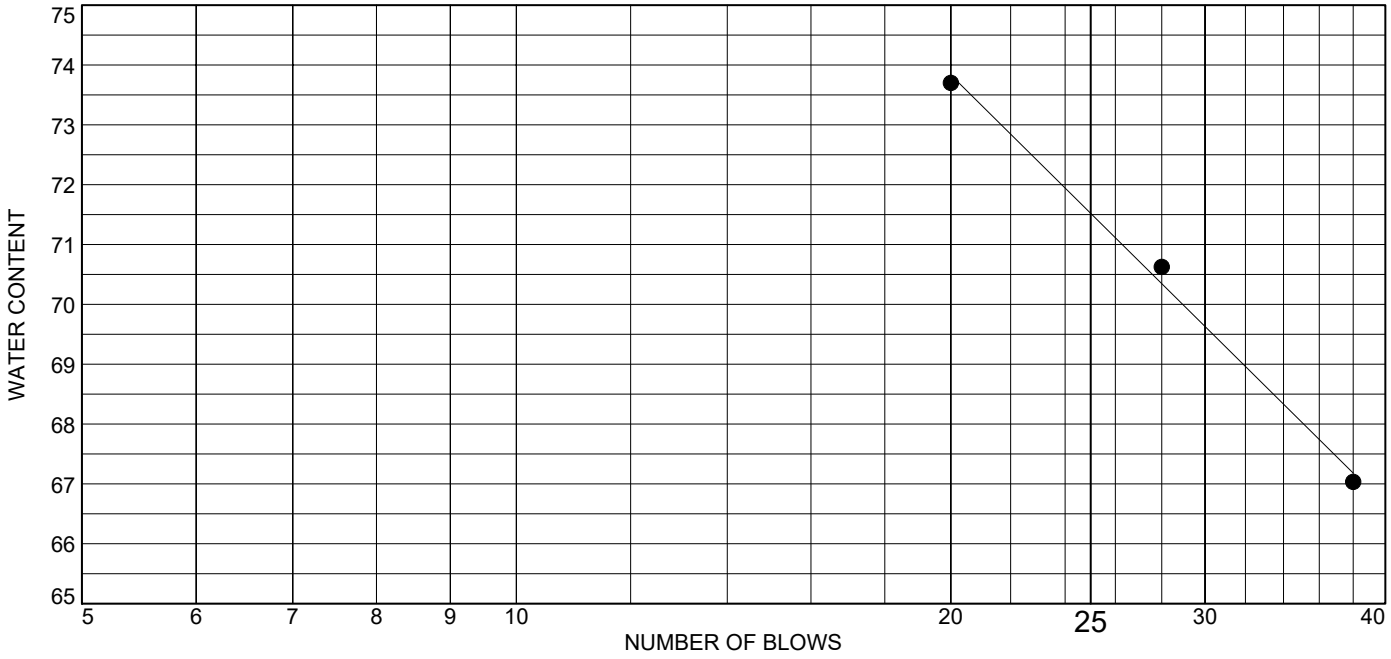
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY ORGANIC SILT	72	37	35			OH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 26.0'-28.0'
Sample Number: S-9

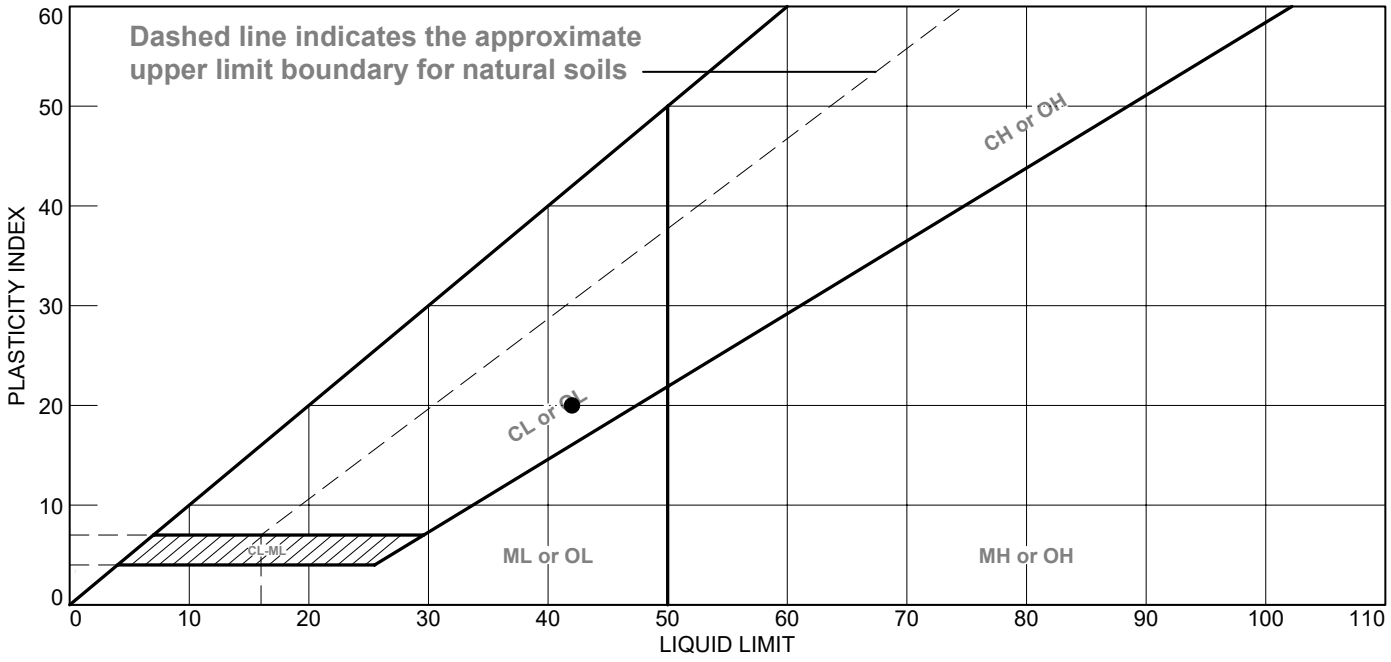
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK BROWN LEAN CLAY WITH SAND	42	22	20			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B008 **Depth:** 2.5'-4.0'
Sample Number: S-2

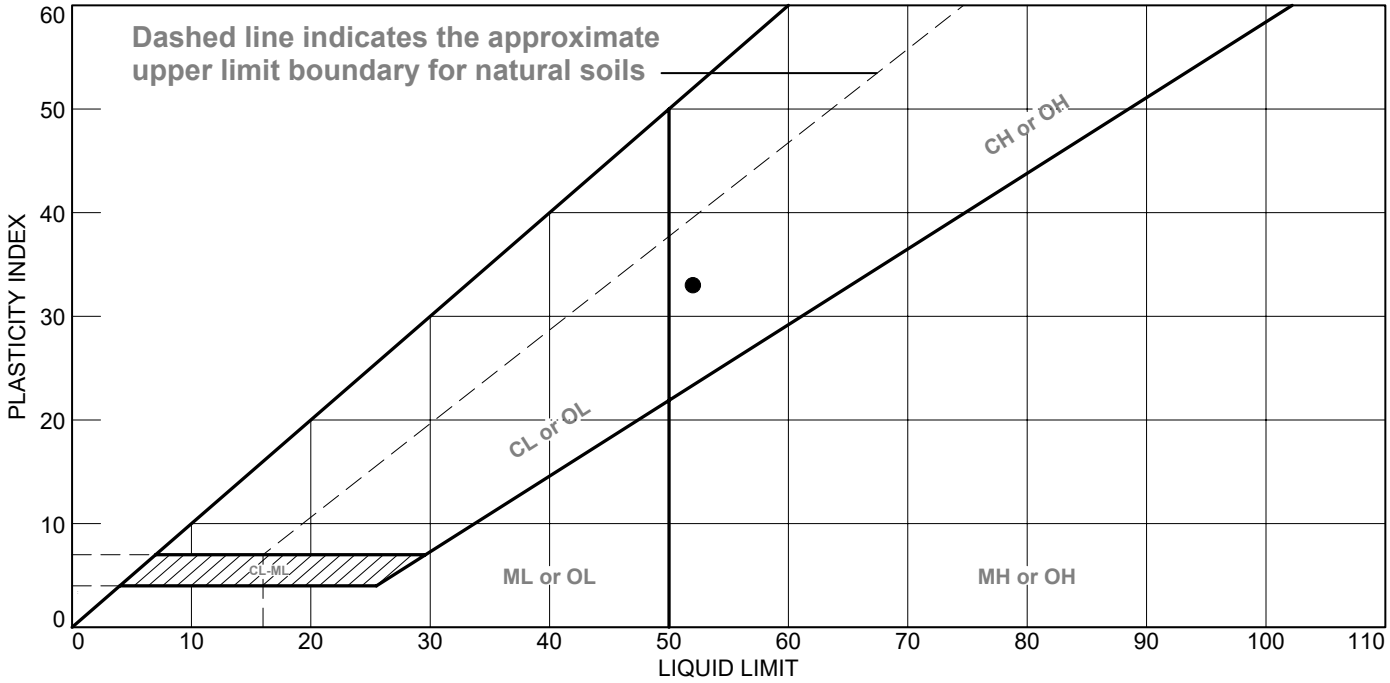
Remarks:

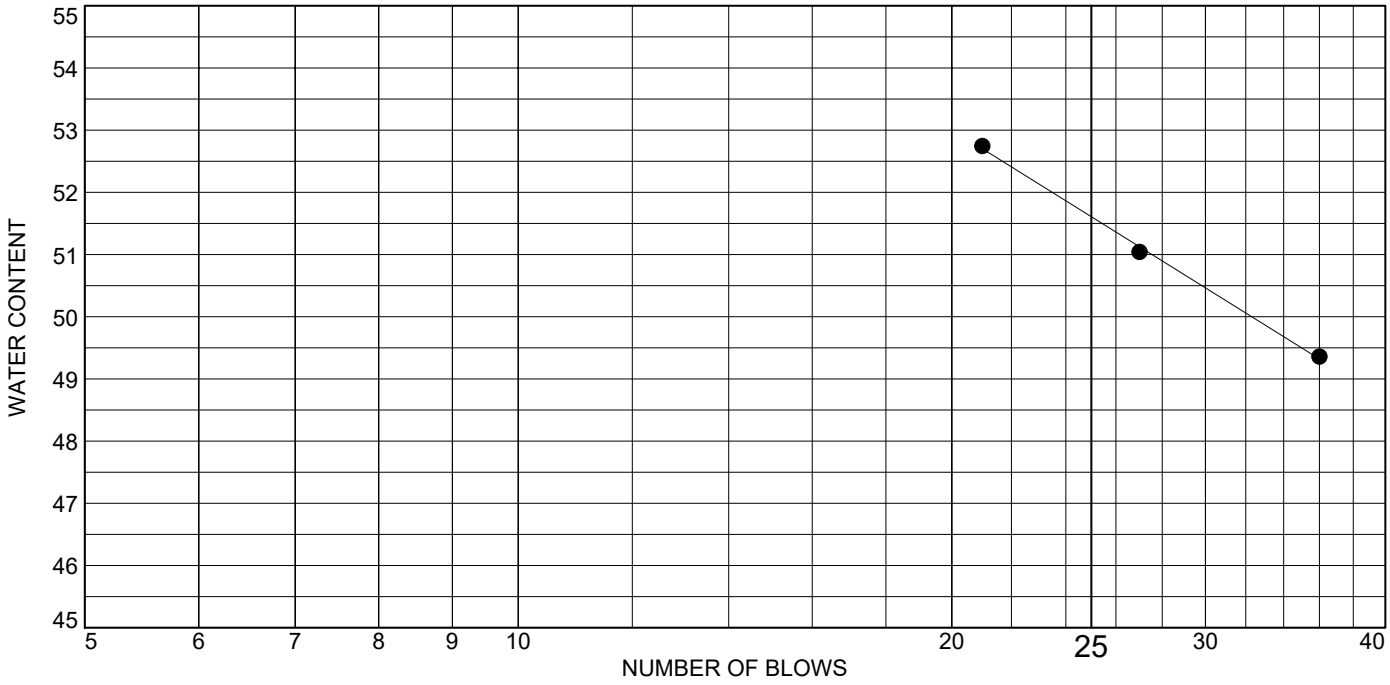
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY FAT CLAY WITH SAND	52	19	33			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

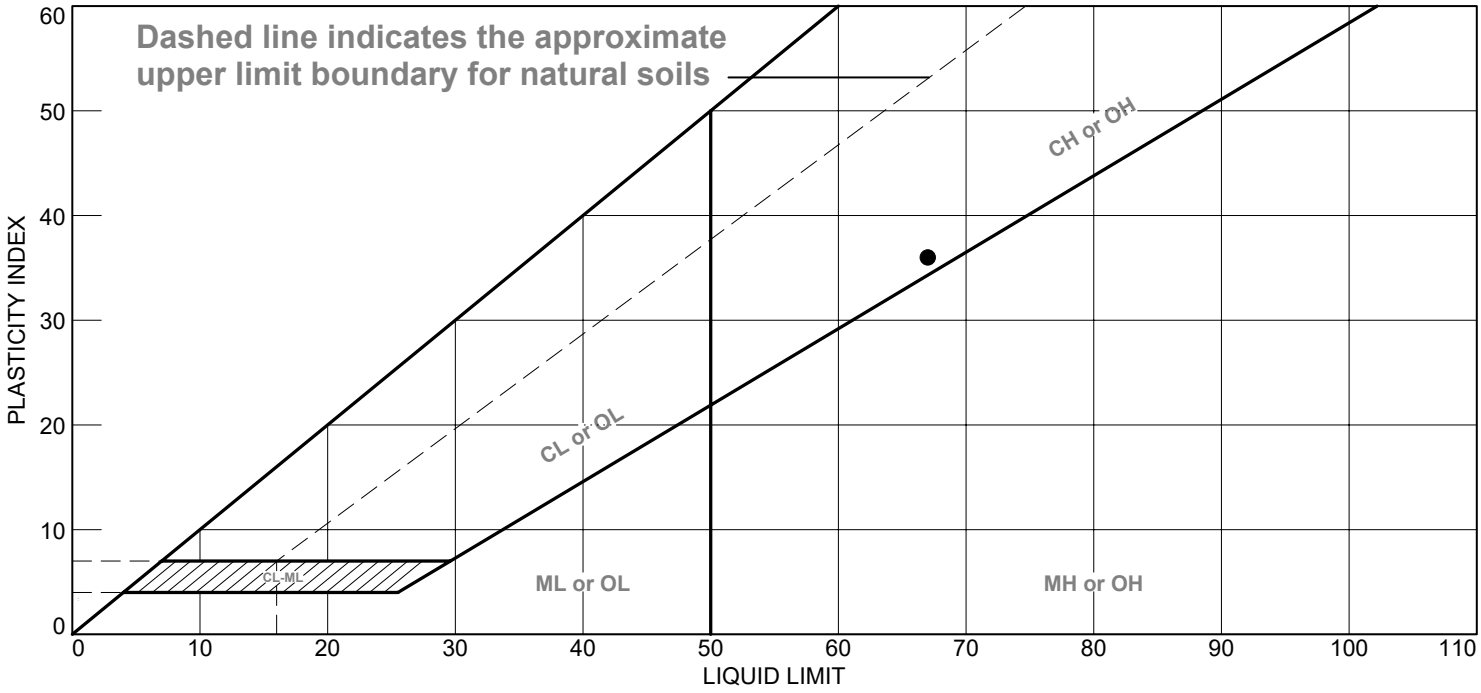
Source of Sample: EDW-B008 **Depth:** 11.0'-13.0'
Sample Number: S-5

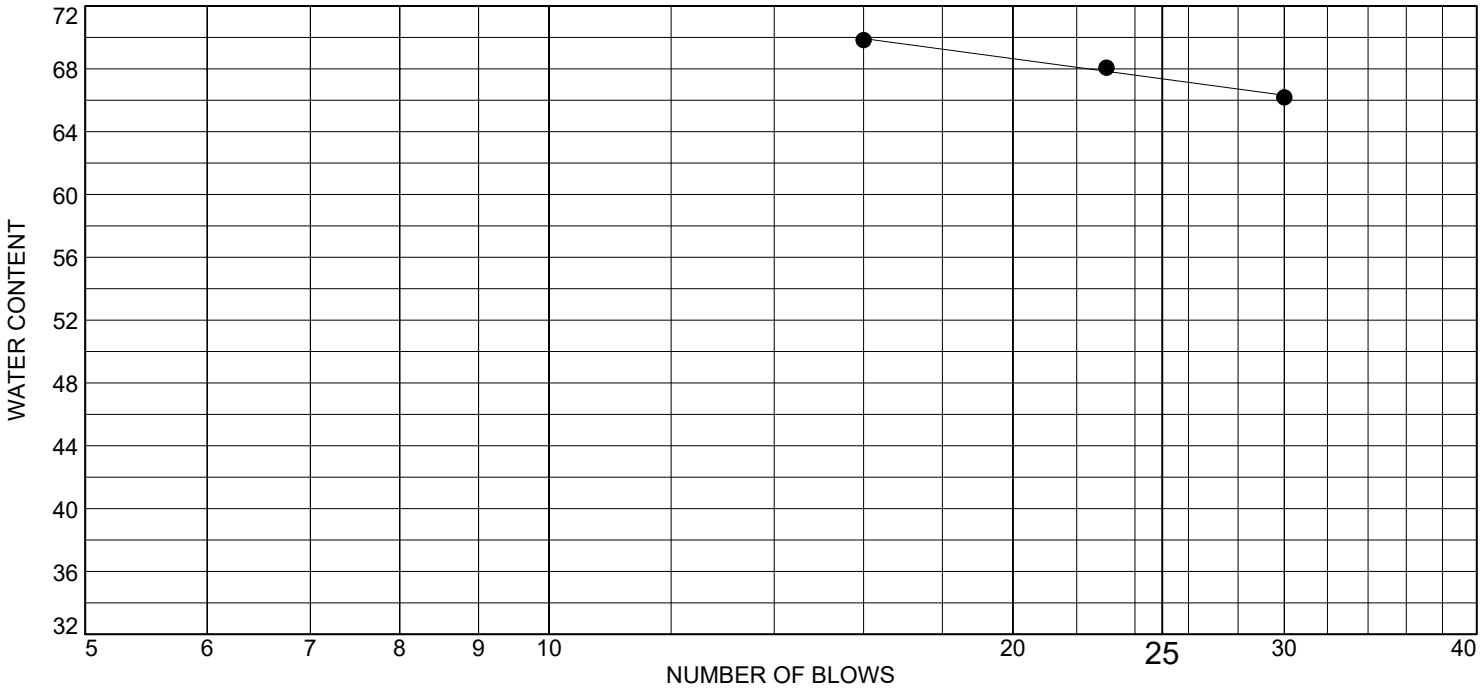
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	67	31	36			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B008 **Depth:** 24.0'-26.5'

Sample Number: S-8

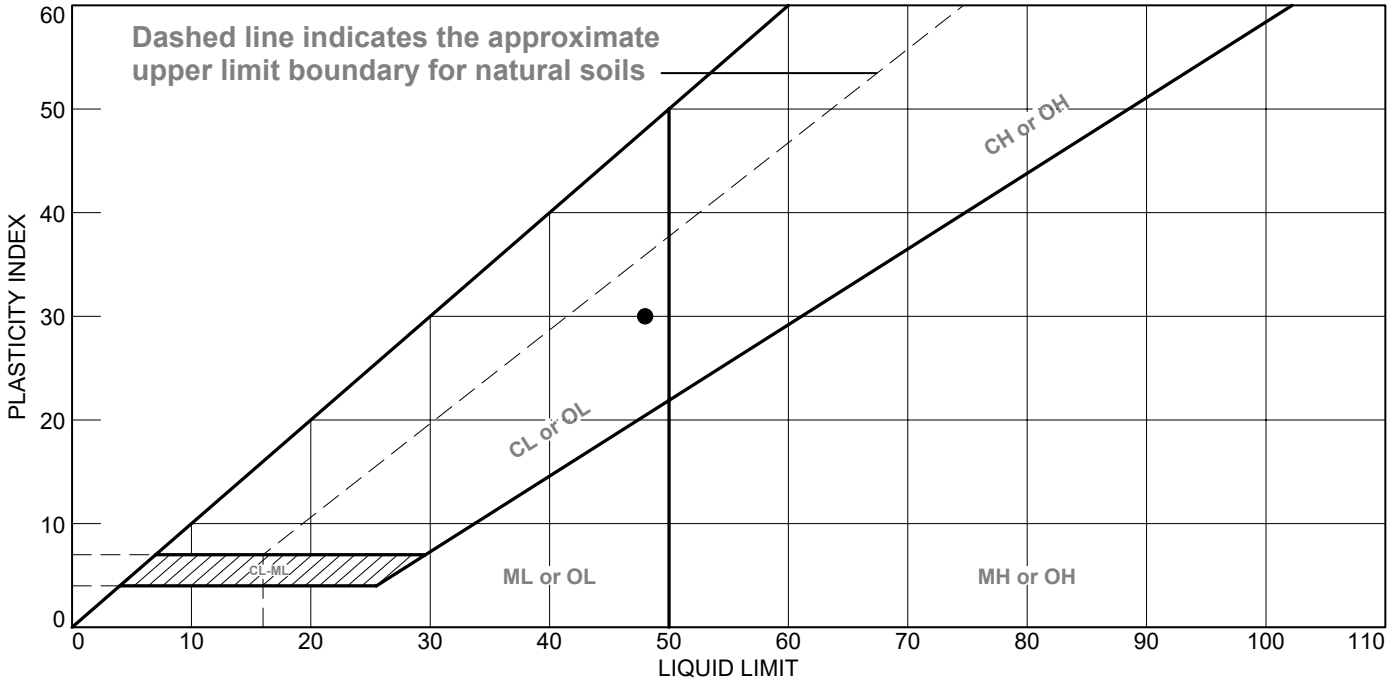
Remarks:

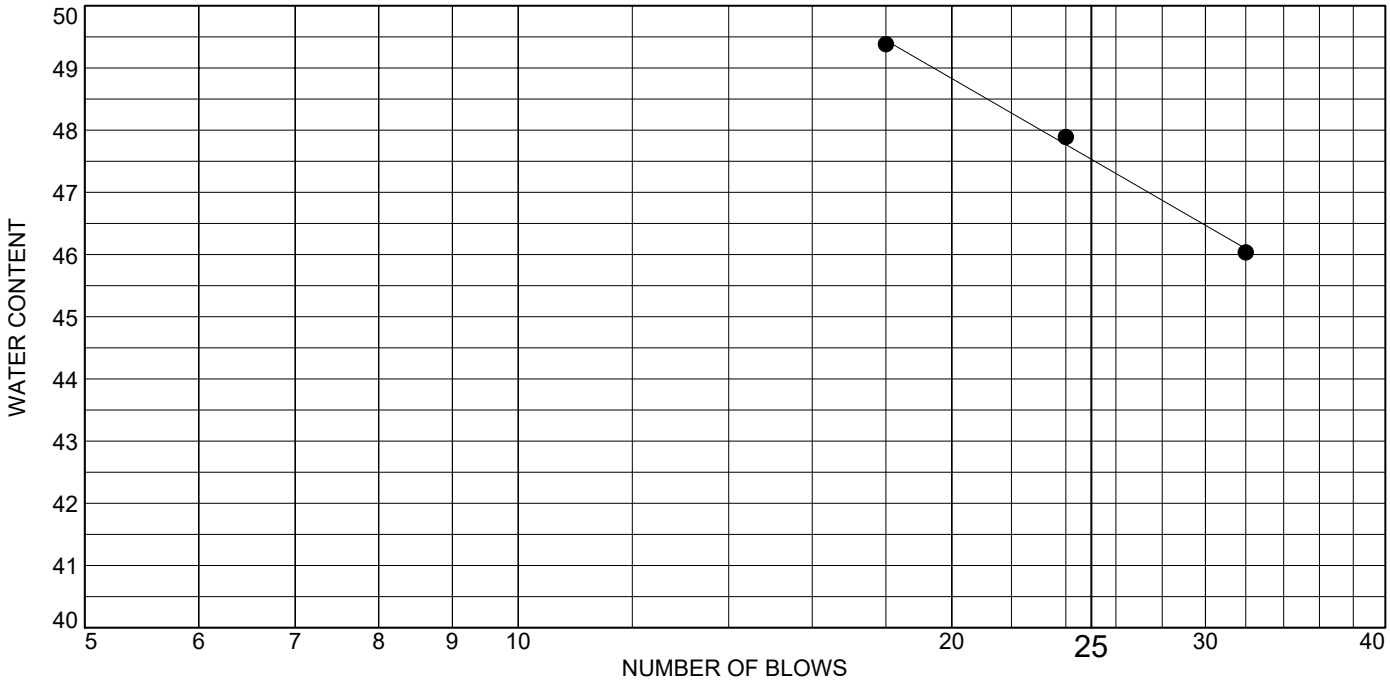
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED LEAN CLAY	48	18	30			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

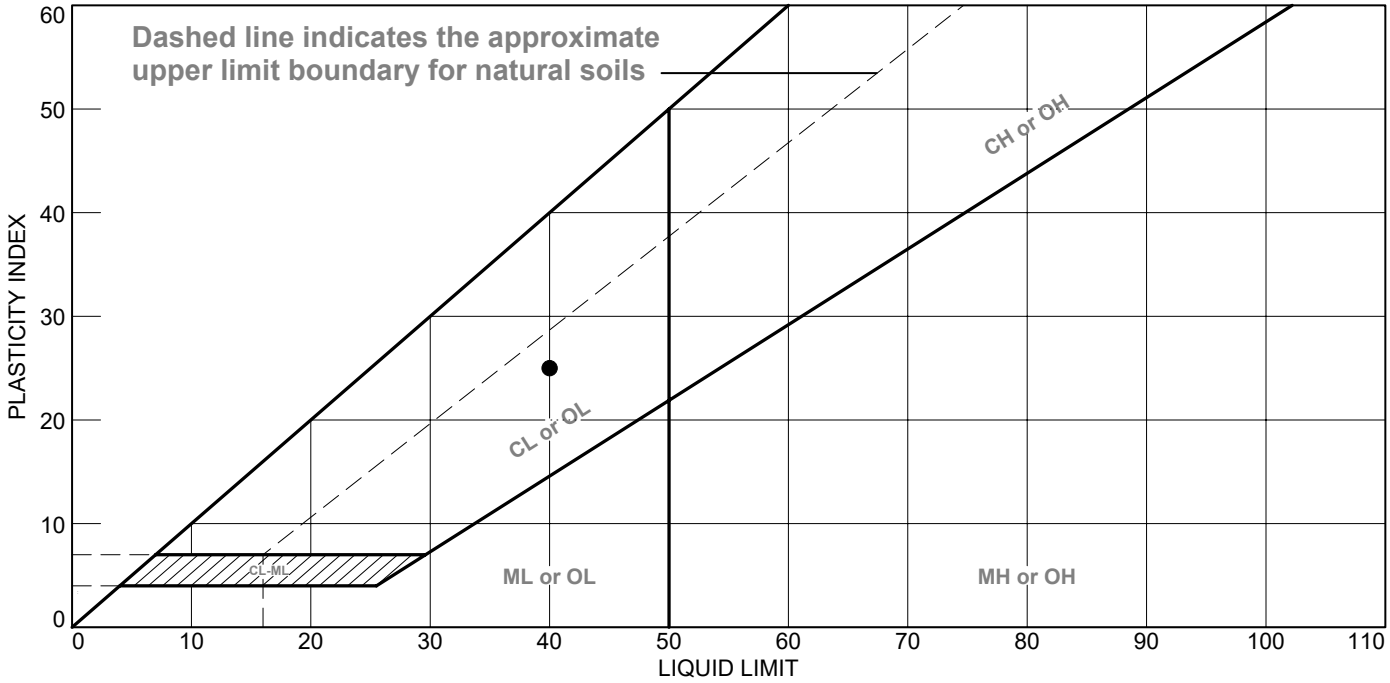
Source of Sample: EDW-B010 **Depth:** 15.0'-17.0'
Sample Number: S-7

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BLUISH GRAY LEAN CLAY	40	15	25			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

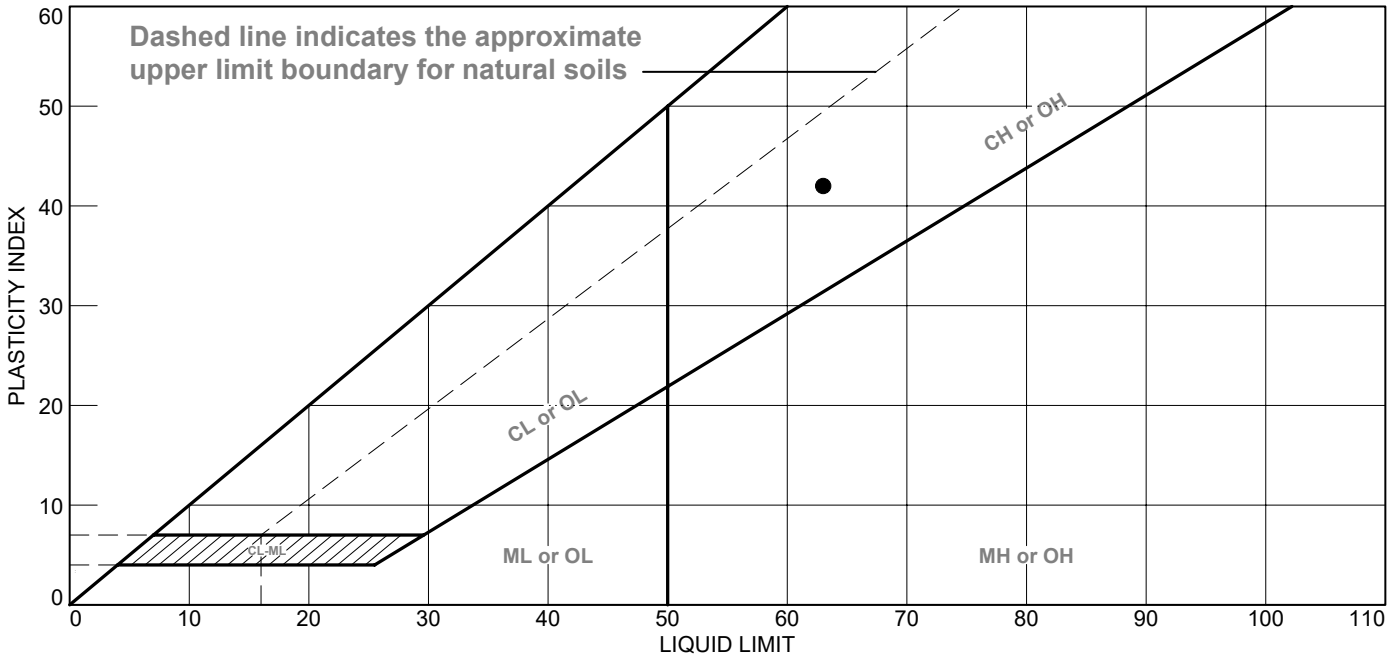
Source of Sample: EDW-B010 **Depth:** 30.0'-32.0'
Sample Number: S-10

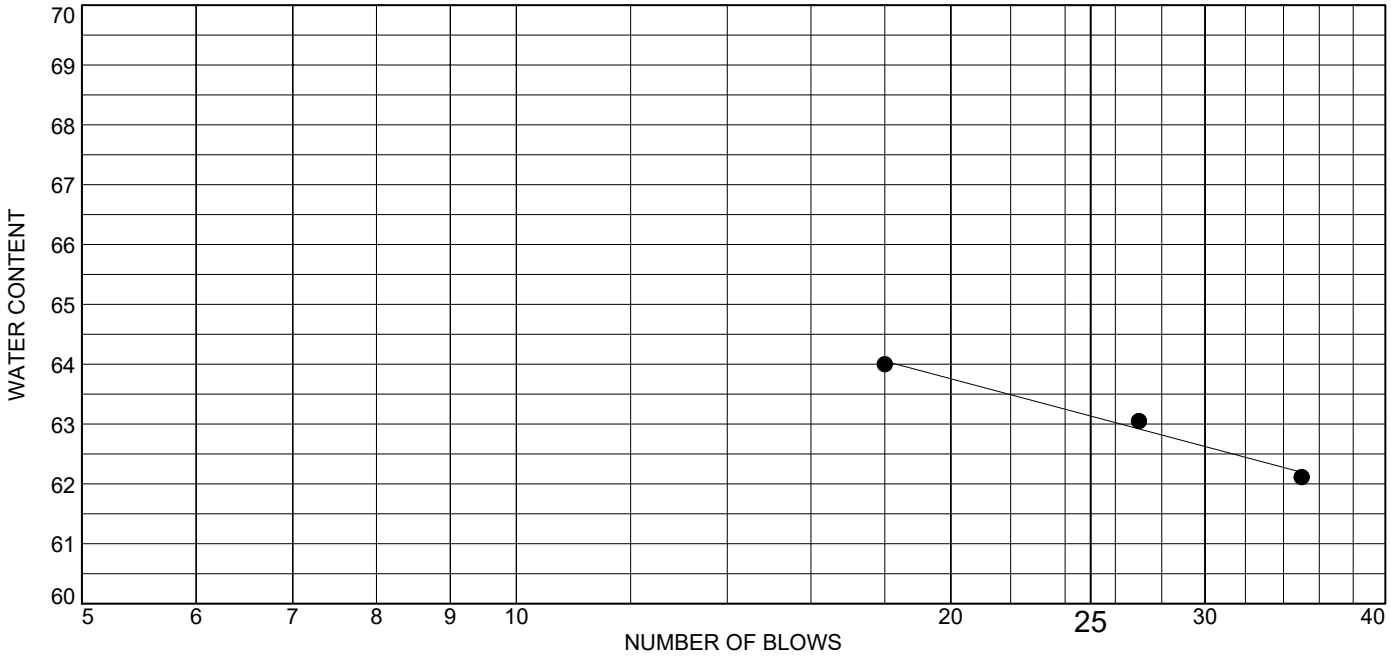
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAYISH BROWN FAT CLAY WITH SAND	63	21	42			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B011 **Depth:** 45.0'-46.5'
Sample Number: S-14

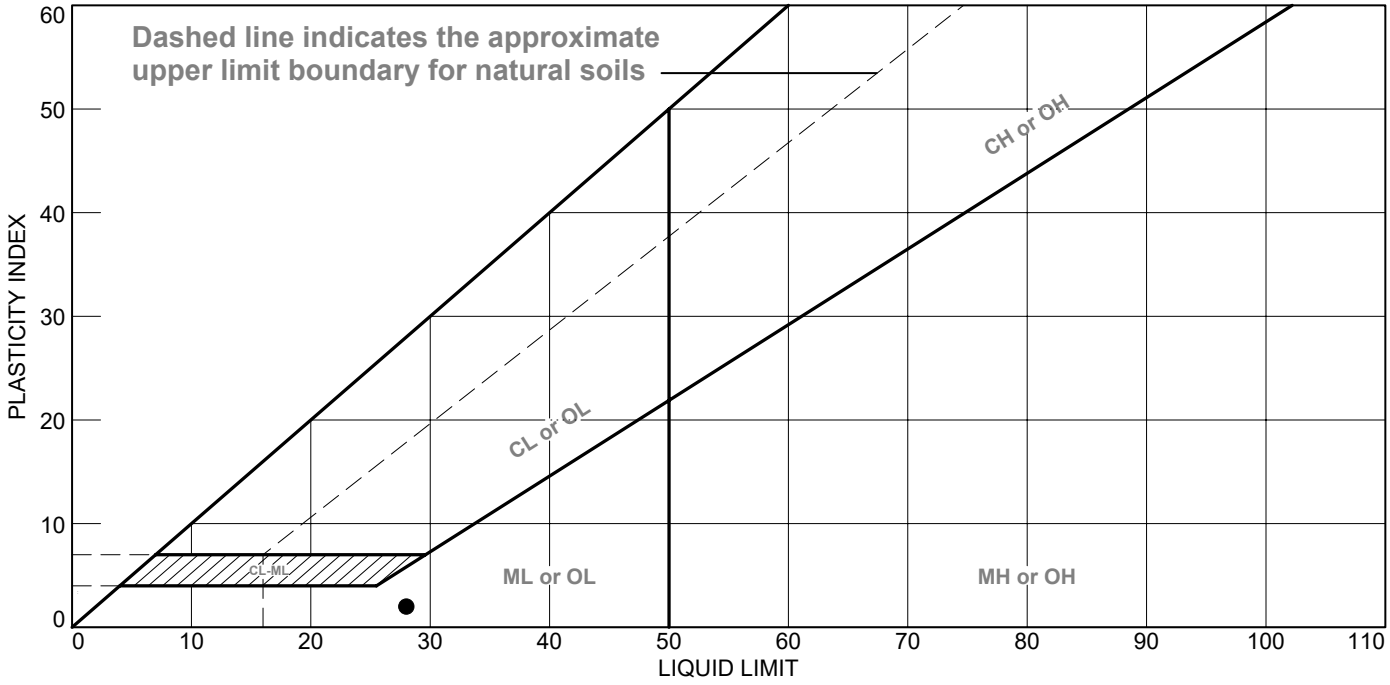
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: DARK GRAY FLY ASH	28	26	2			

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

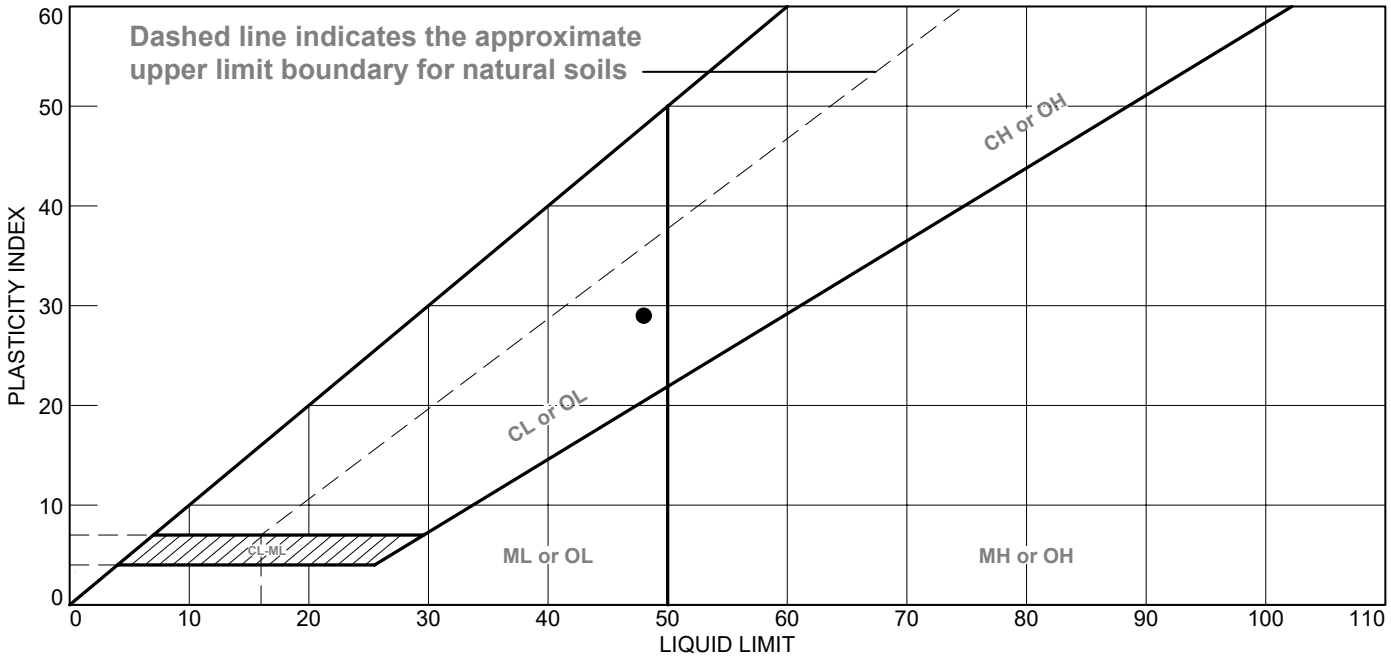
Source of Sample: EDW-B012 **Depth:** 2.5'-4.0'
Sample Number: S-2

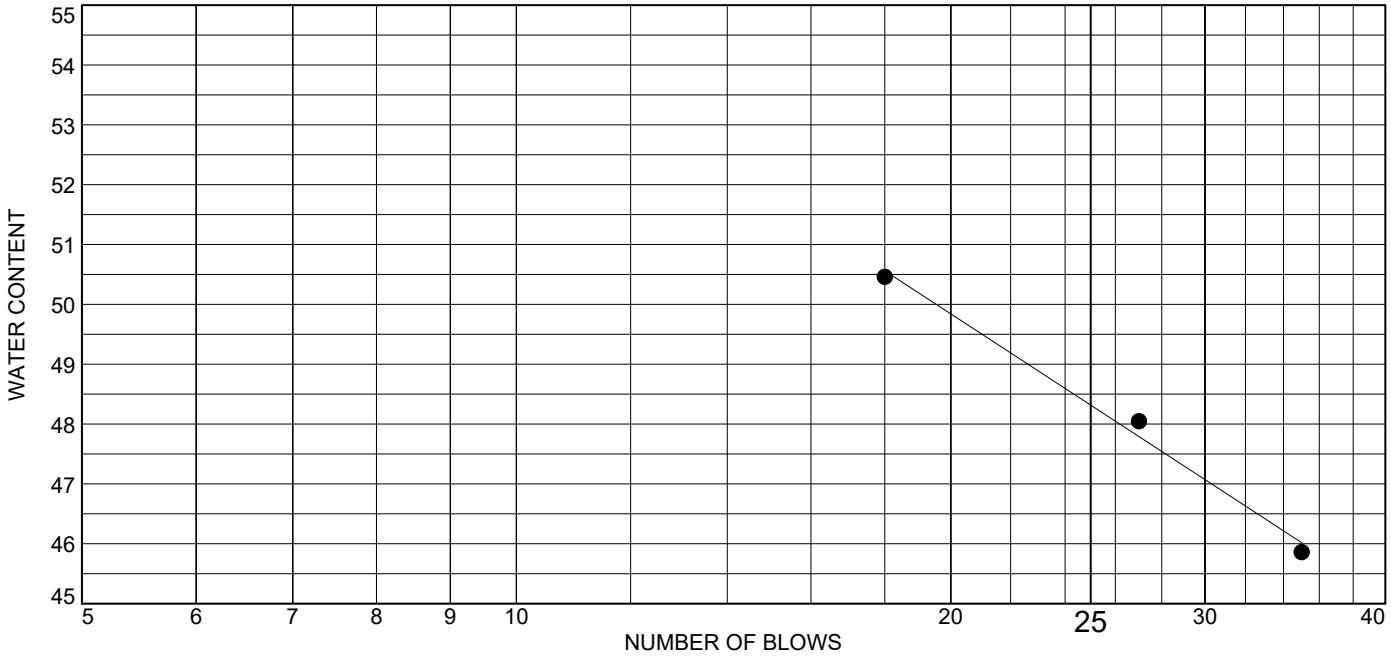
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND RUST BROWN MOTTLED LEAN CLAY	48	19	29			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B012 **Depth:** 15.0'-16.5'
Sample Number: S-7

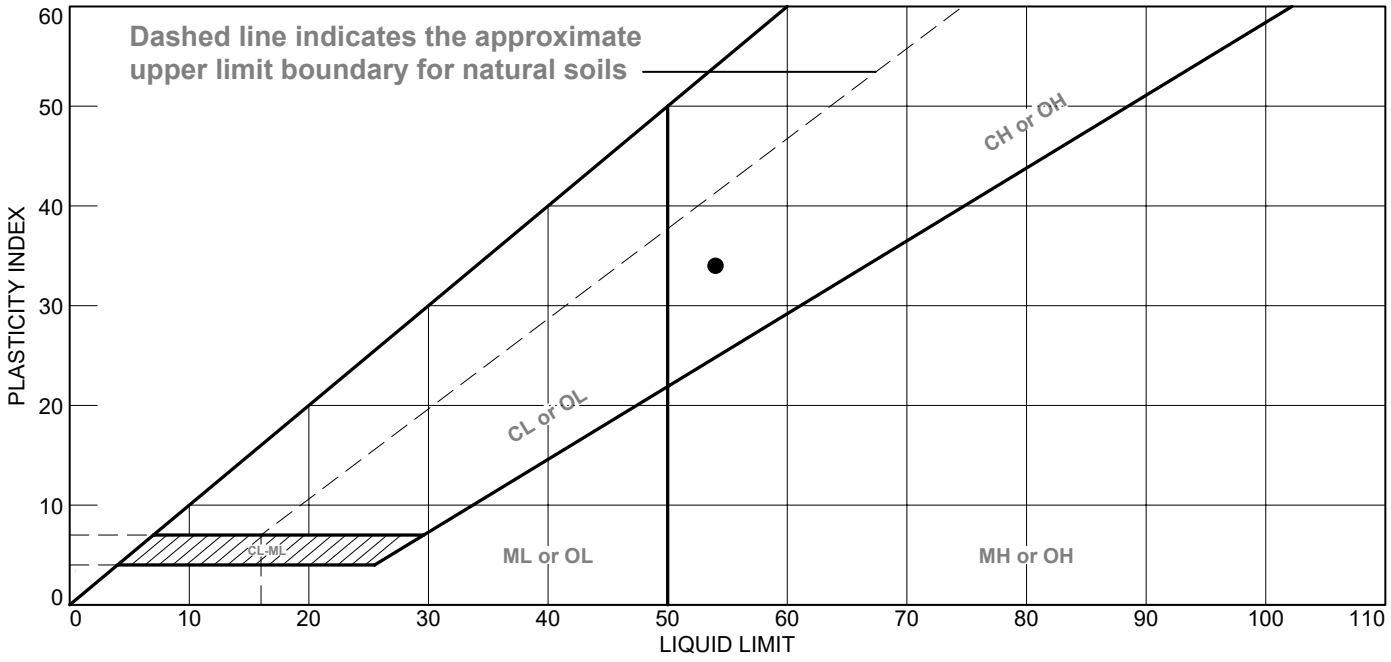
Remarks:

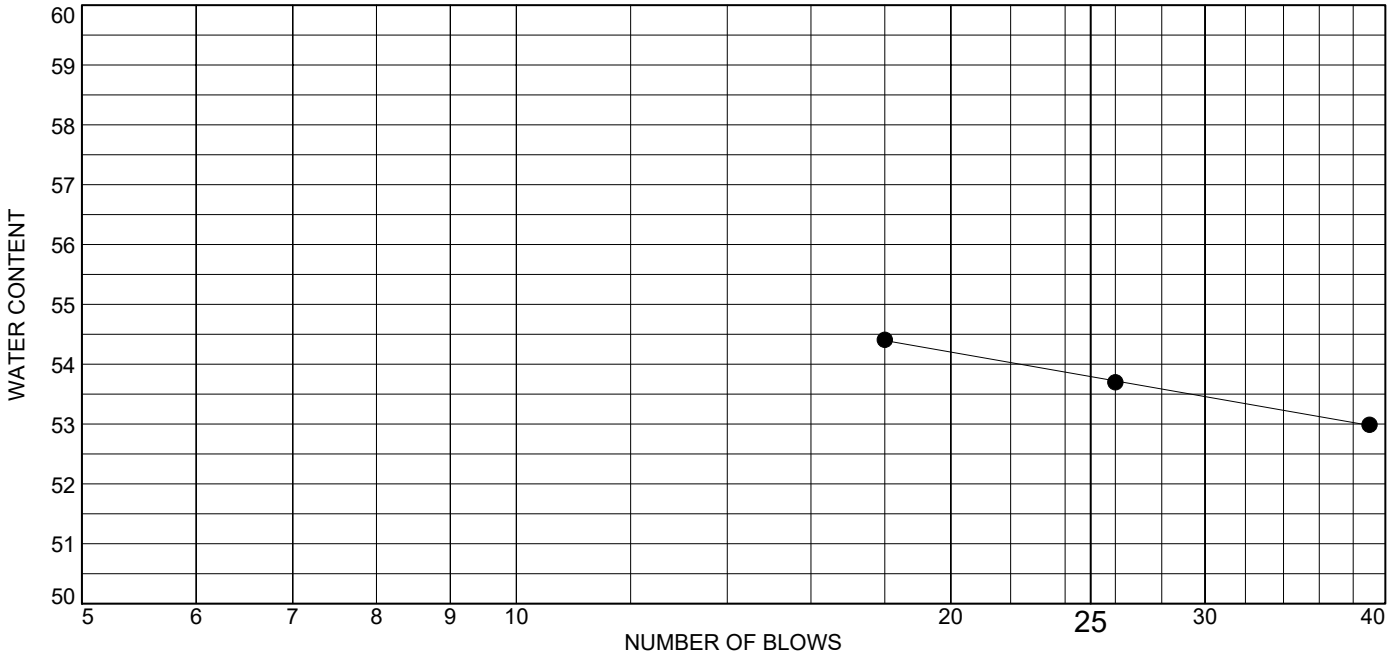
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	54	20	34			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B012 **Depth:** 47.0'-49.0'
Sample Number: S-14

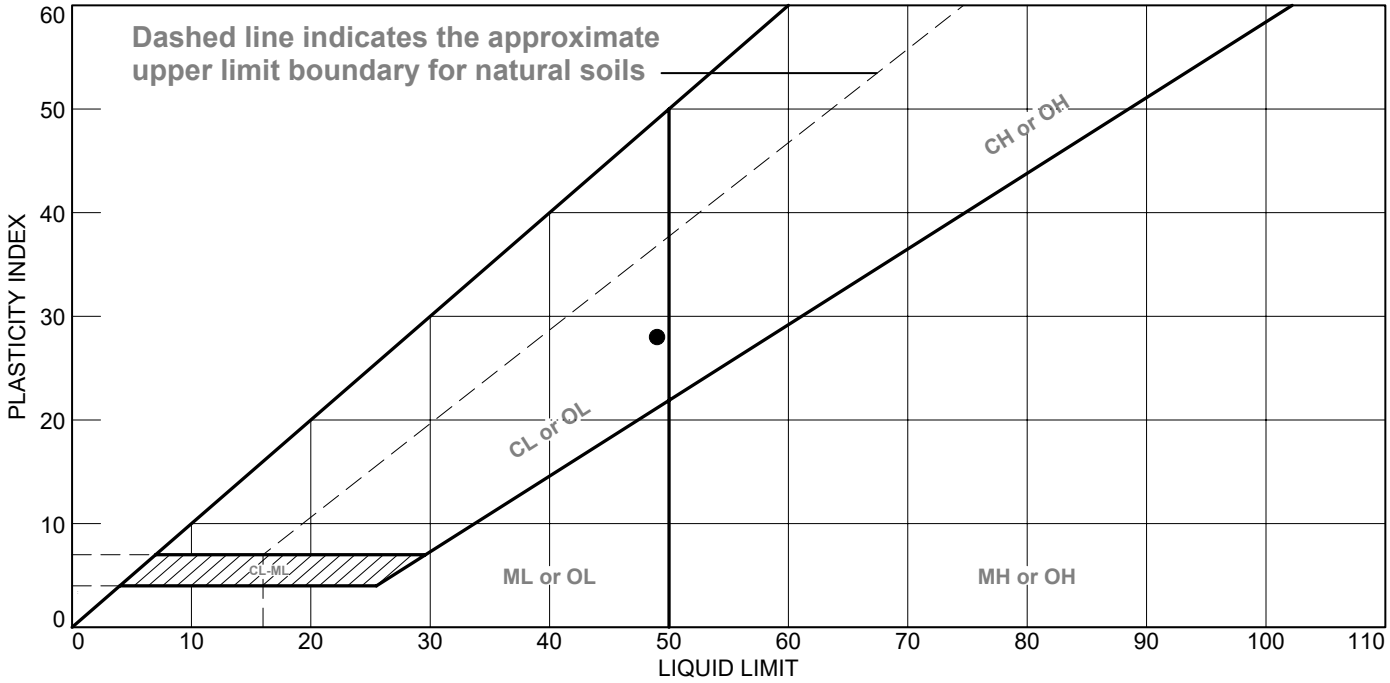
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	49	21	28			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

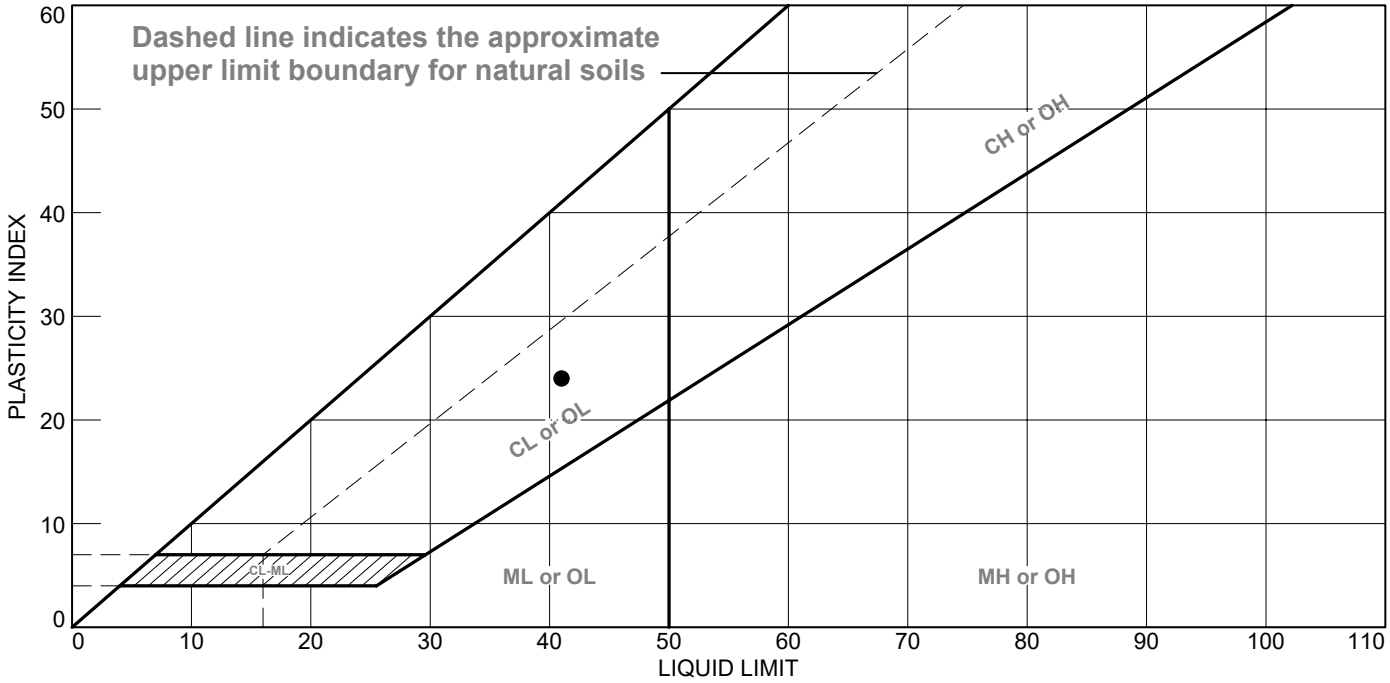
Source of Sample: EDW-B013 **Depth:** 6.0'-8.0'
Sample Number: S-3

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY AND BROWNISH GRAY LEAN CLAY	41	17	24			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

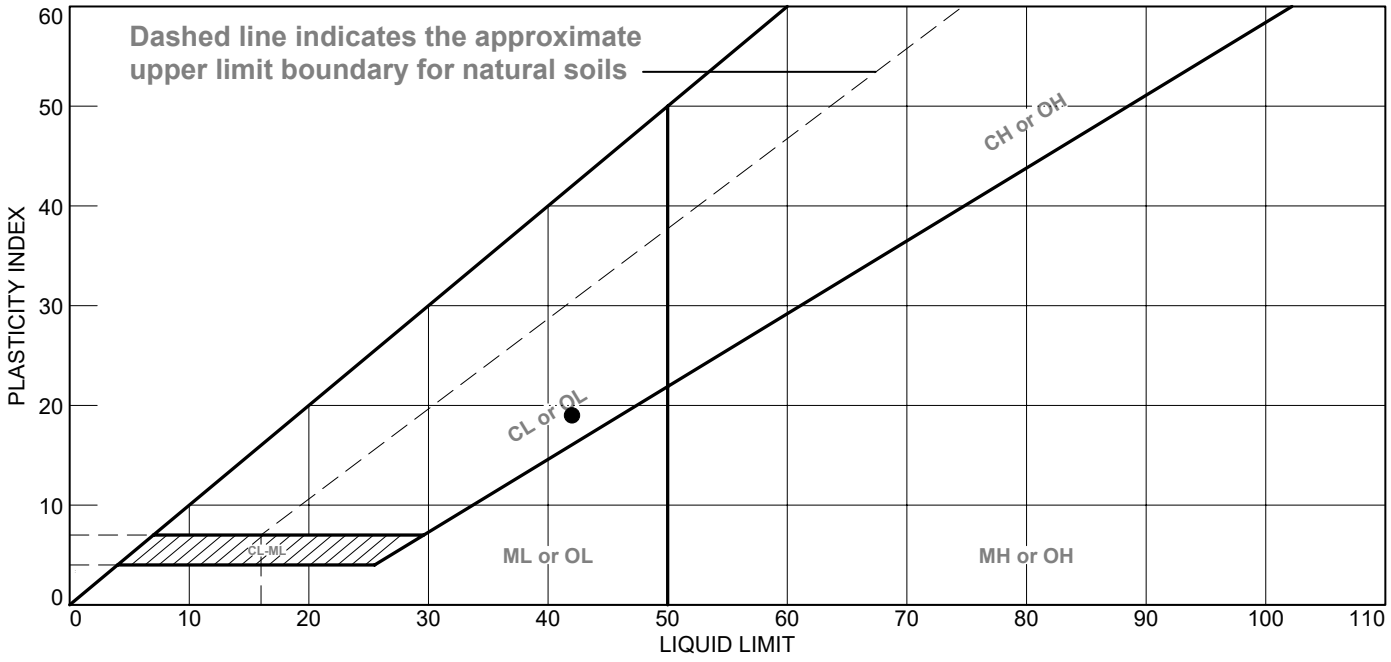
Source of Sample: EDW-B013 **Depth:** 15.0'-16.5'
Sample Number: S-6

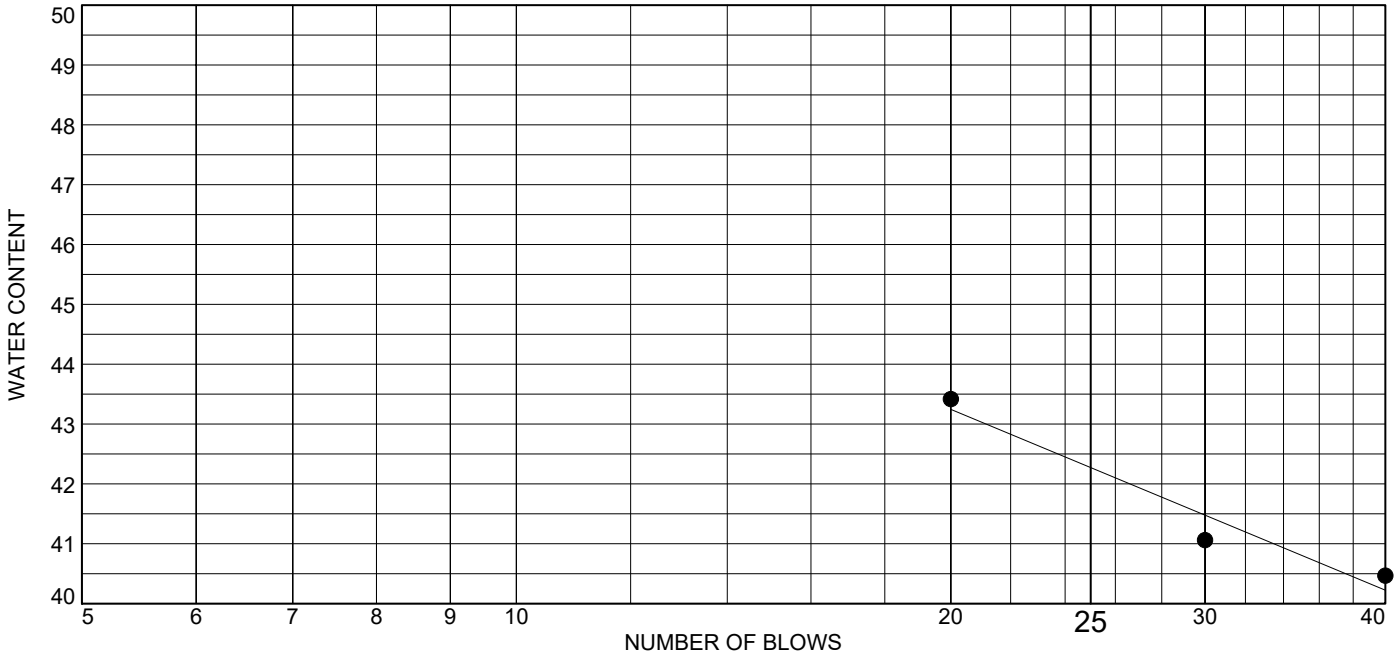
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND BROWN LEAN CLAY WITH SAND	42	23	19			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B013 **Depth:** 32.0'-34.0'
Sample Number: S-10

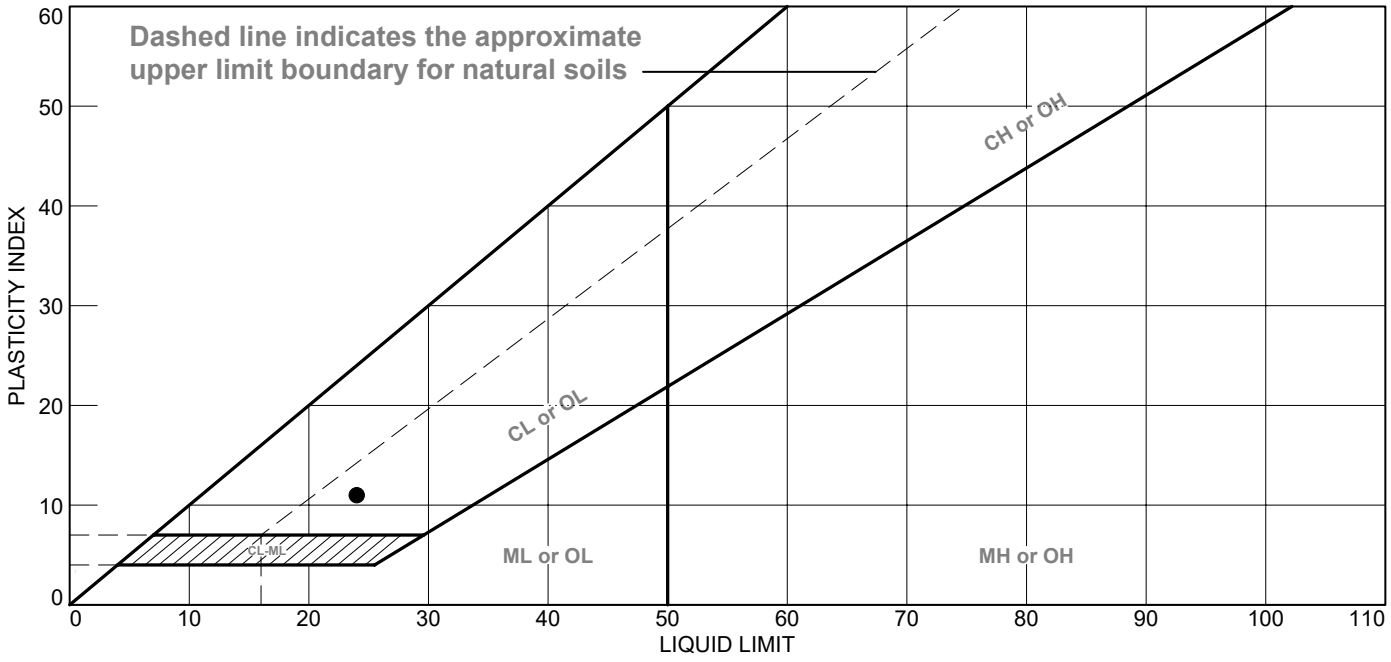
Remarks:

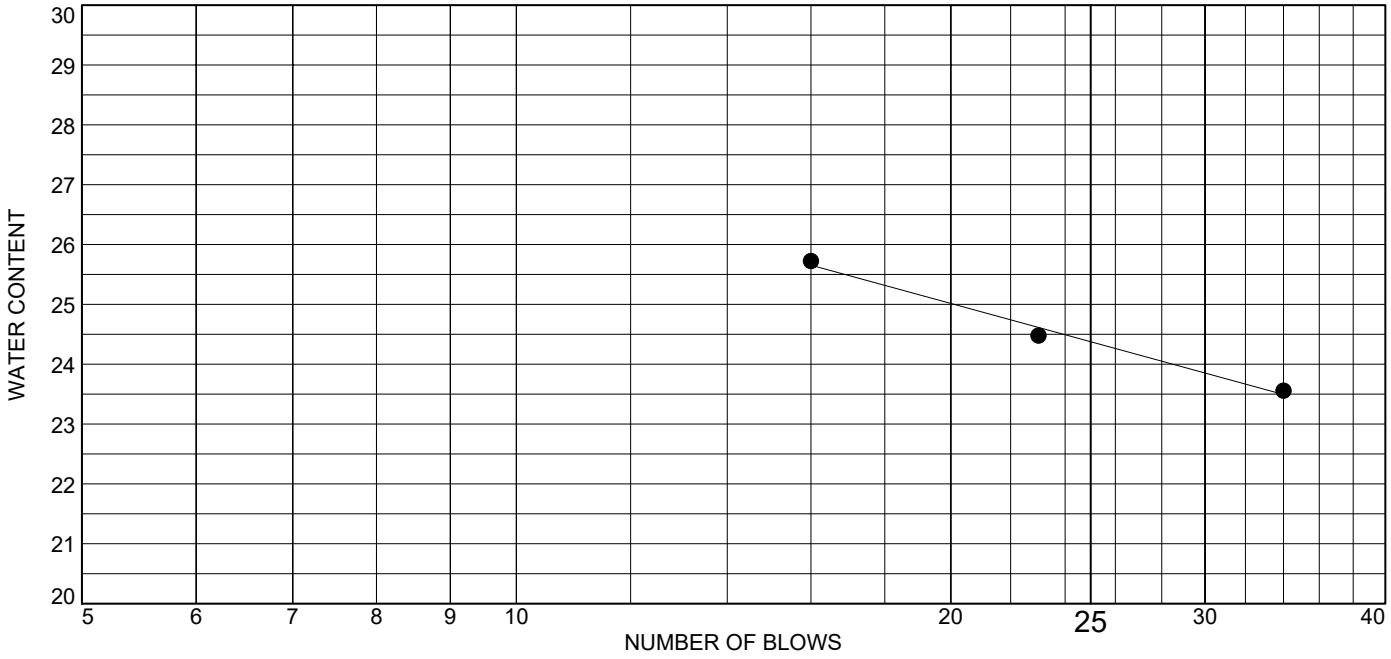
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	24	13	11			CL

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 31.0'-33.0'
Sample Number: S-10

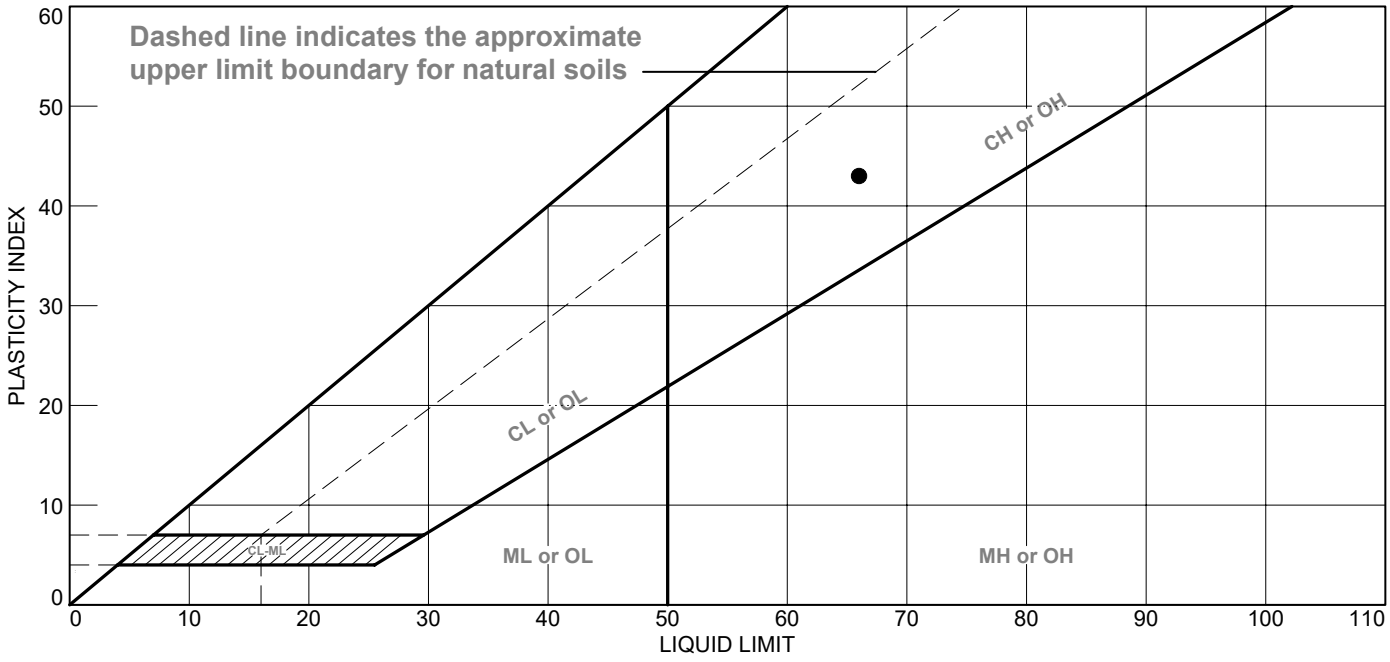
Remarks:

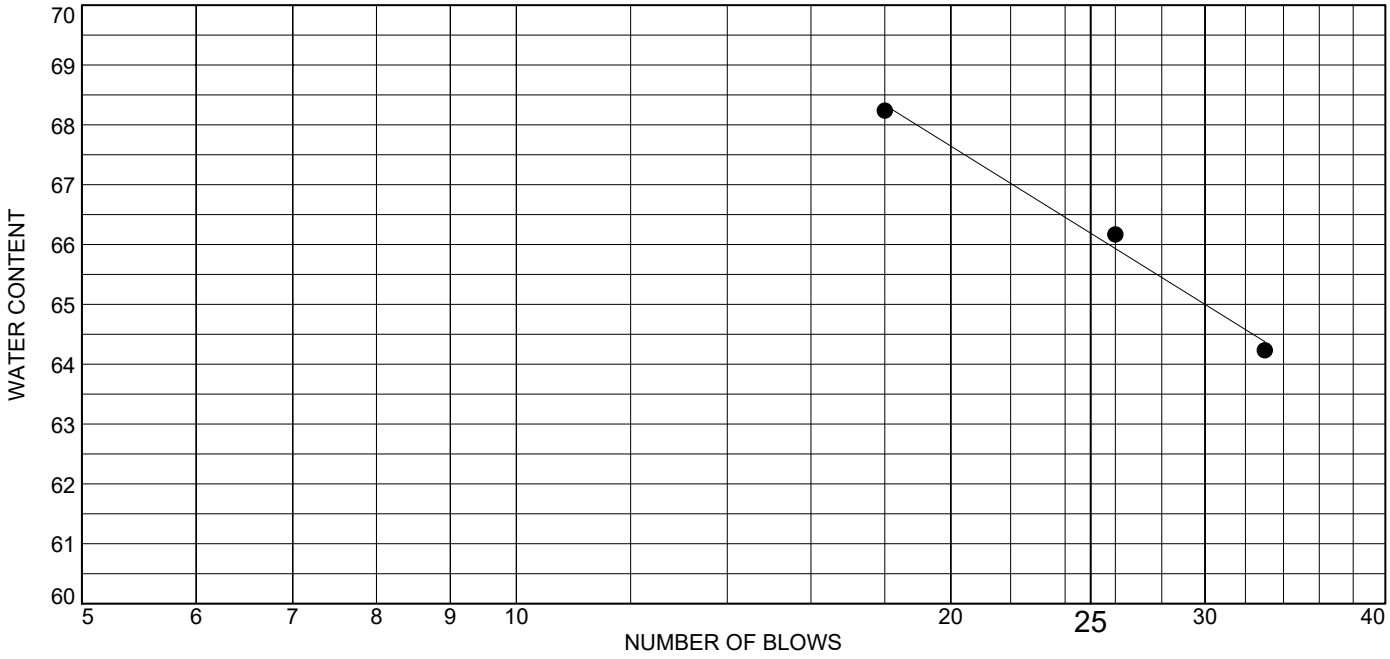
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	66	23	43			CH

Project No. MR155218 **Client:** DYNERGY

Project: DYNERGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 37.0'-39.0'
Sample Number: S-12

Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

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Consulting Engineers & Scientists

SPECIFIC GRAVITY OF SOIL SOLIDS
ASTM D-854

Project Number: MR155218
Project Name: Dynergy Edwards
Test Date: 11/10/2015

Results Summary

Boring / Sample	Sample Description	USCS	Sample Number	Depth (ft)	Passing #4	Specific Gravity (Gs)
EDW-B002	DARK GRAY FLY ASH		S-8	25.0'-27.0'	100.00%	2.471
EDW-B002	GRAY LEAN CLAY	CL	S-11	40.0'-41.5'	100.00%	2.592
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND		S-1	0.0'-1.5'	100.00%	2.469
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		S-6	15.0'-16.5'	100.00%	2.772
EDW-B004	GRAY LEAN CLAY WITH SAND	CL	S-14	50.0'-51.5'	100.00%	2.617
EDW-B005	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED	CL	S-12	45.0'-46.5'	100.00%	2.521
EDW-B011	FILL: DARK GRAY FLY ASH - CLAY NOTED		S-8	25.0'-29.0'	100.00%	2.691
EDW-B014	FILL: DARK GRAY FLY ASH		S-7	20.0'-22.5'	100.00%	2.524
EDW-B014	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	S-11	40.0'-40.5'	100.00%	2.719

Terracon
Consulting Engineers & Scientists

Laboratory Services Group | 750 Corporate Woods Parkway | Vernon Hills, Illinois 60061 | Ph. (224)352-7000 | Fax (224)352-7024

Soil Resistivity	**AASHTO T 288/ ASTM G 57**
Soil pH	**AASHTO T 289/ ASTM G 51**
Soil REDOX	**DIPRA**
Soil Sulfides	**DIPRA**
Water Content	**AASHTO T 93/ ASTM D 2216**

Soil Corrosivity Indication Series

Project No.: MR155218
Project Name: DYNERGY EDWARDS

Client Name: AECOM
Test Date: 5/11/13/15

Summary of Test Results

Boring / Sample No.	Resistivity Natural Miller Soil Box(ohms)	Resistivity Saturated Miller Soil Box(ohms)	pH Soil Water Slurry	REDOX (mV)Soil Water Slurry	Sulfides Reaction	As Received WC%	Saturated WC%	Total Points
EDW-B002 S6	**1,720**	**1,550**	**9.77**	**65**	**NEG**	**52.3**	**77.4**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B004 S3	**3,380**	**3,070**	**8.97**	**140**	**NEG**	**21.4**	**36.9**	**3.0**
Points	0	0	3	0	0			
Description:	BROWN AND GRAY LEAN CLAY							
EDW-B005 S12	**1,120**	**960**	**8.38**	**195**	**NEG**	**88.7**	**99.4**	**10.0**
Points	0	10	0	0	0			
Description:	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND							
EDW- B011 S6	**1,760**	**1,600**	**9.85**	**60**	**NEG**	**63.6**	**82.3**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B0014 S7	**1,995**	**1,810**	**10.89**	**35**	**4**	**86.5**	**98.6**	**15.0**
Points	0	8	3	4	0			
Description:	DARK GRAY FLY ASH							

Resistivity:	Points:	pH:	Points:	Redox:	Points:	Sulfides:	Points:	†
<1500 ohms	10	0.0-2.0	5	Negative	5	Positive	3.5	
1500-1800	8	2.0-4.0	3	0 - 50mV	4	Trace	2	
1800-2100	5	4.0-6.5	0	50 - 100mV	3.5	Negative	0	
2100-2500	2	6.5-7.5	0*	100mV+	0			
2500-3000	1	7.5-8.5	0					
3000+	0	8.5 +	3					

*- If Sulfides are present and a low or neg. ReDox, add 3 points

† - THIS SYSTEM IS BASED ON A 25.5 POINT CORROSIVITY RATING SYSTEM DEVELOPED BY THE AMERICAN NATIONAL STANDARDS FOR POLYETHYLENE ENCASEMENT AND DUCTILE-IRON PIPE SYSTEMS. IT SHOULD BE NOTED THAT THESE TEST RESULTS ARE AN INDICATION OF SOIL CHEMISTRY AND SHOULD BE USED AS A INDICATION OF POSSIBLE CORROSIVE CONDITIONS. TERRACON IS NOT LIABLE FOR ANY REMEDIAL MEASURES TAKEN ON THE BASIS OF THESE RESULTS.

Tested by: BCM

Checked By: WPQ

Terracon
Consulting Engineers & Scientists

ORGANIC CONTENT TEST
ASTM D-2974
Method C

Laboratory Services Group *750 Corporate Woods Parkway, Vernon Hills, Illinois 60061* *Phone: (224) 352-7000 Fax:(224)352-7*

Project No.: MR155218
Project Name: DYNERGY - EDWARDS SITE
Client: AECOM
Date Tested: 11/13/2015

Sample Information

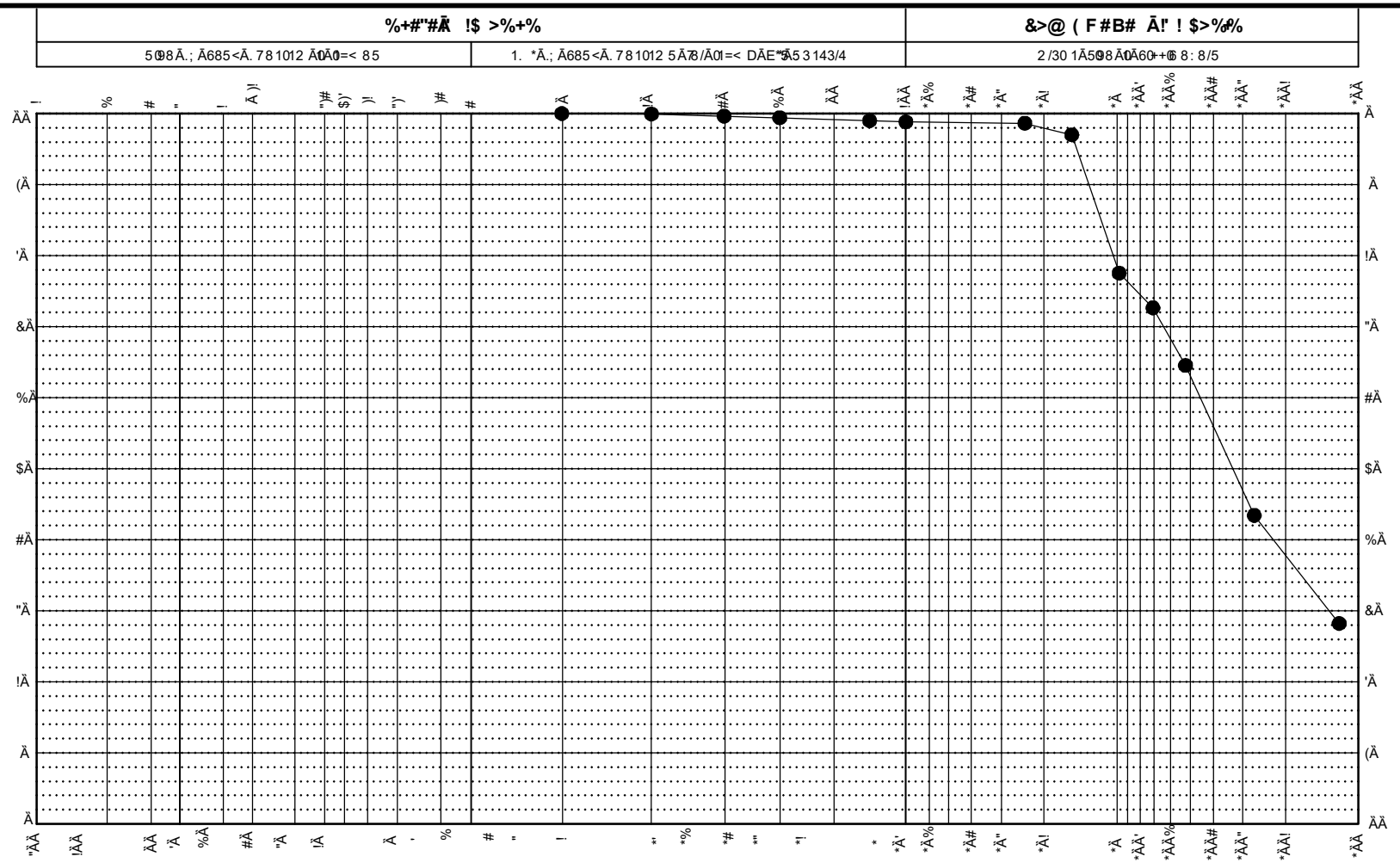
Boring / Source:	EDW-B005
Sample No.:	S-12
Depth (ft.):	45.0-46.5'
Description:	CL

Organic Content Test Data

Tare No.:	C
Tare Wt. (gm):	20.04
Wet Wt. + Tare (gm):	49.66
Dry Wt. + Tare (gm):	36.05
Moisture Content (%):	**85.01**
Wt. of Ash + Tare (gm):	34.63
Percent Ash:	91.13
Organic Content (%):	**8.87**

** Note: Test performed by heating the sample to 440 degrees Centigrade until constant weight of ash is attained.

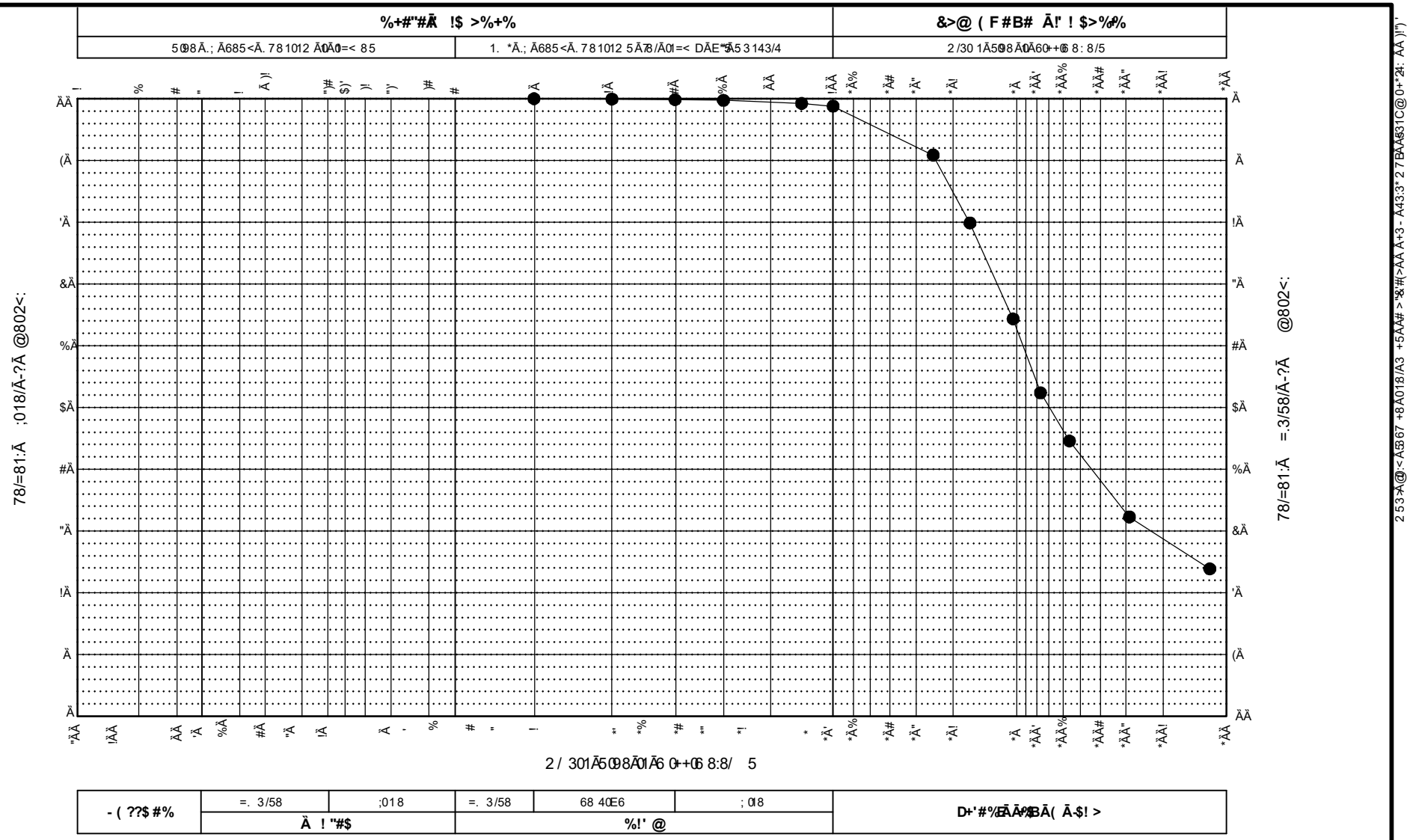
HALEY & ALDRICH, INC.
GEOTECHNICAL LABORATORY REPORTS



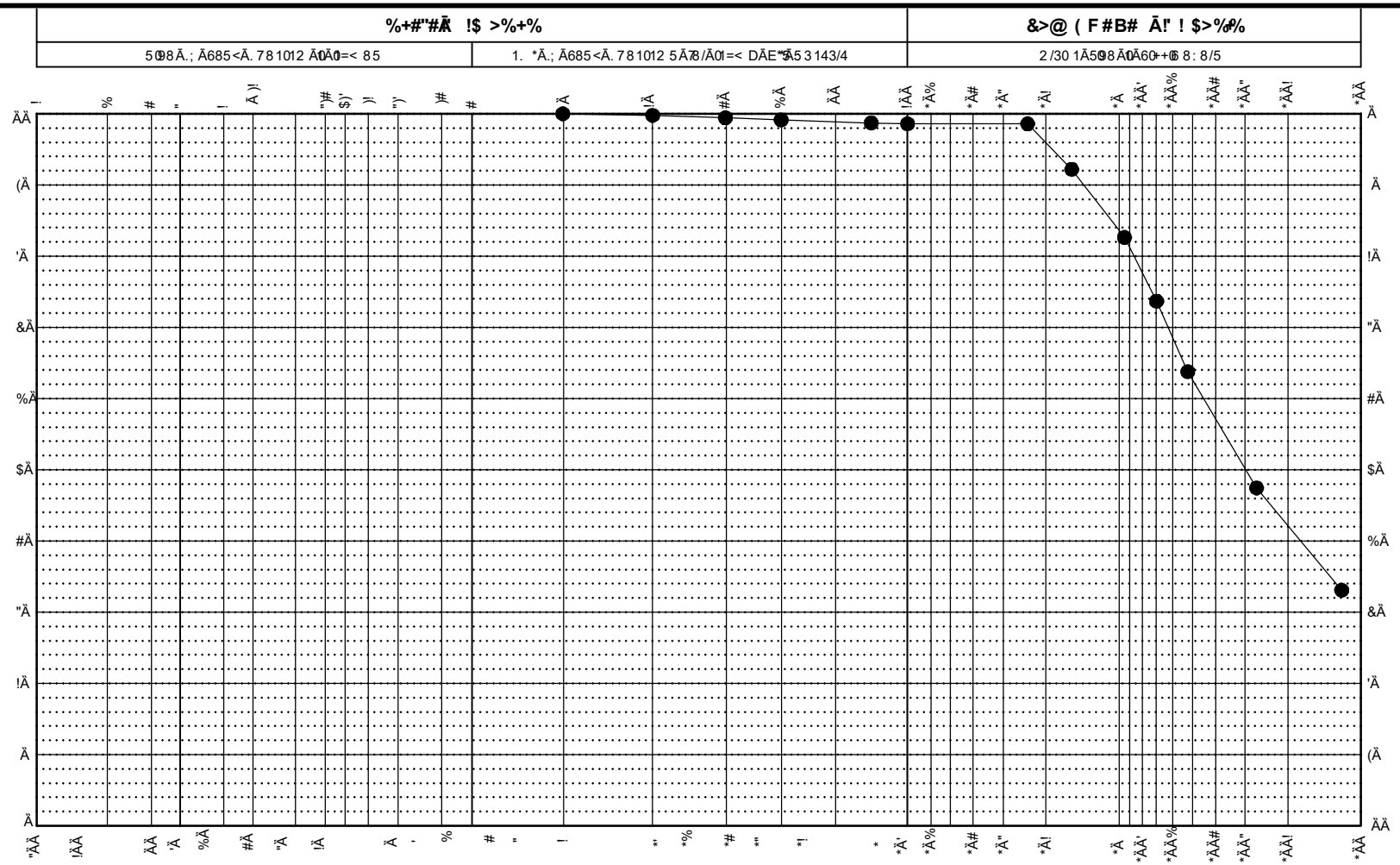
- (??$ #%	=. 3/58	;018	=. 3/58	68 40E6	; 018	D+'#%BÃÃ#%BÃ(Ã-$! >
	À ! "#$		%!' @			

- ./ 0 2Ã314 5367+8Ã1*	487: < FGHIJ	E*5*=*5* 5?6 - . +	536 7+8 485= / 07: 0 1	;0185 ,	13 : * @*=*Ã	++ ,	7+ ,	70 ,	8OPLKOGÃXRPHÃ5ILISRTÃ3QÃRTO - LKRTVSNÃNNSQ
● <3-> DÃE$	$ * $Ã-Ã$"*$	=<	2KLMDÃIÃ-NM	('* '	$&'(	%'	!(	"(	À ! +Ã%A#Ã@%B +?CB+('
									BLTWKÃMÃÀ ' # > >"&'#(>ÀÀ
									%&!"('Ã)Ã* +$%(' Ã-. A/ 01/ 2345267Ã48Ã49504; / 4 67Ã 04<=7641< D+À.

2 53>A@<ÃB67 +8A018/A3 +5AA# > *#(>AA A+3 - A43:3* 2 7BAÃ631C@0+*24: AA)"A'



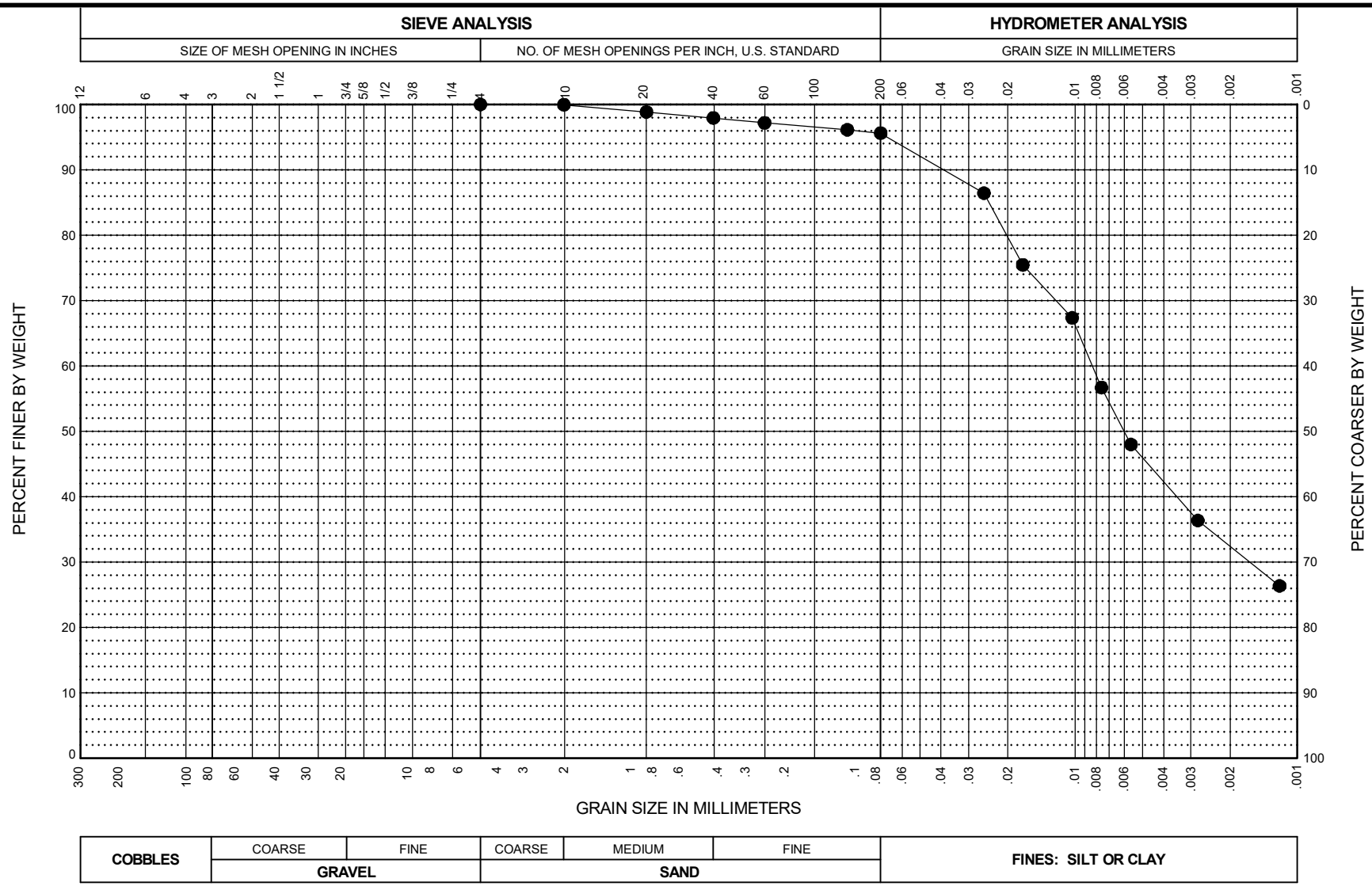
- ./ 0 2Ā314 5367+8Ā1*	487: < FGHIJ	E*5*=*5* 5?6 - . +	536 7+8 485= / 0 7: 0 1	;0185 ,	13 : * @*=*Ā	++ ,	7+ ,	70 ,	8SPLKSTĀOPHĒILIJQĀ3ĀOQS - LKOQJVURĀRRQJQ
● <3-> " DĀE"	$$*ĀĀ$&*$	=<	2 KLM+NKOPQDĀ IĀ=RJM	('* '	#Ā*	$&	!"	"#	À ! +Ā%A#Ā@%B +?CB+(' BLQXIKĀĀ ' # > >"&'#(>ĀÀ %&!"('Ā)Ā* +$%(' Ā-. Ā/ 01 2345267Ā48Ā49504; / 4 67Ā 04<=7641< D+À.



- (??$ #%	=. 3/58	;018	=. 3/58	68 40E6	; 018	D+'#%BÃÃ#%BÃ(Ã-$! >
	À ! "#$		%!' @			

- ./ 0 2Ã314 5367+8Ã1*	487: < FGHIJ	E*5*=*5* 5?6 - . +	536 7+8 485= / 07: 0 1	;0185 ,	13 : * @*=*Ã	++ ,	7+ ,	70 ,	8OPLKOGÃXRPHÃ5ILISRTÃ3QÃRTO - LKRTVSNÃNNSSQ
● <3-> $LÃE"	"$* $ÃÃ&*$	=<	2KLMDÃIÃ=NLM	(* %	"(* À	%#	!#	"(	À ! +Ã%A#Ã@%B +?CB+(' BLTWKLÃÃ ' # > >"&'#(>ÀÀ %&!"('Ã)Ã* +$%(' Ã-. Á/ 01/ 2345267Ã48Á#49504; / 4 67Á 04<=7641< D+À.

2 53>A@<ÁÃ367 +8A018/A3 +5AA# > *&'#(>AA A+3 - Á43:3* 2 7BAÃ631C@0+*24: AA) &'



BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SAMPLE DESCRIPTION	FINES %	NAT. W.C. %	LL %	PL %	PI %
● HA-OW-01, U3	28.5 - 30.5	CL	Gray and brown, Lean Clay.	95.6	33.1	48	19	29

Edwards Power Station Ash Pond
Bartonville, Illinois

GRAIN SIZE DISTRIBUTION

January 2018 41-1-37849-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

GSA- WITH SAMPLE INTERVALS 41-1-37849-001 LAB DATA.GPJ SHAN_WIL.GDT 2/1/18

HYDRAULIC CONDUCTIVITY

Project	Edwards Power Station Ash Pond
Location	Bartonville, Illinois
Job No.	41-1-37849-001
Boring	HAB-1
Sample	U5
Depth (ft)	52.7
Description	Gray, Fat Clay (CH).

		Date
Tested By	CMB	1/23/18
Calculated By	CMB	1/31/18
Checked By	DPM	1/31/18
File	41-1-37849-001 HAB-1 U5 D5084	
Procedure	ASTM D5084	
Permeant	Deaired Water	

Permeameter No. 14

Standpipe Vol (cm^3/cm) Inflow: 1.242 Outflow: 1.239

	Before Test	After Test
Sample Diameter (in)	2.827	2.817
Sample Length (in)	2.114	2.095
Sample Area (cm^2)	40.50	40.21
Sample Volume (cm^3)	217.44	213.97
Sample Wt. (g)	360.63	360.22
Wet Density (pcf)	103.5	105.1
Dry Density (pcf)	67.4	67.4
Saturation (%)	96.9	101.0
Consolidation (psi)	8 min	9 max

	Before Test	After Test
Tare No.	1-5	8
Tare Wt. (g)	2.50	99.87
Wet Soil + Tare (g)	84.76	459.62
Dry Soil + Tare (g)	56.06	330.77
Water Content (%)	53.6	55.8
Porosity	0.597	
Pore Volume (CC)	129.83	
Starting B.P. Saturation (%)	97	

Specific Gravity 2.68 (estimated)

Read Time day	hr	min	P_{cell} psi	P_{in} psi	P_{out} psi	Readings (cm) h_{in}	h_{out}	Water Temp. °C	Inflow PV	Outflow PV	Storage PV	Total PV	i	K @ 20°C cm/s
24	8	37	99.0	91.0	90.0	81.10	30.40	23.2	---	---	---	---	---	---
24	10	15	99.0	91.0	90.0	80.95	30.65	23.2	0.00	0.00	0.00	0.00	22.5	4.3E-08
24	11	55	99.0	91.0	90.0	80.80	30.85	23.4	0.00	0.00	0.00	0.00	22.4	3.7E-08
24	14	1	99.0	91.0	90.0	80.60	31.00	23.4	0.00	0.00	0.00	0.01	22.3	2.9E-08
24	15	46	99.0	91.0	90.0	80.40	31.20	23.3	0.00	0.00	0.00	0.01	22.3	4.0E-08
25	9	21	99.0	91.0	90.0	78.65	33.00	22.8	-0.02	0.02	0.00	0.02	21.6	3.6E-08
25	11	48	99.0	91.0	90.0	78.40	33.20	23.1	0.00	0.00	0.00	0.03	21.5	3.4E-08
29	7	57	99.0	91.0	90.0	70.25	40.80	22.6	-0.08	0.07	0.00	0.10	18.6	3.4E-08
29	10	35	99.0	91.0	90.0	70.05	41.00	22.6	0.00	0.00	0.00	0.10	18.5	3.3E-08
29	12	55	99.0	91.0	90.0	69.85	41.20	22.7	0.00	0.00	0.00	0.10	18.4	3.7E-08
29	15	42	99.0	91.0	90.0	69.60	41.40	22.7	0.00	0.00	0.00	0.10	18.4	3.5E-08
30	7	39	99.0	91.0	90.0	68.35	42.55	22.8	-0.01	0.01	0.00	0.12	17.9	3.3E-08

Average Hydraulic Conductivity at Completion @ 20°C (m/s)	3.4E-10
Average Hydraulic Conductivity at Completion @ 20°C (cm/s)	3.4E-08

Shannon & Wilson, Inc.
2043 Westport Center Drive
St. Louis, MO 63146

HYDRAULIC CONDUCTIVITY

Project	Edwards Power Station Ash Pond
Location	Bartonville, Illinois
Job No.	41-1-37849-001
Boring	HAB-3
Sample	U3
Depth (ft)	56.6
Description	Gray-brown, Fat Clay (CH).

		Date
Tested By	CMB	1/23/18
Calculated By	CMB	1/31/18
Checked By	DPM	1/31/18
File	41-1-37849-001 HAB-3 U3 D5084	
Procedure	ASTM D5084	
Permeant	Deaired Water	

Permeameter No. 16

Standpipe Vol (cm^3/cm) Inflow: 1.247 Outflow: 1.240

	Before Test	After Test
Sample Diameter (in)	2.837	2.837
Sample Length (in)	2.186	2.162
Sample Area (cm^2)	40.78	40.78
Sample Volume (cm^3)	226.44	223.96
Sample Wt. (g)	457.85	458.25
Wet Density (pcf)	126.2	127.7
Dry Density (pcf)	101.7	102.6
Saturation (%)	100.0	104.1
Consolidation (psi)	7 min	8 max

	Before Test	After Test
Tare No.	3-3	12
Tare Wt. (g)	2.54	102.09
Wet Soil + Tare (g)	107.24	559.53
Dry Soil + Tare (g)	86.95	469.51
Water Content (%)	24.0	24.5
Porosity	0.392	
Pore Volume (CC)	88.71	
Starting B.P. Saturation (%)	95	

Specific Gravity 2.68 (estimated)

Read Time day hr min	P_{cell} psi	P_{in} psi	P_{out} psi	Readings (cm) h_{in}	Readings (cm) h_{out}	Water Temp. °C	Inflow PV	Outflow PV	Storage PV	Total PV	i	K @ 20°C cm/s
24 8 38	98.0	91.0	90.0	92.75	30.60	23.0	---	---	---	---	---	---
24 10 16	98.0	91.0	90.0	92.75	31.40	23.1		0.01	0.01	0.01	23.7	8.1E-08
24 11 56	98.0	91.0	90.0	92.45	31.75	23.2	0.00	0.00	0.00	0.02	23.6	6.5E-08
24 14 2	98.0	91.0	90.0	92.10	32.15	23.4	0.00	0.01	0.00	0.02	23.5	5.9E-08
24 15 47	98.0	91.0	90.0	91.80	32.40	23.4	0.00	0.00	0.00	0.03	23.4	5.2E-08
25 9 22	98.0	91.0	90.0	89.30	34.80	22.9	-0.04	0.03	0.00	0.06	22.5	4.8E-08
25 11 49	98.0	91.0	90.0	89.00	35.10	23.1	0.00	0.00	0.00	0.06	22.4	4.3E-08
29 11 37	98.0	91.0	90.0	62.60	44.85	22.8	---	---	---	---	15.9	---
29 12 56	98.0	91.0	90.0	62.45	44.95	22.9	0.00	0.00	0.00	0.06	15.8	4.7E-08
29 15 43	98.0	91.0	90.0	61.95	45.05	22.8	-0.01	0.00	0.00	0.07	15.7	5.4E-08
30 7 40	98.0	91.0	90.0	60.30	46.70	22.7	-0.02	0.02	0.00	0.09	15.1	5.3E-08

Average Hydraulic Conductivity at Completion @ 20°C (m/s)	4.9E-10
Average Hydraulic Conductivity at Completion @ 20°C (cm/s)	4.9E-08

Shannon & Wilson, Inc.
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HYDRAULIC CONDUCTIVITY

Project	Edwards Power Station Ash Pond
Location	Bartonville, Illinois
Job No.	41-1-37849-001
Boring	HAB-5
Sample	U3
Depth (ft)	36.3
Description	Gray-brown, Fat Clay (CH).

		Date
Tested By	CMB	1/23/18
Calculated By	CMB	1/31/18
Checked By	DPM	1/31/18
File	41-1-37849-001 HAB-5 U3 D5084	
Procedure	ASTM D5084	
Permeant	Deaired Water	

Permeameter No. 17

Standpipe Vol (cm^3/cm) Inflow: 1.240 Outflow: 1.240

	Before Test	After Test
Sample Diameter (in)	2.816	2.815
Sample Length (in)	2.132	2.130
Sample Area (cm^2)	40.18	40.15
Sample Volume (cm^3)	217.59	217.23
Sample Wt. (g)	384.42	388.30
Wet Density (pcf)	110.2	111.5
Dry Density (pcf)	78.6	77.8
Saturation (%)	95.8	101.1
Consolidation (psi)	14 min	15 max

	Before Test	After Test
Tare No.	5-3	29
Tare Wt. (g)	2.53	165.59
Wet Soil + Tare (g)	84.89	553.20
Dry Soil + Tare (g)	61.22	436.05
Water Content (%)	40.3	43.3
Porosity	0.530	
Pore Volume (CC)	115.38	
Starting B.P. Saturation (%)	95	

Specific Gravity 2.68 (estimated)

Read Time day	hr	min	P_{cell} psi	P_{in} psi	P_{out} psi	Readings (cm) h_{in}	h_{out}	Water Temp. °C	Inflow PV	Outflow PV	Storage PV	Total PV	i	K @ 20°C cm/s
24	8	39	105.0	91.0	90.0	88.35	32.35	23.2	---	---	---	---	---	---
24	10	17	105.0	91.0	90.0	88.55	34.40	23.2					23.0	
24	11	57	105.0	91.0	90.0	88.00	35.00	23.4	-0.01	0.01	0.00	0.01	22.8	1.2E-07
24	14	3	105.0	91.0	90.0	87.40	35.70	23.4	-0.01	0.01	0.00	0.01	22.5	1.1E-07
24	15	48	105.0	91.0	90.0	86.90	36.20	23.3	-0.01	0.01	0.00	0.02	22.4	1.0E-07
25	9	23	105.0	91.0	90.0	82.50	40.40	22.9	-0.05	0.05	0.00	0.06	20.8	9.0E-08
25	11	50	105.0	91.0	90.0	82.00	40.95	23.1	-0.01	0.01	0.00	0.07	20.6	8.3E-08
29	7	59	105.0	91.0	90.0	64.95	56.80	22.7	-0.18	0.17	-0.01	0.24	14.5	8.2E-08
29	10	36	105.0	91.0	90.0	64.50	57.20	22.7	0.00	0.00	0.00	0.25	14.3	9.1E-08
29	12	57	105.0	91.0	90.0	64.15	57.60	22.9	0.00	0.00	0.00	0.25	14.2	9.0E-08
29	15	44	105.0	91.0	90.0	63.65	58.00	22.9	-0.01	0.00	0.00	0.25	14.0	9.2E-08
30	7	41	105.0	91.0	90.0	61.25	60.20	22.7	-0.03	0.02	0.00	0.28	13.2	8.5E-08

Average Hydraulic Conductivity at Completion @ 20°C (m/s)	8.9E-10
Average Hydraulic Conductivity at Completion @ 20°C (cm/s)	8.9E-08

Shannon & Wilson, Inc.
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HYDRAULIC CONDUCTIVITY

Project	Edwards Power Station Ash Pond
Location	Bartonville, Illinois
Job No.	41-1-37849-001
Boring	HA-OW-01
Sample	U3
Depth (ft)	29.3
Description	Gray-brown, Lean Clay (CL).

		Date
Tested By	CMB	1/31/18
Calculated By	CMB	2/7/18
Checked By	DPM	2/7/18
File	41-1-37849-001 HA-OW-01 U3 D5084	
Procedure	ASTM D5084	
Permeant	Deaired Water	

Permeameter No. 17

Standpipe Vol (cm^3/cm) Inflow: 1.240 Outflow: 1.240

	Before Test	After Test
Sample Diameter (in)	2.821	2.800
Sample Length (in)	1.928	1.875
Sample Area (cm^2)	40.32	39.73
Sample Volume (cm^3)	197.47	189.19
Sample Wt. (g)	376.66	370.79
Wet Density (pcf)	119.0	122.3
Dry Density (pcf)	90.1	93.1
Saturation (%)	100.6	105.5
Consolidation (psi)	11 min	12 max

	Before Test	After Test
Tare No.	1-3	25
Tare Wt. (g)	2.53	161.25
Wet Soil + Tare (g)	77.63	531.39
Dry Soil + Tare (g)	59.36	443.03
Water Content (%)	32.1	31.4
Porosity	0.461	
Pore Volume (CC)	91.12	
Starting B.P. Saturation (%)	96	

Specific Gravity 2.68 (estimated)

Read Time day	hr	min	P_{cell} psi	P_{in} psi	P_{out} psi	Readings (cm) h_{in}	h_{out}	Water Temp. °C	Inflow PV	Outflow PV	Storage PV	Total PV	i	K @ 20°C cm/s
1	12	7	102.0	91.0	90.0	89.85	37.25	22.6	---	---	---	---	---	---
1	15	39	102.0	91.0	90.0	89.75	37.70	22.6	0.00	0.01	0.00	0.01	25.0	2.5E-08
2	7	34	102.0	91.0	90.0	88.65	38.75	22.4	-0.01	0.01	0.00	0.02	24.6	2.2E-08
2	10	26	102.0	91.0	90.0	88.45	38.95	22.4	0.00	0.00	0.00	0.02	24.5	2.3E-08
2	13	18	102.0	91.0	90.0	88.30	39.16	22.5	0.00	0.00	0.00	0.03	24.4	2.0E-08
5	7	34	102.0	91.0	90.0	83.85	43.00	22.4	-0.06	0.05	0.00	0.08	22.7	2.1E-08
5	10	1	102.0	91.0	90.0	83.70	43.10	22.5	0.00	0.00	0.00	0.08	22.7	1.8E-08
5	13	14	102.0	91.0	90.0	83.50	43.30	22.5	0.00	0.00	0.00	0.08	22.6	2.2E-08
5	16	4	102.0	91.0	90.0	83.35	43.45	22.4	0.00	0.00	0.00	0.08	22.5	1.9E-08
6	7	35	102.0	91.0	90.0	82.40	44.30	22.3	-0.01	0.01	0.00	0.10	22.1	2.1E-08

Average Hydraulic Conductivity at Completion @ 20°C (m/s)	2.0E-10
Average Hydraulic Conductivity at Completion @ 20°C (cm/s)	2.0E-08

Shannon & Wilson, Inc.
2043 Westport Center Drive
St. Louis, MO 63146

TABLE I

SUMMARY OF CURRENT SUBSURFACE EXPLORATIONS
DYNEGY
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

Exploration Designation[1]	Ground Surface El.[2] (ft)	Northing[2]	Easting[2]	Total Exploration Depth (ft)	Water[3]	
					Depth Below Ground Surface (ft)	Elevation (ft)
HAB-01	457.8	1,429,282.52	2,435,251.74	58.8	5.5	452.3
HAB-02	458.4	1,429,903.58	2,435,764.03	38.5	5.0	453.4
HAB-03	469.9	1,430,619.71	2,434,935.46	118.0	15.0	454.9
HAB-04	458.3	1,431,767.36	2,434,995.09	16.5	DRY	DRY
HAB-05	459.2	1,428,320.25	2,435,895.55	41.5	15.0	444.2
HA-OW-01	455.6	1,431,706.38	2,435,054.27	34.5	4.8	450.8

Notes:

1) Technical monitoring of explorations completed during the period 27 November 2017 through 8 December 2017 was performed by Haley & Aldrich, Inc.

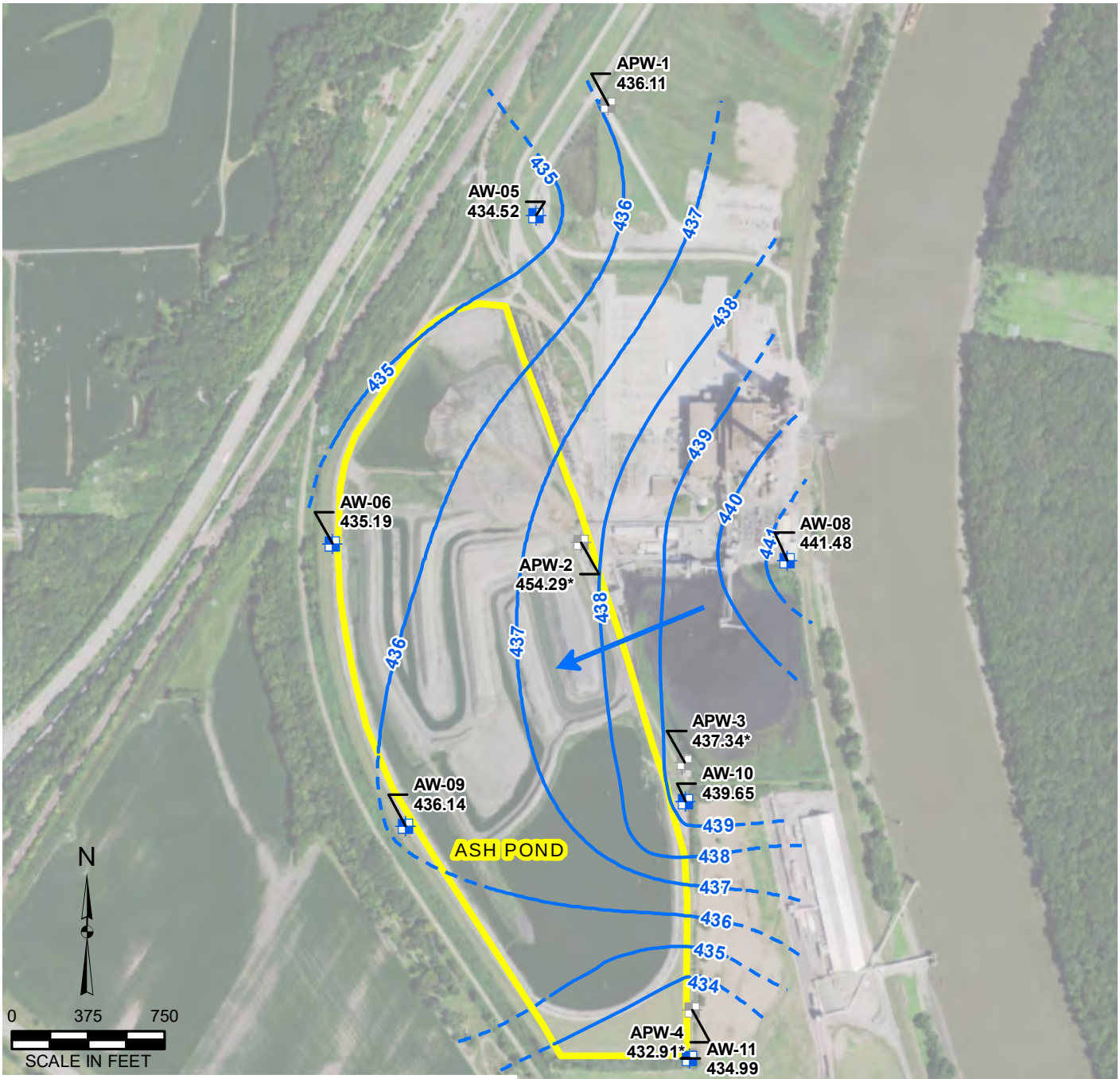
2) As drilled locations and ground surface elevations of test borings were determined in the field by Maurer-Stutz, Inc. of Peoria, IL by optical survey. Coordinates are shown in Illinois State Plane West Zone NAD83. Elevations are in units of feet, relative to NAVD88.

3) Water level readings represent the highest water level observed either during drilling, after completion of the boring, or as indicated by subsurface exploration instruments. Refer to the subsurface exploration logs for additional water level data. Water level readings have been made in the subsurface explorations at times and under conditions discussed herein. However, it must be noted that fluctuations in the level of the water may occur due to variations in season, rainfall, temperature, plant operations, and other factors not evident at the time measurements were made and reported.

TABLE II
SUMMARY OF LABORATORY TEST RESULTS
DYNEGY
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

Exploration Designation	Sample Number	Sample Type	Sample Depth (ft)	USCS Symbol	Material Type	Moisture Content (%)	LL	PL	PI	% Gravel	% Sand	% Fines	Hydraulic Conductivity		
													Dry Density (pcf)	k (cm/sec)	Confining Pressure (psi)
HAB-1	U5	Shelby Tube	51.5-53.5	CH	Alluvial Deposits	57.9	68	29	39	0	1	99	67.4	3.4E-08	8
HAB-3	U3	Shelby Tube	56.0-57.0	CH	Alluvial Deposits	40.3	57	23	34	0	1	99	101.7	4.9E-08	7
HAB-5	U3	Shelby Tube	35.5-37.5	CH	Alluvial Deposits	39.0	64	24	39	0	1	99	78.6	8.9E-08	14
HA-OW-01	U3	Shelby Tube	28.5-30.5	CL	Alluvial Deposits	33.1	48	19	29	0	4	96	90.1	2.0E-08	11

APPENDIX E
GROUNDWATER CONTOUR MAPS AND ELEVATIONS



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ANS 1/25/17
APPROVED BY/DATE:
JJW 2/7/17

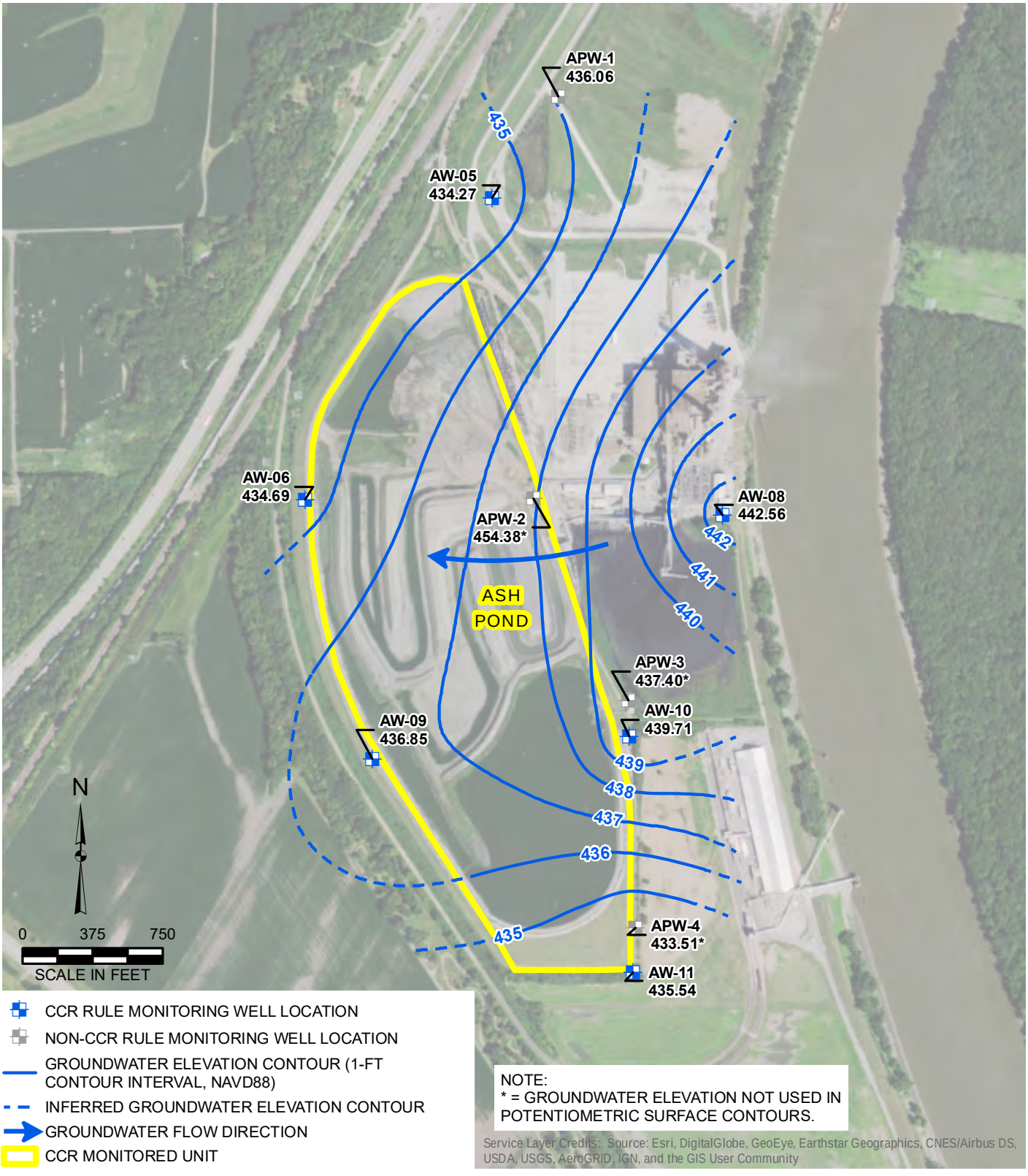
EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 1: DECEMBER 21, 2015

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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APPROVED BY/DATE:
JJW 2/8/17

EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 2: FEBRUARY 17, 2016

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
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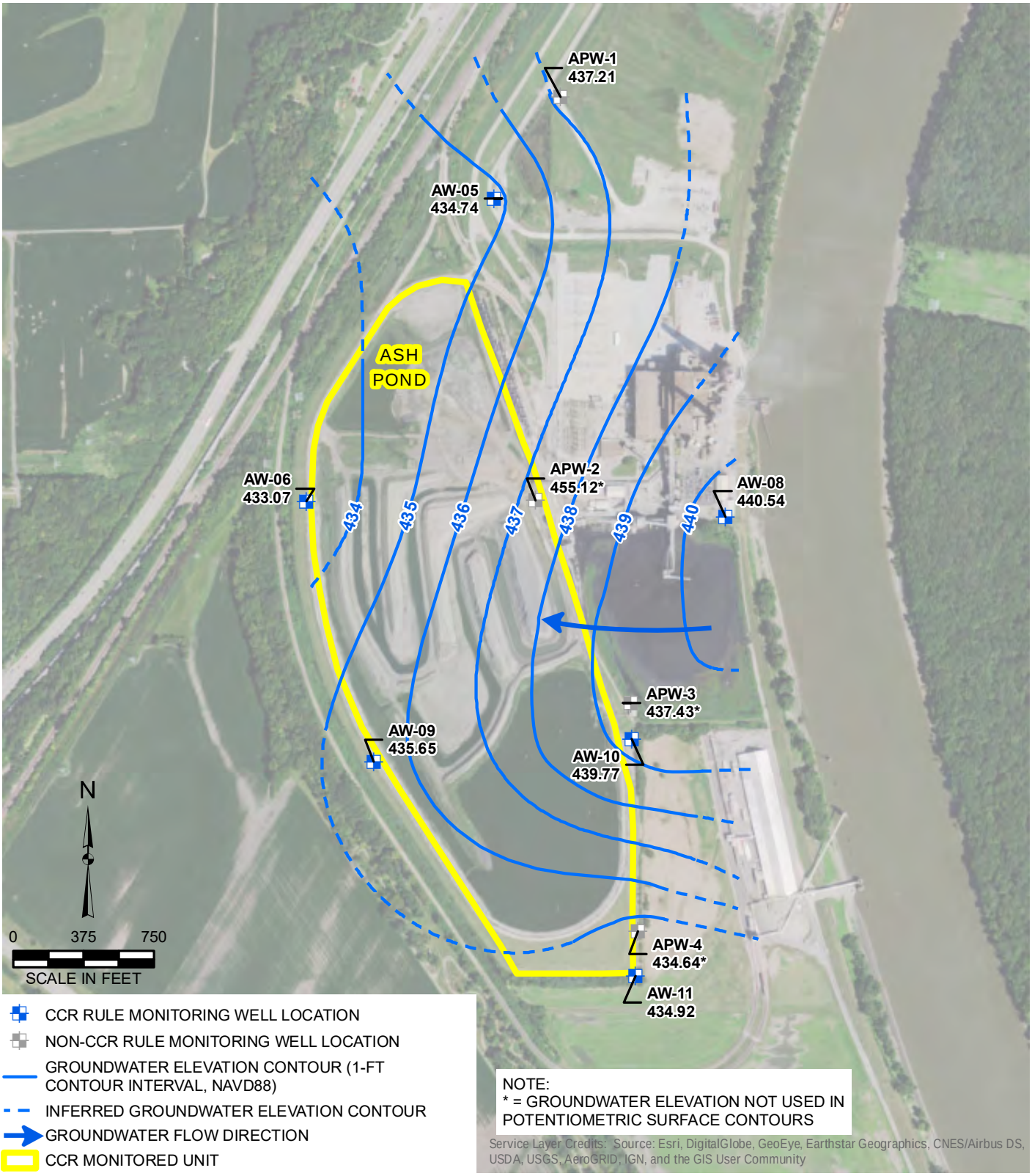

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ANS 1/25/17
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JJW 2/8/17

EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 3: MAY 17, 2016

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
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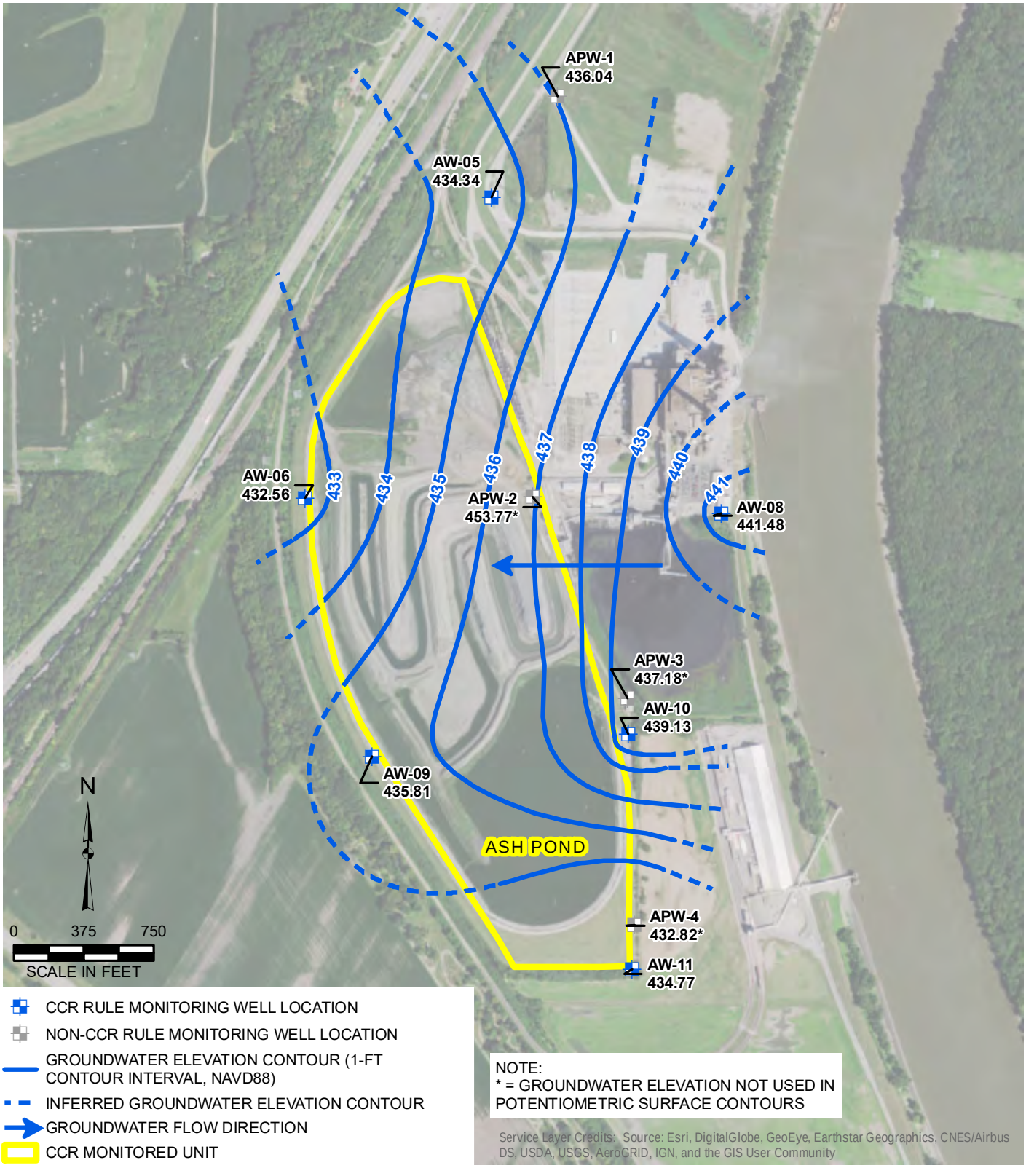

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REVIEWED BY/DATE:
ANS 1/25/17
APPROVED BY/DATE:
JJW 2/8/17

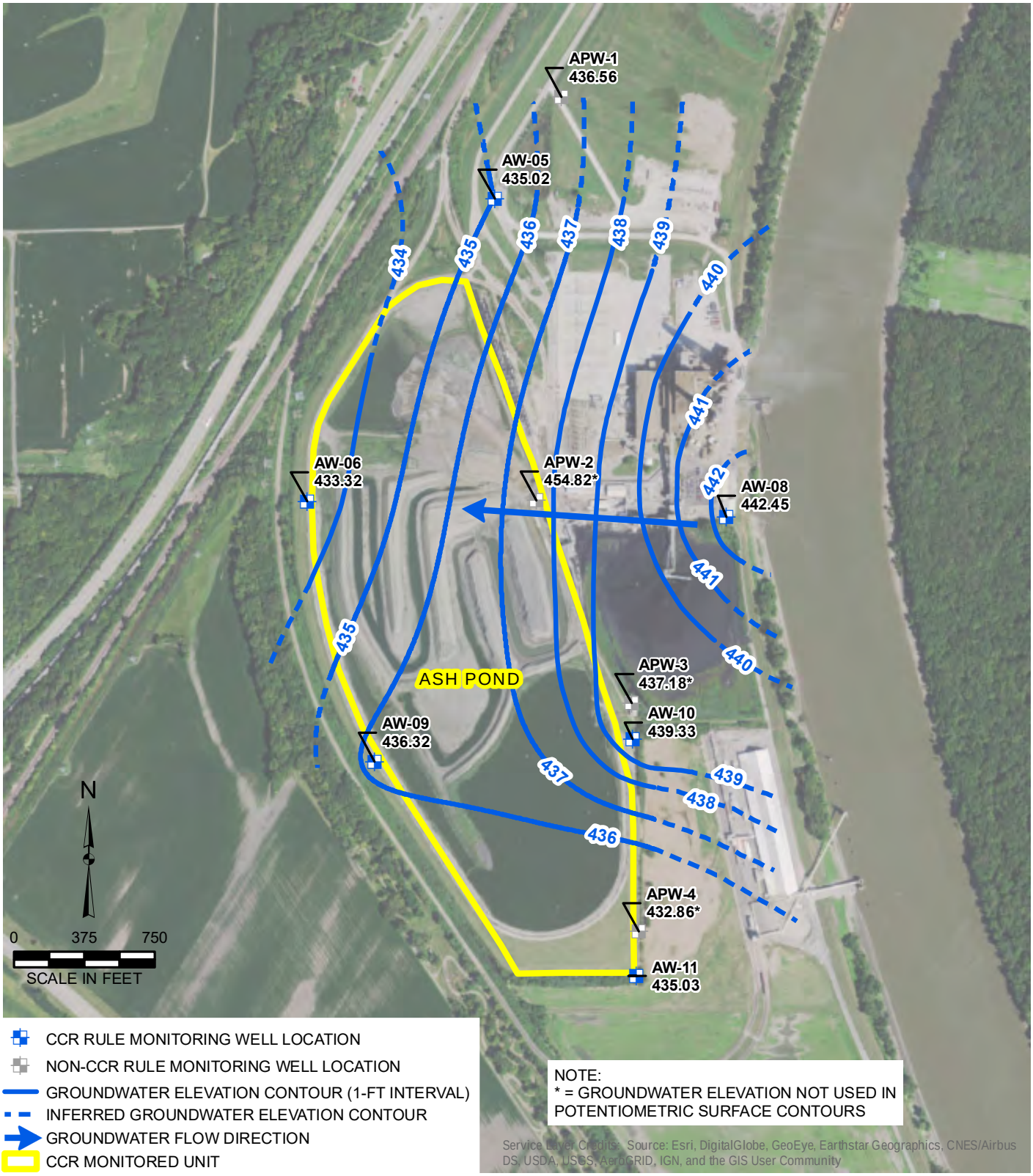
EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 4: JULY 21, 2016

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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ANS 3/6/17
APPROVED BY/DATE:
JJW 9/1/17

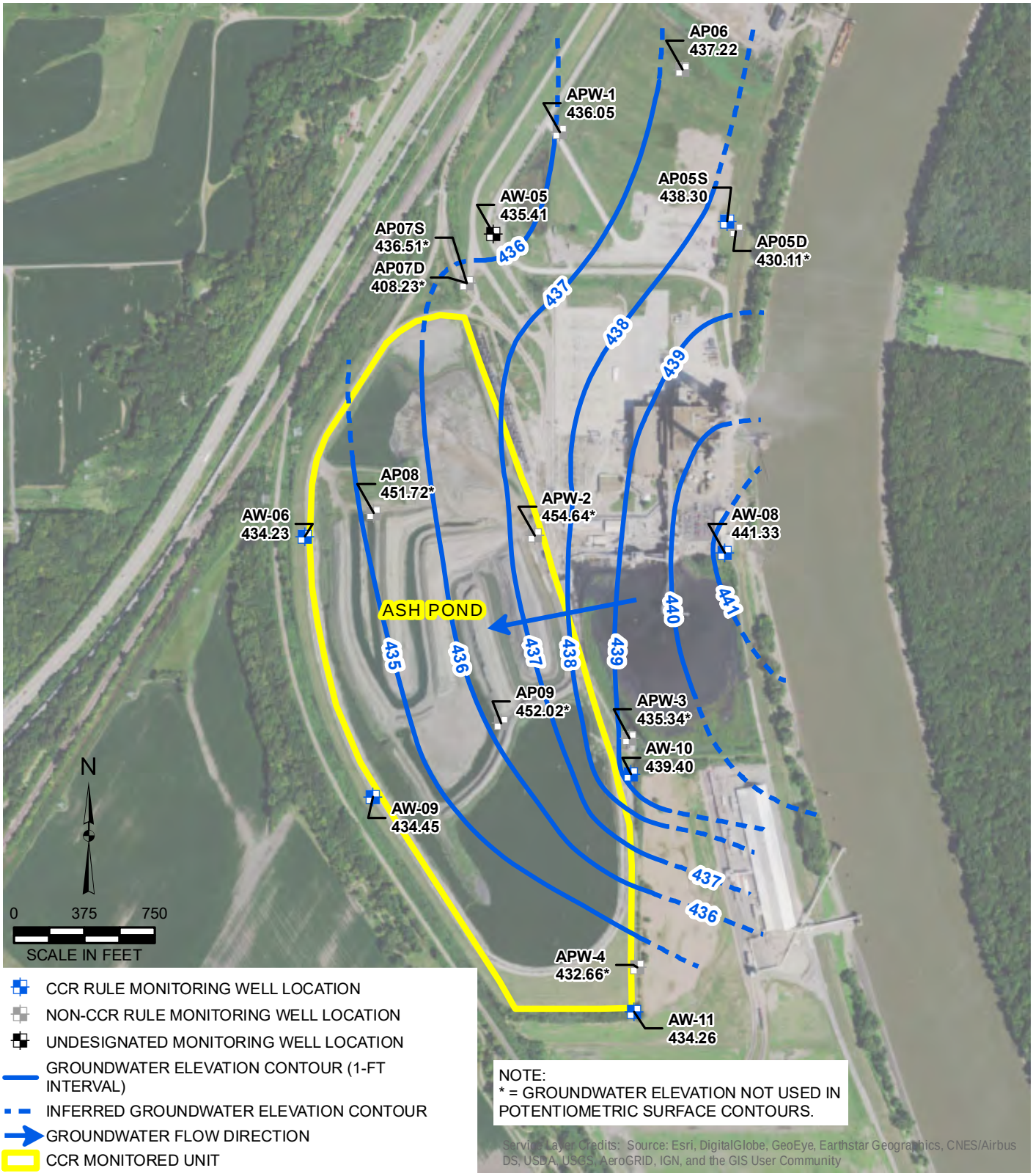
EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 5: NOVEMBER 10, 2016

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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ANS 3/6/17
APPROVED BY/DATE:
JJW 9/1/17

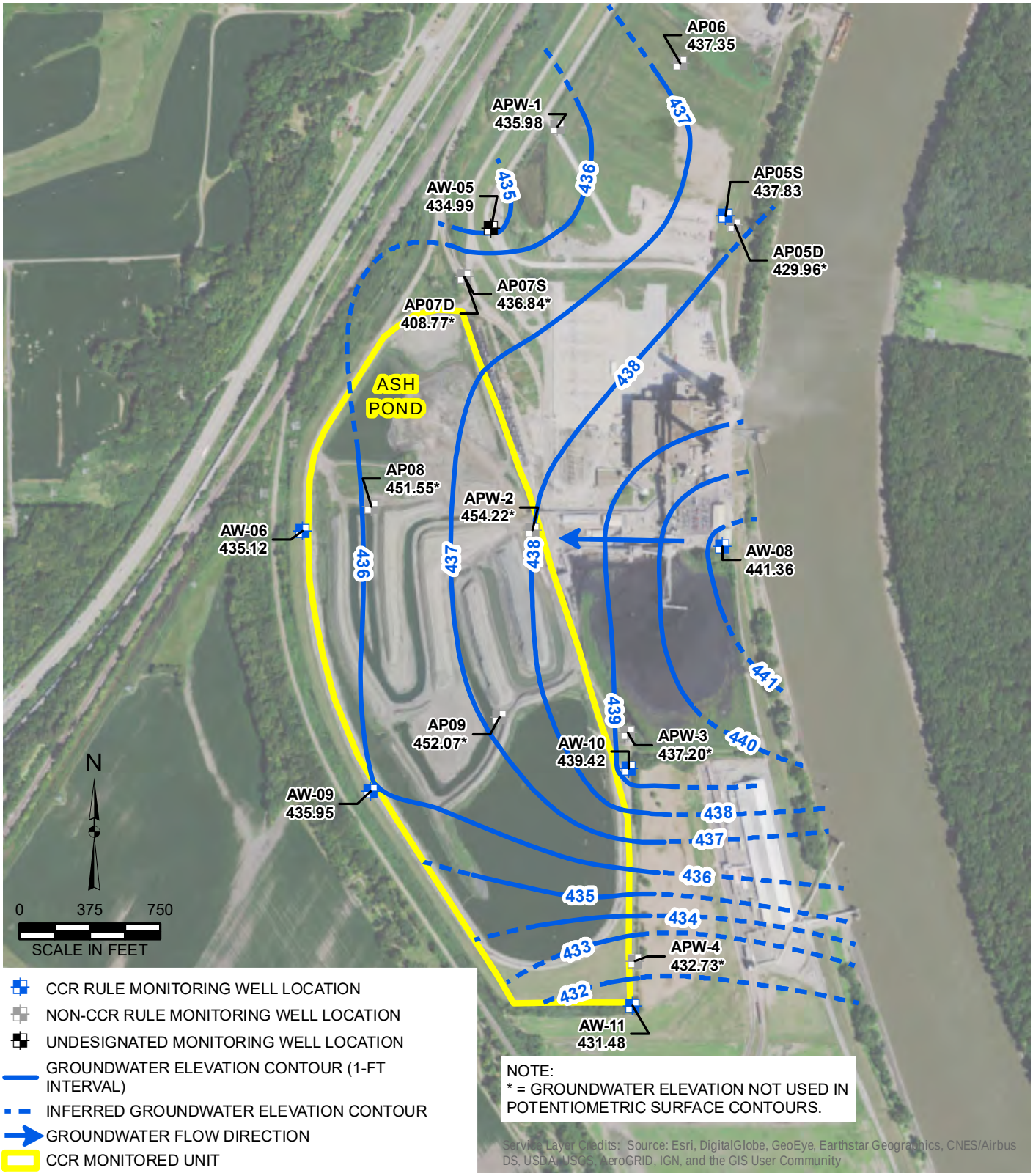
EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 6: JANUARY 16, 2017

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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ANS 6/21/17
APPROVED BY/DATE:
JJW 9/1/17

EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 7: MAY 8, 2017

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY

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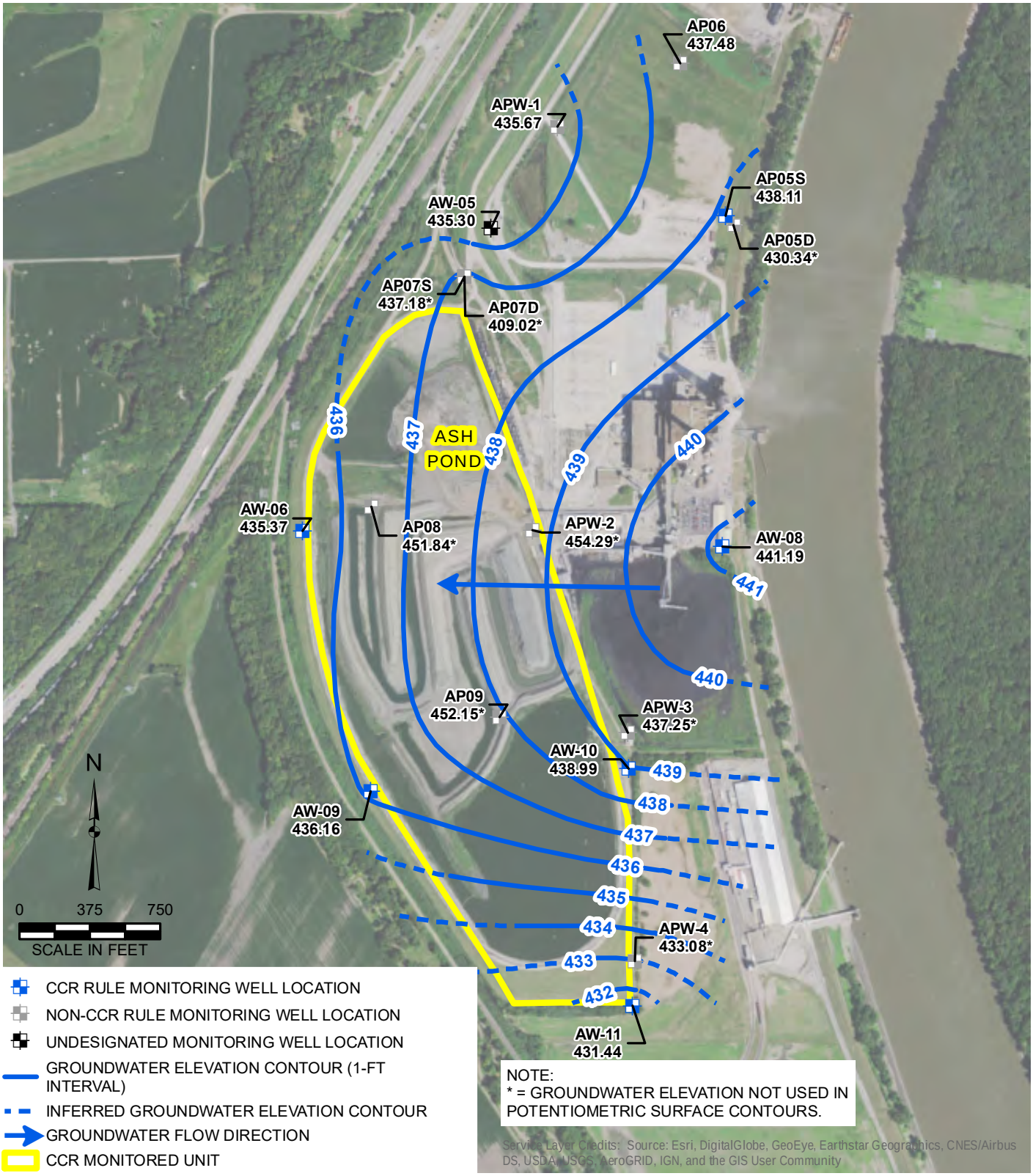

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DRAWN BY/DATE:
SDS 7/29/17
REVIEWED BY/DATE:
ANS 7/29/17
APPROVED BY/DATE:
JJW 9/1/17

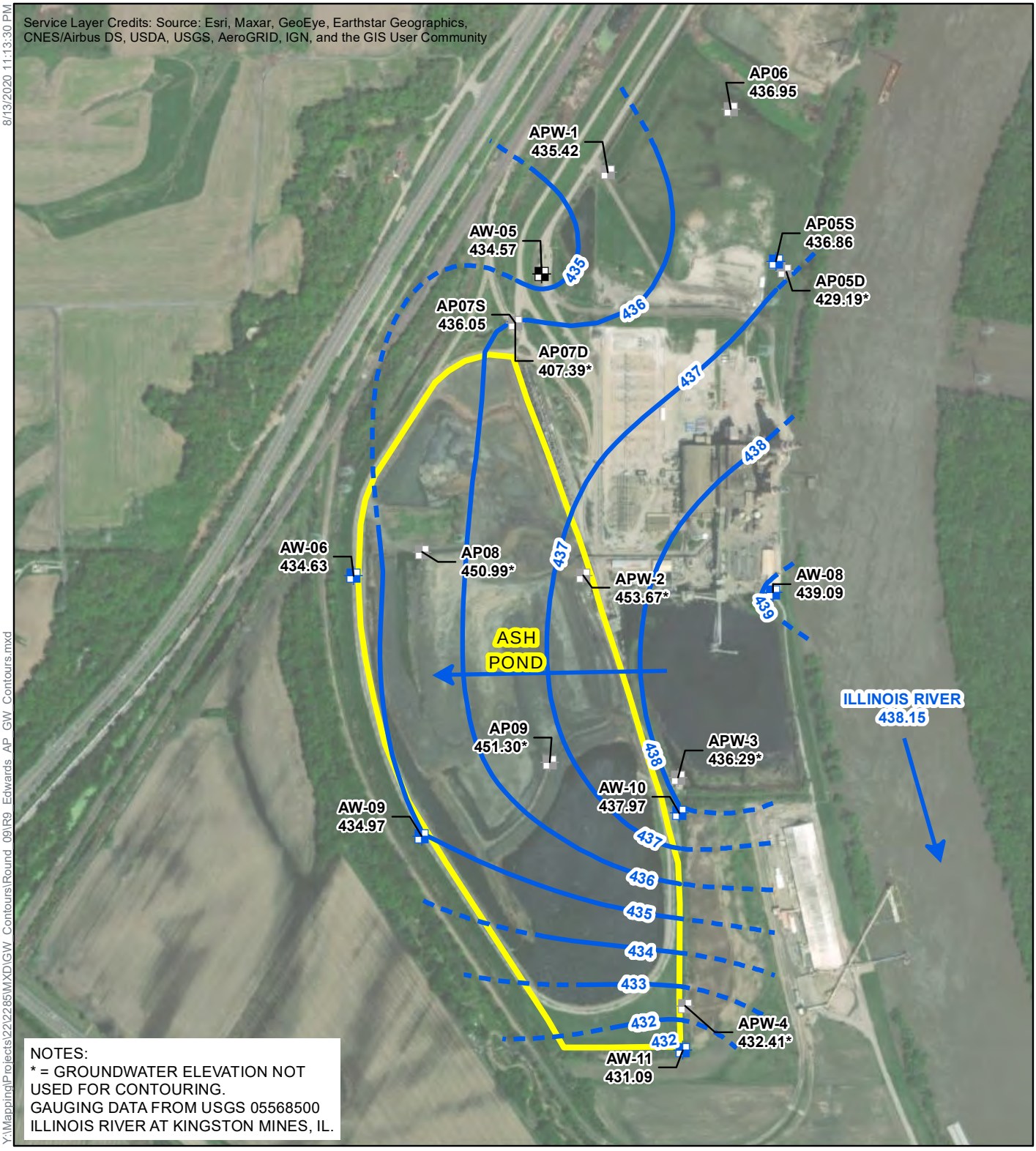
EDWARDS ASH POND (UNIT ID: 301)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 8: JULY 19, 2017

DYNEGY CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONSVILLE, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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NOTES:
* = GROUNDWATER ELEVATION NOT USED FOR CONTOURING.
GAUGING DATA FROM USGS 05568500 ILLINOIS RIVER AT KINGSTON MINES, IL.

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- UNDESIGNATED MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

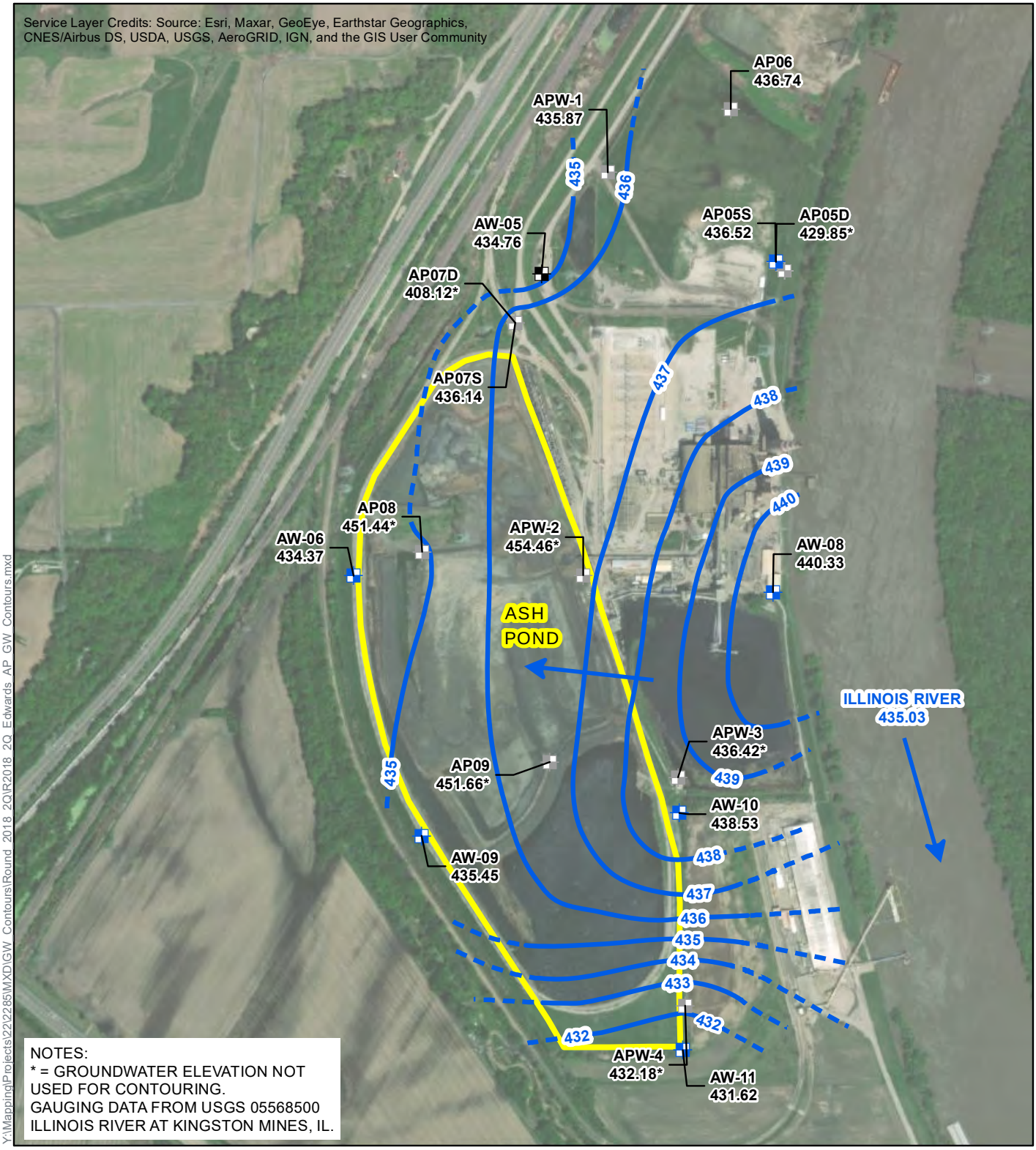
EDWARDS ASH POND (UNIT ID: 301)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 1, 2017

CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

0 187.5 375 750
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



CCR RULE MONITORING WELL LOCATION
NON-CCR RULE MONITORING WELL LOCATION
UNDESIGNATED MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

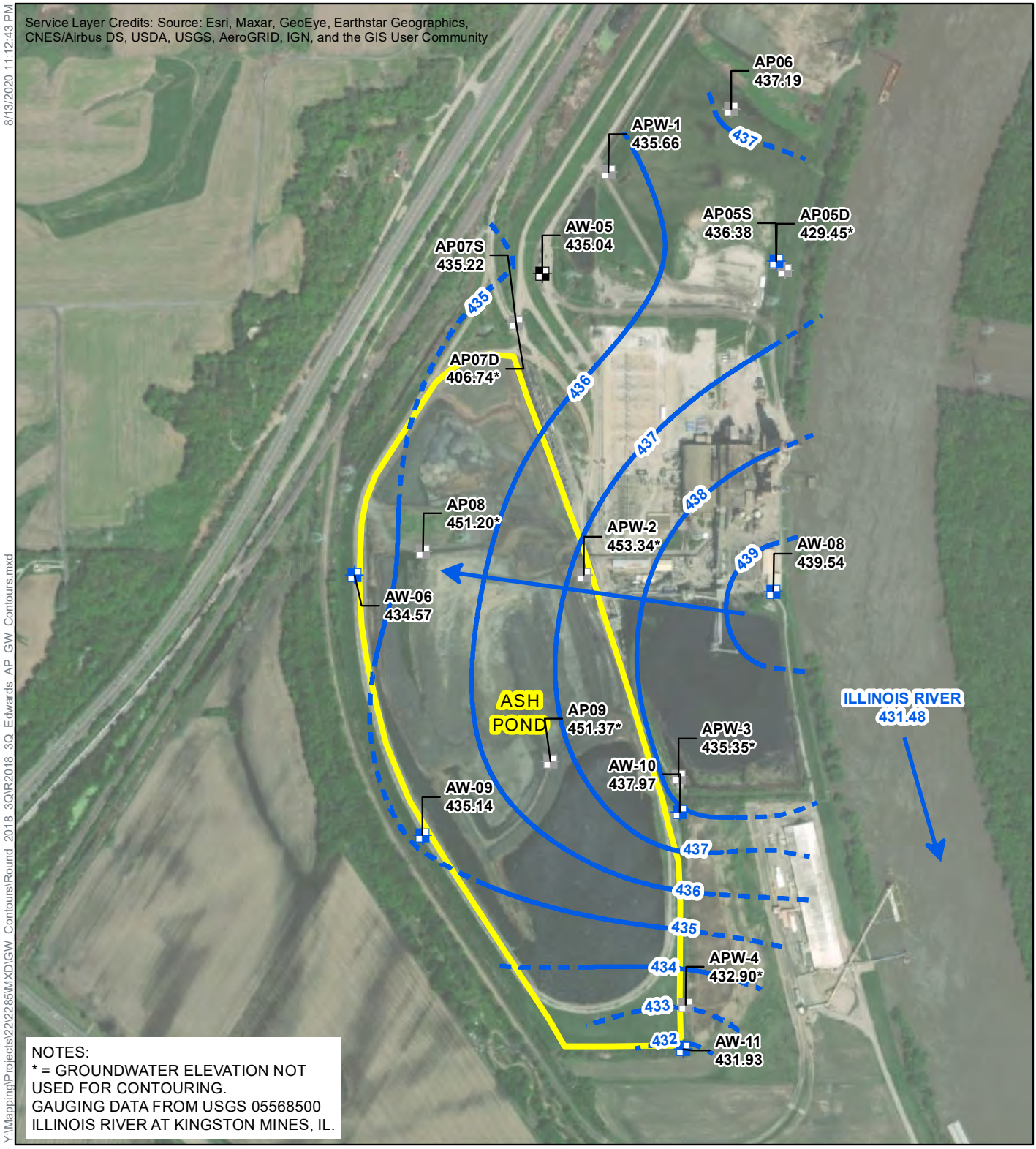
EDWARDS ASH POND (UNIT ID: 301)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 4, 2018

CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

0 187.5 375 750
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



NOTES:
* = GROUNDWATER ELEVATION NOT USED FOR CONTOURING.
GAUGING DATA FROM USGS 05568500 ILLINOIS RIVER AT KINGSTON MINES, IL.

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- UNDESIGNATED MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

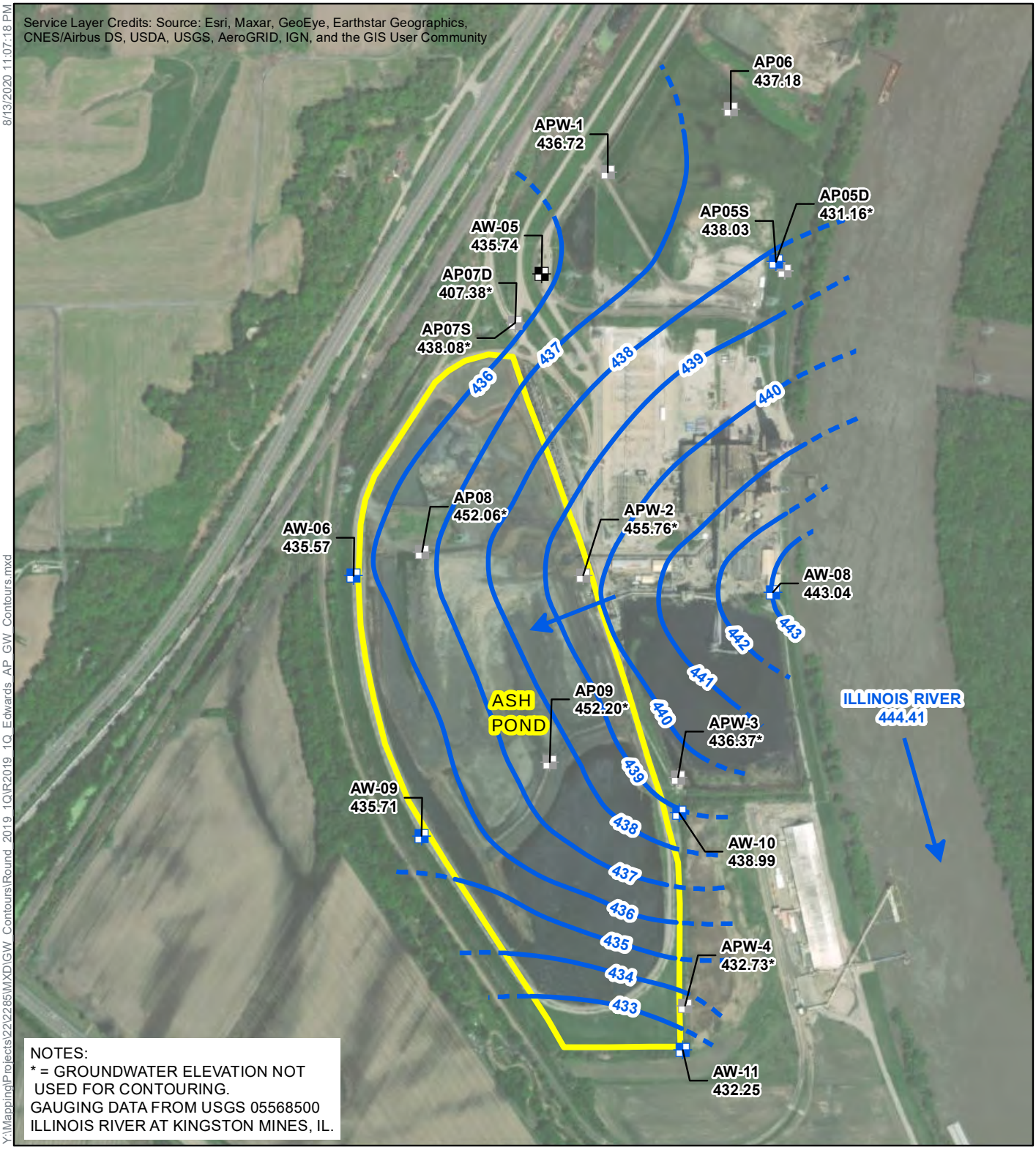
EDWARDS ASH POND (UNIT ID: 301)
GROUNDWATER ELEVATION CONTOUR MAP
JULY 26, 2018

CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

0 187.5 375 750
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



CCR RULE MONITORING WELL LOCATION
NON-CCR RULE MONITORING WELL LOCATION
UNDESIGNATED MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

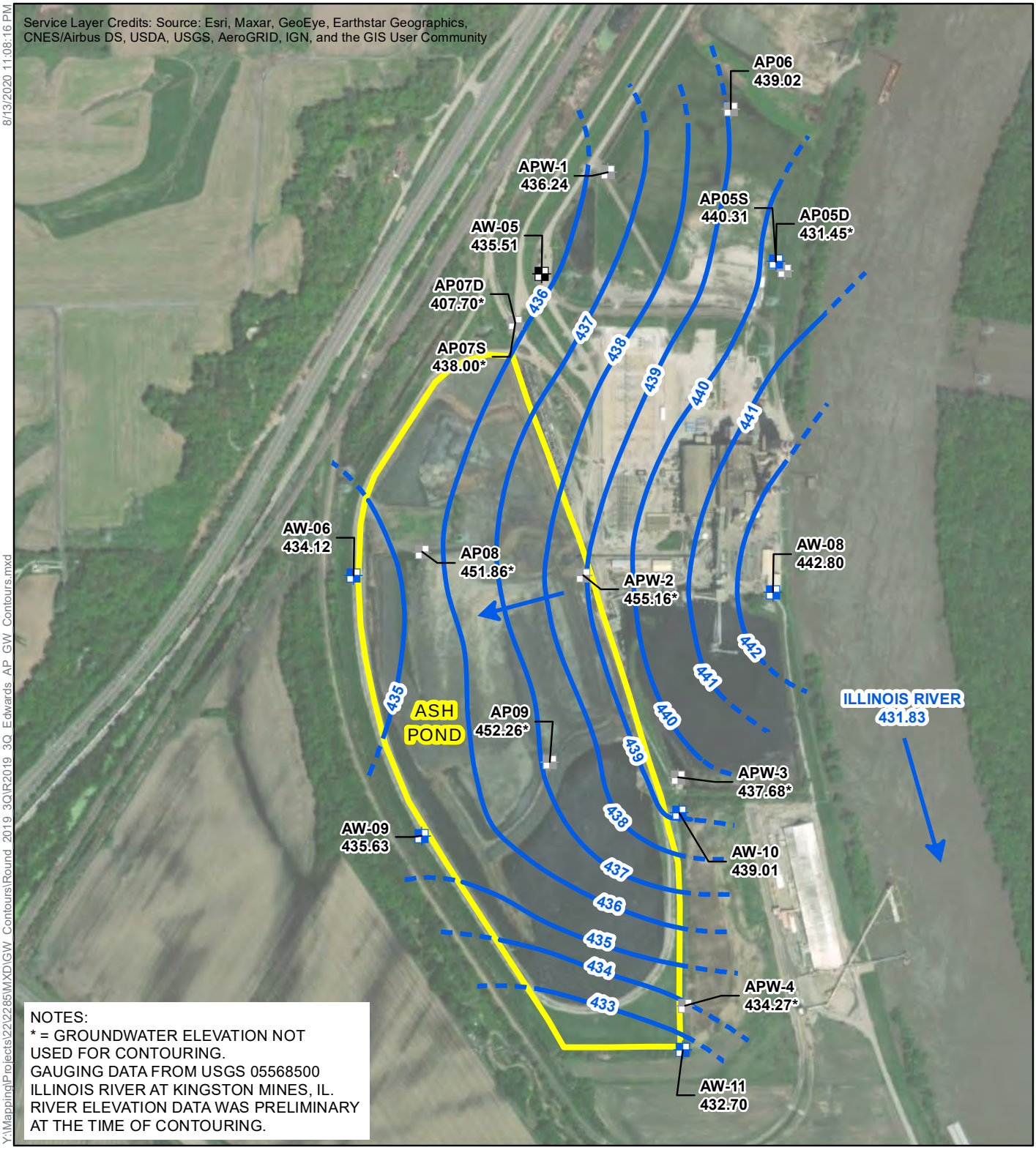
EDWARDS ASH POND (UNIT ID: 301)
GROUNDWATER ELEVATION CONTOUR MAP
FEBRUARY 25, 2019

CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

0 187.5 375 750
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



CCR RULE MONITORING WELL LOCATION
NON-CCR RULE MONITORING WELL LOCATION
UNDESIGNATED MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

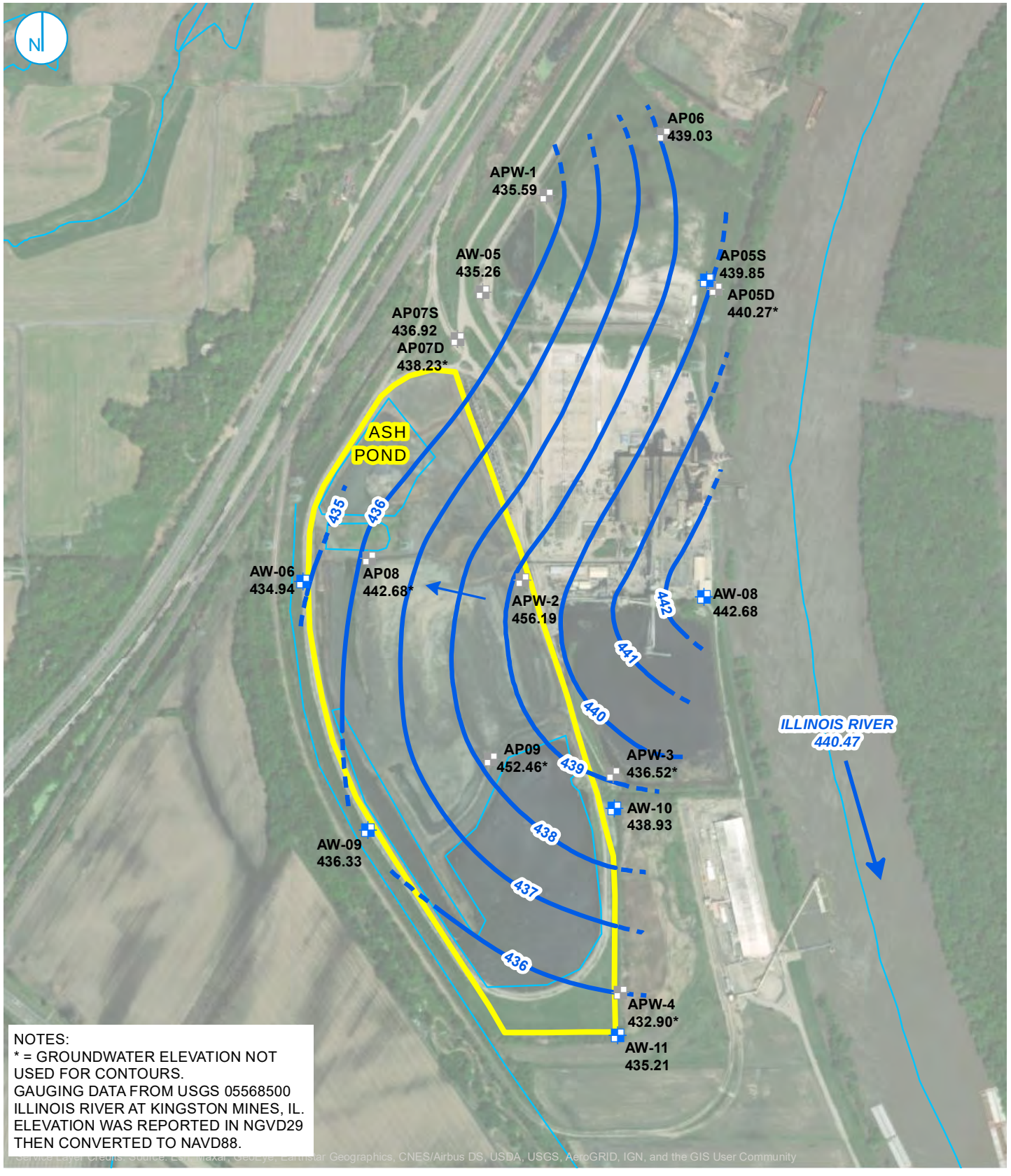
EDWARDS ASH POND (UNIT ID: 301)
GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 6, 2019

CCR RULE GROUNDWATER MONITORING
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

0 187.5 375 750
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



NOTES:
* = GROUNDWATER ELEVATION NOT USED FOR CONTOURS.
GAUGING DATA FROM USGS 05568500 ILLINOIS RIVER AT KINGSTON MINES, IL. ELEVATION WAS REPORTED IN NGVD29 THEN CONVERTED TO NAVD88.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECT: 169000XXXX | DATED: 8/14/2020 | DESIGNER: STOLZSD

- CCR RULE MONITORING WELL
- NON-CCR RULE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT
- SURFACE WATER FEATURE

0 450 900 Feet

GROUNDWATER ELEVATION CONTOUR MAP
FEBRUARY 27, 2020

EDWARDS ASH POND (UNIT ID: 301)
VISTRA ENERGY
EDWARDS POWER STATION
BARTONVILLE, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

TABLE E-1. GROUNDWATER ELEVATION RESULTS

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AP05S	01/16/2017	438.30
AP05S	05/08/2017	437.83
AP05S	06/07/2017	438.37
AP05S	06/22/2017	438.08
AP05S	07/19/2017	438.11
AP05S	07/31/2017	438.35
AP05S	08/07/2017	438.44
AP05S	08/23/2017	438.53
AP05S	11/01/2017	436.86
AP05S	05/04/2018	436.52
AP05S	07/26/2018	436.38
AP05S	08/27/2018	436.59
AP05S	02/25/2019	438.03
AP05S	08/06/2019	440.31
AP05S	02/27/2020	439.85
AP05S	08/31/2020	438.32
AP05S	09/01/2020	438.19
AP05S	02/09/2021	437.61
AP05S	02/10/2021	437.61
AP05S	02/11/2021	437.95
AP05S	02/23/2021	437.84
AP05S	03/02/2021	437.93
AP05S	03/08/2021	437.93
AP05S	03/22/2021	438.43
AP05S	03/24/2021	438.43
AP05S	04/12/2021	438.59
AP05S	04/13/2021	438.41
AP05S	05/04/2021	438.43
AP05S	05/07/2021	438.41
AP05S	06/15/2021	438.30
AP05S	06/16/2021	438.25
AP05S	06/28/2021	438.24
AP05S	06/29/2021	438.27
AP05S	07/21/2021	438.67
AP05S	07/22/2021	438.68
AP05S	08/30/2021	438.13
AP05D	01/16/2017	430.11
AP05D	05/08/2017	429.96
AP05D	07/19/2017	430.34
AP05D	11/01/2017	429.19
AP05D	05/04/2018	429.85
AP05D	07/26/2018	429.45
AP05D	02/25/2019	431.16
AP05D	08/06/2019	431.45
AP05D	02/27/2020	440.27

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AP05D	08/31/2020	440.23
AP05D	02/09/2021	439.14
AP05D	02/10/2021	439.14
AP05D	02/11/2021	430.80
AP05D	03/02/2021	435.81
AP05D	03/08/2021	435.81
AP05D	03/22/2021	433.33
AP05D	03/24/2021	433.33
AP05D	04/12/2021	431.96
AP05D	04/15/2021	432.63
AP05D	05/04/2021	432.29
AP05D	05/07/2021	433.08
AP05D	06/15/2021	435.02
AP05D	06/28/2021	433.14
AP05D	07/21/2021	437.15
AP05D	08/30/2021	438.36
AP06	01/16/2017	437.22
AP06	05/08/2017	437.35
AP06	07/19/2017	437.48
AP06	11/01/2017	436.95
AP06	05/04/2018	436.74
AP06	07/26/2018	437.19
AP06	02/25/2019	437.18
AP06	08/06/2019	439.02
AP06	02/27/2020	439.03
AP06	08/31/2020	436.24
AP06	02/09/2021	438.27
AP06	02/11/2021	437.92
AP06	03/02/2021	438.67
AP06	03/22/2021	438.98
AP06	04/12/2021	438.77
AP06	05/04/2021	438.02
AP06	06/15/2021	436.60
AP06	06/28/2021	437.92
AP06	07/21/2021	438.04
AP06	08/30/2021	436.85
AP07S	01/16/2017	436.51
AP07S	05/08/2017	436.84
AP07S	07/19/2017	437.18
AP07S	11/01/2017	436.05
AP07S	05/04/2018	436.14
AP07S	07/26/2018	435.22
AP07S	02/25/2019	438.08
AP07S	08/06/2019	438.00
AP07S	02/27/2020	436.92

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AP07S	08/31/2020	435.45
AP07S	02/09/2021	436.14
AP07S	02/10/2021	436.14
AP07S	02/11/2021	436.12
AP07S	03/02/2021	436.50
AP07S	03/04/2021	436.50
AP07S	03/22/2021	436.73
AP07S	03/24/2021	436.73
AP07S	04/12/2021	436.61
AP07S	04/13/2021	436.50
AP07S	05/04/2021	436.23
AP07S	05/05/2021	436.13
AP07S	06/15/2021	435.97
AP07S	06/16/2021	436.30
AP07S	06/28/2021	436.37
AP07S	07/21/2021	436.26
AP07S	07/22/2021	436.21
AP07S	08/30/2021	435.75
AP07D	01/16/2017	408.23
AP07D	05/08/2017	408.77
AP07D	07/19/2017	409.02
AP07D	11/01/2017	407.39
AP07D	05/04/2018	408.12
AP07D	07/26/2018	406.74
AP07D	02/25/2019	407.38
AP07D	08/06/2019	407.70
AP07D	02/27/2020	438.23
AP07D	08/31/2020	437.77
AP07D	02/09/2021	437.76
AP07D	02/10/2021	437.76
AP07D	02/11/2021	429.88
AP07D	03/02/2021	431.15
AP07D	03/08/2021	431.15
AP07D	03/22/2021	415.52
AP07D	03/24/2021	415.52
AP07D	04/12/2021	407.02
AP07D	04/13/2021	407.18
AP07D	05/04/2021	402.41
AP07D	05/05/2021	402.50
AP07D	06/15/2021	399.23
AP07D	06/28/2021	397.79
AP07D	07/21/2021	399.78
AP07D	07/22/2021	399.87
AP07D	08/30/2021	400.21
AP08	01/16/2017	451.72

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AP08	01/18/2017	451.72
AP08	05/08/2017	451.55
AP08	07/19/2017	451.84
AP08	11/01/2017	450.99
AP08	05/04/2018	451.44
AP08	07/26/2018	451.20
AP08	02/25/2019	452.06
AP08	08/06/2019	451.86
AP08	02/27/2020	453.97
AP08	08/31/2020	451.28
AP08	02/09/2021	452.60
AP08	02/11/2021	452.58
AP08	03/02/2021	452.85
AP08	03/22/2021	453.59
AP08	04/12/2021	453.16
AP08	05/04/2021	452.70
AP08	06/15/2021	452.40
AP08	06/28/2021	452.92
AP08	07/21/2021	452.97
AP08	08/30/2021	451.89
AP09	01/17/2017	452.02
AP09	01/18/2017	452.02
AP09	05/08/2017	452.07
AP09	07/19/2017	452.15
AP09	11/01/2017	451.30
AP09	05/04/2018	451.66
AP09	07/26/2018	451.37
AP09	02/25/2019	452.20
AP09	08/06/2019	452.26
AP09	02/27/2020	452.46
AP09	08/31/2020	451.49
AP09	02/09/2021	451.96
AP09	02/11/2021	451.84
AP09	03/02/2021	451.95
AP09	03/22/2021	451.95
AP09	04/12/2021	451.86
AP09	05/04/2021	452.12
AP09	06/15/2021	451.61
AP09	06/28/2021	452.09
AP09	07/21/2021	452.19
AP09	08/30/2021	451.96
APW-01	12/21/2015	436.11
APW-01	02/17/2016	436.06
APW-01	05/17/2016	437.21
APW-01	07/21/2016	436.04

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
APW-01	11/10/2016	436.56
APW-01	01/16/2017	436.05
APW-01	05/08/2017	435.98
APW-01	07/19/2017	435.67
APW-01	11/01/2017	435.42
APW-01	05/04/2018	435.87
APW-01	07/26/2018	435.66
APW-01	02/25/2019	436.72
APW-01	08/06/2019	436.24
APW-01	02/27/2020	435.59
APW-01	08/31/2020	434.34
APW-01	02/09/2021	435.24
APW-01	02/11/2021	435.14
APW-01	03/02/2021	435.42
APW-01	03/22/2021	435.38
APW-01	04/12/2021	435.56
APW-01	05/04/2021	435.19
APW-01	06/15/2021	433.62
APW-01	06/17/2021	434.54
APW-01	06/28/2021	435.32
APW-01	06/29/2021	435.57
APW-01	07/21/2021	435.05
APW-01	07/22/2021	435.00
APW-01	08/30/2021	434.98
APW-02	12/21/2015	454.29
APW-02	02/17/2016	454.38
APW-02	05/17/2016	455.12
APW-02	07/21/2016	453.77
APW-02	11/10/2016	454.82
APW-02	01/16/2017	454.64
APW-02	05/08/2017	454.22
APW-02	07/19/2017	454.29
APW-02	11/01/2017	453.67
APW-02	05/04/2018	454.46
APW-02	07/26/2018	453.34
APW-02	02/25/2019	455.76
APW-02	08/06/2019	455.16
APW-02	02/27/2020	456.19
APW-02	08/31/2020	455.43
APW-02	02/09/2021	455.40
APW-02	02/10/2021	450.37
APW-02	02/11/2021	450.37
APW-02	03/02/2021	455.31
APW-02	03/03/2021	455.31
APW-02	03/22/2021	455.21

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
APW-02	03/24/2021	455.21
APW-02	04/12/2021	455.43
APW-02	04/13/2021	455.44
APW-02	05/04/2021	455.43
APW-02	05/06/2021	455.46
APW-02	06/15/2021	455.70
APW-02	06/28/2021	455.63
APW-02	07/21/2021	455.69
APW-02	08/30/2021	455.55
APW-03	12/21/2015	437.34
APW-03	02/17/2016	437.40
APW-03	05/17/2016	437.43
APW-03	07/21/2016	437.18
APW-03	11/10/2016	437.18
APW-03	01/16/2017	435.34
APW-03	05/08/2017	437.20
APW-03	07/19/2017	437.25
APW-03	11/01/2017	436.29
APW-03	05/04/2018	436.42
APW-03	07/26/2018	435.35
APW-03	02/25/2019	436.37
APW-03	08/06/2019	437.68
APW-03	02/27/2020	436.52
APW-03	08/31/2020	435.69
APW-03	02/09/2021	436.78
APW-03	02/10/2021	429.81
APW-03	02/11/2021	429.81
APW-03	03/02/2021	436.47
APW-03	03/04/2021	436.47
APW-03	03/22/2021	436.75
APW-03	03/24/2021	436.75
APW-03	04/12/2021	436.25
APW-03	04/13/2021	436.10
APW-03	05/04/2021	436.06
APW-03	05/07/2021	435.94
APW-03	06/15/2021	435.64
APW-03	06/28/2021	436.22
APW-03	07/21/2021	436.13
APW-03	08/30/2021	435.57
APW-04	12/21/2015	432.91
APW-04	02/17/2016	433.51
APW-04	05/17/2016	434.64
APW-04	07/21/2016	432.82
APW-04	11/10/2016	432.86
APW-04	01/16/2017	432.66

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
APW-04	05/08/2017	432.73
APW-04	07/19/2017	433.08
APW-04	11/01/2017	432.41
APW-04	05/04/2018	432.18
APW-04	07/26/2018	432.90
APW-04	02/25/2019	432.73
APW-04	08/06/2019	434.27
APW-04	02/27/2020	432.90
APW-04	08/31/2020	431.05
APW-04	02/09/2021	432.44
APW-04	02/10/2021	432.30
APW-04	02/11/2021	432.30
APW-04	03/02/2021	432.74
APW-04	03/04/2021	432.74
APW-04	03/22/2021	432.75
APW-04	04/12/2021	432.91
APW-04	04/13/2021	432.84
APW-04	05/04/2021	432.40
APW-04	05/07/2021	432.31
APW-04	06/15/2021	431.79
APW-04	06/28/2021	431.21
APW-04	07/21/2021	432.13
APW-04	08/30/2021	431.98
AW-05	11/09/2015	434.06
AW-05	12/21/2015	434.52
AW-05	02/17/2016	434.27
AW-05	05/17/2016	434.74
AW-05	07/21/2016	434.34
AW-05	11/10/2016	435.02
AW-05	01/16/2017	435.41
AW-05	05/08/2017	434.99
AW-05	07/19/2017	435.30
AW-05	11/01/2017	434.57
AW-05	05/04/2018	434.76
AW-05	07/26/2018	435.04
AW-05	02/25/2019	435.74
AW-05	08/06/2019	435.51
AW-05	02/27/2020	435.26
AW-05	08/31/2020	434.16
AW-05	02/09/2021	435.10
AW-05	02/11/2021	435.03
AW-05	03/02/2021	435.17
AW-05	03/22/2021	435.28
AW-05	04/12/2021	435.55
AW-05	05/04/2021	435.16

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-05	06/15/2021	434.68
AW-05	06/17/2021	434.27
AW-05	06/28/2021	435.12
AW-05	07/21/2021	434.91
AW-05	07/22/2021	434.79
AW-05	08/30/2021	434.44
AW-06	11/09/2015	434.65
AW-06	12/21/2015	435.19
AW-06	02/17/2016	434.69
AW-06	05/17/2016	433.07
AW-06	07/21/2016	432.56
AW-06	11/10/2016	433.32
AW-06	01/16/2017	434.23
AW-06	05/08/2017	435.12
AW-06	07/19/2017	435.37
AW-06	11/01/2017	434.63
AW-06	05/04/2018	434.37
AW-06	07/26/2018	434.57
AW-06	02/25/2019	435.57
AW-06	08/06/2019	434.12
AW-06	02/27/2020	434.94
AW-06	08/31/2020	433.60
AW-06	02/09/2021	434.40
AW-06	02/11/2021	434.50
AW-06	02/23/2021	434.81
AW-06	03/02/2021	434.62
AW-06	03/22/2021	434.70
AW-06	04/12/2021	434.85
AW-06	05/04/2021	434.48
AW-06	06/15/2021	434.26
AW-06	06/28/2021	434.60
AW-06	07/21/2021	434.40
AW-06	08/30/2021	436.01
AW-08	11/09/2015	439.28
AW-08	12/21/2015	441.48
AW-08	02/17/2016	442.56
AW-08	05/17/2016	440.54
AW-08	07/21/2016	441.48
AW-08	11/10/2016	442.45
AW-08	01/16/2017	441.33
AW-08	05/08/2017	441.36
AW-08	07/19/2017	441.19
AW-08	11/01/2017	439.09
AW-08	05/04/2018	440.33
AW-08	07/26/2018	439.54

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-08	08/27/2018	439.63
AW-08	02/25/2019	443.04
AW-08	08/06/2019	442.80
AW-08	02/27/2020	442.68
AW-08	08/31/2020	440.09
AW-08	09/01/2020	440.07
AW-08	02/09/2021	438.28
AW-08	02/10/2021	434.16
AW-08	02/11/2021	434.16
AW-08	02/23/2021	438.16
AW-08	03/02/2021	437.77
AW-08	03/05/2021	437.77
AW-08	03/22/2021	439.27
AW-08	03/24/2021	439.27
AW-08	04/12/2021	440.09
AW-08	04/13/2021	440.01
AW-08	05/04/2021	439.47
AW-08	05/07/2021	439.38
AW-08	06/15/2021	440.14
AW-08	06/16/2021	440.16
AW-08	06/28/2021	439.41
AW-08	07/21/2021	441.74
AW-08	08/30/2021	439.49
AW-09	11/09/2015	435.03
AW-09	12/21/2015	436.14
AW-09	02/17/2016	436.85
AW-09	05/17/2016	435.65
AW-09	07/21/2016	435.81
AW-09	11/10/2016	436.32
AW-09	01/16/2017	434.45
AW-09	05/08/2017	435.95
AW-09	07/19/2017	436.16
AW-09	11/01/2017	434.97
AW-09	05/04/2018	435.45
AW-09	07/26/2018	435.14
AW-09	02/25/2019	435.71
AW-09	08/06/2019	435.63
AW-09	02/27/2020	436.33
AW-09	08/31/2020	435.29
AW-09	02/09/2021	435.73
AW-09	02/11/2021	435.67
AW-09	02/23/2021	435.76
AW-09	03/02/2021	434.63
AW-09	03/22/2021	435.77
AW-09	04/12/2021	435.96

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-09	05/04/2021	435.63
AW-09	06/15/2021	435.64
AW-09	06/28/2021	436.51
AW-09	07/21/2021	435.90
AW-09	08/30/2021	435.35
AW-10	11/09/2015	438.64
AW-10	12/21/2015	439.65
AW-10	02/17/2016	439.71
AW-10	05/17/2016	439.77
AW-10	07/21/2016	439.13
AW-10	11/10/2016	439.33
AW-10	01/16/2017	439.40
AW-10	05/08/2017	439.42
AW-10	07/19/2017	438.99
AW-10	11/01/2017	437.97
AW-10	05/04/2018	438.53
AW-10	07/26/2018	437.97
AW-10	08/27/2018	438.62
AW-10	02/25/2019	438.99
AW-10	08/06/2019	439.01
AW-10	02/27/2020	438.93
AW-10	08/31/2020	438.84
AW-10	02/23/2021	438.84
AW-10	03/02/2021	438.84
AW-10	03/22/2021	438.84
AW-10	03/23/2021	438.84
AW-10	04/12/2021	438.85
AW-10	05/04/2021	438.80
AW-10	06/15/2021	438.62
AW-10	06/28/2021	438.61
AW-10	07/21/2021	438.60
AW-10	08/30/2021	437.93
AW-11	11/09/2015	434.19
AW-11	12/21/2015	434.99
AW-11	02/17/2016	435.54
AW-11	05/17/2016	434.92
AW-11	07/21/2016	434.77
AW-11	11/10/2016	435.03
AW-11	01/16/2017	434.26
AW-11	05/08/2017	431.48
AW-11	07/19/2017	431.44
AW-11	11/01/2017	431.09
AW-11	05/04/2018	431.62
AW-11	07/26/2018	431.93
AW-11	02/25/2019	432.25

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-11	08/06/2019	432.70
AW-11	02/27/2020	435.21
AW-11	08/31/2020	434.18
AW-11	02/09/2021	434.17
AW-11	02/11/2021	434.13
AW-11	02/23/2021	434.63
AW-11	03/02/2021	434.51
AW-11	03/22/2021	434.60
AW-11	04/12/2021	434.65
AW-11	05/04/2021	434.56
AW-11	06/15/2021	433.40
AW-11	06/28/2021	434.38
AW-11	07/21/2021	434.56
AW-11	08/30/2021	434.05
AW-12	02/09/2021	435.75
AW-12	03/02/2021	436.97
AW-12	03/04/2021	436.97
AW-12	03/22/2021	437.06
AW-12	03/24/2021	437.06
AW-12	04/12/2021	436.81
AW-12	05/04/2021	436.66
AW-12	05/07/2021	436.29
AW-12	06/15/2021	435.14
AW-12	06/28/2021	436.75
AW-12	07/21/2021	438.01
AW-12	08/30/2021	435.86
AW-13	02/09/2021	435.52
AW-13	03/02/2021	435.84
AW-13	03/04/2021	435.84
AW-13	03/22/2021	435.86
AW-13	03/23/2021	435.86
AW-13	04/12/2021	435.92
AW-13	05/04/2021	435.83
AW-13	05/07/2021	435.77
AW-13	06/15/2021	435.56
AW-13	06/28/2021	435.40
AW-13	07/21/2021	435.98
AW-13	08/30/2021	435.28
AW-14	02/09/2021	433.03
AW-14	03/02/2021	432.94
AW-14	03/04/2021	432.94
AW-14	03/22/2021	432.79
AW-14	04/12/2021	432.95
AW-14	05/04/2021	432.99
AW-14	05/06/2021	432.41

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-14	06/15/2021	372.50
AW-14	06/28/2021	432.87
AW-14	07/21/2021	433.04
AW-14	08/30/2021	432.21
AW-15	02/09/2021	433.03
AW-15	02/12/2021	433.03
AW-15	03/02/2021	433.50
AW-15	03/05/2021	433.50
AW-15	03/22/2021	433.68
AW-15	04/12/2021	433.76
AW-15	05/04/2021	433.69
AW-15	05/06/2021	433.60
AW-15	06/15/2021	433.65
AW-15	06/28/2021	433.59
AW-15	07/21/2021	433.65
AW-15	08/30/2021	434.43
AW-15C	02/09/2021	433.32
AW-15C	02/12/2021	431.22
AW-15C	03/02/2021	433.50
AW-15C	03/04/2021	433.50
AW-15C	03/22/2021	433.66
AW-15C	04/12/2021	433.80
AW-15C	04/13/2021	433.64
AW-15C	05/04/2021	433.71
AW-15C	05/06/2021	433.61
AW-15C	06/15/2021	433.63
AW-15C	06/28/2021	433.58
AW-15C	07/21/2021	433.67
AW-15C	08/30/2021	431.51
AW-15S	02/09/2021	431.91
AW-15S	02/12/2021	434.01
AW-15S	03/02/2021	431.19
AW-15S	03/04/2021	431.19
AW-15S	03/22/2021	431.33
AW-15S	04/12/2021	431.13
AW-15S	04/26/2021	431.15
AW-15S	05/04/2021	429.82
AW-15S	05/06/2021	430.14
AW-15S	06/15/2021	431.00
AW-15S	06/17/2021	430.24
AW-15S	06/28/2021	429.86
AW-15S	06/29/2021	429.06
AW-15S	07/21/2021	431.25
AW-15S	08/30/2021	430.87
AW-16	02/09/2021	437.63

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-16	03/02/2021	437.61
AW-16	03/03/2021	437.61
AW-16	03/22/2021	437.67
AW-16	03/24/2021	437.67
AW-16	04/12/2021	437.79
AW-16	04/23/2021	437.78
AW-16	05/04/2021	437.74
AW-16	05/05/2021	437.68
AW-16	06/15/2021	437.77
AW-16	06/24/2021	437.89
AW-16	06/28/2021	437.79
AW-16	06/29/2021	437.81
AW-16	07/21/2021	437.74
AW-16	08/30/2021	437.41
AW-17	02/09/2021	436.85
AW-17	03/02/2021	437.20
AW-17	03/03/2021	437.20
AW-17	03/22/2021	437.42
AW-17	03/23/2021	437.42
AW-17	04/12/2021	437.58
AW-17	04/23/2021	437.48
AW-17	05/04/2021	437.40
AW-17	05/05/2021	437.20
AW-17	06/15/2021	437.34
AW-17	06/24/2021	437.30
AW-17	06/28/2021	437.24
AW-17	06/29/2021	437.30
AW-17	07/21/2021	437.70
AW-17	08/30/2021	437.03
AW-18	02/09/2021	435.27
AW-18	03/02/2021	435.17
AW-18	03/03/2021	435.17
AW-18	03/22/2021	435.38
AW-18	03/23/2021	435.38
AW-18	04/12/2021	435.37
AW-18	04/13/2021	435.25
AW-18	05/04/2021	435.04
AW-18	05/05/2021	434.97
AW-18	06/15/2021	434.98
AW-18	06/23/2021	435.03
AW-18	06/28/2021	435.23
AW-18	06/29/2021	435.34
AW-18	07/21/2021	435.25
AW-18	08/30/2021	434.68
AW-19	02/09/2021	447.65

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-19	03/02/2021	447.64
AW-19	03/03/2021	447.64
AW-19	03/22/2021	447.71
AW-19	03/23/2021	447.71
AW-19	04/12/2021	447.55
AW-19	05/04/2021	447.36
AW-19	05/05/2021	447.33
AW-19	06/15/2021	447.09
AW-19	06/23/2021	447.15
AW-19	06/28/2021	447.40
AW-19	06/29/2021	447.42
AW-19	07/21/2021	447.22
AW-19	08/30/2021	446.88
AW-20	02/09/2021	445.11
AW-20	03/02/2021	445.23
AW-20	03/03/2021	445.23
AW-20	03/22/2021	445.41
AW-20	03/23/2021	445.41
AW-20	04/12/2021	445.29
AW-20	05/04/2021	445.08
AW-20	05/05/2021	445.07
AW-20	06/15/2021	444.55
AW-20	06/28/2021	445.08
AW-20	07/21/2021	445.24
AW-20	08/30/2021	444.25
AW-21	02/09/2021	444.04
AW-21	03/02/2021	444.20
AW-21	03/03/2021	444.20
AW-21	03/22/2021	444.42
AW-21	03/23/2021	444.42
AW-21	04/12/2021	444.17
AW-21	05/04/2021	443.74
AW-21	05/05/2021	443.72
AW-21	06/15/2021	442.83
AW-21	06/23/2021	443.13
AW-21	06/28/2021	443.79
AW-21	06/29/2021	443.82
AW-21	07/21/2021	443.46
AW-21	08/30/2021	442.68
AW-22	02/09/2021	451.45
AW-22	02/12/2021	451.45
AW-22	03/02/2021	451.64
AW-22	03/03/2021	451.64
AW-22	03/22/2021	451.80
AW-22	03/23/2021	451.80

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
AW-22	04/12/2021	451.55
AW-22	04/23/2021	451.53
AW-22	05/04/2021	451.46
AW-22	05/05/2021	451.29
AW-22	06/15/2021	451.30
AW-22	06/28/2021	451.44
AW-22	07/21/2021	451.54
AW-22	08/30/2021	452.04
P002	02/09/2021	448.41
P002	02/12/2021	448.41
P002	03/02/2021	448.50
P002	03/03/2021	448.50
P002	03/22/2021	448.60
P002	03/23/2021	448.60
P002	04/12/2021	448.42
P002	04/13/2021	448.33
P002	05/04/2021	448.31
P002	06/15/2021	448.19
P002	06/28/2021	448.33
XPW01A	02/09/2021	452.42
XPW01A	03/02/2021	452.72
XPW01A	03/04/2021	452.72
XPW01A	03/22/2021	452.88
XPW01A	03/23/2021	452.88
XPW01A	04/12/2021	452.65
XPW01A	05/04/2021	452.41
XPW01A	06/15/2021	452.13
XPW01A	06/28/2021	452.98
XPW01A	07/21/2021	452.63
XPW01A	08/30/2021	452.32
XPW02	02/09/2021	452.97
XPW02	03/02/2021	453.17
XPW02	03/03/2021	453.17
XPW02	03/22/2021	454.08
XPW02	03/23/2021	454.08
XPW02	04/12/2021	453.73
XPW02	05/04/2021	453.23
XPW02	06/15/2021	452.90
XPW02	06/28/2021	453.47
XPW02	07/21/2021	453.67
XPW02	07/22/2021	453.55
XPW02	08/30/2021	452.36
XPW03	02/09/2021	450.74
XPW03	03/02/2021	450.72
XPW03	03/03/2021	450.72

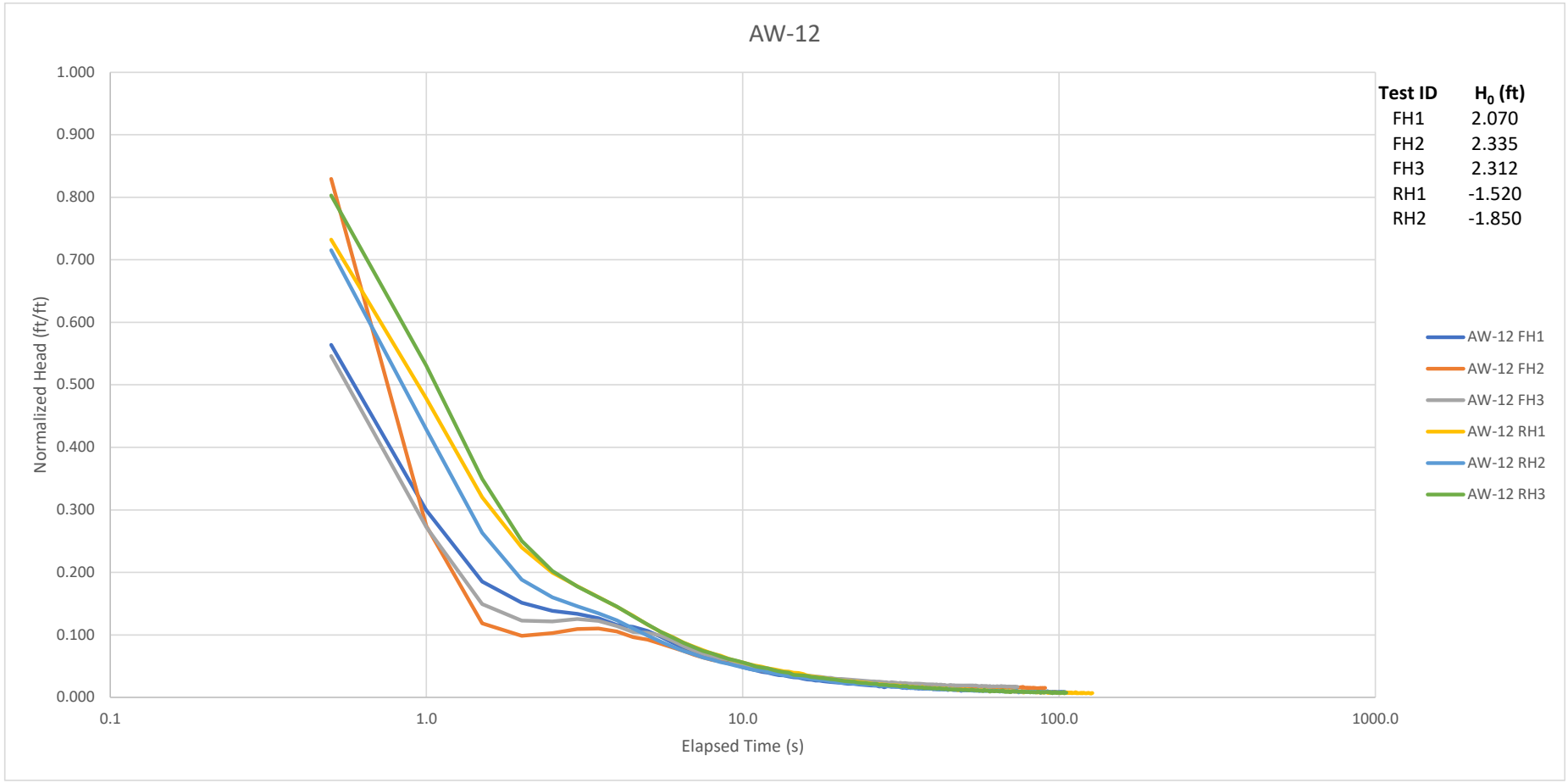
TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

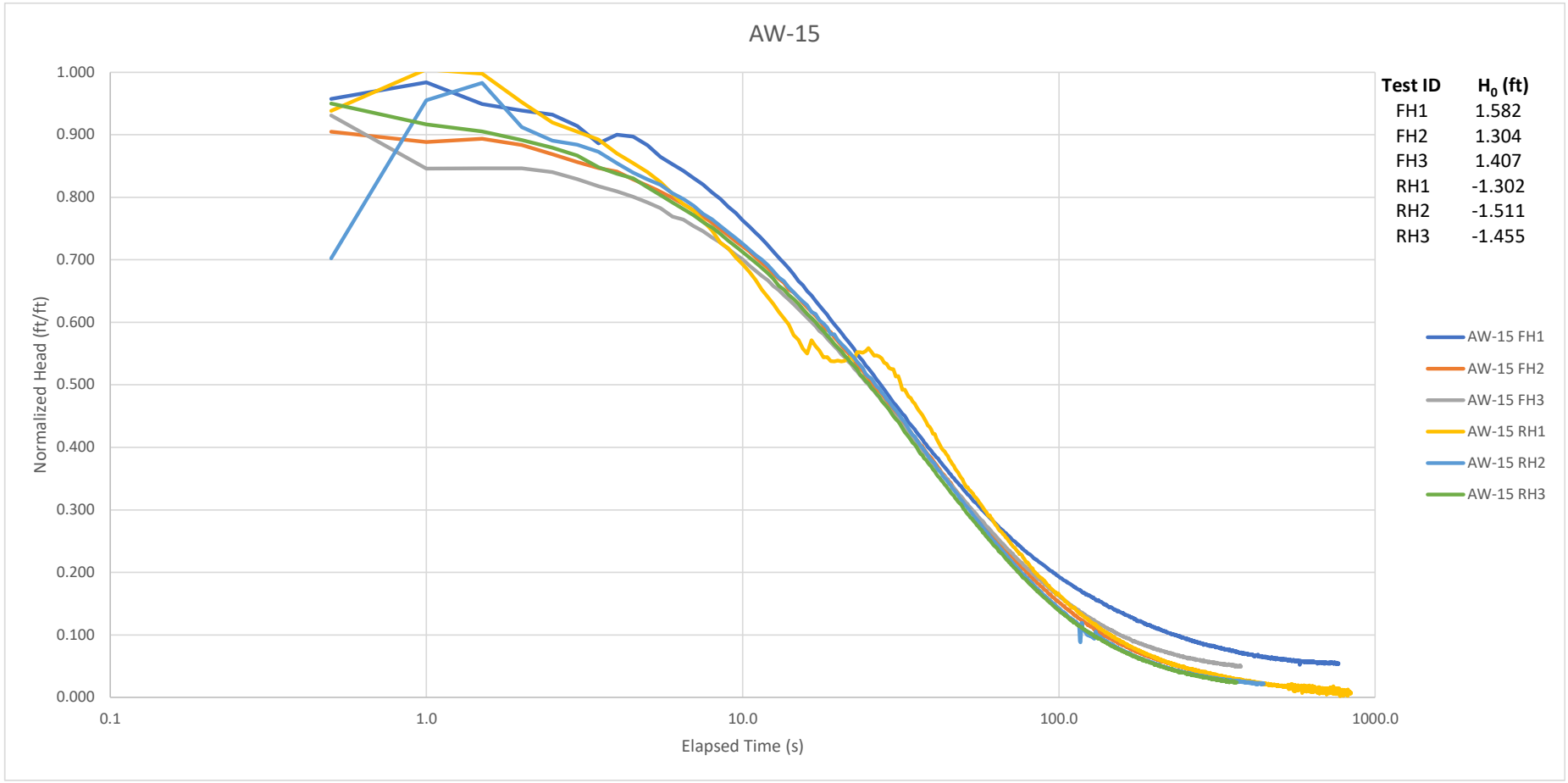
Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
XPW03	03/22/2021	450.77
XPW03	03/23/2021	450.77
XPW03	04/12/2021	450.62
XPW03	05/04/2021	450.84
XPW03	06/15/2021	450.38
XPW03	06/28/2021	450.86
XPW03	07/21/2021	451.03
XPW03	07/22/2021	450.86
XPW03	08/30/2021	450.76
SG-01	06/15/2021	625.21

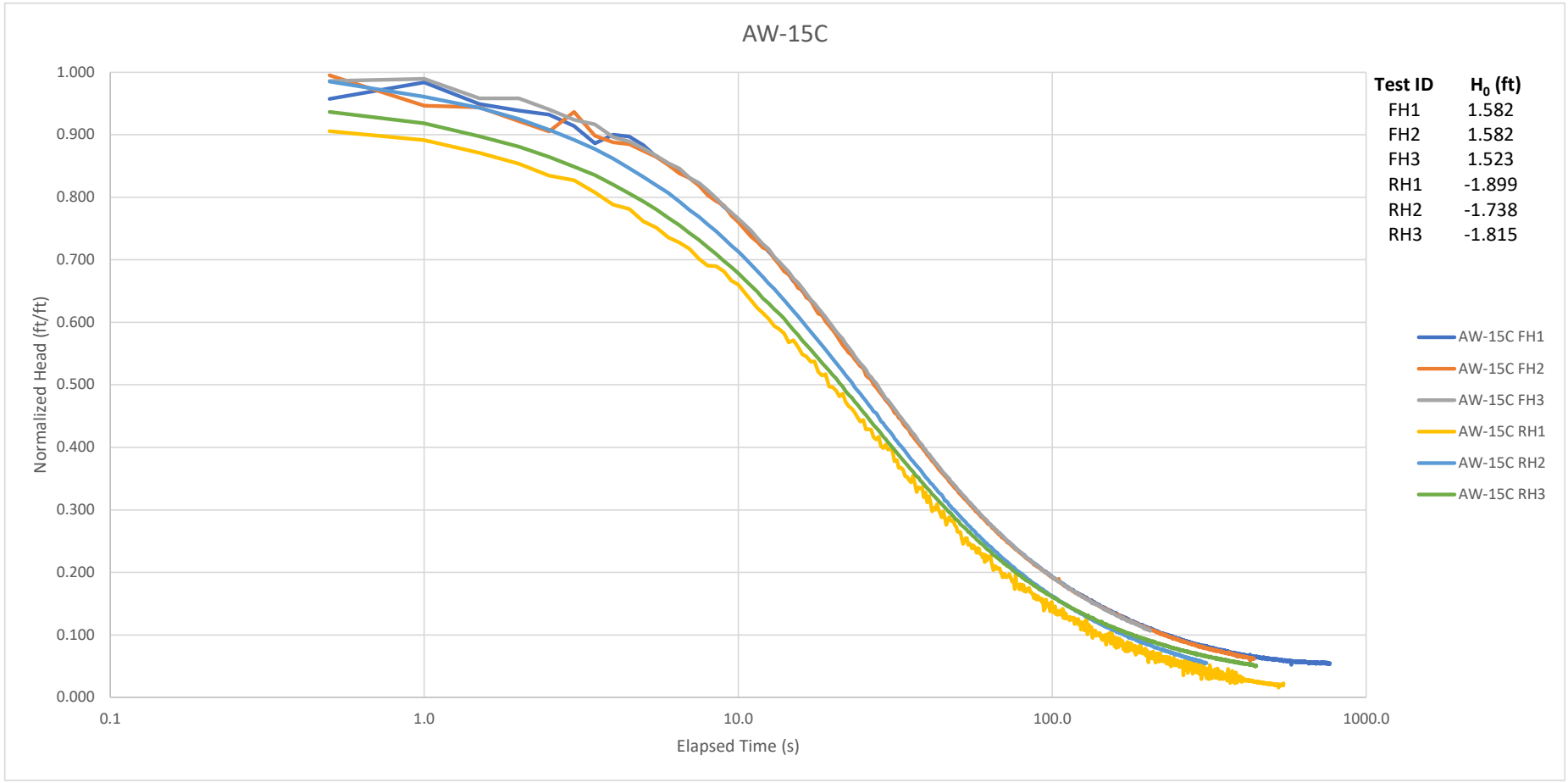
Notes:
ft NAVD88 = feet relative to the North American Vertical Datum 1988, GEOID 12A

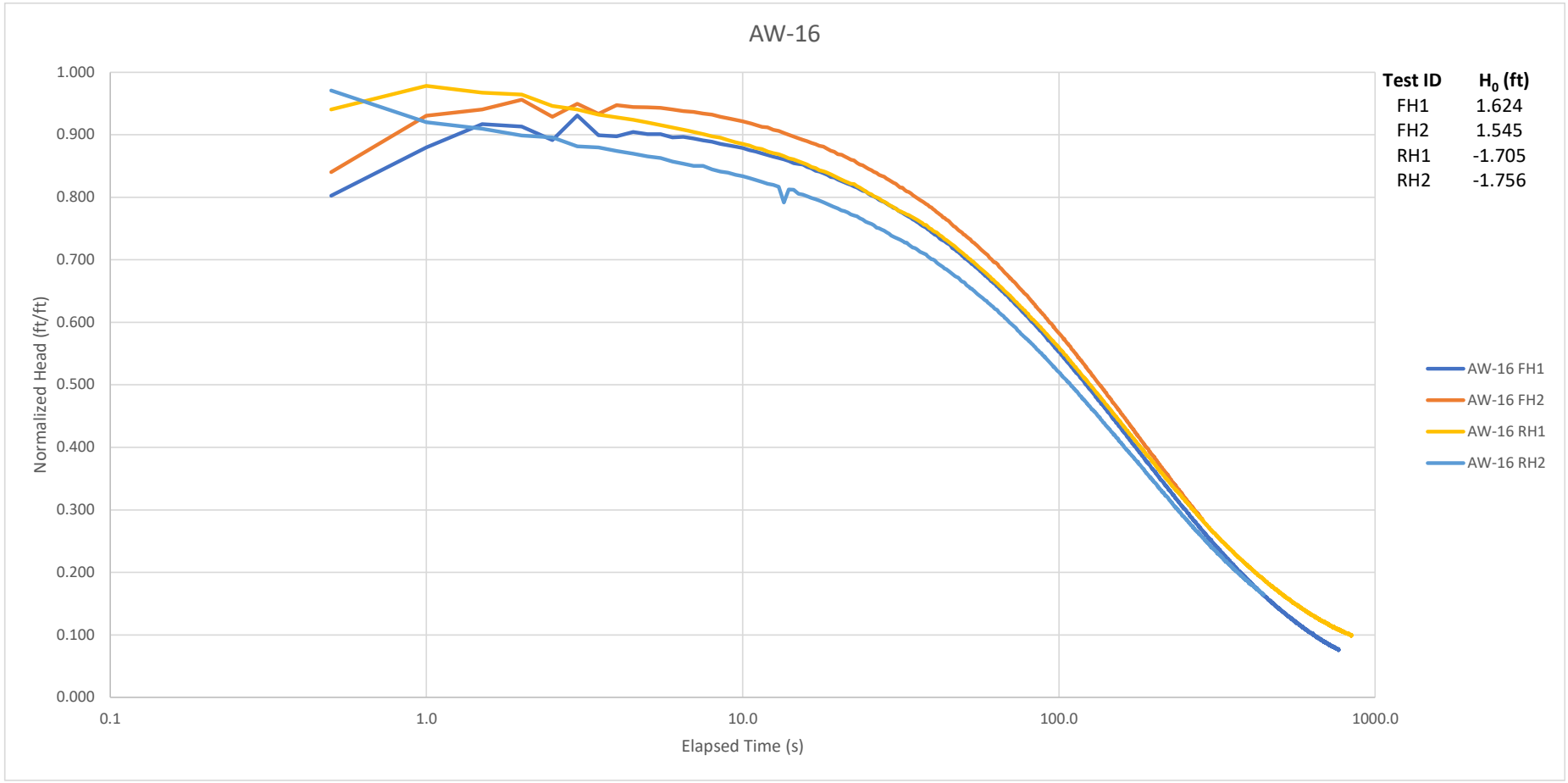
generated 10/05/2021, 4:08:22 PM CDT

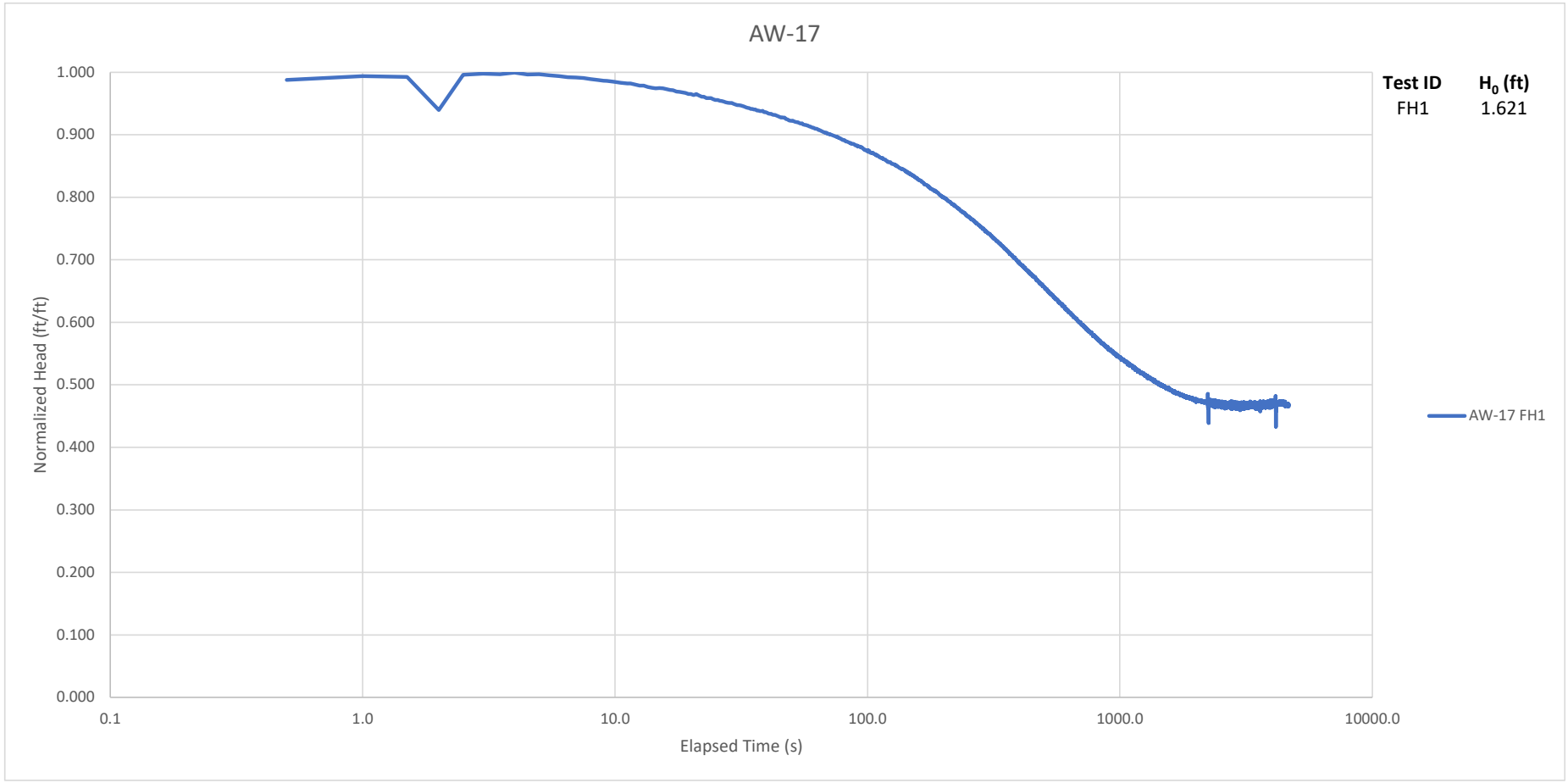
APPENDIX F
HYDRAULIC CONDUCTIVITY TEST DATA

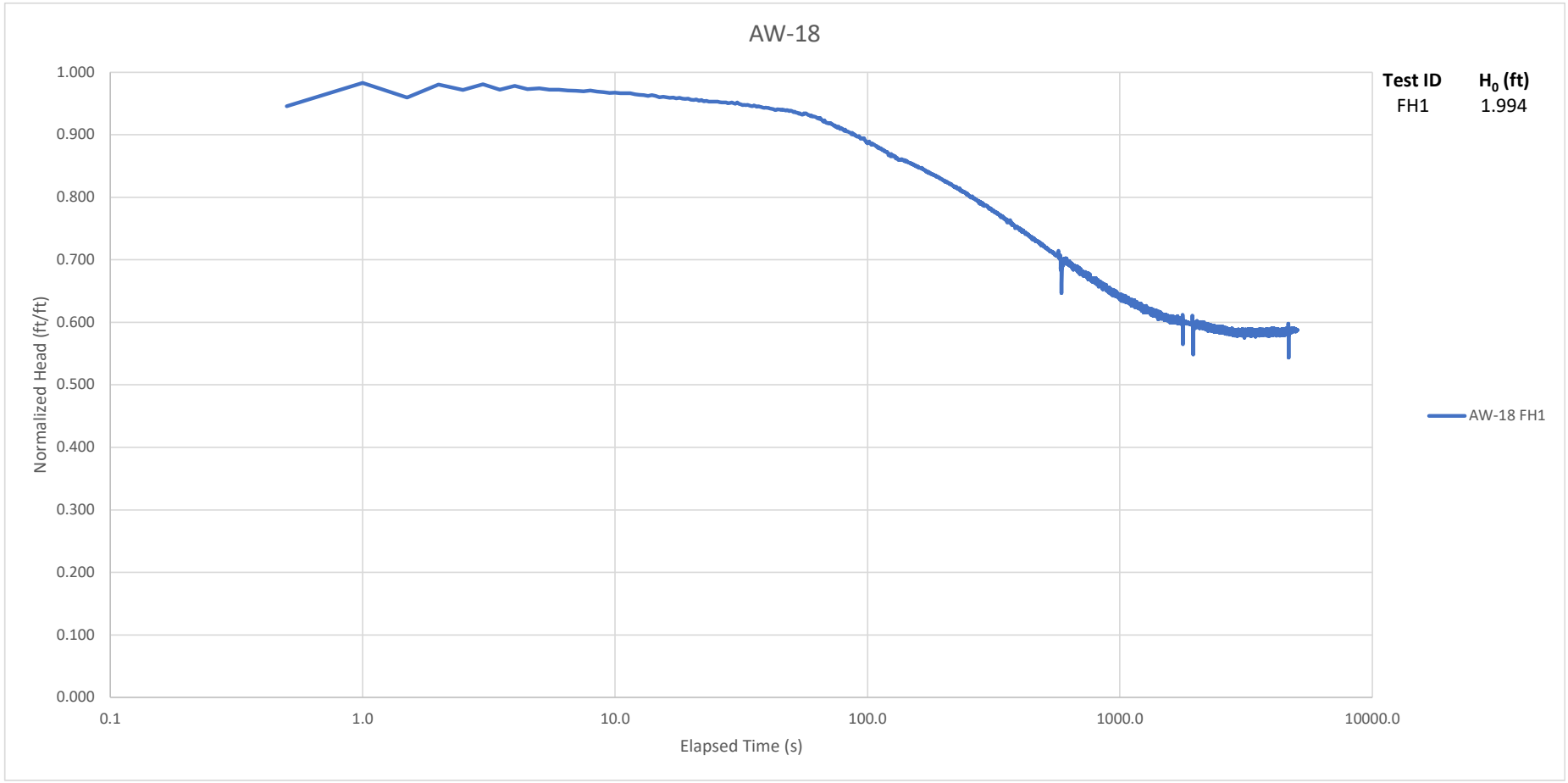

AW-12
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1 2.070
FH2 2.335
FH3 2.312
RH1 -1.520
RH2 -1.850
AW-12 FH1
AW-12 FH2
AW-12 FH3
AW-12 RH1
AW-12 RH2
AW-12 RH3

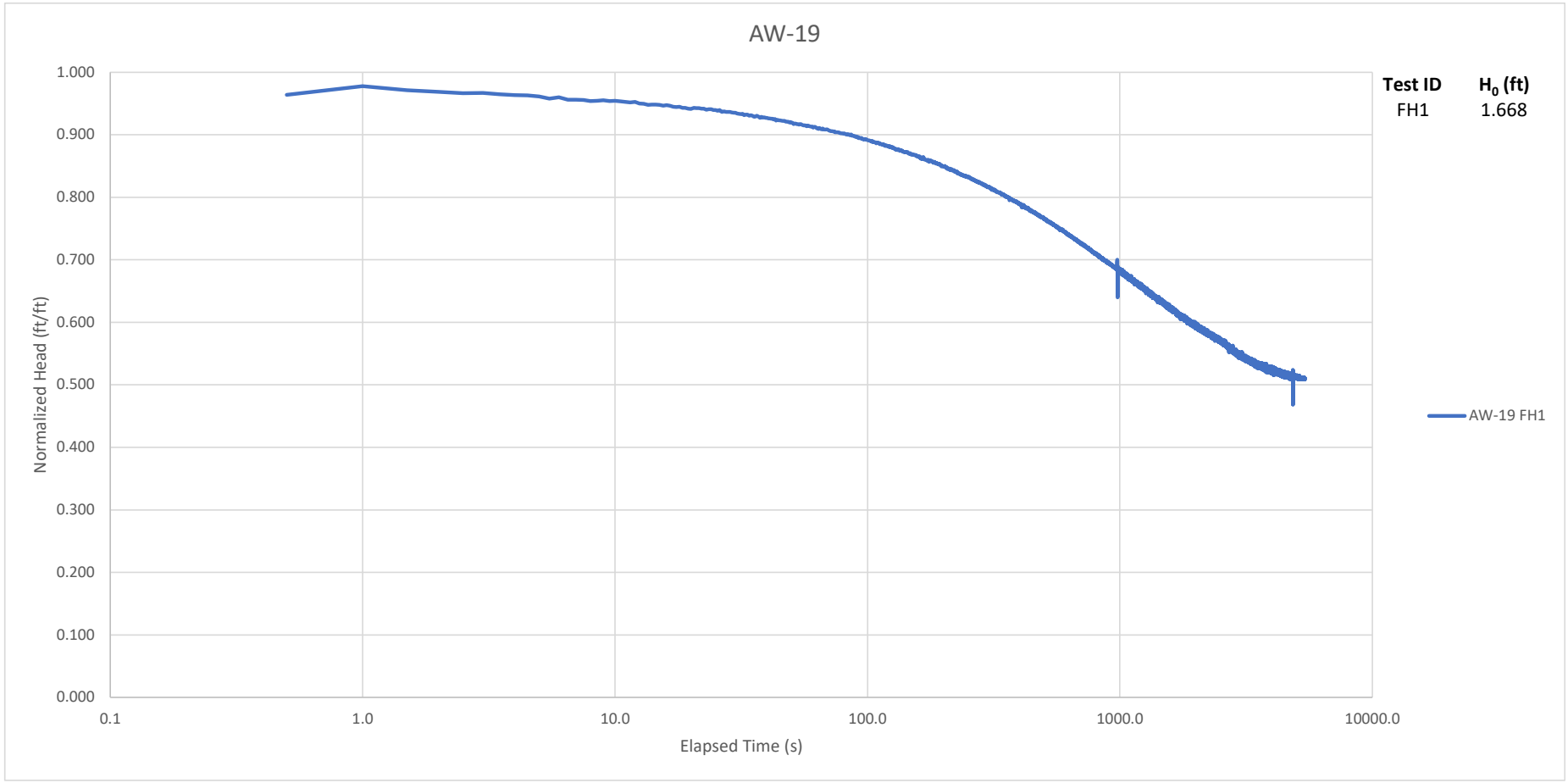

AW-15
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1 1.582
FH2 1.304
FH3 1.407
RH1 -1.302
RH2 -1.511
RH3 -1.455
AW-15 FH1
AW-15 FH2
AW-15 FH3
AW-15 RH1
AW-15 RH2
AW-15 RH3

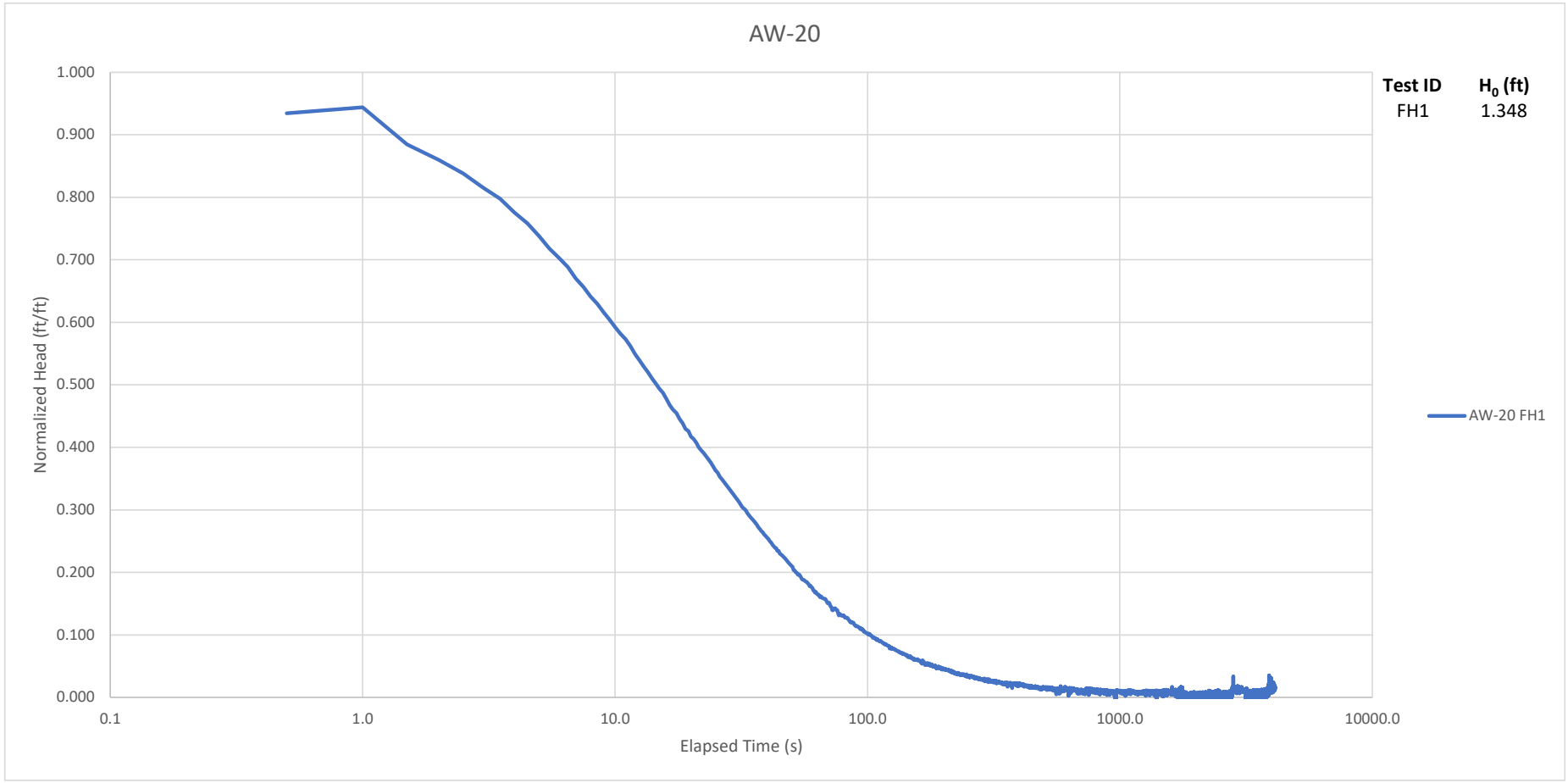

AW-15C
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1 1.582
FH2 1.582
FH3 1.523
RH1 -1.899
RH2 -1.738
RH3 -1.815
AW-15C FH1
AW-15C FH2
AW-15C FH3
AW-15C RH1
AW-15C RH2
AW-15C RH3

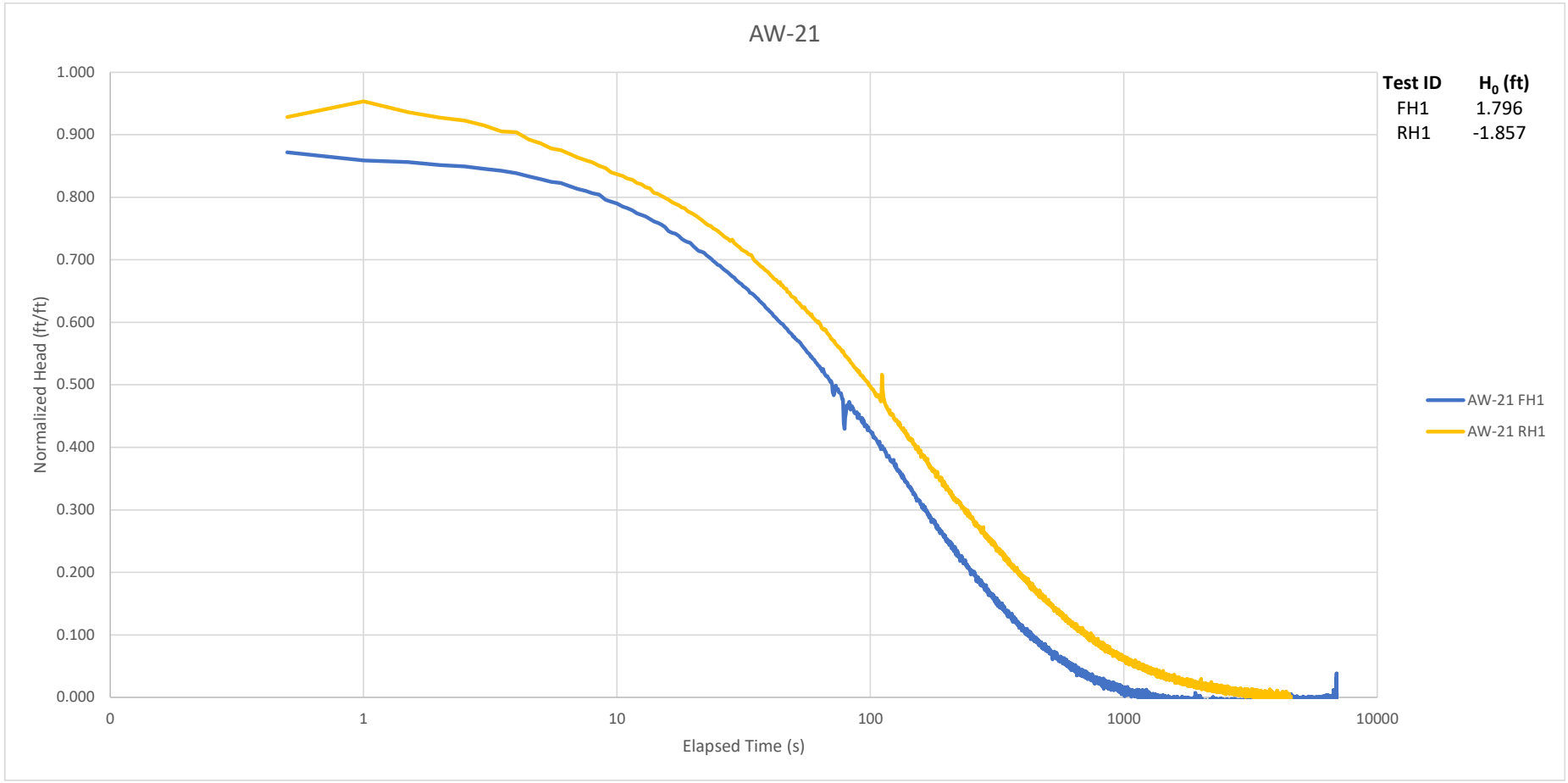

AW-16
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1 1.624
FH2 1.545
RH1 -1.705
RH2 -1.756
AW-16 FH1
AW-16 FH2
AW-16 RH1
AW-16 RH2

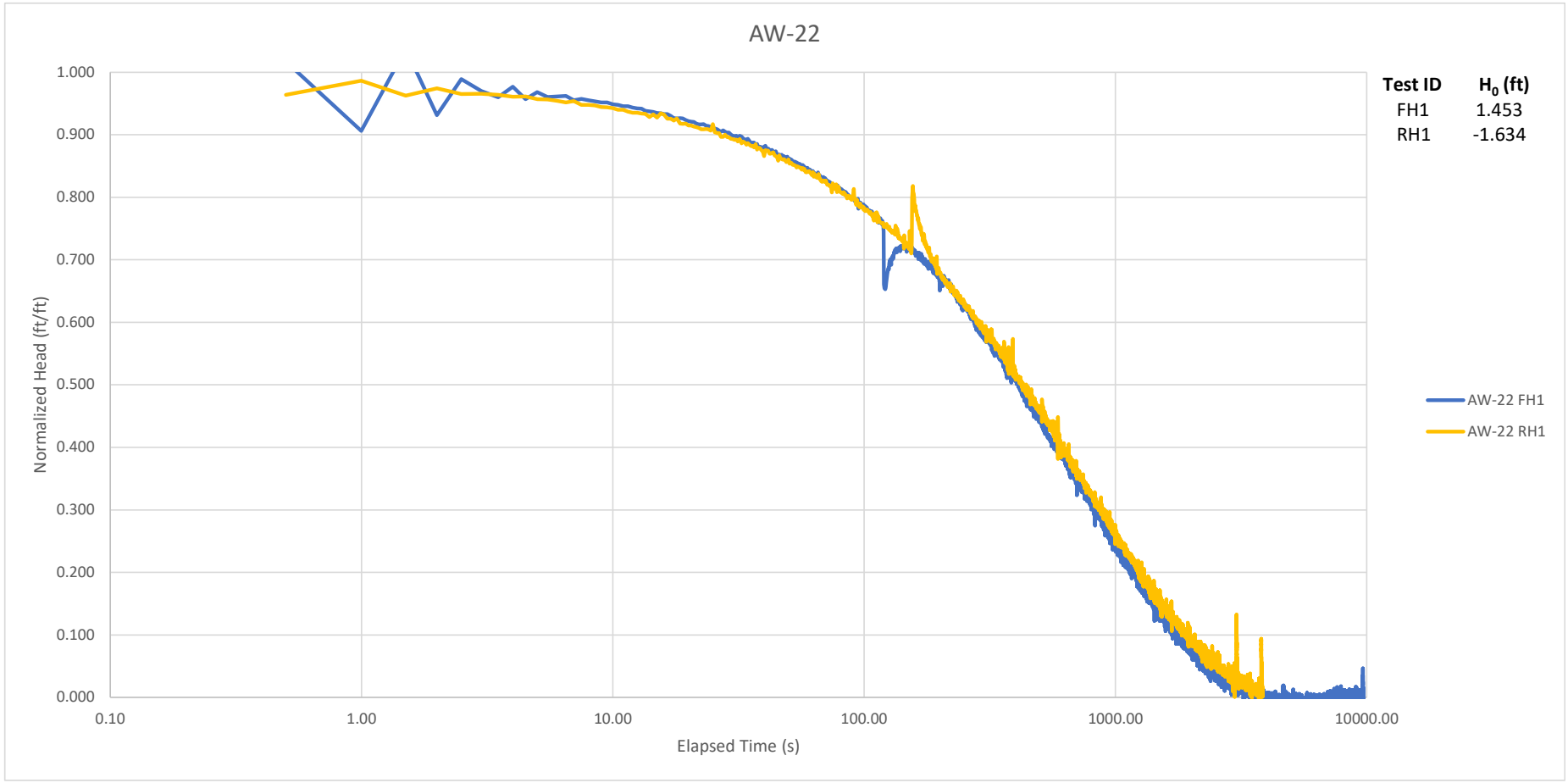

AW-17
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
10000.0
Elapsed Time (s)
Test ID
FH1
H0 (ft)
1.621
AW-17 FH1

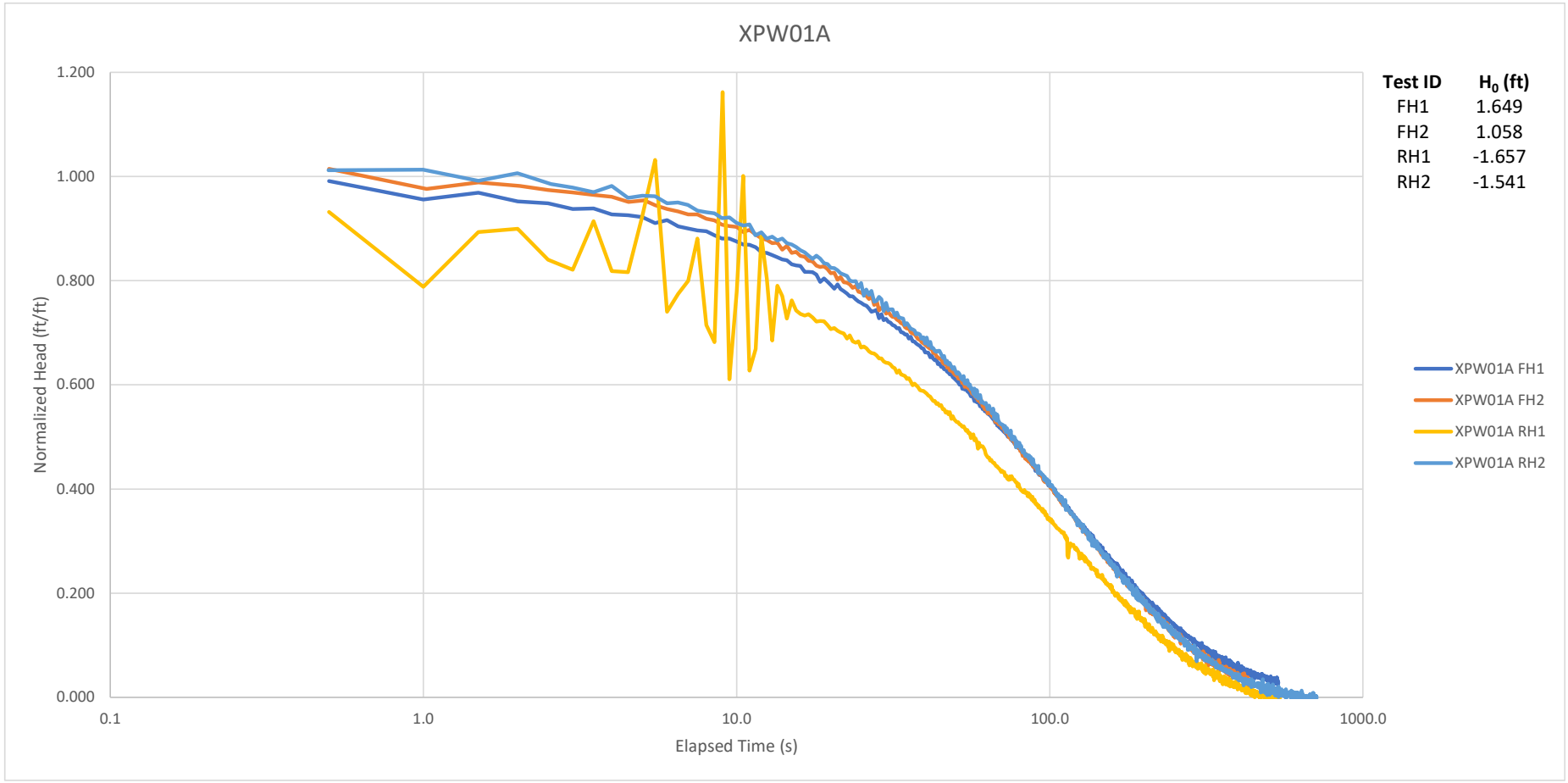

AW-18
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
10000.0
Elapsed Time (s)
Test ID
H0 (ft)
FH1
1.994
AW-18 FH1

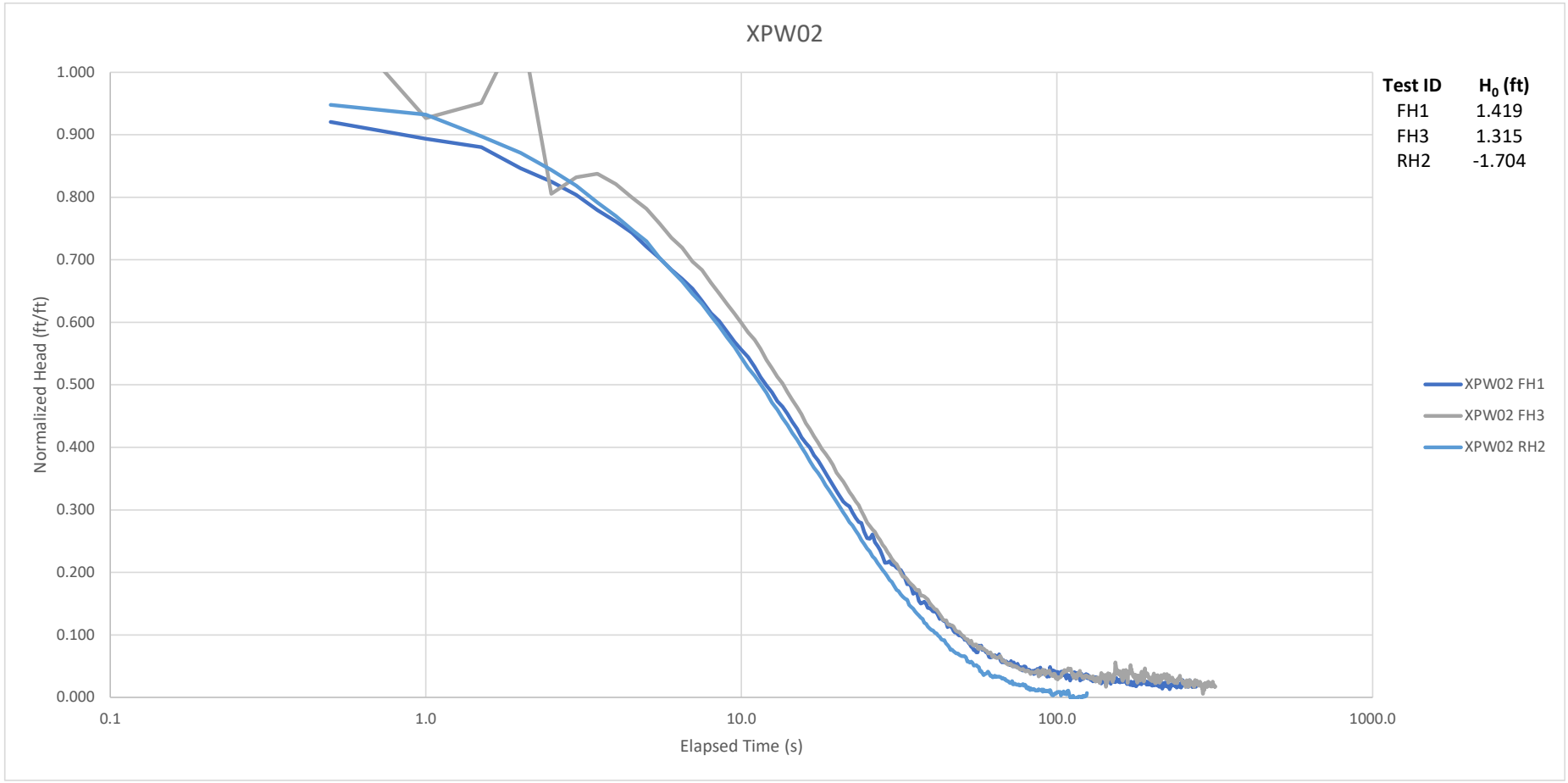

AW-19
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
10000.0
Elapsed Time (s)
Test ID
FH1
H0 (ft)
1.668
AW-19 FH1

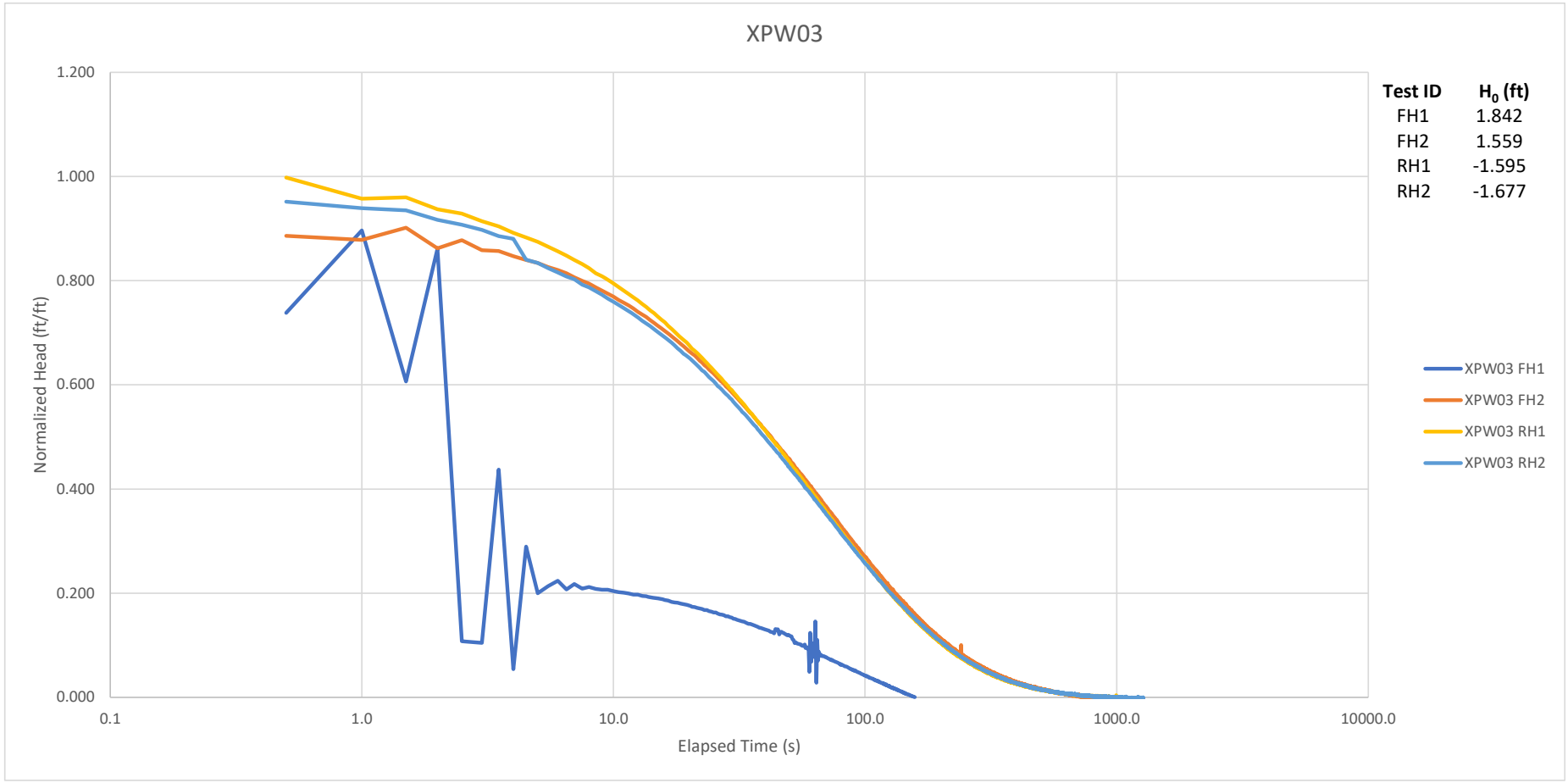

AW-20
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Normalized Head (ft/ft)
0.1
1.0
10.0
100.0
1000.0
10000.0
Elapsed Time (s)
Test ID
FH1
H_0 (ft)
1.348
AW-20 FH1

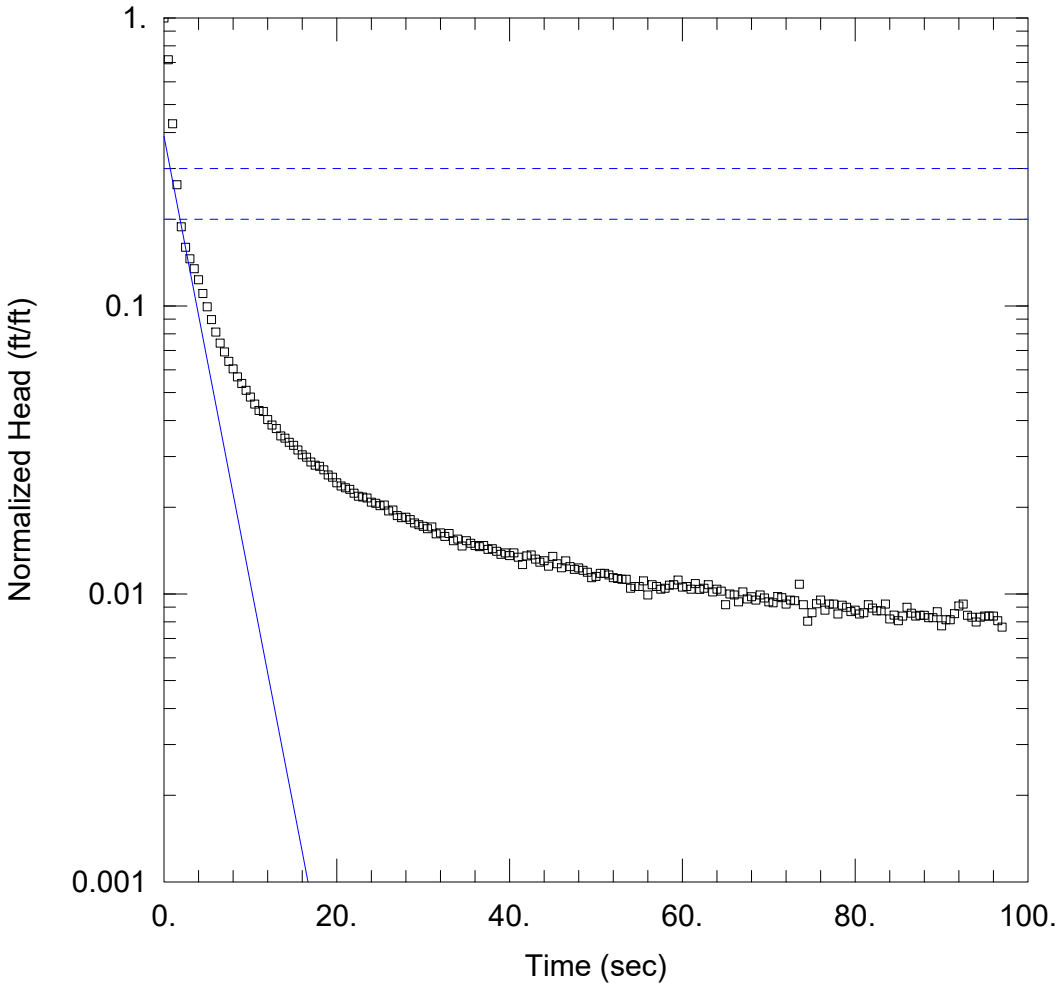

AW-21
Test ID
H_0 (ft)
FH1
1.796
RH1
-1.857
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0
1
10
100
1000
10000
Elapsed Time (s)
AW-21 FH1
AW-21 RH1


AW-22
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.10
1.00
10.00
100.00
1000.00
10000.00
Elapsed Time (s)
Test ID
H0 (ft)
FH1
1.453
RH1
-1.634
AW-22 FH1
AW-22 RH1


XPW01A
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Normalized Head (ft/ft)
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1 1.649
FH2 1.058
RH1 -1.657
RH2 -1.541
XPW01A FH1
XPW01A FH2
XPW01A RH1
XPW01A RH2


XPW02
Test ID
H_0 (ft)
FH1
1.419
FH3
1.315
RH2
-1.704
Normalized Head (ft/ft)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.1
1.0
10.0
100.0
1000.0
Elapsed Time (s)
XPW02 FH1
XPW02 FH3
XPW02 RH2


XPW03
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Normalized Head (ft/ft)
0.1
1.0
10.0
100.0
1000.0
10000.0
Elapsed Time (s)
Test ID
H_0 (ft)
FH1
1.842
FH2
1.559
RH1
-1.595
RH2
-1.677
XPW03 FH1
XPW03 FH2
XPW03 RH1
XPW03 RH2



AW-12 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-12
Test Date: 3/26/21

AQUIFER DATA

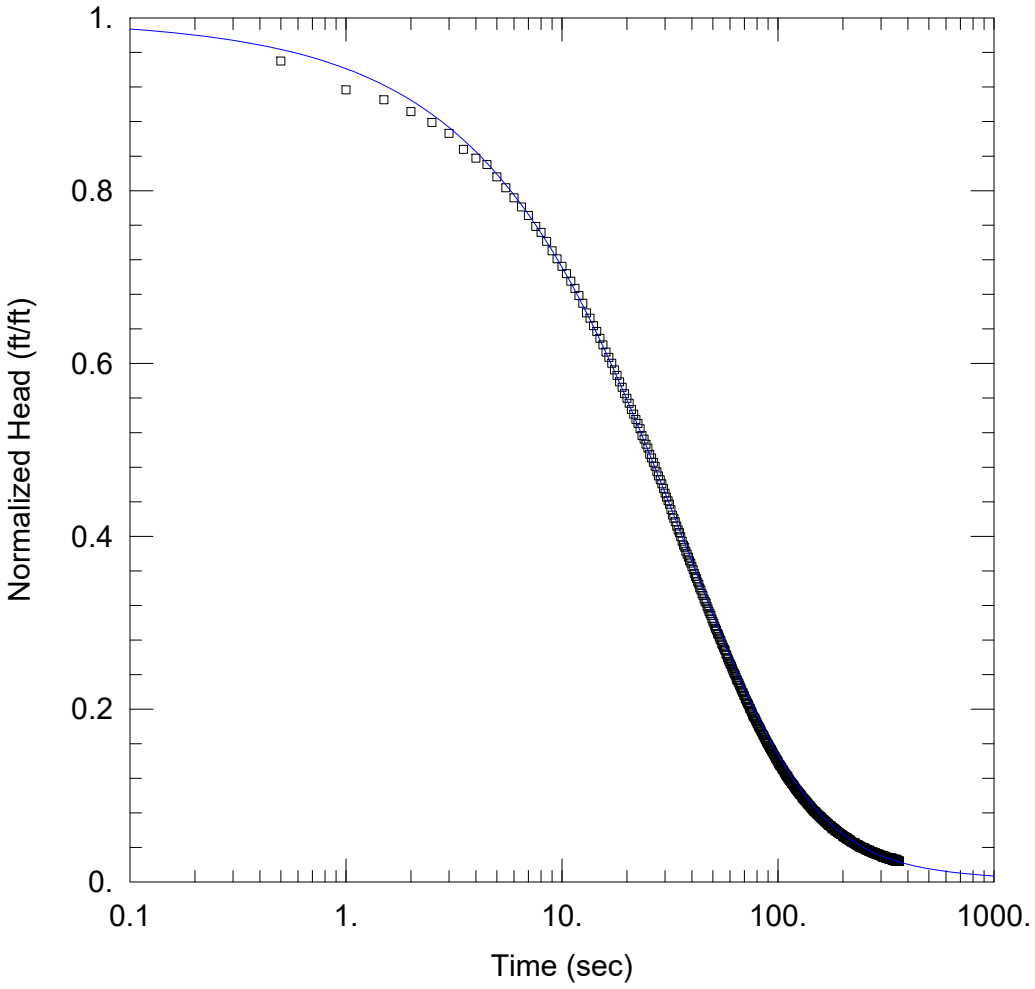
Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-12)

Initial Displacement: -1.85 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08625 ft
Static Water Column Height: 26.87 ft
Screen Length: 4. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
K = 0.01541 cm/sec
Solution Method: Bouwer-Rice
y0 = -0.7181 ft



AW-15 RH3

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-15
Test Date: 3/26/21

AQUIFER DATA

Saturated Thickness: 1.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-15)

Initial Displacement: -1.455 ft
Total Well Penetration Depth: 1.1 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 32.64 ft
Screen Length: 1.1 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.2498 cm^2/sec
S = 0.0004365

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
170.5	-0.09726	358.	-0.03627
171.	-0.09813	358.5	-0.03592
171.5	-0.09536	359.	-0.03433
172.	-0.097	359.5	-0.03553
172.5	-0.0949	360.	-0.03482
173.	-0.09536	360.5	-0.03584
173.5	-0.09506	361.	-0.03465
174.	-0.09481	361.5	-0.03491
174.5	-0.09536	362.	-0.03449
175.	-0.0934	362.5	-0.03449
175.5	-0.09326	363.	-0.03592
176.	-0.09269	363.5	-0.03543
176.5	-0.09258	364.	-0.03522
177.	-0.09444	364.5	-0.03506
177.5	-0.09229	365.	-0.03476
178.	-0.08948	365.5	-0.03491

SOLUTION

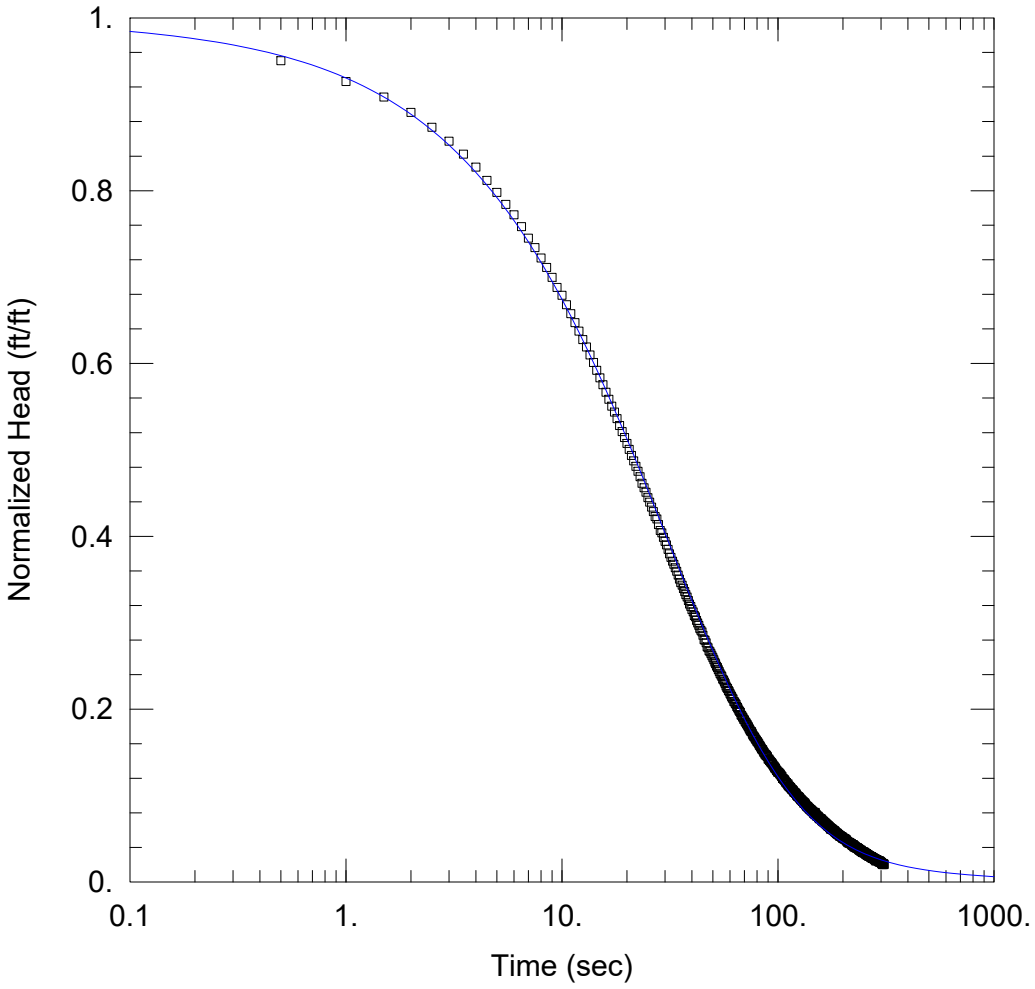
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.2498	cm^2/sec
S	0.0004365	

K = T/b = 0.007449 cm/sec
Ss = S/b = 0.0003968 1/ft



AW-15C RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-15C
Test Date: 3/25/21

AQUIFER DATA

Saturated Thickness: 11. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-15C)

Initial Displacement: -1.738 ft
Total Well Penetration Depth: 11. ft
Casing Radius: 0.08625 ft
Static Water Column Height: 44.27 ft
Screen Length: 11. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.2765 cm^2/sec
S = 0.000631

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
142.5	-0.143	300.	-0.039
143.	-0.144	300.5	-0.038
143.5	-0.144	301.	-0.038
144.	-0.142	301.5	-0.039
144.5	-0.141	302.	-0.039
145.	-0.142	302.5	-0.038
145.5	-0.141	303.	-0.037
146.	-0.139	303.5	-0.037
146.5	-0.138	304.	-0.036
147.	-0.14	304.5	-0.035
147.5	-0.137	305.	-0.036
148.	-0.139	305.5	-0.036
148.5	-0.135	306.	-0.035
149.	-0.14	306.5	-0.036
149.5	-0.137	307.	-0.036
150.	-0.136	307.5	-0.036
150.5	-0.135	308.	-0.037
151.	-0.133	308.5	-0.035
151.5	-0.132	309.	-0.035
152.	-0.132	309.5	-0.035
152.5	-0.132	310.	-0.036
153.	-0.132		

SOLUTION

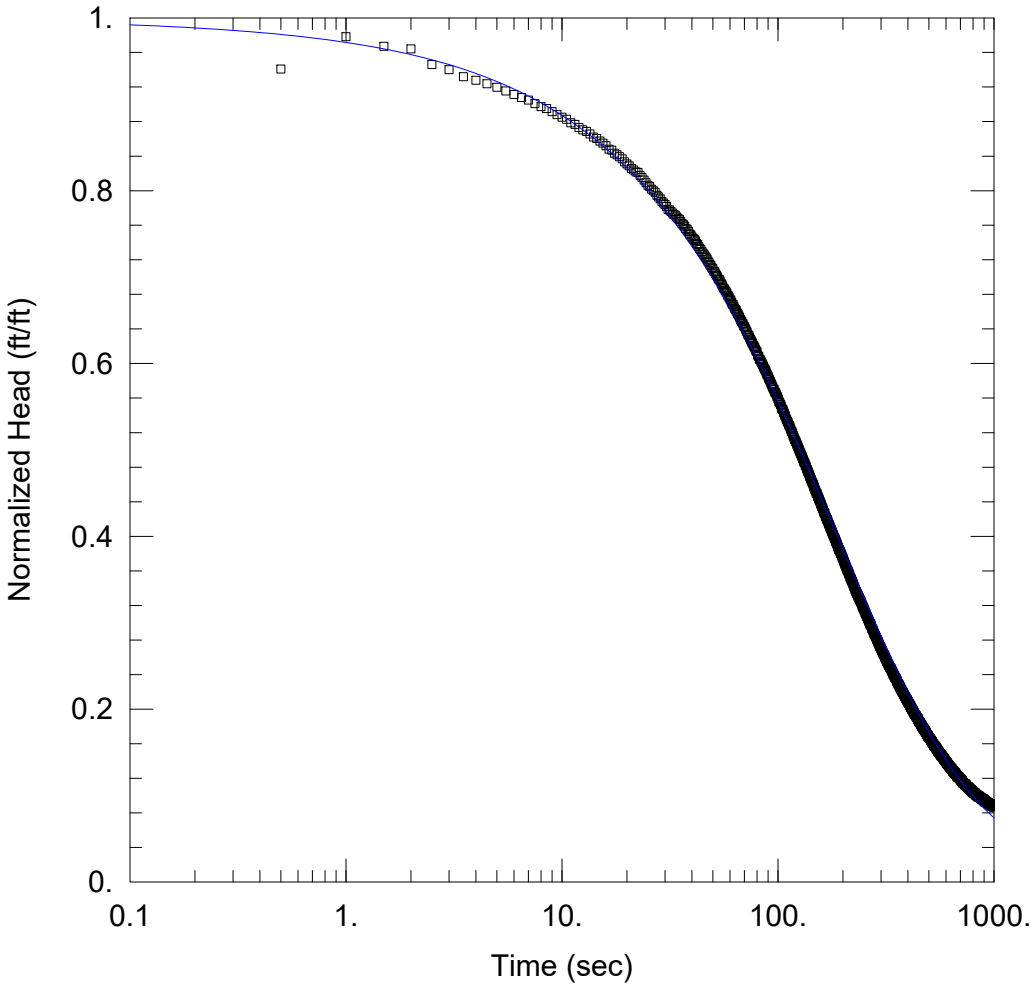
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.2765	cm^2/sec
S	0.000631	

K = T/b = 0.0008246 cm/sec
Ss = S/b = 5.736E-5 1/ft



AW-16 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-16
Test Date: 3/25/21

AQUIFER DATA

Saturated Thickness: 1.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-16)

Initial Displacement: -1.705 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08625 ft
Static Water Column Height: 38.27 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.035 cm^2/sec
S = 0.001995

SOLUTION

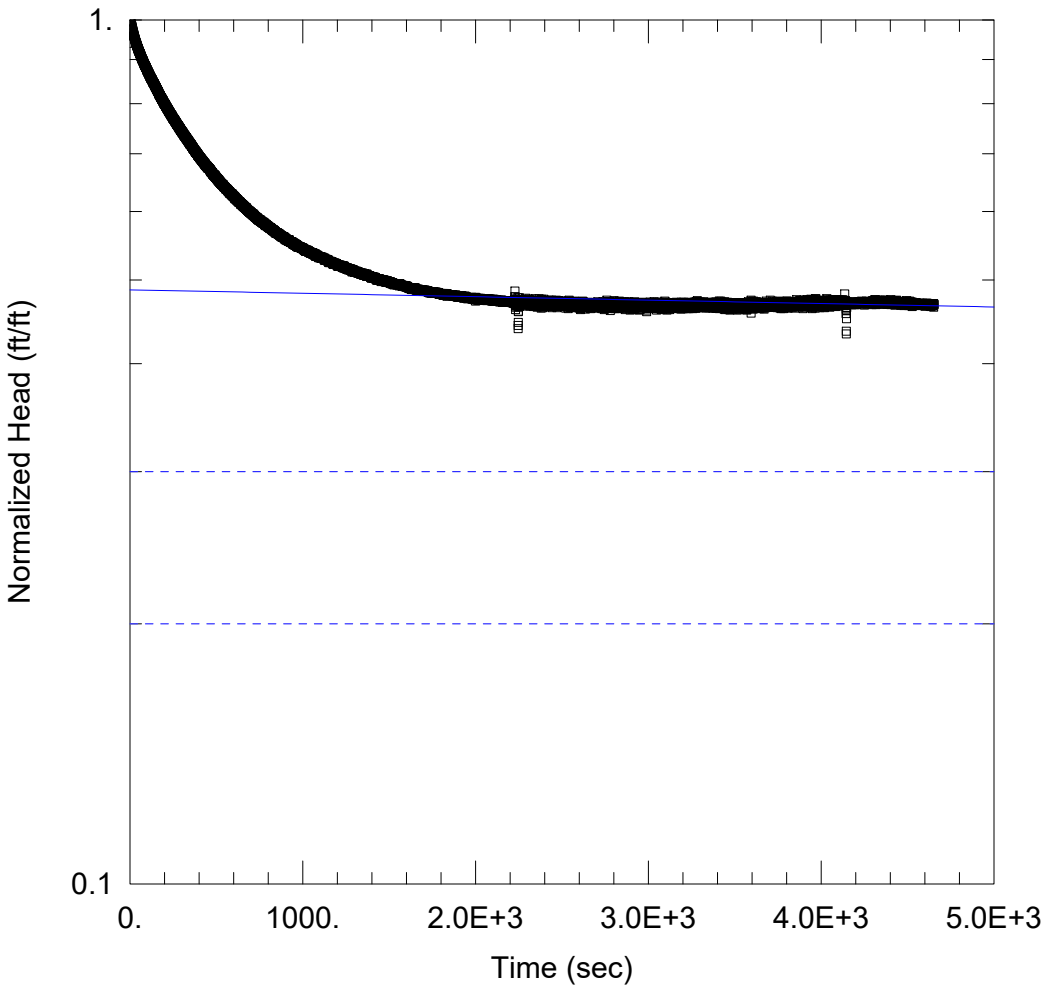
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.035	cm^2/sec
S	0.001995	

K = T/b = 0.0007656 cm/sec
Ss = S/b = 0.00133 1/ft



AW-17 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-17
Test Date: 3/25/21

AQUIFER DATA

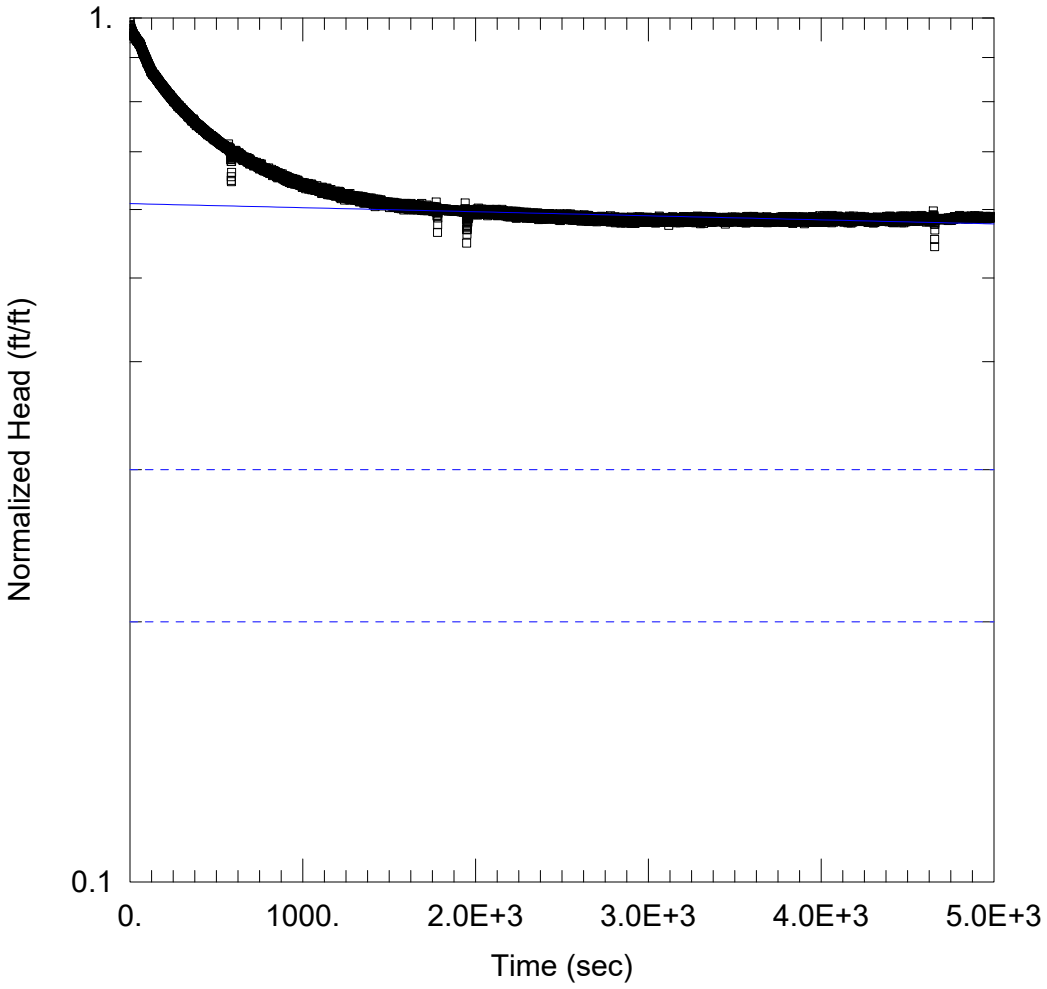
Saturated Thickness: 3.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-17)

Initial Displacement: 1.621 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 33.31 ft
Screen Length: 3.9 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
K = 4.687E-7 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.7895 ft



AW-18 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-18
Test Date: 3/25/21

AQUIFER DATA

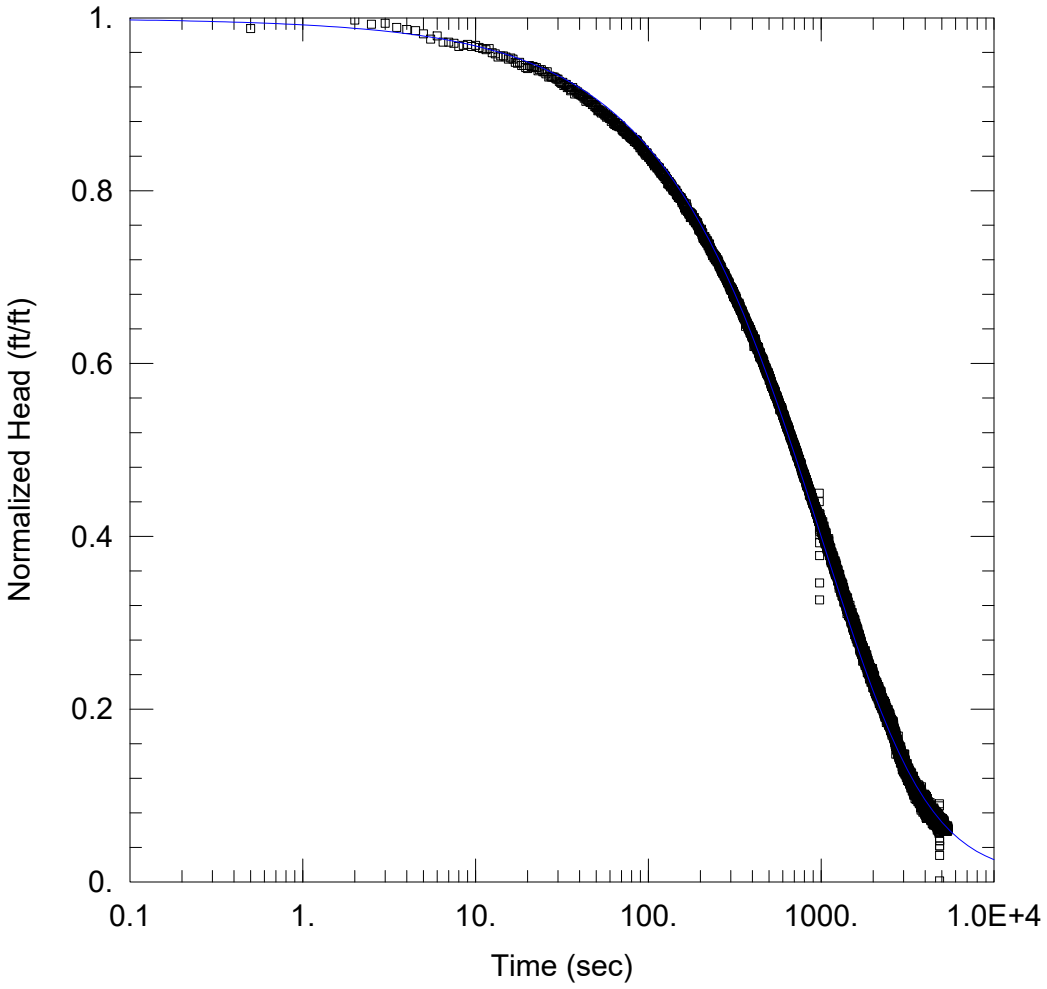
Saturated Thickness: 7.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-18)

Initial Displacement: 1.994 ft
Total Well Penetration Depth: 1.2 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 24.97 ft
Screen Length: 1.2 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
K = 7.343E-7 cm/sec
Solution Method: Bouwer-Rice
y0 = 1.216 ft



AW-19 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-19
Test Date: 3/25/21

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-19)

Initial Displacement: 0.818 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08625 ft
Static Water Column Height: 28.39 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.008186 cm^2/sec
S = 0.000721

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
2681.	0.14	5387.	0.051
2681.5	0.13	5387.5	0.051
2682.	0.135	5388.	0.05
2682.5	0.134	5388.5	0.05
2683.	0.135	5389.	0.05
2683.5	0.135	5389.5	0.051
2684.	0.136	5390.	0.05
2684.5	0.136	5390.5	0.052
2685.	0.133	5391.	0.051
2685.5	0.138	5391.5	0.05
2686.	0.137	5392.	0.051
2686.5	0.136	5392.5	0.05
2687.	0.137	5393.	0.051
2687.5	0.137	5393.5	0.05
2688.	0.134	5394.	0.05
2688.5	0.143	5394.5	0.051
2689.	0.133	5395.	0.053
2689.5	0.134	5395.5	0.052
2690.	0.132	5396.	0.049
2690.5	0.129	5396.5	0.05
2691.	0.139	5397.	0.051
2691.5	0.138	5397.5	0.052
2692.	0.137	5398.	0.052
2692.5	0.134	5398.5	0.053
2693.	0.134	5399.	0.05
2693.5	0.13	5399.5	0.049
2694.	0.137	5400.	0.05
2694.5	0.136	5400.5	0.05
2695.	0.137	5401.	0.049
2695.5	0.134	5401.5	0.05
2696.	0.132	5402.	0.049
2696.5	0.133	5402.5	0.05
2697.	0.134	5403.	0.049
2697.5	0.142	5403.5	0.051
2698.	0.134	5404.	0.05
2698.5	0.135	5404.5	0.05
2699.	0.134		

SOLUTION

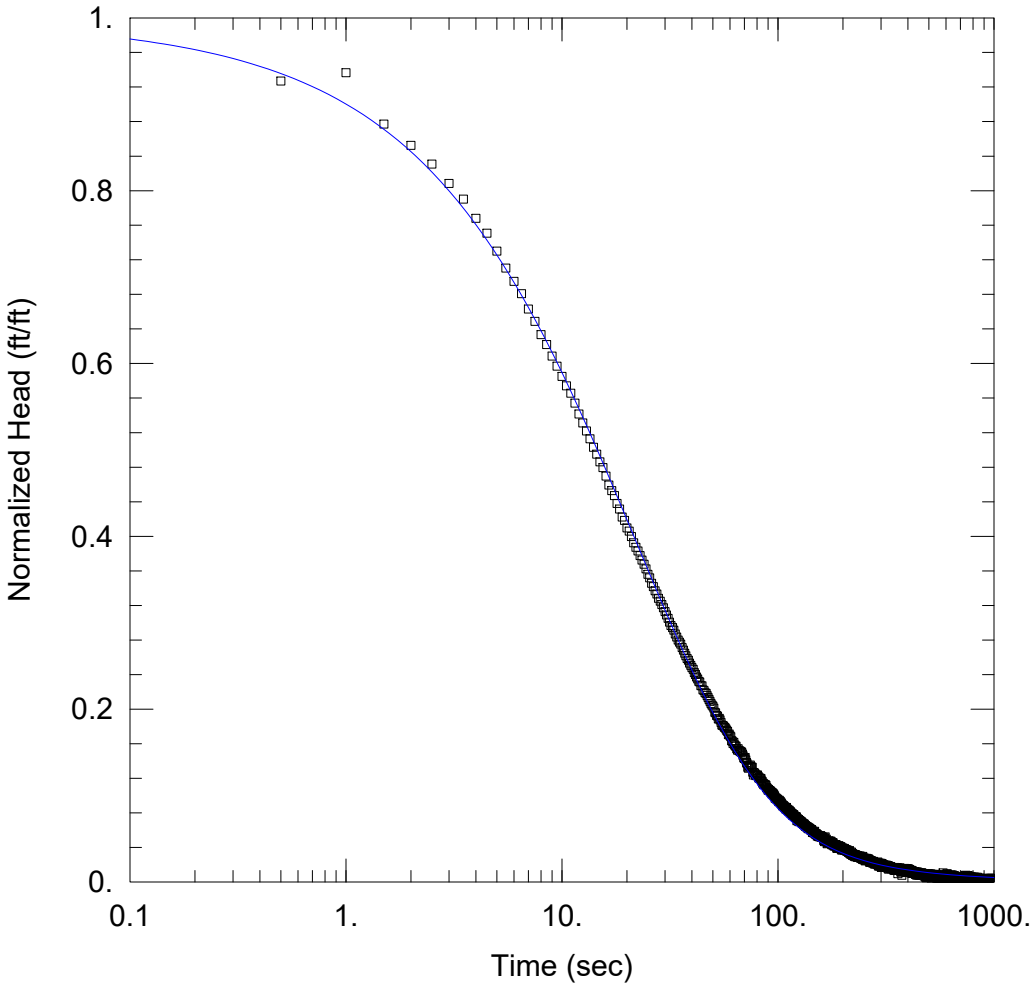
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.008186	cm^2/sec
S	0.000721	

K = T/b = 4.132E-5 cm/sec
Ss = S/b = 0.0001109 1/ft



AW-20 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-20
Test Date: 4/26/21

AQUIFER DATA

Saturated Thickness: 4.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-20)

Initial Displacement: 1.348 ft
Total Well Penetration Depth: 0.7 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 27.43 ft
Screen Length: 0.7 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.3262 cm^2/sec
S = 0.001523

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
2051.5	-0.01633	4117.5	0.01078
2052.	-0.01155	4118.	0.00906
2052.5	-0.0067	4118.5	0.01181
2053.	-0.00585	4119.	0.01042
2053.5	-0.00294	4119.5	0.01162
2054.	-0.00769	4120.	0.01006
2054.5	-0.00864	4120.5	0.01078
2055.	-0.00811	4121.	0.011
2055.5	-0.0063	4121.5	0.01
2056.	-0.0128	4122.	0.01146
2056.5	-0.00571		

SOLUTION

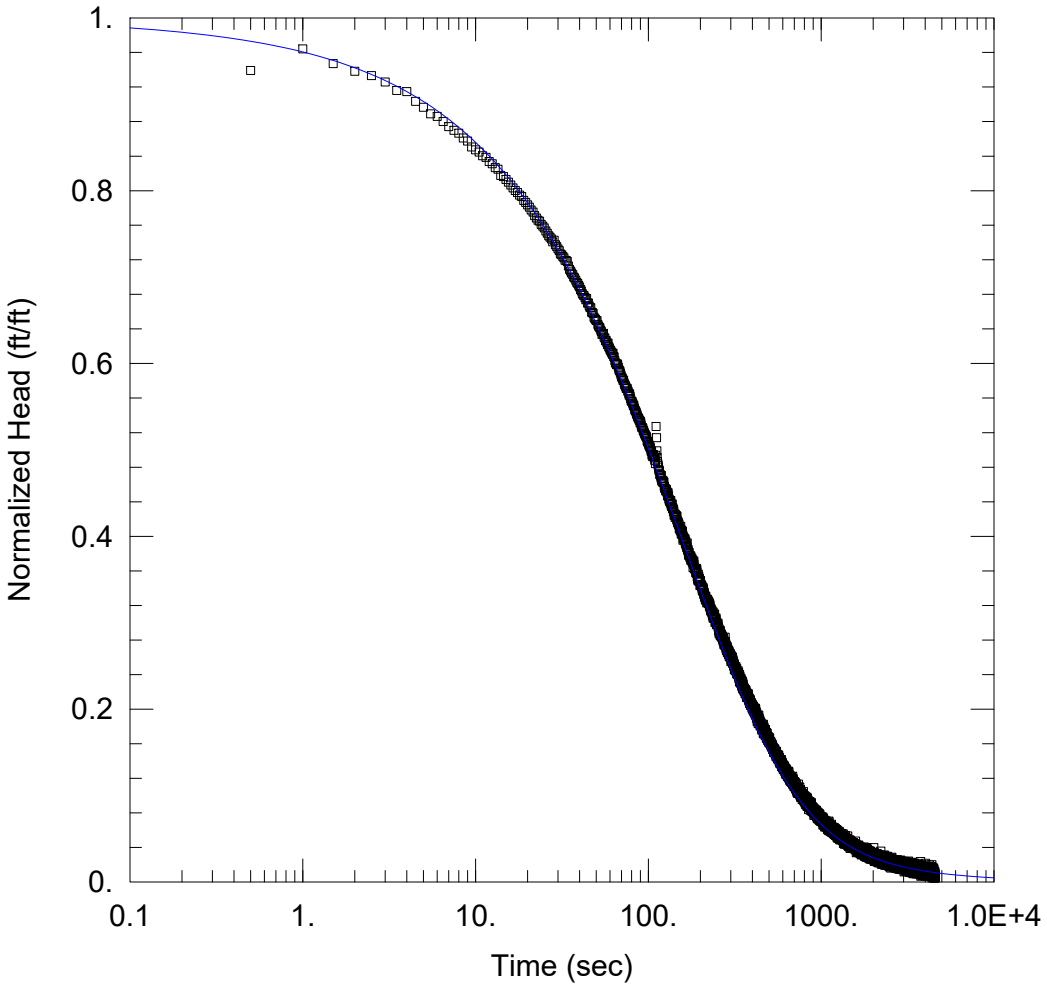
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.3262	cm^2/sec
S	0.001523	

K = T/b = 0.002548 cm/sec
Ss = S/b = 0.0003626 1/ft



AW-21 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-21
Test Date: 4/26/21

AQUIFER DATA

Saturated Thickness: 4.6 ft
Anisotropy Ratio (Kz/Kr): 1.

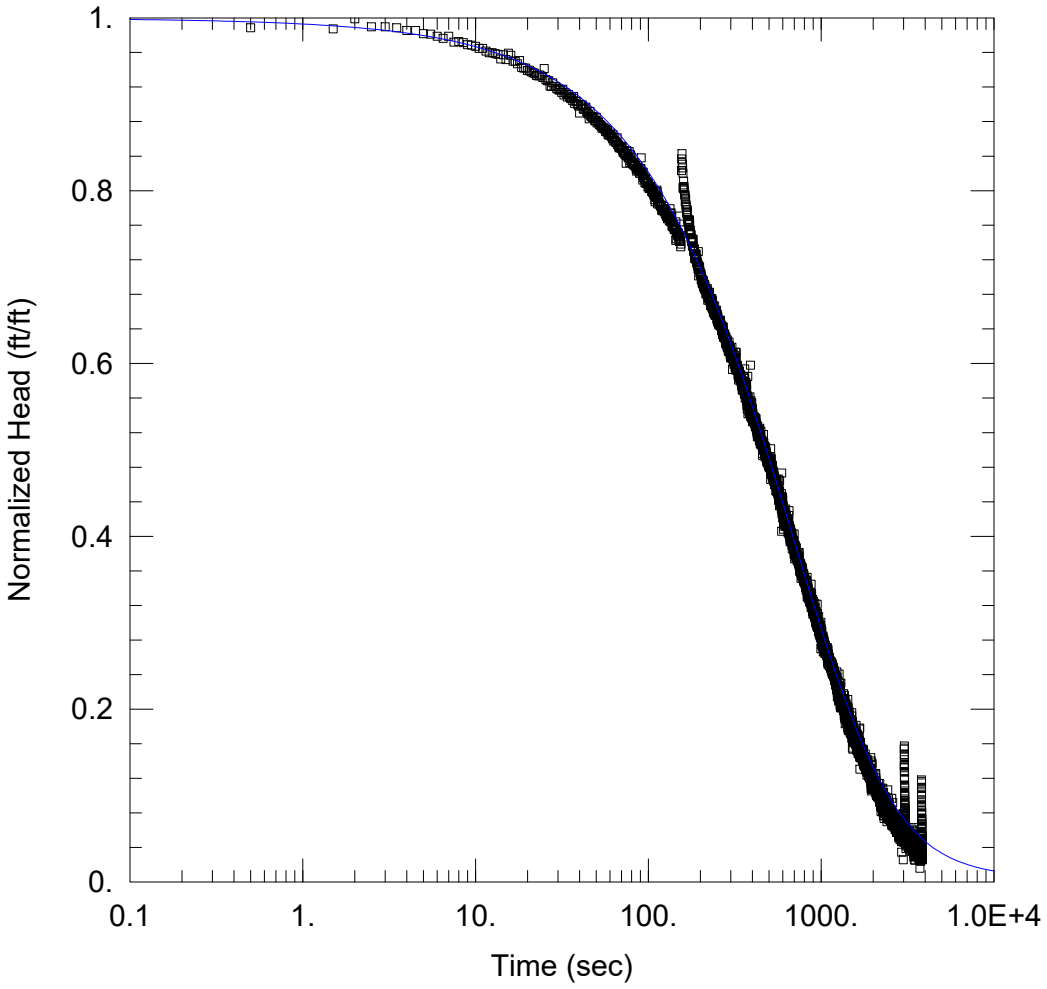
WELL DATA (AW-21)

Initial Displacement: -1.857 ft
Total Well Penetration Depth: 1.6 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 22.48 ft
Screen Length: 1.6 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.03465 cm^2/sec
S = 0.004463

K = T/b = 0.0002471 cm/sec
Ss = S/b = 0.0009703 1/ft



AW-22 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: AW-22
Test Date: 4/26/21

AQUIFER DATA

Saturated Thickness: 4.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AW-22)

Initial Displacement: -1.634 ft
Total Well Penetration Depth: 1.5 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 40.37 ft
Screen Length: 1.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.01475 cm^2/sec
S = 0.000209

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1916.5	-0.198	3849.5	-0.055
1917.	-0.204	3850.	-0.049
1917.5	-0.199	3850.5	-0.056
1918.	-0.2	3851.	-0.057
1918.5	-0.206	3851.5	-0.052
1919.	-0.199	3852.	-0.053
1919.5	-0.208	3852.5	-0.056
1920.	-0.205	3853.	-0.044
1920.5	-0.197		

SOLUTION

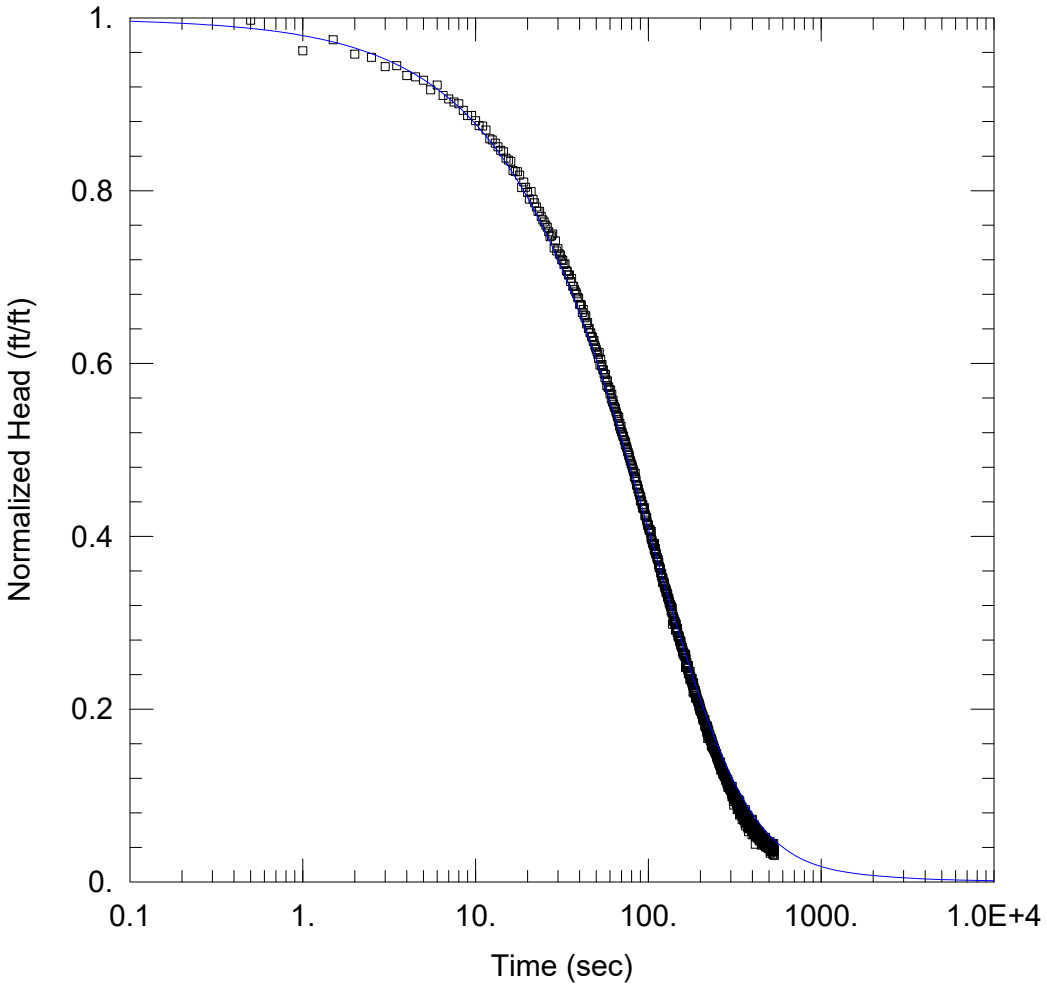
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.01475	cm^2/sec
S	0.000209	

K = T/b = 0.0001075 cm/sec
Ss = S/b = 4.644E-5 1/ft



XPW01A FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: XPW01A
Test Date: 4/26/21

AQUIFER DATA

Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW01A)

Initial Displacement: 1.649 ft
Total Well Penetration Depth: 12. ft
Casing Radius: 0.08625 ft
Static Water Column Height: 34.39 ft
Screen Length: 12. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1187 cm^2/sec
S = 5.41E-5

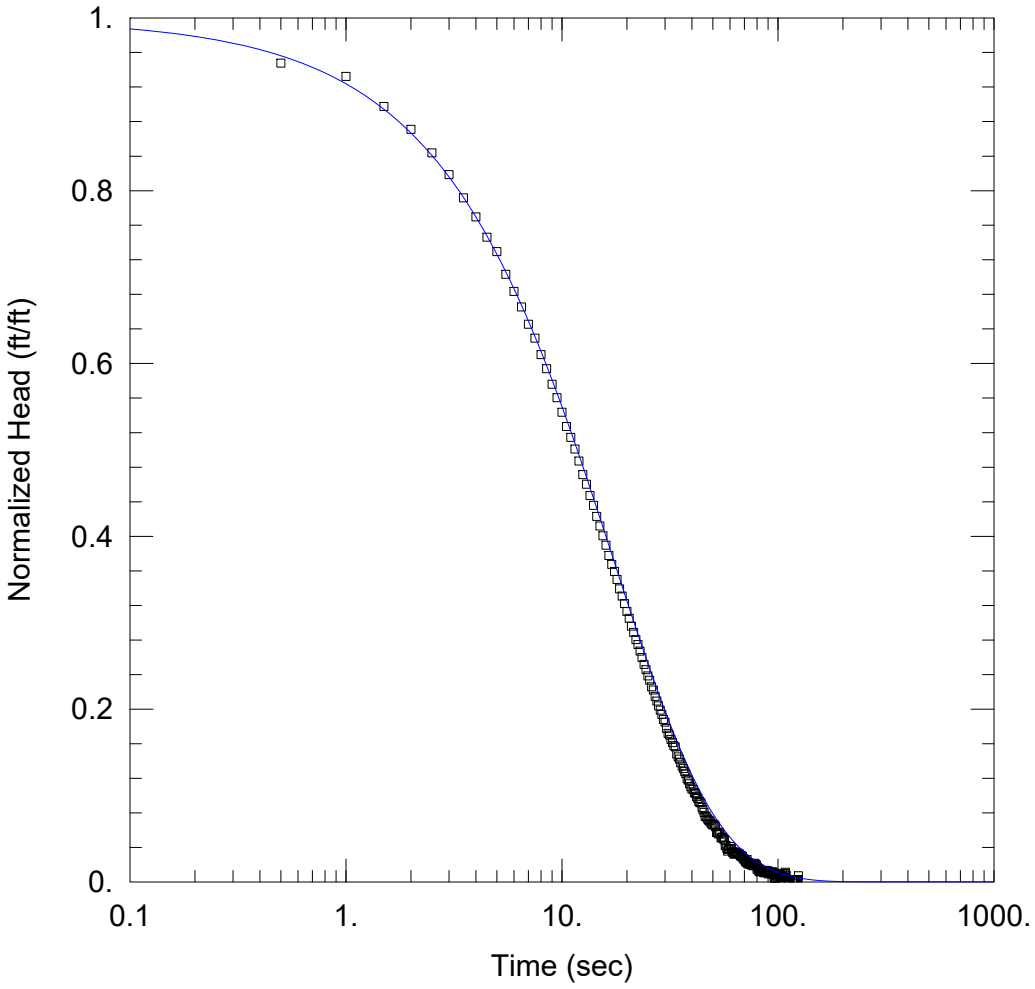
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.1187	cm^2/sec
S	5.41E-5	

K = T/b = 0.0003245 cm/sec
Ss = S/b = 4.509E-6 1/ft



XPW02 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: XPW02
Test Date: 4/26/21

AQUIFER DATA

Saturated Thickness: 42.4 ft

WELL DATA (XPW02)

Initial Displacement: -1.704 ft
Total Well Penetration Depth: 28.45 ft
Casing Radius: 0.08625 ft

Static Water Column Height: 28.45 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

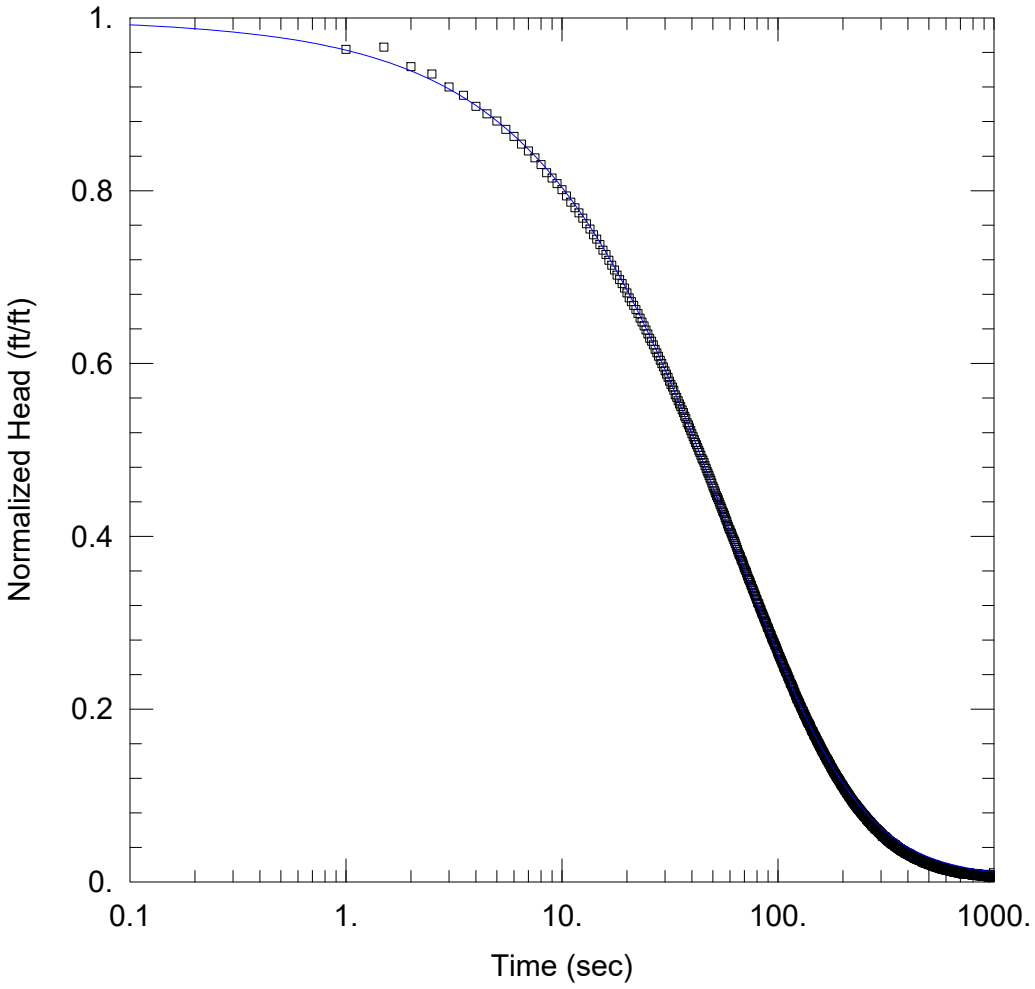
SOLUTION

Aquifer Model: Unconfined

Kr = 0.001787 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 7.211E-6 ft^{-1}



XPW03 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPRG
Project: 1940100457-001
Location: Bartonville, IL
Test Well: XPW03
Test Date: 4/27/21

AQUIFER DATA

Saturated Thickness: 9.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: -1.595 ft
Total Well Penetration Depth: 9.6 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 25.21 ft
Screen Length: 9.6 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1608 cm^2/sec
S = 0.0002548

Parameter	Estimate	
T	0.1608	cm^2/sec
S	0.0002548	

K = T/b = 0.0005494 cm/sec
Ss = S/b = 2.654E-5 1/ft

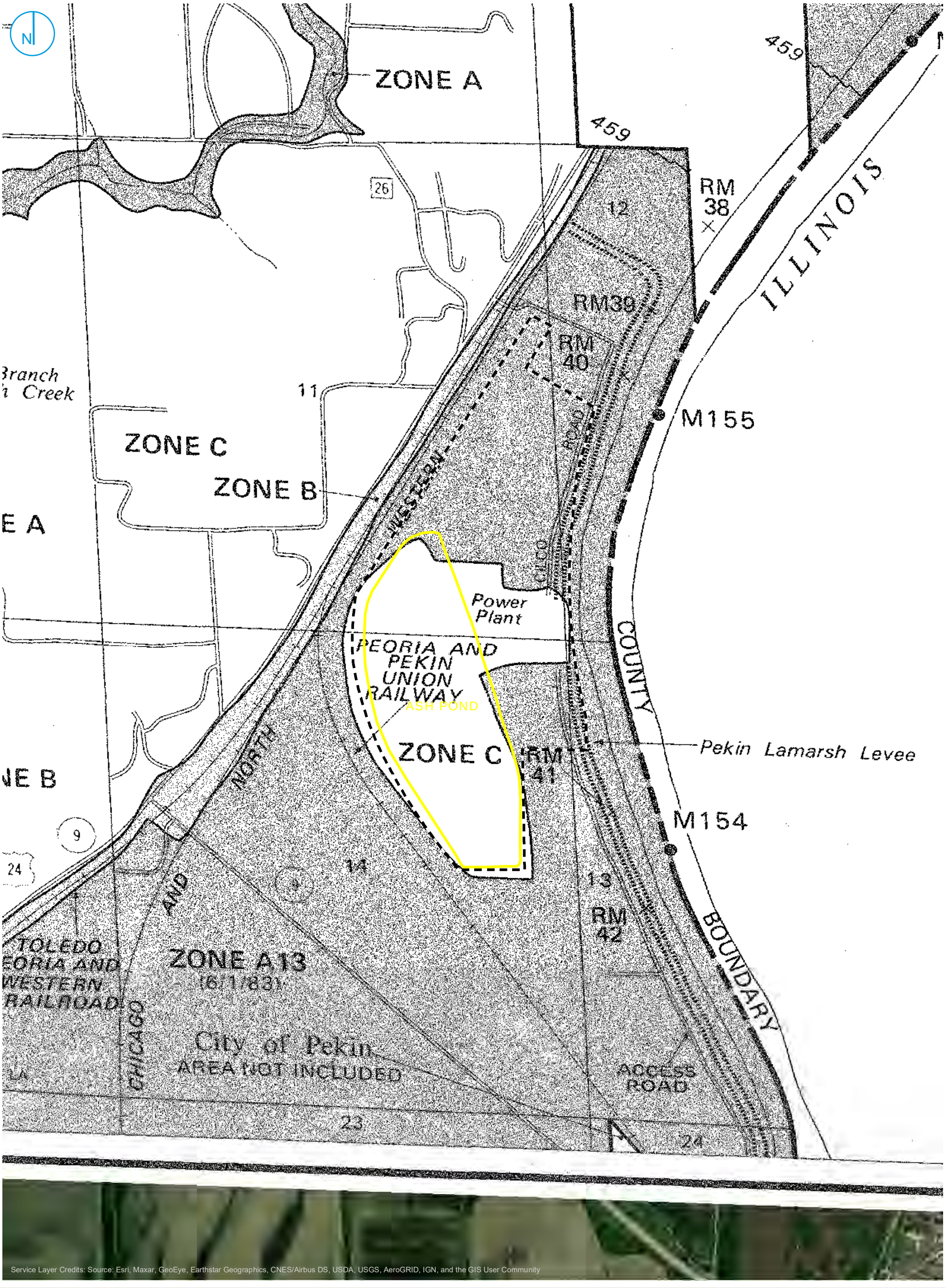
NRT HYDRAULIC CONDUCTIVITY TEST DATA

Table 2
Summary of Field and Laboratory Hydraulic Conductivity Tests
Hydrogeologic Monitoring Plan
Edwards Power Station

Field Tests						
Well ID	Analysis Method	Hydraulic Conductivity (cm/sec, falling head test)	Hydraulic Conductivity (cm/sec, rising head test)	Well Geometric Mean (cm/sec)	Approximate Screened Elevation (ft)	Interpreted Unit
Uppermost Aquifer						
APW1	KGS	2.60E-03	2.70E-03	2.65E-03	430.4-420.4	Clay-Shale Contact
AP05S	KGS	2.40E-03	2.60E-03	2.50E-03	408.5-403.5	Clay-Siltstone Contact
AP06	Hvorslev	3.30E-04	5.40E-04	4.22E-04	419.6-414.8	Clay
AP07S	KGS	6.00E-04	5.70E-04	5.85E-04	428.4-423.6	Sand/ Silty Sand
AW05	KGS	1.00E-03	1.30E-03	1.14E-03	424.7-420.1	Clay-Shale Contact
AW06	KGS	7.20E-06	4.00E-06	5.37E-06	422.6-418.1	Clay-Shale Contact
AW08	B&R	3.50E-06	9.50E-06	5.77E-06	413.1-403.5	Silt-Shale Contact
AW09	B&R	1.00E-05	4.50E-05	2.12E-05	411.2-406.7	Silt-Shale Contact
AW10	KGS	3.50E-05	4.10E-05	3.79E-05	410.0-405.4	Silt-Shale Contact
AW11	KGS	3.10E-03	3.40E-03	3.25E-03	413.0-408.4	Thin Sand, Clay-Shale Contact
Additional Monitored Units						
AP05D	KGS	4.50E-08	2.70E-06	3.49E-07	394-384	Siltstone (w/ thin sandstone)
AP07D	KGS	1.50E-07	8.00E-08	1.10E-07	403.3-393.8	Siltstone (w/ thin sandstone)
AP08	KGS	2.80E-03	2.60E-03	2.70E-03	448.1-438.5	CCR
AP09	KGS	1.30E-03	1.60E-03	1.44E-03	447.5-437.9	CCR

Laboratory Tests			
Well/ Soil Boring ID	Approximate Sample Elevation (ft)	Hydraulic Conductivity (cm/sec)	Interpreted Unit
EDW-B002	447.0	9.2E-05	CCR Unit
EDW-B003	430.0	6.8E-05	
Geometric Mean		**7.9E-05**	
EDW-B004	425.0	7.2E-07	Clay

APPENDIX G
FEMA FLOOD HAZARD MAP



PART 845 REGULATED UNIT (SUBJECT UNIT)

PROPERTY BOUNDARY

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations*
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE A1
ZONE A5
ZONE B

0 500 1,000 Feet

NOTE

GIS DATA OF THE NATIONAL FLOOD HAZARD LAYER NOT AVAILABLE FOR PEORIA COUNTY.

FLOODPLAIN MAP

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

APPENDIX G

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Appendix F

Closure Priority Categorization

Phil Morris
Illinois Power Resources Generating
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 Resources Generating, LLC

Dear Mr. LeCrone:

Pursuant to 35 I.A.C. 845.700(c), Illinois Power Resources Generating, LLC submits the information necessary to categorize the CCR surface impoundments located at the Edwards Power Plant and the now retired Duck Creek 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 Edwards and Duck Creek 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)
Edwards	Ash Pond 1	Existing	No	No	No	Yes	5
Duck Creek	Bottom Ash Basin	Inactive	No	No	Yes	NA[3]	3
	GMF Pond	Inactive	No	No	Yes	NA[3]	3
	GMF Recycle Pond	Inactive	No	No	Yes	NA[3]	3

[1] See Attachment 2 Environmental Justice Area Map

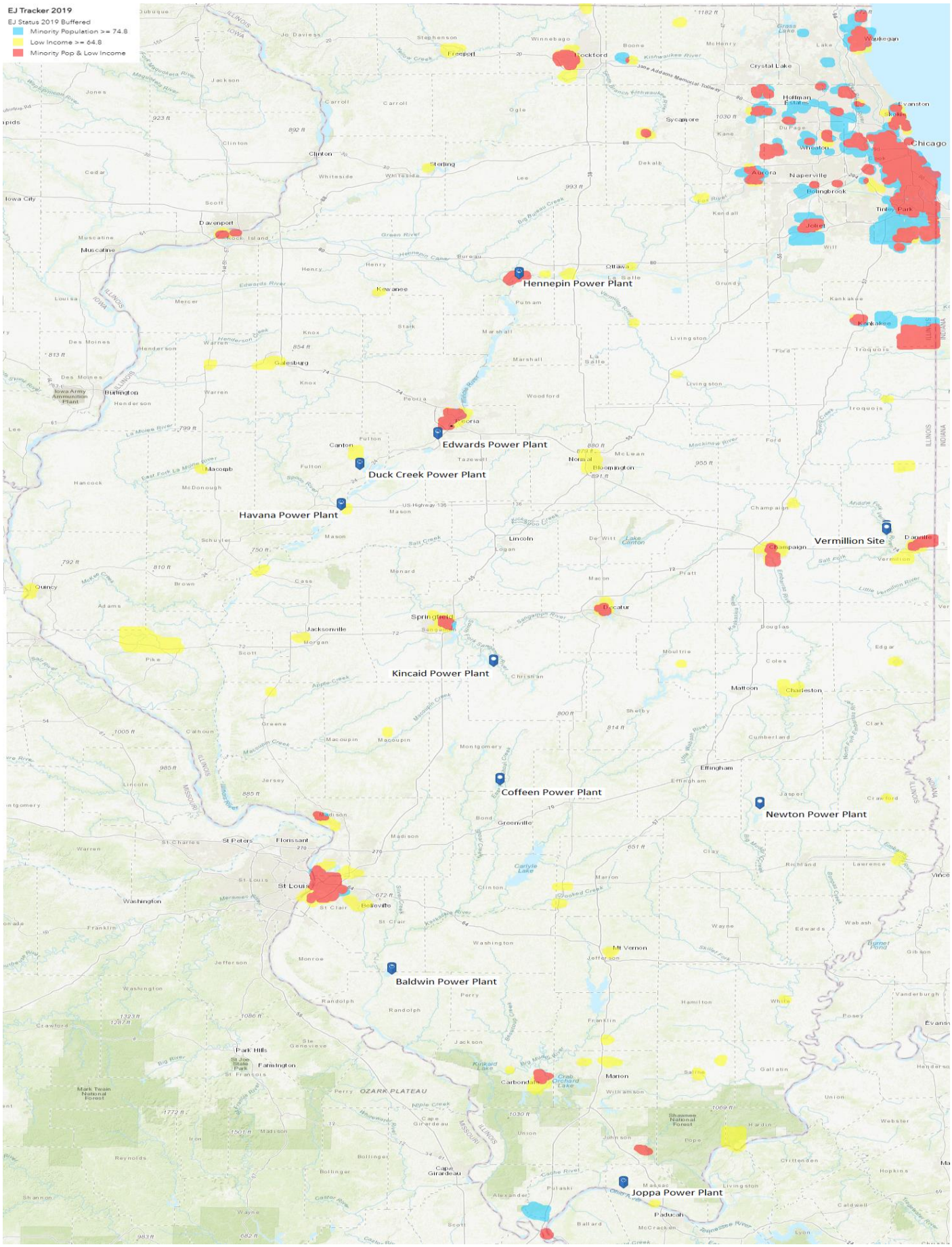
[2] Ground water analyses for purposes of categories 4-7, assumptions have been made based on current groundwater data. However, since sampling and analysis is ongoing and subject to IEPA review and approval, IPGC reserves the right to update its category designations for Categories 4-7.

[3] NA for this determination since the CCR surface impoundment was assign a highest priority category

Table 2: Impacts to Potable Water Supply

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
Edwards	**Present, but not at risk** Seven (7) water wells were identified and one (or possibly two) are located potentially downgradient of the site. Based on Ramboll's review of groundwater data, these wells are unlikely to be impacted by coal ash constituents.	**Present, but not at risk** One non-CWS well was identified; however, it is unlikely to be at risk because of its hydrogeologic location relative to the power plant.	Absent	Absent	Absent
Duck Creek	**Present, but not at risk** Three (3) water wells were identified; however, they are unlikely to be at risk because of their hydrogeologic location relative to the power plant and/or they are abandoned. None of the off-site wells are located in a downgradient direction.	Absent	Absent	Absent	Absent

Attachment 2: EJ Mapping Denoting Facilities with Impoundments



Appendix G

Groundwater Modeling

Intended for
Illinois Power Resources Generating, LLC

Date
June 30, 2022

Project No.
1940101010-010

GROUNDWATER MODELING REPORT

ASH POND

EDWARDS POWER PLANT

BARTONVILLE, ILLINOIS

GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT ASH POND

Project Name	**Edwards Power Plant Ash Pond**
Project No.	**1940101010-010**
Recipient	**Illinois Power Resources Generating, LLC**
Document Type	**Groundwater Modeling Report**
Revision	**FINAL**
Date	**June 30, 2022**

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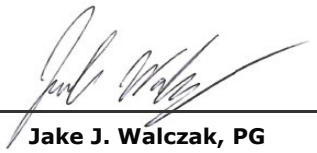


Jake J. Walczak, PG
Senior Hydrogeologist

Brian G. Hennings, PG
Senior Managing Hydrogeologist

CONTENTS

Executive Summary		**6**
1.	**Introduction**	**9**
1.1	Overview	9
1.2	Site Location and Background	9
1.3	Site History and Unit Description	9
2.	**Site Geology and Hydrogeology**	**10**
3.	**Groundwater Quality**	**13**
4.	**Groundwater Model**	**15**
4.1	Overview	15
4.2	Conceptual Site Model	15
4.3	Model Approach	15
5.	**Model Setup and Calibration**	**18**
5.1	Model Descriptions	18
5.2	Flow and Transport Model Setup	19
5.2.1	Grid and Boundary Conditions	19
5.2.2	Flow Model Input Values and Sensitivity	20
5.2.2.1	Model Layers	20
5.2.2.2	Hydraulic Conductivity	20
5.2.2.3	Recharge	21
5.2.2.4	Storage and Specific Yield	22
5.2.2.5	River Parameters	22
5.2.2.6	General Head Boundary Parameters	23
5.2.3	Transport Model Input Values and Sensitivity	23
5.2.3.1	Initial Concentrations	24
5.2.3.2	Source Concentrations	24
5.2.3.3	Effective Porosity	24
5.2.3.4	Storage and Specific Yield Sensitivity	25
5.2.3.5	Dispersivity	25
5.2.3.6	Retardation	25
5.3	Flow and Transport Model Assumptions and Limitations	26
5.4	Calibration Flow and Transport Model Results	26
6.	**Simulation of Closure Scenarios**	**28**
6.1	Overview and Prediction Model Development	28
6.2	HELP Model Setup and Results	29
6.3	Simulation of Closure Scenarios	30
6.3.1	Closure Scenario 1 (CIP) Predicted Boron Concentrations	30
6.3.2	Closure Scenario 2 (CBR) Predicted Boron Concentrations	32
7.	**Conclusions**	**33**
8.	**References**	**35**

TABLES (ATTACHED)

Table 2-1 Monitoring Well Locations and Construction Details
Table 2-2 Flow and Transport Model Calibration Targets
Table 5-1 Flow Model Input and Sensitivity Analysis Results
Table 5-2 Transport Model Input Values (Calibration)
Table 5-3 Transport Model Input Values (Sensitivity)
Table 6-1 HELP Model Input and Output Values
Table 6-2 Prediction Model Input Values

FIGURES (IN TEXT)

Figure A Boron Correlation with Sulfate in UCF and UA Wells
Figure B Boron Correlation with TDS in UCF and UA Wells

FIGURES (ATTACHED)

Figure 1-1 Site Location Map
Figure 1-2 Site Map
Figure 2-1 Site Topographic Map
Figure 2-2 Uppermost Aquifer Potentiometric Surface Map, February 9, 2021
Figure 2-3 Uppermost Aquifer Potentiometric Surface Map, March 22, 2021
Figure 2-4 Monitoring Well Location Map
Figure 4-1 Closure Scenario Calibration and Prediction Model Timeline
Figure 5-1 Model Grid for Layers 1 through 5
Figure 5-2 Boundary Conditions for Layer 1
Figure 5-3 Boundary Conditions for Layer 2
Figure 5-4 Boundary Conditions for Layer 3
Figure 5-5 Boundary Conditions for Layer 4
Figure 5-6 Boundary Conditions for Layer 5
Figure 5-7 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 1
Figure 5-8 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 2
Figure 5-9 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 3
Figure 5-10 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 4
Figure 5-11 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 5
Figure 5-12 Distribution of Recharge Zones (feet/day)
Figure 5-13 Observed versus Simulated Groundwater Elevations Layer 1
Figure 5-14 Observed versus Simulated Groundwater Elevations Layer 2
Figure 5-15 Observed versus Simulated Groundwater Elevations Layer 3
Figure 5-16 Observed versus Simulated Groundwater Elevations Layer 4
Figure 5-17 Observed versus Simulated Groundwater Elevations Layer 5
Figure 5-18 Steady State MODFLOW Calibration Results – Observed versus Simulated (ft)
Figure 5-19 Steady State MODFLOW Calibration Results – Observed versus Residuals (ft)
Figure 5-20 Observed and Simulated Boron Concentrations (mg/L)
Figure 5-21 Layer 1 Distribution of Boron Concentrations (mg/L) in the Calibrated Model (UCF)
Figure 5-22 Layer 2 Distribution of Boron Concentrations (mg/L) in the Calibrated Model (UCF [PMP])
Figure 5-23 Layer 3 Distribution of Boron Concentrations (mg/L) in the Calibrated Model (UCF)
Figure 5-24 Layer 4 Distribution of Boron Concentrations (mg/L) in the Calibrated Model (UA)
Figure 5-25 Layer 5 Distribution of Boron Concentrations (mg/L) in the Calibrated Model (BCU)
Figure 6-1 Distribution of Recharge Zones (feet/day) for Closure In Place

Figure 6-2 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 1 for Closure In Place
Figure 6-3 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 2 for Closure In Place
Figure 6-4 Distribution of Recharge Zones (feet/day) for Closure By Removal
Figure 6-5 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 1 for Closure By Removal
Figure 6-6 Distribution of Hydraulic Conductivity Zones (feet/day) for Layer 2 for Closure By Removal
Figure 6-7 CIP - Model Predicted Boron Concentration
Figure 6-8 CIP - (Scenario 1) – Model Predicted Maximum Boron Plume in All Layers Approximately 382 Years after Implementation
Figure 6-9 CIP - (Scenario 1) – Model Predicted Maximum Boron Plume in All Layers Approximately 767 Years after Implementation
Figure 6-10 Scenario 1 (CIP) – Hydraulic Steady State Reductions in Total Flux In and Out of Fill Unit (CCR)
Figure 6-11 Scenario 1 (CIP) – Reductions in Total Flux In and Out of Fill Unit (CCR)
Figure 6-12 CBR - Model Predicted Boron Concentration
Figure 6-13 CBR - (Scenario 2) – Model Predicted Maximum Boron Plume in All Layers Approximately 201 Years after Implementation
Figure 6-14 CBR - (Scenario 2) – Model Predicted Maximum Boron Plume in All Layers Approximately 748 Years after Implementation

APPENDICES

Appendix A Evaluation of Potential GWPS Exceedances (Golder Associates USA Inc., 2022)
Appendix B Figure 5 and Figure 6 of *Burch, S. L. and D. J. Kelly., 1993. Peoria-Pekin Regional Ground-Water Quality Assessment. Illinois State Water Survey (ISWS), Champaign, Research Report 124.*
Appendix C MODFLOW, MT3DMS, HELP Model, and Flux Evaluation Data Export Files (Electronic Only)
Appendix D Evaluation of Partition Coefficient Results (Golder Associates USA Inc., 2022)
Appendix E HELP Model Output Files
Appendix F Flux Evaluation Data

ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
BCU	bedrock confining unit
bgs	below ground surface
CBR	closure by removal
CCR	coal combustion residuals
CIP	closure in place
cm/s	centimeters per second
CSM	conceptual site model
EPP	Edwards Power Plant
Federal CCR Rule	40 C.F.R. § 257 Subpart D
ft/day	feet/foot per day
ft^2/d	feet squared per day
GHB	general head boundary conditions
GMP	Groundwater Monitoring Plan
GMR	Groundwater Modeling Report
Golder	Golder Associates USA Inc.
GWPS	Groundwater Protection Standard
HCR	Hydrogeologic Site Characterization Report
HELP	Hydrologic Evaluation of Landfill Performance
ID	identification
IEPA	Illinois Environmental Protection Agency
in	inches
in/yr	inches per year
IngenAE	IngenAE, LLC
IPRG	Illinois Power Resources Generating, LLC
ISWS	Illinois State Water Survey
Kd	distribution coefficient
K_D	linear partition coefficients
K_F	Freundlich partition coefficients
K_L	Langmuir partition coefficients
Kh/Kv	vertical anisotropy
L/kg	liters per kilogram
mg/L	milligrams per liter
MGD	million gallons per day
mL/g	milliliters per gram
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.

NRT/OBG	Natural Resource Technology Inc., an OBG Company
p	probability
Part 845	35 I.A.C. § 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments
PMP	Potential Migration Pathway
R2	correlation coefficient
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
SSR	sum of squared residuals
S_y	specific yield
SW	surface water
TDS	total dissolved solids
TVD	total-variation-diminishing
UA	uppermost aquifer
UCF	Upper Cahokia Formation
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Wittman	Wittman Hydro Planning Associates, Inc.

EXECUTIVE SUMMARY

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Modeling Report (GMR) on behalf of the Edwards Power Plant (EPP), operated by Illinois Power Resources Generating, LLC (IPRG), 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], April 15, 2021). This document presents the results of predictive groundwater modeling simulations for proposed closure scenarios for the Ash Pond. The Ash Pond (Vistra identification [ID] number [No.] 301, IEPA ID No. W1438050005-01, and National Inventory of Dams [NID] No. IL50710) is the only coal combustion residuals (CCR) unit present on the EPP property.

The EPP is located in Bartonville, Illinois (**Figure 1-1**). The EPP property is situated in an agricultural/industrial area. The EPP is bound by a salt processing facility to the north, a fertilizer processing plant and the Illinois River to the east, agricultural fields to the south, and railroad tracks, former Orchard Mines, and Highway 24 to the west (**Figure 1-2**).

A detailed summary of site conditions was provided in the Hydrogeologic Site Characterization Report (HCR; Ramboll, 2021a). Four distinct water-bearing units have been identified in the vicinity of the Ash Pond based on stratigraphic relationships and common hydrogeologic characteristics. The units are described as follows from the surface downward:

- **CCR:** Saturated CCR consisting primarily of fly ash within the Ash Pond. CCR is present at thicknesses up to 46.5 feet and at elevations as low as 413.9 feet North American Vertical Datum of 1988 (NAVD88) in the central and northern portion of the Ash Pond.
- **Upper Cahokia Formation (UCF)/Potential Migration Pathway (PMP):** Low permeability clays and silts of the UCF are present at the surface. This unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the UCF adjacent to the Ash Pond.
- **Uppermost Aquifer (UA):** Thin (generally less than 4 feet), moderate permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present. In locations where higher permeability materials and coarser grained material are absent, the UA is interpreted as the interface between the Lower Cahokia Formation and shale bedrock.
- **Bedrock Confining Unit (BCU):** Thick, very low permeability shales and siltstones of the Carbondale and Modesto Formations. This unit was encountered at elevations ranging from approximately 400 to 422 feet NAVD88 with higher bedrock elevations occurring beneath the northern portion of the Ash Pond.

In general, the UCF consists of low permeability clays and silts, with limited occurrences of thin discontinuous sand lenses. Occasional sand lenses within the UCF, and clay intervals downgradient at elevations similar to the base of ash in the Ash Pond were identified as PMPs. In several locations, generally near the southern and western portions of the unit, coarser grained materials are present at the base of the Lower Cahokia Formation and/or the top of the bedrock is weathered resulting in relatively higher hydraulic conductivities. Because the interface is laterally continuous, and has relatively higher conductivity, the unlithified/lithified contact was designated as the UA.

The underlying bedrock is interpreted as the lower confining unit and has hydraulic conductivities generally an order of magnitude less than those measured in the UA. Groundwater occurs within both the unlithified materials and bedrock and consistently flows east to west in the UA. Offsite groundwater in the Sankoty Aquifer flows to the north and south towards identified Peoria and Pekin pumping centers, respectively. Groundwater in the Sankoty Aquifer may be hydraulically connected to the UA (*i.e.,* unlithified/ lithified contact) identified onsite.

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: barium, boron, chloride, lithium, sulfate, and total dissolved solids (TDS) (Ramboll, 2021b).

A Technical Memorandum (**Appendix A**) was prepared by Golder Associates USA Inc. (Golder, 2022a), *Evaluation of Potential GWPS Exceedances, Edwards Ash Pond [CCR Unit 301], Edwards Power Plant, Peoria County, Illinois*, to further evaluate potential GWPS exceedances. The results of the evaluation demonstrated that the potential GWPS exceedances of lithium in well AP05D and AP07D, chloride in well AP07D, and barium in well AW-15C are not related to the Ash Pond based on multiple lines of evidence presented in the Technical Memorandum. Statistically significant correlations between boron concentrations and concentrations of sulfate and TDS identified as potential exceedances of the GWPS indicate boron is an acceptable surrogate for these parameters in the groundwater model. Concentrations of these parameters are expected to change along with model predicted boron concentrations.

Groundwater monitoring wells recently installed near the plant's property boundary have detected elevated levels of boron in groundwater. IPRG notified IEPA of the elevated boron detections and letters were issued to neighboring property owners in May of 2022 requesting permission for IPRG's consultants to access their property and collect groundwater samples. Until responses are received, and access granted, the groundwater modeling and available well data are being used to delineate the plume.

It was assumed that boron 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).

Data collected from previous field investigations, as well as the 2021 field investigations, were used to develop a groundwater model for the Ash Pond. The MODFLOW and MT3DMS models were then used to evaluate two closure scenarios, including CCR consolidation and closure in place (CIP), and closure by removal (CBR) scenarios, using information provided in the Final Closure Plan (IngenAE, 2022):

- 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)
- Scenario 2: CBR (CCR removal from the Ash Pond)

Prior to the simulation of these scenarios, a dewatering simulation was included for the removal of free liquids from the Ash Pond prior to the implementation of the two scenarios.

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 97% and 94%, respectively, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize.

Differences exist in the timeframes to reach the GWPS for most monitoring wells between CIP and CBR. For instance, wells with observations above the standard GWPS for boron (2 milligrams per liter [mg/L]) from November 2015 to August 2021 (AP07S, AW-05, AW-15S, AW-18, AW-19, AW-20, AW-21) are predicted to reach the GWPS in 198 years after CIP implementation, and 104 years after CBR implementation. Shorter timeframes were predicted to reach the GWPS for wells located on the northern edge of the Ash Pond where observed boron concentrations were the highest (AW-21 and AP07S). AW-21 and AP07S, which had the highest concentrations in the UA and UCF, respectively, were predicted to decline below the GWPS at 121 and 32 years, respectively, after CIP implementation, and at 88 and 15 years, respectively, after CBR implementation. However, as a result of the south-southwest trending plume of residual boron concentrations above the standard GWPS for boron (2 mg/L) released prior to closure, which remains for a long period of time following implementation of both scenarios, all monitoring wells are not predicted to reach the GWPS until after 767 years and 748 years following implementation of CIP and CBR, respectively.

The observed timeframes to reach the GWPS for both the CIP and CBR prediction scenarios were on the order of hundreds of years from present. These predicted timeframes to meet the GWPS are less reliable than timeframes that are closer temporally to the data used for calibration (between 2015 and 2021). From a modeling perspective, the 19-year difference between CIP and CBR to reach the GWPS at all monitoring wells surrounding the ash pond is negligible. In other words, both scenarios are predicted to reach the GWPS after approximately 750 years, and the simulated 19-year difference between these two scenarios is not significant. Further, the boron plumes for both CIP and CBR remain in close proximity to the Ash Pond while they recede, indicating they are equally protective.

Results of groundwater fate and transport modeling conservatively estimate that groundwater will attain the GWPS for all constituents identified as potential exceedances of the GWPS in approximately 750 years following closure implementation for both CIP and CBR. The long timeframes observed are a result of the generally low permeability materials adjacent to and underlying the Ash Pond, and generally low groundwater flow velocities observed within the water-bearing units of the site, which results in reduced transport and slow physical attenuation (dilution and dispersion). The predicted maximum extent of the plume above the standard GWPS for boron (2 mg/L) stays in close proximity to the ash pond as it recedes.

1. INTRODUCTION

1.1 Overview

In accordance with requirements of Part 845 (IEPA, 2021), Ramboll has prepared this GMR on behalf of EPP, operated by IPRG. This report will apply specifically to the CCR unit referred to as the Ash Pond (**Figure 1-1**). The Ash Pond is a 91-acre unlined CCR surface impoundment (SI) used to manage CCR and non-CCR waste streams prior to discharge in accordance with the plant's National Pollutant Discharge Elimination System (NPDES) permit (IL0001970) at the EPP. 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 (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)
- Scenario 2: CBR (CCR removal from the Ash Pond)

1.2 Site Location and Background

The EPP is located in Peoria County between Mapleton and Bartonville in Section 11, Township 7 North, Range 7 East (**Figure 1-1**). The EPP is located near the Illinois River adjacent to a levee and has one CCR SI, the Ash Pond.

The EPP is situated in a predominantly agricultural area with industrial parcels bordering the property. Historically several coal mines were operated at depths of 100 to 160 feet below ground surface (bgs) in the vicinity of the EPP. The EPP property is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and fertilizer production facility to the east, and agricultural land to the south (**Figure 1-2**).

The Ash Pond was investigated in 2013 (Natural Resource Technology, Inc. [NRT], 2013) and exceedances of Class I Groundwater Standards were reported for pH, chloride, iron, manganese, TDS, and sulfate. Additional wells were installed in 2015 to comply with Title 40 of the Code of Federal Regulations (40 C.F.R) § 257 Subpart D (Federal CCR Rule), and again in 2021 to collect additional data to meet the requirements of 35 I.A.C. § 845.620.

1.3 Site History and Unit Description

The EPP began power generation in 1960 and the original Ash Pond embankments were placed into service at that time. In 2004, modifications to the rail loop surrounding the Ash Pond increased the elevations of the embankments and reduced the footprint of the active impoundment (AECOM, 2016a). CCR material remains between the rail loop and the berm at the south end of the Ash Pond. High power transmission lines bisect the Ash Pond and two sub-basins, referred to as the North and South Ponds, were established. The sub-basins are hydraulically connected and CCR placement is continuous throughout the Ash Pond.

The Ash Pond has a surface area of approximately 91 acres with berms up to 27 feet higher than the surrounding land surface. This pond currently discharges to the Illinois River through Outfall 001 included in the facility NPDES permit, IL0001970. The primary treatment method for the pond water is settlement via reduced velocity whereby solids settle out in various flow channels and in the main South Pond. The permitted total average daily flow is 5.24 million gallons per day (MGD) (Foth, 2017).

2. SITE GEOLOGY AND HYDROGEOLOGY

Ash Pond hydrogeologic and groundwater quality data presented in the HCR (Ramboll, 2021a) was used to establish a conceptual site model (CSM) for this GMR, and is summarized below. The EPP and embankments surrounding the Ash Pond are located at an elevation of approximately 460 feet NAVD88 (**Figure 2-1**). Topographic maps drawn prior to construction indicate the areas of the Ash Pond were generally between 435 and 440 feet National Geodetic Vertical Datum (NGVD29), except for a historic drainage feature or former river channel located in the western portion of the Ash Pond, which has an elevation of approximately 430 feet NGVD29 (Appendix A of the HCR). The areas surrounding the EPP are generally at an elevation of around 435 to 440 feet NVGD29. West of the Ash Pond (across Highway 24), the elevation increases to approximately 600 feet NGVD29 (**Figure 1-1**), where bedrock outcrops are present near the surface at the edge of the former historic Illinois River valley.

There are three principal types of unlithified materials above the bedrock in the vicinity of the Ash Pond, these include the following in descending order: Fill, predominantly coal ash (fly ash, bottom ash, and slag) within the Ash Pond, and materials within constructed berms and railroad embankments, are present around the Ash Pond; UCF (fine-grained deposits of the Cahokia Formation ranging in thickness at the Ash Pond from 5 to 40 feet); and Lower Cahokia Formation (course-grained deposits of the Cahokia Formation consisting of sands and gravels ranging in thickness at the Ash Pond from 1 to 4 feet). Depth to bedrock at the Ash Pond ranges from approximately 20 feet in the north to 58 feet in the southwest.

Four distinct water-bearing units have been identified in the vicinity of the Ash Pond based on stratigraphic relationships and common hydrogeologic characteristics. The units are described as follows from the surface downward:

- **CCR:** Saturated CCR consisting primarily of fly ash within the Ash Pond. CCR is present at thicknesses up to 46.5 feet and at elevations as low as 413.9 feet NAVD88 in the central and northern portion of the Ash Pond**.**
- **UCF/ PMP:** Low permeability clays and silts of the UCF are present at the surface. This unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the UCF adjacent to the Ash Pond.
- **UA:** Thin (generally less than 4 feet), moderate permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present. In locations where higher permeability materials and coarser grained material are absent, the UA is interpreted as the interface between the Lower Cahokia Formation and shale bedrock.
- **BCU:** Thick, very low permeability shales and siltstones of the Carbondale and Modesto Formations. This unit was encountered at elevations ranging from approximately 400 to 422 feet NAVD88 with higher bedrock elevations occurring beneath the northern portion of the Ash Pond.

In general, the UCF consists of low permeability clays and silts, with limited occurrences of thin discontinuous sand lenses. Occasional sand lenses within the UCF, and clay intervals downgradient at elevations similar to the base of ash in the Ash Pond were identified as PMPs. In several locations, generally near the southern and western portions of the Ash Pond, coarser

grained materials are present at the base of the Lower Cahokia Formation and/or the top of the bedrock is weathered resulting in relatively higher hydraulic conductivities. Because the interface is laterally continuous, and has relatively higher conductivity, the unlithified/lithified contact was designated as the UA.

The underlying bedrock is interpreted as the lower confining unit and has hydraulic conductivities generally an order of magnitude less than those measured in the UA. Groundwater occurs within both the unlithified materials and bedrock and consistently flows east to west in the UA (**Figure 2-2** and **Figure 2-3**). In the northernmost portion of the Ash Pond there is a minor northwest and northern component of flow in both the UA and PMP. In the southern portion of the Ash Pond, groundwater flow has a southerly component of flow towards what is interpreted as a former channel of the Illinois River. Groundwater elevations vary seasonally, generally less than 5 feet, while across the site they range between approximately 430 and 450 feet, although flow directions are generally consistent. Additional groundwater contour maps are located in Appendix E of the HCR (Ramboll, 2021a).

Groundwater elevations in PMP wells range from approximately 455 feet NAVD88 (APW-02) to 430 feet NAVD88 (AW-15S) with flow generally from the east to the south and northwest (**Figure 2-2** and **Figure 2-3**), similar to that observed in the UA. Groundwater elevations measured at APW02 are similar to CCR piezometers and the location of the well (within the berm of the unit) may be affected by water elevations in the active Ash Pond. Given the elevations of groundwater detected in these unconfined wells and the lowest elevation of ash (414 feet NAVD88), portions of the Ash Pond are likely in contact with groundwater. Comparison of elevations in bedrock wells shows flow directions may be consistent with shallower flow systems.

Groundwater velocities in the UA determined in the center portion of the Ash Pond (between AW-08 and AW-06) ranged from approximately 1.7×10^{-4} to 4.0×10^{-4} feet per day (ft/day) in 2021 with an average of 2.5×10^{-4} ft/day. Groundwater velocities determined in the southern portion of the Ash Pond between AW-10 and AW-15 were consistent with an average of 0.26 ft/day. The higher velocities observed in the southern portion of the Ash Pond are a result of coarse-grained materials present there.

The results of a recent review of available offsite groundwater level and flow direction data completed after submittal of the HCR (Ramboll, 2021a) and presented herein supports the CSM presented in the HCR (summarized above) and further describes offsite hydrogeologic conditions. The existing CSM has been refined in this GMR to incorporate additional offsite hydrogeologic information as follows:

- The unlithified/lithified contact designated as the UA onsite may be hydraulically connected to the sands of the Sankoty Aquifer identified offsite and utilized for potable supply in Peoria, East Peoria, and Pekin.
- The thick sand and gravels along the Illinois River from Hennepin to Peoria form what has been commonly referred to as the Sankoty Aquifer. The Sankoty sand and gravels are hydrologically connected to the Illinois River and are a productive aquifer in the Middle Illinois water supply planning (Illinois State Water Survey [ISWS], 2016). At the EPP, the thick sands and gravels of the Sankoty Aquifer are absent. Fine-grained quaternary deposits of the Cahokia Formation are present from ground surface to the top of bedrock. The UA at the EPP represents the most permeable material present above bedrock. Alluvial deposits belonging to either the Cahokia or the Sankoty are present in a north-south orientation along the Illinois

River at the EPP and are not expected to occur in the areas west of United States (US) Highway 24 where the bedrock elevation increases above ground surface at the EPP. US Highway 24 runs along the base of the bluff and areas west of US Highway 24 are coincident with areas where the aquifer is not present as illustrated in Figure 5 of Burch and Kelly, 1993 (**Appendix B**).

- Offsite groundwater in the Sankoty Aquifer flows to the north and south towards identified Peoria and Pekin pumping centers, respectively, as illustrated in Figure 5 and Figure 6 of Burch and Kelly, 1993 (**Appendix B**). As reported by Burch and Kelly (1993), "*Smaller flow domains are sometimes formed by pumpage at municipal well fields, which reverse the ground-water flow direction and frequently capture induced recharge from the river and the ground-water ordinarily moving toward it*."
- A review of pumping data for Peoria (ISWS, 2018) indicates that between 1990 and 2010 potable groundwater supply usage increased approximately three percent, while East Peoria and Pekin estimates (Wittman Hydro Planning Associates, Inc. [Wittman], 2008) indicate an increase of 30 and 60 percent, respectively, between 1990 and 2005. Based on these references and IEPA databases (IEPA, 2022) Peoria and Pekin pumping centers identified in the 1993 ISWS Peoria-Pekin Regional Ground-Water Quality Assessment report (Burch and Kelly, 1993) remain active. The increase in reported usage in conjunction with historic records and reports (Burch and Kelley, 1993) indicate high-capacity wells located in Peoria and Pekin continue to influence groundwater flow directions towards their respective pumping centers.

Prior to 2015, there were four monitoring wells (APW-01 through APW-04) located around the Ash Pond for monitoring groundwater. In 2015 and 2017, additional wells and piezometers were installed within and around the Ash Pond to meet requirements of 40 C.F.R. § 257. In 2021, additional wells were installed to provide information to meet the requirements of Part 845. A summary of monitoring well locations and construction details are included in **Table 2-1** and depicted on **Figure 2-4**. Boring logs, monitoring well and piezometer construction forms are provided in Appendix C of the HCR (Ramboll, 2021a).

3. GROUNDWATER QUALITY

Per 35 I.A.C. § 620.210, groundwater within the UA at the Ash Pond meets the definition of a Class I – Potable Resource Groundwater based on the following criteria:

- Groundwater in the UA extends 10 feet or more below the land surface.
- Hydraulic conductivity exceeds the 1 x 10^{-4} centimeters per second (cm/s) criterion (Table 3-3 of the HCR; Ramboll, 2021a).

Field hydraulic conductivity tests performed on the unlithified geologic materials that include moderate permeability sand, silty sand, and clayey gravel units which includes the Lower Cahokia Formation and the bedrock interface) and lithified materials (shales and siltstones of the Carbondale and Modesto Formations) at the EPP had geometric mean hydraulic conductivities exceeding 1 x 10^{-4} cm/s. Based on this information groundwater is classified as Class I – Potable Resource Groundwater.

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 groundwater monitoring plan (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:

- Barium – determined at well AW-15C
- Boron – determined at wells AP07S, AW-05, AW-15S, AW-19, AW-20, and AW-21
- Chloride – determined at wells AP07D
- Lithium – determined at wells AP05D and AP07D
- Sulfate – determined at well AW-15S
- TDS – determined at wells AP07S and AW-15S

A Technical Memorandum (**Attachment A**) was prepared by Golder (2022), *Evaluation of Potential GWPS Exceedances, Edwards Ash Pond [CCR Unit 301], Edwards Power Plant, Peoria County, Illinois*, to further evaluate potential GWPS exceedances. The results of the evaluation demonstrated that the potential GWPS exceedances of lithium in well AP05D and AP07D, chloride in well AP07D and barium in well AW-15C are not related to the Ash Pond based on several lines of evidence presented in the Technical Memorandum. Since potential GWPS exceedances for lithium, chloride, and barium are not related to the Ash Pond, these parameters will not be discussed further in this GMR.

Groundwater monitoring wells recently installed near the plant's property boundary have detected elevated levels of boron in groundwater. IPRG notified IEPA of the elevated boron detections and letters were issued to neighboring property owners in May of 2022 requesting permission for IPRG's consultants to access their property and collect groundwater samples. Until responses are received, and access granted, the groundwater modeling and available well data are being used to delineate the plume.

4. GROUNDWATER MODEL

4.1 Overview

Data collected from previous field investigations, as well as the 2021 field investigations, were used to develop a groundwater model for the Ash Pond. The MODFLOW and MT3DMS models were then used to evaluate two closure scenarios, including CCR consolidation and CIP using information provided in the Final Closure Plan (IngenAE, 2022), and CBR scenarios. The results of the CIP and CBR closure scenarios are summarized and evaluated in this GMR. Associated model files are included as **Appendix C.**

4.2 Conceptual Site Model

The HCR (Ramboll, 2021a) is the foundation document for the site setting and CSM that describes groundwater flow at the Site, which was refined to incorporate additional offsite hydrogeologic information summarized in Section 2 of this GMR. The Ash Pond overlies the recharge area for the underlying geologic media (*i.e.,* low permeability clays and silts of the UCF; and moderate permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present [UA]). Groundwater enters the model domain vertically via recharge. Groundwater may also enter or exit the model through the stormwater drainage ditches and ponds identified immediately west and north of the Ash Pond, or the Illinois River located east of the Ash Pond. Groundwater occurs within both the unlithified materials and bedrock and consistently flows east to west in the UA. In the northernmost portion of the Ash Pond, there is a minor northwest and northern component of flow in both the UA and PMP. In the southern portion of the Ash Pond groundwater flow has a southerly component of flow towards what is interpreted as a former channel of the Illinois River. Offsite groundwater in the Sankoty Aquifer flows to the north and south towards identified Peoria and Pekin pumping centers, respectively.

Boron was selected for transport modeling. Boron is commonly used as an indicator parameter for contaminant transport modeling for CCR because: (i) it is commonly present in coal ash leachate; (ii) it is mobile and typically not very reactive but conservative (*i.e.*, low rates of sorption or degradation) in groundwater; and (iii) it 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 the Ash Pond. The Ash Pond is constructed over low permeability clays and silts of the UCF. Mass (boron) is added to groundwater via vertical recharge through CCR, and horizontal groundwater flow through CCR where it is in contact with the water table. Mass flows with groundwater (onsite and offsite groundwater flow directions described above). The primary transport pathway is the UA, as indicated by groundwater observations. The UCF is also a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the UCF adjacent to the Ash Pond.

4.3 Model Approach

Comparisons of observed sulfate and TDS concentrations to boron (**Figure A** and **Figure B**, respectively, below) indicate statistically significant correlations between these parameters at UCF and UA wells. Observed concentrations were transformed into Log10 concentrations for evaluation. The correlation coefficient (R2) and p values (indicator of statistical significance) are also provided on **Figure A** and **Figure B**. Higher R2 values (*i.e.*, closer to 1) indicate stronger

correlation between parameters. A correlation is considered statistically significant when the probability (p) value is lower than 0.05. Both correlations have p values less than the target of 0.05, indicating correlations are statistically significant. The correlations are strongest between sulfate and boron. The statistically significant correlations associated with boron concentrations indicate boron is an acceptable surrogate for sulfate and TDS in the groundwater model, and concentrations of these parameters are expected to change along with model predicted boron concentrations.

Figure A. Boron Correlation with Sulfate in UCF and UA Wells

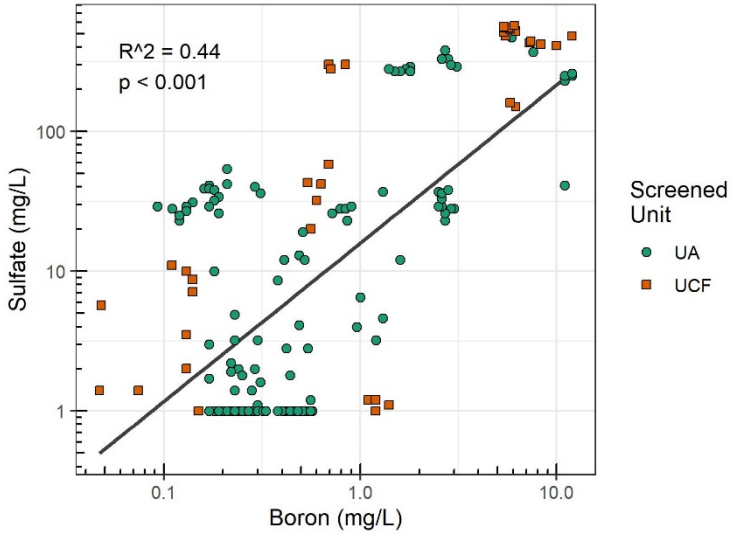
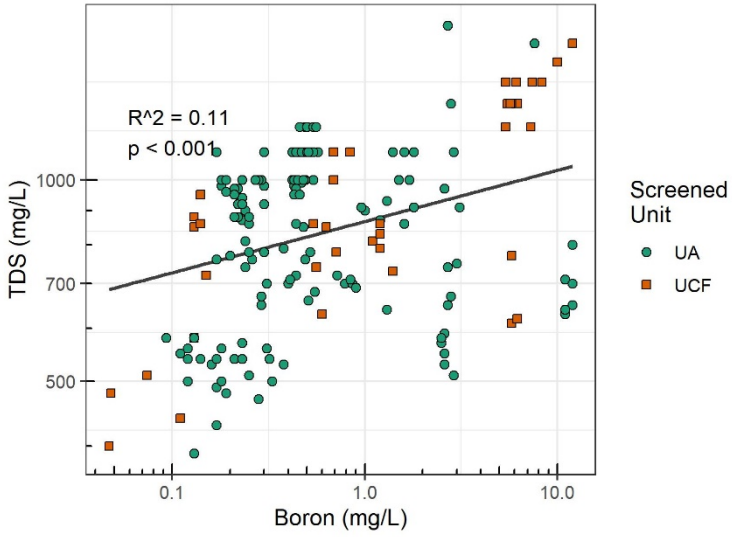


Figure B. Boron Correlation with TDS in UCF and UA Wells



A three-dimensional groundwater flow and transport model was calibrated to represent the conceptual flow system described above. Initial modeling was performed for a 62-year period to

represent boron concentrations for site conditions in 2022, 62 years following construction of the Ash Pond in 1960. The model was calibrated to match groundwater elevation and concentration observed at each monitoring well. Prediction simulations were then performed to evaluate the effects of CIP and CBR closure scenarios for the Ash Pond on groundwater quality for a period of 1,000 years following initial corrective action measures, which include dewatering of the Ash Pond (1-year period), consolidation of CCR and cover system construction or removal of CCR. The calibration and prediction model timelines are illustrated in **Figure 4-1**.

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) after consolidation of CCR and cover system construction was modeled using the results of the Hydrologic Evaluation of Landfill Performance (HELP) model.

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 United States Geological Survey (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.

Major assumptions of the MODFLOW 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 the Ash Pond. 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), were used to estimate the hydraulic conditions beneath removal and consolidation areas.

5.2 Flow and Transport Model Setup

The modeled area was approximately 15,975 feet (478 rows) by 9,500 feet (334 columns) with the Ash Pond located in the west-central portion of the model. The eastern edge of the model is bounded by the Illinois River. The north, west, and south edges of the model were selected to maintain sufficient distance from the Ash Pond to reduce boundary interference with model calculations, while not extending too far past the extent of available calibration data. The northwest edge of the model is defined by the edge of the former historic Illinois River valley, where the elevation increases to approximately 600 feet NGVD29, and bedrock outcrops or is present near the surface (across Highway 24). The model grid and boundary conditions are displayed in **Figure 5-1 through Figure 5-6**.

Evaluation of monitoring well data for the Ash Pond has not identified statistically significant seasonal trends in groundwater quality which could affect model applicability for prediction of boron transport. The MODFLOW model was calibrated to mean groundwater elevation collected from November 2015 to August 2021 presented in **Table 2-2**. MT3DMS was run on the calibrated flow model and model-simulated concentrations were calibrated to the range of observed boron concentration values at the monitoring wells from November 2015 to August 2021 presented in **Table 2-2**. Multiple iterations of MODFLOW and MT3DMS calibration were performed to achieve an acceptable match to observed flow and transport data. For the Ash Pond, the calibrated flow and transport models were used in predictive modeling to evaluate the CIP and CBR closure scenarios by removing saturated ash cells and using HELP modeled recharge values to simulate changes proposed in the closure scenarios.

5.2.1 Grid and Boundary Conditions

A five-layer, 478 x 334 node grid was established with 25-foot grid spacing in the vicinity of the Ash Pond and EPP property. The grid increases gradually to a maximum 225-foot row spacing and 112.5-foot column spacing near the edges of the model (**Figure 5-1**). Boundary conditions are illustrated in **Figure 5-2 through Figure 5-6**. The northwest and eastern edges of the model are no-flow (Neumann) boundaries in all layers of the model with the exceptions of the eastern edge in Layer 3, where a river (Mixed) boundary was placed to simulate the mean flow conditions of the Illinois River, and the north and southeast edges in layer 4, where a general head (Dirichlet) boundary (denoted as general head boundary conditions [GHB] on the figure) was placed to simulate the influence of pumping centers located in Peoria and Pekin on groundwater flow direction. The bottom of the model was also a no-flow (Neumann) boundary. The top of the model was a time-dependent specified flux (Neumann) boundary, with specified flux rates equal to the recharge rate. A specified mass flux (Cauchy condition) boundary was used to simulate downward percolation of solute mass from the Ash Pond. This boundary condition assigns a specified concentration to recharge water entering the node, and the resulting concentration in the node 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

Flow model input values and sensitivity analyses results are presented in **Table 5-1** and described below.

The modeled well location layers and flow model calibration targets (*i.e.*, mean groundwater elevations from November 2015 to August 2021 and target well locations) are summarized in **Table 2-2**. Anomalous groundwater elevations (*e.g.,* groundwater elevations that do not represent static groundwater conditions or groundwater elevations measured in error) monitored between November 2015 and August 2021 were removed from the mean groundwater calculations used as flow calibration targets at wells AP05D, AP07D, APW-02, APW-03, AW-08, and AW-14. Wells APW-02, AW-18, AW-19, AW-20, AW-21, AW-22, and P002 are hydraulically connected to multiple hydrostratigraphic units (*i.e.,* modeled layers) and/or screened across multiple hydrostratigraphic units (*i.e.,* modeled layers). In the flow calibration model, flow calibration targets for wells APW-02, AW-18, AW-19, AW-20, AW-21, AW-22, and P002 were placed in model layers that exhibited heads more representative of the groundwater observations in these wells.

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 between one-tenth and ten times calibrated values. Recharge terms were varied between one-half and two times calibrated values. River stage for river reach 1 and general head boundary head terms were varied between 98.5 and 101.5 percent of calibrated values. River stage for river reaches 2 through 4 were varied between 99.5 and 100.5 percent of calibrated values. When the calibrated model was tested, SSR was 374.3. Sensitivity test results were categorized into negligible, low, moderate, moderately high, and high sensitivity based on the change in SSR as summarized in the notes in **Table 5-1**.

5.2.2.1 Model Layers

The bottom elevation of the BCU in layer 5 was flat lying and assumed to be an elevation of 200 feet NAVD88. All available boring log data included in the HCR (Ramboll, 2021a) was used to develop surfaces utilizing Surfer® software for each of the four distinct water-bearing units described in **Section 2**. The modeled UCF was split into three modeled layers, where model layer 1 represented the upper clay of the UCF, model layer 2 represented a transmissive zone within the UCF (this unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the UCF adjacent to the Ash Pond), and model layer 3 represented the lower clay of the UCF. Model layer 4 represented the UA onsite, as well as the hydraulically connected sands of the Sankoty Aquifer identified offsite. Model layer 5 represented the BCU. The approximate base of ash surface in the Ash Pond was developed from information presented in the HCR (Ramboll, 2021a) and confirmed with IngenAE. The CCR was modeled in layers 1 and 2 within the limits of the Ash Pond, where the base of layer 2 within the limits of the Ash Pond was consistent with the base of ash surface. The resulting surfaces were imported as layers into the model to represent the distribution and change in thickness of each water-bearing unit across the model domain.

5.2.2.2 Hydraulic Conductivity

Hydraulic conductivity values and sensitivity results are summarized in **Table 5-1**. When available, these values were derived from field or laboratory measured values reported in the

Geotechnical Data Report (AECOM, 2016b), Hydrogeologic Monitoring Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017), Technical Memorandum: Ash Pond – Underlying Clay and Depth of CCR Evaluation (Haley & Aldrich, Inc., 2018), and Hydrogeologic Site Characterization Report (Ramboll, 2021a), to be representative of site-specific conditions. The sources of the hydraulic conductivity values are summarized in **Table 5-1**. Conductivity zones that did not have representative site data (*i.e.,* zones 7 and 9, representing the cells above the river cells and the Sankoty Aquifer, respectively) were determined through model calibration. No horizontal anisotropy was assumed. Vertical anisotropy (presented as Kh/Kv in **Table 5-1**) was applied to conductivity zones to simulate preferential flow in the horizontal direction in these materials. Permeability tests discussed in the Geotechnical Data Report (AECOM, 2016b), 2017 Hydrogeologic Monitoring Plan (NRT/OBG, 2017), Technical Memorandum: Ash Pond – Underlying Clay and Depth of CCR Evaluation (Haley & Aldrich, Inc., 2018), and 2021 Hydrogeologic Characterization Report (Ramboll, 2021a) indicate vertical conductivity values that are lower than horizontal conductivity values.

The spatial distribution of the hydraulic conductivity zones (**Figure 5-7 through Figure 5-11**) in each layer simulates the distribution of hydrostratigraphic units as reported in the HCR (Ramboll, 2021a). All hydraulic conductivity zones were laterally continuous within the model with the exception of the Fill Unit (CCR) hydraulic conductivity zone (zone 6), the Weathered Shale (UA) hydraulic conductivity zone (zone 4), and the Sankoty Aquifer hydraulic conductivity (zone 9). The limits of the ash fill were determined from data presented in the HCR (Ramboll, 2021a) and confirmed with IngenAE. The ash fill extent was propagated through all related ash fill property zones and boundary conditions (*i.e.*, recharge, storage, effective porosity, and constant concentration cells). The extent of the Weathered Shale (UA) hydraulic conductivity zone and Sankoty Aquifer hydraulic conductivity zone offsite in model layer 4 was determined through a review of available offsite water well boring logs and through calibration. Conductivity zone 7 was also placed above river cells representing the Illinois River to improve communication between the river and the groundwater in layers above the layer in which the river was placed.

The model was highly sensitive to changes in horizontal conductivity in zones 2 (Transmissive Zone [UCF/PMP]), 4 (Weathered Shale [UA]), 6 (Fill Unit [CCR]), and 9 (Sankoty Aquifer - Sands), where the model was moderately sensitive to horizontal conductivity in the remaining hydrostratigraphic units and low in zone 1 (Upper Clay [UCF]). The model was highly sensitive to changes in vertical conductivity in zone 1 (Upper Clay [UCF]) and zone 3 (Lower Clay [UCF]), while the model exhibited a negligible to moderate sensitivity in the remaining zones.

5.2.2.3 Recharge

Recharge rates were determined through calibration of the model to the groundwater elevation and groundwater quality data collected from November 2015 to August 2021 (**Table 5-1**). The spatial distribution of recharge zones were based on the location and type of material present at land surface (**Figure 5-12**). Six different zones were created to simulate recharge in the model area. One zone (zone 1) was used to simulate ambient recharge over the upper clay of the UCF outside the limits of the Ash Pond. The recharge occurring through the ash fill placed in the Ash Pond was split into five different values, where recharge was varied based upon the historical use of each ash fill area (AECOM, 2016a) and the response of flow calibration target heads. Zones 2, 3, 4, 5, and 7 represent recharge in the Ash Pond area. The greatest recharge in the model was simulated in an area on the northeast edge of the pond where the fill materials are sluiced into the Ash Pond (zone 7) and the greatest heads were observed. The remaining ash fill areas

(recharge zones) are listed in order of greatest to least simulated recharge along with their historical use based on the history of construction (AECOM, 2016a): central area (zone 2, Fly Ash Pond), northwest area (zone 4, Process Water Pond), south area (zone 5, Clarification Pond), and south of railroad area (zone 3, Inactive Area). The area south of the railroad (zone 3) was simulated to have recharge values near ambient recharge as a result of the 2004 modifications to the rail loop surrounding the Ash Pond which increased the elevations of the embankments and reduced the footprint of the active impoundment (AECOM, 2016a).

The model had a high sensitivity to changes in recharge in zones 1 (Upper Clay [UCF]), 2 (Fill Unit – CCR [Central, Fly Ash Pond]), and 7 (Fill Unit - CCR [Northeast, Sluice Area]). The model had negligible to moderate sensitivity to changes in recharge in the remaining zones, with the exception of zone 4 (Fill Unit – CCR [Northwest, Process Water Pond), where sensitivity was moderately high.

5.2.2.4 Storage and Specific Yield

The calibration model did not use these terms because it was run at steady state. For the transport model, which was run in transient, no field data defining these terms were available so published values were used consistent with Fetter (1988). Specific yield (S_y) was set to equal effective porosity values described in **Section 5.2.3.3**. 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 5.2.3.4**.

5.2.2.5 River Parameters

The Illinois River was simulated using head-dependent flux nodes in modeled river reach 1 that required inputs for river stage, width, bed thickness, and bed hydraulic conductivity (**Table 5-1**). River width, bed thickness, and bed hydraulic conductivity parameters were used to calculate a conductance term for the boundary node. This conductance term was determined by adjusting hydraulic conductivity during model calibration, while bed thickness was set at 1 foot and river width was set at 750 feet. Final hydraulic conductivity value was set at 1 ft/day. The length of the modeled river extends from the northernmost extent of the model domain to the southernmost extent of the model domain using river reach 1. The modeled river stage in the calibration model was based on available Illinois River stage data at Peoria, Illinois (United States Army Corps of Engineers [USACE] 404208089335201 Illinois River at Peoria, Illinois [Corps]), Edwards Power Plant (Plant Gaging Station), and Kingston, Illinois (USGS 05568500 Illinois River at Kingston Mines, Illinois) gaging stations. The river boundary was placed in layer 3 corresponding with simulated river elevation (**Figure 5-4**).

A median slope was calculated from available data at upstream Peoria, Illinois gaging station (USACE 404208089335201 Illinois River at Peoria, Illinois [Corps]) and downstream Kingston, Illinois gaging station (USGS 05568500 Illinois River at Kingston Mines, Illinois). The mean river stage was then calculated based upon available gage data (hourly data from October 2007 to January 2022) of the Illinois River from Kingston, Illinois (USGS 05568500 Illinois River at Kingston Mines, Illinois) gaging station. The calculated median slope along with the mean river stage at Kingston, Illinois was used to interpolate the mean river stage throughout the model domain. The interpolated mean value near the EPP was confirmed to be within the range of observations at EPP gaging station.

The drainage ditch, bordering the western edge of the Ash Pond and continuing south to the Illinois River, was simulated using head dependent flux nodes in modeled river reach 2 (**Table 5-1**). The conductance term was determined by adjusting hydraulic conductivity during model calibration, while bed thickness was set at 1 foot and river width was set at 20 feet. Final hydraulic conductivity value was set at 0.00001 ft/day to reflect the low vertical hydraulic conductivity of the underlying UCF material. The drainage ditch stage was based on the mean drainage ditch water surface elevation from survey data collected by IngenAE in February 2022. The drainage ditch modeled river reach 2 was placed in layer 1. A second drainage feature, the drainage swale (reach 3) to the north of the Ash Pond had similar input parameters, however the river width was set to 25 and simulated river stage had a slightly lower elevation based on survey data collected by IngenAE in February 2022. A third drainage feature, the drainage pond (reach 4) to the northeast of the Ash Pond had similar input parameters; however, the river stage had a slightly higher elevation based on survey data collected by IngenAE in February 2022. River reaches 3 through 4 were also placed in layer 1.

The model had negligible to low sensitivity to changes in river stage, with the exception of reach 1 (Illinois River), where the sensitivity was moderate. The model had negligible to low sensitivity to changes in river conductance, with the exception of reach 2 (Drainage Ditch West of Ash Pond), where the sensitivity was moderate.

5.2.2.6 General Head Boundary Parameters

GHB were used along the north edge of the model as well as along the southeast edge of the model in layer 4 (**Figure 5-5**). The GHB at the northern limit of the model (reach 1) was used to simulate groundwater flow leaving the model domain in the Sankoty Aquifer due to the influence of pumping centers in Peoria. GHB elevation, conductance, and distance were established during calibration (**Table 5-1**). GHB cell width was set at 150 feet, distance to the GHB head was set at 1 foot, and average saturated thickness of the cell was set at 100 feet. Final hydraulic conductivity value was set at 100 ft/day to be similar in magnitude to the horizontal conductivity of the permeable sands. The GHB at the southeastern limit of the model (reach 1) was used to simulate groundwater flow leaving the model domain in the Sankoty Aquifer due to the influence of pumping centers in Pekin. GHB elevation, conductance, and distance were established during calibration (**Table 5-1**). GHB cell width was set at 750 feet, distance to the GHB head was set at 1 foot, and average saturated thickness of the cell was set at 39 feet. Final hydraulic conductivity value was set at 100 ft/day to be similar in magnitude to the horizontal hydraulic conductivity of the permeable sands. The GHB at the north edge of the model (reach 1) and the southeast edge of the model (reach 1) were placed in layer 4 with a constant elevation of 426 feet NAVD88. The sensitivity to changes in specified head was high for reach 1. The flow calibration model had a negligible sensitivity to changes in conductance.

5.2.3 Transport Model Input Values and Sensitivity

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 boron concentration ranges at each well as measured from the monitoring wells between November 2015 and August 2021. The transport model calibration targets are summarized in **Table 2-2**.

Sensitivity analysis was conducted by changing input values and observing percent change in boron concentration at each well from the calibrated model boron 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. High specific yield sensitivity was not analyzed for zone 8 (UCF above River Boundary Conditions) since the calibration value was already near upper limits of acceptable values for specific yield (0.5).

5.2.3.1 Initial Concentrations

No initial concentrations were placed in the calibration model. The flow model was run as transient and concentration was added to the model through recharge and constant concentration cells starting at the same time as flow simulation. Modeling was performed for two stress periods, where the first stress period (stress period 1) started at the time of Ash Pond construction (1960) and ended in 2004 (44-year stress period) when modifications to the rail loop surrounding the Ash Pond increased the elevations of the embankments and reduced the footprint of the active impoundment (AECOM, 2016a). The second stress period (stress period 2) started in 2005 following the Ash Pond modifications and included reduced recharge in the ash fill area south of the railroad (recharge zone 3) to simulate the reduced activity in this area of the pond. The second stress period ended in 2022 (18-year stress period). The transport model timeline is illustrated in **Figure 4-1**.

5.2.3.2 Source Concentrations

Five concentration sources in the form of vertical percolation (recharge) through CCR were simulated in fill unit layer 1 for calibration (**Table 5-2**) (in order of greatest to least simulated recharge): (i) percolation through CCR in the northeast edge of the pond where the fill materials are sluiced into the Ash Pond (zone 7, Sluice Area), (ii) percolation through CCR in the central area (zone 2, Fly Ash Pond), (iii) percolation through CCR in the northwest area (zone 4, Process Water Pond), (iv) percolation through CCR in the south area (zone 5, Clarification Pond), and (v) percolation through CCR south of railroad (zone 3, Inactive Area)(**Figure 5-12**). All five sources were simulated by assigning concentration to the recharge input. The CCR sources were also simulated with constant concentration cells placed in fill unit layer 1 and layer 2 (**Figure 5-2** and **Figure 5-3**) to simulate saturated ash 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 boron 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.

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.

5.2.3.3 Effective Porosity

Effective porosity for each modeled hydrostratigraphic unit were derived from an average between estimated values of 0.20 for silt material, 0.267 for gravel, 0.07 for clay, and 0.28 for sand from Morris and Johnson (1967) and Heath (1983) and presented in **Table 5-2**.

The model had a negligible to moderately high sensitivity to decreases in porosity values, with the exception of four monitoring locations where sensitivity was high (*i.e.,* APW-01, APW-04,

AW-05, and AW-12) and not including monitoring locations where the calibration concentration was less than 0.1 mg/L (*i.e.*, AP05S, AP05D, AP07D, AW-06, AW-08, and AW-15C) (**Table 5-3**). The model had a negligible to moderate sensitivity to increases in porosity values, not including monitoring locations where the calibration concentration was less than 0.1 mg/L (*i.e.*, AP05S, AP05D, AP07D, APW-01, APW-04, AW-06, AW-08, AW-12, and AW-15C) (**Table 5-3**).

5.2.3.4 Storage and Specific Yield Sensitivity

The transport model had a negligible to low sensitivity to changes in storage and specific yield, with the exception of sensitivity at monitoring wells AP05S, AP05D, APW-01, APW-04, and AW-12, where sensitivity was moderate to moderately high; however, boron concentration in both the calibrated model and sensitivity models were negligible (<0.1 mg/L) at these wells (**Table 5-3**).

5.2.3.5 Dispersivity

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).

Dispersivity values were applied to the entire model domain and determined during calibration. Longitudinal dispersivity was set at 3 feet. The transverse and vertical dispersivity were set at 1/10 and 1/100 of longitudinal dispersivity. These input values were determined during model calibration. With travel distances of less than 100 feet for groundwater from the source to the majority of the monitoring points, the model is not expected to be sensitive to dispersivity inputs and the sensitivity of the model to dispersivity was not tested.

5.2.3.6 Retardation

It was assumed that boron would not significantly sorb or chemically react with aquifer solids (distribution coefficient [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 (Golder, 2022b, **Appendix D**) for locations AW-15S and AW-19. Results of the testing are summarized below:

- Boron: Calculated linear partition coefficient (K_D) values were 1.50 and -0.19 liters per kilogram (L/kg), respectively. Langmuir partition coefficient (K_L) values were 3.8×10^4 and -2×10^5 L/kg, respectively. Freundlich partition coefficients (K_F) values were 82 and 215 L/kg, respectively. In Strenge and Peterson (1989), partition coefficients for boron range from 0.19 to 1.3 L/kg, depending on pH conditions and the amount of sorbent present.
- Sulfate: Calculated K_D values were 0.47 and -1.0 L/kg, respectively. K_L values were 778 and -2,950 L/kg, respectively. The K_F values for AW-15S and AW-19 were 63 and 1.2 L/kg,

respectively. In Strenge and Peterson (1989), partition coefficients for sulfate are 0.0 L/kg, regardless of pH conditions and the amount of sorbent present.

The results from site samples have a high degree of variation and little correlation with the literature values provided for comparison. 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 boron transport in the model (*i.e.,* Kd was set to 0).

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 can be simulated as steady state.
- Natural recharge is constant over the long term.
- Fluctuations in river 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 Ash Pond was developed from information presented in the HCR (Ramboll, 2021a) and confirmed with IngenAE. Observed concentrations in groundwater exhibit no long-term trend.
- Source concentrations are assumed to remain constant over time. Only recharge rate was modified in 2004 to simulate modifications to Ash Pond operation south of the railroad (recharge zone 3).
- Boron 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 near the Ash Pond, 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 between 2015 and 2021.

5.4 Calibration Flow and Transport Model Results

Results of the MODFLOW/MT3DMS modeling are presented below. Electronic copies of the model files are attached to this report (**Appendix C**).

Observed and simulated heads are presented in **Figure 5-13 through Figure 5-17**. The mass balance error for the flow model was -0.19 percent and the ratio of the residual standard deviation to the range was 11.6 percent; the mass balance error for the flow model was within the target for the criteria of 1 percent and the ratio of the residual standard deviation to the range was near target for the criteria 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 5-18**. The near-linear relationship between observed and simulated values indicates that the model adequately represents the calibration dataset. The residual mean was -1.81 feet; in general the simulated values were

evenly distributed above and below the observed values. This is also illustrated in the observed versus residuals plot at the bottom of **Figure 5-19**; however, some simulated values were overpredicted in the areas north of the Ash Pond or in model layer 2 immediately adjacent to the Ash Pond (transmissive zone within the UCF) where observed heads in the UCF (flow calibration targets) were significantly lower than observed heads (flow calibration targets) in the adjacent Ash Pond. These residuals plot in the lower left quadrant of **Figure 5-19**.

The range of observed boron concentrations between November 2015 and August 2021 for transport calibration locations are summarized in **Table 2-2**. The goals of the transport model calibration were to have predicted concentrations fall within the range of observed concentrations, and/or have predicted concentrations above and below the GWPS for boron (2 mg/L) match observed concentrations above or below the standard at each well. One or both of these goals were achieved at all but three of the transport calibration location wells, including AW-17, AW-22, and P002, where concentrations were overpredicted (**Figure 5-20**). Deviations from the observed ranges are discussed below.

- P002 is identified as a PMP well in the HCR (Ramboll, 2021a). P002 was modeled in layer 3 which represents the lower clay beneath the Ash Pond rather than layer 2, which represents the transmissive zone of the UCF (PMP) in the model. Since layer 2 was modeled as ash fill at the location of P002, the well was placed in layer 3 of the model immediately beneath the ash fill. The ash fill above the modeled location of P002 had the highest model source concentrations, which contribute to the over-predicted concentrations of boron at P002.
- In general, the model over-predicts boron concentrations to the north of the Ash Pond (AW-19, AW-20, AW-22, and P002) in wells adjacent to wells AP07S and AW021 where the highest boron concentrations were observed. The proximity of P002 and AW-22 to the highest boron concentration targets contributed to the over-predicted boron concentrations at these wells. Similarly, the over-prediction of boron concentration at AW-17 is associated with the proximity of AW-17 to AW-18 where observed boron concentrations are elevated.

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 boron (2 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 boron concentrations relative to wells with concentrations above and below the GWPS. UA well AW-21, located north of the Ash Pond, where the highest boron concentrations were observed, was also calibrated near the mean concentration of the observed values from November 2015 to August 2021. Similarly, PMP well AP07S located north of the Ash Pond, where the highest concentrations in the UCF were observed, was calibrated just below the maximum of the observed range from November 2015 to August 2021. The calibration result for wells AW-21 and AP07S indicate the transport calibration model was able to simulate the highest observed concentrations in both the UA and transmissive zone of the UCF (PMP), respectively. The remaining wells with observations above the standard GWPS for boron (2 mg/L) from November 2015 to August 2021 had calibrated concentrations above the GWPS (AW-05, AW-15S, AW-18, AW-19, AW-20). The distribution of boron concentrations in the calibrated model are presented on **Figure 5-21 through Figure 5-25**.

6. SIMULATION OF CLOSURE SCENARIOS

6.1 Overview and Prediction Model Development

Prediction simulations were performed to evaluate the effects of closure (source control) measures (CCR consolidation and CIP and CBR scenarios) for the Ash Pond on groundwater quality following initial corrective action measures, which includes removal of free liquids from the Ash Pond (**Figure 4-1**). As discussed in **Section 5.2.3.5**, 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 boron transport in the model (*i.e.,* Kd was set to 0) as discussed in **Section 5.2.3.6**. The following methods were used to develop the prediction models and simulate the CIP and CBR closure scenarios:

- Define ash fill material removal and consolidation areas based on designs provided in the Final Closure Plan (IngenAE, 2022).
- Apply a constant head to the Ash Pond for the dewatering period (approximately 1 year) to remove free liquids within the Ash Pond and simulate heads near ambient conditions.
- Remove source concentrations within the removal areas (source concentrations associated with recharge zones and saturated ash cells [constant concentration cells]).
- Apply drains (drain input parameters approximated designs provided in the Final Closure Plan [IngenAE, 2022]) to simulate storm water management within removal areas following closure.
- Apply hydraulic conductivity, recharge (HELP calculated percolation rates were developed based on soil backfill materials and final grading designs provided in the Final Closure Plan [IngenAE, 2022]), storage, and specific yield property zones to simulate soil backfill materials placed in the Ash Pond removal areas.
- Apply reduced recharge in the consolidation and closure in place areas to simulate the effects of the cover system on transport (HELP calculated percolation rates were developed based on cover system construction materials and designs provided in the Final Closure Plan [IngenAE, 2022]).

HELP modeling input and output values are summarized in **Table 6-1** and described in detail below. Prediction simulations were performed to evaluate changes in boron concentrations from two closure scenarios, including consolidation and CIP, and CBR scenarios. The following simplifying assumptions were made during the simulations:

- In the two 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 closure.
- Changes in recharge resulting from dewatering, ash fill removal, consolidation, construction of the cover system, and soil backfill placement and final grading (recharge rates are based on HELP-calculated average annual percolation rates) have an instantaneous effect on recharge and percolation through surface materials.

- Boron source concentrations were assumed to remain constant as a function of time following the end of the calibration simulation. Boron concentration in the ash fill removal areas was assumed to be 0 mg/L following construction to simulate removal of ash that is the source of boron.
- The start of each closure prediction simulation was initiated at the end of the calibration model period from 1960 to 2022. Two models were included for each closure prediction simulation, where the first model simulated the removal of free liquids period (1 year) and the second model simulated the final closure conditions (1,000 years). The prediction modeling timeline for each scenario is illustrated in **Figure 4-1**.
- The geocomposite drainage layer and geomembrane liner placed over the ash consolidation area were assumed to have good field placement and assumed to have the same slope as the final grade of the overlying cover materials based on the design drawings provided in the Final Closure Plan (IngenAE, 2022).
- Ash fill removal areas were assumed to be graded following placement of soil backfill based on the design drawings provided in the Final Closure Plan (IngenAE, 2022).
- All saturated ash (constant concentration cells) within removal areas in the transport calibration model were removed instantaneously in all prediction models following ash fill removal/final soil backfill grading. Local fill materials assumed to be sourced from surrounding UCF materials replaced ash fill in areas of removal.
- Local fill materials applied to the prediction models have similar hydraulic properties as the UCF materials used in the transport calibration models.

6.2 HELP Model Setup and Results

HELP (Version 4.0; Tolaymat and Krause, 2020) was used to estimate percolation through the Ash Pond areas for two ash fill closure scenarios and three area types, including CBR removal areas, CIP removal areas, and CIP consolidation and cover system areas. HELP files are included electronically (**Appendix C**) and outputs are attached to this report (**Appendix E**).

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 Peoria, Illinois (the closest weather station included in the HELP database). Precipitation, temperature, and solar radiation was simulated based on the latitude of the Ash Pond. Thickness and type of the geosynthetic drainage layer, geomembrane liner, soil backfill, and soil runoff input parameters were developed for the ash fill removal and consolidation scenarios using data provided the Final Closure Plan (IngenAE, 2022).

HELP model results (**Table 6-1**) indicated 5.09 inches of percolation per year for the Ash Pond CBR removal areas, 4.03 inches of percolation per year for the Ash Pond CIP removal areas, and 0.0002 inches of percolation per year for the Ash Pond consolidation and cover system areas. The differences in HELP model runs for each area included the following parameters: evaporation zone thickness (limited by unsaturated soil backfill thickness in the Ash Pond), area, soil backfill thickness, and soil runoff slope length; all other HELP model input parameters were the same for each simulated area. Two additional HELP model simulations were completed to support the *Proposed Alternative Final Protective Layer Equivalency Demonstration*, (Geosyntec, 2022) 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 E**.

6.3 Simulation of Closure Scenarios

The calibrated model was used to evaluate the effectiveness of the two closure scenarios by defining ash fill material removal and consolidation area, reducing head to simulate a dewatering period (approximately 1 year), removing source concentrations within the removal areas, applying drains to simulate storm water management within removal areas following closure, applying hydraulic conductivity, recharge, storage, and specific yield property zones to simulate soil backfill materials placed in the Ash Pond removal areas, and applying reduced recharge in the consolidation and closure in place areas to simulate the effects of the cover system on transport.

Each prediction scenario was initiated at the end of the calibration model and consisted of two models where the first model simulated the dewatering period (1 year) and the second model simulated the final closure conditions (**Figure 4-1**). The prediction model input values are summarized in **Table 6-2** and illustrated in **Figure 6-1 through Figure 6-6**.

In general, long predicted timeframes to reach the GWPS were observed for most wells in both CIP and CBR prediction scenarios. The long timeframes observed are a result of the generally low permeability materials adjacent to and underlying the Ash Pond, and generally low groundwater flow velocities observed within the water-bearing units of the site, which results in reduced transport and slow physical attenuation (dilution and dispersion). The observed timeframes to reach the GWPS for some wells in both the CIP and CBR prediction scenarios were on the order of hundreds of years from present. These predicted timeframes to meet the GWPS are less reliable than timeframes that are closer temporally to the data used for calibration (between 2015 and 2021). The two closure scenarios are discussed in this report based on predicted changes in boron concentrations as described below.

6.3.1 Closure Scenario 1 (CIP) Predicted Boron Concentrations

The design for Scenario 1: CIP includes an initial 1-year dewatering period to remove free liquids followed by 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 (**Figure 4-1**).

Predicted concentrations start to decline at all monitoring wells with observations above the GWPS for boron (2 mg/L) (AP07S, AW-05, AW-15S, AW-18, AW-19, AW-20, AW-21) once closure actions are initiated within the prediction model. These declines occur as the northwest area of ash fill is removed and saturated ash cells (constant concentration cells) are reduced in the area of the highest modeled source concentrations. Following removal of ash fill in the northwest area, boron concentrations are no longer entering the model domain from recharge or from saturated ash cells (constant concentration cells). Dewatering also reduces the head within the Ash Pond. 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 northwest, and by the greatly reduced infiltration rates (recharge) that result from placement of the cover system over the consolidated ash fill. As a result of the reduced heads and recharge, downward percolation of solute mass from the Ash Pond is reduced, which decreases the boron concentration entering the model domain. The reduced recharge resulting from placement of the cover system also reduces the number of

active saturated ash cells (constant concentration cells) contributing boron to the model domain. All monitoring wells with observations above the GWPS for boron (2 mg/L) are predicted to be below the GWPS 198 years after CIP implementation (model year 260 as illustrated in **Figure 6-7**). AW-19 takes the longest of these wells to be reduced below the GWPS, but like AW-20, this well is over-predicted in the calibration model. AW-21 and AP07S, which had the highest concentrations in the UA and UCF, respectively, and were among the wells with the best-fit model calibrations for boron concentration, were predicted to decline below the GWPS at 121 (model year 183) and 32 years (model year 94) after CIP implementation, as illustrated in **Figure 6-7**.

With the exception of wells AW-09 and AW-16, located along the southwestern side of the Ash Pond, all other modeled boron concentrations are predicted to decrease below the GWPS 382 years after CIP implementation (model year 444 as illustrated in **Figure 6-7**). The maximum extent of the plume above the standard GWPS for boron (2 mg/L) at this time is illustrated in **Figure 6-8,** where boron exceedances have retreated within the footprint of the former Ash Pond except along the southwestern edge of the pond. Along the southwestern edge of the pond, including wells AW-09 and AW-16, the model indicates concentrations will increase for a period of time following implementation of corrective measures before decreases are predicted.

The predicted increase and delayed reduction in concentration at wells AW-09 and AW-16 is a result of the wells being located along the flow path of the residual boron concentrations released into native geologic materials prior to closure. The prediction model indicates that as the plume recedes over time a south-southwest trending plume of historic boron concentrations above the standard GWPS for boron (2 mg/L) slowly moves along this flow path as physical attenuation takes place, eventually reducing concentrations at these wells to concentrations below the standard GWPS 767 years after implementation of closure (model year 829 as illustrated in **Figure 6-7**). The maximum extent of the plume at this time (model year 829) is illustrated in **Figure 6-9**. As illustrated in **Figure 6-8** and **Figure 6-9** the maximum extent of the plume at 382 (model year 444) and 767 (model year 829) years after CIP implementation remains in close proximity to the Ash Pond as the plume recedes and concentrations at monitoring wells AW-09 and AW-16 decrease (**Figure 6-7**).

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 F** and discussed below. Data export files used for flux evaluations are found along with model files in **Appendix C**.

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 97% and 94%, respectively, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize (approximate hydraulic steady state) as illustrated in **Figure 6-10**. **Figure 6-11** 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 increases for approximately 2 years as free liquids are no longer being actively removed from the CCR unit, then influx to the CCR unit decreases rapidly as illustrated in

Figure 6-11. Concurrently, outflux from the CCR unit is briefly reduced by approximately 100% following removal of free liquids, after 30 days a reduction of outflux of at least 80% is maintained as heads approach hydraulic stabilization (**Figure 6-11**).

6.3.2 Closure Scenario 2 (CBR) Predicted Boron Concentrations

The design for Scenario 2: CBR includes an initial 1-year dewatering period followed by CCR removal from the Ash Pond (**Figure 4-1**).

Like CIP, predicted concentrations for CBR start to decline at all monitoring wells with observations above the standard GWPS for boron (2 mg/L) (AP07S, AW-05, AW-15S, AW-18, AW-19, AW-20, AW-21) once the closure actions are initiated within the prediction model. In CBR, these declines occur as the ash fill is removed from the Ash Pond and saturated ash cells (constant concentration cells) are removed. Following removal of ash fill, boron 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 the Ash Pond. These low heads are maintained following completion of closure by the drain cells that simulate storm water management designs within the Ash Pond. As a result of the reduced heads, downward percolation of existing solute mass from the Ash Pond is reduced. All monitoring wells with observations above the standard GWPS for boron (2 mg/L) are predicted to be below the GWPS 104 years after closure implementation (model year 166 as illustrated in **Figure 6-12**). Similar to CIP, AW-19 takes the longest of these wells to be reduced below the GWPS. AW-21 and AP07S, which had the highest concentrations in the UA and UCF, respectively, and were among the wells with the best-fit model calibrations for boron concentration, were predicted to decline below the GWPS at 88 (model year 150) and 15 years (model year 77) after CBR implementation, as illustrated in **Figure 6-12**.

With the exception of wells AW-09 and AW-16, boron concentrations are predicted to decrease below the GWPS 201 years after CBR implementation (model year 263 as illustrated in **Figure 6-12**). The maximum extent of the plume at this time is illustrated in **Figure 6-13** where boron exceedances have retreated within the footprint of the former Ash Pond except along a limited portion of the southwestern edge of the pond. Like CIP, at wells AW-09 and AW-16 the model indicates concentrations will increase for a period of time following implementation of closure before decreases are predicted.

Also, like CIP, the predicted increase and delayed reduction in concentration at wells AW-09 and AW-16 is a result of the wells being located along the flow path of the residual boron concentrations released into native geologic materials prior to closure. The prediction model indicates that as the plume recedes over time a south-southwest trending plume of historic boron concentrations above the standard GWPS for boron (2 mg/L) slowly moves along this flow path as physical attenuation takes place, eventually reducing concentrations at these wells to concentrations below the GWPS 748 years after implementation of closure (model year 810 as illustrated in **Figure 6-12**). The maximum extent of the plume at this time is illustrated in **Figure 6-14**. As illustrated in **Figure 6-13** and **Figure 6-14**, the maximum extent of the plume at 201 (model year 263) and 748 (model year 810) years after CBR implementation, remains in close proximity to the Ash Pond as the plume recedes and concentrations at monitoring wells AW-09 and AW-16 decrease (**Figure 6-12**).

7. CONCLUSIONS

This GMR has been prepared to evaluate how proposed CIP and CBR closure scenarios will achieve compliance with the applicable groundwater standards at the EPP. Data collected from sampling events between November 2015 and August 2021 was used to develop a groundwater model for the EPP Ash Pond and surrounding area. The MODFLOW and MT3DMS models were then used to evaluate CIP using information provided in the Final Closure Plan (IngenAE, 2022), and CBR closure scenarios:

- 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)
- Scenario 2: CBR (CCR removal from the Ash Pond)

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 97% and 94%, respectively, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize.

Differences exist in the timeframes to reach the GWPS for most monitoring wells between CIP and CBR. For instance, wells with observations above the standard GWPS for boron (2 mg/L) from November 2015 to August 2021 (AP07S, AW-05, AW-15S, AW-18, AW-19, AW-20, AW-21) are predicted to reach the GWPS in 198 years after CIP implementation, and 104 years after CBR implementation. Shorter timeframes were predicted to reach the GWPS for wells located on the northern edge of the Ash Pond where observed boron concentrations were the highest (AW-21 and AP07S). AW-21 and AP07S, which had the highest concentrations in the UA and UCF, respectively, were predicted to decline below the GWPS at 121 and 32 years, respectively, after CIP implementation, and at 88 and 15 years, respectively, after CBR implementation. However, as a result of the south-southwest trending plume of residual boron concentrations above the GWPS for boron (2 mg/L) released to native geologic materials prior to closure, which remains for a long period of time following implementation of both scenarios, all monitoring wells are not predicted to reach the GWPS until after 767 years and 748 years following implementation of CIP and CBR, respectively.

The observed timeframes to reach the GWPS for both the CIP and CBR prediction scenarios were on the order of hundreds of years from present; these predicted timeframes to meet the GWPS are less reliable than timeframes that are closer temporally to the data used for calibration (between 2015 and 2021). From a modeling perspective, the 19-year difference between CIP and CBR to reach the GWPS is negligible. In other words, both scenarios are predicted to reach the GWPS after approximately 750 years, and the simulated 19-year difference between these two scenarios is not significant. Further, the boron plumes for both CIP and CBR remain in close proximity to the Ash Pond while they recede, indicating they are equally protective.

Statistically significant correlations between boron concentrations and concentrations of sulfate and TDS identified as potential exceedances of the GWPS indicate boron is an acceptable surrogate for these parameters in the groundwater model. Concentrations of these parameters are expected to change along with model predicted boron concentrations.

Results of groundwater fate and transport modeling conservatively estimate that groundwater will attain the GWPS for all constituents identified as potential exceedances of the GWPS in approximately 750 years following closure implementation for both CIP and CBR. The long timeframes observed are a result of the generally low permeability materials adjacent to and

underlying the Ash Pond, and generally low groundwater flow velocities observed within the water-bearing units of the site, which results in reduced transport and slow physical attenuation (dilution and dispersion). The predicted maximum extent of the plume above the standard GWPS for boron (2 mg/L) stays in close proximity to the ash pond as it recedes.

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TABLES

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AP05S	UA	11/29/2016	443.53	443.53	Top of PVC	441.13	32.87	37.64	408.26	403.49	38.06	403.10	4.8	2	40.598807	-89.66191
AP05D	BCU	12/05/2016	443.45	443.45	Top of PVC	441.23	47.09	56.69	394.14	384.54	57.17	382.90	9.6	2	40.598796	-89.661901
AP06	UCF	11/30/2016	442.17	442.17	Top of PVC	439.53	19.93	24.72	419.60	414.81	25.00	414.50	4.8	2	40.601038	-89.662759
AP07S	UCF	12/02/2016	461.08	461.08	Top of PVC	458.31	29.95	34.74	428.36	423.57	35.00	423.30	4.8	2	40.59793	-89.666919
AP07D	BCU	12/08/2016	460.89	460.89	Top of PVC	458.42	55.01	64.59	403.41	393.83	65.00	393.40	9.6	2	40.597941	-89.666926
AP08	CCR	12/06/2016	460.60	460.60	Top of PVC	458.10	9.99	19.58	448.11	438.52	19.98	438.10	9.6	2	40.594578	-89.668728
AP09	CCR	12/07/2016	460.22	460.22	Top of PVC	457.24	9.79	19.39	447.45	437.85	19.80	437.40	9.6	2	40.59149	-89.666303
APW-01	UCF	07/27/2010	441.07	441.07	Top of PVC	437.83	7.60	18.00	430.23	419.83	18.00	419.30	10.4	2	40.600127	-89.66512
APW-02	UCF	07/20/2010	464.92	464.92	Top of PVC	461.72	39.60	50.00	422.12	411.72	50.00	411.70	10.4	2	40.594228	-89.665642
APW-03	UCF	07/19/2010	444.37	444.37	Top of PVC	441.22	19.60	30.00	421.62	411.22	30.00	411.20	10.4	2	40.591259	-89.663843
APW-04	UCF	07/27/2010	439.66	439.66	Top of PVC	437.19	9.60	20.00	427.59	417.19	20.00	417.20	10.4	2	40.587909	-89.663726
AW-01	PMP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AW-05	UA	07/22/2015	--	443.37	Top of Disk	440.55	15.87	20.47	424.68	420.08	21.10	419.50	4.6	2	40.598645	-89.666407
AW-06	UA	08/03/2015	--	461.57	Top of Disk	459.19	36.60	41.09	422.59	418.10	41.69	416.90	4.5	2	40.594237	-89.670051
AW-08	UA	07/21/2015	--	462.54	Top of Disk	460.66	47.55	57.19	413.11	403.47	57.70	403.00	9.6	2	40.593964	-89.661996
AW-09	UA	08/03/2015	--	461.45	Top of Disk	458.32	47.14	51.62	411.18	406.70	52.23	406.10	4.5	2	40.590422	-89.668777
AW-10	UA	07/23/2015	--	439.93	Top of Disk	437.64	27.62	32.23	410.02	405.41	32.74	404.90	4.6	2	40.590733	-89.663826
AW-11	UA	07/28/2015	--	439.87	Top of Disk	437.16	24.21	28.81	412.95	408.35	29.31	407.20	4.6	2	40.587261	-89.663781
AW-12	UA	01/07/2021	443.80	443.80	Top of PVC	441.16	26.00	31.00	415.16	410.16	31.00	406.20	5	2	40.591071	-89.661333
AW-13	UA	01/09/2021	441.26	441.26	Top of PVC	438.67	25.00	30.00	413.67	408.67	30.00	408.70	5	2	40.588378	-89.663714
AW-14	UA	01/08/2021	439.40	439.40	Top of PVC	436.83	24.00	29.00	412.83	407.83	29.00	401.80	5	2	40.58729	-89.665621
AW-15	UA	01/08/2021	441.51	441.51	Top of PVC	438.95	33.00	38.00	405.95	400.95	38.00	399.00	5	2	40.587964	-89.666822
AW-15C	BCU	01/08/2021	440.02	440.02	Top of PVC	437.62	43.00	48.00	394.62	389.62	48.00	337.60	5	2	40.588	-89.666882

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
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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)
AW-15S	UCF	01/08/2021	440.71	440.71	Top of PVC	437.92	8.00	18.00	429.92	419.92	18.00	417.90	10	2	40.587955	-89.666841
AW-16	UA	01/08/2021	461.79	461.79	Top of PVC	459.45	55.00	60.00	404.45	399.45	60.00	396.50	5	2	40.589457	-89.667799
AW-17	UA	01/08/2021	462.10	462.10	Top of PVC	459.69	51.00	56.00	408.69	403.69	56.00	402.70	5	2	40.591698	-89.669404
AW-18	UA	01/09/2021	462.65	462.65	Top of PVC	460.28	46.00	51.00	414.28	409.28	51.00	405.30	5	2	40.593044	-89.669822
AW-19	UA	01/09/2021	460.74	460.74	Top of PVC	458.53	35.00	40.00	423.53	418.53	40.00	415.50	5	2	40.595434	-89.66972
AW-20	UA	01/10/2021	461.48	461.48	Top of PVC	459.08	36.50	41.50	422.58	417.58	41.50	416.10	5	2	40.596469	-89.66891
AW-21	UA	01/10/2021	460.61	460.61	Top of PVC	458.28	32.00	37.00	426.28	421.28	37.00	420.30	5	2	40.597294	-89.667734
AW-22	UA	01/08/2021	463.19	463.19	Top of PVC	460.30	44.00	49.00	416.30	411.30	49.00	410.30	5	2	40.596836	-89.666783
P002	UCF	--	460.39	460.39	Top of PVC	458.70	30.60	35.60	--	--	35.90	--	5	2	40.596235	-89.669084
XPW01A	CCR	01/09/2021	464.16	464.16	Top of PVC	460.99	33.00	43.00	427.99	417.99	43.00	418.00	10	2	40.596306	-89.667345
XPW02	CCR	01/09/2021	473.79	473.79	Top of PVC	471.16	36.00	46.00	435.16	425.16	46.00	424.20	10	2	40.594351	-89.668312
XPW03	CCR	01/10/2021	466.04	466.04	Top of PVC	462.62	27.00	37.00	435.62	425.62	37.00	422.60	10	2	40.591416	-89.666188
SG-01	SW	--	--	--	--	--	--	--	--	--	--	--	--	--	40.596075	-89.661625

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
-- = data not available
BCU = bedrock confining unit
bgs = below ground surface
CCR = coal combustion residuals
ft = foot or feet
HSU = Hydrostratigraphic Unit
PMP = potential migration pathway
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer
UCF = Upper Cahokia Formation

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TABLE 2-2. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, IL

Well ID	Monitored Hydrogeologic Unit	Modeled Well Location (Layer Number)	Modeled Target Location (Layer Number)	Flow Model Target Groundwater Elevation Mean Value November 2015 to August 2021 (feet NAVD88)	Transport Model Target Boron Concentrations November 2015 to August 2021 (mg/L)		
					Minimum	Mean	Maximum
G01D	UA	4	4	438.14	0.2	0.3	0.4
G02D	BCU	5	5	439.88 [1]	1.0	1.3	1.7
G03	UCF	3	3	437.72	No Target		
G04	UCF	2	2	436.45	5.8	7.9	12.0
G05	BCU	5	5	437.92 [1]	1.2	1.4	1.8
G06	CCR	1	1	452.28	3.0	7.5	12.0
G07	CCR	1	1	451.93	3.1	4.2	5.3
APW-01	UCF	3	3	435.62	0.7	0.7	0.8
APW-02	UCF	3	1	454.95 [2]	0.0	0.1	0.1
APW-03	UCF	3	3	436.52 [2]	0.1	0.1	0.2
APW-04	UCF	2	2	432.65	0.5	0.6	0.7
AW-05	UA	4	4	434.93	1.4	2.9	7.6
AW-06	UA	5	5	434.49	0.1	0.2	0.3
AW-08	UA	4	4	440.60 [2]	0.1	0.1	0.2
AW-09	UA	4	4	435.68	0.2	0.5	1.3
AW-10	UA	4	4	438.89	0.4	0.5	0.6
AW-11	UA	4	4	433.79	0.2	0.2	0.3
AW-12	UA	4	4	436.56	0.2	0.2	0.3
AW-13	UA	4	4	435.69	0.3	0.3	0.3
AW-14	UA	4	4	432.85 [3]	0.2	0.2	0.2
AW-15	UA	4	4	433.66	0.3	0.4	0.6
AW-15C	BCU	5	5	433.38	0.6	0.7	0.8
AW-15S	UCF	2	2	430.93	5.4	5.7	6.2
AW-16	UA	4	4	437.68	0.5	0.5	0.6
AW-17	UA	4	4	437.31	0.4	0.4	0.5
AW-18	UA	4	5	435.15	0.4	1.5	3.0
AW-19	UA	4	3	447.39	2.5	2.7	2.9
AW-20	UA	4	3	445.03	2.1	2.2	2.3
AW-21	UA	4	3	443.70	11.0	11.5	12.0
AW-22	UA	3	1	451.58	0.2	0.3	0.4

TABLE 2-2. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING REPORT

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, IL

Well ID	Monitored Hydrogeologic Unit	Modeled Well Location (Layer Number)	Modeled Target Location (Layer Number)	Flow Model Target Groundwater Elevation Mean Value November 2015 to August 2021 (feet NAVD88)	Transport Model Target Boron Concentrations November 2015 to August 2021 (mg/L)		
					Minimum	Mean	Maximum
P002	UCF	3	2	448.39	1.1	1.2	1.4
XPW01A	CCR	2	2	452.57	15	16.7	19
XPW02	CCR	2	2	453.29	13	14.5	16
XPW03	CCR	2	2	450.75	4.9	5.5	7

[O: EGP4/5/22, C: JJW 4/5/22; JRK 4/11/22]

Notes:

[1] Target groundwater elevations presented are from data collected between February 2020 and February 2021. Groundwater elevations collected prior to and after these dates were recovering between sampling events and do not represent static groundwater conditions in each well.

[2] Target groundwater elevations exclude February 11th, 2021 event due to groundwater elevations recovering between sampling events.

[3] Target groundwater elevations exclude June 15th, 2021 event due to gauging error.

ID = identification

mg/L = milligrams per liter

NAVD88 = North American Vertical Datum of 1988

Hydrogeologic Unit:

BCU = bedrock confining unit

CCR = coal combustion residuals

PMP = primary migration pathway

UA = uppermost aquifer

UCF = upper cahokia formation

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Zone	Hydrostratigraphic Unit	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1]
Horizontal Hydraulic Conductivity			**Calibration Model**			**Calibration Model**	
1	Upper Clay (UCF)	clay and silt	0.002	7.06E-07	NA	Calibrated	low
2	Transmissive Zone (UCF [PMP])	clay and silt at elevations similar to base of ash, thin discontinuous sand lenses	2	7.06E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	high
3	Lower Clay (UCF)	clay and silt	0.011	3.88E-06	NA	Calibrated	moderate
4	Weathered Shale (UA)	weathered shale, sand, silty sand, clayey gravel, bedrock contact with overlying materials	3	1.06E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	high
5	Competent Shale (BCU)	shale	0.01	3.53E-06	NA	Geomean of Field Test Results (Ramboll, 2021a)	moderate
6	Fill Unit (CCR)	CCR	0.1	3.53E-05	NA	Calibrated	high
7	UCF above River Boundary Conditions	NA	200	7.06E-02	NA	Calibrated - Conductivity Value to Allow Groundwater Flow from UCF to River Boundary Conditions	moderate
9	Sankoty Aquifer - Sands	sand	42	1.48E-02	NA	Calibrated	high
Vertical Hydraulic Conductivity			**Calibration Model**			**Calibration Model**	
1	Upper Clay (UCF)	clay and silt	0.0002	7.06E-08	10	Geomean of Laboratory Test Results (Ramboll, 2021a)	high
2	Transmissive Zone (UCF [PMP])	clay and silt at elevations similar to base of ash, thin discontinuous sand lenses	0.2	7.06E-05	10	Calibrated	low
3	Lower Clay (UCF)	clay and silt	0.00011	3.88E-08	100	Geomean of Laboratory Test Results (Ramboll, 2021a; Haley & Aldrich, Inc., 2018)	high
4	Weathered Shale (UA)	weathered shale, sand, silty sand, clayey gravel, bedrock contact with overlying materials	0.3	1.06E-04	10	Calibrated	negligible
5	Competent Shale (BCU)	shale	0.0001	3.53E-08	100	Calibrated	moderate
6	Fill Unit (CCR)	CCR	0.006	2.12E-06	17	Calibrated - Within Range Laboratory Test Results (Ramboll, 2021a)	moderate
7	UCF above River Boundary Conditions	NA	200	7.06E-02	1	Calibrated - Conductivity Value to Allow Groundwater Flow from UCF to River Boundary Conditions	negligible
9	Sankoty Aquifer - Sands	sand	42	1.48E-02	1	Calibrated	negligible
Zone	**Hydrostratigraphic Unit**	**Materials**	**ft/d**	**in/yr**	**Kh/Kv**	**Value Source**	**Sensitivity[1]**
Recharge			**Calibration Model**			**Calibration Model**	
1	Upper Clay (UCF)	clay and silt	1.00E-05	0.044	NA	Calibrated	high
2	Fill Unit - CCR (Central, Fly Ash Pond)	CCR	2.20E-04	0.96	NA	Calibrated	high
3	Fill Unit - CCR (South of Railroad, Inactive Area)	CCR	1.00E-05	0.044	NA	Calibrated	negligible
4	Fill Unit - CCR (Northwest, Process Water Pond)	CCR	1.50E-04	0.66	NA	Calibrated	moderately high
5	Fill Unit - CCR (South, Clarification Pond)	CCR	5.00E-05	0.22	NA	Calibrated	moderate
7	Fill Unit - CCR (Northeast, Sluice Area)	CCR	9.00E-04	3.94	NA	Calibrated	high
Storage							
1	Upper Clay (UCF)	clay and silt	*Not used in steady-state calibration model*				
2	Transmissive Zone (UCF [PMP])	clay and silt at elevations similar to base of ash, thin discontinuous sand lenses					
3	Lower Clay (UCF)	clay and silt					
4	Weathered Shale (UA)	weathered shale, sand, silty sand, clayey gravel, bedrock contact with overlying materials					
5	Competent Shale (BCU)	shale					
6	Fill Unit (CCR)	CCR					
7	Sankoty Aquifer - Sands	sand					
8	UCF above River Boundary Conditions	NA					

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

River Parameters

	Relative Location	River Width (feet)	Average Length of River (feet)	Bed Thickness (feet)	Hydraulic Conductivity (ft/d)	Stage (feet)	Average River Conductance (ft^2/d)
Reach 1	Illinois River	750	24.5	1	1	438.44 - 438.24	1.84E+04
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	moderate	negligible
Reach 2	Drainage Ditch West of Ash Pond	20	25	1	0.00001	432	5.00E-03
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	low	moderate
Reach 3	Drainage Swale North of Ash Pond	25	25	1	0.00001	430.07	6.25E-03
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	negligible	low
Reach 4	Drainage Pond Northeast of Ash Pond	25	25	1	0.00001	433.24	6.25E-03
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	low	low
Value Source	NA	Calibrated	Calibrated	Calibrated	Calibrated	Calibrated - Mean Illinois River Stage at Edwards Power Plant Interpolated from Stage Data Provided at Peoria, Illinois (USCE 404208089335201), Edwards Power Plant (Plant Gaging Station), and Kingston, Illinois (USGS 05568500) Gaging Stations; Drainage Feature Stage (Reach 2 - 4) Based on Survey Data Collected by IngenAE in February 2022	Calibrated

General Head Parameters

	Relative Location	Width of General Head Boundary Cell (feet)	Distance to General Head Boundary Head (feet)	Average Saturated Thickness of Cell (feet)	Hydraulic Conductivity (ft/d)	Head (feet)	Average General Head Boundary Conductance (ft^2/d)
Reach 1	North Edge of Model (Peoria Pumping Center) and Southeast Edge of Model (Pekin Pumping Center)	150 (North Edge of Model); 750 (Southeast Edge of Model)	1	100 (North Edge of Model); 39 (Southeast Edge of Model)	100	426	1.50E+06 (North Edge of Model); 2.92E+06 (Southeast Edge of Model)
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	high	negligible
Value Source	NA	Calibrated	Calibrated	Calibrated	Calibrated	Calibrated - Location of General Head Boundaries Based on Data Availabile in Burch and Kelly (1993)	Calibrated

[O: JJW 4/14/22; C: JRK 4/14/22]

Notes:

[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%
SSR = sum of squared residuals
- - - = not tested
CCR = coal combustion residuals
cm/s = centimeters per second
ft/d = feet per day
ft^2/day = feet squared per day
in/yr = inches per year
Kh/Kv = anisotropy ratio
NA = not applicable

Hydrogeologic Unit:
BCU = bedrock confining unit
CCR = coal combustion residuals
PMP = primary migration pathway
UA = uppermost aquifer
UCF = upper cahokia formation

References:

Burch, S. L. and D. J. Kelly., 1993. Peoria-Pekin Regional Ground-Water Quality Assessment. Illinois State Water Survey (ISWS), Champaign, Research Report 124.
Haley & Aldrich, Inc., 2018. Technical Memorandum: Ash Pond – Underlying Clay and Depth of CCR Evaluation, Edwards Station, Bartonville, Illinois, February 12, 2018.
Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021a. Hydrogeologic Site Characterization Report. Edwards Ash Pond. Edwards Power Plant. Bartonville, Illinois.

TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Zone	Hydrostratigraphic Unit	Materials	Calibration Model						
			Stress Period 1 Dates: 1960-2004 Recharge (ft/d)	Stress Period 2 Dates: 2005-2022 Recharge (ft/d)	Boron Concentration (mg/L)			Value Source	Sensitivity
Initial Concentration									
Entire Domain	NA	NA	NA	NA	0			NA	- - -
Source Concentration (recharge)									
2	Fill Unit - CCR (Central, Fly Ash Pond)	CCR	2.20E-04	2.20E-04	3			calibrated	- - -
3	Fill Unit - CCR (South of Railroad, Inactive Area)	CCR	5.00E-05	1.00E-05	3			calibrated	- - -
4	Fill Unit - CCR (Northwest, Process Water Pond)	CCR	1.50E-04	1.50E-04	13			calibrated	- - -
5	Fill Unit - CCR (South, Clarification Pond)	CCR	5.00E-05	5.00E-05	3			calibrated	- - -
7	Fill Unit - CCR (Northeast, Sluice Area)	CCR	9.00E-04	9.00E-04	0.5			calibrated	- - -
Source Concentration (constant concentration cells)									
Reach 2	Fill Unit - CCR (Central, Fly Ash Pond)	CCR	NA	NA	3			calibrated	- - -
Reach 3	Fill Unit - CCR (South of Railroad, Inactive Area)	CCR	NA	NA	3			calibrated	- - -
Reach 4	Fill Unit - CCR (Northwest, Process Water Pond)	CCR	NA	NA	13			calibrated	- - -
Reach 5	Fill Unit - CCR (South, Clarification Pond)	CCR	NA	NA	3			calibrated	- - -
Reach 7	Fill Unit - CCR (Northeast, Sluice Area)	CCR	NA	NA	0.5			calibrated	- - -
Storage, Specific Yield and Effective Porosity									
Zone	**Hydrostratigraphic Unit**	**Materials**	NA	NA	**Storage**	**Specific Yield**	**Effective Porosity**	**Value Source**	**Sensitivity**
1	Upper Clay (UCF)	clay and silt	NA	NA	0.003	0.135	0.135	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
2	Transmissive Zone (UCF [PMP])	clay and silt at elevations similar to base of ash, thin discontinuous sand lenses	NA	NA	0.003	0.183	0.183	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
3	Lower Clay (UCF)	clay and silt	NA	NA	0.003	0.07	0.07	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
4	Weathered Shale (UA)	weathered shale, sand, silty sand, clayey gravel, bedrock contact with overlying materials	NA	NA	0.003	0.204	0.204	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
5	Competent Shale (BCU)	shale	NA	NA	0.003	0.1	0.1	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
6	Fill Unit (CCR)	CCR	NA	NA	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
7	Sankoty Aquifer - Sands	sand	NA	NA	0.003	0.274	0.274	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
8	UCF above River Boundary Conditions	NA	NA	NA	0.003	0.5	0.5	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Effective Porosity Esitmated from Literature (Morris and Johnson, 1967; Heath, 1983)	see Table 5-3
Dispersivity									
Applicable Region	**Hydrostratigraphic Unit**	**Materials**	NA	NA	**Longitudinal (feet)**	**Transverse (feet)**	**Vertical (feet)**	**Value Source**	**Sensitivity**
Entire Domain	NA	NA	NA	NA	3	0.3	0.03	calibrated	- - -

[O: JJW 4/11/22; EGP 4/11/22]

Notes:
[1] The concentrations from the end of the calibrated transport model were imported as initial concentrations for the prediction model runs.
- - - = not tested
ft/d = feet per day
mg/L = milligrams per liter
NA = not applicable

References:

Fetter, C.W., 1988, Applied Hydrogeology, Merrill Publishing Company, Columbis, Ohio.
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.
Heath, R.C., 1983. Basic ground-water hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p.

Hydrogeologic Unit:
BCU = bedrock confining unit
CCR = coal combustion residuals
PMP = primary migration pathway
UA = uppermost aquifer
UCF = upper cahokia formation

TABLE 5-3. TRANSPORT MODEL INPUT VALUES (SENSITIVITY)
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Well ID	Calibration Concentration (mg/L)	Storage and Specific Yield				Effective Porosity			
		File Name		File Name		File Name		File Name	
		EDW_Conc_339_s_sy_low.gwv		EDW_Conc_339_s_sy_high.gwv		EDW_Conc_339_Por_low.gwv		EDW_Conc_339_Por_high.gwv	
		Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]
AP05S	0.0	0.0	moderate	0.0	moderate	0.0	high	0.0	moderately high
AP05D	0.0	0.0	moderately high	0.0	moderately high	0.0	high	0.0	moderately high
AP07S	11.6	11.5	negligible	11.5	negligible	11.8	low	11.3	low
AP07D	0.0	0.0	low	0.0	low	0.1	high	0.0	moderately high
AP08	3.0	3.0	negligible	3.0	negligible	3.0	negligible	3.0	negligible
AP09	3.0	3.0	negligible	3.0	negligible	3.0	negligible	3.0	negligible
APW-01	0.0	0.0	moderate	0.0	moderate	0.4	high	0.0	moderately high
APW-02	0.8	0.8	low	0.8	low	1.4	moderately high	0.5	moderate
APW-03	1.3	1.3	low	1.3	low	2.1	moderately high	0.9	moderate
APW-04	0.1	0.1	low	0.1	moderate	0.3	high	0.0	moderately high
AW-05	2.3	2.4	low	2.3	low	7.5	high	0.6	moderately high
AW-06	0.0	0.0	low	0.0	low	0.0	high	0.0	moderately high
AW-08	0.0	0.0	low	0.0	low	0.0	high	0.0	moderately high
AW-09	1.3	1.3	negligible	1.3	negligible	2.3	moderately high	0.7	moderate
AW-10	1.1	1.1	negligible	1.1	negligible	1.9	moderately high	0.7	moderate
AW-11	1.6	1.6	negligible	1.6	negligible	2.0	moderate	1.3	moderate
AW-12	0.0	0.0	moderate	0.0	moderate	0.1	high	0.0	moderately high
AW-13	1.6	1.6	low	1.6	low	2.1	moderate	1.3	moderate
AW-14	1.9	1.9	negligible	1.9	low	2.3	moderate	1.7	moderate
AW-15	1.5	1.5	low	1.6	low	2.1	moderate	1.2	moderate
AW-15C	0.0	0.0	negligible	0.0	low	0.0	high	0.0	moderately high
AW-15S	2.4	2.4	negligible	2.5	negligible	2.6	low	2.2	low
AW-16	1.2	1.2	negligible	1.2	negligible	2.0	moderately high	0.7	moderate
AW-17	2.2	2.2	negligible	2.2	negligible	2.9	moderate	1.6	moderate
AW-18	2.8	2.8	negligible	2.8	negligible	3.3	moderate	2.3	moderate
AW-19	7.3	7.3	negligible	7.3	negligible	9.5	moderate	5.4	moderate
AW-20	5.3	5.5	low	5.5	low	9.4	moderately high	3.2	moderate
AW-21	11.4	11.4	negligible	11.4	negligible	12.4	low	10.2	moderate
AW-22	3.3	3.3	negligible	3.3	negligible	3.6	moderate	2.5	moderate
P002	11.4	11.4	negligible	11.4	negligible	12.3	low	10.4	low
XPW01A	13.0	13.0	negligible	13.0	negligible	13.0	negligible	13.0	negligible
XPW02	3.0	3.0	negligible	3.0	negligible	3.0	negligible	3.0	negligible
XPW03	3.0	3.0	negligible	3.0	negligible	3.0	negligible	3.0	negligible
		S*0.1 Sy*0.5		S*10 Sy*2^2		Porosity-0.05		Porosity+0.05	

[O: JJW 4/14/22; C: JRK 4/14/22]

TABLE 5-3. TRANSPORT MODEL INPUT VALUES (SENSITIVITY)

GROUNDWATER MODELING REPORT

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, ILLINOIS

Notes:

[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] High specific yield sensitivity not analyzed for zone 8 (UCF above River Boundary Conditions) since the calibration value was already near upper limits of acceptable values for specific yield

ID = identification

mg/L = milligrams per liter

S = storativity

Sy = specific yield

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Closure Scenario - Area Description	CBR - Removal Area	CIP - Removal Area	CIP - Consolidation and Cover System Area	Notes
Input Parameter				
Climate-General				
City	Bartonville, IL	Bartonville, IL	Bartonville, IL	Nearby city to the Site within HELP database
Latitude	40.60	40.60	40.60	Site latitude
Evaporative Zone Depth	18	18	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	Peoria, IL	Peoria, IL	Peoria, IL	Nearby city to the Edwards Ash Pond 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: 40.60/-89.66	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 40.60/-89.66	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 40.60/-89.66	
Soils-General				
% where runoff possible	100	100	100	
Area (acres)	91	22	69	CBR - Removal Area based on HCR (Ramboll, 2021a); CIP - Consolidation and Cover System Area based on construction drawing for Edwards Ash Pond; 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	Unsaturated Backfill Material (HELP Final Cover Soil [topmost layer])	Unsaturated Backfill Material (HELP Final Cover Soil [topmost layer])	Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])	Layers details for CBR and CIP areas based on grading plans, construction drawings, and cover system design for Edwards Ash Pond
2	--	--	Protective Soil Layer (HELP Vertical Percolation Layer)	
3	--	--	Geocomposite Drainage Layer (HELP Geosynthetic Drainage Net)	
4	--	--	Geomembrane Liner	
5	--	--	Unsaturated CCR Material (HELP Waste)	
Soil Parameters--Layer 1, Unsaturated Backfill Material (HELP Final Cover Soil [topmost layer]) or Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])				
Type	1	1	1	Vertical Percolation Layer (Cover Soil)
Thickness (in)	12	72	6	For CBR and CIP removal areas, layer 1 thickness is the average thickness of unsaturated backfill material placed after removal
Texture	12	12	23	defaults used
Description	Silty Clay Loam	Silty Clay Loam	Silty Loam (Moderate)	
Saturated Hydraulic Conductivity (cm/s)	4.20E-05	4.20E-05	9.00E-06	defaults used
Soil Parameters--Layer 2, Protective Soil Layer (HELP Vertical Percolation Layer)				
Type	--	--	1	Vertical Percolation Layer
Thickness (in)	--	--	18	design thickness
Texture	--	--	10	defaults used
Description	--	--	Sandy Clay Loam	
Saturated Hydraulic Conductivity (cm/s)	--	--	1.20E -4	defaults used

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Closure Scenario - Area Description	CBR - Removal Area	CIP - Removal Area	CIP - Consolidation and Cover System Area	Notes
Soil Parameters--Layer 3, Geocomposite Drainage Layer(HELP Geosynthetic Drainage Net)				
Type	--	--	2	Lateral Drainage Layer
Thickness (in)	--	--	0.2	design thickness
Texture	--	--	20	defaults used
Description	--	--	Geosynthetic Drainage Net	
Saturated Hydraulic Conductivity (cm/s)	--	--	1.00E+01	defaults used
Soil Parameters--Layer 4, Geomembrane Liner				
Type	--	--	4	Flexible Membrane Liner
Thickness (in)	--	--	0.04	design thickness
Texture	--	--	36	defaults used
Description	--	--	Geomembrane	
Saturated Hydraulic Conductivity (cm/s)			4.00E -13	defaults used
Soil Parameters--Layer 5, Unsaturated CCR Material (HELP Waste)				
Type	--	--	1	Vertical Percolation Layer (Waste)
Thickness (in)	--	--	408	Estimated unsaturated CCR thickness within CIP Consolidation and Cover System Area
Texture	--	--	30	Custom layer, adjusted for site specific hydraulic conductivity
Description	--	--	High-Density Electric Plant Coal Fly Ash	
Saturated Hydraulic Conductivity (cm/s)	--	--	2.08E-06	calibrated flow model vertical hydraulic conductivity for CCR
Soils--Runoff				
Runoff Curve Number	86.1	86.1	89.3	HELP-computed curve number
Slope	0.25%	0.25%	1.27%	Estimated average from construction design drawings for Edwards Ash Pond
Length (ft)	1300	1300	1190	estimated maximum flow path
Texture	12	12	23	uppermost layer texture
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				
Percolation Rate (in/yr)	**5.09**	**4.03**	**0.0002**	

O: EGP 4/5/2022 C: JJW 4/5/2022

Notes:
% = percent
cm/s = centimeters per second
ft = feet
HELP = Hydrologic Evaluation of Landfill Performance
IL = Illinois
in = inches
in/yr = inches per year
Lat = latitude
Long = longitude
CBR = Closure By Removal
CIP = Closure In Place
HCR = Hydrogeologic Characterization Report

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), 2021a. Hydrogeologic Site Characterization Report. Edwards Ash Pond. Edwards Power Plant. Bartonville, Illinois.

TABLE 6-2. PREDICTION MODEL INPUT VALUES
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

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)	Hydrostratigraphic Unit	Recharge Zone	Boron Recharge Concentration (mg/L)	Recharge (ft/day)	Recharge (in/yr)	Constant Head (feet)	Constant Concentration (mg/L)
Dewatering	1	Fill Unit - CCR Consolidation and Cover System (Central, Fly Ash Pond)	2	3	4.44E-08	0.0002	434	3
Dewatering	1	Fill Unit - CCR Consolidation and Cover System (South of Railroad, Inactive Area)	3	3	4.44E-08	0.0002	434	3
Dewatering	1	Fill Unit - CCR Consolidation and Cover System (Northwest, Process Water Pond)	4	13	4.44E-08	0.0002	434	13
Dewatering	1	Fill Unit - CCR Consolidation and Cover System (South, Clarification Pond)	5	3	4.44E-08	0.0002	434	3
Dewatering	1	Fill Unit - CCR Consolidation and Cover System (Northeast, Sluice Area)	7	0.5	4.44E-08	0.0002	434	0.5
Dewatering	1	Fill Unit - CCR Removal (Northwest, Process Water Pond and Fly Ash Pond)	10	0	9.19E-04	4.03	434	0
CIP	1000	Fill Unit - CCR Consolidation and Cover System (Central, Fly Ash Pond)	2	3	4.44E-08	0.0002	--	3
CIP	1000	Fill Unit - CCR Consolidation and Cover System (South of Railroad, Inactive Area)	3	3	4.44E-08	0.0002	--	3
CIP	1000	Fill Unit - CCR Consolidation and Cover System (Northwest, Process Water Pond)	4	13	4.44E-08	0.0002	--	13
CIP	1000	Fill Unit - CCR Consolidation and Cover System (South, Clarification Pond)	5	3	4.44E-08	0.0002	--	3
CIP	1000	Fill Unit - CCR Consolidation and Cover System (Northeast, Sluice Area)	7	0.5	4.44E-08	0.0002	--	0.5
CIP	1000	Fill Unit - CCR Removal (Northwest, Process Water Pond and Fly Ash Pond)	10	0	9.19E-04	4.03	--	--

Prediction Model	Construction Period (years)	Hydrostratigraphic Unit	Hydraulic Conductivity Zone	Horizontal Hydraulic Conductivity (ft/d)	Horizontal Hydraulic Conductivity (cm/s)	Vertical Hydraulic Conductivity (ft/d)		Vertical Hydraulic Conductivity (cm/s)
Dewatering	1	Fill Unit (CCR)	6	0.1	3.53E-05	0.006		2.12E-06
Dewatering	1	Fill Unit (Soil Backfill)	10	1.19	4.20E-04	0.119		4.20E-05
CIP	1000	Fill Unit (CCR)	6	0.1	3.53E-05	0.006		2.12E-06
CIP	1000	Fill Unit (Soil Backfill)	10	1.19	4.20E-04	0.119		4.20E-05

Prediction Model	Construction Period (years)	Hydrostratigraphic Unit	Storage, Specific Yield and Effective Porosity Zone	Storage	Specific Yield		Effective Porosity
Dewatering	1	Fill Unit (CCR)	6	0.003	0.2		0.2
Dewatering	1	Fill Unit (Soil Backfill)	10	0.003	0.16		0.16
CIP	1000	Fill Unit (CCR)	6	0.003	0.2		0.2
CIP	1000	Fill Unit (Soil Backfill)	10	0.003	0.16		0.16

Prediction Model	Construction Period (years)	Drain Width (feet)	Length of Drain Cell (feet)	Drain Bed Thickness (feet)	Hydraulic Conductivity (ft/d)	Stage of Drain (feet)		Drain Conductance (ft^2/d)
Dewatering	1	Fill Unit (Soil Backfill)	--	--	--	--		--
CIP	1000	Fill Unit (Soil Backfill)	25	1	50	433		3.13E+04

TABLE 6-2. PREDICTION MODEL INPUT VALUES
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Scenario 2: CBR (CCR removal from the Ash Pond)

Prediction Model	Construction Period (years)	Hydrostratigraphic Unit	Recharge Zone	Boron Recharge Concentration (mg/L)	Recharge (ft/day)	Recharge (in/yr)	Constant Head (feet)	Constant Concentration (mg/L)
Dewatering	1	Fill Unit - CCR Removal (Central, Fly Ash Pond)	2	0	1.16E-03	5.08	434	0
Dewatering	1	Fill Unit - CCR Removal (South of Railroad, Inactive Area)	3	0	1.16E-03	5.08	434	0
Dewatering	1	Fill Unit - CCR Removal (Northwest, Process Water Pond)	4	0	1.16E-03	5.08	434	0
Dewatering	1	Fill Unit - CCR Removal (South, Clarification Pond)	5	0	1.16E-03	5.08	434	0
Dewatering	1	Fill Unit - CCR Removal (Northeast, Sluice Area)	7	0	1.16E-03	5.08	434	0
CBR	1000	Fill Unit - CCR Removal (Central, Fly Ash Pond)	2	0	1.16E-03	5.08	--	--
CBR	1000	Fill Unit - CCR Removal (South of Railroad, Inactive Area)	3	0	1.16E-03	5.08	--	--
CBR	1000	Fill Unit - CCR Removal (Northwest, Process Water Pond)	4	0	1.16E-03	5.08	--	--
CBR	1000	Fill Unit - CCR Removal (South, Clarification Pond)	5	0	1.16E-03	5.08	--	--
CBR	1000	Fill Unit - CCR Removal (Northeast, Sluice Area)	7	0	1.16E-03	5.08	--	--

Prediction Model	Construction Period (years)	Hydrostratigraphic Unit	Hydraulic Conductivity Zone	Horizontal Hydraulic Conductivity (ft/d)	Horizontal Hydraulic Conductivity (cm/s)	Vertical Hydraulic Conductivity (ft/d)		Vertical Hydraulic Conductivity (cm/s)
Dewatering	1	Fill Unit (CCR)	--	--	--	--		--
Dewatering	1	Fill Unit (Soil Backfill)	6	1.19	4.20E-04	0.119		4.20E-05
CBR	1000	Fill Unit (CCR)	--	--	--	--		--
CBR	1000	Fill Unit (Soil Backfill)	6	1.19	4.20E-04	0.119		4.20E-05

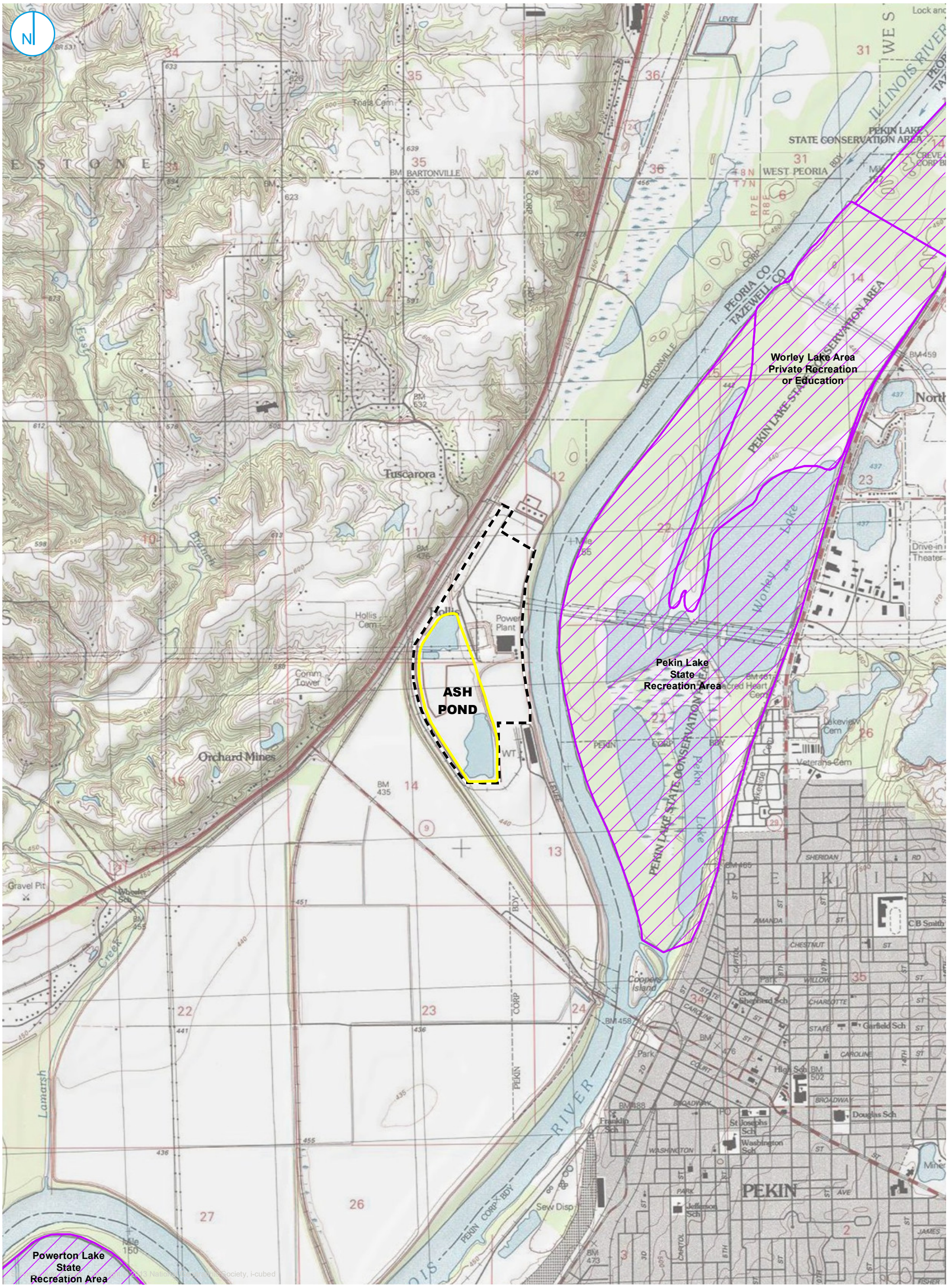
Prediction Model	Construction Period (years)	Hydrostratigraphic Unit	Storage, Specific Yield and Effective Porosity Zone	Storage	Specific Yield		Effective Porosity
Dewatering	1	Fill Unit (CCR)	--	--	--		--
Dewatering	1	Fill Unit (Soil Backfill)	6	0.003	0.16		0.16
CBR	1000	Fill Unit (CCR)	--	--	--		--
CBR	1000	Fill Unit (Soil Backfill)	6	0.003	0.16		0.16

Prediction Model	Construction Period (years)	Drain Width (feet)	Length of Drain Cell (feet)	Drain Bed Thickness (feet)	Hydraulic Conductivity (ft/d)	Stage of Drain (feet)		Drain Conductance (ft^2/d)
Dewatering	1	Fill Unit (Soil Backfill)	--	--	--	--		--
CBR	1000	Fill Unit (Soil Backfill)	25	1	50	433		3.13E+04

[O: JJW 4/11/22; C: EGP 4/12/22]

Notes:
-- = boundary condition or property zone not included in prediction model
CBR = Closure By Removal
CCR = coal combustion residuals
CIP = Closure In Place
ft^2/day = feet squared per day
ft/day = feet per day
in/yr = inches per year
mg/L = milligrams per liter
cm/s = centimeters per second

FIGURES



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
PROTECTED AREA

0 1,000 2,000 Feet

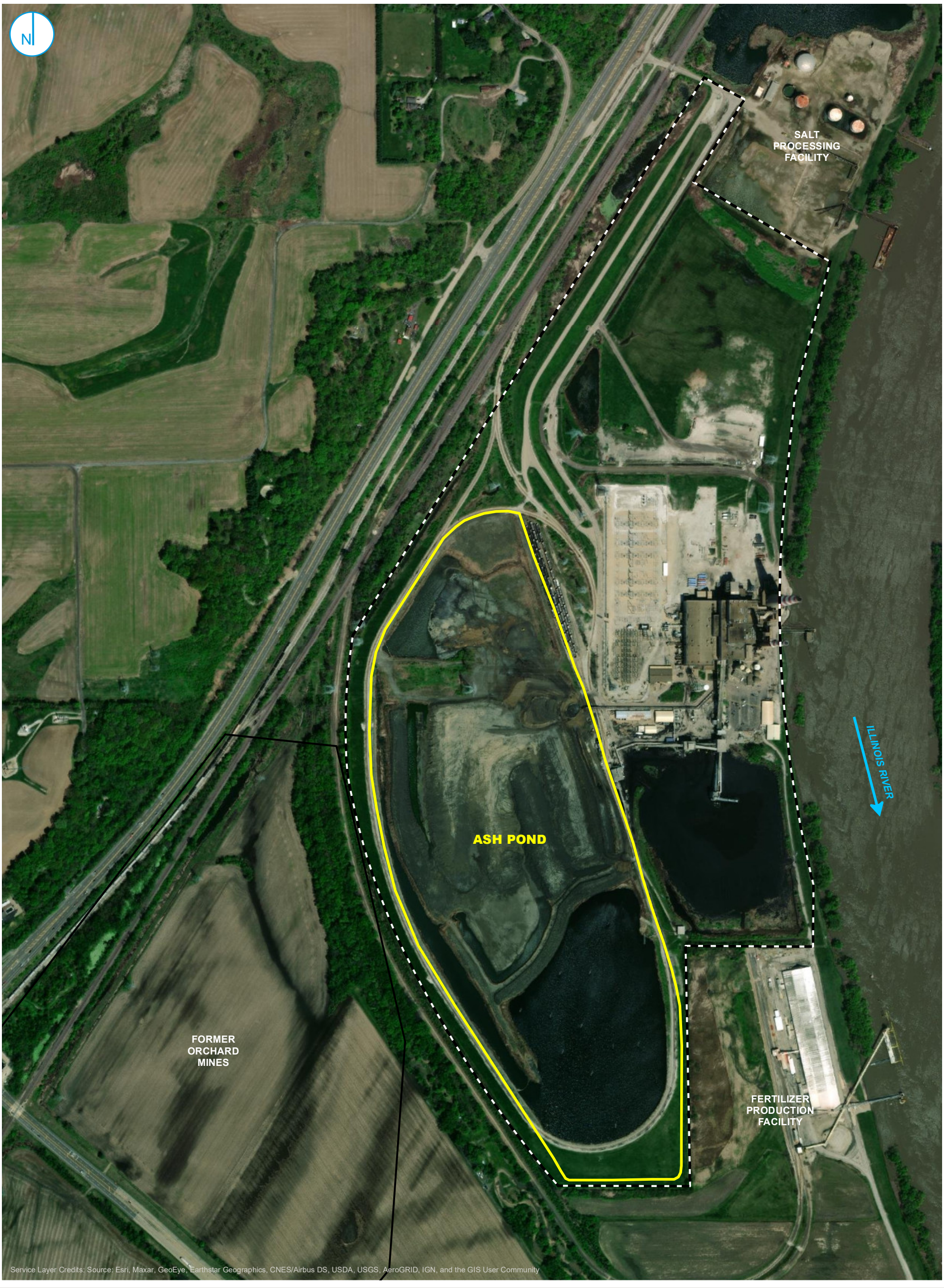
SITE LOCATION MAP

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 1-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



PART 845 REGULATED UNIT (SUBJECT UNIT)
FORMER ORCHARD MINES AREA
PROPERTY BOUNDARY

0 250 500 Feet

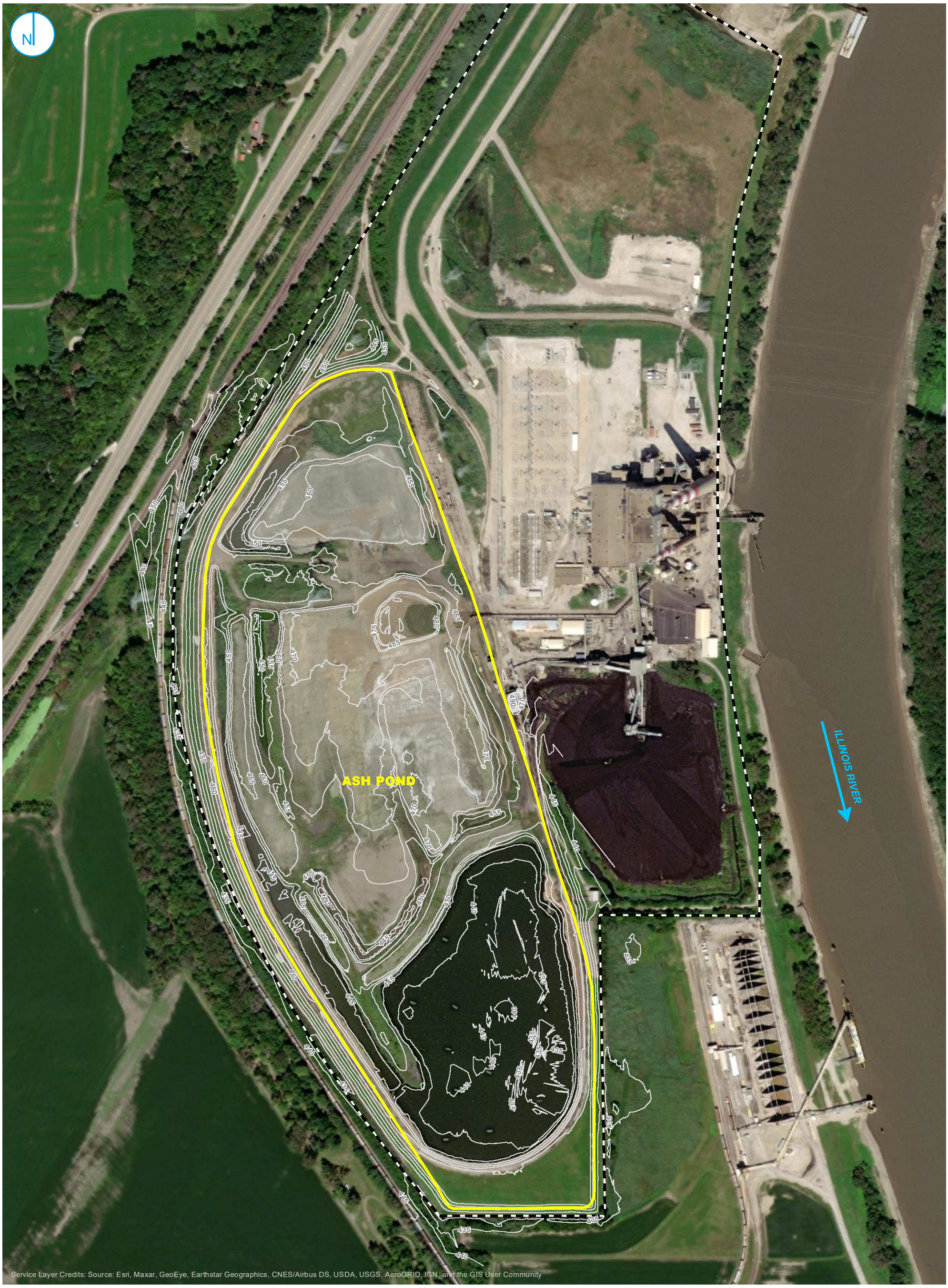
SITE MAP

FIGURE 1-2

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



5FT TOPOGRAPHIC CONTOUR
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

Note:
Elevation contours shown in feet, North American Vertical Datum of 1988 (NAVD88)

0 200 400
Feet

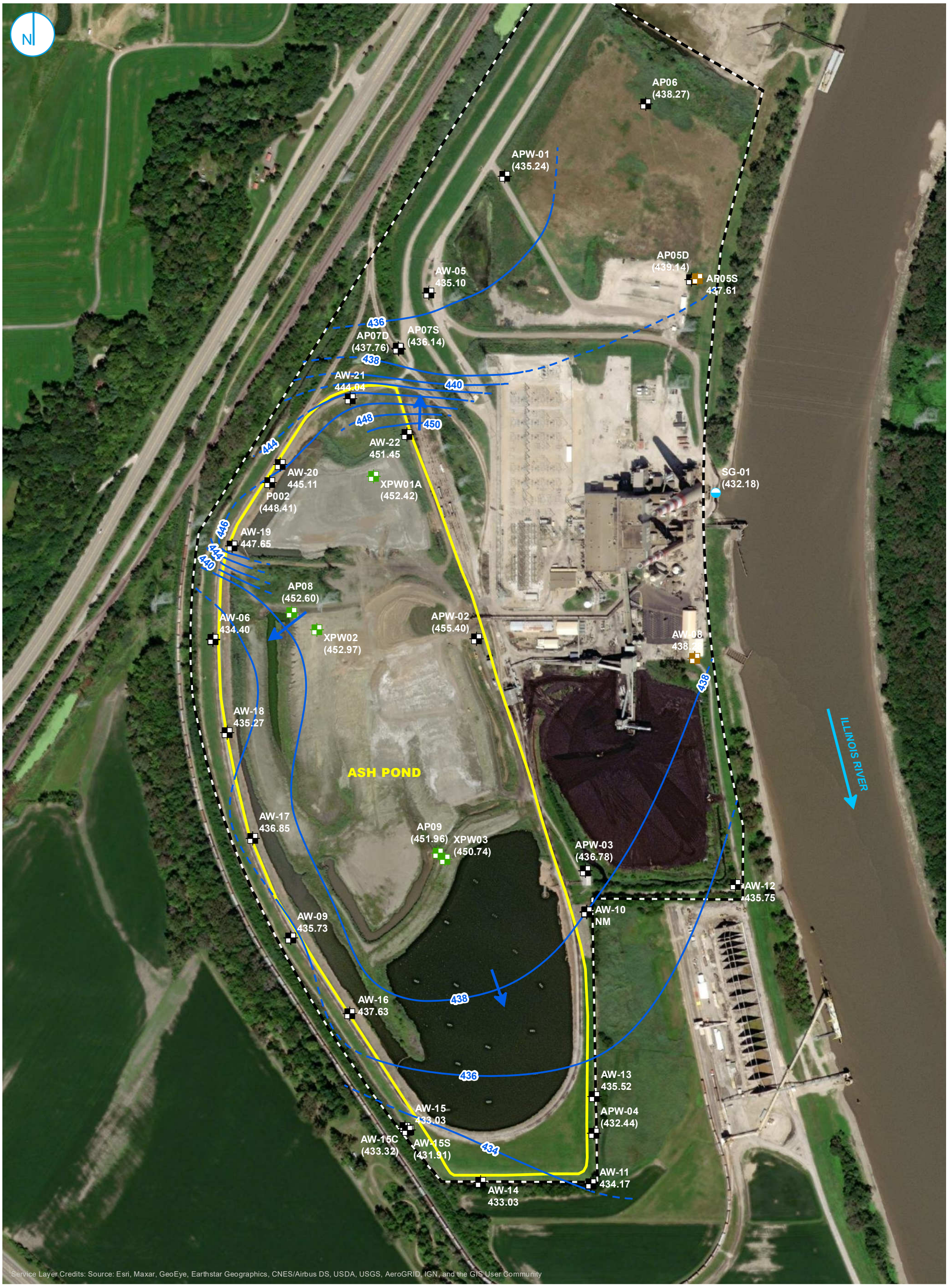
SITE TOPOGRAPHIC MAP

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
PORE WATER WELL
STAFF GAGE, RIVER
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 212.5 425 Feet

NOTES
1. PARENTHESIS INDICATES WELL NOT USED FOR CONTOURING
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988

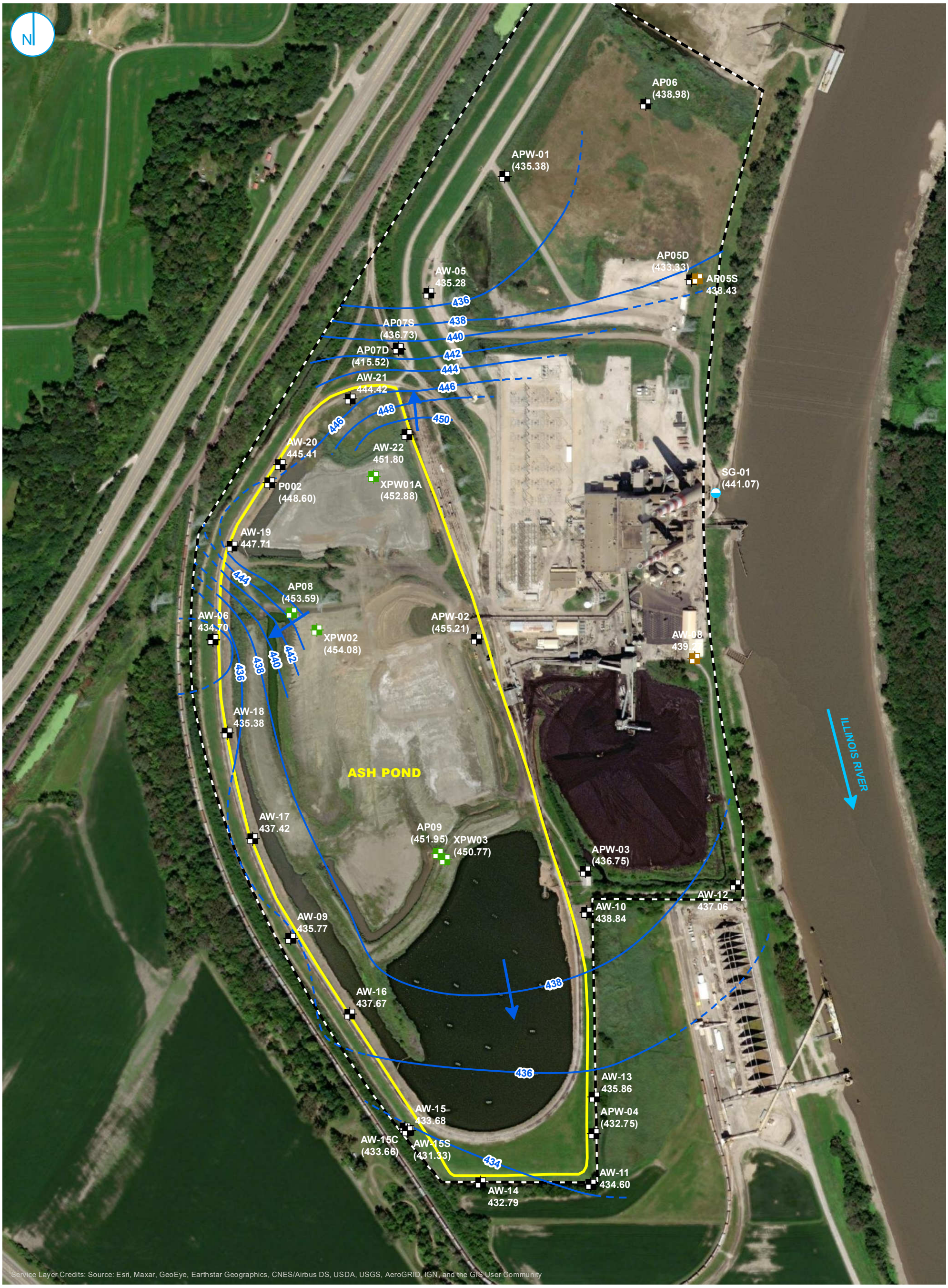
UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP FEBRUARY 9, 2021

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
PORE WATER WELL
STAFF GAGE, RIVER
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 212.5 425 Feet

NOTES
1. PARENTHESIS INDICATES WELL NOT USED FOR CONTOURING
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

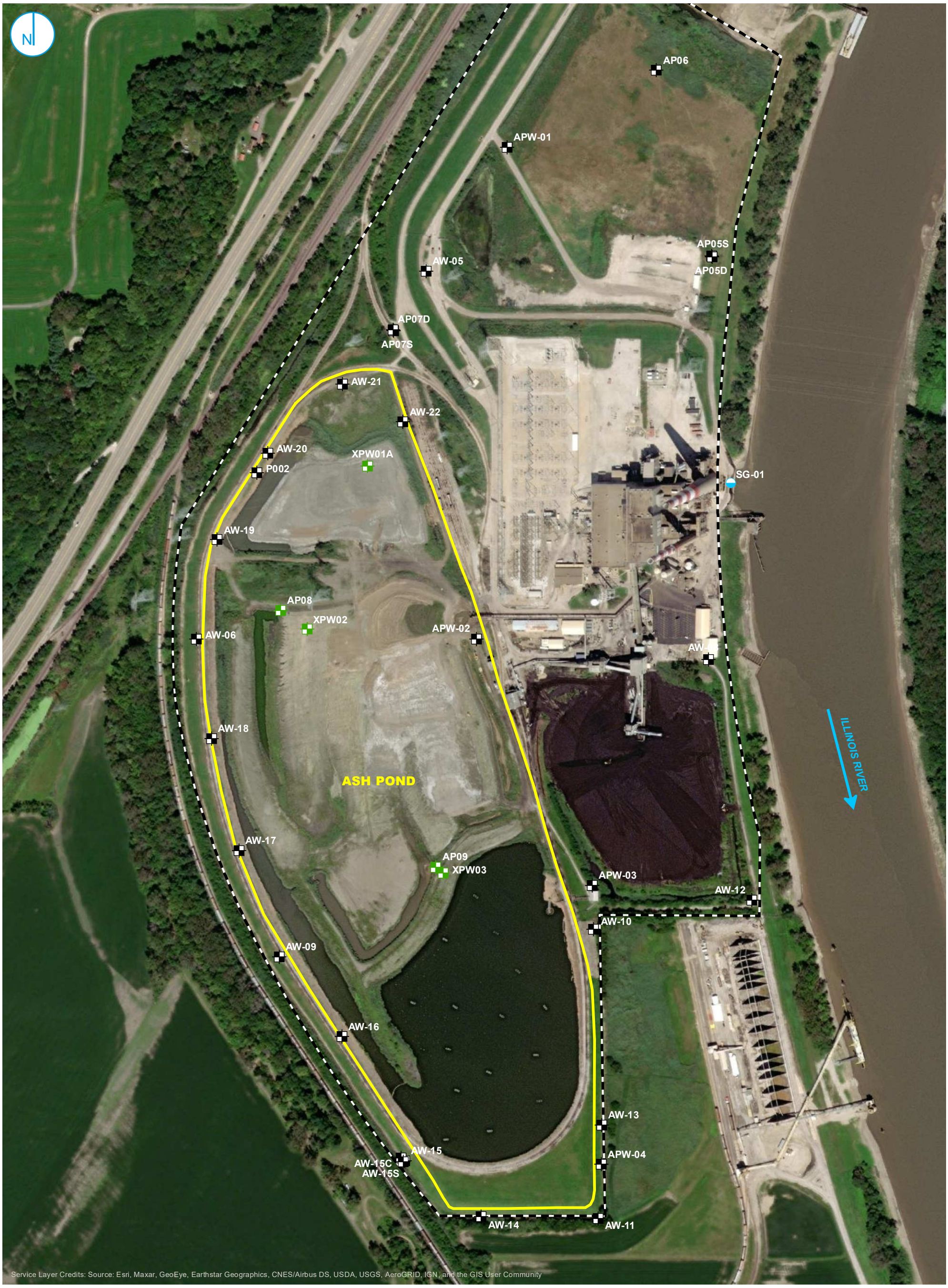
UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP MARCH 22, 2021

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



MONITORING WELL
PORE WATER WELL
STAFF GAGE, RIVER
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 200 400 Feet

MONITORING WELL LOCATION MAP

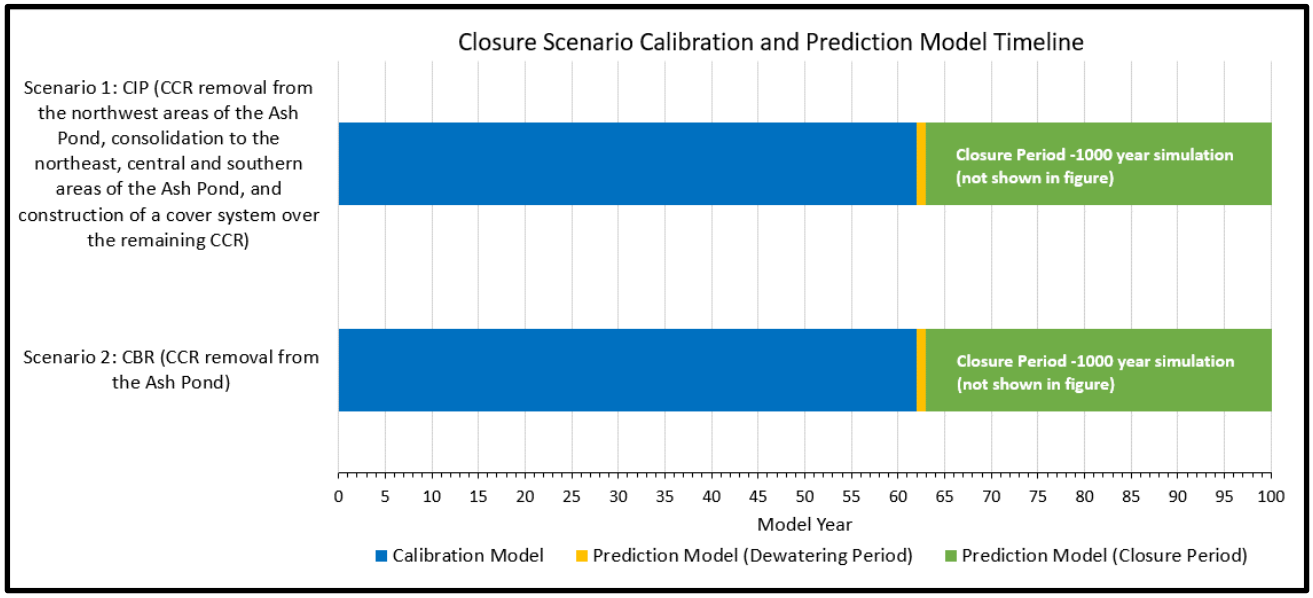
GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

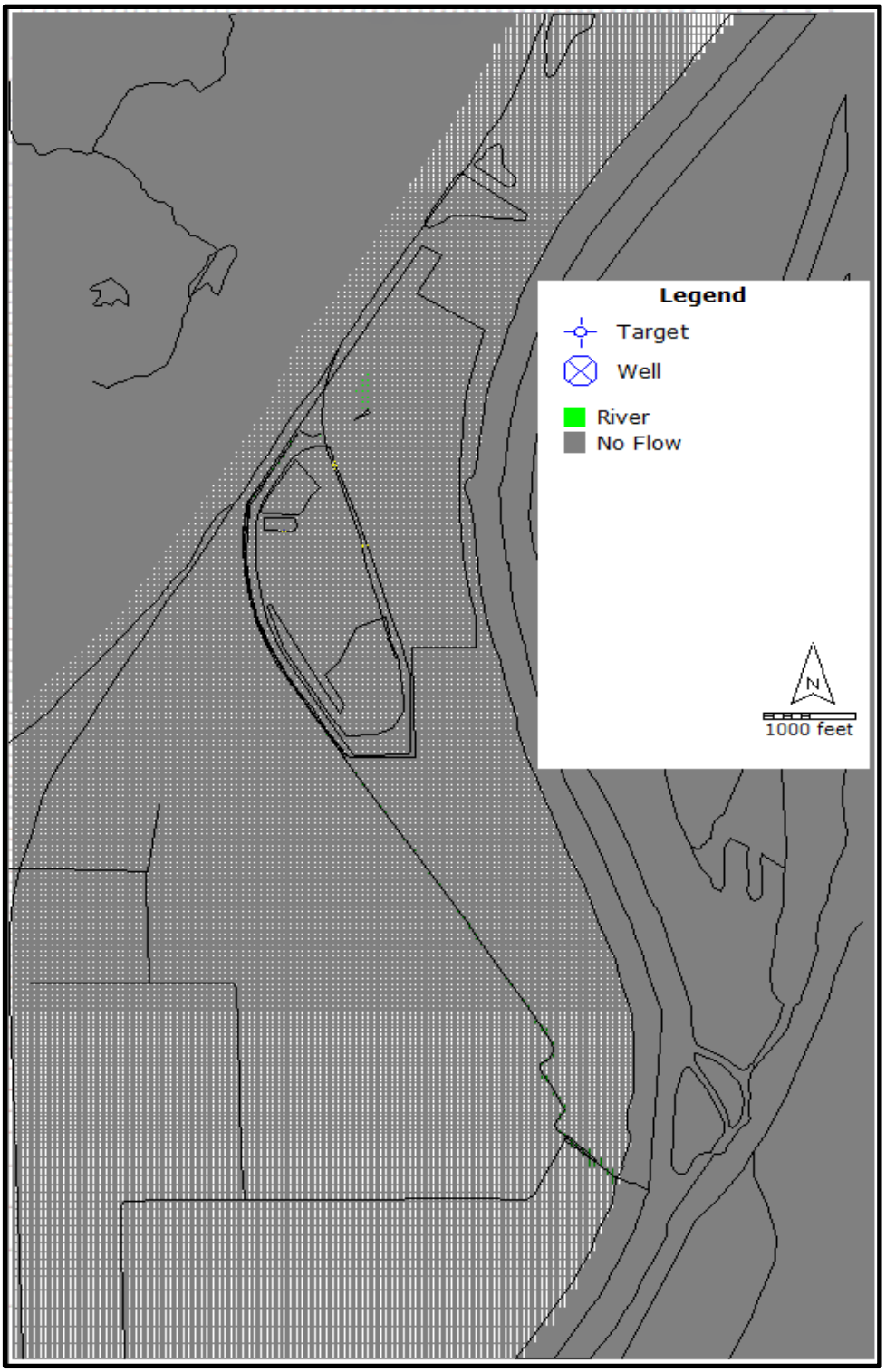
FIGURE 4-1



CLOSURE SCENARIO CALIBRATION AND PREDICTION MODEL TIMELINE

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

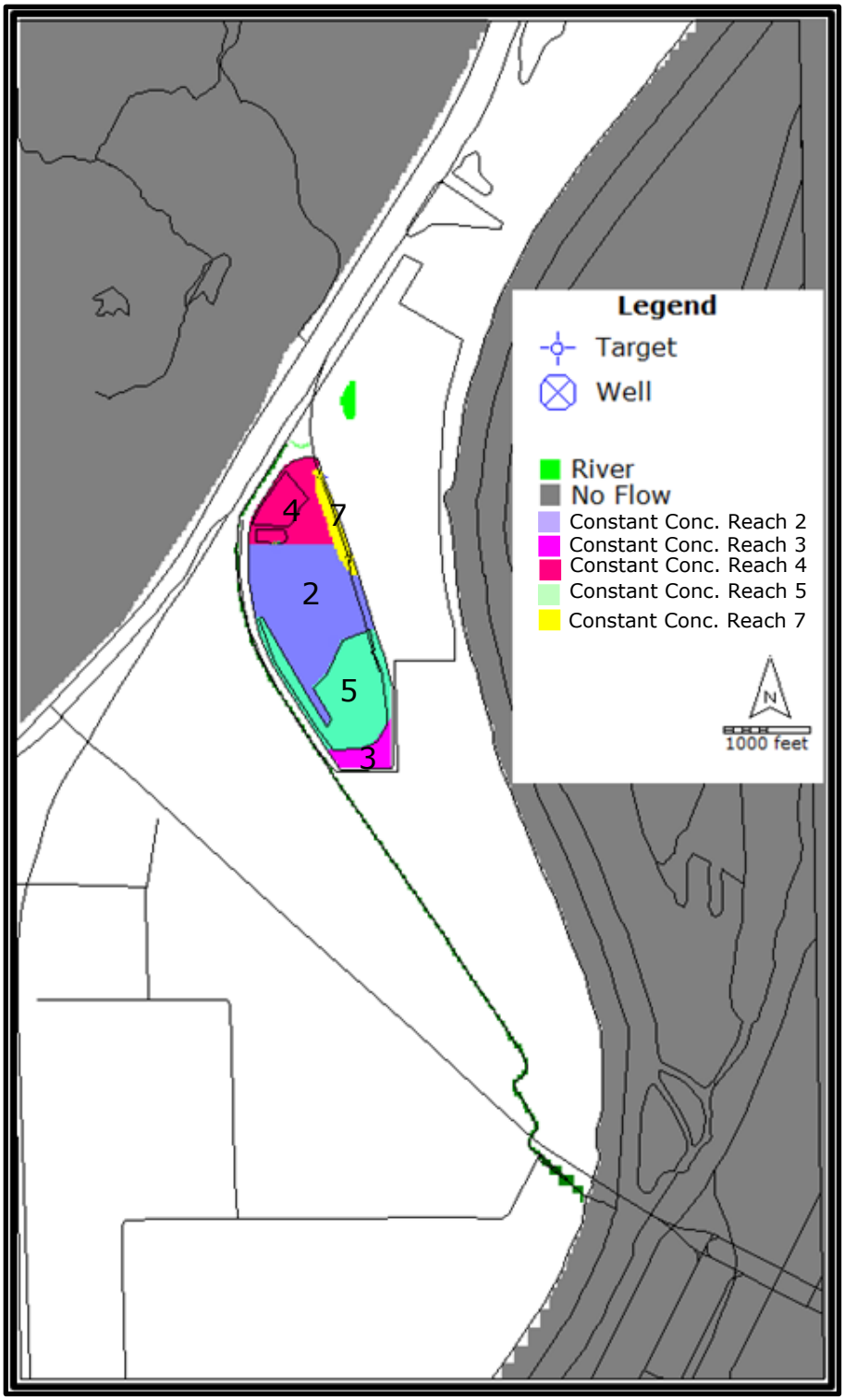
RAMBOLL



MODEL GRID FOR LAYERS 1 THROUGH 5

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

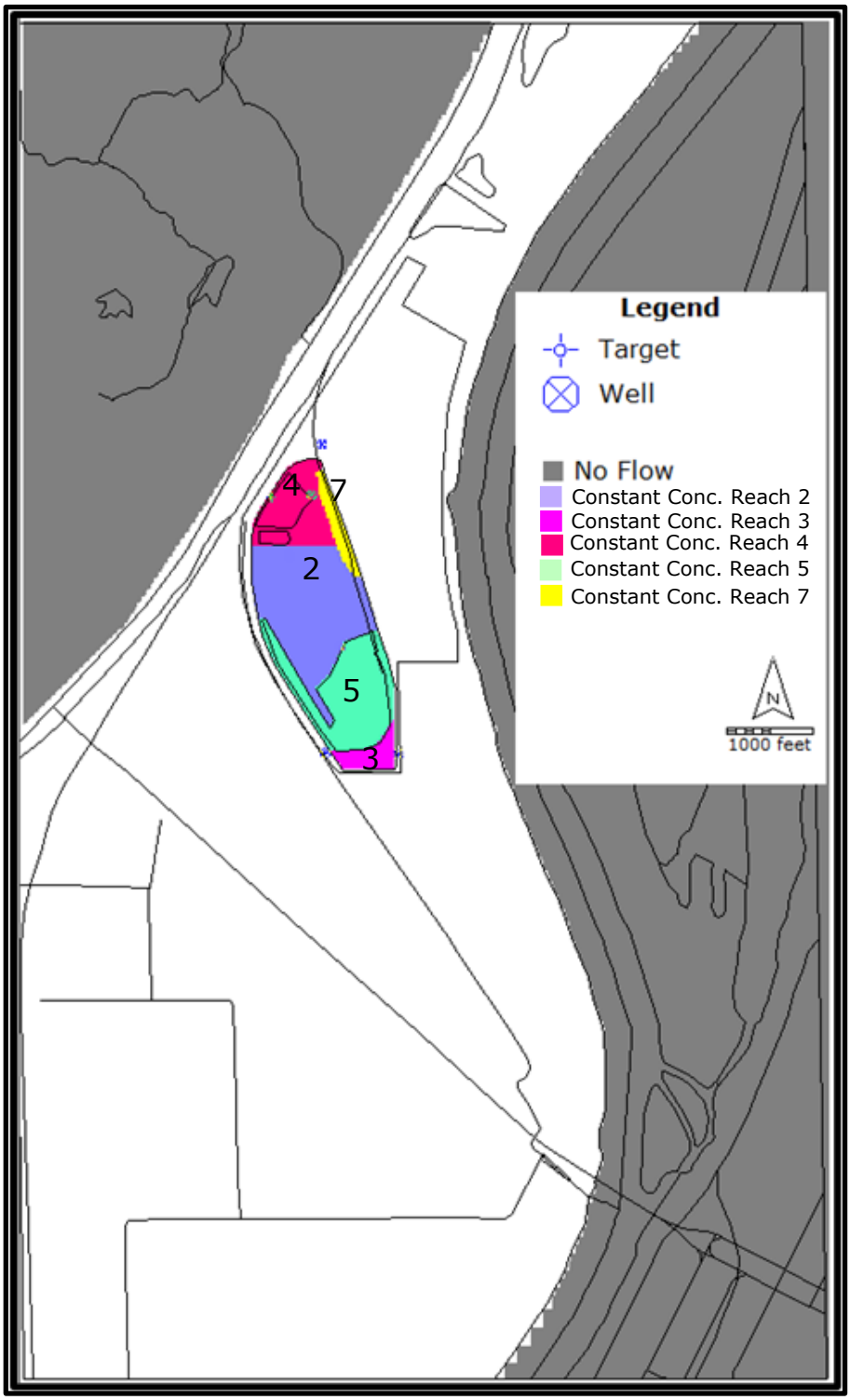
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

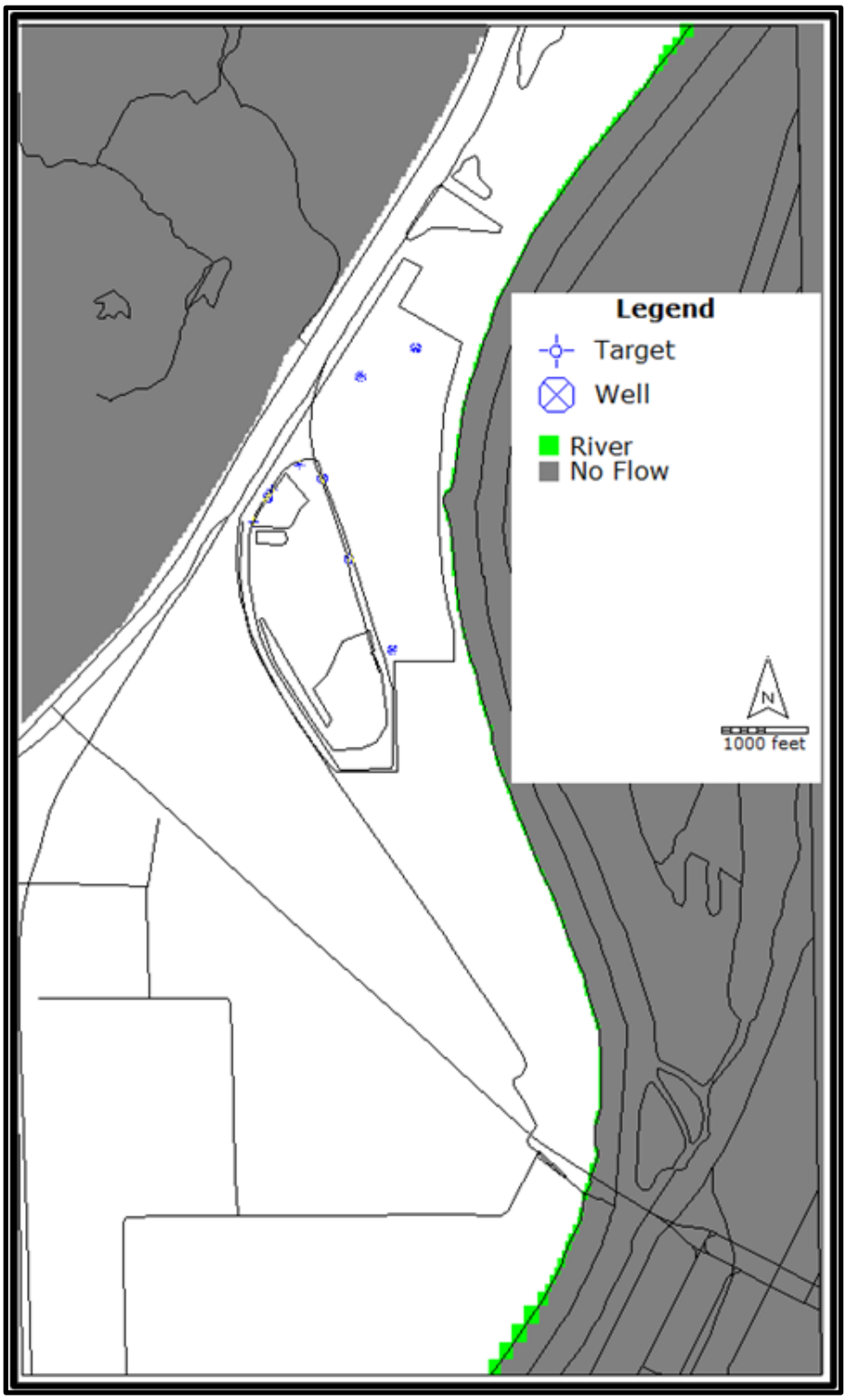
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

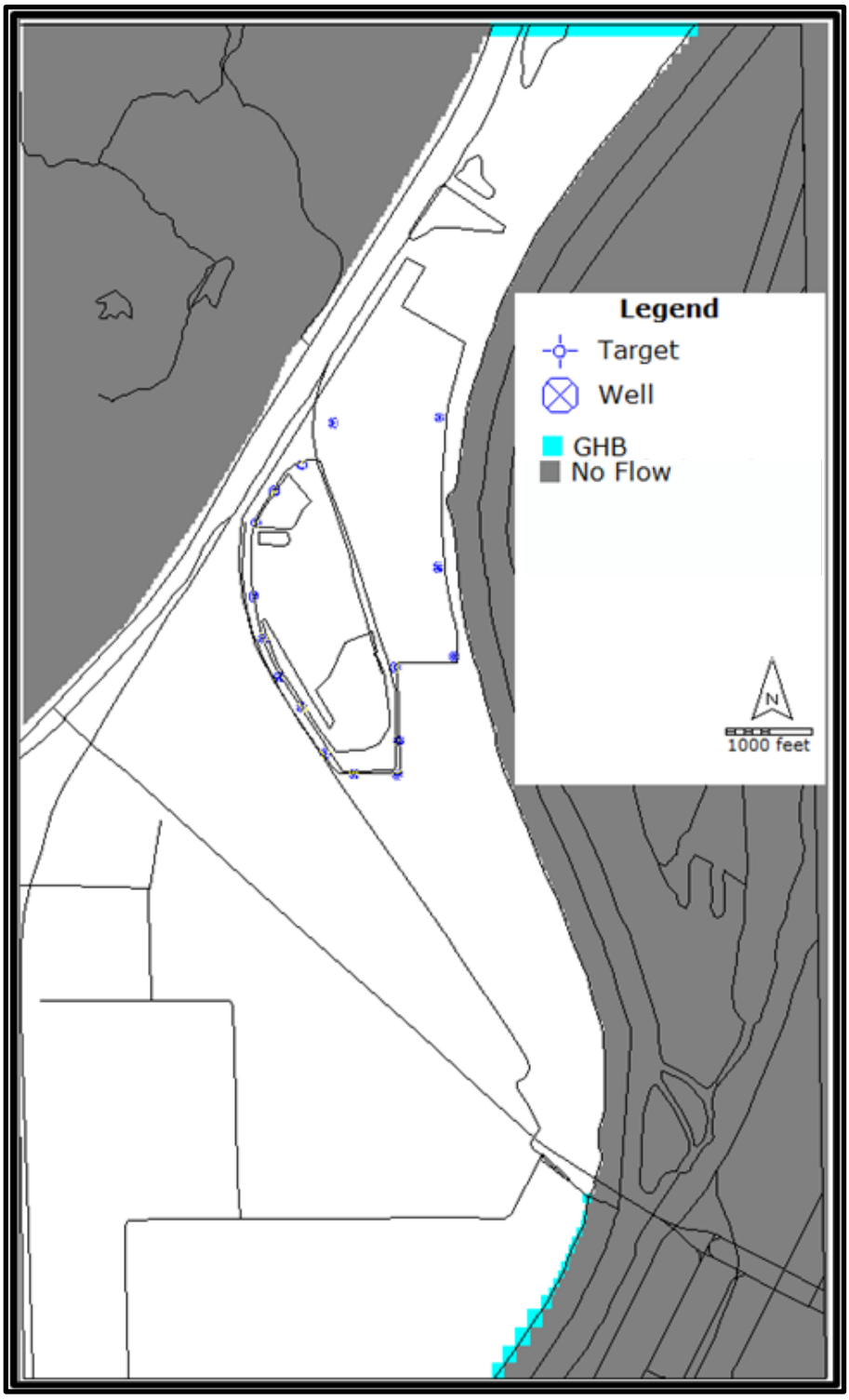
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

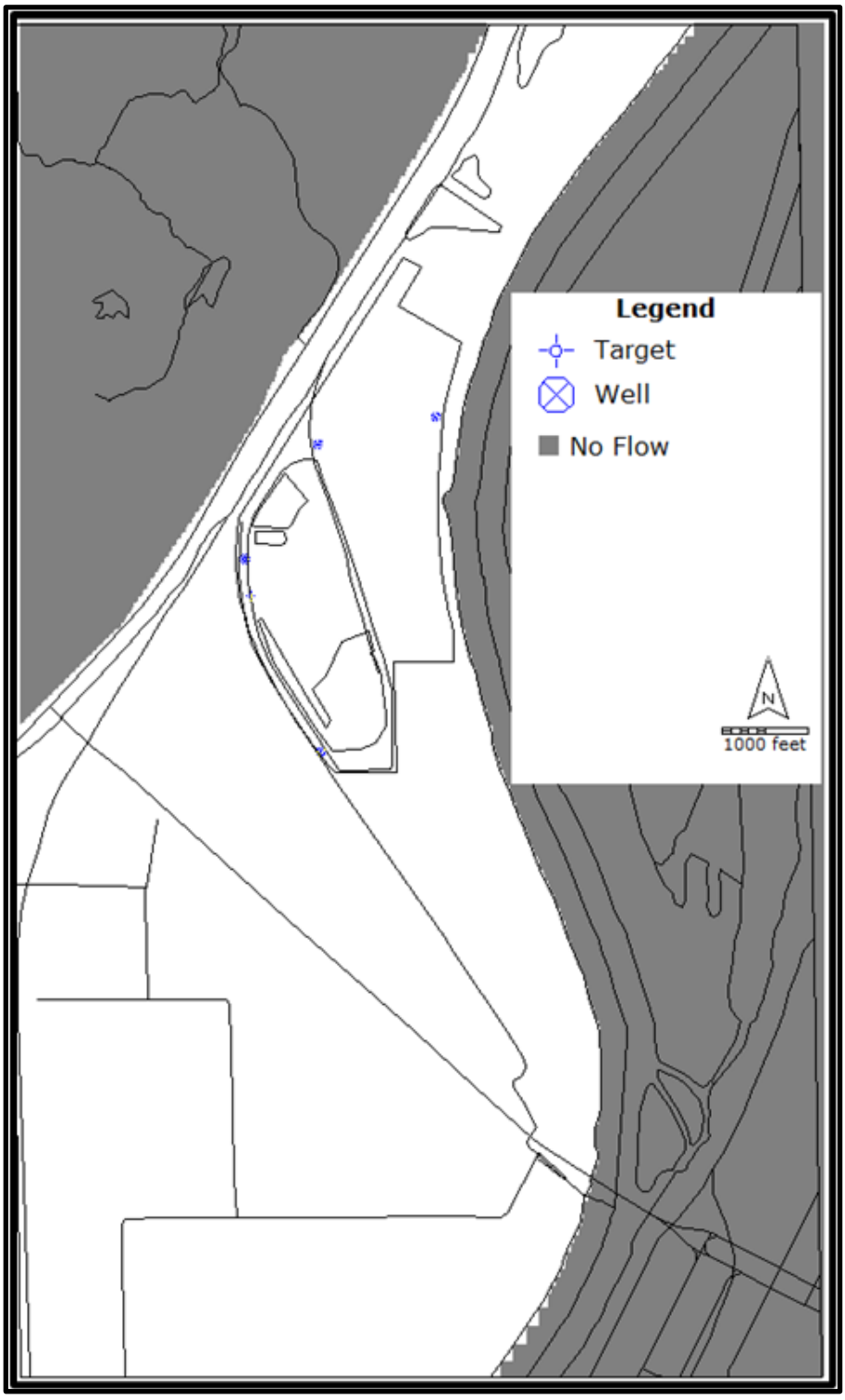
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

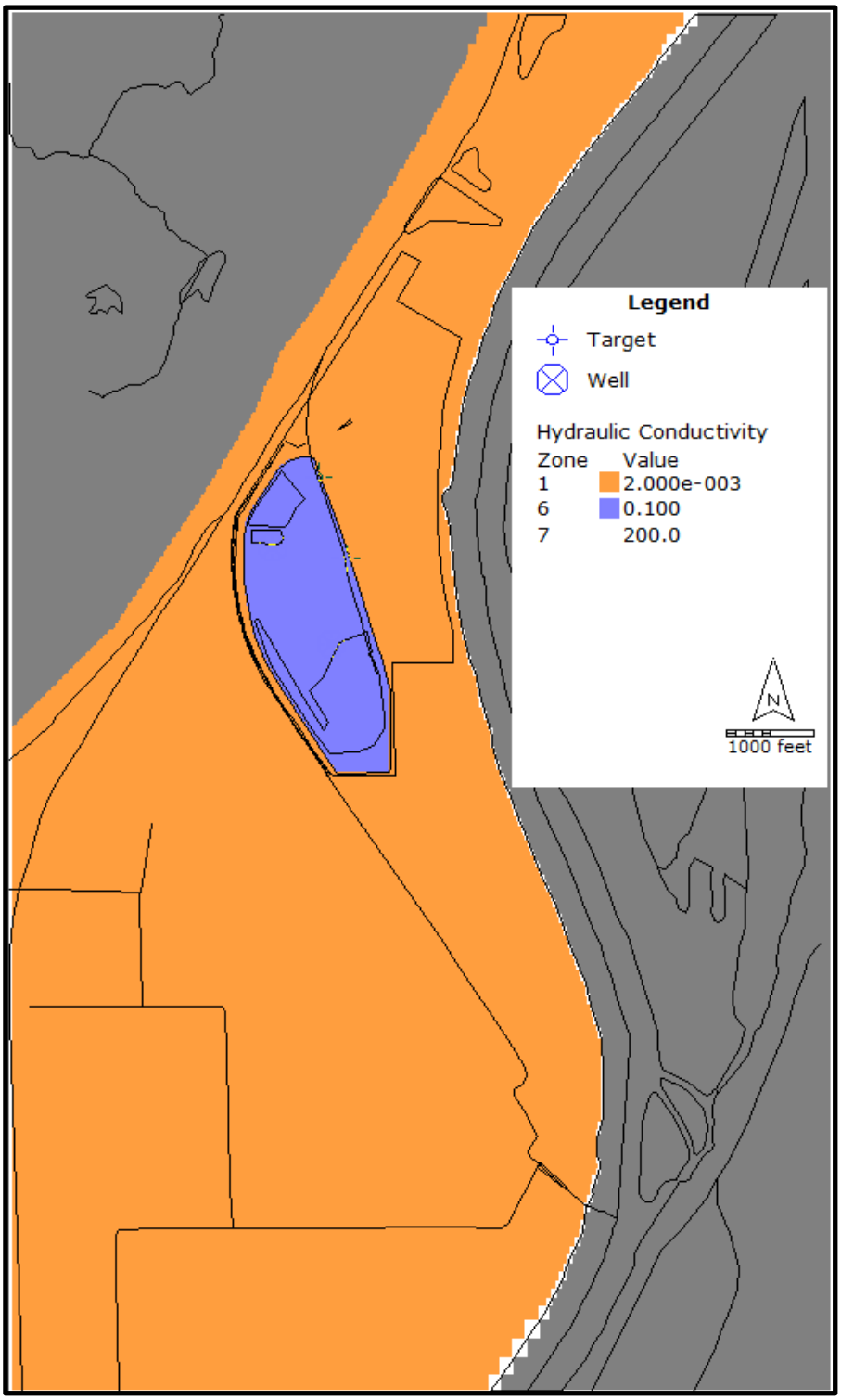
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

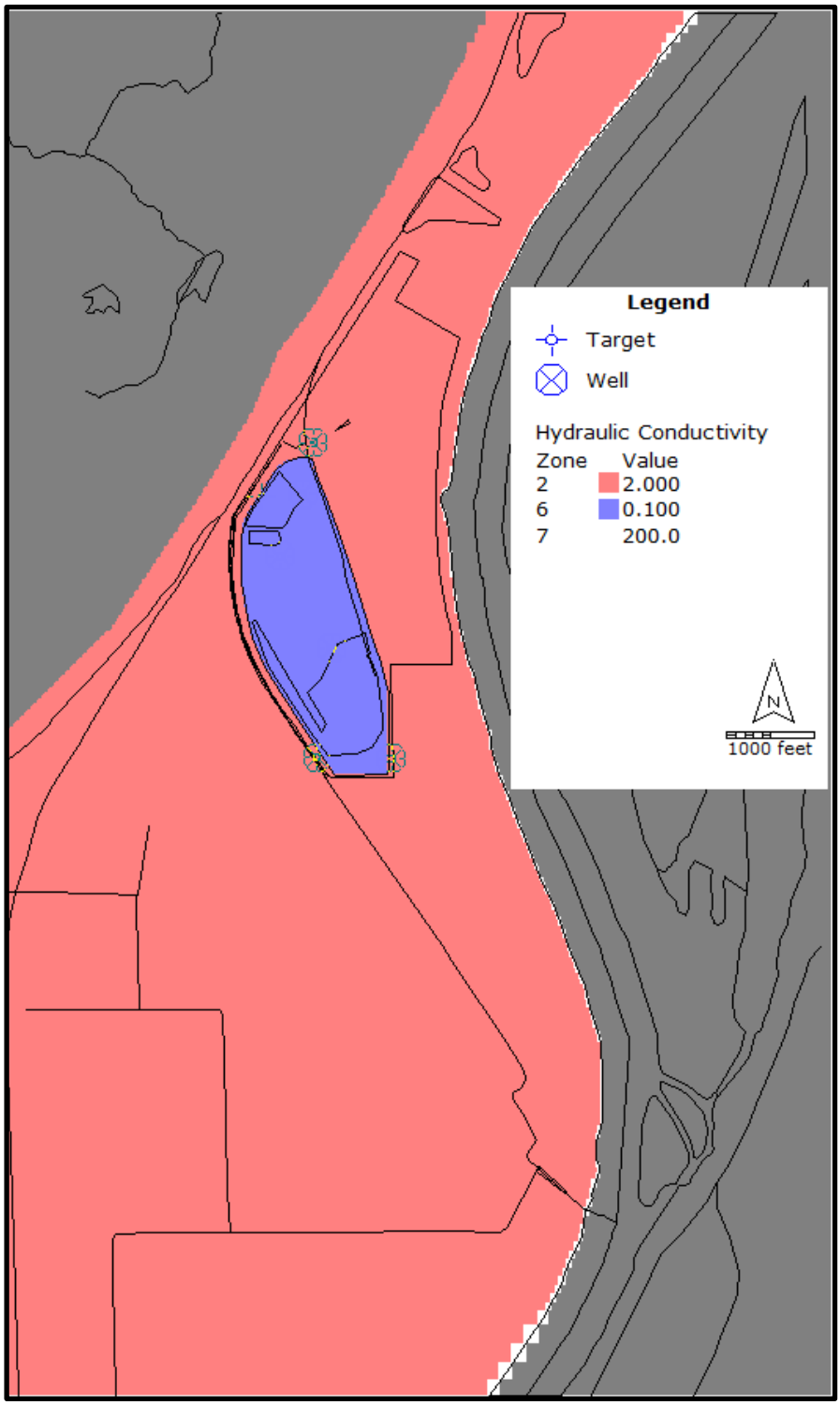
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONE (FEET/DAY) FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

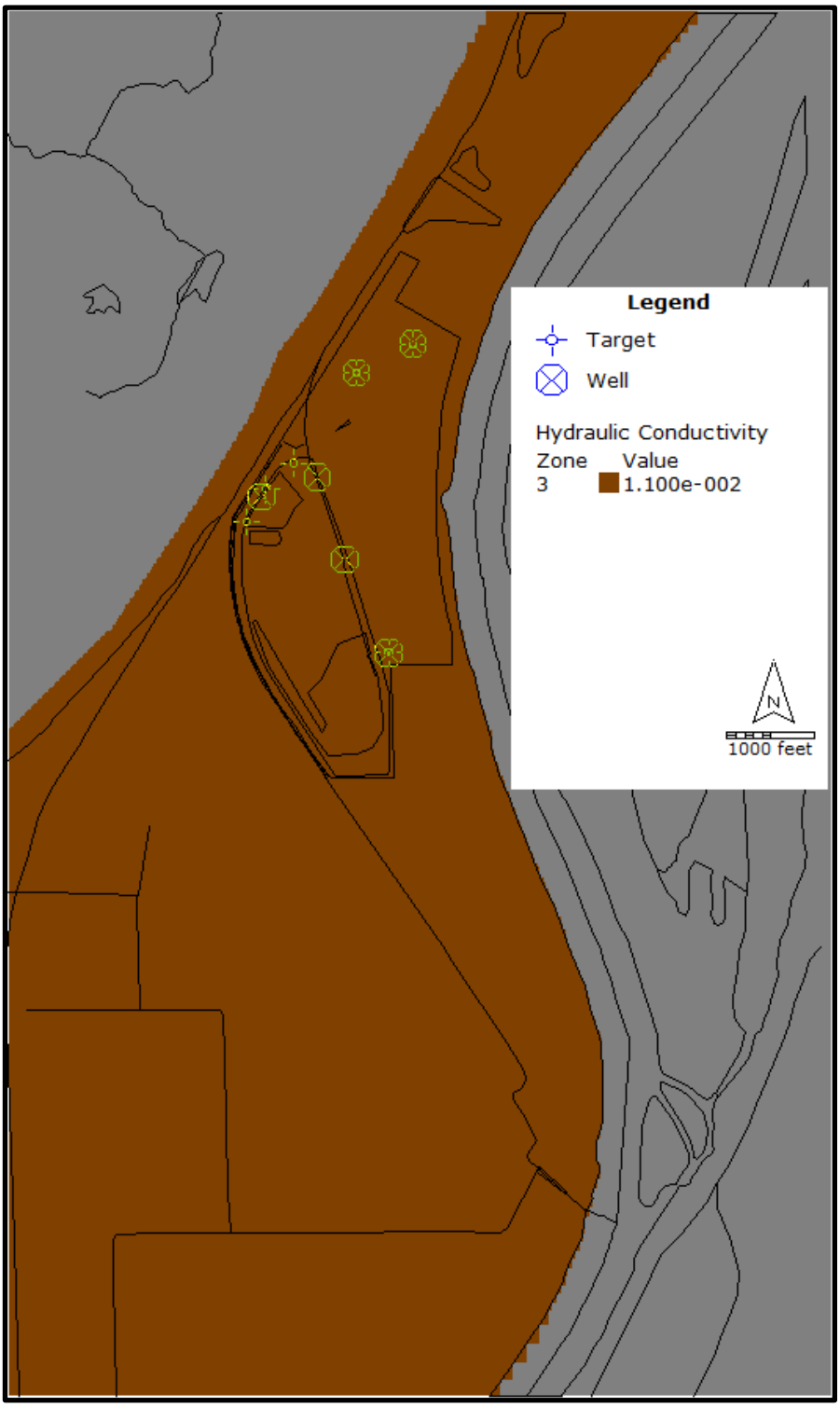
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONE (FEET/DAY) FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

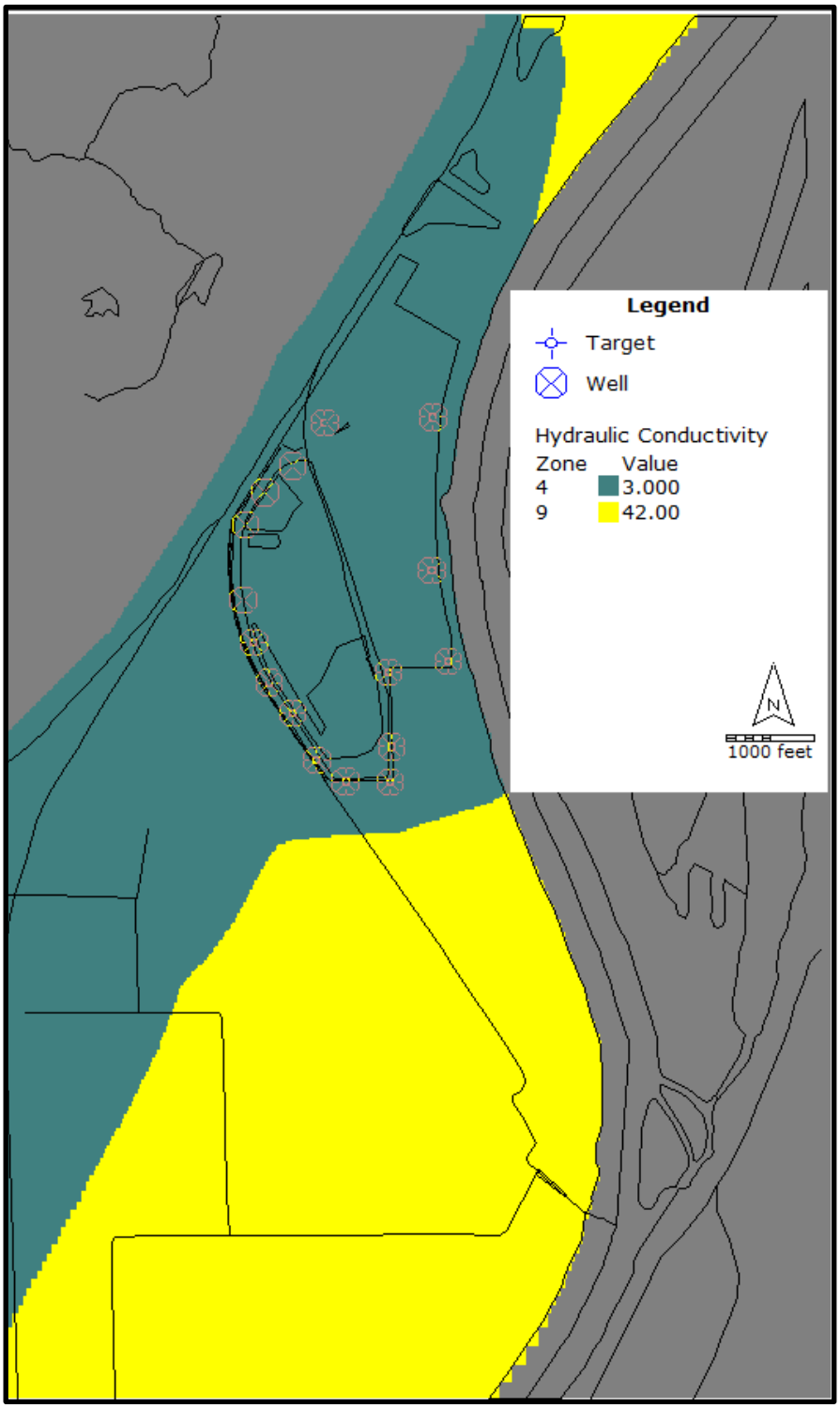
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONE (FEET/DAY) FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

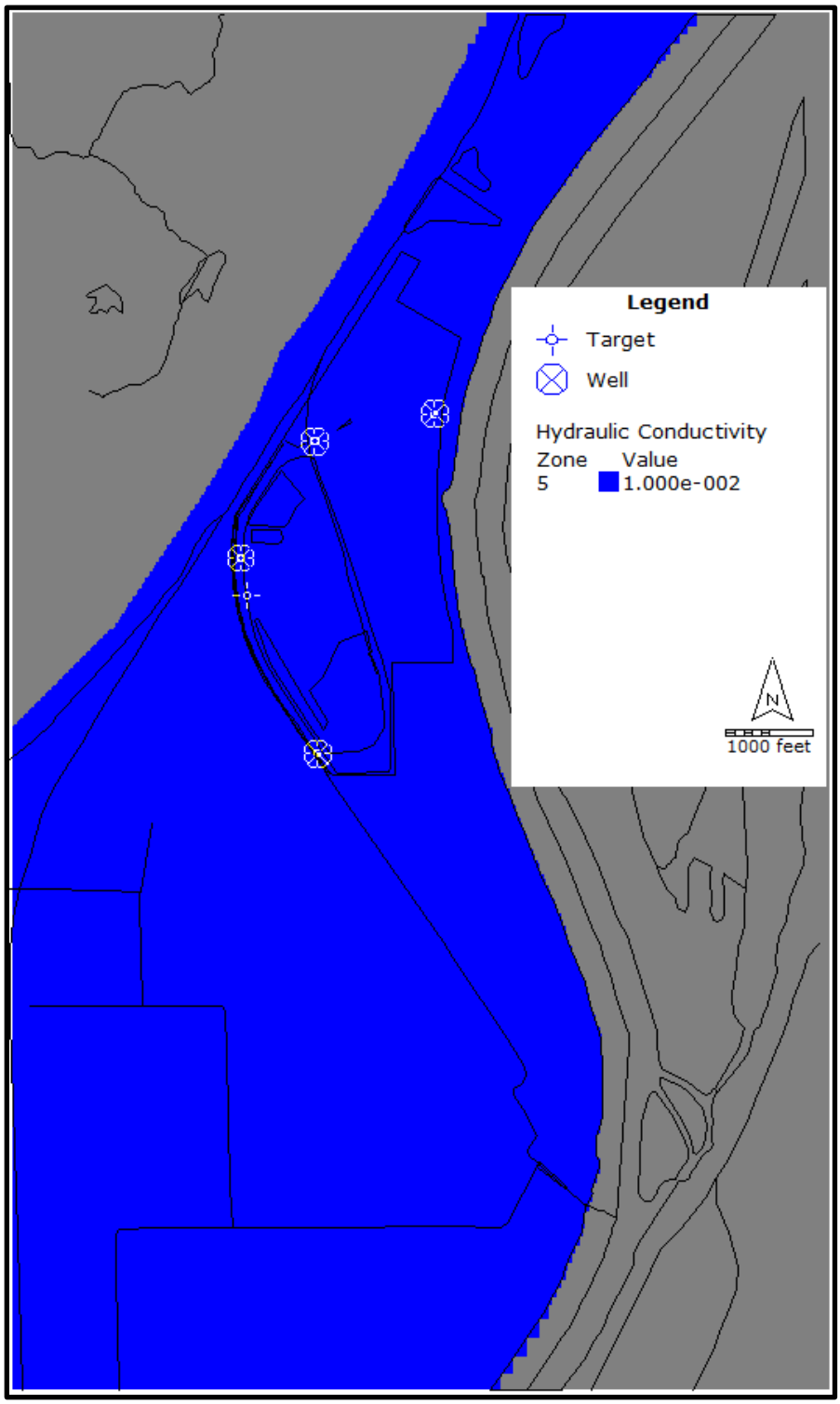
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONE (FEET/DAY) FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

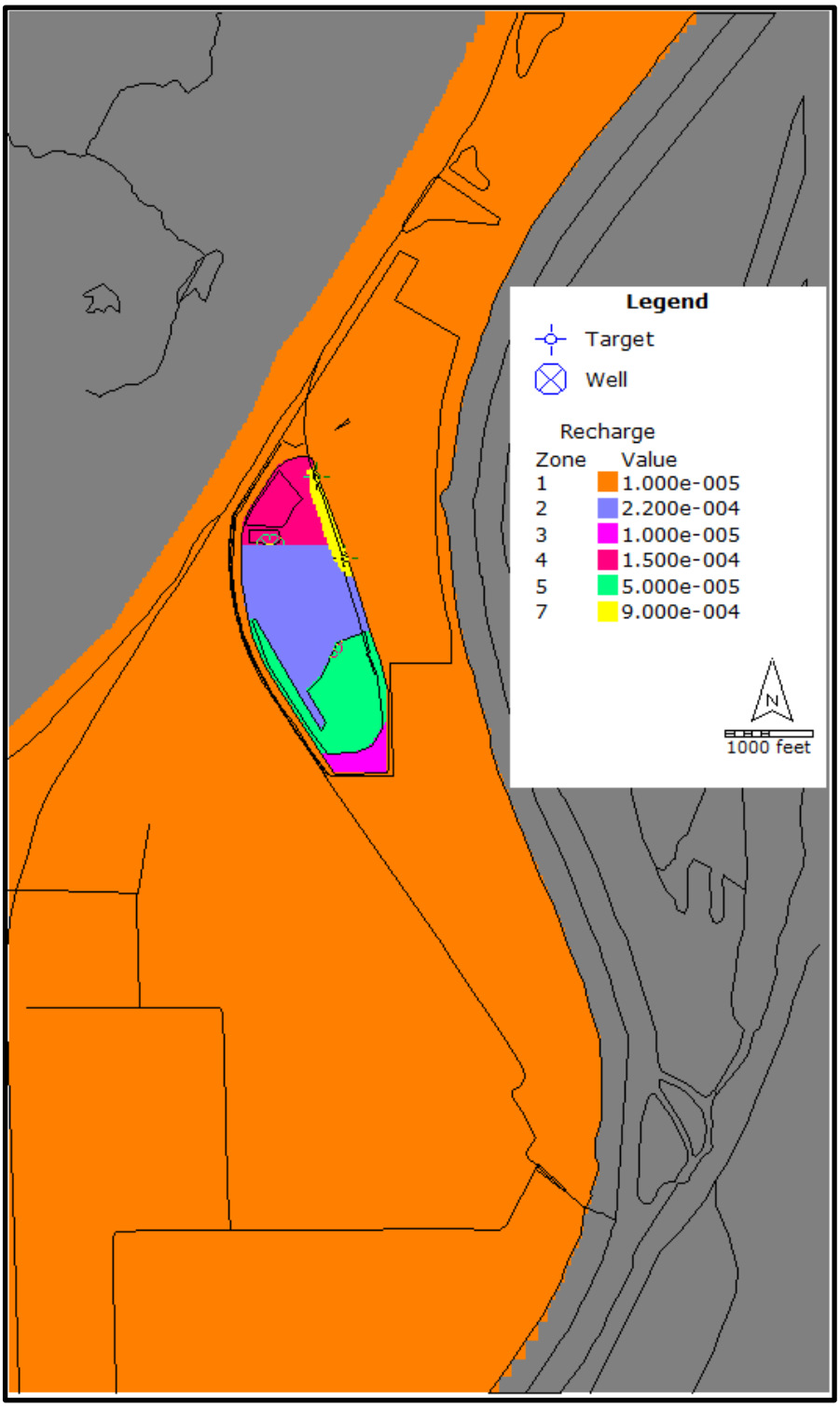
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONE (FEET/DAY) FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

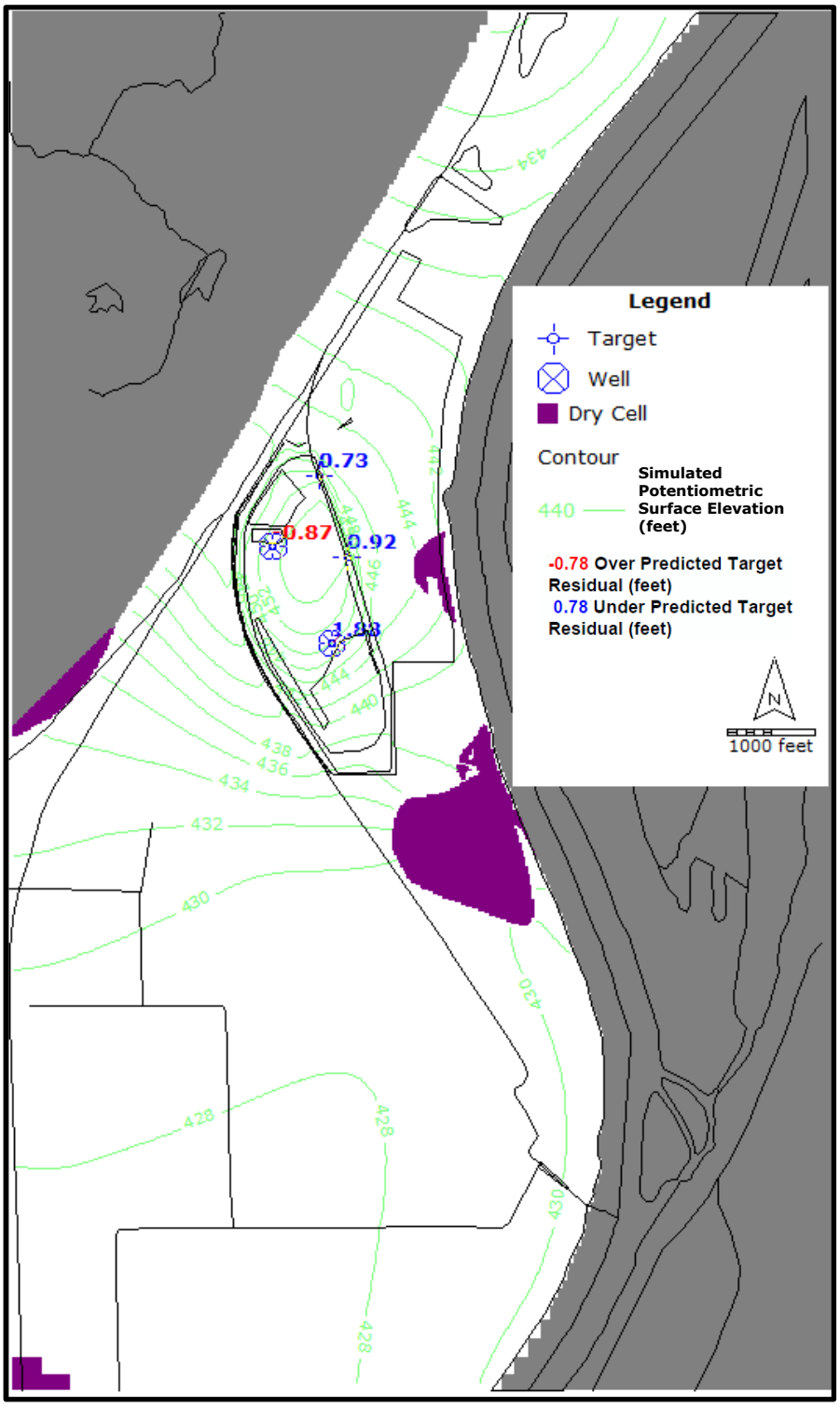
RAMBOLL



DISTRIBUTION OF RECHARGE ZONES (FEET/DAY)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

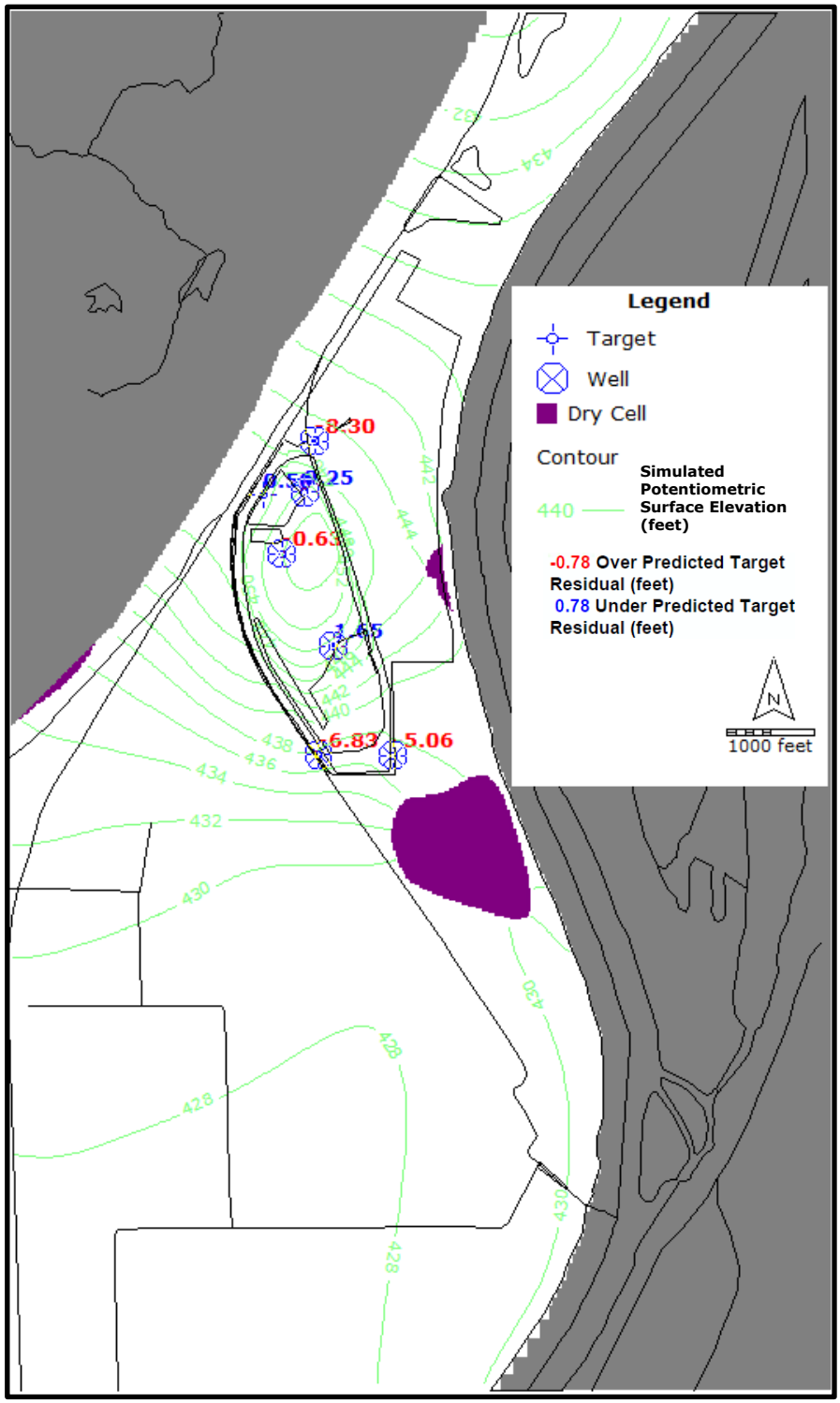
RAMBOLL



OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

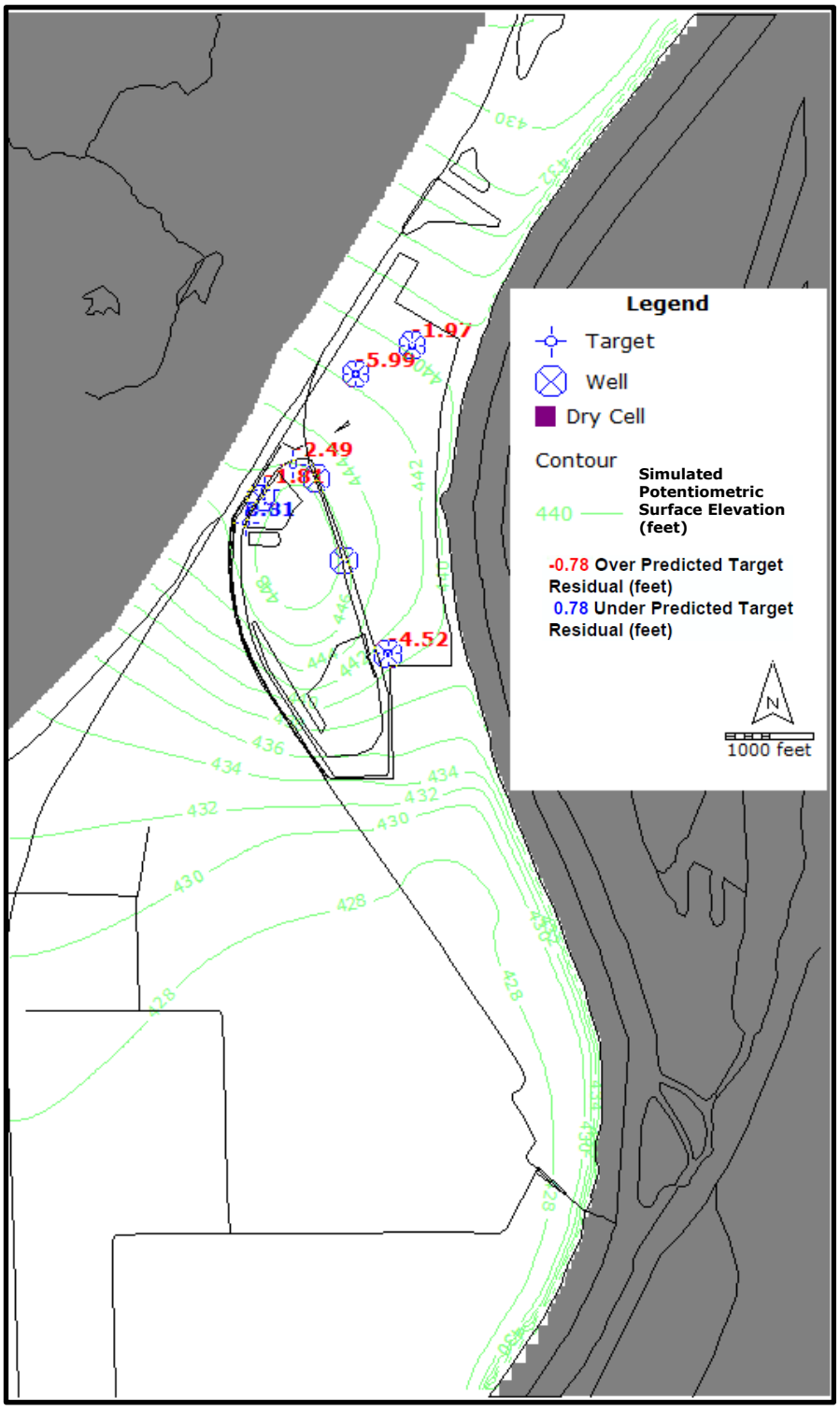
RAMBOLL



OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

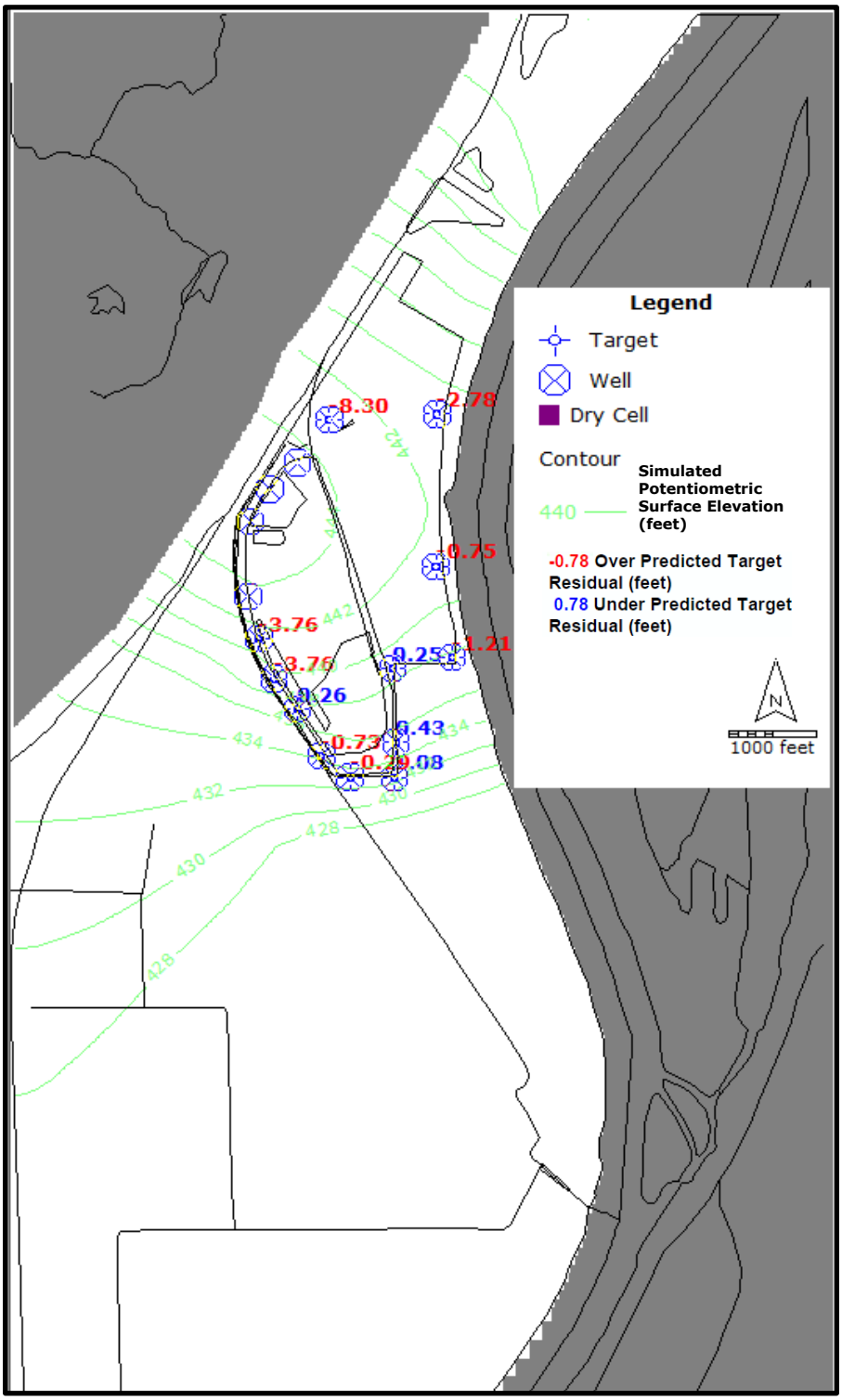
RAMBOLL



OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

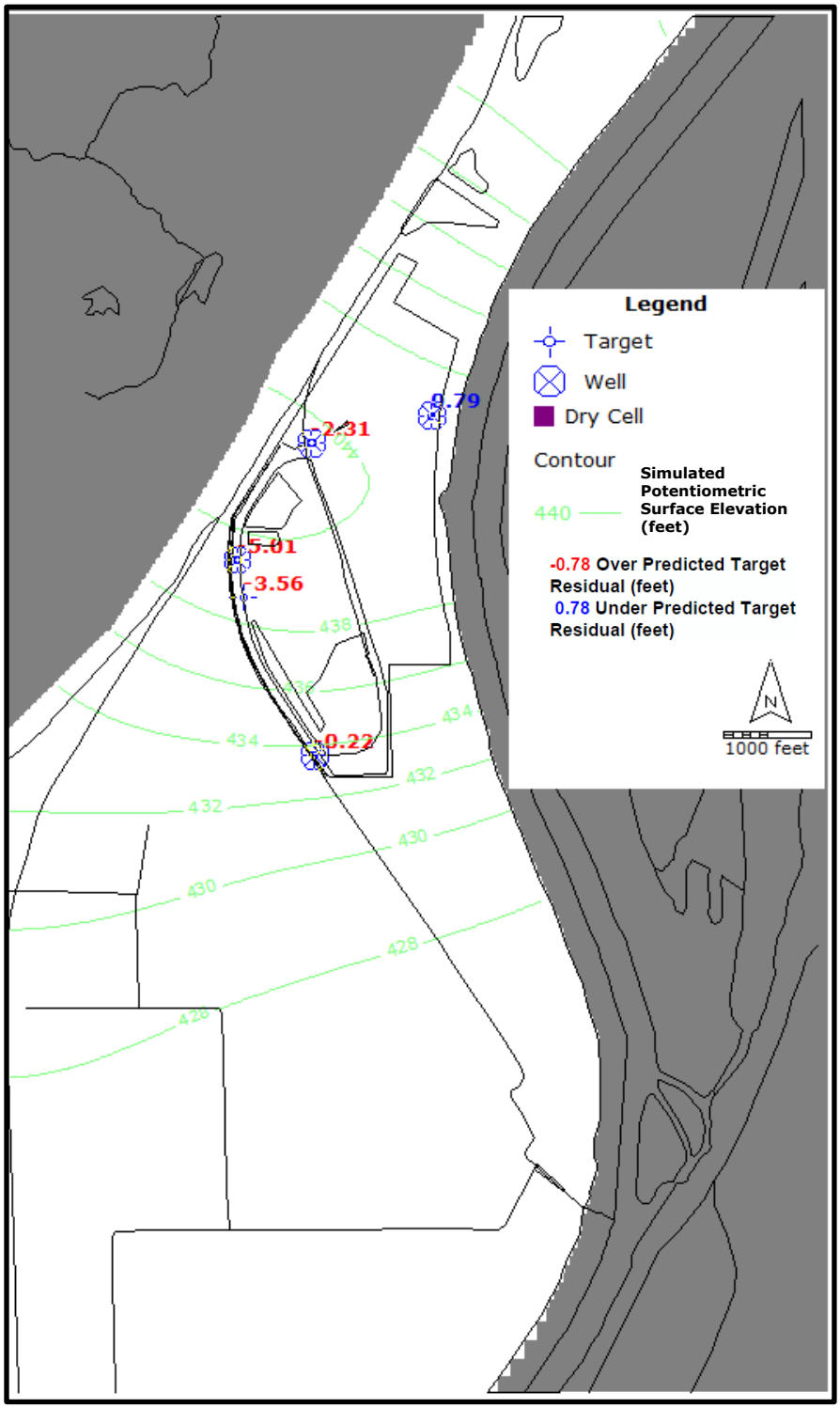
RAMBOLL



OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

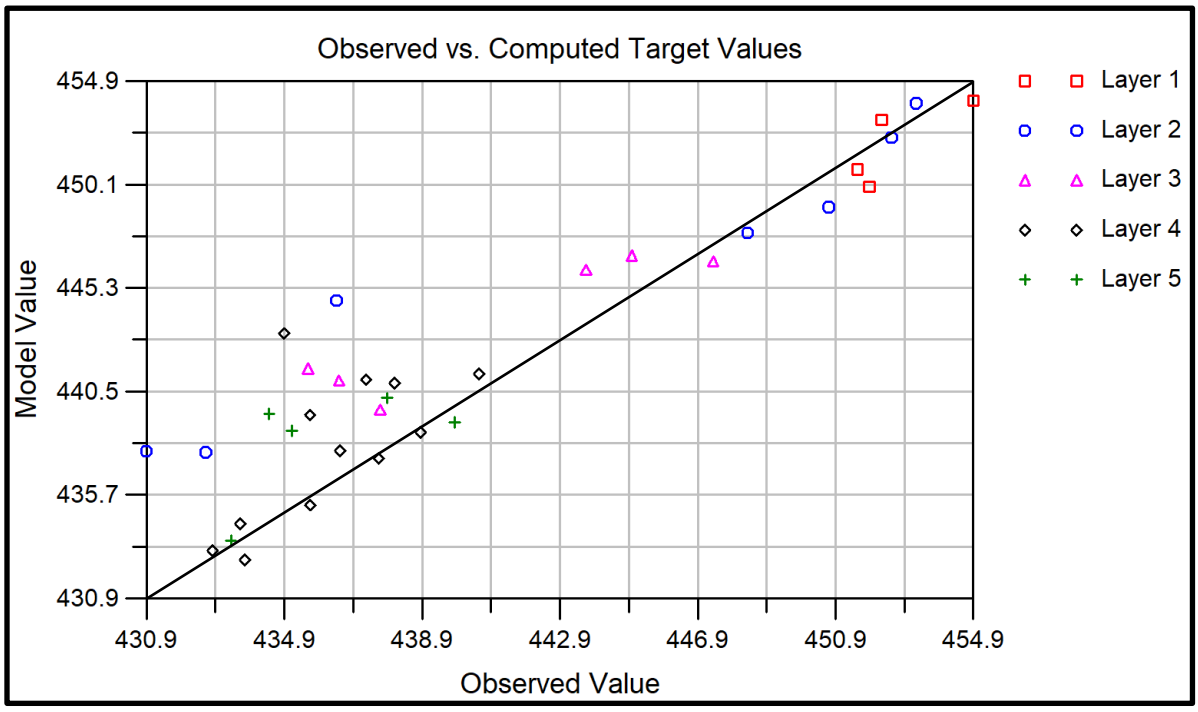


OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

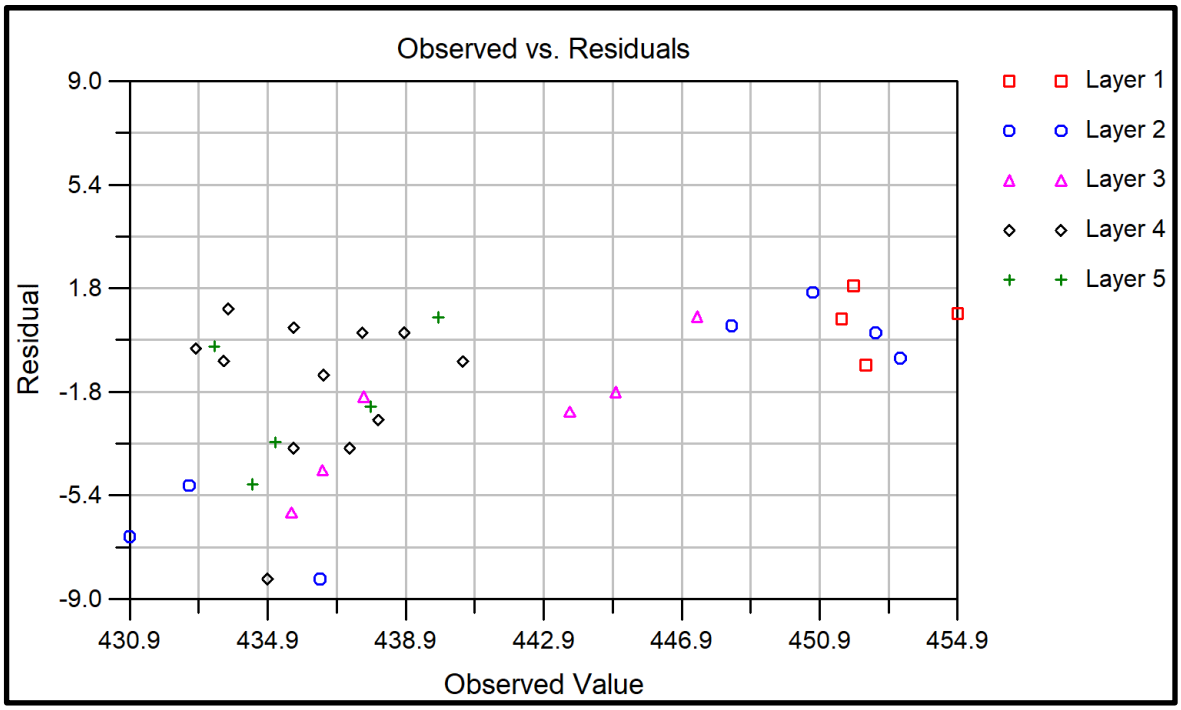
FIGURE 5-18



STEADY STATE MODFLOW CALIBRATION RESULTS – OBSERVED VERSUS SIMULATED (FT)

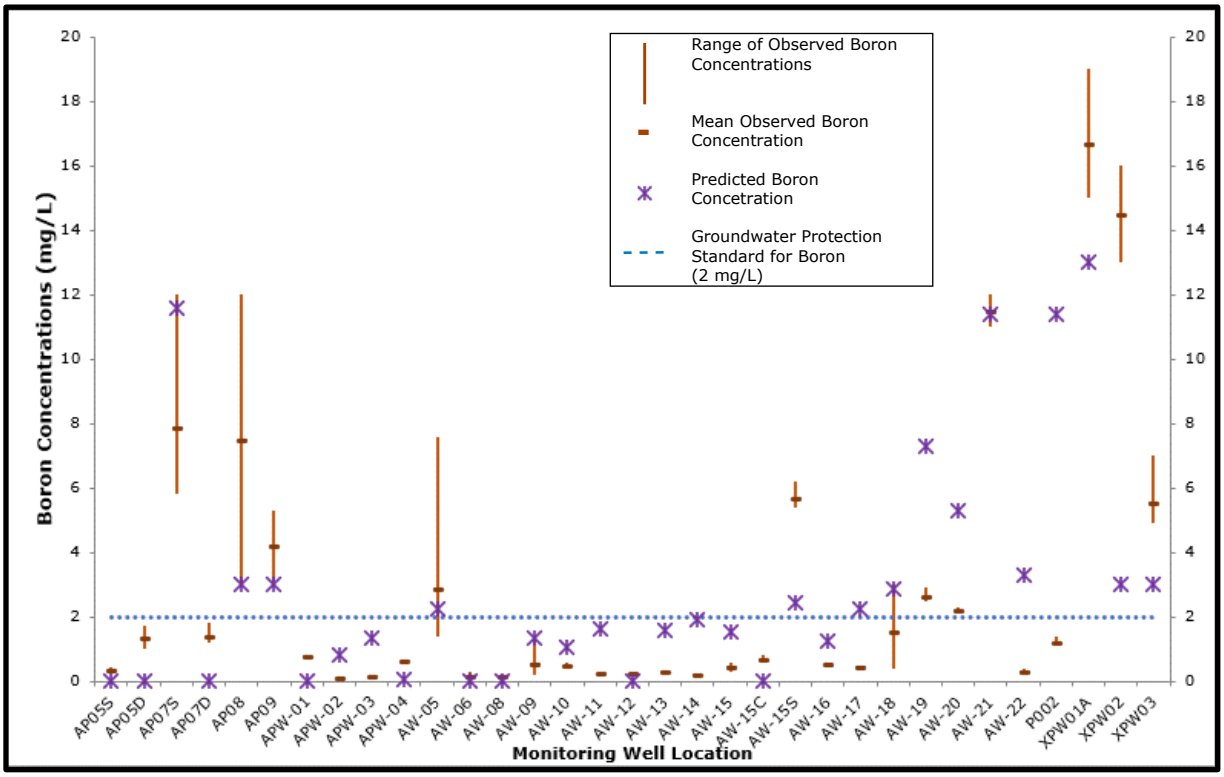
GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL



STEADY STATE MODFLOW CALIBRATION RESULTS – OBSERVED VERSUS RESIDUALS (FT)

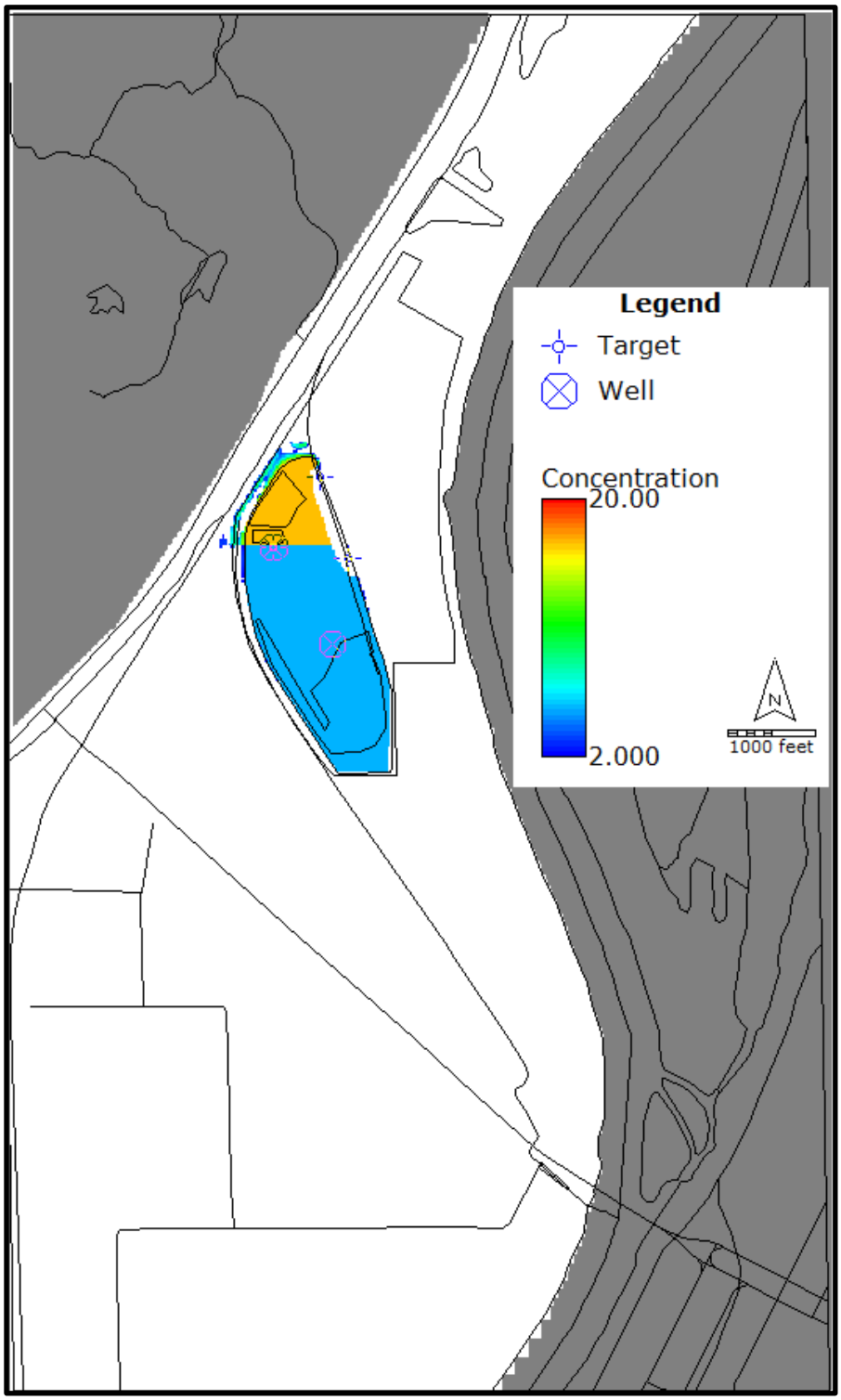
FIGURE 5-20



OBSERVED AND SIMULATED BORON CONCENTRATIONS (mg/L)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

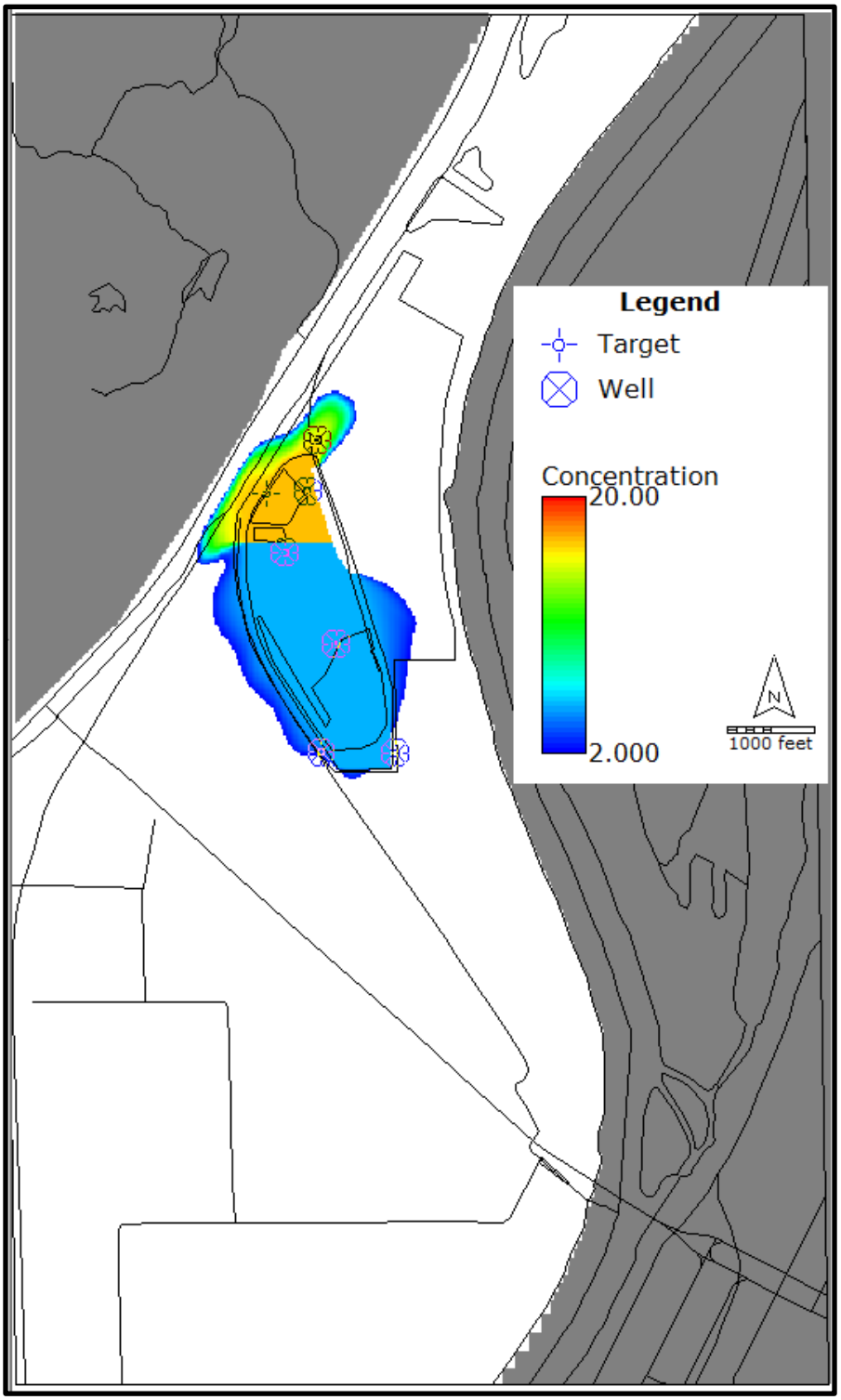
RAMBOLL



LAYER 1 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UCF)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

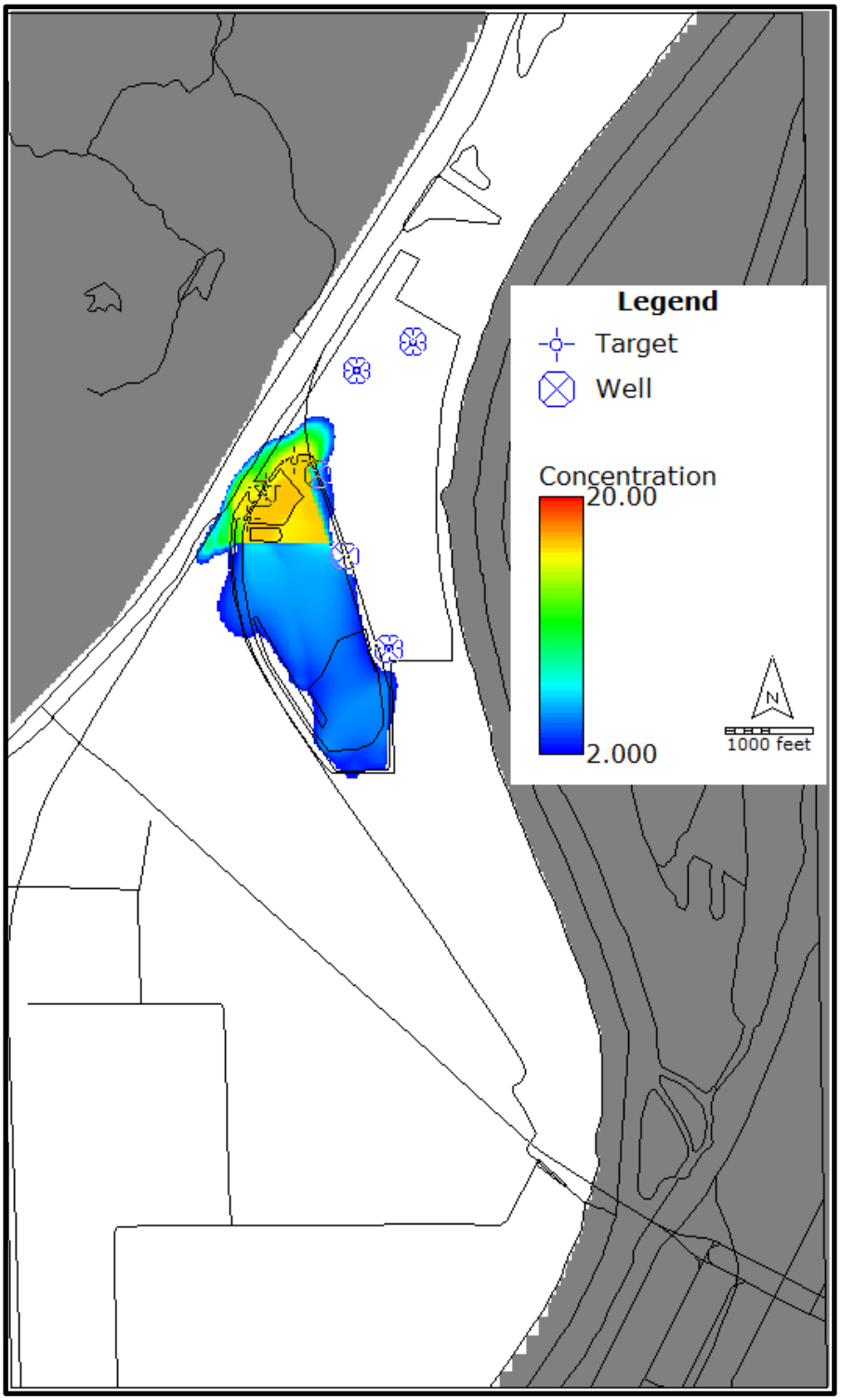
RAMBOLL



LAYER 2 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UCF [PMP])

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

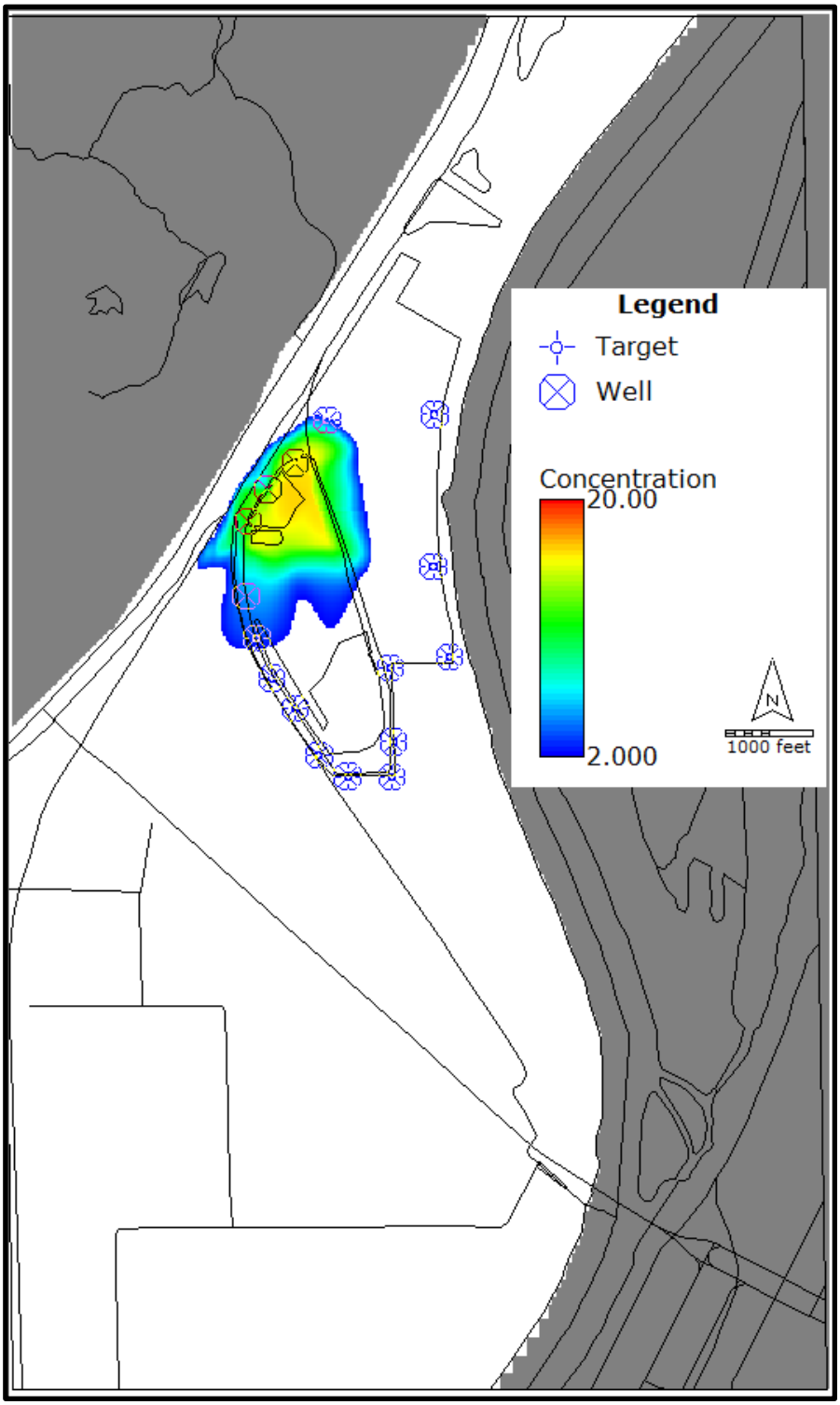
RAMBOLL



LAYER 3 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UCF)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

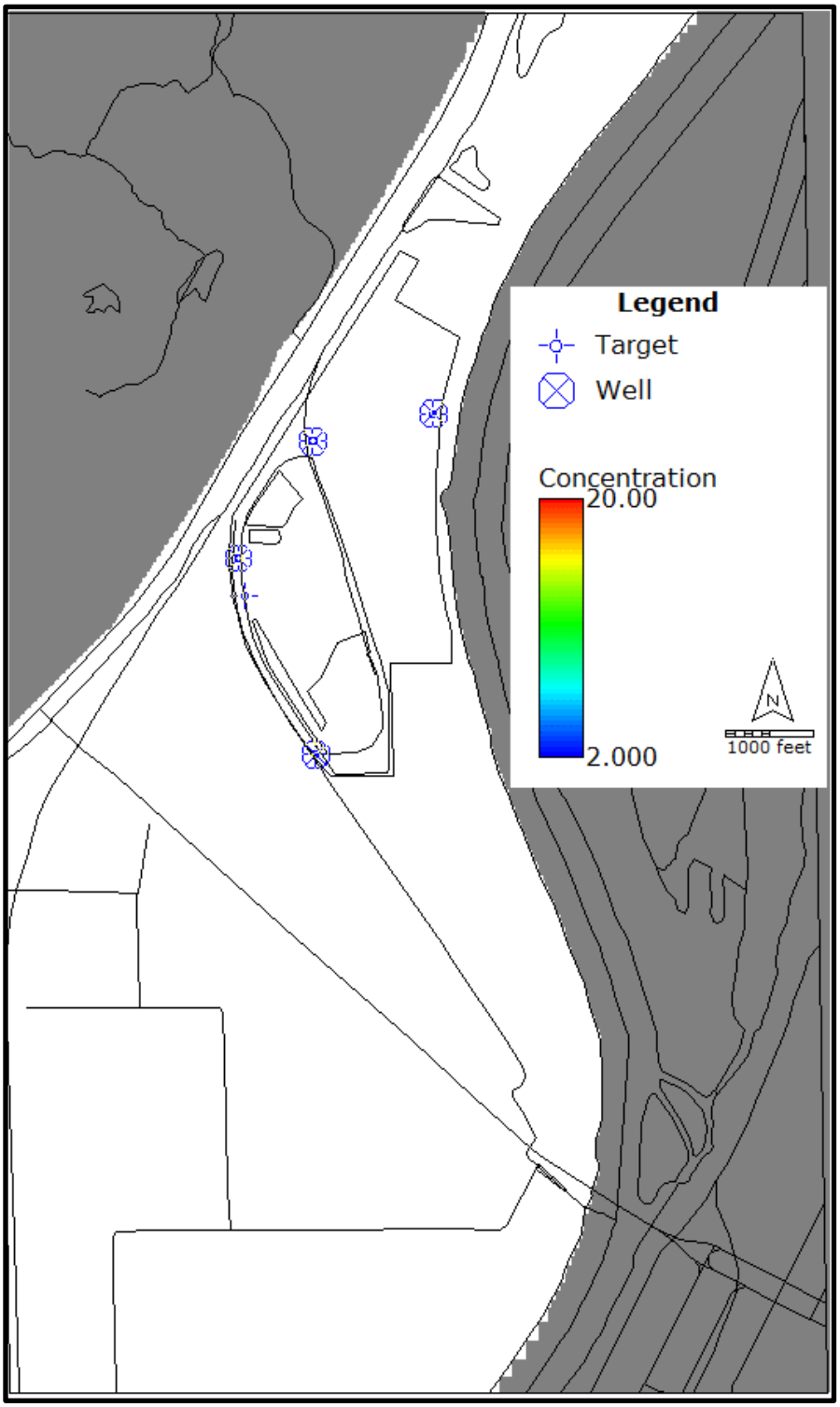
RAMBOLL



LAYER 4 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UA)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

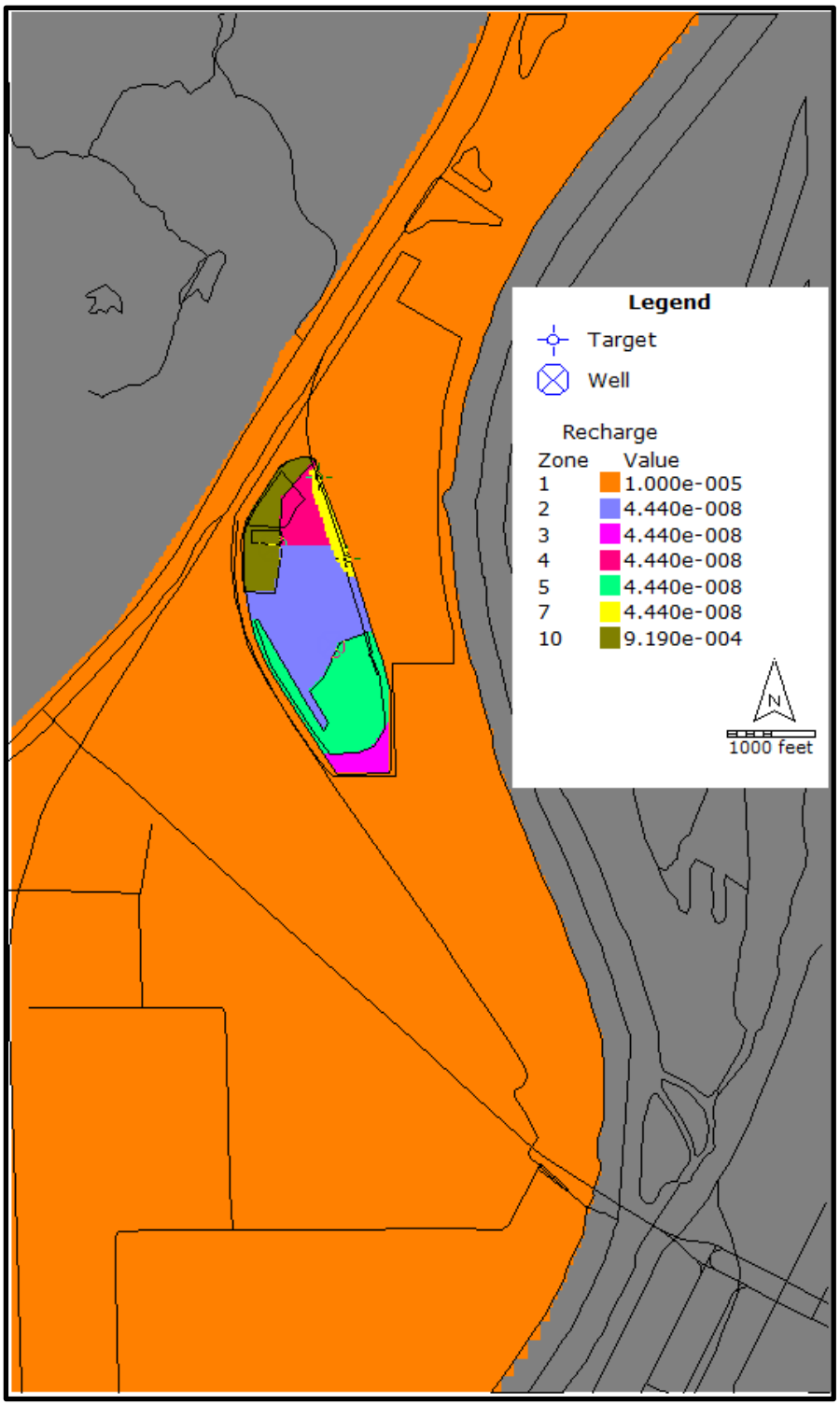
RAMBOLL



LAYER 5 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (BCU)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

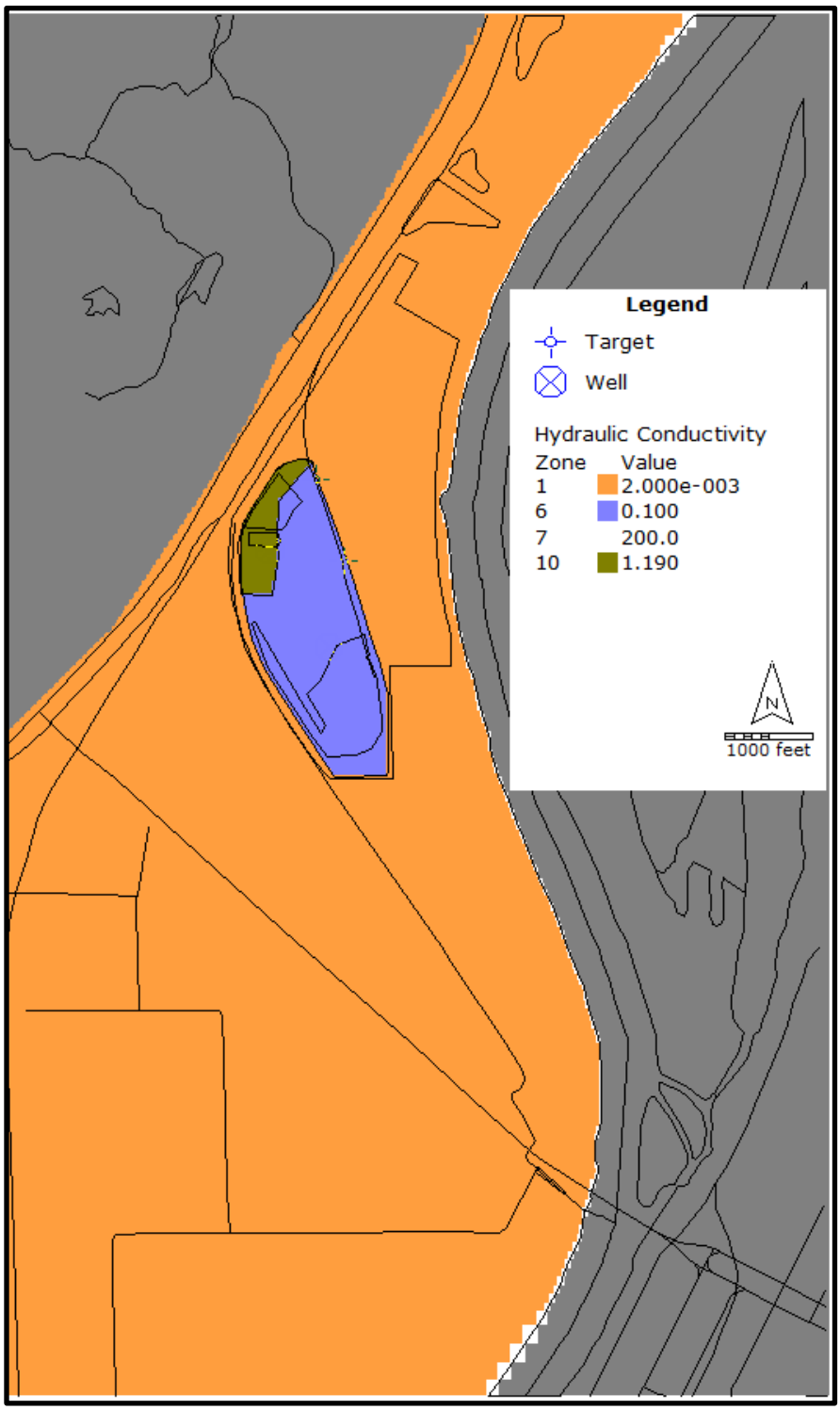
RAMBOLL



DISTRIBUTION OF RECHARGE ZONES (FEET/DAY) FOR CLOSURE IN PLACE

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

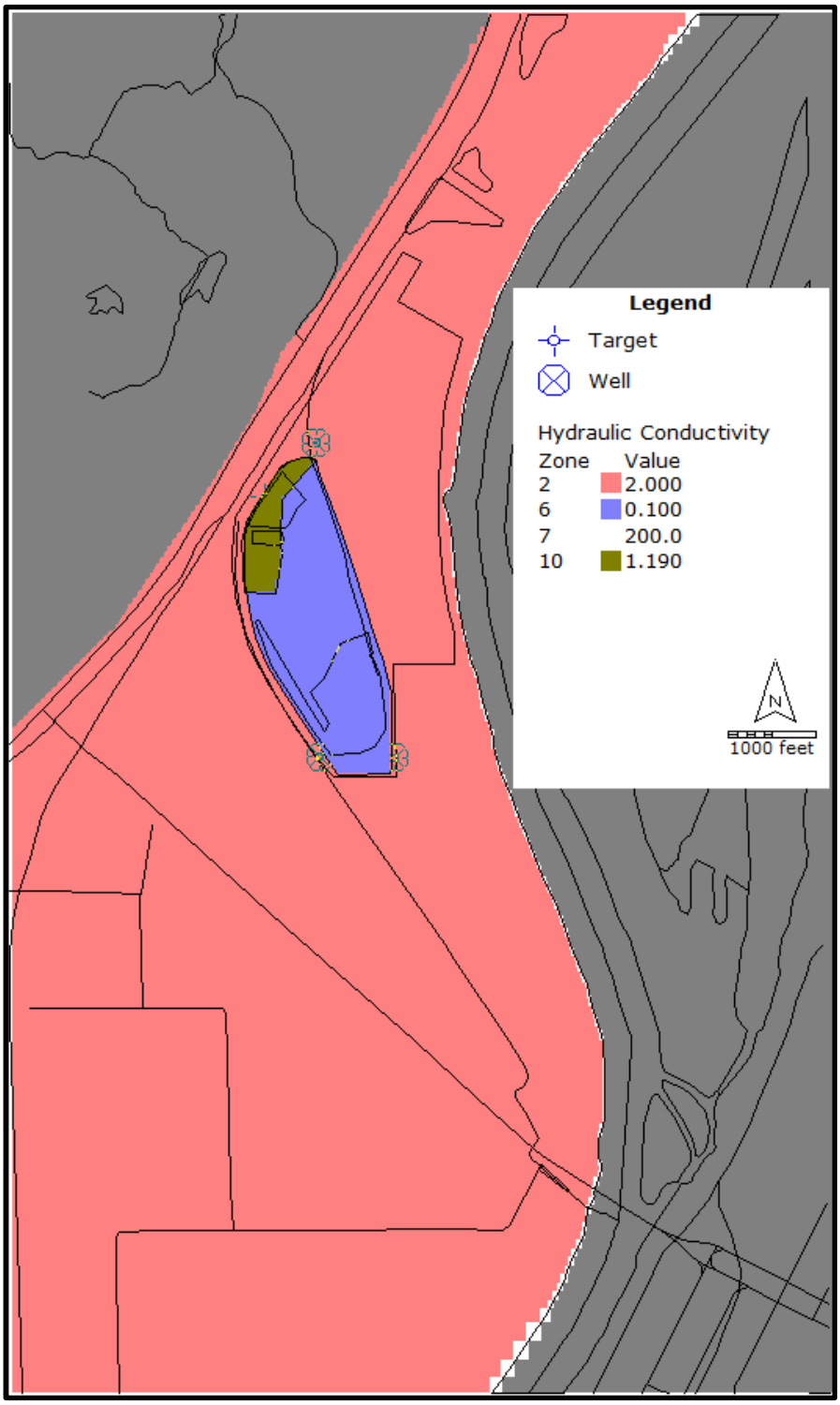
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES (FEET/DAY) FOR LAYER 1 FOR CLOSURE IN PLACE

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

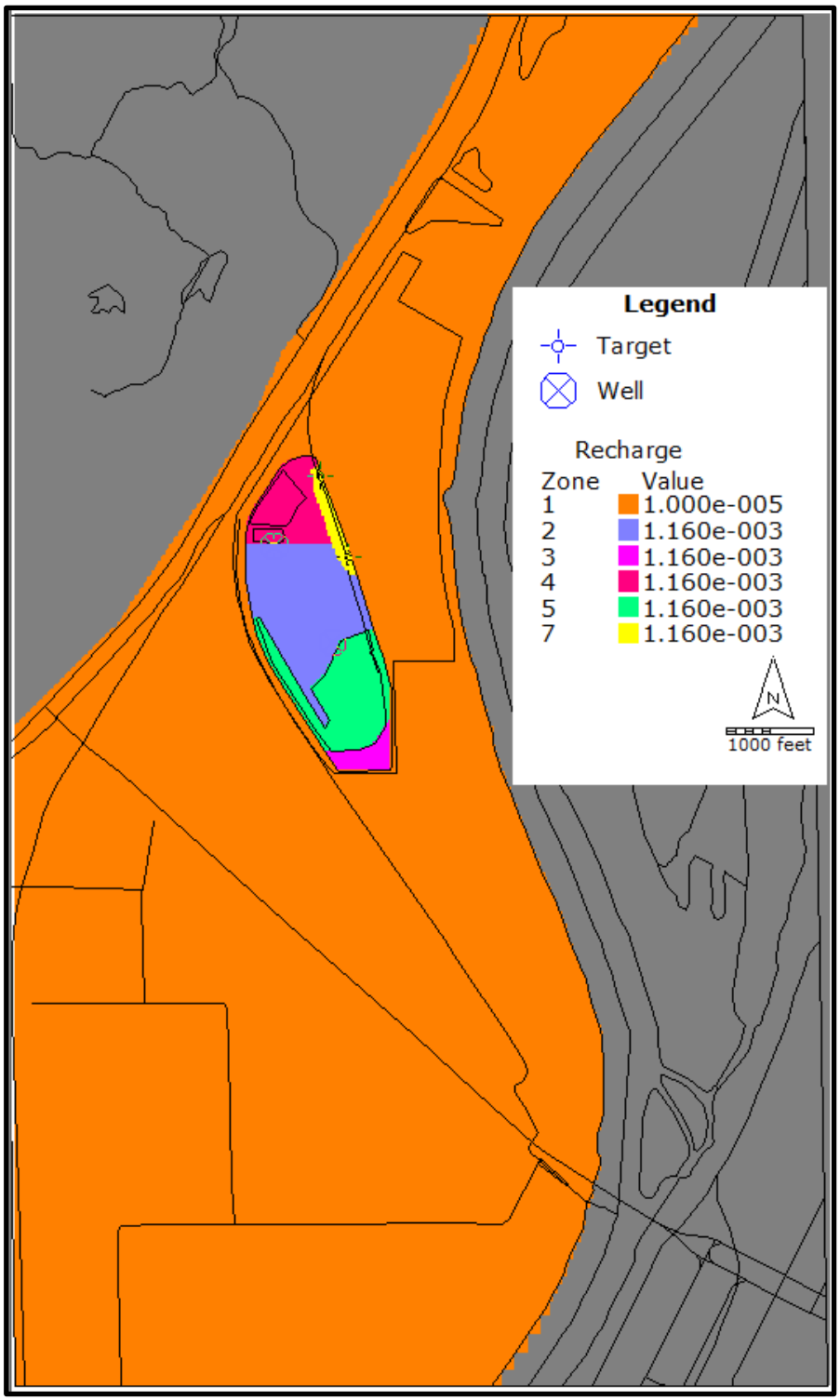
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES (FEET/DAY) FOR LAYER 2 FOR CLOSURE IN PLACE

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

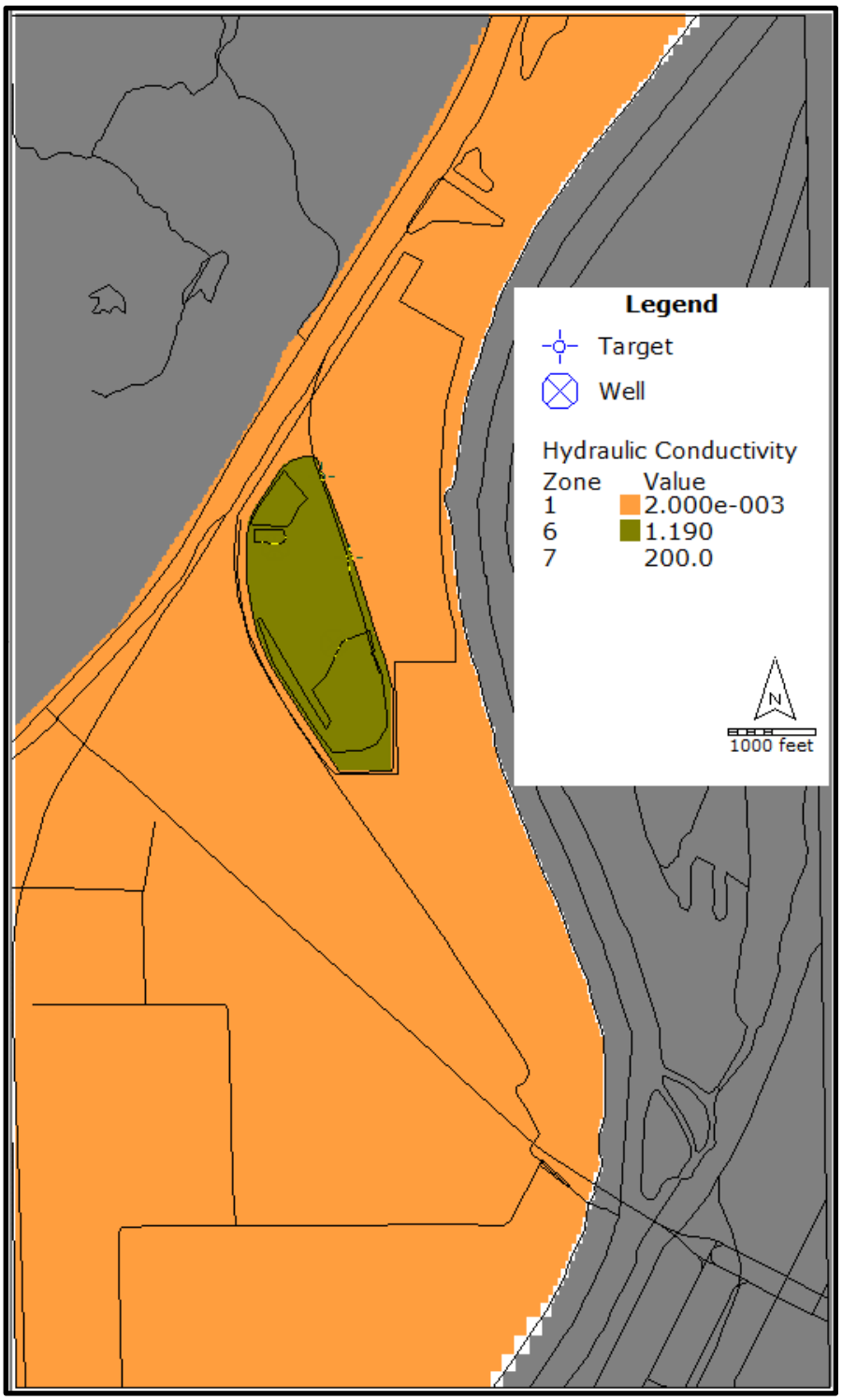
RAMBOLL



DISTRIBUTION OF RECHARGE ZONES (FEET/DAY) FOR CLOSURE BY REMOVAL

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

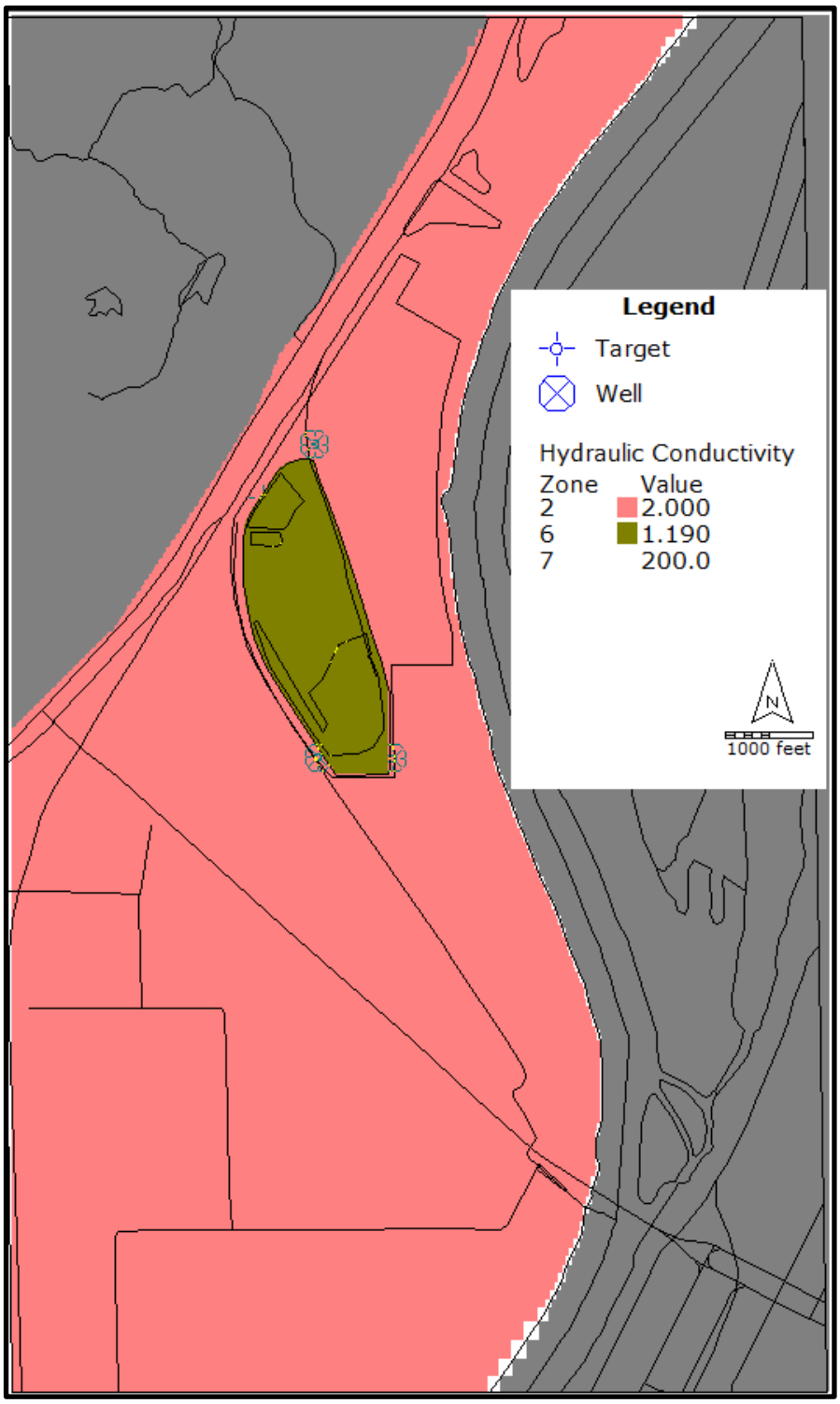
RAMBOLL



DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES (FEET/DAY) FOR LAYER 1 FOR CLOSURE BY REMOVAL

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

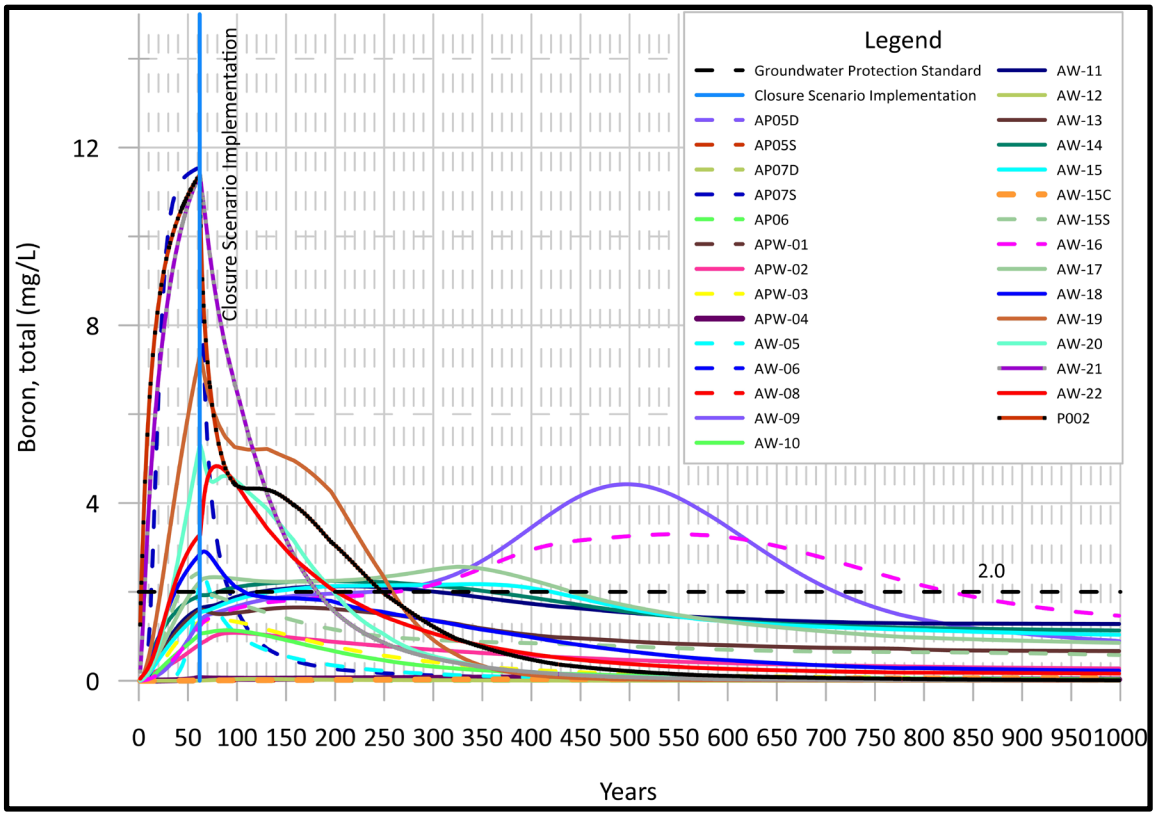


DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES (FEET/DAY) FOR LAYER 2 FOR CLOSURE BY REMOVAL

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

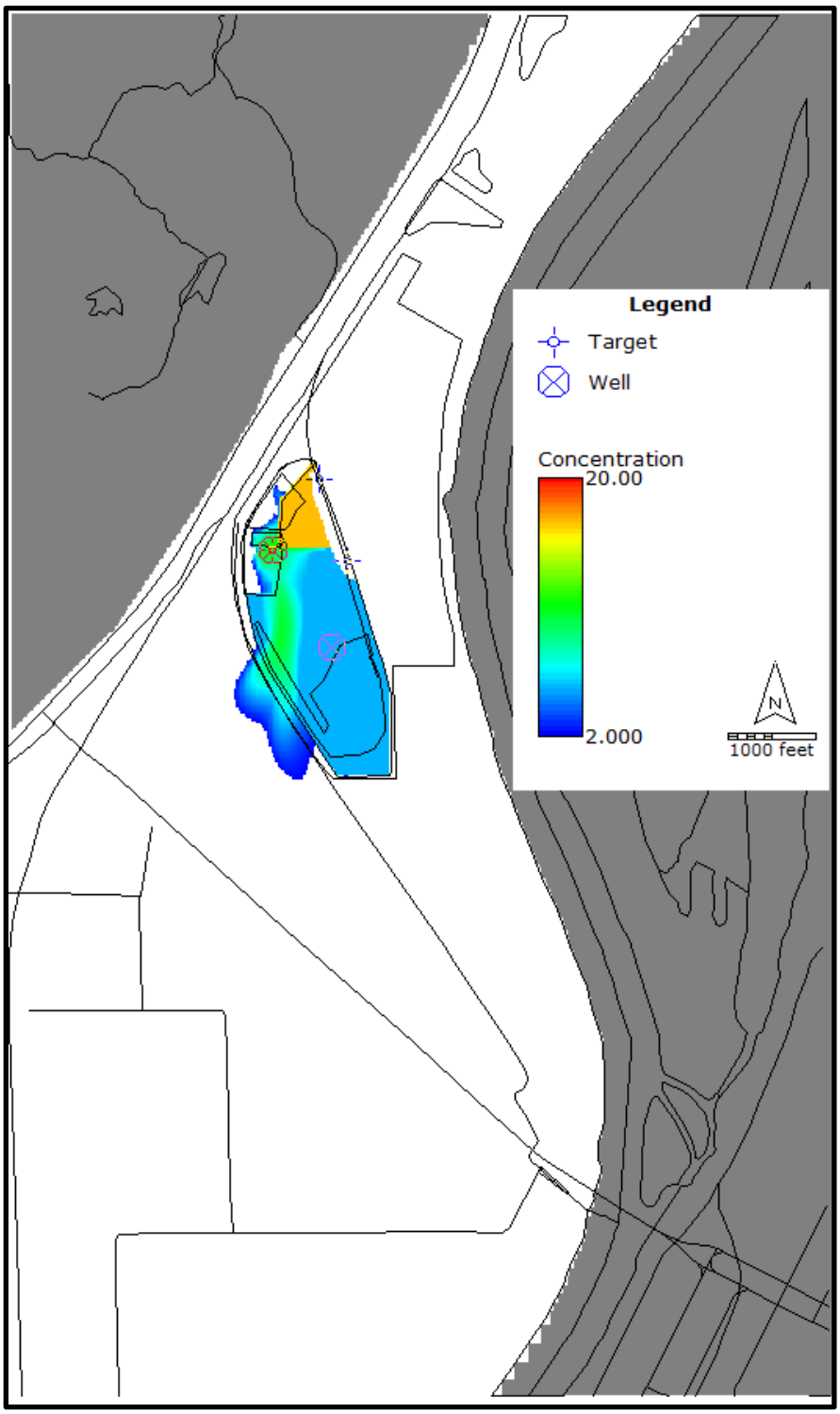
FIGURE 6-7



CIP – MODEL PREDICTED BORON CONCENTRATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

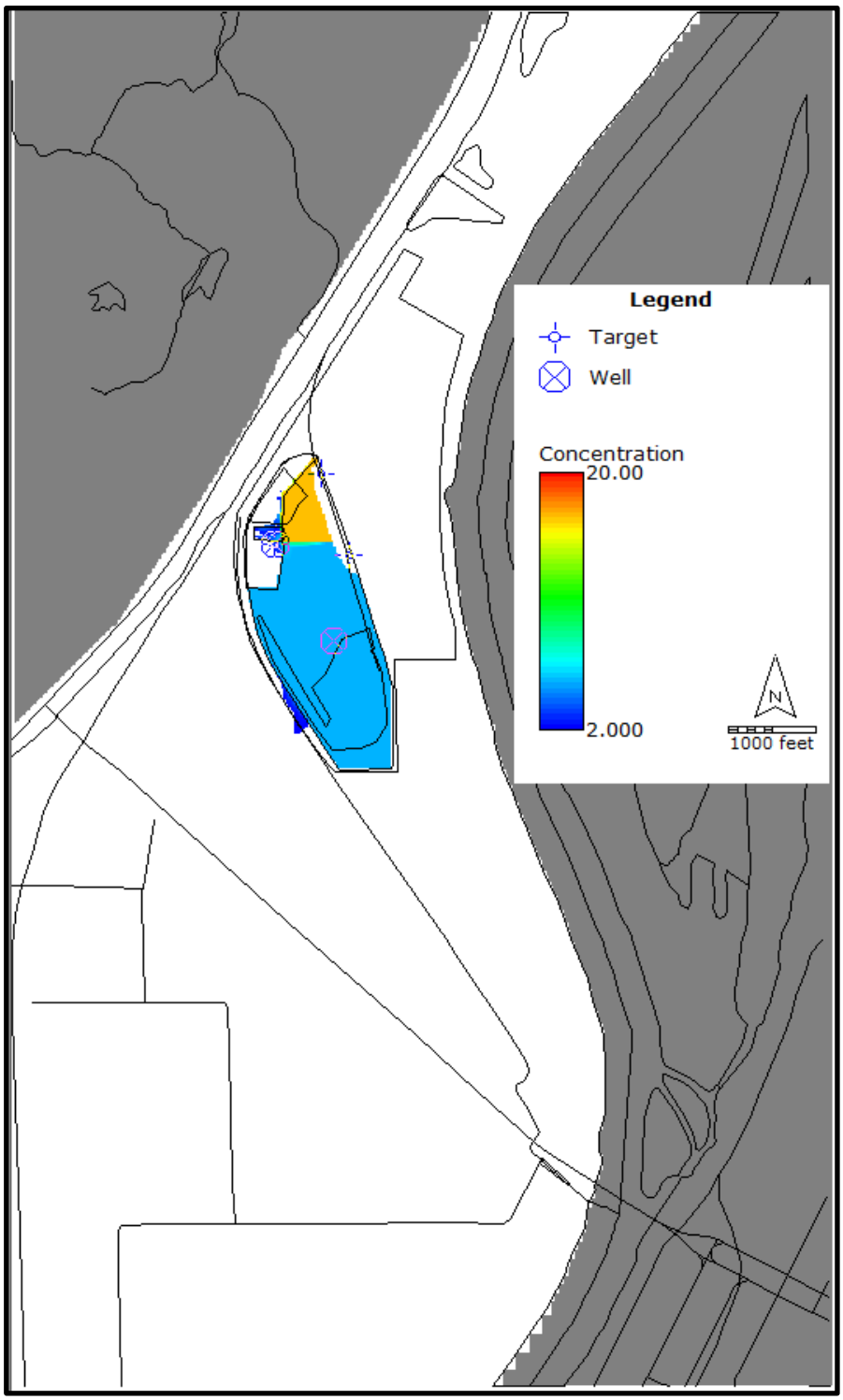
RAMBOLL



CIP – (SCENARIO 1) – MODEL PREDICTED MAXIMUM BORON PLUME IN ALL LAYERS
APPROXIMATELY 382 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

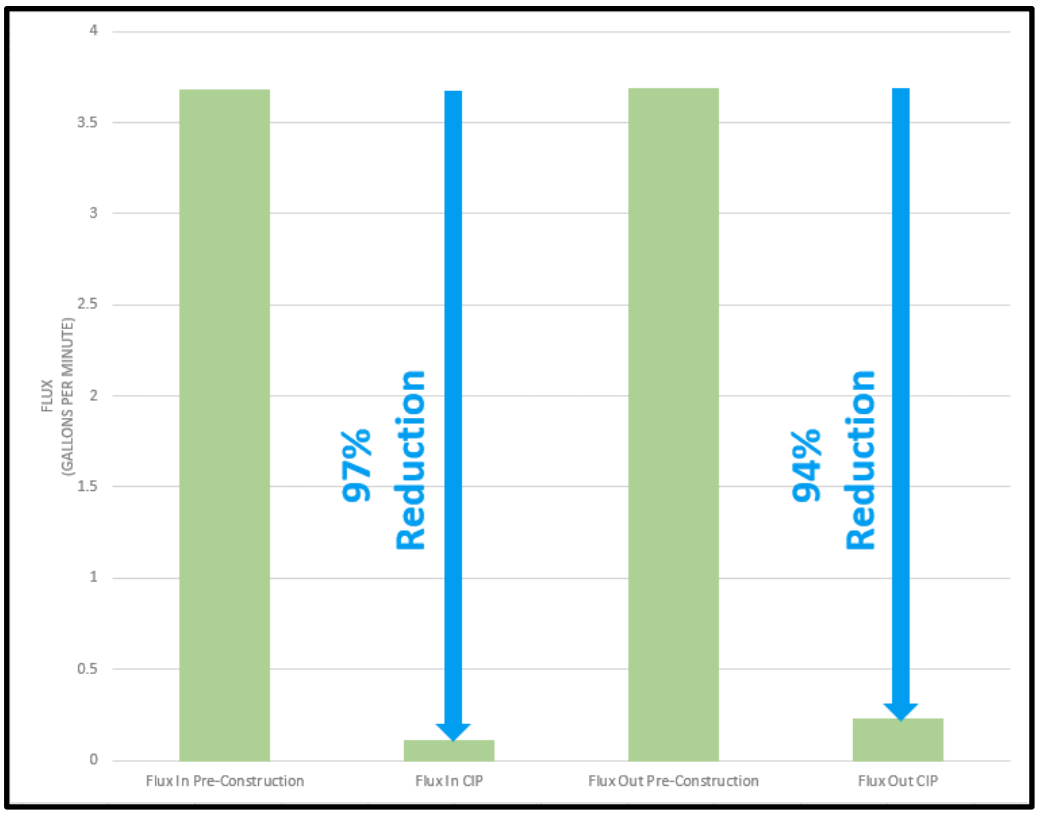


CIP – (SCENARIO 1) – MODEL PREDICTED MAXIMUM BORON PLUME IN ALL LAYERS
APPROXIMATELY 767 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

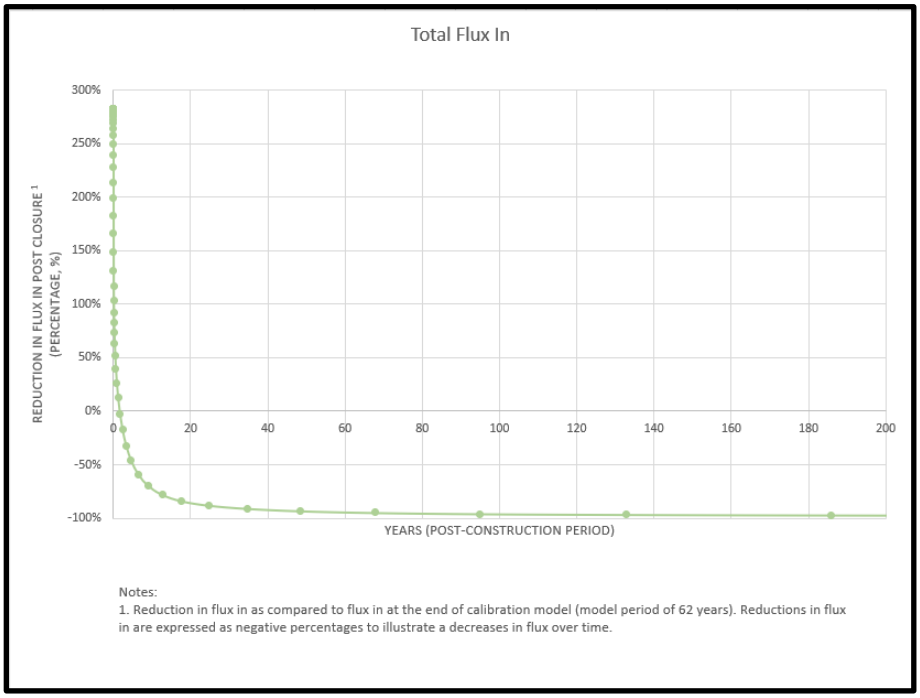
FIGURE 6-10

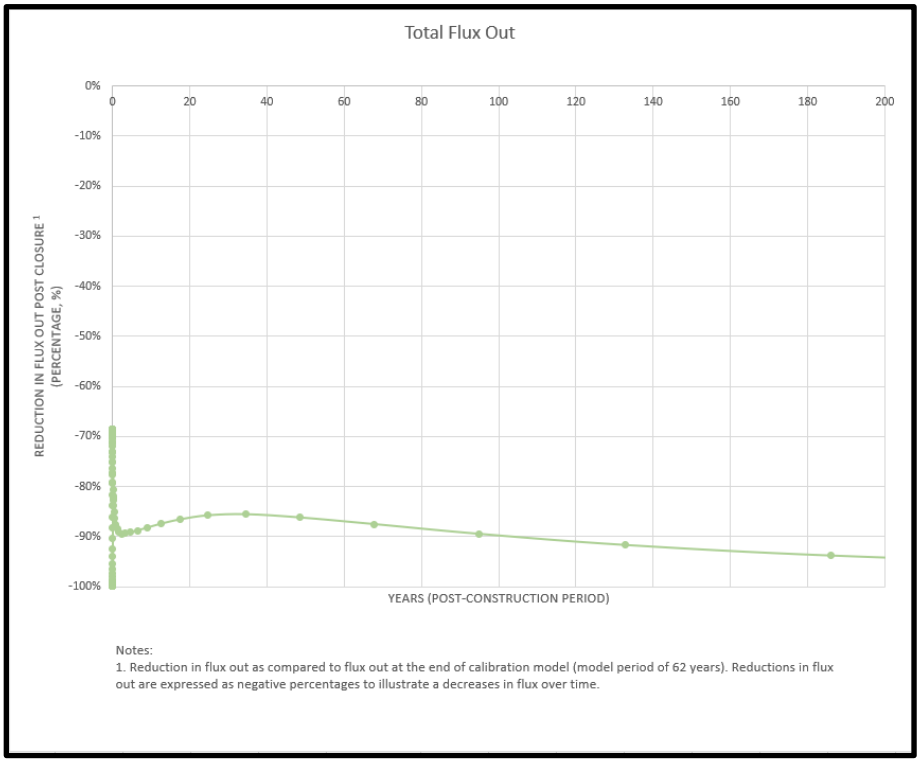


SCENARIO 1 (CIP) –
HYDRAULIC STEADY STATE REDUCTIONS IN TOTAL FLUX IN AND OUT OF FILL UNIT (CCR)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL



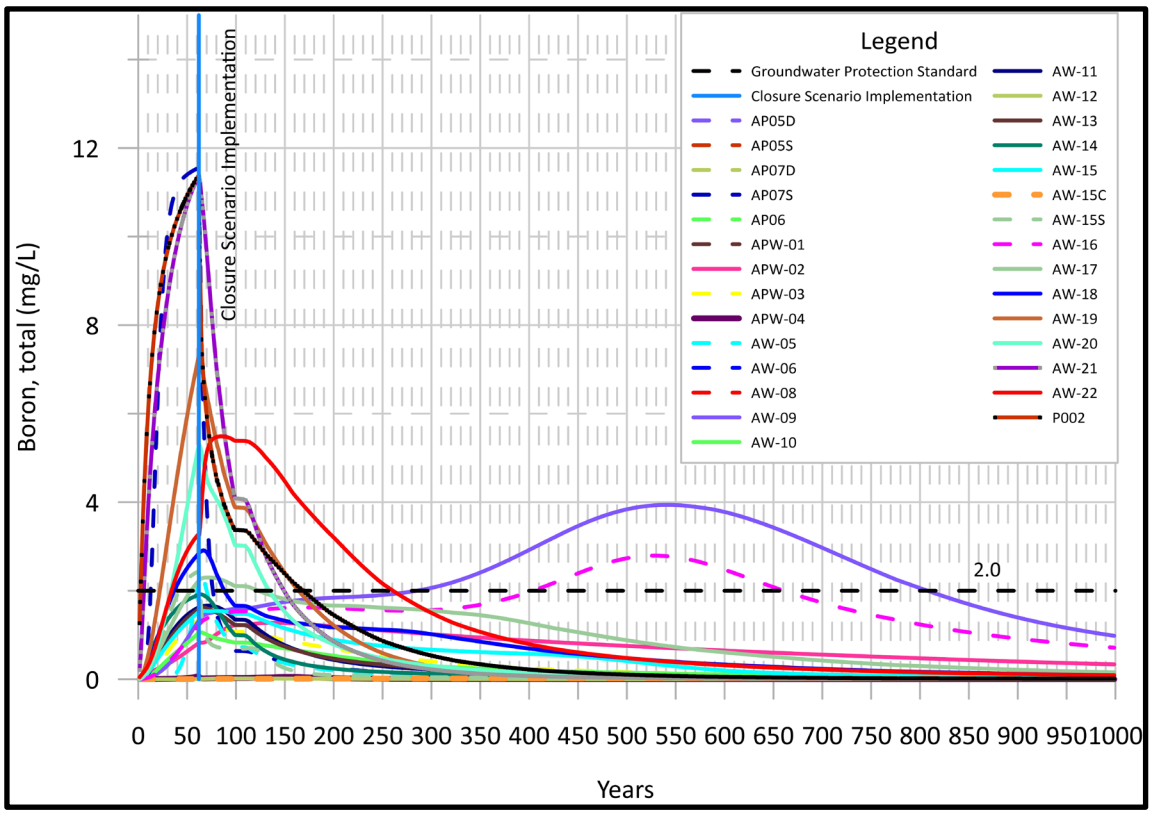


SCENARIO 1 (CIP) –
REDUCTIONS IN TOTAL FLUX IN AND OUT OF FILL UNIT (CCR)

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

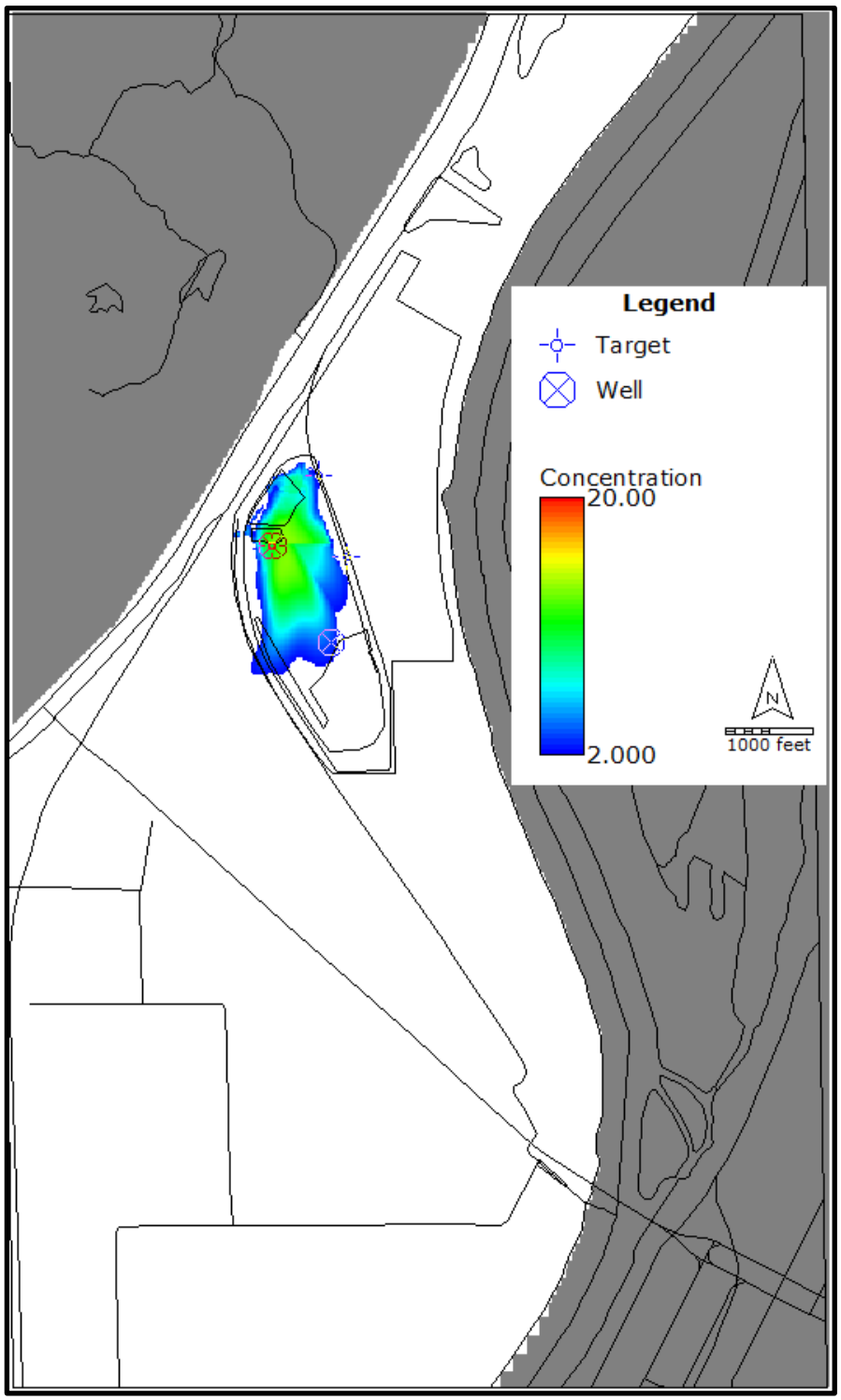
FIGURE 6-12



CBR – MODEL PREDICTED BORON CONCENTRATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

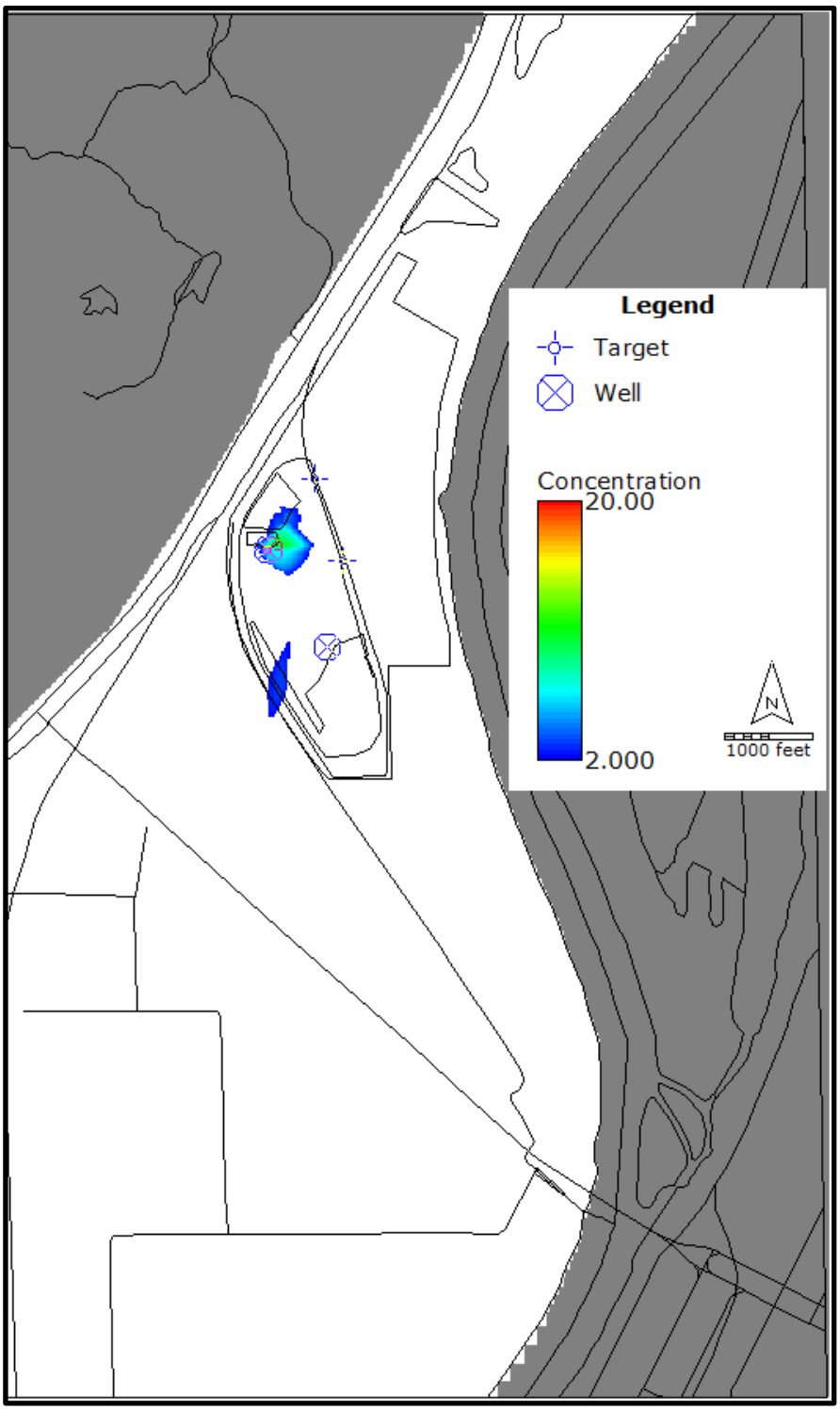
RAMBOLL



CBR – (SCENARIO 2) – MODEL PREDICTED MAXIMUM BORON PLUME IN ALL LAYERS
APPROXIMATELY 201 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL



CBR – (SCENARIO 2) – MODEL PREDICTED MAXIMUM BORON PLUME IN ALL LAYERS
APPROXIMATELY 748 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING REPORT
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL

APPENDIX A
EVALUATION OF POTENTIAL GWPS EXCEEDANCES (GOLDER ASSOCIATES USA INC., 2022)

TECHNICAL MEMORANDUM

DATE April 14, 2022 **Project No.** 21454831

TO David Mitchell, Stu Cravens, Vic Modeer
Illinois Power Resources Generating, LLC.

CC Brian Hennings - Ramboll

FROM Roberta Russell, Jeffrey Ingram, Pat Behling **EMAIL jeffrey.ingram@wsp.com**

EVALUATION OF POTENTIAL GWPS EXCEEDANCES, EDWARDS ASH POND (CCR UNIT 301), EDWARDS POWER PLANT, PEORIA COUNTY, ILLINOIS

1.0 INTRODUCTION

Illinois Power Resource Generating, LLC (IPRG) currently operates the Edwards Power Plant (EPP) located in Peoria County, Illinois. The Edwards Ash Pond (EAP), Illinois Environmental Protection Agency (IEPA ID No. W1438050005 - 01) is a 91-acre unlined surface impoundment used to manage coal combustion residuals (CCRs) at the EPP. The EAP is regulated under Part 845 *"Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments"* (State CCR Rule or Part 845) which was promulgated by the Illinois Pollution Control Board (IPCB) on April 21, 2021.

IPRG is currently preparing a Construction Permit application for the EAP as required under Section 845.220 which requires groundwater modeling be completed for the known potential exceedances of groundwater protection standards (GWPS) as outlined in the Operating Permit application (Burns and McDonnell 2021). In October 2021, Ramboll Americas Engineering Solutions, Inc. (Ramboll) identified potential GWPS exceedances for lithium, chloride and barium in certain monitoring wells in the vicinity of the EAP (Ramboll 2021b). This Technical Memorandum was developed to further evaluate these potential GWPS exceedances.

1.1 Site Setting, Geology, and Hydrogeology

The EPP is located in Peoria County between Mapleton and Bartonville in Section 11, Township 7 North, Range 7 East, on the floodplain of the Illinois River adjacent to a levee. The EPP has one CCR surface impoundment, the Ash Pond, covering approximately 91 surface acres.

The EPP is situated in a predominantly agricultural area with industrial parcels bordering the property. Historically, several coal mines were operated at depths of 100 to 160 feet below ground surface (bgs) in the vicinity of the EPP. The EPP property is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and a fertilizer production facility to the east, and agricultural land to the south.

Four hydrogeologic units are present at the EPP. They are described as follows in the Hydrogeologic Site Characterization Report (Ramboll 2021c), in downward order:

- **CCR:** Saturated CCR consisting primarily of fly ash within the Ash Pond. CCR is present at thicknesses up to 46.5 feet and at elevations as low as 413.9 feet North American Vertical Datum of 1988 (NAVD88) in the central and northern portion of the Ash Pond**.**
- **Upper Cahokia Formation/Potential Migration Pathway (PMP):** Low-permeability clays and silts of the Upper Cahokia Formation are present at the surface. This unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the Upper Cahokia Formation adjacent to the Ash Pond.
- **Uppermost Aquifer (UA):** Thin (generally less than 4 feet), moderate-permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present. In locations where higher-permeability materials and coarser-grained materials are absent, the Uppermost Aquifer is interpreted as the interface between the Lower Cahokia Formation and the Bedrock Confining Unit.
- **Bedrock Confining Unit (BCU):** Thick, very low-permeability shales and siltstones of the Carbondale and Modesto Formations. This unit was encountered at elevations ranging from approximately 400 to 422 feet NAVD88 with higher bedrock elevations occurring beneath the northern portion of the Ash Pond. In general, the Upper Cahokia Formation consists of low-permeability clays and silts, with limited occurrences of thin, discontinuous sand lenses. In several locations, generally near the southern and western portions of the unit, coarser-grained materials are present at the base of the Lower Cahokia Formation and/or the top of the bedrock is weathered, resulting in relatively higher hydraulic conductivities. Because the interface is laterally continuous and has relatively higher conductivity, the unlithified/lithified upper contact was designated as the Uppermost Aquifer.

Occasional sand lenses within the Upper Cahokia Formation and downgradient clay intervals present at elevations similar to the base of ash in the Ash Pond were identified as PMPs. The underlying BCU is interpreted as the confining base of the aquifer, with hydraulic conductivities generally two orders of magnitude lower than those measured in the Uppermost Aquifer (Ramboll 2021c).

Groundwater flows east to west in the central portion of the EAP, south/southeast at the south end of the EAP and to the north/northwest at the north end of the EAP (Ramboll 2021b) (**Figure 1**).

2.0 POTENTIAL GWPS EXCEEDANCES REVIEW

As required by Section 845.230 (d)(2)(M), an evaluation of the history of potential GWPS exceedances was completed for the Operating Permit application (Burns and McDonnell 2021 and Ramboll 2021b). Water quality data from groundwater samples collected from the EAP monitoring well network since February 2021 were evaluated using the statistical methods described in the Statistical Analysis Plan included in the Operating Permit application (Ramboll, 2021b). The following potential exceedances of the GWPSs were evaluated in this Technical Memorandum:

- Barium at monitoring well AW-15C: A barium exceedance (2.9 mg/L) in this well was reported based on calculation of a confidence interval around the mean of samples collected during 2021. AW-15C is located downgradient from the EAP and the screened interval is within a shale unit of the BCU.

- Chloride at monitoring well AP07D: A chloride exceedance (498 mg/L) in this well was reported based on calculation of a confidence interval around the mean of samples collected during 2021. AP07D is located downgradient from the Ash Pond; the screened interval is within a siltstone unit of the BCU.
- Lithium at monitoring well AP05D: A lithium exceedance (0.077 mg/L) in this well was reported based on calculation of a future median (i.e. a median of the three most recent samples) of samples collected during 2021. AP05D is located cross-gradient from the EAP and the screened interval is within a siltstone unit of the BCU.
- Lithium at monitoring well AP07D: A lithium exceedance (0.15 mg/L) in this well was reported based on calculation of a future median of samples collected during 2021. AP07D is located downgradient from the EAP and the screened interval is within a siltstone unit of the BCU.

3.0 COMPOSITIONAL ANALYSIS OF GEOLOGIC MATERIAL

3.1 Chemical Composition and Sequential Extraction

Results from sequential extractions and chemical analysis were used to determine the chemical composition of the BCU and the distribution of barium and lithium over various operationally-defined fractions in the BCU material. This testing was conducted on three samples collected from two boreholes (E-SB-05 and E-SB-07; Figure 1) advanced within the BCU. Results are presented in Section 4.0.

A description of the sequential extractions is presented in Footnote 1, Section 4.0. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). Total metal quantities from the sequential extraction are expressed as “SEP Total”, extracted by a discrete total step (separate aliquot of same sample). The sum of the sequential extraction steps is also calculated but does not represent an analytically determined value. The leachates produced during each step of the sequential extractions and the total metals step were analyzed for metal concentrations using US EPA SW-846 Method 6010B.

3.2 Mineralogical Composition

Quantitative X-ray diffraction (XRD) with Rietveld refinement was used to identify and quantify minerals in three BCU samples collected from two borings (E-SB-05 and E-SB-07) during drilling activities. These samples were obtained to determine the mineralogical composition of the BCU and identify any naturally occurring minerals that have the potential to release constituents of potential concern into groundwater. The mineralogical results are presented in Table 1. The mineralogical composition primarily included quartz and feldspars (58 – 63%) and phyllosilicates muscovite, chlorite and biotite (33 – 36%). The samples also contained from less than 1% - 6% carbonates (e.g. dolomite, calcite, siderite) and 1% iron or titanium oxides.

4.0 EVIDENCE THAT POTENTIAL GWPS EXCEEDANCES ARE NOT RELATED TO THE EAP

Groundwater quality data for samples collected from monitoring wells that exhibited potential GWPS exceedances, background monitoring well AP05S, upgradient monitoring wells, and pore water samples from the EAP were evaluated. The review indicates that the GWPS exceedances are not related to the EAP, as described in the lines of evidence that follow:

- **In accordance with the procedures of the Statistical Analysis Plan, barium, chloride, or lithium did not occur statistically above the GWPS in any wells completed within the shallower UA and paired with or upgradient of AP05D, AP07D and AW-15C.**

Shallow paired wells are completed adjacent to AP05D (AP05S), AP07D (AP07S) and AW-15C (AW-15S and AW-15) in either the PMP or the UA. Groundwater samples collected from the shallow paired wells did not contain concentrations of barium, chloride, or lithium above the site GWPS (Table 2). In addition, wells between these locations and the Ash Pond (in a vertical migration pathway), or upgradient of these locations did not detect concentrations above the GWPS for these parameters. This includes AW-16 (upgradient of AW-15C), AW-21 and AW-22 (upgradient of AP07D). There are no monitoring wells directly upgradient of AP05D. A cross section location map and cross section showing the hydraulic positions of these wells is presented on Figures 2 and 3. The elevated concentrations of barium, chloride or lithium are not attributed to the Ash Pond because the migration pathway is not impacted (i.e. concentrations of the constituents in paired wells completed in the UA, which overlies the BCU, would be equal to or greater than the paired/exceedance wells completed in the BCU). Figures 4 to 6 show concentrations of barium, chloride and lithium in groundwater from the wells with GWPS exceedances; their respective paired wells AP05S, AP07S, AW-15, and AW-15S; and upgradient wells AW-16, AW-21, and AW-22.

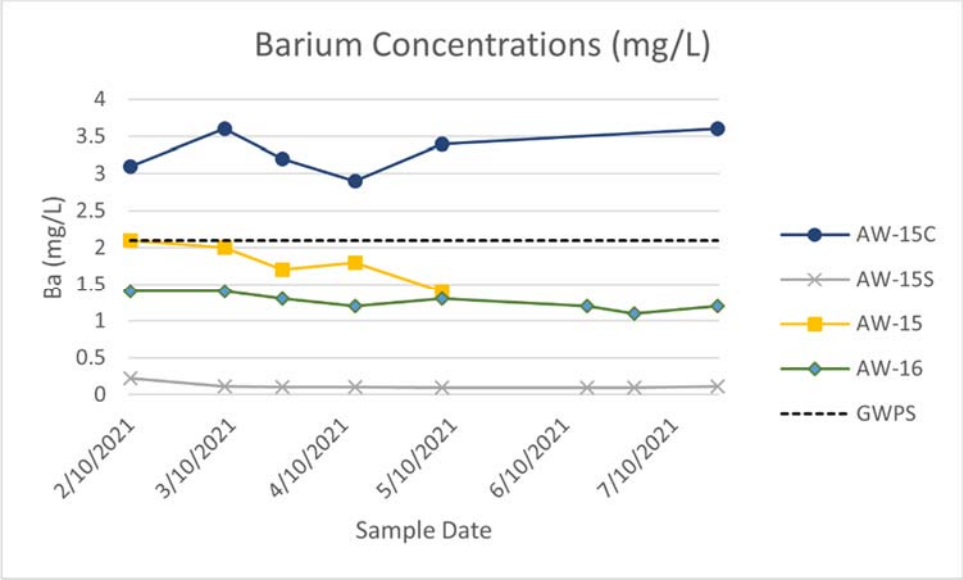


Figure 4. Barium (Ba) concentrations in groundwater from exceedance well AW-15C, shallow paired wells AW-15S and AW-15, and upgradient well AW-16

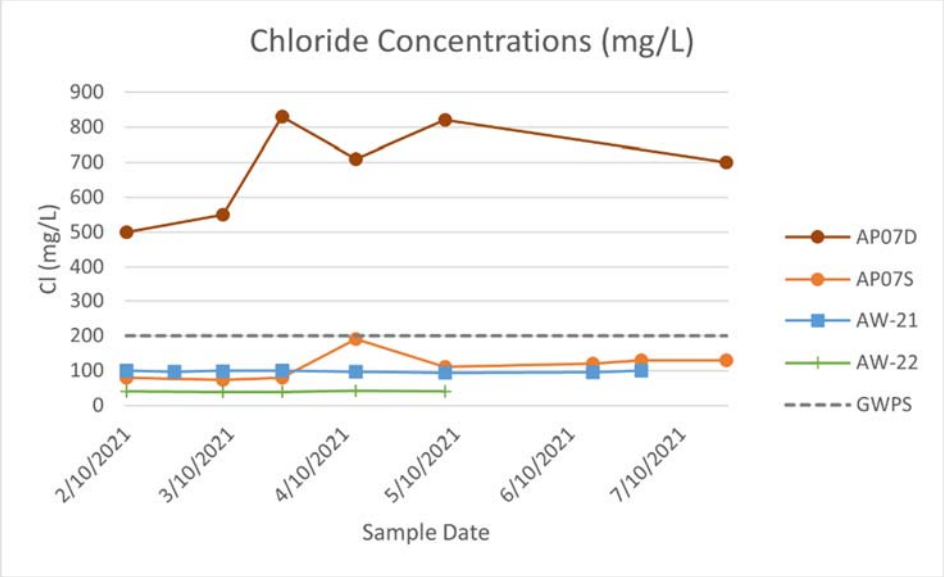


Figure 5. Chloride (Cl) concentrations in groundwater exceedance well AP07D, shallow paired well AP07S, and upgradient wells AW-21 and AW 22

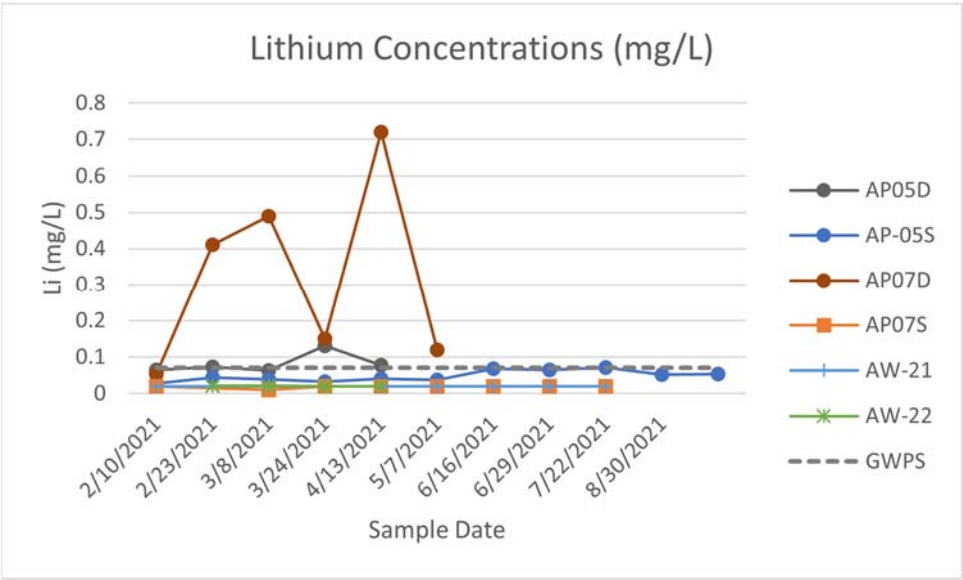


Figure 6. Lithium (Li) concentrations in groundwater exceedance wells AP05D and AP07D, shallow paired wells AP05S and AP07S, and upgradient wells AW21 and AW22

- **Concentrations of key CCR tracer constituents in EAP pore water samples differ significantly from groundwater in BCU monitoring wells AP05D, AP07D, and AW-15C.**

Concentrations of indicator parameters typically associated with the CCR managed in the EAP (e.g., boron, chloride, and sulfate) differ between porewater in the EAP and groundwater in the BCU wells AP05D, AP07D, and AW-15C. Data from the May 2021 sampling event for pore water, the BCU/exceedance wells, the shallow paired wells, and the background well are summarized in Table 3. Boron and sulfate concentrations are higher while chloride concentrations are lower in CCR porewater samples when compared to groundwater concentrations in

the wells with GWPS exceedances and the background well. The relative proportions of these constituents in porewater versus the BCU/exceedance wells differ as well, as shown on the ternary diagram (Figure 7). The BCU/exceedance wells plot with the background well AP05S on the ternary diagram. The EAP porewater plots closer to the sulfate apex than the background and exceedance wells. Given the conservative behavior of sulfate and boron (see next paragraph for more detail on sulfate), if the EAP were the source, groundwater in the exceedance wells would plot in between the background groundwater and EAP pore water compositions. The concentrations of chloride in the porewater are consistently lower than in AP07D, as discussed in the next line of evidence

Sulfate, unlike boron and chloride, is sensitive to redox conditions (e.g., reduction of sulfate to sulfide) and may also be affected by the precipitation of sulfate-bearing minerals. These geochemical processes may alter sulfate concentrations in Site groundwater and affect the interpretive value of graphical methods such as ternary diagrams. To evaluate the potential for sulfate reactions in porewater and groundwater (which could affect the interpretation of sulfate concentration data), precipitation of sulfate-bearing minerals was evaluated with the help of the geochemical modeling code PHREEQC (Parkhurst and Appelo 2013), using a saturation index (SI) calculation:

$$SI = \log (IAP/Ksp)$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are generally considered to represent ‘equilibrium’ in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling (Nordstrom and Alpers 1999). The widely accepted thermodynamic database Minteq.v4, 2017 edition (USEPA 1998b, as amended), was used as a basis for the thermodynamic constants required for modeling, with additions and modifications from recent literature as required. Relevant sulfate-bearing minerals that were evaluated included gypsum, barite, and others that would be kinetically feasible to form under low-temperature conditions, as listed in Table 6.10 in Nordstrom and Alpers (1999). Calculated mineral SIs are presented in Table 4.

The geochemical modeling indicates that sulfate-bearing minerals are undersaturated across the Site, with the exception of barite. However, barite precipitation will be minimal, and is not expected to be a significant influence on sulfate concentrations in groundwater. Additionally, slightly oxidizing to oxidizing redox conditions were observed in Site groundwater (average Eh of +270 mV), indicating that reduction of sulfate to sulfide is not occurring. As such, sulfate in Site groundwater behaves conservatively and can be used as a tracer for potential EAP impacts.

These observations support that the GWPS exceedances of Ba in AW-15C, Li in AP05D, and Li and Cl in AP07D are not related to the EAP.

Table 3. Concentrations of boron, sulfate and chloride in exceedance wells and EAP pore water samples.

Well ID	Date	Boron (mg/L)	Sulfate (mg/L)	Chloride (mg/L)
Background Well				
AP-05S	5/7/2021	0.36	2.7	43
Bedrock Confining Unit Wells (GWPS Exceedance Wells)				
AP05D	5/7/2021	1.6	1.3	510
AP07D	5/5/2021	1.4	47	820
AW-15C	5/6/2021	0.63	<1	63
EAP Pore Water Samples				
XPW01A	5/4/2021	17	210	47
XPW02	5/4/2021	15	950	120
XPW03	5/4/2021	5.5	280	86

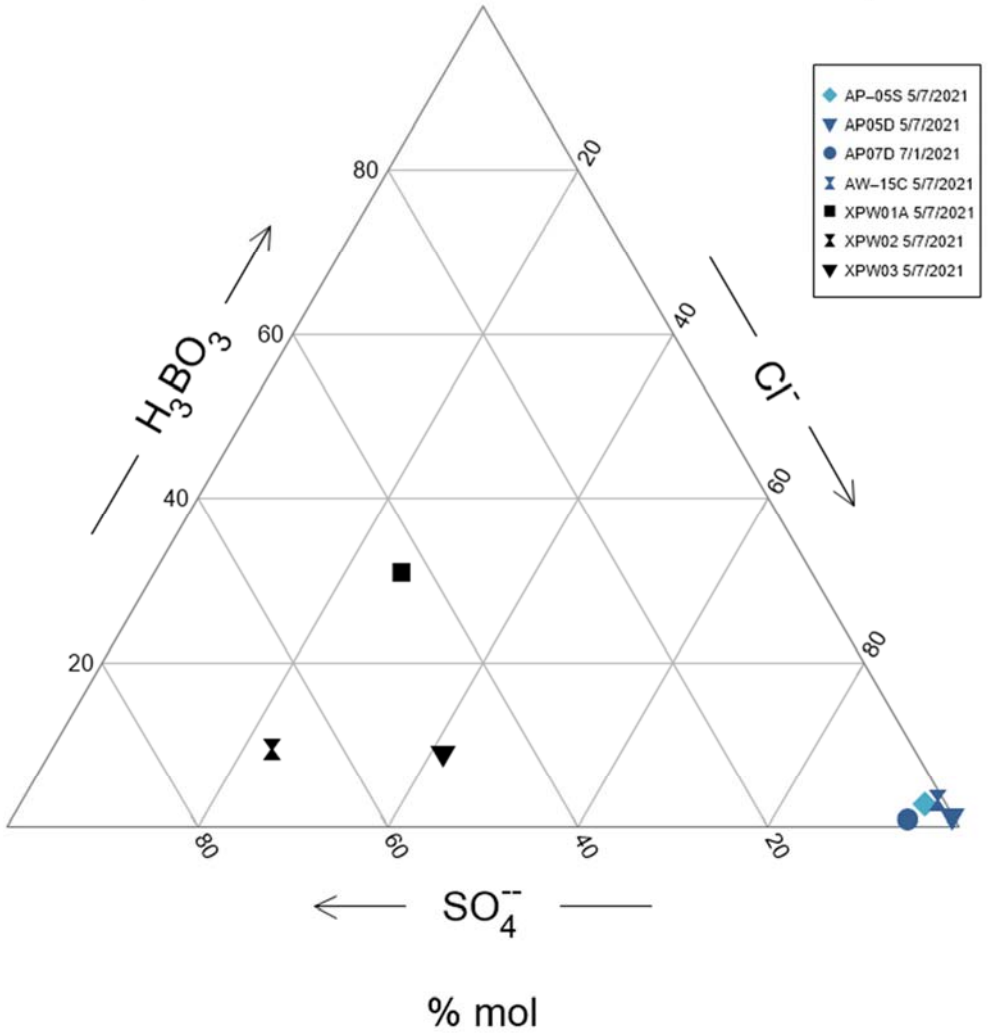


Figure 7: Ternary diagram showing relationships between CCR tracers boron, chloride, and sulfate.

- **Barium and chloride concentrations in CCR porewater are consistently lower than in BCU wells AW-15C and AP07D.**

Barium and chloride concentrations are consistently lower in CCR porewater than in BCU wells AW-15C and AP07D, as shown on **Figures 8 and 9**. Therefore, barium and chloride cannot be sourced from the CCR porewater.

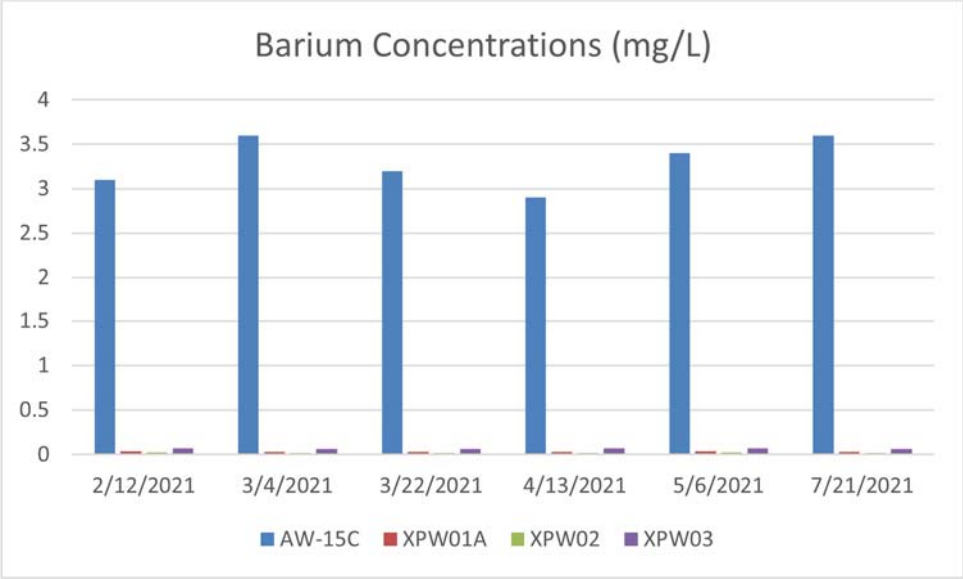


Figure 8. Barium concentrations in monitoring well AW-15C and CCR porewater samples XPW01A, XPW02 and XPW03.

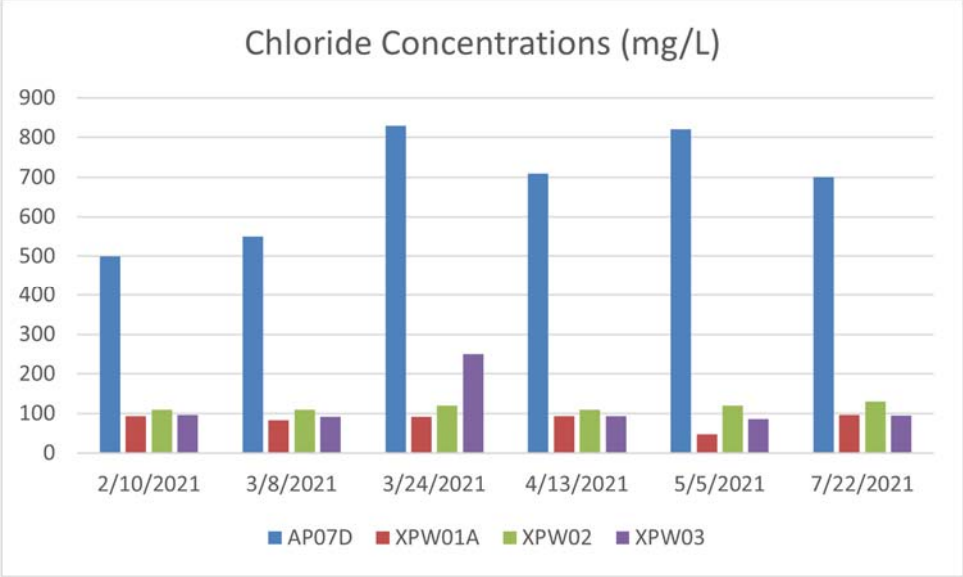


Figure 9. Chloride concentrations in monitoring well AP07D and CCR porewater samples XPW01A, XPW02 and XPW03.

- **Barium, lithium and chloride are naturally occurring constituents of the BCU.**

Barium, lithium, and chloride occur naturally within the BCU. Samples collected from the BCU aquifer matrix were analyzed for total concentrations and sequential extractions[1] were performed for barium and lithium. Total concentrations were between 390 and 480 mg/kg and 42 and 49 mg/kg for barium and lithium, respectively. For comparison, consensus average crustal barium and lithium concentrations are very similar, at 430 mg/kg and 30 mg/kg, respectively, with ranges of 179 to 1,070 mg/kg and 18 to 65 mg/kg (Smith and Huyck 1999). According to Hem (1985), average concentrations of barium and lithium in typical shale, such as the shale that comprises the BCU (Section 1.1) are 250 and 46 mg/kg, respectively.

The results of the sequential extractions are summarized in **Figures 10** and **11** for barium and lithium, respectively. As indicated in the figures, the majority of barium and lithium is present in fractions that have limited environmental availability under typical groundwater conditions, i.e. the acid/sulfide fraction and the residual fraction (and organic fraction for barium). The remainder of the barium and lithium occurs within the environmentally available fractions (exchangeable, carbonate, amorphous and metal hydroxide). As such, a natural reservoir for these parameters is present, albeit that their release from aquifer solids will likely be slow.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Fraction: This extraction includes trace elements that are reversibly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Fraction: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals (carbonate minerals comprised between 1-6 percent of BCU samples).

Step 3 - Non-Crystalline Materials Fraction: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Fraction: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Fraction: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides (silicates and refractory oxides comprised between 94-99% of BCU samples).

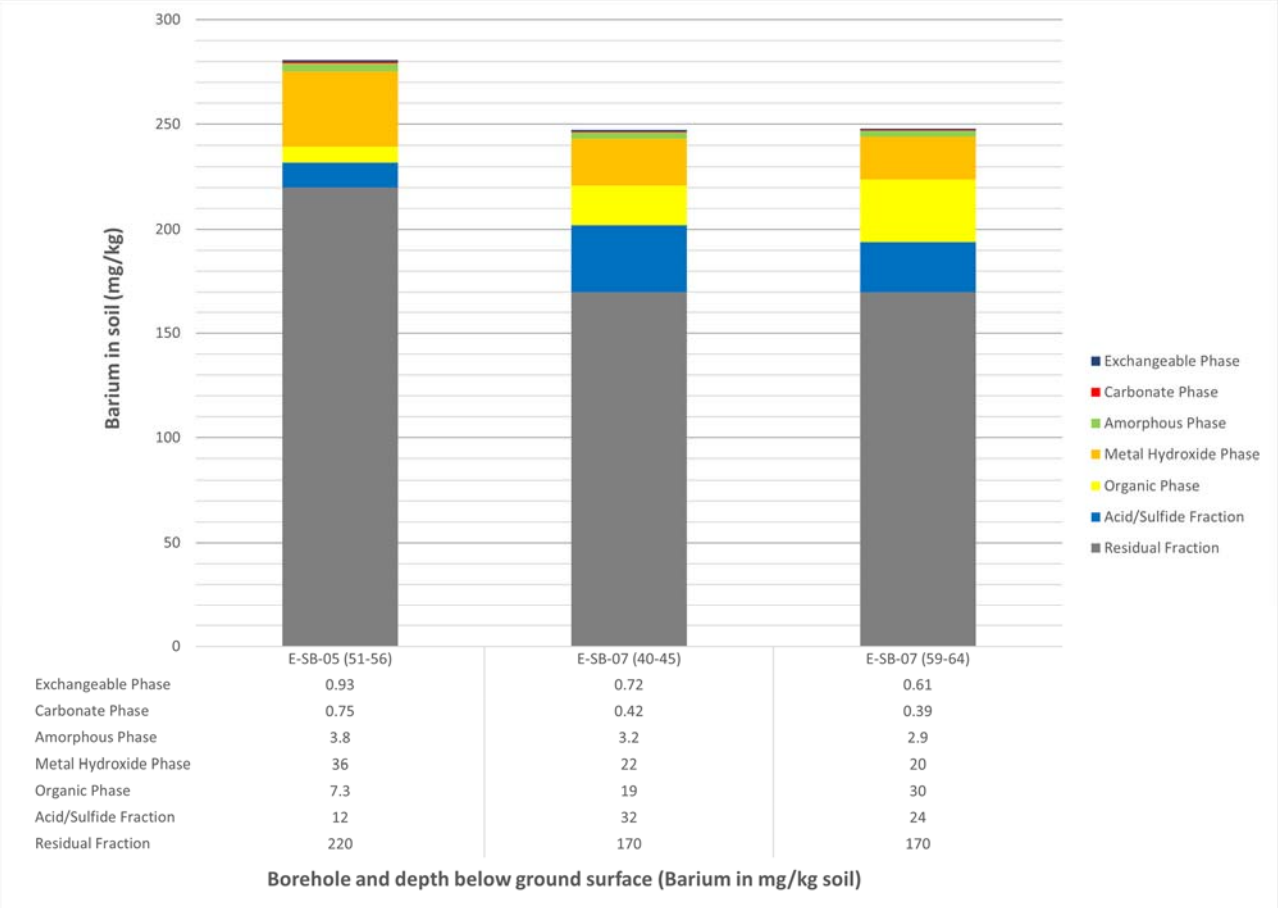


Figure 10. Sequential extraction results for barium. Concentrations in mg/kg are shown at the bottom of the figure, with the distribution presented in the bar graphs.

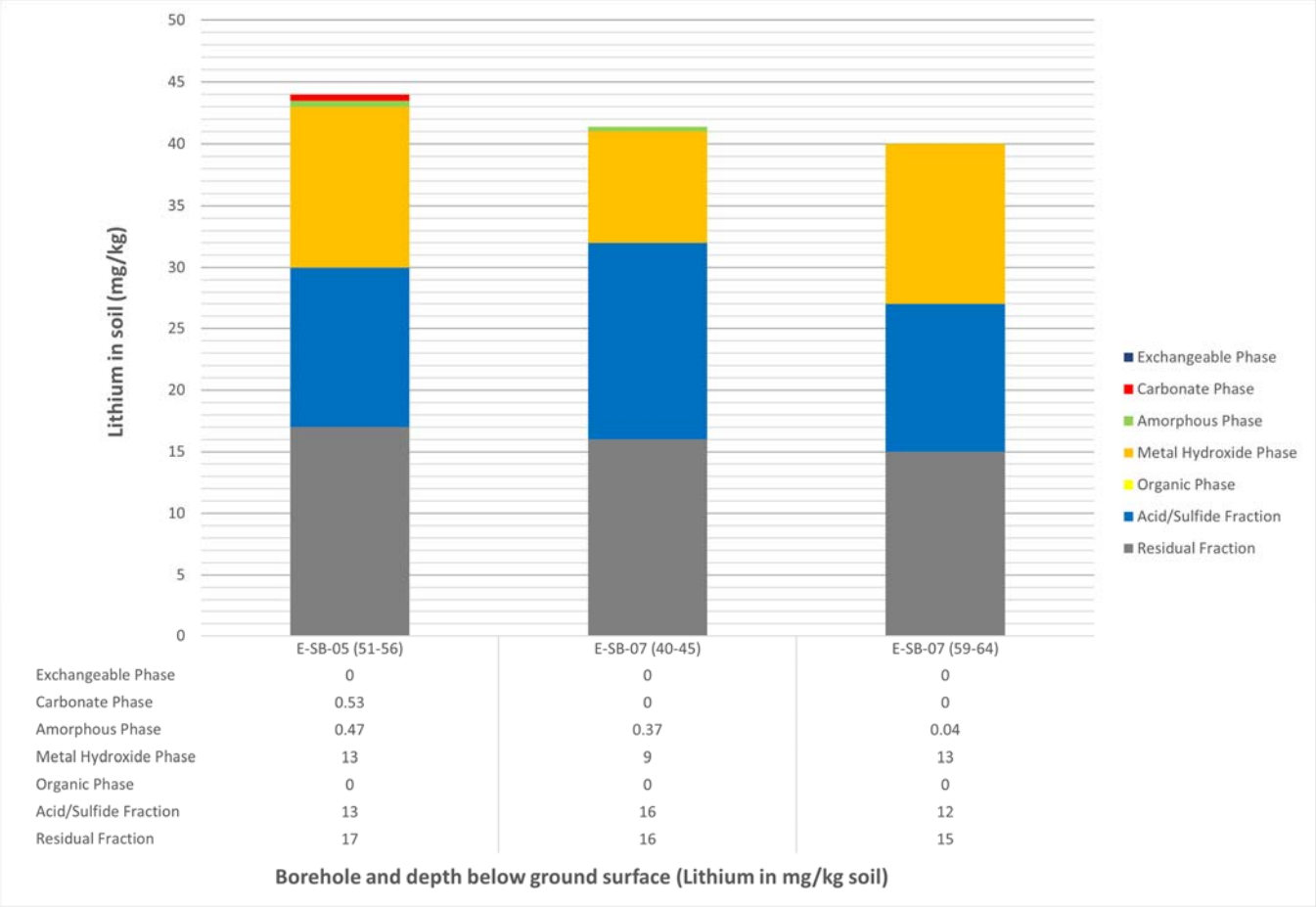


Figure 11. Sequential extraction results for lithium. Concentrations in mg/kg are shown at the bottom of the figure, with the distribution presented in the bar graphs.

Although chloride in aquifer matrix samples was not analyzed in the sequential extraction, chlorides are naturally occurring within shale of marine origin such as that which comprises the BCU. Hem (1985) discusses the geochemistry of various geologic materials. Typical chloride concentrations of shale are indicated as approximately 170 mg/kg in Hem (1985). In addition, the groundwater samples collected from the BCU occurs within a weathered zone of the BCU that is overlain and underlain by very low-permeability shales and siltstones. The constituents released as a product of the weathering process have the potential to increase due to long residence time and limited recharge.

5.0 SUMMARY

The evaluation presented in this document demonstrates that the GWPS exceedances of lithium in well AP05D and AP07D, chloride in well AP07D, and barium in well AW-15C are not attributable to the EAP based on the following lines of evidence:

- The migration pathway between Ash Pond and the wells with GWPS exceedances is not impacted with Ba, Li and/or Cl. Evaluations of groundwater water quality data in accordance with the procedures of the

Statistical Analysis Plan indicate that barium, lithium, and/or chloride do not occur above the GWPS the shallow UA wells paired with, or upgradient of AP05D, AP07D and AW-15C.

- Concentrations and relative proportions of key CCR indicator parameters differ significantly between AP porewater and groundwater from monitoring wells AP05D, AP07D and AW-15C.
- Barium and chloride concentrations in CCR porewater are consistently lower than in BCU wells AW-15C and AP07D.
- Barium, lithium, and chloride occur naturally in the aquifer minerals and/or connate water of siltstones and shales including those of the BCU.

6.0 CLOSING

Golder appreciates the opportunity to serve as your consultant on this project. If you have any questions concerning this Technical Memorandum or need additional information, please contact the undersigned.

Golder Associates USA Inc.

Roberta Russell
Senior Geologist

Patrick J. Behling
Principal, Practice Leader

RR/JSI/PJN/RV/PJB

Attachments: Table 1 – Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results
Table 2 – Evaluation of Potential GWPS Exceedances
Table 4 – Gypsum Saturation Indices

Figure 1 – Edwards Well Locations and Typical Groundwater Flow Direction
Figure 2 – Generalized Fence Diagram Location
Figure 3 – Generalized Fence Diagram of Monitoring Wells

7.0 REFERENCES

Burns and McDonnell 2021. Initial Operating Permit, Edwards Power Plan Ash Pond. October 25.

Hem, John D, 1985. Study and Interpretation of the Chemical Characteristics of Natural Water. United States Geological Survey Water-Supply Paper 2254.

Parkhurst, D. and Appelo, C. 2013. Description of input and examples for PHREEQC version 3: a computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations (No. 6-A43). US Geological Survey.

Ramboll, 2021a. Groundwater Sampling and Analysis Program. Ash Pond, Edwards Power Plant, Bartonville, Illinois. October 25.

Ramboll, 2021b. History of Known Groundwater Exceedances. Ash Pond, Edwards Power Plant, Bartonville, Illinois.

Ramboll 2021c. Hydrogeologic Site Characterization Report. Ash Pond, Edwards Power Plant, Bartonville, Illinois. October 25.

Smith, K. and Huyck, H. 1999. An Overview of the Abundance, Relative Mobility, Bioavailability, and Human Toxicity of Metals. The Environmental Geochemistry of Mineral Deposits, Reviews in Economic Geology Vol. 6A, pp.29-70.

Tessier, A., Campbell, P.G. and Bisson, M., 1979. Sequential extraction procedure for the speciation of particulate trace metals. Analytical chemistry, 51(7), pp.844-851.

Tables

Table 1
Evaluation of Potential Exceedances
Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results
Edwards Ash Pond, Peoria County, IL

Mineral	Mineral Formula	E-SB-07 40-45 ft bgs	E-SB-07 59-64 ft bgs	E-SB-05 51-56 ft bgs
Quartz	SiO_2	44.9	43.6	38.7
Albite	$NaAlSi_3O_8$	14.7	15.6	15.0
Microcline	$KAlSi_3O_8$	2.9	3.4	4.3
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	8.1	9.4	7.5
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	22.4	22.5	24.1
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	2.5	3.8	3.7
Ankerite	$CaFe(CO_3)_2$	0.0	0.0	0.1
Dolomite	$CaMg(CO_3)_2$	0.0	0.0	0.8
Calcite	$CaCO_3$	0.4	0.5	0.3
Siderite	$FeCO_3$	3.1	0.2	5.0
Hematite	Fe_2O_3	0.0	0.0	0.0
Magnetite	Fe_3O_4	0.3	0.3	0.4
Ilmenite	$FeTiO_3$	0.1	0.0	0.1
Rutile	TiO_2	0.7	0.6	0.3
Diopside	$CaMgSi_2O_6$	-	-	-
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	-	-	-
Epidote	$Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$	-	-	-
Kaolinite	$Al_2Si_2O_5(OH)_4$	-	-	-
Mullite	$\sim Al_6Si_3O_{15}$	-	-	-
Anorthite	$CaAl_2Si_2O_8$	-	-	-
TOTAL		100	100	100

Notes:
1.) Results provided in weight percentage - percent by weight of each mineral.
2.) ft bgs - feet below ground surface.
3.) Non-detect minerals within a sample are represented by "-".
4.) Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.
5.) Samples were collected by Golder in August 2021.

Created by: CWK
Checked by: RJR
Reviewed by: PJB

Table 2
Evaluation of Potential GWPS Exceedances
Constituent Concentrations
Edwards Ash Pond
Peoria County, Illinois

Well ID	Sample Date	Barium mg/L	Lithium mg/L	Chloride mg/L
Part 845 Groundwater Protection Standards				
Site Background[1]		2.1	0.071	56
Part 845 Standard		2	0.04	200
Part 845 GWPS		2.1	0.071	200
Bedrock Confining Unit Wells				
AP05D	5/7/2021	1.3	0.077	510
AP05D	Statistical Result[2]	0.044	0.077	122
AP07D	5/5/2021	8.6	0.72	820
AP07D	Statistical Result	-1.15	0.15	498
AW-15C	5/6/2021	3.4	0.047	63
AW-15C	Statistical Result	2.9	0.047	46
Wells Paired with Bedrock Confining Unit Wells[3]				
AP05S	5/7/2021	1.2	0.037	43
AP07S	5/5/2021	0.15	<0.02	110
AW-15S	5/6/2021	0.098	<0.02	40
AW-15	5/6/2021	1.8	0.033	41
Wells Upgradient from Bedrock Confining Wells				
AW-16	5/5/2021	1.3	0.039	53
AW-21	5/5/2021	0.067	<0.02	96
AW-22	5/5/2021	0.8	<0.02	40
EAP Pore Water Samples				
XPW01A	5/4/2021	0.034	0.67	47
XPW02	5/4/2021	0.022	0.3	120
XPW03	5/4/2021	0.07	0.16	86

1. Site background is for the uppermost aquifer (UA).
2. Calculated in accordance with Statistical Analysis Plan using constituent concentrations observed at monitoring well during all sampling events from February-July 2021
3. Paired wells are completed in the UA.
4. mg/L - milligrams per liter.
5. EAP - Edwards Ash Pond.
6. GWPS - Groundwater Protection Standard.

Created by: RR
Checked by: BTT
Reviewed by: PJB

Table 4
Evaluation of Potential GWPS Exceedances
Gypsum Saturation Indices
Edwards Ash Pond, Peoria County, Illinois

MINERAL PHASES - Saturation Indices		APW-1	AP-05S	AP05D	AW-05	AW-06	AP07S	AP07D	AW-09	AW-14	AW-15
Gypsum	$CaSO_4:2H_2O$	-1.03	-3.13	-4.10	-1.02	-2.06	-0.73	-2.47	-3.52	-3.45	-3.53
Barite	$BaSO_4$	**0.95**	**-0.14**	**-0.50**	**0.77**	**0.08**	**0.99**	**1.33**	-1.03	-0.82	**-0.41**

MINERAL PHASES - Saturation Indices		AW-15S	AW-15C	AW-16	AW-17	AW-18	AW-19	AW-20	AW-21	AW-22
Gypsum	$CaSO_4:2H_2O$	-0.62	-3.60	-3.55	-3.59	-2.92	-1.98	-1.83	-1.14	-3.62
Barite	$BaSO_4$	**1.03**	**-0.09**	-0.59	-0.59	**-0.09**	**0.19**	**0.09**	**0.63**	-0.64

Notes:

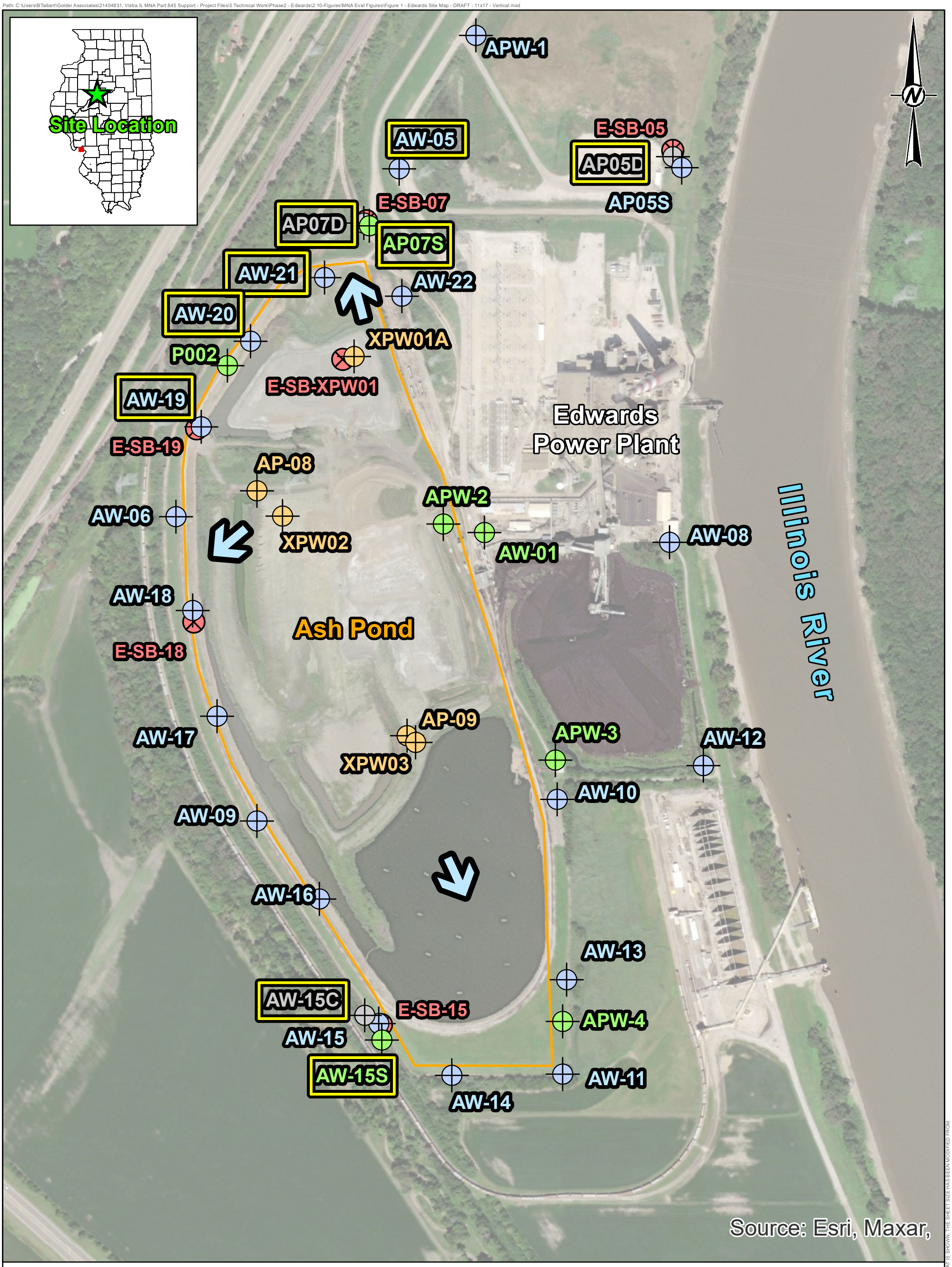
1) SI values between -0.5 and 0.5 are generally considered to represent 'equilibrium' in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling (Nordstrom and Alpers 1999).

2) SI values greater than -0.5 identified by red bold type and grey shading.

Created by: CWK
Checked by: PJN
Reviewed by: PJN

Figures

Path: C:\Users\BTalbert\Golder Associates\21454831, Vistra IL MNA Part 845 Support - Project Files\5 Technical Work\Phase2 - Edwards\2.10-Figures\MNA Eval Figures\Figure 1 - Edwards Site Map - DRAFT - 11x17 - Vertical.mxd



LEGEND

- Ash Pond
- Soil Boring Location

Monitoring Wells

- Monitoring Well Screened in Bedrock
- Monitoring Well Screened in CCR Material
- Monitoring Well Screened in the Upper Cahokia Formation
- Monitoring Well Screened in the Uppermost
- Typical Groundwater Flow Direction
- Potential Exceedance

NOTES

1. SOIL BORING LOCATIONS SURVEYED BY INGENAE ON SEPTEMBER 23, 2021.
2. ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
3. GWPS - GROUNDWATER PROTECTION STANDARD

REFERENCE

1. BURNS AND MCDONNELL 2021, INITIAL OPERATING PERMIT - EDWARDS POWER PLANT ASH POND. AVAILABLE ONLINE AT HTTPS://WWW.LUMINANT.COM/ILLINOIS-CCR/

0 500 1,000 Feet

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC.

PROJECT
EDWARDS POWER PLANT - EVALUATION OF POTENTIAL GWPS EXCEEDANCES

TITLE
EDWARDS WELL LOCATIONS AND TYPICAL GROUNDWATER FLOW DIRECTION

CONSULTANT

YYYY-MM-DD	2022-02-17
PREPARED	BTT
DESIGN	BTT
REVIEW	JSI
APPROVED	PJB

PROJECT No. 21454831 PHASE 0002A FIGURE **1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in 0

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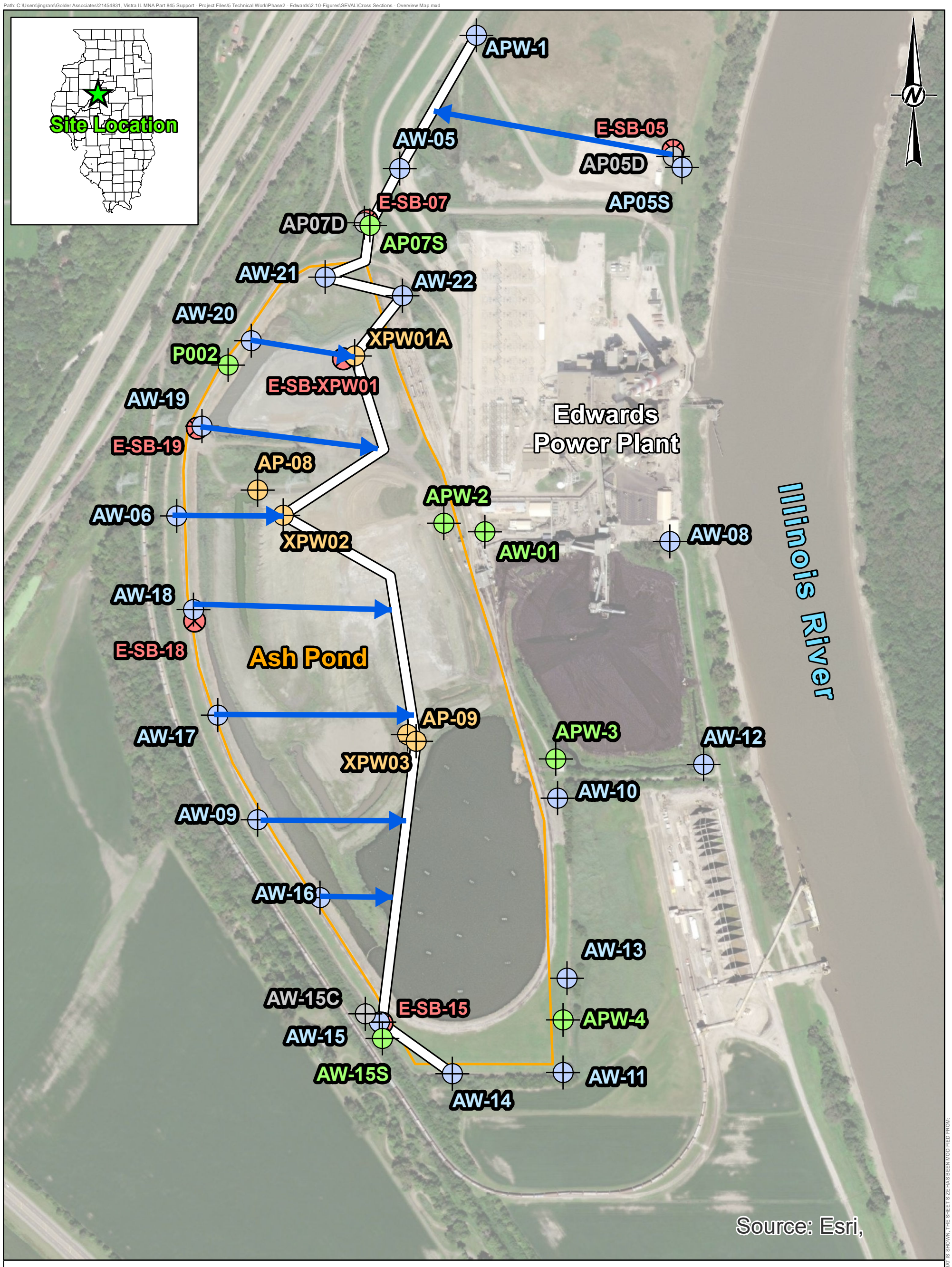


LEGEND

- Ash Pond
- Golder Soil Boring Location
- Monitoring Wells Projected onto the Generalized Fence Diagram Line
- Generalized Fence Diagram Line

Monitoring Wells

- Monitoring Well Screened in Bedrock
- Monitoring Well Screened in CCR Material
- Monitoring Well Screened in the Upper Cahokia Formation
- Monitoring Well Screened in the Uppermost Aquifer

NOTES

1. SOIL BORING LOCATIONS SURVEYED BY INGENAE ON SEPTEMBER 23, 2021.
2. ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.

REFERENCE

1. BURNS AND MCDONNELL 2021, INITIAL OPERATING PERMIT - EDWARDS POWER PLANT ASH POND. AVAILABLE ONLINE AT HTTPS://WWW.LUMINANT.COM/ILLINOIS-CCR/

0 500 1,000 Feet

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC.

PROJECT
EDWARDS POWER PLANT - EVALUATION OF POTENTIAL GWPS EXCEEDANCES

TITLE
GENERALIZED FENCE DIAGRAM LOCATION

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-02-17
PREPARED	JSI
DESIGN	JSI
REVIEW	BTT
APPROVED	PJB

PROJECT No. 21454831 PHASE 0002 FIGURE **2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in 0

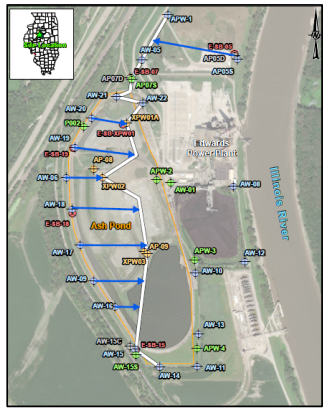
Coal Combustion Residuals (CCR Unit)

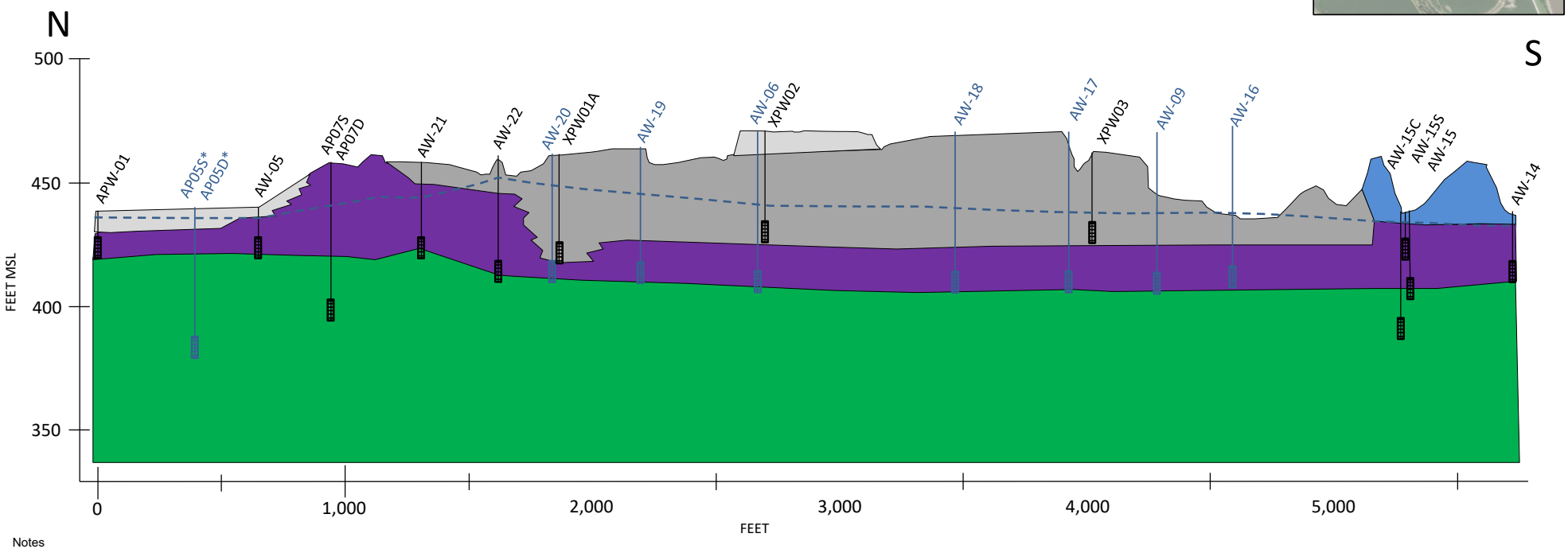
Fill

Upper Cahokia Formation (Clay and Sand)

Silt

Bedrock/Weathered Bedrock (Confining Unit)





Notes
1) mg/L – Milligrams per liter, MSL – mean sea level
2) Wells in blue text indicate wells projected onto the cross section. Well screen location for projected wells are based on geologic unit, not elevation.
3) Wells in black text indicate wells located along the tie line. Well screen locations are based on elevation.
4) Generalized fence diagram based on generalized cross section from Ramboll (2021).
5) * indicates well is upgradient of the Edwards Ash Pond, near the Illinois River north of the plant.
6) Sizes and distances not to scale.
7) GWPS – Groundwater Protection Standards

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC.

CONSULTANT
GOLDER

YYYY-MM-DD	2022-03-16
PREPARED	BTT
DESIGNED	JSI
REVIEWED	GTM
APPROVED	PJB

PROJECT
EDWARDS POWER PLANT – EVALUATION OF POTENTIAL GWPS EXCEEDANCES

TITLE
Generalized Fence Diagram of Monitoring Wells

PROJECT NO.	PHASE	REV.	FIGURE
21454831	0002		3

https://golder.sharepoint.com/sites/20129/Deliverables/Forms/AllItems.aspx?viewpath=%2Fsites%2F20129%2FDeliverables%2FForms%2FAllItems.aspx

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

APPENDIX B
FIGURE 5 AND FIGURE 6 OF *BURCH, S. L. AND D. J. KELLY., 1993. PEORIA-PEKIN REGIONAL GROUND-WATER QUALITY ASSESSMENT. ILLINOIS STATE WATER SURVEY (ISWS), CHAMPAIGN, RESEARCH REPORT 124.*

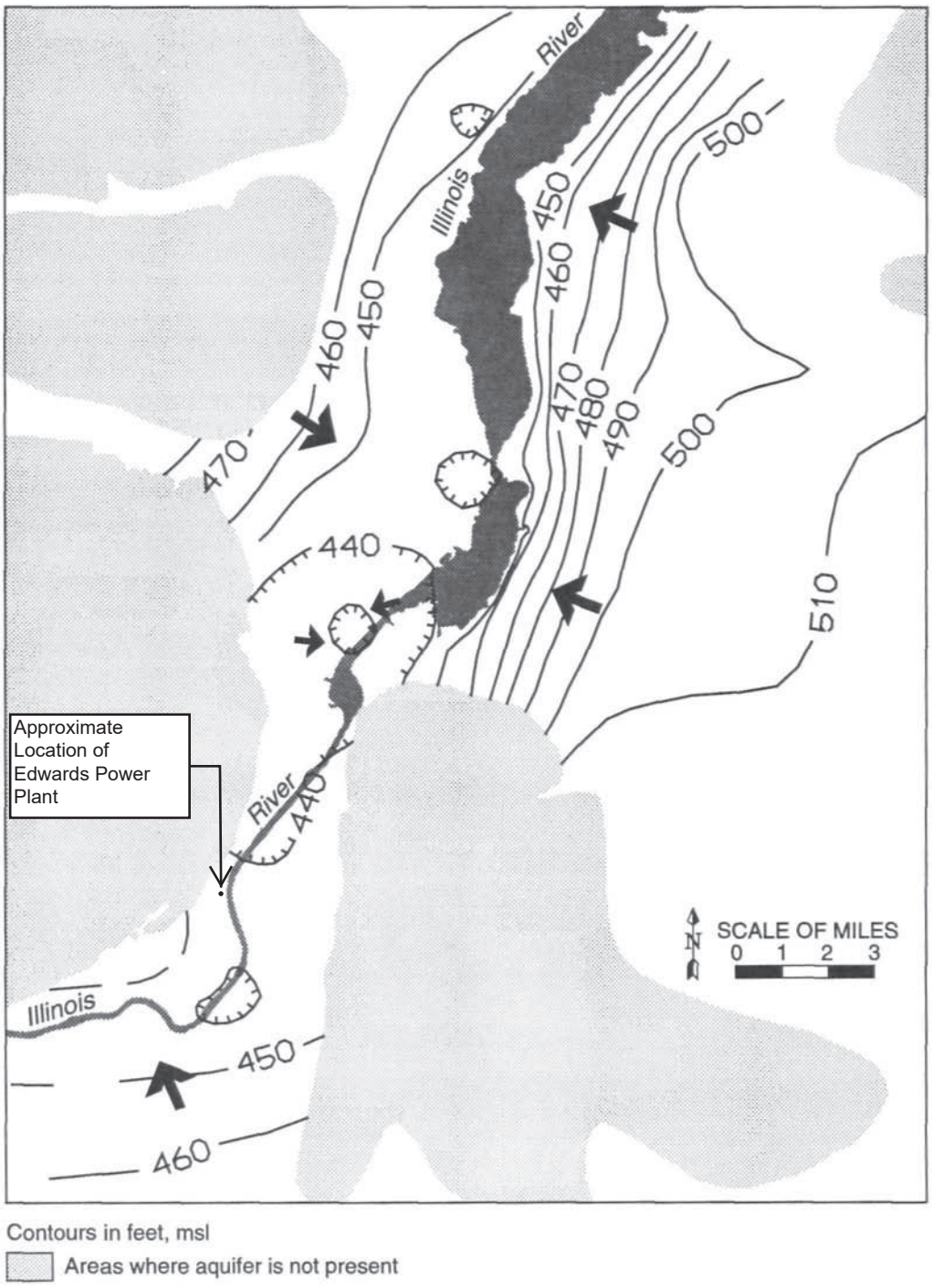


Figure 5. Elevation of potentiometric surface and direction of regional ground-water flow for the Peoria-Pekin region: 1990-1991 data

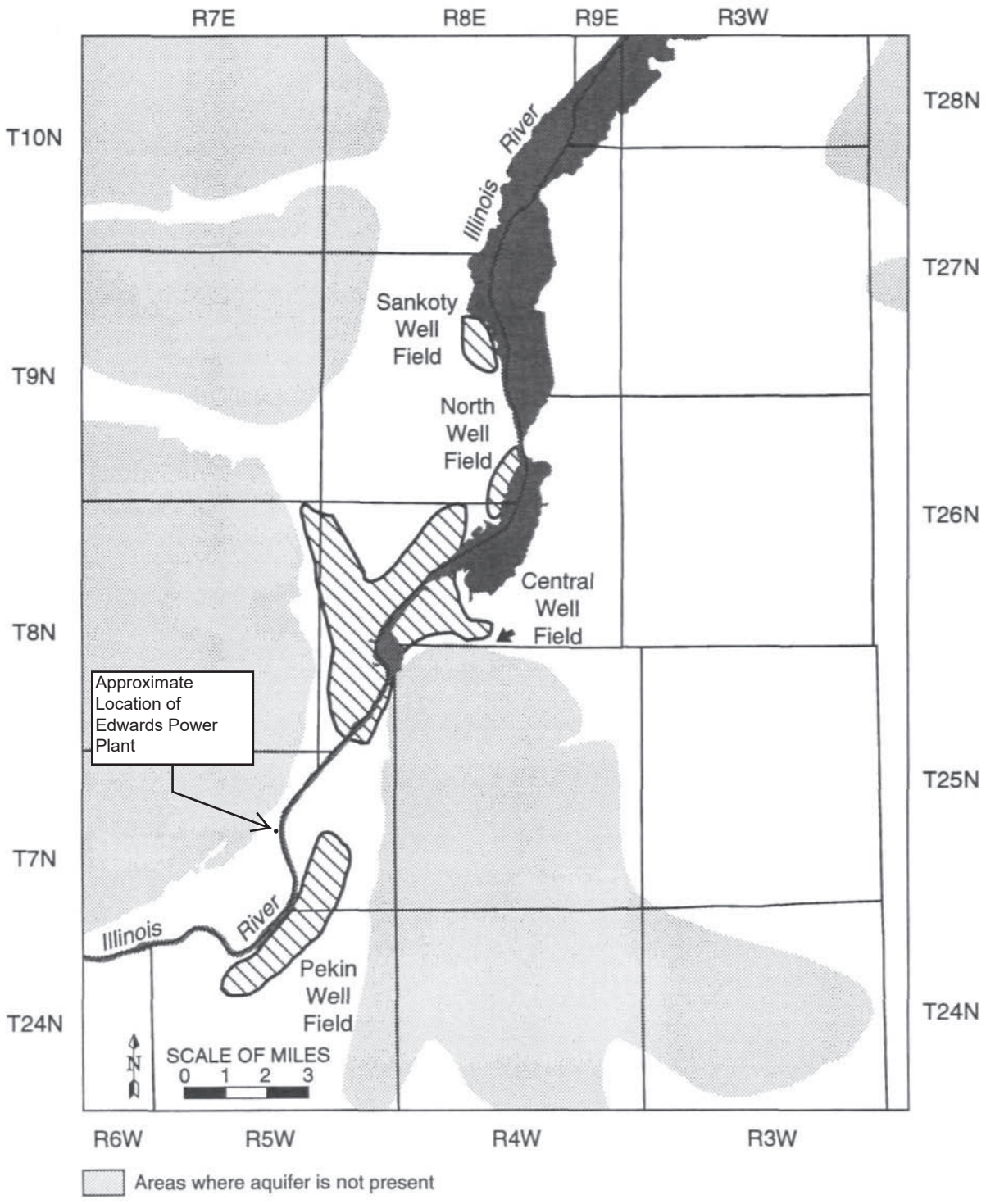


Figure 6. Locations of the Sankoty, North, Central, and Pekin municipal well fields

APPENDIX C
MODFLOW, MT3DMS, HELP MODEL, AND FLUX EVALUATION DATA EXPORT FILES (ELECTRONIC ONLY)

APPENDIX D
EVALUATION OF PARTITION COEFFICIENT RESULTS (GOLDER ASSOCIATES USA INC., 2022)

TECHNICAL MEMORANDUM

DATE March 30, 2022 **Project No.** 21454831

TO David Mitchell, Stu Cravens, Vic Modeer
Illinois Power Resources Generating, LLC

CC Brian Henning - Ramboll

FROM Golder Associates USA Inc. **EMAIL** **Jeffrey_Ingram@golder.com**

EVALUATION OF PARTITION COEFFICIENT RESULTS, EDWARDS ASH POND (CCR UNIT 301), EDWARDS POWER PLANT, PEORIA COUNTY, ILLINOIS

1.0 INTRODUCTION

Illinois Power Resource Generating, LLC (IPRG) operates the Edwards Power Plant (EPP) located in Peoria County, Illinois. The Edwards Ash Pond (EAP or Site), Illinois Environmental Protection Agency [IEPA] ID No. W1438050005 - 01) is a 91-acre unlined surface impoundment used to manage coal combustion residuals (CCRs) at the EPP. The EAP is regulated under Part 845 *"Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments"* (State CCR Rule or Part 845) which was promulgated by the Illinois Pollution Control Board (IPCB) on April 21, 2021. WSP Golder (Golder) is assisting IPRG with Part 845 compliance at the Site.

IPRG is currently preparing a Construction Permit application for the EAP as required under Section 845.220. As a part of the Construction Permit application, groundwater modeling is being completed for known potential exceedances of groundwater protection standards (GWPS) as outlined in the Operating Permit application for the EAP (Burns and McDonnell, 2021). In the Operating Permit (October 2021), Ramboll Americas Engineering Solutions, Inc. (Ramboll) identified potential GWPS exceedances for several compounds potentially associated with the EAP, including barium, boron, lithium, sulfate and total dissolved solids (TDS). Batch adsorption testing was conducted to generate site-specific partition coefficient results for these parameters for use in the groundwater models. This Technical Memorandum summarizes the results of the batch adsorption testing.

2.0 OVERVIEW

In August 2021, Golder conducted a field investigation at the EPP which included the completion of six (6) soil/rock borings ranging in depth from 40 to 64 feet below ground surface. As a 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.

Table 1: Batch Attenuation Testing Data Summary

Groundwater Sample ID	Soil Sample ID	Soil: Water Ratio
AW-15S	E-SB-05 (30.0-33.5 ft bgs)	2:1
		1:1

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Groundwater Sample ID	Soil Sample ID	Soil: Water Ratio
		1:5
		1:10
		1:20
AW-19	E-SB-05 (30.0-33.5 ft bgs)	2:1
		1:1
		1:5
		1:10
		1:20

Notes:

1) Ft bgs – Feet below ground surface

Site-specific partitioning coefficients were determined for contaminants of interest (COIs) identified based on statical evaluation of potential groundwater exceedances calculated at the Site: barium, boron, lithium, and sulfate (Burns & McDonnell, 2021). Two groundwater samples (AW-15S and AW-19) and one soil sample (E-SB-05) were used for batch attenuation testing at various ratios (Table 1). For each treatment, 0.1 L of groundwater was brought in contact with an amount of soil (0.2 to 2 kg, depending on the ratio) over a seven-day period. Each contact water/soil microcosm was amended (spiked) with barium hydroxide, boric acid, sodium chloride, lithium chloride, and sodium sulfate to a target concentration of barium, boron, lithium, and sulfate, respectively (Table 2). After the seven-day contact period, COI concentrations were analyzed in the contact water. The control samples (i.e., groundwater samples AW-15S and AW-19) were only analyzed at the initiation of testing. 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.

Table 2: Microcosm amendment and target concentration for COIs

COI	Amendment	Target Concentration (mg/L)
Barium	1.75 mL of a 1 g/L $Ba(OH)_2 \cdot 8H_2O$ solution	0.5
Boron	36.43 mL of a 2 g/L H_3BO_3 solution	12
Lithium	5.97 mL of a 1 g/L LiCl solution	0.5
Sulfate	1769.5 mg of Na_2SO_4	1,100

Notes:

1) Mg/L – milligrams per liter
2) $Ba(OH)_2 \cdot 8H_2O$ - barium hydroxide
3) H_3BO_3 - boric acid
4) LiCl - lithium chloride
5) Na_2SO_4 - sodium sulfate

The results of batch attenuation testing (Tables 3 and 4) were used to calculate the following adsorption isotherms for each COI:

- Linear: $q_e = K_D * C_e$

- Langmuir: $C_e/q_e = 1/(K_L * q_m) + C_e/q_m$
- Freundlich: $\log(q_e) = \log(K_F) + (1/n)\log(C_e)$

Where

K_D, K_L, and K_F = the linear, Langmuir, and Freundlich partition coefficients, respectively (in liters per kilogram; L/kg).

q_e = concentration of the adsorbate in soil

C_e = aqueous concentration of the adsorbate

q_m = 1/slope in the linear expression of the isotherm

n = non-linearity constant

3.0 SUMMARY OF RESULTS

Figures that show the linear, Langmuir, and Freundlich isotherms for each COI are provided in Appendix A. The partition coefficient values for AW-15S and AW-19 are presented in Tables 5 and 6, respectively. The results of the batch adsorption testing can be summarized as follows:

- **Barium**: The calculated K_D and K_L values for both AW-15S and AW-19 were negative (AW-15S: -22.9 and -6.5E+8 L/kg; AW-19: -12.4 and -8.5E+8 L/kg), indicating an inverse relationship between the concentration of barium in solution and the concentration of barium in soil. The K_F values for AW-15S and AW-19 were 736 and 738 L/kg, respectively. For comparison, in Strenge and Peterson (1989), partition coefficients for barium range from 53 to 16,000 L/kg, depending on pH conditions and the amount of sorbent (i.e. clay, organic matter, and iron and aluminum oxyhydroxide) present.
- **Boron**: Calculated K_D values for AW-15S and AW-19 were 1.50 and -0.19 L/kg, respectively, K_L values 3.8E+4 and -2E+5 L/kg, respectively, and K_F values 82 and 215 L/kg, respectively. In Strenge and Peterson (1989), partition coefficients for boron range from 0.19 to 1.3 L/kg, depending on pH conditions and the amount of sorbent present.
- **Lithium**: Calculated K_D values for AW-15S and AW-19 were 1.89 and -1.27 L/kg, respectively, K_L values 2.6E+8 and -2.4E+8 L/kg, respectively, and K_F values 234 and 230 L/kg, respectively. In Strenge and Peterson (1989), partition coefficients for lithium range from 0 to 0.8 L/kg, depending on pH conditions and the amount of sorbent present.
- **Sulfate**: Calculated K_D values for AW-15S and AW-19 were 0.47 and -1.0 L/kg, respectively, and K_L values 778 and -2,950 L/kg, respectively. The K_F values for AW-15S and AW-19 were 63 and 1.2 L/kg, respectively. In Strenge and Peterson (1989), partition coefficients for sulfate are 0.0 L/kg, regardless of pH conditions and the amount of sorbent present.
- **pH and Redox**: Generally, after the seven-day contact time, the pH of each contact water was consistent with the pH of the control (6.95 to 6.96), ranging from 6.83 to 6.99 across the batch tests. The redox value of the control sample after the seven-day contact time was +65 mV for AW-15S and +51 for AW-19. The redox value of contact water ranged from -71 to +71 mV across treatments.

4.0 REFERENCES

Burns & McDonnell, 2021. Initial Operating Permit Edwards Power Plant Ash Pond.

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).

5.0 CLOSING

Golder appreciates the opportunity to serve as your consultant on this project. If you have any questions concerning this technical memorandum or need additional information, please contact the undersigned.

Golder Associates USA Inc.

Jeffrey Ingram

Senior Consultant, Geologist

Pat Behling

Practice Leader

CK/CK/JSI/PJB

Attachments Appendix A – Partition Coefficient Graphs

Table 3: Batch Attenuation Testing Results, AW-15S

Geologic Material Sample ID	Treatment	Date	Day	Replicate	Dissolved Barium	Dissolved Boron	Dissolved Lithium	Dissolved Sulfate	pH	ORP
					mg/L	mg/L	mg/L	mg/L	SU	mV
	Groundwater Only Control	1/14/2022	0	AW-15S-1a	0.31	12	0.47	390	7.07	202
				AW-15S-2a	0.36	13	0.48	397	7.06	181
				Average Concentration (mg/L)	**0.33**	**13**	**0.48**	**394**	**7.07**	**192**
		1/21/2022	7	AW-15S-1a	0.069	13	0.49	395	6.95	64
				AW-15S-2a	0.074	13	0.48	392	6.96	66
				Average Concentration (mg/L)	**0.072**	**13**	**0.49**	**394**	**6.96**	**65**
AW-15S E-SB-05 (30.0-33.5)	2:1 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-15S 2:1-1	0.39	4.6	0.15	266	6.89	-60
				E-SB-05 (30.0-33.5): AW-15S 2:1-2	0.32	4.4	0.12	274	6.93	-75
				Average Concentration (mg/L)	**0.35**	**4.5**	**0.14**	**270**	**6.91**	**-68**
	1:1 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-15S 1:1-1	0.23	6.5	0.21	313	6.83	-68
				E-SB-05 (30.0-33.5): AW-15S 1:1-2	--	--	--	--	--	--
				Average Concentration (mg/L)	**0.23**	**6.5**	**0.21**	**313**	**6.83**	**-68**
	1:5 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-15S 1:5-1	0.13	10	0.36	375	6.89	15
				E-SB-05 (30.0-33.5): AW-15S 1:5-2	0.12	10	0.36	370	6.86	72
				Average Concentration (mg/L)	**0.13**	**10**	**0.36**	**373**	**6.88**	**44**
	1:10 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-15S 1:10-1	0.12	11	0.42	382	6.91	73
				E-SB-05 (30.0-33.5): AW-15S 1:10-2	0.11	12	0.43	375	6.94	68
				Average Concentration (mg/L)	**0.11**	**11**	**0.43**	**379**	**6.93**	**71**
	1:20 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-15S 1:20-1	0.10	12	0.45	393	6.99	96
				E-SB-05 (30.0-33.5): AW-15S 1:20-2	0.11	12	0.44	383	6.96	42
				Average Concentration (mg/L)	**0.11**	**12**	**0.45**	**388**	**6.98**	**69**

Notes:
1) mg/L- Miligrams per liter
2) SU - Standard Units
3) mV -milivolts
4) ORP - Oxidation Reduction Potential

Table 4: Batch Attenuation Testing Results, AW-19

Geologic Material Sample ID	Treatment	Date	Day	Replicate	Dissolved Barium	Dissolved Boron	Dissolved Lithium	Dissolved Sulfate	pH	ORP
					mg/L	mg/L	mg/L	mg/L	SU	mV
	Groundwater Only Control	1/14/2022	0	AW-19-1a	0.22	12	0.46	386	7.08	156
				AW-19-2a	0.27	12	0.45	380	7.07	133
				Average Concentration (mg/L)	**0.25**	**12**	**0.46**	**383**	**7.08**	**145**
		1/21/2022	7	AW-19-1a	0.048	12	0.48	375	6.98	39
				AW-19-2a	0.049	12	0.51	390	6.92	62
				Average Concentration (mg/L)	**0.049**	**12**	**0.50**	**383**	**6.95**	**51**
AW-19 E-SB-05 (30.0-33.5)	2:1 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-19 2:1-1	0.27	4.3	0.11	270	6.93	-58
				E-SB-05 (30.0-33.5): AW-19 2:1-2	0.51	4.4	0.15	269	6.94	-71
				Average Concentration (mg/L)	**0.39**	**4.4**	**0.13**	**270**	**6.94**	**-65**
	1:1 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-19 1:1-1	0.24	6.6	0.24	314	6.98	-60
				E-SB-05 (30.0-33.5): AW-19 1:1-2	0.32	6.3	0.22	308	6.99	-82
				Average Concentration (mg/L)	**0.28**	**6.5**	**0.23**	**311**	**6.99**	**-71**
	1:5 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-19 1:5-1	0.16	10	0.36	358	6.92	-42
				E-SB-05 (30.0-33.5): AW-19 1:5-2	0.19	10	0.38	360	6.95	-32
				Average Concentration (mg/L)	**0.18**	**10**	**0.37**	**359**	**6.94**	**-37**
	1:10 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-19 1:10-1	0.17	10	0.40	365	6.92	-48
				E-SB-05 (30.0-33.5): AW-19 1:10-2	0.14	11	0.45	389	6.95	-52
				Average Concentration (mg/L)	**0.16**	**11**	**0.43**	**377**	**6.94**	**-50**
	1:20 Soil:Water Ratio	1/14/2022	0							
		1/21/2022	7	E-SB-05 (30.0-33.5): AW-19 1:20-1	0.11	12	0.46	381	7.00	-3
				E-SB-05 (30.0-33.5): AW-19 1:20-2	0.16	12	0.47	387	6.97	-45
				Average Concentration (mg/L)	**0.13**	**12**	**0.47**	**384**	**6.99**	**-24**

Notes:
1) mg/L- Miligrams per liter
2) SU - Standard Units
3) mV -milivolts
4) ORP - Oxidation Reduction Potential

Table 5: Partition Coefficient Results, AW-15S

Analyte	Isotherm	Variable	With Soil Mass
Barium	Raw Data R^2		0.46
	Linear K_D (L/kg)		-22.85
	Langmuir	R^2	1.00
		q_m (mg/g)	0.498
		K_L (L/kg)	-6.48E+08
	Freundlich	R^2	0.55
		1/n	-0.01
		K_F (L/kg)	736.03
Boron	Raw Data R^2		0.99
	Linear K_D (L/kg)		1.50
	Langmuir	R^2	0.79
		q_m (mg/g)	0.068
		K_L (L/kg)	3.79E+04
	Freundlich	R^2	0.98
		1/n	0.764
		K_F (L/kg)	82.21
Lithium	Raw Data R^2		0.80
	Linear K_D (L/kg)		1.89
	Langmuir	R^2	1.00
		q_m (mg/g)	0.035
		K_L (L/kg)	2.58E+08
	Freundlich	R^2	0.79
		1/n	0.014
		K_F (L/kg)	234.30
Sulfate	Raw Data R^2		0.54
	Linear K_D (L/kg)		0.47
	Langmuir	R^2	0.07
		q_m (mg/g)	0.88
		K_L (L/kg)	7.78E+02
	Freundlich	R^2	0.56
		1/n	0.8
		K_F (L/kg)	63.43

Note(s):
K_D: linear partition coefficient
K_L: Langmuir partition coefficient
K_F: Freundlich partition coefficient
qm: 1/slope in the linear expression of the isotherm
n: non-linearity constant

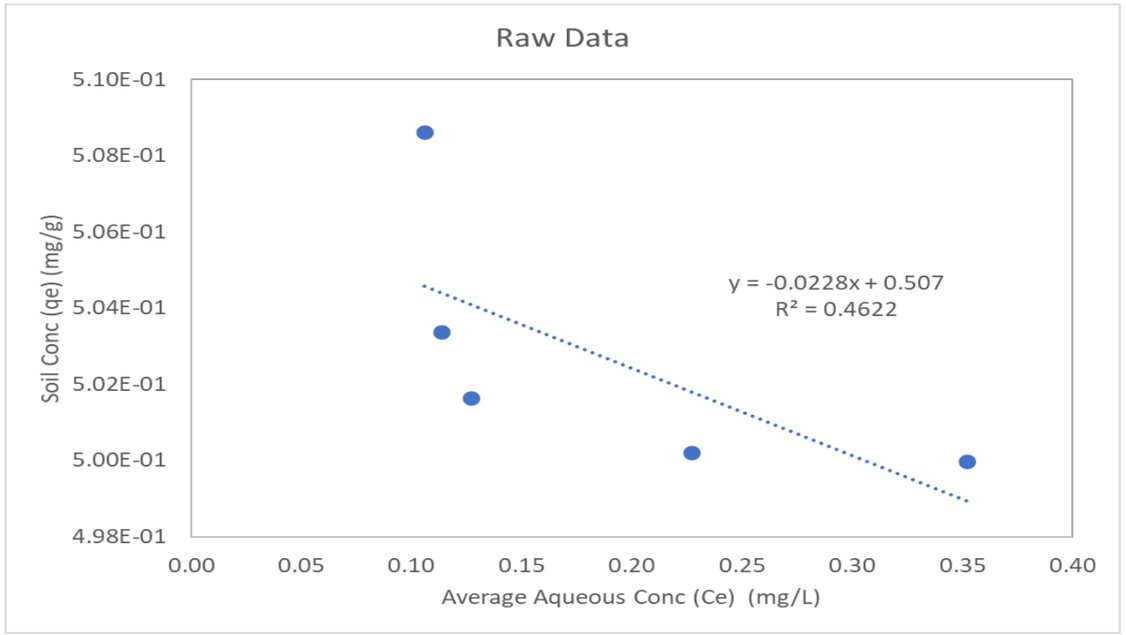
Table 6: Partition Coefficient Results, AW-19

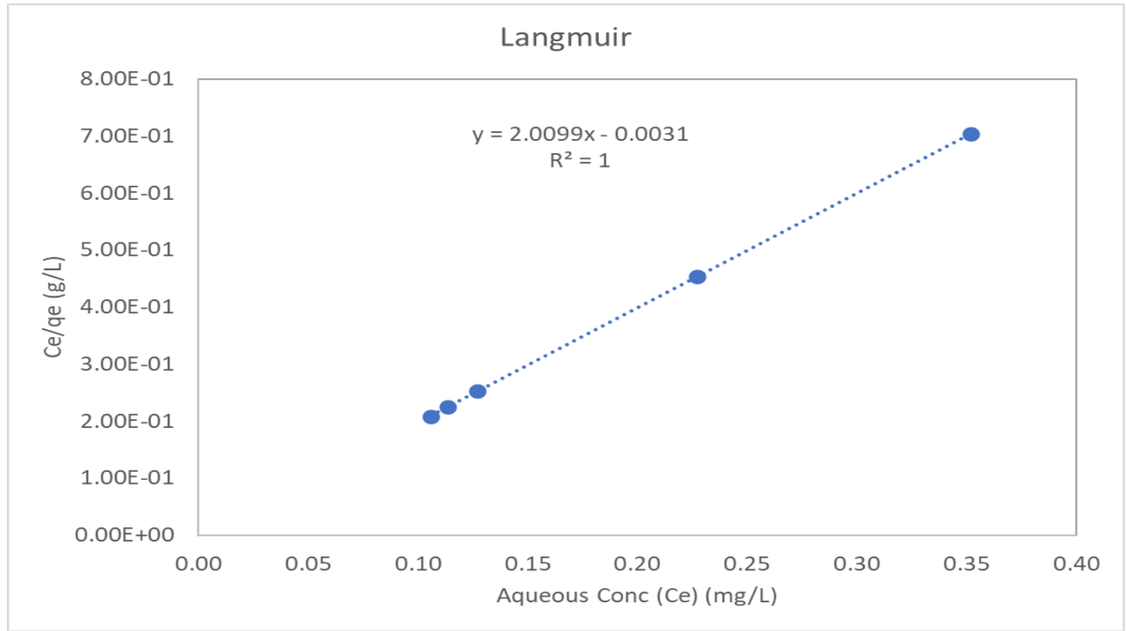
Analyte	Isotherm	Variable	With Soil Mass
Barium	Raw Data R^2		0.51
	Linear K_D (L/kg)		-12.44
	Langmuir	R^2	1.00
		q_m (mg/g)	0.498
		K_L (L/kg)	-8.45E+08
	Freundlich	R^2	0.62
		1/n	-0.007
		K_F (L/kg)	737.55
Boron	Raw Data R^2		0.01
	Linear K_D (L/kg)		-0.19
	Langmuir	R^2	0.35
		q_m (mg/g)	0.002
		K_L (L/kg)	-1.99E+05
	Freundlich	R^2	0.07
		1/n	-0.578
		K_F (L/kg)	215.36
Lithium	Raw Data R^2		0.19
	Linear K_D (L/kg)		-1.27
	Langmuir	R^2	1.00
		q_m (mg/g)	0.034
		K_L (L/kg)	-2.37E+08
	Freundlich	R^2	0.119
		1/n	-0.008
		K_F (L/kg)	230.26
Sulfate	Raw Data R^2		0.28
	Linear K_D (L/kg)		-1.00
	Langmuir	R^2	0.16
		q_m (mg/g)	-0.021
		K_L (L/kg)	-2.95E+03
	Freundlich	R^2	0.16
		1/n	2.40
		K_F (L/kg)	1.16

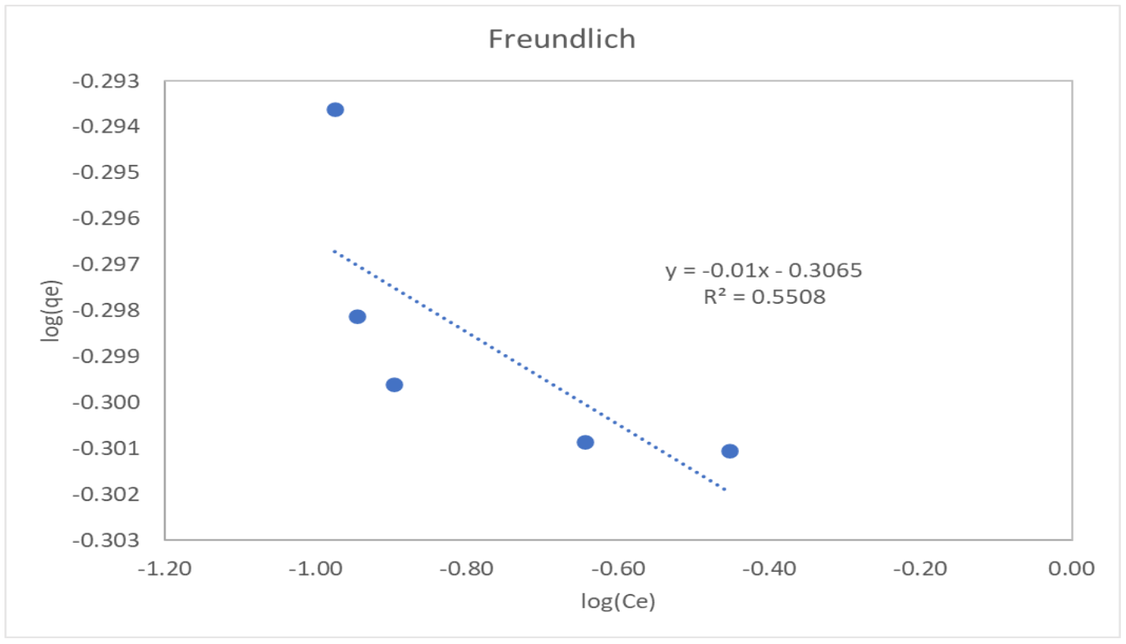
Note(s):
K_D: linear partition coefficient
K_L: Langmuir partition coefficient
K_F: Freundlich partition coefficient
qm: 1/slope in the linear expression of the isotherm
n: non-linearity constant

APPENDIX A

Partition Coefficient Graphs







Note(s):
mg/L: milligrams per liter
mg/g: milligrams per gram
g/L: grams per liter
Ce: aqueous concentration of the adsorbate

CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

CONSULTANT
WSP GOLDER

PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-15S BARIUM PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
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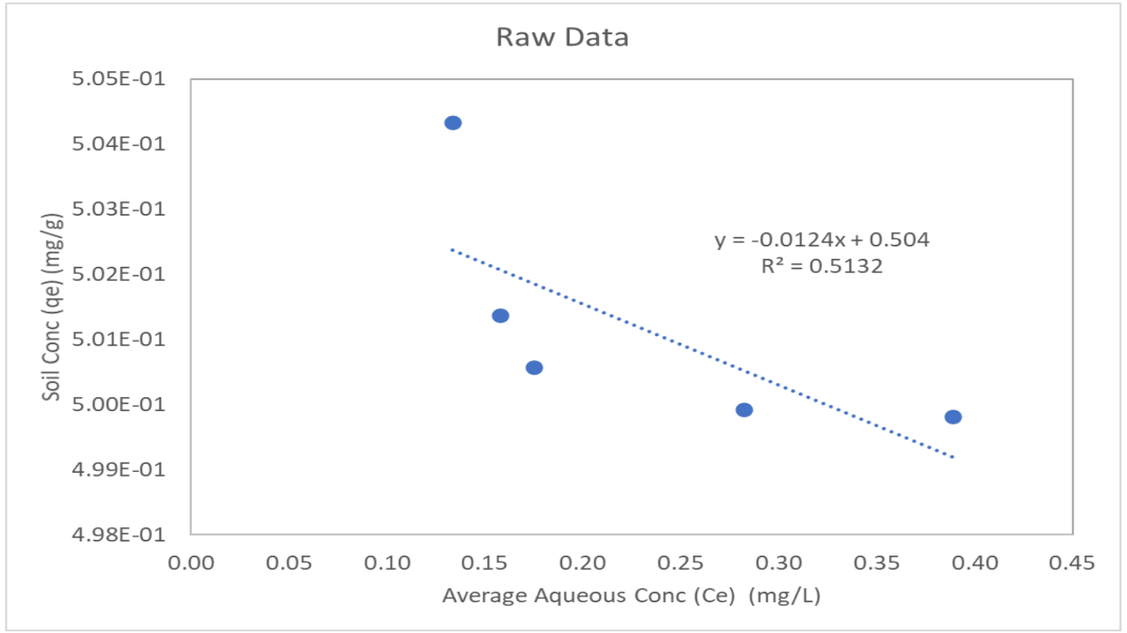
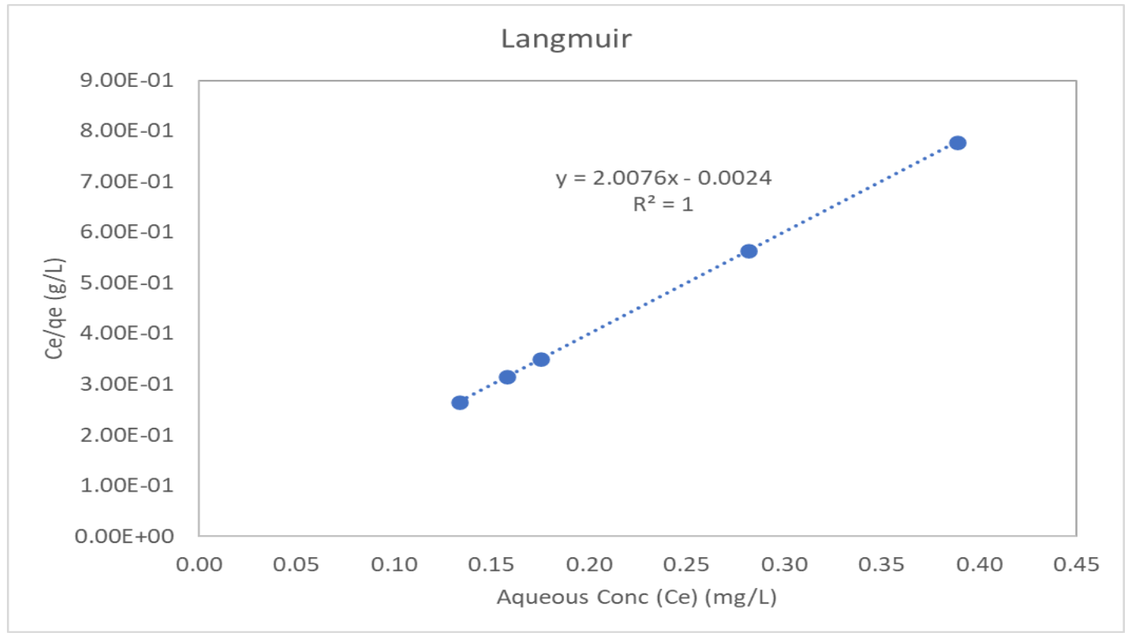
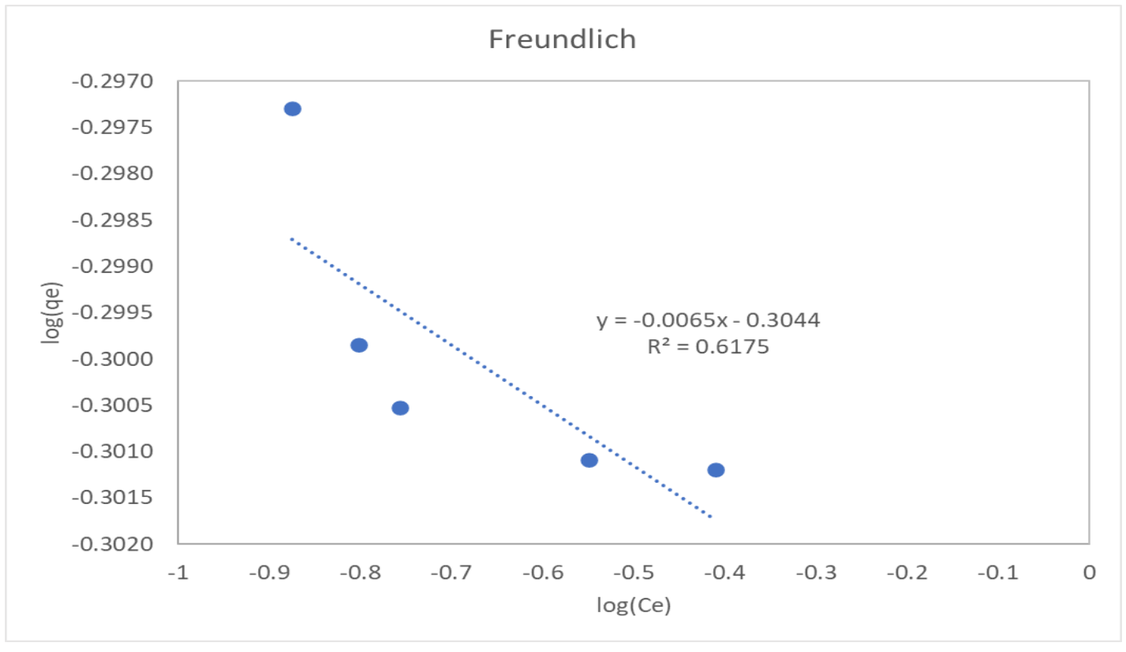






Note(s):
mg/L: milligrams per liter
mg/g: milligrams per gram
g/L: grams per liter
Ce: aqueous concentration of the adsorbate

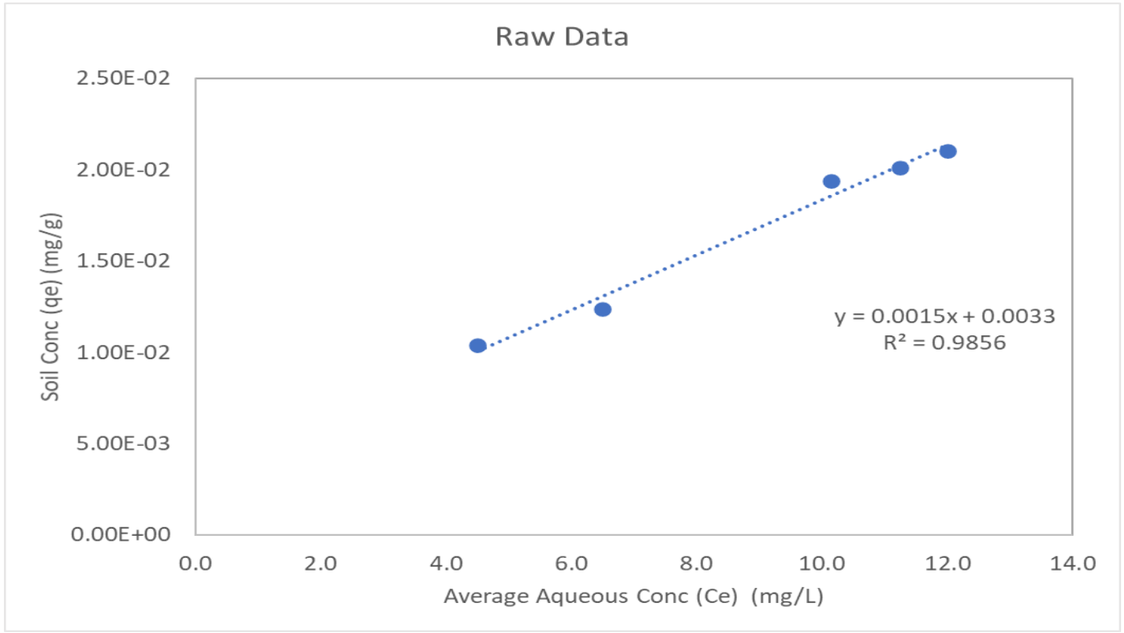
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

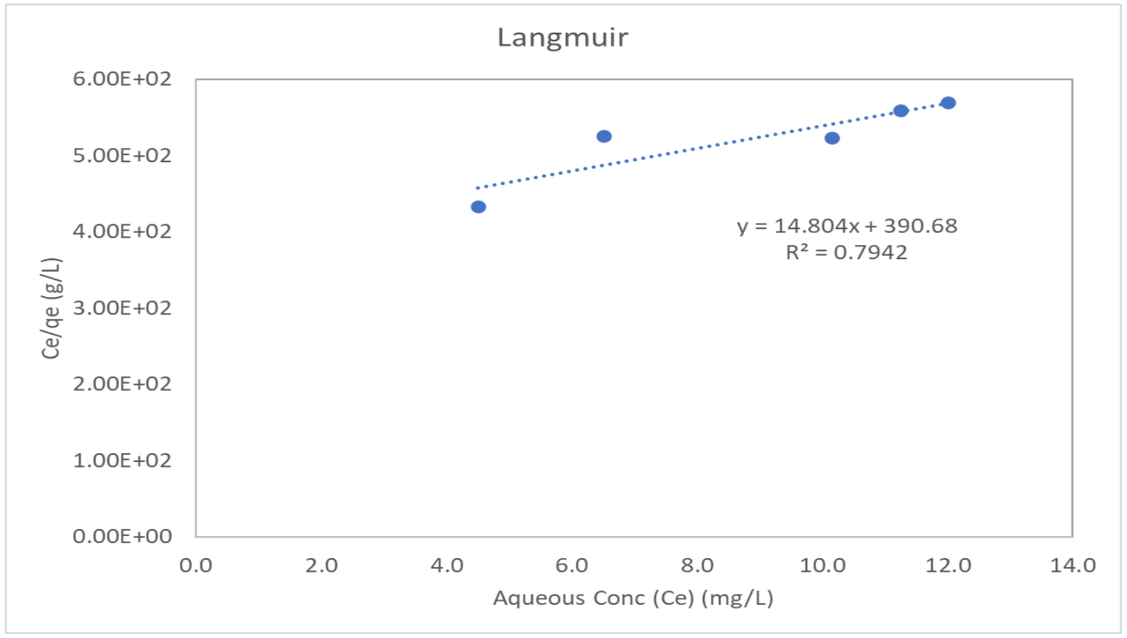
CONSULTANT
WSP GOLDER

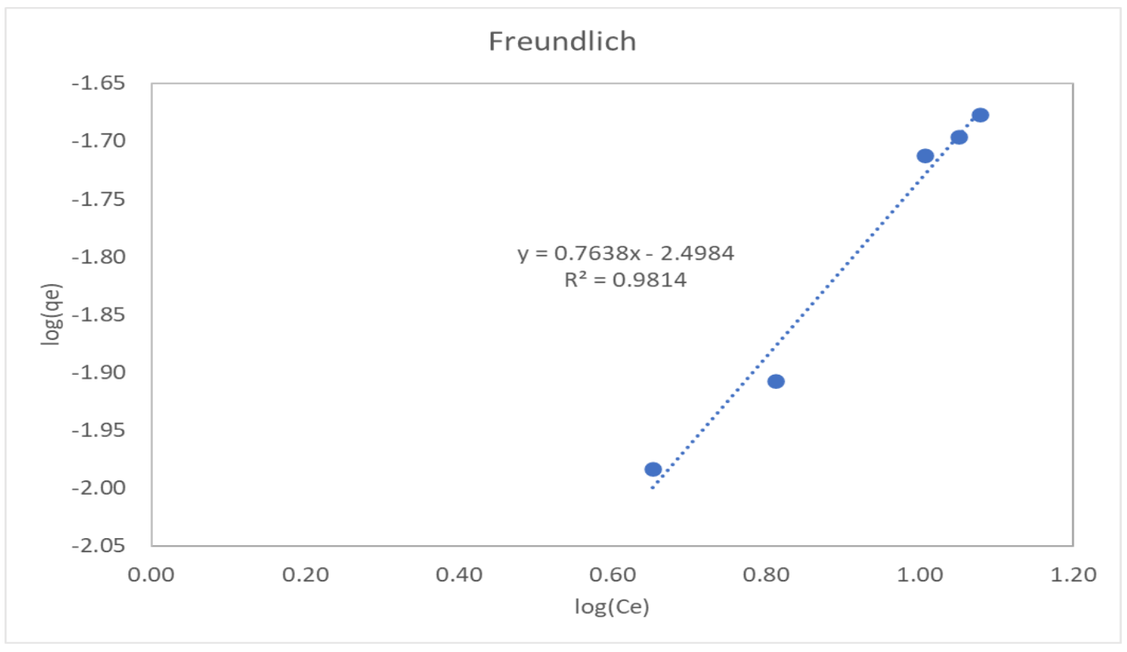
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-19 BARIUM PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-2







Note(s):
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g/L: grams per liter
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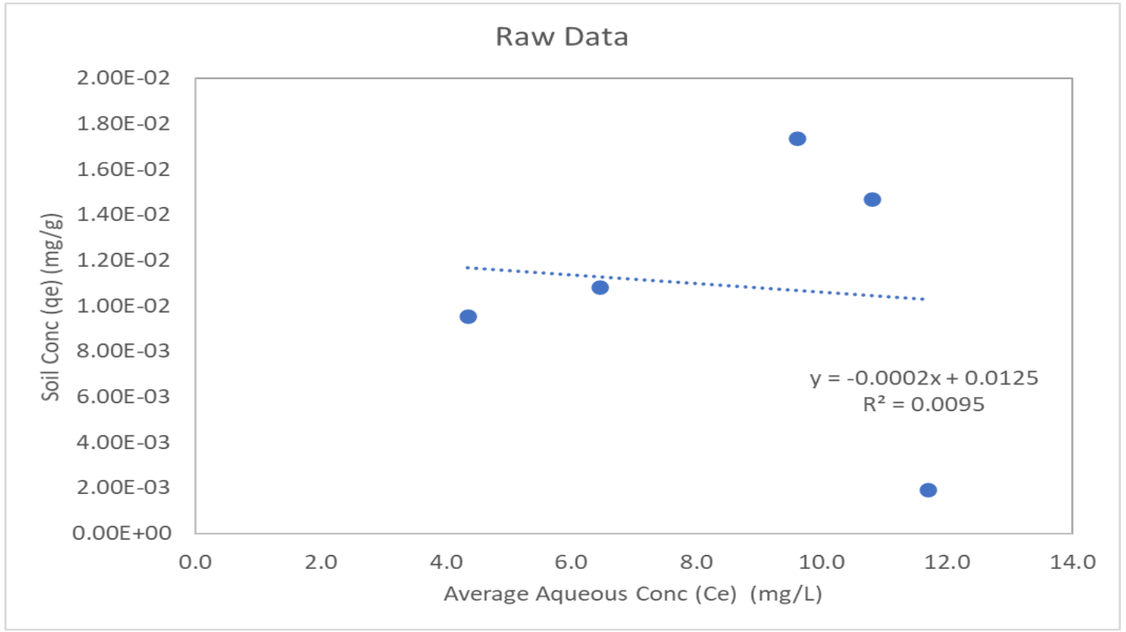
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

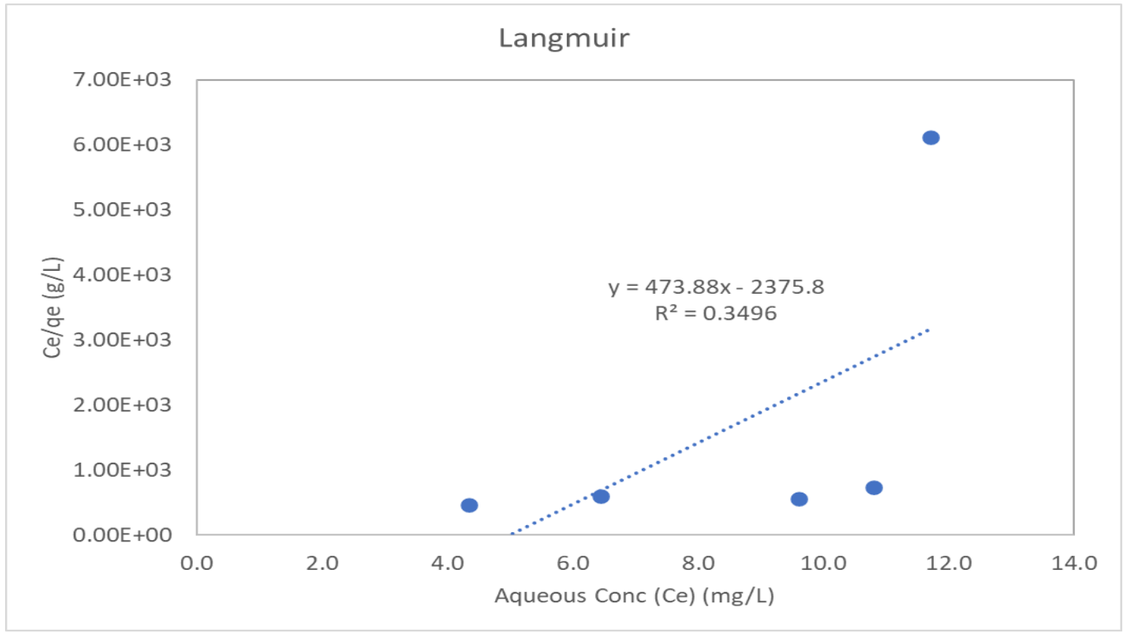
CONSULTANT
WSP GOLDER

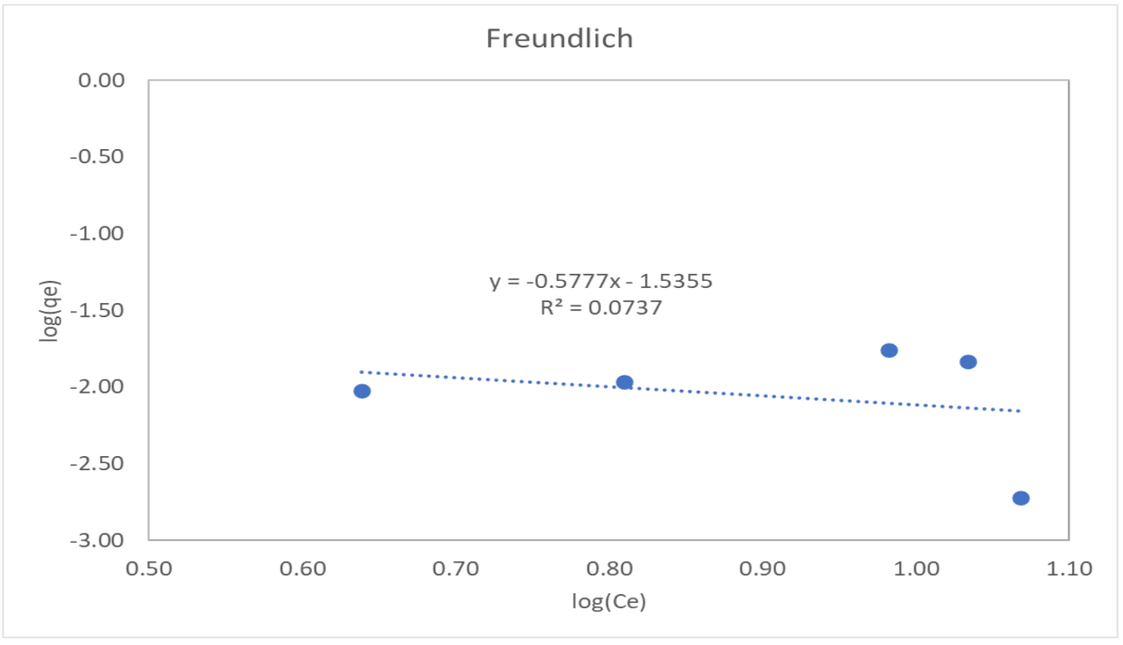
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-15S BORON PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-3







Note(s):
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mg/g: milligrams per gram
g/L: grams per liter
Ce: aqueous concentration of the adsorbate

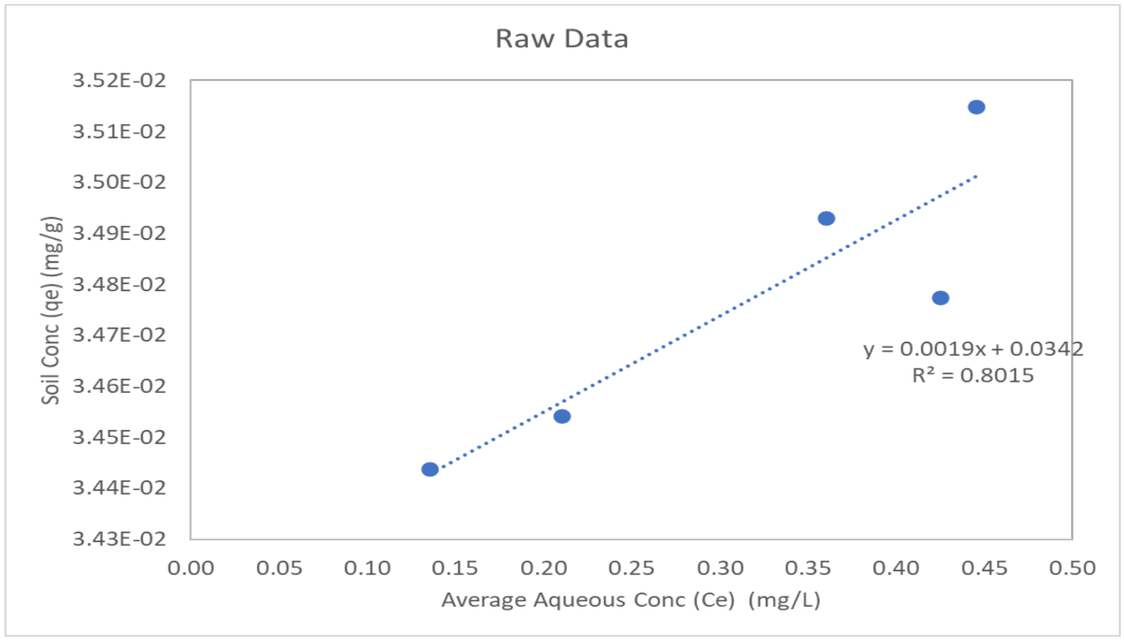
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

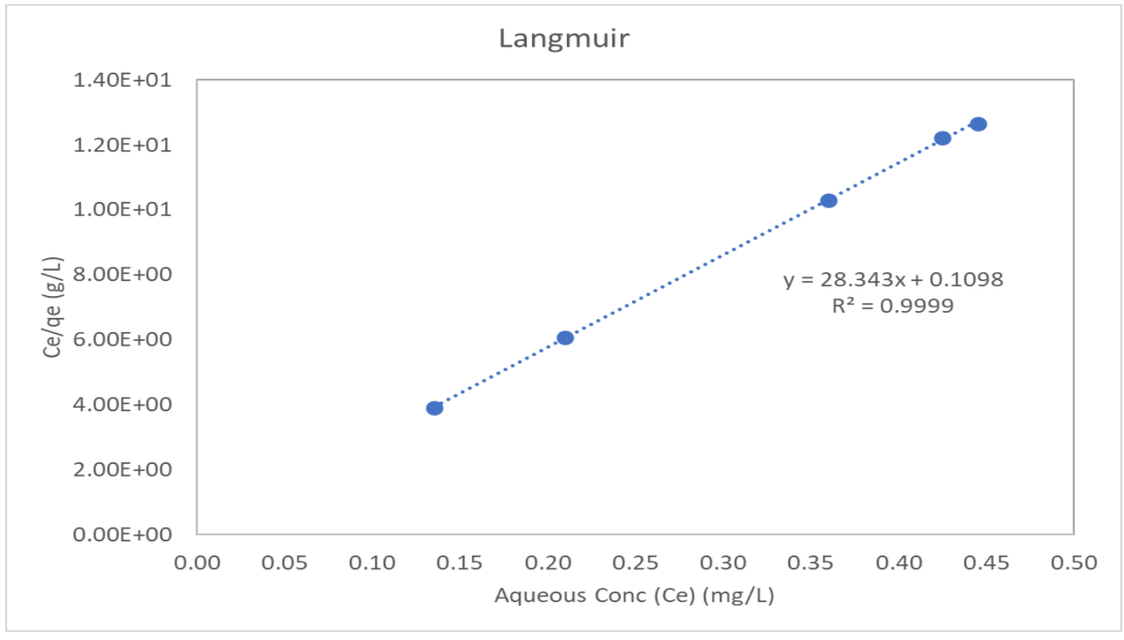
CONSULTANT
WSP GOLDER

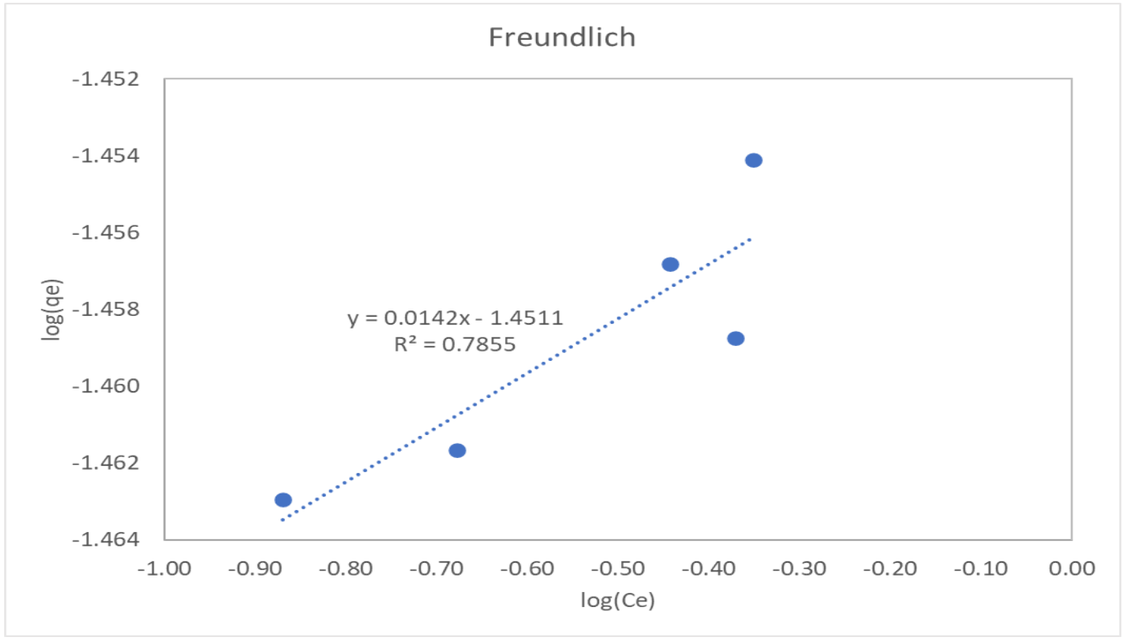
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-19 BORON PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-4







Note(s):
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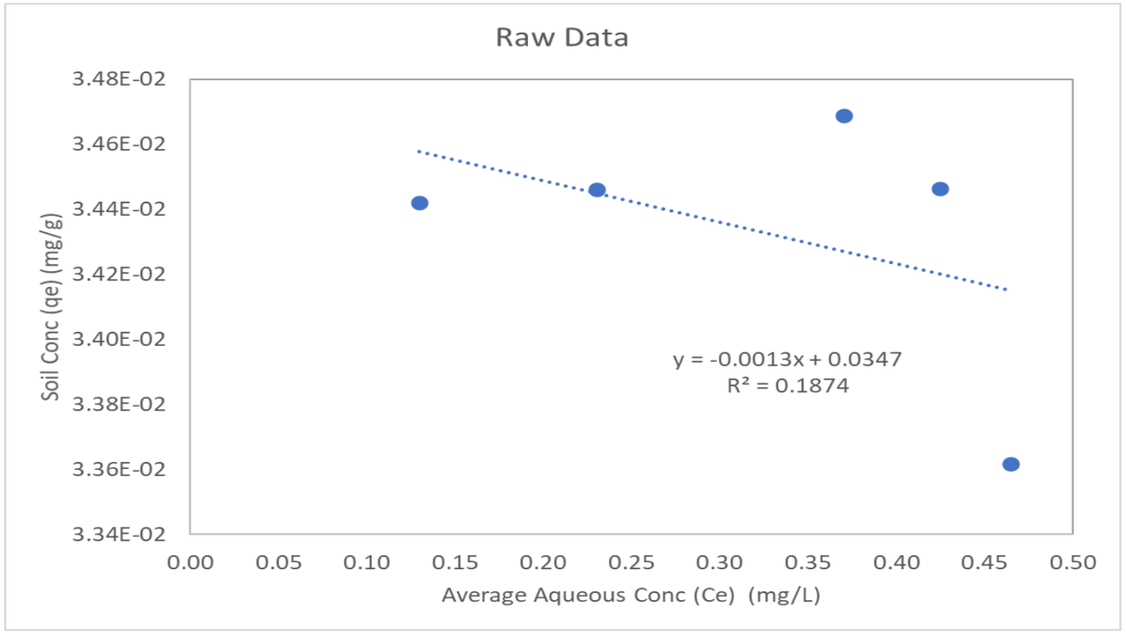
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

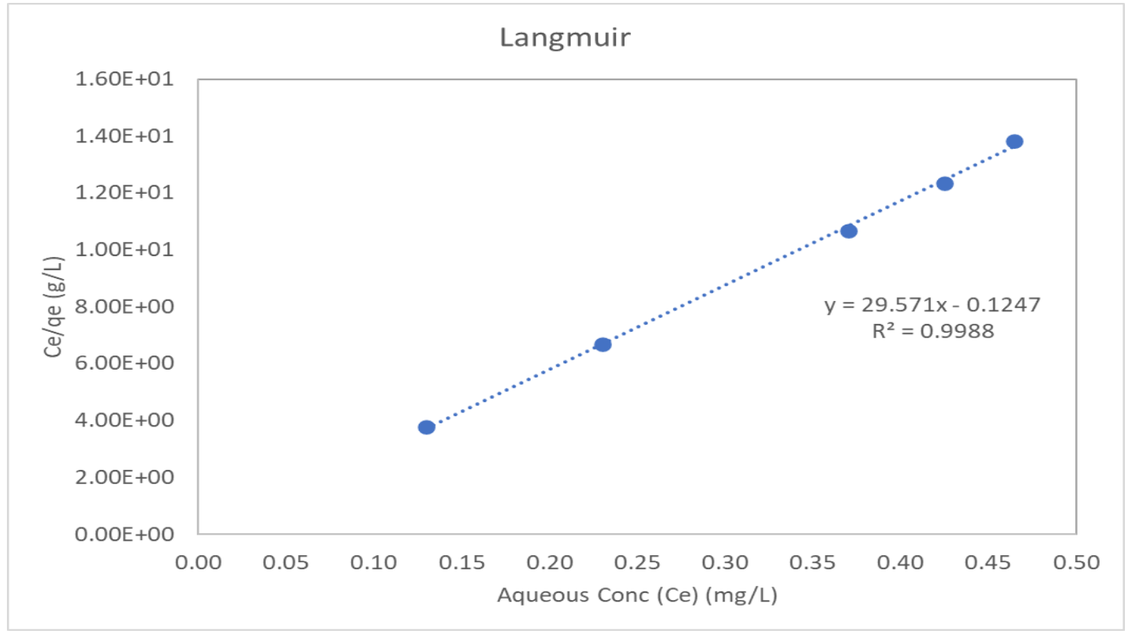
CONSULTANT
WSP GOLDER

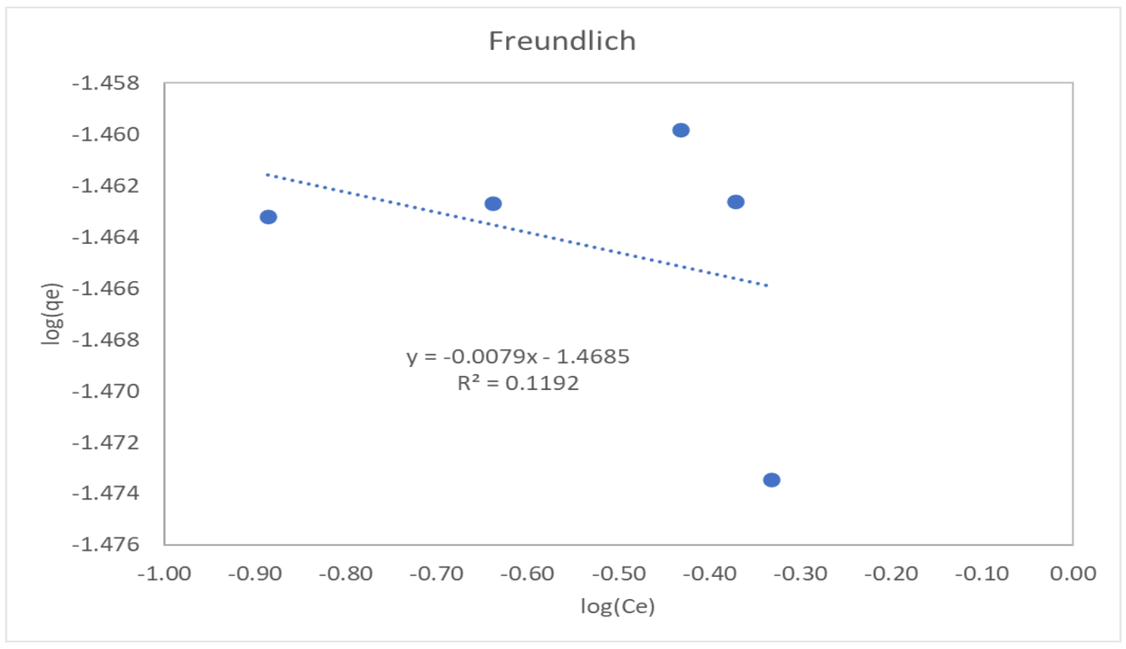
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-15S LITHIUM PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-5







Note(s):
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mg/g: milligrams per gram
g/L: grams per liter
Ce: aqueous concentration of the adsorbate

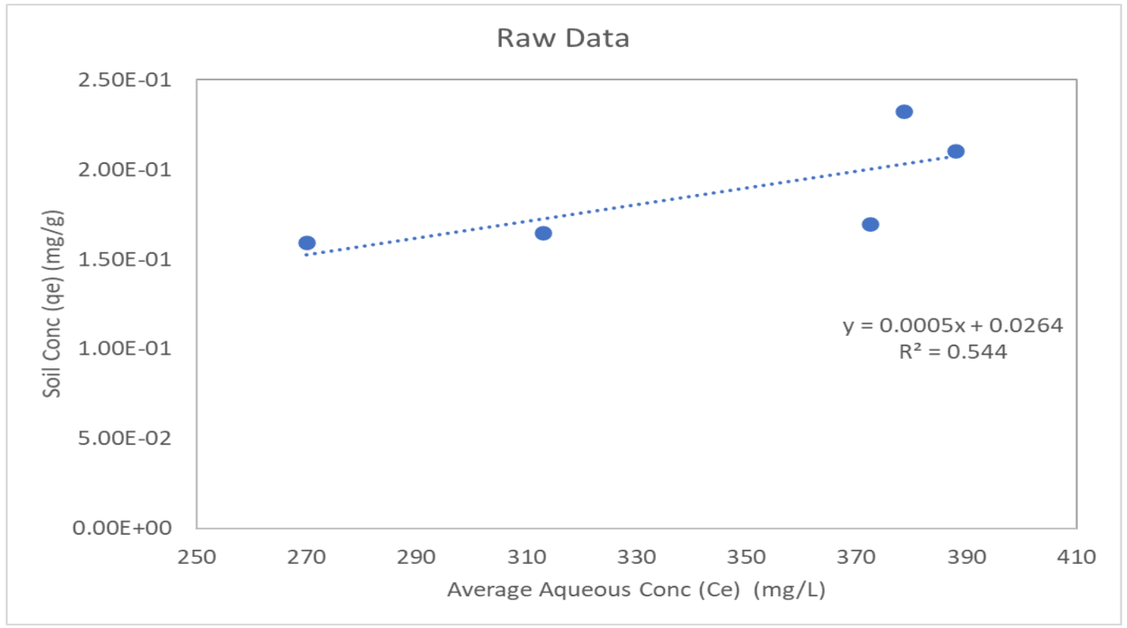
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

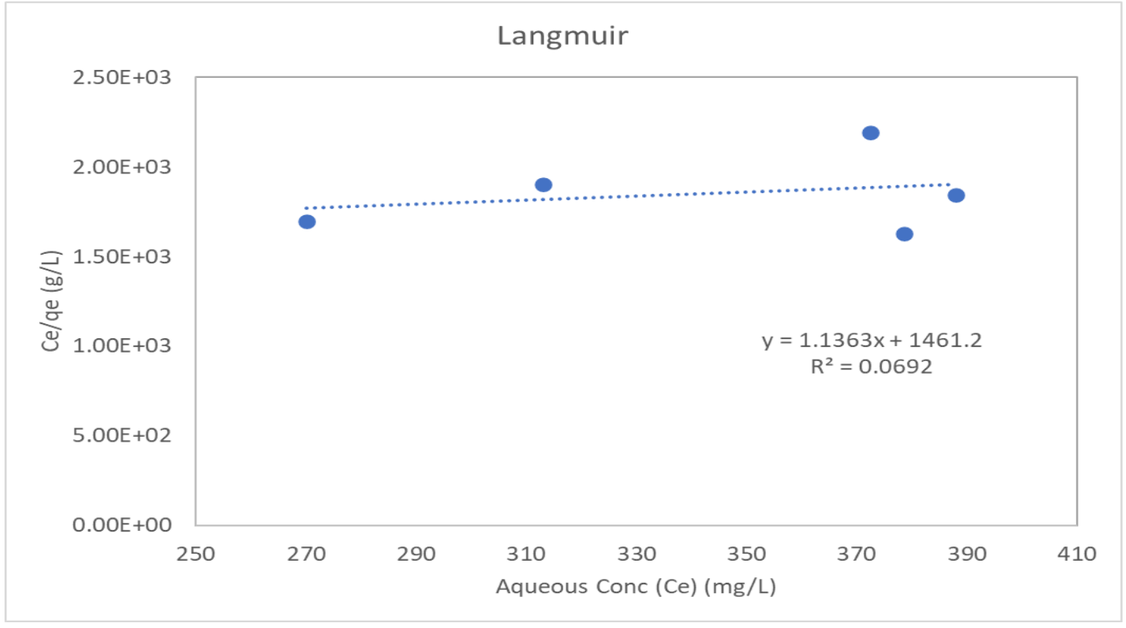
CONSULTANT
wsp GOLDER

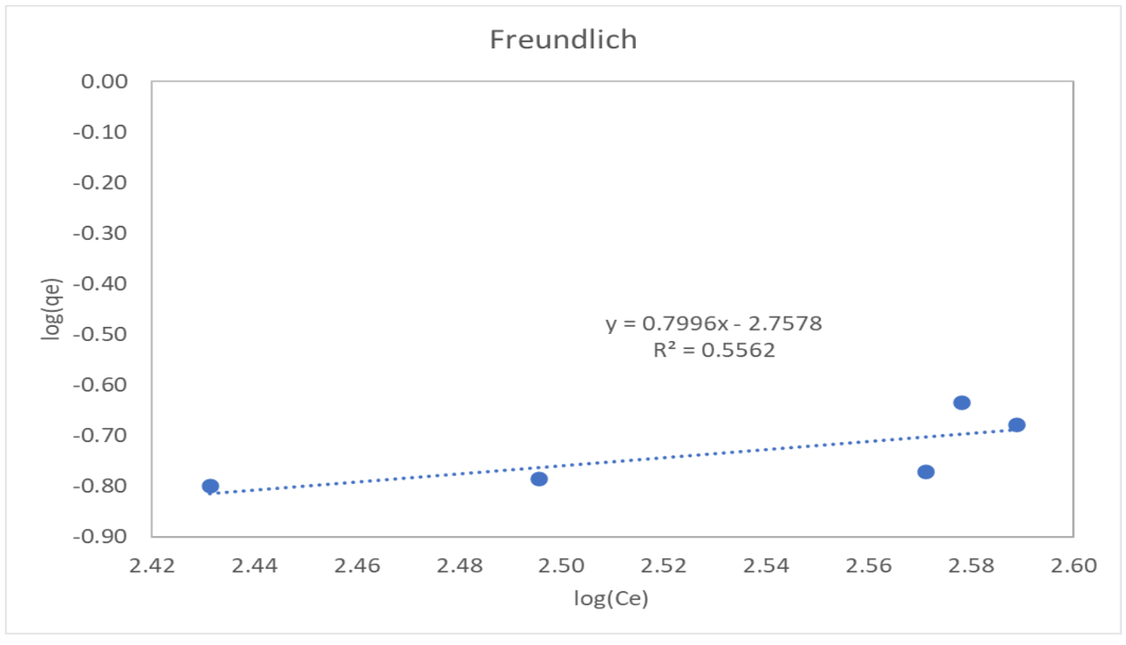
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-19 LITHIUM PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-6







Note(s):
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mg/g: milligrams per gram
g/L: grams per liter
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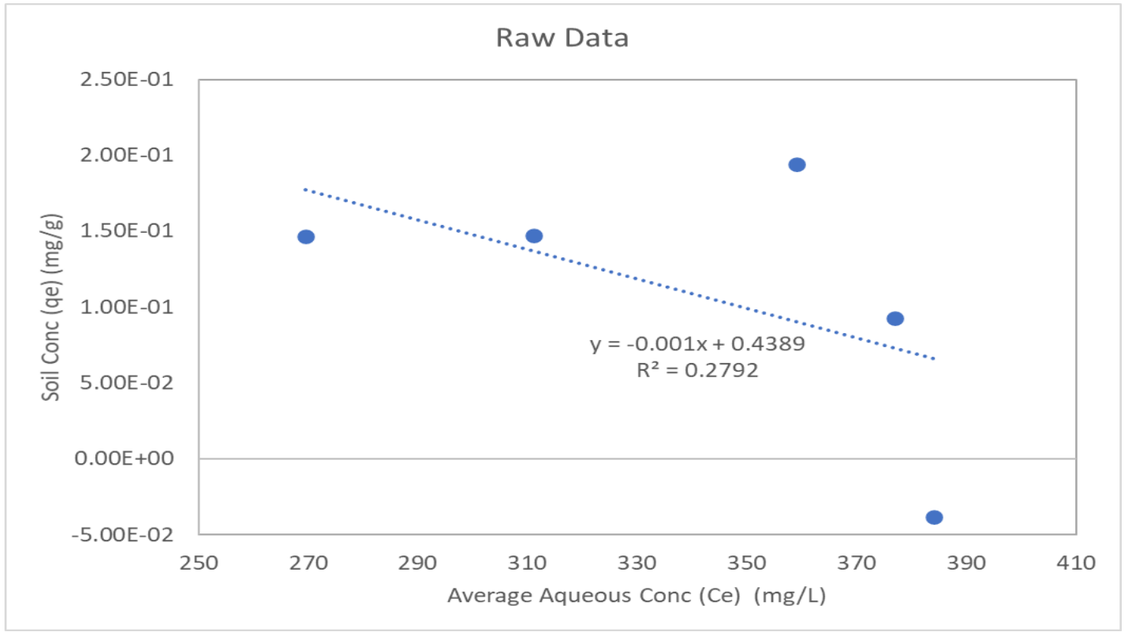
CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

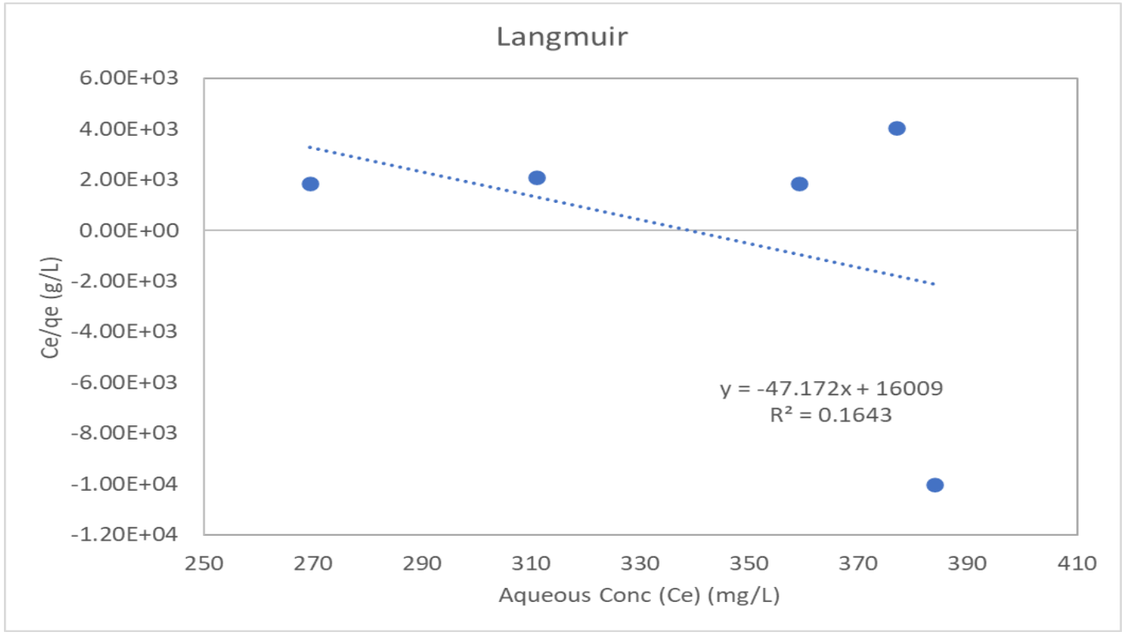
CONSULTANT
WSP GOLDER

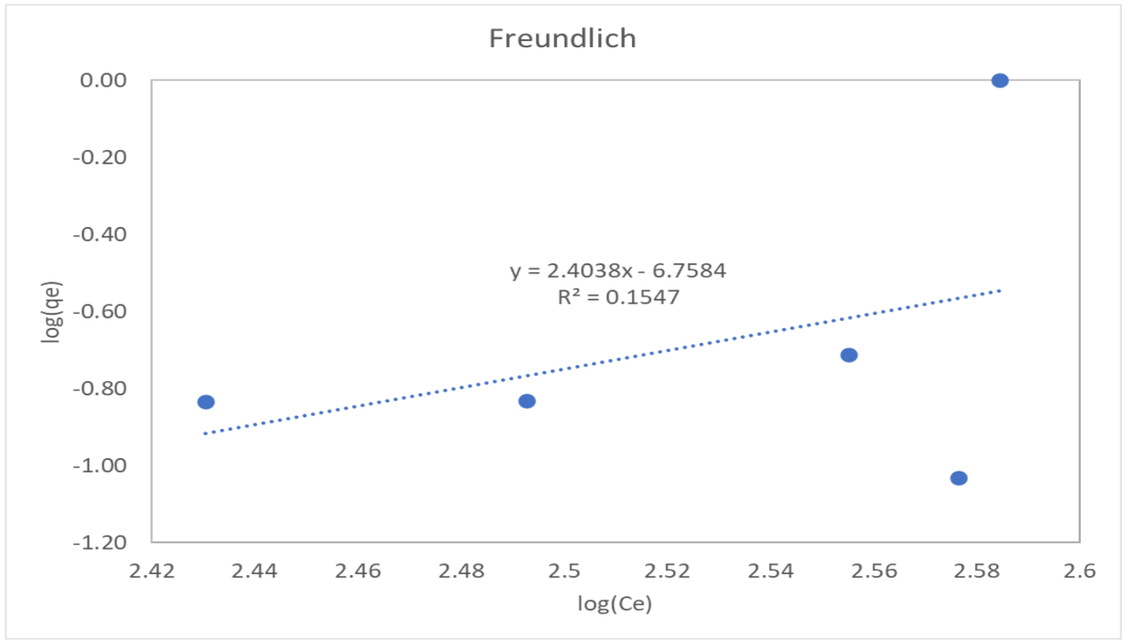
PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-15S SULFATE PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-7







Note(s):
mg/L: milligrams per liter
mg/g: milligrams per gram
g/L: grams per liter
Ce: aqueous concentration of the adsorbate

CLIENT
ILLIONIS POWER RESOURCES GENERATING, LLC
EDWARDS ASH POND (CCR UNIT 301)

CONSULTANT
WSP GOLDER

PROJECT
EVALUATION OF PARTITION COEFFICIENT RESULTS EAP

TITLE
AW-19 SULFATE PARTITION COEFFICIENTS

PROJECT NO.	PHASE	REV.	FIGURE
21454831	002	0	A-8

APPENDIX E
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: EDW AP CBR **Simulated On:** 6/24/2022 15:45

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam
Material Texture Number 12

Thickness	=	12	inches
Porosity	=	0.471	vol/vol
Field Capacity	=	0.342	vol/vol
Wilting Point	=	0.21	vol/vol
Initial Soil Water Content	=	0.3322	vol/vol
Effective Sat. Hyd. Conductivity	=	4.20E-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	=	86.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	91	acres
Evaporative Zone Depth	=	12	inches
Initial Water in Evaporative Zone	=	3.987	inches
Upper Limit of Evaporative Storage	=	5.652	inches
Lower Limit of Evaporative Storage	=	2.52	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	3.987	inches
Total Initial Water	=	3.987	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph

Average 1st Quarter Relative Humidity	=	70 %
Average 2nd Quarter Relative Humidity	=	66 %
Average 3rd Quarter Relative Humidity	=	74 %
Average 4th Quarter Relative Humidity	=	77 %

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP CBR
Simulated on: 6/24/2022 15:46

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	11,411,896.6	100.00
Runoff	3.704	[2.301]	1,223,418.2	10.72
Evapotranspiration	25.760	[3.86]	8,509,175.3	74.56
Subprofile1				
Percolation/leakage through Layer 1	5.087551	[1.891252]	1,680,570.9	14.73
Water storage				
Change in water storage	-0.0038	[0.8344]	-1,267.8	-0.01

* 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: EDW AP CIP Rem **Simulated On:** 6/24/2022 15:41

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam
Material Texture Number 12

Thickness	=	72	inches
Porosity	=	0.471	vol/vol
Field Capacity	=	0.342	vol/vol
Wilting Point	=	0.21	vol/vol
Initial Soil Water Content	=	0.3456	vol/vol
Effective Sat. Hyd. Conductivity	=	4.20E-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	=	86.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	22	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	6.174	inches
Upper Limit of Evaporative Storage	=	8.478	inches
Lower Limit of Evaporative Storage	=	3.78	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	24.883	inches
Total Initial Water	=	24.883	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph

Average 1st Quarter Relative Humidity	=	70 %
Average 2nd Quarter Relative Humidity	=	66 %
Average 3rd Quarter Relative Humidity	=	74 %
Average 4th Quarter Relative Humidity	=	77 %

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP CIP Rem
Simulated on: 6/24/2022 15:41

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	2,758,920.1	100.00
Runoff	3.567	[2.195]	284,844.6	10.32
Evapotranspiration	26.939	[3.969]	2,151,375.4	77.98
Subprofile1				
Percolation/leakage through Layer 1	4.025858	[1.305157]	321,505.0	11.65
Water storage				
Change in water storage	0.0150	[1.5498]	1,195.0	0.04

* 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: EDW AP CIP Cons **Simulated On:** 6/27/2022 16:01

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	18	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2559	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Drainage Net (0.5 cm)
Material Texture Number 20

Thickness	=	0.2	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.0126	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	1.27	%
Drainage Length	=	1190	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.187	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.231	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	82.995	inches
Total Initial Water	=	82.995	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph

Average 1st Quarter Relative Humidity	=	70 %
Average 2nd Quarter Relative Humidity	=	66 %
Average 3rd Quarter Relative Humidity	=	74 %
Average 4th Quarter Relative Humidity	=	77 %

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP CIP Cons
Simulated on: 6/27/2022 16:02

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.498	[2.429]	1,379,079.0	15.91
Evapotranspiration	26.321	[3.85]	6,602,232.4	76.19
Subprofile1				
Lateral drainage collected from Layer 3	2.7222	[1.0387]	682,816.5	7.88
Percolation/leakage through Layer 4	0.000194	[0.000197]	48.6	0.00
Average Head on Top of Layer 4	0.0594	[0.0662]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000195	[0.000191]	48.8	0.00
Water storage				
Change in water storage	0.0053	[1.0273]	1,340.4	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: EDW AP Default **Simulated On:** 6/24/2022 16:19

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	30	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2511	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Drainage Net (0.5 cm)
Material Texture Number 20

Thickness	=	0.2	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.0126	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	1.27	%
Drainage Length	=	1190	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.187	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.231	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	85.923	inches
Total Initial Water	=	85.923	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days

End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph
Average 1st Quarter Relative Humidity	=	70	%
Average 2nd Quarter Relative Humidity	=	66	%
Average 3rd Quarter Relative Humidity	=	74	%
Average 4th Quarter Relative Humidity	=	77	%

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP Default
Simulated on: 6/24/2022 16:20

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.500	[2.427]	1,379,467.8	15.92
Evapotranspiration	26.321	[3.847]	6,602,070.5	76.19
Subprofile1				
Lateral drainage collected from Layer 3	2.7200	[0.9825]	682,274.9	7.87
Percolation/leakage through Layer 4	0.000098	[0.000126]	24.6	0.00
Average Head on Top of Layer 4	0.0267	[0.0439]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000098	[0.000117]	24.7	0.00
Water storage				
Change in water storage	0.0067	[1.1405]	1,679.2	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: EDW AP Default Earth **Simulated On:** 6/24/2022 16:16

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	30	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2563	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.1894	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.235	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	102.427	inches
Total Initial Water	=	102.427	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph
Average 1st Quarter Relative Humidity	=	70	%
Average 2nd Quarter Relative Humidity	=	66	%
Average 3rd Quarter Relative Humidity	=	74	%
Average 4th Quarter Relative Humidity	=	77	%

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP Default Earth
Simulated on: 6/24/2022 16:17

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.205	[2.496]	1,305,465.6	15.07
Evapotranspiration	27.450	[3.924]	6,885,299.6	79.46
Subprofile1				
Percolation/leakage through Layer 3	1.826281	[0.161421]	458,091.5	5.29
Average Head on Top of Layer 3	16.9565	[4.5453]	---	---
Subprofile2				
Percolation/leakage through Layer 4	0.000191	[0.001041]	47.8	0.00
Water storage				
Change in water storage	1.8925	[1.6409]	474,704.0	5.48

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX F
FLUX EVALUATION DATA

APPENDIX F. FLUX EVALUATION DATA
GROUNDWATER MODELING REPORT
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Calibration Model					
Model	**Years (Model Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	
Calibration Model	62	Fill Unit (CCR)	708.27	3.68	
Model	**Years (Model Period)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	
Calibration Model	62	Fill Unit (CCR)	-709.88	-3.69	
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	**Years (Post-Construction Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	**Reduction in Flux In Post Closure[2] (Percentage, %)**
CIP	186	Fill Unit (CCR)	20.95	0.11	97%
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	**Reduction in Flux Out Post Closure[2] (Percentage, %)**
CIP	186	Fill Unit (CCR)	-43.80	-0.23	94%

[O: JJW 6/20/22; C: EGP 6/16/22; U: JJW 6/24/22;U: BGH 6/27/22]

Notes:
1. Reduction in flux in as compared to flux in at the end of calibration model (model period of 62 years).
2. Total flux in and out source data provided in flux calculation data files included in Appendix C.

CCR = coal combustion residuals
CIP = closure in place
HSU = Hydrostratigraphic Unit
% = percentage
ft^3/d = cubic feet per day
gpm = gallons per minute

Appendix H

Final Closure Plan

FINAL CLOSURE PLAN

EDWARDS POWER PLANT
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

June 2022

PREPARED FOR:

Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

PREPARED BY:

IngenAE, LLC
502 Earth City Expressway, Suite 120
Earth City, MO 63045

Project Number: VST002-D22-001-01

TABLE OF CONTENTS

1. INTRODUCTION 1-1
1.1 Proposed Selected Closure Method 1-1
2. FINAL CLOSURE PLAN 2-1
2.1 Narrative Description of Closure 2-1
2.2 CCR Removal and Decontamination of the CCR Surface Impoundment 2-5
2.3 Final Cover System Design 2-5
2.4 Estimate of Maximum CCR Inventory 2-5
2.5 Estimate of Largest Area of CCR Surface Impoundment 2-6
2.6 Final Closure Completion Schedule 2-6
3. REVISION OF THE FINAL CLOSURE PLAN 3-1
4. CLOSURE WITH A FINAL COVER SYSTEM 4-1
4.1 Control, Minimization or Elimination of Post-Closure Infiltration and Releases 4-1
4.2 Preclusion of Future Impoundment of Water, Sediment or Slurry 4-2
4.3 Stability Measures for Prevention of Sloughing or Movement 4-2
4.4 Minimize the Need for Further Maintenance 4-2
4.5 Be Completed in the Shortest Amount of Time 4-3
4.6 Drainage and Stabilization of CCR Surface Impoundments 4-3
4.7 Final Cover System 4-4
4.7.1 Standards for the Low Permeability Layer 4-4
4.7.2 Standards for the Final Protective Layer 4-5
4.8 Final Cover Settlement 4-6
4.9 Certification 4-7
4.10 Use of CCR in Closure of Surface Impoundments 4-8
4.11 Additional Information 4-9
4.12 Proposed PV Solar Power Facility 4-9
5. CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER 5-1
6. REFERENCES 6-1

TABLES

Table 1 – Final Closure Completion Schedule……7

APPENDICES

Appendix A – Closure Alternative Analysis

Appendix B – Final Closure Drawings

Appendix C – Alternative Final Protective Layer Equivalency Demonstration

Appendix D– Storm Water Calculations

Appendix E – Slope Stability Calculations

1. INTRODUCTION

Illinois Power Resources Generating, LLC is submitting this Final Closure Plan for Edwards Power Plant Ash Pond (IEPA ID. W1438050005-01) as part of the construction permit for closure required per the Illinois Administrative Code Title 35, Part 845, Standards for Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (Part 845).

Edwards Power Plant is a coal-fired power plant and is located at 7800 South Cilco Lane in Bartonville, Peoria County, Illinois. The power plant is scheduled to close no later than December 31, 2022. The Ash Pond will be closed in accordance with Part 845. As part of the closure effort, a new photovoltaic (PV) solar power facility will be installed on top of the closed ash pond with a rated power of approximately 19 megawatts AC (MWac) and an installed power of approximately 25 megawatts DC (MWdc). Interconnection of the solar facility will occur at the existing Edwards substation.

1.1 Proposed Selected Closure Method

Part 845, Subpart G: Closure and Post-Closure Care, Section 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 alternative analysis specified in Section 845.710.

A Closure Alternatives Analysis was performed by Gradient Corporation to evaluate the method of closure for the Edwards Power Plant Ash Pond. Closure-in place (CIP) (Section 845.750) was compared with closure by removal (CBR) (Section 845.740). The results indicate CIP was the most appropriate closure method. The Closure Alternative Analysis is included in Appendix A. A report of supplemental information, by IngenAE, LLC, for the Closure Alternative Analysis is also included in Appendix A.

2. FINAL CLOSURE PLAN

This Final Closure Plan for the Edwards Power Plant Ash Pond is required by Section 845.720. The following addresses the requirements in subsection (a)(1).

2.1 Narrative Description of Closure

Section 845.720(a)(1)(A): A narrative description of how the CCR surface impoundment will be closed in accordance with this Part.

The final cover system design for final closure is based on the closure-in place option of Section 845.710 and is detailed in the construction permit design drawings included in Appendix B.

Final closure of the CCR surface impoundment will include the following components:

1. site preparation,
2. removing free liquids,
3. relocation to the south sections of the pond of approximately 1,130,000 cubic yards (CY) of CCR from the high points and northwest sections of the ash pond and approximately 210,000 CY from the rail line embankment,
4. over-excavation of commingled ash and soils below the CCR relocation area,
5. construction of an earthen separation berm at the perimeter of the relocation area of the ash pond to contain the relocated ash,
6. removal of the existing rail loop, ballast, and ash embankments,
7. removal of onsite existing structures,
8. grading of the CCR subgrade,
9. installation of the designed final cover system,
10. backfill and grading the northwest relocation area to promote positive drainage,
11. installation of stormwater structures,
12. seeding and fertilization of the final protective soil layer and other disturbed areas.

The sequence of construction events for closure of the CCR surface impoundment are detailed below:

- Site Preparation

  The site will be prepared for closure by establishing perimeter stormwater Best Management Practices (BMPs), as and if needed, at the construction limits of disturbance.

- Removing free liquids

  Free liquid is defined as liquid waste that flows freely from the undisturbed ash under ambient conditions. Free liquids will be removed through a combination of the following methods:.

  1. Drilled sumps
     a. These consist of 4-foot to 6-foot diameter drilled holes in the ash greater than 10-feet thick. An HDPE pipe perforated to allow free

liquids to flow into the pipe is inserted into the drilled hole. The annulus between the ash and the pipe is back filled with clean gravel.
    b. A series of piezometers is installed to determine the drawdown of the phreatic surface around the sump.
    c. The drawdown will determine the spacing of the sumps.
2. Engineered trenches
    a. Excavated and properly designed sloped trenches may be used for depths less than 10-feet.
    b. Piezometers are installed to determine the drawdown of the phreatic surface around the ditch.
3. Horizontal wells
    a. Directionally drilled or excavated and installed horizontal wells may be used in ash zones of low permeability that are not responding to flow of liquid waste to sumps and trenches.
    b. Piezometers are installed to determine the drawdown of the phreatic surface around the horizontal well.

The liquids will be pumped to a temporary storage system, such as a treatment pond, settling pond or tanks, prior to discharge to an NPDES-permitted outfall.

- Relocation of CCR

  As the phreatic surface is lowered to a safe level, heavy equipment will be mobilized to relocate approximately 1,130,000 CY of CCR from the high points and northwest sections of the surface impoundment to the south end and other low areas of the surface impoundment. Additionally, approximately 210,000 CY will be relocated from the rail loop embankment into the surface impoundment closure area. The ash will be relocated by loading the material with excavators into offroad articulated trucks which will haul the material to fill areas in the central and south sections of the surface impoundment. The relocated CCR will be used to attain design grades in these areas of the surface impoundment and will be placed in 1-foot-thick compacted lifts. A dust control plan will be followed during the relocation and placement of the CCR.

- Excavation of the CCR relocation area

  The CCR within the designated CCR relocation area located at the northwest portion of the impoundment shall be completely removed and relocated to the areas of the pond to receive final cover. After CCR and CCR residue is removed, up to 1 foot of soil will be removed beneath this area. The subsoils will be visually observed for signs of CCR staining. If subsoils with CCR staining are observed, they will be removed and disposed.

- Construction of an earthen berm

  An earthen berm will be constructed to contain and stabilize the remaining CCR in the north and middle sections of the surface impoundment. The earthen berm will be constructed with local silty clayey soils and compacted in 8-inch loose lifts from the

bottom of the surface impoundment to the final design grade of the CCR subgrade. The compaction will be based on 95% of the soils Standard Proctor maximum dry density.

- Removal of existing rail loop

  The existing rail loop constructed on the perimeter berm of the surface impoundment will be removed as part of the final closure of the surface impoundment. The steel rails will be recycled after decontamination. The rail ties will be disposed of in a landfill or construction demolition site. Ballast and encountered ash (approximately 210,000 CY) used in the construction of the rail line berm will be loaded and hauled to the surface impoundment closure area.

- Removal of existing structures

  Structures within the surface impoundment will be removed or closed in place as part of the final closure of the surface impoundment. The structures include, but are not limited to, culverts, the surface impoundment spill way structure and outfall pipe, and a sewer forcemain. Removal of the structures will be documented by the CQA firm as part of the closure.

- Grading of the CCR to final cover design subgrade elevations

  Existing and relocated CCR will be graded to design final cover subgrade elevations. The CCR will be placed in areas requiring fill in 1-foot loose lifts and compacted with a roller or compactor of sufficient weight to create a surface that will support the low permeability layer and protective soil layer of the final cover system. Ballast from demolition of the rail loop and residual coal from the coal pile may be used as backfill material to achieve design final grades. The construction will be documented by the CQA firm.

- Installation of the final cover system

  The final cover system design for the CCR surface impoundment will encompass an area of approximately 69.1 acres of CCR closed in place and will include from bottom to top:

  A low permeability layer consisting of a 40 mil LLDPE geomembrane to be placed and seamed on top of the prepared CCR subgrade. The geomembrane installation will be installed and documented in accordance with GRI-GM19a specifications by the CQA firm. The geomembrane material will be evaluated and required to meet GRI-GM17 specifications.

  A 200 mil geocomposite with 6 oz nonwoven HDPE geotextile fabric on both sides will be placed on top of the 40 mil LLDPE geomembrane to provide drainage from the top of the geomembrane.

  The final protective layer will consist of two feet of soil materials obtained from an off-site borrow area and placed on top of the geocomposite drainage layer.

The soil material will include six-inches of soils to support vegetative growth to reduce potential erosion. Based on the demonstration provided in Appendix C in accordance with Section 845.750(c)(2), the proposed final protective layer provides equivalent or superior performance to the requirements of Section 845.750(c)(2)

- Backfill and grading the northwest relocation area

  Additional soil will be transported from the borrow area to the northwest relocation area and graded to promote positive drainage toward the proposed stormwater pond.

- Installation of stormwater structures

  Stormwater structures will be installed on the west side of the final cover system to direct stormwater to the existing drainage ditch on the west side of the CCR surface impoundment. The stormwater will discharge from the drainage ditch to the Illinois River per the Plant's NPDES permit.

- Seeding and fertilization of the final protective layer of the final cover system and other disturbed areas

  At the completion of the construction of the final cover system, the entire final protective layer will be seeded, fertilized, amended, and mulched as required to promote the establishment of vegetation that is sustainable in the local climate. The base seed mixture will be determined in consultation with local agronomists at the time of planting and shall consist primarily of turf grasses.

  For select areas of the site, the vegetation shall include native pollinator plantings consistent with IDNR's "Solar Site Pollinator Scorecard" [1]. In the northwest reclamation area, outside of the capped area, the soils will be fertilized and planted with pollinator plants. If pollinators are proposed for the capped areas, the final grading plan shall be revised to increase the depth of the protective soil to accommodate the deeper roots of the pollinators. In accordance with the Pollinator Establishment Guidelines prepared by the Illinois Department of Natural Resources (IDNR), native prairie species will be planted approximately 1/8"-1/4" on bare firm ground free of weeds. A ratio of 25% Native Grasses to 75% wildflowers is preferred and on slopes 5% or less, the minimum seeding rate is 20 seeds/ft^2 Pure Live Seed (PLS). PLS is calculated by the following equation: PLS = % Purity X % Total Germination/100.

  Long-term maintenance of the pollinators shall be performed in accordance with IDNR guidelines. The site should be checked for undesirable species such as woody plants or invasive species at least annually. During the first year, mowing at a height of 10" or greater 1-3 times during the growing season. Spot mowing and/or spot herbicide treatment will be performed to control noxious and undesirable weeds. After the first year, mowing will not take place during April 15th – October 1st.

2.2 CCR Removal and Decontamination of the CCR Surface Impoundment

Section 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.

Based on the proposed design, CCR will be removed from the northwest area of the CCR surface impoundment and relocated on the south end as part of the subgrade design. The ash will be relocated by loading the material with excavators into offroad articulated trucks which will haul the material to fill areas in the central and south sections of the surface impoundment. The remaining base soils within the area of CCR removal will be observed for CCR staining and removed if encountered. Approximately 1 foot of material may be removed. The materials will be incorporated into the grading of the CCR to final cover design subgrade elevations.

2.3 Final Cover System Design

Section 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 Sections 2.1 and 4.0 and detailed in the final cover construction permit drawings included in Appendix B of this final closure plan. The final cover system design is in accordance with the required installation methods and procedures of Section 845.750 and describes how the final cover system design will achieve the performance standards of Section 845.750.

2.4 Estimate of Maximum CCR Inventory

Section 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.

The Ash Pond currently contains approximately 4,135,000 CY of CCR. This estimate is based on the comparison between the existing surface contours surveyed on December 1, 2020, and the bottom contours of the CCR. Edwards Power Plant is scheduled to close no later than December 31, 2022, and before closure, additional CCR will be placed in the surface impoundment. According to Section 2.4 of the 2021 USEPA CCR Rule Periodic Certification Report, dated October 11, 2021, by Geosyntec [2], 126,383 CY of CCR was placed in the Ash Pond between July 2015 and December 2020. This corresponds to approximately 23,000 CY per year. Therefore, for the two-year period between the survey conducted in December 2020 and the expected date of plant closure in December 2022, an additional 46,000 CY of CCR is expected to be placed in the Ash Pond. Furthermore, approximately 210,000 CY of ash is currently in the surface impoundment rail line embankments and will be placed inside the surface impoundment upon closure, resulting in a maximum CCR capacity of approximately 4,391,000 CY.

2.5 Estimate of Largest Area of CCR Surface Impoundment

Section 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.

The largest estimated area of the CCR surface impoundment ever requiring a final cover is 102.06 acres based on the CCR Facility Boundary Exhibit located in Attachment A of the Initial Operating Permit submittal by Burns & McDonnell dated October 25, 2021 [3]. The actual design acreage required for a final cover system based on this final closure plan is approximately 69.1 acres.

2.6 Final Closure Completion Schedule

Section 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).

The final closure completion schedule with major milestones is included below in Table 1 – Final Closure Completion Schedule.

TABLE 1 – FINAL CLOSURE COMPLETION SCHEDULE

Milestone	Timeframe
Final Closure Plan Submittal	August 1, 2022
Agency Coordination and Permit Approvals. • State permits for dewatering, land disturbance, stormwater discharge, and dam modifications.	6 to 12 months after the approval of the Final Closure and Construction Permit Application.
Dewater and Stabilize CCR. • Dewater surface impoundment. • Stabilize dewatered CCR.	18 to 24 months after approved permits.
Subgrade Stabilization • Relocate CCR from the northwest section, middle section and rail line embankment areas of the surface impoundment to the south end and place to final design elevations. • Remove existing structures. • Construct northwest berm. • Remove rail line.	18 to 24 months after the completion of the dewatering and stabilization of the ash subgrade. Can be completed in conjunction with stabilization of ash.
Installation of the Final Cover System. • Prepare the CCR subgrade for the placement of the final cover system. • Install geomembrane/geocomposite. • Install/place the final protective cover soil layer. • Backfill and grade the northwest relocation area. • Install stormwater structures.	8 to 12 months after subgrade stabilization. Can be completed in conjunction with subgrade stabilization.
Site Restoration. • Amend, Seed, fertilize, and mulch the final protective layer. • Fertilize and plant pollinator plants in the northwest relocation area. • Demobilization.	2 to 4 months after the completion of the final cover system construction. Can be completed in conjunction with final cover system construction.
Timeframe to Complete Closure	**Prior to October 2028**

3. REVISION OF THE FINAL CLOSURE PLAN

Section 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.

If an event triggering a revision is necessary for the written closure plan, the owner will submit a request to modify the construction permit within 60 days of the triggering event.

4. CLOSURE WITH A FINAL COVER SYSTEM

This section addresses the closure performance standards when leaving CCR in place for the Edwards Power Plant Ash Pond as required by Section 845.750.

4.1 Control, Minimization or Elimination of Post-Closure Infiltration and Releases

Section 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 final cover system design will, to the maximum extent feasible, minimize infiltration of liquids into the retained CCR with the following design features and specifications:

- A 40 mil LLDPE geomembrane low permeability layer will be placed over the entirety of the CCR surface impoundment closure footprint, approximately 69 acres, to control and minimize infiltration into the waste. The geomembrane will be constructed on a subgrade that is free of sharp rocks and other debris.

- A 200 mil geocomposite with 6 oz nonwoven HDPE geotextile fabric on both sides will be placed on top of the 40 mil LLDPE geomembrane to protect and provide drainage from the top of the geomembrane.

- A two-foot-thick final protective layer of soil materials. The final protective layer will allow the establishment of vegetation on the top of the final cover system. The soil and vegetation will reduce the amount of infiltration to the geocomposite and geomembrane layers.

Surface stormwater will be routed off the top of the surface impoundment final cover, conveyed to drainage stormwater channels, and discharge into the west perimeter ditch and northeast stormwater pond. The stormwater management system will drain by gravity and preclude water impoundment on top of the final cover system, thereby minimizing post-closure infiltration into the CCR.

Releases of CCR leachate and/or contaminated run-off into the groundwater, surface water, and/or atmosphere will be minimized, to the maximum extent feasible, as:

- CCR leachate (e.g., pore water within the CCR) will be minimized via the installation of the final cover system, including a low-permeability geomembrane layer. The final cover system will minimize infiltration and therefore the amount of leachate within the CCR.

- Releases of CCR leachate via the existing outlet culverts will be prevented by removing or sealing existing penetrations into the ash pond. Sealing will include the capping of plastic culverts and the cleaning of concrete pipe culverts and filling with cement bentonite

grout, thereby removing potential flow paths that could otherwise allow leachate to be released.

4.2 Preclusion of Future Impoundment of Water, Sediment or Slurry

Section 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 design of the final cover system will be sloped to ensure positive drainage of stormwater from the final cover system surface and directed to drainage structures of the final cover system. The drainage structures will convey the stormwater to the existing drainage ditch on the west side of the CCR surface impoundment and discharge into the existing perimeter west ditch in accordance with the terms of an NPDES permit. Stormwater calculations supporting the design of the final cover system to minimize releases are included in Appendix D.

4.3 Stability Measures for Prevention of Sloughing or Movement

Section 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 period.

The existing perimeter berms around the ash pond are constructed using compacted soil materials. The proposed separation berm for the northwest section of the surface impoundment will also be constructed using compacted soil materials.

Sloughing and movement of the final cover system will be minimized by constructing the final cover system at relatively flat slopes, including 2.7% over most of the final cover and 3H:1V at the edges of the final cover, as necessary to tie into existing grades. The limited areas of 3H:1V slope are 20 feet or less in total slope height

Geotechnical calculations completed for the design of the final cover system and the stability of the existing and proposed berms show that the final cover system will be prevented from sloughing or movement during the closure and post-closure period. Slope stability calculations are included in Appendix E.

4.4 Minimize the Need for Further Maintenance

Section 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 final cover system design of the surface impoundment is designed to promote stormwater run-off yet minimize erosion of the final protective layer. The majority of the final cover system is sloped at less than 3%. These relatively shallow slopes will help with the establishment of vegetation and minimize the need for further maintenance of the final cover system. Isolated steeper slopes, associated with the perimeter drainageway, were designed with short slope lengths to minimize erosion. Any further maintenance will be described in the Post-Closure Care Plan in accordance with Section 845.780.

The final cover system design includes stormwater controls systems that will reduce the possibility of major erosion by controlling the flow of stormwater away from the final cover system. Calculations for sizing the stormwater control systems are included in Appendix D.

4.5 Be Completed in the Shortest Amount of Time

Section 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.*

Closure construction is expected to be completed within an amount of time that is consistent with recognized and generally accepted timeframes required to permit, design, bid, and construct a CCR impoundment final closure system, with a consideration of other permits form multiple agencies that are also required for the project. Where possible, construction tasks will occur concurrently to reduce project construction time. The estimated Final Closure Completion Schedule is included in Table 1 in Section 2.6 of this final closure plan. It should be noted that this schedule may change based on contractor, equipment, and material availability and actual weather conditions at the time at which closure occurs.

4.6 Drainage and Stabilization of CCR Surface Impoundments

Section 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.*

Prior to installing the final cover system, free liquids will be eliminated by removing the liquid waste from the Ash Pond. Engineering measures to be used to remove liquid waste that flows freely from the undisturbed ash under ambient conditions are discussed in Section 2.1.

The removal of free liquids will result in the stabilization of the remaining CCR and will therefore allow the final cover to be placed on stable subgrade.

4.7 Final Cover System

Section 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.

The following sections define the low permeability layer and the final protective layer components of the proposed final cover system which is designed in accordance with Section 845.750.

4.7.1 Standards for the Low Permeability Layer

Section 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 meters (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 the 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 proposed final cover system low permeability layer will be a 40 mil LLDPE geomembrane as shown on the construction permit drawings in Appendix B. The geomembrane will be tested to meet the requirements of the Geosynthetic Institute GRI-GM17. A 40 mil LLDPE geomembrane that conforms to these specifications is less permeable than three feet of compacted clay soil and able to withstand normal stresses imposed by waste stabilization.

The installation of the 40 mil LLDPE geomembrane will be completed per the Geosynthetic Institute GRI-GM19a specifications and will be installed on a prepared subgrade, after the underlying CCR has been stabilized. Therefore, additional normal stresses will not be imparted on the geomembrane due to the waste stabilization process. The prepared subgrade shall be free of sharp or protruding objects and other materials that may cause damage.

A 200 mil geocomposite will be placed on top of the 40 mil LLDPE geomembrane. The geocomposite will convey clean stormwater that infiltrates the protective soil layer off the geomembrane.

4.7.2 Standards for the Final Protective Layer

Section 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.

The proposed final cover system final protective layer consists of 2 feet of soil material, the top six-inches capable of supporting vegetation. Soil protective layer material will be placed on top of the geocomposite drainage layer as soon as possible. The sandy, silty clay soil material will be borrowed from local sources. The top 6 inches of soil material will be amended with fertilizers as needed to help establish vegetation. A demonstration is included in Appendix C for approval in accordance with Section 845.750(c)(2) demonstrating that the proposed design provides equivalent or superior performance to the requirements of Section 845.750(c)(2).

The entire final protective layer will be seeded, fertilized, amended, and mulched as required to promote the establishment of vegetation that is sustainable in the local climate. Temporary erosion and sediment controls (ESCs) will be installed, as necessary, 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 such as straw mulch, hydroseeding binder, ECBs, or engineering growing media shall be deployed as required. he 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.

The base seed mixture will be determined in consultation with local agronomists at the time of planting and shall consist primarily of turf grasses. For select areas of the site, the vegetation shall include native pollinator plantings consistent with IDNR's "Solar Site Pollinator Scorecard" [1]. In the northwest reclamation area, outside of the capped area, the soils will be fertilized and planted with pollinator plants. If pollinators are proposed for the capped areas, the final grading plan shall be revised to increase the depth of the protective soil to accommodate the deeper roots of the pollinators. In accordance with the Pollinator Establishment Guidelines prepared by the Illinois Department of Natural Resources (IDNR), native prairie species will be planted approximately 1/8"-1/4" on bare firm ground free of weeds. A ratio of 25% Native Grasses to 75% wildflowers is preferred and on slopes 5% or less, the minimum seeding rate is 20 seeds/ft^2 Pure Live Seed (PLS). PLS is calculated by the following equation: PLS = % Purity X % Total Germination/100.

Long-term maintenance of the pollinators shall be performed in accordance with IDNR guidelines. The site should be checked for undesirable species such as woody plants or invasive species at least annually. During the first year, mowing at a height of 10" or greater 1-3 times during the growing season. Spot mowing and/or spot herbicide treatment will be performed to control noxious and undesirable weeds. After the first year, mowing will not take place during April 15th – October 1st.

4.8 Final Cover Settlement

Section 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 final cover system design includes slopes that will accommodate final cover settlement and subsidence and still maintain positive stormwater flow off the final cover surface. Slope stability calculations showing the stability of the final cover system design are included in Appendix E.

4.9 Certification

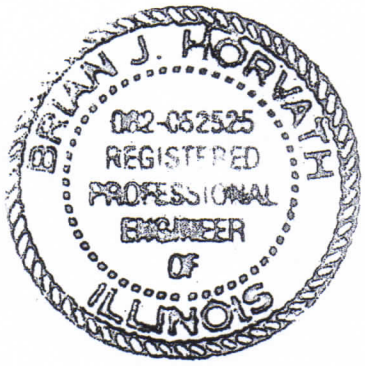
Section 845.750(c)(4): The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that that the design of the final cover system meets the requirements of this Section.

As a registered professional engineer in good standing with the State of Illinois I hereby certify that the design of the final cover system meets the requirements of Section 845.750.

Brian J Horvath
Printed Name

Bri~ J Hor 6/24/22
Signature Date

062-052525 11/30/23
Registration Number Expiration Date



4.10 Use of CCR in Closure of Surface Impoundments

Section 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.

Based on the final cover system design approximately 1,130,000 CY of CCR from the northwest and middle sections of the surface impoundment will be relocated to areas of the central and south sections of the surface impoundment. CCR encountered from excavation of the rail loop embankments will also be relocated. The relocated CCR will only be placed above the elevation of the existing CCR that will remain as subgrade within the footprint of the perimeter berms of the CCR surface impoundment. This reuse of CCR in the closure of the surface impoundment is in accordance with the requirements in Section 845.750(d).

Final cover slopes will typically consist of 2.7% cross-slopes and 1% stormwater flowline slopes within the limits of final cover, which are less than 5%. However, short lengths of 3(H):1(V) final cover slopes, up to 20 ft in height, will be used in limited areas near the perimeter of the final cover, as needed to tie the final cover into the existing grades, as shown in the drawings. The 3(H):1(V) slopes will be utilized to allow most of the final cover, in area, to drain towards the west perimeter ditch. This will reduce the volume of post-closure stormwater runoff that is routed to the east (towards the new northeast pond). The stability of final cover slopes has been evaluated, and these calculations are provided in Appendix E. Resulting factors of safety exceed typical minimum factors of safety.

4.11 Additional Information

Both the lateral migration of groundwater and vertical infiltration of liquids, and releases of CCR, and leachate, and contaminated run-off into and out of the Ash Pond will be controlled, minimized, or eliminated, to the maximum extent feasible, under post closure conditions.

- Closure of the Ash Pond will include constructing a final cover system, thereby encapsulating CCR within the Ash Pond on the top and sides, as discussed in Section 4.

- In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the Upper Cahokia Formation has been observed, as stated in the 2021 Hydrogeologic Site Characterization Report [4]. This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas.

- CCR within the northwest area of the Ash Pond will be re-located to the south end to provide a minimum separation of 5 feet above the uppermost aquifer. The lowest elevation of CCR withing the consolidated area of the Ash Pond is approximately El. 413.9 ft, as shown in the Groundwater Modelling Report [5].

- The proposed 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. Specifically, the closure design will result in a reduction of infiltration into the Ash Pond by 97% compared to pre-closure conditions as shown in the Groundwater Modelling Report [5]. Additionally, the Groundwater Modelling Report shows that the closure design will result in a reduction of hydraulic flux out of the Ash Pond by 94% compared to pre-closure conditions. Due to the reduction in the hydraulic flux out of the Ash Pond, the mass flux out of the Ash Pond will also be controlled or minimized as much as feasible as a result of closure design.

4.12 Proposed PV Solar Power Facility

As part of the closure effort, a new photovoltaic (PV) solar power facility will be installed on top of the closed ash pond with a rated power of approximately 19 megawatts AC (MWac) and an installed power of approximately 25 megawatts DC (MWdc). Interconnection of the solar facility will occur at the existing Edwards substation.

The solar facility layout is proposed to include a 2V fixed tilt ballasted system using FirstSolar Series 6 CuRe PV modules rated at 480 W and six Sungrow 3600 kVA inverters. The layout includes PV modules, inverters and MV transformers, access roads, and entrances. Alternate PV module and inverter models may be installed, as approved by Engineer, to incorporate the most efficient technology available at the time of installation. The layout includes various 16-footwide access roads to be installed within the site connecting two solar facility entrances. Transmission line easements intersecting the ash pond will be clear of the pond surface and the panels. The facility layout is shown on the Drawings included in Appendix B.

The PV racking system and electrical equipment will be placed on concrete foundations placed directly on the protective soil layer. A thin layer of select aggregate may be placed beneath some of the concrete

foundations for leveling purposes. The racks and equipment will be placed to avoid interference with existing monitoring devices or the storm water management system.

The ballast blocks will be designed to minimize the additional load on the protective soil layer so it will not adversely impact the final cover system. The stormwater drainage system will not be significantly altered by the proposed solar PV facility. All electric components will be installed above grade or within the protective soil layer; the geomembrane will not be penetrated. If changes are proposed to the closure design, a revised closure plan will be submitted to the Illinois EPA for approval.

5. CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

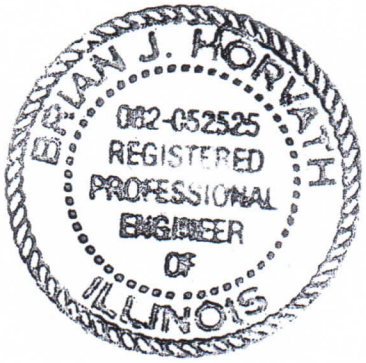
Section 845.720(b)(5): The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that the final written closure plan meets the requirements of this Part.

I, Brian J. Horvath, 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 construction permit application has been prepared in accordance with the accepted practice of engineering and the requirements of Title 35, Subtitle G, Chapter I, Subchapter j, Section 845.720 of the Illinois Administrative Code.

Brian J. Horvath
Printed Name

Signature 6/24/22
Date

062-052525 11/30/23
Registration Number Expiration Date



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[3] Burns & McDonnell, “Initial Operating Permit Edwards Power Plant Ash Pond,” St. Louis, MO, October 25, 2021.

[4] Ramboll. 2021. "Hydrogeologic Site Characterization Report, Ash Pond, Edwards Power Plant, Bartonville, Illinois." Report to Illinois Power Resources Generating, LLC. 733p. October 25.

[5] Ramboll. 2022. "Groundwater Modeling Report, Ash Pond, Edwards Power Plant, Bartonville, Illinois (Final)." Report to Illinois Power Resources Generating, LLC. 39p

Appendix A

Closure Alternative Analysis

Closure Alternatives Analysis and Preliminary Corrective Measures Assessment for the Ash Pond at the Edwards Power Plant Bartonville, Illinois

June 30, 2022

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Table of Contents

Page

Summary of Findings S-1

1 Introduction 1
- 1.1 Site Description and History 1
  - 1.1.1 Site Location and History 1
  - 1.1.2 CCR Impoundment 1
  - 1.1.3 Surface Water Hydrology 2
  - 1.1.4 Hydrogeology 3
  - 1.1.5 Site Vicinity 4
- 1.2 IAC Part 845 Regulatory Review and Requirements 4

2 Closure Alternatives Analysis 5
- 2.1 Closure Alternative Descriptions (IAC Section 845.710(c)) 5
  - 2.1.1 Closure-in-Place 5
  - 2.1.2 Closure-by-Removal with Off-Site CCR Disposal 8
- 2.2 Long- and Short-Term Effectiveness of the Closure Alternative (IAC Section 845.710(b)(1)) 11
  - 2.2.1 Magnitude of Reduction of Existing Risks (IAC Section 845.710(b)(1)(A)) 11
  - 2.2.2 Likelihood of Future Releases of CCR (IAC Section 845.710(b)(1)(B)) 11
  - 2.2.3 Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (IAC Section 845.710(b)(1)(C)) 12
  - 2.2.4 Short-Term Risks to the Community or the Environment During Implementation of Closure (IAC Section 845.710(b)(1)(D)) 13
    - 2.2.4.1 Worker Risks 13
    - 2.2.4.2 Community Risks 14
    - 2.2.4.3 Environmental Risks 18
  - 2.2.5 Time Until Groundwater Protection Standards Are Achieved (IAC Sections 845.710(b)(1)(E) and 845.710(d)(2 and 3)) 20
  - 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)) 21
  - 2.2.7 Long-Term Reliability of the Engineering and Institutional Controls (IAC Section 845.710(b)(1)(G)) 22
  - 2.2.8 Potential Need for Future Corrective Action Associated with the Closure (IAC Section 845.710(b)(1)(H)) 22

2.3 Effectiveness of the Closure Alternative in Controlling Future Releases (IAC Section 845.710(b)(2)) 22
2.3.1 Extent to Which Containment Practices Will Reduce Further Releases (IAC Section 845.710(b)(2)(A)) 22
2.3.2 Extent to Which Treatment Technologies May Be Used (IAC Section 845.710(b)(2)(B)) 22
2.4 Ease or Difficulty of Implementing Closure Alternative (IAC Section 845.710(b)(3)) 23
2.4.1 Degree of Difficulty Associated with Constructing the Closure Alternative 23
2.4.2 Expected Operational Reliability of the Closure Alternative 23
2.4.3 Need to Coordinate with and Obtain Necessary Approvals and Permits from Other Agencies 23
2.4.4 Availability of Necessary Equipment and Specialists 24
2.4.5 Available Capacity and Location of Needed Treatment, Storage, and Disposal Services 24
2.5 Impact of Closure Alternative on Waters of the State (IAC Section 845.710(d)(4)) 25
2.6 Concerns of Residents Associated with Closure Alternatives (IAC Section 845.710(b)(4)) 26
2.7 Class 4 Estimate (IAC Section 845.710(d)(1)) 26
2.8 Summary 26

3 Corrective Measures Assessment 28
3.1 Corrective Measure Alternative Descriptions 29
3.1.1 Source Control with Monitored Natural Attenuation 29
3.1.2 Source Control with Groundwater Extraction 30
3.1.3 Source Control with Construction of an Interceptor Trench 30
3.1.4 Source Control with Construction of a Cutoff Wall 31
3.1.5 Source Control with Construction of a Permeable Reactive Barrier 31
3.2 Performance, Reliability, Ease of Implementation, and Potential Impacts of the Corrective Measure Alternative (IAC Section 845.660(c)(1)) 32
3.2.1 Performance of the Corrective Measure Alternative – Controlling the Source (IAC Section 845.660(c)(1)) 32
3.2.2 Performance of the Corrective Measure Alternative – Likelihood of Future Releases of CCR (IAC Section 845.660(c)(1)) 33
3.2.3 Performance of the Corrective Measure Alternative – Long-Term Management (IAC Section 845.660(c)(1)) 33
3.2.4 Reliability of the Corrective Measure Alternative – Engineering and Institutional Controls (IAC Section 845.660(c)(1)) 34
3.2.5 Reliability of the Corrective Measure Alternative – Potential Need for Replacement of the Corrective Measure (IAC Section 845.660(c)(1)) 35
3.2.6 Ease of Implementation (IAC Section 845.660(c)(1)) 35

3.2.7 Potential Impacts – Risks to the Community or the Environment During Implementation of Remedy (IAC Section 845.660(c)(1)) 36
3.3 The Time Required to Begin and Complete the Corrective Action Plan (IAC Section 845.660(c)(2)) 38
3.4 State or Local Permit Requirements or Other Environmental or Public Health Requirements that May Substantially Affect Implementation of the Corrective Action Plan (IAC Section 845.660(c)(3)) 38
3.5 Summary 38

References 39

Attachment A Human Health and Ecological Risk Assessment
Attachment B Supporting Information

List of Tables

Table S.1 Comparison of Proposed Closure Scenarios

Table S.2 Comparison of Proposed Corrective Measure Alternatives

Table 2.1 Key Parameters for the Closure-in-Place Scenario

Table 2.2 Key Parameters for the Closure-by-Removal with Off-Site CCR Disposal Scenario

Table 2.3 Expected Number of On-Site Worker Accidents Under Each Closure Scenario

Table 2.4 Expected Number of Off-Site Worker Accidents Due to Hauling Under Each Closure Scenario

Table 2.5 Expected Number of Community Accidents Due to Hauling Under Each Closure Scenario

List of Figures

Figure 1.1 Site Location Map

Figure 2.1 Environmental Justice Communities in the Vicinity of the Site and the Off-Site Landfill

Figure 2.2 Wetlands and Surface Water Bodies in the Vicinity of the Edwards Ash Pond

Abbreviations

AACE	Association for the Advancement of Cost Engineering
BCU	Bedrock Confining Unit
BFE	Base Flood Elevation
BMP	Best Management Practice
CAA	Closure Alternatives Analysis
CAAA	Corrective Action Alternatives Analysis
CBR	Closure-by-Removal
CBR-Offsite	Closure-by-Removal with Off-Site CCR Disposal
CCR	Coal Combustion Residual
CIP	Closure-in-Place
CMA	Corrective Measures Assessment
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CW	Cutoff Wall
CY	Cubic Yard
EJ	Environmental Justice
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
ft-amsl	Feet Above Mean Sea Level
GE	Groundwater Extraction
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
IPRG	Illinois Power Resources Generating, LLC
IT	Interceptor Trench
LCF	Lower Cahokia Formation
LLDPE	Linear Low-Density Polyethylene
MNA	Monitored Natural Attenuation
N_2O	Nitrous Oxide
NID	National Inventory of Dams
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PM	Particulate Matter
PRB	Permeable Reactive Barrier
SFWA	State Fish and Wildlife Area
Source Control-CW	Source Control with Construction of a Cutoff Wall
Source Control-GE	Source Control with Groundwater Extraction
Source Control-IT	Source Control with Construction of an Interceptor Trench

Source Control-MNA	Source Control with Monitored Natural Attenuation
Source Control-PRB	Source Control with Construction of a Permeable Reactive Barrier
TDS	Total Dissolved Solids
UA	Uppermost Aquifer
UCF	Upper Cahokia Formation
US DOT	United States Department of Transportation
US EPA	United States Environmental Protection Agency
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. Part 845 additionally requires that a Corrective Measures Assessment (CMA) be performed prior to undertaking corrective measures at certain CCR surface impoundments. Pursuant to requirements under IAC Section 845.710, this report presents a CAA for the Ash Pond located on Illinois Power Resources Generating, LLC's (IPRG) Edwards Power Plant property in Peoria County, Illinois. This report also presents a CMA for the Ash Pond pursuant to requirements under IAC Section 845.660 (IEPA, 2021a).

Closure Alternatives Analysis

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; the scenario's potential positive and negative short- and long-term impacts on human health and the environment; and the scenario's ability to address concerns raised by residents (IAC Part 845; IEPA, 2021a). Gradient evaluated two specific closure scenarios for the Ash Pond: Closure-in-Place (CIP) with consolidation and Closure-by-Removal with Off-Site CCR Disposal (CBR-Offsite). The CIP scenario entails the relocation of CCR located in the northwestern portion of the Ash Pond to the southern portion of the Ash Pond, followed by capping with a new cover system consisting of, from bottom to top, a geomembrane layer, a geocomposite drainage layer, and 24 inches of vegetated soil. The CBR-Offsite scenario entails excavating all of the CCR from the Ash Pond and transporting it to an off-Site landfill for disposal. IPRG will also continue to evaluate potential opportunities for beneficial re-use of CCR excavated from the Ash Pond 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 no existing on-Site landfill at the Edwards Power Plant Site, and the property is too small to accommodate the construction of a new on-Site landfill. Moreover, the owned property outside of the Ash Pond and the Edwards Power Plant lies within the 100-year flood zone for the Illinois River. For these reasons, neither expansion of an existing on-Site landfill nor construction of a new on-Site landfill is a viable alternative at this Site (Attachment B).

Table S.1 summarizes the expected impacts of the CIP and CBR-Offsite 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 the Ash Pond. Key benefits of the CIP scenario relative to the CBR-Offsite scenario include the more rapid re-development of the Site for installation of a solar facility on the capped impoundment and reduced impacts to workers, community members, and the environment during construction (*e.g.*, fewer constructed-related accidents, lower energy demands, less air pollution and greenhouse gas [GHG] emissions, reduced duration of traffic-related impacts, and potentially lower impacts to environmental justice [EJ] communities). Moreover, 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), whereas the CBR-Offsite scenario would be unable to meet this required schedule.

Table S.1 Comparison of Proposed Closure Scenarios

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
Closure Alternative Descriptions (Section 2.1, IAC Section 845.710(c))	All CCR would be consolidated in the southern section of the Ash Pond and then capped in place with a new cover system consisting of, from bottom to top, a geomembrane layer, a geocomposite drainage layer, and 24 inches of vegetated soil. 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.	All CCR would be excavated from the Ash Pond and transported to an off-Site landfill for disposal. Expansion of the off-Site landfill may be necessary in order to accept all of the CCR from the Ash Pond.
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 the Ash Pond 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 the Ash Pond. 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 the Ash Pond. 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 the Ash Pond (due to, *e.g.*, 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 the Ash Pond (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 0.011 worker fatalities and 1.7 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.0012 worker fatalities and 0.051 worker injuries would be expected to occur off-Site due to vehicle accidents during off-Site hauling. In total, a minimum of 0.012 worker fatalities and 1.8 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be somewhat higher under the CBR-Offsite scenario than under the CIP scenario.	An estimated 0.0051 worker fatalities and 0.79 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.039 worker fatalities and 1.7 worker injuries would be expected to occur off-Site due to vehicle accidents during off-Site hauling. In total, a minimum of 0.044 worker fatalities and 2.5 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be somewhat higher under the CBR-Offsite scenario than 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 likely be less under this closure scenario than under the CBR-Offsite scenario, because it would require less off-Site hauling than the CBR-Offsite scenario. In total, an estimated 0.0053 fatalities and 0.15 injuries would be expected to occur among community members due to off-Site hauling under this scenario. With regard to traffic impacts, a haul truck would be likely to pass a location near the Site every 3.2-4.5 minutes on average during working hours for the duration of hauling activities under this scenario (2.2-3.0 years).	Off-Site impacts on nearby residents would likely be greater under the CBR-Offsite closure scenario than under the CIP scenario, because it would require more off-Site hauling than the CIP scenario. In total, an estimated 0.18 fatalities and 5.0 injuries would be expected to occur among community members due to off-Site hauling under this scenario. With regard to traffic impacts, a haul truck would be likely to pass location near the Site every 3.0-3.8 minutes on average during working hours for the duration of hauling activities under this scenario (8 months per year for 15.3-19.3 years). In addition, transport of CCR to the off-Site landfill may require hauling CCR through the EJ community near Peoria/Bartonville.
▪ *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 Illinois River. Because the expected duration of construction activities is shorter under the CIP scenario than under the CBR-Offsite 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-Offsite scenario. There are no historical sites within 1,000 meters of the impoundment. No impacts on historical sites would therefore be expected under either closure scenario.	Due to (*e.g.*) noise and visual disturbances, construction activities may have short-term negative impacts on the recreational use of the Illinois River. Because the expected duration of construction activities is longer under the CBR-Offsite 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-Offsite scenario than under the CIP scenario. There are no historical sites within 1,000 meters of the impoundment. No impacts on historical sites would therefore be expected under either closure scenario.

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
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-Offsite scenario, because the CIP scenario would have a shorter duration of construction activities and require less CCR dewatering and handling. The CIP scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the final cover system. Construction of a utility-scale battery storage facility and installation of a solar facility on the capped impoundment at the Edwards Power Plant Site would help the state meet its goal of decarbonizing electricity generation and would improve the overall reliability of the electricity grid. Re-development of the Site as a solar facility would occur more rapidly under the CIP scenario than under the CBR-Offsite scenario.	Total energy demands and GHG emissions would be greater under this closure scenario than under the CIP scenario, because the CBR-Offsite scenario would have a longer duration of construction activities and require more CCR dewatering and handling. If expansion of the off-Site landfill became necessary in order to accept all of the CCR from the Ash Pond, then the CBR-Offsite scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the expanded landfill liner. Installation of a solar facility at the Edwards Power Plant Site would help the state meet its goal of decarbonizing electricity generation and would improve the overall reliability of the electricity grid. Re-development of the Site for solar facility installation would occur more rapidly under the CIP scenario than under the CBR-Offsite scenario.
▪ *Impacts on Natural Resources and Habitat*	Construction activities may have short-term negative impacts on some species located in the vicinity of the Ash Pond, the off-Site borrow soil location, and the off-Site landfill. Short-term impacts on natural resources and habitat would be smaller under the CIP scenario than under the CBR-Offsite scenario, because the overall duration of construction is shorter under the former scenario.	Construction activities may have short-term negative impacts on some species located in the vicinity of the Ash Pond, the off-Site borrow soil location, and the off-Site landfill. Short-term impacts on natural resources and habitat would be greater under the CBR-Offsite 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 the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is on the order of hundreds of years for both scenarios. The model predicts minimal and insignificant differences between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario. Furthermore, the predicted maximum plume extents in excess of GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022).	Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is on the order of hundreds of years for both scenarios. The model predicts minimal and insignificant differences between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario. Furthermore, the predicted maximum plume extents in excess of GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (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-Offsite 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. Section 3 of this report (Corrective Measures Assessment) presents and evaluates the corrective measures being considered at the Site, consistent with the requirements in IAC Section 845.660.	Corrective action is expected at the Site. Section 3 of this report (Corrective Measures Assessment) presents and evaluates the corrective measures being considered at the Site, consistent with the requirements in IAC Section 845.660.
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 the Ash Pond. 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 the Ash Pond. 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-Offsite**
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.	Hauling will be more difficult to implement under the CBR-Offsite scenario than under the CIP scenario, due to significantly larger earthwork volumes and more haul traffic on public roadways required under this scenario. Off-Site hauling under the CIP scenario would entail the transport of approximately 1,030,000 CY of soil and would not require the transportation of any CCR over public roadways; off-Site hauling under the CBR-Offsite scenario, in contrast, would entail the transport of approximately 900,000 CY of soil and 4,390,000 CY of CCR over public roadways. As described in Section 2.2.4.2 (Community Impacts), off-Site hauling may also have detrimental impacts due to an increased incidence of vehicle accidents, traffic-related impacts, noise, and air pollution. Off-Site landfilling under the CBR-Offsite scenario would 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 both closure scenarios.	Operational reliability would be expected under both closure scenarios.
▪ *Need for Permits and Approvals*	Permits required under both 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 the Ash Pond 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 both 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 the Ash Pond to be modified as part of closure; a construction stormwater permit through IEPA; and a 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 the Ash Pond.
▪ *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 both 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-Offsite scenario, shortages may cause fewer challenges under the CIP scenario than under the CBR-Offsite 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 both 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-Offsite scenario than under the CIP scenario, shortages may cause greater challenges under the CBR-Offsite scenario than under the CIP scenario. The current shortage of truck drivers may be particularly impactful under the CBR-Offsite scenario, due to the large volumes of material to be hauled to and from the Site.
▪ *Available Capacity and Location of Treatment, Storage, and Disposal Services*	Under the CIP scenario, all of the CCR currently within the Ash Pond would be stored within the existing footprint of the impoundment. Treatment would consist of unwatering and dewatering the Ash Pond at the start of construction and managing stormwater inflow. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility.	The capacity remaining at the preferred off-Site landfill (Indian Creek Landfill #2 in Hopedale, Illinois) would be sufficient to receive all of the CCR in the Ash Pond. However, due to the relatively short period 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. 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. Likely alternatives to the Indian Creek Landfill #2 include the Envirofil of Illinois Inc. Landfill in Macomb, Illinois, and the Clinton Landfill #3 in Clinton, Illinois. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility.
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 either closure scenario.	No current or future exceedances of any screening benchmarks for surface water would be expected under either 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. IngenAE evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barge and found that neither option is likely to be 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.

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	CBR-Offsite
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-Offsite, CIP also presents fewer risks to nearby residents and potentially to EJ communities in the form of accidents, traffic-related impacts, noise, and air pollution. Moreover, under the CIP scenario, the Site could be more rapidly re-developed for installation of a solar facility on the capped impoundment. A public meeting was held on May 25, 2022, pursuant to requirements under IAC Section 845.710(e) (Illinois Power Resources Generating, LLC, 2022). 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-Offsite scenario has several disadvantages with regard to potential community concerns. Relative to CIP, the CBR-Offsite scenario presents greater risks to nearby residents and potentially to EJ communities in the form of accidents, traffic-related impacts, noise, and air pollution. Moreover, under the CBR-Offsite scenario, the Site could take longer to re-develop for installation of a solar facility. A public meeting was held on May 25, 2022, pursuant to requirements under IAC Section 845.710(e) (Illinois Power Resources Generating, LLC, 2022). Questions raised by attendees were addressed at the meeting; subsequently, a written summary of the questions and responses was prepared.

Notes:
AACE = Association for the Advancement of Cost Engineering; CBR = Closure-by-Removal; CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place; CY = Cubic Yard; 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; WPC Permit = Water Pollution Control Construction and Operating Permit.

Corrective Measures Assessment

The goal of performing a CMA is to holistically evaluate proposed corrective measures designed to remediate groundwater and achieve compliance with the groundwater protection standards (GWPSs) specified under IAC Section 845.600 (IEPA, 2021a). A CMA provides a screening-level analysis of potential corrective measures based on a wide range of factors, including their performance, reliability, ease of implementation, and potential impacts on human health and the environment (IEPA, 2021a). This analysis determines which corrective measures are potentially viable at a site and should be evaluated further in a Corrective Action Alternatives Analysis (CAAA). The CAAA for a given site must be submitted to the Agency within 1 year of submission of the CMA.

Many CCR sites are complex groundwater environments where remedial actions will inherently take many years to complete. While no formal definition of a complex groundwater environment exists, most would agree that there are a number of common characteristics at complex groundwater sites, including the following (National Research Council, 2013):

- Highly heterogeneous subsurface environments;
- Large source zones;
- Multiple, recalcitrant constituents; and
- Long timeframes over which releases occurred.

Each of these characteristics is common at CCR sites. Surface impoundments are often tens to hundreds of acres in size and many have operated for decades, leading to large source zones and prolonged releases. Furthermore, CCR impoundments are often located in alluvial geologic settings where sands are interbedded with silts and clays. This results in a heterogeneous environment where constituent mass may persist for many years in low-permeability deposits. Finally, the constituents that are most common at CCR sites include metals and inorganics that do not naturally biodegrade. The combination of these factors results in a complex groundwater environment where remediation, even under the best of circumstances, may take many years to achieve GWPSs. It is for these reasons that United States Environmental Protection Agency (US EPA) refused to specify what is a reasonable *vs.* an unreasonable timeframe for groundwater corrective actions at CCR sites, stating that "EPA was truly unable to establish an outer limit on the necessary timeframes—including even a presumptive outer bound" (US EPA, 2015a, p. 21419).

It is also important to note that source control, which at a CCR impoundment could include either capping or excavation, is generally considered to be one of the more effective remedial action approaches. Source control involves removing the hydraulic head from an impoundment (*i.e.*, unwatering and dewatering) in order to prevent the further downward migration of constituents. US EPA has found that "releases from surface impoundments [to groundwater] drop dramatically after closure" (US EPA, 2014a, pp. 5-18 to 5-19). As a result, the implementation of source control often has a more substantial and more immediate effect on groundwater quality improvements than other groundwater corrective measures. In this CMA, source control is paired with other additional groundwater remediation strategies.

Five potential corrective measures were selected for consideration in this CMA. Each corrective measure includes source control based on the CIP scenario (*i.e.*, Closure-in-Place with consolidation). Corrective measures considered in this CMA include Source Control with Monitored Natural Attenuation (Source Control-MNA), Source Control with Groundwater Extraction (Source Control-GE), Source Control with Construction of an Interceptor Trench (Source Control-IT), Source Control with Construction of a Cutoff Wall (Source Control-CW), and Source Control with Construction of a Permeable Reactive Barrier

(Source Control-PRB). Each of these corrective measures was evaluated in the CMA for its potential viability at the Site. Under the Source Control-MNA alternative, groundwater concentrations of dissolved constituents would attenuate *via* naturally occurring physical and chemical processes in areas downgradient of the Ash Pond; active monitoring would be performed to verify and document the remediation processes. Under the Source Control-GE alternative, a groundwater extraction (GE) system comprised of groundwater pumping wells would be installed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-IT alternative, an interceptor trench (IT) would be constructed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-CW alternative, a trench would be installed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier to the lateral migration of constituents. Under the Source Control-PRB alternative, a subsurface barrier of reactive materials (*e.g.*, zerovalent iron) would be placed in the path of groundwater flow downgradient of the Ash Pond in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents.

Table S.2 evaluates the corrective measures included in this CMA with regard to each of the factors specified under IAC Section 845.660(c) (IEPA, 2021a). Boron, sulfate, and total dissolved solids (TDS) have been identified as potential constituents of concern at the Site; consequently, groundwater corrective measures focus on these constituents. Based on this evaluation and the details provided in Section 3 of this report, four corrective measures have been identified as potentially viable technologies for further consideration in the CAAA pursuant to IAC Section 845.670: Source Control-MNA, Source Control-GE, Source Control-IT, and Source Control-CW. These technologies may be combined in different manners to potentially address different zones of groundwater impacts (*i.e.*, near-field *vs*. far-field) and different constituents. For example, monitored natural attenuation (MNA) combined with one of the other remedies may be a more optimal approach than relying on just a single remedial technology. The fifth corrective measure evaluated in this CMA, Source Control-PRB, is not being retained for further evaluation in the CAAA because permeable reactive barriers (PRBs) have not been proven effective for boron in groundwater, construction of the PRB would likely be difficult due to its required length and depth, and a PRB would have relatively large impacts on worker safety, air quality, and potentially surface water quality and sediment quality due to the substantial construction activities required.

Table S.2 Comparison of Proposed Corrective Measure Alternatives

Evaluation Factor (Report Section; Part 845 Section)	Corrective Measure Alternative				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
Corrective Measure Alternative Descriptions (Section 3.1)	Source Control-MNA would rely on naturally occurring physical and chemical processes to immobilize and attenuate concentrations of CCR-associated constituents in groundwater downgradient of the Ash Pond. Active groundwater monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-GE, groundwater pumping wells would be installed on-Site to extract potentially impacted groundwater and prevent the lateral migration of constituents off-Site. Groundwater captured by the GE system would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-IT, an interceptor trench would be installed on-Site to collect potentially impacted groundwater and prevent the lateral migration of constituents off-Site. Groundwater captured by the IT would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-CW, a trench would be constructed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier that would prevent the lateral migration of constituents. Hydraulic control wells would likely be required to prevent groundwater mounding from occurring behind the CW. Groundwater captured by the hydraulic control wells would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-PRB, a subsurface barrier of reactive materials would be placed in the path of groundwater flow in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents. Monitoring would be performed to ensure that the remedy was working as intended.
Performance – Controlling the Source (Section 3.2.1; IAC Section 845.660(c)(1))	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Under the Source Control-MNA alternative, the attenuation of dissolved constituent concentrations in the subsurface (secondary source control) would be achieved through natural processes. A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-GE would also likely be effective with regard to secondary source control, although GE system performance can vary from site to site.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-IT would also likely be effective with regard to secondary source control, although IT performance can vary from site to site.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-CW would also likely be effective with regard to secondary source control, if the hydraulic control system were designed and operated appropriately.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-PRB would likely be effective with regard to secondary source control for some constituents. However, Source-Control PRB is unlikely to be an effective technology for boron.
Performance – Likelihood of Future Releases of CCR (Section 3.2.2; IAC Section 845.660(c)(1))	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.
Performance – Long-Term Management (Section 3.2.3; IAC Section 845.660(c)(1))	Minimal long-term O&M efforts would be required under Source Control-MNA, because it would not require the installation, operation, or maintenance of any engineered systems or structures other than monitoring wells. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-GE would include the monitoring and maintenance of the GE system and the management and discharge of extracted groundwater. Fouling and scaling of the well screens could reduce the efficiency of the GE system over time and potentially create a need for the replacement of individual wells. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-IT would include the monitoring and maintenance of the IT and the management and discharge of intercepted groundwater. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-CW would include the monitoring and maintenance of the CW and hydraulic gradient control system and the management and discharge of extracted groundwater. Fouling and scaling of the well screens could reduce the efficiency of the hydraulic gradient control system over time and potentially create a need for the replacement of individual wells. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-PRB would include the monitoring and maintenance of the PRB. Groundwater sampling would continue until GWPSs had been achieved. The PRB would also be monitored for treatment efficacy. If necessary, the PRB media may be amended or exchanged to extend the life of the PRB.

Evaluation Factor (Report Section; Part 845 Section)	Corrective Measure Alternative				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
Reliability - Engineering and Institutional Controls (Section 3.2.4; IAC Section 845.660(c)(1))	A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Long-term reliability would be expected for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.	Long-term reliability would be expected for Source Control-GE, as long as the system was designed and constructed for Site-specific conditions.	Long-term reliability would be expected for Source Control-IT, as long as the system was designed and constructed for Site-specific conditions.	Long-term reliability would be expected for Source Control-CW, as long as the system was designed and constructed for Site-specific conditions.	Source Control-PRB may not be reliable over the long term with respect to engineering and institutional controls, because PRBs generally have limited success at treating boron in groundwater. The effectiveness of the PRB would also decrease over time, resulting in a potential need for the eventual replacement of the remedy.
Reliability - Potential Need for Replacement of the Corrective Measure (Section 3.2.5; IAC Section 845.660(c)(1))	A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Potential replacement of the remedy would be unlikely for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-GE. However, it may be necessary to replace individual wells and/or pumps over time, because fouling and scaling could occur and because groundwater hydraulic controls would need to be maintained on a long-term basis.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-IT.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-CW. Replacement of individual hydraulic control wells may be necessary, because fouling and scaling could occur and because groundwater hydraulic controls would need to be maintained on a long-term basis.	Given the low effectiveness of PRBs for treating boron in groundwater, replacement of the Source Control-PRB remedy would likely be necessary. Replacement of the remedy would also be necessary if the effectiveness of the PRB declined over time.
Ease of Implementation (Section 3.2.6; IAC Section 845.660(c)(1))	Construction under Source Control-MNA would be limited to the installation of monitoring wells. Source Control-MNA therefore would not pose any significant construction challenges.	Construction under Source Control-GE would be limited to the installation of extraction wells and monitoring wells. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates of the GE system wells for the effective capture of impacted groundwater.	Construction under Source Control-IT would be limited to the installation of trenches and monitoring wells. Additional testing would be required to determine the optimal location and depth of the IT system.	Construction of the CW under Source Control-CW may be relatively difficult, due to the required length and depth of the CW.	Construction of the PRB under Source Control-PRB may be relatively difficult, due to the required length and depth of the PRB.
Potential Impacts – Risks to the Community or the Environment During Implementation of Remedy (Section 3.2.7; IAC Section 845.660(c)(1))	Minimal impacts to worker safety, air quality, and surface water and sediment quality would be expected under Source Control-MNA, due to the minimal nature of the construction activities required under this alternative.	Modest impacts to worker safety, air quality, and potentially surface water and sediment quality would be expected under Source Control-GE, due to the modest construction activities required for the installation of the GE system.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-IT, due to the substantial construction activities that may be required for the installation of the IT.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-CW, due to the substantial construction activities that may be required for the installation of the CW.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-PRB, due to the substantial construction activities that may be required for the installation of the PRB.
The Time Required to Begin and Complete the Corrective Action Plan (Section 3.3; IAC Section 845.660(c)(2))	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.

Evaluation Factor (Report Section; Part 845 Section)	Corrective Measure Alternative				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
State or Local Permit Requirements or Other Environmental or Public Health Requirements that May Substantially Affect Implementation of the Corrective Action Plan (Section 3.4; IAC Section 845.660(c)(3))	Source Control-MNA would require regulatory approval prior to implementation. The approval process would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-GE would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-IT would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-CW would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-PRB would require regulatory approval prior to implementation. The approval process would not be expected to substantially affect the implementation of the Corrective Action Plan.

Notes:

Agency = Illinois Environmental Protection Agency; CAAA = Corrective Action Alternatives Analysis; CCR = Coal Combustion Residual; CMA = Corrective Measures Assessment; CW = Cutoff Wall; GWPS = Groundwater Protection Standard; IAC = Illinois Administrative Code; MNA = Monitored Natural Attenuation; NPDES = National Pollutant Discharge Elimination System; O&M = Operations and Maintenance; PRB = Permeable Reactive Barrier; Source Control-CW = Source Control with Construction of a Cutoff Wall; Source Control-GE = Source Control with Groundwater Extraction; Source Control-IT = Source Control with Construction of an Interceptor Trench; Source Control-MNA = Source Control with Monitored Natural Attenuation; Source Control-PRB = Source Control with Construction of a Permeable Reactive Barrier.

1 Introduction

1.1 Site Description and History

1.1.1 Site Location and History

Illinois Power Resources Generating, LLC's (IPRG) Edwards Power Plant is an electric power generating facility with coal-fired units located along the Illinois River between Mapleton and Bartonville in Peoria County, Illinois (Ramboll, 2021). The facility began operating in 1960 and will be retired in 2022 (Ramboll, 2021; Vistra, 2021).

1.1.2 CCR Impoundment

The Edwards Power Plant produces and stores coal combustion residuals (CCRs) as a part of its operations. The Edwards Ash Pond (the "Ash Pond") (Vistra identification number [ID No.] CCR Unit 301, Illinois Environmental Protection Agency [IEPA] ID No. W1438050005-01, and National Inventory of Dams [NID] ID No. IL50710), which is the only CCR-containing impoundment at this Site, is the subject of this report.

The Ash Pond (Figure 1.1) is an approximately 91-acre unlined surface impoundment constructed in 1960 for the management of sluiced bottom ash, fly ash, and other non-CCR wastes generated historically by the facility (AECOM, 2016a; Ramboll, 2021). The Ash Pond has been in continuous operation since 1960 (Ramboll, 2021). After the Edwards Power Plant is retired in 2022, the Ash Pond will no longer receive sluiced ash.

There are three sub-basins within the Ash Pond: the Process Water Pond (the "North Cell"), the Fly Ash Pond, and the Clarification Pond (the "South Cell"; AECOM, 2016a; Figure 1.1). CCR and other waste streams from the facility are sluiced into the Process Water Pond and the Fly Ash Pond. Serpentine channels located within the Fly Ash Pond settle out the majority of the CCR prior to discharging decanted water into the Clarification Pond, which serves as the settling basin for the unit. The Clarification Pond discharges to the Illinois River *via* a National Pollutant Discharge Elimination System (NPDES)-permitted outfall (AECOM, 2016a; Ramboll, 2021).

In 2004, a rail loop was constructed immediately south of the Clarification Pond. The embankments for the rail loop were constructed with ash, as a permissible beneficial use. The footprint of the Ash Pond was reduced at that time, and the CCR material located south of the rail loop was capped with soil (AECOM, 2016a). The CCR used in the construction of the rail loop embankments is considered in the closure evaluations presented in this Closure Alternatives Analysis (CAA).

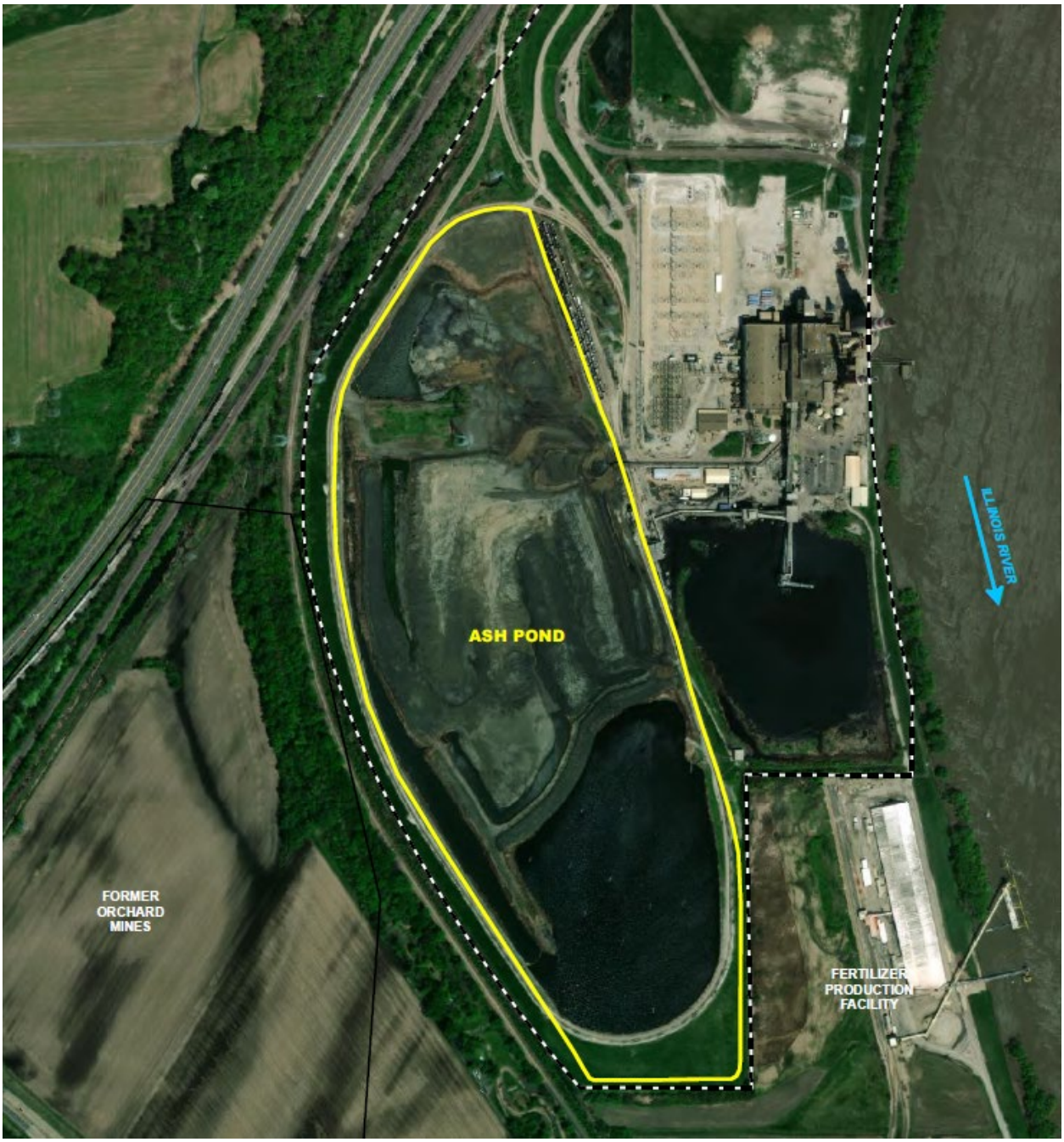

Figure 1.1 Site Location Map. Ramboll (2021).

1.1.3 Surface Water Hydrology

The Clarification Pond associated with the Ash Pond (Figure 1.1) discharges decanted water to the Illinois River *via* a NPDES-permitted outfall. The Illinois River is located more than 800 feet east of the outer perimeter of the Ash Pond within the Pekin Lake-Illinois River subwatershed (Hydrologic Unit Code [HUC] 071300030304; Ramboll, 2021). The segment of the Illinois River adjacent to the Site (Section IL_D-05) is listed on the 2018 Illinois Section 303(d) List as being impaired for fish consumption due to mercury and polychlorinated biphenyls (IEPA, 2016, 2019a). Two lakes, Pekin Lake and Worley Lake,

are located approximately 0.5 miles east of the Ash Pond on the opposite side of the Illinois River (Ramboll, 2021).

1.1.4 Hydrogeology

The geology underlying the Site in the vicinity of the Ash Pond primarily consists of unlithified deposits of the Cahokia Formation underlain by a thick shale bedrock (Ramboll, 2021). The uppermost aquifer (UA) has been identified as the Lower Cahokia Formation (LCF) and saturated portions of the Upper Cahokia Formation (UCF) (Ramboll, 2021). The underlying shale has been identified as a bedrock confining unit (BCU) (Ramboll, 2021).

The UCF consists of low-permeability clays and silts, as well as discontinuous lenses of sand, sandy clay to clayey sand, and sandy silt. The saturated and unconfined sandy lenses within the UCF have been identified as Potential Migration Pathways. The thickness of the UCF ranges between 5 and 40 feet in the vicinity of the Ash Pond (Ramboll, 2021). The LCF consists of coarse materials of sand and gravel directly overlying the bedrock. The UA includes the LCF and, where saturated, portions of the UCF (Ramboll, 2021). The UA is primarily composed of moderately permeable sands and clayey gravels (Ramboll, 2021). The bottom of the UA (*i.e.*, LCF) overlies the shale BCU. This confining layer consists of very low-permeability shales and siltstones with interbedded sandstone.

The alluvial soils of the UA are limited to areas immediately adjacent to and underlying the Illinois River and are located in a north-south orientation parallel to the river (Ramboll, 2022). In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2021). This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas. West of the Ash Pond, the elevation of the ground surface increases, and correspondingly, the elevation of the shale BCU increases. Based on regional information, alluvial soils are not expected to occur in the areas west of the US Highway 24 (Ramboll, 2022).

Groundwater flow within the UA occurs in both a northward and southward direction along the orientation of the UA, parallel to the river. The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the Edwards Power Plant Site. Due to the hydraulic influence of the Ash Pond, a groundwater mound (*i.e.*, piezometric maximum) is located underneath the Ash Pond. This mound facilitates groundwater flow in both a northward and southward direction. Moreover, the groundwater mound associated with the Ash Pond may have resulted in a localized area in which groundwater flows easterly, into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure, when the hydraulic head in the Ash Pond is removed. Because the shale BCU is elevated in the areas west of the Ash Pond and alluvial soils are also not expected to occur west of the Ash Pond past US Highway 24, there is only a limited groundwater flow component from areas underlying the Ash Pond toward the west.

During groundwater interaction with surface water, CCR-related constituents may partition between sediments and the surface water column. It should be noted that many CCR-related constituents occur naturally in sediments and surface water (and can also arise from other industrial sources). As a result, their presence in the sediments and/or surface water of the Illinois River does not necessarily signify contributions from the Ash Pond.

The "Hydrogeologic Site Characterization Report" prepared by Ramboll as part of the operating permit for the Ash Pond includes an evaluation of groundwater data collected from Ash Pond monitoring wells between 2015 and 2021 (Ramboll, 2021).

1.1.5 Site Vicinity

The Edwards Power Plant Site is bordered by a salt processing facility to the north, a railroad right-of-way and Highway 42 to the west, agricultural fields to the south, and the Illinois River and a fertilizer production facility to the east (Ramboll, 2021; Figure 1.1). Coal mining operations occurred in the vicinity of the Site from 1890 until 1940. The mine located closest to the Ash Pond was the Orchard Mine (Mine ID #828), which operated from 1890 until 1909 and extended laterally (within uncertainty bounds) to the western edge of the Ash Pond. The Petri Mine (Mine ID #6673) operated from 1919 until 1933 and was located approximately 0.1 miles northwest of the Ash Pond. The Hollis Mine (Mine ID #3021) operated from 1933 until 1940 and was located approximately 0.6 miles north of the Ash Pond (Ramboll, 2021).

Although the area surrounding the Site is predominantly agricultural and industrial, there are a few scenic and recreational areas located within a few miles of the Site. These include the Illinois River, Worley Lake, the Pekin Lake State Fish and Wildlife Area (Pekin Lake SFWA), and the Powerton Lake State Fish and Wildlife Area (Powerton Lake SFWA). Pekin Lake SFWA is located east of the Site on the opposite bank of the Illinois River. Powerton Lake SFWA is located approximately 3 miles downstream of the Site on the opposite bank of the Illinois River. Based on a review of the Illinois Department of Natural Resources (IDNR) Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of the Ash Pond (Ramboll, 2021).

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 CAA prior to undertaking closure activities at certain CCR-containing surface impoundments in the state of Illinois. Part 845 additionally requires that a Corrective Measures Assessment (CMA) be performed prior to undertaking any corrective measures at certain CCR-containing impoundments. Section 2 of this report presents a CAA for the Ash Pond pursuant to requirements under IAC Section 845.710. Section 3 presents a CMA for the Ash Pond pursuant to requirements under IAC Section 845.660. 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; each scenario's potential positive and negative short- and long-term impacts on human health and the environment; and each scenario's ability to address concerns raised by residents (IEPA, 2021a). The CMA similarly evaluates a range of factors for the various corrective measures being considered at an impoundment. A CAA and CMA are decision-making tools that are designed to aid in the selection of a closure alternative for the impoundment(s) 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 the Edwards Ash Pond pursuant to requirements under IAC Section 845.710 (IEPA, 2021a). The two closure scenarios evaluated in this CAA are Closure-in-Place (CIP) with consolidation and Closure-by-Removal with Off-Site CCR Disposal (CBR-Offsite). Under the CIP scenario, the CCR in the northwestern portion of the Ash Pond would be relocated to the southern portion of the Ash Pond and then capped with a new cover system. Under the CBR-Offsite scenario, all of the CCR would be excavated from the impoundment and hauled to an off-Site landfill for disposal. IPRG will also continue to evaluate potential opportunities for beneficial re-use of CCR excavated from the Ash Pond 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 no existing on-Site landfill at the Edwards Power Plant Site, and the property is too small to accommodate the construction of a new on-Site landfill. Moreover, the owned property outside of the Ash Pond and the Edwards Power Plant lies within the 100-year flood zone for the Illinois River. For these reasons, neither expansion of an existing on-Site landfill nor construction of a new on-Site landfill is a viable alternative at this Site (Attachment B).

Sections 2.1.1 and 2.1.2 provide detailed descriptions of the CIP and CBR-Offsite closure scenarios. These scenarios are based on closure documents and analyses provided to Gradient by IngenAE, which are attached to this report as Attachment B.

2.1.1 Closure-in-Place

Under the CIP scenario, the CCR in the Ash Pond would be consolidated in the southern section of the Ash Pond, reducing the footprint of the Ash Pond by 24%, and then capped with a final cover system. This scenario includes the following work elements (IngenAE LLC, 2022):

- Unwatering and dewatering to remove liquid wastes from the Ash Pond *via* pumping and the construction of drilled sumps, engineered trenches, and/or horizontal wells. Water would be managed in accordance with the NPDES permit for the facility.
- Relocation of CCR from the northwestern portion of the impoundment to an approximately 69-acre area in the southern portion of the impoundment. The relocated CCR would be used to attain design grades in these areas of the impoundment. All CCR and up to one foot of underlying soils would be removed from the designated CCR removal area.
- Construction of an earthen berm, which would divide the designated CCR removal area from the final closure area in the southern section of the impoundment.
- Removal of the rail loop located on the perimeter berm of the Ash Pond, followed by the removal of the ballast and embankment materials underlying the rail loop and the removal of structures located within the impoundment (*e.g.*, culverts, a spillway structure, an outfall pipe, and a sewer

force main). Any CCR-containing embankment material excavated from beneath the rail loop during this phase of closure would be relocated to the final closure area.

- Contouring and grading of the northwestern portion to manage stormwater.
- Construction of an alternative cover system over the consolidated ash consisting of a 40-mil linear low-density polyethylene (LLDPE) geomembrane layer, a geocomposite drainage layer, 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). A solar facility atop the cover system is currently being designed. Components of the vegetative cover may change as details of the solar facility are finalized. However, any changes to the cover are expected to be protective of human health and the environment and meet the requirements of Section 845.750(c).
- Installation of stormwater control structures. Stormwater would be conveyed to the existing drainage ditch on the western side of the CCR surface impoundment, which discharges to the Illinois River per the Edwards Power Plant's NPDES permit.
- 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 (IngenAE LLC, 2022).

- An alternative cover system would be installed over the CCR that remains in the Ash Pond. The cover, consisting of a 40-mil LLDPE geomembrane low-permeability layer, a geocomposite drainage layer, and 24 inches of soil, would minimize vertical infiltration of precipitation into the basin [Part 845.750(a)(1)] (Geosyntec Consultants, 2022). A solar facility atop the cover system is currently being designed. Components of the vegetative cover may change as details of the solar facility are finalized. However, any changes are expected to be protective of human health and the environment and meet the requirements of Section 845.750(c).
- 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 the Ash Pond to existing site drainages [Part 845.750(a)(2)].
- Free liquids would be removed from the Ash Pond *via* unwatering and dewatering, as described above, and managed in accordance with the NPDES permit for the facility [845.750(b)(1) and 845.750(b)(2)]. The methods by which free liquids will be removed may include drilled sumps, engineered trenches, and/or horizontal wells.
- 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 the Ash Pond by 97% compared to pre-closure conditions (Ramboll, 2022). Additionally, CIP will result in a reduction of hydraulic flux out of the Ash Pond by 94% compared to pre-closure conditions (Ramboll, 2022). Due to the reduction in the hydraulic flux out of the Ash Pond, the mass flux out of the Ash Pond will also be controlled or minimized as much as feasible as a result of CIP.

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.

In total, approximately 1,340,000 cubic yards (CY) of CCR would be relocated from the rail line embankment and the northwestern portion of the impoundment into the final closure area under the CIP scenario (an assumed average one-way travel distance of 1 mile; Attachment B). Construction of the northwest berm, the final cover system, and an access road would require an additional 977,000 CY of soil to be hauled to the Site from a nearby borrow area. It is expected that a suitable borrow location can be identified within 2 miles of the Site, resulting in a 4-mile round trip travel distance (Attachment B). In addition to the haul volumes listed above, approximately 53,300 CY of subsoil overexcavated from beneath the designated CCR removal area would be hauled to an off-Site landfill for disposal. The preferred off-Site landfill for the disposal of overexcavated soils is the Indian Creek Landfill #2 in Hopedale, Illinois (24501 McMullen Road), which is located approximately 24 miles (one-way) from the Site (Attachment B). Soil would be hauled to and from the Site using haul trucks with an assumed capacity of 16.5 CY (Attachment B). CCR would be hauled around the Site using haul trucks with an assumed capacity of 34 CY (Attachment B).

Under the CIP scenario, the overall expected duration of closure activities (excluding agency coordination and permit approvals) is approximately 3.8-5.3 years (46-64 months; IngenAE LLC, 2022). 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 Ash Pond	102 acres
Surface Area of Final Cover System	69 acres
Volume of CCR to be Relocated	1,340,000 CY
Average Travel Distance for Relocation of CCR	1 mile
Required Volume of Borrow Soil	977,000 CY
Distance to Borrow Site	2 miles
Volume of Subsoil Overexcavation	53,300 CY
Distance to Off-Site Landfill	24 miles
Total On-Site Labor Hours	148,000 hours
Total Off-Site Labor Hours	31,700 hours
On-Site Haul Truck Miles	79,000 miles
Off-Site Haul Truck Miles	398,000 miles
Duration of Construction Activities	3.8-5.3 years

Notes:
CCR = Coal Combustion Residual; CY = Cubic Yard.
Source: IngenAE LLC (2022); Attachment B.

2.1.2 Closure-by-Removal with Off-Site CCR Disposal

Under the CBR-Offsite scenario, all CCR would be excavated from the Ash Pond and transported to an off-Site landfill for disposal. "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" (Attachment B). 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 closest permitted landfills to the Edwards Site are the Peoria City/County Landfill #2 in Brimfield, Illinois, Indian Creek Landfill #2 in Hopedale, Illinois, Envirofil of Illinois Inc. in Macomb, Illinois, and Clinton Landfill #3 in Clinton, Illinois (Attachment B).

The Peoria City/County Landfill #2 is located approximately 20 miles from the Site (Attachment B). However, the Peoria City/County Landfill #2 is expected to close in 2023 and be replaced by Landfill #3, which is currently under development (Attachment B). For this assessment, disposal of CCR at the Peoria City/County Landfill #2 was not considered a viable option because its disposal capacity will be exhausted and it will close in 2023. Peoria City/County Landfill #3 is currently under development and does not have any current permitted disposal capacity. Once operational, Peoria City/County Landfill #3 is expected to provide approximately 13.4 million CY of disposal capacity in order to manage waste for the residents of the City and County of Peoria (Attachment B). The addition of 4,391,000 CY of CCR from the Ash Pond, approximately one-third of the planned capacity of the Peoria City/County Landfill #3, would present significant operational disruptions for a landfill owned by a local government intended to provide waste disposal capacity for its residents (Attachment B). Thus, disposal of CCR at the Peoria City/County Landfill #3 was not considered a viable option for this analysis. However, even if the Peoria City/County Landfill #3 was determined to be a viable disposal location for CCR from the Site, the

conclusions presented in this CAA regarding the CIP *vs.* CBR-Offsite closure scenarios are not expected to change.

The preferred landfill for disposal of CCR that meets the criteria listed above is the Indian Creek Landfill #2 in Hopedale, Illinois (24501 McMullen Road), which is located approximately 24 miles from the Site (Attachment B). The Indian Creek Landfill #2 is located closer to the Ash Pond (24 miles away) than the Envirofil landfill in Macomb, Illinois, and the Clinton Landfill #3 in Clinton, Illinois (60 miles and 71 miles away, respectively; Attachment B). The Indian Creek Landfill #2 has sufficient capacity to accept all of the CCR from the Edwards Ash Pond (Attachment B); however, the owner of the landfill has not been contacted to determine if they would be willing to accept the CCR. CCR would be hauled to the Indian Creek Landfill #2 using haul trucks with a capacity of 16.5 CY.

IAC Section 845.710(c)(1) requires Closure-by-Removal (CBR) alternatives to consider multiple methods for transporting CCR off-Site, including rail, barges, and trucks. IngenAE evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barges and found that neither option is likely to be viable at this Site (Attachment B). Although there is a rail loop encircling the Ash Pond, it is expected to be demolished during closure of the Ash Pond. Moreover, none of the three off-Site landfills located nearest to the Site have an established rail terminal. Even if it were possible to construct new rail loading and unloading facilities, the design, permitting, and construction of these new rail facilities would likely delay closure of the Ash Pond by 5-7 years (Attachment B). Moreover, 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. Finally, there is no direct rail route from the Site to the three nearest off-Site landfills. In order to haul CCR from the Site to the off-Site landfill, it would therefore be necessary to haul the CCR on tracks owned by multiple rail lines and to transfer the CCR from line to line.

Barge transport would require the construction of a new barge loadout facility along the Illinois River, which would necessitate additional permitting and could negatively impact the project schedule. The Peoria Barge Terminal is located approximately 6 miles north of the Site by road; however, this terminal does not belong to IPRG. Use of this terminal would therefore require negotiating agreements with the terminal owner and/or operator. Finally, none of the three off-Site landfills located nearest to the Site are located along the Illinois River or near an existing barge loadout facility. As with rail terminals, trucks would still be needed to haul CCR to and from the loading and unloading terminals, and additional CCR exposures could occur during the loading and unloading of CCR into trucks and onto barges.

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 preferred off-Site landfill are suitable for CCR transport *via* truck (Attachment 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 (Attachment B):

- Unwatering and dewatering to remove liquid wastes from the Ash Pond *via* pumping and the construction of dewatering ditches and sumps. Water would be managed in accordance with the NPDES permit for the facility.
- Excavation of CCR from the Ash Pond and the existing rail line embankment, followed by excavation of approximately one foot of underlying soil from these areas and the transport of these materials to the off-Site landfill.

- Removal of the rail line and existing structures.
- Backfilling of the former impoundment with clean soil to a minimum elevation of approximately 432 feet above mean sea level (ft-amsl), followed by grading of the surface at a 0.25% slope in order to route stormwater towards the existing west ditch.
- The top six inches of imported soil shall be capable of supporting vegetation. Disturbed surfaces shall be revegetated with native grasses or pollinators.
- Monitoring for 3 years post-closure or until such time as GWPSs are achieved, whichever is longer.

Under this scenario, approximately 4,390,000 CY of CCR would be excavated from the Ash Pond and the rail line embankment and hauled off-Site for disposal. Backfilling of the impoundment and Site restoration would require an additional 900,000 CY of soil to be hauled to the Site from a nearby borrow area. As with the CIP scenario, a suitable borrow location is assumed to be located within 2 miles of the Site. A haul truck capacity of 16.5 CY is assumed for the off-Site transport of borrow soil and CCR (Attachment B).

The overall duration of closure activities under this closure scenario (excluding agency coordination and permit approvals) is approximately 16.9-21.7 years (203-260 months; Attachment B). The CBR-Offsite scenario will not 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-Offsite scenario are shown in Table 2.2.

Table 2.2 Key Parameters for the Closure-by-Removal with Off-Site CCR Disposal Scenario

Parameter	Value
Surface Area of Ash Pond	102 acres
Volume of CCR to be Hauled to the Off-Site Landfill	4,390,000 CY
Distance to Off-Site Landfill	24 miles
Required Volume of Borrow Soil	900,000 CY
Distance to Borrow Site	2 miles
Total On-Site Labor Hours	68,400 hours
Total Off-Site Labor Hours	446,000 hours
On-Site Haul Truck Miles	0 miles
Off-Site Haul Truck Miles	13,500,000 miles
Duration of Construction Activities	16.9-21.7 years

Notes:
CCR = Coal Combustion Residual; CY = Cubic Yard.
Source: Attachment 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 (Attachment A of this report), which provides a detailed evaluation of the magnitude of existing risks to human and ecological receptors associated with the Ash Pond. This report concluded that there are no current unacceptable risks to any human or ecological receptors associated with the Ash Pond. 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 either closure scenario. Thus, there would be no current risk or future risk under either 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

The effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Site indicates that the Ash Pond was constructed within the 100-year flood zone for the Illinois River (FEMA, 1983). However, for the CIP scenario, the final cap will be designed with a minimum elevation of approximately 462 feet, which is 4.5 feet higher than the base flood elevation (BFE) of 457.5 feet in the Illinois River (Illinois Power Resources Generating, LLC, 2022). Furthermore, a review of the nearest river gauges shows that the highest recorded flood elevation at the Illinois River at Peoria Lake and Dam, located approximately 9 miles upstream of the Ash Pond, was 457.75 feet, and the highest flood recorded at the nearest downstream gauge, Illinois River near Havana, which is approximately

34 miles downstream, was 452.18 feet (Illinois Power Resources Generating, LLC, 2022). Thus, Ash Pond and the final engineered cover will be protected from flood conditions on the Illinois River. Furthermore, the Ash Pond is located behind a United States Army Corps of Engineers levee, the Pekin Marsh Levee, which is 3 feet higher in elevation than the 100-year flood elevation of the river (AECOM, 2016b; FEMA, 1983; Geosyntec Consultants, 2021).

Additionally, due to the presence of the Ash Pond embankments, the area within the footprint of the Ash Pond is designated Zone C on the FEMA FIRM, or an area of "minimal flooding" (FEMA, 1983). Engineering analyses show that the Ash Pond dikes are expected to remain stable under static, seismic, and flood conditions (AECOM, 2016c; Geosyntec Consultants, 2021). Engineering analyses also show that the risk of overtopping occurring during flood conditions is minimal under current conditions. Specifically, AECOM (2016d) and Geosyntec Consultants (2021) evaluated the risk of flood overtopping occurring at the Ash Pond and found that the impoundment can adequately manage flow during peak discharge from a calculated probable maximum flood event. Prior to closure (*i.e.*, under current conditions), the risk of overtopping or dike failure occurring during floods or other storm-related events is therefore minimal. Post-closure, risks 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 (IngenAE LLC, 2022). Under the CBR-Offsite scenario, all of the CCR in the Ash Pond 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 either 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). However, the Edwards Power Plant property does not lie within a Seismic Impact Zone, defined in the Federal CCR Rule (40 CFR Part 257 Subpart D; US EPA, 2015a) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years" (Burns & McDonnell, 2021a). The nearest known faults are four unnamed faults associated with the Troy Grove Dome, which are located about 63 miles northeast of the Ash Pond. The Ash Pond 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; Burns & McDonnell, 2021b). Thus, the risk of dike failure occurring during or following closure activities due to seismic activity is exceedingly low at the Ash Pond.

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 the Ash Pond under each closure scenario are described in Section 2.1 (Closure Alternatives Descriptions). In summary, under the CIP scenario, the Ash Pond would undergo monitoring for 30 years post-closure, or until such time as GWPSs are achieved. Under the CBR-Offsite scenario, the Ash Pond would undergo monitoring for 3 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.

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 and 2.2, IngenAE estimates that the CIP scenario would require 148,000 on-Site labor hours and the CBR-Offsite scenario would require approximately 68,400 on-Site labor hours (Attachment 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 Attachment B, we estimate that approximately 1.7 worker injuries and 0.011 worker fatalities would occur on-Site under the CIP scenario and approximately 0.79 worker injuries and 0.0051 worker fatalities would occur on-Site under the CBR-Offsite scenario (Table 2.3).

Table 2.3 Expected Number of On-Site Worker Accidents Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	1.7	0.011
CBR-Offsite	0.79	0.0051

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

Off-Site, a far greater number of haul truck miles would be required under the CBR-Offsite scenario than would be required under the CIP scenario (Tables 2.1 and 2.2). Under the CBR-Offsite scenario, 13,500,000 off-Site haul truck miles would be required to haul CCR and borrow soil to and from the Site. Under the CIP scenario, only 398,000 off-Site haul truck miles would be required (Attachment 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 2.4 shows the expected number of off-Site accidents under each closure scenario due to off-Site hauling. Based on US DOT's accident statistics and the mileage estimates in Attachment B, an estimated 0.051 worker injuries and 0.0012 worker fatalities would be expected to occur due to off-Site hauling under the CIP scenario. Under the CBR-Offsite scenario, an estimated 1.7 worker injuries and 0.039 worker fatalities would be expected to occur due to off-Site hauling.

Table 2.4 Expected Number of Off-Site Worker Accidents Due to Hauling Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	0.051	0.0012
CBR-Offsite	1.7	0.039

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

Overall, taking into account accidents occurring both on- and off-Site, a minimum of 1.8 worker injuries and 0.012 worker fatalities would be expected under the CIP scenario, and 2.5 worker injuries and 0.044 worker fatalities would be expected under the CBR-Offsite scenario. In summary, overall risks to workers due to on-Site and off-Site accidents would likely be somewhat greater under the CBR-Offsite scenario than under the CIP scenario. These estimates reflect the minimum number of worker accidents that are likely to occur under each scenario, because they do not account for the additional off-Site vehicle accidents that may occur during non-hauling activities such as labor mobilization and demobilization, equipment mobilization and demobilization, and material deliveries. The vehicle mileages associated with these off-Site activities are not known.

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 haul truck mileages reported in Attachment B, off-Site hauling could result in an estimated 0.15 injuries and 0.0053 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 2.5). Under the CBR-Offsite scenario, off-Site hauling could result in an estimated 5.0 community injuries and 0.18 community fatalities.

Table 2.5 Expected Number of Community Accidents Due to Hauling Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	0.15	0.0053
CBR-Offsite	5.0	0.18

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

In addition to impacts due to off-Site hauling, all scenarios may have off-Site impacts due to labor mobilization and demobilization, equipment and vehicle mobilization and demobilization, and material deliveries. The vehicle mileages associated with these off-Site activities are not known.

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, the borrow site, and the off-Site landfill. Traffic could potentially cause travel delays on local roads and also cause damage to local roadways. It could also cause delays in the re-development of the Site as a solar facility.

Traffic may increase temporarily around the Site under both 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 (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for 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 and borrow soil hauling. Under the CBR-Offsite scenario, hauling-related construction activities would be expected to take approximately 15.3-19.3 years (with 8 months of hauling per year or 123-156 months) and require approximately 321,000 truckloads of CCR and soil (Attachment B). Assuming 26 working days per month and 10-hour working days, a haul truck would need to pass a given location near the Site once every 3.0-3.8 minutes on average for the duration of hauling-related activities under this closure scenario. The CIP scenario requires approximately 62,400 truckloads to transport soil to and from the Site, which corresponds with a haul truck passing a given location near the Site once every 3.2-4.5 minutes on average for the duration of hauling-related construction activities (approximately 2.2-3.0 years). Thus, while the CIP and CBR-Offsite scenarios are expected to have similar impacts on traffic, the traffic impacts associated with the CIP scenario will be over a much shorter duration (2.2-3.0 years) compared to the CBR-Offsite scenario (15.3-19.3 years).

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." As identified in aerials and Google Street View (Google LLC, 2022), there are a small number of residences located within 1,500 feet of the Ash Pond to the west of the Site. Additionally, the fertilizer production facility located east of the Site lies within 1,500 feet of the Ash Pond. These residences and businesses may be adversely impacted by noise pollution under every closure scenario. Recreator and wildlife areas along the Illinois River, which also lie within 1,500 feet of the Ash Pond, could also be temporarily impacted by construction noise under both scenarios. The duration of noise impacts in the vicinity of the Ash Pond would be greater under the CBR-Offsite scenario than under the CIP scenario, because the expected duration of construction is longer under the former scenario (3.8-5.3 years under the CIP scenario *vs.* 16.9-21.7 years under the CBR-Offsite scenario).

In addition to impacts in the immediate vicinity of on-Site construction areas, local roads near the Site, the off-Site landfill (CBR-Offsite scenario only), and the off-Site borrow site (both scenarios) may also experience noise pollution due to high volumes of truck traffic. As described above (Traffic), the construction schedule for the CBR-Offsite scenario requires haul trucks to pass by a given location every 3.0-3.8 minutes on average for 10 hours each day for the duration of hauling-related activities at the Site (approximately 15.3-19.3 years). The construction schedule for the CIP scenario requires haul trucks to pass a given location every 3.2-4.5 minutes on average for 10 hours each day for the duration of hauling-related activities (approximately 2.2-3.0 years). 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 (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for 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 greatest under the CBR-Offsite scenario and least under the CIP scenario.

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.

The air pollutant mass released under a given closure scenario will be proportional to the expected duration and intensity of construction activities under that scenario. The CIP scenario is the closure scenario with the shortest expected duration of construction activities, the smallest required volumes of CCR dewatering and handling, the least amount of total on-Site and off-Site labor hours, and the least amount of required on-Site and off-Site hauling. This scenario is therefore likely to result in fewer overall air emissions than the CBR-Offsite 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 (EJ Start; IEPA, 2019b), the outer perimeter of the 1-mile buffer zone for the nearest EJ community lies approximately 2.5 miles northeast of the Site near Peoria/Bartonville (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, 2014b). The EJ community near Peoria/Bartonville is therefore unlikely to be directly impacted by on-Site air emissions, noise pollution, or other negative impacts arising at the Site. However, this community could nonetheless be affected by off-Site impacts, including CCR hauling (CBR-Offsite scenario only), borrow soil hauling (both scenarios), 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 (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for material deliveries). Hauling, in contrast, would rely on a single transport route that would be in continual use throughout the entire excavation period. Off-Site hauling is therefore more likely to have a significant impact on EJ communities than other types of off-Site vehicle use.

Two types of off-Site hauling are evaluated in this report: CCR hauling and borrow soil hauling. Overall, haul truck impacts on EJ communities due to borrow soil hauling are expected to be small, because borrow soil would be sourced from within 2 miles of the Site. The EJ community near Peoria/Bartonville lies within 4 miles of the Site, and it was assumed that a suitable borrow soil location could be found outside of this community. Under the CBR-Offsite scenario, however, EJ communities located along the haul route to the off-Site landfill or near the off-Site landfill 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 preferred off-Site landfill (the Indian Creek Landfill #2 in Hopedale, Illinois) is not located within the 1-mile buffer zone of an EJ community. However, one of the three major haul routes suggested by Google Maps (Google LLC, 2022) would require hauling CCR through the 1-mile buffer zone of the EJ community near Peoria/Bartonville (Figure 2.1).

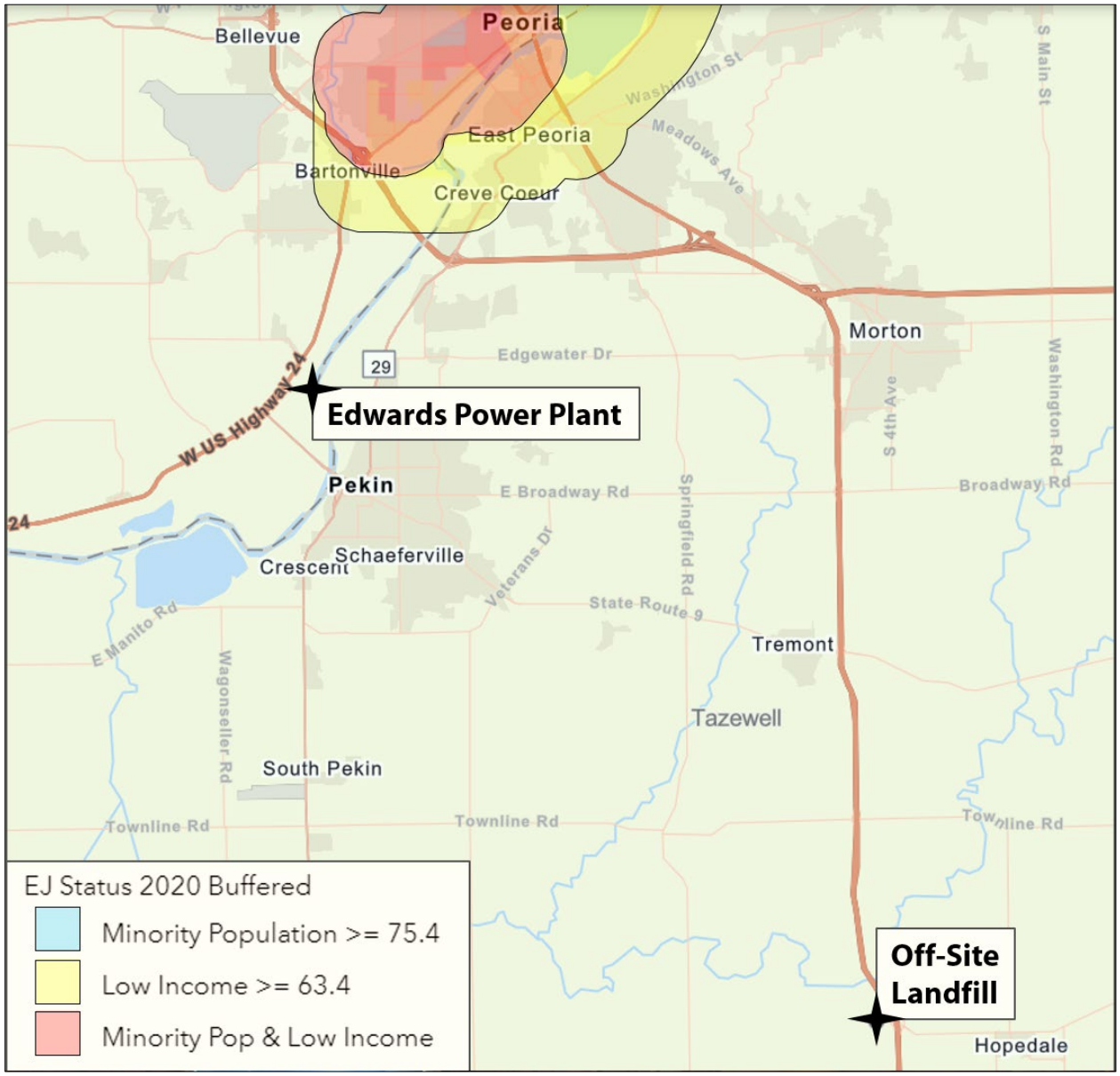

Figure 2.1 Environmental Justice Communities in the Vicinity of the Site and the Off-Site Landfill. EJ = Environmental Justice. Adapted from IEPA (2019b).

Scenic, Historical, and Recreational Value

During construction activities, negative impacts on scenic and recreational value may occur along the Illinois River, which lies within 1,500 feet of the Ash Pond. Noise impacts were described above. In addition, construction activities at the Ash Pond may be visible to recreators using the Illinois River, potentially interfering with enjoyment of the view. Negative impacts would not necessarily be expected to occur within any scenic or recreational areas located further away from the Site, including Worley Lake, the Pekin Lake SFWA, and the Powerton Lake SFWA. The expected duration of construction activities is longer under the CBR-Offsite scenario than under the CIP scenario (3.8-5.3 years under the CIP scenario *vs*. 16.9-21.7 years under the CBR-Offsite scenario). It is therefore anticipated that short-term impacts on the scenic and recreational value of the Illinois River would be greater under the CBR-Offsite 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 the Ash Pond (Ramboll, 2021).

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. The CIP scenario has the shortest expected duration of construction activities, the smallest required volumes of CCR dewatering and handling, the least amount of total on-Site and off-Site labor hours, and the least amount of required on-Site and off-Site hauling; this scenario is therefore likely to have the lowest amount of predicted GHG emissions across closure scenarios.

We did not quantify the carbon footprint of the approximately 69 acres of 40-mil LLDPE geomembrane liner required for the final Ash Pond 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-Offsite 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. In summary, the energy requirements of construction are expected to be smallest under the CIP scenario and largest under the CBR-Offsite 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-Offsite scenario.

The Edwards Power Plant Site is slated for re-development as a utility-scale battery energy storage facility and, if CIP is approved, the installation of a solar facility. The installation of the utility-scale battery energy storage facility and a solar facility will provide additional tax revenue to the local community, provide jobs, benefit the reliability of the electrical grid, and support Illinois's path toward 100 percent clean energy by 2050. Because the CIP scenario requires less overall construction activity than the CBR-Offsite scenario and would be completed over a shorter time period, the CIP scenario would be expected to result in fewer delays to re-development on the capped impoundment – and, hence, the more rapid realization of grid-scale solar energy benefits – than the CBR-Offsite scenario.

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 direct 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). The duration of time over which various short-term negative habitat impacts might occur due to construction would be longer under the CBR-Offsite scenario than under the CIP scenario, due to the longer expected duration of construction activities under the former scenario (3.8-5.3 years for CIP *vs.* 16.9-21.7 years for CBR-Offsite). Thus, negative short-term impacts to natural resources and habitat due to closure activities would likely be greater under the CBR-Offsite scenario than under the CIP scenario.

The Ash Pond is separated spatially from the Illinois River by the Edwards Power Plant, the coal pile for the facility, and an off-Site fertilizer production facility (a buffer distance of at least 800 feet; Figure 1.1). For this reason, construction activities at the Ash Pond are unlikely to have a significant negative impact on aquatic species found in the Illinois River (due to, *e.g.*, erosion and sediment runoff). However, there are some small, discontiguous wetland areas in the immediate vicinity of the Ash Pond (Figure 2.2; US FWS, 2021). Wetland species in these areas could potentially be subjected to temporary, minor disturbances as a result of closure activities. Terrestrial species located near the Ash Pond could also potentially be temporarily impacted by closure. According to the IDNR Natural Heritage Database, there are 9 endangered species and 15 threatened species within Peoria County (Ramboll, 2021). 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.

In addition to the short-term habitat impacts described above, closure may also result in long-term shifts in the habitat types overlying the major construction locations associated with closure (the Ash Pond, the borrow area, and the off-Site landfill). 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 the Ash Pond would constitute a positive or negative long-term change with regard to factors such as biodiversity, ecosystem services, or the preferences of recreators/sightseers.

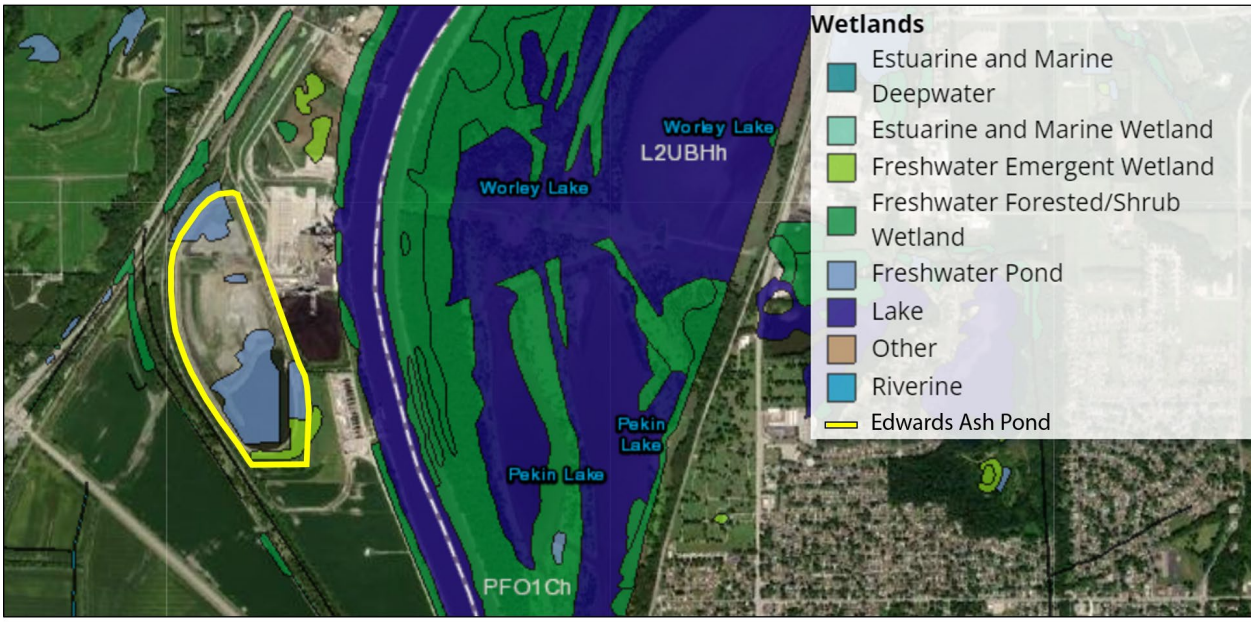

Figure 2.2 Wetlands and Surface Water Bodies in the Vicinity of the Edwards Ash Pond. Adapted from US FWS (2021).

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 above in Section 1.1.4 (Hydrogeology), the UA is a moderately permeable sand and gravel zone that is oriented parallel to the Illinois River (Ramboll, 2021). The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the Site. Groundwater in the UA flows in both a northward and southward direction along the orientation of the UA, parallel to the river. In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the UCF has been observed. This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas. A groundwater mound associated with the operation of Ash Pond may have resulted in a localized zone in which groundwater flows easterly, into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the Ash Pond is removed. There is only a limited groundwater flow component from areas underlying the Ash Pond toward the west. Vertical groundwater migration from the UA into the underlying bedrock is significantly restricted due to the presence of low-permeability shale (Ramboll, 2021).

CCR-related constituents from the Ash Pond may migrate vertically downward and into groundwater. Once in groundwater, these constituents may migrate northward and southward consistent with the primary groundwater flow directions in the UA. Based on groundwater modeling and groundwater monitoring conducted at the Site, no CCR-related constituents from the Ash Pond have migrated off of the property to either the north or the south in excess of GWPSs. There is limited off-Site migration of

CCR-related constituents in excess of GWPSs into farmland areas west of the Ash Pond resulting from the groundwater mound associated with the operation of Ash Pond. Because the shale BCU is elevated in the areas west of the Ash Pond and alluvial soils are not expected to occur west of the Ash Pond past US Highway 24, further off-site migration to the west is not anticipated. Some CCR-constituents may have migrated eastward into the Illinois River, as a result of the groundwater mound caused by the Ash Pond. Due to groundwater interaction with surface water, dissolved constituents in the groundwater may partition between surface water and river sediments.

Seasonal variation in groundwater levels generally results in groundwater elevation fluctuations of less than 5 feet at the Edwards Power Plant Site. Groundwater flow directions at the Site generally do not vary in response to groundwater elevation changes or the elevation of the Illinois River (Ramboll, 2021).

Groundwater modeling was performed to evaluate the future groundwater quality in the vicinity of the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is approximately 750 years (Ramboll, 2022). The long model-predicted timeframes are the result of the low permeability materials adjacent to and underlying the Ash Pond, and low groundwater flow velocities observed within the water-bearing units of the Site, which results in reduced transport and slow physical attenuation (*i.e.*, dilution and dispersion). From a modeling perspective, the minimal difference between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario (approximately 19 years) is not significant. Furthermore, the predicted maximum extents of the boron plume above the GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022).

Additionally, changing geochemical conditions during an extended excavation associated with the CBR-Offsite scenario 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-Offsite scenario.

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 the Ash Pond. 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 the Ash Pond. 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-related impacts, 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-Offsite scenario (see Section 2.2.2 above). Additionally, there are no current or future unacceptable risks to any human or ecological receptors under either 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 off-Site landfill under the CBR-Offsite 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. Section 3 of this report (Corrective Measures Assessment) evaluates the corrective measures being considered at the Site consistent with the requirements in IAC Section 845.660.

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 the Ash Pond 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 either closure scenario.

2.3.2 Extent to Which Treatment Technologies May Be Used (IAC Section 845.710(b)(2)(B))

Under both 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 to the Illinois River 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-Offsite poses additional implementation difficulties due to higher earthwork volumes and longer construction schedules. For example, off-Site hauling under the CIP scenario would only entail the transport of approximately 1,030,000 CY of soil and would not require the transportation of any CCR over public roadways. In contrast, off-Site hauling under the CBR-Offsite scenario would entail the transport of approximately 900,000 CY of soil and 4,390,000 CY of CCR over public roadways. As described in Section 2.2.4.2 (Community Impacts), off-Site hauling may also have detrimental impacts due to an increased incidence of vehicle accidents, truck traffic, noise, and air pollution.

In addition to off-Site hauling, off-Site landfilling under the CBR-Offsite scenario may pose particular challenges. A disposal plan would need to be developed between IPRG 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 the Ash Pond.

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 CBR-Offsite scenario. 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 off-Site landfill under the CBR-Offsite scenario. As such, operational reliability would be expected under both 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 both closure scenarios. Components of both 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 the Illinois River *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 the Ash Pond 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, the off-Site landfill may require expansion under the CBR-Offsite scenario in order to accommodate all of the material excavated from the Ash Pond. 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-Offsite 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 both 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-Offsite 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-Offsite 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 the Ash Pond would be stored within the existing footprint of the impoundment. Treatment would consist of unwatering and dewatering the Ash Pond at the start of construction and managing stormwater inflow. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility. Under the CBR-Offsite scenario, water treatment would similarly consist of unwatering and dewatering the Ash Pond at the start of construction and discharging water from unwatering/dewatering in accordance with the NPDES permit for the facility.

Under the CBR-Offsite scenario, approximately 4,390,000 CY of CCR would be excavated from the Ash Pond and the rail line embankment. 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 Indian Creek Landfill #2 in Hopedale, Illinois. This facility has 12,500,000 CY of remaining capacity in its current permitted footprint. It receives 399,000 CY of waste annually, and is located approximately 24 miles from the Site by road. The Indian Creek Landfill #2 therefore has sufficient capacity to receive CCR from the Ash Pond. However, closure of the Ash Pond would increase the annual waste receipt rate at the off-Site landfill. Due to the short timeframe 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 Indian Creek Landfill #2 is impractical or infeasible, then an alternative landfill located farther from the Site would need to be identified. Likely alternatives to the Indian Creek Landfill #2 include the Envirofil of Illinois Inc. Landfill in Macomb, Illinois, and the Clinton Landfill #3 in Clinton, Illinois. The Envirofil of Illinois Inc. Landfill has 7,690,000 CY of remaining capacity in its current permitted footprint, receives 97,300 CY of waste annually, and is located approximately 60 miles from the Site. The Clinton Landfill #3 has 25,700,000 CY of remaining capacity in its current permitted footprint, receives 559,000 CY of waste annually, and is located approximately 71 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 (Attachment A), both modeled and measured surface water concentrations in the Illinois River are below relevant human health and ecological screening benchmarks. Thus, there is no current impact from the Ash Pond to the Illinois River.

Under normal, regional conditions, surface water from the Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater as opposed to groundwater flowing into surface water). The eastward groundwater flow component from the Ash Pond toward the Illinois River is only a result of the groundwater mound that has formed under the Ash Pond as a result of Ash Pond operation. For both closure alternatives, the free-standing water in the Ash Pond will be removed; consequently, the groundwater mound underlying the Ash Pond will decline. Ultimately, the declining groundwater mound will eliminate the eastward groundwater flow component toward the Illinois River, and the groundwater system will return to its normal, regional conditions. Thus, surface water concentrations of CCR-associated constituents are expected to decline over time under both closure scenarios, and there is no expected impact to the Illinois River as a result of either closure alternative.

The lined landfill that would receive the CCR excavated from the impoundment under the CBR-Offsite 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 either 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 Edwards Ash Pond on groundwater and surface water quality, including Earthjustice, the Prairie Rivers Network, the League of Women Voters, and the Sierra Club (Earthjustice *et al*., 2018; LWVGP, 2021; Sierra Club, 2014; Sierra Club and CIHCA, 2014; UCS, 2018). 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 the Ash Pond *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 the Ash Pond under either scenario. There is also minimal risk of future CCR releases occurring under either scenario. Furthermore, groundwater modeling conducted at the Site demonstrated that both closure scenarios perform equivalently with regard to achieving the GWPSs (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-Offsite scenario with regards to likely community concerns. Notably, the CIP scenario presents fewer risks to workers, nearby residents, and potentially EJ communities 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-Offsite scenario, due to the shorter duration of construction activities. Finally, the Site could be more rapidly re-developed for installation of a solar facility on the capped impoundment under the CIP scenario than under the CBR-Offsite scenario. Re-development of the Site as a solar facility would bring new jobs to the community and help the state meet its goal of decarbonizing electricity generation.

A public meeting was held on May 25, 2022, pursuant to requirements under IAC Section 845.710(e) (Illinois Power Resources Generating, LLC, 2022). 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-Offsite 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 the Ash Pond. Key benefits of the CIP scenario relative to the CBR-Offsite scenario include the more rapid re-development of the Site for installation of a solar facility on the capped impoundment and 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, reduced duration of traffic-related impacts, and potentially lower impacts to EJ communities). Moreover, 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), whereas the CBR-Offsite scenario would be unable to meet this required schedule.

3 Corrective Measures Assessment

This section of the report presents a CMA pursuant to requirements under IAC Section 845.660 (IEPA, 2021a). The goal of performing a CMA is to holistically evaluate proposed corrective measures designed to remediate groundwater and achieve compliance with the GWPSs specified under IAC Section 845.600 (IEPA, 2021a). A CMA provides a screening-level analysis of potential corrective measures based on a wide range of factors, including their performance, reliability, ease of implementation, and potential impacts on human health and the environment (IEPA, 2021a). This analysis determines which corrective measures are potentially viable at a site and should be evaluated further in a Corrective Action Alternatives Analysis (CAAA). The CAAA for a given site must be submitted to the Agency within 1 year of submission of the CMA.

Many CCR sites are complex groundwater environments where remedial actions will inherently take many years to complete. While no formal definition of a complex groundwater environment exists, most would agree that there are a number of common characteristics at complex groundwater sites, including the following (National Research Council, 2013):

- Highly heterogeneous subsurface environments;
- Large source zones;
- Multiple, recalcitrant constituents; and
- Long timeframes over which releases occurred.

Each of these characteristics is common at CCR sites. Surface impoundments are often tens to hundreds of acres in size and many have operated for decades, leading to large source zones and prolonged releases. Furthermore, CCR impoundments are often located in alluvial geologic settings where sands are interbedded with silts and clays. This results in a heterogeneous environment where constituent mass may persist for many years in low-permeability deposits. Finally, the constituents that are most common at CCR sites include metals and inorganics that do not naturally biodegrade. The combination of these factors results in a complex groundwater environment where remediation, even under the best of circumstances, may take many years to achieve GWPSs. It is for these reasons that US EPA refused to specify what is a reasonable *vs.* an unreasonable timeframe for groundwater corrective actions at CCR sites, stating that "EPA was truly unable to establish an outer limit on the necessary time frames—including even a presumptive outer bound" (US EPA, 2015a, p. 21419).

It is also important to note that source control, which at a CCR impoundment could include either capping or excavation, is generally considered to be one of the more effective remedial action approaches. Source control involves removing the hydraulic head from an impoundment (*i.e.*, unwatering and dewatering) in order to prevent the further downward migration of constituents. United States Environmental Protection Agency (US EPA) has found that "releases from surface impoundments [to groundwater] drop dramatically after closure" (US EPA, 2014a, pp. 5-18 to 5-19). As a result, the implementation of source control often has a more substantial and more immediate effect on groundwater quality improvements than other groundwater corrective measures. In this CMA, source control is paired with other additional groundwater remediation strategies.

It is also important to note that after additional data are collected and the groundwater plume is further delineated, evaluations of interim remedies may be conducted and implemented prior to pond closure. Interim remedies that are considered may include, but are not limited to, groundwater extraction (GE) and other remedial technologies described in this CMA.

3.1 Corrective Measure Alternative Descriptions

Five potential corrective measures were selected for consideration in this CMA. Each corrective measure includes source control based on the CIP scenario (*i.e.*, Closure-in-Place with consolidation). Corrective measures considered in this CMA include Source Control with Monitored Natural Attenuation (Source Control-MNA), Source Control with Groundwater Extraction (Source Control-GE), Source Control with Construction of an Interceptor Trench (Source Control-IT), Source Control with Construction of a Cutoff Wall (Source Control-CW), and Source Control with Construction of a Permeable Reactive Barrier (Source Control-PRB). Each of these corrective measures was evaluated in the CMA for its potential viability at the Site. Under the Source Control-MNA alternative, groundwater concentrations of dissolved constituents would attenuate *via* naturally occurring physical and chemical processes in areas downgradient of the Ash Pond; active monitoring would be performed to verify and document the remediation processes. Under the Source Control-GE alternative, a GE system comprised of groundwater pumping wells would be installed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-IT alternative, an interceptor trench (IT) would be constructed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-CW alternative, a trench would be installed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier to the lateral migration of constituents. Under the Source Control-PRB alternative, a subsurface barrier of reactive materials (*e.g.*, zerovalent iron) would be placed in the path of groundwater flow downgradient of the Ash Pond in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents.

The performance of each of these corrective measures would necessarily be influenced by the closure activities described in Section 2 (the CAA). However, because the impacts of closure on human health and the environment, engineering reliability, and other factors were already evaluated in Section 2, they were not re-evaluated in this section. Additionally, because the same source control measures would be undertaken at the Site under all of the corrective measure alternatives, the impacts of source control would be the same under all of the alternatives. We have therefore omitted discussion of the impacts of closure-related activities from this section of the report.

This report evaluates the potential performance, reliability, and impacts of various corrective measures at the Edwards Power Plant Site. However, it does not make any judgments regarding the need for these corrective measures at the Site.

Boron, sulfate, and total dissolved solids (TDS) have been identified as potential constituents of concern at the Site; consequently, groundwater corrective measures focus on these constituents.

3.1.1 Source Control with Monitored Natural Attenuation

US EPA (1999) defines monitored natural attenuation (MNA) as "[t]he reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that offered by

other more active methods." MNA relies on naturally occurring physical and chemical processes to immobilize potentially problematic constituents in groundwater and attenuate dissolved concentrations of those constituents. Chemical processes that naturally promote the attenuation of dissolved inorganic constituent concentrations in groundwater include sorption, precipitation, and redox reactions. Physical processes that promote attenuation include dispersion and dilution (US EPA, 2015b). US EPA has determined that MNA can be a viable alternative at sites impacted by inorganic constituents such as metals and metalloids, especially when implemented alongside source control measures (US EPA, 1999, 2015b).

Because MNA relies on natural processes, implementation of the Source Control-MNA alternative would not require the installation, operation, or maintenance of any engineered systems or structures at the Site other than the monitoring well network. Long-term management associated with groundwater monitoring would be undertaken to ensure that attenuation was occurring as planned. Groundwater monitoring would continue until GWPSs were achieved. Following the completion of source control measures, the Source Control-MNA remedy would require 1-2 years to design, construct, and implement. This includes any additional investigations required to characterize Site conditions and additional work related to the design and installation of the groundwater monitoring system.

3.1.2 Source Control with Groundwater Extraction

Under the Source Control-GE alternative, a GE system comprised of groundwater pumping wells would be installed downgradient of the Ash Pond to extract potentially impacted groundwater from the aquifer. Extraction would help contain the contaminant plume and prevent the lateral migration of constituents off-Site. If groundwater monitoring revealed a need for the treatment of extracted groundwater prior to discharge, then a treatment system would also be designed and implemented at the Site. Under this scenario, groundwater captured by the GE system would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing a GE system. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates for the extraction wells in order to effectively capture impacted groundwater. In total, following the completion of source control measures, the Source Control-GE remedy would require 2-3 years to design and construct. Long-term management of the GE system would include periodic inspections and routine maintenance, including the replacement of worn or damaged parts. Monitoring would also be undertaken to ensure that the GE system was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.3 Source Control with Construction of an Interceptor Trench

Under the Source Control-IT alternative, an interceptor trench would be installed downgradient of the Ash Pond to extract potentially impacted groundwater from the aquifer. Extraction would help contain the contaminant plume and prevent the lateral migration of constituents off-Site. If groundwater monitoring revealed a need for the treatment of intercepted groundwater prior to discharge, then a treatment system would be designed and implemented at the Site. Under this scenario, groundwater captured by the IT would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing an IT system. In total, following the completion of source control measures, the Source Control-IT remedy would require 2-3 years to design and construct. Long-term management of the IT system would include periodic

inspections and routine maintenance. Monitoring would also be undertaken to ensure that the IT was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.4 Source Control with Construction of a Cutoff Wall

Under the Source Control-CW alternative, a trench would be constructed downgradient of the Ash Pond and filled with a soil-bentonite mixture. This process would create a low-permeability subsurface barrier to the lateral migration of constituents off-Site. The cutoff wall (CW) would extend all the way down to the underlying bedrock, creating a barrier to constituent transport both immediately beneath the impoundment and at depth.

In the absence of additional hydraulic controls, CWs can unintentionally function as subsurface dams, routing groundwater around the wall rather than preventing its lateral migration. In order to ensure that this would not occur at the Edwards Power Plant Site, a series of hydraulic control wells would need to be installed in the vicinity of the CW. These wells would serve as a "hydraulic gradient control system," ensuring that groundwater flowed inward through the wall, rather than flowing outward (thus containing any potentially impacted groundwater behind the wall). If groundwater monitoring revealed a need for the treatment of extracted groundwater prior to discharge, then a treatment system would be designed and implemented at the Site. Under this scenario, groundwater captured by the hydraulic gradient control system would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing a CW system. In total, following the completion of source control measures, the Source Control-CW remedy would require 2-3 years to design, construct, and implement. Long-term management under the Source Control-CW alternative would include periodic inspections and routine maintenance of the CW and the hydraulic gradient control system. Monitoring would also be undertaken to ensure that the corrective measure was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.5 Source Control with Construction of a Permeable Reactive Barrier

Under the Source Control-PRB alternative, a subsurface barrier of reactive materials would be placed in the path of groundwater flow in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents. A permeable barrier would be used so that the barrier would not hinder groundwater flow. At the Edwards Power Plant Site, the permeable reactive barrier (PRB) would extend all the way down to the underlying bedrock.

One potential reactive material that can effectively immobilize many CCR-associated constituents is zerovalent iron. However, zerovalent iron has not been proven effective for boron (EPRI, 2006).

Site investigations and engineering analyses must be conducted prior to designing a PRB. In total, following the completion of source control measures, the Source Control-PRB remedy would require 2-3 years to design, construct, and implement. Long-term management under the Source Control-PRB alternative would include periodic maintenance and possibly replacement of the reactive media in order to extend the life of the PRB. Monitoring would also be undertaken to ensure that the corrective measure was working as intended. Monitoring would continue until GWPSs were achieved.

3.2 Performance, Reliability, Ease of Implementation, and Potential Impacts of the Corrective Measure Alternative (IAC Section 845.660(c)(1))

3.2.1 Performance of the Corrective Measure Alternative – Controlling the Source (IAC Section 845.660(c)(1))

"Primary source control" refers to means of preventing CCR-associated constituents from leaching from an impoundment into underlying groundwater. Source control would be undertaken at the Site prior to the implementation of any corrective measures, as described in Section 2 (the CAA). Thus, all of the corrective measure alternatives would be equally protective with regard to primary source control, and the infiltration of CCR-associated constituents into groundwater would be greatly reduced following closure. However, impacted soils underlying the impoundments could potentially act as a secondary source of CCR-associated impacts even after closure had occurred. The effectiveness of the various corrective measure alternatives with respect to secondary source control is summarized as follows:

- Under the Source Control-MNA alternative, the attenuation of dissolved constituent concentrations in the subsurface would be achieved through natural processes. MNA relies on a combination of natural physical, chemical, biological, and related processes to mitigate groundwater contaminant migration and achieve groundwater remediation objectives. The groundwater constituents of concern identified for the Site (boron, sulfate, and TDS) are affected by these natural processes in multiple ways and to varying degrees. A detailed assessment of the performance of MNA as a potential groundwater remediation technology for the Site will be included in the CAAA.
- Under the Source Control-GE alternative, extraction wells would be used to capture dissolved constituent concentrations emanating from secondary source areas and prevent the lateral migration of constituents off-Site. GE is a widely used corrective measure. However, its performance can vary from site to site. Although good performance would generally be expected for this alternative, additional Site investigations and engineering analyses may be required to design the GE system.
- Under the Source Control-IT alternative, an interceptor trench would be used to capture dissolved constituent concentrations emanating from secondary source areas and prevent the lateral migration of constituents off-Site. Although good performance would generally be expected for this alternative, performance can vary from site to site. Additional Site investigations and engineering analyses may be required to design the IT.
- Under the Source Control-CW alternative, a low-permeability subsurface barrier would prevent the lateral migration of constituents off-Site. This barrier, which would extend all the way down to the bedrock, would likely be highly effective at preventing lateral constituent migration. Source Control-CW would likely be effective with regard to secondary source control, if the hydraulic control system were designed and operated appropriately. Additional Site investigations and engineering analyses may be required to design the CW and the associated hydraulic control system.
- Under the Source Control-PRB alternative, a PRB would be placed into the path of groundwater flow in order to promote the transformation and immobilization of constituents. The ability of this barrier to prevent the lateral migration of constituents would depend on Site-specific factors, such as Site hydrogeology and geochemical conditions. Moreover, the effectiveness of the barrier would vary by constituent. PRBs generally have limited success at treating boron in

groundwater, for example, which could limit the effectiveness of a PRB at this Site. Additional Site investigations and engineering analyses may be required to design the PRB.

3.2.2 Performance of the Corrective Measure Alternative – Likelihood of Future Releases of CCR (IAC Section 845.660(c)(1))

All of the corrective measures evaluated in this report present the same risks with respect to future releases of CCR, because all of them are assumed to employ the same source control method (Closure-in-Place with consolidation). Section 2.2.2 of the CAA discussed the potential for a sudden release of CCR to occur during or following closure activities at the Ash Pond. That analysis showed that there is minimal risk of sudden CCR releases occurring at the Ash Pond during or following the implementation of CIP.

3.2.3 Performance of the Corrective Measure Alternative – Long-Term Management (IAC Section 845.660(c)(1))

The type and degree of long-term management required under each corrective measure is summarized as follows:

- The Source Control-MNA alternative would not require the installation, operation, or maintenance of any engineered systems or structures other than the monitoring well network. Long-term management associated with groundwater sampling would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d).
- Operations and maintenance (O&M) under the Source Control-GE scenario would include routine groundwater sampling and hydraulic gradient monitoring to ensure that the GE system was working as intended. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The GE would need to be regularly inspected and maintained to prevent the fouling and scaling of well screens from impacting the effectiveness of the remedy. Over time, fouling and scaling could potentially create a need for the replacement of individual extraction wells. The Source Control-GE alternative would additionally require the management and discharge of extracted groundwater. Treatment of extracted groundwater may be required prior to discharge.
- O&M under the Source Control-IT scenario would include routine groundwater sampling and hydraulic gradient monitoring to ensure that the IT was working as intended. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The Source Control-IT alternative would additionally require the management and discharge of intercepted groundwater. Treatment of intercepted groundwater may be required prior to discharge.
- O&M under the Source Control-CW scenario would include routine groundwater sampling and periodic maintenance of the CW and the hydraulic gradient control system, including the replacement of worn or damaged parts. The hydraulic gradient control system would need to be regularly inspected and maintained to prevent the fouling and scaling of well screens from impacting the effectiveness of the remedy. Over time, fouling and scaling could potentially create a need for the replacement of individual hydraulic gradient control wells. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The Source Control-CW alternative would

additionally require the management and discharge of groundwater extracted by the hydraulic gradient control system. Treatment of extracted groundwater may be required prior to discharge.

- O&M under the Source Control-PRB scenario would include routine groundwater sampling downgradient of the PRB until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The PRB would also be monitored for treatment efficacy. If necessary, the PRB media may need to be amended or exchanged to extend the life of the PRB.

3.2.4 Reliability of the Corrective Measure Alternative – Engineering and Institutional Controls (IAC Section 845.660(c)(1))

The long-term reliability of the corrective measure alternatives is summarized as follows:

- A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Long-term reliability would be expected for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.
- The Source Control-GE alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the GE system and (if necessary) the treatment system for extracted groundwater. However, maintenance of these systems would most likely be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-IT alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the IT and (if necessary) the treatment system for intercepted groundwater. However, maintenance of these systems would most likely be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-CW alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the hydraulic gradient control system wells and (if necessary) the treatment system for extracted groundwater. However, maintenance of these systems would be expected to be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-PRB alternative may not be reliable over the long term at this Site. The reliability of this alternative would depend on Site-specific groundwater hydraulics and geochemical conditions, including the behavior of the constituents of concern. PRBs generally have limited success at treating boron in groundwater. The effectiveness of the PRB would also decrease over time, resulting in a potential need for the eventual replacement of the remedy.

3.2.5 Reliability of the Corrective Measure Alternative – Potential Need for Replacement of the Corrective Measure (IAC Section 845.660(c)(1))

The potential need for the eventual replacement of each corrective measure alternative is summarized as follows:

- A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Replacement of the remedy would be unlikely for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.
- For the Source Control-GE alternative, implementation of the GE system would rely on physical management of the groundwater flow path. Fouling and scaling could reduce the effectiveness of the GE system over time and potentially create a need for the replacement of individual extraction wells. Pump replacement may also be required under this alternative, because groundwater hydraulic controls would need to be maintained on a long-term basis. However, it is unlikely that the entire remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- For the Source Control-IT alternative, implementation of the IT would rely on physical management of the groundwater flow path. It is unlikely that this remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- For the Source Control-CW alternative, implementation of the CW would rely on physical management of the groundwater flow path. Fouling and scaling could reduce the effectiveness of the hydraulic gradient control system over time and potentially create a need for the replacement of individual hydraulic gradient control wells. Pump replacement may also be required under this alternative, because groundwater hydraulic controls would need to be maintained on a long-term basis. However, it is unlikely that the entire remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- PRBs would rely on the chemical treatment of groundwater along the flow path. Given the low effectiveness of PRBs for boron, replacement of the PRB remedy would likely be necessary at the Site. Replacement of this remedy would also be necessary if the effectiveness of the PRB declined over time, or if groundwater flow conditions changed at the Site.

3.2.6 Ease of Implementation (IAC Section 845.660(c)(1))

The expected degree of difficulty associated with implementing each corrective measure is summarized as follows:

- The Source Control-MNA alternative would rely entirely on natural processes and therefore should not pose any significant construction challenges. This alternative would only require the installation of monitoring wells.
- Construction under the Source Control-GE alternative would be limited to the installation of extraction wells and monitoring wells. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates of the GE system wells for the effective capture of impacted groundwater.

- Construction under the Source Control-IT alternative would be limited to the installation of the IT and monitoring wells. Additional testing would be required to determine the optimal location and depth of the IT system. Specialized trenching equipment may be required.
- Construction of a CW under the Source Control-CW scenario would likely be difficult due to the required length and depth of the CW. Construction of the CW, which would be on the order of 30-50 feet deep, would entail excavating into the low-permeability bedrock unit at the Site and then backfilling the excavated trench. Specialized equipment may be required. Design of the hydraulic gradient control system would require a good understanding of groundwater flow conditions at the Site, including an evaluation of the ability of the system to contain groundwater effectively.
- Construction of the PRB under the Source Control-PRB alternative would likely be difficult due to the required length and depth of the PRB. The PRB would need to be extended down to the low-permeability bedrock unit at the Site, which is approximately 30-50 feet below ground surface.

3.2.7 Potential Impacts – Risks to the Community or the Environment During Implementation of Remedy (IAC Section 845.660(c)(1))

Safety Impacts

Best practices will 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 risks to workers during construction activities. For example, injuries and fatalities can occur due to truck accidents or equipment malfunctions. Truck accidents that occur off-Site can also result in injuries or fatalities to community members. The safety impacts of construction under each corrective measure alternative are summarized as follows:

- The Source Control-MNA alternative would not require the construction of any engineered systems or structures other than monitoring wells. Construction would not be expected to result in any significant negative safety impacts under this alternative.
- A moderate level of construction activity would be required under the Source Control-GE alternative, including the construction of extraction wells and monitoring wells. The construction-related safety impacts of this alternative would likely be modest. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.
- The construction requirements of the Source Control-IT alternative could be considerable due to the planned extent of construction activities. The Source Control-IT alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.
- The construction requirements of the Source Control-CW alternative could be considerable due to the planned extent of construction activities (*i.e.*, excavation and backfilling of an approximately 30- to 50-foot-deep trench). The Source Control-CW alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.

- The construction requirements of the Source Control-PRB alternative could be considerable due to the planned extent of construction activities (*i.e.*, excavation of an approximately 30- to 50-foot-deep trench). The Source Control-PRB alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.

Cross-Media Impacts to Air

Diesel emissions are a major source of air pollutants and GHG emissions at construction sites. Corrective measures that require a high level of construction activity relative to alternatives will result in relatively large air impacts in the form of diesel emissions. The Source Control-MNA alternative would be expected to have minimal air impacts, because it would not require the construction of any engineered systems or structures other than monitoring wells. The Source Control-GE alternative would be expected to have moderate air impacts, because it would have modest construction requirements. The Source Control-IT, Source Control-CW, and Source Control-PRB alternatives would be expected to have the most considerable air impacts across all evaluated corrective measures, because these alternatives are associated with the most significant construction requirements.

Cross-Media Impacts to Surface Water and Sediments

Due to erosion and runoff, construction can have short-term negative impacts on the surface water and sediment quality immediately adjacent to a site. Minimal surface water or sediment impacts due to erosion and runoff would be expected during construction under the Source Control-MNA alternative, because it would not require the construction of any engineered systems or structures other than monitoring wells. In contrast, the Source Control-GE, Source Control-IT, Source Control-CW, and Source Control-PRB alternatives could have short-term negative impacts on the Illinois River due to erosion and sediment runoff during construction. These impacts would likely be greater under the Source-Control-IT, Source Control-CW, and Source Control-PRB alternatives than under the Source Control-GE alternative, due to the greater extent and duration of construction activities required for the former alternatives relative to the latter alternative.

Under the Source Control-GE, Source Control-IT, and Source Control-CW alternatives, extracted and/or intercepted groundwater would be discharged to the Illinois River *via* an existing NPDES-permitted outfall. If necessary, extracted and/or intercepted groundwater would be treated prior to discharge in order to ensure compliance with water quality standards. Thus, no surface water or sediment impacts would be expected under any of the corrective measure alternatives due to the permitted discharge of extracted and/or intercepted groundwater into the Illinois River.

Control of Exposure to Any Residual Contamination During Implementation of the Remedy

Under all evaluated corrective measures, risks to workers arising from potential contact with CCR, impacted soils, or impacted groundwater during construction, operation, and maintenance activities would be managed through the use of rigorous safety protocols and personal protective equipment.

Other Identified Impacts

In addition to safety impacts, cross-media impacts, and the potential for workers to be exposed to residual contamination, construction activities can also have significant energy demands and cause nuisance impacts such as traffic and noise. Moreover, construction can have temporary negative impacts on the scenic, historical, and recreational value of areas near the Site, as well as nearby natural resources and

habitat. There are no historical sites in the immediate vicinity of the Ash Pond; thus, no impacts to historical areas are expected under any of the evaluated corrective measures. However, the Illinois River has scenic and recreational value, and also provides habitat for many species. For each corrective measure alternative, the potential magnitude of the construction-related impacts described above is likely to be proportional to the expected duration and intensity of the construction activities that are required under that corrective measure alternative. Because the Source Control-MNA alternative would not require any significant construction activity, the construction-related impacts listed above would not be a concern under this alternative. In contrast, modest construction-related impacts would be expected under the Source Control-GE alternative. The most significant construction-related impacts would likely to occur under the Source Control-CW and Source Control-PRB alternatives, both of which potentially require the construction of an approximately 30- to 50-foot-deep earthen trench.

3.3 The Time Required to Begin and Complete the Corrective Action Plan (IAC Section 845.660(c)(2))

IAC Section 845.670 states that a Corrective Action Plan must be submitted to the Agency within 1 year of submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.

3.4 State or Local Permit Requirements or Other Environmental or Public Health Requirements that May Substantially Affect Implementation of the Corrective Action Plan (IAC Section 845.660(c)(3))

All of the evaluated corrective measures would require regulatory approvals prior to implementation. The Source Control-GE, Source Control-IT, and Source Control-CW alternatives may also require modifications to the Site's existing NPDES permit in order to manage groundwater extracted by the GE system (Source Control-GE alternative), intercepted by the IT (Source-Control-IT alternative), or extracted by the hydraulic gradient control system (Source Control-CW alternative). However, these requirements would not be expected to substantially affect the implementation of the Corrective Action Plan.

3.5 Summary

Table S.2 evaluates the corrective measures included in this CMA with regards to each of the factors specified under IAC Section 845.660(c) (IEPA, 2021a). Based on this evaluation and the details provided in Section 3 of this report, four corrective measures have been identified as potentially viable technologies for further consideration in the CAAA pursuant to IAC Section 845.670: Source Control-MNA, Source Control-GE, Source Control-IT, and Source Control-CW. These technologies may be combined in different manners to potentially address different zones of groundwater impacts (*i.e.*, near-field *vs*. far-field) and different constituents. For example, MNA combined with one of the other remedies may be a more optimal approach than relying on just a single remedial technology. The fifth corrective measure evaluated in this CMA, Source Control-PRB, is not being retained for further evaluation in the CAAA because PRBs have not been proven effective for boron in groundwater, construction of a PRB would likely be difficult due to its required length and depth, and a PRB would have relatively large impacts on worker safety, air quality, and potentially surface water quality and sediment quality due to the substantial construction activities required.

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Attachment A

Human Health and Ecological Risk Assessment

Human Health and Ecological Risk Assessment
Ash Pond
Edwards Power Plant
Bartonville, Illinois

June 30, 2022

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Table of Contents

Page

1 Introduction 1

2 Site Overview 3
- 2.1 Site Description 3
- 2.2 Geology/Hydrogeology 5
- 2.3 Conceptual Site Model 6
- 2.4 Groundwater Monitoring 9
- 2.5 Surface Water Sampling 11

3 Risk Evaluation 14
- 3.1 Risk Evaluation Process 14
- 3.2 Human and Ecological Conceptual Exposure Models 15
  - 3.2.1 Human Conceptual Exposure Model 16
    - 3.2.1.1 Groundwater or Surface Water as a Drinking Water/Irrigation Source 17
    - 3.2.1.2 Recreational Exposures 18
  - 3.2.2 Ecological Conceptual Exposure Model 19
- 3.3 Identification of Constituents of Interest 20
  - 3.3.1 Human Health Constituents of Interest 20
  - 3.3.2 Ecological Constituents of Interest 21
  - 3.3.3 Surface Water and Sediment Modeling 24
- 3.4 Human Health Risk Evaluation 27
  - 3.4.1 Recreators Exposed to Surface Water 27
  - 3.4.2 Recreators Exposed to Sediment 29
- 3.5 Ecological Risk Evaluation 30
  - 3.5.1 Ecological Receptors Exposed to Surface Water 31
  - 3.5.2 Ecological Receptors Exposed to Sediment 33
  - 3.5.3 Ecological Receptors Exposed to Bioaccumulative Constituents of Interest 34
- 3.6 Uncertainties and Conservatisms 35

4 Summary and Conclusions 37

References 39

Appendix A Surface Water and Sediment Modeling
Appendix B Screening Benchmarks

List of Tables

Table 2.1 Groundwater Monitoring Wells Related to Edwards Ash Pond

Table 2.2 Groundwater Data Summary

Table 2.3 Surface Water Data Summary

Table 3.1 Human Health Constituents of Interest

Table 3.2 Ecological Constituents of Interest

Table 3.3 Groundwater and Surface Water Properties Used in Modeling

Table 3.4 Sediment Properties Used in Modeling

Table 3.5 Surface Water and Sediment Modeling Results

Table 3.6 Risk Evaluation for Recreators Exposed to Surface Water

Table 3.7 Risk Evaluation for Recreators Exposed to Sediment

Table 3.8 Risk Evaluation of Ecological Receptors Exposed to Surface Water

Table 3.9 Risk Evaluation of Ecological Receptors Exposed to Sediment

List of Figures

Figure 2.1 Site Location Map

Figure 2.2 Groundwater Elevation in Uppermost Aquifer – February 2021

Figure 2.3 Modeled and Observed Extent of Boron in Groundwater and Water Wells Identified in Receptor Survey

Figure 2.4 Monitoring Well Locations

Figure 2.5 Surface Water Sampling Location

Figure 3.1 Overview of Risk Evaluation Methodology

Figure 3.2 Human Conceptual Exposure Model

Figure 3.3 Ecological Conceptual Exposure Model

Abbreviations

ADI	Acceptable Daily Intake
AP	Ash Pond
BCF	Bioconcentration Factor
BCG	Biota Concentration Guide
BCU	Bedrock Confining Unit
CAA	Closure Alternatives Assessment
CCR	Coal Combustion Residual
CEM	Conceptual Exposure Model
COI	Constituent of Interest
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
EPP	Edwards Power Plant
ESV	Ecological Screening Value
GWPS	Groundwater Protection Standard
GWQS	Groundwater Quality Standards
HTC	Human Threshold Criteria
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
ILWATER	Illinois Water and Related Wells
IPRG	Illinois Power Resources Generating, LLC
ISGS	Illinois State Geological Survey
MCL	Maximum Contaminant Level
NOEC	No Observed Effect Concentration
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
ORNL RAIS	Oak Ridge National Laboratory's Risk Assessment Information System
PMP	Potential Migration Pathway
PRG	Preliminary Remediation Goal
RfD	Reference Dose
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SWQS	Surface Water Quality Standards
TEC	Threshold Effect Concentration
UA	Uppermost Aquifer
UCF	Upper Cahokia Formation
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1 Introduction

The Edwards Power Plant (EPP or "the Site") is an electric power-generating facility with coal-fired units located in Peoria County, Illinois, between Mapleton and Bartonville. The facility is owned by Illinois Power Resources Generating, LLC (IPRG), and began operations in 1960. The EPP has one surface impoundment for storage of coal combustion residuals (CCR) known as the Ash Pond (AP), which covers approximately 91 acres (Ramboll, 2021). The EPP Ash Pond (Illinois Environmental Protection Agency [IEPA] ID No. W1438050005-01) is planned to commence closure by the end of 2022 and is the subject of this report.

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 potentially impacted by the AP. This risk evaluation was performed to support the Closure Alternatives Assessment (CAA) for the AP in accordance with requirements in Title 35 Part 845 of the Illinois Administrative Code (IAC) (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 Illinois River 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 relevant surface water quality standards (SWQS) (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, Gradient 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 and ecological receptors resulting from CCR exposures associated with the AP 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 swimming or boating in the Illinois River adjacent to the Site.
- No unacceptable risks were identified for recreators exposed to sediment in the Illinois River 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 the AP 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 EPP is located in Peoria County, Illinois, between Mapleton and Bartonville, in a predominantly agricultural area. The EPP is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and fertilizer production facility to the east, and agricultural land to the south (Figure 2.1) (Ramboll, 2021). The Illinois River flows adjacent to the facility from north to south (Figure 2.1). The AP discharges to the Illinois River under a National Pollutant Discharge Elimination System (NPDES) permit (Ramboll, 2021).

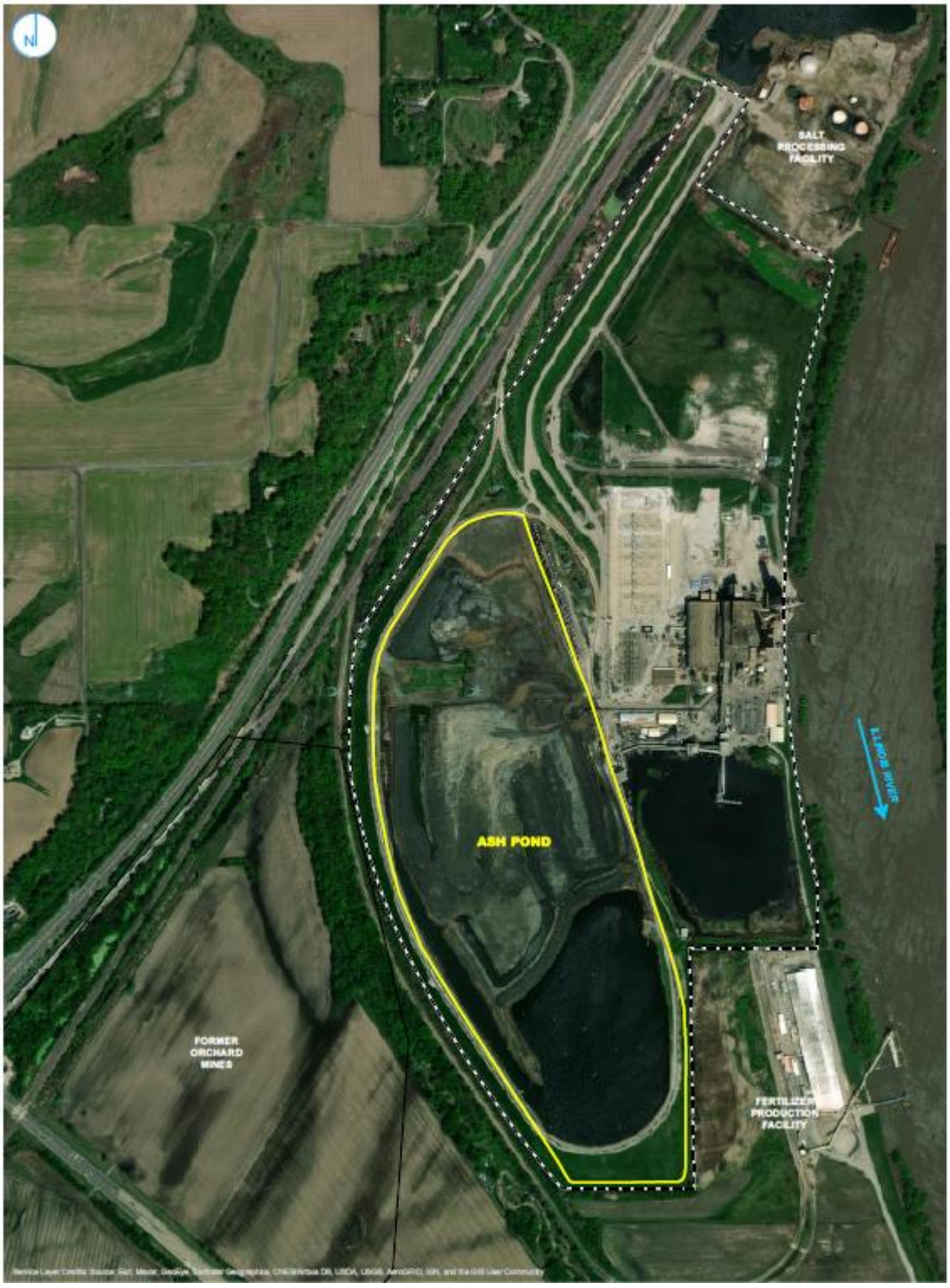

Figure 2.1 Site Location Map. Source: Ramboll (2021).

2.2 Geology/Hydrogeology

The geology underlying the Site in the vicinity of the AP primarily consists of unlithified deposits of the Cahokia Formation, underlain by a thick shale bedrock (Ramboll, 2021). The uppermost aquifer (UA) has been identified as the Lower Cahokia Formation (LCF) and saturated portions of the Upper Cahokia Formation (UCF) (Ramboll, 2021). The underlying shale has been identified as a bedrock confining unit (BCU) (Ramboll, 2021).

The UCF consists of low-permeability clays and silts, as well as discontinuous lenses of sand, sandy clay to clayey sand, and sandy silt. The saturated and unconfined sandy lenses within the UCF have been identified as Potential Migration Pathways. The thickness of the UCF ranges between 5 and 40 feet (ft) in the vicinity of the AP (Ramboll, 2021). The LCF consists of coarse materials of sand and gravel directly overlying the bedrock. The UA includes the LCF and, where saturated, portions of the UCF (Ramboll, 2021). The UA is primarily composed of moderately permeable sands and clayey gravels with a geometric mean horizontal hydraulic conductivity of 1.6×10^{-4} centimeters per second (cm/s) (Ramboll, 2021). Horizontal hydraulic gradients calculated for the UA range from 0.001 to 0.004 ft/ft (Ramboll, 2021). The bottom of the UA (*i.e.*, LCF) overlies the shale BCU. This confining layer consists of very low-permeability shales and siltstones with interbedded sandstone. The BCU has a geometric mean horizontal hydraulic conductivity of 3.2×10^{-6} cm/s (Ramboll, 2021), approximately two orders of magnitude lower than the overlying UA.

The alluvial soils of the UA are limited to areas immediately adjacent to and underlying the Illinois River and are located in north-south orientation parallel to the river (Ramboll, 2022a). In the area immediately underlying the AP, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2022a). This clay layer restricts the migration of groundwater from the saturated deposits underlying the AP into the surrounding areas. West of the AP, the elevation of the ground surface increases and, correspondingly, the elevation of the shale BCU also increases. Based on regional information, alluvial soils are not expected to occur in the areas west of US Highway 24 (Ramboll, 2022a).

Groundwater flow within the UA occurs in both a northward and southward direction along the orientation of the UA, parallel to the river (Figure 2.2). The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the EPP. Due to the hydraulic influence of the AP, a groundwater mound (*i.e.*, piezometric maximum) is located underneath the AP. This mound facilitates groundwater flow in both a northward and southward direction (Figure 2.2). Moreover, the groundwater mound associated with the AP may have resulted in a localized area in which groundwater flows in an easterly direction to the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the AP is removed. Because the shale BCU is elevated in the areas west of the AP and alluvial soils are not expected to occur west of the AP past US Highway 24, there is expected to be only a limited groundwater flow component from areas underlying the AP toward the west.

Figure 2.2 Groundwater Elevation in Uppermost Aquifer – February 2021. Source: 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 the AP migrates and potentially interacts with surface water and sediment in the adjacent Illinois River. The CSM was developed using available hydrogeologic data specific to the AP (Ramboll, 2021), including information on groundwater flow and surface water characteristics.

CCR-related constituents from the AP may migrate vertically downward and into groundwater. Once in groundwater, these constituents may migrate northward and southward consistent with the primary groundwater flow directions. Based on groundwater modeling and groundwater monitoring conducted at the Site, and because of the low-permeability clays underlying the AP, no CCR-related constituents from

the AP have migrated off of the EPP property to the north or the south in excess of their GWPS (Figure 2.3). Some CCR-constituents may migrate eastward to the Illinois River, as a result of the groundwater mound caused by the AP. As a result, dissolved constituents in groundwater may partition between river sediments and Illinois River surface water.

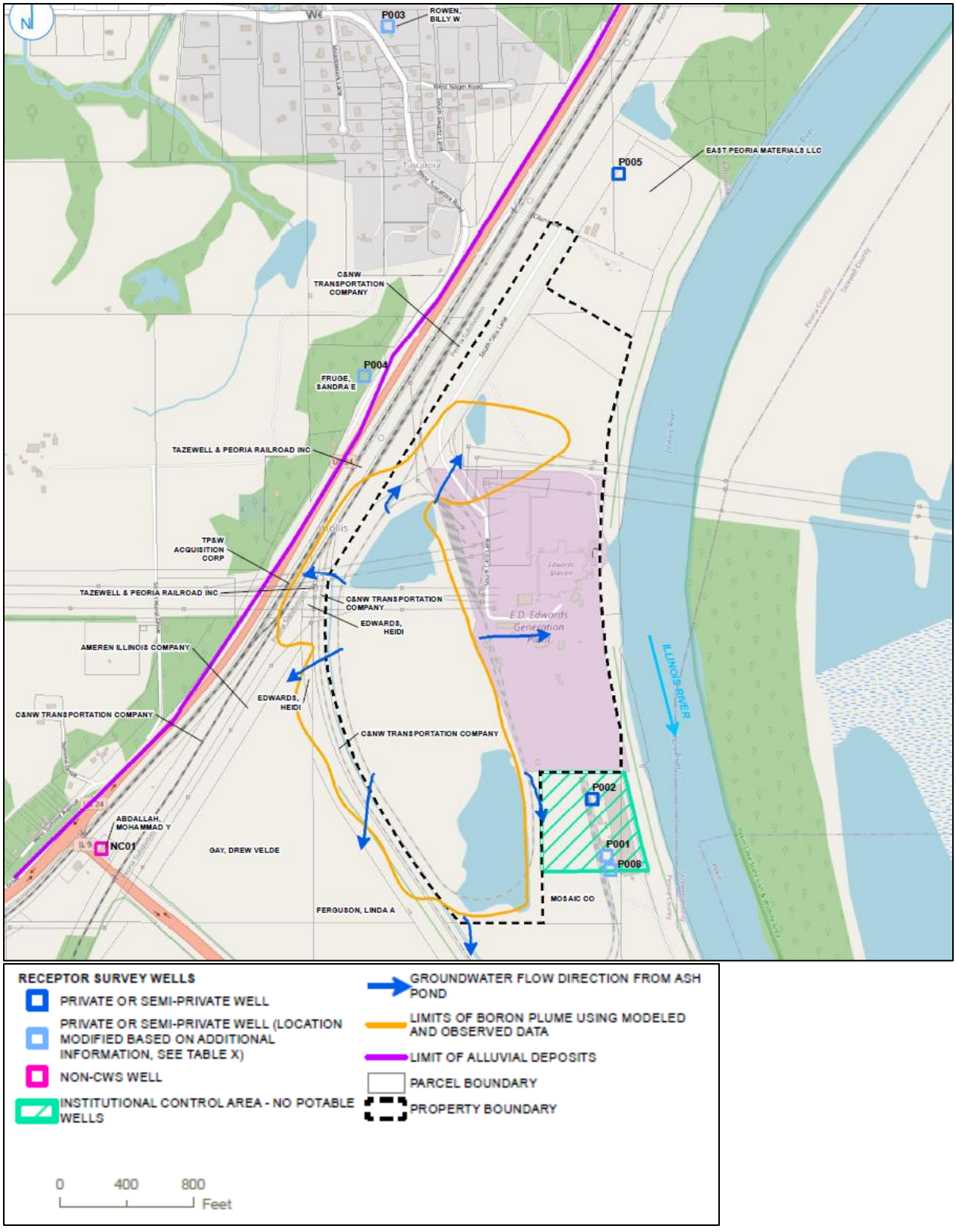

Figure 2.3 Modeled and Observed Extent of Boron in Groundwater and Water Wells Identified in Receptor Survey. Source: Ramboll (2022b).

2.4 Groundwater Monitoring

A total of 28 wells have been used to monitor the groundwater quality near and downgradient of the AP. Of these, 18 wells are screened in the UA, 8 are screened in the UCF, and 3 are screened in the BCU (Table 2.1) (Ramboll, 2021). The analyses presented in this report relied on all available data from the 28 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 AP well locations are shown in Figure 2.4. Note that there are additional wells located within the boundary of the AP and screened in pore water, that were not used in this risk analysis because they are not reflective of groundwater. The use of groundwater data in this risk evaluation does not imply that any detected constituents are associated with the AP or that they have been identified as potential groundwater exceedances.

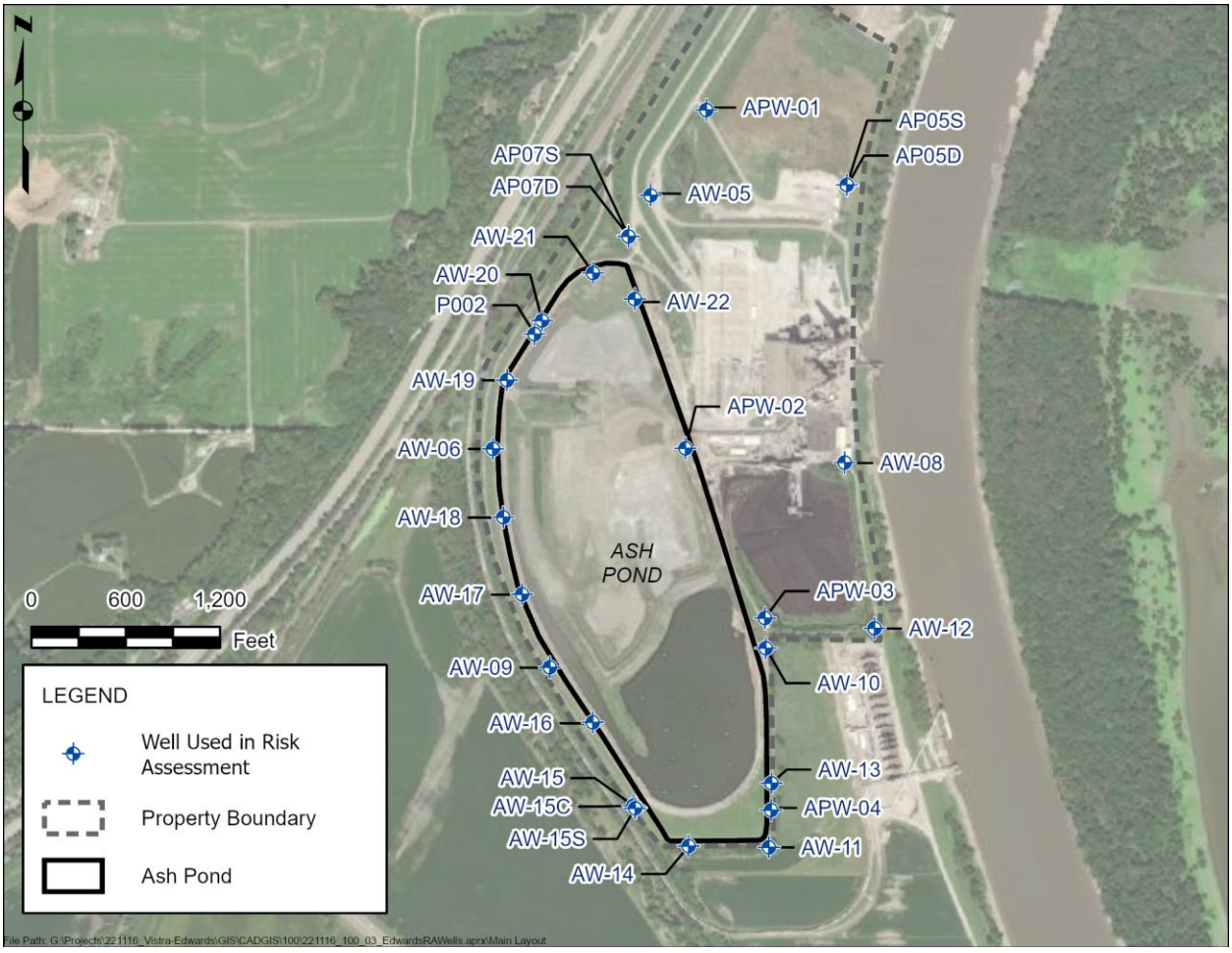

Figure 2.4 Monitoring Well Locations. Source: Ramboll (2021).

[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 Edwards Ash Pond

Well	Hydrogeologic Unit	Date Constructed	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Well Depth (ft bgs)
AP05S	UA	11/29/2016	32.87	37.64	38.06
AP05D	BCU	12/05/2016	47.09	56.69	57.17
AP06[a]	UCF	11/30/2016	19.93	24.72	25.00
AP07S	UCF	12/02/2016	29.95	34.74	35.00
AP07D	BCU	12/08/2016	55.01	64.59	65.00
APW-01	UCF	07/27/2010	7.60	18.00	18.00
APW-02	UCF	07/20/2010	39.60	50.00	50.00
APW-03	UCF	07/19/2010	19.60	30.00	30.00
APW-04	UCF	07/27/2010	9.60	20.00	20.00
AW-05	UA	07/22/2015	15.87	20.47	21.10
AW-06	UA	08/03/2015	36.60	41.09	41.69
AW-08	UA	07/21/2015	47.55	57.19	57.70
AW-09	UA	08/03/2015	47.14	51.62	52.23
AW-10	UA	07/23/2015	27.62	32.23	32.74
AW-11	UA	07/28/2015	24.21	28.81	29.31
AW-12	UA	01/07/2021	26.00	31.00	31.00
AW-13	UA	01/09/2021	25.00	30.00	30.00
AW-14	UA	01/08/2021	24.00	29.00	29.00
AW-15	UA	01/08/2021	33.00	38.00	38.00
AW-15C	BCU	01/08/2021	43.00	48.00	48.00
AW-15S	UCF	01/08/2021	8.00	18.00	18.00
AW-16	UA	01/08/2021	55.00	60.00	60.00
AW-17	UA	01/08/2021	51.00	56.00	56.00
AW-18	UA	01/09/2021	46.00	51.00	51.00
AW-19	UA	01/09/2021	35.00	40.00	40.00
AW-20	UA	01/10/2021	36.50	41.50	41.50
AW-21	UA	01/10/2021	32.00	37.00	37.00
AW-22	UA	01/08/2021	44.00	49.00	49.00
P002	UCF	--	30.60	35.60	35.90

Notes:
Source: Ramboll (2021).
-- = Data Unavailable; BCU = Bedrock Confining Unit; bgs = Below Ground Surface; ft = Feet; UA = Uppermost Aquifer; UCF = Upper Cahokia Formation.

Table 2.2 Groundwater Data Summary

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Detection Limit
Total Metals (mg/L)					
Antimony	4	229	0.003	0.0045	0.003
Arsenic	228	253	0.001	0.097	0.02
Barium	253	253	0.062	8.6	0.02
Beryllium	29	253	0.00085	0.017	0.001
Boron	260	260	0.047	12	0.4
Cadmium	14	229	0.0011	0.004	0.001
Chromium	93	253	0.004	0.59	0.004
Cobalt	141	253	0.002	0.29	0.002
Lead	109	253	0.001	0.27	0.001
Lithium	179	253	0.011	0.85	0.02
Mercury	8	229	0.00021	0.0018	0.0002
Molybdenum	211	253	0.001	0.046	0.002
Selenium	57	253	0.001	0.019	0.004
Thallium	5	229	0.0012	0.0026	0.001
Radionuclides (pCi/L)					
Radium-226+228	252	252	0	23	1.93
Other (mg/L)					
Chloride	260	260	5.2	830	250
Fluoride	128	260	0.25	10.2	2.5
Sulfate	181	260	1	570	250
Total Dissolved Solids	260	260	390	2,600	34

Notes:
Source: Ramboll (2021).
pCi/L = PicoCuries Per Liter.

2.5 Surface Water Sampling

One surface water sample was collected from the Illinois River in 2017, as part of the Antidegradation Alternatives Analysis (Foth Infrastructure & Environment, LLC, 2017). The sample was collected from the "River Inlet," located approximately 1,000 feet north (upstream) of the AP outfall to the river (Figure 2.5, Table 2.3) (Foth Infrastructure & Environment, LLC, 2017). It should be noted that although this sample location is due east of the northern end of the AP, it was not collected specifically to examine the potential impact of the AP on the Illinois River. Data from this sample are included in this report for completeness; however, due to the lack of upstream and downstream samples, results from this sample are insufficient to evaluate the potential impact of the AP on the surface water quality conditions in the Illinois River. Instead, the potential impact of groundwater flowing from the UA to the Illinois River was modeled to predict potential surface water effects resulting from the AP (Section 3.3.3). These model-predicted surface water concentrations were used in this evaluation to assess potential risk to surface water receptors.

Figure 2.5 Surface Water Sampling Location. Source: Foth Infrastructure & Environment, LLC (2017, Figure 1).

Table 2.3 Surface Water Data Summary

Constituent	Detected Concentration (mg/L)
Total Metals	
Arsenic	0.0025
Barium	0.080
Boron	0.097
Cadmium	0.00023
Chromium	0.0073
Copper	0.0063
Iron	4.2
Lead	0.0049
Manganese	0.11
Mercury	0.000015
Nickel	0.0060
Selenium	0.0012
Silver	0.000028
Zinc	0.033
Other	
Chloride	100
Fluoride	0.23
Sulfate	65
Total Dissolved Solids	534

Notes:
Source: Foth Infrastructure & Environment, LLC (2017).
Sample collected from the River Inlet location on February 13, 2017.

3 Risk Evaluation

3.1 Risk Evaluation Process

A risk evaluation was conducted to determine whether constituents present in groundwater underlying and downgradient of the AP 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.

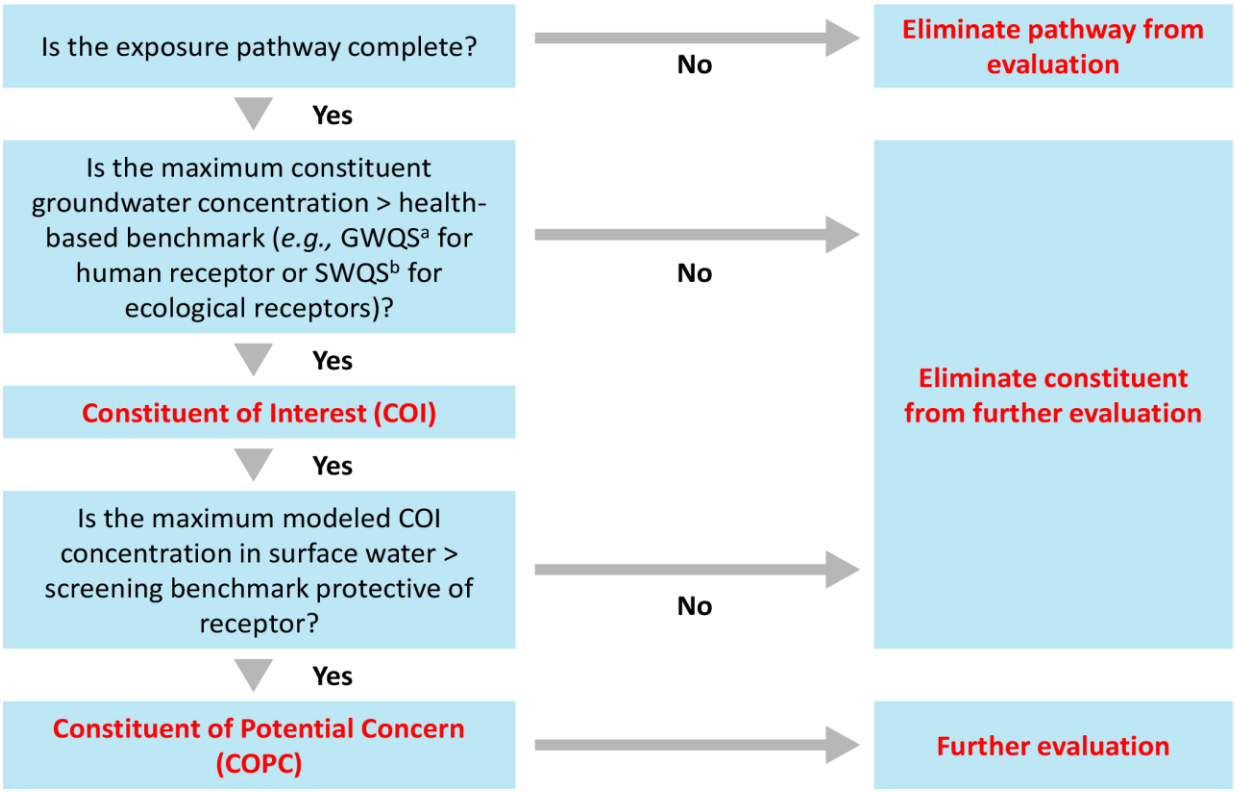

Figure 3.1 Overview of Risk Evaluation Methodology. GWQS = Groundwater Quality Standard; IEPA = Illinois Environmental Protection Agency; SWQS = Surface Water Quality Standard.
(a) The IEPA Part 845 GWPS were used to identify COIs.
(b) IEPA SWQS protective of chronic exposures to aquatic organisms were used to identify ecological COIs. In the absence of SWQS, US EPA Region IV Ecological Screening Values (ESV) 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 SWQS for ecological receptors. Based on the CSM (Section 2.2), groundwater flows in both a northward and southward direction along the orientation of the LCF/UA, parallel to the river. In the area immediately underlying the AP, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2022a). This clay layer restricts groundwater migration from the saturated deposits underlying the AP to the surrounding areas. A groundwater mound associated with operation of the AP may cause a localized zone where groundwater flows in an easterly direction into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the AP is removed. There is expected to be only a limited groundwater flow component from areas underlying the AP toward the west.

One surface water sample was collected from the Illinois River adjacent to the Site; however, sediment samples have not been collected from the river. 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 AP-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; it only indicates 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 the AP 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.

[2] As discussed further in Section 3.3.2, groundwater quality standards 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.

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 the 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 the AP into groundwater, surface water, sediment, and fish. The following human receptors and exposure pathways were evaluated for inclusion in the Site-specific CEM:

- Residents – exposure to groundwater/surface water as drinking water
- Residents – exposure to groundwater/surface water used for irrigation
- Recreators in the river near 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. 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.

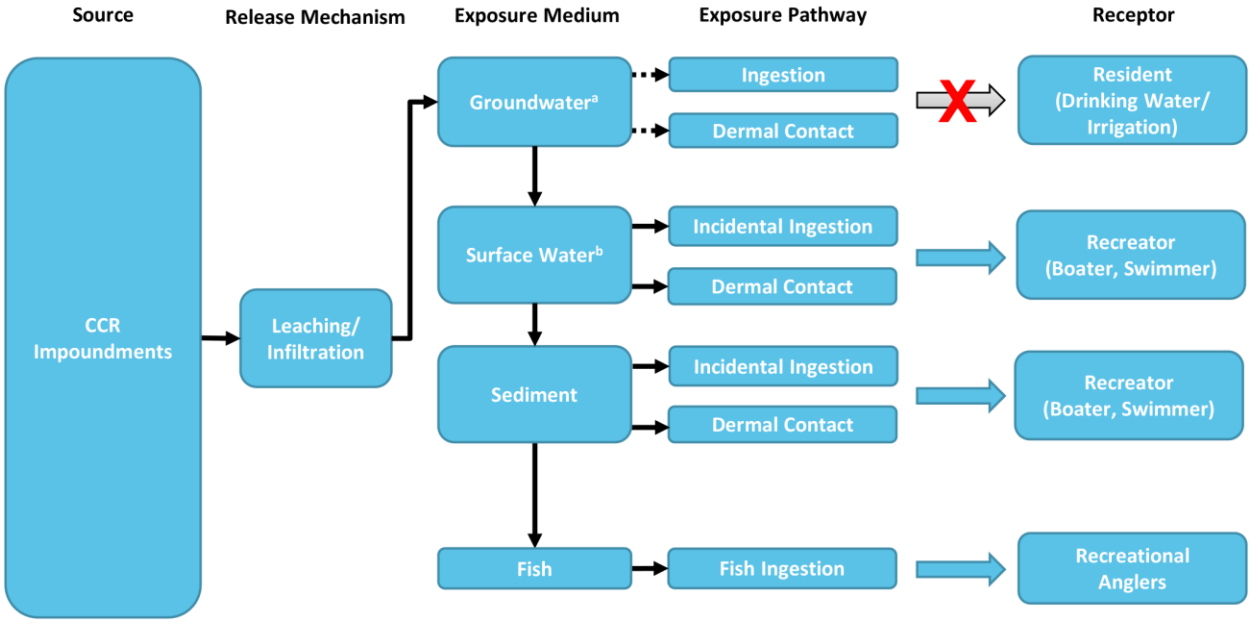

Figure 3.2 Human Conceptual Exposure Model. CCR = Coal Combustion Residual. Dashed line/Red X = Incomplete or Insignificant Exposure Pathway.
(a) Groundwater in the vicinity of the Site is not used as a drinking water or irrigation source.
(b) Surface water is not used as a drinking water source.

3.2.1.1 Groundwater or Surface Water as a Drinking Water/Irrigation Source

Groundwater as a source of drinking water and/or irrigation water is not a complete exposure pathway for CCR-related constituents originating from the AP. Based on groundwater modeling and groundwater monitoring conducted at the Site, and because of the low-permeability clays underlying the AP, no CCR-related constituents from the AP have migrated off of the EPP property to the north or the south in excess of their GWPS (Figure 2.3). Additionally, a summary of the evidence, presented below, supports the conclusion that there are no residential uses of groundwater that could be impacted as a result of the AP. Furthermore, Illinois River surface water is not used as a source of drinking water in the area.

- **There are no groundwater users near the EPP in areas where groundwater could be impacted due to the AP.** Relying on federal and state databases, Ramboll completed a potable water well survey in 2021 (Ramboll, 2021). A total of 7 wells were identified proximate to the EPP during a comprehensive search of the Illinois State Geological Survey's (ISGS) Illinois Water and Related Wells (ILWATER) Map (ISGS, 2020; Ramboll, 2021) (Figure 2.3). All of these wells are either in areas where groundwater is not expected to be impacted by the AP or are industrial wells that are not used for domestic purposes (Ramboll, 2021). Specific information pertaining to each well identified in the receptor survey is provided below.

    - Well P004: This is a residential well located on the bluff above the Illinois River, north of the AP. The well is 65 feet deep and screened in the shale bedrock (ISGS, 1978). The shale bedrock is a hydrostratigraphic unit that has a limited hydraulic connection to the UCF and LCF soil deposits located on the EPP property. Based on topographic maps, the ground surface elevation at the well is approximately 480 ft msl (based on NAVD88)[3] (USGS, 2017). Thus, the bottom of P004 is located at an elevation of approximately 415 ft msl (570 ft minus 65 ft). The well log indicates that the bedrock was encountered at a depth of 30 feet (ISGS, 1978), which is at an elevation of 450 ft msl (480 ft minus 30 ft). Additionally, the well log indicates that groundwater was encountered at a depth of 37 feet below the top casing (which is 36 feet below ground surface [ft bgs]; ISGS, 1978). Thus, the groundwater elevation at P004 is 444 ft msl (480 ft minus 36 ft). Because the groundwater elevation is below the depth of the bedrock, the unlithified soils at P004 are unsaturated (*i.e.*, there is no alluvial aquifer at P004). Additionally, the measured groundwater elevation at P004 (444 ft msl) is higher than the measured groundwater elevations at AW-05 and APW-01 (approximately 435 ft msl; Figure 2.2), which are the closest monitoring wells to P004, and are screened in unlithified soils of the UCF and LCF. Thus, it is impossible for any groundwater impacts associated with the AP to impact groundwater quality at well P004.

    - Well P003: This is a residential well located to the north of the EPP. The well is 43 feet deep and screened in clay (ISGS, 1969). Based on topographic maps, the ground surface elevation at the well is approximately 570 ft msl (based on NAVD88) (USGS, 2017); thus, the bottom of P003 is located at an elevation of approximately 527 ft msl (570 ft minus 43 ft). Because groundwater underlying the AP is located at an elevation of approximately 430 to 440 ft msl (Figure 2.2; *i.e.*, 87 to 97 ft lower than P003), it is impossible for any groundwater impacts associated with the AP to impact groundwater quality at P003.

    - Well P005: This is a well located on an industrial property, owned by East Peoria Materials LLC, north of the EPP. The well was installed to a depth of 60 ft bgs into bedrock (ISGS, 1987). After the well was drilled, the driller's notes indicated that it did not yield sufficient

[3] NAVD88 is the North American Vertical Datum of 1988.

water ("no water"; ISGS, 1987); thus, Gradient believes this well is not likely to be active, if it even still exists.

- Well P001: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 20 ft bgs into clay (ISGS, 2001). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- Well P002: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 30 ft bgs into clay (ISGS, 1968). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- Well P008: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 300 ft bgs into shale bedrock (ISGS, 2017). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- NC-01: This is a non-community water source well associated with the Freedom Gas Station (Hahn, 2020). Peoria County Health Department indicated that the well is not a potable well (Hahn, 2020). Moreover, the well is side-gradient from the AP and unlikely to be affected by any AP-related impacts.

- **The Illinois River is not used as a public water supply adjacent to the Site.** The Illinois River is classified as a "General Use Water." IEPA supports the use of the Illinois River for aquatic life and primary contact recreation, but it is not designated for public and food processing water supplies (IEPA, 2018). The Illinois River is used as a public water supply in the city of Peoria, IL; however, this location is approximately 9 miles upstream of the Site (ISWS, 2022). The segment of the Illinois River adjacent to the Site (Assessment Unit ID: IL D-05) is listed on the 2018 Illinois Section 303(d) List as being impaired for fish consumption, due to mercury and polychlorinated biphenyls (US EPA, 2018; IEPA, 2021b). Therefore, surface water adjacent to the Site is not used as a source of drinking water, and this exposure pathway was not evaluated further.
- **The AP has a limited hydraulic connection to underlying bedrock groundwater resources**. The shale bedrock aquitard underlying the UA forms a hydraulic barrier between the AP and deeper groundwater resources. Due to very low hydraulic conductivity of the shale bedrock aquitard, downward migration of shallow groundwater to the underlying aquifers is expected to be limited. Therefore, the likelihood of AP-related impacts to the deep groundwater resources is minimal.

3.2.1.2 Recreational Exposures

The Illinois River flows from north to south past the Site. Recreational exposure to surface water and sediment may occur during activities such as swimming, boating, or fishing in the river. Exposure estimates for swimmers provide a health-protective means to evaluate exposure during other recreational activities. Recreational anglers may also consume locally caught fish from the Illinois River.

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 as well as secondary toxicity *via* bioaccumulation. Figure 3.3 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, 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, fish)

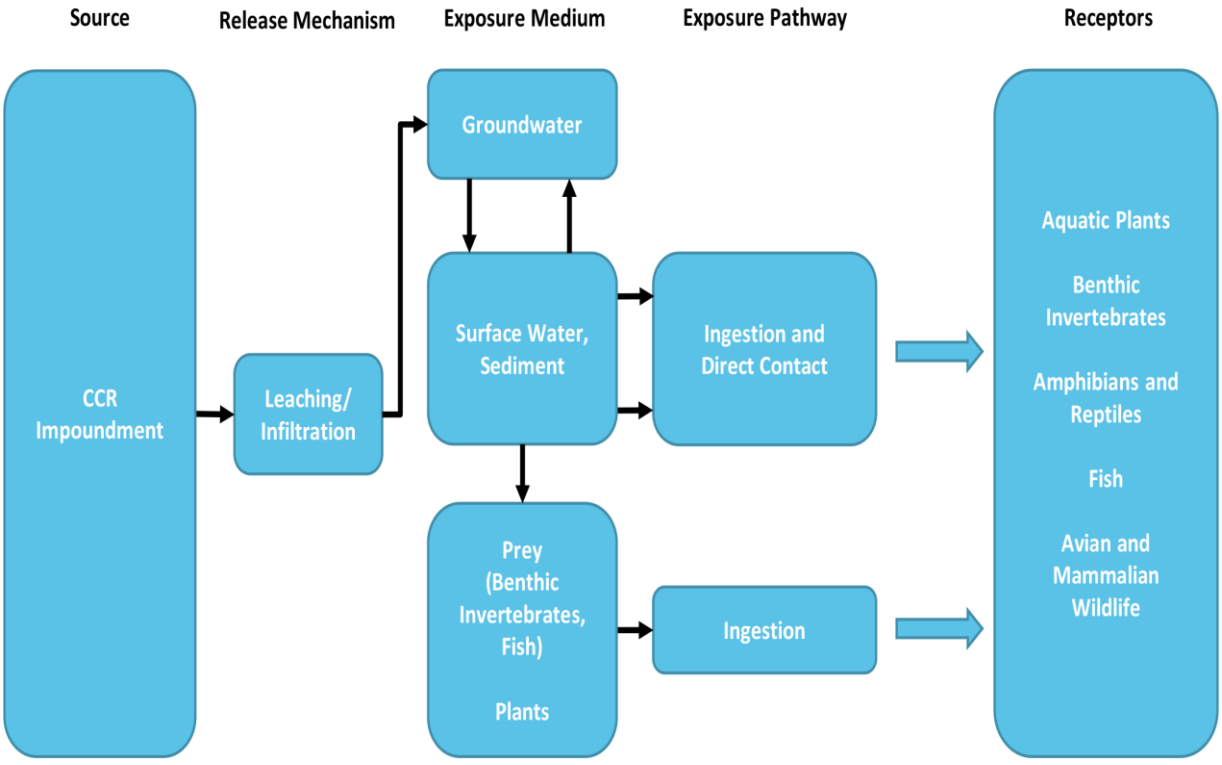

Figure 3.3 Ecological Conceptual Exposure Model. CCR = Coal Combustion Residual.

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 AP-associated wells, regardless of hydrostratigraphic unit. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with the AP or that they have been identified as potential groundwater exceedances. Using this approach, 11 COIs (arsenic, barium, beryllium, boron, chromium, cobalt, lead, lithium, thallium, radium-226+228, and fluoride) 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 chloride, 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 chloride, sulfate, and total dissolved solids are based on aesthetic quality. The secondary MCLs for chloride and sulfate (250 mg/L) are 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	0.0045	0.006	No
Arsenic	0.097	0.01	Yes
Barium	8.6	2	Yes
Beryllium	0.017	0.004	Yes
Boron	12	2	Yes
Cadmium	0.004	0.005	No
Chromium	0.59	0.1	Yes
Cobalt	0.29	0.006	Yes
Lead	0.27	0.0075	Yes
Lithium	0.85	0.04	Yes
Mercury	0.0018	0.002	No
Molybdenum	0.046	0.1	No
Selenium	0.019	0.05	No
Thallium	0.0026	0.002	Yes
Radionuclides (pCi/L)			
Radium-226+228	23	5	Yes
Other (mg/L, unless otherwise noted)			
Chloride	830	200	No[d]
Fluoride	10.2	4	Yes
Sulfate	570	400	No[d]
Total Dissolved Solids	2,600	1,200	No[e]

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 IL Part 845.600 GWPS (IEPA, 2021a).
(b) The IL 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.
(e) Total dissolved solids are not considered a COI because the MCL is based on aesthetic quality.

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) SWQS. IEPA SWQS are health-protective benchmarks for aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). The SWQS 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).[4]
- US EPA Region IV (2018) surface water Ecological Screening Values (ESVs) for hazardous waste sites.

Benchmarks from a United States Department of Energy (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 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 AP-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. Barium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, radium-226+228, chloride, and fluoride were identified as COIs for ecological receptors (Table 3.2).

[4] Hardness data are not available for the Illinois River 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	0.0045	0.19	US EPA R4 ESV	No
Arsenic	0.097	0.19	IEPA SWQC	No
Barium	8.6	5	IEPA SWQC	Yes
Beryllium	0.017	0.064	US EPA R4 ESV	No
Boron	12	7.6	IEPA SWQC	Yes
Cadmium	0.004	0.0011	IEPA SWQC	Yes
Chromium	0.59	0.21	IEPA SWQC	Yes
Cobalt	0.29	0.019	US EPA R4 ESV	Yes
Lead	0.27	0.020	IEPA SWQC	Yes
Lithium	0.85	0.44	US EPA R4 ESV	Yes
Mercury	0.0018	0.0011	IEPA SWQC	Yes
Molybdenum	0.046	7.2	US EPA R4 ESV	No
Selenium	0.019	1	IEPA SWQC	No
Thallium	0.0026	0.006	US EPA R4 ESV	No
Radionuclides (pCi/L)				
Radium-226+228	23	3	US DOE	Yes
Other (mg/L, unless otherwise noted)				
Chloride	830	500	IEPA SWQC	Yes
Fluoride	10.2	4	IEPA SWQC	Yes
Sulfate	570	NA	NA	No
Total Dissolved Solids	2,600	NA	NA	No

Notes:
AP = Ash Pond; COI = Constituent of Interest; ESV = Ecological Screening Value; GWPS = Groundwater Protection Standard; IEPA = Illinois Environmental Protection Agency; NA = Not Available; 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 IL Part 845.600 GWPS (IEPA, 2021a) that were detected in at least one groundwater sample from the 28 wells related to the Edwards AP.
(b) Ecological benchmarks are from the hierarchy of sources discussed in Section 3.3.2: IEPA SWQC (IEPA, 2019); US EPA R4 "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

One surface water sample was collected from the Illinois River adjacent to the Site; however, as discussed in Section 2.5, this sample is insufficient to evaluate the potential impact of the AP on the Illinois River. Therefore, to estimate the potential contribution to surface water (and sediment) from groundwater specifically associated with the AP, Gradient modeled concentrations in the Illinois River surface water and sediment from groundwater that may flow to the Illinois River for the detected human and ecological COIs (arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, thallium, radium-226+228, chloride, and fluoride). The constituents detected in groundwater above a 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 metal 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 to and mix with surface water.

The 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 AP-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 partition 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, Gradient 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).

The aquifer and surface water properties used to estimate the volume of groundwater flowing to the Illinois River 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 the Illinois River, 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. 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	Value	Notes/Source
Groundwater			
COI Concentration	mg/L	Constituent specific	Maximum detected concentration in groundwater.
Cross Section Area for the UA[a]	m^2	1,277	The length of the groundwater discharge zone was assumed to be equal to the length of the AP (*i.e.*, approximately 1,047 m). The thickness of the discharge zone was assumed to be equal to the maximum thickness of the UA (1.22 m) (Ramboll, 2021).
Hydraulic Gradient	m/m	0.004	Maximum average horizontal hydraulic gradient determined for the UA (Ramboll, 2021).
Hydraulic Conductivity of the UA	cm/s	0.00017	Geometric mean horizontal hydraulic conductivity for all UA wells (Ramboll, 2021).
Surface Water			
Surface Water Flow Rate	L/yr	5.3×10^{12}	Representative low flow (10^{th} percentile) discharge rate for the Illinois River at USGS Kingston Mines, Illinois, gauging station (USGS 05568500) (USGS, 2022).
Total Suspended Solids (TSS)	mg/L	105	TSS data from Illinois River inlet (Foth Infrastructure & Environment, LLC, 2017).
Depth of the Water Column	m	2.74	Illinois River bathymetry data (Bist LLC, 2022).
Suspended Sediment to Water Partition Coefficient	mg/L	Constituent specific	Values based on US EPA (2014).

Notes:
AP = Ash Pond; COI = Constituent of Interest; L/yr = Liter Per Year; UA = Uppermost Aquifer; US EPA = United States Environmental Protection Agency; USGS = United States Geological Survey.
(a) The cross-sectional area represents the area through which groundwater flows from the UA to the Illinois River.

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	2.77	Depth of water column (2.74 m, as indicated by Illinois River bathymetry data (Bist LLC, 2022) plus 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	0.29	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 Partitioning 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/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	0.097	2.7E+04	5.1E-09	6.9E-07
Barium	8.6	2.4E+06	4.5E-07	6.9E-05
Beryllium	0.017	4.7E+03	8.9E-10	2.1E-07
Boron	12	3.3E+06	6.3E-07	2.2E-06
Cadmium	0.0040	1.1E+03	2.1E-10	4.5E-08
Chromium	0.59	1.6E+05	3.1E-08	1.7E-04
Cobalt	0.29	7.9E+04	1.5E-08	2.5E-06
Lead	0.27	7.4E+04	1.4E-08	1.0E-05
Lithium	0.85	2.3E+05	4.4E-08	(a)
Mercury	0.0018	4.9E+02	9.4E-11	3.4E-07
Thallium	0.0026	7.1E+02	1.4E-10	1.2E-09
Radionuclides				
Radium-226+228	23	6.3E+06	1.2E-06	5.0E-03
Other				
Chloride	830	2.3E+08	4.3E-05	(a)
Fluoride	10.2	2.8E+06	5.3E-07	8.3E-05
Sulfate	570	1.6E+08	3.0E-05	(a)

Notes:
COI = Constituent of Concern; K_d = Equilibrium Partition Coefficient; pCi/L = PicoCuries Per Liter; pCi/kg = PicoCuries Per Kilogram.
(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.

3.4 Human Health Risk Evaluation

The section below presents the results of the human health risk evaluation for recreators (boaters, swimmers and anglers) along the Illinois River 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 swimming or boating. In addition, anglers could consume fish caught in the Illinois River. 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 swimming) 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, 2021c) 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).[5] 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, 2020a,b; ATSDR, 2010).

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 and water 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 ($1x10^{-5}$)
SF = Food ingestion slope factor (risk/pCi)
BAF = Bioaccumulation factor (L/kg-tissue)
F = Fish consumption rate (kg/day)

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 swimming. However, given that the measured and modeled COI surface water concentrations are orders of magnitude below 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 swimming and anglers consuming fish caught in the Illinois River.

[5] 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.

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	5.1E-09	2.5E-03	0.022	2.0	0.023	No	No
Barium	4.5E-07	8.0E-02	1.5	400	1.5	No	No
Beryllium	8.9E-10	NR	0.021	0.80	0.021	No	NA
Boron	6.3E-07	9.7E-02	467	1,400	700	No	No
Cadmium	2.1E-10	2.3E-04	0.0018	1.0	0.0019	No	No
Chromium	3.1E-08	7.3E-03	0.61	20	0.63	No	No
Cobalt	1.5E-08	NR	0.0035	2.1	0.0035	No	NA
Lead	1.4E-08	4.9E-03	0.015	0.015	0.015	No	No
Lithium	4.4E-08	NR	4.7	14	7.0	No	NA
Mercury	9.4E-11	1.5E-05	0.000053	0.40	0.000053	No	No
Thallium	1.4E-10	NR	0.0017	0.40	0.0017	No	NA
Radionuclides (pCi/L)							
Radium-226+228	1.2E-06	NR	1,000	1,000	87,413	No	NA
Other (mg/L)							
Chloride	4.3E-05	1.0E+02	NA	NA	NA	NA	NA
Fluoride	5.3E-07	2.3E-01	143	800	174	No	No
Sulfate	3.0E-05	6.5E+01	NA	NA	NA	NA	NA

Notes:

COI = Constituent of Interest; COPC = Constituent of Potential Concern; HTC = Human Threshold Criteria; NA = Not Analyzed or Not Applicable; NR = Not Reported; pCi/L = PicoCuries Per Liter.

(a) Measured concentrations are shown only for 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.

3.4.2 Recreators Exposed to Sediment

Recreational exposure to sediment may occur during boating and swimming activity along the Illinois River; 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, 2021b). 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, 2021b). These benchmarks were calculated using the recommended assumptions (*i.e.*, oral bioavailability, body weights, 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 a year (or two weekend days per week for 30 weeks a 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 four 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, 2021b). The sediment screening benchmarks were calculated based on a target hazard quotient of 1, or a target cancer risk of $1x10^{-5}$. 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 swimming or boating.

Table 3.7 Risk Evaluation for Recreators Exposed to Sediment

COI[a]	Modeled Sediment Concentration (mg/kg)	Recreator Sediment Screening Benchmark (mg/kg)	COPC
Total Metals (mg/kg)			
Arsenic	6.9E-07	6.8E+01	No
Barium	6.9E-05	2.7E+05	No
Beryllium	2.1E-07	2.7E+03	No
Boron	2.2E-06	2.7E+05	No
Chromium	1.7E-04	2.1E+06	No
Cobalt	2.5E-06	4.1E+02	No
Lead	1.0E-05	4.0E+02	No
Lithium	(a)	2.7E+03	NA
Thallium	1.2E-09	1.4E+01	No
Radionuclides (pCi/kg)			
Radium-226+228	5.0E-03	7.9E+03	No
Other (mg/kg)			
Fluoride	8.3E-05	5.5E+04	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; K_d = Equilibrium Partition Coefficient; 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 3.3), ecological receptors could be exposed to surface water and dietary items (*i.e.*, prey and plants) potentially impacted by identified COIs (barium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, radium-226+228, chloride, and fluoride).

3.5.1 Ecological Receptors Exposed to Surface Water

Screening Exposures: The ecological evaluation considered aquatic communities in the Illinois River 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 SWQS (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).[6]
- US EPA Region IV (2018) surface water ESVs for hazardous waste sites.
- US DOE benchmarks from the guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).

Risk Evaluation: The maximum measured or modeled COI concentrations in surface water were compared to the benchmarks protective of aquatic life (Table 3.8). The modeled surface water concentrations were below their respective benchmarks. In the measured data, iron, nickel, and zinc were slightly above their respective benchmarks (Table 3.8); however, they were not retained as COPCs. The measured concentrations for these three constituents are likely reflective of background concentrations in the Illinois River, as opposed to the AP, because they are all naturally occurring constituents that are not commonly associated with CCR (*i.e.*, none of the three constituents are listed in Appendix IV of the Federal CCR Rule [US EPA, 2015a]). Furthermore, the exceedance ratios (measured concentration divided by the benchmark) were very low for nickel (1.2) and zinc (1.03), thus, they are not expected to present an ecological risk. Iron was detected at 4.2 mg/L, *versus* an ecological benchmark of 1 mg/L; however, iron is ubiquitous in the environment and is not characteristic of impacts from CCR impoundments. Thus, none of the COIs evaluated are expected to pose an unacceptable risk to aquatic life in the Illinois River.

[6] Conservatisms associated with using a default hardness value are discussed in Section 3.6.

Table 3.8 Risk Evaluation of Ecological Receptors Exposed to Surface Water

COI	Maximum Surface Water Concentration		Ecological Freshwater Benchmark	Basis	COPC	
	Modeled	Measured			Based on Modeled Concentrations	Based on Measured Concentrations
Total Metals (mg/L)						
Barium	4.5E-07	8.0E-02	5.0	IEPA (2019)	No	No
Boron	6.3E-07	9.7E-02	7.6	IEPA (2019)	No	No
Cadmium	2.1E-10	2.3E-04	0.00093	IEPA (2019)	No	No
Chromium	3.1E-08	7.3E-03	0.18	IEPA (2019)	No	No
Cobalt	1.5E-08	NA	0.019	US EPA R4 (2018)	No	NA
Lead	1.4E-08	4.9E-03	0.016	IEPA (2019)	No	No
Lithium	4.4E-08	NA	0.44	US EPA R4 (2018)	No	NA
Mercury	9.4E-11	1.5E-05	0.0011	IEPA (2019)	No	No
Thallium	1.4E-10	NA	0.0060	US EPA R4 (2018)	No	NA
Radionuclides (pCi/L)						
Radium-226+228	1.2E-06	NA	3.4	US DOE (2019)	No	NA
Other (mg/L)						
Chloride	4.3E-05	1.0E+02	230	US EPA R4 (2018)	No	No
Fluoride	5.3E-07	2.3E-01	2.7	US EPA R4 (2018)	No	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; IEPA = Illinois Environmental Protection Agency; NA =Not Analyzed or Not Applicable; pCi/L = PicoCuries Per Liter; US DOE = United States Department of Energy; US EPA R4 = United States Environmental Protection Agency Region IV.

3.5.2 Ecological Receptors Exposed to Sediment

Screening Exposures: COIs in impacted groundwater flowing to the Illinois River 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.

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 (TECs) 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).[7] The no observed effect concentration (NOEC) of 38 mg/kg was used as a conservative benchmark for boron in the absence of an ESV (ECHA, 2019). Lithium, 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 1% of the sediment screening benchmark. Therefore, the modeled sediment concentrations attributed to potential contributions from Site groundwater are not expected to significantly contribute to ecological exposures in the Illinois River adjacent to the Site.

[7] The biota concentration guide (BCG) for sediment is 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 (US DOE, 2019).

Table 3.9 Risk Evaluation of Ecological Receptors Exposed to Sediment

COI	Modeled Sediment Concentration	ESV[a]	COPC	% of Benchmark
Total Metals (mg/kg)				
Barium	6.9E-05	20	No	0.00035%
Boron	2.2E-06	38[b]	No	0.000006%
Cadmium	4.5E-08	0.99	No	0.000005%
Chromium	1.7E-04	43	No	0.0004%
Cobalt	2.5E-06	50	No	0.000005%
Lead	1.0E-05	35.8	No	0.00003%
Lithium	-	-	-	-
Mercury	3.4E-07	0.18	No	0.0002%
Radionuclides (pCi/kg)				
Radium-226+228	5.0E-03	90,000[c]	No	0.0000056%
Other (mg/kg)				
Chloride	-	-	-	-
Fluoride	8.3E-05	NA	No	-

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; ESV = Ecological Screening Value; NA = Not Available; NOEC = No Observed Effect Concentration; 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) NOEC of 38 mg/kg was used as a conservative benchmark for boron in the absence of an ESV (ECHA, 2019).
(c) 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) guidance and IEPA's SWQS (IEPA, 2019) guidance were used to identify constituents with potential bioaccumulative effects.

Risk Evaluation: With the exception of mercury, the ecological COIs (barium, boron, cadmium, chromium, cobalt, lead, lithium, radium-226+228, chloride, and fluoride) 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.[8]

The modeled mercury concentration in surface water (9.4×10^{-11} mg/L) was below the mercury surface water ESV for wildlife (1.3×10^{-6} mg/L), and the modeled mercury concentration in sediment (3.4×10^{-7} 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

[8] 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.

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.

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 IL Part 845.600 constituents detected in groundwater samples collected from wells associated with the AP. However, it is possible that not all of the detected constituents are related specifically to the AP.
- 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 the AP groundwater, the detection limits were below the IL 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 to 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-AP-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 AP-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-AP-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 that 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. Gradient relied on US EPA's default hardness of 100 mg/L due to the lack of hardness data from the Illinois River adjacent to the Site. However, United States Geological Survey (USGS) data from Hennepin, Illinois, (approximately 55 miles upstream of the Site) reported hardness ranging from 200 to 370 mg/L, with a mean of 288 mg/L, based on samples collected in 1980-1997 (USGS, 2021). Increasing the hardness from 100 to 288 mg/L would increase the cadmium SWQS because benchmarks increase (become less stringent) with higher levels of hardness. Regardless of the hardness, the maximum modeled cadmium concentration is orders of magnitude below the SWQS.
- 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. 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 that 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 Site-related constituents in groundwater at the EPP in Peoria County, Illinois, between Mapleton and Bartonville. The CSM developed for the Site indicates that groundwater beneath the AP flows into the Illinois River 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 in the Illinois River who are exposed to surface water and sediment (boaters and swimmers) 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, and data from the one available surface water sample was 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 and ecological receptors resulting from CCR exposures associated with the AP 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 (boaters and swimmers) 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 boating or swimming in the Illinois River 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 concentration are not expected to pose an unacceptable risk to recreators exposed to sediment in the Illinois River 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 the Illinois River.
- 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, 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; 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. Exposure estimates assumed 100% metal bioavailability, which likely results in overestimates of exposure and risks. 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 the AP 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.

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Appendix A

Surface Water and Sediment Modeling

Gradient modeled concentrations in river surface water and sediment based on available groundwater data. First, we estimated the flow rate of constituents of interest (COIs) discharged to the Illinois River *via* groundwater. Then, we adapted United States Environmental Protection Agency (US EPA) indirect exposure assessment methodology (US EPA, 1998) in order to model surface water and sediment water concentrations in the Illinois River.

Model Overview

The groundwater flow to the river is represented by a one-dimensional, steady-state model. In this model, the groundwater plume migrates horizontally in the Uppermost Aquifer (UA) prior to flowing to the Illinois River. The groundwater flow entering the river is the flow going through a cross-sectional area that has a length equal to the Edwards Ash Pond (AP) and a width equal to the maximum saturated thickness of the UA. It was assumed that all the groundwater flowing through the UA would ultimately discharge to the Illinois River. The length of groundwater discharge zone was estimated using Google Earth Pro (Google, LLC, 2022).

The groundwater flow to the Illinois River mixes with the surface water in the river. The COIs entering the river *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. Further, Gradient ignored adsorption by subsurface soil and assumed that all the groundwater flowing through the UA was discharged into the river.

For each groundwater unit, the groundwater flow rate into the river 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 river 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 in milligrams per liter (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 1,277 m^2. The length of the discharge zone was estimated to be equal to the length of the AP (*i.e.*, approximately 1,047 m). The height of the discharge zone was assumed to be the maximum thickness of the UA (1.22 m) (Burns McDonnell, 2021). The hydraulic gradient was 0.004 m/m, based on the maximum average horizontal hydraulic gradient determined for the UA (Burns McDonnell, 2021). The hydraulic conductivity of the UA was 0.00017 cm/s, based on the geometric mean horizontal hydraulic conductivity for all UA wells (Burns McDonnell, 2021).

Surface Water and Sediment Concentration

Groundwater discharged into the river 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 we 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 [CCR]" (US EPA, 2014). This model describes the partitioning of constituents between surface water, suspended sediments, and benthic sediments based on equilibrium partition coefficients (K_d). 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 our 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)

For the Illinois River annual flow rate, Gradient conservatively used the low flow (10^{th} percentile) discharge rate of about 5,946 cubic feet per second (cfs) or 5.3 x 10^{12} L/yr based on the daily mean discharge rates measured at United States Geological Survey (USGS) station at Kingston Mines, IL (USGS 05568500) between 2017 and 2021 (USGS, 2022). The surface water parameters are presented in Table A.3.

The fraction of COIs 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 COIs 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:

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 105 mg/L measured at the Illinois River inlet (Foth Infrastructure & Environment, LLC, 2017)
0.000001	=	Units conversion factor
d_w	=	Depth of the water column (m). The depth of the water column was estimated as 2.74 m, based on bathymetry data for the Illinois River (Bist LLC, 2022).
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)
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 contaminant 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 (used the 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
UA	A	Cross-Sectional Area	1,277	m^2
UA	i	Hydraulic Gradient	0.004	m/m
UA	K	Hydraulic Conductivity	0.00017	cm/s

Notes:
Source: Hydraulic gradient and hydraulic conductivity values from Burns McDonnell (2021).
Cross-sectional area was estimated from Burns McDonnell (2021).
UA = Uppermost Aquifer.

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
Barium	2.5	3.16E+02	4	1.00E+04
Beryllium	2.8	6.31E+02	4.2	1.58E+04
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
Thallium	1.3	2.00E+01	4.1	1.26E+04
Radionuclides				
Radium-226+228	-	7.40E+03	-	7.40E+03
Other				
Chloride	-	-	-	-
Fluoride	2.2	1.58E+02	2.2	1.58E+02
Sulfate	-	-	-	-

Notes:
Source: US EPA (2014).
Lithium, chloride, 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	105	mg/L
V_{fx}	Surface Water Flow Rate	5.3×10^{12}	L/yr
d_b	Depth of Upper Benthic Layer (default)	0.03	m
d_w	Depth of Water Column	2.74	m
d_z	Depth of Water Body	2.77	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]	0.29	kg/m^2
M_S	Sediment Mass per Unit Area[b]	30	kg/m^2

Notes:
Source of default values: US EPA (2014).
Source of TSS data: Foth Infrastructure & Environment, LLC (2017).
(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, by the sediment bed particle concentration of 1 g/cm^3.

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	0.400	0.600	0.545
Barium	0.372	0.628	0.488
Beryllium	0.278	0.722	0.375
Boron	0.960	0.040	0.545
Cadmium	0.300	0.700	0.107
Chromium	0.016	0.984	0.070
Cobalt	0.356	0.644	0.131
Lead	0.110	0.890	0.019
Lithium	0.993	0.007	
Mercury	0.025	0.975	0.046
Thallium	0.912	0.088	0.431
Radionuclides			
Radium-226+228	0.021	0.979	0.563
Other			
Fluoride	0.369	0.631	0.984

Notes:
COI = Constituent of Concern.

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	0.097	2.7E+04	5.1E-09	6.9E-07
Barium	8.6	2.4E+06	4.5E-07	6.9E-05
Beryllium	0.017	4.7E+03	8.9E-10	2.1E-07
Boron	12	3.3E+06	6.3E-07	2.2E-06
Cadmium	0.0040	1.1E+03	2.1E-10	4.5E-08
Chromium	0.59	1.6E+05	3.1E-08	1.7E-04
Cobalt	0.29	7.9E+04	1.5E-08	2.5E-06
Lead	0.27	7.4E+04	1.4E-08	1.0E-05
Lithium	0.85	2.3E+05	4.4E-08	(a)
Mercury	0.0018	4.9E+02	9.4E-11	3.4E-07
Thallium	0.0026	7.1E+02	1.4E-10	1.2E-09
Radionuclides				
Radium-226+228	23	6.3E+06	1.2E-06	5.0E-03
Other				
Chloride	830	2.3E+08	4.3E-05	(a)
Fluoride	10.2	2.8E+06	5.3E-07	8.3E-05
Sulfate	570	1.6E+08	3.0E-05	(a)

Notes:

COI = Constituent of Concern; 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 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)	Water Only (mg/L)	Fish Only (mg/L)
Arsenic	44	NRWQC (2002)	0.010	0.00030	0.020	0.022	2.0	0.023
Barium	130	US EPA (2014)	2.0	0.20	4.0	1.5	400	1.5
Beryllium	19	NRWQC (2002)	0.0040	0.0020	0.0080	0.021	0.80	0.021
Boron	1	(c)	NC	0.20	14	467	1,400	700
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
Fluoride	2.3	US EPA (2014)	4.0	0.040	8.0	143	800	174
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
Thallium	116	NRWQC (2002)	0.0020	0.000010	0.0040	0.0017	0.40	0.0017

Human Health COI	BAF (L/kg-tissue)		MCL (pCi/L)	ADI (pCi/day)	Food Ingestion Slope Factor[d] (risk/pCi)	Human Threshold Criteria		
	SW-Fish	Basis				Water & Fish (pCi/L)	Water Only (pCi/L)	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				Cancer SL (mg/kg)	Non-Cancer								Recreator RSL Sediment (mg/kg)	Basis[a]
			TRV		Child + Adult			TRV		Child		Adult		Child	Adult		
			CSF (mg/kg-day)$^{-1}$	Dermal CSF (mg/kg-day)$^{-1}$	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)		RfD (mg/kg-day)	Dermal RfD (mg/kg-day)	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)	Non-Cancer SL (mg/kg)			
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
Barium	1	NA	NC	NC	NC	NC	NC	2.0E-01	1.4E-02	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Beryllium	1	NA	NC	NC	NC	NC	NC	2.0E-03	1.4E-05	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
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
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
Thallium	1	NA	NC	NC	NC	NC	NC	1.0E-05	1.0E-05	1.4E+01	NA	1.5E+02	NA	1.4E+01	1.5E+02	1.4E+01	nc
Other																	
Fluoride	1	NA	NC	NC	NC	NC	NC	4.0E-02	4.0E-02	5.5E+04	NA	5.8E+05	NA	5.5E+04	5.8E+05	5.5E+04	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)

$$\text{Intake Factor (IF)} = \frac{IR \times EF \times ED \times CF}{BW \times AT} =$$

			Non-Cancer		Cancer		
			7.3E-07 Child	6.8E-08 Adult	6.3E-08 Child	2.0E-08 Adult	Basis
	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)

$$\text{Intake Factor (IF)} = \frac{SA \times AF \times EF \times ED \times CF}{BW \times AT} =$$

			Non-Cancer		Cancer		
			2.2E-06 Child	1.2E-06 Adult	1.9E-07 Child	3.6E-07 Adult	Basis
	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

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.

Attachment B

Supporting Information for the Closure Alternatives Analysis – Ash Pond at the Edwards Power Plant

CLOSURE ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT

EDWARDS POWER PLANT
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

June 2022

PREPARED FOR:

Illinois Power Resources Generating, LLC
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Project Number: VST002-D22-001-01

TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND 1
1.1. Report Contents 1
2. CLOSURE-BY-REMOVAL INFORMATION 2
2.1. Evaluation of On-site Landfill Options 2
2.1.1. Feasibility of New On-site Landfill Construction 2
2.2. Potential CBR-Offsite Receiving Landfills 2
2.3. Potential CBR-Offsite Transportation Methods 3
2.3.1. Transportation by Rail 3
2.3.2. Transportation by Barge 3
2.3.3. Transportation by Truck 4
3. CLOSURE DESCRIPTION NARRATIVES 5
3.1. CIP 5
3.2. CBR-Offsite 6
4. CONSTRUCTION SCHEDULES 7
4.1. CIP 7
4.2. CBR-Offsite 7
5. MATERIAL, QUANTITY, COST, LABOR, AND MILEAGE ESTIMATES 8
5.1. Quantity and Cost Estimates 8
5.2. Labor and Mileage Estimates 8
5.3. Results 8
6. REFERENCES 9

FIGURES

Figure 1 Potential On-Site Landfill Locations
Figure 2 Off-site Landfill Locations and Transportation Routes
Figure 3 Final Grading Plan - Closure By Removal
Figure 4 Final Grading Plan - Closure In Place

TABLES

Table 1 Off-site Landfill Information

Table 2 Construction Schedule – CBR-Offsite

Table 3 Material, Quantity, Labor, and Mileage Estimates– CIP

Table 4 Material, Quantity, Labor, and Mileage Estimates – CBR-Offsite

1. INTRODUCTION AND BACKGROUND

Illinois Power Resources Generating, LLC (IPRG) is the owner of the coal-fired Edwards Power Plant (EPP), also referred to as Edwards Power Station, located at 7800 South Cilco Lane in Bartonville, Peoria County, Illinois. EPP is currently active but expected to cease operations no later than December 31, 2022. IPRG intends to complete closure of the Ash Pond at Edwards Power Plant (IEPA ID No. W1438050005-01, CCR Unit ID 301, and National Inventory of Dams Number IL50710). Closure of the Ash Pond will be performed under the relevant Illinois Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845) [1] and the United States Environmental Protection Agency (USEPA) CCR Rule [2].

Part 845, Section 854.710, requires a Closure Alternatives Analysis (CAA) to be completed to support the Closure Plan prepared pursuant to Section 845.720. The CAA for the Ash Pond at the Edwards Power Plant will be performed by Gradient Corporation (Gradient). IngenAE, LLC (IngenAE) has prepared this Closure Alternatives Analysis Supporting Information Report (Report) to provide information requested by Gradient to support their preparation of the CAA.

1.1. Report Contents

The following information is contained within this report:

- **Section 1** Introduction and Background

- **Section 2** Information related to closure-by-removal (CBR) including:
  - A feasibility evaluation of CBR using an on-site landfill (CBR-Onsite)
  - An evaluation of potential off-site landfill to receive the CCR for CBR-Offsite
  - A feasibility evaluation of CCR transportation for CBR-Offsite using over-the-road trucks, rail, and barging.

- **Section 3** An overview of the planned construction for both CIP and CBR-Offsite

- **Section 4** Project schedule for both CIP and CBR-Offsite

- **Section 5** Estimates for construction material quantities, labor, vehicle miles, and equipment miles, for both CIP and CBR-Offsite.

2. CLOSURE-BY-REMOVAL INFORMATION

Section 845.710(c)(1) requires the evaluation of complete removal of CCR (e.g., CBR), and Section 845.710(c)(2) requires the CAA to identify if the Power Plant has a landfill that can accept CCR, or if construction of 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 Landfill Options

2.1.1. Feasibility of New On-site Landfill Construction

The EPP property boundary was evaluated to consider if constructing a new on-site landfill was feasible. The entire property owned by IPRG, including Edwards Power Plant, the Ash Pond, and the Coal Yard is approximately 216 acres. The Ash Pond is approximately 102 acres, and the Edwards Power Plant and Coal Yard are approximately 60 acres of the total 216. Combined, these three areas encompass 162 acres of the 216, which leaves less than 60 acres available for potential development of a landfill. This is not enough space for the landfill, buffers, stormwater ponds, and other infrastructure that would be required. Furthermore, except for the Ash Pond and Power Plant, the rest of the owned property is within an area that recent FEMA resources designate as being subject to inundation by the 1-percent-annual-chance flood event. Therefore, there is no feasible area for constructing a landfill within the existing EPP property boundary. The property boundary is shown in **Figure 1**.

2.2. Potential CBR-Offsite Receiving Landfills

Potential off-site landfills suitable for disposing of approximately 4,391,000 CY of CCR from the Ash Pond were evaluated based on available disposal capacity and feasibility to transport CCR from the Ash Pond to the Landfill in a working day. The permitted landfill capacity was evaluated using IEPA's online Illinois Disposal Capacity report [3]. 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.

The closest permitted landfills to the site, by road miles, are Peoria City/County Landfill No. 2 in Brimfield, Illinois, Indian Creek Landfill #2 in Hopedale, Illinois, Envirofil of Illinois Inc. in Macomb, Illinois, and Clinton Landfill #3 in Clinton, Illinois.

Peoria City/County Landfill No. 2, located approximately 20 miles (one way) from EPP, is expected to close in 2023 and be replaced by Landfill No. 3, which is currently under development. Landfill No. 2 is operated by Waste Management and is jointly owned by the City and County of Peoria. It is used for disposal of waste generated within the City and County. Because it's disposal capacity will be exhausted in 2023, it was not considered a viable disposal option.

Future Peoria City/County Landfill No. 3 is currently under development. Since the landfill is not yet open, it currently does not provide any permitted disposal capacity. Once it is open, this new landfill will be

operated by GFL and owned by the City and County of Peoria. It is expected to provide approximately 13.4 million cubic yards of disposal capacity to continue to manage waste for the residents of the City and County of Peoria. The disposal of the 4,391,000 cubic yards of CCR from the EPP would consume approximately one-third of this proposed capacity. The addition of such a large new waste stream would present significant operational disruptions to any landfill, but such disruptions would be especially challenging for a landfill owned by a local government and intended to secure long-term waste disposal capacity for its residents.

The Indian Creek Landfill #2 is the preferred landfill due to its location being the closest to EPP (24 miles vs. 60 and 71 one-way miles, respectively), thereby resulting in reduced hauling mileage. All three remaining landfills have sufficient remaining permitted capacity to receive the approximate 4,391,000 CY of CCR, 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 all landfills is provided in **Table 1** and the location of each landfill relative to the EPP is provided in **Figure 2**.

2.3. Potential CBR-Offsite Transportation Methods

Section 845.710(c)(1) required CBR 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

Edwards Power Plant currently has a coal rail line encircling the Ash Pond, however, the rail loop is required to be demolished to complete closure of the Ash Pond. Additionally, there are no rail unloading facilities at any of the off-site disposal sites. Even if it is possible to construct new rail loading and unloading facilities; the design, permitting, and construction of these new rail facilities would likely delay closure of the ash pond by 5 to 7 years. 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.

Furthermore, a direct rail route from the Edwards Power Plant to the off-site landfills does not exist. Hauling CCR to Indian Creek Landfill would involve hauling by rail on tracks owned by three separate rail lines (Union Pacific Railroad, Illinois and Midland Railroad Inc., and Canadian National Rys.). Hauling CCR to Envirofil of Illinois Inc. would involve hauling over two separately owned rail lines (Keokuk Junction Ry. and BNSF Ry. Co.) and hauling CCR to Clinton Landfill would involve hauling over three separate rail lines (Union Pacific Railroad, Illinois and Midland Railroad Inc., and Canadian National Rys.). All these rail routes are shown on **Figure 2.** 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 the EPP Ash Pond, due to the need to design, permit, and construct additional unloading infrastructure, which would result in corresponding project schedule delays, and the number of rail lines which the CCR would need to be transported over.

2.3.2. Transportation by Barge

Edwards Power Plant is located along the Illinois River but does not currently have a barge loadout facility on-site. The Peoria Barge Terminal is located approximately 6 miles north of EPP by road, but this would require additional CCR handling and exposure to the surrounding environment. Design, permitting, and construction of a new on-site barge terminal would entail extensive project delays (again likely 5 to 7 years), and it may not be possible to achieve the required permits. Additionally, none of the potential off-

site landfills are located along the Illinois River or near a barge loadout facility so trucking will still be required to haul the CCR to the final disposal location. Therefore, transporting CCR by barge is unlikely to be a viable option for the EPP Ash Pond.

2.3.3. Transportation by Truck

Transporting CCR by truck will not require the construction of additional loading or unloading infrastructure at either the receiving landfills or the EPP. CCR would be loaded into trucks using heavy equipment at the Ash Pond. CCR will then be unloaded at the receiving landfill by the trucks directly. Since no construction is required, project delays related to coordination with other entities, design, and permitting are unlikely to be required. Therefore, transporting CCR by truck is a viable option for the EPP Ash Pond. Potential travel routes between the EPP and the potential off-site landfills are shown on **Figure 2**, although actual travel routes may vary.

3. 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 CIP and CBR-Offsite and are included within this section.

3.1. CIP

The CIP scenario entails relocating approximately 1,130,000 cubic yards of CCR from the high points, the northwest section of the Ash Pond, and the rail line embankment to the south end of the existing impoundment to achieve proposed final grades. The remaining 69 acres of the impoundment will then be capped with a final cover system. The new cover system will consist of, from bottom to top, a 40-mil LLDPE geomembrane, a geocomposite drainage layer, and 24 inches of soil including 6 inches of soil to support vegetative growth.

The proposed CIP final grading plan can be found in **Figure 4**. The major components of construction are described below:

- Free liquids will be removed from the Ash Pond by pumping free surface water and discharged at the existing NPDES Outfall. A temporary water management system will be constructed within the Ash Pond, including ditches and sumps. Collected liquids will be pumped to temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- As the phreatic surface is lowered to a safe level, heavy equipment will be mobilized to relocate CCR from the high points and northwest sections of the surface impoundment to the south end and other low areas of the surface impoundment to achieve the proposed grading plan.
- An earthen berm will be constructed of local silty soils to contain and stabilize the remaining CCR in the north and middle sections of the surface impoundment.
- Structures within the surface impoundment, including culverts, the spillway structure and outfall pipe, and a sewer forcemain, will be removed or closed in place
- A final cover system consisting of, from bottom to top, a 40-mil LLDPE geomembrane, a geocomposite drainage layer, and 24 inches of soil including 6 inches of soil to support vegetative growth, shall be constructed.
- Stormwater structures will be installed on the west side of the final cover system to direct stormwater to the existing drainage ditch on the west side of the CCR surface impoundment. The noncontact stormwater will discharge from the drainage ditch in accordance with the Plant's NPDES permit.
- Additional soil will be placed in the northwest relocation area and graded to promote positive drainage toward the proposed stormwater pond.
- The disturbed areas and newly placed soils will be fertilized and planted with native grasses or pollinators. If pollinators are proposed for the capped areas, the final grading plan shall be revised as required to increase the depth of the protective soil to accommodate the deeper roots of the pollinators.
- The development of a solar facility and/or battery storage within the project area is currently under consideration.

3.2. CBR-Offsite

A narrative description of how CBR-Offsite of the Ash Pond is provided below:

- Free liquids will be removed from the Ash Pond by pumping free surface water and discharged at the existing NPDES Outfall.
- A temporary water management system will be constructed within the Ash Pond, including ditches and sumps. The system will maintain the Ash Pond in an unwatered state by collecting contact stormwater during closure construction. Unwatering flows will be pumped to temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- CCR will be removed from the Ash Pond using mass mechanical excavation techniques. Much of the CCR will be saturated or nearly saturated, so mass excavation will include the use of dewatering trenches or other forms of passive dewatering to moisture-condition the CCR prior to handling. Dewatering flows will be pumped to the temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- CCR will be loaded into over-the-road dump trucks and hauled to the off-site receiving landfill.
- After CCR and CCR residue is removed, up to 1 foot of soil will be removed beneath this area. The subsoils will be visually observed for signs of CCR staining. If subsoils with CCR staining are observed, they will be removed and disposed in the off-site receiving landfill.
- The excavated former Ash Pond will be backfilled with an estimated volume of 900,000cy to achieve a minimum elevation of approximately 432 feet and sloped at 0.25% to promote drainage towards the existing west ditch. Backfill materials shall include clean soil material excavated from the borrow source.
- The top six inches of imported soil shall be capable of supporting vegetation. Disturbed surfaces shall be revegetated with native grasses or pollinators. Stormwater best management practices (BMPs) such as erosion control blankets and straw wattles 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 completed.

The CBR-Offsite final grading plan can be found in **Figure 3**.

4. 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 CIP and CBR-Offsite and are included within this section. Schedules were prepared using estimates of task durations based on IngenAE's experience, typical weather conditions at the site, and expected construction rates relative to estimated construction quantities.

4.1. CIP

The proposed closure completion schedule for CIP is provided in Section 2.6 of the Edwards Power Plant Ash Pond Final Closure Plan [4].

4.2. CBR-Offsite

The proposed closure construction schedule for CBR-Offsite is provided in **Table 2.**

5. MATERIAL, QUANTITY, COST, LABOR, AND MILEAGE ESTIMATES

5.1. Quantity and Cost Estimates

Section 845.720(d)(1) requires an analysis for each alternative to be prepared in accordance with the Class 4 standards of the Association for the Advancement of Cost Engineering (AACE) [5]. Analyses for both CIP and CBR-Offsite were prepared in accordance with the AACE Class 4 standards, utilizing the following approach:

- Major construction components and line-items were identified, in accordance with the narrative closure description (**Section 3**).
- Construction quantities were estimated based on volume estimates, area estimates, and proposed construction schedules (**Section 4**).
- Soil fill was assumed to come from off-site borrow sources located within 4 miles of the site, as limited borrow soil is expected to be available at EPP.

5.2. Labor and Mileage Estimates

In addition to construction schedule and quantity estimates, IngenAE also prepared estimates of construction labor hours, equipment usage, and haul truck mileage. These estimates were prepared using the following approach:

- For line items where RSMeans Heavy Construction Cost Data [6] was utilized , the corresponding RSMeans crew size, equipment description, and daily output were utilized to estimate the total number of man-hours and equipment hours.
- For line items where RSMeans data was unavailable, the crew size, equipment description, and daily output were estimated based on IngenAE's experience.
- 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.

5.3. Results

The detailed labor and mileage estimates for CIP and CBR-Offsite are provided in **Tables 3** and **4**, respectively.

6. 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] 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,” 2015.

[3] Illinois Environmental Protection Agency, “Illinois Landfill Disposal Capacity Report,” August 2021.

[4] IngenAE, LLC, “Final Closure Plan, Edwards Power Plant, Ash Pond,” St. Louis, Missouri, March 2022.

[5] AACE International, “Recommended Practice 18R-97: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries,” 2020.

[6] RSMeans, “Heavy Construction Costs with RSMeans Data,” Gordian, 2021.

FIGURES

N

0' 300' 600'

Notes:

1. No onsite landfill is shown because outside of the Ash Pond and Power Plant, the rest of the owned property is within an area that recent FEMA resources designate as being subject to inundation by the 1-percent-annual-chance flood event.

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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

EDWARDS POWER PLANT ASH POND CONCEPTUAL CLOSURE ALTERNATIVES

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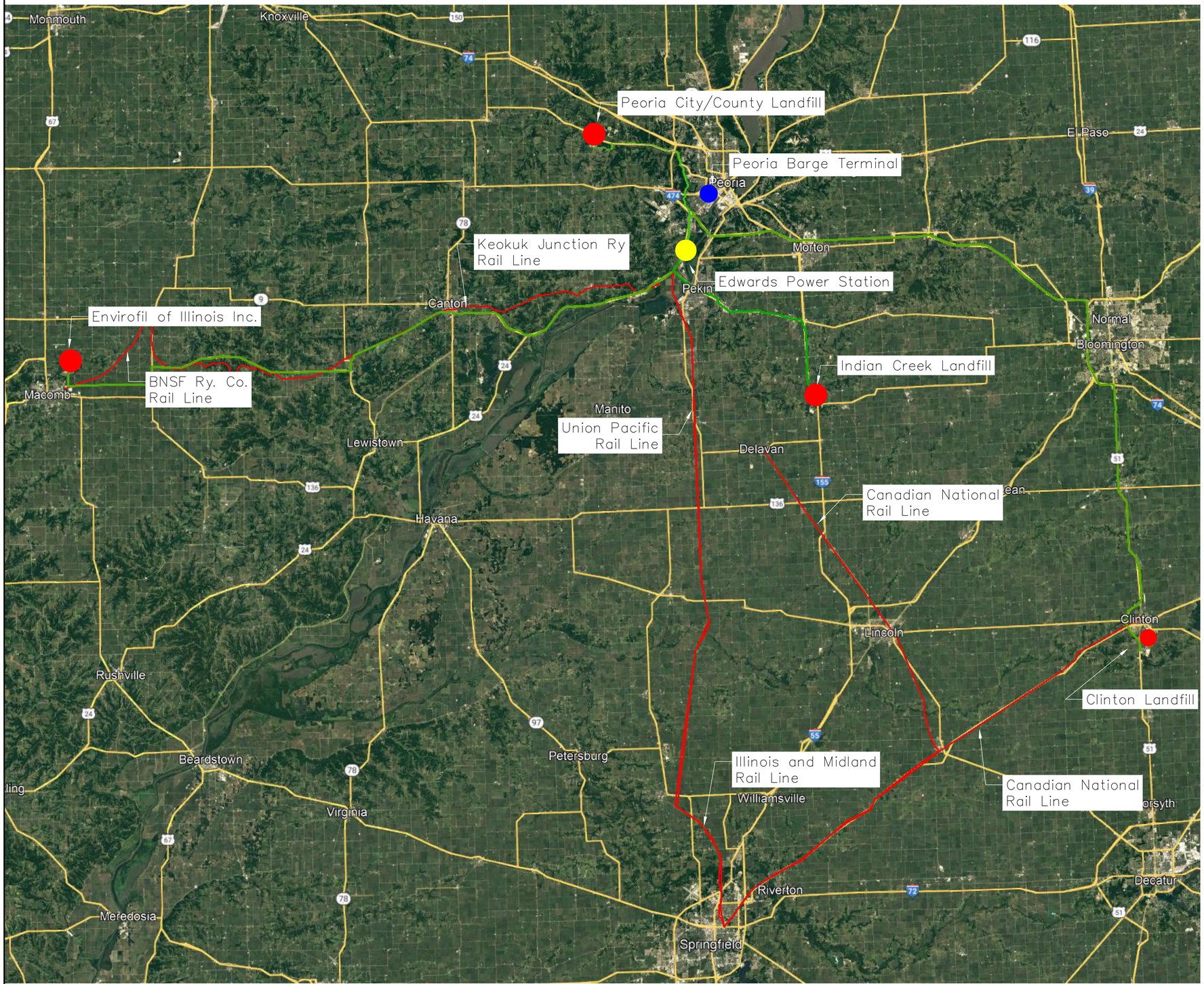
Drawing Name:

POTENTIAL ONSITE LANDFILL LOCATIONS

Date: 6/14/2022	Project No.
Type: SITE	Figure No. 1
Drawn By: MC	
Approved By: BH	
Scale: AS NOTED	



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0 1 2
MILES

LEGEND

- EDWARDS POWER PLANT
- POTENTIAL OFFSITE LANDFILL
- EXISTING BARGE TERMINAL
- POTENTIAL RAIL HAUL ROUTE
- POTENTIAL TRUCK HAUL ROUTE
- HIGHWAY

NOTES

1.Imagery and basemap from Google Earth Pro (2021)
2. Railways from Illinois Road Map (2018) by Illinois Department of Transportation

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Drawing Name:

OFFSITE LANDFILL TRANSPORTATION ROUTES

Date: 6/14/2022	Project No.
Type: SITE	Drawing No. 2
Drawn By: MC	
Approved By: BH	
Scale: AS NOTED	

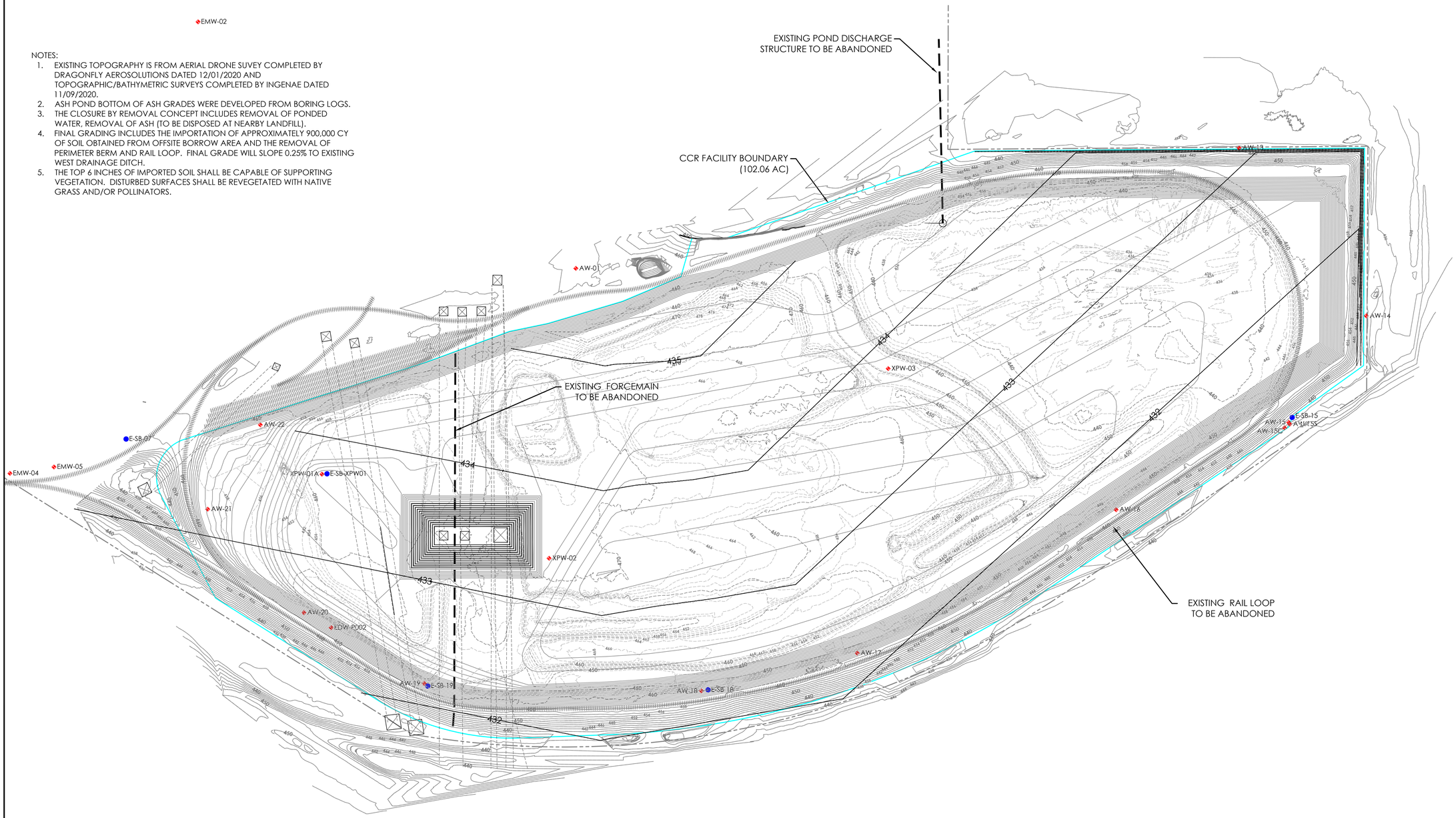
LEGEND

- BOTTOM OF ASH CONTOUR (2' INTERVAL)
- BOTTOM OF ASH CONTOUR (10' INTERVAL)
- RESTRICTED USE BOUNDARY
- CCR FACILITY BOUNDARY
- PROPOSED FINAL GRADE CONTOUR (2' INTERVAL)
- PROPOSED FINAL GRADE CONTOUR (10' INTERVAL)
- WELL
- BORING

EMW-02

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. ASH POND BOTTOM OF ASH GRADES WERE DEVELOPED FROM BORING LOGS.
3. THE CLOSURE BY REMOVAL CONCEPT INCLUDES REMOVAL OF PONDED WATER, REMOVAL OF ASH (TO BE DISPOSED AT NEARBY LANDFILL).
4. FINAL GRADING INCLUDES THE IMPORTATION OF APPROXIMATELY 900,000 CY OF SOIL OBTAINED FROM OFFSITE BORROW AREA AND THE REMOVAL OF PERIMETER BERM AND RAIL LOOP. FINAL GRADE WILL SLOPE 0.25% TO EXISTING WEST DRAINAGE DITCH.
5. THE TOP 6 INCHES OF IMPORTED SOIL SHALL BE CAPABLE OF SUPPORTING VEGETATION. DISTURBED SURFACES SHALL BE REVEGETATED WITH NATIVE GRASS AND/OR POLLINATORS.



0' 150' 300'

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Project Name & Location:

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Drawing Name:

FINAL GRADING PLAN - CLOSURE BY REMOVAL

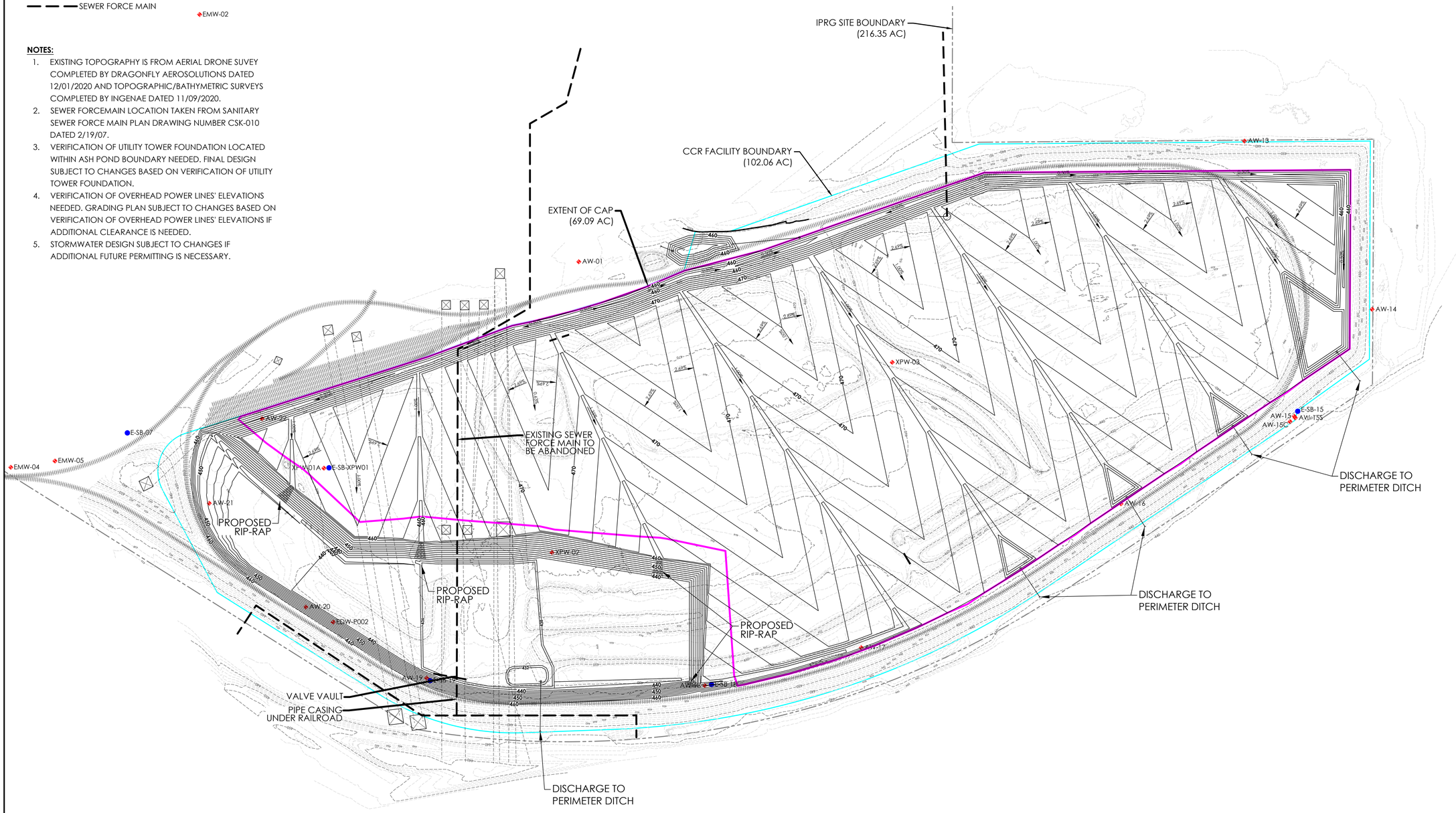
Date: 4/20/2022	Project No.
Type: PLAN	Figure No. 3
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN
- EMW-02

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.
5. STORMWATER DESIGN SUBJECT TO CHANGES IF ADDITIONAL FUTURE PERMITTING IS NECESSARY.



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Drawing Name:

FINAL GRADING PLAN - CLOSURE IN PLACE

Date: 6/30/2022	Project No.
Type: PLAN	Figure No. 4
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

TABLES

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) [3]	2020 Remaining Capacity Reported (in-place CY) [3]
Peoria City/County Landfill #2	City and County of Peoria	Brimfield, IL	20	226,415	747,562
Peoria City/County Landfill #3	City and County of Peoria	Brimfield, IL	20	-	13,400,000*
Indian Creek Landfill #2	GFL Environmental	Hopedale, IL	24	399,120	12,547,615
Envirofil of Illinois Inc.	Waste Management	Macomb, IL	60	97,327	7,690,440
Clinton Landfill #3	GFL Environmental	Clinton, IL	71	558,567	25,685,737

*** Capacity of Peoria City/County Landfill #3 was estimated from the January 19, 2022 Peoria City/County Landfill committee meeting.**

Table 2: Construction Schedule – CBR-Offsite

Milestone	Timeframe (Estimate)
Agency Coordination and Permit Approvals. • State permits for dewatering, land disturbance, stormwater discharge, and dam modifications.	6 to 12 months after the approval of the Final Closure Plan.
Dewater and Stabilize CCR. • Dewater surface impoundment. • Stabilize dewatered CCR.	18 to 24 months after approved permits.
CCR Ash Removal Offsite • Mass excavation and disposal of CCR from surface impoundment and rail line embankment to an approved landfill (assume hauling operations occur 7-9 months out of the year). • Removal and decontamination of the subsoils (approximately 1 foot). • Removal of existing structures. • Remove of rail line.	15 to 19 years after the completion of the dewatering and stabilization of the CCR subgrade. Can be completed in conjunction with dewatering and stabilization of CCR.
Placement of Vegetative Soil Backfill. • Backfill the surface impoundment with minimum of 6 inches of vegetative soil. • Install stormwater structures.	3 to 4 months after subsoils removal and decontamination. Can be completed in conjunction with the removal and decontamination of the subsoils.
Site Restoration. • Lime, Seed, fertilize, and mulch the final protective layer. • Demobilization.	2 to 4 months after the completion of the vegetative soil backfill. Can be completed in conjunction with the placement of the vegetative soils.
Timeframe to Complete Closure	**18 to 23 years**

Table 3: Material, Quantity, Labor, and Mileage Estimates - CIP (1 of 2)

TABLE 3
SCENARIO 1 - CLOSURE IN PLACE
MATERIAL, QUANTITY, LABOR, AND MILEAGE ESTIMATES
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage
Mobilization/Demobilization		**Lump Sum**	**1**						
Survey		**Lump Sum**	**1**						
Site and Borrow Area Preparation/Remediation		**Lump Sum**	**1**						
	Construction Trailers and Storge	Month	40	2 Skwk					
	Stormwater Controls	Linear feet	9,000	B62	333	2 Laborers, 1 Light Equipment Operator	110	1 Loader, 1 Skid Steer, 30 H.P.	
	Stripping Borrow	Cubic Yds	40,400	B10B	202	.5 Laborer, 1 Medium Equipment Operator	135	1 Dozer, 200 H.P.	
	Dust Control	Day	560	B59	4,480	1 Heavy Truck Driver	4,480	1 Truck Tractor, 220 H.P., 1 Water Tank Trailer, 5,000 Gal.	44,800
	Road Maintenance	Day	200	B86A	1,600	1 Medium Equipment Operator	1,600	1 Grader, 30,000 lbs	16,000
Standing Water Removal - Ponds		**Day**	**49**	B-10K	588	.5 Laborer, 1 Medium Equipment Operator	394	6" Water Pump with Suction and Discharge Hoses	
Ash Pond Dewatering		**Day**	**306**	B-10K	3,672	.5 Laborer, 1 Medium Equipment Operator	2,460	6" Water Pump with Suction and Discharge Hoses	
Installation of Dewatering Trenches		**BCY**	**51,250**	B12D	461	1 Laborer, 1 Crane Operator	231	1 Excavator, 3.5 Cyds	
Demolition of Rail Line		**Lump Sum**	**1**						
	Track and Tie Removal	Linear Feet	10,300	B13	1,751	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	250	1 Crane, 25 Tons	
	Ballast Removal	Cubic Yds	22,900	B14	2,198	1 Labor Foreman, 4 Laborers, 1 Light Equipment Operator	366	1 Backhoe Loader, 48 H.P.	
Demolition of Structures		**Lump Sum**	**1**						
	Demolition of Outfall Structure	LS	1	B21C, B69	151	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	22	1 Boom Crane, 90 Tons	
	Demolition of Leachate Line	LS	1		8	2 Laborers	4	1 Truck	
	Demolition of Culverts	BCY	1350	B12F	96	1 Laborer, 1 Crane Operator	48	1 Excavator, .75 Cyds	
Ash Relocation - Rail Line Embankment Ash		**Cubic Yds**	**210,000**						
	Excavate and Load Ash Subgrade	Cubic Yds	210,000	B14A	840	.5 Laborer, 1 Crane Operator	563	1 Excavator, 4.5 Cyds	
	Haul Ash Subgrade	Cubic Yds	210,000	B34G	2,100	1 Heavy Truck Driver	2,100	1 Dump Truck (Off Road), 65 Tons	12,400
	Place Ash Subgrade	Cubic Yds	210,000	B10B	2,520	.5 Laborer, 1 Medium Equipment Operator	1,688	1 Dozer, 200 H.P.	
	Compact Ash Subgrade	Cubic Yds	210,000	B10Y	1,050	.5 Laborer, 1 Medium Equipment Operator	704	1 Vibratory Roller, 12 Tons	
Ash Relocation - Northwest Area/High Points		**Cubic Yds**	**1,130,000**						
	Excavate and Load Ash Subgrade	Cubic Yds	1,130,000	B14A	4,520	.5 Laborer, 1 Crane Operator	3,028	1 Excavator, 4.5 Cyds	
	Haul Ash Subgrade	Cubic Yds	1,130,000	B34G	11,300	1 Heavy Truck Driver	11,300	1 Dump Truck (Off Road), 65 Tons	66,600
	Place Ash Subgrade	Cubic Yds	1,130,000	B10B	13,560	.5 Laborer, 1 Medium Equipment Operator	9,085	1 Dozer, 200 H.P.	
	Compact Ash Subgrade	Cubic Yds	1,130,000	B10Y	5,650	.5 Laborer, 1 Medium Equipment Operator	3,786	1 Vibratory Roller, 12 Tons	
Construction of Northwest Berm		**Cubic Yds**	**410,000**						
	Purchase Offsite Clay Soils	Cubic Yds	410,000						
	Excavate and Load Clay from Borrow	Cubic Yds	410,000	B14A	1,640	.5 Laborer, 1 Crane Operator	1,099	1 Excavator, 4.5 Cyds	
	Haul Clay from Borrow	Cubic Yds	410,000	B34C	9,430	1 Heavy Truck Driver	9,430	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	99,400
	Place Clay from Borrow	Cubic Yds	410,000	B10B	4,920	.5 Laborer, 1 Medium Equipment Operator	3,296	1 Dozer, 200 H.P.	
	Compact Lifts of clay from Borrow	Cubic Yds	410,000	B10G	3,690	.5 Laborer, 1 Medium Equipment Operator	2,472	1 Sheepsfoot Roller, 240 H.P.	
Subsoil Overexcavation		**Cubic Yards**	**53,250**						
	Excavation and Load Subsoils	Cubic Yds	53,250	B14A	213	.5 Laborer, 1 Crane Operator	143	1 Excavator, 4.5 Cyds	
	Haul subsoils to Landfill	Cubic Yds	53,250	B34C	5,112	1 Heavy Truck Driver	5112	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	161,500
	Tipping Fee at Landfill	Tons	28,800						

Table 3: Material, Quantity, Labor, and Mileage Estimates - CIP (2 of 2)

TABLE 3
SCENARIO 1 - CLOSURE IN PLACE
MATERIAL, QUANTITY, LABOR, AND MILEAGE ESTIMATES
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage
Geomembrane Installation		**Square Feet**	**3,310,000**	B63B	56,270	1 Labor Foreman, 2 Laborers, 1 Light Equipment Operator	14,068	1 Loader, 1 Skid Steer, 30 H.P.	
Geocomposite Installation		**Square Feet**	**3,310,000**	B63B	13,240	1 Labor Foreman, 2 Laborers, 1 Light Equipment Operator	3,310	1 Loader, 1 Skid Steer, 30 H.P.	
Anchor Trench Installation		**Linear Feet**	**8,462**						
	Excavation	Cubic Yds	1,260	B11C	135	1 Laborer, 1 Medium Equipment Operator	67	1 Backhoe Loader, 48 H.P.	
	Backfilling	Cubic Yds	1,260	B10R	38	.5 Laborer, 1 Medium Equipment Operator	25	1 Front End Loader, 1 Cyd	
	Compaction	Cubic Yds	1,260	A1D	72	1 Building Laborer	72	1 Vibrating Plate, 18"	
Protective Soil Layer		**Cubic Yds**	**566,000**						
	Purchase Offsite Protective Soils	Cubic Yds	566,000						
	Excavate and Load Protective Soil from Borrow	Cubic Yds	566,000	B14A	2,264	.5 Laborer, 1 Crane Operator	1,517	1 Excavator, 4.5 Cyds	
	Haul Protective Soil from Borrow	Cubic Yds	566,000	B34C	13,000	1 Heavy Truck Driver	13,000	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	137,212
	Place Protective Soil from Borrow	Cubic Yds	566,000	B10B	6,792	.5 Laborer, 1 Medium Equipment Operator	4,551	1 Dozer, 200 H.P.	
Fertilizing and Seeding		**MSF**	**5,200**						
	Lime	MSF	5,200	B66	57	1 Light Equipment Operator	57	1 Loader-Backhoe, 40 H.P.	
	Fertilizing	MSF	5,200	B66	57	1 Light Equipment Operator	57	1 Loader-Backhoe, 40 H.P.	
	Seeding	MSF	5,200	B66	801	1 Light Equipment Operator	801	1 Loader-Backhoe, 40 H.P.	
	Mulch	MSF	5,200	B65	156	1 Laborer, 1 Light Truck Driver,	156	1 Large Power Mulcher, 1 Flatbed Truck, 1.5 Ton	
Stormwater/Erosion Controls		**Lump Sum**	**1**						
	Riprap Letdowns	SYD	2,500	B13	2,643	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	378	1 Crane, 25 Tons	
	Geotextile	SYD	2,500	2 Clab	15	2 Laborers	0	None	
	Stormwater Channel Erosion Blanket	SYD	25,000	B80A	1,175	3 Laborers	388	1 Flatbed Truck, 3 Ton	
	Stormwater Outfalls	Lump Sum	5	B3A	1,000	4 Laborers, 1 Light Equipment Operator	200	1 Excavator, 1.5 Cyds	
Access Road		**Linear Feet**	**2,800**						
	Material	Cubic Yds	850						
	Hauling	Cubic Yds	850	B34C	24	1 Heavy Truck Driver	24	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	208
	Placement and Compaction	SYD	2,500	B32	20	1 Laborer, 3 Medium Equipment Operators	15	1 Grader, 30,000 Lbs, 1 Tandem Roller, 10 Tons, 1 Dozer, 200 H.P.	
Construction Quality Assurance (CQA)		**Lump Sum**	**1**						
Additional Construction		**Lump Sum**	**1**						
Total Hours/Miles					**179,843**		**102,591**		**538,120**

Table 4: Material, Quantity, Labor, and Mileage Estimates - CBR-Offsite (1 of 2)

TABLE 4
SCENARIO 2 - CLOSURE BY REMOVAL OFFSITE
MATERIAL, QUANTITY, LABOR, AND MILEAGE ESTIMATES
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage
Mobilization/Demobilization		**Lump Sum**	**1**						
Survey		**Lump Sum**	**1**						
Site Area Preparation/Remediation		**Lump Sum**	**1**						
	Construction Trailers and Storge	Month	40	2 Skwk					
	Stormwater Controls	Linear feet	9,000	B62	333	2 Laborers, 1 Light Equipment Operator	110	1 Loader, 1 Skid Steer, 30 H.P.	
	Stripping Borrow	Cubic Yds	5,700	B10B	29	.5 Laborer, 1 Medium Equipment Operator	19	1 Dozer, 200 H.P.	
	Dust Control	Day	560	B59	4,480	1 Heavy Truck Driver	4,480	1 Truck Tractor, 220 H.P., 1 Water Tank Trailer, 5,000 Gal.	44,800
	Road Maintenance	Day	200	B86A	1,600	1 Medium Equipment Operator	1,600	1 Grader, 30,000 lbs	16,000
Standing Water Removal - Ponds		**Day**	**49**	B-10K	588	.5 Laborer, 1 Medium Equipment Operator	394	6" Water Pump with Suction and Discharge Hoses	
Ash Pond Dewatering		**Day**	**1,200**	B-10K	14,400	.5 Laborer, 1 Medium Equipment Operator	9,648	6" Water Pump with Suction and Discharge Hoses	
Installation of Dewatering Trenches		**BCY**	**51,250**	B12D	461	1 Laborer, 1 Crane Operator	231	1 Excavator, 3.5 Cyds	
Demolition of Rail Line		**Lump Sum**	**1**						
	Track and Tie Removal	Linear Feet	10,300	B13	1,751	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	250	1 Crane, 25 Tons	
	Ballast Removal	Cubic Yds	22,900	B14	2,198	1 Labor Foreman, 4 Laborers, 1 Light Equipment Operator	366	1 Backhoe Loader, 48 H.P.	
Demolition of Structures		**Lump Sum**	**1**						
	Demolition of Outfall Structure	LS	1	B21C, B69	151	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	22	1 Boom Crane, 90 Tons	
	Demolition of Leachate Line	LS	1		8	2 Laborers	4	1 Truck	
	Demolition of Culverts	BCY	1350	B12F	96	1 Laborer, 1 Crane Operator	48	1 Excavator, .75 Cyds	
Ash Removal Offsite		**Cubic Yds**	**4,391,000**						
	Excavate and Load Ash Subgrade	Cubic Yds	4,391,000	B14A	17,564	.5 Laborer, 1 Crane Operator	11,768	1 Excavator, 4.5 Cyds	
	Haul Ash Subgrade to Landfill	Cubic Yds	4,391,000	B34C	421,536	1 Heavy Truck Driver	421,536	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	13,306,061
	Tipping Fee at Landfill	Tons	2,371,140						
Protective Soil Layer		**Cubic Yds**	**900,000**						
	Purchase Offsite Protective Soils	Cubic Yds	900,000						
	Excavate and Load Protective Soil from Borrow	Cubic Yds	900,000	B14A	3,600	.5 Laborer, 1 Crane Operator	2,412	1 Excavator, 4.5 Cyds	
	Haul Protective Soil from Borrow	Cubic Yds	900,000	B34C	20,700	1 Heavy Truck Driver	20,700	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	218,182
	Place Protective Soil from Borrow	Cubic Yds	900,000	B10B	10,800	.5 Laborer, 1 Medium Equipment Operator	7,236	1 Dozer, 200 H.P.	
Clay From Berm for Interior		**Cubic Yds**	**405,000**		12,555	1.5 Labs, I Crane Opr, 2 Med Equipment Oprs, I Heavy Truck Driver	9,793	1 Exc 4.5 Cyds, 1 Dump Truck (Off Road), 1 200 H.P. Dozer, 1 Vib Roller	
Fertilizing and Seeding		**MSF**	**4,750**						
	Lime	MSF	4,750	B66	52	1 Light Equipment Operator	52	1 Loader-Backhoe, 40 H.P.	
	Fertilizing	MSF	4,750	B66	52	1 Light Equipment Operator	52	1 Loader-Backhoe, 40 H.P.	
	Seeding	MSF	4,750	B66	732	1 Light Equipment Operator	732	1 Loader-Backhoe, 40 H.P.	
	Mulch	MSF	4,750	B65	143	1 Laborer, 1 Light Truck Driver	143	1 Large Power Mulcher, 1 Flatbed Truck, 1.5 Ton	

Table 4: Material, Quantity, Labor, and Mileage Estimates - CBR-Offsite (2 of 2)

TABLE 4
SCENARIO 2 - CLOSURE BY REMOVAL OFFSITE
MATERIAL, QUANTITY, LABOR, AND MILEAGE ESTIMATES
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage
Stormwater Outfalls		**Lump Sum**	**2**	B3A	400	4 Laborers, 1 Light Equipment Operator	80	1 Excavator, 1.5 Cyds	
Construction Quality Assurance (CQA)		**Lump Sum**	**1**						
Additional Construction		**Lump Sum**	**1**						
Total Hours/Miles					**514,229**		**491,675**		**13,585,042**

Appendix B

Final Closure Drawings

ILLINOIS POWER RESOURCES GENERATING, LLC.
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS
ASH POND
PART 845 CONSTRUCTION DRAWINGS

PREPARED BY:

IngenAE

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Earth City, MO 63045
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LIST OF DRAWINGS

1	-	TITLE SHEET
2	-	SITE LOCATION PLAN
3	-	EXISTING CONDITIONS
4	-	SEPARATION BERM
5	-	TOP OF ASH GRADING PLAN
6	-	FINAL COVER & STORMWATER PLAN
7	-	SOLAR PLAN
8	-	SECTIONS
9	-	DETAILS
10	-	STORMWATER DETAILS
11	-	SOLAR DETAILS

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Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

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Drawing Name:

TITLE SHEET

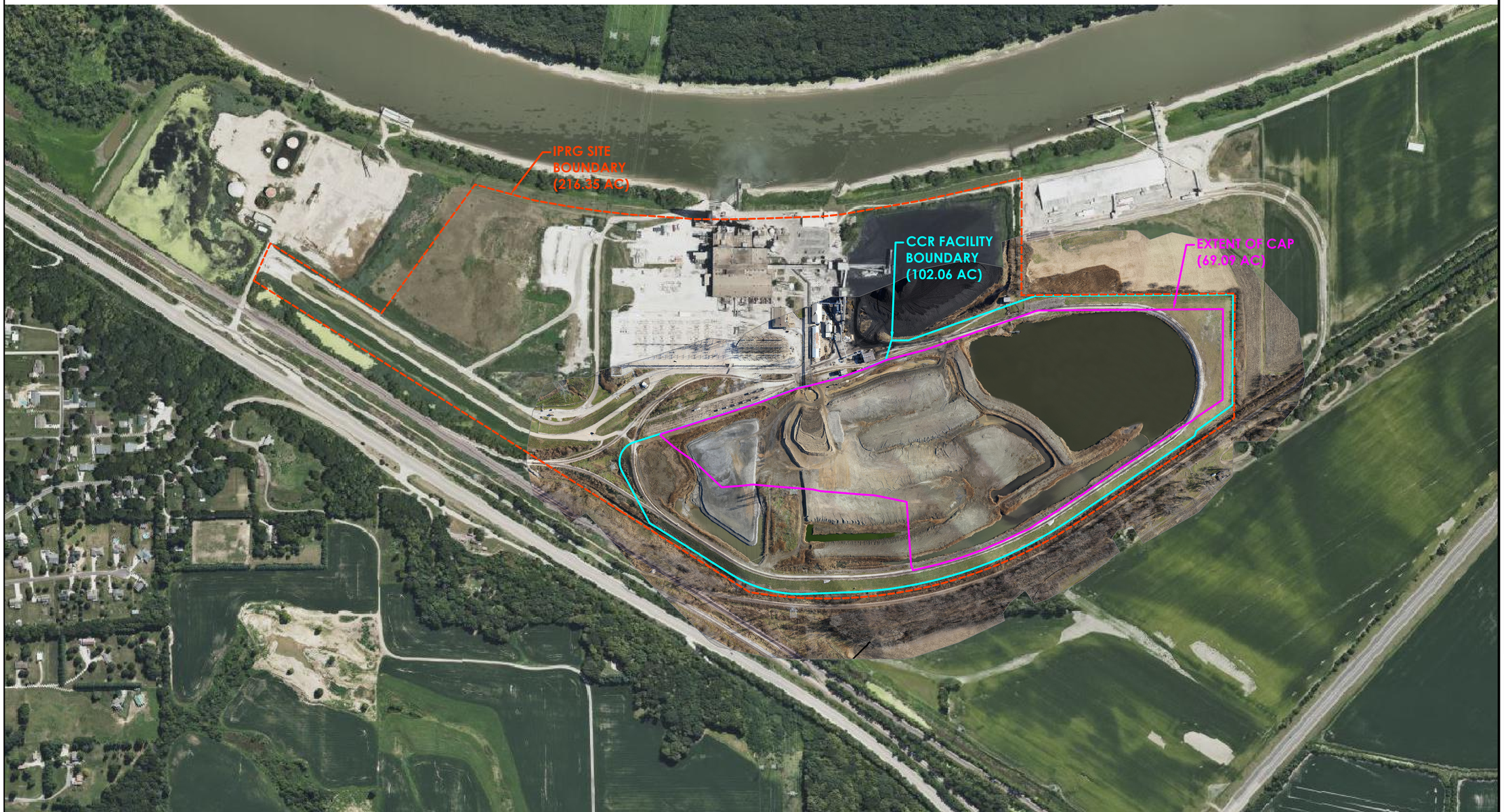
Date: 6/30/2022	Project No.
Type: TITLE	Drawing No. 1
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- IPRG SITE BOUNDARY
- CCR FACILITY BOUNDARY
- EXTENT OF CAP

NOTES:

1. AERIAL PROVIDED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020.



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Drawing Name:

SITE LOCATION PLAN

Date:	Project No.
6/30/2022	
Type: PLAN	Drawing No. 2
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

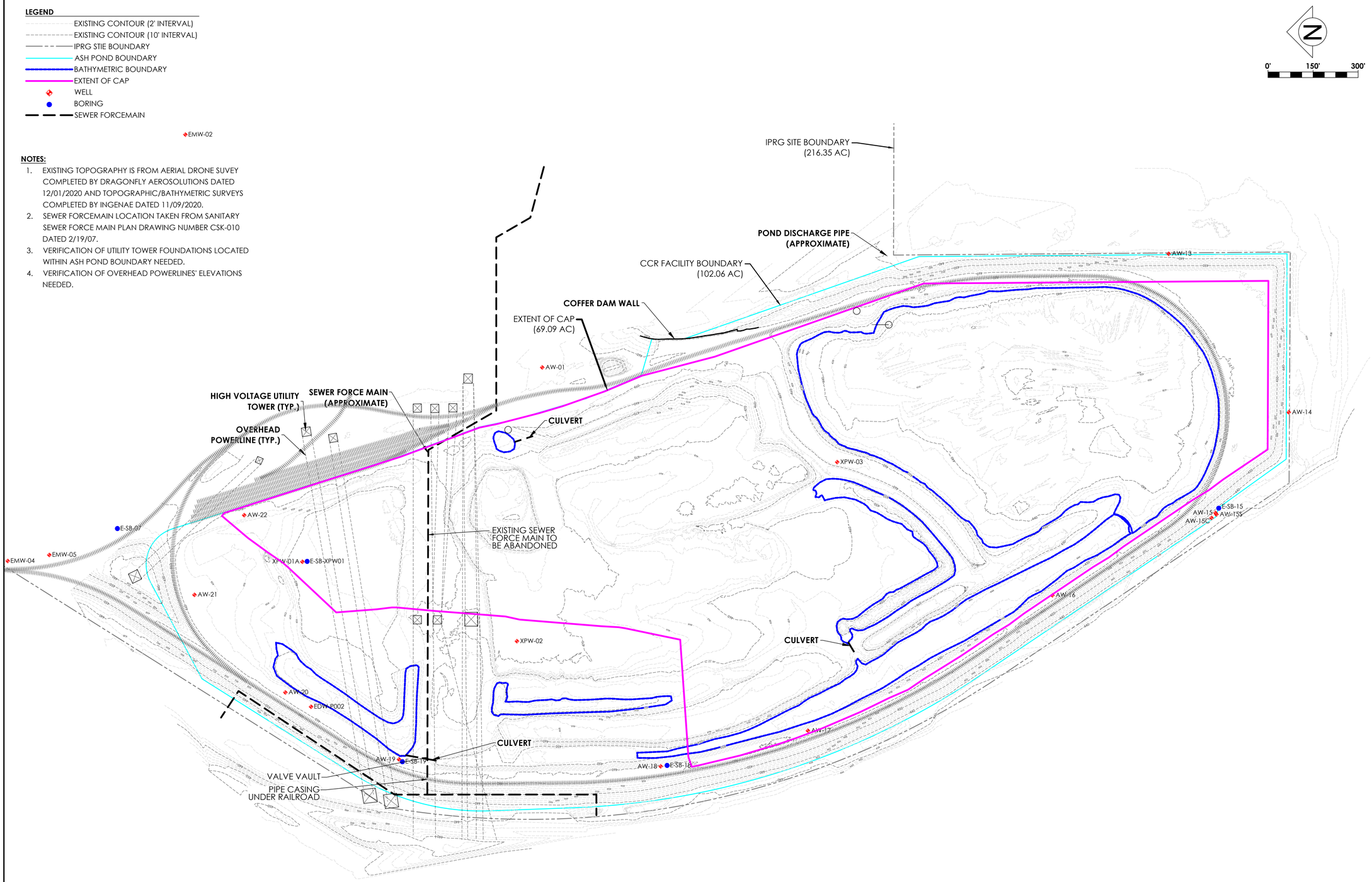
LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG STIE BOUNDARY
- ASH POND BOUNDARY
- BATHYMETRIC BOUNDARY
- EXTENT OF CAP
- WELL
- BORING
- SEWER FORCEMAIN

EMW-02

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATIONS LOCATED WITHIN ASH POND BOUNDARY NEEDED.
4. VERIFICATION OF OVERHEAD POWERLINES' ELEVATIONS NEEDED.



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Drawing Name:

EXISTING CONDITIONS

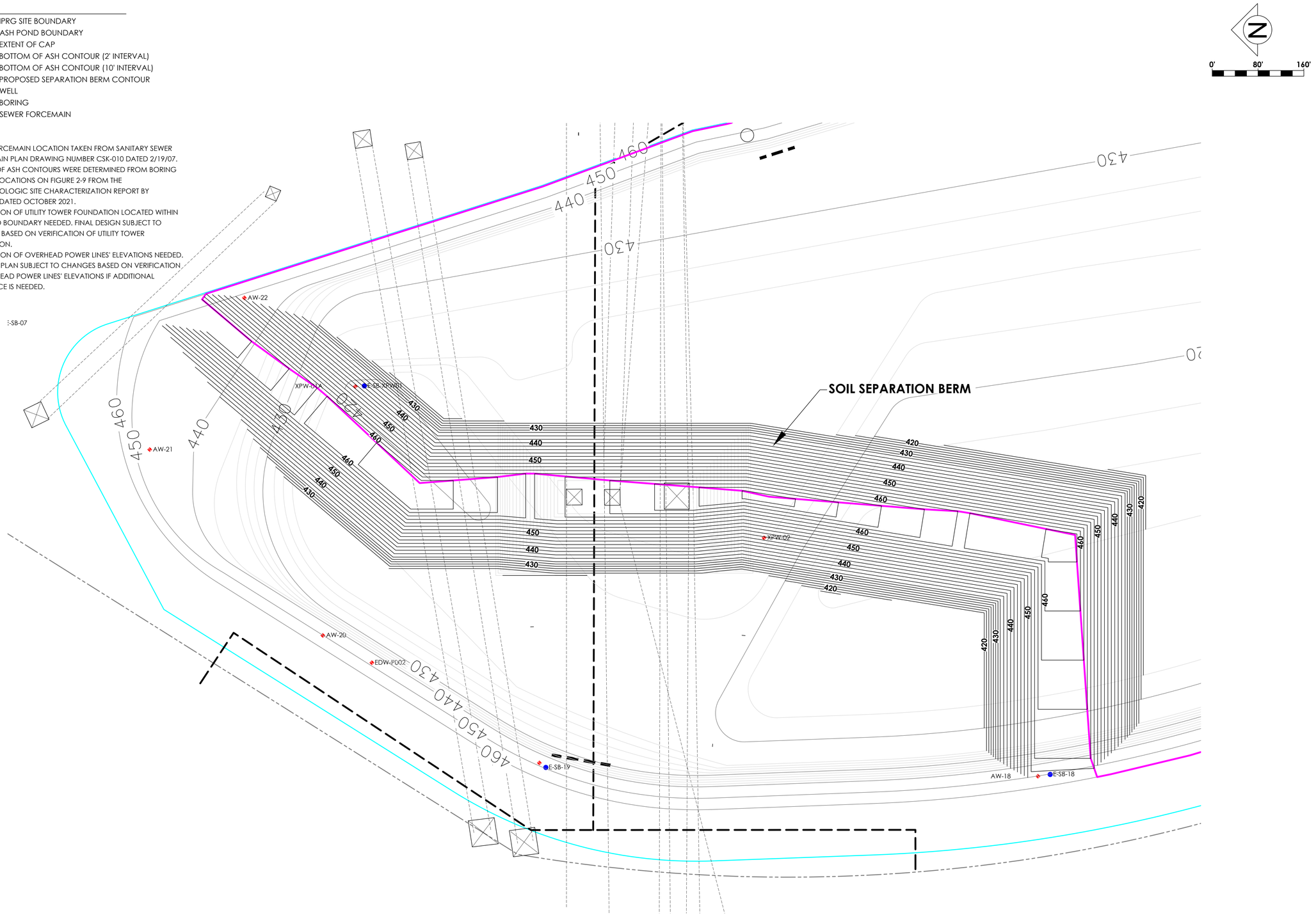
Date:	Project No.
6/30/2022	
Type: PLAN	Drawing No. 3
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- EXTENT OF CAP
- BOTTOM OF ASH CONTOUR (2' INTERVAL)
- BOTTOM OF ASH CONTOUR (10' INTERVAL)
- PROPOSED SEPARATION BERM CONTOUR
- WELL
- BORING
- SEWER FORCEMAIN

NOTES:

1. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
2. BOTTOM OF ASH CONTOURS WERE DETERMINED FROM BORING LOGS AT LOCATIONS ON FIGURE 2-9 FROM THE HYDROGEOLOGIC SITE CHARACTERIZATION REPORT BY RAMBOLL DATED OCTOBER 2021.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.



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Drawing Name:

SEPARATION BERM

Date:	Project No.
6/30/2022	
Type: PLAN	Drawing No. 4
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- BATHYMETRIC BOUNDARY
- PROPOSED TOP OF ASH CONTOUR (2' INTERVAL)
- PROPOSED TOP OF ASH CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

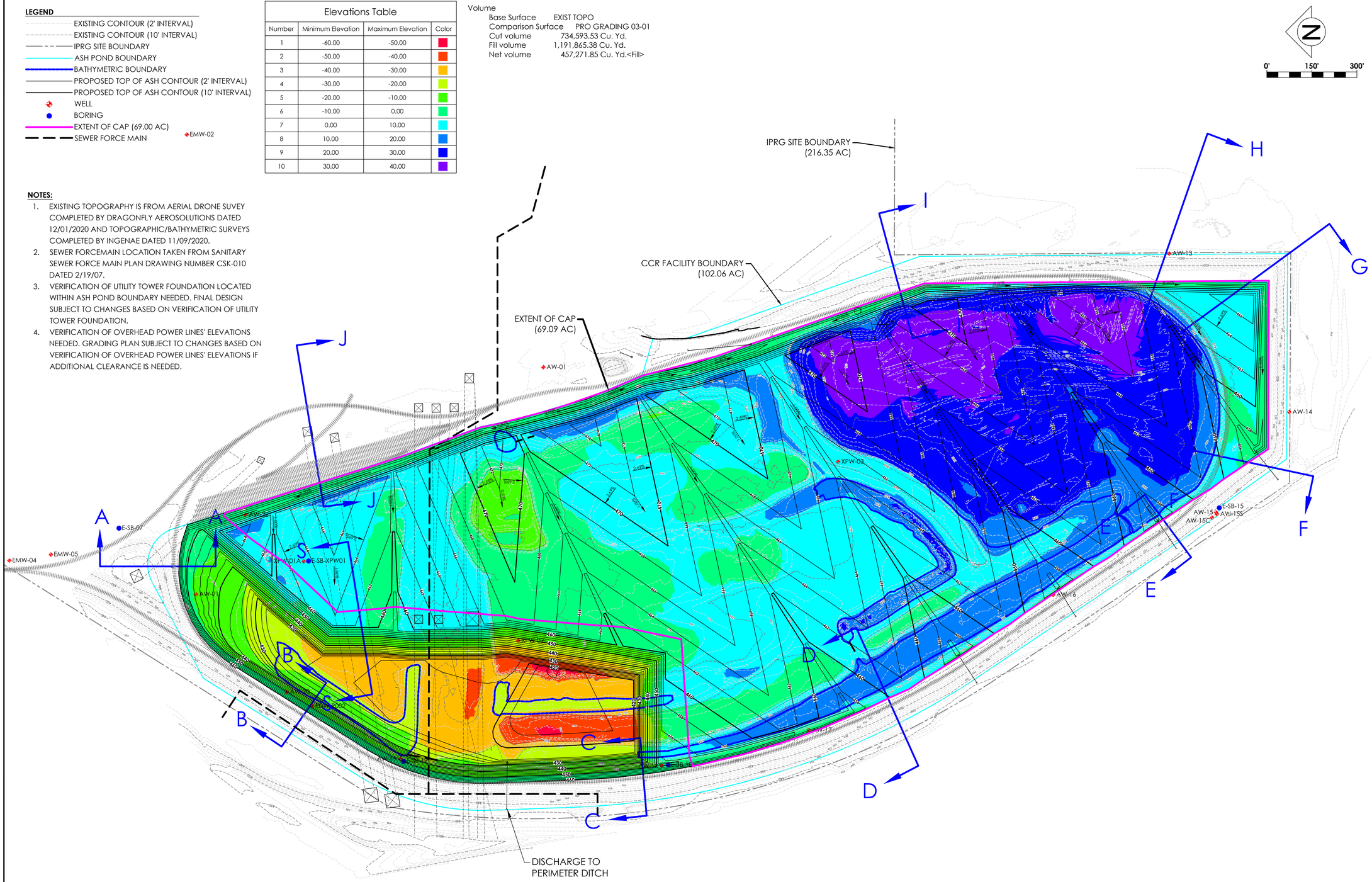
EMW-02

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-60.00	-50.00	
2	-50.00	-40.00	
3	-40.00	-30.00	
4	-30.00	-20.00	
5	-20.00	-10.00	
6	-10.00	0.00	
7	0.00	10.00	
8	10.00	20.00	
9	20.00	30.00	
10	30.00	40.00	

Volume
Base Surface EXIST TOPO
Comparison Surface PRO GRADING 03-01
Cut volume 734,593.53 Cu. Yd.
Fill volume 1,191,865.38 Cu. Yd.
Net volume 457,271.85 Cu. Yd.<Fill>

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.



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Drawing Name:

TOP OF ASH GRADING PLAN

Date:	Project No.
6/30/2022	
Type: PLAN	Drawing No. 5
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

EMW-02

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
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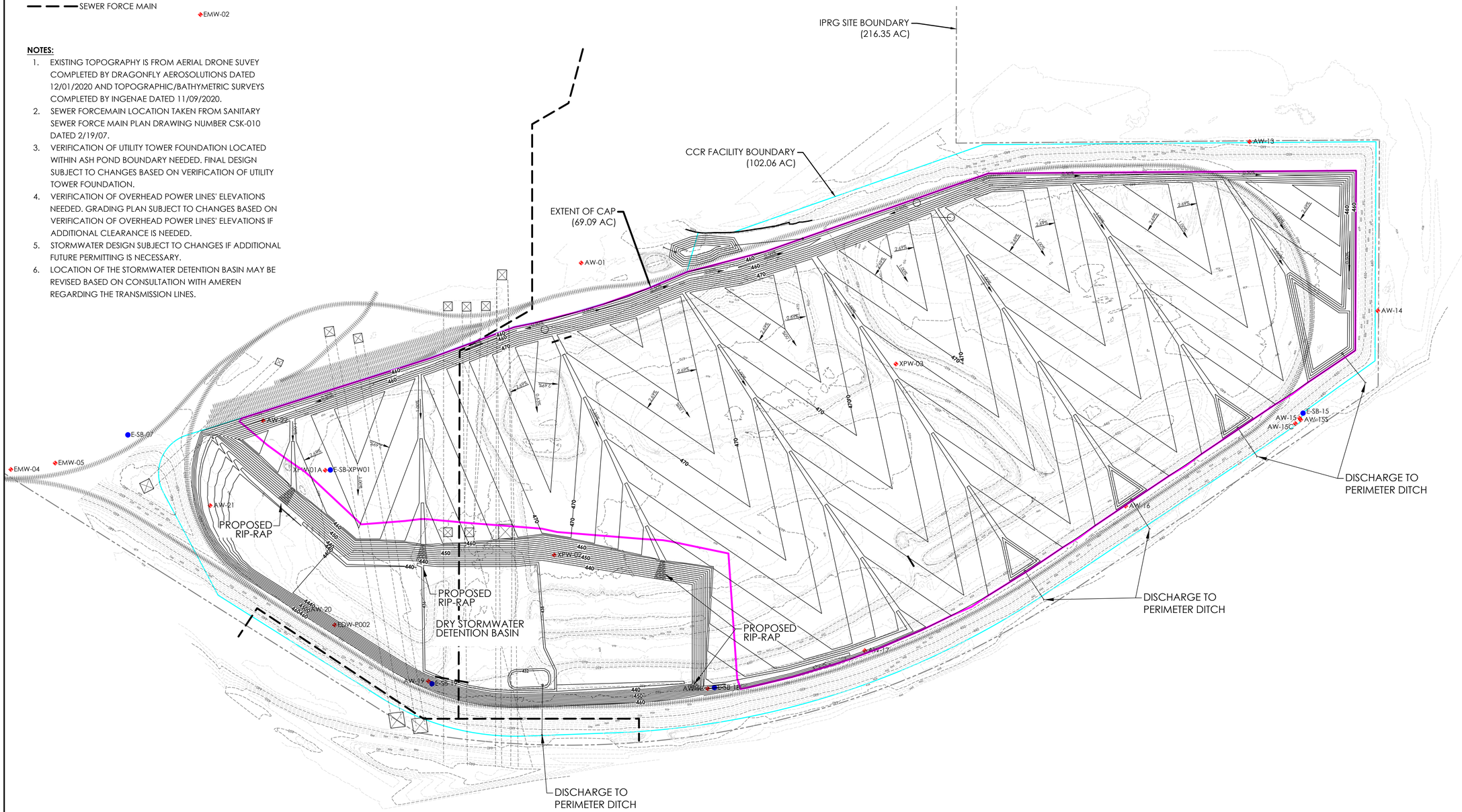
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.
5. STORMWATER DESIGN SUBJECT TO CHANGES IF ADDITIONAL FUTURE PERMITTING IS NECESSARY.
6. LOCATION OF THE STORMWATER DETENTION BASIN MAY BE REVISED BASED ON CONSULTATION WITH AMEREN REGARDING THE TRANSMISSION LINES.



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Drawing Name:

FINAL COVER & STORMWATER PLAN

Date: 6/30/2022	Project No.
Type: PLAN	Drawing No. 6
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG STIE BOUNDARY
- ASH POND BOUNDARY
- BATHYMETRIC BOUNDARY
- EXTENT OF CAP
- WELL
- BORING
- SEWER FORCEMAIN
- E-SB-05

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
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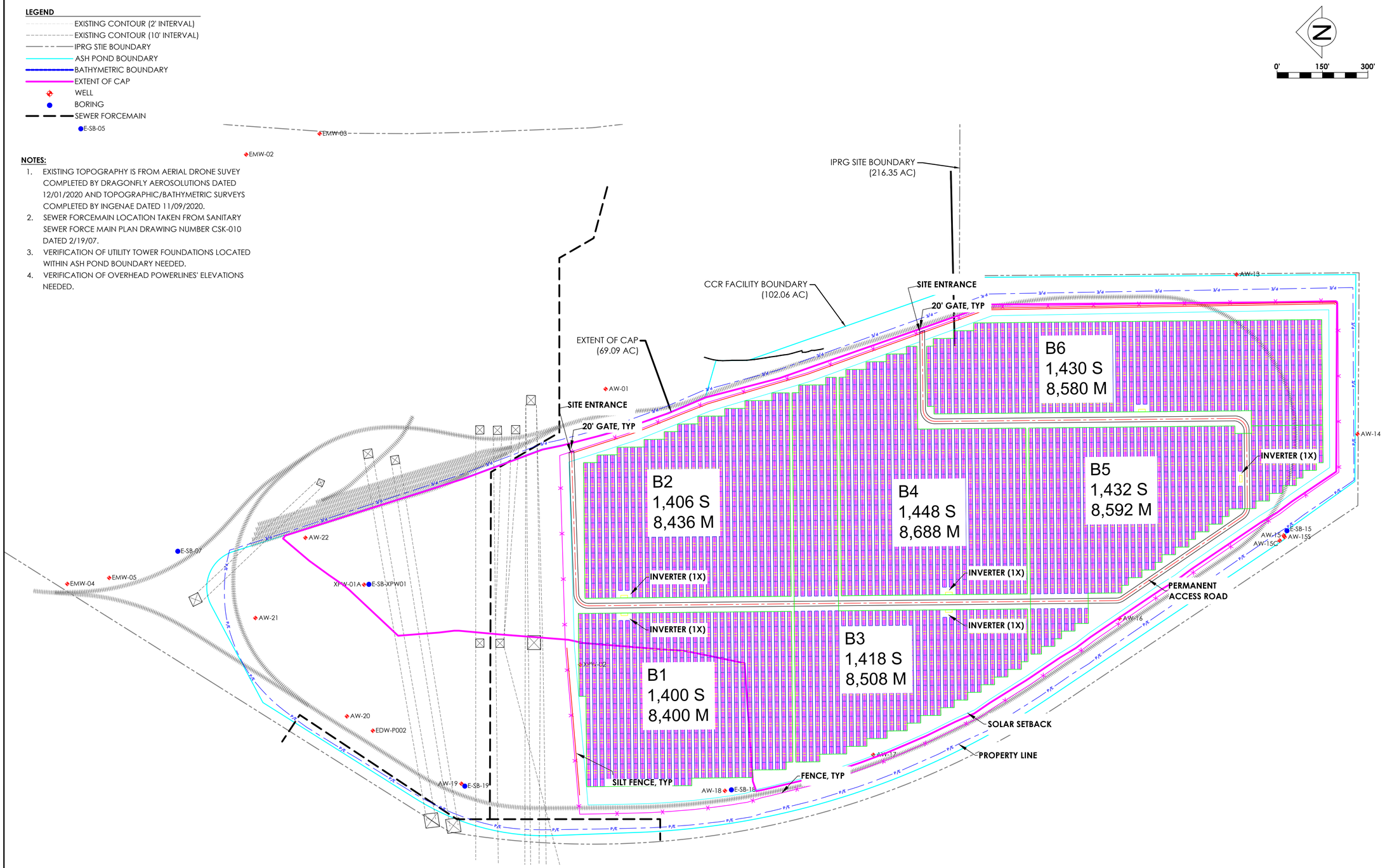
3. VERIFICATION OF UTILITY TOWER FOUNDATIONS LOCATED WITHIN ASH POND BOUNDARY NEEDED.
4. VERIFICATION OF OVERHEAD POWERLINES' ELEVATIONS NEEDED.



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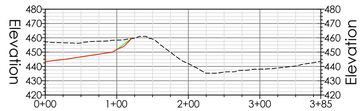
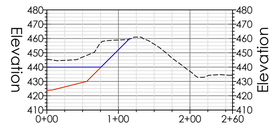
Drawing Name:

SOLAR LAYOUT

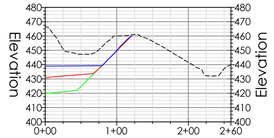
Date: 6/30/2022	Project No.
Type: PLAN	Drawing No. 7
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	



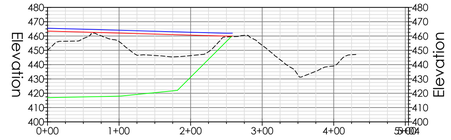
A-A CROSS SECTION



B-B CROSS SECTION



C-C CROSS SECTION



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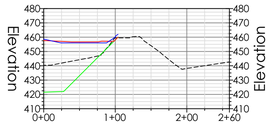
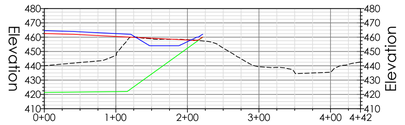
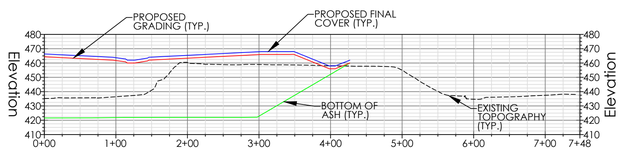


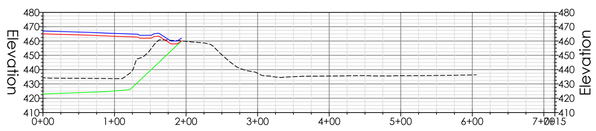
E-E CROSS SECTION



F-F CROSS SECTION



G-G CROSS SECTION



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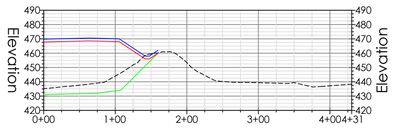
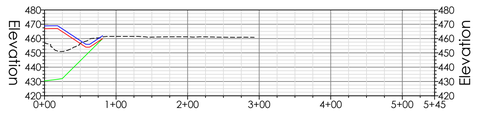
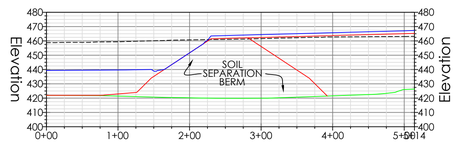


I-I CROSS SECTION



J-J CROSS SECTION



S-S CROSS SECTION

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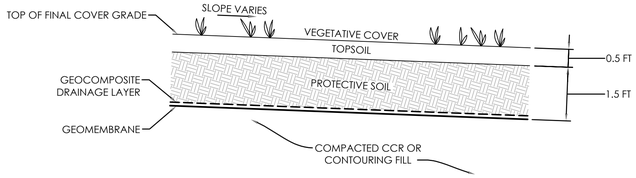
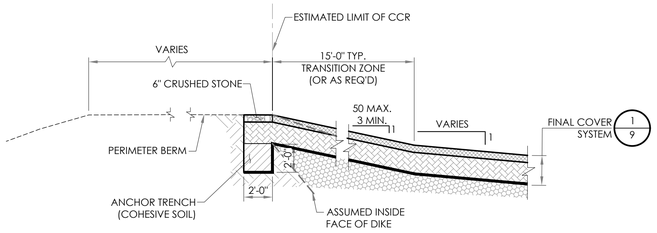
SECTIONS

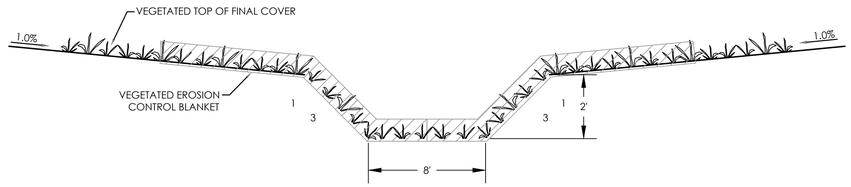
Date: 6/30/2022	Project No.
Type: PLAN	Drawing No. 8
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	



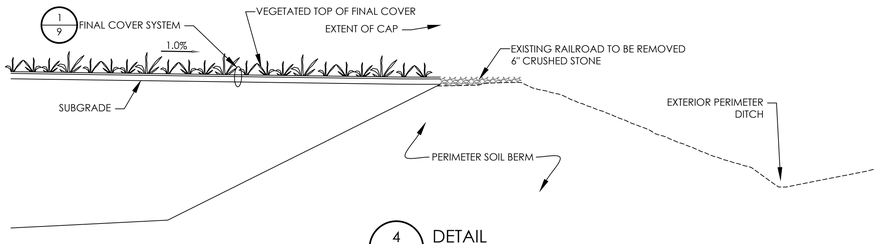
1/9 DETAIL
FINAL COVER
N.T.S.



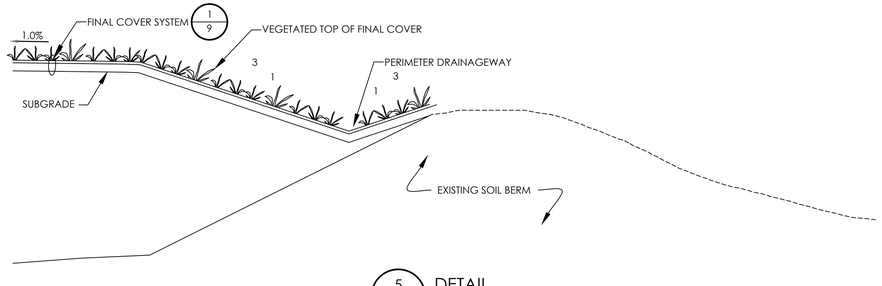
2/9 DETAIL
ANCHOR TRENCH
N.T.S.



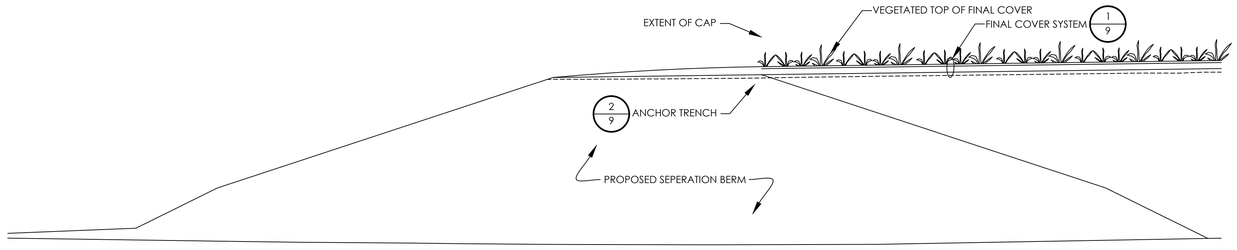
3/9 DETAIL
STORMWATER CHANNEL
N.T.S.



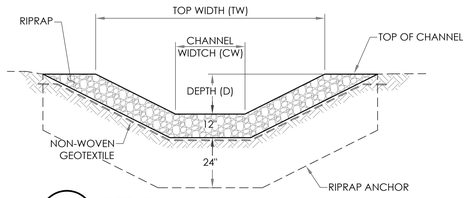
4/9 DETAIL
WEST TERMINATION BERM
N.T.S.



5/9 DETAIL
EAST TERMINATION BERM
N.T.S.



6/9 DETAIL
PROPOSED SEPERATION BERM
N.T.S.



7/9 DETAIL
RIPRAP OUTLET CHANNEL PROTECTION
N.T.S.

MATERIAL SPECIFICATIONS

1. RIPRAP
RIPRAP IS TO CONSIST OF A CRUSHED NATURAL LIMESTONE OR DOLOMITE MATERIAL WITH A D50 OF AT LEAST 11 INCHES, AND CONFORMING TO THE ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION SECTION 281 REQUIREMENTS, CLASS A OR CLASS B QUALITY.

2. EROSION CONTROL BLANKET
EROSION CONTROL BLANKETS ARE TO BE A ROLLED EROSION CONTROL PRODUCT WITH NETTING CAPABLE OF STORMWATER FLOW VELOCITIES OF UP TO 2.1 FEET PER SECOND.

3. CRUSHED STONE
CRUSHED STONE IS TO CONSIST OF A SCREENED GRAVEL MATERIAL CONFORMING TO THE IDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION SECTION 1004 REQUIREMENTS, GRADATION CA 6.

4. VEGETATIVE SOIL LAYER
THE VEGETATIVE SOIL LAYER IS TO CONSIST OF 6 INCHES OF A NATURAL SOIL MATERIAL THAT IS RELATIVELY HOMOGENOUS, FREE OF DEBRIS, FOREIGN OBJECTS, AND LARGE ROCK FRAGMENTS THAT WILL SUPPORT VEGETATIVE GROWTH. THE TOPSOIL IS TO:
- BE CLASSIFIED AS SC, CL, ML, OR OL (PER ASTM D2487), AND
- BE FERTILIZED, AS NECESSARY BASED ON AGRONOMIC TESTING, TO SUPPORT VEGETATION GROWTH AT THE SITE.

5. PROTECTIVE SOIL LAYER
PROTECTIVE SOIL LAYER IS TO CONSIST OF 18 INCHES OF A NATURAL SOIL MATERIAL THAT IS RELATIVELY HOMOGENOUS, FREE OF DEBRIS, FOREIGN OBJECTS, AND LARGE ROCK FRAGMENTS. THE PROTECTIVE SOIL LAYER IS TO:
- BE CLASSIFIED AS A CL, CH, CL-CH, CL-ML, SC, OR SM (PER ASTH D2487), AND
- HAVE A MAXIMUM PARTICLE SIZE OF 1.5 INCHES (PER ASTM D422 OR D6943).

6. GEOTEXTILE
THE GEOTEXTILE IS TO CONSIST OF A NONWOVEN POLYPROPYLENE MATERIAL MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GRI-GT12(A) STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
- MINIMUM MASS PER UNIT ARE OF 16 OZ/SYD (PER ASTM D5261),
- MINIMUM GRAB STRENGTH OF 270 LB (PER ASTM D4632),
- MINIMUM TEAR STRENGTH OF 105 LB (PER ASTM D4533), AND
- MINIMUM PUNCTURE STRENGTH OF 725 LB (PER ASTM D6241).

GEOTEXTILE SEAMS ARE TO OVERLAPPED BY 1 FT DURING PLACEMENT AND EITHER MACHINE-SEWN OR THERMALLY BONDED TO ONE ANOTHER.

7. GEOCOMPOSITE
THE GEOCOMPOSITE WILL CONSIST OF A GEONET MADE FROM HDPE RESIN WITH NONWOVEN POLYPROPYLENE GEOTEXTILE FABRIC HEAT BONDED ON BOTH SIDES OF THE GEONET MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GN4 STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
- GEONET
- MINIMUM THICKNESS OF 200 MIL (PER ASTM D5199),
- MINIMUM DENSITY OF 0.95G/CC (PER ASTM D1505/D792),
- CARBON BLACK CONTENT OF 1 TO 3 PERCENT (PER ASTM D1603/D4218),
- MINIMUM TENSILE STRENGTH OF 45 LBS/IN (PER ASTM D7179),
- MINIMUM COMPRESSION STRENGTH OF 120 LBS/IN (PER ASTM D6364), AND
- MINIMUM FLOW RATE/WIDTH OF 5.0 GPM/FT (PER ASTM D4716),
- GEOTEXTILE
- MINIMUM MASS PER UNIT ARE OF 6 OZ/SYD (PER ASTM D5261),
- MINIMUM GRAB STRENGTH OF 157 LB (PER ASTM D4632),
- MINIMUM TEAR STRENGTH OF 55 LB (PER ASTM D4533), AND
- MINIMUM PUNCTURE STRENGTH OF 725 LB (PER ASTM D6241),
- DOUBLE-SIDED COMPOSITE
- MINIMUM FLOW RATE/WIDTH OF 2.0 GPM/FT (PER ASTM D4716), AND
- MINIMUM PLY ADHESION OF 1.0 LB/IN (PER ASTM D7005).

8. GEOMEMBRANE
THE GEOMEMBRANE IS TO CONSIST OF A LINEAR, LOW-DENSITY POLYETHYLENE (LLDPE) MATERIAL, TEXTURED ON BOTH SIDES, MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GM17 STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
- MINIMUM NOMINAL HEIGHT OF 40 MIL (PER ASTM D5994),
- MINIMUM ASPERITY HEIGHT OF 16 MIL (PER ASTM D7466),
- MAXIMUM DENSITY OF 0.939 G/ML (PER ASTM D792, OR ASTM D1505),
- MINIMUM TENSILE STRENGTH AT BREAK OF 60 LB/IN (PER ASTM 36692),
- MINIMUM ELONGATION AT BREAK OF 250% (PER ASTM D6693),
- MINIMUM TEAR RESISTANCE OF 22 LB (PER ASTM D1004), AND
- MINIMUM PUNCTURE RESISTANCE OF 44 LB (PER ASTM D3895).

GEOMEMBRANCE SEAMS ARE TO BE FUSION-WELDED; REPAIRS AND PENETRATIONS FOR PIPE BOOTS ARE TO BE EXTRUSION WELDED.

9. SUBGRADE MATERIALS
THE SUBGRADE MATERIALS WILL CONSIST OF ONSITE MATERIALS THAT WILL BE RELOCATED OR DISPOSED OF AS PART OF THE FINAL CLOSURE CONSTRUCTION OF THE SURFACE IMPOUNDMENT THAT ARE RELATIVELY HOMOGENOUS, FREE OF DEBRIS, AND FOREIGN OBJECTS. THE SUBGRADE MATERIALS WILL CONSIST OF:
- CCR ASH FROM THE SURFACE IMPOUNDMENT AND THE RAIL LINE ENBANKMENTS,
- BALLAST REMOVED DURING THE DEMOLITION OF THE RAIL LINE,
- ANY COAL LEFT IN THE COAL PILE AFTER THE SHUTDOWN OF THE PLANT IF APPROVED BY THE OWNER, AND
- STAINED OR ASH CONTAMINATED INSITU SOILS REMOVED FROM THE BOTTOM OF NORTHWEST ASH RELOCATION AREA.

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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

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Drawing Name:

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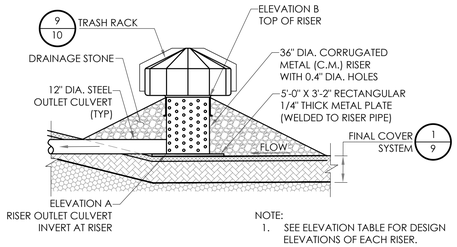
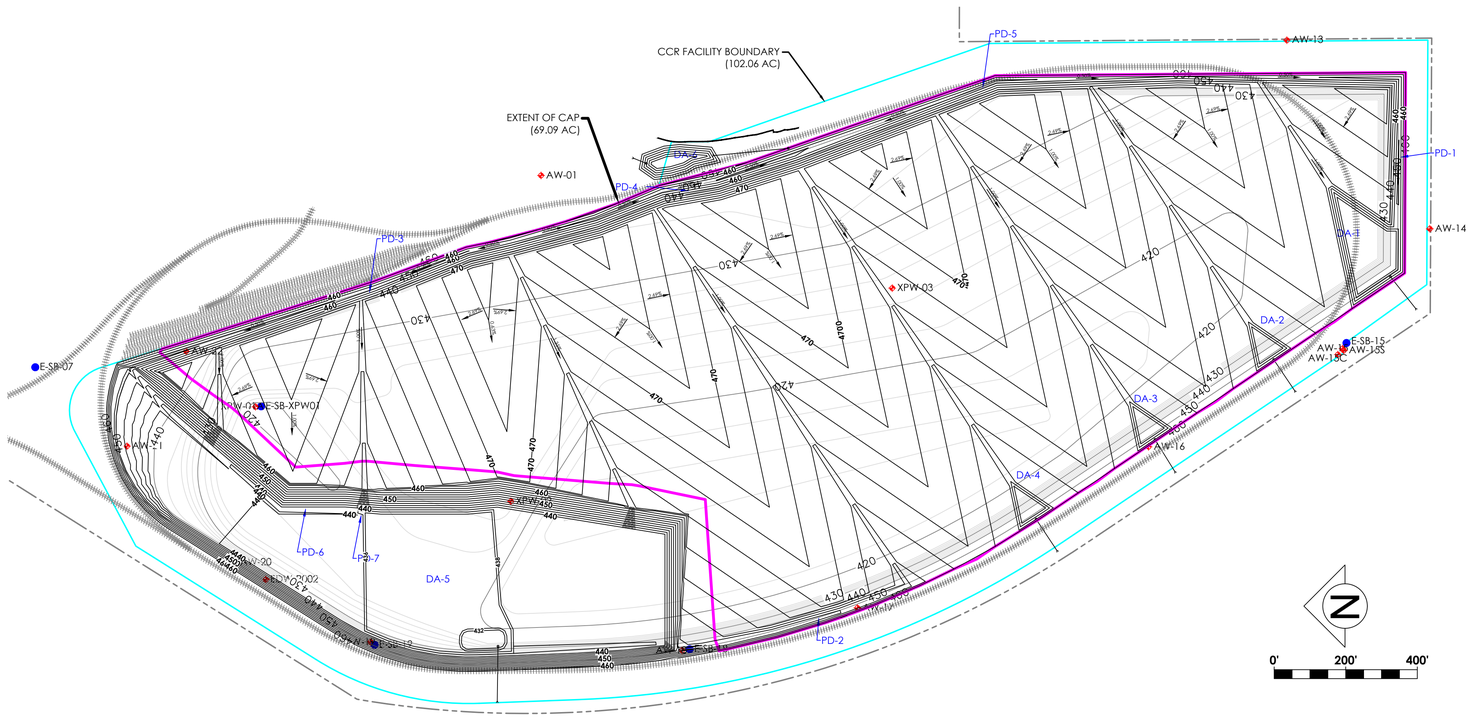
Date: 6/30/2022	Project No.
Type: PLAN	Drawing No. 9
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

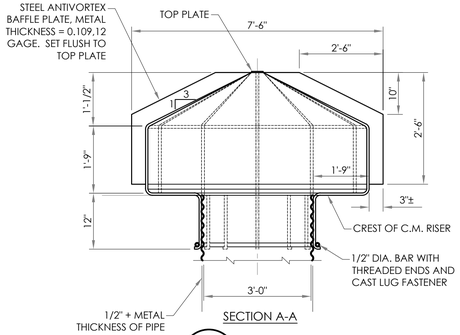


NOTE:
1. SEE ELEVATION TABLE FOR DESIGN ELEVATIONS OF EACH RISER.

8/10 DETAIL
RISER AT OUTLET
N.T.S.

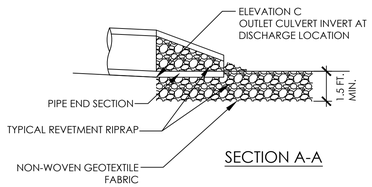


PLAN VIEW

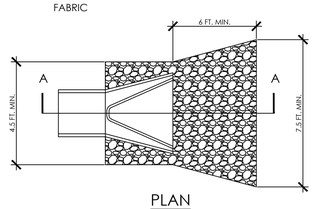


SECTION A-A

9/10 DETAIL
TRASH RACK
N.T.S.



SECTION A-A



PLAN

NOTES:
1. GEOTEXTILE FABRIC SPLICES SHALL OVERLAP A MINIMUM OF 18" WITH UPSTREAM GEOTEXTILE OVERLAPPING THE ABUTTING DOWNSTREAM GEOTEXTILE. BURY END OF GEOTEXTILE FABRIC 12" MINIMUM.
2. SEE ELEVATION TABLE FOR DESIGN ELEVATION.

10/10 DETAIL
CONCRETE FLARED END SECTION
N.T.S.

Drainage Area ID	Elevation A - Riser Outlet Culvert Invert at Riser	Elevation B - Top of Riser	Elevation C - Outlet Culvert Invert at Discharge Location
DA-1	458.11	454.11	436
DA-2	456	460	438
DA-3	456	460	432
DA-4	456	460	444
DA-5	434	437	433.26
PD-4/5 into DA-6	454.43	N/A	453.39
DA-6	454	458	453.5

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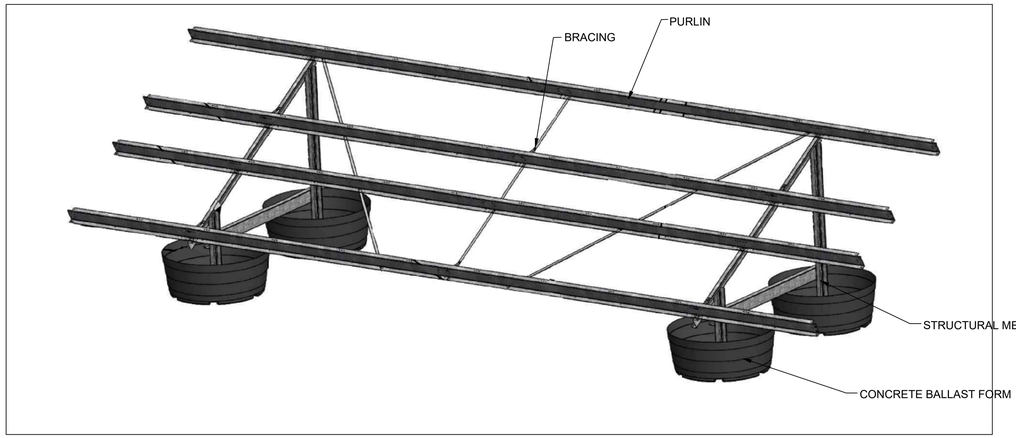
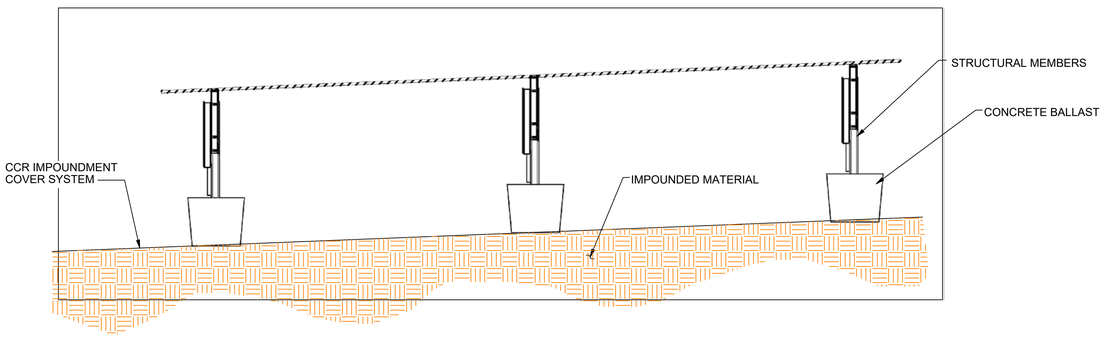
STORMWATER DETAILS

Date: 6/30/2022	Project No.
Type: PLAN	Drawing No. 10
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	



11/11 DETAIL
TYP. FIXED TILT BALLAST RACKING
N.T.S.

13/11 DETAIL
TYP. SOLAR MODULE
N.T.S.



12/11 DETAIL
PROFILE VIEW OF BALLAST ON CAP
N.T.S.

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Submissions / Revisions:		Date:
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Prepared for:

ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

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Drawing Name:

SOLAR DETAILS

Date:	Project No.
6/30/2022	
Type: PLAN	Drawing No. 11
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

Appendix C

Alternative Final Protection Layer Equivalency Demonstration

Geosyntec consultants

134 N. La Salle Street, Suite 300
Chicago, Illinois 60602
PH 312.658.0500
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Technical Memorandum

Date:	June 30, 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, Edwards Power Plant Bartonville, Illinois Geosyntec Project: GLP8024

PROPOSAL

An alternative final protective layer is proposed by Illinois Power Resources Generating, LLC (IPRG) for the Ash Pond (AP) surface impoundment that will be closed-in-place at the Edwards Power Plant (EPP). 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 geocomposite drainage layer consisting of geogrid web with geotextiles molded on top and bottom of the geogrid ("drainage layer") will be 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, 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 drainage layer[1]; 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**.

[1] The drainage layer is not required by Section 845 but has been included to provide for additional reduction of water available for infiltration and for protection for the geomembrane.

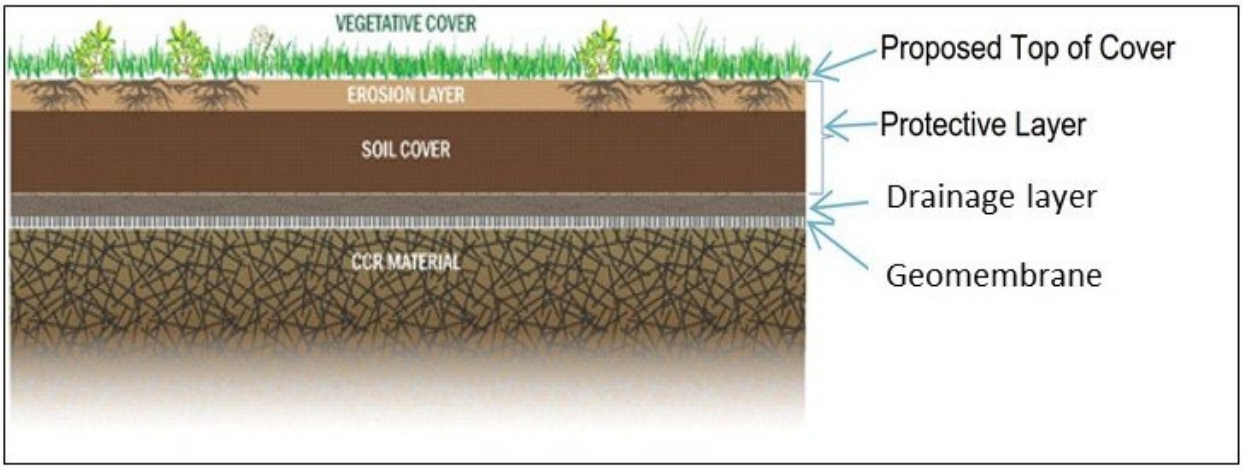


Figure 1: Proposed Alternative Final Cover System

The EPP Site is slated for re-development as a utility-scale solar facility if closure in place (CIP) is approved. A solar facility atop the cover system is currently being designed. Components of the vegetative cover may change as details of the solar facility are finalized. This will be discussed further under "Additional Considerations."

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 Appendix B 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 EPP AP. 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 geocomposite drainage layer covered by a geotextile filter, 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 EPP 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 EPP AP in the Construction Permit within the Construction Permit Application, Appendix J [2].

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 EPP AP Closure Plan (Section 4.7.2 [2]) states that the geotextile and cover soil "…will be placed as soon as practical after the geomembrane has been deployed and both quality assurance and quality control testing has been performed on the geomembrane seams."

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.

Vegetation will be established to cover the final protective layer immediately after the protective layer is installed, as noted in the discussion regarding Section 4.7.2 [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 flat grades (e.g., typically 2.7%, with 33% slopes used near the perimeter of the final cover system). The use of flat grades will reduce water runoff velocities and therefore reduce the potential for water erosion of the final cover soils.
    - The geocomposite drainage layer helps to facilitate lateral drainage of infiltration off the geomembrane, thereby reducing the amount of water available for infiltration through the geomembrane and provides cushioning over the geomembrane. This layer is not required by Section 845.750, but it enhances the final cover system performance.
    - A stormwater management system consisting of channels, diversion berms, culverts, and letdown structures is included in the Construction Permit Application 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 flat (2.7% with limited areas of steeper slopes); 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 EPP AP Construction Permit Application [2], to estimate post-closure liquid infiltration rates through both the default and the proposed alternate final cover systems at the EPP AP. The infiltration analysis used the Hydrologic Evaluation of Landfill Performance (HELP) software promulgated by the USEPA [8]. 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 – EPP AP Final Cover Systems for Infiltration Analysis

Description	Low Permeability Layer[2]	Final Protective Layer	Infiltration Rate[3]
Proposed Alternative Final Cover System	40-mil Linear Low-Density Polyethylene (LLDPE) Geomembrane	2 ft of cover material, including, from bottom to top, a 200-mil geosynthetic drainage layer[4], 1.5 ft of sandy clay loam and 0.5 ft of silty loam topsoil	0.0002 in/yr
Default Cover with Geomembrane Barrier	40-mil LLDPE Geomembrane	3 ft of cover material, including, from bottom to top, a 200-mil geosynthetic drainage layer, 2.5 ft of sandy clay loam soil and 0.5 ft of silty loam topsoil	0.0001 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 sandy clay loam soil and 0.5 ft of silty loam topsoil	1.83 in/yr

The EPP AP analysis indicated that the proposed alternative final cover system with a geomembrane and a two-foot-thick final protective is equivalent to the performance offered by the default final cover system utilizing a geomembrane with the default three-foot-thick protective layer and drainage layer. The soil default final cover system is a three-foot-thick compacted earthen low permeability layer and a three-foot-thick final protective layer (a total cover thickness of six feet).

The infiltration rate of the two final cover systems that include a geomembrane are equivalent. Infiltration is reduced by each geomembrane cover system by a factor of 99.99% compared to the default soil cover system without a geomembrane.

Post-Closure Construction of Solar Panel Electrical Generating System

The EPP Site is slated for re-development as a utility-scale solar facility if closure in place (CIP) is approved. A solar facility atop the cover system is currently being designed. Components of the vegetative cover may change as details of the solar facility are finalized. The system will be

[2] All HELP run versions used a pinhole density of 1 hole per acre, installation defects of 1 hole/acre, and construction quality as "good".
[3] Infiltration is out the bottom of the low permeability layer.
[4] The geocomposite drainage layer was not included in the HELP run as HELP does not include a default drainage value for geotextiles drains. If the geocomposite drainage layer was included, infiltration may reduce even further than indicated in Table 1, relative to the default cover. \

designed, installed, and operated such that the closure performance standards will be maintained at an equivalent level as proposed in the EPP AP Closure Plan.

For example, the panels are expected to be supported by concrete slab ballast foundations that will replace the erosion (topsoil) layer and not cause excessive settlement of the cover and will reduce the amount of infiltration. The ballast foundations will not penetrate the geomembrane low-permeability layer to reduce the potential for defects that could otherwise increase infiltration. The space around the panel foundations will be replaced with an alternative to shallow rooted vegetation and will include stormwater runoff and erosion measures that will meet the erosion control standards of Section 845.750 and may also include forbs (herbaceous flowering plants).

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 offsite soil fill that needs to be excavated, hauled to the construction location, and placed. This provides multiple benefits, such as:
    - Reduced disruption to offsite areas caused by the excavation of fill materials and corresponding disturbance to the natural environment.
    - Reduced haul truck traffic on local roadways, thereby reducing traffic impacts, roadway damage, 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.
- The installation of a solar panel electrical generating system will provide green energy to the community and reduce the maintenance associated with the shallow rooted vegetation.

SUMMARY

The proposed alternate final protective layer will:

- Provide equivalent or superior performance to the requirements of Section 845.750 (c)(2).
- Have a drainage layer, which is not required by Section 845.750, over the geomembrane that adds both lateral drainage layer to reduce the amount of water available for infiltration through the geomembrane and 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 EPP AP.
- A solar panel electrical generating system will provide green energy to the community and reduce the maintenance of the cover.

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] IngenAE Consultants, "Construction Permit Application, Edwards Power Plant, Ash Pond," St. Louis, 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] 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: EPP AP- 2-FT FINAL PROTECTIVE COVER SOIL

A-2: EPP AP-3-FT FINAL PROTECTIVE COVER SOIL

A-3: EPP AP-3-FT COMPACTED EARTH LAYER, 3-FT FINAL PROTECTIVE COVER SOIL

APPENDIX A-1

EPP AP- 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: EDW AP CIP Cons **Simulated On:** 6/27/2022 16:01

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	18	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2559	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Drainage Net (0.5 cm)
Material Texture Number 20

Thickness	=	0.2	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.0126	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	1.27	%
Drainage Length	=	1190	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.187	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.231	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	82.995	inches
Total Initial Water	=	82.995	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph

Average 1st Quarter Relative Humidity	=	70 %
Average 2nd Quarter Relative Humidity	=	66 %
Average 3rd Quarter Relative Humidity	=	74 %
Average 4th Quarter Relative Humidity	=	77 %

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP CIP Cons
Simulated on: 6/27/2022 16:02

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.498	[2.429]	1,379,079.0	15.91
Evapotranspiration	26.321	[3.85]	6,602,232.4	76.19
Subprofile1				
Lateral drainage collected from Layer 3	2.7222	[1.0387]	682,816.5	7.88
Percolation/leakage through Layer 4	0.000194	[0.000197]	48.6	0.00
Average Head on Top of Layer 4	0.0594	[0.0662]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000195	[0.000191]	48.8	0.00
Water storage				
Change in water storage	0.0053	[1.0273]	1,340.4	0.02

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX A-2

EPP AP- 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: EDW AP Default **Simulated On:** 6/24/2022 16:19

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	30	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2511	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Drainage Net (0.5 cm)
Material Texture Number 20

Thickness	=	0.2	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.0126	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	1.27	%
Drainage Length	=	1190	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.187	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.231	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	85.923	inches
Total Initial Water	=	85.923	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days

End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph
Average 1st Quarter Relative Humidity	=	70	%
Average 2nd Quarter Relative Humidity	=	66	%
Average 3rd Quarter Relative Humidity	=	74	%
Average 4th Quarter Relative Humidity	=	77	%

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP Default
Simulated on: 6/24/2022 16:20

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.500	[2.427]	1,379,467.8	15.92
Evapotranspiration	26.321	[3.847]	6,602,070.5	76.19
Subprofile1				
Lateral drainage collected from Layer 3	2.7200	[0.9825]	682,274.9	7.87
Percolation/leakage through Layer 4	0.000098	[0.000126]	24.6	0.00
Average Head on Top of Layer 4	0.0267	[0.0439]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000098	[0.000117]	24.7	0.00
Water storage				
Change in water storage	0.0067	[1.1405]	1,679.2	0.02

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX A-3

EPP AP-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: EDW AP Default Earth **Simulated On:** 6/24/2022 16:16

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam(Moderate)
Material Texture Number 23

Thickness	=	6	inches
Porosity	=	0.461	vol/vol
Field Capacity	=	0.36	vol/vol
Wilting Point	=	0.203	vol/vol
Initial Soil Water Content	=	0.3485	vol/vol
Effective Sat. Hyd. Conductivity	=	9.00E-06	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	30	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.2563	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	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 Fly Ash
Material Texture Number 30

Thickness	=	408	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.1894	vol/vol
Effective Sat. Hyd. Conductivity	=	2.08E-06	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	=	89.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	69.1	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.235	inches
Upper Limit of Evaporative Storage	=	7.542	inches
Lower Limit of Evaporative Storage	=	2.85	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	102.427	inches
Total Initial Water	=	102.427	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.6	Degrees
Maximum Leaf Area Index	=	2	
Start of Growing Season (Julian Date)	=	120	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	9	mph
Average 1st Quarter Relative Humidity	=	70	%
Average 2nd Quarter Relative Humidity	=	66	%
Average 3rd Quarter Relative Humidity	=	74	%
Average 4th Quarter Relative Humidity	=	77	%

Note: Evapotranspiration data was obtained for Bartonville, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
1.919862	1.515505	2.970702	3.839356	3.771468	3.644309
3.594188	3.45941	2.562909	2.359867	2.871942	2.037439

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
29.8	35.5	42.2	56.1	68.7	78.2
83.2	80.7	72	62.3	43.5	35.6

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.6/-89.66

Average Annual Totals Summary

Title: EDW AP Default Earth
Simulated on: 6/24/2022 16:17

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	34.55	[4.31]	8,665,517.1	100.00
Runoff	5.205	[2.496]	1,305,465.6	15.07
Evapotranspiration	27.450	[3.924]	6,885,299.6	79.46
Subprofile1				
Percolation/leakage through Layer 3	1.826281	[0.161421]	458,091.5	5.29
Average Head on Top of Layer 3	16.9565	[4.5453]	---	---
Subprofile2				
Percolation/leakage through Layer 4	0.000191	[0.001041]	47.8	0.00
Water storage				
Change in water storage	1.8925	[1.6409]	474,704.0	5.48

* Note: Average inches are converted to volume based on the user-specified area.

Appendix D

Storm Water Calculations

STORMWATER MANAGEMENT PLAN

EDWARDS POWER STATION
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

March 2022

PREPARED FOR:
Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

PREPARED BY:

IngenAE, LLC
502 Earth City Expressway, Suite 120
Earth City, MO 63045

Project Number: VST002-D22-001-01

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 STORMWATER MANAGMENT 1

3.0 DRAINAGE SYSTEM DESIGN 1
- **3.1 Hydrology Watershed Subcatchments and Schematization 1**
- **3.2 Time of Concentration 1**
- **3.3 Rainfall Data 2**
- **3.4 Runoff Curve Number 2**
- **3.5 Hydraulic design 2**

4.0 CONCLUSION 2

Exhibit – Stormwater Drainage Areas

Appendix A – Rainfall Data and Curve Number

Appendix B – 25-year 24-hour HydroCAD Results

Appendix C – 2-year 24-hour HydroCAD Results

1.0 INTRODUCTION

The objective of this Stormwater Management Plan is to evaluate the hydrology of the stormwater runoff and the hydraulics of the designed stormwater controls of the Edwards Power Ash Pond Closure Design. A combination of HydroCAD Version 10.00-25 and excel spreadsheets were used for most of the calculations. A summary of the supporting design models, calculations, and reference material are included in this report.

2.0 STORMWATER MANAGMENT

Stormwater runoff will be collected in the diversion berms located near the upper grade of the Ash Pond and on the side slopes, conveyed to drainage stormwater channels that will either drain into the perimeter ditch or in the proposed northwest or northeast stormwater pond.

3.0 DRAINAGE SYSTEM DESIGN

Drainage calculations for the final cover system erosion control structures and perimeter drainage system are based on the peak flow rate resulting from the 2-year, 24-hour and the 25-year, 24-hour storm event. The model program HydroCAD Version 10.00-25. was used to compute the drainage calculations. Design slopes along the primary drainage channels were kept to 1.0% minimum and perimeter drainage slopes were kept at a 0.5% minimum.

3.1 Hydrology Watershed Subcatchments and Schematization

The final cover will produce stormwater runoff that flow into the sedimentation basins and perimeter ditches. The final cover is divided into subcatchmenet areas to calculate the peak flows for the design of the perimeter drainage ditch. These areas were calculated using AutoCAD 2018 Civil 3D, and can be found in the attached Exhibit. Hydrographs were developed for each subcatchment area, stormwater channel, and perimeter ditch that conveys into the stormwater ponds.

Maximum surface runoff overland flow distance will be minimized by designing grass-lined stormwater channels. Grass-lined channels typically results in peak velocity <4.0 fps, but when additional erosion protection is required, channels with include rip rap lining; all discharge channels will be designed with rip rap lining.

3.2 Time of Concentration

The Time of Concentration (Tc) was calculated in HydroCAD based on manually calculated input distances. Watershed criteria included a maximum length of 100 feet for sheet flow during the time of concentration. Overland flow distance beyond 100’ was treated as shallow concentrated flow up to the point where flow paths intercept secondary or

primary drainage channels. The remaining distance to the outfalls was defined as channel flow.

3.3 Rainfall Data

Rainfall depths were based on the Table 1. Rainfall Depth-Duration-Frequency Data for Peoria County of 3.02 inches for a 2-year, 24-hour storm event and 4.32 inches for a 25-year, 24-hour storm event. Refer to Appendix A.

3.4 Runoff Curve Number

A curve number of 78 was selected assuming a level D hydrologic soil with a meadow or grassed surface. The SCS/NRCS TR-55 publication and a copy of this table is found at the end of this report. Refer to Appendix A.

3.5 Hydraulic design

Hydraulic analysis calculations were preformed using HydroCAD SCS Unit Hydrograph method (TR-20) to show that stormwater channels and perimeter ditches on the final cover will be able to handle the peak flow of the 25-year, 24-hour storm event The stormwater management system includes the stormwater channels and perimeter ditches that will collect and direct stormwater runoff to the perforated 36” riser and culvert pipes that will be constructed at each drainage outfall area. A manning’s number .030 was used to calculate the peak discharge, maximum velocity, and maximum flow depth.

Each outfall within the Ash Pond will have its own temporary stormwater detention area. The stage storage relationships within these detention areas were calculated using AutoCAD and manually entered into HydroCAD. The discharge control devices through which peak flow attenuation is achieved include the 36” perforated riser pipe, ranging from 4.0 to 7.0 fps for each outfall location, besides DA-4 resulted in a peak velocity of 7.36 fps. An IDOT or equivalent rip rap will surround each riser to prevent clogging of the perforations. The outfall culvert pipes will be 12-inch diameter steel pipe, except for PD-4/PD-5 that drains into DA-6 is designed to be 24-inch diameter steel pipe.

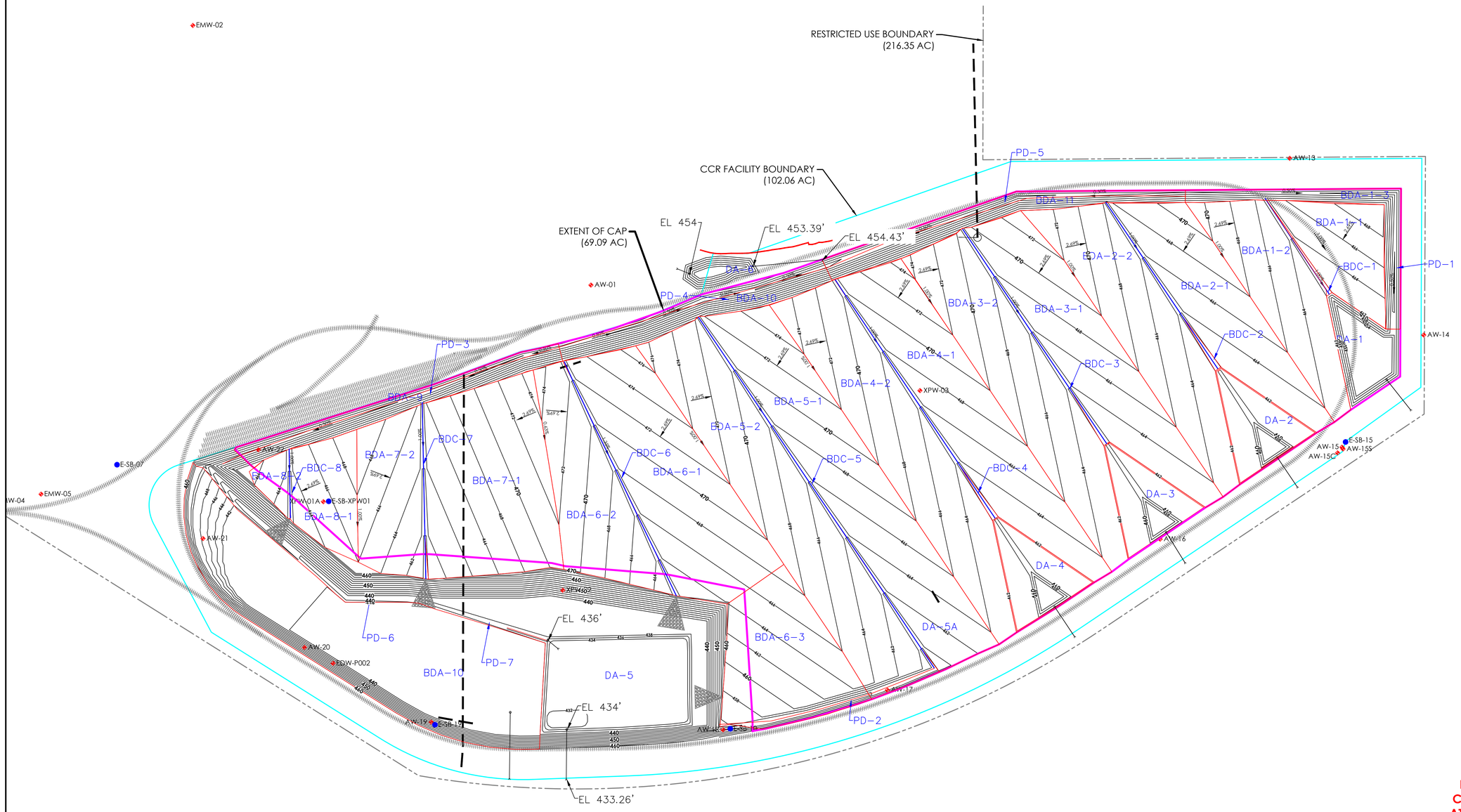
4.0 CONCLUSION

The 36” perforated riser pipe and culverts have been designed to accommodate and attenuate the peak discharges for storm events of a 24-hour/25-year storm event without having the peak elevation over top the riser, and the stormwater channels and perimeter ditches were designed so that no ditches will over top the flow depths.

EXHIBIT – STORMWATER DRAINAGE AREAS

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- RESTRICTED USE BOUNDARY
- CCR FACILITY BOUNDARY
- PROPOSED TOP OF ASH CONTOUR (2' INTERVAL)
- PROPOSED TOP OF ASH CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.09 AC)



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Submissions / Revisions:		Date:
1		
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Project Name & Location:

ILLINOIS POWER RESOURCES GENERATING, LLC. EDWARDS POWER PLANT

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STORMWATER EXHIBIT

Date: 3/31/22	Project No.
Type: PLAN	Drawing No. 1
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

APPENDIX A – RAINFALL DATA AND CURVE NUMBER

APPENDIX D - PEORIA COUNTY STANDARDS FOR STORMWATER DESIGN ANALYSES

The following are the minimum standard, methods and procedures to be used to comply with the stormwater design requirements of Sections 3.12 ("General Erosion and Sediment Control Permits"), 3.13 ("Erosion, Sediment, and Stormwater Control Permits"), and 7.13 ("Erosion, Sediment, and Stormwater Control"). If an applicant determines that different methods are necessary based on site specific conditions, the applicant must request approval from the erosion control administrator to use other methods prior to submittal.

The design methods listed below are readily available in a number of computer programs, including the Soil Conservation Service's TR 20 (SCS) and HEC-1 (U.S. Army Corps of Engineers. Additionally, a simplified methodology which is based on the use of these methods is available in TR 55 (SCS, 1986). TR 55 can be applied using either manual computations or a computerized version.

Rainfall depth and intensity data. Use data for Peoria County (Illinois State Water Survey, BUL-70/89, 1989) as presented in attached Table I and graphically in Figure 1.

Storm event rainfall runoff. Use the SCS Runoff Curve Number Method to determine rainfall runoff depth. See Figure 2-1 and Tables 2-2a through 2-2c (attached) from TR 55. Soil type information is available from the SCS Peoria County Soil Survey, 1992.

Storm distribution (cumulative rainfall versus time). Use the SCS Type 11 storm distribution. See attached Table 3 and Figure 3.

Runoff hydrograph. Use the SCS dimensionless hydrograph. See SCS (1974) for in- formation regarding this procedure. As a substitute for detailed hydrograph analysis, TR 55 (SCS, 1986) can be used, either manually or computer program.

Storage routing (detention pond analysis). Use the continuity equation, also known as the Modified-Pula and Storage indication methods. As a substitute for detailed storage routing of a hydrograph, TR 55 (SCS, 1986) can be used, either manually or computer program. If TR 55 is used and a detention basin with a two-stage outlet control structure including a rectangular weir and/or orifice outlet is included as a part of the control measures, use the attached detention basin outlet work sheet to determine and present the structure design information.

TABLE 1

RAINFALL DEPTH-DURATION-FREQUENCY DATA FOR PEORIA COUNTY

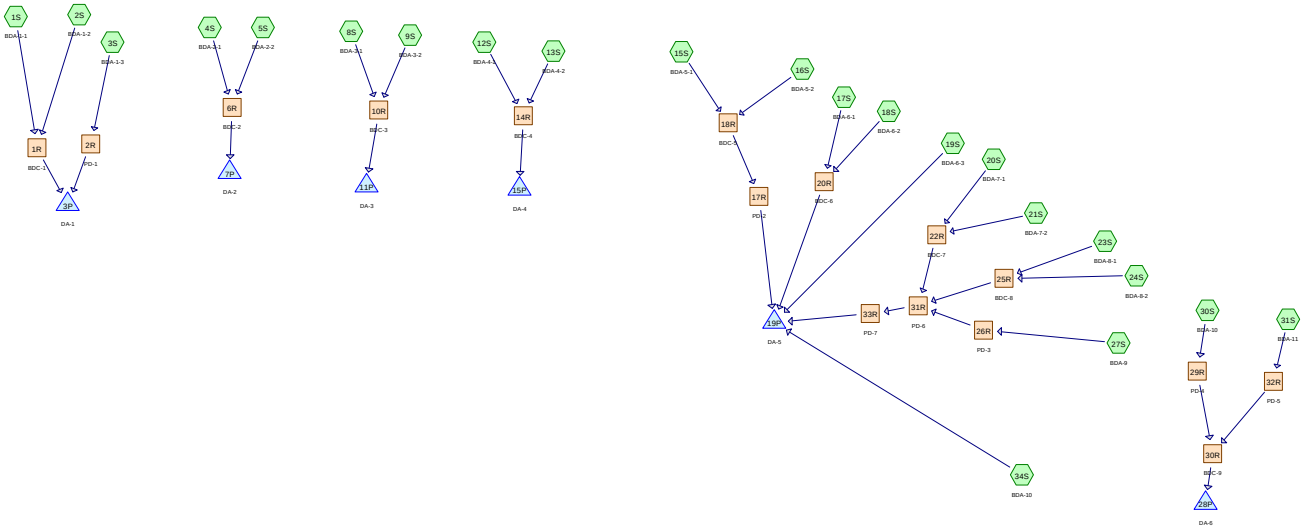
Rainfall Depth (inches) for Given Frequency

Duration	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5-min.	0.36	0.45	0.53	0.64	0.73	0.83
10-min.	0.66	0.83	0.98	1.17	1.34	1.52
15-min.	0.81	1.02	1.20	1.44	1.64	1.87
30-min.	1.12	1.39	1.64	1.97	2.25	2.56
1-hr.	1.42	1.77	2.09	2.50	2.86	3.25
2-hr.	1.78	2.22	2.62	3.14	3.59	4.08
3-hr.	1.93	2.41	2.85	3.41	3.89	4.43
6-hr.	2.26	2.82	3.33	3.99	4.56	5.19
12-hr.	2.62	3.27	3.87	4.63	5.29	6.02
18-hr.	2.75	3.46	4.09	4.90	5.59	6.37
24-hr.	3.02	3.76	4.45	4.32	6.08	6.92
48-hr.	3.38	4.19	4.86	5.78	6.62	7.51
72-hr.	3.70	4.55	5.26	6.15	7.25	8.16
5-day	4.17	5.11	5.84	6.96	7.98	9.21

Select Curve Number

ne	Description	Condition	A	B	C	D	Condensed Description
	CN Values for Ia = 0.20 S						
	FULLY DEVELOPED URBAN AREAS	Veg Estab					
	Open space (Lawns,parks etc.)						
	grass cover < 50%	Poor	68	79	86	89	<50% Grass cover, Poor
	grass cover 50% to 75%	Fair	49	69	79	84	50-75% Grass cover, Fair
	grass cover > 75%	Good	39	61	74	80	>75% Grass cover, Good
V1	Pond and Lake Surfaces						
V2	Classified as Impervious		98	98	98	98	Water Surface
V3	Classified as Pervious	0% imp	98	98	98	98	Water Surface, 0% imp
	Impervious Areas						
	Paved parking lots, driveways		98	98	98	98	Paved parking
a	Unconnected Impervious		98	98	98	98	Unconnected pavement
b	Roofs		98	98	98	98	Roofs
c	Unconnected Impervious		98	98	98	98	Unconnected roofs
	Streets and roads						
	Paved; curbs and storm sewers		98	98	98	98	Paved roads w/curbs & sewers
0	Paved; open ditches (w/ROW)	50% imp	83	89	92	93	Paved roads w/open ditches, 5
1a	Gravel (w/o right-of-way)		96	96	96	96	Gravel surface
1	Gravel (w/ right-of-way)		76	85	89	91	Gravel roads
2	Dirt (w/ right-of-way)		72	82	87	89	Dirt roads
3	Urban Districts	impervious					
4	Commercial & business	85% imp	89	92	94	95	Urban commercial, 85% imp
5	Industrial	72% imp	81	88	91	93	Urban industrial, 72% imp
6	Residential districts						
7	(by average lot size)	impervious					
8	1/8 acre (town houses)	65% imp	77	85	90	92	1/8 acre lots, 65% imp
9	1/4 acre	38% imp	61	75	83	87	1/4 acre lots, 38% imp
0	1/3 acre	30% imp	57	72	81	86	1/3 acre lots, 30% imp
1	1/2 acre	25% imp	54	70	80	85	1/2 acre lots, 25% imp
2	1 acre	20% imp	51	68	79	84	1 acre lots, 20% imp
3	2 acre	12% imp	46	65	77	82	2 acre lots, 12% imp
4	Western Desert Urban Areas						
5	Natural desert (pervious areas only)		63	77	85	88	Natural western desert
6	Artifical desert landscaping		96	96	96	96	Artifical desert landscape
9	DEVELOPING URBAN AREA	(No Veg)					
0	Newly graded area (pervious only)		77	86	91	94	Newly graded area
1	CULTIVATED AGRICULTURAL LAND						
2	Fallow						
3	Bare soil		77	86	91	94	Fallow, bare soil
4	Crop residue (CR)	Poor	76	85	90	93	Fallow, crop residue, Poor
5	Crop residue (CR)	Good	74	83	88	90	Fallow, crop residue, Good
6	Row crops						
7	Straight row (SR)	Poor	72	81	88	91	Row crops, straight row, Poor
8	Straight row (SR)	Good	67	78	85	89	Row crops, straight row, Good
9	SR + Crop residue	Poor	71	80	87	90	Row crops, SR + CR, Poor
0	SR + Crop residue	Good	64	75	82	85	Row crops, SR + CR, Good
1	Contoured (C)	Poor	70	79	84	88	Row crops, contoured, Poor
2	Contoured (C)	Good	65	75	82	86	Row crops, contoured, Good
3	C + Crop residue	Poor	69	78	83	87	Row crops, C + CR, Poor
4	C + Crop residue	Good	64	74	81	85	Row crops, C + CR, Good
5	Contoured & terraced (C&T)	Poor	66	74	80	82	Row crops, C&T, Poor
6	Contoured & terraced (C&T)	Good	62	71	78	81	Row crops, C&T, Good
7	C&T + Crop residue	Poor	65	73	79	81	Row crops, C&T + CR, Poor
8	C&T + Crop residue	Good	61	70	77	80	Row crops, C&T + CR, Good
9	Small grain						
0	Straight row (SR)	Poor	65	76	84	88	Small grain, straight row, Poor
1	Straight row (SR)	Good	63	75	83	87	Small grain, straight row, Good
2	SR + Crop residue	Poor	64	75	83	86	Small grain, SR + CR, Poor
3	SR + Crop residue	Good	60	72	80	84	Small grain, SR + CR, Good
4	Contoured (C)	Poor	63	74	82	85	Small grain, contoured, Poor
5	Contoured (C)	Good	61	73	81	84	Small grain, contoured, Good
6	C + Crop residue	Poor	62	73	81	84	Small grain, C + CR, Poor
7	C + Crop residue	Good	60	72	80	83	Small grain, C + CR, Good
8	Contoured & terraced (C&T)	Poor	61	72	79	82	Small grain, C&T, Poor
9	Contoured & terraces (C&T)	Good	59	70	78	81	Small grain, C&T, Good
0	C&T + Crop residue	Poor	60	71	78	81	Small grain, C&T + CR, Poor
1	C&T + Crop residue	Good	58	69	77	80	Small grain, C&T + CR, Good
2	Close-seeded legumes/rotat.meadow						
3	Straight row	Poor	66	77	85	89	Legumes, straight row, Poor
4	Straight row	Good	58	72	81	85	Legumes, straight row, Good
5	Contoured	Poor	64	75	83	85	Legumes, contoured, Poor
6	Contoured	Good	55	69	78	83	Legumes, contoured, Good
7	Cont & terraced	Poor	63	73	80	83	Legumes, C&T, Poor
8	Cont & terraced	Good	51	67	76	80	Legumes, C&T, Good
9	OTHER AGRICULTURAL LAND						
0	Pasture, grassland or range	Poor	68	79	86	89	Pasture/grassland/range, Poor
1		Fair	49	69	79	84	Pasture/grassland/range, Fair
2		Good	39	61	74	80	Pasture/grassland/range, Good
3	Meadow, cont. grass, non-grazed		30	58	71	78	Meadow, non-grazed
4	Brush, brush/weed/grass mix	Poor	48	67	77	83	Brush, Poor
5		Fair	35	56	70	77	Brush, Fair

APPENDIX B – 25-YEAR 24-HOUR HYDROCAD RESULTS



Subcat Reach Pond Link

Routing Diagram for EDWARDS STORMWATER HYDROCAD CALCS
Prepared by {enter your company name here}, Printed 3/31/2022
HydroCAD® 10.00-26 s/n 10085 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
74.410	78	(1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S)
74.410	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
74.410	Other	1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
74.410		**TOTAL AREA**

Ground Covers (selected 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	74.410	74.410		1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
0.000	**0.000**	**0.000**	**0.000**	**74.410**	**74.410**	**TOTAL AREA**	

Pipe Listing (selected 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	30R	454.43	453.39	207.0	0.0050	0.030	24.0	0.0	0.0
2	3P	454.11	436.00	111.0	0.1632	0.030	12.0	0.0	0.0
3	7P	456.00	438.00	105.0	0.1714	0.025	12.0	0.0	0.0
4	11P	456.00	432.00	105.0	0.2286	0.025	12.0	0.0	0.0
5	15P	456.00	440.00	104.5	0.1531	0.025	12.0	0.0	0.0
6	19P	434.00	433.26	147.0	0.0050	0.025	12.0	0.0	0.0
7	28P	454.00	453.50	100.0	0.0050	0.025	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: BDA-1-1 Runoff Area=1.740 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=241' Slope=0.0269 '/' Tc=11.5 min CN=78 Runoff=5.42 cfs 0.311 af

Subcatchment 2S: BDA-1-2 Runoff Area=2.780 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=265' Slope=0.0269 '/' Tc=11.9 min CN=78 Runoff=8.54 cfs 0.497 af

Subcatchment 3S: BDA-1-3 Runoff Area=0.960 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=27' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=3.77 cfs 0.172 af

Subcatchment 4S: BDA-2-1 Runoff Area=3.320 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=201' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=10.51 cfs 0.593 af

Subcatchment 5S: BDA-2-2 Runoff Area=3.940 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=260' Slope=0.0269 '/' Tc=11.8 min CN=78 Runoff=12.15 cfs 0.704 af

Subcatchment 8S: BDA-3-1 Runoff Area=4.270 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=187' Slope=0.0269 '/' Tc=10.8 min CN=78 Runoff=13.62 cfs 0.763 af

Subcatchment 9S: BDA-3-2 Runoff Area=4.510 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=1,570' Slope=0.0269 '/' Tc=30.8 min CN=78 Runoff=8.19 cfs 0.806 af

Subcatchment 12S: BDA-4-1 Runoff Area=4.710 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=204' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=14.92 cfs 0.842 af

Subcatchment 13S: BDA-4-2 Runoff Area=4.940 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=205' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=15.64 cfs 0.883 af

Subcatchment 15S: BDA-5-1 Runoff Area=5.710 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=297' Slope=0.0269 '/' Tc=12.4 min CN=78 Runoff=17.24 cfs 1.021 af

Subcatchment 16S: BDA-5-2 Runoff Area=5.860 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=327' Slope=0.0269 '/' Tc=12.8 min CN=78 Runoff=17.44 cfs 1.048 af

Subcatchment 17S: BDA-6-1 Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=224' Slope=0.0269 '/' Tc=11.3 min CN=78 Runoff=15.86 cfs 0.904 af

Subcatchment 18S: BDA-6-2 Runoff Area=2.980 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=130' Slope=0.0269 '/' Tc=9.9 min CN=78 Runoff=9.79 cfs 0.533 af

Subcatchment 19S: BDA-6-3 Runoff Area=3.200 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=413' Slope=0.0269 '/' Tc=14.0 min CN=78 Runoff=9.13 cfs 0.572 af

Subcatchment 20S: BDA-7-1 Runoff Area=4.860 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=371' Slope=0.0269 '/' Tc=13.4 min CN=78 Runoff=14.16 cfs 0.869 af

Subcatchment 21S: BDA-7-2 Runoff Area=2.140 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=206' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=6.78 cfs 0.383 af

Subcatchment 23S: BDA-8-1 Runoff Area=1.440 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=213' Slope=0.0269 '/' Tc=11.1 min CN=78 Runoff=4.55 cfs 0.257 af

Subcatchment 24S: BDA-8-2 Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=96' Slope=0.0269 '/' Tc=9.2 min CN=78 Runoff=1.15 cfs 0.061 af

Subcatchment 27S: BDA-9 Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.02 cfs 0.229 af

Subcatchment 30S: BDA-10 Runoff Area=1.330 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=96' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.22 cfs 0.238 af

Subcatchment 31S: BDA-11 Runoff Area=1.390 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.45 cfs 0.248 af

Subcatchment 34S: BDA-10 Runoff Area=7.650 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=1,194' Slope=0.0130 '/' Tc=35.5 min CN=78 Runoff=12.61 cfs 1.367 af

Reach 1R: BDC-1 Avg. Flow Depth=0.51' Max Vel=2.81 fps Inflow=13.95 cfs 0.808 af
n=0.030 L=344.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=13.57 cfs 0.808 af

Reach 2R: PD-1 Avg. Flow Depth=0.70' Max Vel=1.68 fps Inflow=3.77 cfs 0.172 af
n=0.030 L=1,000.0' S=0.0050 '/' Capacity=40.58 cfs Outflow=2.50 cfs 0.172 af

Reach 6R: BDC-2 Avg. Flow Depth=0.66' Max Vel=3.27 fps Inflow=22.64 cfs 1.298 af
n=0.030 L=600.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=21.42 cfs 1.298 af

Reach 10R: BDC-3 Avg. Flow Depth=0.56' Max Vel=3.05 fps Inflow=17.87 cfs 1.569 af
n=0.030 L=771.7' S=0.0104 '/' Capacity=173.00 cfs Outflow=16.64 cfs 1.569 af

Reach 14R: BDC-4 Avg. Flow Depth=0.78' Max Vel=3.48 fps Inflow=30.56 cfs 1.725 af
n=0.030 L=857.9' S=0.0093 '/' Capacity=164.08 cfs Outflow=27.89 cfs 1.725 af

Reach 17R: PD-2 Avg. Flow Depth=0.81' Max Vel=3.41 fps Inflow=30.23 cfs 2.068 af
n=0.030 L=667.0' S=0.0086 '/' Capacity=157.21 cfs Outflow=28.87 cfs 2.068 af

Reach 18R: BDC-5 Avg. Flow Depth=0.79' Max Vel=3.68 fps Inflow=34.67 cfs 2.068 af
n=0.030 L=1,262.7' S=0.0103 '/' Capacity=172.40 cfs Outflow=30.23 cfs 2.068 af

Reach 20R: BDC-6 Avg. Flow Depth=0.64' Max Vel=3.74 fps Inflow=25.58 cfs 1.437 af
n=0.030 L=774.6' S=0.0135 '/' Capacity=197.35 cfs Outflow=23.85 cfs 1.437 af

Reach 22R: BDC-7 Avg. Flow Depth=0.58' Max Vel=3.53 fps Inflow=20.80 cfs 1.251 af
n=0.030 L=527.8' S=0.0133 '/' Capacity=195.68 cfs Outflow=20.10 cfs 1.251 af

Reach 25R: BDC-8 Avg. Flow Depth=0.30' Max Vel=2.07 fps Inflow=5.67 cfs 0.318 af
n=0.030 L=206.8' S=0.0100 '/' Capacity=170.00 cfs Outflow=5.57 cfs 0.318 af

Reach 26R: PD-3 Avg. Flow Depth=0.78' Max Vel=1.83 fps Inflow=5.02 cfs 0.229 af
n=0.030 L=1,062.6' S=0.0052 '/' Capacity=6.50 cfs Outflow=3.36 cfs 0.229 af

Reach 29R: PD-4 Avg. Flow Depth=0.83' Max Vel=1.87 fps Inflow=5.22 cfs 0.238 af
n=0.030 L=832.0' S=0.0050 '/' Capacity=6.39 cfs Outflow=3.86 cfs 0.238 af

Reach 30R: BDC-9 Avg. Flow Depth=1.74' Max Vel=2.52 fps Inflow=7.44 cfs 0.486 af
24.0" Round Pipe n=0.030 L=207.0' S=0.0050 '/' Capacity=6.95 cfs Outflow=7.27 cfs 0.486 af

Reach 31R: PD-6 Avg. Flow Depth=0.69' Max Vel=3.78 fps Inflow=28.60 cfs 1.798 af
n=0.030 L=1,060.0' S=0.0126 '/' Capacity=190.90 cfs Outflow=26.04 cfs 1.798 af

Reach 32R: PD-5 Avg. Flow Depth=0.81' Max Vel=1.85 fps Inflow=5.45 cfs 0.248 af
n=0.030 L=1,107.0' S=0.0050 '/' Capacity=6.41 cfs Outflow=3.60 cfs 0.248 af

Reach 33R: PD-7 Avg. Flow Depth=0.89' Max Vel=2.74 fps Inflow=26.04 cfs 1.798 af
n=0.030 L=125.0' S=0.0050 '/' Capacity=119.67 cfs Outflow=26.01 cfs 1.798 af

Pond 3P: DA-1 Peak Elev=455.62' Storage=0.960 af Inflow=15.99 cfs 0.980 af
Outflow=0.02 cfs 0.062 af

Pond 7P: DA-2 Peak Elev=459.84' Storage=0.599 af Inflow=21.42 cfs 1.298 af
Outflow=2.47 cfs 1.296 af

Pond 11P: DA-3 Peak Elev=460.13' Storage=0.678 af Inflow=16.64 cfs 1.569 af
Outflow=4.12 cfs 1.568 af

Pond 15P: DA-4 Peak Elev=460.25' Storage=0.728 af Inflow=27.89 cfs 1.725 af
Outflow=5.78 cfs 1.723 af

Pond 19P: DA-5 Peak Elev=436.34' Storage=8.786 af Inflow=91.83 cfs 7.243 af
Outflow=1.21 cfs 2.920 af

Pond 28P: DA-6 Peak Elev=455.11' Storage=0.599 af Inflow=7.27 cfs 0.486 af
Outflow=0.42 cfs 0.389 af

Total Runoff Area = 74.410 ac Runoff Volume = 13.301 af Average Runoff Depth = 2.15"
100.00% Pervious = 74.410 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: BDA-1-1

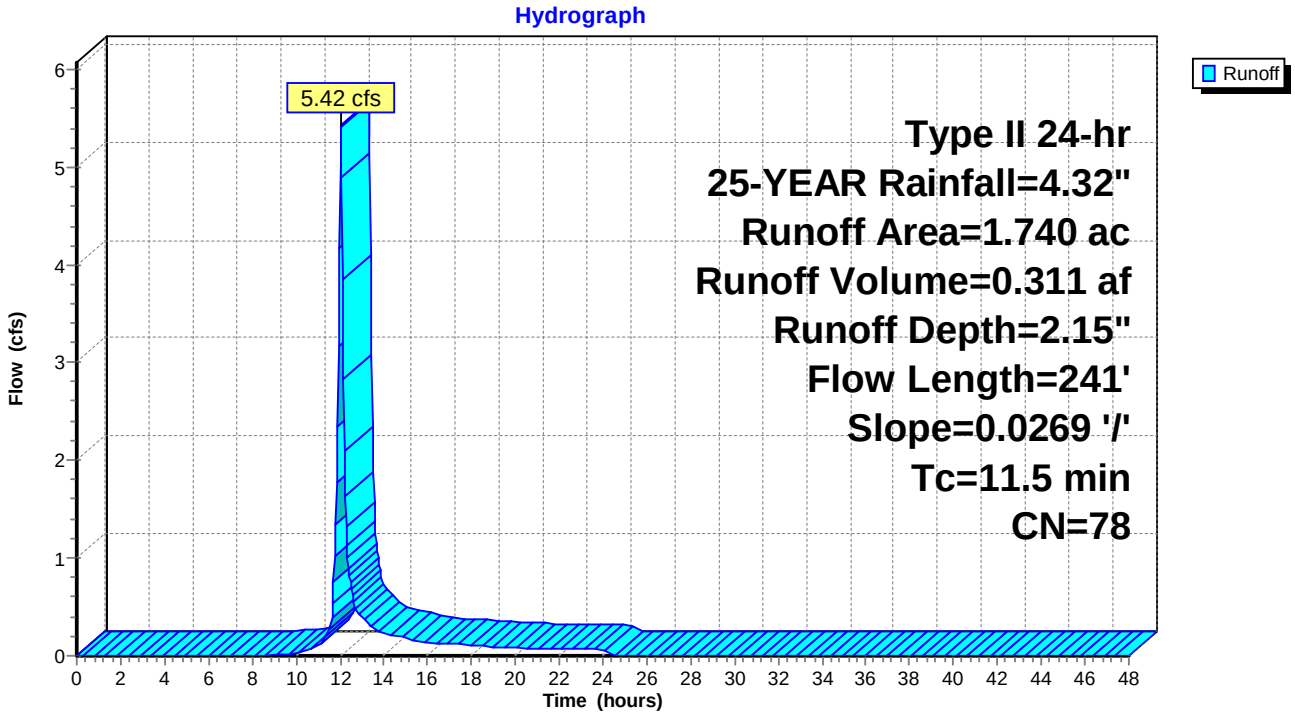
Runoff = 5.42 cfs @ 12.03 hrs, Volume= 0.311 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.740	78	
	1.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.0	141	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	241	Total			

Subcatchment 1S: BDA-1-1



Summary for Subcatchment 2S: BDA-1-2

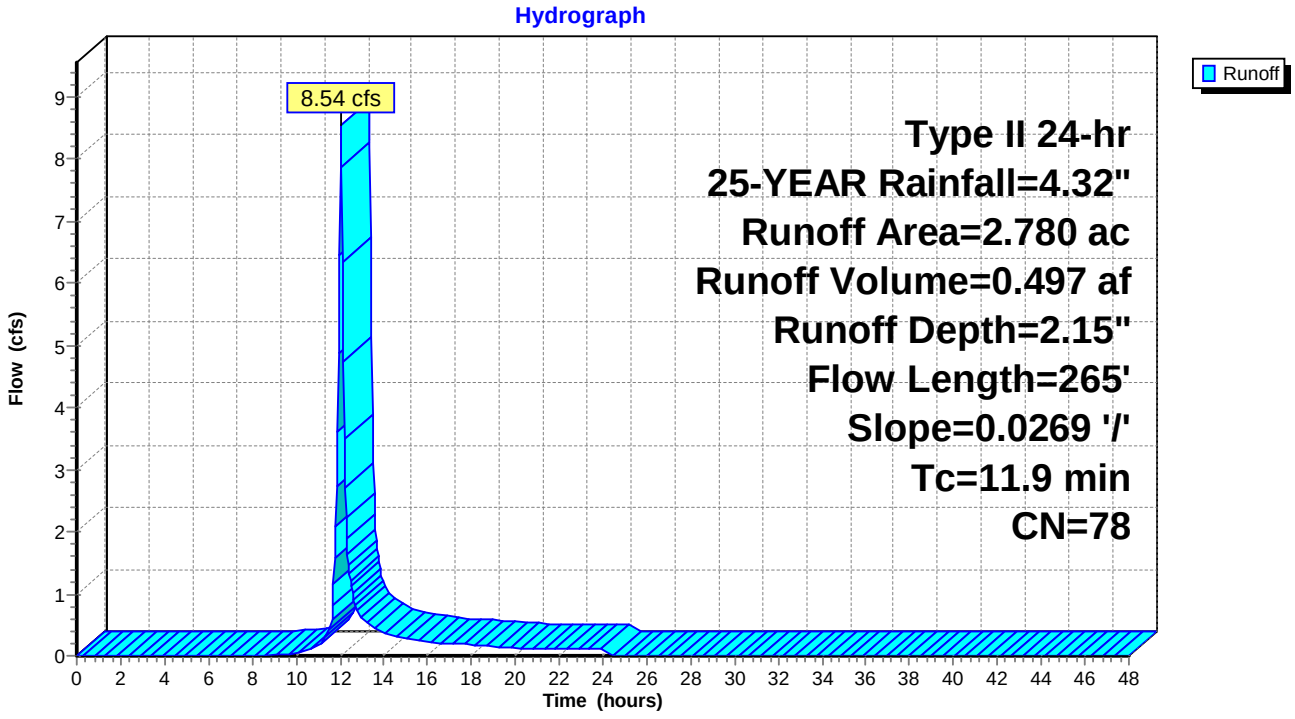
Runoff = 8.54 cfs @ 12.04 hrs, Volume= 0.497 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.780	78	
	2.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.4	165	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.9	265	Total			

Subcatchment 2S: BDA-1-2



Summary for Subcatchment 3S: BDA-1-3

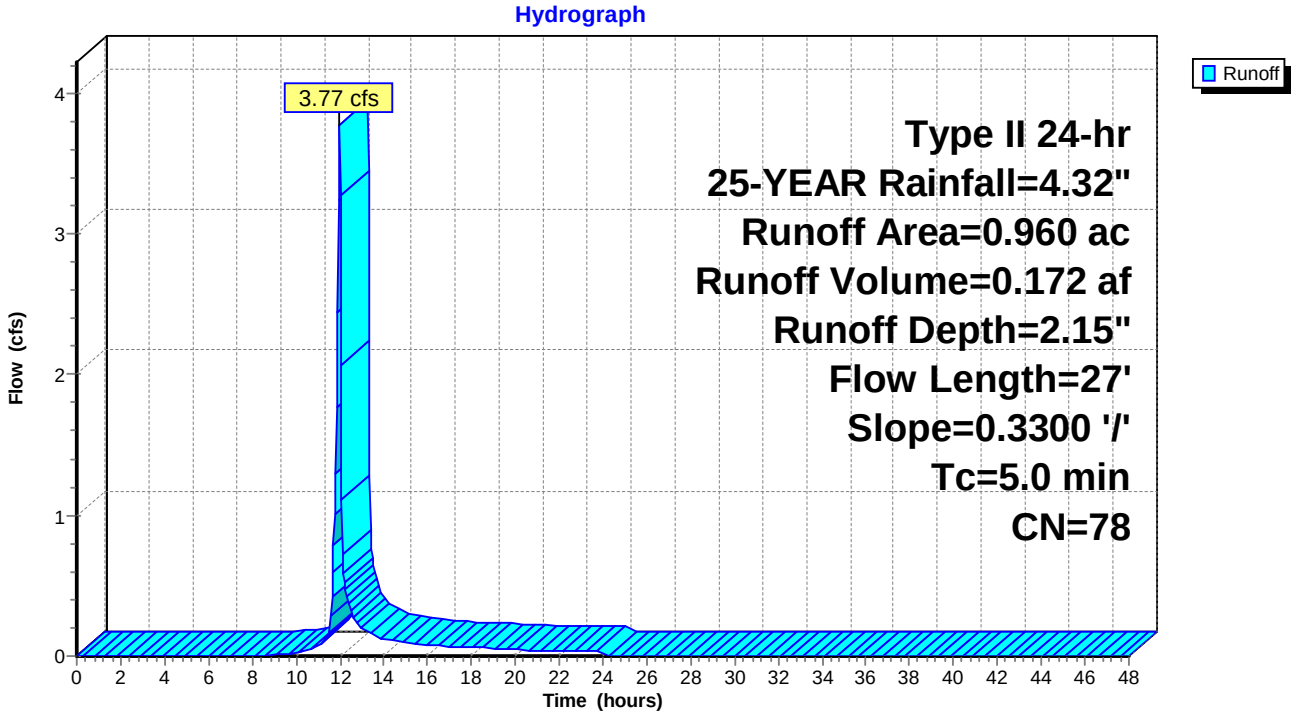
Runoff = 3.77 cfs @ 11.96 hrs, Volume= 0.172 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	0.960	78	
	0.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	27	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.2	27	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 3S: BDA-1-3



Summary for Subcatchment 4S: BDA-2-1

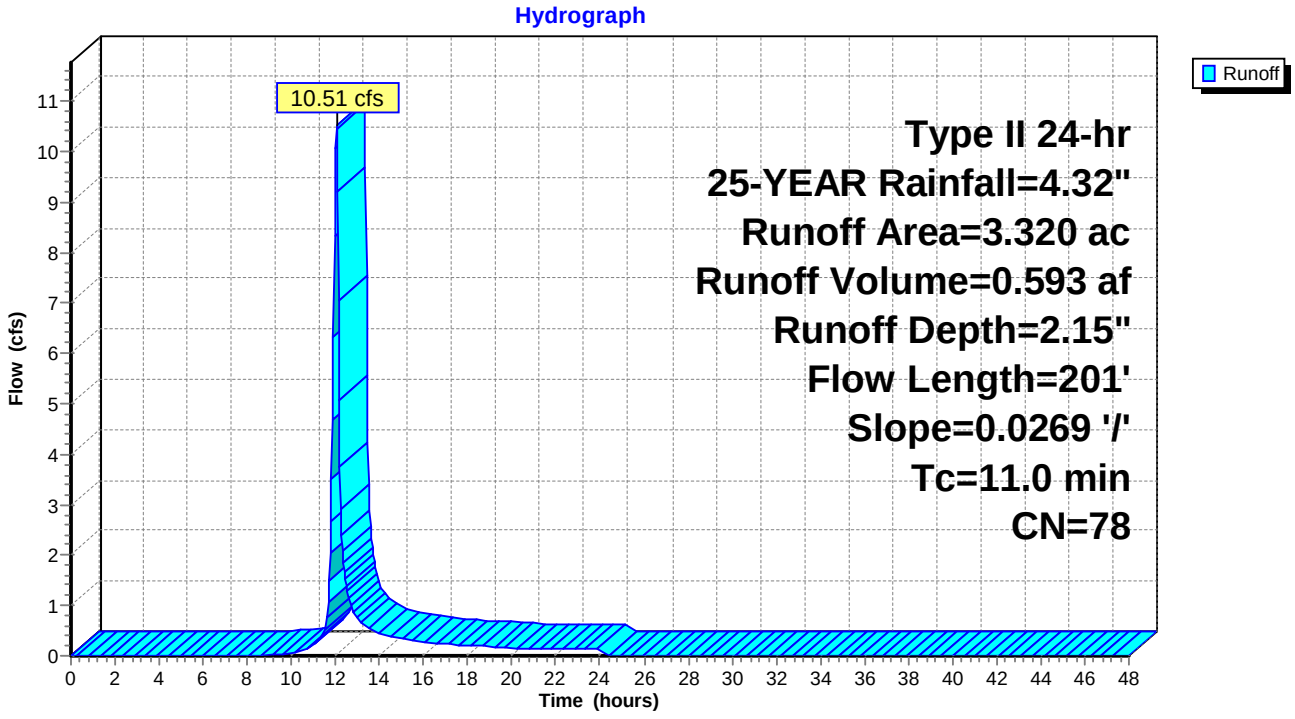
Runoff = 10.51 cfs @ 12.03 hrs, Volume= 0.593 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.320	78	
	3.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	101	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	201	Total			

Subcatchment 4S: BDA-2-1



Summary for Subcatchment 5S: BDA-2-2

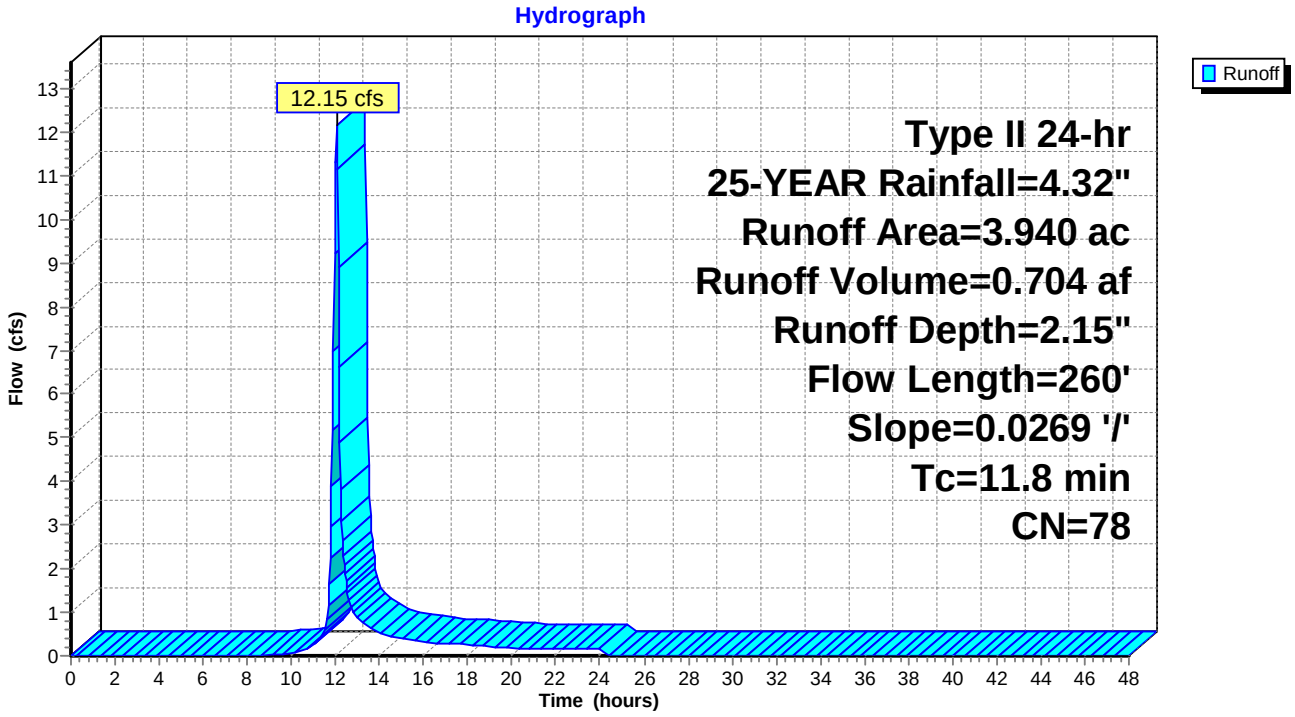
Runoff = 12.15 cfs @ 12.04 hrs, Volume= 0.704 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.940	78	
	3.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.3	160	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	260	Total			

Subcatchment 5S: BDA-2-2



Summary for Subcatchment 8S: BDA-3-1

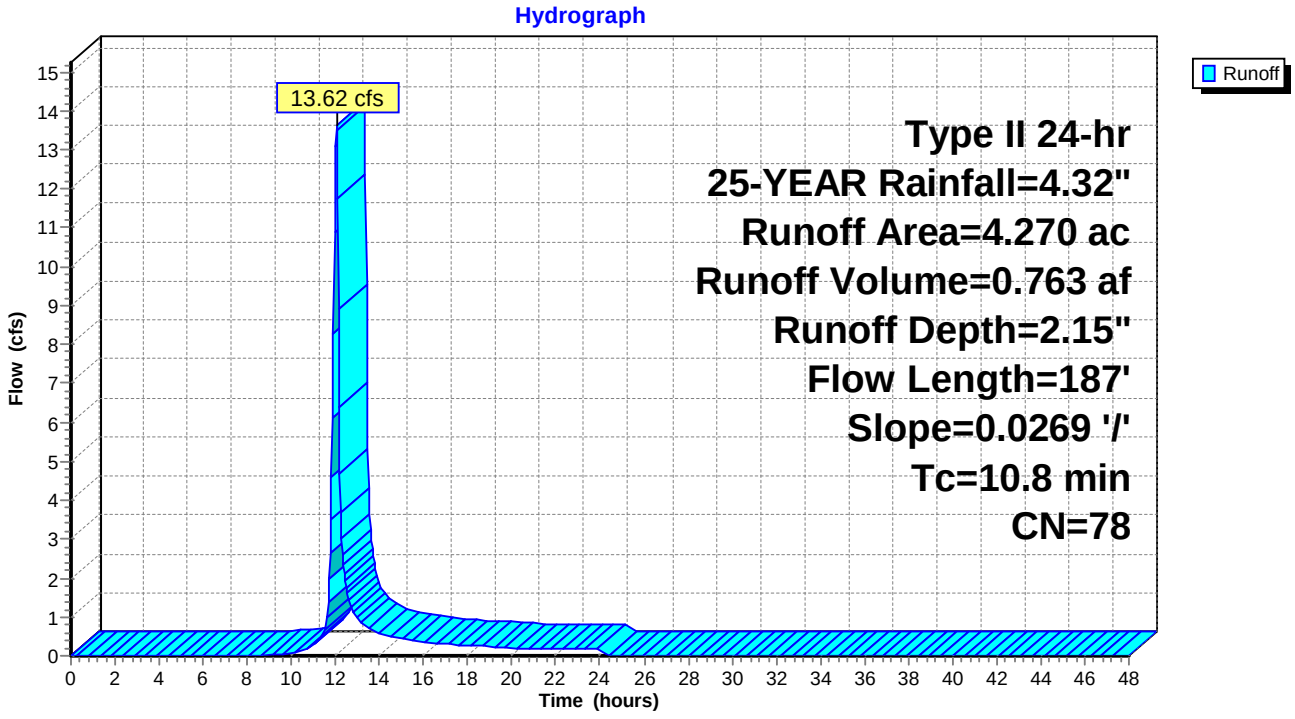
Runoff = 13.62 cfs @ 12.03 hrs, Volume= 0.763 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.270	78	
	4.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.3	87	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	187	Total			

Subcatchment 8S: BDA-3-1



Summary for Subcatchment 9S: BDA-3-2

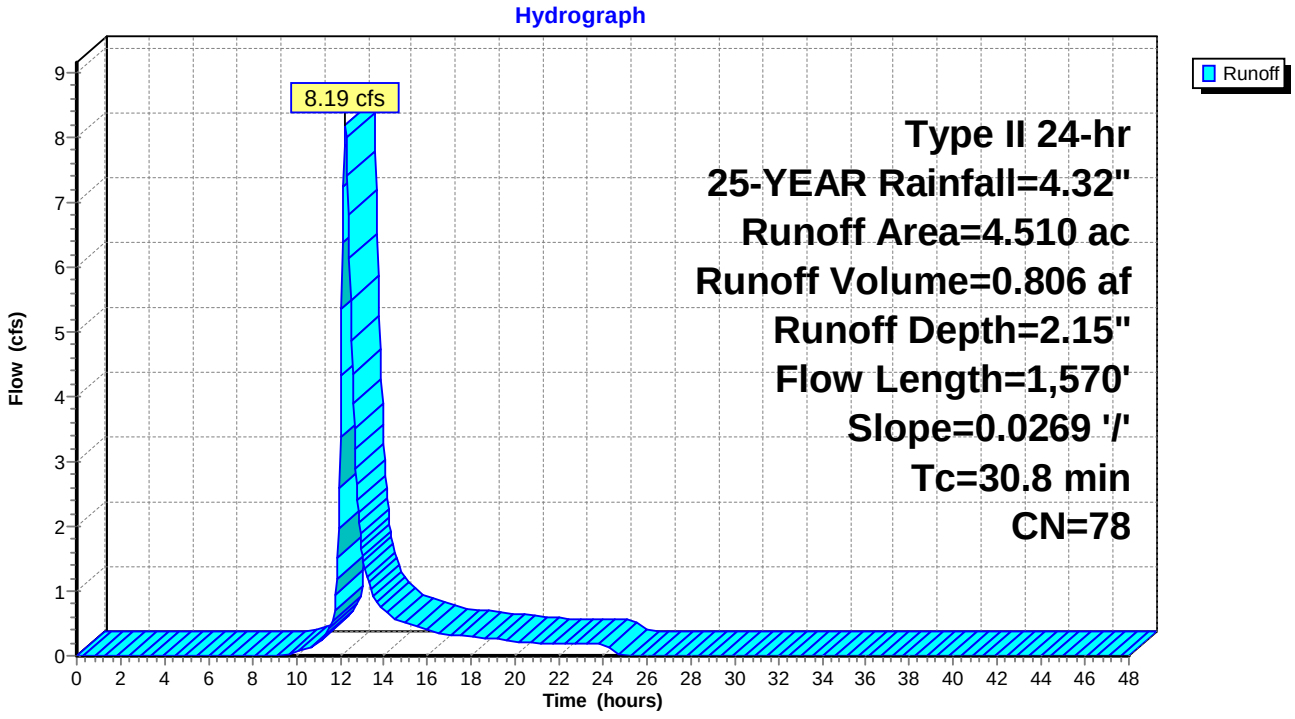
Runoff = 8.19 cfs @ 12.26 hrs, Volume= 0.806 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.510	78	
	4.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
21.3	1,470	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
30.8	1,570	Total			

Subcatchment 9S: BDA-3-2



Summary for Subcatchment 12S: BDA-4-1

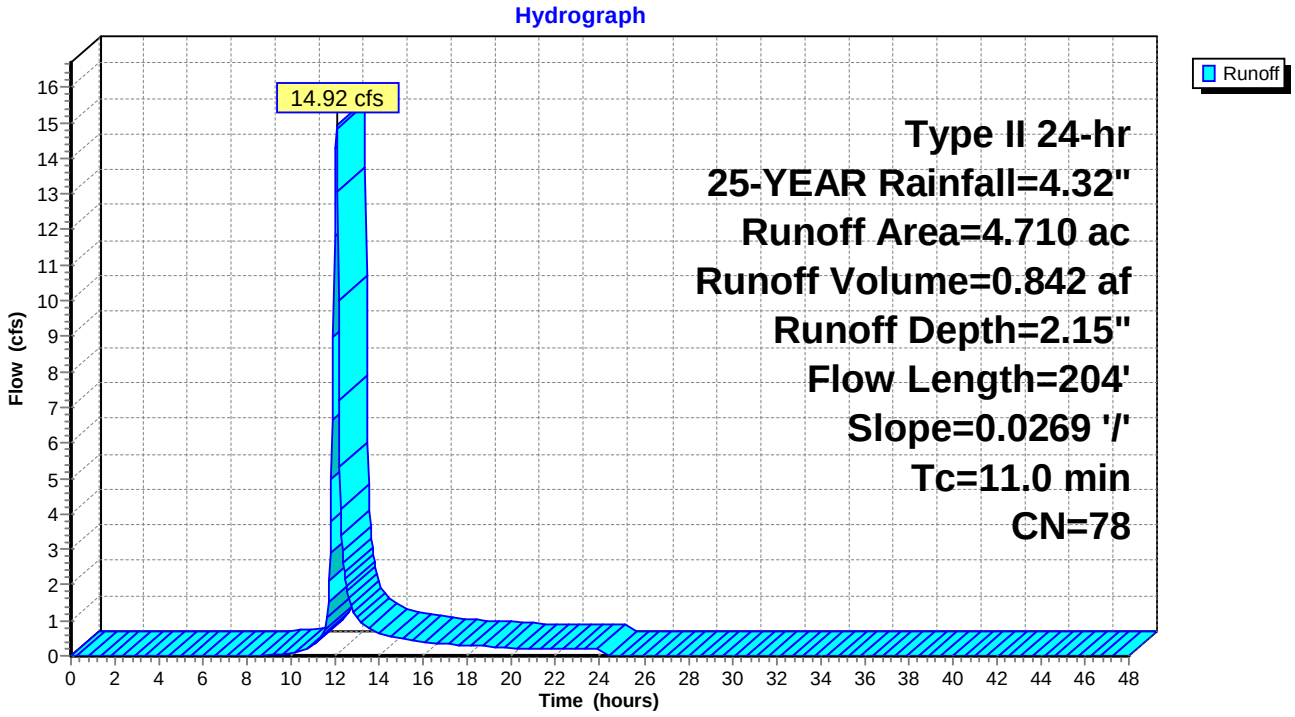
Runoff = 14.92 cfs @ 12.03 hrs, Volume= 0.842 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.710	78	
	4.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	104	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	204	Total			

Subcatchment 12S: BDA-4-1



Summary for Subcatchment 13S: BDA-4-2

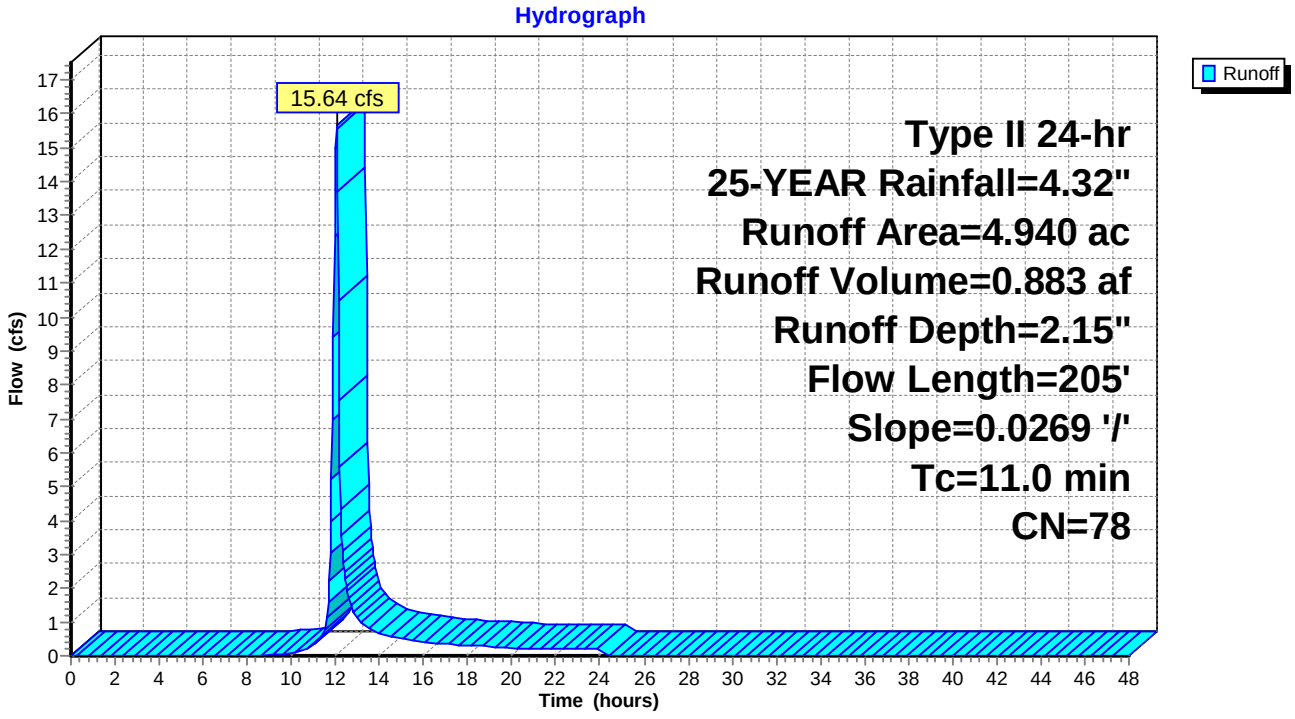
Runoff = 15.64 cfs @ 12.03 hrs, Volume= 0.883 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.940	78	
	4.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	105	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	205	Total			

Subcatchment 13S: BDA-4-2



Summary for Subcatchment 15S: BDA-5-1

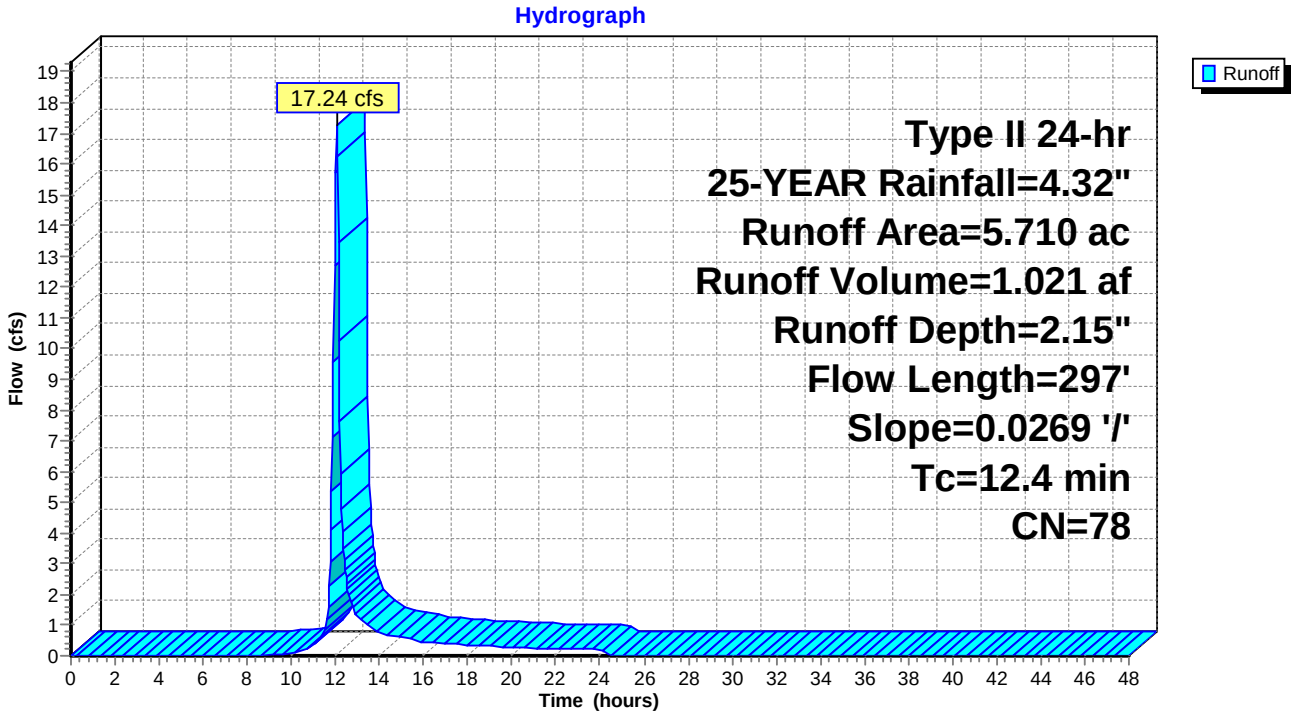
Runoff = 17.24 cfs @ 12.04 hrs, Volume= 1.021 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.710	78	
	5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.9	197	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	297	Total			

Subcatchment 15S: BDA-5-1



Summary for Subcatchment 16S: BDA-5-2

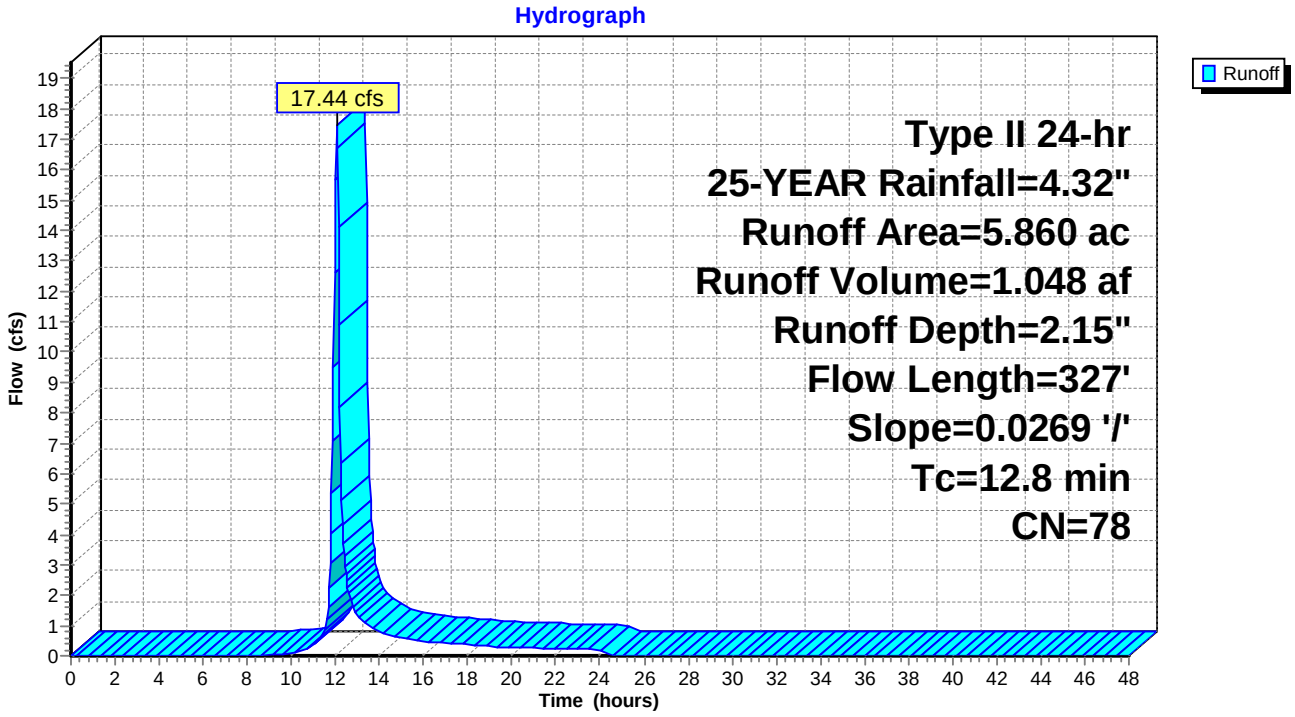
Runoff = 17.44 cfs @ 12.05 hrs, Volume= 1.048 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.860	78	
	5.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.3	227	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	327	Total			

Subcatchment 16S: BDA-5-2



Summary for Subcatchment 17S: BDA-6-1

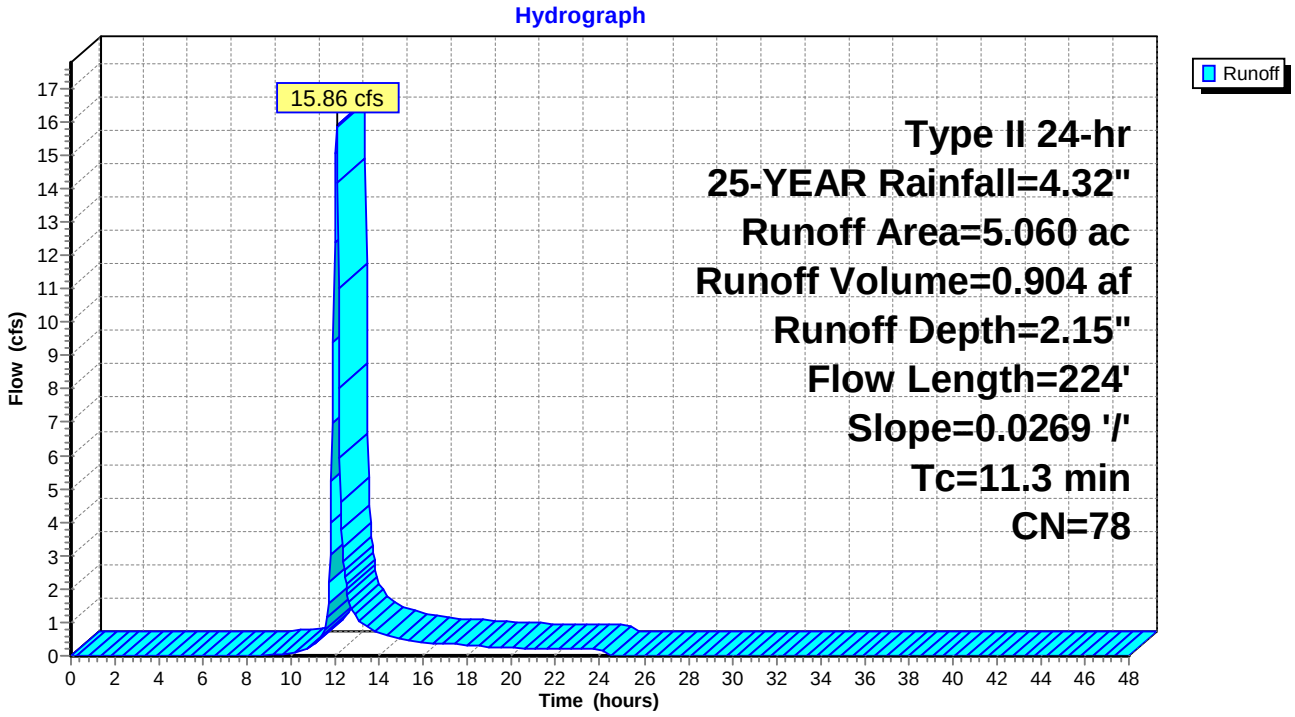
Runoff = 15.86 cfs @ 12.03 hrs, Volume= 0.904 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.060	78	
	5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.8	124	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	224	Total			

Subcatchment 17S: BDA-6-1



Summary for Subcatchment 18S: BDA-6-2

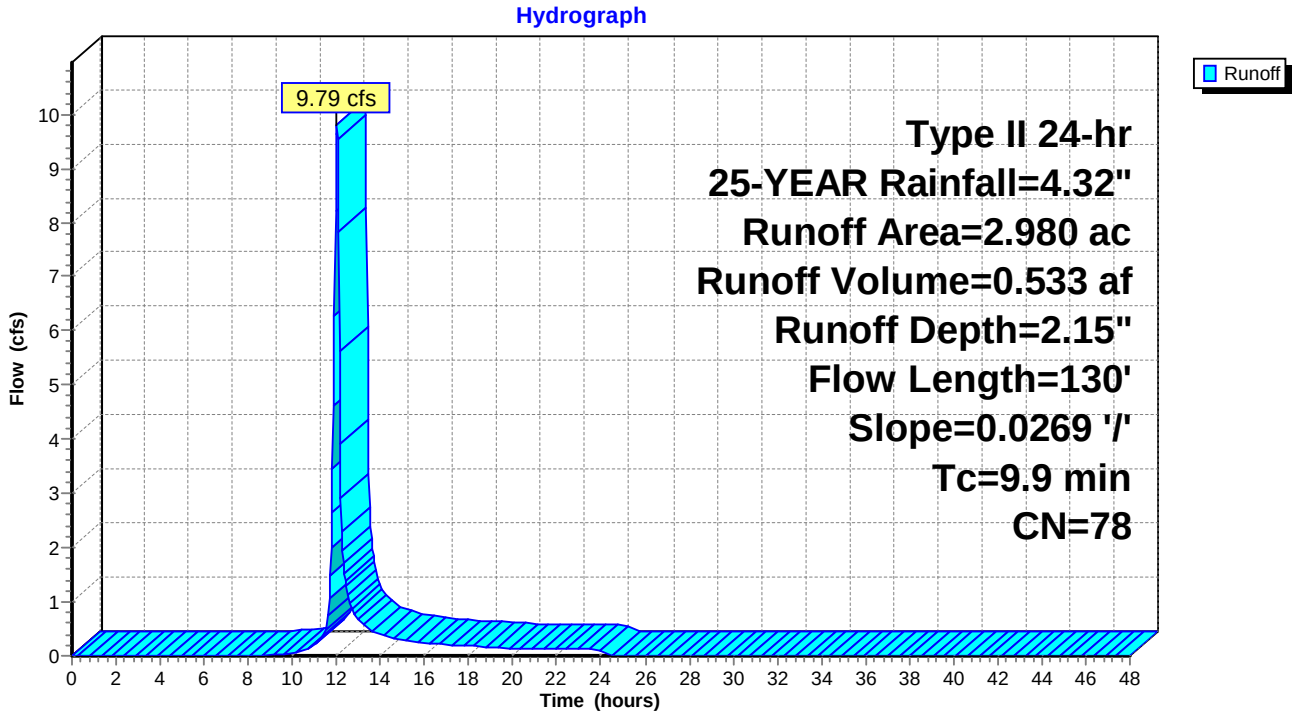
Runoff = 9.79 cfs @ 12.02 hrs, Volume= 0.533 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.980	78	
	2.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
0.4	30	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.9	130	Total			

Subcatchment 18S: BDA-6-2



Summary for Subcatchment 19S: BDA-6-3

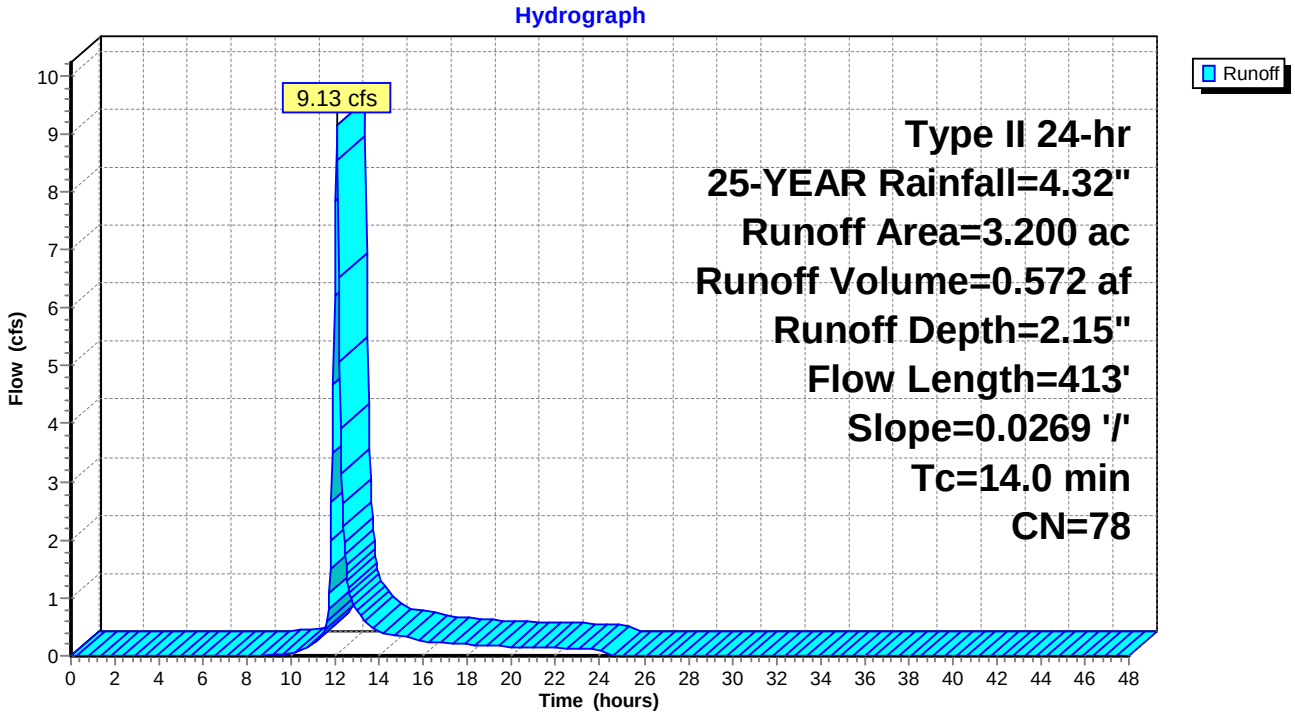
Runoff = 9.13 cfs @ 12.06 hrs, Volume= 0.572 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.200	78	
	3.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
4.5	313	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	413	Total			

Subcatchment 19S: BDA-6-3



Summary for Subcatchment 20S: BDA-7-1

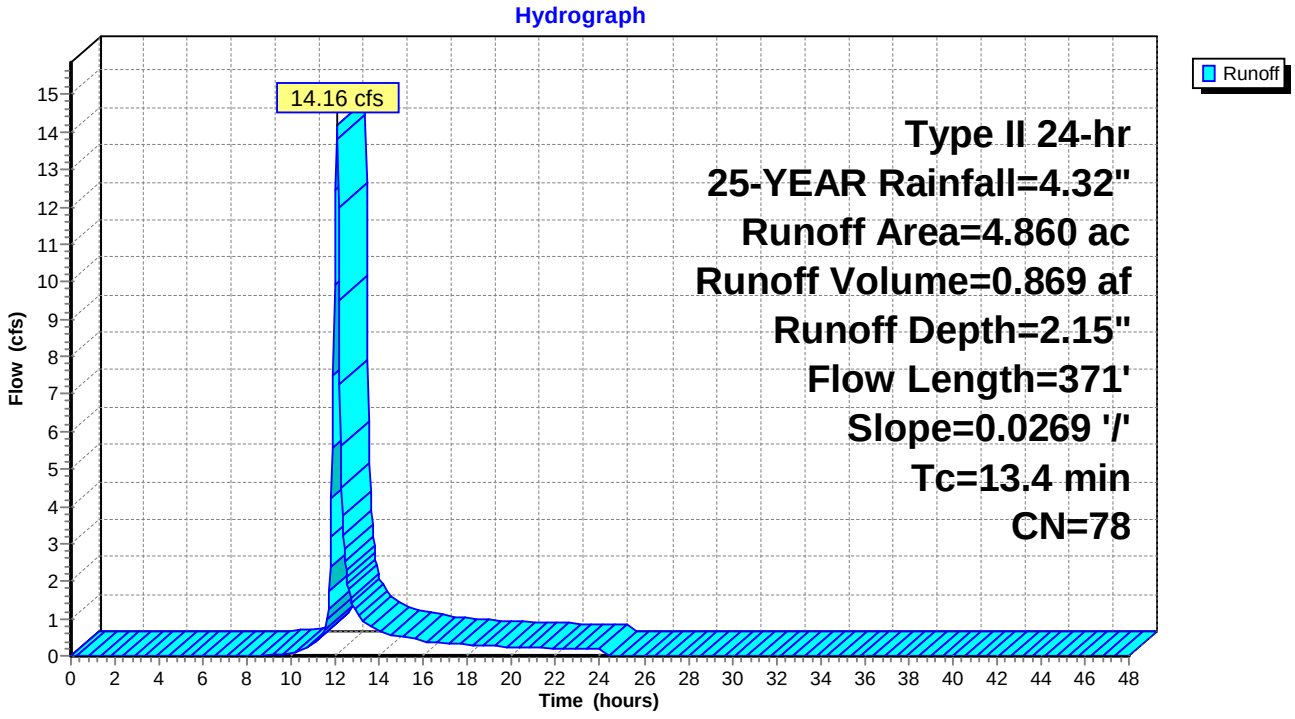
Runoff = 14.16 cfs @ 12.06 hrs, Volume= 0.869 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.860	78	
	4.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.9	271	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	371	Total			

Subcatchment 20S: BDA-7-1



Summary for Subcatchment 21S: BDA-7-2

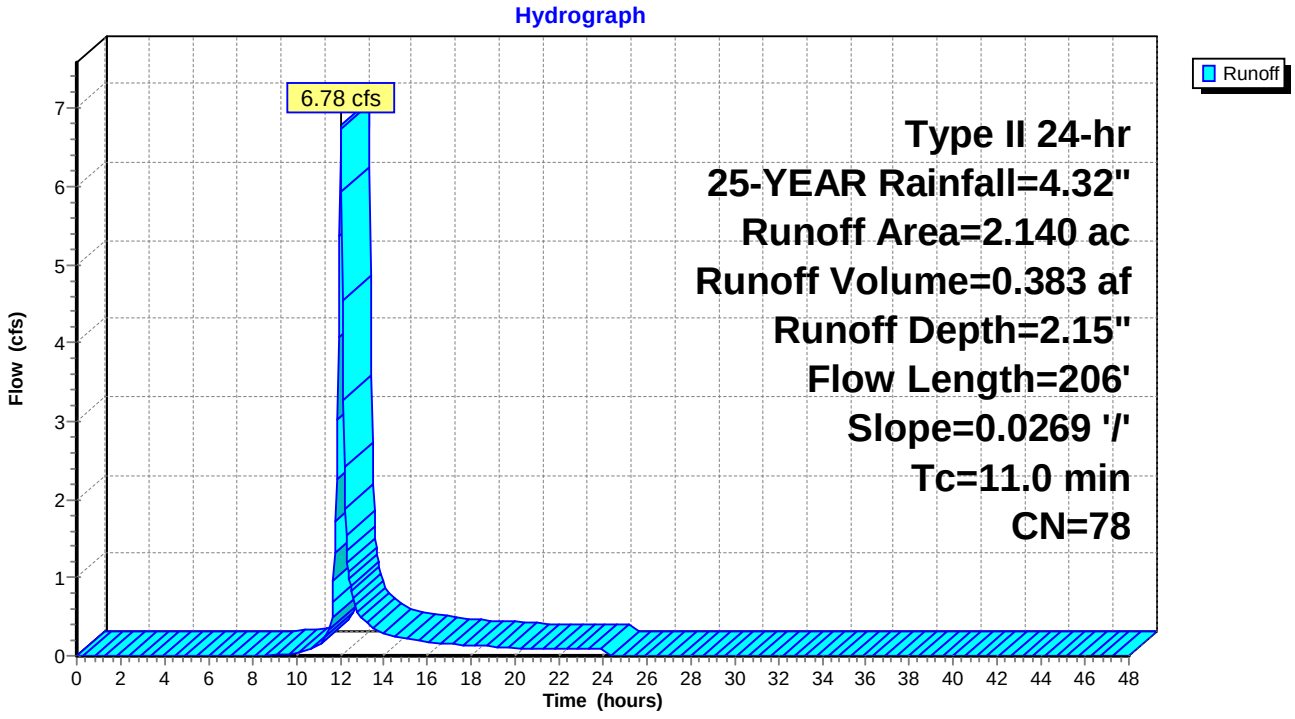
Runoff = 6.78 cfs @ 12.03 hrs, Volume= 0.383 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.140	78	
	2.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	106	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	206	Total			

Subcatchment 21S: BDA-7-2



Summary for Subcatchment 23S: BDA-8-1

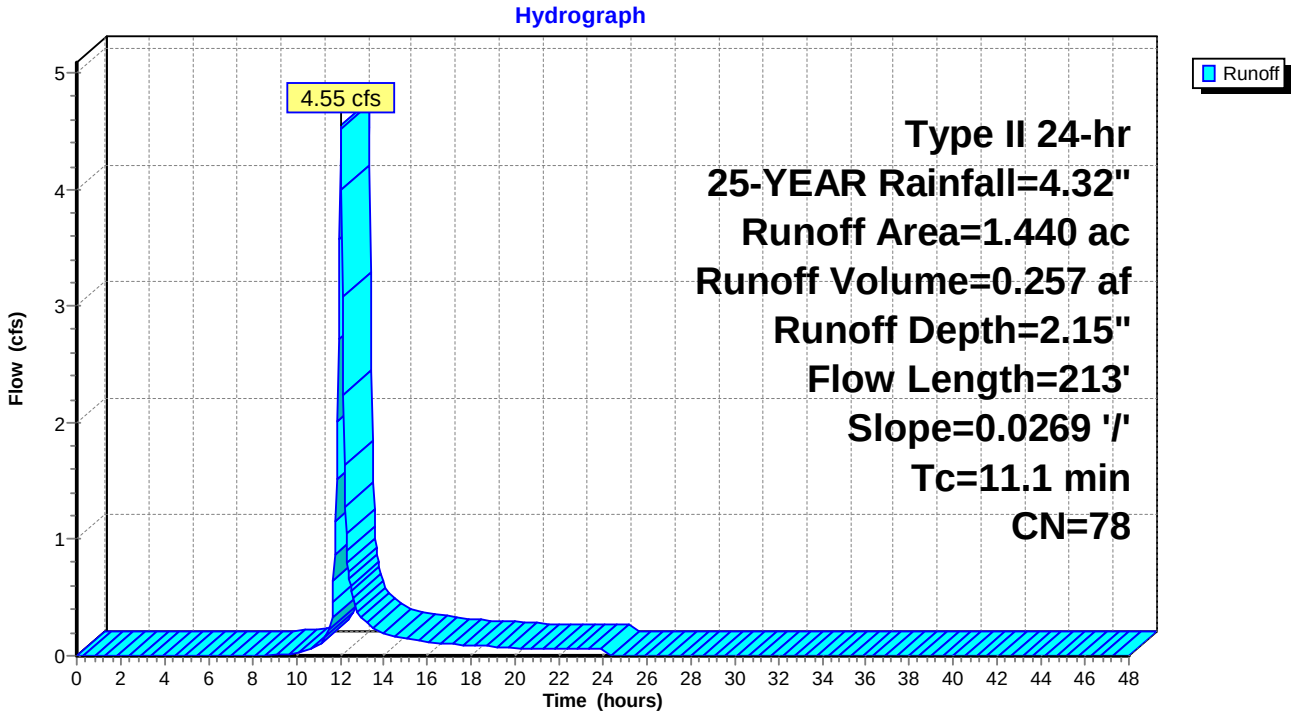
Runoff = 4.55 cfs @ 12.03 hrs, Volume= 0.257 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.440	78	
	1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.6	113	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	213	Total			

Subcatchment 23S: BDA-8-1



Summary for Subcatchment 24S: BDA-8-2

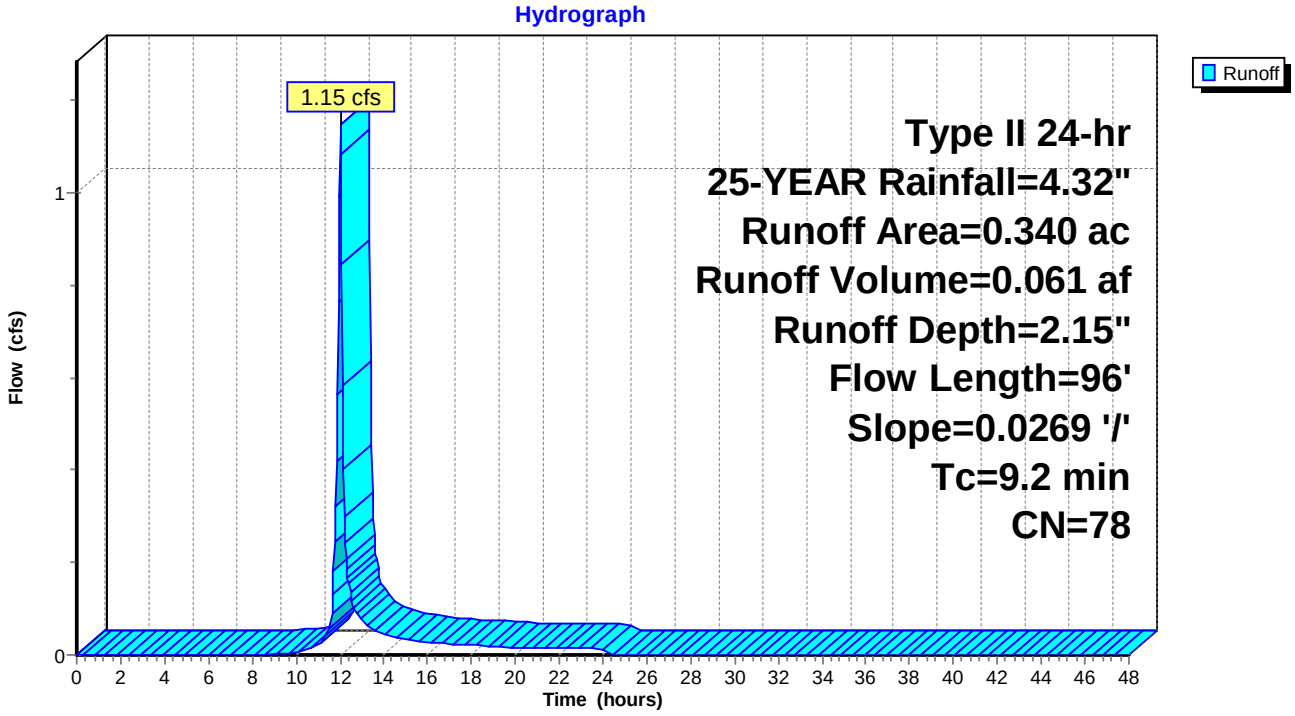
Runoff = 1.15 cfs @ 12.01 hrs, Volume= 0.061 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	0.340	78	
	0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	96	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"

Subcatchment 24S: BDA-8-2



Summary for Subcatchment 27S: BDA-9

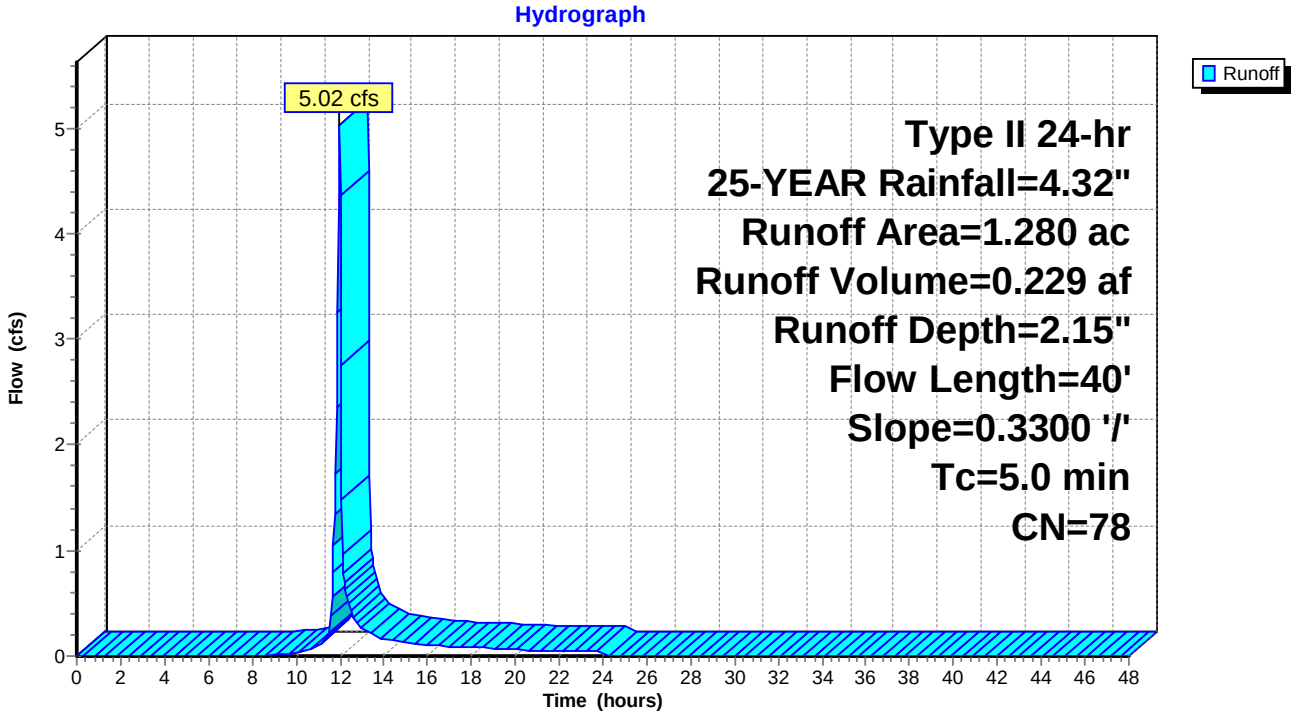
Runoff = 5.02 cfs @ 11.96 hrs, Volume= 0.229 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.280	78	
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 27S: BDA-9



Summary for Subcatchment 30S: BDA-10

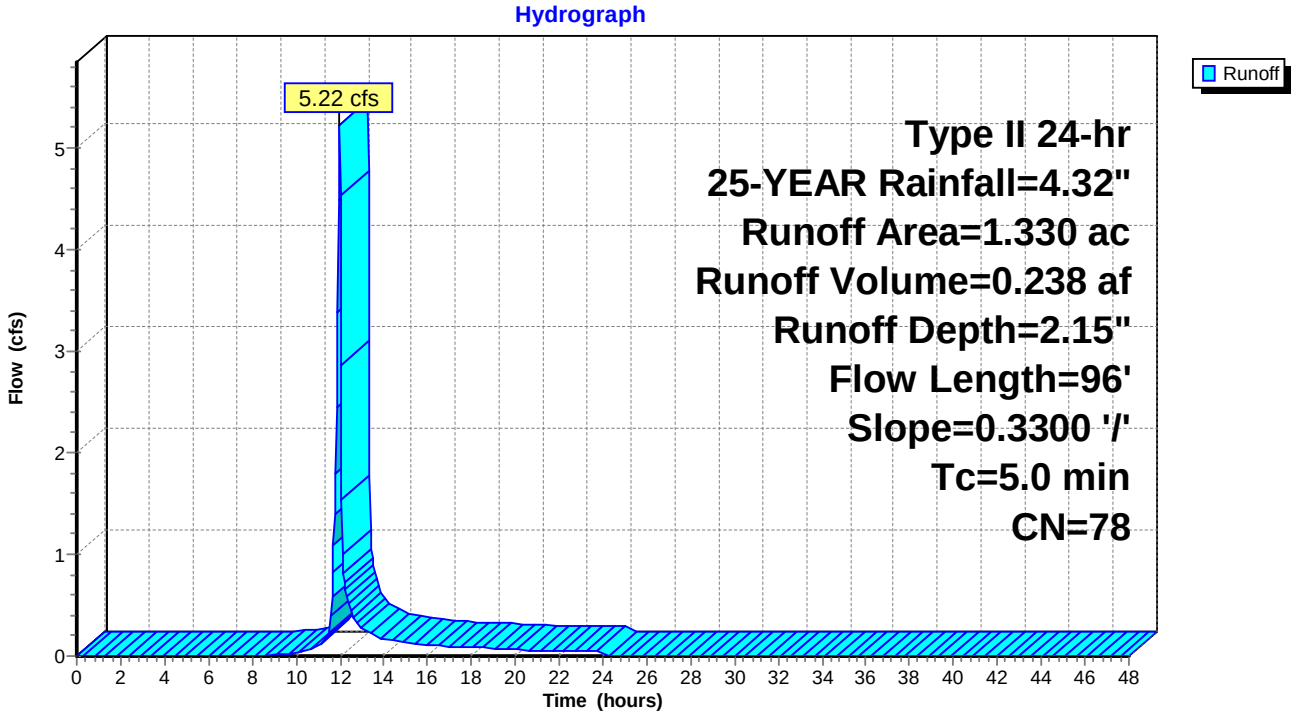
Runoff = 5.22 cfs @ 11.96 hrs, Volume= 0.238 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.330	78	
	1.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	96	0.3300	0.47		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.4	96	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30S: BDA-10



Summary for Subcatchment 31S: BDA-11

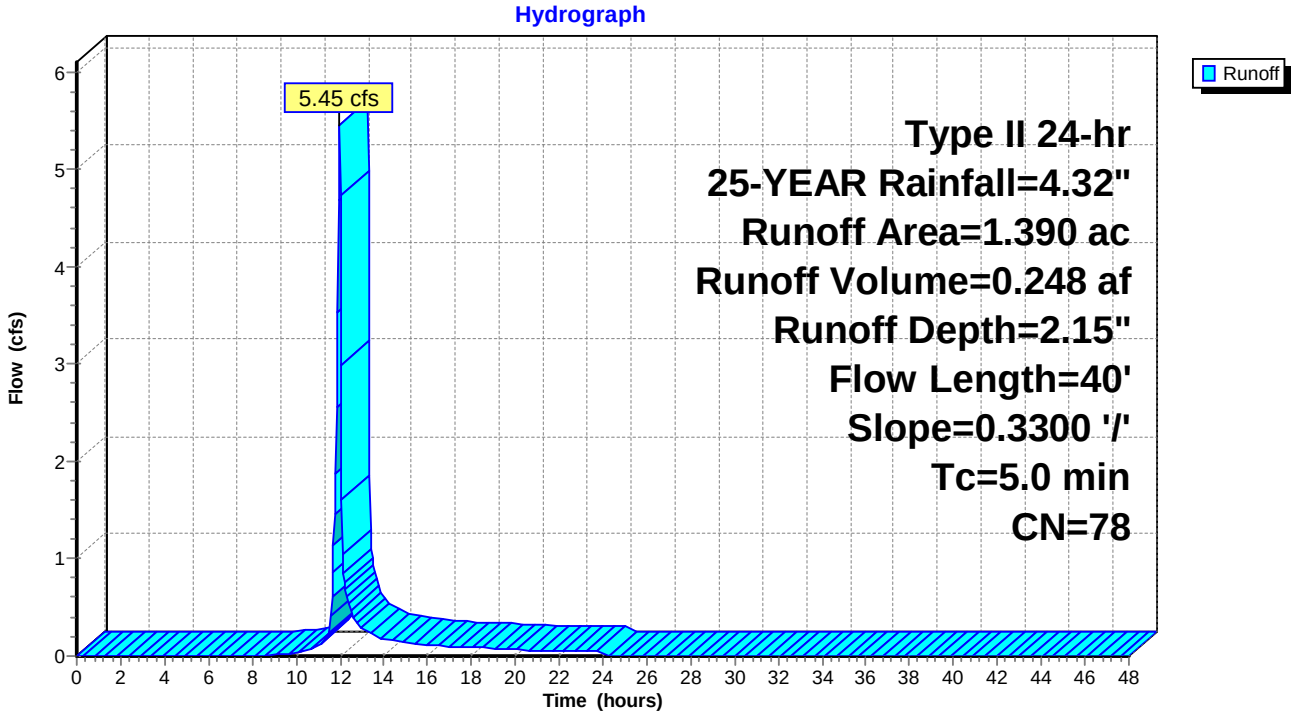
Runoff = 5.45 cfs @ 11.96 hrs, Volume= 0.248 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.390	78	
	1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 31S: BDA-11



Summary for Subcatchment 34S: BDA-10

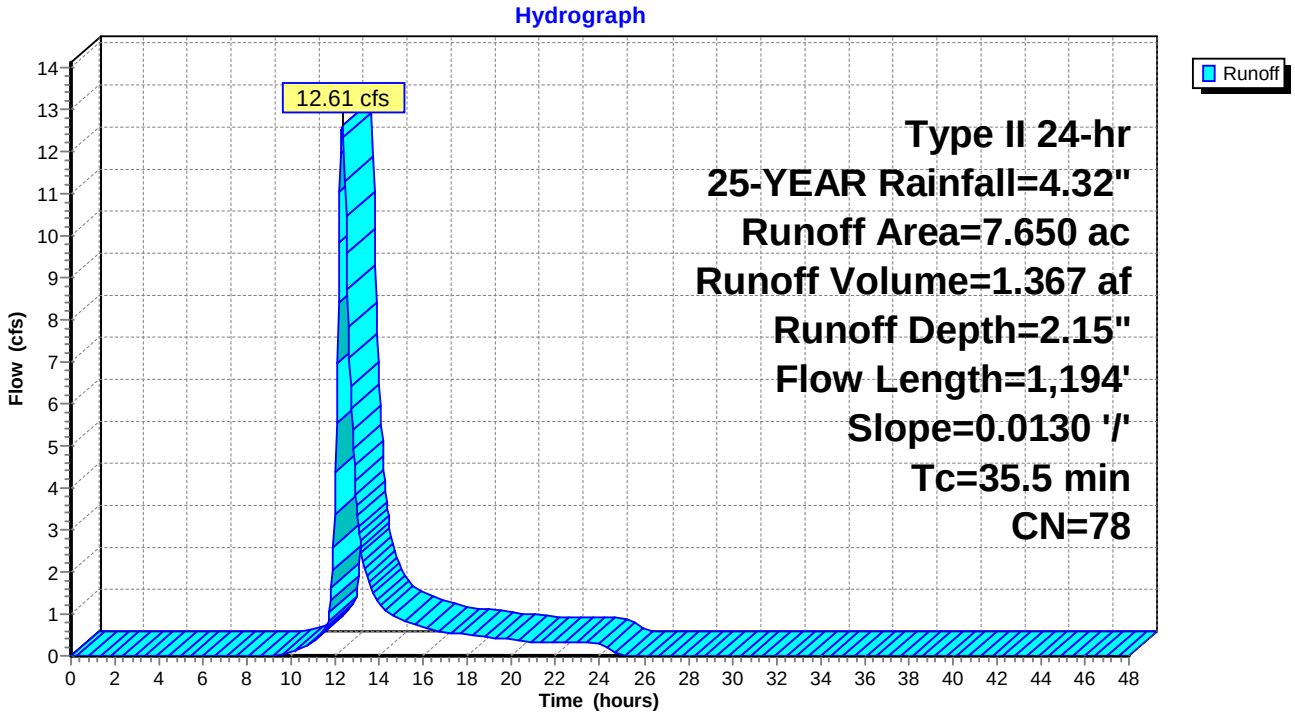
Runoff = 12.61 cfs @ 12.32 hrs, Volume= 1.367 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	7.650	78	
	7.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0130	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
22.8	1,094	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.5	1,194	Total			

Subcatchment 34S: BDA-10



Summary for Reach 1R: BDC-1

Inflow Area = 4.520 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 13.95 cfs @ 12.04 hrs, Volume= 0.808 af
Outflow = 13.57 cfs @ 12.06 hrs, Volume= 0.808 af, Atten= 3%, Lag= 1.4 min

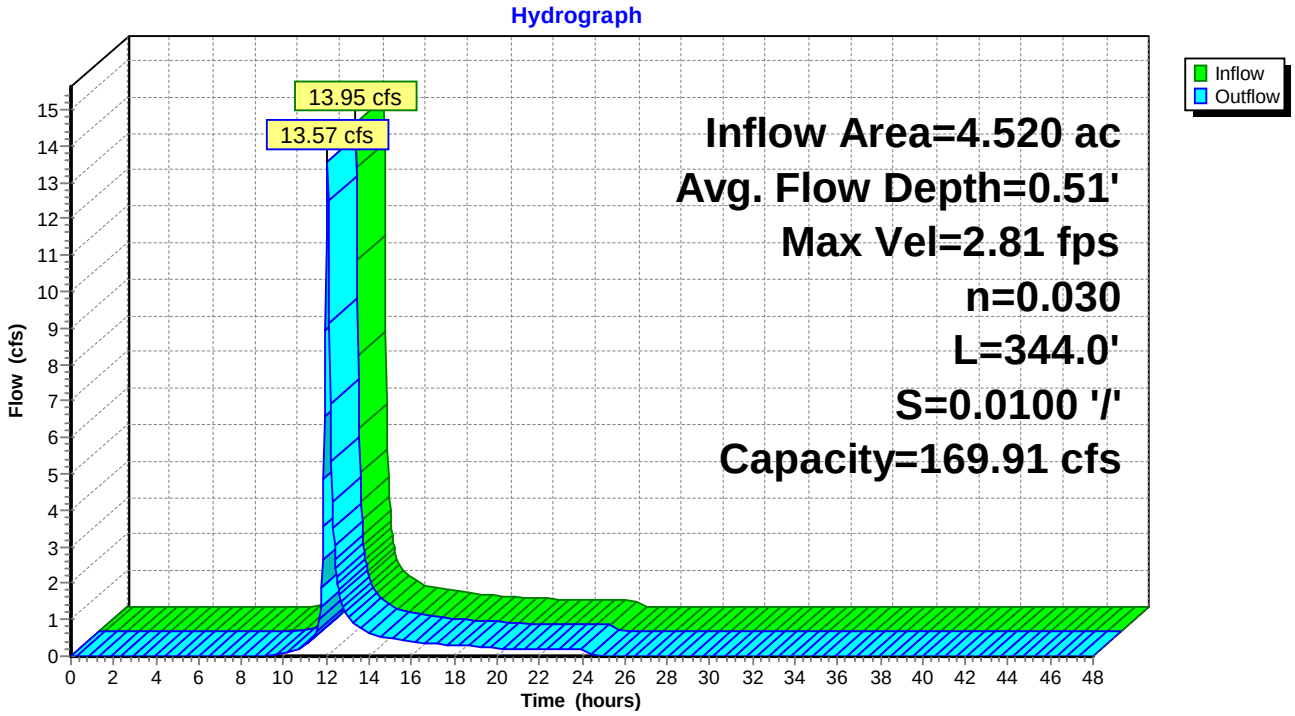
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.81 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 8.1 min

Peak Storage= 1,655 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 344.0' Slope= 0.0100 '/'
Inlet Invert= 464.00', Outlet Invert= 460.56'

‡

Reach 1R: BDC-1



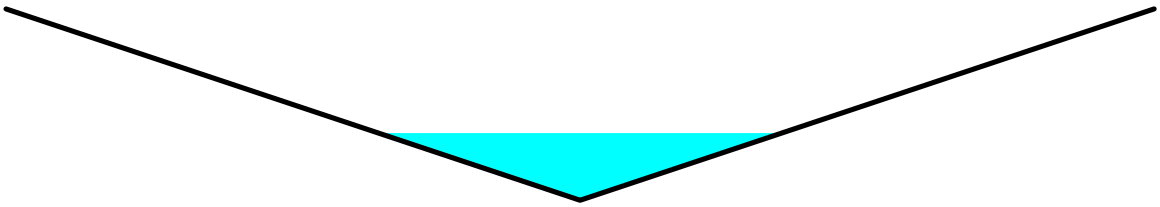
Summary for Reach 2R: PD-1

Inflow Area = 0.960 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 3.77 cfs @ 11.96 hrs, Volume= 0.172 af
Outflow = 2.50 cfs @ 12.03 hrs, Volume= 0.172 af, Atten= 34%, Lag= 4.1 min

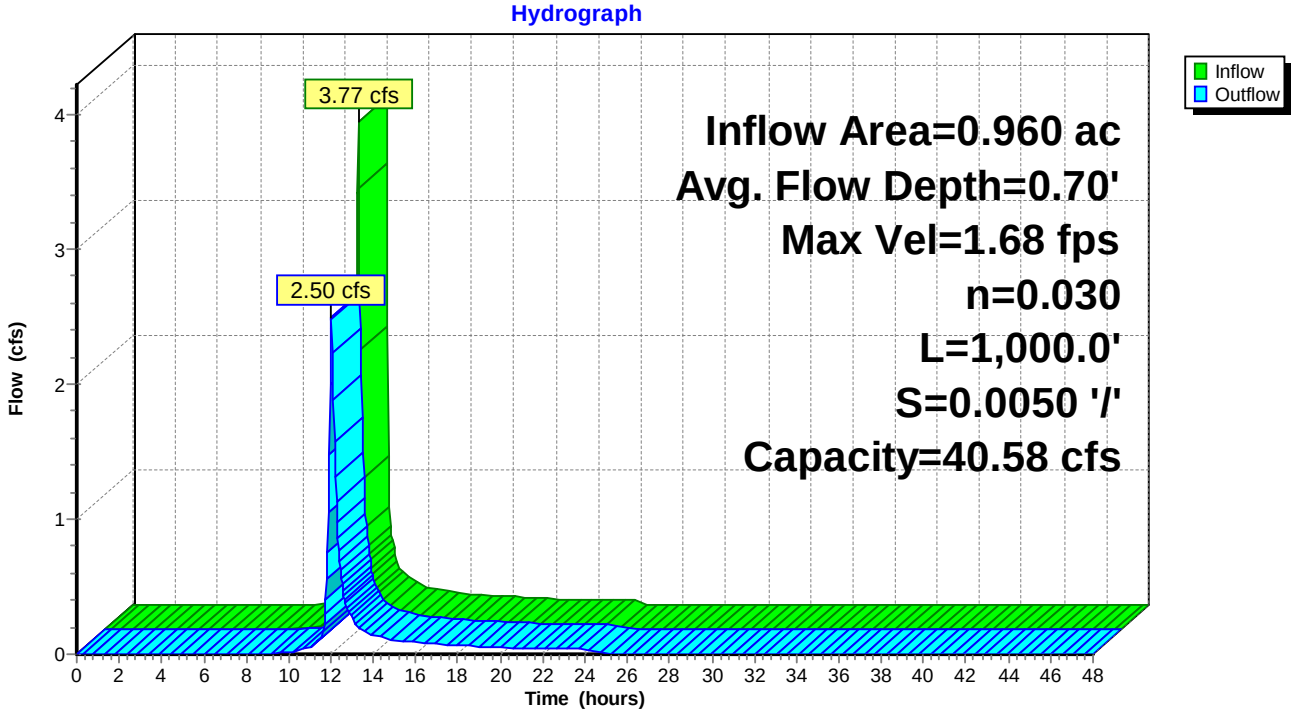
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.68 fps, Min. Travel Time= 9.9 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 31.7 min

Peak Storage= 1,482 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 40.58 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 1,000.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 455.00'



Reach 2R: PD-1



Summary for Reach 6R: BDC-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 22.64 cfs @ 12.03 hrs, Volume= 1.298 af
Outflow = 21.42 cfs @ 12.07 hrs, Volume= 1.298 af, Atten= 5%, Lag= 2.0 min

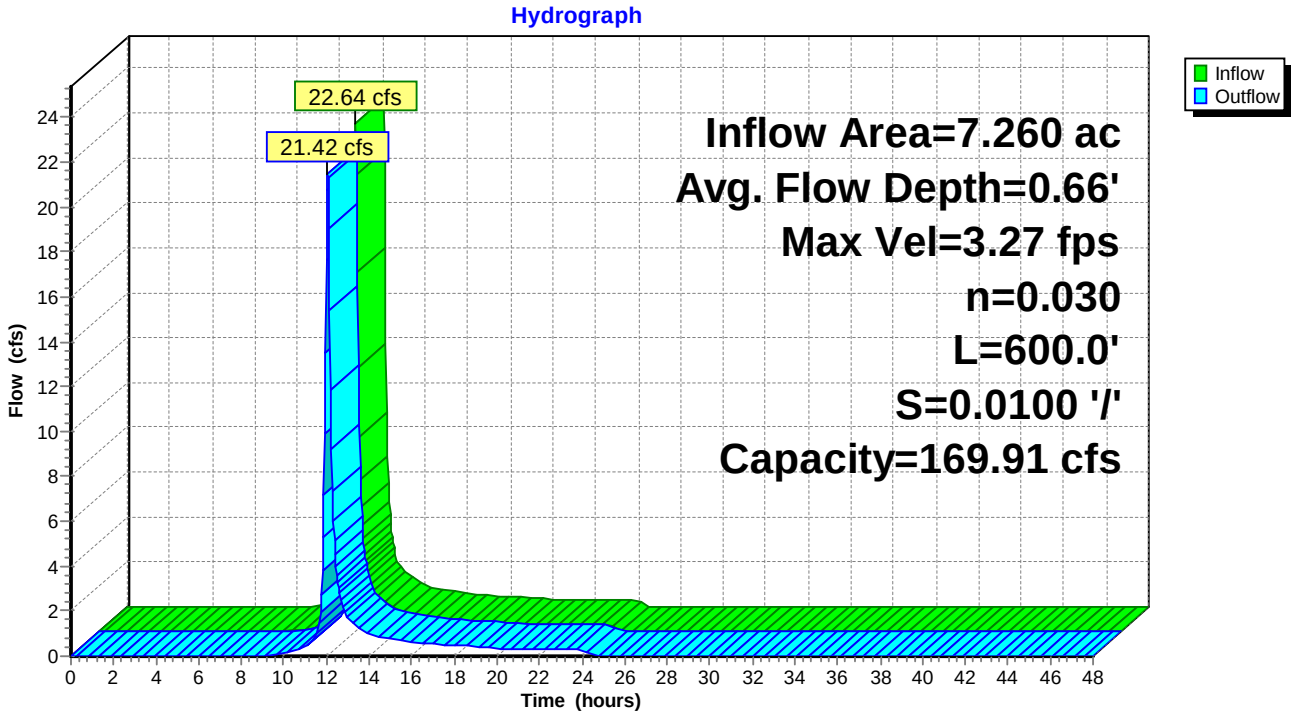
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.27 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 12.6 min

Peak Storage= 3,922 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 600.0' Slope= 0.0100 '/'
Inlet Invert= 466.00', Outlet Invert= 460.00'

‡

Reach 6R: BDC-2



Summary for Reach 10R: BDC-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 17.87 cfs @ 12.05 hrs, Volume= 1.569 af
Outflow = 16.64 cfs @ 12.09 hrs, Volume= 1.569 af, Atten= 7%, Lag= 2.9 min

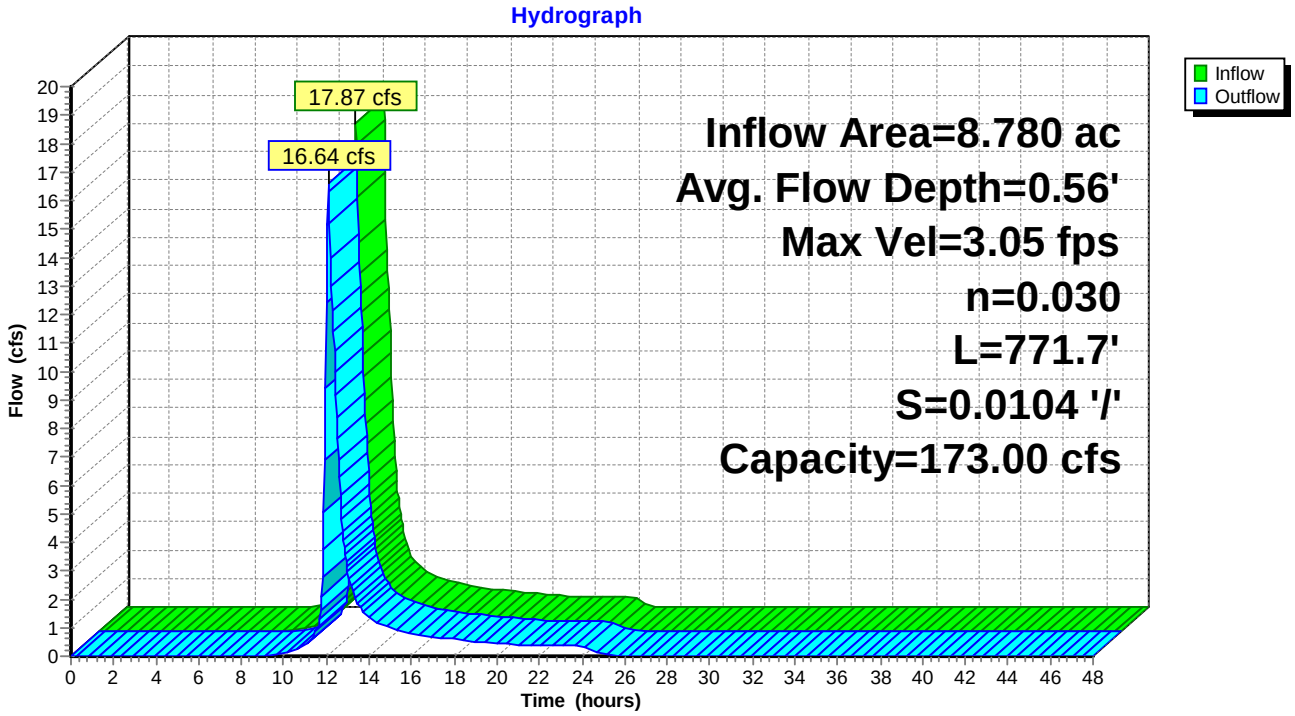
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 15.4 min

Peak Storage= 4,203 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 173.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 771.7' Slope= 0.0104 '/'
Inlet Invert= 468.00', Outlet Invert= 460.00'

‡

Reach 10R: BDC-3



Summary for Reach 14R: BDC-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 30.56 cfs @ 12.03 hrs, Volume= 1.725 af
Outflow = 27.89 cfs @ 12.07 hrs, Volume= 1.725 af, Atten= 9%, Lag= 2.6 min

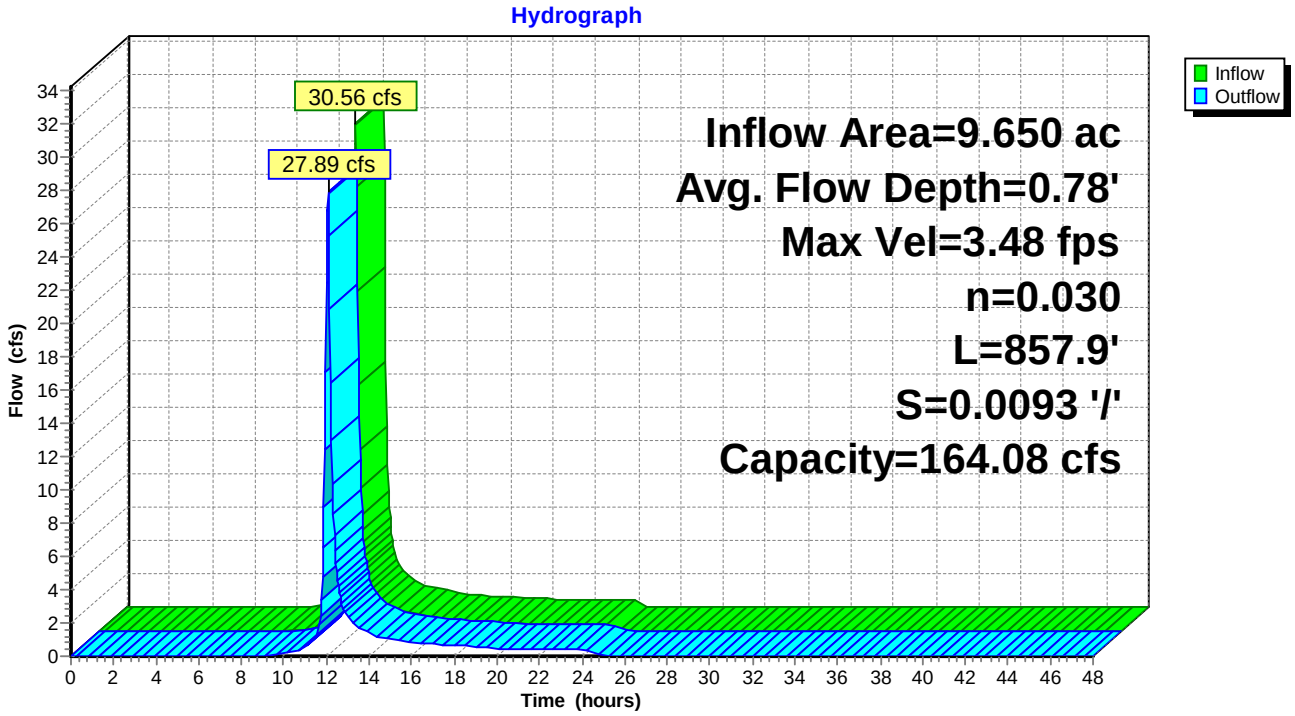
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 17.6 min

Peak Storage= 6,874 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 164.08 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 857.9' Slope= 0.0093 '/'
Inlet Invert= 470.00', Outlet Invert= 462.00'

‡

Reach 14R: BDC-4



Summary for Reach 17R: PD-2

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 30.23 cfs @ 12.10 hrs, Volume= 2.068 af
Outflow = 28.87 cfs @ 12.14 hrs, Volume= 2.068 af, Atten= 4%, Lag= 2.3 min

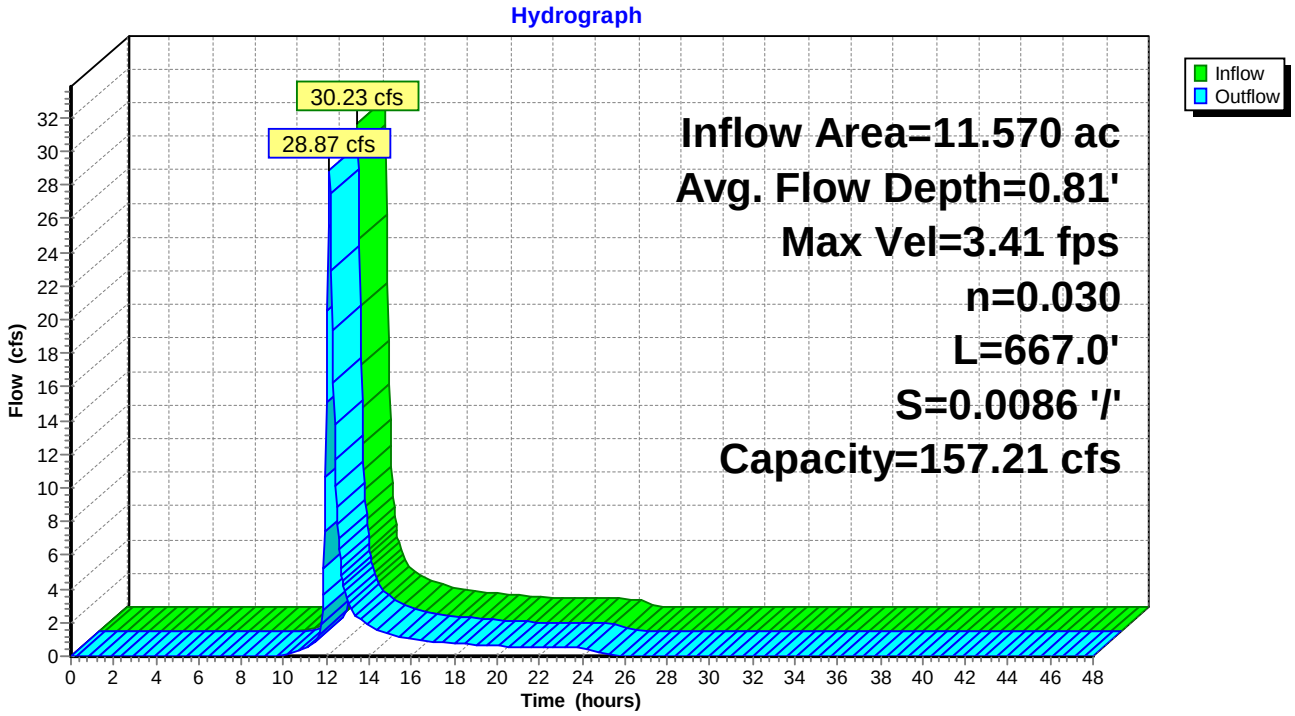
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.41 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 14.4 min

Peak Storage= 5,636 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.21 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 667.0' Slope= 0.0086 '/'
Inlet Invert= 457.00', Outlet Invert= 451.29'

‡

Reach 17R: PD-2



Summary for Reach 18R: BDC-5

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 34.67 cfs @ 12.05 hrs, Volume= 2.068 af
Outflow = 30.23 cfs @ 12.10 hrs, Volume= 2.068 af, Atten= 13%, Lag= 3.4 min

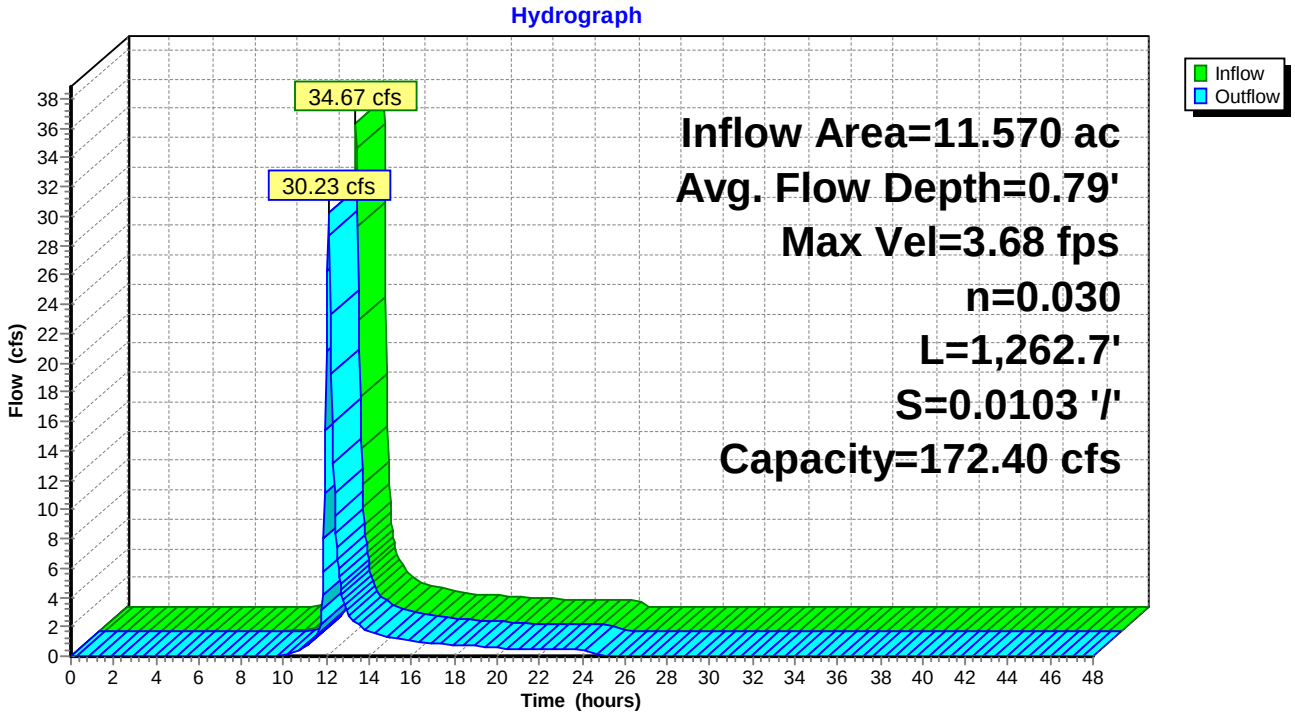
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 25.0 min

Peak Storage= 10,336 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 172.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,262.7' Slope= 0.0103 '/'
Inlet Invert= 470.00', Outlet Invert= 457.00'

‡

Reach 18R: BDC-5



Summary for Reach 20R: BDC-6

Inflow Area = 8.040 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 25.58 cfs @ 12.03 hrs, Volume= 1.437 af
Outflow = 23.85 cfs @ 12.06 hrs, Volume= 1.437 af, Atten= 7%, Lag= 2.2 min

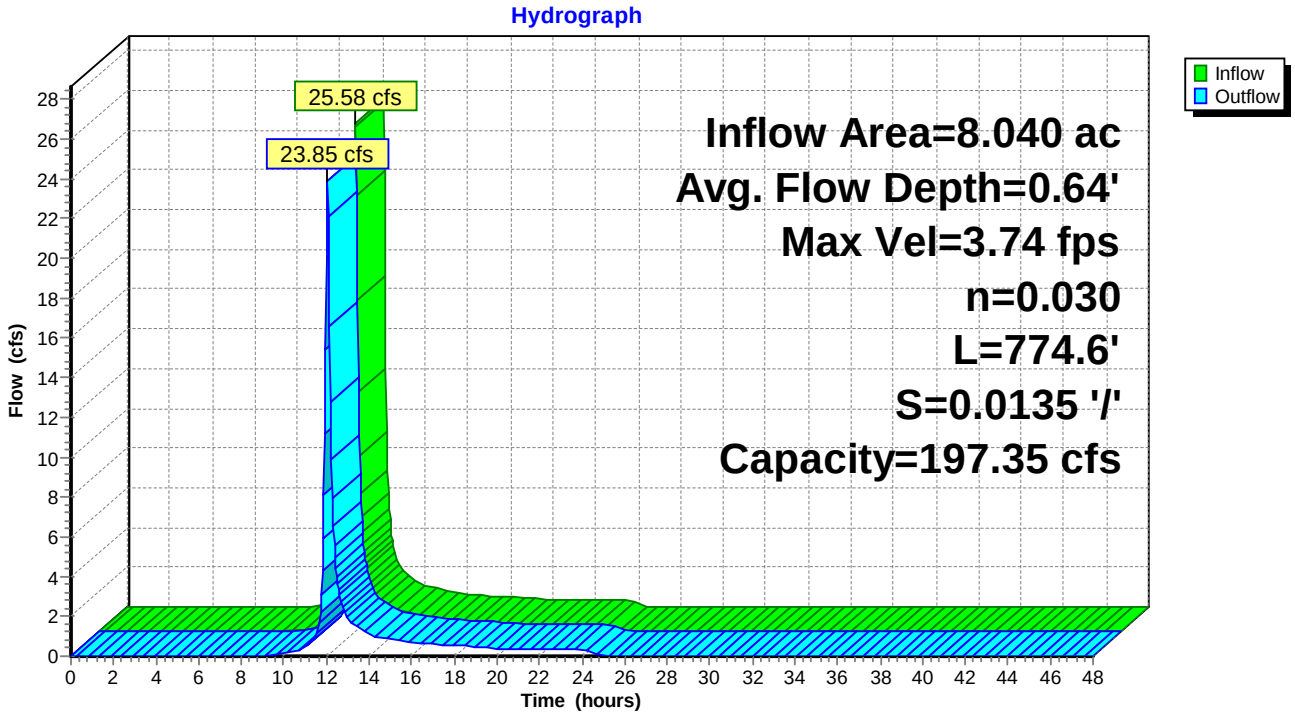
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.74 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 14.4 min

Peak Storage= 4,922 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 197.35 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 774.6' Slope= 0.0135 '/'
Inlet Invert= 469.45', Outlet Invert= 459.00'

‡

Reach 20R: BDC-6



Summary for Reach 22R: BDC-7

Inflow Area = 7.000 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 20.80 cfs @ 12.05 hrs, Volume= 1.251 af
Outflow = 20.10 cfs @ 12.07 hrs, Volume= 1.251 af, Atten= 3%, Lag= 1.7 min

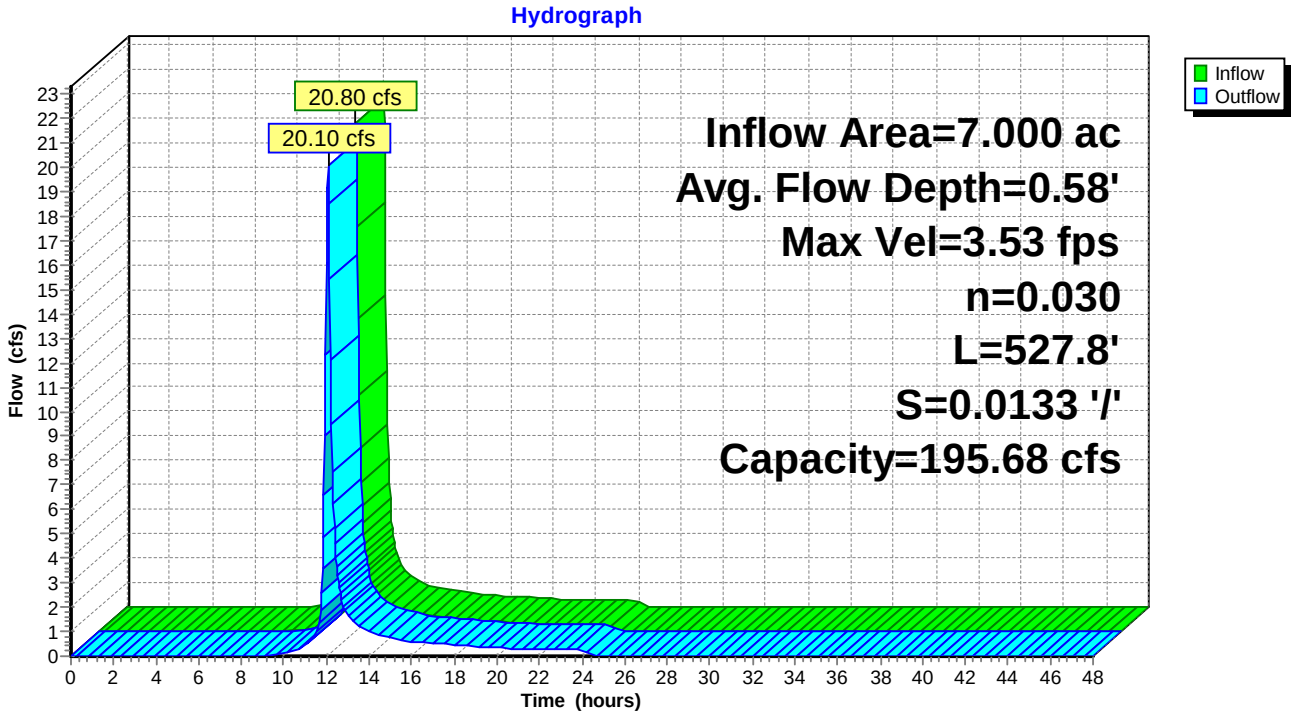
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.53 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 10.0 min

Peak Storage= 3,005 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 195.68 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 527.8' Slope= 0.0133 '/'
Inlet Invert= 462.00', Outlet Invert= 455.00'

‡

Reach 22R: BDC-7



Summary for Reach 25R: BDC-8

Inflow Area = 1.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.67 cfs @ 12.03 hrs, Volume= 0.318 af
Outflow = 5.57 cfs @ 12.04 hrs, Volume= 0.318 af, Atten= 2%, Lag= 1.1 min

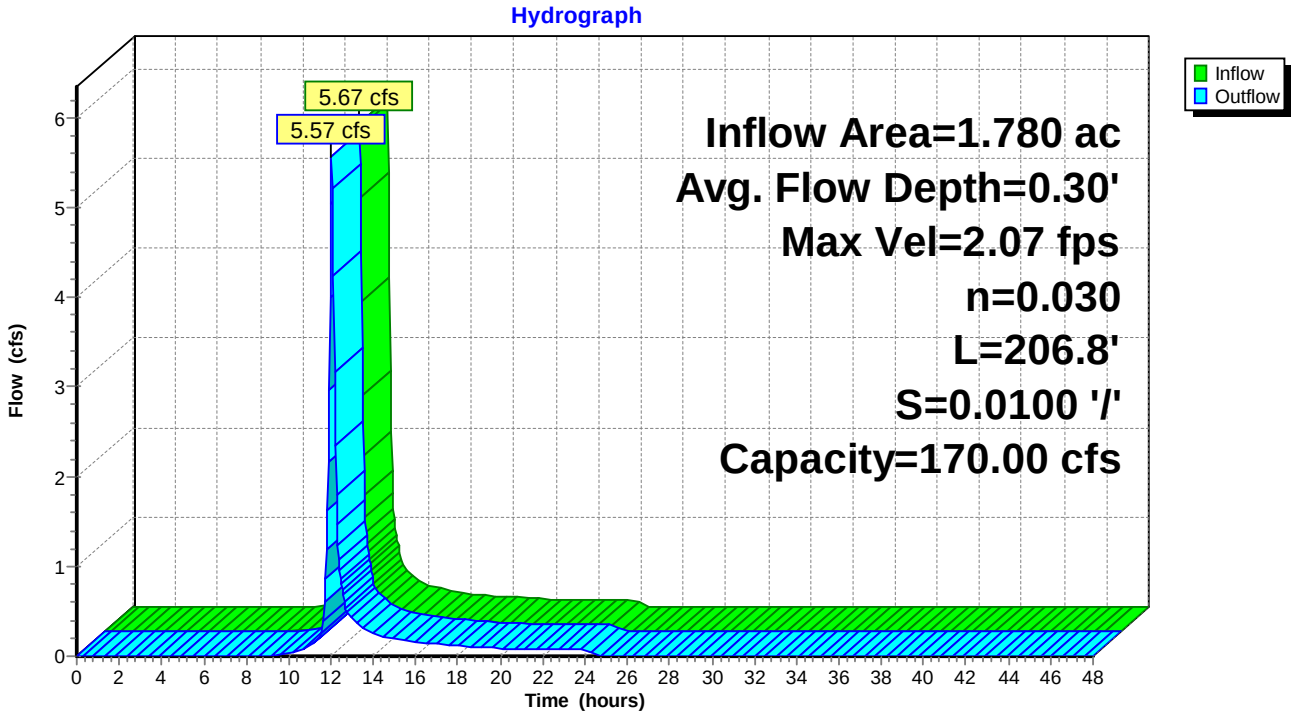
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 6.5 min

Peak Storage= 555 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 170.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 206.8' Slope= 0.0100 '/'
Inlet Invert= 461.97', Outlet Invert= 459.90'

‡

Reach 25R: BDC-8



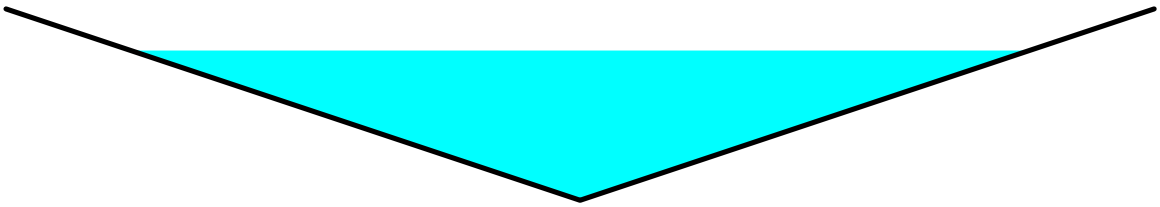
Summary for Reach 26R: PD-3

Inflow Area = 1.280 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.02 cfs @ 11.96 hrs, Volume= 0.229 af
Outflow = 3.36 cfs @ 12.03 hrs, Volume= 0.229 af, Atten= 33%, Lag= 4.0 min

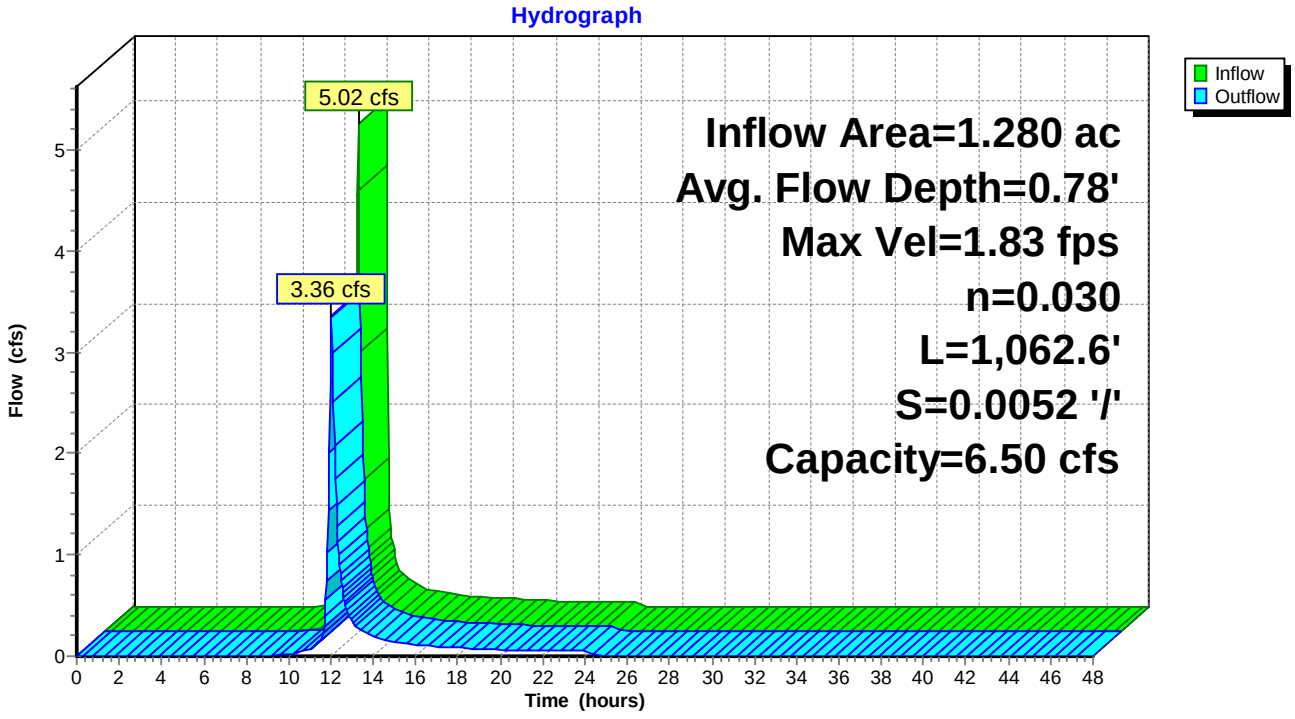
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 9.7 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 33.9 min

Peak Storage= 1,945 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.50 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,062.6' Slope= 0.0052 '/'
Inlet Invert= 457.49', Outlet Invert= 452.00'



Reach 26R: PD-3



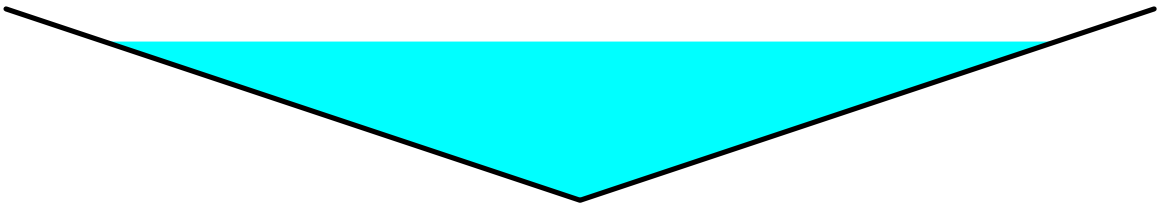
Summary for Reach 29R: PD-4

Inflow Area = 1.330 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.22 cfs @ 11.96 hrs, Volume= 0.238 af
Outflow = 3.86 cfs @ 12.02 hrs, Volume= 0.238 af, Atten= 26%, Lag= 3.4 min

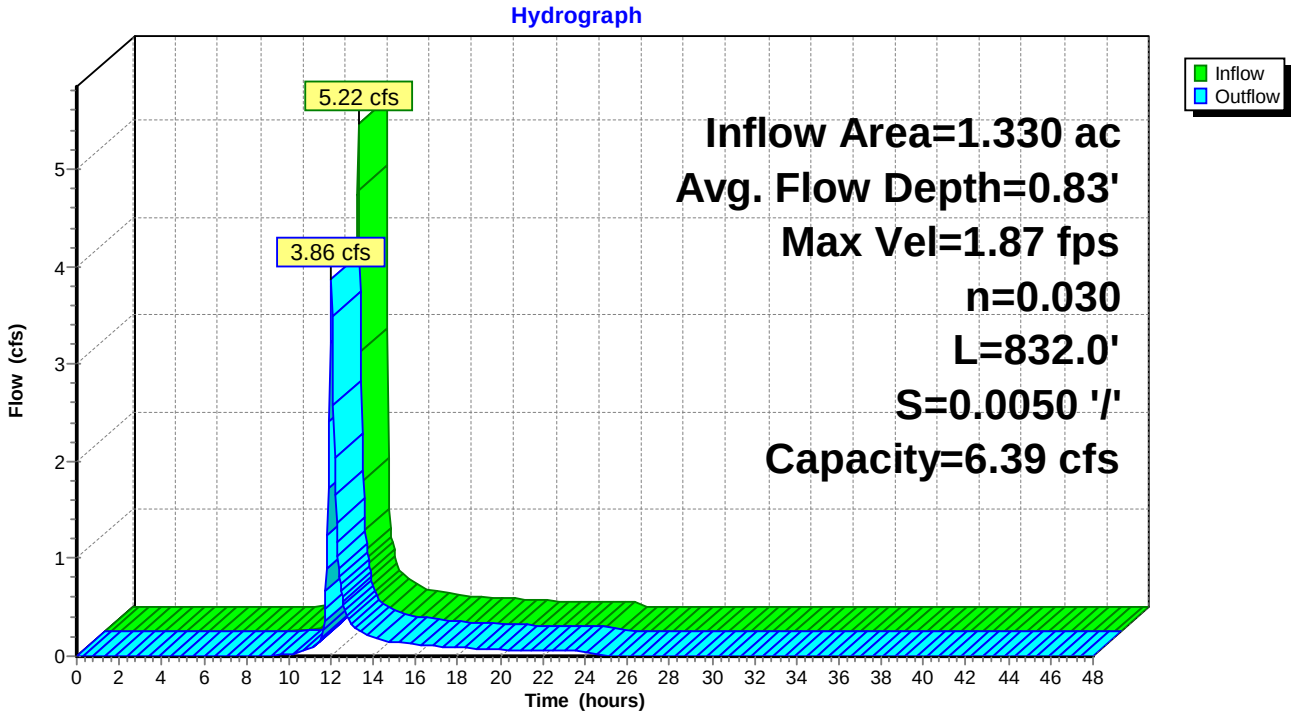
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.87 fps, Min. Travel Time= 7.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 25.2 min

Peak Storage= 1,710 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.39 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 832.0' Slope= 0.0050 '/'
Inlet Invert= 458.59', Outlet Invert= 454.43'



Reach 29R: PD-4



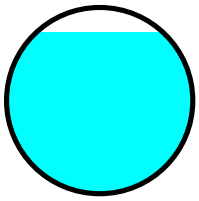
Summary for Reach 30R: BDC-9

Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 7.44 cfs @ 12.02 hrs, Volume= 0.486 af
Outflow = 7.27 cfs @ 12.05 hrs, Volume= 0.486 af, Atten= 2%, Lag= 1.4 min

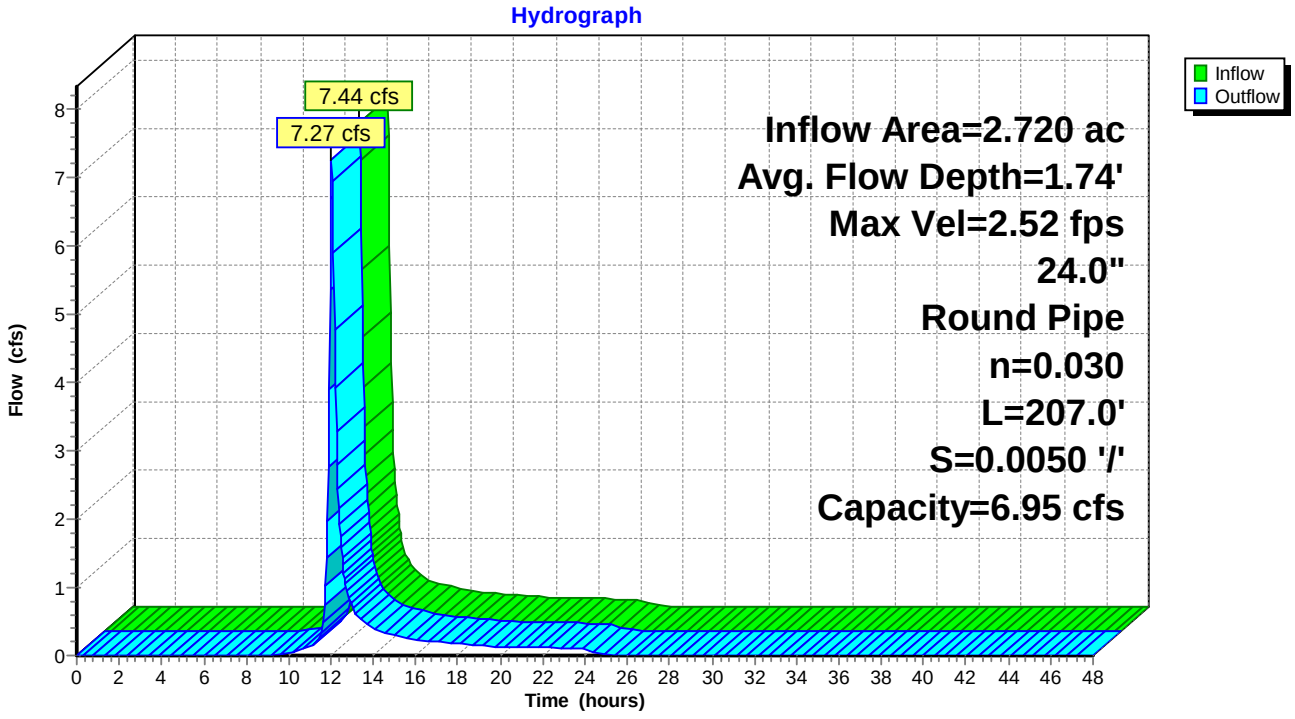
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 5.0 min

Peak Storage= 600 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.74'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 6.95 cfs

24.0" Round Pipe
n= 0.030 Corrugated metal
Length= 207.0' Slope= 0.0050 '/'
Inlet Invert= 454.43', Outlet Invert= 453.39'



Reach 30R: BDC-9



Summary for Reach 31R: PD-6

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 28.60 cfs @ 12.06 hrs, Volume= 1.798 af
Outflow = 26.04 cfs @ 12.11 hrs, Volume= 1.798 af, Atten= 9%, Lag= 3.1 min

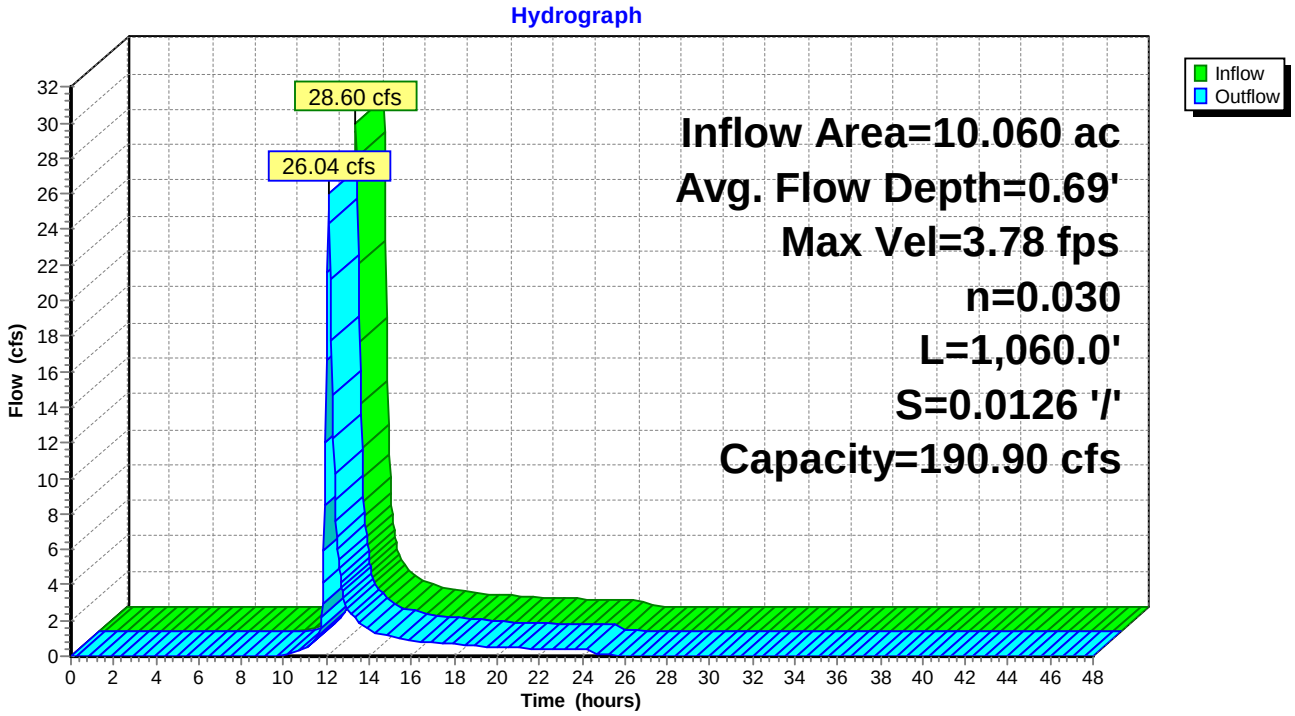
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 20.4 min

Peak Storage= 7,309 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 190.90 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,060.0' Slope= 0.0126 '/'
Inlet Invert= 450.00', Outlet Invert= 436.62'

‡

Reach 31R: PD-6



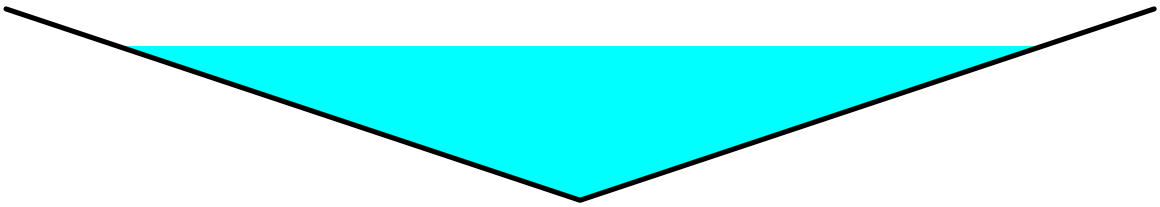
Summary for Reach 32R: PD-5

Inflow Area = 1.390 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.45 cfs @ 11.96 hrs, Volume= 0.248 af
Outflow = 3.60 cfs @ 12.03 hrs, Volume= 0.248 af, Atten= 34%, Lag= 4.1 min

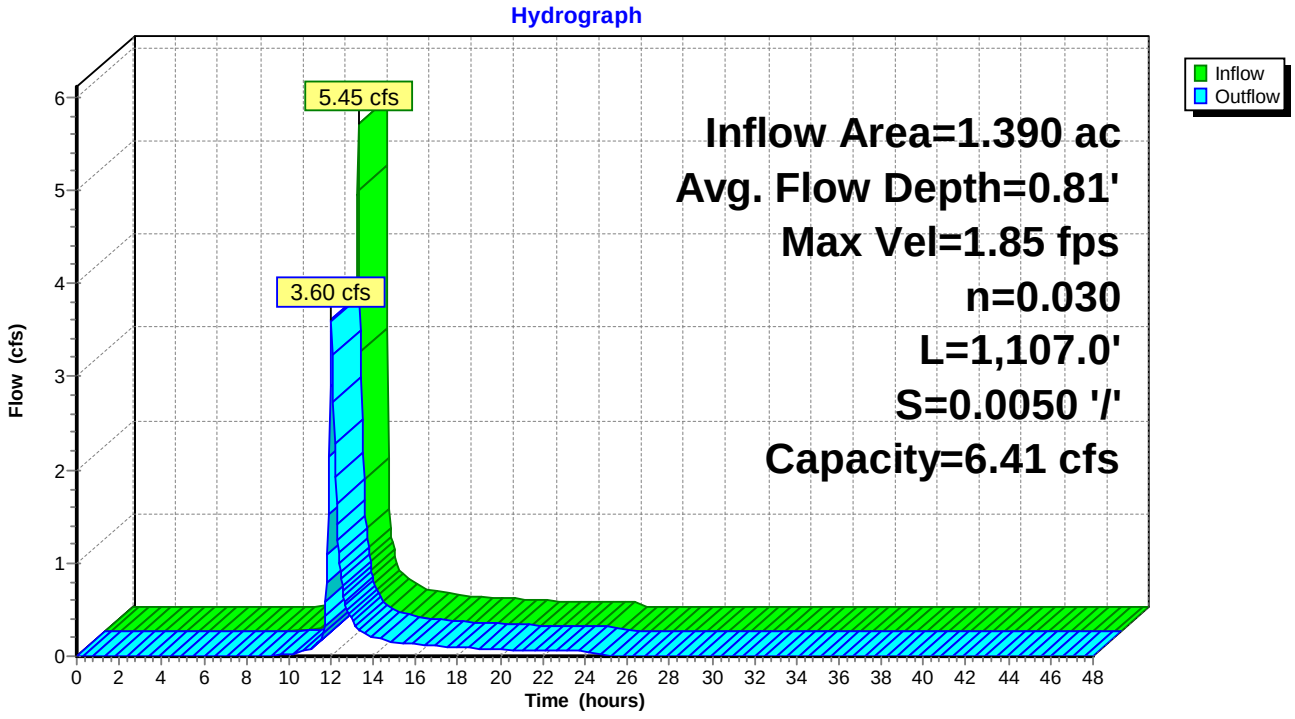
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.85 fps, Min. Travel Time= 10.0 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 35.6 min

Peak Storage= 2,155 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.41 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,107.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 454.43'



Reach 32R: PD-5



Summary for Reach 33R: PD-7

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 26.04 cfs @ 12.11 hrs, Volume= 1.798 af
Outflow = 26.01 cfs @ 12.12 hrs, Volume= 1.798 af, Atten= 0%, Lag= 0.5 min

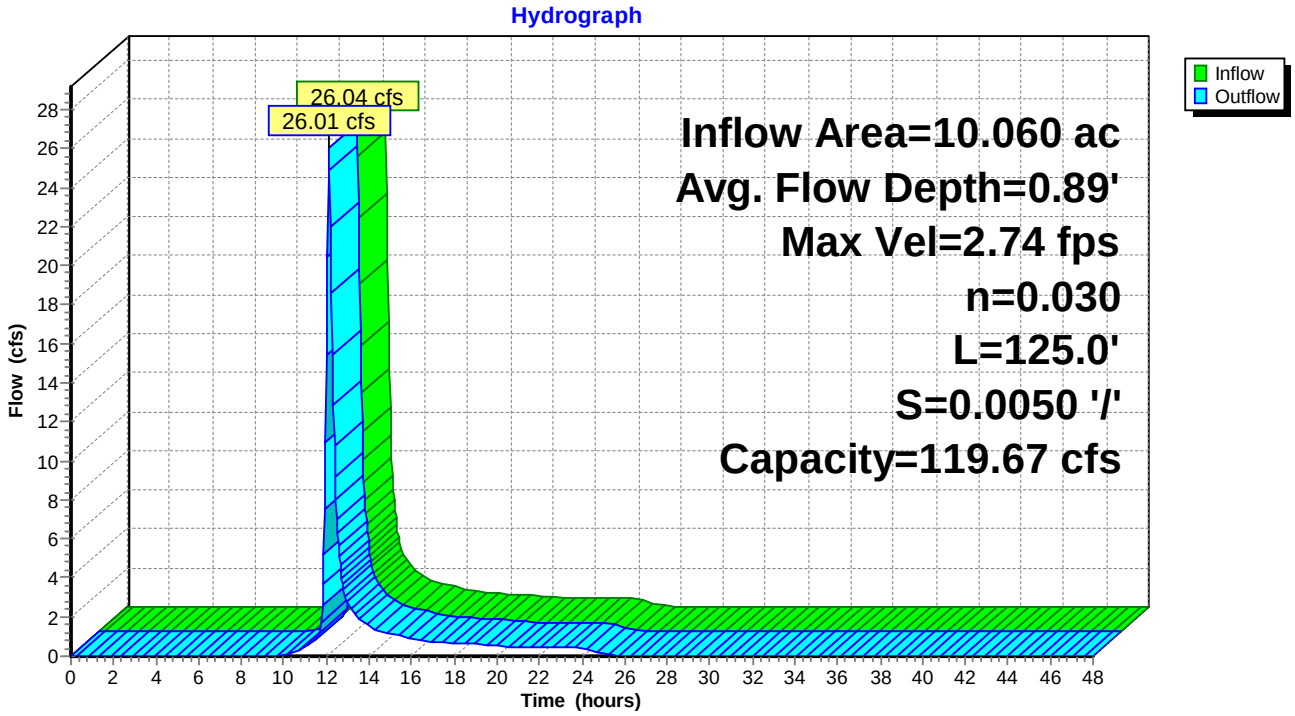
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 3.4 min

Peak Storage= 1,186 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 119.67 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 436.62', Outlet Invert= 436.00'

‡

Reach 33R: PD-7



Summary for Pond 3P: DA-1

Inflow Area = 5.480 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 15.99 cfs @ 12.06 hrs, Volume= 0.980 af
Outflow = 0.02 cfs @ 24.73 hrs, Volume= 0.062 af, Atten= 100%, Lag= 760.3 min
Primary = 0.02 cfs @ 24.73 hrs, Volume= 0.062 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 455.62' @ 24.73 hrs Surf.Area= 0.635 ac Storage= 0.960 af

Plug-Flow detention time= 1,186.3 min calculated for 0.062 af (6% of inflow)
Center-of-Mass det. time= 1,014.8 min (1,856.9 - 842.1)

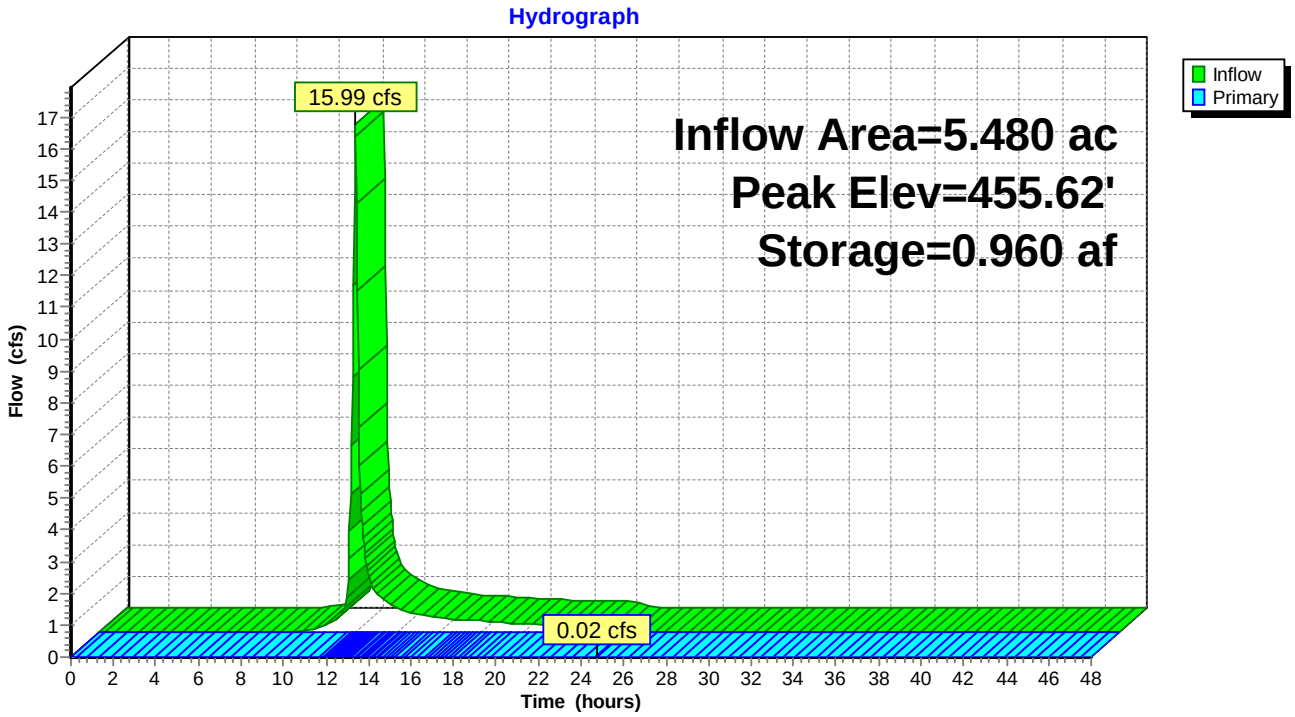
Volume	Invert	Avail.Storage	Storage Description
#1	454.00'	6.154 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
454.00	0.553	0.000	0.000
456.00	0.654	1.207	1.207
458.00	0.764	1.418	2.625
460.00	0.880	1.644	4.269
462.00	1.005	1.885	6.154

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.11'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.11'	**0.4" Vert. Orifice/Grate** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.11'	**12.0" Round Culvert** L= 111.0' Ke= 0.900 Inlet / Outlet Invert= 454.11' / 436.00' S= 0.1632 '/' Cc= 0.900 n= 0.030, Flow Area= 0.79 sf

Primary OutFlow Max=0.02 cfs @ 24.73 hrs HW=455.62' (Free Discharge)
└**3=Culvert** (Passes 0.02 cfs of 2.99 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.23 fps)

Pond 3P: DA-1


Hydrograph
Inflow
Primary
15.99 cfs
0.02 cfs
Inflow Area=5.480 ac
Peak Elev=455.62'
Storage=0.960 af
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Summary for Pond 7P: DA-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 21.42 cfs @ 12.07 hrs, Volume= 1.298 af
Outflow = 2.47 cfs @ 12.67 hrs, Volume= 1.296 af, Atten= 88%, Lag= 35.9 min
Primary = 2.47 cfs @ 12.67 hrs, Volume= 1.296 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 459.84' @ 12.67 hrs Surf.Area= 0.239 ac Storage= 0.599 af

Plug-Flow detention time= 183.8 min calculated for 1.295 af (100% of inflow)
Center-of-Mass det. time= 183.8 min (1,026.9 - 843.1)

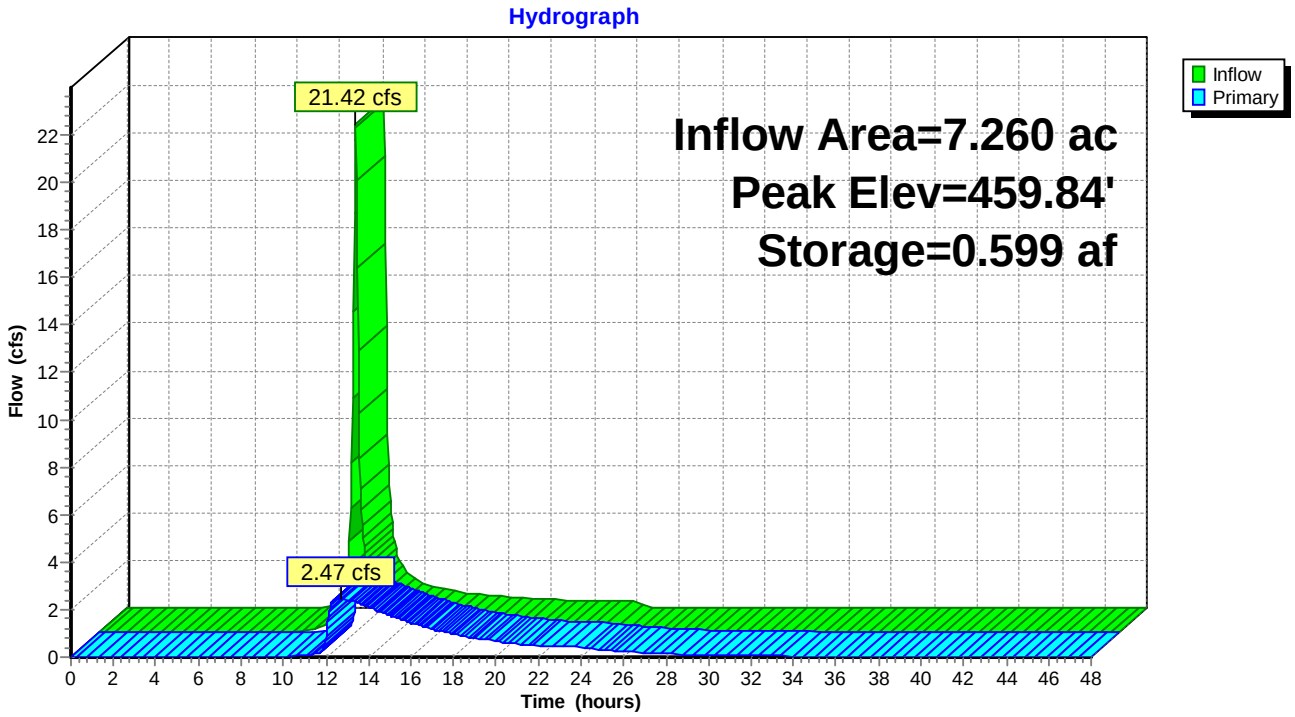
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.374 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.247	0.397	0.637
461.00	1.034	0.640	1.277
462.00	1.160	1.097	2.374

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 438.00' S= 0.1714 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=2.47 cfs @ 12.67 hrs HW=459.84' (Free Discharge)
└**3=Culvert** (Passes 2.47 cfs of 5.46 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 2.47 cfs @ 6.32 fps)

Pond 7P: DA-2


Hydrograph
Inflow
Primary
21.42 cfs
2.47 cfs
Inflow Area=7.260 ac
Peak Elev=459.84'
Storage=0.599 af
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 2 4 6 8 10 12 14 16 18 20 22

Summary for Pond 11P: DA-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 16.64 cfs @ 12.09 hrs, Volume= 1.569 af
Outflow = 4.12 cfs @ 12.80 hrs, Volume= 1.568 af, Atten= 75%, Lag= 42.2 min
Primary = 4.12 cfs @ 12.80 hrs, Volume= 1.568 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 460.13' @ 12.80 hrs Surf.Area= 0.350 ac Storage= 0.678 af

Plug-Flow detention time= 176.5 min calculated for 1.566 af (100% of inflow)
Center-of-Mass det. time= 176.5 min (1,030.1 - 853.6)

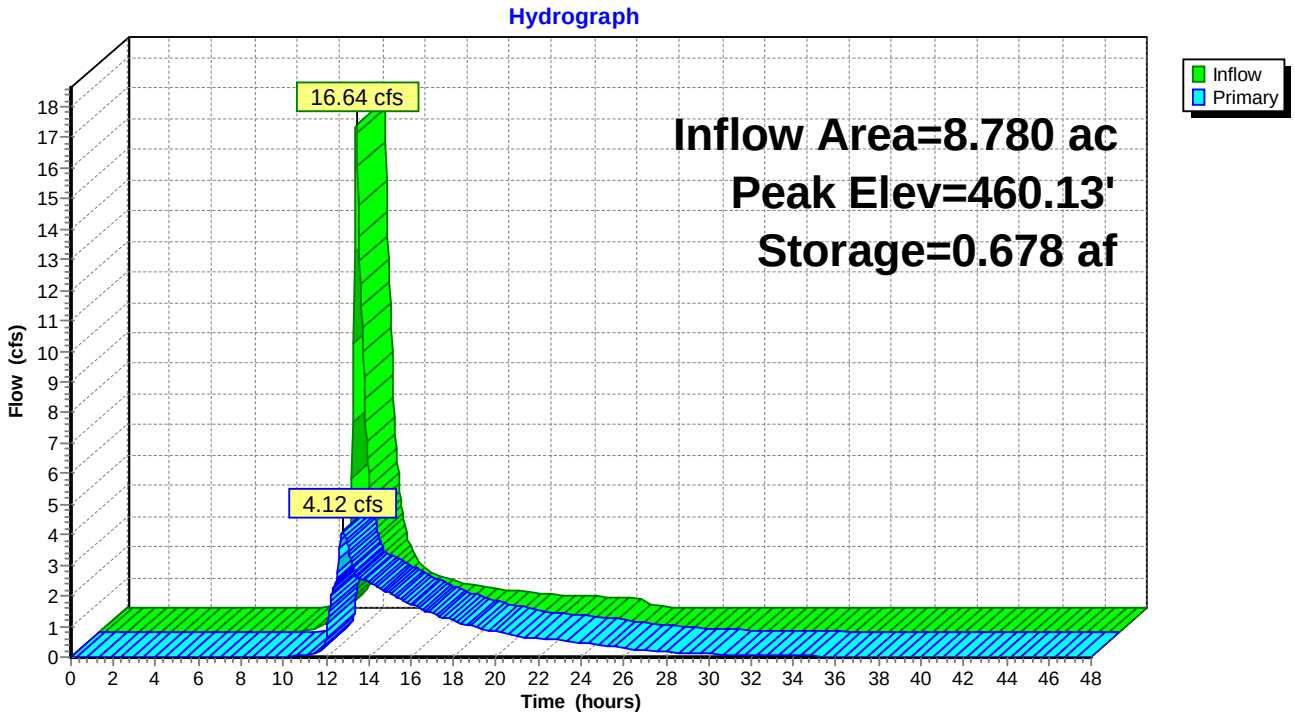
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.357 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.040	0.645	1.285
462.00	1.104	1.072	2.357

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 432.00' S= 0.2286 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=4.12 cfs @ 12.80 hrs HW=460.13' (Free Discharge)
└**3=Culvert** (Passes 4.12 cfs of 5.69 cfs potential flow)
  ├**1=Orifice/Grate** (Weir Controls 1.38 cfs @ 1.16 fps)
  └**2=Orifice/Grate** (Orifice Controls 2.74 cfs @ 6.59 fps)

Pond 11P: DA-3


Hydrograph
16.64 cfs
4.12 cfs
Inflow Area=8.780 ac
Peak Elev=460.13'
Storage=0.678 af
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 15P: DA-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 27.89 cfs @ 12.07 hrs, Volume= 1.725 af
Outflow = 5.78 cfs @ 12.43 hrs, Volume= 1.723 af, Atten= 79%, Lag= 21.5 min
Primary = 5.78 cfs @ 12.43 hrs, Volume= 1.723 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 460.25' @ 12.43 hrs Surf.Area= 0.461 ac Storage= 0.728 af

Plug-Flow detention time= 168.0 min calculated for 1.723 af (100% of inflow)
Center-of-Mass det. time= 167.2 min (1,012.3 - 845.1)

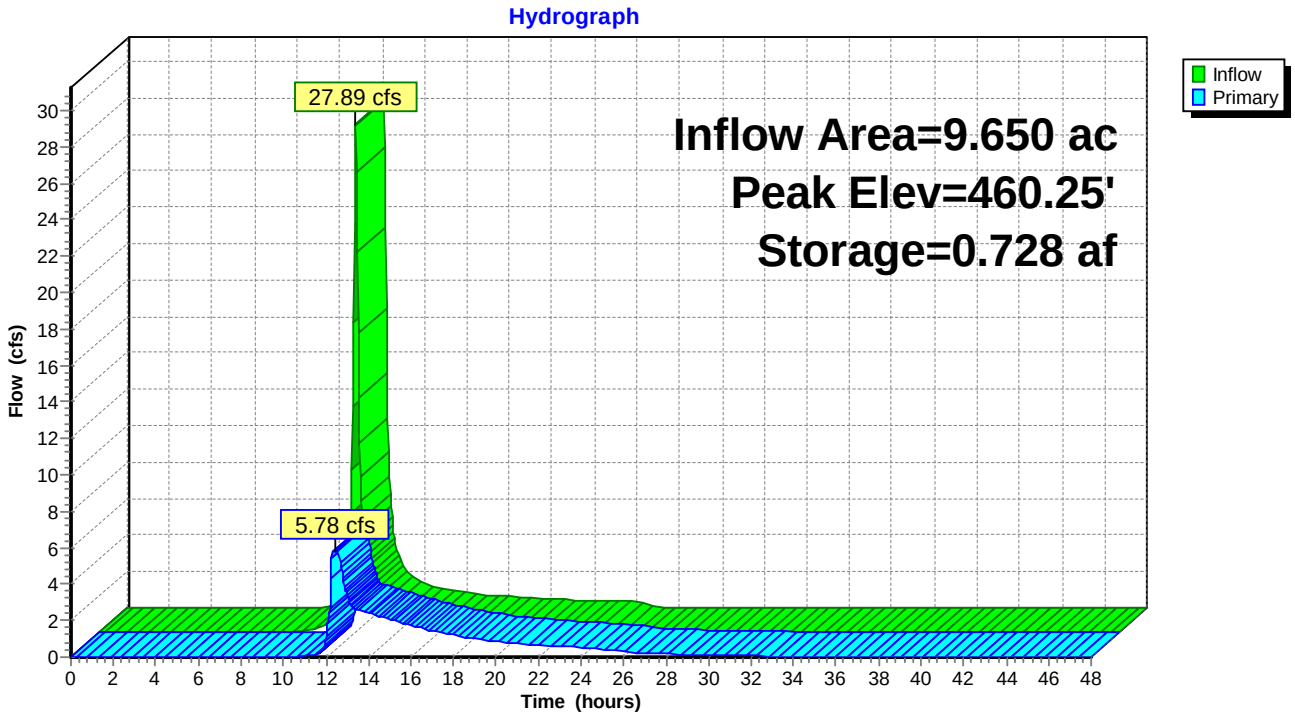
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.418 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.103	0.676	1.317
462.00	1.100	1.101	2.418

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 104.5' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 440.00' S= 0.1531 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=5.78 cfs @ 12.43 hrs HW=460.25' (Free Discharge)
└**3=Culvert** (Inlet Controls 5.78 cfs @ 7.36 fps)
  └**1=Orifice/Grate** (Passes < 3.77 cfs potential flow)
  └**2=Orifice/Grate** (Passes < 2.84 cfs potential flow)

Pond 15P: DA-4


Hydrograph
27.89 cfs
5.78 cfs
Inflow Area=9.650 ac
Peak Elev=460.25'
Storage=0.728 af
Inflow
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

Summary for Pond 19P: DA-5

Inflow Area = 40.520 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 91.83 cfs @ 12.11 hrs, Volume= 7.243 af
Outflow = 1.21 cfs @ 24.30 hrs, Volume= 2.920 af, Atten= 99%, Lag= 731.1 min
Primary = 1.21 cfs @ 24.30 hrs, Volume= 2.920 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 434.00' Surf.Area= 2.510 ac Storage= 2.640 af
Peak Elev= 436.34' @ 24.30 hrs Surf.Area= 2.734 ac Storage= 8.786 af (6.146 af above start)

Plug-Flow detention time= 2,083.2 min calculated for 0.279 af (4% of inflow)
Center-of-Mass det. time= 904.6 min (1,757.2 - 852.7)

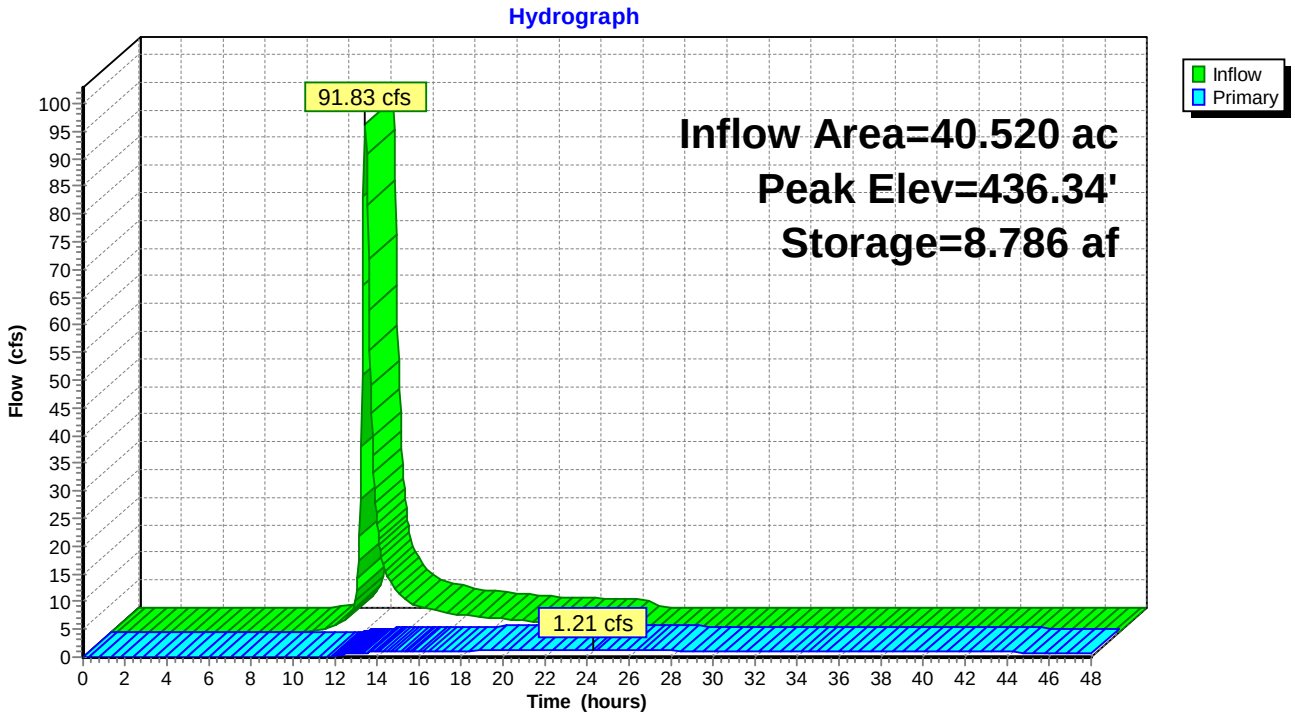
Volume	Invert	Avail.Storage	Storage Description
#1	432.00'	13.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
432.00	0.130	0.000	0.000
434.00	2.510	2.640	2.640
436.00	2.700	5.210	7.850
438.00	2.900	5.600	13.450

Device	Routing	Invert	Outlet Devices
#1	Device 3	437.00'	**36.0" Horiz. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Device 3	434.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	434.00'	**12.0" Round Culvert** L= 147.0' Ke= 0.900 Inlet / Outlet Invert= 434.00' / 433.26' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 24.30 hrs HW=436.34' (Free Discharge)
└**3=Culvert** (Passes 1.21 cfs of 2.09 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 1.21 cfs @ 4.95 fps)

Pond 19P: DA-5


Hydrograph
Inflow
Primary
91.83 cfs
1.21 cfs
Inflow Area=40.520 ac
Peak Elev=436.34'
Storage=8.786 af
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Summary for Pond 28P: DA-6

Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 7.27 cfs @ 12.05 hrs, Volume= 0.486 af
Outflow = 0.42 cfs @ 13.85 hrs, Volume= 0.389 af, Atten= 94%, Lag= 108.0 min
Primary = 0.42 cfs @ 13.85 hrs, Volume= 0.389 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 453.39' Surf.Area= 0.137 ac Storage= 0.324 af
Peak Elev= 455.11' @ 13.85 hrs Surf.Area= 0.185 ac Storage= 0.599 af (0.275 af above start)

Plug-Flow detention time= 1,183.6 min calculated for 0.065 af (13% of inflow)
Center-of-Mass det. time= 359.2 min (1,206.9 - 847.7)

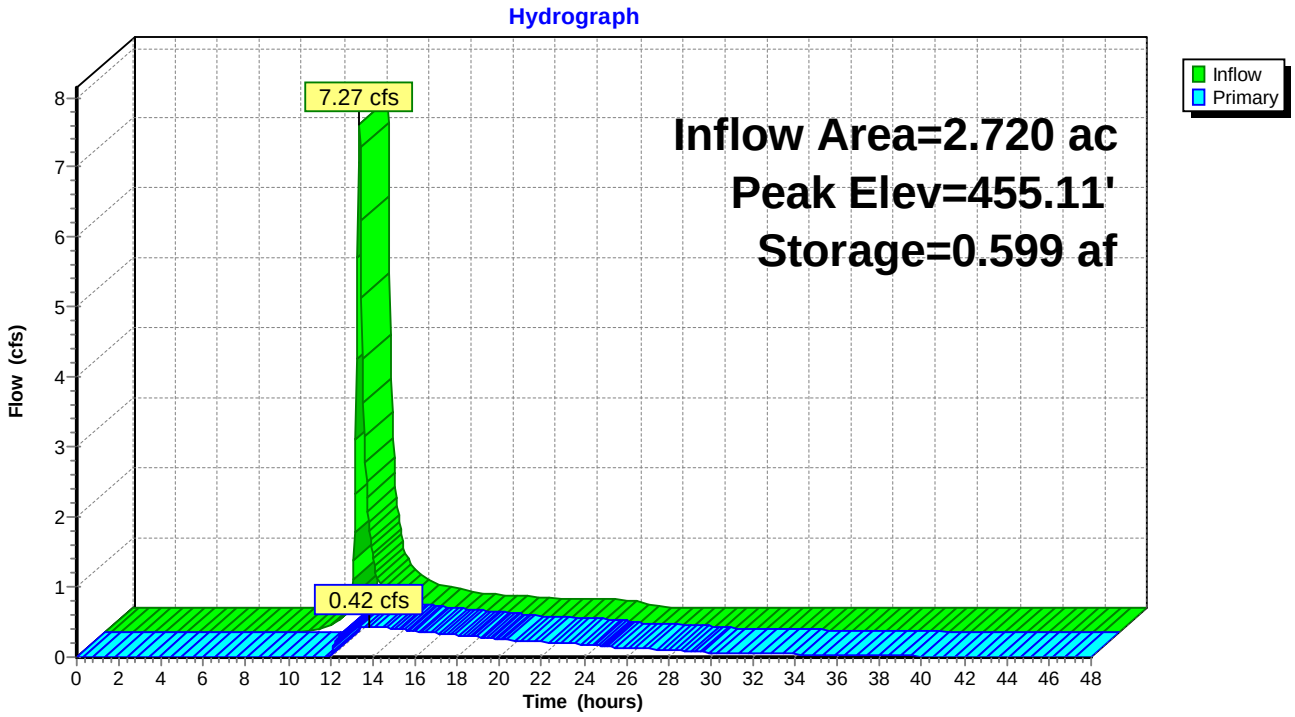
Volume	Invert	Avail.Storage	Storage Description
#1	450.00'	1.895 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
450.00	0.057	0.000	0.000
452.00	0.101	0.158	0.158
454.00	0.153	0.254	0.412
456.00	0.210	0.363	0.775
458.00	0.280	0.490	1.265
460.00	0.350	0.630	1.895

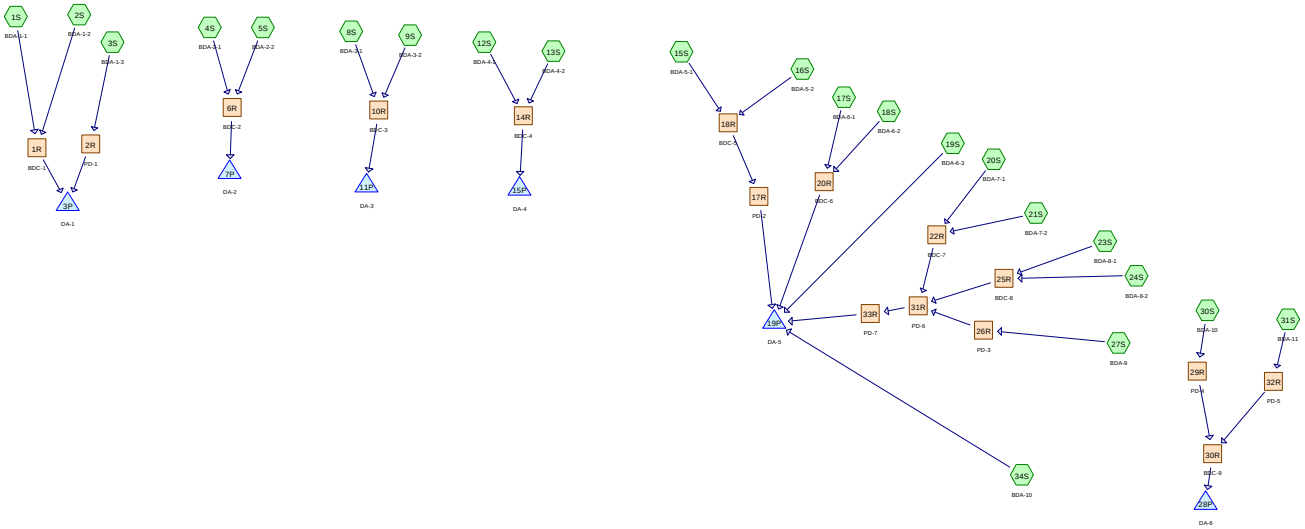
Device	Routing	Invert	Outlet Devices
#1	Device 3	458.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.00'	**12.0" Round Culvert** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 454.00' / 453.50' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 13.85 hrs HW=455.11' (Free Discharge)
└─**3=Culvert** (Passes 0.42 cfs of 1.50 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 3.48 fps)

Pond 28P: DA-6


Hydrograph
Inflow
Primary
7.27 cfs
0.42 cfs
Inflow Area=2.720 ac
Peak Elev=455.11'
Storage=0.599 af
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

APPENDIX C – 2-YEAR 24-HOUR HYDROCAD RESULTS



Subcat Reach Pond Link

Routing Diagram for EDWARDS STORMWATER HYDROCAD CALCS
Prepared by {enter your company name here}, Printed 3/31/2022
HydroCAD® 10.00-26 s/n 10085 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
74.410	78	(1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S)
74.410	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
74.410	Other	1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
74.410		**TOTAL AREA**

Ground Covers (selected 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	74.410	74.410		1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
0.000	**0.000**	**0.000**	**0.000**	**74.410**	**74.410**	**TOTAL AREA**	

Pipe Listing (selected 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	30R	454.43	453.39	207.0	0.0050	0.030	24.0	0.0	0.0
2	3P	454.11	436.00	111.0	0.1632	0.030	12.0	0.0	0.0
3	7P	456.00	438.00	105.0	0.1714	0.025	12.0	0.0	0.0
4	11P	456.00	432.00	105.0	0.2286	0.025	12.0	0.0	0.0
5	15P	456.00	440.00	104.5	0.1531	0.025	12.0	0.0	0.0
6	19P	434.00	433.26	147.0	0.0050	0.025	12.0	0.0	0.0
7	28P	454.00	453.50	100.0	0.0050	0.025	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: BDA-1-1 Runoff Area=1.740 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=241' Slope=0.0269 '/' Tc=11.5 min CN=78 Runoff=2.86 cfs 0.166 af

Subcatchment 2S: BDA-1-2 Runoff Area=2.780 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=265' Slope=0.0269 '/' Tc=11.9 min CN=78 Runoff=4.49 cfs 0.265 af

Subcatchment 3S: BDA-1-3 Runoff Area=0.960 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=27' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.01 cfs 0.091 af

Subcatchment 4S: BDA-2-1 Runoff Area=3.320 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=201' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=5.55 cfs 0.316 af

Subcatchment 5S: BDA-2-2 Runoff Area=3.940 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=260' Slope=0.0269 '/' Tc=11.8 min CN=78 Runoff=6.39 cfs 0.375 af

Subcatchment 8S: BDA-3-1 Runoff Area=4.270 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=187' Slope=0.0269 '/' Tc=10.8 min CN=78 Runoff=7.19 cfs 0.407 af

Subcatchment 9S: BDA-3-2 Runoff Area=4.510 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=1,570' Slope=0.0269 '/' Tc=30.8 min CN=78 Runoff=4.22 cfs 0.430 af

Subcatchment 12S: BDA-4-1 Runoff Area=4.710 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=204' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=7.87 cfs 0.449 af

Subcatchment 13S: BDA-4-2 Runoff Area=4.940 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=205' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=8.25 cfs 0.471 af

Subcatchment 15S: BDA-5-1 Runoff Area=5.710 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=297' Slope=0.0269 '/' Tc=12.4 min CN=78 Runoff=9.06 cfs 0.544 af

Subcatchment 16S: BDA-5-2 Runoff Area=5.860 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=327' Slope=0.0269 '/' Tc=12.8 min CN=78 Runoff=9.16 cfs 0.558 af

Subcatchment 17S: BDA-6-1 Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=224' Slope=0.0269 '/' Tc=11.3 min CN=78 Runoff=8.36 cfs 0.482 af

Subcatchment 18S: BDA-6-2 Runoff Area=2.980 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=130' Slope=0.0269 '/' Tc=9.9 min CN=78 Runoff=5.18 cfs 0.284 af

Subcatchment 19S: BDA-6-3 Runoff Area=3.200 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=413' Slope=0.0269 '/' Tc=14.0 min CN=78 Runoff=4.79 cfs 0.305 af

Subcatchment 20S: BDA-7-1 Runoff Area=4.860 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=371' Slope=0.0269 '/' Tc=13.4 min CN=78 Runoff=7.42 cfs 0.463 af

Subcatchment 21S: BDA-7-2 Runoff Area=2.140 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=206' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=3.57 cfs 0.204 af

Subcatchment 23S: BDA-8-1 Runoff Area=1.440 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=213' Slope=0.0269 '/' Tc=11.1 min CN=78 Runoff=2.40 cfs 0.137 af

Subcatchment 24S: BDA-8-2 Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=96' Slope=0.0269 '/' Tc=9.2 min CN=78 Runoff=0.61 cfs 0.032 af

Subcatchment 27S: BDA-9 Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.68 cfs 0.122 af

Subcatchment 30S: BDA-10 Runoff Area=1.330 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=96' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.79 cfs 0.127 af

Subcatchment 31S: BDA-11 Runoff Area=1.390 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.91 cfs 0.132 af

Subcatchment 34S: BDA-10 Runoff Area=7.650 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=1,194' Slope=0.0130 '/' Tc=35.5 min CN=78 Runoff=6.48 cfs 0.729 af

Reach 1R: BDC-1 Avg. Flow Depth=0.35' Max Vel=2.25 fps Inflow=7.35 cfs 0.431 af
n=0.030 L=344.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=7.06 cfs 0.431 af

Reach 2R: PD-1 Avg. Flow Depth=0.53' Max Vel=1.40 fps Inflow=2.01 cfs 0.091 af
n=0.030 L=1,000.0' S=0.0050 '/' Capacity=40.58 cfs Outflow=1.19 cfs 0.091 af

Reach 6R: BDC-2 Avg. Flow Depth=0.45' Max Vel=2.63 fps Inflow=11.93 cfs 0.692 af
n=0.030 L=600.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=11.01 cfs 0.692 af

Reach 10R: BDC-3 Avg. Flow Depth=0.38' Max Vel=2.41 fps Inflow=9.22 cfs 0.836 af
n=0.030 L=771.7' S=0.0104 '/' Capacity=173.00 cfs Outflow=8.24 cfs 0.836 af

Reach 14R: BDC-4 Avg. Flow Depth=0.53' Max Vel=2.79 fps Inflow=16.12 cfs 0.919 af
n=0.030 L=857.9' S=0.0093 '/' Capacity=164.08 cfs Outflow=14.13 cfs 0.919 af

Reach 17R: PD-2 Avg. Flow Depth=0.54' Max Vel=2.71 fps Inflow=15.00 cfs 1.102 af
n=0.030 L=667.0' S=0.0086 '/' Capacity=157.21 cfs Outflow=14.03 cfs 1.102 af

Reach 18R: BDC-5 Avg. Flow Depth=0.53' Max Vel=2.94 fps Inflow=18.22 cfs 1.102 af
n=0.030 L=1,262.7' S=0.0103 '/' Capacity=172.40 cfs Outflow=15.00 cfs 1.102 af

Reach 20R: BDC-6 Avg. Flow Depth=0.44' Max Vel=3.00 fps Inflow=13.50 cfs 0.766 af
n=0.030 L=774.6' S=0.0135 '/' Capacity=197.35 cfs Outflow=12.20 cfs 0.766 af

Reach 22R: BDC-7 Avg. Flow Depth=0.40' Max Vel=2.83 fps Inflow=10.92 cfs 0.667 af
n=0.030 L=527.8' S=0.0133 '/' Capacity=195.68 cfs Outflow=10.39 cfs 0.667 af

Reach 25R: BDC-8 Avg. Flow Depth=0.21' Max Vel=1.64 fps Inflow=2.99 cfs 0.170 af
n=0.030 L=206.8' S=0.0100 '/' Capacity=170.00 cfs Outflow=2.91 cfs 0.170 af

Reach 26R: PD-3 Avg. Flow Depth=0.59' Max Vel=1.53 fps Inflow=2.68 cfs 0.122 af
n=0.030 L=1,062.6' S=0.0052 '/' Capacity=6.50 cfs Outflow=1.61 cfs 0.122 af

Reach 29R: PD-4 Avg. Flow Depth=0.63' Max Vel=1.57 fps Inflow=2.79 cfs 0.127 af
n=0.030 L=832.0' S=0.0050 '/' Capacity=6.39 cfs Outflow=1.88 cfs 0.127 af

Reach 30R: BDC-9 Avg. Flow Depth=1.01' Max Vel=2.22 fps Inflow=3.59 cfs 0.259 af
24.0" Round Pipe n=0.030 L=207.0' S=0.0050 '/' Capacity=6.95 cfs Outflow=3.53 cfs 0.259 af

Reach 31R: PD-6 Avg. Flow Depth=0.46' Max Vel=2.98 fps Inflow=14.69 cfs 0.958 af
n=0.030 L=1,060.0' S=0.0126 '/' Capacity=190.90 cfs Outflow=12.78 cfs 0.958 af

Reach 32R: PD-5 Avg. Flow Depth=0.61' Max Vel=1.54 fps Inflow=2.91 cfs 0.132 af
n=0.030 L=1,107.0' S=0.0050 '/' Capacity=6.41 cfs Outflow=1.72 cfs 0.132 af

Reach 33R: PD-7 Avg. Flow Depth=0.60' Max Vel=2.18 fps Inflow=12.78 cfs 0.958 af
n=0.030 L=125.0' S=0.0050 '/' Capacity=119.67 cfs Outflow=12.71 cfs 0.958 af

Pond 3P: DA-1 Peak Elev=454.89' Storage=0.514 af Inflow=8.20 cfs 0.522 af
Outflow=0.01 cfs 0.025 af

Pond 7P: DA-2 Peak Elev=458.36' Storage=0.298 af Inflow=11.01 cfs 0.692 af
Outflow=1.22 cfs 0.690 af

Pond 11P: DA-3 Peak Elev=458.67' Storage=0.352 af Inflow=8.24 cfs 0.836 af
Outflow=1.46 cfs 0.835 af

Pond 15P: DA-4 Peak Elev=458.88' Storage=0.392 af Inflow=14.13 cfs 0.919 af
Outflow=1.63 cfs 0.918 af

Pond 19P: DA-5 Peak Elev=435.32' Storage=6.029 af Inflow=45.11 cfs 3.860 af
Outflow=0.54 cfs 1.308 af

Pond 28P: DA-6 Peak Elev=454.47' Storage=0.487 af Inflow=3.53 cfs 0.259 af
Outflow=0.13 cfs 0.163 af

Total Runoff Area = 74.410 ac Runoff Volume = 7.088 af Average Runoff Depth = 1.14"
100.00% Pervious = 74.410 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: BDA-1-1

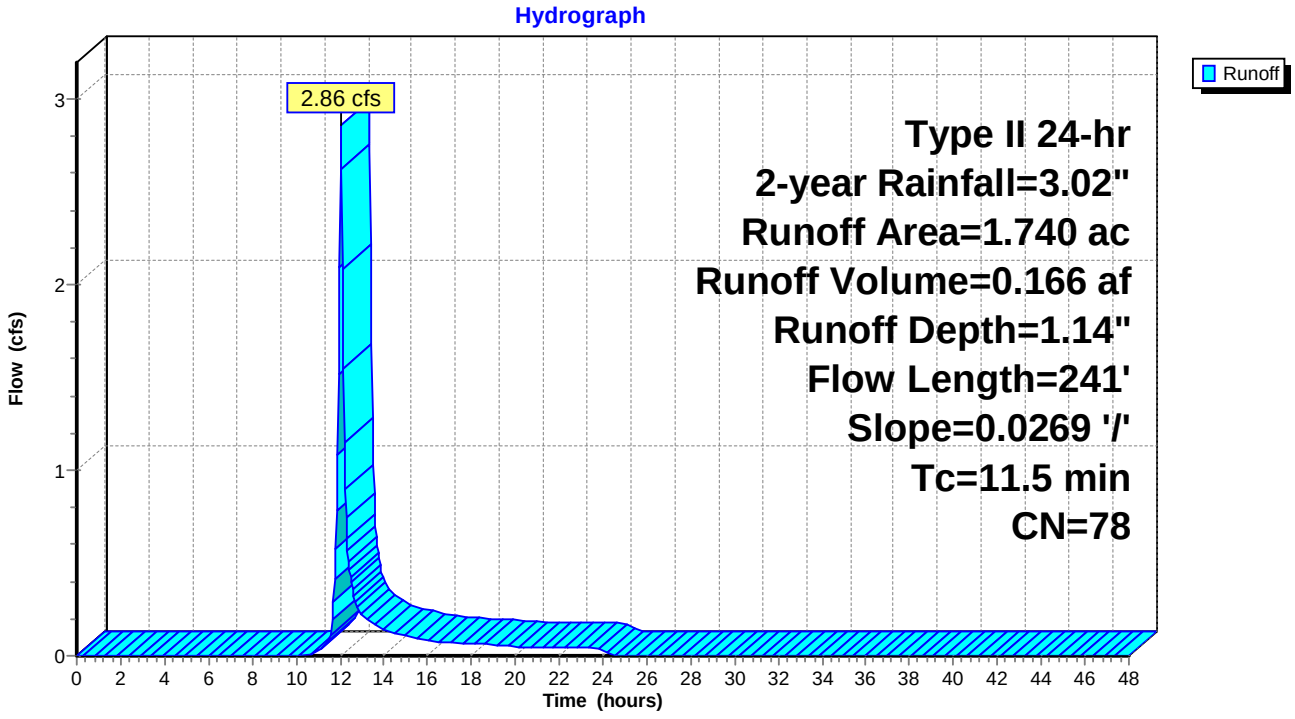
Runoff = 2.86 cfs @ 12.04 hrs, Volume= 0.166 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.740	78	
	1.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.0	141	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	241	Total			

Subcatchment 1S: BDA-1-1



Summary for Subcatchment 2S: BDA-1-2

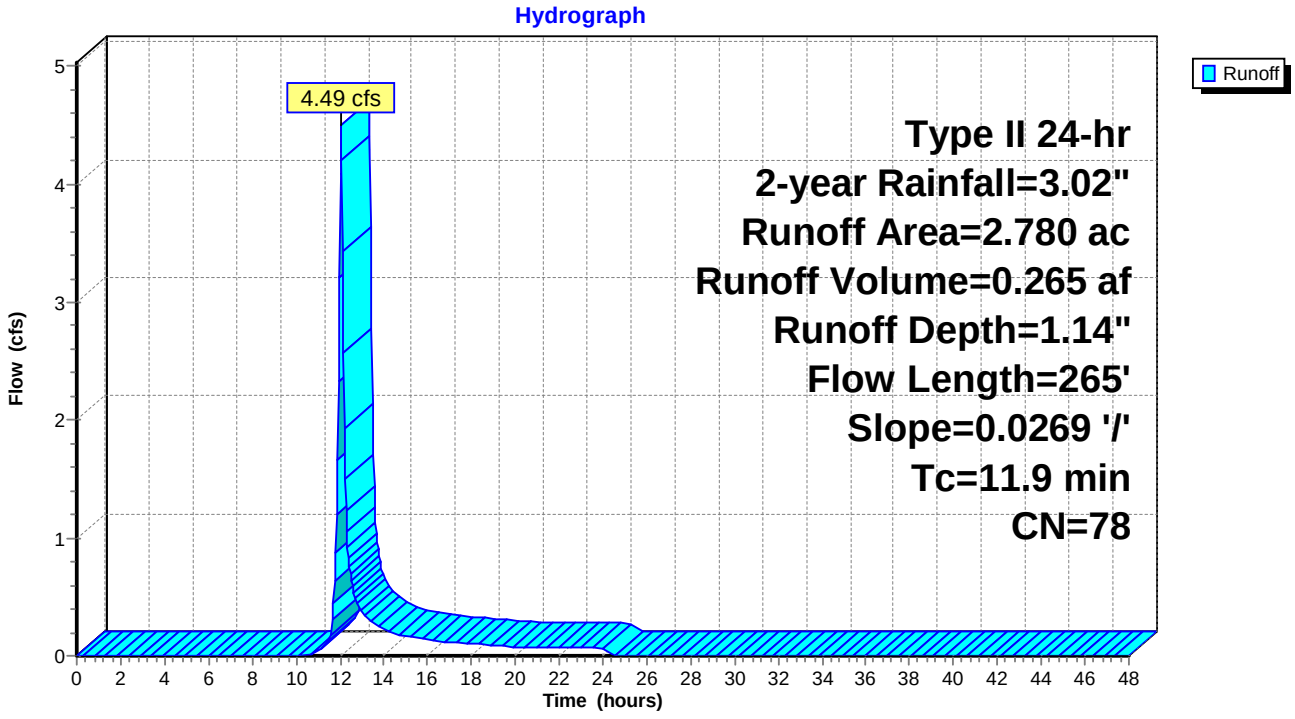
Runoff = 4.49 cfs @ 12.04 hrs, Volume= 0.265 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.780	78	
	2.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.4	165	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.9	265	Total			

Subcatchment 2S: BDA-1-2



Summary for Subcatchment 3S: BDA-1-3

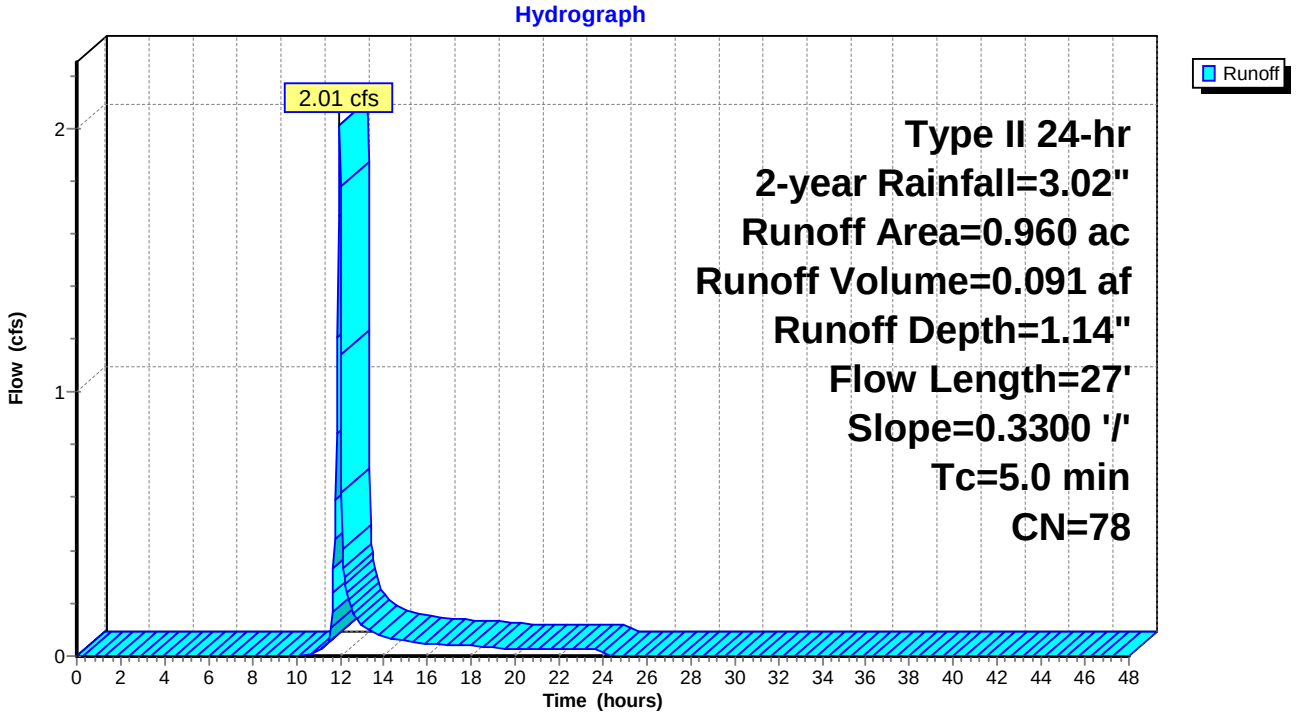
Runoff = 2.01 cfs @ 11.96 hrs, Volume= 0.091 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	0.960	78	
	0.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	27	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.2	27	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 3S: BDA-1-3



Summary for Subcatchment 4S: BDA-2-1

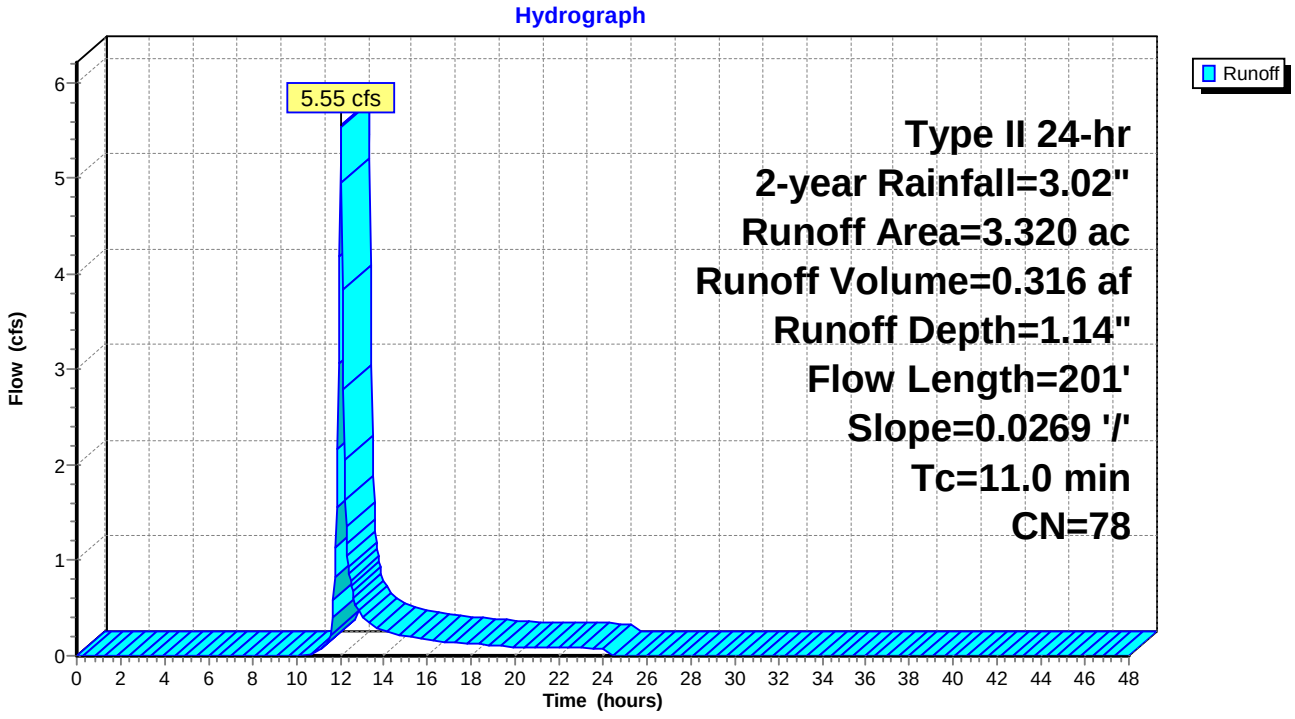
Runoff = 5.55 cfs @ 12.03 hrs, Volume= 0.316 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.320	78	
	3.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	101	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	201	Total			

Subcatchment 4S: BDA-2-1



Summary for Subcatchment 5S: BDA-2-2

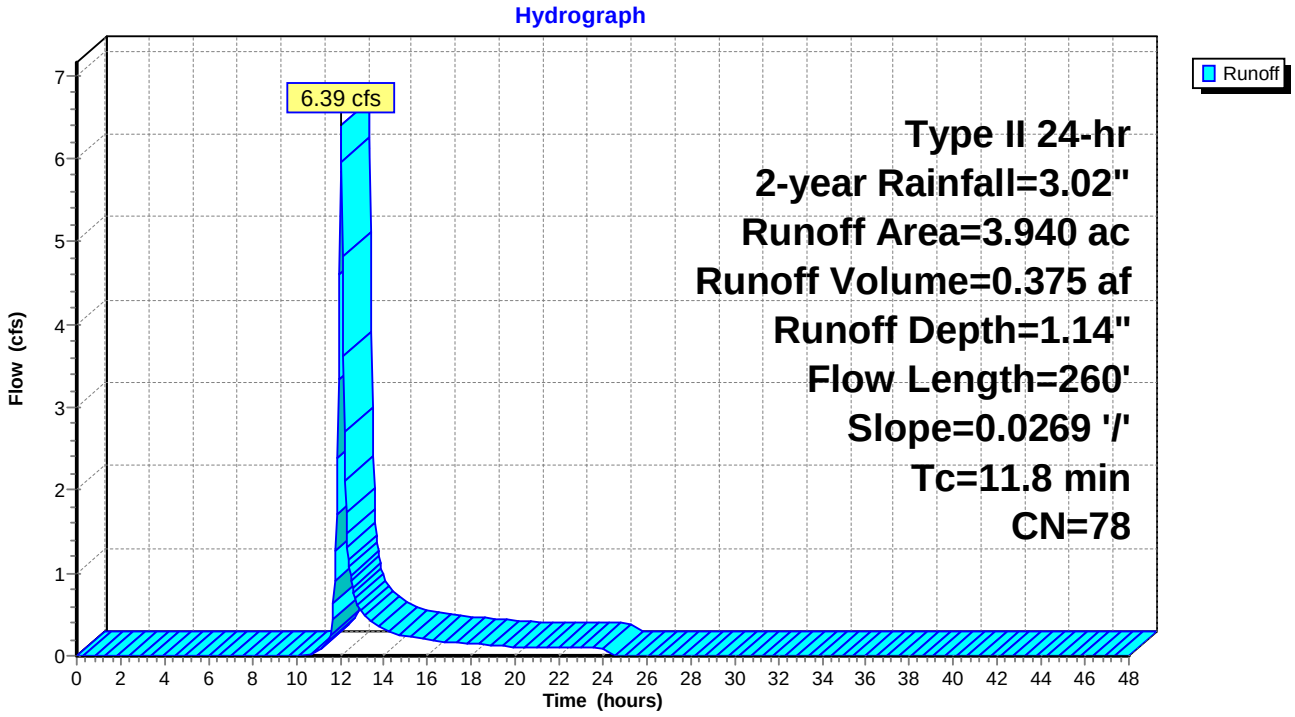
Runoff = 6.39 cfs @ 12.04 hrs, Volume= 0.375 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.940	78	
	3.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.3	160	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	260	Total			

Subcatchment 5S: BDA-2-2



Summary for Subcatchment 8S: BDA-3-1

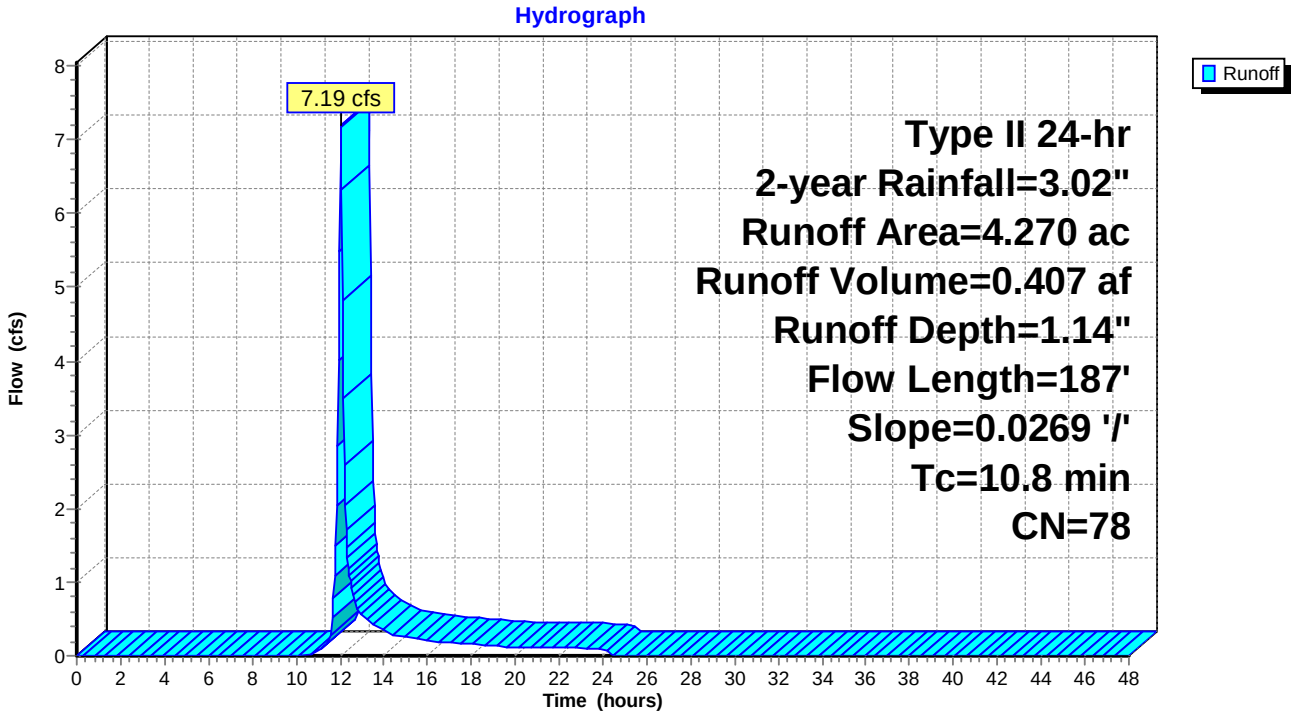
Runoff = 7.19 cfs @ 12.03 hrs, Volume= 0.407 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.270	78	
	4.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.3	87	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	187	Total			

Subcatchment 8S: BDA-3-1



Summary for Subcatchment 9S: BDA-3-2

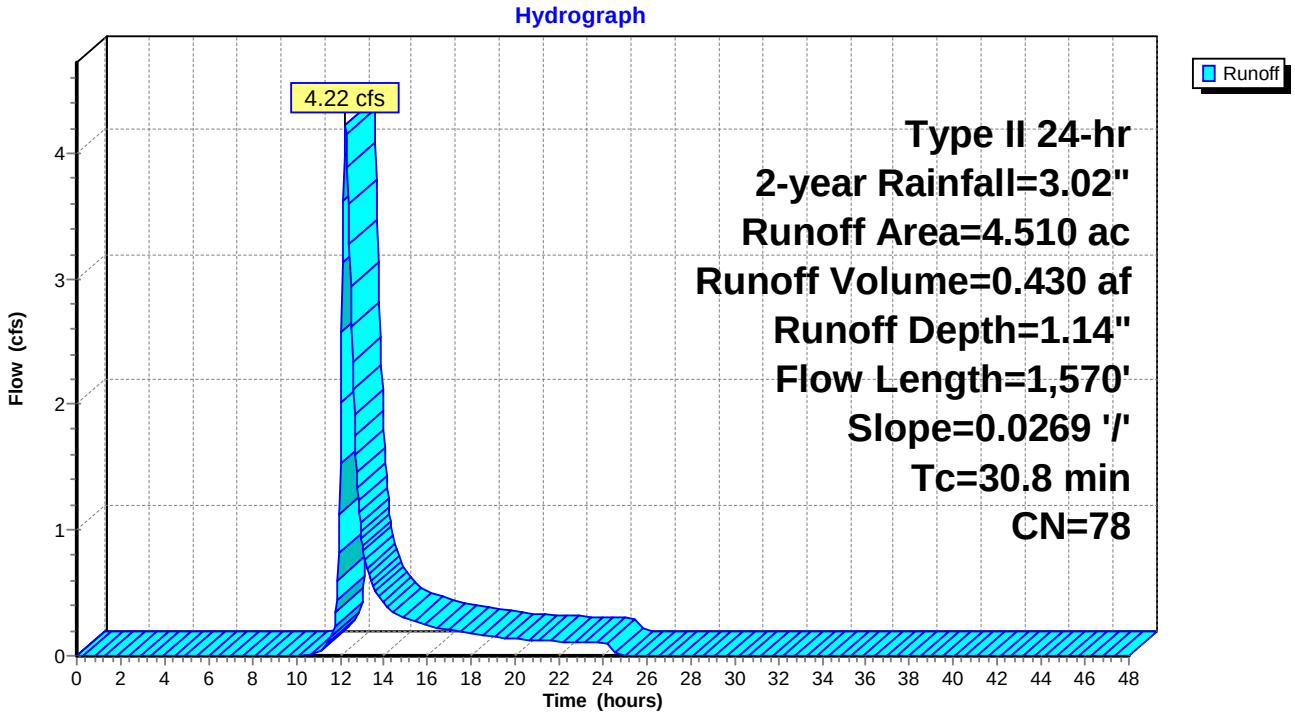
Runoff = 4.22 cfs @ 12.27 hrs, Volume= 0.430 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.510	78	
	4.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
21.3	1,470	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
30.8	1,570	Total			

Subcatchment 9S: BDA-3-2



Summary for Subcatchment 12S: BDA-4-1

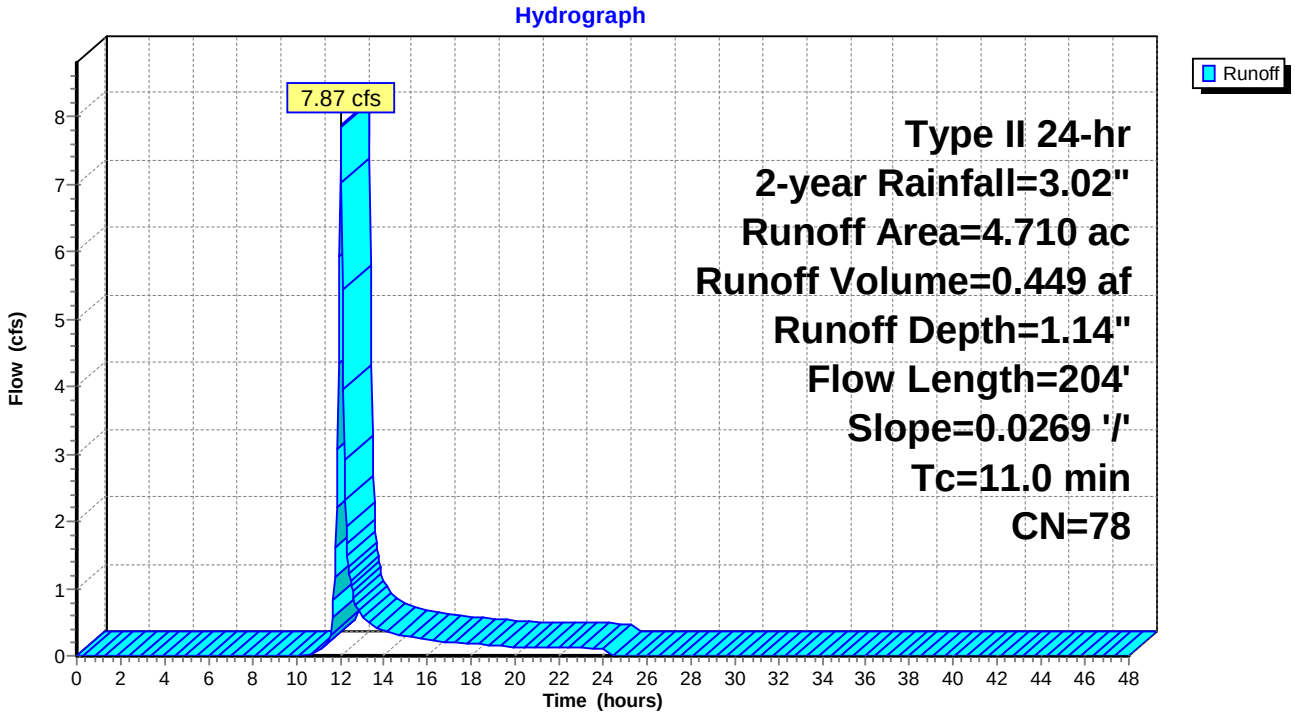
Runoff = 7.87 cfs @ 12.03 hrs, Volume= 0.449 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.710	78	
	4.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	104	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	204	Total			

Subcatchment 12S: BDA-4-1



Summary for Subcatchment 13S: BDA-4-2

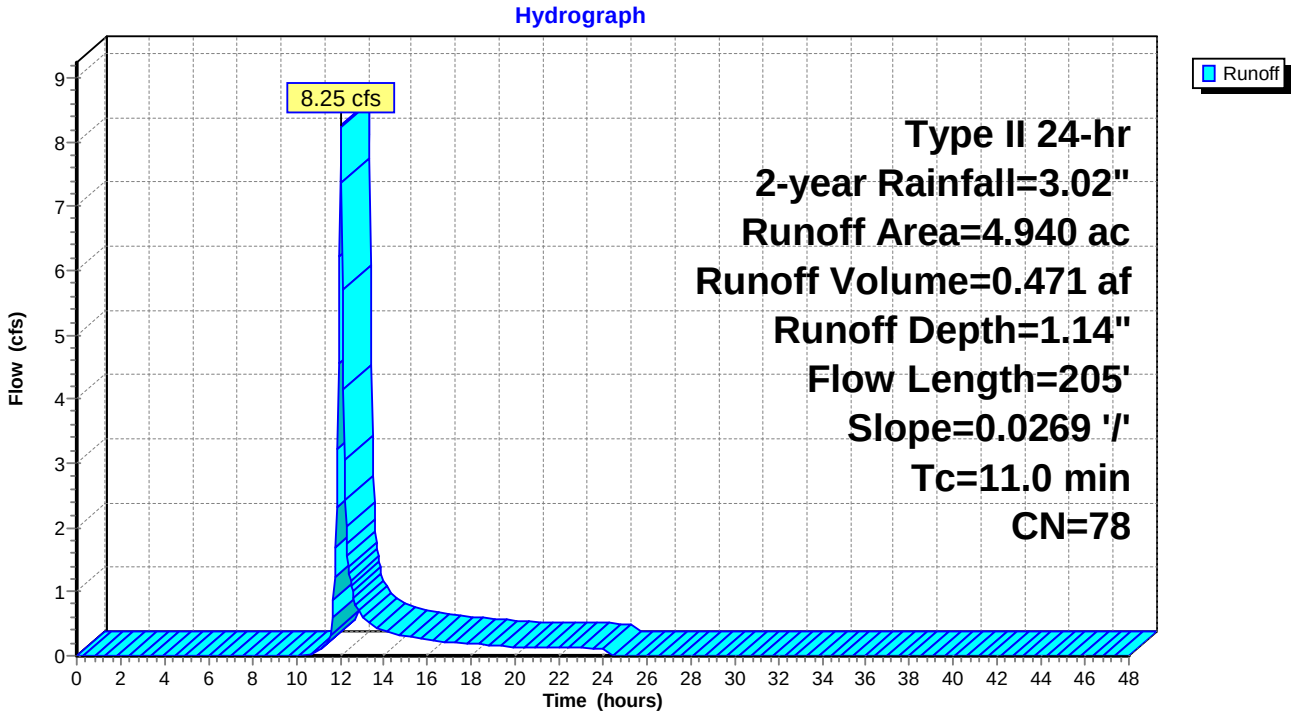
Runoff = 8.25 cfs @ 12.03 hrs, Volume= 0.471 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.940	78	
	4.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	105	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	205	Total			

Subcatchment 13S: BDA-4-2



Summary for Subcatchment 15S: BDA-5-1

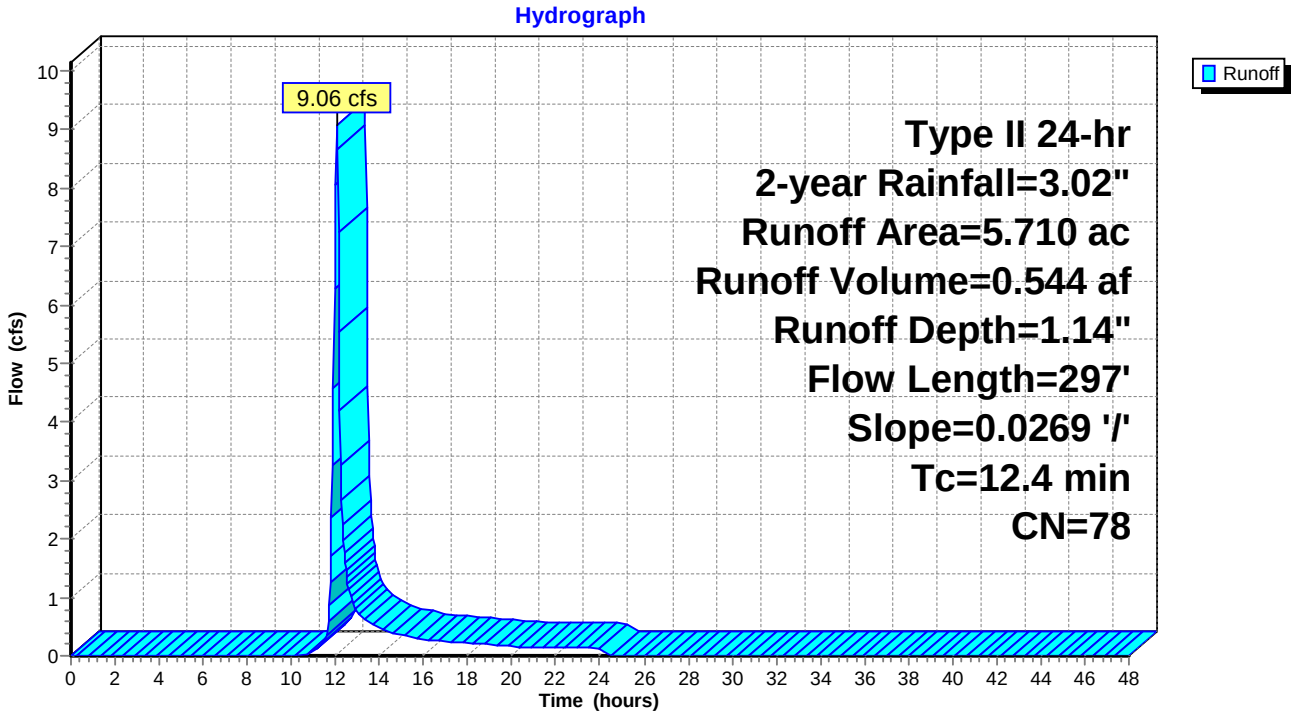
Runoff = 9.06 cfs @ 12.05 hrs, Volume= 0.544 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.710	78	
	5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.9	197	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	297	Total			

Subcatchment 15S: BDA-5-1



Summary for Subcatchment 16S: BDA-5-2

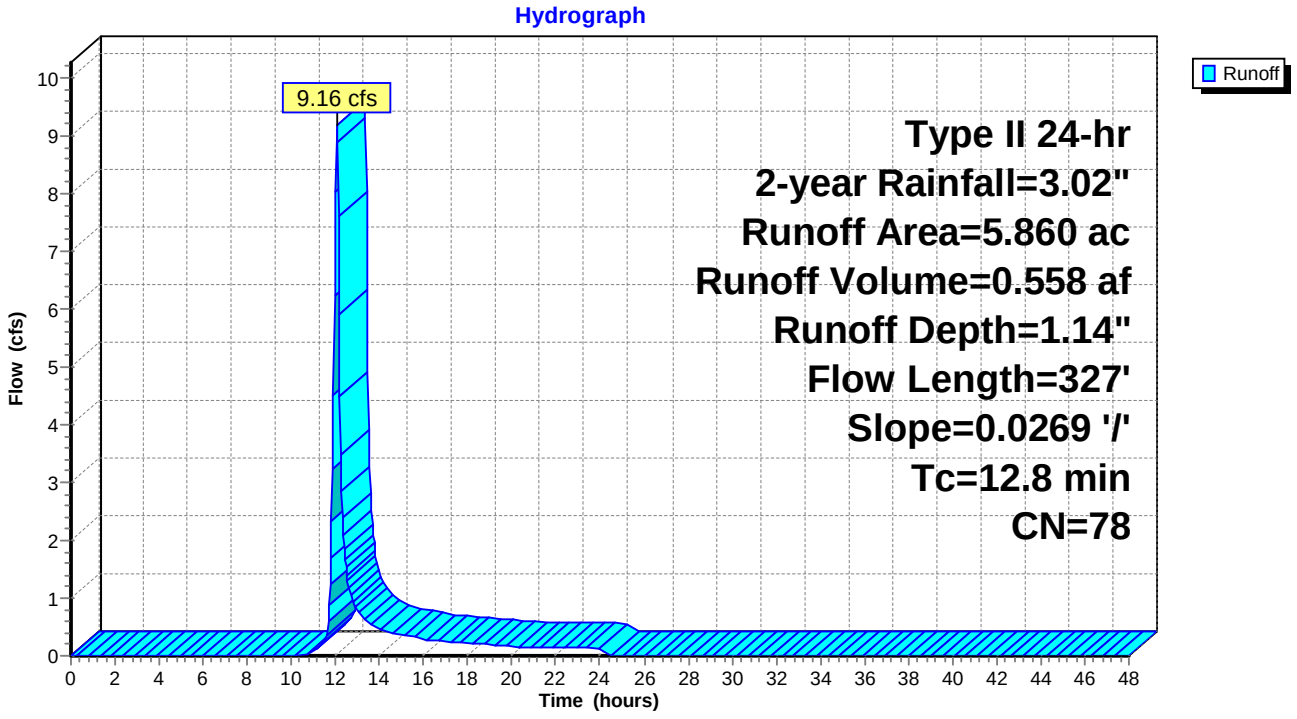
Runoff = 9.16 cfs @ 12.05 hrs, Volume= 0.558 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.860	78	
	5.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.3	227	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	327	Total			

Subcatchment 16S: BDA-5-2



Summary for Subcatchment 17S: BDA-6-1

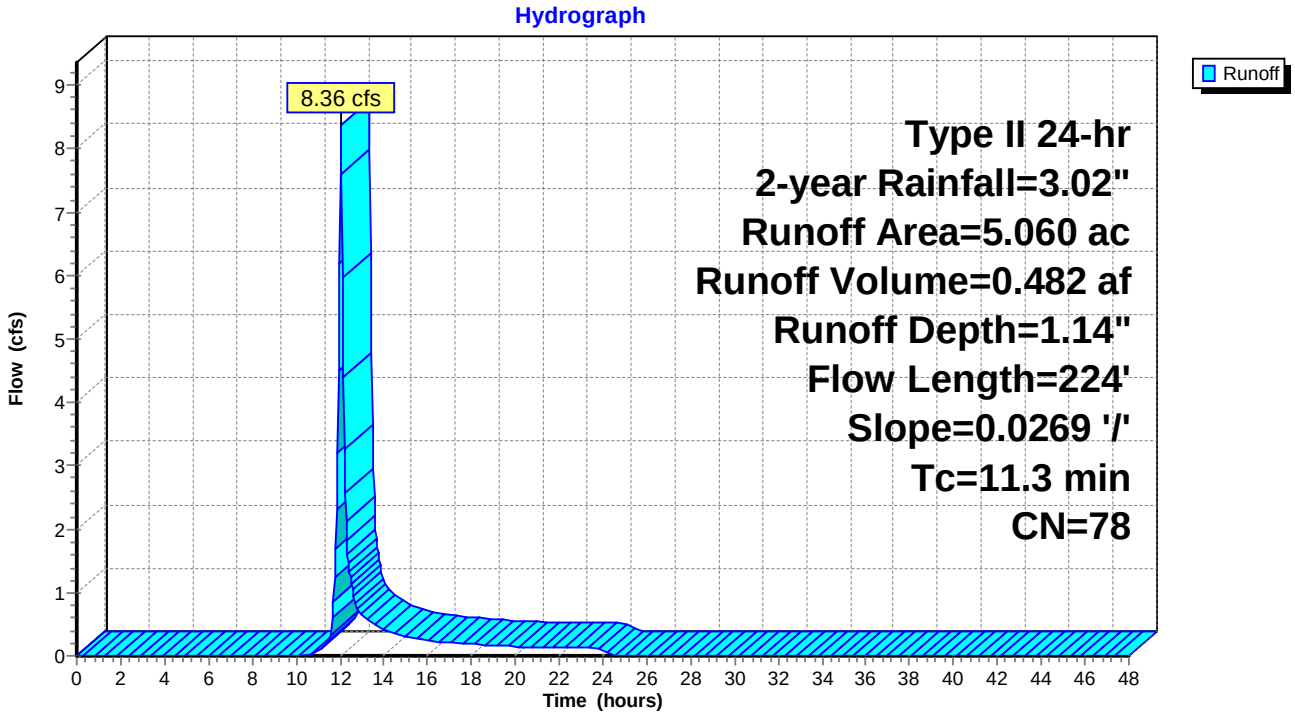
Runoff = 8.36 cfs @ 12.04 hrs, Volume= 0.482 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.060	78	
	5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.8	124	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	224	Total			

Subcatchment 17S: BDA-6-1



Summary for Subcatchment 18S: BDA-6-2

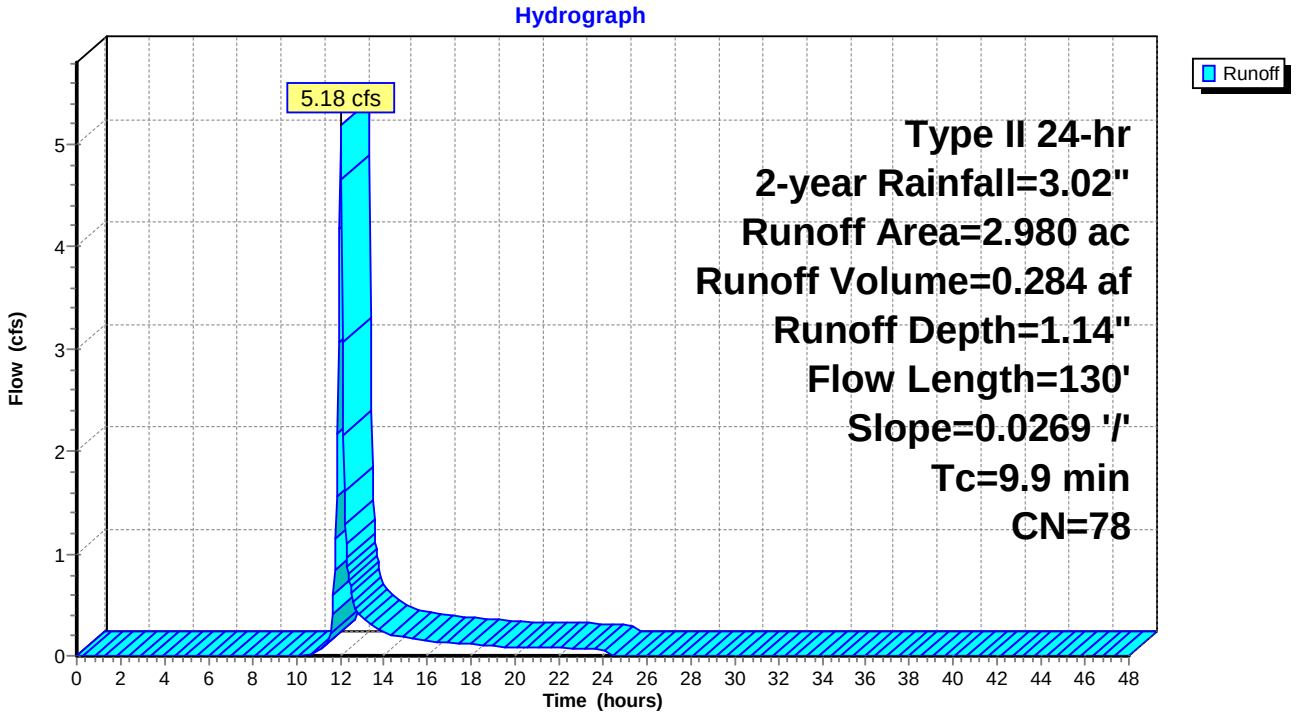
Runoff = 5.18 cfs @ 12.02 hrs, Volume= 0.284 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.980	78	
	2.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
0.4	30	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.9	130	Total			

Subcatchment 18S: BDA-6-2



Summary for Subcatchment 19S: BDA-6-3

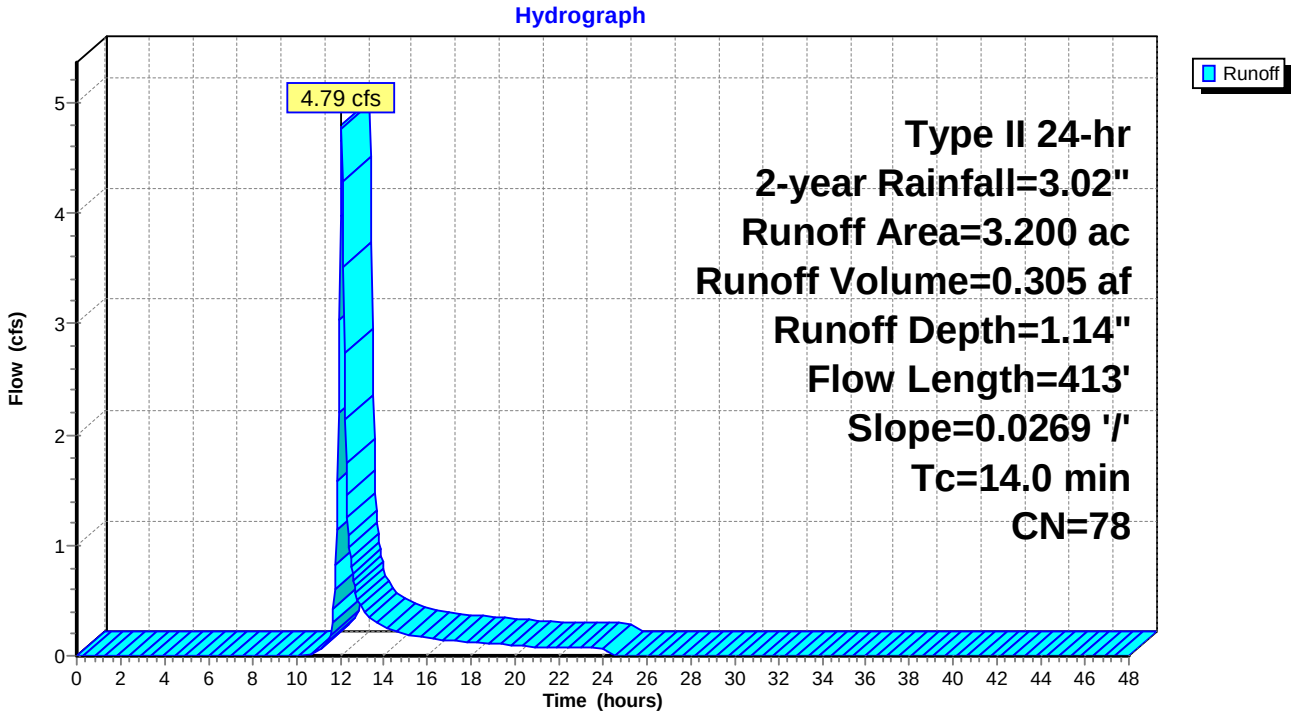
Runoff = 4.79 cfs @ 12.07 hrs, Volume= 0.305 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.200	78	
	3.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
4.5	313	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	413	Total			

Subcatchment 19S: BDA-6-3



Summary for Subcatchment 20S: BDA-7-1

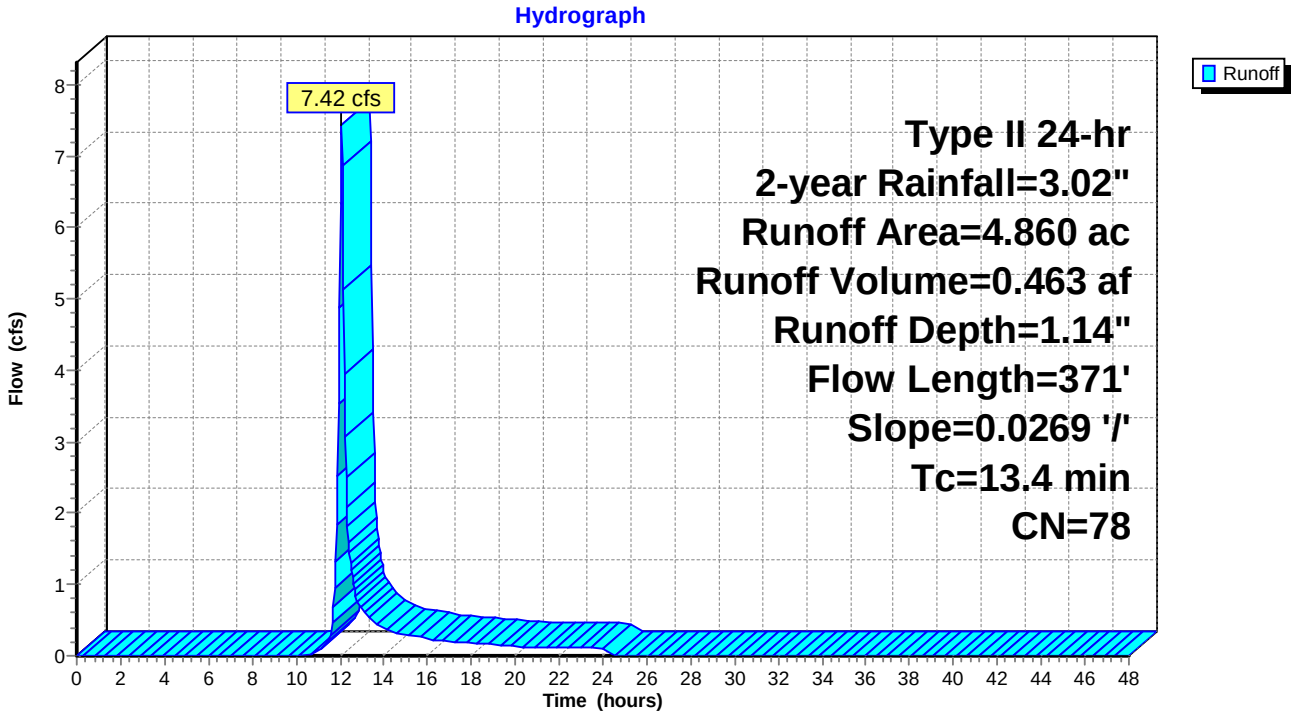
Runoff = 7.42 cfs @ 12.06 hrs, Volume= 0.463 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.860	78	
	4.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.9	271	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	371	Total			

Subcatchment 20S: BDA-7-1



Summary for Subcatchment 21S: BDA-7-2

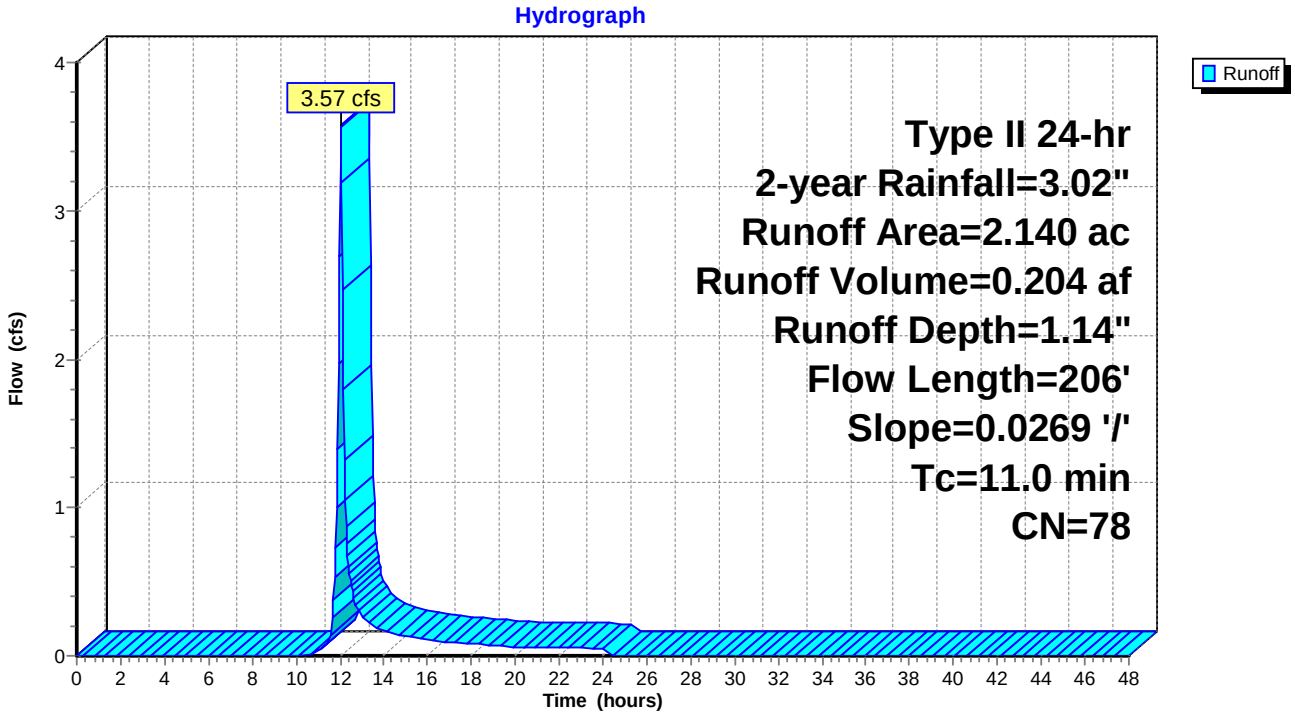
Runoff = 3.57 cfs @ 12.03 hrs, Volume= 0.204 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.140	78	
	2.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	106	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	206	Total			

Subcatchment 21S: BDA-7-2



Summary for Subcatchment 23S: BDA-8-1

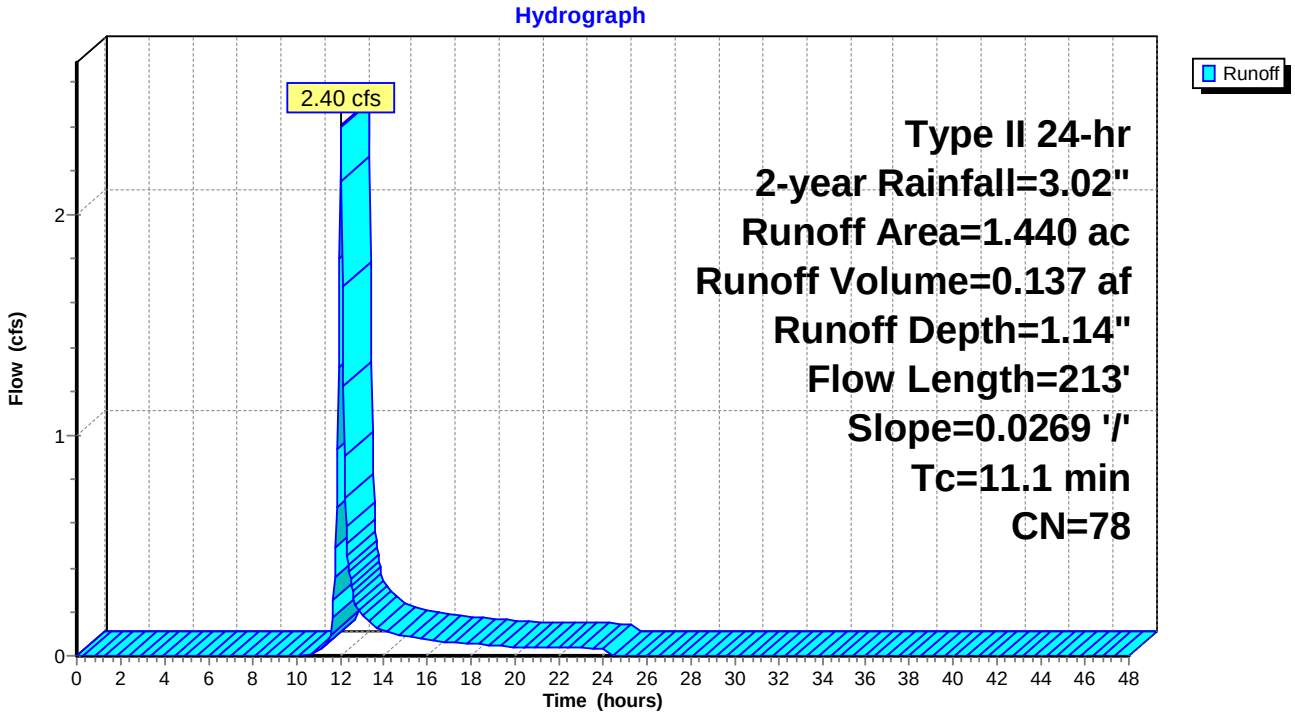
Runoff = 2.40 cfs @ 12.04 hrs, Volume= 0.137 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.440	78	
	1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.6	113	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	213	Total			

Subcatchment 23S: BDA-8-1



Summary for Subcatchment 24S: BDA-8-2

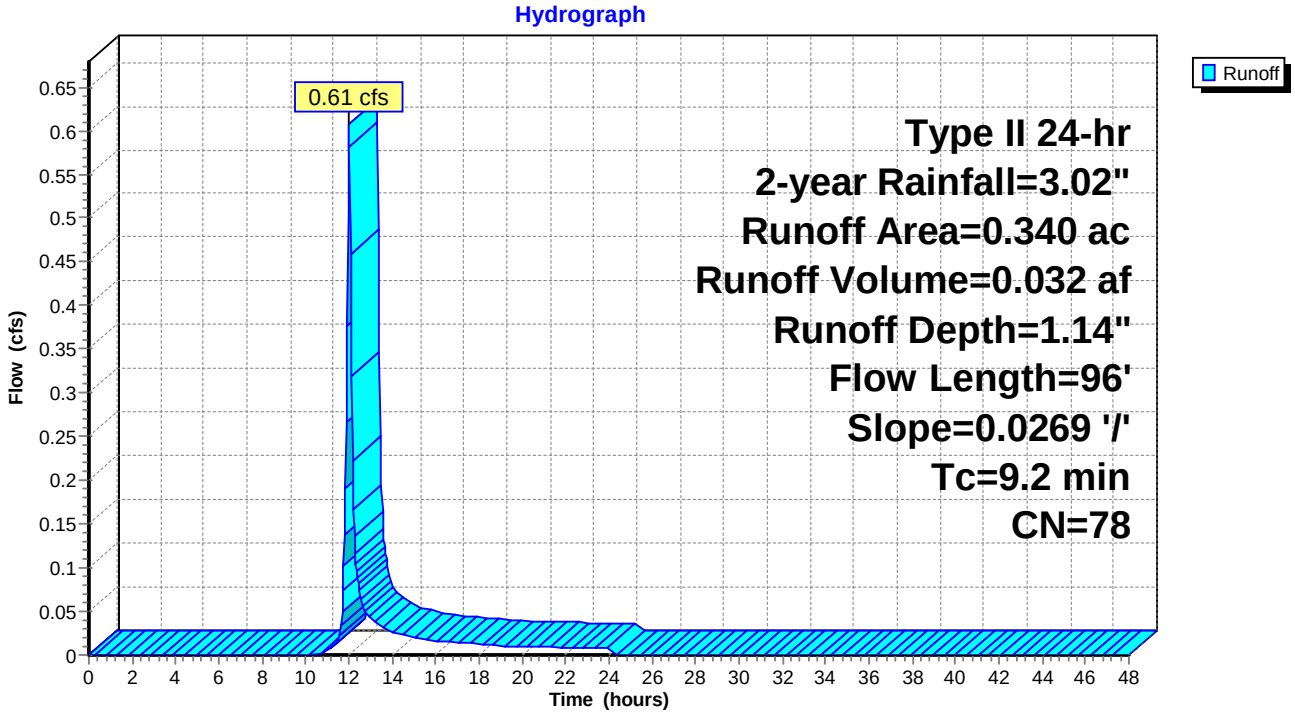
Runoff = 0.61 cfs @ 12.01 hrs, Volume= 0.032 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	0.340	78	
	0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	96	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"

Subcatchment 24S: BDA-8-2



Summary for Subcatchment 27S: BDA-9

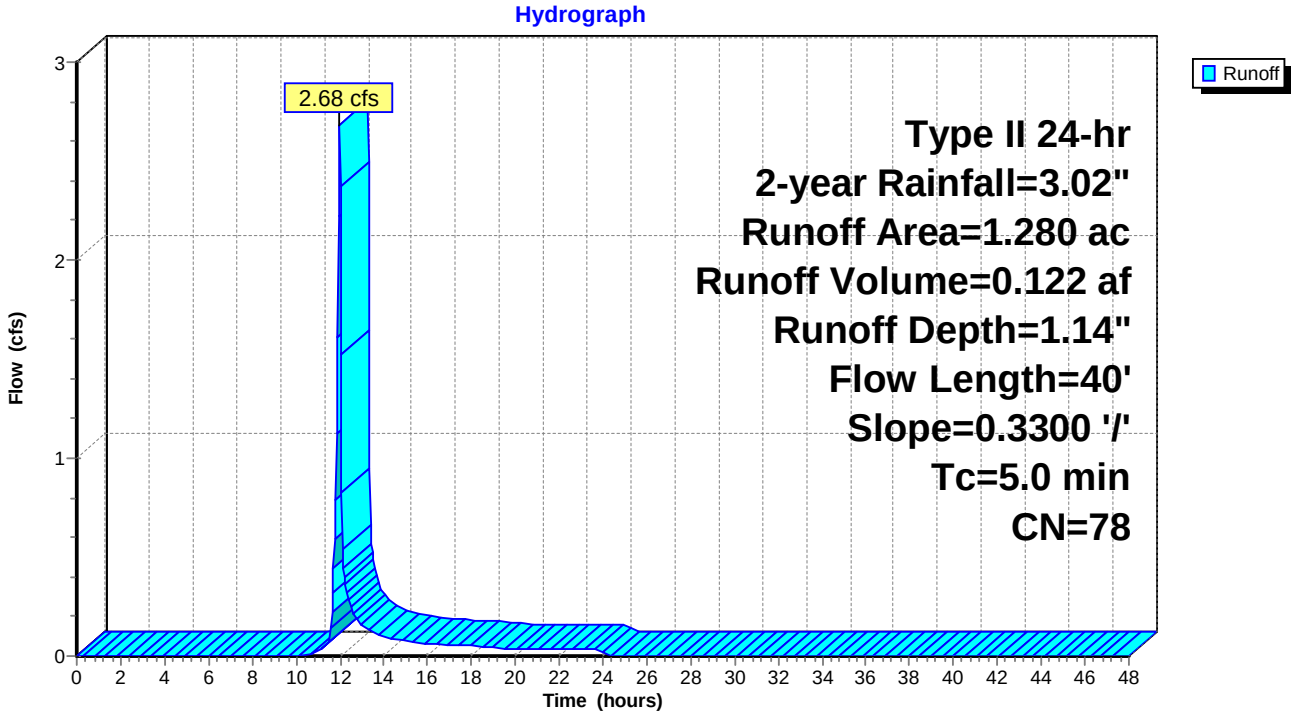
Runoff = 2.68 cfs @ 11.96 hrs, Volume= 0.122 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.280	78	
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 27S: BDA-9



Summary for Subcatchment 30S: BDA-10

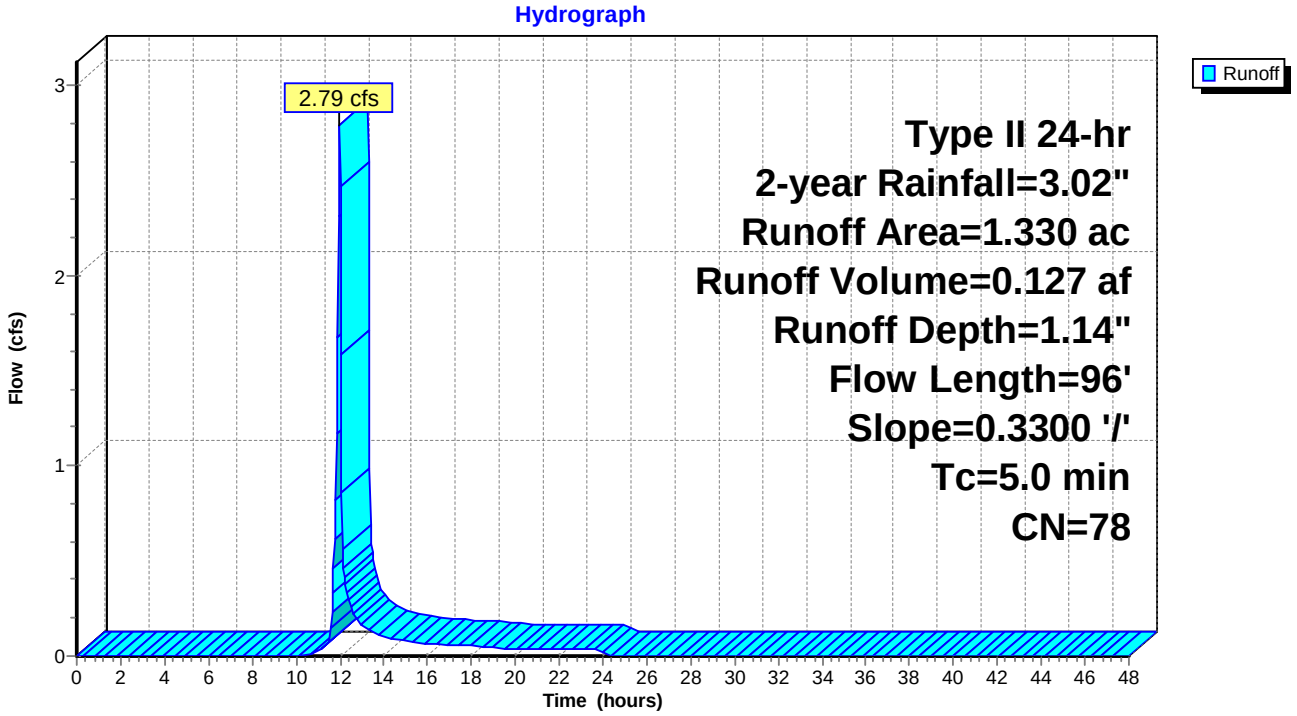
Runoff = 2.79 cfs @ 11.96 hrs, Volume= 0.127 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.330	78	
	1.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	96	0.3300	0.47		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.4	96	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30S: BDA-10



Summary for Subcatchment 31S: BDA-11

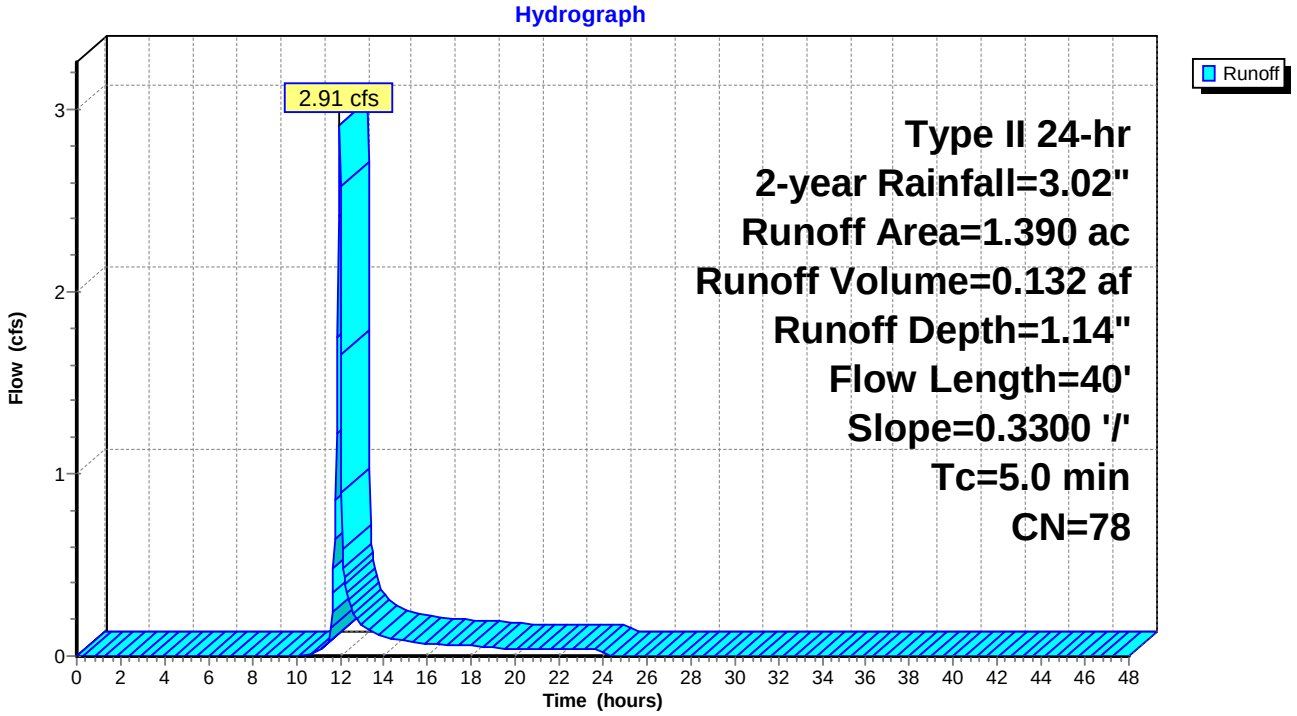
Runoff = 2.91 cfs @ 11.96 hrs, Volume= 0.132 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.390	78	
	1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 31S: BDA-11



Summary for Subcatchment 34S: BDA-10

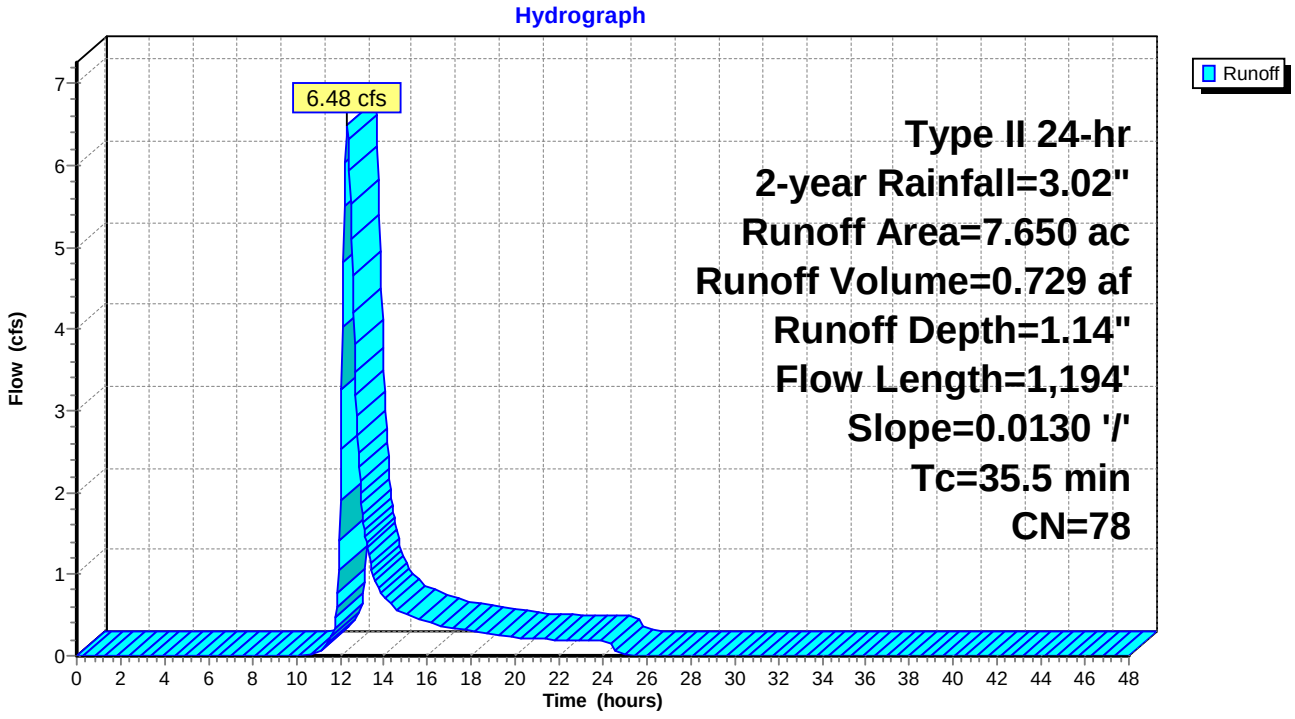
Runoff = 6.48 cfs @ 12.33 hrs, Volume= 0.729 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	7.650	78	
	7.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0130	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
22.8	1,094	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.5	1,194	Total			

Subcatchment 34S: BDA-10



Summary for Reach 1R: BDC-1

Inflow Area = 4.520 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 7.35 cfs @ 12.04 hrs, Volume= 0.431 af
Outflow = 7.06 cfs @ 12.07 hrs, Volume= 0.431 af, Atten= 4%, Lag= 1.7 min

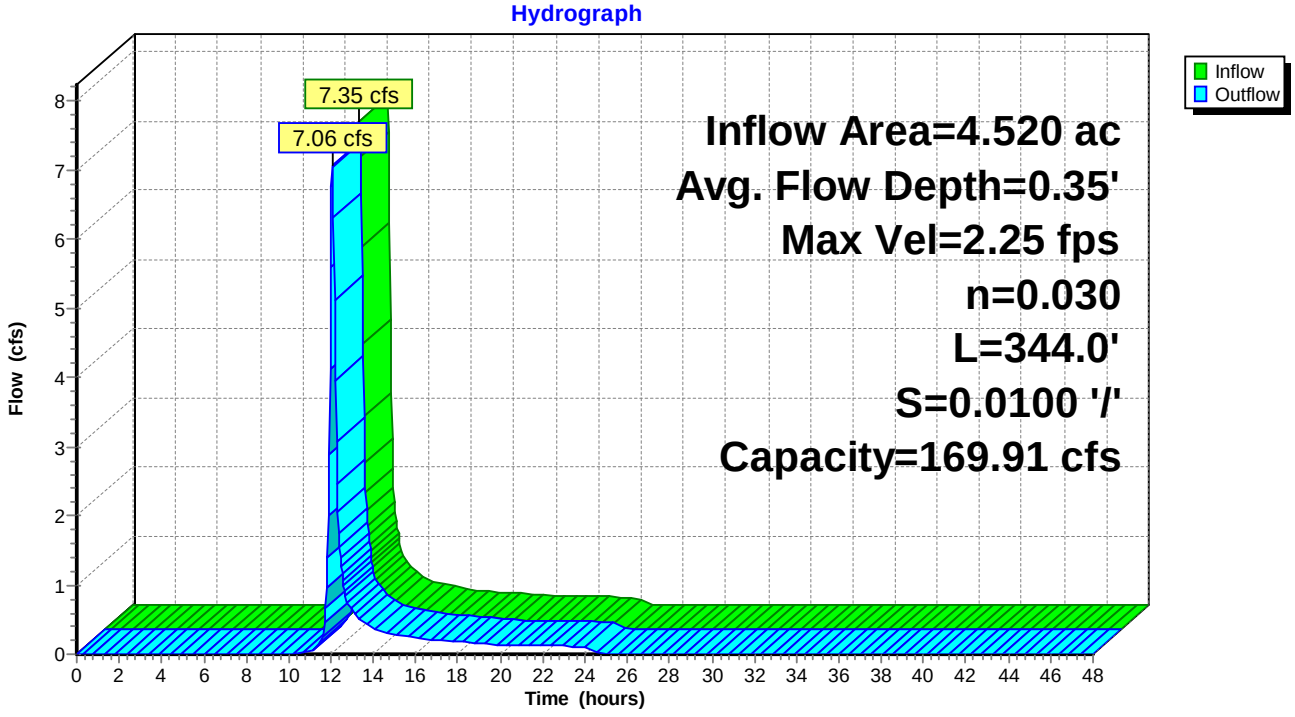
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.25 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 9.5 min

Peak Storage= 1,077 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 344.0' Slope= 0.0100 '/'
Inlet Invert= 464.00', Outlet Invert= 460.56'

‡

Reach 1R: BDC-1



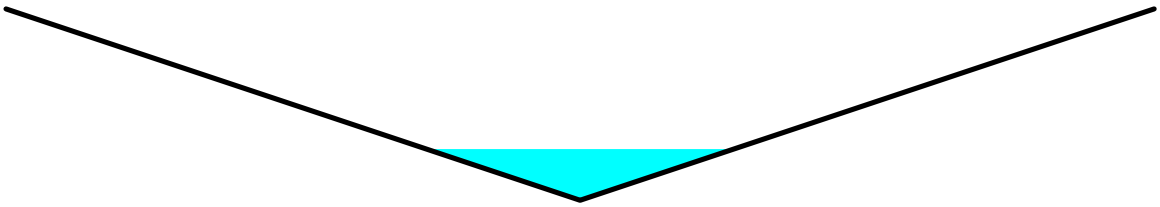
Summary for Reach 2R: PD-1

Inflow Area = 0.960 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.01 cfs @ 11.96 hrs, Volume= 0.091 af
Outflow = 1.19 cfs @ 12.04 hrs, Volume= 0.091 af, Atten= 41%, Lag= 4.6 min

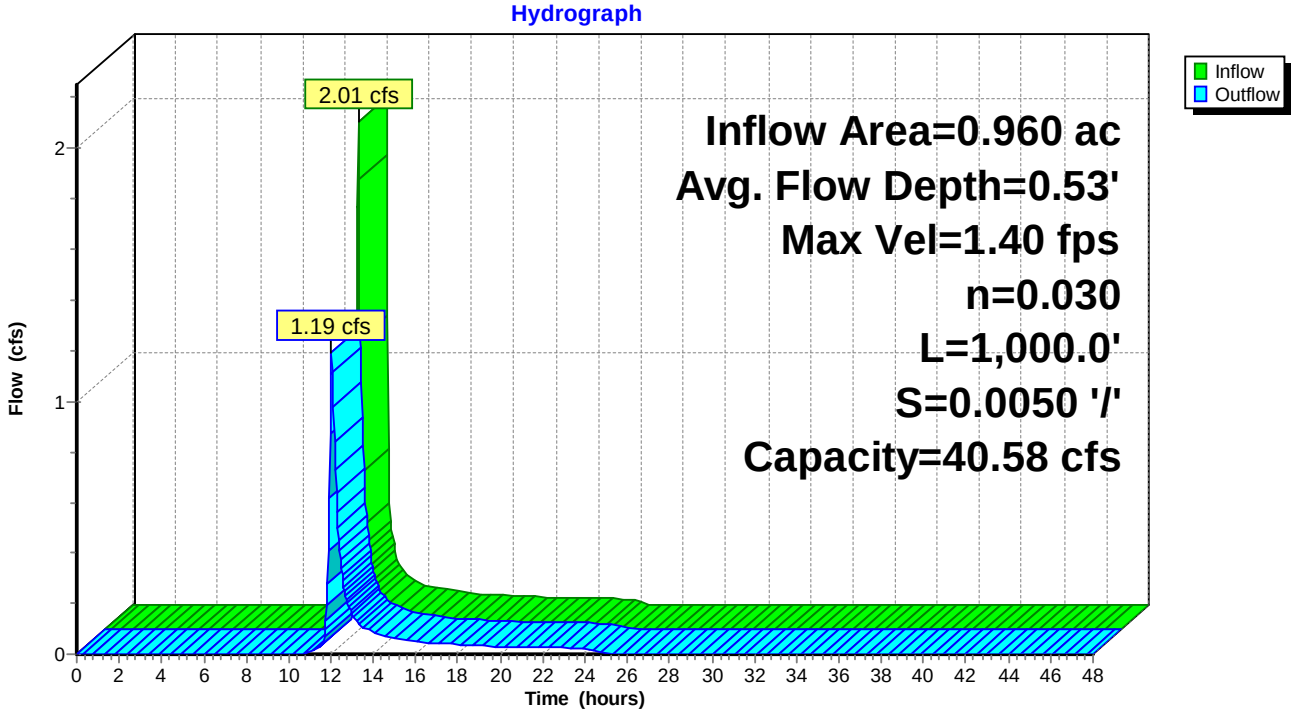
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.40 fps, Min. Travel Time= 11.9 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 35.3 min

Peak Storage= 850 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 40.58 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 1,000.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 455.00'



Reach 2R: PD-1



Summary for Reach 6R: BDC-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 11.93 cfs @ 12.04 hrs, Volume= 0.692 af
Outflow = 11.01 cfs @ 12.08 hrs, Volume= 0.692 af, Atten= 8%, Lag= 2.4 min

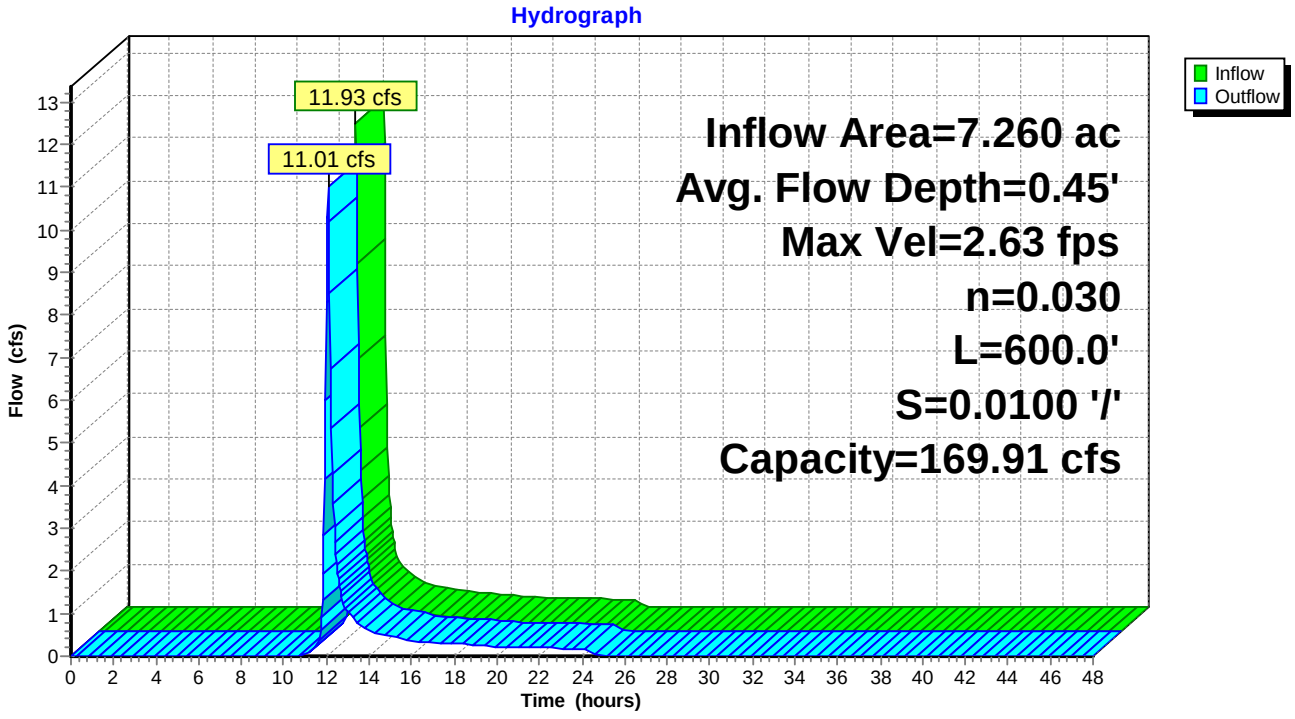
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.63 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 14.8 min

Peak Storage= 2,513 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 600.0' Slope= 0.0100 '/'
Inlet Invert= 466.00', Outlet Invert= 460.00'

‡

Reach 6R: BDC-2



Summary for Reach 10R: BDC-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 9.22 cfs @ 12.05 hrs, Volume= 0.836 af
Outflow = 8.24 cfs @ 12.11 hrs, Volume= 0.836 af, Atten= 11%, Lag= 3.9 min

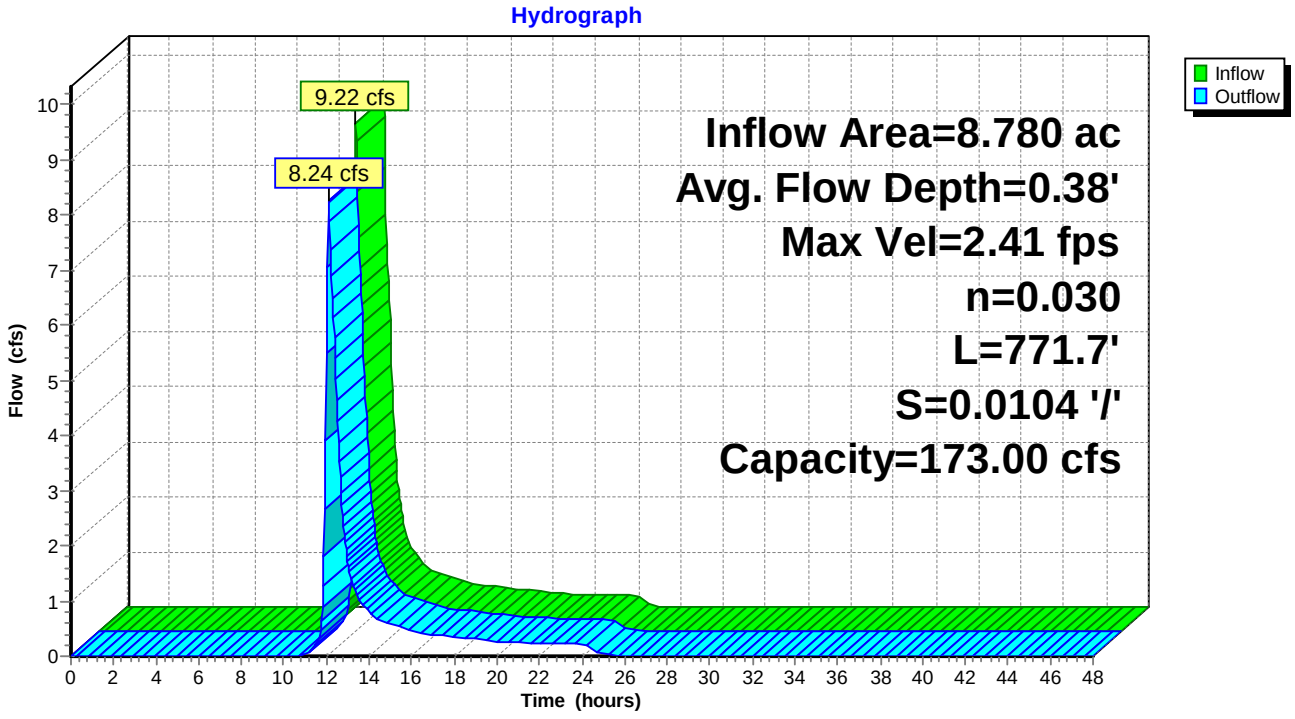
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.41 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 18.0 min

Peak Storage= 2,641 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 173.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 771.7' Slope= 0.0104 '/'
Inlet Invert= 468.00', Outlet Invert= 460.00'

‡

Reach 10R: BDC-3



Summary for Reach 14R: BDC-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 16.12 cfs @ 12.03 hrs, Volume= 0.919 af
Outflow = 14.13 cfs @ 12.08 hrs, Volume= 0.919 af, Atten= 12%, Lag= 3.0 min

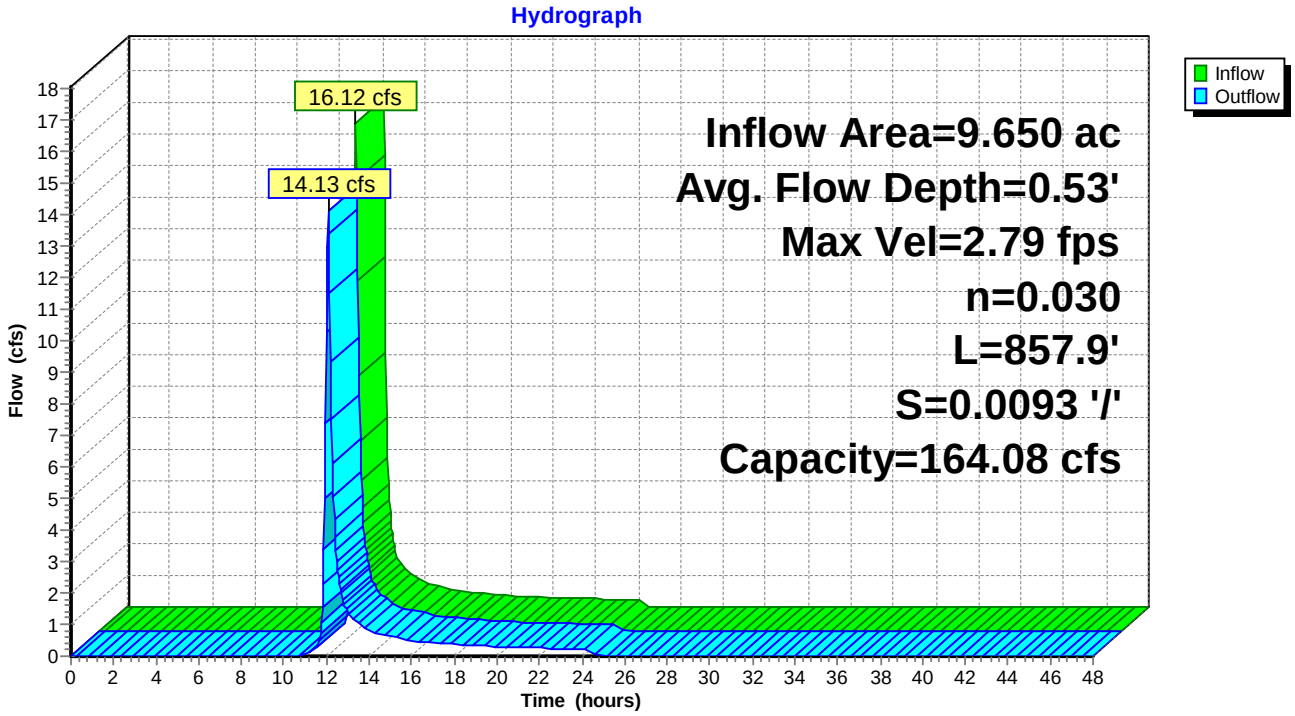
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.79 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 20.6 min

Peak Storage= 4,340 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 164.08 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 857.9' Slope= 0.0093 '/'
Inlet Invert= 470.00', Outlet Invert= 462.00'

‡

Reach 14R: BDC-4



Summary for Reach 17R: PD-2

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 15.00 cfs @ 12.12 hrs, Volume= 1.102 af
Outflow = 14.03 cfs @ 12.17 hrs, Volume= 1.102 af, Atten= 6%, Lag= 2.9 min

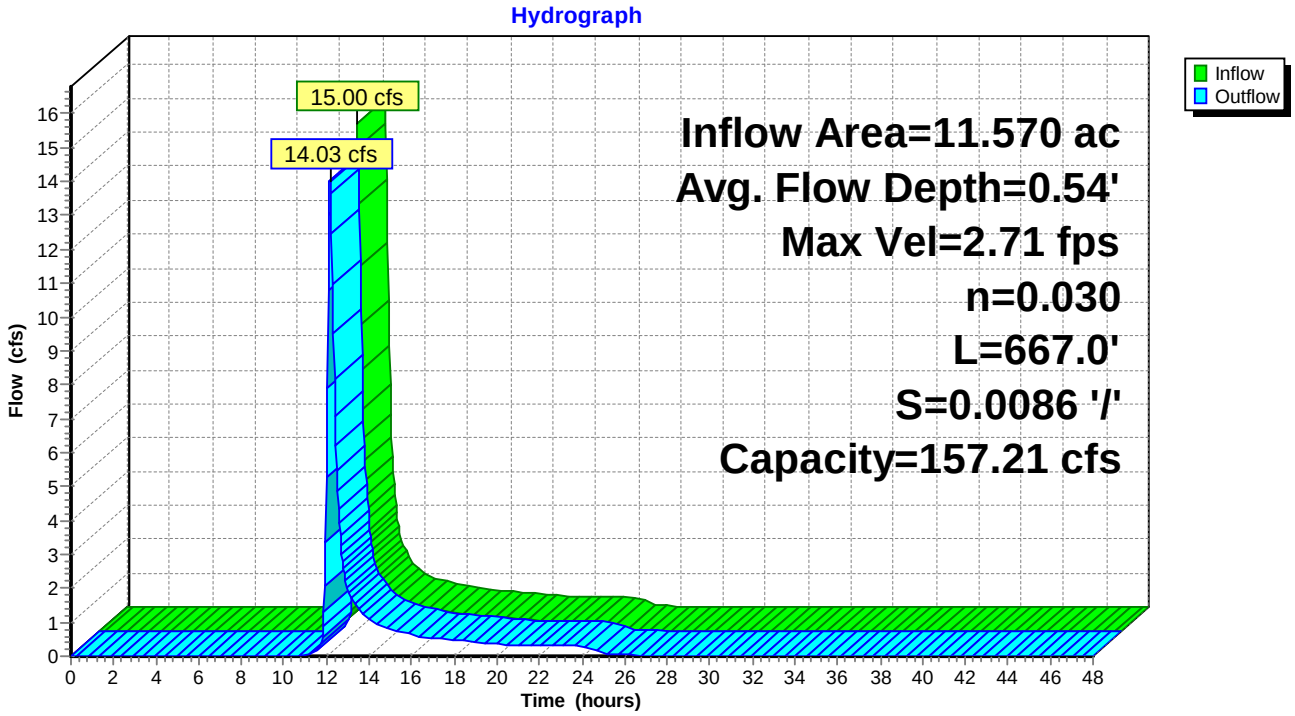
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.71 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 16.7 min

Peak Storage= 3,456 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.21 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 667.0' Slope= 0.0086 '/'
Inlet Invert= 457.00', Outlet Invert= 451.29'

‡

Reach 17R: PD-2



Summary for Reach 18R: BDC-5

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 18.22 cfs @ 12.05 hrs, Volume= 1.102 af
Outflow = 15.00 cfs @ 12.12 hrs, Volume= 1.102 af, Atten= 18%, Lag= 4.2 min

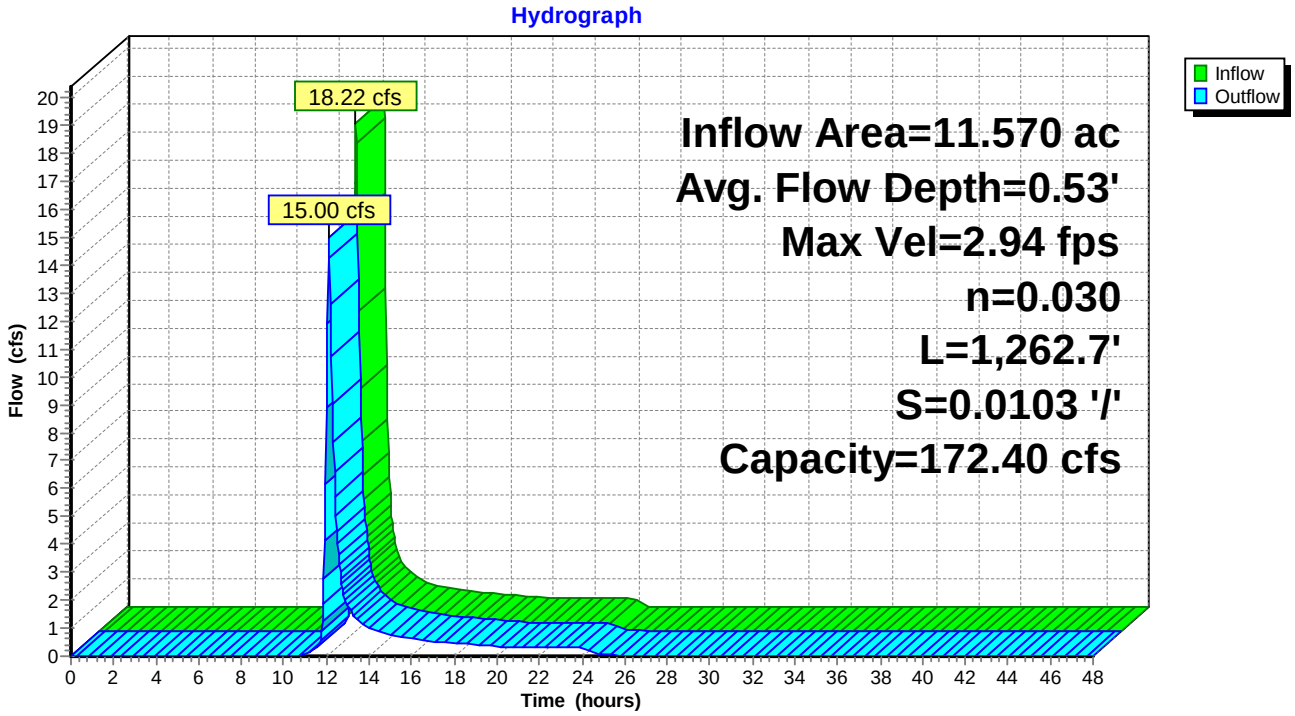
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 29.2 min

Peak Storage= 6,431 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 172.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,262.7' Slope= 0.0103 '/'
Inlet Invert= 470.00', Outlet Invert= 457.00'

‡

Reach 18R: BDC-5



Summary for Reach 20R: BDC-6

Inflow Area = 8.040 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 13.50 cfs @ 12.03 hrs, Volume= 0.766 af
Outflow = 12.20 cfs @ 12.08 hrs, Volume= 0.766 af, Atten= 10%, Lag= 2.6 min

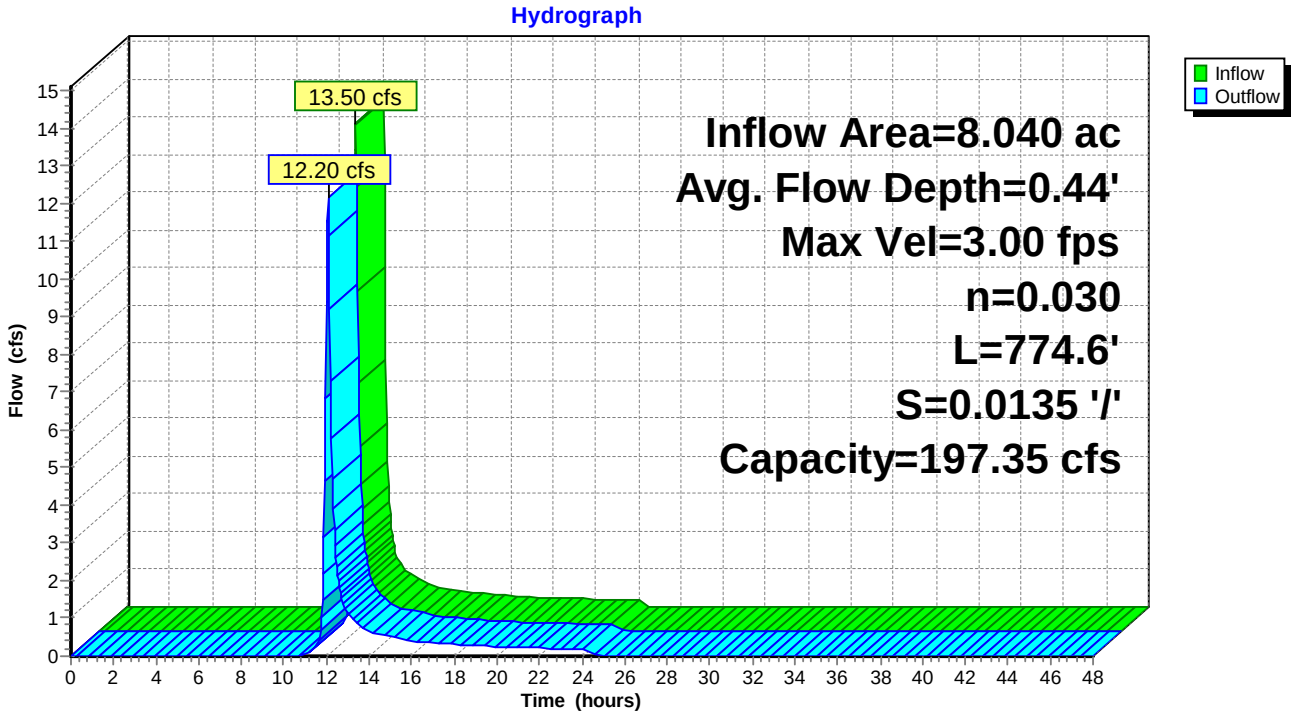
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 16.8 min

Peak Storage= 3,144 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 197.35 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 774.6' Slope= 0.0135 '/'
Inlet Invert= 469.45', Outlet Invert= 459.00'

‡

Reach 20R: BDC-6



Summary for Reach 22R: BDC-7

Inflow Area = 7.000 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 10.92 cfs @ 12.05 hrs, Volume= 0.667 af
Outflow = 10.39 cfs @ 12.09 hrs, Volume= 0.667 af, Atten= 5%, Lag= 2.1 min

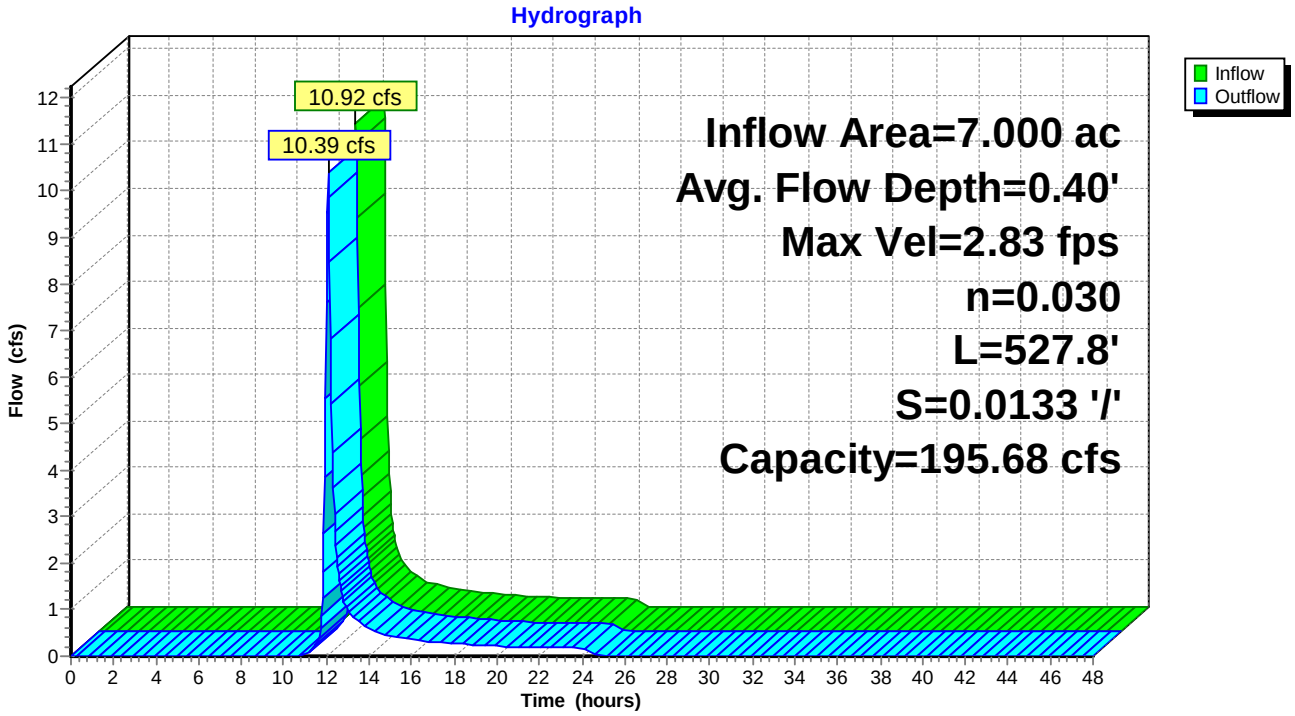
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 11.7 min

Peak Storage= 1,939 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 195.68 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 527.8' Slope= 0.0133 '/'
Inlet Invert= 462.00', Outlet Invert= 455.00'

‡

Reach 22R: BDC-7



Summary for Reach 25R: BDC-8

Inflow Area = 1.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.99 cfs @ 12.03 hrs, Volume= 0.170 af
Outflow = 2.91 cfs @ 12.05 hrs, Volume= 0.170 af, Atten= 3%, Lag= 1.3 min

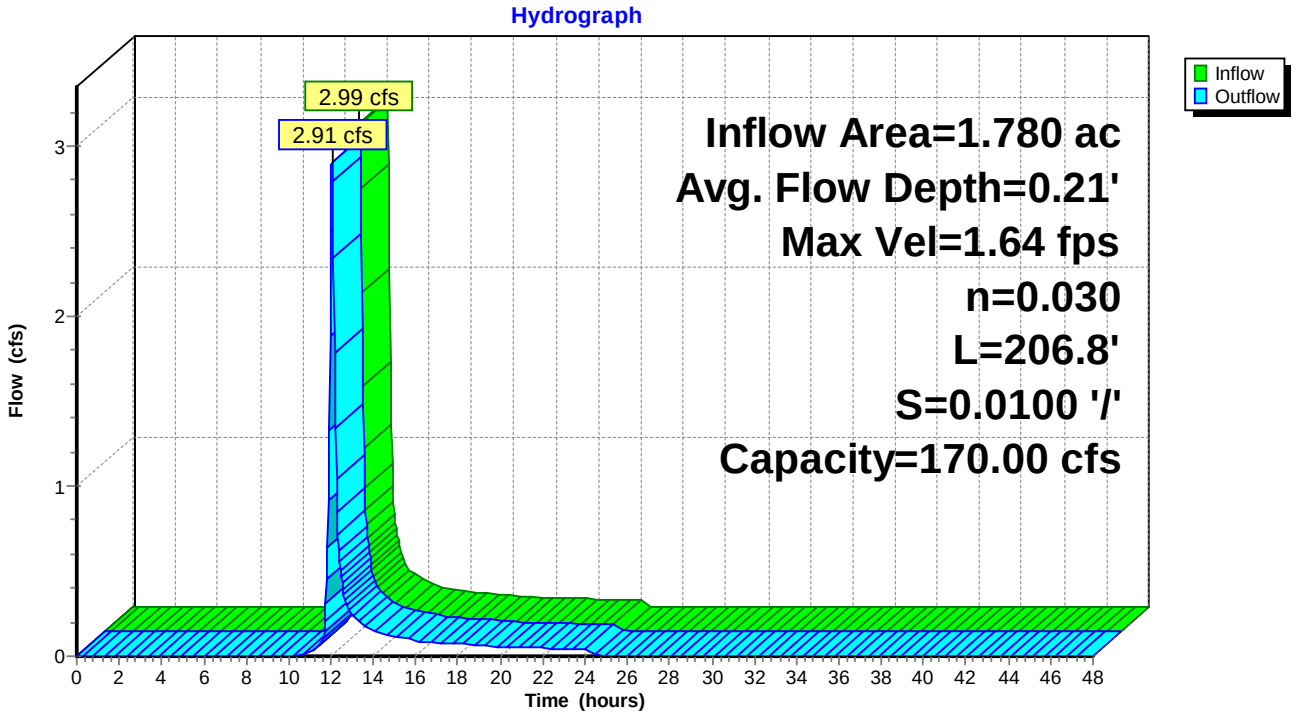
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.64 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 7.6 min

Peak Storage= 366 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 170.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 206.8' Slope= 0.0100 '/'
Inlet Invert= 461.97', Outlet Invert= 459.90'

‡

Reach 25R: BDC-8



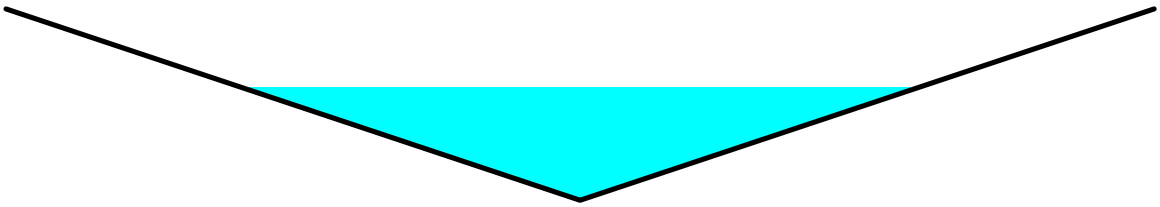
Summary for Reach 26R: PD-3

Inflow Area = 1.280 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.68 cfs @ 11.96 hrs, Volume= 0.122 af
Outflow = 1.61 cfs @ 12.04 hrs, Volume= 0.122 af, Atten= 40%, Lag= 4.6 min

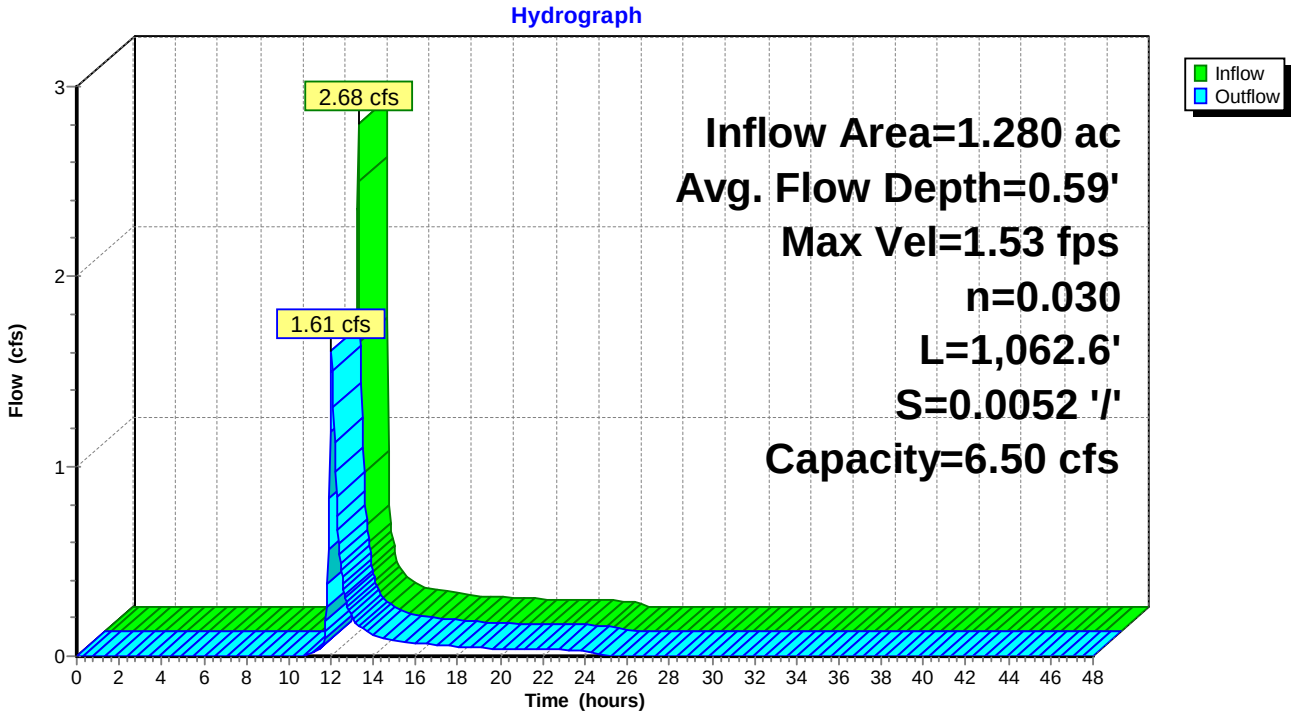
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.53 fps, Min. Travel Time= 11.6 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 38.2 min

Peak Storage= 1,118 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.50 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,062.6' Slope= 0.0052 '/'
Inlet Invert= 457.49', Outlet Invert= 452.00'



Reach 26R: PD-3



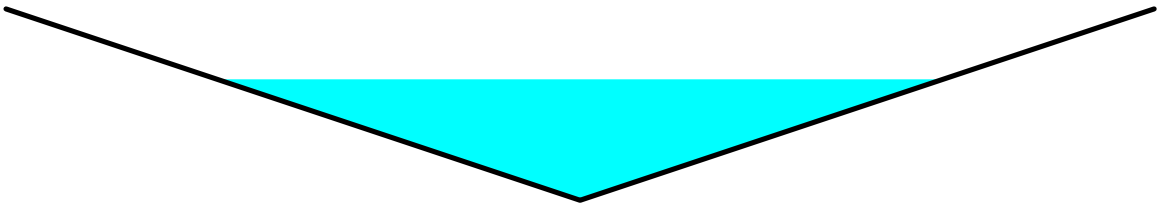
Summary for Reach 29R: PD-4

Inflow Area = 1.330 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.79 cfs @ 11.96 hrs, Volume= 0.127 af
Outflow = 1.88 cfs @ 12.03 hrs, Volume= 0.127 af, Atten= 32%, Lag= 4.0 min

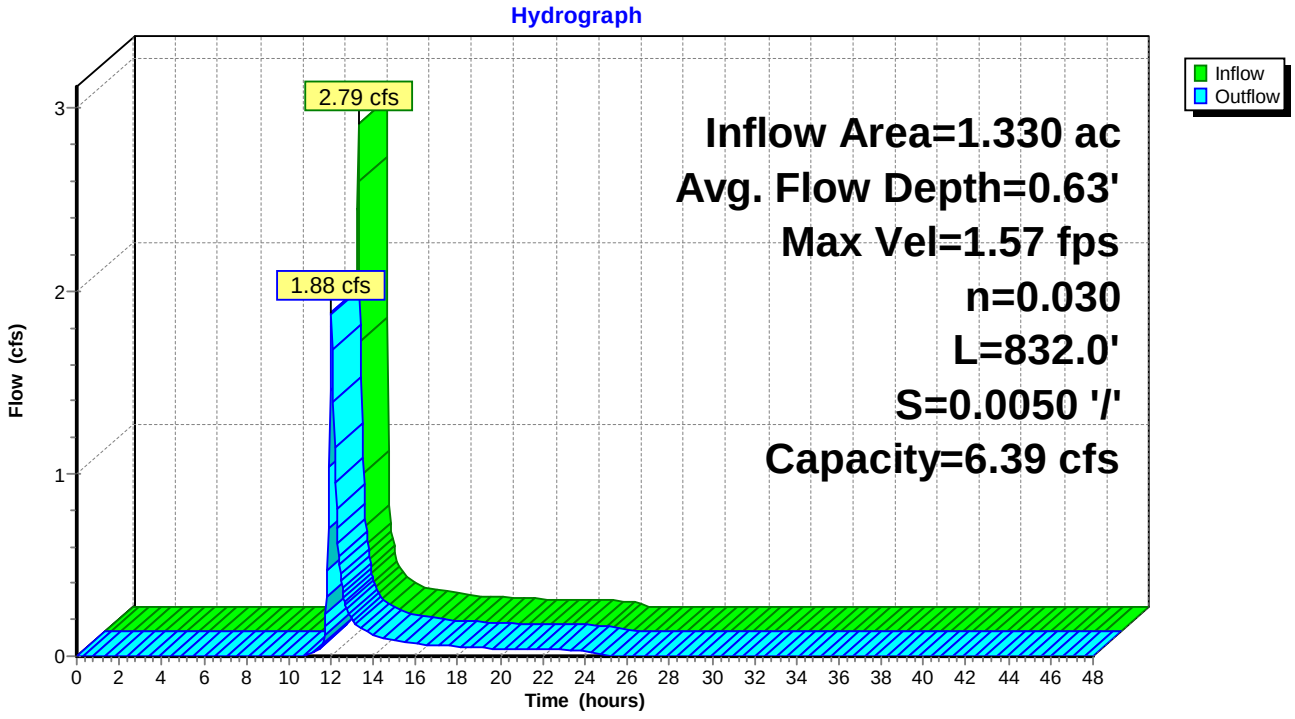
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.57 fps, Min. Travel Time= 8.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 28.4 min

Peak Storage= 997 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.39 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 832.0' Slope= 0.0050 '/'
Inlet Invert= 458.59', Outlet Invert= 454.43'



Reach 29R: PD-4



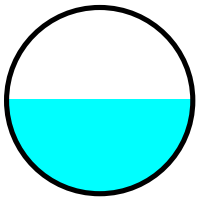
Summary for Reach 30R: BDC-9

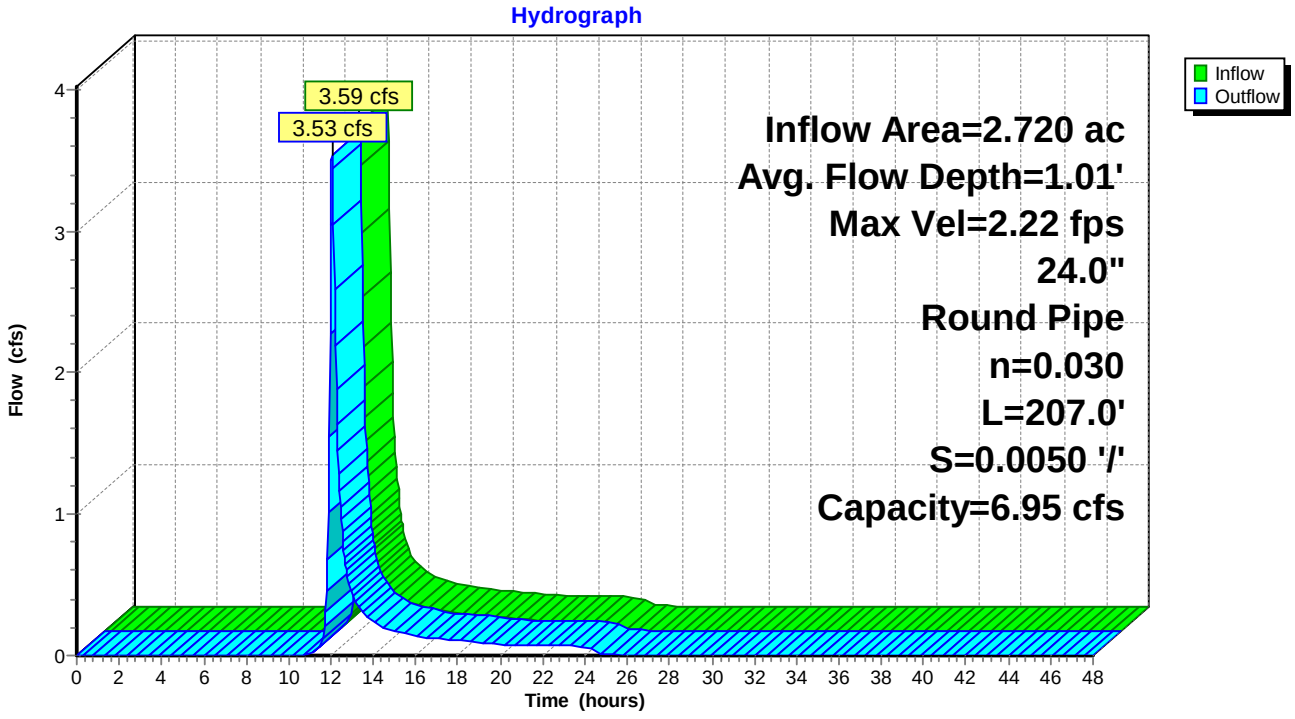
Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 3.59 cfs @ 12.04 hrs, Volume= 0.259 af
Outflow = 3.53 cfs @ 12.06 hrs, Volume= 0.259 af, Atten= 2%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 5.7 min

Peak Storage= 329 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 6.95 cfs

24.0" Round Pipe
n= 0.030 Corrugated metal
Length= 207.0' Slope= 0.0050 '/'
Inlet Invert= 454.43', Outlet Invert= 453.39'





Summary for Reach 31R: PD-6

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 14.69 cfs @ 12.07 hrs, Volume= 0.958 af
Outflow = 12.78 cfs @ 12.14 hrs, Volume= 0.958 af, Atten= 13%, Lag= 3.7 min

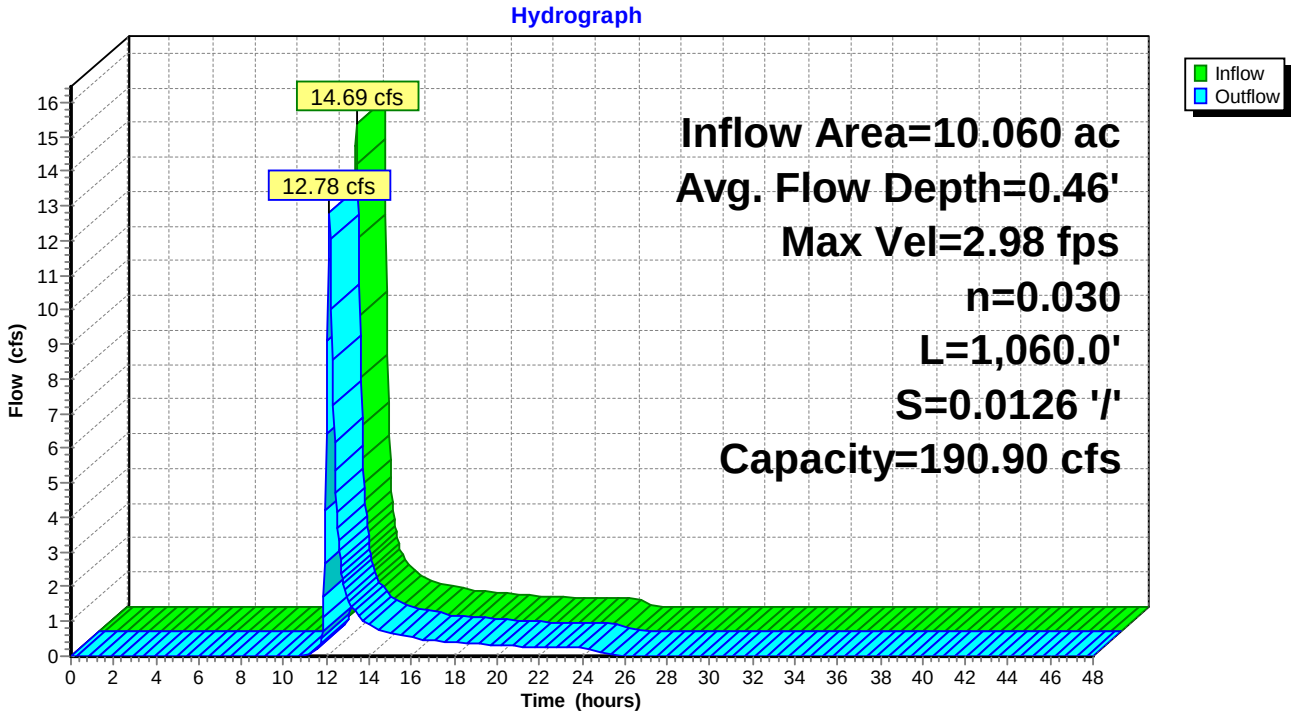
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 5.9 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 23.7 min

Peak Storage= 4,537 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 190.90 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,060.0' Slope= 0.0126 '/'
Inlet Invert= 450.00', Outlet Invert= 436.62'

‡

Reach 31R: PD-6



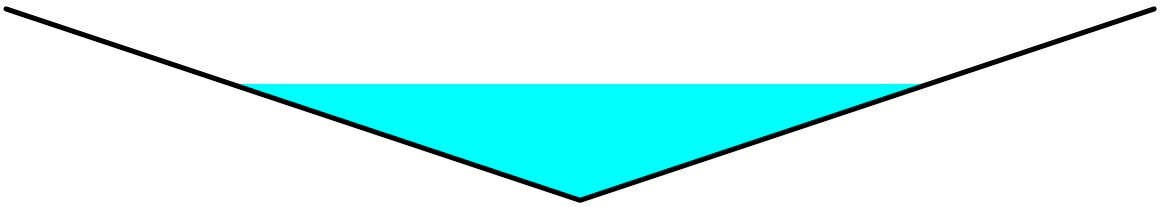
Summary for Reach 32R: PD-5

Inflow Area = 1.390 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.91 cfs @ 11.96 hrs, Volume= 0.132 af
Outflow = 1.72 cfs @ 12.04 hrs, Volume= 0.132 af, Atten= 41%, Lag= 4.7 min

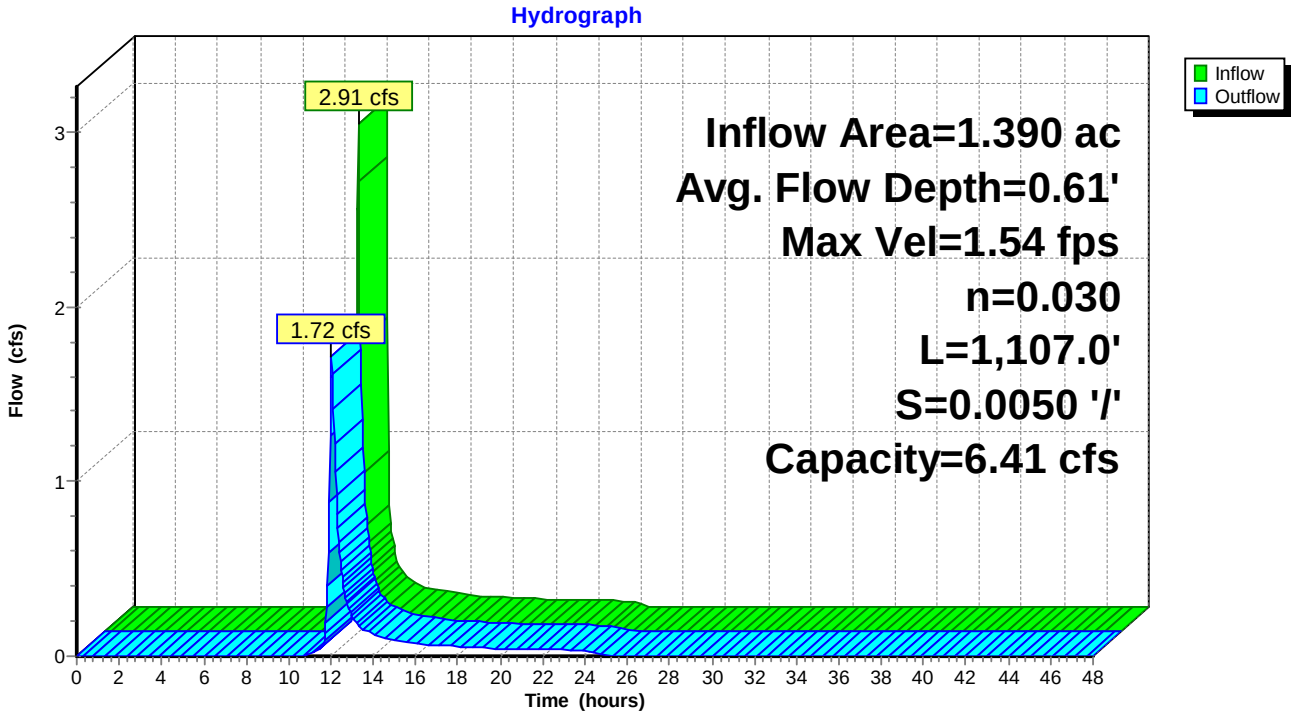
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.54 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 40.0 min

Peak Storage= 1,236 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.41 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,107.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 454.43'



Reach 32R: PD-5



Summary for Reach 33R: PD-7

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 12.78 cfs @ 12.14 hrs, Volume= 0.958 af
Outflow = 12.71 cfs @ 12.15 hrs, Volume= 0.958 af, Atten= 1%, Lag= 0.8 min

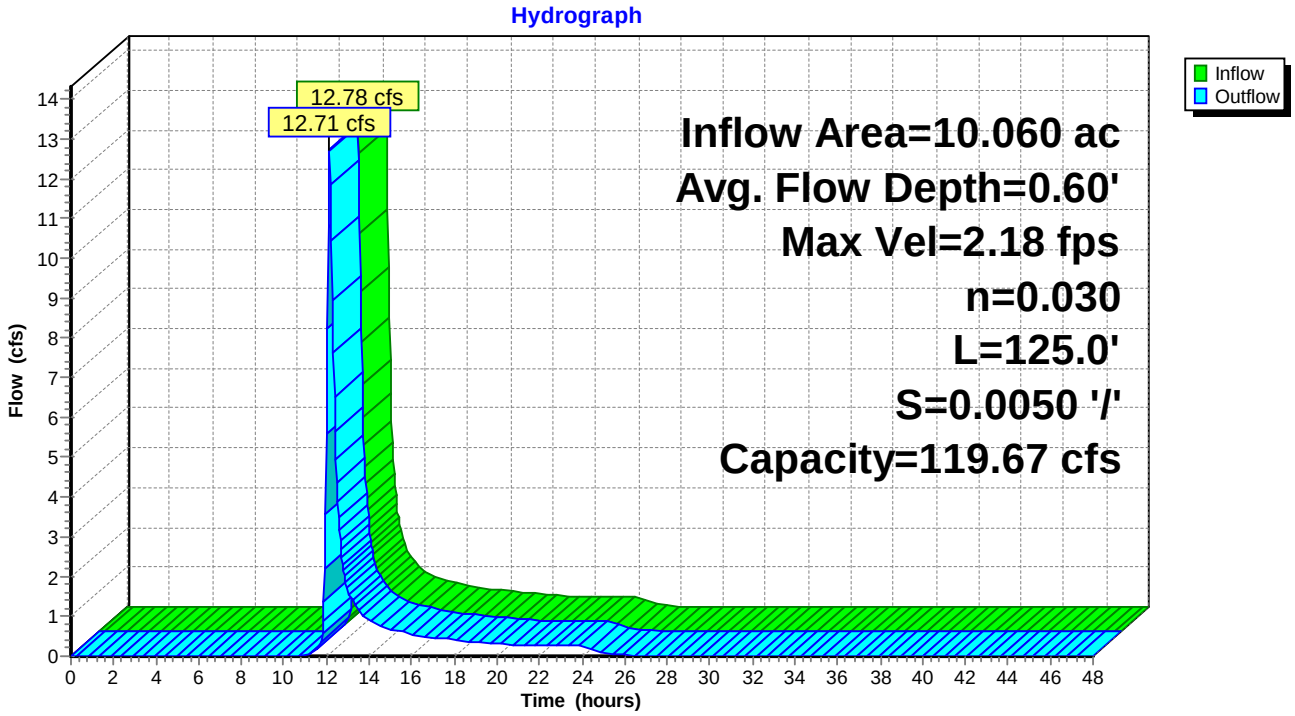
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.18 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 4.0 min

Peak Storage= 728 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 119.67 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 436.62', Outlet Invert= 436.00'

‡

Reach 33R: PD-7



Summary for Pond 3P: DA-1

Inflow Area = 5.480 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 8.20 cfs @ 12.07 hrs, Volume= 0.522 af
Outflow = 0.01 cfs @ 24.93 hrs, Volume= 0.025 af, Atten= 100%, Lag= 771.7 min
Primary = 0.01 cfs @ 24.93 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 454.89' @ 24.93 hrs Surf.Area= 0.598 ac Storage= 0.514 af

Plug-Flow detention time= 1,166.7 min calculated for 0.025 af (5% of inflow)
Center-of-Mass det. time= 1,004.0 min (1,866.0 - 862.0)

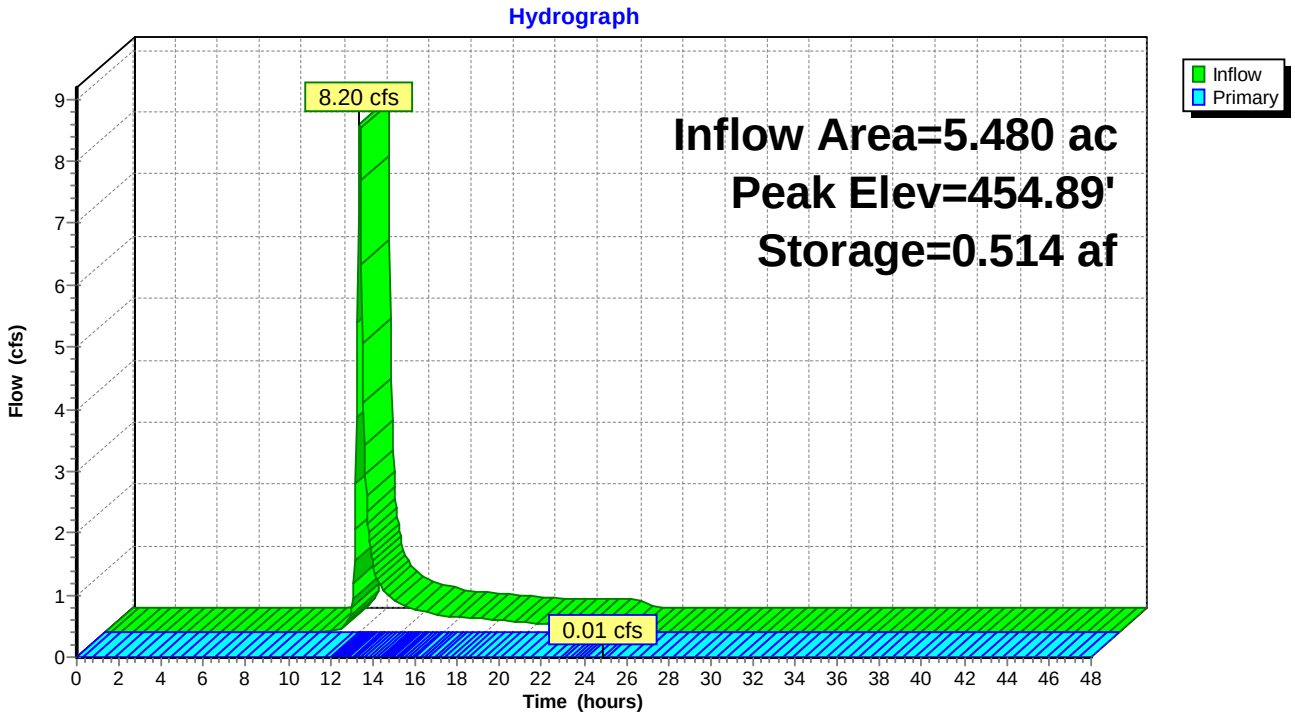
Volume	Invert	Avail.Storage	Storage Description
#1	454.00'	6.154 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
454.00	0.553	0.000	0.000
456.00	0.654	1.207	1.207
458.00	0.764	1.418	2.625
460.00	0.880	1.644	4.269
462.00	1.005	1.885	6.154

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.11'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.11'	**0.4" Vert. Orifice/Grate** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.11'	**12.0" Round Culvert** L= 111.0' Ke= 0.900 Inlet / Outlet Invert= 454.11' / 436.00' S= 0.1632 '/' Cc= 0.900 n= 0.030, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 24.93 hrs HW=454.89' (Free Discharge)
└**3=Culvert** (Passes 0.01 cfs of 1.57 cfs potential flow)
  └**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 2.70 fps)

Pond 3P: DA-1


Hydrograph
Inflow
Primary
8.20 cfs
0.01 cfs
Inflow Area=5.480 ac
Peak Elev=454.89'
Storage=0.514 af
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 7P: DA-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 11.01 cfs @ 12.08 hrs, Volume= 0.692 af
Outflow = 1.22 cfs @ 12.79 hrs, Volume= 0.690 af, Atten= 89%, Lag= 42.8 min
Primary = 1.22 cfs @ 12.79 hrs, Volume= 0.690 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.36' @ 12.79 hrs Surf.Area= 0.168 ac Storage= 0.298 af

Plug-Flow detention time= 194.5 min calculated for 0.689 af (100% of inflow)
Center-of-Mass det. time= 194.0 min (1,057.2 - 863.3)

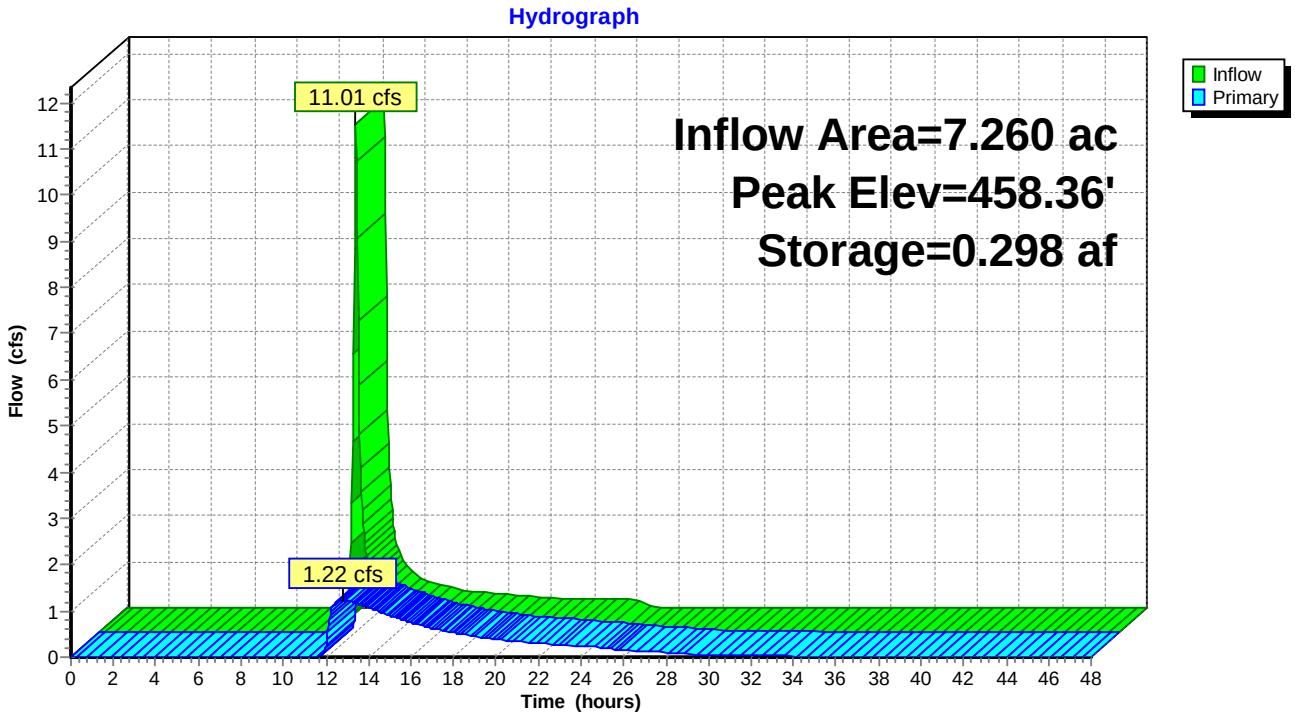
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.374 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.247	0.397	0.637
461.00	1.034	0.640	1.277
462.00	1.160	1.097	2.374

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 438.00' S= 0.1714 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.22 cfs @ 12.79 hrs HW=458.36' (Free Discharge)
└**3=Culvert** (Passes 1.22 cfs of 4.08 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 1.22 cfs @ 5.01 fps)

Pond 7P: DA-2


Hydrograph
11.01 cfs
1.22 cfs
Inflow Area=7.260 ac
Peak Elev=458.36'
Storage=0.298 af
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 11P: DA-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 8.24 cfs @ 12.11 hrs, Volume= 0.836 af
Outflow = 1.46 cfs @ 13.14 hrs, Volume= 0.835 af, Atten= 82%, Lag= 61.3 min
Primary = 1.46 cfs @ 13.14 hrs, Volume= 0.835 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.67' @ 13.14 hrs Surf.Area= 0.184 ac Storage= 0.352 af

Plug-Flow detention time= 191.2 min calculated for 0.835 af (100% of inflow)
Center-of-Mass det. time= 189.9 min (1,064.1 - 874.2)

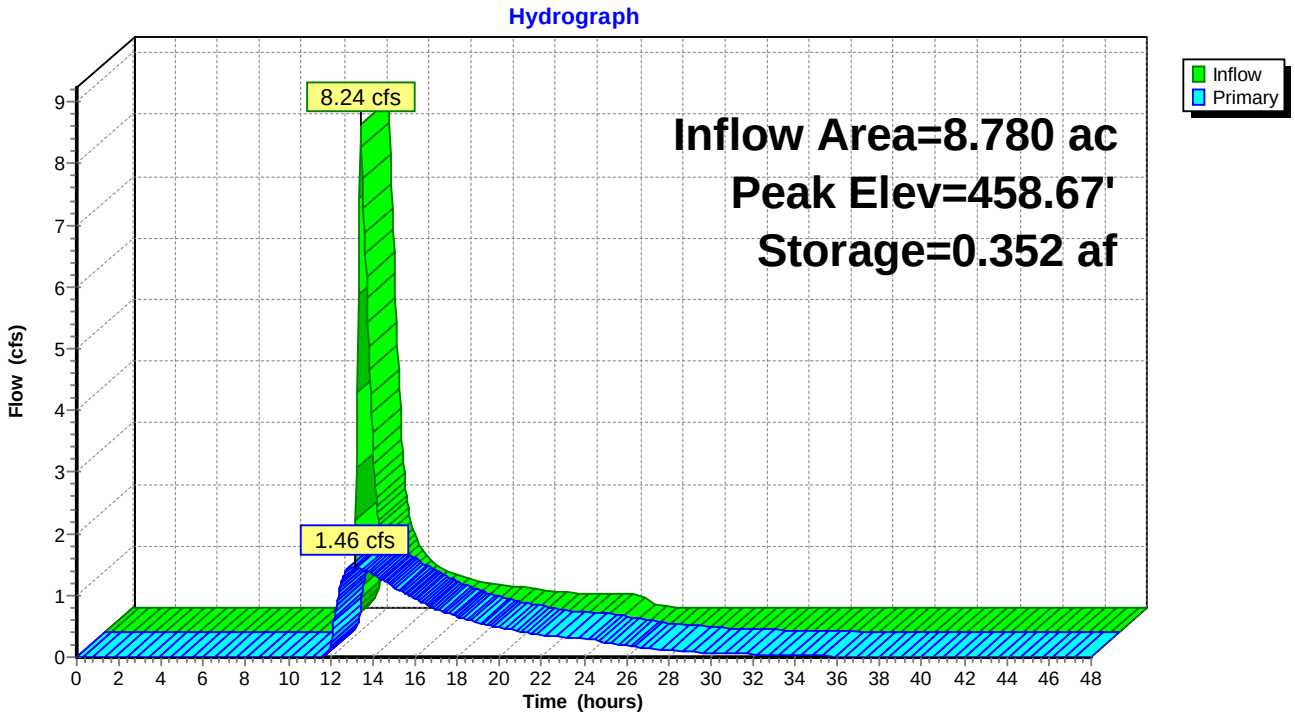
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.357 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.040	0.645	1.285
462.00	1.104	1.072	2.357

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 432.00' S= 0.2286 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.46 cfs @ 13.14 hrs HW=458.67' (Free Discharge)
└**3=Culvert** (Passes 1.46 cfs of 4.40 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 1.46 cfs @ 5.41 fps)

Pond 11P: DA-3


Hydrograph
Inflow
Primary
8.24 cfs
1.46 cfs
Inflow Area=8.780 ac
Peak Elev=458.67'
Storage=0.352 af
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 15P: DA-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 14.13 cfs @ 12.08 hrs, Volume= 0.919 af
Outflow = 1.63 cfs @ 12.83 hrs, Volume= 0.918 af, Atten= 88%, Lag= 44.5 min
Primary = 1.63 cfs @ 12.83 hrs, Volume= 0.918 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.88' @ 12.83 hrs Surf.Area= 0.194 ac Storage= 0.392 af

Plug-Flow detention time= 189.4 min calculated for 0.918 af (100% of inflow)
Center-of-Mass det. time= 188.2 min (1,054.0 - 865.8)

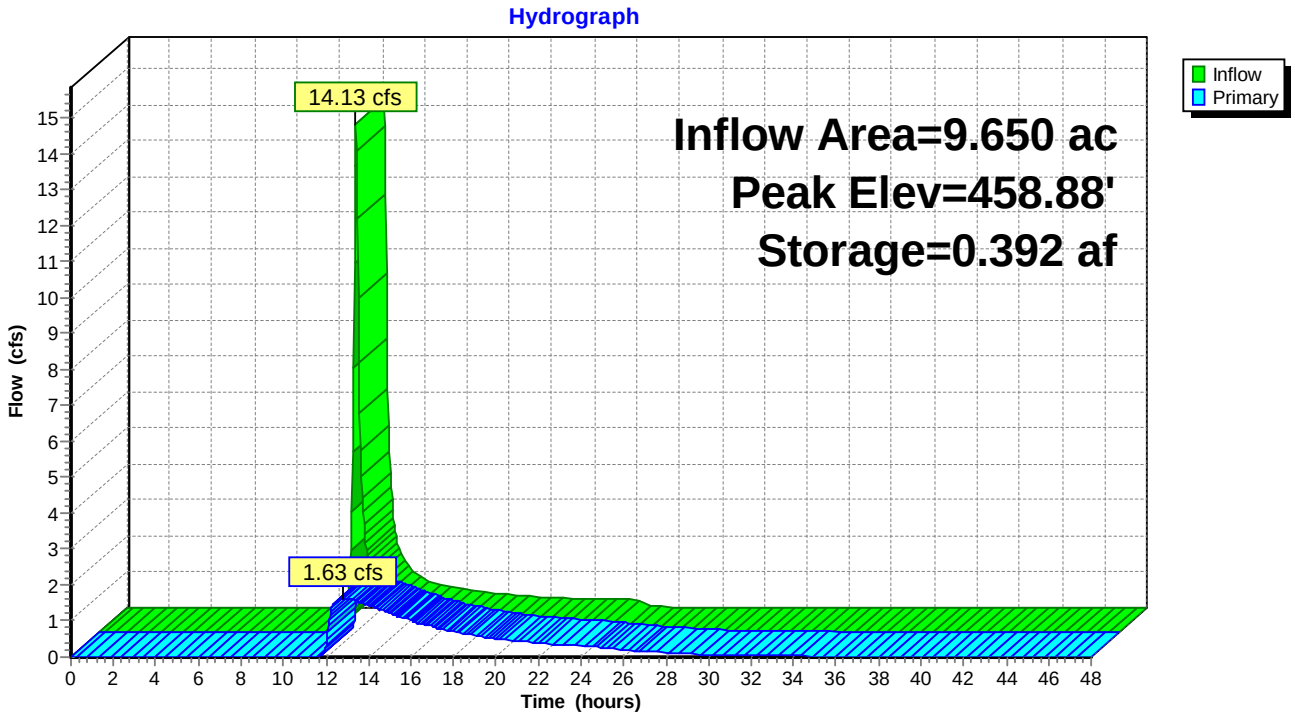
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.418 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.103	0.676	1.317
462.00	1.100	1.101	2.418

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 104.5' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 440.00' S= 0.1531 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.63 cfs @ 12.83 hrs HW=458.88' (Free Discharge)
└**3=Culvert** (Passes 1.63 cfs of 4.61 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 1.63 cfs @ 5.54 fps)

Pond 15P: DA-4


Hydrograph
Inflow
Primary
14.13 cfs
1.63 cfs
Inflow Area=9.650 ac
Peak Elev=458.88'
Storage=0.392 af
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 19P: DA-5

Inflow Area = 40.520 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 45.11 cfs @ 12.13 hrs, Volume= 3.860 af
Outflow = 0.54 cfs @ 24.47 hrs, Volume= 1.308 af, Atten= 99%, Lag= 740.5 min
Primary = 0.54 cfs @ 24.47 hrs, Volume= 1.308 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 434.00' Surf.Area= 2.510 ac Storage= 2.640 af
Peak Elev= 435.32' @ 24.47 hrs Surf.Area= 2.635 ac Storage= 6.029 af (3.389 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 919.5 min (1,793.6 - 874.1)

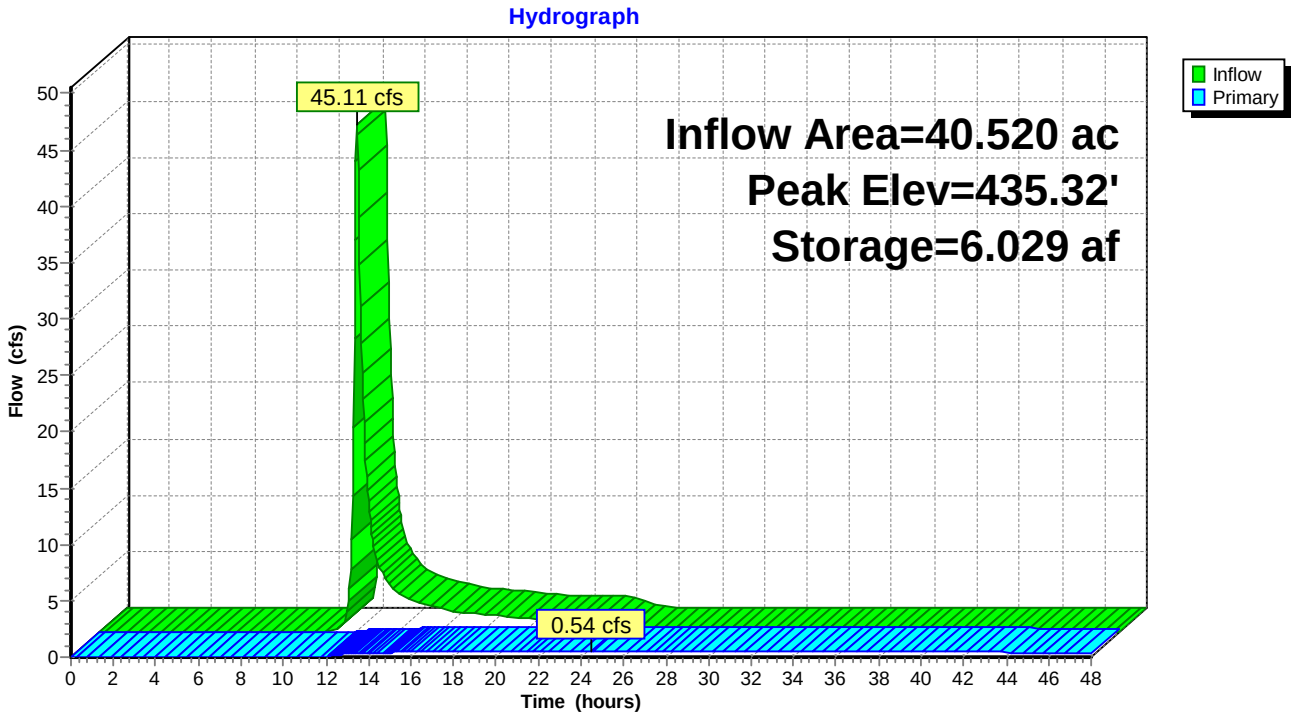
Volume	Invert	Avail.Storage	Storage Description
#1	432.00'	13.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
432.00	0.130	0.000	0.000
434.00	2.510	2.640	2.640
436.00	2.700	5.210	7.850
438.00	2.900	5.600	13.450

Device	Routing	Invert	Outlet Devices
#1	Device 3	437.00'	**36.0" Horiz. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Device 3	434.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	434.00'	**12.0" Round Culvert** L= 147.0' Ke= 0.900 Inlet / Outlet Invert= 434.00' / 433.26' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 24.47 hrs HW=435.32' (Free Discharge)
└**3=Culvert** (Passes 0.54 cfs of 1.56 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 0.54 cfs @ 3.67 fps)

Pond 19P: DA-5


Hydrograph
45.11 cfs
0.54 cfs
Inflow Area=40.520 ac
Peak Elev=435.32'
Storage=6.029 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
5
10
15
20
25
30
35
40
45
50
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 28P: DA-6

Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 3.53 cfs @ 12.06 hrs, Volume= 0.259 af
Outflow = 0.13 cfs @ 16.36 hrs, Volume= 0.163 af, Atten= 96%, Lag= 258.0 min
Primary = 0.13 cfs @ 16.36 hrs, Volume= 0.163 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 453.39' Surf.Area= 0.137 ac Storage= 0.324 af
Peak Elev= 454.47' @ 16.36 hrs Surf.Area= 0.166 ac Storage= 0.487 af (0.163 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 438.2 min (1,307.4 - 869.2)

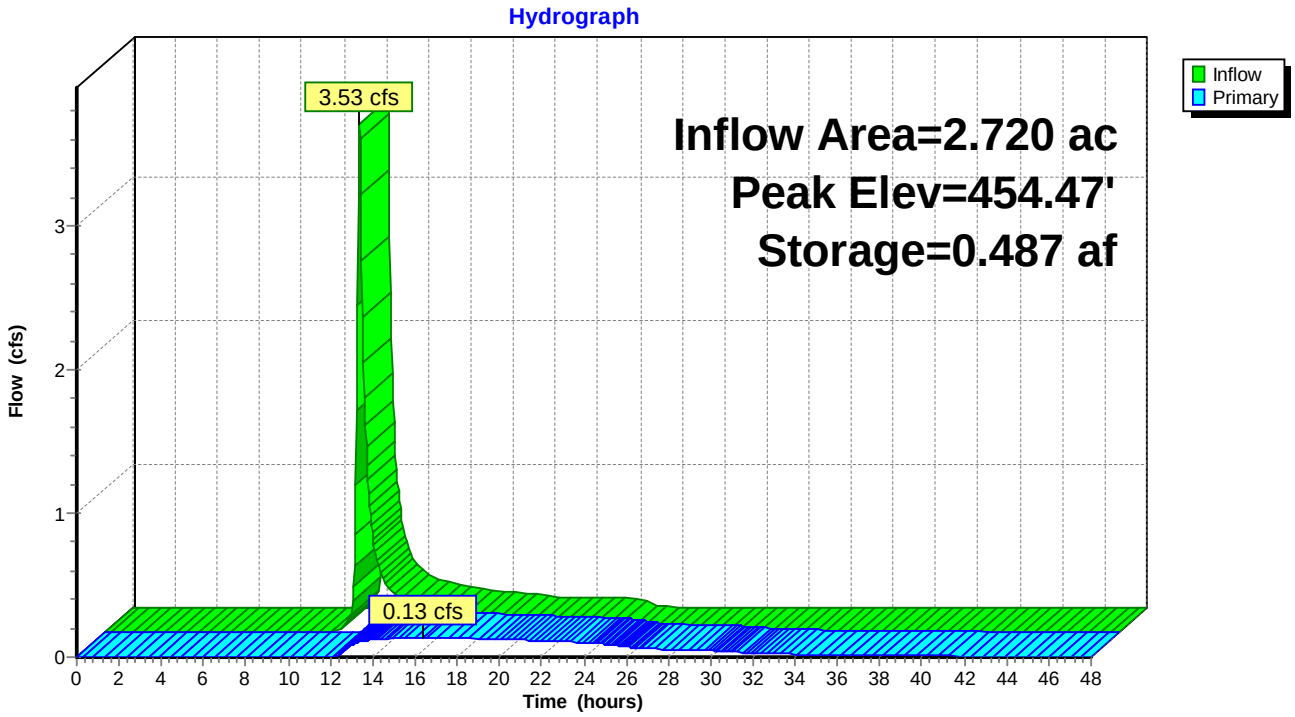
Volume	Invert	Avail.Storage	Storage Description
#1	450.00'	1.895 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
450.00	0.057	0.000	0.000
452.00	0.101	0.158	0.158
454.00	0.153	0.254	0.412
456.00	0.210	0.363	0.775
458.00	0.280	0.490	1.265
460.00	0.350	0.630	1.895

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.00'	**12.0" Round Culvert** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 454.00' / 453.50' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 16.36 hrs HW=454.47' (Free Discharge)
└**3=Culvert** (Passes 0.13 cfs of 0.36 cfs potential flow)
  ├**1=Orifice/Grate** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 2.70 fps)

Pond 28P: DA-6


Hydrograph
Inflow
Primary
3.53 cfs
0.13 cfs
Inflow Area=2.720 ac
Peak Elev=454.47'
Storage=0.487 af
Flow (cfs)
0
1
2
3
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Appendix E

Slope Stability Calculations

Millennia Professional Services, Ltd

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Geotechnical Report

Slope Stability and Related Considerations
Coal Combustion Residual Storage Pond Closure
Edwards Power Station
Bartonville, Illinois

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Millennia Project Number MG21023
March 31, 2022

Contents

1.0 PROJECT DESCRIPTION 3
1.1 Introduction 3
1.2 Project Description 3
1.3 Purpose and Scope 4

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING 5
2.1 Previous Studies 5
2.2 Data 5

3.0 SUBSURFACE CONDITIONS 6
3.1 Geotechnical Soil Parameters 6
3.2 Groundwater 6

4.0 GEOTECHNICAL RECOMMENDATIONS 7
4.1 Global Stability Assessment 7

5.0 CONSTRUCTION CONSIDERATIONS 9
5.1 Excavations 9
5.2 Subgrade Preparation 9
5.3 Subgrade Protection 9
5.4 Fill Material 10
5.5 Fill Placement 10
5.6 Groundwater Considerations 10
5.7 Soft Subgrade 11
5.8 Soil Sensitivity 11

6.0 CONSTRUCTION PHASE SERVICES 12

7.0 CLOSING 13

Appendix A - Cross Section Location Plan
Appendix B - Global Stability Models

Geotechnical Report
Coal Combustion Residual Storage Pond Closure
Edwards Power Station
Bartonville, Illinois

1.0 Project Description

1.1 Introduction

Millennia Professional Services (Millennia) is pleased to submit this geotechnical report to IngenAE, performed for the design and construction of the coal combustion residual storage pond closure project at the Edwards Power Station in Bartonville, Illinois. The purpose of this study was to provide a geotechnical assessment, based on subsurface conditions encountered at the boring locations performed by Millennia. This report describes the exploration procedures used (by others), presents the field and laboratory data (by others), and includes an assessment of the subsurface conditions in the area. The work was performed in general accordance with the proposal for the project, dated June 9, 2021.

1.2 Project Description

The Edwards Power Station is located on the west bank of the Illinois River, northeast of the intersection of Illinois Routes 24 and 9. The plant began operating around 1960. The plant is scheduled to shut down operations in December, 2022.

Fly ash and bottom ash have been placed by sluice into a storage pond situated west and south of the plant. The pond includes an area of about 102 acres. At this time, it is anticipated that the pond will be closed in-place, which is expected to involve dewatering and re-grading the ash within the existing pond limits, as appropriate, installing a cover system and establishing vegetation, and performing related site restoration activities.

The elevation of the natural floodplain south and west of the pond is approximately 440 feet, while the top of the perimeter pond embankment is approximately 464, suggesting a typical embankment height of 24 feet. The crest width varies, but is wide enough to accommodate a railway loop that was constructed in 2004 to expedite coal delivery and unloading.

Based on information provided by IngenAE, the interior ash pond slopes will be temporarily re-graded at inclinations of approximately 2H:1V once removal and replacement of the existing ash has been completed. The exterior slopes will generally remain unchanged. The ash will be reconsolidated throughout the footprint of the existing ash pond, with areas regraded to included additional amounts of ash placed near the southern half of the enclosure. Current preliminary grading plans indicate the northwestern portion of the ash pond enclosure remaining open after removal of the existing ash. This area will be backfilled with a soil to a minimum elevation of 432 feet, and a portion of this area will act as additional stormwater storage to approximately Elevation 437.5.

The grading plans also include a proposed berm to be placed within the northwestern portion of the interior of the enclosure. Existing transmission line foundation elements shall remain in

place within this area. The foundation as-built documentation was not available for review. Details of the berm construction and grading may require revision upon review of the as-built documentation.

The approximate locations of the cross sectional areas used for this study are presented in Appendix A.

1.3 Purpose and Scope

The purpose of Millennia's services is to assist IngenAE with the geotechnical aspects of the project. This primarily involves assessing the stability of the permanent slopes, along with the stability of selected slopes during temporary or interim conditions during the closure period. Because the project will involve dewatering the pond to some degree, the potential effects of the dewatering on slope stability also requires consideration. In addition, slope stability assessments of this type usually consider short term and long term, seismic effects, and in some situations, rapid drawdown effects.

It is our understanding that dewatering of the pond will be accomplished primarily by gravity drainage.

2.0 Subsurface Exploration and Laboratory Testing

2.1 Previous Studies

The geotechnical assessment and recommendations summarized in this report are based on the soil borings and laboratory test results that were performed by others at the Edwards Power Station Ash Pond. Specifically, this report references the data presented in the geotechnical report performed by AECOM and dated, October 7, 2016. The same cross sectional areas presented within the report have been reanalyzed for the regrading and closure of the ash pond.

2.2 Data

Neither the soil borings nor the laboratory testing prepared for the previous geotechnical investigations were performed by Millennia. The soil and rock samples are no longer available for viewing or further testing, and Millennia is unable to physically verify the classifications and other test results. However, the work was done by established, experienced geotechnical firms, and the content of the reports appear to be reliable for use in preparing this report.

Typically, the results of the field tests and measurements were recorded on field logs and appropriate data sheets in the field. These data sheets and logs contain information concerning the drilling methods, samples attempted and recovered, indications of the presence of various subsurface materials, and the observation of groundwater. The field logs and data sheets contain the engineer's interpretations of the conditions between samples, based on the performance of the equipment and cuttings brought to the surface by the drilling tools.
Data and observations from laboratory tests were recorded on laboratory data sheets during the course of the testing program.

3.0 Subsurface Conditions

3.1 Geotechnical Soil Parameters

Millennia reviewed the laboratory test results and parameters presented within Appendix F of the 2016 geotechnical report performed by AECOM. The parameters appear to be reliable for use in the global stability analyses presented within this report submittal.

A summary of the soil and bedrock parameters use in the stability analyses are as follows:

Table 1: Summary of Global Stability Soil Parameters

Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2,500	0
Old Embankment 1	125	125	200	28	2,500	0
Old Embankment 2	125	125	100	29	1,250	0
Native Clay Crust	120	120	200	27.5	1,250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	125	200	28	1,000	0
Recent Fill	115	115	200	30	1,250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1,000	36	1,000	36

Consistent with current practices within the profession, Millennia used reduced shear strength values (approximately 2/3 of the total undrained shear strength), as well as conservative estimated friction angle values for the rapid drawdown condition.

3.2 Groundwater

Groundwater assumptions were based on information provided within the AECOM geotechnical report, as well as information provided by IngenAE. The base flood elevation for the project area is generally Elevation 457.5 according to the Floodplain Compliance document prepared by Burns & McDonnell in 2021.

4.0 Geotechnical Recommendations

4.1 Global Stability Assessment

As previously mentioned, the engineering properties of the soil used in the stability assessment are based on the results of the field and laboratory tests performed by others on the materials that comprise the embankment and subgrade. The groundwater level was conservatively positioned for the computer models to generally match those assumed for the previous study. Seismic influences were assessed using psuedo-static forces, with the horizontal acceleration conservatively selected as being equal to the PGA available through the IBC ASCE/SEI 7-22 hazards report.

Based on cross section drawings provided by IngenAE, Millennia selected eight sections to perform detailed slope stability assessments. The slope stability assessments were performed at the areas near cross sections B-B through I-I. The locations were selected based upon slope height, inclination, and the general proposed grading for the specific cross section. As stated previously, the interior slopes will be temporarily re-graded to 2H:1V inclinations and the exterior slopes will remain essentially unchanged.

The parameters used for the stability assessments were based on the results of the field and laboratory investigations, along with Millennia's experience in the area, and are shown on the Summary Stability Profiles provided in Appendix B.

The global stability assessments were conducted for short term (undrained, or total stress) for temporary construction for the interior slope conditions, as well as the exterior existing slope, long term (drained, or effective stress), seismic, and rapid drawdown scenarios using the program SLOPE/W. The results are summarized in the following table:

Table 2:
Summary of Global Stability Results

Analysis Location Section	Minimum Computed Factor of Safety				
	Short Term (Temporary Construction)	Short Term (Exterior Slope)	Long-Term	Seismic	Rapid Drawdown
Cross Section B-B	1.97	2.74	1.96	1.76	1.76
Cross Section C-C – Storage Pond	1.49	2.07	2.25	1.47	1.47
Cross Section D-D	1.37	1.62	1.80	1.17	1.11
Cross Section E-E	1.35	1.96	1.59	1.50	1.23
Cross Section F-F	1.94	3.68	3.10	2.38	2.38
Cross Section G-G	1.49	2.33	2.17	1.59	1.26
Cross Section H-H	1.31	1.60	2.07	1.09	1.17
Cross Section I-I	1.68	2.10	2.29	1.34	1.38

N/A = not applicable for this scenario

The minimum desired safety factor with regard to the potential for massive, global slope failure is 1.3 for short-term (undrained or temporary construction) conditions and 1.5 for long-term (drained) conditions. For the seismic condition, a factor of safety 1.0 or greater is desired. For the rapid drawdown condition, a factor of safety 1.1 or greater is desired.

On this basis, the results of the stability assessments at the eight sections summarized above are considered acceptable for all scenarios.

Soil types such as those found within the existing embankments are highly erosive, a mechanism of soil movement unrelated to global stability. Future erosion and shallow, superficial slumps are always a possibility, despite the results of advanced computer modeling for slope stability. Maintaining healthy vegetation, along with appropriate erosion control practices, will reduce the potential for these issues to become problematic.

In addition, the geotechnical conditions between the boring locations are essentially unknown. If the contractor exposes conditions during excavation and other earthwork activities that differ from those indicated at the boring locations, Millennia should be notified to assess the effect (if any) of the unanticipated conditions upon the findings of the global slope stability assessment. This recommendation is of particular importance regarding the amounts of existing fly ash materials anticipated to be removed. Undetected zones of unsuitable materials placed during prior site development or other human activity, such as buried wood or other debris, could also result in risks to slope stability considerations.

As mentioned previously, an interior berm is proposed for near the northwestern portion of the project, separating the planned stormwater storage and re-graded fly ash areas. Existing transmission line foundation elements are located within the planned footprint of the berm. Details such as the composition of the foundations were not provided for review. As such, Millennia will evaluate the global stability of the interior berm once that information becomes available.

In addition, a sheet pile wall is present along an existing section outside the perimeter embankment on the east side of the pond. At this time, details regarding the structural design and construction of the wall are not available. Slope stability at the sheet pile wall shalle be assessed after the disposition of the wall becomes available.

5.0 Construction Considerations

5.1 Excavations

Trenching, excavating, and bracing should be performed in accordance with Occupational Safety and Health Administration (OSHA) regulations, and other applicable regulatory agencies. In accordance with the OSHA excavation standards, the soil at the site is considered to be Type C, which requires a side slope for excavations no steeper than 1.5H:1.0V. However, worker safety and classification of the excavation soil is the responsibility of the contractor. According to OSHA requirements, any excavation extending to a depth of more than 20 feet must be designed by a registered professional engineer. Where the excavation lies within the zone of influence of existing pavements, buildings, utilities, or other structures, the integrity of those elements should be maintained by a properly designed earth retention system, underpinning, or other suitable means.

Portions of the excavations may be constructed within a few feet horizontally of existing utilities. Some of these utilities are likely backfilled with granular material. The granular backfill may contain free water and could be unstable when excavating beneath or adjacent to it. The undermining of these utilities and the adjacent area could occur due to running and caving of the granular backfill and surrounding soils. Temporary support of any utilities, if present, that cross over or lie adjacent to the excavations will likely be required.

Adequate benching along the slopes to allow for construction equipment and production should be utilized and follow OSHA standards. Heavy machinery, equipment, and tooling should not be stored on the construction benches for extended periods of time. The benches should be constructed with positive drainage in a way to eliminate ponding or standing water while in use. The benches should be backfilled and dressed as the construction advances to eliminate the potential for saturating the slopes.

5.2 Subgrade Preparation

Where further excavation is not planned, the exposed subgrade should be proof-rolled, which is accomplished by passing over the subgrade with a loaded tandem axle dump truck and observing the subgrade for pockets of excessively soft, wet, disturbed, or otherwise unsuitable soils. Any unacceptable materials thus found should be excavated and either recompacted or replaced with new fill.

Generally, prior to placing fill, pavement materials, or structural elements in any area, the subgrade should be scarified to a depth of about six inches, the moisture content of the soil adjusted to near its optimum moisture content, and the subgrade recompacted in accordance with recommendations made in subsequent sections of this report. This recommended proof-rolling and recompaction of the subgrade may be waived by Millennia if it is determined based on field observations that it is unnecessary or could be detrimental to the existing subgrade condition.

5.3 Subgrade Protection

Construction areas should be properly drained in order to reduce or prevent surface runoff from collecting on the subgrade. Any ponded water on the exposed subgrade should be removed

immediately. To prevent unnecessary disturbance of the subgrade soils, trucks and other heavy construction vehicles should be restricted from traveling through the finished subgrade area. If disturbed areas develop, they should be reworked and compacted as previously described.

5.4 Fill Material

The required site and structural fill and backfill may be constructed using the natural lean clay materials available from on-site excavations. Fill material from off-site borrow sources may also be used, but should be approved by a registered professional engineer prior to placement. In general, structural fill should consist of low plasticity lean clays or clayey silts with a liquid limit of less than 50 and a plasticity index of less than 25.

At the time of construction, the moisture content of the fill materials may be variable, and may not be within the range considered necessary for proper placement and compaction. Prior to compaction, some of the soil may require moisture content adjustment. During warm weather, moisture reduction can generally be accomplished by disking, or otherwise aerating, the soil.

If earthwork is performed during a period of dry weather, some of the fill may require the addition of moisture prior to compaction. This should be performed in a controlled manner using a tank truck with a spray bar, and the moistened soil should be thoroughly blended with a disk to produce a uniform moisture content. Repeated passages of the equipment may be required to achieve a reasonably uniform moisture content.

5.5 Fill Placement

Fill for general site grading should be placed in layers not exceeding eight inches in loose thickness and compacted to the required dry density. Backfill compacted by handheld equipment should be placed in layers not greater than six inches. The layer thickness may be increased if tests indicate that compaction could be achieved uniformly throughout the layer using a greater thickness. At the time of compaction, fill should generally be within three percent, wet or dry, of the optimum moisture content of the material as determined by the standard Proctor compaction test, ASTM D 698. Fill should be compacted to a dry density of not less than 95 percent of the standard Proctor maximum dry density of the material.

Backfill placed next to walls or foundations should be compacted with hand-operated compaction equipment and not large self-propelled or machine-operated equipment. The operation of large pieces of equipment adjacent to these structures can result in overcompaction and higher lateral pressures than those recommended herein for design. Compaction should be reduced within approximately one foot of the wall. Structures should be observed periodically during backfilling for signs of movement. If movement is detected, it may be necessary to change backfilling procedures.

5.6 Groundwater Considerations

The potential for groundwater seepage will depend in-part upon the magnitude of cuts and fills required to develop the site, which will be governed by the eventual final grading plan. Groundwater seepage is anticipated to be significant during general site grading activities for the fly ash removal and regrading. Should groundwater seepage be encountered during excavation, groundwater may be handled by an excavation drainage system consisting of

drainage ditches, sumps, and pumps. In the absence of significant rainfall, saturated zones should drain over a period of days.

5.7 Soft Subgrade

Soft subgrade conditions should be anticipated within the ash pond once the ash has been removed and the natural soil subgrade is exposed. If during the course of construction, soft or disturbed soils are encountered, the recommendations in the following paragraph should be followed. Millennia recommends utilizing a performance specification for the initial lift of fill material placed on the exposed soil subgrade. A thicker lift of material may need to be placed to effectively “bridge” over any soft areas. The material should then be compacted by making several passes over the bridge lift until the areas appear to be stable. Millennia should be consulted if extensive areas of soft subgrade soils are encountered that prove difficult to compact and additional alternatives are required.

5.8 Soil Sensitivity

The silty soil and fly ash present at the site are considered potentially sensitive and susceptible to strength loss caused by excess moisture or disturbance by construction activity. Repetitious passage of equipment can result in rutting and “pumping” (deflection under passing load), even if the soil was properly compacted. Once disturbed, extensive effort is required to restore the integrity of the soils.

General site grading activities and excavations must be performed in a manner that limits disturbance to subgrade soils. The contractor should select earth moving equipment appropriately and should be prepared to adjust the type or usage of the equipment as necessary to minimize distress to the subgrade. It is sometimes necessary to remove topsoil or perform limited cuts using a trackhoe rather than a highlift, scrapers, or other equipment that might repeatedly pass directly over the subgrade.

6.0 Construction Phase Services

It is recommended that Millennia review the plans and specifications for the project prior to bid solicitation in order to determine the relationship of the geotechnical information presented in this report with the final grading design of the ash pond closure. This additional service is recommended in order to reduce construction phase problems that might otherwise arise in the field and result in construction delays or change orders.

7.0 Closing

This report has been prepared for the exclusive use of IngenAE for use in the design and construction for the Coal Combustion Residual Storage Pond Closure project at the Edwards Power Station in Bartonville, Illinois. This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made to the professional advice and recommendations included herein. This report is not for use by parties other than those named or for purposes other than those stated herein. It may not contain sufficient information for the use of other parties or for other purposes.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed by Millennia to determine the applicability of the analyses and recommendations considering the changed conditions and time lapse. The report should also be reviewed by Millennia if changes occur in structure location, size, and type, or in the planned loads, elevations, grading plans, and project concepts.

These analyses and recommendations are based on data obtained from site reconnaissance, the borings performed for this study and other pertinent information presented herein. This report does not reflect any variations between, beyond, or below the borings. Should such variations become evident, it may be necessary to re-evaluate the recommendations of this report after performing on-site observation during the construction period and noting the characteristics of any such variation.

We appreciate this opportunity to be of service to you and would be pleased to discuss any aspect of this report with you at your convenience.

Sincerely,

Millennia Professional Services, Ltd.

Jacob A. Schaeffer, P.E.
Project Manager

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Appendix A

Cross Section Location Plan

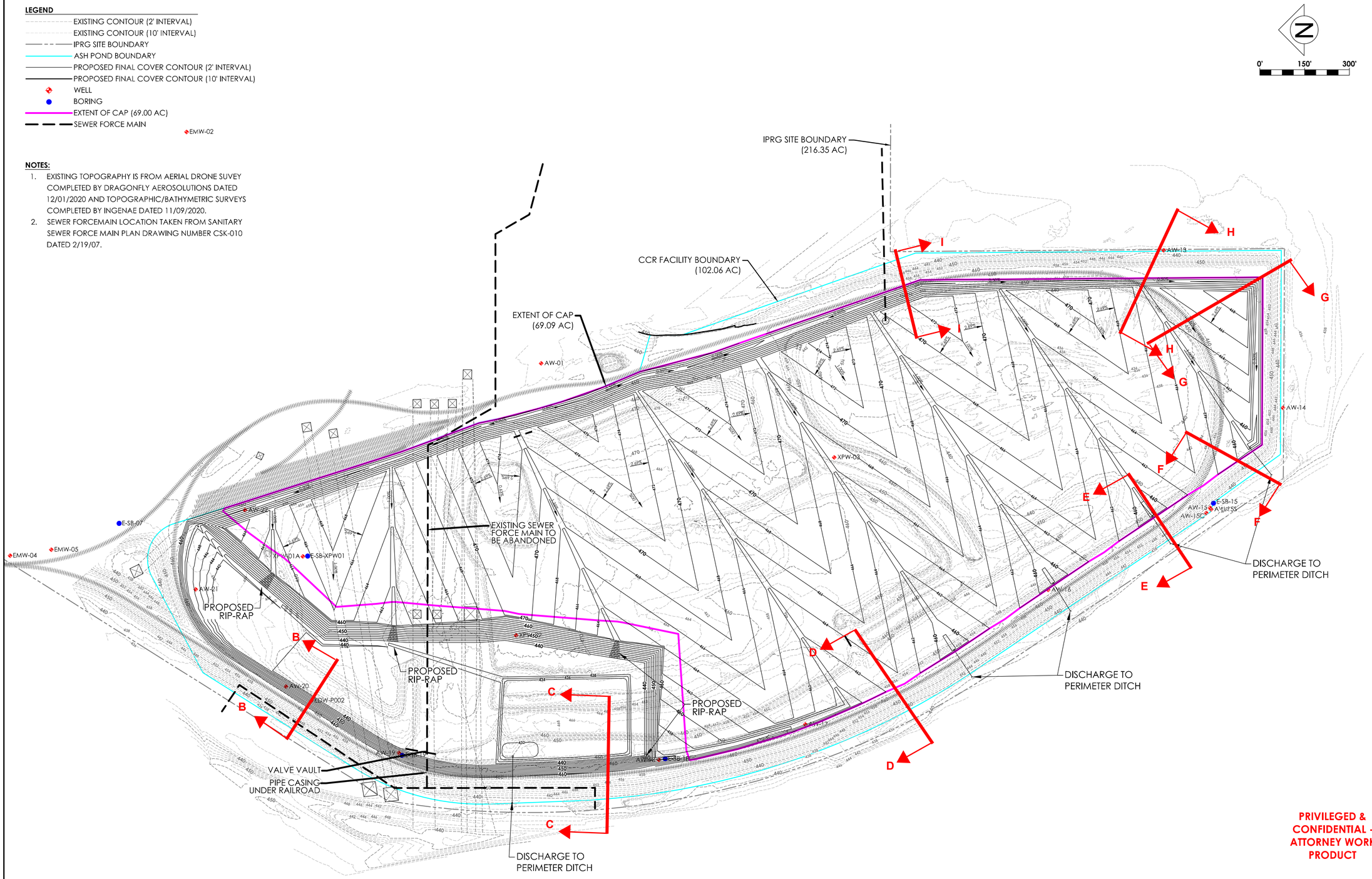
LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

EMW-02

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

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Drawing Name:

FINAL COVER & STORMWATER PLAN

Date:	Project No.
3/30/2022	
Type: PLAN	Drawing No. 6
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

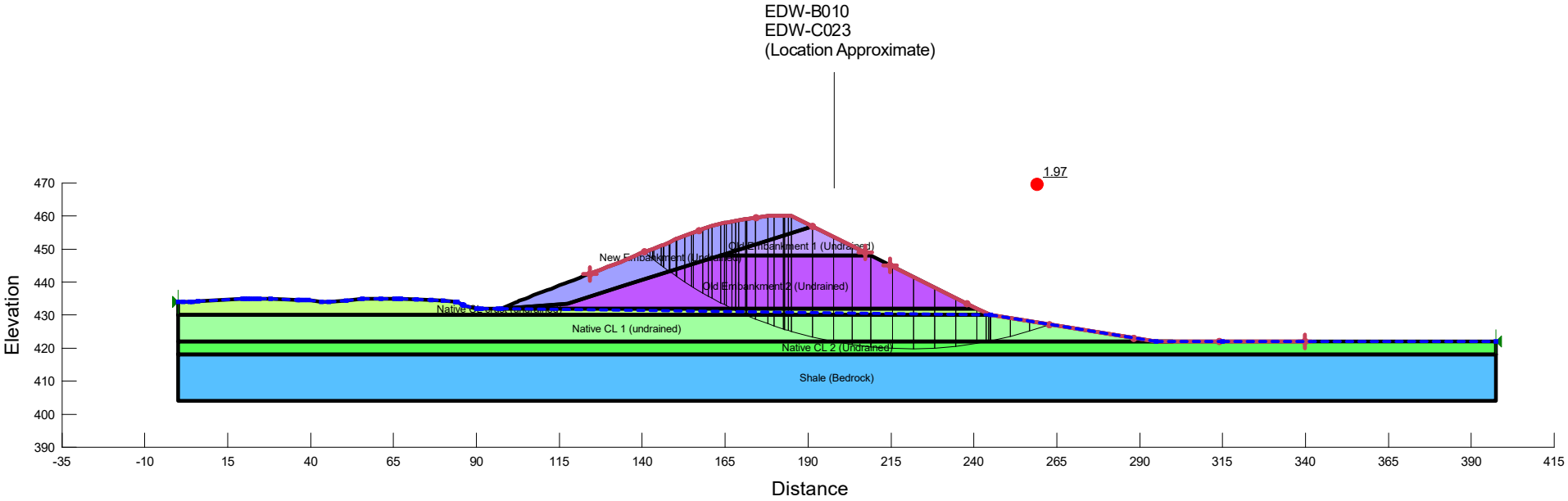
6439 Plymouth Avenue, Suite W-129, St. Louis, Missouri 63133 618-624-8610

Appendix B

Global Stability Models

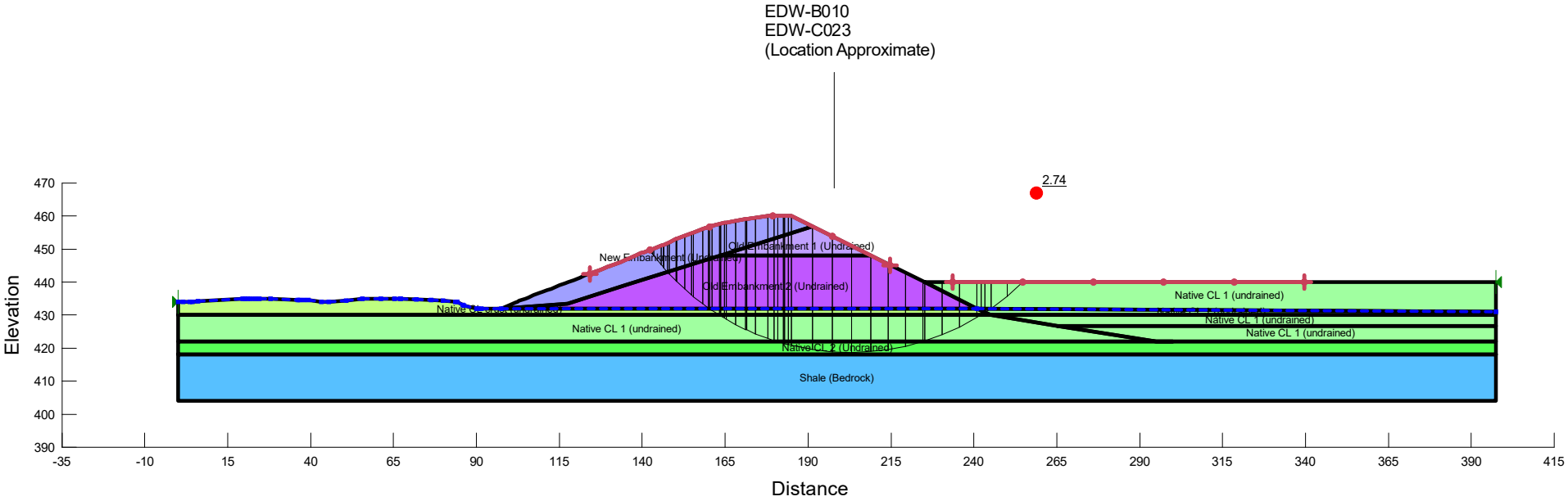
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B
Slope Stability - Temporary Construction



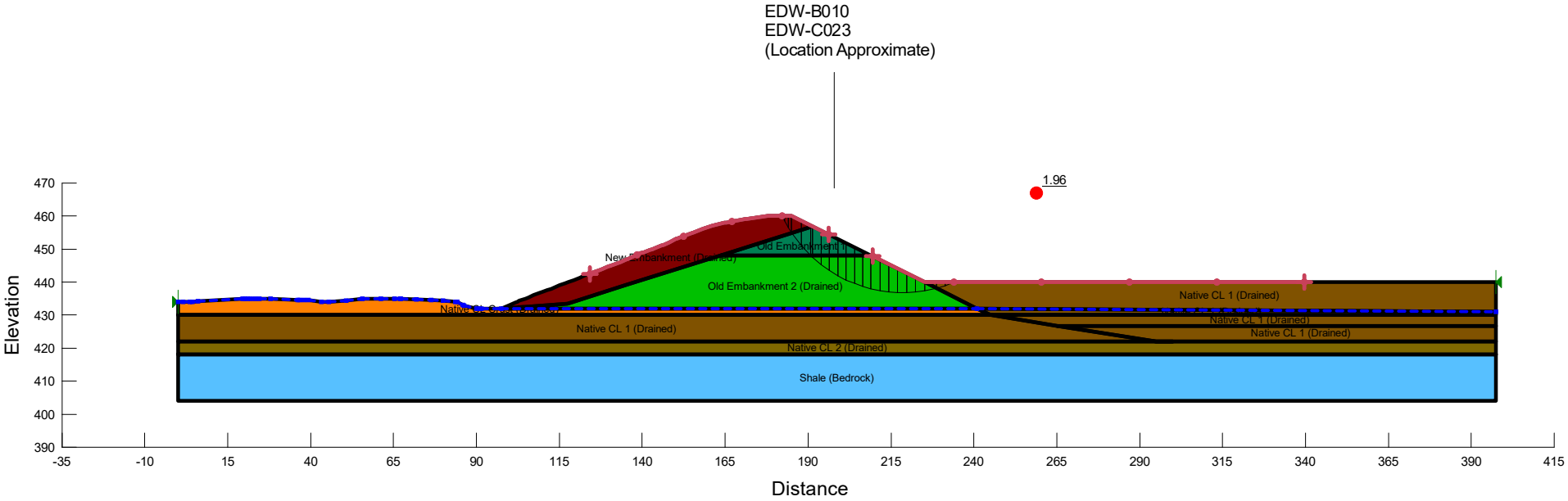
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Undrained



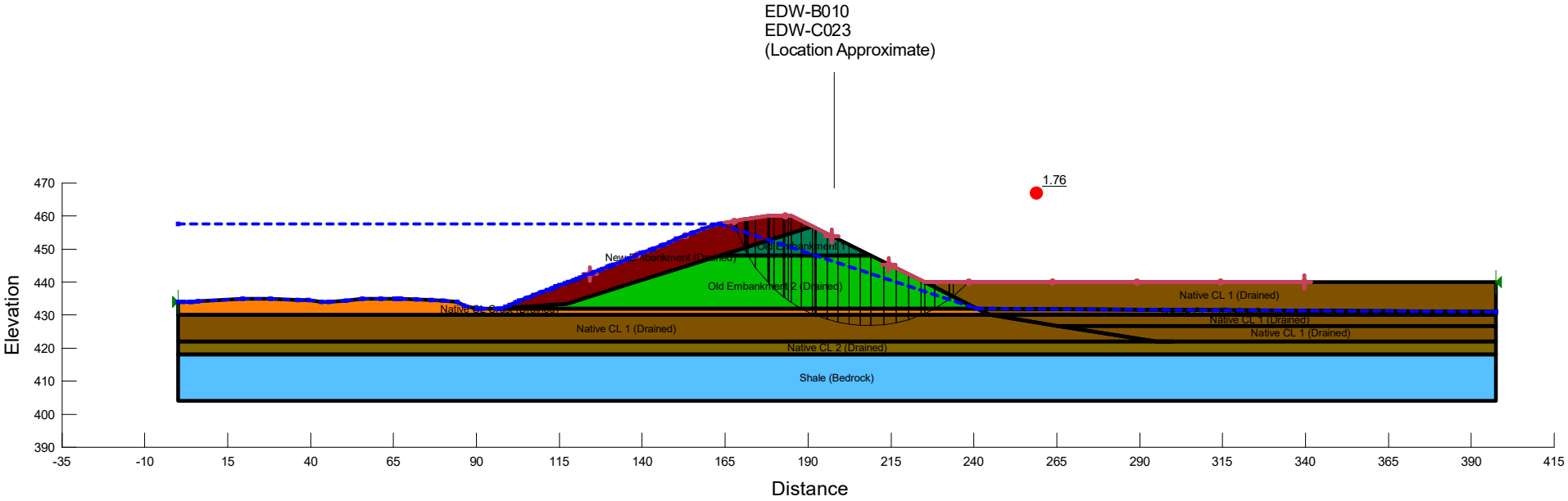
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Drained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	430	5	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section B
Slope Stability - Drawdown



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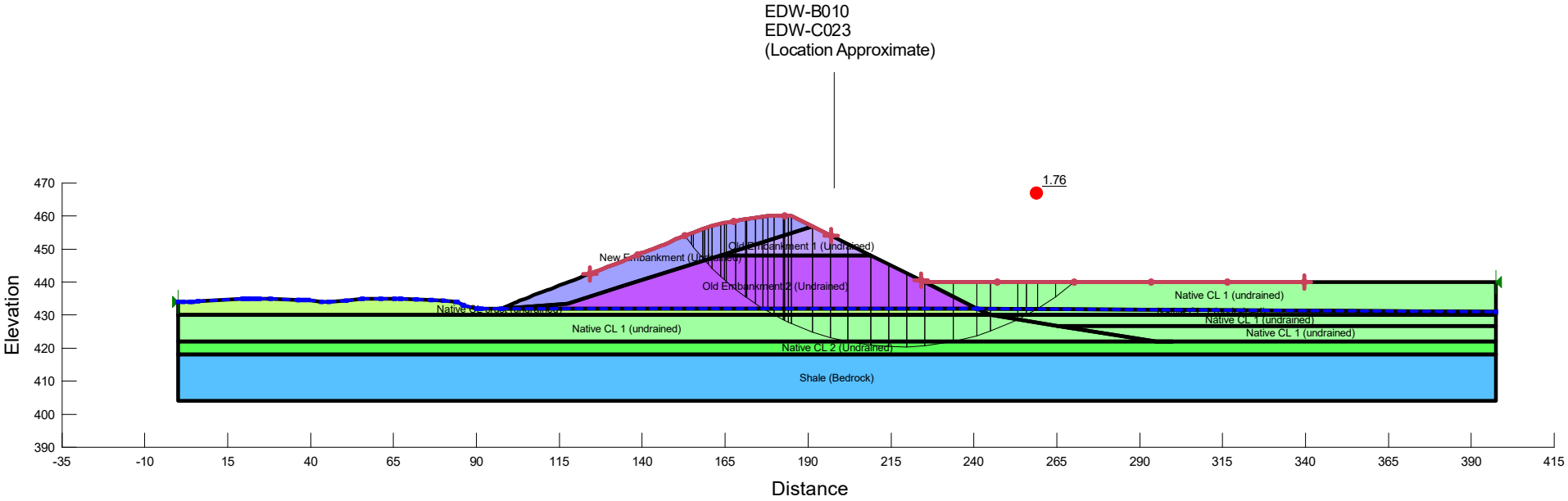
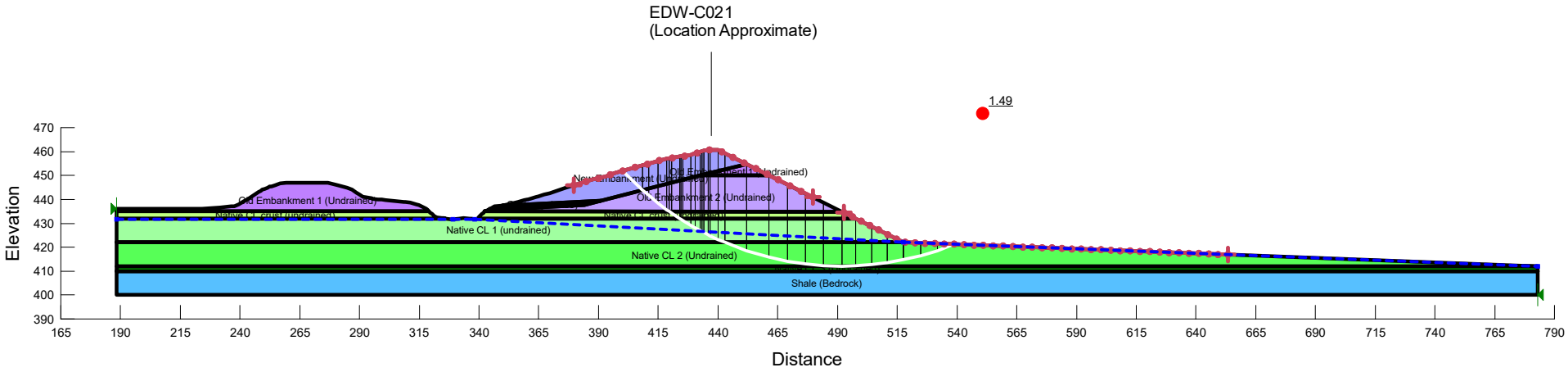
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Seismic - PGA = 0.1g



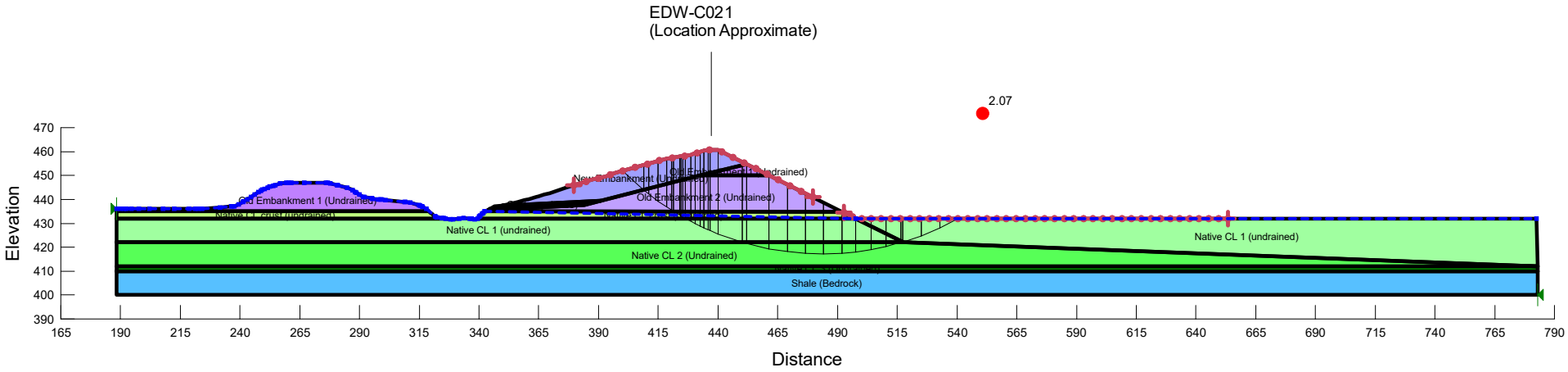
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Temporary Construction



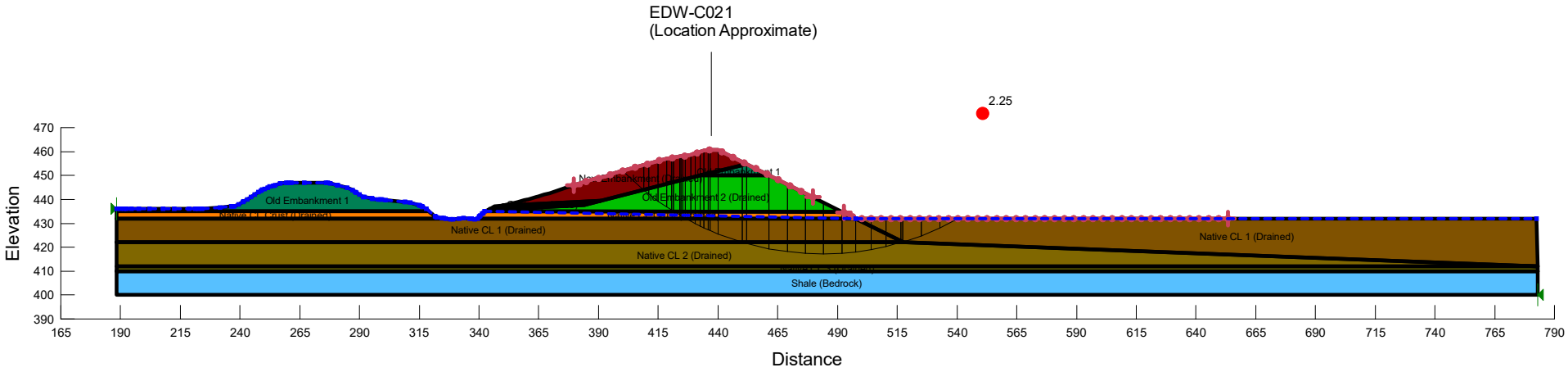
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Undrained



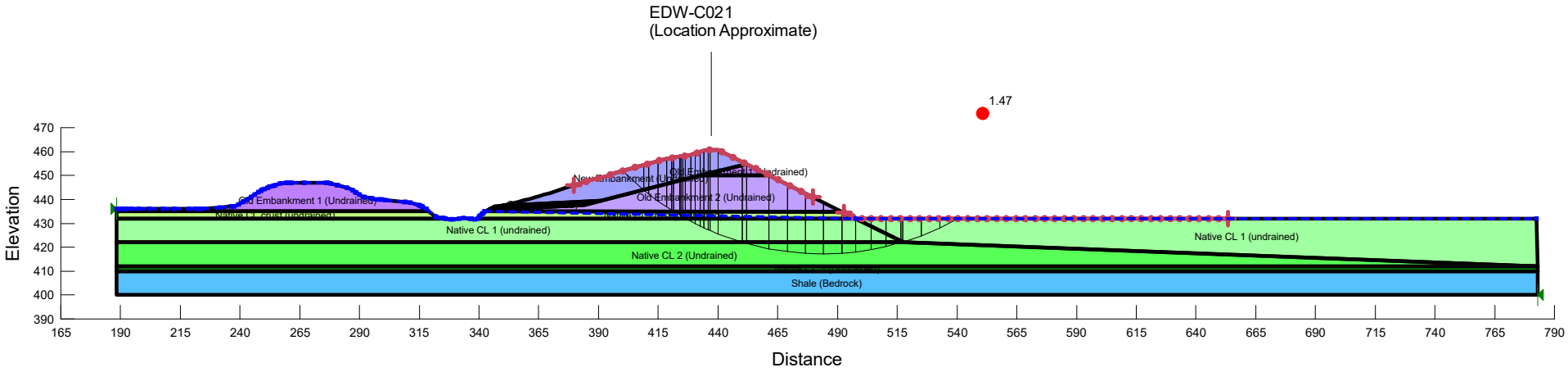
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Drained



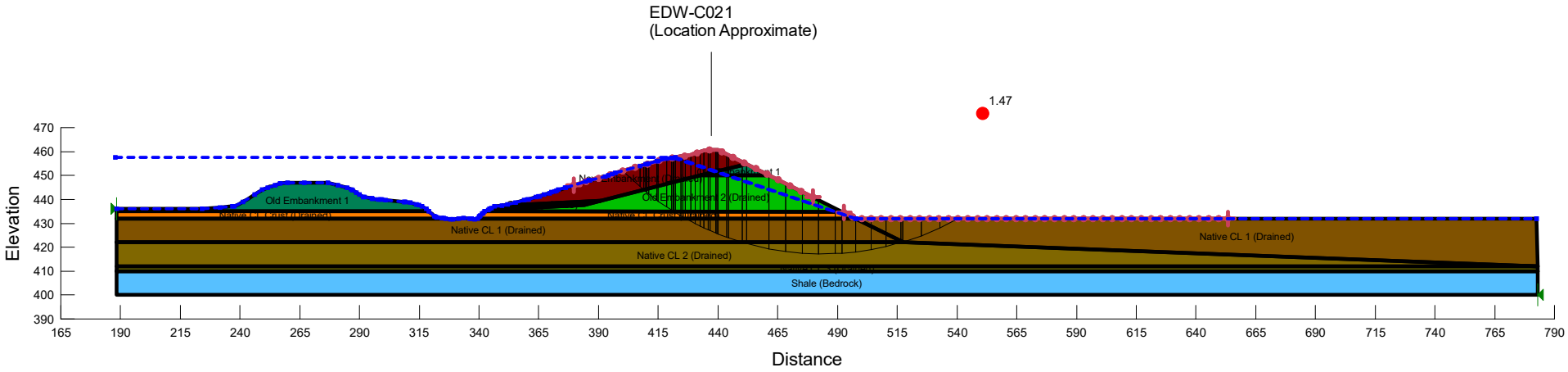
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Seismic - PGA = 0.1g



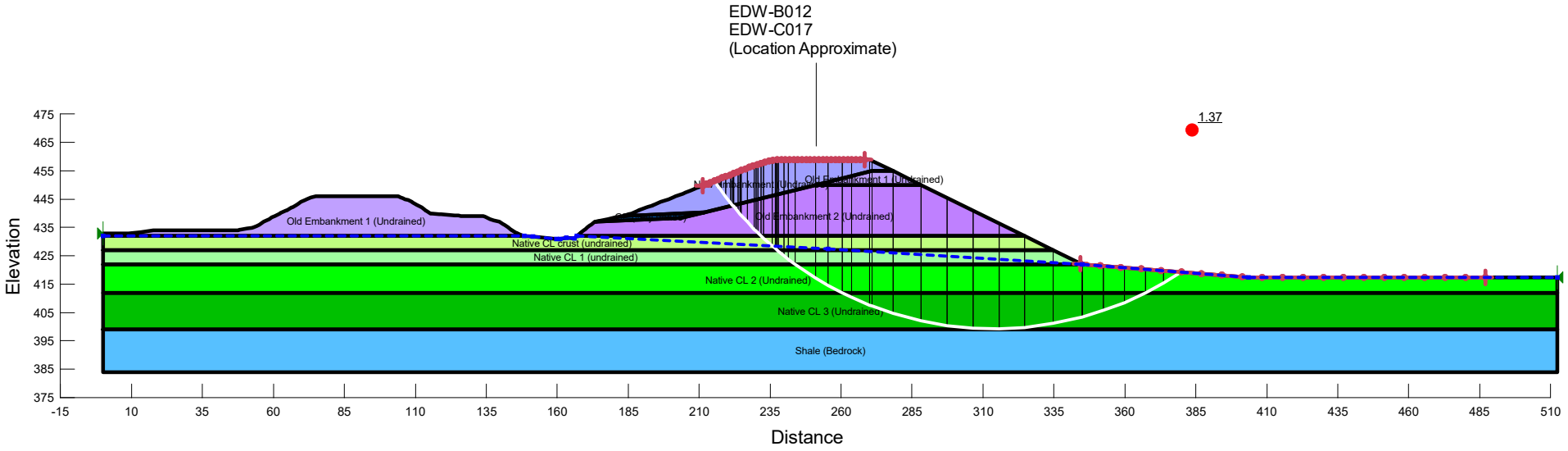
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Hennepin
Cross-section C
Slope Stability - Drawdown



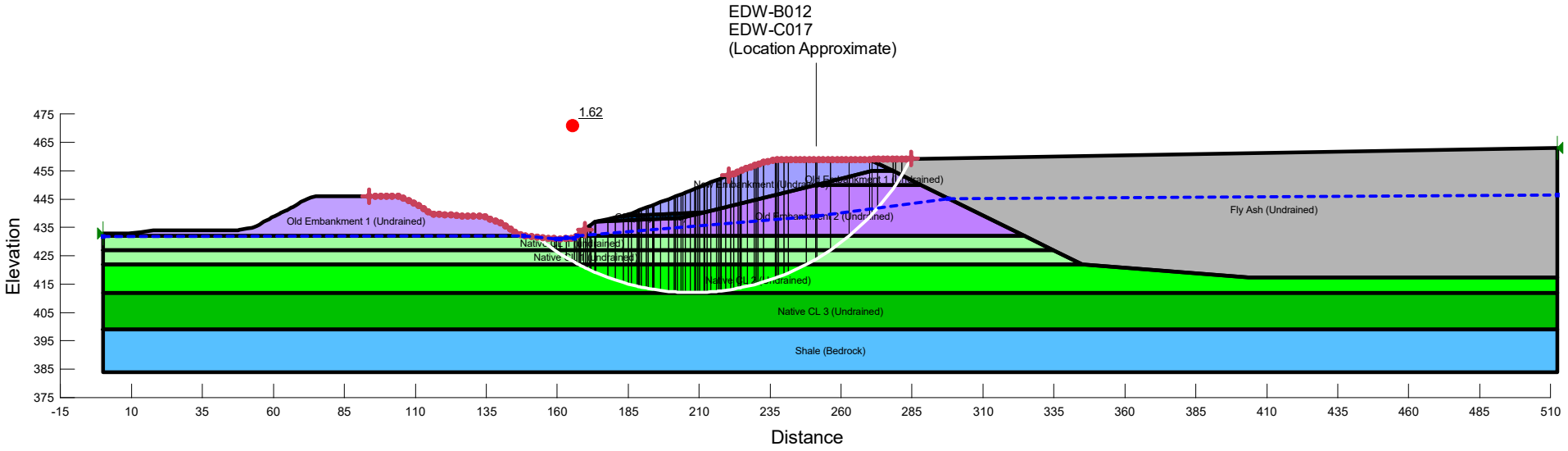
Color	Name	Unit Weight (pcf)	Cohesion (psf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135		0	36	1
	Native CL 1 (undrained)	117	650			1
	Native CL 2 (Undrained)	105	700			1
	Native CL 3 (Undrained)	105	900			1
	Native CL crust (undrained)	120	1,250			1
	New Embankment (Undrained)	115	2,500			1
	Old Embankment 1 (Undrained)	125	2,500			1
	Old Embankment 2 (Undrained)	125	1,250			1
	Shale (Bedrock)	140		1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Temporary Construtcion



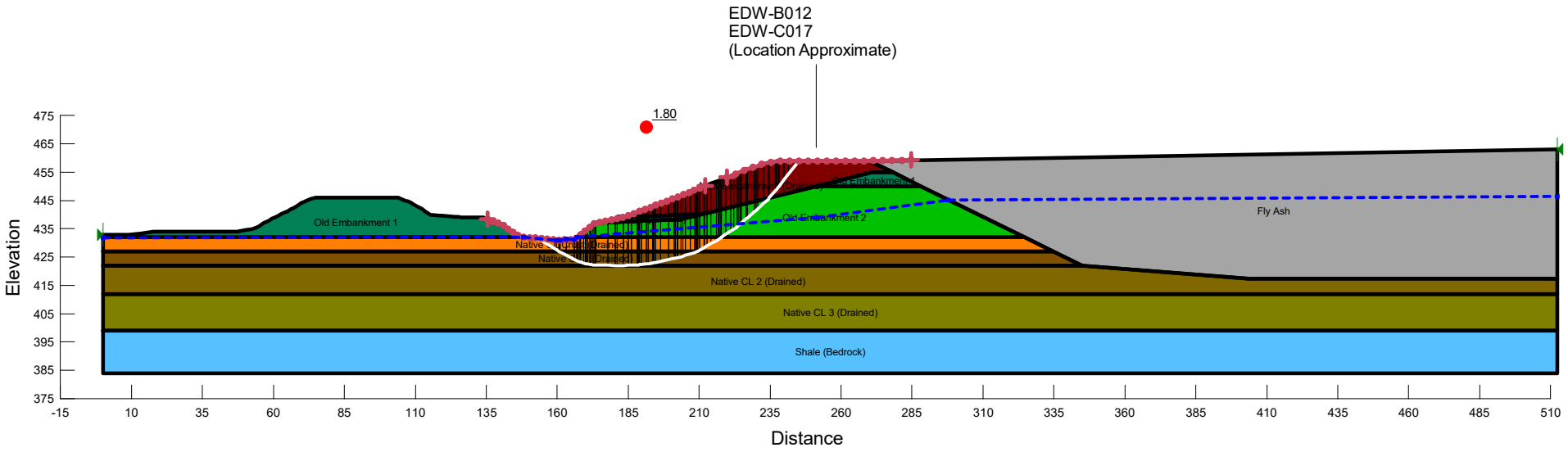
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Undrained



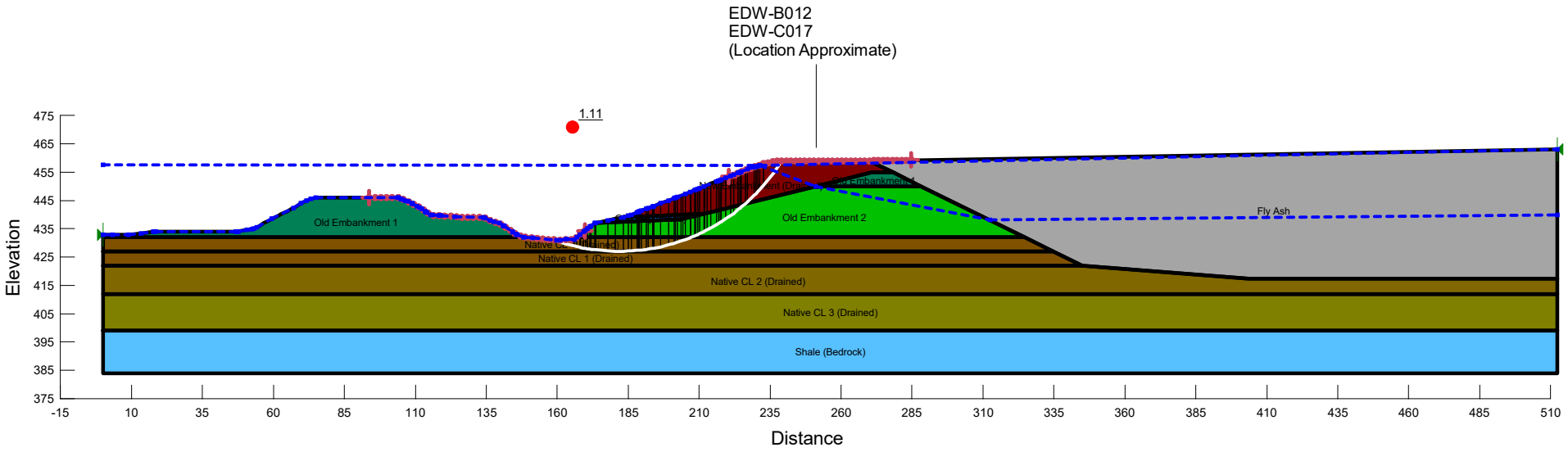
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash	105	100	27	1
	GP (very dense)	135	0	36	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Drained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash	105	100	27	400	8	1	2
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	8	1	2
	Native CL 2 (Drained)	105	200	26	470	8	1	2
	Native CL 3 (Drained)	105	200	26	600	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section D
Slope Stability - Rapid Drawdown



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
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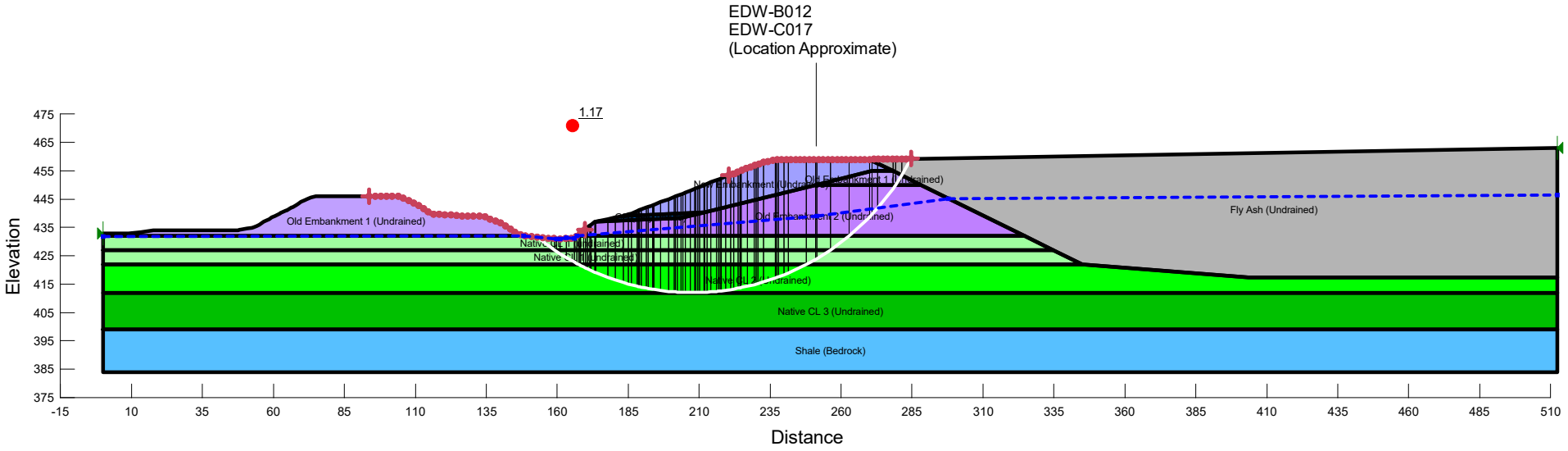
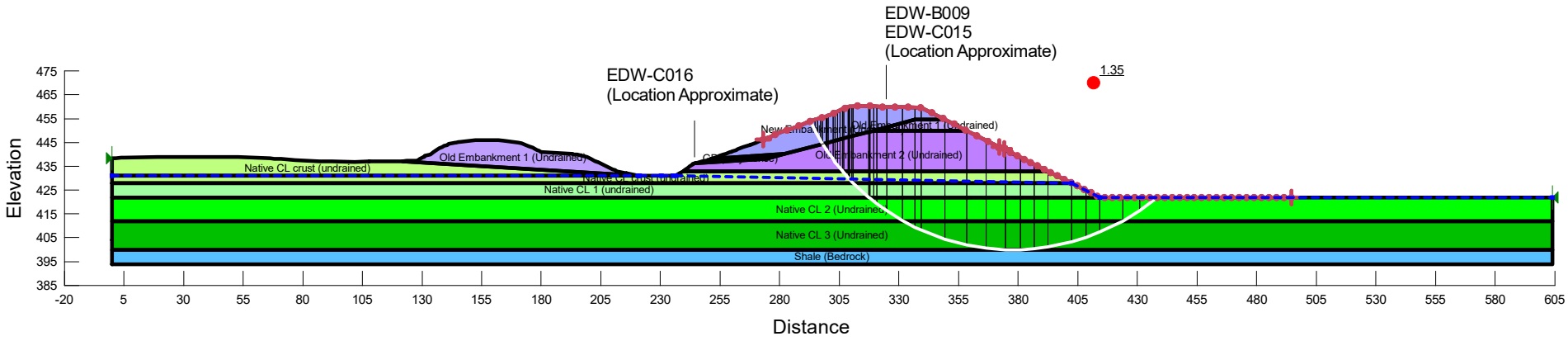
	Native CL 3 (Undrained)	105	900	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Seismic - PGA = 0.1g



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Temporary Construction



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
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	GP (very dense)	135	0	36	1
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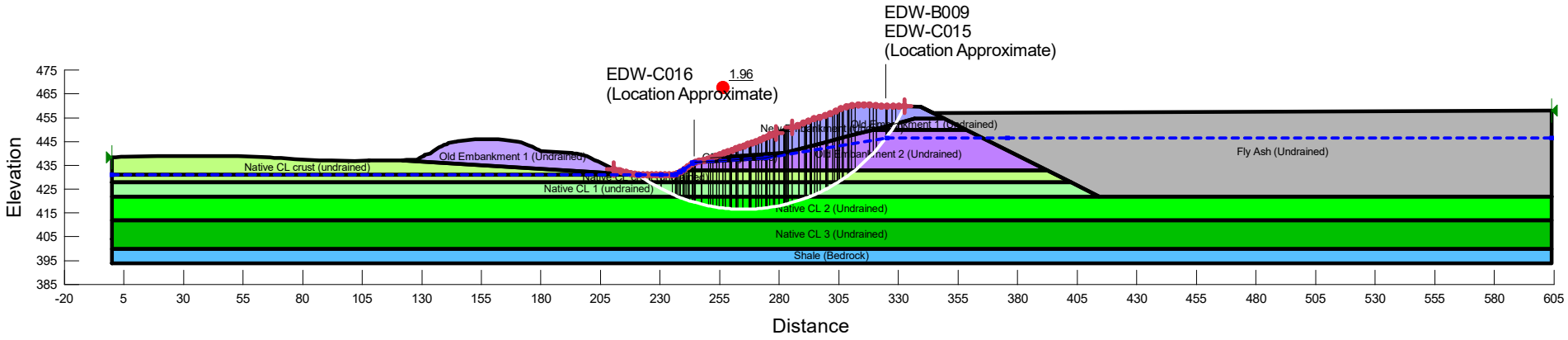
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Undrained



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	GP (very dense)	135	0	36	1
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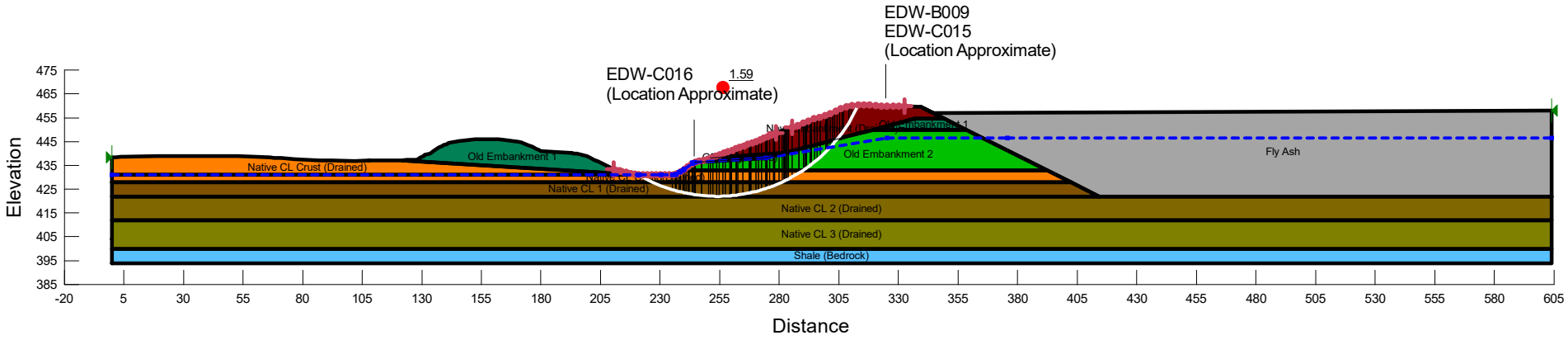
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Drained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
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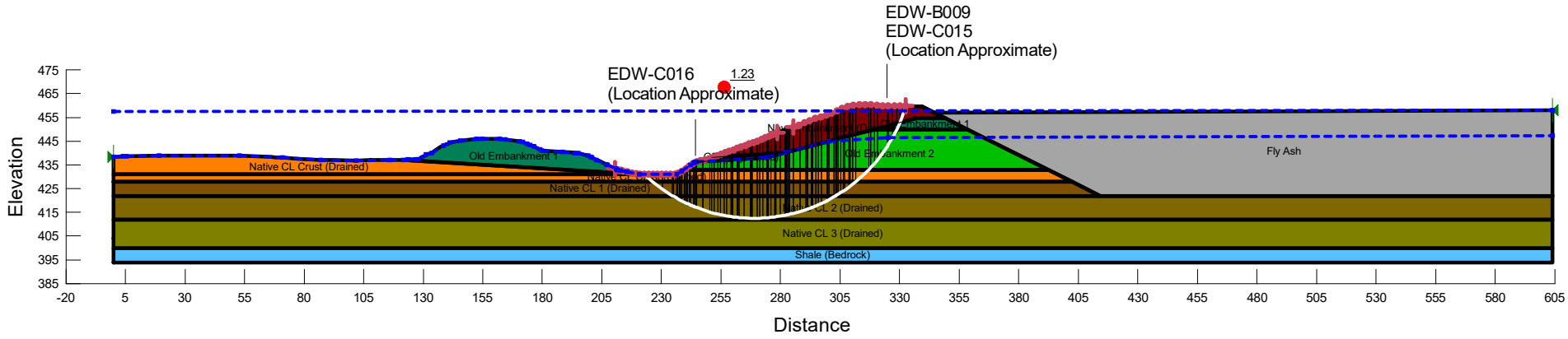
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section E
Slope Stability - Rapid Drawdown



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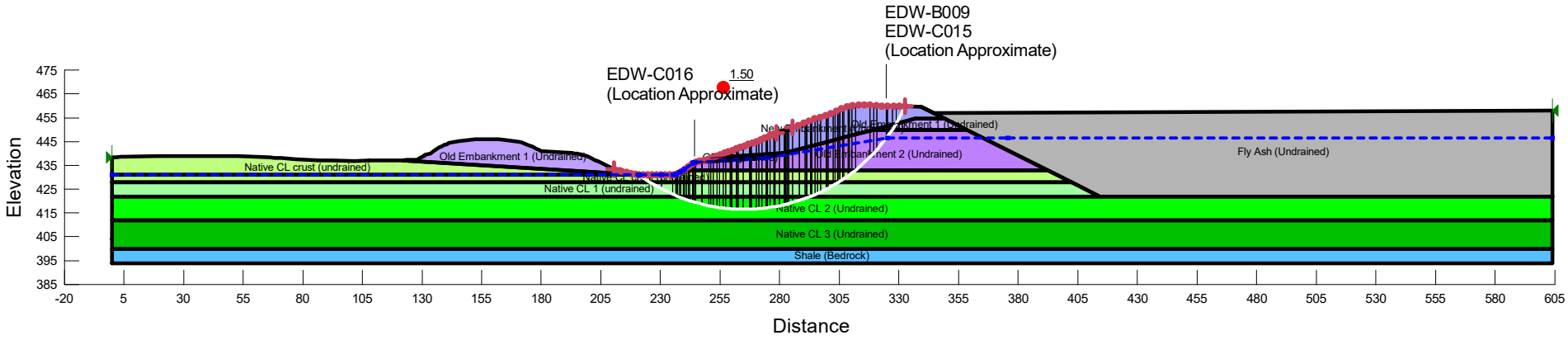
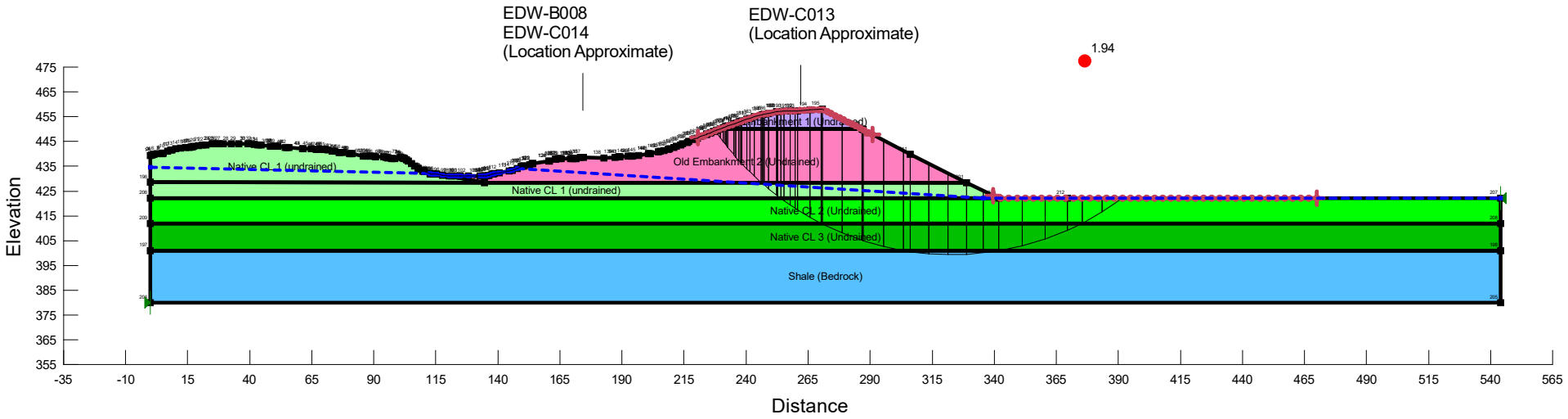
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Seismic - PGA = 0.1g



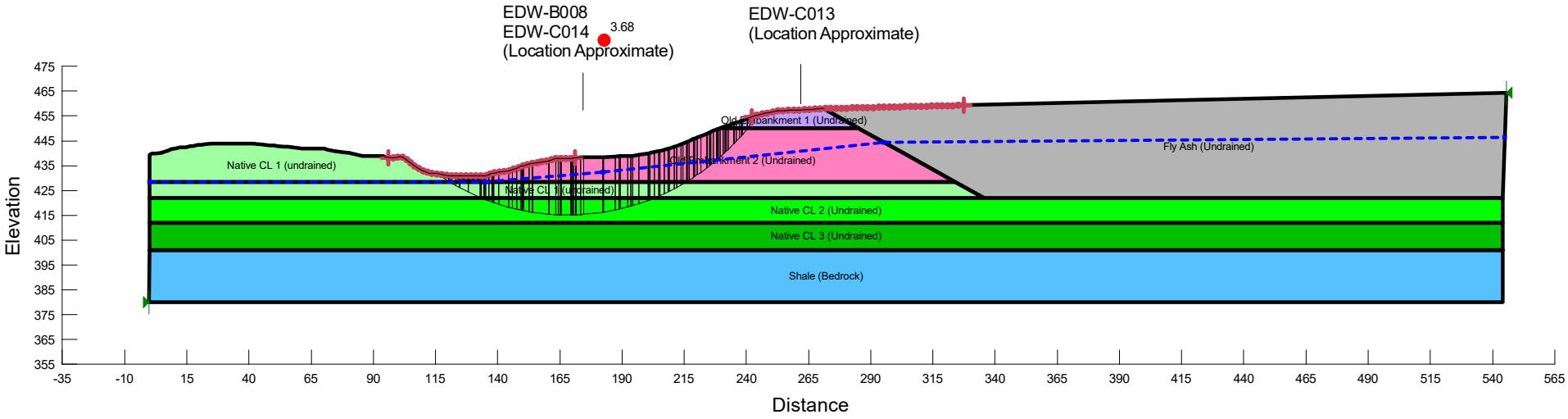
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Temporary Construction



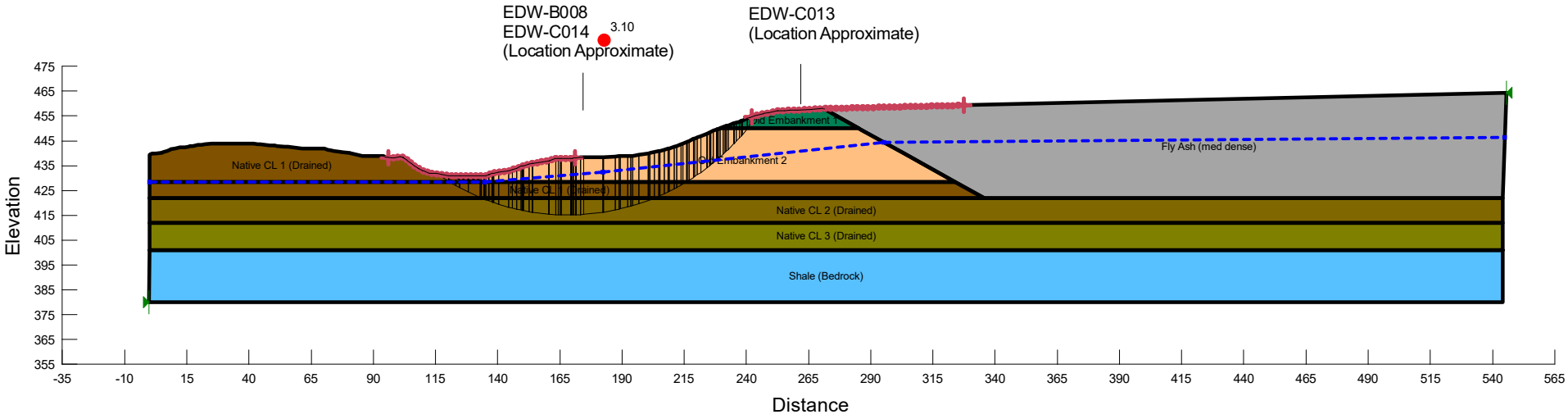
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Undrained



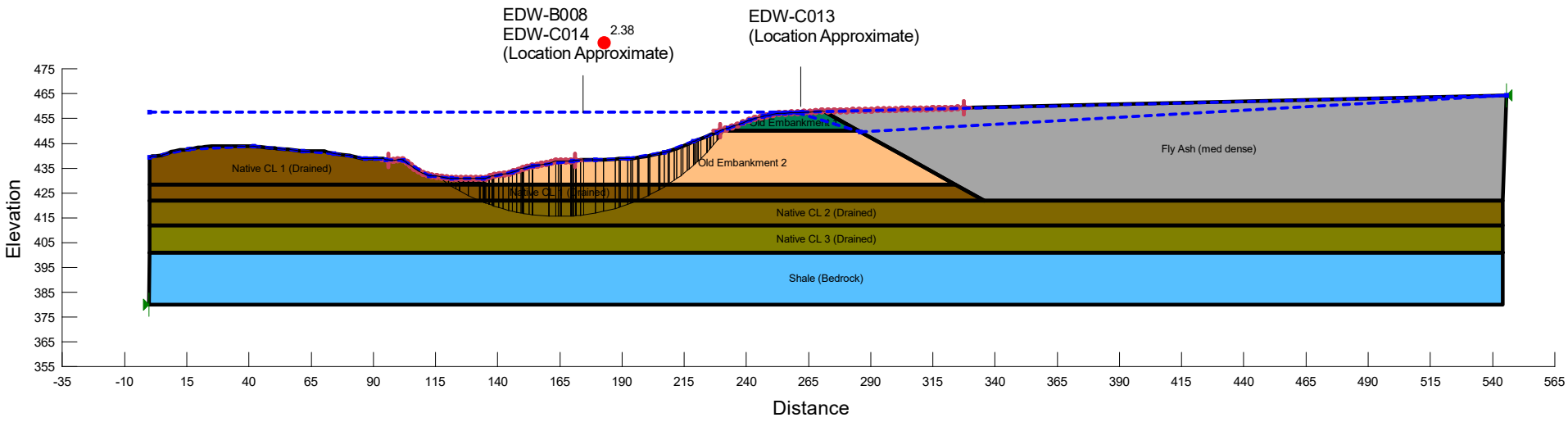
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	200	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Drained



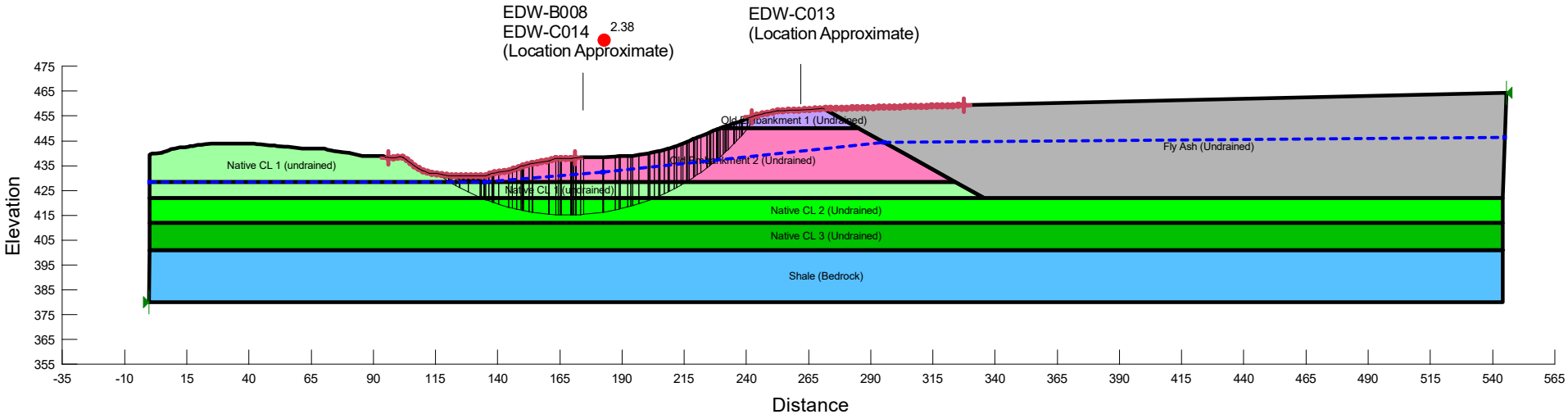
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	200	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section F
Slope Stability - Rapid Drawdown



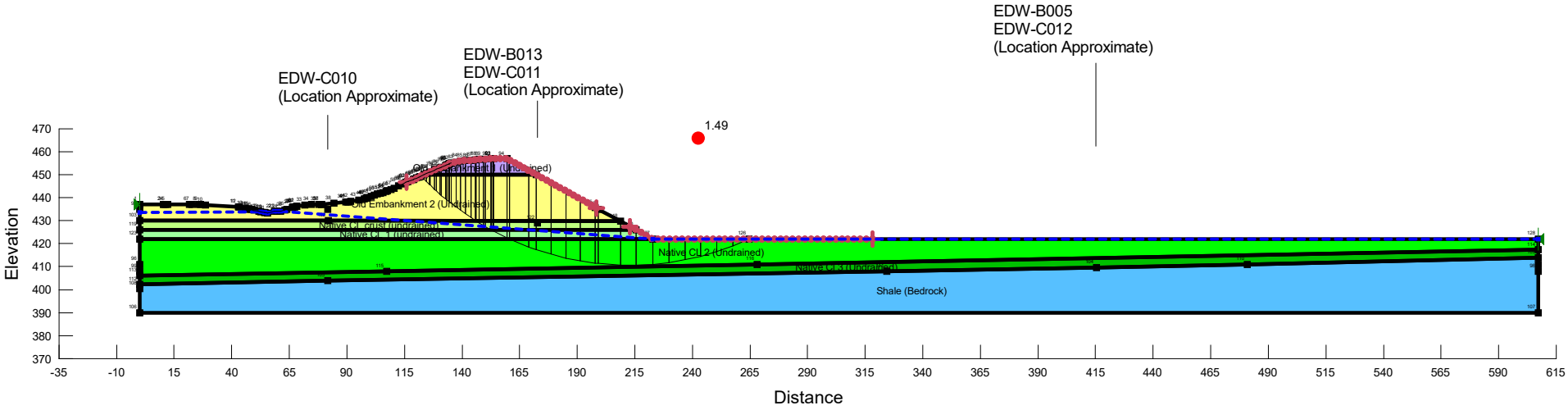
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Seismic - PGA = 0.1g



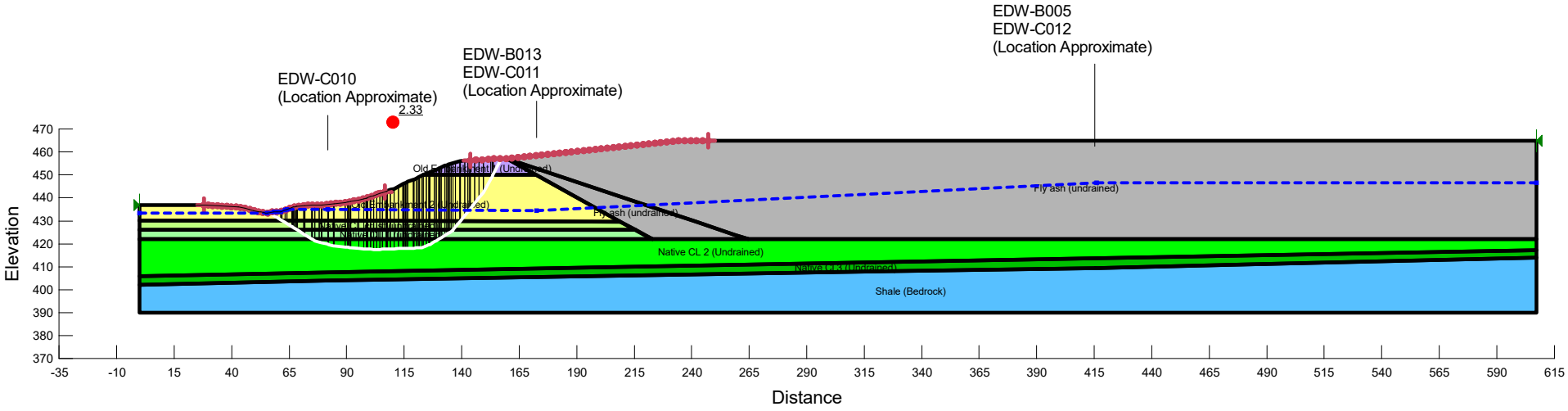
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native Cl 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section G
Slope Stability - Temporary Construction



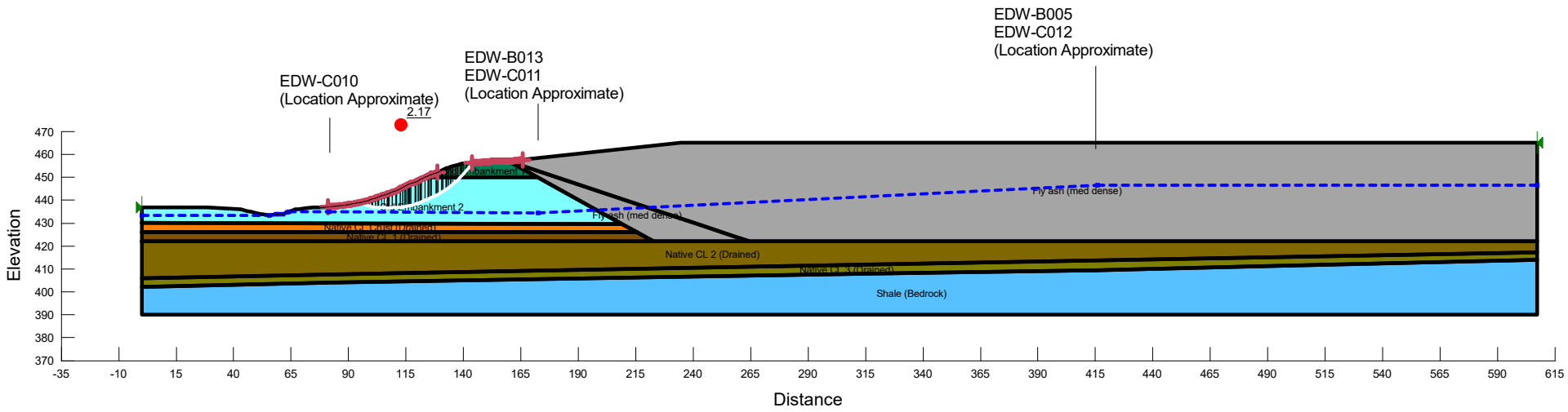
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Fly ash (undrained)	105			600	1
	Native CL 1 (undrained)	117	650	0		1
	Native CL 2 (Undrained)	105	700	0		1
	Native Cl 3 (Undrained)	105	900	0		1
	Native CL crust (undrained)	120	1,250	0		1
	Old Embankment 1 (Undrained)	125	2,500	0		1
	Old Embankment 2 (Undrained)	125	1,250	0		1
	Shale (Bedrock)	140	1,000	36		1

Dynegy Edwards
Cross-section G
Slope Stability - Undrained



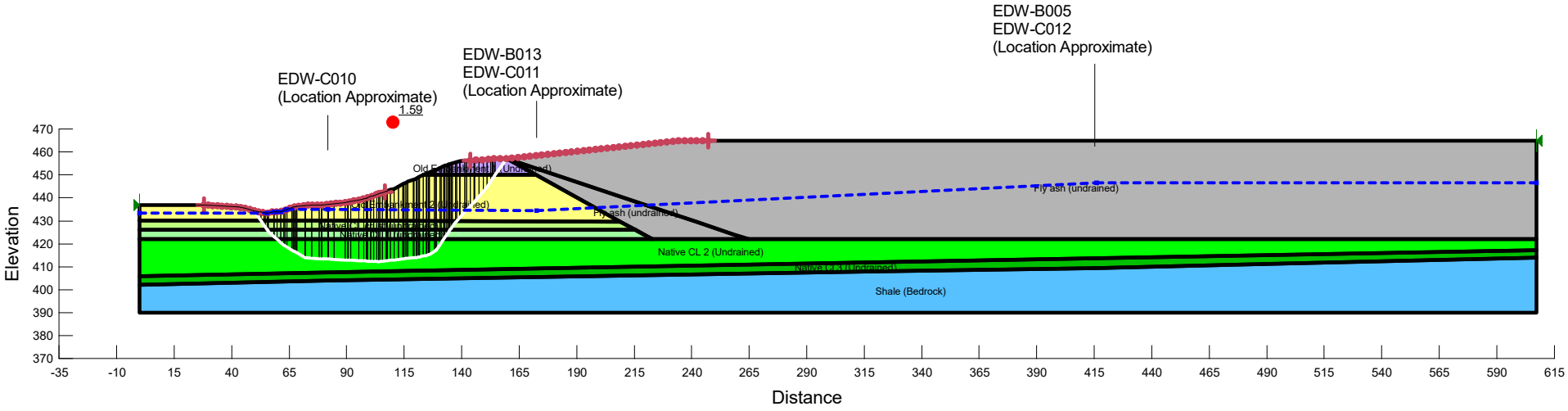
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section G
Slope Stability - Drained



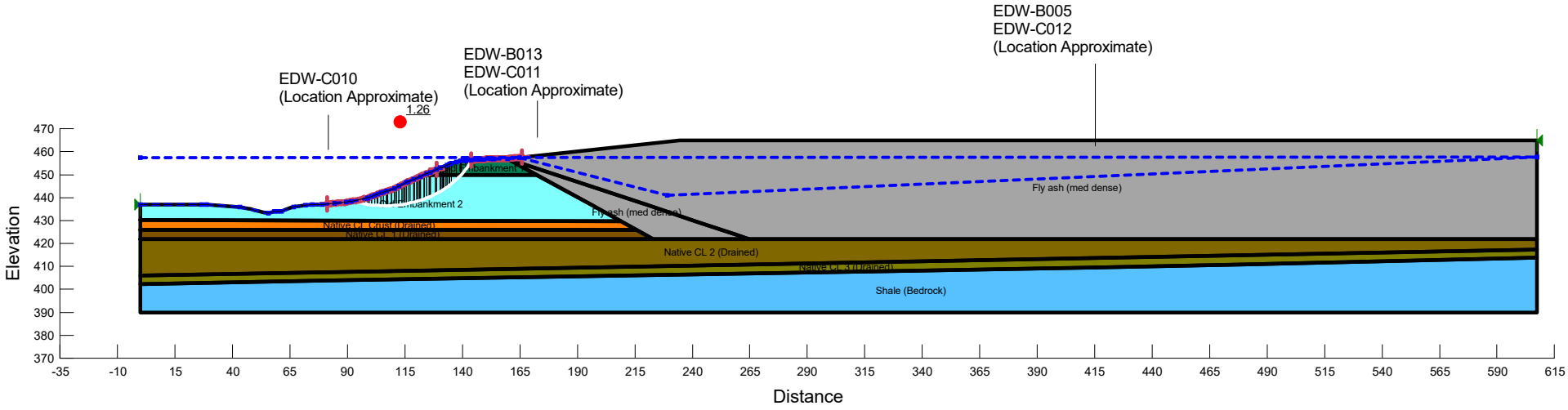
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Fly ash (undrained)	105			600	1
	Native CL 1 (undrained)	117	650	0		1
	Native CL 2 (Undrained)	105	700	0		1
	Native Cl 3 (Undrained)	105	900	0		1
	Native CL crust (undrained)	120	1,250	0		1
	Old Embankment 1 (Undrained)	125	2,500	0		1
	Old Embankment 2 (Undrained)	125	1,250	0		1
	Shale (Bedrock)	140	1,000	36		1

Dynegy Edwards
Cross-section G
Slope Stability - Seismic - PGA = 0.1g



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

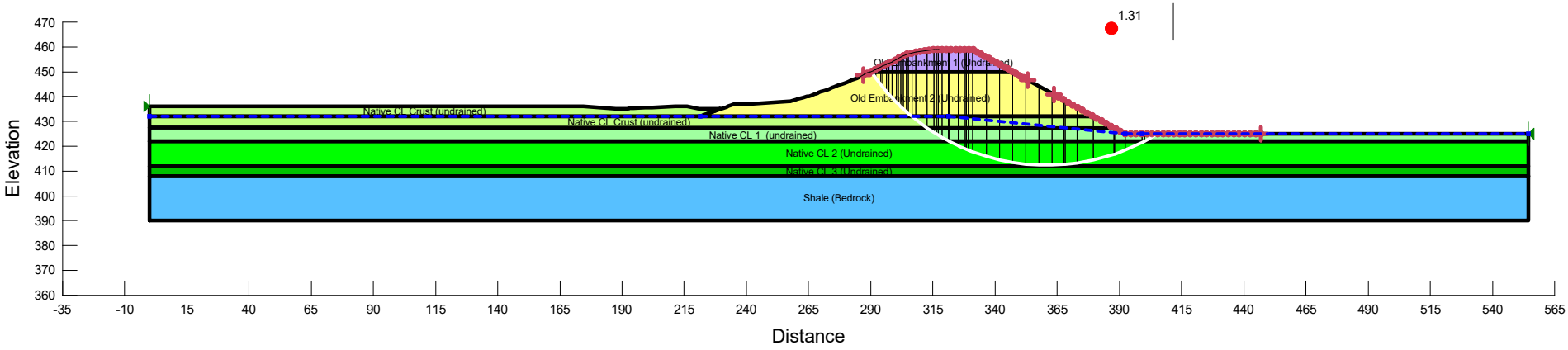
Dynegy Edwards
Cross-section G
Slope Stability - Rapid Drawdown



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

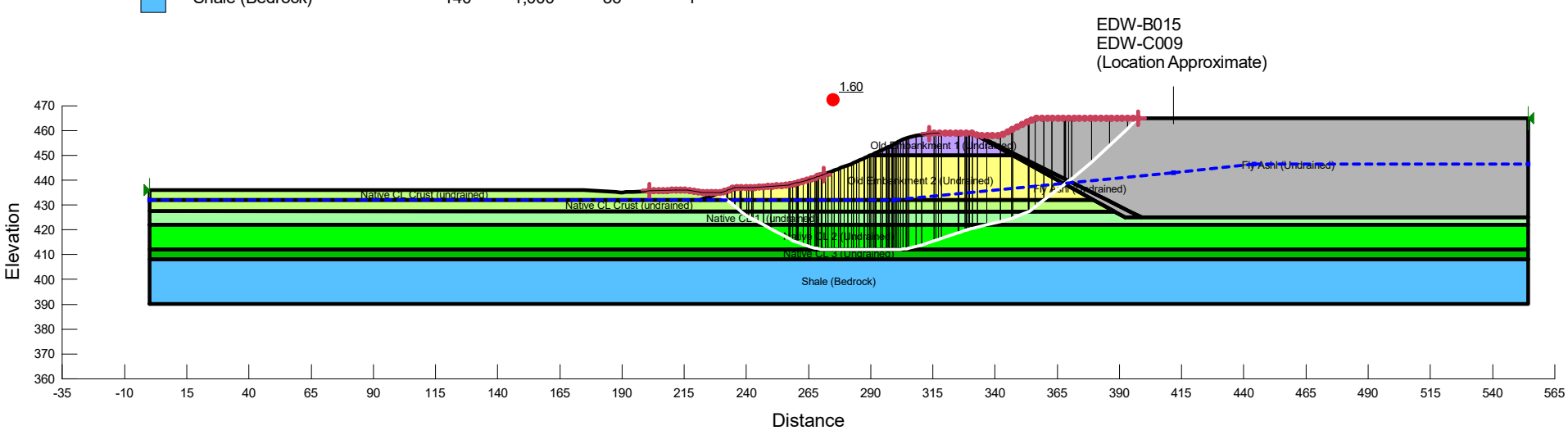
Dynegy Edwards
Cross-section H
Slope Stability - Temporary Construction

EDW-B015
EDW-C009
(Location Approximate)



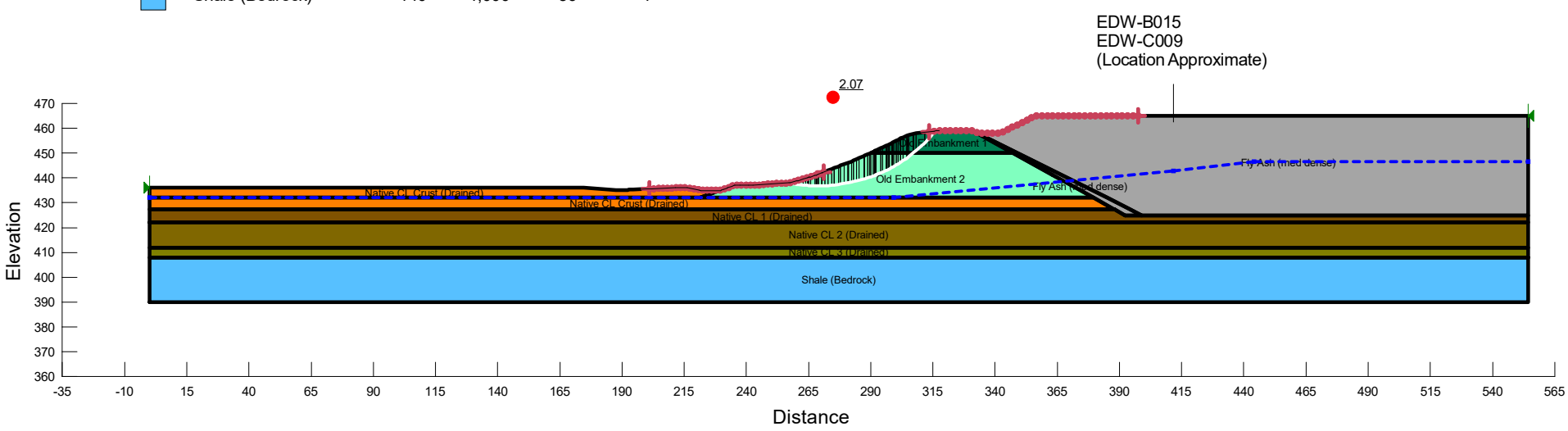
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ashl (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section H
Slope Stability - Undrained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

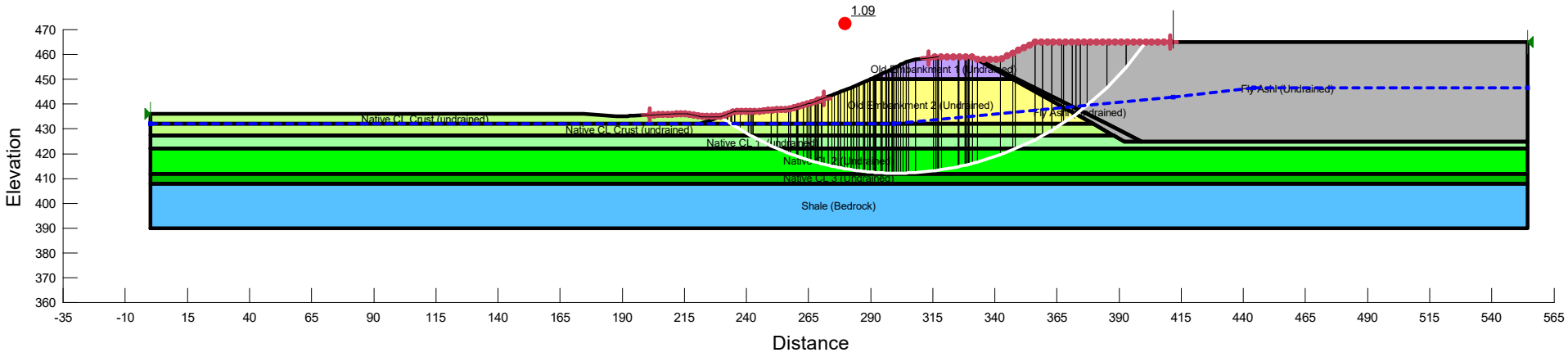
Dynegy Edwards
Cross-section H
Slope Stability - Drained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ashl (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

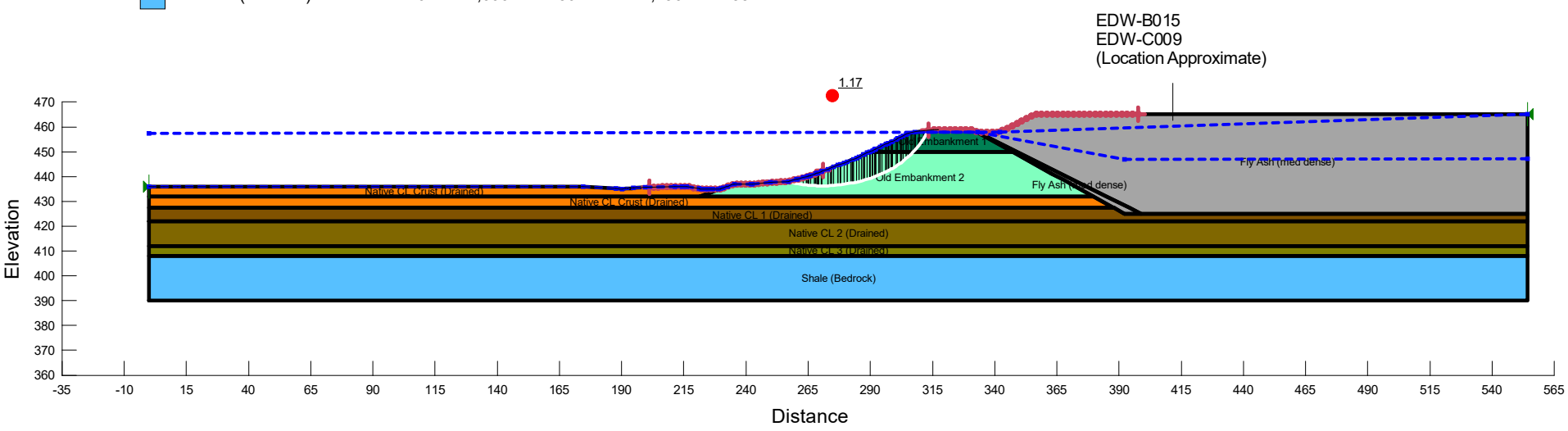
Dynegy Edwards
Cross-section H
Seismic - PGA = 0.1g

EDW-B015
EDW-C009
(Location Approximate)



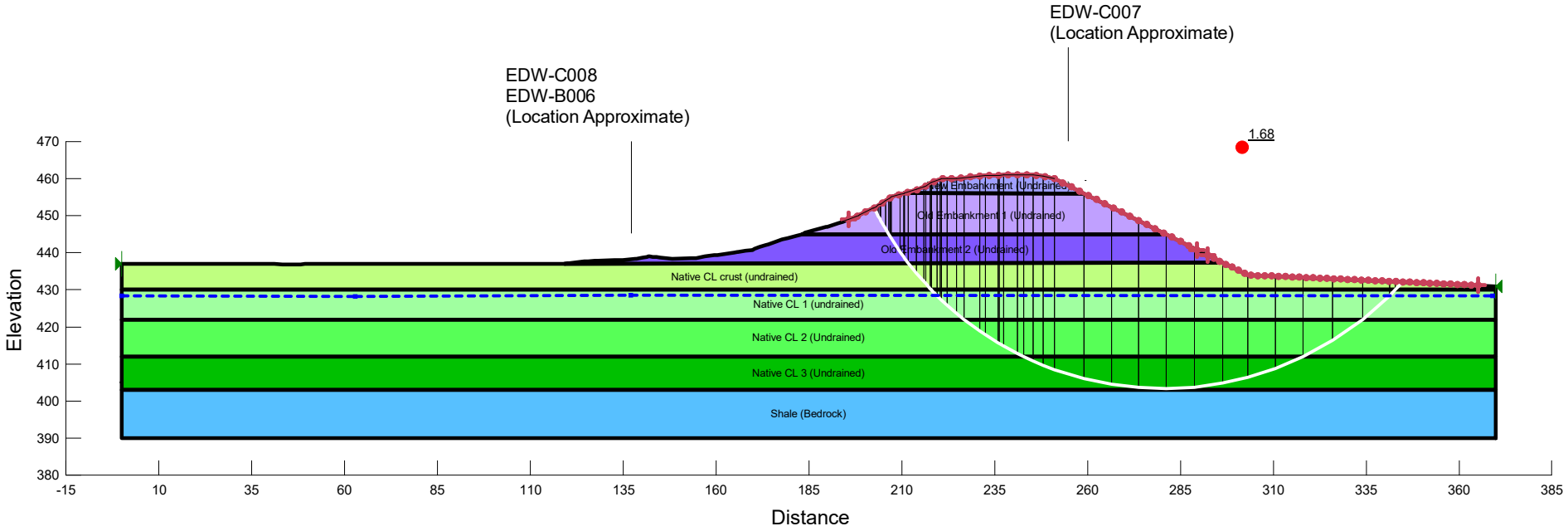
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section H
Slope Stability - Rapid Drawdown



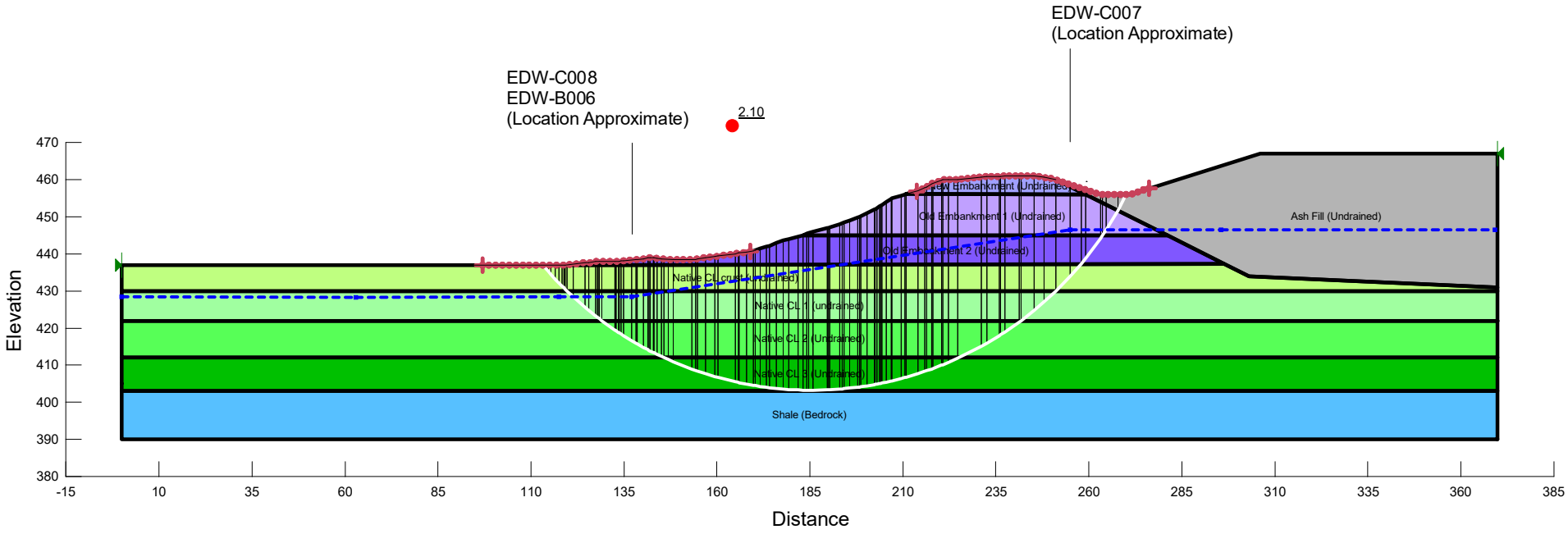
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Temporary Construction



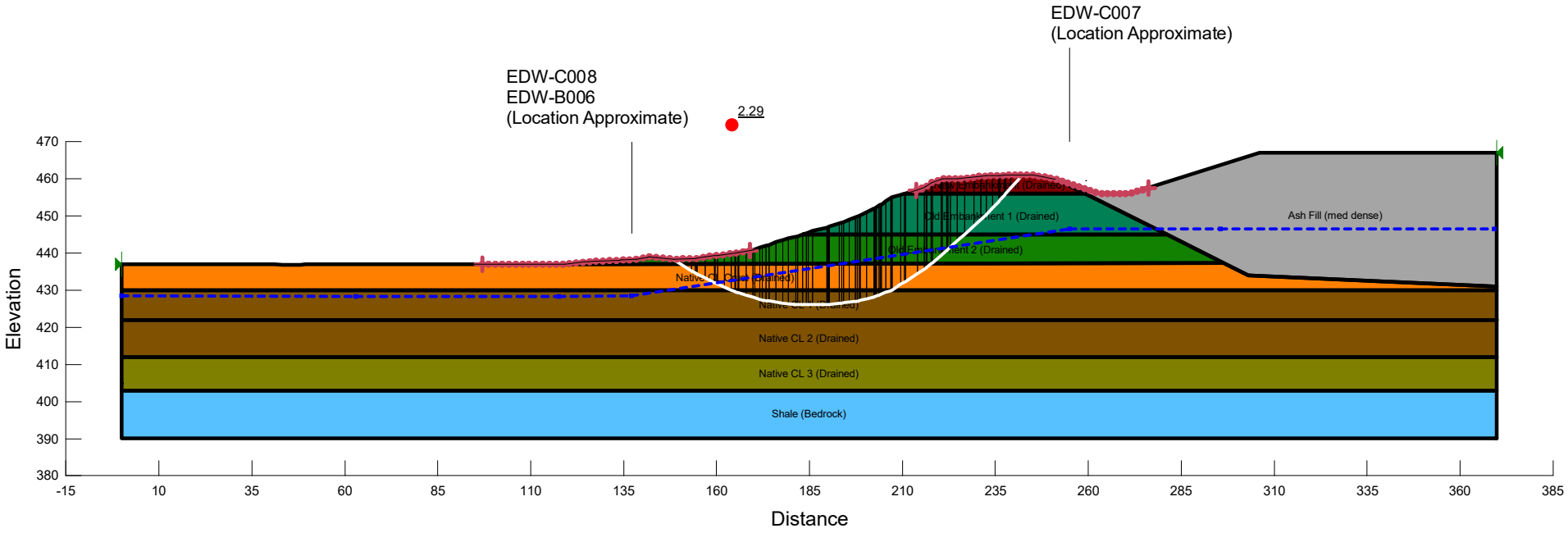
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Undrained



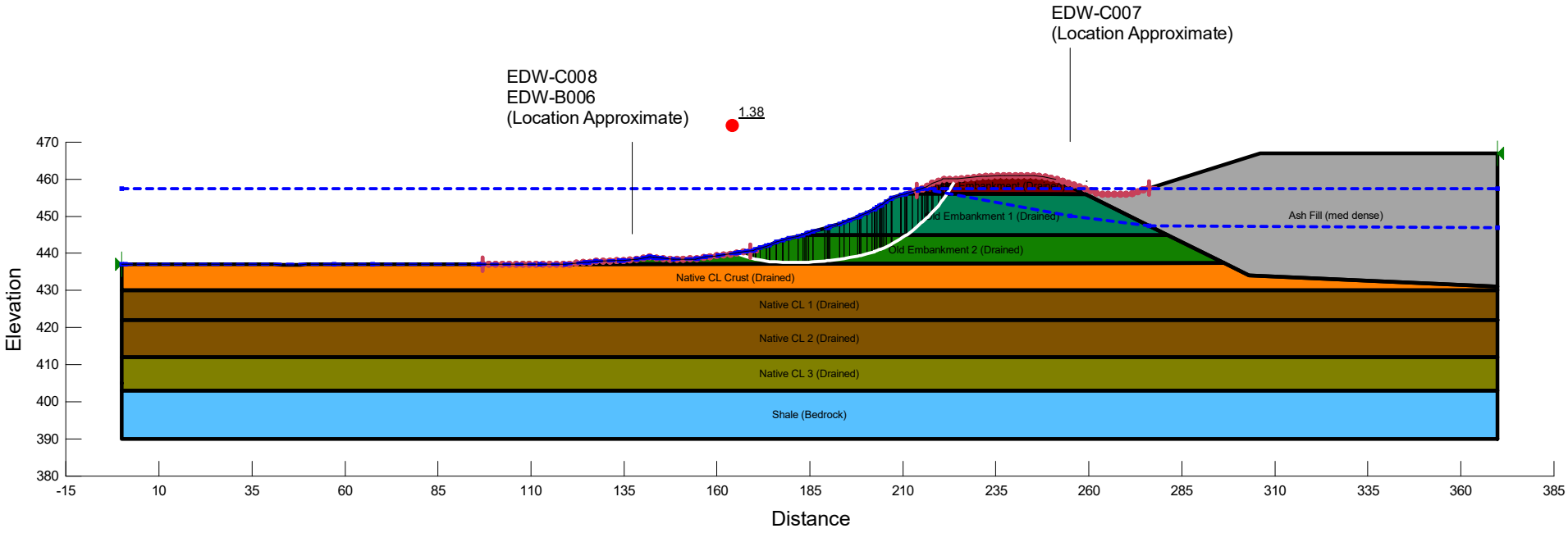
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1 (Drained)	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Drained



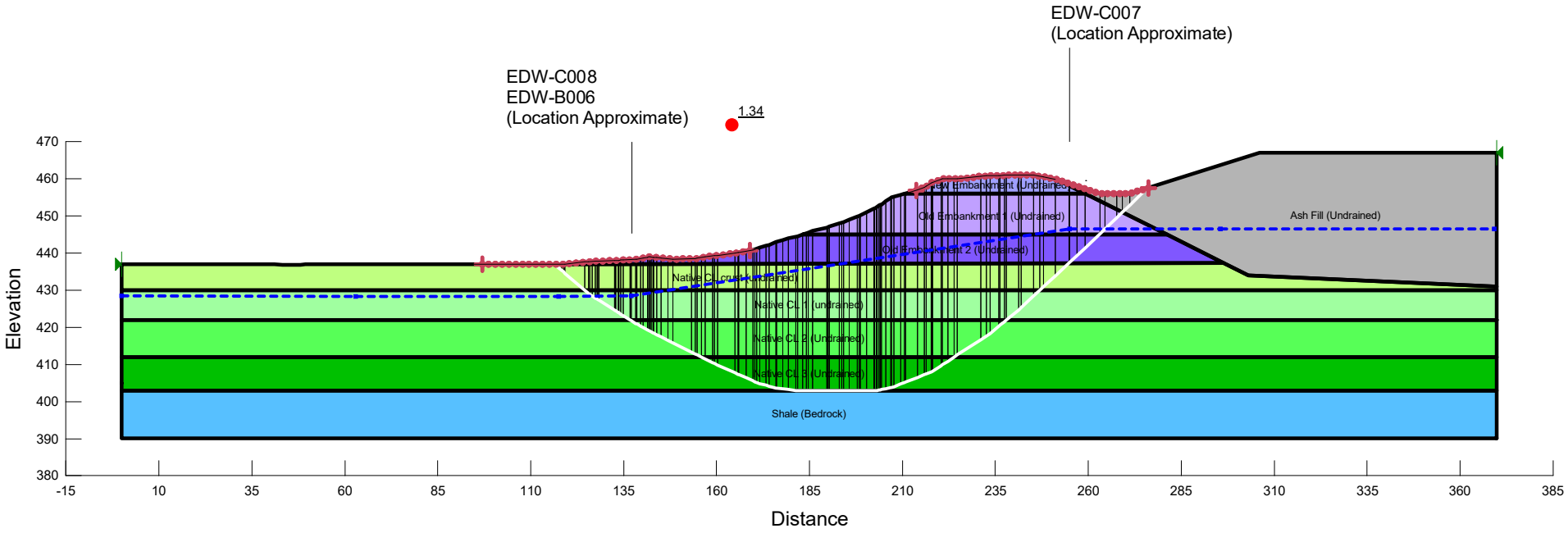
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Ash Fill (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1 (Drained)	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section I
Slope Stability - Rapid Drawdown



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross Section I
Seismic - PGA = 0.1g



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www.aecom.com

314.429.0100 tel
314.429.0462 fax

October 7, 2016

Mr. Matt Ballance, PE
Senior Project Engineer
Dynegy Inc.
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

RE: Geotechnical Report
Edwards Power Station
Ash Pond

Dear Mr. Ballance:

AECOM is pleased to provide this Geotechnical Report for the Illinois Power Resource Generating, LLC (IPRG) Ash Pond Coal Combustion Residuals (CCR) unit at the Edwards Power Station located in Bartonville, Illinois. This Geotechnical Report has been prepared to document the analysis performed to check that the facility meets the geotechnical slope stability requirements including Factors of Safety required by 40 CFR § 257.73.

AECOM looks forward to providing continued support to Illinois Power Resource Generating, LLC and working together on this important program. Please do not hesitate to call Ron Hager at 314-429-0100 (office) / 440-591-7868 (mobile), if you have any questions or comments on this Geotechnical Report.

Sincerely,

AECOM

Jeremy Thomas, PE
Site Manager
jeremy.thomas@aecom.com

Ronald Hager
Program Manager
ronald.hager@aecom.com

cc: Mark Rokoff, PE – AECOM

Attachments:

A. Figures
B. Boring Logs
C. Piezometer Logs
D. CPT Data Report
E. Laboratory Test Data
F. Material Characterization Calculations
G. Slope Stability Analysis
H. Liquefaction Analysis

1. INTRODUCTION

1.1. Purpose of This Report

This report presents the results of the geotechnical analyses prepared by AECOM for the Illinois Power Resources Generating, LLC (IPRG[1]) Coal Combustion Residuals (CCR) Ash Pond at the Edwards Power Station, located in Bartonville, Illinois (see **Figure 1, Attachment A** for Location Map). The purpose of the geotechnical investigation and analyses performed is to evaluate the design, performance, and condition of the impoundment and associated structures using the data collected from surface and subsurface investigations, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents provided to AECOM by IPRG. This information was then used to evaluate the design and operation of the surface impoundment against the regulatory standards set in 40 CFR § 257.73.

The geotechnical field exploration was conducted between August 19 and November 5, 2015. The field program consisted of conventional mud rotary borings, Standard Penetration Testing (SPT), Cone Penetration testing (CPT), and piezometer installation. Laboratory testing was conducted on the materials obtained through various sampling techniques to assist in characterization of the subsurface conditions, especially with respect to defining material parameters in stability analyses. Stability analyses were performed by AECOM to evaluate the potential for slope instabilities, in accordance with the Environmental Protection Agency (EPA) regulation 40 CFR § 257.73(d) and (e).

A summary of the geotechnical field program, laboratory testing program, and stability evaluations are presented herein. Detailed interpretations, calculations, and presentation of analysis results are provided in the Attachments to this report.

1.2. Description of Impoundment

There is one CCR unit at the Edwards Power Station: the Ash Pond. The Ash Pond is approximately 95 acres in size and is contained by a perimeter embankment that forms the exterior of the impoundment on all but the northeast side of the Ash Pond. The northeast side is bordered by the Edwards Station building grounds and switch yard which are at approximately the same elevation as the top of the pond embankment.

The original Ash Pond embankment is composed primarily of low plasticity compacted clays. An engineered raise of the embankment, constructed of ash placed on the crest and outboard side of the existing embankment, was completed in 2004 to facilitate the addition of a rail loop at the crest of the embankment. Additionally, this raise project also included constructing a new crushed stone embankment through and within the southern end of the Ash Pond, isolating a portion of the Ash Pond that was filled with ash and is vegetated. The original embankment still forms the perimeter of the Ash Pond at the southern end of this filled and vegetated area.

[1] Although the Ash Pond is owned by IPRG, Dynegy Administrative Services Company (Dynegy) contracted AECOM to develop this geotechnical report on behalf of IPRG. Therefore, “Dynegy” is referenced in materials attached to this geotechnical report.

Embankment heights range from approximately 0 feet (east and northeastern side of the embankment) to 29 feet (south and western side of the embankment), relative to the outboard toe. The typical crest elevation is approximately elevation 460 to 461 feet (all elevations in this report are listed in the NAVD88 datum, unless otherwise stated), based on the 2015 Maurer-Stutz survey for the site. Based on 2015 Illinois state LiDAR data, embankment outboard slopes range from approximately 2.5H:1V (horizontal to vertical) at the southern end of Ash Pond to 3.4H:1V at the western side of Ash Pond. Embankment crest widths range from approximately 15 feet to 42 feet, with narrower crest widths along the northern portion of the embankment and wider crest widths along the south, east, and west sides of the CCR unit.

Site location and site vicinity maps are included **Attachment A**, **Figure 1**.

2. SUMMARY OF FIELD INVESTIGATIONS

A subsurface exploration program was undertaken at the Ash Pond, including 14 soil borings, installation of 4 standpipe piezometers, and 22 cone penetration test (CPT) soundings with shear wave velocity (Vs) measurements and pore pressure dissipation (PPD) testing. The borings were drilled by AECOM's subcontractor Strata Earth Services, LLC of Palatine, IL, under the full-time supervision of AECOM geotechnical personnel. Strata Earth Services used both an All-Terrain Vehicle-mounted Diedrich D-120 drill rig and a truck-mounted Mobile B-57 drill rig, in conjunction with 3¼-inch inner diameter hollow stem augers and mud rotary methods to drill the borings. CPT soundings were performed by AECOM's subcontractor ConeTec, Inc., again with full-time oversight by AECOM personnel.

Boring depths varied from 37 to 66.5 feet below ground surface (bgs) and CPT depths varied from approximately 15 to 56 feet bgs. Boring and CPT sounding locations are depicted in **Figure 2** and piezometer locations are depicted in **Figure 3**. Logs of the borings are presented in **Attachment B**. Logs of the CPT soundings are presented in **Attachment D**, and piezometer logs are presented in **Attachment C**. Approximate locations of borings and CPTs are listed in **Table 1**.

Representative soil samples were collected from each of the borings for classification and/or testing. The SPT soil samples were obtained with a split-spoon sampler, in accordance with ASTM D 1586. Undisturbed samples of fly ash and fine-grained soils were obtained using 3-inch outside diameter steel (Shelby) tubes, either conventionally pushed in accordance with ASTM D 1587 or by utilizing a piston sampler in accordance with ASTM D 6519 (in ash and very soft soils). Results of the laboratory testing are presented in **Attachment E**.

Table 1
Boring and CPT Exploration Location[1] Data

Exploration ID	Easting (ft NAD83)	Northing (ft NAD83)	Elevation (ft NAVD88)
Auger Borings			
EDW-B001	2435307.9	1431922.3	461.0
EDW-B002	2435311.8	1431230.1	454.9
EDW-B003	2435399.3	1430502.0	460.0
EDW-B003A	2435404.3	1430502.0	460.0
EDW-B004	2435844.2	1430395.2	460.5
EDW-B005	2436105.4	1428429.4	459.0
EDW-B006	2436239.1	1429340.9	436.0
EDW-B008	2435578.9	1428207.8	438.8
EDW-B009	2435438.4	1428498.4	460.1
EDW-B010	2434755.0	1431482.0	459.0
EDW-B011	2435211.9	1429262.2	456.4
EDW-B012	2434793.9	1429514.9	459.0
EDW-B013	2436189.5	1428284.1	457.0
EDW-B014	2434647.2	1430898.4	457.7
EDW-B015	2436104.4	1428611.5	460.0
EDW-B015A	2436099.4	1428606.5	460.0
CPT Soundings			
EDW-C001	2435307.9	1431922.3	461.0
EDW-C003	2435533.2	1431377.1	461.9
EDW-C005	2435844.2	1430395.2	460.5
EDW-C006	2435902.5	1429921.9	462.0
EDW-C007	2436127.3	1429449.6	458.1
EDW-C008	2436239.1	1429340.9	436.0
EDW-C009	2436104.4	1428611.5	460.0
EDW-C010	2436245.5	1428211.6	437.8
EDW-C011	2436189.5	1428284.1	457.0
EDW-C012	2436105.4	1428429.4	459.0
EDW-C013	2435634.1	1428281.0	457.9
EDW-C014	2435578.9	1428207.8	438.8
EDW-C015	2435438.4	1428498.4	460.1
EDW-C015A	2435501.3	1428444.5	460.1
EDW-C016	2435383.1	1428461.7	436.9
EDW-C017	2434793.9	1429514.9	459.0
EDW-C019	2434931.7	1429697.8	457.0
EDW-C021	2434538.8	1430424.2	460.0
EDW-C022	2434647.2	1430898.4	457.7
EDW-C023	2434755.0	1431482.0	459.0
EDW-C025	2435311.8	1431230.1	454.9
EDW-C026	2435399.3	1430502.0	460.0
EDW-C026B	2435404.2	1430505.4	460.0
EDW-C027	2435211.9	1429262.2	456.4

[1] Locations above were not surveyed. Locations were approximated based on handheld GPS measurements taken during the investigation. Elevations are based on site topographic LiDAR survey from Illinois Geospatial Data Clearinghouse for Peoria County downloaded in December of 2015. The expected accuracy of these measurements is expected to be approximately ±5 feet horizontal and ±1 foot vertical.

3. SUMMARY OF SITE-SPECIFIC SUBSURFACE CONDITIONS

3.1. Site Stratigraphy

New Embankment Fill Materials: The perimeter embankment dike of the Ash Pond was constructed in two stages, with an original embankment, and a later raise constructed on top of and on the outboard slope of the existing embankment. This raise brought the embankment crest from an original elevation around 455 feet to the current elevation around 460 to 461 feet. This newer embankment fill material is comprised of fly ash from the plant (as beneficial use material), classified as lean silt (United Soil Classification of ML) to poorly graded silty sand with gravel (SP). The consistency of the new embankment fill, as measured by uncorrected SPT N-values, ranged from soft to very stiff, but generally had a stiff to very stiff consistency and appeared to be well-compacted.

Old Embankment Fill Materials: The original perimeter embankment of the Ash Pond is largely comprised of clay fill with trace sand and shell fragments, classified as lean clay (CL). The consistency of the old embankment fill, as measured by uncorrected SPT N-values, ranged from soft to stiff, but generally had a stiff consistency and appeared to be well-compacted. It was noted that the old embankment fill generally had a higher measured shear strength above approximately elevation 450 ft, so this material was split into two materials within the slope stability analytical models.

Impounded Ash Materials: Ash materials were encountered in the borings drilled within the Ash Pond. The material was classified as a silt (ML - fly ash) with some sand and clay and trace gravel. The measured consistency of the ash ranged from very loose to very dense, though generally, the consistency of ash was loose to very loose and was saturated below the pool level in the Ash Pond.

Native Alluvial Clay Crust: The Ash Pond is underlain by native clay of alluvial origin. This material was typically classified as lean clay (CL), with occasional zones of interbedded fat clay (CH). Much of the clay has a liquid limit near 50, denoting borderline fat/lean clay. The uppermost approximate 5 feet of this native alluvial clay measured significantly higher in strength, signifying a desiccated crust layer near the original ground surface. The consistency of this clay was generally stiff.

Native Alluvial Clay: As noted above, the Ash Pond is underlain by native clay of alluvial origin, typically classified as lean clay (CL) with occasional zones of interbedded fat clay (CH). Much of the clay has a liquid limit near 50 moderate to high plasticity. Beneath the upper crust material, the clay exhibited significantly less shear strength, and was normally consolidated to slightly overconsolidated, with shear strengths increasing with depth. The clay consistency varied from soft to medium stiff near the top of the stratum, generally increasing with depth to a consistency of medium stiff to stiff near the level of the bedrock. To capture this strength increase within the stability models, this material was divided into three layers.

Shale Bedrock: Shale bedrock was encountered below the native alluvial soils in the deeper borings. The shale was found to be slightly weathered to weathered near the upper contact, and became hard with depth. The shale was cored in two locations to verify classification, but no further testing was completed on this material.

Other Materials: Other materials were encountered in relatively small quantities at the site, appearing at only one or two exploration locations, and were not considered part of the site-wide stratigraphy. These materials include old and recent fill (similar in properties to the old and new embankment fill materials), historic ash material (similar in properties to the more recent ash fill),

and crushed stone embankment fill in the rail loop embankment that constructed the isolated filled and vegetated area in the southern end of the Ash Pond. The crushed stone embankment fill was observed to be medium dense, fine to coarse, crushed stone gravel with sand, classified as poorly graded gravel (GP). A clean crushed stone toe drain material was also noted on available historical design drawings, but was not encountered in the borings performed for this investigation.

Specific information used to assess and develop the design site stratigraphy can be found in **Attachment B** – Boring Logs, **Attachment D** – CPT Data Report, and **Attachment E** – Lab Test Data.

3.2. Phreatic Conditions

AECOM evaluated piezometer data from five measurement events (10/28/15, 11/24/15, 12/17/15, 1/14/16, and 2/11/16), interpreted pore pressure data from CPT soundings, and measured phreatic water in boreholes immediately after drilling. Piezometer data were judged to be the most representative of in-situ, steady state conditions. Data from CPT PPD tests in ash were judged to be representative of steady state phreatic conditions, but PPD tests within and outboard of the embankment were not consistently representative. Water was encountered in 6 of the 14 borings during drilling, observations which were unlikely to be representative of steady state conditions due to the time required for water levels to equilibrate in the relatively low-permeability embankment and foundation soils.

A total of four open standpipe piezometers were installed at the Ash Pond. All of the piezometers were installed through the perimeter embankment. Two of the piezometers (EDW-P002 and EDW-P004) were installed with the screened elevation within sluiced as in the Ash Pond. The remaining two piezometers (EDW-P001 and EDW-P003) were installed with the screen elevations located within the foundation soils. Piezometer locations and measurements are summarized in **Table 2**.

Table 2
Piezometer Location and Phreatic Level Data

Piezometer No.	Impoundment Embankment	Northing (ft NAD83)[1]	Easting (ft NAD83)	Ground Surface Elevation (ft NAVD88)	Location	Piezometer Type[2]	Total Depth[3] (feet)	Phreatic Elevation (ft NAVD88)				
								10/28/2015[4]	11/24/2015	12/17/2015	1/14/2016	2/11/2016
EDW-P001	North	2440516.6	1426796.5	461	Crest	OSP	36.5	-	436.7	438.9	441.8	438.3
EDW-P002	Northwest	2440043.6	1427380.9	459	Crest	OSP	29.0	449.7	449.8	450.2	451.0	450.4
EDW-P003	West	2438062.1	1427345.5	459.6	Crest	OSP	49.6	437.3	438.7	439.1	439.6	439.8
EDW-P004	Southeast	2437206.1	1426013.0	455.6	Crest	OSP	30.2	-	442.8	442.9	445.2	442.8

Notes:

1. Locations above were not surveyed. Locations are approximated based on handheld GPS measurements taken during investigation. Elevations are based on site topographic LiDAR survey from Illinois Geospatial Data Clearinghouse for Peoria County downloaded in December of 2015. The expected accuracy of these measurements is expected to be approximately ±5 feet horizontal and ±1 foot vertical.
2. OSP = open standpipe piezometer.
3. Total Depth = Approx. bottom of screen for standpipe piezometers.
4. Readings on 10/28/2015 at EDW-P001 and EDW-P004 were before piezometers were developed, and are not presented.

4. SUMMARY OF LABORATORY TESTING

4.1. Summary of Laboratory Testing Scope

Soil samples collected from the subsurface exploration were sealed at the site and were then transported to the lab of AECOM's laboratory testing subcontractors; Terracon of Vernon Hills, Illinois, where an AECOM geotechnical engineer reviewed the samples and selected samples for laboratory testing. The laboratory testing program performed for the Ash Pond was intended to obtain information on index and shear strength properties of the subsurface material at the site. The laboratory testing program for characterization of the materials at the Ash Pond is summarized in **Table 3**.

Table 3
Summary of Laboratory Testing Program for the Ash Pond

ASTM Designation	Test Type	Number of Tests							
		Total	Ash	New Embankment Fill	Old Embankment Fill	Other Fill Materials	Native Clay Crust	Native Clay	Bedrock
D2216	Moisture Content	181	47	15	21	19	5	56	18
D4318	Atterberg Limits	26	4	1	5	1	1	14	-
T311[1], D1140, D422	Gradation / Hydrometer	10	7	3	-	-	-	-	-
D854	Specific Gravity	9	5	-	-	-	4	-	-
D5084	Hydraulic Conductivity	3	2	-	-	-	-	1	-
D2435	Consolidation	2	-	-	-	-	-	2	-
D 2166	Unconfined Compression	5	-	-	-	-	-	5	-
D4767	Consolidated Undrained Triaxial (CIU)	5	-	-	3	-	-	2	-
D6528	Direct Shear (DS)	8	2	-	-	-	1	5	-
G57, G51	Corrosion Suite	5	4	-	-	-	-	1	-

[1] American Association of State Highway and Transportation Officials (AASHTO) test designation

4.2. Summary of Laboratory Testing Results

A summary of laboratory test results for the impounded ash, new embankment fill, old embankment fill, native clay crust, and native clay at the Ash Pond are presented in **Tables 4, 5, 6, 7** and **8**, respectively. A summary of laboratory tests results for other fill materials and shale bedrock are presented in **Tables 9** and **10**. Laboratory test data is included in **Attachment E**. Graphical displays of the shear strength characterization for the stratigraphic materials are included in the Material Characterization Calculation Package in **Attachment F**.

Table 4
Summary of Laboratory Test Results – Impounded Ash

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Direct Shear		Hydraulic Conductivity (cm/sec)	Corrosion Suite (ANS Point Rating)
														c' (psf)	phi' (deg)		
EDW-B002	S-1	0.0'-1.5'	SM	38.4	4.50+												
EDW-B002	S-2	2.5'-4.0'	ML	62.4	3.50												
EDW-B002	S-3	5.0'-7.0'	MH	66.6						65	36	29					
EDW-B002	S-4	7.5'-10.0'		79.0		0.0	7.4	73.1	19.5								
EDW-B002	S-5	10.0'-12.0'		76.9						17	27	NP		112	29.8	9.19E-05	
EDW-B002	S-6	15.0'-16.5'		52.5													14.5
EDW-B002	S-7	20.0'-21.5'		67.8													
EDW-B002	S-8	25.0'-27.0'		63.9									2.471				
EDW-B003	S-1	0.0'-1.5'		44.4									2.469				
EDW-B003	S-10	35.0'-36.5'		51.9													
EDW-B003	S-2	2.5'-4.0'		27.3	2.00												
EDW-B003	S-3	5.0'-6.5'	OL	37.2	1.00												
EDW-B003	S-4	7.5'-9.5'		55.5													
EDW-B003	S-5	10.0'-11.5'		50.6		2.3	19.8	56.3	21.6								
EDW-B003	S-6	15.0'-16.5'		29.7									2.772				
EDW-B003	S-7	20.0'-21.5'		42.1													
EDW-B003	S-8	25.0'-27.0'		54.9													
EDW-B003	S-9	30.0'-32.0'		71.7		0.0	20.6	66.4	13.0					82.8	26.9	6.79E-05	
EDW-B004	S-1	0.0'-1.5'		18.9	4.50+												
EDW-B004	S-2	2.5'-3.5'		28.5	4.00												
EDW-B004	S-2A	3.5'-4.0'	CL	20.1	3.25												
EDW-B004	S-3	5.0'-6.5'	CL	21.6	1.75												3.0
EDW-B004	S-4	7.5'-9.0'	CL	23.4	4.00	0.0	9.3	43.3	47.4	37	16	21					
EDW-B004	S-5	10.0'-11.5'	CL	21.5	2.25												
EDW-B005	S-1	0.0'-1.5'	SC	45.8	4.50												
EDW-B005	S-2	2.5'-4.0'	ML	26.0													
EDW-B005	S-3	5.0'-6.5'	MH	50.9	3.25					61	54	7					
EDW-B005	S-4	8.5'-10.0'	ML	37.4	4.50+												
EDW-B005	S-5	10.0'-11.5'	SC	44.3													
EDW-B011	S-1	0.0'-1.5'		27.7	4.50+												
EDW-B011	S-10	35.0'-37.0'		93.9													
EDW-B011	S-2	2.5'-4.0'		16.3	4.50+												
EDW-B011	S-3	5.0'-6.5'		29.4	4.50+												
EDW-B011	S-4	7.5'-9.0'		45.3	3.00												
EDW-B011	S-5	9.0'-11.0'		70.0		15.5	21.3	46.0	17.2								
EDW-B011	S-6	15.0'-17.0'		63.2													14.5
EDW-B011	S-7	19.5'-21.5'		84.9		0.2	16.7	58.0	25.1								
EDW-B011	S-8	25.0'-27.0'		74.7									2.691				
EDW-B011	S-9	30.0'-32.0'		73.7													
EDW-B014	S-1	0.0'-1.5'		28.2	4.00												
EDW-B014	S-2	2.5'-3.5'	CL-ML	40.8	1.50												
EDW-B014	S-2A	3.5'-4.0'	CL-ML	50.0													
EDW-B014	S-4	7.0'-8.5'	SM	60.2		0.0	35.1	45.4	19.5								
EDW-B014	S-6	15.0'-17.0'		78.7	3.50												
EDW-B014	S-7	20.0'-22.5'		86.5	1.50								2.524				15.0
EDW-B014	S-8	25.0'-26.7'		73.1													
EDW-B014	S-9	30.0'-31.5'	CL	48.7													

Table 5
Summary of Laboratory Test Results – New Embankment Fill

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	Liquid Limit	Plastic Limit	Plasticity Index
EDW-B005	S-6	15.0'-16.5'	ML	41.4								
EDW-B005	S-7	20.0'-21.5'		51.1	1.75	3.1	21.3	51.7	23.9			
EDW-B005	S-8	25.0'-26.0'	ML	55.3								
EDW-B010	S-1 BOTTOM	0.0'-0.5'	CL	17.4	4.50+							
EDW-B010	S-1 TOP	0.0'-0.5'	SP	7.2								
EDW-B010	S-1A	0.5'-1.5'		27.9								
EDW-B010	S-2	2.5'-3.0'		20.9								
EDW-B010	S-2A	3.0'-4.0'		30.7	4.50							
EDW-B010	S-3	5.0'-6.5'	SP	14.8		12.6	54.8	26.0	6.6			
EDW-B010	S-4	7.5'-9.0'	CL	22.0	3.75							
EDW-B012	S-1	0.0'-1.5'	ML	23.0								
EDW-B012	S-2	2.5'-4.0'		23.8	4.50+					28	26	2
EDW-B012	S-3	5.0'-6.5'		26.5		0.0	9.6	73.7	16.7			
EDW-B012	S-4	7.5'-9.0'		26.5	4.50							
EDW-B012	S-5	10.0'-11.0'	CL	24.7	3.75							

Table 6
Summary of Laboratory Test Results – Old Embankment Fill

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Consolidated Undrained Triaxial			
									c (psf)	phi (deg)	c' (psf)	phi' (deg)
EDW-B008	S-1	0.0'-1.5'	CL	13.2	4.50+							
EDW-B008	S-2	2.5'-4.0'	CL	19.5	3.75	42	22	20				
EDW-B008	S-3	5.0'-6.5'	CL	42.3	2.00							
EDW-B008	S-4	7.5'-9.0'	CL	22.8	2.00							
EDW-B010	S-5	10.0'-11.5'	CL	24.0	2.00							
EDW-B010	S-6	12.5'-14.0'	CL	28.0	1.25							
EDW-B010	S-7	15.0'-17.0'	CL	30.5		48	18	30	420	11.1	199.6	24.8
EDW-B010	S-8	20.0'-21.5'	CL	32.9	0.75							
EDW-B010	S-9	25.0'-26.5'	CL	21.4	0.50							
EDW-B012	S-5A	11.0'-11.5'	CL	24.9	2.00							
EDW-B012	S-6	12.5'-14.0'	CL	22.0	3.50							
EDW-B012	S-7	15.0'-16.5'	CL	24.3	3.25	48	19	29	426	14.6	496	23.5
EDW-B012	S-8	20.0'-22.0'	CL	23.8								
EDW-B012	S-9	25.0'-26.5'	CL	23.2	1.25							
EDW-B013	S-2	2.5'-4.0'	CL	17.4	4.50+							
EDW-B013	S-3	6.0'-8.0'	CL	24.3		49	21	28	418	15.2	115.2	29.7
EDW-B013	S-4	8.0'-9.5'	CL	24.3	3.00							
EDW-B013	S-5	10.0'-11.5'	CL	25.4	2.25							
EDW-B013	S-6	15.0'-16.5'	CL	25.5	1.50	41	17	24				
EDW-B013	S-7	20.0'-21.5'	CL	23.5	1.75							
EDW-B013	S-8	25.0'-26.5'	CL	27.7								

Table 7
Summary of Laboratory Test Results – Native Clay Crust

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Direct Shear	
										c' (psf)	phi' (deg)
EDW-B006	S-1	0.0'-1.5'	CL	26.4	2.25						
EDW-B006	S-2	2.5'-5.0'	CL	30.1	1.25						
EDW-B012	S-10	30.0'-31.5'	CL	24.8	1.50						
EDW-B013	S-9	30.0'-31.5'	CL	20.2	0.50						
EDW-B015	S-10	31.0'-33.0'	CL	20.2		24	13	11		193.4	27.6

Table 8

Summary of Laboratory Test Results – Native Clay

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Unconfined Compression	Consolidated Undrained Triaxial				Direct Shear		Hydraulic Conductivity (cm/sec)	Corrosion Suite (ANS Point Rating)	Consolidation, Pc (psf)
										c (psf)	c (psf)	phi (deg)	c' (psf)	phi' (deg)	c' (psf)	phi' (deg)			
EDW-B002	S-10	35.0'-37.0'	CL	31.6		36	18	18		273.46			273.46						
EDW-B002	S-11	40.0'-41.5'	CL	42.9	1.00				2.592										
EDW-B002	S-12	45.0'-46.5'	CL	57.7	0.75														
EDW-B002	S-9	30.0'-30.5'	CL	126.1	<.25														
EDW-B002	S-9A	30.5'-31.5'	CL	31.1	0.50														
EDW-B003	S-10A	36.5'-37.0'	CL	43.0	2.25														
EDW-B003	S-11	40.0'-41.5'	CL	31.6	1.25														
EDW-B003	S-12	45.0'-47.0'	CH	46.0		51	17	34		632.48									2200
EDW-B003	S-13	50.0'-51.5'	CL	55.4	0.50														
EDW-B004	S-11	36.0'-38.0'	CL	20.1		35	17	18		615.04							7.20E-07		
EDW-B004	S-12	40.0'-41.5'	CL	30.0	1.25														
EDW-B004	S-13	45.0'-46.0'	CL	39.5	1.00														
EDW-B004	S-13A	46.0'-46.5'	CL	35.1															
EDW-B004	S-14	50.0'-51.5'	CL	65.2	1.75				2.617										
EDW-B004	S-15	55.0'-56.5'	CL	33.4	1.25														
EDW-B004	S-15A	56.0'-56.5'	ML	13.2															
EDW-B005	S-11	41.0'-43.0'	CH	44.8		57	22	35							262	27.2			
EDW-B005	S-12	45.0'-46.5'	CL	88.7	1.00				2.521									10.0	
EDW-B006	S-10	30.0'-31.0'	CL	43.4	0.50														
EDW-B006	S-10A	31.0'-31.5'	CL	19.6															
EDW-B006	S-3	5.0'-6.5'	CL	24.8	2.25	48	19	29											
EDW-B006	S-4	7.5'-10.0'	CL	26.0	2.50														
EDW-B006	S-5	10.0'-11.5'	CL	34.2	1.25														
EDW-B006	S-6	13.0'-15.0'	CH	31.1		62	20	42							316	23.7			
EDW-B006	S-7	15.0'-16.5'	CL	40.8	1.00														
EDW-B006	S-8	20.0'-21.5'	CL	43.4	0.75														
EDW-B006	S-9	26.0'-28.0'	OH	76.0		72	37	35			666	8.5	396	28.5					
EDW-B008	S-10	35.0'-36.5'	CL	56.9	0.25														
EDW-B008	S-5	11.0'-13.0'	CH	33.6		52	19	33		354									1860
EDW-B008	S-6	15.0'-16.5'	CL	64.6	0.50														
EDW-B008	S-7	20.0'-21.5'	CL	44.4	0.50														
EDW-B008	S-8	24.0'-26.5'	CH	68.9		67	31	36							848	27.3			
EDW-B008	S-9	30.0'-31.5'	CL	71.4	0.50														
EDW-B010	S-10	30.0'-32.0'	CL	30.0		40	15	25							31.8	24.1			
EDW-B010	S-11	35.0'-36.5'	CL	28.2	1.50														
EDW-B011	S-13	40.0'-41.5'	CL	47.9	1.00														
EDW-B011	S-14	45.0'-46.5'	CH	63.3	0.50	63	21	42											
EDW-B011	S-15	50.0'-51.5'	CL	62.5	0.50														
EDW-B011	S-16	55.0'-56.5'	CL	52.9	0.75														
EDW-B012	S-11	35.0'-36.5'	CL	28.3	1.50														
EDW-B012	S-12	40.0'-41.5'	CL	32.2	1.00														
EDW-B012	S-13	45.0'-46.5'	CL	50.2	1.25														
EDW-B012	S-14	47.0'-49.0'	CH	50.8		54	20	34							31.2	26			
EDW-B012	S-15	49.0'-50.5'	CL	67.4	1.00														
EDW-B012	S-16	55.0'-55.5'	CL	50.5	1.75														
EDW-B013	S-10	32.0'-34.0'	CL	33.3		42	23	19			450	11.8	116.6	26.4					
EDW-B013	S-11	34.0'-35.5'	CL	58.0	0.50														
EDW-B013	S-12	40.0'-41.5'	CL	54.5	1.75														
EDW-B013	S-13	45.0'-46.5'	CL	66.2	1.25														
EDW-B014	S-10	35.0'-36.7'	CL	31.6	0.75														
EDW-B014	S-11	40.0'-40.5'	CL	27.3	4.00				2.719										
EDW-B015	S-11	35.0'-36.5'	CL	33.8	1.50														
EDW-B015	S-12	37.0'-39.0'	CH	41.0		66	23	43		1072.18									
EDW-B015	S-13	39.0'-40.5'	CL	36.2	0.50														
EDW-B015	S-14	45.0'-46.5'	CL	49.4	1.00														
EDW-B015	S-15	50.0'-51.0'	CL	30.9	1.50														

Table 9
Summary of Laboratory Test Results – Other Fill Materials

Boring Number	Sample Number	Depth	Material Unit	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index
EDW-B005	S-10	35.0'-36.5'	Historic Ash Fill	CL	37.3	1.00			
EDW-B005	S-8A	26.0'-27.0'	Historic Ash Fill	OL	47.6		44	29	15
EDW-B005	S-9	29.0'-31.0'	Historic Ash Fill		69.3				
EDW-B013	S-1	0.0'-1.5'	Historic Ash Fill	CL	13.6	4.50+			
EDW-B004	S-10	30.0'-31.5'	Historic Fill	CL	19.7	3.75			
EDW-B004	S-6	12.5'-14.0'	Historic Fill	CL	25.4	1.25			
EDW-B004	S-7	15.0'-16.5'	Historic Fill	CL	25.8	2.50			
EDW-B004	S-8	20.0'-21.5'	Historic Fill	CL	31.3	1.00			
EDW-B004	S-9	25.0'-26.0'	Historic Fill	CL	23.0	1.25			
EDW-B004	S-9A	26.0'-26.5'	Historic Fill	SC	19.5	0.75			
EDW-B015	S-1	0.0'-1.5'	Rock Embankment Fill	ML	54.7				
EDW-B015	S-2	2.5'-4.0'	Rock Embankment Fill	SP	4.5				
EDW-B015	S-3	5.0'-6.5'	Rock Embankment Fill	SP	5.4				
EDW-B015	S-4	7.5'-9.0'	Rock Embankment Fill	SP	7.2				
EDW-B015	S-5	10.0'-11.5'	Rock Embankment Fill	SP	6.5				
EDW-B015	S-6	13.0'-14.25'	Rock Embankment Fill	GP	3.6				
EDW-B015	S-7	15.0'-16.5'	Rock Embankment Fill	GP	8.2				
EDW-B015	S-8	20.0'-21.5'	Rock Embankment Fill	GP	7.8				
EDW-B015	S-9	25.0'-26.5'	Rock Embankment Fill	GP	8.1				

Table 10
Summary of Laboratory Test Results – Shale Bedrock

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)
EDW-B002	S-13	50.0'-50.25'	ML	11.1	4.50+
EDW-B003	S-14	55.0'-55.5'	ML	23.3	3.50
EDW-B003	S-14A	55.5'-55.92'	ML	9.8	
EDW-B003	S-15	60.0'-60.25'	ML	7.1	
EDW-B004	S-16	60.0'-60.25'		8.8	
EDW-B005	S-13	50.0'-51.0'	CL-ML	15.9	4.50+
EDW-B005	S-14	51.0'-51.5'		12.8	
EDW-B006	S-11	35.0'-35.42'	ML	14.2	3.50
EDW-B008	S-11	40.0'-40.33'	ML	12.6	3.00
EDW-B010	S-12	40.0'-41.0'	SM	17.0	
EDW-B010	S-13	45.0'-45.25'	CL-ML	16.4	4.50
EDW-B011	S-17	60.0'-60.25'		9.1	
EDW-B012	S-16A	55.5'-56.5'	CL-ML	15.3	4.50
EDW-B012	S-17	60.0'-60.21'	CL-ML	17.9	1.50
EDW-B014	S-11A	40.5'-41.0'	ML	19.6	4.50+
EDW-B014	S-11B	41.0'-41.5'		10.2	
EDW-B014	S-12	45.0'-45.5'	ML	14.5	4.50
EDW-B015	S-16	55.0'-55.5'	ML	11.0	4.25

5. SLOPE STABILITY ANALYSES

Slope stability analyses were performed for varying loading conditions at selected representative embankment cross-sections, as described in the following sub-sections. Development of cross-sections for analysis, soil material properties, and seismic analyses related to the slope stability analysis are also discussed in the following sub-sections.

5.1. Cross-Sections for Analysis

Ten cross sections were identified as representative cross sections for the evaluation of the Ash Pond perimeter embankment slope stability. Cross-sections were selected at various locations around the perimeter embankments based on critical slope orientation, height, and subsurface conditions. The location of each analysis section and the relevant CPT soundings and test borings that were used to develop subsurface stratigraphy are listed in **Table 11** and shown on **Figure 3** (**Attachment A**):

Table 11
Cross Section Locations for Slope Stability Analyses

Cross-Section	Approximate Station	Location (Crest/Toe)	Boring/CPT Number
A	15+00	CREST	EDW-B001, EDW-C001
		TOE	-
B	21+00	CREST	EDW-B010, EDW-C023
		TOE	-
C	31+00	CREST	EDW-C021
		TOE	-
D	40+00	CREST	EDW-B012, EDW-C017
		TOE	-
E	51+00	CREST	EDW-B009, EDW-C015
		TOE	EDW-C016
F	54+00	CREST	EDW-C013
		TOE	EDW-B008, EDW-C014
G	58+00	CREST	EDW-B005, EDW-B013, EDW-C011, EDW-C012
		TOE	EDW-C010
H	60+00	CREST	EDW-B015, EDW-C009
		TOE	-
I	67+00	CREST	EDW-C007
		TOE	EDW-B006, EDW-C008
J	87+00	CREST	EDW-C003
		TOE	-

The surface geometry for each analysis cross-section was determined based on the LiDAR ground surface topographic contours obtained from the Illinois Geospatial Data Clearinghouse (IGDC, 2015), shown on **Figure 3 (Attachment A)**. Additionally, design drawings from "Proposed 150 Car Loop Track For Edwards Power Plant Bartonville, Illinois" by Design Nine, Inc. (2003) were used to supplement the subsurface investigation in developing the subsurface embankment geometry. The phreatic surfaces for each analysis section were estimated based on the normal pool elevations of 447.2 and 449.5 feet for the Clarification Pond and Cooling Pond, respectively, based on the

AECOM hydraulics and hydrology report (AECOM, 2016), and phreatic readings in the piezometers, CPT soundings and borings. The development of the analysis cross-sections is further discussed in **Attachment G**.

5.2. Stability Analysis Conditions Considered

Consistent with the criteria provided in the USEPA CCR Rule § 257.73(e), the stability of the ash pond embankment was evaluated for the following three load cases:

Static, Steady-State, Normal Pool Condition*:* This case models the embankment under static, long-term conditions, at normal water levels within the impoundment. Drained (effective stress) shear strength parameters were used for all materials, and phreatic conditions were estimated based on available piezometer and CPT data. The normal storage pool elevation within the Process Water[2] and Clarification Ponds were modeled at 449.5 ft and 447.2 ft, respectively, based on AECOM's *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016). ***Target Factor of Safety of 1.50.***

Static, Maximum Surcharge Pool Condition: This case models the conditions under short-term surcharge pool conditions; water surface elevations of 457.8 ft and 457.4 ft for the Process Water and Clarification Ponds, respectively, based on AECOM's *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016). Drained (effective stress) shear strength parameters were used for all materials, as the critical surface in the normal pool case was found to be in the downstream slope of the embankment. Due to the relatively large width of the embankment, the increase in pool level does not add driving force to this slip surface and is therefore unlikely to initiate total stress mechanisms of failure. It was assumed that the temporary surcharge load was not of a sufficient duration to significantly alter the phreatic surface (i.e. saturation line within the embankment); although the phreatic surface was increased in the raised fill part of the embankment, where more permeable materials are present. Therefore, the phreatic surface was modeled equivalent in the clay embankment fill and foundation to the steady state case in all cases except cross-section J. In this cross-section, horizontal phreatic surfaces at the elevations noted above were assumed as the section is located several hundred feet from the free water pool in the Cooling Pond. ***Target Factor of Safety of 1.40.***

Seismic Slope Stability Analysis: These analyses incorporate a horizontal seismic coefficient k_h selected to be representative of expected loading during the design earthquake event (i.e., a "pseudostatic" analysis). The analyses utilized peak undrained strengths for all materials. The pool levels and phreatic surface corresponding to the steady state pool from the static analyses were utilized. ***Target Factor of Safety of 1.00***.

Post-Liquefaction Slope Stability Analyses: Soils susceptible to liquefaction were not identified in the embankment or foundation soils at the Ash Pond. Therefore, post-liquefaction conditions were not evaluated.

[2] The Process Water Pond was historically referred to as the Cooling Pond, and may be called the Cooling Pond in the attachments to this report.

5.3. Material Properties

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from CPT and SPT data. The material characterization and development of strength parameters is described further in **Attachment F**.

Unit weights for the materials were evaluated using laboratory test results from relatively undisturbed samples. New embankment fill was conservatively assigned unit weights consistent with the observed material type based on previous experience with similar materials.

Shear strengths for the native alluvial clays and the old embankment fill were evaluated for the normal operating (steady-state) loading condition using results from the consolidated undrained triaxial (CIU) and direct shear (DS) tests, as well as correlations with SPT data. Shear strengths for the native clay crust and the fly ash material for the steady-state loading condition were evaluated using results from DS tests, as well as correlations with SPT data. In general, when assigning lab tests, direct shear tests were assigned for deeper samples and CIU tests were assigned to shallower samples to match the assumed orientation of the slope stability slip surface. For the new embankment fill and the crushed stone (rail loop embankment) materials, where undisturbed Shelby tube samples were not obtained, unit weights and shear strengths were based on published correlations for SPT and CPT data, and previous experience with similar materials.

For the pseudo-static analyses, undrained shear strengths for the old embankment fill and native alluvial clays were developed using CIU and unconfined compression (UC) tests, published correlations for SPT and CPT data, as well as previous experience with similar materials.

The material properties developed for use in slope stability analysis are listed in **Table 12**.

Table 12
Material Properties for Slope Stability Analyses

Material	Total Unit Weight Above and Below Water Table (pcf)	Effective (Drained) Shear Strength Parameters		Total (Undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	200	30	2500	0
Old Embankment 1	125	200	28	2500	0
Old Embankment 2	125	100	29	1250	0
Native Clay Crust	120	200	27.5	1250	0
Native Clay 1	117	100	26	650	0
Native Clay 2	105	200	26	700	0
Native Clay 3	105	200	26	900	0
Impounded Ash	105	100	27	600	0
Historic Ash	105	100	26	750	0
Historic Fill	125	200	28	1000	0
Recent Fill	115	200	30	1250	0
GP (Very Dense)	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	0	32	0	32
Bedrock - Shale	140	1000	36	1000	36

5.4. Methodology of Analyses

Limit equilibrium stability analyses were completed using the two-dimensional SLOPE/W 2012 (v. 8.15.4.11512 by GeoStudio) computer program. Factors of safety were calculated with Spencer's method using circular search routines with optimization to develop non-circular sliding surfaces through lower-strength layers which may represent a lower factor of safety than circular sliding surfaces. Slip surfaces which intersected the embankment crest and could result in a release of CCR materials were analyzed. Pore pressures were assigned as hydrostatic pressures under the phreatic surface.

A brief summary of the analyses is presented in the following sections. A more detailed discussion is provided in **Attachment G**.

5.4.1. Static Analysis Conditions

Static stability was evaluated for steady-state conditions using both the normal pool elevation and the maximum flood surcharge pool elevation. The normal pool elevation of 449.5 feet and surcharge pool elevation of 457.8 ft was used for the northern portion of the site (Cross-Sections A, B, and J). A normal pool elevation of 447.2 feet and surcharge pool elevation of 457.4 ft was used for the southern portion of the site (Cross-Sections C, D, E, F, G, H, and I). All elevations were taken from the 2016 AECOM *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016).

5.4.2. Earthquake Analysis Conditions

Earthquake ground motions at the site were developed using simplified procedures, as described in the following sub-sections.

5.4.3. Determination of Ground Motion Parameters

Seismic ground motions were estimated using the United States Geological Survey (USGS) 2008 Interactive Deaggregation tool (http:earthquake.usgs.gov/hazards/apps/). This application generates acceleration values, including peak ground acceleration (PGA) for top of rock, and mean and modal moment magnitudes based on user entered values of location, exceedance probability, and spectral period. Results are computed based on the 2008 National Seismic Hazard Mapping Project (NSHMP) Probabilistic Seismic Hazard Analysis (PSHA) Maps.

For the Edwards Power Station, the calculated PGA for an event with a probability of exceedance of 2% in 50 years (approximately a 2,500 year average return period) was 0.067g at the top of hard rock. To estimate the free-field, ground surface horizontal acceleration, the site was classified according to the site classes defined in International Building Code (IBC, 2003) and amplified using the site amplification factors found in National Earthquake Hazards Reduction Program (NEHRP, 2009). The site class was determined based on the weighted average of the shear wave velocity of the upper 100 feet of the stratigraphic profile and found to be Site Class D ($600 \leq Vs \leq 1{,}200$ ft/sec). This corresponds to a NEHRP amplification factor of 1.6, resulting in a ground surface acceleration of 0.107g. The Peak Transverse Acceleration at the dike crest was estimated using the ground surface acceleration and the procedure proposed by Idriss (2015), resulting in a peak crest acceleration of 0.32g. Details of the estimation of ground motion parameters are included in **Attachment G**.

5.4.4. Seismic Coefficient

The horizontal acceleration (k_h) calculated for use in the pseudostatic slope stability analysis was based on the simplified procedure developed by Makdisi and Seed (1978). For the estimated peak crest acceleration value of 0.32g and the full-height critical slip surfaces that were identified in the analyses (presented in **Attachment G**), a seismic coefficient of 0.109g was estimated for k_h in the pseudostatic analysis.

5.4.5. Liquefaction Triggering Analysis

Liquefaction is used to describe the contraction of coarse-grained (i.e. cohesionless) sand and gravel soils under cyclic loading imposed by earthquake shaking. The result is a reduction in the effective confining stress within the soil and an associated loss of strength (Idriss and Boulanger 2008). Liquefaction only occurs in saturated soils. Liquefaction susceptibility also largely depends on compositional characteristics such as particle size, shape, and gradation; however, laboratory and field observations also indicate that plasticity characteristics influence liquefaction susceptibility (Kramer 1996). Idriss and Boulanger (2008) suggested that soils with a plasticity index (PI) greater than about 7 are not susceptible to liquefaction.

AECOM's field exploration did not encounter cohesionless soils in the embankment or foundation of the Ash Pond. Only cohesive soils were encountered by AECOM, and out of the 52 Atterberg limit tests performed, all but one sample had a PI of above 7. This means that the soils encountered in AECOM's field exploration are not susceptible to liquefaction. Consequently, a formal liquefaction analysis was determined to be unnecessary as the embankment and foundation soils at the site are not susceptible to liquefaction based on their composition and observed index properties. Due to the generally medium stiff to stiff nature of the embankment and foundation clays, and the relatively low seismicity at the site, the embankment and foundation soils are also unlikely to be susceptible to cyclic softening.

6. RESULTS

6.1. Results of Static Stability Analyses

The results of the limit equilibrium slope stability analyses for the static load cases are summarized in **Table 13**. The Slope/W output figures showing the critical slip surfaces and details of the analyses are included in **Attachment G.1**.

Table 13
Summary of Minimum Slope Stability Factors of Safety for Static Load Cases

Load Case	Program Criteria	Section									
		A	B	C	D	E	F	G	H	I	J
Steady State (Normal Pool)	FS≥1.50	2.02	1.59	1.83	1.79	1.54	2.31	2.12	2.08	2.26	2.08
Surcharge Pool (Flood Pool)	FS≥1.40	2.02	1.59	1.82	1.79	1.54	2.31	2.12	2.08	2.26	2.00

6.2. Results of Earthquake Stability Analyses

6.2.2. Seismic Stability Analysis

The results of the slope stability analyses for the seismic load cases are summarized in **Table 14**. The Slope/W output figures showing the critical slip surfaces and details of the analyses are included in **Attachment G.1**.

Table 14
Summary of Minimum Slope Stability Factors of Safety for Earthquake Load Cases

Load Case	Program Criteria	Section									
		A	B	C	D	E	F	G	H	I	J
Seismic (Pseudostatic)	FS ≥ 1.00	1.37	1.28	1.09	1.18	1.11	1.08	1.13	1.08	1.30	2.08

7. CONCLUSIONS

The calculated factors of safety from the limit equilibrium slope stability analysis satisfy the USEPA CCR Rule § 257.73(e) requirements for each loading condition at all of the analysis sections that represent the embankments of Ash Pond at the Edwards Power Station. Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool and seismic (pseudo-static).

8. LIMITATIONS

Background information, design basis, and other data have been furnished to AECOM by IPRG. AECOM has used this data in preparing this report. AECOM has relied on this information as furnished, and is not responsible for the accuracy of this information.

Borings have been spaced as closely as economically feasible, but variations in soil properties between borings, that may become evident at a later date, are possible. The conclusions developed in this report are based on the assumption that the subsurface soil, rock, and phreatic conditions do not deviate appreciably from those encountered in the site-specific exploratory borings. If any variations or undesirable conditions are encountered in any future exploration, we should be notified so that additional analyses can be made, if necessary.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as provided by IPRG. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the changes, and revise the report if necessary.

This geotechnical investigation was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the geological and geotechnical engineering profession. The conclusions presented in this report are professional opinions based on the

indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

9. REFERENCES

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Attachment A. Figures

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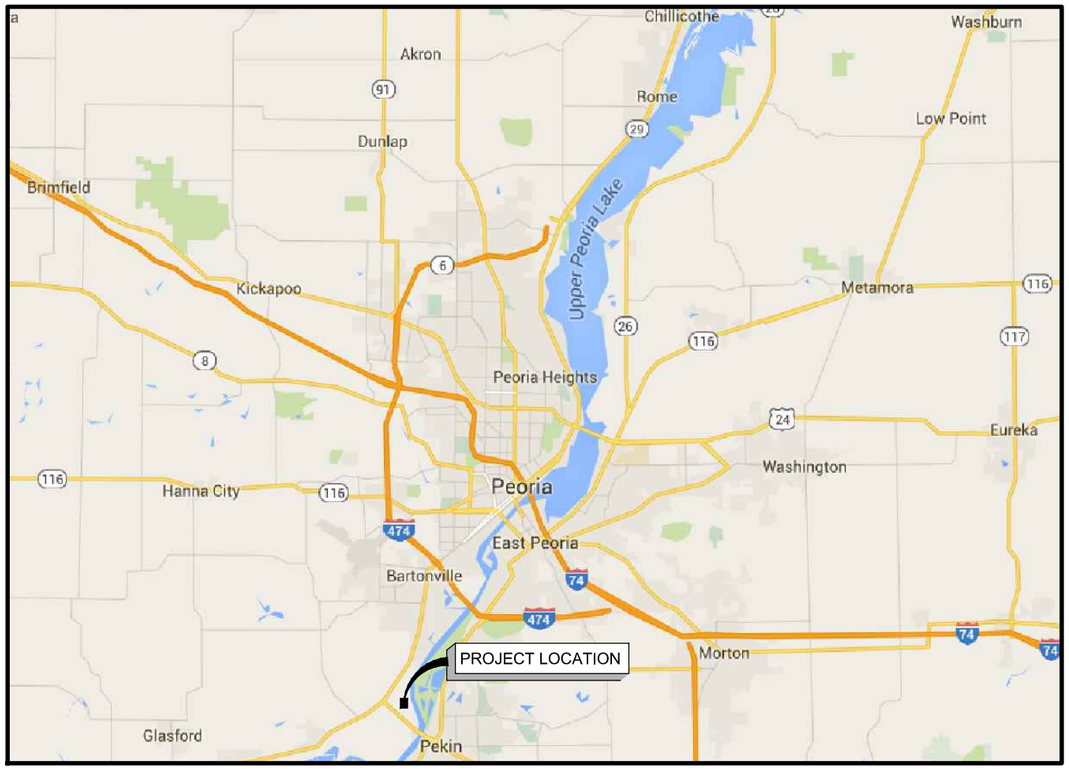
AECOM DRAWING PATH: K:\Projects\60427894--Dynegy\900--WORKING DOCS--CAD\902--SHEETS\30% Design Sheets_Edwards\EDW 1 LOCATION PLAN.dwg



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

AERIAL FROM GOOGLE EARTH PRO
MAP FROM GOOGLE

AECOM
558 N Main Street
Oshkosh, Wisconsin
920 235-0270 (phone)
920 235-0321 (fax)

DYNEGY
Dynegy Inc.
1500 East Port Plaza Drive
Collinsville, IL 62234

CCR RULE ASSESSMENT
OF PLANTS

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

GEOTECHNICAL
REPORT
ASH POND

ISSUED FOR BIDDING — DATE BY

ISSUED FOR CONSTRUCTION — DATE BY

REVISIONS

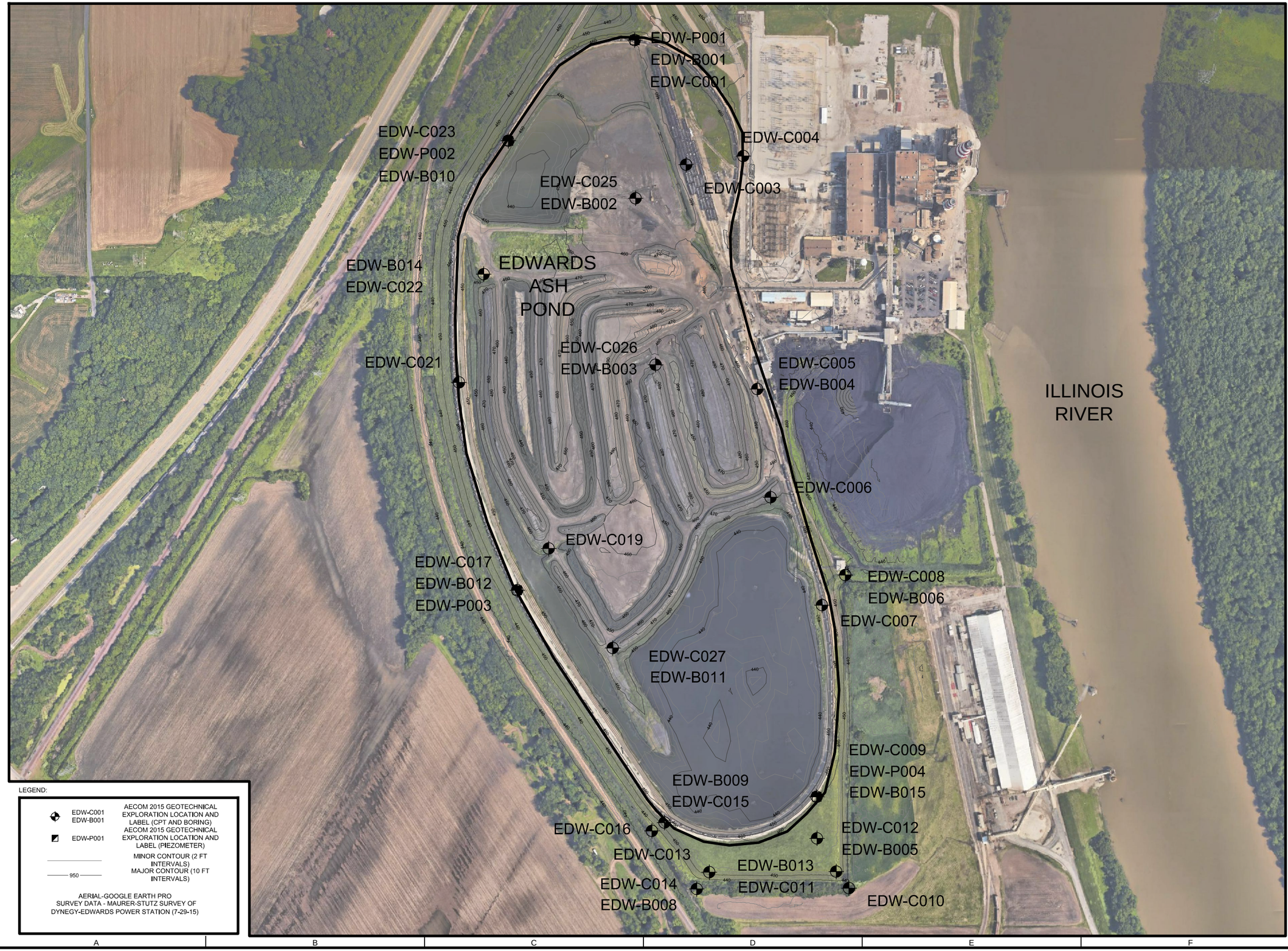
NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60440742
DRAWN BY:	TPB
DESIGNED BY:	_
CHECKED BY:	_
DATE CREATED:	2/17/2016
PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

LOCATION MAP AND
SITE VICINITY MAP

Figure 1



LEGEND:

EDW-C001 / EDW-B001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (CPT AND BORING)
EDW-P001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (PIEZOMETER)
	MINOR CONTOUR (2 FT INTERVALS)
950	MAJOR CONTOUR (10 FT INTERVALS)

AERIAL-GOOGLE EARTH PRO
SURVEY DATA - MAURER-STUTZ SURVEY OF
DYNEGY-EDWARDS POWER STATION (7-29-15)

AECOM
558 N Main Street
Oshkosh, Wisconsin
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DYNEGY
Dynegy Inc.
1500 East Port Plaza Drive
Collinsville, IL 62234

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

N

0 300 600

SCALE IN FEET

ISSUED FOR BIDDING DATE BY

ISSUED FOR CONSTRUCTION DATE BY

REVISIONS

NO.	DESCRIPTION	DATE
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△		

AECOM PROJECT NO:	60440742
DRAWN BY:	TPB
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CHECKED BY:	_
DATE CREATED:	2/17/2016
PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

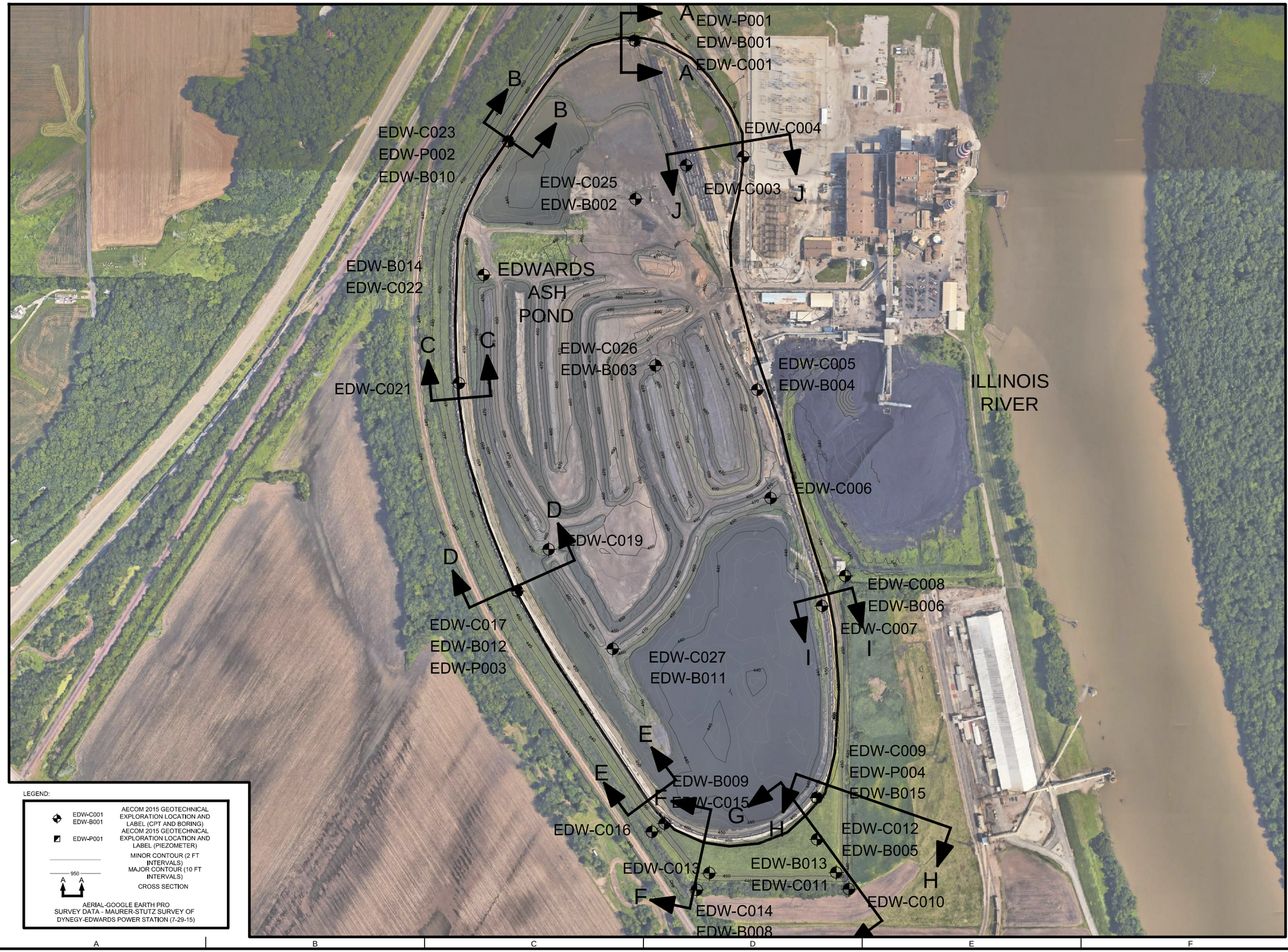
SHEET TITLE

OVERALL
GEOTECHNICAL
SITE PLAN

Figure 2

AECOM DRAWING PATH: K:\Projects\60427894-Dynegy\900-WORKING DOCS-CAD\902-SHEETS\30% Design Sheets_Edwards\EDW 2-1 OVERALL GEOTECHNICAL SITE PLAN.dwg

BRAND, TRAVIS, 10/3/2016 10:09 AM



AECOM
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1500 East Port Plaza Drive
Collinsville, IL 62234

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

N

SCALE IN FEET

ISSUED FOR BIDDING	DATE	BY
ISSUED FOR CONSTRUCTION	DATE	BY

REVISIONS

NO.	DESCRIPTION	DATE
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AECOM PROJECT NO:	60440742
DRAWN BY:	TPB
DESIGNED BY:	_
CHECKED BY:	_
DATE CREATED:	2/17/2016
PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

ASH POND
GEOTECHNICAL
SITE PLAN

Figure 3

AECOM DRAWING PATH: K:\Projects\60427894-Dynegy\900-WORKING DOCS-CAD\902-SHEETS\30% Design Sheets_Edwards\EDW 2-2 ASH POND GEOTECHNICAL SITE PLAN.dwg
BRAND, TRAVIS, 10/3/2016 10:13 AM

Attachment B. Boring Logs

Project:	EDWARDS POWER STATION
Project Location:	BARTONVILLE, ILLINOIS
Project Number:	60440202

Key to Soil Boring Logs

Sheet 1 of 1

	Graphic Symbol	Description	USCS Classification
SAND AND GRAVEL		SAND poorly graded	SP
		SAND well graded	SW
		Silty SAND	SM
		Clayey SAND	SC
		GRAVEL poorly graded	GP
LOW PLASTIC SILTS AND CLAYS		Inorganic low plastic SILT	ML
		Inorganic low plastic CLAY	CL
		Inorganic low plastic SILTY–CLAY	CL–ML
HIGH PLASTIC SILT AND CLAYS		Inorganic high plastic CLAY	CH
		Sandy Inorganic high plastic CLAY	CH
		Inorganic elastic SILT	MH
SURFACE MATERIALS		Asphalt, Pavement	
		Topsoil	
		Gravel Limestone	
		Fly Ash	
		Bottom Ash	
		Fill	

TERMS DESCRIBING DENSITY OR CONSISTENCY

Coarse grained soils (major portion retained on No. 200 sieve) include gravels and sands. Density is based on the Standard Penetration Test (SPT).

Density	SPT blows per foot
Very loose	0 – 5
Loose	5 – 10
Medium dense	10 – 30
Dense	30 – 50
Very dense	Greater than 50

Fine grained soils (major portion passing No. 200 sieve) include clays and silts. Consistency is rated according to shearing strength, as indicated by uncorrected SPT blows per foot.

Descriptive Term	SPT blows per foot	Estimated undrained shear strength (ksf)	Hand Test
Very soft	0–2	< 0.25	Extrudes between fingers
Soft	2–4	0.25–0.5	Molded by slight pressure
Medium stiff	4–8	0.5–1.0	Molded by strong pressure
Stiff	8–15	1.0–2.0	Indented by thumb
Very stiff	15–30	2.0–4.0	Indented by thumbnail
Hard	> 30	> 4.0	Difficult to indent

LEGEND AND NOMENCLATURE

Standard penetration split spoon test sample

Undisturbed shelby tube sample

PP qu	Pocket penetrometer unconfined compressive strength
NMC	Natural Moisture Content, %
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
NP	Non–plastic
▽	Depth Groundwater enters at time of drilling.
▼	Groundwater Level at some specified time after drilling
Su	Undrained Shear Strength
TXUU	Triaxial Unconsolidated Undrained
DTW	Depth to water
N/A	Not Applicable

SAMPLING RESISTANCE

P	Sample pushed by hydraulic rig action.
3 6 9	Numbers indicate blows per 6 in. of sampler penetration. Standard penetration test sampler, (2–in O.D.) and oversize penetration sample (3–in O.D.) are driven by a 140 lb hammer falling freely 30–in
50/2	Number of blows (50) used to drive a penetration sampler a certain number of inches (2)
WOH	Weight of hammer
WOR	Weight of rods

ABBREVIATIONS USED UNDER "REMARKS"

HSA	Hollow Stem Auger	No.	Number
ATD	At Time of Drilling	CIU	Isotropically Consolidated Undrained
AD	After Drilling	ST	Shelby Tube
ID	Inside Diameter	SS	Split Spoon
OD	Outside Diameter		
RQD	Rock Quality Designation		
-#200	(% Pass #200 Sieve)		
Sa (%)	Sieve Analysis (% Passing #200)		

File: P:\RESOURCES\GINTDATA\GINT\GEOTECHNICAL\BORING KEY LOGS\DYNEGY GEO KEY.DWG Last edited: DEC. 16, 15 @ 09:38 a.m. by: david_deguire

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Sheet 1 of 2

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	NDS
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	51.0 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	461.0 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					461.0 / 0.0								
460		SS-1	2 6 8	61		Stiff, dry, gray mottled with brown, lean CLAY (CL).					3.0			
						458.5 / 2.5								
		SS-2	3 4 5	94		Stiff, moist, brown mottled with gray and black, lean CLAY (CL), trace shell fragments.					3.0			
	5													
455		SS-3	3 3 3	75		Becomes medium stiff.					1.0			
		ST-4	200 psi	100										*Pushed shelby tube from 7.0 to 9.0 feet*
	10					451.0 / 10.0								
450		SS-5	3 3 6	83		Stiff, moist, grayish black, lean CLAY (CL), trace organics.					1.0 1.5			
	15													
445		SS-6	1 3 5	78							1.25			
	20					441.0 / 20.0								
440		SS-7	1 6 7	100		Stiff, moist, very dark gray to grayish black with some brown, lean CLAY (CL).					1.5 2.5			
	25					436.0 / 25.0								
435		SS-8	WOH WOH 2	100		Very soft, wet, brown mottled with gray, sandy lean CLAY (CL).					1.0 0.5			
	30					431.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:36 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	150 psi	100		Soft, wet, gray, silty lean CLAY (CL-ML).					1.25			*Pushed shelby tube from 30.0 to 32.0 feet*
						426.0 / 35.0								
425	35	SS-10	2 2 4	100		Loose, wet, gray, silty SAND (SM), trace wood fragments. 425.2 / 35.8					0.5 1.0			
						Medium stiff, moist, gray, lean CLAY (CL).								
420	40	SS-11	50/3"	100		421.0 / 40.0 CLAYSTONE: Brown and gray, weathered, hard.								
415	45	SS-12	50/2"			415.0 / 46.0 SILTSTONE: Thin to medium bedding, fresh, argillaceous.								*Run 1 - Start 13:46, End 14:00*
		Run 1	16.7	36.7										
410	50					410.0 / 51.0 End of Boring at 51 ft								*Boring backfilled with Portland Cement and bentonite*
405	55													
400	60													
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:36 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	52.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	454.9 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	7 6 8	89		454.9 / 0.0 Medium dense, moist, dark brown, FLY ASH [Fill].	38.4							
						452.4 / 2.5								
		SS-1	3 2 2	100		Loose, moist, dark gray, FLY ASH [Fill].	62.4							
450	5	ST-3	150 psi	62.5			66.6		65	29				*Pushed shelby tube from 5.0 to 7.0 feet*
						447.4 / ▽ 7.5								
		SS-4	WOR	100		Very loose, wet, black, FLY ASH [Fill].	79.0							
445	10	ST-5		55			76.9	90.8 94.3 91.2	17	NP				*10.0 feet switch to mud rotary* *Pushed shelby tube from 10.0 to 12.0 feet*
						Becomes dark gray.								
						Hard layer at tip of tube.								
440	15	SS-6	1 2 3	100		Becomes loose.	52.5							
435	20	SS-7	12 17 2	37		434.9 / 20.0 Medium dense, wet, dark gray, FLY ASH [Fill], with cementous layers.	67.8							
430	25					429.9 / 25.0								
		SS-8	1 WOH WOH	100		Very loose, wet, dark gray, FLY ASH [Fill].	63.9							
425	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:42 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	WOR WOH WOH	100		424.4 / 30.5 With clay. Very soft, wet, brown, lean CLAY (CL), with sand.	126.1 31.1				0.5			
420	35	ST-10	100 psi	100		419.9 / 35.0 Very soft, gray, lean CLAY (CL), with sand, trace shells.	31.6		36	18	0.25			
415	40	SS-11	WOH WOH WOH	100			42.9				0.75			
410	45	SS-12	WOH WOH 2	100		Grades with trace organics.	57.7				0.25			
						407.9 / 47.0 SHALE: Light gray, silt sized.								
405	50	SS-13	50/3"	100			11.1							
						402.4 / 52.5 End of Boring at 52.5 ft								*Boring backfilled with bentonite and cement fluid*
400	55													
395	60													
390	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:42 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	7 7 7	83		460.0 / 0.0 Medium dense, moist, dark gray, FLY ASH [Fill].	44.4							
		SS-2	3 2 2	100		Becomes loose.	27.3							
455	5	SS-3	1 WOH 2			455.0 / 5.0 Very soft, moist, lean CLAY (CL) with ash, sand, and organics.	37.2							
						▽ 452.5 / 7.5								
		ST-4	<100 psi	100		Ash, dark gray [Fill].	55.5							*Pushed shelby tube from 7.5 to 9.5 feet*
450	10	SS-5	WOR WOR WOR	67			50.6							*10.0 feet: Switch to mud rotary*
						447.0 / 13.0 Very dense, dark gray, moist, fine to coarse ASH with sand and gravel, slightly cemented [Fill].								*13.0 feet: Hard drilling*
445	15	SS-6	26 37 29	100			29.7							
						Becomes very loose, dark gray, fine.								
440	20	SS-7	1 1 1	100			42.1							
435	25	ST-8	100 psi	100		Grades with sand.	54.9							*Pushed shelby tube from 25.0 to 27.0 feet*
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:48 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST-9	100 psi	100		Varved FLY ASH [Fill].	71.7	91.2 92.9 92.0						*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS-10	WOR WOR WOR	100		423.5 / 36.5	51.9 43.0							
						Very soft, moist, brown to gray, silty CLAY (CL), trace sand, shells, and organics.								
420	40	SS-11	WOH WOH WOR	100			31.6				.75			
415	45	ST-12	100 psi	100		415.0 / 45.0 Soft, moist, dark gray, fat CLAY (CH) with sand.	46.0				1.0			*Pushed shelby tube from 45.0 to 47.0 feet*
410	50	SS-13	1 2 3	100		410.0 / 50.0 Medium stiff, moist, brownish to greenish, gray, lean CLAY (CL), with sand.	55.4				1.0			
						406.0 / 54.0 SHALE, gray, weathered, silt sized.								
405	55	SS-14	11 50/5"	100			23.3 9.8							
400	60	SS-15	50/3"	100		399.5 / 60.5 End of Boring at 60.5 ft	7.1							*Boring backfilled with bentonite and cement fluid*
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:48 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003A

Sheet 1 of 1

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	9.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' East of EDW-B003 (ft NAD83)	Groundwater Level(s)	7 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0					Elevation (feet) 460.0 / Depth (feet) 0.0 Offset boring to attempt shelby tube at 7.5 feet								
455	5													
		ST-1		0										*Pushed shelby tube from 7.5 to 9.5 feet*
						450.5 / 9.5 End of Boring at 9.5 ft								*Boring backfilled with bentonite and cement fluid*
450	10													
445	15													
440	20													
435	25													
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:54 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.5 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					460.5 / 0.0								
460		SS-1	16 12 15	83		460.0 6" stone at surface [Fill]. 0.5 Medium dense, moist, dark gray, ASH [Fill].	18.9							
		SS-2	3 2 2	100		457.0 3.5 Becomes dark gray to dark brown, trace silty clay, sand and gravel [Fill].	28.5 20.1							
	5													
455		SS-3	2 2 4	77							1.25			
		SS-4	2 3 4	100			21.6				2.0			
	10													
450		SS-5	2 2 2	67			21.5				2.0			*10.0 feet: Switch to mud rotary*
		SS-6	2 2 2	100		448.0 12.5 Soft, wet, brown mottled, silty CLAY (CL), trace sand and gravel.	25.4				1.25			
	15													
445		SS-7	2 3 3	77			25.8				1.25			
	20													
440		SS-8	WOH 2 3	89		Grades brown, with sand.	31.3				.75			
	25													
435		SS-9	2 2 3	89		434.5 26.0 434.0 Medium stiff, wet, brown, clayey SAND (SC). 26.5 Medium stiff, wet, dark gray to gray, silty CLAY (CL), trace sand.	23.0 19.5							
	30					430.5 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:57 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Elevation (feet)	Depth (feet)	SAMPLES Type Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	SS-10	2 7 6	89		Stiff, gray, wet, lean CLAY (CL), with sand, and organics.	19.7				4.0			
						425.5 / 35.0								
425	35	ST-11		100		Stiff, wet, gray mottled, lean CLAY (CL) with sand.	20.1				1.25			*Pushed shelby tube from 36.0 to 38.0 feet*
						420.5 / 40.0								
420	40	SS-12	2 3 3	89		Stiff, wet, brown mottled, lean CLAY (CL), trace sand.	30.0				1.75			
						415.5 / 45.0								
415	45	SS-13	2 3 5	83		Medium stiff, wet, dark gray, lean CLAY (CL).	39.5 35.1				1.25			
						410.5 / 50.0								
410	50	SS-14	2 2 3	100		Medium, stiff, wet, gray, lean CLAY (CL) with sand, trace shells and organics.	65.2				1.25			
405	55	SS-15	3 8 23			404.5 / 56.0 SHALE: Light gray, weathered.	33.4 13.2							*56.5 to 60.0 feet: Solid drilling*
						400.5 / 60.0								
400	60	SS-16	50/3"	100		End of Boring at 60.3 ft	8.8							*Boring backfilled with bentonite and cement fluid*
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:57 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	8 ft on 9/10/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	4 4 5	95		459.0 / 0.0 Medium, stiff, moist, brown, clayey SAND (SC), trace gravel, topsoil, roots and fill.	45.8				2.0			
						456.5 / 2.5								
		SS-2	9 15 11	100		Medium dense, moist, brown, sandy SILT (ML) with gravel.	26.0							
455														
	5	SS-3	2 2 2	100		454.0 / 5.0 Loose, moist, brown, sandy elastic SILT (MH) with clay.	50.9				1.8			
						451.0 / ▽ 8.0								
		SS-4		100		Loose, wet, brown, sandy SILT (ML) with gravel.	37.4							
450														
	10	SS-5	1 2 5	100		449.0 / 10.0 Medium stiff, wet, light brown and gray, clayey SAND (SC) with gravel.	44.3							*10.0 feet: Switch to mud rotary*
445														
	15	SS-6	2 8 10	100		444.0 / 15.0 Very stiff, wet, brown, sand SILT (ML) with gravel.	41.4							
440														
	20	SS-7	1 1 1	100		439.0 / 20.0 Soft, wet, brown, gravelly CLAY (CL), trace sand.	51.1							
435														
	25	SS-8	2"	100		432.5 / 26.5 Very loose, wet, dark brown ASH [Fill].	55.3 47.6							
430														
	30	SS-9		100			69.3							

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:03 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9		100			69.3							
425														
	35	SS-10	WOR WOH WOH	67		424.0 / 35.0 Very loose, wet, black, ASH, with organic clay [Fill].	37.3							
						421.0 / 38.0 Soft, wet, gray, fat CLAY (CH), trace sand, shells, and organics.								
420	40	ST-11	150 psi	100			44.8		57	35				*Pushed shelby tube from 41.0 to 43.0 feet*
415														
	45	SS-12	WOH 2 2	100		414.0 / 45.0 Soft, wet, dark gray and greenish gray, lean CLAY (CL), with sand, organics and shale.	88.7							
410						409.5 / 49.5 SHALE: light gray, weathered.								
	50	SS-13	11 18 44	89			15.9 12.8							
405						406.0 / 53.0 End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:03 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Date(s) Drilled	09/08/2015 to 09/08/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	37.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	436.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	3 4 6	94		436.0 / 0.0 Stiff, moist, dark brown, lean CLAY (CL) with sand and glass.	26.4				3.0			
435						433.5 / 2.5								
		SS-2	3 3 3	67		Medium stiff, brown to dark brown lean CLAY (CL), trace sand.	30.1				1.25			
	5					431.0 / 5.0								
430		SS-3	2 3 4	100		Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	24.8		48	29	2.0			
		SS-4	3 4 4	100			26.0				1.5			
	10	SS-5	1 2 1	100		Becomes soft.	34.2				1.0			*10.0 feet: Switch to mud rotary*
425						423.0 / 13.0								*Pushed shelby tube from 12.0 to 14.0 feet*
		ST-6		100		Soft, moist, gray fat CLAY (CH) with sand and shells.	31.1		62	42	1.25			
	15	SS-7	1 1 1	100		421.0 / 15.0 Soft, moist, brownish gray, lean CLAY (CL).	40.8				1.0			
420														
	20	SS-8	WOH WOH 1	100		Becomes very soft, brown and gray, with sand.	43.4				0.75			
415														
	25													
410		ST-9		100		410.0 / 26.0 Very soft, moist, dark gray, organic SILT (OH).	76.0		72	35	0.75			*Pushed shelby tube from 26.0 to 28.0 feet*
	30					406.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:09 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
405	30	SS-10		89		Very soft, moist, gray lean CLAY (CL) with sand, pockets of organics. 405.0 / 31.0	43.4 19.6				0.75			
						Very soft, moist, grayish brown, lean CLAY (CL) with sand, silt, and organics. 403.0 / 33.0								
						SHALE: light gray, weathered.								
400	35	SS-11		84			14.2							
						399.0 / 37.0 End of Boring at 37 ft								*Boring backfilled with bentonite and cement fluid*
395	40													
390	45													
385	50													
380	55													
375	60													
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:09 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Date(s) Drilled	09/13/2015 to 09/13/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	42.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	438.8 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	3 4 4	100		438.8 / 0.0 Stiff, moist, brown, lean CLAY (CL) with sand and gravel, trace roots.	13.2				4.0			
		SS-2	3 4 6	100			19.5		42	20	4.25			
435	5	SS-3	2 3 5	67		Becomes medium stiff.	42.3				2.0			
		SS-4	1 3 2	89		431.3 / 7.5 Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	22.8				2.5			
430	10	ST-5	150 psi	85		427.8 / 11.0 Medium stiff, moist, brown and gray fat CLAY (CH), trace sand.	33.6		52	33	0.75			*10.0 feet: Switch to mud rotary*
425	15	SS-6	WOH 1 1	100		423.8 / 15.0 Soft, moist, dark brown, lean CLAY (CL), trace shells.	64.6				0.75			
420	20	SS-7	WOH WOH WOH	100		Becomes very soft.	44.4				0.75			
415	25	ST-8	150 psi			414.8 / 24.0 Very soft, moist, dark gray, fat CLAY (CL), trace organics.	68.9		67	36	1.0			
410	30					408.8 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:15 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	WOH WOH WOH	100		Very soft, moist, gray and brownish gray, lean CLAY (CL), trace sand.	71.4				0.5			
405	35	SS-10	WOH WOH WOH	100		Trace wood, organics, and shells.	56.9				0.75			
400						399.8 / 39.0 SHALE: Light gray, slightly weathered.								
	40	SS-11	66/4"	100			12.6							*40.0 to 42.5 feet: Solid drilling*
395	45					396.3 / 42.5 End of Boring at 42.5 ft								*Boring backfilled with bentonite and cement fluid*
390	50													
385	55													
380	60													
375	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:15 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	66.5 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	460.1 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	11 13 15	100		460.1 / 0.0 459.6 / 0.5 Medium dense, moist, brown silty SAND (SM).					1.0 1.25			
						Very stiff, moist, gray and brown, sandy SILT (ML).								
		SS-2	2 1 1	67		457.6 / 2.5 Soft, dry, gray and brown sandy SILT (ML)					0.25			
455	5					455.6 / 4.5 Concrete from 4.5 to 5.5 [Fill].								
		SS-3	5 2 5	11		454.6 / 5.5 Light brown, well graded GRAVEL (GW).								*5.5 feet: Limestone cobbles*
		SS-4	5 4 4	89		452.6 / 7.5 Stiff, dry, brownish gray, silty SAND with GRAVEL (SM). 451.6 / 8.5					1.0			
450	10					Medium dense, moist, black, sandy SILT (ML).								
		ST-5	250 psi	75		449.1 / 11.0 Medium stiff, moist, brownish gray, lean CLAY (CL).					1.5			*Pushed shelby tube from 11.0 to 13.0 feet* *Trace gravel in top of tube*
445	15	SS-6	1 5 5	89		445.1 / 15.0 Medium dense, moist, brown mottled with reddish brown, lean CLAY (CL).					2.0			
440	20	SS-7	WOH 2 4	94		440.1 / 20.0 Very soft to medium dense, moist to wet, gray, lean CLAY (CL) with shell and wood fragments.					1.0			
435	25	SS-8	WOH WOH 3	100		435.1 / 25.0 Very soft to soft, wet, gray, lean CLAY (CL) with shell fragments.					0.5 1.0			
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:20 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	SS-9	WOH 7 7	100		429.6 / 30.5 Stiff, dry, black, lean CLAY (CL), low plasticity.					1.0 1.25			
425	35	ST-10	125 psi	100		Becomes gray.					1.0			*Pushed shelby tube from 35.0 to 37.0 feet*
420	40	SS-11	WOH WOH 4	100		420.1 / 40.0 Soft, moist to wet, gray, lean CLAY (CL) with shell fragments, low to medium plasticity.					0.5			
415	45	SS-12	WOH 1 4	100							1.0			
410	50	SS-13	WOH WOH WOH	100		410.1 / 50.0 Very soft, wet, gray, SILT (ML) with shell fragments, low plasticity.					1.0			
405	55	SS-14	WOH WOH 17	100		404.1 / 56.0 Medium dense, wet, gray, fine to coarse clayey GRAVEL (GC), trace fine to coarse sand, reddish brown gravel.					3.0			
400	60	SS-15	50/3"	17		400.1 / 60.0 CLAYSTONE: Gray.								*61.5 feet: Run 1 - Start 7:57, End 8:10*
		Run 1	0	0										
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:20 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395		Run 1	0	0		Elevation (feet) 393.6 / Depth (feet) 66.5: End of Boring at 66.5 ft								
390	70													
385	75													
380	80													
375	85													
370	90													
365	95													
	100													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:21 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Date(s) Drilled	09/04/2015 to 09/04/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459.0	0					459.0 / 0.0								
		SS-1	10 6 10	56		458.5 / 0.5 Medium dense, moist, brown, SAND (SP) with gravel and clay.	7.2							
						Medium dense, moist, dark gray, fine to coarse ASH [Fill].	17.4 27.9							
		SS-2	9 8 8	83			20.9 30.7							
455	5	SS-3	3 6 4	100			14.8							
						451.5 / 7.5								
		SS-4	3 3 6	78		Stiff, moist, brown lean CLAY (CL), trace sand and gravel.	22.0							
450	10	SS-5	2 3 4	78		449.0 / 10.0 Medium stiff, moist, brown and mottled gray, lean CLAY (CL), trace sand.	24.0							
		SS-6	2 2 3	78			28.0							*12.0 feet: Switch to mud rotary*
445	15	ST-7	250 psi	83			30.5		48	30				*Pushed shelby tube from 15.0 to 17.0 feet*
						440.0 / 19.0								
440	20	SS-8	1 1 1	83		Soft, wet, gray, lean CLAY (CL), trace sand and shells.	32.9							
435	25	SS-6	WOH WOH 3	89			21.4							
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:29 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	ST-10		72			30.0	117.6 118.9 118.6	40	25				*Pushed shelby tube from 30.0 to 32.0 feet*
425														
	35	SS-11	1 2 3	94		Becomes medium stiff.	28.2							
420														
	40	SS-12	6 7 50/3.5"	83		419.0 / 40.0 Medium dense, wet, brown, fine to coarse silty SAND (SP) with gravel. 418.0 / 41.0 SHALE: Light gray, weathered.	17.0							*41.0 to 43.0 feet: Hard drilling*
415														
	45	SS-13	50/3"	35		413.8 / 45.3 End of Boring at 45.25 ft	16.4							*Boring backfilled with bentonite and cement fluid*
410														
	50													
405														
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:29 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	62.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456.4 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) 456.4 / Depth (feet) 0.0								
	0	SS-1	9 12 12	89		Medium dense, moist, dark gray, ASH [Fill].	27.7							
455		SS-2	8 9 14	100			16.3							
	5	SS-3	6 9 9	94			29.4							
450		SS-4	2 1 1	100		Becomes loose, wet. ▽	45.3							
	10	SS-5		84			70.0							*10.0 feet: Switch to mud rotary*
445														
	15	SS-6	WOR WOR WOR WOR	100		Becomes very loose.	63.2							
440														
	20	SS-7		56			84.9							
435														
	25	SS-8	WOR WOR WOR WOR	89			74.7							
430														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:35 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30	SS-9	WOR WOR WOR WOR	100			73.7							
420	35	SS-10	WOR WOR WOR WOR	84			93.9							
415	40	SS-11	WOH 1 2	100		416.4 / 40.0 Soft, wet, gray, silty CLAY (CL), trace sand, shells, and organics.	47.9							
410	45	SS-12	WOR WOR WOH	94		411.4 / 45.0 Very soft, wet, gray, fat CLAY (CH), trace sand, shells, and wood.	63.3		63	42				
405	50	SS-13	WOR WOR WOH	89		406.4 / 50.0 Very soft, wet, dark gray and grayish brown, lean CLAY (CL).	62.5							
400	55	SS-14	WOR WOR WOH	100		Grades gray.	52.9							
395	60	SS-15	50/3"	100		398.4 / 58.0 SHALE: Light gray, soft.	9.1							*58.0 to 62.0 feet: Solid drilling*
	65					394.4 / 62.0 End of Boring at 62 ft								*Boring backfilled with bentonite and cement fluid*

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:35 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Date(s) Drilled	09/09/2015 to 09/09/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
	0					459.0 / 0.0								
		SS-1	6 6 4	94		458.6 / 0.4 Limestone gravel [Fill]. Stiff, moist, brown sandy SILT (ML), trace clay, gravel, and topsoil.	23.0							
						456.5 / 2.5								
455		SS-2	5 4 3	78		Loose, moist, dark brown ASH [Fill].	23.8		28	2				
	5	SS-3	3 4 11	56			26.5							
		SS-4	10 10 7	89			26.5							
450														
	10	SS-5	2 3 4	89		With clay. 448.0 / 11.0 Stiff, moist, brown to gray, silty CLAY (CL), trace sand, shells, and roots.	24.7 24.9							
		SS-6	3 3 6	94			22.0							
445														
	15	SS-7	2 3 4	61		Becomes medium stiff.	24.3		48	29				*15.0 feet: Switch to mud rotary*
440														
	20	ST-8	100 psi	75			23.8							*Pushed shelby tube from 20.0 to 22.0 feet*
435														
	25	SS-9	3 3 3	100			23.2							
430														
	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:41 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B012

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-10	2 2 4	61			24.8							
425														
	35	SS-11	2 2 2	100		Becomes soft, trace sand.	28.3							
420						Becomes soft, trace sand, shells, and organics.								
	40	SS-12	WOH 2 2	100			32.2							
415														
	45	SS-13	1 2 3	100			50.2							
						412.0 / 47.0								
		ST-14		100		Medium stiff, moist, dark gray, fat CLAY (CH).	50.8	104.4 104.9 104.0	54	34				*Pushed shelby tube from 47.0 to 49.0 feet*
410						410.0 / 49.0								
	50	SS-15	3 2 4	100		Medium stiff, moist, gray and brownish gray, lean CLAY (CL), trace sand.	67.4							
405														
	55	SS-16	11 21 23	100		403.5 / 55.5 Gray broken rock, weathered.	50.5 15.3							
						402.0 / 57.0 Light gray rock, weathered.								
400														
	60	SS-17	50/2.5"	75		398.8 / 60.2 End of Boring at 60 ft	17.9							*Boring backfilled with bentonite and cement fluid*
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:41 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) 457.0 / Depth (feet) 0.0								
	0	SS-1	4 4 7	44		Medium stiff, moist, dark gray to brown, CLAY (CL) with ASH [Fill].	13.6							
455						454.5 / 2.5								
		SS-2	1 3 4	83		Medium stiff, moist, brown, silty CLAY (CL), trace sand, gravel, and roots.	17.4				2.0			
	5													
450		SS-3		46			24.3 20.0		49	28				
						449.0 / 8.0								
		SS-4	3 4 6	72		Stiff, moist, dark gray, silty CLAY (CL), trace sand.	24.3				2.0			
	10	SS-5	2 4 7	83			25.4				2.0			*10.0 feet: Switch to mud rotary*
445						Gray and mottled brown silty CLAY (CL), trace sand.								
	15	SS-6	2 2 4	100		Becomes medium stiff, gray and mottled brown.	25.5		41	29	1.0			
440														
	20	SS-7	2 3 3	67			23.5				1.0			
435														
	25	SS-8	3 3 4	67		Becomes gray, trace organics.	27.7				1.25			
430														
	30					427.0 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:46 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	1 2 2	94		Medium stiff, moist, brown mottled gray, sandy CLAY (CL), trace silt and shells.	20.2				1.5			
425						425.0 / 32.0								
		ST-10		100		Medium stiff, moist, gray and brown lean CLAY (CL) with sand.	33.3		42	19	1.25			*Pushed shelby tube from 32.0 to 34.0 feet*
	35	SS-11	2 2 2	89		Becomes dark gray, trace organics.	58.0				1.0			
420														
	40	SS-12	2 2 3	100			54.5				1.25			
415														
	45	SS-13	2 2 4	100		Grades with calcium carbonate seams and shells.	66.2				1.75			
410						Gravel layer 47.5 feet to 49.0 feet								
	50													
405						404.0 / 53.0								
						End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:46 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457.7 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) 457.7 / Depth (feet) 0.0								
	0	SS-1	1 4 10	89		Medium dense, moist, dark gray, ASH [Fill].	28.2							
455		SS-2	7 2 1	100		Becomes wet, gray.	40.8							
	5	ST-3		35		▽								*Pushed shelby tube from 5.0 to 7.0 feet*
450		SS-4	1 1 1	100		Becomes light gray.	60.2							
	10	SS-5		100		Becomes dark gray.	78.7							*10.0 feet: Switch to mud rotary* *Pushed shelby tube from 10.0 to 12.0 feet*
445														
	15	ST-6	1/12" 1/12"	100		Becomes light gray.	86.5							
440														
	20	SS-7	1/12" 1/12"	100			73.1							
435														
	25	SS-8	WOR WOR WOR	100			48.7							
430														
	30					427.7 / 30.0								

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:52 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	WOR WOR WOR	67		Very loose, wet, black to gray, ASH with clay [Fill].	31.6							
425														
	35	SS-10	WOH 1 2	100		422.7 / 35.0 Soft, wet, gray, silty CLAY (CL), trace shells and wood.								
420														
	40	SS-11	2 18 34	100		417.2 / 40.5 SHALE: Light gray, weathered.	27.3 19.6 10.2							*42.0 to 45.0 feet: Solid drilling*
415														
	45	SS-12	56	100		412.2 / 45.5 End of Boring at 45.5 ft	14.2							*Boring backfilled with bentonite and cement fluid*
410														
	50													
405														
	55													
400														
	60													
395														
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:52 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	57.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
						Elevation (feet) / Depth (feet)								
460	0					460.0 / 0.0								
		SS-1	5 4 1	72		459.6 / 0.4 Brown gravel.	54.7							
						Medium stiff, moist, gray to brown, sandy CLAY (CL), trace silt.								
						457.5 / 2.5								
		SS-2	5 9 13	50		Medium dense, moist, light brown to white, fine to coarse GRAVEL (GP) with sand, trace silt and limestone.	4.5							
455	5	SS-3	6 10 13	39			5.4							
		SS-4	6 9 7	39			7.2							
450	10	SS-5	4 5 6	39			6.5							*10.0 feet: Switch to mud rotary; borehole collapsed*
		SS-6	10 3 2	11			3.6							
445	15	SS-7	4 4 4	39		Some coarse limestone.	8.2							
440	20	SS-8	10 7 9	39			7.8							
435	25	SS-9	7 4 11	33			8.1							*23.0 to 25.0 feet: Drove casing with hammer* *23.0 to 29.0 feet: Hard drilling*
430	30													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:58 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30					429.0 / 31.0 Medium stiff, wet, gray, sandy CLAY (CL), trace silt, shells, and organics.		122.2						
		ST-10	300 psi	100			20.2	121.0 119.8	24	11	2.5			*Pushed shelby tube from 31.0 to 33.0 feet*
425	35					425.0 / 35.0 Medium stiff, wet, gray and dark gray lean CLAY (CL)								
		SS-11	WOH 2 3	94			33.8				1.25			
						423.0 / 37.0 Soft, wet, dark gray, fat CLAY (CH).								
		ST-12	175 psi				41.0		66	43	1.0			*Pushed shelby tube from 37.0 to 39.0 feet*
						421.0 / 39.0 Soft, wet, brown and gray, lean CLAY (CL).								
420	40	SS-13	WOH 2 2	100			36.2				1.0			
415	45	SS-14	WOH 2 2	83		Grades with sand.	49.4				1.0			
410	50	SS-15	3 5 14	22		Grades without sand.	30.9				0.5			
						408.0 / 52.0 SHALE: Light gray, silt sized, weathered.								*52.0 feet: Solid drilling*
405	55	SS-16	71/6"	oK			11.0							
						403.0 / 57.0 End of Boring at 57 ft								*Boring backfilled with bentonite and cement fluid*
400	60													
395	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:58 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015A

Sheet 1 of 1

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	30.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' SW of EDW-B015 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0					Elevation (feet) 460.0 / Depth (feet) 0.0 Blank power auger to 30.0 feet to confirm 29.0 feet of gravel.								*Offset 5.0 feet west of EDW-B015*
455	5													*5.0 to 30.0 feet: No cuttings*
														7.0 feet: Borehole collapsed; created a 14" diameter hole with no cuttings
450	10													
445	15													
440	20													*20.0 feet: Groundwater encountered*
435	25													*Auger hole collapsed and auger removed. No clay on auger.*
430	30					430.0 / 30.0								

End of Boring at 30 ft

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Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:23:03 PM

Attachment C. Piezometer Logs

Project: Dynegy

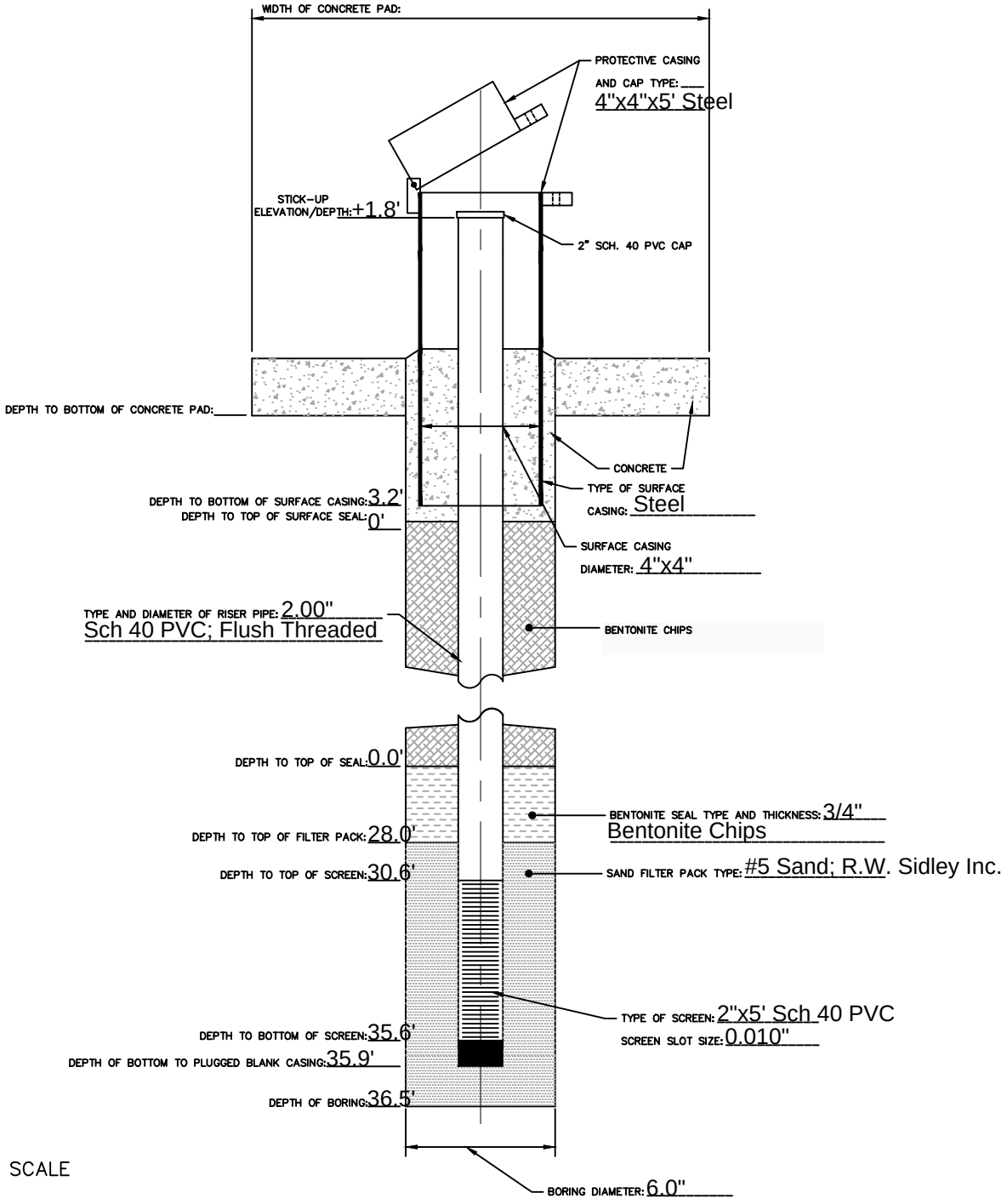
Project Location: Bartonville, IL

Project Number: 60440202

Log of Piezometer

Sheet 1 of 1

Piezometer Location	EDW-P001	Date Installed	11/05/15	Time	5:30 P.M.
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	36.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	461.0 (NAVD88)
Screened Interval	30.6-35.6'				
		Groundwater Level(s)	24.64' from top of casing		



AECOM

Project: Dynegy

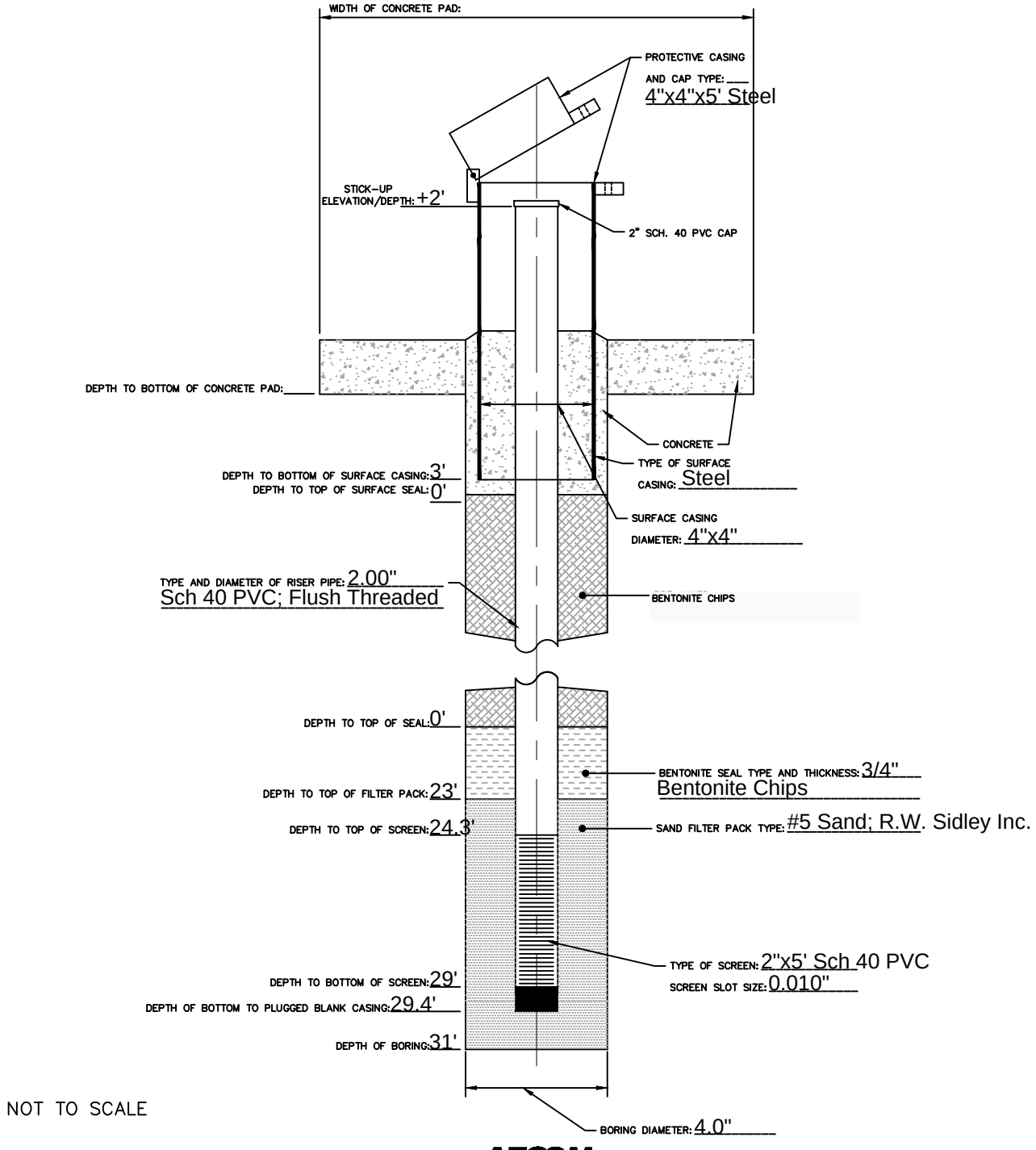
Project Location: Bartonville, IL

Project Number: 60440202

Log of Piezometer

Sheet 1 of 1

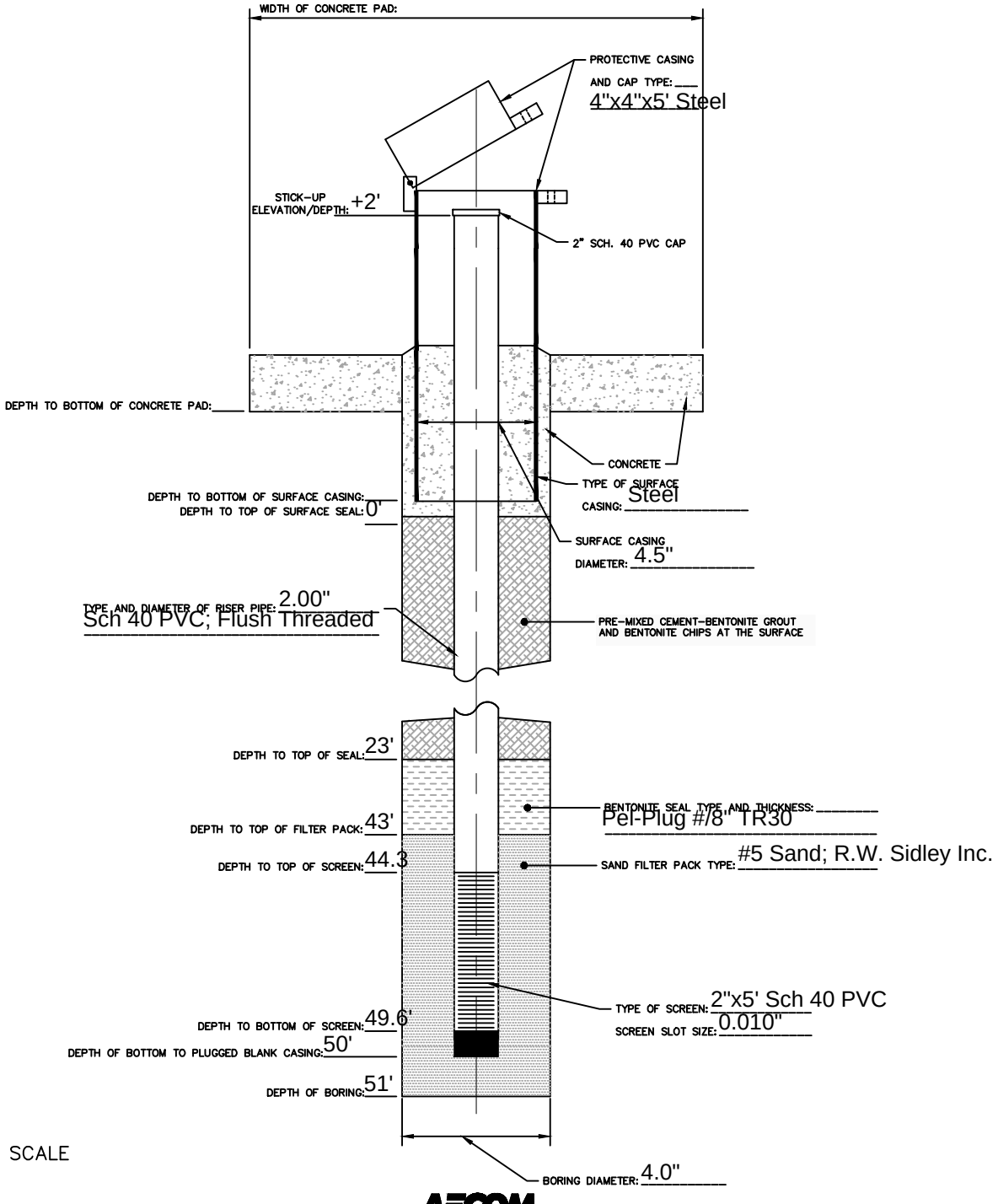
Piezometer Location	EDW-P002	Date Installed	09/04/15	Time	11:00-12:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	31'
Method of Installation	4" Power Auger	Drilling Contractor	Strata	Surface Elevation	459.0 (NAVD88)
Screened Interval	24-29'				
		Groundwater Level(s)	29' After Drilling		



AECOM

Project: Dynegy Project Location: Bartonville, IL Project Number: 60440202	Log of Piezometer Sheet 1 of 1

Piezometer Location	EDW-P003	Date Installed	09/04/15	Time	3:30-6:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	51'
Method of Installation	3 7/8" Rock Bit	Drilling Contractor	Strata	Surface Elevation	459.6 (NAVD88)
Screened Interval	44.3-49.6'				



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Project: Dynegy

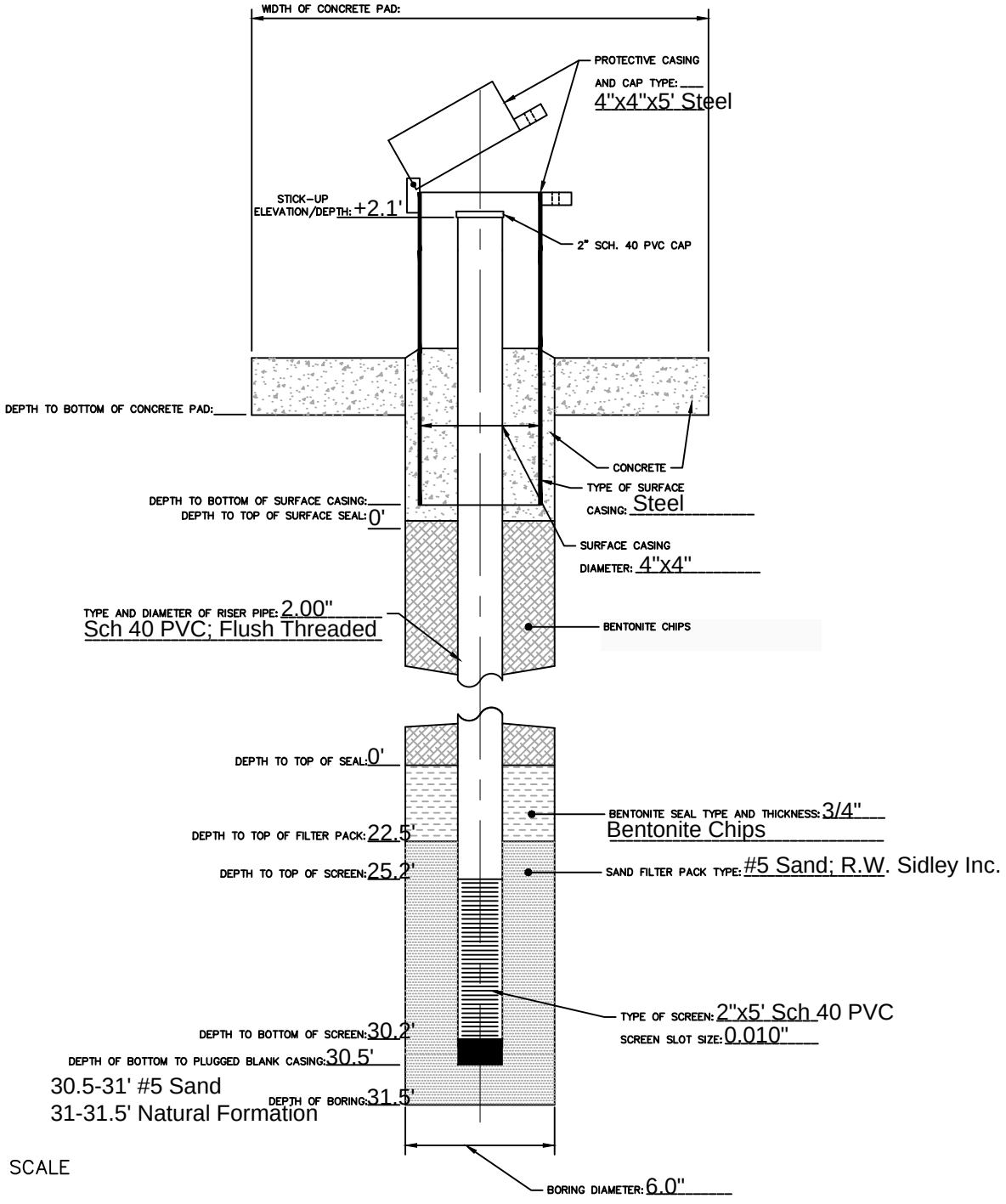
Project Location: Bartonville, IL

Project Number: 60440202

Log of Piezometer

Sheet 1 of 1

Piezometer Location	EDW-P004	Date Installed	11/04/15	Time	12:00
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	31.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	455.6 (NAVD88)
Screened Interval	25.2-30.2'				
		Groundwater Level(s)	14.85 From Top of Casing		



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Attachment D. CPT Data Report

PRESENTATION OF SITE INVESTIGATION RESULTS

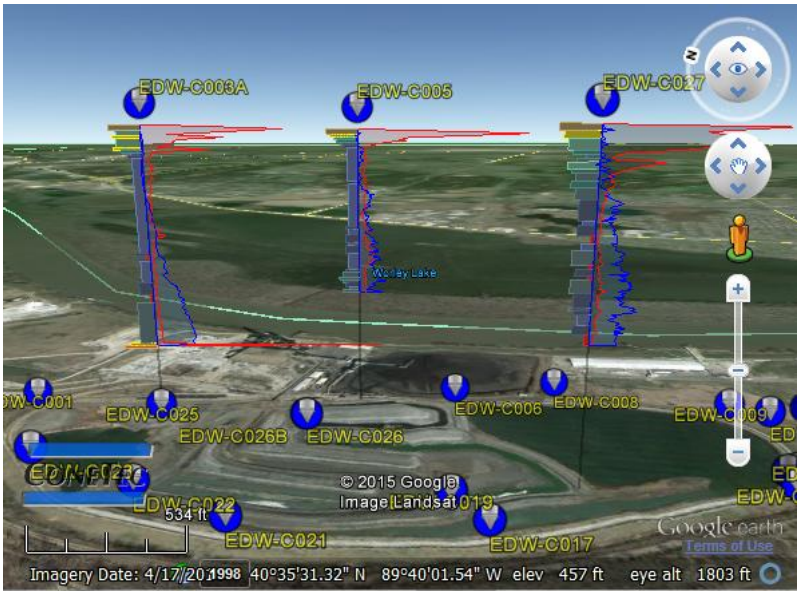
Edwards Power Station
Peoria, Illinois

Prepared for:

AECOM

ConeTec Job No: 15-53073

Project Start Date: 19-Aug-2015
Project End Date: 29-Aug-2015
Report Date: 31-Aug-2015



Prepared by:

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Introduction

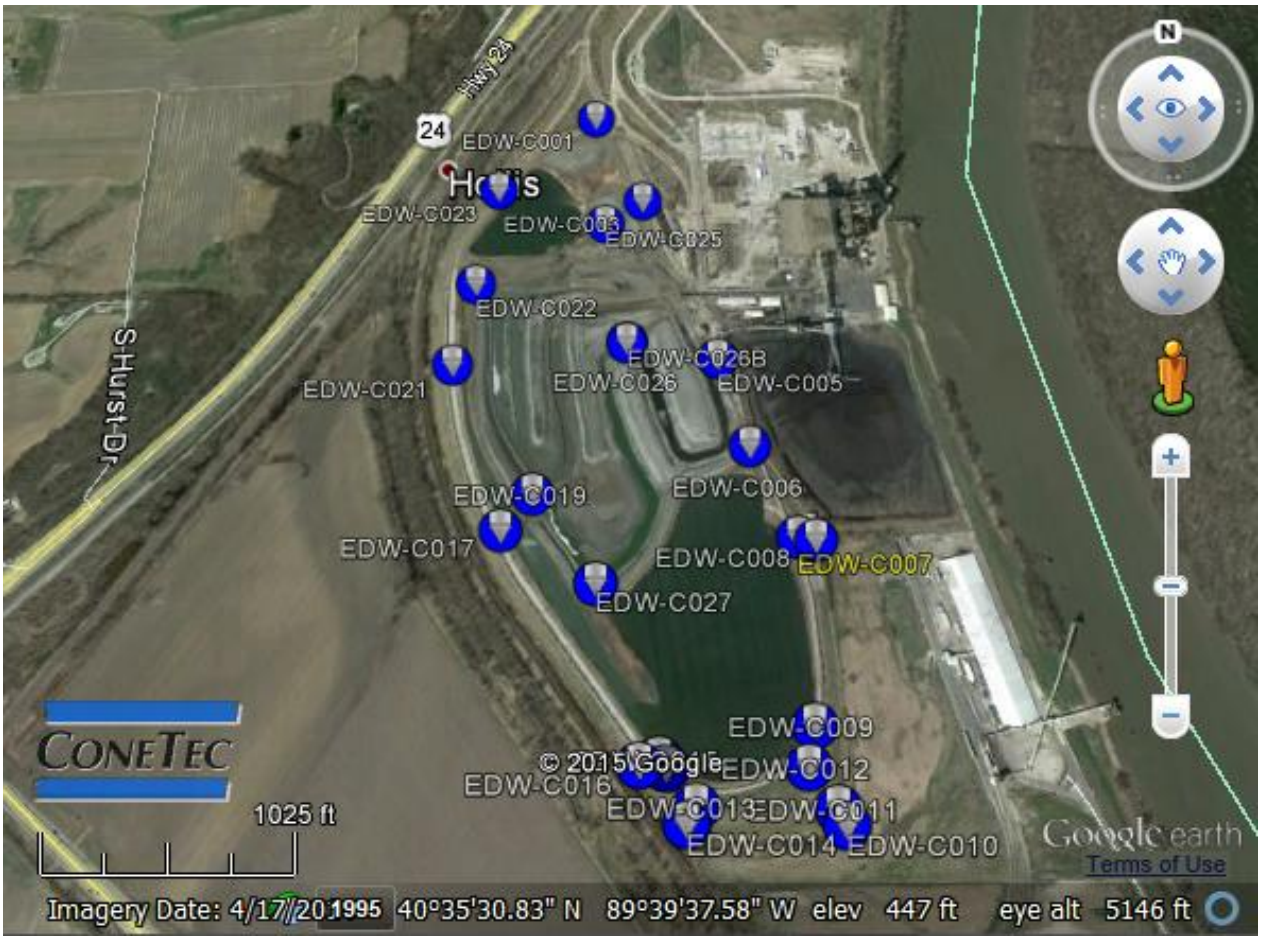
The enclosed report presents the results of a piezocone penetration testing (CPTu or CPT) and seismic piezocone penetration testing (SCPTu or SCPT) program carried out at the Edwards Power Station site located in Peoria, Illinois. The site investigation program was conducted by ConeTec Inc., under contract to AECOM of Chicago, Illinois.

A total of fourteen cone penetration tests and ten seismic cone penetration tests were completed at twenty two locations (There were two shallow refusals). The CPT and SCPT program was performed to evaluate the subsurface soil conditions. CPT and SCPT sounding locations were selected and numbered under the supervision of AECOM personnel (Mr. Daryle Harrison and Mr. Adam Grossman).

Project Information

Project	
Client	AECOM
Project	Edwards Power Station, Peoria, IL
ConeTec project number	15-53073

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Truck Rig	25 ton truck mounted (twin cylinders)	CPT and SCPT
CPT Track Rig	20 ton track mounted (twin cylinders)	CPT and SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
CPT and SCPT	GPS (Handheld)	32616 (WGS 84 / UTM North)

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Fifty seven pore pressure dissipation tests were completed primarily to determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at five foot intervals at ten locations.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
335:T1500F15U500	335	15	225	1500	15	500
340:T1500F15U500	340	15	225	1500	15	500
374:T1500F15U500	374	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of AECOM (Client) for the project titled “Edwards Power Station, Peoria, IL”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec, Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

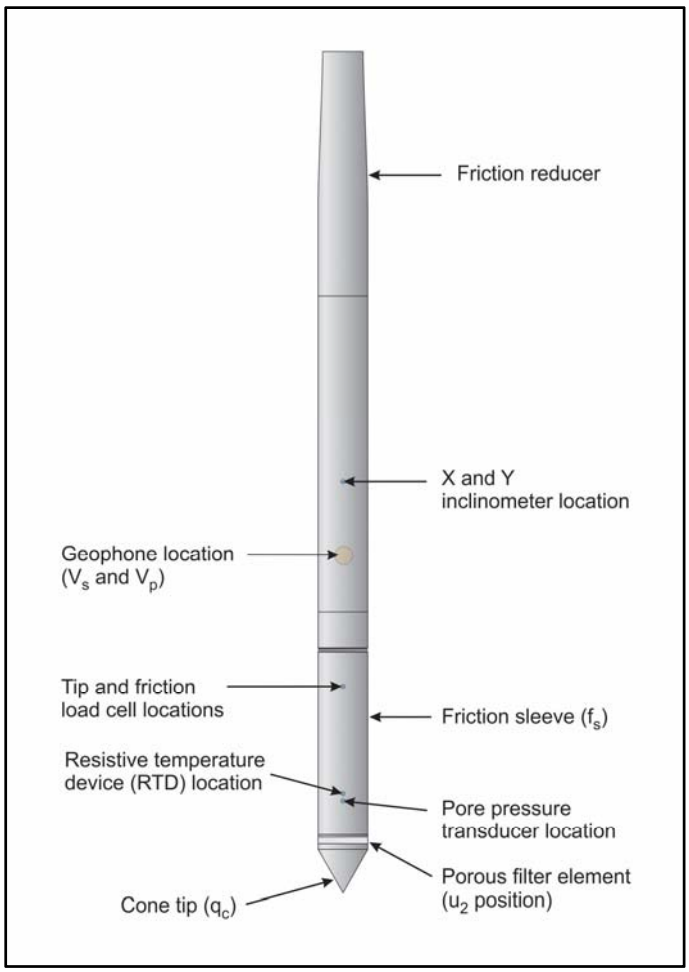


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

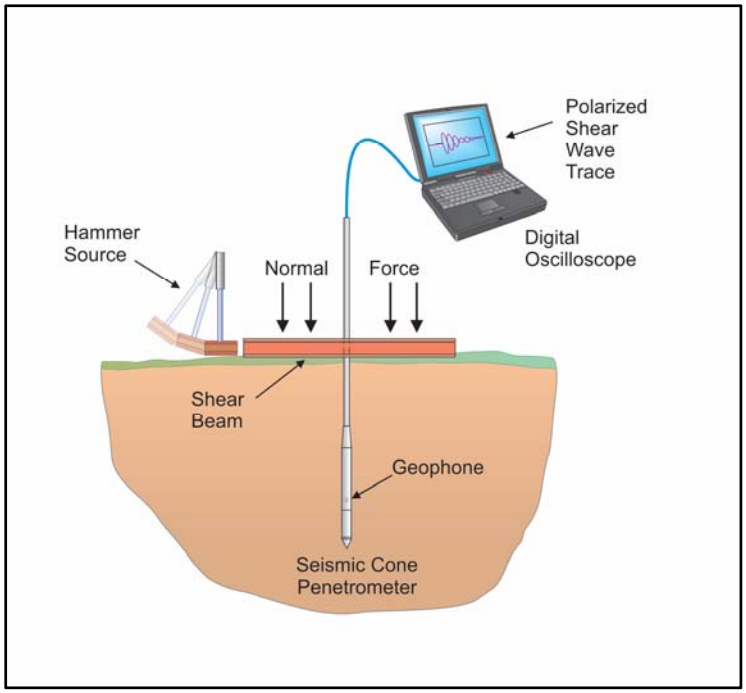


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

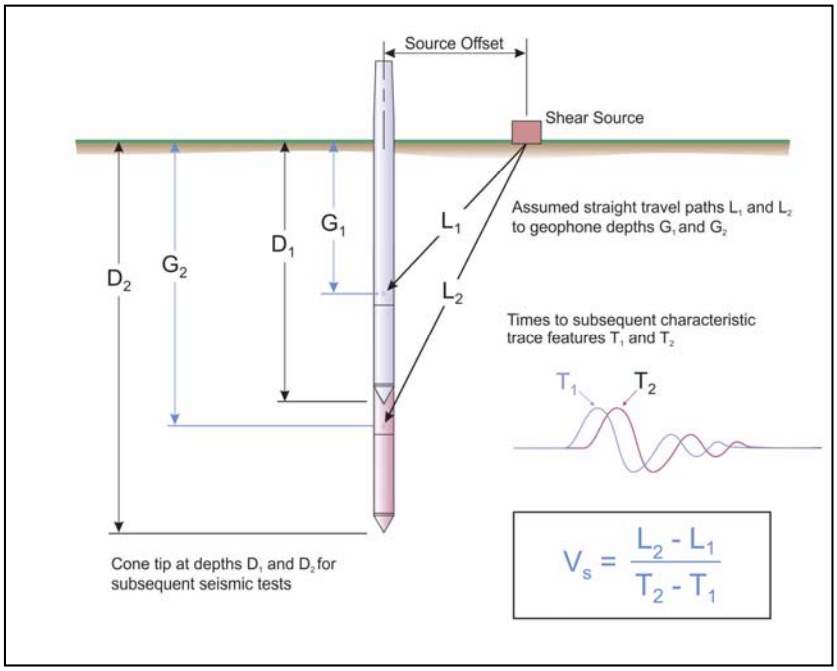


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

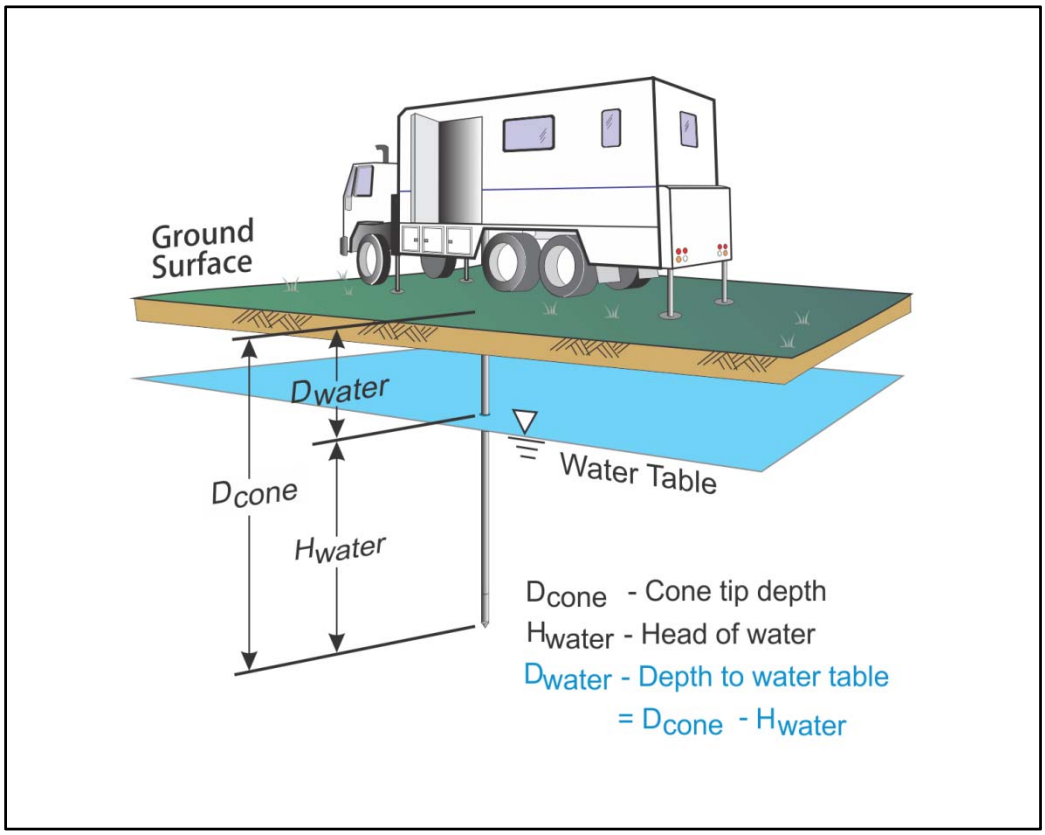


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

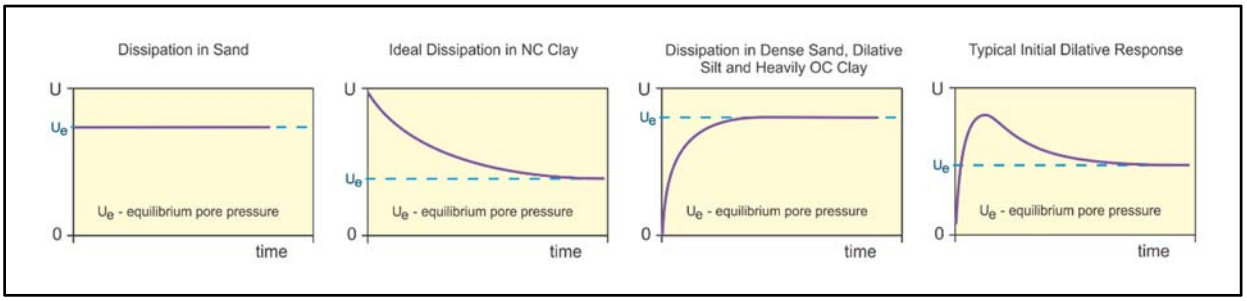


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station, Peoria, IL
Start Date: 19-Aug-2015
End Date: 29-Aug-2015

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Refer to Notation Number
EDW-C001	15-53073_SP01	19-Aug-2015	374:T1500F15U500	9.4	38.88	8	4497502	274312	
EDW-C003	15-53073_SP03	27-Aug-2015	340:T1500F15U500	9.0	54.63	8	4497325	274377	
EDW-C005	15-53073_CP05	26-Aug-2015	374:T1500F15U500	7.0	40.03		4497026	274468	3
EDW-C006	15-53073_CP06	25-Aug-2015	374:T1500F15U500	11.5	40.03		4496880	274500	
EDW-C007	15-53073_CP07	29-Aug-2015	340:T1500F15U500	8.9	54.79		4496737	274551	
EDW-C008	15-53073_CP08	27-Aug-2015	374:T1500F15U500	10.0	33.63		4496731	274576	3
EDW-C009	15-53073_CP09	28-Aug-2015	340:T1500F15U500	19.9	52.17		4496476	274538	
EDW-C010	15-53073_CP10	27-Aug-2015	374:T1500F15U500	2.2	30.02		4496351	274562	
EDW-C011	15-53073_CP11	28-Aug-2015	340:T1500F15U500	22.5	47.08		4496372	274553	
EDW-C012	15-53073_SP12	28-Aug-2015	340:T1500F15U500	23.3	50.20	10	4496424	274524	
EDW-C013	15-53073_SP13	28-Aug-2015	340:T1500F15U500	22.7	56.27	11	4496386	274376	
EDW-C014	15-53073_CP14	27-Aug-2015	374:T1500F15U500	4.9	38.22		4496366	274362	
EDW-C015	15-53073_SP15	19-Aug-2015	335:T1500F15U500		8.04	2	4496447	274334	4
EDW-C015A	15-53073_SP15A	19-Aug-2015	335:T1500F15U500	12.0	40.03	8	4496435	274342	3
EDW-C016	15-53073_CP16	28-Aug-2015	374:T1500F15U500	3.8	36.91		4496442	274308	
EDW-C017	15-53073_SP17	27-Aug-2015	340:T1500F15U500	24.2	55.94	12	4496775	274137	
EDW-C019	15-53073_CP19	27-Aug-2015	340:T1500F15U500	6.5	53.31		4496825	274184	
EDW-C021	15-53073_CP21	27-Aug-2015	340:T1500F15U500	13.0	49.38		4497046	274071	3
EDW-C022	15-53073_SP22	26-Aug-2015	374:T1500F15U500	6.7	20.01	4	4497185	274108	
EDW-C023	15-53073_CP23	27-Aug-2015	340:T1500F15U500	15.1	40.68		4497364	274147	
EDW-C025	15-53073_CP25	25-Aug-2015	374:T1500F15U500	6.0	20.01		4497285	274315	
EDW-C026	15-53073_SP26	26-Aug-2015	374:T1500F15U500	7.2	14.27	3	4497062	274334	
EDW-C026B	15-53073_SP26B	26-Aug-2015	374:T1500F15U500	6.8	14.60	2	4497064	274335	
EDW-C027	15-53073_CP27	25-Aug-2015	374:T1500F15U500	7.4	40.03		4496687	274266	
Totals	24 soundings				929.12	68			

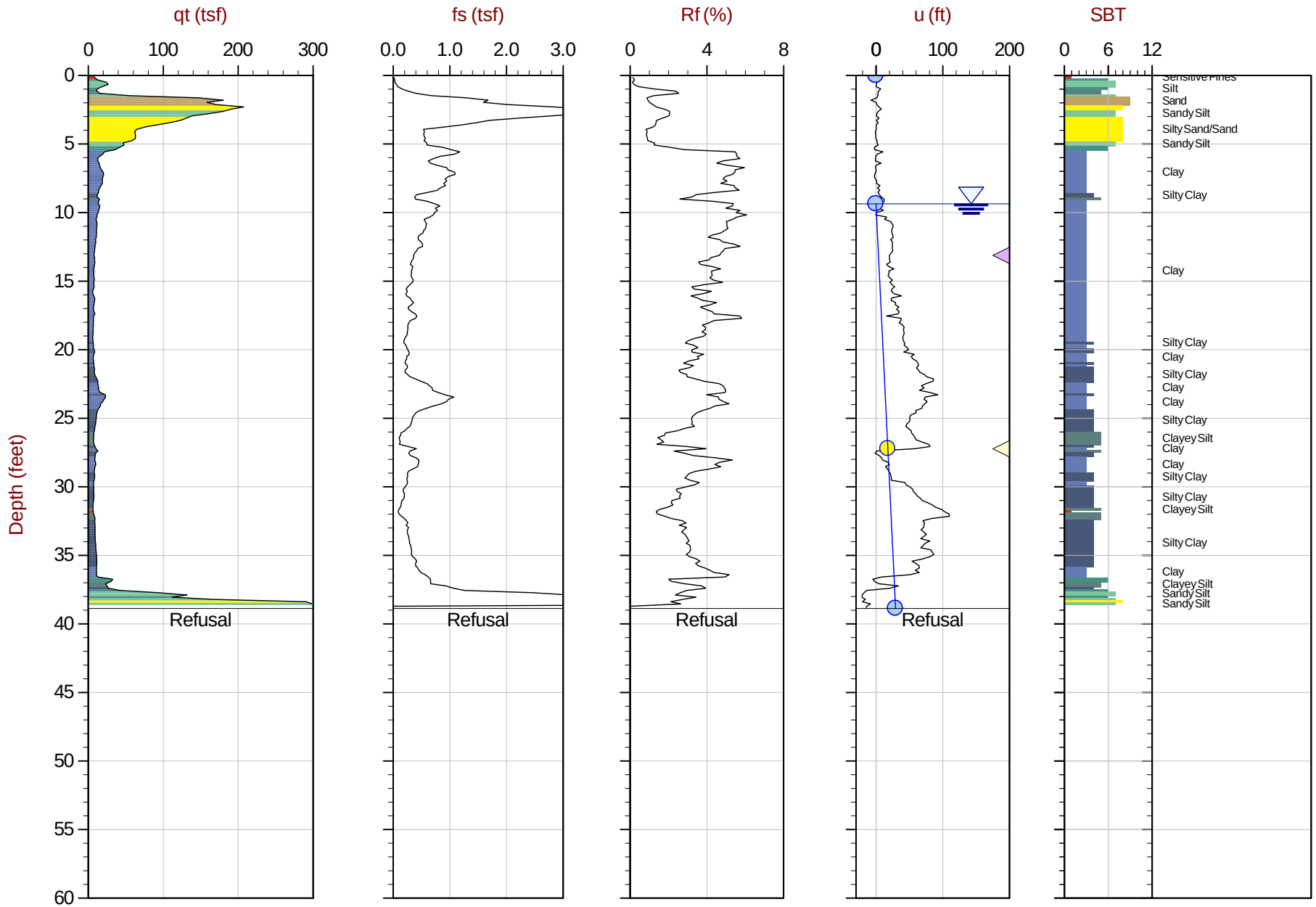
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are WGS 84 / UTM Zone 16 and were collected using a handheld GPS Receiver.
3. Assumed phreatic surface estimated from dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374:T1500F15U500



Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

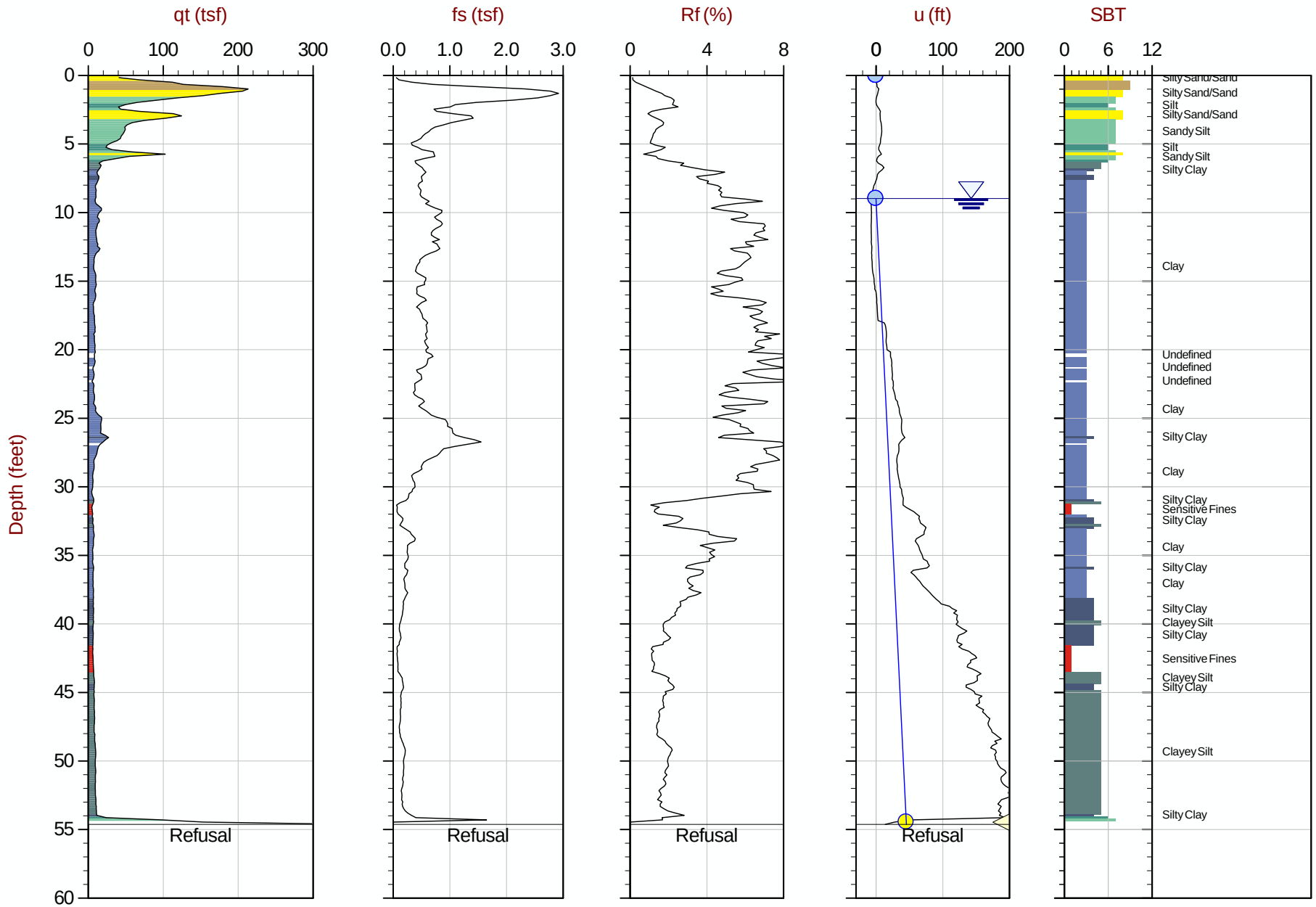
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:22
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: 340:T1500F15U500



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

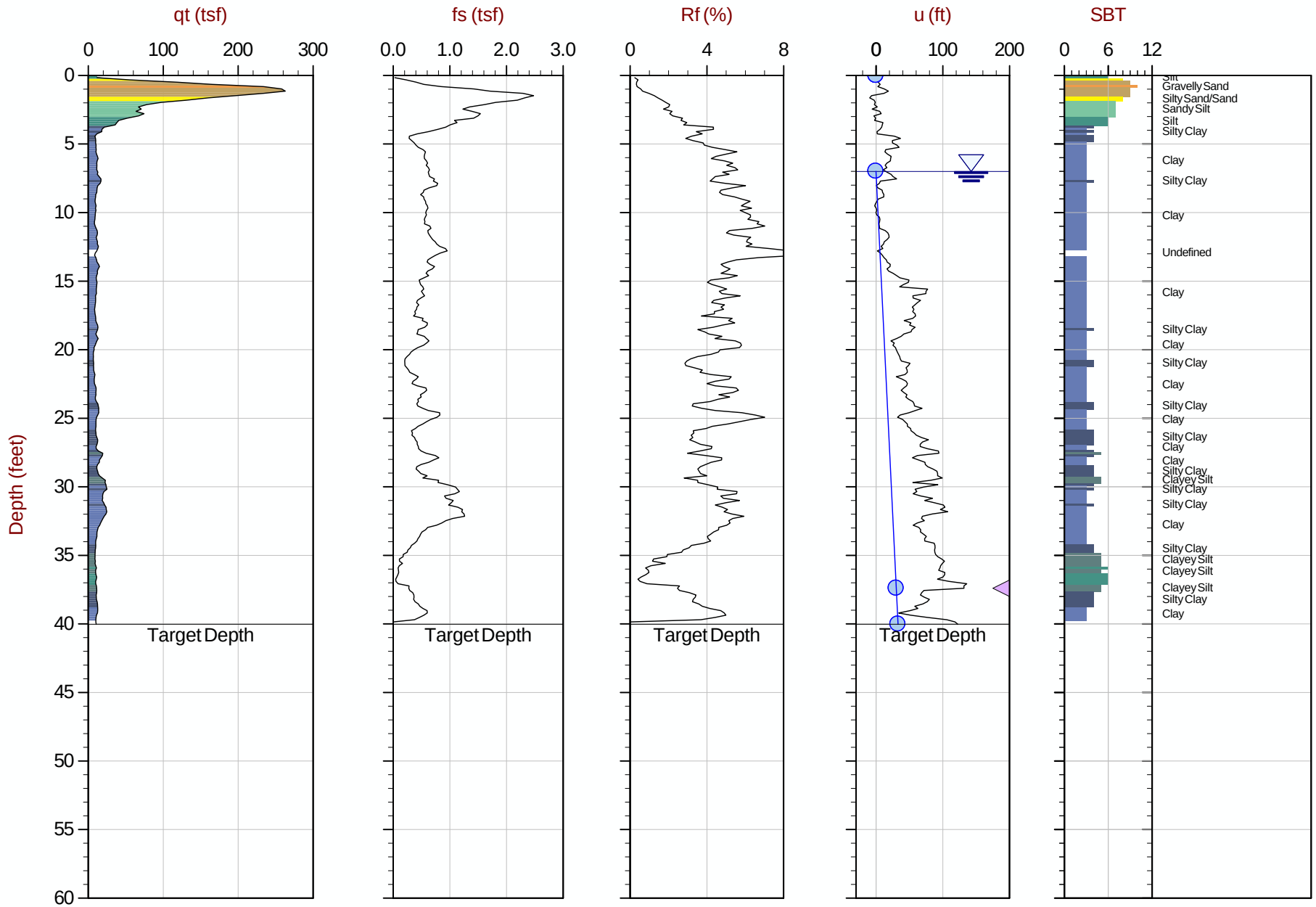
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 15:05
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C005
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP05.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497026m E: 274468m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

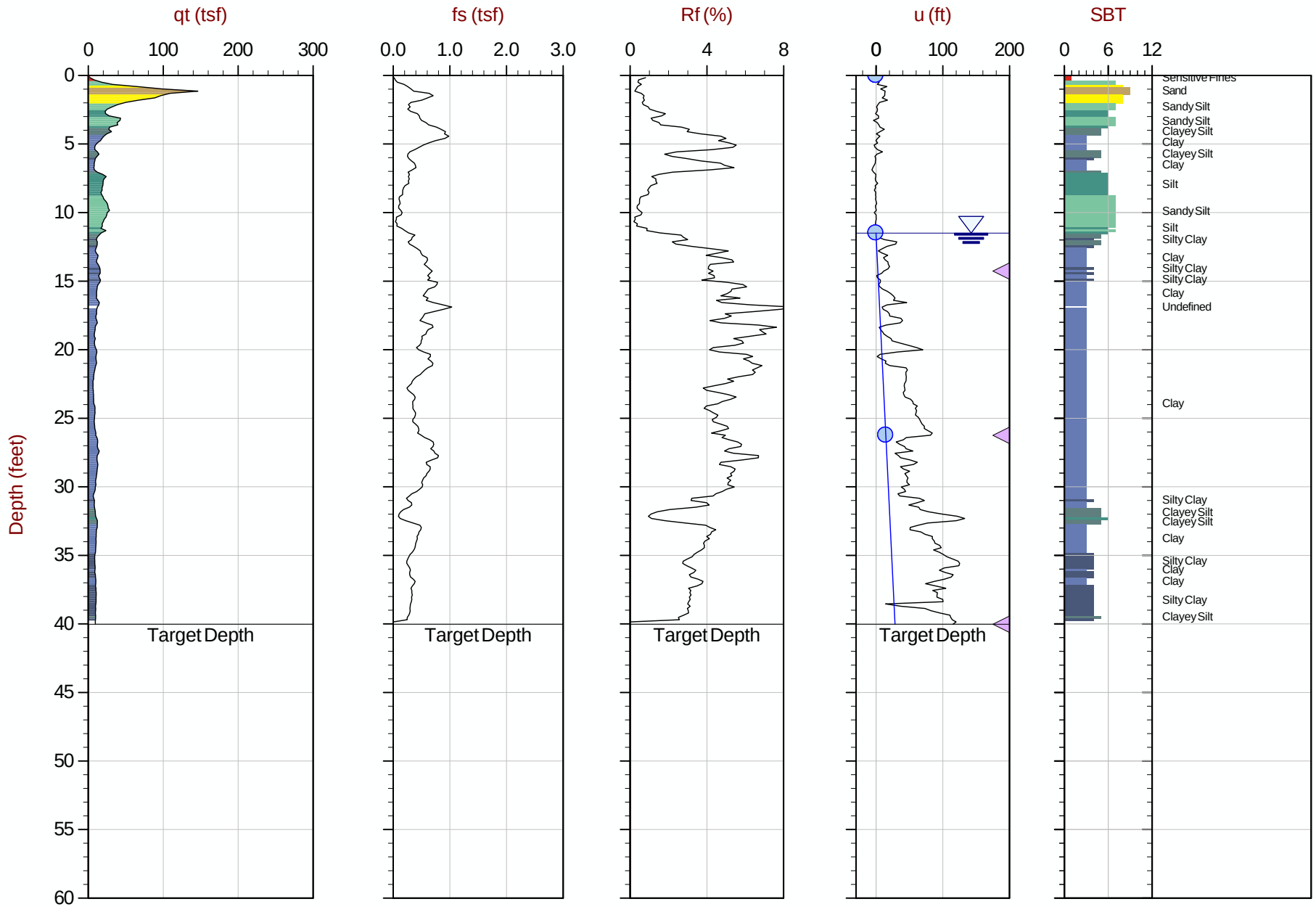
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 15:52
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP06.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496880m E: 274500m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

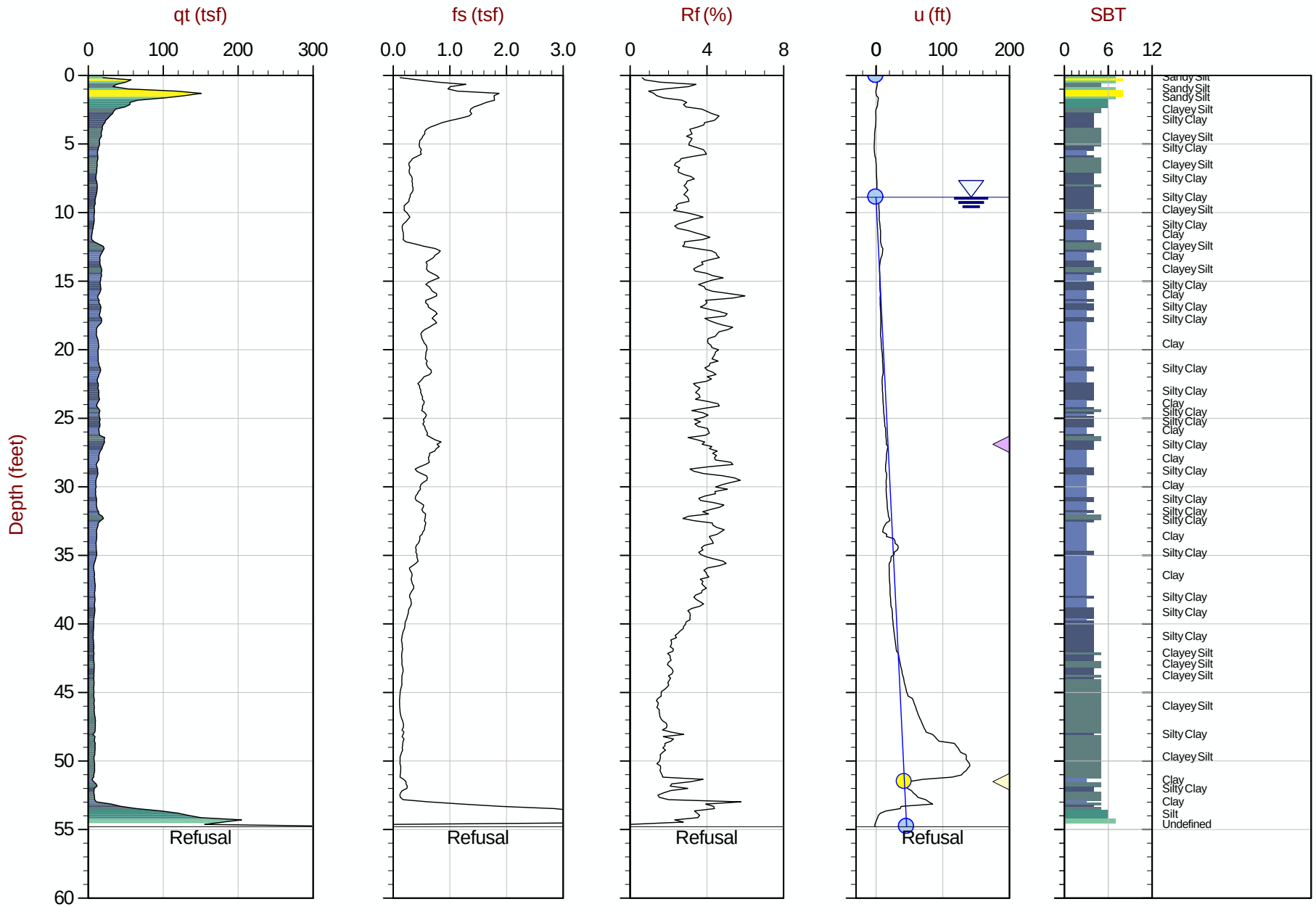
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:29:15 09:19
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: 340:T1500F15U500



Max Depth: 16.700 m / 54.79 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP07.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496736m E: 274551m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

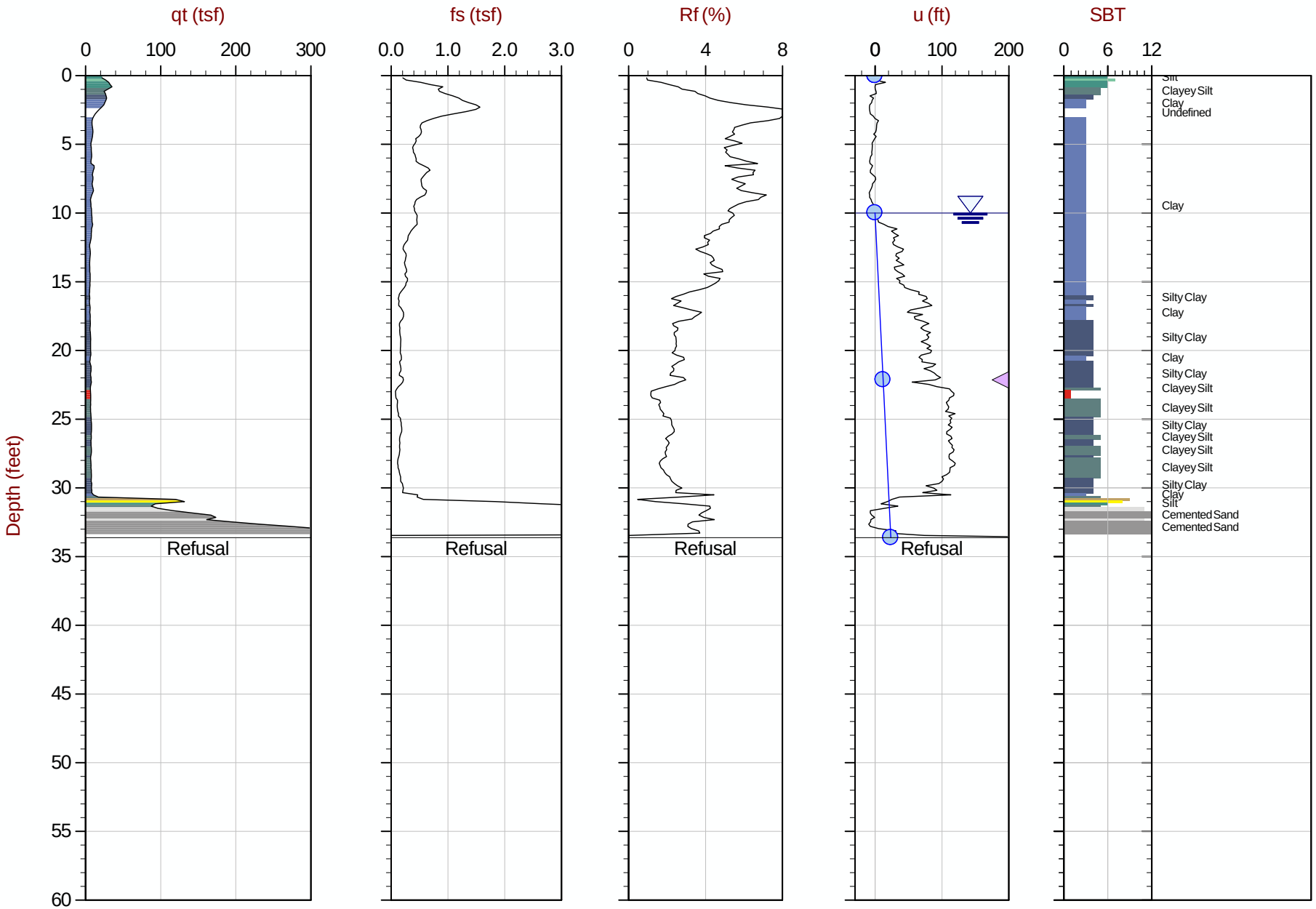
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:50
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374:T1500F15U500



Max Depth: 10.250 m / 33.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP08.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496731m E: 274576m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

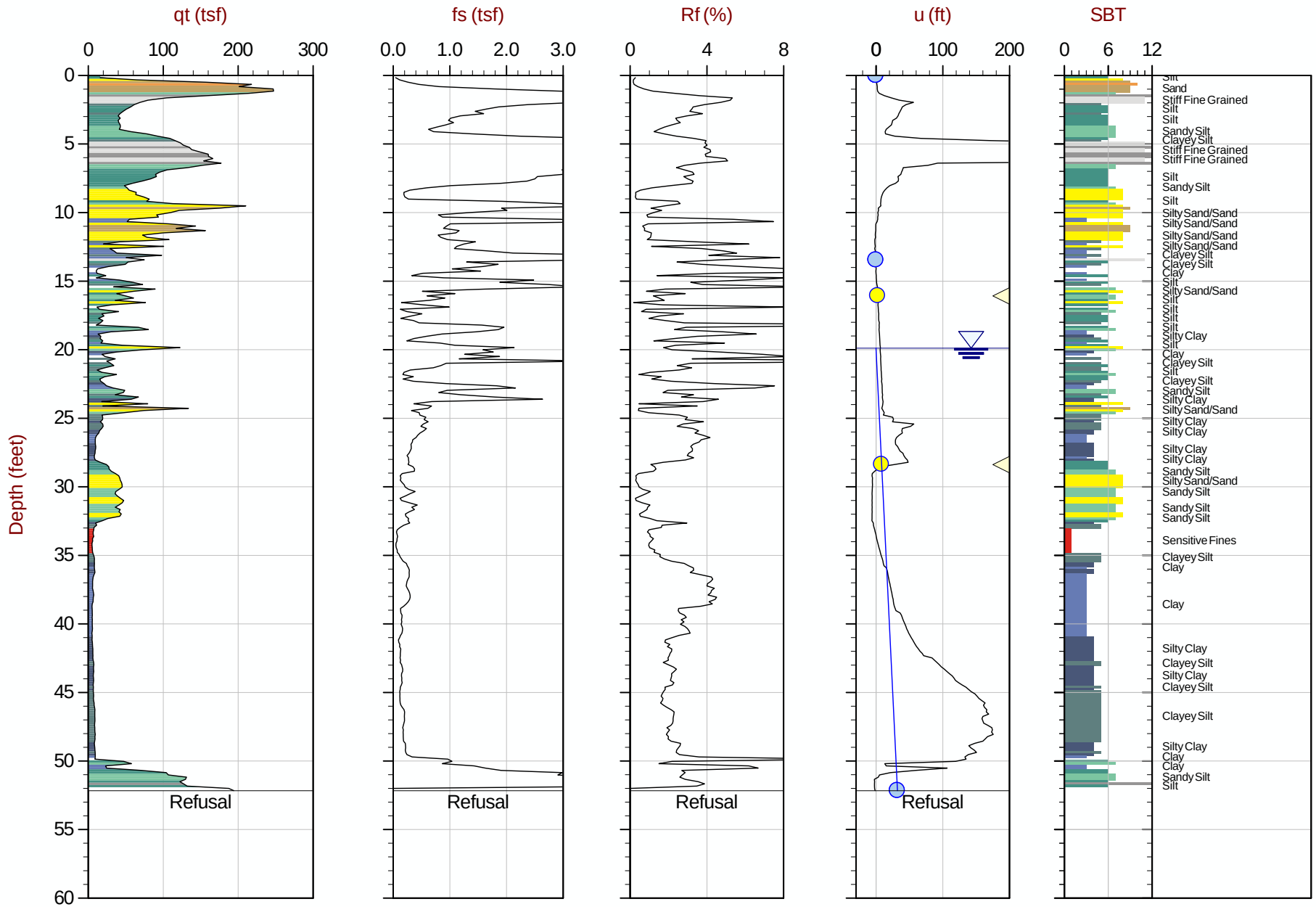
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 16:08
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: 340:T1500F15U500



Max Depth: 15.900 m / 52.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP09.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496476m E: 274538m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

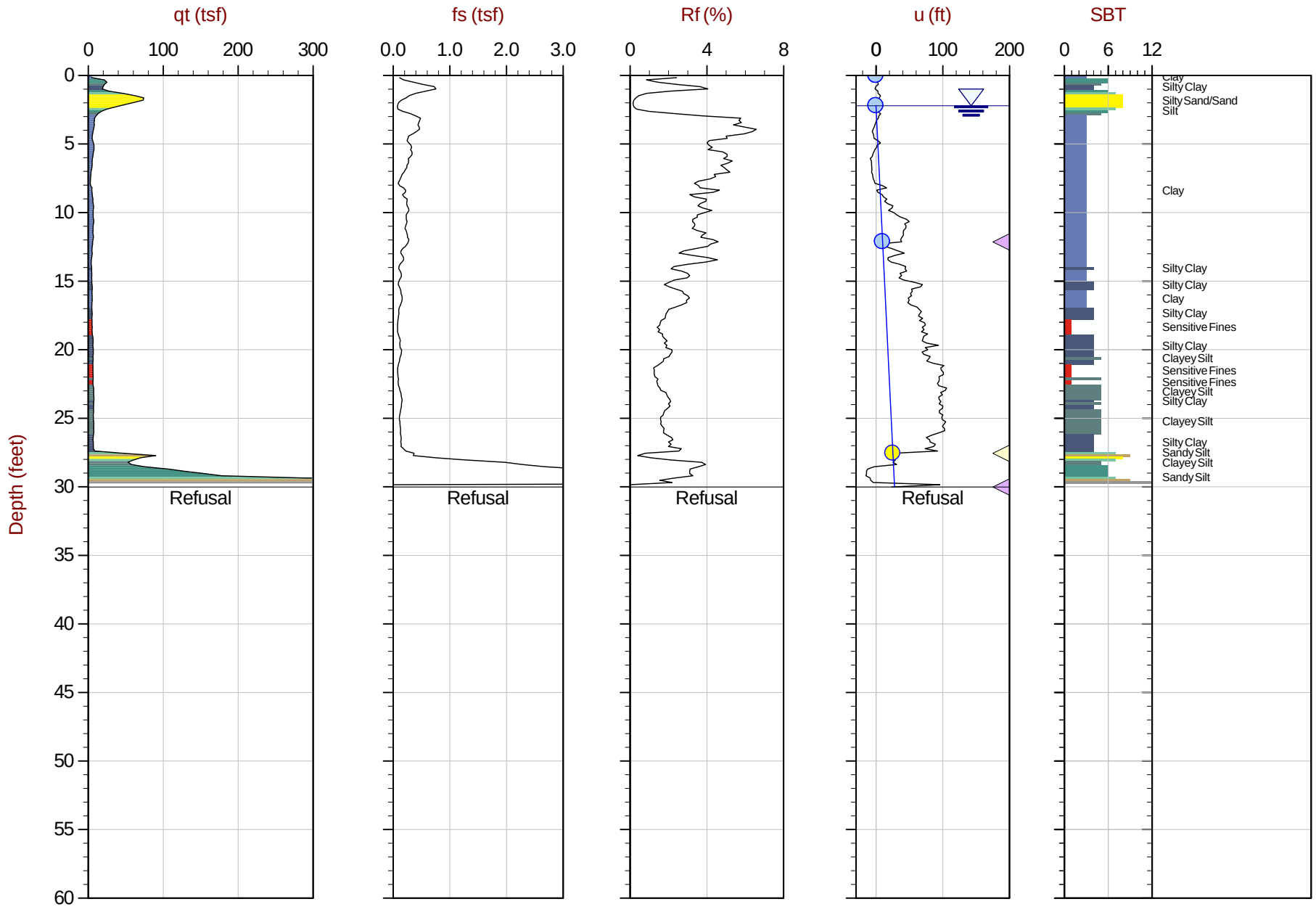
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 12:10
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374:T1500F15U500



Max Depth: 9.150 m / 30.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP10.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496351m E: 274562m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

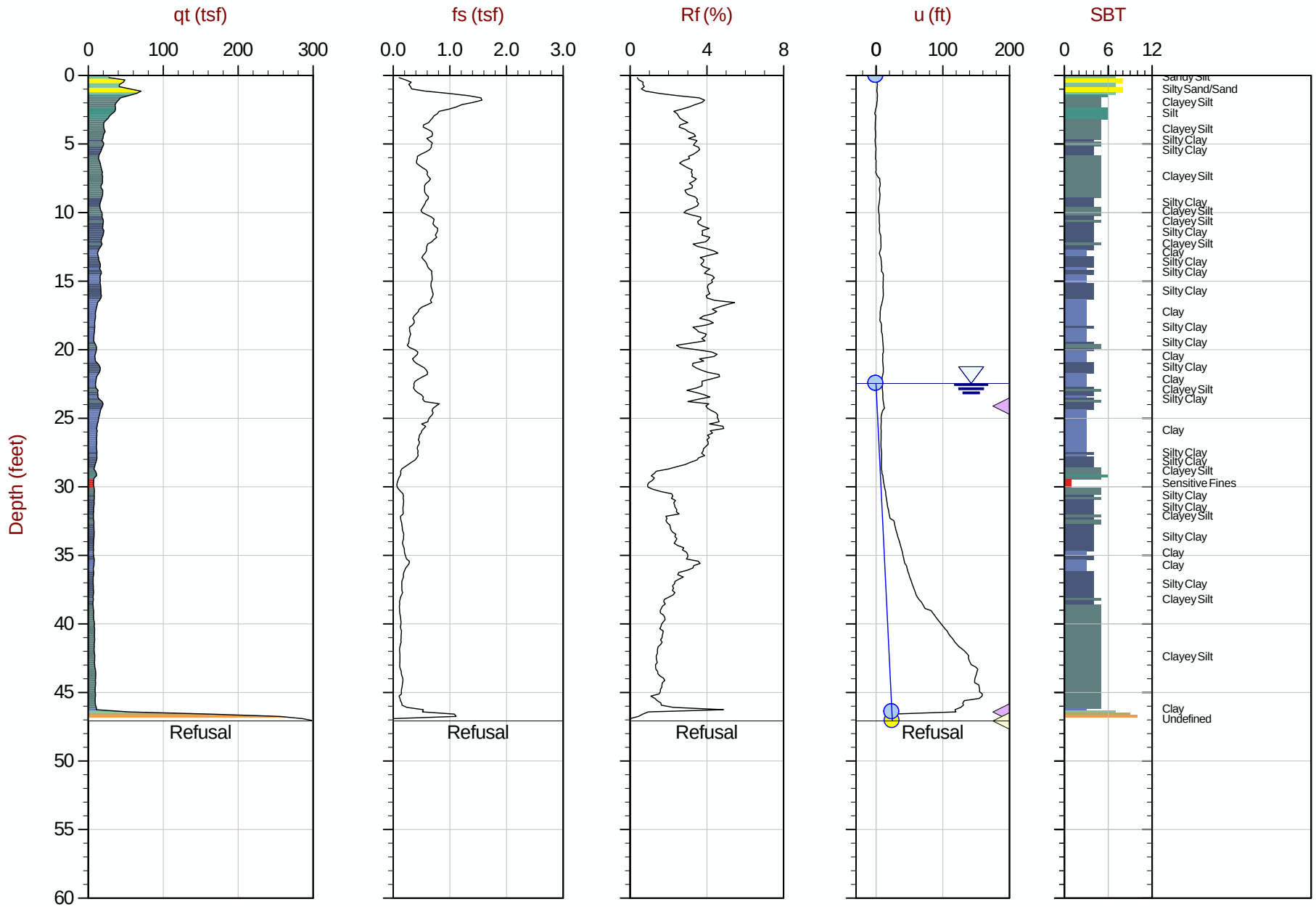
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 10:19
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: 340:T1500F15U500



Max Depth: 14.350 m / 47.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP11.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496372m E: 274553m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

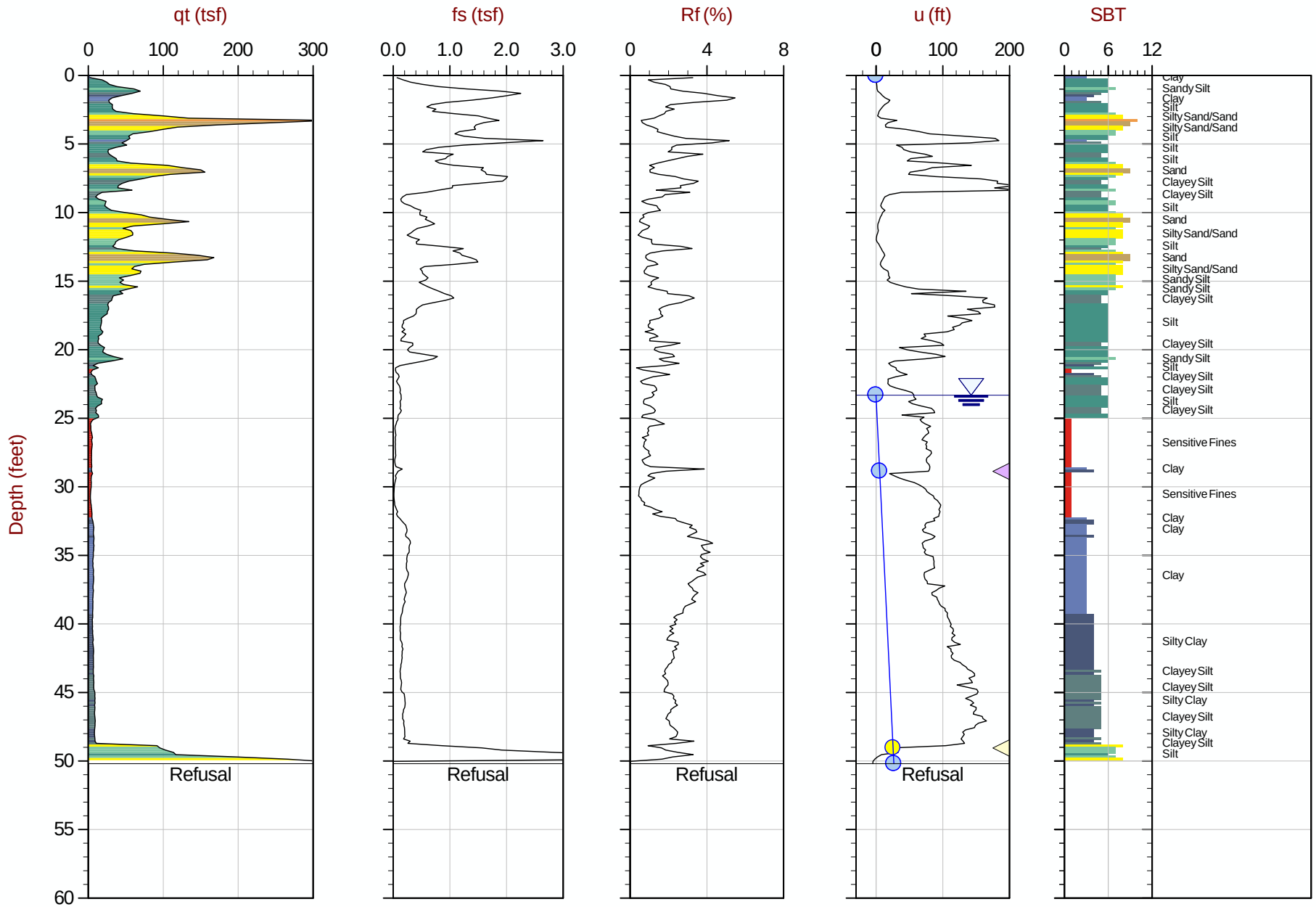
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

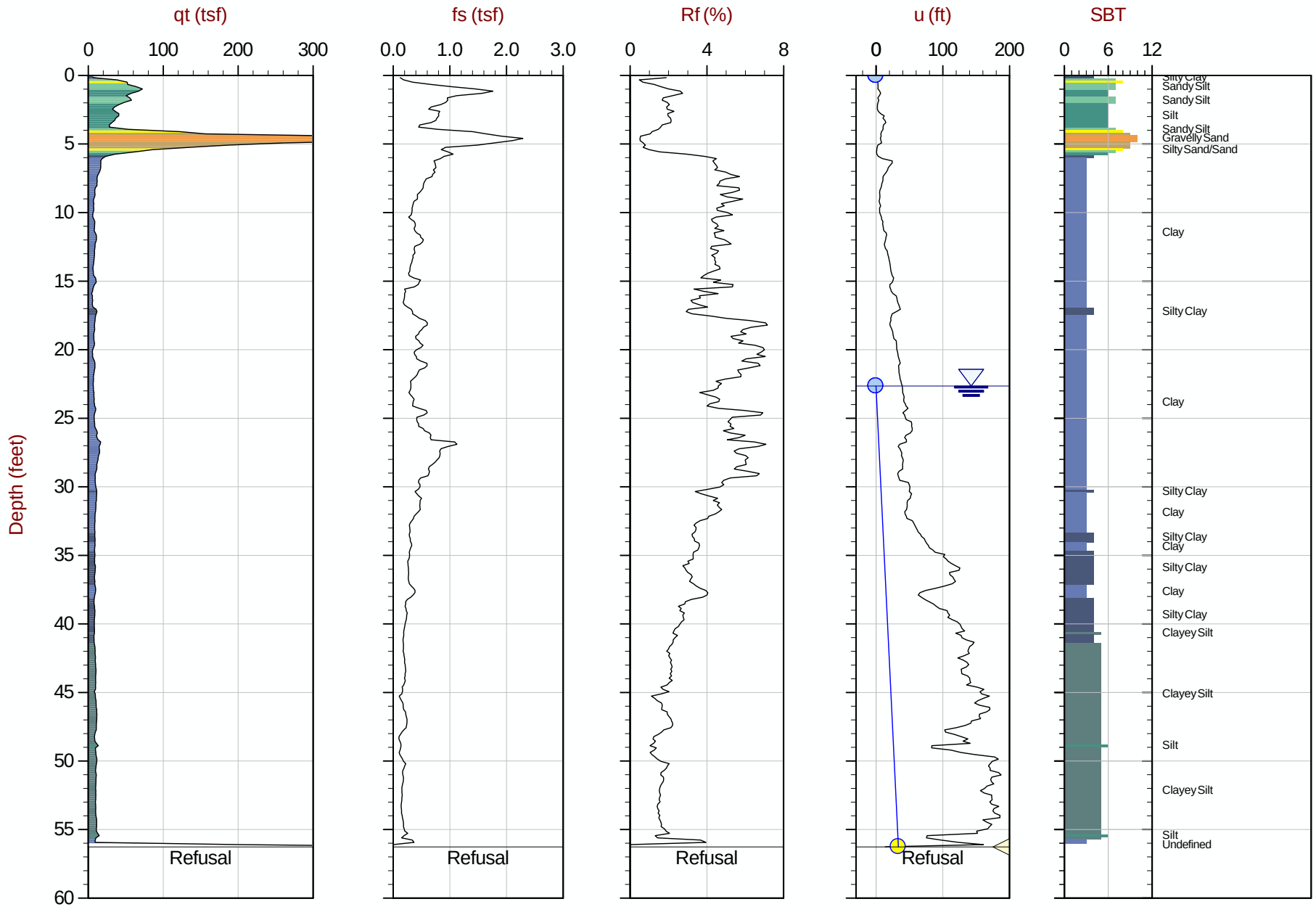
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

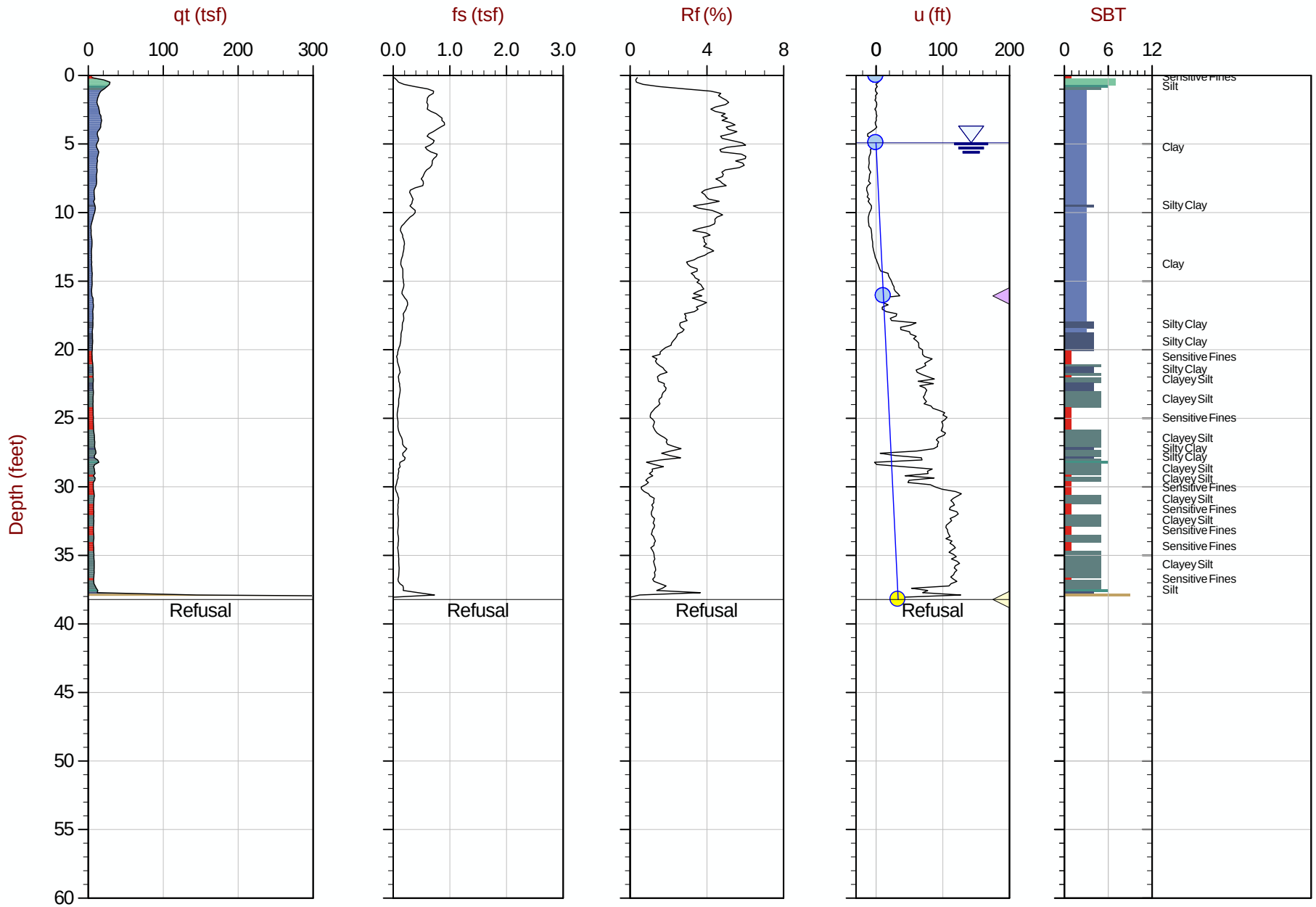
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 14:29
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374:T1500F15U500



Max Depth: 11.650 m / 38.22 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP14.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496366m E: 274362m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

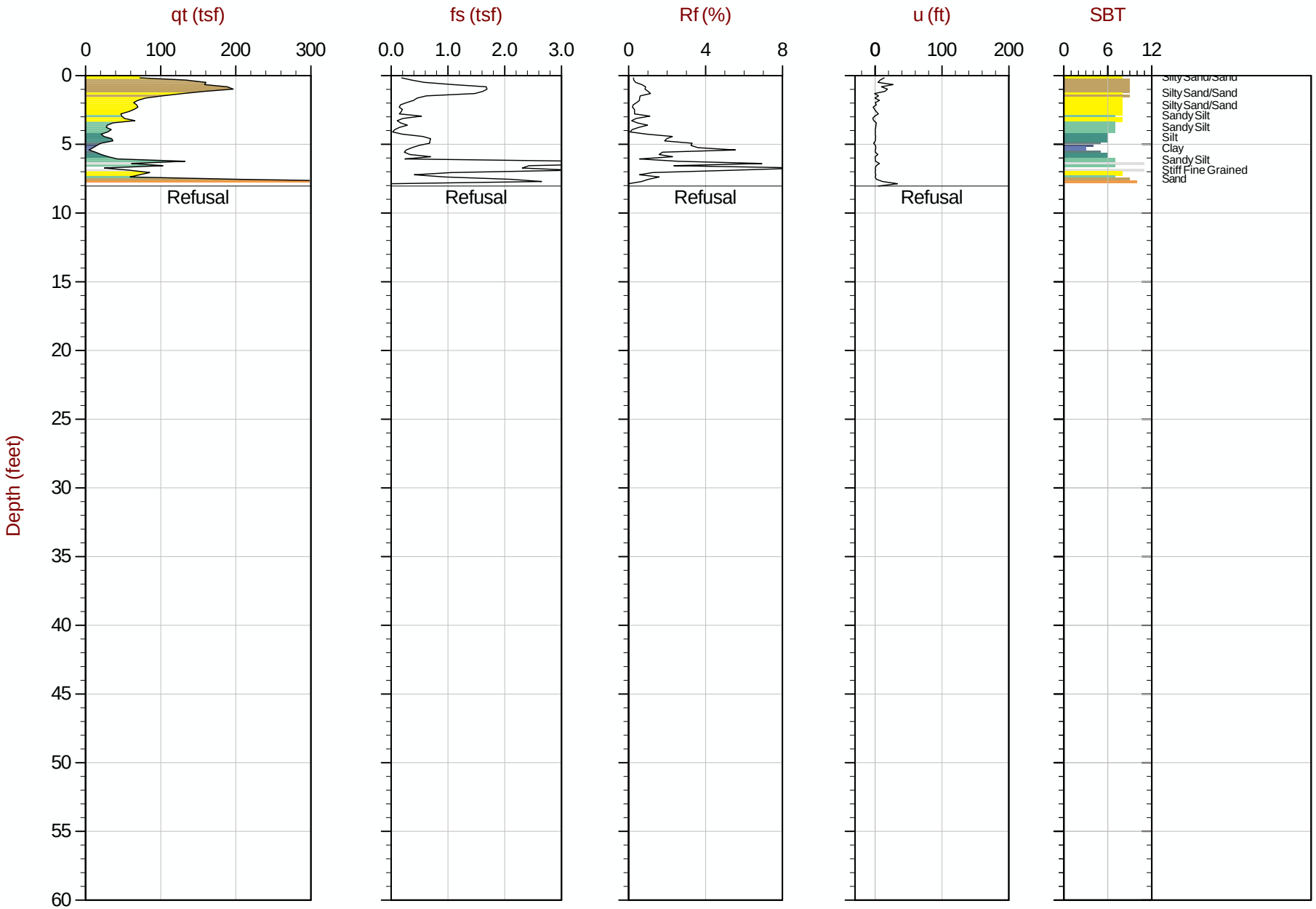
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

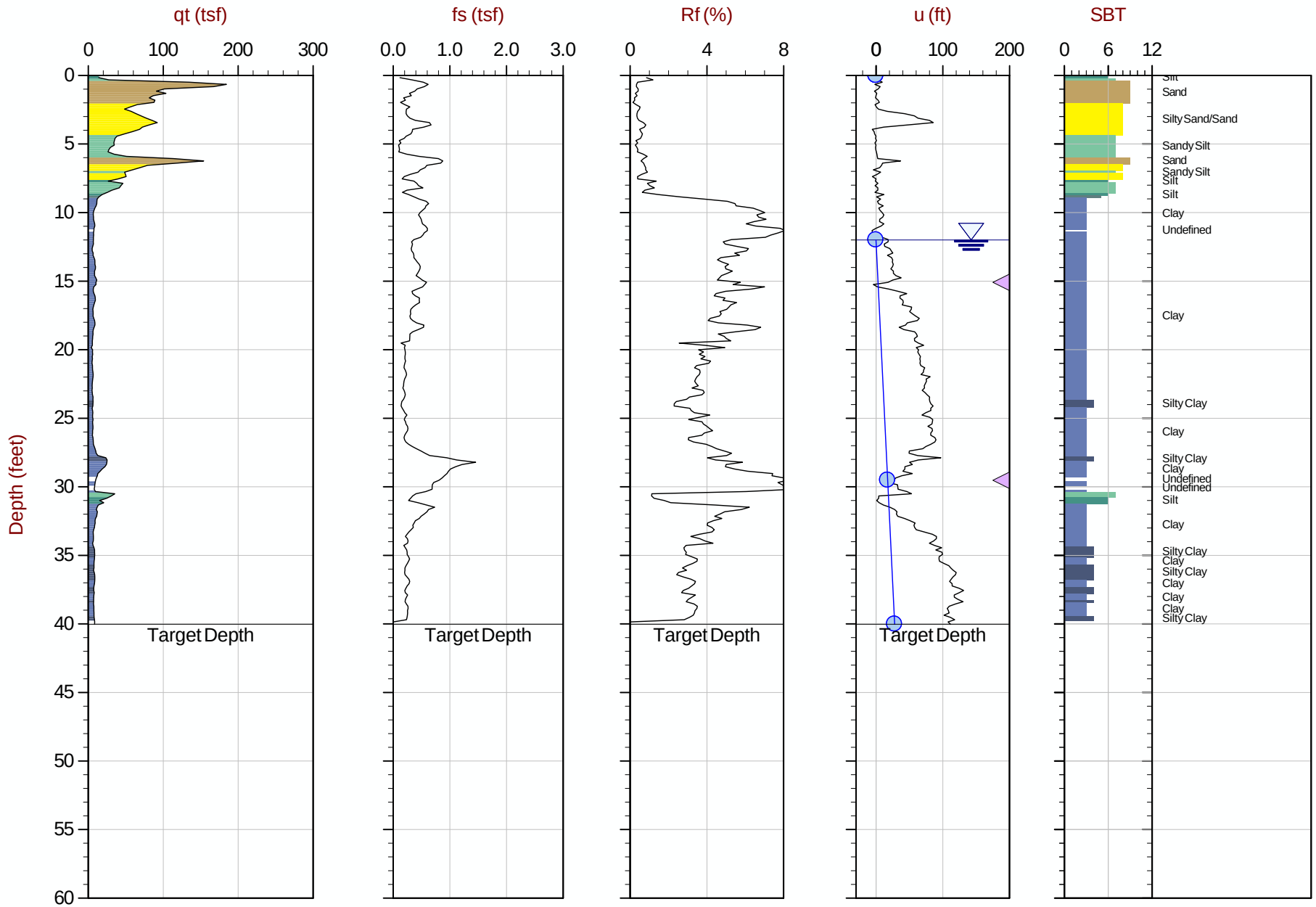
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 14:12
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

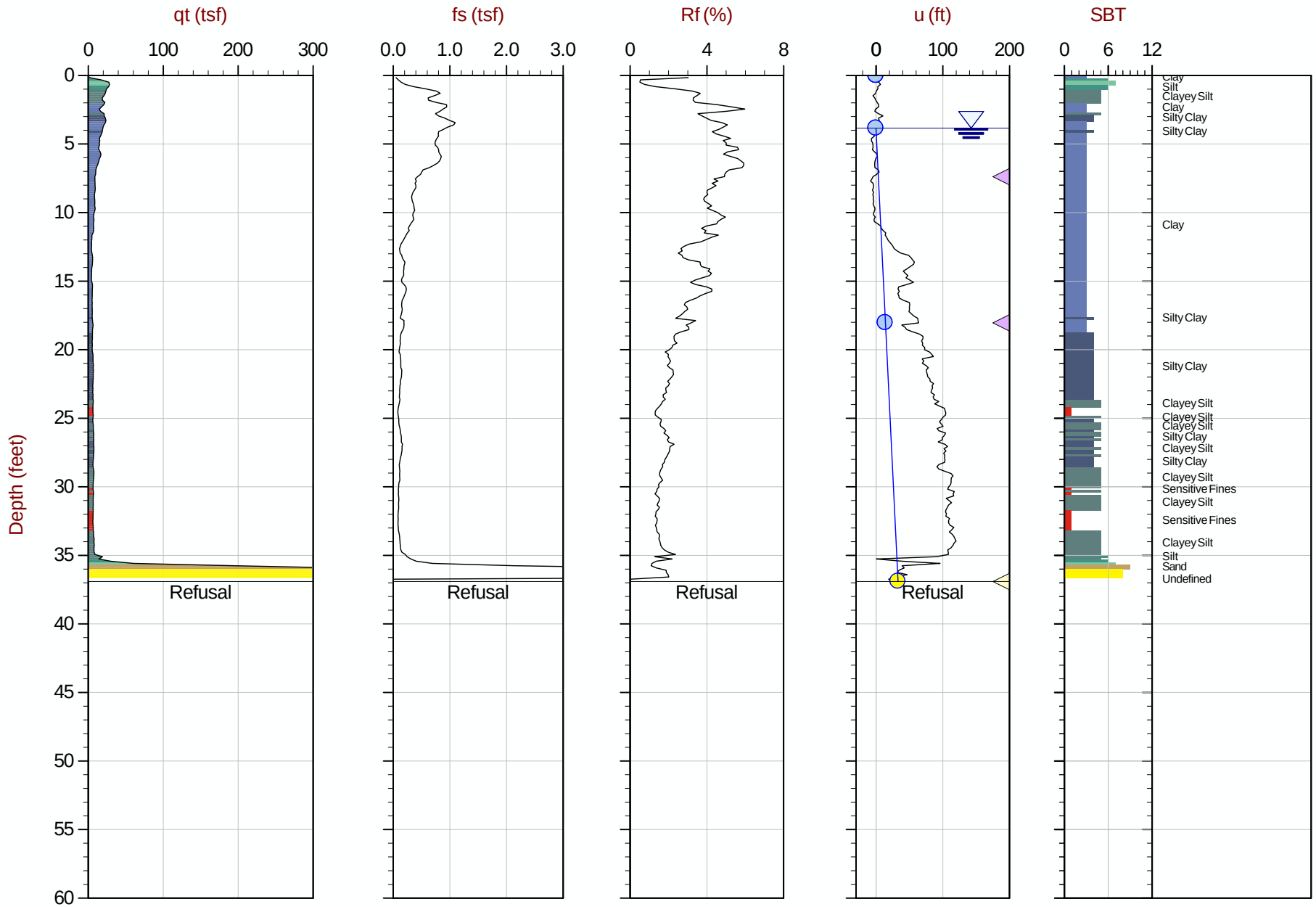
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374:T1500F15U500



Max Depth: 11.250 m / 36.91 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP16.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496442m E: 274308m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

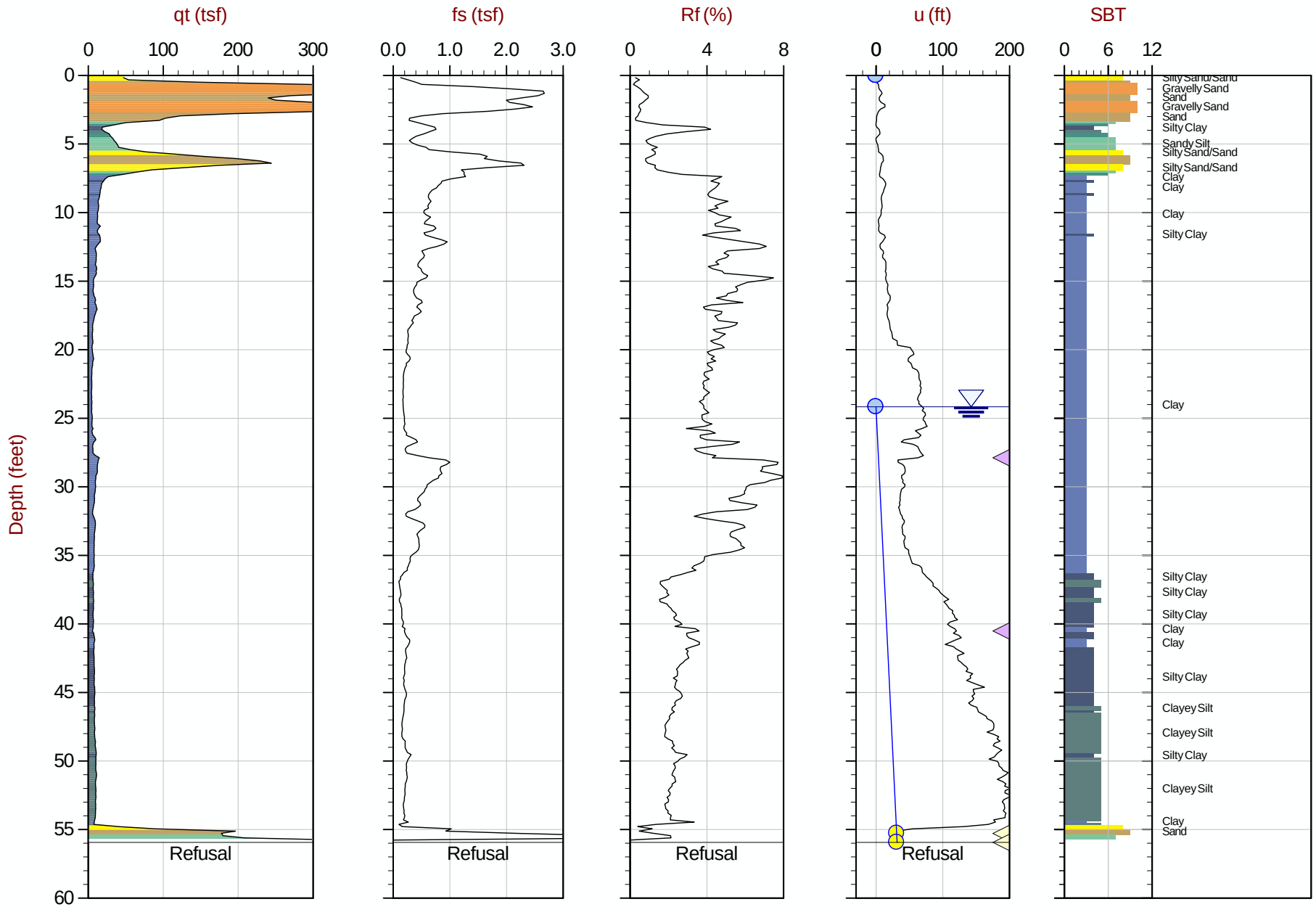
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

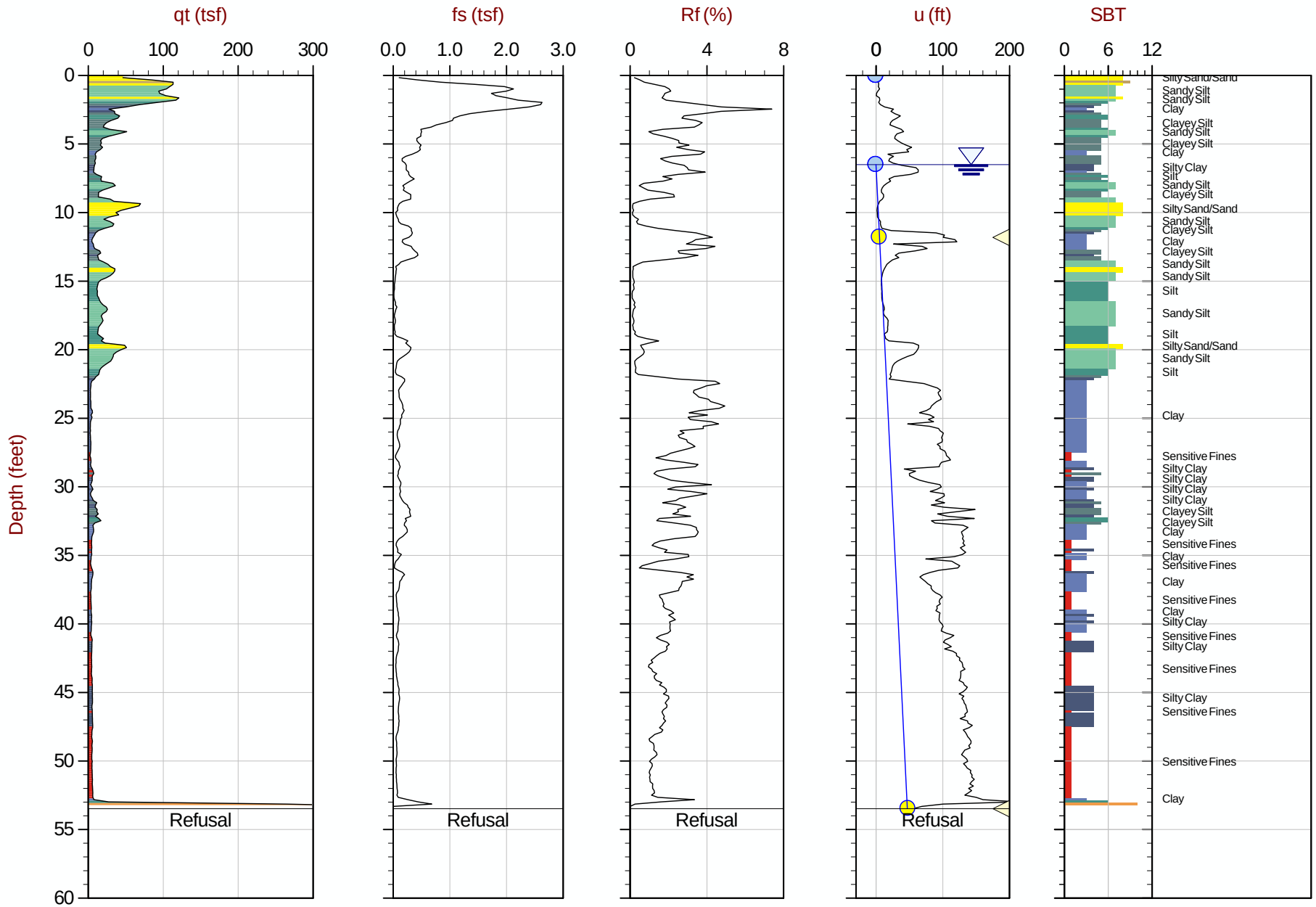
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:23
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: 340:T1500F15U500



Max Depth: 16.300 m / 53.48 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP19.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496825m E: 274184m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

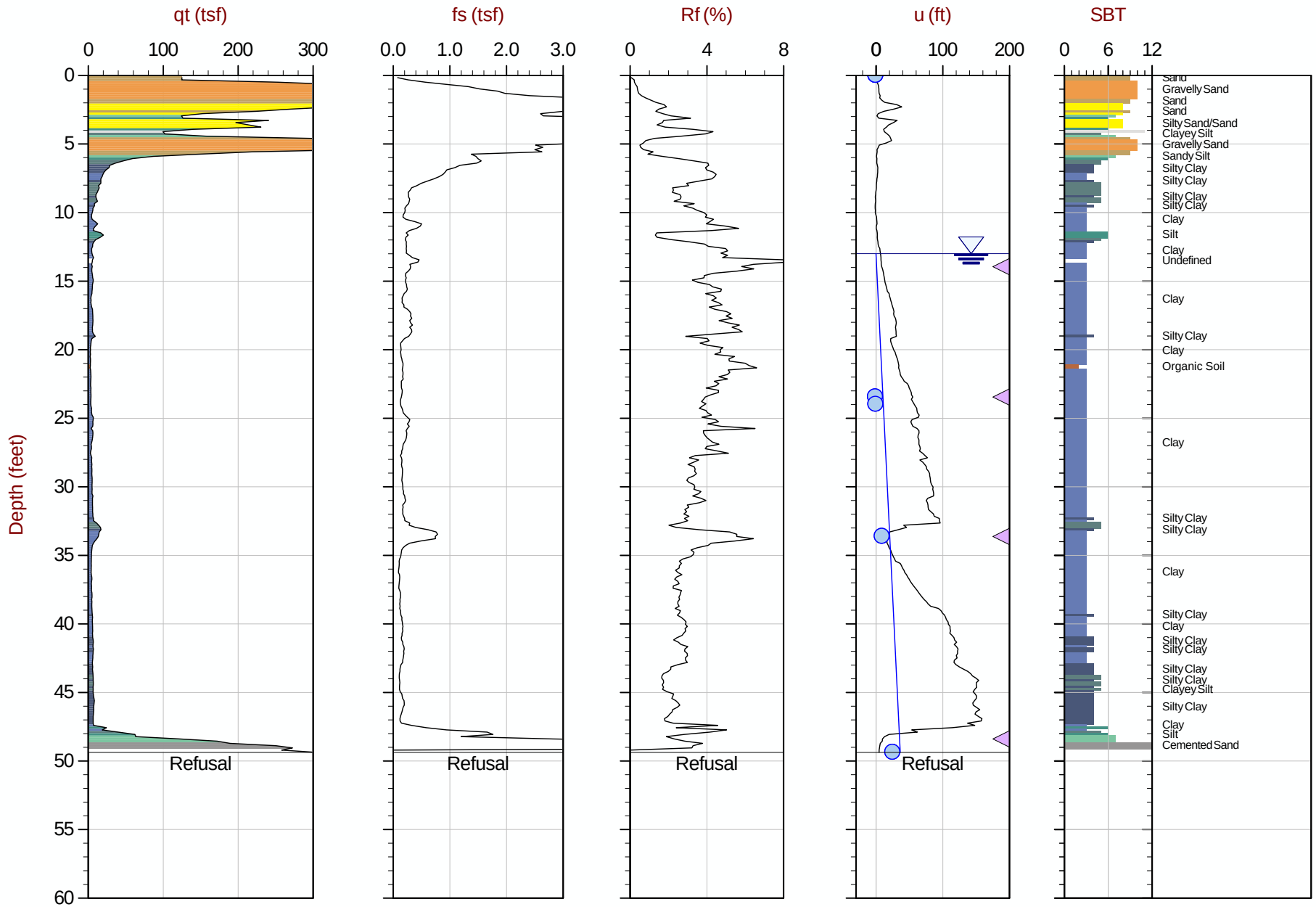
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 13:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: 340:T1500F15U500



Max Depth: 15.050 m / 49.38 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP21.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497046m E: 274071m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

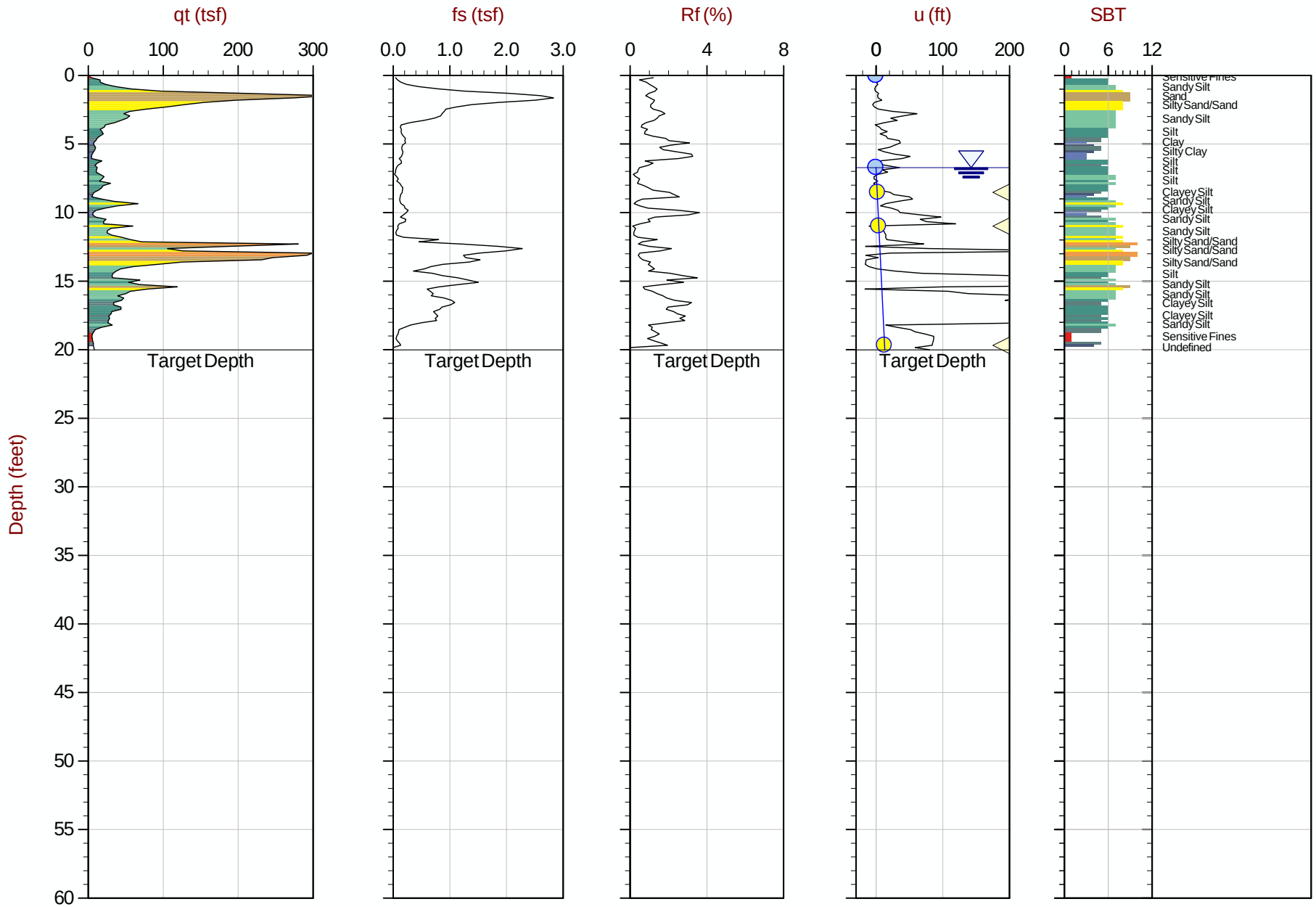
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

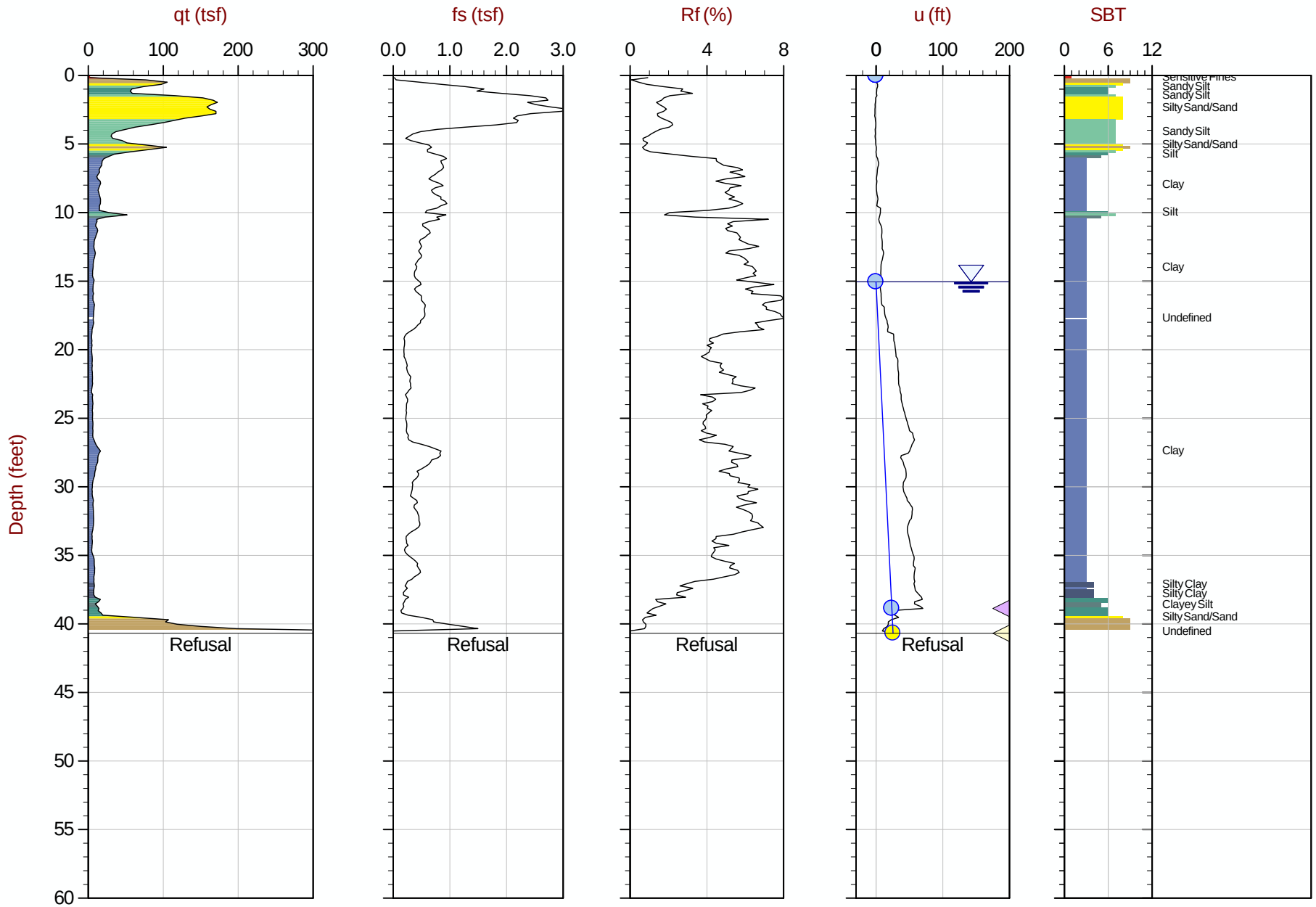
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:52
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: 340:T1500F15U500



Max Depth: 12.400 m / 40.68 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP23.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497364m E: 274147m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

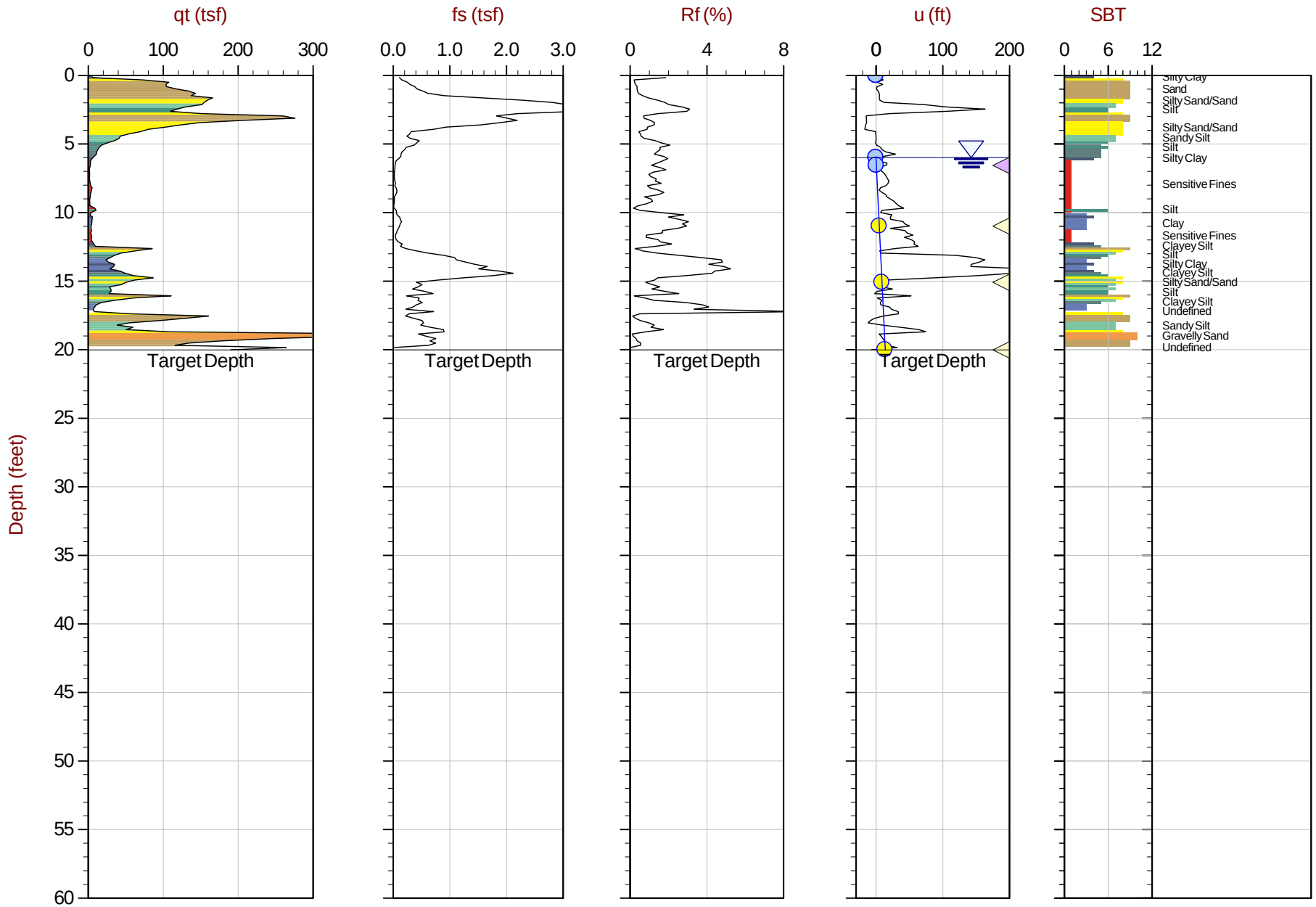
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 13:44
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP25.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497285m E: 274315m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

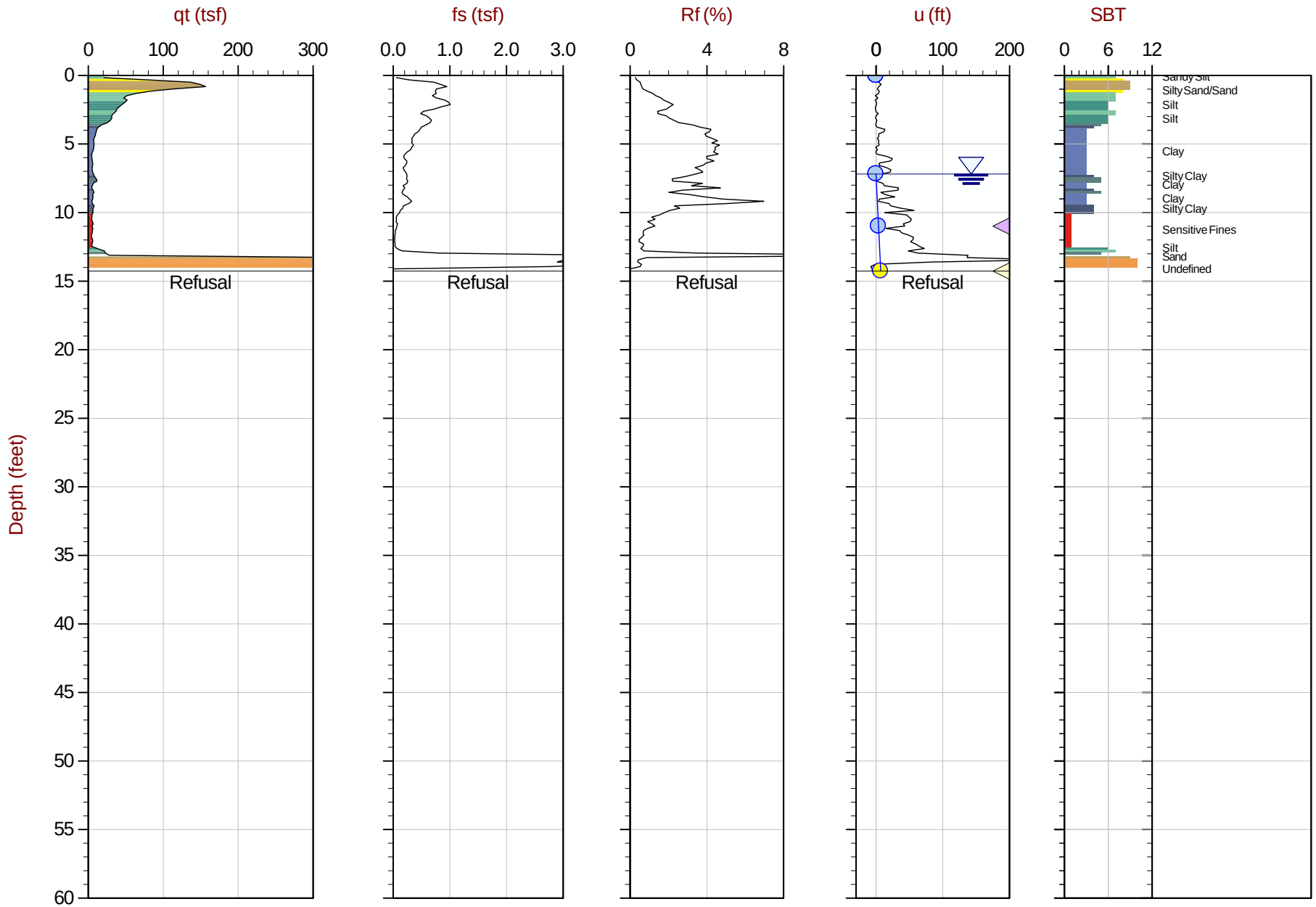
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

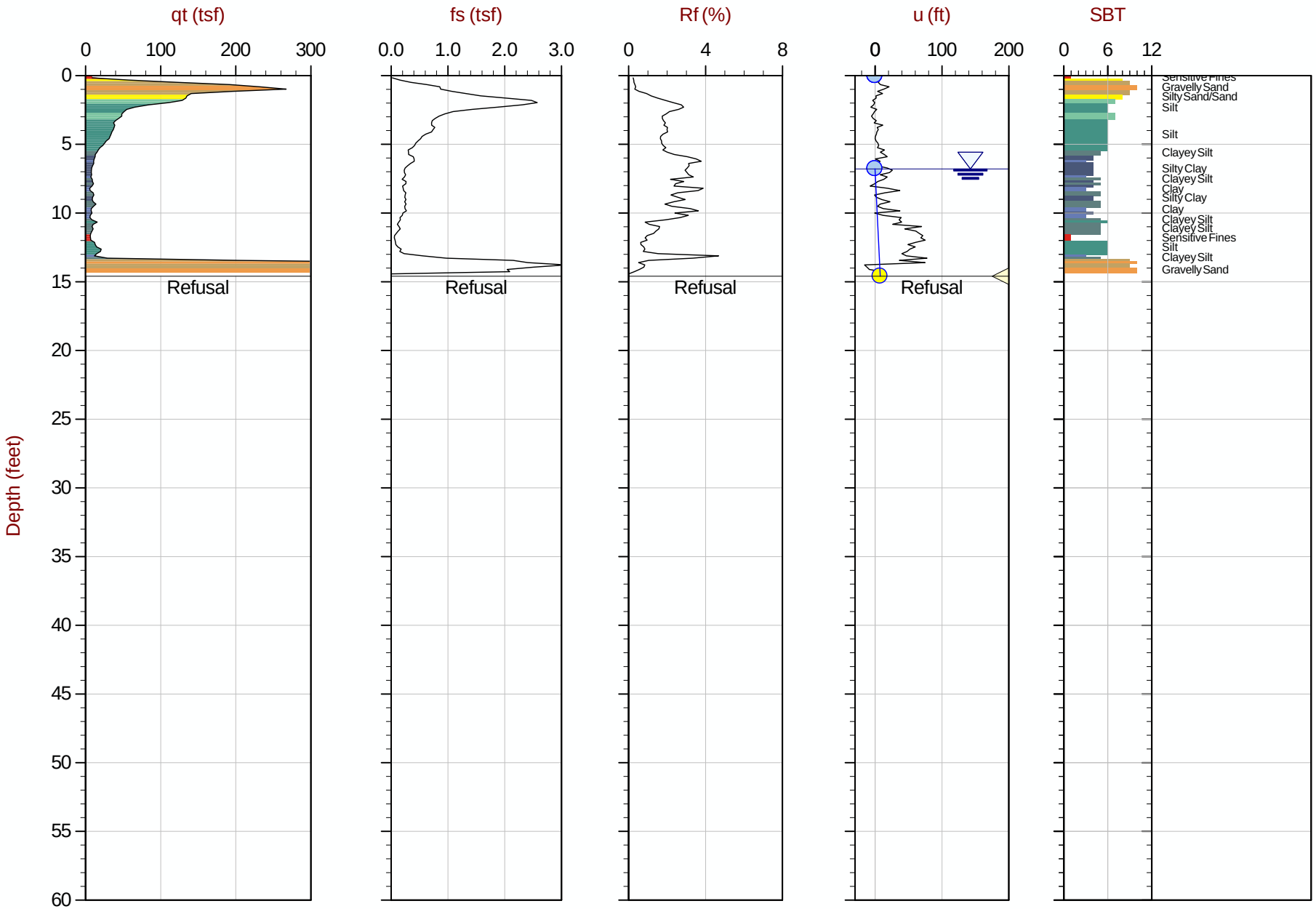
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

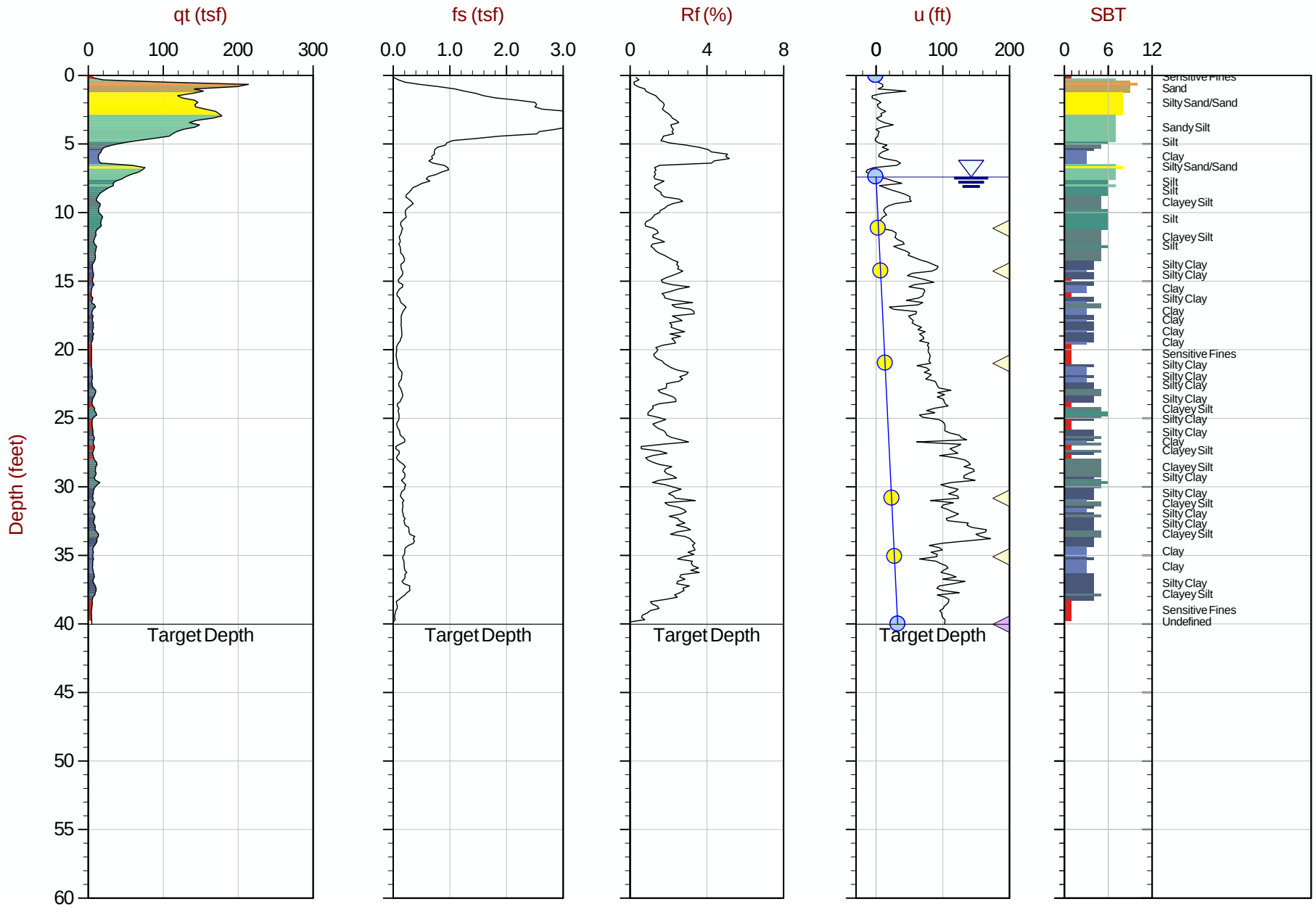
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 11:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP27.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496687m E: 274266m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

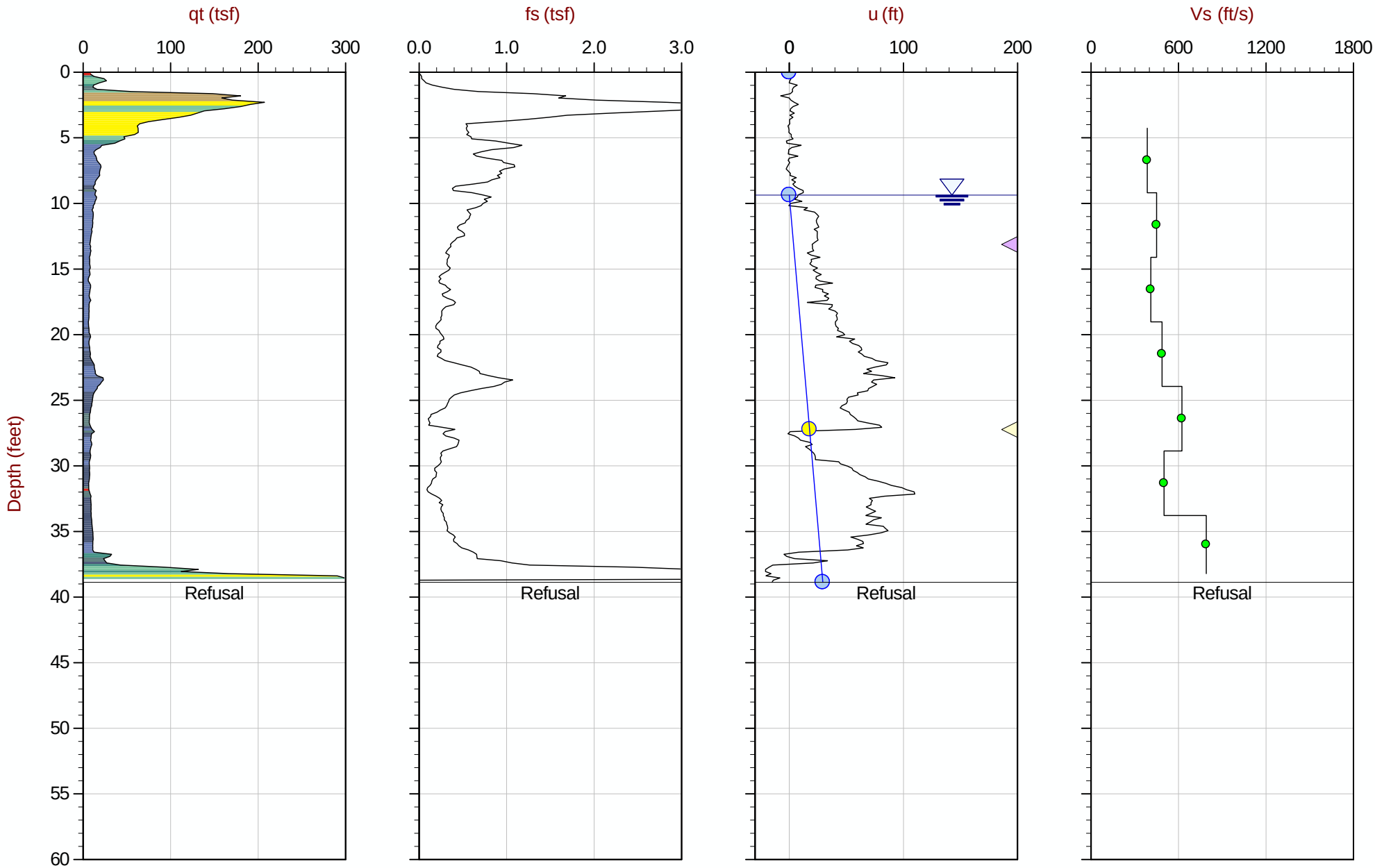
CONETEC

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374:T1500F15U500



Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

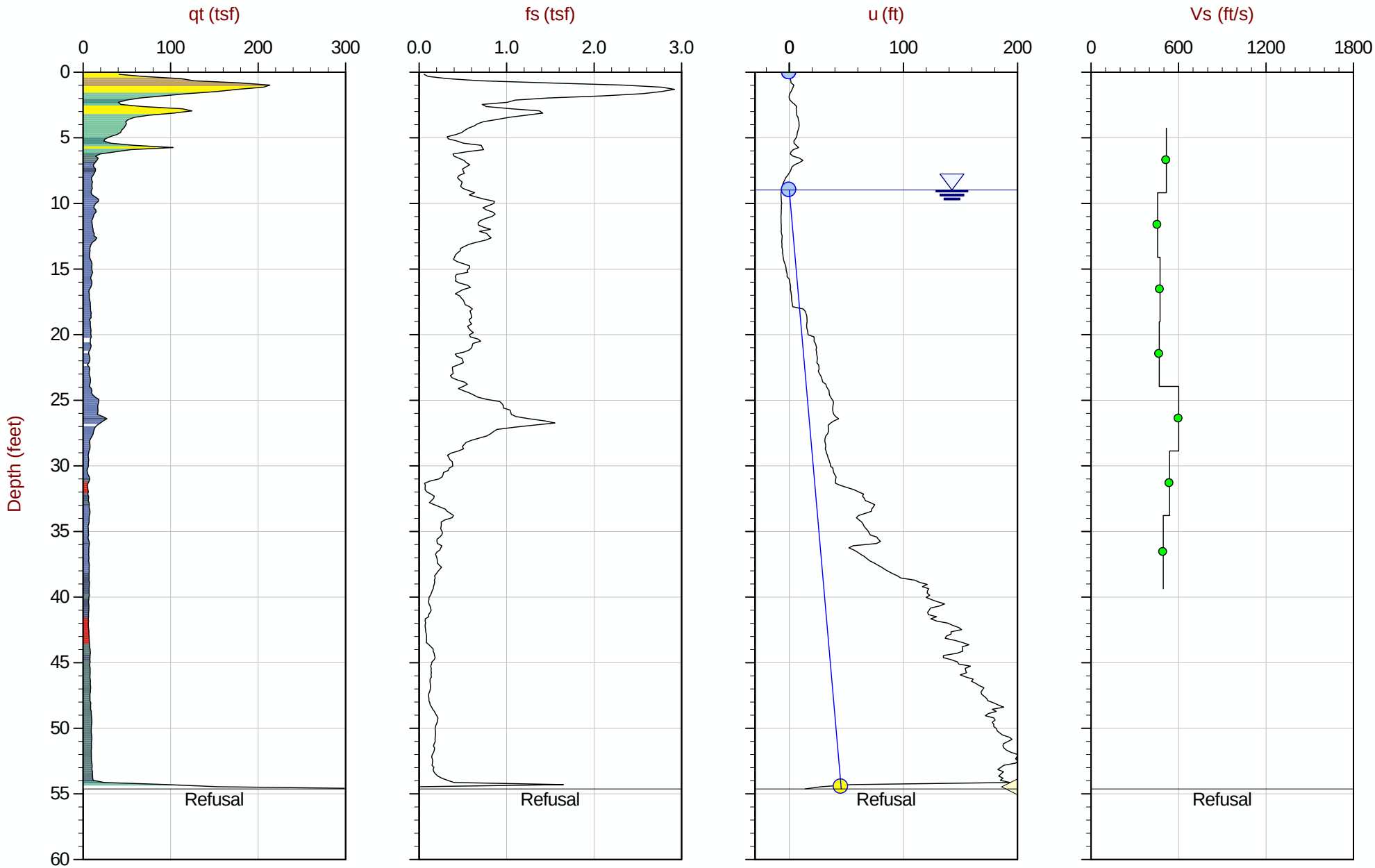
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 15:22
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: 340:T1500F15U500



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

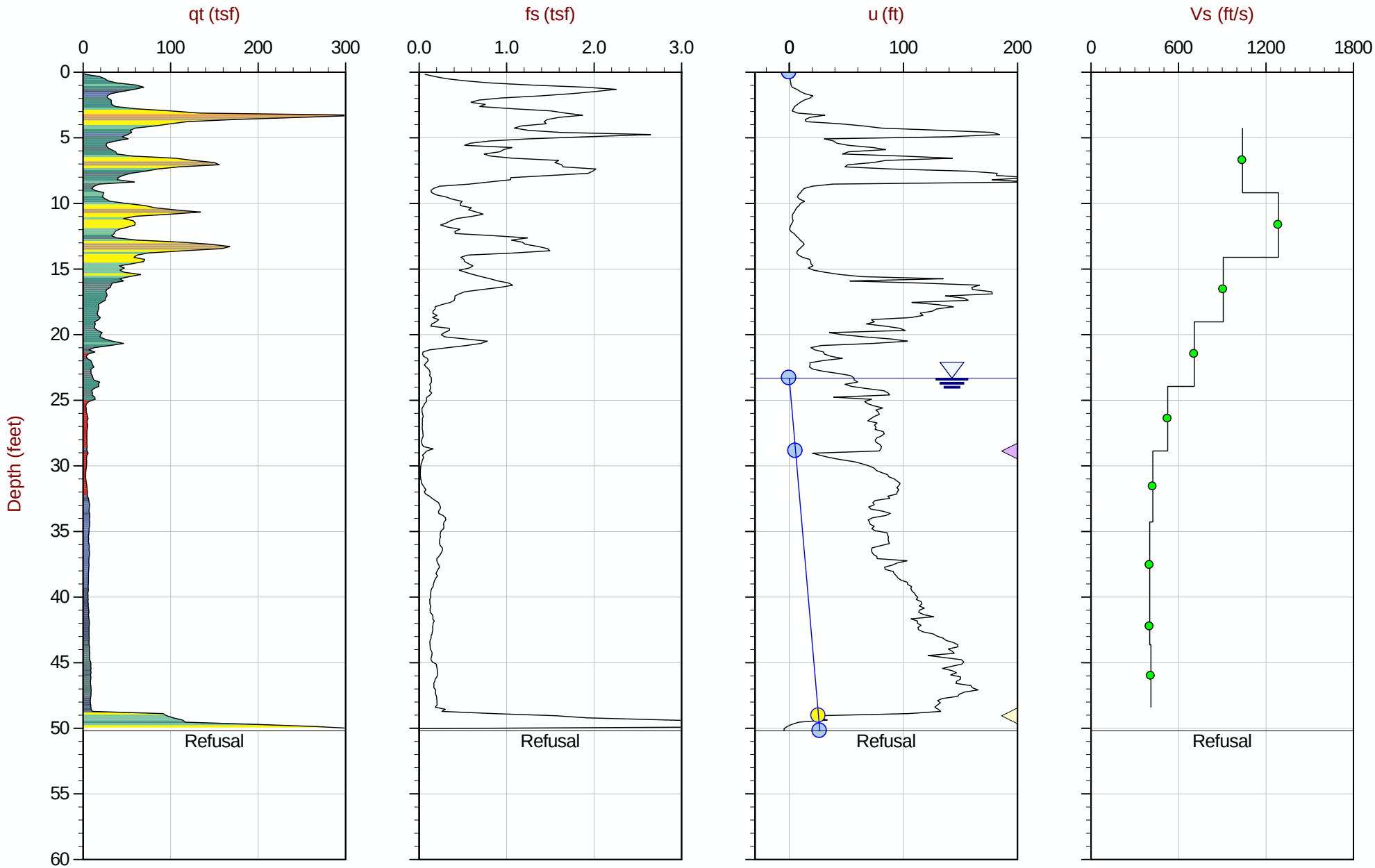
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

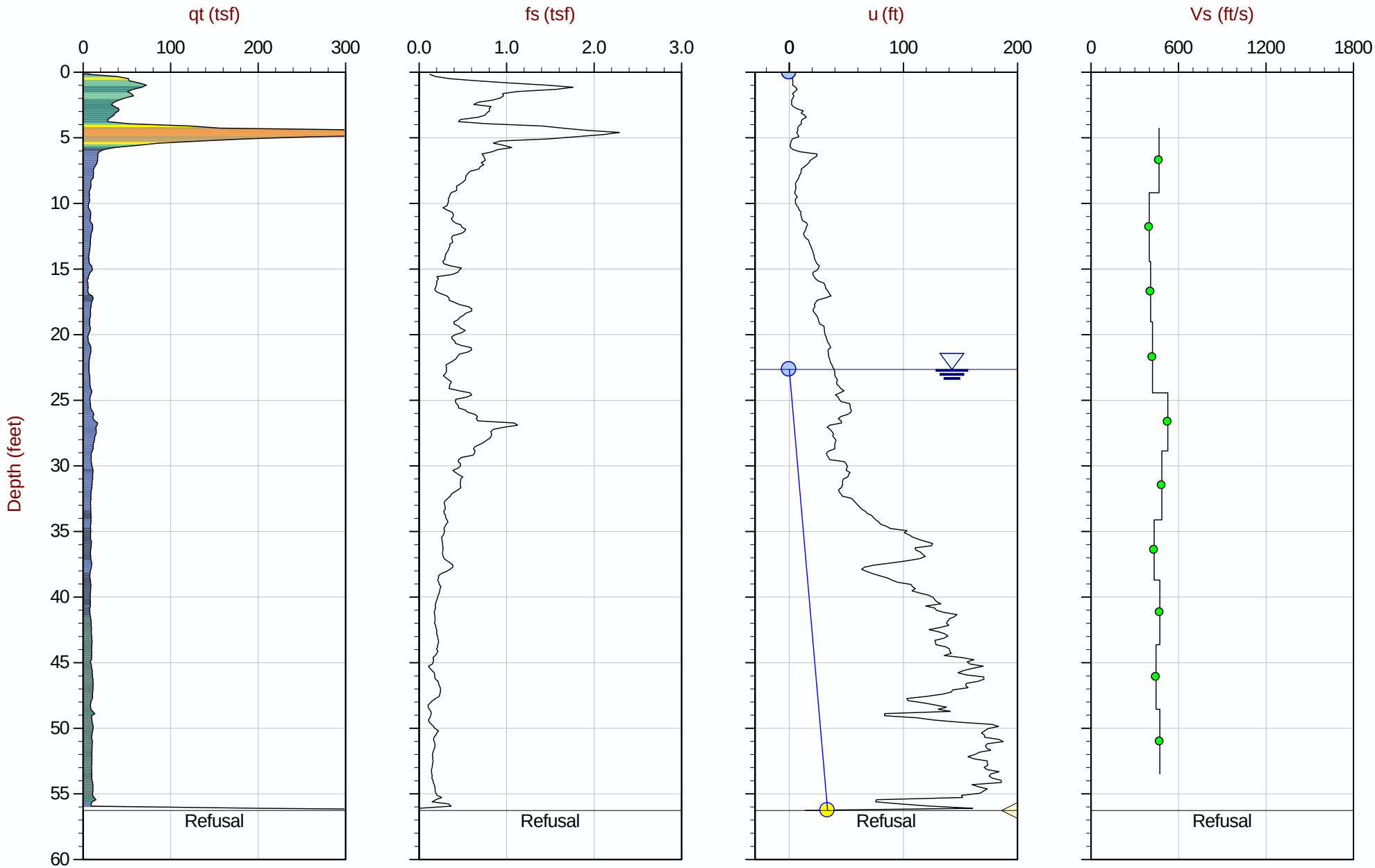
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

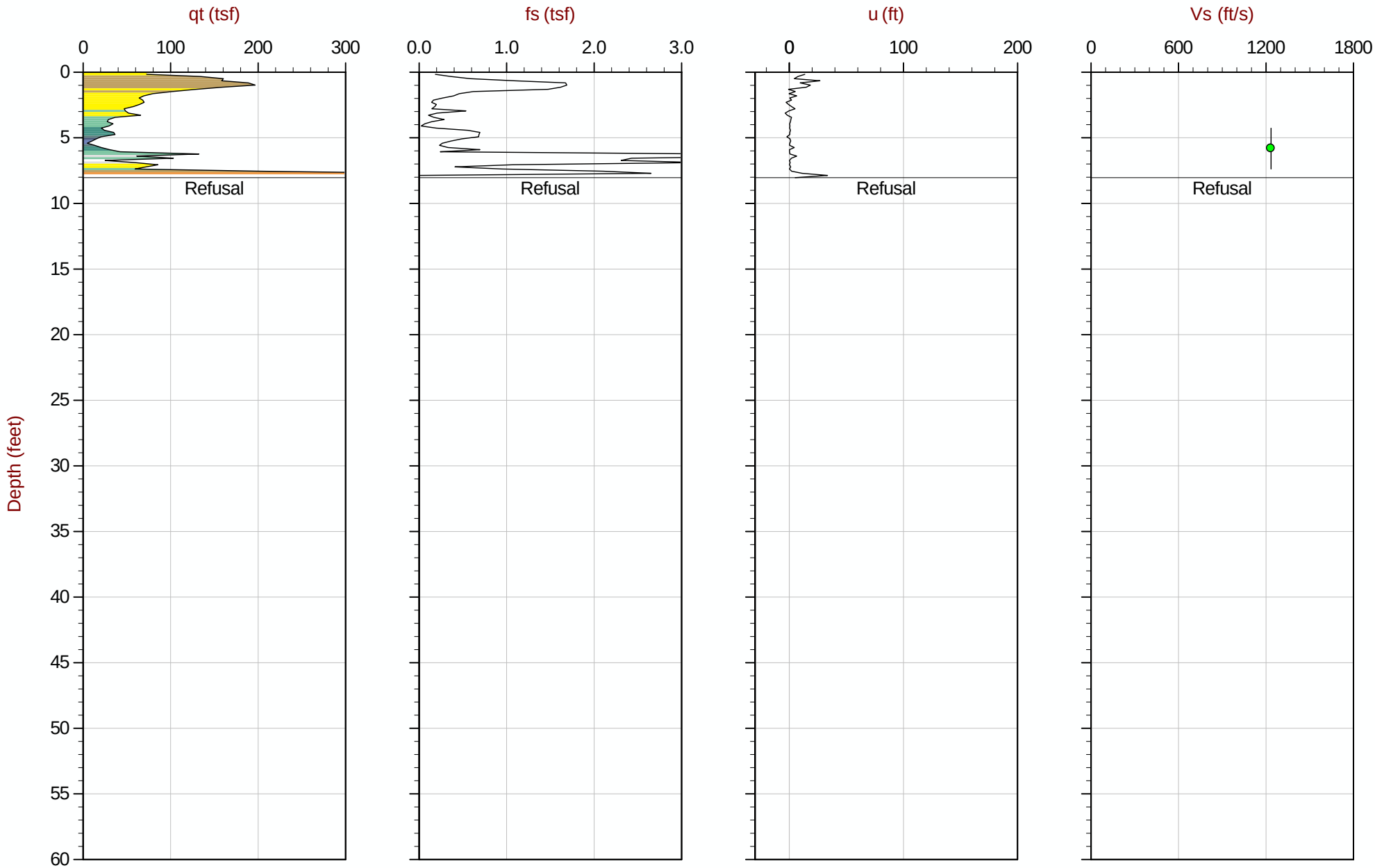
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

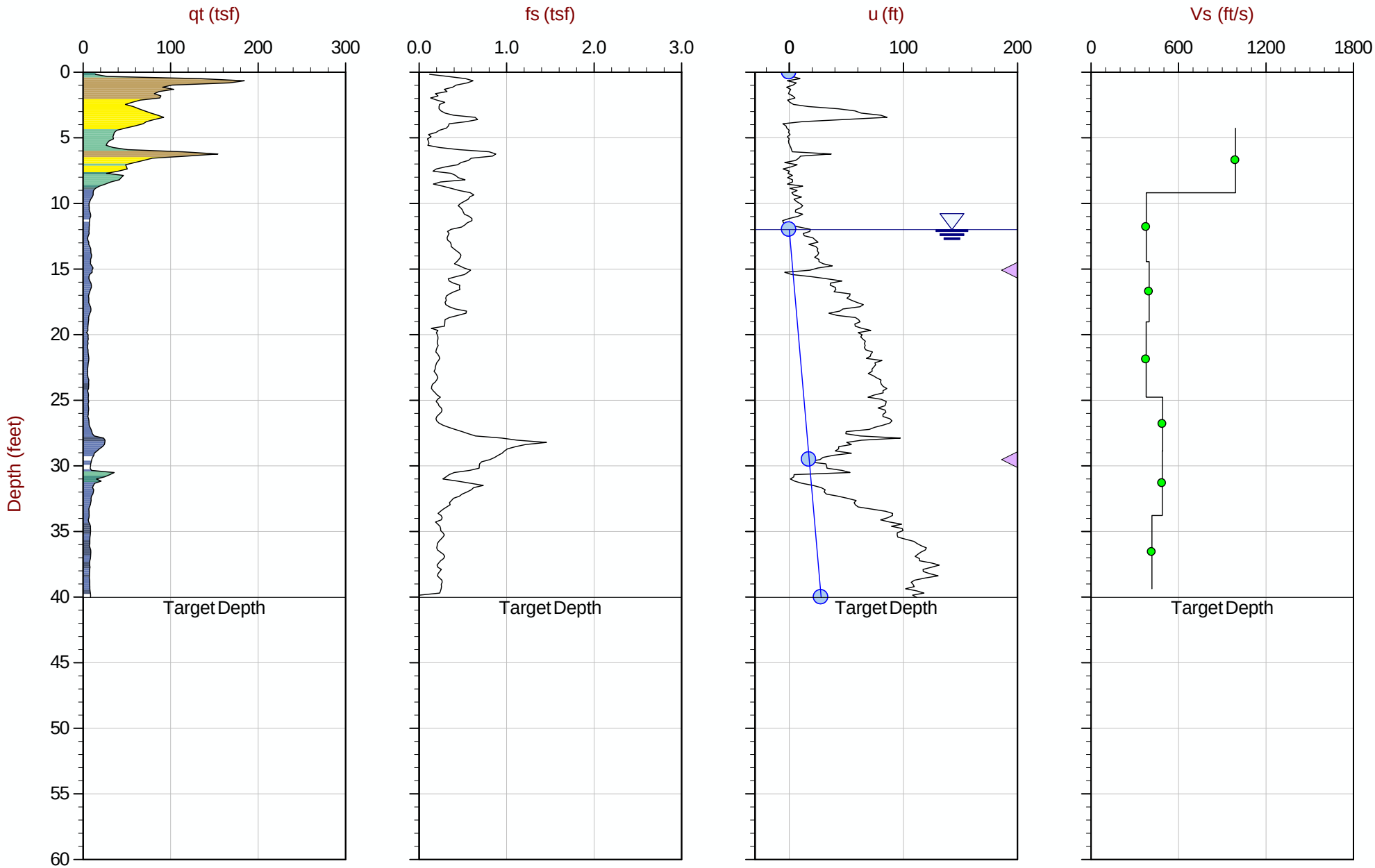
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 14:12
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

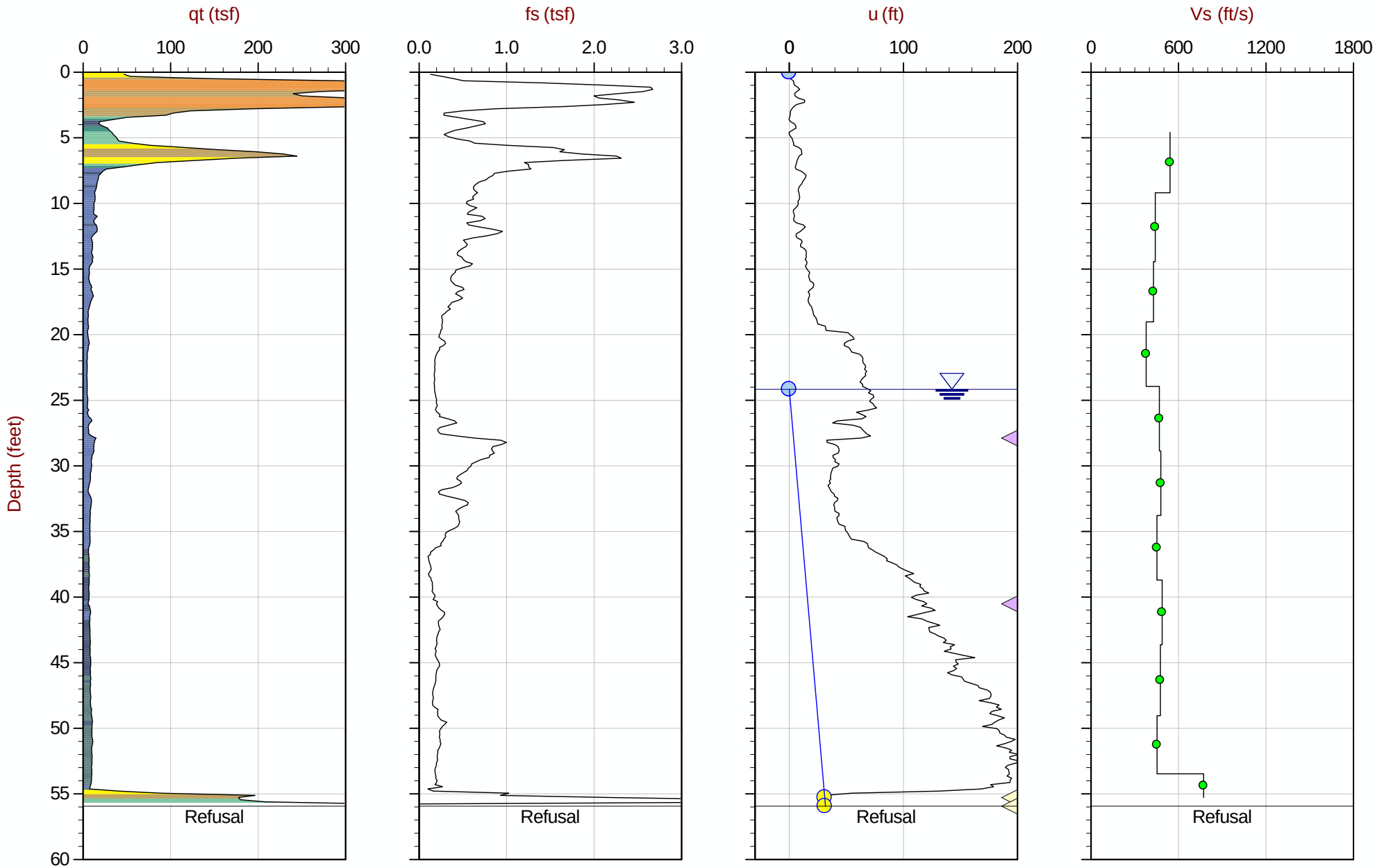
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

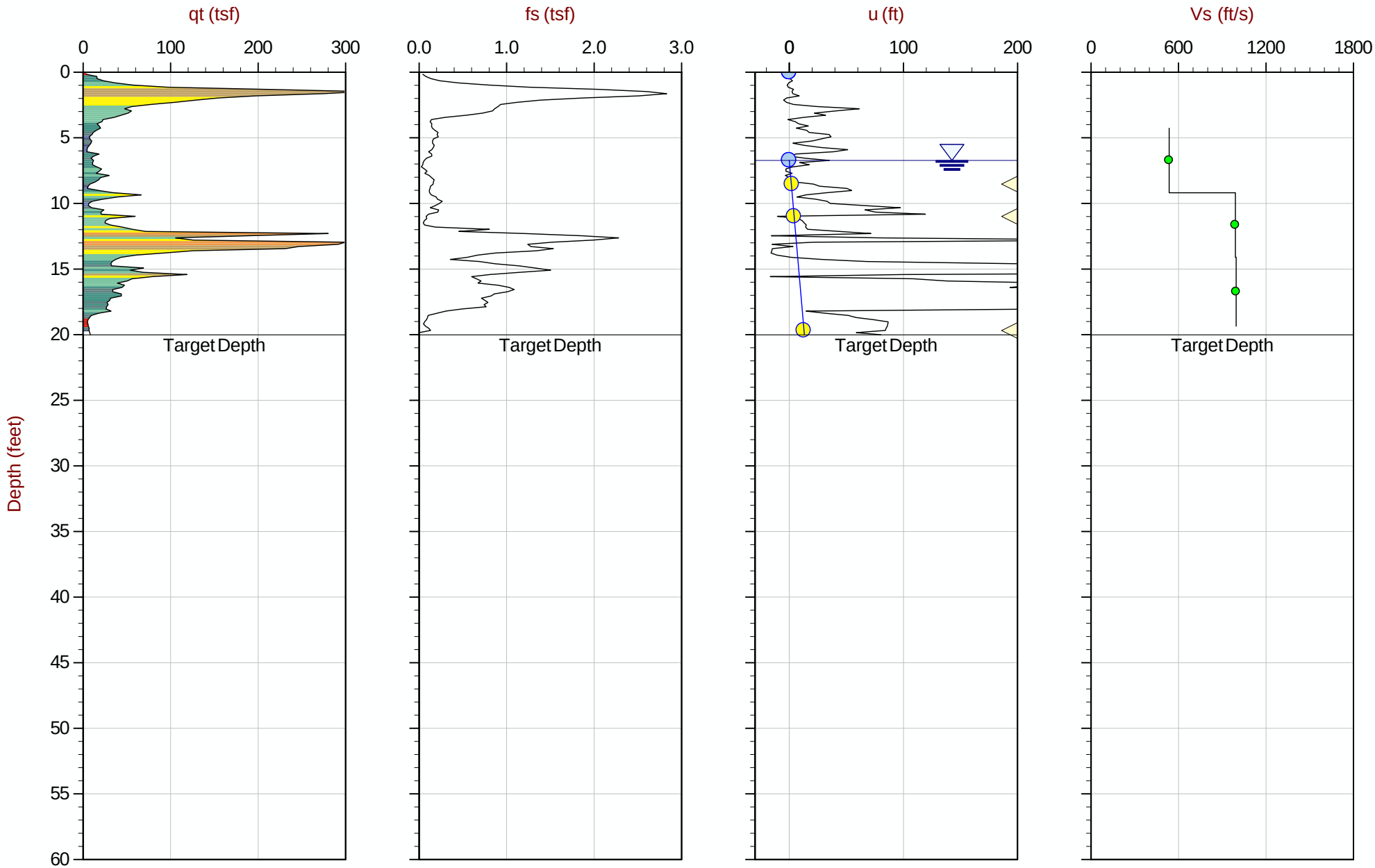
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

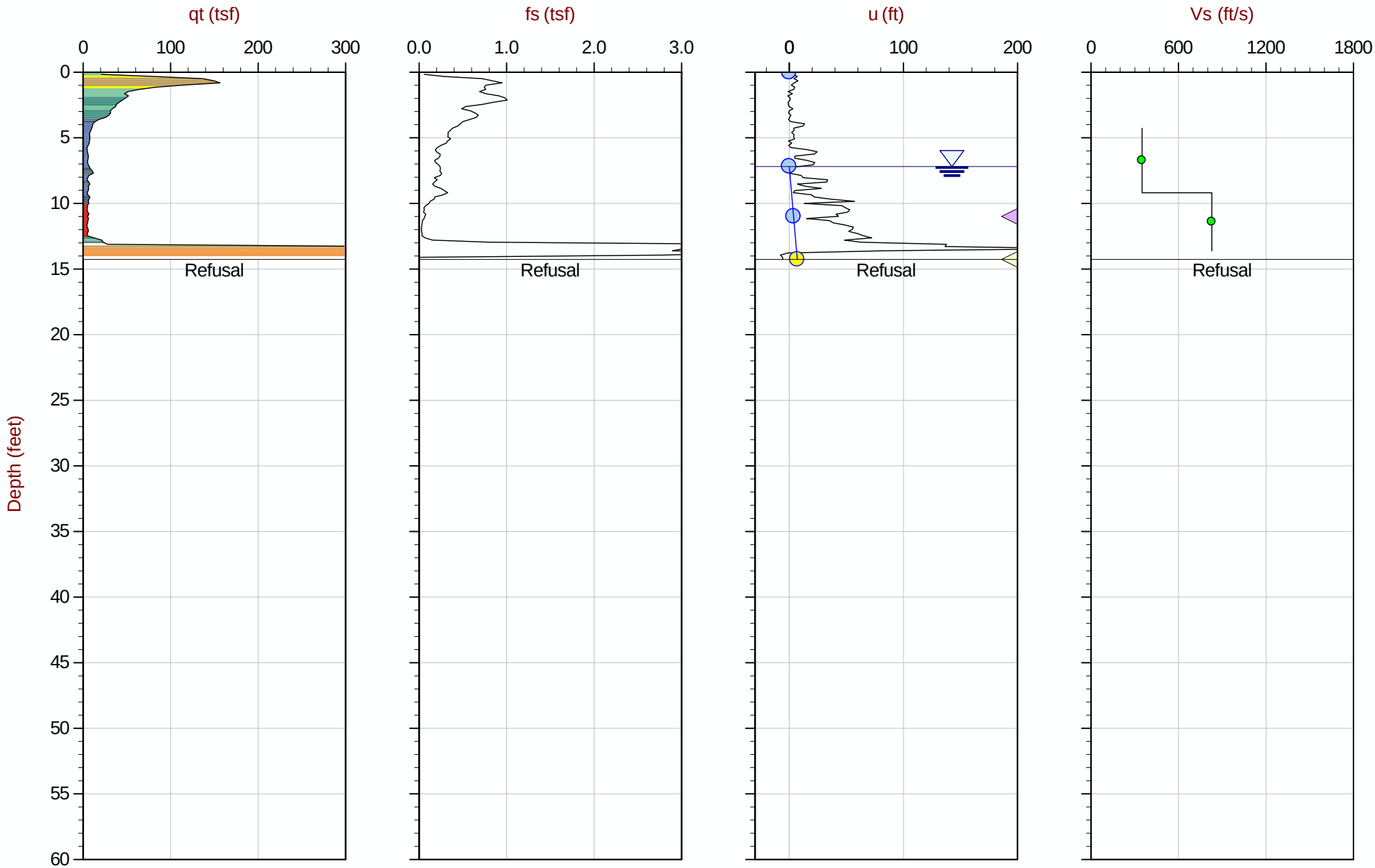
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

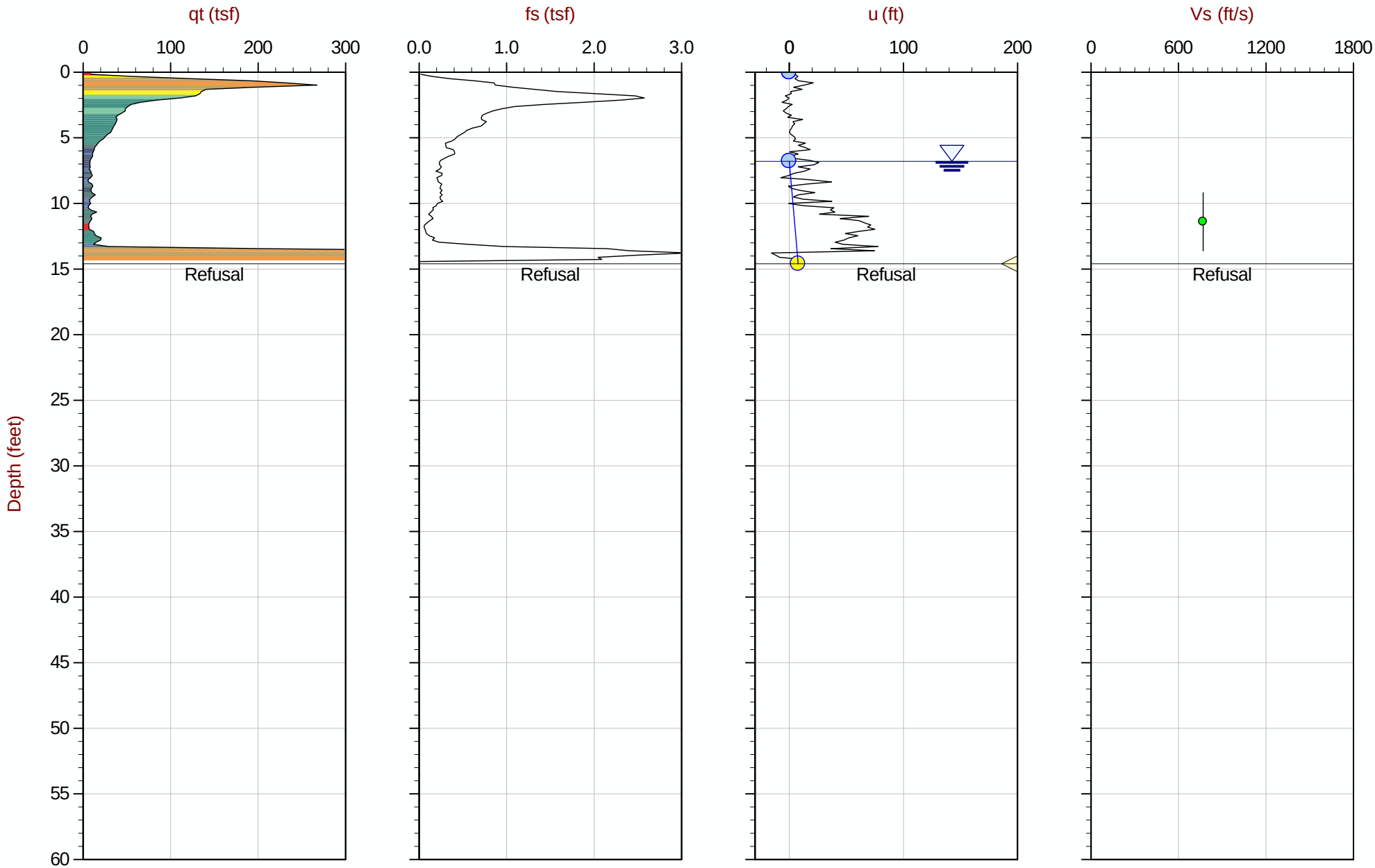
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results (Vs)

CONETEC

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C001
Date:	19-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	8.55	386
14.76	14.11	15.84	4.17	9.25	450
19.69	19.03	20.35	4.51	10.98	410
24.61	23.95	25.01	4.66	9.57	487
29.53	28.87	29.76	4.75	7.61	624
34.45	33.79	34.55	4.80	9.57	501
38.88	38.22	38.90	4.34	5.49	791

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C003
Date:	25-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	9.08	517
14.76	14.11	14.24	4.85	10.62	457
19.69	19.03	19.13	4.89	10.30	474
24.61	23.95	24.03	4.90	10.48	468
29.53	28.87	28.94	4.91	8.15	602
34.45	33.79	33.85	4.91	9.12	539
40.03	39.37	39.42	5.57	11.23	496

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C012
Date:	28-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	4.52	1039
14.76	14.11	14.24	4.85	3.77	1285
19.69	19.03	19.13	4.89	5.39	907
24.61	23.95	24.03	4.90	6.92	708
29.53	28.87	28.94	4.91	9.33	526
34.94	34.28	34.34	5.40	12.74	424
41.50	40.85	40.89	6.55	16.28	403
44.29	43.64	43.68	2.79	6.92	403
49.05	48.39	48.43	4.75	11.55	411

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C013
Date:	28-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	10.06	467
15.09	14.44	14.57	5.17	12.94	400
19.69	19.03	19.13	4.56	11.16	409
25.10	24.44	24.52	5.39	12.78	422
29.53	28.87	28.94	4.42	8.39	527
34.78	34.12	34.18	5.24	10.79	486
39.37	38.71	38.76	4.59	10.58	433
44.29	43.64	43.68	4.92	10.42	472
49.21	48.56	48.60	4.92	11.04	446
54.13	53.48	53.51	4.92	10.42	472

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C015
Date:	19-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.52			
8.04	7.38	7.53	3.01	2.44	1235

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C015A
Date:	19-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.52			
9.84	9.19	9.31	4.79	4.83	991
15.09	14.44	14.51	5.21	13.73	379
19.69	19.03	19.09	4.57	11.46	399
25.43	24.77	24.82	5.73	15.15	378
29.53	28.87	28.91	4.09	8.34	491
34.45	33.79	33.83	4.92	10.05	489
40.03	39.37	39.40	5.57	13.34	418

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C017
Date:	27-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.25	4.59	5.00			
9.84	9.19	9.40	4.40	8.11	542
15.09	14.44	14.57	5.17	11.73	441
19.69	19.03	19.13	4.56	10.62	429
24.61	23.95	24.03	4.90	12.96	378
29.53	28.87	28.94	4.91	10.47	469
34.45	33.79	33.85	4.91	10.26	479
39.37	38.71	38.76	4.91	10.87	452
44.29	43.64	43.68	4.92	10.08	488
49.70	49.05	49.09	5.41	11.37	476
54.13	53.48	53.51	4.43	9.77	453
55.94	55.28	55.32	1.80	2.33	772

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C022
Date:	26-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	6.16	536
14.76	14.11	15.84	4.17	4.21	990
20.01	19.36	20.66	4.81	4.83	996

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C026
Date:	26-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	9.43	350
14.27	13.62	15.41	3.73	4.50	829

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C026B
Date:	26-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
9.84	9.19	11.68			
14.27	13.62	15.41	3.73	4.85	769

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

CONETEC

CONETEC

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station, Peoria, IL
Start Date: 19-Aug-2015
End Date: 29-Aug-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
EDW-C001	15-53073_SP01	15	200	13.12						
EDW-C001	15-53073_SP01	15	9000	27.23	17.86	9.37		81	100	8.69
EDW-C003	15-53073_SP03	15	1020	54.46	45.49	8.98				
EDW-C005	15-53073_CP05	15	6000	37.40	30.40		7.00	3717	100	0.19
EDW-C006	15-53073_CP06	15	360	14.27						
EDW-C006	15-53073_CP06	15	7200	26.25	14.75		11.50	7114	100	0.10
EDW-C006	15-53073_CP06	15	1200	40.03						
EDW-C007	15-53073_CP07	15	600	26.90						
EDW-C007	15-53073_CP07	15	4000	51.51	42.62	8.89				
EDW-C008	15-53073_CP08	15	4800	22.15	12.15		10.00	2835	100	0.25
EDW-C008	15-53073_CP08	15	1800	33.63						
EDW-C009	15-53073_CP09	15	800	16.08	2.61	13.46				
EDW-C009	15-53073_CP09	15	600	28.38	8.49	19.89				
EDW-C010	15-53073_CP10	15	3000	12.14	9.93		2.21	1239	100	0.57
EDW-C010	15-53073_CP10	15	300	27.56	25.35	2.21				
EDW-C010	15-53073_CP10	15	600	30.02	0.00					
EDW-C011	15-53073_CP11	15	3800	24.11						
EDW-C011	15-53073_CP11	15	7500	46.42	23.96		22.47	1082	100	0.65
EDW-C011	15-53073_CP11	15	400	47.08	24.61	22.47				
EDW-C012	15-53073_SP12	15	1500	28.87	5.55		23.32	120	100	5.86
EDW-C012	15-53073_SP12	15	1000	49.05	25.73	23.32				
EDW-C013	15-53073_SP13	15	1205	56.27	33.61	22.65				
EDW-C014	15-53073_CP14	15	4000	16.08	11.16		4.91	2190	100	0.32
EDW-C014	15-53073_CP14	15	500	38.22	33.31	4.91				
EDW-C015A	15-53073_SP15A	15	2000	15.09						
EDW-C015A	15-53073_SP15A	15	10800	29.53	17.53		12.00	6095	100	0.12
EDW-C016	15-53073_CP16	15	900	7.38						
EDW-C016	15-53073_CP16	15	3600	18.04	14.20		3.85	1538	100	0.46
EDW-C016	15-53073_CP16	15	500	36.91	33.06	3.85				
EDW-C017	15-53073_SP17	15	500	27.89						
EDW-C017	15-53073_SP17	15	525	40.52						
EDW-C017	15-53073_SP17	15	600	55.28	31.11	24.17				
EDW-C017	15-53073_SP17	15	85	55.94	31.25	24.69				
EDW-C019	15-53073_CP19	15	600	11.81	5.31	6.51				
EDW-C019	15-53073_CP19	15	1500	53.48	48.16	5.31				
EDW-C021	15-53073_CP21	15	550	13.94						
EDW-C021	15-53073_CP21	15	8000	23.46	10.46		13.00	2190	100	0.32
EDW-C021	15-53073_CP21	15	12070	33.63	20.63		13.00	1449	100	0.48
EDW-C021	15-53073_CP21	15	1600	48.39						
EDW-C022	15-53073_SP22	15	300	8.53	2.39	6.14				
EDW-C022	15-53073_SP22	15	300	10.99	4.27	6.72				
EDW-C022	15-53073_SP22	15	1200	19.68	12.85	6.84				
EDW-C023	15-53073_CP23	15	4000	38.88	23.82		15.06	78	100	9.01
EDW-C023	15-53073_CP23	15	400	40.68	25.63	15.06				
EDW-C025	15-53073_CP25	15	1500	6.56	0.57		5.99	36	100	19.34

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station, Peoria, IL
Start Date:	19-Aug-2015
End Date:	29-Aug-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
EDW-C025	15-53073_CP25	15	500	10.99	5.00	5.99				
EDW-C025	15-53073_CP25	15	500	15.09	9.03	6.06				
EDW-C025	15-53073_CP25	15	500	20.01	13.58	6.44				
EDW-C026	15-53073_SP26	15	2700	10.99	3.80		7.19	31	100	22.51
EDW-C026	15-53073_SP26	15	1100	14.27	7.08	7.19				
EDW-C026B	15-53073_SP26B	15	800	14.60	7.81	6.79				
EDW-C027	15-53073_CP27	15	500	11.15	3.75	7.40				
EDW-C027	15-53073_CP27	15	300	14.27	7.50	6.77				
EDW-C027	15-53073_CP27	15	360	21.00	14.24	6.76				
EDW-C027	15-53073_CP27	15	500	30.84	24.17	6.67				
EDW-C027	15-53073_CP27	15	500	35.10	28.47	6.63				
EDW-C027	15-53073_CP27	15	1800	40.03	33.25		6.77	1185	100	0.59
Totals	54 dissipations		1879.3 min							

a. Time is relative to where umax occurred

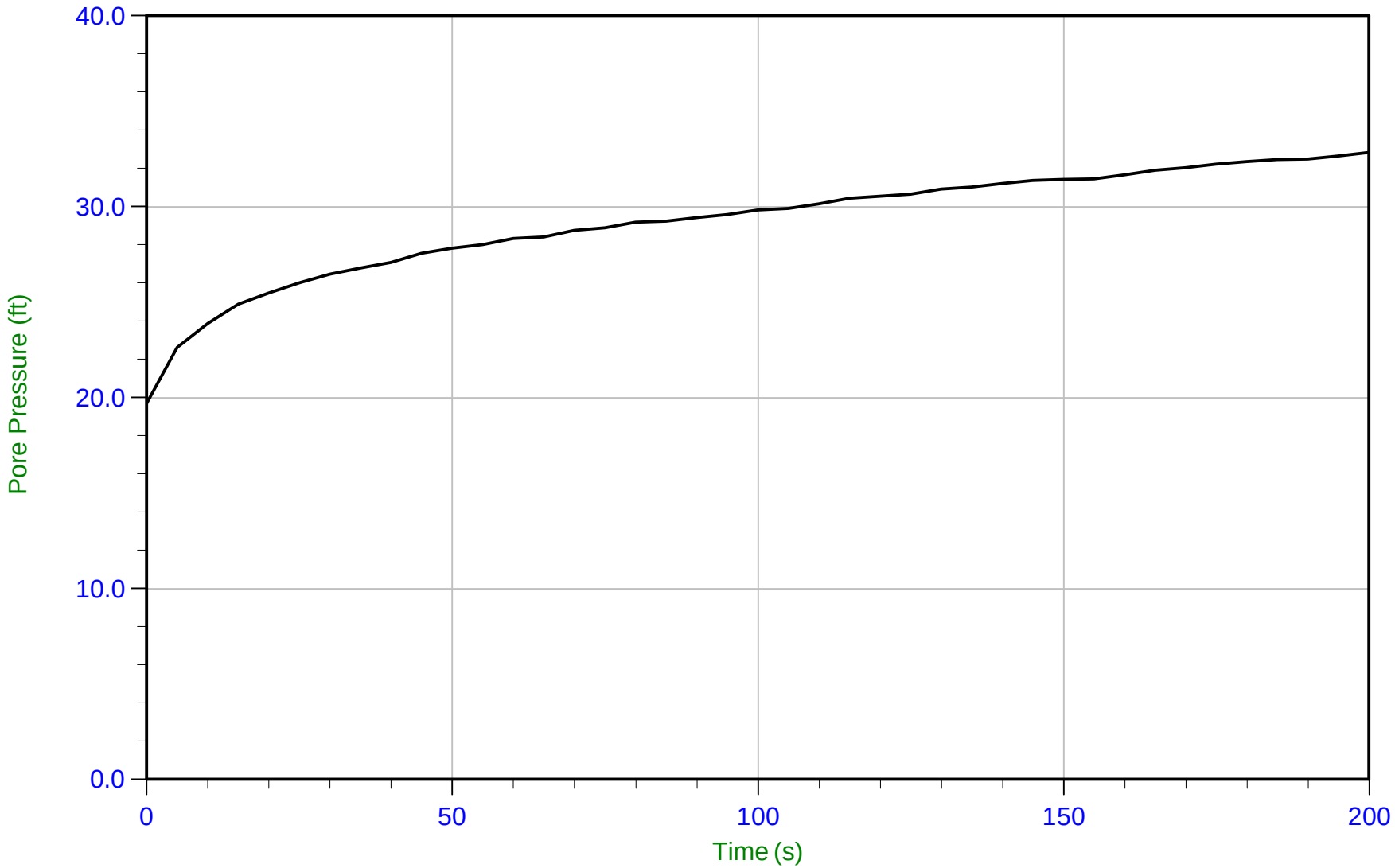
b. Houlsby and Teh, 1991

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 13:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP01.PPD
Depth: 4.000 m / 13.123 ft
Duration: 200.0 s

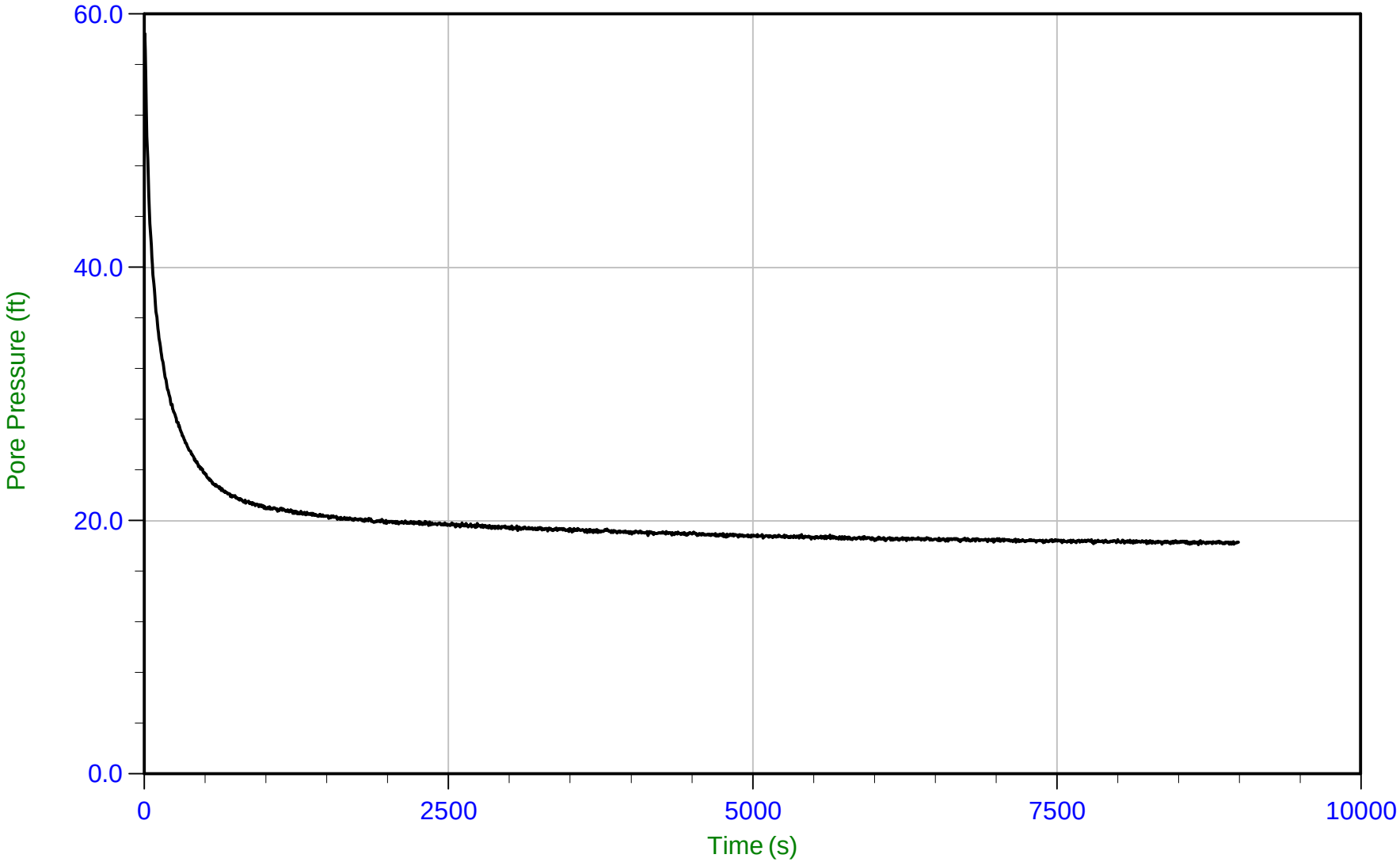
U Min: 19.7 ft
U Max: 32.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 13:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP01.PPD
Depth: 8.300 m / 27.231 ft
Duration: 9000.0 s

U Min: 18.1 ft
U Max: 58.5 ft

WT: 2.855 m / 9.367 ft
Ueq: 17.9 ft
U(50): 38.16 ft

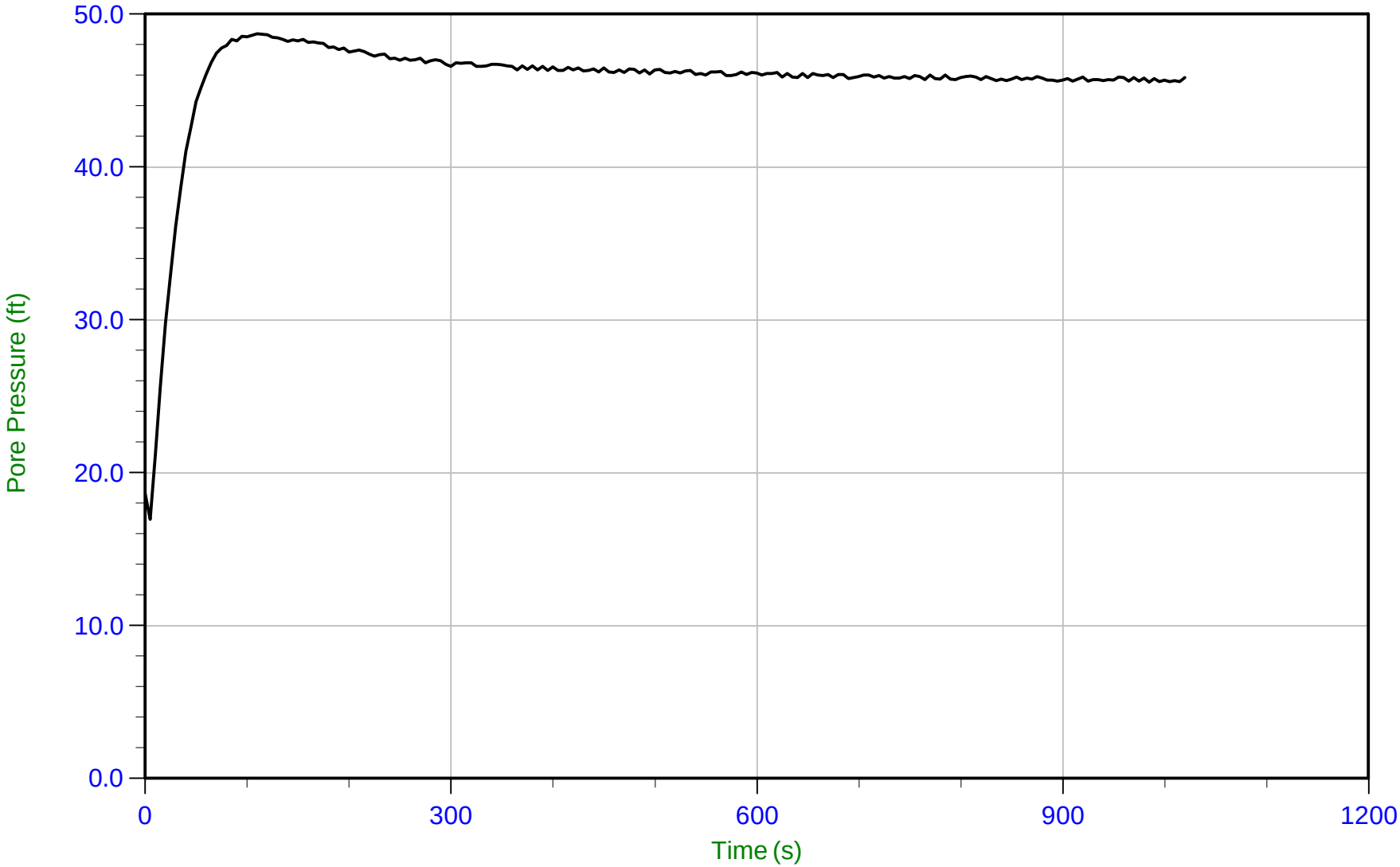
T(50): 80.8 s
Ir: 100
Ch: 8.7 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 14:27:54
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP03.PPD
Depth: 16.600 m / 54.461 ft
Duration: 1020.0 s

U Min: 16.9 ft
U Max: 48.7 ft

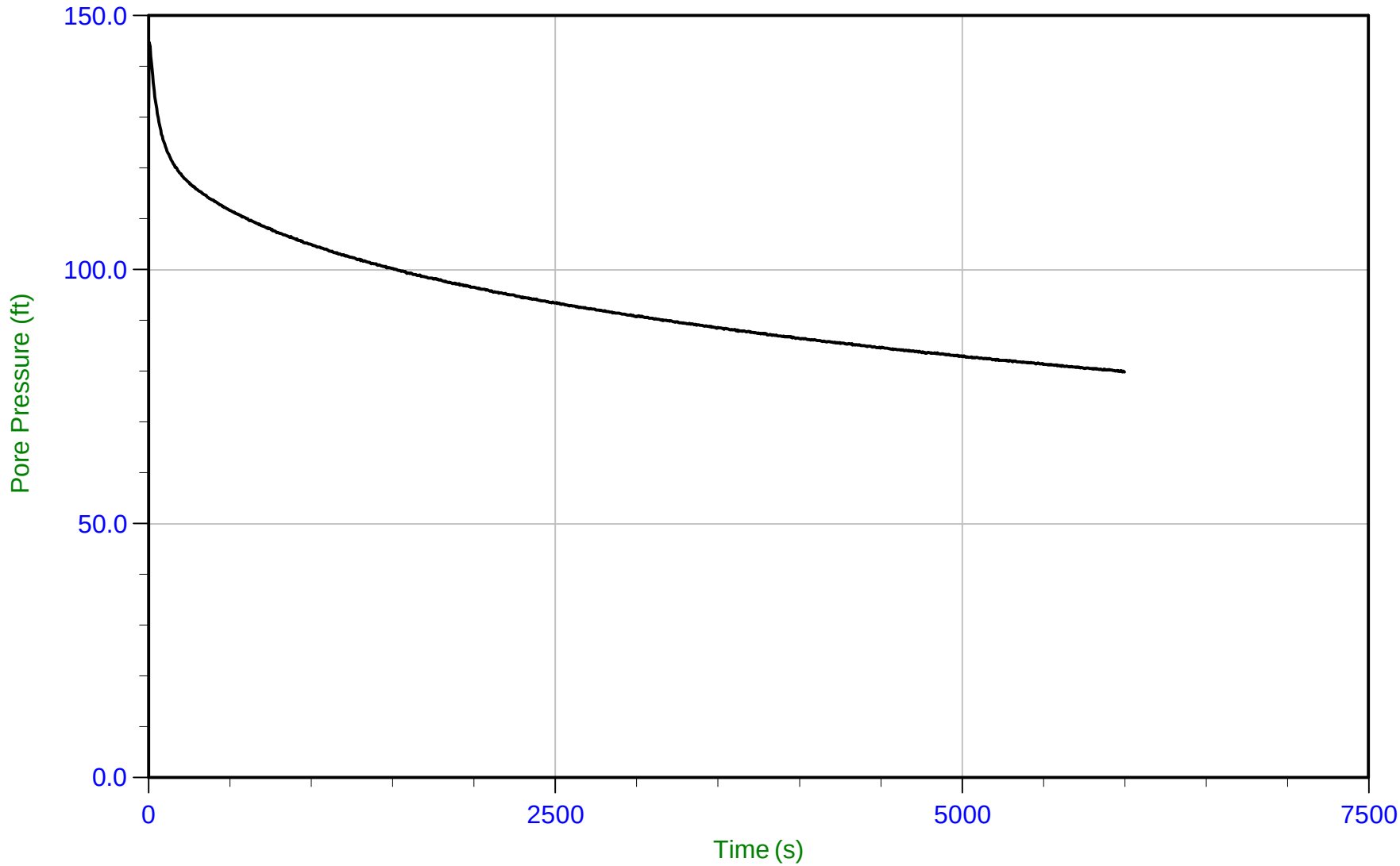
WT: 2.736 m / 8.976 ft
Ueq: 45.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 15:05:24
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C005
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP05.PPD
Depth: 11.400 m / 37.401 ft
Duration: 6000.0 s

U Min: 79.9 ft
U Max: 144.8 ft

WT: 2.134 m / 7.001 ft
Ueq: 30.4 ft
U(50): 87.59 ft

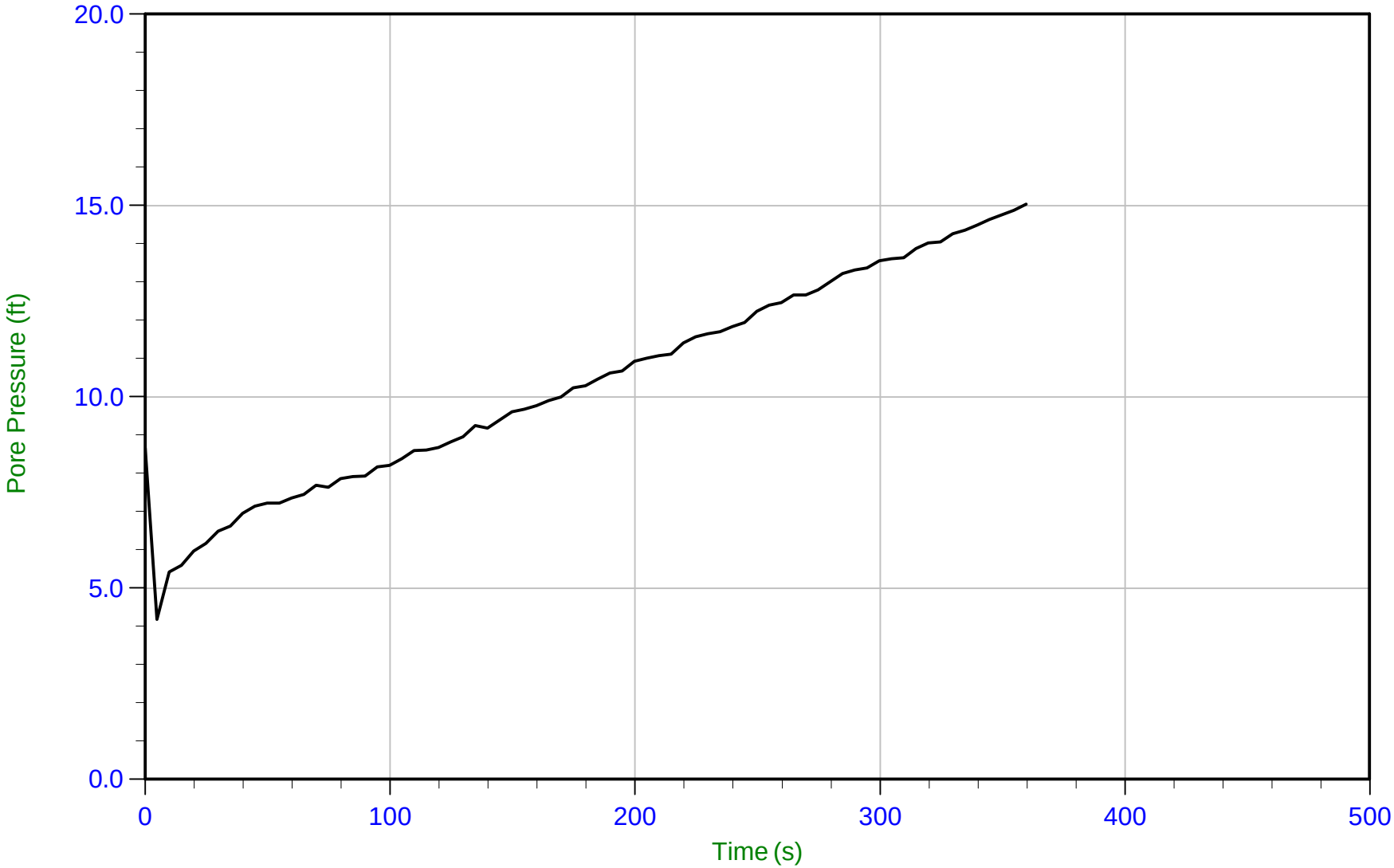
T(50): 3717.5 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 4.350 m / 14.271 ft
Duration: 360.0 s

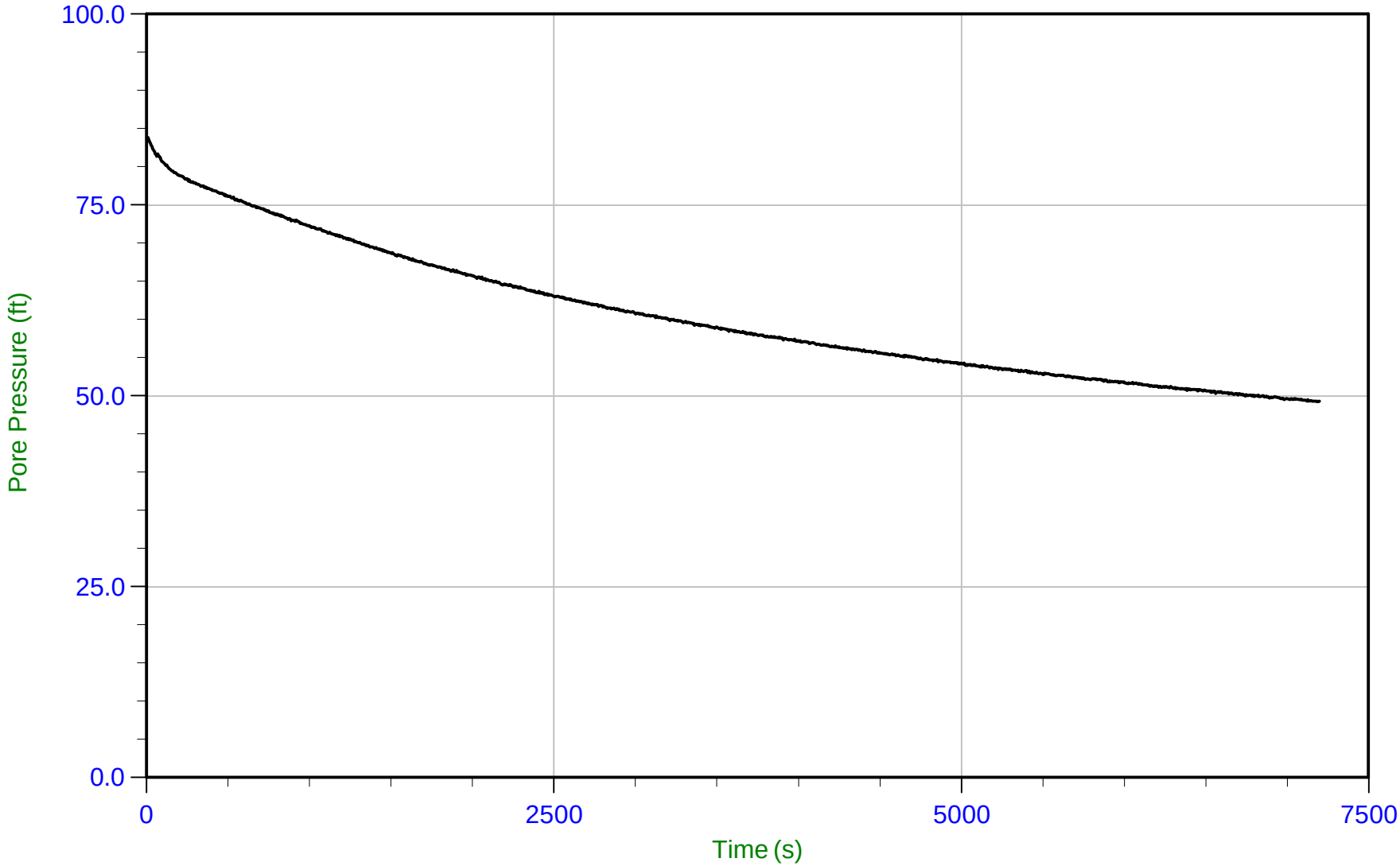
U Min: 4.2 ft
U Max: 15.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 8.000 m / 26.246 ft
Duration: 7200.0 s

U Min: 49.2 ft
U Max: 83.8 ft

WT: 3.505 m / 11.499 ft
Ueq: 14.7 ft
U(50): 49.29 ft

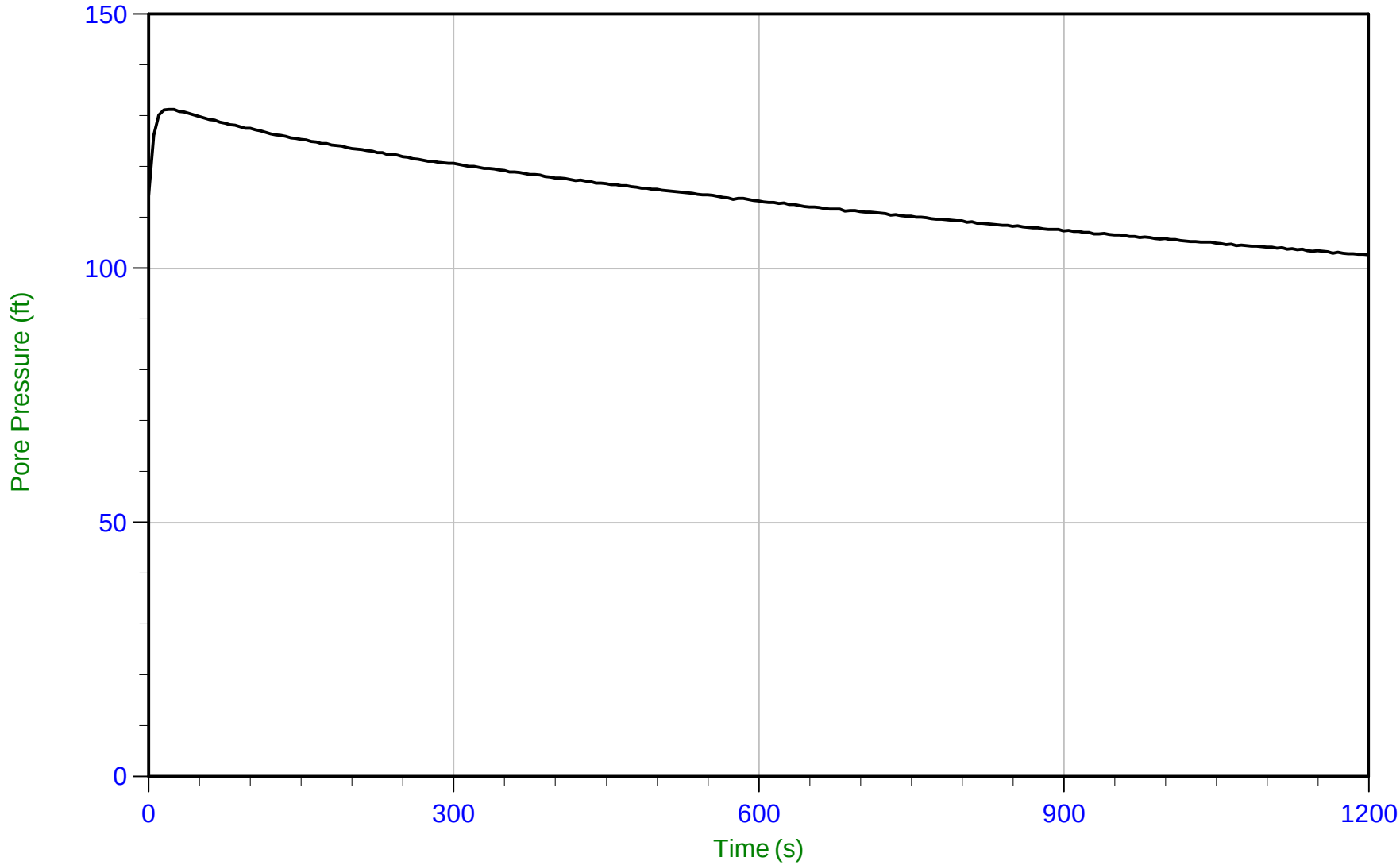
T(50): 7113.9 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1200.0 s

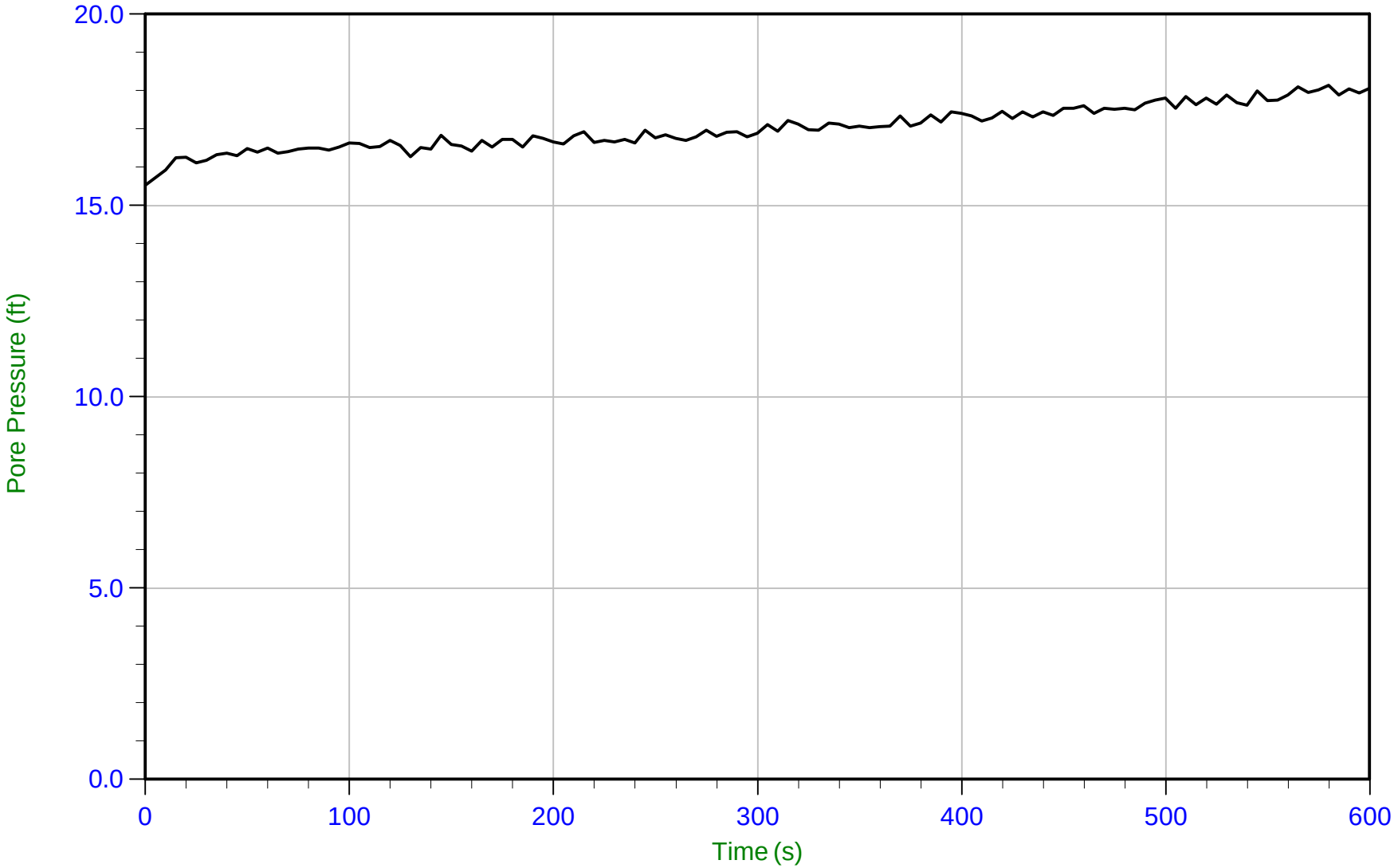
U Min: 102.7 ft
U Max: 131.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 8.200 m / 26.903 ft
Duration: 600.0 s

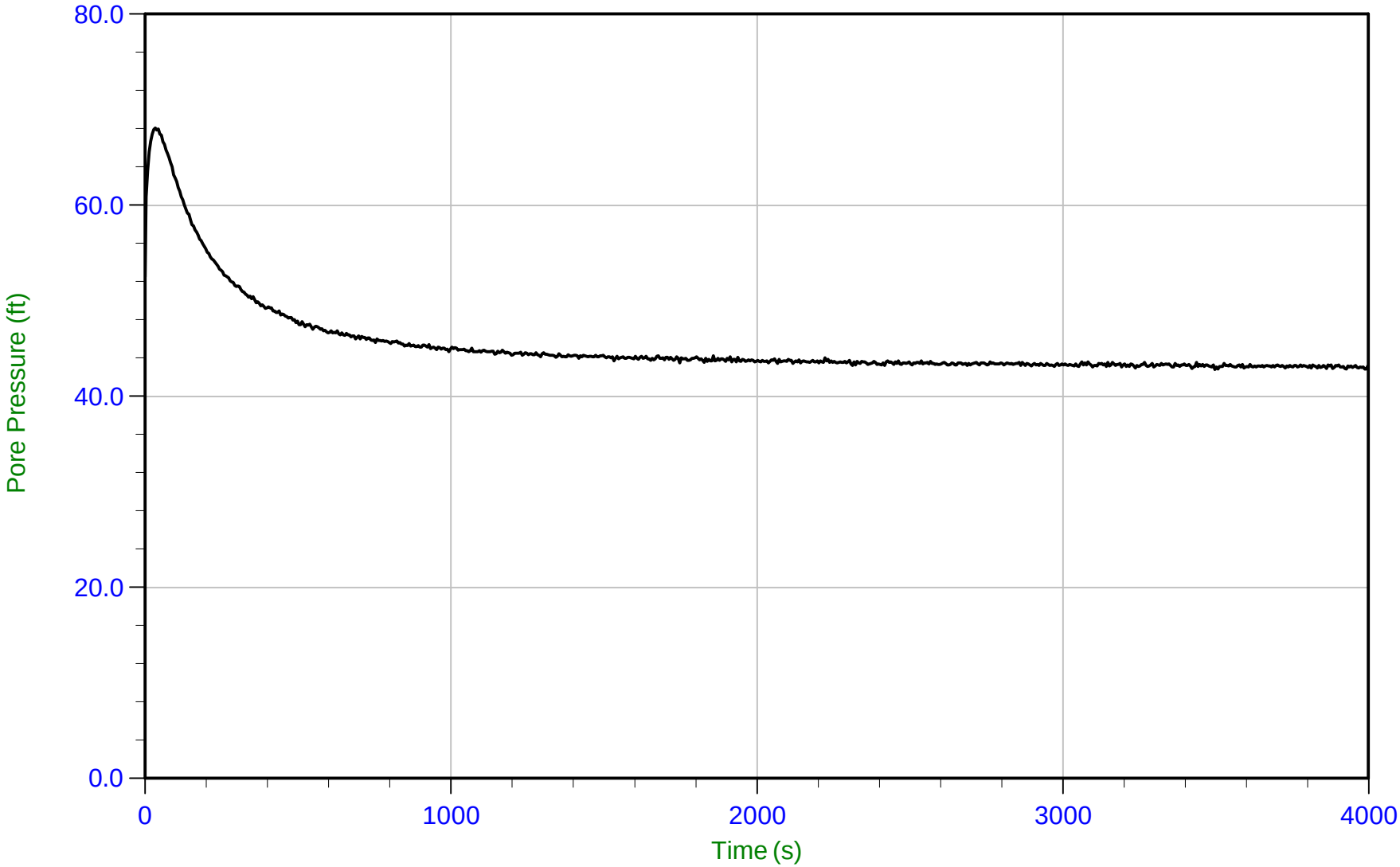
U Min: 15.5 ft
U Max: 18.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 15.700 m / 51.509 ft
Duration: 4000.0 s

U Min: 42.8 ft
U Max: 68.1 ft

WT: 2.709 m / 8.888 ft
Ueq: 42.6 ft
U(50): 55.34 ft

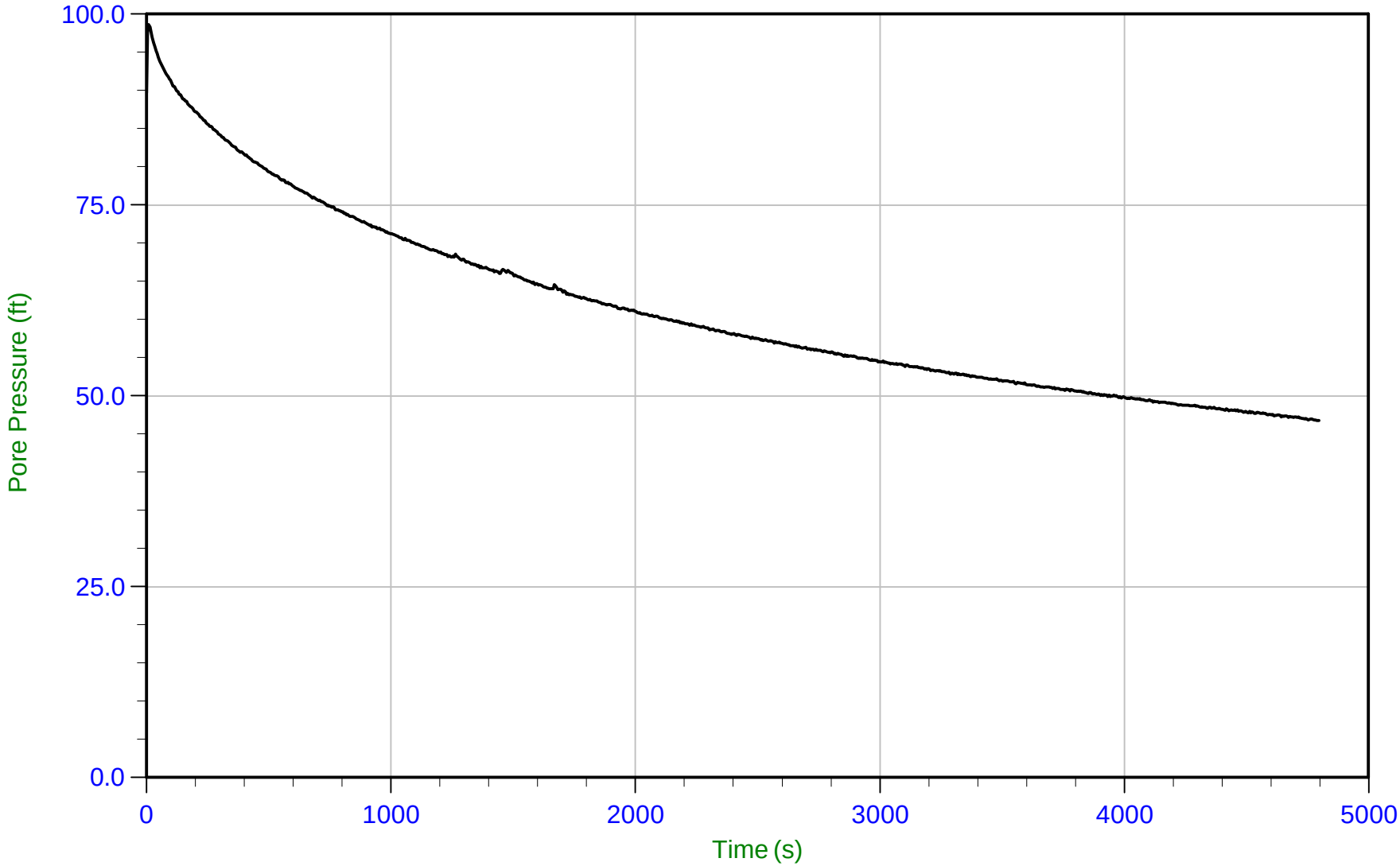
T(50): 166.2 s
Ir: 100
Ch: 4.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 6.750 m / 22.145 ft
Duration: 4800.0 s

U Min: 46.8 ft
U Max: 98.7 ft

WT: 3.048 m / 10.000 ft
Ueq: 12.1 ft
U(50): 55.40 ft

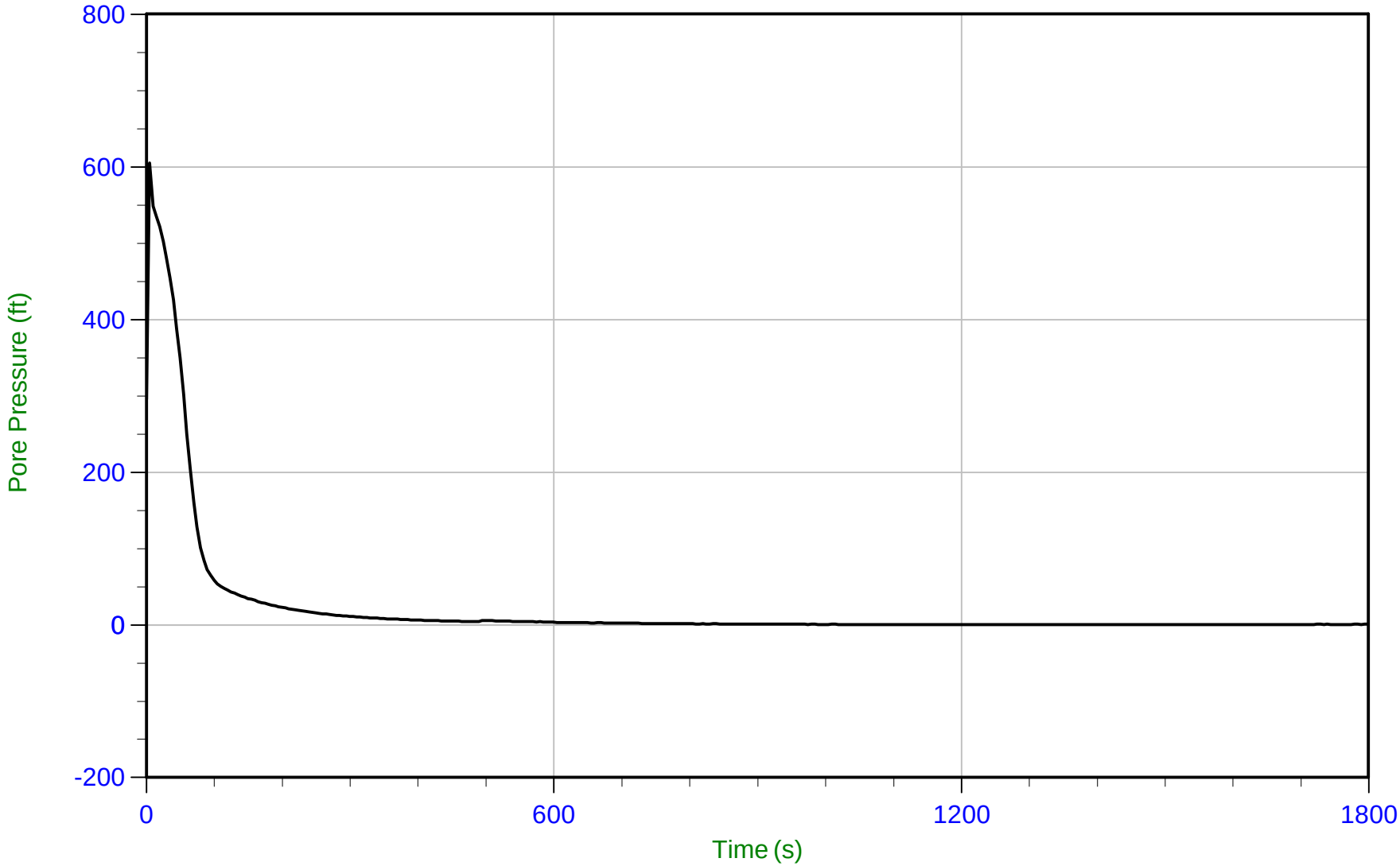
T(50): 2835.5 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 10.250 m / 33.628 ft
Duration: 1800.0 s

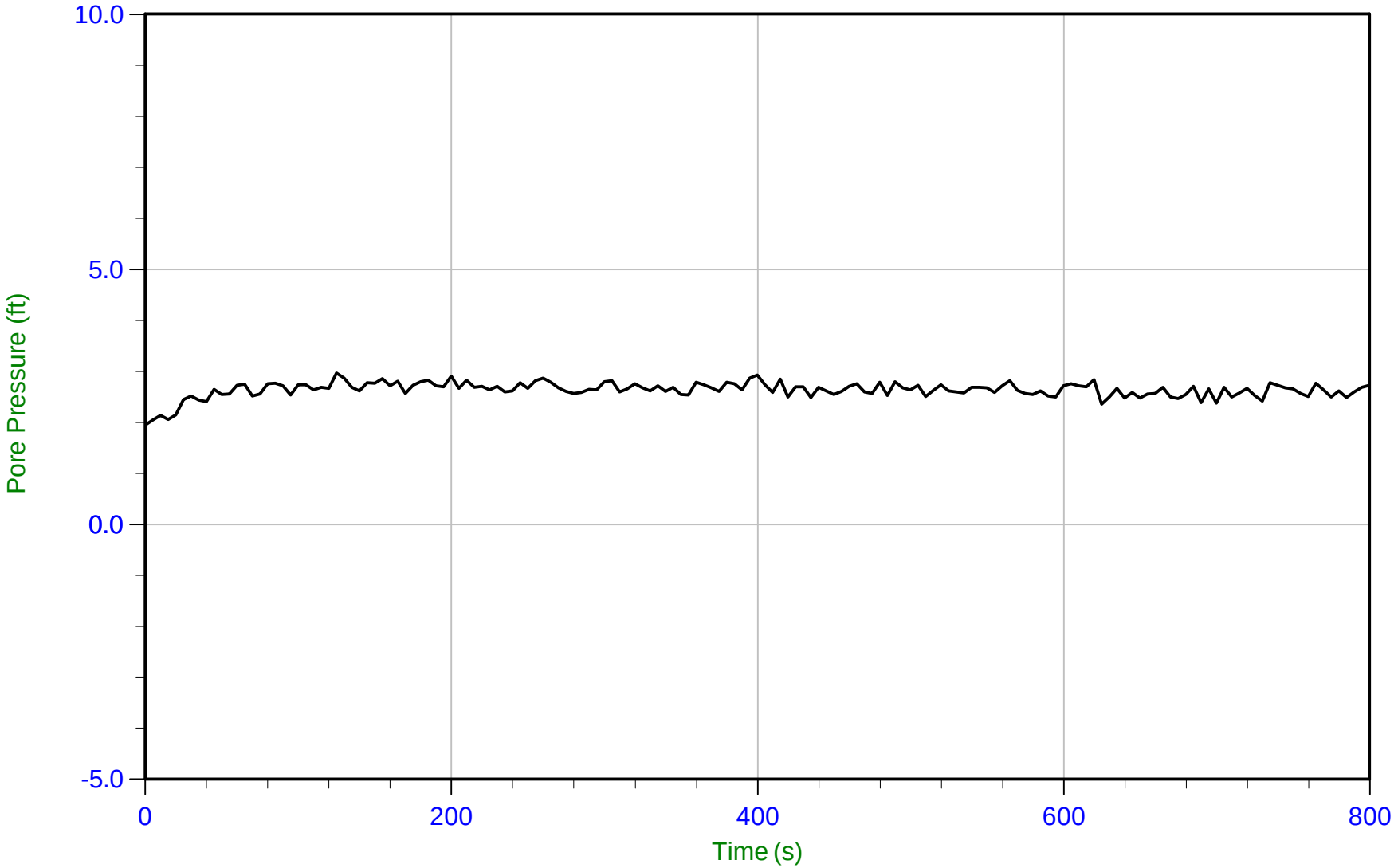
U Min: 0.1 ft
U Max: 605.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 4.900 m / 16.076 ft
Duration: 800.0 s

U Min: 1.9 ft
U Max: 3.0 ft

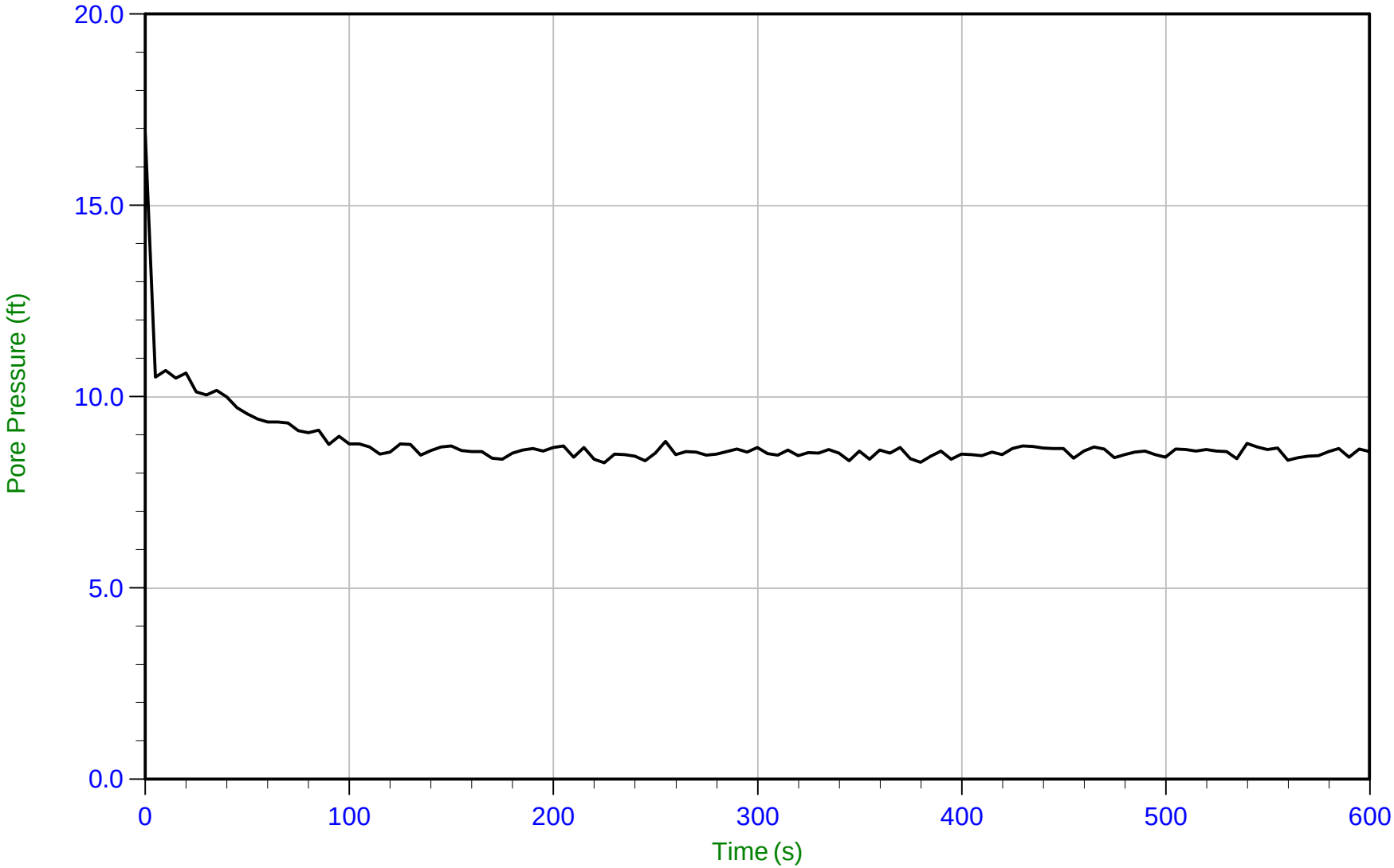
WT: 4.104 m / 13.464 ft
Ueq: 2.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 8.650 m / 28.379 ft
Duration: 600.0 s

U Min: 8.3 ft
U Max: 16.9 ft

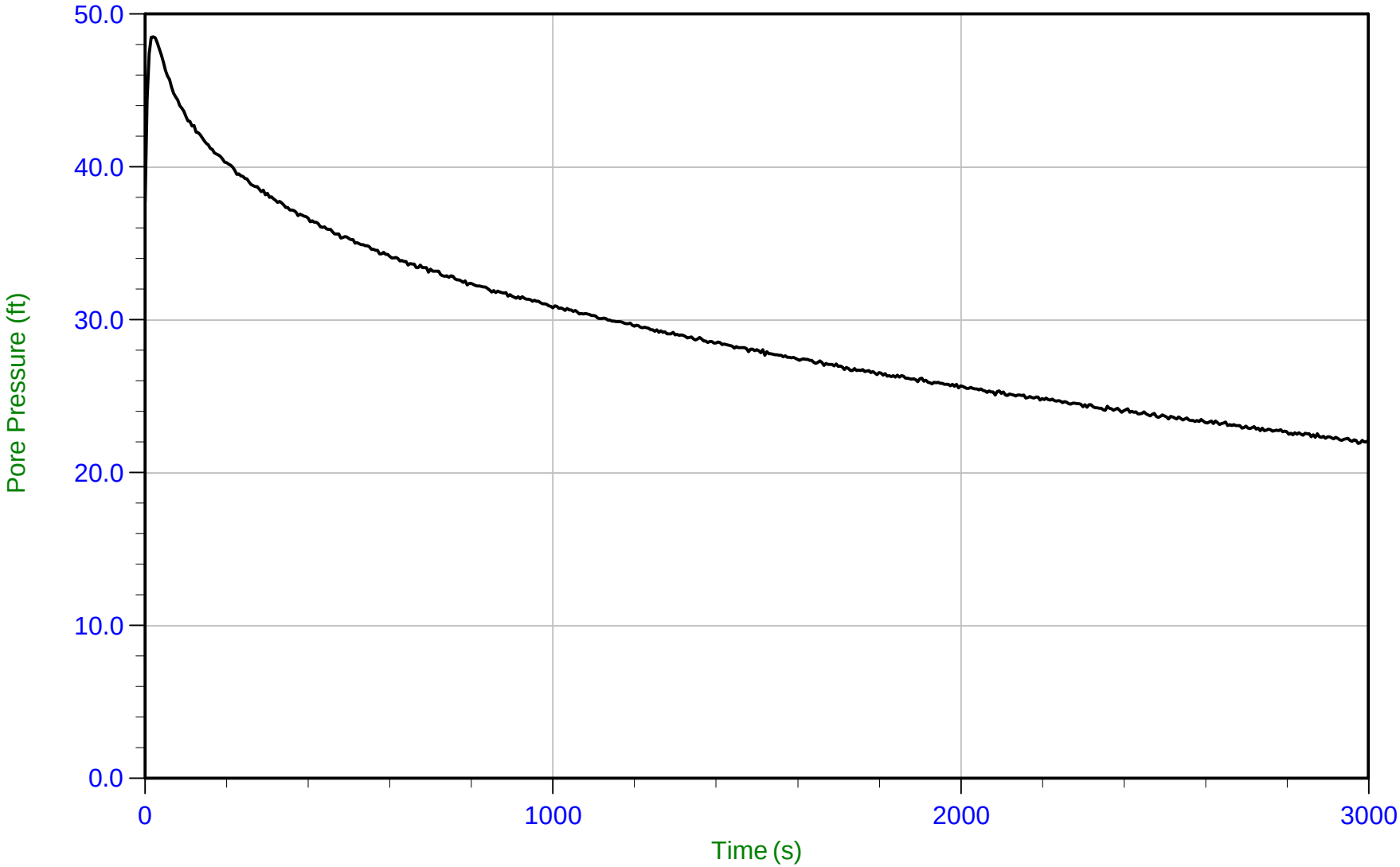
WT: 6.062 m / 19.888 ft
Ueq: 8.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 3.700 m / 12.139 ft
Duration: 3000.0 s

U Min: 21.9 ft
U Max: 48.5 ft

WT: 0.674 m / 2.211 ft
Ueq: 9.9 ft
U(50): 29.22 ft

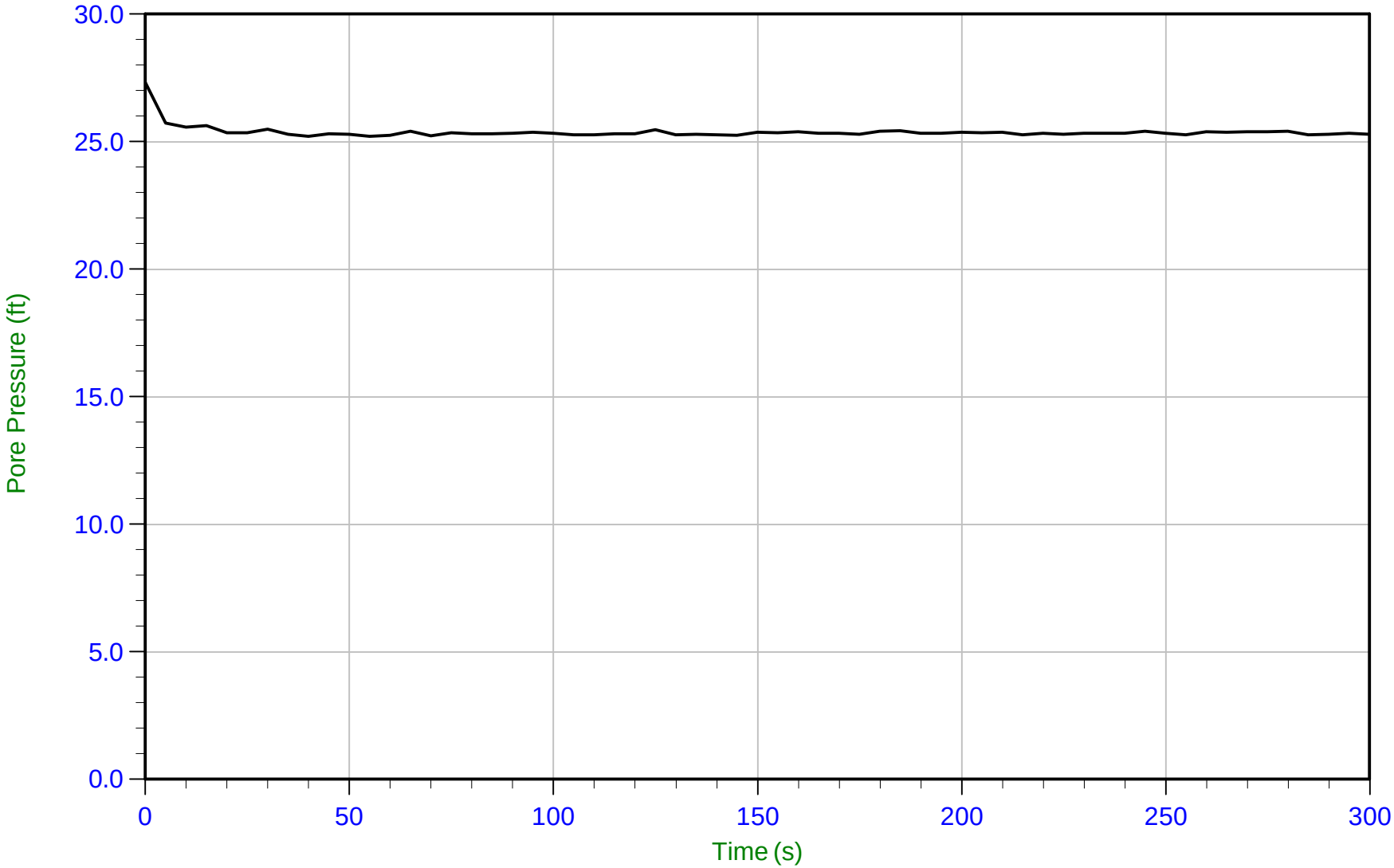
T(50): 1239.4 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 8.400 m / 27.559 ft
Duration: 300.0 s

U Min: 25.2 ft
U Max: 27.3 ft

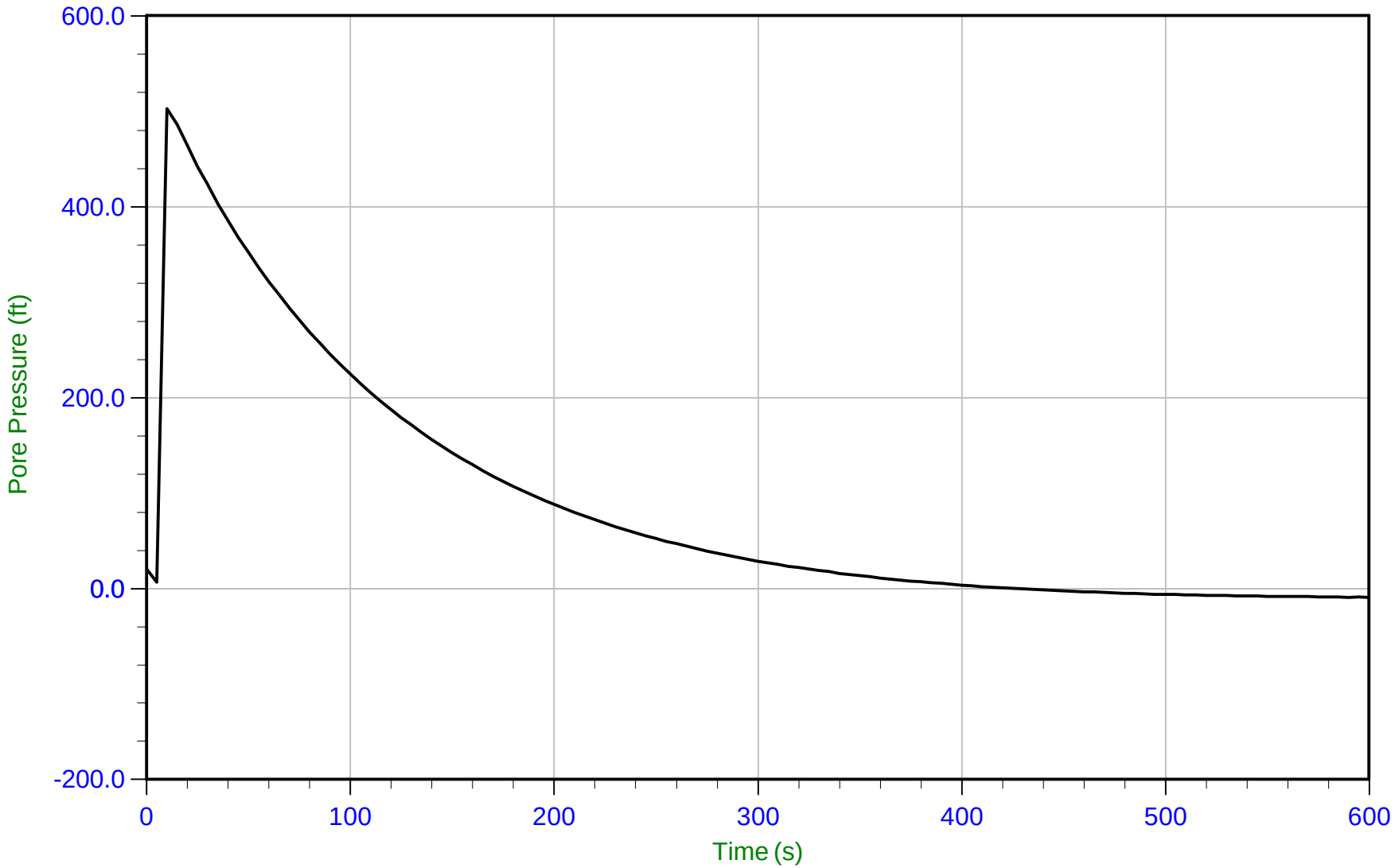
WT: 0.674 m / 2.211 ft
Ueq: 25.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 9.150 m / 30.019 ft
Duration: 600.0 s

U Min: -9.2 ft
U Max: 502.6 ft

WT: 9.150 m / 30.019 ft
Ueq: 0.0 ft
U(50): 251.28 ft

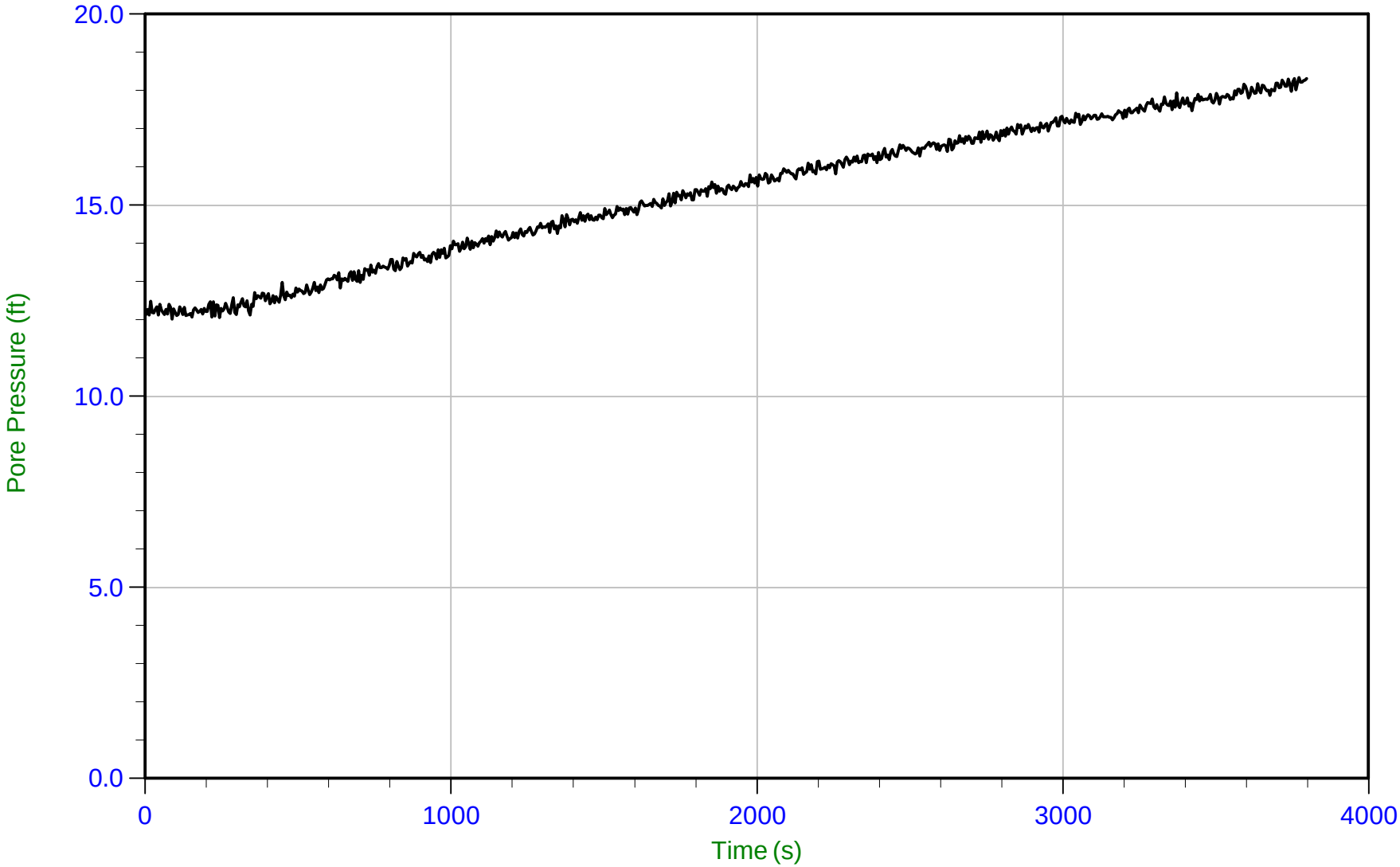
T(50): 77.5 s
Ir: 100
Ch: 9.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 7.350 m / 24.114 ft
Duration: 3800.0 s

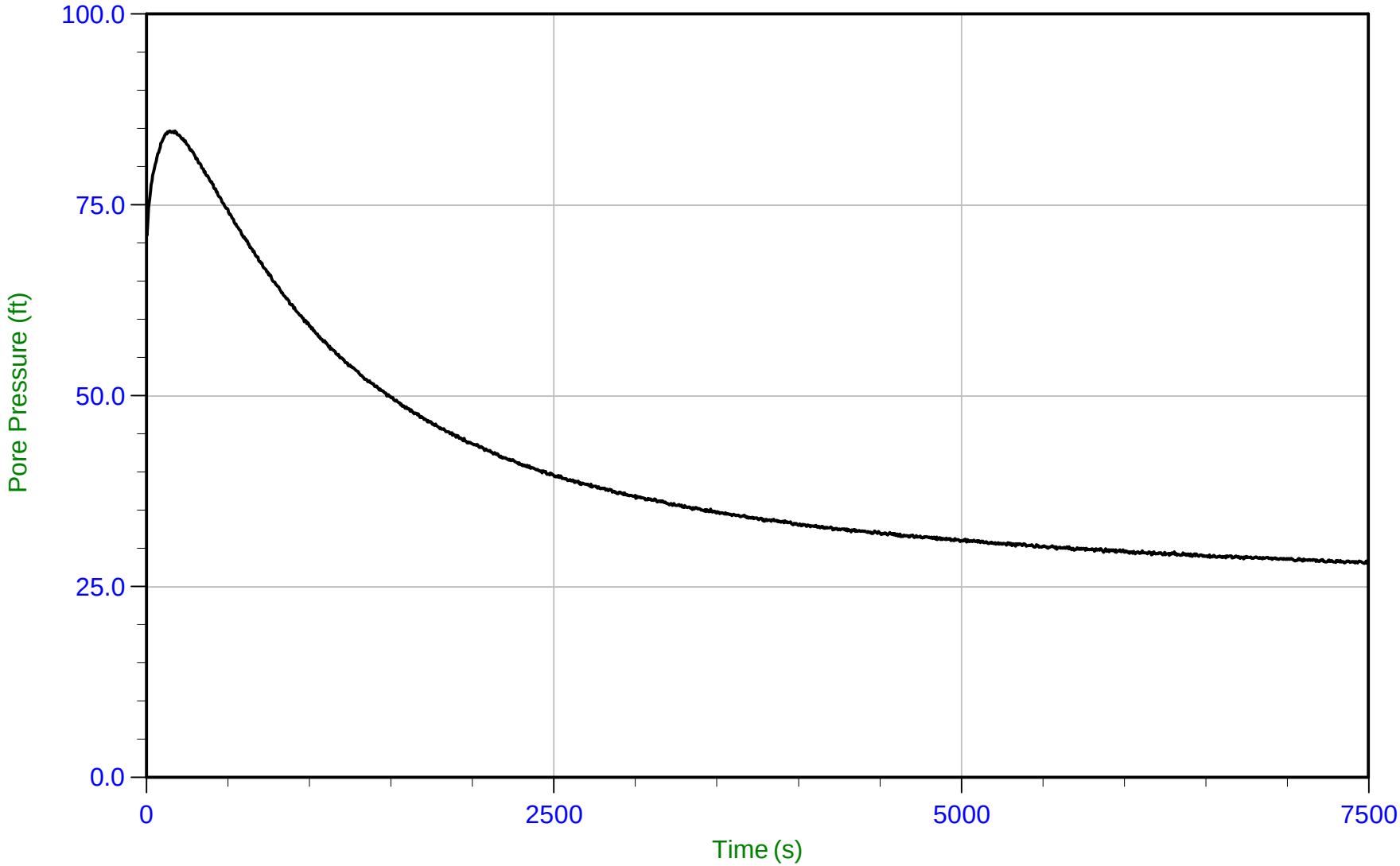
U Min: 12.0 ft
U Max: 18.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.150 m / 46.423 ft
Duration: 7500.0 s

U Min: 28.0 ft
U Max: 84.7 ft

WT: 6.848 m / 22.467 ft
Ueq: 24.0 ft
U(50): 54.34 ft

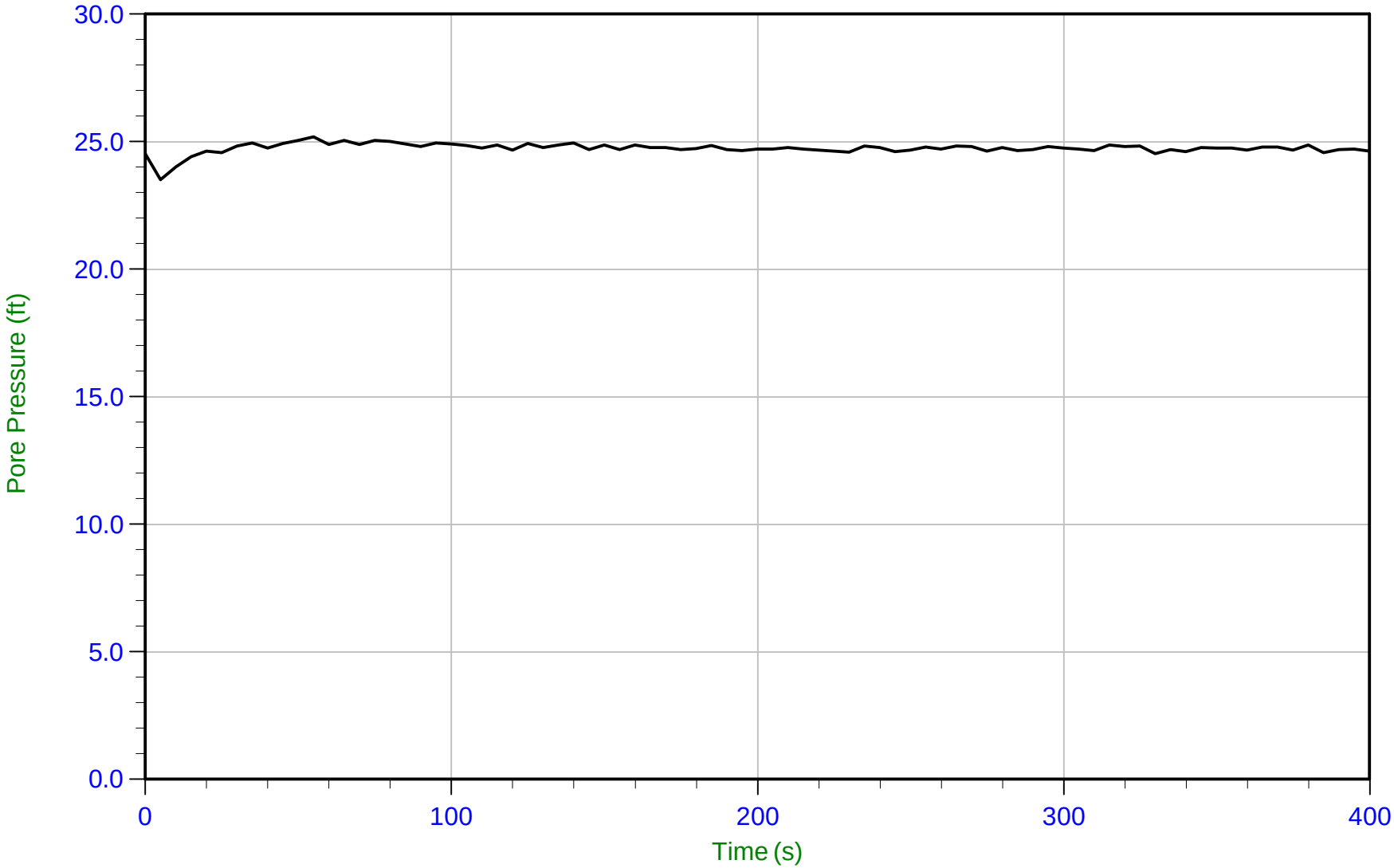
T(50): 1082.1 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.350 m / 47.079 ft
Duration: 400.0 s

U Min: 23.5 ft
U Max: 25.2 ft

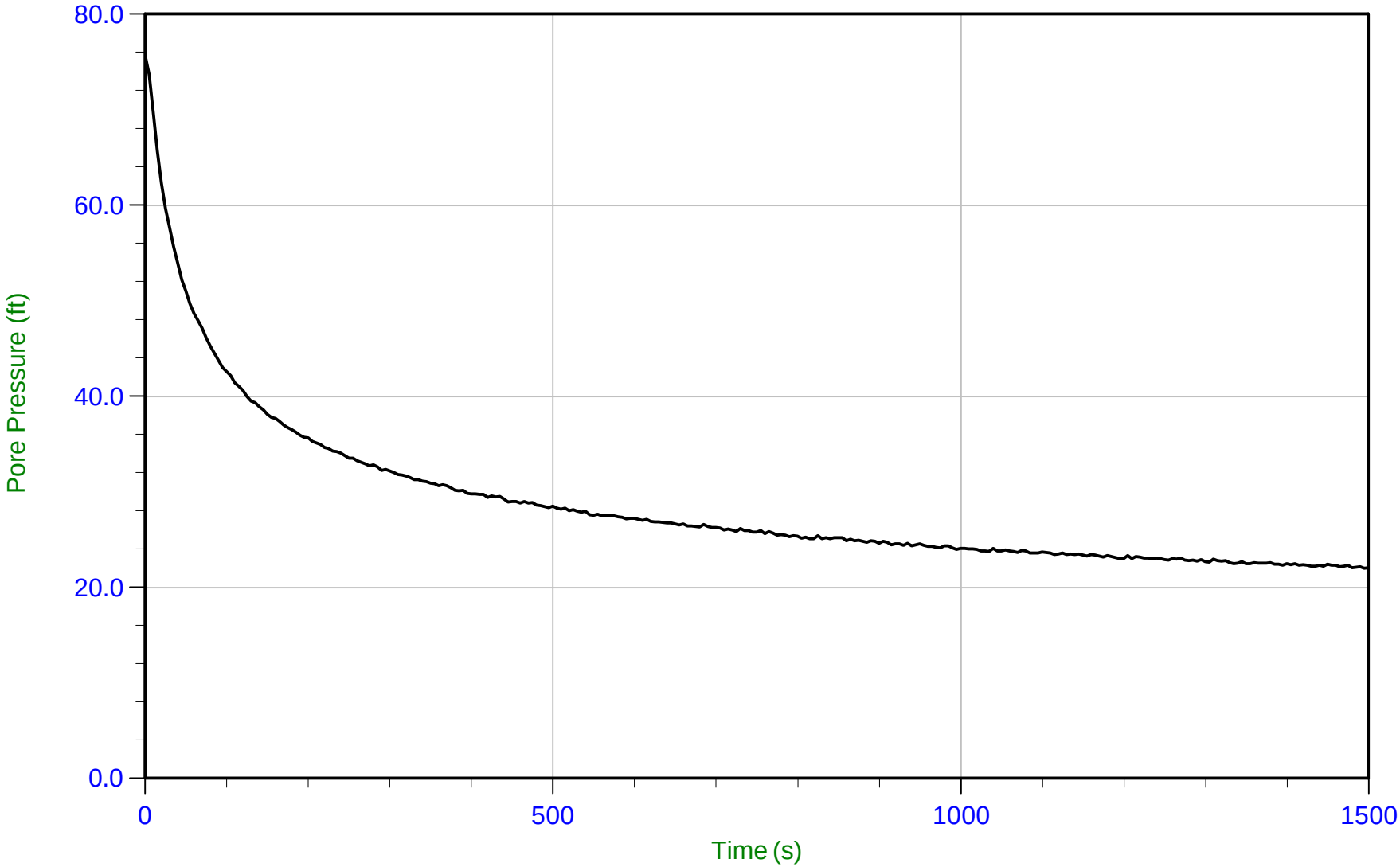
WT: 6.848 m / 22.467 ft
Ueq: 24.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 14:27:24
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP12.PPD
Depth: 8.800 m / 28.871 ft
Duration: 1500.0 s

U Min: 22.0 ft
U Max: 75.7 ft

WT: 7.108 m / 23.320 ft
Ueq: 5.6 ft
U(50): 40.63 ft

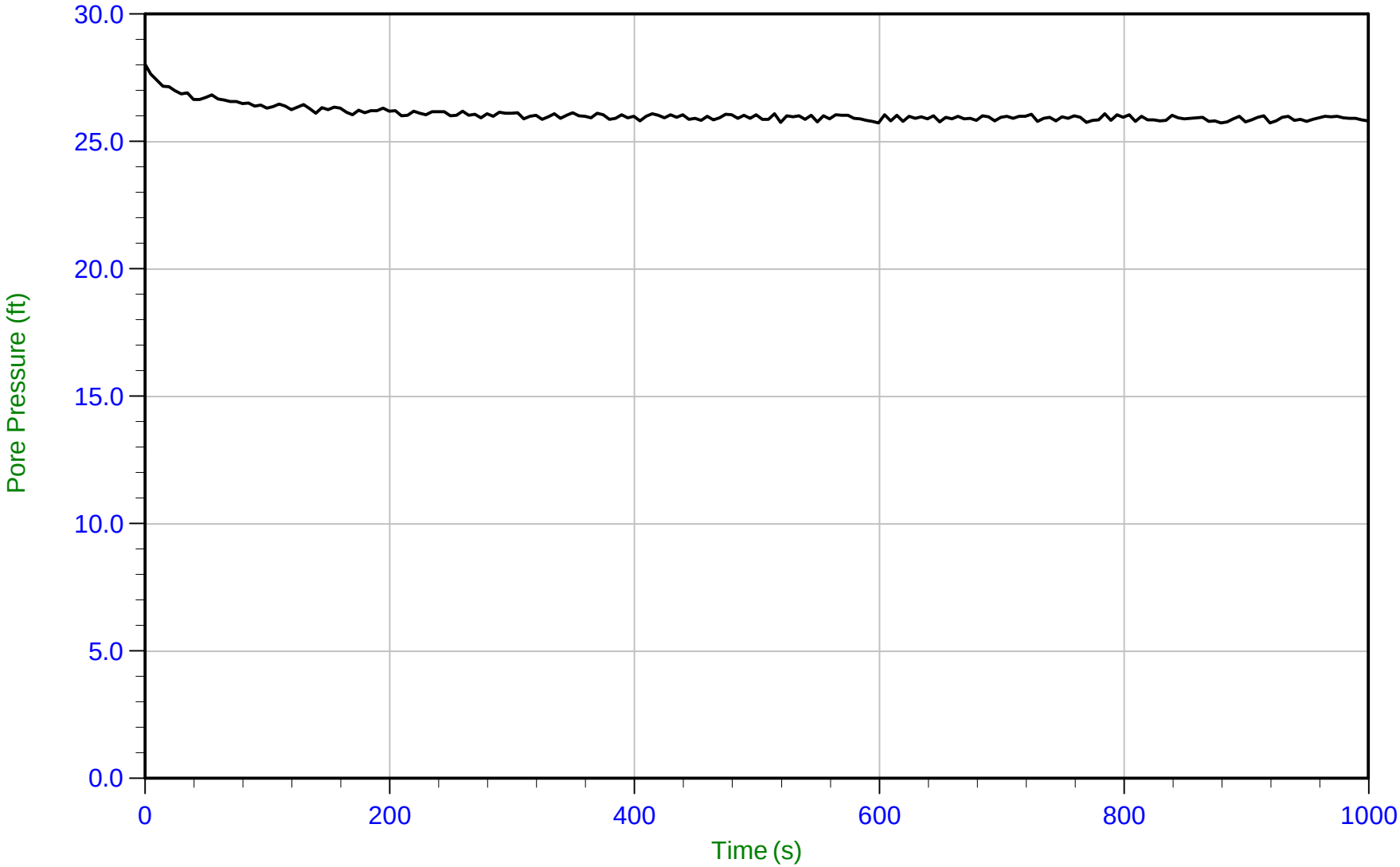
T(50): 119.8 s
Ir: 100
Ch: 5.9 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 14:27:24
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP12.PPD
Depth: 14.950 m / 49.048 ft
Duration: 1000.0 s

U Min: 25.7 ft
U Max: 28.0 ft

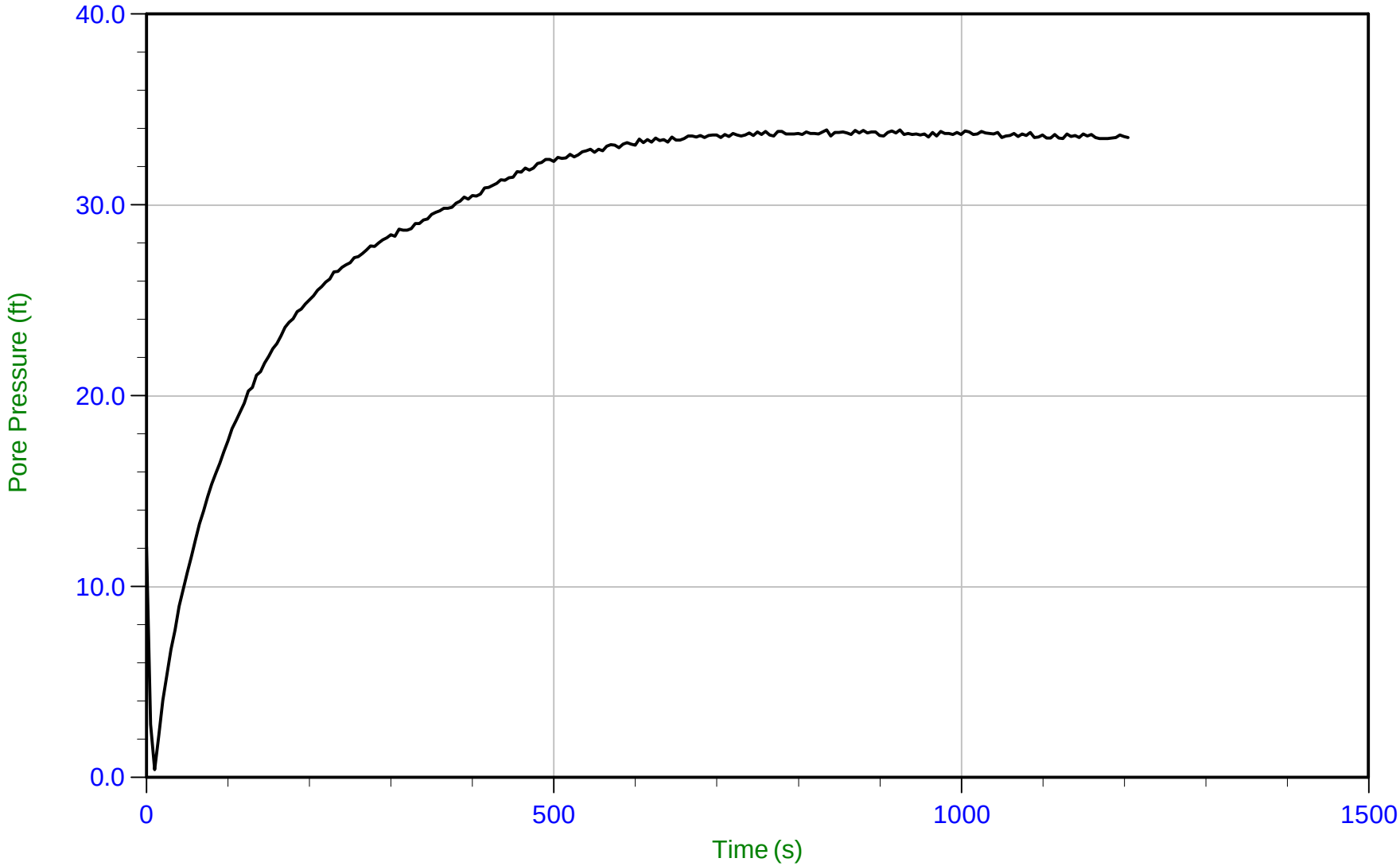
WT: 7.108 m / 23.320 ft
Ueq: 25.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:45:02
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP13.PPD
Depth: 17.150 m / 56.266 ft
Duration: 1205.0 s

U Min: 0.4 ft
U Max: 33.9 ft

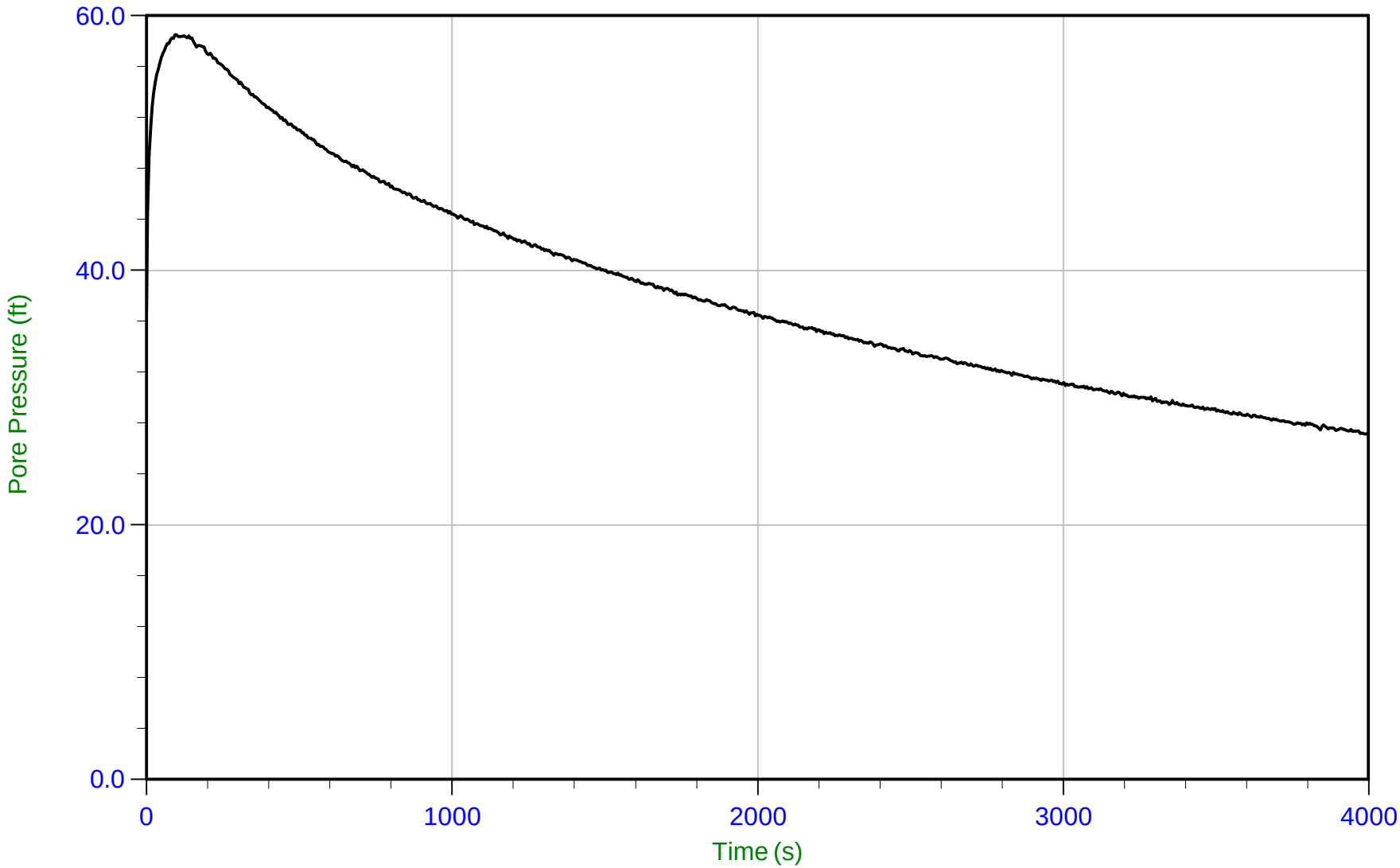
WT: 6.905 m / 22.654 ft
Ueq: 33.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 14:29:59
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP14.PPD
Depth: 4.900 m / 16.076 ft
Duration: 4000.0 s

U Min: 27.1 ft
U Max: 58.5 ft

WT: 1.498 m / 4.915 ft
Ueq: 11.2 ft
U(50): 34.84 ft

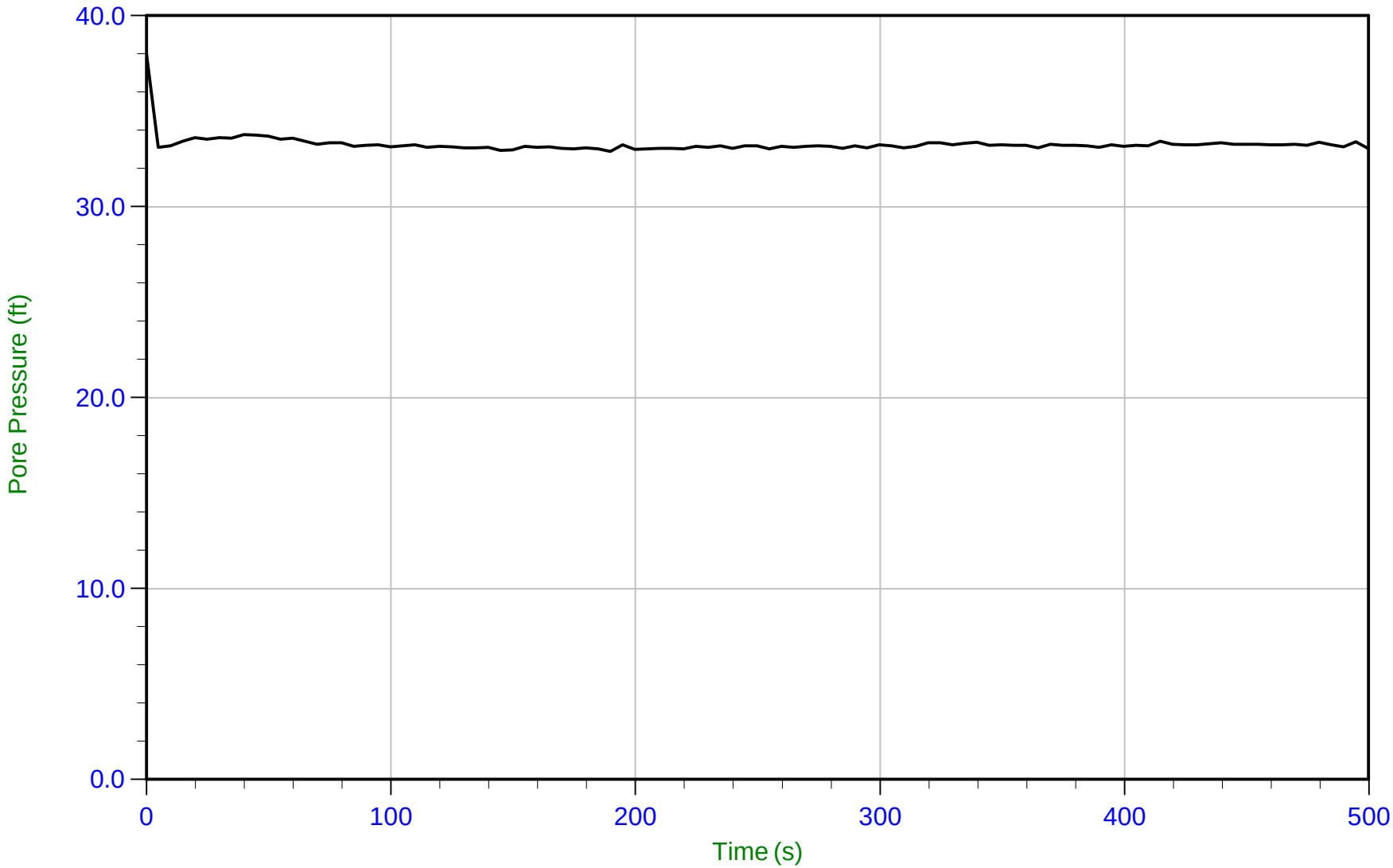
T(50): 2190.4 s
Ir: 100
Ch: 0.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 14:29:59
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP14.PPD
Depth: 11.650 m / 38.221 ft
Duration: 500.0 s

U Min: 32.9 ft
U Max: 38.0 ft

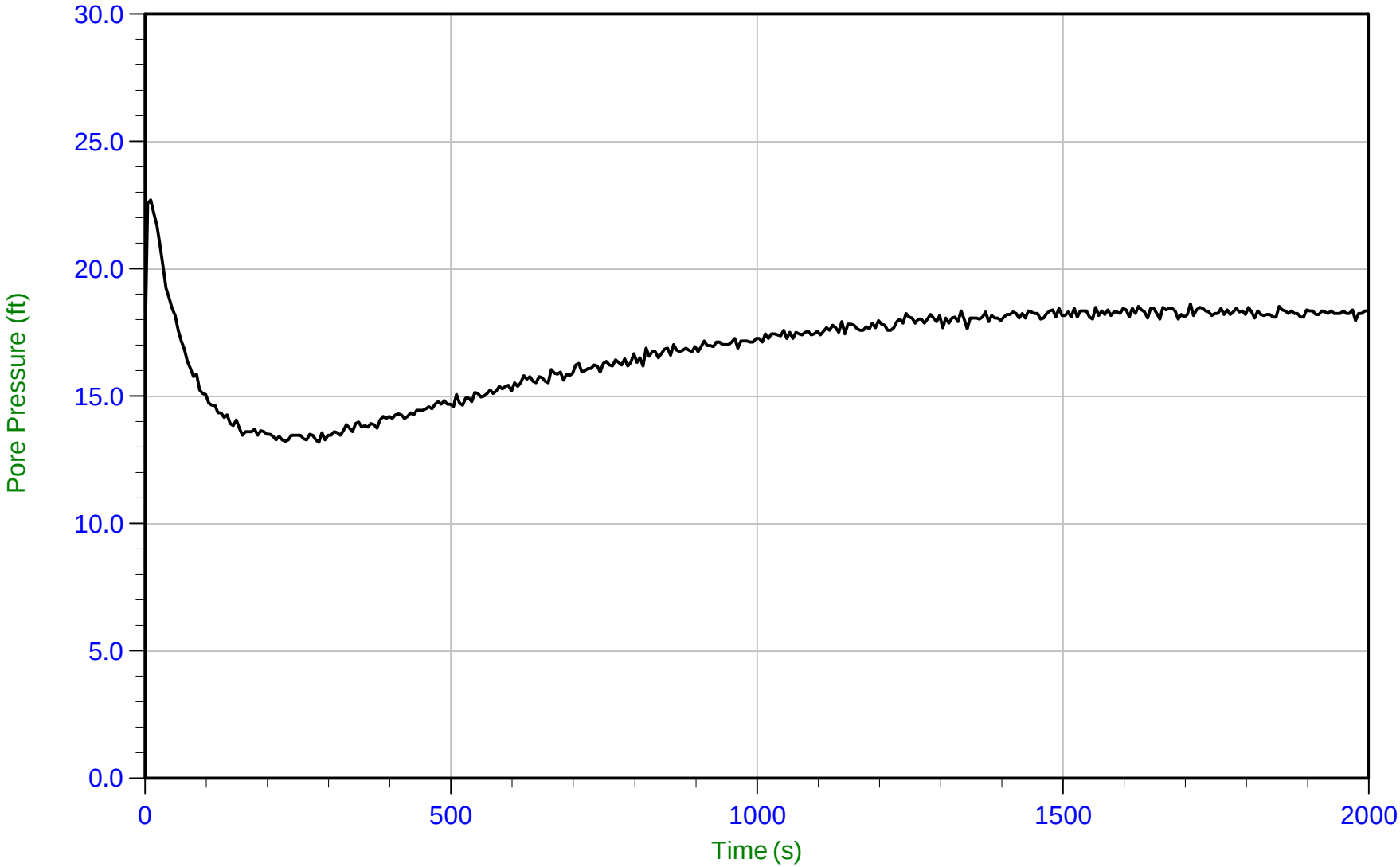
WT: 1.498 m / 4.915 ft
Ueq: 33.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 14:12:51
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP15A.PPD
Depth: 4.600 m / 15.092 ft
Duration: 2000.0 s

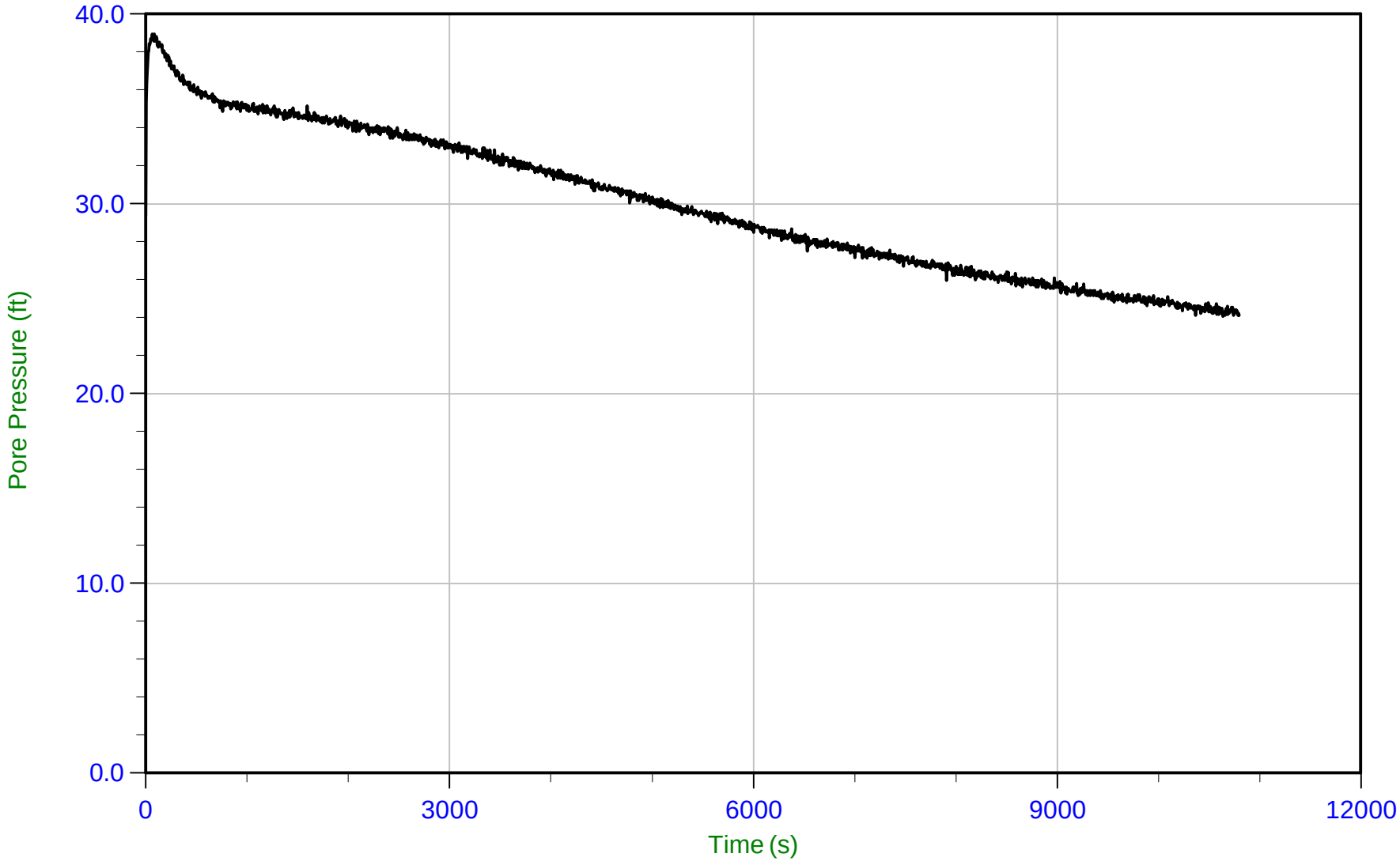
U Min: 13.2 ft
U Max: 22.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 14:12:51
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP15A.PPD
Depth: 9.000 m / 29.527 ft
Duration: 10800.0 s

U Min: 24.1 ft
U Max: 39.0 ft

WT: 3.658 m / 12.001 ft
Ueq: 17.5 ft
U(50): 28.24 ft

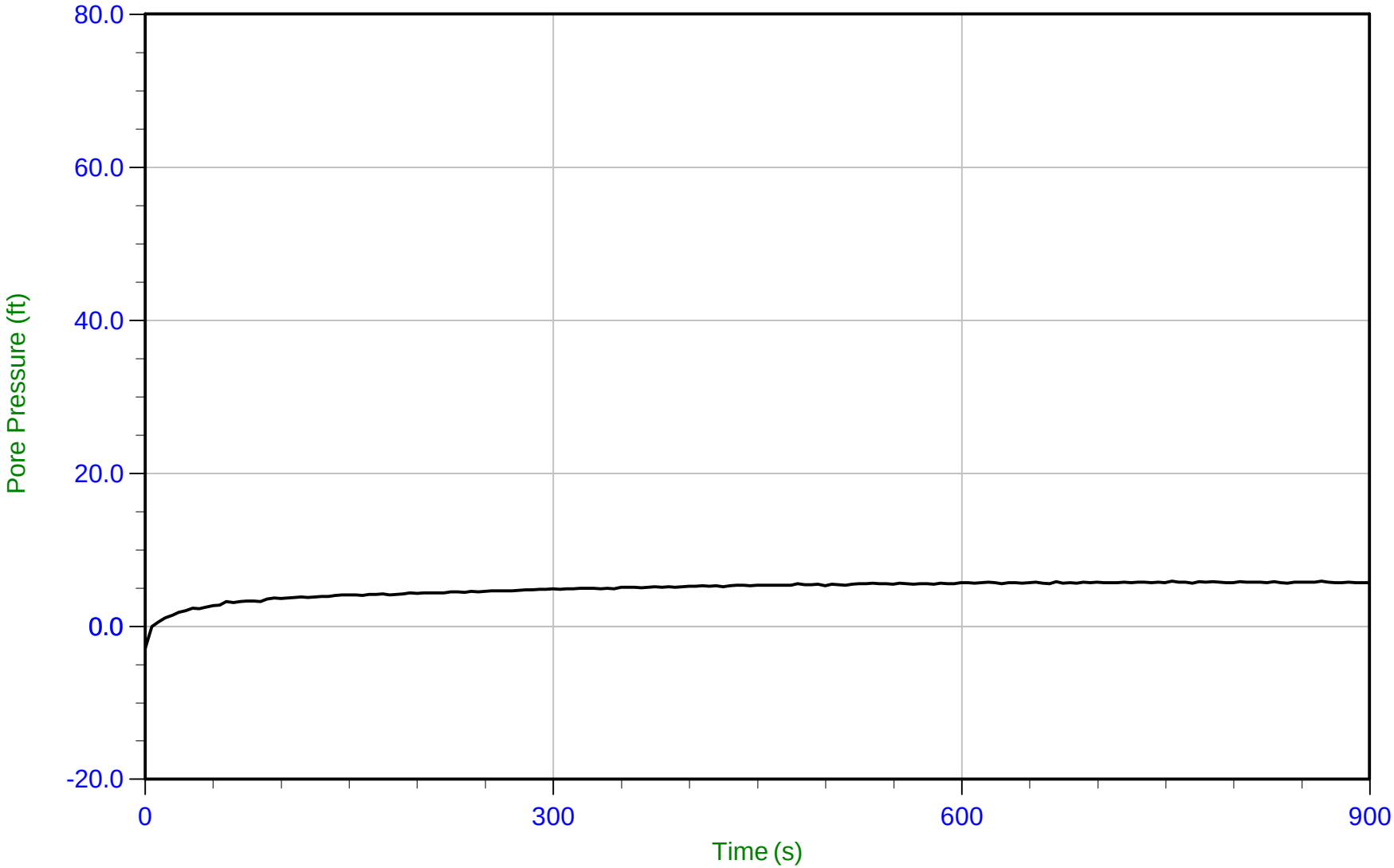
T(50): 6094.6 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 2.250 m / 7.382 ft
Duration: 900.0 s

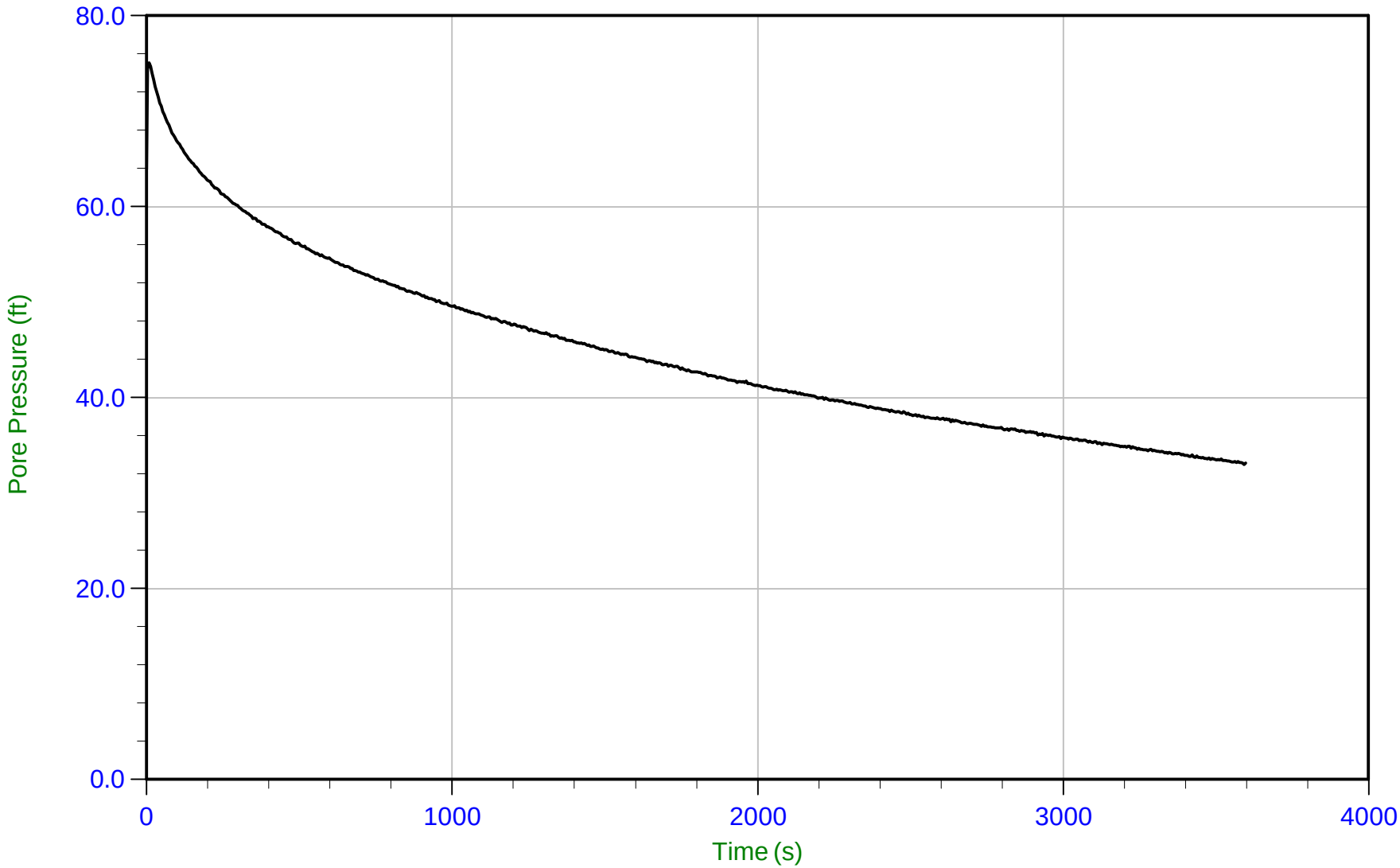
U Min: -2.9 ft
U Max: 5.9 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 5.500 m / 18.044 ft
Duration: 3600.0 s

U Min: 33.0 ft
U Max: 75.1 ft

WT: 1.173 m / 3.848 ft
Ueq: 14.2 ft
U(50): 44.64 ft

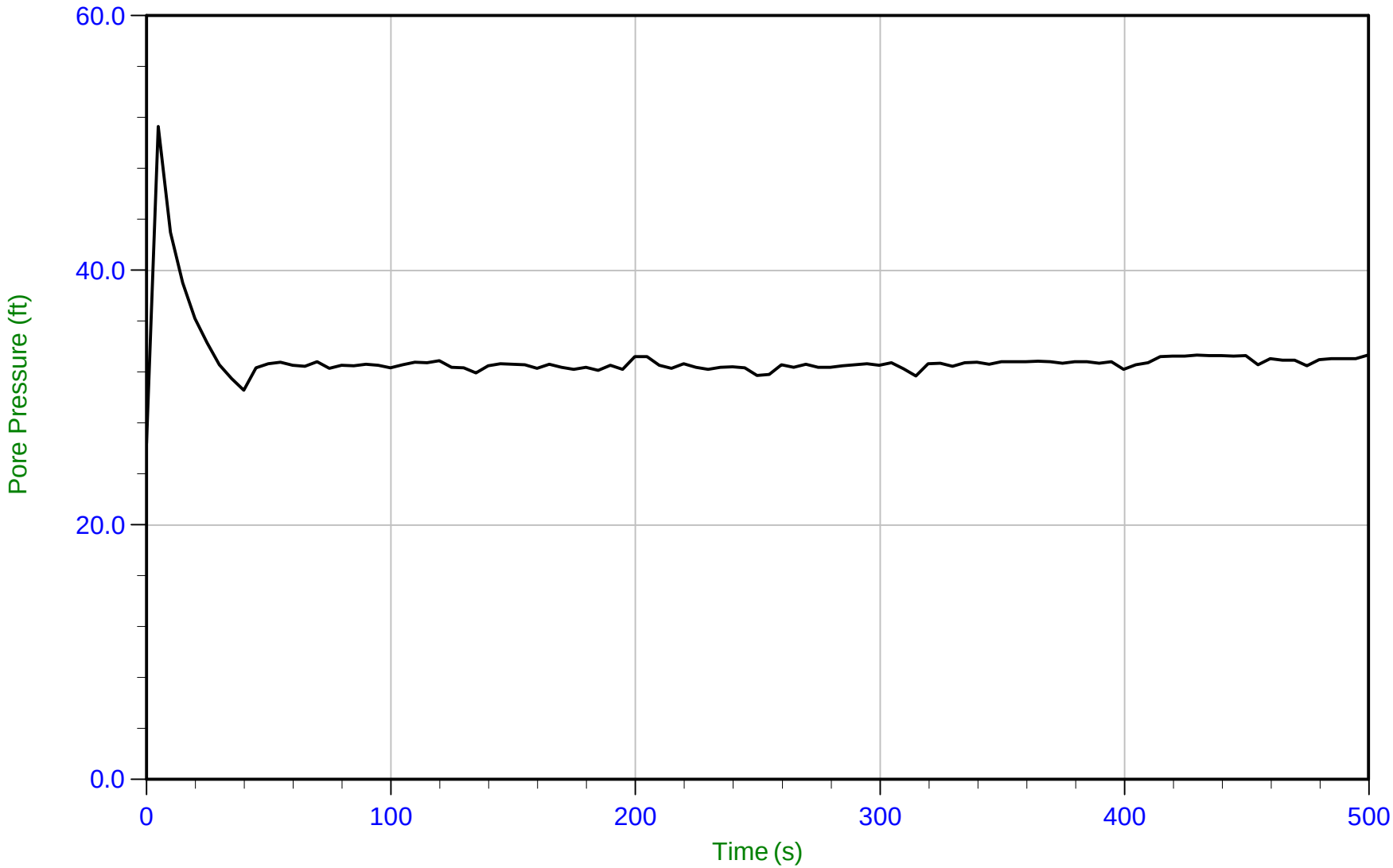
T(50): 1538.2 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 11.250 m / 36.909 ft
Duration: 500.0 s

U Min: 26.4 ft
U Max: 51.3 ft

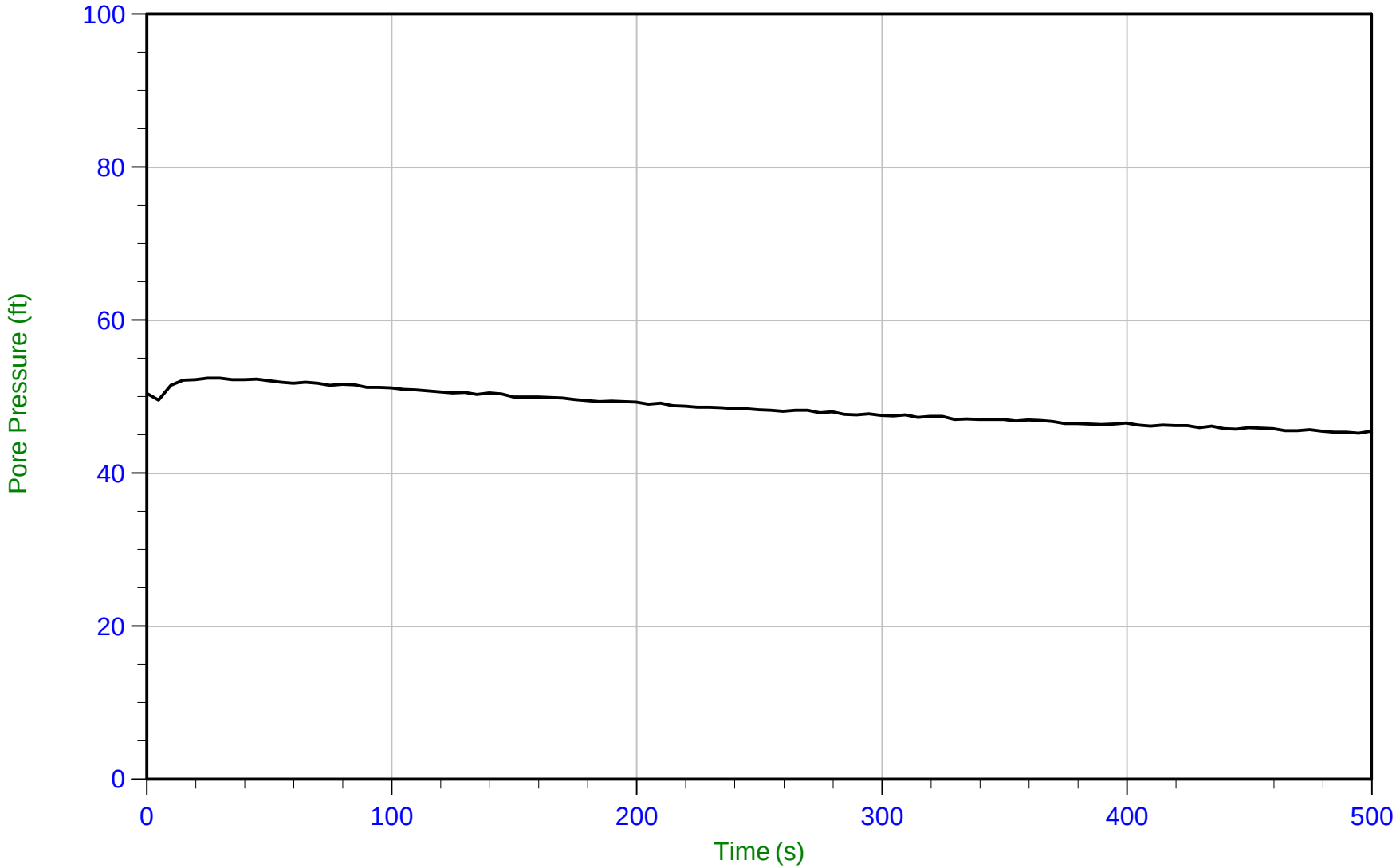
WT: 1.173 m / 3.848 ft
Ueq: 33.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 8.500 m / 27.887 ft
Duration: 500.0 s

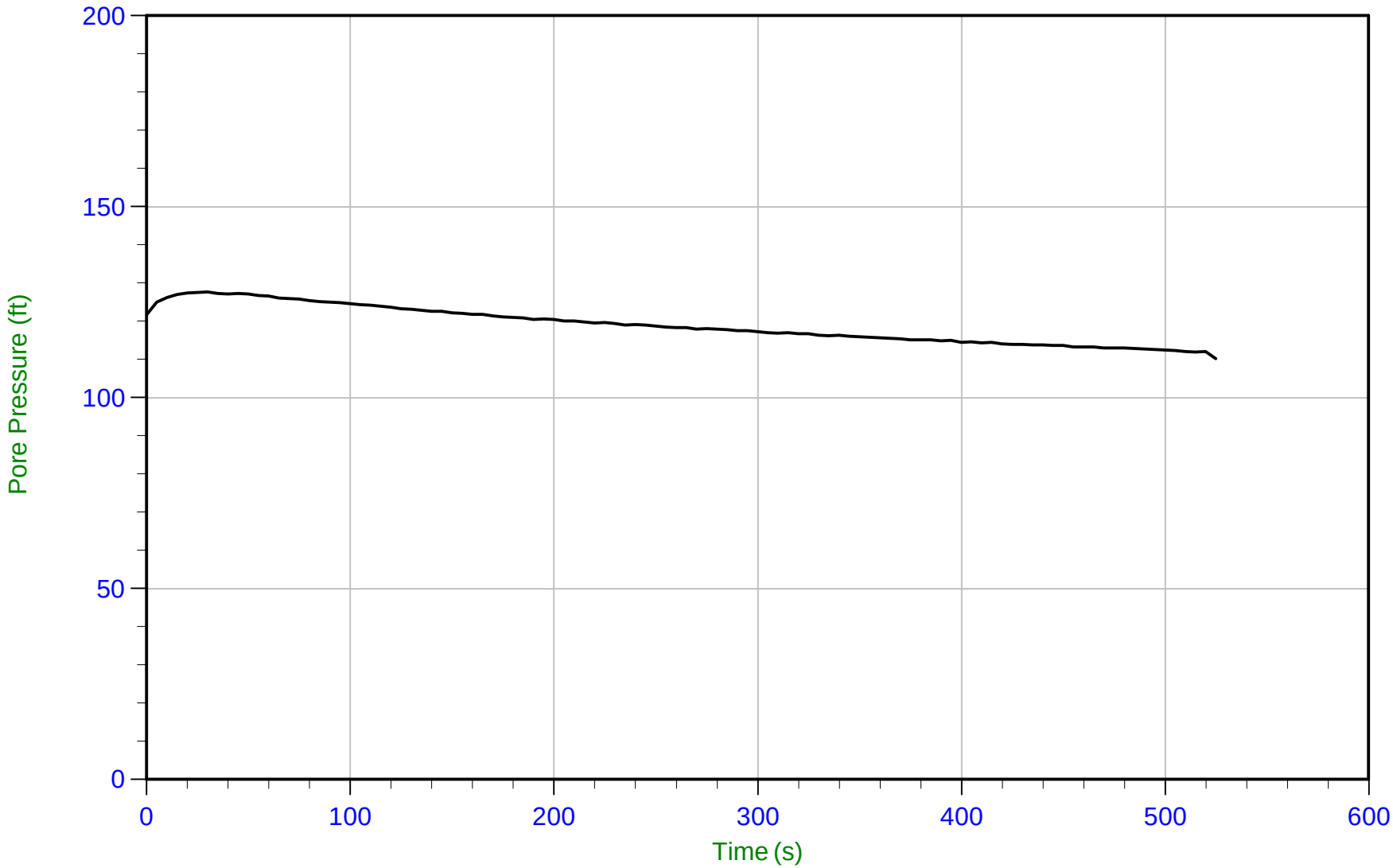
U Min: 45.3 ft
U Max: 52.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 12.350 m / 40.518 ft
Duration: 525.0 s

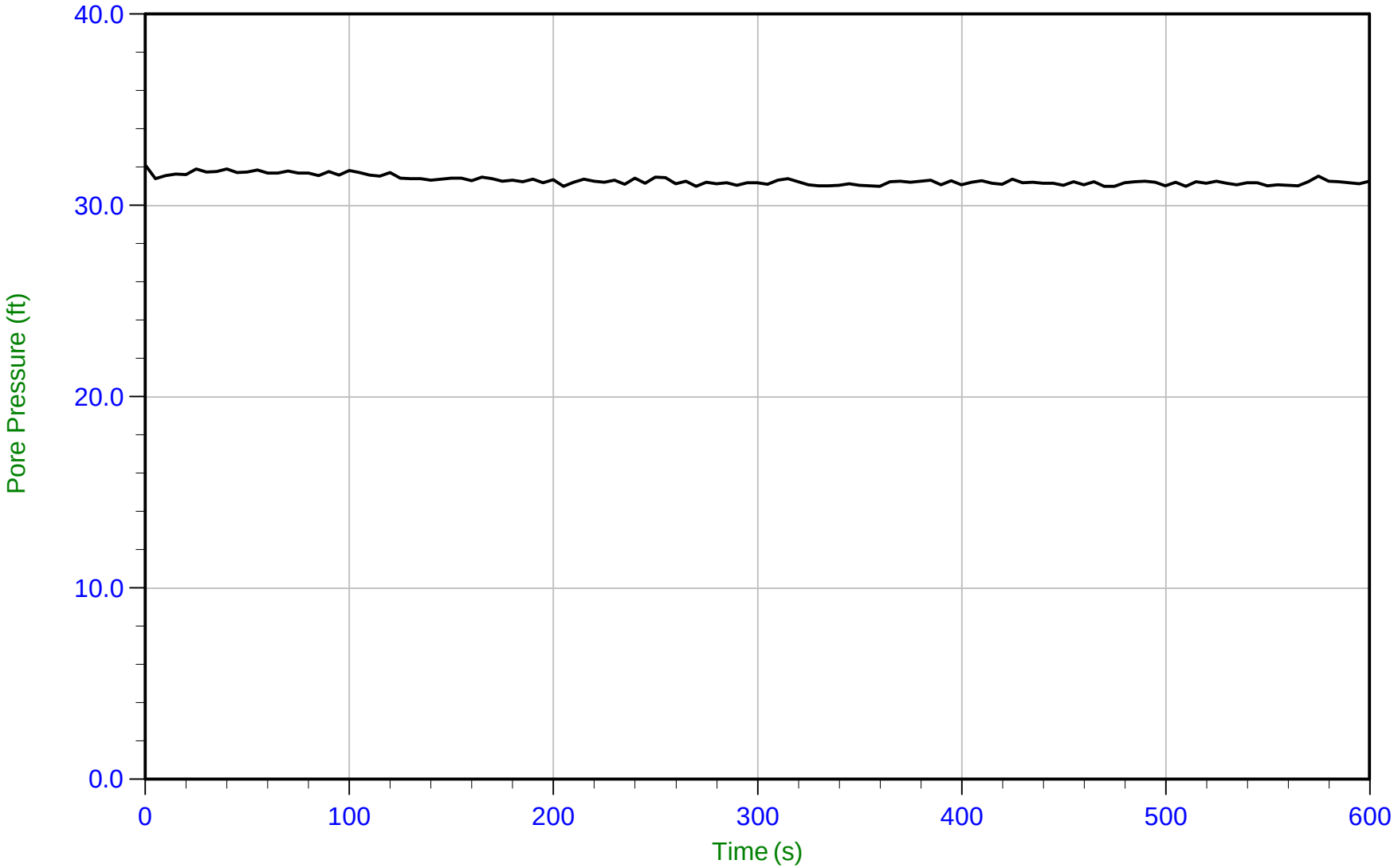
U Min: 110.3 ft
U Max: 127.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 16.850 m / 55.281 ft
Duration: 600.0 s

U Min: 31.0 ft
U Max: 32.1 ft

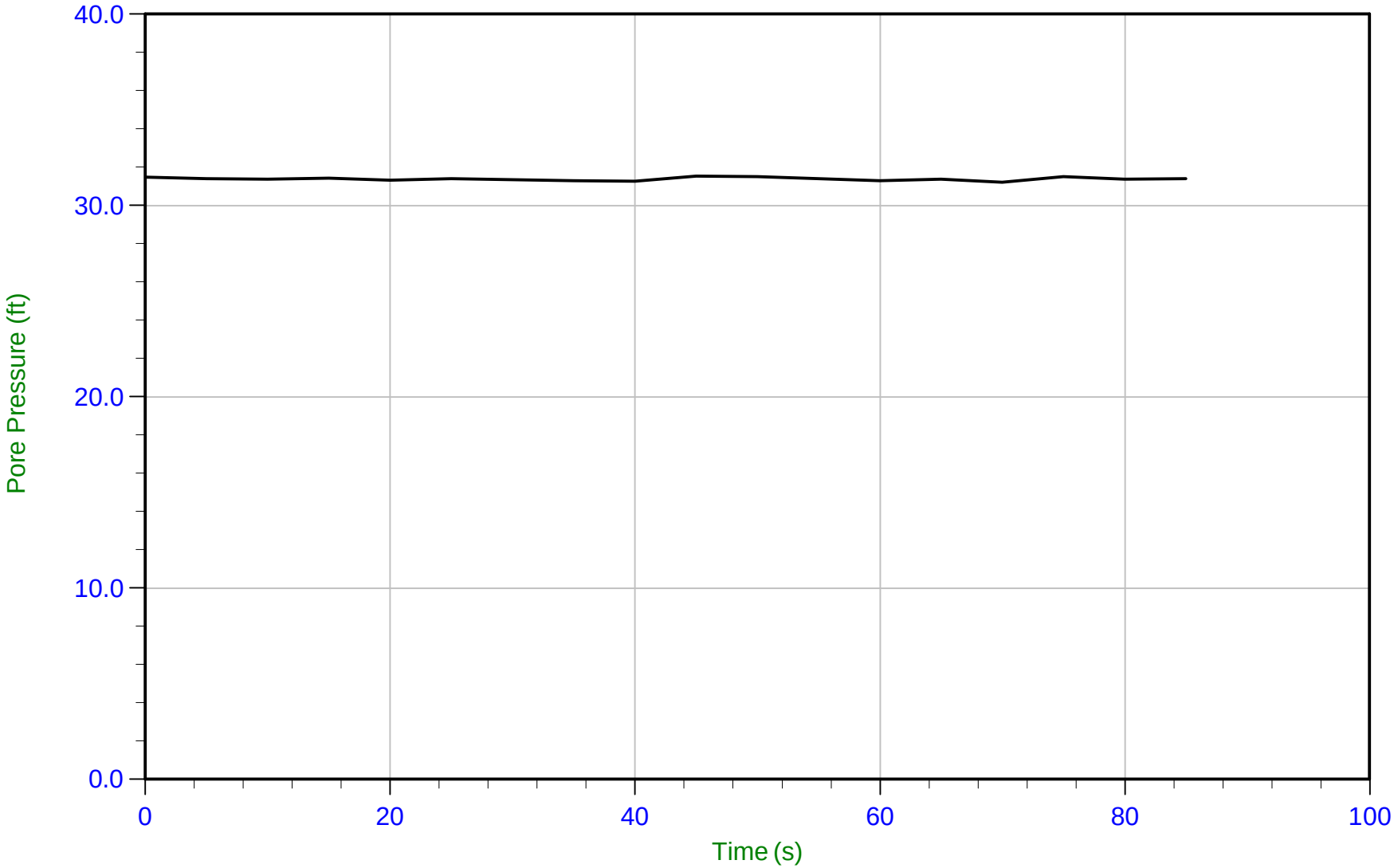
WT: 7.367 m / 24.170 ft
Ueq: 31.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 17.050 m / 55.938 ft
Duration: 85.0 s

U Min: 31.2 ft
U Max: 31.5 ft

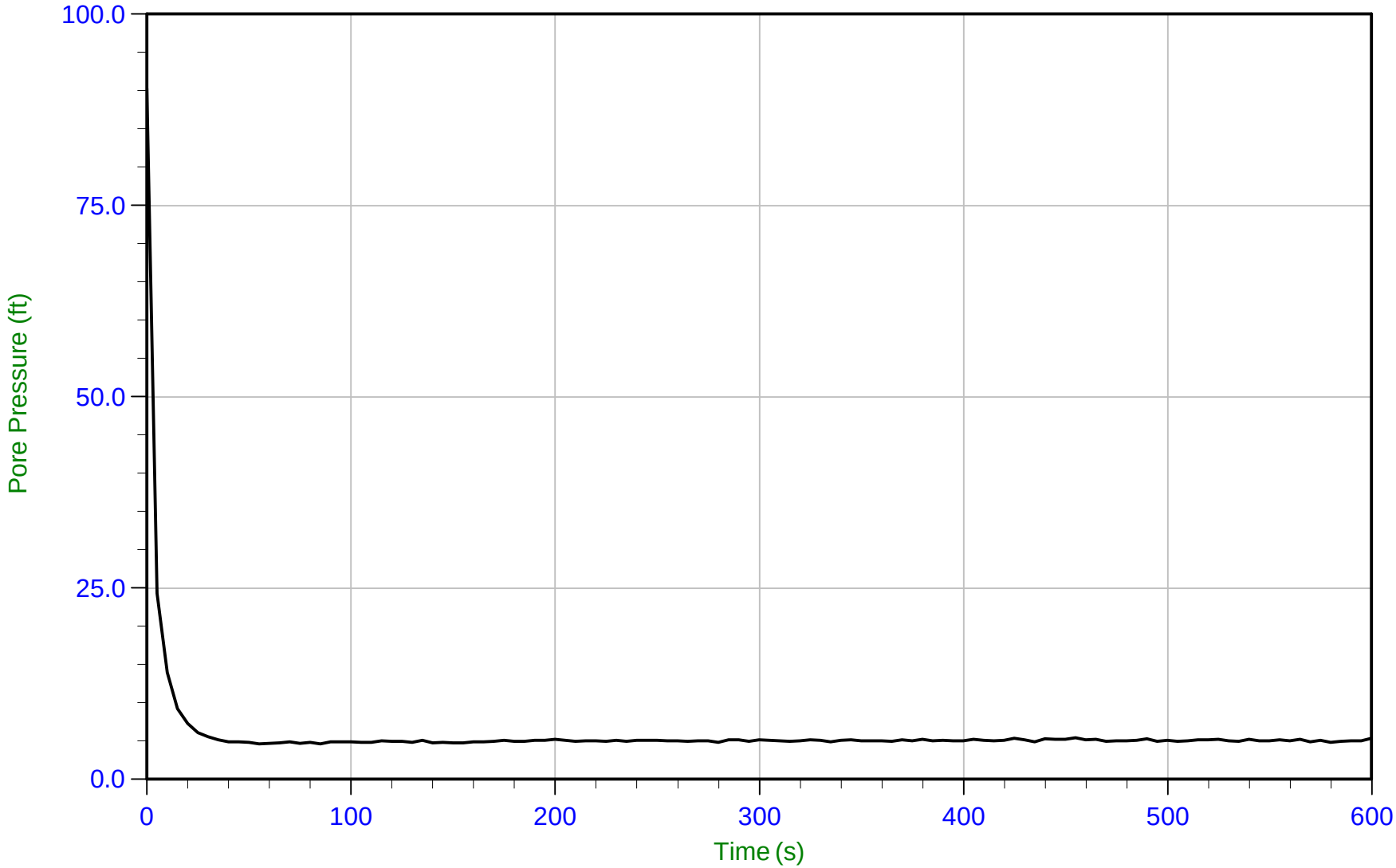
WT: 7.525 m / 24.688 ft
Ueq: 31.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:13:53
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP19.PPD
Depth: 3.600 m / 11.811 ft
Duration: 600.0 s

U Min: 4.7 ft
U Max: 90.3 ft

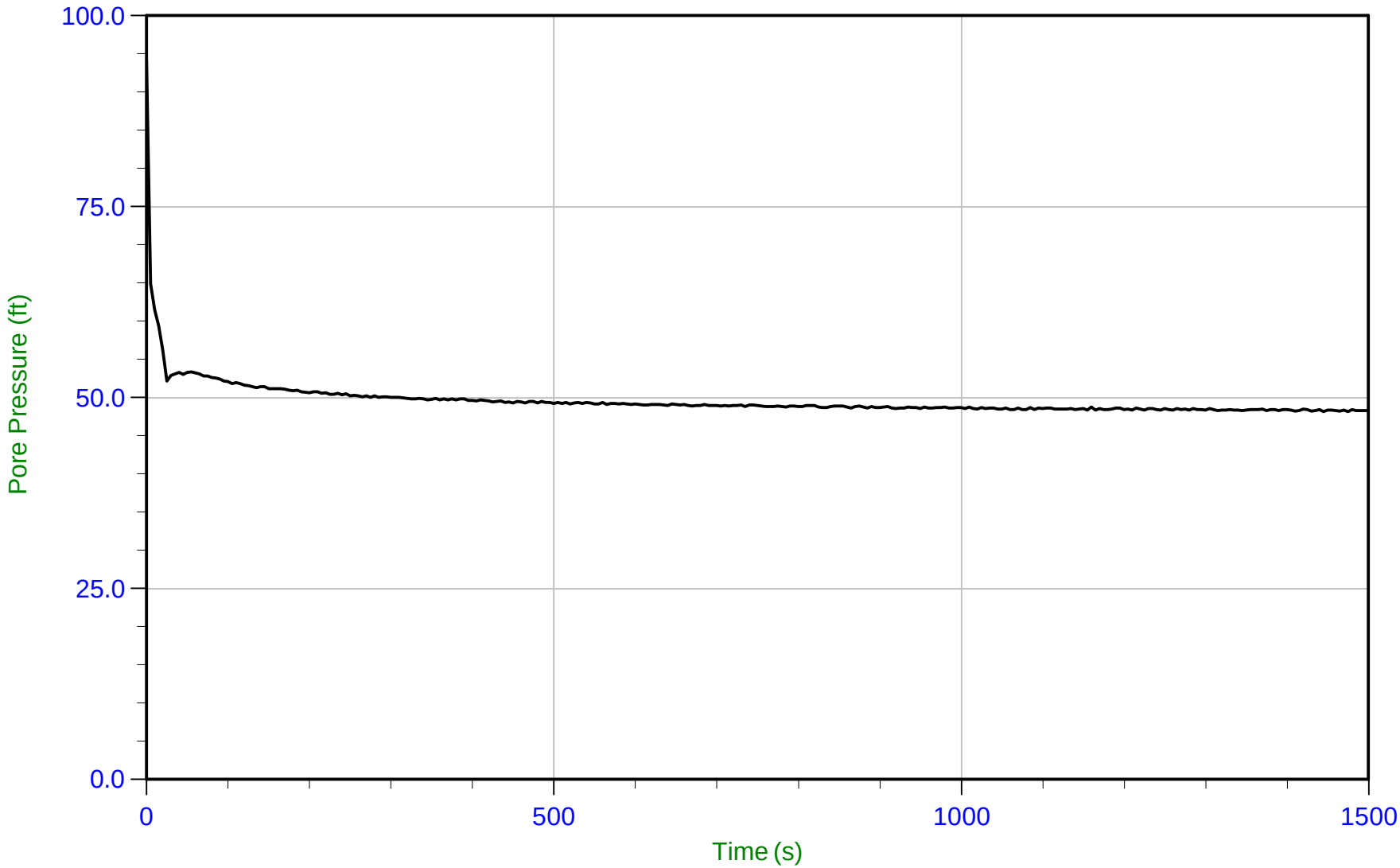
WT: 1.983 m / 6.506 ft
Ueq: 5.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:13:53
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP19.PPD
Depth: 16.300 m / 53.477 ft
Duration: 1500.0 s

U Min: 48.2 ft
U Max: 94.2 ft

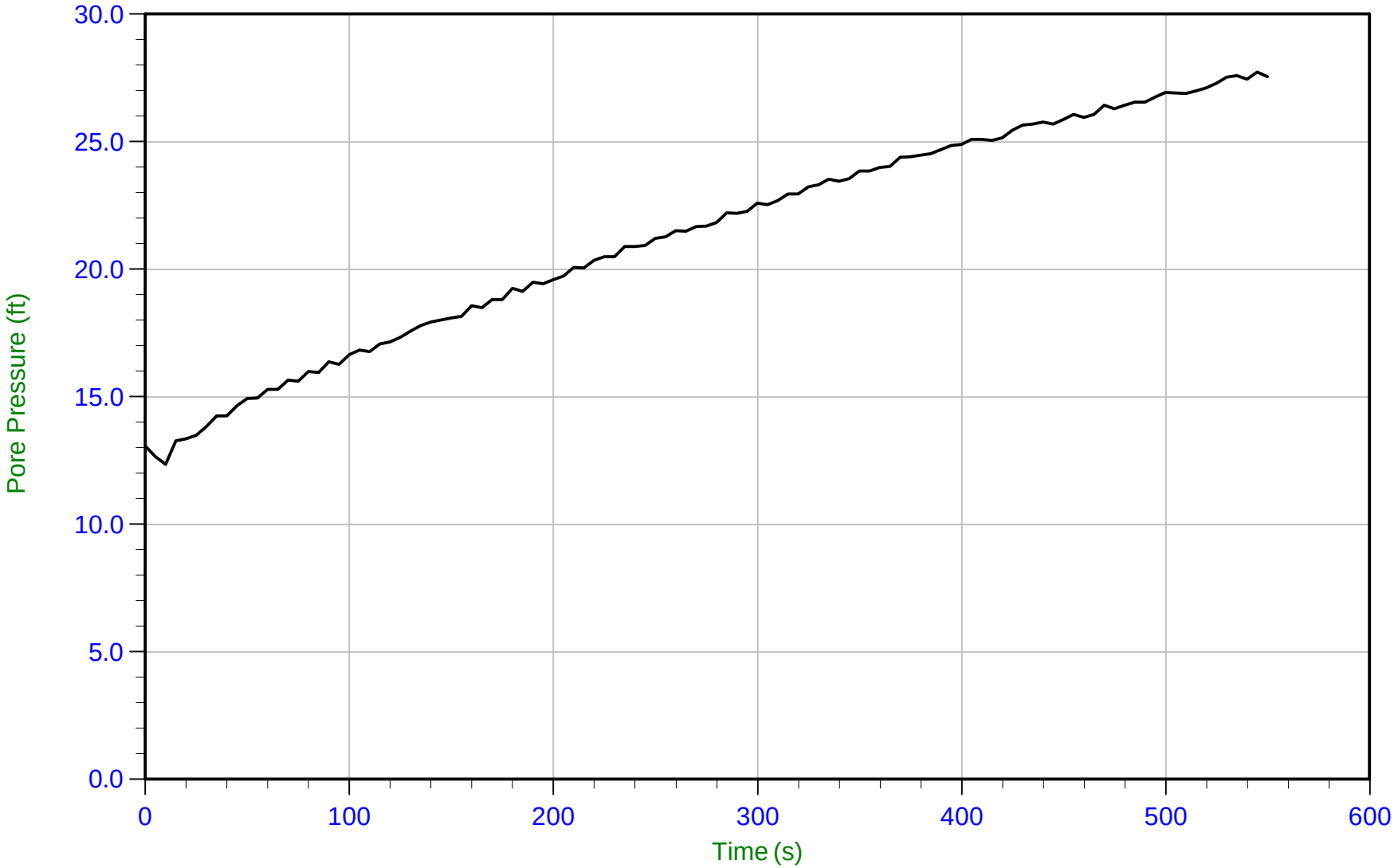
WT: 1.620 m / 5.315 ft
Ueq: 48.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 4.250 m / 13.943 ft
Duration: 550.0 s

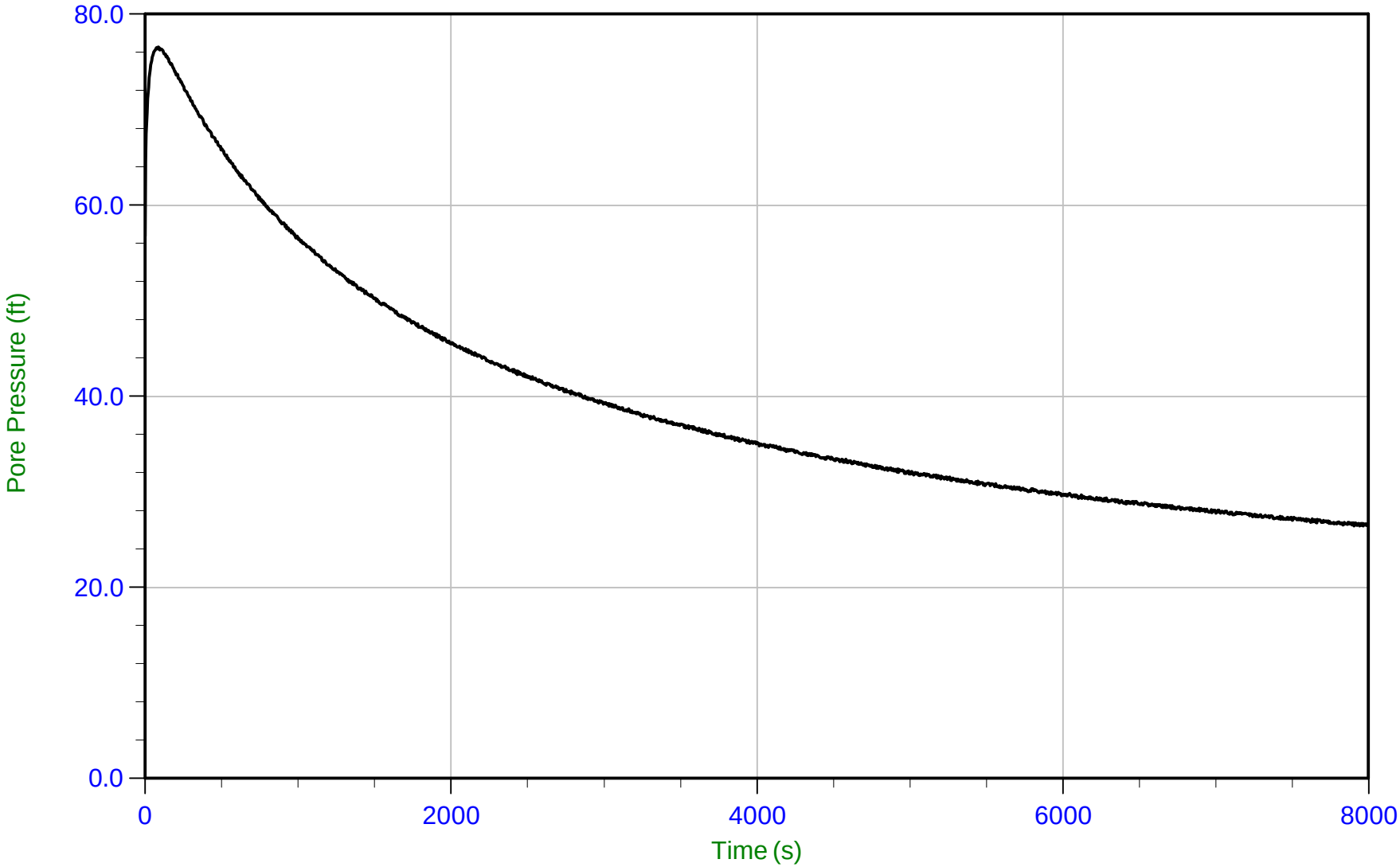
U Min: 12.4 ft
U Max: 27.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 7.150 m / 23.458 ft
Duration: 8000.0 s

U Min: 26.4 ft
U Max: 76.5 ft

WT: 3.962 m / 13.000 ft
Ueq: 10.5 ft
U(50): 43.50 ft

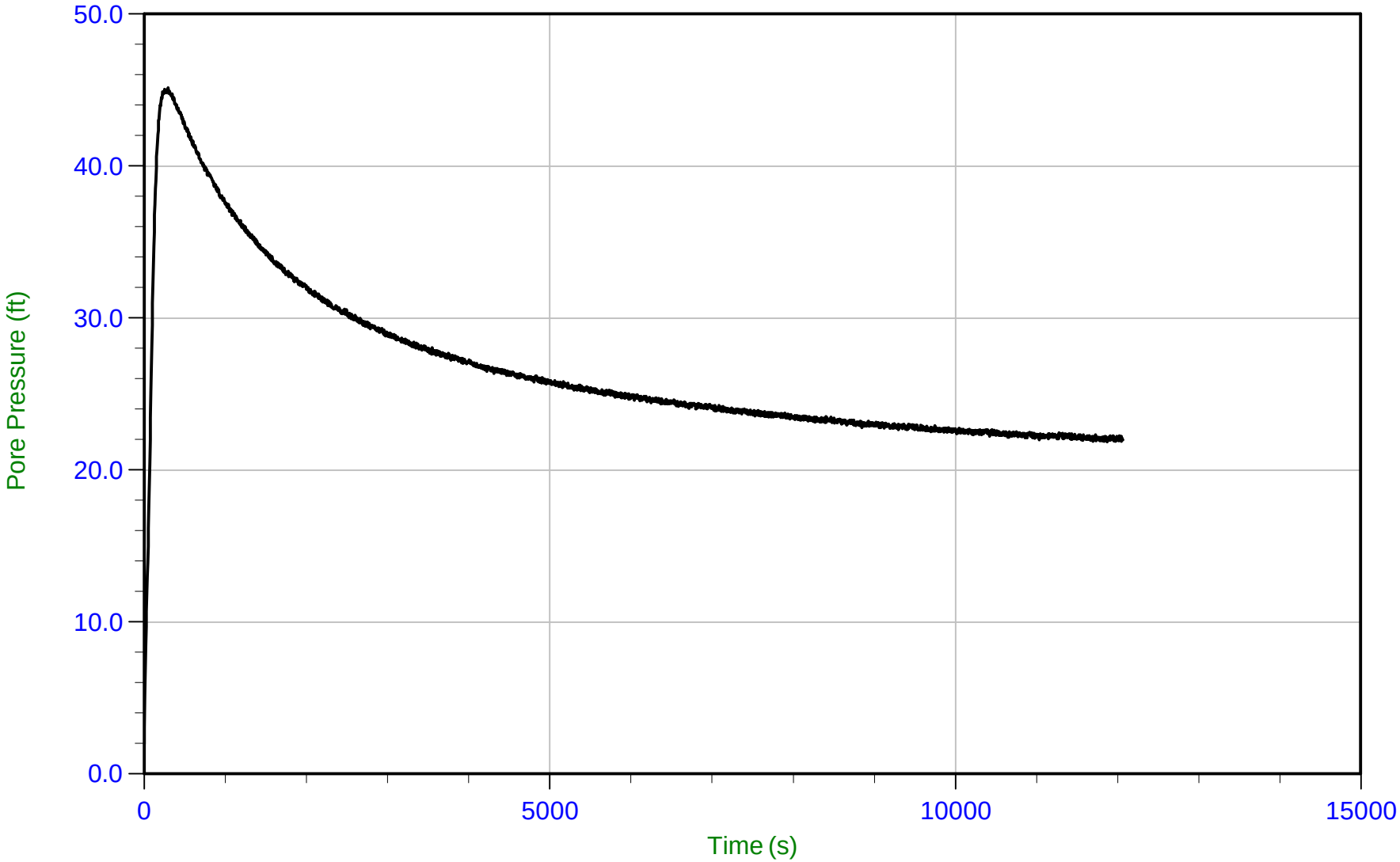
T(50): 2190.1 s
Ir: 100
Ch: 0.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 10.250 m / 33.628 ft
Duration: 12070.0 s

U Min: 2.0 ft
U Max: 45.1 ft

WT: 3.962 m / 13.000 ft
Ueq: 20.6 ft
U(50): 32.88 ft

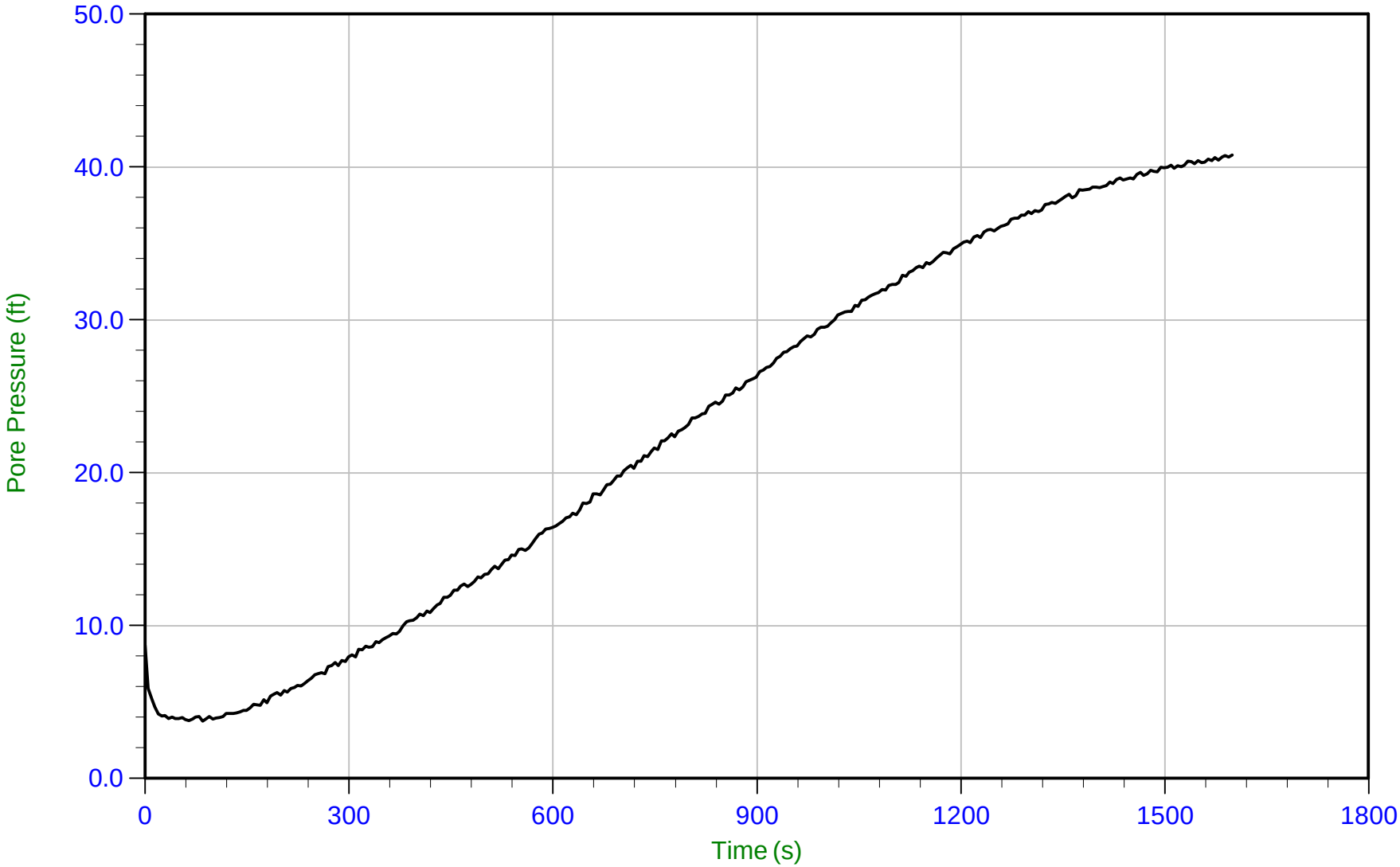
T(50): 1449.3 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 14.750 m / 48.392 ft
Duration: 1600.0 s

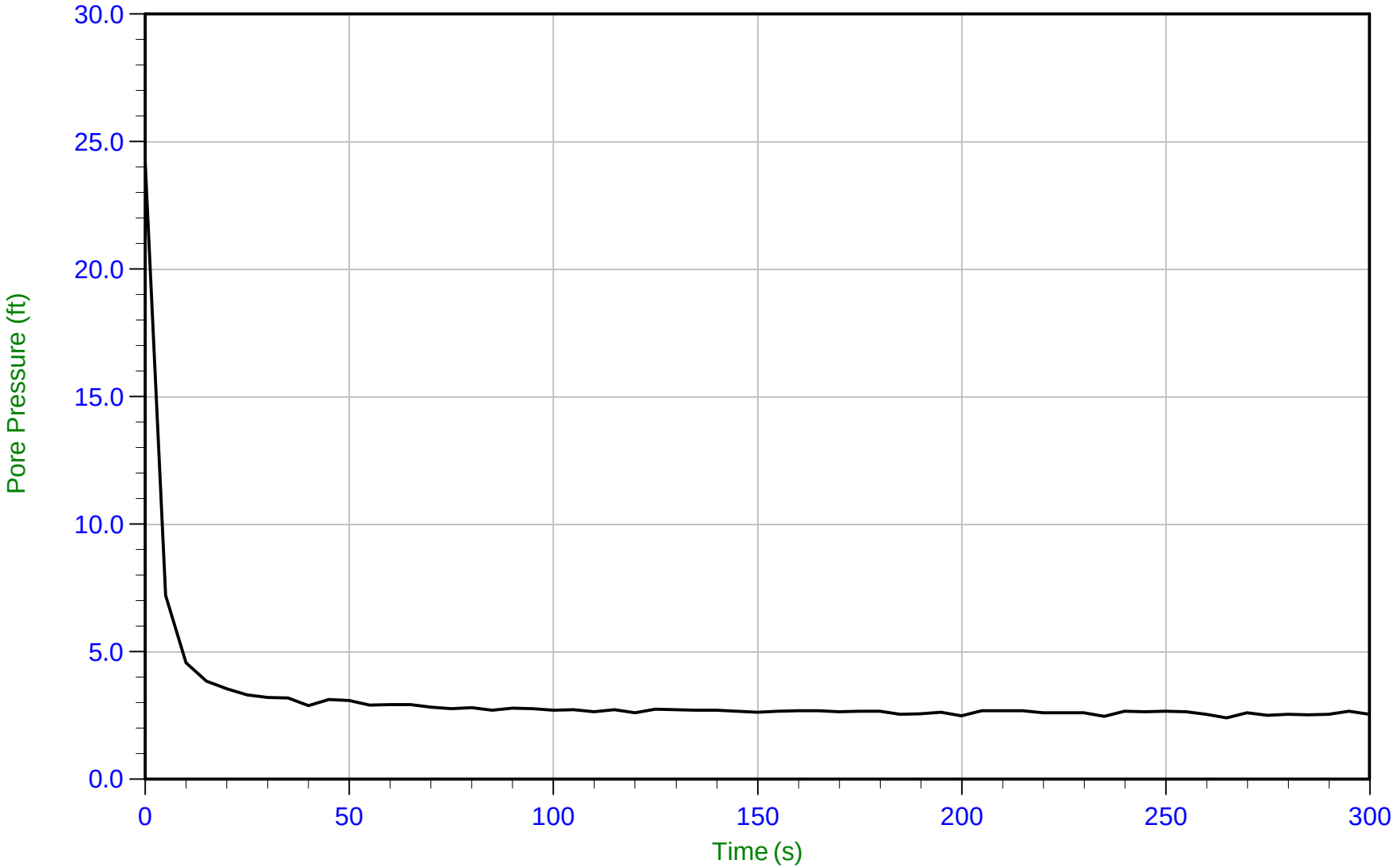
U Min: 3.8 ft
U Max: 40.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 2.600 m / 8.530 ft
Duration: 300.0 s

U Min: 2.4 ft
U Max: 24.2 ft

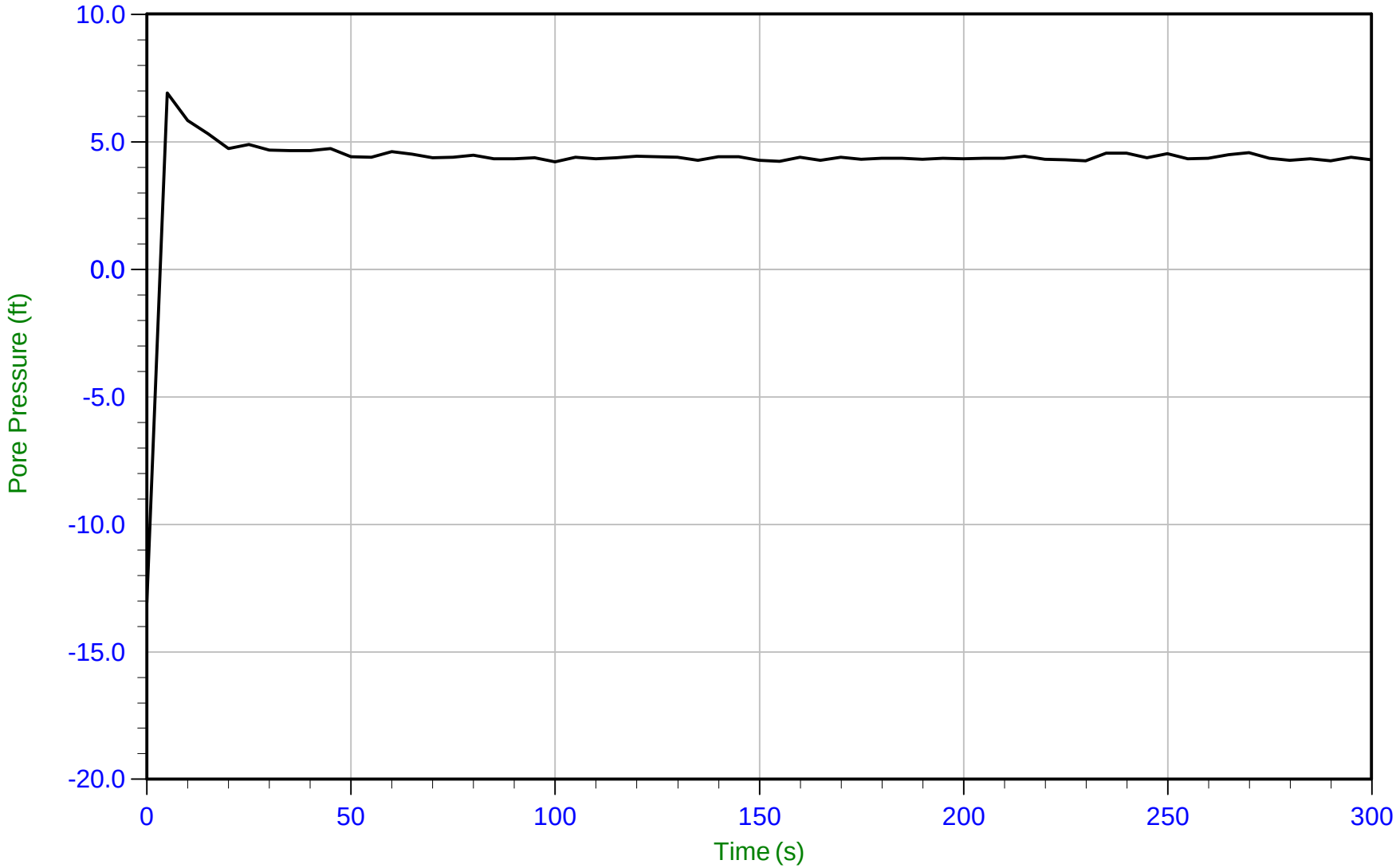
WT: 1.870 m / 6.135 ft
Ueq: 2.4 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 3.350 m / 10.991 ft
Duration: 300.0 s

U Min: -13.1 ft
U Max: 6.9 ft

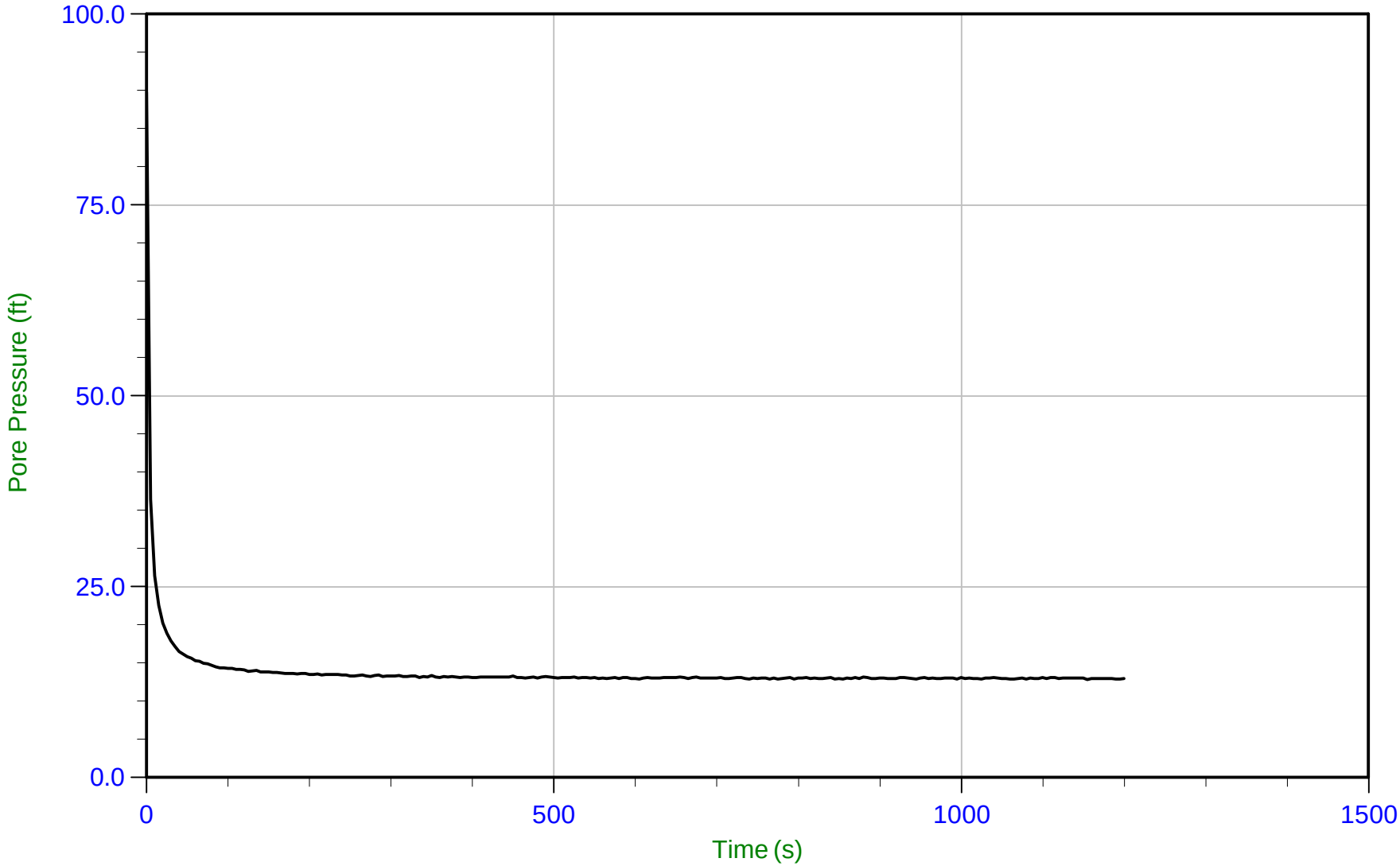
WT: 2.048 m / 6.719 ft
Ueq: 4.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 6.000 m / 19.685 ft
Duration: 1200.0 s

U Min: 12.8 ft
U Max: 89.8 ft

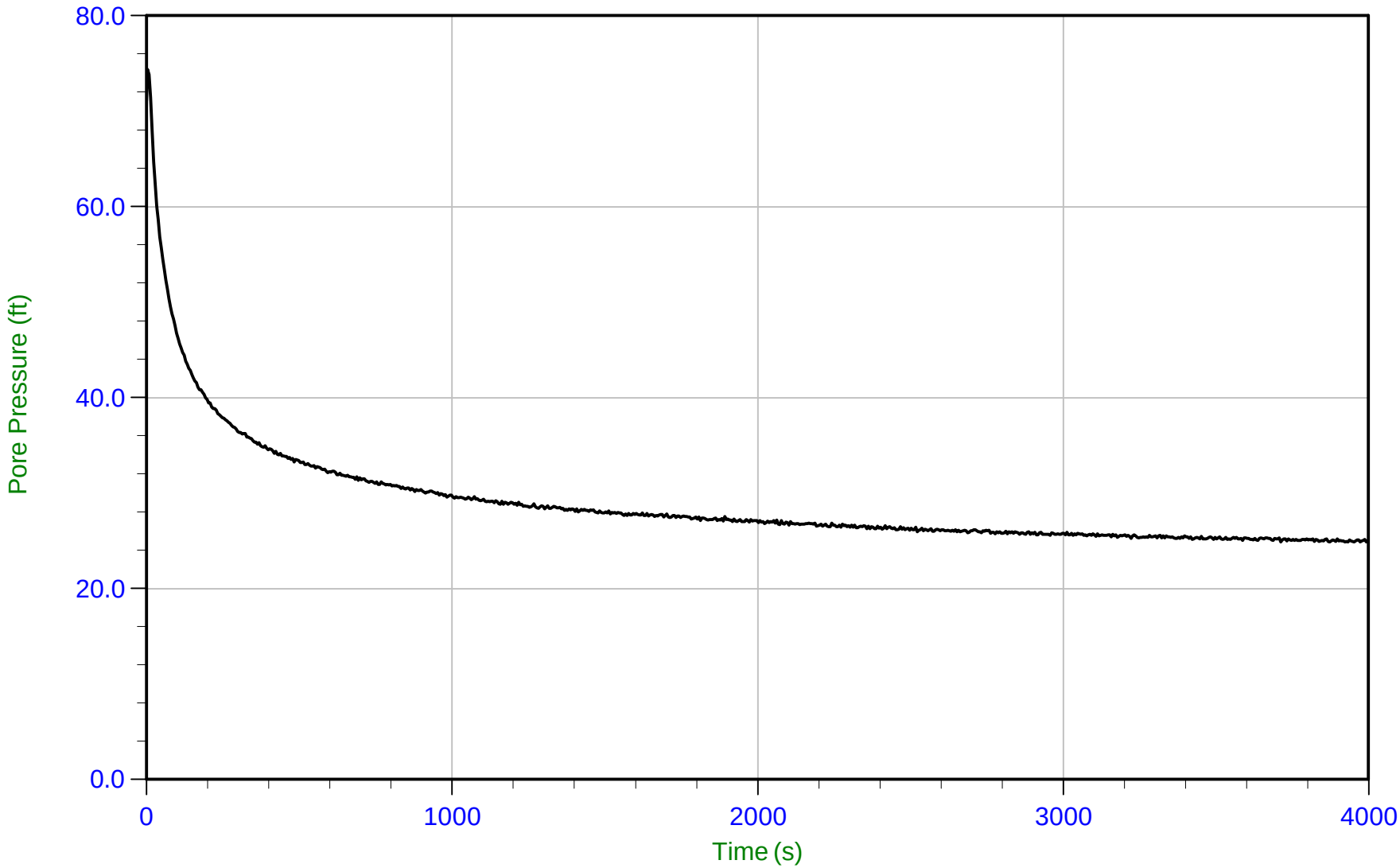
WT: 2.084 m / 6.837 ft
Ueq: 12.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 11.850 m / 38.877 ft
Duration: 4000.0 s

U Min: 24.9 ft
U Max: 74.4 ft

WT: 4.589 m / 15.056 ft
Ueq: 23.8 ft
U(50): 49.09 ft

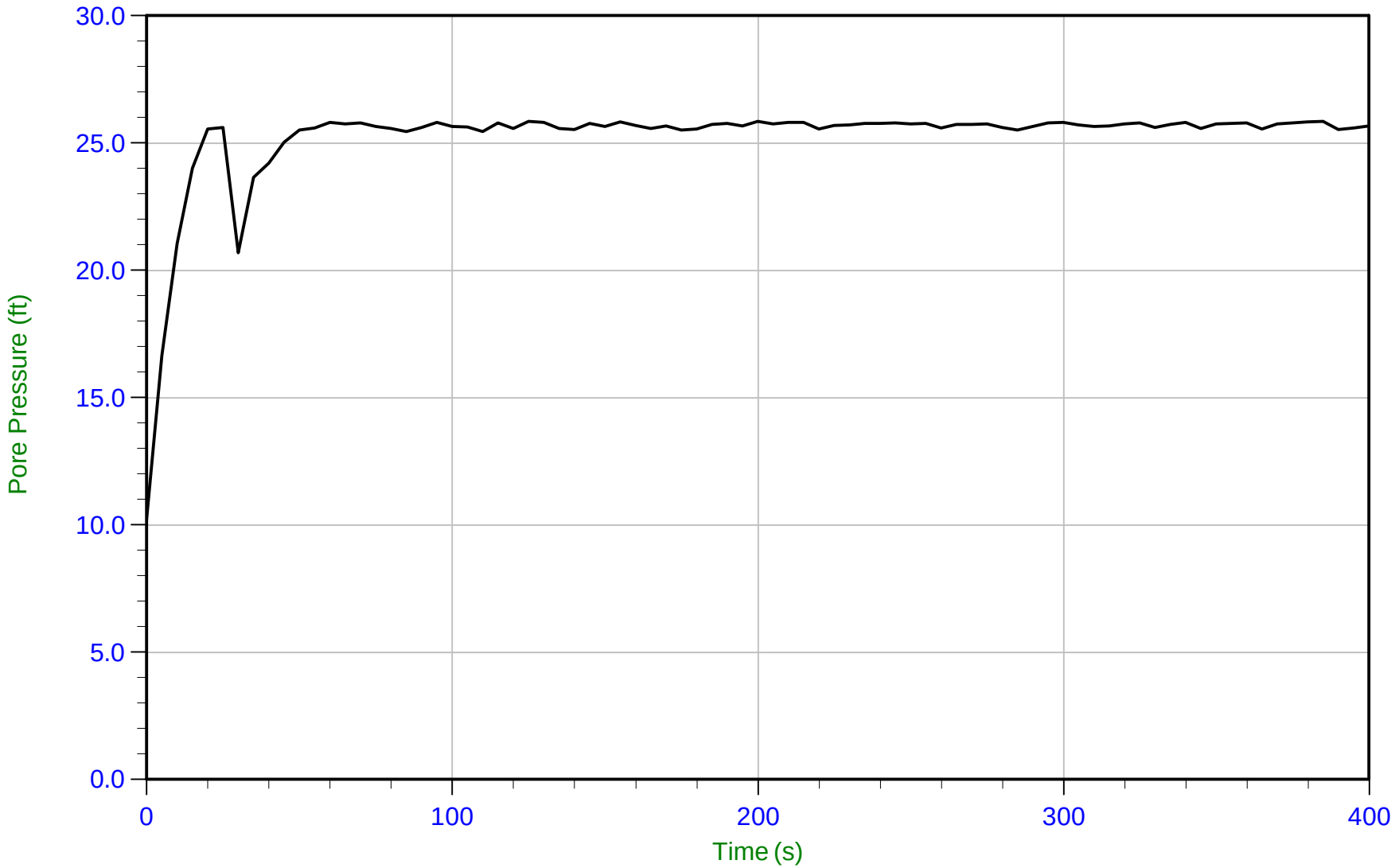
T(50): 77.9 s
Ir: 100
Ch: 9.0 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 12.400 m / 40.682 ft
Duration: 400.0 s

U Min: 10.2 ft
U Max: 25.9 ft

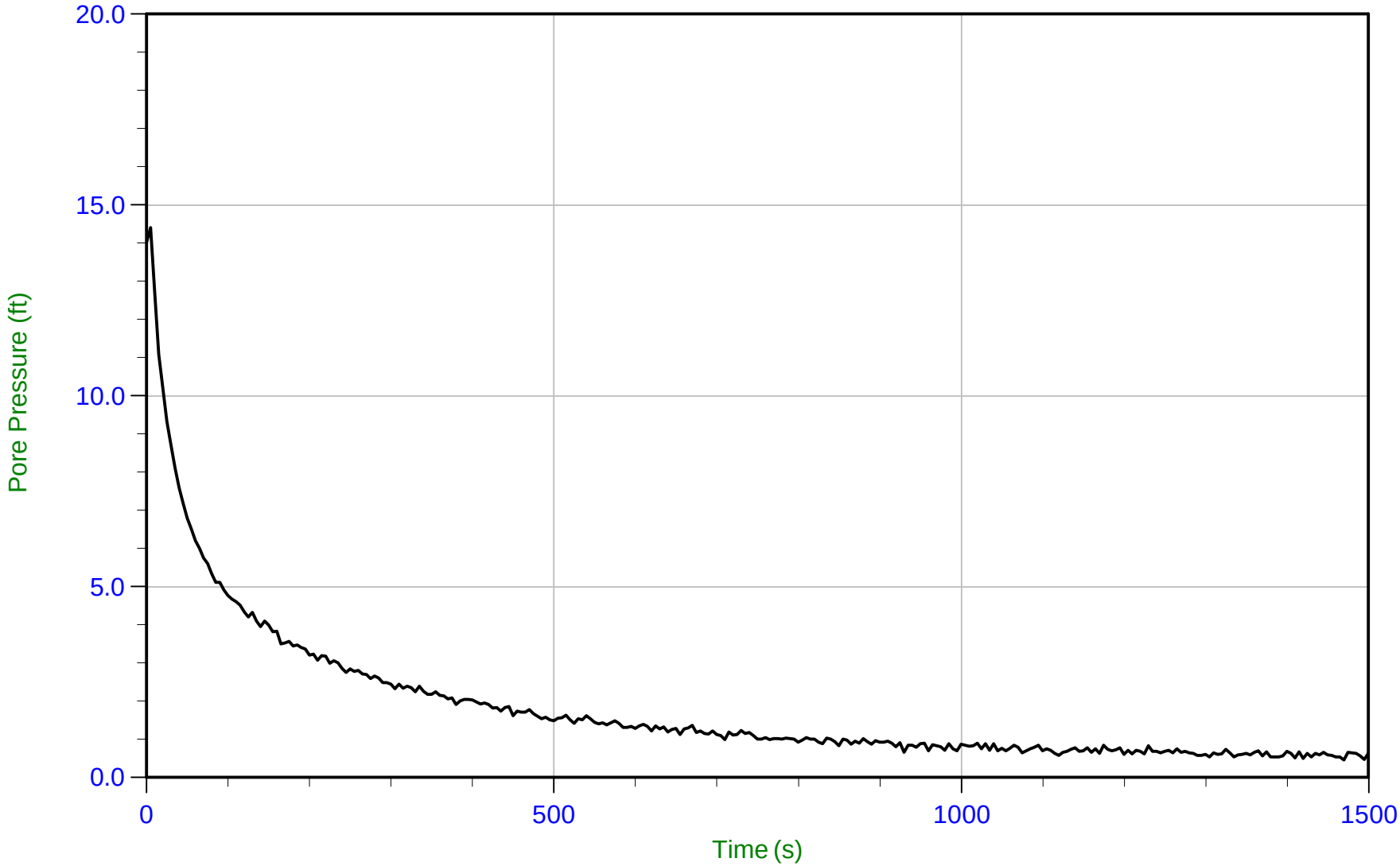
WT: 4.589 m / 15.056 ft
Ueq: 25.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 2.000 m / 6.562 ft
Duration: 1500.0 s

U Min: 0.5 ft
U Max: 14.4 ft

WT: 1.826 m / 5.991 ft
Ueq: 0.6 ft
U(50): 7.49 ft

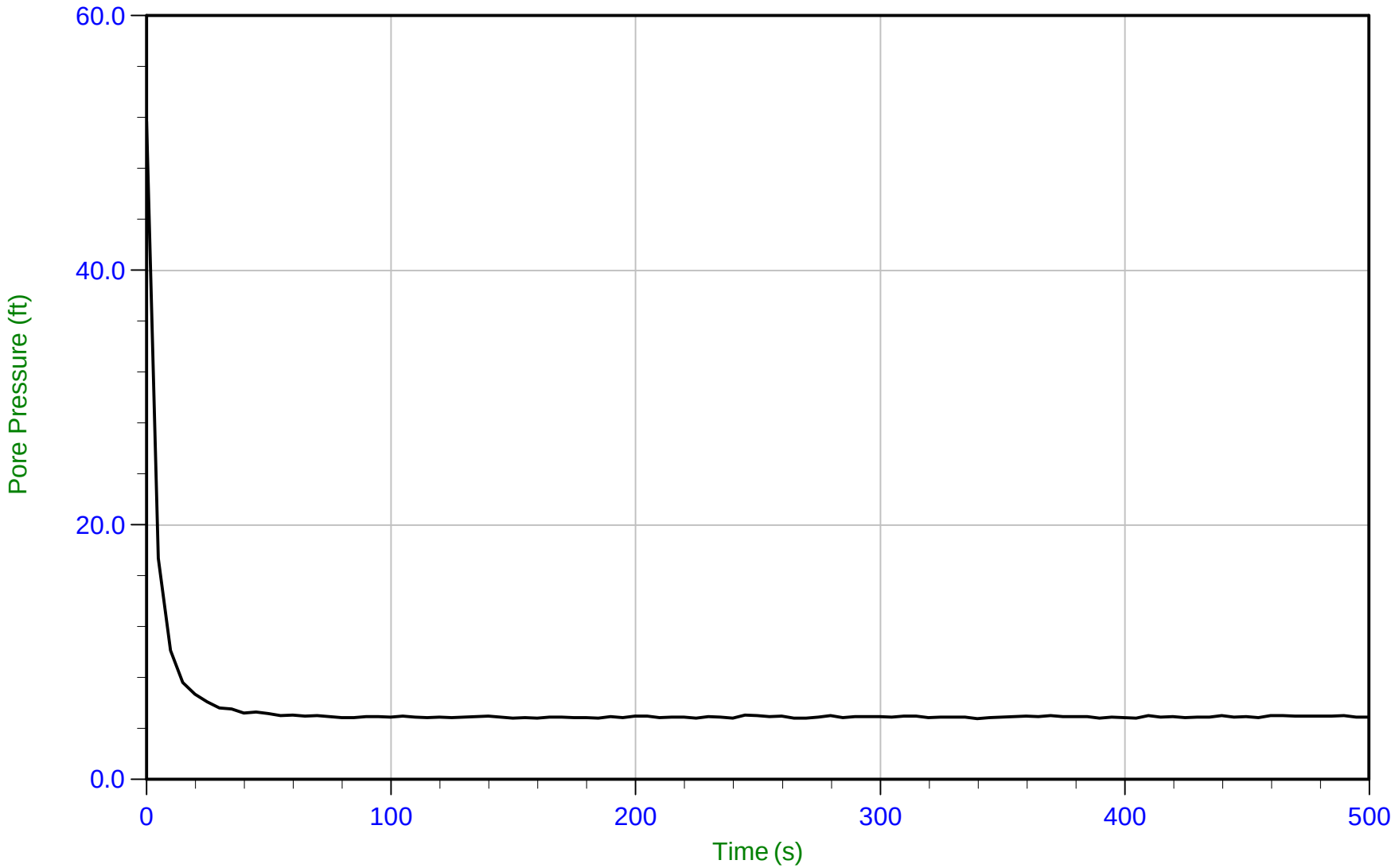
T(50): 36.3 s
Ir: 100
Ch: 19.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 3.350 m / 10.991 ft
Duration: 500.0 s

U Min: 4.8 ft
U Max: 51.7 ft

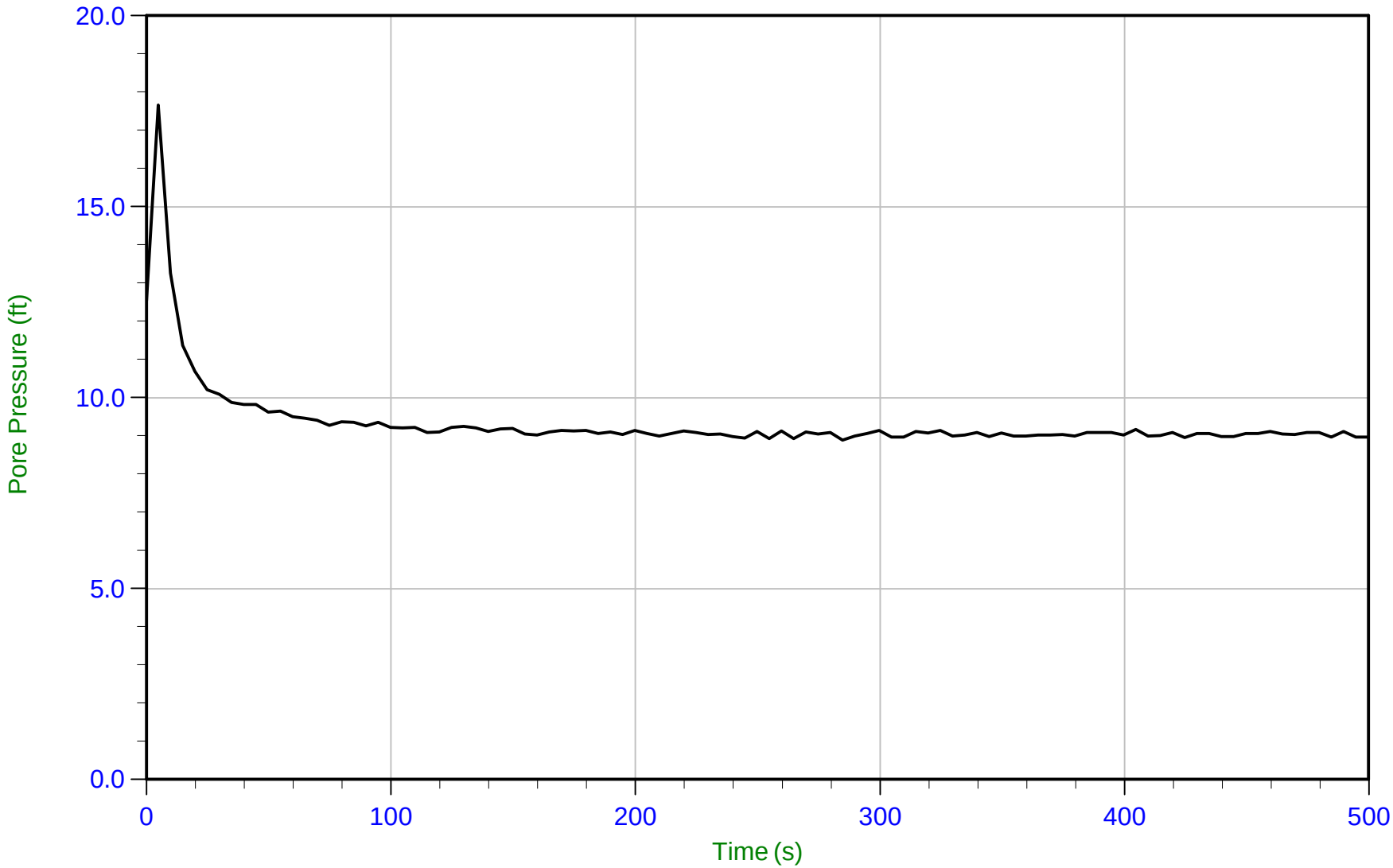
WT: 1.826 m / 5.991 ft
Ueq: 5.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 4.600 m / 15.092 ft
Duration: 500.0 s

U Min: 8.9 ft
U Max: 17.7 ft

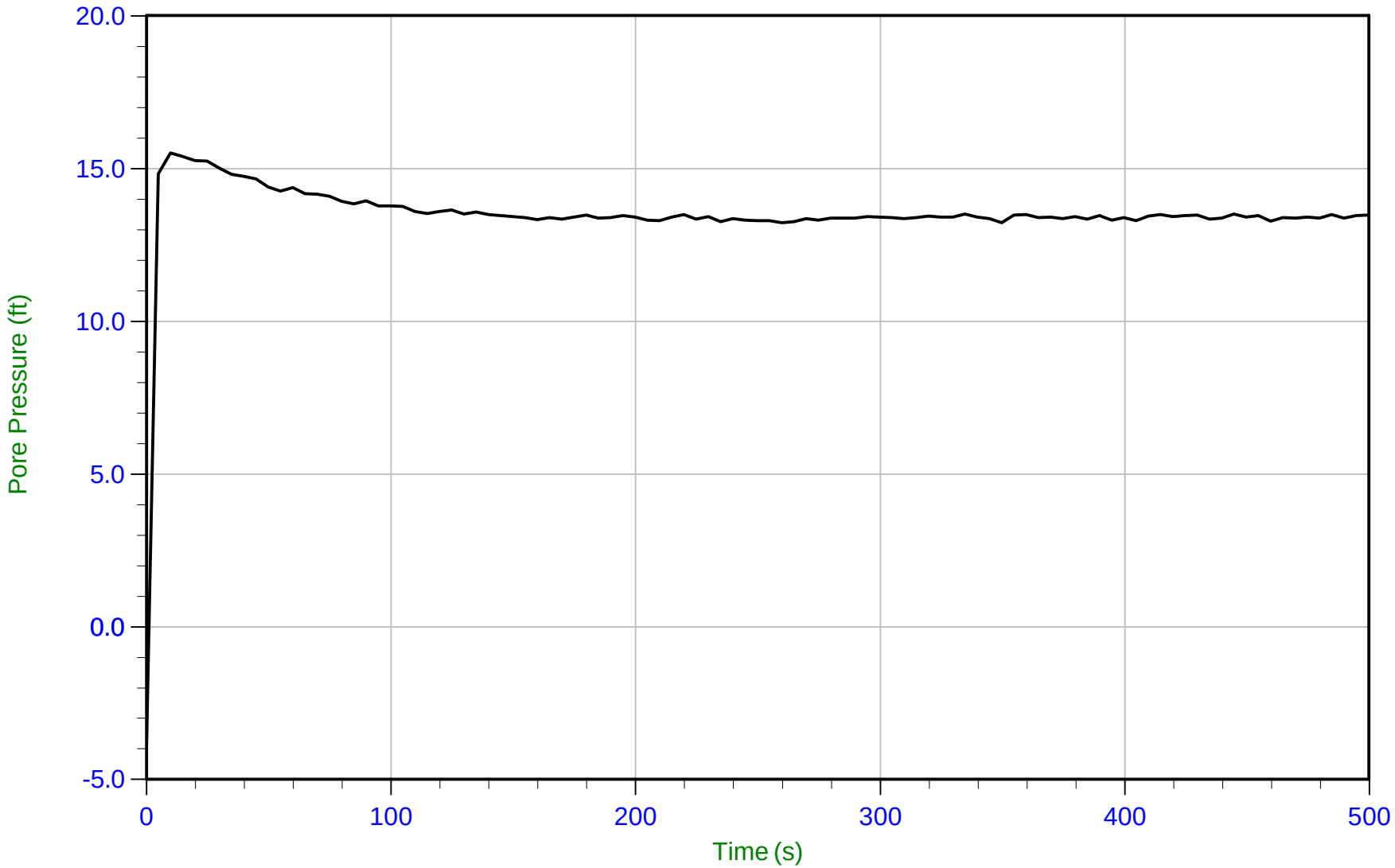
WT: 1.848 m / 6.063 ft
Ueq: 9.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 6.100 m / 20.013 ft
Duration: 500.0 s

U Min: -3.8 ft
U Max: 15.5 ft

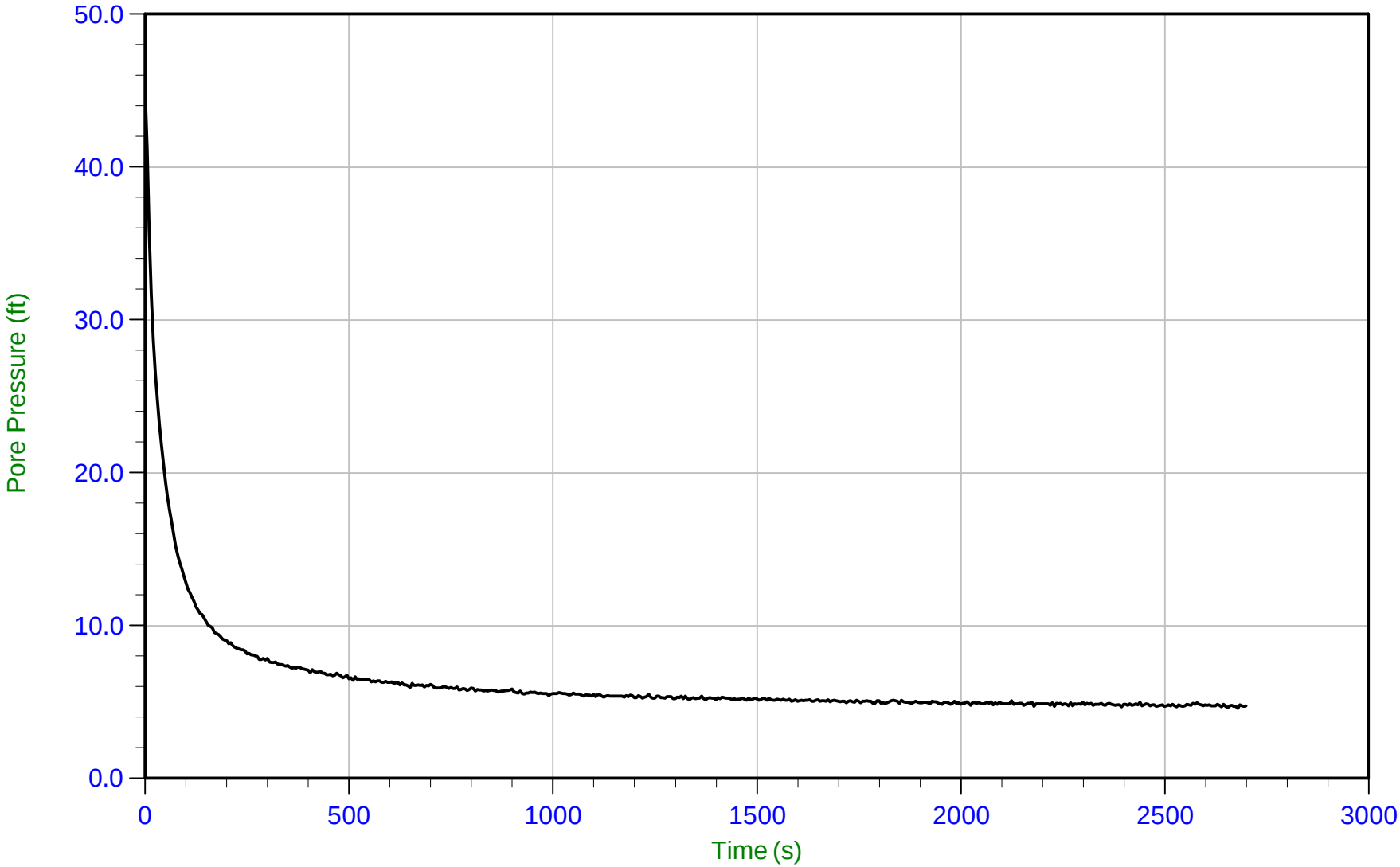
WT: 1.962 m / 6.437 ft
Ueq: 13.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 3.350 m / 10.991 ft
Duration: 2700.0 s

U Min: 4.6 ft
U Max: 45.1 ft

WT: 2.191 m / 7.188 ft
Ueq: 3.8 ft
U(50): 24.43 ft

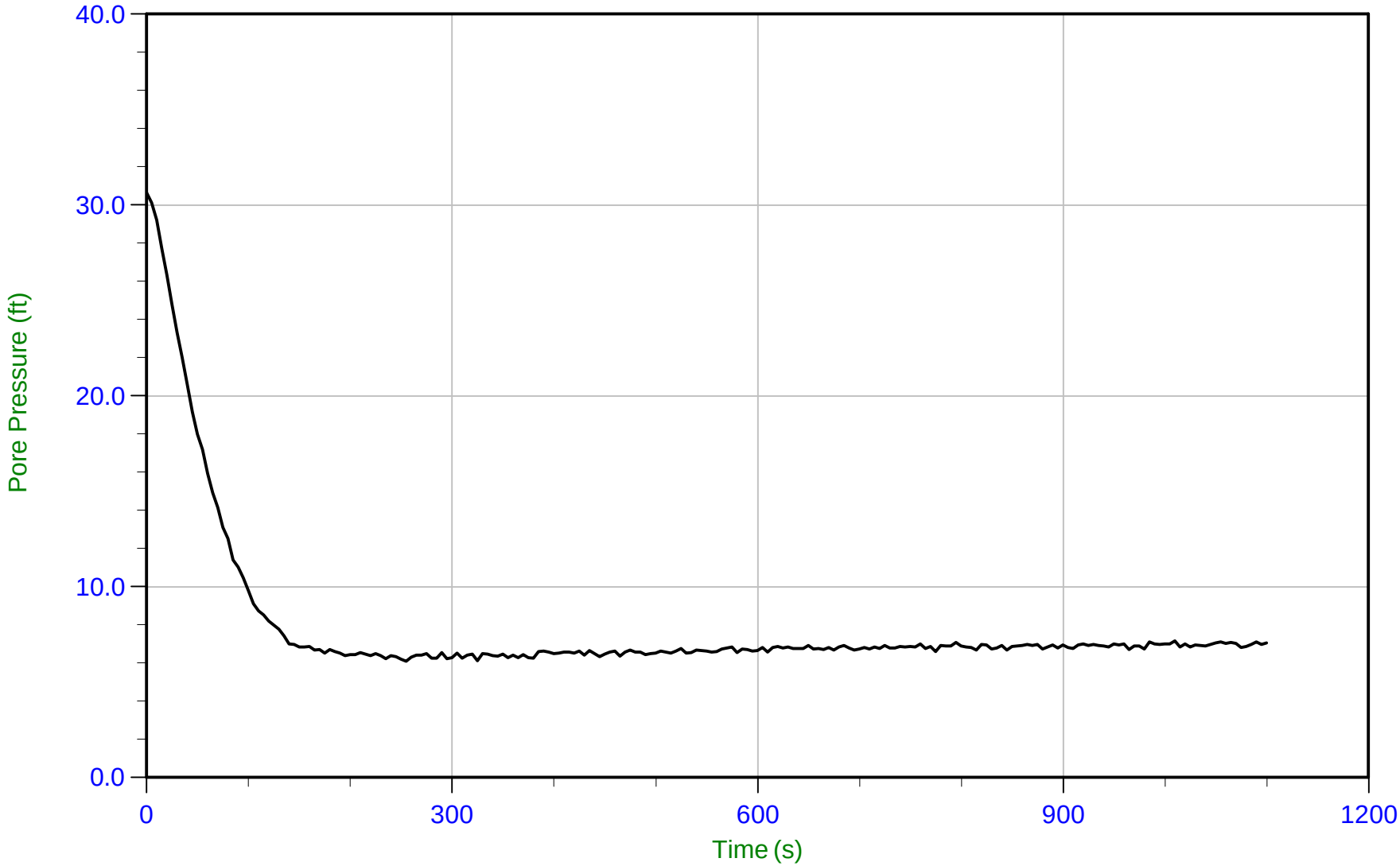
T(50): 31.2 s
Ir: 100
Ch: 22.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 4.350 m / 14.271 ft
Duration: 1100.0 s

U Min: 6.1 ft
U Max: 30.7 ft

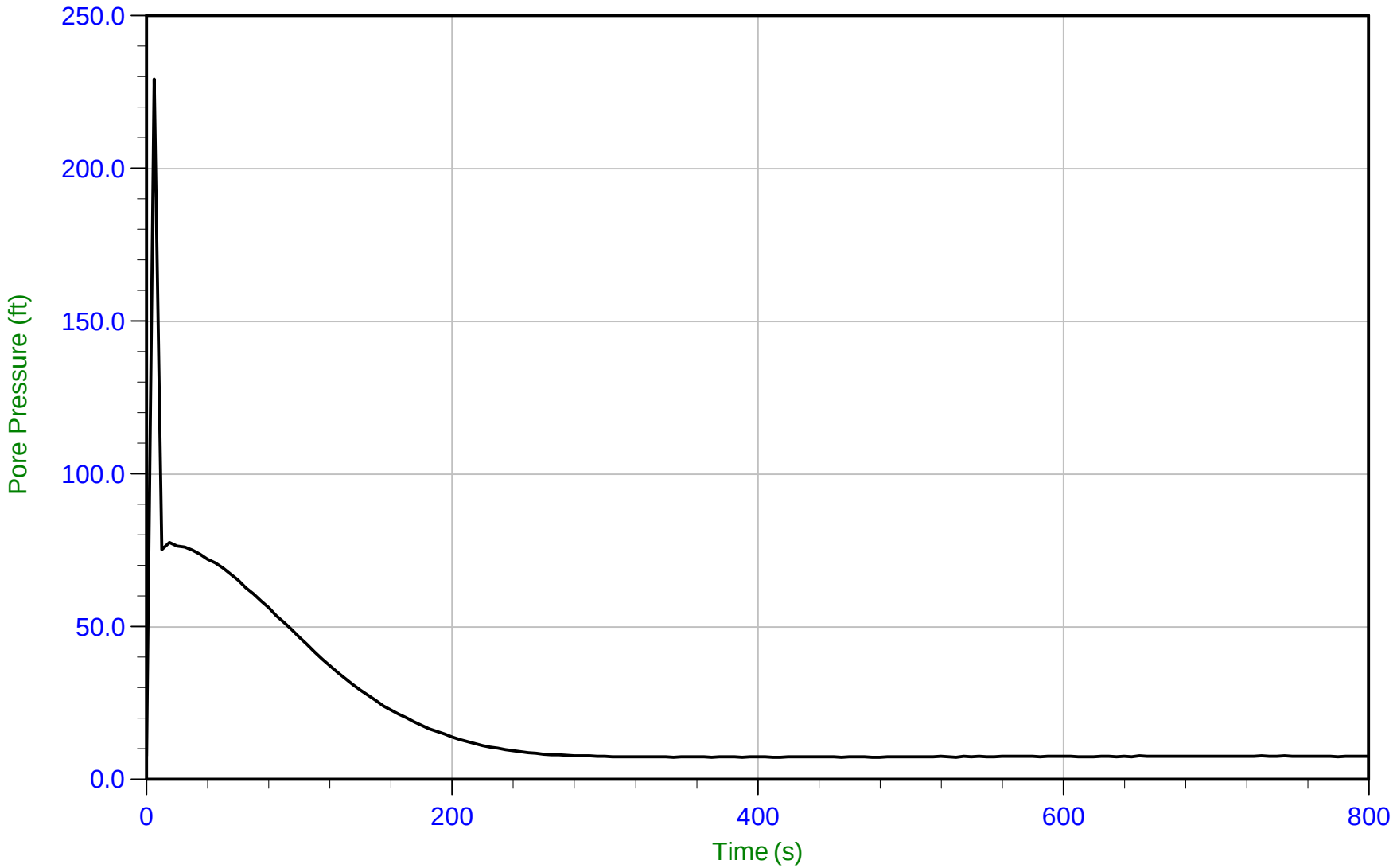
WT: 2.191 m / 7.188 ft
Ueq: 7.1 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 14:00:29
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26B.PPD
Depth: 4.450 m / 14.600 ft
Duration: 800.0 s

U Min: 7.3 ft
U Max: 229.3 ft

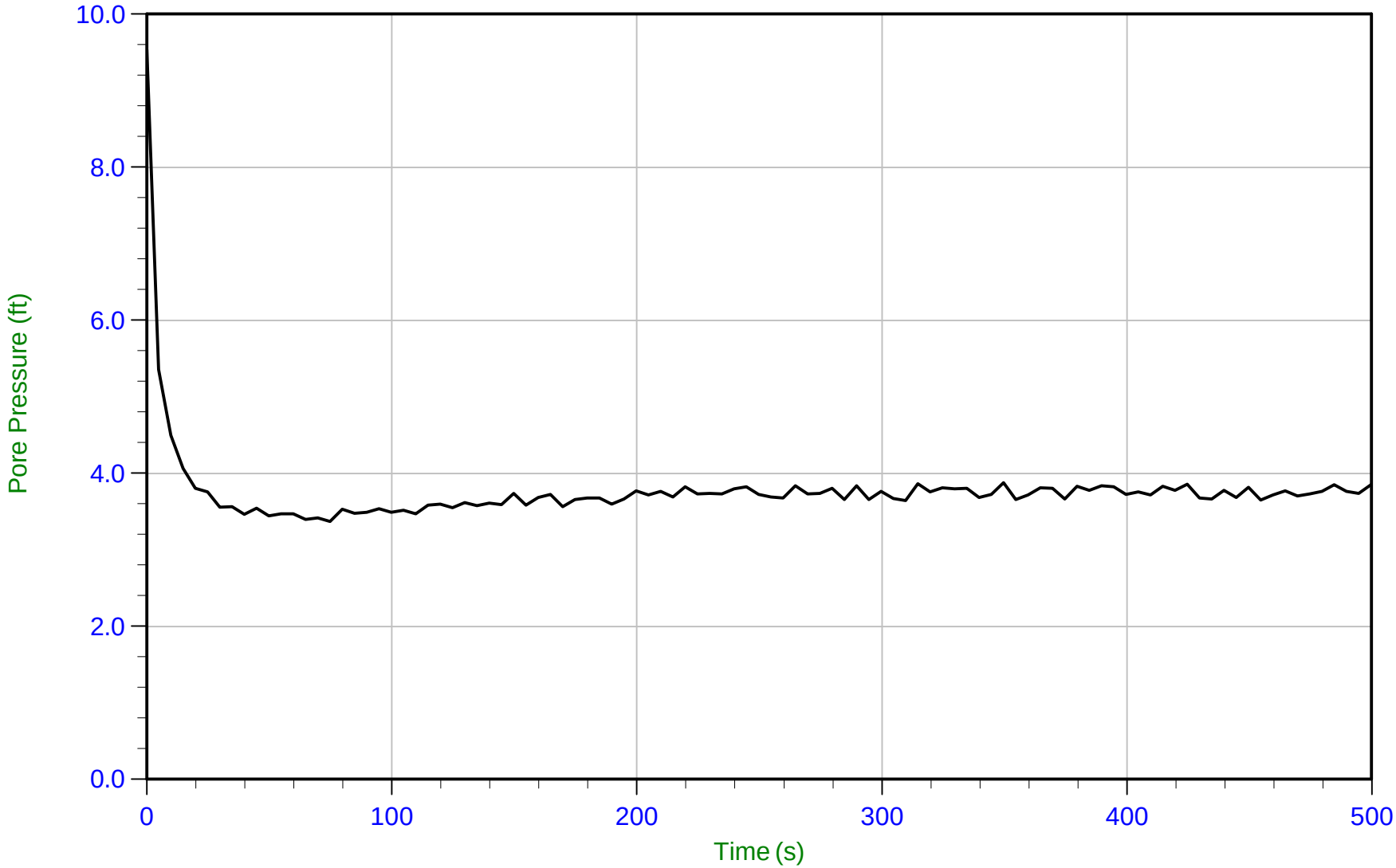
WT: 2.069 m / 6.788 ft
Ueq: 7.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 3.400 m / 11.155 ft
Duration: 500.0 s

U Min: 3.4 ft
U Max: 9.5 ft

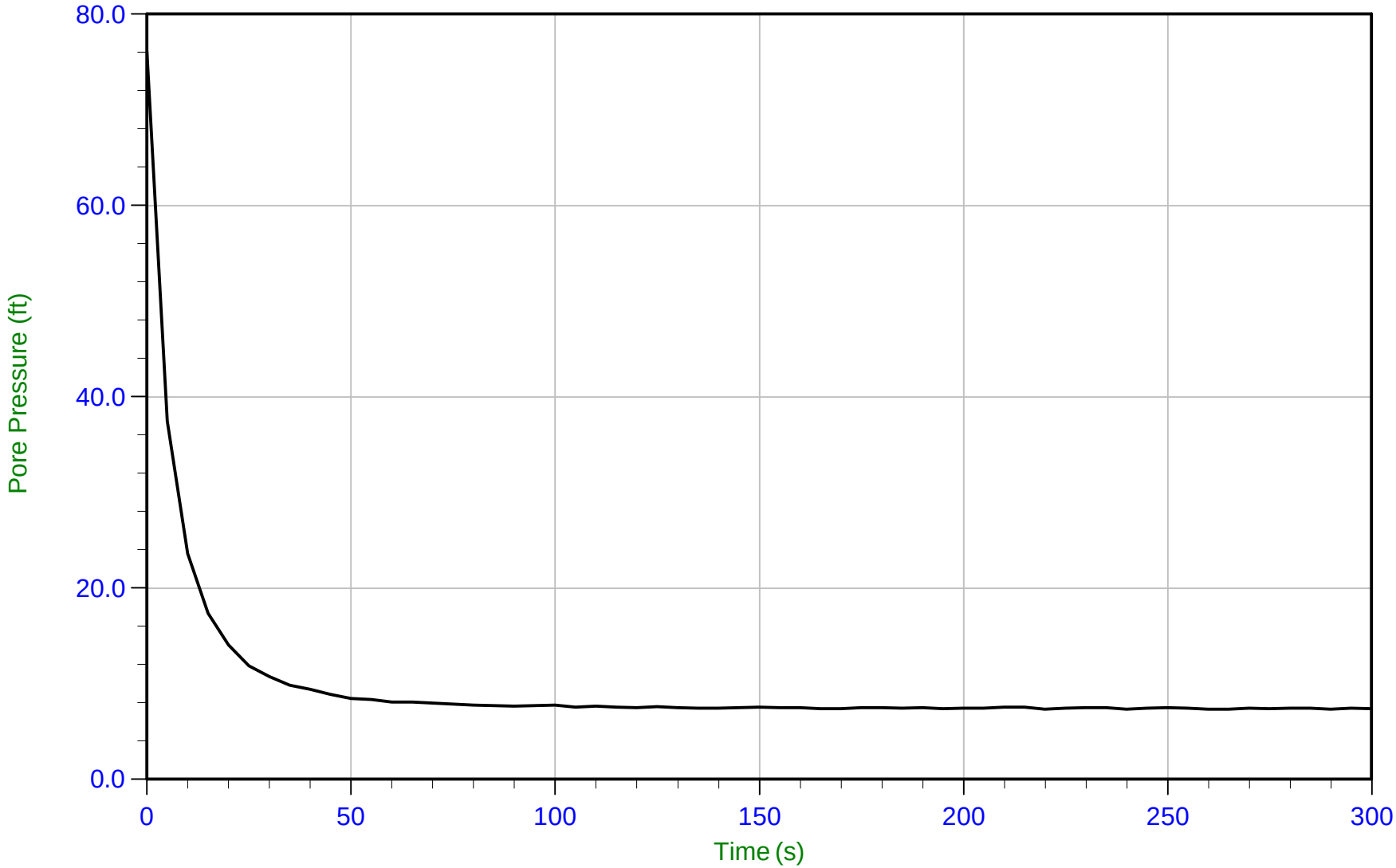
WT: 2.257 m / 7.405 ft
Ueq: 3.7 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

U Min: 7.3 ft
U Max: 76.2 ft

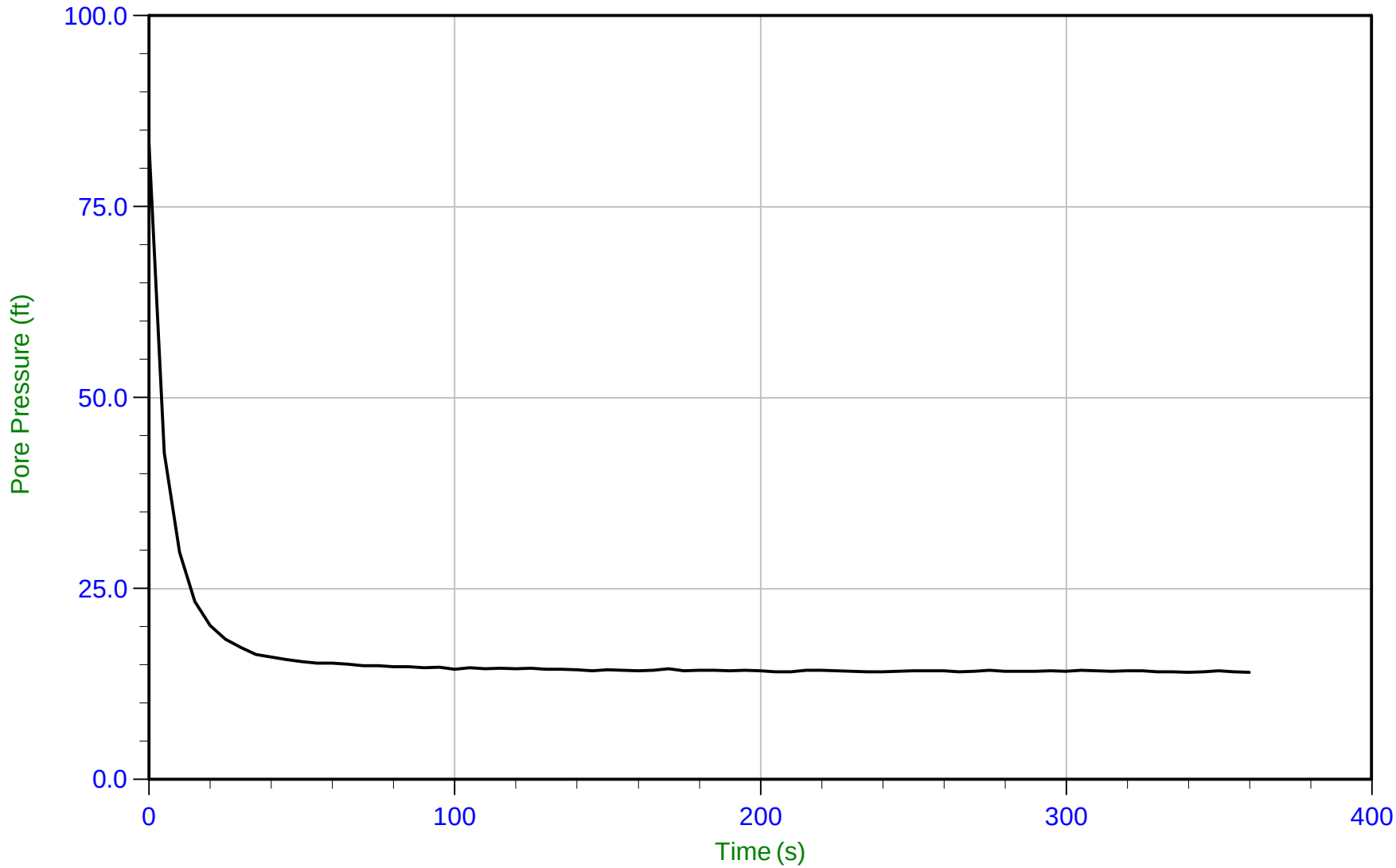
WT: 2.064 m / 6.772 ft
Ueq: 7.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 6.400 m / 20.997 ft
Duration: 360.0 s

U Min: 14.0 ft
U Max: 83.3 ft

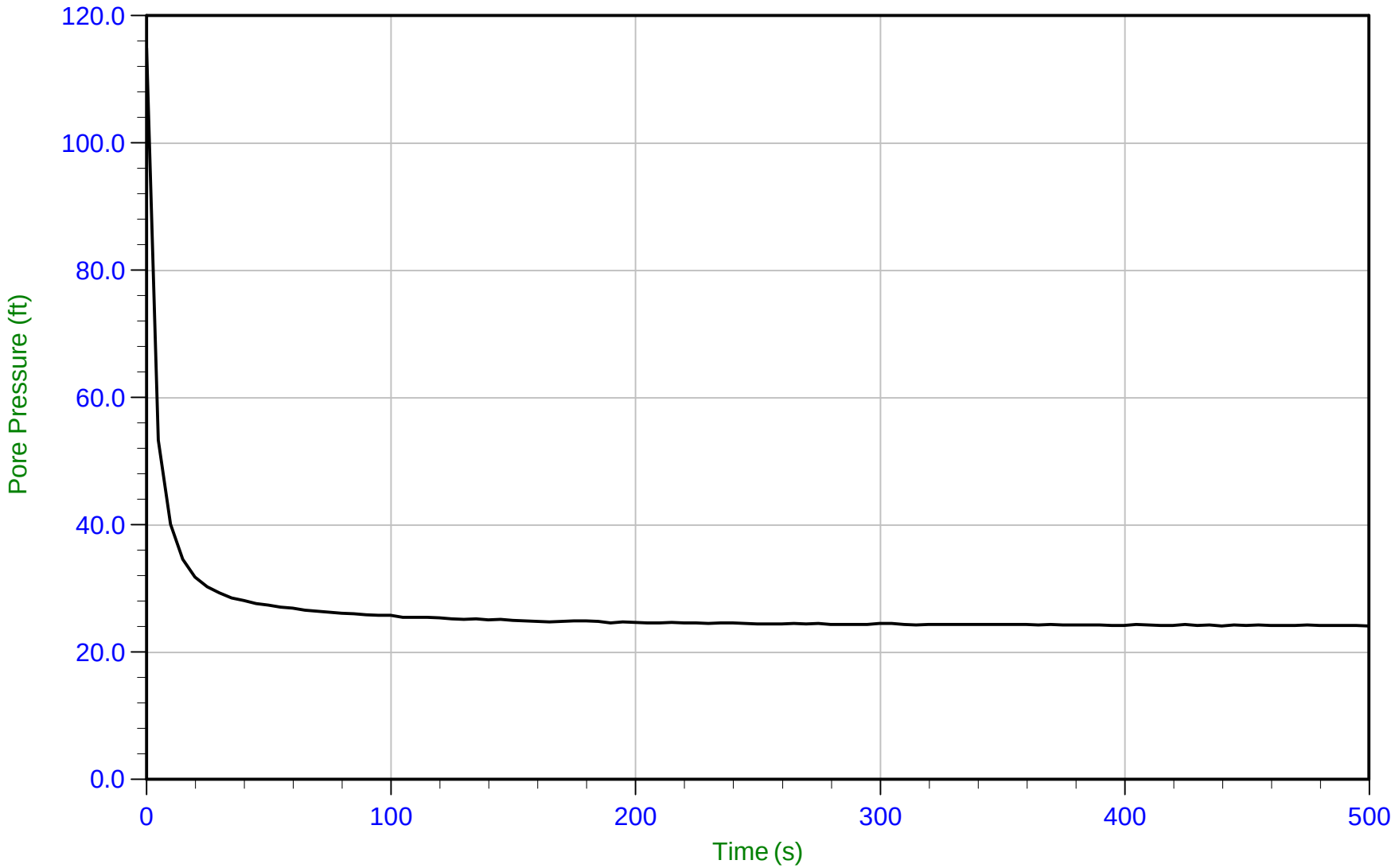
WT: 2.061 m / 6.762 ft
Ueq: 14.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 9.400 m / 30.840 ft
Duration: 500.0 s

U Min: 24.1 ft
U Max: 114.9 ft

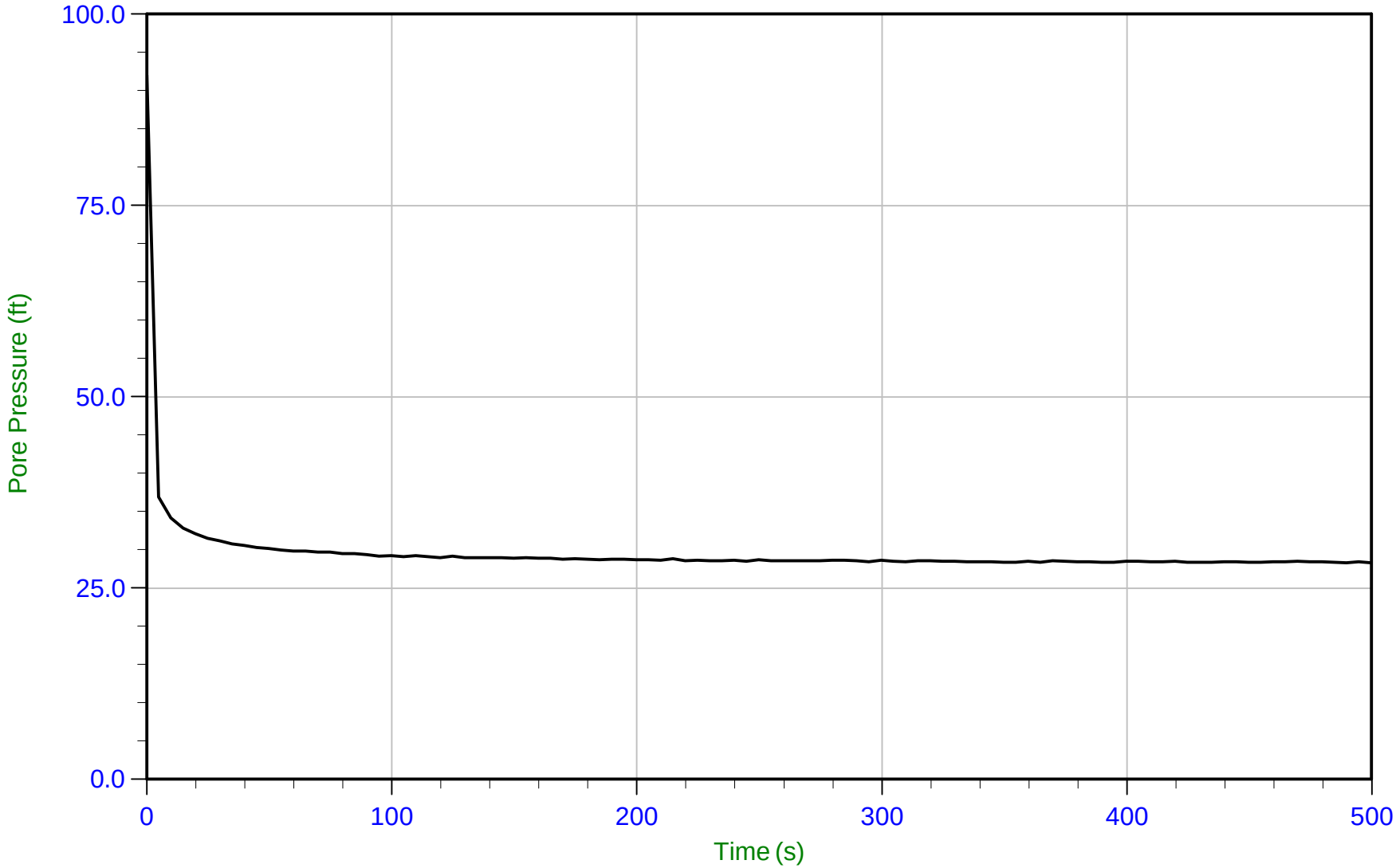
WT: 2.034 m / 6.673 ft
Ueq: 24.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 10.700 m / 35.105 ft
Duration: 500.0 s

U Min: 28.3 ft
U Max: 92.0 ft

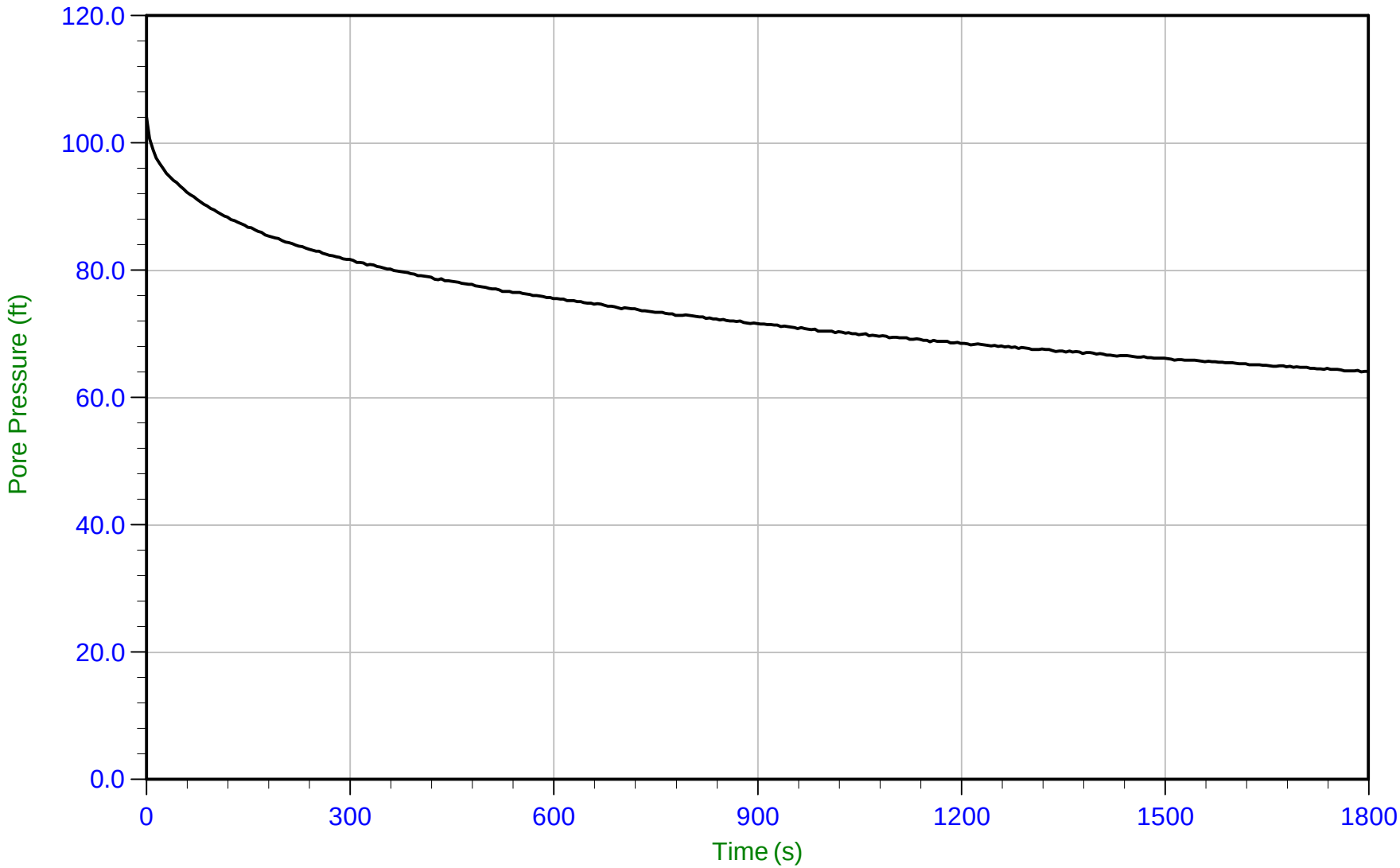
WT: 2.022 m / 6.634 ft
Ueq: 28.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1800.0 s

U Min: 64.1 ft
U Max: 104.0 ft

WT: 2.064 m / 6.772 ft
Ueq: 33.3 ft
U(50): 68.65 ft

T(50): 1184.7 s
Ir: 100
Ch: 0.6 sq cm/min

Attachment E. Laboratory Test Data

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B002	S-1	0.0'-1.5'	FILL: OLIVE BROWN TRACE BROWN SILTY SAND WITH GRAVEL		38.4	4.50+								
EDW-B002	S-2	2.5'-4.0'	GRAY SANDY SILT		62.4	3.50								
EDW-B002	S-3	5.0'-7.0'	GREENISH GRAY SANDY SILT	MH	66.6						65	36	29	
EDW-B002	S-4	7.5'-10.0'	DARK GRAY FLY ASH		79.0		0.0	7.4	73.1	19.5				
EDW-B002	S-5	10.0'-12.0'	GRAY TO DARK GRAY VARVED FLY ASH		76.9						17	27	NP	
EDW-B002	S-6	15.0'-16.5'	DARK GRAY FLY ASH		52.5									
EDW-B002	S-7	20.0'-21.5'	DARK GRAY FLY ASH WITH SAND AND GRAVEL		67.8									
EDW-B002	S-8	25.0'-27.0'	DARK GRAY FLY ASH		63.9									2.471
EDW-B002	S-9	30.0'-30.5'	LIGHT GRAY LEAN CLAY WITH ORGANIC POCKETS		126.1	<.25								
EDW-B002	S-9A	30.5'-31.5'	BROWN TO RUST BROWN LEAN CLAY WITH SAND		31.1	0.50								
EDW-B002	S-10	35.0'-37.0'	GRAY LEAN CLAY WITH SAND	CL	31.6						36	18	18	
EDW-B002	S-11	40.0'-41.5'	GRAY LEAN CLAY		42.9	1.00								2.592
EDW-B002	S-12	45.0'-46.5'	GRAY TO DARK GRAY LEAN CLAY WITH SAND		57.7	0.75								
EDW-B002	S-13	50.0'-50.25'	GRAY SILT WITH SAND	ML	11.1	4.50+								
EDW-B003	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH WITH SAND		44.4									2.469
EDW-B003	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH WITH SAND		27.3	2.00								
EDW-B003	S-3	5.0'-6.5'	FILL: BROWN AND BLACK LEAN CLAY WITH SAND AND ORGANICS		37.2	1.00								
EDW-B003	S-4	7.5'-9.5'	FILL: DARK GRAY FLY ASH		55.5									
EDW-B003	S-5	10.0'-11.5'	FILL: DARK GRAY FLY ASH		50.6		2.3	19.8	56.3	21.6				
EDW-B003	S-6	15.0'-16.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		29.7									2.772
EDW-B003	S-7	20.0'-21.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		42.1									
EDW-B003	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH WITH SAND		54.9									
EDW-B003	S-9	30.0'-32.0'	FILL: VERY DARK GRAY VARVED FLY ASH		71.7		0.0	20.6	66.4	13.0				
EDW-B003	S-10	35.0'-36.5'	FILL: DARK GRAY FLY ASH WITH SAND		51.9									
EDW-B003	S-10A	36.5'-37.0'	GRAY LEAN CLAY WITH ORGANIC POCKETS		43.0	2.25								
EDW-B003	S-11	40.0'-41.5'	GRAY TO BROWNISH GRAY LEAN CLAY WITH SAND		31.6	1.25								
EDW-B003	S-12	45.0'-47.0'	DARK GRAY FAT CLAY WITH SAND	CH	46.0						51	17	34	
EDW-B003	S-13	50.0'-51.5'	BROWNISH GRAY TO GREENISH GRAY LEAN CLAY WITH SAND		55.4	0.50								
EDW-B003	S-14	55.0'-55.5'	BLUISH GRAY CLAYEY SILT		23.3	3.50								
EDW-B003	S-14A	55.5'-55.92'	BLUISH GRAY SILT		9.8									
EDW-B003	S-15	60.0'-60.25'	BLUISH GRAY SILT		7.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B004	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		18.9	4.50+								
EDW-B004	S-2	2.5'-3.5'	FILL: DARK GRAY FLY ASH WITH SAND		28.5	4.00								
EDW-B004	S-2A	3.5'-4.0'	BROWN TO GRAY LEAN CLAY WITH SAND - FLY ASH NOTED		20.1	3.25								
EDW-B004	S-3	5.0'-6.5'	BROWN AND GRAY LEAN CLAY		21.6	1.75								
EDW-B004	S-4	7.5'-9.0'	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	CL	23.4	4.00	0.0	9.3	43.3	47.4	37	16	21	
EDW-B004	S-5	10.0'-11.5'	BROWN AND DARK GRAY LEAN CLAY		21.5	2.25								
EDW-B004	S-6	12.5'-14.0'	BROWN AND GRAY LEAN CLAY WITH SAND		25.4	1.25								
EDW-B004	S-7	15.0'-16.5'	DARK GRAY LEAN CLAY		25.8	2.50								
EDW-B004	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND		31.3	1.00								
EDW-B004	S-9	25.0'-26.0'	BROWN AND GRAY LEAN CLAY WITH SAND AND SAND POCKETS		23.0	1.25								
EDW-B004	S-9A	26.0'-26.5'	GRAY AND BROWN CLAYEY SAND		19.5	0.75								
EDW-B004	S-10	30.0'-31.5'	GRAYISH BROWN AND DARK GRAY LEAN CLAY WITH SAND - ORGANIC		19.7	3.75								
EDW-B004	S-11	36.0'-38.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	CL	20.1						35	17	18	
EDW-B004	S-12	40.0'-41.5'	BROWN, RUST BROWN AND GRAY LEAN CLAY		30.0	1.25								
EDW-B004	S-13	45.0'-46.0'	GRAY LEAN CLAY		39.5	1.00								
EDW-B004	S-13A	46.0'-46.5'	BROWNISH GRAY LEAN CLAY WITH SAND		35.1									
EDW-B004	S-14	50.0'-51.5'	GRAY LEAN CLAY WITH SAND		65.2	1.75								2.617
EDW-B004	S-15	55.0'-56.5'	BROWN AND BLUISH GRAY LEAN CLAY WITH SAND		33.4	1.25								
EDW-B004	S-15A	56.0'-56.5'	BLUISH GRAY SILT		13.2									
EDW-B004	S-16	60.0'-60.25'	BLUISH GRAY SOFT SHALE		8.8									
EDW-B005	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN CLAYEY SAND WITH GRAVEL AND SILT		45.8	4.50								
EDW-B005	S-2	2.5'-4.0'	FILL: BROWN SANDY SILT WITH GRAVEL		26.0									
EDW-B005	S-3	5.0'-6.5'	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	MH	50.9	3.25					61	54	7	
EDW-B005	S-4	8.5'-10.0'	FILL: BROWN SANDY SILT WITH GRAVEL		37.4	4.50+								
EDW-B005	S-5	10.0'-11.5'	FILL: LIGHT BROWN AND GRAY CLAYEY SAND WITH GRAVEL		44.3									
EDW-B005	S-6	15.0'-16.5'	FILL: BROWN SANDY SILT WITH GRAVEL		41.4									
EDW-B005	S-7	20.0'-21.5'	FILL: GRAY FLY ASH		51.1	1.75	3.1	21.3	51.7	23.9				
EDW-B005	S-8	25.0'-26.0'	FILL: BROWNISH GRAY CLAYEY SILT WITH SAND AND GRAVEL		55.3									
EDW-B005	S-8A	26.0'-27.0'	FILL: GRAY AND BLACK ORGANIC SILT	OL	47.6						44	29	15	
EDW-B005	S-9	29.0'-31.0'	FILL: DARK GRAY FLY ASH		69.3									
EDW-B005	S-10	35.0'-36.5'	GRAY AND GRAYISH BLACK LEAN CLAY WITH SAND AND ORGANICS		37.3	1.00								
EDW-B005	S-11	41.0'-43.0'	GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	44.8						57	22	35	
EDW-B005	S-12	45.0'-46.5'	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED		88.7	1.00								2.521
EDW-B005	S-13	50.0'-51.0'	BLUISH GRAY CLAYEY SILT		15.9	4.50+								
EDW-B005	S-14	51.0'-51.5'	BLUISH GRAY SOFT SHALE		12.8									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B006	S-1	0.0'-1.5'	FILL: DARK BROWN AND DARK GRAY LEAN CLAY WITH SAND AND BRICK		26.4	2.25								
EDW-B006	S-2	2.5'-5.0'	RUST BROWN AND GRAY MOTTLED LEAN CLAY		30.1	1.25								
EDW-B006	S-3	5.0'-6.5'	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	CL	24.8	2.25					48	19	29	
EDW-B006	S-4	7.5'-10.0'	GRAY AND RUST BROWN MOTTLED LEAN CLAY		26.0	2.50								
EDW-B006	S-5	10.0'-11.5'	BROWNISH GRAY LEAN CLAY		34.2	1.25								
EDW-B006	S-6	13.0'-15.0'	GRAY FAT CLAY WITH SAND	CH	31.1						62	20	42	
EDW-B006	S-7	15.0'-16.5'	BROWNISH GRAY LEAN CLAY		40.8	1.00								
EDW-B006	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND		43.4	0.75								
EDW-B006	S-9	26.0'-28.0'	DARK GRAY ORGANIC SILT	OH	76.0						72	37	35	
EDW-B006	S-10	30.0'-31.0'	GRAY LEAN CLAY WITH SAND - ORGANIC POCKETS NOTED		43.4	0.50								
EDW-B006	S-10A	31.0'-31.5'	BLUISH GRAY LEAN CLAY WITH SAND AND SILT		19.6									
EDW-B006	S-11	35.0'-35.42'	BLUISH GRAY SILT WITH SAND		14.2	3.50								
EDW-B008	S-1	0.0'-1.5'	BROWN LEAN CLAY WITH SAND AND GRAVEL		13.2	4.50+								
EDW-B008	S-2	2.5'-4.0'	DARK BROWN LEAN CLAY WITH SAND	CL	19.5	3.75					42	22	20	
EDW-B008	S-3	5.0'-6.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY WITH SAND		42.3	2.00								
EDW-B008	S-4	7.5'-9.0'	BROWN AND LIGHT GRAY LEAN CLAY WITH SAND		22.8	2.00								
EDW-B008	S-5	11.0'-13.0'	BROWN AND GRAY FAT CLAY WITH SAND	CH	33.6						52	19	33	
EDW-B008	S-6	15.0'-16.5'	GRAY LEAN CLAY WITH SAND		64.6	0.50								
EDW-B008	S-7	20.0'-21.5'	BROWN AND GRAY LEAN CLAY - SHELL NOTED		44.4	0.50								
EDW-B008	S-8	24.0'-26.5'	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	68.9						67	31	36	
EDW-B008	S-9	30.0'-31.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND		71.4	0.50								
EDW-B008	S-10	35.0'-36.5'	GRAY LEAN CLAY WITH SAND - WOODCHIPS, ORGANICS AND SHELL NOTED		56.9	0.25								
EDW-B008	S-11	40.0'-40.33'	BLUISH GRAY SILT WITH SOFT SHALE		12.6	3.00								

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B010	S-1 TOP	0.0'-0.5'	FILL: BROWN SAND WITH GRAVEL		7.2									
EDW-B010	BOTTOM	0.0'-0.5'	FILL: BROWN LEAN CLAY WITH SAND AND GRAVEL		17.4	4.50+								
EDW-B010	S-1A	0.5'-1.5'	FILL: DARK GRAY FLY ASH		27.9									
EDW-B010	S-2	2.5'-3.0'	FILL: DARK GRAY FLY ASH		20.9									
EDW-B010	S-2A	3.0'-4.0'	FILL: DARK GRAY FLY ASH		30.7	4.50								
EDW-B010	S-3	5.0'-6.5'	FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED	SP	14.8		12.6	54.8	26.0	6.6				
EDW-B010	S-4	7.5'-9.0'	BROWN WITH RUST BROWN STAINS LEAN CLAY WITH SAND		22.0	3.75								
EDW-B010	S-5	10.0'-11.5'	BROWN AND RUST BROWN LEAN CLAY WITH SAND		24.0	2.00								
EDW-B010	S-6	12.5'-14.0'	BROWN LEAN CLAY		28.0	1.25								
EDW-B010	S-7	15.0'-17.0'	BROWN AND GRAY MOTTLED LEAN CLAY	CL	30.5						48	18	30	
EDW-B010	S-8	20.0'-21.5'	GRAY LEAN CLAY		32.9	0.75								
EDW-B010	S-9	25.0'-26.5'	GRAY LEAN CLAY WITH SAND		21.4	0.50								
EDW-B010	S-10	30.0'-32.0'	BLUISH GRAY LEAN CLAY	CL	30.0						40	15	25	
EDW-B010	S-11	35.0'-36.5'	BROWNISH GRAY LEAN CLAY		28.2	1.50								
EDW-B010	S-12	40.0'-41.0'	BROWN, RUST BROWN AND GRAY SILTY SAND WITH GRAVEL		17.0									
EDW-B010	S-13	45.0'-45.25'	BLUISH GRAY CLAYEY SILT - SHALE NOTED		16.4	4.50								
EDW-B011	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		27.7	4.50+								
EDW-B011	S-2	2.5'-4.0'	FILL: DARK GRAY AND BLACK FLY ASH - ASPHALT NOTED		16.3	4.50+								
EDW-B011	S-3	5.0'-6.5'	FILL: GRAY FLY ASH		29.4	4.50+								
EDW-B011	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		45.3	3.00								
EDW-B011	S-5	9.0'-11.0'	FILL: VERY DARK GRAY FLY ASH		70.0		15.5	21.3	46.0	17.2				
EDW-B011	S-6	15.0'-17.0'	FILL: DARK GRAY FLY ASH		63.2									
EDW-B011	S-7	19.5'-21.5'	FILL: GRAY FLY ASH		84.9		0.2	16.7	58.0	25.1				
EDW-B011	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH - CLAY NOTED		74.7									2.691
EDW-B011	S-9	30.0'-32.0'	FILL: DARK GRAY FLY ASH		73.7									
EDW-B011	S-10	35.0'-37.0'	FILL: DARK GRAY FLY ASH		93.9									
EDW-B011	S-13	40.0'-41.5'	BROWN AND GRAY LEAN CLAY		47.9	1.00								
EDW-B011	S-14	45.0'-46.5'	GRAYISH BROWN FAT CLAY WITH SAND	CH	63.3	0.50					63	21	42	
EDW-B011	S-15	50.0'-51.5'	DARK GRAY AND GRAYISH BROWN LEAN CLAY		62.5	0.50								
EDW-B011	S-16	55.0'-56.5'	GRAY LEAN CLAY		52.9	0.75								
EDW-B011	S-17	60.0'-60.25'	BLUISH GRAY SOFT SHALE		9.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B012	S-1	0.0'-1.5'	FILL: BROWN SANDY SILT WITH GRAVEL		23.0									
EDW-B012	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH		23.8	4.50+					28	26	2	
EDW-B012	S-3	5.0'-6.5'	FILL: DARK GRAY FLY ASH		26.5		0.0	9.6	73.7	16.7				
EDW-B012	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		26.5	4.50								
EDW-B012	S-5	10.0'-11.0'	FILL: DARK BROWN LEAN CLAY WITH SAND - FLY ASH NOTED		24.7	3.75								
EDW-B012	S-5A	11.0'-11.5'	BROWN AND GRAYISH BROWN LEAN CLAY		24.9	2.00								
EDW-B012	S-6	12.5'-14.0'	BROWN LEAN CLAY		22.0	3.50								
EDW-B012	S-7	15.0'-16.5'	BROWN AND RUST BROWN MOTTLED LEAN CLAY	CL	24.3	3.25					48	19	29	
EDW-B012	S-8	20.0'-22.0'	BROWNISH GRAY MOTTHED LEAN CLAY WITH SAND		23.8									
EDW-B012	S-9	25.0'-26.5'	BROWNISH GRAY LEAN CLAY WITH SAND		23.2	1.25								
EDW-B012	S-10	30.0'-31.5'	BROWN AND GRAY LEAN CLAY		24.8	1.50								
EDW-B012	S-11	35.0'-36.5'	RUST BROWN AND GRAY LEAN CLAY WITH SAND		28.3	1.50								
EDW-B012	S-12	40.0'-41.5'	BLUISH GRAY AND BROWNISH GRAY LEAN CLAY		32.2	1.00								
EDW-B012	S-13	45.0'-46.5'	BROWNISH GRAY LEAN CLAY		50.2	1.25								
EDW-B012	S-14	47.0'-49.0'	DARK GRAY FAT CLAY	CH	50.8						54	20	34	
EDW-B012	S-15	49.0'-50.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND		67.4	1.00								
EDW-B012	S-16	55.0'-55.5'	GRAY LEAN CLAY WITH SAND		50.5	1.75								
EDW-B012	S-16A	55.5'-56.5'	BLUISH GRAY CLAYEY SILT		15.3	4.50								
EDW-B012	S-17	60.0'-60.21'	BLUISH GRAY CLAYEY SILT		17.9	1.50								
EDW-B013	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN LEAN CLAY WITH SAND AND GRAVEL		13.6	4.50+								
EDW-B013	S-2	2.5'-4.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND		17.4	4.50+								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	24.3						49	21	28	
EDW-B013	S-4	8.0'-9.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY		24.3	3.00								
EDW-B013	S-5	10.0'-11.5'	DARK GRAY LEAN CLAY		25.4	2.25								
EDW-B013	S-6	15.0'-16.5'	DARK GRAY AND BROWNISH GRAY LEAN CLAY	CL	25.5	1.50					41	17	24	
EDW-B013	S-7	20.0'-21.5'	BROWN AND DARK GRAY LEAN CLAY		23.5	1.75								
EDW-B013	S-8	25.0'-26.5'	DARK BROWNISH GRAY LEAN CLAY		27.7									
EDW-B013	S-9	30.0'-31.5'	GRAY AND RUST BROWN MOTTLED SANDY LEAN CLAY		20.2	0.50								
EDW-B013	S-10	32.0'-34.0'	GRAY AND BROWN LEAN CLAY WITH SAND	CL	33.3						42	23	19	
EDW-B013	S-11	34.0'-35.5'	DARK GRAY LEAN CLAY		58.0	0.50								
EDW-B013	S-12	40.0'-41.5'	GRAY LEAN CLAY WITH SAND		54.5	1.75								
EDW-B013	S-13	45.0'-46.5'	GRAY LEAN CLAY - CALCIUM CABONATE SEAMS AND SHELL NOTED		66.2	1.25								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL		20.0									

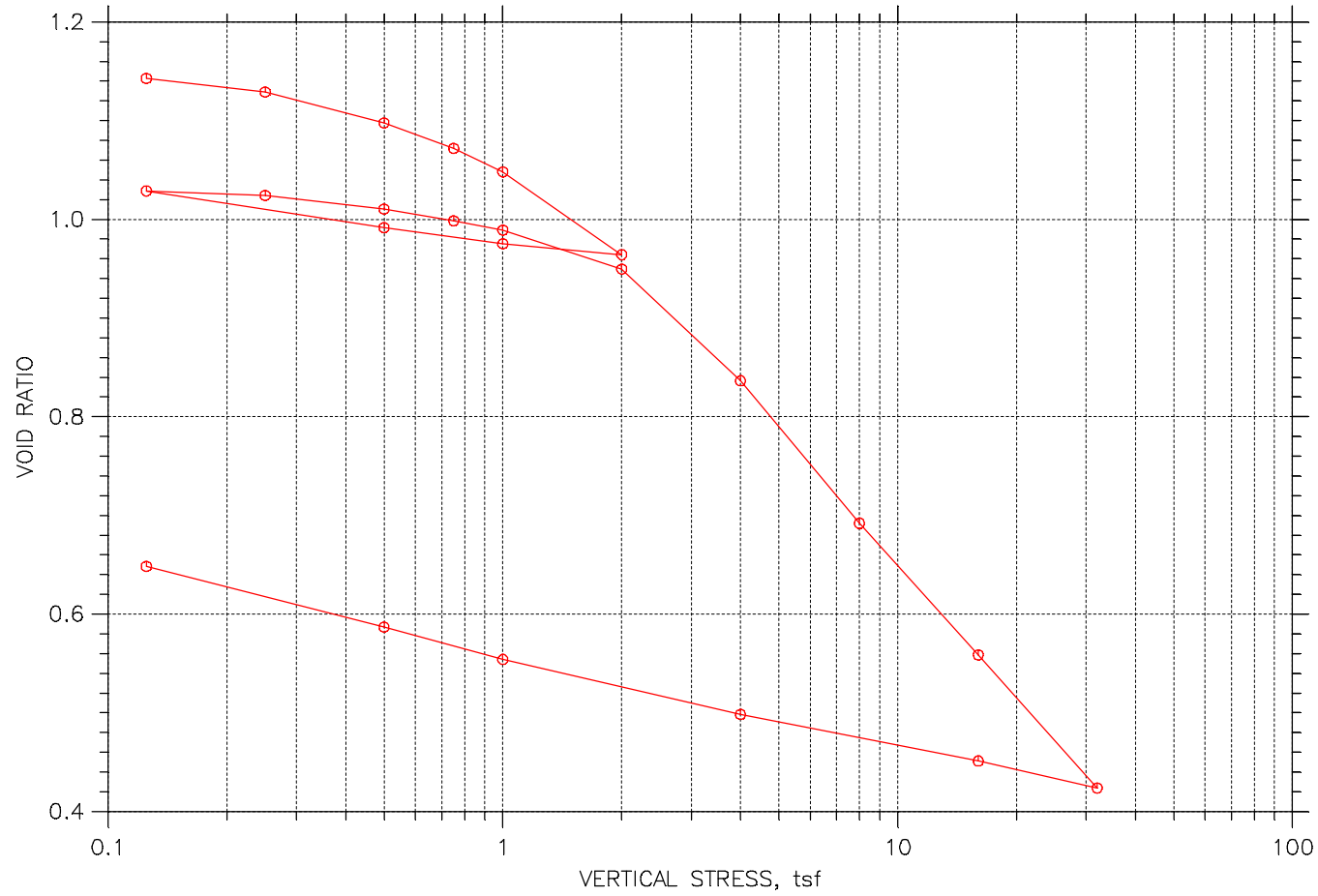
LABORATORY TESTING SUMMARY

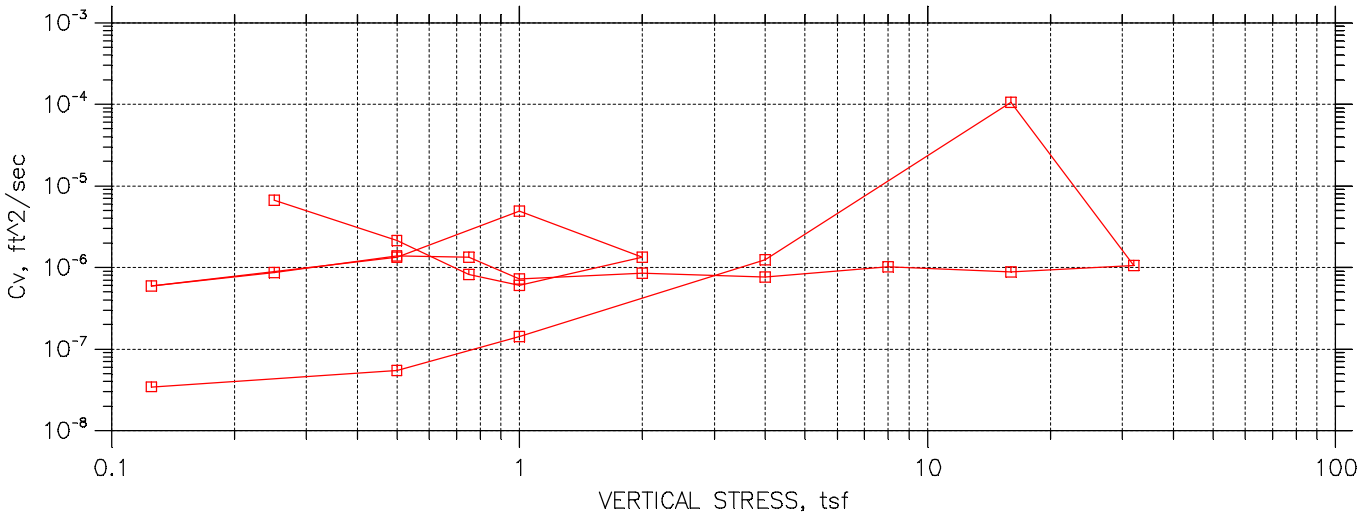
PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B014	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		28.2	4.00								
EDW-B014	S-2	2.5'-3.5'	FILL: DARK GRAY CLAYEY SILT - FLY ASH NOTED		40.8	1.50								
EDW-B014	S-2A	3.5'-4.0'	FILL: GRAY CLAYEY SILT WITH SAND - FLY ASH NOTED		50.0									
EDW-B014	S-4	7.0'-8.5'	FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED	SM	60.2		0.0	35.1	45.4	19.5				
EDW-B014	S-6	15.0'-17.0'	FILL: GRAY AND DARK GRAY FLY ASH		78.7	3.50								
EDW-B014	S-7	20.0'-22.5'	FILL: DARK GRAY FLY ASH		86.5	1.50								2.524
EDW-B014	S-8	25.0'-26.7'	FILL: DARK GRAY FLY ASH - CLAY NOTED		73.1									
EDW-B014	S-9	30.0'-31.5'	GRAY AND DARK GRAY LEAN CLAY - ORGANIC POCKETS NOTED		48.7									
EDW-B014	S-10	35.0'-36.7'	GRAY LEAN CLAY		31.6	0.75								
EDW-B014	S-11	40.0'-40.5'	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL		27.3	4.00								2.719
EDW-B014	S-11A	40.5'-41.0'	BLUISH GRAY AND GREENISH GRAY SILT WITH SOFT SHALE		19.6	4.50+								
EDW-B014	S-11B	41.0'-41.5'	GRAY SOFT SHALE		10.2									
EDW-B014	S-12	45.0'-45.5'	GRAY SILT WITH SAND		14.5	4.50								
EDW-B015	S-1	0.0'-1.5'	FILL: GRAYISH BROWN SANDY SILT		54.7									
EDW-B015	S-2	2.5'-4.0'	BROWN SAND WITH GRAVEL		4.5									
EDW-B015	S-3	5.0'-6.5'	BROWN SAND WITH GRAVEL		5.4									
EDW-B015	S-4	7.5'-9.0'	BROWN SAND WITH GRAVEL		7.2									
EDW-B015	S-5	10.0'-11.5'	BROWN SAND WITH GRAVEL		6.5									
EDW-B015	S-6	13.0'-14.25'	BROWN AND GRAY GRAVEL		3.6									
EDW-B015	S-7	15.0'-16.5'	LIGHT GRAY GRAVEL WITH SAND - LIMESTONE FRAGMENTS NOTED		8.2									
EDW-B015	S-8	20.0'-21.5'	GRAY GRAVEL WITH SAND		7.8									
EDW-B015	S-9	25.0'-26.5'	LIGHT GRAY GRAVEL WITH SAND AND SILT		8.1									
EDW-B015	S-10	31.0'-33.0'	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	CL	20.2						24	13	11	
EDW-B015	S-11	35.0'-36.5'	GRAY AND DARK GRAY LEAN CLAY		33.8	1.50								
EDW-B015	S-12	37.0'-39.0'	DARK GRAY FAT CLAY	CH	41.0						66	23	43	
EDW-B015	S-13	39.0'-40.5'	BROWN AND GRAY LEAN CLAY		36.2	0.50								
EDW-B015	S-14	45.0'-46.5'	BROWN AND GRAY LEAN CLAY WITH SAND		49.4	1.00								
EDW-B015	S-15	50.0'-51.0'	GRAY LEAN CLAY		30.9	1.50								
EDW-B015	S-16	55.0'-55.5'	BLUISH GRAY SILT - SHALE NOTED		11.0	4.25								

CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003
Sample No.: S-12
Test No.: EDW003S12

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 45.0'-47.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 1.15
Final Void Ratio: 0.65

Liquid Limit: 51
Plastic Limit: 24
Plasticity Index: 27

Initial Height: 1.00 in
Specimen Diameter: 2.50 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X-14	RING	RING	X-19
Wt. Container + Wet Soil, gm	165.03	249.08	236.35	164.81
Wt. Container + Dry Soil, gm	127.13	213.35	213.35	142.68
Wt. Container, gm	44.81	111.54	111.54	44.72
Wt. Dry Soil, gm	82.32	101.81	101.81	97.96
Water Content, %	46.04	35.09	22.59	22.59
Void Ratio	---	1.15	0.65	---
Degree of Saturation, %	---	83.18	94.86	---
Dry Unit Weight, pcf	---	79.069	103.05	---

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003
Sample No.: S-12
Test No.: EDW003S12

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 45.0'-47.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

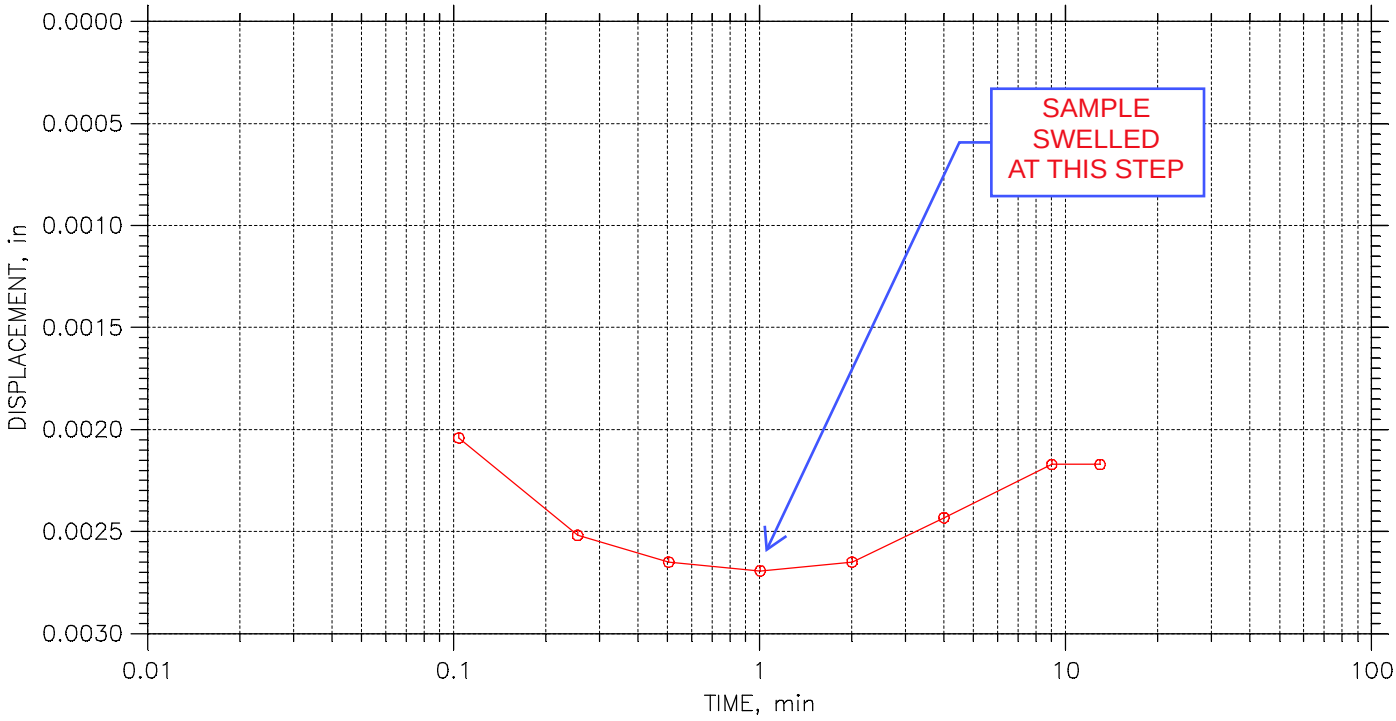
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.002172	1.143	0.22	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.008644	1.129	0.87	1.0	0.6	5.41e-006	8.79e-006	6.69e-006
3	0.5	0.02315	1.098	2.32	3.9	1.2	1.42e-006	4.45e-006	2.15e-006
4	0.75	0.03518	1.072	3.53	6.5	4.7	8.27e-007	1.15e-006	9.61e-007
5	1	0.04617	1.048	4.63	8.6	0.0	6.06e-007	0.00e+000	6.06e-007
6	2	0.08522	0.964	8.54	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
7	1	0.08005	0.975	8.02	1.0	0.0	4.94e-006	0.00e+000	4.94e-006
8	0.5	0.07245	0.992	7.26	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
9	0.125	0.05516	1.029	5.53	8.4	0.0	5.93e-007	0.00e+000	5.93e-007
10	0.25	0.05733	1.024	5.74	5.8	0.0	8.68e-007	0.00e+000	8.68e-007
11	0.5	0.06376	1.010	6.39	3.6	0.0	1.38e-006	0.00e+000	1.38e-006
12	0.75	0.06924	0.999	6.94	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
13	1	0.07358	0.989	7.37	11.4	2.0	4.29e-007	2.42e-006	7.28e-007
14	2	0.09195	0.950	9.21	8.7	2.5	5.48e-007	1.92e-006	8.53e-007
15	4	0.1446	0.836	14.49	5.8	5.7	7.57e-007	7.69e-007	7.63e-007
16	8	0.2117	0.692	21.21	3.8	3.7	1.02e-006	1.04e-006	1.03e-006
17	16	0.2736	0.559	27.42	3.8	3.6	8.62e-007	9.02e-007	8.81e-007
18	32	0.3363	0.424	33.70	2.1	3.1	1.30e-006	8.96e-007	1.06e-006
19	16	0.3237	0.451	32.43	0.0	0.0	1.05e-004	0.00e+000	1.05e-004
20	4	0.3017	0.498	30.23	2.1	0.0	1.25e-006	0.00e+000	1.25e-006
21	1	0.2758	0.554	27.64	20.3	0.0	1.42e-007	0.00e+000	1.42e-007
22	0.5	0.2611	0.586	26.16	78.7	39.4	3.86e-008	7.70e-008	5.14e-008
23	0.125	0.2322	0.648	23.27	93.5	0.0	3.45e-008	0.00e+000	3.45e-008

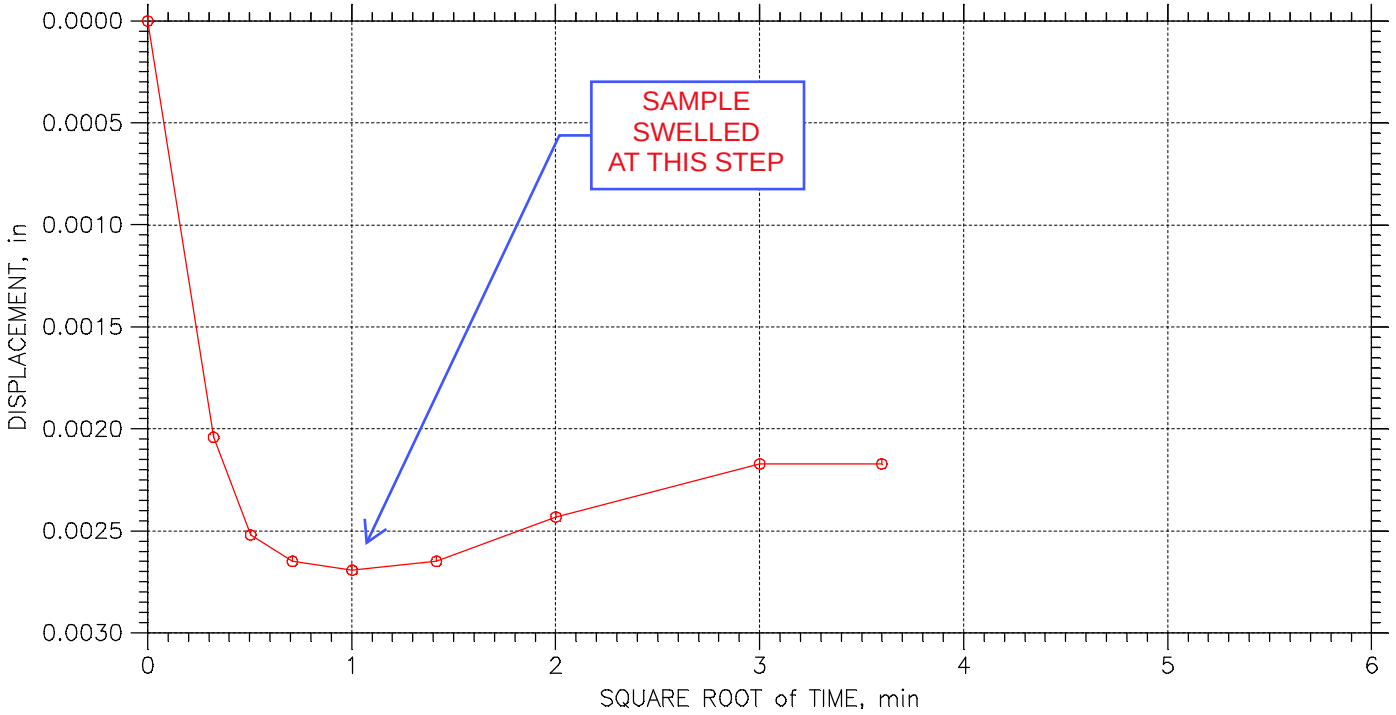
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

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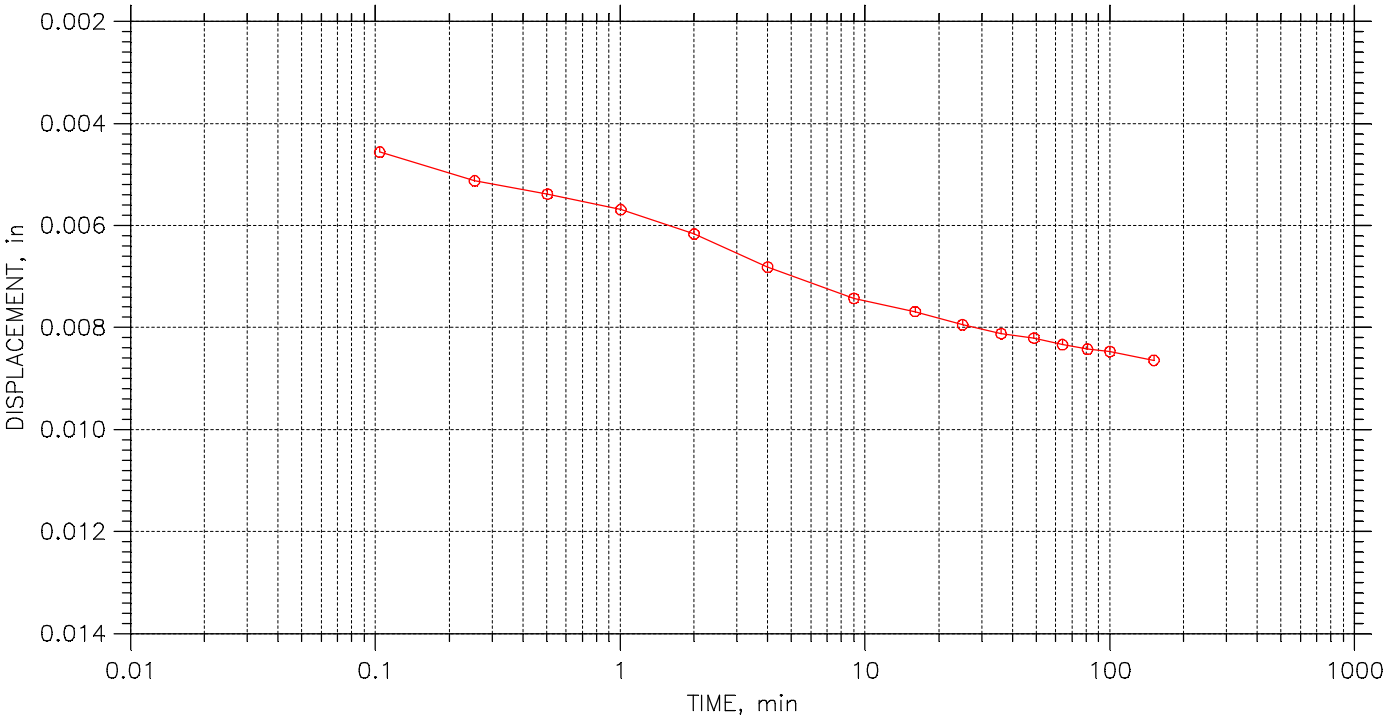
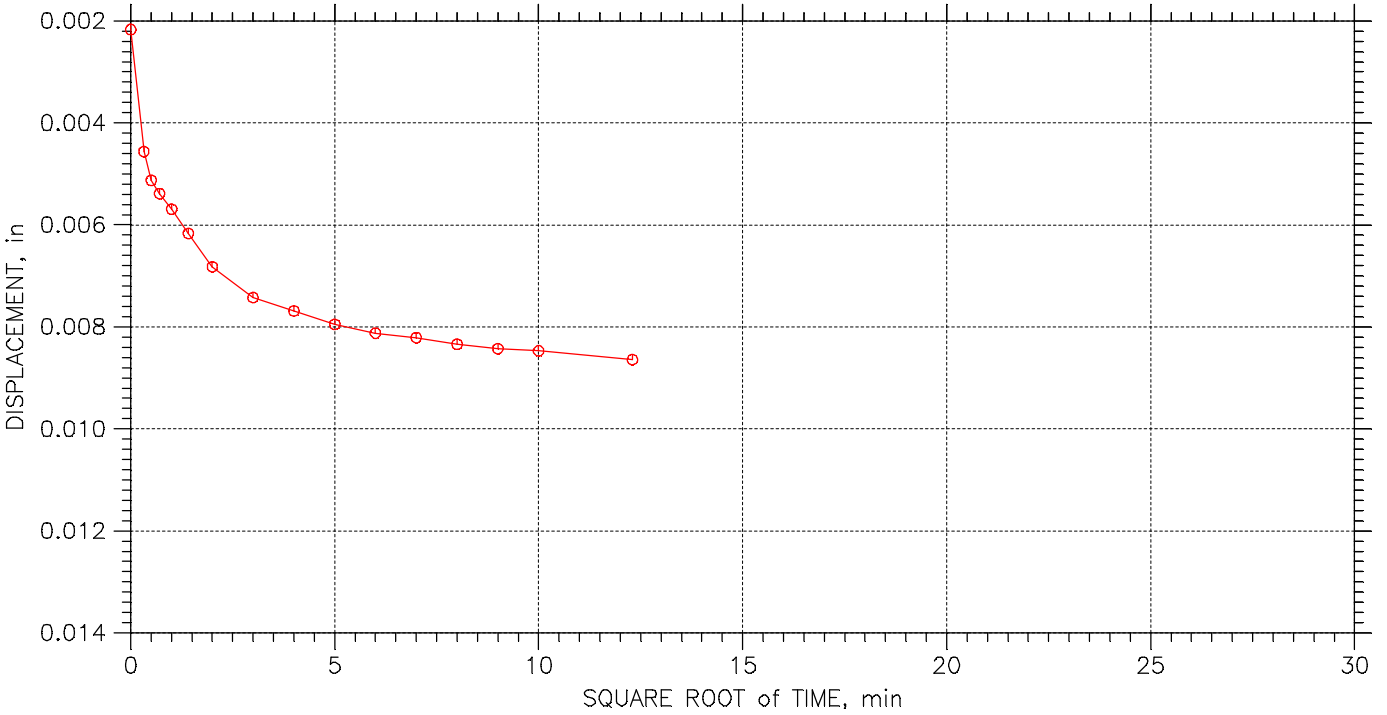
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





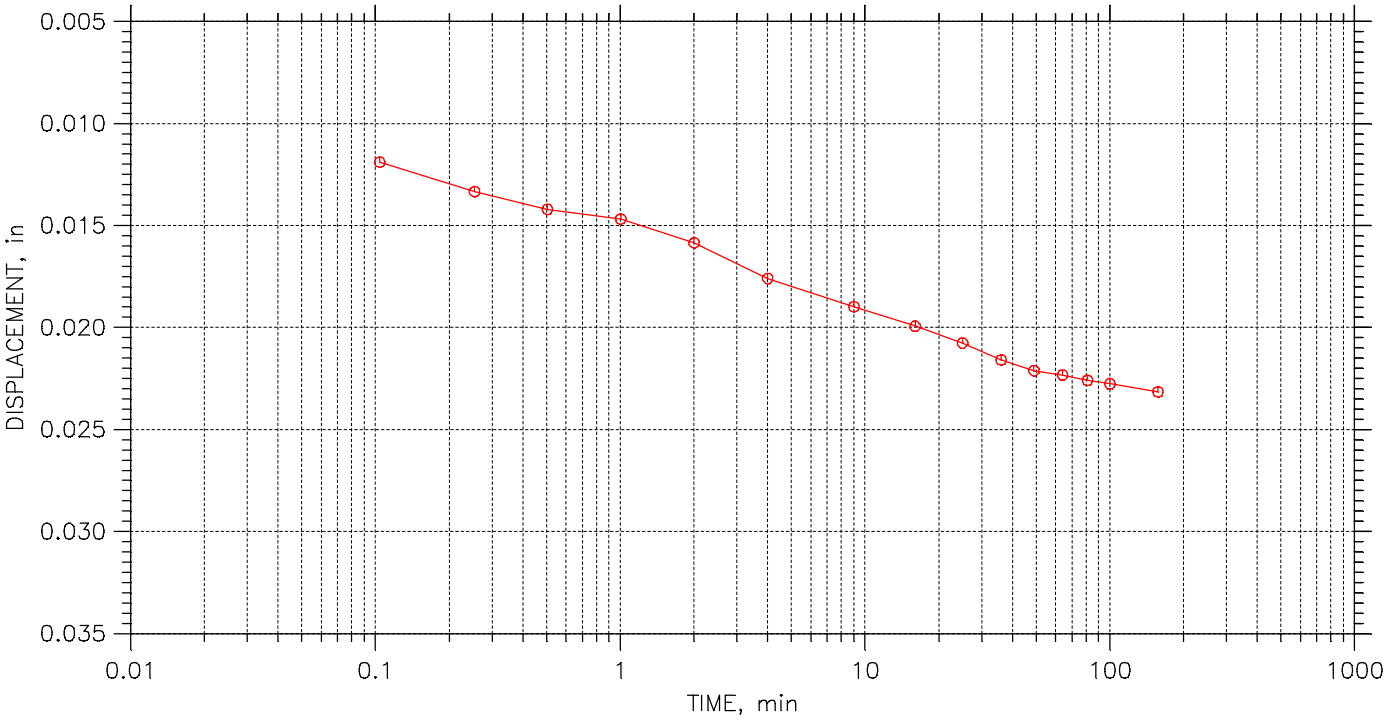
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

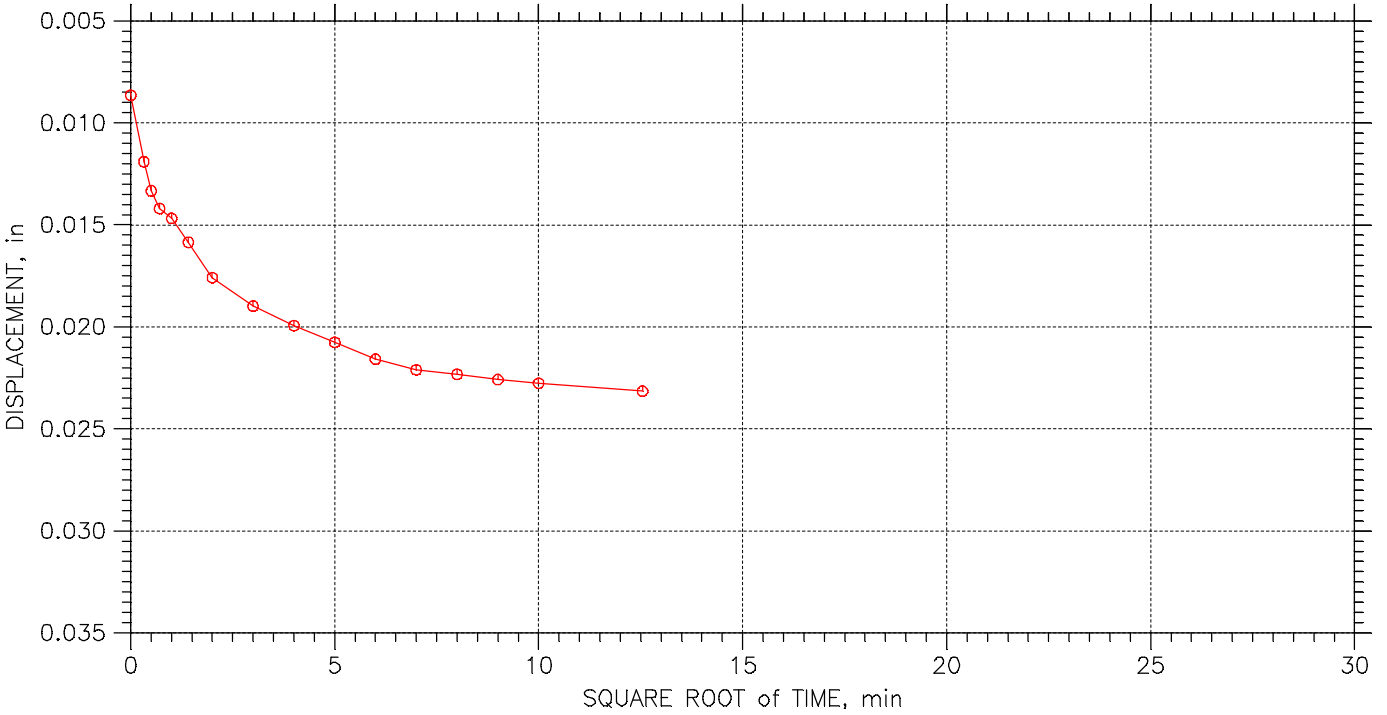
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





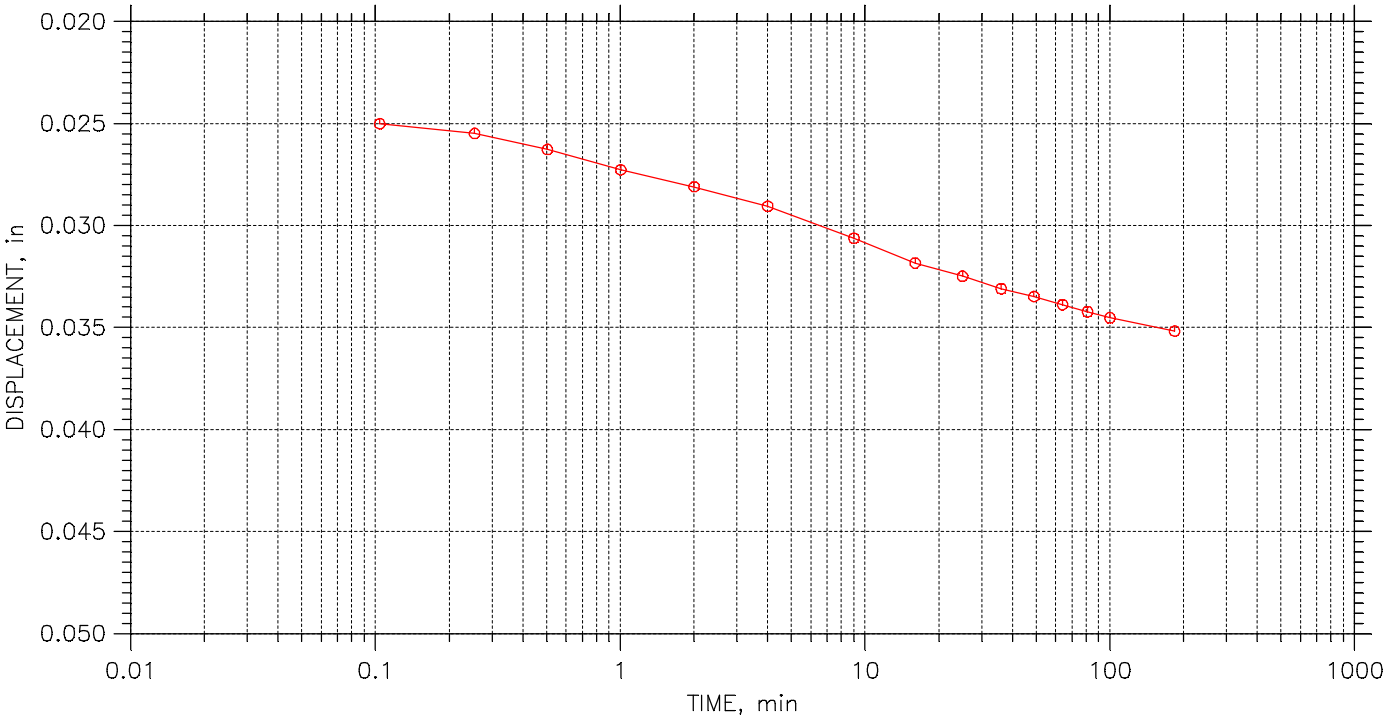
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

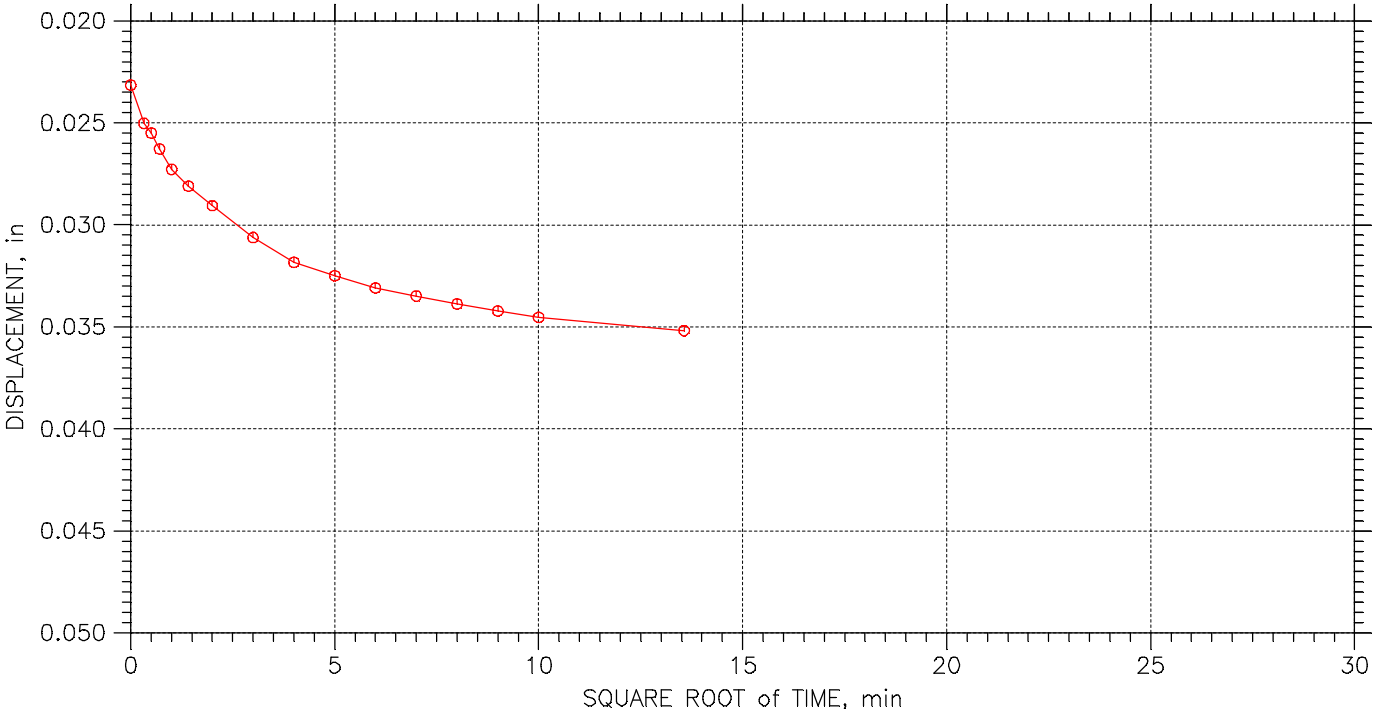
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





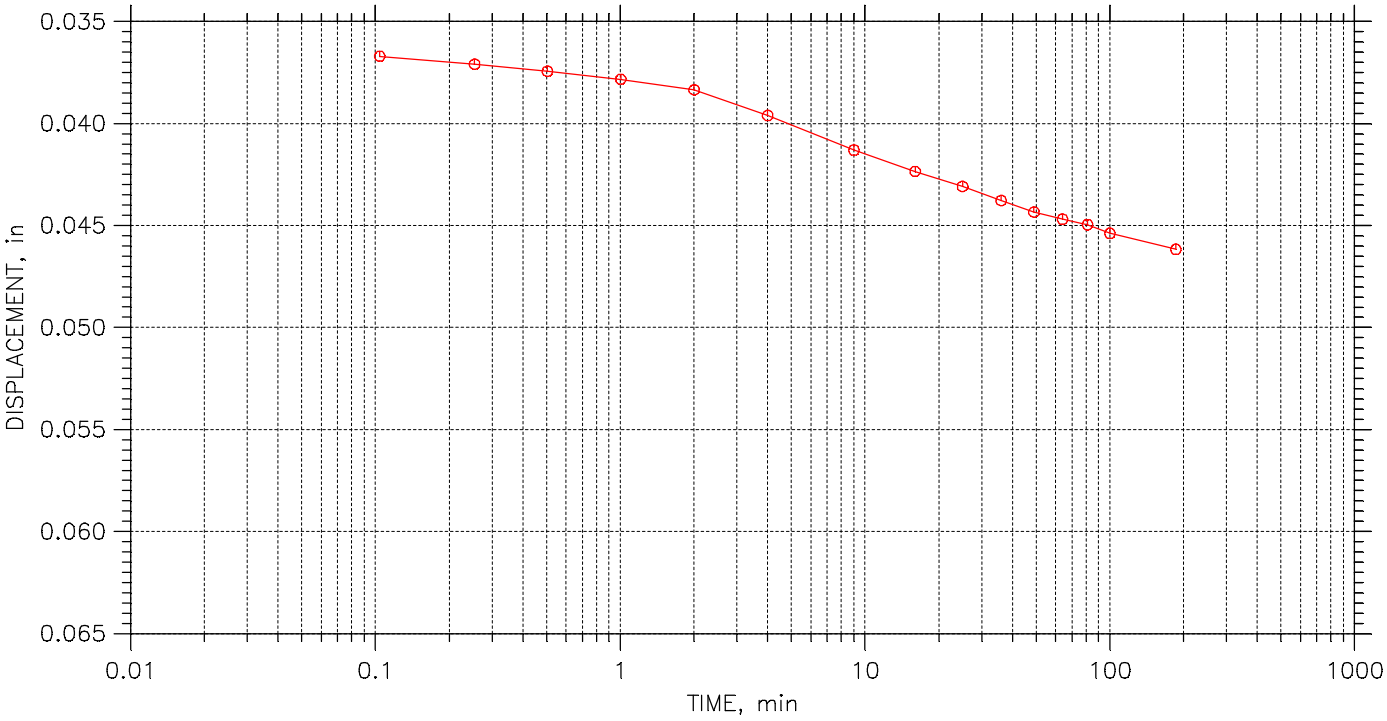
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

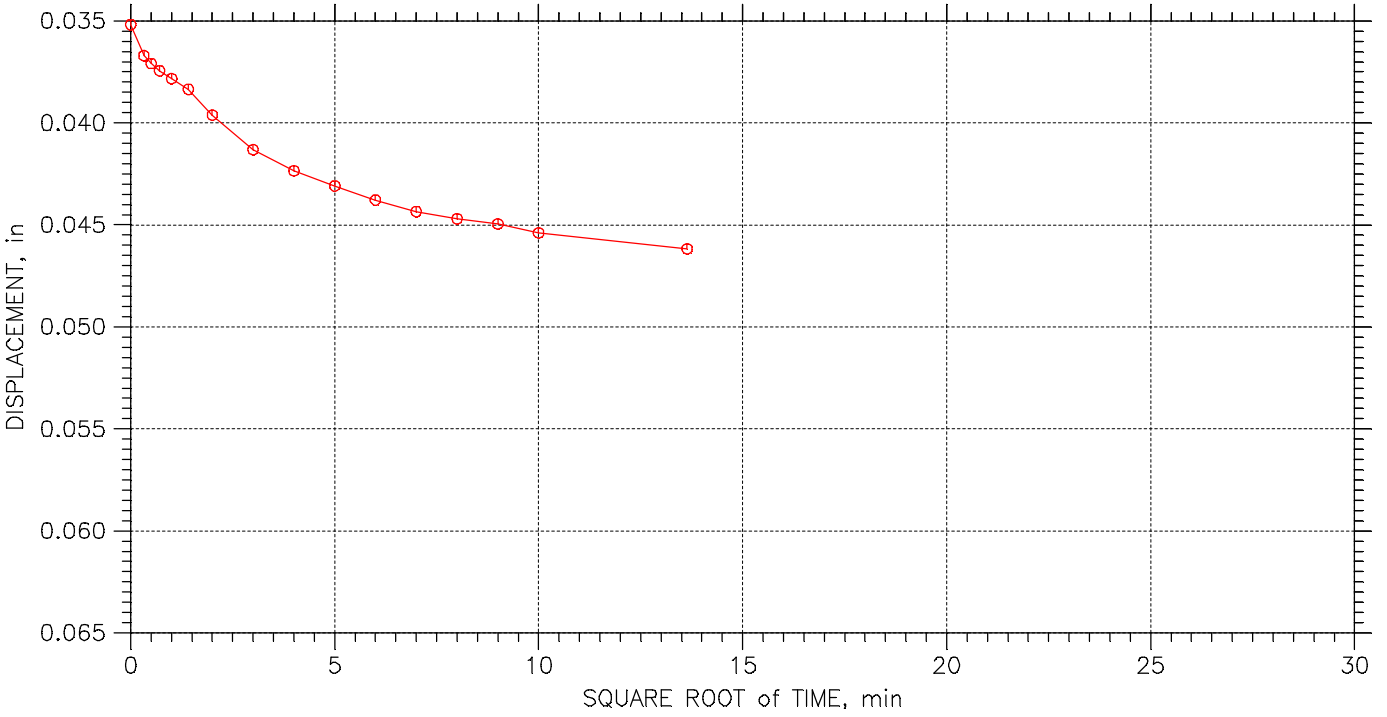
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





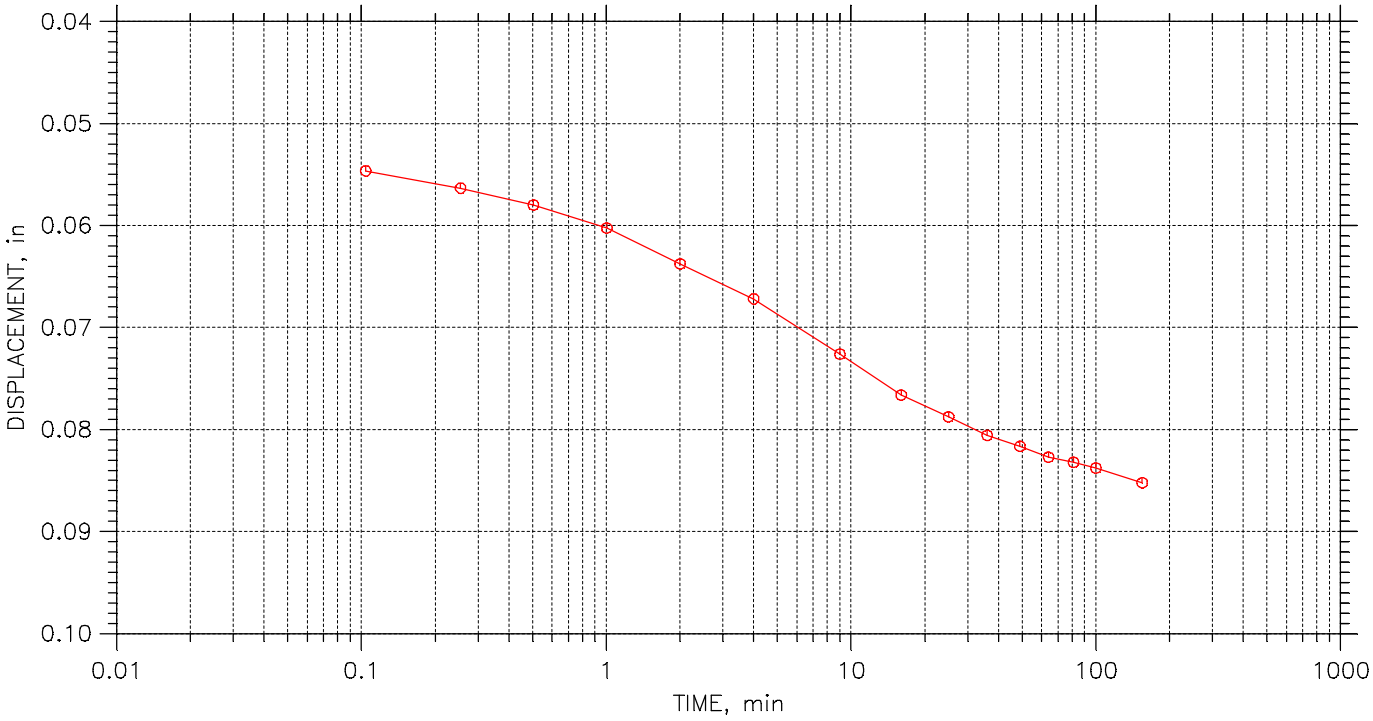
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

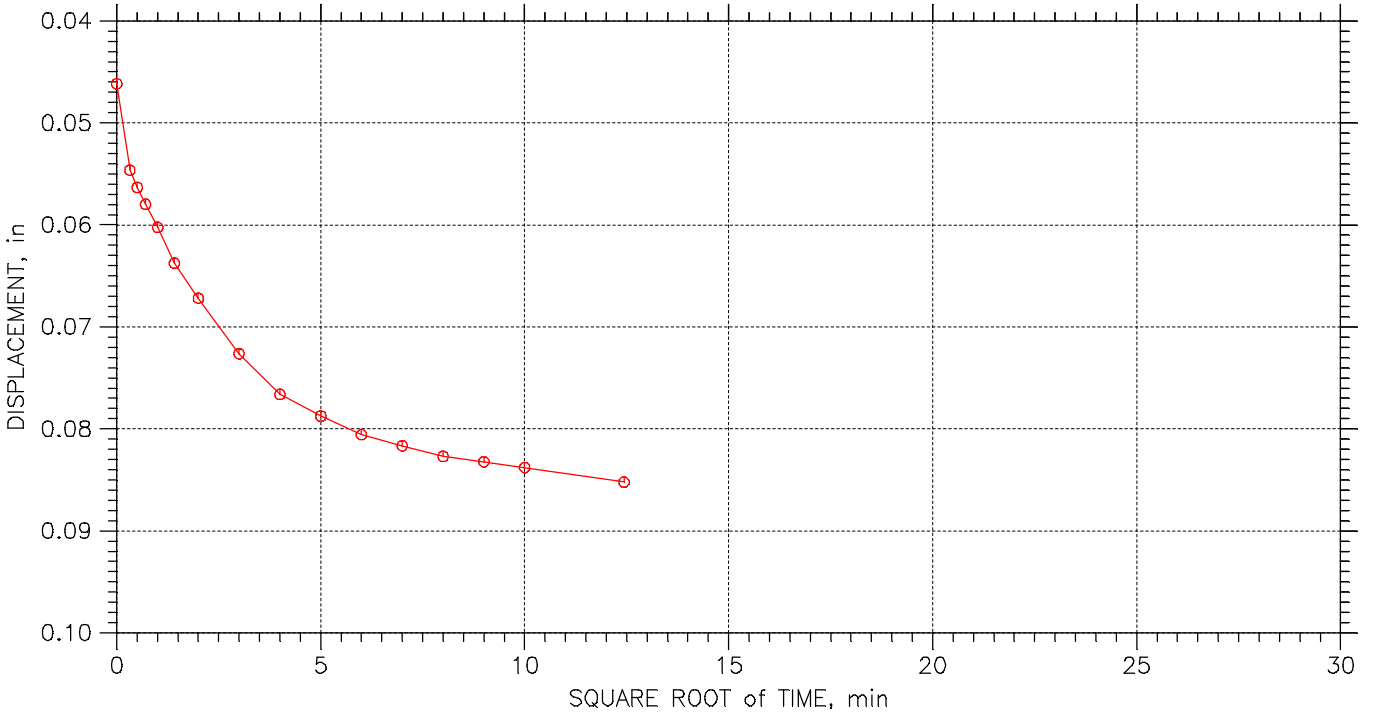
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





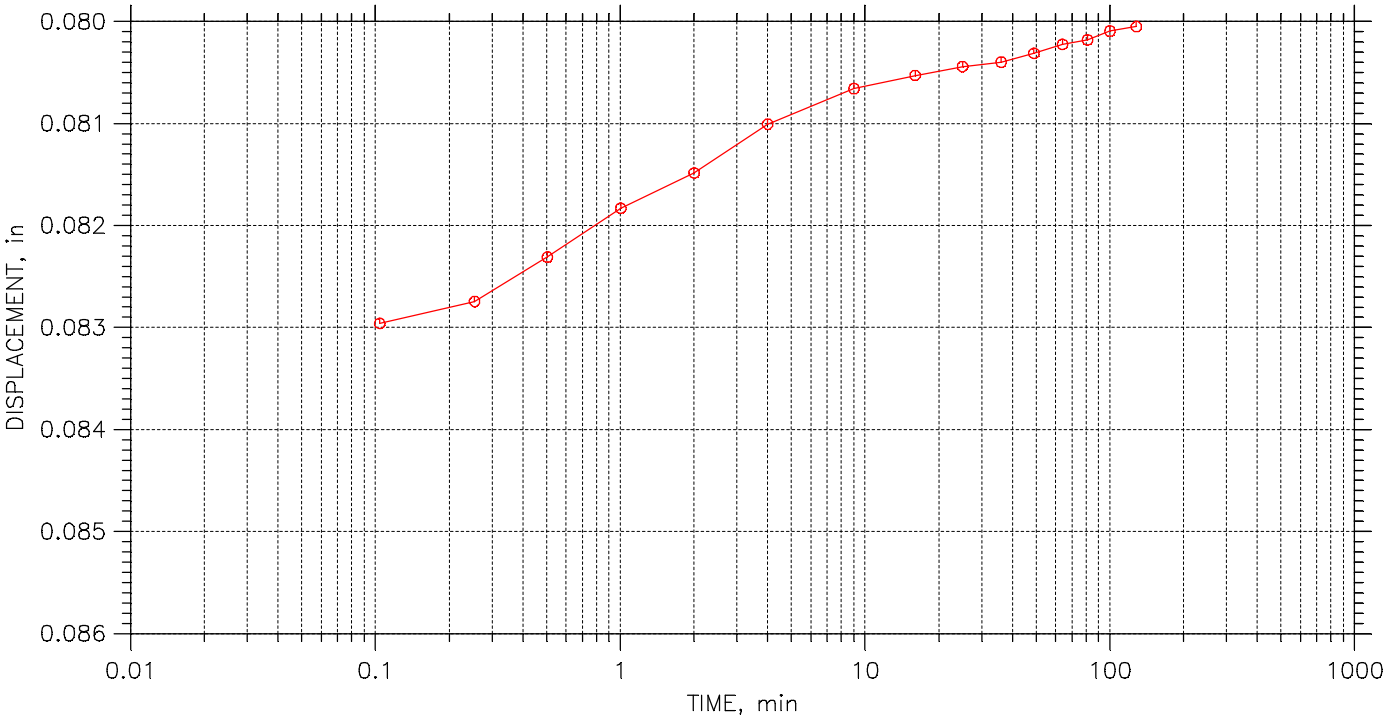
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

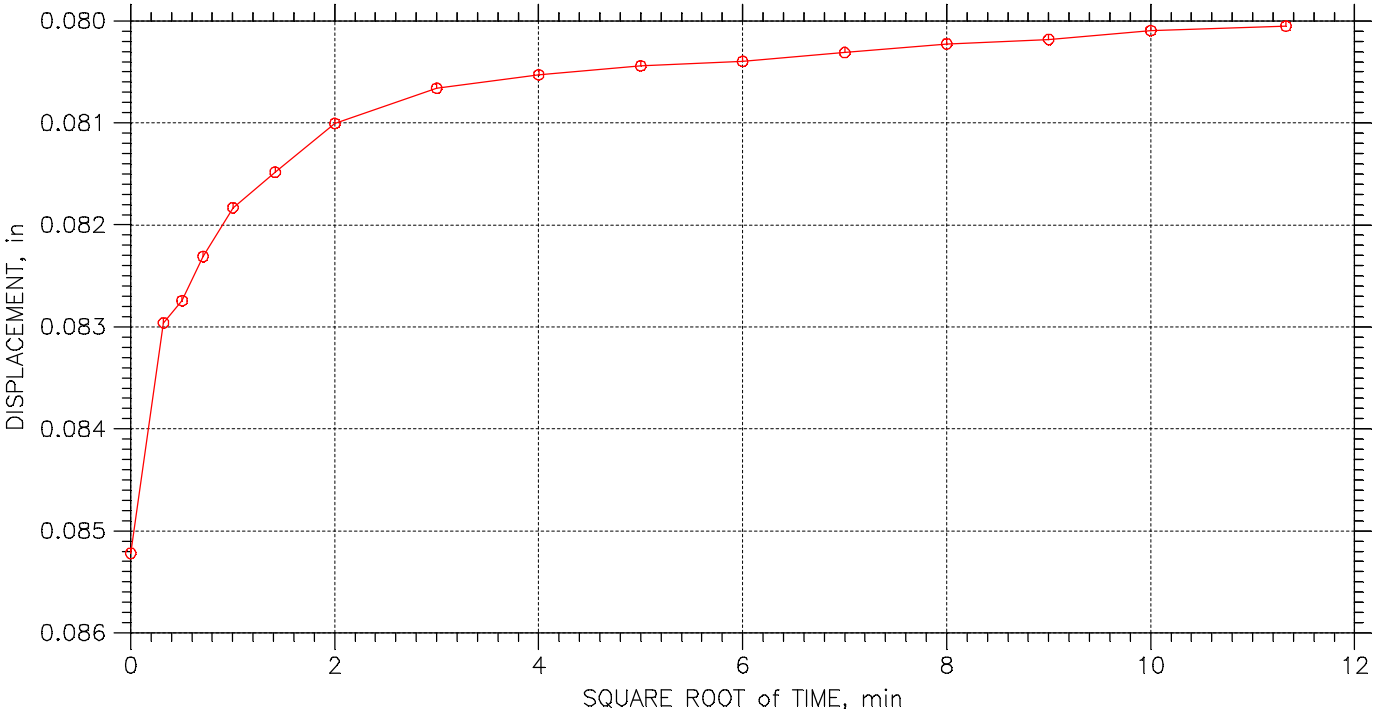
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





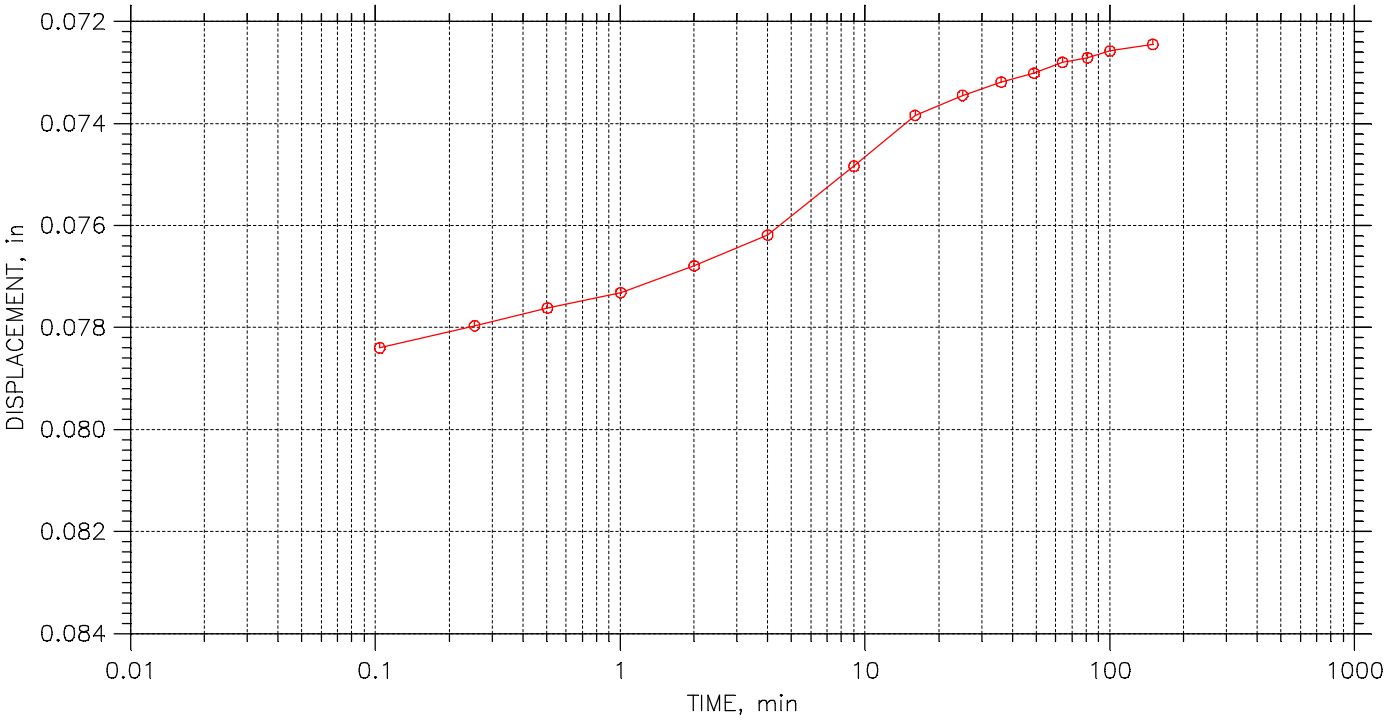
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

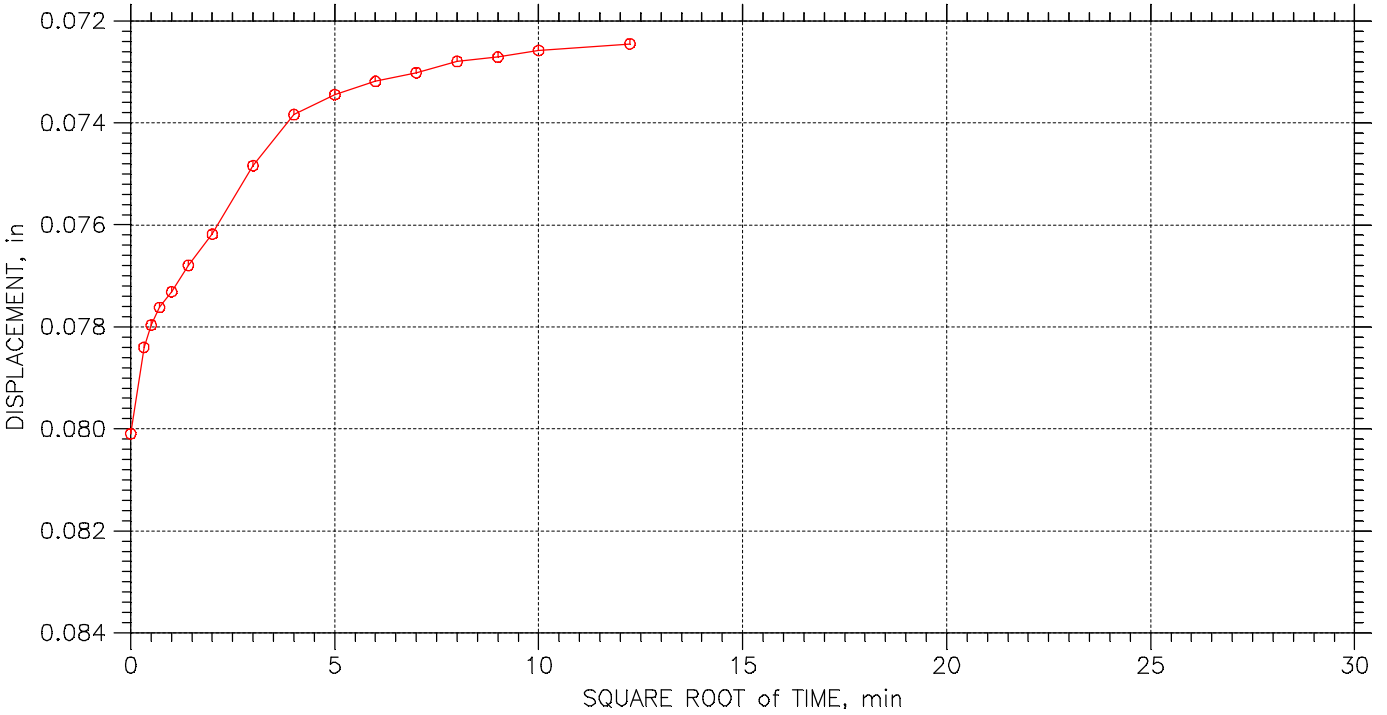
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





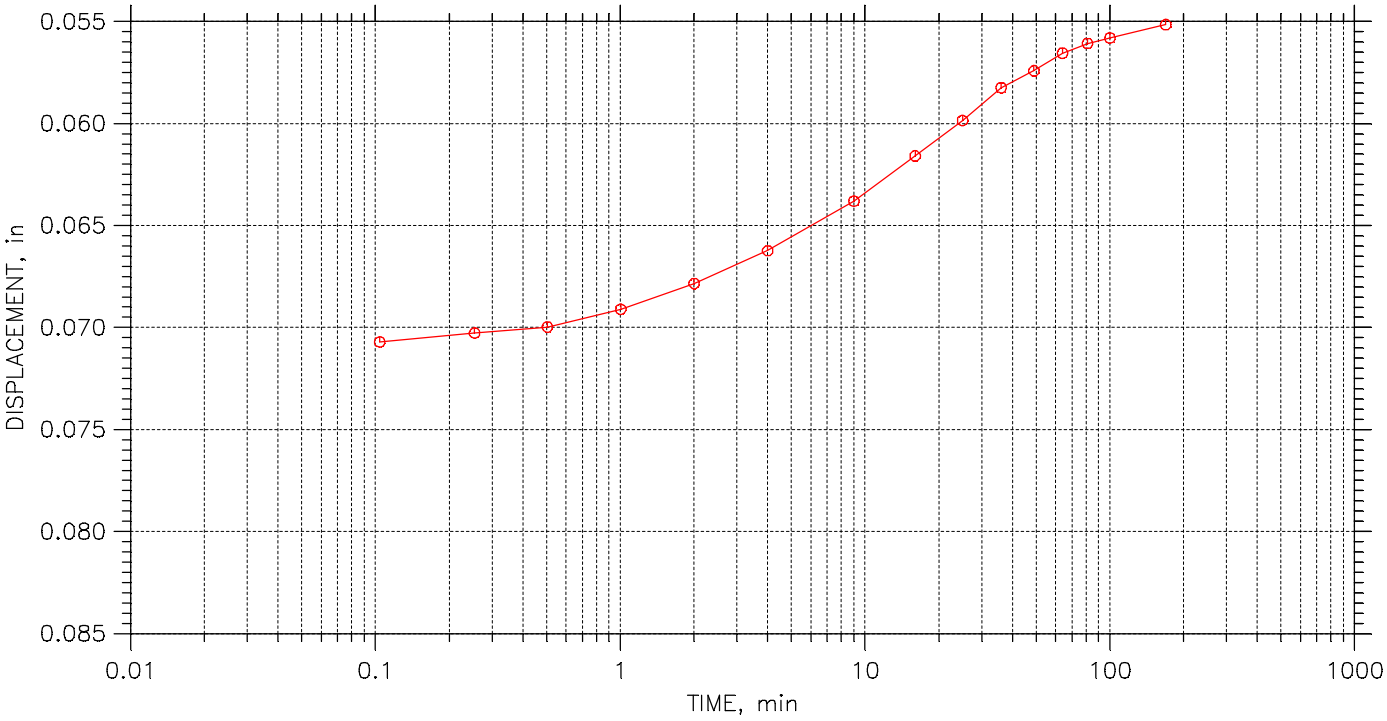
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

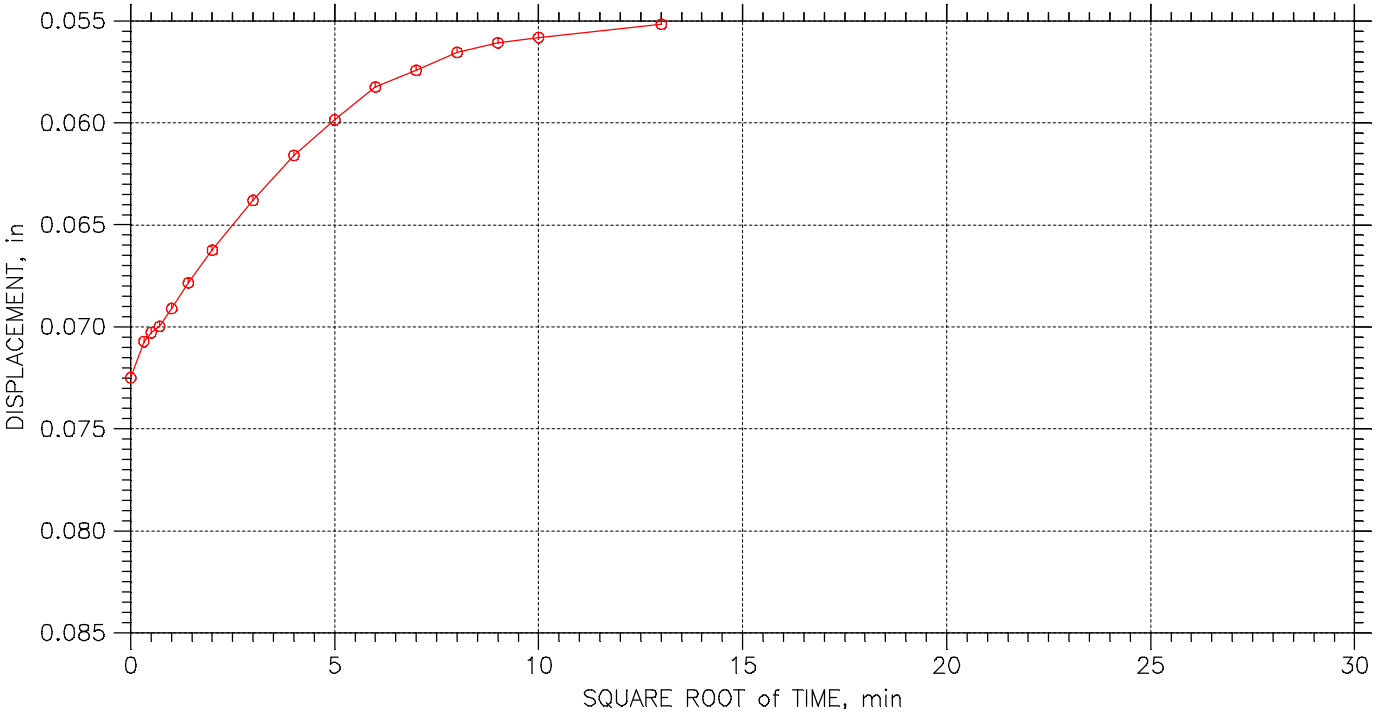
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





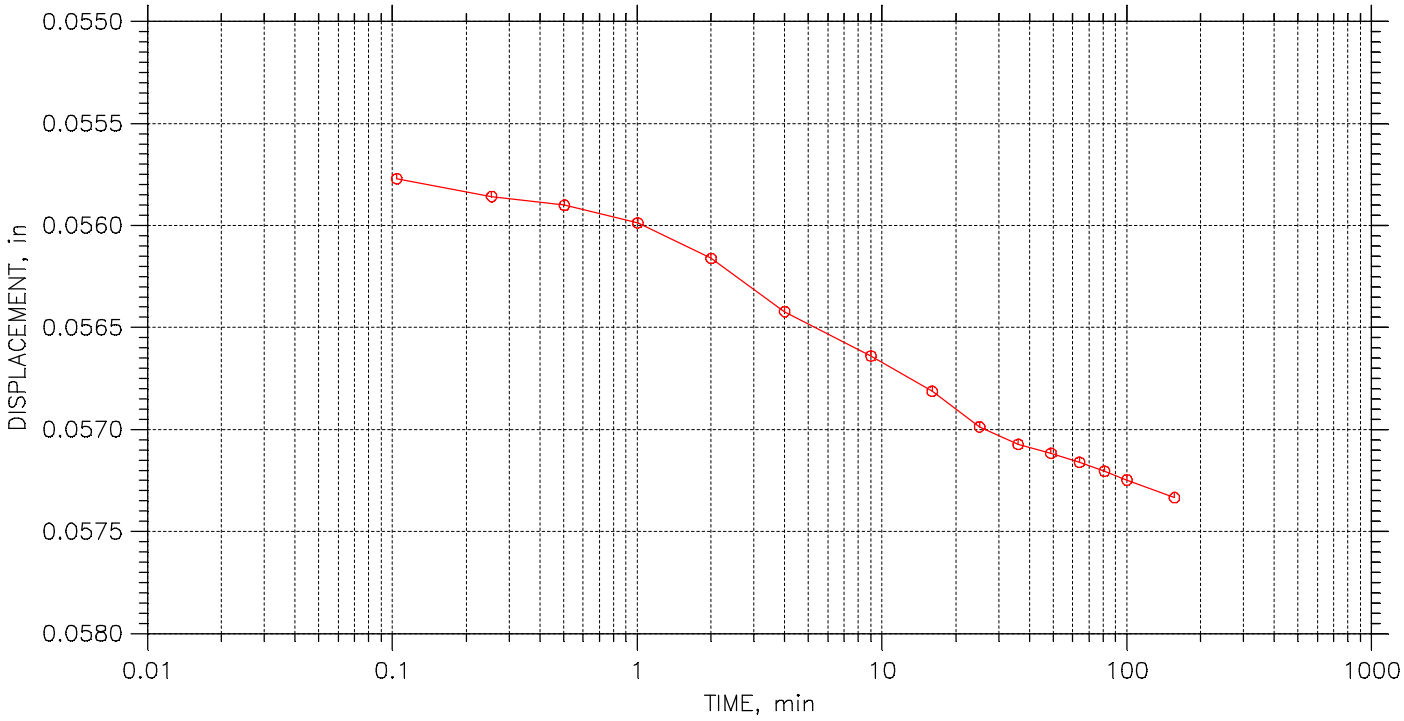
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

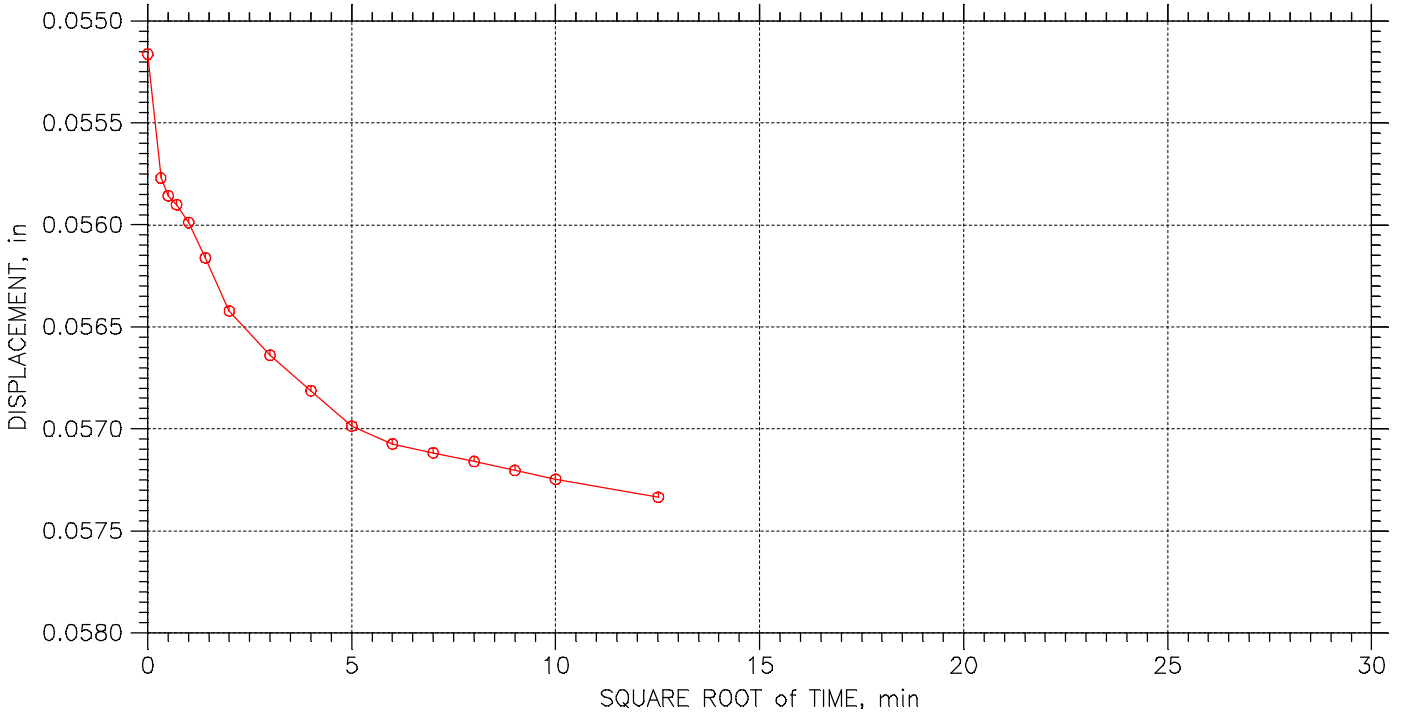
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





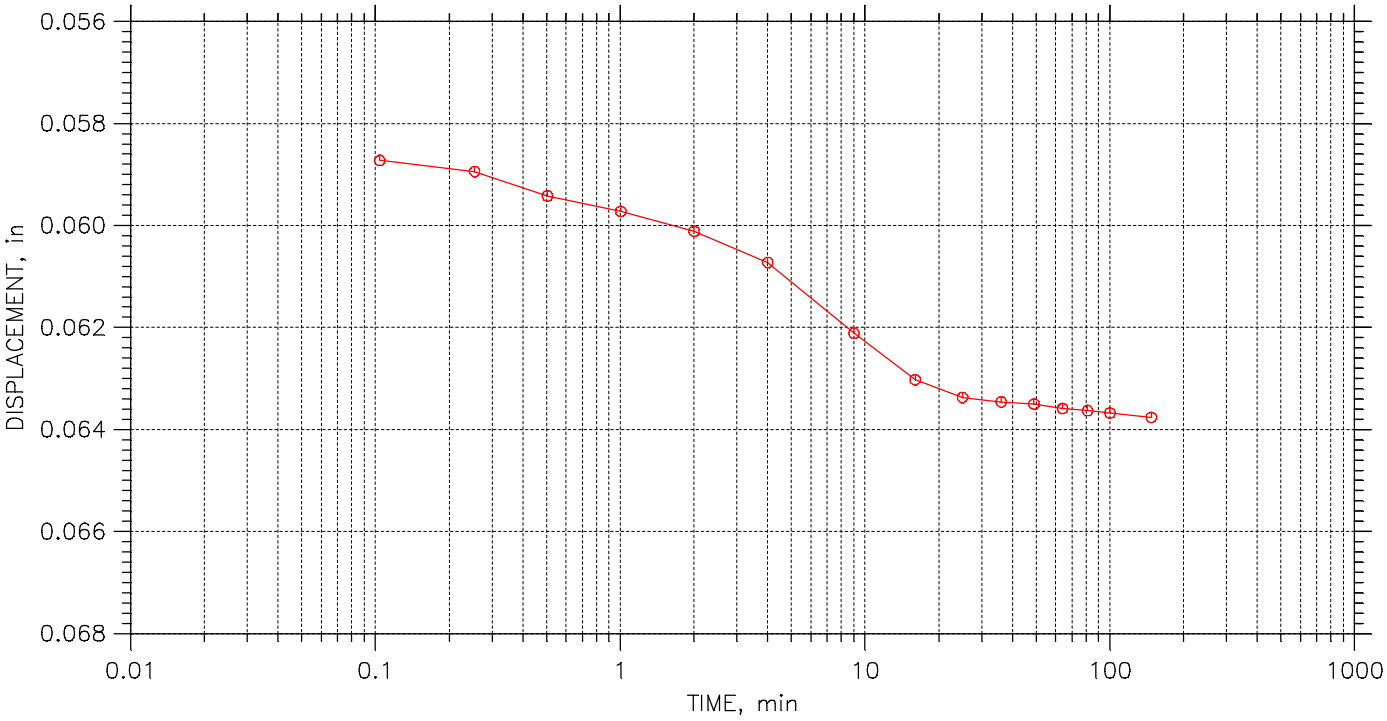
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

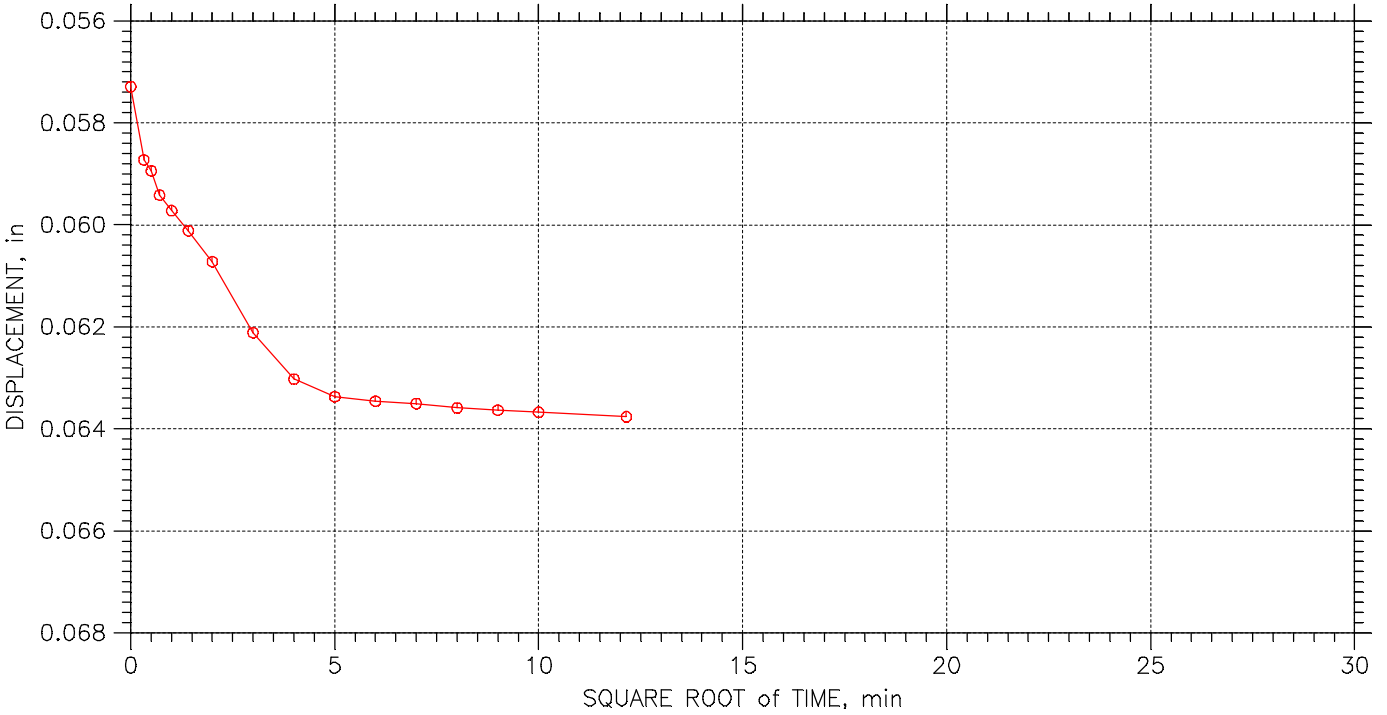
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





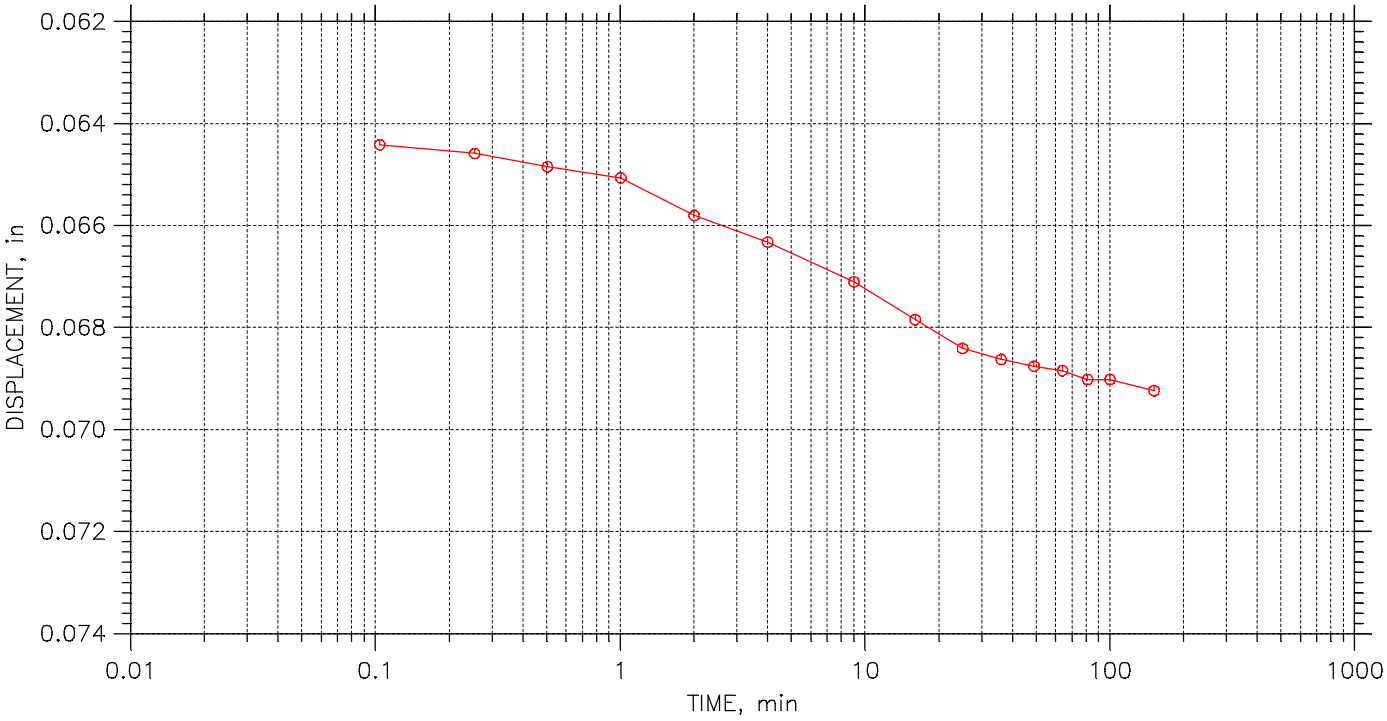
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

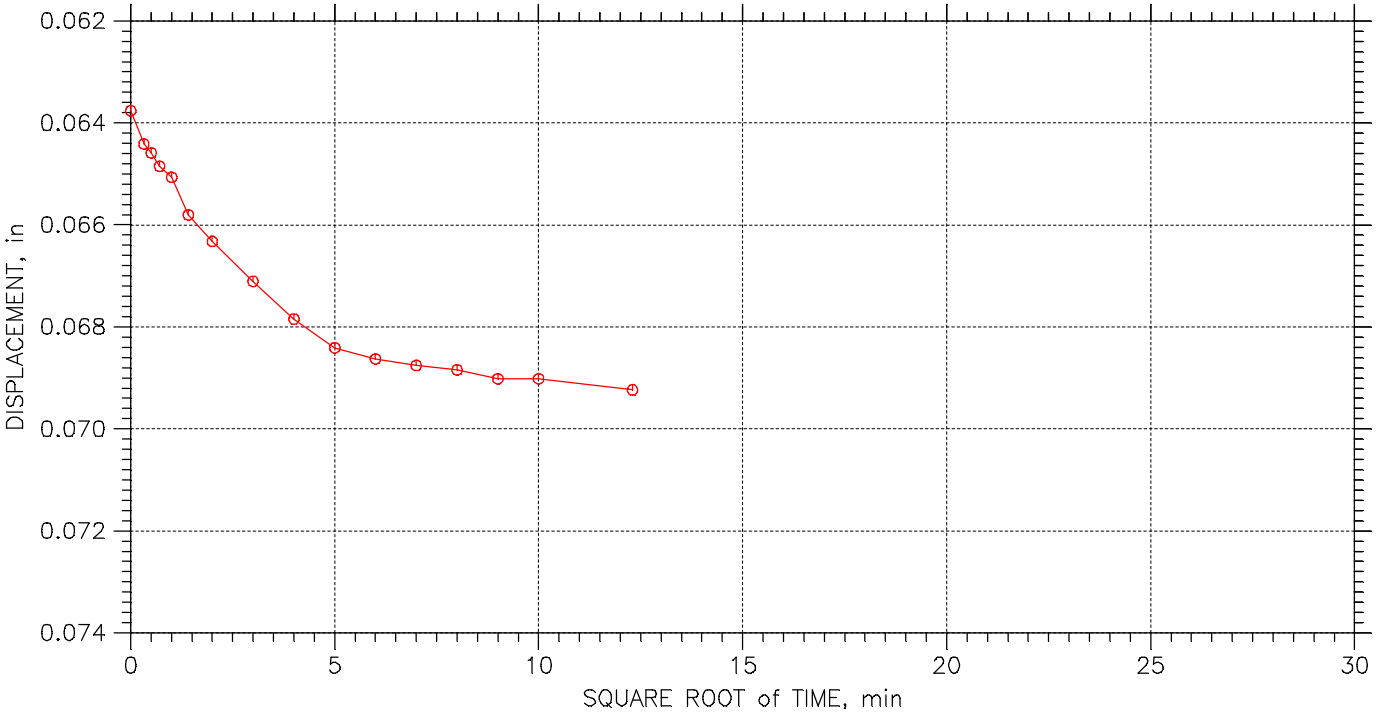
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





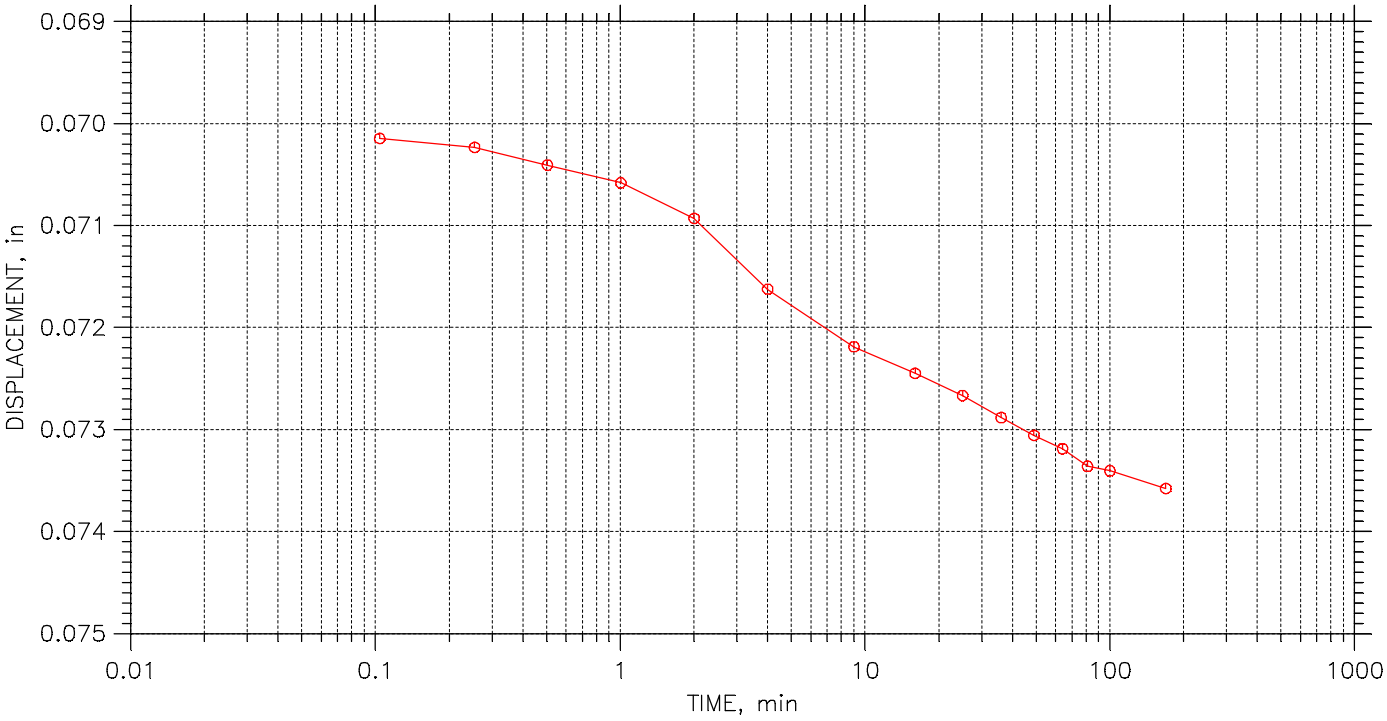
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

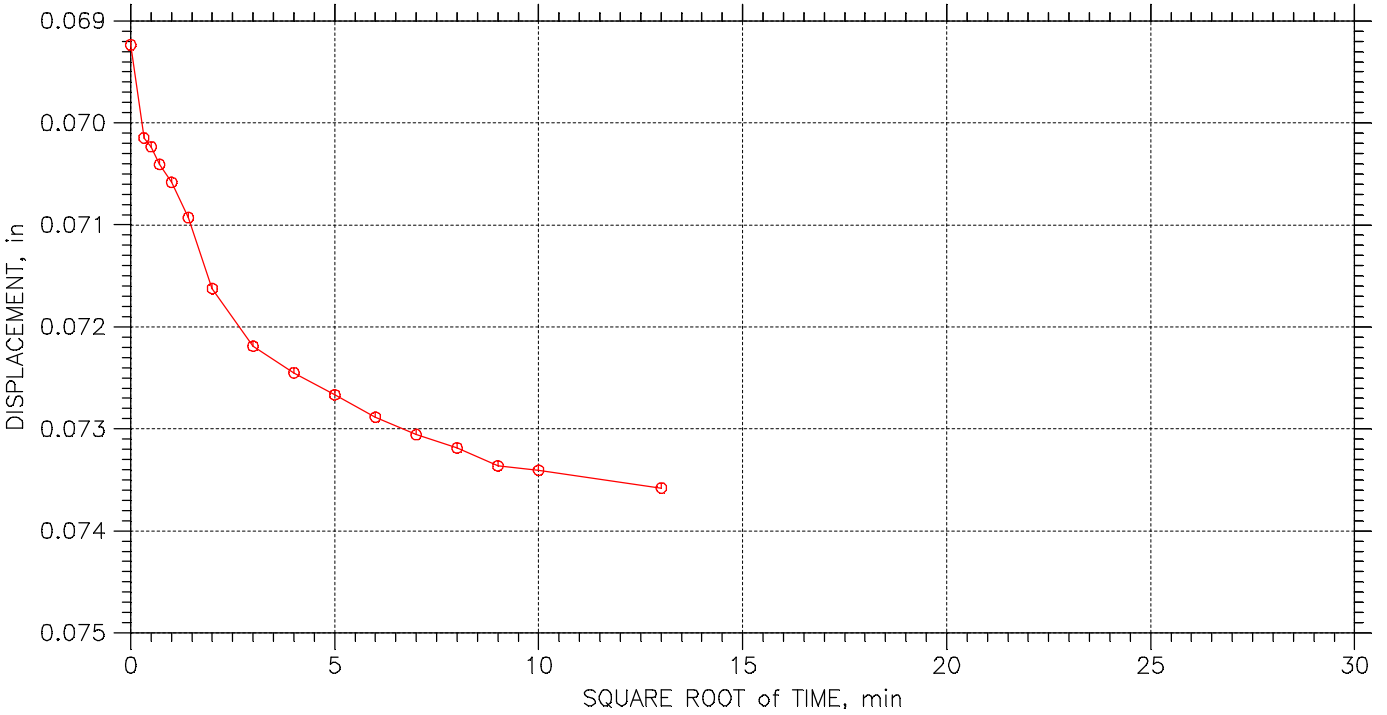
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





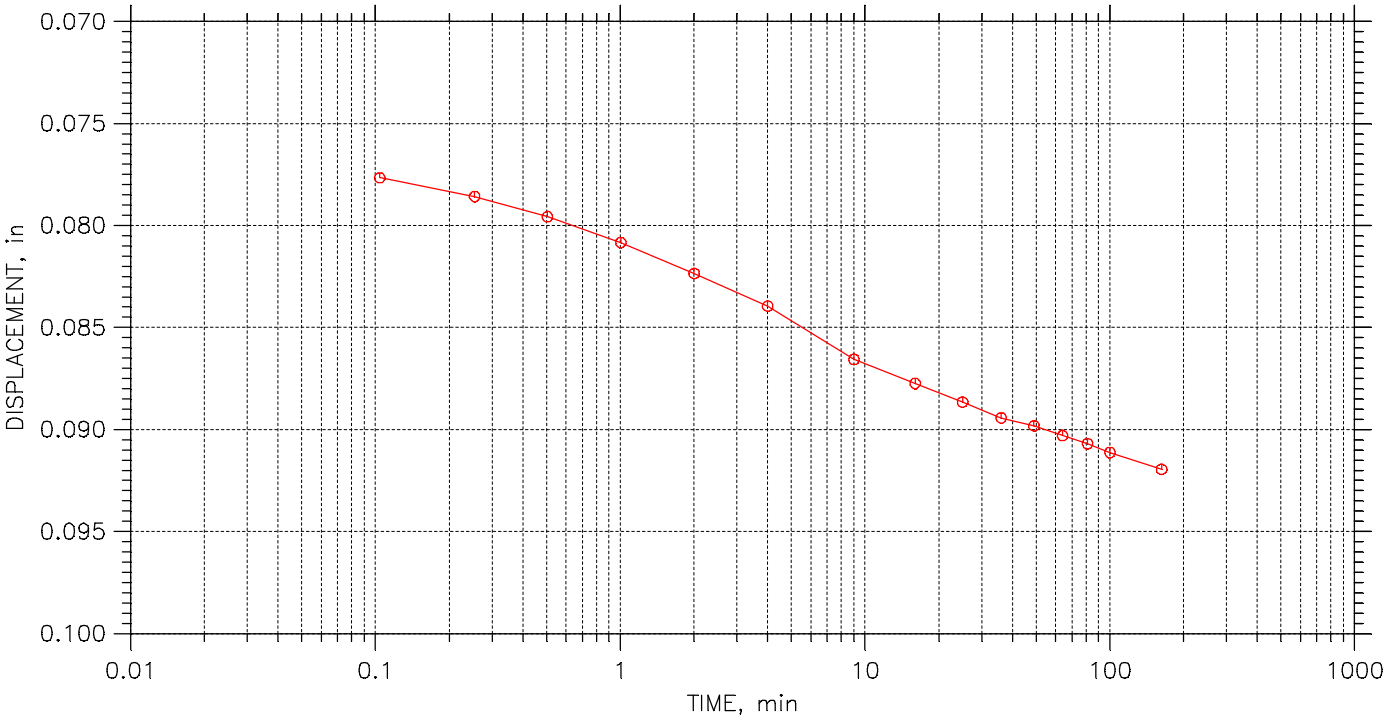
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

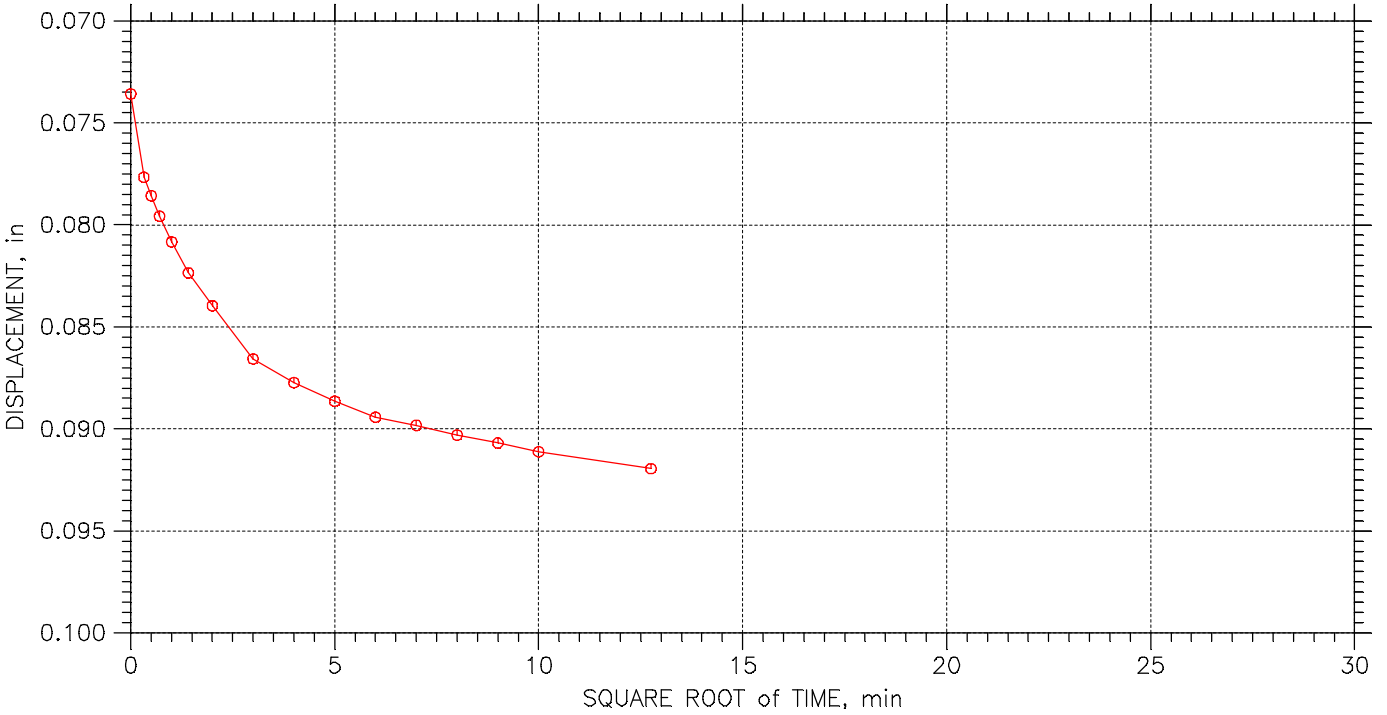
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





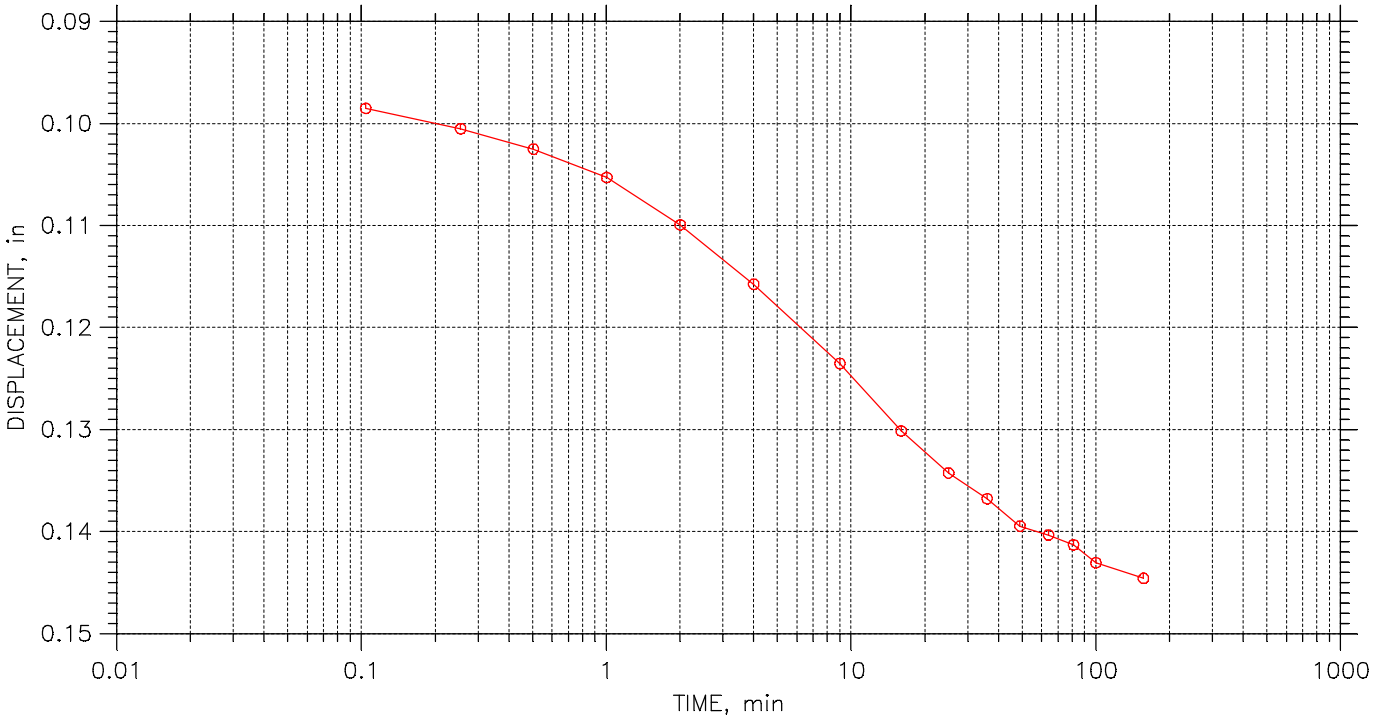
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

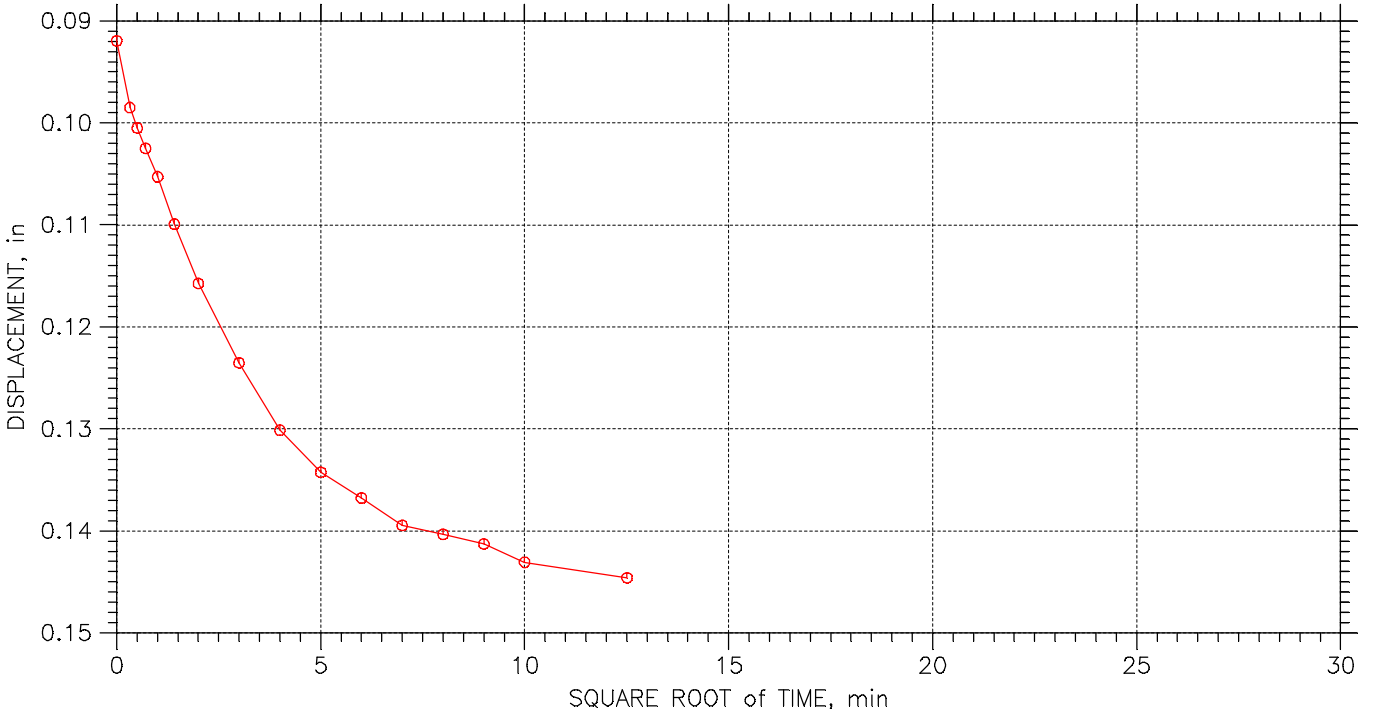
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





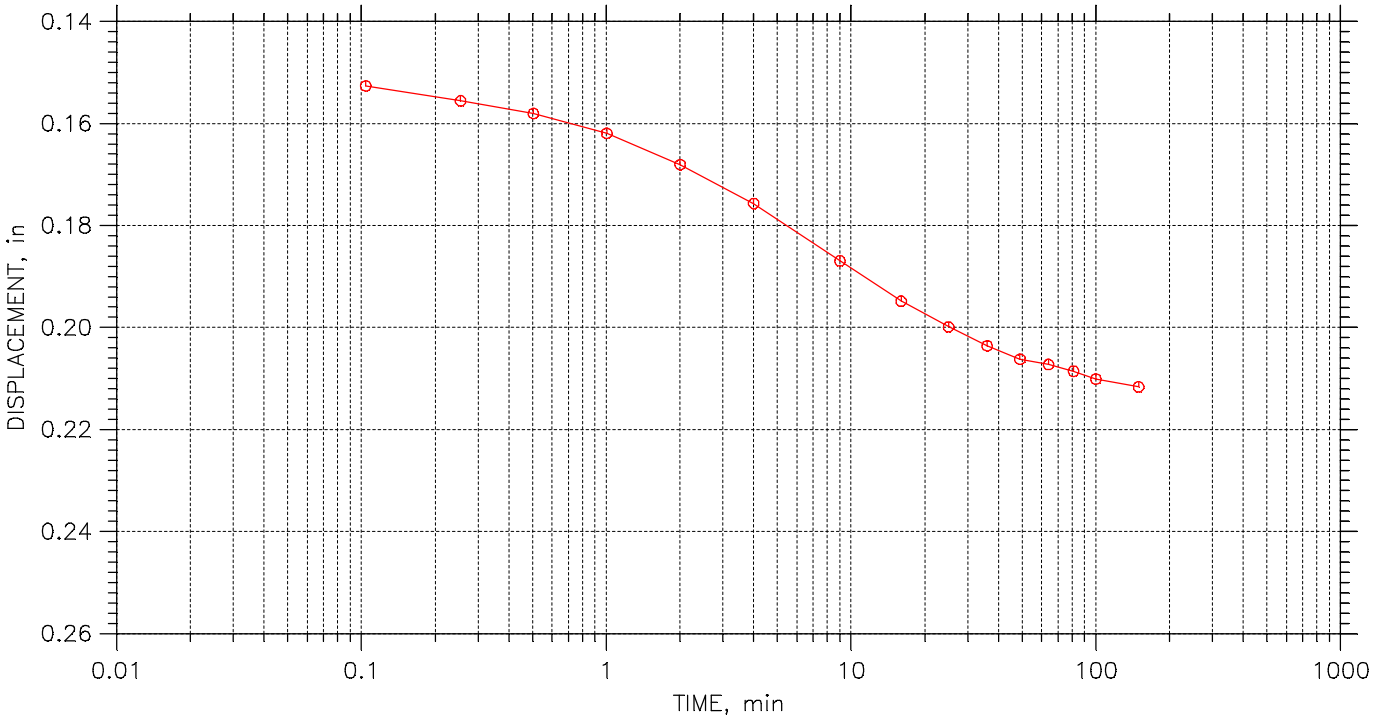
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

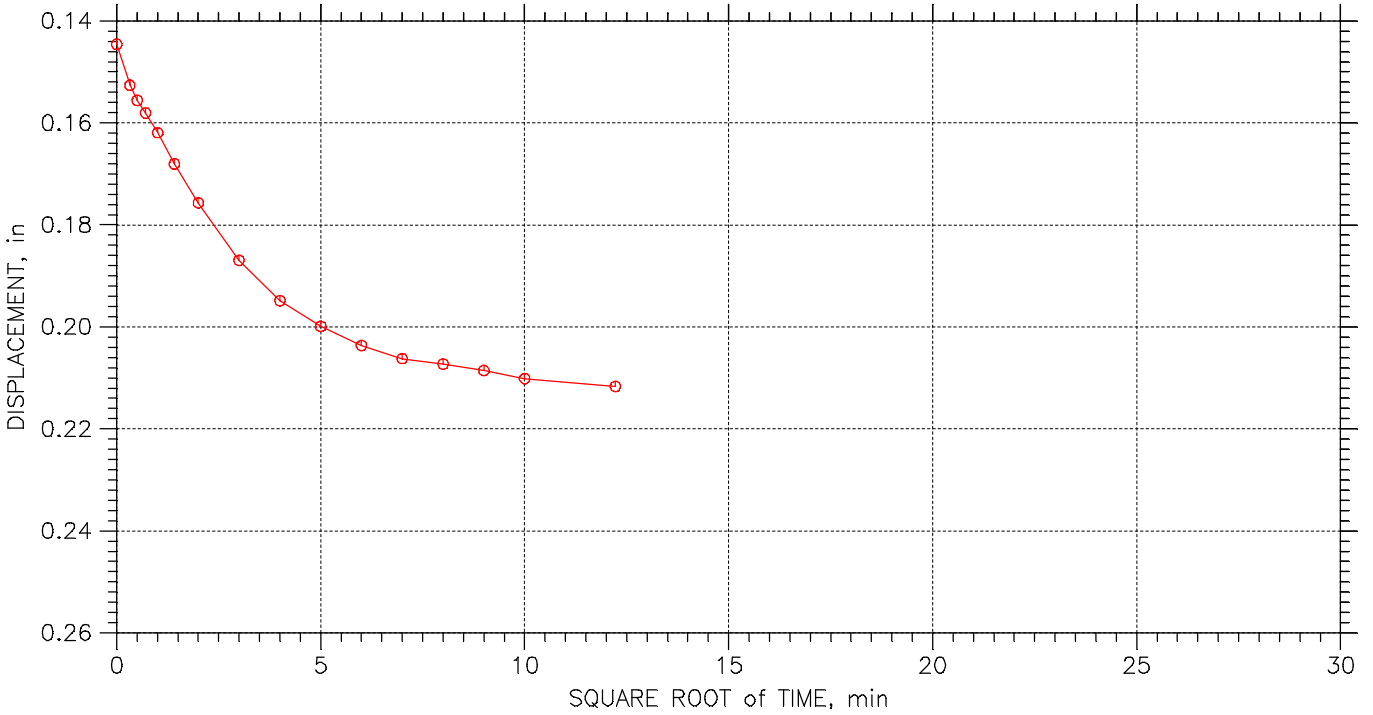
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





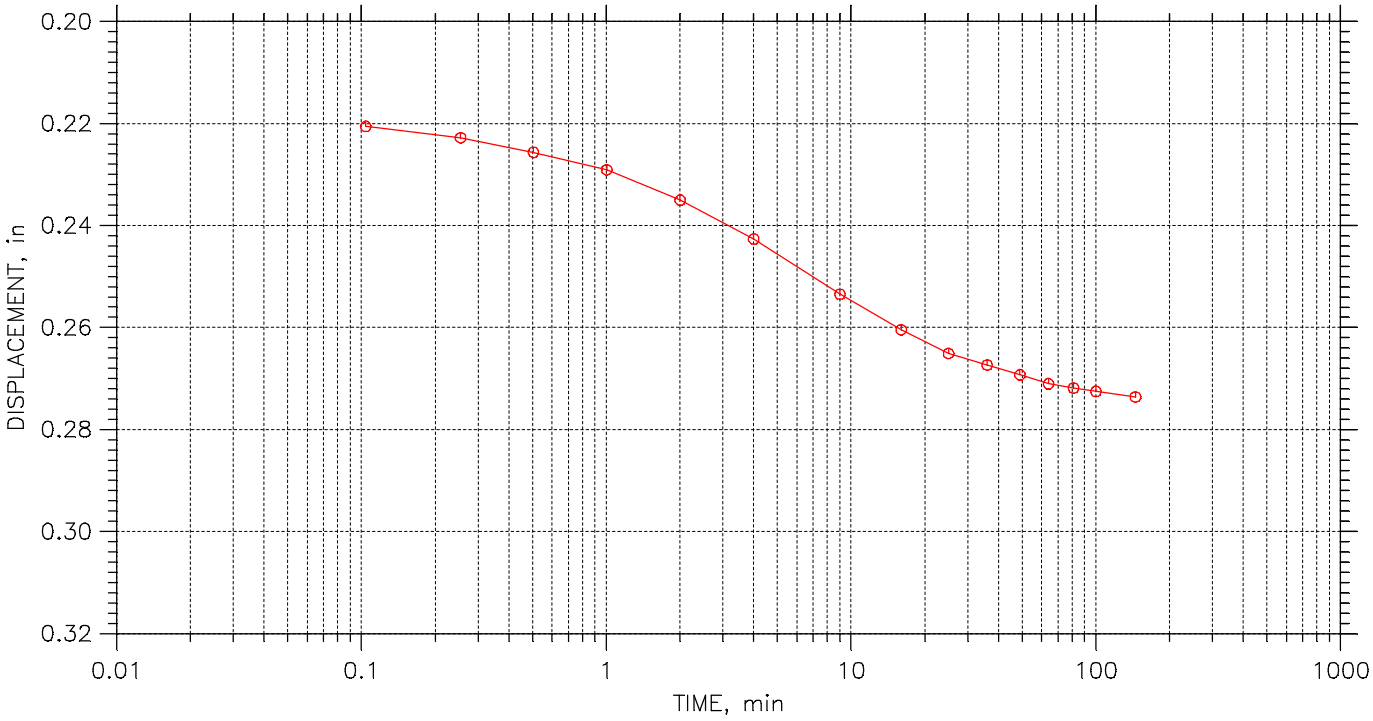
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

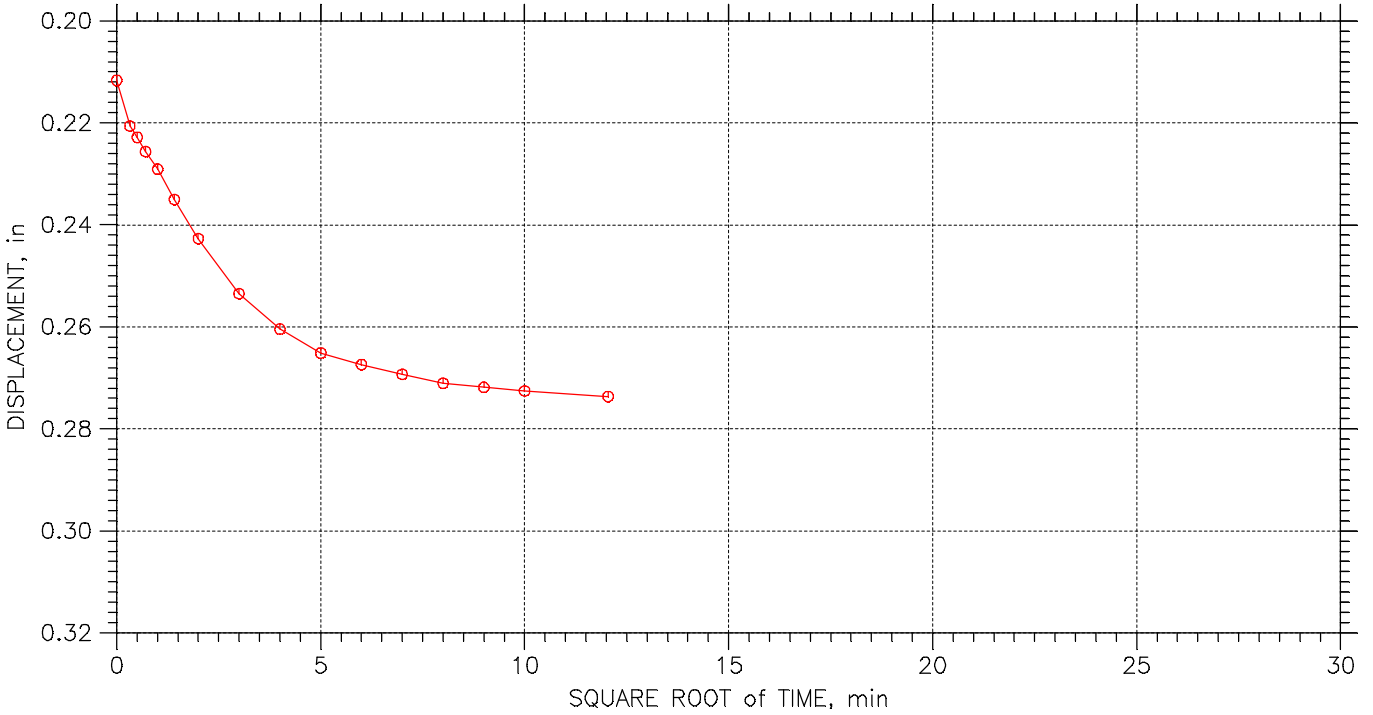
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





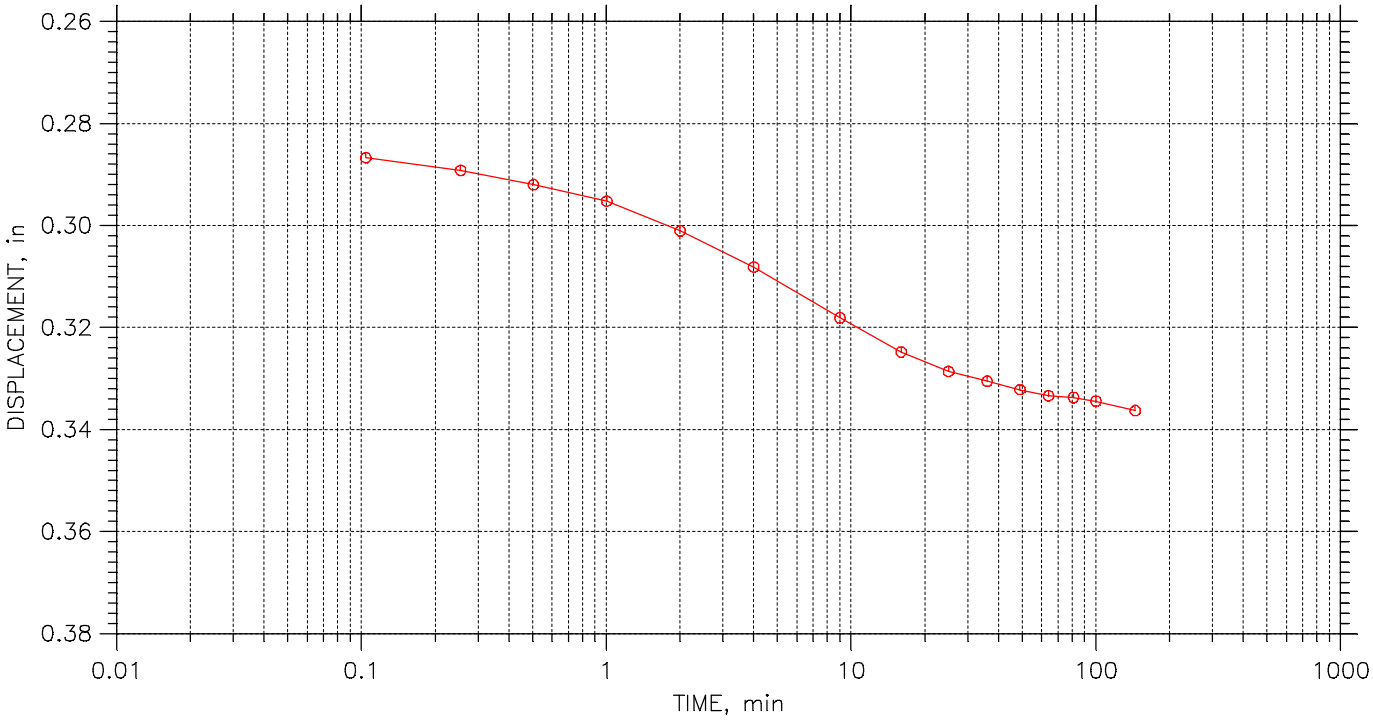
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

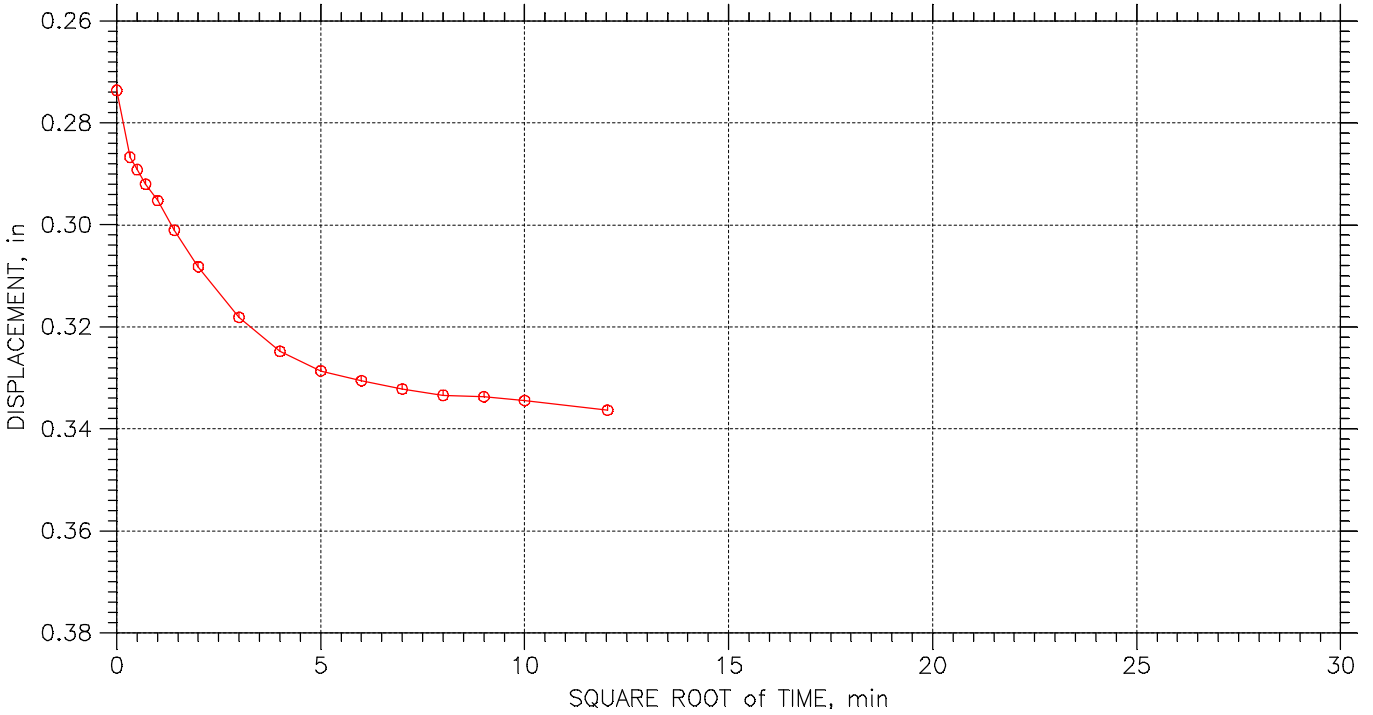
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





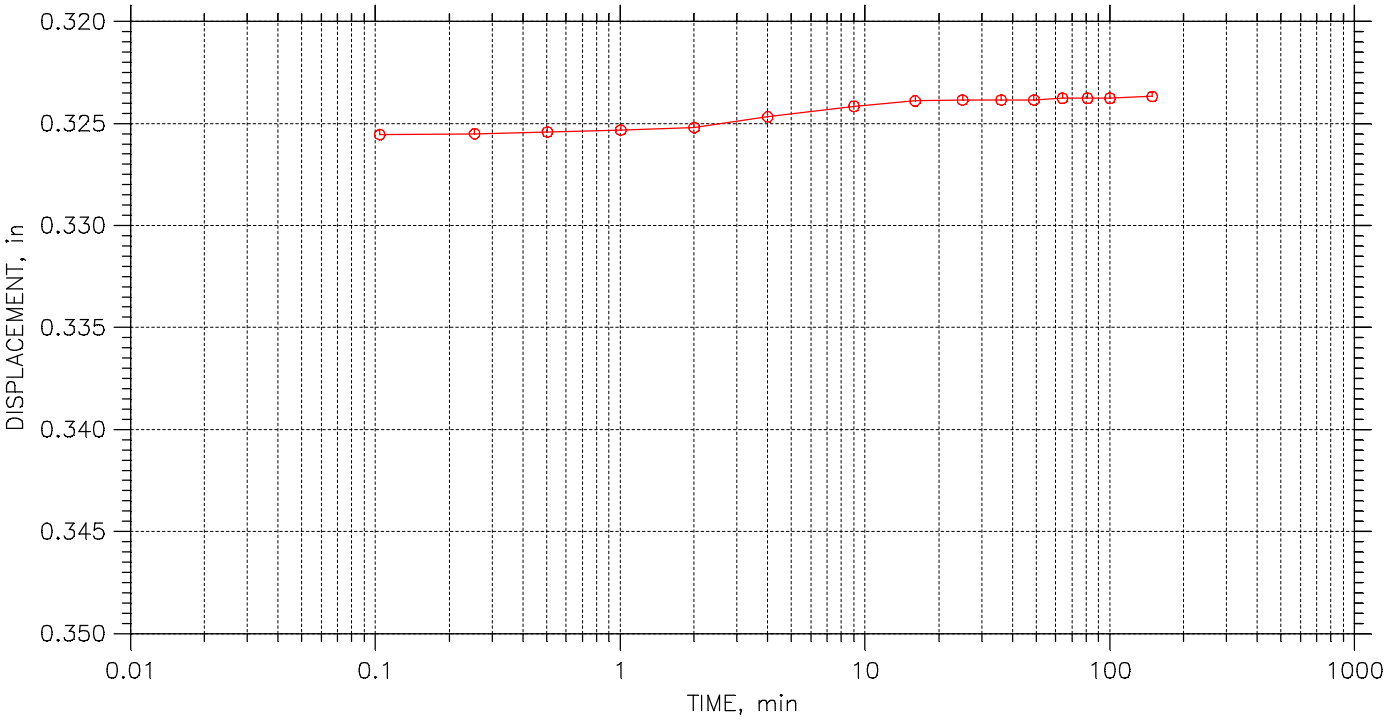
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

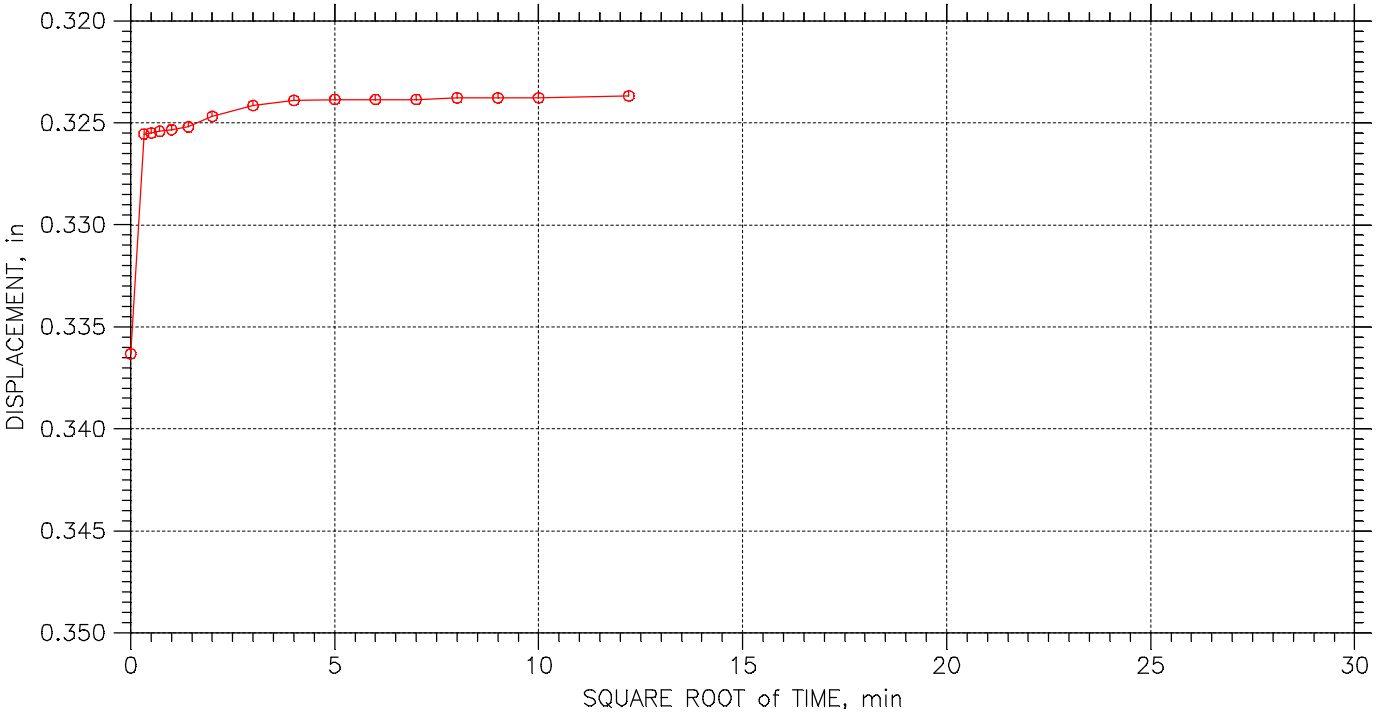
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





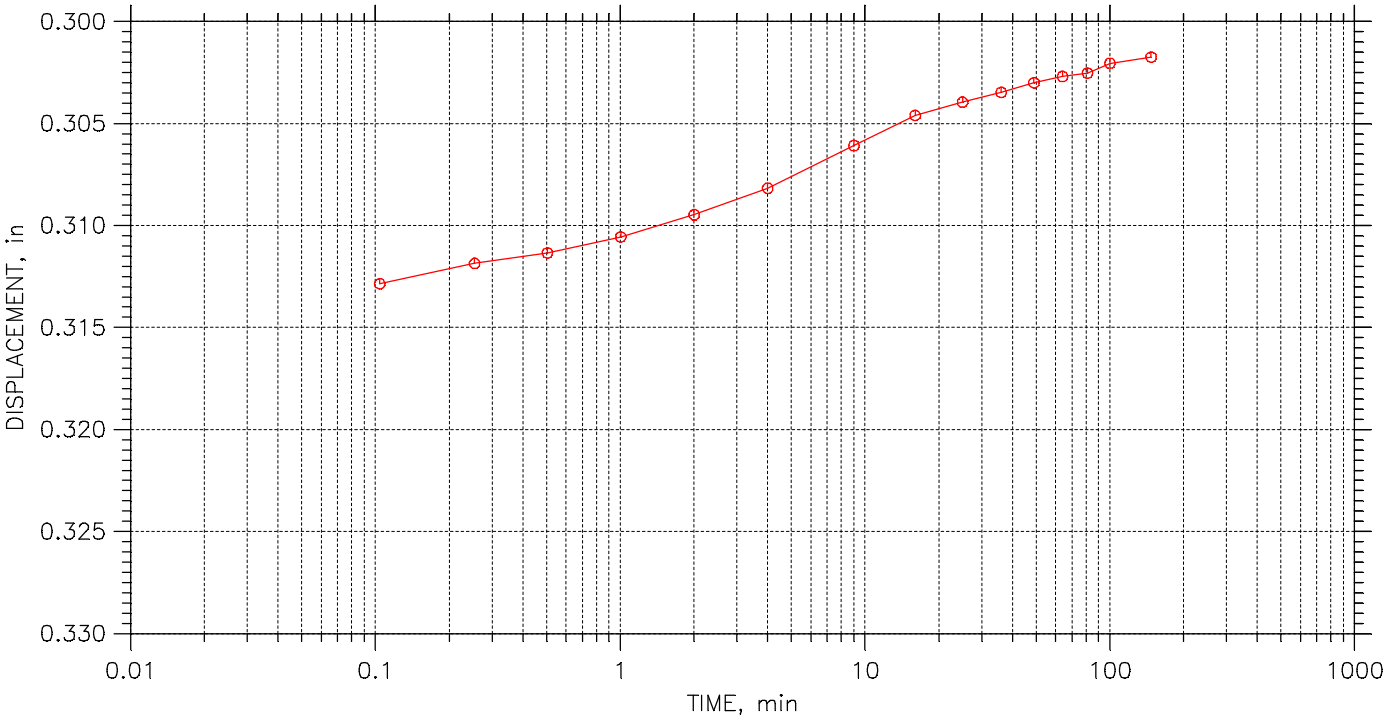
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

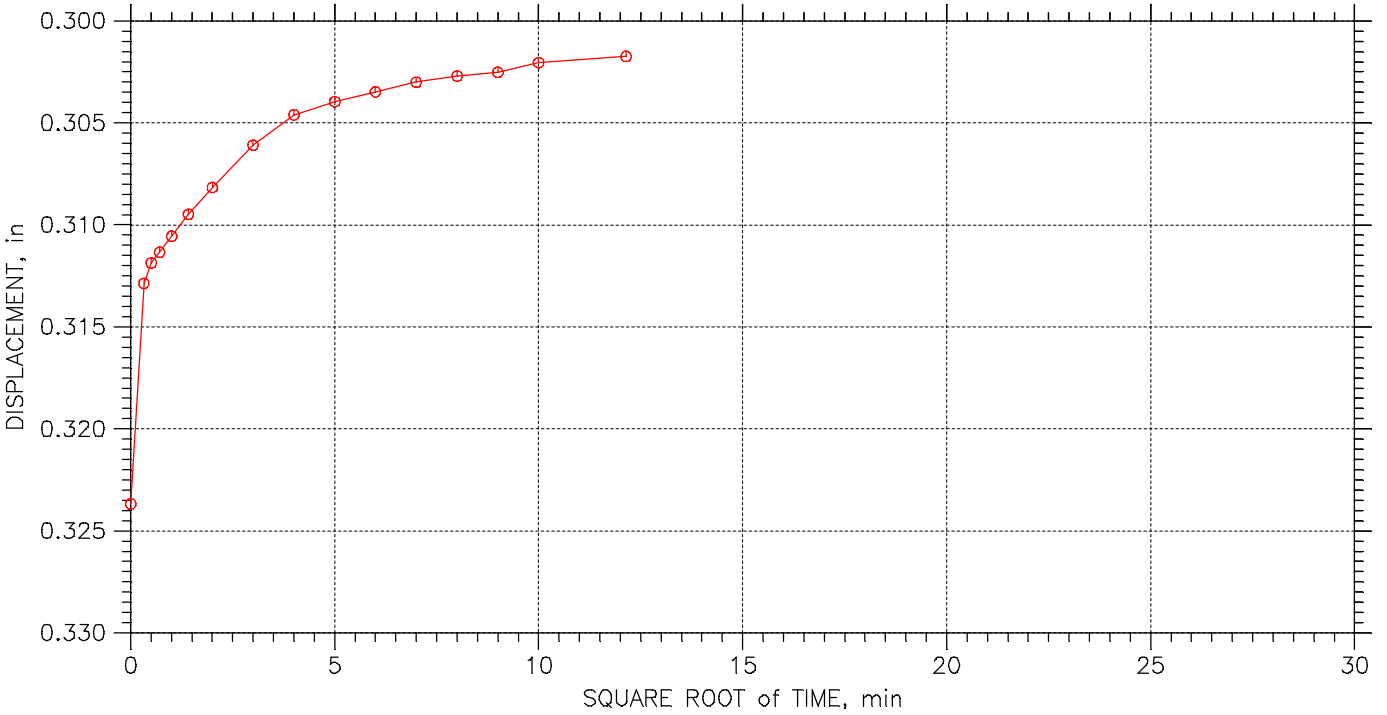
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





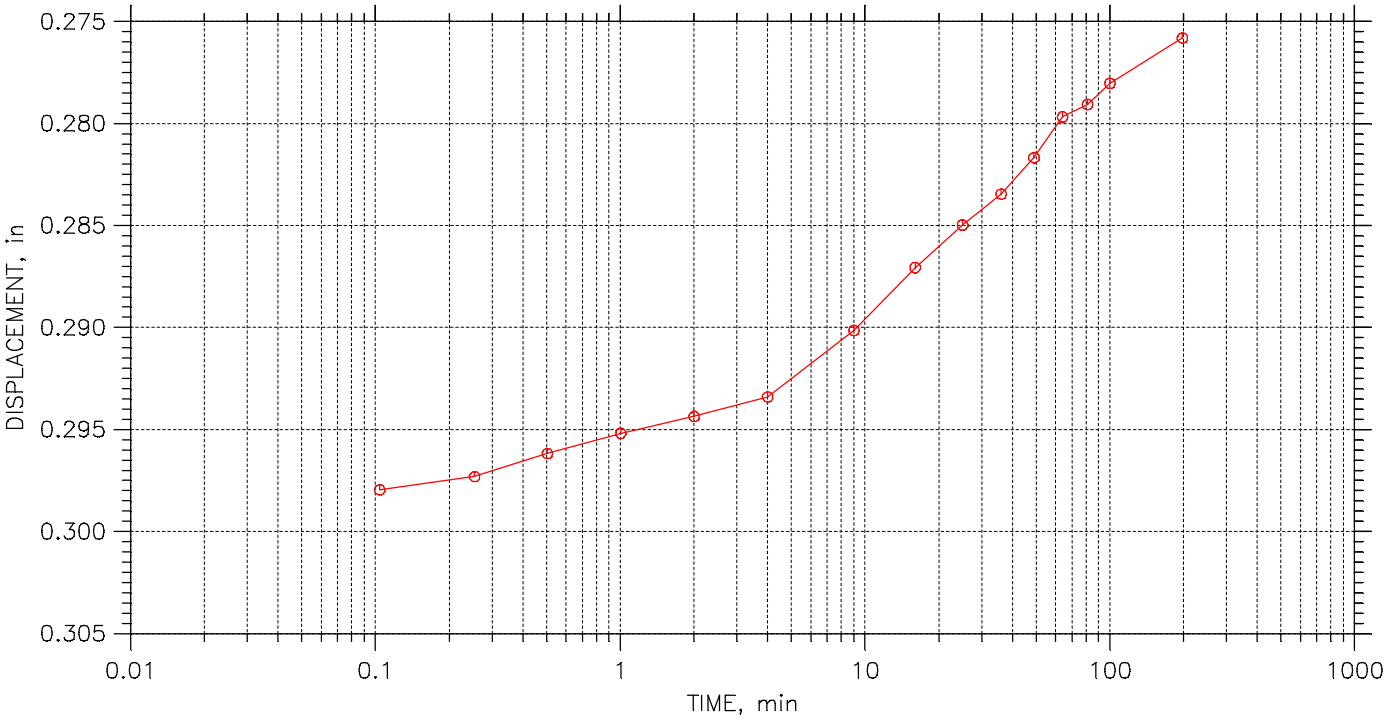
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

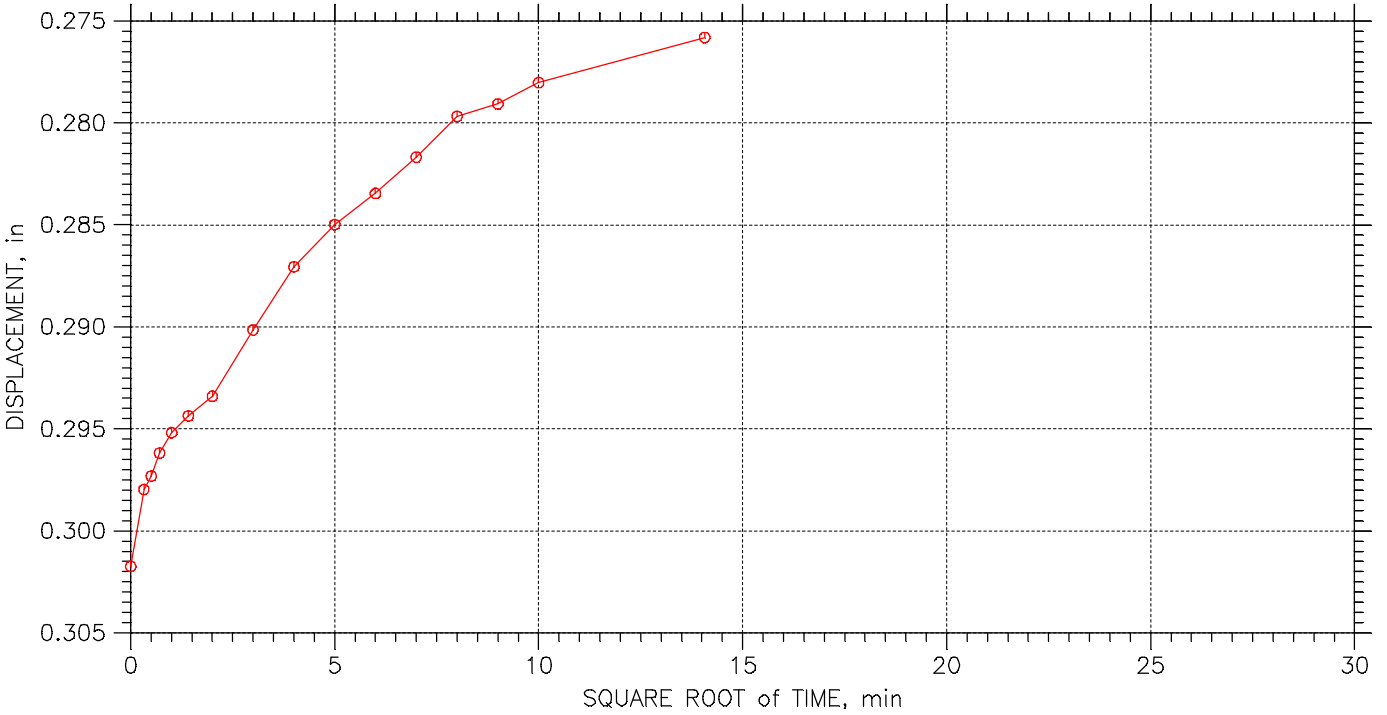
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





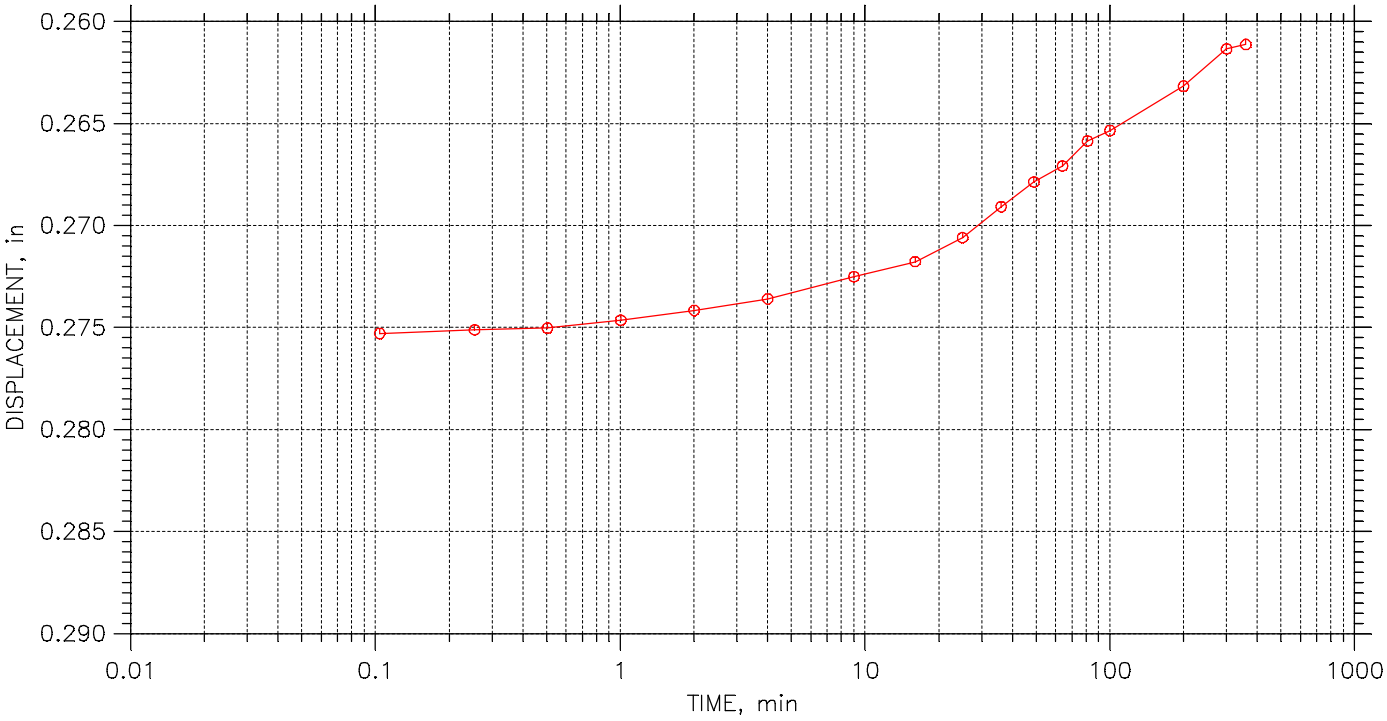
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

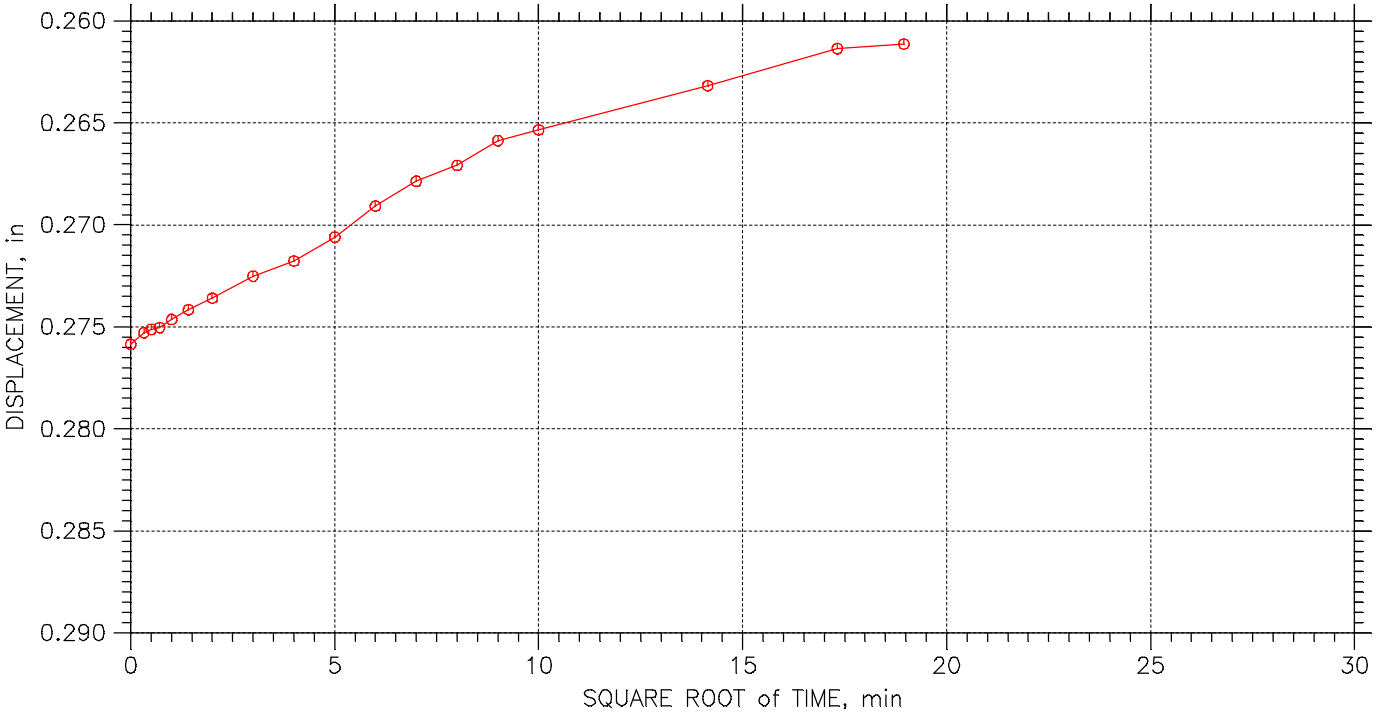
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





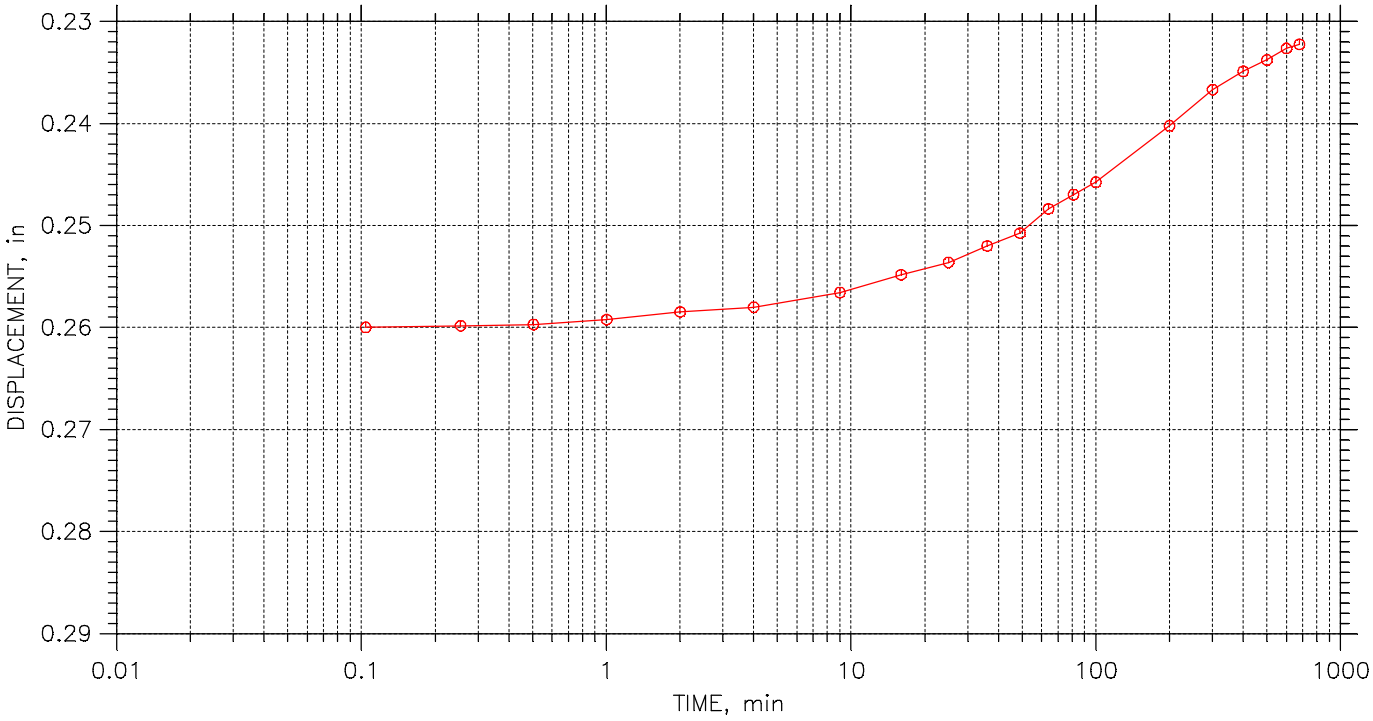
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

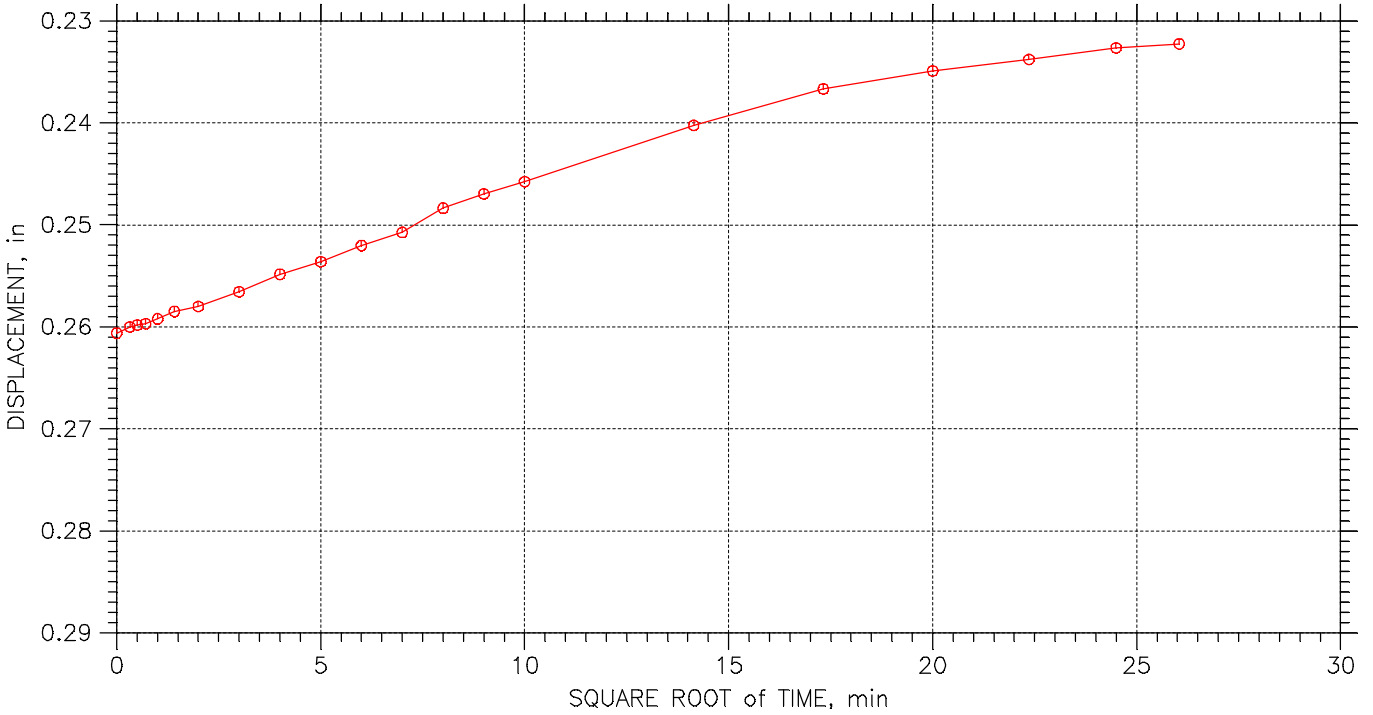
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf

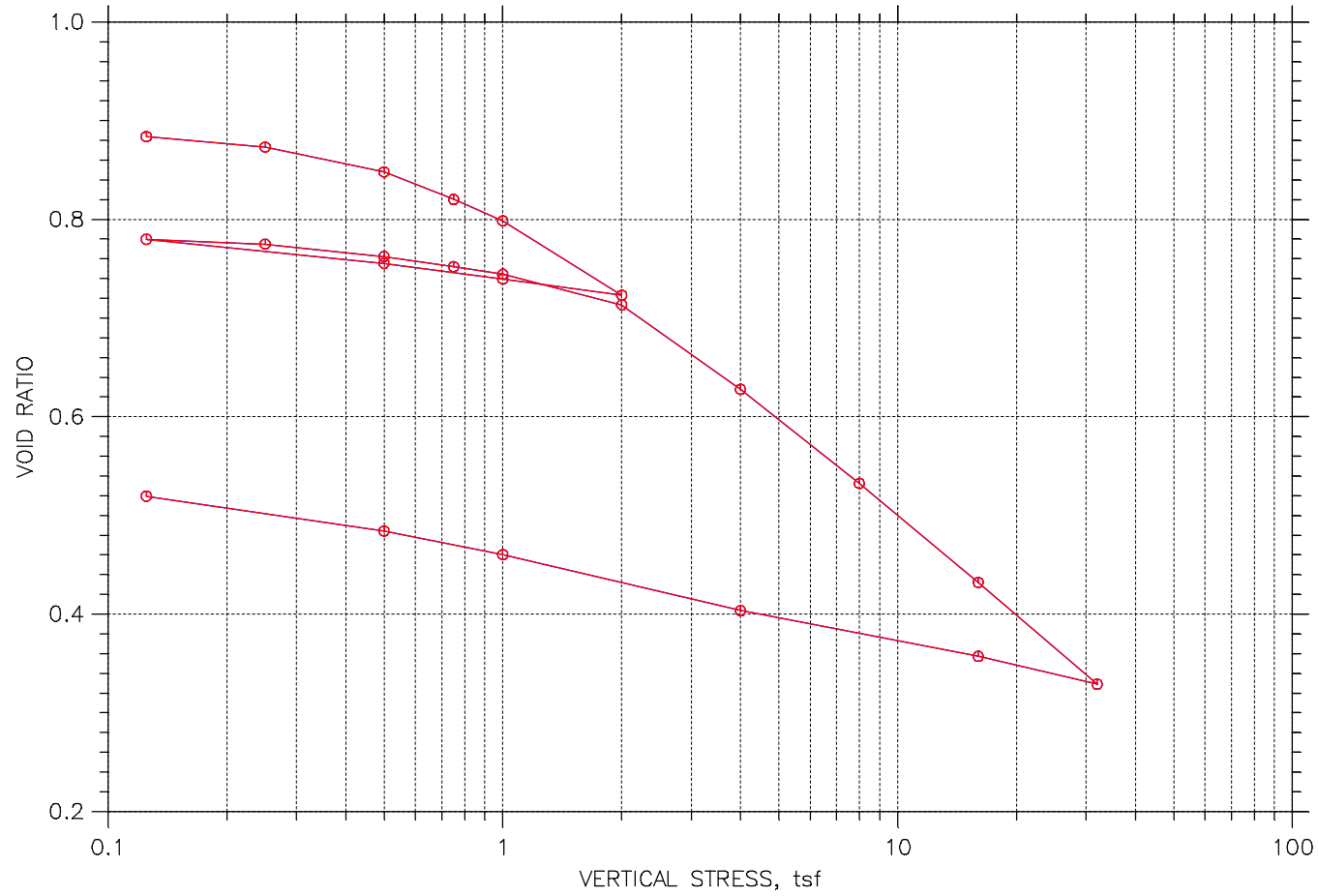


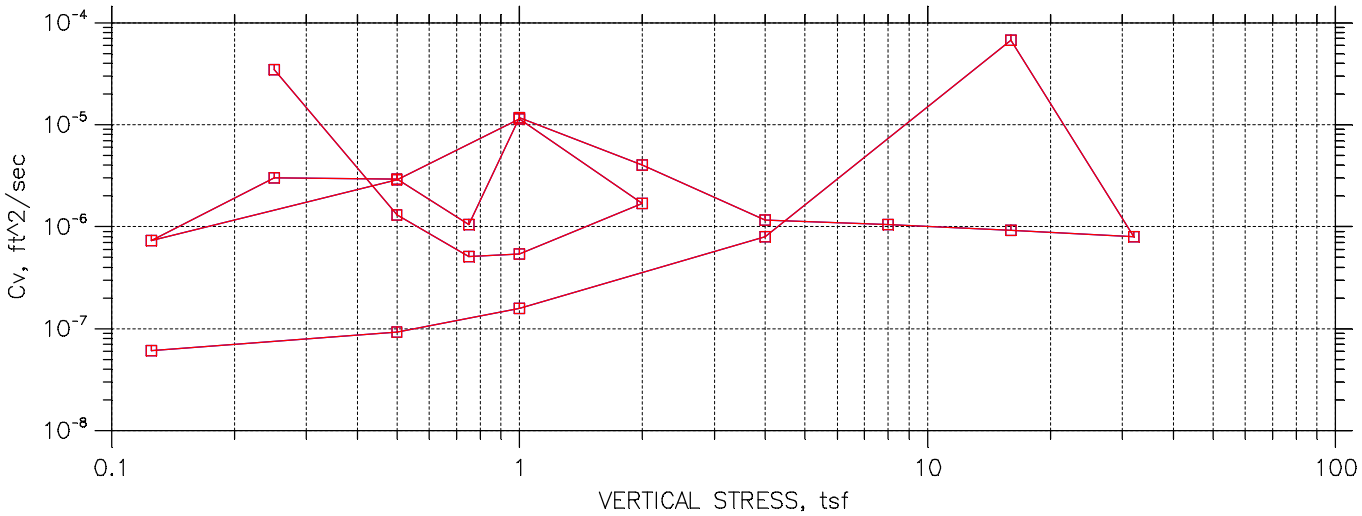


Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 0.91
Final Void Ratio: 0.52

Liquid Limit: 52
Plastic Limit: 19
Plasticity Index: 33

Initial Height: 0.75 in
Specimen Diameter: 2.49 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X19	RING	RING	A-8
Wt. Container + Wet Soil, gm	194.52	185.3	175.79	131.94
Wt. Container + Dry Soil, gm	156.81	159.5	159.5	115.76
Wt. Container, gm	44.78	74.3	74.3	31.14
Wt. Dry Soil, gm	112.03	85.199	85.199	84.62
Water Content, %	33.66	30.28	19.12	19.12
Void Ratio	---	0.91	0.52	---
Degree of Saturation, %	---	90.87	100.68	---
Dry Unit Weight, pcf	---	89.066	111.96	---

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

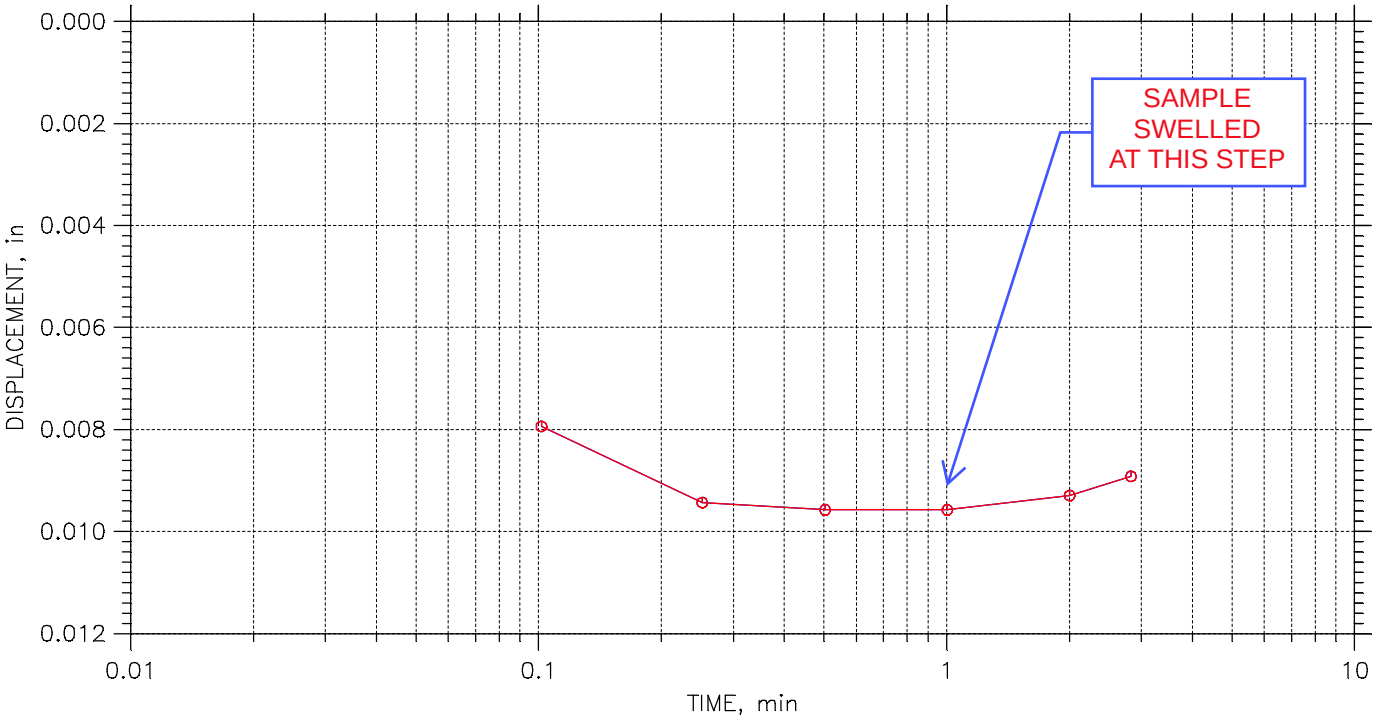
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.008922	0.884	1.19	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.01289	0.874	1.72	0.1	0.0	3.48e-005	0.00e+000	3.48e-005
3	0.5	0.02294	0.848	3.07	1.5	0.5	2.05e-006	5.95e-006	3.05e-006
4	0.75	0.03373	0.821	4.51	5.8	0.0	5.07e-007	0.00e+000	5.07e-007
5	1	0.04241	0.798	5.67	3.8	3.2	7.58e-007	8.96e-007	8.21e-007
6	2	0.07189	0.723	9.61	2.1	1.1	1.30e-006	2.41e-006	1.69e-006
7	1	0.06554	0.739	8.76	0.2	0.0	1.15e-005	0.00e+000	1.15e-005
8	0.5	0.05914	0.756	7.91	0.9	0.0	2.88e-006	0.00e+000	2.88e-006
9	0.125	0.0497	0.780	6.64	3.7	0.0	7.35e-007	0.00e+000	7.35e-007
10	0.25	0.05157	0.775	6.89	0.9	0.0	3.01e-006	0.00e+000	3.01e-006
11	0.5	0.05657	0.762	7.56	0.9	0.0	2.94e-006	0.00e+000	2.94e-006
12	0.75	0.06059	0.752	8.10	3.9	1.3	6.94e-007	2.10e-006	1.04e-006
13	1	0.06357	0.744	8.50	0.2	0.0	1.18e-005	0.00e+000	1.18e-005
14	2	0.07577	0.713	10.13	0.9	0.4	2.80e-006	7.14e-006	4.02e-006
15	4	0.1094	0.628	14.62	2.1	0.0	1.17e-006	0.00e+000	1.17e-006
16	8	0.1468	0.532	19.63	2.1	0.0	1.04e-006	0.00e+000	1.04e-006
17	16	0.1861	0.432	24.88	2.1	0.0	9.17e-007	0.00e+000	9.17e-007
18	32	0.2266	0.329	30.29	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
19	16	0.2155	0.357	28.81	0.0	0.0	6.68e-005	0.00e+000	6.68e-005
20	4	0.1974	0.403	26.38	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
21	1	0.1751	0.460	23.40	11.4	0.0	1.58e-007	0.00e+000	1.58e-007
22	0.5	0.1661	0.483	22.21	8.8	0.0	2.16e-007	0.00e+000	2.16e-007
23	0.125	0.153	0.517	20.45	32.0	0.0	6.18e-008	0.00e+000	6.18e-008

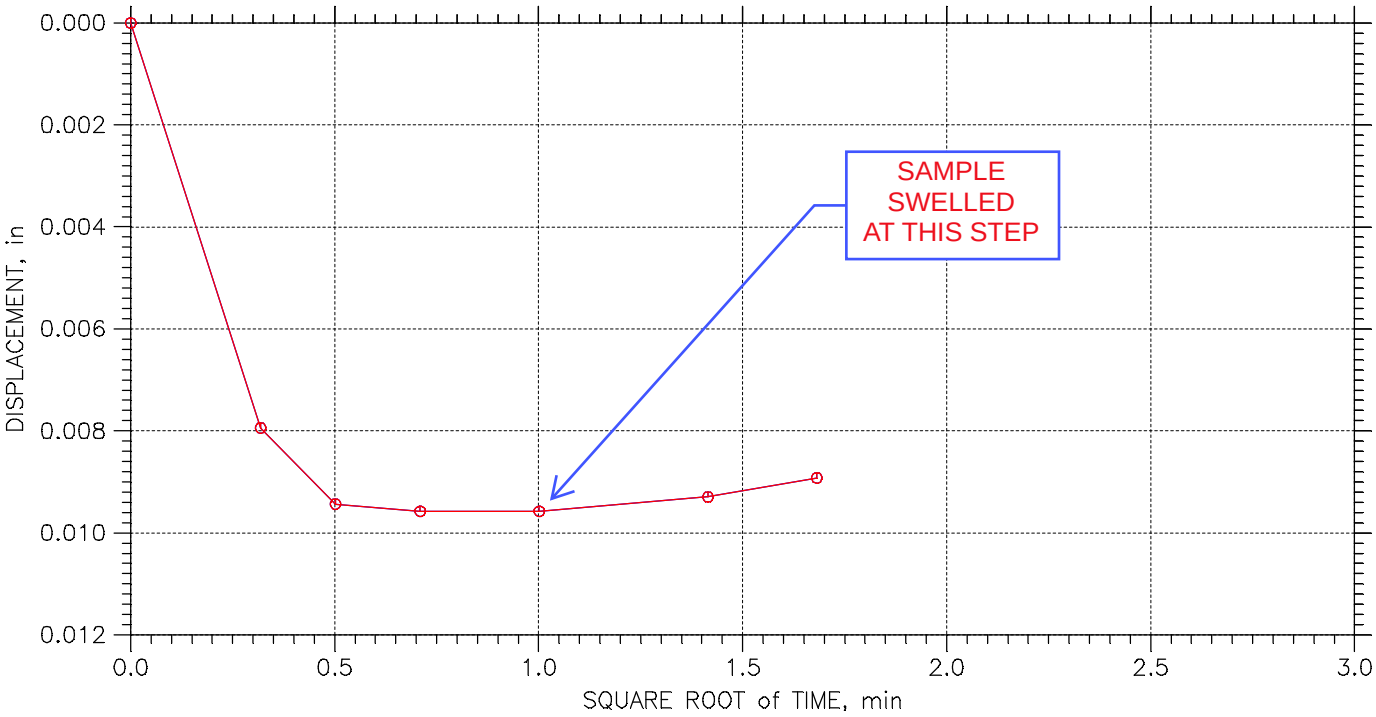
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





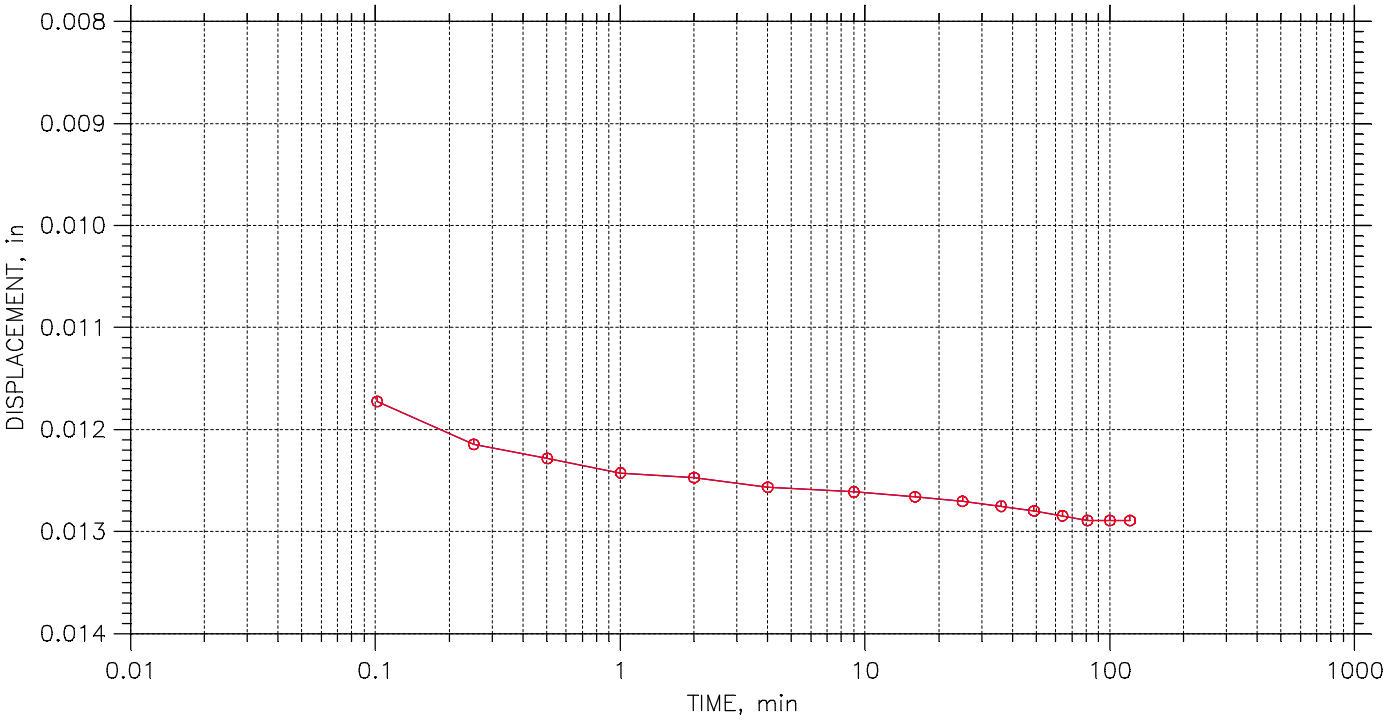
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

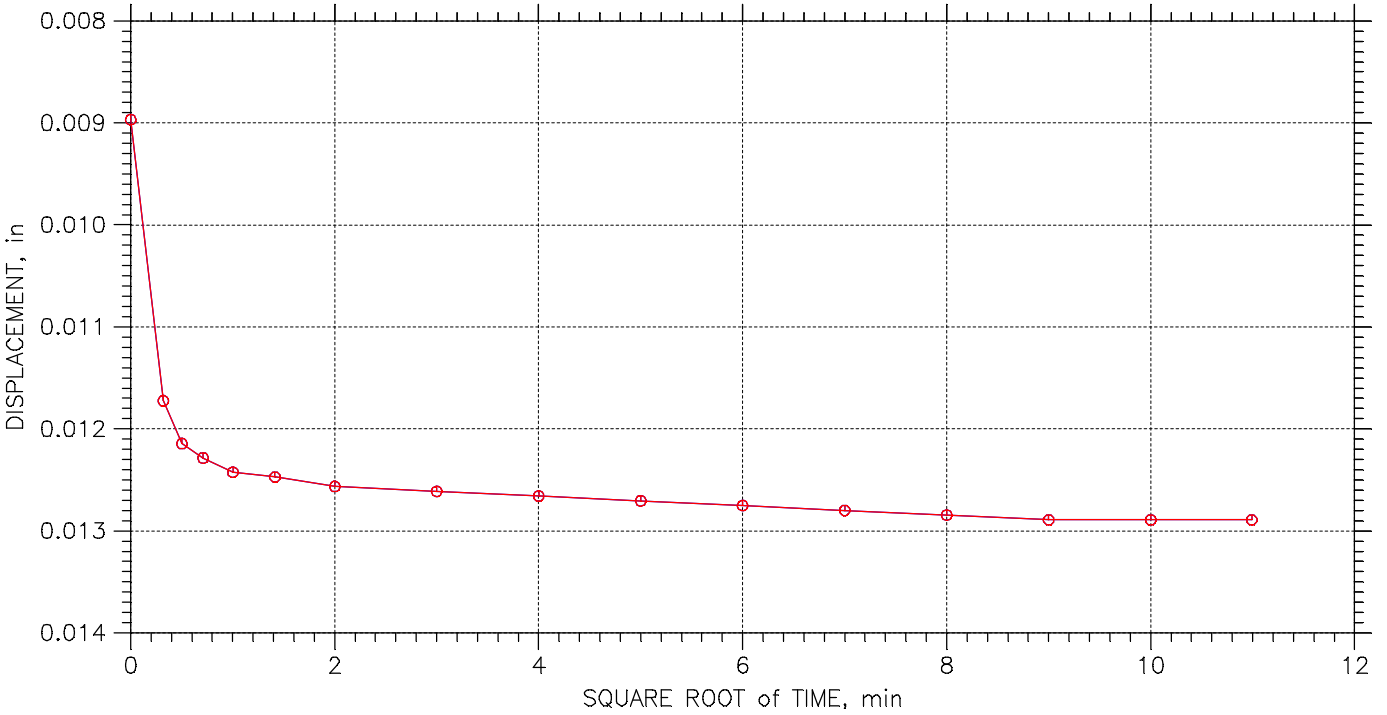
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





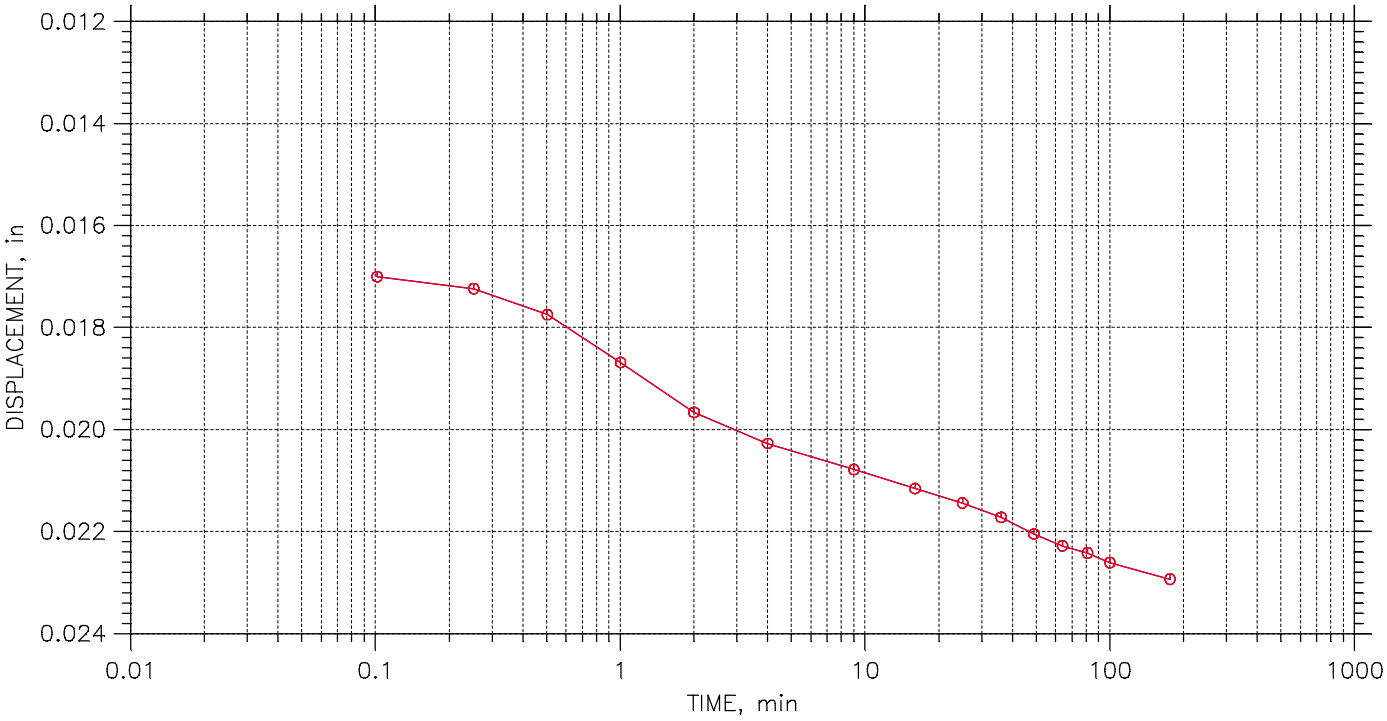
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

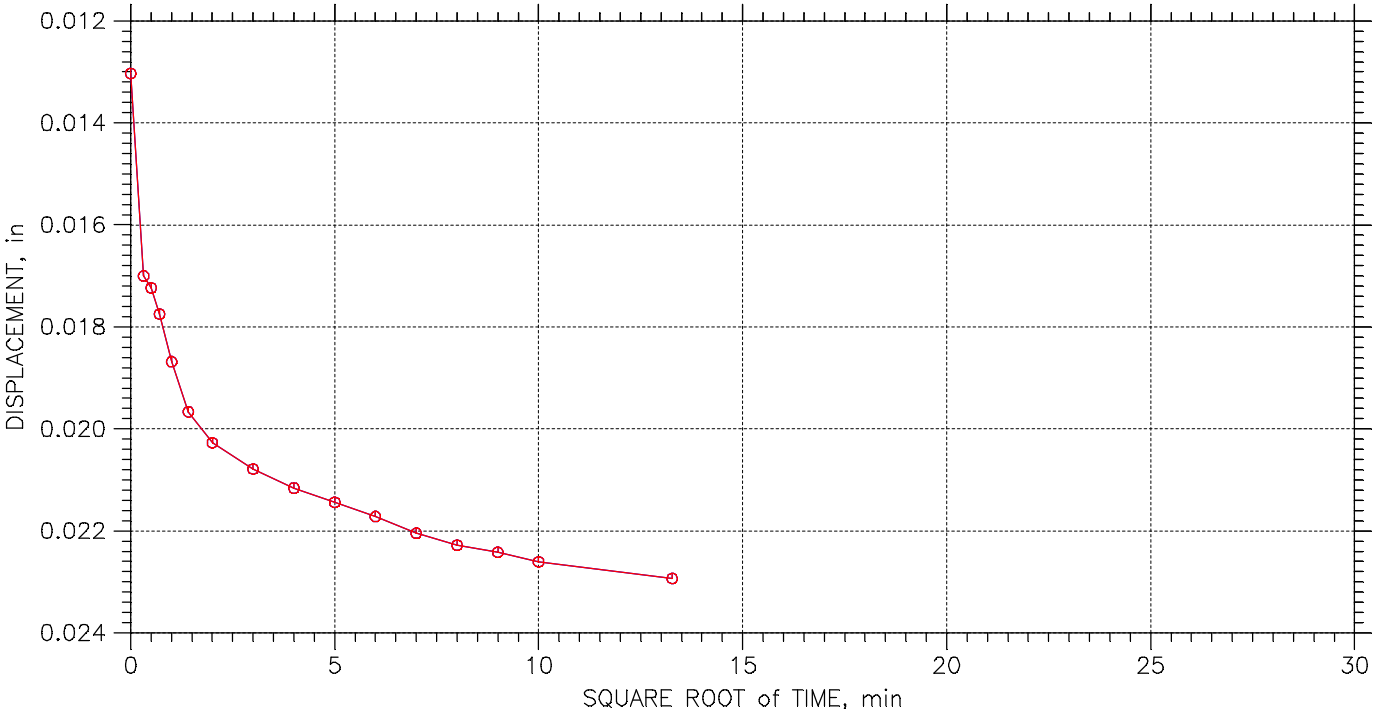
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





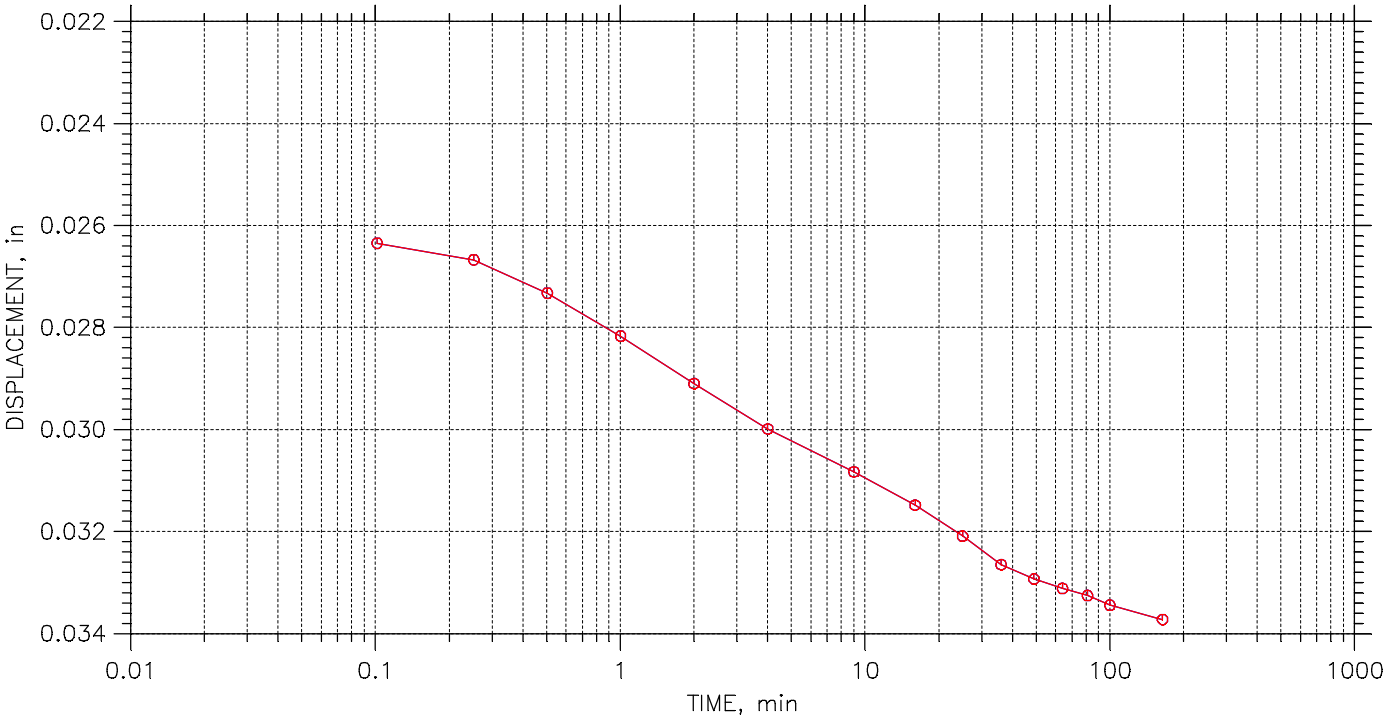
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

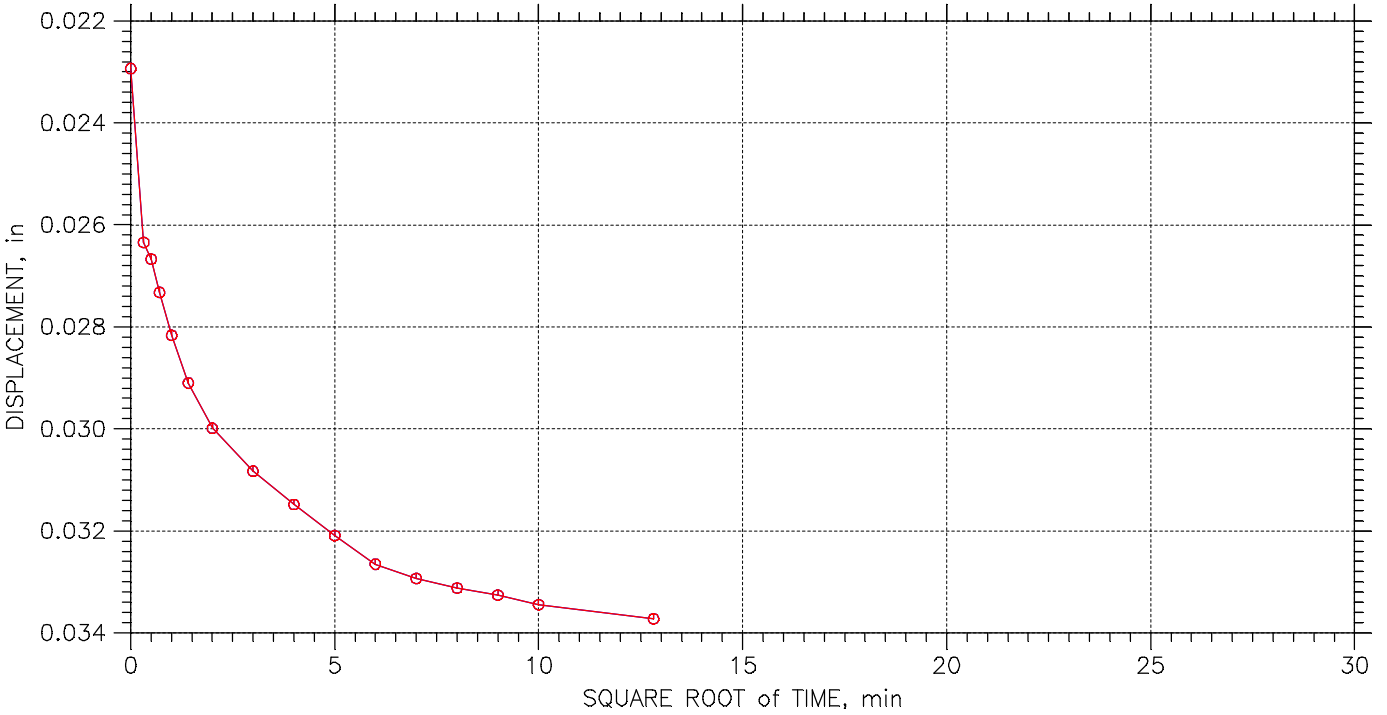
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





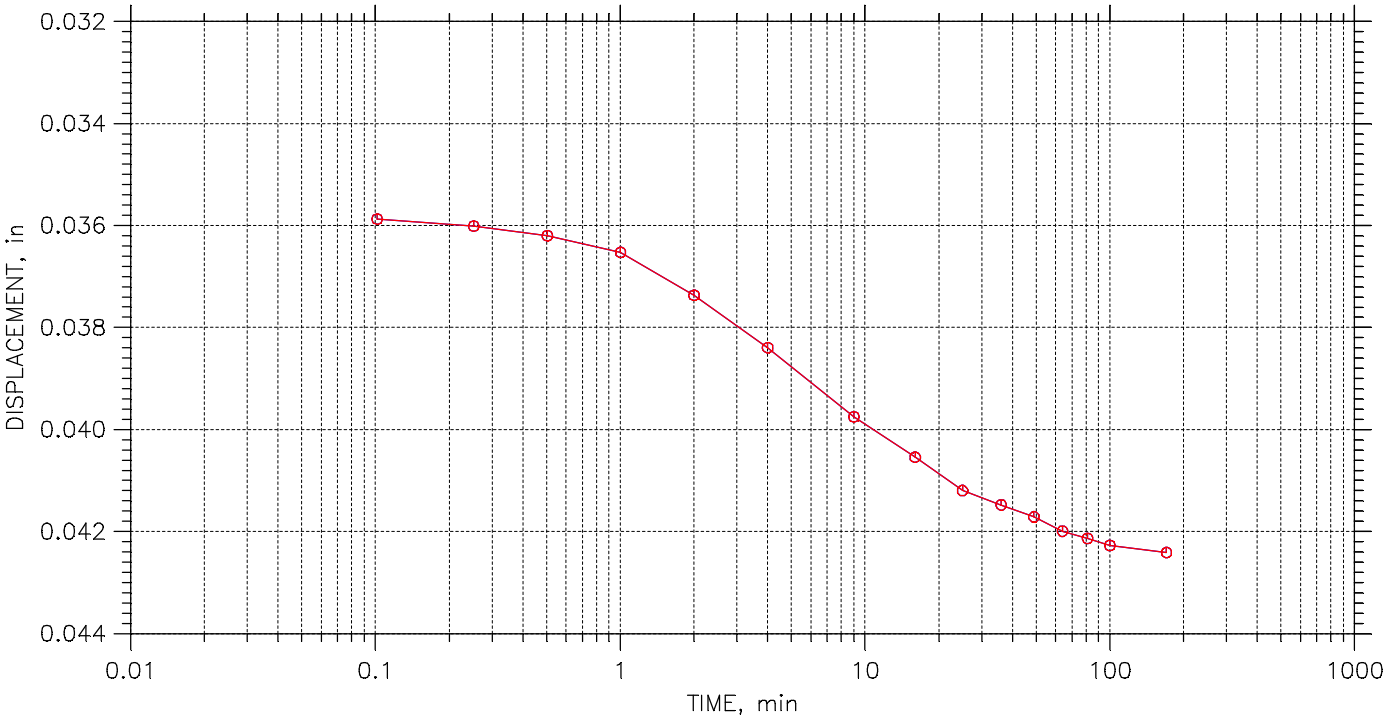
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

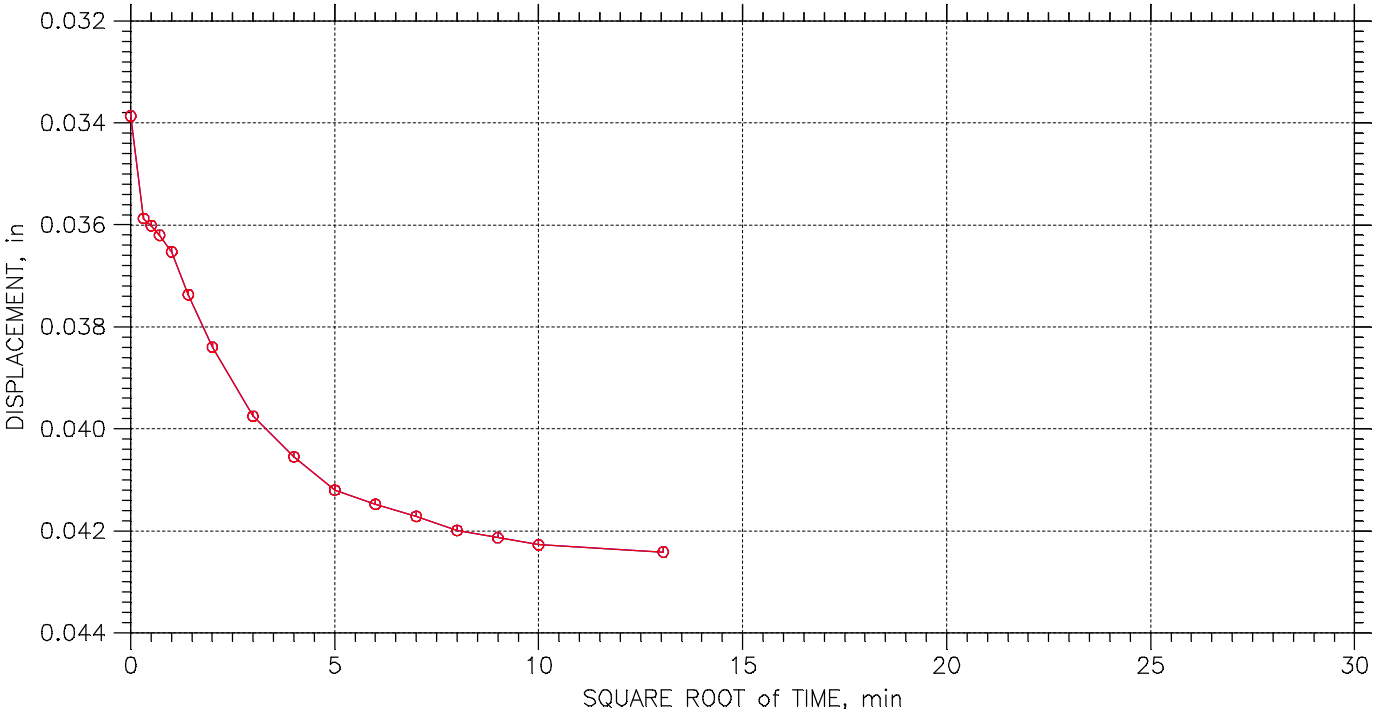
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





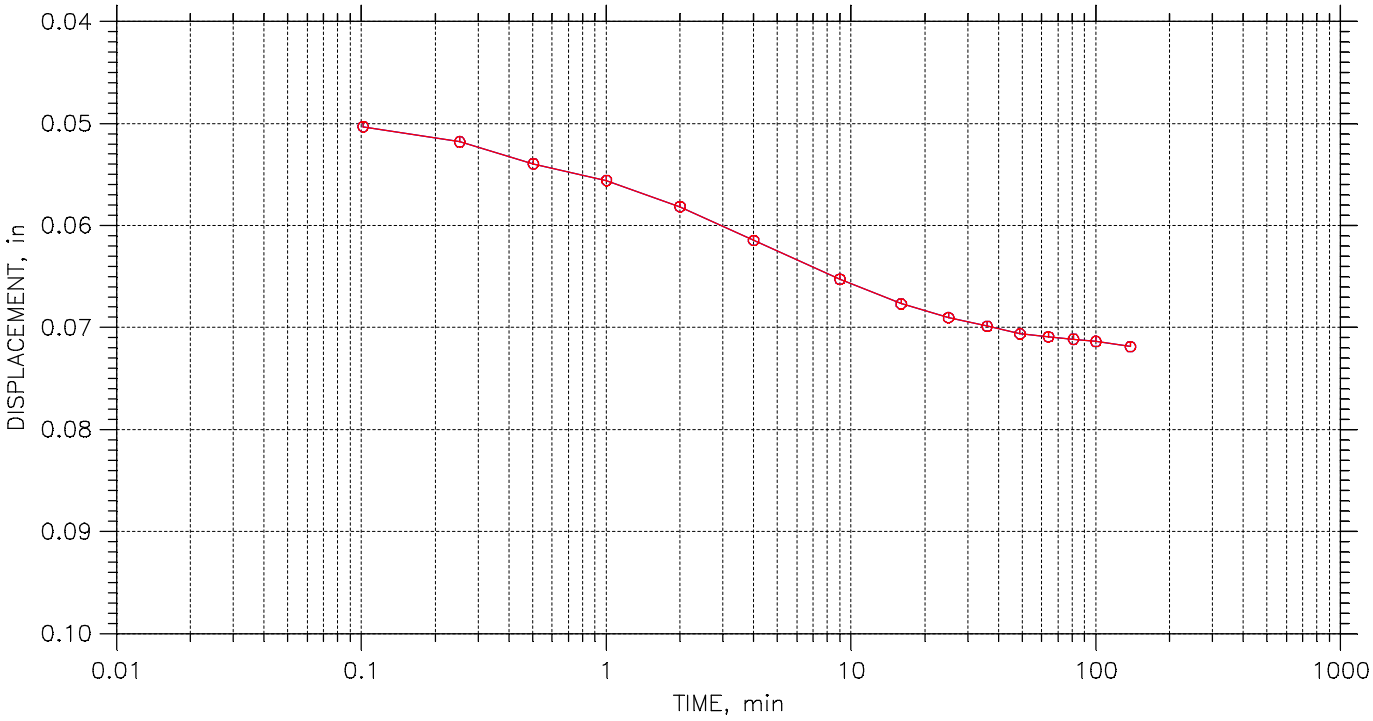
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

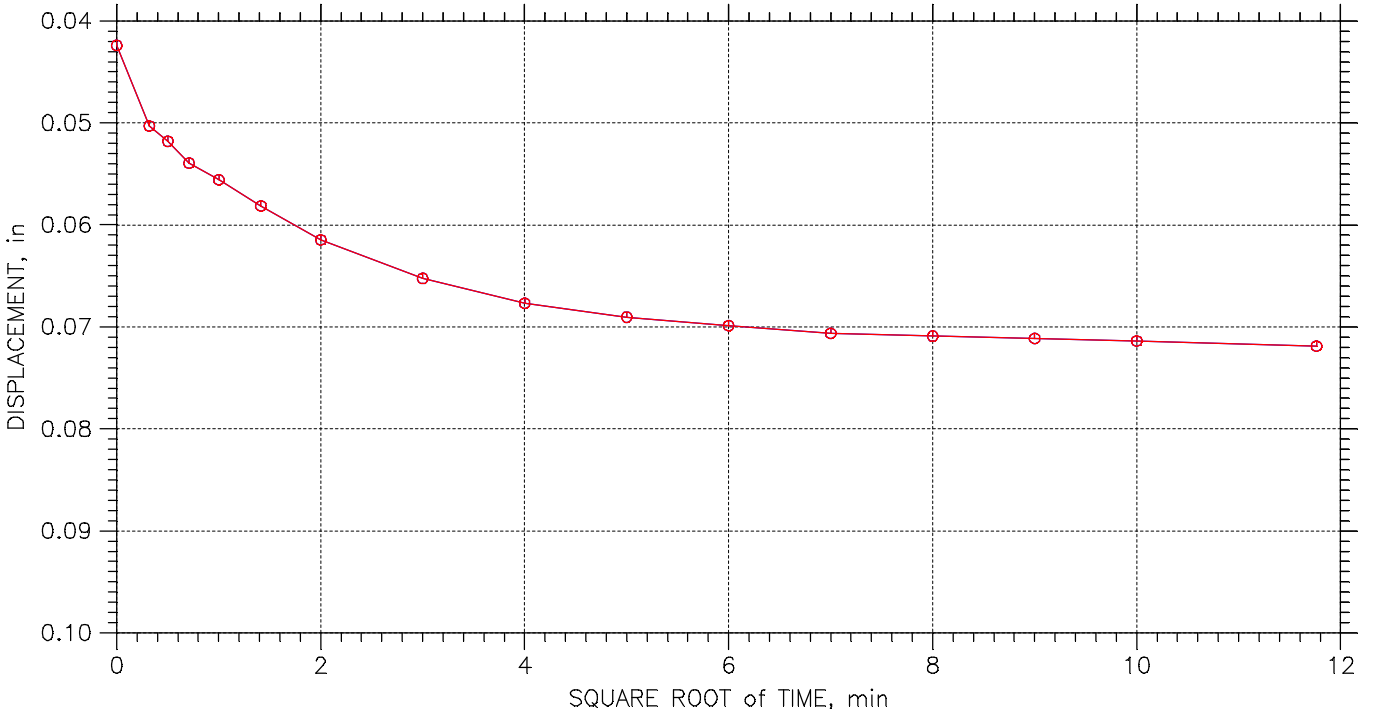
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





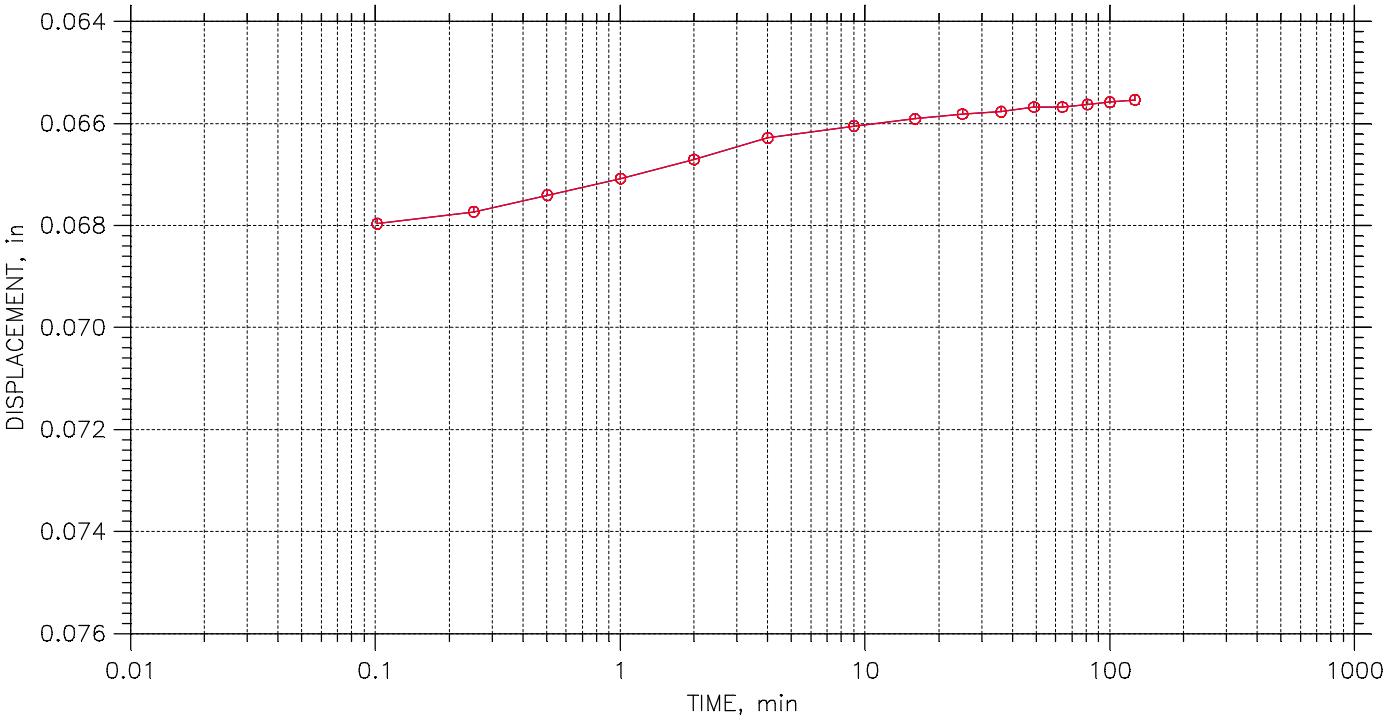
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

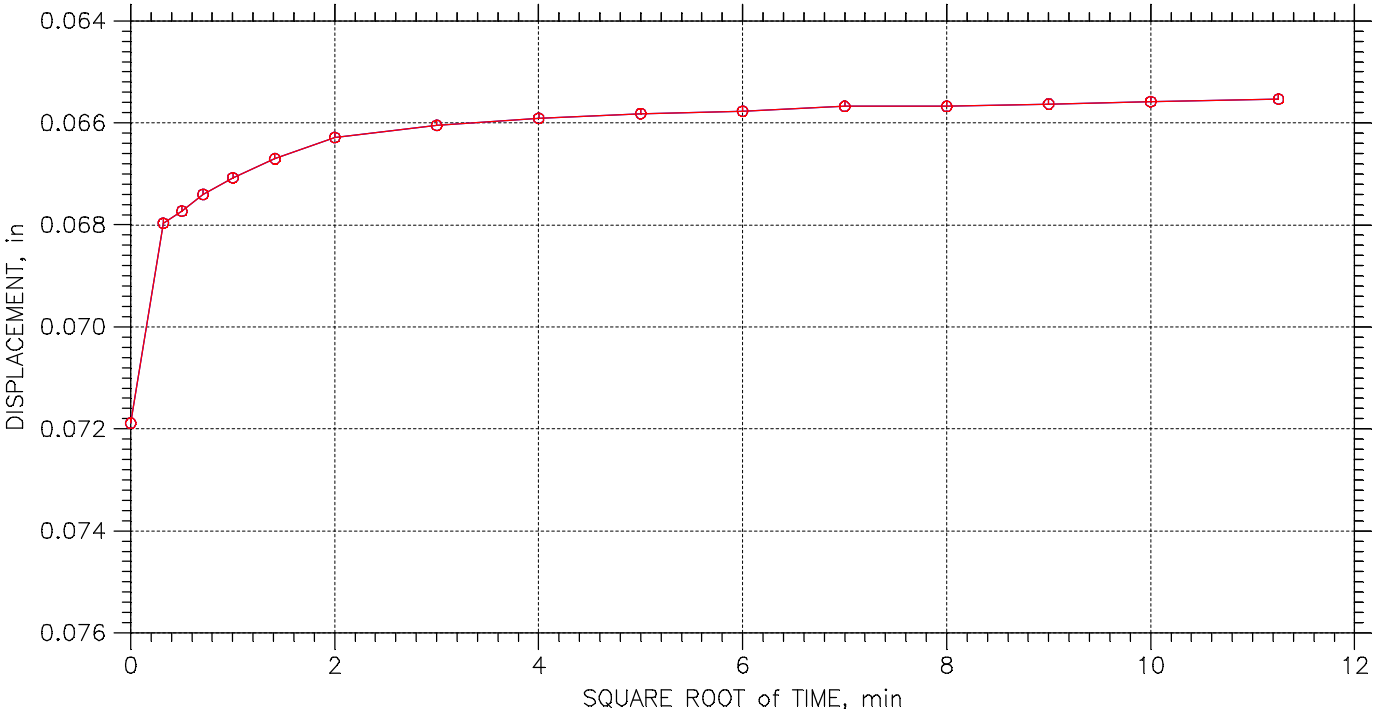
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





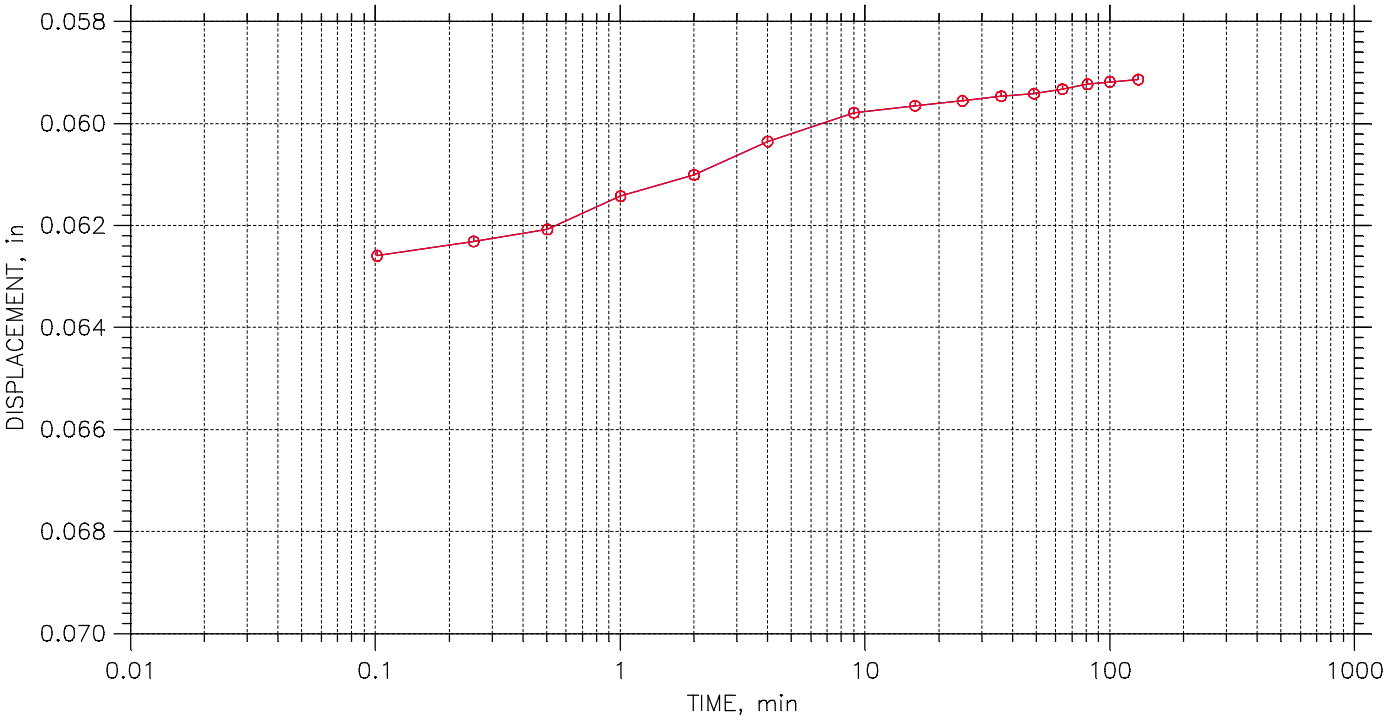
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

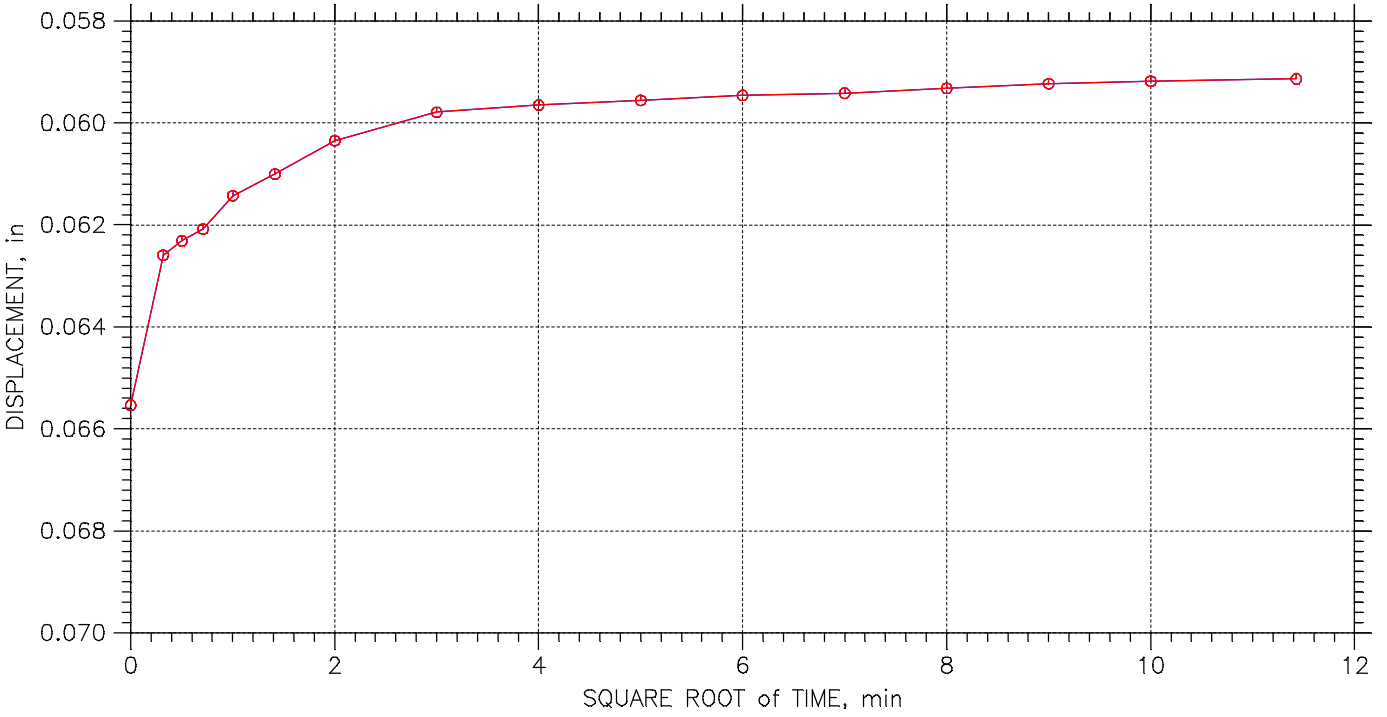
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





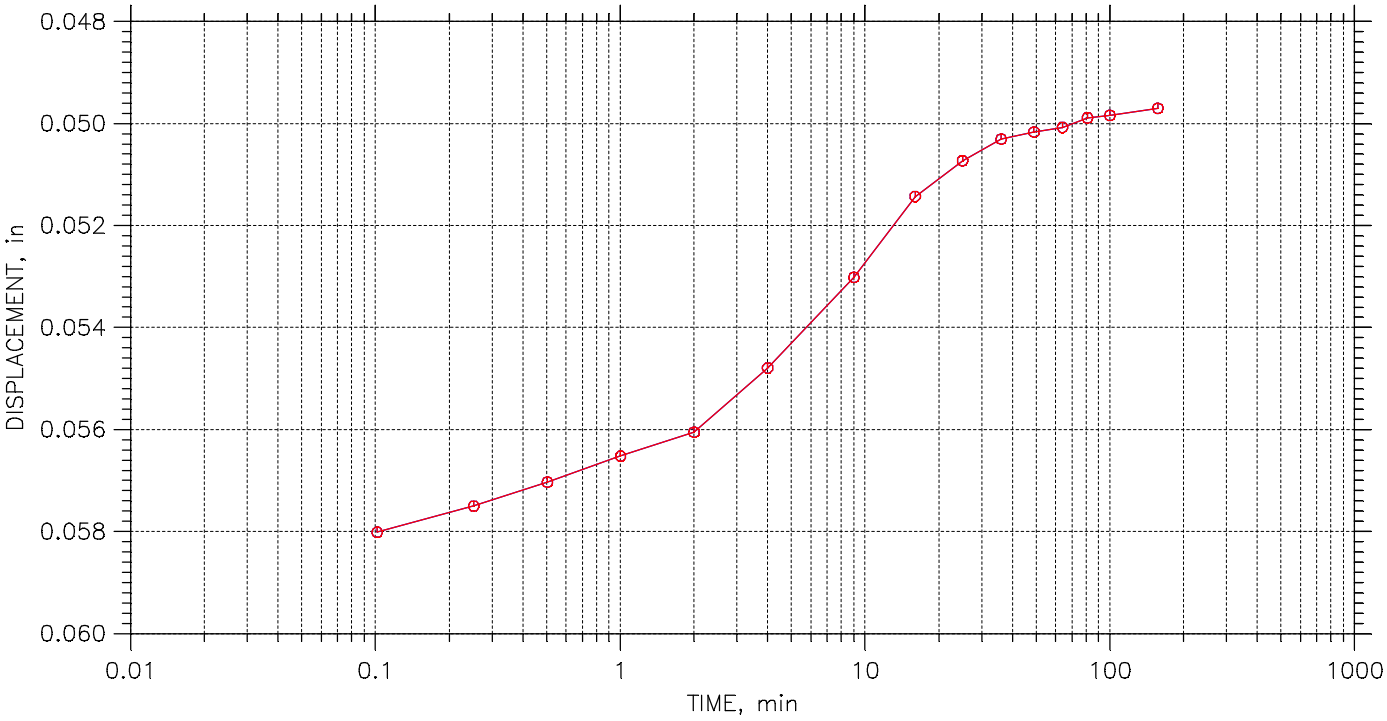
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

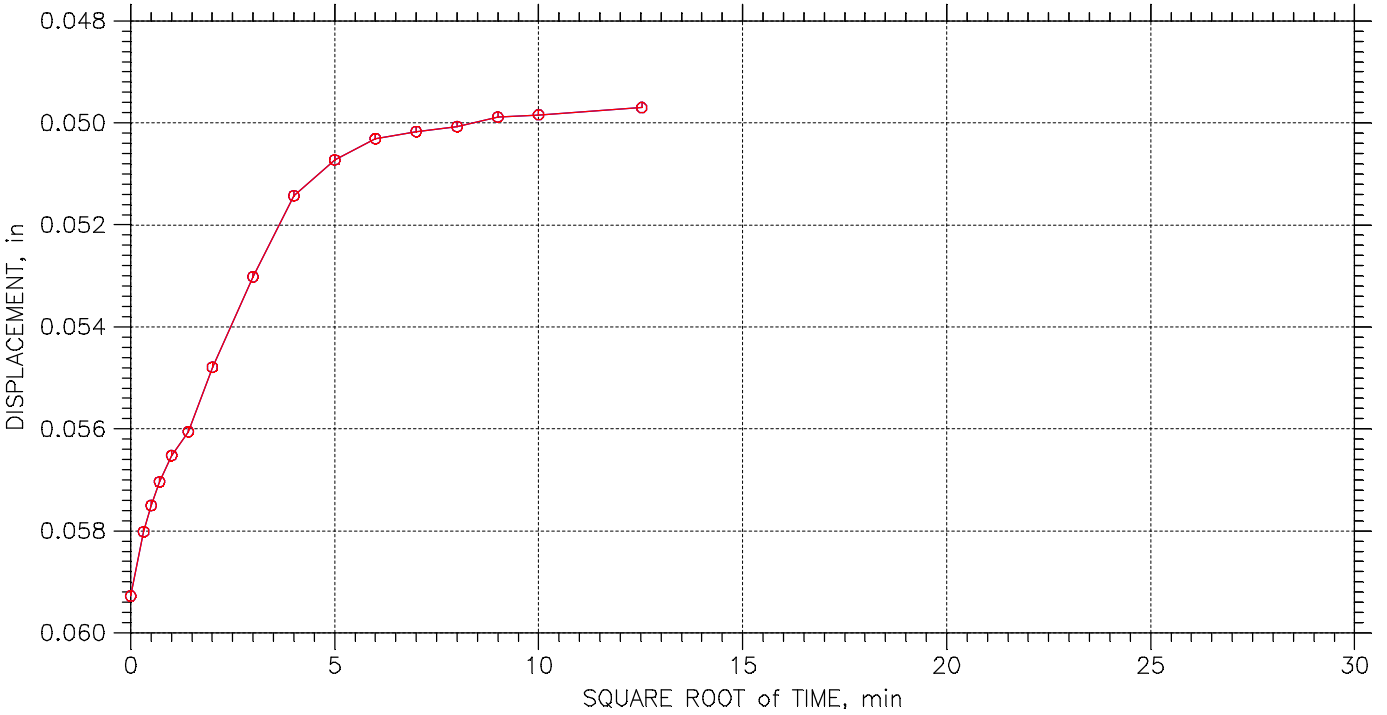
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





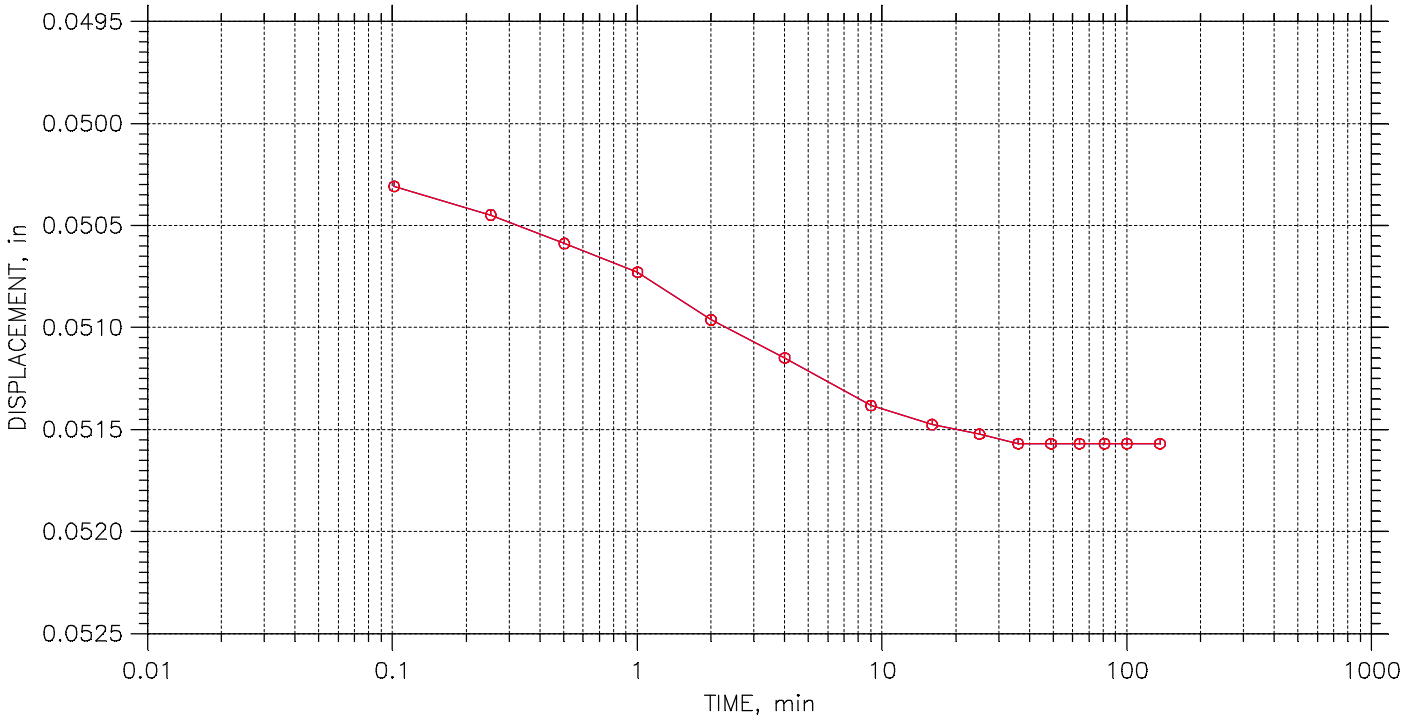
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

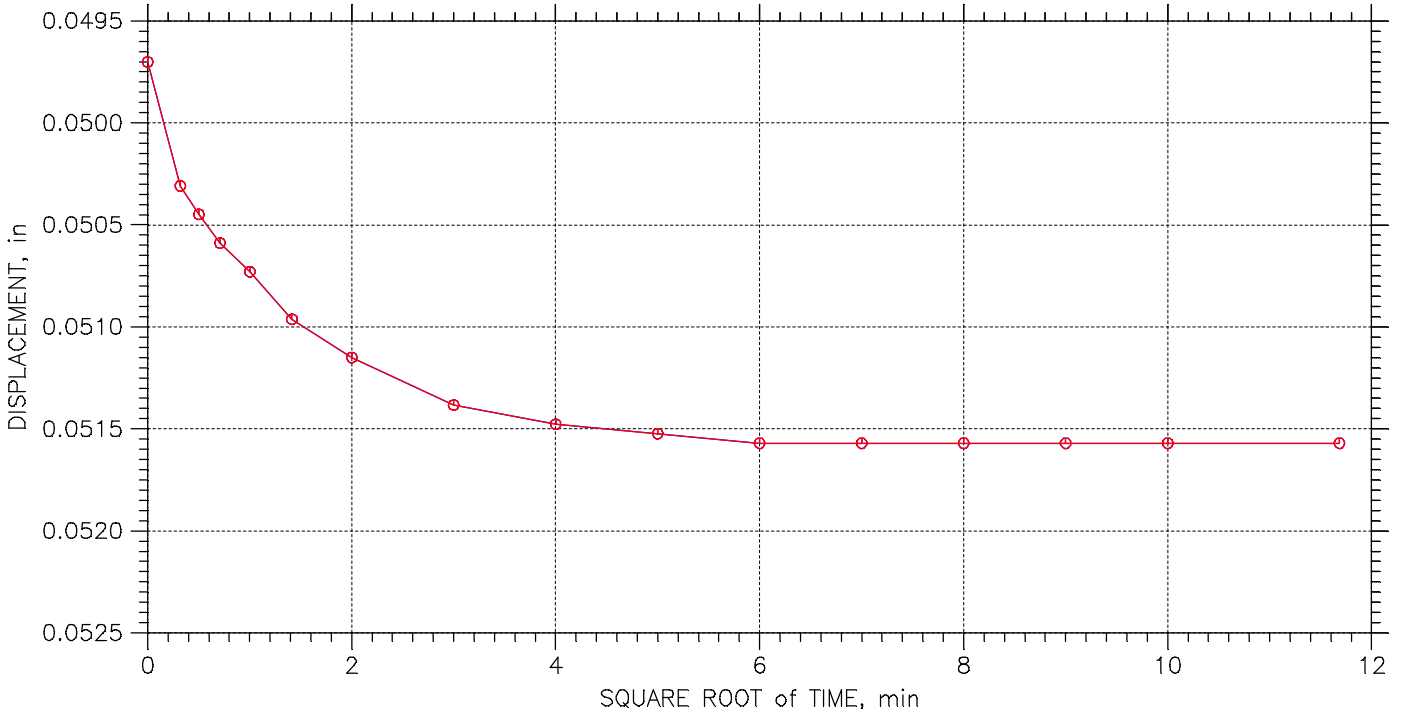
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





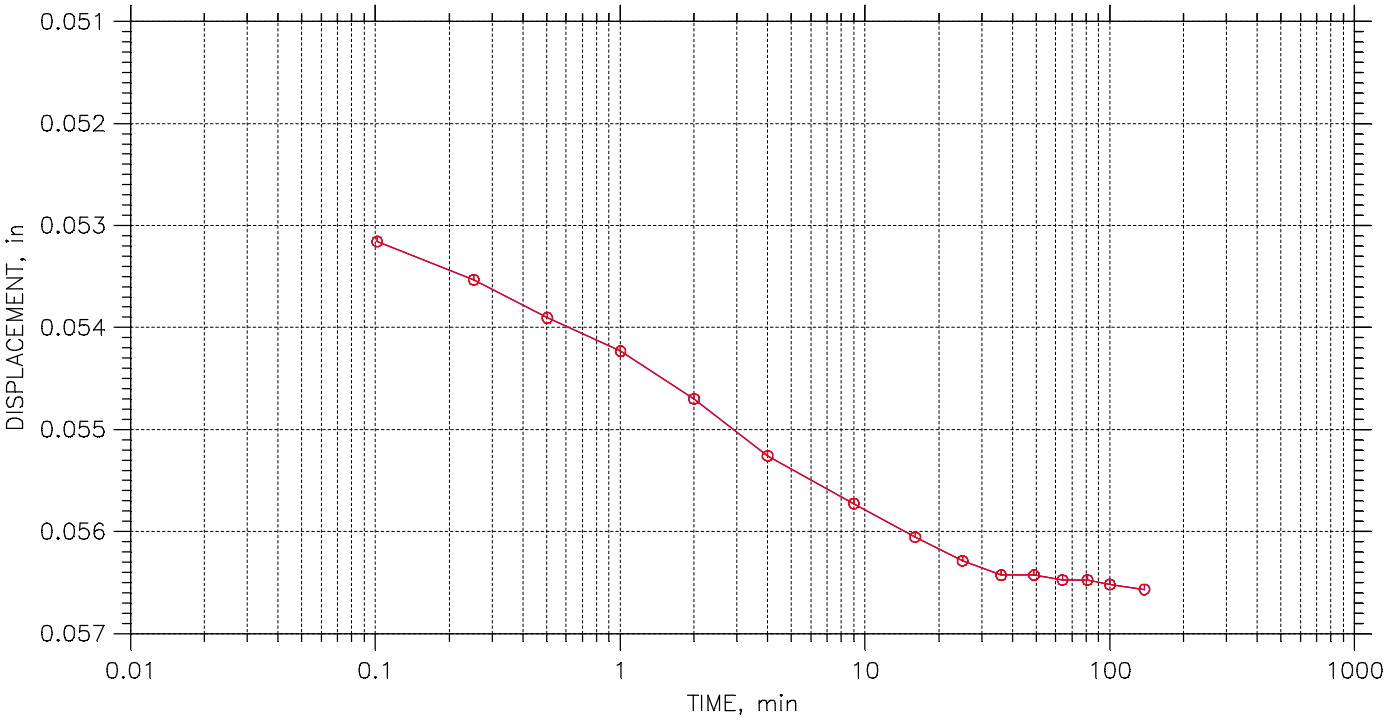
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

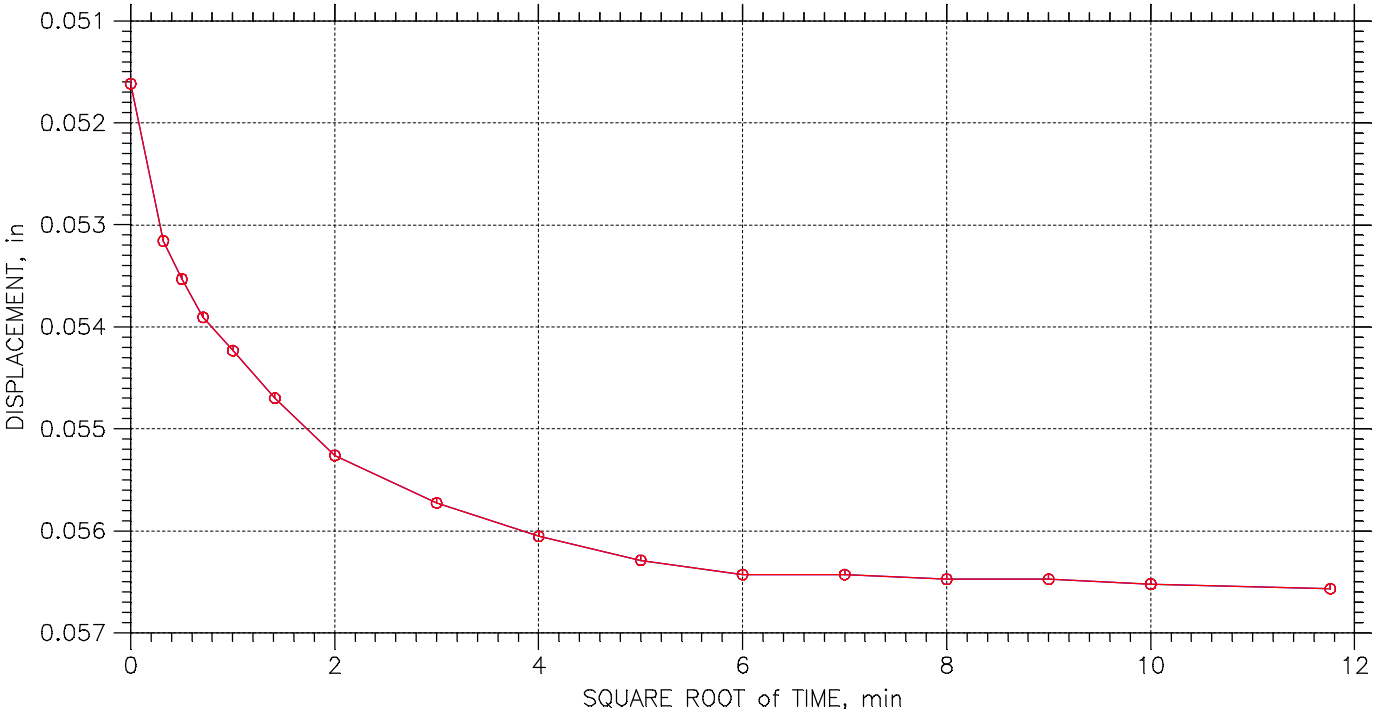
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





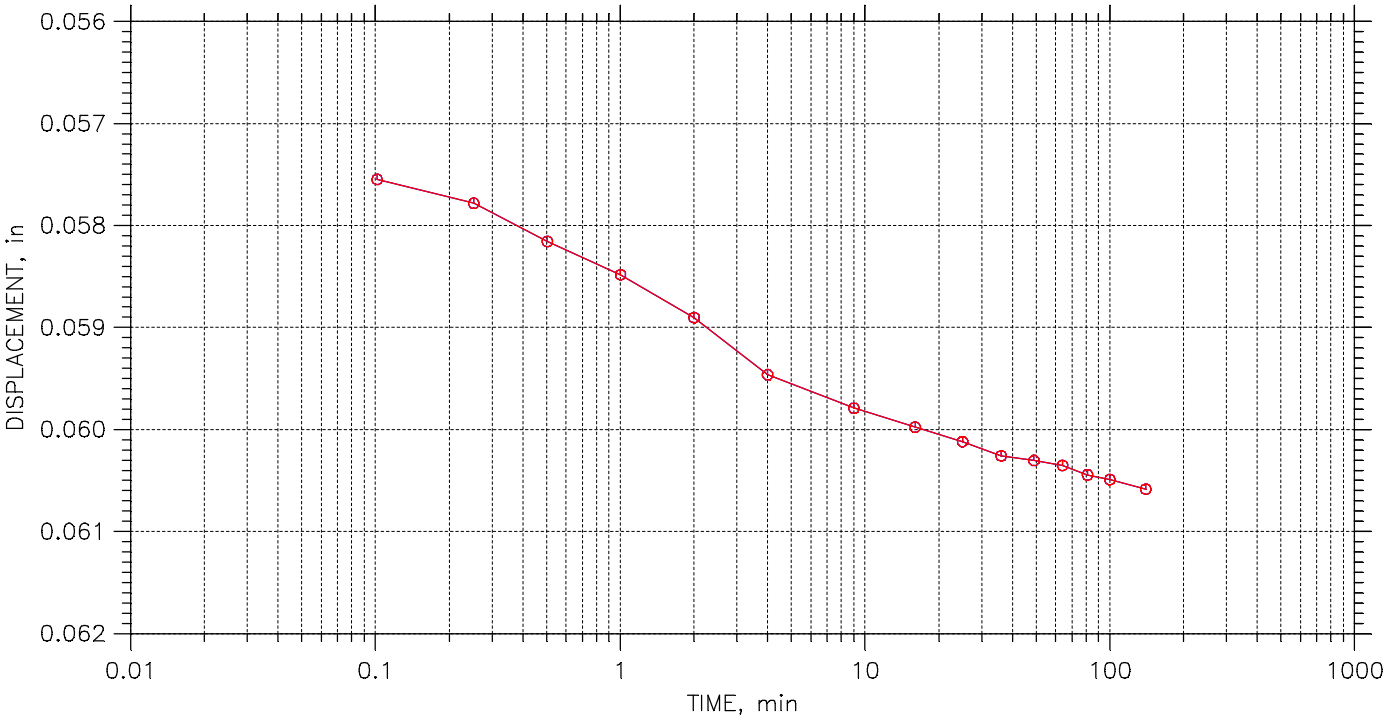
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

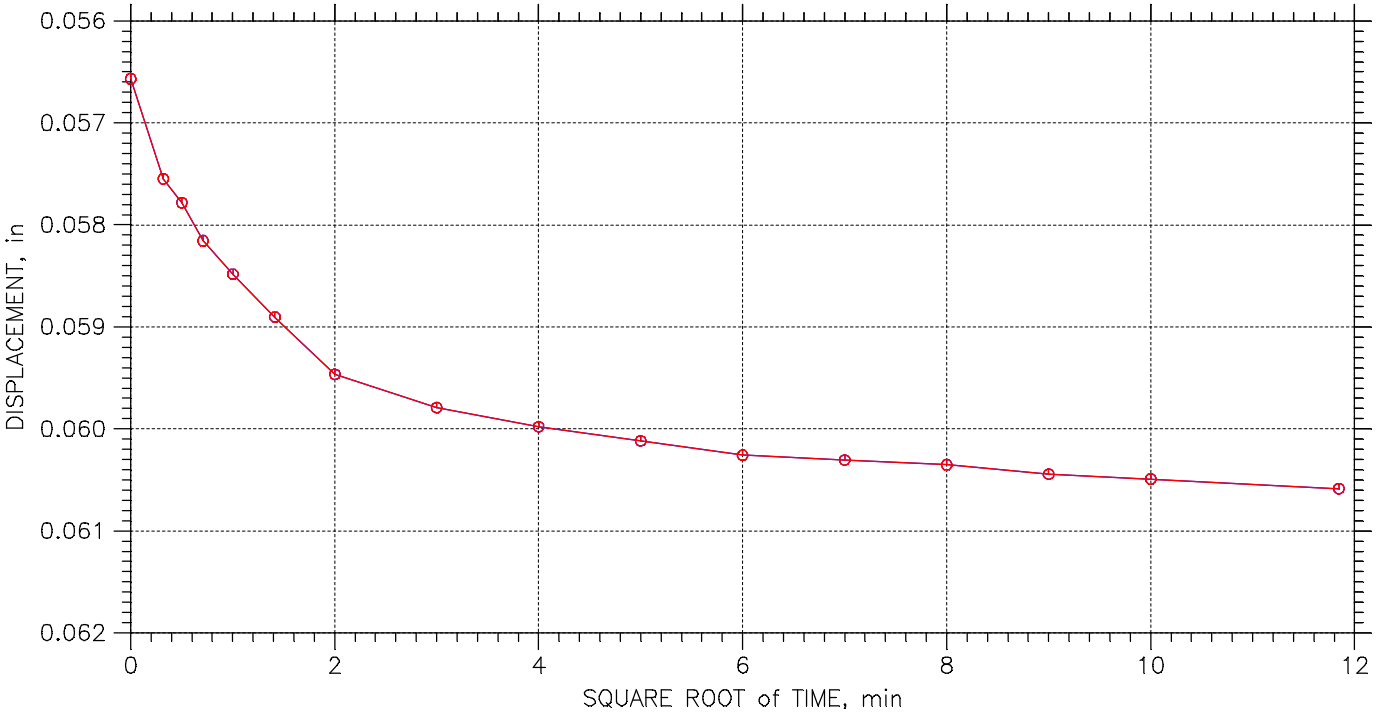
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





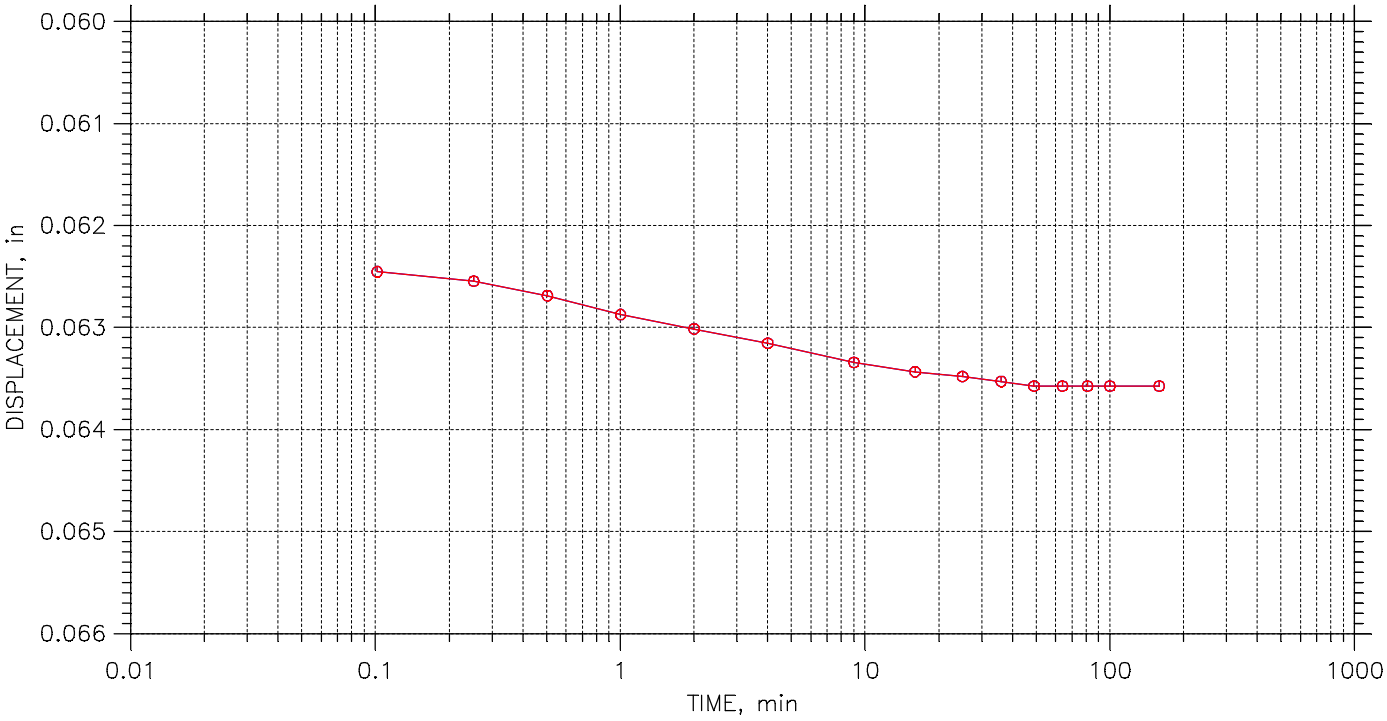
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

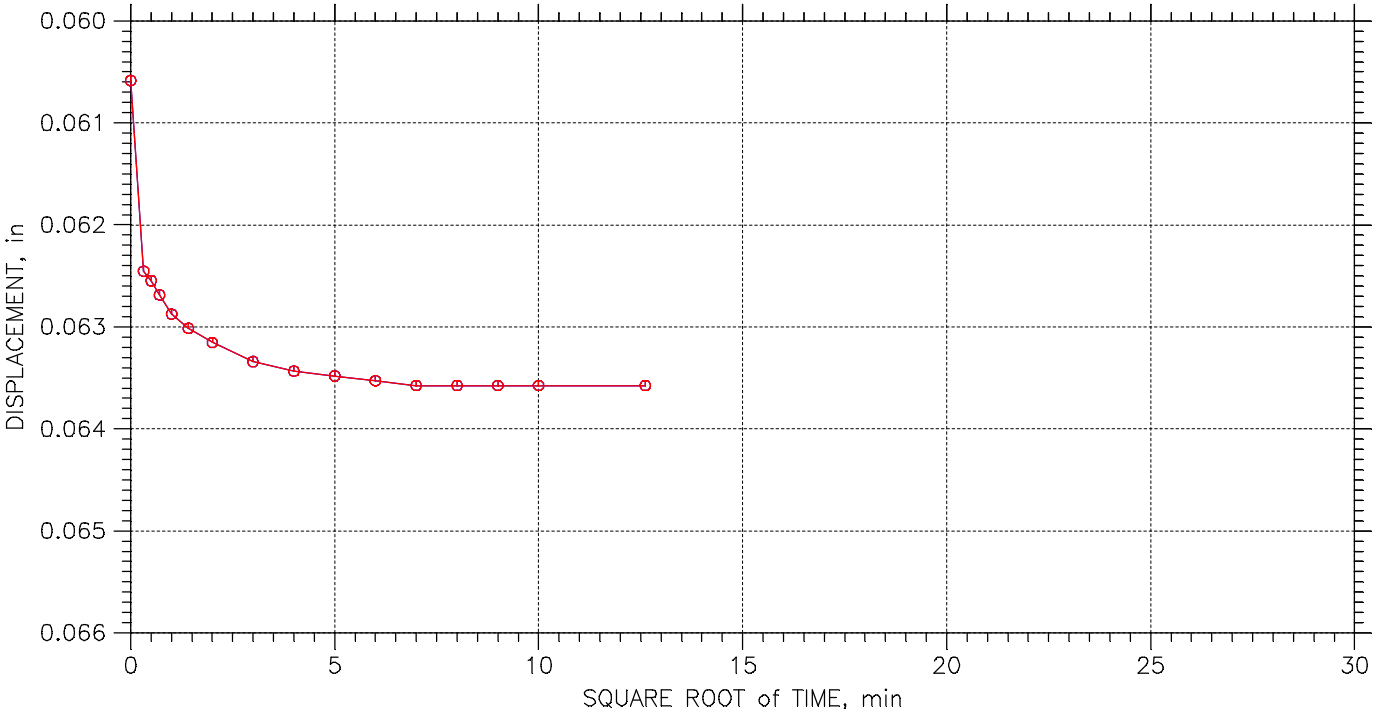
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





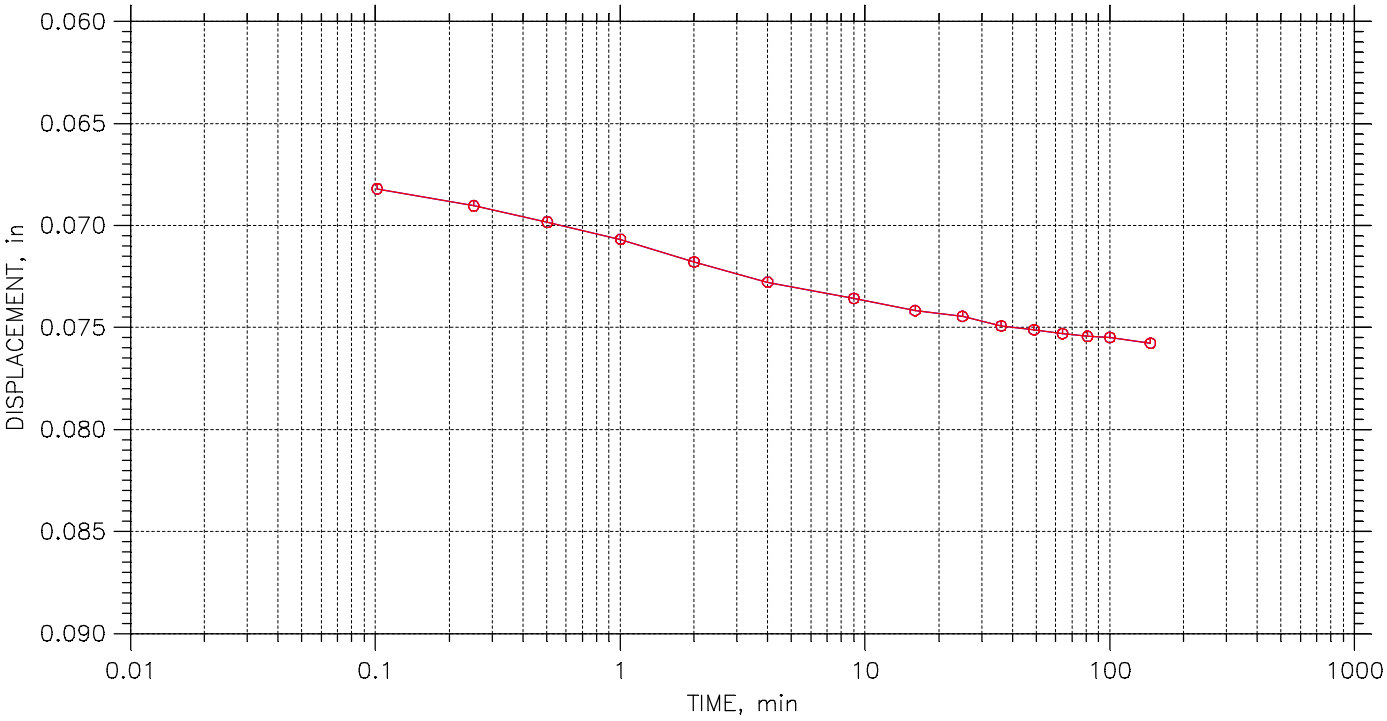
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

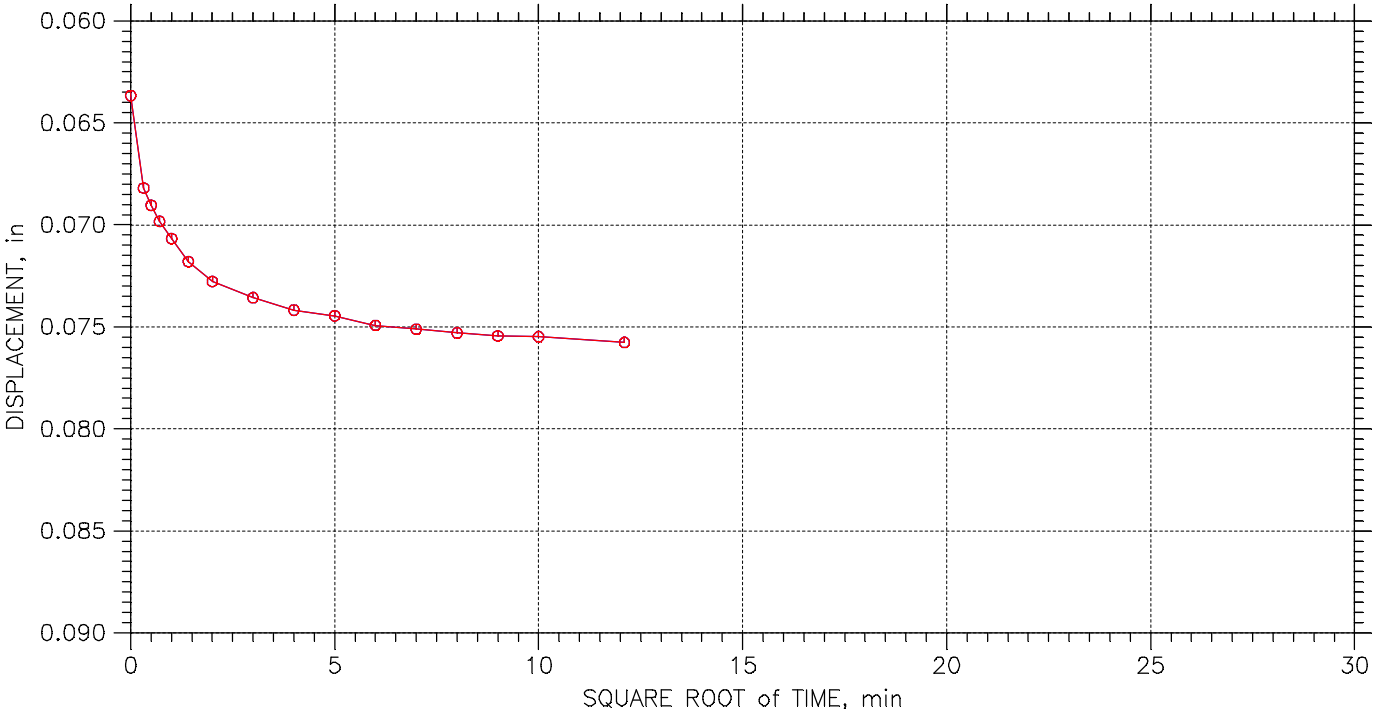
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





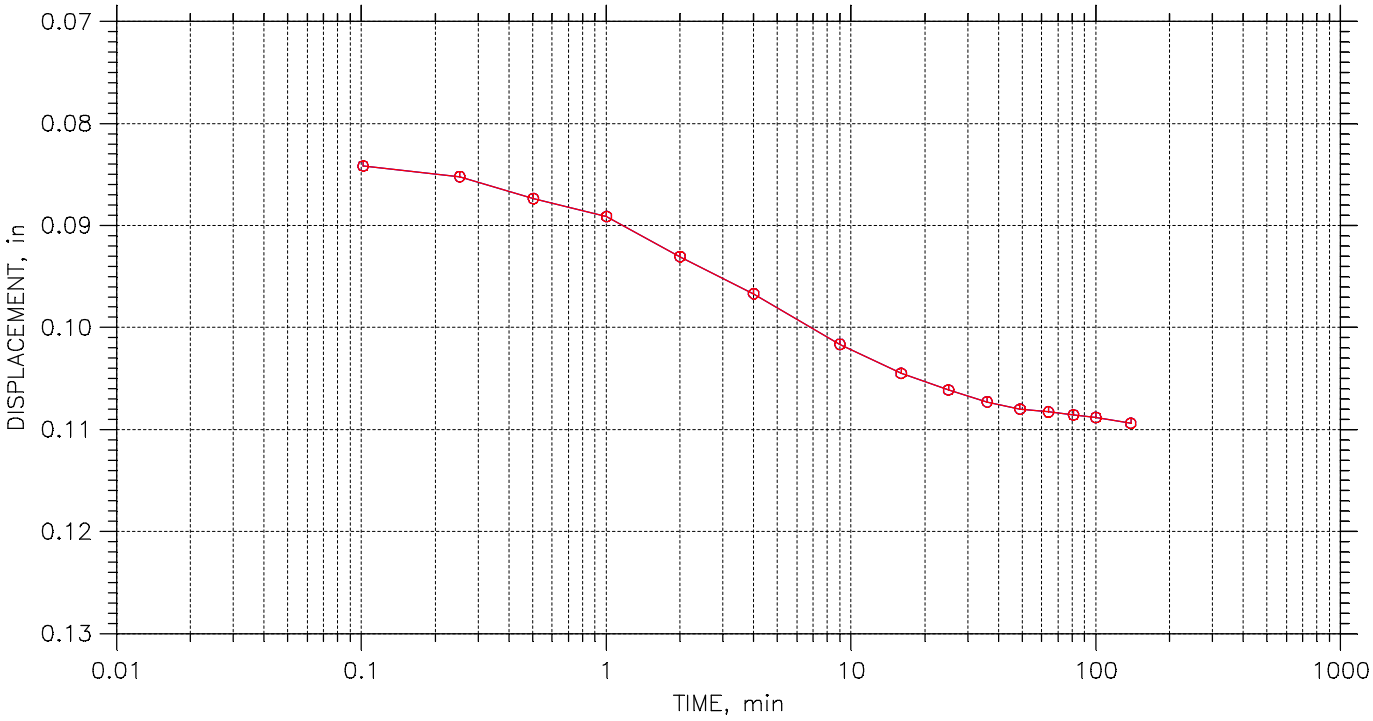
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

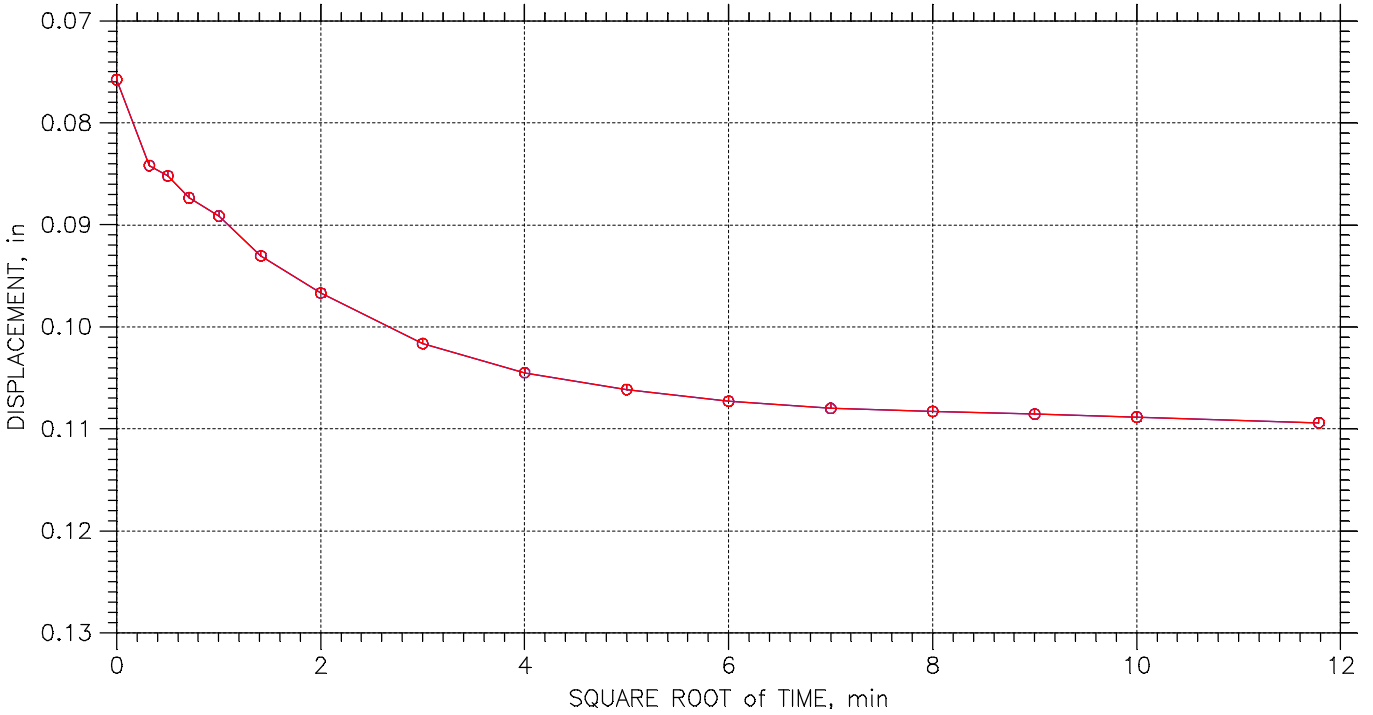
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





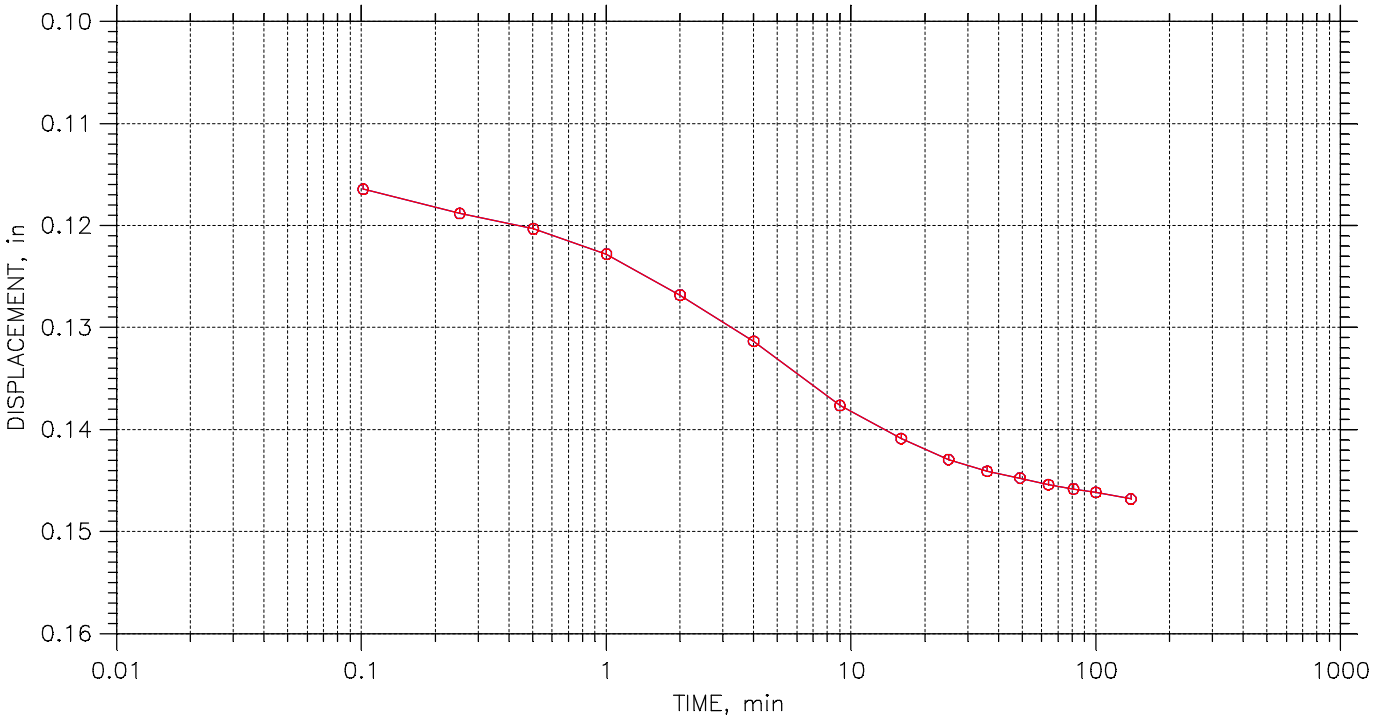
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

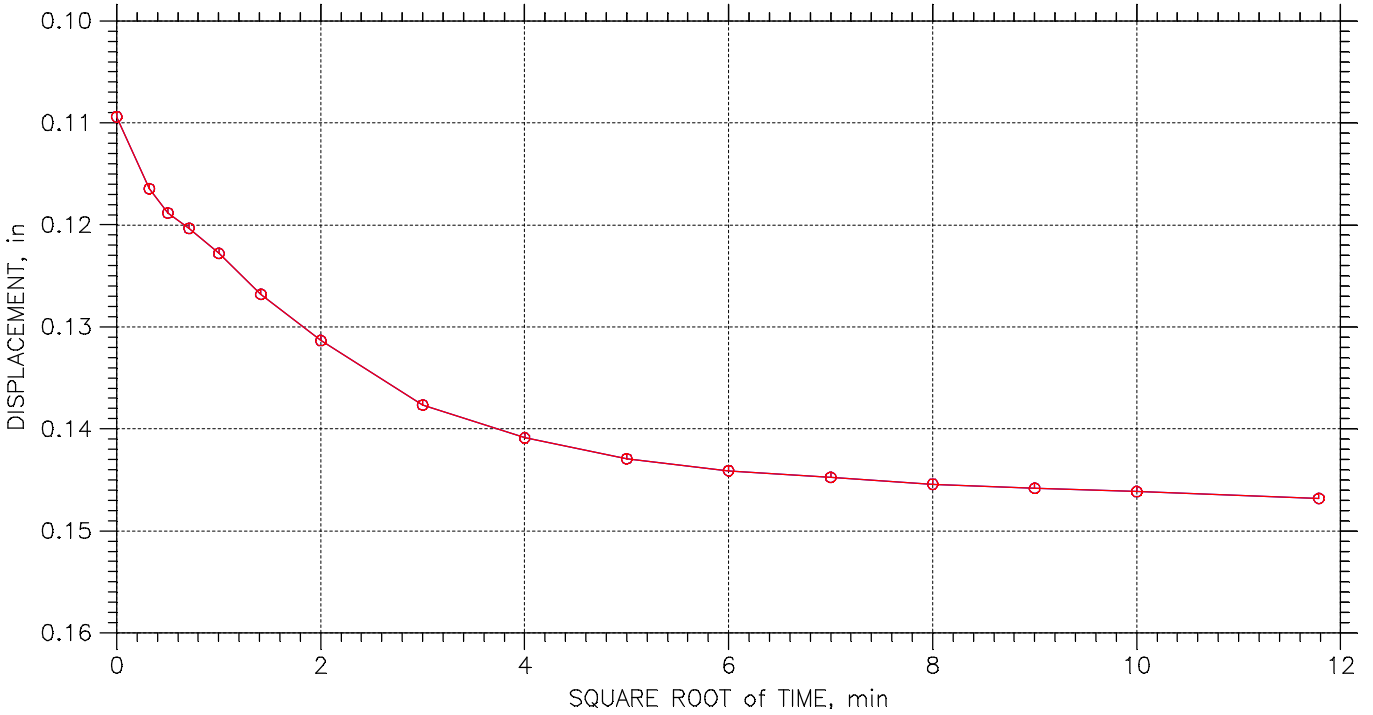
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





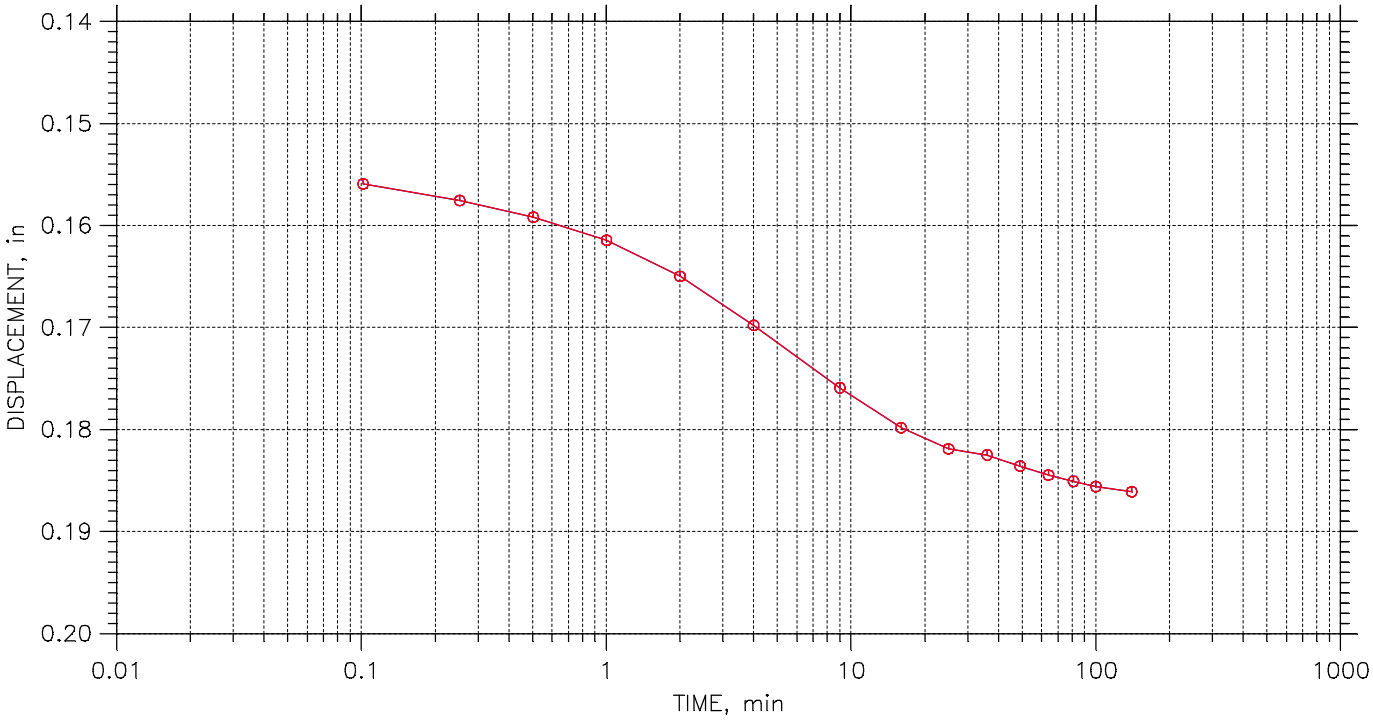
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

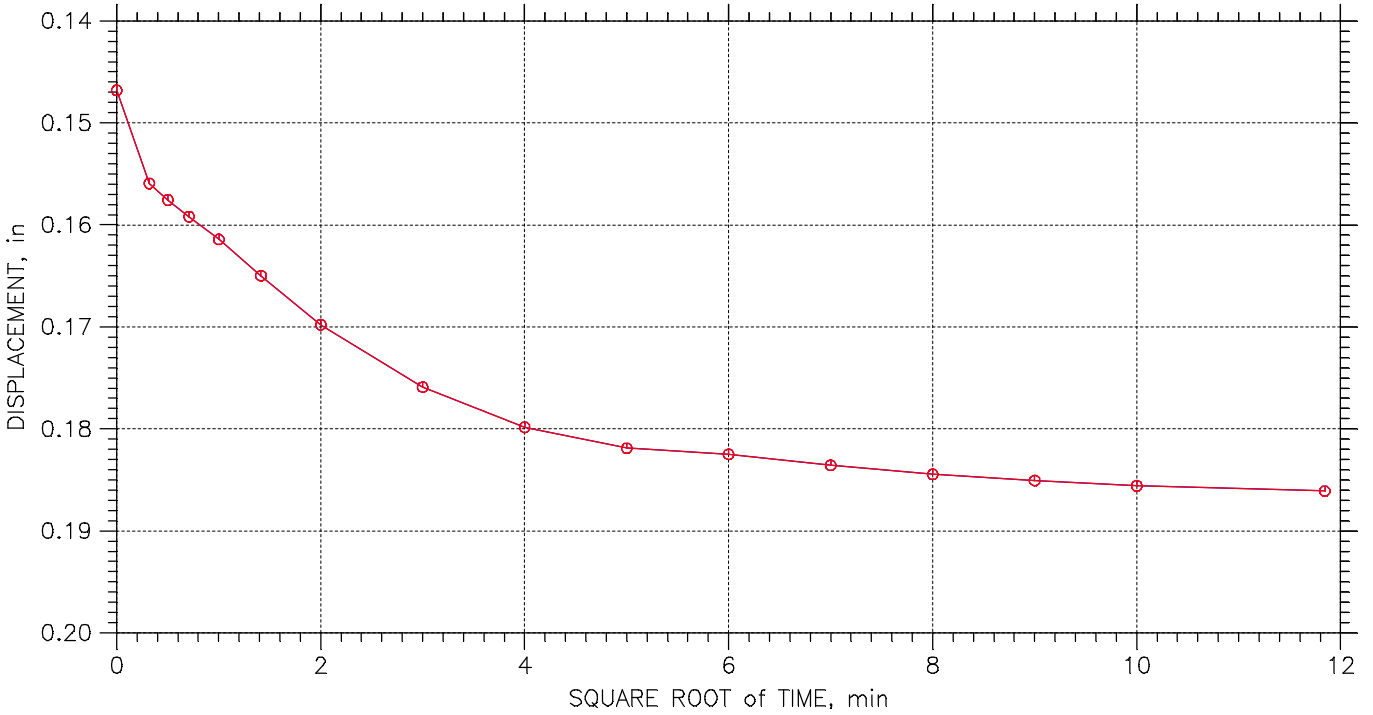
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





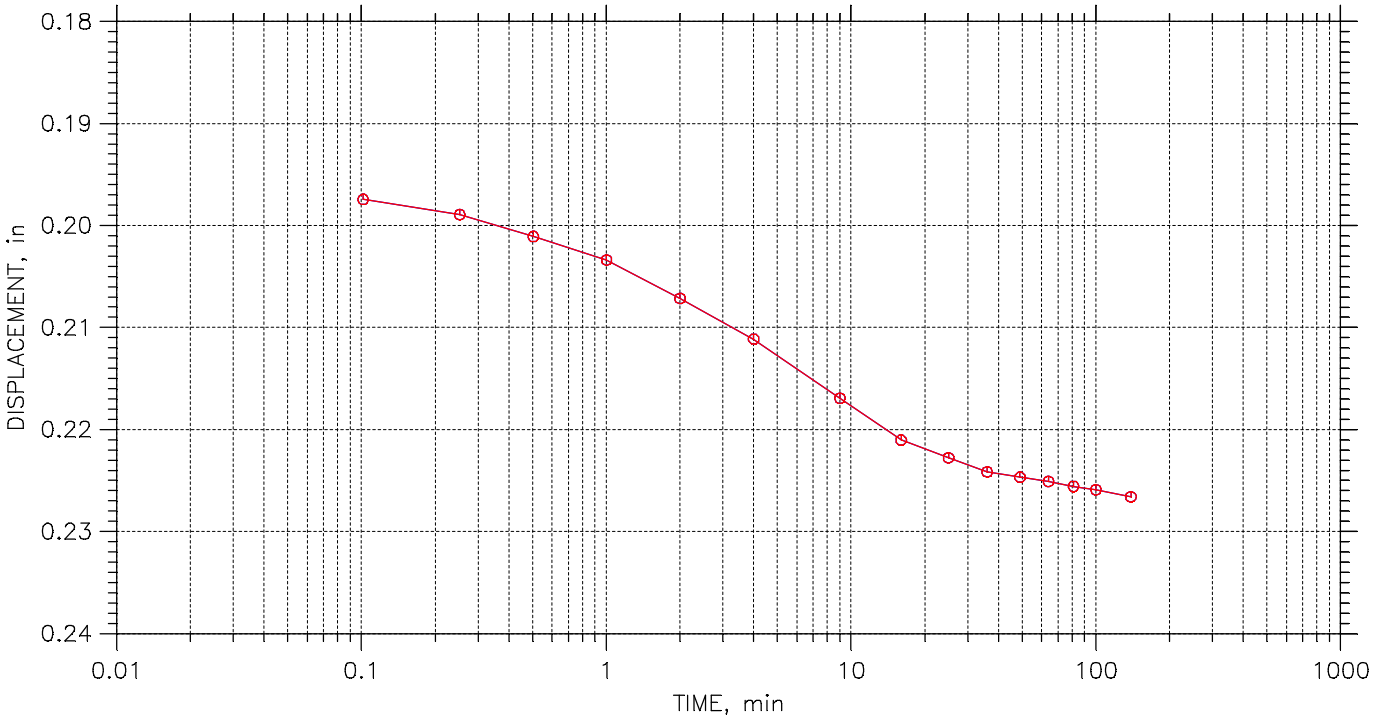
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

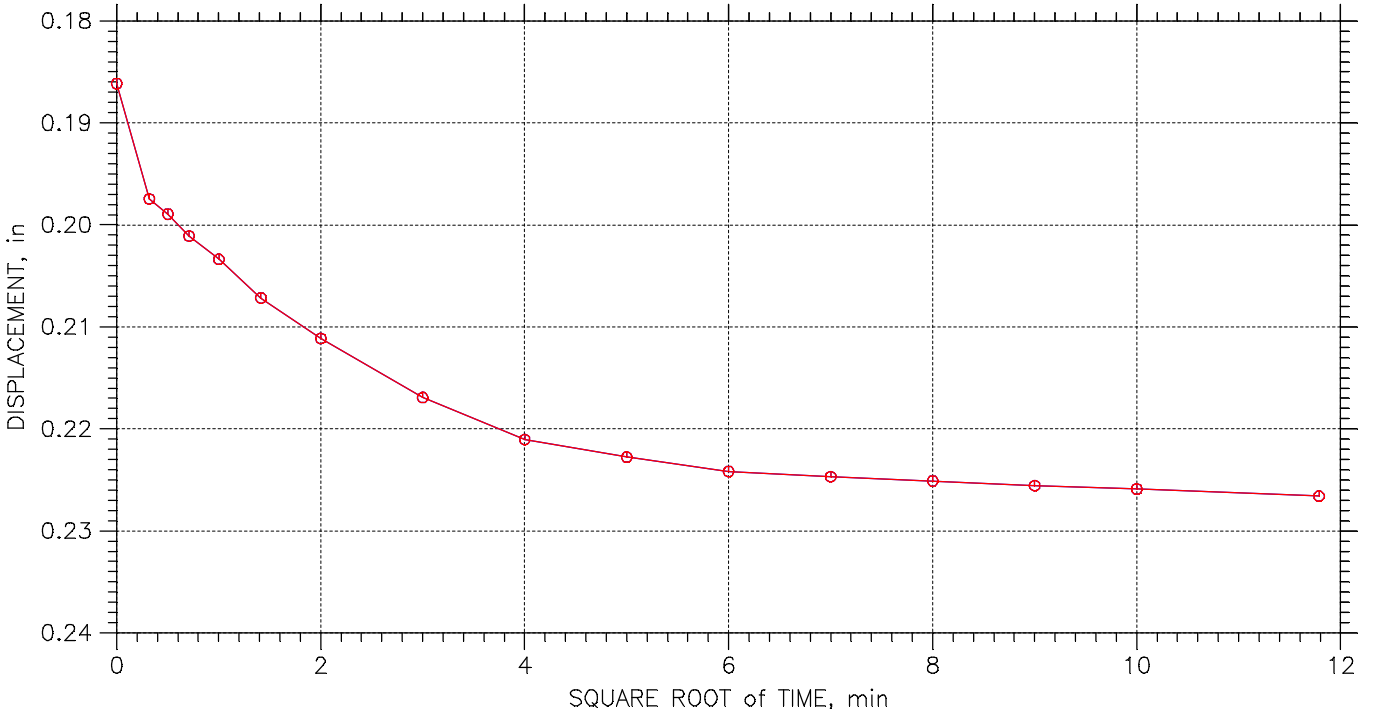
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





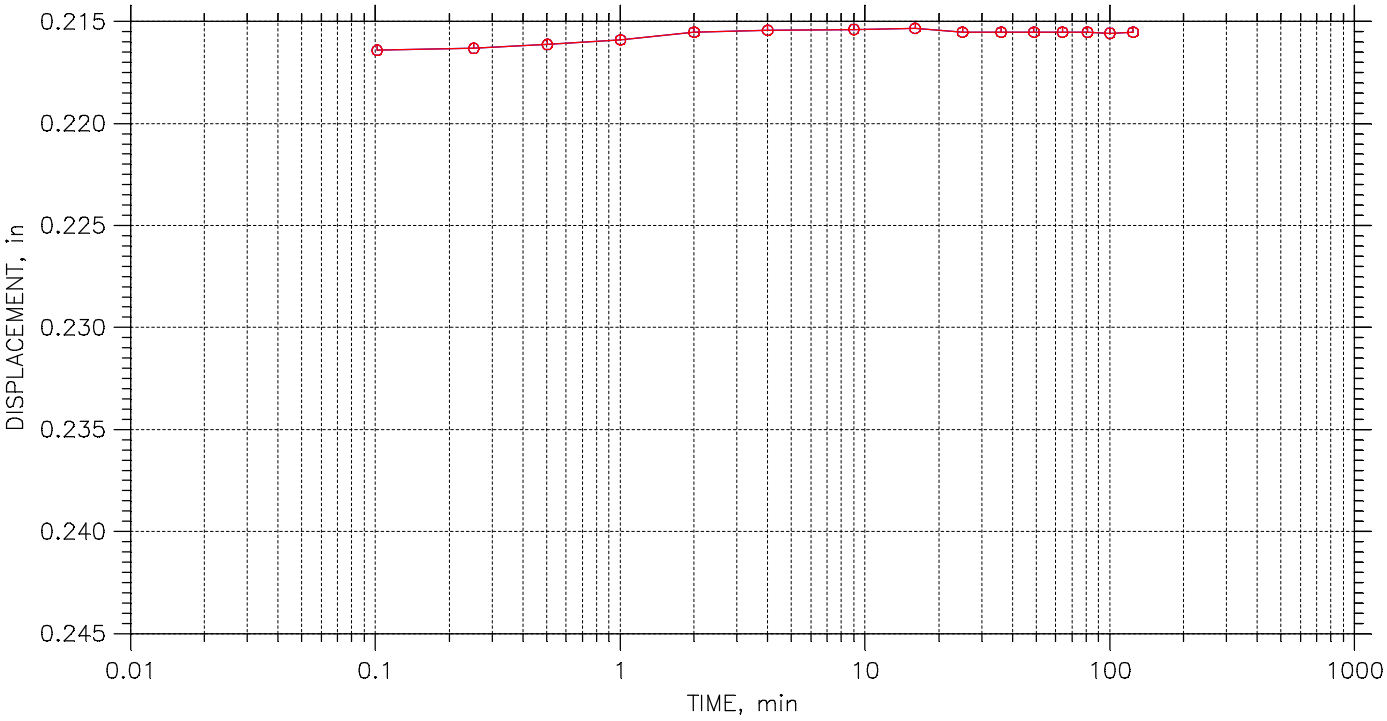
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

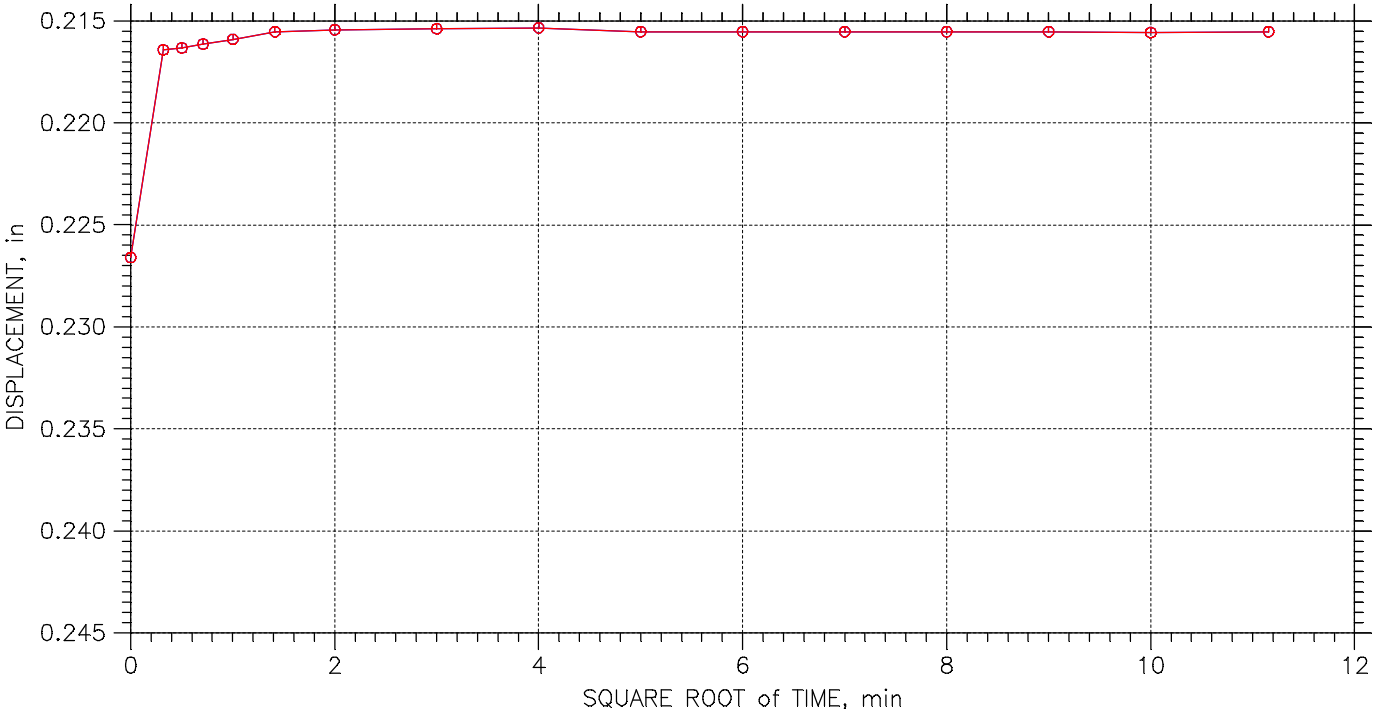
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





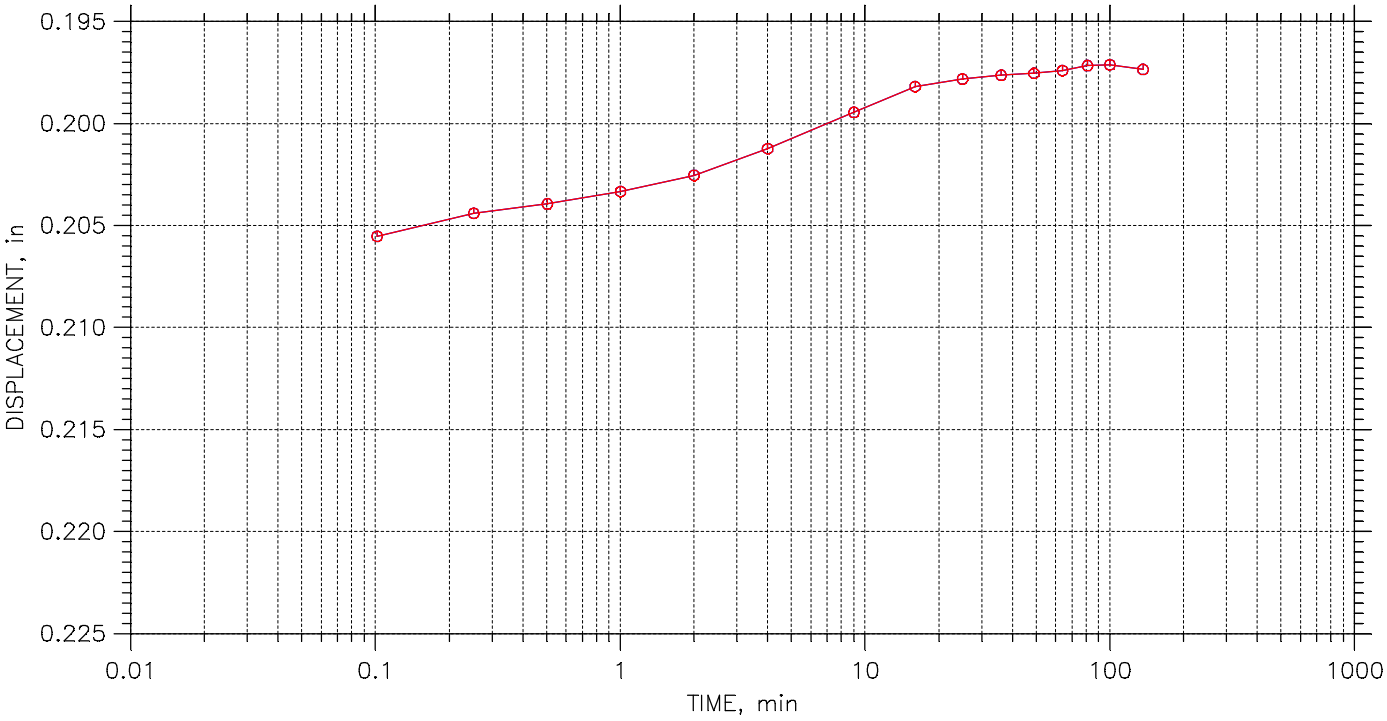
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

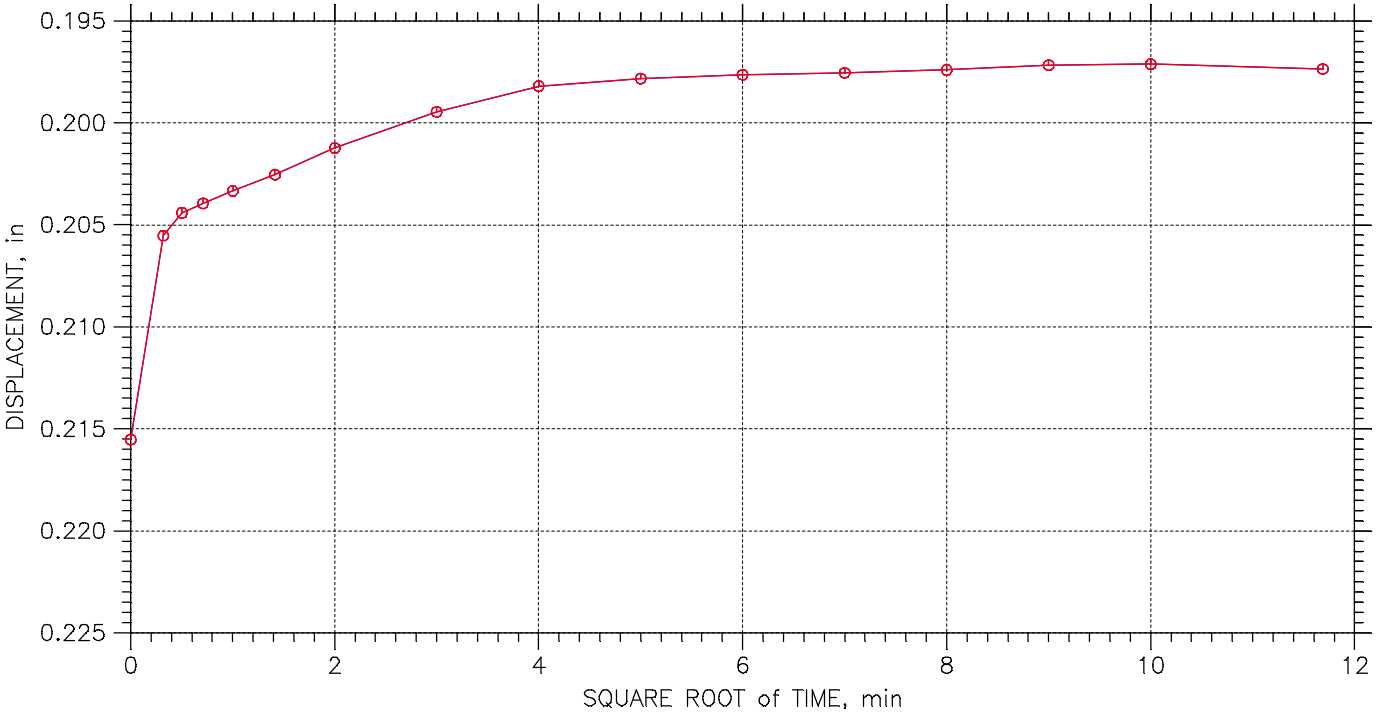
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





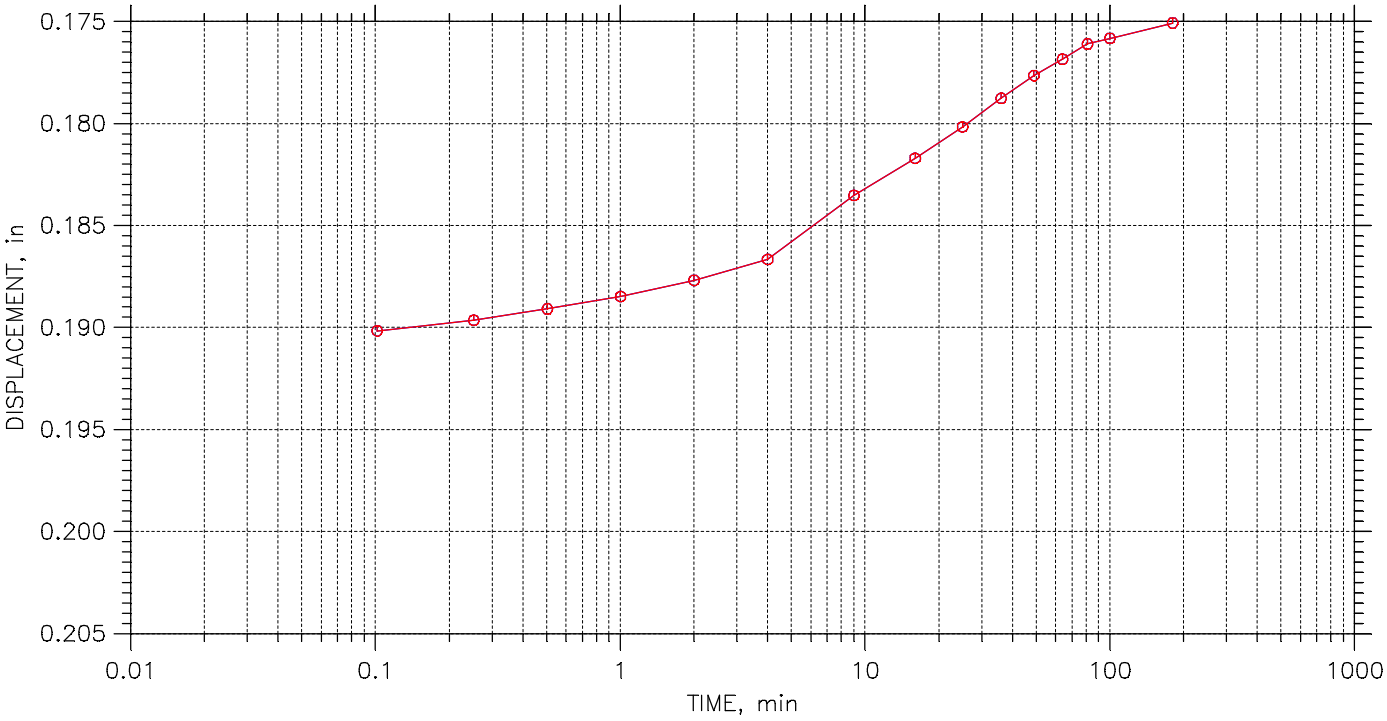
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

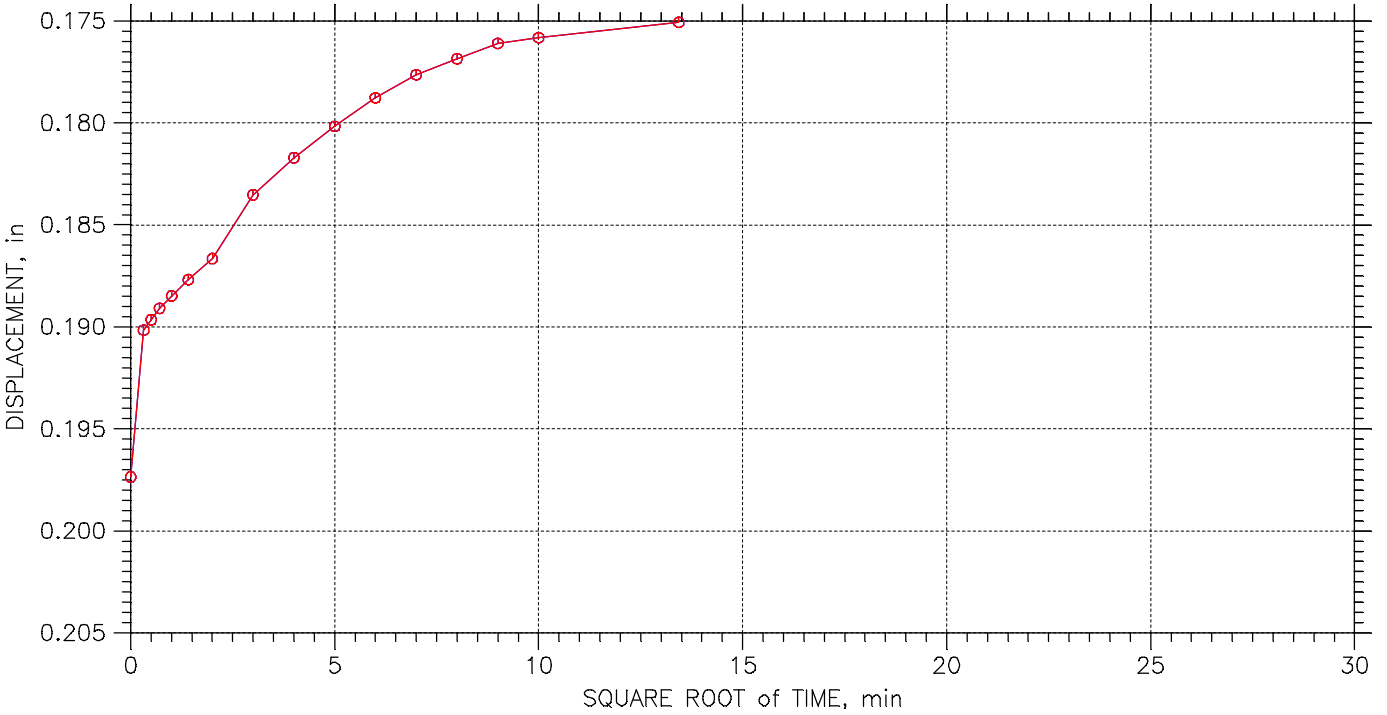
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





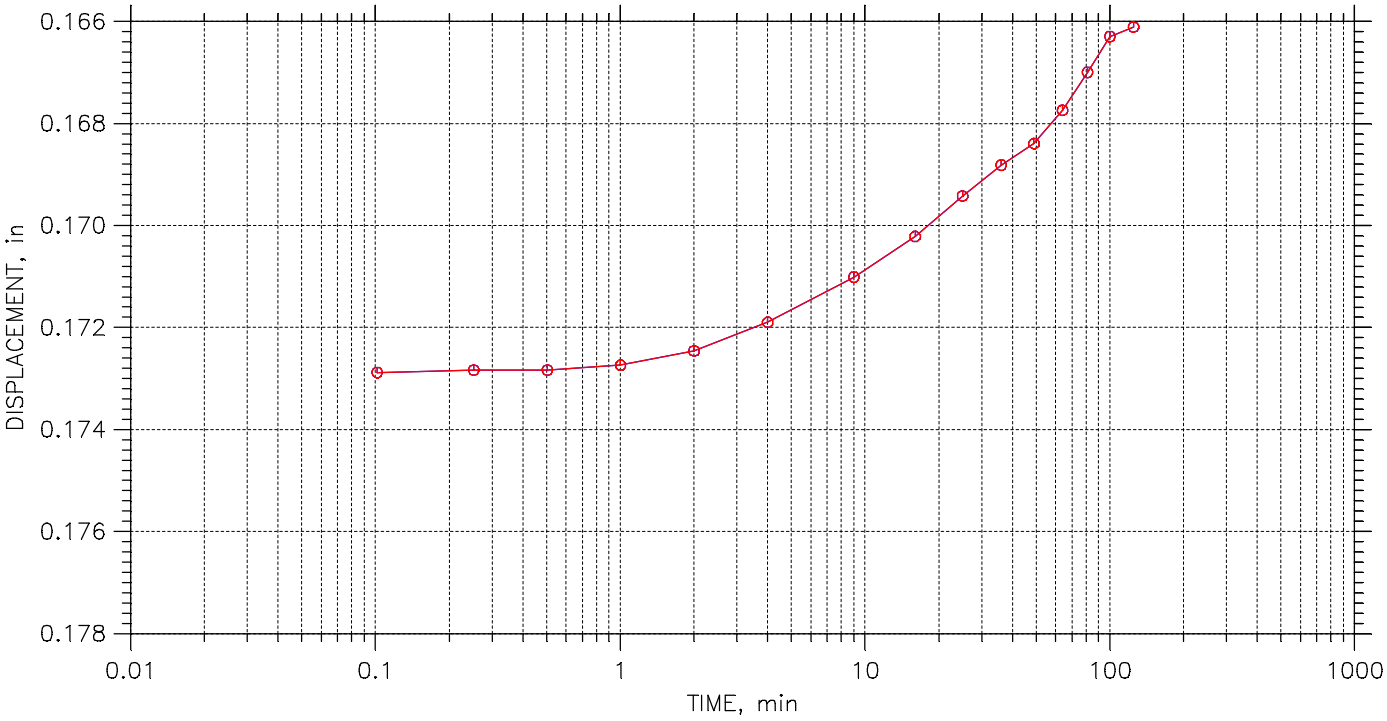
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

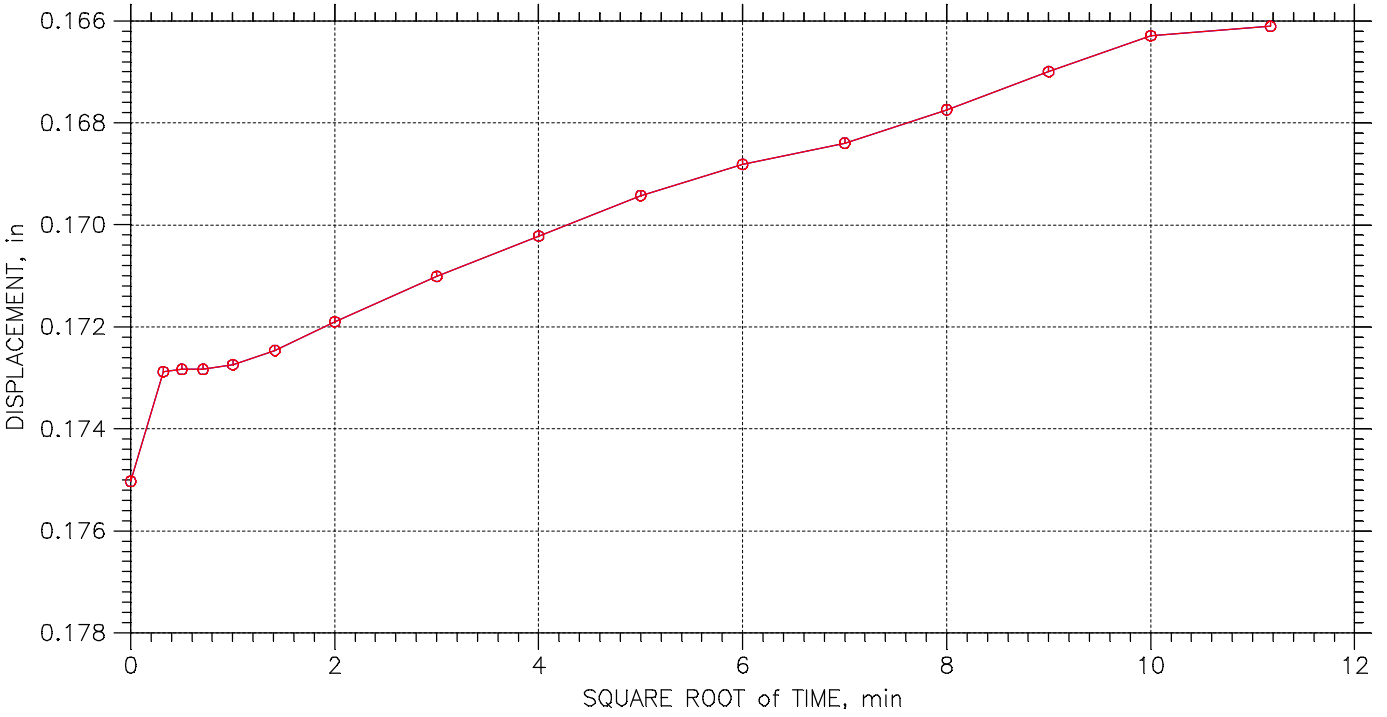
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





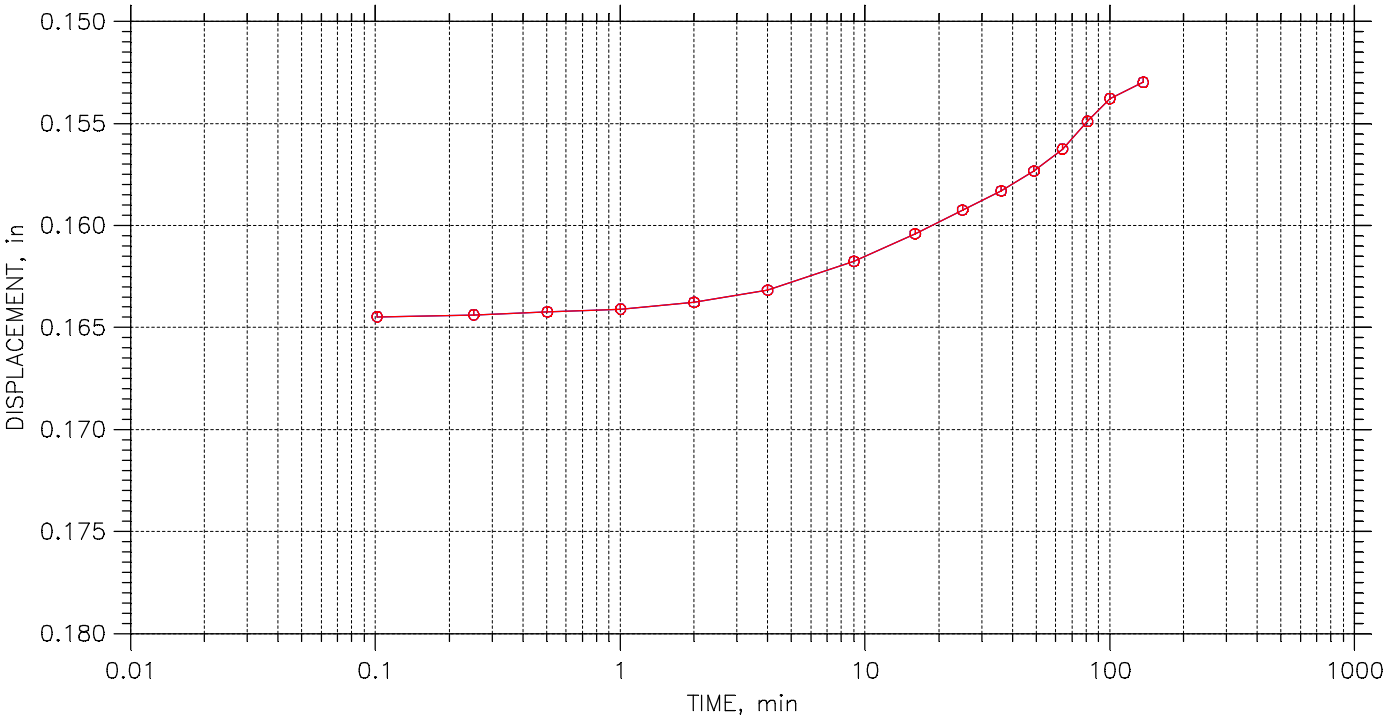
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

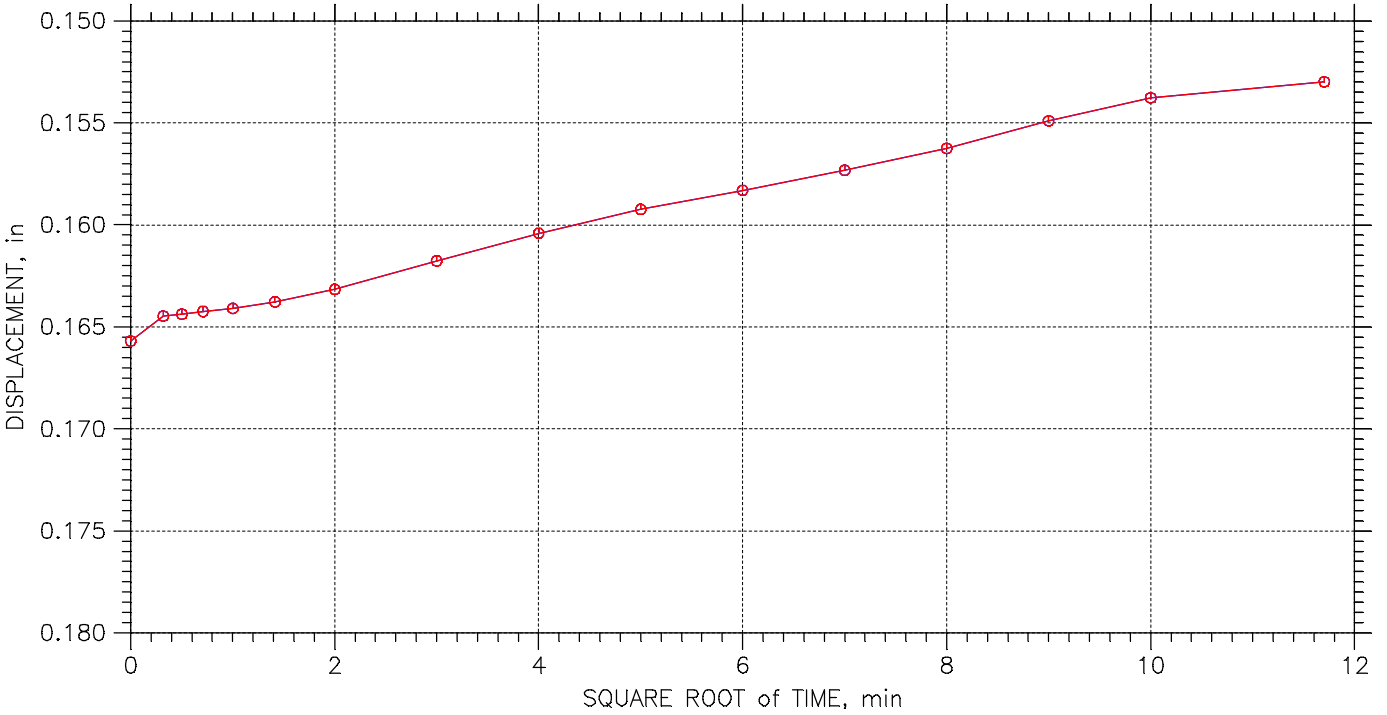
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf

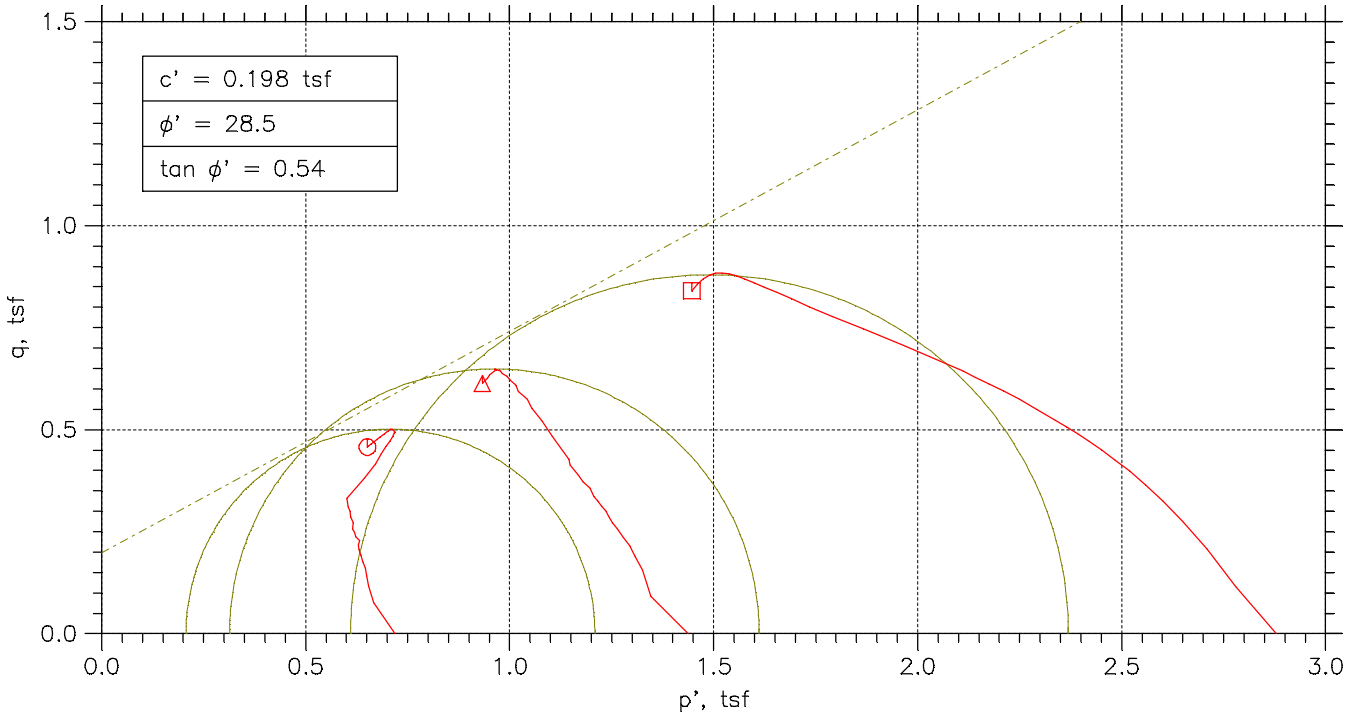


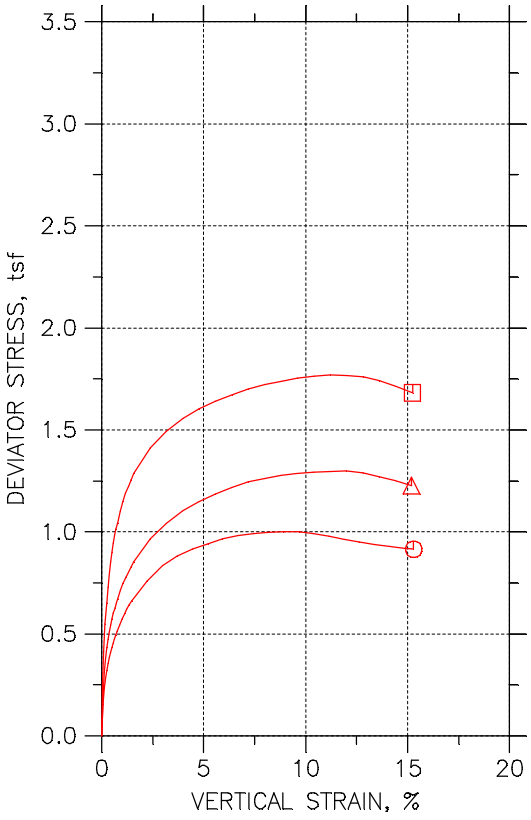


Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

Terracon
Consulting Engineers & Scientists





Symbol		⏲	△	⊡	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8213	2.8323	2.8173	
	Height, in	6.3035	6.2161	6.1913	
	Water Content, %	75.11	79.41	77.79	
	Dry Density, pcf	54.95	52.86	53.58	
	Saturation, %	99.96	99.73	99.68	
	Void Ratio	1.9536	2.0704	2.0291	
Before Shear	Water Content, %	68.95	65.19	53.75	
	Dry Density, pcf	58.12	60.23	67.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	1.7926	1.6948	1.3974	
	Back Press., tsf	5.0417	5.0434	5.0421	
Minor Prin. Stress, tsf		0.71831	1.4366	2.8779	
Max. Dev. Stress, tsf		1.0023	1.2984	1.7688	
Time to Failure, min		780	900	840	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.96	0.99	0.95	
Estimated Specific Gravity		2.60	2.60	2.60	
Liquid Limit		72	72	72	
Plastic Limit		37	37	37	
Plasticity Index		35	35	35	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW006 S9
Sample Type: 3.0" ST

Failure Sketch

Description: DARK GRAY ORGANIC SILT OH SHELL NOTED

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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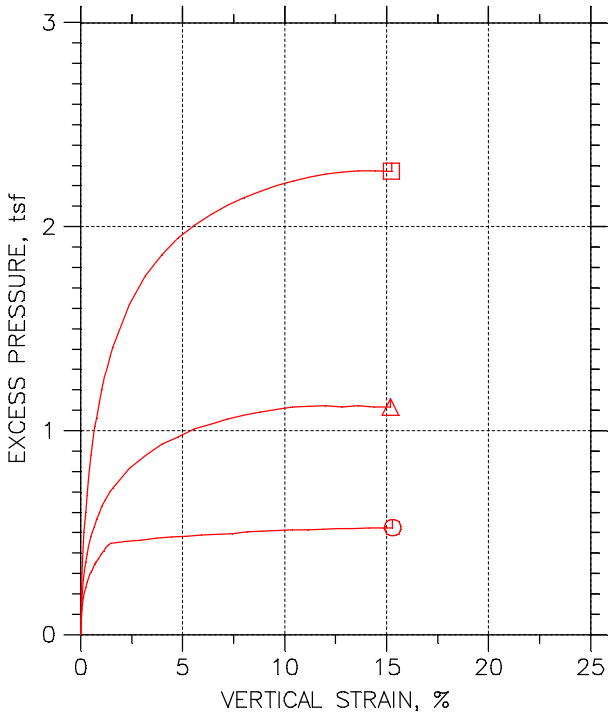
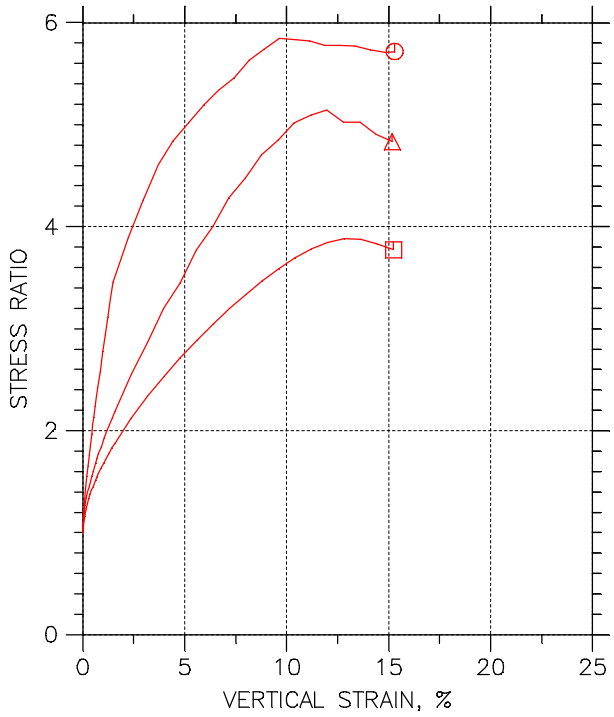
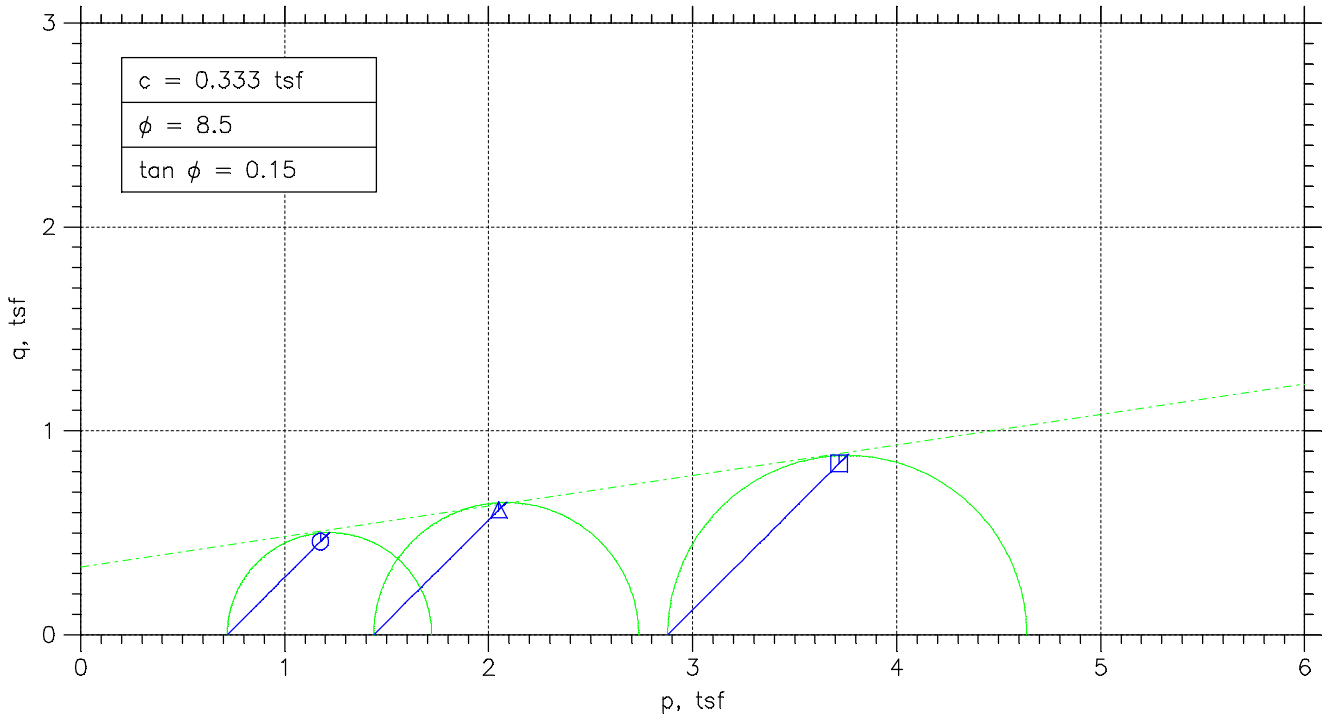
CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

Terracon
Consulting Engineers & Scientists







Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW006 S9	Tested By: BCM	Checked By: WPQ
Sample No.: S-9	Test Date: 10/29/15	Depth: 26.0'-28.0'
Test No.: EDW006 S9	Sample Type: 3.0" ST	Elevation: ----
Description: DARK GRAY ORGANIC SILT OH SHELL NOTED		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2514	0	0	5.0417	5.76	5.76
2	5.0001	0.062925	6.2553	13.244	0.15244	5.17	5.76	5.9124
3	10	0.12448	6.2592	20.256	0.233	5.2217	5.76	5.993
4	15	0.18877	6.2632	24.54	0.28211	5.2513	5.76	6.0421
5	20	0.2517	6.2672	27.823	0.31965	5.2728	5.76	6.0796
6	25	0.31326	6.271	30.773	0.35331	5.2966	5.76	6.1133
7	30	0.37618	6.275	33.555	0.38502	5.3169	5.76	6.145
8	35	0.43911	6.279	35.892	0.41157	5.3355	5.76	6.1716
9	40	0.4993	6.2828	37.896	0.43428	5.3483	5.76	6.1943
10	45	0.56085	6.2866	39.843	0.45632	5.3564	5.76	6.2163
11	50	0.62241	6.2905	41.568	0.47578	5.375	5.76	6.2358
12	55	0.68534	6.2945	43.405	0.49649	5.3878	5.76	6.2565
13	60	0.74689	6.2984	44.74	0.51144	5.4	5.76	6.2714
14	70	0.87137	6.3063	47.578	0.5432	5.4145	5.76	6.3032
15	80.001	0.99586	6.3143	50.305	0.57361	5.4371	5.76	6.3336
16	90.001	1.119	6.3221	52.698	0.60015	5.4511	5.76	6.3602
17	100	1.2393	6.3298	54.645	0.62158	5.4662	5.76	6.3816
18	110	1.3625	6.3377	56.704	0.64419	5.4795	5.76	6.4042
19	120	1.4856	6.3457	58.429	0.66296	5.49	5.76	6.423
20	180	2.2256	6.3937	67.5	0.76012	5.4975	5.76	6.5201
21	240	2.9766	6.4432	74.567	0.83326	5.5045	5.76	6.5933
22	300	3.7112	6.4923	79.52	0.88187	5.5155	5.76	6.6419
23	360	4.4485	6.5424	83.304	0.91676	5.5214	5.76	6.6768
24	420	5.2009	6.5943	86.308	0.94235	5.5254	5.76	6.7024
25	480	5.9368	6.6459	89.202	0.96639	5.5295	5.76	6.7264
26	540	6.6769	6.6986	91.372	0.98211	5.5335	5.76	6.7421
27	600	7.4293	6.7531	92.93	0.99081	5.5376	5.76	6.7508
28	660	8.1638	6.8071	94.322	0.99766	5.5446	5.76	6.7577
29	720	8.9039	6.8624	95.435	1.0013	5.5486	5.76	6.7613
30	780	9.6562	6.9196	96.325	1.0023	5.5533	5.76	6.7623
31	840	10.394	6.9765	96.047	0.99124	5.555	5.76	6.7512
32	900	11.131	7.0344	95.768	0.98023	5.5568	5.76	6.7402
33	960	11.883	7.0944	94.878	0.9629	5.5585	5.76	6.7229
34	1020	12.607	7.1532	94.489	0.95107	5.5608	5.76	6.7111
35	1080	13.351	7.2146	94.043	0.93853	5.5632	5.76	6.6985
36	1140	14.11	7.2784	93.876	0.92866	5.5637	5.76	6.6887
37	1200	14.841	7.3408	93.71	0.91912	5.5649	5.76	6.6791
38	1236.6	15.291	7.3798	93.765	0.91481	5.5661	5.76	6.6748

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71831	0.71831	1.000	0.71831	0
2	0.06	5.9124	5.76	0.12834	0.842	0.74242	0.58998	1.258	0.6662	0.07622
3	0.12	5.993	5.76	0.18002	0.773	0.77129	0.53829	1.433	0.65479	0.1165
4	0.19	6.0421	5.76	0.20963	0.743	0.79079	0.50868	1.555	0.64973	0.14105
5	0.25	6.0796	5.76	0.23112	0.723	0.80684	0.48719	1.656	0.64702	0.15982
6	0.31	6.1133	5.76	0.25493	0.722	0.8167	0.46338	1.762	0.64004	0.17666
7	0.38	6.145	5.76	0.27525	0.715	0.82807	0.44306	1.869	0.63556	0.19251
8	0.44	6.1716	5.76	0.29384	0.714	0.83605	0.42447	1.970	0.63026	0.20579
9	0.50	6.1943	5.76	0.30661	0.706	0.84598	0.4117	2.055	0.62884	0.21714
10	0.56	6.2163	5.76	0.31474	0.690	0.85989	0.40357	2.131	0.63173	0.22816
11	0.62	6.2358	5.76	0.33333	0.701	0.86077	0.38499	2.236	0.62288	0.23789
12	0.69	6.2565	5.76	0.3461	0.697	0.8687	0.37221	2.334	0.62045	0.24824
13	0.75	6.2714	5.76	0.3583	0.701	0.87146	0.36002	2.421	0.61574	0.25572
14	0.87	6.3032	5.76	0.37281	0.686	0.8887	0.3455	2.572	0.6171	0.2716
15	1.00	6.3336	5.76	0.39546	0.689	0.89647	0.32285	2.777	0.60966	0.28681
16	1.12	6.3602	5.76	0.4094	0.682	0.90907	0.30891	2.943	0.60899	0.30008
17	1.24	6.3816	5.76	0.4245	0.683	0.91539	0.29382	3.116	0.6046	0.31079
18	1.36	6.4042	5.76	0.43785	0.680	0.92465	0.28046	3.297	0.60255	0.3221
19	1.49	6.423	5.76	0.4483	0.676	0.93297	0.27001	3.455	0.60149	0.33148
20	2.23	6.5201	5.76	0.45585	0.600	1.0226	0.26246	3.896	0.64252	0.38006
21	2.98	6.5933	5.76	0.46282	0.555	1.0887	0.25549	4.261	0.67212	0.41663
22	3.71	6.6419	5.76	0.47386	0.537	1.1263	0.24446	4.608	0.68539	0.44094
23	4.45	6.6768	5.76	0.47966	0.523	1.1554	0.23865	4.841	0.69703	0.45838
24	5.20	6.7024	5.76	0.48373	0.513	1.1769	0.23458	5.017	0.70576	0.47118
25	5.94	6.7264	5.76	0.48779	0.505	1.1969	0.23052	5.192	0.71371	0.48319
26	6.68	6.7421	5.76	0.49186	0.501	1.2086	0.22645	5.337	0.71751	0.49106
27	7.43	6.7508	5.76	0.49592	0.501	1.2132	0.22239	5.455	0.71779	0.4954
28	8.16	6.7577	5.76	0.50289	0.504	1.2131	0.21542	5.631	0.71425	0.49883
29	8.90	6.7613	5.76	0.50696	0.506	1.2127	0.21136	5.738	0.712	0.50065
30	9.66	6.7623	5.76	0.5116	0.510	1.209	0.20671	5.849	0.70785	0.50114
31	10.39	6.7512	5.76	0.51334	0.518	1.1962	0.20497	5.836	0.70059	0.49562
32	11.13	6.7402	5.76	0.51509	0.525	1.1835	0.20323	5.823	0.69334	0.49012
33	11.88	6.7229	5.76	0.51683	0.537	1.1644	0.20148	5.779	0.68293	0.48145
34	12.61	6.7111	5.76	0.51915	0.546	1.1502	0.19916	5.775	0.6747	0.47554
35	13.35	6.6985	5.76	0.52147	0.556	1.1354	0.19684	5.768	0.6661	0.46927
36	14.11	6.6887	5.76	0.52205	0.562	1.1249	0.19626	5.732	0.66058	0.46433
37	14.84	6.6791	5.76	0.52322	0.569	1.1142	0.1951	5.711	0.65466	0.45956
38	15.29	6.6748	5.76	0.52438	0.573	1.1087	0.19393	5.717	0.65134	0.4574

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
Specimen Area: 6.30 in^2
Specimen Volume: 39.16 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0434	6.48	6.48
2	5.0002	0.053874	6.3037	16.056	0.18339	5.2253	6.48	6.6634
3	10	0.11698	6.3077	27.272	0.3113	5.3105	6.48	6.7913
4	15	0.18163	6.3118	33.307	0.37994	5.363	6.48	6.8599
5	20	0.24782	6.316	37.862	0.43162	5.4014	6.48	6.9116
6	25	0.31247	6.3201	41.506	0.47285	5.4382	6.48	6.9528
7	30	0.3802	6.3244	44.922	0.51142	5.4714	6.48	6.9914
8	35	0.44639	6.3286	47.826	0.54411	5.5006	6.48	7.0241
9	40	0.51412	6.3329	50.502	0.57417	5.5245	6.48	7.0542
10	45	0.57876	6.337	52.95	0.60161	5.5449	6.48	7.0816
11	50	0.64649	6.3413	55.228	0.62706	5.5682	6.48	7.1071
12	55	0.71268	6.3456	57.391	0.65119	5.5898	6.48	7.1312
13	60	0.77887	6.3498	59.327	0.67271	5.6102	6.48	7.1527
14	70	0.91279	6.3584	62.857	0.71177	5.6382	6.48	7.1918
15	80.001	1.0467	6.367	65.988	0.74622	5.6732	6.48	7.2262
16	90.001	1.1791	6.3755	68.778	0.77673	5.7	6.48	7.2567
17	110	1.4485	6.3929	73.504	0.82783	5.7449	6.48	7.3078
18	120	1.5824	6.4016	75.895	0.8536	5.7619	6.48	7.3336
19	180	2.3828	6.4541	86.713	0.96734	5.8598	6.48	7.4473
20	240	3.1817	6.5074	94.171	1.0419	5.9216	6.48	7.5219
21	300	3.9805	6.5615	100.66	1.1046	5.9782	6.48	7.5846
22	360	4.7763	6.6164	105.5	1.1481	6.0115	6.48	7.6281
23	420	5.5721	6.6721	109.89	1.1858	6.0517	6.48	7.6658
24	480	6.371	6.729	113.87	1.2184	6.0739	6.48	7.6984
25	540	7.1745	6.7873	117.29	1.2442	6.1013	6.48	7.7242
26	600	7.978	6.8465	119.96	1.2616	6.1176	6.48	7.7416
27	660	8.7738	6.9063	122.35	1.2756	6.1357	6.48	7.7556
28	720	9.5758	6.9675	124.58	1.2873	6.1456	6.48	7.7673
29	780	10.378	7.0299	126.17	1.2922	6.1584	6.48	7.7722
30	840	11.177	7.0931	127.76	1.2969	6.1631	6.48	7.7769
31	900	11.976	7.1575	129.07	1.2984	6.1666	6.48	7.7784
32	960	12.787	7.224	129.36	1.2893	6.1596	6.48	7.7693
33	1020	13.584	7.2907	128.62	1.2702	6.1643	6.48	7.7502
34	1080	14.381	7.3586	127.93	1.2518	6.1596	6.48	7.7318
35	1140	15.18	7.4279	126.51	1.2263	6.1602	6.48	7.7063

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
Specimen Area: 6.30 in^2
Specimen Volume: 39.16 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4366	1.4366	1.000	1.4366	0
2	0.05	6.6634	6.48	0.18195	0.992	1.4381	1.2547	1.146	1.3464	0.091693
3	0.12	6.7913	6.48	0.2671	0.858	1.4808	1.1695	1.266	1.3252	0.15565
4	0.18	6.8599	6.48	0.31958	0.841	1.497	1.117	1.340	1.307	0.18997
5	0.25	6.9116	6.48	0.35807	0.830	1.5102	1.0786	1.400	1.2944	0.21581
6	0.31	6.9528	6.48	0.39482	0.835	1.5147	1.0418	1.454	1.2782	0.23642
7	0.38	6.9914	6.48	0.42806	0.837	1.52	1.0086	1.507	1.2643	0.25571
8	0.45	7.0241	6.48	0.45722	0.840	1.5235	0.97941	1.556	1.2515	0.27206
9	0.51	7.0542	6.48	0.48113	0.838	1.5297	0.9555	1.601	1.2426	0.28708
10	0.58	7.0816	6.48	0.50154	0.834	1.5367	0.93509	1.643	1.2359	0.30081
11	0.65	7.1071	6.48	0.52487	0.837	1.5388	0.91176	1.688	1.2253	0.31353
12	0.71	7.1312	6.48	0.54644	0.839	1.5414	0.89018	1.732	1.2158	0.32559
13	0.78	7.1527	6.48	0.56685	0.843	1.5425	0.86977	1.773	1.2061	0.33635
14	0.91	7.1918	6.48	0.59485	0.836	1.5535	0.84178	1.846	1.1977	0.35589
15	1.05	7.2262	6.48	0.62984	0.844	1.553	0.80679	1.925	1.1799	0.37311
16	1.18	7.2567	6.48	0.65666	0.845	1.5567	0.77996	1.996	1.1683	0.38836
17	1.45	7.3078	6.48	0.70157	0.847	1.5629	0.73506	2.126	1.149	0.41392
18	1.58	7.3336	6.48	0.71848	0.842	1.5717	0.71814	2.189	1.1449	0.4268
19	2.38	7.4473	6.48	0.81646	0.844	1.5875	0.62017	2.560	1.1038	0.48367
20	3.18	7.5219	6.48	0.87827	0.843	1.6003	0.55835	2.866	1.0793	0.52097
21	3.98	7.5846	6.48	0.93484	0.846	1.6064	0.50178	3.201	1.0541	0.55229
22	4.78	7.6281	6.48	0.96809	0.843	1.6166	0.46854	3.450	1.0426	0.57404
23	5.57	7.6658	6.48	1.0083	0.850	1.6141	0.4283	3.769	1.0212	0.5929
24	6.37	7.6984	6.48	1.0305	0.846	1.6246	0.40614	4.000	1.0153	0.6092
25	7.17	7.7242	6.48	1.0579	0.850	1.6229	0.37873	4.285	1.0008	0.6221
26	7.98	7.7416	6.48	1.0742	0.852	1.624	0.3624	4.481	0.99318	0.63078
27	8.77	7.7556	6.48	1.0923	0.856	1.6199	0.34432	4.705	0.98212	0.63779
28	9.58	7.7673	6.48	1.1022	0.856	1.6217	0.33441	4.850	0.97807	0.64366
29	10.38	7.7722	6.48	1.115	0.863	1.6138	0.32158	5.018	0.96769	0.64611
30	11.18	7.7769	6.48	1.1197	0.863	1.6138	0.31691	5.092	0.96536	0.64845
31	11.98	7.7784	6.48	1.1232	0.865	1.6118	0.31341	5.143	0.96261	0.6492
32	12.79	7.7693	6.48	1.1162	0.866	1.6097	0.32041	5.024	0.96505	0.64464
33	13.58	7.7502	6.48	1.1209	0.882	1.5859	0.31575	5.023	0.95083	0.63509
34	14.38	7.7318	6.48	1.1162	0.892	1.5722	0.32041	4.907	0.9463	0.62588
35	15.18	7.7063	6.48	1.1168	0.911	1.5461	0.31983	4.834	0.93298	0.61315

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2339	0	0	5.0421	7.92	7.92
2	5.0041	0.048386	6.237	20.074	0.23173	5.2556	7.92	8.1517
3	10.004	0.10997	6.2408	35.922	0.41443	5.4179	7.92	8.3344
4	15	0.17448	6.2448	47.727	0.55027	5.5452	7.92	8.4703
5	20	0.239	6.2489	56.501	0.65101	5.6441	7.92	8.571
6	25	0.30498	6.253	63.345	0.72938	5.7261	7.92	8.6494
7	30	0.37096	6.2572	69.271	0.79709	5.7994	7.92	8.7171
8	35	0.43547	6.2612	74.094	0.85204	5.8628	7.92	8.772
9	40	0.50292	6.2655	78.366	0.90055	5.9192	7.92	8.8206
10	45	0.57036	6.2697	82.179	0.94372	5.971	7.92	8.8637
11	50	0.63781	6.274	85.44	0.98051	6.0187	7.92	8.9005
12	55	0.70379	6.2781	88.426	1.0141	6.0629	7.92	8.9341
13	60	0.77124	6.2824	91.274	1.0461	6.1059	7.92	8.9661
14	70	0.90613	6.291	96.097	1.0998	6.1781	7.92	9.0198
15	80	1.0381	6.2993	100.51	1.1488	6.2449	7.92	9.0688
16	90	1.173	6.3079	104.27	1.1902	6.3054	7.92	9.1102
17	100	1.3079	6.3166	107.4	1.2242	6.3572	7.92	9.1442
18	110	1.4398	6.325	110.34	1.256	6.4072	7.92	9.176
19	120	1.5747	6.3337	113.19	1.2867	6.4514	7.92	9.2067
20	180	2.3709	6.3853	125.22	1.412	6.6602	7.92	9.332
21	240	3.1832	6.4389	133.67	1.4947	6.801	7.92	9.4147
22	300	3.9838	6.4926	140.24	1.5552	6.9063	7.92	9.4752
23	360	4.7858	6.5473	145.66	1.6018	6.9854	7.92	9.5218
24	420	5.5951	6.6034	150.49	1.6408	7.0493	7.92	9.5608
25	480	6.3957	6.6599	154.71	1.6726	7.1017	7.92	9.5926
26	540	7.1948	6.7172	158.57	1.6997	7.1459	7.92	9.6197
27	600	8.0027	6.7762	162.01	1.7215	7.1825	7.92	9.6415
28	660	8.8047	6.8358	165.09	1.7389	7.2151	7.92	9.6589
29	720	9.6009	6.896	167.99	1.7539	7.2424	7.92	9.6739
30	780	10.406	6.958	170.42	1.7635	7.2651	7.92	9.6835
31	840	11.211	7.0211	172.49	1.7688	7.2843	7.92	9.6888
32	900	12.013	7.0851	173.91	1.7673	7.2989	7.92	9.6873
33	960	12.824	7.151	174.74	1.7594	7.3099	7.92	9.6794
34	1020	13.618	7.2167	174.37	1.7397	7.3151	7.92	9.6597
35	1080	14.419	7.2843	173.27	1.7126	7.3157	7.92	9.6326
36	1140	15.24	7.3548	171.71	1.6809	7.314	7.92	9.6009

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8779	2.8779	1.000	2.8779	0
2	0.05	8.1517	7.92	0.21346	0.921	2.8961	2.6644	1.087	2.7803	0.11587
3	0.11	8.3344	7.92	0.37573	0.907	2.9166	2.5021	1.166	2.7093	0.20721
4	0.17	8.4703	7.92	0.50311	0.914	2.925	2.3748	1.232	2.6499	0.27514
5	0.24	8.571	7.92	0.60199	0.925	2.9269	2.2759	1.286	2.6014	0.3255
6	0.30	8.6494	7.92	0.68399	0.938	2.9233	2.1939	1.332	2.5586	0.36469
7	0.37	8.7171	7.92	0.75728	0.950	2.9177	2.1206	1.376	2.5191	0.39854
8	0.44	8.772	7.92	0.82068	0.963	2.9092	2.0572	1.414	2.4832	0.42602
9	0.50	8.8206	7.92	0.8771	0.974	2.9013	2.0008	1.450	2.451	0.45028
10	0.57	8.8637	7.92	0.92886	0.984	2.8927	1.949	1.484	2.4209	0.47186
11	0.64	8.9005	7.92	0.97655	0.996	2.8818	1.9013	1.516	2.3916	0.49026
12	0.70	8.9341	7.92	1.0208	1.007	2.8712	1.8571	1.546	2.3642	0.50705
13	0.77	8.9661	7.92	1.0638	1.017	2.8601	1.8141	1.577	2.3371	0.52303
14	0.91	9.0198	7.92	1.1359	1.033	2.8418	1.7419	1.631	2.2919	0.54992
15	1.04	9.0688	7.92	1.2028	1.047	2.8238	1.6751	1.686	2.2494	0.57439
16	1.17	9.1102	7.92	1.2633	1.061	2.8048	1.6146	1.737	2.2097	0.5951
17	1.31	9.1442	7.92	1.3151	1.074	2.787	1.5628	1.783	2.1749	0.61209
18	1.44	9.176	7.92	1.3651	1.087	2.7688	1.5128	1.830	2.1408	0.62801
19	1.57	9.2067	7.92	1.4093	1.095	2.7552	1.4686	1.876	2.1119	0.64333
20	2.37	9.332	7.92	1.6181	1.146	2.6717	1.2598	2.121	1.9658	0.70598
21	3.18	9.4147	7.92	1.7588	1.177	2.6137	1.119	2.336	1.8664	0.74736
22	3.98	9.4752	7.92	1.8641	1.199	2.569	1.0137	2.534	1.7914	0.77761
23	4.79	9.5218	7.92	1.9432	1.213	2.5365	0.93464	2.714	1.7356	0.80092
24	5.60	9.5608	7.92	2.0072	1.223	2.5115	0.87066	2.885	1.6911	0.8204
25	6.40	9.5926	7.92	2.0595	1.231	2.4909	0.81832	3.044	1.6546	0.83629
26	7.19	9.6197	7.92	2.1037	1.238	2.4738	0.77411	3.196	1.6239	0.84983
27	8.00	9.6415	7.92	2.1404	1.243	2.4589	0.73747	3.334	1.5982	0.86073
28	8.80	9.6589	7.92	2.173	1.250	2.4438	0.7049	3.467	1.5743	0.86944
29	9.60	9.6739	7.92	2.2003	1.255	2.4315	0.67756	3.589	1.5545	0.87696
30	10.41	9.6835	7.92	2.223	1.261	2.4184	0.65488	3.693	1.5366	0.88174
31	11.21	9.6888	7.92	2.2422	1.268	2.4045	0.63569	3.783	1.5201	0.88442
32	12.01	9.6873	7.92	2.2567	1.277	2.3885	0.62115	3.845	1.5048	0.88367
33	12.82	9.6794	7.92	2.2678	1.289	2.3695	0.61009	3.884	1.4898	0.87969
34	13.62	9.6597	7.92	2.273	1.307	2.3445	0.60486	3.876	1.4747	0.86983
35	14.42	9.6326	7.92	2.2736	1.328	2.3169	0.60428	3.834	1.4606	0.85632
36	15.24	9.6009	7.92	2.2718	1.352	2.287	0.60602	3.774	1.4465	0.84046

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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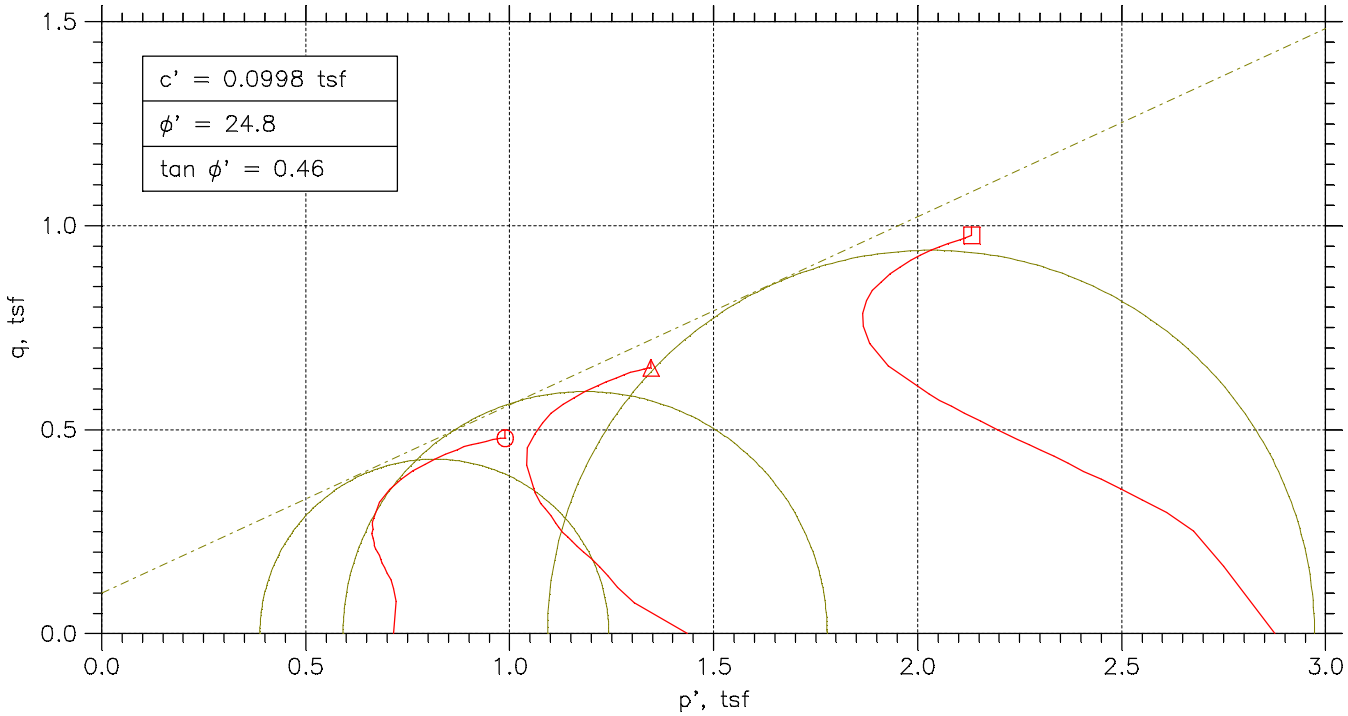

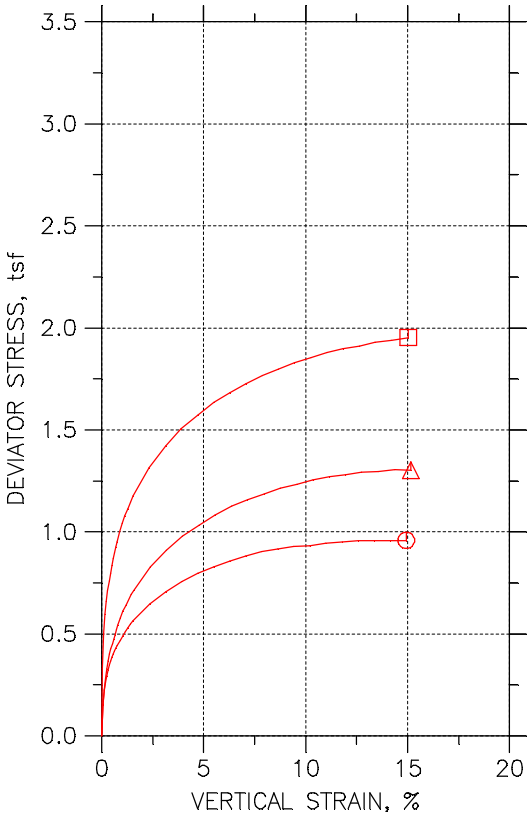

Symbol		⏲	△	⊡	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8094	2.8291	2.8406	
	Height, in	5.9575	6.2256	6.276	
	Water Content, %	27.95	28.58	25.69	
	Dry Density, pcf	95.83	93.77	96.62	
	Saturation, %	98.51	95.87	92.26	
	Void Ratio	0.77188	0.81092	0.75748	
Before Shear	Water Content, %	27.39	26.71	23.87	
	Dry Density, pcf	97.31	98.35	103.	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.74495	0.72649	0.64936	
	Back Press., tsf	5.0452	5.044	5.045	
Minor Prin. Stress, tsf		0.71483	1.436	2.875	
Max. Dev. Stress, tsf		0.95795	1.304	1.9522	
Time to Failure, min		1140	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.95	0.97	0.95	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		18	18	18	
Plasticity Index		30	30	30	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW010 S-7
Sample Type: 3.0" ST

Failure Sketch

Description: BROWN AND GRAY MOTTLED LEAN CLAY CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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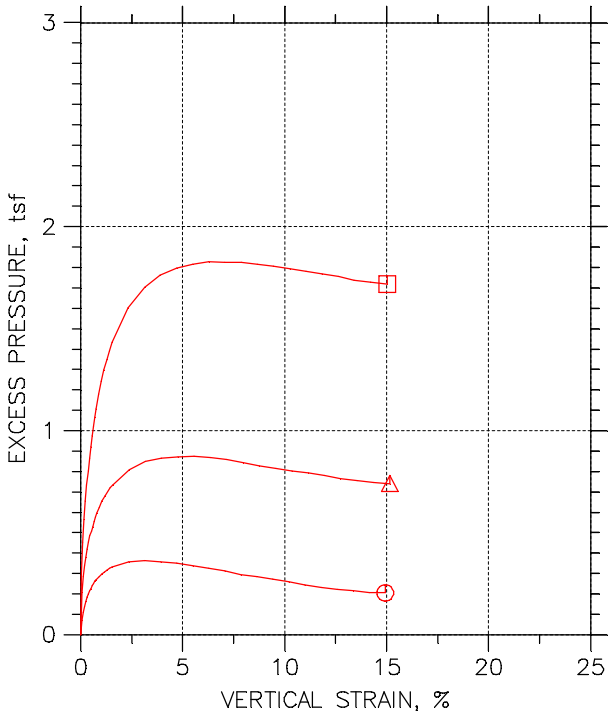

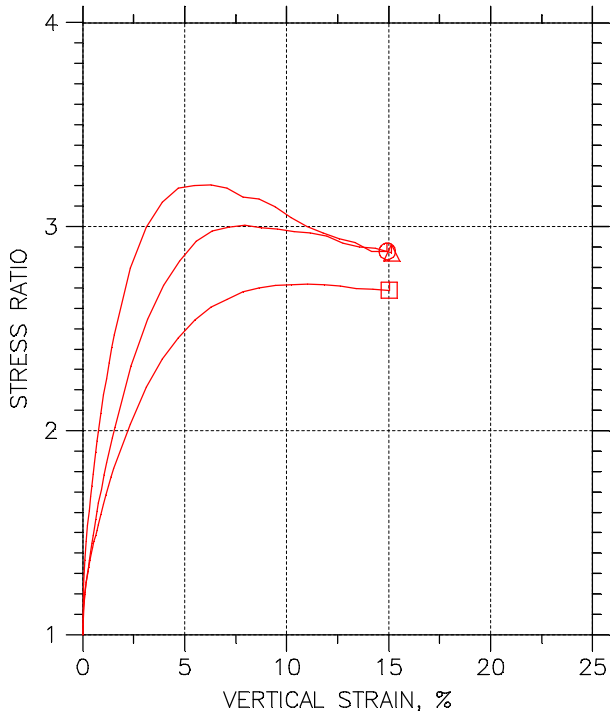

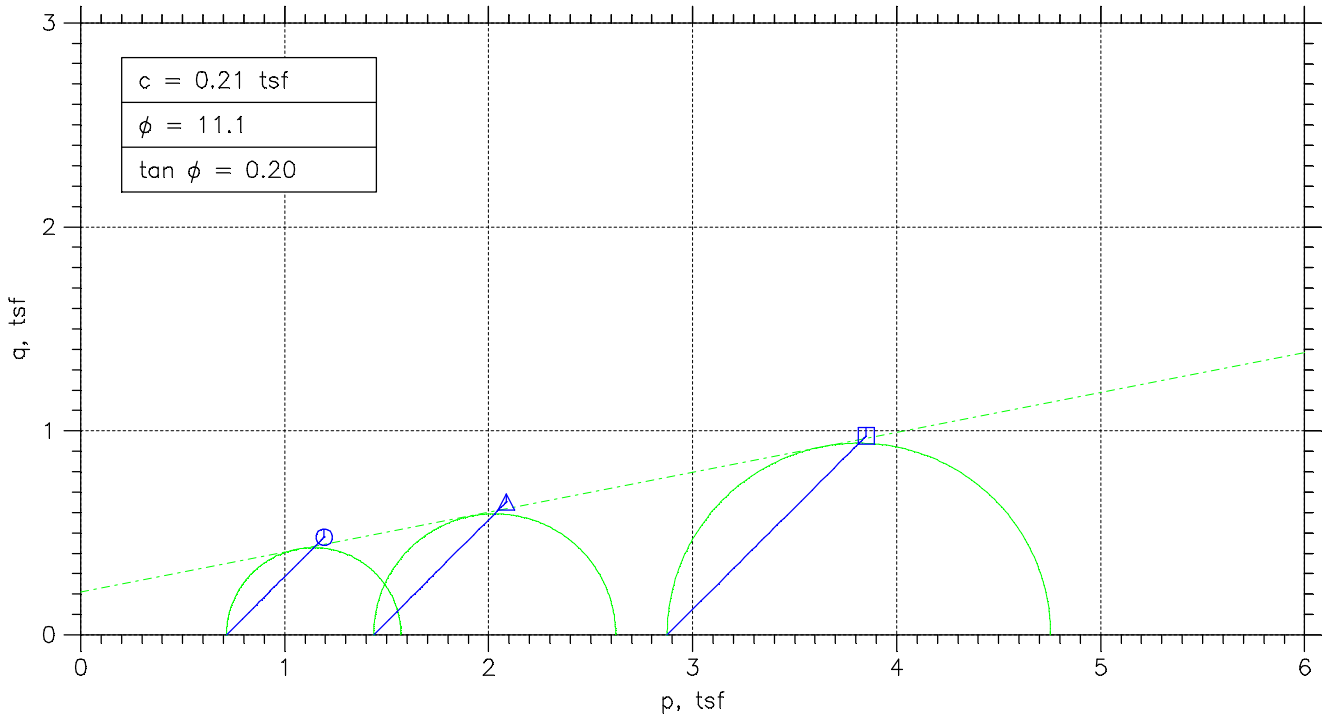

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-010 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 10/29/15	Depth: 15.0'-17.0'
Test No.: EDW-010 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND GRAY MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.1991	0	0	5.0452	5.76	5.76
2	5.0041	0.056448	6.2027	13.621	0.15811	5.1172	5.76	5.9181
3	10.004	0.12013	6.2066	19.07	0.22122	5.1549	5.76	5.9812
4	15.004	0.18382	6.2106	22.767	0.26394	5.1834	5.76	6.0239
5	20	0.24895	6.2146	25.54	0.29589	5.2078	5.76	6.0559
6	25	0.31408	6.2187	27.923	0.3233	5.2287	5.76	6.0833
7	30	0.37922	6.2227	29.967	0.34673	5.2467	5.76	6.1067
8	35	0.4429	6.2267	31.669	0.36619	5.2595	5.76	6.1262
9	40	0.50948	6.2309	33.275	0.3845	5.2716	5.76	6.1445
10	45	0.57462	6.235	34.734	0.4011	5.285	5.76	6.1611
11	50	0.63975	6.2391	36.047	0.41599	5.296	5.76	6.176
12	55	0.70488	6.2432	37.312	0.43031	5.3065	5.76	6.1903
13	60	0.77001	6.2473	38.48	0.44348	5.314	5.76	6.2035
14	70	0.90028	6.2555	40.669	0.4681	5.3286	5.76	6.2281
15	80	1.032	6.2638	42.663	0.4904	5.3431	5.76	6.2504
16	90	1.1608	6.272	44.609	0.5121	5.3512	5.76	6.2721
17	100	1.2925	6.2803	46.263	0.53038	5.3622	5.76	6.2904
18	110	1.4213	6.2885	47.869	0.54807	5.3704	5.76	6.3081
19	120	1.5516	6.2969	49.377	0.56459	5.3762	5.76	6.3246
20	180	2.3404	6.3477	56.868	0.64504	5.4011	5.76	6.405
21	240	3.1249	6.3991	62.706	0.70554	5.407	5.76	6.4655
22	300	3.908	6.4513	67.717	0.75576	5.4035	5.76	6.5158
23	360	4.7026	6.5051	72.046	0.79743	5.3959	5.76	6.5574
24	420	5.4871	6.5591	75.549	0.82931	5.3831	5.76	6.5893
25	480	6.2774	6.6144	78.565	0.85521	5.3721	5.76	6.6152
26	540	7.0676	6.6706	81.63	0.88108	5.3576	5.76	6.6411
27	600	7.8492	6.7272	84.305	0.90231	5.3396	5.76	6.6623
28	660	8.6337	6.7849	86.446	0.91734	5.3303	5.76	6.6773
29	720	9.424	6.8441	88.197	0.92783	5.3175	5.76	6.6878
30	780	10.213	6.9043	89.462	0.93294	5.3036	5.76	6.6929
31	840	10.997	6.9651	91.213	0.94289	5.2891	5.76	6.7029
32	900	11.786	7.0274	92.818	0.95098	5.2769	5.76	6.711
33	960	12.572	7.0906	94.083	0.95535	5.2682	5.76	6.7154
34	1020	13.361	7.1551	95.105	0.95701	5.2618	5.76	6.717
35	1080	14.148	7.2208	95.981	0.95705	5.2502	5.76	6.717
36	1140	14.93	7.2871	96.953	0.95795	5.2502	5.76	6.7179

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71483	0.71483	1.000	0.71483	0
2	0.06	5.9181	5.76	0.072008	0.455	0.80093	0.64282	1.246	0.72188	0.079057
3	0.12	5.9812	5.76	0.10975	0.496	0.82629	0.60507	1.366	0.71568	0.11061
4	0.18	6.0239	5.76	0.13821	0.524	0.84056	0.57662	1.458	0.70859	0.13197
5	0.25	6.0559	5.76	0.1626	0.550	0.84812	0.55223	1.536	0.70018	0.14795
6	0.31	6.0833	5.76	0.1835	0.568	0.85462	0.53132	1.608	0.69297	0.16165
7	0.38	6.1067	5.76	0.2015	0.581	0.86005	0.51332	1.675	0.68669	0.17336
8	0.44	6.1262	5.76	0.21428	0.585	0.86674	0.50055	1.732	0.68364	0.1831
9	0.51	6.1445	5.76	0.22648	0.589	0.87285	0.48835	1.787	0.6806	0.19225
10	0.57	6.1611	5.76	0.23983	0.598	0.87609	0.475	1.844	0.67555	0.20055
11	0.64	6.176	5.76	0.25086	0.603	0.87996	0.46396	1.897	0.67196	0.208
12	0.70	6.1903	5.76	0.26132	0.607	0.88382	0.45351	1.949	0.66866	0.21515
13	0.77	6.2035	5.76	0.26887	0.606	0.88944	0.44596	1.994	0.6677	0.22174
14	0.90	6.2281	5.76	0.28338	0.605	0.89954	0.43144	2.085	0.66549	0.23405
15	1.03	6.2504	5.76	0.2979	0.607	0.90733	0.41693	2.176	0.66213	0.2452
16	1.16	6.2721	5.76	0.30603	0.598	0.9209	0.4088	2.253	0.66485	0.25605
17	1.29	6.2904	5.76	0.31707	0.598	0.92814	0.39776	2.333	0.66295	0.26519
18	1.42	6.3081	5.76	0.3252	0.593	0.9377	0.38963	2.407	0.66367	0.27403
19	1.55	6.3246	5.76	0.331	0.586	0.94841	0.38382	2.471	0.66612	0.28229
20	2.34	6.405	5.76	0.35597	0.552	1.0039	0.35885	2.797	0.68137	0.32252
21	3.12	6.4655	5.76	0.36178	0.513	1.0586	0.35305	2.998	0.70582	0.35277
22	3.91	6.5158	5.76	0.3583	0.474	1.1123	0.35653	3.120	0.73441	0.37788
23	4.70	6.5574	5.76	0.35075	0.440	1.1615	0.36408	3.190	0.7628	0.39872
24	5.49	6.5893	5.76	0.33797	0.408	1.2062	0.37686	3.201	0.79151	0.41466
25	6.28	6.6152	5.76	0.32694	0.382	1.2431	0.38789	3.205	0.8155	0.42761
26	7.07	6.6411	5.76	0.31242	0.355	1.2835	0.40241	3.190	0.84295	0.44054
27	7.85	6.6623	5.76	0.29442	0.326	1.3227	0.42041	3.146	0.87156	0.45115
28	8.63	6.6773	5.76	0.28513	0.311	1.347	0.4297	3.135	0.88837	0.45867
29	9.42	6.6878	5.76	0.27235	0.294	1.3703	0.44248	3.097	0.90639	0.46391
30	10.21	6.6929	5.76	0.25841	0.277	1.3894	0.45641	3.044	0.92288	0.46647
31	11.00	6.7029	5.76	0.2439	0.259	1.4138	0.47093	3.002	0.94238	0.47144
32	11.79	6.711	5.76	0.2317	0.244	1.4341	0.48313	2.968	0.95862	0.47549
33	12.57	6.7154	5.76	0.22299	0.233	1.4472	0.49184	2.942	0.96951	0.47768
34	13.36	6.717	5.76	0.2166	0.226	1.4552	0.49822	2.921	0.97673	0.47851
35	14.15	6.717	5.76	0.20499	0.214	1.4669	0.50984	2.877	0.98836	0.47852
36	14.93	6.7179	5.76	0.20499	0.214	1.4678	0.50984	2.879	0.98881	0.47897

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2863	0	0	5.044	6.48	6.48
2	5.0041	0.05533	6.2898	13.126	0.15025	5.2498	6.48	6.6303
3	10.004	0.11988	6.2939	19.719	0.22558	5.328	6.48	6.7056
4	15.004	0.18597	6.298	24.693	0.2823	5.381	6.48	6.7623
5	20.004	0.25206	6.3022	28.769	0.32867	5.4242	6.48	6.8087
6	25.004	0.31968	6.3065	32.245	0.36814	5.4644	6.48	6.8481
7	30.004	0.38731	6.3108	35.122	0.40071	5.4988	6.48	6.8807
8	35.004	0.45339	6.315	37.46	0.4271	5.5286	6.48	6.9071
9	40.004	0.52256	6.3193	39.617	0.45138	5.5525	6.48	6.9314
10	45.004	0.58557	6.3234	41.595	0.47362	5.5747	6.48	6.9536
11	50.004	0.65166	6.3276	43.633	0.49649	5.5991	6.48	6.9765
12	55.004	0.71775	6.3318	45.791	0.5207	5.6207	6.48	7.0007
13	60.004	0.7823	6.3359	47.769	0.54284	5.6394	6.48	7.0228
14	70.004	0.91601	6.3444	50.885	0.57747	5.6668	6.48	7.0575
15	80	1.0497	6.353	54.002	0.61202	5.6983	6.48	7.092
16	90	1.1834	6.3616	56.459	0.639	5.7228	6.48	7.119
17	110	1.4493	6.3788	61.314	0.69208	5.7642	6.48	7.1721
18	120	1.583	6.3874	63.292	0.71343	5.7776	6.48	7.1934
19	180	2.3746	6.4392	73.961	0.82699	5.8522	6.48	7.307
20	240	3.1676	6.492	82.052	0.91001	5.8919	6.48	7.39
21	300	3.9653	6.5459	89.124	0.9803	5.9077	6.48	7.4603
22	360	4.766	6.6009	94.698	1.0329	5.9158	6.48	7.5129
23	420	5.5652	6.6568	100.03	1.082	5.9193	6.48	7.562
24	480	6.366	6.7137	104.89	1.1248	5.9117	6.48	7.6048
25	540	7.1682	6.7717	108.78	1.1566	5.9012	6.48	7.6366
26	600	7.9582	6.8299	112.56	1.1866	5.8884	6.48	7.6666
27	660	8.7559	6.8896	116.22	1.2145	5.8709	6.48	7.6945
28	720	9.5582	6.9507	119.03	1.233	5.8598	6.48	7.713
29	780	10.356	7.0125	122.09	1.2535	5.8453	6.48	7.7335
30	840	11.16	7.076	124.79	1.2697	5.8353	6.48	7.7497
31	900	11.954	7.1398	127	1.2807	5.8248	6.48	7.7607
32	960	12.753	7.2052	129.22	1.2913	5.8073	6.48	7.7713
33	1020	13.56	7.2725	130.84	1.2954	5.7986	6.48	7.7754
34	1080	14.358	7.3402	132.94	1.304	5.791	6.48	7.784
35	1140	15.15	7.4087	134.02	1.3024	5.7846	6.48	7.7824

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.06	6.6303	6.48	0.20586	1.370	1.3804	1.2302	1.122	1.3053	0.075127
3	0.12	6.7056	6.48	0.28401	1.259	1.3776	1.152	1.196	1.2648	0.11279
4	0.19	6.7623	6.48	0.33708	1.194	1.3813	1.099	1.257	1.2401	0.14115
5	0.25	6.8087	6.48	0.38024	1.157	1.3845	1.0558	1.311	1.2201	0.16434
6	0.32	6.8481	6.48	0.42048	1.142	1.3837	1.0156	1.362	1.1996	0.18407
7	0.39	6.8807	6.48	0.45488	1.135	1.3819	0.98116	1.408	1.1815	0.20036
8	0.45	6.9071	6.48	0.48463	1.135	1.3785	0.95142	1.449	1.165	0.21355
9	0.52	6.9314	6.48	0.50854	1.127	1.3789	0.92751	1.487	1.1532	0.22569
10	0.59	6.9536	6.48	0.5307	1.121	1.379	0.90535	1.523	1.1422	0.23681
11	0.65	6.9765	6.48	0.55519	1.118	1.3773	0.88085	1.564	1.1291	0.24825
12	0.72	7.0007	6.48	0.57677	1.108	1.38	0.85927	1.606	1.1196	0.26035
13	0.78	7.0228	6.48	0.59543	1.097	1.3834	0.84061	1.646	1.112	0.27142
14	0.92	7.0575	6.48	0.62284	1.079	1.3907	0.8132	1.710	1.1019	0.28874
15	1.05	7.092	6.48	0.65433	1.069	1.3937	0.78171	1.783	1.0877	0.30601
16	1.18	7.119	6.48	0.67883	1.062	1.3962	0.75722	1.844	1.0767	0.3195
17	1.45	7.1721	6.48	0.72023	1.041	1.4079	0.71581	1.967	1.0619	0.34604
18	1.58	7.1934	6.48	0.73365	1.028	1.4158	0.7024	2.016	1.0591	0.35672
19	2.37	7.307	6.48	0.80829	0.977	1.4547	0.62775	2.317	1.0412	0.41349
20	3.17	7.39	6.48	0.84795	0.932	1.4981	0.58809	2.547	1.0431	0.455
21	3.97	7.4603	6.48	0.8637	0.881	1.5526	0.57235	2.713	1.0625	0.49015
22	4.77	7.5129	6.48	0.87186	0.844	1.5971	0.56418	2.831	1.0806	0.51646
23	5.57	7.562	6.48	0.87536	0.809	1.6426	0.56068	2.930	1.1017	0.54098
24	6.37	7.6048	6.48	0.86778	0.771	1.6931	0.56827	2.979	1.1307	0.56242
25	7.17	7.6366	6.48	0.85728	0.741	1.7354	0.57876	2.998	1.1571	0.57831
26	7.96	7.6666	6.48	0.84445	0.712	1.7782	0.59159	3.006	1.1849	0.5933
27	8.76	7.6945	6.48	0.82695	0.681	1.8236	0.60909	2.994	1.2163	0.60726
28	9.56	7.713	6.48	0.81587	0.662	1.8532	0.62017	2.988	1.2367	0.61651
29	10.36	7.7335	6.48	0.80129	0.639	1.8883	0.63475	2.975	1.2615	0.62676
30	11.16	7.7497	6.48	0.79138	0.623	1.9144	0.64466	2.970	1.2795	0.63487
31	11.95	7.7607	6.48	0.78088	0.610	1.9359	0.65516	2.955	1.2955	0.64037
32	12.75	7.7713	6.48	0.76339	0.591	1.9639	0.67266	2.920	1.3183	0.64564
33	13.56	7.7754	6.48	0.75464	0.583	1.9768	0.6814	2.901	1.3291	0.64768
34	14.36	7.784	6.48	0.74706	0.573	1.993	0.68899	2.893	1.341	0.65199
35	15.15	7.7824	6.48	0.74064	0.569	1.9978	0.6954	2.873	1.3466	0.6512

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3372	0	0	5.045	7.92	7.92
2	5.0034	0.036161	6.3395	29.009	0.32946	5.3353	7.92	8.2495
3	10.003	0.10125	6.3436	44.36	0.50349	5.4952	7.92	8.4235
4	15.003	0.16634	6.3477	52.512	0.59563	5.6081	7.92	8.5156
5	20.003	0.23288	6.352	58.07	0.65823	5.6994	7.92	8.5782
6	25.003	0.29942	6.3562	62.835	0.71176	5.7779	7.92	8.6318
7	30.003	0.36451	6.3604	66.964	0.75804	5.8489	7.92	8.678
8	35.003	0.43104	6.3646	70.351	0.79586	5.9111	7.92	8.7159
9	40.003	0.49758	6.3689	73.792	0.83422	5.9681	7.92	8.7542
10	45.003	0.56122	6.3729	76.915	0.86897	6.0199	7.92	8.789
11	50.003	0.62632	6.3771	79.509	0.89769	6.0658	7.92	8.8177
12	55.003	0.69141	6.3813	82.103	0.92637	6.11	7.92	8.8464
13	60.003	0.7565	6.3855	84.432	0.95202	6.1513	7.92	8.872
14	70.003	0.88523	6.3938	88.826	1.0003	6.2246	7.92	8.9203
15	80.003	1.0154	6.4022	92.637	1.0418	6.2874	7.92	8.9618
16	90.003	1.1441	6.4105	96.078	1.0791	6.3444	7.92	8.9991
17	100	1.2743	6.419	99.307	1.1139	6.3944	7.92	9.0339
18	110	1.4031	6.4273	102.17	1.1445	6.4386	7.92	9.0645
19	120	1.5318	6.4357	105.08	1.1756	6.4788	7.92	9.0956
20	180	2.3245	6.488	118.31	1.313	6.648	7.92	9.233
21	240	3.1243	6.5415	129.11	1.4211	6.7475	7.92	9.3411
22	300	3.8982	6.5942	137.9	1.5057	6.8062	7.92	9.4257
23	360	4.6923	6.6492	145.04	1.5706	6.8405	7.92	9.4906
24	420	5.4951	6.7056	152.14	1.6335	6.8615	7.92	9.5535
25	480	6.2791	6.7617	157.91	1.6814	6.8719	7.92	9.6014
26	540	7.0746	6.8196	163.31	1.7241	6.8714	7.92	9.6441
27	600	7.8702	6.8785	168.65	1.7654	6.8702	7.92	9.6854
28	660	8.6498	6.9372	173.1	1.7966	6.8621	7.92	9.7166
29	720	9.454	6.9988	177.86	1.8298	6.8516	7.92	9.7498
30	780	10.257	7.0614	181.83	1.854	6.8399	7.92	9.774
31	840	11.038	7.1234	185.96	1.8796	6.8272	7.92	9.7996
32	900	11.839	7.1882	189.4	1.8971	6.8149	7.92	9.8171
33	960	12.632	7.2534	192.47	1.9106	6.8021	7.92	9.8306
34	1020	13.412	7.3187	196.23	1.9305	6.7824	7.92	9.8505
35	1080	14.223	7.388	199.09	1.9403	6.7742	7.92	9.8603
36	1140	15.029	7.458	202.21	1.9522	6.7638	7.92	9.8722

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.875	2.875	1.000	2.875	0
2	0.04	8.2495	7.92	0.29023	0.881	2.9142	2.5847	1.127	2.7495	0.16473
3	0.10	8.4235	7.92	0.45018	0.894	2.9283	2.4248	1.208	2.6765	0.25174
4	0.17	8.5156	7.92	0.56302	0.945	2.9076	2.3119	1.258	2.6098	0.29781
5	0.23	8.5782	7.92	0.65433	0.994	2.8789	2.2206	1.296	2.5497	0.32912
6	0.30	8.6318	7.92	0.73285	1.030	2.8539	2.1421	1.332	2.498	0.35588
7	0.36	8.678	7.92	0.80381	1.060	2.8292	2.0711	1.366	2.4502	0.37902
8	0.43	8.7159	7.92	0.86604	1.088	2.8048	2.0089	1.396	2.4068	0.39793
9	0.50	8.7542	7.92	0.92304	1.106	2.7861	1.9519	1.427	2.369	0.41711
10	0.56	8.789	7.92	0.97481	1.122	2.7691	1.9001	1.457	2.3346	0.43449
11	0.63	8.8177	7.92	1.0208	1.137	2.7519	1.8542	1.484	2.303	0.44885
12	0.69	8.8464	7.92	1.065	1.150	2.7364	1.81	1.512	2.2732	0.46318
13	0.76	8.872	7.92	1.1063	1.162	2.7207	1.7687	1.538	2.2447	0.47601
14	0.89	8.9203	7.92	1.1795	1.179	2.6957	1.6954	1.590	2.1955	0.50013
15	1.02	8.9618	7.92	1.2424	1.192	2.6744	1.6326	1.638	2.1535	0.52091
16	1.14	8.9991	7.92	1.2994	1.204	2.6547	1.5756	1.685	2.1152	0.53955
17	1.27	9.0339	7.92	1.3494	1.211	2.6395	1.5256	1.730	2.0825	0.55695
18	1.40	9.0645	7.92	1.3936	1.218	2.6258	1.4814	1.773	2.0536	0.57224
19	1.53	9.0956	7.92	1.4337	1.220	2.6168	1.4412	1.816	2.029	0.58778
20	2.32	9.233	7.92	1.603	1.221	2.5849	1.272	2.032	1.9285	0.65648
21	3.12	9.3411	7.92	1.7024	1.198	2.5936	1.1725	2.212	1.8831	0.71053
22	3.90	9.4257	7.92	1.7612	1.170	2.6194	1.1138	2.352	1.8666	0.75283
23	4.69	9.4906	7.92	1.7955	1.143	2.6501	1.0795	2.455	1.8648	0.7853
24	5.50	9.5535	7.92	1.8164	1.112	2.6921	1.0585	2.543	1.8753	0.81676
25	6.28	9.6014	7.92	1.8269	1.087	2.7295	1.0481	2.604	1.8888	0.84071
26	7.07	9.6441	7.92	1.8263	1.059	2.7728	1.0486	2.644	1.9107	0.86207
27	7.87	9.6854	7.92	1.8251	1.034	2.8152	1.0498	2.682	1.9325	0.88268
28	8.65	9.7166	7.92	1.817	1.011	2.8545	1.0579	2.698	1.9562	0.89828
29	9.45	9.7498	7.92	1.8065	0.987	2.8982	1.0684	2.713	1.9833	0.91488
30	10.26	9.774	7.92	1.7949	0.968	2.9341	1.0801	2.717	2.0071	0.92701
31	11.04	9.7996	7.92	1.7821	0.948	2.9725	1.0928	2.720	2.0327	0.93981
32	11.84	9.8171	7.92	1.7699	0.933	3.0022	1.1051	2.717	2.0536	0.94857
33	12.63	9.8306	7.92	1.7571	0.920	3.0284	1.1179	2.709	2.0731	0.95528
34	13.41	9.8505	7.92	1.7373	0.900	3.0681	1.1376	2.697	2.1029	0.96525
35	14.22	9.8603	7.92	1.7292	0.891	3.086	1.1458	2.693	2.1159	0.97013
36	15.03	9.8722	7.92	1.7187	0.880	3.1084	1.1562	2.688	2.1323	0.97609

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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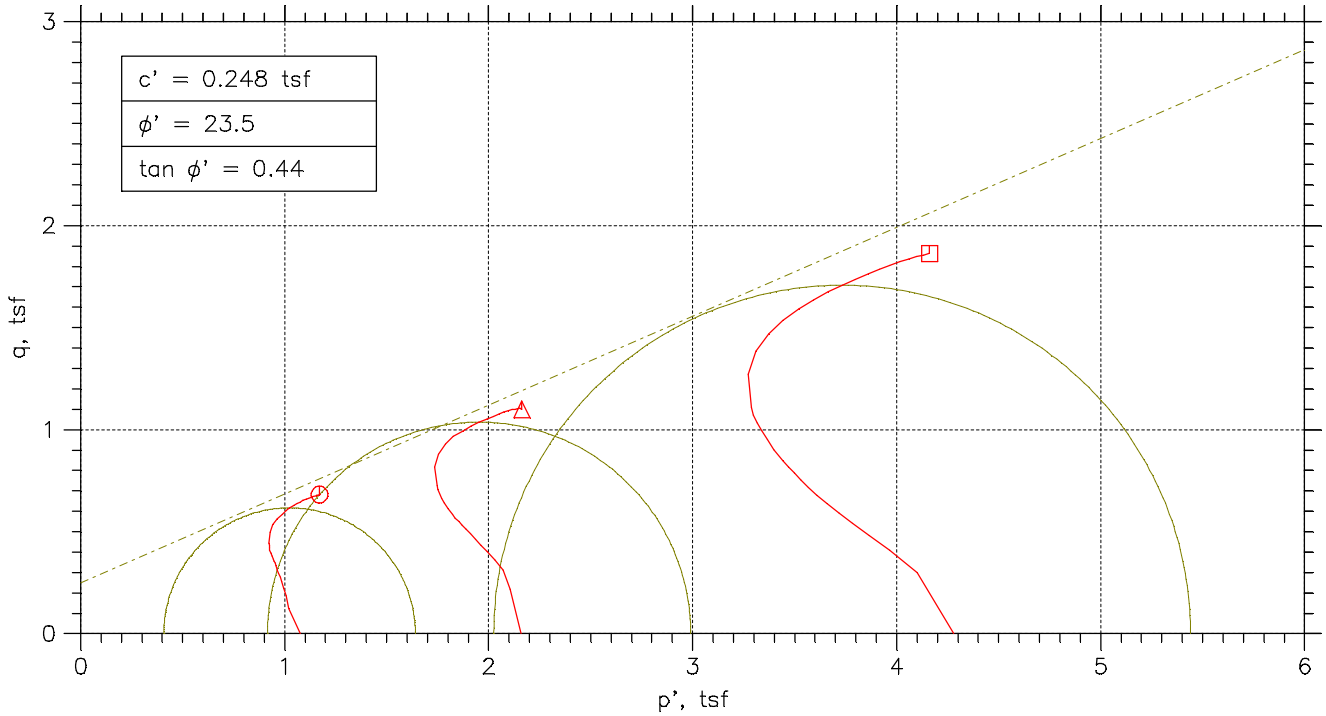

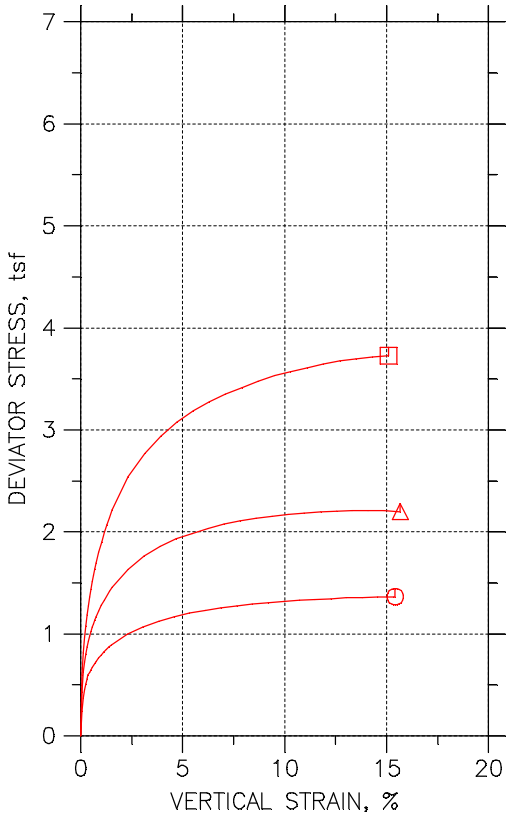

Symbol		⏲	△	⊡	
Test No.		15.0 PSI	30.0 PSI	60.0 PSI	
Initial	Diameter, in	2.8382	2.8134	2.8295	
	Height, in	6.3996	6.3425	6.2551	
	Water Content, %	31.54	29.27	28.87	
	Dry Density, pcf	87.92	91.94	94.81	
	Saturation, %	92.13	94.02	99.28	
	Void Ratio	0.93126	0.84681	0.791	
Before Shear	Water Content, %	31.86	27.59	24.62	
	Dry Density, pcf	90.97	97.01	101.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.86663	0.75044	0.66973	
	Back Press., tsf	5.0434	5.0422	5.0794	
Minor Prin. Stress, tsf		1.0766	2.1578	4.2806	
Max. Dev. Stress, tsf		1.3642	2.2082	3.7265	
Time to Failure, min		1205.9	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.97	0.98	0.96	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		19	19	19	
Plasticity Index		29	29	29	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-012 S-7
Sample Type: 3.0" ST

Failure Sketch

Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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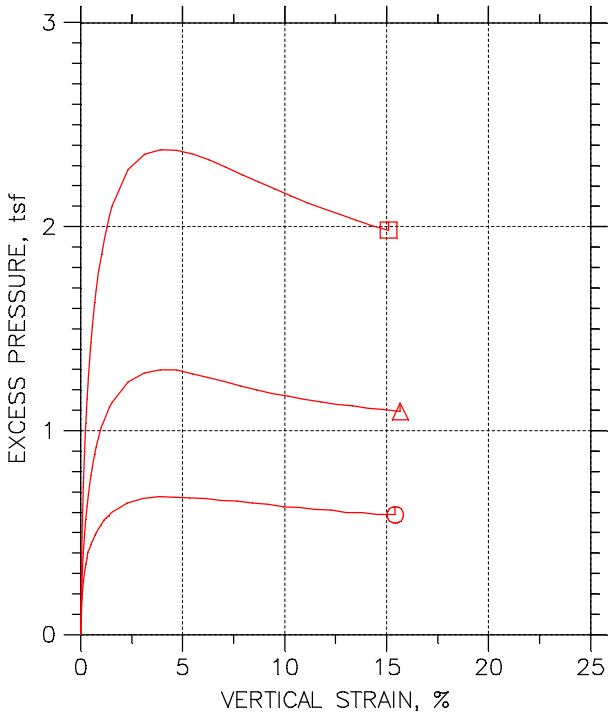
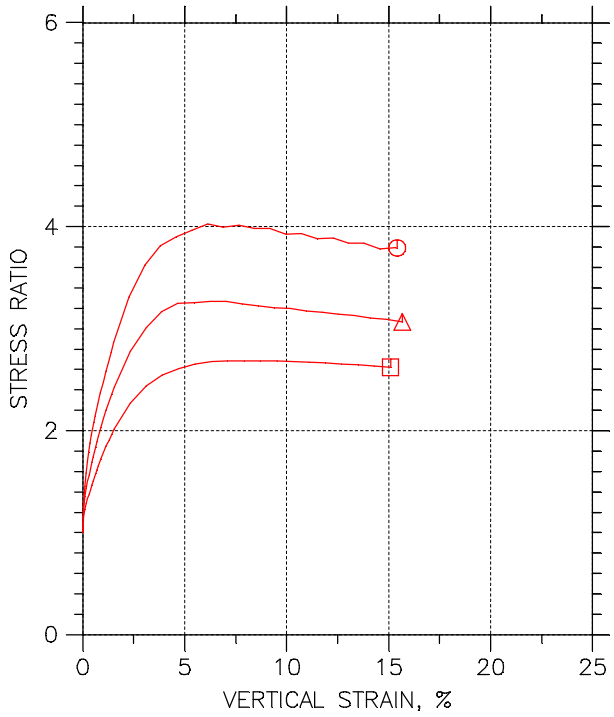
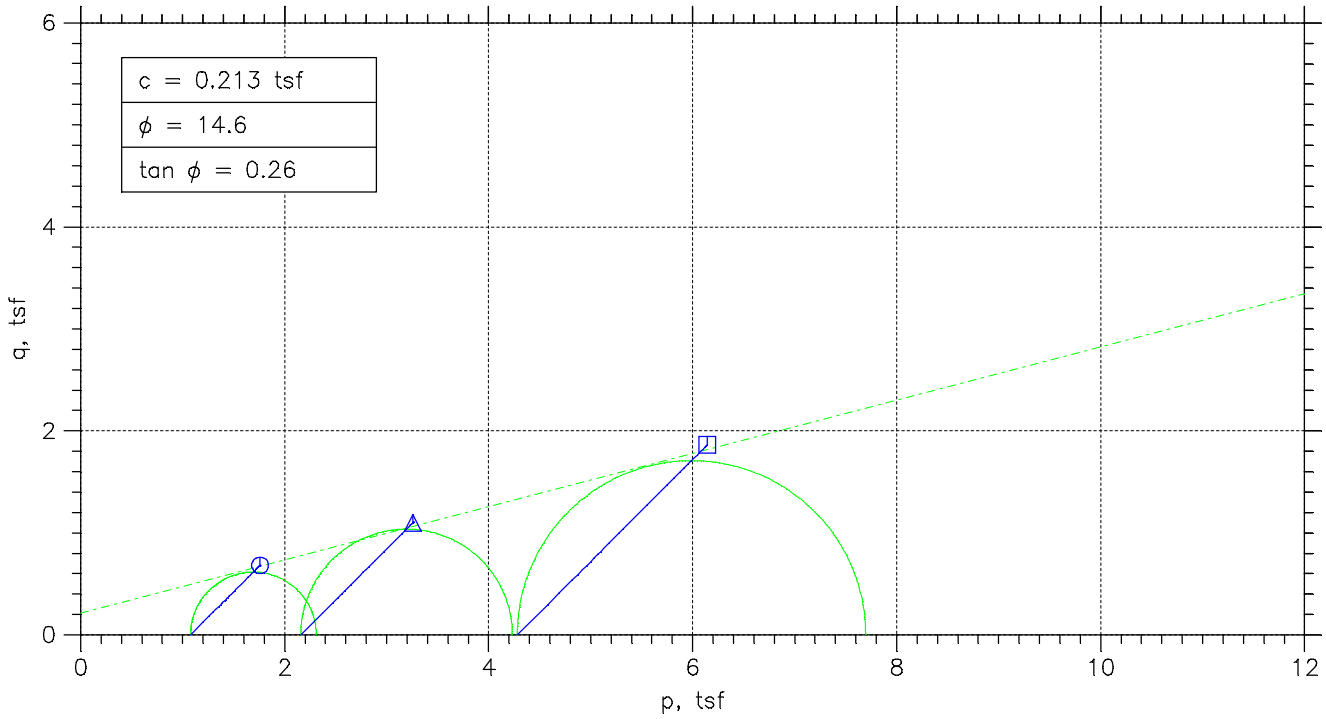
Consulting Engineers & Scientists







Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-012 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 11/5/15	Depth: 15.0'-17.0'
Test No.: EDW-012 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3266	0	0	5.0434	6.12	6.12
2	5.0003	0.05234	6.3299	21.743	0.24732	5.2234	6.12	6.3673
3	10	0.11458	6.3339	32.694	0.37164	5.2995	6.12	6.4916
4	15	0.17541	6.3377	39.538	0.44917	5.3506	6.12	6.5692
5	20	0.23765	6.3417	44.908	0.50986	5.3907	6.12	6.6299
6	25	0.30131	6.3458	49.067	0.55672	5.4203	6.12	6.6767
7	30	0.36214	6.3496	52.331	0.5934	5.4476	6.12	6.7134
8	35	0.42579	6.3537	54.963	0.62285	5.4673	6.12	6.7428
9	40	0.48945	6.3577	57.122	0.64689	5.4848	6.12	6.7669
10	45	0.55452	6.3619	59.175	0.66971	5.4993	6.12	6.7897
11	50.001	0.61818	6.366	61.228	0.6925	5.5132	6.12	6.8125
12	55.001	0.68183	6.3701	62.966	0.71169	5.5283	6.12	6.8317
13	60.001	0.74549	6.3741	64.545	0.72908	5.5399	6.12	6.8491
14	70.001	0.87563	6.3825	67.599	0.76257	5.5632	6.12	6.8826
15	80.001	1.0029	6.3907	70.284	0.79184	5.5829	6.12	6.9118
16	90.001	1.1303	6.399	72.863	0.81985	5.6032	6.12	6.9398
17	100	1.259	6.4073	75.18	0.84481	5.6154	6.12	6.9648
18	110	1.3863	6.4156	77.444	0.86913	5.6276	6.12	6.9891
19	120	1.5136	6.4239	79.392	0.88984	5.6427	6.12	7.0098
20	180	2.2832	6.4745	89.553	0.99588	5.6886	6.12	7.1159
21	240	3.0499	6.5257	96.923	1.0694	5.7124	6.12	7.1894
22	300	3.8194	6.5779	102.87	1.126	5.7194	6.12	7.246
23	360	4.5847	6.6306	107.72	1.1697	5.7165	6.12	7.2897
24	420	5.35	6.6842	111.77	1.2039	5.7141	6.12	7.3239
25	480	6.1238	6.7393	115.4	1.2329	5.7124	6.12	7.3529
26	540	6.8848	6.7944	118.4	1.2547	5.7014	6.12	7.3747
27	600	7.6572	6.8512	121.14	1.2731	5.6973	6.12	7.3931
28	660	8.4239	6.9086	123.83	1.2905	5.6874	6.12	7.4105
29	720	9.1878	6.9667	126.25	1.3047	5.6822	6.12	7.4247
30	780	9.9587	7.0264	128.56	1.3174	5.67	6.12	7.4374
31	840	10.721	7.0864	130.72	1.3282	5.6671	6.12	7.4482
32	900	11.496	7.1484	132.83	1.3379	5.6561	6.12	7.4579
33	960	12.266	7.2111	134.78	1.3457	5.6538	6.12	7.4657
34	1020	13.031	7.2746	136.78	1.3537	5.6433	6.12	7.4737
35	1080	13.799	7.3394	138.3	1.3568	5.6416	6.12	7.4768
36	1140	14.57	7.4057	139.88	1.36	5.6317	6.12	7.48
37	1200	15.338	7.4728	141.57	1.364	5.6317	6.12	7.484
38	1205.9	15.418	7.4798	141.73	1.3642	5.6311	6.12	7.4842

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.12	6.12	0	0.000	1.0766	1.0766	1.000	1.0766	0
2	0.05	6.3673	6.12	0.18002	0.728	1.1439	0.89655	1.276	1.0202	0.12366
3	0.11	6.4916	6.12	0.25609	0.689	1.1921	0.82048	1.453	1.0063	0.18582
4	0.18	6.5692	6.12	0.30719	0.684	1.2185	0.76938	1.584	0.99396	0.22459
5	0.24	6.6299	6.12	0.34726	0.681	1.2392	0.72931	1.699	0.98424	0.25493
6	0.30	6.6767	6.12	0.37688	0.677	1.2564	0.69969	1.796	0.97805	0.27836
7	0.36	6.7134	6.12	0.40417	0.681	1.2658	0.6724	1.883	0.9691	0.2967
8	0.43	6.7428	6.12	0.42392	0.681	1.2755	0.65265	1.954	0.96408	0.31142
9	0.49	6.7669	6.12	0.44134	0.682	1.2821	0.63523	2.018	0.95868	0.32345
10	0.55	6.7897	6.12	0.45585	0.681	1.2904	0.62072	2.079	0.95557	0.33485
11	0.62	6.8125	6.12	0.46979	0.678	1.2993	0.60678	2.141	0.95303	0.34625
12	0.68	6.8317	6.12	0.48489	0.681	1.3034	0.59168	2.203	0.94753	0.35585
13	0.75	6.8491	6.12	0.4965	0.681	1.3091	0.58007	2.257	0.94461	0.36454
14	0.88	6.8826	6.12	0.51973	0.682	1.3194	0.55684	2.369	0.93812	0.38128
15	1.00	6.9118	6.12	0.53948	0.681	1.3289	0.53709	2.474	0.93301	0.39592
16	1.13	6.9398	6.12	0.5598	0.683	1.3366	0.51677	2.586	0.92669	0.40992
17	1.26	6.9648	6.12	0.572	0.677	1.3494	0.50457	2.674	0.92698	0.42241
18	1.39	6.9891	6.12	0.58419	0.672	1.3615	0.49238	2.765	0.92694	0.43456
19	1.51	7.0098	6.12	0.59929	0.673	1.3671	0.47728	2.864	0.9222	0.44492
20	2.28	7.1159	6.12	0.64516	0.648	1.4273	0.43141	3.308	0.92935	0.49794
21	3.05	7.1894	6.12	0.66897	0.626	1.477	0.4076	3.624	0.94229	0.53469
22	3.82	7.246	6.12	0.67594	0.600	1.5266	0.40063	3.811	0.96364	0.56301
23	4.58	7.2897	6.12	0.67304	0.575	1.5732	0.40353	3.899	0.98836	0.58483
24	5.35	7.3239	6.12	0.67072	0.557	1.6098	0.40585	3.966	1.0078	0.60197
25	6.12	7.3529	6.12	0.66897	0.543	1.6405	0.4076	4.025	1.024	0.61645
26	6.88	7.3747	6.12	0.65794	0.524	1.6733	0.41863	3.997	1.046	0.62736
27	7.66	7.3931	6.12	0.65387	0.514	1.6958	0.42269	4.012	1.0592	0.63654
28	8.42	7.4105	6.12	0.644	0.499	1.7231	0.43257	3.983	1.0778	0.64524
29	9.19	7.4247	6.12	0.63878	0.490	1.7425	0.43779	3.980	1.0902	0.65237
30	9.96	7.4374	6.12	0.62658	0.476	1.7674	0.44999	3.928	1.1087	0.6587
31	10.72	7.4482	6.12	0.62368	0.470	1.7811	0.45289	3.933	1.117	0.66409
32	11.50	7.4579	6.12	0.61264	0.458	1.8018	0.46392	3.884	1.1329	0.66893
33	12.27	7.4657	6.12	0.61032	0.454	1.8119	0.46625	3.886	1.1391	0.67284
34	13.03	7.4737	6.12	0.59987	0.443	1.8304	0.4767	3.840	1.1536	0.67687
35	13.80	7.4768	6.12	0.59813	0.441	1.8352	0.47844	3.836	1.1568	0.67838
36	14.57	7.48	6.12	0.58826	0.433	1.8483	0.48831	3.785	1.1683	0.67999
37	15.34	7.484	6.12	0.58826	0.431	1.8523	0.48831	3.793	1.1703	0.68199
38	15.42	7.4842	6.12	0.58767	0.431	1.8531	0.48889	3.790	1.171	0.68212

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2165	0	0	5.0422	7.2	7.2
2	5	0.057327	6.2201	37.373	0.4326	5.3099	7.2	7.6326
3	10	0.11918	6.224	53.994	0.62462	5.4417	7.2	7.8246
4	15	0.18405	6.228	62.676	0.72458	5.5332	7.2	7.9246
5	20	0.24892	6.232	69.557	0.80361	5.6096	7.2	8.0036
6	25	0.31228	6.236	75.327	0.86972	5.6726	7.2	8.0697
7	30	0.37564	6.24	80.356	0.92719	5.728	7.2	8.1272
8	35	0.44202	6.2441	85.068	0.9809	5.7788	7.2	8.1809
9	40	0.50689	6.2482	88.985	1.0254	5.8225	7.2	8.2254
10	45	0.57025	6.2522	92.478	1.065	5.8616	7.2	8.265
11	50	0.6321	6.2561	95.602	1.1003	5.8972	7.2	8.3003
12	55	0.69697	6.2602	98.513	1.133	5.9298	7.2	8.333
13	60	0.76033	6.2642	101.53	1.167	5.9607	7.2	8.367
14	70	0.88856	6.2723	106.72	1.225	6.0115	7.2	8.425
15	80	1.0198	6.2806	111.69	1.2804	6.0569	7.2	8.4804
16	90	1.1496	6.2888	115.93	1.3273	6.0949	7.2	8.5273
17	110	1.412	6.3056	123.92	1.415	6.1573	7.2	8.615
18	120	1.5403	6.3138	127.47	1.4536	6.1806	7.2	8.6536
19	180	2.3247	6.3645	144.14	1.6307	6.2815	7.2	8.8307
20	240	3.1062	6.4158	156.9	1.7608	6.3252	7.2	8.9608
21	300	3.8877	6.468	167.01	1.8591	6.3415	7.2	9.0591
22	360	4.6691	6.521	175.01	1.9323	6.3398	7.2	9.1323
23	420	5.4611	6.5756	181.3	1.9852	6.32	7.2	9.1852
24	480	6.2516	6.6311	187.18	2.0324	6.3025	7.2	9.2324
25	540	7.0361	6.687	192.69	2.0747	6.2844	7.2	9.2747
26	600	7.8221	6.7441	197.24	2.1057	6.2616	7.2	9.3057
27	660	8.6005	6.8015	201.31	2.1311	6.2418	7.2	9.3311
28	720	9.391	6.8608	205.13	2.1527	6.2237	7.2	9.3527
29	780	10.177	6.9209	208.78	2.172	6.2109	7.2	9.372
30	840	10.96	6.9817	211.85	2.1847	6.1957	7.2	9.3847
31	900	11.752	7.0444	214.97	2.1972	6.1841	7.2	9.3972
32	960	12.536	7.1076	217.25	2.2007	6.1713	7.2	9.4007
33	1020	13.315	7.1714	219.79	2.2067	6.1631	7.2	9.4067
34	1080	14.104	7.2373	221.96	2.2082	6.1514	7.2	9.4082
35	1140	14.884	7.3036	223.76	2.2059	6.145	7.2	9.4059
36	1200	15.665	7.3713	225.14	2.199	6.1363	7.2	9.399

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	2.1578	2.1578	1.000	2.1578	0
2	0.06	7.6326	7.2	0.26768	0.619	2.3227	1.8901	1.229	2.1064	0.2163
3	0.12	7.8246	7.2	0.39948	0.640	2.3829	1.7583	1.355	2.0706	0.31231
4	0.18	7.9246	7.2	0.49104	0.678	2.3913	1.6668	1.435	2.029	0.36229
5	0.25	8.0036	7.2	0.56744	0.706	2.394	1.5904	1.505	1.9922	0.4018
6	0.31	8.0697	7.2	0.63042	0.725	2.3971	1.5274	1.569	1.9622	0.43486
7	0.38	8.1272	7.2	0.68582	0.740	2.3992	1.472	1.630	1.9356	0.4636
8	0.44	8.1809	7.2	0.73656	0.751	2.4021	1.4212	1.690	1.9117	0.49045
9	0.51	8.2254	7.2	0.7803	0.761	2.4029	1.3775	1.744	1.8902	0.5127
10	0.57	8.265	7.2	0.81937	0.769	2.4034	1.3384	1.796	1.8709	0.53249
11	0.63	8.3003	7.2	0.85495	0.777	2.4031	1.3028	1.845	1.853	0.55013
12	0.70	8.333	7.2	0.88761	0.783	2.4032	1.2702	1.892	1.8367	0.56651
13	0.76	8.367	7.2	0.91851	0.787	2.4063	1.2393	1.942	1.8228	0.58349
14	0.89	8.425	7.2	0.96925	0.791	2.4136	1.1885	2.031	1.8011	0.61251
15	1.02	8.4804	7.2	1.0147	0.792	2.4235	1.1431	2.120	1.7833	0.64022
16	1.15	8.5273	7.2	1.0526	0.793	2.4324	1.1051	2.201	1.7688	0.66363
17	1.41	8.615	7.2	1.115	0.788	2.4577	1.0427	2.357	1.7502	0.7075
18	1.54	8.6536	7.2	1.1384	0.783	2.473	1.0194	2.426	1.7462	0.7268
19	2.32	8.8307	7.2	1.2393	0.760	2.5492	0.91853	2.775	1.7339	0.81533
20	3.11	8.9608	7.2	1.283	0.729	2.6356	0.87479	3.013	1.7552	0.88039
21	3.89	9.0591	7.2	1.2993	0.699	2.7176	0.85846	3.166	1.788	0.92957
22	4.67	9.1323	7.2	1.2976	0.672	2.7925	0.86021	3.246	1.8263	0.96614
23	5.46	9.1852	7.2	1.2778	0.644	2.8652	0.88004	3.256	1.8726	0.9926
24	6.25	9.2324	7.2	1.2603	0.620	2.9299	0.89753	3.264	1.9137	1.0162
25	7.04	9.2747	7.2	1.2422	0.599	2.9903	0.91561	3.266	1.9529	1.0373
26	7.82	9.3057	7.2	1.2194	0.579	3.0441	0.93836	3.244	1.9912	1.0529
27	8.60	9.3311	7.2	1.1996	0.563	3.0893	0.95818	3.224	2.0237	1.0655
28	9.39	9.3527	7.2	1.1815	0.549	3.1289	0.97626	3.205	2.0526	1.0763
29	10.18	9.372	7.2	1.1687	0.538	3.1611	0.98909	3.196	2.0751	1.086
30	10.96	9.3847	7.2	1.1535	0.528	3.189	1.0043	3.175	2.0966	1.0924
31	11.75	9.3972	7.2	1.1419	0.520	3.2131	1.0159	3.163	2.1145	1.0986
32	12.54	9.4007	7.2	1.129	0.513	3.2295	1.0287	3.139	2.1291	1.1004
33	13.31	9.4067	7.2	1.1209	0.508	3.2436	1.0369	3.128	2.1402	1.1033
34	14.10	9.4082	7.2	1.1092	0.502	3.2567	1.0486	3.106	2.1527	1.1041
35	14.88	9.4059	7.2	1.1028	0.500	3.2608	1.055	3.091	2.1579	1.1029
36	15.67	9.399	7.2	1.0941	0.498	3.2628	1.0637	3.067	2.1633	1.0995

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2881	0	0	5.0794	9.36	9.36
2	5	0.055149	6.2915	52.036	0.59549	5.5563	9.36	9.9555
3	10	0.11755	6.2955	71.569	0.81852	5.8035	9.36	10.179
4	15	0.18141	6.2995	84.326	0.96381	5.9774	9.36	10.324
5	20	0.24672	6.3036	94.702	1.0817	6.1181	9.36	10.442
6	25	0.31203	6.3078	103.75	1.1843	6.2356	9.36	10.544
7	30	0.37733	6.3119	111.85	1.2759	6.3392	9.36	10.636
8	35	0.44119	6.3159	119.26	1.3596	6.4305	9.36	10.72
9	40	0.5065	6.3201	125.99	1.4353	6.5113	9.36	10.795
10	45	0.5718	6.3242	132.6	1.5097	6.5858	9.36	10.87
11	50	0.63566	6.3283	138.48	1.5755	6.6503	9.36	10.936
12	55	0.70097	6.3325	143.88	1.6359	6.7091	9.36	10.996
13	60	0.76628	6.3366	149.33	1.6968	6.7667	9.36	11.057
14	70	0.89544	6.3449	158.97	1.8039	6.8626	9.36	11.164
15	80	1.0261	6.3533	167.86	1.9023	6.9446	9.36	11.262
16	90	1.1567	6.3617	176.06	1.9927	7.0185	9.36	11.353
17	100	1.2873	6.3701	183	2.0684	7.0773	9.36	11.428
18	110	1.4165	6.3784	189.56	2.1398	7.1325	9.36	11.5
19	120	1.5471	6.3869	196.55	2.2157	7.1802	9.36	11.576
20	180	2.3351	6.4384	227.25	2.5413	7.3582	9.36	11.901
21	240	3.1261	6.491	249.54	2.768	7.4332	9.36	12.128
22	300	3.9156	6.5443	267.01	2.9376	7.4565	9.36	12.298
23	360	4.7123	6.599	281.56	3.0721	7.453	9.36	12.432
24	420	5.5149	6.6551	294.48	3.1859	7.4338	9.36	12.546
25	480	6.3087	6.7115	305.17	3.2739	7.4059	9.36	12.634
26	540	7.1069	6.7692	315.07	3.3513	7.3716	9.36	12.711
27	600	7.9066	6.8279	323.91	3.4156	7.3349	9.36	12.776
28	660	8.699	6.8872	332.28	3.4737	7.2994	9.36	12.834
29	720	9.5044	6.9485	340.75	3.5308	7.2645	9.36	12.891
30	780	10.304	7.0104	347.84	3.5725	7.2302	9.36	12.932
31	840	11.102	7.0734	354.51	3.6086	7.1977	9.36	12.969
32	900	11.898	7.1372	361.34	3.6452	7.1668	9.36	13.005
33	960	12.697	7.2026	367.64	3.675	7.1383	9.36	13.035
34	1020	13.49	7.2686	373.2	3.6967	7.1104	9.36	13.057
35	1080	14.297	7.337	378.28	3.7121	7.0837	9.36	13.072
36	1140	15.095	7.406	383.31	3.7265	7.0621	9.36	13.086

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	9.36	9.36	0	0.000	4.2806	4.2806	1.000	4.2806	0
2	0.06	9.9555	9.36	0.47694	0.801	4.3992	3.8037	1.157	4.1015	0.29775
3	0.12	10.179	9.36	0.72413	0.885	4.375	3.5565	1.230	3.9658	0.40926
4	0.18	10.324	9.36	0.89803	0.932	4.3464	3.3826	1.285	3.8645	0.4819
5	0.25	10.442	9.36	1.0388	0.960	4.3235	3.2419	1.334	3.7827	0.54084
6	0.31	10.544	9.36	1.1563	0.976	4.3087	3.1244	1.379	3.7165	0.59215
7	0.38	10.636	9.36	1.2598	0.987	4.2967	3.0208	1.422	3.6588	0.63796
8	0.44	10.72	9.36	1.3511	0.994	4.2891	2.9295	1.464	3.6093	0.67979
9	0.51	10.795	9.36	1.432	0.998	4.2839	2.8487	1.504	3.5663	0.71764
10	0.57	10.87	9.36	1.5064	0.998	4.2839	2.7742	1.544	3.5291	0.75483
11	0.64	10.936	9.36	1.571	0.997	4.2852	2.7097	1.581	3.4974	0.78777
12	0.70	10.996	9.36	1.6297	0.996	4.2868	2.6509	1.617	3.4689	0.81795
13	0.77	11.057	9.36	1.6873	0.994	4.2901	2.5933	1.654	3.4417	0.84839
14	0.90	11.164	9.36	1.7833	0.989	4.3013	2.4974	1.722	3.3993	0.90195
15	1.03	11.262	9.36	1.8653	0.981	4.3177	2.4154	1.788	3.3665	0.95115
16	1.16	11.353	9.36	1.9391	0.973	4.3341	2.3415	1.851	3.3378	0.99633
17	1.29	11.428	9.36	1.9979	0.966	4.3511	2.2827	1.906	3.3169	1.0342
18	1.42	11.5	9.36	2.0531	0.960	4.3673	2.2275	1.961	3.2974	1.0699
19	1.55	11.576	9.36	2.1008	0.948	4.3955	2.1798	2.016	3.2877	1.1079
20	2.34	11.901	9.36	2.2788	0.897	4.5432	2.0018	2.270	3.2725	1.2707
21	3.13	12.128	9.36	2.3539	0.850	4.6947	1.9268	2.437	3.3108	1.384
22	3.92	12.298	9.36	2.3771	0.809	4.8411	1.9035	2.543	3.3723	1.4688
23	4.71	12.432	9.36	2.3736	0.773	4.9791	1.907	2.611	3.443	1.536
24	5.51	12.546	9.36	2.3544	0.739	5.1121	1.9262	2.654	3.5192	1.593
25	6.31	12.634	9.36	2.3265	0.711	5.228	1.9541	2.675	3.5911	1.6369
26	7.11	12.711	9.36	2.2922	0.684	5.3397	1.9884	2.685	3.6641	1.6756
27	7.91	12.776	9.36	2.2556	0.660	5.4407	2.0251	2.687	3.7329	1.7078
28	8.70	12.834	9.36	2.2201	0.639	5.5342	2.0606	2.686	3.7974	1.7368
29	9.50	12.891	9.36	2.1852	0.619	5.6263	2.0955	2.685	3.8609	1.7654
30	10.30	12.932	9.36	2.1509	0.602	5.7022	2.1298	2.677	3.916	1.7862
31	11.10	12.969	9.36	2.1183	0.587	5.7709	2.1623	2.669	3.9666	1.8043
32	11.90	13.005	9.36	2.0875	0.573	5.8383	2.1932	2.662	4.0158	1.8226
33	12.70	13.035	9.36	2.059	0.560	5.8967	2.2217	2.654	4.0592	1.8375
34	13.49	13.057	9.36	2.031	0.549	5.9463	2.2496	2.643	4.098	1.8484
35	14.30	13.072	9.36	2.0043	0.540	5.9885	2.2763	2.631	4.1324	1.8561
36	15.09	13.086	9.36	1.9828	0.532	6.0243	2.2979	2.622	4.1611	1.8632

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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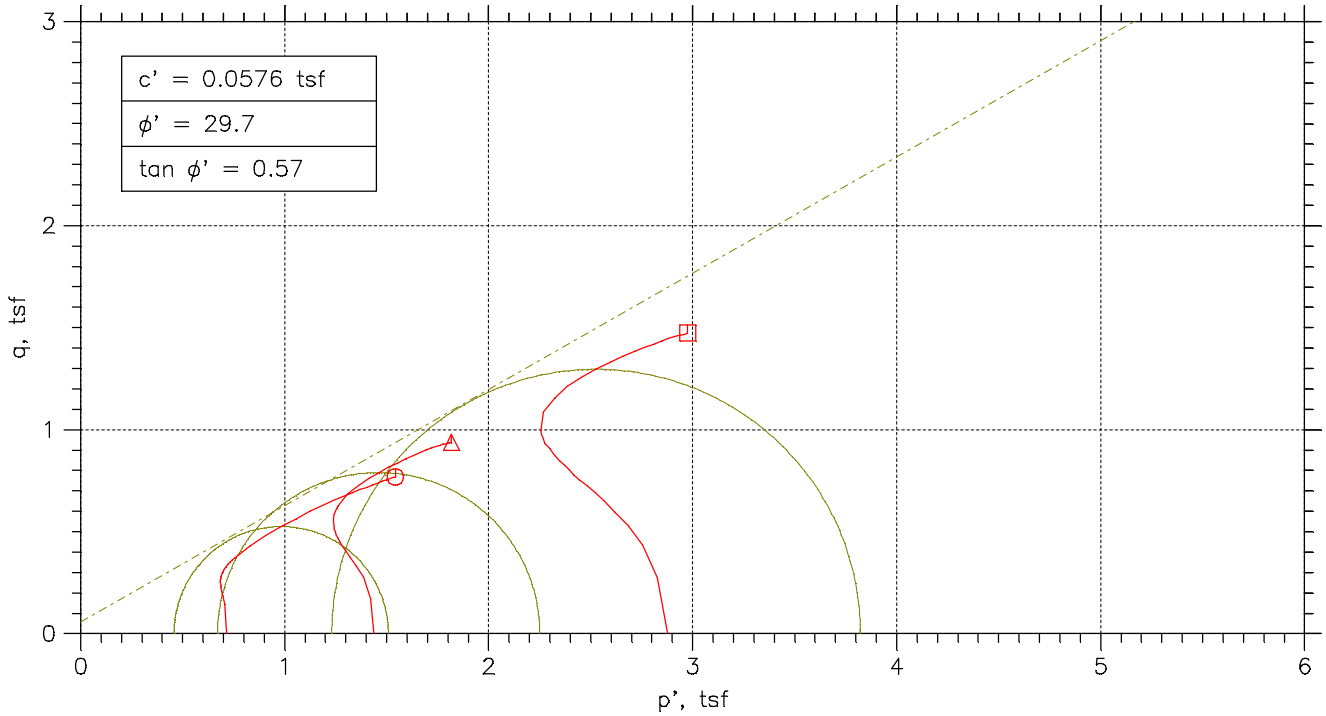

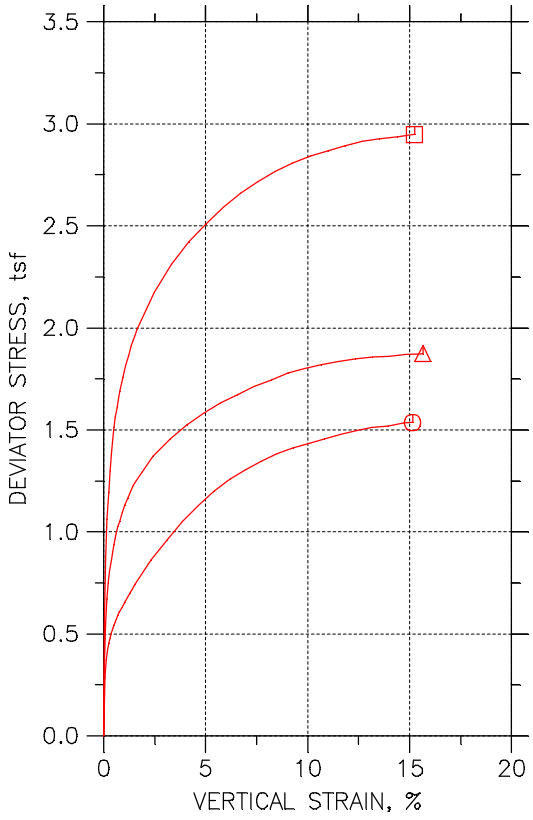

Symbol		⏲	△	⊡	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8386	2.8571	2.8543	
	Height, in	6.0421	6.0181	5.878	
	Water Content, %	19.07	19.02	18.95	
	Dry Density, pcf	111.5	111.3	111.5	
	Saturation, %	99.28	98.47	98.47	
	Void Ratio	0.52245	0.52554	0.52343	
Before Shear	Water Content, %	18.80	18.40	16.50	
	Dry Density, pcf	112.4	113.2	117.2	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.51129	0.50044	0.4489	
	Back Press., tsf	5.0445	5.044	5.0432	
Minor Prin. Stress, tsf		0.71549	1.436	2.8768	
Max. Dev. Stress, tsf		1.536	1.8745	2.9478	
Time to Failure, min		1174.7	1140	1080	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.95	0.97	0.97	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		49	49	49	
Plastic Limit		21	21	21	
Plasticity Index		28	28	28	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-013 S3
Sample Type: 3.0" ST

Failure Sketch

Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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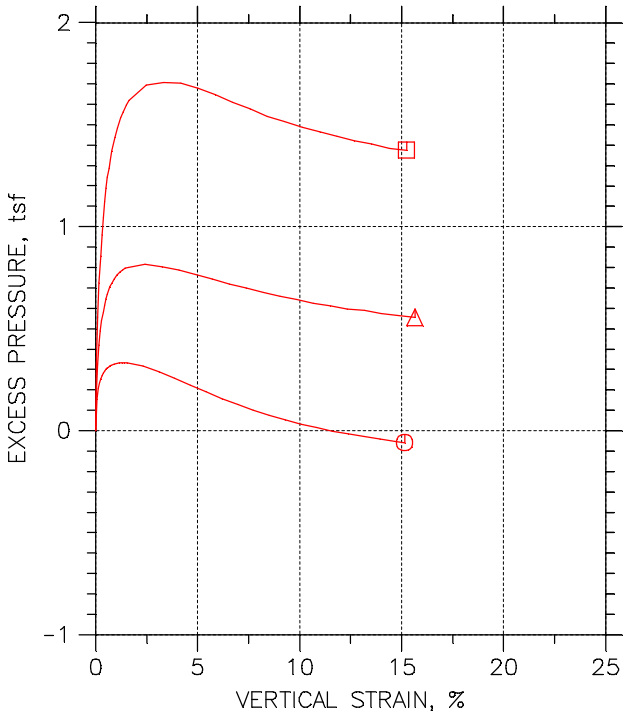

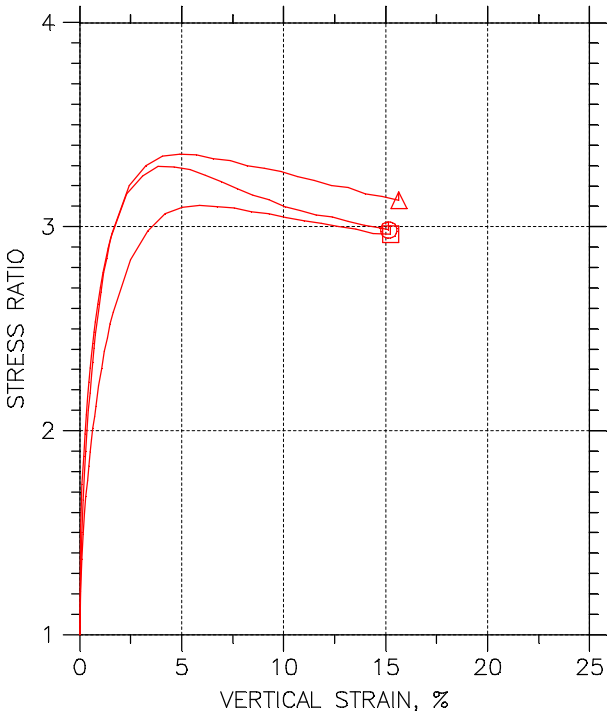

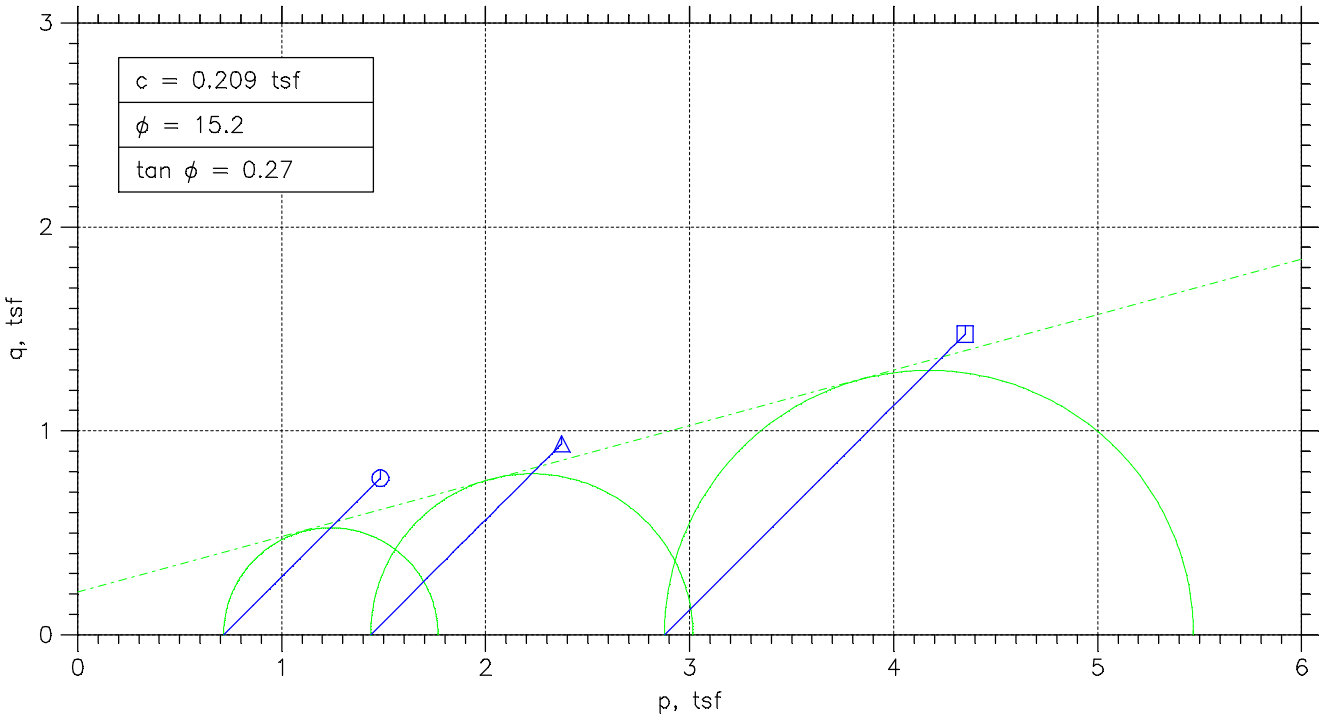

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S3	Tested By: BCM	Checked By: WPQ
Sample No.: S-3	Test Date: 11/4/15	Depth: 6.0'-8.0'
Test No.: EDW-013 S3	Sample Type: 3.0" ST	Elevation: -----
Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3284	0	0	5.0445	5.76	5.76
2	5.0002	0.058512	6.3321	25.429	0.28914	5.1976	5.76	6.0491
3	10	0.12273	6.3362	32.957	0.3745	5.2511	5.76	6.1345
4	15	0.18695	6.3402	36.958	0.4197	5.2802	5.76	6.1797
5	20	0.25117	6.3443	39.959	0.45348	5.3	5.76	6.2135
6	25	0.31682	6.3485	42.381	0.48065	5.3139	5.76	6.2407
7	30	0.38104	6.3526	44.539	0.50481	5.3273	5.76	6.2648
8	35	0.44526	6.3567	46.277	0.52416	5.3372	5.76	6.2842
9	40	0.50948	6.3608	47.909	0.5423	5.3454	5.76	6.3023
10	45	0.5737	6.3649	49.488	0.55981	5.3512	5.76	6.3198
11	50	0.63935	6.3691	50.91	0.57551	5.3564	5.76	6.3355
12	55	0.70357	6.3732	52.278	0.5906	5.3617	5.76	6.3506
13	60	0.76922	6.3774	53.542	0.60448	5.3657	5.76	6.3645
14	70.001	0.89623	6.3856	55.911	0.63042	5.371	5.76	6.3904
15	80.001	1.0232	6.3938	58.175	0.6551	5.375	5.76	6.4151
16	90.001	1.1503	6.402	60.386	0.67913	5.3774	5.76	6.4391
17	100	1.2787	6.4104	62.387	0.70072	5.3779	5.76	6.4607
18	110	1.4043	6.4185	64.387	0.72227	5.3785	5.76	6.4823
19	120	1.5342	6.427	66.493	0.74491	5.3768	5.76	6.5049
20	180	2.3134	6.4783	77.602	0.86247	5.3611	5.76	6.6225
21	240	3.0926	6.5303	87.078	0.96008	5.3331	5.76	6.7201
22	300	3.8561	6.5822	96.028	1.0504	5.3023	5.76	6.8104
23	360	4.6339	6.6359	103.98	1.1282	5.268	5.76	6.8882
24	420	5.4102	6.6903	111.3	1.1977	5.2348	5.76	6.9577
25	480	6.1766	6.745	117.72	1.2566	5.2016	5.76	7.0166
26	540	6.9544	6.8014	123.3	1.3053	5.172	5.76	7.0653
27	600	7.7321	6.8587	128.09	1.3446	5.1446	5.76	7.1046
28	660	8.4985	6.9162	132.78	1.3822	5.1184	5.76	7.1422
29	720	9.2777	6.9756	136.88	1.4129	5.0975	5.76	7.1729
30	780	10.057	7.036	140.2	1.4347	5.0759	5.76	7.1947
31	840	10.819	7.0961	143.62	1.4572	5.0591	5.76	7.2172
32	900	11.602	7.159	146.99	1.4783	5.0416	5.76	7.2383
33	960	12.382	7.2227	150.1	1.4963	5.0288	5.76	7.2563
34	1020	13.151	7.2866	152.89	1.5107	5.0148	5.76	7.2707
35	1080	13.932	7.3527	155.15	1.5193	5.0032	5.76	7.2793
36	1140	14.706	7.4195	157.94	1.5327	4.9921	5.76	7.2927
37	1174.7	15.146	7.458	159.1	1.536	4.9857	5.76	7.296

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71549	0.71549	1.000	0.71549	0
2	0.06	6.0491	5.76	0.15304	0.529	0.85158	0.56245	1.514	0.70701	0.14457
3	0.12	6.1345	5.76	0.20658	0.552	0.88341	0.50891	1.736	0.69616	0.18725
4	0.19	6.1797	5.76	0.23567	0.562	0.89951	0.47981	1.875	0.68966	0.20985
5	0.25	6.2135	5.76	0.25546	0.563	0.91352	0.46003	1.986	0.68677	0.22674
6	0.32	6.2407	5.76	0.26942	0.561	0.92672	0.44606	2.078	0.68639	0.24033
7	0.38	6.2648	5.76	0.2828	0.560	0.93749	0.43268	2.167	0.68508	0.2524
8	0.45	6.2842	5.76	0.2927	0.558	0.94695	0.42279	2.240	0.68487	0.26208
9	0.51	6.3023	5.76	0.30084	0.555	0.95694	0.41464	2.308	0.68579	0.27115
10	0.57	6.3198	5.76	0.30666	0.548	0.96863	0.40882	2.369	0.68873	0.27991
11	0.64	6.3355	5.76	0.3119	0.542	0.9791	0.40359	2.426	0.69134	0.28776
12	0.70	6.3506	5.76	0.31714	0.537	0.98895	0.39835	2.483	0.69365	0.2953
13	0.77	6.3645	5.76	0.32121	0.531	0.99875	0.39428	2.533	0.69651	0.30224
14	0.90	6.3904	5.76	0.32645	0.518	1.0195	0.38904	2.620	0.70425	0.31521
15	1.02	6.4151	5.76	0.33052	0.505	1.0401	0.38496	2.702	0.71252	0.32755
16	1.15	6.4391	5.76	0.33285	0.490	1.0618	0.38264	2.775	0.7222	0.33956
17	1.28	6.4607	5.76	0.33343	0.476	1.0828	0.38206	2.834	0.73241	0.35036
18	1.40	6.4823	5.76	0.33401	0.462	1.1037	0.38147	2.893	0.74261	0.36113
19	1.53	6.5049	5.76	0.33227	0.446	1.1281	0.38322	2.944	0.75567	0.37245
20	2.31	6.6225	5.76	0.31656	0.367	1.2614	0.39893	3.162	0.83017	0.43124
21	3.09	6.7201	5.76	0.28862	0.301	1.3869	0.42686	3.249	0.9069	0.48004
22	3.86	6.8104	5.76	0.25778	0.245	1.5081	0.4577	3.295	0.98291	0.52521
23	4.63	6.8882	5.76	0.22345	0.198	1.6202	0.49203	3.293	1.0561	0.56408
24	5.41	6.9577	5.76	0.19028	0.159	1.7229	0.5252	3.281	1.1241	0.59887
25	6.18	7.0166	5.76	0.15711	0.125	1.815	0.55837	3.250	1.1867	0.6283
26	6.95	7.0653	5.76	0.12744	0.098	1.8933	0.58805	3.220	1.2407	0.65263
27	7.73	7.1046	5.76	0.10009	0.074	1.96	0.6154	3.185	1.2877	0.67232
28	8.50	7.1422	5.76	0.073902	0.053	2.0238	0.64158	3.154	1.3327	0.69112
29	9.28	7.1729	5.76	0.052953	0.037	2.0754	0.66253	3.133	1.369	0.70643
30	10.06	7.1947	5.76	0.031423	0.022	2.1187	0.68406	3.097	1.4014	0.71734
31	10.82	7.2172	5.76	0.014548	0.010	2.1582	0.70094	3.079	1.4296	0.72862
32	11.60	7.2383	5.76	-0.0029095	-0.002	2.1967	0.7184	3.058	1.4576	0.73916
33	12.38	7.2563	5.76	-0.015711	-0.011	2.2275	0.7312	3.046	1.4793	0.74813
34	13.15	7.2707	5.76	-0.029677	-0.020	2.2559	0.74516	3.027	1.5005	0.75534
35	13.93	7.2793	5.76	-0.041315	-0.027	2.2761	0.7568	3.008	1.5164	0.75964
36	14.71	7.2927	5.76	-0.052371	-0.034	2.3005	0.76786	2.996	1.5342	0.76634
37	15.15	7.296	5.76	-0.058772	-0.038	2.3102	0.77426	2.984	1.5422	0.76798

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.4112	0	0	5.044	6.48	6.48
2	5.0001	0.036568	6.4135	30.226	0.33933	5.2282	6.48	6.8193
3	10	0.095395	6.4173	49.495	0.55532	5.3711	6.48	7.0353
4	15	0.16217	6.4216	59.764	0.67009	5.4644	6.48	7.1501
5	20	0.22895	6.4259	66.858	0.74912	5.5321	6.48	7.2291
6	25	0.29572	6.4302	72.098	0.8073	5.5828	6.48	7.2873
7	30	0.36409	6.4346	76.704	0.85828	5.6254	6.48	7.3383
8	35	0.43405	6.4391	80.568	0.90088	5.6604	6.48	7.3809
9	40	0.50082	6.4434	83.903	0.93755	5.689	6.48	7.4175
10	45	0.57078	6.448	86.92	0.97058	5.7129	6.48	7.4506
11	50	0.63756	6.4523	89.62	1.0001	5.7309	6.48	7.4801
12	55	0.70433	6.4566	92.002	1.0259	5.7496	6.48	7.5059
13	60	0.77429	6.4612	94.384	1.0518	5.7642	6.48	7.5318
14	70	0.91261	6.4702	98.513	1.0962	5.7881	6.48	7.5762
15	80.001	1.0478	6.479	101.9	1.1324	5.8068	6.48	7.6124
16	90.001	1.1861	6.4881	105.29	1.1684	5.8219	6.48	7.6484
17	100	1.3212	6.497	108.15	1.1985	5.8301	6.48	7.6785
18	110	1.4595	6.5061	110.79	1.2261	5.8394	6.48	7.7061
19	120	1.5947	6.5151	113.28	1.2519	5.8435	6.48	7.7319
20	180	2.423	6.5704	125.03	1.3702	5.8581	6.48	7.8502
21	240	3.2498	6.6265	133.87	1.4546	5.847	6.48	7.9346
22	300	4.0702	6.6832	141.44	1.5238	5.8307	6.48	8.0038
23	360	4.8969	6.7413	147.9	1.5797	5.8091	6.48	8.0597
24	420	5.7253	6.8005	154.2	1.6326	5.7863	6.48	8.1126
25	480	6.5521	6.8607	159.44	1.6733	5.763	6.48	8.1533
26	540	7.3804	6.922	164.79	1.7141	5.742	6.48	8.1941
27	600	8.2072	6.9844	169.34	1.7457	5.7204	6.48	8.2257
28	660	9.0339	7.0479	174.05	1.7781	5.7024	6.48	8.2581
29	720	9.8591	7.1124	177.97	1.8016	5.686	6.48	8.2816
30	780	10.684	7.1781	181.41	1.8196	5.6697	6.48	8.2996
31	840	11.508	7.2449	184.64	1.835	5.6563	6.48	8.315
32	900	12.335	7.3132	187.76	1.8486	5.6406	6.48	8.3286
33	960	13.166	7.3832	190.52	1.8579	5.633	6.48	8.3379
34	1020	13.991	7.4541	192.74	1.8617	5.619	6.48	8.3417
35	1080	14.821	7.5267	195.44	1.8695	5.6096	6.48	8.3495
36	1140	15.646	7.6003	197.87	1.8745	5.5997	6.48	8.3545

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.04	6.8193	6.48	0.18429	0.543	1.5911	1.2518	1.271	1.4214	0.16966
3	0.10	7.0353	6.48	0.32717	0.589	1.6642	1.1089	1.501	1.3865	0.27766
4	0.16	7.1501	6.48	0.42048	0.627	1.6857	1.0156	1.660	1.3506	0.33504
5	0.23	7.2291	6.48	0.48812	0.652	1.697	0.94792	1.790	1.3225	0.37456
6	0.30	7.2873	6.48	0.53886	0.667	1.7045	0.89718	1.900	1.3008	0.40365
7	0.36	7.3383	6.48	0.58143	0.677	1.7129	0.85461	2.004	1.2837	0.42914
8	0.43	7.3809	6.48	0.61643	0.684	1.7205	0.81962	2.099	1.2701	0.45044
9	0.50	7.4175	6.48	0.645	0.688	1.7286	0.79104	2.185	1.2598	0.46877
10	0.57	7.4506	6.48	0.66891	0.689	1.7377	0.76713	2.265	1.2524	0.48529
11	0.64	7.4801	6.48	0.68699	0.687	1.7491	0.74905	2.335	1.2491	0.50003
12	0.70	7.5059	6.48	0.70565	0.688	1.7563	0.73039	2.405	1.2434	0.51297
13	0.77	7.5318	6.48	0.72023	0.685	1.7676	0.71581	2.469	1.2417	0.52588
14	0.91	7.5762	6.48	0.74414	0.679	1.7881	0.6919	2.584	1.24	0.54812
15	1.05	7.6124	6.48	0.7628	0.674	1.8056	0.67324	2.682	1.2394	0.5662
16	1.19	7.6484	6.48	0.77797	0.666	1.8265	0.65808	2.775	1.2423	0.58421
17	1.32	7.6785	6.48	0.78613	0.656	1.8484	0.64991	2.844	1.2492	0.59925
18	1.46	7.7061	6.48	0.79546	0.649	1.8667	0.64058	2.914	1.2536	0.61305
19	1.59	7.7319	6.48	0.79954	0.639	1.8884	0.6365	2.967	1.2625	0.62596
20	2.42	7.8502	6.48	0.81412	0.594	1.9921	0.62192	3.203	1.307	0.68508
21	3.25	7.9346	6.48	0.80304	0.552	2.0876	0.633	3.298	1.3603	0.7273
22	4.07	8.0038	6.48	0.78671	0.516	2.1731	0.64933	3.347	1.4112	0.76191
23	4.90	8.0597	6.48	0.76514	0.484	2.2506	0.67091	3.355	1.4607	0.78983
24	5.73	8.1126	6.48	0.74239	0.455	2.3262	0.69365	3.354	1.5099	0.8163
25	6.55	8.1533	6.48	0.71907	0.430	2.3903	0.71698	3.334	1.5536	0.83664
26	7.38	8.1941	6.48	0.69807	0.407	2.452	0.73797	3.323	1.595	0.85703
27	8.21	8.2257	6.48	0.67649	0.388	2.5052	0.75955	3.298	1.6324	0.87284
28	9.03	8.2581	6.48	0.65841	0.370	2.5557	0.77763	3.287	1.6667	0.88905
29	9.86	8.2816	6.48	0.64209	0.356	2.5956	0.79396	3.269	1.6948	0.90081
30	10.68	8.2996	6.48	0.62576	0.344	2.6299	0.81029	3.246	1.7201	0.90982
31	11.51	8.315	6.48	0.61234	0.334	2.6587	0.8237	3.228	1.7412	0.91748
32	12.33	8.3286	6.48	0.5966	0.323	2.688	0.83945	3.202	1.7637	0.92428
33	13.17	8.3379	6.48	0.58902	0.317	2.7049	0.84703	3.193	1.776	0.92893
34	13.99	8.3417	6.48	0.57502	0.309	2.7227	0.86102	3.162	1.7919	0.93084
35	14.82	8.3495	6.48	0.56569	0.303	2.7399	0.87036	3.148	1.8051	0.93477
36	15.65	8.3545	6.48	0.55577	0.296	2.7548	0.88027	3.129	1.8175	0.93725

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
Specimen Area: 6.40 in^2
Specimen Volume: 37.61 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3988	0	0	5.0432	7.92	7.92
2	5.0041	0.048179	6.4019	48.62	0.54682	5.3658	7.92	8.4668
3	10.004	0.10879	6.4058	77.205	0.86778	5.6	7.92	8.7878
4	15.004	0.17407	6.41	94.356	1.0599	5.7689	7.92	8.9799
5	20.004	0.23934	6.4142	106.47	1.1952	5.9005	7.92	9.1152
6	25.004	0.30772	6.4186	115.76	1.2985	6.0036	7.92	9.2185
7	30	0.37611	6.423	123.2	1.3811	6.0892	7.92	9.3011
8	35	0.44449	6.4274	129.5	1.4506	6.1649	7.92	9.3706
9	40	0.51287	6.4318	135	1.5113	6.2313	7.92	9.4313
10	45	0.58125	6.4362	139.57	1.5613	6.2855	7.92	9.4813
11	50	0.65119	6.4407	143.87	1.6083	6.3309	7.92	9.5283
12	55	0.72113	6.4453	147.8	1.6511	6.3746	7.92	9.5711
13	60	0.78951	6.4497	151.16	1.6874	6.413	7.92	9.6074
14	70	0.93094	6.4589	157.56	1.7563	6.4788	7.92	9.6763
15	80	1.0724	6.4682	162.96	1.814	6.5278	7.92	9.734
16	90	1.2138	6.4774	167.78	1.865	6.5767	7.92	9.785
17	100	1.3568	6.4868	172.3	1.9124	6.607	7.92	9.8324
18	110	1.4982	6.4961	176.23	1.9532	6.639	7.92	9.8732
19	120	1.6381	6.5054	179.9	1.9911	6.6605	7.92	9.9111
20	180	2.4804	6.5616	198.15	2.1743	6.7374	7.92	10.094
21	240	3.3274	6.619	212.42	2.3106	6.7514	7.92	10.231
22	300	4.176	6.6777	224.69	2.4227	6.7467	7.92	10.343
23	360	5.0277	6.7375	234.87	2.5099	6.7217	7.92	10.43
24	420	5.8747	6.7982	244.73	2.5919	6.6891	7.92	10.512
25	480	6.7264	6.8602	253.49	2.6604	6.6512	7.92	10.58
26	540	7.5718	6.923	261.25	2.717	6.6209	7.92	10.637
27	600	8.4204	6.9871	268.49	2.7667	6.5848	7.92	10.687
28	660	9.2674	7.0524	275.04	2.808	6.5598	7.92	10.728
29	720	10.122	7.1194	280.92	2.841	6.5301	7.92	10.761
30	780	10.979	7.1879	286.37	2.8685	6.5068	7.92	10.789
31	840	11.838	7.258	291.67	2.8934	6.4858	7.92	10.813
32	900	12.685	7.3284	296.55	2.9135	6.4643	7.92	10.834
33	960	13.532	7.4002	300.74	2.9261	6.4474	7.92	10.846
34	1020	14.391	7.4745	304.73	2.9354	6.4276	7.92	10.855
35	1080	15.24	7.5493	309.08	2.9478	6.4183	7.92	10.868

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Terracon
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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
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Piston Area: 0.00 in^2
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Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8768	2.8768	1.000	2.8768	0
2	0.05	8.4668	7.92	0.32266	0.590	3.101	2.5542	1.214	2.8276	0.27341
3	0.11	8.7878	7.92	0.55679	0.642	3.1878	2.32	1.374	2.7539	0.43389
4	0.17	8.9799	7.92	0.72569	0.685	3.211	2.1511	1.493	2.6811	0.52993
5	0.24	9.1152	7.92	0.85732	0.717	3.2147	2.0195	1.592	2.6171	0.59758
6	0.31	9.2185	7.92	0.96041	0.740	3.2149	1.9164	1.678	2.5657	0.64924
7	0.38	9.3011	7.92	1.046	0.757	3.2119	1.8308	1.754	2.5213	0.69054
8	0.44	9.3706	7.92	1.1217	0.773	3.2057	1.7551	1.827	2.4804	0.72532
9	0.51	9.4313	7.92	1.1881	0.786	3.2	1.6887	1.895	2.4443	0.75564
10	0.58	9.4813	7.92	1.2423	0.796	3.1958	1.6345	1.955	2.4152	0.78065
11	0.65	9.5283	7.92	1.2877	0.801	3.1974	1.5891	2.012	2.3932	0.80414
12	0.72	9.5711	7.92	1.3314	0.806	3.1965	1.5454	2.068	2.371	0.82554
13	0.79	9.6074	7.92	1.3698	0.812	3.1944	1.507	2.120	2.3507	0.84371
14	0.93	9.6763	7.92	1.4357	0.817	3.1975	1.4412	2.219	2.3193	0.87817
15	1.07	9.734	7.92	1.4846	0.818	3.2062	1.3922	2.303	2.2992	0.90699
16	1.21	9.785	7.92	1.5335	0.822	3.2083	1.3433	2.388	2.2758	0.93251
17	1.36	9.8324	7.92	1.5638	0.818	3.2254	1.313	2.456	2.2692	0.95619
18	1.50	9.8732	7.92	1.5958	0.817	3.2342	1.281	2.525	2.2576	0.97662
19	1.64	9.9111	7.92	1.6174	0.812	3.2506	1.2595	2.581	2.255	0.99555
20	2.48	10.094	7.92	1.6943	0.779	3.3569	1.1826	2.839	2.2697	1.0872
21	3.33	10.231	7.92	1.7082	0.739	3.4792	1.1686	2.977	2.3239	1.1553
22	4.18	10.343	7.92	1.7036	0.703	3.5959	1.1733	3.065	2.3846	1.2113
23	5.03	10.43	7.92	1.6785	0.669	3.7082	1.1983	3.095	2.4532	1.2549
24	5.87	10.512	7.92	1.6459	0.635	3.8228	1.2309	3.106	2.5269	1.296
25	6.73	10.58	7.92	1.6081	0.604	3.9292	1.2688	3.097	2.599	1.3302
26	7.57	10.637	7.92	1.5778	0.581	4.0161	1.2991	3.092	2.6576	1.3585
27	8.42	10.687	7.92	1.5417	0.557	4.1018	1.3352	3.072	2.7185	1.3833
28	9.27	10.728	7.92	1.5166	0.540	4.1682	1.3602	3.064	2.7642	1.404
29	10.12	10.761	7.92	1.4869	0.523	4.2309	1.3899	3.044	2.8104	1.4205
30	10.98	10.789	7.92	1.4636	0.510	4.2817	1.4132	3.030	2.8475	1.4343
31	11.84	10.813	7.92	1.4427	0.499	4.3276	1.4342	3.017	2.8809	1.4467
32	12.69	10.834	7.92	1.4211	0.488	4.3692	1.4557	3.001	2.9125	1.4568
33	13.53	10.846	7.92	1.4042	0.480	4.3987	1.4726	2.987	2.9357	1.463
34	14.39	10.855	7.92	1.3844	0.472	4.4278	1.4924	2.967	2.9601	1.4677
35	15.24	10.868	7.92	1.3751	0.466	4.4495	1.5017	2.963	2.9756	1.4739

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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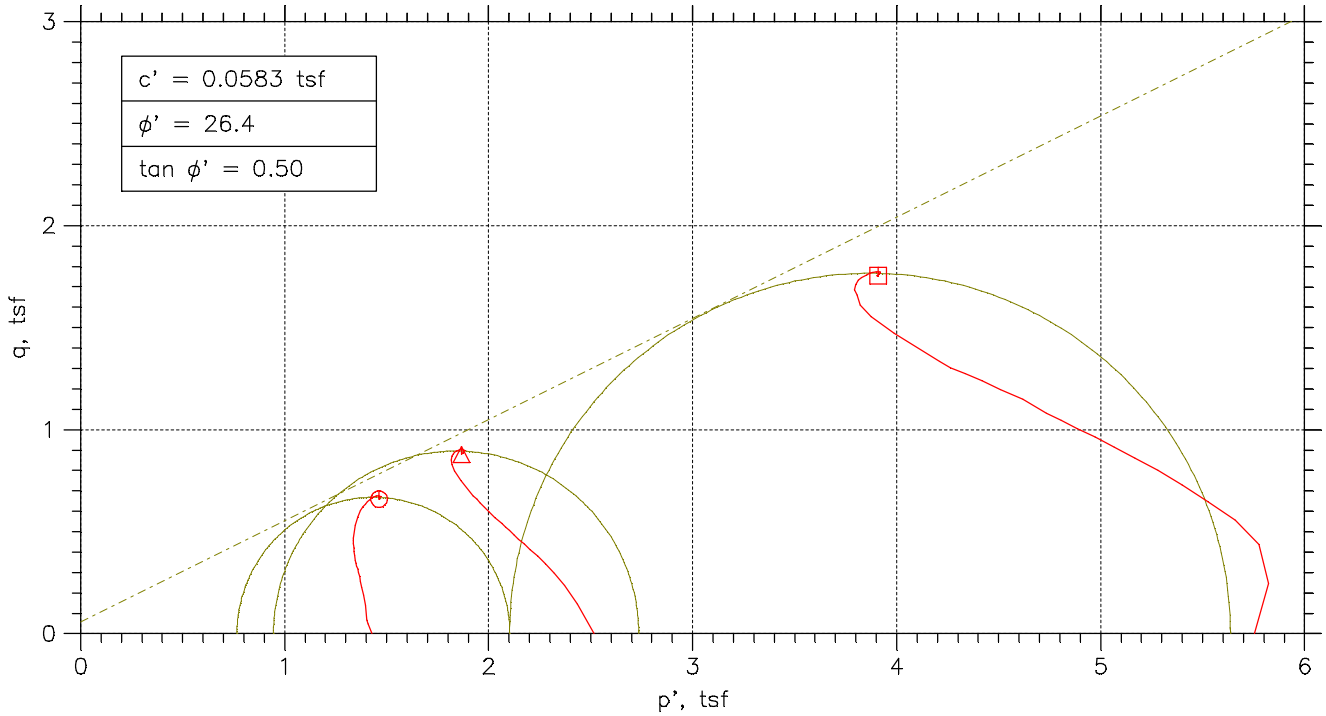

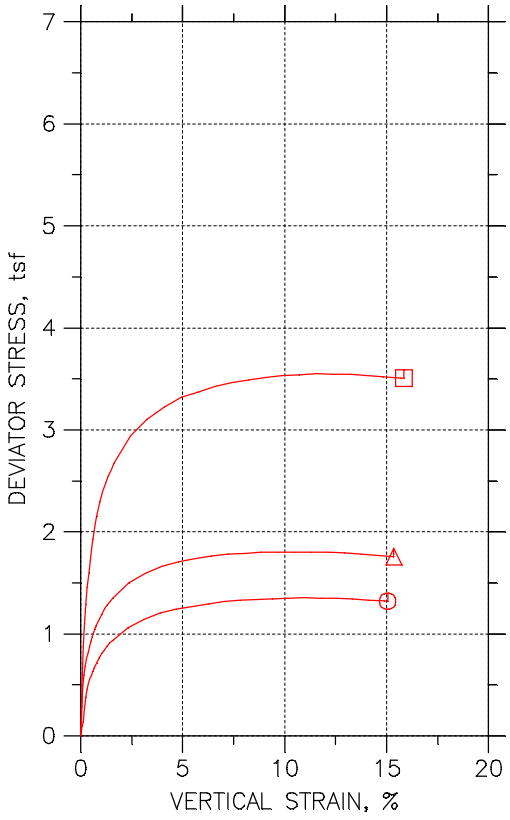

Symbol		⏲	△	◫	
Test No.		20.0 PSI	40.0 PSI	80.0 PSI	
Initial	Diameter, in	2.8323	2.8394	2.8232	
	Height, in	5.9835	6.1287	6.0461	
	Water Content, %	35.45	32.69	30.23	
	Dry Density, pcf	84.39	88.44	92.32	
	Saturation, %	95.27	96.65	97.97	
	Void Ratio	1.0122	0.91997	0.83931	
Before Shear	Water Content, %	27.91	28.32	23.10	
	Dry Density, pcf	96.52	95.92	104.3	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.75927	0.7702	0.62821	
	Back Press., tsf	5.0509	5.0422	1.4473	
Minor Prin. Stress, tsf		1.4291	2.5178	5.7527	
Max. Dev. Stress, tsf		1.3524	1.8029	3.5485	
Time to Failure, min		840	780	840	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.98	0.99	0.96	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		42	42	42	
Plastic Limit		23	23	23	
Plasticity Index		19	19	19	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-013 S10
Sample Type: 3.0" ST

Failure Sketch

Description: GRAY AND BROWN LEAN CLAY WITH SAND CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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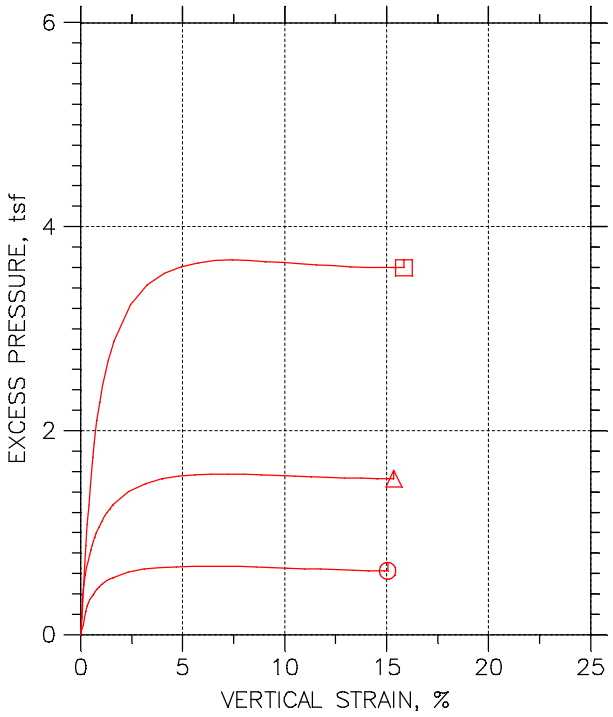

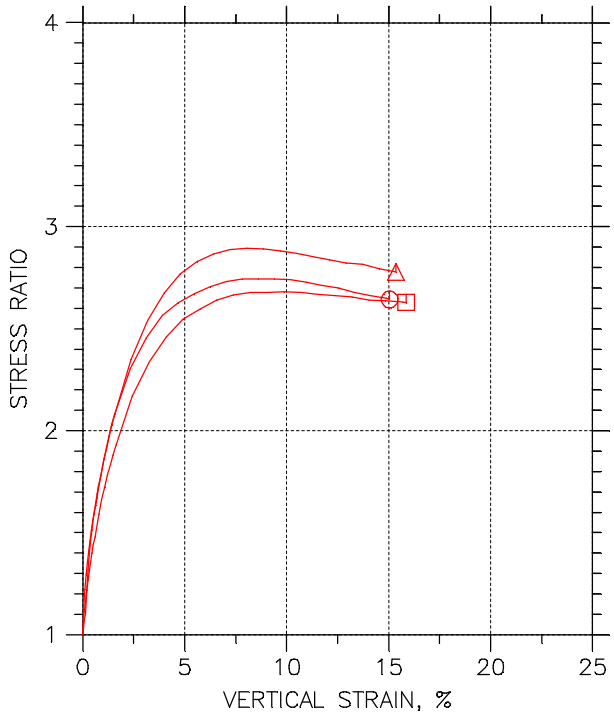

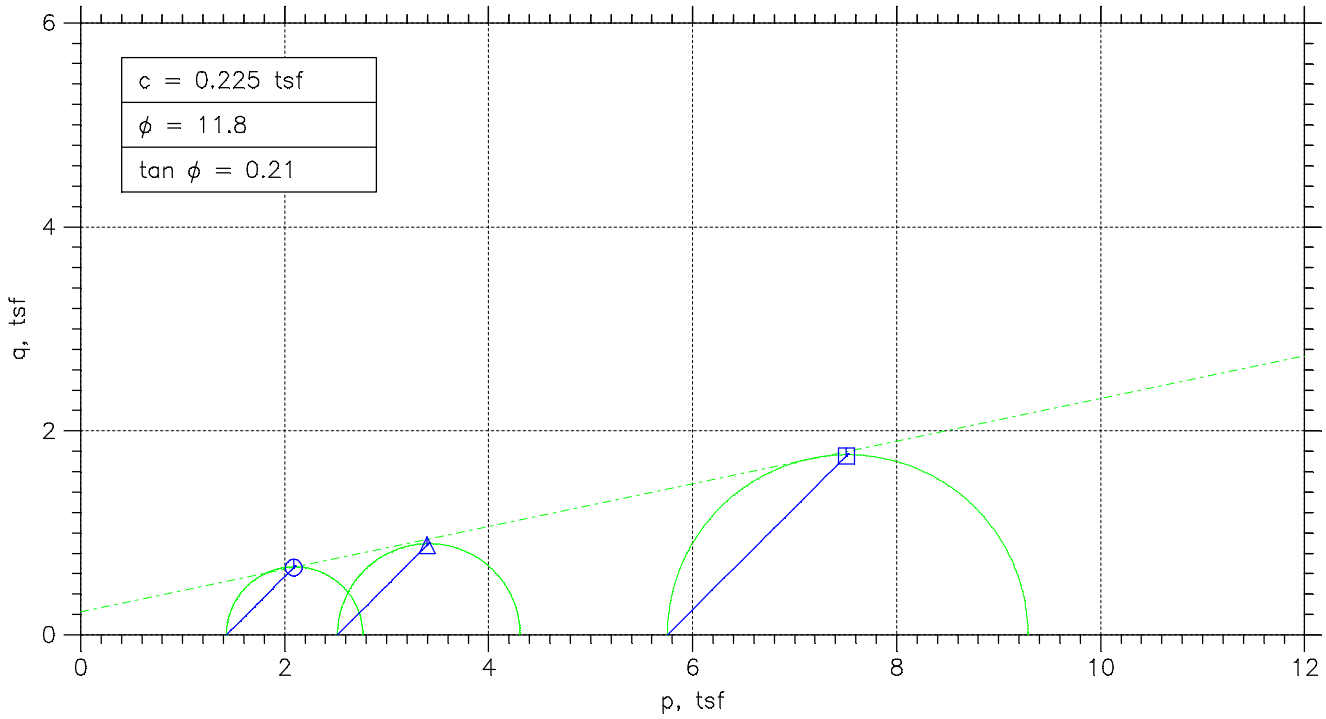

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 10/29/15	Depth: 32.0'-34.0'
Test No.: EDW-013 S10	Sample Type: 3.0" ST	Elevation: -----
Description: GRAY AND BROWN LEAN CLAY WITH SAND CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

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Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0509	6.48	6.48
2	5.0003	0.070614	6.3048	8.4452	0.096443	5.1202	6.48	6.5764
3	10	0.13546	6.3089	11.964	0.13654	5.1458	6.48	6.6165
4	15	0.19743	6.3128	24.163	0.27558	5.2208	6.48	6.7556
5	20	0.26228	6.3169	33.487	0.38169	5.2837	6.48	6.8617
6	25	0.32713	6.321	40.115	0.45693	5.3296	6.48	6.9369
7	30	0.39054	6.325	45.041	0.51272	5.364	6.48	6.9927
8	35	0.45539	6.3292	49.088	0.55842	5.3925	6.48	7.0384
9	40	0.52024	6.3333	52.665	0.59872	5.4169	6.48	7.0787
10	45	0.58653	6.3375	55.773	0.63364	5.4396	6.48	7.1136
11	50	0.6485	6.3415	58.412	0.66321	5.4594	6.48	7.1432
12	55	0.71335	6.3456	61.052	0.69272	5.4775	6.48	7.1727
13	60.001	0.7782	6.3497	63.339	0.7182	5.4932	6.48	7.1982
14	70.001	0.9079	6.3581	67.62	0.76574	5.5199	6.48	7.2457
15	80.001	1.039	6.3665	71.315	0.80652	5.5438	6.48	7.2865
16	90.001	1.1687	6.3748	74.716	0.84388	5.5636	6.48	7.3239
17	100	1.297	6.3831	77.825	0.87784	5.5816	6.48	7.3578
18	110	1.4281	6.3916	80.698	0.90905	5.5979	6.48	7.389
19	120	1.5593	6.4001	83.161	0.93555	5.6095	6.48	7.4155
20	180	2.3332	6.4508	95.243	1.063	5.6642	6.48	7.543
21	240	3.1229	6.5034	103.34	1.144	5.6945	6.48	7.624
22	300	3.904	6.5563	109.67	1.2044	5.7102	6.48	7.6844
23	360	4.6807	6.6097	114.07	1.2426	5.7172	6.48	7.7226
24	420	5.469	6.6648	117.59	1.2703	5.7201	6.48	7.7503
25	480	6.2544	6.7207	120.81	1.2943	5.7218	6.48	7.7743
26	540	7.0312	6.7768	123.8	1.3153	5.7207	6.48	7.7953
27	600	7.8223	6.835	126.21	1.3295	5.7178	6.48	7.8095
28	660	8.6063	6.8936	128.03	1.3372	5.7137	6.48	7.8172
29	720	9.3787	6.9524	129.79	1.3441	5.709	6.48	7.8241
30	780	10.17	7.0136	131.6	1.351	5.7044	6.48	7.831
31	840	10.952	7.0752	132.89	1.3524	5.6974	6.48	7.8324
32	900	11.731	7.1376	133.72	1.3488	5.6928	6.48	7.8288
33	960	12.525	7.2024	134.83	1.3478	5.6875	6.48	7.8278
34	1020	13.309	7.2675	135.53	1.3427	5.68	6.48	7.8227
35	1080	14.091	7.3337	135.65	1.3318	5.6794	6.48	7.8118
36	1140	14.882	7.4019	135.94	1.3224	5.6776	6.48	7.8024
37	1152.3	15.045	7.4161	135.89	1.3193	5.677	6.48	7.7993

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4291	1.4291	1.000	1.4291	0
2	0.07	6.5764	6.48	0.069246	0.718	1.4563	1.3598	1.071	1.4081	0.048221
3	0.14	6.6165	6.48	0.09485	0.695	1.4708	1.3342	1.102	1.4025	0.068269
4	0.20	6.7556	6.48	0.16992	0.617	1.5348	1.2592	1.219	1.397	0.13779
5	0.26	6.8617	6.48	0.23276	0.610	1.578	1.1963	1.319	1.3872	0.19084
6	0.33	6.9369	6.48	0.27873	0.610	1.6073	1.1504	1.397	1.3788	0.22846
7	0.39	6.9927	6.48	0.31306	0.611	1.6287	1.116	1.459	1.3724	0.25636
8	0.46	7.0384	6.48	0.34158	0.612	1.6459	1.0875	1.513	1.3667	0.27921
9	0.52	7.0787	6.48	0.36602	0.611	1.6618	1.0631	1.563	1.3624	0.29936
10	0.59	7.1136	6.48	0.38871	0.613	1.674	1.0404	1.609	1.3572	0.31682
11	0.65	7.1432	6.48	0.4085	0.616	1.6838	1.0206	1.650	1.3522	0.3316
12	0.71	7.1727	6.48	0.42653	0.616	1.6953	1.0025	1.691	1.3489	0.34636
13	0.78	7.1982	6.48	0.44225	0.616	1.705	0.98684	1.728	1.3459	0.3591
14	0.91	7.2457	6.48	0.46901	0.612	1.7258	0.96007	1.798	1.3429	0.38287
15	1.04	7.2865	6.48	0.49287	0.611	1.7427	0.93621	1.861	1.3395	0.40326
16	1.17	7.3239	6.48	0.51266	0.608	1.7603	0.91643	1.921	1.3384	0.42194
17	1.30	7.3578	6.48	0.5307	0.605	1.7762	0.89839	1.977	1.3373	0.43892
18	1.43	7.389	6.48	0.54699	0.602	1.7911	0.8821	2.031	1.3366	0.45452
19	1.56	7.4155	6.48	0.55863	0.597	1.806	0.87046	2.075	1.3382	0.46777
20	2.33	7.543	6.48	0.61333	0.577	1.8788	0.81576	2.303	1.3473	0.53152
21	3.12	7.624	6.48	0.64358	0.563	1.9295	0.7855	2.456	1.3575	0.57202
22	3.90	7.6844	6.48	0.6593	0.547	1.9742	0.76979	2.565	1.372	0.60219
23	4.68	7.7226	6.48	0.66628	0.536	2.0054	0.76281	2.629	1.3841	0.62128
24	5.47	7.7503	6.48	0.66919	0.527	2.0302	0.7599	2.672	1.395	0.63515
25	6.25	7.7743	6.48	0.67093	0.518	2.0524	0.75815	2.707	1.4053	0.64715
26	7.03	7.7953	6.48	0.66977	0.509	2.0747	0.75931	2.732	1.417	0.65767
27	7.82	7.8095	6.48	0.66686	0.502	2.0917	0.76222	2.744	1.427	0.66474
28	8.61	7.8172	6.48	0.66279	0.496	2.1035	0.7663	2.745	1.4349	0.66858
29	9.38	7.8241	6.48	0.65813	0.490	2.115	0.77095	2.743	1.443	0.67204
30	10.17	7.831	6.48	0.65348	0.484	2.1266	0.77561	2.742	1.4511	0.67551
31	10.95	7.8324	6.48	0.64649	0.478	2.135	0.78259	2.728	1.4588	0.67619
32	11.73	7.8288	6.48	0.64184	0.476	2.1361	0.78725	2.713	1.4617	0.67442
33	12.52	7.8278	6.48	0.6366	0.472	2.1403	0.79248	2.701	1.4664	0.67392
34	13.31	7.8227	6.48	0.62904	0.468	2.1428	0.80005	2.678	1.4714	0.67137
35	14.09	7.8118	6.48	0.62845	0.472	2.1324	0.80063	2.663	1.4665	0.66588
36	14.88	7.8024	6.48	0.62671	0.474	2.1247	0.80238	2.648	1.4636	0.66118
37	15.05	7.7993	6.48	0.62613	0.475	2.1222	0.80296	2.643	1.4626	0.65963

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

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Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3319	0	0	5.0422	7.56	7.56
2	5.0001	0.049959	6.3351	25.547	0.29035	5.2708	7.56	7.8503
3	10.004	0.10929	6.3388	41.648	0.47306	5.4236	7.56	8.0331
4	15.004	0.17017	6.3427	52.381	0.59462	5.5356	7.56	8.1546
5	20.004	0.23262	6.3467	60.539	0.68679	5.6242	7.56	8.2468
6	25.004	0.29975	6.3509	67.151	0.76129	5.7006	7.56	8.3213
7	30.004	0.36533	6.3551	72.647	0.82305	5.7683	7.56	8.3831
8	35.004	0.4309	6.3593	77.585	0.87841	5.8248	7.56	8.4384
9	40.004	0.49803	6.3636	81.878	0.9264	5.8756	7.56	8.4864
10	45.004	0.56204	6.3677	85.914	0.97144	5.9211	7.56	8.5314
11	50.004	0.62761	6.3719	89.435	1.0106	5.9619	7.56	8.5706
12	55.004	0.6963	6.3763	92.698	1.0467	6.001	7.56	8.6067
13	60.004	0.76187	6.3805	95.875	1.0819	6.0371	7.56	8.6419
14	70.004	0.89614	6.3892	101.2	1.1404	6.1001	7.56	8.7004
15	80.004	1.0304	6.3978	105.97	1.1925	6.1538	7.56	8.7525
16	90.004	1.1631	6.4064	110.34	1.2401	6.201	7.56	8.8001
17	100	1.3005	6.4153	114.08	1.2803	6.2412	7.56	8.8403
18	110	1.4332	6.424	117.56	1.3176	6.2774	7.56	8.8776
19	120	1.569	6.4328	120.69	1.3509	6.3118	7.56	8.9109
20	180	2.3684	6.4855	135.2	1.501	6.4477	7.56	9.061
21	240	3.1786	6.5398	144.78	1.594	6.5241	7.56	9.154
22	300	3.9889	6.595	152.03	1.6598	6.569	7.56	9.2198
23	360	4.7976	6.651	157.53	1.7053	6.5952	7.56	9.2653
24	420	5.6095	6.7082	162	1.7387	6.6086	7.56	9.2987
25	480	6.4166	6.766	165.6	1.7622	6.6151	7.56	9.3222
26	540	7.2316	6.8255	168.65	1.779	6.6174	7.56	9.339
27	600	8.0434	6.8857	171.18	1.79	6.6145	7.56	9.35
28	660	8.8506	6.9467	173.55	1.7987	6.6092	7.56	9.3587
29	720	9.6608	7.009	175.35	1.8013	6.6022	7.56	9.3613
30	780	10.477	7.073	177.11	1.8029	6.5958	7.56	9.3629
31	840	11.286	7.1374	178.61	1.8018	6.5882	7.56	9.3618
32	900	12.099	7.2035	180.03	1.7994	6.5812	7.56	9.3594
33	960	12.914	7.2709	181.32	1.7955	6.5748	7.56	9.3555
34	1020	13.732	7.3398	181.88	1.7841	6.5766	7.56	9.3441
35	1080	14.54	7.4092	182.18	1.7703	6.5725	7.56	9.3303
36	1140	15.353	7.4804	182.61	1.7576	6.5719	7.56	9.3176

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.56	7.56	0	0.000	2.5178	2.5178	1.000	2.5178	0
2	0.05	7.8503	7.56	0.22861	0.787	2.5795	2.2892	1.127	2.4344	0.14517
3	0.11	8.0331	7.56	0.3814	0.806	2.6094	2.1364	1.221	2.3729	0.23653
4	0.17	8.1546	7.56	0.49337	0.830	2.619	2.0244	1.294	2.3217	0.29731
5	0.23	8.2468	7.56	0.58202	0.847	2.6226	1.9358	1.355	2.2792	0.34339
6	0.30	8.3213	7.56	0.65841	0.865	2.6207	1.8594	1.409	2.24	0.38064
7	0.37	8.3831	7.56	0.72606	0.882	2.6148	1.7917	1.459	2.2033	0.41153
8	0.43	8.4384	7.56	0.78263	0.891	2.6136	1.7352	1.506	2.1744	0.43921
9	0.50	8.4864	7.56	0.83337	0.900	2.6108	1.6844	1.550	2.1476	0.4632
10	0.56	8.5314	7.56	0.87886	0.905	2.6104	1.6389	1.593	2.1247	0.48572
11	0.63	8.5706	7.56	0.91968	0.910	2.6087	1.5981	1.632	2.1034	0.50529
12	0.70	8.6067	7.56	0.95875	0.916	2.6058	1.559	1.671	2.0824	0.52336
13	0.76	8.6419	7.56	0.99491	0.920	2.6048	1.5229	1.710	2.0638	0.54095
14	0.90	8.7004	7.56	1.0579	0.928	2.6003	1.4599	1.781	2.0301	0.57021
15	1.03	8.7525	7.56	1.1115	0.932	2.5988	1.4062	1.848	2.0025	0.59626
16	1.16	8.8001	7.56	1.1588	0.934	2.5991	1.359	1.913	1.9791	0.62007
17	1.30	8.8403	7.56	1.199	0.936	2.5991	1.3188	1.971	1.9589	0.64017
18	1.43	8.8776	7.56	1.2352	0.937	2.6002	1.2826	2.027	1.9414	0.65879
19	1.57	8.9109	7.56	1.2696	0.940	2.5991	1.2482	2.082	1.9236	0.67543
20	2.37	9.061	7.56	1.4055	0.936	2.6133	1.1123	2.349	1.8628	0.7505
21	3.18	9.154	7.56	1.4819	0.930	2.6299	1.0359	2.539	1.8329	0.79698
22	3.99	9.2198	7.56	1.5268	0.920	2.6508	0.99102	2.675	1.8209	0.82991
23	4.80	9.2653	7.56	1.553	0.911	2.6701	0.96477	2.768	1.8174	0.85267
24	5.61	9.2987	7.56	1.5664	0.901	2.6901	0.95136	2.828	1.8207	0.86936
25	6.42	9.3222	7.56	1.5728	0.893	2.7072	0.94495	2.865	1.8261	0.88112
26	7.23	9.339	7.56	1.5752	0.885	2.7217	0.94261	2.887	1.8321	0.88952
27	8.04	9.35	7.56	1.5723	0.878	2.7355	0.94553	2.893	1.8405	0.89498
28	8.85	9.3587	7.56	1.567	0.871	2.7495	0.95078	2.892	1.8501	0.89937
29	9.66	9.3613	7.56	1.56	0.866	2.759	0.95778	2.881	1.8584	0.90063
30	10.48	9.3629	7.56	1.5536	0.862	2.7671	0.96419	2.870	1.8656	0.90145
31	11.29	9.3618	7.56	1.546	0.858	2.7736	0.97177	2.854	1.8727	0.90089
32	12.10	9.3594	7.56	1.539	0.855	2.7782	0.97877	2.838	1.8785	0.89971
33	12.91	9.3555	7.56	1.5326	0.854	2.7807	0.98519	2.822	1.8829	0.89775
34	13.73	9.3441	7.56	1.5344	0.860	2.7675	0.98344	2.814	1.8755	0.89205
35	14.54	9.3303	7.56	1.5303	0.864	2.7578	0.98752	2.793	1.8727	0.88516
36	15.35	9.3176	7.56	1.5297	0.870	2.7457	0.9881	2.779	1.8669	0.87881

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2601	0	0	1.4473	7.2	7.2
2	5.0002	0.057416	6.2637	42.956	0.49377	1.6232	7.2	7.6938
3	10	0.12843	6.2682	75.999	0.87297	1.8591	7.2	8.073
4	15	0.19491	6.2723	96.821	1.1114	2.0973	7.2	8.3114
5	20	0.26139	6.2765	112.87	1.2948	2.3215	7.2	8.4948
6	25	0.32939	6.2808	127.24	1.4586	2.53	7.2	8.6586
7	30	0.39436	6.2849	139.93	1.6031	2.7199	7.2	8.8031
8	35	0.46084	6.2891	150.32	1.7209	2.8923	7.2	8.9209
9	40	0.52581	6.2932	159.97	1.8302	3.0478	7.2	9.0302
10	45	0.59531	6.2976	168.57	1.9273	3.1905	7.2	9.1273
11	50	0.6633	6.3019	175.7	2.0074	3.3198	7.2	9.2074
12	55	0.7313	6.3062	183.2	2.0917	3.438	7.2	9.2917
13	60	0.79929	6.3105	189.45	2.1615	3.5452	7.2	9.3615
14	70	0.9383	6.3194	201.61	2.2971	3.7298	7.2	9.4971
15	80	1.0758	6.3282	210.37	2.3936	3.8876	7.2	9.5936
16	90.001	1.2163	6.3372	218.14	2.4784	4.0228	7.2	9.6784
17	100	1.3538	6.346	224.69	2.5493	4.1375	7.2	9.7493
18	110	1.4928	6.355	230.15	2.6075	4.2388	7.2	9.8075
19	120	1.6303	6.3639	236.18	2.6721	4.3262	7.2	9.8721
20	180	2.4432	6.4169	262.25	2.9425	4.685	7.2	10.142
21	240	3.2787	6.4723	279.34	3.1075	4.8801	7.2	10.308
22	300	4.1067	6.5282	292.25	3.2232	4.9907	7.2	10.423
23	360	4.9136	6.5836	303.47	3.3188	5.0548	7.2	10.519
24	420	5.7506	6.6421	310.87	3.3698	5.0903	7.2	10.57
25	480	6.5802	6.701	318.68	3.4241	5.1136	7.2	10.624
26	540	7.4006	6.7604	325.24	3.4638	5.1206	7.2	10.664
27	600	8.2346	6.8219	330.8	3.4913	5.1171	7.2	10.691
28	660	9.0626	6.884	336.15	3.5158	5.1061	7.2	10.716
29	720	9.877	6.9462	340.92	3.5338	5.0973	7.2	10.734
30	780	10.714	7.0113	344.8	3.5408	5.088	7.2	10.741
31	840	11.542	7.0769	348.79	3.5485	5.0746	7.2	10.749
32	900	12.361	7.1431	351.99	3.5479	5.0647	7.2	10.748
33	960	13.204	7.2124	355.4	3.5478	5.0566	7.2	10.748
34	1020	14.025	7.2813	357.18	3.5319	5.0478	7.2	10.732
35	1080	14.848	7.3517	359.59	3.5217	5.0496	7.2	10.722
36	1140	15.696	7.4256	361.69	3.507	5.049	7.2	10.707
37	1151.2	15.853	7.4395	362.53	3.5086	5.0455	7.2	10.709

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	5.7527	5.7527	1.000	5.7527	0
2	0.06	7.6938	7.2	0.17589	0.356	6.0706	5.5768	1.089	5.8237	0.24688
3	0.13	8.073	7.2	0.41177	0.472	6.2139	5.3409	1.163	5.7774	0.43648
4	0.19	8.3114	7.2	0.64998	0.585	6.2141	5.1027	1.218	5.6584	0.5557
5	0.26	8.4948	7.2	0.87421	0.675	6.1733	4.8785	1.265	5.5259	0.64739
6	0.33	8.6586	7.2	1.0827	0.742	6.1286	4.67	1.312	5.3993	0.72932
7	0.39	8.8031	7.2	1.2726	0.794	6.0832	4.4801	1.358	5.2816	0.80155
8	0.46	8.9209	7.2	1.445	0.840	6.0286	4.3077	1.399	5.1682	0.86046
9	0.53	9.0302	7.2	1.6005	0.874	5.9824	4.1522	1.441	5.0673	0.9151
10	0.60	9.1273	7.2	1.7432	0.904	5.9368	4.0095	1.481	4.9731	0.96363
11	0.66	9.2074	7.2	1.8725	0.933	5.8877	3.8802	1.517	4.8839	1.0037
12	0.73	9.2917	7.2	1.9907	0.952	5.8537	3.762	1.556	4.8078	1.0459
13	0.80	9.3615	7.2	2.0979	0.971	5.8163	3.6548	1.591	4.7356	1.0807
14	0.94	9.4971	7.2	2.2825	0.994	5.7673	3.4702	1.662	4.6187	1.1485
15	1.08	9.5936	7.2	2.4403	1.020	5.7059	3.3124	1.723	4.5091	1.1968
16	1.22	9.6784	7.2	2.5755	1.039	5.6556	3.1772	1.780	4.4164	1.2392
17	1.35	9.7493	7.2	2.6902	1.055	5.6118	3.0625	1.832	4.3371	1.2746
18	1.49	9.8075	7.2	2.7915	1.071	5.5686	2.9612	1.881	4.2649	1.3037
19	1.63	9.8721	7.2	2.8789	1.077	5.5459	2.8738	1.930	4.2098	1.336
20	2.44	10.142	7.2	3.2377	1.100	5.4575	2.515	2.170	3.9863	1.4712
21	3.28	10.308	7.2	3.4328	1.105	5.4274	2.3199	2.339	3.8737	1.5538
22	4.11	10.423	7.2	3.5434	1.099	5.4325	2.2093	2.459	3.8209	1.6116
23	4.91	10.519	7.2	3.6075	1.087	5.464	2.1452	2.547	3.8046	1.6594
24	5.75	10.57	7.2	3.643	1.081	5.4794	2.1097	2.597	3.7945	1.6849
25	6.58	10.624	7.2	3.6663	1.071	5.5105	2.0864	2.641	3.7984	1.712
26	7.40	10.664	7.2	3.6733	1.060	5.5432	2.0794	2.666	3.8113	1.7319
27	8.23	10.691	7.2	3.6698	1.051	5.5742	2.0829	2.676	3.8285	1.7457
28	9.06	10.716	7.2	3.6588	1.041	5.6097	2.0939	2.679	3.8518	1.7579
29	9.88	10.734	7.2	3.65	1.033	5.6364	2.1027	2.681	3.8695	1.7669
30	10.71	10.741	7.2	3.6407	1.028	5.6528	2.112	2.677	3.8824	1.7704
31	11.54	10.749	7.2	3.6273	1.022	5.6739	2.1254	2.670	3.8996	1.7743
32	12.36	10.748	7.2	3.6174	1.020	5.6832	2.1353	2.662	3.9092	1.774
33	13.20	10.748	7.2	3.6093	1.017	5.6913	2.1434	2.655	3.9173	1.7739
34	14.02	10.732	7.2	3.6005	1.019	5.6841	2.1522	2.641	3.9181	1.766
35	14.85	10.722	7.2	3.6023	1.023	5.6721	2.1504	2.638	3.9113	1.7609
36	15.70	10.707	7.2	3.6017	1.027	5.658	2.151	2.630	3.9045	1.7535
37	15.85	10.709	7.2	3.5982	1.026	5.6631	2.1545	2.628	3.9088	1.7543

DIRECT SHEAR TEST REPORT

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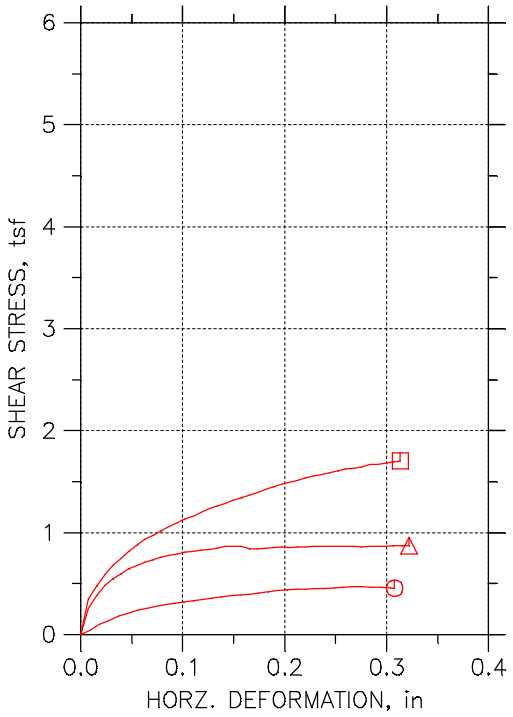

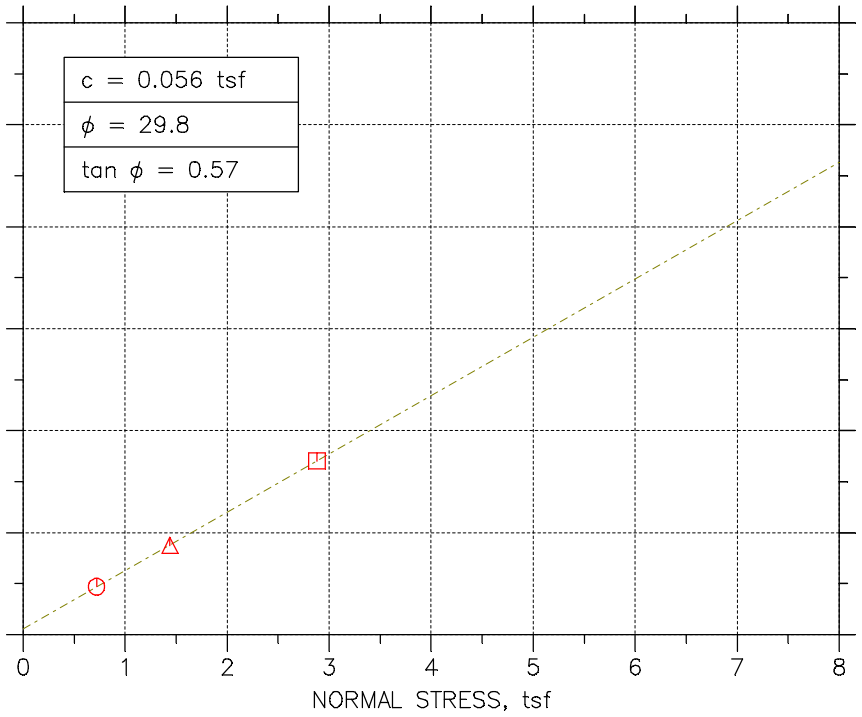

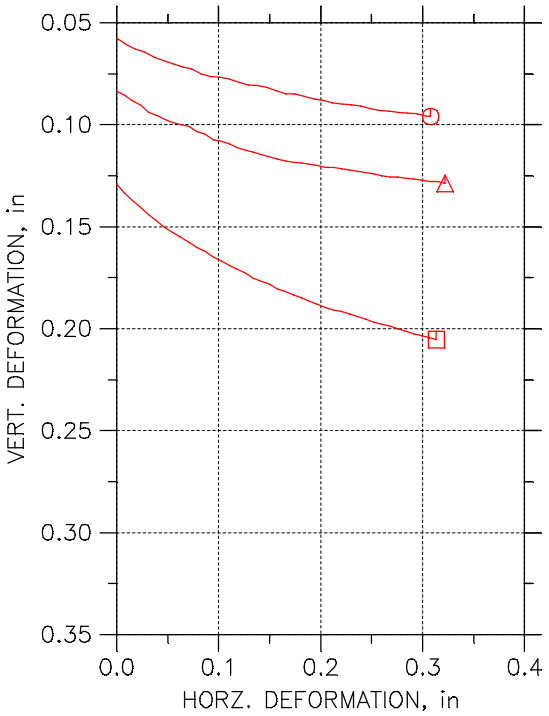

Symbol		⏲	△	⧈	
Test No.		10 PSI	20 PSI	40 PSI	
Sample No.		S-5	S-5	S-5	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.502	2.5016	2.5035	
	Area, in^2	4.9165	4.9149	4.9227	
	Height, in	1.0098	1.0087	1.0067	
	Water Content, %	75.08	66.70	67.21	
	Dry Density, pcf	51.869	56.572	54.543	
	Saturation, %	97.66	99.74	94.70	
	Void Ratio	1.7682	1.5381	1.6325	
Consol. Height, in		0.955	0.93155	0.88124	
Consol. Void Ratio		1.6179	1.344	1.3044	
Final	Water Content, %	64.90	53.10	47.20	
	Dry Density, pcf	57.319	64.848	68.523	
	Saturation, %	99.18	100.59	99.10	
	Void Ratio	1.505	1.2142	1.0954	
Normal Stress, tsf		0.71991	1.4387	2.88	
Max. Shear Stress, tsf		0.47008	0.87498	1.7039	
Ult. Shear Stress, tsf		0.45479	0.87367	1.7039	
Time to Failure, min		3678.3	1181.7	1190.6	
Disp. Rate, in/min		6.49e-005	0.000267	0.000267	
Estimated Specific Gravity		2.30	2.30	2.30	
Liquid Limit		NP	NP	NP	
Plastic Limit		NP	NP	NP	
Plasticity Index		NP	NP	NP	

Project: DYNEGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW-B002 S5	
Sample Type: 3.0" ST	
Description: GRAY TO DARK GRAY VARVED FLY ASH	
Remarks: TEST PERFORMED AS PER ASTM D3080.	

DIRECT SHEAR TEST DATA

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Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 10 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	0.7191	0.05749	0	0
2	156.95	0.7199	0.06058	0.04248	0.009199
3	277.29	0.7199	0.06298	0.1019	0.0184
4	393.34	0.7199	0.06449	0.1405	0.0276
5	521.67	0.7199	0.06689	0.1795	0.03679
6	638.11	0.7191	0.06852	0.2096	0.04599
7	753.57	0.7199	0.07016	0.2362	0.05519
8	865.04	0.7199	0.07168	0.2577	0.06439
9	981.73	0.7199	0.07275	0.2764	0.07359
10	1096.66	0.7199	0.07502	0.2939	0.08279
11	1214.45	0.7199	0.07628	0.3104	0.09199
12	1328.38	0.7199	0.07678	0.3228	0.1012
13	1454.83	0.7199	0.07767	0.3353	0.1104
14	1573.59	0.7199	0.0793	0.3472	0.1196
15	1688.63	0.7199	0.08044	0.3596	0.1288
16	1817.30	0.7199	0.08094	0.3721	0.138
17	1955.96	0.7199	0.08183	0.3817	0.1472
18	2070.95	0.7199	0.08321	0.3902	0.1564
19	2203.51	0.7199	0.08473	0.3965	0.1656
20	2323.62	0.7199	0.08485	0.4072	0.1748
21	2452.80	0.7199	0.08599	0.4191	0.184
22	2580.16	0.7199	0.08731	0.431	0.1932
23	2700.75	0.7199	0.08813	0.4401	0.2024
24	2823.89	0.7199	0.08933	0.4463	0.2116
25	2950.56	0.7199	0.09002	0.4486	0.2208
26	3070.17	0.7199	0.09027	0.4491	0.23
27	3194.72	0.7199	0.09078	0.4514	0.2392
28	3328.14	0.7199	0.09217	0.4588	0.2483
29	3443.95	0.7191	0.09292	0.4655	0.2575
30	3554.17	0.7191	0.09343	0.4695	0.2667
31	3678.32	0.7199	0.09393	0.4701	0.2759
32	3812.79	0.7199	0.09443	0.4678	0.2851
33	3932.15	0.7199	0.09475	0.4633	0.2943
34	4054.51	0.7199	0.09576	0.4571	0.3035
35	4102.88	0.7199	0.09601	0.4548	0.3078

DIRECT SHEAR TEST DATA

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Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.08377	0	0
2	33.66	1.439	0.08551	0.2598	0.007876
3	62.53	1.439	0.08828	0.3842	0.01575
4	94.03	1.439	0.09063	0.4817	0.02363
5	123.61	1.439	0.09391	0.5451	0.0315
6	153.40	1.439	0.09565	0.5982	0.03938
7	184.06	1.439	0.09749	0.644	0.04725
8	213.02	1.439	0.09903	0.6793	0.05513
9	241.92	1.439	0.09985	0.7094	0.06301
10	271.68	1.439	0.101	0.7362	0.07088
11	302.17	1.439	0.1033	0.7611	0.07876
12	330.34	1.439	0.1047	0.7781	0.08663
13	360.65	1.439	0.1073	0.7886	0.09451
14	392.06	1.439	0.1082	0.8089	0.1024
15	421.40	1.439	0.1095	0.818	0.1103
16	448.87	1.439	0.1113	0.8259	0.1181
17	477.79	1.439	0.1125	0.8351	0.126
18	506.84	1.439	0.1134	0.8495	0.1339
19	537.40	1.439	0.1148	0.8632	0.1418
20	593.97	1.439	0.1167	0.8652	0.1575
21	623.57	1.439	0.1179	0.8429	0.1654
22	655.08	1.439	0.1184	0.8423	0.1733
23	684.47	1.439	0.1188	0.8481	0.1811
24	712.80	1.439	0.1195	0.8521	0.189
25	740.02	1.439	0.1199	0.8573	0.1969
26	771.65	1.439	0.1208	0.8567	0.2048
27	801.16	1.439	0.121	0.858	0.2126
28	830.38	1.439	0.1215	0.8625	0.2205
29	861.82	1.439	0.1222	0.8645	0.2284
30	891.86	1.439	0.1228	0.8665	0.2362
31	920.33	1.439	0.1234	0.8678	0.2441
32	947.61	1.439	0.124	0.8645	0.252
33	978.79	1.439	0.1249	0.8645	0.2599
34	1008.02	1.439	0.1256	0.8645	0.2677
35	1036.49	1.439	0.1257	0.8625	0.2756
36	1067.92	1.439	0.1262	0.8652	0.2835
37	1095.86	1.439	0.1267	0.8652	0.2914
38	1124.42	1.439	0.1273	0.8691	0.2992
39	1152.92	1.439	0.1277	0.8704	0.3071
40	1181.69	1.439	0.128	0.875	0.315
41	1207.99	1.439	0.1287	0.8737	0.322

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

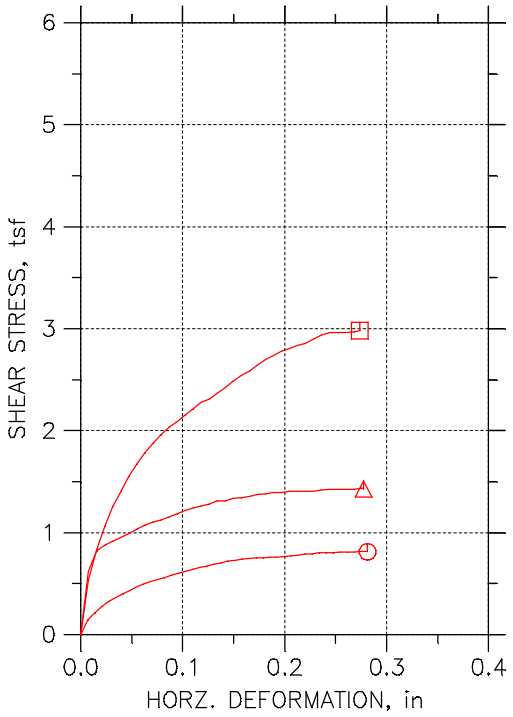
Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

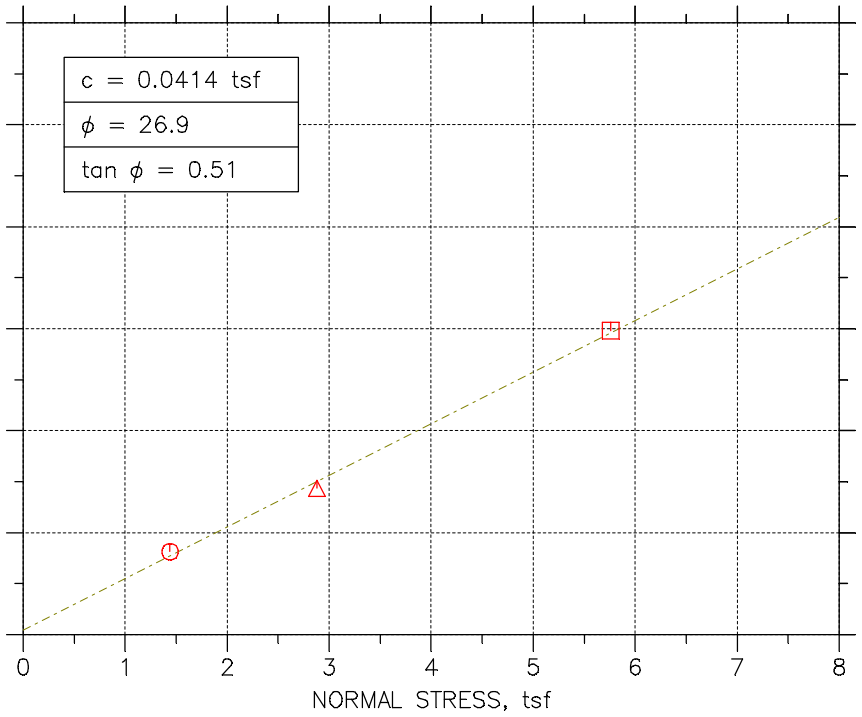
Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

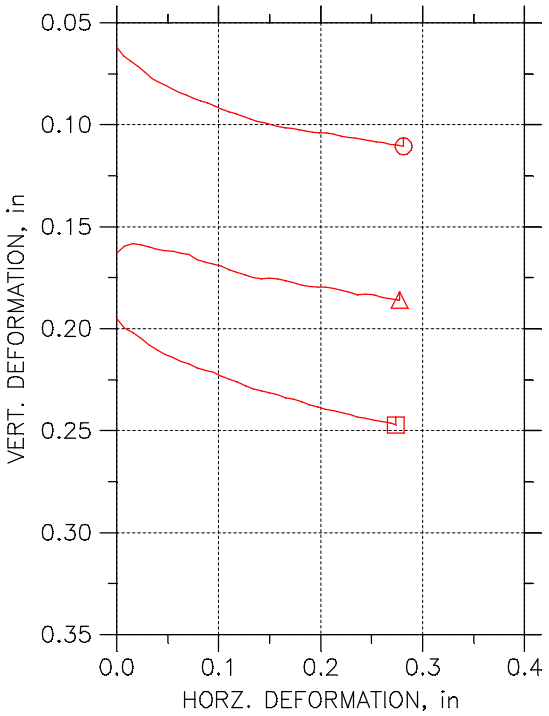
	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1292	0	0
2	34.66	2.879	0.1336	0.3516	0.007876
3	65.95	2.879	0.1374	0.4772	0.01575
4	98.49	2.879	0.1406	0.5912	0.02363
5	128.04	2.879	0.1442	0.6779	0.0315
6	157.00	2.879	0.1474	0.7496	0.03938
7	188.14	2.88	0.1504	0.8151	0.04725
8	217.44	2.88	0.1529	0.8772	0.05513
9	247.88	2.879	0.1551	0.9339	0.06301
10	276.45	2.879	0.1577	0.9701	0.07088
11	306.20	2.879	0.1601	1.017	0.07876
12	336.36	2.879	0.162	1.06	0.08663
13	366.50	2.879	0.1648	1.096	0.09451
14	397.75	2.879	0.1667	1.135	0.1024
15	427.67	2.88	0.169	1.161	0.1103
16	455.53	2.88	0.171	1.197	0.1181
17	485.04	2.879	0.1726	1.234	0.126
18	515.15	2.879	0.1753	1.262	0.1339
19	546.34	2.879	0.1769	1.285	0.1418
20	576.29	2.879	0.1782	1.317	0.1496
21	605.44	2.879	0.1806	1.346	0.1575
22	631.71	2.879	0.1819	1.367	0.1654
23	663.92	2.879	0.1834	1.395	0.1733
24	693.09	2.879	0.1851	1.423	0.1811
25	722.31	2.879	0.1865	1.447	0.189
26	753.49	2.88	0.1881	1.472	0.1969
27	783.68	2.879	0.1898	1.494	0.2048
28	812.56	2.879	0.1911	1.515	0.2126
29	840.21	2.879	0.1916	1.537	0.2205
30	873.07	2.879	0.1927	1.556	0.2284
31	901.78	2.88	0.194	1.57	0.2362
32	929.62	2.88	0.1952	1.589	0.2441
33	960.88	2.88	0.1967	1.608	0.252
34	990.19	2.88	0.1979	1.625	0.2599
35	1019.61	2.88	0.1986	1.632	0.2677
36	1048.80	2.879	0.1999	1.647	0.2756
37	1076.60	2.88	0.2013	1.668	0.2835
38	1109.68	2.88	0.2026	1.67	0.2914
39	1138.55	2.88	0.2036	1.681	0.2992
40	1167.91	2.879	0.2044	1.694	0.3071
41	1190.59	2.88	0.2054	1.704	0.3133

DIRECT SHEAR TEST REPORT

Terracon
Consulting Engineers & Scientists







Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-9	S-9	S-9	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5035	2.4988	2.4921	
	Area, in^2	4.9227	4.9041	4.8779	
	Height, in	1.0067	0.98937	0.99213	
	Water Content, %	71.70	70.21	69.53	
	Dry Density, pcf	53.119	54.563	54.248	
	Saturation, %	96.83	98.97	97.11	
	Void Ratio	1.7031	1.6315	1.6468	
Consol. Height, in		0.95172	0.83719	0.8042	
Consol. Void Ratio		1.5555	1.2268	1.1454	
Final	Water Content, %	60.80	49.80	42.70	
	Dry Density, pcf	59.677	67.193	72.249	
	Saturation, %	99.46	100.75	99.47	
	Void Ratio	1.406	1.1369	0.98736	
Normal Stress, tsf		1.4396	2.8798	5.7593	
Max. Shear Stress, tsf		0.81396	1.4353	2.9807	
Ult. Shear Stress, tsf		0.81396	1.4289	2.9807	
Time to Failure, min		1202.3	4163.3	1353.2	
Disp. Rate, in/min		0.000267	6.69e-005	0.000207	
Estimated Specific Gravity		2.30	2.30	2.30	
Liquid Limit		NP	NP	NP	
Plastic Limit		NP	NP	NP	
Plasticity Index		NP	NP	NP	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-B003 S9
Sample Type: 3.0" ST
Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

DIRECT SHEAR TEST DATA

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Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.06197	0	0
2	29.97	1.439	0.06626	0.1471	0.006868
3	57.78	1.439	0.06903	0.2144	0.01374
4	88.56	1.439	0.07142	0.2734	0.0206
5	120.00	1.439	0.0742	0.3261	0.02747
6	147.42	1.439	0.07741	0.3658	0.03434
7	177.07	1.44	0.07918	0.4002	0.04121
8	208.08	1.439	0.08094	0.4362	0.04807
9	237.87	1.439	0.08258	0.468	0.05494
10	268.15	1.44	0.08422	0.4952	0.06181
11	297.24	1.44	0.08555	0.5181	0.06868
12	327.37	1.439	0.08693	0.5374	0.07555
13	354.52	1.44	0.08832	0.5599	0.08241
14	388.81	1.439	0.08933	0.5859	0.08928
15	414.34	1.439	0.0909	0.6053	0.09615
16	443.05	1.44	0.09235	0.6214	0.103
17	475.44	1.44	0.09362	0.6428	0.1099
18	503.04	1.439	0.09456	0.6569	0.1168
19	531.73	1.44	0.09576	0.672	0.1236
20	563.76	1.44	0.09708	0.6908	0.1305
21	590.20	1.44	0.09841	0.7049	0.1374
22	620.48	1.439	0.09897	0.719	0.1442
23	648.48	1.44	0.09992	0.7268	0.1511
24	679.58	1.44	0.1007	0.7399	0.158
25	707.75	1.44	0.1014	0.7493	0.1648
26	736.66	1.44	0.1019	0.7503	0.1717
27	766.24	1.44	0.1026	0.754	0.1786
28	796.15	1.44	0.1031	0.7592	0.1854
29	823.23	1.439	0.1038	0.7618	0.1923
30	851.40	1.44	0.104	0.767	0.1991
31	883.03	1.44	0.1041	0.7727	0.206
32	911.21	1.44	0.1047	0.7764	0.2129
33	944.16	1.44	0.1056	0.7879	0.2197
34	971.55	1.44	0.1061	0.7936	0.2266
35	1000.34	1.44	0.1065	0.802	0.2335
36	1031.20	1.44	0.1073	0.803	0.2403
37	1059.90	1.439	0.1079	0.8067	0.2472
38	1088.96	1.44	0.1084	0.8113	0.2541
39	1119.26	1.44	0.1087	0.8108	0.2609
40	1145.99	1.44	0.1097	0.8098	0.2678
41	1177.16	1.44	0.1101	0.814	0.2747
42	1202.27	1.44	0.1106	0.814	0.2812

DIRECT SHEAR TEST DATA

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Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	4.541	0.1631	0	0
2	165.26	2.88	0.1594	0.623	0.007876
3	285.62	2.88	0.1584	0.8242	0.01575
4	408.00	2.88	0.1589	0.8772	0.02363
5	528.28	2.88	0.1597	0.9172	0.0315
6	644.59	2.88	0.161	0.9573	0.03938
7	763.78	2.88	0.1618	0.994	0.04725
8	884.32	2.88	0.1622	1.033	0.05513
9	993.76	2.88	0.163	1.072	0.06301
10	1117.20	2.88	0.1637	1.102	0.07088
11	1235.24	2.88	0.166	1.124	0.07876
12	1344.93	2.88	0.1672	1.154	0.08663
13	1464.24	2.88	0.1684	1.183	0.09451
14	1587.75	2.88	0.1694	1.219	0.1024
15	1704.16	2.879	0.171	1.241	0.1103
16	1806.00	2.879	0.1724	1.26	0.1181
17	1919.53	2.88	0.1737	1.281	0.126
18	2040.50	2.88	0.1748	1.31	0.1339
19	2161.06	2.88	0.1757	1.312	0.1418
20	2270.85	2.88	0.1753	1.338	0.1496
21	2391.12	2.88	0.1755	1.346	0.1575
22	2509.07	2.88	0.1764	1.356	0.1654
23	2633.81	2.88	0.1773	1.373	0.1733
24	2755.77	2.88	0.1787	1.382	0.1811
25	2871.20	2.88	0.1792	1.392	0.189
26	2977.15	2.88	0.1795	1.392	0.1969
27	3107.25	2.88	0.1796	1.405	0.2048
28	3223.67	2.88	0.1804	1.408	0.2126
29	3336.47	2.88	0.1812	1.406	0.2205
30	3458.59	2.88	0.1821	1.403	0.2284
31	3580.72	2.88	0.1833	1.418	0.2362
32	3695.22	2.879	0.1829	1.425	0.2441
33	3803.01	2.88	0.1834	1.426	0.252
34	3924.20	2.88	0.1847	1.426	0.2599
35	4048.11	2.88	0.1853	1.428	0.2677
36	4163.33	2.88	0.1858	1.435	0.2756
37	4182.96	2.88	0.186	1.429	0.2775

DIRECT SHEAR TEST DATA

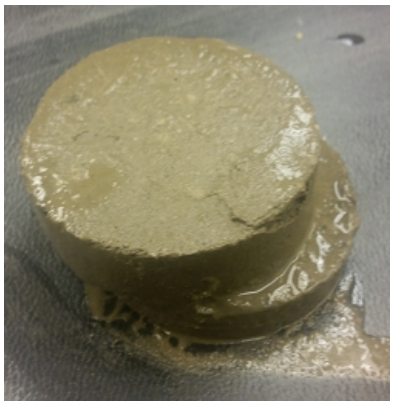
Terracon Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080



	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.195	0	0
2	58.95	5.759	0.1996	0.5335	0.007876
3	100.20	5.759	0.2019	0.8357	0.01575
4	140.38	5.759	0.2048	1.069	0.02363
5	178.98	5.759	0.2079	1.257	0.0315
6	214.75	5.759	0.2102	1.405	0.03938
7	256.36	5.759	0.2126	1.554	0.04725
8	295.19	5.759	0.2142	1.68	0.05513
9	332.54	5.759	0.216	1.784	0.06301
10	373.08	5.759	0.2174	1.879	0.07088
11	411.52	5.759	0.219	1.962	0.07876
12	450.22	5.759	0.2203	2.034	0.08663
13	487.04	5.759	0.2214	2.089	0.09451
14	524.30	5.759	0.2232	2.152	0.1024
15	562.81	5.759	0.2247	2.215	0.1103
16	600.83	5.759	0.2262	2.277	0.1181
17	638.96	5.759	0.2278	2.314	0.126
18	681.52	5.759	0.2295	2.365	0.1339
19	716.24	5.759	0.2303	2.426	0.1418
20	755.33	5.76	0.2315	2.489	0.1496
21	791.66	5.759	0.2324	2.542	0.1575
22	830.85	5.759	0.2338	2.587	0.1654
23	870.20	5.759	0.2346	2.643	0.1733
24	908.45	5.759	0.2356	2.697	0.1811
25	944.85	5.759	0.2372	2.738	0.189
26	983.52	5.759	0.2383	2.779	0.1969
27	1022.76	5.759	0.2395	2.809	0.2048
28	1059.45	5.759	0.2401	2.838	0.2126
29	1096.13	5.759	0.2411	2.858	0.2205
30	1136.62	5.759	0.2421	2.903	0.2284
31	1174.43	5.759	0.2433	2.936	0.2362
32	1210.69	5.759	0.244	2.961	0.2441
33	1248.49	5.759	0.2448	2.964	0.252
34	1288.45	5.759	0.2456	2.966	0.2599
35	1323.77	5.759	0.2462	2.967	0.2677
36	1353.20	5.759	0.2472	2.982	0.2737

DIRECT SHEAR TEST REPORT

Terracon
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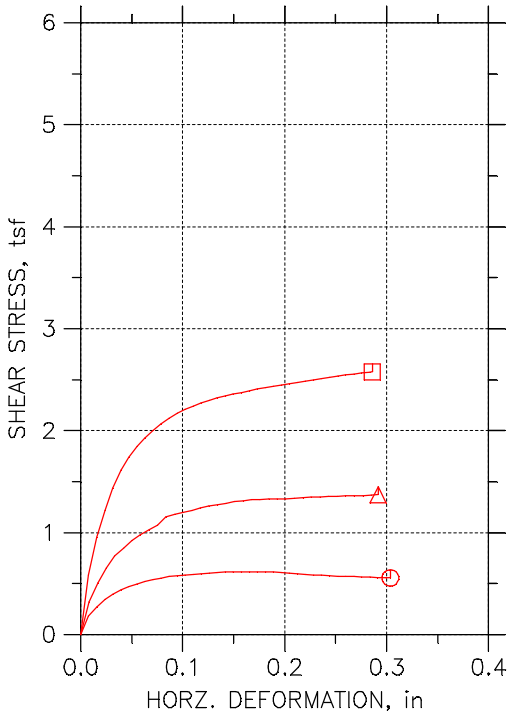

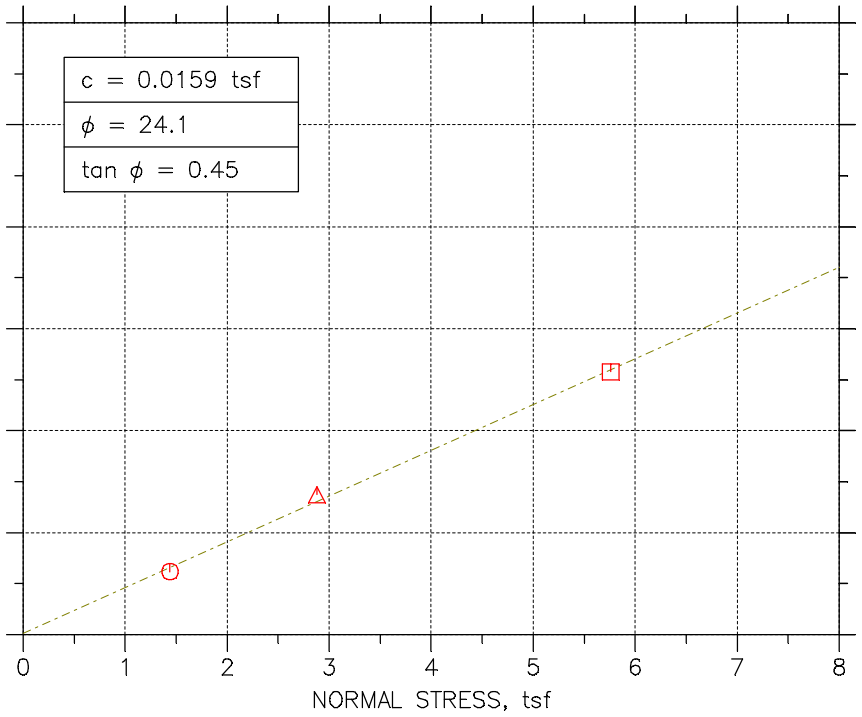

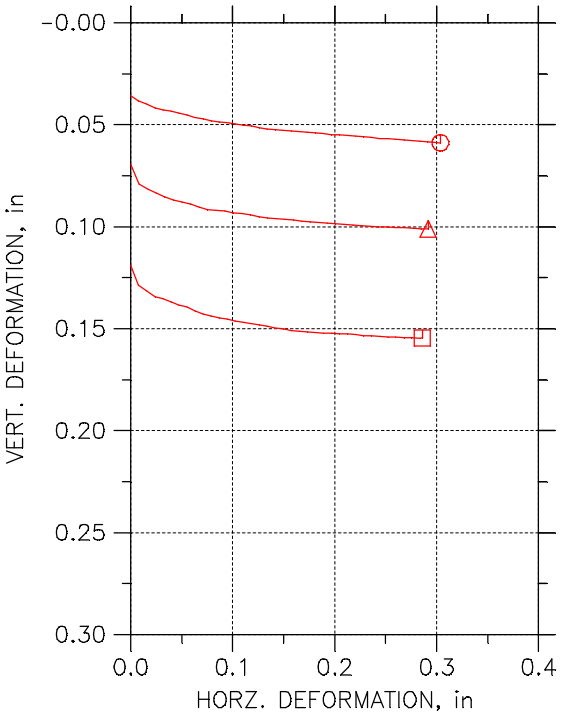

Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-10	S-10	S-10	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.4921	2.4996	2.4976	
	Area, in^2	4.8779	4.9072	4.8995	
	Height, in	0.99606	0.98583	0.98858	
	Water Content, %	29.91	28.99	29.10	
	Dry Density, pcf	90.515	92.188	91.834	
	Saturation, %	92.88	93.65	93.21	
	Void Ratio	0.87597	0.84192	0.84903	
Consol. Height, in		0.96227	0.91945	0.88312	
Consol. Void Ratio		0.81233	0.71789	0.65176	
Final	Water Content, %	28.10	23.40	19.70	
	Dry Density, pcf	96.208	102.73	108.85	
	Saturation, %	99.92	97.47	95.68	
	Void Ratio	0.76496	0.653	0.56003	
Normal Stress, tsf		1.4392	2.8795	5.7594	
Max. Shear Stress, tsf		0.61821	1.3715	2.5767	
Ult. Shear Stress, tsf		0.55697	1.3715	2.5767	
Time to Failure, min		793.54	1341	1400	
Disp. Rate, in/min		0.000207	0.000207	0.000207	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		40	40	40	
Plastic Limit		15	15	15	
Plasticity Index		25	25	25	

Project: DYNEGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW010 S10	
Sample Type: 3.0" ST	
Description: BLUISH GRAY LEAN CLAY CL	
Remarks: TEST PERFORMED AS PER ASTM D3080	

Tue, 17-NOV-2015 16:39:52

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.03587	0	0
2	39.39	1.439	0.03845	0.185	0.007876
3	76.42	1.439	0.0399	0.2733	0.01575
4	116.70	1.439	0.04167	0.343	0.02363
5	155.57	1.439	0.04274	0.3971	0.0315
6	194.59	1.439	0.04325	0.439	0.03938
7	231.17	1.439	0.04419	0.4699	0.04725
8	266.54	1.439	0.04514	0.4951	0.05513
9	305.27	1.439	0.0464	0.5183	0.06301
10	340.94	1.439	0.04709	0.537	0.07088
11	379.25	1.439	0.04797	0.555	0.07876
12	423.04	1.439	0.04873	0.5699	0.08663
13	457.67	1.439	0.04905	0.5782	0.09451
14	495.80	1.439	0.04968	0.586	0.1024
15	531.98	1.439	0.05012	0.5924	0.1103
16	571.20	1.439	0.05068	0.5989	0.1181
17	608.83	1.439	0.0515	0.604	0.126
18	647.29	1.439	0.05207	0.6079	0.1339
19	683.43	1.438	0.05239	0.6124	0.1418
20	721.04	1.438	0.0527	0.615	0.1496
21	758.83	1.439	0.05295	0.6169	0.1575
22	793.54	1.439	0.05327	0.6182	0.1654
23	830.97	1.439	0.05365	0.6176	0.1733
24	869.12	1.439	0.05396	0.615	0.1811
25	906.41	1.439	0.0544	0.6124	0.189
26	945.26	1.439	0.05491	0.6073	0.1969
27	982.69	1.439	0.0551	0.6021	0.2048
28	1020.06	1.439	0.05529	0.5957	0.2126
29	1059.90	1.439	0.0556	0.5905	0.2205
30	1095.28	1.439	0.05585	0.586	0.2284
31	1131.23	1.439	0.05617	0.5821	0.2362
32	1169.64	1.439	0.05674	0.5776	0.2441
33	1209.10	1.439	0.05699	0.5731	0.252
34	1244.59	1.439	0.0573	0.5718	0.2599
35	1283.36	1.439	0.05762	0.5705	0.2677
36	1319.90	1.439	0.05775	0.5679	0.2756
37	1357.90	1.439	0.05806	0.5641	0.2835
38	1393.69	1.438	0.05838	0.5615	0.2914
39	1434.20	1.44	0.05875	0.5589	0.2992
40	1455.26	1.439	0.05894	0.557	0.3036

DIRECT SHEAR TEST DATA

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Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.06953	0	0
2	66.92	2.879	0.07899	0.3222	0.00838
3	104.04	2.88	0.0817	0.5099	0.01676
4	142.82	2.879	0.08347	0.6542	0.02514
5	185.18	2.88	0.08542	0.7741	0.03352
6	219.73	2.88	0.08681	0.8505	0.0419
7	257.69	2.88	0.08794	0.9202	0.05028
8	298.10	2.88	0.08882	0.982	0.05866
9	333.83	2.88	0.09046	1.029	0.06704
10	369.75	2.88	0.0916	1.072	0.07542
11	413.04	2.88	0.09204	1.152	0.0838
12	445.97	2.88	0.09229	1.18	0.09218
13	485.62	2.88	0.09317	1.197	0.1006
14	521.13	2.88	0.09368	1.22	0.1089
15	559.14	2.88	0.09418	1.241	0.1173
16	595.57	2.879	0.095	1.261	0.1257
17	634.46	2.88	0.09563	1.272	0.1341
18	671.61	2.88	0.0962	1.289	0.1425
19	707.68	2.88	0.09645	1.303	0.1508
20	746.34	2.88	0.0967	1.312	0.1592
21	785.27	2.879	0.09727	1.321	0.1676
22	821.12	2.88	0.09778	1.327	0.176
23	858.67	2.88	0.09796	1.33	0.1844
24	895.38	2.88	0.09834	1.334	0.1927
25	934.75	2.88	0.09866	1.333	0.2011
26	971.24	2.88	0.09891	1.337	0.2095
27	1007.72	2.88	0.09916	1.342	0.2179
28	1045.96	2.88	0.09941	1.346	0.2262
29	1084.53	2.88	0.09992	1.351	0.2346
30	1120.37	2.88	0.1001	1.354	0.243
31	1156.63	2.88	0.1002	1.357	0.2513
32	1197.77	2.88	0.1003	1.36	0.2597
33	1233.68	2.88	0.1004	1.362	0.2681
34	1272.09	2.88	0.1006	1.364	0.2765
35	1311.64	2.88	0.1009	1.369	0.2849
36	1340.99	2.88	0.1011	1.371	0.2916

DIRECT SHEAR TEST DATA

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Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.1189	0	0
2	53.81	5.759	0.1286	0.586	0.007876
3	93.90	5.759	0.1315	0.9544	0.01575
4	132.06	5.759	0.1342	1.218	0.02363
5	171.21	5.759	0.1354	1.435	0.0315
6	211.15	5.759	0.1367	1.61	0.03938
7	250.46	5.759	0.1385	1.74	0.04725
8	288.21	5.759	0.1395	1.844	0.05513
9	324.71	5.759	0.1411	1.926	0.06301
10	364.16	5.759	0.1428	2.004	0.07088
11	401.96	5.759	0.1437	2.067	0.07876
12	438.83	5.759	0.1446	2.119	0.08663
13	478.24	5.759	0.1452	2.171	0.09451
14	515.94	5.759	0.1461	2.207	0.1024
15	554.42	5.759	0.1469	2.242	0.1103
16	590.30	5.759	0.1476	2.272	0.1181
17	626.52	5.759	0.1482	2.294	0.126
18	663.24	5.759	0.1488	2.321	0.1339
19	700.05	5.759	0.1496	2.34	0.1418
20	741.31	5.759	0.15	2.362	0.1496
21	780.69	5.759	0.1509	2.374	0.1575
22	817.38	5.759	0.1512	2.393	0.1654
23	854.69	5.759	0.1515	2.407	0.1733
24	892.50	5.759	0.1519	2.423	0.1811
25	930.62	5.759	0.1523	2.434	0.189
26	969.48	5.759	0.1523	2.444	0.1969
27	1008.12	5.759	0.1525	2.457	0.2048
28	1045.34	5.759	0.1527	2.471	0.2126
29	1083.92	5.759	0.1529	2.484	0.2205
30	1123.76	5.759	0.1533	2.499	0.2284
31	1160.12	5.759	0.1535	2.512	0.2362
32	1197.88	5.759	0.1537	2.526	0.2441
33	1240.24	5.759	0.1541	2.536	0.252
34	1277.15	5.759	0.1541	2.545	0.2599
35	1312.34	5.759	0.1543	2.556	0.2677
36	1351.46	5.759	0.1543	2.566	0.2756
37	1391.74	5.759	0.1546	2.576	0.2835
38	1399.98	5.759	0.1545	2.577	0.2859

DIRECT SHEAR TEST REPORT

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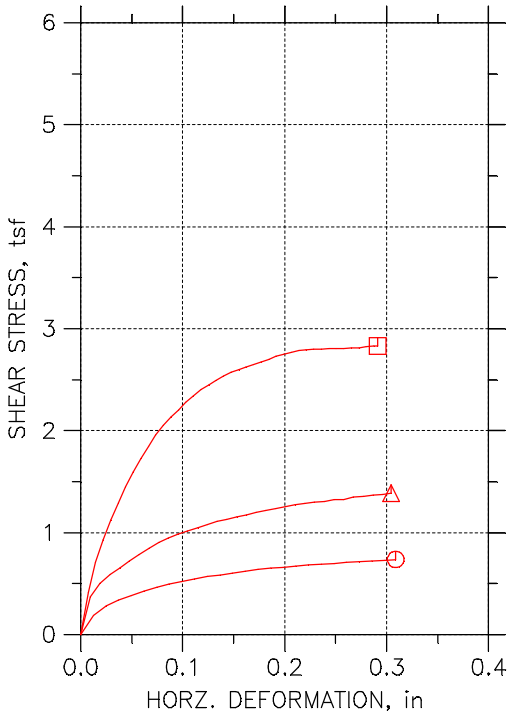

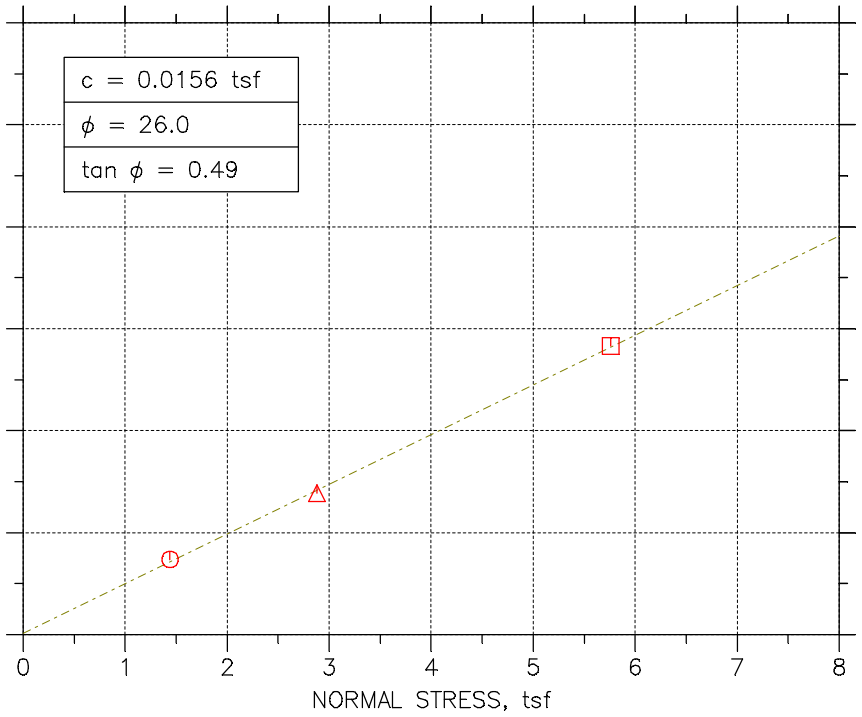

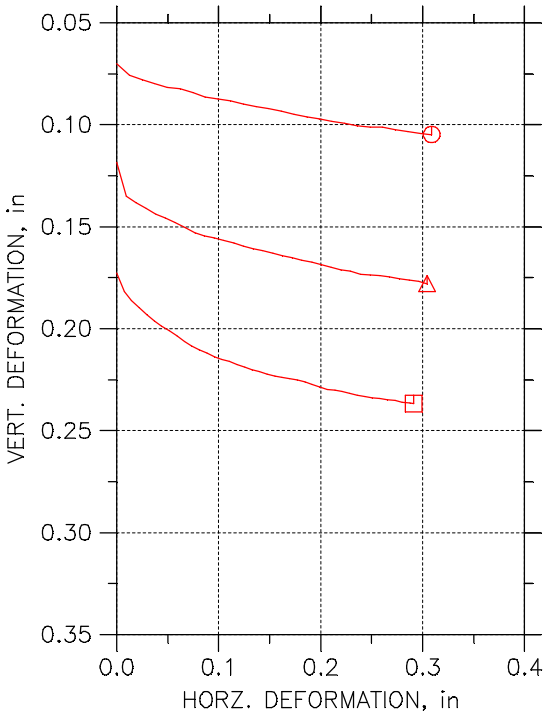

Symbol		⏲	△	◫	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-14	S-14	S-14	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5087	2.5067	2.502	
	Area, in^2	4.9428	4.9351	4.9165	
	Height, in	0.99961	1.0098	0.99646	
	Water Content, %	50.80	50.19	50.11	
	Dry Density, pcf	69.233	69.813	69.282	
	Saturation, %	95.13	95.32	93.94	
	Void Ratio	1.4527	1.4323	1.4509	
Consol. Height, in		0.93203	0.8987	0.83564	
Consol. Void Ratio		1.2868	1.1646	1.0554	
Final	Water Content, %	44.10	36.30	31.60	
	Dry Density, pcf	77.344	84.748	90.862	
	Saturation, %	100.34	98.38	98.93	
	Void Ratio	1.1954	1.0036	0.86882	
Normal Stress, tsf		1.4393	2.8799	5.7593	
Max. Shear Stress, tsf		0.73733	1.3874	2.8312	
Ult. Shear Stress, tsf		0.73733	1.3874	2.8312	
Time to Failure, min		961	3164.9	1365.2	
Disp. Rate, in/min		0.000207	8.85e-005	0.000232	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		54	54	54	
Plastic Limit		20	20	20	
Plasticity Index		34	34	34	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW012 S14
Sample Type: 3.0" ST

Description: DARK GRAY FAT CLAY CH SHELL NOTED

Remarks: TEST PERFORMED AS PER ASTM D3080.

Tue, 17-NOV-2015 17:00:29

DIRECT SHEAR TEST DATA

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Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.07004	0	0
2	47.30	1.438	0.0759	0.1909	0.01241
3	86.02	1.439	0.07811	0.2818	0.02482
4	124.31	1.439	0.07994	0.3416	0.03724
5	160.06	1.438	0.08176	0.3855	0.04965
6	200.31	1.439	0.08246	0.4281	0.06206
7	238.78	1.438	0.08441	0.4644	0.07447
8	275.86	1.439	0.08649	0.4949	0.08688
9	314.97	1.439	0.08737	0.5229	0.09929
10	355.17	1.439	0.08832	0.5477	0.1117
11	393.92	1.439	0.08977	0.5706	0.1241
12	429.38	1.439	0.09128	0.5859	0.1365
13	468.43	1.439	0.09223	0.6056	0.1489
14	506.02	1.439	0.09336	0.6215	0.1614
15	542.62	1.439	0.09481	0.6381	0.1738
16	586.75	1.439	0.09614	0.6521	0.1862
17	618.29	1.439	0.09721	0.6616	0.1986
18	656.28	1.438	0.09828	0.6718	0.211
19	696.76	1.439	0.09935	0.682	0.2234
20	732.98	1.439	0.1005	0.6915	0.2358
21	769.67	1.439	0.1012	0.6998	0.2482
22	812.59	1.439	0.1013	0.7093	0.2606
23	848.00	1.439	0.1026	0.7151	0.2731
24	887.83	1.438	0.1033	0.724	0.2855
25	924.52	1.438	0.1043	0.731	0.2979
26	961.00	1.439	0.1048	0.7373	0.3088

DIRECT SHEAR TEST DATA

Terracon Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/7/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1185	0	0
2	372.53	2.88	0.1351	0.3735	0.009556
3	468.99	2.88	0.1381	0.5003	0.01911
4	564.01	2.88	0.141	0.5902	0.02867
5	651.75	2.88	0.144	0.656	0.03822
6	744.20	2.88	0.1459	0.7228	0.04778
7	835.68	2.879	0.1481	0.7865	0.05733
8	925.97	2.88	0.1505	0.8454	0.06689
9	1018.05	2.88	0.1529	0.9026	0.07645
10	1104.25	2.88	0.1545	0.9476	0.086
11	1195.15	2.88	0.1556	0.9882	0.09556
12	1289.11	2.88	0.1568	1.019	0.1051
13	1376.20	2.88	0.158	1.049	0.1147
14	1467.76	2.88	0.1596	1.082	0.1242
15	1560.82	2.88	0.1608	1.11	0.1338
16	1648.67	2.88	0.1618	1.132	0.1433
17	1734.35	2.88	0.1631	1.153	0.1529
18	1827.14	2.88	0.1642	1.177	0.1624
19	1925.93	2.88	0.1651	1.202	0.172
20	2006.92	2.88	0.1663	1.219	0.1816
21	2105.98	2.88	0.1673	1.236	0.1911
22	2191.37	2.88	0.1688	1.253	0.2007
23	2278.65	2.88	0.1698	1.274	0.2102
24	2368.36	2.88	0.1711	1.289	0.2198
25	2452.94	2.88	0.1719	1.301	0.2293
26	2544.63	2.88	0.1735	1.308	0.2389
27	2629.18	2.88	0.1737	1.323	0.2485
28	2720.25	2.88	0.1741	1.327	0.2579
29	2813.74	2.88	0.1747	1.347	0.2675
30	2902.90	2.88	0.1755	1.353	0.2771
31	2995.72	2.88	0.1763	1.367	0.2866
32	3085.70	2.879	0.177	1.376	0.2962
33	3164.86	2.88	0.178	1.387	0.3043

DIRECT SHEAR TEST DATA

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Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/9/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.758	0.1729	0	0
2	39.55	5.758	0.1819	0.4139	0.007372
3	77.10	5.759	0.1863	0.7122	0.01474
4	112.99	5.759	0.1897	0.9304	0.02212
5	148.81	5.759	0.193	1.122	0.02949
6	184.76	5.759	0.1961	1.293	0.03686
7	219.25	5.759	0.1988	1.448	0.04423
8	256.03	5.759	0.2008	1.596	0.0516
9	290.21	5.759	0.2034	1.726	0.05897
10	325.35	5.759	0.2062	1.846	0.06635
11	362.78	5.759	0.2083	1.96	0.07372
12	397.12	5.759	0.2103	2.054	0.08109
13	429.34	5.759	0.2121	2.132	0.08846
14	462.52	5.759	0.2137	2.205	0.09583
15	499.06	5.759	0.215	2.279	0.1032
16	532.30	5.759	0.2162	2.34	0.1106
17	569.81	5.76	0.2177	2.403	0.1179
18	598.74	5.759	0.2187	2.447	0.1253
19	633.77	5.759	0.2199	2.494	0.1327
20	670.11	5.759	0.2209	2.537	0.1401
21	703.89	5.759	0.2224	2.574	0.1474
22	737.17	5.759	0.2233	2.6	0.1548
23	771.57	5.759	0.2238	2.622	0.1622
24	805.68	5.759	0.2246	2.647	0.1696
25	841.96	5.759	0.2251	2.675	0.1769
26	874.04	5.759	0.226	2.7	0.1843
27	910.30	5.759	0.2273	2.727	0.1917
28	942.84	5.759	0.2287	2.746	0.199
29	977.11	5.759	0.2297	2.769	0.2064
30	1011.86	5.759	0.2302	2.785	0.2137
31	1046.27	5.759	0.2307	2.794	0.2211
32	1078.57	5.759	0.2316	2.801	0.2285
33	1111.99	5.759	0.2326	2.8	0.2359
34	1147.40	5.759	0.2332	2.803	0.2432
35	1179.32	5.759	0.2338	2.804	0.2506
36	1216.60	5.759	0.2341	2.806	0.258
37	1246.79	5.759	0.2347	2.809	0.2653
38	1278.72	5.759	0.2353	2.814	0.2727
39	1316.44	5.759	0.236	2.823	0.2801
40	1349.92	5.759	0.2364	2.829	0.2875
41	1365.24	5.759	0.2367	2.831	0.2913

DIRECT SHEAR TEST REPORT

Terracon
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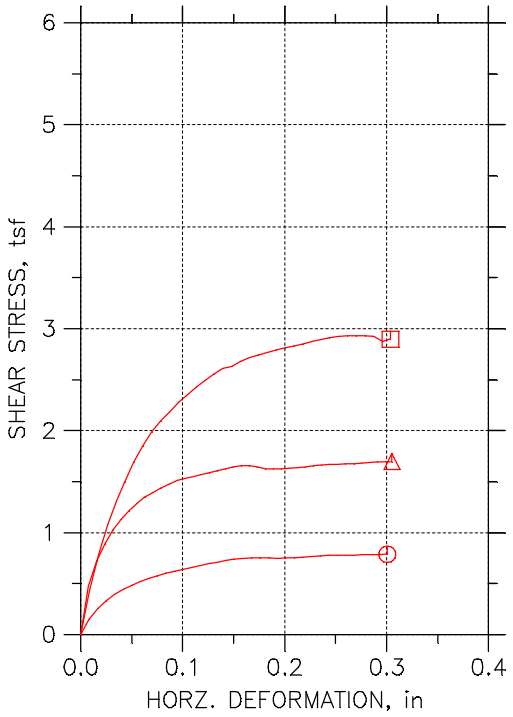

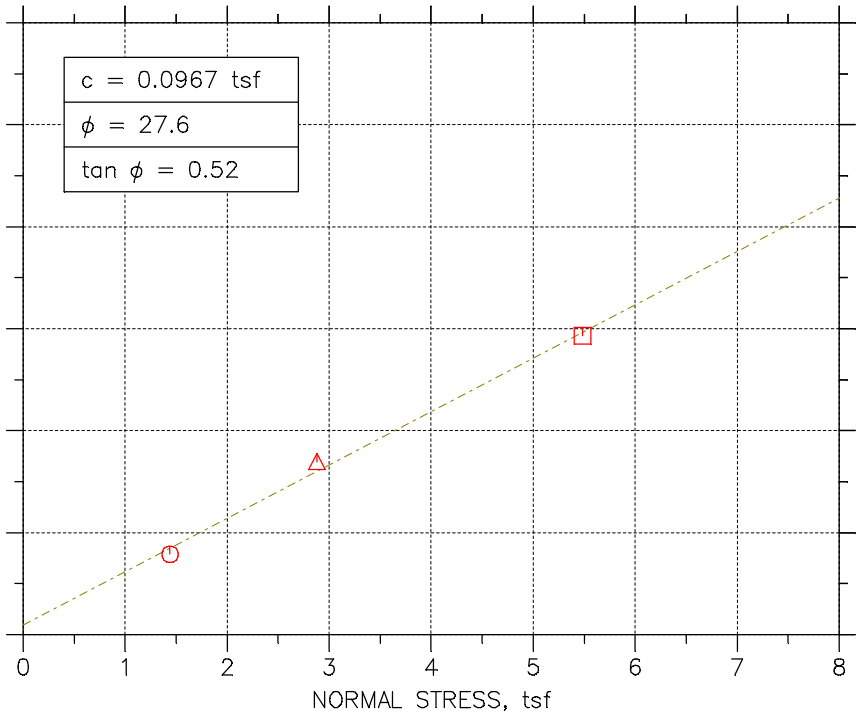

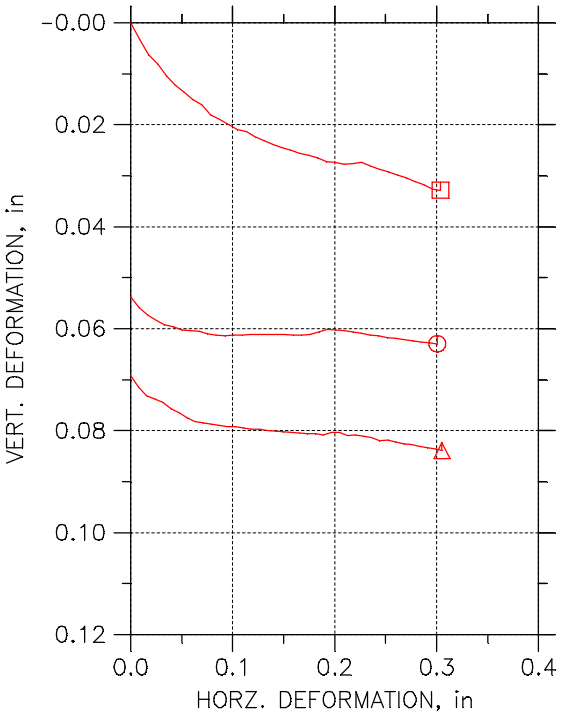

Symbol		⏲	△	⊡	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-10	S-10	S-10	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.498	2.5	2.5087	
	Area, in^2	4.901	4.9087	4.9431	
	Height, in	0.98898	0.99252	0.99606	
	Water Content, %	20.30	20.20	20.70	
	Dry Density, pcf	101.54	100.62	99.218	
	Saturation, %	85.50	83.10	82.20	
	Void Ratio	0.62921	0.64421	0.66738	
Consol. Height, in		0.94144	0.9279	0.99606	
Consol. Void Ratio		0.5509	0.53717	0.66738	
Final	Water Content, %	19.10	18.60	22.80	
	Dry Density, pcf	108.45	109.91	102.6	
	Saturation, %	96.32	97.56	98.66	
	Void Ratio	0.52546	0.50521	0.61241	
Normal Stress, tsf		1.4396	2.8794	5.4854	
Max. Shear Stress, tsf		0.78821	1.6963	2.9302	
Ult. Shear Stress, tsf		0.78821	1.6963	2.8965	
Time to Failure, min		1242.6	1357.2	1031.5	
Disp. Rate, in/min		0.000232	0.000232	0.000232	
Estimated Specific Gravity		2.65	2.65	2.65	
Liquid Limit		24	24	24	
Plastic Limit		13	13	13	
Plasticity Index		11	11	11	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW015 S10
Sample Type: 3.0" ST
Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.439	0.05371	0	0
2	53.95	1.44	0.05592	0.1498	0.00838
3	89.12	1.439	0.05743	0.2586	0.01676
4	121.56	1.439	0.05838	0.3313	0.02514
5	157.67	1.44	0.05919	0.3949	0.03352
6	194.41	1.44	0.05957	0.4472	0.0419
7	229.85	1.44	0.0602	0.4865	0.05028
8	262.66	1.44	0.06033	0.5204	0.05866
9	296.74	1.44	0.06052	0.5501	0.06704
10	331.66	1.44	0.06102	0.577	0.07542
11	364.35	1.44	0.06128	0.6007	0.0838
12	395.09	1.44	0.06134	0.6201	0.09218
13	431.13	1.44	0.06121	0.6417	0.1006
14	466.24	1.44	0.06121	0.6611	0.1089
15	499.12	1.44	0.06109	0.6772	0.1173
16	531.39	1.44	0.06109	0.6939	0.1257
17	565.38	1.44	0.06115	0.7106	0.1341
18	600.22	1.44	0.06115	0.7257	0.1425
19	633.76	1.44	0.06115	0.7381	0.1508
20	668.19	1.44	0.06121	0.7478	0.1592
21	702.22	1.44	0.06121	0.7543	0.1676
22	736.72	1.44	0.06115	0.7553	0.176
23	772.13	1.439	0.06058	0.7521	0.1844
24	804.93	1.44	0.06008	0.7494	0.1927
25	838.10	1.44	0.06027	0.751	0.2011
26	873.29	1.44	0.06033	0.7548	0.2095
27	907.96	1.44	0.06058	0.7613	0.2179
28	940.97	1.44	0.06083	0.7661	0.2262
29	974.96	1.44	0.06121	0.771	0.2346
30	1009.21	1.44	0.0614	0.7758	0.243
31	1042.51	1.44	0.06178	0.7769	0.2513
32	1073.94	1.439	0.06191	0.778	0.2597
33	1112.13	1.44	0.06216	0.7801	0.2681
34	1143.69	1.44	0.06241	0.7823	0.2765
35	1177.31	1.44	0.0626	0.785	0.2849
36	1213.76	1.44	0.06273	0.7861	0.2932
37	1242.60	1.44	0.06298	0.7882	0.3006

DIRECT SHEAR TEST DATA

Terracon
Consulting Engineers & Scientists

Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.887	0.06916	0	0
2	81.09	2.879	0.07142	0.4785	0.007876
3	117.60	2.879	0.07313	0.7219	0.01575
4	151.97	2.879	0.07376	0.8898	0.02363
5	186.66	2.879	0.07439	1.023	0.0315
6	221.15	2.879	0.07571	1.129	0.03938
7	253.83	2.879	0.07647	1.211	0.04725
8	289.37	2.879	0.07741	1.288	0.05513
9	323.30	2.879	0.07823	1.347	0.06301
10	356.53	2.879	0.07849	1.394	0.07088
11	391.02	2.879	0.07867	1.439	0.07876
12	424.56	2.879	0.07893	1.477	0.08663
13	459.98	2.879	0.07918	1.51	0.09451
14	492.86	2.879	0.07924	1.534	0.1024
15	523.80	2.879	0.07943	1.552	0.1103
16	556.72	2.879	0.07968	1.571	0.1181
17	588.93	2.879	0.07975	1.588	0.126
18	622.51	2.879	0.08	1.607	0.1339
19	657.43	2.879	0.08006	1.626	0.1418
20	692.69	2.879	0.08025	1.644	0.1496
21	724.45	2.879	0.08031	1.655	0.1575
22	759.66	2.879	0.08044	1.658	0.1654
23	791.34	2.88	0.08057	1.646	0.1733
24	825.40	2.879	0.08063	1.628	0.1811
25	858.43	2.879	0.08082	1.623	0.189
26	892.73	2.879	0.08031	1.623	0.1969
27	926.40	2.879	0.08038	1.63	0.2048
28	958.76	2.879	0.08101	1.635	0.2126
29	993.58	2.879	0.08088	1.643	0.2205
30	1027.07	2.879	0.08113	1.655	0.2284
31	1059.32	2.88	0.08132	1.662	0.2362
32	1094.50	2.879	0.08195	1.667	0.2441
33	1128.29	2.879	0.08189	1.671	0.252
34	1161.15	2.879	0.08227	1.676	0.2599
35	1194.98	2.879	0.08258	1.676	0.2677
36	1230.64	2.879	0.08271	1.684	0.2756
37	1263.56	2.879	0.08315	1.688	0.2835
38	1294.95	2.879	0.0834	1.693	0.2914
39	1331.25	2.879	0.08365	1.694	0.2992
40	1357.24	2.879	0.08391	1.696	0.3052

DIRECT SHEAR TEST DATA

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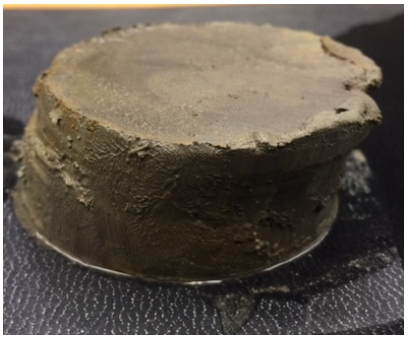
Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/12/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.



	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.485	0	0	0
2	36.40	5.485	0.003256	0.437	0.008716
3	71.32	5.485	0.006327	0.7826	0.01743
4	106.78	5.485	0.008001	1.076	0.02615
5	141.55	5.485	0.01042	1.313	0.03486
6	173.06	5.485	0.01219	1.499	0.04358
7	209.72	5.485	0.01358	1.693	0.05229
8	245.51	5.485	0.01507	1.854	0.06101
9	279.22	5.485	0.0161	1.987	0.06973
10	314.35	5.485	0.01805	2.098	0.07844
11	349.53	5.485	0.01898	2.187	0.08716
12	383.30	5.485	0.02	2.276	0.09587
13	415.59	5.485	0.02093	2.352	0.1046
14	449.70	5.485	0.0214	2.428	0.1133
15	485.17	5.485	0.02242	2.494	0.122
16	517.51	5.485	0.02317	2.551	0.1307
17	556.85	5.485	0.02382	2.612	0.1395
18	584.89	5.485	0.02447	2.627	0.1482
19	618.32	5.485	0.02503	2.678	0.1569
20	654.74	5.485	0.02568	2.719	0.1656
21	687.22	5.485	0.02596	2.742	0.1743
22	720.44	5.485	0.02652	2.766	0.183
23	755.56	5.485	0.02726	2.793	0.1917
24	788.89	5.485	0.02735	2.81	0.2005
25	823.96	5.485	0.02782	2.83	0.2092
26	856.37	5.485	0.02763	2.851	0.2179
27	893.08	5.485	0.02735	2.874	0.2266
28	925.58	5.485	0.02819	2.893	0.2353
29	960.00	5.485	0.02875	2.911	0.244
30	995.06	5.485	0.02931	2.924	0.2527
31	1031.53	5.485	0.02987	2.93	0.2614
32	1062.43	5.485	0.03042	2.929	0.2701
33	1097.75	5.486	0.03117	2.929	0.2789
34	1131.93	5.485	0.03182	2.926	0.2876
35	1165.06	5.485	0.03266	2.877	0.2963
36	1194.80	5.485	0.03284	2.897	0.3037

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Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNEGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B002
SAMPLE NO.	S-5
DEPTH:	10.0'-12.0'
CLASSIFICATION	GRAY TO DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	55.9	59.7
WATER CONTENT (%)	66.4	60.8
DIAMETER (cm)	7.218	7.030
LENGTH (cm)	8.678	8.558
HYDRAULIC GRADIENT (MAXIMUM)	10.87	
PERCENT SATURATION	100.0	

SAMPLE PHOTO

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 9.19E-05

Deaired water was used as the liquid permeant.

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNEGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B003
SAMPLE NO.	S-9
DEPTH:	30.0'-32.0'
CLASSIFICATION	VERY DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	53.2	59.3
WATER CONTENT (%)	71.2	61.7
DIAMETER (cm)	7.206	6.968
LENGTH (cm)	8.429	8.091

SAMPLE PHOTO

HYDRAULIC GRADIENT (MAXIMUM)	11.19
PERCENT SATURATION	100.2

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec): 6.79E-05

Deaired water was used as the liquid permeant.

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Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNEGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B004
SAMPLE NO.	S-11
DEPTH:	36.0'-38.0'
CLASSIFICATION	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	111.1	113.9
WATER CONTENT (%)	19.3	18.0
DIAMETER (cm)	7.117	7.074
LENGTH (cm)	8.145	8.042

SAMPLE PHOTO

HYDRAULIC GRADIENT (MAXIMUM) 20.21

PERCENT SATURATION 100.5 (Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec) 7.20E-07

Deaired water was used as the liquid permeant.

UNCONFINED COMPRESSION TEST REPORT

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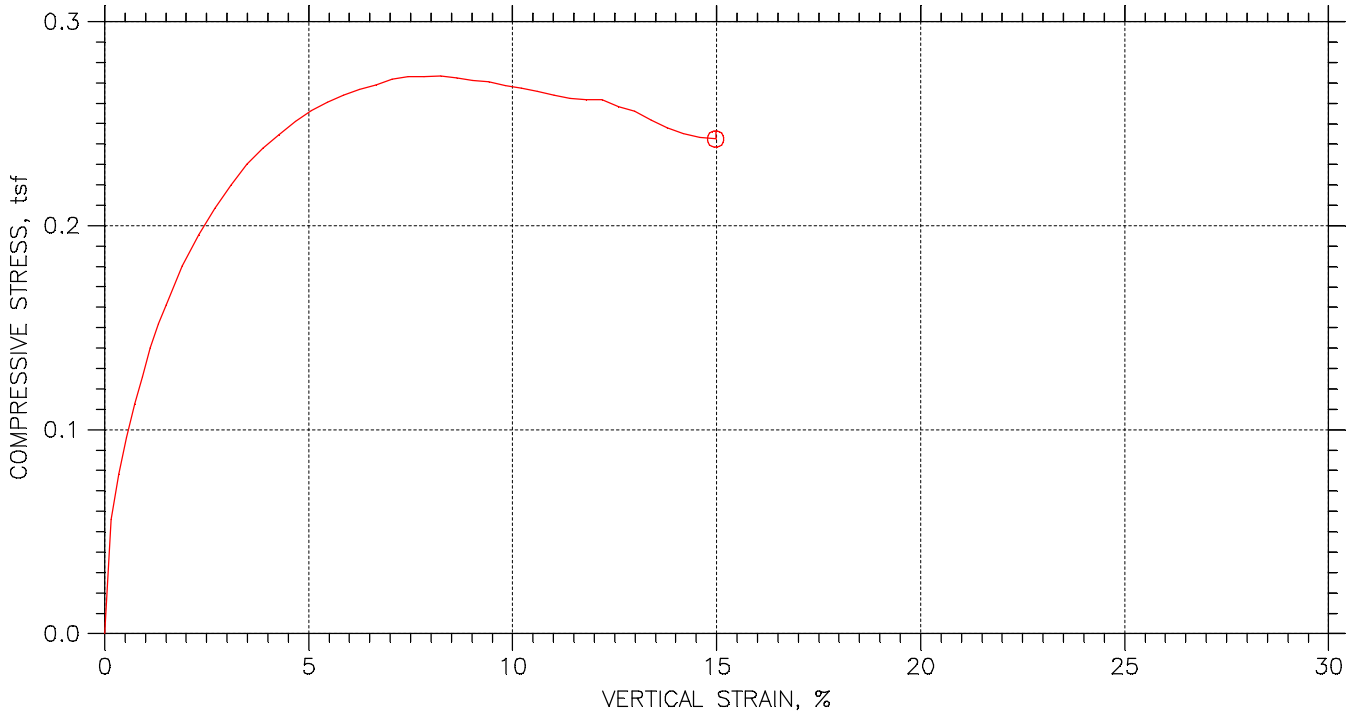

Symbol		⏲			
Test No.		EDW-002 S10			
Initial	Diameter, in	2.8118			
	Height, in	5.9587			
	Water Content, %	29.48			
	Dry Density, pcf	93.81			
	Saturation, %	98.98			
	Void Ratio	0.81002			
Unconfined Compressive Strength, tsf		0.27347			
Undrained Shear Strength, tsf		0.13673			
Time to Failure, min		10.5			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		36			
Plastic Limit		18			
Plasticity Index		18			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155199
Boring No.: EDW-002 S10
Sample Type: 3.0" ST
Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-002 S10
Sample No.: S-10
Test No.: EDW-002 S10

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/17/15
Sample Type: 3.0" ST

Project No.: MR155199
Checked By: WPQ
Depth: 35.0'-37.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Specimen Height: 5.96 in
Specimen Area: 6.21 in^2
Specimen Volume: 37.00 in^3

Liquid Limit: 36
Plastic Limit: 18
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2096	0	0
2	0.25007	0.0091325	0.15326	4.8253	6.2191	0.055864	0.027932
3	0.50007	0.020663	0.34678	6.7659	6.2312	0.078179	0.039089
4	0.75007	0.032286	0.54184	8.3394	6.2434	0.096171	0.048086
5	1.0001	0.043725	0.73381	9.808	6.2555	0.11289	0.056444
6	1.2501	0.055348	0.92887	10.962	6.2678	0.12592	0.062961
7	1.5001	0.066879	1.1224	12.221	6.2801	0.14011	0.070054
8	1.7501	0.078318	1.3144	13.27	6.2923	0.15184	0.075919
9	2.0001	0.089941	1.5094	14.109	6.3047	0.16112	0.080561
10	2.5001	0.11346	1.9042	15.84	6.3301	0.18016	0.090082
11	3.0001	0.13708	2.3005	17.256	6.3558	0.19548	0.097739
12	3.5001	0.1606	2.6953	18.462	6.3816	0.2083	0.10415
13	4.0001	0.18413	3.09	19.564	6.4076	0.21983	0.10991
14	4.5001	0.20756	3.4833	20.56	6.4337	0.23009	0.11504
15	5.0001	0.23108	3.878	21.347	6.4601	0.23792	0.11896
16	5.5001	0.2546	4.2728	22.029	6.4867	0.24451	0.12225
17	6.0001	0.27822	4.6691	22.71	6.5137	0.25103	0.12552
18	6.5001	0.30183	5.0654	23.287	6.5409	0.25634	0.12817
19	7.0001	0.32536	5.4602	23.759	6.5682	0.26045	0.13022
20	7.5001	0.34897	5.8565	24.179	6.5959	0.26394	0.13197
21	8.0001	0.37249	6.2513	24.546	6.6236	0.26682	0.13341
22	8.5001	0.39602	6.6461	24.861	6.6517	0.2691	0.13455
23	9.0001	0.41972	7.0439	25.228	6.6801	0.27191	0.13596
24	9.5001	0.44343	7.4418	25.438	6.7088	0.273	0.1365
25	10	0.46686	7.835	25.543	6.7375	0.27296	0.13648
26	10.5	0.49039	8.2298	25.7	6.7664	0.27347	0.13673
27	11	0.51372	8.6215	25.7	6.7954	0.2723	0.13615
28	11.5	0.53734	9.0178	25.7	6.825	0.27112	0.13556
29	12	0.56114	9.4172	25.753	6.8551	0.27048	0.13524
30	12.5	0.58503	9.8182	25.7	6.8856	0.26873	0.13437
31	13	0.60874	10.216	25.7	6.9161	0.26755	0.13377
32	13.5	0.63235	10.612	25.648	6.9468	0.26582	0.13291
33	14	0.65588	11.007	25.595	6.9776	0.26411	0.13205
34	14.5	0.67912	11.397	25.543	7.0083	0.26241	0.13121
35	15	0.70274	11.794	25.595	7.0398	0.26178	0.13089
36	15.5	0.72654	12.193	25.7	7.0718	0.26166	0.13083
37	16	0.75043	12.594	25.49	7.1043	0.25834	0.12917
38	16.5	0.77414	12.992	25.385	7.1368	0.2561	0.12805
39	17	0.79784	13.39	25.071	7.1696	0.25177	0.12589
40	17.5	0.82155	13.788	24.808	7.2026	0.24799	0.124
41	18	0.84517	14.184	24.651	7.2359	0.24529	0.12264
42	18.5	0.86887	14.582	24.546	7.2696	0.24311	0.12156
43	19	0.8924	14.976	24.599	7.3034	0.2425	0.12125

UNCONFINED COMPRESSION TEST REPORT

Terracon
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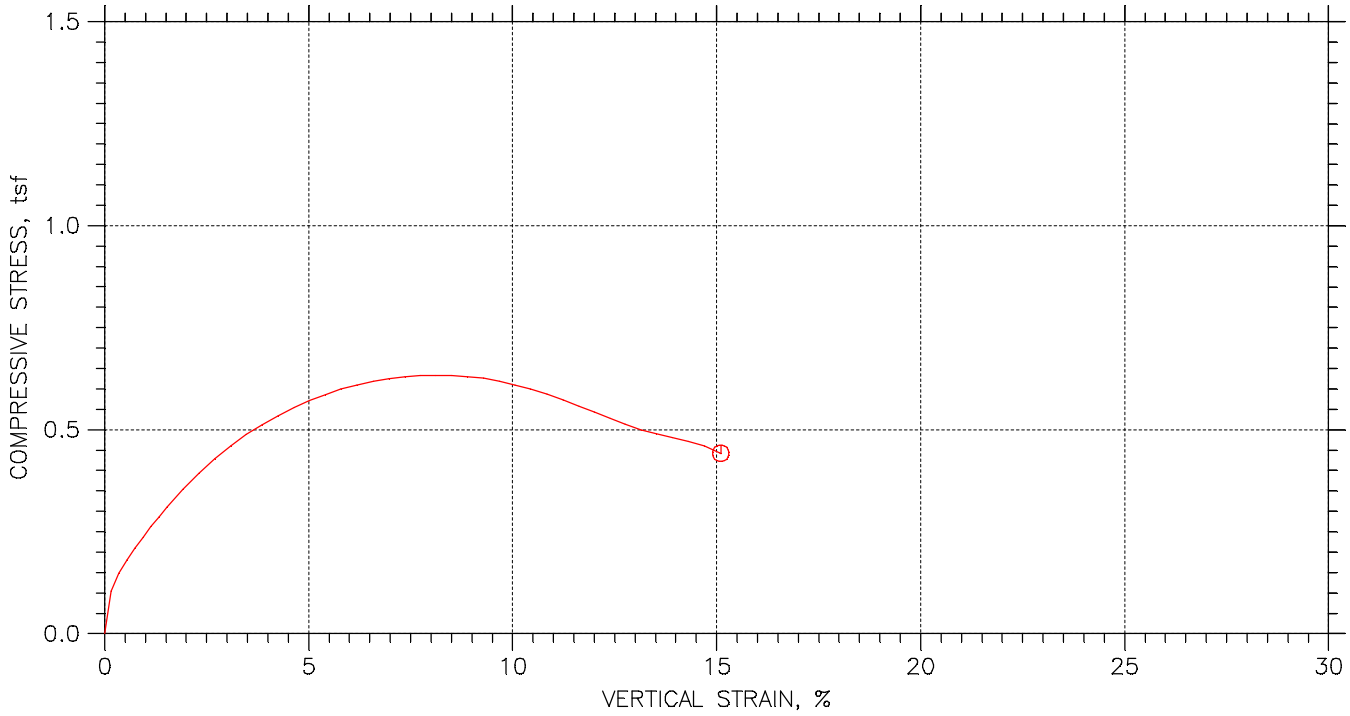

Symbol		⏲			
Test No.		EDWB003S12			
Initial	Diameter, in	2.8343			
	Height, in	6.0811			
	Water Content, %	41.57			
	Dry Density, pcf	79.31			
	Saturation, %	99.09			
	Void Ratio	1.141			
Unconfined Compressive Strength, tsf		0.63249			
Undrained Shear Strength, tsf		0.31624			
Time to Failure, min		10.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		51			
Plastic Limit		17			
Plasticity Index		34			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-003 S12
Sample Type: 3.0" ST
Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-003 S12
Sample No.: S-12
Test No.: EDWB003S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 45.0'-47.0'
Elevation: -----

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Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.08 in
Specimen Area: 6.31 in^2
Specimen Volume: 38.37 in^3

Liquid Limit: 51
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.3091	0	0
2	0.25402	0.0096859	0.15928	9.0737	6.3192	0.10339	0.051693
3	0.50402	0.021401	0.35193	13.007	6.3314	0.14792	0.07396
4	0.75402	0.033117	0.54458	15.945	6.3436	0.18097	0.090485
5	1.004	0.044924	0.73875	18.515	6.356	0.20973	0.10486
6	1.254	0.056824	0.93444	20.927	6.3686	0.23659	0.1183
7	1.504	0.068816	1.1316	23.235	6.3813	0.26216	0.13108
8	1.754	0.080808	1.3288	25.385	6.3941	0.28585	0.14293
9	2.004	0.092893	1.5276	27.536	6.407	0.30944	0.15472
10	2.504	0.11678	1.9205	31.522	6.4326	0.35282	0.17641
11	3.004	0.14058	2.3118	35.246	6.4584	0.39293	0.19646
12	3.504	0.1642	2.7002	38.55	6.4842	0.42806	0.21403
13	4.004	0.18754	3.084	41.592	6.5099	0.46002	0.23001
14	4.504	0.21115	3.4723	44.319	6.536	0.48822	0.24411
15	5.004	0.23505	3.8652	46.732	6.5628	0.5127	0.25635
16	5.504	0.25885	4.2565	48.935	6.5896	0.53468	0.26734
17	6.004	0.28246	4.6449	50.981	6.6164	0.55477	0.27739
18	6.504	0.30571	5.0272	52.764	6.643	0.57188	0.28594
19	7.004	0.32905	5.4109	54.285	6.67	0.58598	0.29299
20	7.504	0.35248	5.7962	55.753	6.6973	0.59938	0.29969
21	8.0041	0.37637	6.1891	56.96	6.7253	0.6098	0.3049
22	8.5041	0.40026	6.582	58.061	6.7536	0.61899	0.30949
23	9.0041	0.42388	6.9704	58.848	6.7818	0.62477	0.31238
24	9.5041	0.44721	7.3542	59.53	6.8099	0.6294	0.3147
25	10.004	0.47018	7.7319	60.054	6.8378	0.63235	0.31618
26	10.504	0.49343	8.1141	60.316	6.8662	0.63249	0.31624
27	11.004	0.51723	8.5055	60.526	6.8956	0.63198	0.31599
28	11.504	0.54121	8.8999	60.631	6.9255	0.63035	0.31517
29	12.004	0.56511	9.2928	60.474	6.9554	0.626	0.313
30	12.504	0.58835	9.6751	60.002	6.9849	0.6185	0.30925
31	13.004	0.61151	10.056	59.372	7.0145	0.60943	0.30471
32	13.504	0.63484	10.44	58.691	7.0445	0.59986	0.29993
33	14.004	0.65874	10.833	57.746	7.0756	0.58762	0.29381
34	14.504	0.68281	11.228	56.593	7.1071	0.57332	0.28666
35	15.004	0.70689	11.624	55.334	7.1389	0.55807	0.27904
36	15.504	0.73023	12.008	54.127	7.1701	0.54353	0.27177
37	16.004	0.7532	12.386	52.816	7.201	0.52809	0.26404
38	16.504	0.77598	12.761	51.505	7.2319	0.51278	0.25639
39	17.004	0.79904	13.14	50.456	7.2635	0.50015	0.25007
40	17.504	0.82266	13.528	49.669	7.2961	0.49015	0.24507
41	18.004	0.84637	13.918	48.987	7.3292	0.48124	0.24062
42	18.504	0.86998	14.306	48.201	7.3624	0.47138	0.23569
43	19.004	0.89341	14.692	47.257	7.3956	0.46007	0.23003
44	19.504	0.91666	15.074	45.736	7.4289	0.44326	0.22163
45	19.538	0.91823	15.1	45.631	7.4312	0.44211	0.22106

UNCONFINED COMPRESSION TEST REPORT

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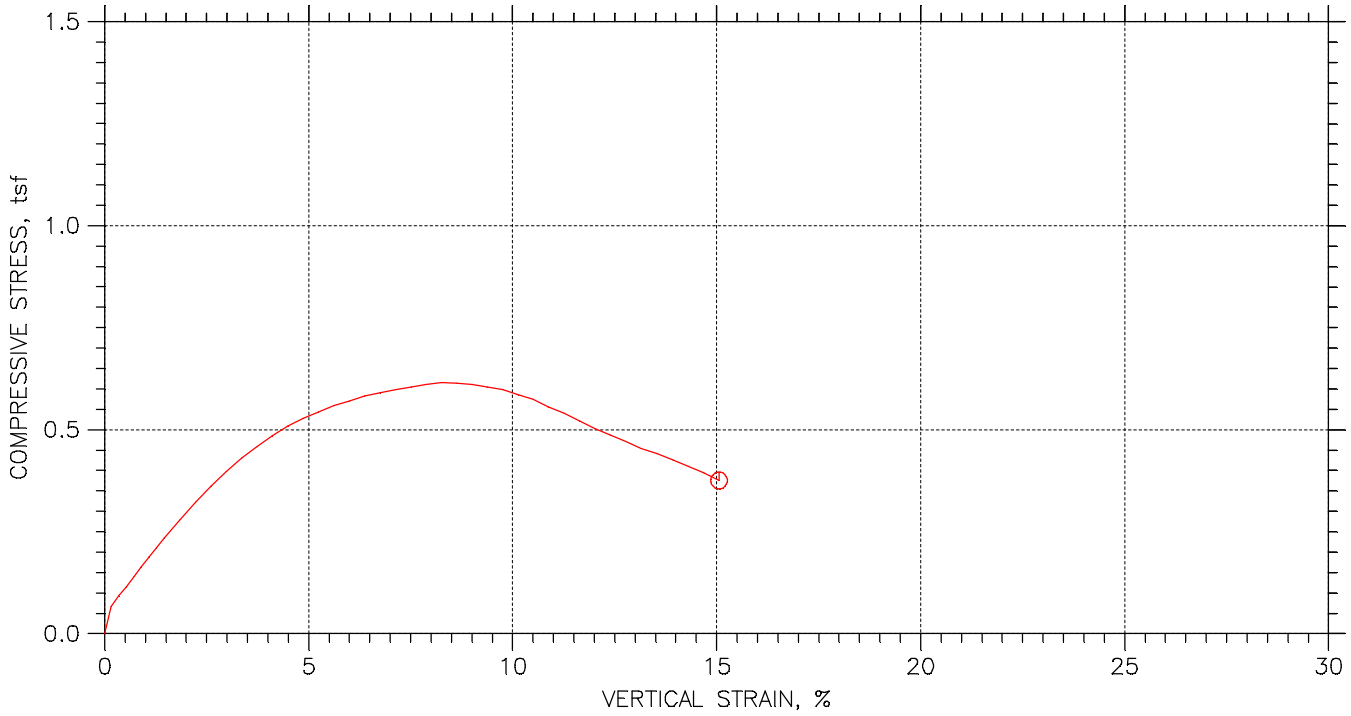

Symbol		⏲			
Test No.		EDWB004S11			
Initial	Diameter, in	2.8217			
	Height, in	6.2535			
	Water Content, %	19.25			
	Dry Density, pcf	111.4			
	Saturation, %	99.83			
	Void Ratio	0.52451			
Unconfined Compressive Strength, tsf		0.61504			
Undrained Shear Strength, tsf		0.30752			
Time to Failure, min		11.004			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		35			
Plastic Limit		17			
Plasticity Index		18			
Failure Sketch					

Project: DYNEGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-004 S11

Sample Type: 3.0" ST

Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL

Remarks: TEST PERFORMED AS PER ASTM D 2166.

Mon, 16-NOV-2015 22:03:56

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-004 S11
Sample No.: S-11
Test No.: EDWB004S11

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 36.0'-38.0'
Elevation: -----

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Soil Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Specimen Height: 6.25 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.10 in^3

Liquid Limit: 35
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25398	0.0096859	0.15489	5.717	6.2628	0.065724	0.032862
3	0.50398	0.021494	0.3437	8.0772	6.2747	0.092683	0.046341
4	0.75398	0.033117	0.52957	10.07	6.2864	0.11534	0.057668
5	1.004	0.04474	0.71543	12.221	6.2982	0.1397	0.069852
6	1.254	0.056363	0.9013	14.319	6.31	0.16338	0.081691
7	1.504	0.068078	1.0886	16.469	6.322	0.18756	0.093782
8	1.754	0.079701	1.2745	18.567	6.3339	0.21106	0.10553
9	2.004	0.091601	1.4648	20.665	6.3461	0.23446	0.11723
10	2.504	0.1154	1.8454	24.808	6.3707	0.28038	0.14019
11	3.004	0.13929	2.2274	28.637	6.3956	0.32239	0.1612
12	3.504	0.16291	2.6051	32.256	6.4204	0.36173	0.18087
13	4.004	0.18652	2.9827	35.56	6.4454	0.39724	0.19862
14	4.504	0.20977	3.3544	38.707	6.4702	0.43074	0.21537
15	5.004	0.2332	3.7291	41.382	6.4953	0.45872	0.22936
16	5.504	0.257	4.1097	43.952	6.5211	0.48528	0.24264
17	6.004	0.2808	4.4903	46.313	6.5471	0.50931	0.25465
18	6.504	0.30442	4.8679	48.201	6.5731	0.52798	0.26399
19	7.004	0.32794	5.244	49.827	6.5992	0.54363	0.27182
20	7.504	0.35128	5.6172	51.4	6.6253	0.55859	0.27929
21	8.004	0.37462	5.9904	52.606	6.6516	0.56944	0.28472
22	8.504	0.39832	6.3696	53.97	6.6785	0.58184	0.29092
23	9.004	0.42221	6.7516	55.019	6.7059	0.59073	0.29537
24	9.504	0.44601	7.1322	55.911	6.7334	0.59785	0.29893
25	10.004	0.46945	7.5069	56.802	6.7606	0.60494	0.30247
26	10.504	0.4926	7.8771	57.537	6.7878	0.61031	0.30515
27	11.004	0.51594	8.2503	58.219	6.8154	0.61504	0.30752
28	11.504	0.53928	8.6235	58.323	6.8433	0.61364	0.30682
29	12.004	0.56298	9.0026	58.323	6.8718	0.61109	0.30555
30	12.504	0.58678	9.3832	58.009	6.9006	0.60525	0.30263
31	13.004	0.6104	9.7608	57.537	6.9295	0.59783	0.29891
32	13.504	0.63355	10.131	56.593	6.9581	0.5856	0.2928
33	14.004	0.65671	10.501	55.701	6.9868	0.574	0.287
34	14.504	0.68014	10.876	54.18	7.0162	0.55599	0.278
35	15.004	0.70394	11.257	52.869	7.0463	0.54022	0.27011
36	15.504	0.72783	11.639	51.295	7.0768	0.52188	0.26094
37	16.004	0.75163	12.019	49.669	7.1074	0.50317	0.25158
38	16.504	0.77515	12.395	48.306	7.1379	0.48726	0.24363
39	17.004	0.79867	12.772	46.889	7.1687	0.47094	0.23547
40	17.504	0.82229	13.149	45.368	7.1998	0.45369	0.22685
41	18.004	0.84655	13.537	44.319	7.2322	0.44122	0.22061
42	18.504	0.87081	13.925	43.008	7.2648	0.42625	0.21312
43	19.004	0.89489	14.31	41.592	7.2974	0.41037	0.20519
44	19.504	0.91832	14.685	40.071	7.3294	0.39363	0.19682
45	20.004	0.94157	15.057	38.393	7.3615	0.3755	0.18775

UNCONFINED COMPRESSION TEST REPORT

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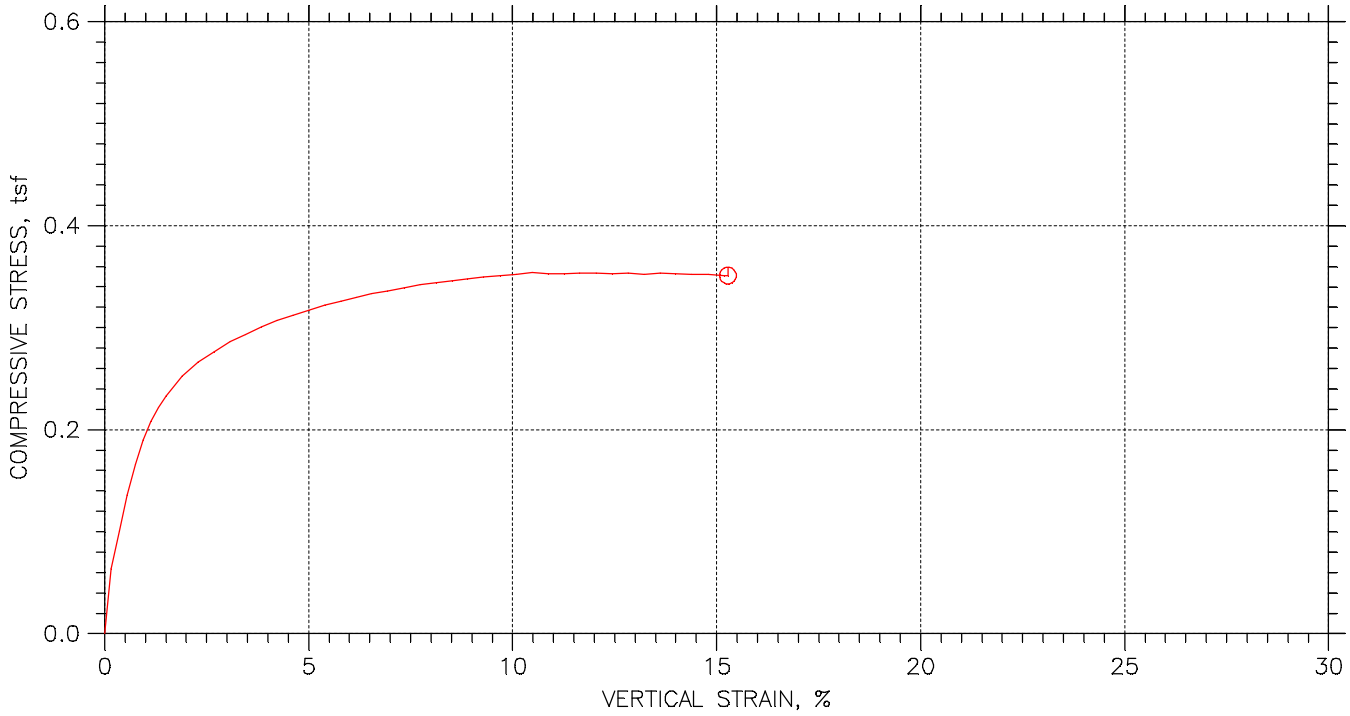

Symbol		⏲			
Test No.		EDWB008S5			
Initial	Diameter, in	2.8047			
	Height, in	6.0665			
	Water Content, %	33.59			
	Dry Density, pcf	88.9			
	Saturation, %	100.40			
	Void Ratio	0.91009			
Unconfined Compressive Strength, tsf		0.35399			
Undrained Shear Strength, tsf		0.177			
Time to Failure, min		13.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		52			
Plastic Limit		19			
Plasticity Index		33			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-008 S5
Sample Type: 3.0" ST
Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 11.0'-13.0'
Elevation: -----

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Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.07 in
Specimen Area: 6.18 in^2
Specimen Volume: 37.48 in^3

Liquid Limit: 52
Plastic Limit: 19
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.1783	0	0
2	0.254	0.0097782	0.16118	5.4547	6.1883	0.063465	0.031732
3	0.504	0.021678	0.35734	8.6541	6.2005	0.10049	0.050246
4	0.754	0.033578	0.55349	11.696	6.2127	0.13555	0.067774
5	1.004	0.045293	0.74661	14.319	6.2248	0.16562	0.082809
6	1.254	0.057009	0.93972	16.417	6.2369	0.18952	0.094758
7	1.504	0.068632	1.1313	18.042	6.249	0.20788	0.10394
8	1.754	0.080255	1.3229	19.301	6.2611	0.22195	0.11098
9	2.004	0.091878	1.5145	20.298	6.2733	0.23296	0.11648
10	2.504	0.11512	1.8977	22.081	6.2978	0.25244	0.12622
11	3.004	0.13865	2.2854	23.392	6.3228	0.26638	0.13319
12	3.504	0.16245	2.6778	24.389	6.3483	0.27661	0.1383
13	4.004	0.18615	3.0685	25.333	6.3739	0.28616	0.14308
14	4.504	0.20949	3.4533	26.067	6.3993	0.29329	0.14664
15	5.004	0.23274	3.8364	26.854	6.4248	0.30094	0.15047
16	5.504	0.25608	4.2212	27.483	6.4506	0.30676	0.15338
17	6.004	0.27969	4.6104	28.06	6.4769	0.31193	0.15596
18	6.504	0.30368	5.0058	28.637	6.5039	0.31702	0.15851
19	7.004	0.32748	5.3981	29.214	6.5309	0.32207	0.16104
20	7.504	0.35091	5.7843	29.686	6.5576	0.32594	0.16297
21	8.004	0.37406	6.166	30.158	6.5843	0.32978	0.16489
22	8.504	0.39731	6.5492	30.63	6.6113	0.33358	0.16679
23	9.004	0.42092	6.9384	30.997	6.639	0.33617	0.16808
24	9.504	0.445	7.3353	31.417	6.6674	0.33927	0.16963
25	10.004	0.46917	7.7337	31.837	6.6962	0.34232	0.17116
26	10.504	0.49315	8.1291	32.151	6.725	0.34422	0.17211
27	11.004	0.51658	8.5153	32.466	6.7534	0.34613	0.17307
28	11.504	0.53992	8.9	32.781	6.7819	0.34802	0.17401
29	12.004	0.56363	9.2908	33.095	6.8111	0.34985	0.17492
30	12.504	0.5878	9.6892	33.358	6.8412	0.35107	0.17554
31	13.004	0.61206	10.089	33.62	6.8716	0.35227	0.17613
32	13.504	0.63614	10.486	33.935	6.9021	0.35399	0.177
33	14.004	0.65966	10.874	33.987	6.9321	0.35301	0.1765
34	14.504	0.68309	11.26	34.092	6.9623	0.35256	0.17628
35	15.004	0.70661	11.648	34.354	6.9928	0.35372	0.17686
36	15.504	0.7305	12.042	34.459	7.0241	0.35322	0.17661
37	16.004	0.75467	12.44	34.564	7.0561	0.35269	0.17634
38	16.504	0.77875	12.837	34.774	7.0882	0.35322	0.17661
39	17.004	0.80255	13.229	34.826	7.1203	0.35216	0.17608
40	17.504	0.8258	13.612	35.088	7.1518	0.35325	0.17662
41	18.004	0.84923	13.999	35.193	7.184	0.35272	0.17636
42	18.504	0.87293	14.389	35.298	7.2168	0.35216	0.17608
43	19.004	0.89719	14.789	35.456	7.2506	0.35208	0.17604
44	19.504	0.92127	15.186	35.508	7.2846	0.35096	0.17548
45	19.621	0.92671	15.276	35.56	7.2923	0.35111	0.17555

UNCONFINED COMPRESSION TEST REPORT

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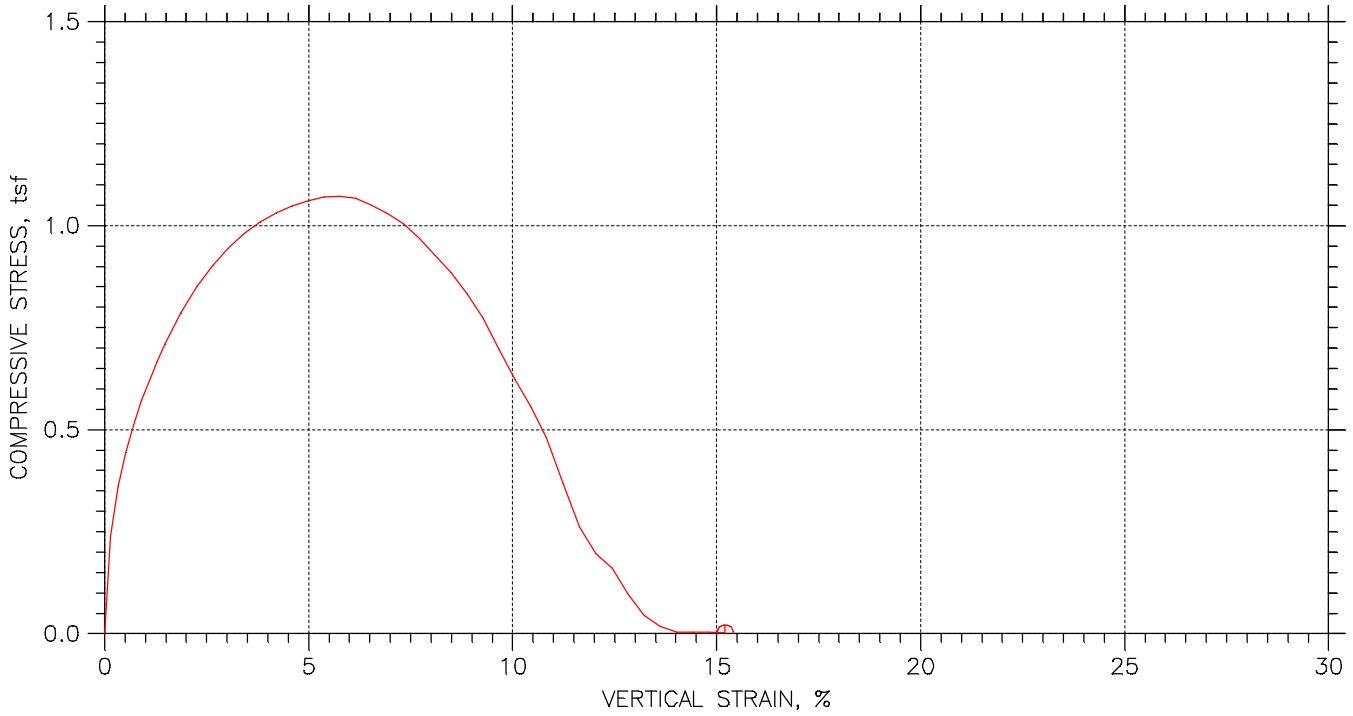

Symbol		⏲			
Test No.		EDWB015S12			
Initial	Diameter, in	2.8217			
	Height, in	6.061			
	Water Content, %	41.01			
	Dry Density, pcf	79.76			
	Saturation, %	98.82			
	Void Ratio	1.1289			
Unconfined Compressive Strength, tsf		1.0722			
Undrained Shear Strength, tsf		0.53609			
Time to Failure, min		7.5002			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		66			
Plastic Limit		23			
Plasticity Index		43			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-015 S12
Sample Type: 3.0" ST
Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Mon, 16-NOV-2015 22:13:27

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-015 S12
Sample No.: S-12
Test No.: EDWB015S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 37.0'-39.0'
Elevation: -----

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Soil Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

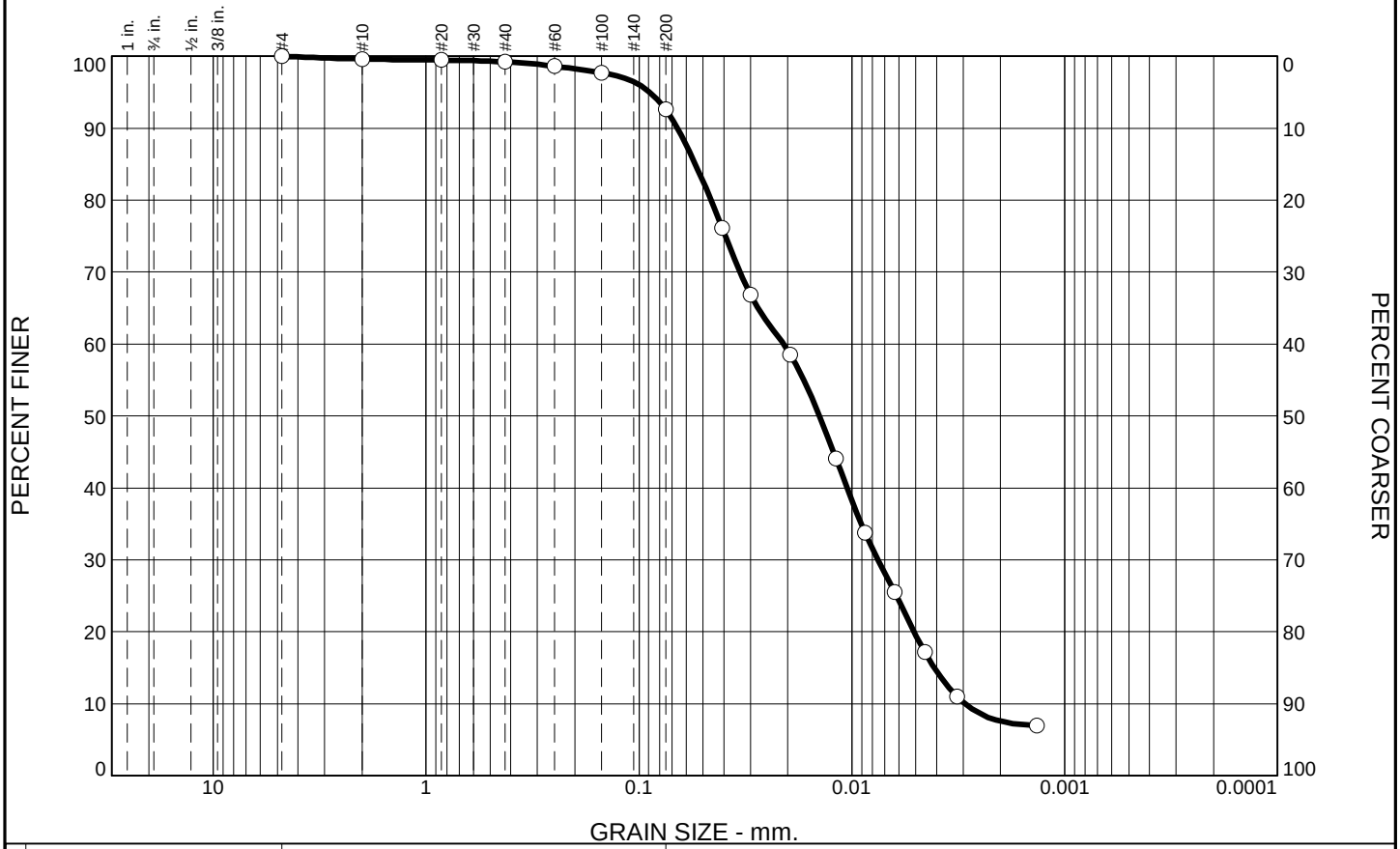
Specimen Height: 6.06 in
Specimen Area: 6.25 in^2
Specimen Volume: 37.90 in^3

Liquid Limit: 66
Plastic Limit: 23
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25015	0.0088557	0.14611	20.683	6.2623	0.2378	0.1189
3	0.50015	0.02011	0.33179	31.44	6.2739	0.3608	0.1804
4	0.75015	0.031548	0.52051	38.87	6.2858	0.44523	0.22261
5	1.0002	0.042987	0.70924	44.692	6.2978	0.51094	0.25547
6	1.2502	0.05461	0.90101	49.96	6.31	0.57006	0.28503
7	1.5002	0.066141	1.0913	54.506	6.3221	0.62075	0.31038
8	1.7502	0.077949	1.2861	58.665	6.3346	0.6668	0.3334
9	2.0002	0.089664	1.4794	62.547	6.347	0.70952	0.35476
10	2.5002	0.11346	1.872	69.644	6.3724	0.78689	0.39344
11	3.0002	0.13726	2.2647	75.633	6.398	0.85113	0.42556
12	3.5002	0.16069	2.6513	80.512	6.4234	0.90246	0.45123
13	4.0002	0.18385	3.0333	84.615	6.4487	0.94473	0.47236
14	4.5002	0.20728	3.4199	88.164	6.4745	0.98043	0.49021
15	5.0002	0.23089	3.8095	91.158	6.5008	1.0096	0.50482
16	5.5002	0.25497	4.2067	93.543	6.5277	1.0318	0.51588
17	6.0002	0.27905	4.604	95.428	6.5549	1.0482	0.5241
18	6.5002	0.30266	4.9936	96.98	6.5818	1.0609	0.53045
19	7.0002	0.32582	5.3756	98.2	6.6084	1.0699	0.53496
20	7.5002	0.34915	5.7607	98.81	6.6354	1.0722	0.53609
21	8.0002	0.37277	6.1503	98.755	6.6629	1.0672	0.53358
22	8.5002	0.39685	6.5475	97.535	6.6912	1.0495	0.52475
23	9.0002	0.42074	6.9417	96.149	6.7196	1.0302	0.51511
24	9.5002	0.44445	7.3329	94.097	6.7479	1.004	0.502
25	10	0.46769	7.7164	91.214	6.776	0.96922	0.48461
26	10.5	0.49085	8.0984	87.72	6.8042	0.92824	0.46412
27	11	0.51428	8.485	84.061	6.8329	0.88577	0.44289
28	11.5	0.53798	8.8761	79.514	6.8622	0.83428	0.41714
29	12	0.56215	9.2749	74.135	6.8924	0.77444	0.38722
30	12.5	0.58614	9.6706	67.093	6.9226	0.69782	0.34891
31	13	0.60966	10.059	60.162	6.9525	0.62304	0.31152
32	13.5	0.63291	10.442	53.897	6.9822	0.55578	0.27789
33	14	0.65652	10.832	46.854	7.0127	0.48106	0.24053
34	14.5	0.6806	11.229	36.153	7.0441	0.36953	0.18476
35	15	0.70532	11.637	25.617	7.0766	0.26064	0.13032
36	15.5	0.72986	12.042	19.296	7.1092	0.19543	0.097714
37	16	0.75366	12.435	15.969	7.1411	0.16101	0.080505
38	16.5	0.77773	12.832	9.5372	7.1736	0.095723	0.047862
39	17	0.80181	13.229	4.3805	7.2065	0.043765	0.021883
40	17.5	0.82543	13.619	1.7744	7.239	0.017648	0.0088241
41	18	0.8496	14.017	0.44359	7.2725	0.0043917	0.0021958
42	18.5	0.87404	14.421	0.38814	7.3068	0.0038247	0.0019123
43	19	0.89802	14.816	0.33269	7.3408	0.0032632	0.0016316
44	19.5	0.92164	15.206	0.16635	7.3745	0.0016241	0.00081206

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	0.4	6.6	73.1	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	99.5		
#40	99.2		
#60	98.6		
#100	97.7		
#200	92.6		

* (no specification provided)

DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0659 D_{85}= 0.0543 D_{60}= 0.0210
D_{50}= 0.0142 D_{30}= 0.0075 D_{15}= 0.0041
D_{10}= 0.0029 C_u= 7.16 C_c= 0.92

Classification

USCS= AASHTO=

Remarks

F.M.=0.05

Source of Sample: EDW-B002 **Depth:** 7.5'-10.0'
Sample Number: S-4 **Date:** 11-5-15

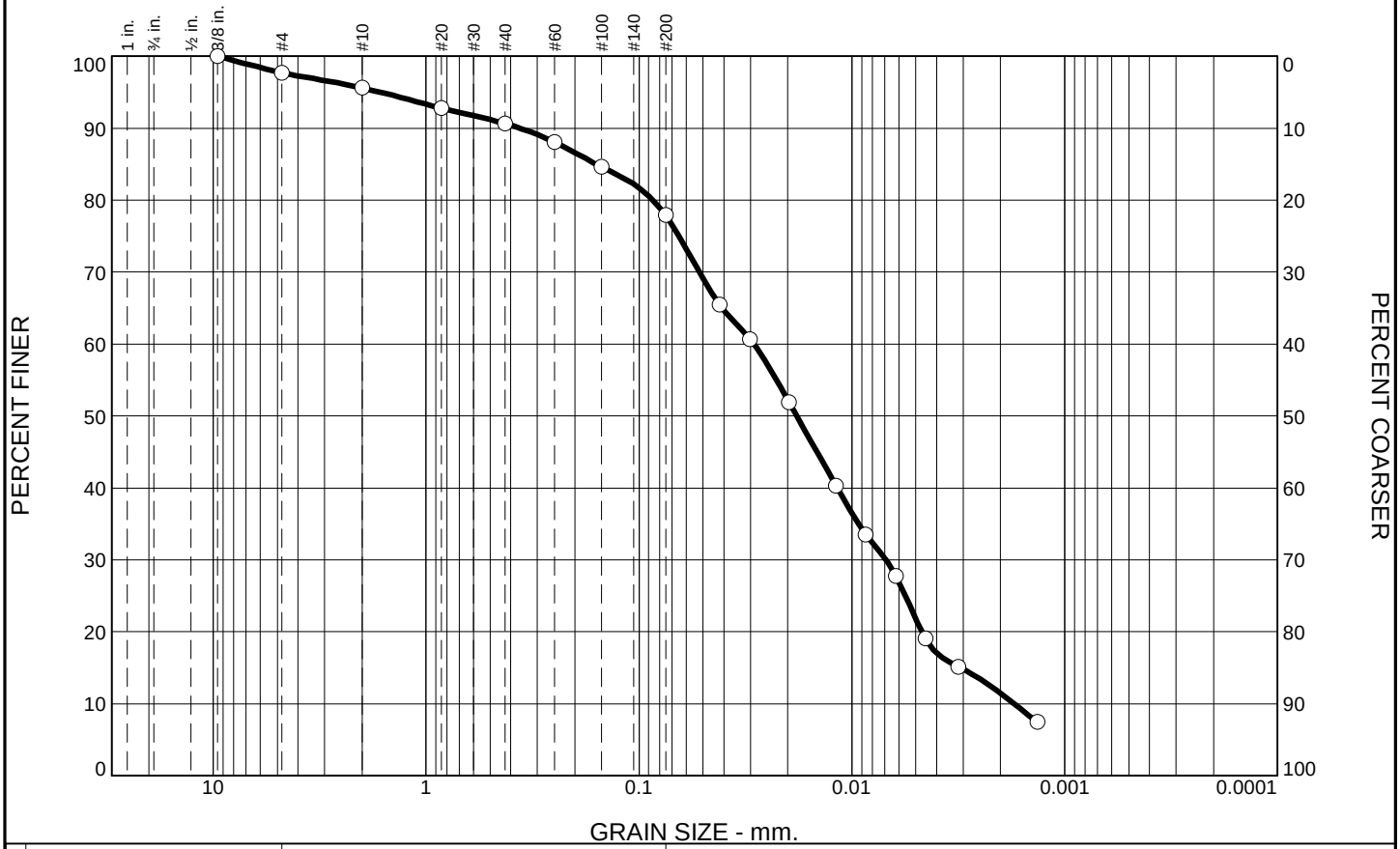
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.3	2.1	5.0	12.7	56.3	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.7		
#10	95.6		
#20	92.8		
#40	90.6		
#60	88.1		
#100	84.6		
#200	77.9		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3632 D_{85}= 0.1593 D_{60}= 0.0290
D_{50}= 0.0181 D_{30}= 0.0069 D_{15}= 0.0031
D_{10}= 0.0017 C_u= 16.81 C_c= 0.96

Classification

USCS= AASHTO=

Remarks

F.M.=0.47

Source of Sample: EDW-B003 **Depth:** 10.0'-11.5'
Sample Number: S-5 **Date:** 11-5-15

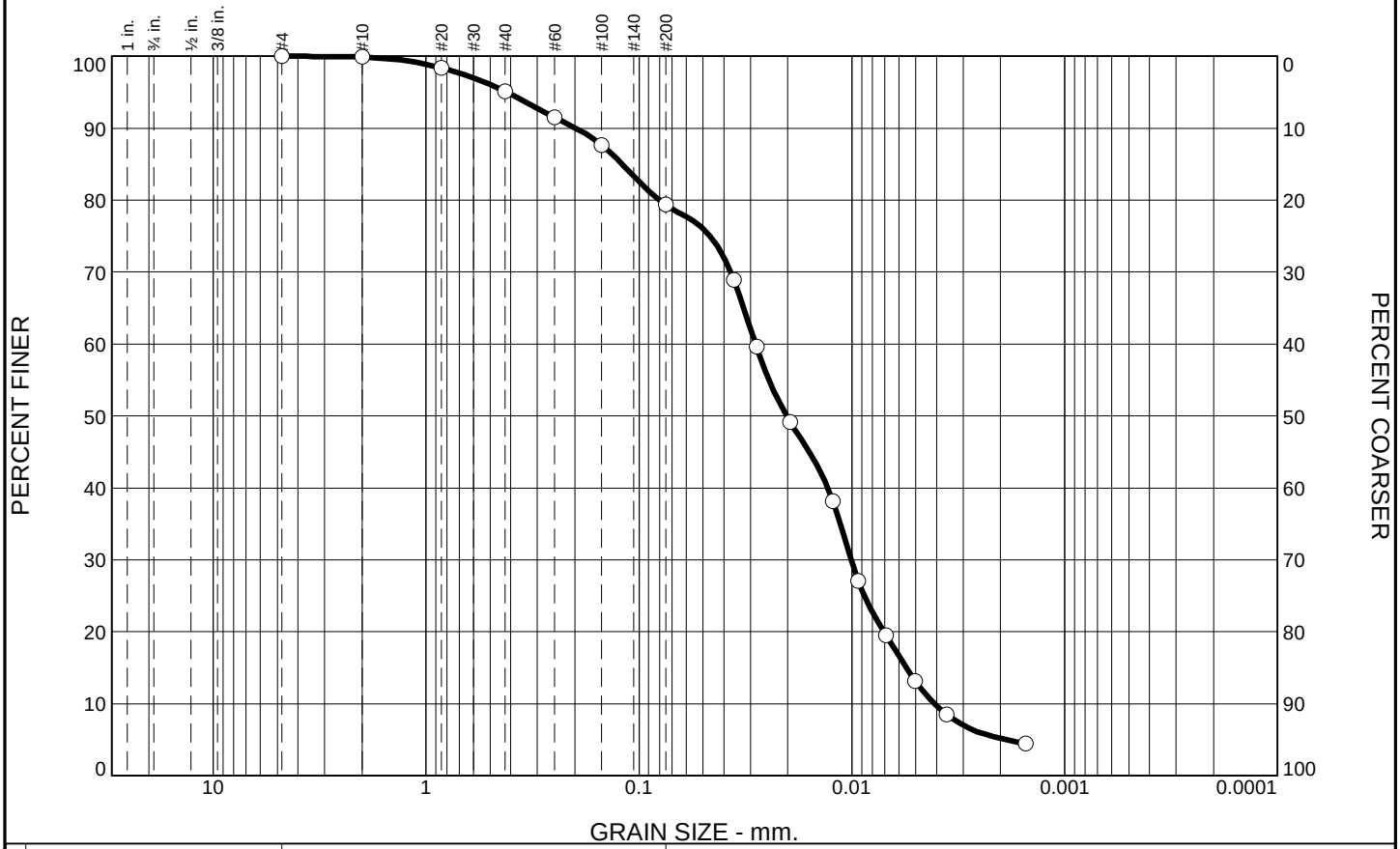
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.8	15.7	66.4	13.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.4		
#40	95.1		
#60	91.5		
#100	87.6		
#200	79.4		

* (no specification provided)

FILL: VERY DARK GRAY VARVED FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1981 D_{85}= 0.1202 D_{60}= 0.0284
D_{50}= 0.0203 D_{30}= 0.0101 D_{15}= 0.0056
D_{10}= 0.0041 C_u= 6.92 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.23

Source of Sample: EDW-B003 **Depth:** 30.0'-32.0'
Sample Number: S-9 **Date:** 11-5-15

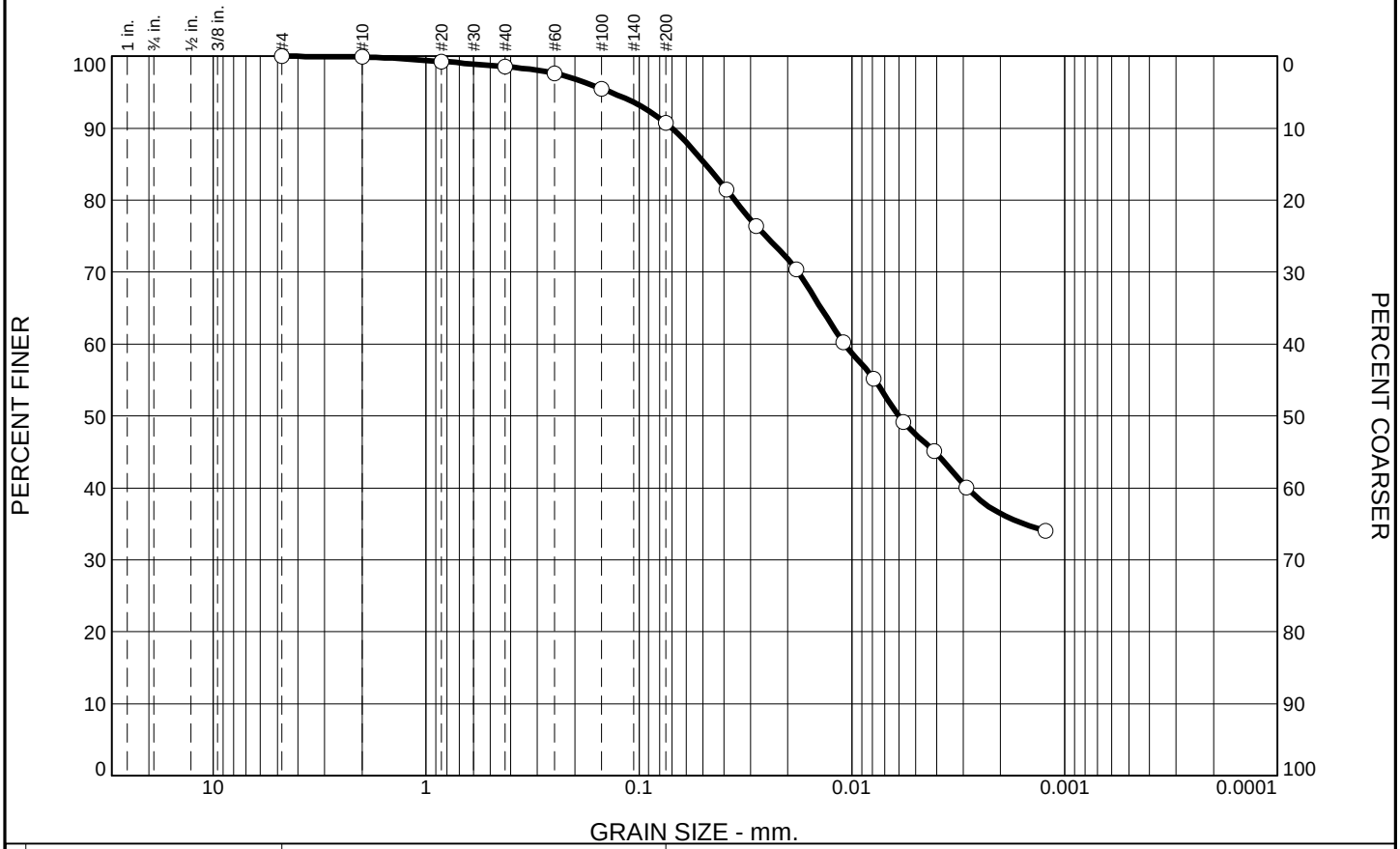
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.4	7.8	43.3	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.3		
#40	98.5		
#60	97.6		
#100	95.5		
#200	90.7		

* (no specification provided)

GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS

Atterberg Limits

PL= 16 LL= 37 PI= 21

Coefficients

D_{90}= 0.0702 D_{85}= 0.0486 D_{60}= 0.0108
D_{50}= 0.0060 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

F.M.=0.08

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4 **Date:** 11-5-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422

	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	1.6	5.6	14.1	51.7	23.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	96.9		
#10	95.3		
#20	92.5		
#40	89.7		
#60	86.7		
#100	82.6		
#200	75.6		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4580 D_{85}= 0.1999 D_{60}= 0.0244
D_{50}= 0.0136 D_{30}= 0.0065 D_{15}= 0.0028
D_{10}= 0.0019 C_u= 12.93 C_c= 0.91

Classification

USCS= AASHTO=

Remarks

F.M.=0.52

Source of Sample: EDW-B005 **Depth:** 20.0'-21.5'
Sample Number: S-7 **Date:** 11-13-15

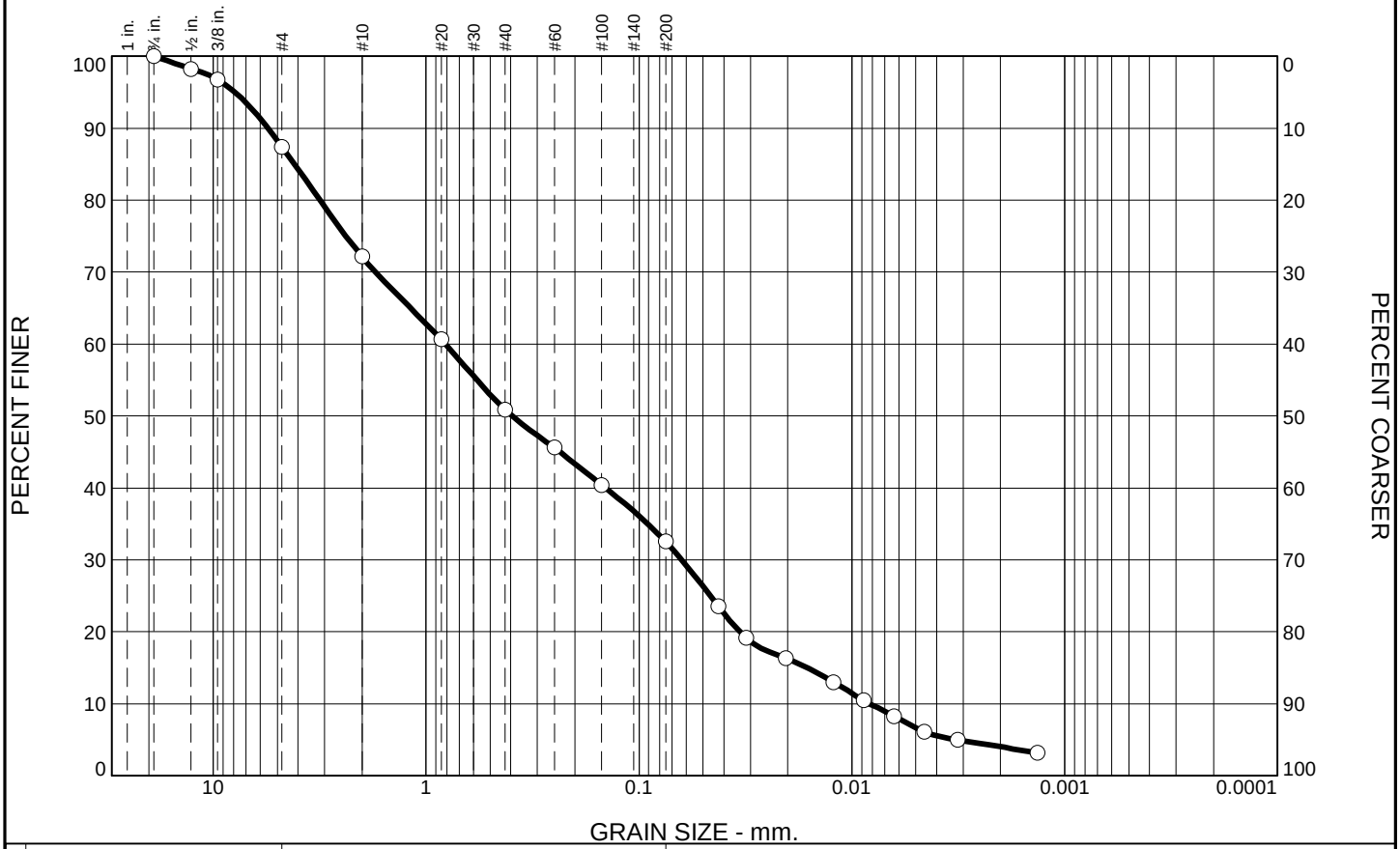
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.6	15.3	21.2	18.3	26.0	6.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	98.2		
.375	96.7		
#4	87.4		
#10	72.1		
#20	60.6		
#40	50.9		
#60	45.6		
#100	40.4		
#200	32.6		

* (no specification provided)

FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.5350 D_{85}= 4.1471 D_{60}= 0.8124
D_{50}= 0.3943 D_{30}= 0.0630 D_{15}= 0.0162
D_{10}= 0.0082 C_u= 98.50 C_c= 0.59

Classification

USCS= SP AASHTO=

Remarks

F.M.=2.33

Source of Sample: EDW-B010 **Depth:** 5.0'-6.5'
Sample Number: S-3 **Date:** 11-5-15

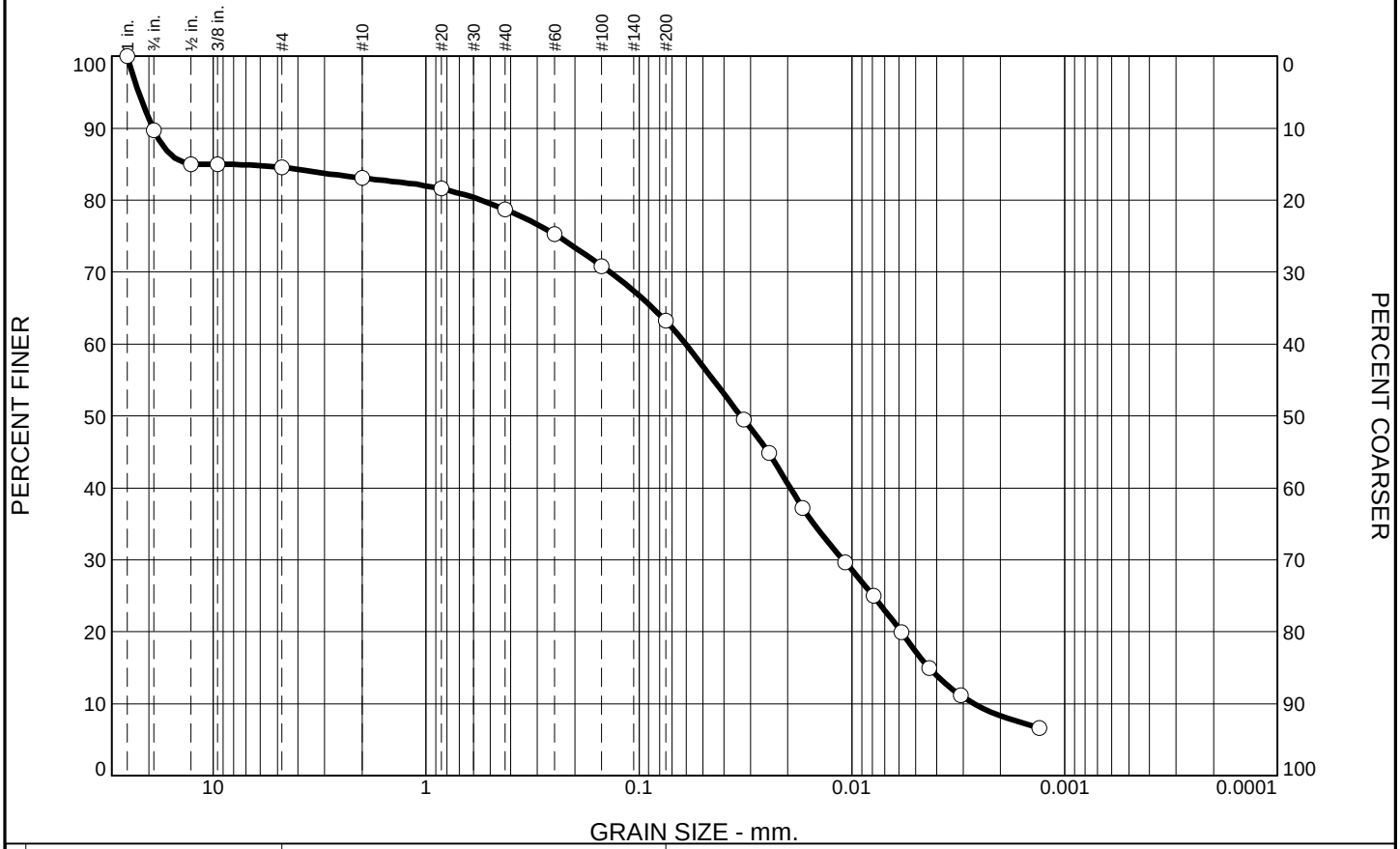
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	5.2	1.4	4.4	15.5	46.0	17.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	89.7		
.5	85.0		
.375	85.0		
#4	84.5		
#10	83.1		
#20	81.6		
#40	78.7		
#60	75.3		
#100	70.8		
#200	63.2		

* (no specification provided)

FILL: VERY DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.2789 D_{85}= 8.9744 D_{60}= 0.0604
D_{50}= 0.0333 D_{30}= 0.0110 D_{15}= 0.0043
D_{10}= 0.0027 C_u= 22.70 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

F.M.=1.47

Source of Sample: EDW-B011 **Depth:** 9.0'-11.0'
Sample Number: S-5 **Date:** 11-12-15

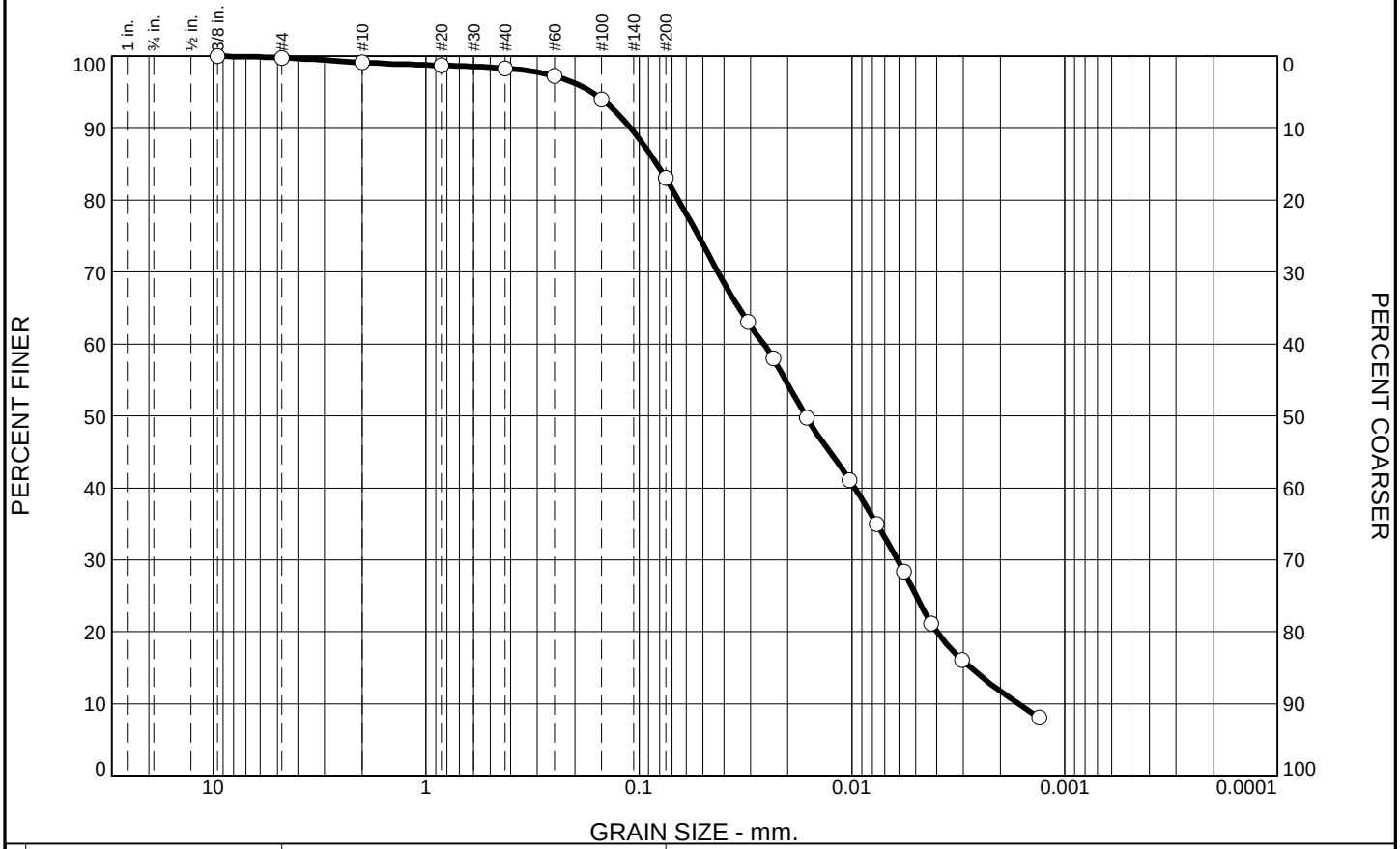
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.7	0.8	15.2	58.0	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.1		
#20	98.7		
#40	98.3		
#60	97.3		
#100	94.0		
#200	83.1		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1094 D_{85}= 0.0823 D_{60}= 0.0260
D_{50}= 0.0165 D_{30}= 0.0061 D_{15}= 0.0028
D_{10}= 0.0017 C_u= 15.75 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

Source of Sample: EDW-B011 **Depth:** 19.5'-21.5'
Sample Number: S-7 **Date:** 11-11-15

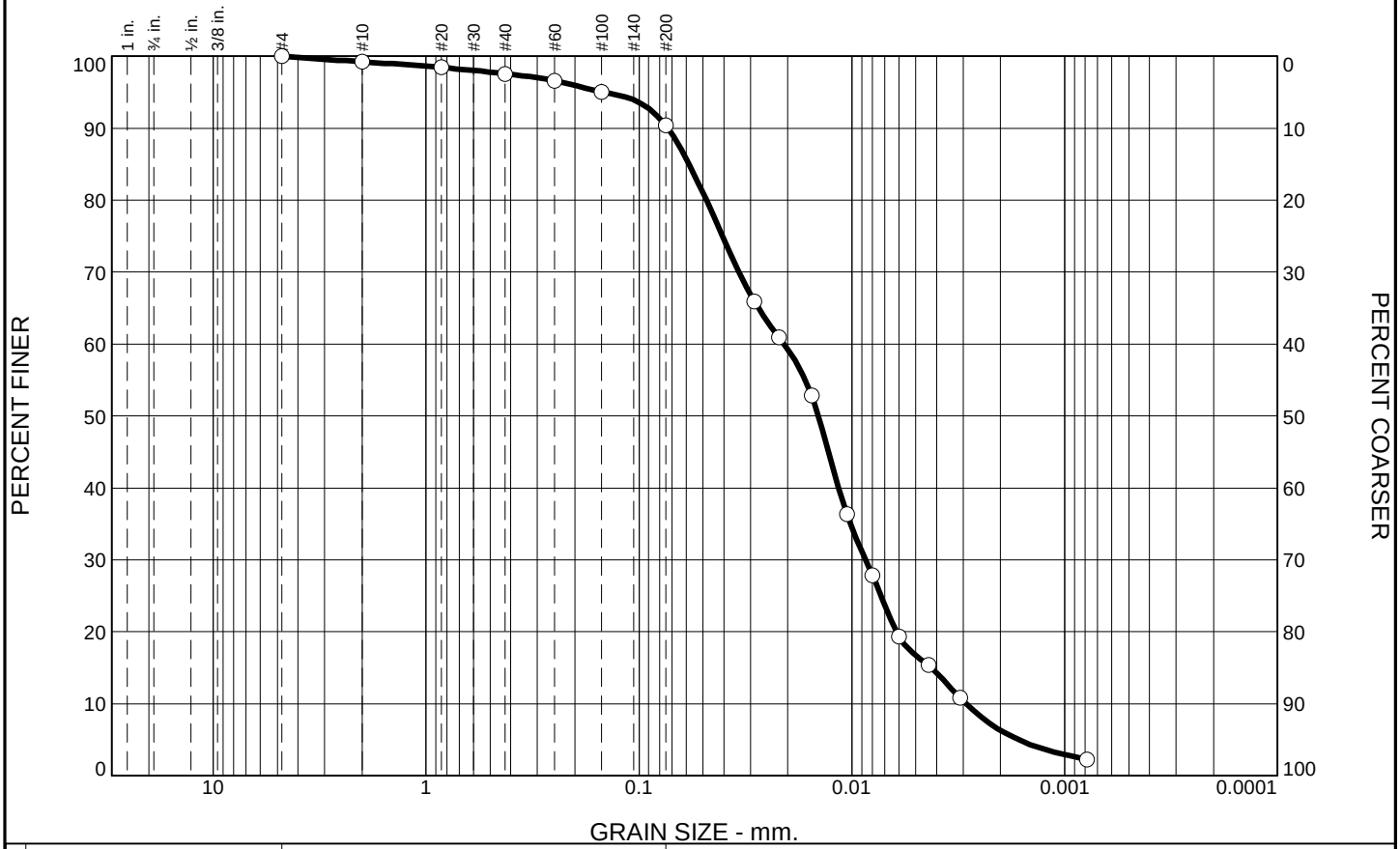
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	1.6	7.2	73.7	16.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	98.4		
#40	97.6		
#60	96.6		
#100	95.1		
#200	90.4		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0732 D_{85}= 0.0581 D_{60}= 0.0208
D_{50}= 0.0144 D_{30}= 0.0086 D_{15}= 0.0042
D_{10}= 0.0029 C_u= 7.17 C_c= 1.22

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

Source of Sample: EDW-B012 **Depth:** 5.0'-6.5'
Sample Number: S-3

Date: 11-13-15

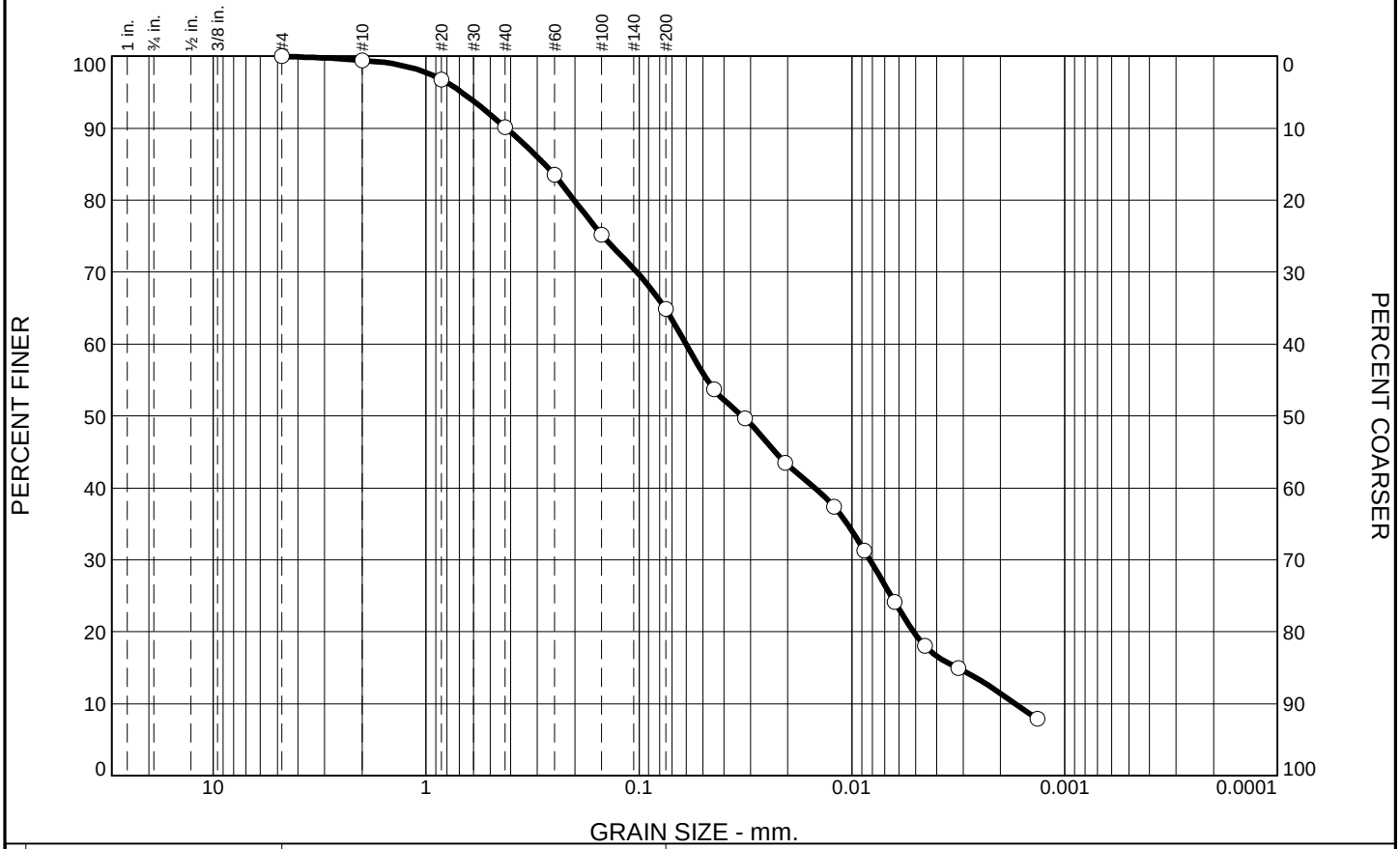
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% Gravel		% Sand			% Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	9.3	25.2	45.4	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	96.8		
#40	90.1		
#60	83.5		
#100	75.2		
#200	64.9		

* (no specification provided)

FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4213 D_{85}= 0.2775 D_{60}= 0.0602
D_{50}= 0.0328 D_{30}= 0.0082 D_{15}= 0.0032
D_{10}= 0.0017 C_u= 35.34 C_c= 0.66

Classification

USCS= SM AASHTO=

Remarks

F.M.=0.47

Source of Sample: EDW-B014 **Depth:** 7.0'-8.5'
Sample Number: S-4 **Date:** 11-5-15

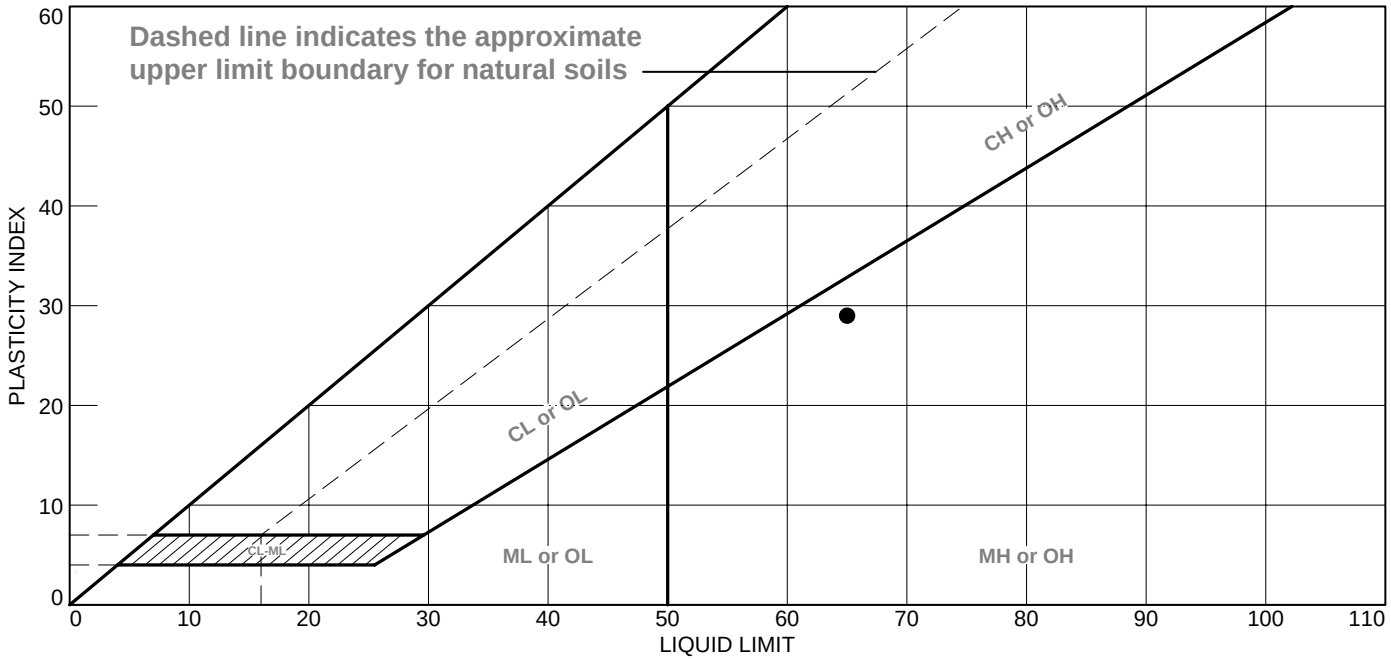
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GREENISH GRAY SANDY SILT	65	36	29			MH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B002 **Depth:** 5.0'-7.0'
Sample Number: S-3

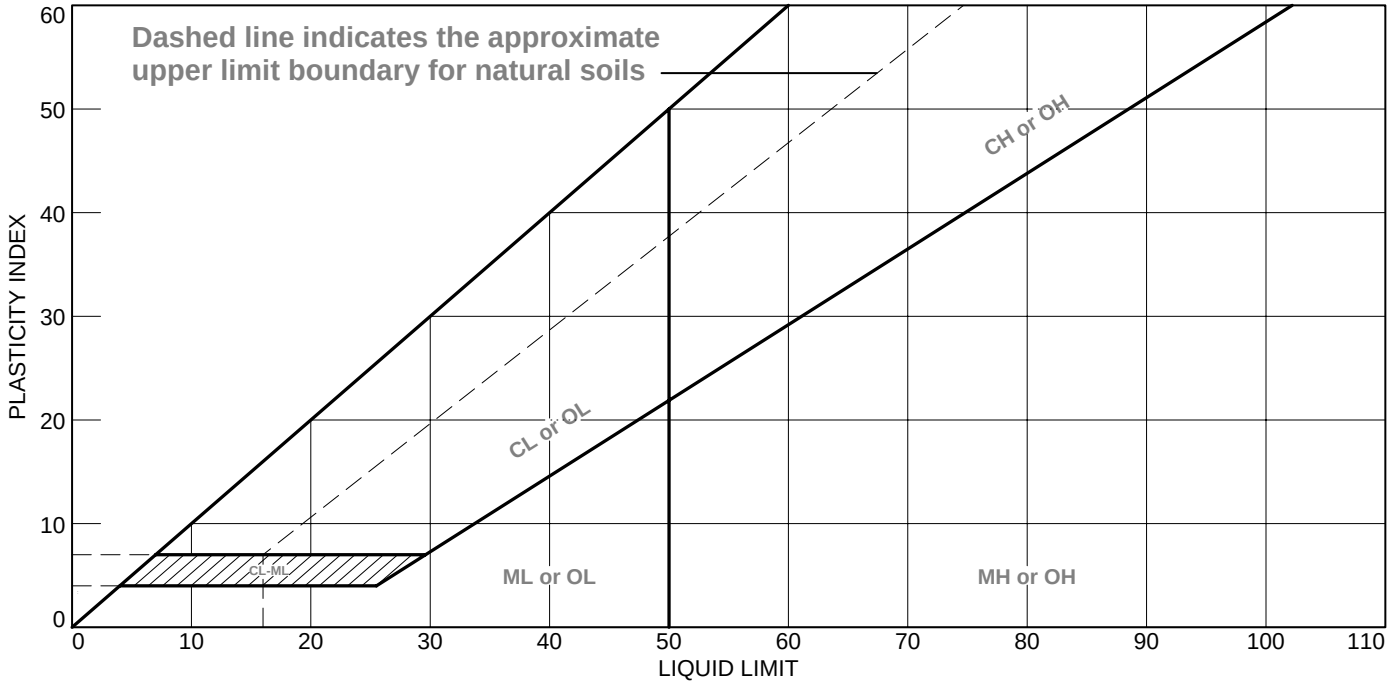
Terracon

Remarks:
● SHELL NOTED

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY TO DARK GRAY FLY ASH	17	27	NP			

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

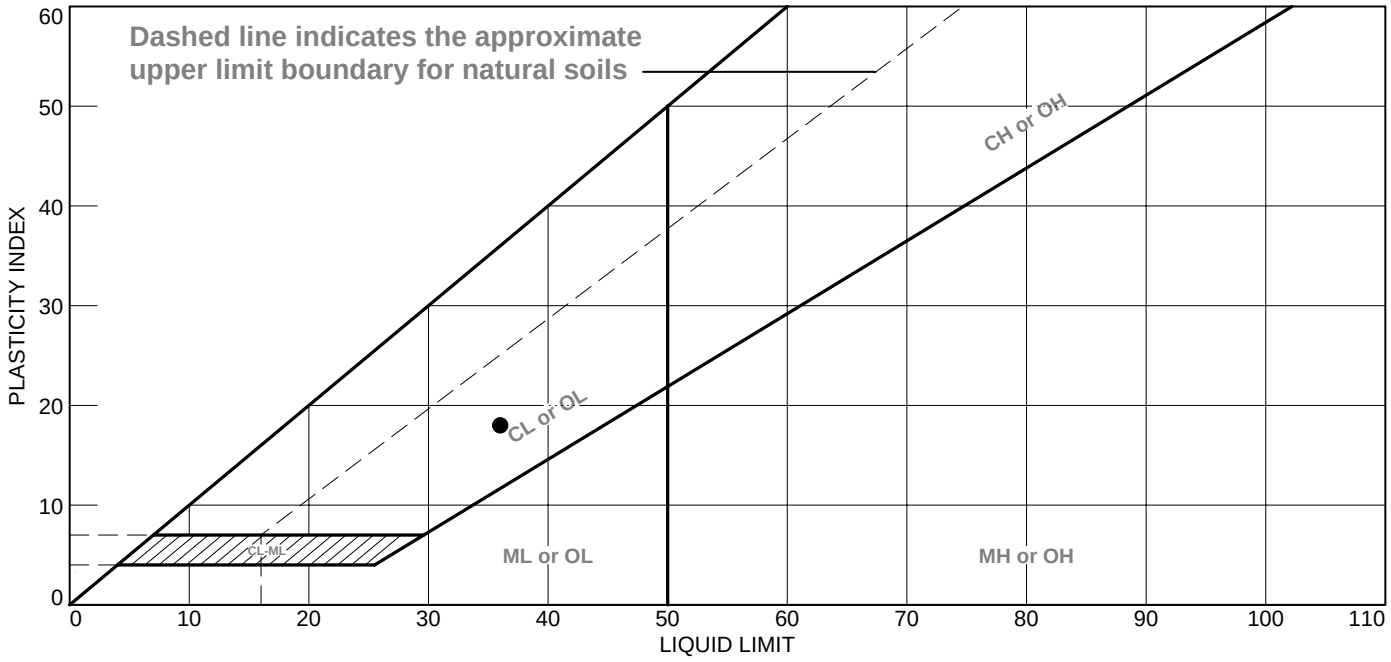
Source of Sample: EDW-B002 **Depth:** 10.0'-12.0'
Sample Number: S-5

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY LEAN CLAY WITH SAND	36	18	18			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B002 **Depth:** 35.0'-37.0'
Sample Number: S-10

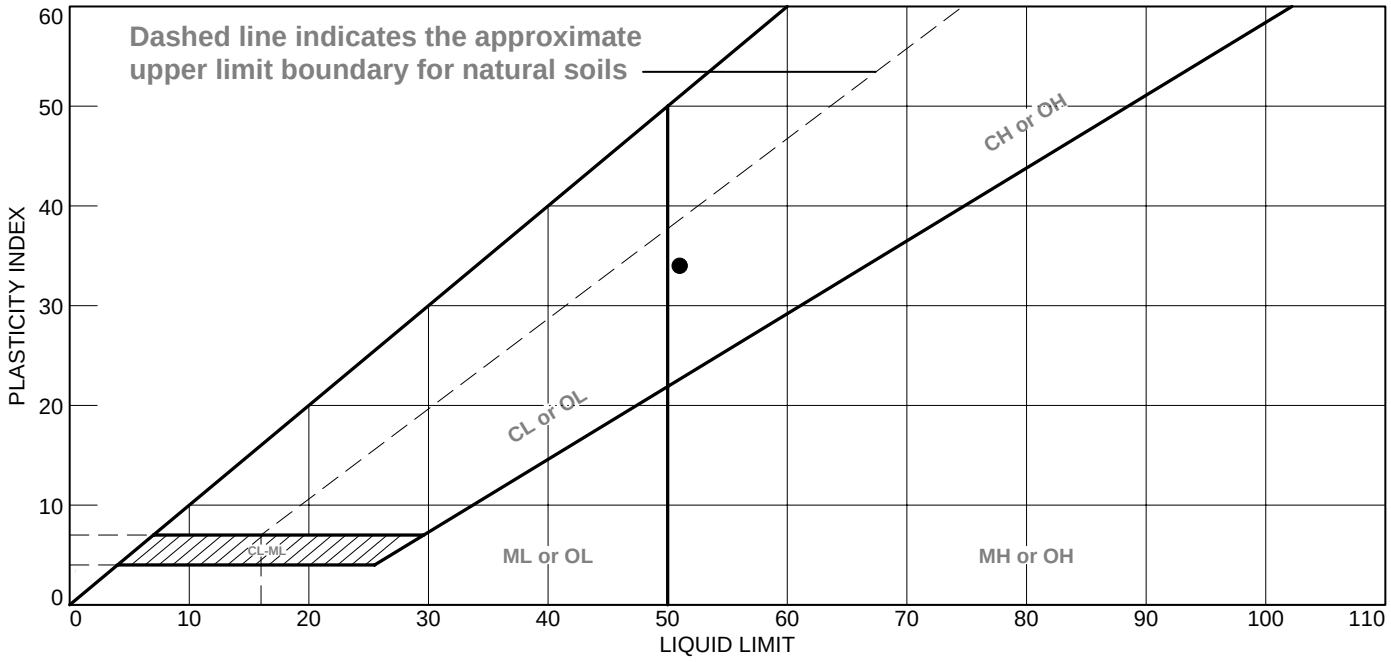
Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY WITH SAND	51	17	34			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B003 **Depth:** 45.0'-47.0'
Sample Number: S-12

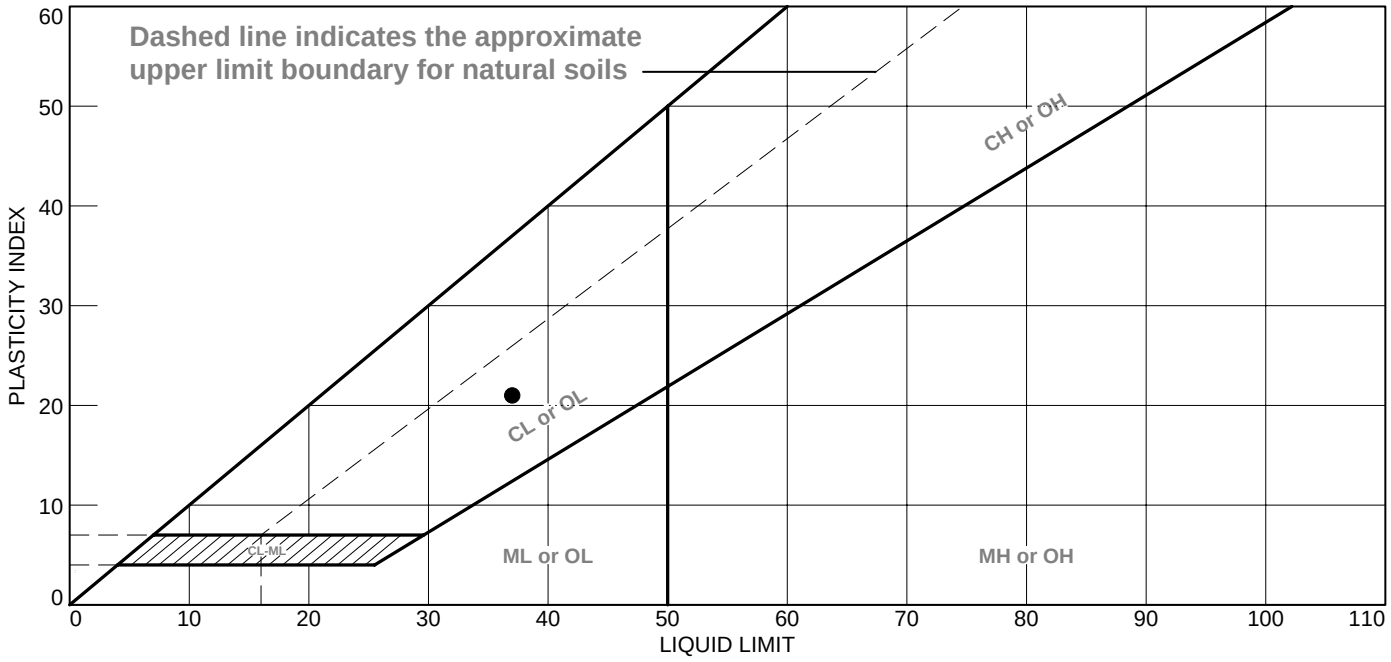
Terracon

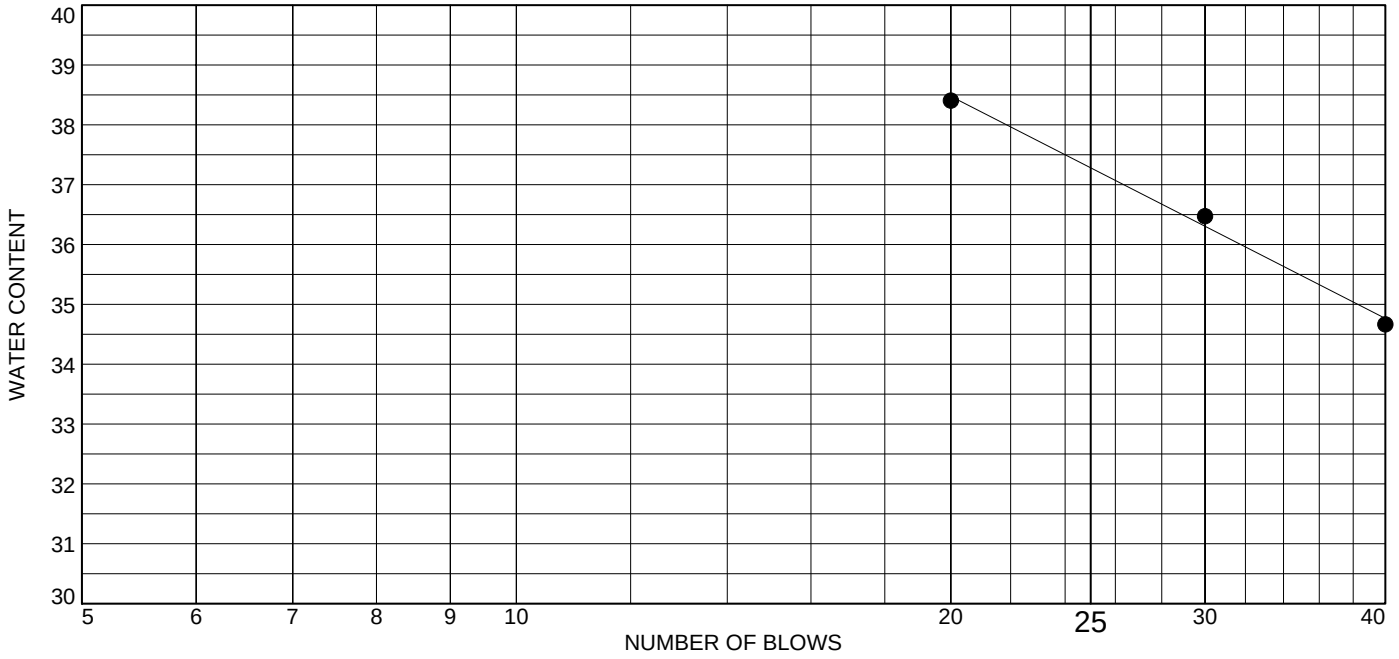
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	37	16	21	98.5	90.7	CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4

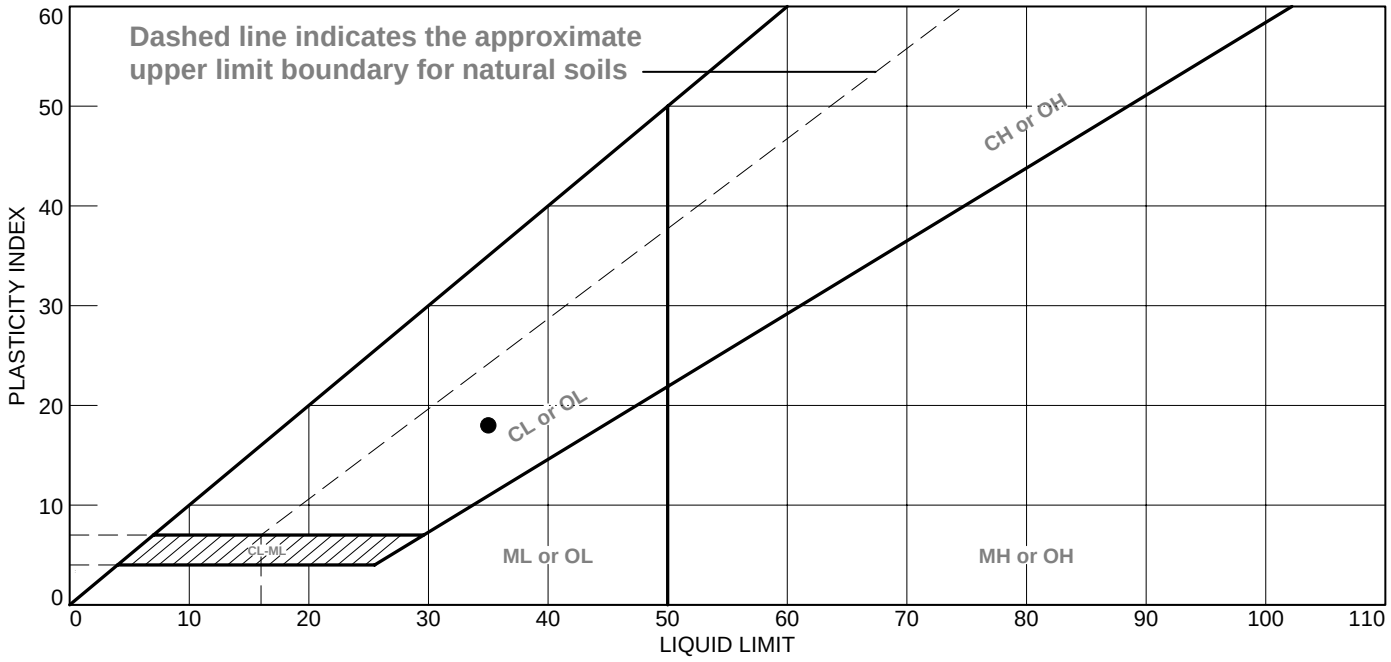
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	35	17	18			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 36.0'-38.0'
Sample Number: S-11

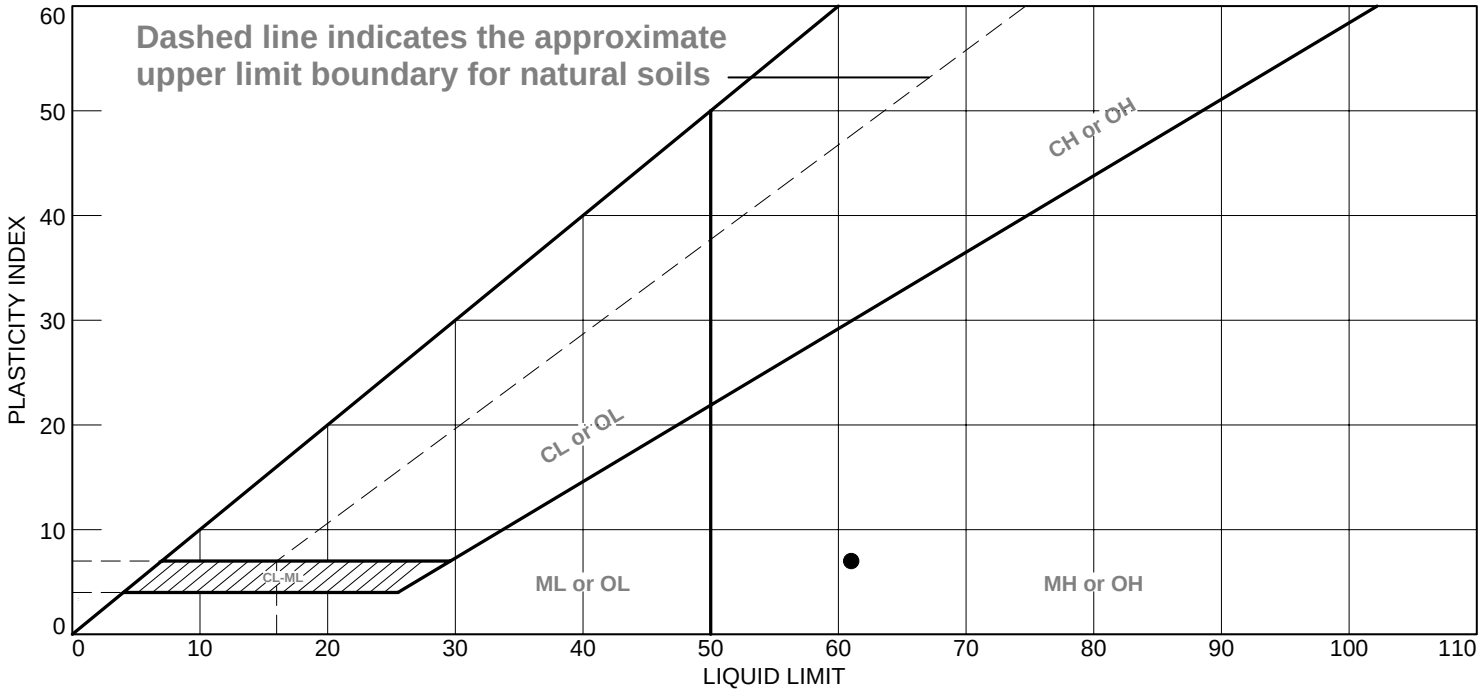
Remarks:

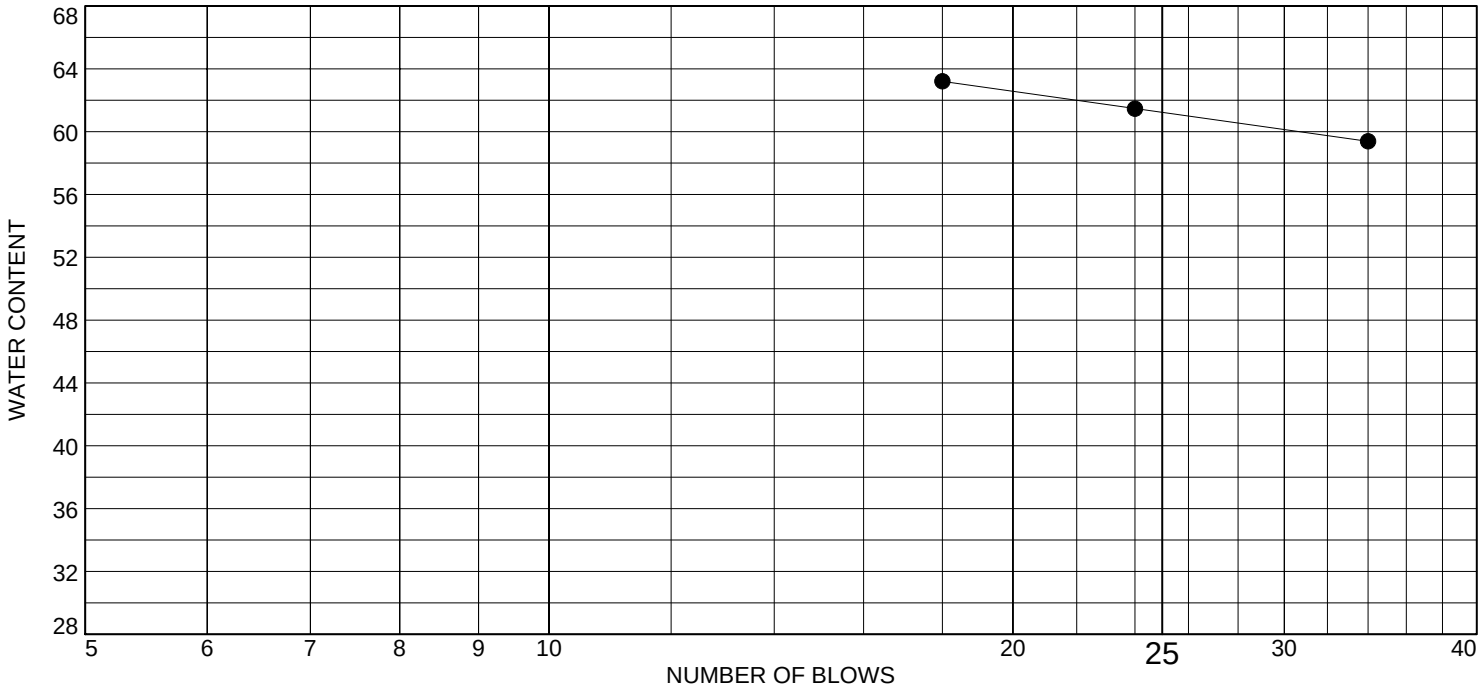
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	61	54	7			MH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 5.0'-6.5'

Sample Number: S-3

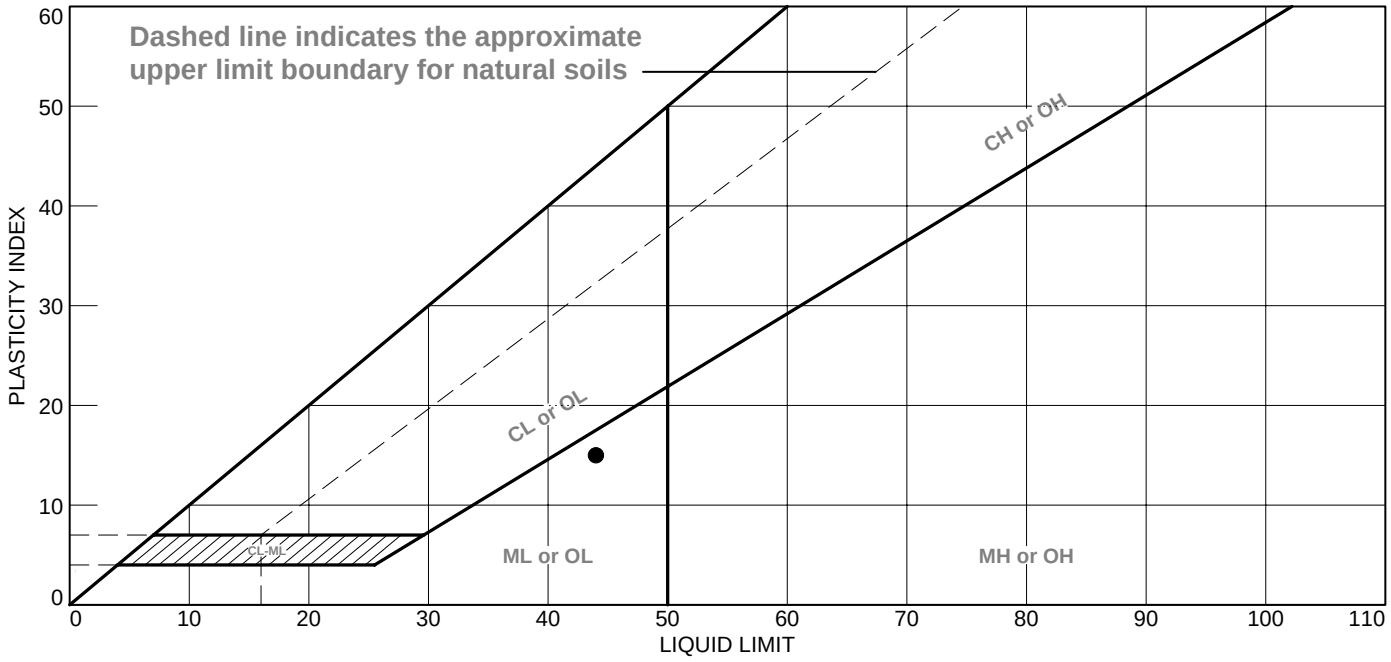
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: GRAY AND BLACK ORGANIC SILT	44	29	15			OL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 26.0'-27.0'
Sample Number: S-8A

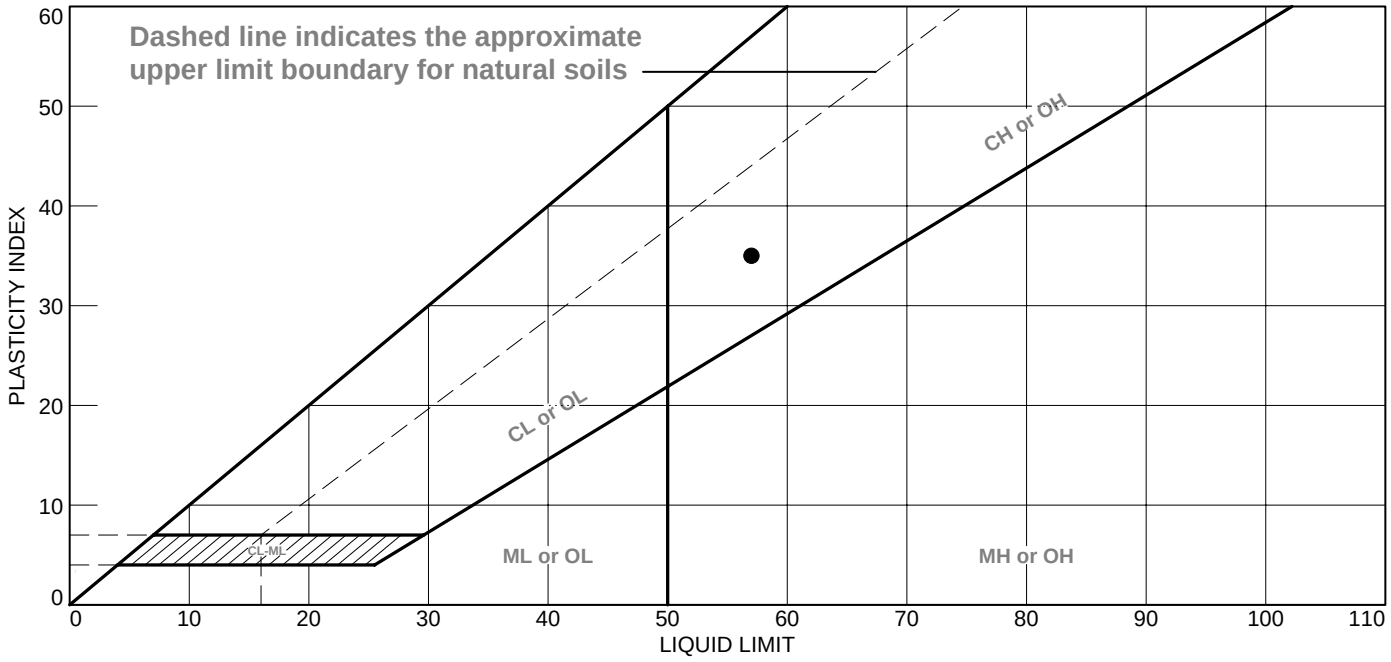
Remarks:

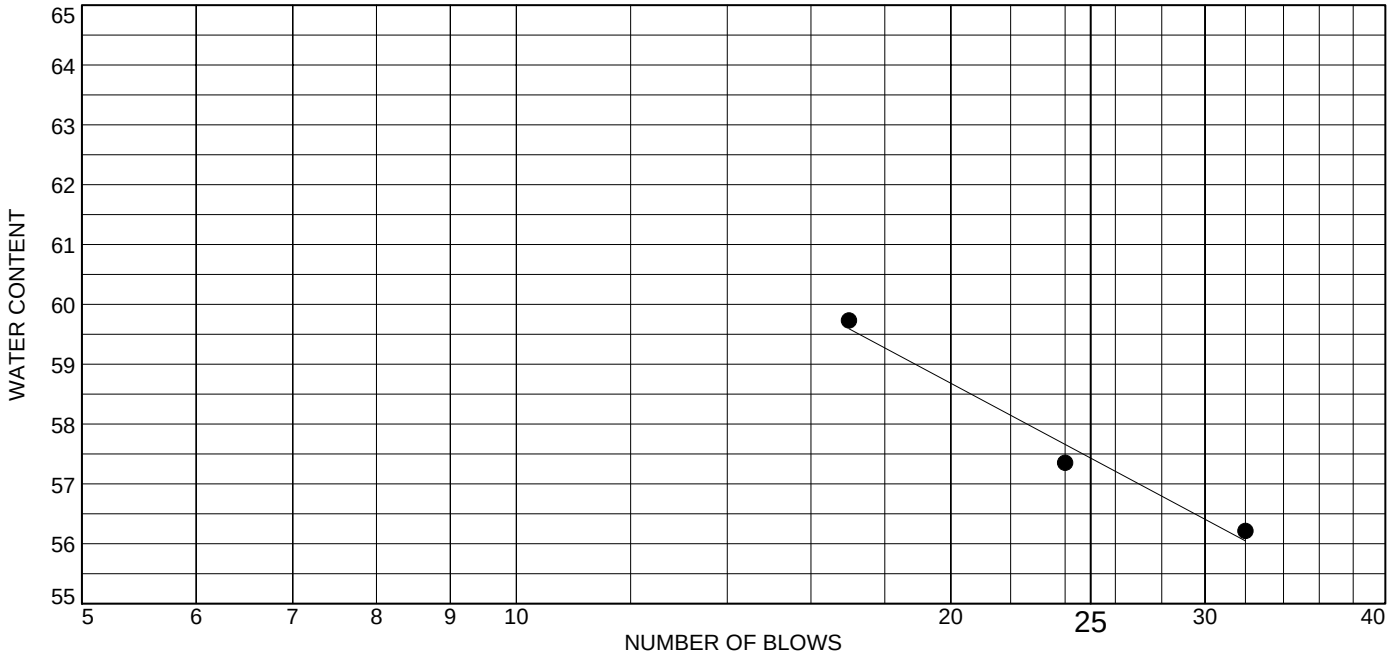
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY SHELL - ORGANICS NOTED	57	22	35			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 41.0'-43.0'
Sample Number: S-11

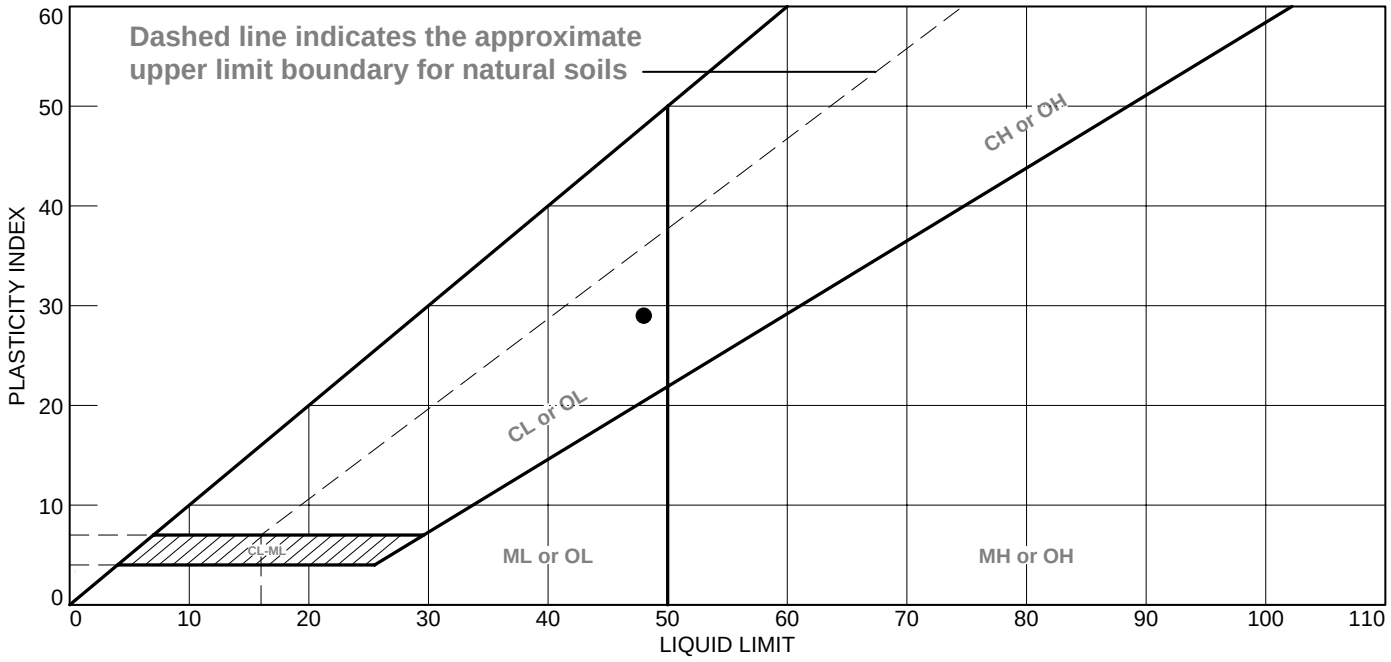
Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	48	19	29			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 5.0'-6.5'
Sample Number: S-3

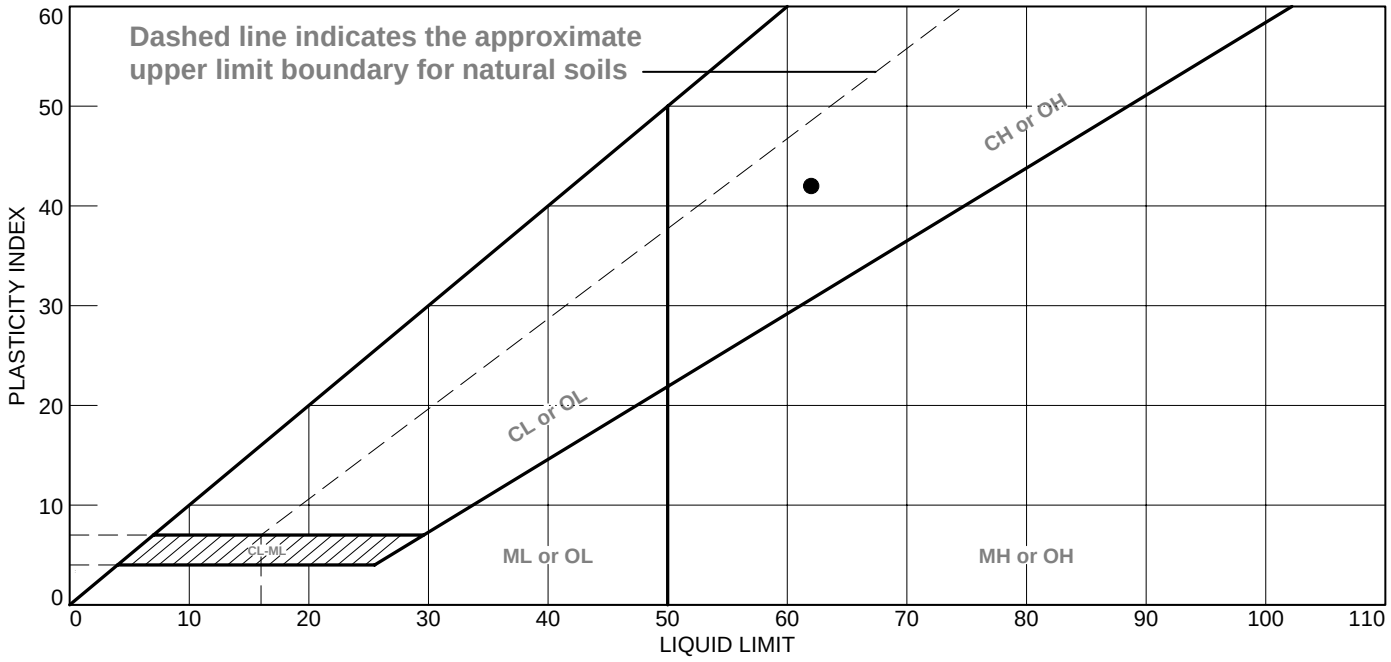
Terracon

Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY WITH SAND	62	20	42			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 13.0'-15.0'
Sample Number: S-6

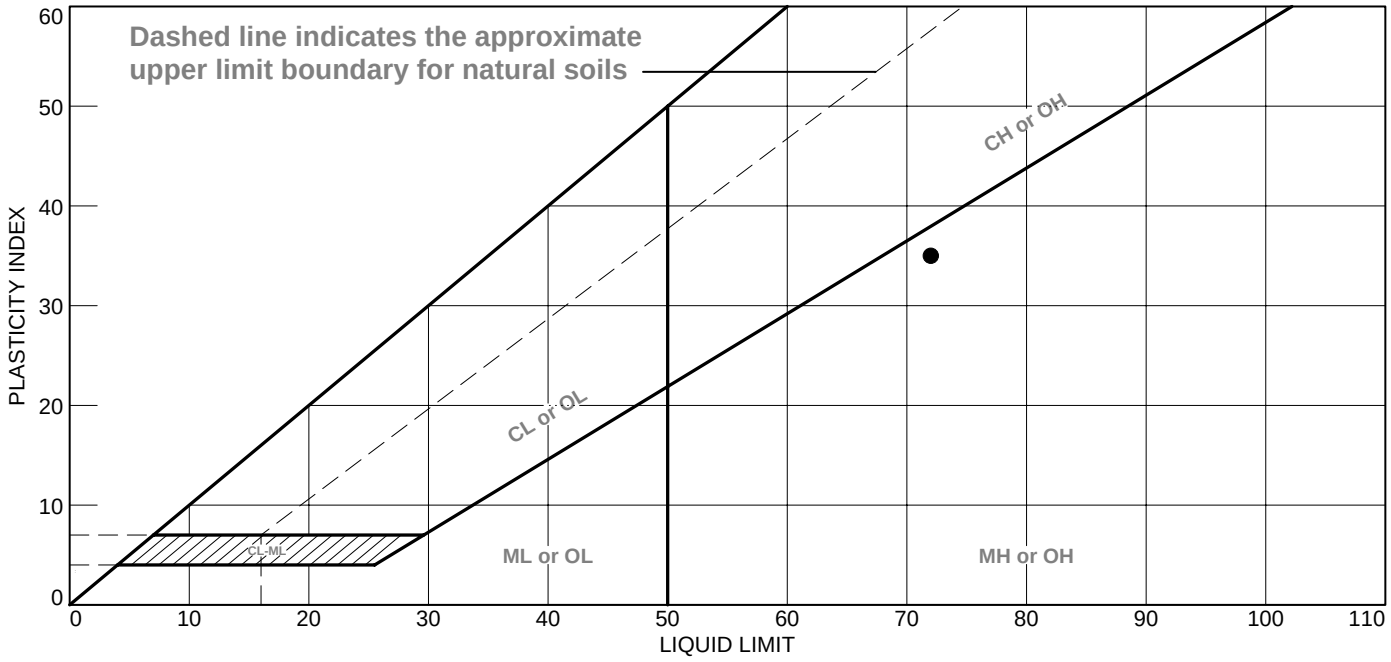
Remarks:

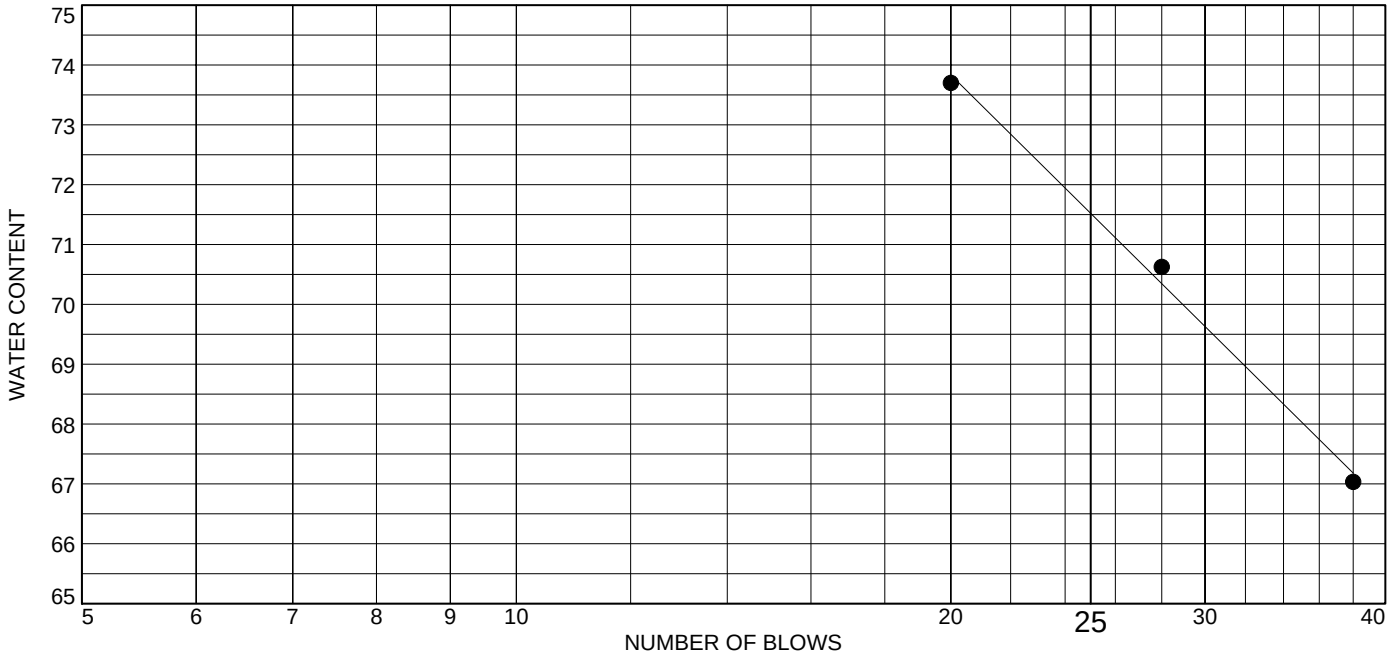
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY ORGANIC SILT	72	37	35			OH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 26.0'-28.0'
Sample Number: S-9

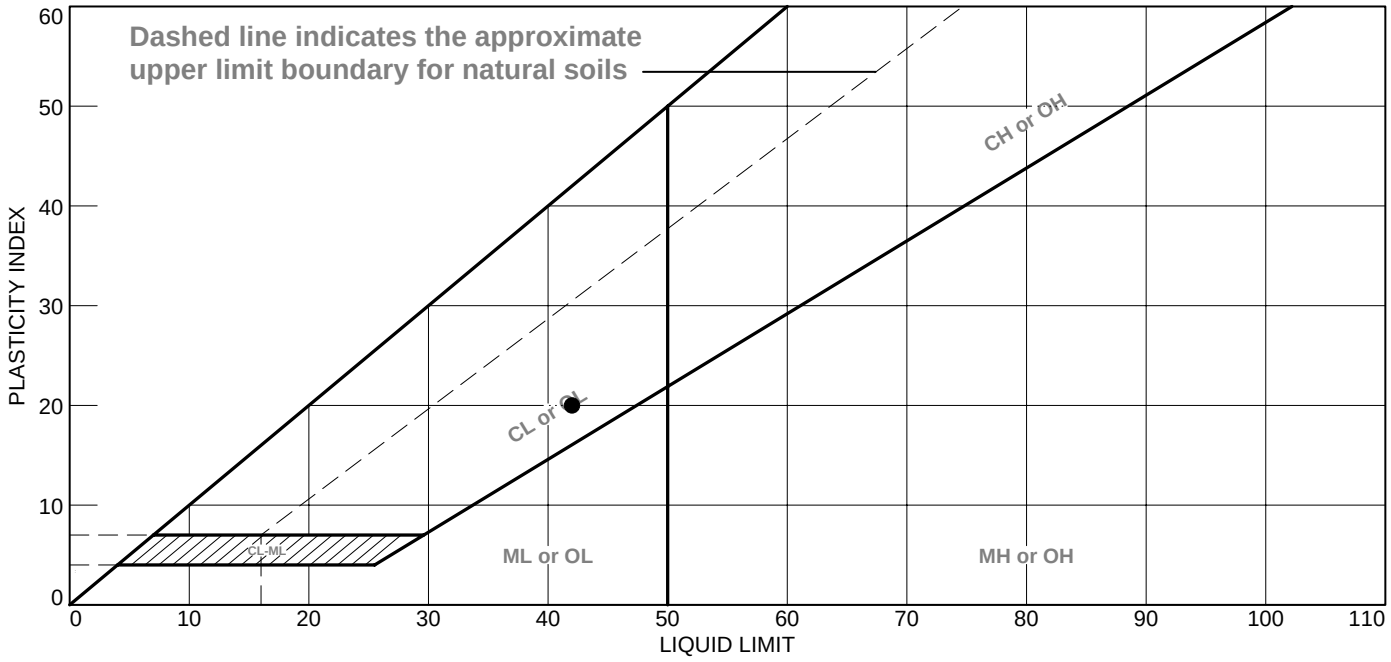
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK BROWN LEAN CLAY WITH SAND	42	22	20			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B008 **Depth:** 2.5'-4.0'
Sample Number: S-2

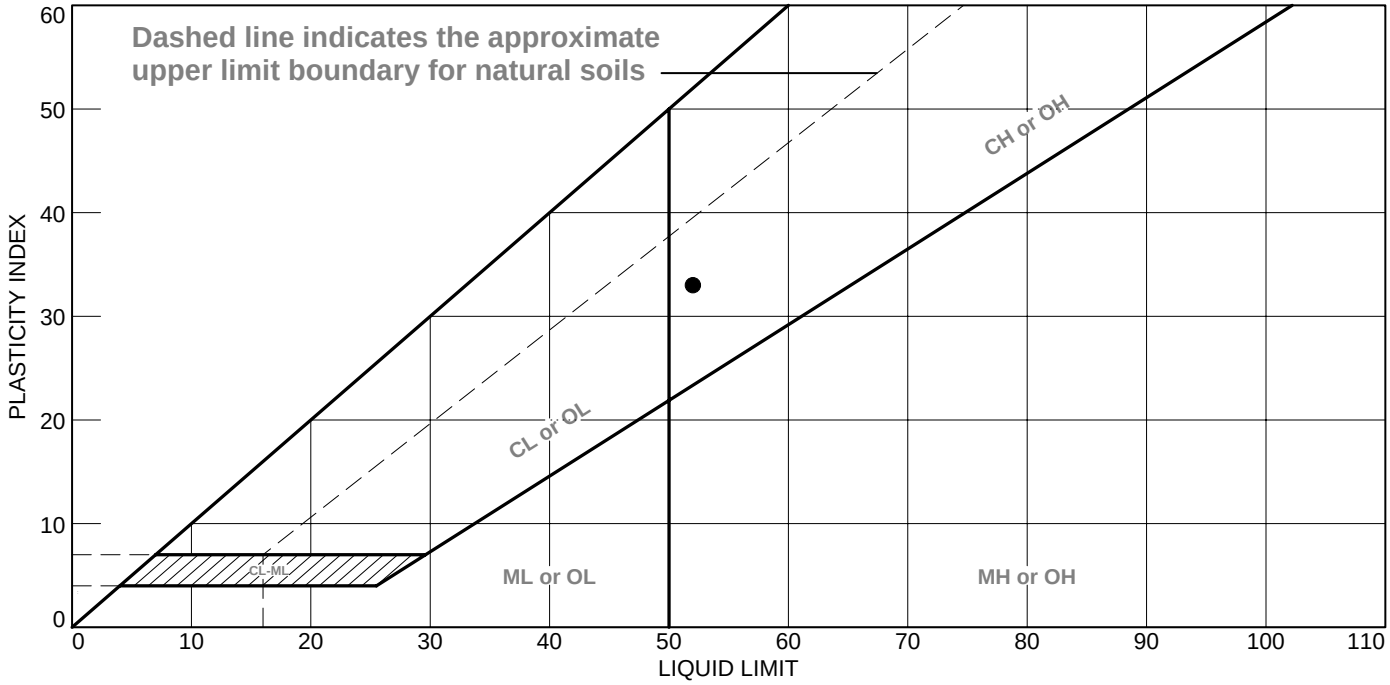
Remarks:

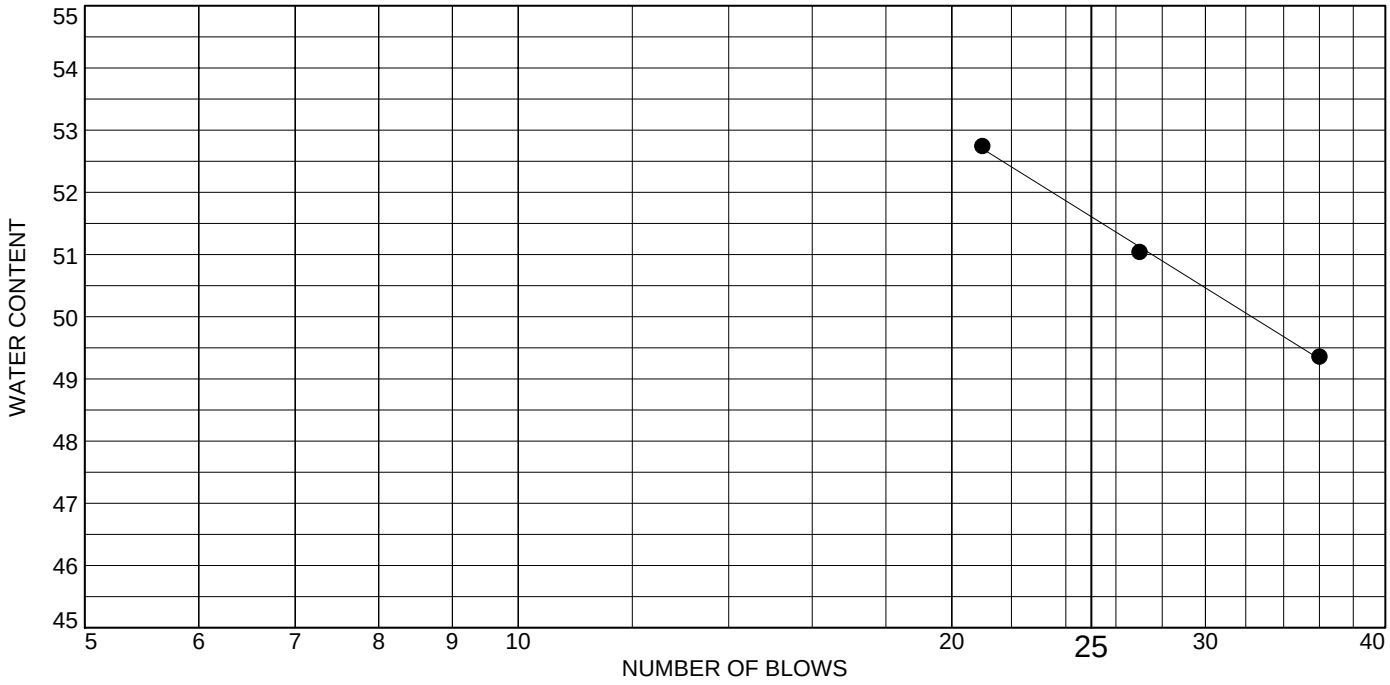
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY FAT CLAY WITH SAND	52	19	33			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

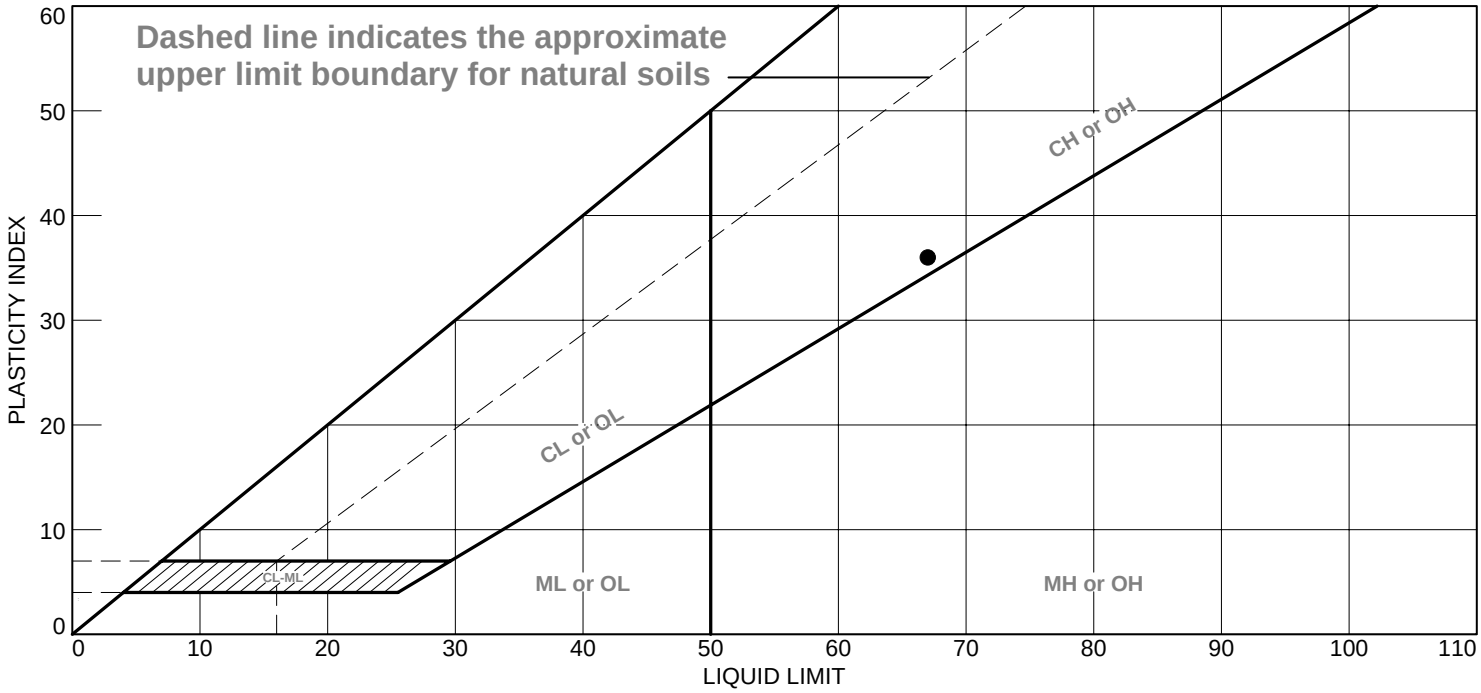
Source of Sample: EDW-B008 **Depth:** 11.0'-13.0'
Sample Number: S-5

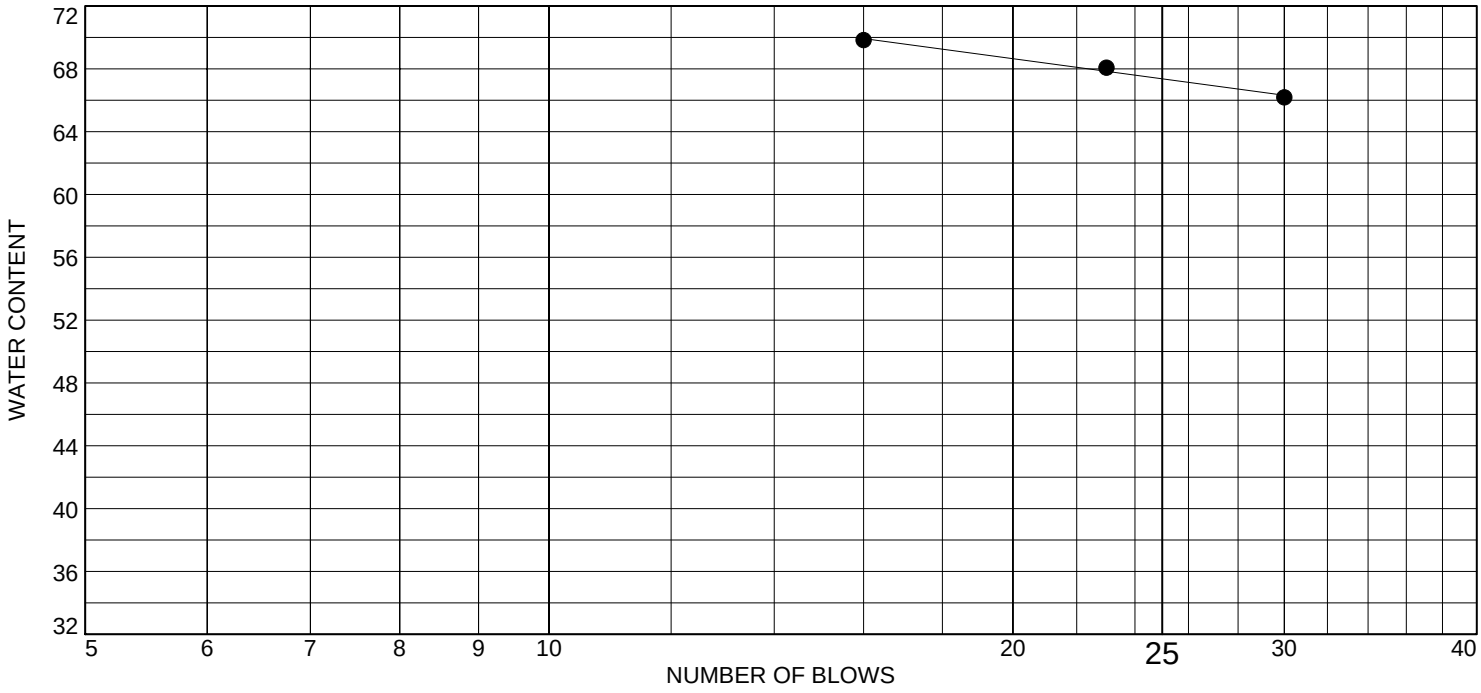
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	67	31	36			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B008 **Depth:** 24.0'-26.5'

Sample Number: S-8

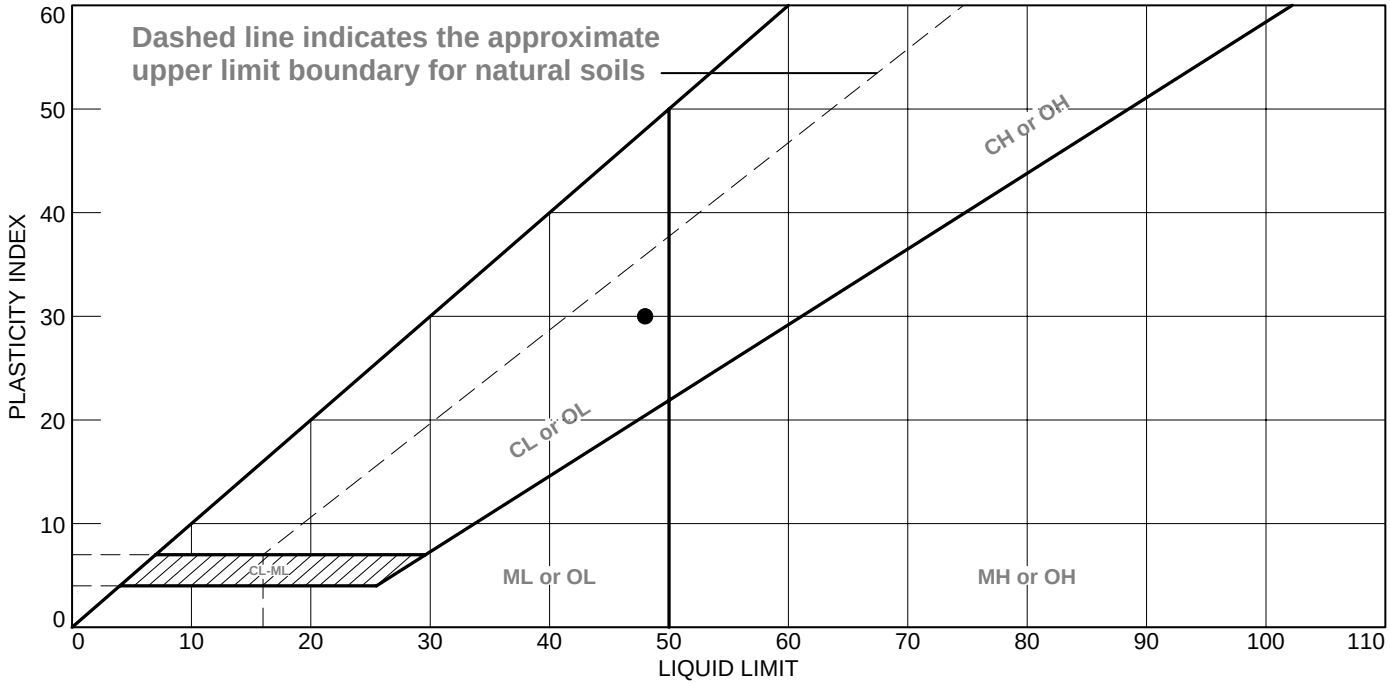
Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED LEAN CLAY	48	18	30			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

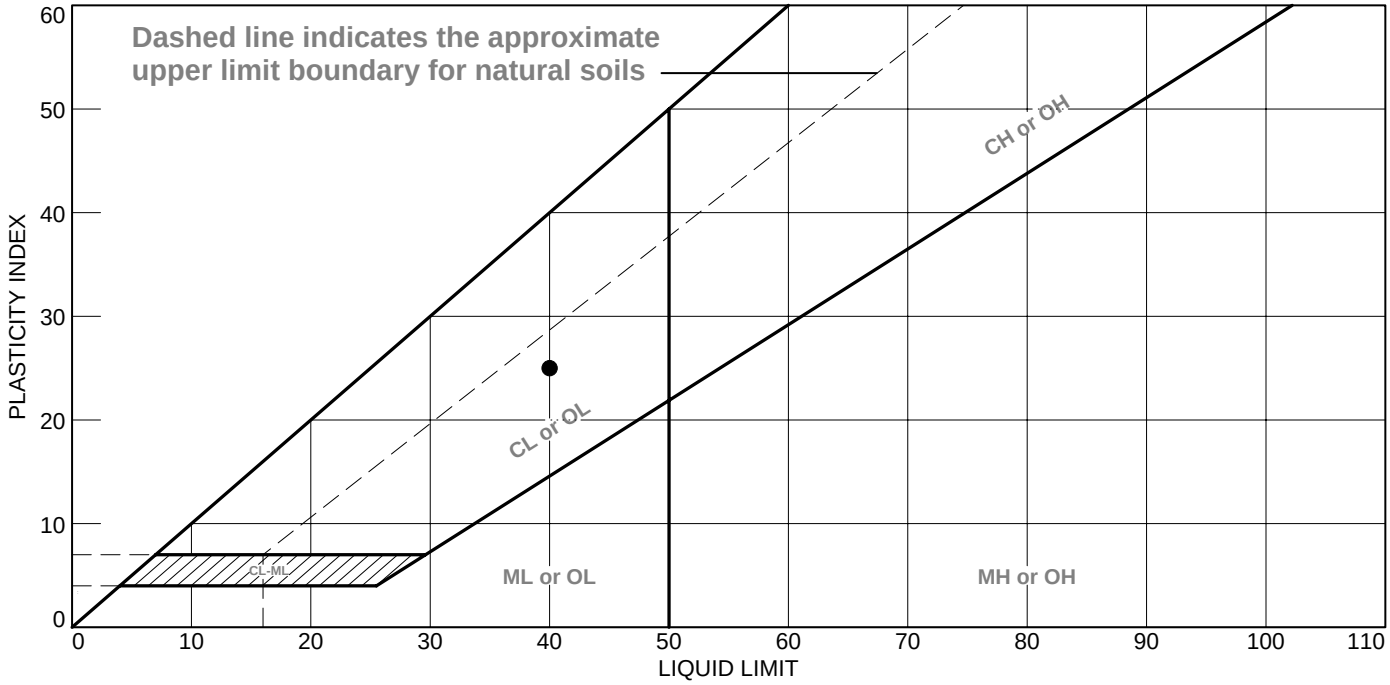
Source of Sample: EDW-B010 **Depth:** 15.0'-17.0'
Sample Number: S-7

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BLUISH GRAY LEAN CLAY	40	15	25			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

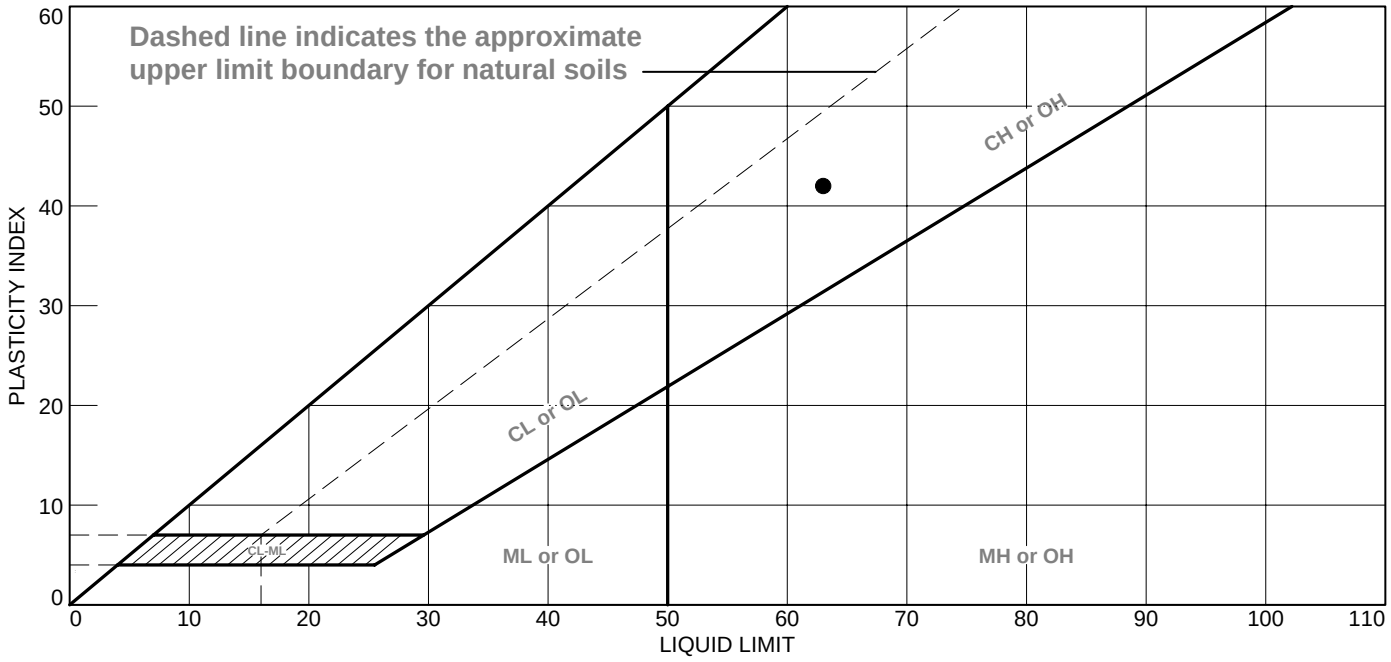
Source of Sample: EDW-B010 **Depth:** 30.0'-32.0'
Sample Number: S-10

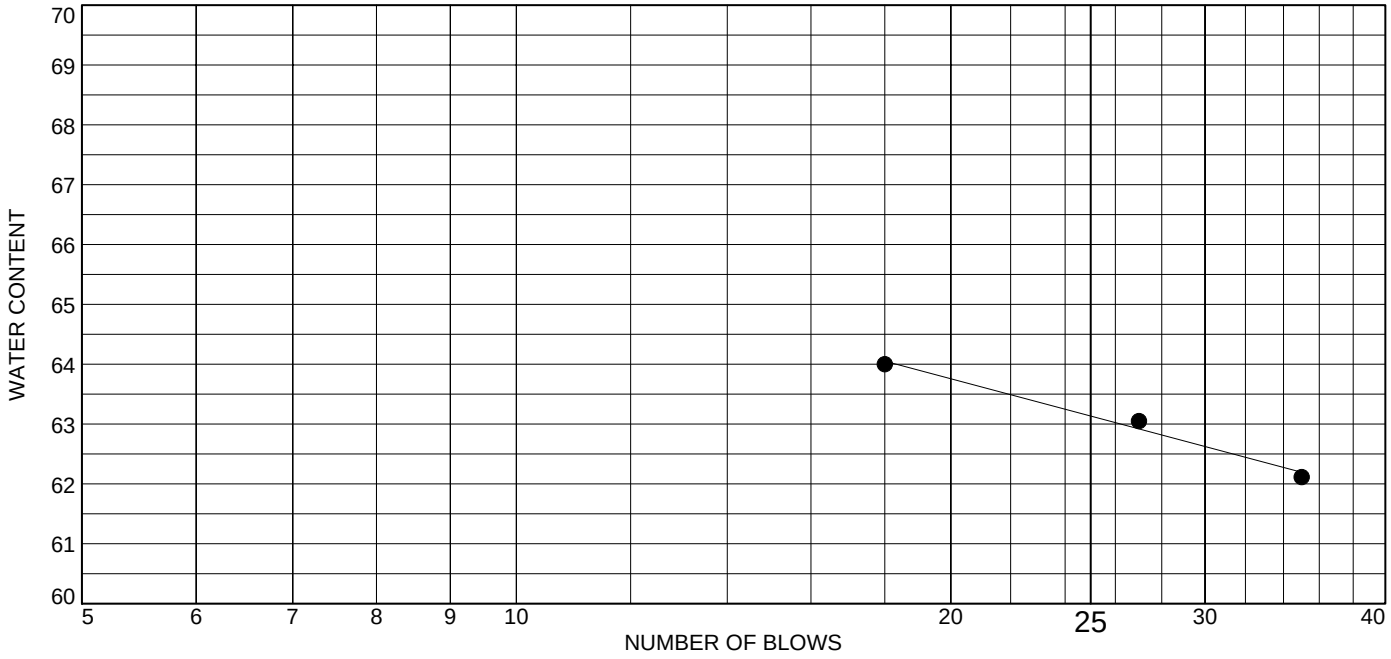
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAYISH BROWN FAT CLAY WITH SAND	63	21	42			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B011 **Depth:** 45.0'-46.5'
Sample Number: S-14

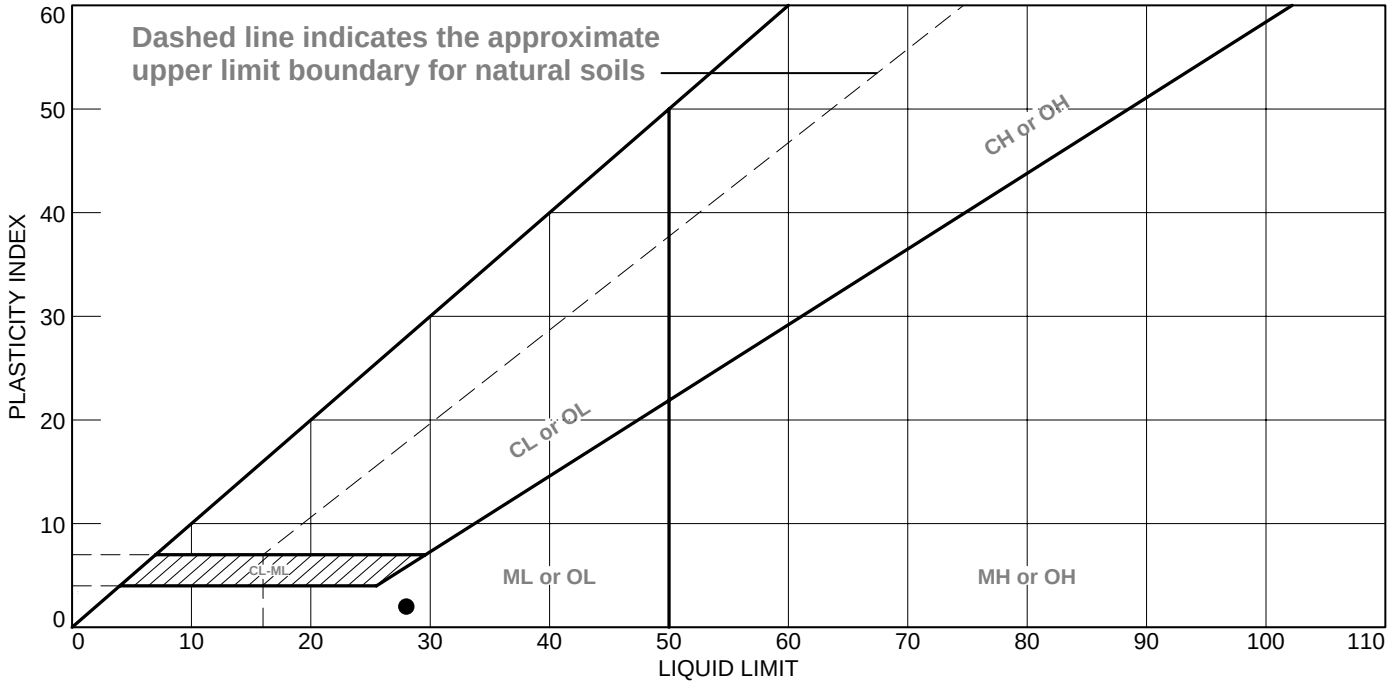
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: DARK GRAY FLY ASH	28	26	2			

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

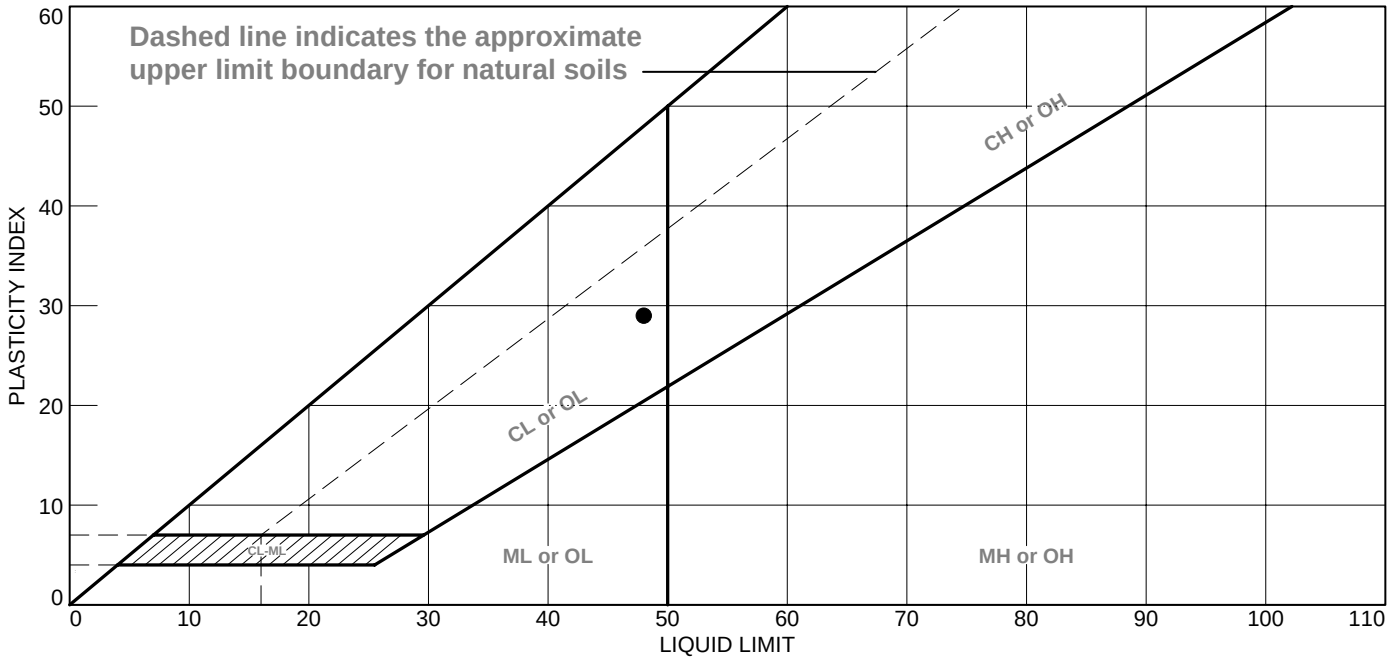
Source of Sample: EDW-B012 **Depth:** 2.5'-4.0'
Sample Number: S-2

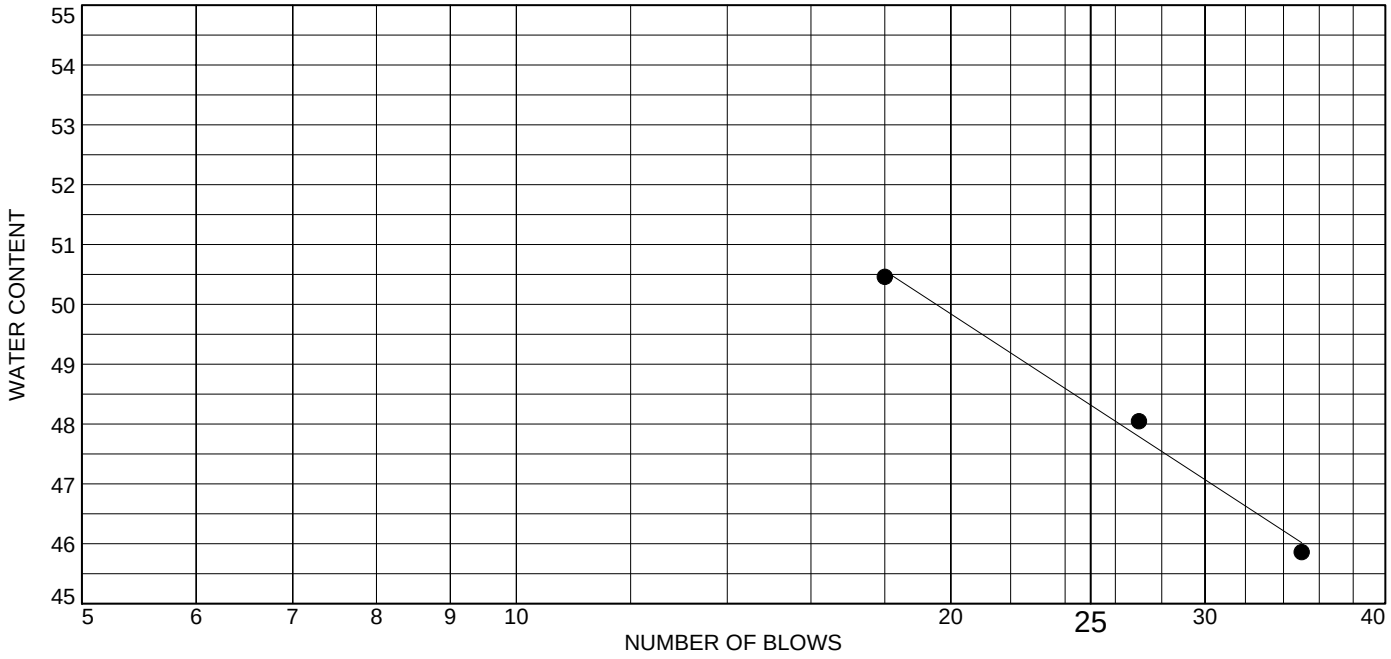
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND RUST BROWN MOTTLED LEAN CLAY	48	19	29			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B012 **Depth:** 15.0'-16.5'
Sample Number: S-7

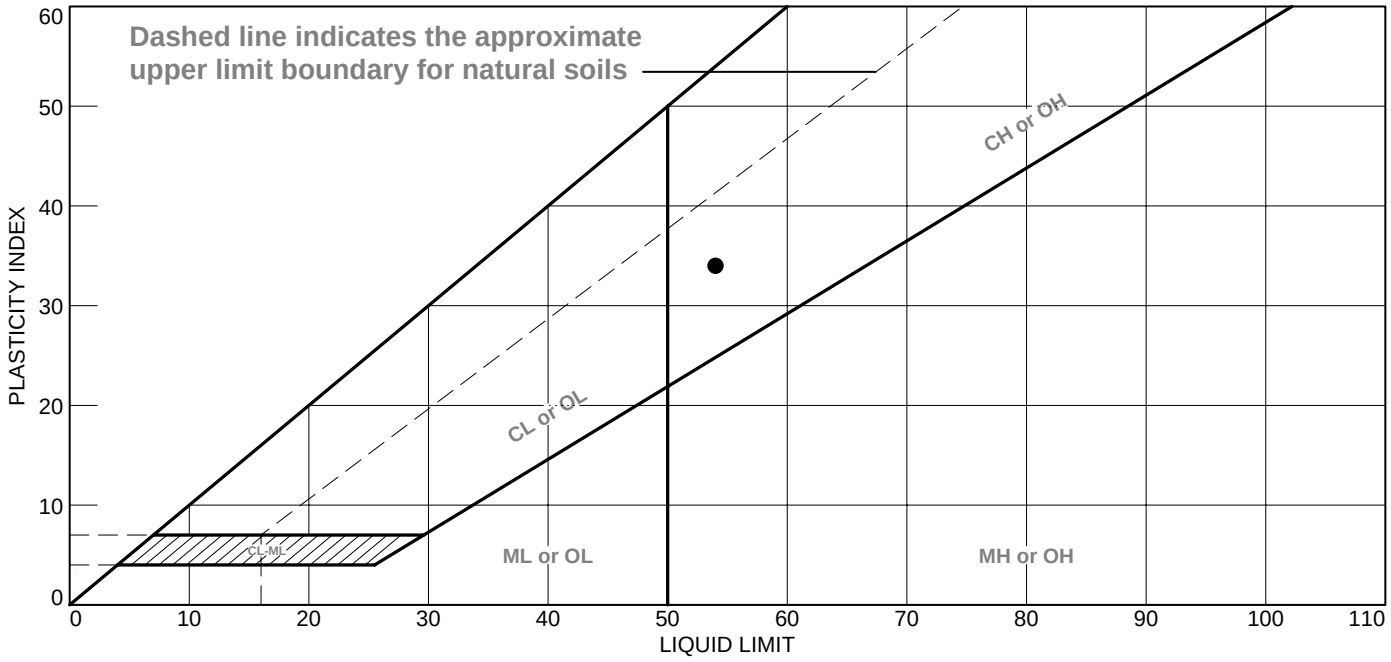
Remarks:

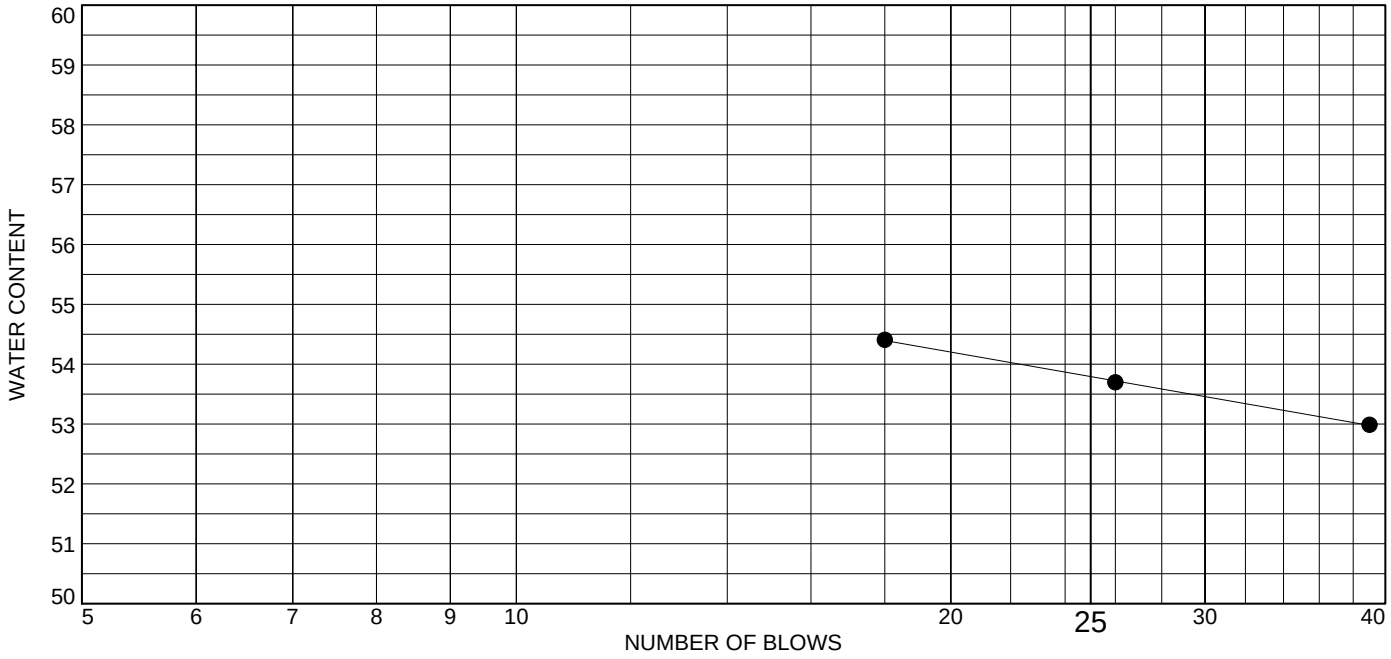
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	54	20	34			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B012 **Depth:** 47.0'-49.0'
Sample Number: S-14

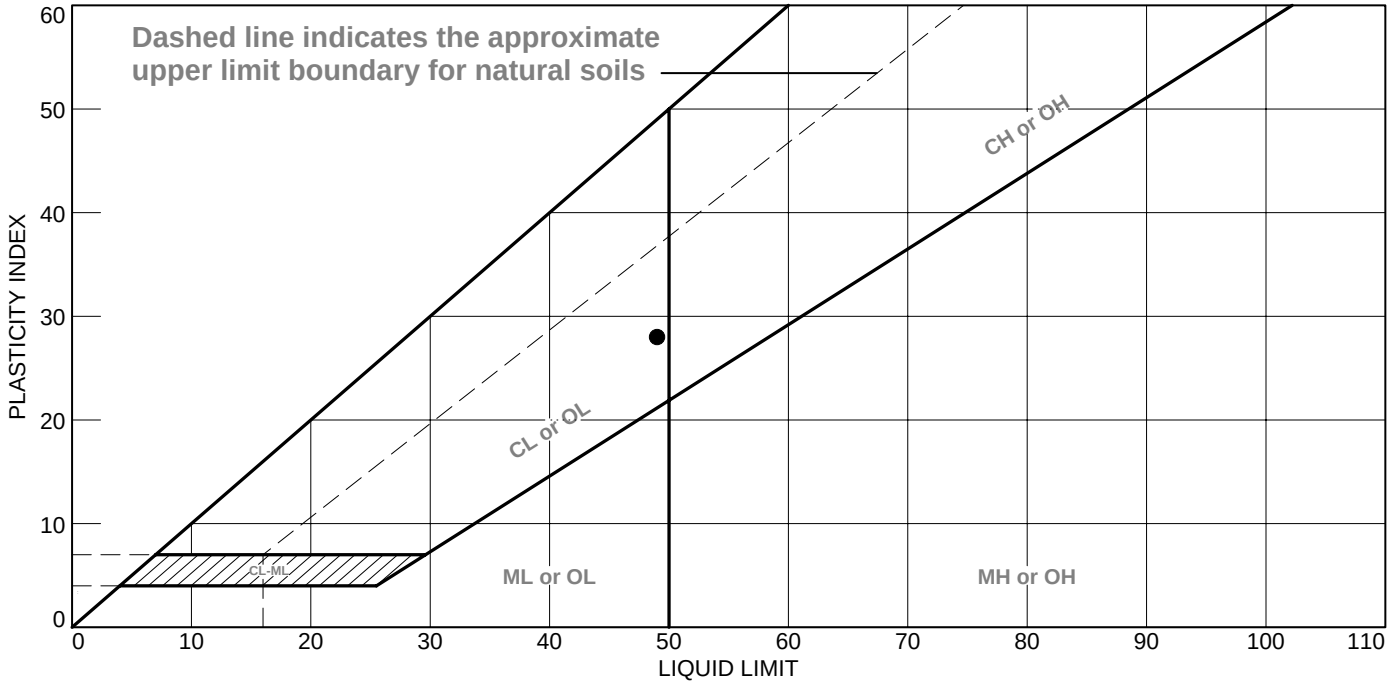
Remarks:

Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	49	21	28			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

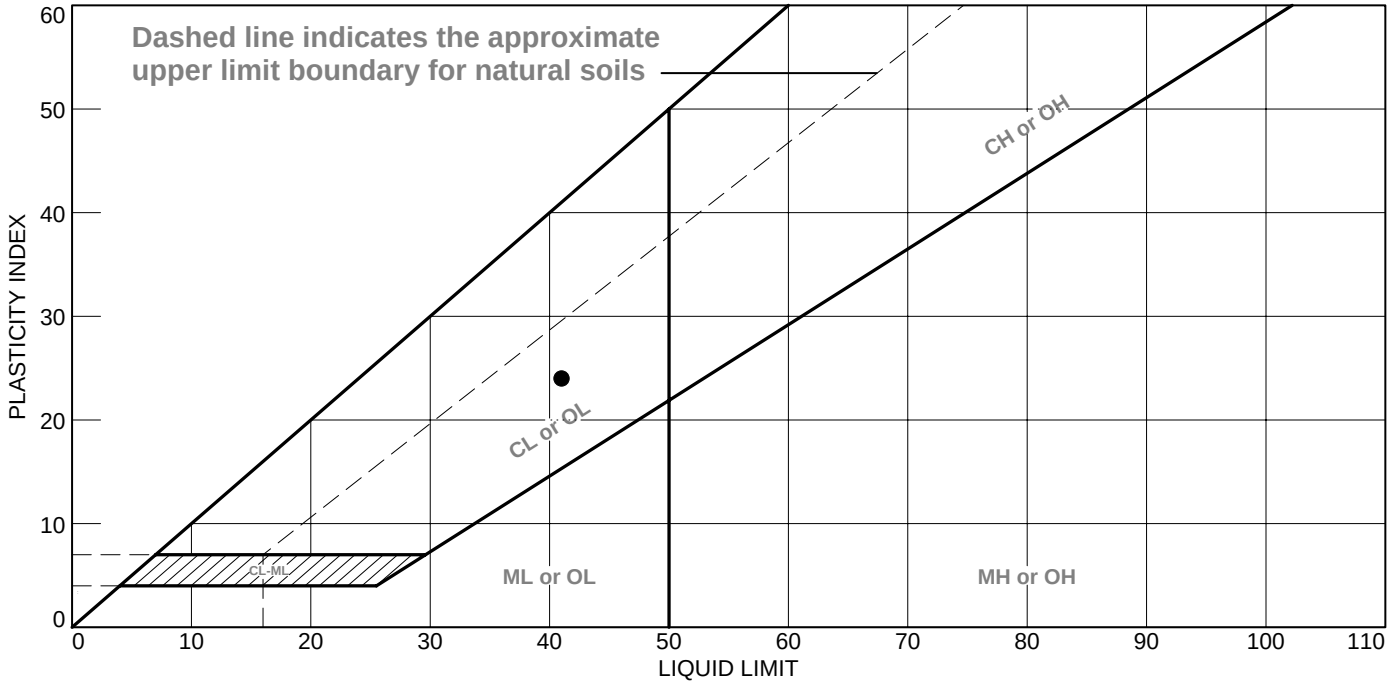
Source of Sample: EDW-B013 **Depth:** 6.0'-8.0'
Sample Number: S-3

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY AND BROWNISH GRAY LEAN CLAY	41	17	24			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

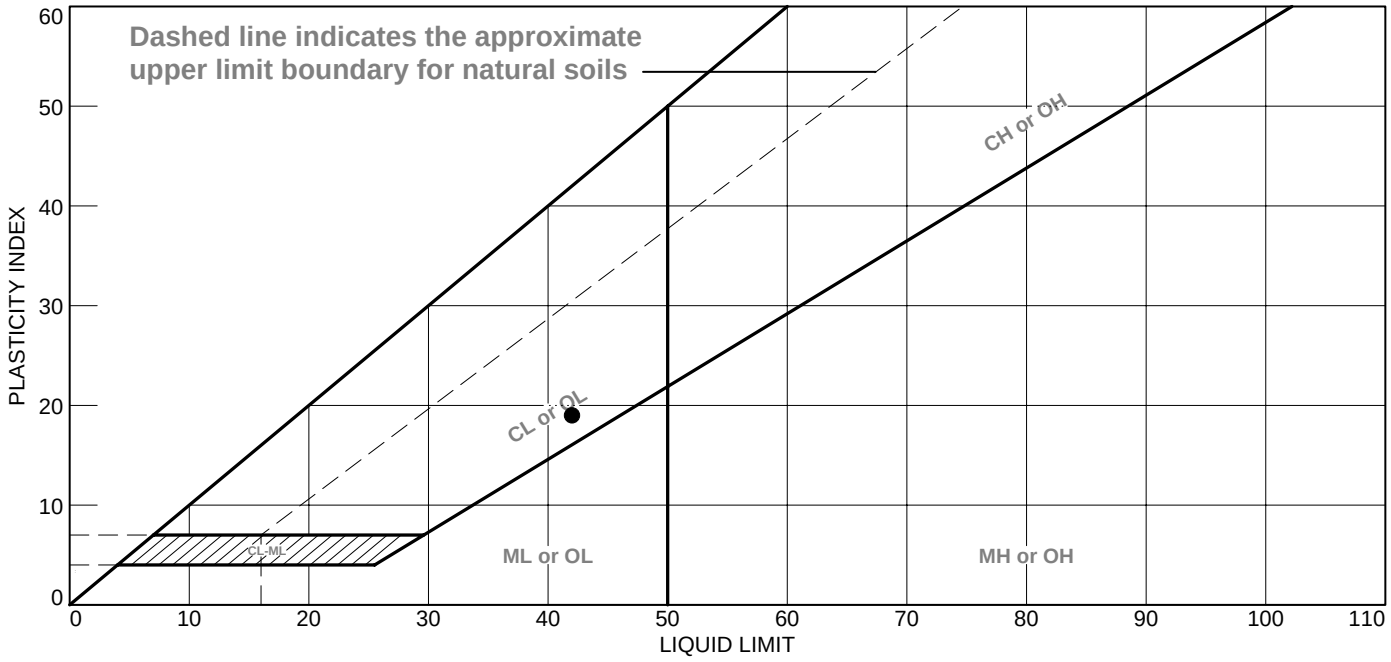
Source of Sample: EDW-B013 **Depth:** 15.0'-16.5'
Sample Number: S-6

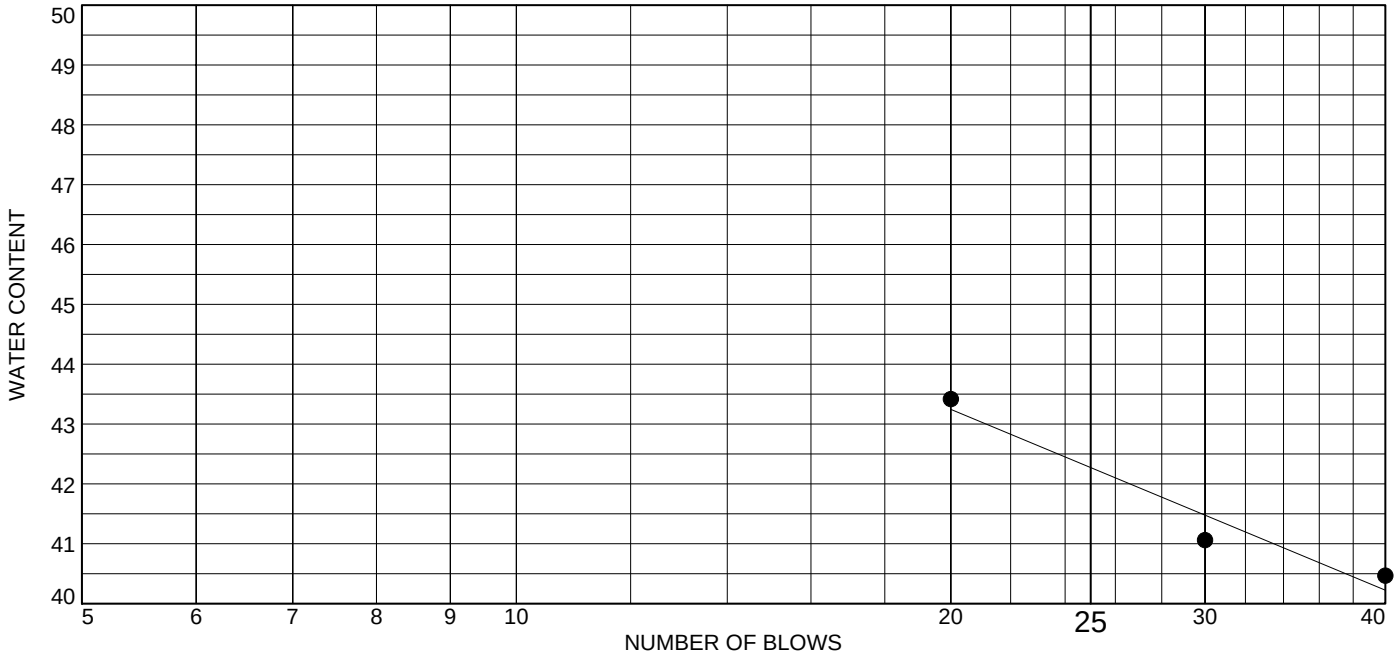
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND BROWN LEAN CLAY WITH SAND	42	23	19			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B013 **Depth:** 32.0'-34.0'
Sample Number: S-10

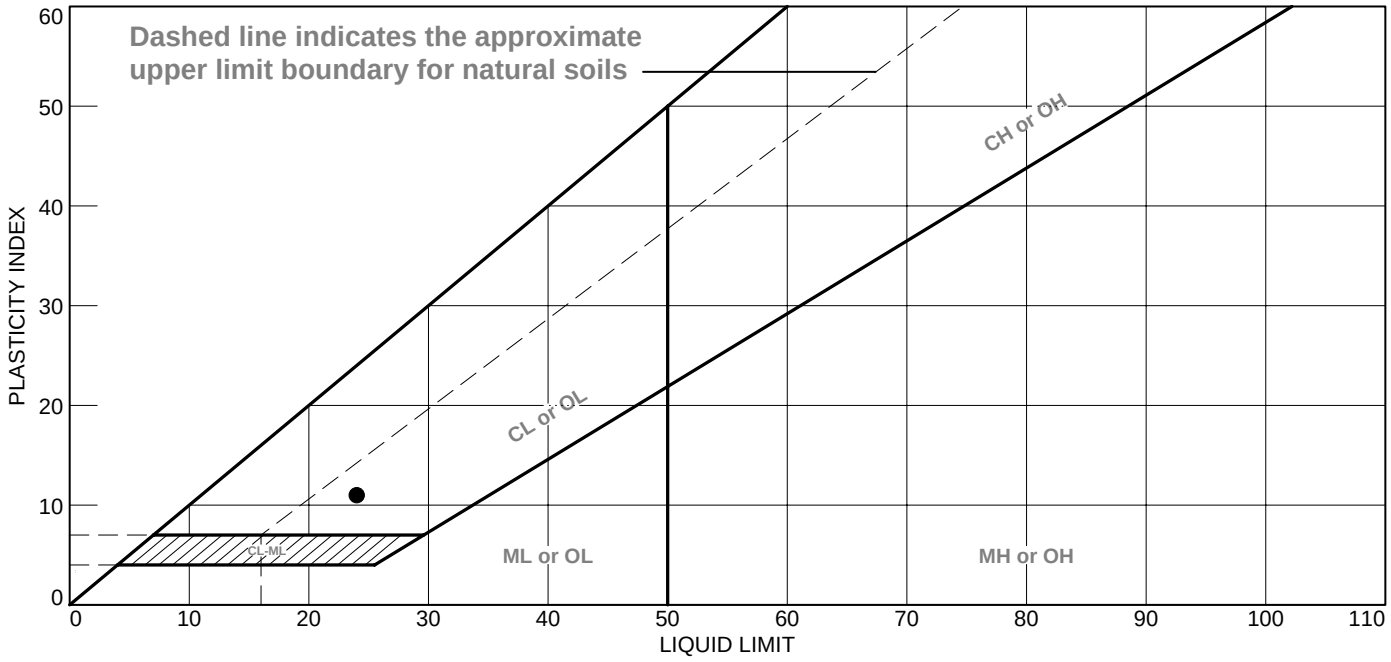
Remarks:

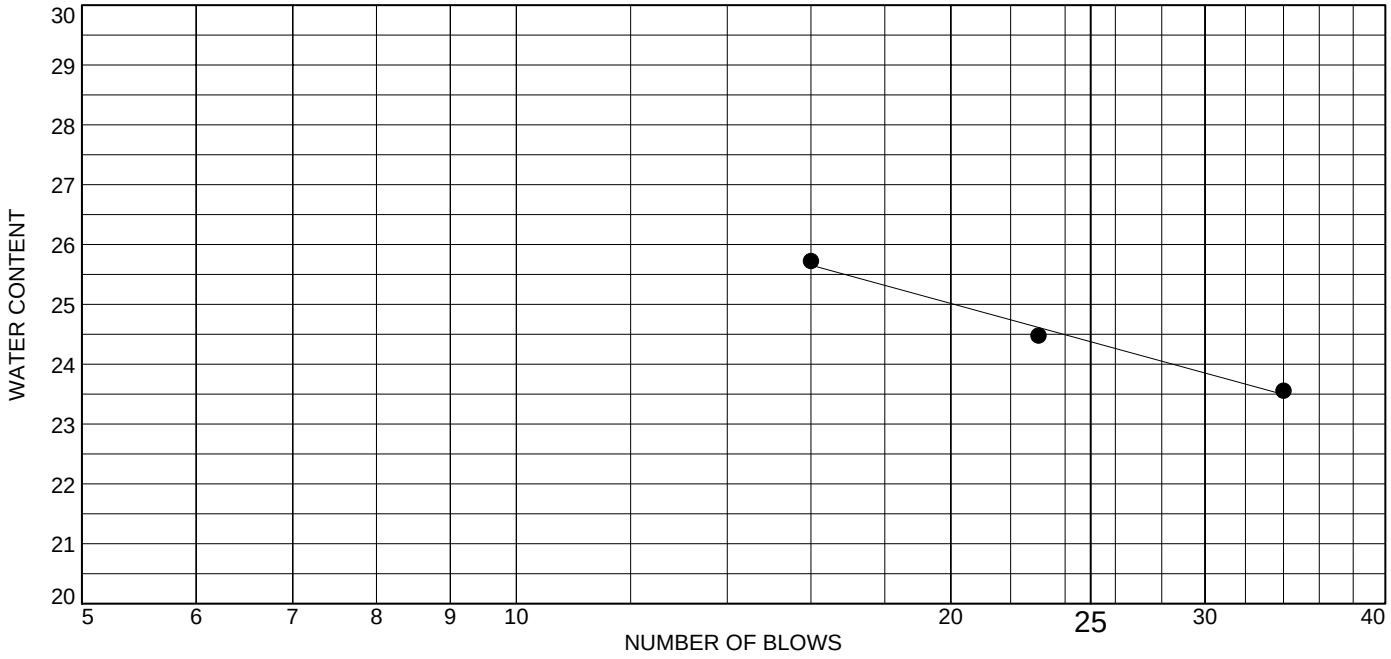
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	24	13	11			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 31.0'-33.0'
Sample Number: S-10

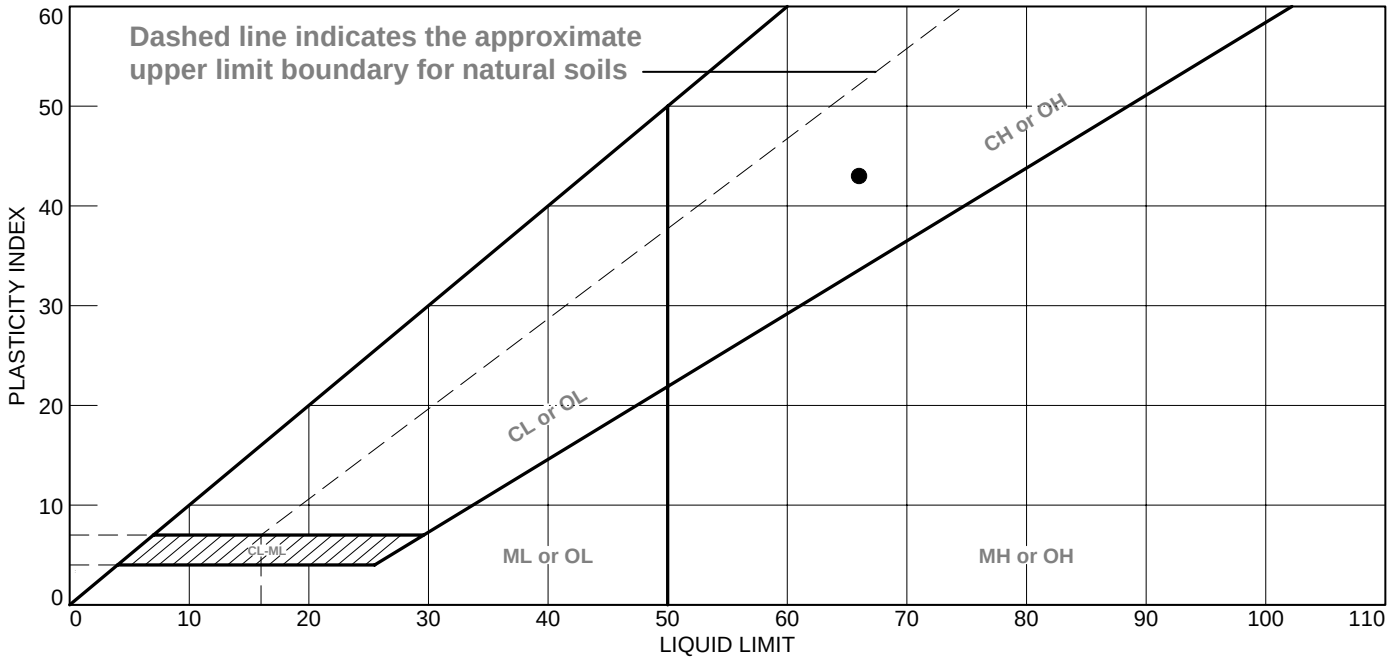
Remarks:

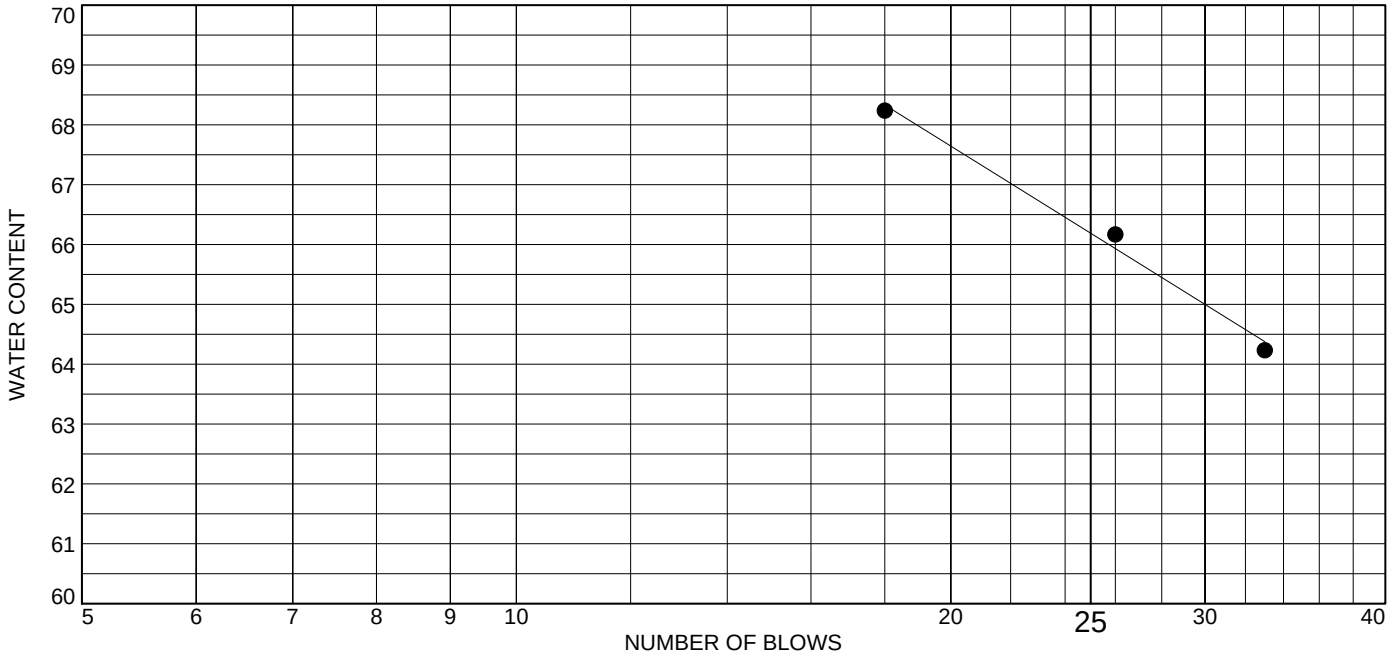
Terracon

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	66	23	43			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 37.0'-39.0'
Sample Number: S-12

Remarks:

Terracon

Figure

Tested By: SJH **Checked By:** WPQ

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SPECIFIC GRAVITY OF SOIL SOLIDS
ASTM D-854

Project Number: MR155218
Project Name: Dynegy Edwards
Test Date: 11/10/2015

Results Summary

Boring / Sample	Sample Description	USCS	Sample Number	Depth (ft)	Passing #4	Specific Gravity (Gs)
EDW-B002	DARK GRAY FLY ASH		S-8	25.0'-27.0'	100.00%	2.471
EDW-B002	GRAY LEAN CLAY	CL	S-11	40.0'-41.5'	100.00%	2.592
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND		S-1	0.0'-1.5'	100.00%	2.469
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		S-6	15.0'-16.5'	100.00%	2.772
EDW-B004	GRAY LEAN CLAY WITH SAND	CL	S-14	50.0'-51.5'	100.00%	2.617
EDW-B005	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED	CL	S-12	45.0'-46.5'	100.00%	2.521
EDW-B011	FILL: DARK GRAY FLY ASH - CLAY NOTED		S-8	25.0'-29.0'	100.00%	2.691
EDW-B014	FILL: DARK GRAY FLY ASH		S-7	20.0'-22.5'	100.00%	2.524
EDW-B014	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	S-11	40.0'-40.5'	100.00%	2.719

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Soil Resistivity	**AASHTO T 288/ ASTM G 57**
Soil pH	**AASHTO T 289/ ASTM G 51**
Soil REDOX	**DIPRA**
Soil Sulfides	**DIPRA**
Water Content	**AASHTO T 93/ ASTM D 2216**

Laboratory Services Group **750 Corporate Woods Parkway** **Vernon Hills, Illinois 60061** **Ph. (224)352-7000** **Fax (224)352-7024**

Soil Corrosivity Indication Series

Project No.: MR155218
Project Name: DYNEGY EDWARDS

Client Name: AECOM
Test Date: 5/11/13/15

Summary of Test Results

Boring / Sample No.	Resistivity Natural Miller Soil Box(ohms)	Resistivity Saturated Miller Soil Box(ohms)	pH Soil Water Slurry	REDOX (mV)Soil Water Slurry	Sulfides Reaction	As Received WC%	Saturated WC%	Total Points
EDW-B002 S6	**1,720**	**1,550**	**9.77**	**65**	**NEG**	**52.3**	**77.4**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B004 S3	**3,380**	**3,070**	**8.97**	**140**	**NEG**	**21.4**	**36.9**	**3.0**
Points	0	0	3	0	0			
Description:	BROWN AND GRAY LEAN CLAY							
EDW-B005 S12	**1,120**	**960**	**8.38**	**195**	**NEG**	**88.7**	**99.4**	**10.0**
Points	0	10	0	0	0			
Description:	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND							
EDW- B011 S6	**1,760**	**1,600**	**9.85**	**60**	**NEG**	**63.6**	**82.3**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B0014 S7	**1,995**	**1,810**	**10.89**	**35**	**4**	**86.5**	**98.6**	**15.0**
Points	0	8	3	4	0			
Description:	DARK GRAY FLY ASH							

Resistivity:	Points:	pH:	Points:	Redox:	Points:	Sulfides:	Points:	†
<1500 ohms	10	0.0-2.0	5	Negative	5	Positive	3.5	
1500-1800	8	2.0-4.0	3	0 - 50mV	4	Trace	2	
1800-2100	5	4.0-6.5	0	50 - 100mV	3.5	Negative	0	
2100-2500	2	6.5-7.5	0*	100mV+	0			
2500-3000	1	7.5-8.5	0					
3000+	0	8.5 +	3					

*- If Sulfides are present and a low or neg. ReDox, add 3 points

† - THIS SYSTEM IS BASED ON A 25.5 POINT CORROSIVITY RATING SYSTEM DEVELOPED BY THE AMERICAN NATIONAL STANDARDS FOR POLYETHYLENE ENCASEMENT AND DUCTILE-IRON PIPE SYSTEMS. IT SHOULD BE NOTED THAT THESE TEST RESULTS ARE AN INDICATION OF SOIL CHEMISTRY AND SHOULD BE USED AS A INDICATION OF POSSIBLE CORROSIVE CONDITIONS. TERRACON IS NOT LIABLE FOR ANY REMEDIAL MEASURES TAKEN ON THE BASIS OF THESE RESULTS.

Tested by: BCM

Checked By: WPQ

Terracon
Consulting Engineers & Scientists

ORGANIC CONTENT TEST
ASTM D-2974
Method C

Laboratory Services Group *750 Corporate Woods Parkway, Vernon Hills, Illinois 60061* *Phone: (224) 352-7000 Fax:(224)352-7*

Project No.: MR155218
Project Name: DYNEGY - EDWARDS SITE
Client: AECOM
Date Tested: 11/13/2015

Sample Information

Boring / Source:	EDW-B005
Sample No.:	S-12
Depth (ft.):	45.0-46.5'
Description:	CL

Organic Content Test Data

Tare No.:	C
Tare Wt. (gm):	20.04
Wet Wt. + Tare (gm):	49.66
Dry Wt. + Tare (gm):	36.05
Moisture Content (%):	**85.01**
Wt. of Ash + Tare (gm):	34.63
Percent Ash:	91.13
Organic Content (%):	**8.87**

** Note: Test performed by heating the sample to 440 degrees Centigrade until constant weight of ash is attained.

Attachment F. Material Characterization Calculations

1. **Objective**

This calculation package summarizes the material characteristics of the subsurface strata encountered during AECOM's geotechnical investigation of the Ash Pond at Dynegy's Edwards Power Station in Bartonville, Illinois. Selection of material properties for slope stability analyses is also developed and summarized within this package.

2. **Subsurface Conditions**

A subsurface exploration was performed at the East Ash Complex between August 19 and November 5, 2015. The subsurface exploration included the following; fourteen soil borings, installation of four piezometers to monitor phreatic conditions, and a program of twenty-two cone penetrometer test (CPT) soundings. Pore pressure dissipation testing and seismic shear wave velocity measurements were conducted on a selection of the CPT soundings. A full set of AECOM's boring logs, including soil descriptions, types of sampling, and choice laboratory test results, is provided in **Attachment B** of the report. A complete report that includes the graphical CPT logs and the results of the SCPTu and PPD tests is included in **Attachment D** of the report. The geotechnical exploration locations are shown on **Figure 2-1 – East Ash Pond Geotechnical Site Plan** in **Attachment A** of the report.

Based on the results of the investigation, five main stratigraphic materials were identified at the site. These are listed below and briefly summarized:

New Embankment Materials: The perimeter embankment / dike of the Edwards Ash Pond was constructed in two stages, with an original embankment, and a later raise constructed on top of and on the downstream slope of the existing dike, to facilitate the addition of a rail loop around the impoundment. This raise was completed in the early 2000s, raising the dike crest from an original elevation around 455 ft to the current typical elevation around 461 ft. This newer embankment fill material is comprised of fly ash from the plant (as beneficial reuse material), classified as lean silt (ML) to poorly-graded silty sand with gravel (SP). The consistency of the new embankment fill, as measured by the standard penetration test, ranged from soft to very stiff, but generally had a stiff to very stiff consistency and appeared to be well-compacted materials.

Table F-1: New Embankment Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	<0.5	<0.5
Thickness (feet)	7.5	11	9.6
SPT-N	2	28	11
Pocket Penetrometer (tsf)	.125	1.5	.75
Cone Resistance (tsf)	2	537	95
Sleeve Resistance (tsf)	<0.25	6.8	1.1
Cone/Sleeve Ratio (%)	<0.25	9.2	2.0
SCPTu Shear Wave Velocity (ft/sec)	400	1250	600

Historical compaction data for the new embankment fill material was not available, but field data are generally indicative of well-compacted materials.

Old Embankment Materials: As noted above, the original Ash Pond dike was constructed to approximately elevation 455 ft, but was raised in the early 2000s to facilitate the addition of the rail loop. The original perimeter embankment / dike of the Edwards Ash Pond is largely comprised of clay fill with trace sand and shells, classified as lean clay (CL). The

consistency of the old embankment fill, as measured by the standard penetration test, ranged from soft to stiff, but generally had a stiff consistency and appeared to be well-compacted materials. It was noted that the Old Embankment Fill generally had a higher measured shear strength above approximately elevation 450 ft, so this material was split into two materials (Old Embankment Fill 1 and Old Embankment Fill 2) within the slope stability models.

Table F-2: Old Embankment Fill Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	11	6.8
Thickness (feet)	11	24.5	16.7
SPT-N	2	13	7
Pocket Penetrometer (tsf)	.25	2.125	1
Cone Resistance (tsf)	2	444	13
Sleeve Resistance (tsf)	<0.25	2.3	<1
Cone/Sleeve Ratio (%)	<0.25	8.3	4.3
SCPTu Shear Wave Velocity (ft/sec)	400	450	400

Impounded Ash Materials: Fly ash materials were encountered in the borings drilled within the Edwards Ash Pond. The material was generally silt sized with some sand and clay, and trace gravel, and was classified as a silt (ML - fly ash). The measured consistency of the ash ranged from very loose to very dense, though generally, the consistency of ash was loose to very loose and was saturated below the residual water level in the Ash Pond.

Table F-3: Ash Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	<0.5	<0.5
Thickness (feet)	2.5	40	24.7
SPT-N	0	100	12
Pocket Penetrometer (tsf)	N/A	N/A	N/A
Cone Resistance (tsf)	2	969	39
Sleeve Resistance (tsf)	<0.25	3.9	<1
Cone/Sleeve Ratio (%)	<0.25	13.8	2.6
SCPTu Shear Wave Velocity (ft/sec)	450	600	600

Native Alluvial Clay Crust: The Edwards Ash Pond is underlain by a native clay of alluvial origin. This material was typically classified as lean clay (CL), with some zones of fat clay (CH) occasionally identified. (Much of the clay has a Liquid Limit near 50, denoting a borderline fat/lean clay.) The uppermost approximately 5 feet of this native alluvial clay, near the original ground surface, measured significantly higher in strength, signifying a desiccated crust layer at the original ground surface. The consistency of this clay was generally stiff.

Table F-4: Native Alluvial Clay Crust Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	0	35	24.9
Thickness (feet)	2	5	4.3
SPT-N	4	14	8
Pocket Penetrometer (tsf)	.5	1.5	.75
Cone Resistance (tsf)	3	47	12
Sleeve Resistance (tsf)	<0.25	1.6	<1
Cone/Sleeve Ratio (%)	<0.25	8.5	4.1
SCPTu Shear Wave Velocity (ft/sec)	450	600	500

Native Alluvial Clay: As noted above, the Edwards Ash Pond is underlain by a native clay of alluvial origin, typically classified as lean clay (CL), with some zones of fat clay (CH) occasionally identified. (Much of the clay has a Liquid Limit near 50, denoting a borderline fat/lean clay.) Beneath the upper crust material, the clay has significantly less shear strength, and is normally consolidated or slightly over-consolidated, with strength increasing with depth. The clay consistency varied from soft to medium stiff near the top of the stratum, generally increasing in strength with depth to a consistency of medium stiff to stiff at the bedrock below. To capture this strength increase within the stability models, this material was divided into three layers (Native Clay 1, Native Clay 2, Native Clay 3).

Table F-5: Native Alluvial Clay Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	5	40	30
Thickness (feet)	5.5	28	17.9
SPT-N	0	100	6
Pocket Penetrometer (tsf)	.125	1.5	.5
Cone Resistance (tsf)	2	40	7
Sleeve Resistance (tsf)	<0.25	1.7	<1
Cone/Sleeve Ratio (%)	<0.25	10.9	2.7
SCPTu Shear Wave Velocity (ft/sec)	400	800	500

Shale Bedrock: Shale bedrock was encountered below the native alluvial soils in several of the borings. The shale was found to be slightly weathered to weathered near the upper contact, and became hard with depth. The shale was cored in two locations to verify classification, but no further testing was completed on this material.

Other Materials: Other materials were encountered in relatively small quantities at the site, appearing at only one or two exploration locations, and were not considered part of the site-wide stratigraphy. These materials include old and recent fill (similar in properties to the old and new embankment fill materials), historic ash material (similar in properties to the more recent ash fill), and crushed stone embankment fill in the cut-off embankment that constructed the “Dead Pond”. The crushed stone embankment fill was observed to be medium dense, fine to coarse, crushed stone gravel with sand, classified as poorly graded gravel (GP). A final additional material, a clean crushed stone toe drain material, was noted on available historical design drawings, but not encountered in the borings performed for this project.

3. **Laboratory Testing Program**

Representative samples were collected at regular intervals from the borings and were utilized for laboratory testing. The laboratory tests were assigned to characterize the site materials including index (moisture content, unit weight, Atterberg limits, specific gravity, and particle size analysis), permeability and consolidation tests. Strength testing included isotropically consolidated-undrained triaxial tests with pore pressure measurements (CIU), Unconfined Compression (UC) tests, and direct shear tests (DS) on the native clay materials, embankment materials, and ash materials.

Table F-6: Laboratory Testing Program for Ash Pond

ASTM Designation	Test Type	Number of Tests							
		Total	Ash	New Embankment Fill	Old Embankment Fill	Other Fill Materials	Native Clay Crust	Native Clay	Bedrock
D2216	Moisture Content	181	47	15	21	19	5	56	18
D4318	Atterberg Limits	26	4	1	5	1	1	14	-
T311, D1140, D422	Gradation / Hydrometer	10	7	3	-	-	-	-	-
D854	Specific Gravity	9	5	-	-	-	4	-	-
D5084	Hydraulic Conductivity	3	2	-	-	-	-	1	-
D2435	Consolidation	2	-	-	-	-	-	2	-
D 2166	Unconfined Compression	5	-	-	-	-	-	5	-
D4767	Consolidated Undrained Triaxial (CIU)	5	-	-	3	-	-	2	-
D6528	Direct Shear (DS)	8	2	-	-	-	1	5	-
G57, G51	Corrosion Suite	5	4	-	-	-	-	1	-

Compete results of the laboratory tests are included in **Attachment E** of the report.

4. **Material Properties**

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from SPT and CPT data.
The following specific material properties were developed for the new embankment material, old embankment material, impounded ash, native clay crust, and native clay, for use in the various stability analyses performed as part of this study:

- Unit Weight
- Drained and Undrained Shear Strength of Fine-Grained Soil Strata
- Drained and Undrained Shear Strength of Ash

Material properties for the various historic fill materials on site were conservatively estimated based on the data available, empirical correlations, and experience with similar materials.

Unit Weight

Unit weight for the old embankment, ash, native clay crust, and native clay materials were evaluated using measured results from samples collected. Values were plotted and design unit weight lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of these measured values are included as Attachments F.1 through F.5 at the end of this document.

For materials that could not be directly measured for unit weight (new embankment and crushed stone, and historic fill materials), estimates of the unit weight were based on empirical correlations, and experience with similar materials.

The following total unit weights were selected for use in stability analyses:

- New embankment (compacted ash): 115 pounds per cubic foot (pcf),
- Old embankment: 125 pcf,
- Ash materials: 105 pcf,
- Native clay crust: 120 pcf, and
- Native Clay: 105-117 pcf.

Drained Shear Strength Selection

Drained shear strengths were selected for all materials for use in the Long Term and Max Pool analyses. Drained strengths were primarily based on results from DS and CIU testing. Plots of both effective friction angle and effective cohesion values were created for each material type to estimate average values across each material. To supplement the effective friction angle measured in laboratory testing, correlated values of phi' were calculated using the procedure developed by Peck, Hanson, and Thornburn, 1974, based on corrected SPT blow counts. Measured laboratory values were given precedence when selecting design values. For materials that could not be directly measured for drained shear strength (new embankment, crushed stone and historic fill materials), the above correlation was used for effective friction angles. Effective cohesion values for these materials were conservatively estimated based on experience with similar materials. Where materials existed, but were not encountered in the field investigation (gravel toe drain, GP) experience with similar materials was used. Design strength lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of the measured and correlated drained shear strength values for the five primary materials are included as Attachments F.1 through F.5.

Undrained Shear Strength Selection

Undrained shear strengths were selected for the cohesive materials for use in the Pseudostatic and analyses. Undrained strengths were based on results from CIU and UC testing, and correlated values of undrained shear strength from the CPT tests. Plots of undrained shear strength were created for each material type to estimate average values across each material. To supplement the undrained shear strengths measured in laboratory testing, correlated values were calculated using the procedure developed by Aas, et al (1986), based on CPT data. An NKT factor of 17 was selected for use in this correlation based on published values. Su / σ'vo lines were also calculated and plotted for comparison purposes. Design strength lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of the measured and correlated undrained shear strength values for the five primary materials are included as Attachments F.1 through F.5.

Bedrock Material Selection

Based on the field investigation, the bedrock encountered is generally hard shale. SPT samples of this material were recovered, though testing, other than water contents, was generally not possible. Therefore, conservative strength and unit weight values were selected for this material, based on experience with similar materials. Failure surfaces within the models are generally not expected to extend through this material.

5. Material Properties for Analysis

The table below summarizes the material parameters used in the stability analysis, based on the analysis and strength selection procedures and considerations presented in the preceding sections.

Table F-8: Summary of Material Parameters used in Stability Analysis

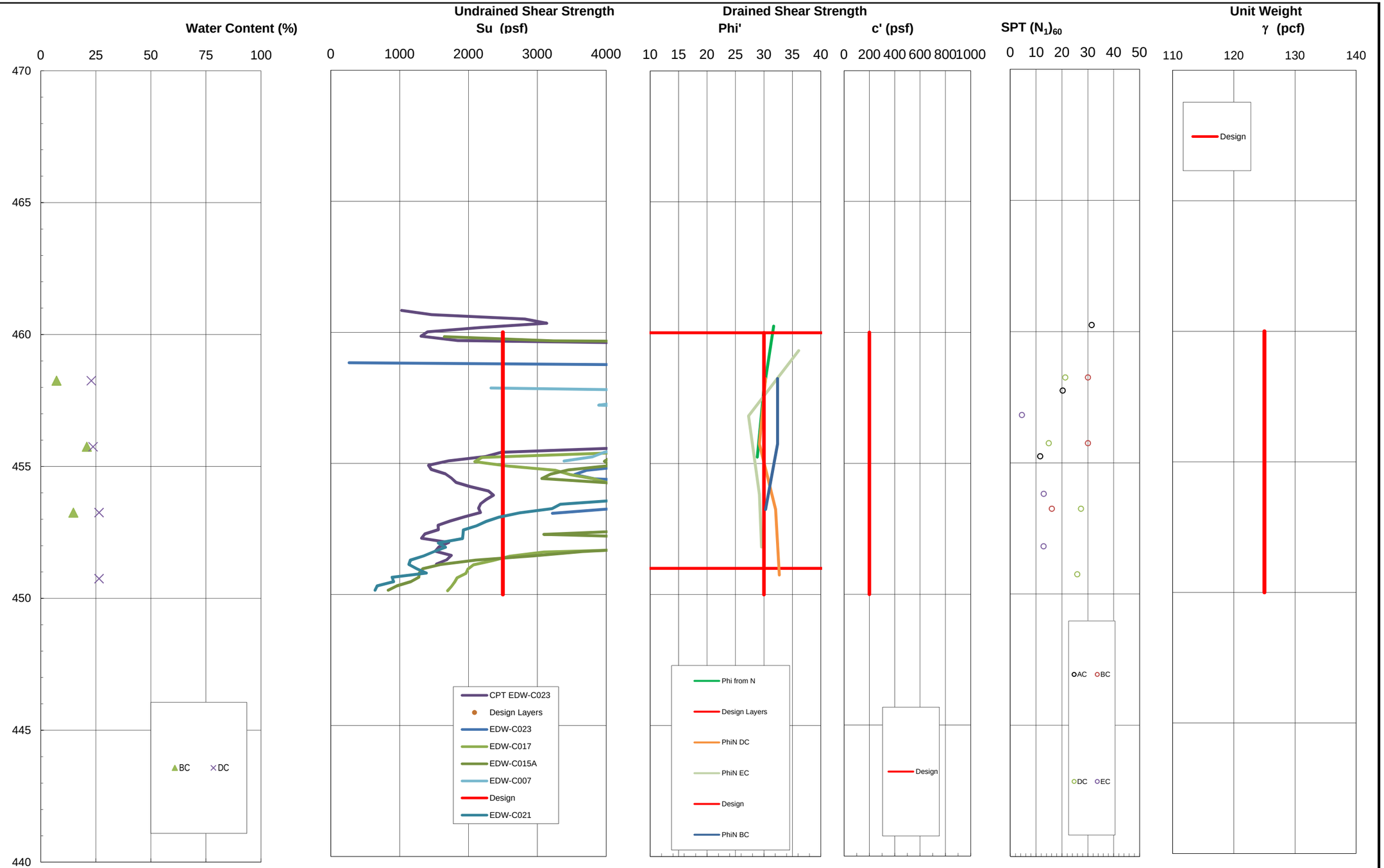
Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2500	0
Old Embankment 1	125	125	200	28	2500	0
Old Embankment 2	125	125	100	29	1250	0
Native Clay Crust	120	120	200	27.5	1250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly Ash	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	125	200	28	1000	0
Recent Fill	115	115	200	30	1250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1000	36	1000	36

References:

Aas, G., Lacasse, S., Lunne, I., and Hoeg, K. (1986). "Use of In situ Tests for Foundation Design in Clay," Proceedings, In Situ 86, American Society of Civil Engineers, pp. 30.

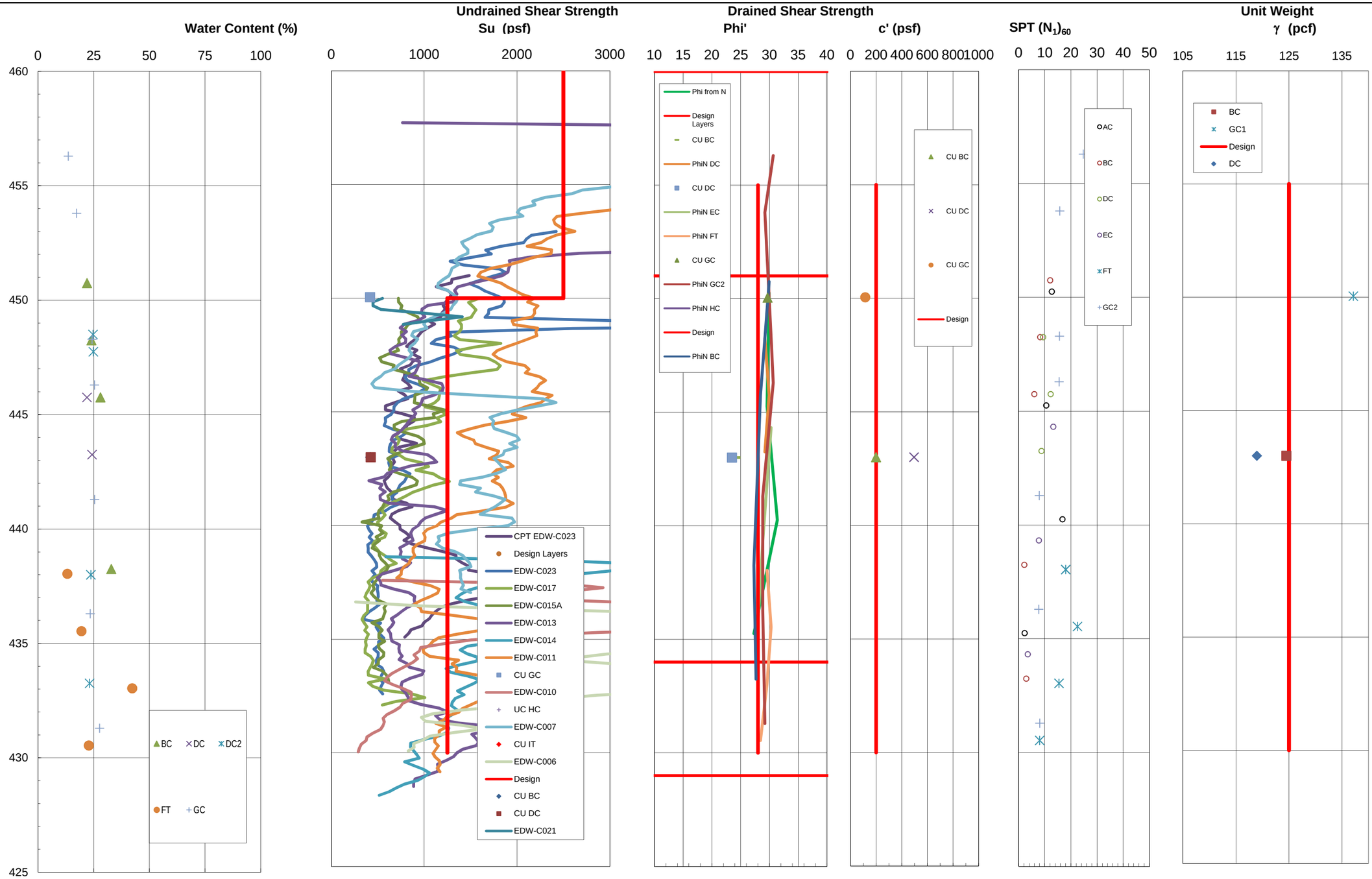
Peck, R.B., Hanson, W.E. and Thornburn, T.H., 1974. Foundation Engineering, 2nd edition, John Wiley and Sons, Inc.

Attachment F.1 Material Characterization Plot – New Embankment



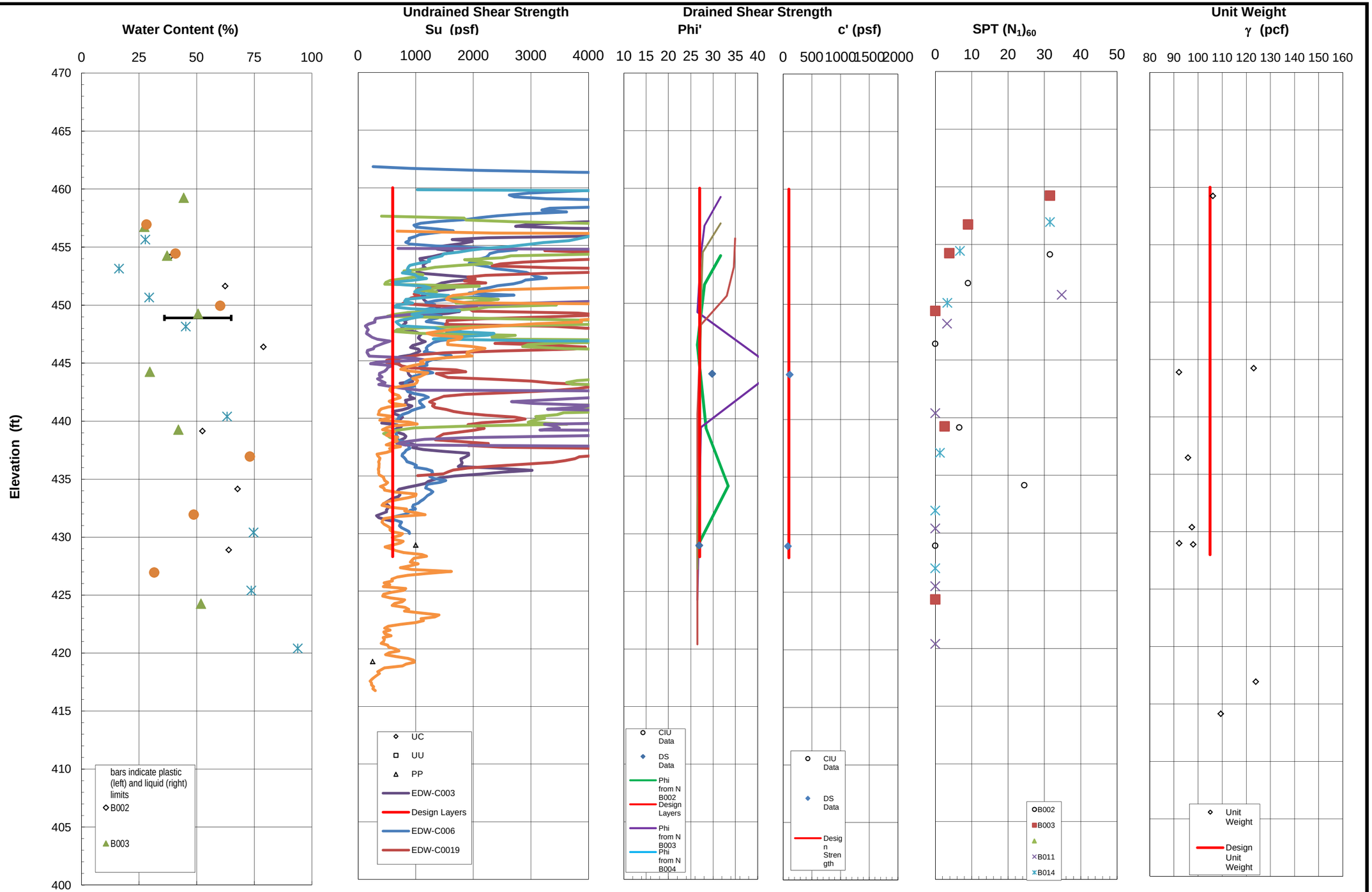
New Embankment Data	Project No. 60440202	Material Properties	AECOM		Attachment F.1

Attachment F.2 Material Characterization Plot – Original Embankment Data



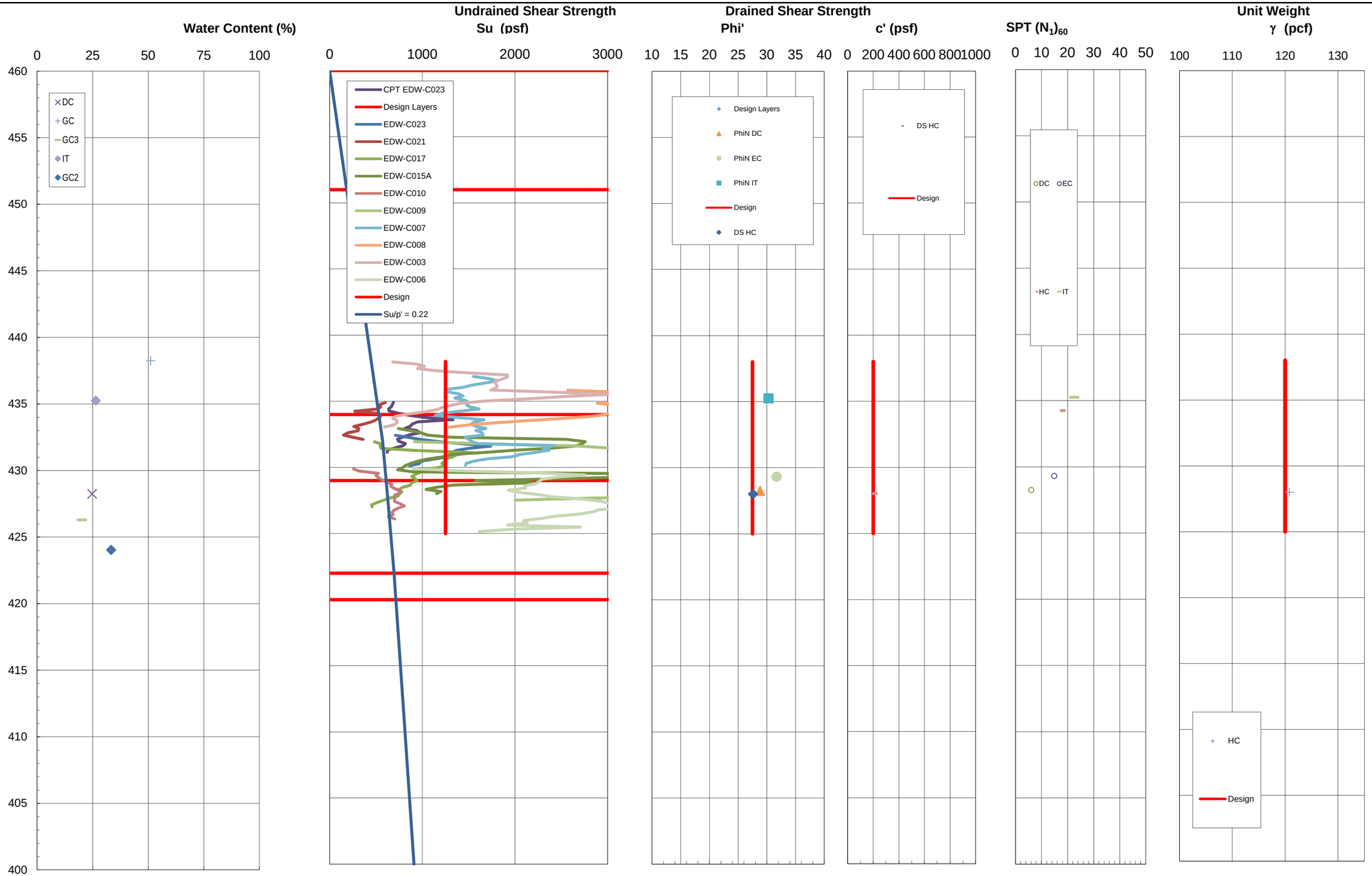
Original Embankment Data	Project No. 60440202	Material Properties	AECOM		Attachment F.2

Attachment F.3 Material Characterization Plot – Ash Data



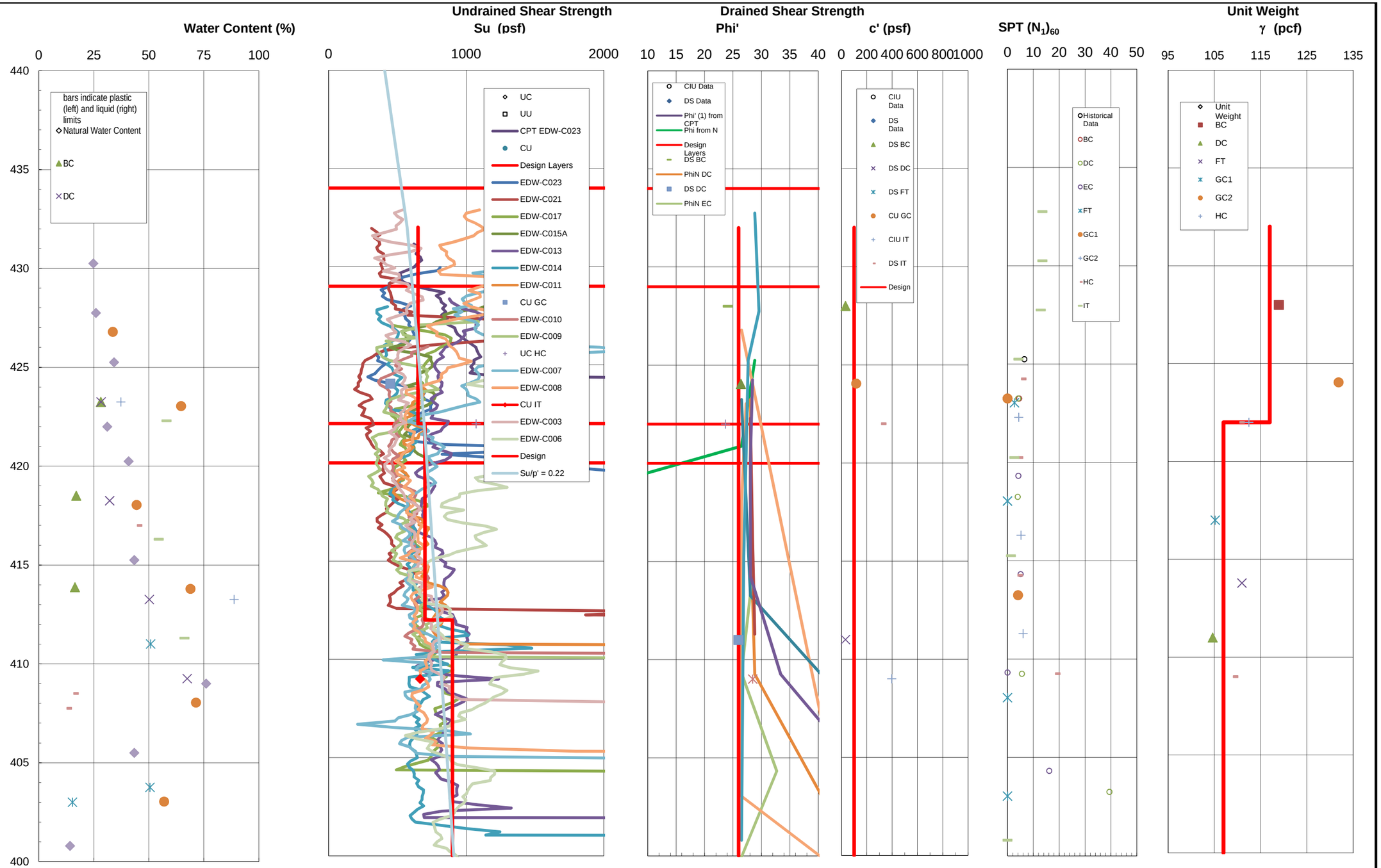
Ash Data	Project No. 60440202	Material Properties	AECOM		Attachment F.3

Attachment F.4 Material Characterization Plot – Native Clay Crust Data



Native Clay Crust Data	Project No. 60440202	Material Properties	AECOM		Attachment F.4

Attachment F.5 Material Characterization Plot – Native Clay Data



Native Clay Data	Project No. 60440202	Material Properties	AECOM		Attachment F.5

Attachment G. Slope Stability Analysis

1. Objective & Introduction

This calculation package summarizes the limit equilibrium slope stability analyses for both the static and seismic loading conditions performed in support of the Edwards Ash Pond CCR Unit Geotechnical Report for Dynegy's Edwards Power Station. Figures, calculations and computer program outputs are provided as attachments and are referenced herein. Slope stability analyses have been completed for ten cross-sections within the Edwards Ash Pond to evaluate the stability of the embankment under loading conditions required by the CCR Rule.

The objective for the slope stability analysis is to determine factors of safety (FoS) at critical cross section locations across the East Ash Pond dike complex for the following loading cases:

- Static, Steady-State, Normal Pool Conditions;
- Static, Maximum Pool Surcharge Conditions;
- Seismic Slope Stability Analysis;

The factors of safety determined from each of these loading conditions will be utilized to determine if the requirements outlined by the USEPA CCR Rule criteria are met. The methodology used to perform the slope stability analysis and the results of the analyses are summarized in the subsequent sections listed below.

2. Development of Cross-Sections for Analysis

A total of ten cross-sections (A, B, C, D, E, F, G, H, I, and J) were utilized to evaluate the perimeter embankment stability at the Ash Pond.

The section geometry for each analysis cross-section was determined based on the LiDAR ground surface topographic contours obtained from the Illinois Geospatial Data Clearinghouse.

3. Subsurface Conditions

Subsurface materials and extents (stratigraphy) at each cross section were developed by utilizing nearby subsurface explorations (CPTs and borings) from AECOM's exploration activities and historic geotechnical explorations. The subsurface strata generally encountered across the exploration locations can be generalized into five typical layers. These layers are listed below and are further described in Appendix F – Material Characterization.

- New Embankment Fill Materials
- Old Embankment Fill Materials
- Ash Material
- Native Alluvial Clay Crust
- Native Alluvial Clay

Material interfaces inferred from the subsurface explorations nearest to the cross-sections were transposed onto the profile and a reasonable interpretation of the subsurface stratigraphy between the exploration locations was developed. Table G-1 below summarizes the exploration locations utilized to construct each cross-section:

Table G-1
Cross-section Locations for Slope Stability Analyses

Cross-Section	Approximate Station	Location (Crest/Toe)	Boring/CPT Number
A	15+00	CREST	EDW-B001, EDW-C001
		TOE	
B	18+00	CREST	EDW-B010, EDW-C023
		TOE	
C	31+00	CREST	EDW-C021
		TOE	
D	41+00	CREST	EDW-B012, EDW-C017
		TOE	
E	51+00	CREST	EDW-B009, EDW-C015
		TOE	EDW-C016
F	54+00	CREST	EDW-C013
		TOE	EDW-B008, EDW-C014
G	58+00	CREST	EDW-B005, EDW-B013, EDW-C011, EDW-C012
		TOE	EDW-C010
H	60+00	CREST	EDW-B015, EDW-C009
		TOE	
I	67+00	CREST	EDW-C007
		TOE	EDW-B006, EDW-C008
J	87+00	CREST	EDW-C003
		TOE	

Additionally, design drawings from "Proposed 150 Car Loop Track For Edwards Power Plant Bartonville, Illinois" by Design Nine, Inc. (2003) were used to supplement the subsurface investigation in developing the subsurface embankment geometry. The relevant CPT soundings and test borings that were used to develop subsurface stratigraphy at the 10 analysis sections are listed in Table E-1 below.

Phreatic conditions were modeled as a piezometric line in SLOPE/W. Elevations and configuration of the lines were established based on the water levels encountered in the borings and CPTs, the piezometers installed during the 2015 AECOM exploration, and the normal pool elevation of approximately 447.2 feet for the Clarification Pond sub-basin and 449.5 feet for the Cooling Pond sub-basin, based on the 2016 AECOM hydraulics and hydrology report (AECOM, 2016).

4. Analysis Methodology

Analyses were performed using Spencer's Method which is a limit equilibrium slope stability analysis procedure. The computer program SLOPE/W 2012 by Geo-Slope International was utilized. The program analyzes a large number of potential slip surface geometries and identifies the geometry that results in a critical (i.e. lowest) factor of safety (FS). Additional information on the program is available at http://www.geo-slope.com/. Circular shaped failure surfaces, with optimization, were analyzed for the each of the loading cases considered. The optimization option within Slope/W allows the checking of non-circular failure surfaces by incrementally altering the location of the failure surface to find the lowest factor of safety. This procedure allows the failure surface to follow thin layers of lower strength, and interface boundaries to calculate a more critical factor of safety.

Each section was analyzed for the following cases:

- **Static, Steady-State, Normal Pool Condition:** This case models the conditions under static, long-term conditions, under the normal storage water level within the impoundment. Drained (effective stress) shear strength parameters were used for all materials, and phreatic conditions were estimated based on available data as described above. A target **Factor of Safety of 1.50** is needed for this loading condition. The operating water level of the Ash Pond is El. 447.2 and 449.5 ft, obtained from AECOM's Hydrologic and Hydraulic Analysis, for the Clarification Pond and Cooling Pond sub-basins, respectively. These levels were utilized in this analysis.
- **Static, Maximum Surcharge Pool Condition:** This case models the conditions under short-term surcharge pool conditions. Drained (effective stress) shear strength parameters were used for all materials, as the change in pool elevation primarily affects the upstream slope of the dike and is not anticipate to result in the development of undrained conditions within the downstream face of the dike, which is where the critical slip surface was found from the normal pool condition analysis. It was assumed that the temporary surcharge load was not of a sufficient duration to significantly alter the phreatic surface (i.e. saturation line within the embankment). Therefore, the phreatic surface was modeled equivalent to the steady state case. A target **Factor of Safety of 1.40** is needed for this loading condition. The water level of the Ash Pond was modeled at El. 457.8 and 457.4 ft for the Clarification Pond and Cooling Pond sub-basins, respectively, for this case. These values are from the 2016 Hydraulics and Hydrology report generated for this project.

- **Seismic Stability Condition:** These analyses incorporate a horizontal seismic coefficient kh selected to be representative of expected loading during the design earthquake event (i.e., a "pseudostatic" analysis). The analyses utilized peak undrained strength parameters in soils that are not consider to be rapidly draining materials, and peak drained strengths in soils considered to freely drain. The phreatic surface and pore water pressures corresponding to the Steady State Normal Storage Pool case from the static analyses were utilized. Seismic loading was included in this analysis using a pseudostatic coefficient (kh). A **Factor of Safety of 1.00** is required for this loading condition.

Ground motion parameters for the pseudostatic analysis were estimated using the USGS Interactive Deaggregation tool (http:earthquake.usgs.gov/hazards/apps/). This application generates acceleration values, including peak ground acceleration (PGA), and mean and modal moment magnitudes, based on user entered values of location, exceedance probability, and spectral period. Results are computed based on the 2008 NSHMP PSHA Seismic Hazard Maps.

For the Edwards Power Station, the calculated PGA for a 2,500-year event was 0.067g for top of hard rock. To determine the free-field, ground surface horizontal acceleration, the site was classified

according to the site classes defined in IBC (2003) and amplified using the site amplification factors found in NEHRP (2009) The site class was determined based on the weighted average of the shear wave velocity of the foundation soils (600 ≤ vs ≤ 1,200 ft/s) and found to be Site Class D. This corresponds to a NEHRP amplification factor of 1.6, resulting in a ground surface acceleration of 0.107g. The Peak Transverse Acceleration at the dike crest was estimated using the ground surface acceleration and the procedure proposed by Idriss (2015), resulting in a crest acceleration of 0.32.

The pseudostatic coefficient was calculated based on the simplified procedure developed by Makdisi and Seed (1978). Specifically, the pseudostatic coefficient was taken as the parameter kmax, which represents the peak average acceleration along the failure surface. As shown in Figure 1 below (excerpted from the above reference), the ratio kmax/umax (where umax is the peak acceleration at the crest of the embankment) for a full height failure surface (y/H = 1.0) is 0.34. From the procedure noted above, the anticipated maximum peak crest acceleration is approximately 0.43g. Therefore, the pseudostatic coefficient kh was estimated as kh= 0.34*0.43g = 0.109g for these analyses.

The seismic hazard deaggregation output and calculations for the pseudostatic coefficient are provided at the back of this document.

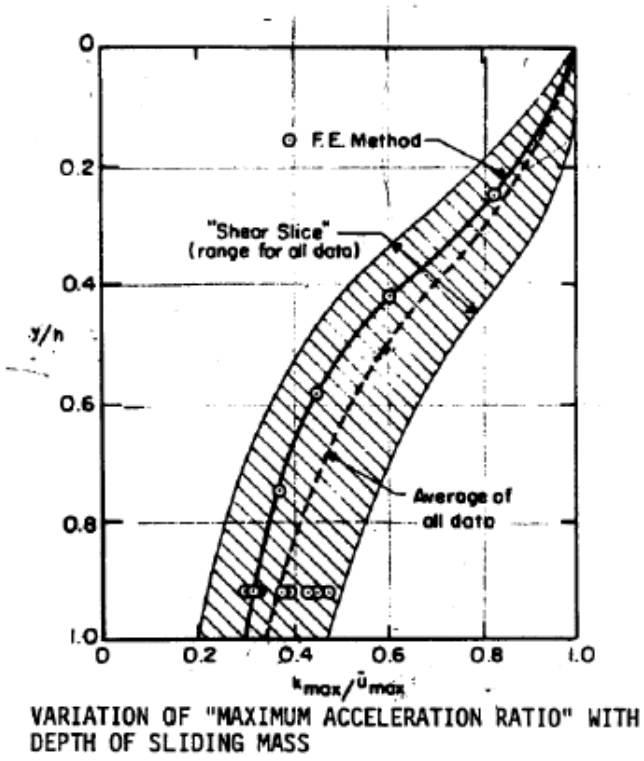


Figure 1: Determination of Maximum Average Acceleration Along Failure Surface

5. Material Properties for Analysis

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from CPT and SPT data. Details of the material characterization and

strength parameter selection for each stratum are provided in Attachment F of this report. The properties used in the stability analysis are summarized in the table below:

Table G-2: Summary of Material Parameters used in Stability Analysis

Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2500	0
Old Embankment 1	125	125	200	28	2500	0
Old Embankment 2	125	125	100	29	1250	0
Native Clay Crust	120	120	200	27.5	1250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly Ash	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	120	200	28	1000	0
Recent Fill	115	115	200	30	1250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1000	36	1000	36

6. Results

Table G-3 summarizes the results of the stability analyses for each section, and output figures from the SLOPE/W models are provided at the back of this document.

Table G-3: Summary of Minimum Slope Stability Factors

Cross Section	Factor of Safety		
	Drained		Undrained
	Steady State (Normal Pool)	Surcharge Pool (Flood)	Seismic (Pseudostatic)
CCR Rule Criteria	*FS ≥ 1.50*	*FS ≥ 1.40*	*FS ≥ 1.00*
A	2.02	2.02	1.37
B	1.59	1.59	1.28
C	1.83	1.82	1.09
D	1.79	1.79	1.18
E	1.54	1.54	1.11
F	2.31	2.31	1.08
G	2.12	2.12	1.13
H	2.08	2.08	1.08
I	2.26	2.26	1.30
J	2.08	2.58	2.00

7. Conclusions

Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool, and seismic (pseudo-static). The calculated factors of safety from the limit equilibrium slope stability analysis satisfy the USEPA CCR Rule § 257.73(e) requirements for all the load cases analyzed at the critical analysis sections for the perimeter of the impoundment. Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool and seismic (pseudo-static).

8. References

AECOM (2016). Hydrologic and Hydraulic Summary Report for Edwards Power Generating Station, Cooling Pond and Clarification Pond CCR Units.

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Makdisi, F.I. and Seed, B. H., August, 1977. "A Simplified Procedure for Estimating Earthquake-Induced Deformations in Dams and Embankments", Earthquake Engineering Research Center Report No. UCB/EERC-77/19, University of California, Berkeley, CA.

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U.S. Environmental Protection Agency [USEPA]. (2015). Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. 40 CFR §257. Federal Register 80, Subpart D, April 17, 2015.

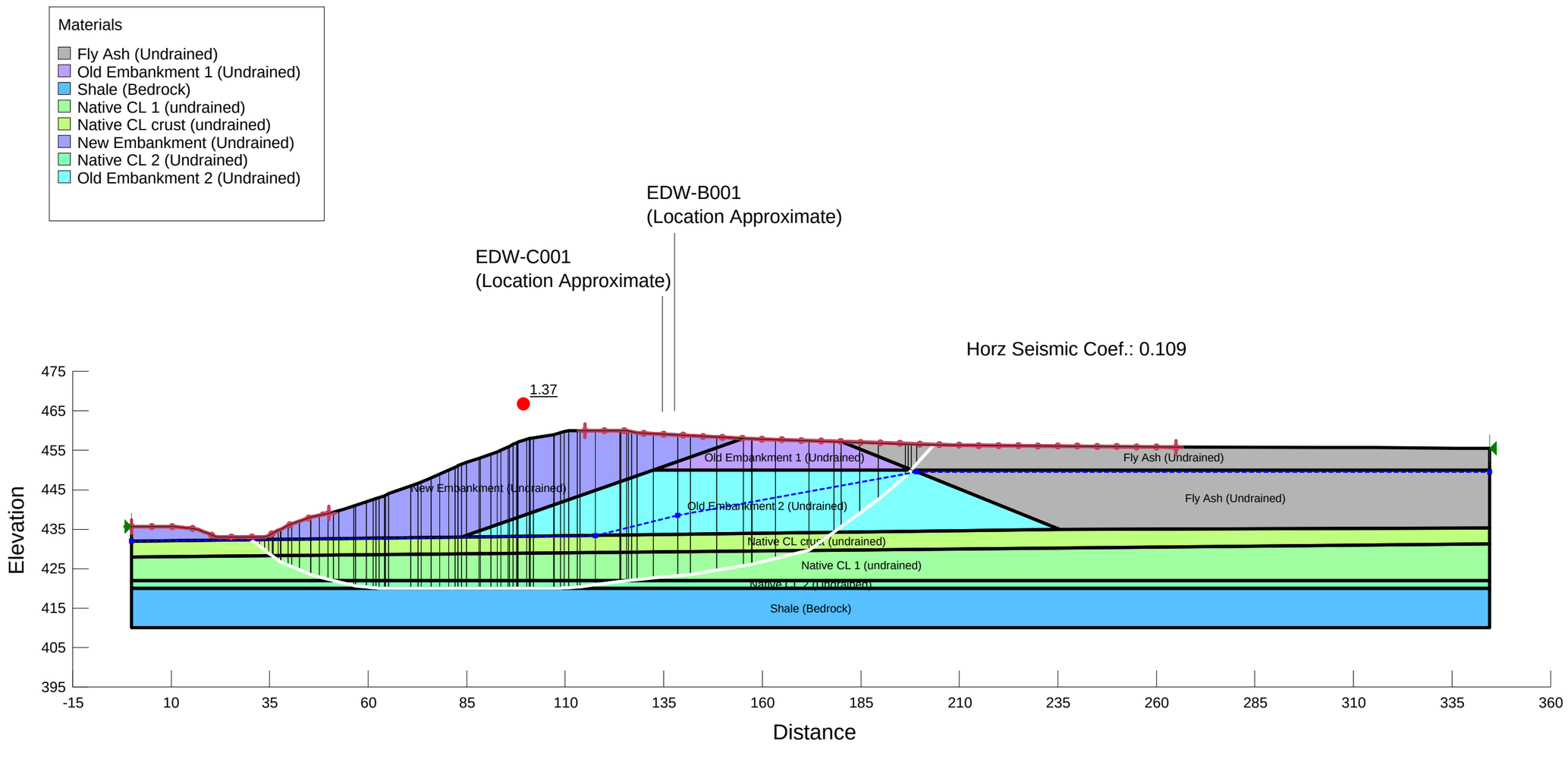
9. Attachments

G.1 Slope Stability Analysis Output Data
G.2 Seismic Parameter Calculations

Attachment G.1 Slope Stability Analysis Output Data

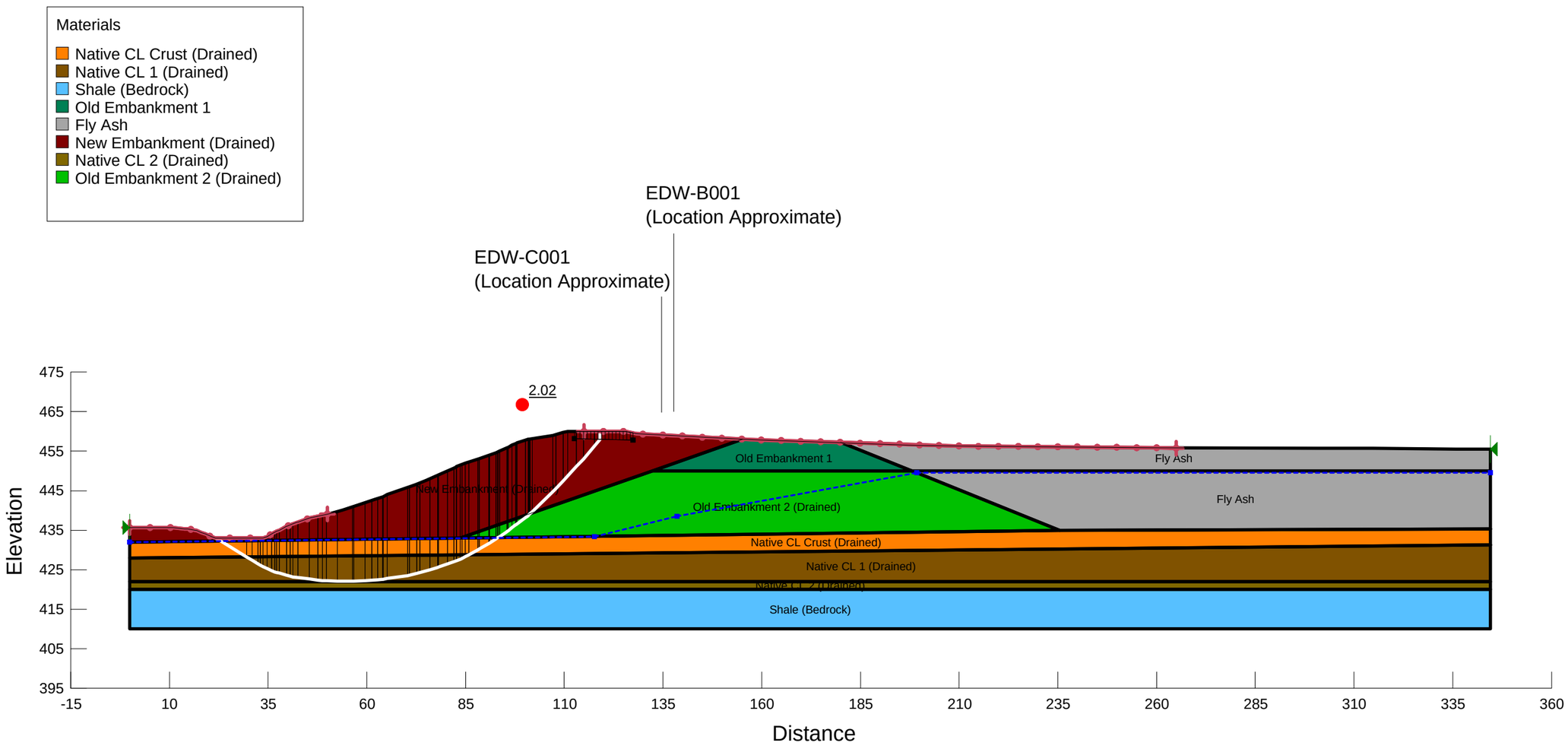
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section A
Slope Stability - Seismic



Dynegy Edwards
Cross-section A
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



Dynegy Edwards
Cross-section A
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
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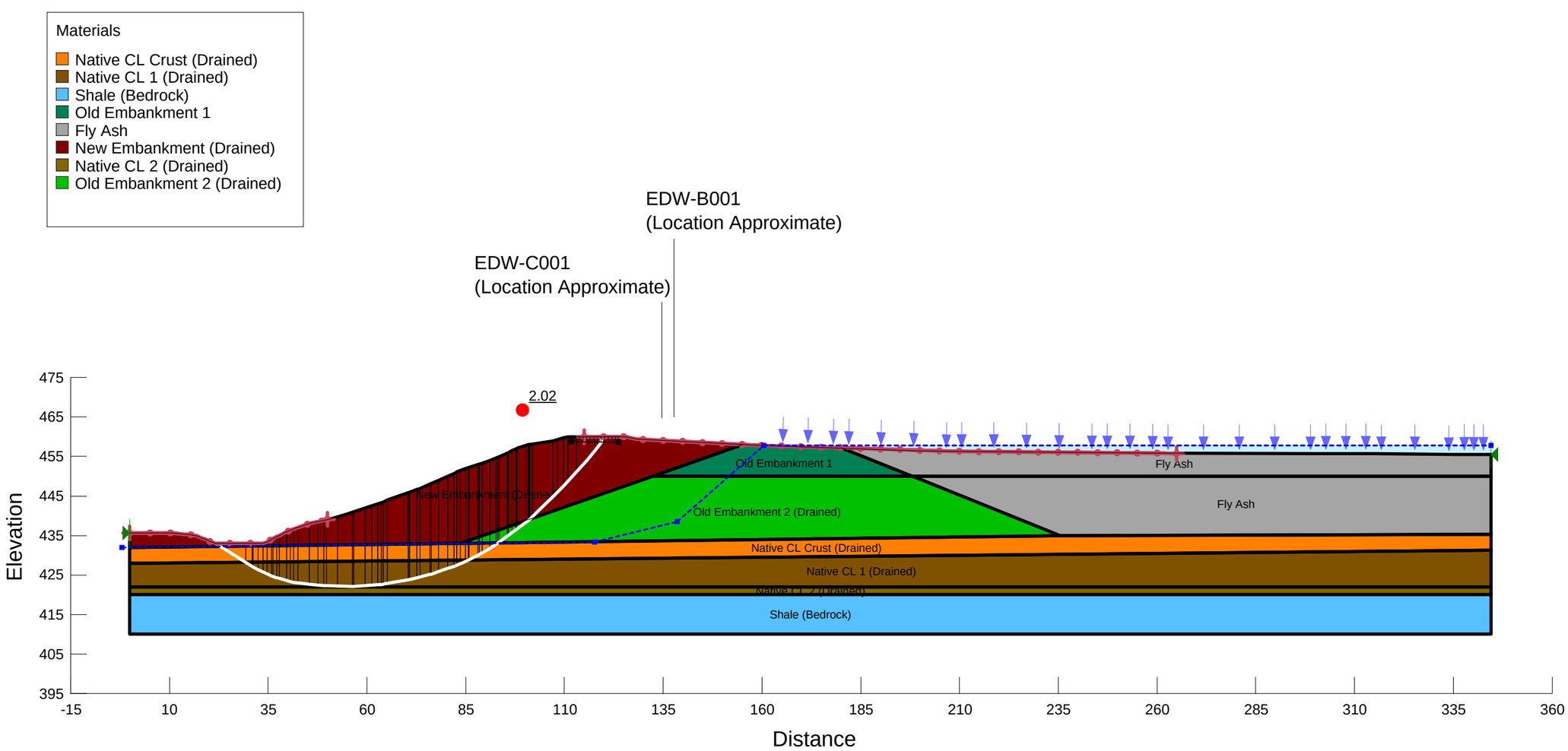


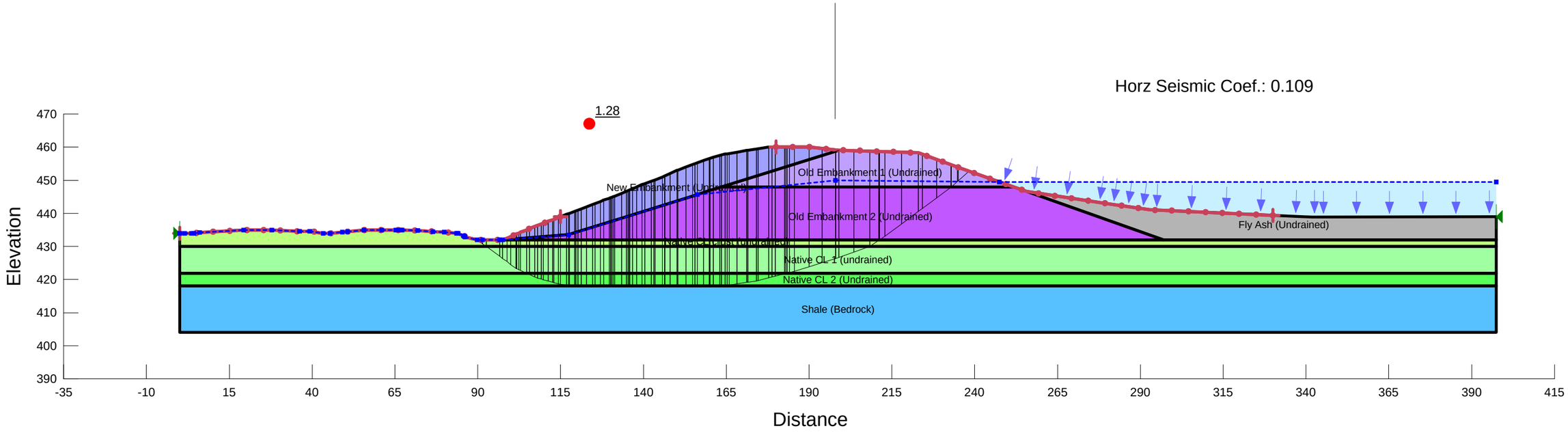
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section B
Slope Stability - Seismic

Materials
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- Old Embankment 2 (Undrained)
- Native CL 2 (Undrained)

EDW-B010
EDW-C023
(Location Approximate)

Horz Seismic Coef.: 0.109

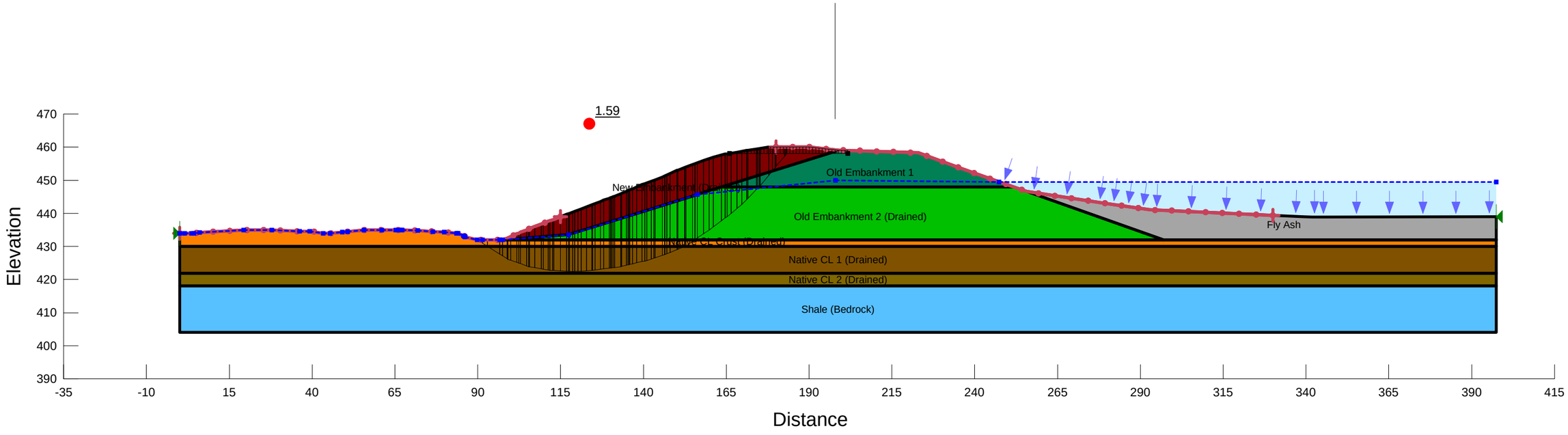


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section B
Slope Stability - Steady State

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- Old Embankment 2 (Drained)
- Native CL 2 (Drained)

EDW-B010
EDW-C023
(Location Approximate)

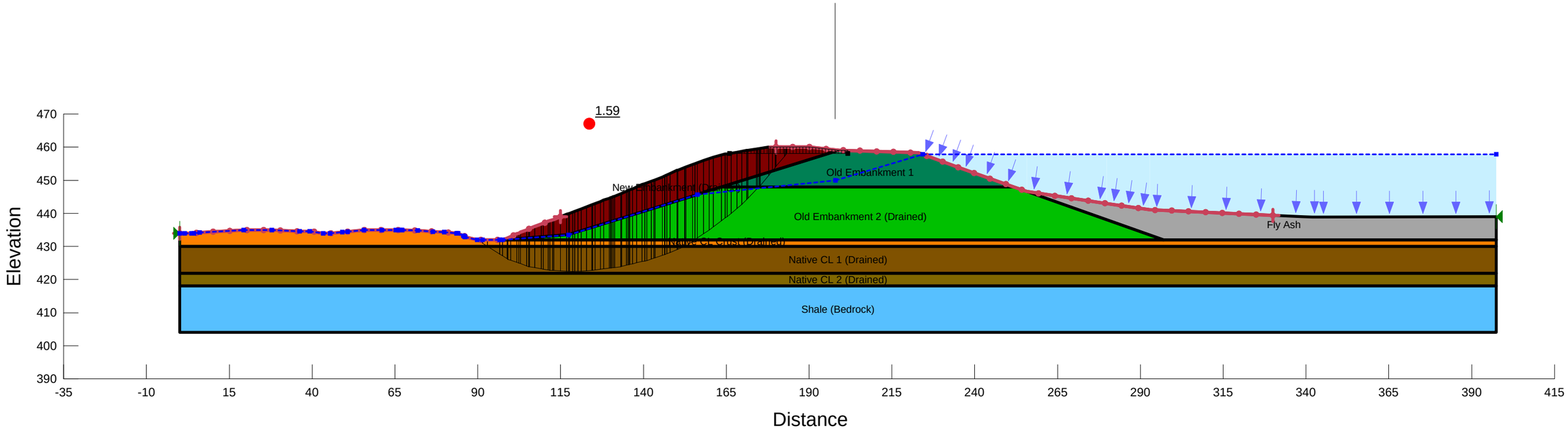


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section B
Slope Stability - Surcharge Pool

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- Old Embankment 2 (Drained)
- Native CL 2 (Drained)

EDW-B010
EDW-C023
(Location Approximate)



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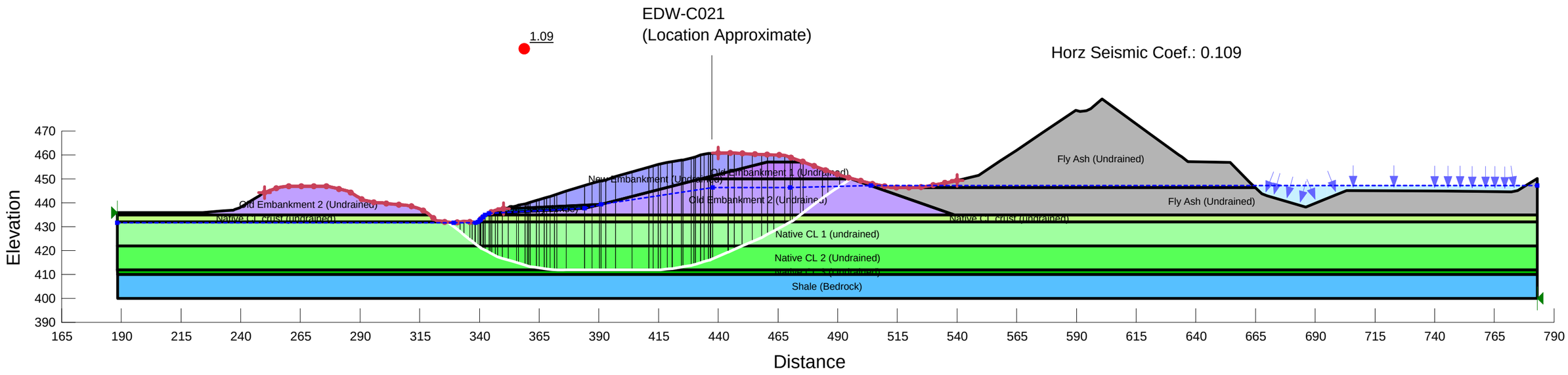
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1

Dynegy Hennepin
Cross-section C
Slope Stability - Seismic

Materials

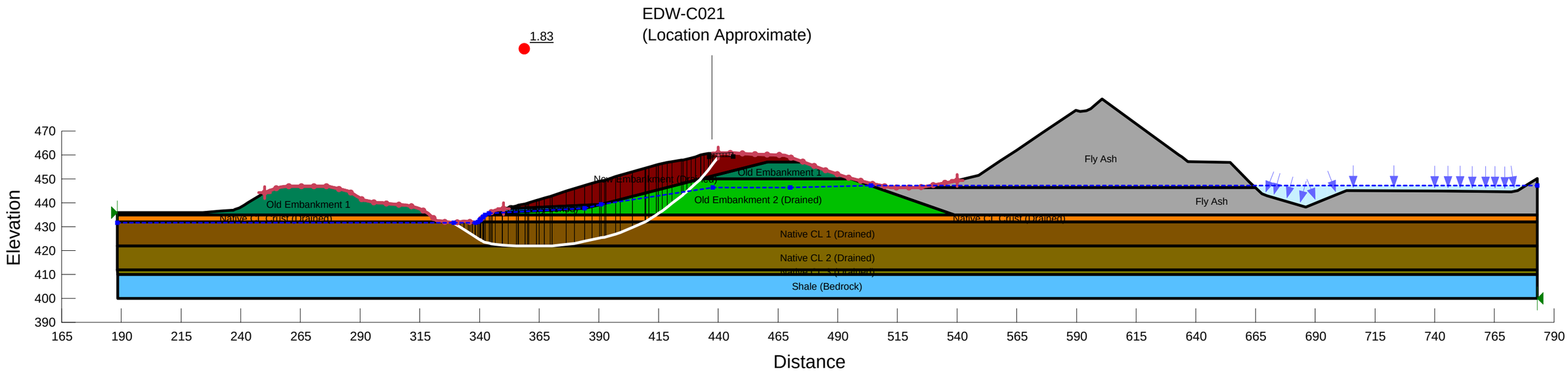
- Fly Ash (Undrained)
- Old Embankment 2 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 1 (Undrained)



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Hennepin
Cross-section C
Slope Stability - Steady State

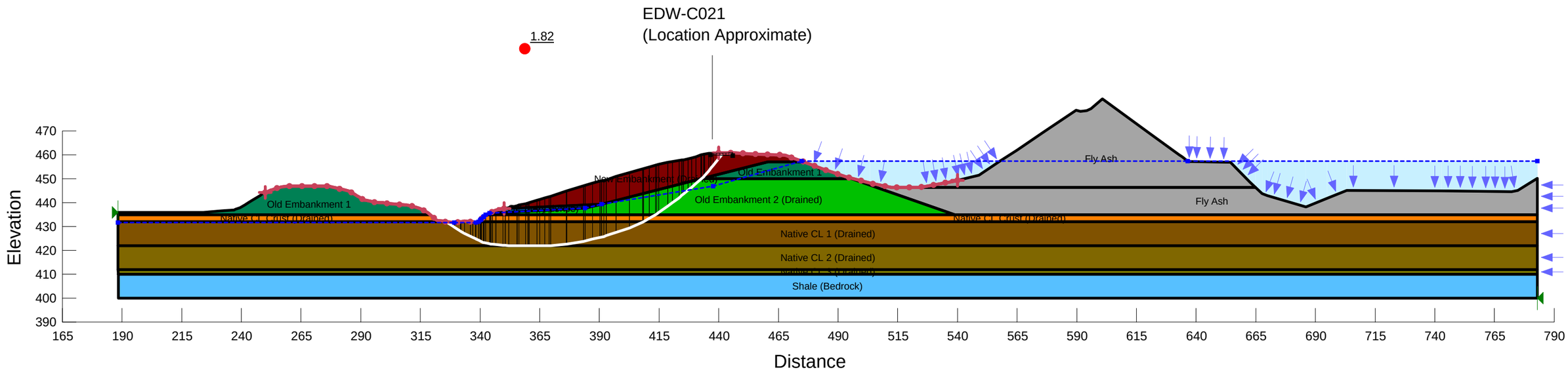
Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2 (Drained)



Dynegy Hennepin
Cross-section C
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2 (Drained)



Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
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Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

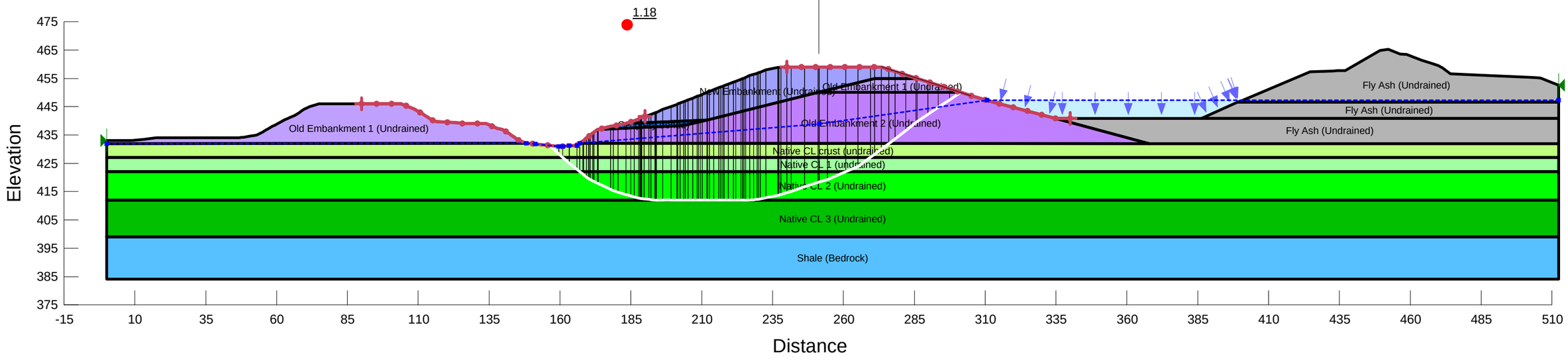
Dynegy Edwards
Cross-section D
Slope Stability - Seismic

Materials

- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)

EDW-B012
EDW-C017
(Location Approximate)

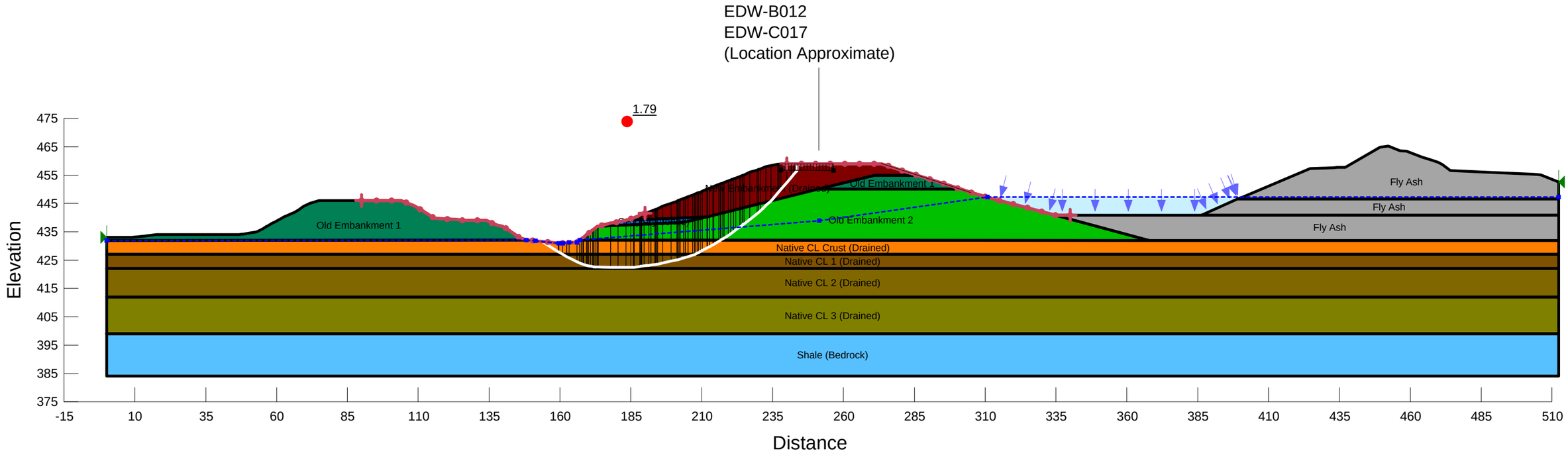
Horz Seismic Coef.: 0.109



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section D
Slope Stability - Steady State

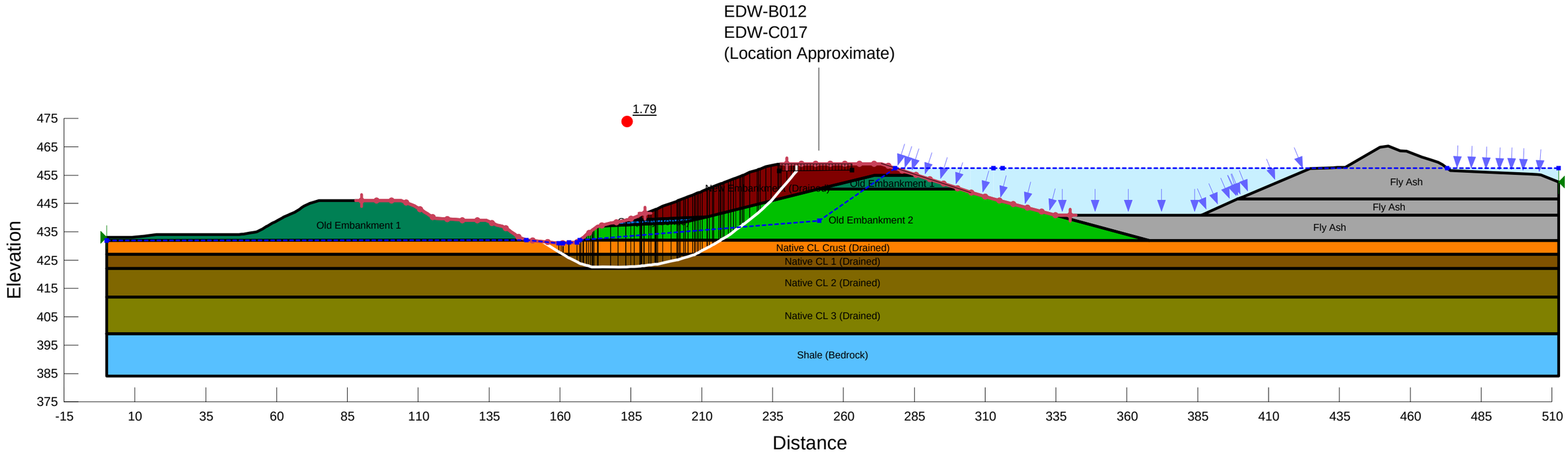
Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section D
Slope Stability - Surcharge Pool

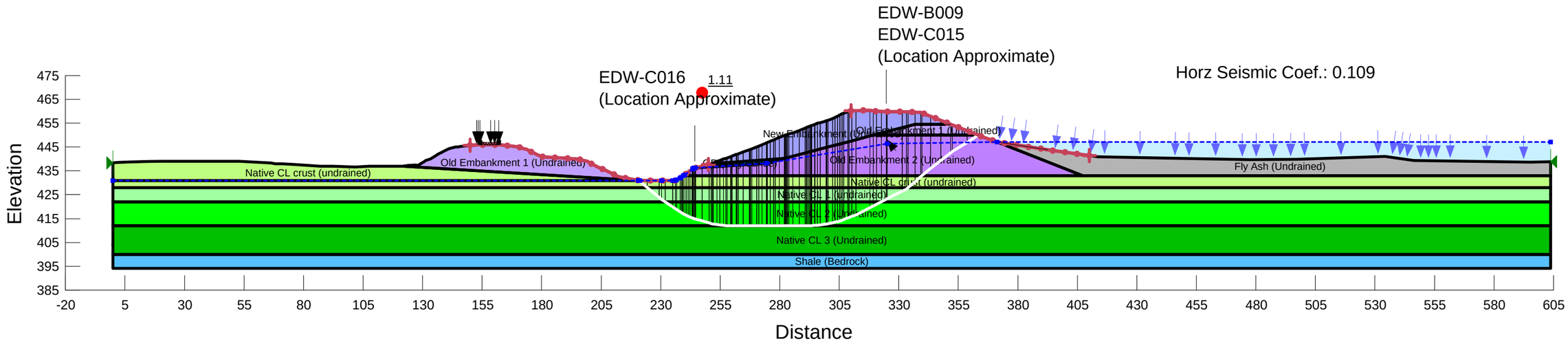
Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Seismic

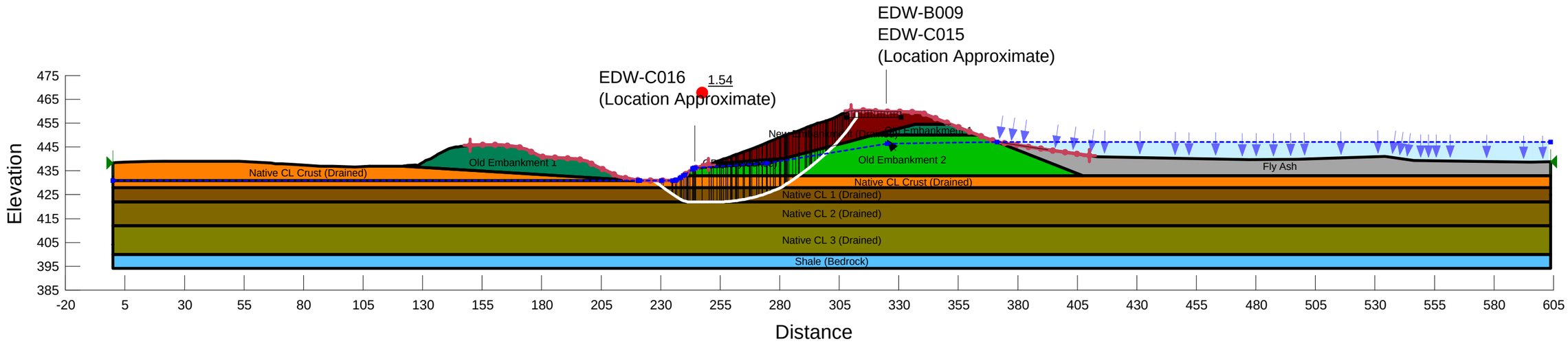
Materials
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Steady State

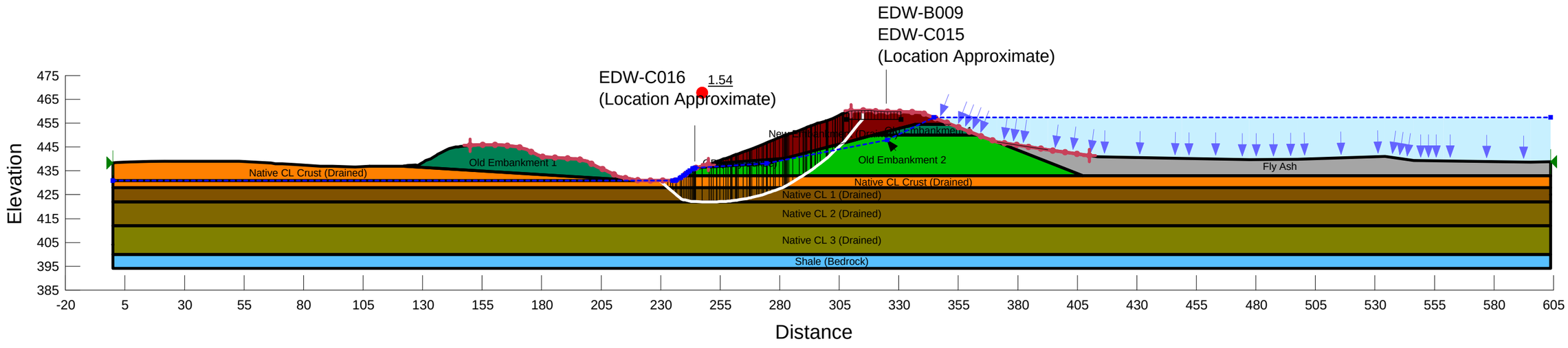
Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Surcharge Pool

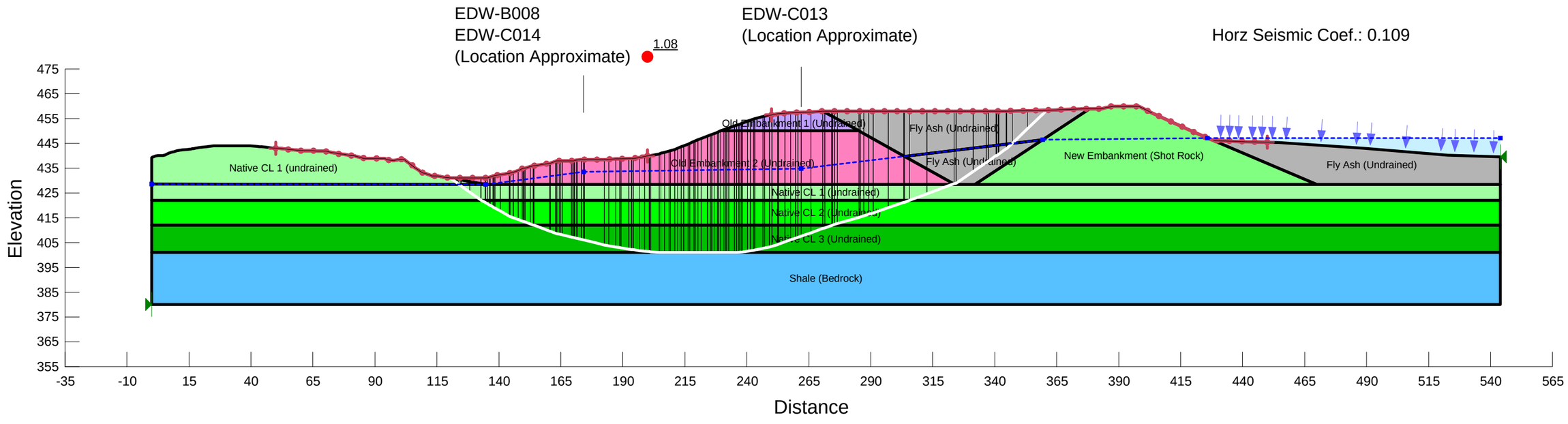
Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section F
Slope Stability - Seismic

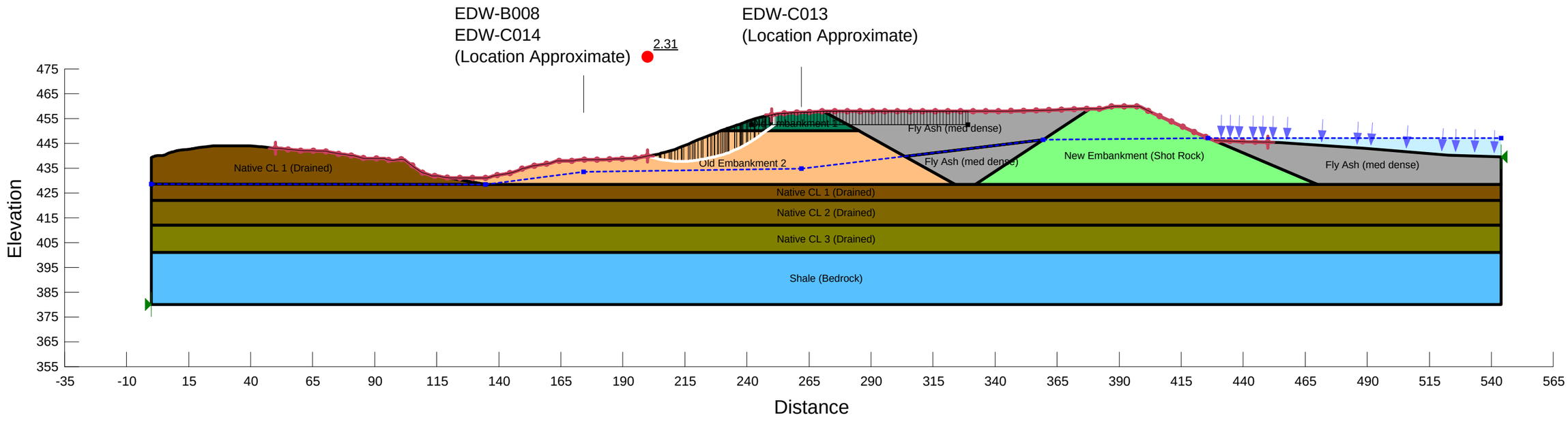
Materials
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- New Embankment (Shot Rock)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)



Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section F
Slope Stability - Steady State

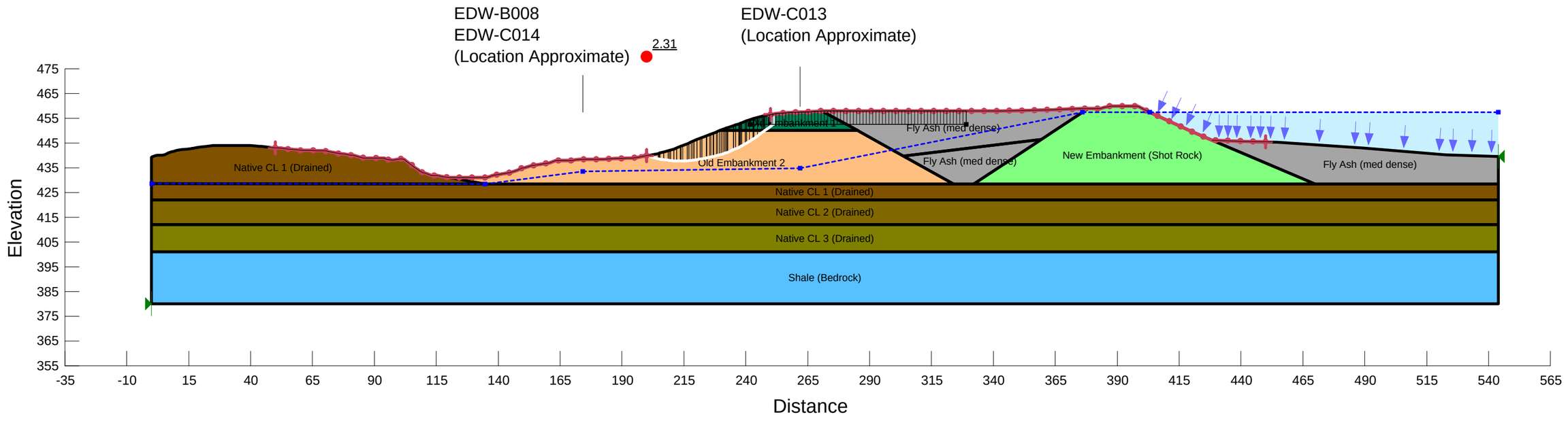
Materials
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Shot Rock)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

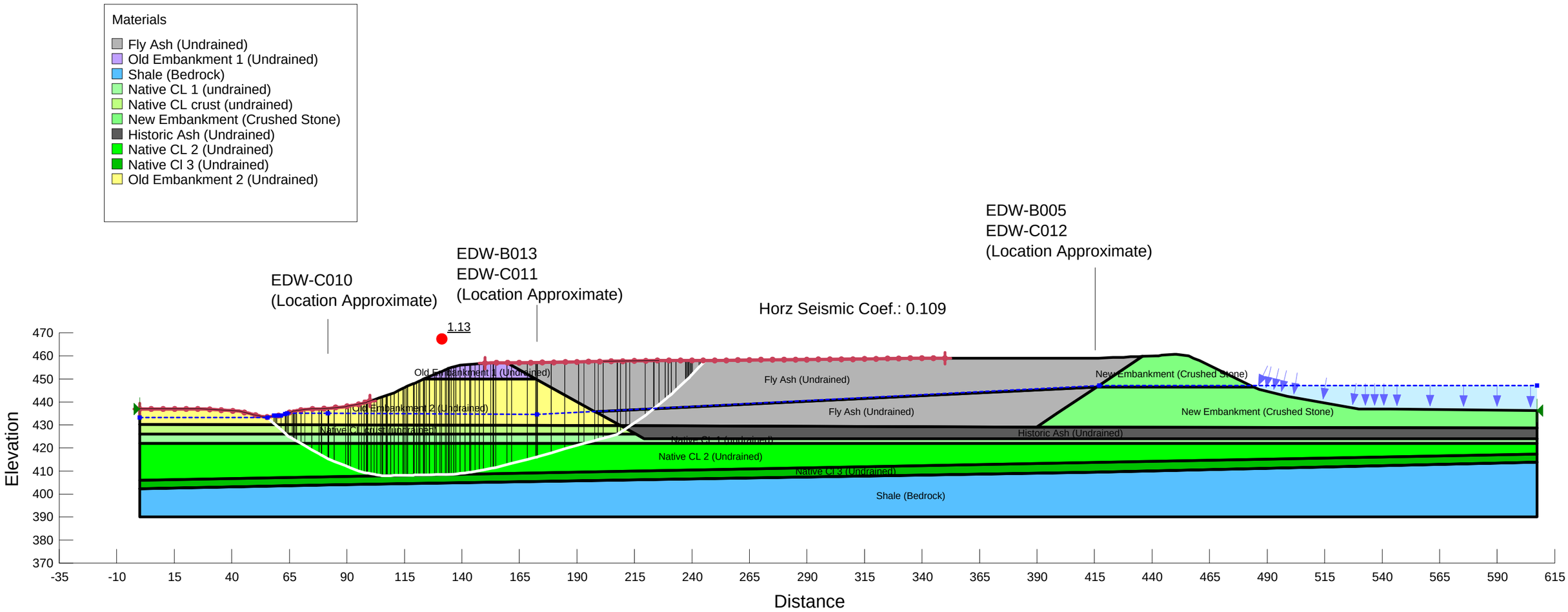
Dynegy Edwards
Cross-section F
Slope Stability - Surcharge Pool

Materials
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Shot Rock)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



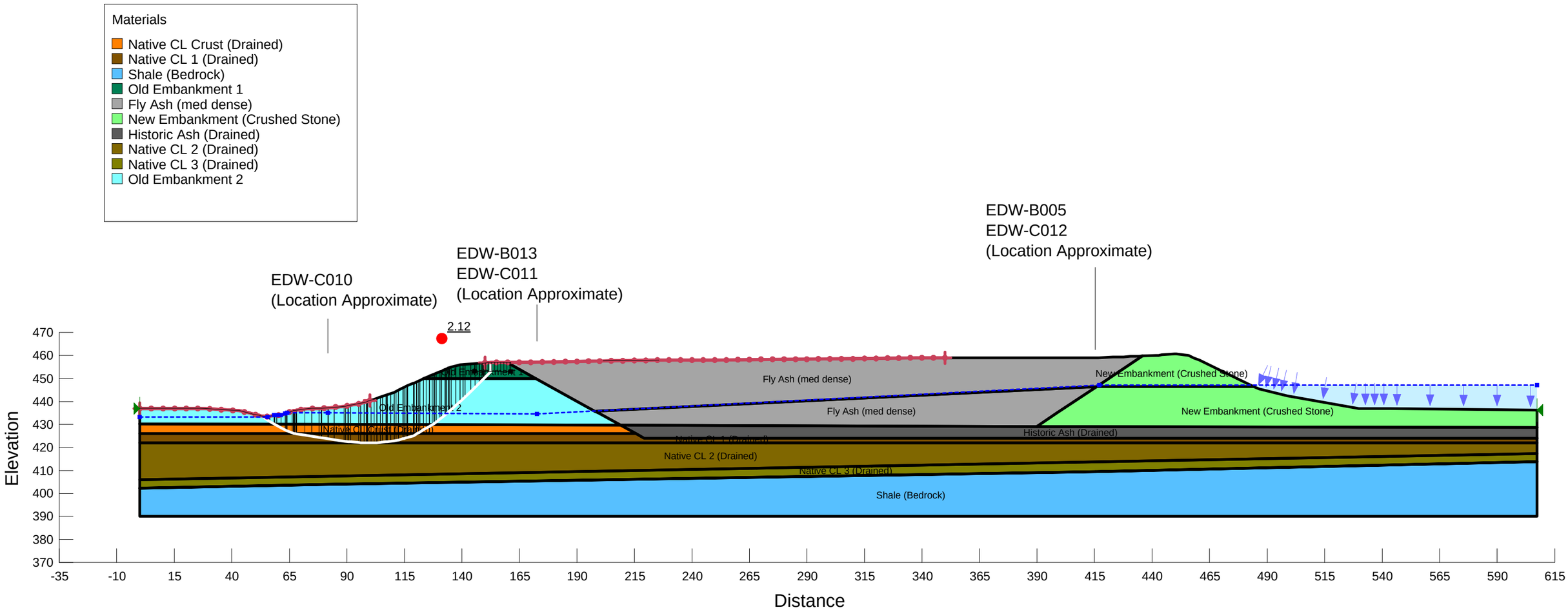
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native Cl 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section G
Slope Stability - Seismic



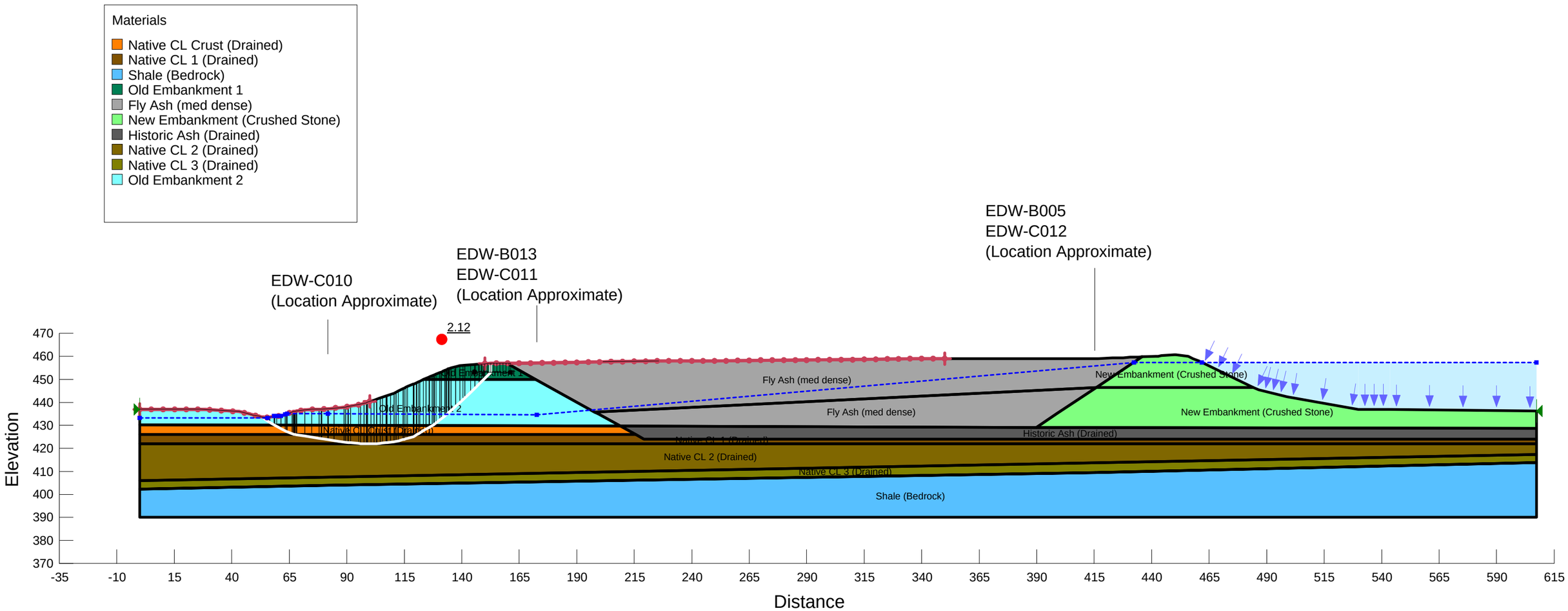
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section G
Slope Stability - Steady State



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

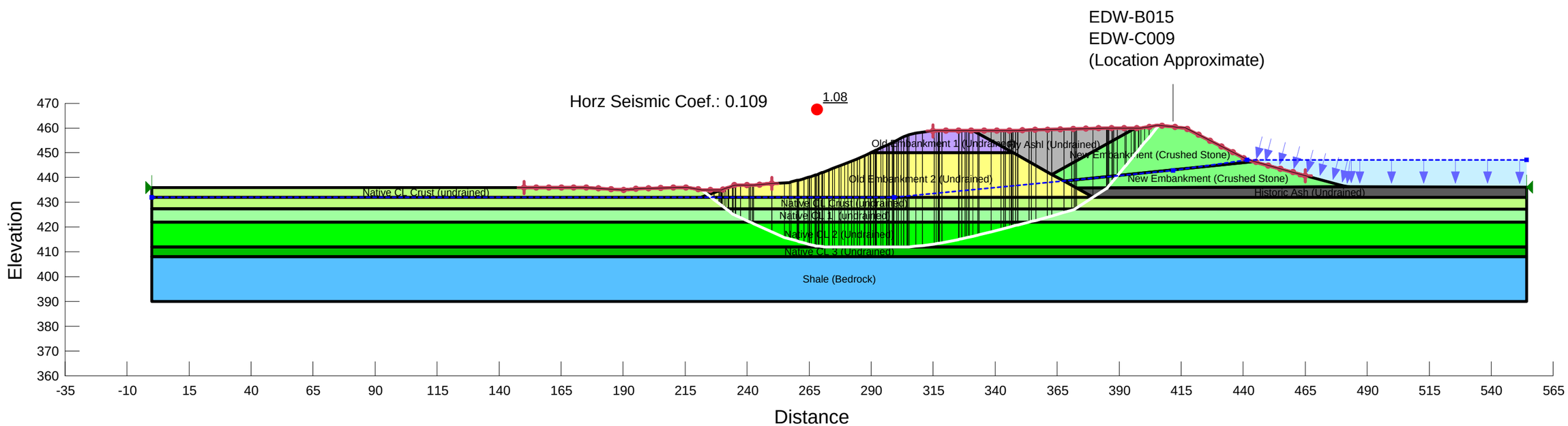
Dynegy Edwards
Cross-section G
Slope Stability - Surcharge Pool



Name: Fly Ashl (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL Crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 117 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section H
Slope Stability - Seismic

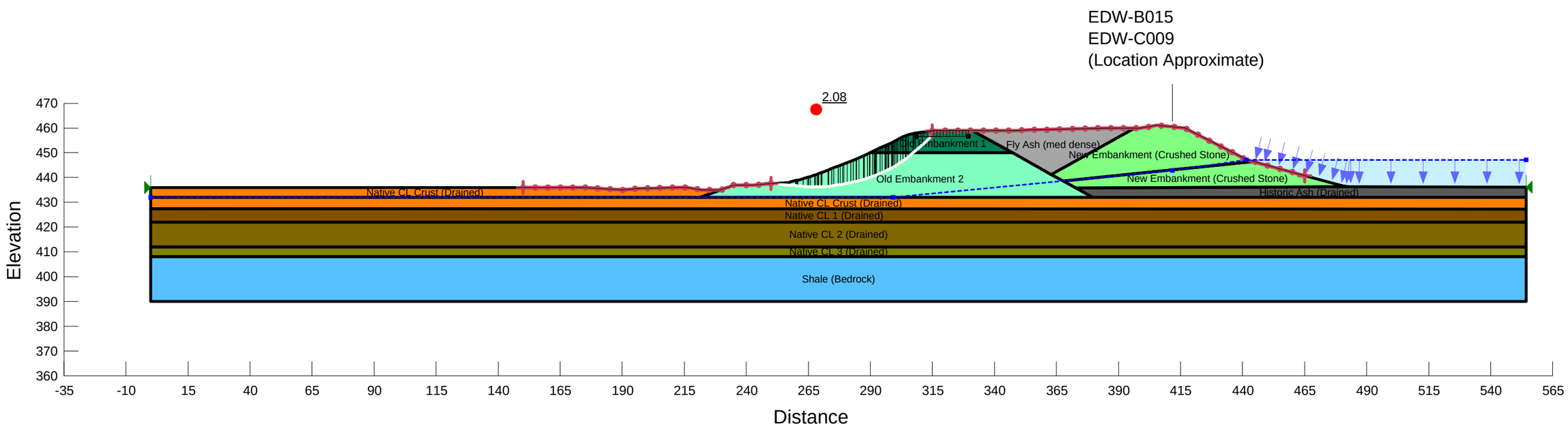
Materials
- Fly Ashl (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL Crust (undrained)
- New Embankment (Crushed Stone)
- Historic Ash (Undrained)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

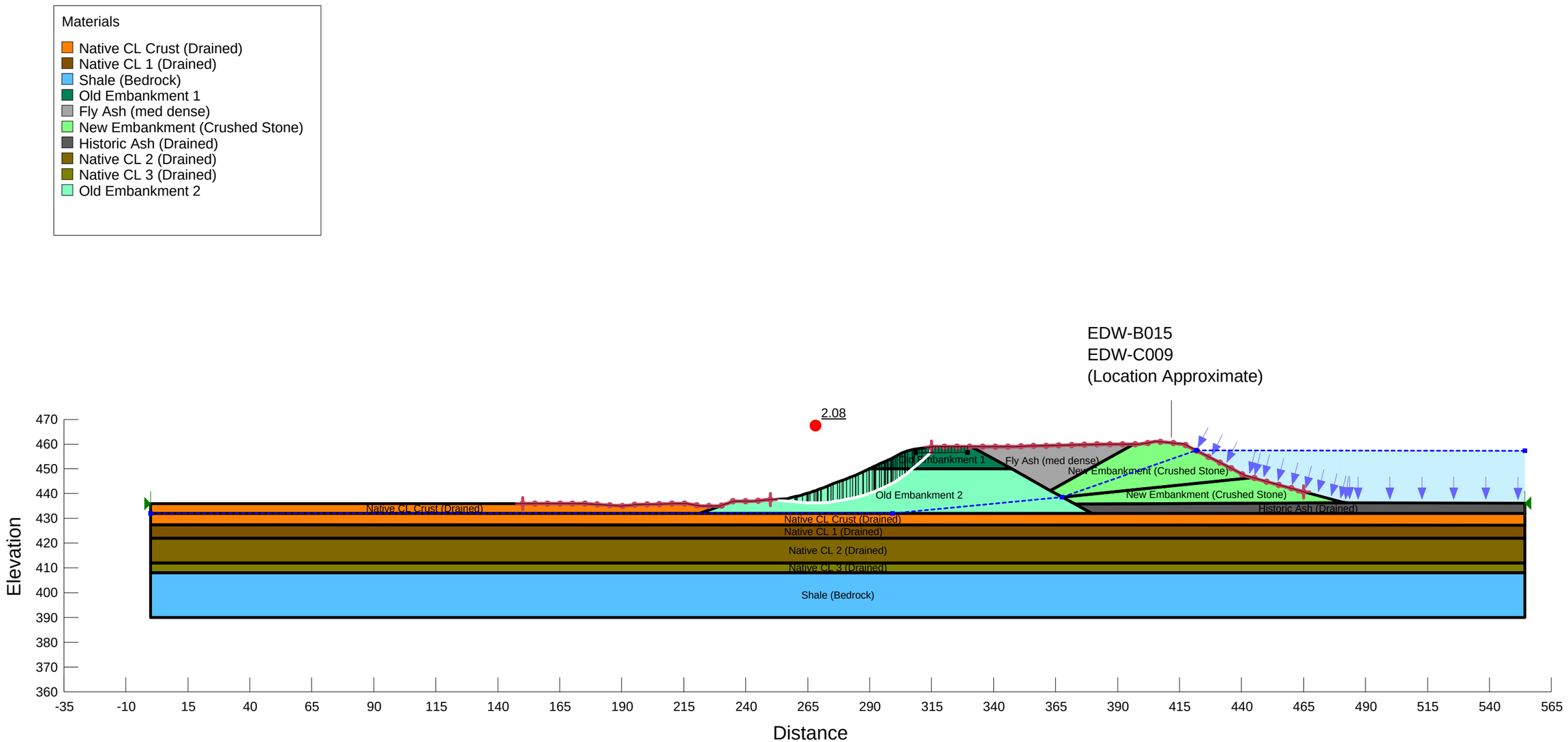
Dynegy Edwards
Cross-section H
Slope Stability - Steady State

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Crushed Stone)
- Historic Ash (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section H
Slope Stability - Surcharge Pool



Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1

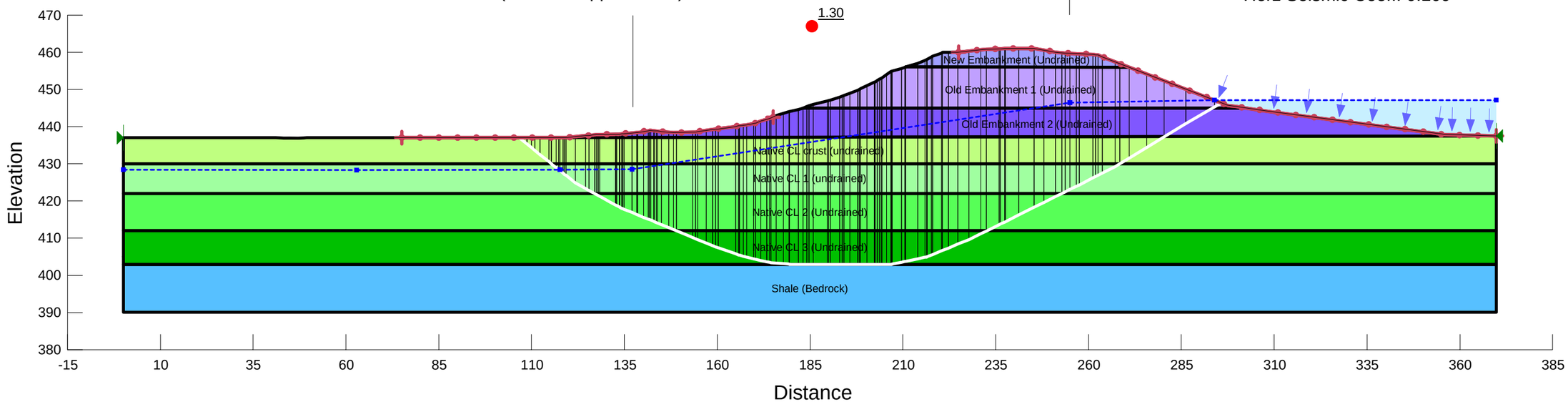
Dynegy Edwards
Cross-section I
Slope Stability - Seismic

Materials
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- Native CL 2 (Undrained)
- Old Embankment 2 (Undrained)
- Native CL 3 (Undrained)

EDW-C007
(Location Approximate)

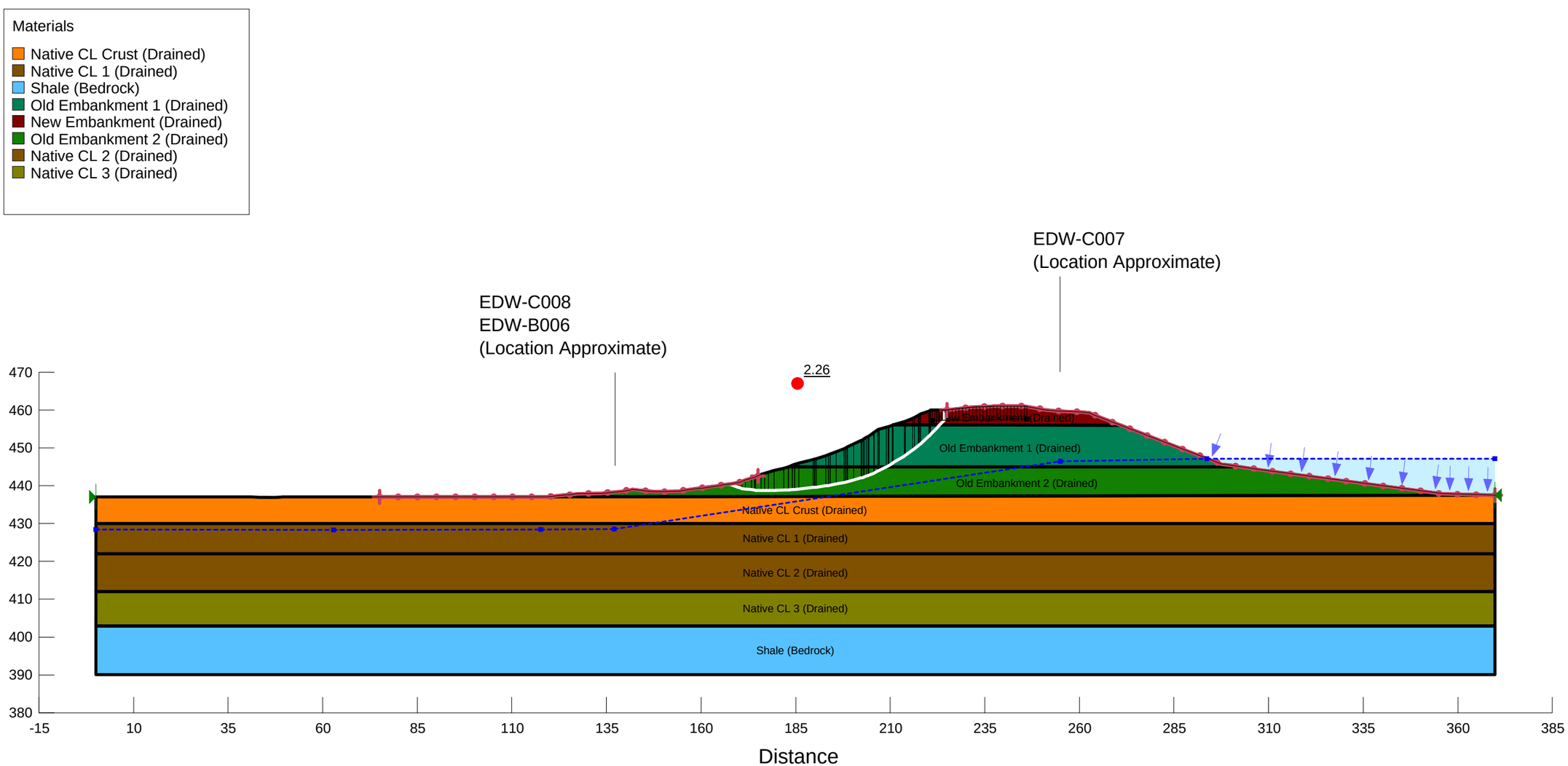
EDW-C008
EDW-B006
(Location Approximate)

Horz Seismic Coef.: 0.109



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section I
Slope Stability - Steady State



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Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
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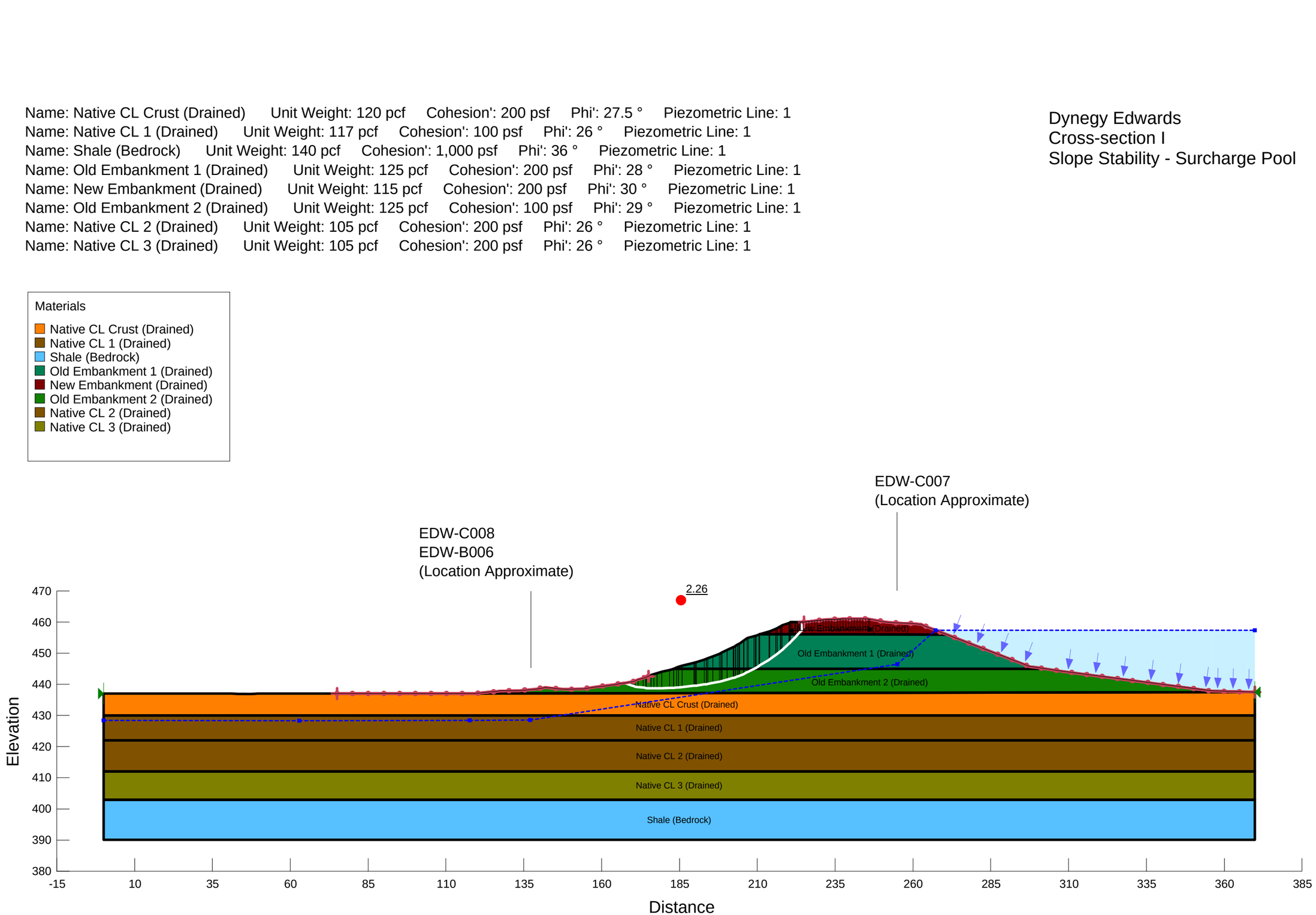
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section I
Slope Stability - Surcharge Pool

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1 (Drained)
- New Embankment (Drained)
- Old Embankment 2 (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)



Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
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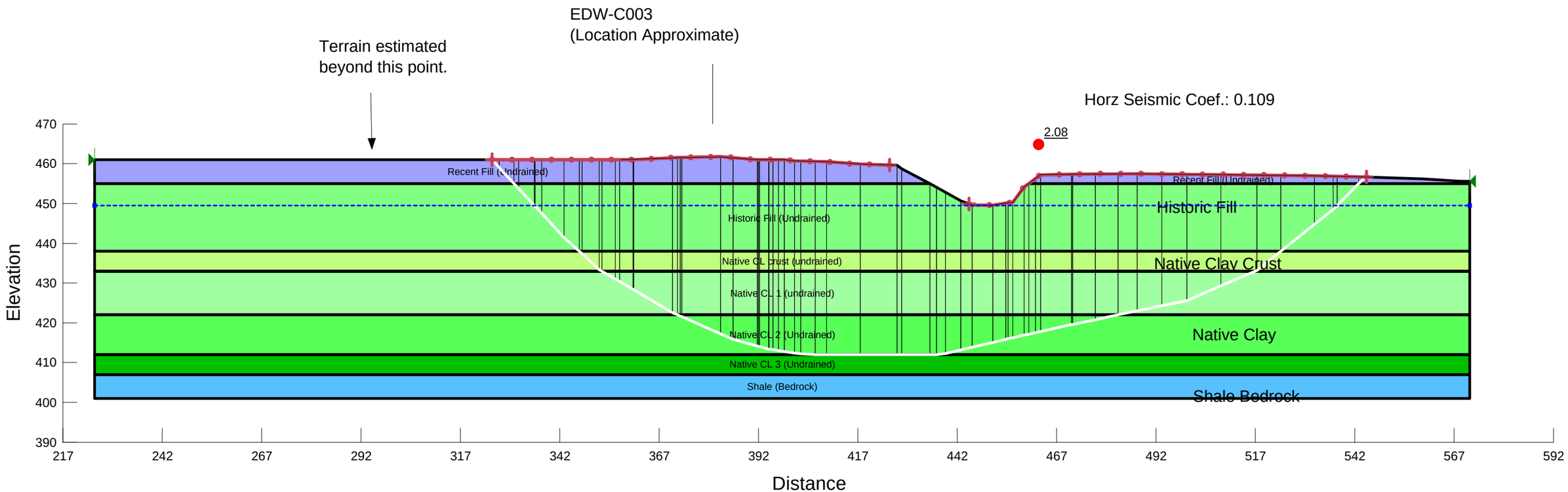
Name: Historic Fill (Undrained) Unit Weight: 125 pcf Cohesion': 1,000 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1

Dynegy Edwards
Cross-section J
Slope Stability - Seismic

Materials
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- Recent Fill (Undrained)
- Historic Fill (Undrained)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)



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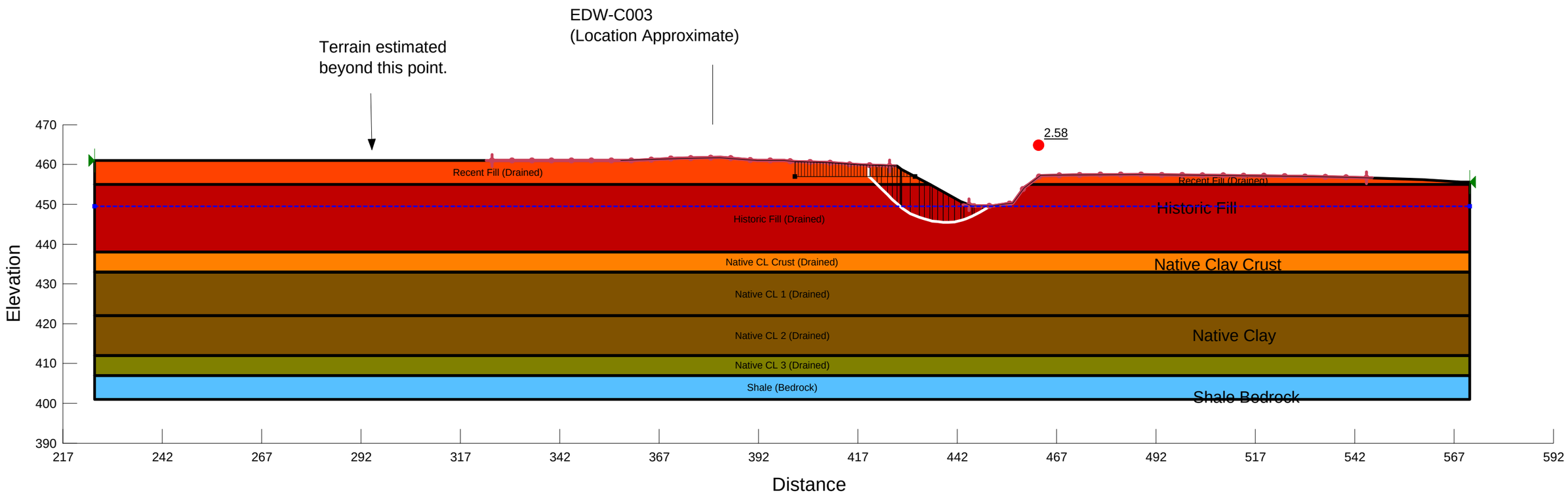
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Recent Fill (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section J
Slope Stability - Steady-State

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Historic Fill (Drained)
- Recent Fill (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)



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Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
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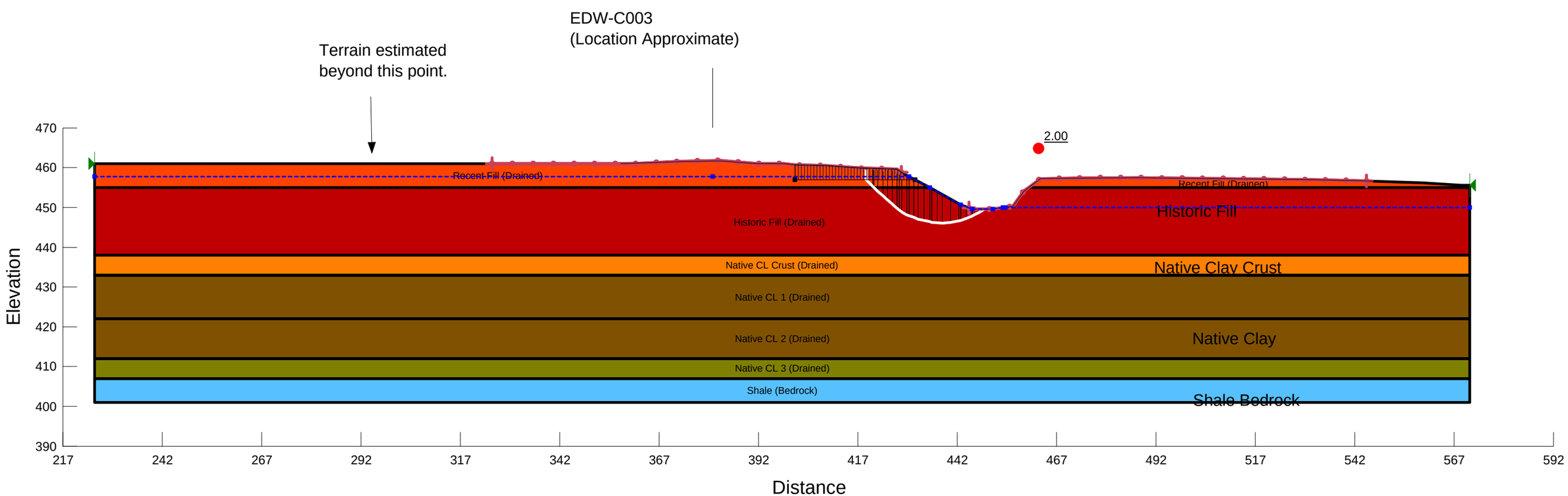
Dynegy Edwards
Cross-section J
Slope Stability - Surcharge Pool

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Historic Fill (Drained)
- Recent Fill (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)



Attachment G.2 Seismic Parameter Calculations

Calculation of K_h for Pseudostatic Analysis

Calc By:	AJW
Date:	2/15/2016

Objective: Estimate kh for pseudostatic analysis.

Given: Seismic Hazard Deaggregation with PGA_{BC} = 0.067, M=6.8
Site Class D, based on IBC (2008)
FPGA = 1.6, based on NEHRP (2009)
Holzer (1998) Figure for estimation of crest acceleration
Makdisi Seed (1978) Figure for Max Acc of Slide Mass

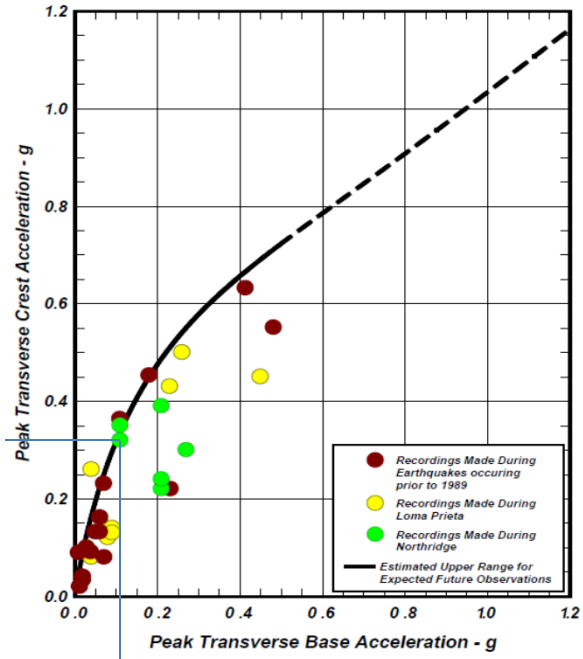


Figure 3. Variations of Recorded Peak Crest Accelerations versus those Recorded at the Base of Earth and Rock Fill Dams by Idriss (2015). Source of recorded values for Loma Prieta Earthquake and prior earthquakes: Holzer, (1998).

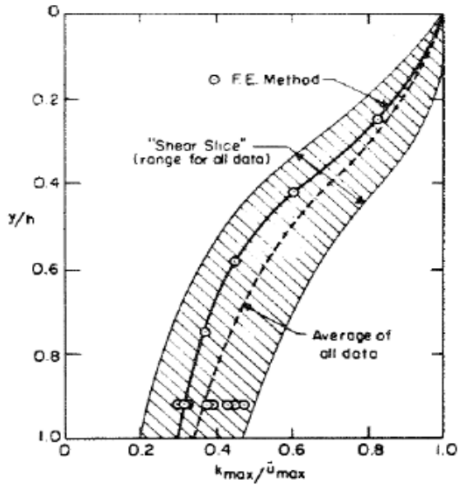


Figure 4. Variations of Maximum Acceleration Ratio with Depth of Sliding Mass (Makdisi and Seed, 1977). Maximum Acceleration Ratio is the Ratio between $(PGA)_{base\ of\ slide\ mass}$ and $(PGA)_{crest}$

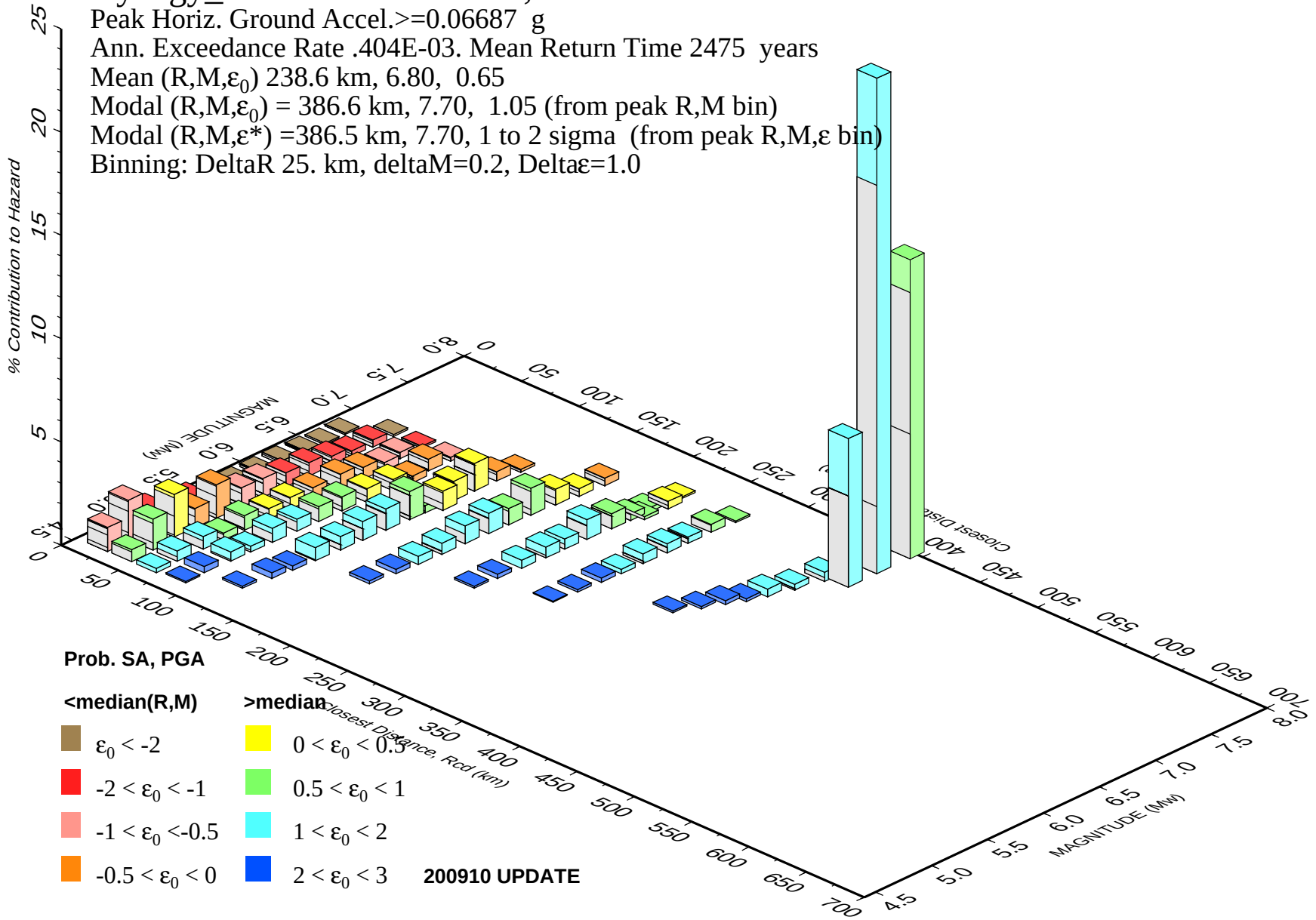
PGA_{BC}	Site class	F_{PGA}	PGA_{BASE}	PGA_{CREST}	Makdisi -Seed reduction for full height failure	k_h
0.06687	D	1.6	0.107	0.32	0.34	0.109

Results:

Use k_h = 0.109 for pseudostatic analyses.

PSH Deaggregation on NEHRP BC rock
Dynegy_Edwards 89.668º W, 40.593 N.

Peak Horiz. Ground Accel.>=0.06687 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 238.6 km, 6.80, 0.65
Modal (R,M,ε_0) = 386.6 km, 7.70, 1.05 (from peak R,M bin)
Modal (R,M,ε*) =386.5 km, 7.70, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Deltaε=1.0



Appendix I

Groundwater Monitoring Plan

Intended for
Illinois Power Resources Generating, LLC

Date
October 25, 2021

Project No.
1940100806-004

GROUNDWATER MONITORING PLAN

ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT ASH POND

Project name	**Edwards Power Plant Ash Pond**
Project no.	**1940100806-004**
Recipient	**Illinois Power Resources Generating, LLC**
Document type	**Groundwater Monitoring Plan**
Revision	**FINAL**
Date	**October 25, 2021**

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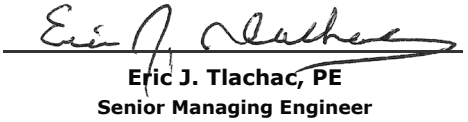
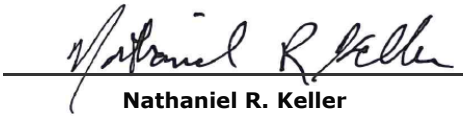


Eric J. Tlachac, PE
Senior Managing Engineer

Scott S. Woods
Hydrogeologist



Nathaniel R. Keller
Senior 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, Edwards Power Plant Ash Pond), 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, Edwards Power Plant Ash Pond), 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

Licensed Professional Certifications		**2**
1.	**Introduction**	**6**
1.1	Overview	6
1.2	Site Location and Background	6
1.3	Conceptual Model	7
2.	**Groundwater Monitoring**	**9**
2.1	Existing Monitoring Well Network and Analysis	9
2.1.1	40 C.F.R. § 257 Monitoring	9
2.1.2	Part 845 Well Installation and Monitoring	10
2.2	Proposed Part 845 Monitoring Well Network	11
2.3	Well Abandonment	12
3.	**Applicable Groundwater Quality Standards**	**13**
3.1	Groundwater Classification	13
3.2	Statistical Evaluation of Background Groundwater Data	13
3.3	Applicable Groundwater Quality Standards	13
4.	**Groundwater Monitoring Plan**	**15**
4.1	Monitoring Networks and Parameters	15
4.1.1	40 C.F.R. § 257 Groundwater Monitoring	15
4.1.2	Part 845 Groundwater Monitoring	15
4.2	Sampling Schedule	16
4.3	Groundwater Sample Collection	16
4.3.1	Methane Monitoring Plan	16
4.4	Laboratory Analysis	17
4.5	Quality Assurance Program	17
4.6	Groundwater Monitoring System Maintenance Plan	17
4.7	Statistical Analysis	18
4.8	Data Reporting	18
4.9	Compliance with Applicable On-site Groundwater Protection Standards	18
4.10	Alternate Source Demonstrations	19
4.11	Assessment of Corrective Measures and Corrective Action	19
5.	**References**	**21**

TABLES (IN TEXT)

Table A 40 C.F.R. § 257 Groundwater Monitoring Program Parameters
Table B Part 845 Groundwater Monitoring Program Parameters
Table C Proposed Part 845 Monitoring Well Network
Table D Part 845 Groundwater Monitoring Program Parameters
Table E Part 845 Sampling Schedule

TABLES (ATTACHED)

Table 1-1 Part 845 Requirements Checklist
Table 2-1 Monitoring Well Locations and Construction Details
Table 3-1 Background Groundwater Quality and Standards
Table 4-1 Sampling and Analysis Summary
Table 4-2 Detection and Reporting Limits for Part 845 Parameters

FIGURES

Figure 1-1 Site Location Map
Figure 1-2 Site Map
Figure 1-3 Uppermost Aquifer Groundwater Elevation Contours – February 9, 2021
Figure 2-1 Proposed Part 845 Groundwater Monitoring Well Network

APPENDICES

Appendix A Statistical Analysis Plan

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
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	coal combustion residuals
cm/s	centimeters per second
EPP	Edwards Power Plant
ft/ft	feet per feet
ft/day	feet per day
GMP	Groundwater Monitoring Plan
GWPS	Groundwater Protection Standard
HCR	Hydrogeologic Site Characterization Report
ID	identification
IEPA	Illinois Environmental Protection Agency
IPRG	Illinois Power Resources Generating, LLC
LEL	lower explosive limit
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	Number
NRT	Natural Resources Technology, Inc.
Part 845	Standards for the Disposal of Coal Combustion 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
USEPA	United States Environmental Protection Agency

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 Edwards Power Plant (EPP) (**Figure 1-1**), operated by Illinois Power Resources Generating, LLC (IPRG). This report will apply specifically to the CCR Unit referred to as the Ash Pond (Vistra identification [ID] number [No.] 301, IEPA ID No. W1438050005-01, and National Inventory of Dams (NID) No. IL50710). The Ash Pond is a 91-acre unlined CCR SI used to manage CCR and non-CCR waste streams at the EPP. 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 the Ash Pond at EPP.

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.

During field activities in 2021 methane was detected above 10% of the lower explosive limit (LEL) at borehole monitoring well locations AW-13, AW-14, AW-15, AW-15C, AW-16, AW-17, AW-22, and P002. Levels quickly dissipated after venting the monitoring wells to the atmosphere. A methane monitoring plan must be used for the safe completion of field activities, including groundwater sampling at EPP.

1.2 Site Location and Background

The EPP is located in Peoria County between Mapleton and Bartonville in Section 11, Township 7 North, Range 7 East (**Figure 1-1**). The EPP is located on the floodplain of the Illinois River adjacent to a levee and has one CCR SI, the Ash Pond, covering approximately 91 surface acres.

The EPP is situated in a predominantly agricultural area with industrial properties bordering the property. Historically, several coal mines were operated at depths of 100 to 160 feet below ground surface (bgs) in the vicinity of the EPP. The EPP property is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and fertilizer production facility to the east, and agricultural land to the south. **Figure 1-1** shows the location of the EPP; **Figure 1-2** is a site map showing the location of the Ash Pond (a Part 845 regulated CCR Unit and the subject of this GMP).

The Ash Pond was investigated in 2013, as requested by IEPA. Results of the investigation (Natural Resources Technology, Inc. [NRT], 2013) indicated that there were exceedances of Class I Groundwater Standards for pH, chloride, iron, manganese, total dissolved solids (TDS), and sulfate. The exceedances were not attributed to the Ash Pond. Additional wells were installed in 2015 to comply with Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, and again in 2021 to collect additional data to meet the requirements of 35 I.A.C. § 845.620.

1.3 Conceptual Model

Significant site investigation has been completed at the EPP to characterize the geology, hydrogeology, and groundwater quality. Based on extensive investigation and monitoring, the Ash Pond has been well characterized and detailed in the Hydrogeologic Site Characterization Report (HCR; included in the Operating Permit to which this Plan is attached). A conceptual site model has been developed and is discussed below.

Four hydrogeologic units are present at the EPP and described as follows from the surface downward:

- **CCR:** Saturated CCR consisting primarily of fly ash within the Ash Pond. CCR is present at thicknesses up to 46.5 feet and at elevations as low as 413.9 feet North American Vertical Datum of 1988 (NAVD88) in the central and northern portion of the Ash Pond**.**
- **Upper Cahokia Formation/Potential Migration Pathway (PMP):** Low permeability clays and silts of the Upper Cahokia Formation are present at the surface. This unit is considered a PMP at elevations similar to the base of the Ash Pond, and in places where thin discontinuous sand lenses occur within the Upper Cahokia Formation adjacent to the Ash Pond.
- **Uppermost Aquifer:** Thin (generally less than 4 feet), moderate permeability sand, silty sand, and clayey gravel material within the Lower Cahokia Formation, bedrock, and/or weathered shale bedrock, where present. In locations where higher permeability materials and coarser grained material are absent, the uppermost aquifer is interpreted as the interface between the Lower Cahokia Formation and shale bedrock.
- **Bedrock Confining Unit:** Thick, very low permeability shales and siltstones of the Carbondale and Modesto Formations. This unit was encountered at elevations ranging from approximately 400 to 422 feet NAVD88 with higher bedrock elevations occurring beneath the northern portion of the Ash Pond.

In general, the Upper Cahokia Formation consists of low permeability clays and silts, with limited occurrences of thin discontinuous sand lenses. In several locations, generally near the southern and western portions of the unit, coarser grained materials are present at the base of the Lower Cahokia Formation and/or the top of the bedrock is weathered resulting in relatively higher hydraulic conductivities. Because the interface is laterally continuous, and has relatively higher conductivity, the unlithified/lithified contact was designated as the uppermost aquifer.

Occasional sand lenses within the Upper Cahokia Formation, and clay intervals downgradient at elevations similar to the base of ash in the Ash Pond were identified as PMPs. The underlying bedrock is interpreted as the lower confining unit and has hydraulic conductivities are generally an order of magnitude lower than those measured in the uppermost aquifer.

Groundwater occurs within both the unlithified materials and bedrock and consistently flows from east to west/southwest at the central portion of the Ash Pond towards what is interpreted as a former channel of the Illinois River, and south/southeast at the south end of the Ash Pond (**Figure 1-3**). Based on calculations in the HCR, horizontal gradients range from 0.0014 to 0.0041 feet per feet (ft/ft) and groundwater velocity in the uppermost aquifer ranges from 1.7×10^{-4} to 2.7×10^{-1} feet per day (ft/day) in the north-central and southern portions of the unit, respectively. Calculation of vertical gradients indicate variable results with groundwater migrating from the lower bedrock confining unit into the uppermost aquifer during the winter season (as observed in February). Upward gradients measured in February 2021 were larger in

well nests nearer to the Illinois River, indicating the Illinois River may be a regional discharge zone for the bedrock near the Ash Pond.

Part 845 parameters were monitored in uppermost aquifer and PMP monitoring wells as part of groundwater quality evaluations performed between 2015 and present. These data were supplemented with installation and 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 – at downgradient uppermost aquifer wells AW-05, AW-09, AW-10, AW-11, AW-13, AW-14, AW-19 and AW-20; downgradient bedrock well AP-07D; and upgradient wells AP05S and AW-08.
- Boron - at downgradient uppermost aquifer wells AW-05, AW-18, AW-19, AW-20, and AW-21; and PMP wells AP07S and AW-15S.
- Chloride – at downgradient uppermost aquifer well AW-05; PMP monitoring well AW-04; and at bedrock monitoring wells AP05D and AP07D.
- Cobalt - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-14, and AW-17; PMP monitoring well AW-15S; downgradient bedrock well AP07D; and upgradient well AP05S.
- Lithium - at downgradient uppermost aquifer wells AW-05, AW-06, AW-09, AW-10, AW-11, AW-15, AW-16, and AW-17; downgradient bedrock well AP07D; and upgradient uppermost aquifer well AP05S and bedrock well AP05D.
- Sulfate – at downgradient uppermost aquifer well AW-05, and at downgradient PMP well AW-15S.
- Total Dissolved Solids (TDS) - at downgradient uppermost aquifer wells APW-01 and AW-05; at downgradient PMP well AW-15S, and bedrock monitoring wells AP07D, and AW-15C.
- Barium, beryllium, chromium, fluoride, lead, radium 226 and 228 combined, and thallium were also detected at concentrations greater than their respective standard at one or more locations during monitoring; however, the occurrences were infrequent and/or isolated and individual locations are not listed.

Concentration results for the above parameters were compared directly to 35 I.A.C. § 845.600 standards, without an evaluation of background concentrations. Evaluation of background groundwater quality will be 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

2.1 Existing Monitoring Well Network and Analysis

Between 2010 and 2012, groundwater samples were collected from several new wells (APW-01 through APW-04) to assess groundwater quality in the vicinity of the Ash Pond as part of an investigation requested by IEPA. Results of the investigation (NRT, 2013) indicated that CCR constituents had not impacted groundwater in the vicinity of the Ash Pond. However, exceedances of Class I Groundwater Standards were reported for pH, chloride, iron, manganese, TDS, and sulfate.

In 2015 and 2016, 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 proposed Part 845 monitoring programs was included in the HCR (included in the Operating Permit to which this Plan is attached) and are discussed in the following sections.

2.1.1 40 C.F.R. § 257 Monitoring

The 40 C.F.R. § 257 monitoring well network consists of six monitoring wells screened in the uppermost aquifer, including two background monitoring wells (AP05S and AW-08) and four compliance wells (AW-06, AW-09, AW-10, and AW-11). 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 the CCR Unit, and are included in Appendix C of the HCR (included in the Operating Permit to which this Plan is attached).

Detection monitoring was initiated in May 2018 following the initial eight rounds of background sampling. 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 the Ash Pond (NRT, 2017).

Groundwater samples are collected semi-annually and analyzed for the laboratory and field parameters 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	Lead	Selenium
Arsenic	Chromium	Lithium	Thallium
Barium	Cobalt	Mercury	Radium 226 and 228 combined
Beryllium	Fluoride	Molybdenum	

[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 (AW-12, AW-13, AW-14, AW-15, AW-15S, AW-15C, AW-16, AW-17, AW-18, AW-19, AW-20, AW-21 and AW-22) were installed around the Ash Pond 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). Additionally, three leachate monitoring wells (XPW01A, XPW02, and XPW03) were installed within the Ash Pond to characterize the CCR materials.

Prospective monitoring wells were sampled for eight rounds between February and August 2021 and the results were assessed for selection of the Ash Pond 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. Subsequently, one additional well, APW-01, was installed in September 2021 on the east side of the Ash Pond between well APW-02 and the Illinois River. This well will be sampled quarterly for eight rounds following approval of this GMP to establish baseline at this location.

Table B. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
pH	Turbidity	Groundwater Elevation	
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 conductivity, 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 was used to evaluate and calculate background concentrations for the Ash Pond. This evaluation and discussion are included in **Section 3.2** of this GMP.

Data collected from the 40 C.F.R. § 257 monitoring network from 2015 to 2020, and from the Part 845 background monitoring was 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 fourteen monitoring wells screened in the Lower Cahokia Formation (wells AP05S, AW-05, AW-06, AW-08, AW-09, AW-10, AW-11, AW-14, AW-15, AW-16, AW-17, AW-18, AW-19, and AW-21), or across the unlithified-lithified interface (*i.e.,* uppermost aquifer), three wells screened in shallow unlithified materials (*i.e.,* PMP) surrounding the Ash Pond (AW-01, AP07S, and AW-15S), three temporary water level only wells screened in CCR materials (XPW01A, XPW02, and XPW03), and one temporary water level only surface water staff gage (SG-01). The proposed network is summarized in **Table C** below and displayed on **Figure 2-1**. Seventeen wells (two background and 15 compliance) will be used to monitor groundwater concentrations within the hydrostratigraphic units.

The groundwater samples collected from the 17 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 [4]
AP05S	UA	33-38	Background
AP07S	PMP	30-35	Compliance
AW-01[1]	PMP	TBD	Compliance
AW-05	UA	16-20	Compliance
AW-06	UA	37-41	Compliance
AW-08	UA	48-57	Background
AW-09	UA	47-52	Compliance
AW-10	UA	28-32	Compliance
AW-11	UA	24-29	Compliance
AW-14	UA	24-29	Compliance
AW-15	UA	33-38	Compliance
AW-15S	PMP	8-18	Compliance
AW-16	UA	55-60	Compliance
AW-17	UA	51-56	Compliance
AW-18	UA	46-51	Compliance
AW-19	UA	35-40	Compliance
AW-21	UA	32-37	Compliance
XPW01A[2,3]	CCR	33-43	WLO
XPW02[2,3]	CCR	36-46	WLO
XPW03[2,3]	CCR	27-37	WLO
SG-01[2,4]	Surface Water	NA	WLO

[1] Well location is planned, construction details unavailable.
[2] Location is temporary pending implementation of impoundment closure per an approved Construction Permit Application.
[3] Well is to be used for water level data collection only.
[4] SG-01 is a surface water level measuring point.
[5] Well type refers to the role of the well in the monitoring network.
NA – Not applicable, surface water location.
PMP – potential migration pathway
TBD – To be determined
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

Per 35 I.A.C. § 620.210, groundwater within the uppermost aquifer at the Ash Pond meets the definition of a Class I, Potable Resource Groundwater based on the following criteria:

- Groundwater in the uppermost aquifer extends 10 feet or more below the land surface.
- Hydraulic conductivity exceeds the 1 x 10^{-4} centimeters per second (cm/s) criterion.

Field hydraulic conductivity tests performed on the unlithified geologic materials that include moderate permeability sand, silty sand, and clayey gravel units which includes the Lower Cahokia Formation and the bedrock interface) and lithified materials (shales and siltstones of the Carbondale and Modesto formations) at the EPP had geometric mean hydraulic conductivities exceeding 1 x 10^{-4} cm/s. Based on this information groundwater is classified as Class I – Potable Resource Groundwater.

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)'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 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 Quality 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 are below the groundwater quality standards listed in 35 I.A.C. § 845.600. Therefore, for these parameters, the groundwater quality standards listed in 35 I.A.C. § 845.600 will be applied to the results from the proposed groundwater monitoring network. The exceptions include arsenic, barium, cobalt, lead, lithium, pH, and radium 226 and 228 combined where the background concentration is greater (or lower for pH lower limit) than the 35 I.A.C. § 845.600 standard. In these instances, 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 networks exist: the 40 C.F.R. § 257 network and the proposed Part 845 network. Both 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 network monitoring 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 (wells AP05S and AW-08), fifteen compliance monitoring wells (wells AW-01, AP07S, AW-05, AW-06, AW-09, AW-10, AW-11, AW-14, AW-15, AW-15S, AW-16, AW-17, AW-18, AW-19, and AW-21), three temporary water level only wells (wells XPW01A, XPW02, and XPW03), and one temporary water level only surface water staff gage (SG-01) (**Figure 2-1**). These monitoring wells are screened within the uppermost aquifer (AP05S, AW-05, AW-06, AW-08, AW-09, AW-10, AW-11, AW-14, AW-15, AW-16, AW-17, AW-18, AW-19, and AW-21), the PMP (AW-01, AP07S and AW-15S), and the CCR materials (XPW01A, XPW02, and XPW03). Groundwater samples will be collected and analyzed for the laboratory and field parameters summarized in **Table D** below.

Table D. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	Turbidity	pH	
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 conductivity, 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 was 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**).

4.3.1 Methane Monitoring Plan

Methane, a decomposition product of organic materials, is a colorless, odorless, flammable gas. Methane is known to be present in aquifers throughout Illinois, due to both natural and anthropogenic processes (coal mining). Methane may accumulate in the borehole, well, protective casing or in the general work area near a well or boring. During field activities in 2021 methane was detected above 10% of the lower explosive limit (LEL) at borehole monitoring well locations AW-13, AW-14, AW-15, AW-15C, AW-16, AW-17, AW-22, and P002. Levels quickly

dissipated after venting the monitoring wells to the atmosphere. A methane monitoring plan was established for the safe completion of field activities, including groundwater sampling at EPP. Anyone accessing any monitoring well at EPP must follow a methane monitoring plan to manage and mitigate potential hazards associated with the presence of methane gas in groundwater.

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 and 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 well network 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 as part of 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 corrective action plan for the Ash Pond 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.
- 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.

If one or more constituents are detected and confirmed by an immediate resample, to be greater than the GWPS in any sampling event, 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 the CCR SI caused the contamination and the CCR SI 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 I.A.C. 35 105 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 Resources Technology, Inc. (NRT), March 2013. Phase I Hydrogeological Assessment Report, Coal Combustion Product Impoundment, E.D. Edwards Energy Center, Peoria County, Illinois, Project No. 2122.

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Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. Hydrogeologic Site Characterization Report. Edwards Ash Pond. Edwards Power Plant. Bartonville, 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.United States Environmental Protection Agency (USEPA), 2015. Title 40 of the Code of Federal Regulations, Part 257.

TABLES

TABLE 1-1. PART 845 REQUIREMENTS CHECKLIST
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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 1.3, 2.2, 3.1, & 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 & 4.1.1 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)	Establishement of background and application of statistical methods	Sections 3 & 4.7 Appendix A
845.640(i)	Analyze total recoverable metals	Section 4.1.2 & 4.4
845.640(j)	Analyze groundwater samples using a certified laboratory	Section 4.4

TABLE 1-1. PART 845 REQUIREMENTS CHECKLIST
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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 (XPW01A, XPW02, & XPW03)
NA	Staff gauge/ piezometer to monitor head of neighboring surface water body	Sections 2.2 & 4.1.12 Figure 2-1 (SG-01)

Notes:

[O: CJC 08/10/21; C: LDC 10/05/21]

GMP = Groundwater Monitoring Plan

NA = Not Applicable

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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)
AP05S	B	UA	11/29/2016	443.53	443.53	Top of PVC	441.13	32.87	37.64	408.26	403.49	38.06	403.10	4.8	2	40.598807	-89.66191
AP07S	C	UCF	12/02/2016	461.08	461.08	Top of PVC	458.31	29.95	34.74	428.36	423.57	35.00	423.30	4.8	2	40.59793	-89.666919
AW-01[1]	C	PMP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AW-05	C	UA	07/22/2015	--	443.37	Top of Disk	440.55	15.87	20.47	424.68	420.08	21.10	419.50	4.6	2	40.598645	-89.666407
AW-06	C	UA	08/03/2015	--	461.57	Top of Disk	459.19	36.60	41.09	422.59	418.10	41.69	416.90	4.5	2	40.594237	-89.670051
AW-08	B	UA	07/21/2015	--	462.54	Top of Disk	460.66	47.55	57.19	413.11	403.47	57.70	403.00	9.6	2	40.593964	-89.661996
AW-09	C	UA	08/03/2015	--	461.45	Top of Disk	458.32	47.14	51.62	411.18	406.70	52.23	406.10	4.5	2	40.590422	-89.668777
AW-10	C	UA	07/23/2015	--	439.93	Top of Disk	437.64	27.62	32.23	410.02	405.41	32.74	404.90	4.6	2	40.590733	-89.663826
AW-11	C	UA	07/28/2015	--	439.87	Top of Disk	437.16	24.21	28.81	412.95	408.35	29.31	407.20	4.6	2	40.587261	-89.663781
AW-14	C	UA	01/08/2021	439.40	439.40	Top of PVC	436.83	24.00	29.00	412.83	407.83	29.00	401.80	5	2	40.58729	-89.665621
AW-15	C	UA	01/08/2021	441.51	441.51	Top of PVC	438.95	33.00	38.00	405.95	400.95	38.00	399.00	5	2	40.587964	-89.666822
AW-15S	C	UCF	01/08/2021	440.71	440.71	Top of PVC	437.92	8.00	18.00	429.92	419.92	18.00	417.90	10	2	40.587955	-89.666841
AW-16	C	UA	01/08/2021	461.79	461.79	Top of PVC	459.45	55.00	60.00	404.45	399.45	60.00	396.50	5	2	40.589457	-89.667799
AW-17	C	UA	01/08/2021	462.10	462.10	Top of PVC	459.69	51.00	56.00	408.69	403.69	56.00	402.70	5	2	40.591698	-89.669404
AW-18	C	UA	01/09/2021	462.65	462.65	Top of PVC	460.28	46.00	51.00	414.28	409.28	51.00	405.30	5	2	40.593044	-89.669822
AW-19	C	UA	01/09/2021	460.74	460.74	Top of PVC	458.53	35.00	40.00	423.53	418.53	40.00	415.50	5	2	40.595434	-89.66972
AW-21	C	UA	01/10/2021	460.61	460.61	Top of PVC	458.28	32.00	37.00	426.28	421.28	37.00	420.30	5	2	40.597294	-89.667734
XPW01A	WLO	CCR	01/09/2021	464.16	464.16	Top of PVC	460.99	33.00	43.00	427.99	417.99	43.00	418.00	10	2	40.596306	-89.667345
XPW02	WLO	CCR	01/09/2021	473.79	473.79	Top of PVC	471.16	36.00	46.00	435.16	425.16	46.00	424.20	10	2	40.594351	-89.668312
XPW03	WLO	CCR	01/10/2021	466.04	466.04	Top of PVC	462.62	27.00	37.00	435.62	425.62	37.00	422.60	10	2	40.591416	-89.666188
SG-01	WLO	SW	--	--	--	--	--	--	--	--	--	--	--	--	--	40.596075	-89.661625

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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:
[1] Well location is planned, construction details unavailable.
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
ft = foot or feet
HSU = Hydrostratigraphic Unit
PMP = potential migration pathway
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer
UCF = Upper Cahokia Formation

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TABLE 3-1. BACKGROUND GROUNDWATER QUALITY AND STANDARDS
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Parameter	Background Concentration	845 Limit	Groundwater Protection Standard	Unit
Antimony, total	0.003	0.006	0.006	mg/L
Arsenic, total	0.03	0.010	0.030	mg/L
Barium, total	2.07	2.0	2.1	mg/L
Beryllium, total	0.0019	0.004	0.004	mg/L
Boron, total	0.535	2	2	mg/L
Cadmium, total	0.001	0.005	0.005	mg/L
Chloride, total	56	200	200	mg/L
Chromium, total	0.048	0.1	0.1	mg/L
Cobalt, total	0.028	0.006	0.028	mg/L
Fluoride, total	0.396	4.0	4.0	mg/L
Lead, total	0.033	0.0075	0.033	mg/L
Lithium, total	0.071	0.04	0.071	mg/L
Mercury, total	0.0002	0.002	0.002	mg/L
Molybdenum, total	0.0062	0.1	0.1	mg/L
pH (field)	7.1 / 6.3	9.0 / 6.5	9.0 / 6.3	SU
Radium 226 and 228 combined	9.6[1]	5	9.6	pCi/L
Selenium, total	0.0032	0.05	0.05	mg/L
Sulfate, total	6	400	400	mg/L
Thallium, total	0.001	0.002	0.002	mg/L
Total Dissolved Solids	1050	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
[1] The background calculation method prescribed by the Statistical Analysis Plan based upon the observed distribution of the background data resulted in an unreasonably elevated background value; therefore, a non-parametric calculation method was utilized, resulting in a more representative background value.

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TABLE 4-1. SAMPLING AND ANALYSIS SUMMARY
GROUNDWATER MONITORING PLAN
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, 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	17	2	0	0	1	20	plastic	600 mL	HNO_3 to pH<2	6 months
Mercury	7470A or 6020	17	2	0	0	1	20	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters											
Fluoride	9214 or EPA 300	17	2	0	0	1	20	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251 or EPA 300	17	2	0	0	1	20	plastic	100 mL	Cool to 4 °C	28 days
Sulfate	9036 or EPA 300	17	2	0	0	1	20	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	17	2	0	0	1	20	plastic	200 mL	Cool to 4 °C	7 days
Radium											
Radium 226	9315 or EPA 903	17	0	0	0	0	17	plastic	1000 mL	HNO_3 to pH<2	6 months
Radium 228	9320 or EPA 904	17	0	0	0	0	17	plastic	1000 mL	HNO_3 to pH<2	6 months
Field Parameters											
pH	SM 4500-H+ B	17	NA	NA	NA	NA	17	flow-through cell	NA	none	immediately
Dissolved Oxygen [8]	SM 4500-O/405.1	17	NA	NA	NA	NA	17	flow-through cell	NA	none	immediately
Temperature [8]	SM 2550	17	NA	NA	NA	NA	17	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential [8]	SM 2580 B	17	NA	NA	NA	NA	17	flow-through cell	NA	none	immediately
Specific Conductance [8]	SM 2510 B	17	NA	NA	NA	NA	17	flow-through cell	NA	none	immediately
Turbidity [7]	SM 2130 B	17	NA	NA	NA	NA	17	flow-through cell or hand-held turbidity meter	NA	none	immediately

[O: CJC 08/10/21; C: LDC 09/20/21]

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 sample. 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
EDWARDS POWER PLANT
ASH POND
BARTONVILLE, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	IL Part 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]
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

TABLE 4-2. DETECTION AND REPORTING LIMITS FOR PART 845 PARAMETERS

GROUNDWATER MONITORING PLAN

EDWARDS POWER PLANT

ASH POND

BARTONVILLE, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	IL Part 845.600	RL [4, 5]	MDL [5]
Turbidity	NA	NTU	SM 2130 B	NS	NS	NA	NA

[O: CJC 08/10/21, C: LDC 09/20/21]

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 availablity. Selected method will ensure reporting limits (RL) are below Title 35 of the Illinois Adminiatrative 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 (MDLs) 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.

µS/cm = microSiemens per centimeter

°C = degrees Celsius

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

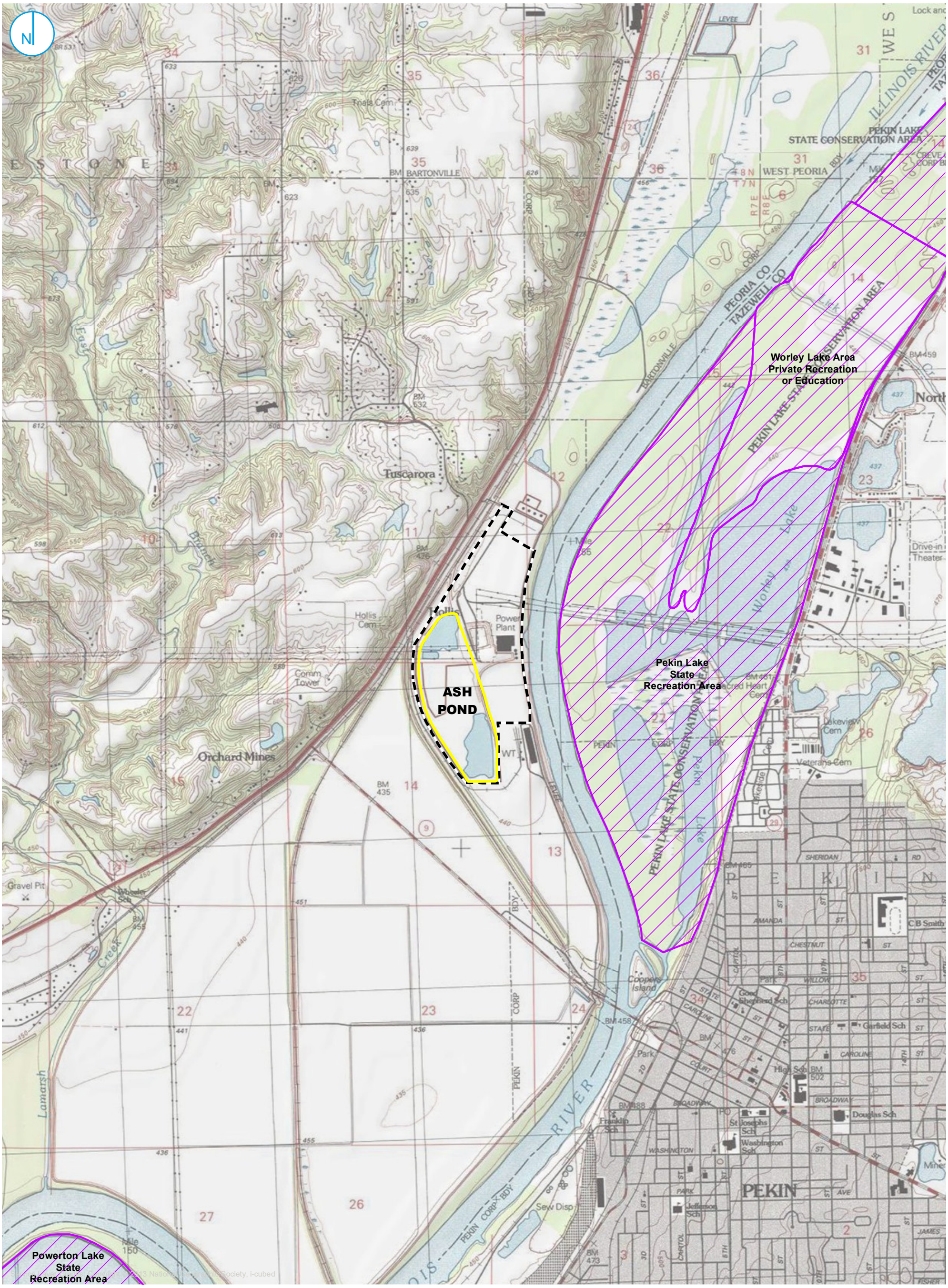
pCi/L = picoCuries per liter

RL = Reporting limit as established by the laboratory

SM = Standard Methods for the Examination of Water and Wastewater

SU = standard units

FIGURES



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
PROTECTED AREA

0 1,000 2,000 Feet

SITE LOCATION MAP

GROUNDWATER MONITORING PLAN
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 1-1

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ENGINEERING SOLUTIONS, INC.

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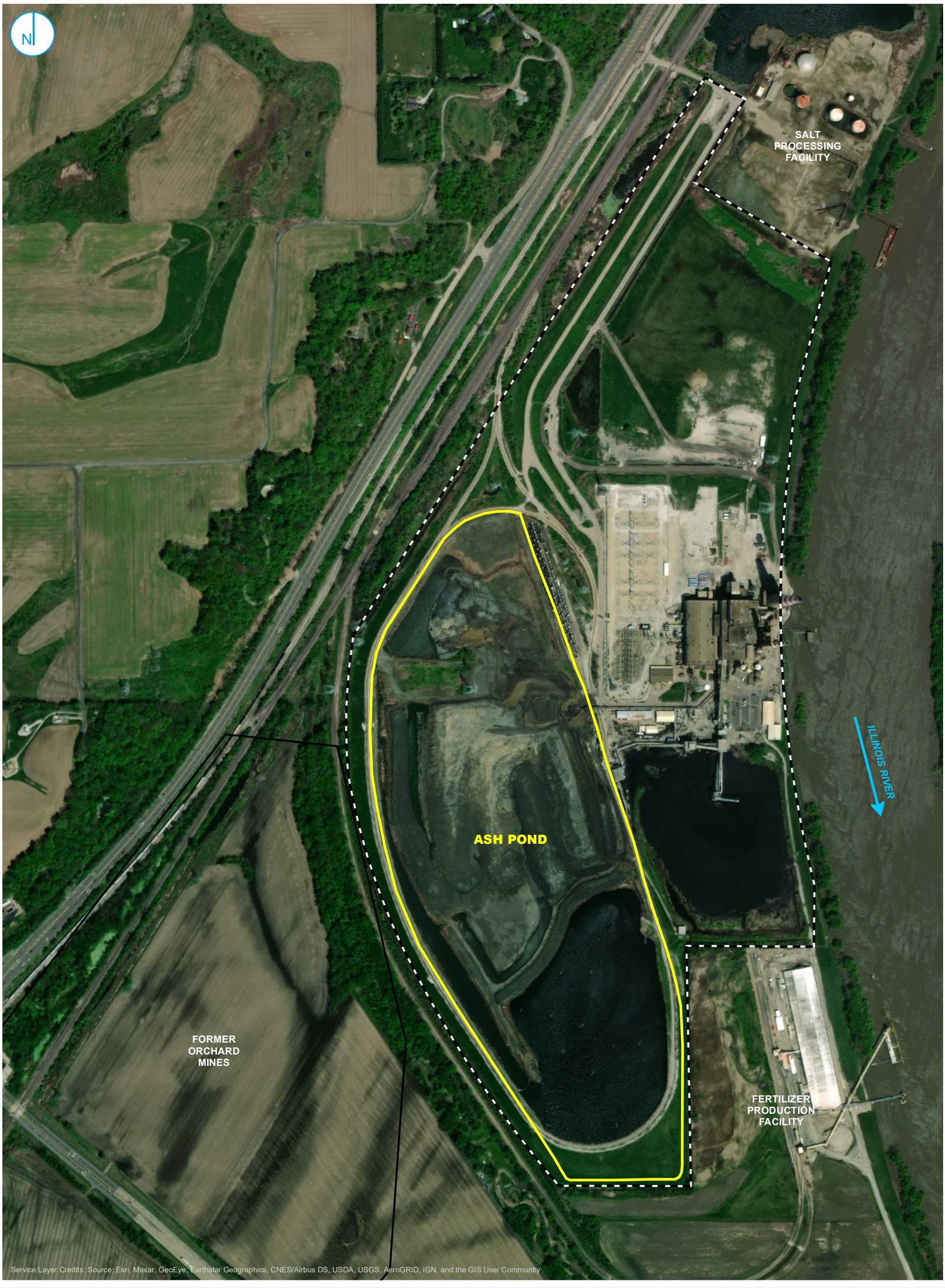

PART 845 REGULATED UNIT (SUBJECT UNIT)
FORMER ORCHARD MINES AREA
PROPERTY BOUNDARY

0 250 500 Feet

SITE MAP

FIGURE 1-2

GROUNDWATER MONITORING PLAN
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL AMERICAS
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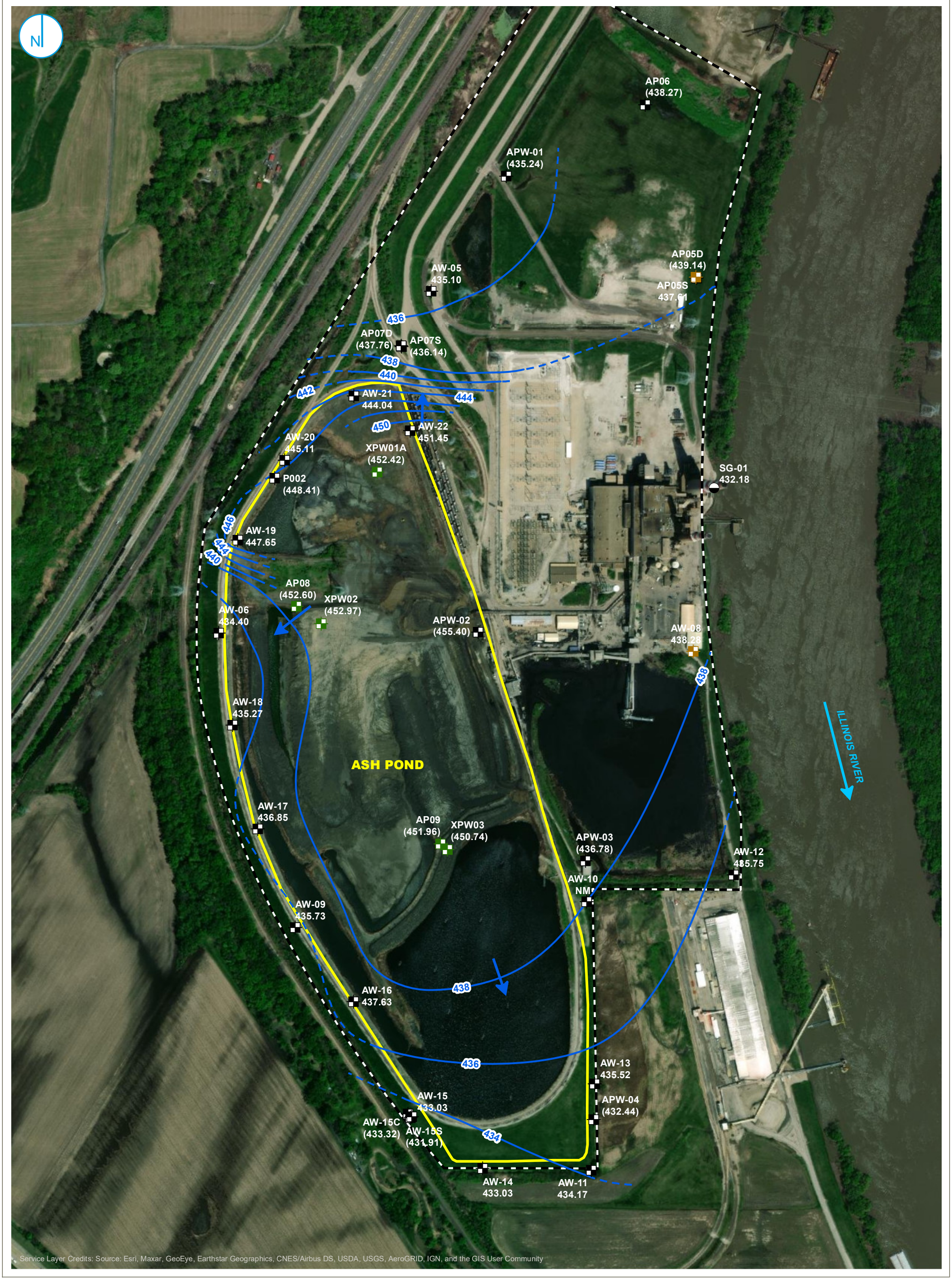

BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 212.5 425 Feet

NOTES
1. PARENTHESIS INDICATES WELL NOT USED FOR CONTOURING
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS FEBRUARY 9, 2021

FIGURE 1-3

GROUNDWATER MONITORING PLAN
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

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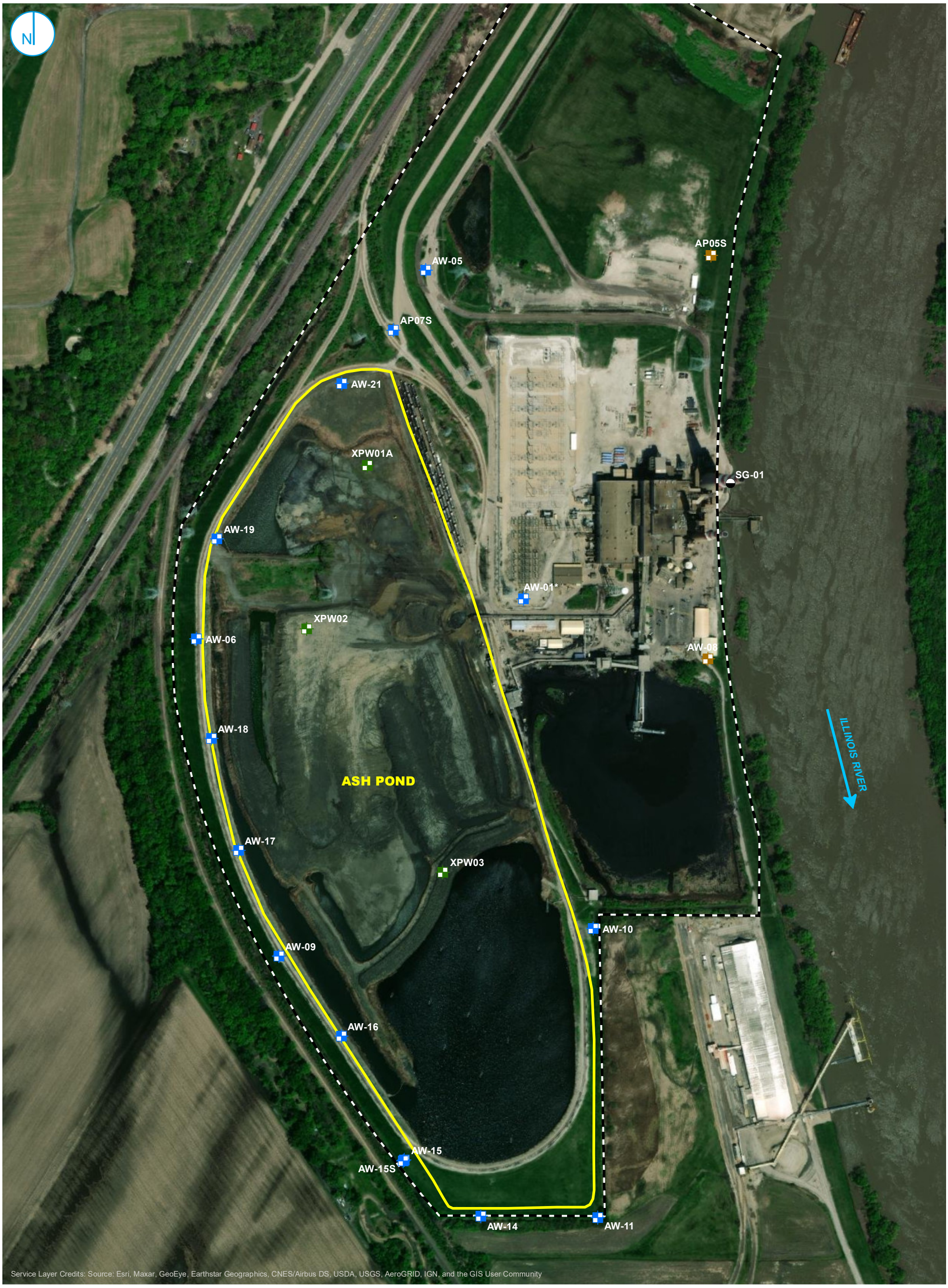

BACKGROUND WELL
COMPLIANCE WELL
SOURCE SAMPLE LOCATION
STAFF GAGE

PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

NOTE
* = APPROXIMATE LOCATION, PENDING COMPLETION OF SURVEY

0 200 400 Feet

PROPOSED PART 845 GROUNDWATER MONITORING NETWORK

GROUNDWATER MONITORING PLAN
ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX A
STATISTICAL ANALYSIS PLAN

Prepared for
Illinois Power Resources Generating, LLC

Date
October 25, 2021

Project No.
1940100806-004

STATISTICAL ANALYSIS PLAN

ASH POND
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

STATISTICAL ANALYSIS PLAN
EDWARDS POWER PLANT ASH POND

Project Name	**Edwards Power Plant Ash Pond**
Project No.	**1940100806-004**
Recipient	**Illinois Power Resources Generating, LLC**
Document Type	**Statistical Analysis Plan**
Version	**FINAL**
Date	**October 25, 2021**

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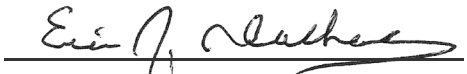


Eric J. Tlachac, PE
Senior Managing Engineer

Rachel A. Banoff, EIT
Project Statistician

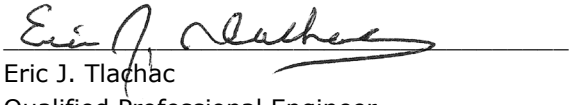
LICENSED PROFESSIONAL CERTIFICATIONS

This certification is based on the description of the statistical methods selected to evaluate groundwater as presented in the following Statistical Analysis Plan; Edwards Power Plant Ash Pond. 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; Edwards Power Plant Ash Pond) 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

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; *Edwards Power Plant Ash Pond) 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

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; *Edwards Power Plant Ash Pond), 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

Licensed Professional Certifications		**2**
1.	**Introduction**	**6**
1.1	Statistical Analysis Objectives	6
1.2	Statistical Analysis Plan Approach	6
2.	**Background Monitoring and Data Preparation**	**8**
2.1	Sample Independence	8
2.2	Non-Detect Data Processing	9
2.3	Testing for Normality	9
2.4	Testing for Outliers	9
2.5	Trend Analysis	10
2.6	Spatial Variation	10
2.7	Temporal Variation	10
2.8	Updating Background	11
3.	**Compliance Monitoring**	**13**
3.1	GWPS Establishment and Exceedance Determination	13
3.1.1	The Upper Tolerance Limit	14
3.1.2	Parametric Confidence Intervals around a Mean	16
3.1.3	Non-Parametric Confidence Intervals around a Median	16
3.1.4	The Upper Prediction Limit for a Future Mean	17
3.1.5	The Non-Parametric Upper Prediction Limit for a Future Median	17
3.1.6	Parametric Linear Regression and Confidence Band	18
3.1.7	Non-Parametric Thiel-Sen Trend Line and Confidence Band	20
3.2	Determination of Statistically Significant Increases over Background	21
4.	**References**	**22**

TABLES (IN TEXT)

Table A Statistical Calculations Used in Compliance Monitoring Procedures

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 α values are tabulated in Table 22-2 of Appendix D of the *Unified Guidance*. The selected minimum α 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-α) and a point in time (t_0), will be computed as follows:

$$LCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-1} \cdot \left[\frac{1}{n} + \frac{(t_0 - \overline{t})^2}{(n-1) \cdot s_t^2}\right]}$$

$$UCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-2} \cdot \left[\frac{1}{n} + \frac{(t_0 - \overline{t})^2}{(n-1) \cdot s_t^2}\right]}$$

$\hat{x}_0$ = 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-α)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 J

Post-Closure Care Plan

POST-CLOSURE PLAN FOR EXISTING CCR SURFACE IMPOUNDMENT
40 CFR § 257.104 and 35 I.A.C. 845.780
REV 0 – 10/30/2021

SITE INFORMATION

Site Name / Address	Edwards Power Plant / 7800 South CILCO Lane, Bartonville, IL 61607		
Owner Name / Address	Illinois Power Resources Generating, LLC / 6555 Sierra Drive Irving, Texas 75039		
CCR Unit	Ash Pond	Closure Method and Final Cover Type	Close In-Place Clayey Soil Cover with Vegetation

POST-CLOSURE PLAN DESCRIPTION

40 CFR § 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 CFR § 257.104(c)(1) and 35 I.A.C. 845.780(c)(1), except as provided by 40 CFR § 257.104(c)(2) and 35 I.A.C. 845.780(c)(2).
40 CFR § 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 CFR § 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 CFR § 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 CFR § 257.90 through 40 CFR § 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 CFR § 257.94(d) and 35 I.A.C. 845.650(b)(4).
40 CFR § 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 Resources Generating, LLC 6555 Sierra Drive Irving, Texas 75039 800.633.4704 ccr@dynegy.com
40 CFR § 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 an operating electric generation facility. Planned uses of the property during the post-closure period are currentlyunknown, 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 CFR 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 CFR § 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 CFR § 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 CFR § 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 CFR § 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 CFR § 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 Edwards Ash Pond 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 CFR § 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 CFR § 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 Resources Generating, LLC; Edwards Power Plant; Ash Pond

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 CFR § 257.104 and 35 I.A.C. 845.780.

John R. Hesemann

Printed Name

9/28/2021

Date

Appendix K

Public Meetings Information

Luminant

Kevin Largent
Illinois Power Resources Generating, LLC
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, IL 62794-9276

Re: 35 IAC 845.220(a)(9) Certification Statement
Edwards Power Plant Ash Pond (IEPA ID # W1438050005-01)

Dear Mr. Darin LeCrone:

For the above-refenced CCR surface impoundment and in accordance with 35 IAC 845.220(a)(9), Illinois Power Resources Generating, LLC 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 Resources Generating, LLC

Kevin Largent
Plant Manager

Edwards Public Meeting Summary, May 25, 2022

On April 25, 2022, Illinois Power Resources Generating, LLC (IPRG, LLC) made available to the public its plans to close the Ash Pond (AP) located at the Edwards Power Plant. On Wednesday, May 25, 2022, IPRG, LLC held in-person public meetings at 3:00 pm and 5:30 pm at the Peoria Marriot Pere Marquette 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. This document also provides as required by 845.240(f)(3), written responses to the questions not addressed during the public meetings.

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
1.	Ash Pond Closure Alternatives/ Risk Assessment	The following alternatives were considered: 1. Closure by removal with onsite disposal 2. Closure by removal with offsite disposal 3. Closure in place Closure of an ash pond means that that ash within the pond is either capped in place (Closed in Place; CIP) or excavated and disposed in an alternative landfill. In Part 845, IEPA allows different closure approaches to be evaluated and sets criteria that must be evaluated for each potential closure approach in the Closure Alternative Analysis (CAA). A risk assessment and groundwater model were completed to provide information needed in selecting an alternative. The groundwater model results show that both CIP and CBR are equally protective to groundwater. The CAA identified CIP as the most appropriate closure approach because it has the least negative impacts overall. The CAA is included in the	The Closure Alternatives Analysis (CAA) provides a detailed evaluation of the different factors that were evaluated for the closure alternatives. These factors include, but are not limited to, reduction of risks, likelihood of future releases, impacts to workers and the community, impacts to scenic, historic, and recreational areas, time until the GWPSs are achieved, and reliability and implementability of the closure approach. The risk assessment and groundwater model provide quantitative data used in the analysis. 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

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
		Construction Permit Application posted on the Luminant website www.luminant.com/ccr/illinois-ccr/.	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 the Illinois River (e.g., boaters and swimmers), anglers on the Illinois River that consume locally caught fish, and ecological receptors in the river and river 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. The groundwater model shows that both CIP and CBR protect groundwater from future impacts. The model also shows the cleanup time of the groundwater contained within the underlying soils is the same for both CIP and CBR. In other words, CBR is not expected to achieve the groundwater protection standards more quickly than CIP. The

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
			groundwater model was developed using site-specific data collected during the site characterization, state and federal geology, hydrogeology (groundwater) and hydrology (river) information, well records, historic aerial photography, mine maps, and other information sources.
2.	Closure-by-Removal with On-Site Disposal	The Edwards Power Plant does not have an onsite landfill; therefore, one would need to be constructed. This alternative was not carried forward as the property is too small to accommodate a landfill and adjacent properties are not suitable for a landfill because they are located within the floodplain.	Purchasing land near, but not adjacent to, the plant would constitute an off-site landfill. To be considered an on-site landfill, the landfill must be contiguous with the power plant. If ash must be hauled over a public road, regardless of distance, then it is considered off-site disposal. Furthermore, we are not aware of any suitable land available for sale adjacent to or near the plant.
3.	Closure-by-Removal with Off-Site Disposal	Landfills within 70 miles that are permitted to handle ash were evaluated for capacity. If closure by removal was the selected remedy, IPRG, LLC would contact potential receiving facilities and IEPA would likely contact the communities that could be affected by truck travel or expansions of existing off-site facilities. However, this is unnecessary at this time since CIP is the preferred and sought-after closure method. Barge and rail transport were considered; however, there are several negative consequences that make trucking to a neighboring landfill the preferred option for CBR.	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

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
			that will be affected by the increase in truck traffic to and from the landfill. The nearest operating landfill to meet the above criteria is Indian Creek Landfill No. 2. IPRG, LLC did not contact the owner or state for disposal approval as the risks and impact associated with off-site disposal are significant, as documented in the CAA. During the meeting, concerns were raised regarding truck traffic and impact to the communities of Hopedale and Bartonville. A question was also asked if the residents of Hopedale are being made aware that a landfill in their community has been identified as a potential disposal site. Any public notification requirement would be the responsibility of the receiving facility. If the facility is being expanded, the landfill owner will likely be subject to the Illinois siting process, which is a months-long process requiring public notice, public hearings, and a decision by the local government. If the facility is modifying its existing permit to accept the CCR, the landfill owner is required to notify public officials and other interested parties. If the CCR can be accepted in accordance with the current permit, then no public involvement is required. A question was asked specifically about disposal at the Peoria City/County Landfill, which is approximately 4 miles closer to the Edwards Power Plant than the off-site facility discussed in the CAA. The Peoria City/County Landfill No. 2 is expected to close in 2023 and be replaced by Landfill No. 3, which is currently under

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
			development. We will evaluate the disposal of CCR at the Peoria City/County Landfill as a potential option for the CBR scenario. This evaluation will be included in an updated CAA included with the Final Closure Plan. Transportation of CCR using rail or barge was evaluated in the CAA. While there is currently a rail line encircling the ash pond, this rail loop must be demolished in order to complete the closure project. Additionally, there are no rail unloading facilities at any of the off-site disposal sites. Even if it is possible to construct new rail loading and unloading facilities, the design, permitting, and construction of these new rail facilities would likely delay closure of the ash pond by 5 to 7 years. Barge transportation has similar restrictions. There are no barge loading or unloading facilities at the power plant or any of the off-site landfills. Design, permitting, and construction of new facilities would entail extensive project delays (again likely 5 to 7 years). Additionally, the off-site landfills are not located on a river, so trucking will still be required to haul the CCR to the final disposal location.
4.	Closure-in-Place/ Ash Dewatering/ Ash Consolidation	The selected closure approach involves removing liquid waste, consolidating the ash within a smaller portion of the ash pond located above the uppermost aquifer, and covering the consolidated ash with a geomembrane. By removing liquid waste, consolidating the ash, and installing a geomembrane over the ash, infiltration into the ash and releases to groundwater will be minimized. Modeling has demonstrated that	Free liquids will be removed from the ash and discharged in accordance with the NPDES permit. If necessary, to meet permit limits, the liquids will be pre-treated. The methods being considered are: 1. Drilled sumps. a. These consist of 4-foot to 6-foot diameter drilled holes in the ash greater than 10-feet thick. An HPDE pipe perforated to allow free liquids

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
		this closure process will result in groundwater concentrations achieving the groundwater protection standards at the same or similar rate as closure by removal.	to flow into the pipe is inserted into the drilled hole. The annulus between the ash and the pipe is back filled with clean gravel. b. A series of piezometers is installed to determine the drawdown of the phreatic surface around the sump. c. The drawdown will determine the spacing of the sumps. d. The discharged liquid waste will be treated and discharged through the NPDES permitted outfall. 2. Engineered Trenches. a. Excavated and properly designed sloped trenches may be used for ash depths less than 10-feet. b. Piezometers are installed to determine the drawdown of the phreatic surface around the ditch. c. The trenches are sloped to a low point to be treated and discharged through the NPDES permitted outfall. 3. Horizontal wells. a. Directionally drilled or excavated and installed horizontal wells may be used in ash zones of low permeability that are not responding to flow of liquid waste to sumps and trenches. b. Piezometers are installed to determine the drawdown of the phreatic surface around the horizontal well.

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
			c. The horizontal wells are cleared by submersible pumps and discharged through the NPDES permitted outfall. After removal of free liquids, the ash will be consolidated by moving the ash from the north to the south, reducing the ash pond footprint by 24%. The approximate 210,000 cy of ash from the rail line embankment located outside of the pond will be placed in the area to be capped. Dust control methods, including spreading water on surface of ash, will be used when handling ash. The cap will be constructed in accordance state-of-the-practice methods and materials. It was asked if moving the ash to one side, then lining the other side and transferring the ash to the lined side was evaluated. Due to constructability issues, this specific CIP option was not included in the CAA; however, groundwater modeling has shown that CIP and CBR are equally protective. Therefore, placement of a liner within the former ash pond will not improve the time to reach the GWPS. The stability, safety, and scheduling challenges that are present due to the amount of ash movement and stockpiling that would be required given the current depth, liquid content, and relatively small area of the ash pond make such a closure option unfeasible.

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
5.	Future Use	IPRG, LLC intends to operate a 37 MW energy storage unit (battery) at the Edwards Power Plant. Installing solar panels on the closed pond is under consideration. Panels are commonly placed using above-grade foundation methods which would eliminate the need to penetrate the cap.	Should the company choose to utilize the surface of the impoundment for a solar facility, the design and slope of the cover system will be modified to maximize electricity generation. Installation of solar on the cover system will provide additional tax revenue to the local community, jobs, benefit the grid, and support Illinois' path toward 100 percent clean energy by 2050.
6.	Groundwater Monitoring	For the closure-in-place alternative, groundwater monitoring will continue on the property for at least 30 years. However, if GWPSs have not been achieved in that timeframe, groundwater monitoring will continue as required.	Groundwater impacts at the property boundary indicate that nearby properties may be impacted. IPRG, LLC has informed the IEPA and adjacent landowners of the potential and has sought access to these properties to characterize the extent. Installation of wells will begin following completion of access agreements on the neighboring properties.
7.	River Flooding	The ash pond is above the base flood elevation.	The embankment of the capped pond is designed with a minimum elevation of approximately 462 ft, which is 4.5 feet higher than the base flood elevation (BFE) of 457.5 ft. Furthermore, a review of the nearest river gages shows that the highest recorded flood elevation at the Illinois River at Peoria Lake and Dam, located approximately 9 miles upstream of the ash pond, was 457.75 ft, and the highest flood recorded at the nearest downstream gage, Illinois River near Havana, which is approximately 34 miles downstream, is 452.18 ft. The ash pond is also protected by the Pekin Marsh Levee, a levee system that ranges in elevation from 455.17 feet to 458.17 feet. The embankment will be vegetated and protected to control erosion. Routine inspections and

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
			maintenance of the cover system and embankments will be performed throughout the post-closure period. Additionally, structural stability assessments have been performed.
8.	Will Union labor be used during closure activities?	Work will be contracted following standard procedures. Additional information will be provided in written responses.	Union labor will be considered.
9	Beneficial Reuse	Continuing to evaluate options for beneficial reuse.	

In accordance with 845.240(f)(4), a list of people who requested to be added to the IEPA Listserv for Edwards is as follows:

Edwards construction permit public meetings	
People requesting to be added to IEPA Listserv	
Name	Email address
Pat Wagner	patriciawagner1963@gmail.com
Barb Gurtler	bbgurtler@sbcglobal.net
Rebecca Carey	racarey25@yahoo.com
Joyce Blumenshine	joblumen@yahoo.com
Diane & Bob Jorgensen	jestpro@aol.com
Joe Kotas	joekotas@gmail.com
Ann Schreifels	annschreifels@gmail.com
Greg Barla	greg.barta@gmail.com
Robin Nolting	petalnrose@gmail.com
Joyce Harant	jahchoices@gmail.com
D Jo Lakota	tewalakota@gmail.com
Mary Anne Michelet	maryannemichelet@hotmail.com
Nancy Long	nclong405@yahoo.com
Rick Fox	rick@rickdfox.com
Bernie & Jim Humphrey	moosersrus@yahoo.com
Jenny Cassel	jcassel@earthjustic.org
Therese Brink	Therese.brink@gmail.com

Appendix L

Training Program Statement

Phil Morris
Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, IL 62234

June 30, 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
Edwards Power Plant Ash Pond (IEPA ID# W1438050005)

Dear Mr. Darin LeCrone:

For the above-referenced CCR surface impoundment and in accordance with 415 ILCS 5/22.59(b)(4), Illinois Power Resources Generating, LLC 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 Resources Generating, LLC

Phil Morris, P.E.
Senior Director, Environmental