OHIO VALLEY ELECTRIC CORPORATION
3932 U. S. Route 23
P. O. Box 468
Piketon, Ohio 45661
740-289-7200

WRITER'S DIRECT DIAL NO:
740-289-7259

June 29, 2023

Delivered Electronically

Mr. Brian Rockensuess
Commissioner
Indiana Department of Environmental Management
100 N. Senate Avenue
Mail Code 50-01
Indianapolis, IN 46204-2251

Re: Indiana-Kentucky Electric Corporation- Clifty Creek Station
Revision to the West Boiler Slag Pond Phase 2-4 Closure Plan

Dear Mr. Rockensuess:

As required by 40 CFR 257.106(i)(4), Indiana-Kentucky Electric Corporation is providing notification to the Commissioner of the Indiana Department of Environmental Management (IDEM) that a revision has been made to the Clifty Creek Station West Boiler Slag Pond Phase 2-4 Closure Plan. The newly revised plan will be placed in the facility's operation record as well as the publicly accessible internet site, which can be viewed at http://www.ovec.com/CCRCompliance.php

If you have any questions, or require any additional information, please call me at (740) 289-7259, or you can contact Tim Fulk at (740) 897-7768.

Sincerely,

Jeremy Galloway
Environmental Specialist

JDG: tlf

Stantec Consulting Services Inc.
9200 Shelbyville Road, Suite 800, Louisville KY 40222-5136

June 27, 2023

Project/File: 175531036

Mr. Gabriel Coriell
Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

Reference: Phases 2-4 Closure Plan
Clifty Creek Station
West Boiler Slag Pond
Madison, Jefferson County, Indiana

Dear Mr. Coriell,

The attached Phases 2-4 closure plan for Clifty Creek Station's West Boiler Slag Pond (WBSP) was prepared by Stantec Consulting Services Inc. (Stantec) for the Indiana-Kentucky Electric Corporation (IKEC).

The initial closure and post-closure plans for the WBSP were posted on October 11, 2016 as part of the U.S. Environmental Protection Agency (EPA) final coal combustion residuals (CCR) rule demonstrations. The plans were conceptual and subject to the completion of all necessary environmental reviews. Though conceptual, they demonstrated compliance with the requirements set forth in 40 CFR 257.102(b) and 257.104(d).

IKEC, Stantec, and the Indiana Department of Environmental Management (IDEM) met in Indianapolis on December 9, 2019 to discuss the requirements for Indiana CCR surface impoundment closures. Addendum 1 was prepared for the closure of 9.2 acres of the WBSP (Phase 1) to incorporate changes requested by the state. IKEC submitted Addendum 1 on February 12, 2020 to IDEM Office of Water Quality (OWQ) and Office of Land Quality (OLQ), Waste Section. IDEM's approval of the partial closure (Phase 1) of the WBSP (SW Program ID 39-005) was received on February 3, 2021.

To address the remaining footprint of the WBSP, IKEC submitted the Phases 2-4 closure plan to IDEM on June 17, 2021. No comment has been received from IDEM on this proposed closure plan to date.

The plan was prepared in accordance with the accepted practice of engineering and accurate information at the date of its submittal to meet the requirements described in 40 CFR 257.102(b). Changes to the closure plan may be required. Revised plans will be posted at that time.

Reference: **Phases 2-4 Closure Plan**
Clifty Creek Station
West Boiler Slag Pond
Madison, Jefferson County, Indiana

Regards,

STANTEC CONSULTING SERVICES INC.

Matt Vaughan
Principal
*Licensed in KY, IN
Phone: (502) 212-5088
matt.vaughan@stantec.com

stantec.com

Attachment: Stantec Consulting Services Inc. (2021). Closure Plan. Clifty Creek Station. West Boiler Slag Pond Closure. Phases 2-4. Madison, Jefferson County, Indiana. Prepared for Indiana-Kentucky Electric Corporation. June 16.

ATTACHMENT

Closure Plan. Clifty Creek Station. West Boiler Slag Pond Closure. Phases 2-4.

Stantec Consulting Services Inc. (2021)

OHIO VALLEY ELECTRIC CORPORATION
INDIANA- KENTUCKY ELECTRIC CORPORATION
3932 U. S. Route 23
P.O. Box 468
Piketon, Ohio 45661
740-289-7200

WRITER'S DIRECT DIAL NO:
(740) 897-7768

June 17, 2021

Ms. Kate Garvey
Office of Land Quality
Indiana Department of Environmental Management
Solid Waste Permits Section
100 N. Senate Avenue
MC 65-45 IGCN 1101
Indianapolis, IN 46204-2205

Dear Ms. Garvey:

Re: Indiana-Kentucky Electric Corporation
Clifty Creek Station West Boiler Slag Pond
Phases 2, 3 and 4 Closure Plan

In accordance with 329 IAC 10-3-1(9), the Indiana-Kentucky Electric Corporation (IKEC) is submitting for agency review the accompanying Closure Plan for the remaining Phases (2, 3 and 4) of Clifty Creek Station's West Boiler Slag Pond (WBSP). IKEC is committed to being a good steward of the environment and to satisfying our environmental compliance obligations. We recognize the importance of maintaining a close partnership with IDEM in this endeavor, and appreciate the opportunity to submit this plan for agency review. Note that while IKEC desires to work closely with IDEM, IKEC is not waiving any of the positions it identified in its May 28, 2021 letter to Steven Thill or those identified in its June 1, 2021 Petition for Review of the Approval of the Partial Closure Plan for IKEC's WBSP.

If you have any questions or comments please contact me at (740) 897-7768.

Sincerely,

Tim Fulk

Tim Fulk
Engineer II

TLF:gsc

Attachments

Closure Plan

Clifty Creek Station

West Boiler Slag Pond Closure

Phases 2-4

Madison, Jefferson County, Indiana

Prepared for:
Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
Piketon, Ohio 45661

June 16, 2021

Design with community in mind

Closure Plan

West Boiler Slag Pond Closure
Phases 2-4
Clifty Creek Station
Madison, Jefferson County, Indiana

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Closure Plan

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Phases 2-4
Clifty Creek Station
Madison, Jefferson County, Indiana

1. Objective

Indiana-Kentucky Electric Corporation (IKEC) is submitting this Closure Plan for the Clifty Creek Station's West Boiler Slag Pond (WBSP) to the Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ) with copies to the Office of Land Quality (OLQ), Waste Section. IKEC requests OWQ coordinate its review and comments with OLQ in a timely manner that facilitates adherence to the proposed schedule to close Phases 2-4 of the WBSP at the Clifty Creek Station.

The WBSP is an active settling facility and manages over 500 acres of stormwater and process flows from the station. The applicable National Pollution Discharge Elimination System (NPDES) Permit No. is IN0001759. IKEC previously submitted a Closure Plan for Phase 1 of the WBSP, which included regrading, capping, and closure of an inactive portion of the WBSP under the requirements of 40 CFR 257.102 of the U.S. Environmental Protection Agency's (USEPA's) Disposal of Coal Combustion Residuals (CCR) from Electric Utilities rule (EPA Final CCR Rule, 2015). The Phase 1 area lies within the WBSP clay dike, is at capacity, and has previously been repurposed as a laydown area for the station. The Phase 1 closure plan was submitted to IDEM in February 2020 and was deemed complete on October 23, 2020. The public involvement period is complete.

This closure plan details the three subsequent closure phases for the WBSP. Their design will be defined by the USEPA's EPA Final CCR Rule and the final rule amending 40 CFR 423, the Effluent Limitations, Guidelines, and Standards for the Steam Electric Power Generating Point Source Category (ELG Postponement Rule), which is addressed to modify operations at the Clifty Creek Station. Phases 2 and 3 will include design and construction of concrete CCR settling tanks and a Low Volume Waste Treatment System (LVWTS) to manage stormwater, plant process water (e.g., coal yard sumps, boiler room sumps, precipitator sumps), and landfill leachate. Phase 3 also includes construction of a new NPDES outfall. The existing NPDES permit and the authorization to discharge, as amended, from the WBSP's Outfall 002 expires on April 30, 2022 (IDEM, 2018). Construction of Phase 4 will then be initiated to close the remainder of the surface impoundment. Phase 4 includes subphases defined by the method of closure. Phase 4A will be completed by closure in place, i.e., final cover and geosynthetic cap placement. Phase 4B will be completed as closure-by-removal of material in accordance with this closure plan.

Appendix A is a list of acronyms and abbreviations.

2. Description of the CCR Unit

The Clifty Creek Station is located on the north bank of the Ohio River west of Madison, Indiana. It consists of six coal-fired electric generating units, each nominally rated at 217 megawatts. The station began producing electricity in 1955 to support the Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant located near Piketon, Ohio. The WBSP is located immediately west of the station and south of Clifty Hollow Road. It was built concurrent to station construction to store sluiced CCRs. Figure 1 shows the location of the Clifty Creek Station and a general overview map of the site, including the locations of the WBSP and supporting appurtenances.

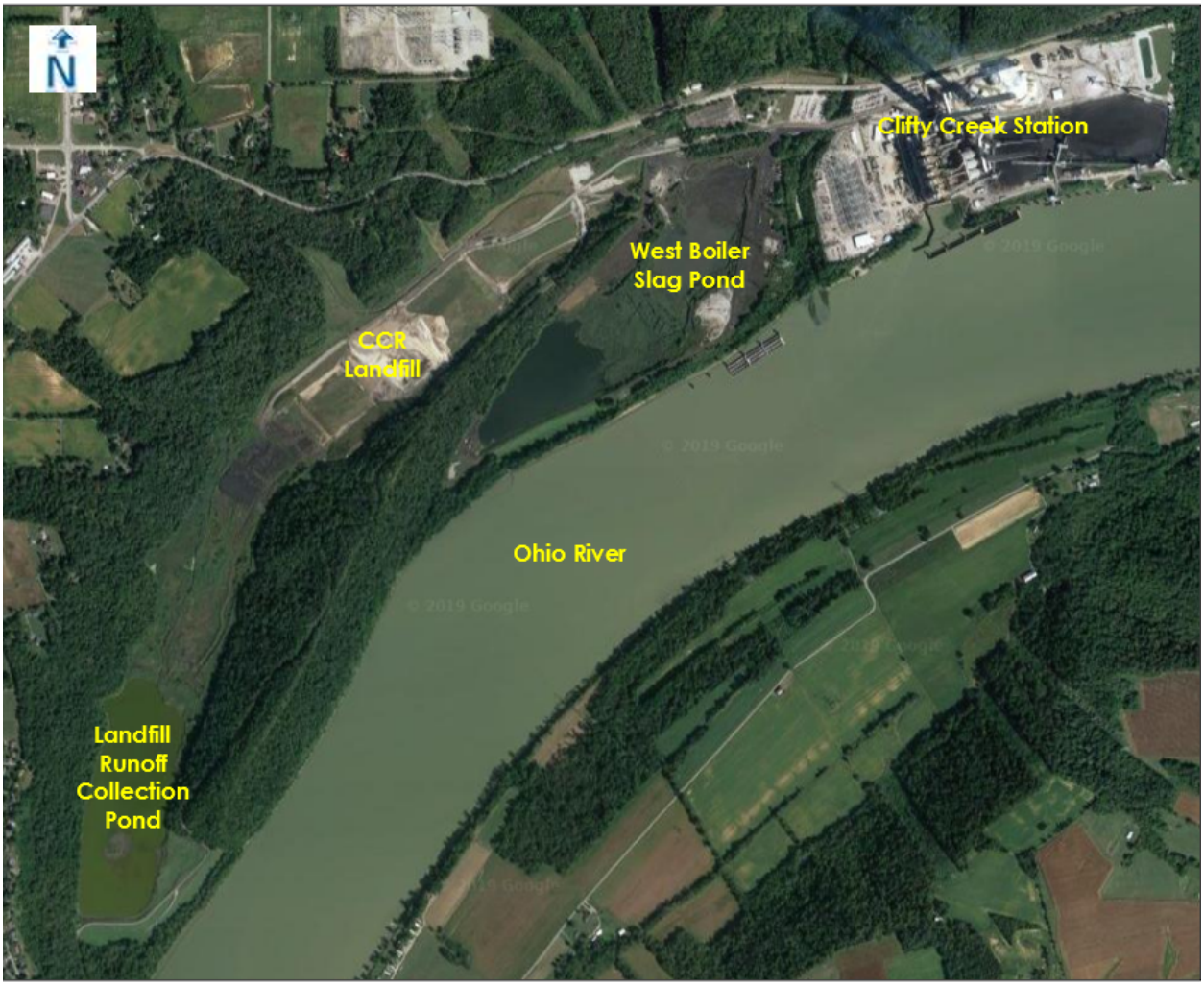

Figure 1- Aerial View of Clifty Creek Station

2.1. Impoundment Structure

The WBSP embankment is approximately 2,500 feet long, encompassing an estimated 80 acres with about 35 acres of surface water. The top of the dike is at an elevation of approximately 475 feet. The dike varies in height above the adjacent plant grades with

a maximum height of approximately 41 feet. FEMA (2015) Flood Insurance Study No. 18077CV000A shows that the flood stages of the Ohio River at the WBSP are approximately 463 feet and 468 feet for the 1 and 0.2 percent annual chance of flooding, respectively.

According to as-built design drawings 16-3002-5, 16-3002A-3, and 16-3033-1, the crest of the dam is 20 feet wide, the upstream slopes are 1.5H:1V (horizontal slope : vertical slope), and the downstream slopes are 2.5H:1V. The exterior toe of the dike is shown as elevation 433.0 feet with an exterior slope bench at 445.5 feet (AEPSC, 2016; Appendix B). The exterior WBSP slopes are grass covered.

2.2. Primary Spillway

The WBSP's primary spillway is a 30-foot tall reinforced concrete decant-type overflow structure built 70 feet east of the southwestern abutment. The intake shaft is rectangular with a 3.25-foot by 3.25-foot interior cross section (GZA, 2009). The top of the structure is approximately elevation 458 feet (AEPSC, 2015). A 36-inch extra strength reinforced concrete pipe connects to the decant structure at elevation 433.0 feet and discharges 300 feet downstream to the Ohio River (GZA, 2009).

Flows from the WBSP are currently permitted to be discharged through Outfall 002 to the Ohio River under modified NPDES Permit No. IN0001759 effective May 1, 2018, which is administered by IDEM. The existing NPDES permit and the authorization to discharge, as amended, from the WBSP's Outfall 002 expires on April 30, 2022 (IDEM, 2018).

2.3. WBSP Location

The Clifty Creek Station is in Jefferson County, Madison Township, Indiana in Township 3N, Range 10E, Section 5. The proposed four phases of closure and the post closure plan include approximately 89.6 acres. A legal description of the facility boundary is included in Appendix C.

In Appendix D, Figures 2 and 3 reflect a half-mile offset from the WBSP's waste boundary with regional water wells identified in the Indiana Department of Natural Resources (IDNR), Division of Water Well Record Database (IDNR, 2019). Figure 2 shows a plan view of the WBSP overlain on a November 2017 ESRI aerial. Figure 3 reflects the same data shown on a portion of the 7½-minute USGS topographic quadrangle map for Madison West (2019).

Six wells are shown within the half-mile offset. Available IDNR well information is provided in Appendix D. Three are a significant withdraw well permit group (registration number 01356) owned by IKEC and located upgradient of the WBSP. Two (Source ID 1 and 2A) provide water to the Clifty Creek Station. The third (Source ID 3) was abandoned in 2012 by Reynolds, Inc.

Logs for two more wells are available with UTM coordinates provided. Drilled in 1957, Wells 220019 and 22024 are owned by IKEC. Both encountered gravel and sand at depths of 58 and 60 feet, respectively. Well 22019 terminated at a bedrock depth of 130

feet. The wells were field located in 1966 and 1967. All IKEC wells are located upgradient of the WBSP.

The sixth well (registration number 219344) is owned by the State of Indiana, Clifty Falls Park and is also located upgradient of the WBSP. Completed in 1952, no UTM coordinates were provided. Comments in the IDNR file stated that drilling could not be verified. The location is estimated by township/range/section, quarter section, and county within the IDNR database and is assumed to be upgradient of the WBSP.

Table 1 - Water Wells Within a Half-Mile Offset

Well Record Reference No.	Type	Depth (feet)	Completion Date	Location	Status
220019	Drilled to Bedrock	130	10/9/1957	Field located (1966); UTM provided	Inactive
220024	Unconsolidated	83	10/23/1957	Field located (1967); UTM provided	Inactive
01356 (1)	Significant Withdraw	122	12/25/1984	UTM provided	Active
01356 (2A)	Significant Withdraw	116	12/25/1984	UTM provided	Active
01356 (3)	Significant Withdraw	83	12/25/1984	General UTM provided	Abandoned
219344	--	--	7/20/1952	No UTM provided, NW ¼ of NW ¼ adj. to Ohio River below park.	Not present at location shown

2.4. Available Geotechnical Data

Geotechnical data is available from six field explorations at the WBSP. A plan view of the borings and logs are provided in Appendix E. Appendix F contains a slope stability analysis for the WBSP Ph. 2-4 closure.

American Gas & Electric Service Corp. (1953)

The 1953 as-built design drawings include geotechnical borings within the Cinder Storage Area, now called the WBSP. The drawings show the embankment dimensions, generalized original ground topography, and geotechnical boring logs used as the basis of design.

The as-built base of the WBSP is 433.0 feet. Borings 3 and 4 show sandy brown clay at this elevation. Construction records reflect controlled compaction techniques using local material to reach the base grades. Borings 1 through 4 noted a silty grey clay with some sand to elevations of 401.0 feet (Boring 3) and 413.8 feet (Boring 4). In Borings 1 and 2, the sandy grey silt persists to 384.0 feet.

Stantec (2016)

Stantec performed two geotechnical field explorations to support the safety factor demonstration under the CCR Rule. Six borings were advanced along the crest and the downstream toe of the WBSP embankment dike in 2009/2010 with a site visit in 2015 to confirm field conditions. Laboratory testing was performed to confirm field classifications (natural moisture content, hydrometer analyses, Atterberg limits), estimate shear strength

(consolidated-undrained triaxial compression testing), and permeability. Results from the explorations indicate that the dikes were constructed of lean clay with sand. A well-graded gravel was encountered in Boring B-2 at elevation 392.5 feet and in Boring B-4 at 372.5 feet. The bedrock beneath the foundation soils is weathered gray shale.

AGES (2016)

Applied Geology and Environmental Science (AGES), Inc. was contracted by IKEC to identify upgrades in the groundwater monitoring program of the WBSP necessary for compliance with the CCR Rule. In 2015, two soil borings were advanced to supplement the existing subsurface geology information for the WBSP. Ten monitoring wells were then installed using a sonic drill rig, three upgradient and seven downgradient. Excerpts from AGES (2018) are included in Appendix E. This includes a well summary table, a generalized geologic cross section, groundwater flow maps for four sampling periods, and sample/well construction logs.

D. W. Kozera (2019)

A field exploration was performed in 2019 to support design and construction of a material handling pad within the proposed Phase 1 closure footprint. Six borings were advanced to a depth of 30 feet below existing grade along the southeastern embankment dike of the WBSP. The logs described the material as manmade fill, consisting of boiler slag (silty sand with gravel) or lean clay. A plan view and boring logs for this exploration are included in Appendix E.

Geotechnology (2020)

A field exploration was performed in 2020 to support design and construction of the Phase 2 closure area. Eight borings were advanced to depths ranging from 16 of 48 feet below existing grade. Seven cone penetrometer test (CPT) soundings were pushed from 4 to 36 feet below existing grade. The logs described the material as manmade fill, consisting of sand, gravel, and clay; boiler slag (coarse sand); lean clay, or shale and limestone bedrock. A plan view and boring logs for this exploration are included in Appendix E.

Stantec (2021)

Stantec conducted a field exploration in 2021 to support design and construction of the Phase 1through 4 closure of the WBSP. Seven geotechnical borings were advanced to depths ranging from 20 to 52 feet below existing grade. The logs described the material as manmade fill, consisting of sand, gravel, and clay; boiler slag (coarse sand); lean clay, gravel, or shale bedrock. Laboratory testing of samples collected during this exploration is ongoing at the time of this report. A plan view and boring logs for this exploration are included in Appendix E.

3. Regulatory Overview

3.1. Regulatory Framework for Design

The United States EPA Final CCR Rule defines the criteria for conducting the closure of CCR units under 40 CFR 257.102.

Per the IDEM CCR Fact Sheet, Indiana coal ash surface impoundments that are subject to an NPDES permit are not regulated under IDEM's solid waste program (IDEM 2021). Once the NPDES permit is terminated, the final disposal of solid waste in the surface impoundment is subject to the closure requirements under 329 Indiana Administrative Code (IAC) 10-9-1(9)(b) and (c), which incorporates portions of the CCR Rule by reference.

This submittal is an amendment to a written closure plan (40 CFR 257.102(b)(3)) describing closure in place (40 CFR 257.102(d)) for the second, third, and fourth phases of the WBSP.

Below is a general summary of how the WBSP will be closed. The permit-level Phase 2-4 drawings are included in Appendix G. Ditch sizing calculations associated with the permit-level design for Phases 2-4 are included in Appendix H.

3.2. Description of Closure Plan - 257.102(b)(1)(i)

[A narrative description of how the CCR unit will be closed in accordance with this section.]

The WBSP is an active settling facility, managing over 500 acres of stormwater and process flows from the station. The intent is to consolidate CCR materials within the WBSP where possible and close the facility in place in accordance with the requirements found in the CCR Rule. The closure will consist of design and construction of concrete CCR settling tanks, a Low Volume Waste Treatment System (LVWTS) consisting of two lined ponds to manage stormwater, process flows from the plant and leachate from the CCR landfill (Phases 2 and 3). Construction of Phase 4 will then be initiated to close the remainder of the surface impoundment through construction of an engineered cap and closure by consolidation.

IDEM's OLQ has requested that the WBSP be closed in accordance with Type I restricted waste site (RWS) standards. Under 329 IAC 10-30-2, final cover must have:

- A maximum projected erosion rate of five tons per acre per year
- A final compacted cover of six inches of topsoil plus a minimum depth of compacted clay of 30 inches:
- Slopes not less than two percent nor greater than 33 percent.

Appendix I includes the final cover soil loss calculations. The final cover consists of a 30-inch cover material layer and six inches of earthen material capable of growing and sustaining native vegetative growth. A geosynthetic membrane liner and geocomposite drainage layer is included below the cover material. The capped surface will be graded

to promote surface water runoff, and then seeded and mulched to promote growth of the vegetative cover.

3.3. Closure in Place - 257.102(b)(1)(iii)

[If closure of the CCR unit will be accomplished by leaving the CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover.]

Prior to installing the final cover system for each of the phases, the CCR unit will be drained of free water and the material within the unit will be stabilized and graded to provide a stable and suitable subgrade upon which to construct the cap. All water will be managed in the remaining open portion of the pond and discharged through the existing NPDES outfall for Phases 2 and 3. Upon completion of the LVWTS and final cover system in Phase 2 and 3, stormwater and treated process flows will be managed through a new NPDES outfall. Construction of Phase 4 will then begin construction to close the remainder of the surface impoundment through construction of an engineered cap and closure by consolidation. The existing CCRs will then be reshaped to provide a firm and stable subgrade and to achieve positive drainage for stormwater runoff.

The final closure system will consist of the following layers (from bottom to top):

- 40-mil LLDPE Flexible Membrane Liner
- Geocomposite Drainage Layer
- 30-inches of cover material
- 6-inches of vegetative cover capable of growing and sustaining native vegetative growth

The flexible geomembrane liner (FML) will have a permeability that is less than or equal to the permeability of the natural subsoils, and is no greater than $1x10^{-5}$ cm/sec. The capped surface will be graded to promote surface water runoff, and then seeded and mulched to promote growth of the vegetative cover.

As part of the LVWTS construction, the primary and secondary basins will be constructed with engineered liner systems. The primary basin liner system shall consist of (from bottom to top):

- Geosynthetic Clay Liner
- 60-mil HDPE Flexible Membrane Liner
- Geotextile Fabric
- 12-inches of fill material
- Concrete work surface

The secondary basin liner system shall consist of:

- Geosynthetic Clay Liner
- 60-mil HDPE Flexible Membrane Liner
- Geotextile Fabric
- 6 inches of fill material
- 18-inches of riprap

For both the primary and secondary basin, the liner system on the side slopes shall consist of:

- Geosynthetic Clay Liner
- 60-mil HDPE Flexible Membrane Liner
- Geotextile Fabric
- 6 inches of fill material
- 18-inches of riprap

Piezometers will be installed within Phases 2-4 to monitor water levels for the closed footprint. Additional measures may be necessary to support subgrade conditioning and construction of the proposed liner and final cover systems. All pumped water will be returned to the remaining open portion of the pond to be discharged through the existing NPDES outfall.

Stormwater drainage improvements will be implemented during the final closure activities with minor grading of existing channels and construction of new channels to improve drainage of the closed pond. The final cover slope will be a minimum of two percent (2%) and will convey surface water to an NPDES-permitted outfall. Permanent stormwater ditch slopes may vary and will be sized to adequately convey anticipated design storm events.

3.4. Closure Performance Standards - 257.102(d)(1)

3.4.1. Section 257.102(d)(1)(i),(ii),(iii)

[(i)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; (ii) Preclude the probability of future impoundment of water, sediment, or slurry; (iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period]

Post-closure infiltration of liquids into the waste will be controlled through the design of the site grading plan, construction of an engineered cap system, and establishment of a

stormwater management system in accordance with engineering practices. The intent of such a plan is to limit the infiltration of precipitation, cover, control, and prevent the releases of CCRs, and promote positive drainage. CCR materials will be placed and compacted in a manner to minimize settling and subsidence that could affect the integrity of the final cover system prior to cap placement.

Installation and quality control testing of the geosynthetics will be performed as specified by the manufacturer.

Stability analyses were performed as part of the EPA Final CCR Rule's design criteria demonstrations (Stantec, 2016). Additional analyses have been performed to support the proposed conveyor system at the southeastern abutment of the pond and to evaluate the perimeter dike stability to support the design grading of the Phases 2 through 4 WBSP closure area grading. These analyses are included in Appendix E.

3.4.2. Section 257.102(d)(1)(iv)

[Minimize the need for further maintenance of the CCR unit.]

The final configuration of the impoundment will be vegetated to mitigate erosion. Maintenance of the final cover system will include regularly scheduled inspections to monitor post-closure conditions and preventative maintenance.

3.4.3. Section 257.102(d)(1)(v)

[Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.]

The impoundment will be closed in a time frame consistent with recognized and generally accepted good engineering practices. Refer to the schedule below for key milestone dates.

3.5. Draining and Stabilizing the Surface Impoundment

[The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of paragraph (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section.]

3.5.1. Section 257.102(d)(2)(i)

[Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residue.]

Free liquid will be removed as part of the final closure of the CCR unit and discharged in a manner consistent with the facility's NPDES permit.

3.5.2. Section 257.102(d)(2)(ii)

[Remaining waste must be stabilized sufficient to support the final cover system.]

The remaining wastes that constitute the subgrade of the final cover system will be stabilized by removal of free liquids and providing bridging material as necessary.

3.6. Final Cover System - 257.102(d)(3)

[If a CCR unit is closed by leaving the 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 paragraph (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.

The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan.]

Refer to Section 3.3 for details regarding the final cover system

3.7. Estimate of Maximum CCR Volume - 257.102(b)(1)(iv)

[An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.]

The estimated maximum amount of CCR to ever be on-site for the WBSP is approximately 3,600 acre-feet.

3.8. Estimate of Largest Area of CCR Requiring Cover - 257.102(b)(1)(v)

[An estimate of the largest area of CCR unit ever requiring a final cover.]

The proposed final cover system area for Phases 2-4 is approximately 60 acres.

3.9. Closure Schedule - 257.102(b)(1)(vi)

[A schedule for collecting all activities necessary to satisfy the closure criteria in the section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization of the CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of the CCR unit closure.]

Phases 2-4 will begin final design and construction upon approval of this permit application. The intent is to complete construction of the Phase 2 concrete CCR settling tanks and Phase 3 Low Volume Waste Treatment System (LVWTS) by end of 2023.

Subsequent Phase 4 construction to close the remainder of the surface impoundment through construction of an engineered cap will be completed within five years of cessation of flows in accordance with the CCR Rule or when technically feasible.

USEPA (2020) has defined a closure schedule process for existing CCR surface impoundments that are considered "unlined" under the CCR Rule. Table 2 provides an approximate closure schedule to meet the required regulation.

Table 2 - Proposed Closure Schedule

Task	Completion Date
Phase 1 construction	End of 2022
Phase 2 and Phase 3 construction	End of 2023
Phase 4 construction	Within 5 years of cessation of flows or when technically feasible

4. General Considerations

General considerations for the WBSP closure are presented in the following sections. Subsequent to final closure, IKEC will address environmental concerns and permit obligations that are regulated by other IDEM divisions during the closure process. All demonstrations reflecting the WBSP's compliance with the EPA Final CCR Rule in terms of location restrictions, design criteria, operating criteria, and groundwater monitoring are available on IKEC's public website, www.ovec.com/CCRClifty.php.

Phase 2 includes the construction of a series of concrete settling tanks to manage operational boiler slag, which will serve as part of the facility's ELG compliance strategy. Phase 3 includes the construction of two geomembrane-lined ponds to treat on-going plant process flows and construction of a new NDPES outfall. Phase 4 consolidates and closes the last of the WBSP active surface impoundment.

5. Closure Plan Scope of Work

Phases 2-4 closure of the WBSP will require continued modification of the current pond system. The following general tasks are anticipated as part of the closure process.

5.1. Phase 2

Phase 2 will consist of the portion of the final cover supporting boiler slag settling tanks, pipes, and ancillary facilities for the operational changes to the process flows. It will be located at the northern end of the WBSP, located closest to the station. Appendix G provides the proposed Phase 2-4 permit drawings, including the boiler slag settling tanks, pipes, and ancillary facilities and associated details, as well as the portion of the final cover supporting these features.

5.2. Phase 3

A significant portion of the waste water flow from the station is planned to be treated with a separate treatment system. The system for handling this flow is termed the Low Volume Waste Treatment System and is not included in the ELG requirements. The Phase 3 area and construction activities will include two lined basins to collect this flow. The Phase 3 design of this system was based on flow rates and minimum required retention times.

5.3. Phase 4

Throughout Phases 2 and 3, process flows will continue to be discharged through Outfall 002 to the Ohio River under modified NPDES Permit No. IN0001759 effective May 1, 2018, which is administered by IDEM. The existing NPDES permit and the authorization to discharge, as amended, from the WBSP's Outfall 002 expires on April 30, 2022 (IDEM, 2018). Construction of Phase 4 will then be initiated to close the remainder of the surface impoundment. Phase 4 consists of two subphases defined by the closure construction anticipated within those phases.

As part of Phase 4A, an engineered cap system will be constructed over the Phase 2-4 closure area. Appendix G provides the proposed Phase 2-4 permit drawings, including the cap area and details.

As part of Phase 4B, the remaining portion of the impoundment will be closed by consolidation (closure by removal). Existing CCR material will be removed in accordance with the requirements of the Quality Management Plan (QMP). Clean fill will be imported to the site to promote positive drainage of stormwater to the existing outfall. A minimum of six inches of vegetative cover will be placed over the fill material capable of growing and sustaining native vegetative growth.

The final cap system design will accommodate settling and subsidence so to preserve the cap system's integrity.

5.4. Stormwater Construction Permit

Since more than one acre will be disturbed during the pond closure activities, a Stormwater Notice of Intent (NOI) to discharge stormwater associated with construction activities will be submitted to IDEM OWQ. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted as required by the NOI along with applicable permit fees. A Notice of Termination (NOT) to terminate the stormwater construction permit will be submitted upon completion of the pond closure.

5.5. Construction Quality Assurance

Construction quality assurance (CQA) activities are outlined in the attached Quality Management Plan (QMP). The QMP will be finalized as part of the detailed design and prior to construction of each phase of the WBSP closure. Construction observations will

be conducted and recorded to document the closure and CQA testing. Sections of the QMP will include:

A. Purpose and Scope

B. Responsibility and Authority

C. Quality Control Activities

D. Quality Assurance Activities

E. Product Submittals and Material Testing

F. Project Documentation

Appendix J includes a draft QMP. This is proposed as the basis for the final plan to maintain consistency on the site.

5.6. Closure Documentation

Upon completion of approved closure construction activities, a closure report will be prepared by an independent professional engineer registered in the State of Indiana to document the completed construction activities. The closure report will be submitted to IDEM OLQ and OWQ. The letter report will document the source of fill material, amount of fill material used, details regarding cap construction, and final cap elevations.

6. Post-Closure Plan

Post-closure care will be performed in accordance with the Post-closure Plan in Appendix K. The closed areas for Phases 2-4 will be included in the active groundwater monitoring program until the ultimate closure of the WBSP. Post-closure care for all phases will begin at that time.

Estimated Closure and Post-Closure costs are provided in Appendix L.

7. References

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Stantec Consulting Services Inc. (2016). *Report of CCR Rule Stability Analyses. AEP Clifty Creek Power Plant. Boiler Slag Pond Dam and Landfill Runoff Collection Pond. Madison, Jefferson County, Indiana.* Prepared for American Electric Power, Columbus, Ohio. February 16.

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APPENDIX A

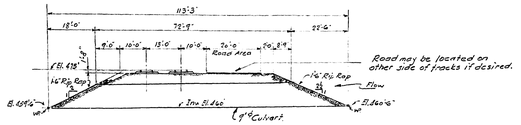
Acronyms and Abbreviations

Acronyms and Abbreviations

AEPSC	American Electric Power Service Corporation
AGES	Applied Geology and Environmental Science, Inc.
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
cm/sec	centimeters per second
CQA	Construction Quality Assurance
DOE	Department of Energy
ELG	Effluent Limitations, Guidelines
FML	flexible membrane liner
H:V	horizontal slope : vertical slope
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IKEC	Indiana-Kentucky Electric Corporation
LVWTS	Low-Volume Waste Treatment System
mW	megawatts
No.	number
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
OLQ	Office of Land Quality
OWQ	Office of Water Quality
QMP	Quality Management Plan
SWPPP	Stormwater Pollution Prevention Plan
UMA	uppermost aquifer
USEPA	United States Environmental Protection Agency
WBSP	West Boiler Slag Pond

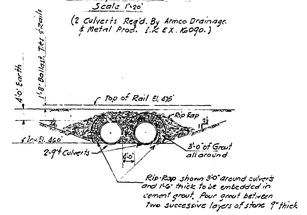
APPENDIX B

As-Built Design Drawings

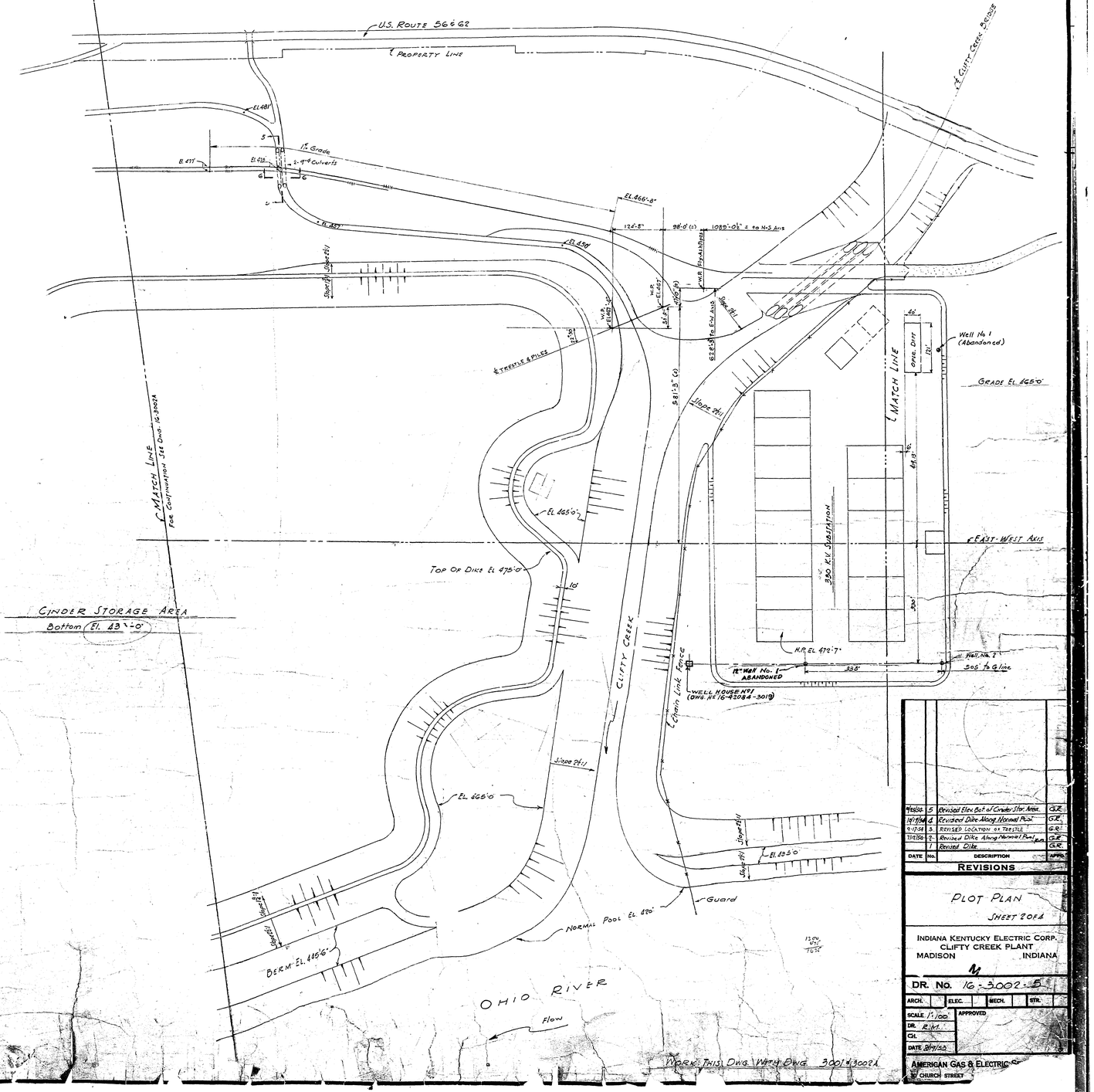


SECTION 5-5
Scale 1"=20'

(2 Culverts Req'd. By Amnco Drainage & Metal Prod. I.C.E.X. K6090.)



SECTION G-G
Scale 1"=20'



DATE	NO.	DESCRIPTION	APPD.
9-16-58	5	Revised Elev. Bot of Cinder Stor. Area.	GR
10-17-58	4	Revised Dike Along Normal Pool	GR
9-17-58	3	REVISED LOCATION OF TRESTLE	GR
7-17-58	2	Revised Dike Along Normal Pool Elev.	GR
6-16-58	1	Revised Dike	GR

REVISIONS

PLOT PLAN
SHEET 2 OF 6

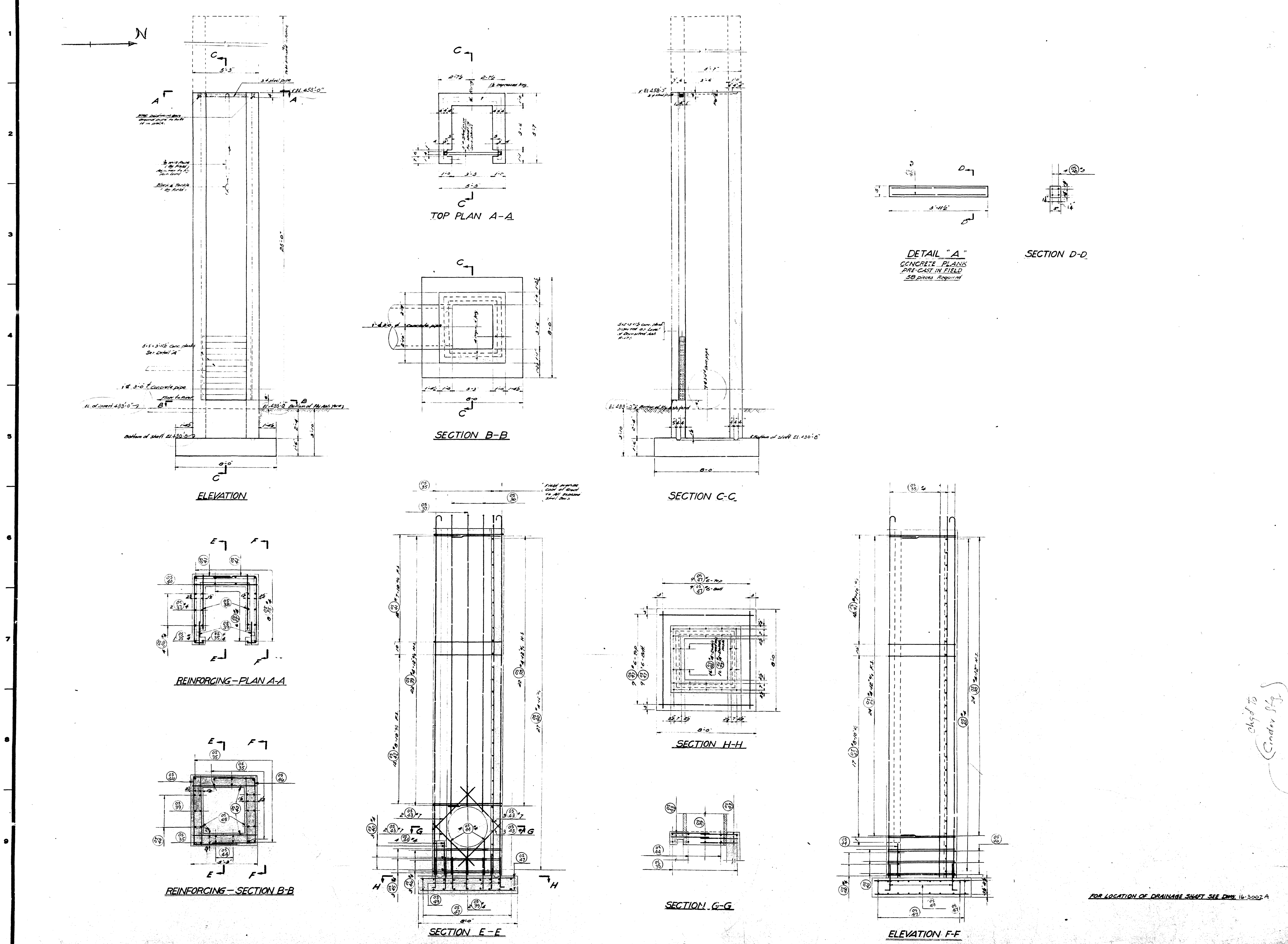
INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA

DR. No. 16-3002-5

ARCH.	ELEC.	MECH.	STR.
SCALE 1"=100'	APPROVED		
DR. R.M.T.			
CH.			
DATE 8/7/58			

AMERICAN GAS & ELECTRIC
30 CHURCH STREET

N.
U.S. Route 56 & 62
Top of Dike El. 475.0'
El. 445.6'
Drainage Shaft
36" R.C. Pipe (Existing)
36" R.C. Pipe (New)
Rip Rap
Normal Pool El. 420.0'
Original Grade
Inv. El. 430'±
Inv. El. 433.0'
Bend Line
El. 433.0
Inv. El.
SECTION A-A
Scale 1"=20'
5175'± to 'G' Line
5000'± to 'G' Line
FLY ASH DISPOSAL AREA
4000'± to 'G' Line
3410'± to 'G' Line
Top of Dike El. 475.0
East-West Axis
CINDER STORAGE AREA
Bottom El. 433.0' Boring's
Match Line
For Continuation See Dwg. 16-3002
Drainage Shaft (Field to Locate)
See Dwg. 16-3003
457'± to 'G' Line of Colo.
Top of Dike El. 475.0'
BERM El. 445.6'
Normal Pool El. 420'
Rip Rap
OHIO RIVER
Flow
Boring 2
Boring 7
130' - 36" Reinf. Conc. Pipe By: Field
220' - New 36" R.C. Pipe By: Field
63'-9"
105'-0"
73'-9"
10'-0"
73'-0"
Varies at other sections of Dike
El. 445.6'
Original Grade
Normal Pool El. 420
El. 433.0'
SECTION B-B
Scale 1"=20'
Work This Dwg. With Dwgs.
Revised Elev. Bott. of Cinder Stor. Area
Revised Dike Along Normal Pool
Revised Dike Along Normal Pool
DATE
No.
DESCRIPTION
REVISIONS
PLOT PLAN
SHEET 3 OF 4
INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA
DR. No. 16-3002A-3
ARCH.
ELEC.
MECH.
STR.
SCALE 1"=100'
APPROVED
AMERICAN GAS & ELECTRIC



General Notes:

Materials:
Concrete: 19 cu yd By Field
pipes: 1 - 3" pipe - 4'-6 Long
Reinforcing Steel By Field

Reference Drawings
RS 776 Reinforcing Schedule
16-3002A Fly Ash Yard

DATE	No.	DESCRIPTION	APPD.
10/25/54	1	Revised Elevations	G.R.

REVISIONS

ASH STORAGE YARD
DRAINAGE SHAFT
MASONRY & REINFORCING

1953-1954 CONSTRUCTION

INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT.
MADISON INDIANA

DR. No. 16-3033 -1

SCALE 3/8"=1'-0"
DR. F.T.K.
CH. M.E.
DATE 4/16/54
APPROVED G.E.

AMERICAN GAS & ELECTRIC SERVICE CORP.
30 CHURCH STREET

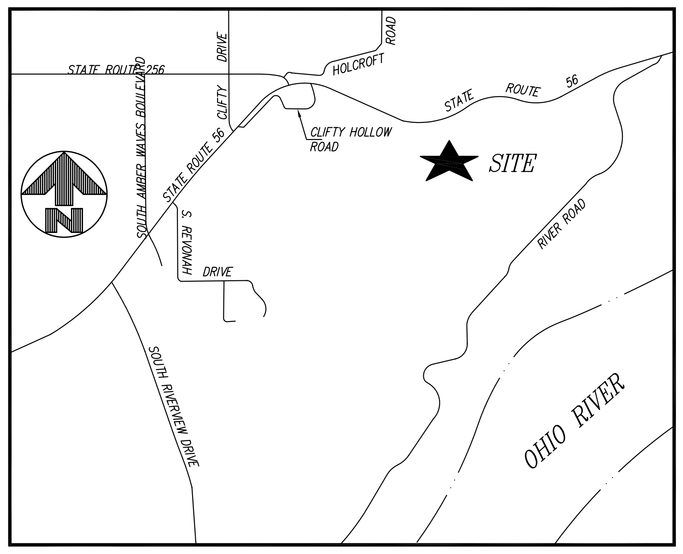
APPENDIX C

Boundary Survey

LEGEND

- ● 5/8" REBAR SET
- ○ 5/8" REBAR FOUND UNLESS NOTED OTHERWISE
- ◎ CONCRETE R/W MARKER FOUND
- △ RAILROAD SPIKE FOUND
- ▲ RAILROAD SPIKE SET
- □ CONCRETE MONUMENT WITH BRASS PLUG FOUND (SET PER 1957 NEAL SURVEY)
- ■ STONE FOUND

CURVE	LENGTH	RADIUS	DELTA	CHORD	
C1	343.16'	806.20'	24°23'16"	S88°56'04"E	340.57'
C2	135.55'	1054.46'	7°21'55"	N55°40'37"E	135.46'
C3	146.10'	2829.79'	2°57'29"	N60°50'19"E	146.08'
C4	312.52'	2754.79'	6°30'00"	N65°34'03"E	312.35'
C5	117.09'	2804.79'	2°23'31"	N70°00'49"E	117.09'



VICINITY MAP
N.T.S.

GENERAL NOTES:

1.) PHYSICAL FEATURES, DRIVES, BUILDINGS, WATER COURSES, ETC. ARE BASED ON A COMBINATION OF FIELD LOCATIONS AND AERIAL PHOTOGRAPHIC MAPPING SUPPLIED BY THE CLIENT.
2.) SECTION LINES ARE SHOWN FOR REFERENCE ONLY. SECTION LINES AND CORNERS WERE NOT RETRACED PER THIS SURVEY.
3.) BEARINGS ARE BASED ON THE INDIANA STATE PLANE COORDINATE SYSTEM, NAD '27, AS PER COORDINATES OF THE PLANT MONUMENTS SHOWN HEREON.
4.) INTERIOR PLANT PARCEL LINES NOT SHOWN IN FULL.
5.) REFERENCES USED INCLUDE INDIANA STATE HIGHWAY COMMISSION, F.A. PROJECT NO. 212 SEC. C PAVING PLANS FOR S.R. 56, DATED AUGUST, 1930 AND ADDITIONAL IMPROVEMENT PLANS DATED 1957.
6.) ADDITIONAL REFERENCE DATA INCLUDES A "REVISED BOUNDARY SURVEY – CLIFTY CREEK POWER PLANT SITE" AS PERFORMED BY GORDON RUSSELL NEAL & ASSOCIATES, DATED JULY, 1957.
7.) EASEMENTS OF RECORD NOT SHOWN.

NOTE: THIS MAP IS BASED, IN PART, ON A PARTIAL BOUNDARY SURVEY OF THE PREMISES BY KLEINGERS & ASSOCIATES IN MAY, 2006. THIS MAP IS TO BE USED FOR GENERAL AND PERMIT PURPOSES AND IS NOT TO BE USED FOR CONVEYANCE OF REAL PROPERTY.

GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

PHILIP L. DIX REGISTERED No. 890008 STATE OF INDIANA LAND SURVEYOR

KLEINGERS & ASSOCIATES
ENGINEERS AND SURVEYORS
6305 Centre Park Drive, West Chester, OH 45069
(513) 779-7851 Fax: (513) 779-7852

REVISIONS

FACILITY BOUNDARY / WASTE BOUNDARY MAP
INDICATING A PORTION OF THE LANDS OF
INDIANA – KENTUCKY ELECTRIC CORPORATION
SECTIONS 5, 6 & 7, TOWN 3 NORTH, RANGE 10 EAST
SECTION 32, TOWN 4 NORTH, RANGE 10 EAST
MADISON & HANOVER TOWNSHIPS JEFFERSON COUNTY, INDIANA

SCALE: 1"=300'
DATE: 11/22/06
DRAWN: DLC
DESIGNED: .
CHECKED: DLC
XREF:
JOB NO.: 060192VB

IN-KY ELECTRIC CORP

Page 1 of 1

KLEINGERS & ASSOCIATES
ENGINEERS AND SURVEYORS

November 22, 2006

LEGAL DESCRIPTION
INDIANA – KENTUCKY ELECTRIC CORPORATION
FACILITY BOUNARY
357.74 ACRES

Situated in Section 5, Town 3 North, Range 10 East, Madison Township and in Sections 6 and 7, Town 3 North, Range 10 East, Hanover Township, Jefferson County, Indiana and being part of the lands conveyed to Indiana-Kentucky Electric Corporation and being more particularly described as follows:

Commencing at a stone found at the northwest corner of said Section 5 and the northeast corner of said Section 6;

Thence along the westerly line of Section 5 and the easterly line of Section 6, also being the line between Madison and Hanover Townships, S00°35’59”E a distance of 803.96 feet;

Thence continuing along said section line, S00°12’42”E a distance of 1471.25 feet to a concrete monument found at the true Point of Beginning;

Thence along the lines or through the lands of the Indiana-Kentucky Electric Corporation the following sixty five (65) courses:

1) N12°01'53"E a distance of 121.63 feet;
2) N55°13'42"E a distance of 602.73 feet;
3) N22°57'31"W a distance of 1060.09 feet;
4) S74°02'58"E a distance of 440.98 feet;
5) S53°54'53"E a distance of 755.90 feet;
6) N38°01'17"E a distance of 621.98 feet;
7) N58°22'33"E a distance of 1611.56 feet;
8) S17°32'00"E a distance of 355.02 feet;
9) N54°42'01"E a distance of 328.58 feet;
10) N82°14'06"E a distance of 433.03 feet;
11) N79°13'01"E a distance of 1171.05 feet;
12) S12°46'08"W a distance of 669.60 feet;
13) S10°35'06"W a distance of 1071.55 feet;
14) S28°32'06"W a distance of 160.62 feet;
15) S61°35'28"W a distance of 950.19 feet;
16) S66°04'42"W a distance of 966.51 feet;
17) S61°55'05"W a distance of 742.11 feet;
18) N69°05'23"W a distance of 65.57 feet;
19) N05°34'13"W a distance of 234.77 feet;

20) N11°51'43"E a distance of 142.75 feet;
21) N34°31'34"E a distance of 734.91 feet;
22) N38°16'11"E a distance of 722.75 feet;
23) N44°51'56"E a distance of 909.64 feet;
24) S88°19'43"W a distance of 414.62 feet;
25) S16°39'44"W a distance of 119.61 feet;
26) S31°25'10"W a distance of 320.27 feet;
27) S50°17'27"W a distance of 297.64 feet;
28) S46°38'57"W a distance of 649.14 feet;
29) S40°04'49"W a distance of 994.34 feet;
30) S40°00'06"W a distance of 395.79 feet;
31) S45°37'31"W a distance of 334.36 feet;
32) S03°21'47"W a distance of 171.75 feet;
33) S11°43'20"E a distance of 167.55 feet;
34) S29°18'24"W a distance of 175.45 feet;
35) S70°04'39"W a distance of 193.60 feet;
36) S78°07'17"W a distance of 265.48 feet;
37) S27°08'06"W a distance of 135.59 feet;
38) S31°49'39"E a distance of 87.81 feet;
39) S17°43'48"E a distance of 249.68 feet;
40) S07°38'52"W a distance of 285.72 feet;
41) S32°04'10"W a distance of 549.95 feet;
42) S58°20'25"W a distance of 224.17 feet;
43) S31°35'23"W a distance of 817.79 feet;
44) S35°16'11"W a distance of 787.93 feet;
45) S22°43'35"W a distance of 180.34 feet;
46) S28°03'43"E a distance of 122.20 feet;
47) S51°58'02"E a distance of 224.52 feet;
48) S03°07'06"E a distance of 121.90 feet;
49) S44°38'09"W a distance of 793.85 feet;
50) Along a curve to the right, an arc distance of 203.67 feet, said curve having a central angle of 38°53'53", a radius of 300.00 feet, and a chord bearing S65°45'49"W for 199.78 feet;
51) N89°41'43"W a distance of 579.01 feet;
52) N02°29'53"E a distance of 1024.08 feet;
53) N17°31'09"E a distance of 988.81 feet;
54) N37°14'24"W a distance of 255.34 feet;
55) N60°25'06"E a distance of 272.79 feet;
56) N03°45'09"W a distance of 579.81 feet;
57) N89°06'31"E a distance of 278.28 feet;
58) N05°17'12"E a distance of 353.12 feet;
59) N24°32'05"W a distance of 636.15 feet;
60) N85°40'11"E a distance of 449.52 feet;
61) N27°24'18"E a distance of 839.97 feet;
62) N52°17'25"W a distance of 406.99 feet;
63) N81°34'55"E a distance of 756.11 feet;
64) N32°20'14"E a distance of 245.12 feet;

65) N52°14'21"E a distance of 142.14 feet to the Point of Beginning, containing 357.74 acres, more or less.

Bearings are based on the Indiana State Plane Coordinate System, NAD ’27 as per the coordinates of the plant monuments provided by others.

This description was prepared by Kleingers & Associates, Inc., under the direction of David L. Cox, Indiana Licensed Surveyor No. 890008 and is based on a partial survey of the subject property performed in April and May, 2006. This description is to be used for permit purposes only and is not for the conveyance of real property.

APPENDIX D

Location Figures

564303 567584 570865

452755

449474

446193

220024 220019

01356-1

219344

01356-2A

01356-3

80043197

80043195

80043196

80043214

40005883

40006032

N

Madison

INDIANA
KENTUCKY

OVEC/IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

Stantec

Legend

- Private Wells
- Wells (Estimated Location)
- Property Line
- Half-Mile Offset
- Waste Boundary

0 1,000 2,000 Feet

1:12,000 (At original document size of 11x17)

Notes

1. Coordinate System: Indiana State Plane East NAD83
2. Base features - ESRI
3. IDNR Water Wells June 2019
4. Kentucky Water Wells - 2015
5. USGS Quadrangle - Madison West
6. IDNR estimated location by township, range, section, quarter section, and county

Project Location
Clifty Creek Station
Jefferson County, IN

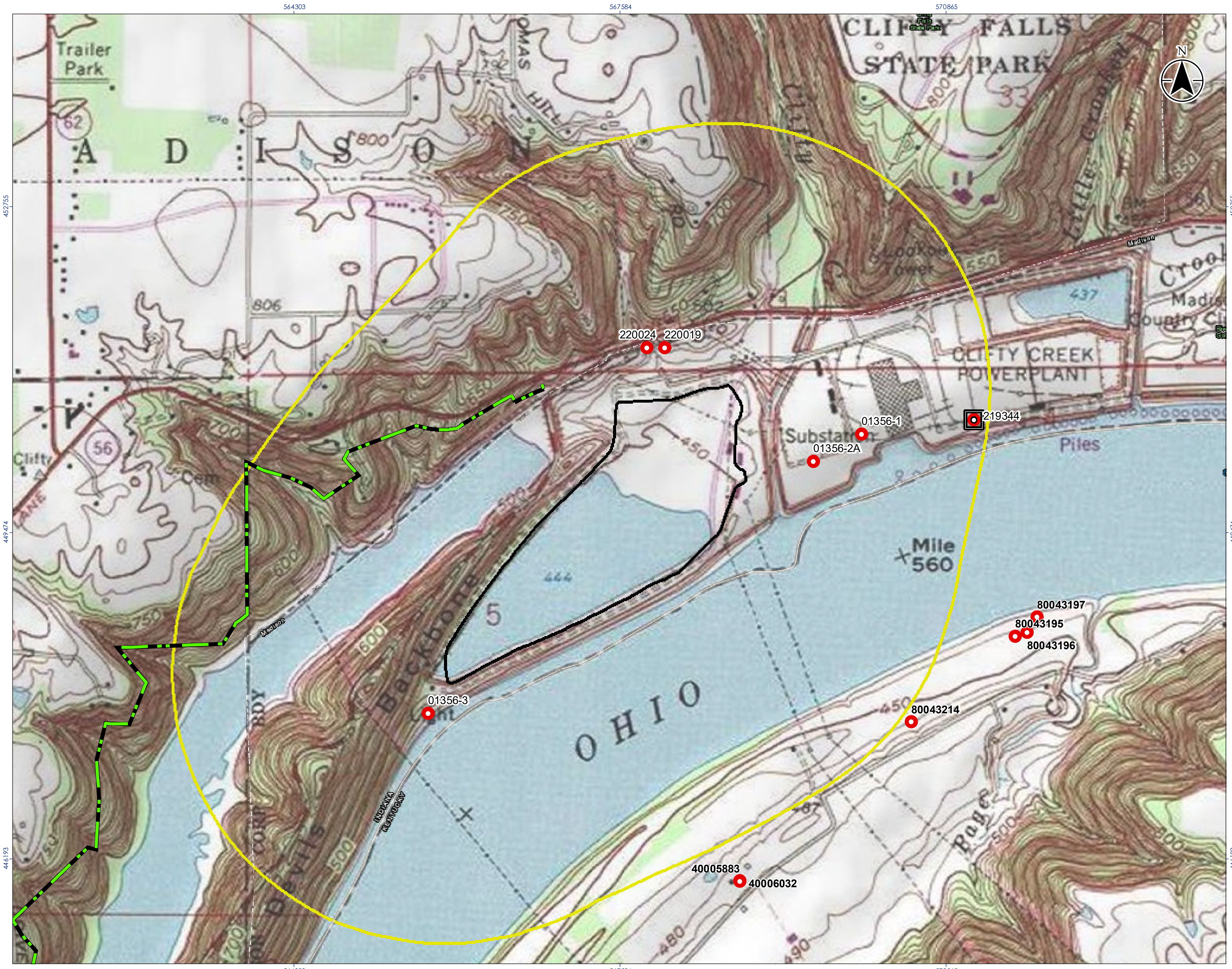
175534018
Prepared by AP on 02/04/2020
Technical Review by JH on 02/04/2020
Independent Review by SH on 02/04/2020

Client/Project
Indiana - Kentucky Electric Corporation
Clifty Creek Station

Figure No.
2

Title
Water Well Half-Mile Offset
West Boiler Slag Pond Closure Plan

V:\175\active\175534018\gis\mxd\WaterWells_Clifty_HalfMile_radius.mxd Revised: 2021-05-21 By: apoder



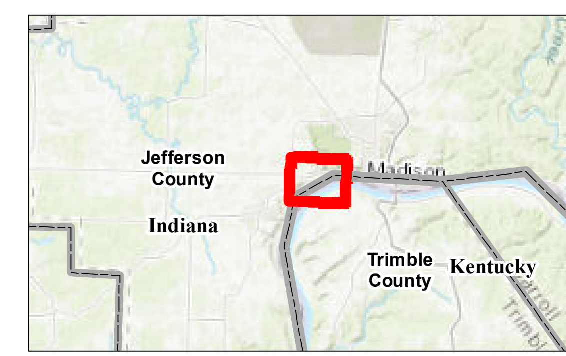
OVEC IKEC
Ohio Valley Electric Corporation | Indiana-Kentucky Electric Corporation

Stantec

Legend
- Private Wells
- Wells (Estimated Location)
- Property Line
- Half-Mile Offset
- Waste Boundary

0 1,000 2,000 Feet
1:12,000 (At original document size of 11x17)

Notes
1. Coordinate System: Indiana State Plane East NAD83
2. Base features - ESRI
3. IDNR Water Wells June 2019
4. Kentucky Water Wells - 2015
5. USGS Quadrangle - Madison West
6. IDNR estimated location by township, range, section, quarter section, and county



Project Location
Clifty Creek Station
Jefferson County, IN

175534018
Prepared by AP on 02/04/2020
Technical Review by JH on 02/04/2020
Independent Review by SH on 02/04/2020

Client/Project
Indiana - Kentucky Electric Corporation
Clifty Creek Station

Figure No.
3

Title
Water Well Half-Mile Offset
West Boiler Slag Pond Closure Plan

Significant Withdraw Wells within a Half-Mile Offset of the WBSP

	County	RegNo	MWU Code	Facility	RegDate	USGS 24k Quad	Township	Range	Section	Source Code	Source ID	Capacity (GPM)	Well Log	Depth (ft)	Diam (in)	Aquifer	UTM North	UTM East	x	y
Significant	39	01356	EP	Indiana Kentucky Electric Corporation	12/26/84	Madison West, IN-KY	3N	10E	4	WELL	1	500		122	12	SG	4288550	637225	637221.5056	4288757.352
Withdraw	39	01356	EP	Indiana Kentucky Electric Corporation	12/26/84	Madison West, IN-KY	3N	10E	4	WELL	2A	500	383112	116	16	SG	4288465	637078	637074.5094	4288672.35
Well	39	01356	EP	Indiana Kentucky Electric Corporation	12/26/84	Madison West, IN-KY	3N	10E	4	WELL	3	500		83	6	SG	4287675	635900		

IDNR Water Well Viewer, DOW Database (accessed February 5, 2020)

Record of Water Well

Indiana Department of Natural Resources

Reference Number	**Driving directions to well**	**Date completed**
220019	WELL #2 2MI W OF MADISON, INDIANA	Oct 09, 1957

Owner-Contractor	**Name**	**Address**	**Telephone**
Owner	INDIANA-KENTUCKY ELE. CO.	MADISON, INDIANA	
Driller	DIEHL PUMP & SUPPLY COMPANY	PO BOX 21266 LOUISVILLE, KENTUCKY	
Operator	A. BURGESS	License: null	

Construction Details

Well	**Use:** Industry	**Drilling method:** Cable Tool	**Pump type:**
	Depth: 130.0	**Pump setting depth:**	**Water quality:**
Casing	**Length:** 100.0	**Material:**	**Diameter:** 12.0
Screen	**Length:** 30.0	**Material:**	**Diameter:** 12.0 **Slot size:** #30

Well Capacity Test

Type of test: **Test rate:** 732.0 gpm for hrs. **BailTest rate:** gpm for hrs.
Drawdown: 7.0 ft. **Static water level:** 51.0 ft. **Bailer Drawdown** ft.

Grouting Information

Material: **Depth:** from to
Installation Method: **Number of bags used:**

Well Abandonment

Sealing material: **Depth:** from to
Installation Method: **Number of bags used:**

Administrative

County: JEFFERSON **Township:** 4N **Range:** 10E
Section: SW of the SE of the SE of Section 32 **Topo map:** MADISON WEST, IN-KY
Grant Number:
Field located by: JUA **on:** Jun 01, 1966
Courthouse location by: **on:**
Location accepted w/o verification by: **on:**
Subdivision name: **Lot number:**
Ft W of EL: 1000.0 **Ft N of SL:** 250.0 **Ft E of WL:** **Ft S of NL:**
Ground elevation: 500.0 **Depth to bedrock:** 130.0 **Bedrock elevation:** 370.0 **Aquifer elevation:**
UTM Easting: 636614.0 **UTM Northing:** 4288800.0

Well Log

Top	Bottom	Formation
0.0	48.0	MED
48.0	58.0	FN SANDY MUD
58.0	65.0	CRS GRAV
65.0	71.0	CRS GRAV
71.0	79.0	CRS GRAV
79.0	84.0	MED SAND
84.0	88.0	CRS SAND
88.0	92.0	CRS GRAV
92.0	100.0	S&G

	100.0	104.0	GRAV
	104.0	109.0	FN GRAV
	109.0	119.0	MED GRAV
	119.0	130.0	MED GRAV
	130.0		LIME

Comments MC370;

Record of Water Well

Indiana Department of Natural Resources

Reference Number	**Driving directions to well**	**Date completed**
220024	2MI. W OF MADISON, INDIANA#1 (RESORT WELL) -RECREATION @ POWER PLANT	Oct 23, 1957

Owner-Contractor	**Name**	**Address**	**Telephone**
Owner	INDIANA-KENTUCKY ELE. CO	MADISON, INDIANA	
Driller	DIEHL PUMP & SUPPLY COMPANY	PO BOX 21266 LOUISVILLE, KENTUCKY	
Operator	A. BURGESS	License: null	

Construction Details

Well	**Use:** Industry	**Drilling method:** Cable Tool	**Pump type:**
	Depth: 82.75	**Pump setting depth:**	**Water quality:**
Casing	**Length:** 76.9	**Material:**	**Diameter:** 6.0
Screen	**Length:** 6.0	**Material:**	**Diameter:** 6.0 **Slot size:** #30

Well Capacity Test

Type of test: **Test rate:** gpm for hrs. **BailTest rate:** gpm for hrs.
Drawdown: ft. **Static water level:** 27.0 ft. **Bailer Drawdown** ft.

Grouting Information

Material: **Depth:** from to
Installation Method: **Number of bags used:**

Well Abandonment

Sealing material: **Depth:** from to
Installation Method: **Number of bags used:**

Administrative

County: JEFFERSON **Township:** 4N **Range:** 10E
Section: SW of the SE of the SE of Section 32 **Topo map:** MADISON WEST, IN-KY
Grant Number:
Field located by: JNA **on:** Jun 01, 1966
Courthouse location by: **on:**
Location accepted w/o verification by: **on:**
Subdivision name: **Lot number:**
Ft W of EL: 1000.0 **Ft N of SL:** 250.0 **Ft E of WL:** **Ft S of NL:**
Ground elevation: 500.0 **Depth to bedrock:** **Bedrock elevation:** **Aquifer elevation:** 423.0
UTM Easting: 636560.0 **UTM Northing:** 4288800.0

Well Log

Top	Bottom	Formation
0.0	57.0	MED
57.0	60.0	COMM BOX
60.0	62.0	LARGE GRAVEL
62.0	64.0	CRS SAND, LARGE GRAV
64.0	67.0	CRS SAND, LARGE GRAV
67.0	69.0	CRS GRAV
69.0	72.0	MED SAND, LARGE GRAV
72.0	77.0	CRS SAND, LARGE GRAV

Comments MDM GRAY SAND-MUD, TRACE SOME GRAV, 57-60;

Record of Water Well

Indiana Department of Natural Resources

Reference Number	**Driving directions to well**	**Date completed**
219344	NW 1/4 OF NW 1/4 ADJ TO OHIO RIVER BELOW PARK	Jul 20, 1952

Owner-Contractor	**Name**	**Address**	**Telephone**
Owner	ST OF IN CLIFTY FALLS PARK		

Construction Details

Well	**Use:**	**Drilling method:**	**Pump type:**
	Depth:	**Pump setting depth:**	**Water quality:**
Casing	**Length:**	**Material:**	**Diameter:**
Screen	**Length:**	**Material:**	**Diameter: Slot size:**

Well Capacity Test

Type of test: **Test rate:** 14.0 gpm for hrs. **BailTest rate:** gpm for hrs.
Drawdown: ft. **Static water level:** ft. **Bailer Drawdown** ft.

Grouting Information

Material: **Depth:** from to
Installation Method: **Number of bags used:**

Well Abandonment

Sealing material: **Depth:** from to
Installation Method: **Number of bags used:**

Administrative

County: JEFFERSON **Township:** 3N **Range:** 10E
Section: of Section 4 **Topo map:** MADISON WEST, IN-KY
Grant Number:
Field located by: **on:**
Courthouse location by: **on:**
Location accepted w/o verification by: **on:**
Subdivision name: **Lot number:**

Ft W of EL:	**Ft N of SL:**	**Ft E of WL:**	**Ft S of NL:**
Ground elevation:	**Depth to bedrock:**	**Bedrock elevation:**	**Aquifer elevation:**
UTM Easting:		**UTM Northing:**	

Well Log

Top	Bottom	Formation

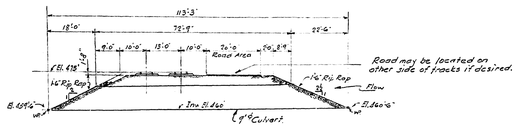
Comments

S&G: DRILLING COULD NOT BE VERIFIED BY GATEMAN WHO WORKED AT THE PACK AT ABOUT THE TIME THE WELL WAS SUPPOSED TO HAVE BEEN DRILLED. THERE IS NOW A LARGE ELECTRIC CO COMPLEX ON THE NW 1/4 NW 1/4 OF 4 J U HORTON IN KENTUCKY ELECTRIC CO. TOPOGRAPHY RIVER FLAT PUMP CAPACITY; 20 STAGE HORSEPOWER; 10 KIND ELECTRIC:

APPENDIX E

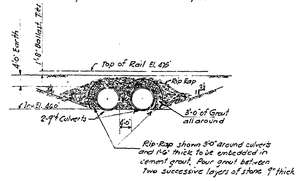
Geotechnical Data

AGESC (1953)

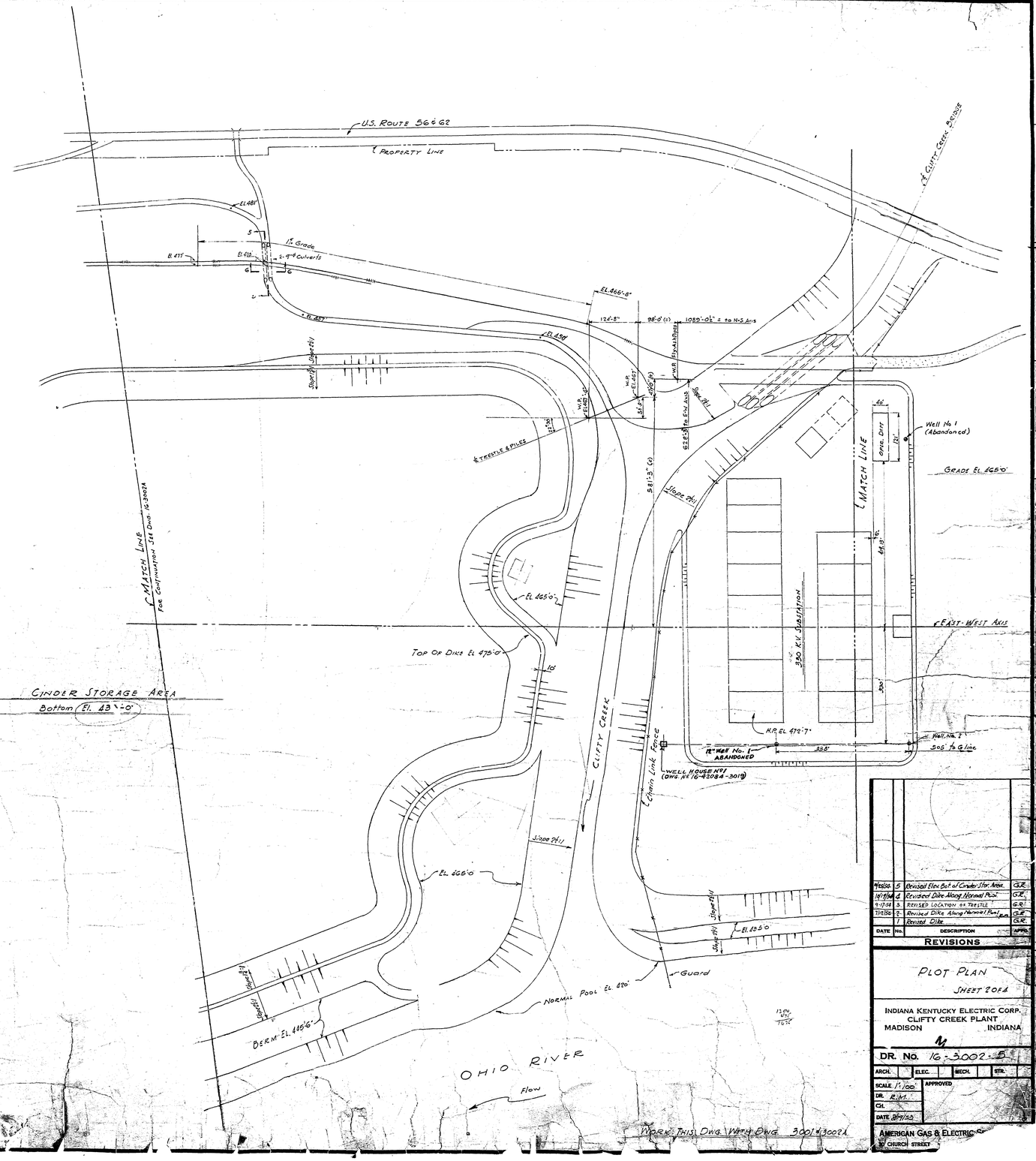


SECTION 5-5
Scale 1"=20'

(2 Culverts Req'd. By Armco Drainage & Metal Prod. I.R.E.X. #6090.)



SECTION G-G
Scale 1"=20'



DATE	NO.	DESCRIPTION	APPR.
4/15/58	5	Revised Flex Bot of Cinder Stor. Area	GR
10/17/58	4	Revised Dike Along Normal Pool	GR
9-17-58	3	REVISED LOCATION OF TRESTLE	GR
7/17/58	2	Revised Dike Along Normal Pool	GR
	1	Revised Dike	GR

REVISIONS

PLOT PLAN

SHEET 2 OF 4

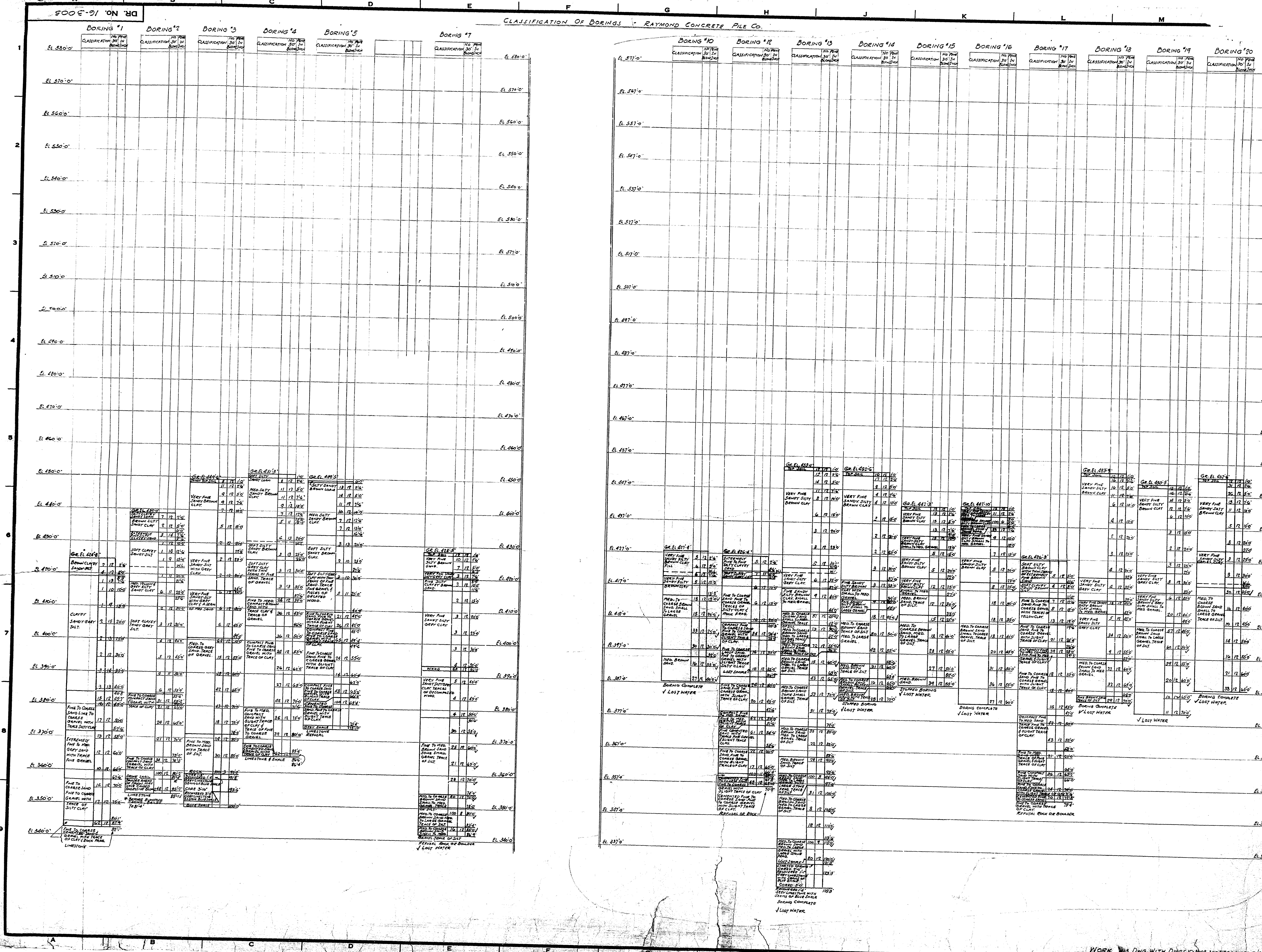
INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA

DR. No. 16-3002-5

ARCH.	ELEC.	MECH.	STR.

SCALE 1"=100' APPROVED
DR. R.M.
CH.
DATE 8/19/55

AMERICAN GAS & ELECTRIC CO.
30 CHURCH STREET



DATE	No.	DESCRIPTION	APPD.
12/19/52	1	Reduced Elevations of Borings 12 to 20 incl. by 3'-0"	G.R.

REVISIONS

LOG OF BORINGS

INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON _______ INDIANA

DR. No. 16-3005-1

ARCH.		ELEC.		MECH.		STR.	

SCALE 1" = 10'
DR. R.M.
CH. AMB
DATE 1-13-53
APPROVED [signature]

AMERICAN GAS & ELECTRIC SERVICE CO.
30 CHURCH STREET NEW Y

DR. No. 16-3007A

CLASSIFICATION OF BORINGS - RAYMOND CONCRETE PILE CO.

BORING '61 · BORING '62 · BORING '63 · BORING '64 · BORING '65 · BORING '66 · BORING '67 · BORING '68 · BORING '69 · BORING '70 · BORING '71 · BORING '72 · BORING '73 · BORING '74 · BORING '75A · BORING '76 · BORING '77 · BORING '78 · BORING '79

EL 577'-0"
EL 567'-0"
EL 557'-0"
EL 547'-0"
EL 537'-0"
EL 527'-0"
EL 517'-0"
EL 507'-0"
EL 497'-0"
EL 487'-0"
EL 477'-0"
EL 467'-0"
EL 457'-0"
EL 447'-0"
EL 437'-0"
EL 427'-0"
EL 417'-0"
EL 407'-0"
EL 397'-0"
EL 387'-0"
EL 377'-0"
EL 367'-0"
EL 357'-0"
EL 347'-0"
EL 337'-0"

Boring Complete
√ Lost Water

Boring Complete
√ Lost Water

Boring Complete
√ Lost Water

Boring Complete
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Boring Complete
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Boring Complete
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Boring Complete
√ Lost Water

Boring Complete
√ Lost Water

Work This Dwg. With Dwgs. 16-3003, 3004, 3005, 3006 & 3007

DATE	No.	DESCRIPTION	APPD.

REVISIONS

LOG OF BORINGS

INDIANA [illegible] ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA

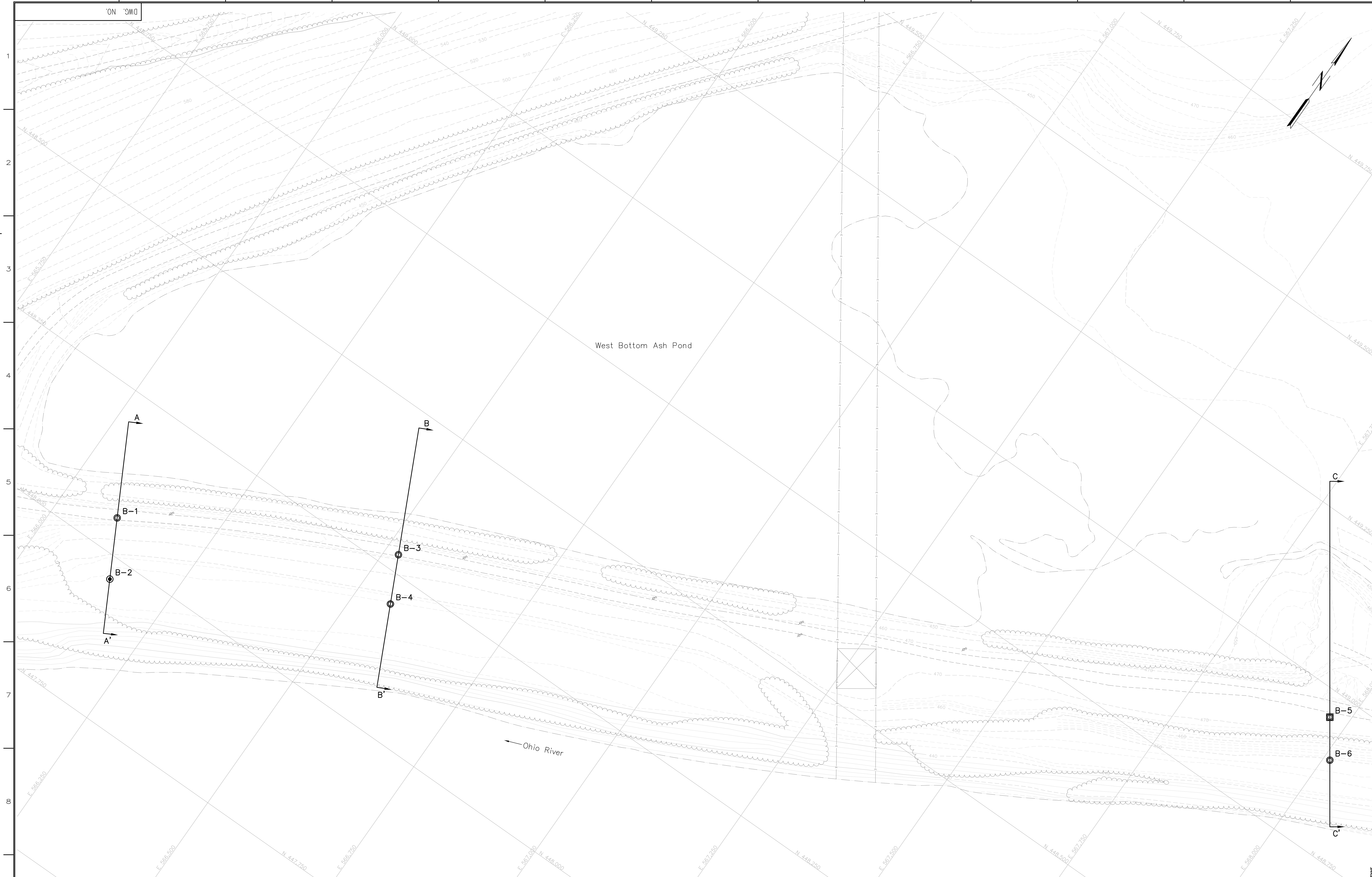
DR. No. 16-3007A

ARCH.	ELEC.	MECH.	STR.

SCALE 1"=10'
DR. R.M.
CH. A.M.B.
DATE 1-13-23
APPROVED

AMERICAN GAS & ELECTRIC SERVICE CORP.
30 CHURCH STREET, NEW YORK

Stantec (2016)



LEGEND

- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests
- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests and Rock Core

BORING LAYOUT
SCALE: 1"=60'

30 0 60 120 FEET
GRAPHIC SCALE

NOTES

REFERENCE DRAWINGS

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

INDIANA – KENTUCKY ELECTRIC CO.

CLIFTY CREEK PLANT

MADISON INDIANA

GEOTECHNICAL EXPLORATION WEST BOTTOM ASH POND BORING LAYOUT

DWG. NO.

SCALE: | CIVIL ENGINEERING DIVISION
DR:
CH:
ARCH:
ENGR:
DATE:
APPROVED BY

AMERICAN ELECTRIC POWER
AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

PLOT DATE: 04/12/2010 USER: WITHERS, CHEYENNE
V:\1755\ACTIVE\175539022\GEOTECHNICAL\DRAWING\39022B-101-BL1.DWG

SCALE:	AS SHOWN
DR:	CW
CH:	EMK
ENGR:	CN
DATE:	APR., 2010

Stantec
Stantec Consulting Services Inc.
11687 Lebanon Rd.
Cincinnati, Ohio
45241
513-842-8200
www.stantec.com

SUBSURFACE LOG

Project Number	175539022	Location	West Crest: West Pond Dam
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-1**
County	Jefferson, IN	Surface Elevation	473.4 ft
Project Type	Geotechnical Exploration	Date Started	11/3/09
Supervisor	C. Nisingizwe	Driller	M. Wethington
Logged By	C. Nisingizwe	Depth to Water	39.2 ft

Total Depth: 71.5 ft
Completed: 11/4/09
Depth to Water: 40.0 ft
Date/Time: 11/4/09
Date/Time: 11/13/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
473.4'	0.0'	Top of Hole							
		Lean Clay With Sand, light yellowish brown with light gray, damp to moist, medium stiff to very stiff, Fill		SPT-1	2.5 - 4.0	1.2	6-5-6	17	N = 11
				SPT-2	5.0 - 6.5	1.3	5-5-5	15	N = 10
				ST-3	7.5 - 9.5	2.0		23	
				SPT-4	10.0 - 11.5	0.4	1-5-5	21	N = 10
				SPT-5	12.5 - 14.0	1.3	2-2-5	17	N = 7
				ST-6	15.0 - 17.0	2.0		20	
				SPT-7	17.5 - 19.0	1.5	5-6-9	19	N = 15
				SPT-8	20.0 - 21.5	1.5	3-5-10	15	N = 15
				SPT-9	22.5 - 24.0	1.5	3-7-7	17	N = 14
				SPT-10	25.0 - 26.5	1.2	3-3-5	17	N = 8
				SPT-11	27.5 - 29.0	1.3	3-4-8	20	N = 12
				SPT-12	30.0 - 31.5	1.4	4-4-7	19	N = 11
				SPT-13	32.5 - 34.0	1.3	2-4-5	18	N = 9
				SPT-14	35.0 - 36.5	1.1	2-5-5	17	N = 10
435.9'	37.5'								
				SPT-15	37.5 - 39.0	1.2	1-2-4	20	N = 6

SUBSURFACE LOG

Project Number 175539022 | Location West Crest: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-1** | Total Depth 71.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Lean Clay With Sand, light yellowish brown with light gray, moist to wet, very soft to medium stiff *(Continued)*		SPT-16	40.0 - 41.5	1.3	1-2-3	24	N = 5
				ST-17	42.5 - 44.5	2.0		22	
				SPT-18	45.0 - 46.5	1.5	1-1-1	30	N = 2
				SPT-19	47.5 - 49.0	1.5	1-1-2	23	N = 3
				SPT-20	50.0 - 51.5	1.1	1-1-3	28	N = 4
				SPT-21	52.5 - 54.0	1.5	1-1-1	27	N = 2
				SPT-22	55.0 - 56.5	1.5	1-2-2	25	N = 4
				SPT-23	57.5 - 59.0	1.1	1-1-3	28	N = 4
				SPT-24	60.0 - 61.5	1.4	1-2-3	28	N = 5
				SPT-25	62.5 - 64.0	1.3	1-2-4	37	N = 6
				SPT-26	65.0 - 66.5	1.2	2-2-5	34	N = 7
405.9'	67.5'								
		Gray, Weathered Shale, Augered		SPT-27	67.5 - 69.0	0.4	50+	14	50+
401.9'	71.5'			SPT-28	70.0 - 71.5	0.3	50+	5	50+
		No Refusal / Bottom of Hole							

SUBSURFACE LOG

Project Number	175539022	Location	West Toe: West Pond Dam		
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-2**	Total Depth	61.0 ft
County	Jefferson, IN	Surface Elevation	444.0 ft		
Project Type	Geotechnical Exploration	Date Started	11/12/09	Completed	11/12/09
Supervisor	C. Nisingizwe Driller M. Wethington	Depth to Water	22.5 ft	Date/Time	11/12/09
Logged By	C. Nisingizwe	Depth to Water	N/A	Date/Time	N/A

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
444.0'	0.0'	Top of Hole							
		Lean Clay With Sand, light yellowish brown with gray, moist to wet, soft to very stiff		SPT-1	2.5 - 4.0	1.2	7-8-11	17	N = 19
				SPT-2	5.0 - 6.5	0.6	4-3-4	19	N = 7
				SPT-3	7.5 - 9.0	0.6	3-3-4	24	N = 7
				ST-4	10.0 - 12.0	1.6		22	
				SPT-5	12.5 - 14.0	1.2	2-2-3	25	N = 5
				SPT-6	15.0 - 16.5	1.2	2-2-2	28	N = 4
				SPT-7	17.5 - 19.0	1.5	1-1-1	30	N = 2
				SPT-8	20.0 - 21.5	1.5	1-2-2	32	N = 4
				ST-9	22.5 - 24.5	2.0		29	
				SPT-10	25.0 - 26.5	1.5	2-2-2	29	N = 4
				SPT-11	27.5 - 29.0	0.7	1-4-5	30	N = 9
414.0'	30.0'								
		Lean Clay With Sand, gray, moist to wet, soft to medium stiff		SPT-12	30.0 - 31.5	1.5	3-3-3	25	N = 6
				SPT-13	32.5 - 34.0	1.5	3-3-3	32	N = 6
				SPT-14	35.0 - 36.5	1.5	1-2-3	33	N = 5
				SPT-15	37.5 - 39.0	1.5	1-2-2	31	N = 4

SUBSURFACE LOG

Project Number 175539022 | Location West Toe: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-2** | Total Depth 61.0 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Lean Clay With Sand, gray, moist to wet, soft to medium stiff *(Continued)*		SPT-16	40.0 - 41.5	1.5	3-3-3	30	N = 6
				ST-17	42.5 - 44.5	1.5		33	
				SPT-18	45.0 - 46.5	1.5	1-1-1	35	N = 2
392.5'	51.5'			SPT-19	50.0 - 51.5	1.5	4-3-3	33	N = 6
		Gravel With Silt And Sand, gray, wet, very dense							
388.5'	55.5'			SPT-20	55.0 - 55.5	0.4	11-50+	10	Began Core N = 50+
		Shale, gray, hard, medium bedded							
383.0'	61.0'			45	5.5	5.5	100	61.0	
		Bottom of Hole Top of Rock = 56.0' Elevation (388.0')							

SUBSURFACE LOG

Project Number	175539022	Location	Middle Crest: West Pond Dam		
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-3**	Total Depth	71.5 ft
County	Jefferson, IN	Surface Elevation	471.6 ft		
Project Type	Geotechnical Exploration	Date Started	11/4/09	Completed	11/5/09
Supervisor	C. Nisingizwe Driller M. Wethington	Depth to Water	40.0 ft	Date/Time	11/4/09
Logged By	C. Nisingizwe	Depth to Water	31.0 ft	Date/Time	11/13/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
471.6'	0.0'	Top of Hole							
		Lean Clay With Sand, light yellowish brown with light gray, damp to moist, stiff to very stiff, Fill		SPT-1	2.5 - 4.0	0.7	4-5-6	15	N = 11
				SPT-2	5.0 - 6.5	1.1	3-4-4	17	N = 8
				SPT-3	7.5 - 9.0	1.1	3-3-7	16	N = 10
				ST-4	10.0 - 12.0	2.0		16	
				SPT-5	12.5 - 14.0	1.5	4-4-5	22	N = 9
				SPT-6	15.0 - 16.5	1.0	3-4-6	17	N = 10
				SPT-7	17.5 - 19.0	1.3	3-5-7	18	N = 12
				ST-8	20.0 - 22.0	2.0		18	
				SPT-9	22.5 - 24.0	1.5	3-5-7	17	N = 12
				SPT-10	25.0 - 26.5	1.3	3-4-5	18	N = 9
				SPT-11	27.5 - 29.0	1.5	6-7-8	16	N = 15
				SPT-12	30.0 - 31.5	1.5	5-5-5	18	N = 10
				SPT-13	32.5 - 34.0	1.5	4-7-10	17	N = 17
				SPT-14	35.0 - 36.5	1.5	5-7-9	22	N = 16
434.1'	37.5'								
				SPT-15	37.5 - 39.0	1.5	5-7-11	20	N = 18

SUBSURFACE LOG

Project Number 175539022 | Location Middle Crest: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-3** | Total Depth 71.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Lean Clay With Sand, gray to light brown, moist to wet, very stiff to very stiff *(Continued)*		SPT-16	40.0 - 41.5	1.5	1-2-2	24	N = 4
				SPT-17	42.5 - 44.0	1.5	1-2-2	23	N = 4
				SPT-18	45.0 - 46.5	1.3	2-3-3	25	N = 6
				ST-19	47.5 - 49.5	2.0		23	
				SPT-20	50.0 - 51.5	1.5	1-2-2	25	N = 4
				SPT-21	52.5 - 54.0	1.5	1-1-1	25	N = 2
				SPT-22	55.0 - 56.5	1.5	1-2-3	24	N = 5
				SPT-23	57.5 - 59.0	1.5	1-1-1	40	N = 2
				SPT-24	60.0 - 61.5	1.5	3-4-4	28	N = 8
				SPT-25	62.5 - 64.0	1.5	1-2-4	33	N = 6
				SPT-26	65.0 - 66.5	1.5	1-3-4	34	N = 7
				SPT-27	67.5 - 69.0	1.5	2-4-5	29	N = 9
400.1'	71.5'			SPT-28	70.0 - 71.5	1.5	3-3-5	31	N = 8
		No Refusal / Bottom of Hole							

SUBSURFACE LOG

Project Number	175539022	Location	Middle Toe: West Pond Dam
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-4** Total Depth 71.5 ft
County	Jefferson, IN	Surface Elevation	444.0 ft
Project Type	Geotechnical Exploration	Date Started	11/10/09 Completed 11/11/09
Supervisor	C. Nisingizwe Driller M. Wethington	Depth to Water	22.5 ft Date/Time 11/10/09
Logged By	C. Nisingizwe	Depth to Water	16.0 ft Date/Time 11/13/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
444.0'	0.0'	Top of Hole							
		Lean Clay With Sand, brown to dark gray, damp to moist, medium stiff to very stiff		SPT-1	2.5 - 4.0	1.3	8-8-8	14	N = 16
				SPT-2	5.0 - 6.5	1.4	6-7-8	16	N = 15
				ST-3	7.5 - 9.5	2.0		--	
				SPT-4	10.0 - 11.5	1.3	3-5-6	19	N = 11
				SPT-5	12.5 - 14.0	1.0	2-3-4	22	N = 7
429.0'	15.0'								
		Lean Clay With Sand, gray, moist to wet, soft to stiff		SPT-6	15.0 - 16.5	1.2	2-2-3	26	N = 5
				ST-7	17.5 - 19.5	2.0		--	
				SPT-8	20.0 - 21.5	1.5	2-2-2	26	N = 4
				SPT-9	22.5 - 24.0	1.5	1-2-3	27	N = 5
				SPT-10	25.0 - 26.5	1.5	2-2-4	26	N = 6
				SPT-11	27.5 - 29.0	1.5	1-2-3	27	N = 5
				SPT-12	30.0 - 31.5	1.5	1-1-2	28	N = 3
				SPT-13	32.5 - 34.0	1.5	1-2-2	35	N = 4
				SPT-14	35.0 - 36.5	1.5	2-4-5	31	N = 9
				ST-15	37.5 - 39.5	2.0		--	

SUBSURFACE LOG

Project Number 175539022 | Location Middle Toe: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-4** | Total Depth 71.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Lean Clay With Sand, gray, moist to wet, soft to stiff *(Continued)*		SPT-16	40.0 - 41.5	1.5	2-2-2	24	N = 4
				SPT-17	42.5 - 44.0	1.2	1-2-3	33	N = 5
				SPT-18	45.0 - 46.5	1.5	2-4-4	35	N = 8
				SPT-19	47.5 - 49.0	1.2	1-2-4	31	N = 6
				SPT-20	50.0 - 51.5	1.5	2-3-4	31	N = 7
				SPT-21	52.5 - 54.0	1.5	1-2-3	30	N = 5
				SPT-22	55.0 - 56.5	1.5	2-3-4	21	N = 7
386.5'	57.5'								
		Gravel With Silt And Sand, gray, moist, dense to very dense		SPT-23	57.5 - 59.0	1.5	10-17-22	13	N = 39
				SPT-24	60.0 - 61.5	1.5	16-28-18	9	N = 46
				SPT-25	65.0 - 66.5	0.7	26-50+	12	N = 50+
372.5'	71.5'			SPT-26	70.0 - 71.5	0.7	20-22-30	9	N = 52
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 175539022 CLIFTY CREEK.GPJ FMSM-GRAPHIC LOG.GDT 5/20/10

SUBSURFACE LOG

Project Number	175539022	Location	East Crest: West Pond Dam		
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-5**	Total Depth	71.5 ft
County	Jefferson, IN	Surface Elevation	468.7 ft		
Project Type	Geotechnical Exploration	Date Started	11/10/09	Completed	11/10/09
Supervisor	C. Nisingizwe Driller M. Wethington	Depth to Water	45.0 ft	Date/Time	11/10/09
Logged By	C. Nisingizwe	Depth to Water	33.8 ft	Date/Time	11/13/09

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
468.7'	0.0'	Top of Hole							
		Lean Clay With Sand, light yellowish brown with light gray, damp to moist, medium stiff to very stiff, Fill		SPT-1	2.5 - 4.0	1.5	6-9-10	15	N = 19
				SPT-2	5.0 - 6.5	1.5	4-4-5	17	N = 9
				ST-3	7.5 - 9.5	1.6		17	
				SPT-4	10.0 - 11.5	1.3	6-7-8	23	N = 15
				SPT-5	12.5 - 14.0	0.0	3-4-6	--	N = 10
				SPT-6	15.0 - 16.5	1.3	1-3-4	16	N = 7
				SPT-7	17.5 - 19.0	1.0	5-7-9	16	N = 16
				SPT-8	20.0 - 21.5	0.6	1-2-5	18	N = 7
				ST-9	22.5 - 24.5	1.8		19	
				SPT-10	25.0 - 26.5	1.2	2-3-5	22	N = 8
				SPT-11	27.5 - 29.0	1.4	1-2-5	25	N = 7
				SPT-12	30.0 - 31.5	1.3	4-5-7	23	N = 12
				SPT-13	32.5 - 34.0	1.5	2-3-5	19	N = 8
432.2'	36.5'			SPT-14	35.0 - 36.5	1.5	4-6-10	18	N = 16
		Lean Clay With Sand, gray, moist, soft		SPT-15	37.5 - 39.0	1.5	2-3-3	21	N = 6

SUBSURFACE LOG

Project Number 175539022 | Location East Crest: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-5** | Total Depth 71.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Lean Clay With Sand, gray, moist, soft *(Continued)*		SPT-16	40.0 - 41.5	1.3	1-1-2	25	N = 3
				ST-17	42.5 - 44.5	2.0		23	
				SPT-18	45.0 - 46.5	1.5	1-1-3	25	N = 4
421.2'	47.5'								
		Sandy Silt, light yellowish brown to gray, wet, soft to stiff		SPT-19	47.5 - 49.0	1.5	1-1-3	28	N = 4
				SPT-20	50.0 - 51.5	1.5	1-1-5	24	N = 6
				SPT-21	52.5 - 54.0	1.0	1-1-1	22	N = 2
				SPT-22	55.0 - 56.5	1.3	1-2-2	23	N = 4
				SPT-23	57.5 - 59.0	1.5	1-2-3	26	N = 5
				SPT-24	60.0 - 61.5	1.5	2-3-4	22	N = 7
				SPT-25	62.5 - 64.0	1.5	2-3-6	27	N = 9
				SPT-26	65.0 - 66.5	1.5	2-5-6	28	N = 11
				SPT-27	67.5 - 69.0	1.5	2-4-5	28	N = 9
397.2'	71.5'			SPT-28	70.0 - 71.5	1.5	3-5-8	30	N = 13
		No Refusal / Bottom of Hole							

SUBSURFACE LOG

Project Number	175539022	Location	East Toe: West Pond Dam
Project Name	AEP Clifty Creek / Ash Ponds	Boring No.	**B-6**
County	Jefferson, IN	Surface Elevation	445.5 ft
Project Type	Geotechnical Exploration	Date Started	11/19/09
Supervisor	C. Nisingizwe	Driller	Danny Jessie
Logged By	C. Nisingizwe	Depth to Water	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %		
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		Remarks
445.5'	0.0'	Top of Hole								
		Lean Clay With Sand, brown to gray, damp to moist, stiff to very stiff		SPT-1	2.5 - 4.0	1.0	2-4-4	19		N = 8
				SPT-2	5.0 - 6.5	1.0	4-4-6	18		N = 10
				ST-3	7.5 - 9.5	2.0		25		
				SPT-4	10.0 - 11.5	1.2	5-7-11	16		N = 18
				SPT-5	12.5 - 14.0	1.1	2-2-2	21		N = 4
				SPT-6	15.0 - 16.5	1.3	1-1-2	31		N = 3
				ST-7	17.5 - 19.5	1.2		32		
				SPT-8	20.0 - 21.5	1.5	0-1-0	32		N = 1
				SPT-9	22.5 - 24.0	1.5	0-0-2	29		N = 2
				SPT-10	25.0 - 26.5	1.5	2-1-3	29		N = 4
418.0'	27.5'									
		Sandy Silt, gray, moist to wet, very soft to stiff		SPT-11	27.5 - 29.0	1.5	0-3-2	32		N = 5
				SPT-12	30.0 - 31.5	1.5	0-0-3	32		N = 3
				SPT-13	32.5 - 34.0	1.5	0-1-2	33		N = 3
				SPT-14	35.0 - 36.5	1.5	0-0-1	35		N = 1
				SPT-15	37.5 - 39.0	1.5	0-0-1	30		N = 1

SUBSURFACE LOG

Project Number 175539022 | Location East Toe: West Pond Dam

Project Name AEP Clifty Creek / Ash Ponds | Boring No. **B-6** | Total Depth 71.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Sandy Silt, gray, moist to wet, very soft to stiff *(Continued)*		ST-16	40.0 - 42.0	1.1		31	
				SPT-17	42.5 - 44.0	1.5	0-1-1	35	N = 2
				SPT-18	45.0 - 46.5	1.5	0-0-1	40	N = 1
				SPT-19	47.5 - 49.0	1.5	0-0-1	40	N = 1
				SPT-20	50.0 - 51.5	1.5	0-2-3	39	N = 5
				SPT-21	52.5 - 54.0	1.5	0-5-6	27	N = 11
				SPT-22	55.0 - 56.5	1.5	4-3-4	31	N = 7
				SPT-23	57.5 - 59.0	1.5	4-4-5	35	N = 9
				SPT-24	60.0 - 61.5	1.5	5-5-6	28	N = 11
				SPT-25	65.0 - 66.5	1.5	4-5-4	28	N = 9
374.0'	71.5'			SPT-26	70.0 - 71.5	0.0	5-5-5	--	N = 10
		No Refusal / Bottom of Hole							

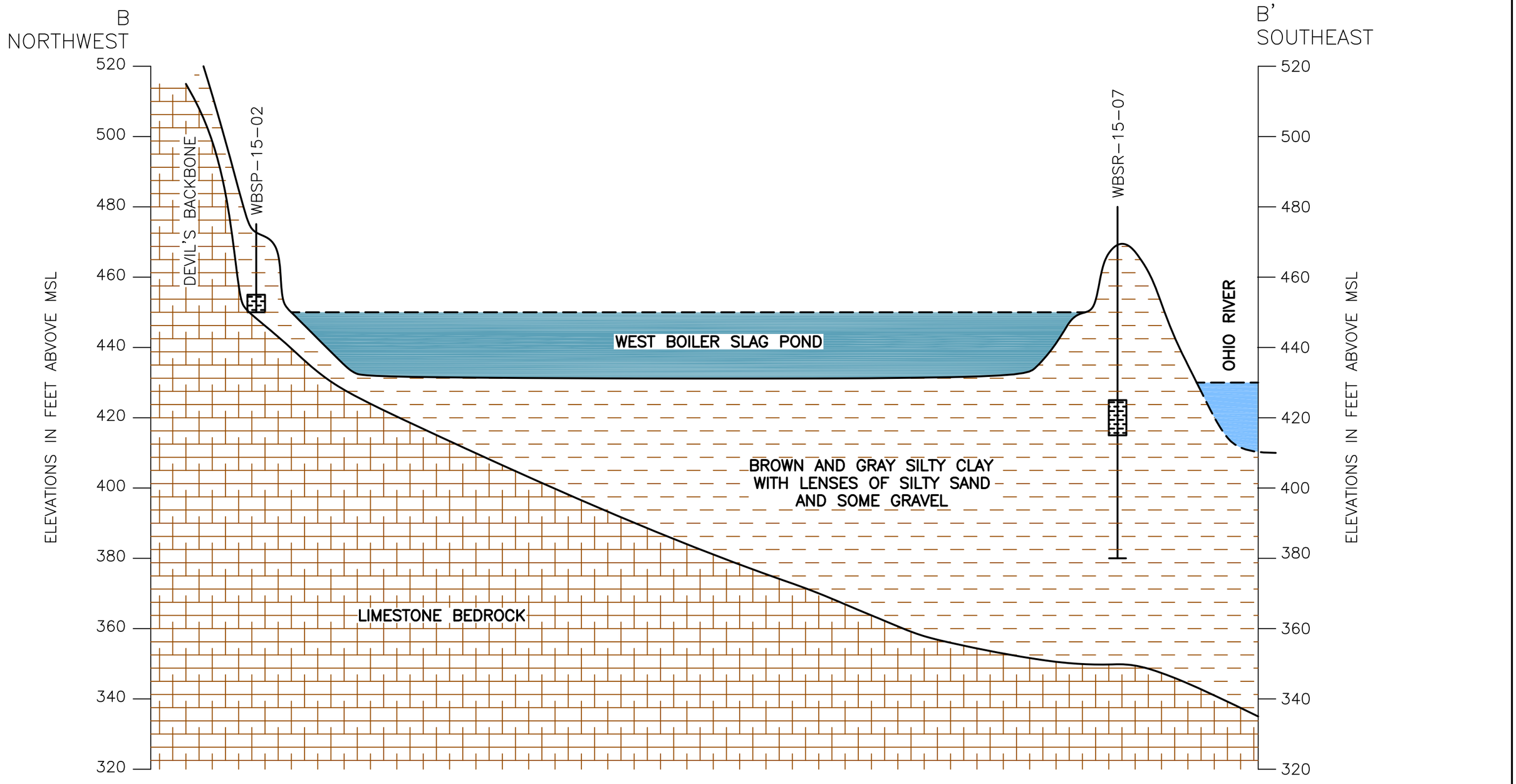
STANTEC/FMSM_LEGACY 175539022 CLIFTY CREEK.GPJ FMSM-GRAPHIC LOG.GDT 5/20/10

AGES (2018)

TABLE 3
GROUNDWATER MONITORING NETWORK
WEST BOILER SLAG POND
CLIFTY CREEK STATION
MADISON, INDIANA

Monitoring Well ID	Designation	Date of Installation	Coordinates		Ground Elevation (ft)[2]	Top of Casing Elevation (ft)[2]	Top of Screen Elevation (ft)	Base of Screen Elevation (ft)	Total Depth From Top of Casing (ft)
			Northing	Easting					
WBSP-15-01	Upgradient	11/30/2015	449072.27	566322.12	466.93	469.36	458.93	448.93	20.43
WBSP-15-02	Upgradient	11/11/2015	449803.91	566987.30	473.83	476.76	457.83	452.83	23.93
WBSP-15-03	Upgradient	12/4/2015	451181.98	568093.60	484.91	488.03	476.91	471.91	16.12
WBSP-15-04	Downgradient	11/12/2015	450610.07	568637.65	471.17	473.71	416.17	406.17	67.54
WBSP-15-05	Downgradient	11/17/2015	450051.40	568495.72	471.90	474.42	410.90	400.90	73.52
WBSP-15-06	Downgradient	11/19/2015	449470.57	568402.50	471.28	473.51	395.78	385.78	87.73
WBSP-15-07	Downgradient	11/23/2015	448947.93	567946.39	468.82	471.31	426.82	416.82	54.49
WBSP-15-08	Downgradient	11/25/2015	448625.46	567343.24	468.56	471.06	415.76	405.76	65.30
WBSP-15-09	Downgradient	1/6/2016	448359.31	566711.13	471.21	470.69	421.21	410.21	59.48
WBSP-15-10	Downgradient	1/5/2016	448125.51	566225.21	471.21	470.69	425.21	435.21	55.48

Notes:
1. The Well locations are referenced to the North American Datum (NAD83), east zone coordinate system.
2. Elevations are referenced to the North American Vertical Datum (NAVD) 1988



NOTE:
CROSS-SECTION LOCATION SHOWN ON FIGURE 6.

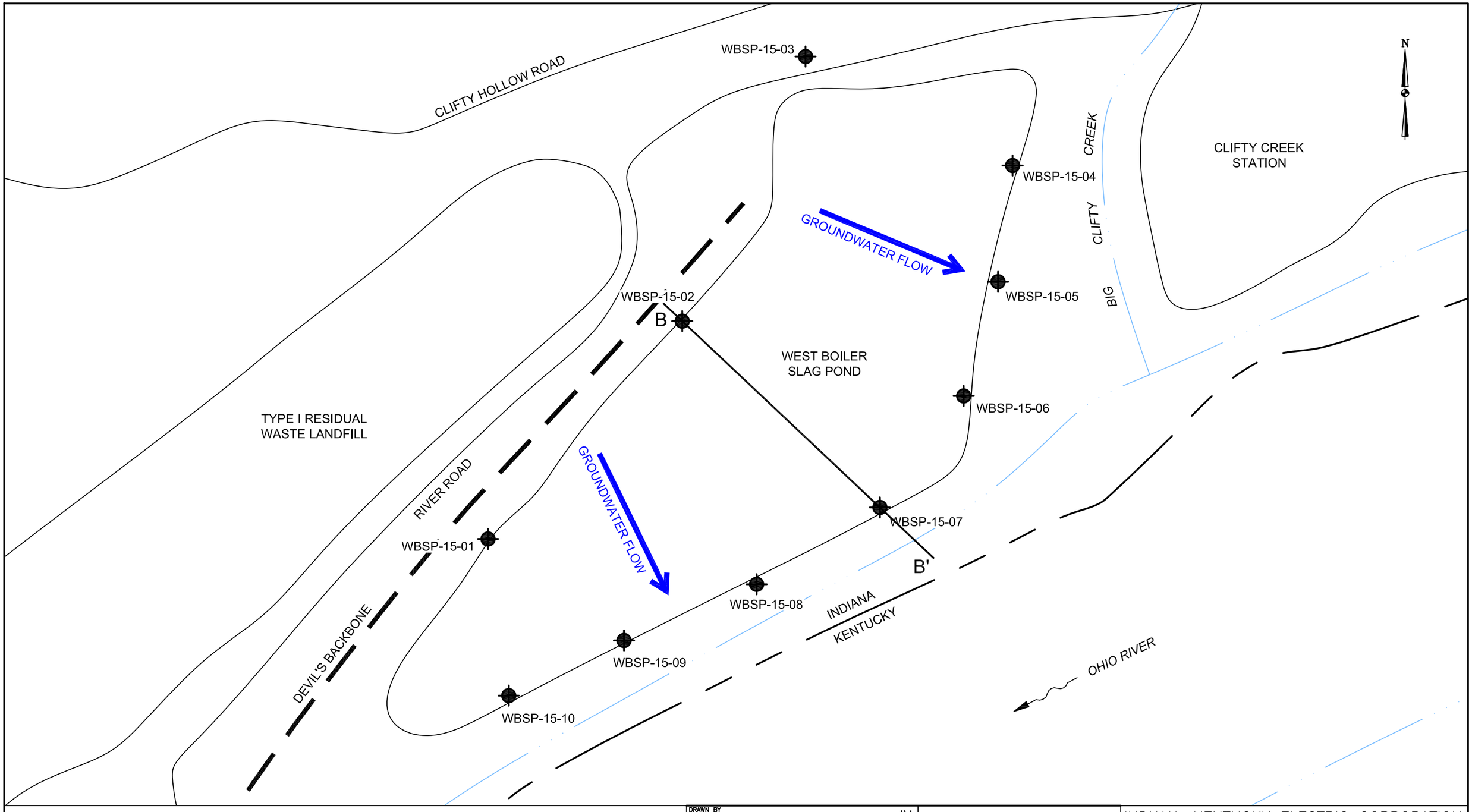
DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLIF
DWG FILE	IKEC_Clifty MW Install_Slag Pond X-Sec b07.dwg
DRAWING SCALE	NOT TO SCALE

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
WEST BOILER SLAG POND
GENERALIZED GEOLOGIC CROSS-SECTION

DRAWING NAME	REV.
FIGURE 5	0



LEGEND:

MONITORING WELL LOCATION

400' 0' 400' 800'

SCALE: 1"= 400'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_MWs_b02-b03-b04.dwg
DRAWING SCALE	AS SHOWN

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
WEST BOILER SLAG POND
MONITORING WELL LOCATIONS AND
GENERALIZED GROUNDWATER FLOW

DRAWING NAME: FIGURE 6

REV.: 0

Plot: 10/18/2016 10:20 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\IKEC_Clifty MW Install_MWs_b02-b03-b04.dwg\b04

BORING NO. ____WBSP-15-01_
SAMPLE/CORE LOG

Project Number:	2015067	Log Page 1 of 1	
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/30/15	AGES Geologist:	Mike Gelles

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	18’	Surface Elevation:	466.93’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	8	NA	Yellow brown silty clay, stiff, plastic, moist	N/A
10-18	8	NA	10’-15’ Yellow brown silty clay, stiff, plastic, moist; 12’-14’ wet; 15’18’ Light gray limestone	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-01

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/30/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/16/15

Development Method: Submersible Pump, Peristaltic Pump, Bailer

Field parameters stabilized.

Turbidity = 3.12 NTUs

Volume Purged: 33 gallons

Static Water-Level* 16.76'

Top of Well Casing Elevation: 469.36'

Well Purpose:
Groundwater Monitoring

Northing (Y): 449072.27

Easting (X): 566322.12

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

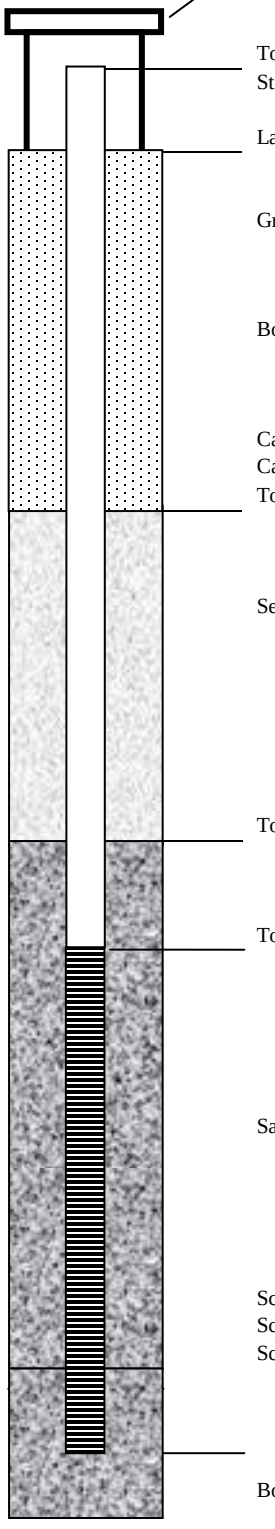
CONSTRUCTION MATERIALS USED:

4 Bags of Sand

2 Bags/Buckets Bentonite Pellets

____ Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 469.36 ft.
Stick-up: 2.43 ft.

Land Surface Elevation: 466.93 ft.

Grout; Type: Potland cement/Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch
Casing Material: PVC
Top of Seal: 2 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 6 ft*

Top of Well Screen 8 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch
Screen Slot-Size: 0.010 Inch
Screen Material: PVC

Bottom of Well Screen 18 ft.*

Base of Borehole: 18 ft.*

Total Depth of Well
Below Top of Casing: 20.43 ft.

*Indicates Depth Below Land Surface

BORING NO. _____WBSP-15-02_

SAMPLE/CORE LOG

Project Number:	2015067	Log Page 1 of 1	
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/11/15	AGES Geologist:	Mike Gelles

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	21’	Surface Elevation:	473.83’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	5	NA	Red brown silt, fine sand, black boiler slag, loose, moist	N/A
10-20	8	NA	10’-11’ Red brown silt, fine sand, black boiler slag, loose, moist; 11’-19’ light brown silty clay, stiff, moist; 19’-20’ light brown silty clay, stiff, rock fragments, moist	N/A
20-21	1	NA	Gray limestone	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-02

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/11/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/7/15

Development Method: Submersible Pump, Peristaltic Pump, Bailer

Field parameters stabilized.

Turbidity = 3.69 NTUs

Volume Purged: 114.5 gallons

Static Water-Level* 15.40’

Top of Well Casing Elevation: 476.76’

Well Purpose:
Groundwater Monitoring

Northing (Y): 449803.91

Easting (X): 566987.30

Comments/Notes:
2 inch PVC riser and screen

5 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

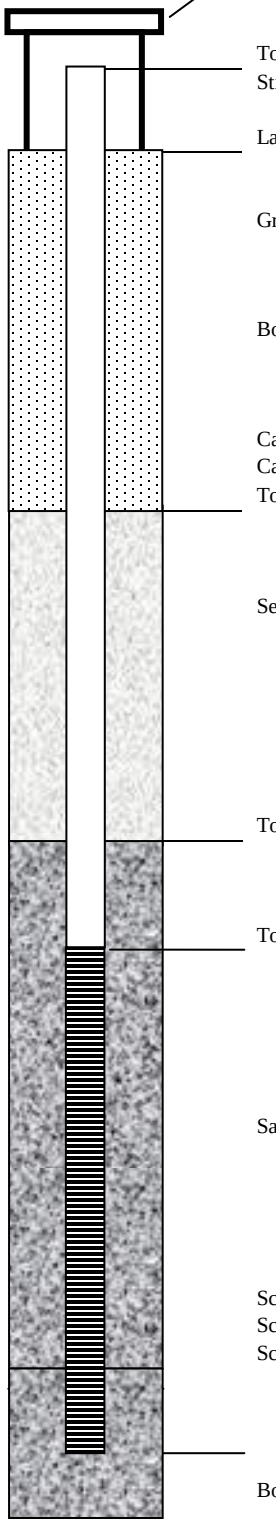
CONSTRUCTION MATERIALS USED:

3 Bags of Sand

4 Bags/Buckets Bentonite Pellets

____ Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 476.76 ft.

Stick-up: 2.93 ft.

Land Surface Elevation: 473.83 ft.

Grout; Type: Portland cement/Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 2 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 14 ft*

Top of Well Screen 16 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 21 ft.*

Base of Borehole: 21 ft.*

Total Depth of Well Below Top of Casing: 23.93 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-03

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	12/4/15	AGES Geologist:	Mike Gelles

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	18’	Surface Elevation:	484.91’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	2	NA	Brown silty clay, black boiler slag, limestone fragments, stiff, plastic, moist	N/A
10-18	8	NA	10’-13’ Brown silty clay, black boiler slag, limestone fragments, stiff, plastic, moist; 13’-18’ Gray, limestone, weathered, dry	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-03

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 12/4/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/15/15

Development Method: Submersible Pump, Peristaltic Pump, Bailer

Field parameters stabilized.

Turbidity = 2.42 NTUs

Volume Purged: 14.5 gallons

Static Water-Level* 11.08'

Top of Well Casing Elevation: 488.03'

Well Purpose:
Groundwater Monitoring

Northing (Y): 451181.98

Easting (X): 568093.60

Comments/Notes:
2 inch PVC riser and screen

5 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

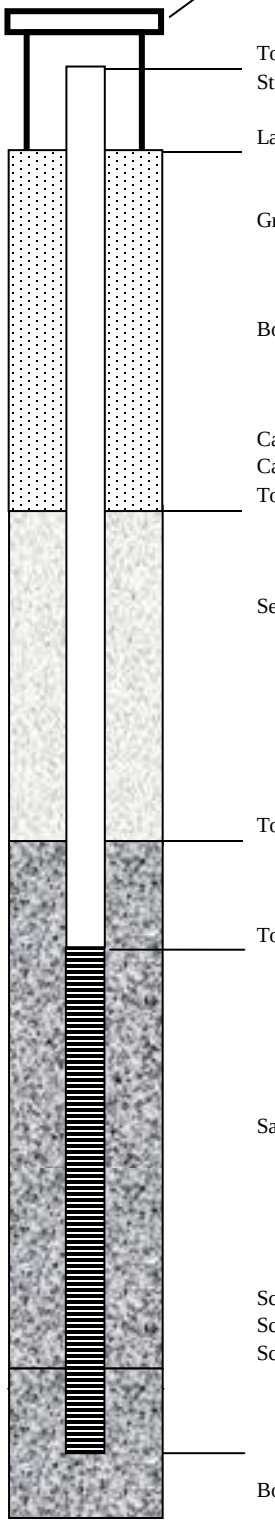
CONSTRUCTION MATERIALS USED:

3 Bags of Sand

4 Bags/Buckets Bentonite Pellets

____ Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 488.03 ft.
Stick-up: 3.12 ft.

Land Surface Elevation: 484.91 ft.

Grout; Type: Portland cement/Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch
Casing Material: PVC
Top of Seal: 2 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 6 ft*

Top of Well Screen 8 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch
Screen Slot-Size: 0.010 Inch
Screen Material: PVC

Bottom of Well Screen 13 ft.*

Base of Borehole: 18 ft.*

Total Depth of Well
Below Top of Casing: 16.12 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-04

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/11/15-11/12/15	AGES Geologist:	Mike Gelles

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	70’	Surface Elevation:	471.17’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	8	NA	Red brown silt, fine sand, boiler slag, loose, moist	N/A
10-20	8	NA	Red brown silt, fine sand, boiler slag, loose, moist	N/A
20-30	8	NA	20’-28’ Red brown silt, fine sand, boiler slag, loose, moist; 28’-30’ wet	N/A
30-40	7	NA	Red brown silt, fine sand, boiler slag, loose, wet	N/A
40-50	10	NA	40’-45’ Red brown silt, fine sand, boiler slag, loose, wet; 45’-47’ Yellow brown clay, stiff, plastic, moist; 47’-49’ Yellow brown gravel angular, fine and medium sand, wet; 49’-50’ Orange brown sandy clay, fine, stiff, moist	N/A
50-60	9	NA	50’-53’ Orange brown sandy clay, fine, stiff, moist; 53’ – 60’ Light brown sand, fine, medium, coarse, gravel angular fine, medium, coarse, large, wet	N/A
60-70	7	NA	60’-68.5’ Light brown sand, fine, medium, coarse, gravel angular fine, medium, coarse, wet; 68.5’ -70’ light brown sand, fine, medium, coarse, black coal and peat, wet	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-04

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/11/15-11/12/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/9/15

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 0.91 NTUs

Volume Purged: 65 gallons

Static Water-Level* 50.68'

Top of Well Casing Elevation: 473.71'

Well Purpose:
Groundwater Monitoring

Northing (Y): 450610.07

Easting (X): 568637.65

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

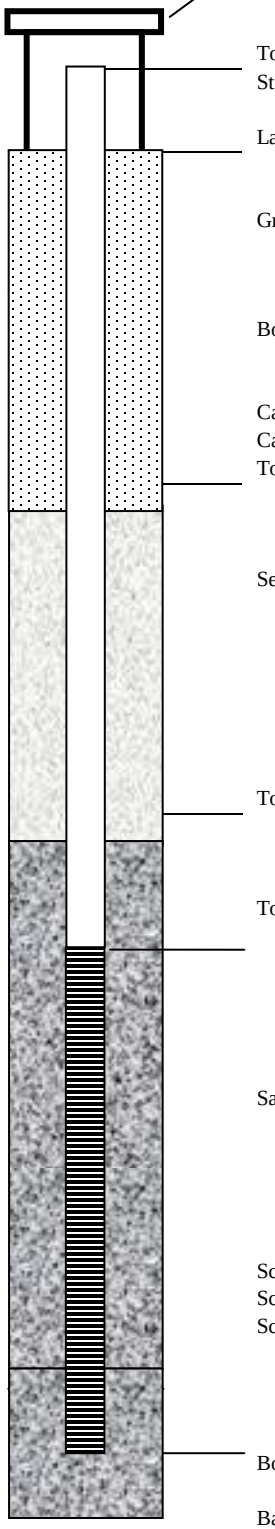
CONSTRUCTION MATERIALS USED:

5 Bags of Sand

2 Bags/Buckets Bentonite Pellets

12 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 473.71 ft.

Stick-up: 2.54 ft.

Land Surface Elevation: 471.17 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 2 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 53 ft*

Top of Well Screen 55 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 65 ft.*

Base of Borehole: 70 ft.*

Total Depth of Well
Below Top of Casing: 67.54 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-05

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/13/15-11/17/15	AGES Geologist:	John Campbell

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	71’	Surface Elevation:	471.90’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	8	NA	Red brown silt, fine sand, black boiler slag, loose, moist	N/A
10-20	8	NA	Red brown silt, fine sand, black boiler slag, loose, moist	N/A
20-30	6	NA	Red brown silt, fine sand, black boiler slag, loose, moist	N/A
30-40	5	NA	30’-33’ Red brown silt, fine sand, black boiler slag, loose, moist; 33’-35’ brown clay, wet, loose	N/A
40-50	8	NA	40’-45’ Brown clay(till), plastic, moist; 45’-50’ gray clay(till), plastic, moist	N/A
50-60	9	NA	50’-59’ Gray silty clay(till); sand fine, medium, coarse, and gravel subrounded fine, medium, coarse, large, little silt, very moist	N/A
60-70	5	NA	Gray to brown sand fine, medium, coarse, and gravel subrounded fine, medium, coarse, large, little silt, wet	N/A
70-71	1	NA	Gray to brown sand fine, medium, coarse, and gravel subrounded fine, medium, coarse, large, little silt, wet	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-05

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/13/15-11/17/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/16/15

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 4.28 NTUs

Volume Purged: 46 gallons

Static Water-Level* 52.42'

Top of Well Casing Elevation: 474.42'

Well Purpose:
Groundwater Monitoring

Northing (Y): 450051.40

Easting (X): 568495.72

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: John Campbell

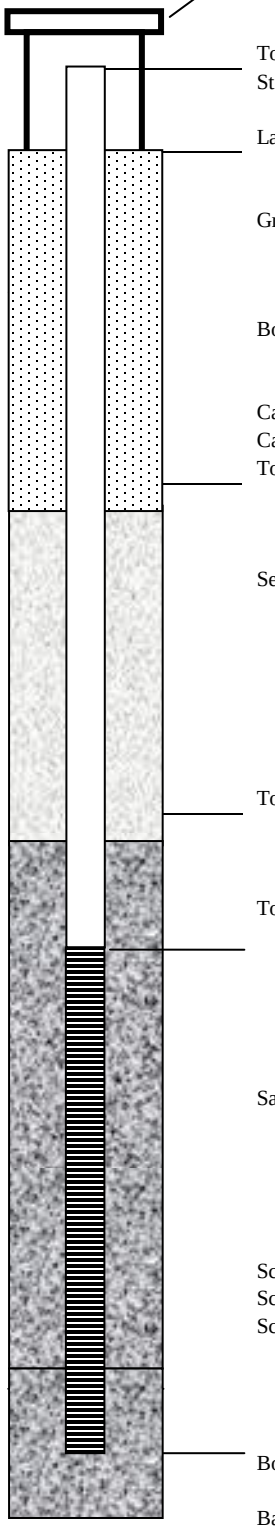
CONSTRUCTION MATERIALS USED:

6 Bags of Sand

2 Bags/Buckets Bentonite Pellets

18 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 474.42 ft.

Stick-up: 2.52 ft.

Land Surface Elevation: 471.90 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 55 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 59 ft*

Top of Well Screen 61 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 71 ft.*

Base of Borehole: 71 ft.*

Total Depth of Well
Below Top of Casing: 73.52 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-06

SAMPLE/CORE LOG

Project Number:	2015067	Log Page 1 of 1	
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/18/15-11/19/15	AGES Geologist:	John Campbell

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	90’	Surface Elevation:	471.28’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	7	NA	Black boiler slag and ash, loose, fill	N/A
10-20	7	NA	Black boiler slag and ash, loose, fill	N/A
20-30	6	NA	Black boiler slag and ash, loose, fill; 27’-30’ wet	N/A
30-40	6	NA	Black boiler slag and ash, loose, fill, 30’-34’ wet; 34’-36’ brown clay, some silt, hard, damp	N/A
40-50	10	NA	40’-48’ Gray silty clay, soft, very moist, moist 7’-8’; brown silty clay, firm, damp	N/A
50-60	10	NA	Gray silty clay, firm to soft, moist to very moist	N/A
60-70	10	NA	60’-65’ Gray silty clay, firm, moist to very moist; 65’ – 70’ Gray silt, clay, firm, wet	N/A
70-80	4	NA	70’ - 72’ Gray silty clay, firm, moist to very moist; 72’ – 74’ Gray silt, clay, firm, wet; 74’-76’ Gray to brown sand fine, medium, coarse, large and gravel subrounded fine, medium, coarse, large, wet	N/A
80-90	9	NA	80’-88’ Gray to brown sand fine, medium, coarse, large and gravel subrounded fine, medium, coarse, large, wet; 88’- 89’ Gray to brown sand fine, medium, coarse, large to sand fine, medium, wet	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-06

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/18/15-11/19/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/9/15

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 3.44 NTUs

Volume Purged: 100 gallons

Static Water-Level* 51.55'

Top of Well Casing Elevation: 473.51'

Well Purpose:
Groundwater Monitoring

Northing (Y): 449470.57

Easting (X): 568402.50

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: John Campbell

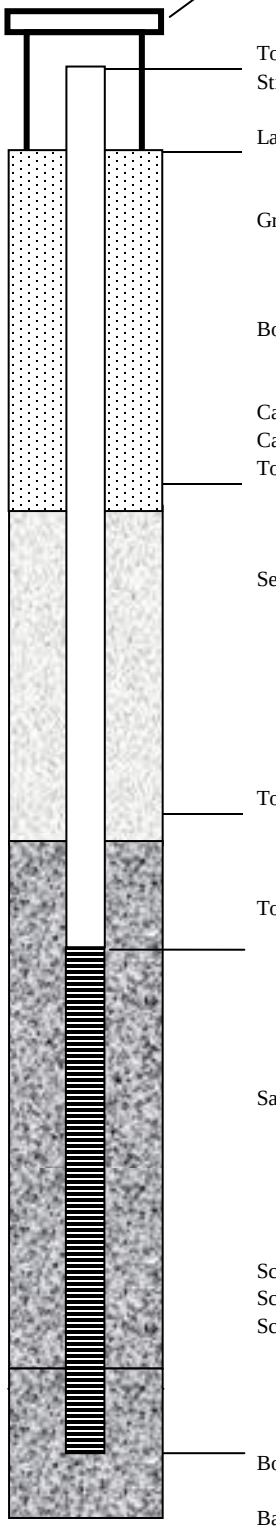
CONSTRUCTION MATERIALS USED:

6 Bags of Sand

2 Bags/Buckets Bentonite Pellets

12 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 473.51 ft.

Stick-up: 2.23 ft.

Land Surface Elevation: 471.28 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 69.5 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 73.5 ft*

Top of Well Screen 75.5 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 85.5 ft.*

Base of Borehole: 85.5 ft.*

Total Depth of Well
Below Top of Casing: 87.73 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-07

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/20/15-11/23/15	AGES Geologist:	John Campbell

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	90’	Surface Elevation:	468.82’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	10	NA	Silty clay, some sand, some fine gravel, dense, hard, slightly moist. fill	N/A
10-20	8.5	NA	Brown silty clay, sand and gravel, gray 13’-14.5’, moist to very moist	N/A
20-30	10	NA	20’-28’ Brown with gray silty clay, moist; 28’-30’ brown silty clay, some gravel, trace sand, very moist to wet	N/A
30-40	10	NA	30’-34’ Gray silt, well compacted, damp; 34’-40’ brown silty clay, very hard, damp	N/A
40-50	10	NA	40’-48’ Gray silt, some very fine sand lenses, some clay; 48’-50’ gray silt, clay, moist	N/A
50-60	10	NA	50’-58’ Gray silt, clay, moist; 58’-60’ yellow brown silty clay, moist	N/A
60-70	10	NA	60’-64’ Gray silt, some sand lenses, some clay; 64’-70’ gray silty clay, some roots and organic matter, firm	N/A
70-80	9	NA	70’-78’ Gray silty clay, some roots and organic matter, firm; 78’-80’ Gray silt, some sand lenses, some clay, wet	N/A
80-90	9	NA	80’-83’ Gray sandy silty, clay, wet; 83’-86’ gray silty clay, hard, moist; 86’-90’ gray sand, silt, wood, wet	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-07

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/20/15-11/23/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/16/15

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 2.86 NTUs

Volume Purged: 35.5 gallons

Static Water-Level* 41.01'

Top of Well Casing Elevation: 471.31'

Well Purpose:
Groundwater Monitoring

Northing (Y): 448947.93

Easting (X): 567946.39

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: John Campbell

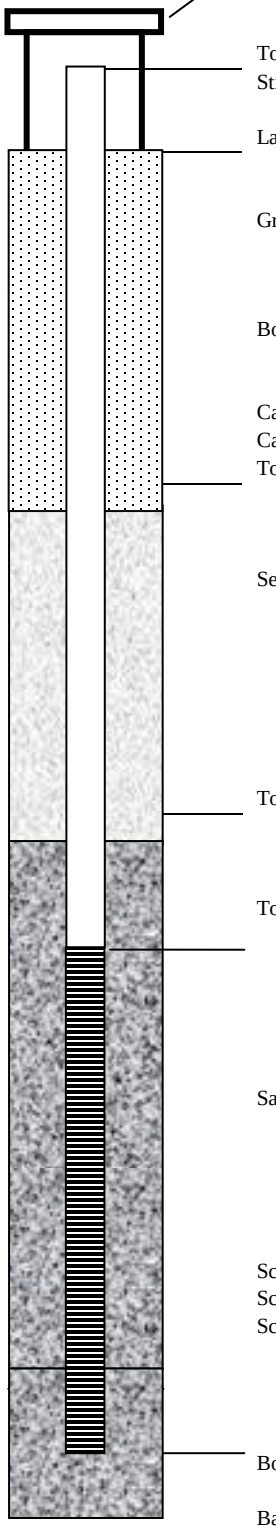
CONSTRUCTION MATERIALS USED:

6 Bags of Sand

14 Bags/Buckets Bentonite Pellets

12 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 471.31 ft.

Stick-up: 2.49 ft.

Land Surface Elevation: 468.82 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 36 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 40 ft*

Top of Well Screen 42 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 52 ft.*

Base of Borehole: 90 ft.*

Total Depth of Well Below Top of Casing: 54.49 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-08

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	11/24/15-11/25/15	AGES Geologist:	John Campbell

Drilling Method:	Roto-Sonic	Coring Device Size:	NA	Hammer Wt.	NA	and Drop	NA
Sampling Method:	NA	Borehole Diameter:	6”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	80’	Surface Elevation:	468.56’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-10	8	NA	Brown silty clay, some sand and gravel, damp, fill	N/A
10-20	9	NA	Brown silty clay, firm, damp to moist	N/A
20-30	7	NA	Brown silty clay, firm, moist	N/A
30-40	10	NA	30’-37’ Brown silty clay, firm, moist; 37’-40’ gray clay, stiff, slightly plastic, very moist	N/A
40-50	9	NA	40’-44.5’ Gray clay, stiff, slightly plastic, very moist; 44.5’-50’ Gray silt, clay, some very fine sand, wet	N/A
50-60	10	NA	50’-59’ Gray silt, clay, some very fine sand, wet; 59’-60’ gray silty clay, moist	N/A
60-70	8.5	NA	Gray silty and silty clay lenses intermittent, wet	N/A
70-80	9	NA	70’-76’ Gray silty and silty clay lenses intermittent, wet; 76’-79’ gray silty clay, firm, moist	N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-08

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 11/24/15-11/25/15

Drilling Method: Roto-Sonic

Drilling Contractor: Bowser Morner

Development Date(s): 12/16/15

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 4.96 NTUs

Volume Purged: 89.5 gallons

Static Water-Level* 37.02'

Top of Well Casing Elevation: 471.06'

Well Purpose:
Groundwater Monitoring

Northing (Y): 448625.46

Easting (X): 567343.24

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: John Campbell

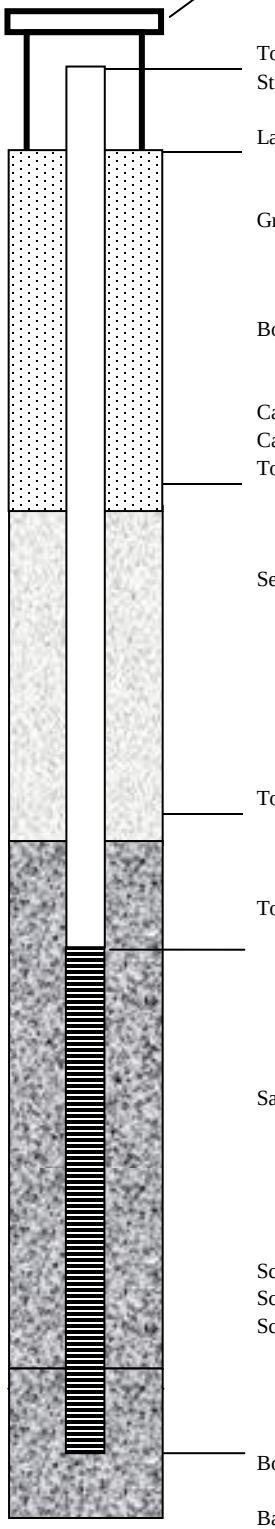
CONSTRUCTION MATERIALS USED:

8 Bags of Sand

4 Bags/Buckets Bentonite Pellets

12 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 471.06 ft.

Stick-up: 2.5 ft.

Land Surface Elevation: 468.56 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 6 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 46.5 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 50.5 ft*

Top of Well Screen 52.8 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 62.8 ft.*

Base of Borehole: 80 ft.*

Total Depth of Well
Below Top of Casing: 65.3 ft.

*Indicates Depth Below Land Surface

BORING NO. ____WBSP-15-09 _
SAMPLE/CORE LOG

Project Number:	2015067	Log Page 1 of 1	
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	1/5/16-1/6/16	AGES Geologist:	Mike Gelles

Drilling Method:	HSA	Coring Device Size:	NA	Hammer Wt.	160lb.	and Drop	2ft
Sampling Method:	NA	Borehole Diameter:	4.25”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	60’	Surface Elevation:	471.21’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-30			Advance augers – no samples	N/A
30-32	1	4-5-7-8	Orange brown silty clay, trace fine sand, stiff, moist	N/A
32-34	1.2	3-6-8-9	Orange brown silty clay, trace fine sand, stiff, moist	N/A
34-36	1.8	3-5-8-7	Orange brown silty clay, trace fine sand, stiff, moist	N/A
36-38	1	2-3-5-7	Orange brown silty clay, trace fine sand, stiff, moist	N/A
38-40	1.6	2-3-4-6	Orange brown silty clay, trace fine sand, stiff, moist	N/A
40-42	1.5	3-3-5-6	Orange brown silty clay, trace fine sand, stiff, moist; to gray last 8”	N/A
42-44	2	3-5-7-8	42’-43’ Orange brown silty clay, trace fine sand, stiff, moist; 43’-44’ Gray silty clay, stiff, moist	N/A
44-46	2	3-4-4-4	44’-44.5’ Gray silty clay, stiff, moist; 44.5’-46’ gray silty fine sand, moist	N/A
46-48	2	1-2-2-3	46’-46.5’ Gray silty fine sand, moist; 46.5’-48’ gray silty clay, fine sand, stiff, plastic, moist	N/A
48-50	2	3-4-4-4	48’-49’ Gray silty clay, fine sand, stiff, plastic, moist; 49’-50’ Orange brown sandy clay fine, stiff, wet	N/A
50-52	2	2-4-4-4	Gray brown sandy silt, fine sand seams, wet	N/A
52-54	2	2-2-3-5	Orange brown sandy silt, fine sand seams, wet	N/A
54-56	2	3-4-5-6	Gray brown sandy silt, fine sand seams, wet	N/A
56-58	2	2-2-2-2	Gray brown sandy silt, fine sand seams, wet	N/A
58-60	2	2-2-3-3	Gray brown sandy silt, fine sand seams, wet	N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-09

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 1/5/16-1/6/16

Drilling Method: Hollow Stem Auger

Drilling Contractor: Bowser Morner

Development Date(s): 1/19/16

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 3.57 NTUs

Volume Purged: 74.5 gallons

Static Water-Level* 38.52’

Top of Well Casing Elevation: 470.69’

Well Purpose:
Groundwater Monitoring

Northing (Y): 448359.31

Easting (X): 566711.13

Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

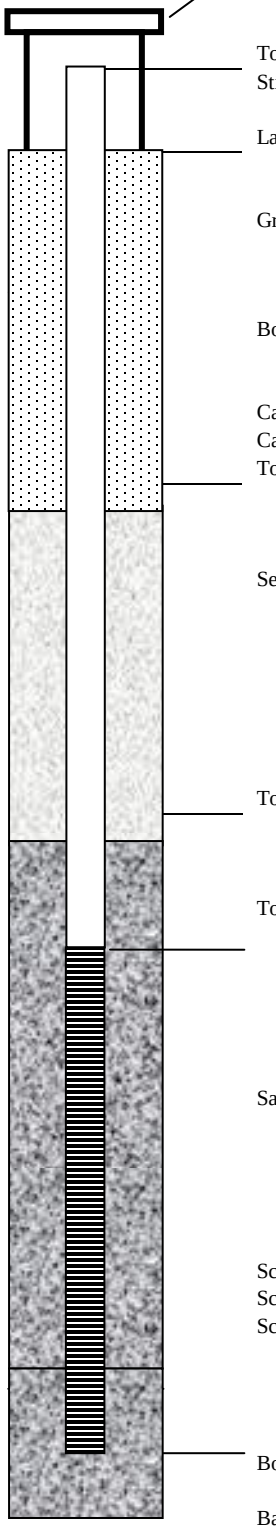
CONSTRUCTION MATERIALS USED:

7 Bags of Sand

2 Bags/Buckets Bentonite Pellets

10 Bags Portland for Grout

____ Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 470.69 ft.

Stick-up: -0.52 ft.

Land Surface Elevation: 471.21 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 4.25 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 44 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 48 ft*

Top of Well Screen 50 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 60 ft.*

Base of Borehole: 60 ft.*

Total Depth of Well
Below Top of Casing: 59.48 ft.

*Indicates Depth Below Land Surface

BORING NO. WBSP-15-10

SAMPLE/CORE LOG

Project Number:	2015067	Log Page	1 of 1
Project Location:	Clifty Creek Plant West Boiler Slag Pond	Drilling Contractor:	Bowser Morner
Drilling Date(s):	1/4/16-1/5/16	AGES Geologist:	Mike Gelles

Drilling Method:	HSA	Coring Device Size:	NA	Hammer Wt.	160lb.	and Drop	2ft
Sampling Method:	NA	Borehole Diameter:	4.25”	Drilling Fluid Used:	Water		
Sampling Interval:	NA	Borehole Depth:	56’	Surface Elevation:	471.21’ MSL		

NOTES/COMMENTS:

Depth Interval (feet)	Sample Recovery (feet)	Penetration (Hyd. Pres. or Blow Counts)	Sample/Core Description	PID (PPM)
0-30			Advance augers – no samples	N/A
30-32	1.5	4-8-10-11	Orange brown silty clay, trace fine sand, stiff, moist	N/A
32-34	2	4-7-9-12	Orange brown silty clay, trace fine sand, stiff, moist	N/A
34-36	1.5	4-8-10-10	Orange brown silty clay, trace fine sand, stiff, moist	N/A
36-38	1.6	4-4-5-7	36’-37’ Orange brown silty clay, trace fine sand, stiff, moist; 37’-38’ brown gray sandy silt, moist	N/A
38-40	2	3-3-4-4	Brown gray silty clay, stiff, moist	N/A
40-42	2	2-2-3-3	Brown gray silty clay, stiff, moist	N/A
42-44	2	2-2-3-3	Orange brown sandy clay, stiff, plastic, moist	N/A
44-46	2	1-1-2-1	Orange brown sandy clay, stiff, plastic, moist; with 3”-4” fine and medium sand seams, wet	N/A
46-48	2	1-1-1-2	Brown gray sandy clay, stiff, plastic, moist; fine and medium sand seams, wet	N/A
48-50	1	1-2-2-3	Brown gray silty clay, fine sand, wet	N/A
50-52	1.6	2-2-3-4	Brown gray silty clay, fine sand, wet	N/A
52-54	1	1-2-2-3	Brown gray silty clay, fine sand, wet	N/A
54-56	2	1-2-2-2	Brown gray silty clay, fine sand, wet	N/A
				N/A
				N/A
				N/A

WELL CONSTRUCTION LOG
WELL NO. WBSP-15-10

Project Number: 2015067

Project Location: Clifty Creek Plant – West Boiler Slag Pond

Installation Date(s): 1/4/16-1/5/16

Drilling Method: Hollow Stem Auger

Drilling Contractor: Bowser Morner

Development Date(s): 1/20/16

Development Method: Submersible Pump

Field parameters stabilized.

Turbidity = 3.59 NTUs

Volume Purged: 58.5 gallons

Static Water-Level* 39.28’

Top of Well Casing Elevation: 470.69’

Well Purpose:
Groundwater Monitoring

Northing (Y): 448125.51

Easting (X): 566225.21

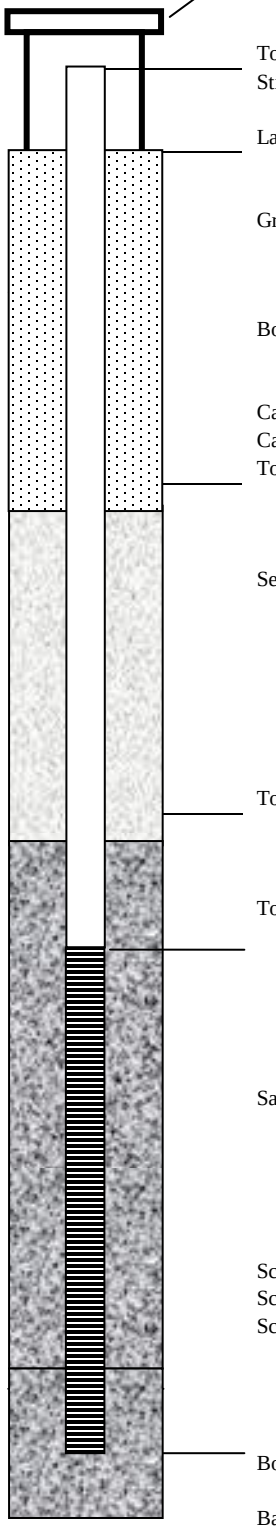
Comments/Notes:
2 inch PVC riser and screen

10 ft of 0.010 pre-packed well screen with an inner filter pack of 0.40 mm clean quartz sand and an outer layer of food-grade nylon mesh.

Inspector: Michael Gelles

CONSTRUCTION MATERIALS USED:

8.5	Bags of Sand
2	Bags/Buckets Bentonite Pellets
10	Bags Portland for Grout
	Bags Concrete/Sakrete



Protective Casing with Locking Cap

Top of Casing Elevation: 470.69 ft.

Stick-up: -0.52 ft.

Land Surface Elevation: 471.21 ft.

Grout; Type: Portland cement/ Grout

Borehole Diameter: 4.25 inch

Casing Diameter: 2 Inch

Casing Material: PVC

Top of Seal: 40 ft*

Seal Type: Bentonite Pellets/Chips

Top of Sand/Gravel Pack: 44 ft*

Top of Well Screen 46 ft*

Sand/Gravel Pack; Type: Global #5

Screen Diameter: 2 Inch

Screen Slot-Size: 0.010 Inch

Screen Material: PVC

Bottom of Well Screen 56 ft.*

Base of Borehole: 56 ft.*

Total Depth of Well Below Top of Casing: 55.48 ft.

*Indicates Depth Below Land Surface

APPENDIX D

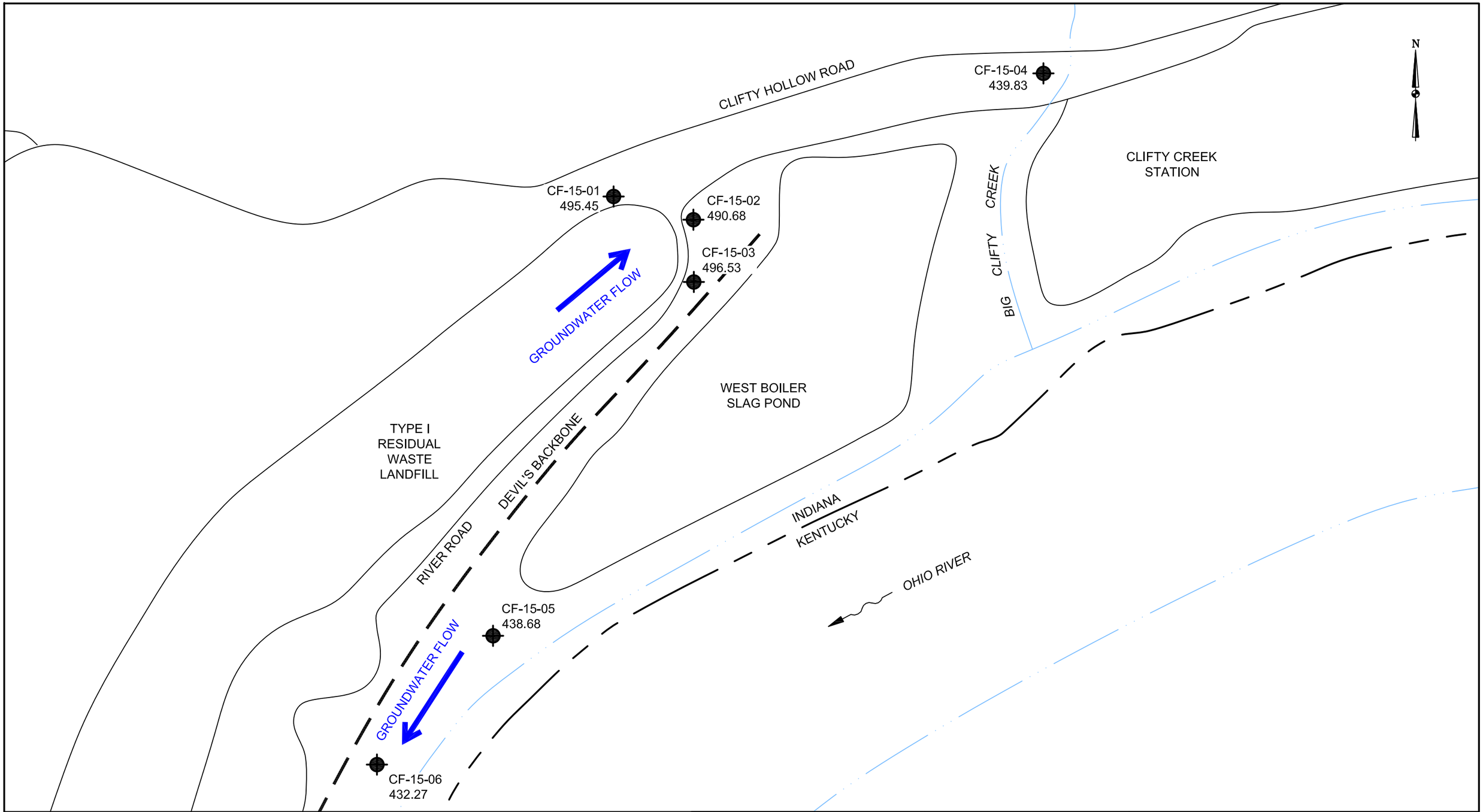
GROUNDWATER LEVELS
January 2016 through May 2016

TABLE D-1
CLIFTY CREEK CREEK PLANT
SUMMARY OF GROUNDWATER ELEVATION DATA
JANUARY 2016 - MAY 2016

Monitoring Well Designation	Jan-16 Groundwater Elevation (ft)	Mar-16 Groundwater Elevation (ft)	May-16 Groundwater Elevation (ft)
LANDFILL AND LANDFILL RUNOFF COLLECTION POND			
CF-15-01	495.45	496.16	496.35
CF-15-02	490.68	490.95	490.97
CF-15-03	496.53	496.64	496.38
CF-15-04	439.83	441.19	441.27
CF-15-05	438.68	439.86	436.25
CF-15-06	432.27	437.12	429.22
CF-15-07	436.61	438.08	437.48
CF-15-08	439.48	440.54	440.88
CF-15-09	450.77	451.58	450.69
WEST BOILER SLAG POND			
WBSP-15-01	451.72	453.01	453.27
WBSP-15-02	468.31	472.52	471.52
WBSP-15-03	477.03	477.11	477.62
WBSP-15-04	429.22	436.25	424.96
WBSP-15-05	428.95	436.12	424.84
WBSP-15-06	428.82	436.06	424.77
WBSP-15-07	429.72	430.41	430.88
WBSP-15-08	434.03	434.62	434.81
WBSP-15-09	432.17	430.39	432.21
WBSP-15-10	431.41	433.28	432.58

APPENDIX E

GROUNDWATER CONTOUR MAPS
January 2016 through May 2016



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

600' 0' 600' 1200'

SCALE: 1"= 600'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_Jan16 b08.dwg
DRAWING SCALE	AS SHOWN

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

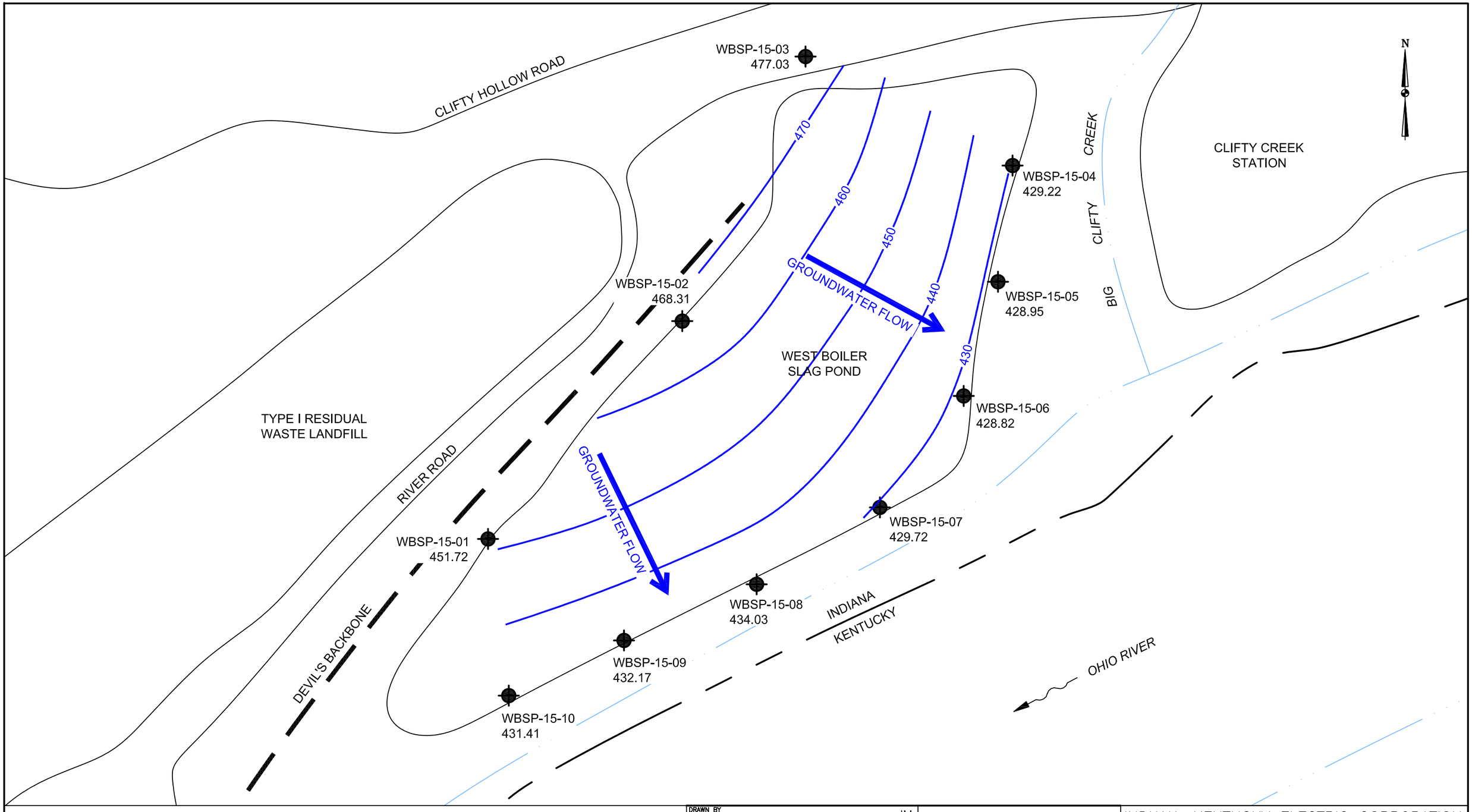
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
NORTHEAST END & BACKGROUND
GROUNDWATER LEVELS & FLOW DIRECTION-JANUARY 2016

DRAWING NAME: FIGURE E-1

REV.: 0

Plot: 10/12/2017 13:34 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_Jan16 b08.dwgE-1



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

400' 0' 400' 800'

SCALE: 1"= 400'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_Jan16 b08.dwg
DRAWING SCALE	AS SHOWN

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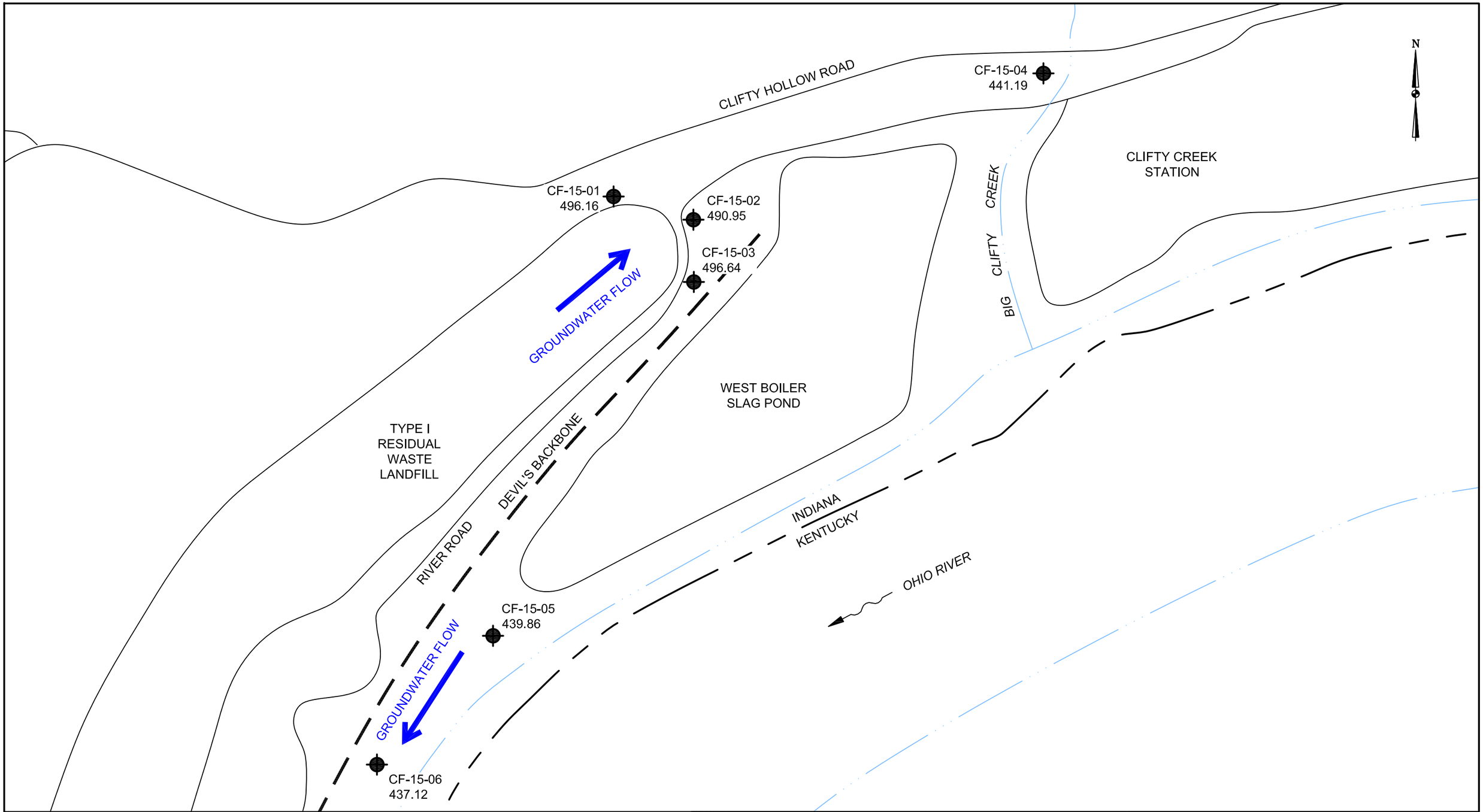
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
WEST BOILER SLAG POND
GROUNDWATER LEVELS & FLOW DIRECTION-JANUARY 2016

DRAWING NAME: FIGURE E-3

REV. 0

Plot: 10/18/2016 11:35 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_Jan16 b08.dwg\E-3



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

600' 0' 600' 1200'

SCALE: 1"= 600'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_Mar16 b09.dwg
DRAWING SCALE	AS SHOWN

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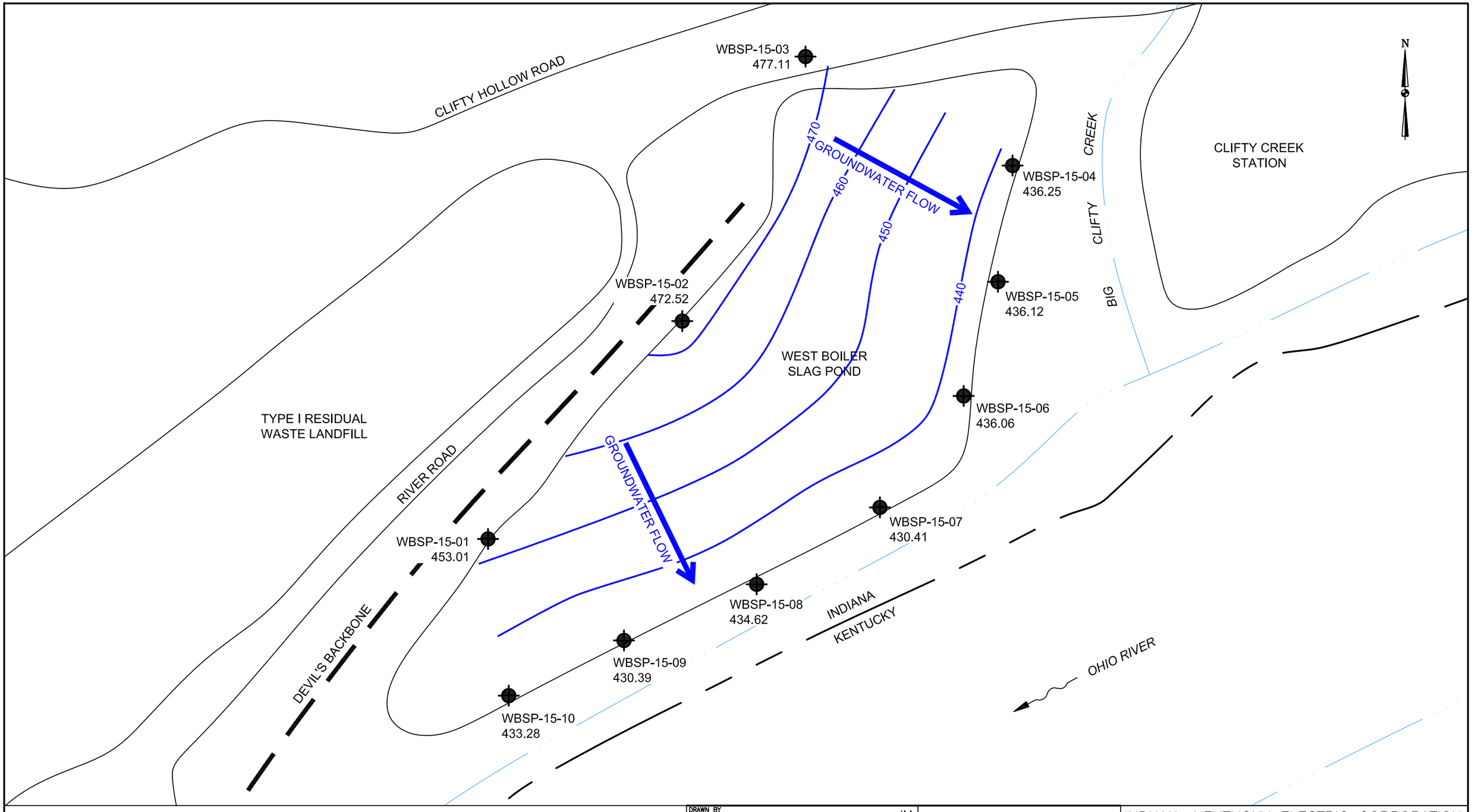
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
NORTHEAST END & BACKGROUND
GROUNDWATER LEVELS & FLOW DIRECTION-MARCH 2016

DRAWING NAME: FIGURE E-4

REV.: 0

Plot: 10/12/2017 13:43 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_Mar16 b09.dwg\E-4



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

400' 0' 400' 800'

SCALE: 1"= 400'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_Mar16 b09.dwg
DRAWING SCALE	AS SHOWN

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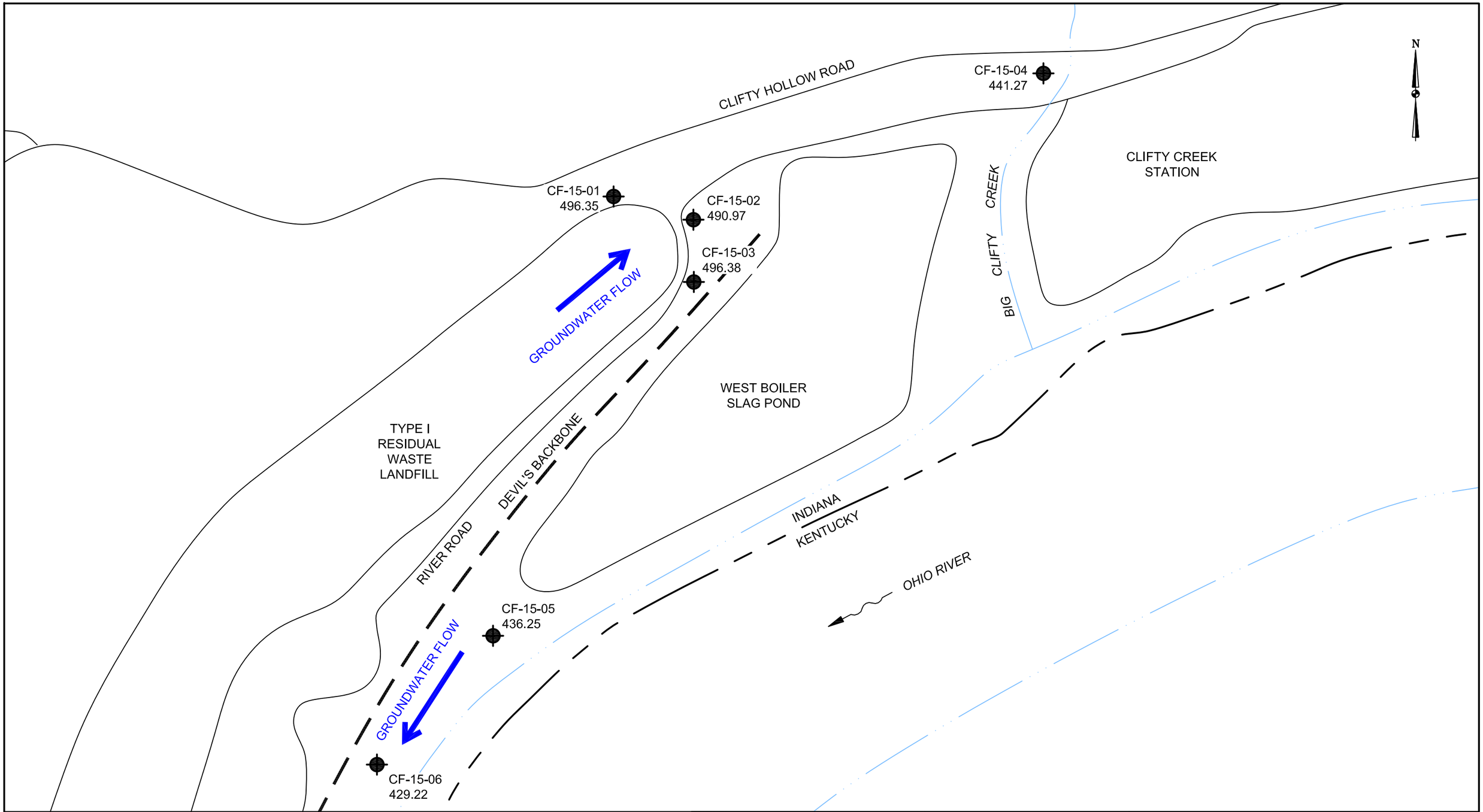
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
WEST BOILER SLAG POND
GROUNDWATER LEVELS & FLOW DIRECTION-MARCH 2016

DRAWING NAME: FIGURE E-6

REV. 0

Plot: 10/18/2016 11:48 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_Mar16 b09.dwg\E-6



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

600' 0' 600' 1200'

SCALE: 1"= 600'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_May16 b10.dwg
DRAWING SCALE	AS SHOWN

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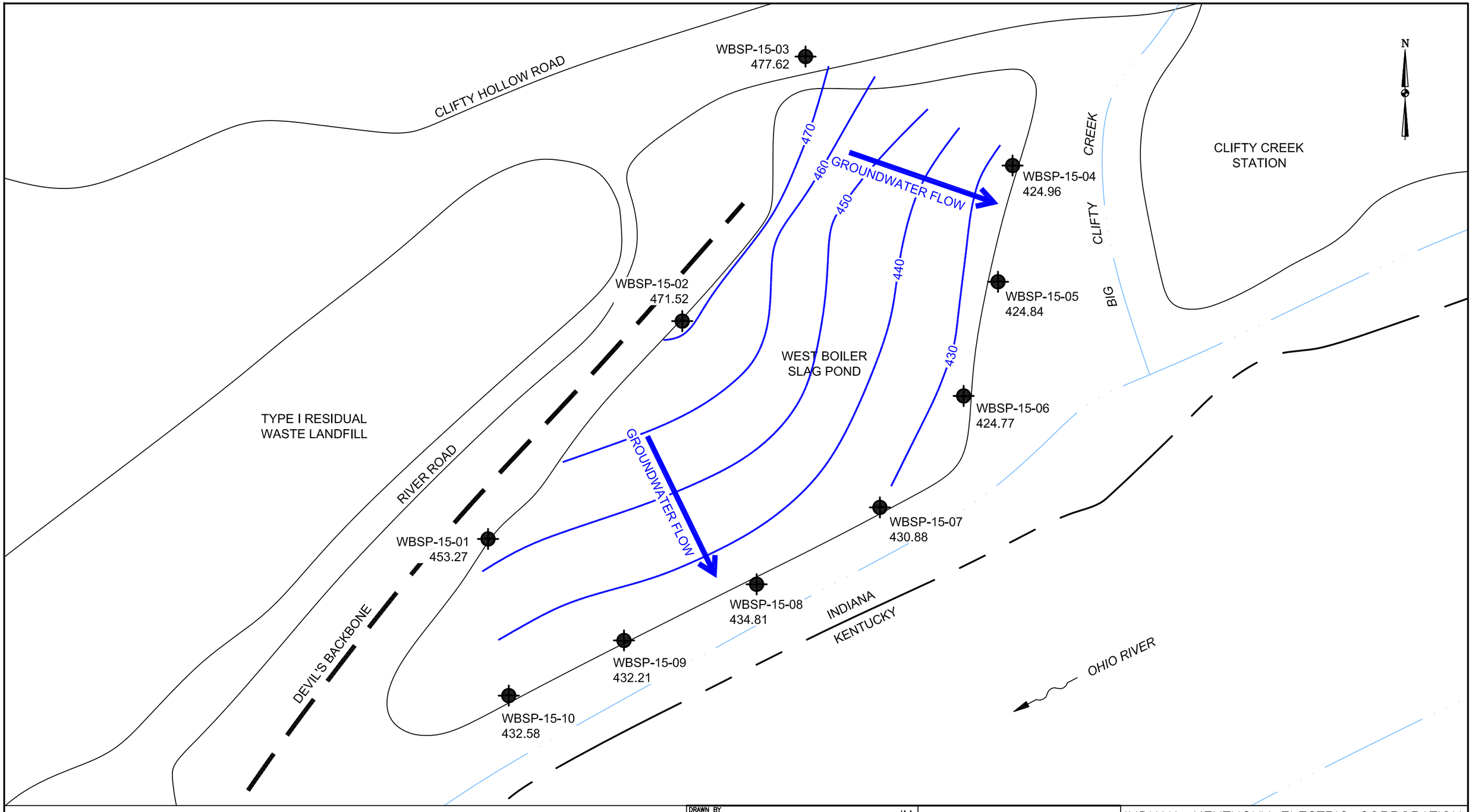
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
NORTHEAST END & BACKGROUND
GROUNDWATER LEVELS & FLOW DIRECTION-MAY 2016

DRAWING NAME: FIGURE E-7

REV.: 0

Plot: 10/12/2017 13:48 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_May16 b10.dwg\E-7



LEGEND:

- MONITORING WELL LOCATION
- GROUNDWATER FLOW DIRECTION

400' 0' 400' 800'

SCALE: 1"= 400'

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLI
DWG. FILE	IKEC_Clifty MW Install_Appx E_May16 b10.dwg
DRAWING SCALE	AS SHOWN

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INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
WEST BOILER SLAG POND
GROUNDWATER LEVELS & FLOW DIRECTION-MAY 2016

DRAWING NAME: FIGURE E-9

REV.: 0

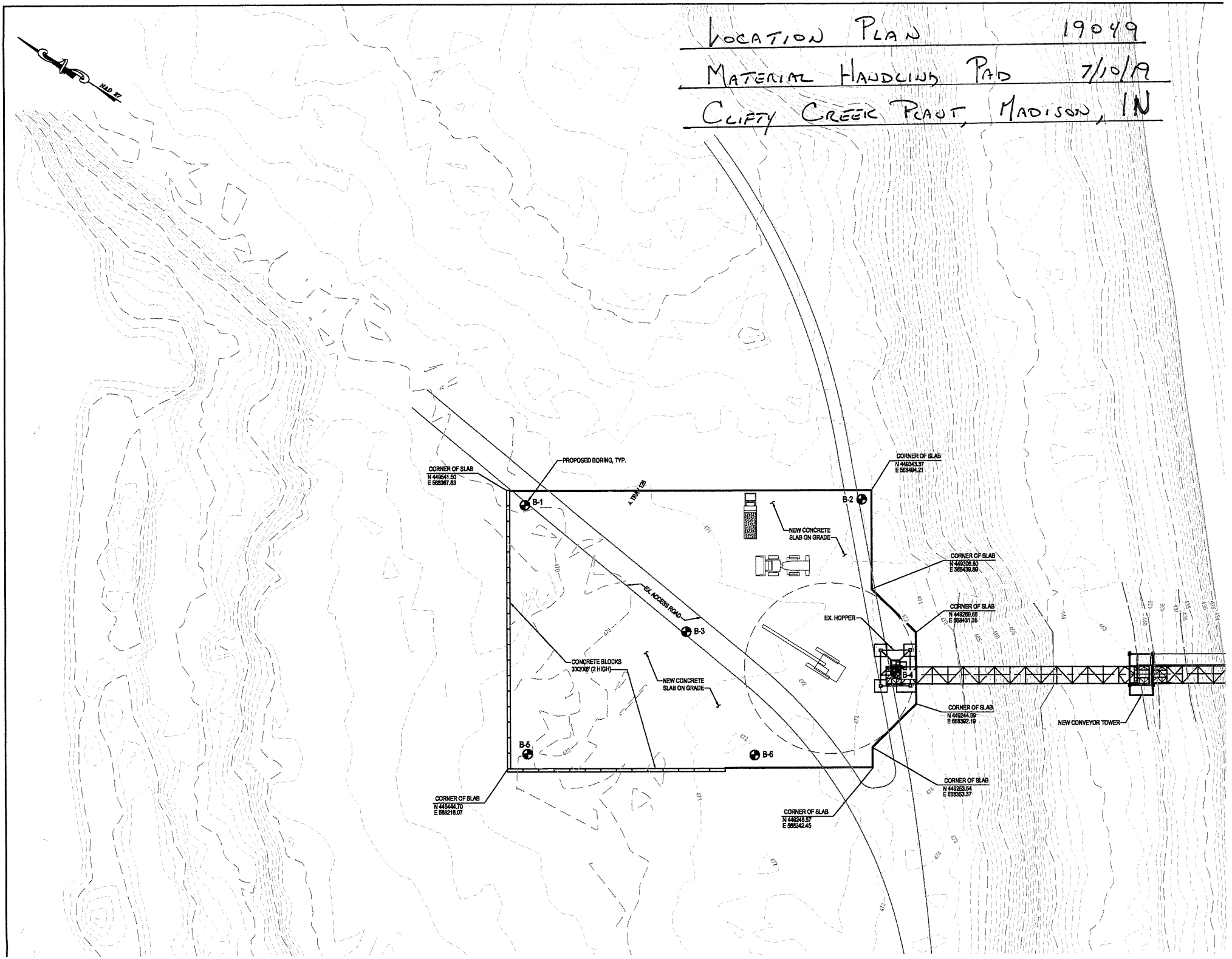
Plot: 10/18/2016 11:52 _PROGRAMS-IKEC\Clifty Creek-CCR Program\CAD\Clifty CCR MW Install\Appendix E\IKEC_Clifty MW Install_Appx E_May16 b10.dwg\E-9

Kozera (2019)

LOCATION PLAN 19049

MATERIAL HANDLING PAD 7/10/19

CLIFTY CREEK PLANT, MADISON, IN



D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B1
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 470.0
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	6-19	08:00	24.0	23.5	---
Completion	6-19	08:05	---	---	---
Casing Pulled	6-19	08:10	---	---	---
	6-19	08:30	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 470.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	470	1	39-29-20	49				Boiler slag, silty sand, FILL, trace gravel, moist, dark brown	Fill	A	
		2	4-4-4	8							
5	465	3	3-2-2	4							
		4	2-3-12	15							
10	460										
		5	13-23-32	55							
15	455										
		6	21-22-22	44							
20	450										
		7	6-3-3	6	▽						
25	445										
		8	2-1-3	4				wet @ 28.0'			
30	440							Bottom of Test Boring @ 30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 7/9/19

D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B2
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 471.0
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	6-19	09:05	Dry	---	---
Completion	6-19	09:06	Dry	---	---
Casing Pulled	6-19	09:10	---	---	---
	6-19	10:00	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 471.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	470	1	13-21-25	46				Boiler slag, silty sand, FILL, trace gravel, moist, dark brown	Fill	A	
		2	9-7-3	10							
5	465	3	3-3-3	6				Lean clay, FILL, moist, tan, gray		A-1	
		4	6-7-4	11							
10	460										
		5	6-7-7	14				Lean clay, FILL, with trace boiler slag			
15	455								Fill		
		6	28-23-12	35				cobbles @ 18.0'			
20	450										
		7	6-7-8	15							
25	445										
		8	3-5-7	12							
30								Bottom of Test Boring @30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 6/28/19

D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B3
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 470.5
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

GROUNDWATER OBSERVATIONS					
	Date	Time	Depth	Casing	Caved
Encountered	6-19	10:20	23.5	23.0	---
Completion	6-19	10:25	---	---	---
Casing Pulled	6-19	10:30	---	---	---
	6-19	10:35	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 470.5	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	470	1	12-14-12	26				Boiler slag FILL, silty sand, trace gravel, moist, dark brown	Fill	A	
		2	18-25-25	50							
5	465	3	15-16-18	34							
		4	19-18-20	38							
10	460										
		5	15-17-18	35							
15	455										
		6	15-28-28	56							
20	450				▽						
		7	11-11-9	20							
25	445										
		8	9-12-12	24				wet @ 28.0'			
30								Bottom of Test Boring @30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 6/28/19

D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B4
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 472.0
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

	GROUNDWATER OBSERVATIONS				
	Date	Time	Depth	Casing	Caved
Encountered	6-19	11:30	Moist	---	---
Completion	6-19	11:35	---	---	---
Casing Pulled	6-19	11:40	---	---	---
	6-19	11:45	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 472.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0								Lean clay, FILL, with gravel, moist, brown	Fill	A-1	
	470	1	12-14-16	30							
		2	6-6-4	10							
5											
	465	3	5-6-7	13							
		4	5-6-8	14							
10								trace boiler slag below 10.0'			
	460										
		5	5-8-8	16							
15											
	455										
		6	6-7-7	14							
20											
	450										
		7	5-7-8	15							
25											
	445										
		8	5-5-8	13							
30								Bottom of Test Boring @ 30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 7/1/19

D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B5
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 470.0
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

	GROUNDWATER OBSERVATIONS				
	Date	Time	Depth	Casing	Caved
Encountered	6-19	13:30	23.5	23.5	---
Completion	6-19	13:35	---	---	---
Casing Pulled	6-19	13:40	---	---	---
	6-19	13:45	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 470.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	470							Lean clay, FILL, with silty sand, moist, dark brown	Fill	A-1	
		1	6-4-6	10							
		2	3-4-6	10							
5	465										
		3	3-4-3	7							
		4	2-1-3	4							
10	460										
		5	2-1-3	4							
15	455										
		6	11-13-16	29				Silty sand, boiler slag FILL, with gravel, dark brown			
20	450										
		7	19-14-9	23	▽						
25	445										
		8	5-4-4	8							
30	440							Bottom of Test Boring @ 30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 7/1/19

D. W. KOZERA, INC.
Baltimore, Maryland
PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B6
Contract No.: 19049
Page: 1 of 1

Project: Clifty Creek Plant
Location: 1335 Clifty Hollow Road
Madison, IN

Ground Surf. El. (±) : 471.5
Date Started : 6-19-19
Date Completed : 6-19-19
Contractor : CinDrill, Inc.
Driller : D. Ciprioni
Rig : cme 55
Drill Method : 3-1/4" HSA
Inspector : D. Kozera

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	6-19	14:30	24.8	23.0	---
Completion	6-19	14:35	---	---	---
Casing Pulled	6-19	14:40	---	---	---
	6-19	14:45	Backfilled	Upon	Completion

Depth (ft)	Surf. Elev. 471.5	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0								Silty sand, boiler slag FILL, with gravel, moist, dark brown	Fill	A	
	470	1	24-28-32	60							
		2	6-7-6	13							
5											
	465	3	6-4-8	14							
		4	16-15-12	27							
10											
	460										
		5	2-2-2	4							
15											
	455										
		6	2-2-2	4							
20											
	450										
		7	3-4-5	9	▽						
25											
	445										
		8	2-3-4	7							
30								Bottom of Test Boring @ 30.0'			

TEST_BORING_LOG 19049.GPJ KOZERA.GDT 7/1/19

Geotechnology (2020)

NOTE: BASE MAP FROM THE JEFFERSON COUNTY, INDIANA GEOGRAPHIC INFORMATION SYSTEM (JEFFERSONIN.WTHGIS.COM)

GEOTECHNOLOGY INC
FROM THE GROUND UP

Project: IKEC Clifty Creek Boiler Slag Project

Location: Madison, Indiana

Title: BORING PLAN

Client: AGES, Inc.

Date: 10/6/2020

Project No.: J036976.01

Sheet No.: 1

APPENDIX B – BORING INFORMATION

Boring Logs

Well Construction Logs

Soil Classification Sheet

Rock Classification Sheet

Surface Elevation: 475.4 Completion Date: 6/30/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Gray moist dense SAND and GRAVEL (Fill).		5-16-36 (82)	SS1
		Reddish brown moist very dense SAND.			
		Gray moist medium dense GRAVEL, traces of sand and lean clay.		6-15-7 (35)	SS2
5	470.4	Interbedded olive brown and gray moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (Bedrock).		19-50/2"	SS3
		Interbedded gray extremely weak to very weak fissile SHALE and light gray medium strong to very strong LIMESTONE. This interval is comprised of approx. 91% shale in up to 12" thick beds and approx. 9% limestone in up to 1/2" thick beds (Dillsboro Formation).		93% 35%	NQ4
10	465.4	Interbedded to irregularly bedded light gray to gray medium strong to very strong fine to coarse-grained crystalline LIMESTONE and gray extremely weak to weak SHALE. This interval is comprised of approx. 81% limestone in up to 5" thick beds and approx. 19% shale in up to 1-1/4" thick beds (Dillsboro Formation).		100% 76%	NQ5
15	460.4	Crystallized mineral filled vug at 15.8'.			
20	455.4				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=100%

REC=100%

REC=88%

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Core water at 3.4' at completion.
Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-1

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 451.0 | Completion Date: 6/30/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown and black moist medium dense SAND (Slag).		8-11-10 (33)	SS1
		Interbedded olive brown and gray moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (Bedrock).		9-12 -50/3" ()	SS2
5	446.0			50/1"	SS3
		Interbedded to irregularly bedded gray extremely weak to weak SHALE and light gray to gray medium strong to very strong LIMESTONE. This interval is comprised of approx. 57% shale in partings to 2" thick beds and approx. 43% limestone in up to 2.5" thick beds (Dillsboro Formation).		50/1"	SS4
10	441.0			90% / 51%	NQ5
		Gray medium strong to very strong LIMESTONE with shale partings (Dillsboro Formation).		100% / 93%	NQ6
15	436.0				
20	431.0				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=78%

REC=67%

REC=100%

REC=100%

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Core water at 2.0' at completion.
Bore hole collapsed before backfilling.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-3

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 466.1 Completion Date: 6/30/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown and black moist medium dense SAND, trace gravel (Fill).		1-6-12 (29)	SS1
		Brown and gray moist dense SAND and GRAVEL with large concrete fragments (Fill). Very rough drilling from 3.0' to 5.0'.		7-30 -50/0" ()	SS2
5	461.1	Brown moist very loose SAND, trace concrete fragments (Fill).		3-2-2 (6)	SS3
				1-1-3 (6)	SS4
10	456.1	Brown, trace black, moist dense SAND (Fill/Slag). Very rough drilling from 11.0' to 12.5'.		6-30 -50/1" ()	SS5
15	451.1				
20	446.1				

SHEAR STRENGTH, tsf
△ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
▲ N-VALUE (BLOWS PER FOOT)
(ASTM D 1586)

WATER CONTENT, %
PL 10 20 30 40 50 LL

REC=67%
REC=33%
REC=33%
REC=28%
REC=55%

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
LDB DRILLER WJL LOGGER
TD-5 DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 95 %

REMARKS: Large pieces of concrete visible on ground surface and on slope into pond. Augers kicked off at 12.5', pulled tooling and offset boring to the north. Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-5A

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 468.1 Completion Date: 7/1/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Overburden (Refer to Boring B-5A).			
		Rough drilling beginning at 3.0'.			
5	463.1				
10	458.1	Brown, trace black, moist very dense SAND (Fill/Slag)		18-36-27 (100)	SS5
		Transitions to medium dense.		3-6-6 (19)	SS6
15	453.1			5-6-6 (19)	SS7
		Brown, trace gray, moist stiff LEAN CLAY.		3-7-7 (22)	SS8
20	448.1	Brown moist stiff LEAN CLAY.			

SHEAR STRENGTH, tsf
△ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
▲ N-VALUE (BLOWS PER FOOT)
(ASTM D 1586)

WATER CONTENT, %
PL 10 20 30 40 50 LL

SS5: 63 ▲, REC=67%
SS6: ▲, REC=83%
SS7: ▲, REC=67%
SS8: ▲ □, REC=89%

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 41 FEET ▽
AT 43.8 FEET AFTER 0 HOURS ▼

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
LDB DRILLER WJL LOGGER
TD-5 DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 95 %

REMARKS: Refer to Boring B-5A for top of profile.
Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-5B

Page 1 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 468.1 Completion Date: 7/1/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown moist stiff LEAN CLAY. *(continued)*			ST9
		Transitions to soft to medium stiff.			
30	438.1	Augers advance very easily from 30' to 35'.		WOH-1-2 (5)	SS10
		Gray very moist soft to medium stiff LEAN CLAY, trace sand.			
35	433.1				ST11
		Gray very moist soft silty LEAN CLAY.			
40	428.1			WOH/18"	SS12
		Rough drilling at 42.5'.			
45	423.1	Interbedded gray moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (Bedrock).		50/3"	SS13

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

3.25

REC=100%

REC=100%

REC=100%

REC=100%

REC=100%

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 41 FEET ▽

AT 43.8 FEET AFTER 0 HOURS ▼

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Refer to Boring B-5A for top of profile.
Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-5B

Page 2 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 448.8 Datum: NAVD 88

Completion Date: 6/30/20

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Black moist very loose SAND (Slag).	1-1-1 (3)	SS1
			1-1-1 (3)	SS2
5	443.8	Drilling mud added to auger stem at 5.0'.	1-1-1 (3)	SS3
		Interbedded gray moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	WOH-1 -50/3" ()	SS4
10	438.8		50/2"	SS5
15	433.8			
20	428.8			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=50%

REC=22%

REC=17%

REC=80%

REC=0%

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 4 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-7

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 448.4 Completion Date: 7/1/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Black moist very loose coarse SAND, trace gravel (Slag).		1-1-2 (5)	SS1
		Black wet very loose coarse SAND, trace gravel (Slag).		REC=61%	
				1-1-1 (3)	SS2
			▽	REC=33%	
5	443.4	Drilling mud added to augers at 5.0'.		WOH-1-1 (3)	SS3
				REC=0%	
				WOH-WOH -1 ()	SS4
				REC=0%	
10	438.4			WOH-1-1 (3)	SS5
				REC=6%	
				1-1-1 (3)	SS6
				REC=6%	
15	433.4	Switched to mud rotary at 15.0'.		2-2-1 (5)	SS7
				REC=6%	
		Gray very moist soft LEAN CLAY.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

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 4 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Drilling mud at ground surface at completion. Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-9

Page 1 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 448.4 Completion Date: 7/1/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Gray very moist soft LEAN CLAY. *(continued)* Switched back to hollow stem augers at 20.0'.		WOH-WOH -2 ()	SS8
25	423.4				ST9
		Gray and brown sandstone and limestone fragments (Possible gravel bed).		32-50/2"	SS10
		Brown medium dense angular GRAVEL, some clay.		8-11-12 (36)	SS11
30	418.4				
		Interbedded gray moist extremely weak to very weak SHALE and gray medium strong to very strong LIMESTONE (Bedrock).		50/2"	SS12
35	413.4				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=100%

REC=0%

REC=100%

REC=78%

REC=100%

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 4 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Drilling mud at ground surface at completion. Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-9

Page 2 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

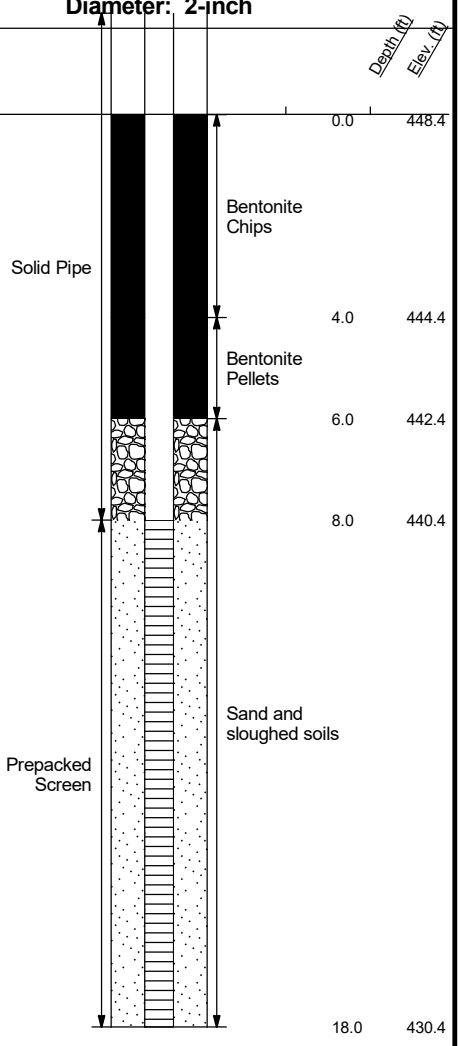
Surface Elevation: 448.4 | Completion Date: 7/8/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Black SAND (Slag).			
5	443.4				
10	438.4				
15	433.4	Piston sampler used from 15' to 17', REC=100% Brown SILT.			SST1
		Gray LEAN CLAY.			
20	428.4				

WELL DIAGRAM

Ground Surface
Diameter: 2-inch



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 1.7 FEET AFTER 0 HOURS ▼

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS:

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: Piezo-9

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: **464.3** Completion Date: **7/1/20**

Datum: **NAVD 88**

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown and black moist medium dense SAND (Fill/Slag).		4-5-6 (17)	SS1
		Transitions to very loose.		2-2-2 (6)	SS2
5	459.3			1-1-2 (5)	SS3
		Brown moist very loose silty SAND (Fill).		WOH-1-1 (3)	SS4
10	454.3	Reddish brown and black moist medium dense SAND and GRAVEL (Fill/Slag).		2-10-15 (40)	SS5
				9-15-14 (46)	SS6
15	449.3	Black very moist medium dense silty fine to coarse SAND (Fill/Slag).		9-13-14 (43)	SS7
		Olive brown and brown moist LEAN CLAY with limestone fragments.			
20	444.3	Rough drilling from 20' to 25'. ▽		13-30 -50/4" ()	SS8
		Interbedded to irregularly bedded gray extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (Bedrock).			
25	439.3			50/3"	SS9

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=72%
REC=50%
REC=50%
REC=39%
REC=78%
REC=78%
REC=83%
REC=100%
REC=100%

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 20 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Auger refusal at 26.3 feet.
Boring backfilled with cement-bentonite grout.

Drawn by: RLB	Checked by: WJL	App'vd. by: LJC
Date: 7/5/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-11

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 449.3 Datum: NAVD 88

Completion Date: 7/6/20

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Black moist very loose SAND, trace gravel (Slag).		1-2-3 (8)	SS1
		Transitions to very loose.		1-1-1 (3)	SS2
5	444.3	Switched to mud rotary at 5'. ▽		WOH-1-1 (3)	SS3
		Black, trace brown, very moist very loose fine SAND, trace gravel (Slag).		WOH-WOH -1 ()	SS4
10	439.3			WOH-1-1 (3)	SS5
		Black very moist very loose GRAVEL, trace sand (Slag).		1-2-1 (5)	SS6
15	434.3			1-1-2 (5)	SS7
		Brown moist dense SAND and GRAVEL, trace silty clay seams.			
		Rough drilling from 19.5' to 23.5'.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=78%

REC=67%

REC=33%

REC=33%

>>

REC=33%

REC=17%

REC=39%

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 5 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Core water at 22.3' at completion.
Boring backfilled with cement-bentonite grout.

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-13

Page 1 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 449.3 Completion Date: 7/6/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown moist dense SAND and GRAVEL, trace silty clay seams. *(continued)*		13-19-23 (67)	SS8
		Very easy drilling from 23.5' to 25'.			
25	424.3	Switched back to augers at 25'.		8-9-50/0" ()	SS9
		Interbedded to irregularly bedded light gray medium strong to very strong LIMESTONE and gray extremely weak to very weak SHALE (Bedrock).		50/1"	SS10
		Interbedded to irregularly bedded light gray medium strong to very strong LIMESTONE and gray extremely weak to very weak SHALE. This interval is comprised of approx. 82 % limestone in up to 1-1/4" thick beds and approx. 18% shale in up to 1" thick beds (Dillsboro Formation).		97% 52%	NQ11
30	419.3	Light gray to gray medium strong to very strong fine- to coarse-grained crystalline LIMESTONE, occasional shale partings (Dillsboro Formation). Water stained joints at 28.1', 28.2' and 29.1'. Water staining from 28.2' to 29.3'.		94% 74%	NQ12
35	414.3	Interbedded to irregularly bedded light gray medium strong to very strong fossiliferous fine-grained LIMESTONE and gray extremely weak to very weak SHALE. This interval is comprised of approx. 70% limestone in up to 2.5" thick beds and approx. 30% shale in up to 3.5" thick beds (Dillsboro Formation). Water stained joints at 34.8' and 35.8'			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=83%

REC=25%

REC=100%

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 5 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Core water at 22.3' at completion.
Boring backfilled with cement-bentonite grout.

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-13

Page 2 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 449.3 | Completion Date: 7/8/20

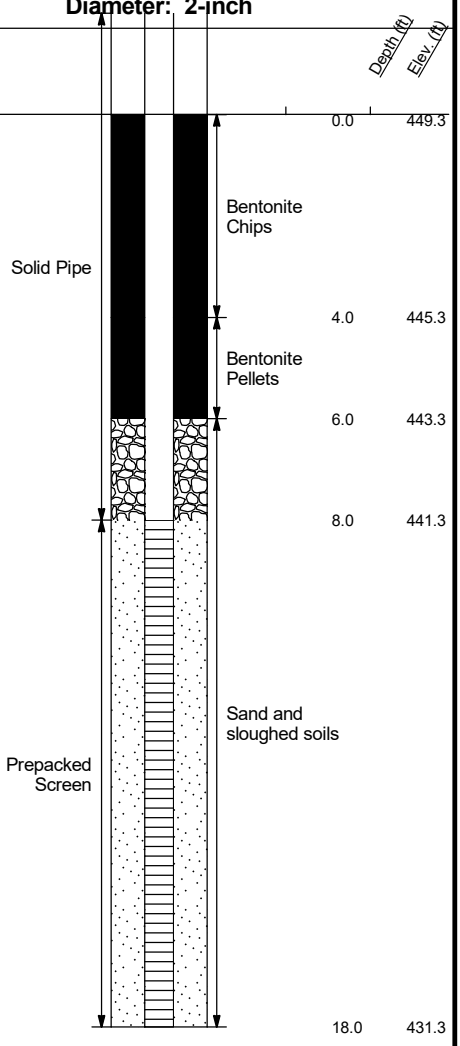
Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL
		Black SAND (Slag).
5	444.3	
10	439.3	
15	434.3	Piston sampler used from 15' to 17', REC=63%.
20	429.3	

GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD | SAMPLES: SST1

WELL DIAGRAM

Ground Surface
Diameter: 2-inch



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 2.4 FEET AFTER 0 HOURS ▼

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
LDB DRILLER WJL LOGGER
TD-5 DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 95 %

REMARKS:

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: Piezo-13

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 449.0 Completion Date: 7/7/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Black moist very loose SAND and Gravel (Slag).		1-1-2 (5)	SS1
				1-1-1 (3)	SS2
5	444.0	Drilling mud added to augers at 5.0'. ▽		1-1-1 (3)	SS3
		Black very moist very loose fine SAND, trace gravel (Slag).		1-1-1 (3)	SS4
10	439.0			WOH-1-1 (3)	SS5
		Black very moist very loose SAND and GRAVEL (Slag).		1-1-1 (3)	SS6
15	434.0	Piston sampler used from 15' to 17'.			SST7
		Reddish brown moist stiff LEAN CLAY.			
20	429.0	Brown moist soft to medium stiff sandy LEAN CLAY.		3-2-2 (6)	SS8
		Brown moist medium stiff LEAN CLAY, some gravel.			ST9
25	424.0	Brown moist medium dense GRAVEL with sand, trace lean clay.		7-6-3 (14)	SS10
		Rough Drilling from 27.5' to 48'.			
		Brown moist medium dense SAND and GRAVEL.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=67%

REC=44%

REC=50%

REC=33%

REC=67%

REC=50%

REC=63%

REC=100%

REC=42%

REC=78%

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 5 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Drilling mud at 17.4' at completion. Boring backfilled with cement-bentonite grout.

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-15

Page 1 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

Surface Elevation: 449.0 Completion Date: 7/7/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD	SAMPLES
		Brown moist medium dense SAND and GRAVEL. *(continued)*		8-10-11 (33)	SS11
		Transitions to dense.			
35	414.0			20-20-25 (71)	SS12
		Transitions to medium dense.			
40	409.0			12-9	SS13
		Brown moist very dense SAND and GRAVEL, trace cobbles.			
45	404.0			30-47-50 (154)	SS14
		Very rough drilling at 48.3'.		50/1"	SS15
50	399.0	Interbedded to irregularly bedded gray extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (Bedrock).			
55	394.0				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)

(ASTM D 1586)

WATER CONTENT, %

PL 10 20 30 40 50 LL

REC=61%

REC=83%

REC=61%

REC=89%

97

REC=100%

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 5 FEET ▽

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS: Drilling mud at 17.4' at completion.
Boring backfilled with cement-bentonite grout.

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: B-15

Page 2 of 2

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

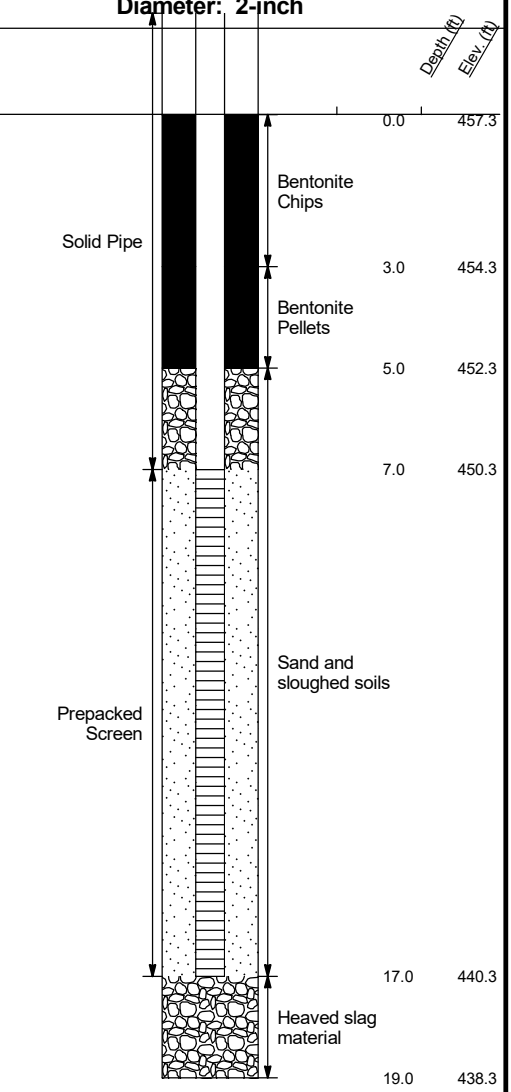
Surface Elevation: 457.3 | Completion Date: 7/8/20

Datum: NAVD 88

DEPTH IN FEET	ELEVATION IN FEET	DESCRIPTION OF MATERIAL
		Black SAND (Slag).
5	452.3	
10	447.3	
15	442.3	
20	437.3	

GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS (N60) CORE RECOVERY/RQD | SAMPLES

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

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 2.6 FEET AFTER 0 HOURS ▼

DRILLING DATA

___ AUGER 3 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

LDB DRILLER WJL LOGGER

TD-5 DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 95 %

REMARKS:

Drawn by: WJL	Checked by: RLB	App'vd. by: LJC
Date: 7/10/20	Date: 8/7/20	Date: 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

IKEC Clifty Creek Boiler Slag Project

LOG OF BORING: Piezo-15

Page 1 of 1

Project No. J036976.01

N60 BORING LOG (WITH PAGE #) J036976.01.GPJ 00 CLONE ME.GPJ 10/8/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

SOIL CLASSIFICATION SHEET

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	- 4 blows/ft. or less
Loose	- 5 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

Relative Properties

Descriptive Term	Percent
Trace	1 – 10
Little	11 – 20
Some	21 – 35
And	36 – 50

Particle Size Identification

Boulders	-	8 inch diameter or more
Cobbles	-	3 to 8 inch diameter
Gravel	- Coarse	- 3/4 to 3 inches
	- Fine	- 3/16 to 3/4 inches
Sand	- Coarse	- 2mm to 5mm (dia. of pencil lead)
	- Medium	- 0.45mm to 2mm (dia. of broom straw)
	- Fine	- 0.075mm to 0.45mm (dia. of human hair)
Silt		- 0.005mm to 0.075mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Field Identification	Unconfined Compressive Strength (tons/sq. ft.)
Very Soft	Easily penetrated several inches by fist	Less than 0.25
Soft	Easily penetrated several inches by thumb	0.25 – 0.5
Medium Stiff	Can be penetrated several inches by thumb with moderate effort	0.5 – 1.0
Stiff	Readily indented by thumb but penetrated only with great effort	1.0 – 2.0
Very Stiff	Readily indented by thumbnail	2.0 – 4.0
Hard	Indented with difficulty by thumbnail	Over 4.0

Classification on logs are made by visual inspection.

Standard Penetration Test – Driving a 2.0" O.D., 1 3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the drill log (Example – 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8+9=17 blows/ft.). Refusal is defined as greater than 50 blows for 6 inches or less penetration.

Strata Changes – In the column "Soil Descriptions" on the drill log, the horizontal lines represent strata changes. A solid line (————) represents an actually observed change; a dashed line (— — — —) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

GEOTECHNOLOGY INC
FROM THE GROUND UP

ROCK CLASSIFICATION SHEET

ROCK WEATHERING

Descriptions	Field Identification
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than it its fresh condition.
Highly Weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Residual Soil	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact with bedding planes visible, and the soil has not been significantly transported.

ROCK STRENGTH

Descriptions	Field Identification	Uniaxial Compressive Strength (psi)
Extremely Weak	Indented by thumbnail	40-150
Very Weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	150-700
Weak	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	700-4,000
Medium Strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow of a geological hammer.	4,000-7,000
Strong	Specimen requires more than one blow of a geological hammer to fracture.	7,000-15,000
Very Strong	Specimen requires many blows with a geological hammer to fracture.	15,000-36,000
Extremely Strong	Specimen can only be chipped with geological hammer.	>36,000

BEDDING

Descriptive Term	Bed Thickness
Massive	> 4 ft.
Thick	2 to 4 ft.
Medium	2 in. to 2 ft.
Thin	< 2 in.

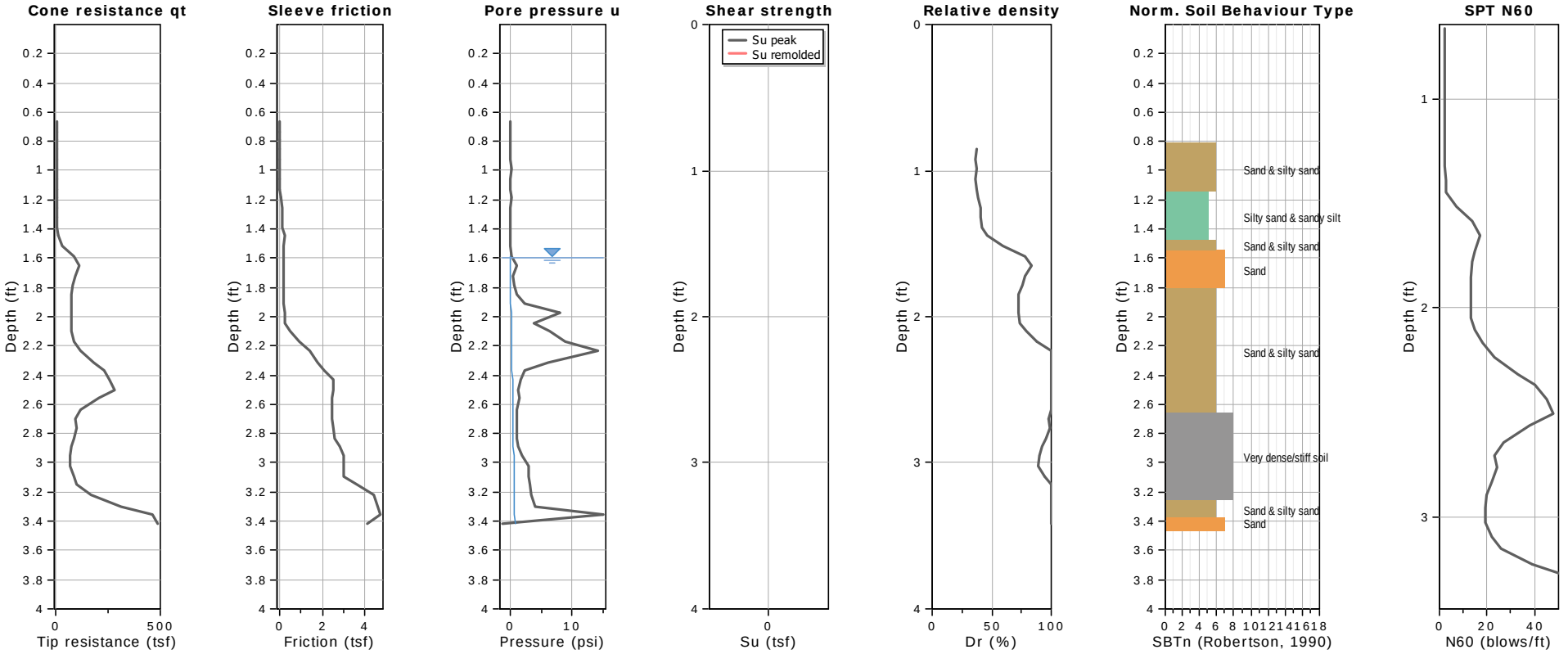
APPENDIX C – ROCK CORE PHOTOGRAPHS

APPENDIX D – CPT SOUNDING INFORMATION

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**

CPT-2A
Total depth: 3.42 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ



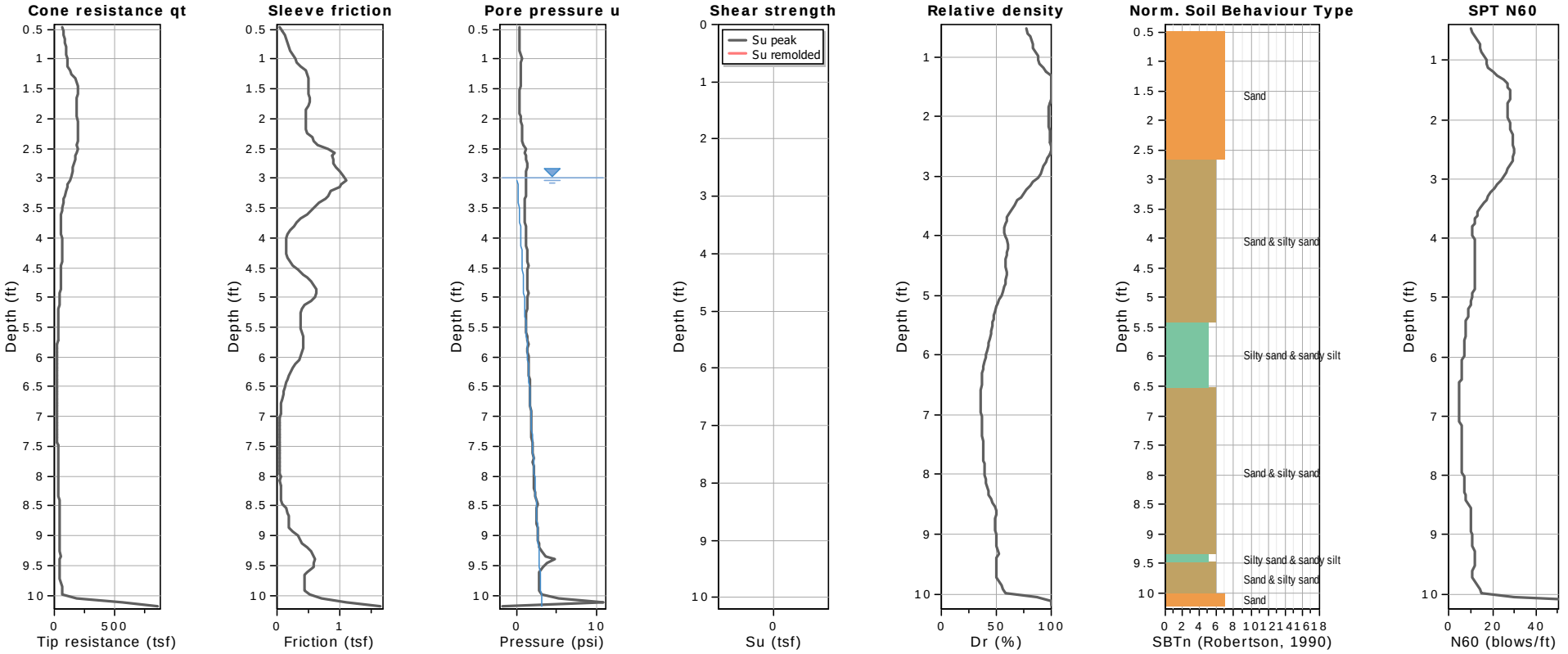
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-4
Total depth: 10.18 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



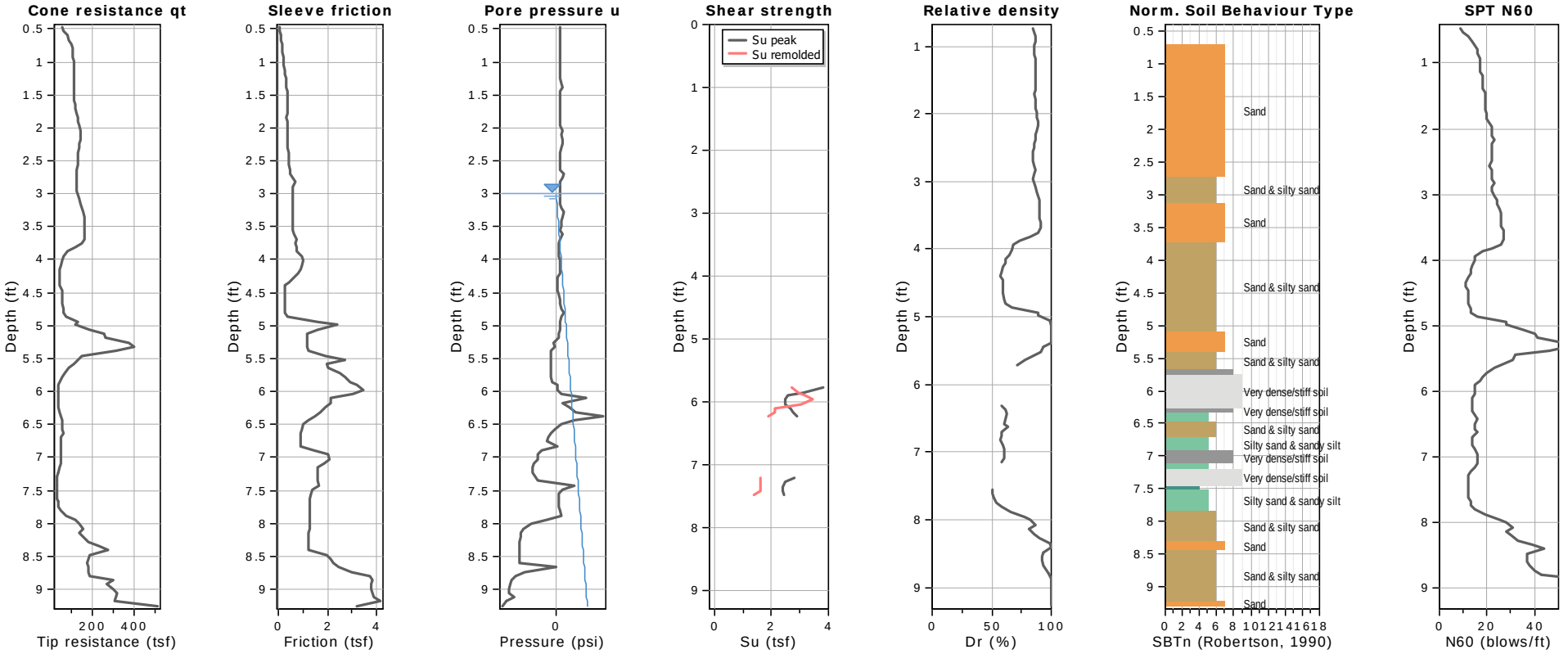
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-6
Total depth: 9.26 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



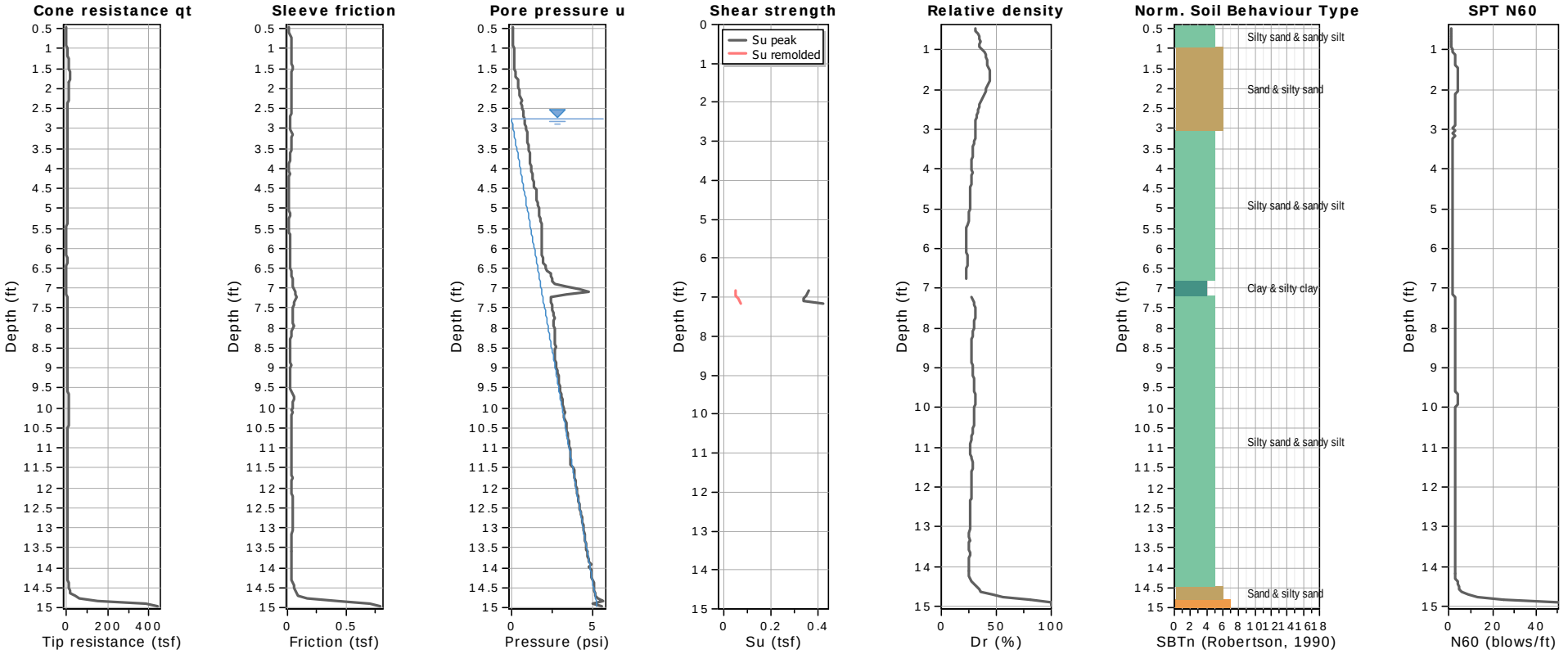
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-8
Total depth: 14.97 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



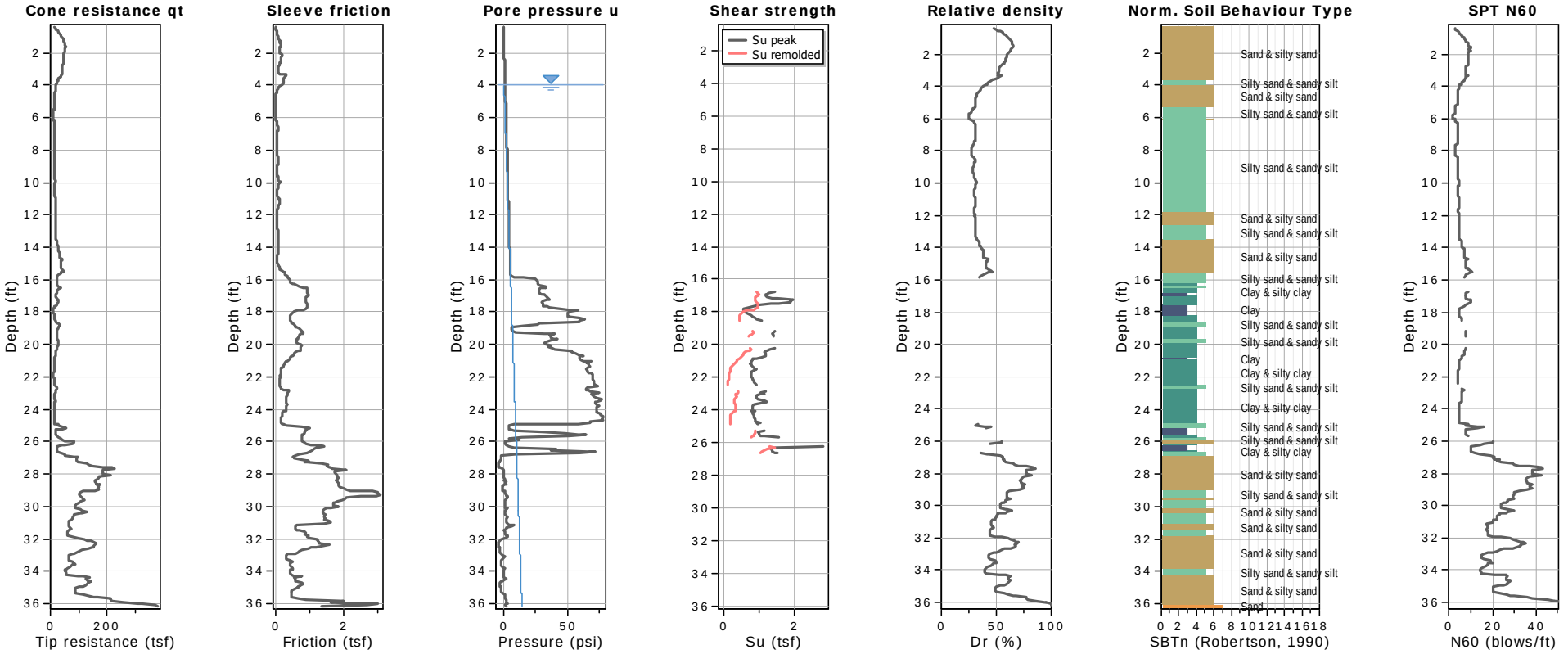
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-10
Total depth: 36.16 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



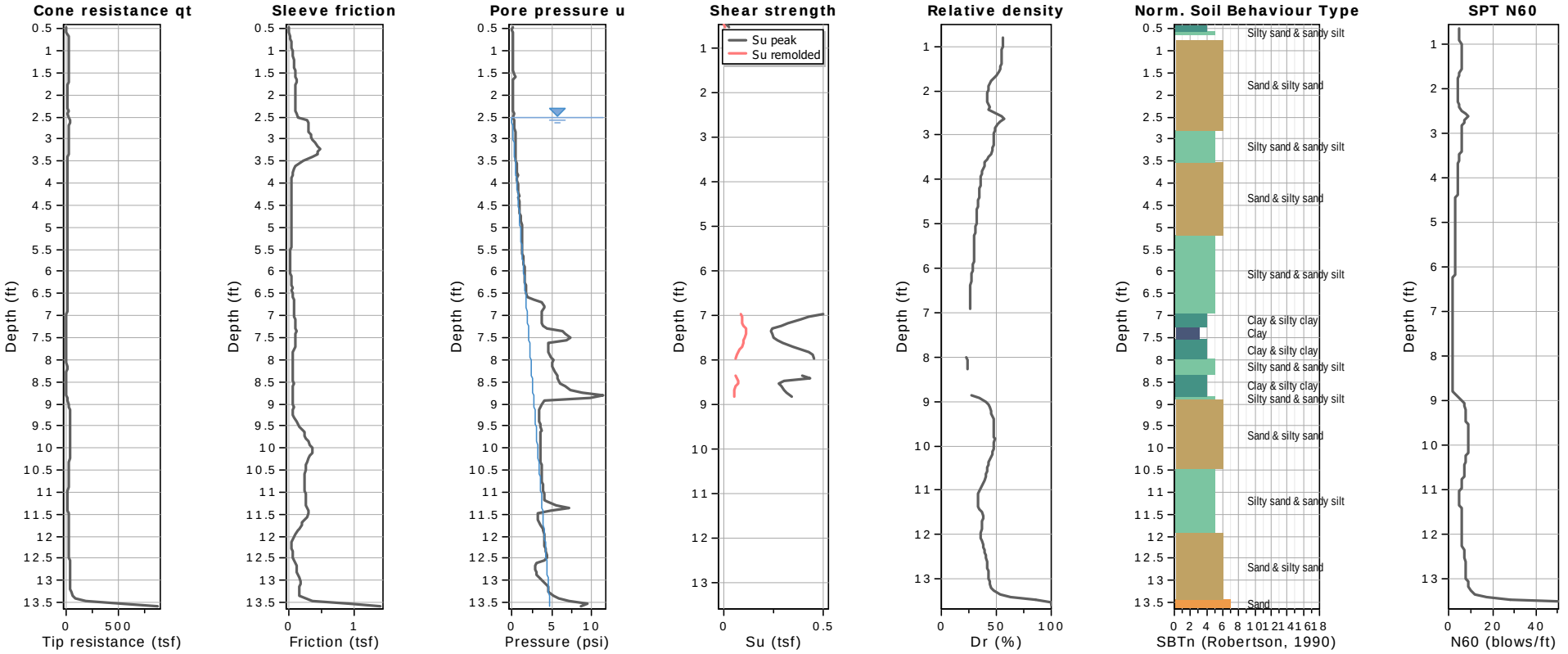
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-12
Total depth: 13.59 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



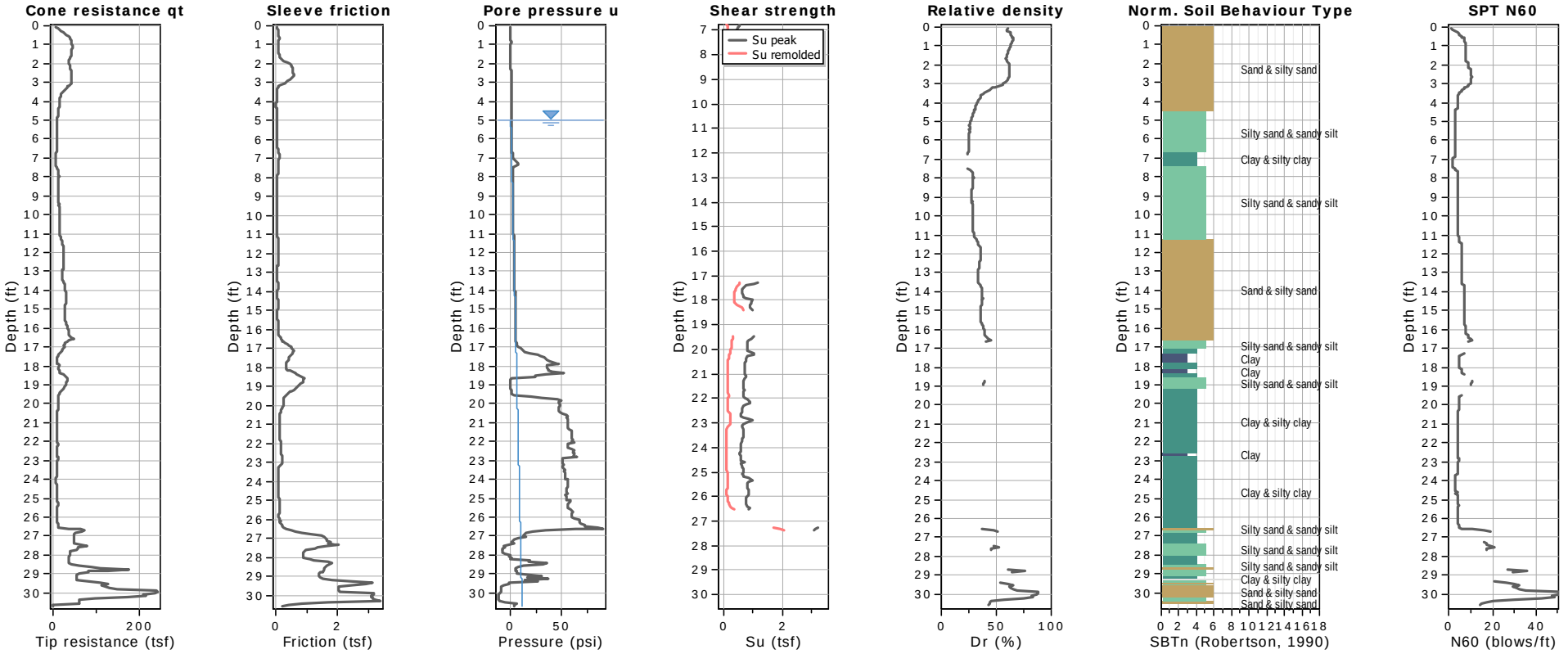
SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Geotechnology
Geotechnical Engineers
11816 Lackland Road
St. Louis, Missouri

CPT-14
Total depth: 30.72 ft, Date: 7/22/2020
Cone Type: 15cm2
Cone Operator: DWJ

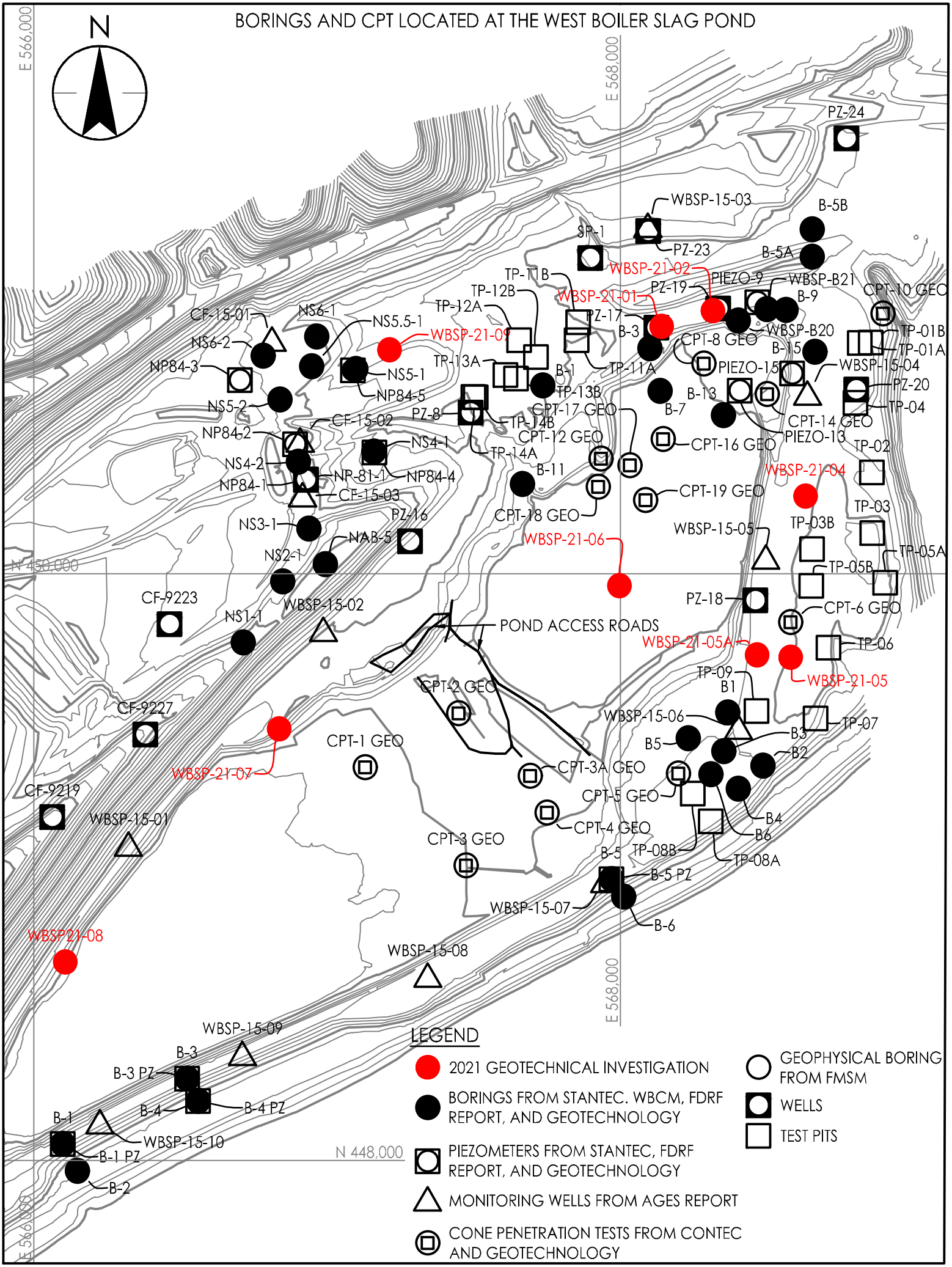
Project: **IKEC Clifty Creek Boiler Slag Project**
Location: **Madison, Indiana**



SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Stantec (2021)


BORINGS AND CPT LOCATED AT THE WEST BOILER SLAG POND
N
E 566,000
E 568,000
N 450,000
N 448,000
E 566,000
E 568,000
PZ-24
WBSP-15-03
B-5B
SR-1
PZ-23
B-5A
WBSP-21-02
TP-11B
TP-12B
TP-12A
WBSP-21-01
PIEZO-9
WBSP-B21
B-9
PZ-19
CPT-10 GEO
PZ-17
B-3
CPT-8 GEO
WBSP-B20
TP-01B
TP-01A
CF-15-01
NS6-1
NS5.5-1
WBSP-21-09
NS6-2
B-15
NP84-3
TP-13A
NS5-1
B-1
TP-11A
PIEZO-15
WBSP-15-04
NP84-5
TP-13B
B-13
PZ-20
NS5-2
PZ-8
TP-14B
CPT-17 GEO
B-7
TP-04
CF-15-02
CPT-14 GEO
NP84-2
NS4-1
CPT-12 GEO
CPT-16 GEO
PIEZO-13
TP-14A
TP-02
NS4-2
NP-81-1
NP84-4
B-11
WBSP-21-04
NP84-1
CF-15-03
CPT-19 GEO
TP-03
PZ-16
CPT-18 GEO
WBSP-15-05
TP-03B
NS3-1
NAB-5
WBSP-21-06
TP-05A
NS2-1
TP-05B
PZ-18
CF-9223
CPT-6 GEO
WBSP-15-02
NS1-1
POND ACCESS ROADS
WBSP-21-05A
TP-06
CPT-2 GEO
TP-09
B1
WBSP-21-05
CF-9227
WBSP-15-06
TP-07
B3
B5
B2
CPT-1 GEO
WBSP-21-07
CPT-3A GEO
CF-9219
CPT-5 GEO
WBSP-15-01
B4
B6
CPT-4 GEO
CPT-3 GEO
TP-08B
TP-08A
B-5
B-5 PZ
WBSP-15-07
B-6
WBSP21-08
WBSP-15-08
WBSP-15-09
B-3
B-3 PZ
B-4
B-4 PZ
B-1
WBSP-15-10
B-1 PZ
B-2
LEGEND
2021 GEOTECHNICAL INVESTIGATION
BORINGS FROM STANTEC. WBCM, FDRF REPORT, AND GEOTECHNOLOGY
PIEZOMETERS FROM STANTEC, FDRF REPORT, AND GEOTECHNOLOGY
MONITORING WELLS FROM AGES REPORT
CONE PENETRATION TESTS FROM CONTEC AND GEOTECHNOLOGY
GEOPHYSICAL BORING FROM FMSM
WELLS
TEST PITS

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-01 | Stantec Boring No.: **WBSP-21-01**

Client: IKEC | Boring Location: 450842.148 N; 568139.505 E

Project Number: 175539026 | Surface Elevation: 476.7 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/23/21 | Completed: 2/23/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: N/A | Date/Time: N/A

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
476.7	0.0	Top of Hole							
		SAND (SW), CCR, dark brown and black, moist, medium dense to dense, with fine grained gravel		SPT-1	0.0 - 1.5	1.4	3-11-19	--	
				SPT-2	1.5 - 3.0	1.2	17-21-21	--	Gravel=10 %, Sand=78%, Fines=12%, Gs=2.86
				SPT-3	3.0 - 4.5	1.3	4-14-17	--	
471.1	5.6			SPT-4	4.5 - 6.0	1.3	4-4-3	--	
		FAT CLAY (CH), light brown, moist, medium stiff to very stiff, trace sand and gravel		SPT-5	6.0 - 7.5	1.3	3-23-35	--	
469.2	7.5	-at 6.0', stiff/hard -at 6.5', gray to light gray gravel and cobbles until 7.5'		SPT-6	7.5 - 9.0	1.2	4-7-8	16	Gravel=1%, Sand=16%, Fines=83%, Gs=2.68, LL=30, PI=14
		LEAN CLAY (CL), light brown with orange and red mottling, moist, medium stiff to stiff		SPT-7	9.0 - 10.5	1.3	5-4-4	--	
				SPT-8	10.5 - 12.0	1.3	2-2-4	--	
464.0	12.7			SPT-9	12.0 - 13.5	1.5	2-9-10	--	
		GRAVELLY CLAY (CL), gray with orange and brown, moist, hard, low plasticity, trace sand		SPT-10	13.5 - 15.0	1.5	5-9-8	--	

Stantec

SUBSURFACE LOG (DRAFT)

Client Borehole Identification WBSP-21-01 Stantec Boring No. **WBSP-21-01**

Client IKEC Boring Location 450842.148 N; 568139.505 E

Project Number 175539026 Surface Elevation 476.7 ft Elevation Datum NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
		GRAVELLY CLAY (CL), gray with orange and brown, moist, hard, low plasticity, trace sand *(Continued)*		SPT-11	15.0 - 16.5	1.5	8-15-11	--	
		-at 16.5', gravel and cobbles from 16.5' to 18.0'		SPT-12	16.5 - 18.0	0.8	9-13-11	--	
458.7	18.0								
		FAT CLAY (CH), yellowish brown with tan, moist, firm, trace gravel		SPT-13	18.0 - 19.5	1.3	3-5-6	--	
				SPT-14	19.5 - 21.0	0.9	2-6-8	--	
455.7	21.0								
		No Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-02 | Stantec Boring No.: **WBSP-21-02**

Client: IKEC | Boring Location: 450896.522 N; 568315.112 E

Project Number: 175539026 | Surface Elevation: 475.1 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/23/21 | Completed: 2/23/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: N/A | Date/Time: N/A

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
475.1	0.0	Top of Hole							
		SAND WITH GRAVEL (SW), CCR, dark brown and black, moist, medium dense		SPT-1	0.0 - 1.5	1.5	6-13-2	--	
472.9	2.2			SPT-2	1.5 - 3.0	1.1	1-2-3	--	
		LEAN CLAY (CL), brown, moist, soft, some gravel							Gravel=2%, Sand=10%, Fines=88%, Gs=2.66, LL=34, PI=16
		-at 3.2', high plasticity		SPT-3	3.0 - 4.5	1.3	WH-WH-WH	22	
				SPT-4	4.5 - 6.0	1.4	1-4-4	--	
468.6	6.5	-at 5.5', cobble and gravel until 6.0'							
		GRAVELLY CLAY (CL), gray, moist, firm		SPT-5	6.0 - 7.5	1.4	5-12-18	--	
467.6	7.5								
		FAT CLAY (CH), olive brown, moist, hard, some gravel with blue, cobbles and gravel from 7.5' to 8.2'		SPT-6	7.5 - 9.0	1.5	6-13-12	--	
				SPT-7	9.0 - 10.5	0.1	8-18-15	--	
		-at 10.5', brown and trace gravel		SPT-8	10.5 - 12.0	1.4	4-8-10	--	
463.1	12.0								
		SILTY CLAY WITH SAND (CL-ML), orange brown, moist, firm		SPT-9	12.0 - 13.5	1.5	3-5-4	--	
				SPT-10	13.5 - 15.0	1.1	3-5-4	19	Sand=27%, Fines=73%, Gs=2.72, LL=24, PI=7

SUBSURFACE LOG (DRAFT)

Client Borehole Identification WBSP-21-02 Stantec Boring No. **WBSP-21-02**

Client IKEC Boring Location 450896.522 N; 568315.112 E

Project Number 175539026 Surface Elevation 475.1 ft Elevation Datum NAVD88

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows/ Press.(psi)	NMC %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Depth	
		SILTY CLAY WITH SAND (CL-ML), orange brown, moist, firm *(Continued)*		SPT-11	15.0 - 16.5	1.5	2-3-4	--	
				SPT-12	16.5 - 18.0	1.5	8-5-5	--	
				SPT-13	18.0 - 19.5	0.9	4-6-6	--	
455.6	19.5	No Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-04 | Stantec Boring No.: **WBSP-21-04**

Client: IKEC | Boring Location: 450263.32 N; 568630.955 E

Project Number: 175539026 | Surface Elevation: 471.9 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/24/21 | Completed: 2/24/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: 26.0 ft | Date/Time: 2/24/21

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows/ Press.(psi)	NMC %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Depth	Remarks
471.9	0.0	Top of Hole							
		SAND (SW), CCR, dark brown, brown and black, moist, loose to dense, little to some gravel		SPT-1	0.0 - 1.5	1.0	2-4-4	--	
				SPT-2	1.5 - 3.0	1.2	10-16-19	--	
				SPT-3	3.0 - 4.5	1.5	13-18-14	--	Gravel=4%, Sand=90%, Fines=6%, Gs=2.82
		-at 4.5', very dense		SPT-4	4.5 - 6.0	1.5	14-33-33	--	
				SPT-5	6.0 - 7.5	1.5	32-33-23	--	
		-at 7.5', medium dense		SPT-6	7.5 - 9.0	1.5	4-7-7	--	
		-at 9.0', very dense and some orange until 10.5'		SPT-7	9.0 - 10.5	1.1	6-25-27	--	
				SPT-8	10.5 - 12.0	1.5	10-21-29	--	
		-at 11.5', little yellow from 11.5' to 11.6'		SPT-9	12.0 - 13.5	1.5	14-20-29	--	
				SPT-10	13.5 - 15.0	1.4	15-17-16	--	Gravel=6%, Sand=84%, Fines=10%, Gs=2.95
				SPT-11	15.0 - 16.5	1.5	14-14-19	--	
				SPT-12	16.5 - 18.0	1.3	12-21-21	--	
				SPT-13	18.0 - 19.5	1.5	11-16-15	--	

Client Borehole Identification WBSP-21-04 Stantec Boring No. **WBSP-21-04**

Client IKEC Boring Location 450263.32 N; 568630.955 E

Project Number 175539026 Surface Elevation 471.9 ft Elevation Datum NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
		SAND (SW), CCR, dark brown, brown and black, moist, loose to dense, little to some gravel *(Continued)*		SPT-14	19.5 - 21.0	1.5	12-16-20	--	
				SPT-15	21.0 - 22.5	1.5	11-18-28	--	
				SPT-16	22.5 - 24.0	1.5	14-21-17	--	
		-at 24.0', medium dense		SPT-17	24.0 - 25.5	1.5	8-9-9	--	
		-at 25.5', black sandy gravel begins -at 26.0', wet		SPT-18	25.5 - 27.0	1.5	9-6-6	--	
				SPT-19	27.0 - 28.5	1.5	4-4-6	--	
				ST-1	28.5 - 30.5	0.8	300 PSI	--	
				SPT-20	30.5 - 32.0	1.4	3-3-4	--	Gravel=6%, Sand=85%, Fines=9%, Gs=2.90
				SPT-21	32.0 - 33.5	1.4	4-4-6	--	
437.1	34.8			SPT-22	33.5 - 35.0	1.5	3-3-4	--	
		LEAN CLAY (CL), gray with brown, moist to wet, soft, low plasticity		SPT-23	35.0 - 36.5	1.5	2-2-4	--	
		-silt with little plasticity from 40.0' to 42.0'		ST-2	40.0 - 42.0	2.0	50 PSI	--	Sand=8%, Fines=92%
				ST-3	45.0 - 47.0	1.8	400 PSI	--	

TVA RO BORING LOG CLIFTY_BORINGS_LOGS.GPJ FMSM-GRAPHIC LOG.GDT 4/14/21

SUBSURFACE LOG (DRAFT)

Client Borehole Identification WBSP-21-04 Stantec Boring No. **WBSP-21-04**

Client IKEC Boring Location 450263.32 N; 568630.955 E

Project Number 175539026 Surface Elevation 471.9 ft Elevation Datum NAVD88

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows/ Press.(psi)	NMC %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Depth	
		LEAN CLAY (CL), gray with brown, moist to wet, soft, low plasticity *(Continued)*							
				ST-4	50.0 - 52.0	1.6	600 PSI	--	
419.9	52.0								
		No Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-05 | Stantec Boring No.: **WBSP-21-05**

Client: IKEC | Boring Location: 449714.499 N; 568579.589 E

Project Number: 175539026 | Surface Elevation: 475.3 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/25/21 | Completed: 2/26/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: N/A | Date/Time: N/A

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows/ Press.(psi)	NMC %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Depth	Remarks
475.3	0.0	Top of Hole							
		SAND WITH GRAVEL (SW), CCR, dark brown with black, moist, loose to very dense		SPT-1	0.0 - 1.5	1.4	4-8-9	--	
473.7	1.6								
		FAT CLAY (CH), gray with little black, moist, soft, trace to little boiler slag		SPT-2	1.5 - 3.0	1.4	3-2-2	--	
472.3	3.0								

No Refusal /
Bottom of Hole

Borehole was backfilled with auger cuttings.

TVA RO BORING LOG_CLIFTY_BORINGS_LOGS.GPJ FMSM-GRAPHIC LOG.GDT 4/14/21

Stantec

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-05A | Stantec Boring No.: **WBSP-21-05A**

Client: IKEC | Boring Location: 449722.618 N; 568465.789 E

Project Number: 175539026 | Surface Elevation: 471.8 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/25/21 | Completed: 2/26/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: 27.0 ft | Date/Time: 2/25/21

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows/ Press.(psi)	NMC %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Depth	Remarks
471.8	0.0	Top of Hole							
		SAND (SW), CCR, dark brown and black, moist, loose to very dense, with little to some gravel		SPT-1	0.0 - 1.5	1.2	2-2-4	--	
				SPT-2	1.5 - 3.0	1.5	13-21-28	--	
				SPT-3	3.0 - 4.5	1.5	10-16-19	--	
				SPT-4	4.5 - 6.0	1.5	11-13-12	--	
				SPT-5	6.0 - 7.5	1.2	9-14-19	--	Gravel=4%, Sand=83%, Fines=13%, Gs=2.90
				SPT-6	7.5 - 9.0	1.4	9-10-14	--	
				SPT-7	9.0 - 10.5	1.4	14-17-22	--	
				SPT-8	10.5 - 12.0	1.5	17-21-24	--	
				SPT-9	12.0 - 13.5	1.5	23-36-33	--	Gravel=8%, Sand=82%, Fines=10%, Gs=2.85
				SPT-10	13.5 - 15.0	1.5	20-30-37	--	
				SPT-11	15.0 - 16.5	1.5	20-37-27	--	
				SPT-12	16.5 - 18.0	1.5	20-28-19	--	
				SPT-13	18.0 - 19.5	1.5	10-12-14	--	

Client Borehole Identification WBSP-21-05A | Stantec Boring No. **WBSP-21-05A**

Client IKEC | Boring Location 449722.618 N; 568465.789 E

Project Number 175539026 | Surface Elevation 471.8 ft | Elevation Datum NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
		SAND (SW), CCR, dark brown and black, moist, loose to very dense, with little to some gravel *(Continued)*		SPT-14	19.5 - 21.0	1.5	11-15-17	--	Gravel=6%, Sand 87%, Fines=7%, Gs=2.87
				SPT-15	21.0 - 22.5	1.5	10-21-21	--	
				SPT-16	22.5 - 24.0	1.5	10-11-15	--	
				SPT-17	24.0 - 25.5	1.5	10-16-13	--	
				SPT-18	25.5 - 27.0	1.5	9-11-9	--	Gravel=3%, Sand= 86%, Fines=11%, Gs=2.91
		-at 27.0', wet		SPT-19	27.0 - 28.5	1.5	5-6-4	--	
				SPT-20	28.5 - 30.0	1.5	2-1-2	--	
				SPT-21	30.0 - 31.5	1.5	3-4-4	--	
439.8	32.0								
		LEAN CLAY (CL), dark brown, moist, firm to stiff, low plasticity, some silt to with silt, trace gravel		SPT-22	31.5 - 33.0	1.5	3-7-10	--	
				SPT-23	33.0 - 34.5	1.5	5-11-17	--	
				ST-1	35.0 - 37.0	2.0	300-PSI	44	Gs=2.63, DD=74.8 pcf
				ST-2	40.0 - 42.0	2.0	700-PSI	--	
				ST-3	45.0 - 47.0	1.5	250-PSI	25	Sand=12%, Fines=88%, Gs=2.70, LL=29, PI=10, DD=87.8 pcf

Stantec

SUBSURFACE LOG (DRAFT)

Client Borehole Identification WBSP-21-05A | Stantec Boring No. **WBSP-21-05A**

Client IKEC | Boring Location 449722.618 N; 568465.789 E

Project Number 175539026 | Surface Elevation 471.8 ft | Elevation Datum NAVD88

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
Elevation	Depth								
		LEAN CLAY (CL), dark brown, moist, firm to stiff, low plasticity, some silt to with silt, trace gravel *(Continued)*		ST-4	50.0 - 52.0	2.0	300-PSI	--	
419.8	52.0	-at 51.9', gray with higher plasticity							
		No Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-06 | Stantec Boring No.: **WBSP-21-06**

Client: IKEC | Boring Location: 449958.925 N; 567996.535 E

Project Number: 175539026 | Surface Elevation: 448.7 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 3/1/21 | Completed: 3/1/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: 4.0 ft | Date/Time: 3/1/21

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
448.7	0.0	Top of Hole							
		SAND WITH GRAVEL (SW), CCR, dark brown and black, moist, very loose to loose		SPT-1	0.0 - 1.5	1.0	1-1-1	--	
				SPT-2	1.5 - 3.0	0.6	1-1-1	--	
		-at 4.0', wet		SPT-3	3.0 - 4.5	1.1	1-1-1	--	Gravel=14%, Sand=78%, Fines=8%, Gs=2.82
				ST-1	4.5 - 6.5	0.0	50-PSI	--	
				ST-2	6.5 - 8.5	0.0		--	
				SPT-4	8.5 - 10.0	0.7	1-WH-WH	--	
				SPT-5	10.0 - 12.5	0.4	1-1-1	--	
				SPT-6	12.5 - 14.0	1.3	1-1-3	--	
				SPT-7	14.0 - 15.5	0.2	WH-WH-1	--	
432.9	15.8								
431.7	17.0	SILTY SAND WITH GRAVEL (SM), CCR (boiler slag with fly ash), gray with black, wet, very loose		SPT-8	15.5 - 17.0	1.4	WH-WH-1	--	
				SPT-9	17.0 - 18.5	1.5	WH-WH-WH	--	
		SANDY SILT WITH GRAVEL (ML), CCR (fly ash), gray and dark gray, wet, very soft		ST-3	18.5 - 20.5	2.0	50-PSI	33	Gs=2.66, DD=87.7 pcf
427.3	21.4			SPT-10	20.5 - 22.0	1.5	2-4-6	--	
		FAT CLAY (CH), brown with light brown and little orange, moist, medium stiff to very stiff							

TVA RO BORING LOG_CLIFTY_BORINGS_LOGS.GPJ FMSM-GRAPHIC LOG.GDT 4/14/21

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SUBSURFACE LOG (DRAFT)

Client Borehole Identification WBSP-21-06 Stantec Boring No. **WBSP-21-06**

Client IKEC Boring Location 449958.925 N; 567996.535 E

Project Number 175539026 Surface Elevation 448.7 ft Elevation Datum NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
		FAT CLAY (CH), brown with light brown and little orange, moist, medium stiff to very stiff *(Continued)* -at 27.5', gray and trace to some sand		ST-4	25.0 - 27.0	1.6	300-PSI	23	Gs=2.72, DD=103.2 pcf
				SPT-11	27.0 - 28.5	1.5	1-2-5	--	
				ST-5	30.0 - 31.7	1.6	300-PSI	--	
		-at 31.7', some gravel starting at this depth, rounded		SPT-12	31.7 - 33.2	1.2	3-4-6	--	
				SPT-13	35.0 - 36.5	1.5	2-1-8	--	
		-at 40.9', gravelly sand from 40.9' to 41.3'		SPT-14	40.0 - 41.5	1.1	8-11-15	14	Gravel=27%, Sand=36%, Fines=37%, Gs=2.71, LL=24, PI=7
				SPT-15	45.0 - 46.5	0.1	5-7-6	--	
398.7	50.0								Gravel=44%, Sand=48%, Fines=8%, Gs=2.71
397.2	51.5	POORLY GRADED GRAVEL WITH SAND (GP), gray with tan and orange, moist to wet, very dense, subangular to rounded		SPT-16	50.0 - 51.5	1.5	11-12-32	--	
		No Refusal / Bottom of Hole							

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-07 | Stantec Boring No.: **WBSP-21-07**

Client: IKEC | Boring Location: 449470.783 N; 566835.777 E

Project Number: 175539026 | Surface Elevation: 465.6 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/26/21 | Completed: 2/27/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: 17.3 ft | Date/Time: 2/26/21

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
465.6	0.0	Top of Hole							
465.1	0.5	CLAY (CL-CH), stockpile		SPT-1	0.0 - 1.5	1.5	2-4-9	--	
		SILTY SAND (SM), gray with little brown, moist, medium dense, trace to some clay		SPT-2	1.5 - 3.0	1.3	6-8-10	37	Gravel=5%, Sand=65%, Fines=30%, Gs=2.59
461.8	3.8	-at 3.0', less silt and more brown		SPT-3	3.0 - 4.5	1.5	8-7-4	--	
		GRAVEL (GW), CCR, dark gray with black, moist, loose		SPT-4	4.5 - 6.0	0.0	1-2-2	--	
		-at 6.0', silty material		SPT-5	6.0 - 7.5	0.4	3-3-3	--	
458.1	7.5								
457.6	8.0	LEAN CLAY (CL), brown with gray, moist, soft		SPT-6	7.5 - 9.0	1.5	2-1-2	--	
		SILTY SAND (SM), dark brown to black, moist, very loose to loose, with coal pieces		SPT-7	9.0 - 10.5	1.3	2-2-3	--	Gravel=5%, Sand=62%, Fines=33%, Gs=2.63
		-lean clay from 9.8' to 10.0'		SPT-8	10.5 - 12.0	1.0	1-2-3	--	
		-roots from 10.3' to 10.5'							
452.6	13.0	-at 10.5', with clay.		SPT-9	12.0 - 13.5	1.3	2-3-2	--	
		SAND (SW), CCR, dark brown with black, moist, loose, some gravel		SPT-10	13.5 - 15.0	1.0	3-3-5	--	
				SPT-11	15.0 - 16.5	0.0	7-7-6	--	
448.3	17.3			SPT-12	16.5 - 18.0	1.4	2-1-1	--	
		SILTY SAND (SM), brown, moist to wet, loose, trace to some clay		SPT-13	18.0 - 19.5	1.0	3-1-3	16	Gravel=8%, Sand=70%, Fines=22%, Gs=2.69
		-from 19.0' to 19.5', mixed							

TVA RO BORING LOG_CLIFTY_BORINGS_LOGS.GPJ FMSM-GRAPHIC LOG.GDT 4/14/21

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-07 | Stantec Boring No.: **WBSP-21-07**

Client: IKEC | Boring Location: 449470.783 N; 566835.777 E

Project Number: 175539026 | Surface Elevation: 465.6 ft | Elevation Datum: NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
444.6	21.0	with ash -from 19.5' to 21.0', roots		SPT-14	19.5 - 21.0	0.1	4-6-5	--	
		SAND (SW), CCR, dark brown with black and some orange, moist, loose, trace gravel		SPT-15	21.0 - 22.5	0.7	3-4-2	--	
441.6	24.0			SPT-16	22.5 - 24.0	1.5	2-1-1	--	
		FLY ASH (ML), CCR, gray layered with black, wet, stiff to very stiff, silty		SPT-17	24.0 - 25.5	1.5	5-8-11	41	Sand=24%, Fines=76%, Gs=2.80
				SPT-18	25.5 - 27.0	1.5	11-5-7	--	
437.6	28.0			ST-1	27.0 - 29.0	2.0	100-PSI	23	Gravel=3%, Sand=31%, Fines=66%, Gs=2.73
		FAT CLAY (CH), light brown, moist to wet, stiff to hard		SPT-19	29.0 - 31.5	1.2	4-6-8	--	
431.2	34.4			SPT-20	34.3 - 34.4	0.1	50/1"	--	
		-BEDROCK, SHALE WITH CHERT, gray with yellow							
		Auger Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification: WBSP-21-08 | Stantec Boring No.: **WBSP-21-08**

Client: IKEC | Boring Location: 448675.992 N; 566107.327 E

Project Number: 175539026 | Surface Elevation: 451.3 ft | Elevation Datum: NAVD88

Project Name: Clifty Creek WBSP and LRCP Closure | Date Started: 2/27/21 | Completed: 2/27/21

Project Location: Clifty Creek Power Plant, Madison, IN | Depth to Water: 7.0 ft | Date/Time: 2/27/21

Logged by: B. Herries | Depth to Water: N/A | Date/Time: N/A

Drilling Contractor: Stantec Consulting Services Inc. | Drill Rig Type and ID: CME 55 Track Rig #711

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
451.3	0.0	Top of Hole							
		SAND WITH GRAVEL (SW), CCR, dark brown and black, moist, loose, some roots from ground surface to approximately 4.5'		SPT-1	0.0 - 1.5	1.1	1-1-1	--	
				SPT-2	1.5 - 3.0	0.3	WH-WH-1	--	
				SPT-3	3.0 - 4.5	1.4	3-2-1	--	
				SPT-4	4.5 - 6.0	0.9	1-1-2	--	
				SPT-5	6.0 - 7.5	1.5	3-3-3	--	
444.0	7.3	-at 7.0', wet							
		LEAN CLAY (CL), light brown, moist, medium stiff to stiff, low to medium plasticity, trace sand		SPT-6	7.5 - 9.0	1.4	4-6-6	--	
				ST-1	9.0 - 11.0	1.7	50-PSI	26	Sand=15%, Fines=85%, Gs=2.72, LL=29, PI=9

TVA RO BORING LOG_CLIFTY_BORINGS_LOGS.GPJ FMSM-GRAPHIC LOG.GDT 4/14/21

Client Borehole Identification WBSP-21-08 Stantec Boring No. **WBSP-21-08**

Client IKEC Boring Location 448675.992 N; 566107.327 E

Project Number 175539026 Surface Elevation 451.3 ft Elevation Datum NAVD88

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
		LEAN CLAY (CL), light brown, moist, medium stiff to stiff, low to medium plasticity, trace sand *(Continued)*		ST-2	15.0 - 17.0	2.0	100-PSI	--	Gravel=1%, Sand=14%, Fines=85%, Gs=2.71
431.6	19.7								
431.1	20.2	BEDROCK		SPT-7	20.0 - 20.2	0.2	50/2"	--	

Auger Refusal / Bottom of Hole

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

SUBSURFACE LOG (DRAFT)

Client Borehole Identification	WBSP-21-09	Stantec Boring No.	**WBSP-21-09**
Client	IKEC	Boring Location	450762.229 N; 567212.578 E
Project Number	175539026	Surface Elevation	484.9 ft
Project Name	Clifty Creek WBSP and LRCP Closure	Date Started	3/8/21
Project Location	Clifty Creek Power Plant, Madison, IN	Depth to Water	5.0 ft
Logged by	B. Herries	Depth to Water	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55 Track Rig #711

Elevation Datum: NAVD88 | Completed: 3/8/21 | Date/Time: 3/8/21 | Date/Time: N/A

Overburden Drilling and Sampling Tools (Type and Size): 4.25" HSA, 2" Split Spoon w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Sampler Hammer Type: Automatic | Weight: 140 lb | Drop: 30 in | Efficiency: 88 % (Avg.)

Borehole Azimuth: N/A (Vertical) | Borehole Inclination (from Vertical): Vertical

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows/ Press.(psi) / Rec. %	NMC % / Depth	Remarks
484.9	0.0	Top of Hole							
484.7	0.2	TOPSOIL		SPT-1	0.0 - 1.5		1-3-3	--	
		SILTY SAND (SM), brown to dark brown, moist, medium dense, trace clay -at 0.4', gravel seam of 0.2'		SPT-2	1.5 - 3.0		4-7-10	--	
479.9	5.0								
		SAND (SP), grayish brown, moist to wet, very dense, some gravel, trace to little clay, with coal pieces of about 1/16" to 3".		SPT-3	5.0 - 6.5		13-25-28	--	
				SPT-4	7.5 - 9.0		6-6-7	--	
		-at 10.0', fine sand for 0.4'		SPT-5	10.0 - 11.5		1-2-3	--	
472.2	12.7								
		FAT CLAY (CH), gray with brown, moist, firm, trace sand and gravel		SPT-6	12.5 - 14.0		3-5-8	--	
469.0	15.9			SPT-7	15.0 - 15.9		16-50/5"	--	
		Auger Refusal / Bottom of Hole							

Borehole was backfilled with a mixture of cement-bentonite grout from the bottom of hole to the ground surface using a tremie pipe.

TVA RO BORING LOG_CLIFTY_BORINGS_LOGS.GPJ, FMSM-GRAPHIC LOG.GDT 4/14/21

APPENDIX F

Slope Stability Analysis

West Boiler Slag Pond Phases 2-4 Perimeter Dike Stability

Closure Plan
West Boiler Slag Pond
Clifty Creek Station
Madison, Jefferson County, Indiana

April 16, 2021

Prepared for:

Indiana-Kentucky Electric Corporation (IKEC)

Prepared by:

Stantec Consulting Services Inc.

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LIST OF ATTACHMENTS

1.0 INTRODUCTION

The Clifty Creek Generating Station's West Boiler Slag Pond Dam (WBSP), owned and operated by the Indiana Kentucky Electric Corporation (IKEC), is located in Jefferson County, Indiana. The facility is bordered in the south by the Ohio River, on the east by Big Clifty Creek and in the northwest by a bedrock outcrop known as the Devil's Backbone. The WBSP served as a settling facility for sluiced bottom ash produced by the generating plant. In addition to the process flows from the power plant, approximately 510 acres drains to the facility. The WBSP will no longer receive bottom ash and closure documentation is being prepared.

Stantec Consulting Services, Inc. (Stantec) was contracted by the IKEC to prepare construction design documents to support the closure of the WBSP. The purpose of this report is to present the results of slope stability analyses of Phases 2-4 of the WBSP closure. Closure will be executed by excavating, filling and grading existing bottom ash in the pond to create positive drainage and will include the installation of a cover system. The cover system, from top to bottom, will consist of 6 inches of topsoil, 2.5 feet of cover soil, a geocomposite drainage layer, and a 40-mil thickness linear low-density polyethylene (LLDPE) flexible membrane liner (FML) overlying the in-place bottom ash coal combustion residual (CCR) material.

This report documents the information reviewed from previous field explorations and laboratory testing and geotechnical engineering analyses performed by Stantec to support the closure requirements. The scope of work includes the following:

- Existing documentation review
- Slope stability analyses of sections 105+00, 122+00 in long-term, long-term high water, and seismic loading conditions

2.0 GLOBAL SLOPE STABILITY ANALYSES

The global slope stability was evaluated using conventional, limit equilibrium, method of slices analysis as implemented in the SLOPE/W module of GeoStudio 2021. Spencer's method was selected for the analyses as this method includes all interslice forces and satisfies both moment and force equilibrium. A slope stability analysis includes a search for the most critical slip surface, corresponding to the lowest factor of safety. Several options are available in SLOPE/W to facilitate the search for the critical failure surface. In the analyses presented in this report, potential circular failure surfaces were generated using the "entry and exit" method. Considering shallow, surficial failures pose little risk to the overall stability of the slopes, and are usually considered as a potential maintenance issue, a minimum slip surface depth of 3 feet was specified in the analyses to force the evaluation on the deeper potential failure surfaces.

When a soil at the entry of a potential failure surface is assigned with a cohesion value (c>0) in a slope stability analysis, tensile stresses are often computed between the slices in this area. In the field, tensile

stresses result in the opening of a tension crack, reducing the lateral stresses to zero. Because tension results in a stabilizing force at the head of the sliding mass, it is unconservative to have tensile stresses between the slices in a slope stability analysis. A tension crack line was used in the analysis to eliminate the tensile inter-slice forces. Multiple iterations were performed to define the appropriate tension crack line.

2.1 LOAD CASES, GROUNDWATER CONDITIONS, AND DESIGN CRITERIA

Global slope stability analyses were performed on the final grading of the Phases 2-4 WBSP closure. The evaluated load cases, along with the target factors of safety, are summarized in Table 2.1. Target factors of safety were selected per criteria presented in the Indian Administrative Code (Table 1 of 329 IAC 10-15-8). If the slope were to fail, it would cause major environmental impact due to material being released into the Ohio River. There is small uncertainty of soil strengths with the laboratory testing performed (discussed in Stantec 2016). Therefore, the minimum factors of safety used for these analyses were 1.5 for static conditions and 1.3 for seismic, post-earthquake conditions.

Table 2.1: Evaluated Load Cases

Slope	Load Case	Analysis	Target Factor of Safety
Perimeter Dike Slope Stability	Long-term	Drained, effective stress	1.5
	High River Long-Term	Drained, effective stress	1.5
	Seismic (Pseudo-static)	Undrained, total stress	1.0
	Seismic (Post-Earthquake)	Residual strengths for liquefied CCR material Undrained, total stress reduced 20% for non-liquefied soils	1.3

2.1.1 Long-Term

This analysis was performed to evaluate the stability of the final grading under the long-term, drained condition after excess pore pressures have dissipated. Drained, effective stress strength parameters were used in the analysis. A long-term piezometric line was applied to the slope stability models assumed to be five feet below the lowest point of the proposed closure liner.

2.1.2 Long-Term High Water

This analysis was performed to evaluate the stability of the embankment dike under a sustained high-water condition in the Ohio River. Drained, effective strength parameters were used in the analysis. The high water piezometric line was assigned based on an anticipated 500-yr storm water surface elevation of

469.7 feet in the Ohio River. Because the riverside slope is subjected to an external stabilizing pressure from water, only the pond side slope is being analyzed under this loading case.

2.1.3 Seismic (Pseudo-static)

This analysis was performed to evaluate the stability of the embankment dike and final grading under seismic loading from a design earthquake event. Undrained, pseudo-static strength parameters were assigned to the low permeability materials in the analysis. Groundwater was assumed to be at the long-term water level.

The US Geological Survey (USGS) Unified Hazard Tool was used to determine the site's peak ground acceleration (PGA) corresponding to a seismic event with a return period of 2,475 years and a peak rock acceleration at the site of 0.0882 g was obtained. Haynes-Griffin and Franklin (1984) recommended that half of the peak rock acceleration be used as the seismic coefficient in the pseudo-static slope stability analysis. Based on that, a seismic coefficient of 0.0441 (=0.5 x 0.0882) was selected. The selected seismic coefficient was rounded and a horizontal seismic coefficient of 0.045 was used in SLOPE/W. The program calculates seismic force (=column weight x seismic coefficient) and applies to each column in the sliding mass.

Note that the pseudo-static stability analysis should only be considered as an index of the seismic resistance available in a structure not subject to build-up of pore pressure from shaking. A pseudo-static factor of safety greater than 1.0 is very strong evidence that there would be little or no damage to the dam from an earthquake (FEMA 2005).

Groundwater was assumed to be at the long-term water level which was assumed to be 5 feet below the proposed closure liner.

2.1.4 Post-Earthquake

This analysis was performed to evaluate the stability of the Bottom Ash (CCR) material within the WBSP for purposes of evaluating response to the design seismic event and to evaluate the potential for a release of CCR offsite. The assumption for performing this analysis is that the saturated very loose Bottom Ash (CCR) deposits will undergo pore pressure build-up and liquefy during the design seismic event. A post-earthquake, residual strength (in the form of Residual Shear Strength ratio as discussed in Section 2.3) was applied to the saturated Bottom Ash and Fly Ash (CCR) layers. Undrained, total stress strength parameters were reduced by 20% and applied to non-liquifiable soils to account for potential strength loss due to earthquake shaking.

Groundwater was assumed to be at the long-term water level which was assumed to be 5 feet below the proposed closure liner.

2.2 SECTION GEOMETRY

Two representative cross sections were selected for slope stability analyses: Sta. 105+00 and Sta. 122+00, along the alignment of Phases 2-4. Locations of the selected cross sections are shown in the drawings. The subsurface profiles

modeled in the analyses for each cross section were selected based on historical data from previous explorations and the Stantec 2021 geotechnical explorations. Soil borings and CPTs selected for definition of the subsurface lithology for each cross section are shown in

Table 2.2 below.

Table 2.2: Soil Borings and CPTs used for Stratigraphy Definition

Cross Section	Soil Boring	CPT
105+00	Stantec B-1, B-2, WBSP-21-08, and AGES WBSP-15-10	N/A
122+00	Stantec B-5, B-6, AGES WBSP-15-07	CPT-3-GEO, CPT-3A-GEO

2.2.1 Station 105+00

This section is located in Phase 4B in the southwest end of the WBSP and extends from north to south until it reaches the Ohio River. This section was selected to evaluate the stability of the existing embankment dike adjacent to the closure by removal area of the site and is the critical perimeter dike section when the Ohio River reaches the 500-yr storm water surface elevation.

2.2.2 Station 122+00

This section is located in Phase 4A in the south end of the WBSP and extends from north to south until it reaches the Ohio River. This section was selected to evaluate the stability of the final grading along the existing embankment dike with modified CCR pond grading.

2.3 MATERIAL PROPERTIES

Material strength parameters used in the stability analyses of this study are summarized in **Error! Reference source not found.** below. These parameters were selected based on the field exploration results, reviewed historical geotechnical information, and engineering judgement. Further refinements to these parameters are anticipated as the 2021 laboratory testing results become available.

Table 2.3: Material Parameters for Slope Stability Analysis

Material	Unit Weight	Drained Shear Strengths		Undrained Shear Strengths	Residual Strength
		Effective Friction Angle ϕ'	Effective Cohesion c'	S_u	S_r
	(pcf)	(deg.)	(psf)	(psf)	(psf)
Embankment	129	27 [1]	500 [1]	1250 [2]	-
Lean Clay with Sand	119	27 [1]	300 [1]	1000 [2]	-
Gravel with Silt and Sand	130	35 [3]	0 [3]	-	-
Bottom Ash (CCR)	115	28 [4]	0 [4]	-	$S_r / \sigma_{vc}' = 0.04$ [5]
Sandy Silt/Silty Sand	125	30 [3]	0 [3]	-	-
Fat Clay	119	27 [6]	300 [6]	1000 [6]	-
Compacted Clay Fill	130	27 [7]	300 [7]	1250 [7]	-
Compacted CCR Fill	115	31 [8]	0 [8]	-	-
Cover Soil	125	27 [9]	300 [9]	1000 [9]	-

Notes:

[1] Based on a review of the CU test data included in the 2016 report.

[2] Based on available CPT and SPT data. Use 80% of the strength for post-earthquake.

[3] Values derived in the 2016 report. Use 80% of the strength for post-earthquake.

[4] Values derived in the 2016 report.

[5] Residual strength of liquefied soil based on SPT data for post-earthquake.

[6] Use Lean Clay values. Will update once 2021 laboratory test results become available.

[7] Use Lean Clay and Embankment values.

[8] Based on typical compacted CCR values from past experience. Use 80% of the strength for post-earthquake.

[9] Use Lean Clay values.

Soil strength parameters were derived in the Stantec February 2016 CCR Rule Stability Analyses report and were amended for the current analyses based on further review of the 2016 testing and the 2021 field exploration. The 2016 parameters were developed using CU triaxial test data for the Embankment Fill and Lean Clay with Sand soils. Drained and undrained shear strengths for the Bottom Ash (CCR) material were taken from SPT correlations for very loose deposits. Strength parameters for the proposed Cover Soil were taken to be identical to the parameters of the Lean Clay with Sand soil and its unit weight was selected based on preliminary standard Proctor testing data of a potential borrow source soil. Undrained shear strength parameters for coarse-grained (or cohesionless) material were taken to be identical to the drained shear strength parameters.

The residual strength of liquefied Bottom Ash (CCR) layers for post-earthquake evaluations was estimated by selecting a conservative Residual Shear Strength ratio, τ/σ (Shear Strength/Effective Overburden Stress Ratio)) of 0.04 based on correlations between corrected SPT blow counts and the Residual Shear Strength Ratio (Idriss and Boulanger, 2008). Based on the SPT blowcounts from existing boring data, a representative SPT $(N_1)_{60\text{-}cs}$ value of 3 was used to select the Residual Shear Strength ratio for the Bottom Ash (CCR).

2.4 ANALYSIS RESULTS

The computed factors of safety of slope stability for the Phase 2-4 WBSP closure grading under the evaluated loading conditions are summarized in **Error! Reference source not found.**, along with the target factors of safety according to the established design criteria for the project. The computed output plots, depicting the predicted critical failure surfaces, are presented in Attachment A.

Table 2.4: Computed Slope Stability Factors of Safety

Sta.	Location	Loading Condition	Computed Slope Stability Factor of Safety	Target Factor of Safety
Sta. 105+00	Dike - Pond Side	Long Term	2.60	1.5
	Dike - Riverside	Long Term	2.83	1.5
	Dike - Pond Side	Long Term High Water	2.07	1.5
	Dike - Pond Side	Seismic (Pseudo-Static)	1.33	1.0
	Dike - Riverside	Seismic (Pseudo-Static)	1.48	1.0
Sta. 122+00	Dike - Pond Side	Long Term	2.79	1.5
	Dike - Riverside	Long Term	2.62	1.5
	Dike - Pond Side	Long Term High Water	2.07	1.5
	Dike - Pond Side	Seismic (Pseudo-Static)	1.67	1.0
	Dike - Riverside	Seismic (Pseudo-Static)	1.63	1.0
	Dike - Pond Side	Seismic (Post-earthquake)	1.69	1.3
	Dike - Riverside	Seismic (Post-earthquake)	1.59	1.3

3.0 CONCLUSION

The calculated factors of safety for the analyzed cases meet the minimum factors of safety required by 329 IAC 10-15-8. This analysis is based on the information discussed in this report and the interpretation of the subsurface conditions encountered at the site. No warranties can be made regarding the continuity of conditions. If future design changes are made, Stantec should be notified so that such changes can be reviewed, and the analysis amended as necessary.

4.0 LIMITATIONS

This report was prepared by Stantec Consulting Services, Inc. (Stantec) for IKEC. Stantec's professional services have been performed using a degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, express or implied, is made as to the professional advice included in this report. This geotechnical report has been prepared for IKEC and is to be used solely for the design of the proposed Phases 2 through 4 Closure for the West Boiler Slag Pond at the Clifty Creek Station in Jefferson County, Indiana and may not contain sufficient information for use by other parties.

The recommendations provided in this geotechnical report are based upon our understanding of the described project information and our interpretation of available published information and previous field and laboratory investigations. We have made our recommendations based upon experience with similar subsurface conditions. The recommendations apply to the specific project discussed in this report; therefore, any change in the configuration of the proposed design or any change to the site grades should be provided to us so that we can review our conclusions and recommendations and make any necessary modifications.

The recommendations provided in this report are based upon the assumption that the necessary geotechnical observations and testing during construction will be performed by our firm during the entire duration of the construction. The field observation services are considered a continuation of the geotechnical investigation and are essential to verify that the actual soil conditions are as expected. This also provides for the procedure whereby IKEC may be advised of unexpected or changed conditions that would require modifications of our original recommendations.

5.0 REFERENCES

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ATTACHMENT A

SLOPE STABILITY ANALYSES OUTPUTS

West Boiler Slag Pond Phases 2-4 - Station 105+00

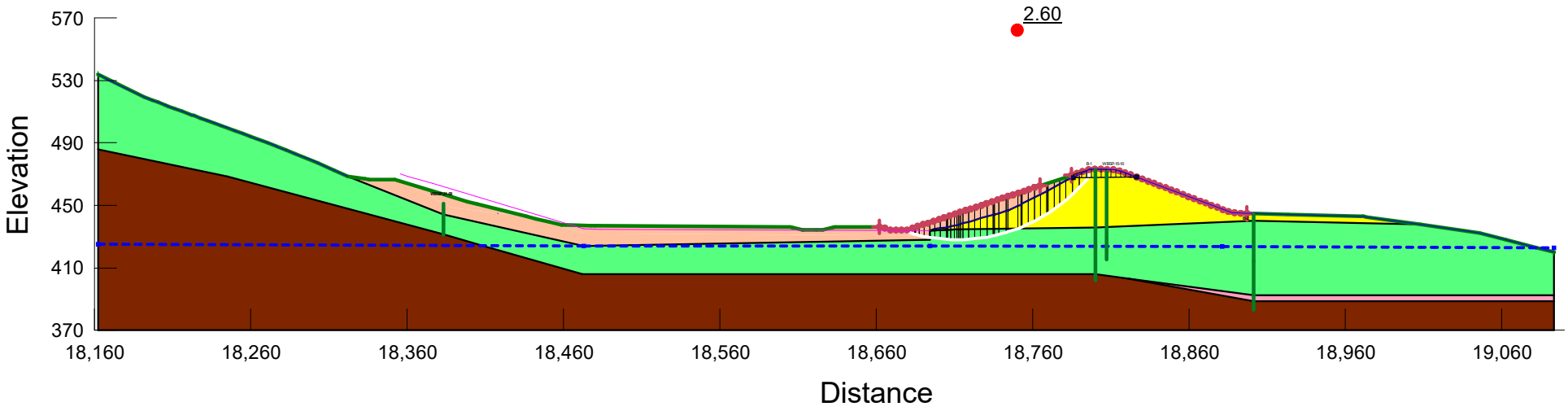
Name: Long Term Pond Side
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.60

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bedrock	Bedrock (Impenetrable)				1
	Embankment (Drained)	Mohr-Coulomb	129	500	27	1
	Fill (Drained)	Mohr-Coulomb	130	300	27	1
	Gravel with Silt and Sand	Mohr-Coulomb	130	0	35	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 105+00

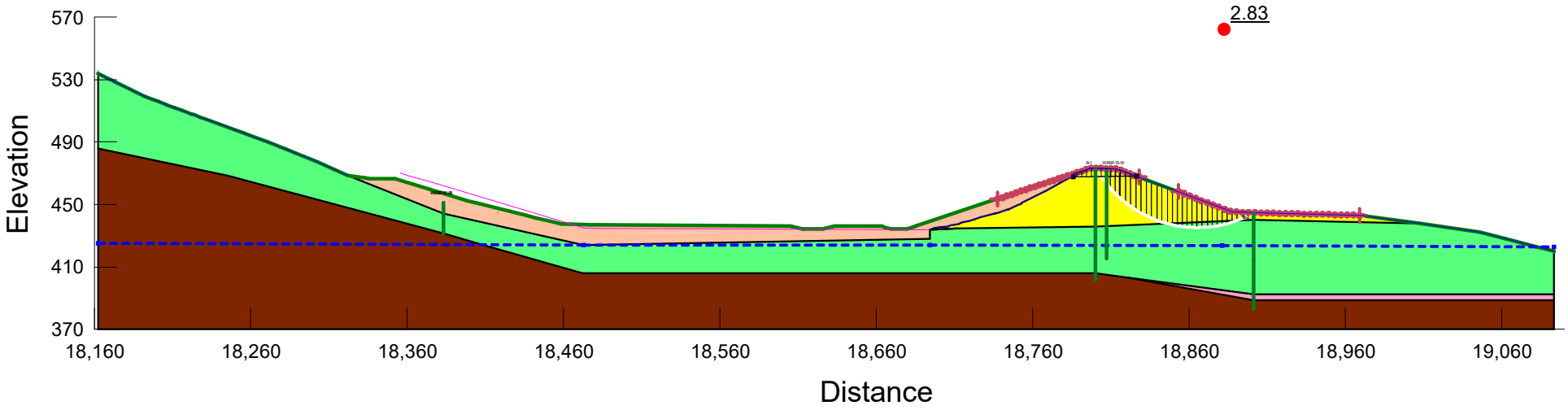
Name: Long Term Riverside
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.83

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bedrock	Bedrock (Impenetrable)				1
	Embankment (Drained)	Mohr-Coulomb	129	500	27	1
	Fill (Drained)	Mohr-Coulomb	130	300	27	1
	Gravel with Silt and Sand	Mohr-Coulomb	130	0	35	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 105+00

Name: Long Term Pond Side High water
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.07

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bedrock	Bedrock (Impenetrable)				1
	Embankment (Drained)	Mohr-Coulomb	129	500	27	1
	Fill (Drained)	Mohr-Coulomb	130	300	27	1
	Gravel with Silt and Sand	Mohr-Coulomb	130	0	35	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
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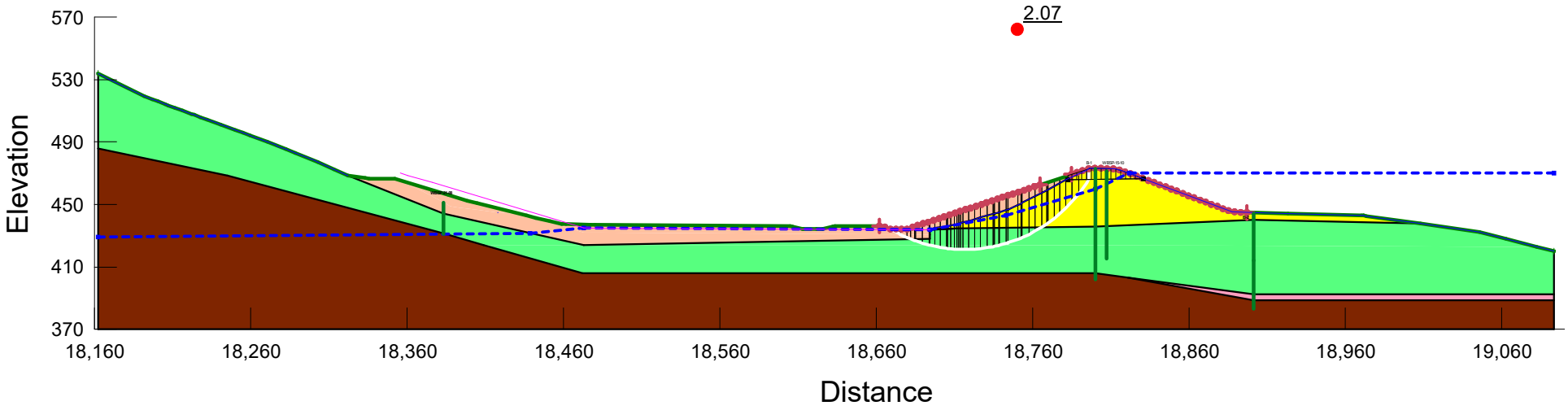


West Boiler Slag Pond Phases 2-4 - Station 105+00

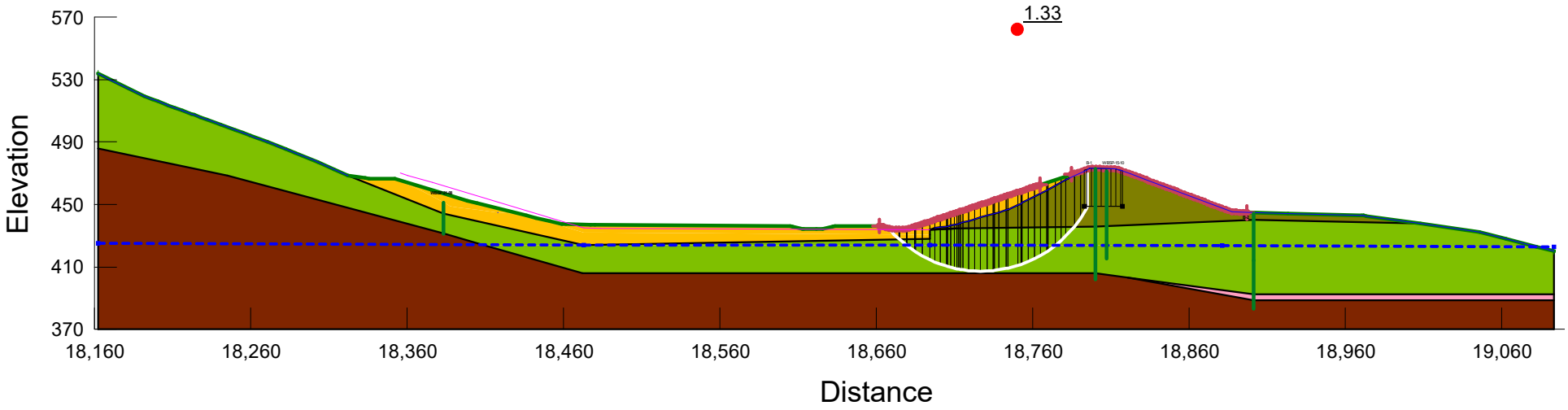
Name: Seismic Pond Side (Drained & Undrained)
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.33
Horz Seismic Coef.: 0.045

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Bedrock	Bedrock (Impenetrable)					1
	Embankment (Undrained)	Undrained (Phi=0)	129			1,250	1
	Fill (Undrained)	Undrained (Phi=0)	130			1,250	1
	Gravel with Silt and Sand	Mohr-Coulomb	130	0	35		1
	Lean Clay with Sand (Undrained)	Undrained (Phi=0)	119			1,000	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 105+00

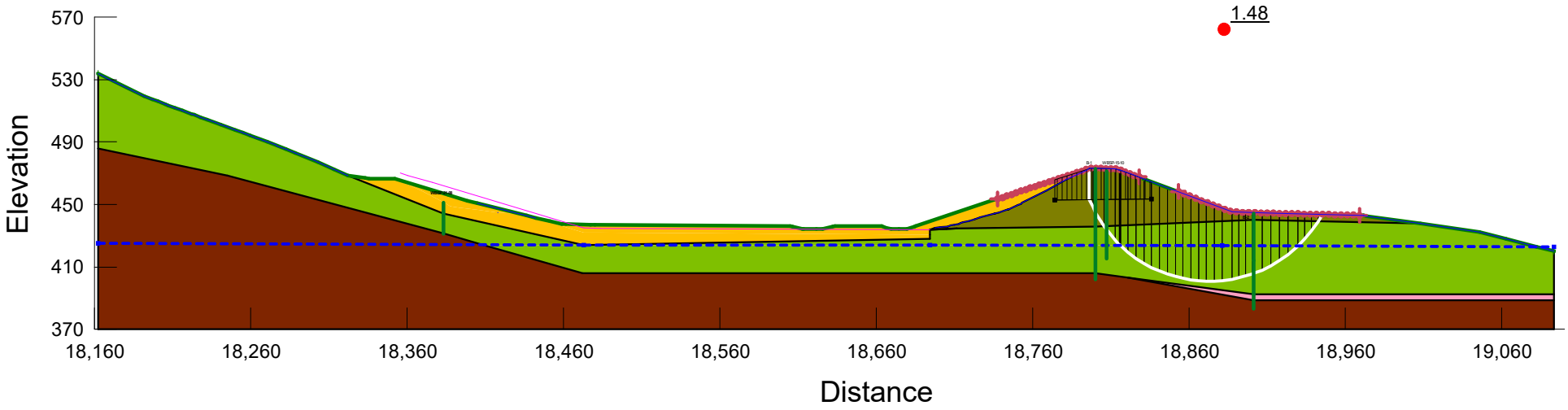
Name: Seismic Riverside (Drained & Undrained)
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.48
Horz Seismic Coef.: 0.045

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Bedrock	Bedrock (Impenetrable)					1
	Embankment (Undrained)	Undrained (Phi=0)	129			1,250	1
	Fill (Undrained)	Undrained (Phi=0)	130			1,250	1
	Gravel with Silt and Sand	Mohr-Coulomb	130	0	35		1
	Lean Clay with Sand (Undrained)	Undrained (Phi=0)	119			1,000	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

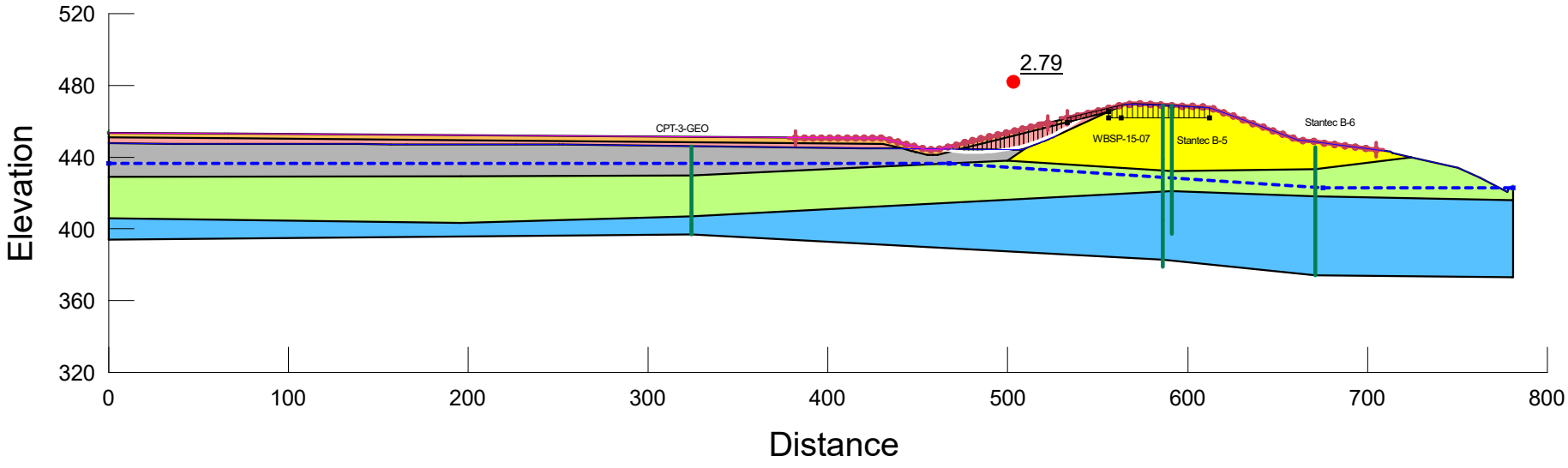
Name: Long Term Pond Side
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.79

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115	0	28	1
	CCR Fill	Mohr-Coulomb	115	0	31	1
	Cover Soil (Drained)	Mohr-Coulomb	125	300	27	1
	Embankment Fill (Drained)	Mohr-Coulomb	129	500	27	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1
	Sandy Silt	Mohr-Coulomb	125	0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

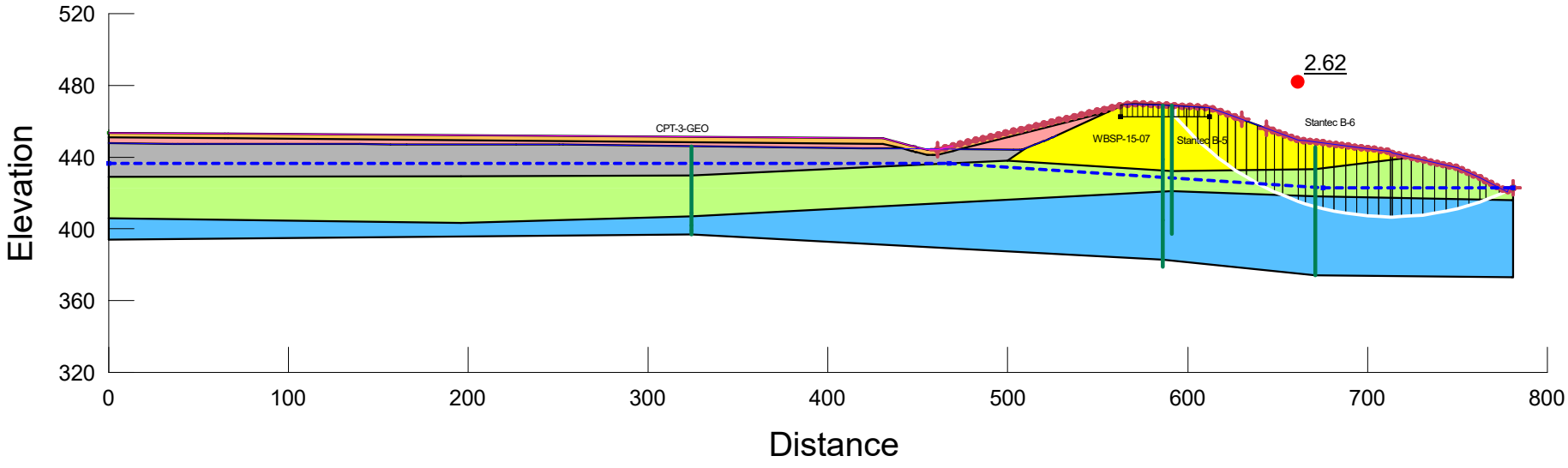
Name: Long Term Riverside
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.62

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115	0	28	1
	CCR Fill	Mohr-Coulomb	115	0	31	1
	Cover Soil (Drained)	Mohr-Coulomb	125	300	27	1
	Embankment Fill (Drained)	Mohr-Coulomb	129	500	27	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1
	Sandy Silt	Mohr-Coulomb	125	0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

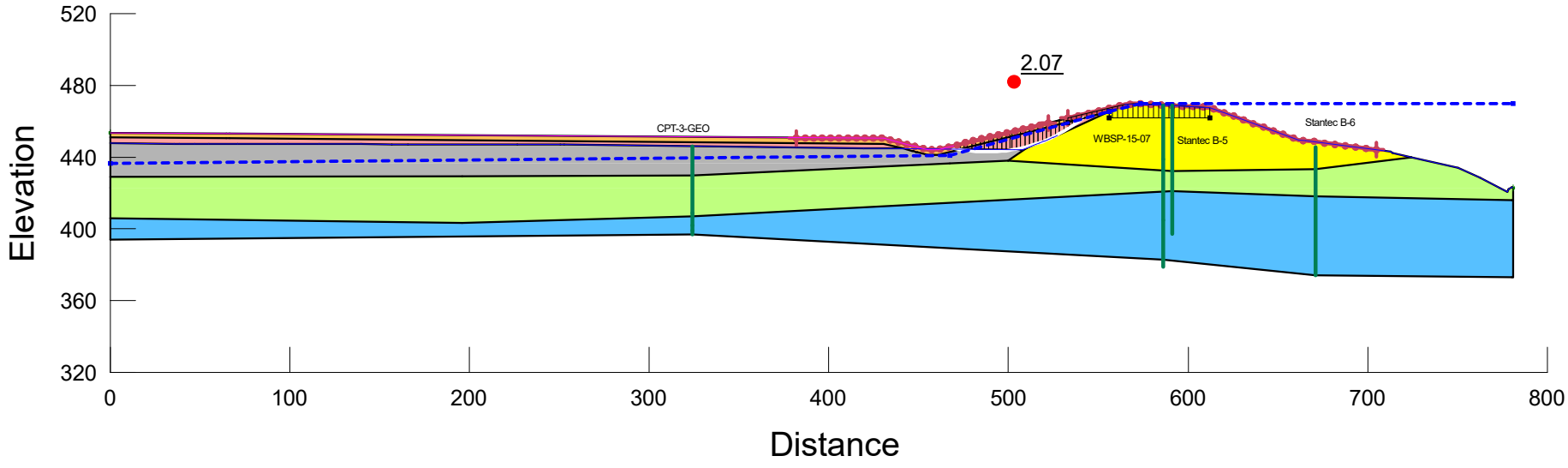
Name: Long Term Pond Side High water
Method: Spencer

Slip Surface: Entry and Exit

FOS: 2.07

Color	Name	Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115	0	28	1
	CCR Fill	Mohr-Coulomb	115	0	31	1
	Cover Soil (Drained)	Mohr-Coulomb	125	300	27	1
	Embankment Fill (Drained)	Mohr-Coulomb	129	500	27	1
	Lean Clay with Sand (Drained)	Mohr-Coulomb	119	300	27	1
	Sandy Silt	Mohr-Coulomb	125	0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

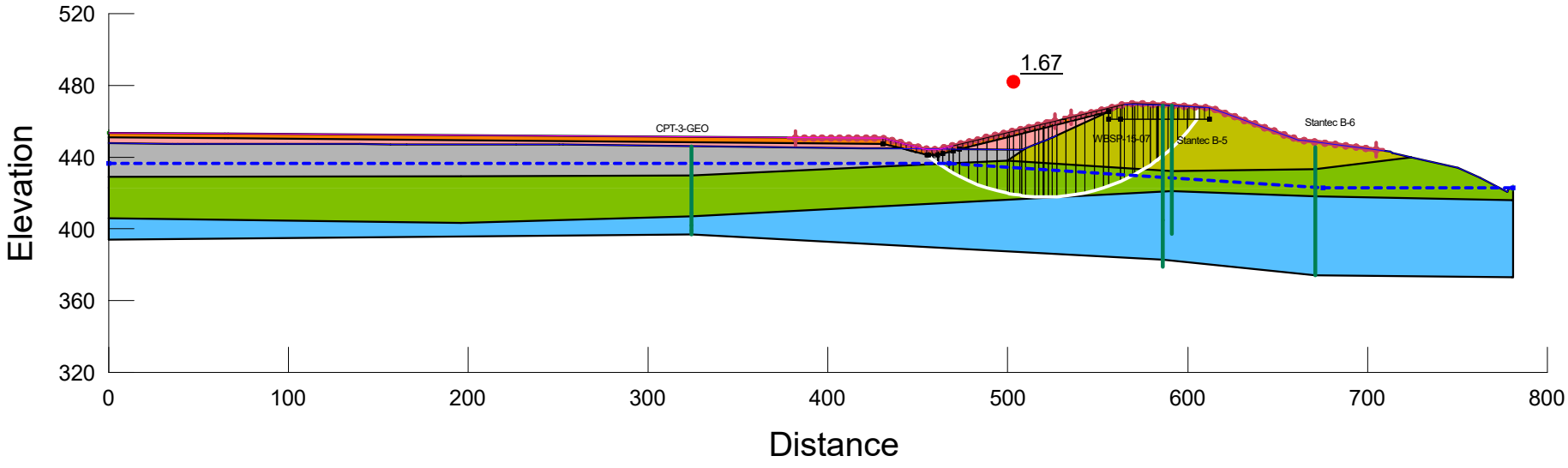
Name: Seismic Pond Side (Drained & Undrained)
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.67
Horz Seismic Coef.: 0.045

Color	Name	Model	Unit Weight (pcf)	Cohesion (psf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115		0	28	1
	CCR Fill	Mohr-Coulomb	115		0	31	1
	Cover Soil (Undrained)	Undrained (Phi=0)	125	1,000			1
	Embankment Fill (Undrained)	Undrained (Phi=0)	129	1,250			1
	Lean Clay with Sand (Undrained)	Undrained (Phi=0)	119	1,000			1
	Sandy Silt	Mohr-Coulomb	125		0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

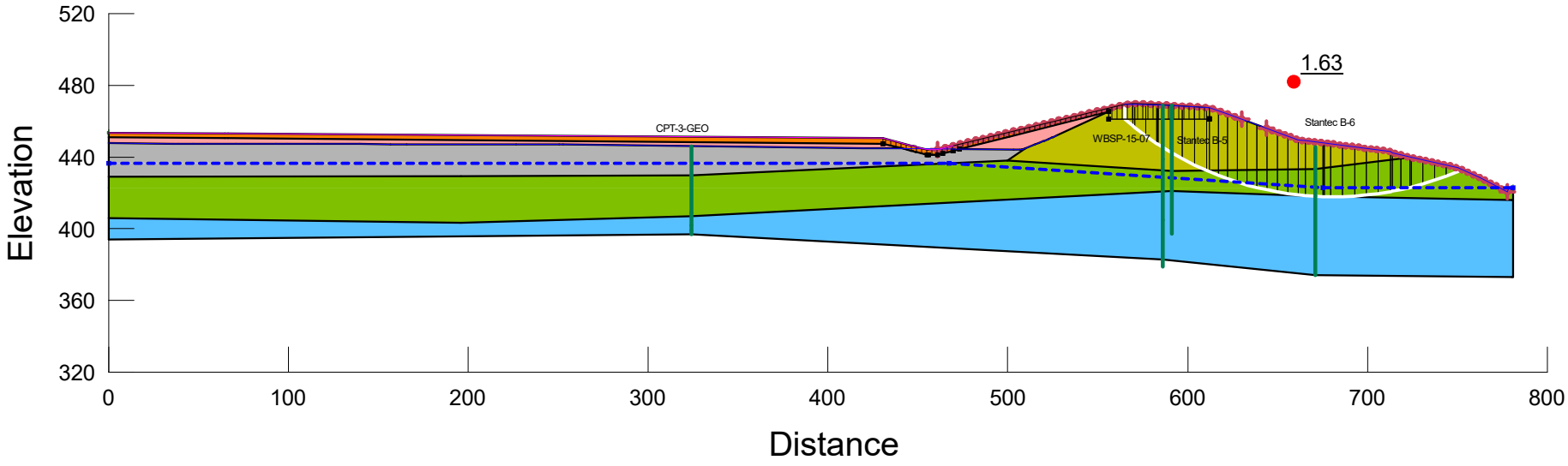
Name: Seismic Riverside (Drained & Undrained)
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.63
Horz Seismic Coef.: 0.045

Color	Name	Model	Unit Weight (pcf)	Cohesion (psf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115		0	28	1
	CCR Fill	Mohr-Coulomb	115		0	31	1
	Cover Soil (Undrained)	Undrained (Phi=0)	125	1,000			1
	Embankment Fill (Undrained)	Undrained (Phi=0)	129	1,250			1
	Lean Clay with Sand (Undrained)	Undrained (Phi=0)	119	1,000			1
	Sandy Silt	Mohr-Coulomb	125		0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

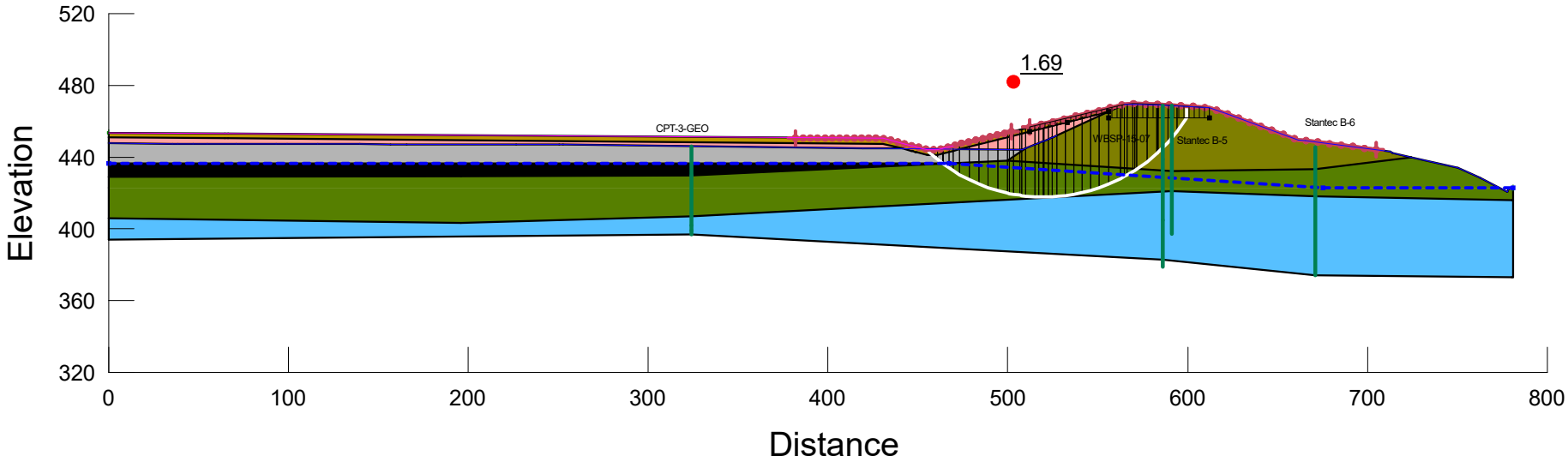
Name: Post Earthquake Pond Side
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.69

Color	Name	Model	Unit Weight (pcf)	Cohesion (psf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115			0	28	1
	Bottom Ash (Residual Strength)	SHANSEP	115		0.04			1
	CCR Fill	Mohr-Coulomb	115			0	31	1
	Cover Soil (Reduced Strength)	Undrained (Phi=0)	125	800				1
	Embankment Fill (Reduced Strength)	Undrained (Phi=0)	129	1,000				1
	Lean Clay with Sand (Reduced Strength)	Undrained (Phi=0)	119	800				1
	Sandy Silt	Mohr-Coulomb	125			0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



West Boiler Slag Pond Phases 2-4 - Station 122+00

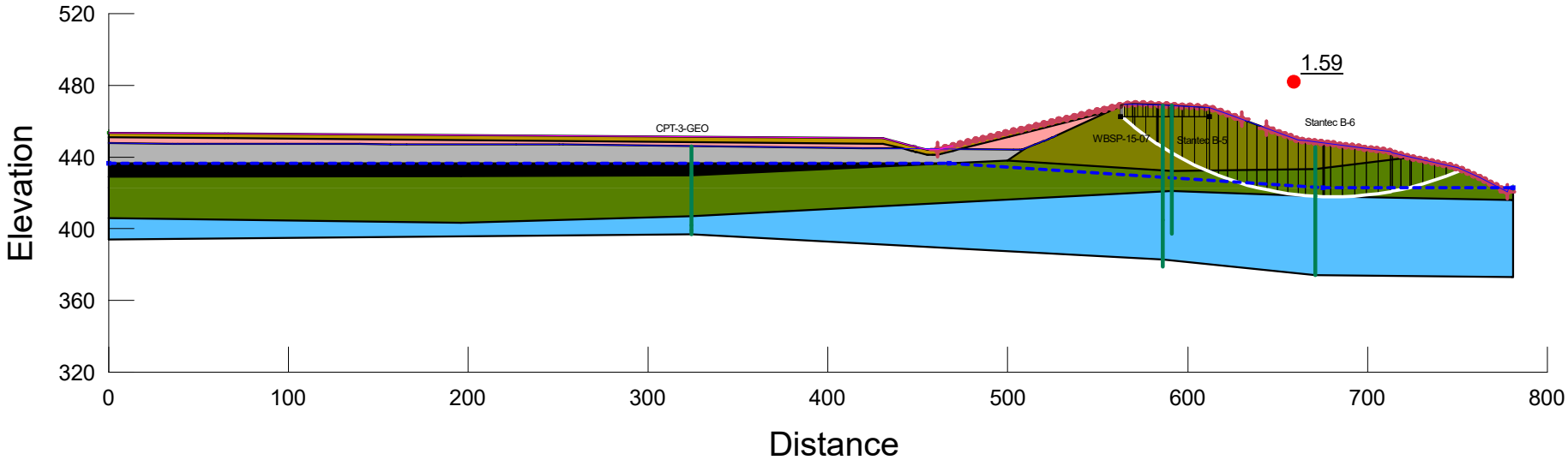
Name: Post Earthquake Riverside
Method: Spencer

Slip Surface: Entry and Exit

FOS: 1.59

Color	Name	Model	Unit Weight (pcf)	Cohesion (psf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Bottom Ash	Mohr-Coulomb	115			0	28	1
	Bottom Ash (Residual Strength)	SHANSEP	115		0.04			1
	CCR Fill	Mohr-Coulomb	115			0	31	1
	Cover Soil (Reduced Strength)	Undrained (Phi=0)	125	800				1
	Embankment Fill (Reduced Strength)	Undrained (Phi=0)	129	1,000				1
	Lean Clay with Sand (Reduced Strength)	Undrained (Phi=0)	119	800				1
	Sandy Silt	Mohr-Coulomb	125			0	30	1

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



APPENDIX G

WBSP Phases 2-4 Permit Drawings

PERMIT DRAWINGS

PHASES 2 - 4
WEST BOILER SLAG POND CLOSURE & LOW VOLUME WASTE TREATMENT SYSTEM
CLIFTY CREEK STATION

JEFFERSON COUNTY, MADISON TOWNSHIP, INDIANA

PREPARED FOR

OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

PIKETON, OHIO

PREPARED BY

Stantec

Stantec Consulting Services Inc.
11687 Lebanon Rd.
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Fax 513.842.8250
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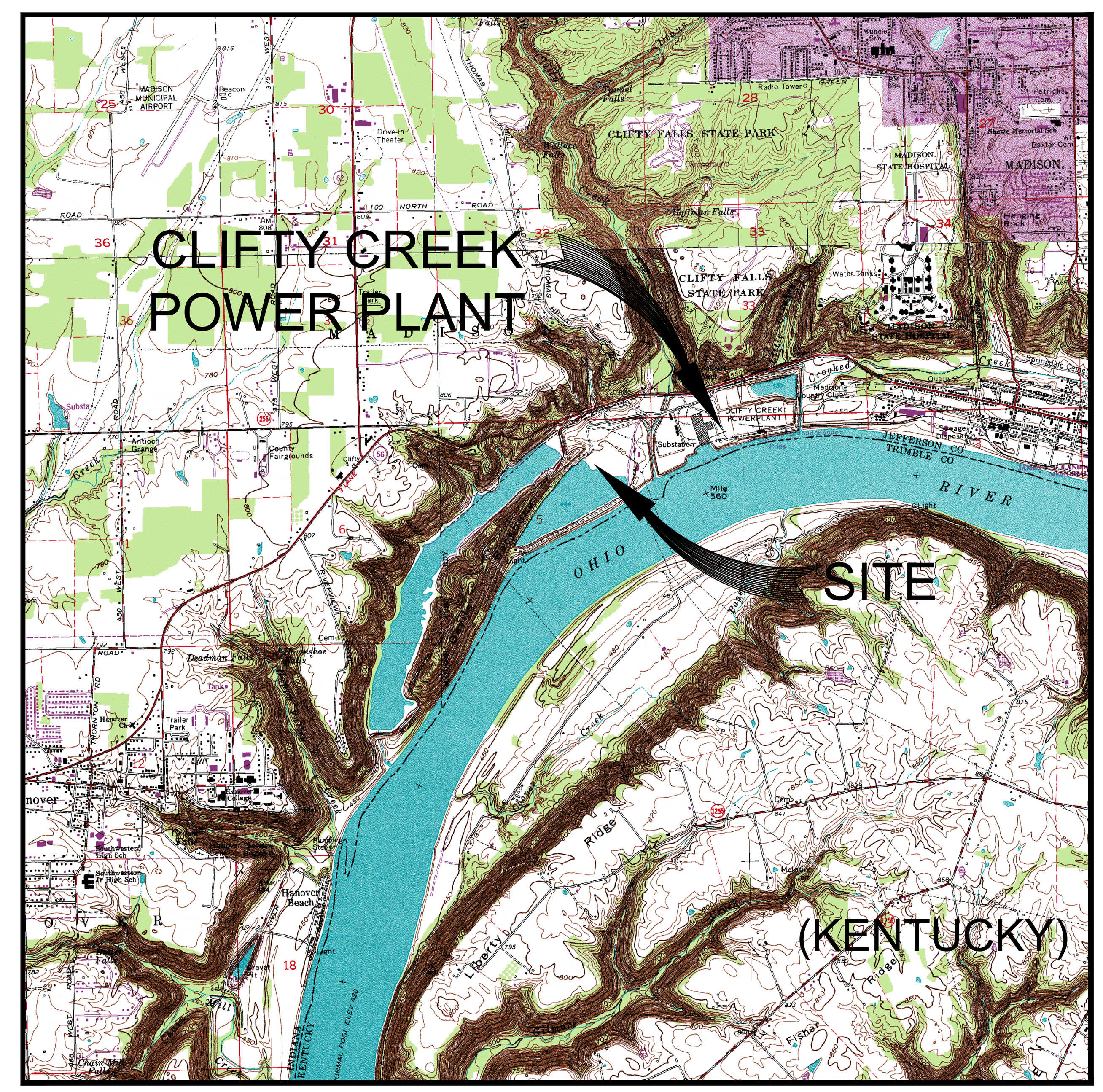

VICINITY MAP

.25 0 .5 1 MILE
GRAPHIC SCALE

INDEX OF SHEETS

SHEET NO.	DRAWING NO.	DESCRIPTION	REVISION
1	P-WBSP2-001-CVR	COVER SHEET	A
2	P-WBSP2-101-OVR	OVERVIEW / SEQUENCING PLAN	A
3	P-WBSP2-102-EC1	EXISTING CONDITIONS	A
4	P-WBSP2-103-FG1	FINAL GRADE PLAN	A
5	P-WBSP2-104-OP1	EXISTING AND PROPOSED OUTFALL PLANS AND PROFILE	A
6	P-WBSP2-105-EPSC	EROSION PREVENTION AND SEDIMENT CONTROL PLAN	A
7	P-WBSP2-106-SM1	STORMWATER MANAGEMENT PLAN	A
8	P-WBSP2-301-PF1	PROFILES - PROJECT BASELINE	A
9	P-WBSP2-302-PF2	PROFILES - EAST, WEST STORMWATER, AND OVERFLOW DITCHES	A
10	P-WBSP2-304-XS1	CROSS SECTIONS - PROJECT BASELINE	A
11	P-WBSP2-305-XS2	CROSS SECTIONS - PROJECT BASELINE	A
12	P-WBSP2-501-DT1	DETAILS	A
13	P-WBSP2-503-DT2	DETAILS	A
14	P-WBSP2-504-DT3	DETAILS	A
15	SB101	FOUNDATION PLAN, RECYCLE AND SETTLING TANKS	A
16	SB102	FOUNDATION SECTION & DETAILS, RECYCLE & SETTLING TANKS	A
17	SB103	STRUCTURAL FOUNDATIONS, BSHS PCM AND TRANSFORMERS FOUNDATION PLAN, SECTIONS AND DETAILS	A
18	SB104	STRUCTURAL FOUNDATIONS, CAUSTIC AND COAGULANT TANK PLAN AND SECTIONS	A
19	SB105	STRUCTURAL FOUNDATIONS, CHEM FEED BUILDING PLAN AND SECTION	A
20	SB109	FOUNDATION PLAN, TRENCH SETTLING TANK	A
21	SB110	FOUNDATION PLAN, TRENCH SETTLING TANK SECTIONS AND DETAILS	A

ISSUED FOR PERMIT

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Consultant

Notes

Revision	By	Appd	YYYY.MM.DD

Issued	By	Appd	YYYY.MM.DD

File Name: 01-P-WBSP2-001-CVR	PJB	KDL	MCV	2021.04.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo

OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
COVER SHEET

Project No.	Scale
175539026	AS SHOWN

Revision	Sheet	Drawing No.
A	1	P-WBSP2-001-CVR

DRAWING NOTE:
PHASE BOUNDARIES SHOWN REPRESENT APPROXIMATE EXTENTS OF CONSTRUCTION REQUIRED TO COMPLETE PHASES OF WORK. PROPOSED FINAL GRADES FOR EACH PHASE ARE SHOWN ON THIS SHEET.

ISSUED FOR PERMIT

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Cincinnati, Ohio 45241-2012
Tel: (513) 842-8200
www.stantec.com

Consultant

Notes

MAPPING SOURCE NOTE:
TOPOGRAPHIC, BATHYMETRIC, AND PLANIMETRIC SURVEY INFORMATION FOR THE PLANS WERE OBTAINED FROM MAPPING PROVIDED BY INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC) AND AMERICAN ELECTRIC POWER (AEP). FIELD SURVEY OF THE WEST BOILER SLAG POND AREA WAS PERFORMED JULY THROUGH OCTOBER 2020 BY HREZO ENGINEERING, INC.. FIELD SURVEY OF THE LANDFILL RUNOFF COLLECTION POND WAS PERFORMED SEPTEMBER THROUGH DECEMBER 2020 BY HREZO ENGINEERING, INC.. ACTIVE WORK AREAS NOT COVERED IN THE 2020 SURVEYS ARE BASED ON AERIAL AND FIELD SURVEYS DATED APRIL 2018, MAY 2018, AND SEPTEMBER 2019. SOME AREAS OUTSIDE OF RECENT WORK ZONES WERE SUPPLEMENTED WITH DATA USED IN THE LANDFILL PERMIT AND CONSTRUCTION DRAWINGS (AERIAL AND FIELD SURVEYS DATED 1992, 2005, 2007, 2008) AND 2011 - 2013 INDIANA STATEWIDE LIDAR (EAST). HORIZONTAL DATUM IS NAD27 AND VERTICAL DATUM IS NAVD88.

PHASE NOTES:
1. FOR MORE INFORMATION ON THE PHASE 1 DESIGN, SEE THE 'PHASE 1 CLOSURE WEST BOILER SLAG POND' DRAWINGS BY STANTEC, DATED 03/01/2021.
2. FOR MORE INFORMATION ON THE PHASE 2 DESIGN, SEE THE BOILER SLAG HANDLING SYSTEM DESIGN DRAWINGS BY BURNS AND MCDONNELL.
3. PHASE 3 WORK CONSISTS OF CONSTRUCTION OF THE LOW VOLUME WASTEWATER TREATMENT SYSTEM AND APPURTENANCES AND FINAL CAP CONSTRUCTION.
4. PHASE 4A WORK CONSISTS OF CLOSURE-IN-PLACE, REGRADING, AND FINAL CAP PLACEMENT.
5. PHASE 4B WORK CONSISTS OF CLOSURE BY REMOVAL WITHIN THE EXISTING POND FOOTPRINT AND REGRADING FOR STORMWATER RUNOFF.

LEGEND
- ELECTRIC TOWER
- PB ELECTRIC PULLBOX
- TREE/SHRUB
- ELECTRIC POLE
- POWER POLE
- CB STORM CATCH BASIN
- OHE OVERHEAD ELECTRIC
- UGE UNDERGROUND ELECTRIC
- X FENCE
- PROPERTY LINE
- RAILROAD TRACKS
- ST STORM SEWER
- EDGE OF WATER
- TREELINE
- 450 EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR

Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16

Issued	By	Appd	YYYY.MM.DD

File Name: 02-P-WBSP2-101-OVR	TJ	KDL	MCV	2021.04.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo

OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
OVERVIEW / SEQUENCING PLAN

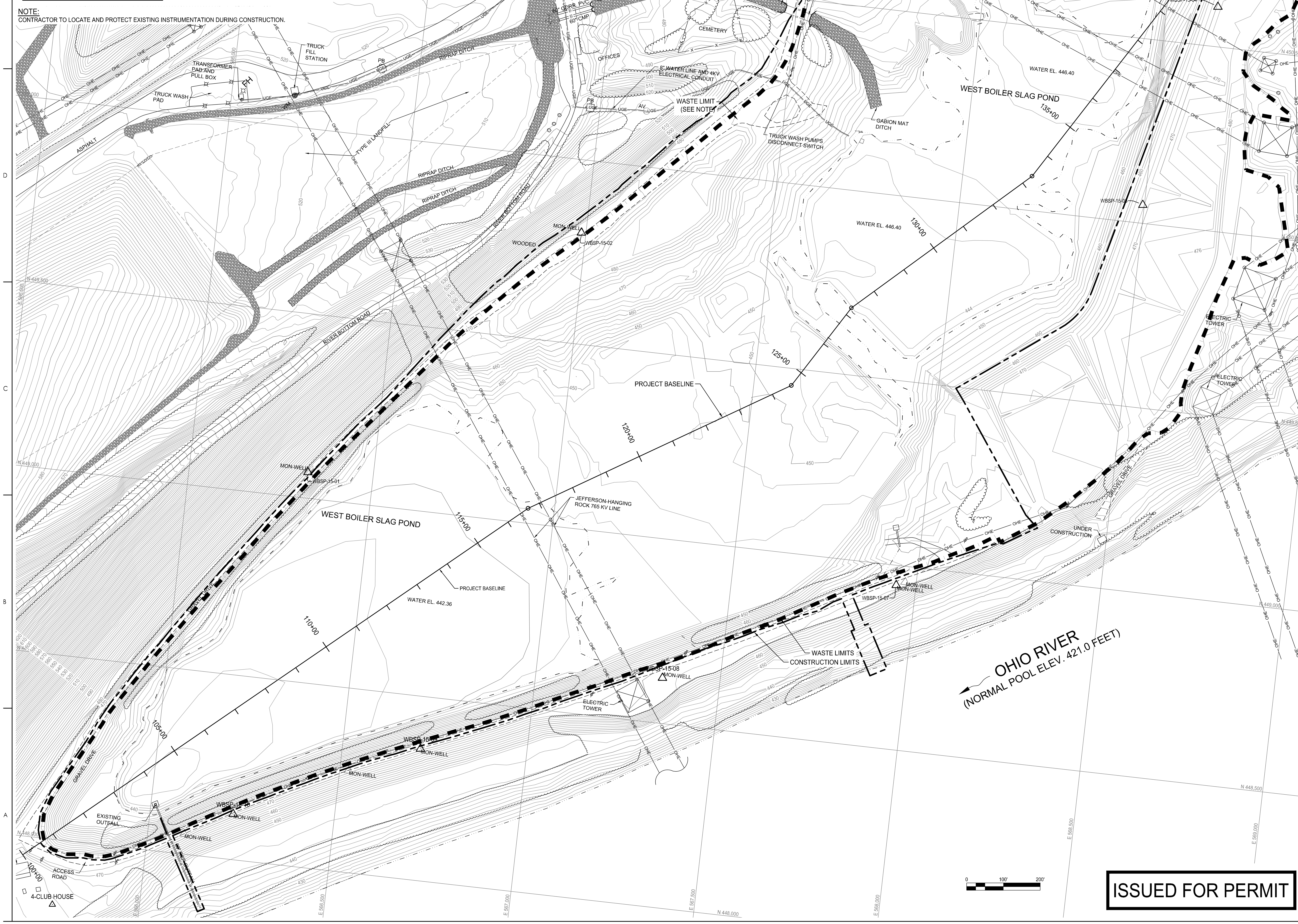
Project No.	Scale
175539026	1"=200'

Revision	Sheet	Drawing No.
A	2	P-WBSP2-101-OVR

MONITORING WELL LOCATION TABLE		
WELL NO.	NORTHING	EASTING
WBSP-15-01	449,072.27	566,322.12
WBSP-15-02	449,803.91	566,987.30
WBSP-15-03	451,181.98	568,093.60
WBSP-15-04	450,610.07	568,637.65
WBSP-15-05	450,051.40	568,495.72
WBSP-15-07	448,947.93	567,946.39
WBSP-15-08	448,625.46	567,343.24
WBSP-15-09	448,359.31	566,711.13
WBSP-15-10	448,125.51	566,225.21

CONTROL MONUMENT TABLE			
MONUMENT NO.	NORTHING	EASTING	ELEVATION (FEET)
1-WEST POND	443,950.45	563,164.42	510.08
2-EXISTING	450,591.79	566,786.87	510.43
3-PARKNG LOT	451,249.94	568,918.63	471.67
4-CLUB HOUSE	447,823.73	565,764.48	468.39
CM7305	450,554.66	570,915.13	464.78
CM7306	450,578.17	566,791.02	506.18
CM7310	443,341.72	561,976.37	508.74

NOTE:
CONTRACTOR TO LOCATE AND PROTECT EXISTING INSTRUMENTATION DURING CONSTRUCTION.



Notes

MAPPING SOURCE NOTE:
TOPOGRAPHIC, BATHYMETRIC, AND PLANIMETRIC SURVEY INFORMATION FOR THE PLANS WERE OBTAINED FROM MAPPING PROVIDED BY INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC) AND AMERICAN ELECTRIC POWER (AEP). FIELD SURVEY OF THE WEST BOILER SLAG POND AREA WAS PERFORMED JULY THROUGH OCTOBER 2020 BY HREZO ENGINEERING, INC.. FIELD SURVEY OF THE LANDFILL RUNOFF COLLECTION POND WAS PERFORMED SEPTEMBER THROUGH DECEMBER 2020 BY HREZO ENGINEERING, INC.. ACTIVE WORK AREAS NOT COVERED IN THE 2020 SURVEYS ARE BASED ON AERIAL AND FIELD SURVEYS DATED APRIL 2018, MAY 2018, AND SEPTEMBER 2019. SOME AREAS OUTSIDE OF RECENT WORK ZONES WERE SUPPLEMENTED WITH DATA USED IN THE LANDFILL PERMIT AND CONSTRUCTION DRAWINGS (AERIAL AND FIELD SURVEYS DATED 1992, 2005, 2007, 2008) AND 2011 - 2013 INDIANA STATEWIDE LIDAR (EAST). HORIZONTAL DATUM IS NAD27 AND VERTICAL DATUM IS NAVD88.

WASTE LIMIT NOTES:
1. WASTE LIMIT SHOWN IS APPROXIMATED FROM HISTORIC PLANT DRAWINGS AND A LIMITED NUMBER OF TEST PITS.
2. WASTE LIMITS SHOWN ON THESE PLANS HAVE BEEN IDENTIFIED USING HISTORICAL OPERATIONAL DOCUMENTS AND CONVERSATIONS WITH IKEC/OVEC PERSONNEL. WASTE BOUNDARY LOCATION WILL BE VERIFIED IN THE FIELD DURING CLOSURE ACTIVITIES AND UPDATED IN THE AS-BUILT DOCUMENTATION.

LEGEND
- ELECTRIC TOWER
- PB ELECTRIC PULLBOX
- TREE/SHRUB
- ELECTRIC POLE
- POWER POLE
- CB STORM CATCH BASIN
- OHE OVERHEAD ELECTRIC
- UGE UNDERGROUND ELECTRIC
- X FENCE
- PROPERTY LINE
- RAILROAD TRACKS
- ST STORM SEWER
- EDGE OF WATER
- TREELINE
- 450 EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- GROUNDWATER MONITORING WELL
- CONTROL MONUMENT
- WASTE LIMITS
- CONSTRUCTION LIMITS

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Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16
Issued	By	Appd	YYYY.MM.DD
File Name: 03-P-WBSP2-102-EC1	TJ / Dwn.	KDL / Dsgn.	MCV / Chkd.	2021.04.16 / YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012286 STATE OF INDIANA PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo

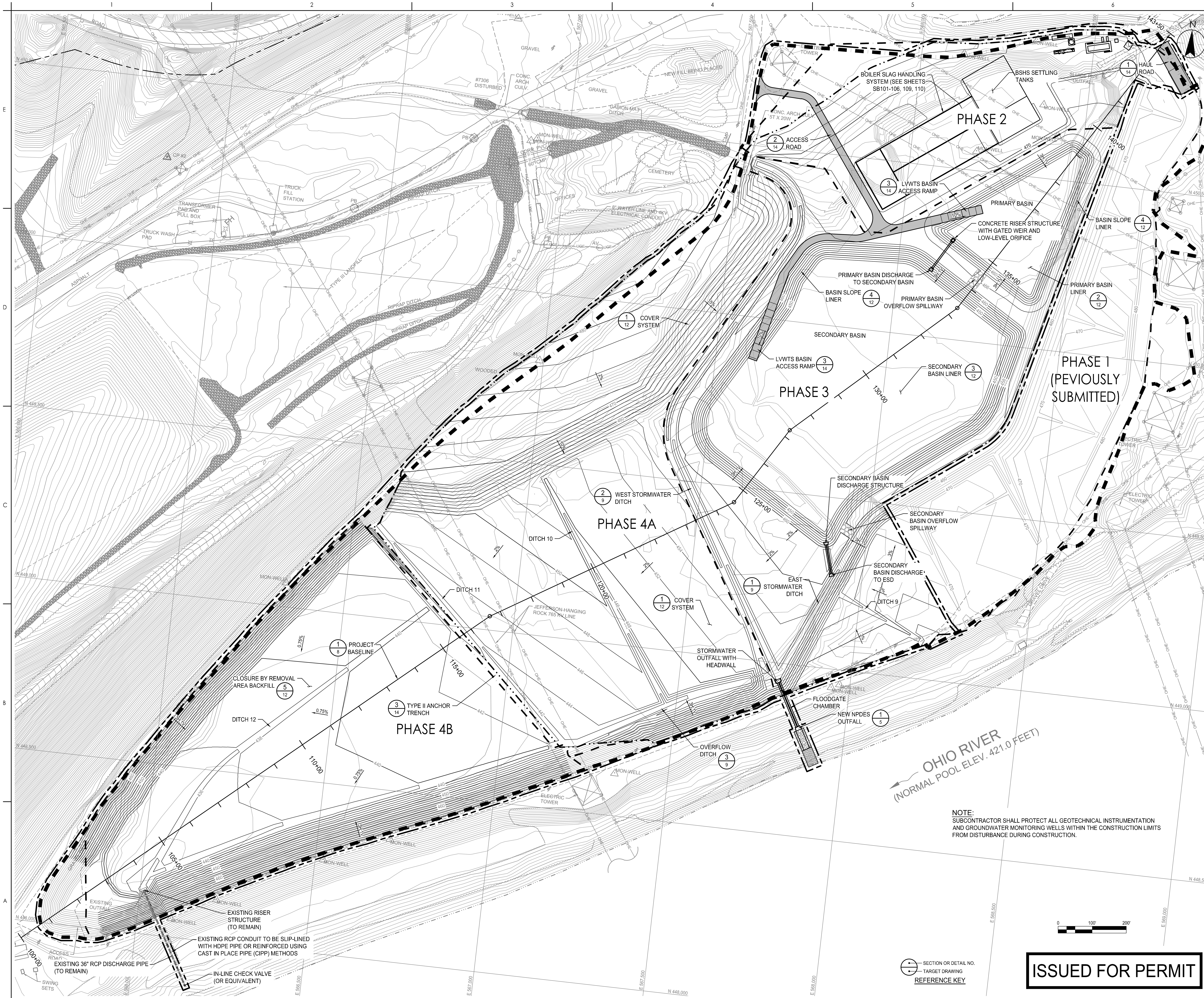
OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
EXISTING CONDITIONS

Project No.	Scale
175539026	1"=100'
Revision A	Sheet 3	Drawing No. P-WBSP2-102-EC1



NOTE:
SUBCONTRACTOR SHALL PROTECT ALL GEOTECHNICAL INSTRUMENTATION AND GROUNDWATER MONITORING WELLS WITHIN THE CONSTRUCTION LIMITS FROM DISTURBANCE DURING CONSTRUCTION.

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

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Notes

MAPPING SOURCE NOTE:
TOPOGRAPHIC, BATHYMETRIC, AND PLANIMETRIC SURVEY INFORMATION FOR THE PLANS WERE OBTAINED FROM MAPPING PROVIDED BY INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC) AND AMERICAN ELECTRIC POWER (AEP). FIELD SURVEY OF THE WEST BOILER SLAG POND AREA WAS PERFORMED JULY THROUGH OCTOBER 2020 BY HREZO ENGINEERING, INC.. FIELD SURVEY OF THE LANDFILL RUNOFF COLLECTION POND WAS PERFORMED SEPTEMBER THROUGH DECEMBER 2020 BY HREZO ENGINEERING, INC.. ACTIVE WORK AREAS NOT COVERED IN THE 2020 SURVEYS ARE BASED ON AERIAL AND FIELD SURVEYS DATED APRIL 2018, MAY 2018, AND SEPTEMBER 2019. SOME AREAS OUTSIDE OF RECENT WORK ZONES WERE SUPPLEMENTED WITH DATA USED IN THE LANDFILL PERMIT AND CONSTRUCTION DRAWINGS (AERIAL AND FIELD SURVEYS DATED 1992, 2005, 2007, 2008) AND 2011 - 2013 INDIANA STATEWIDE LIDAR (EAST). HORIZONTAL DATUM IS NAD27 AND VERTICAL DATUM IS NAVD88.

EXISTING OUTFALL
SUBCONTRACTOR TO SLIP LINE EXISTING RCP CONDUIT WITH HDPE PIPE OR PERFORM CAST IN PLACE PIPE (CIPP) TREATMENT FOR THE PURPOSE OF IMPROVING STRUCTURAL INTEGRITY OF THE PIPE.

LEGEND
ELECTRIC TOWER
PB ELECTRIC PULLBOX
TREE/SHRUB
ELECTRIC POLE
POWER POLE
CB STORM CATCH BASIN
OHE OVERHEAD ELECTRIC
UGE UNDERGROUND ELECTRIC
X FENCE
PROPERTY LINE
RAILROAD TRACKS
ST STORM SEWER
EDGE OF WATER
TREELINE
450 EXISTING INDEX CONTOUR
EXISTING INTERMEDIATE CONTOUR
WASTE LIMITS
CONSTRUCTION LIMITS
COVER SYSTEM LIMITS

Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16
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File Name: 04-P-WBSP2-103-FG1	TJ KDL	MCV	2021.04.16
	Dwn. Dsgn.	Chkd.	YYYY.MM.DD

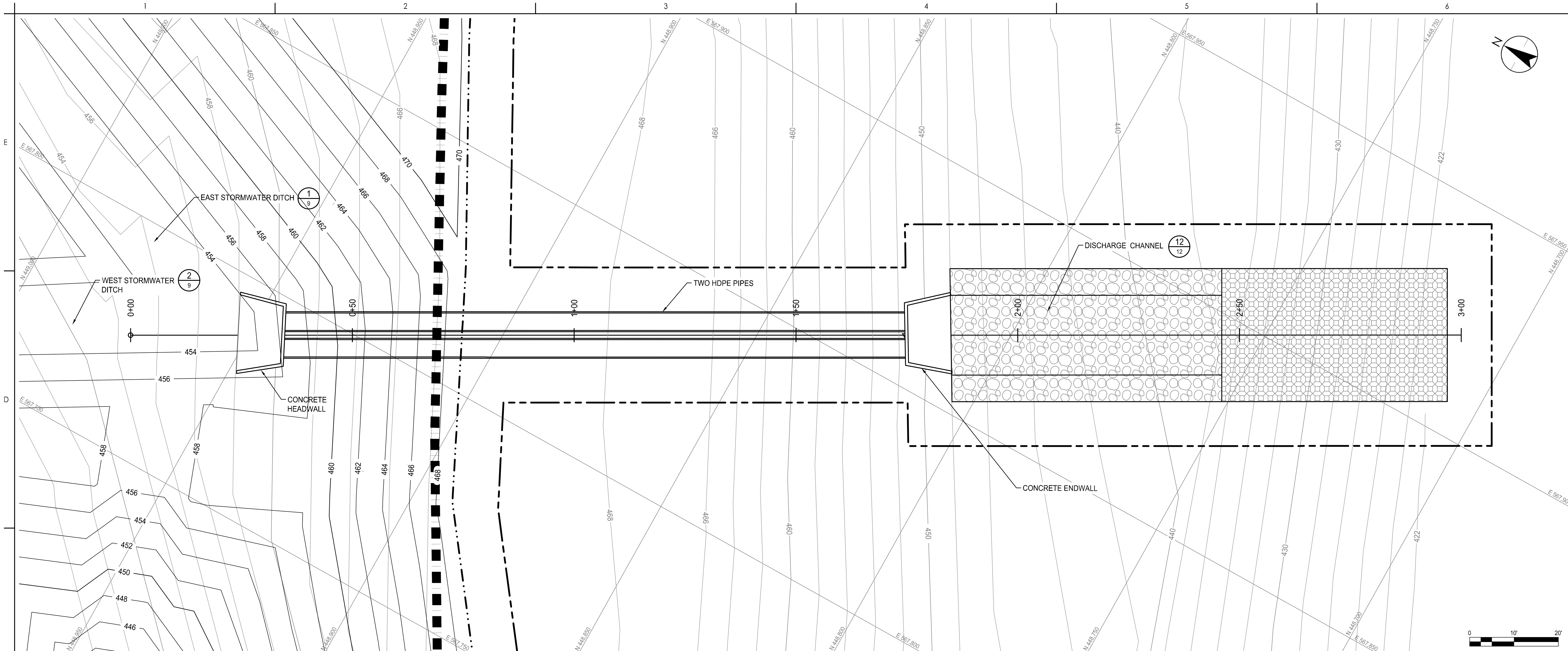
Permit/Seal
MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo
OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

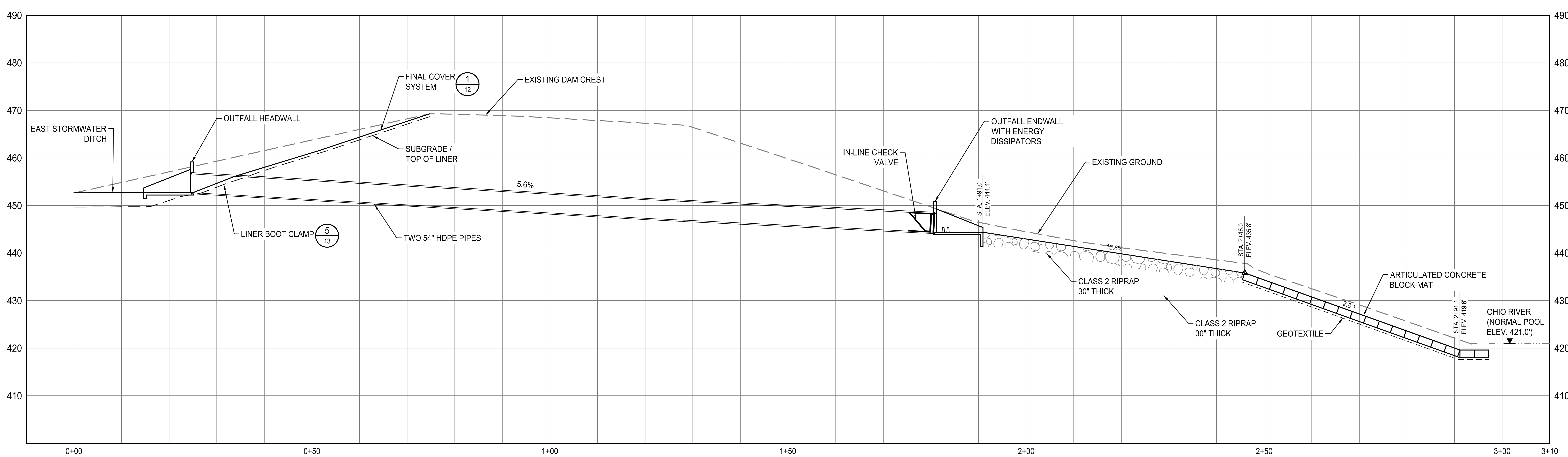
Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
FINAL GRADING PLAN

Project No.	Scale
175539026	1"=100'
Revision A Sheet 4	Drawing No. P-WBSP2-103-FG1



1/5 PLAN - PROPOSED OUTFALL
SCALE: 1"=10'



3/5 PROFILE - PROPOSED OUTFALL PIPE AND DITCH
SCALE: 1"=10'

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

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Consultant

Notes

MAPPING SOURCE NOTE:
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LEGEND
- ELECTRIC TOWER
- PB ELECTRIC PULLBOX
- TREE/SHRUB
- ELECTRIC POLE
- POWER POLE
- CB STORM CATCH BASIN
- OHE OVERHEAD ELECTRIC
- UGE UNDERGROUND ELECTRIC
- X FENCE
- PROPERTY LINE
- RAILROAD TRACKS
- ST STORM SEWER
- EDGE OF WATER
- TREELINE
- 450 EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- WASTE LIMITS
- CONSTRUCTION LIMITS
- COVER SYSTEM LIMITS

Revision	By	Appd	YYYY.MM.DD
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File Name: 05-P-WBSP2-104-OP1	TJ	KDL	JSH	2021.04.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo

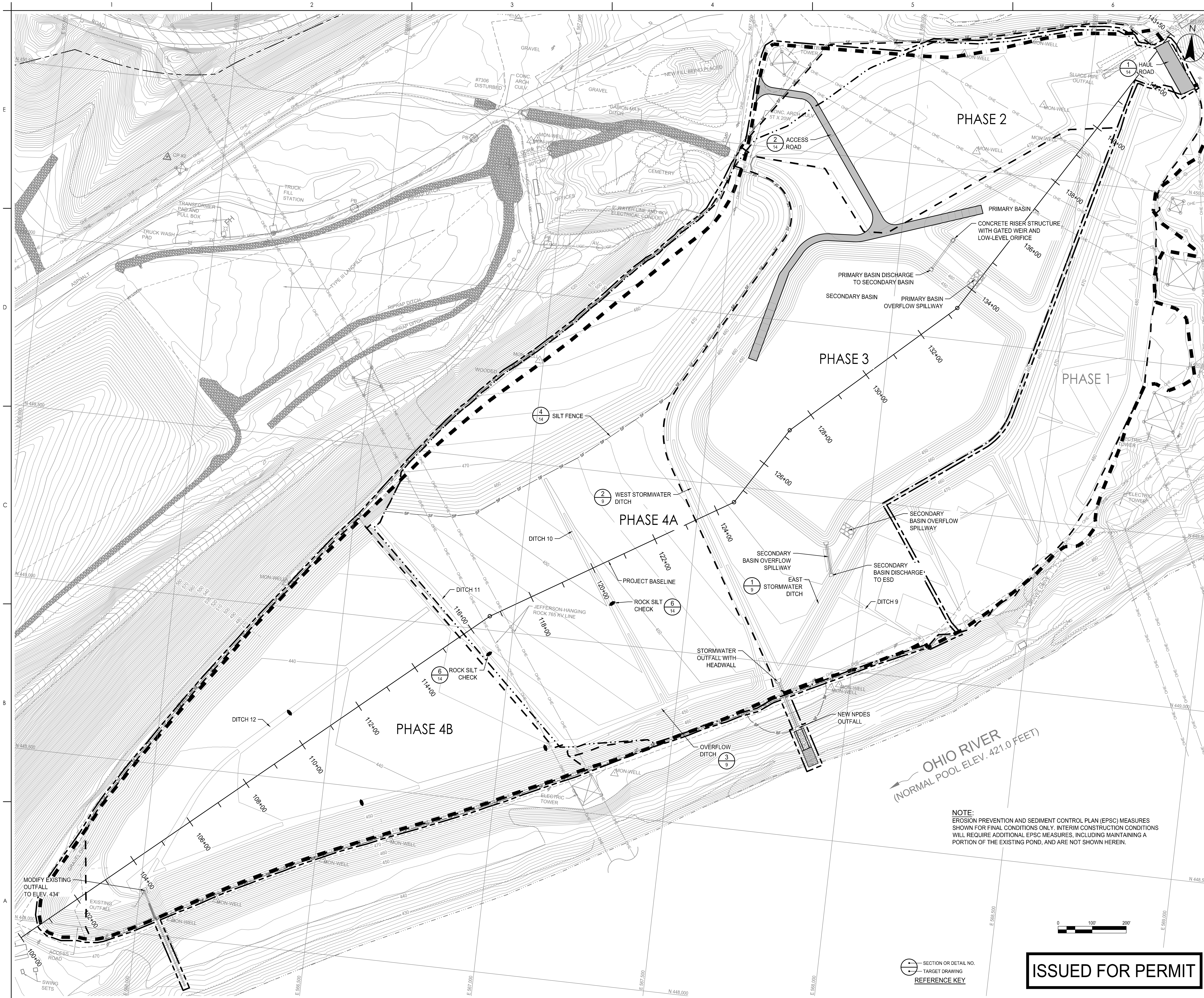
OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
EXISTING AND PROPOSED OUTFALL PLANS AND PROFILE

Project No.	Scale
175539026	1"=100'

Revision	Sheet	Drawing No.
A	5	P-WBSP2-104-OP1



NOTE:
EROSION PREVENTION AND SEDIMENT CONTROL PLAN (EPSC) MEASURES SHOWN FOR FINAL CONDITIONS ONLY. INTERIM CONSTRUCTION CONDITIONS WILL REQUIRE ADDITIONAL EPSC MEASURES, INCLUDING MAINTAINING A PORTION OF THE EXISTING POND, AND ARE NOT SHOWN HEREIN.

ISSUED FOR PERMIT

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Notes

MAPPING SOURCE NOTE:
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LEGEND

- ELECTRIC TOWER
- ELECTRIC PULLBOX
- TREE/SHRUB
- ELECTRIC POLE
- POWER POLE
- STORM CATCH BASIN
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC
- FENCE
- PROPERTY LINE
- RAILROAD TRACKS
- STORM SEWER
- EDGE OF WATER
- TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- WASTE LIMITS
- CONSTRUCTION LIMITS
- COVER SYSTEM LIMITS
- SILT FENCE

Revision	By	Appd	YYYY.MM.DD

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	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER 6/16/21

Client/Project Logo

OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

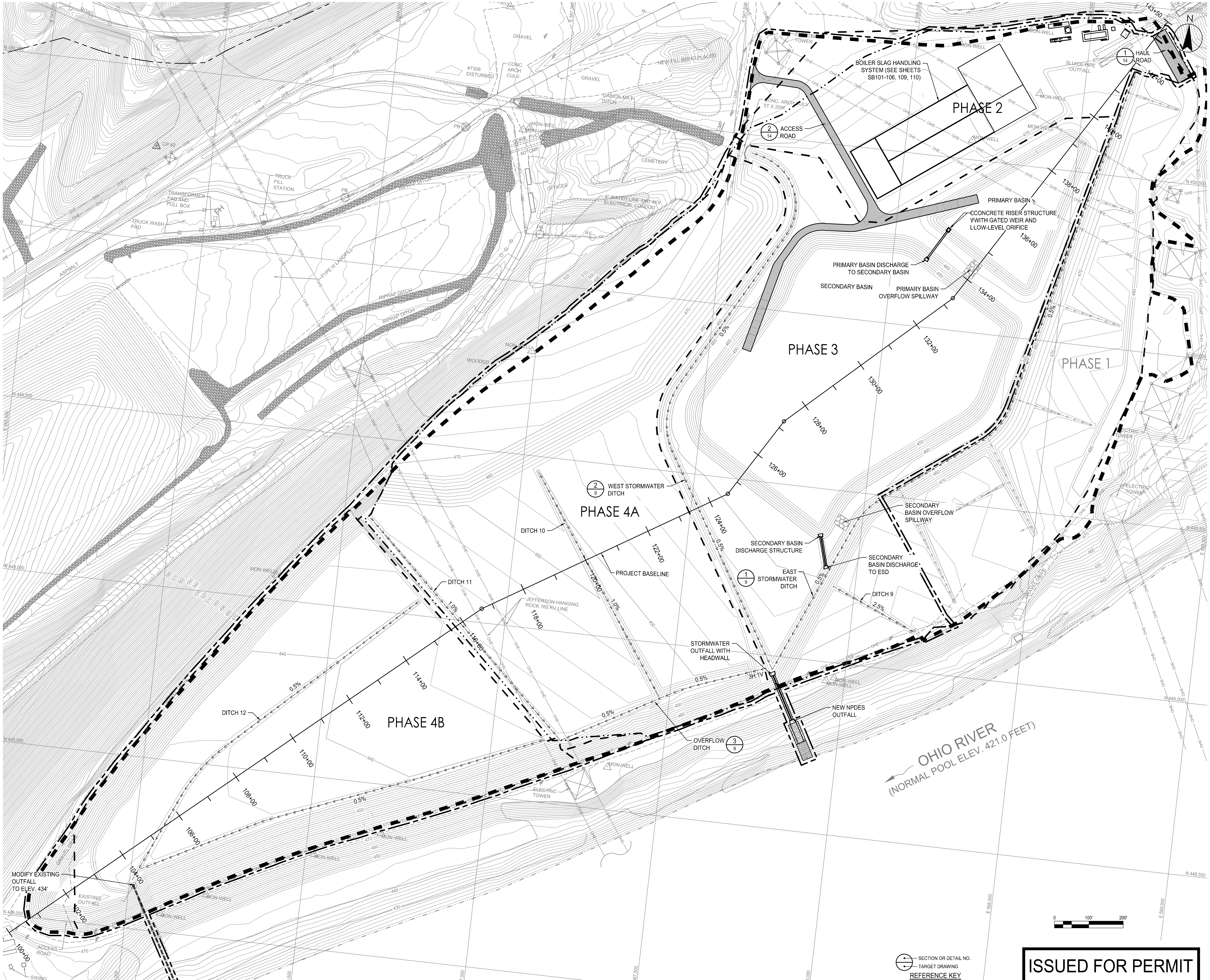
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
EROSION PREVENTION AND SEDIMENT CONTROL PLAN

Project No.	Scale
175539026	1"=100'

Revision	Sheet	Drawing No.
A	6	P-WBSP2-105-EPSC



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Consultant

Notes

MAPPING SOURCE NOTE:
TOPOGRAPHIC, BATHYMETRIC, AND PLANIMETRIC SURVEY INFORMATION FOR THE PLANS WERE OBTAINED FROM MAPPING PROVIDED BY INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC) AND AMERICAN ELECTRIC POWER (AEP). FIELD SURVEY OF THE WEST BOILER SLAG POND AREA WAS PERFORMED JULY THROUGH OCTOBER 2020 BY HREZO ENGINEERING, INC.. FIELD SURVEY OF THE LANDFILL RUNOFF COLLECTION POND WAS PERFORMED SEPTEMBER THROUGH DECEMBER 2020 BY HREZO ENGINEERING, INC.. ACTIVE WORK AREAS NOT COVERED IN THE 2020 SURVEYS ARE BASED ON AERIAL AND FIELD SURVEYS DATED APRIL 2018, MAY 2018, AND SEPTEMBER 2019. SOME AREAS OUTSIDE OF RECENT WORK ZONES WERE SUPPLEMENTED WITH DATA USED IN THE LANDFILL PERMIT AND CONSTRUCTION DRAWINGS (AERIAL AND FIELD SURVEYS DATED 1992, 2005, 2007, 2008) AND 2011 - 2013 INDIANA STATEWIDE LIDAR (EAST). HORIZONTAL DATUM IS NAD27 AND VERTICAL DATUM IS NAVD88.

LEGEND

- ELECTRIC TOWER
- PB ELECTRIC PULLBOX
- TREE/SHRUB
- ELECTRIC POLE
- POWER POLE
- CB STORM CATCH BASIN
- OHE OVERHEAD ELECTRIC
- UGE UNDERGROUND ELECTRIC
- X FENCE
- PROPERTY LINE
- RAILROAD TRACKS
- ST STORM SEWER
- EDGE OF WATER
- TREELINE
- 450 EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- WASTE LIMITS
- CONSTRUCTION LIMITS
- COVER SYSTEM LIMITS
- DITCH FLOW DIRECTION

Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16
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File Name: 07-P-WBSP2-106-SM1	TJ	KDL	JSH	2021.04.16
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Permit/Seal

MATTHEW C. VAUGHAN REGISTERED No. PE11012285 STATE OF INDIANA PROFESSIONAL ENGINEER

6/16/21

Client/Project Logo

OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

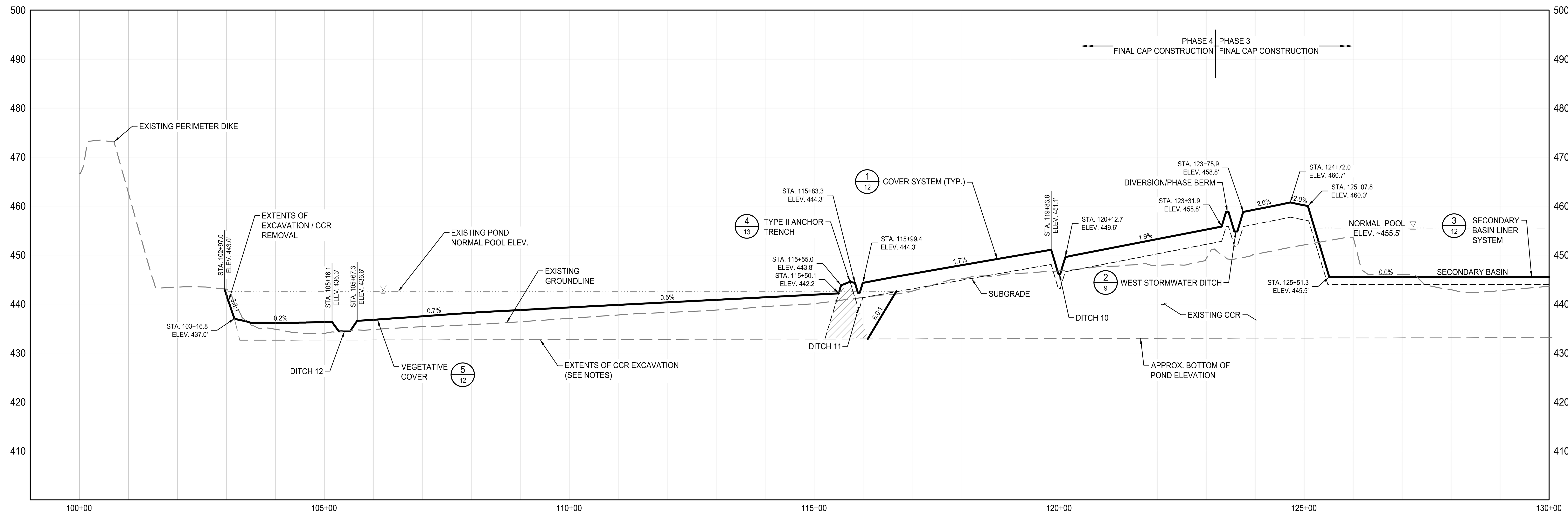
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

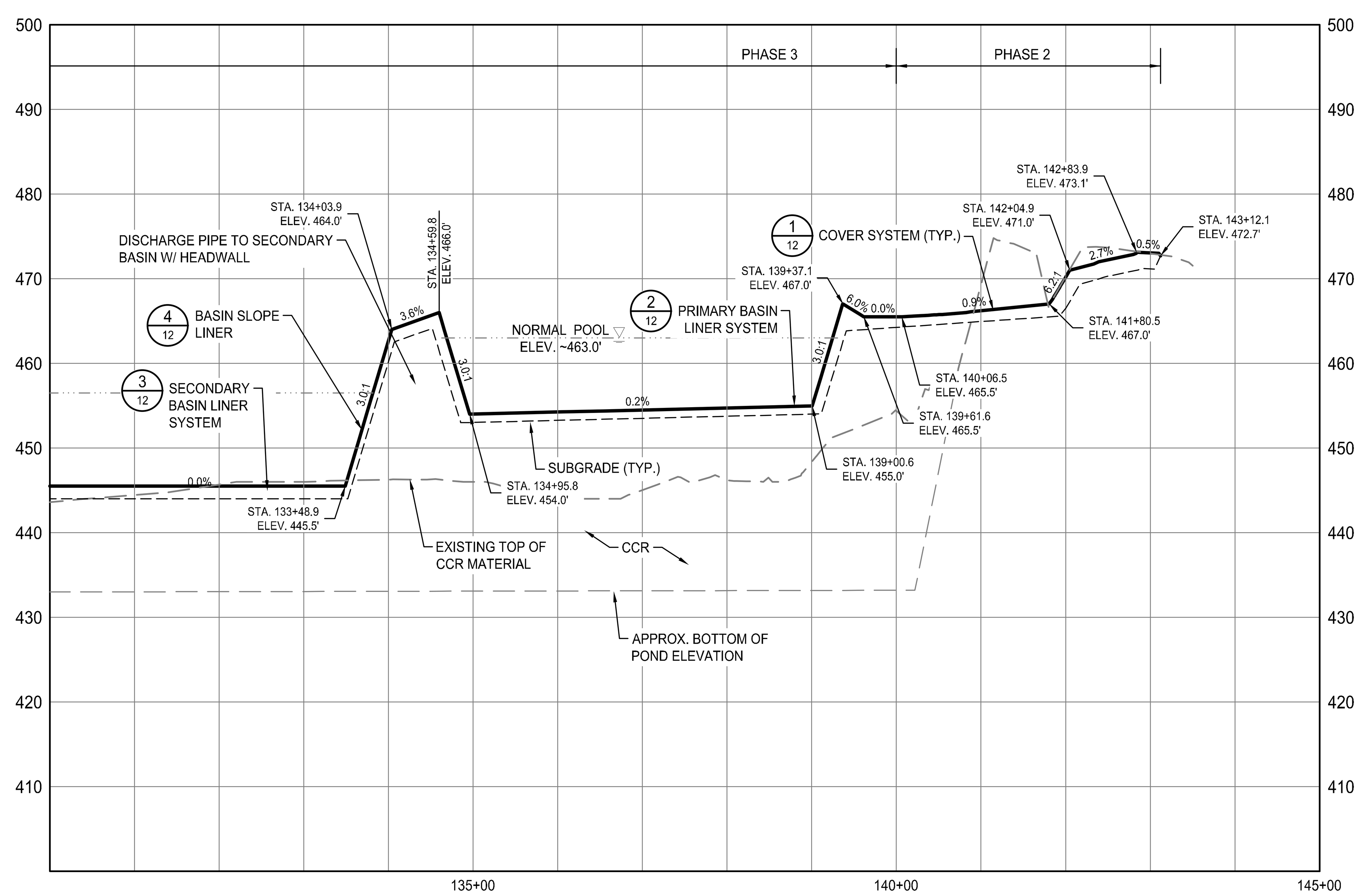
Title
STORMWATER MANAGEMENT PLAN

Project No.	Scale
175539026	1"=100'

Revision	Sheet	Drawing No.
A	7	P-WBSP2-106-SM1



1 / 8 PROFILE - PROJECT BASELINE STA 100+00 TO STA 130+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



1 / 8 PROFILE - PROJECT BASELINE STA 130+00 TO STA 145+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

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Notes

1. BOTTOM SURFACE ELEVATION IS BASED ON HISTORIC DRAWING NUMBER 16-3002A-3. AFTER ALL VISIBLE CCR IS REMOVED, AN ADDITIONAL 6 INCHES OF SOIL WILL BE EXCAVATED.

Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16
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File Name: 08_09-P-WBSP2-301-PF1	TJ	KDL	MCV	2021.04.16
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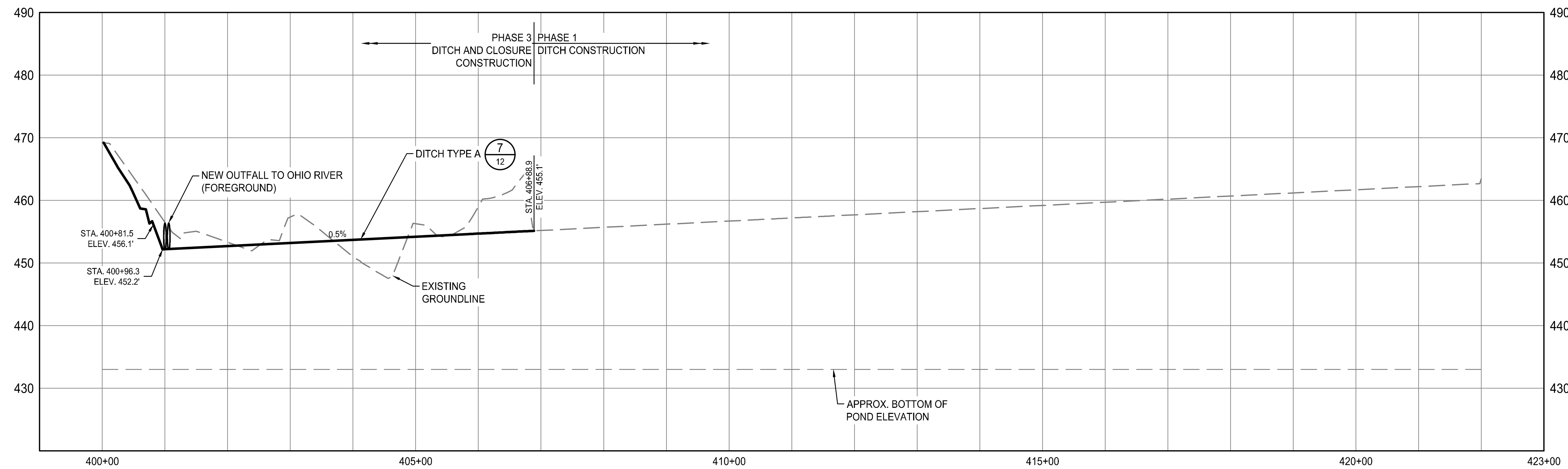
INDIANA-KENTUCKY ELECTRIC CORPORATION
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

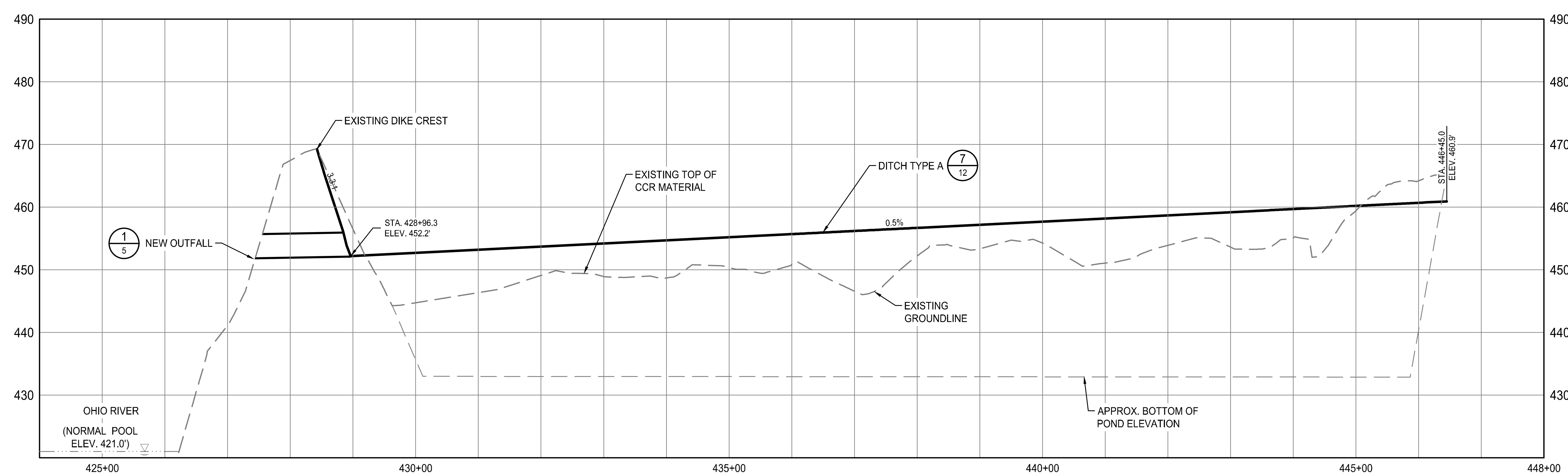
Title
PROFILES - PROJECT BASELINE

Project No.	Scale
175539026	AS SHOWN

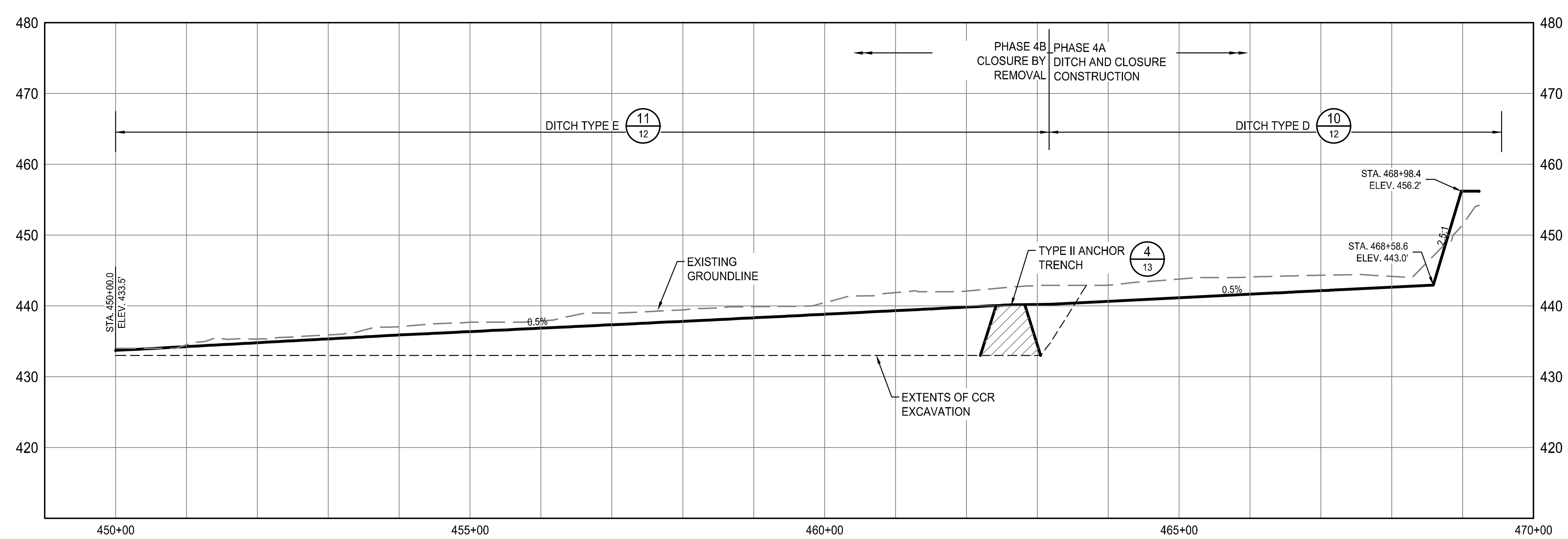
Revision	Sheet	Drawing No.
A	8	P-WSBP2-301-PF1



1/9 PROFILE - EAST STORMWATER DITCH BASELINE
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



2/9 PROFILE - WEST STORMWATER DITCH BASELINE
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



3/9 PROFILE - OVERFLOW DITCH BASELINE
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

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Stantec

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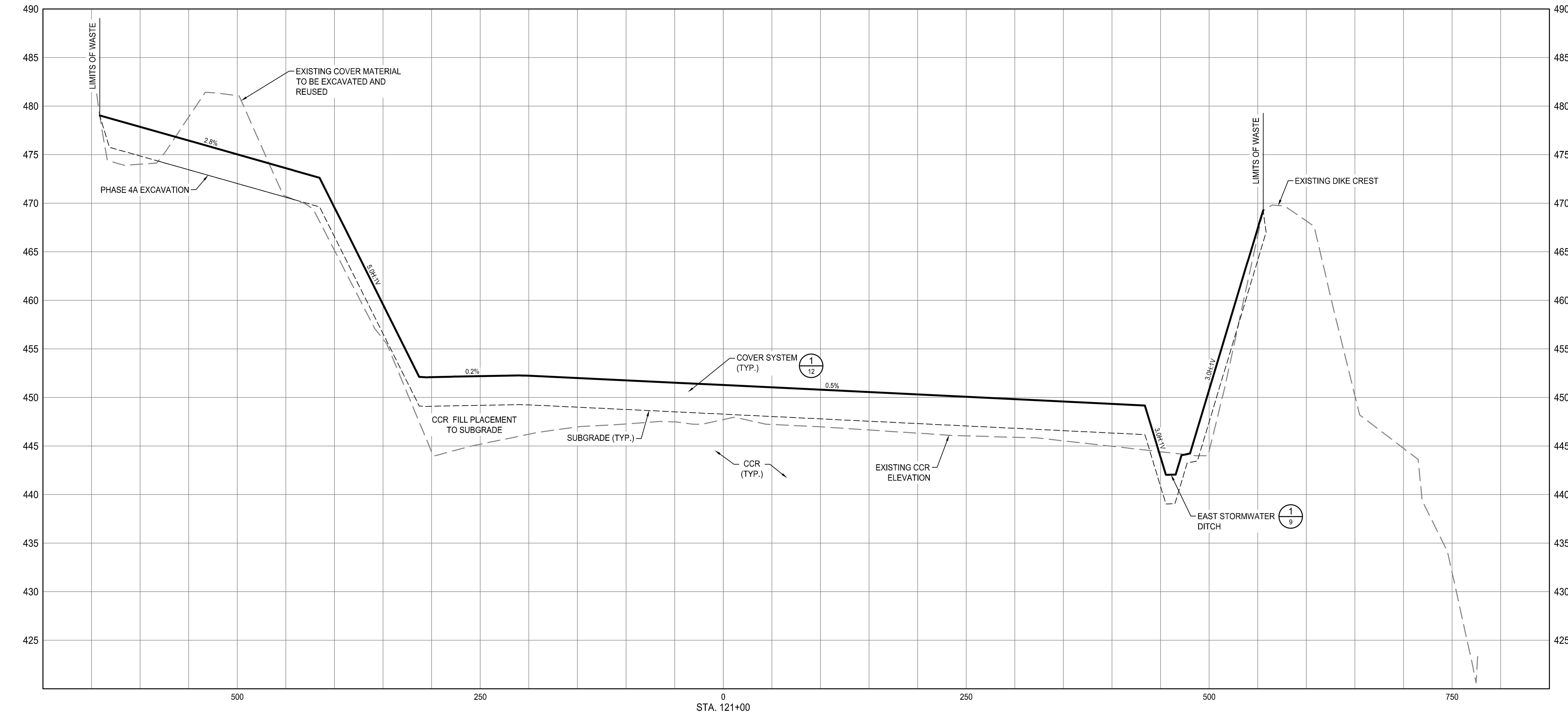
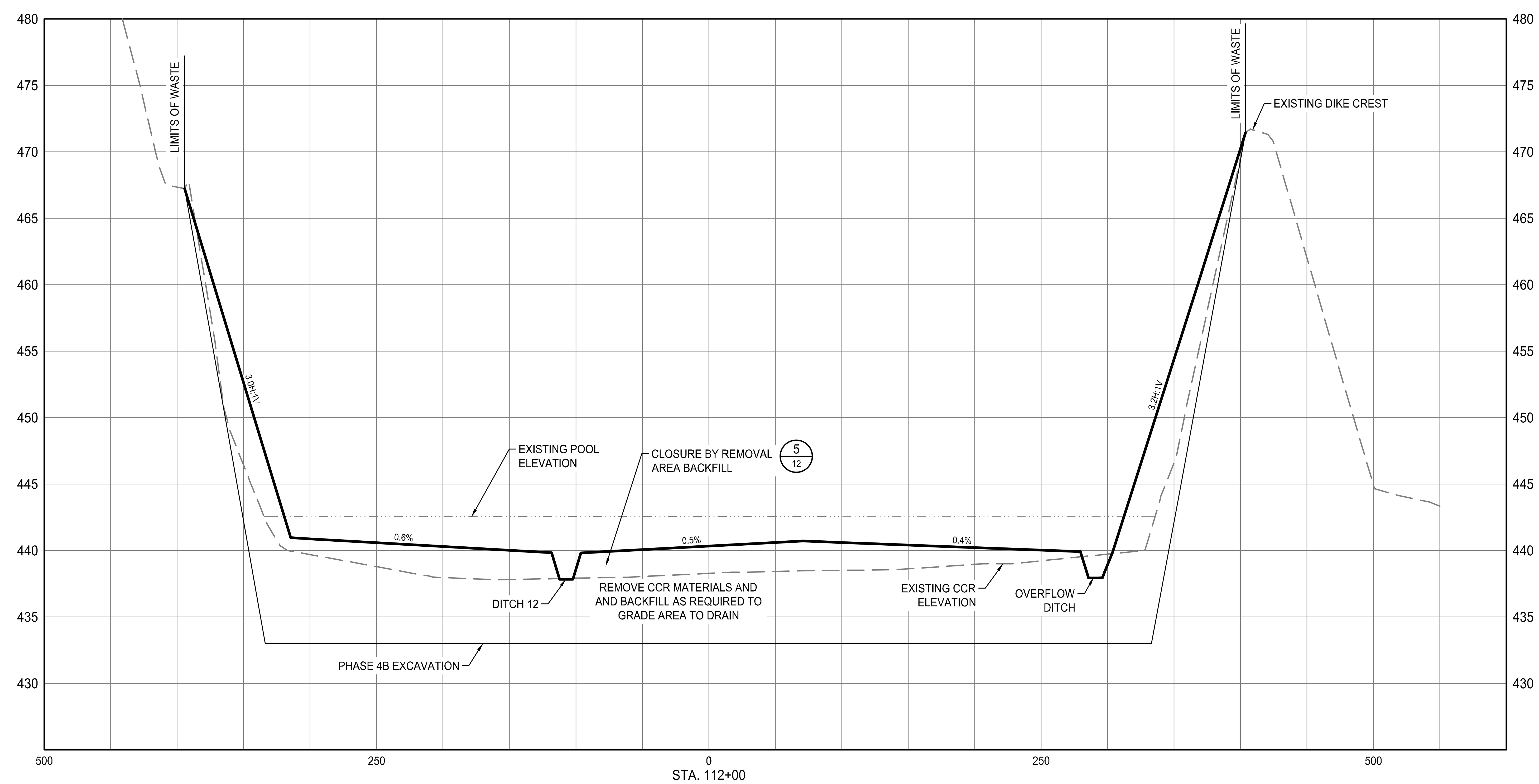
INDIANA-KENTUCKY ELECTRIC CORPORATION
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
PROFILE - EAST, WEST STORWATER, AND OVERFLOW DITCHES

Project No.	Scale
175539026	AS SHOWN

Revision	Sheet	Drawing No.
A	9	P-WSBP2-302-PF2





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TARGET DRAWING
REFERENCE KEY

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	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

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6/16/21

Client/Project Logo

OVEC IKEC
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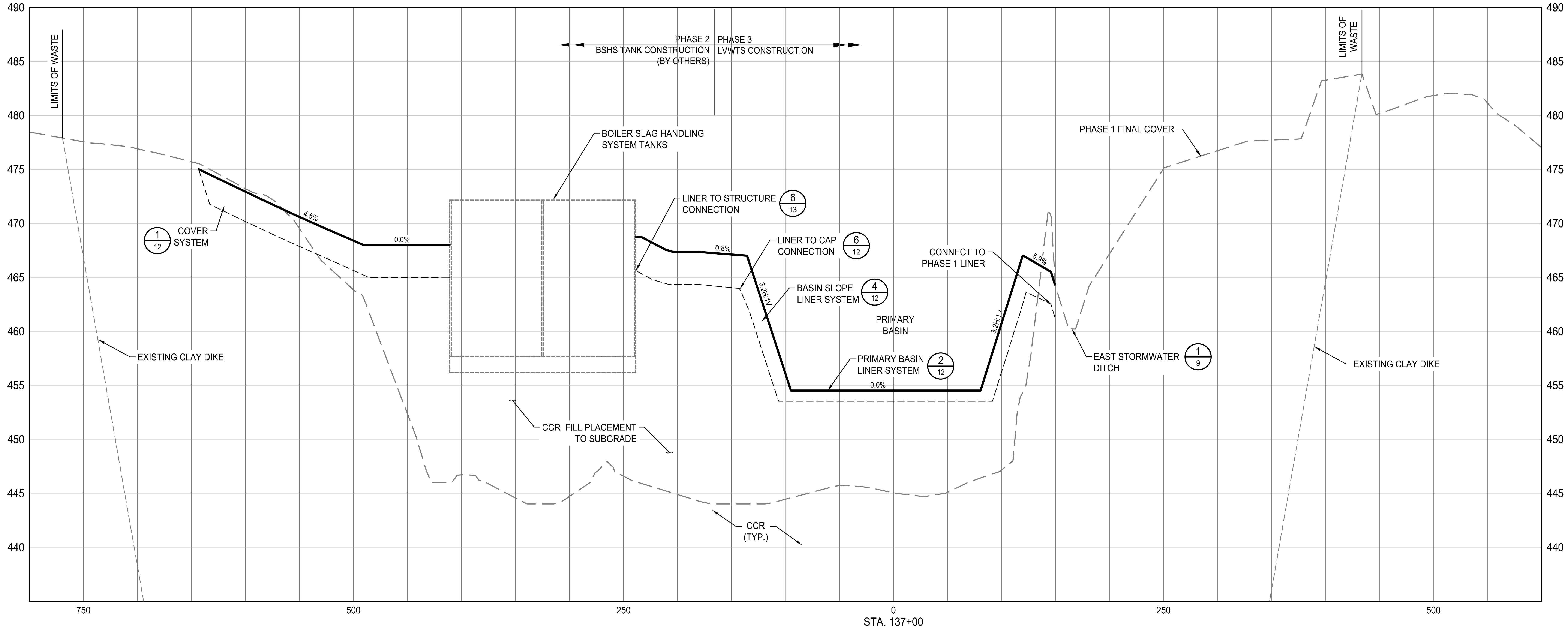
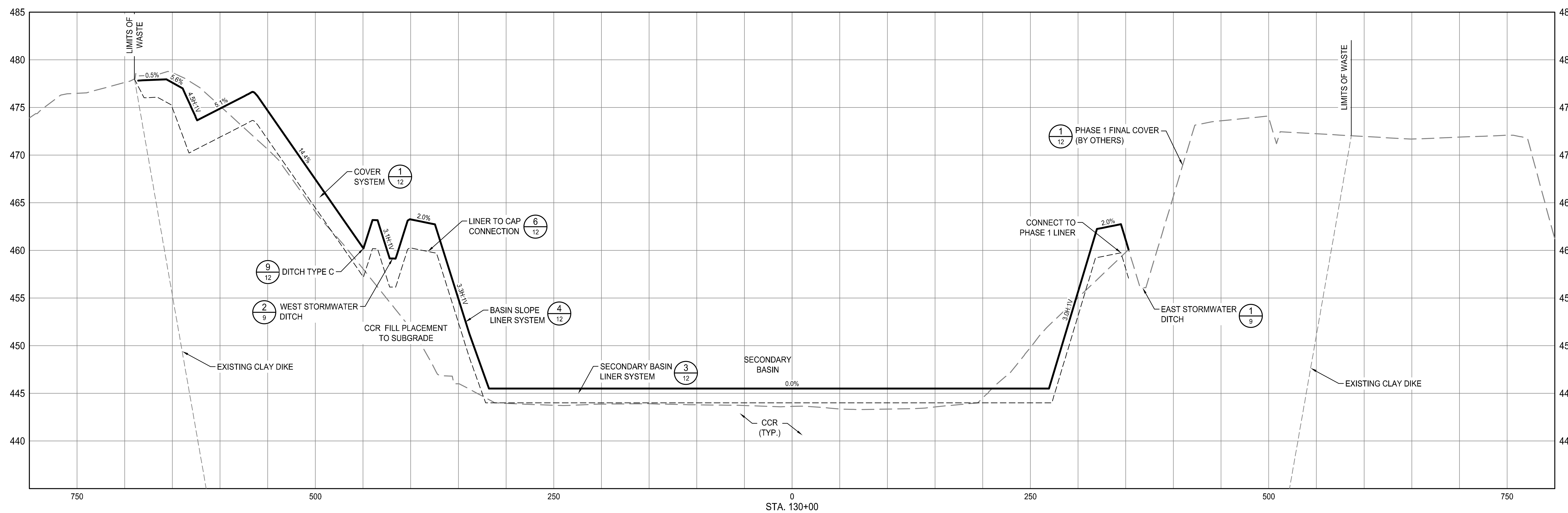
Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
CROSS SECTIONS - PROJECT BASELINE

Project No.	Scale
175539026	AS SHOWN

Revision	Sheet	Drawing No.
A	10	P-WSBP2-304-XS1





SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

Stantec

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Cincinnati, Ohio 45241-2012
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Notes

Revision	By	Appd	YYYY.MM.DD
A ISSUED FOR PERMIT	KDL	MCV	2021.04.16

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File Name: 10_11-P-WBSP2-304-XS1	TJ	KDL	MCV	2021.04.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

MATTHEW C. VAUGHAN
REGISTERED
No. PE11012285
STATE OF INDIANA
PROFESSIONAL ENGINEER
6/16/21

Client/Project Logo

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Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

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PHASE 2 - 4 WBSP CLOSURE AND LVWTS
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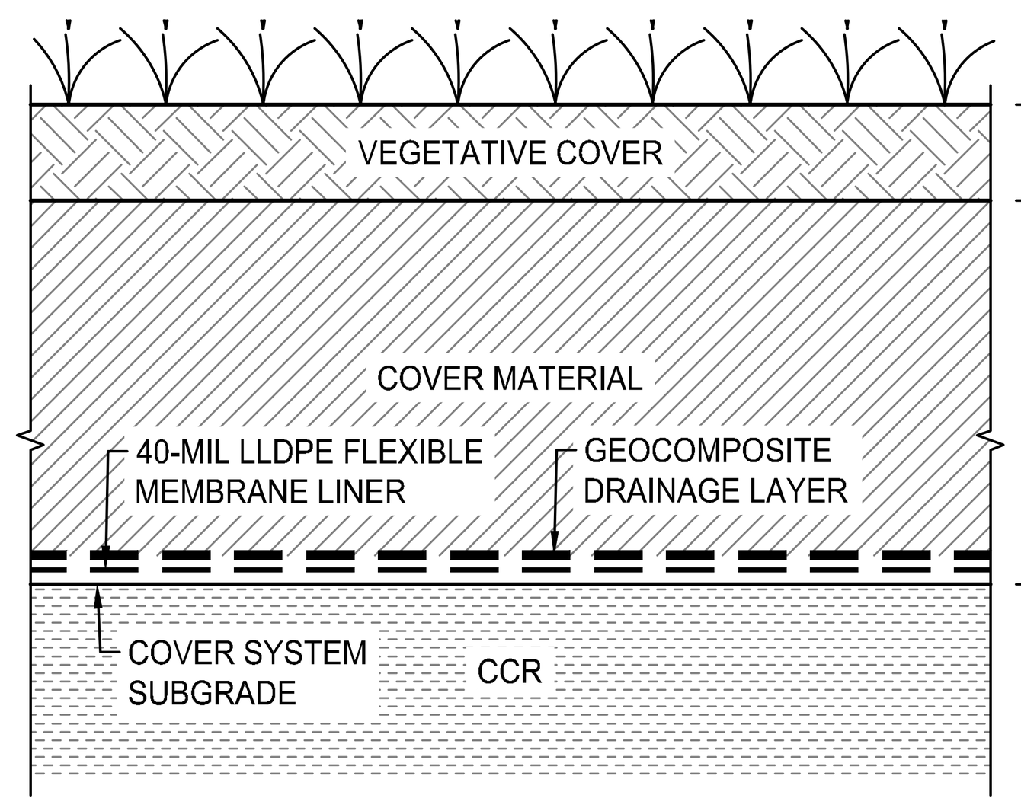
Title
CROSS SECTIONS - PROJECT BASELINE

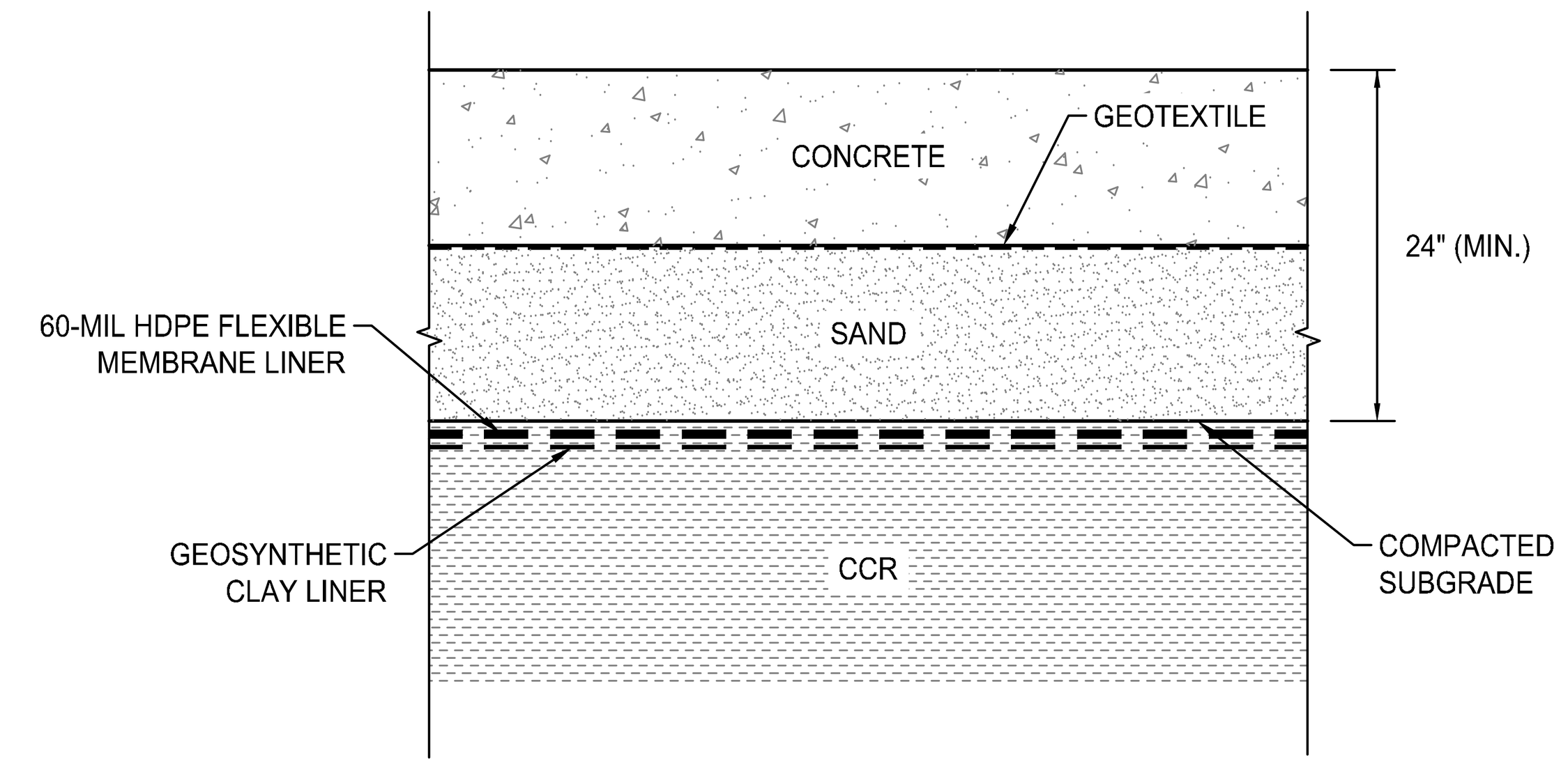
Project No.	Scale
175539026	AS SHOWN

Revision	Sheet	Drawing No.
A	11	P-WSBP2-305-XS2

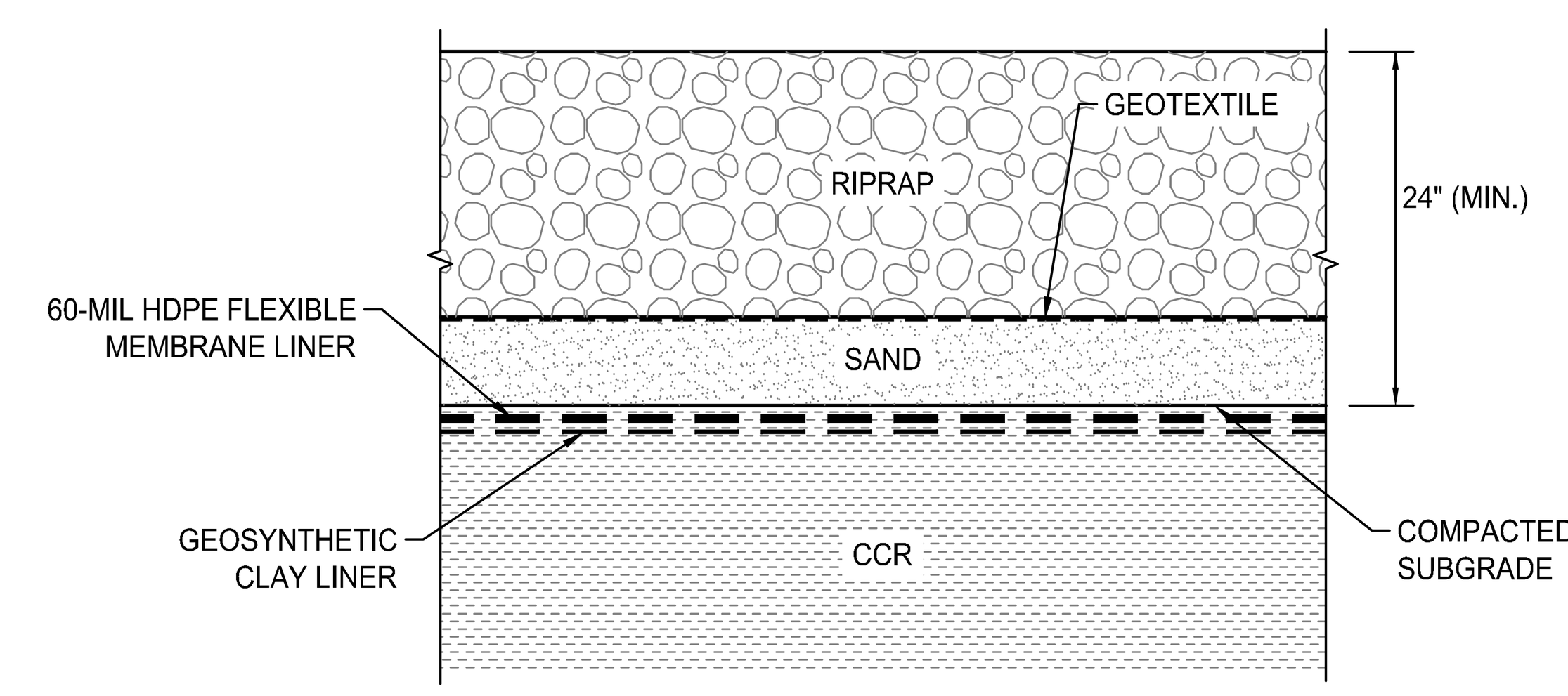


NOTES:
1. MINIMUM CROSS SLOPE = 2%.
2. MAXIMUM SLOPE = 3H:1V.

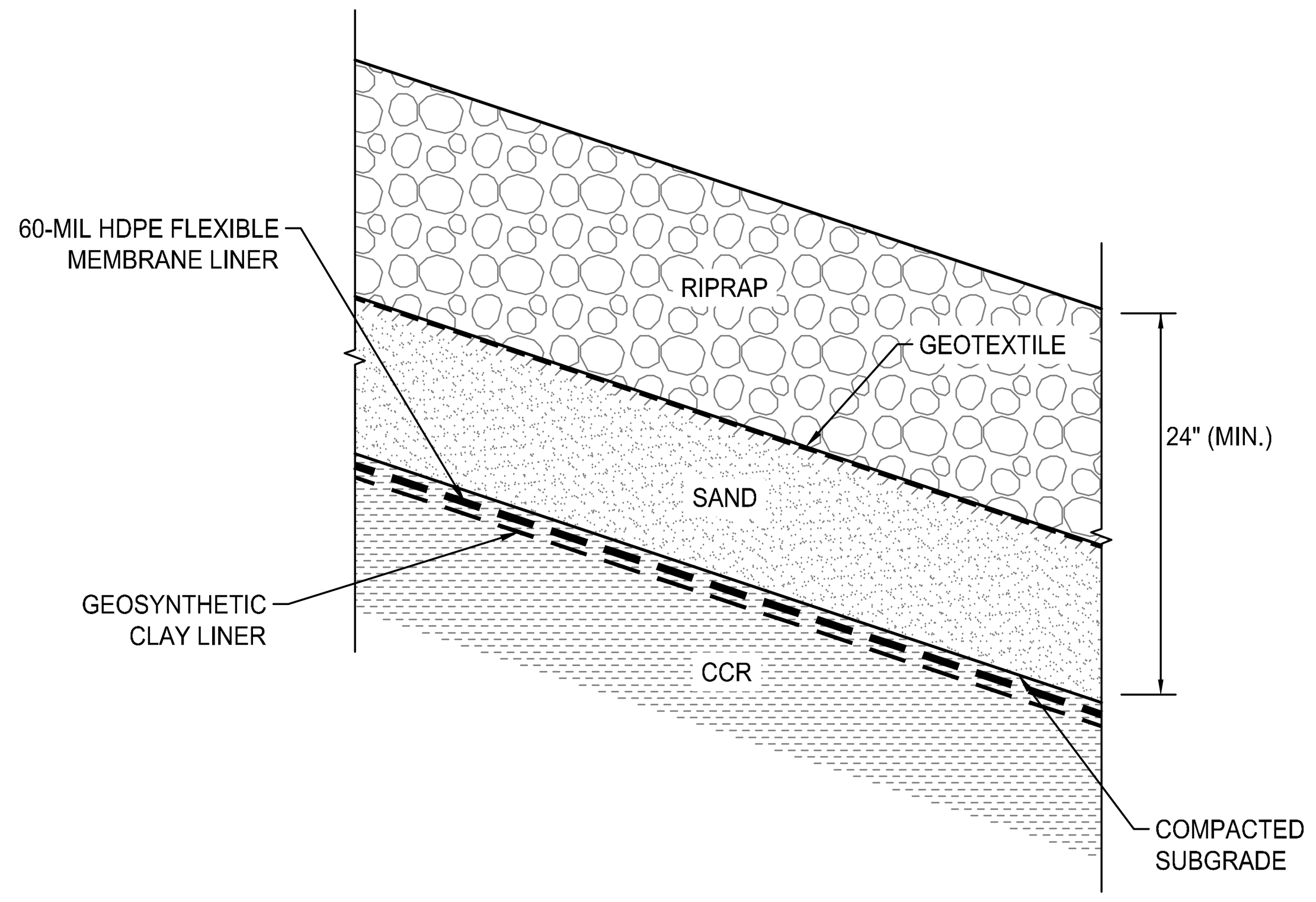
1/12 DETAIL - COVER SYSTEM
SCALE: 1"=1'-0"



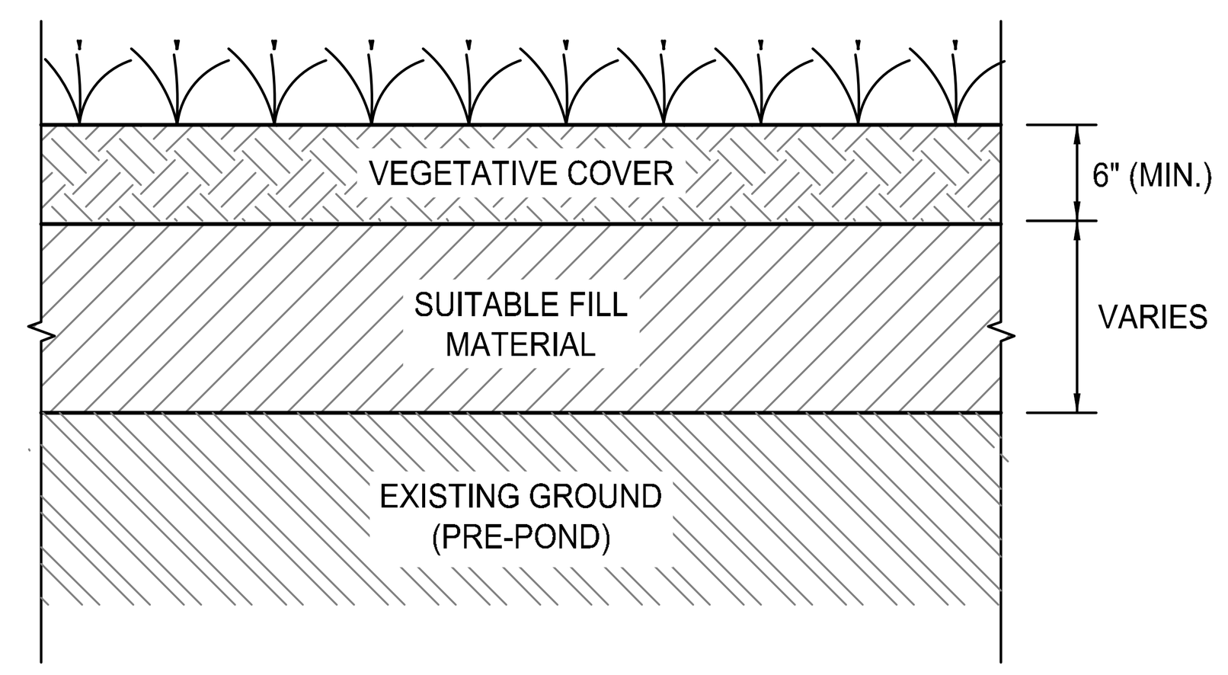
2/12 DETAIL - PRIMARY BASIN TYPICAL LINER SYSTEM
SCALE: 1"=1'-0"



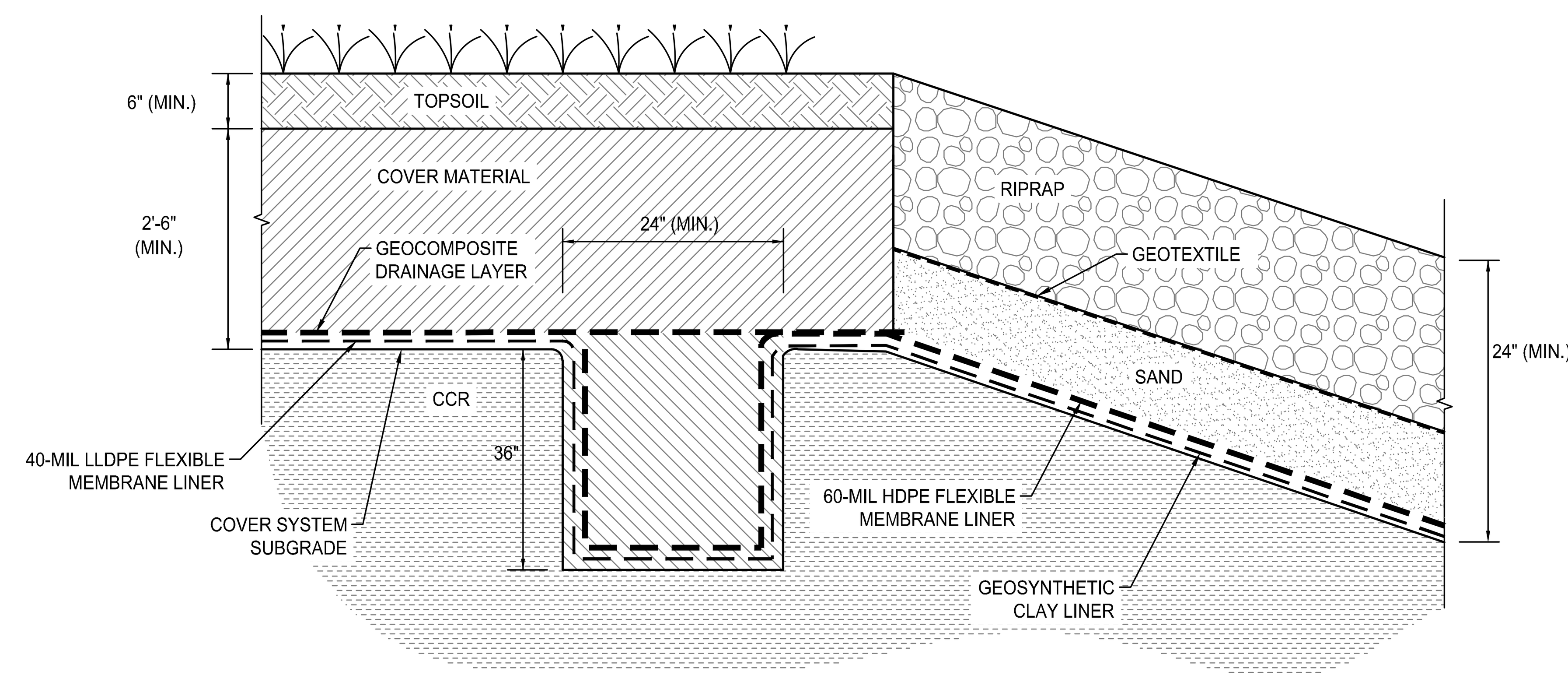
3/12 DETAIL - SECONDARY BASIN TYPICAL LINER SYSTEM
SCALE: 1"=1'-0"



4/12 DETAIL - PRIMARY AND SECONDARY BASIN SLOPE LINER
SCALE: 1"=1'-0"

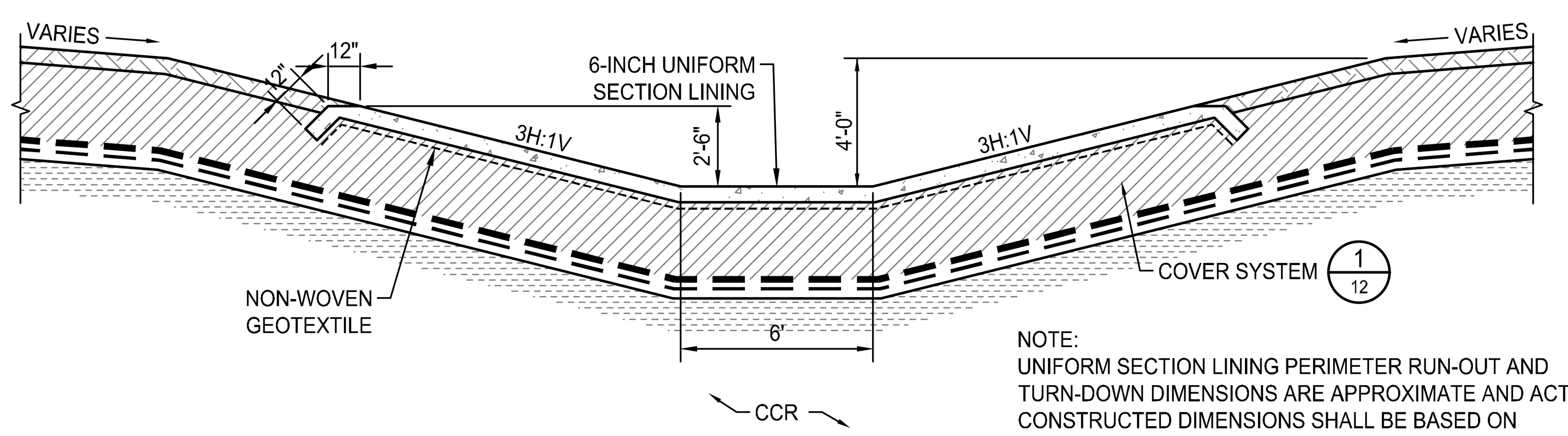


5/12 DETAIL - CLOSURE BY REMOVAL AREA BACKFILL
SCALE: 1"=1'-0"



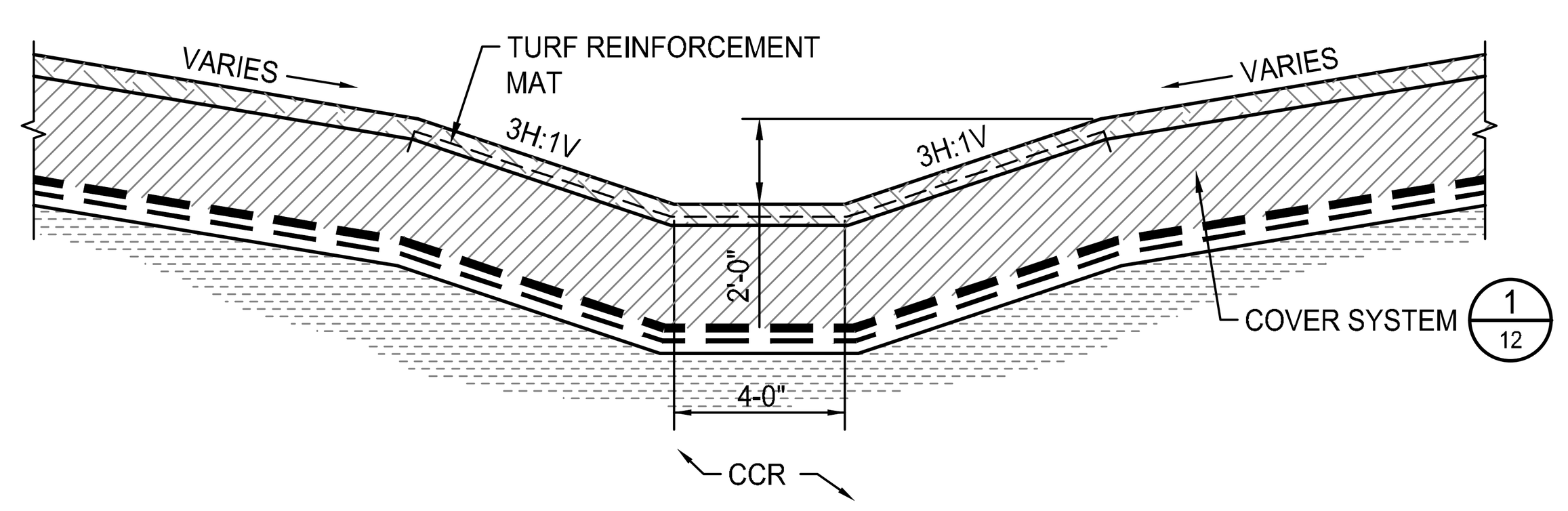
NOTE:
DISSIMILAR LINER MATERIALS TO BE INSTALLED PER MANUFACTURER'S REQUIREMNETS

6/12 DETAIL - LVWTS BASIN LINER AND FINAL CAP CONNECTION
SCALE: 1"=1'-0"

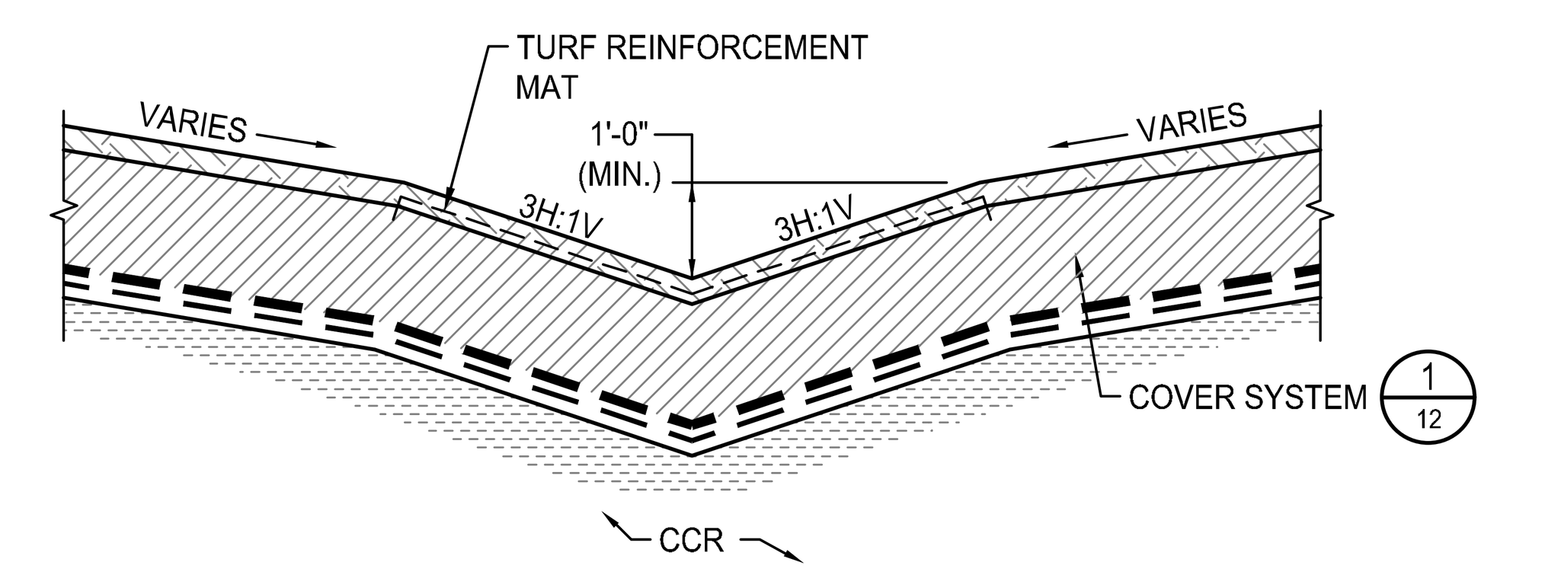


NOTE:
UNIFORM SECTION LINING PERIMETER RUN-OUT AND TURN-DOWN DIMENSIONS ARE APPROXIMATE AND ACTUAL CONSTRUCTED DIMENSIONS SHALL BE BASED ON MANUFACTURER RECOMMENDATIONS.

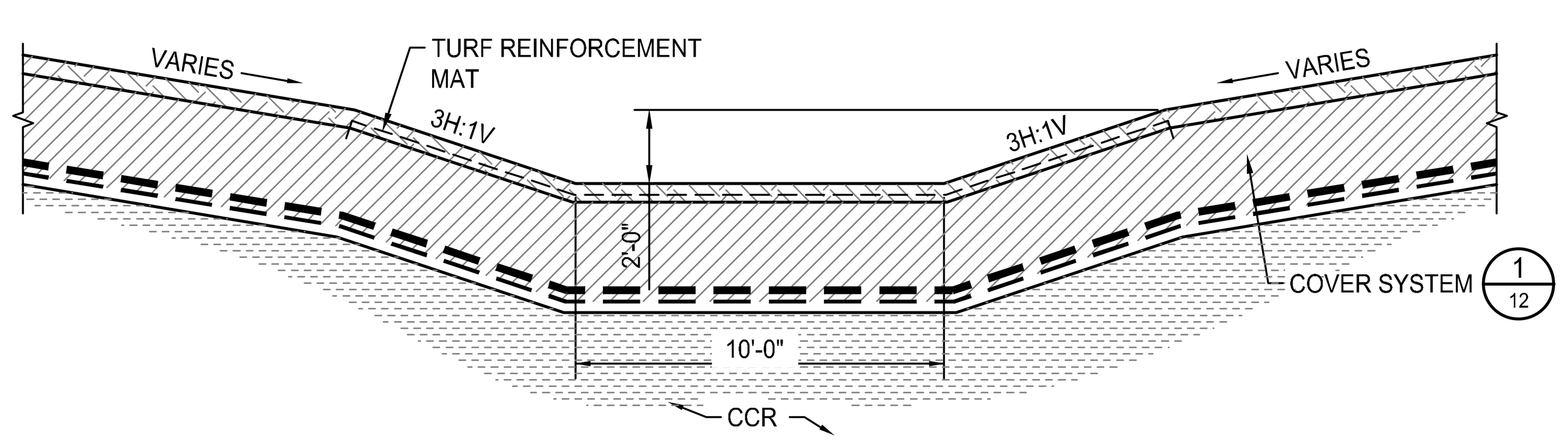
7/12 DETAIL - DITCH TYPE A
NOT TO SCALE



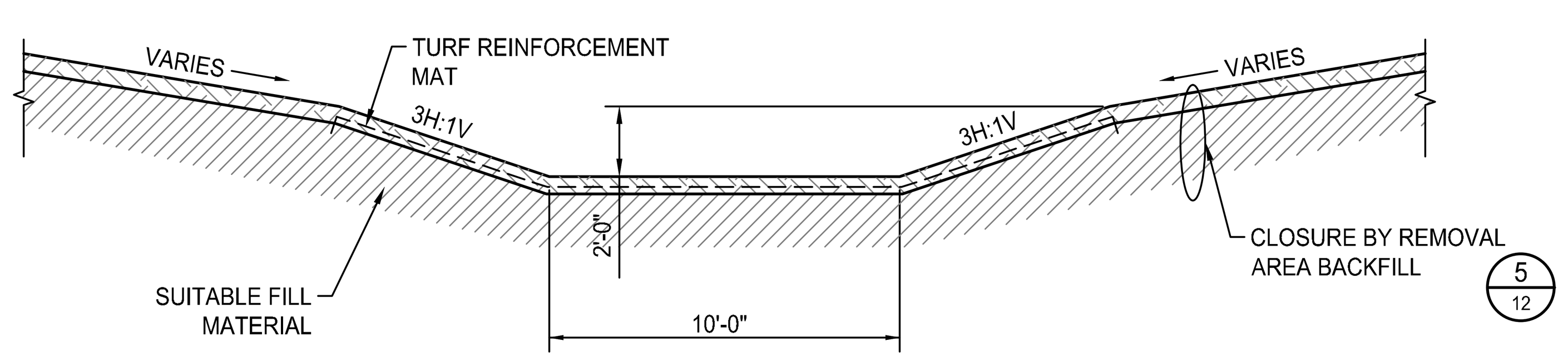
8/12 DETAIL - DITCH TYPE B
NOT TO SCALE



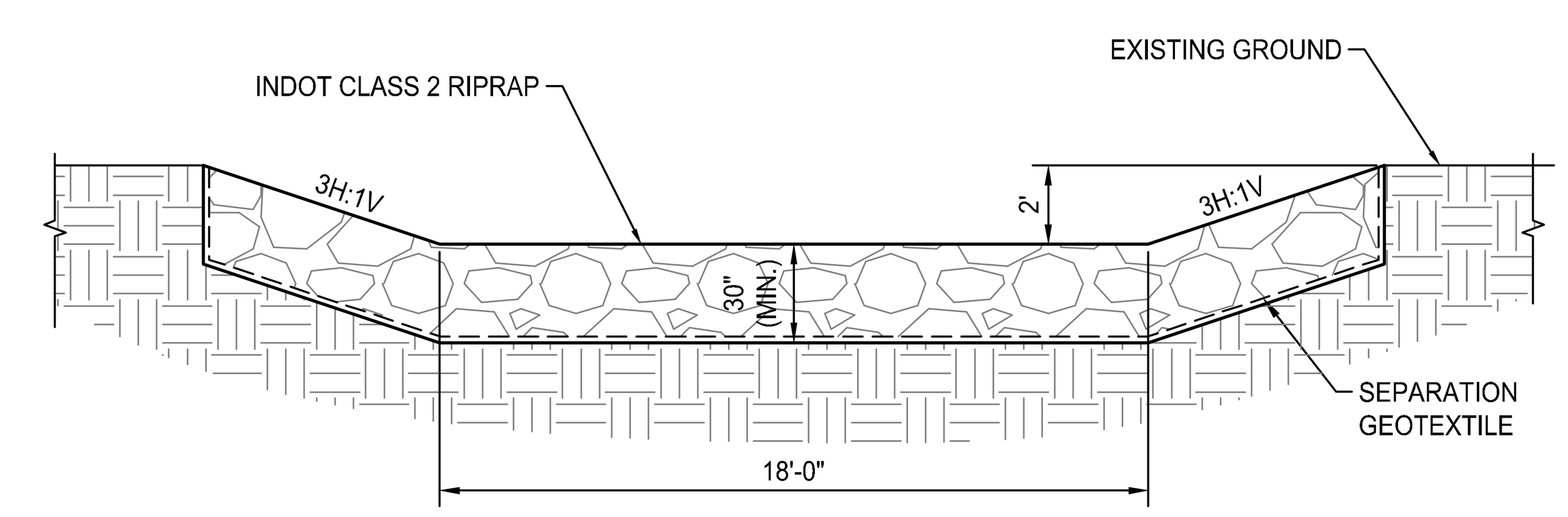
9/12 DETAIL - DITCH TYPE C
NOT TO SCALE



10/12 DETAIL - DITCH TYPE D
NOT TO SCALE



11/12 DETAIL - DITCH TYPE E
NOT TO SCALE



12/12 DETAIL - OUTFALL DISCHARGE CHANNEL
NOT TO SCALE

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

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Notes

Revision	By	Appd	YYYY.MM.DD
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Permit/Seal

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6/16/21

Client/Project Logo

OVEC IKEC
Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

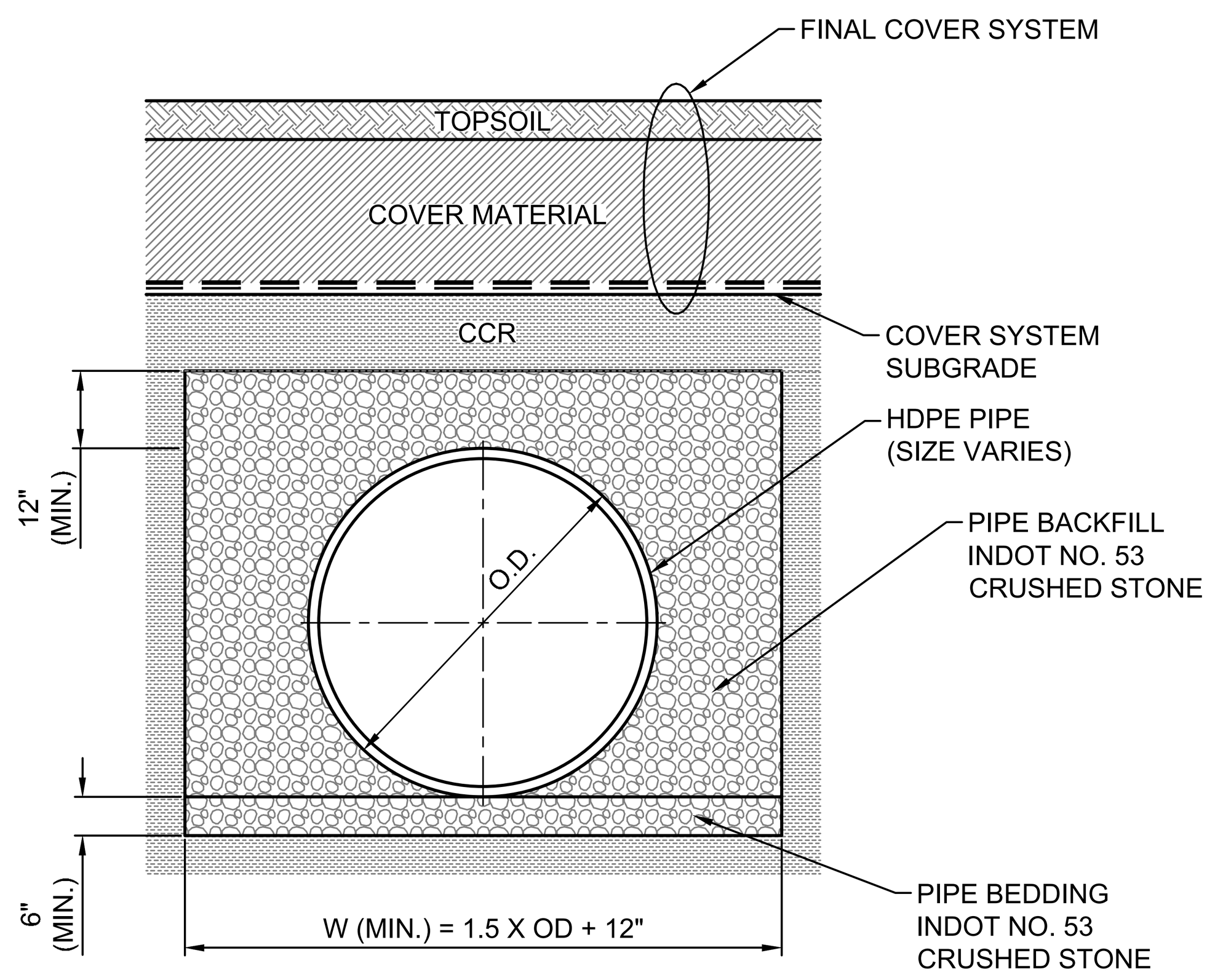
Client/Project
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

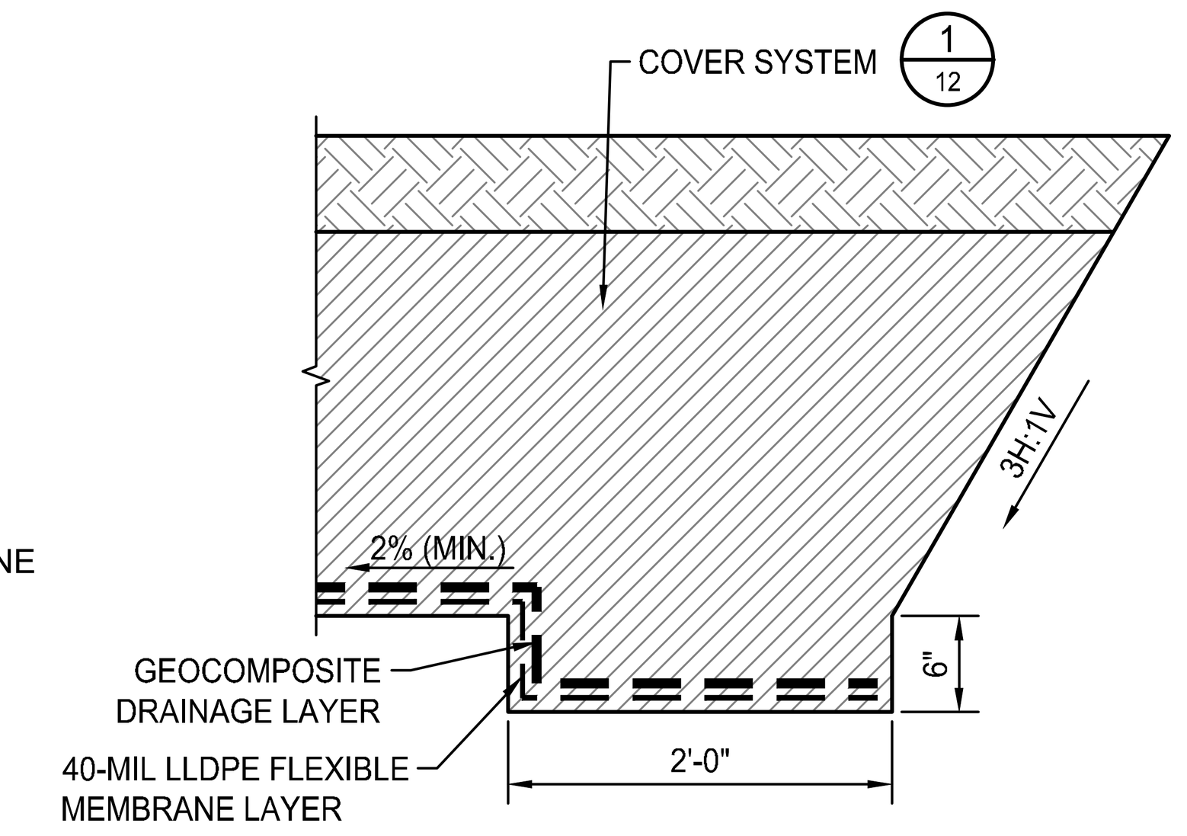
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
DETAILS

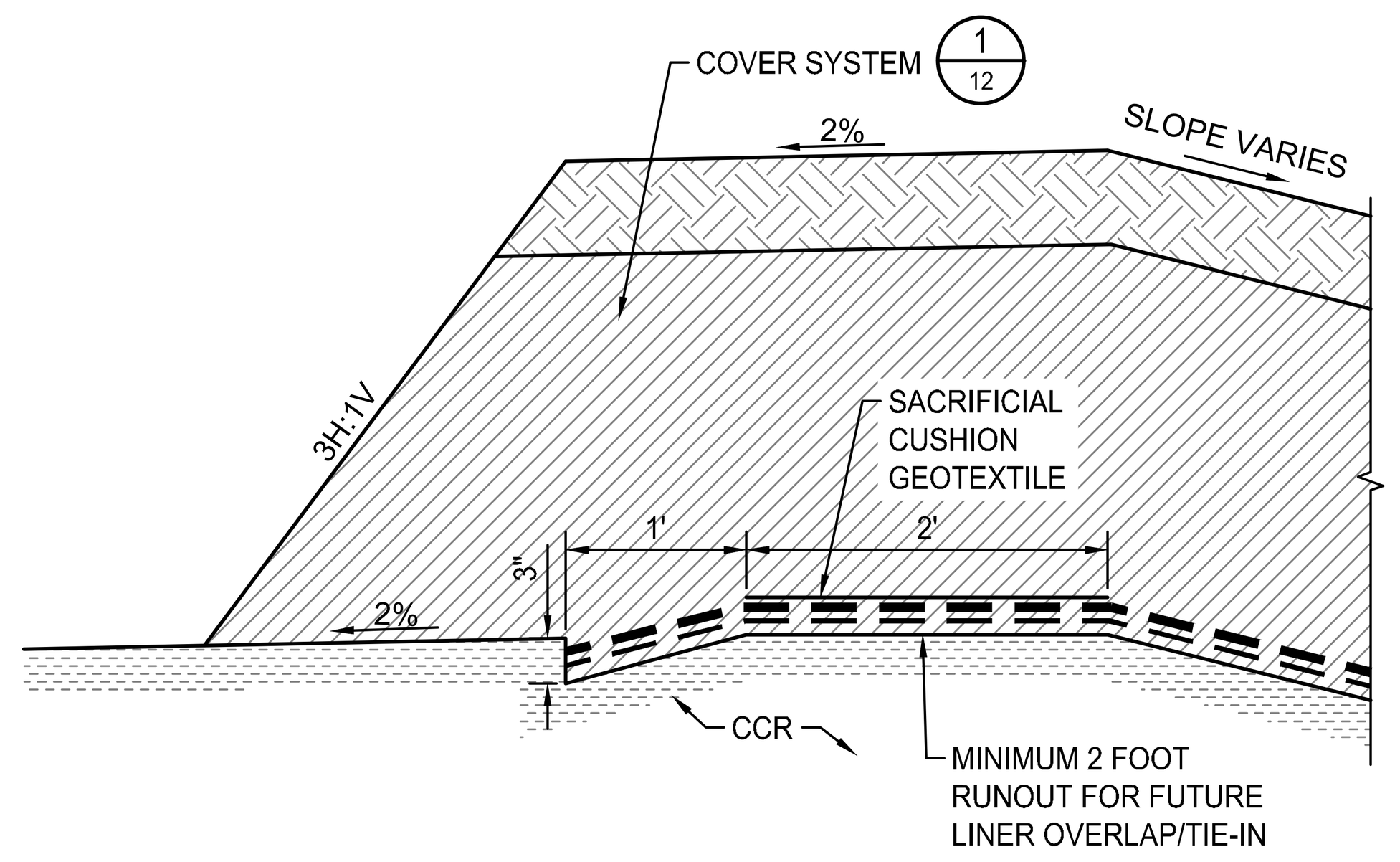
Project No.	Scale
175539026	AS SHOWN
Revision A	Sheet 12	Drawing No. P-WBSP2-501-DT1



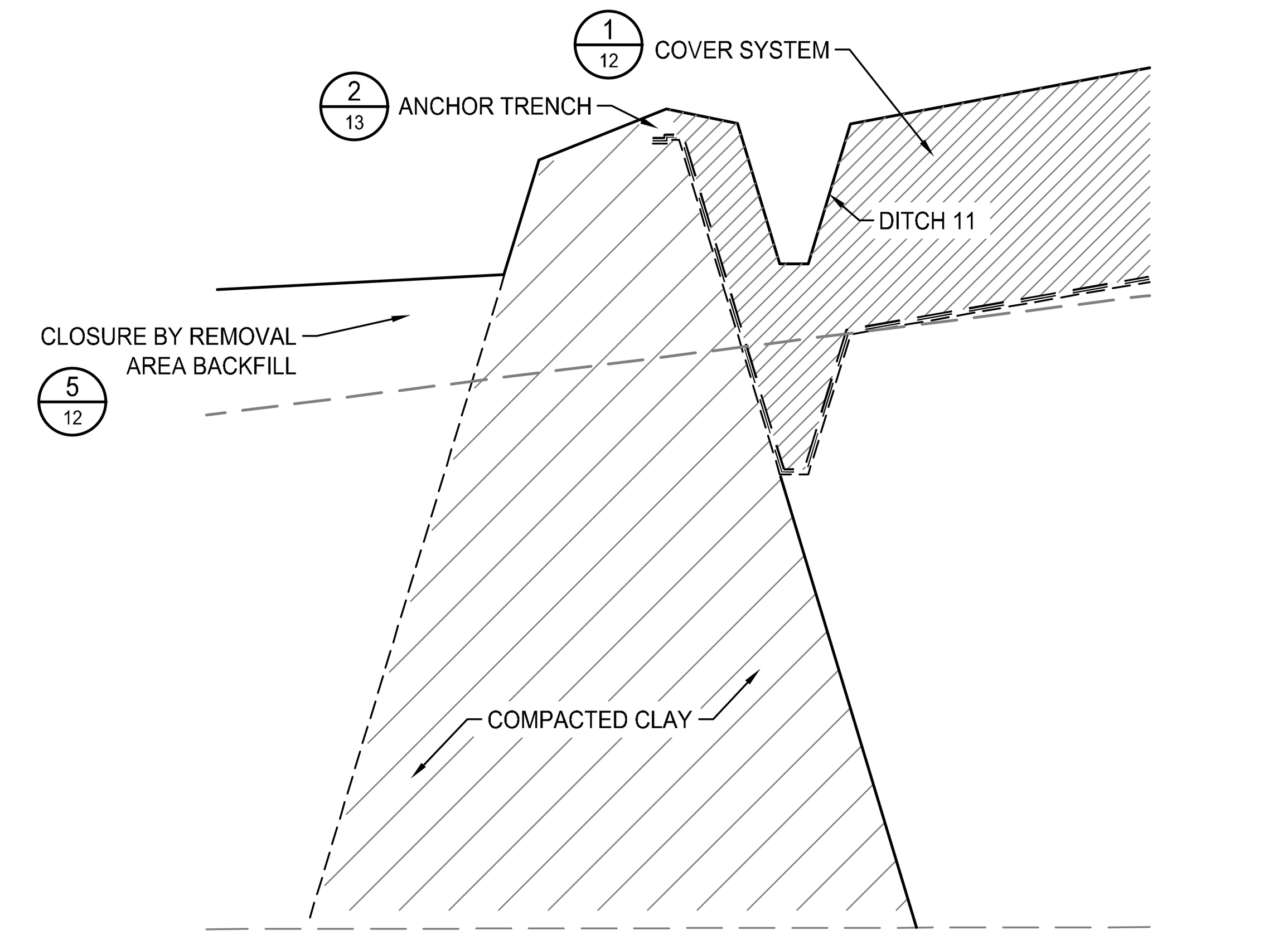
1 / 13 DETAIL - HDPE PIPE TRENCH
SCALE: 1/2"=1'-0"



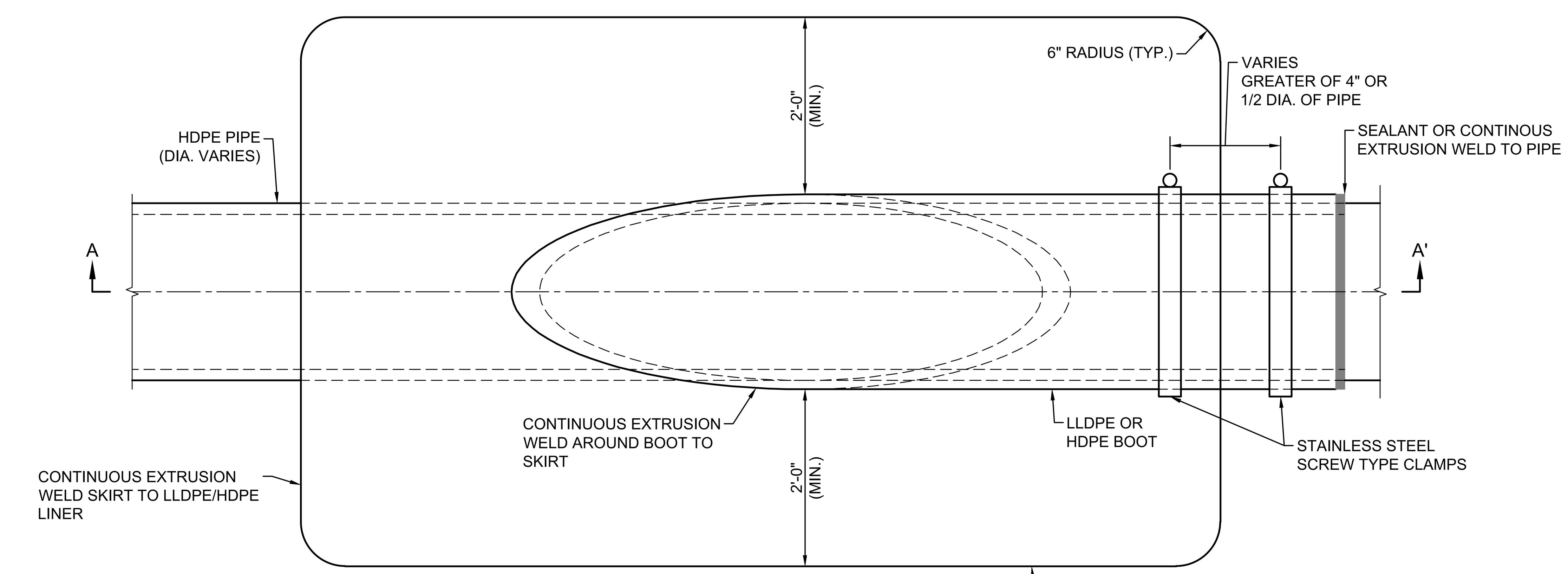
2 / 13 DETAIL - ANCHOR TRENCH
SCALE: 1"=1'-0"

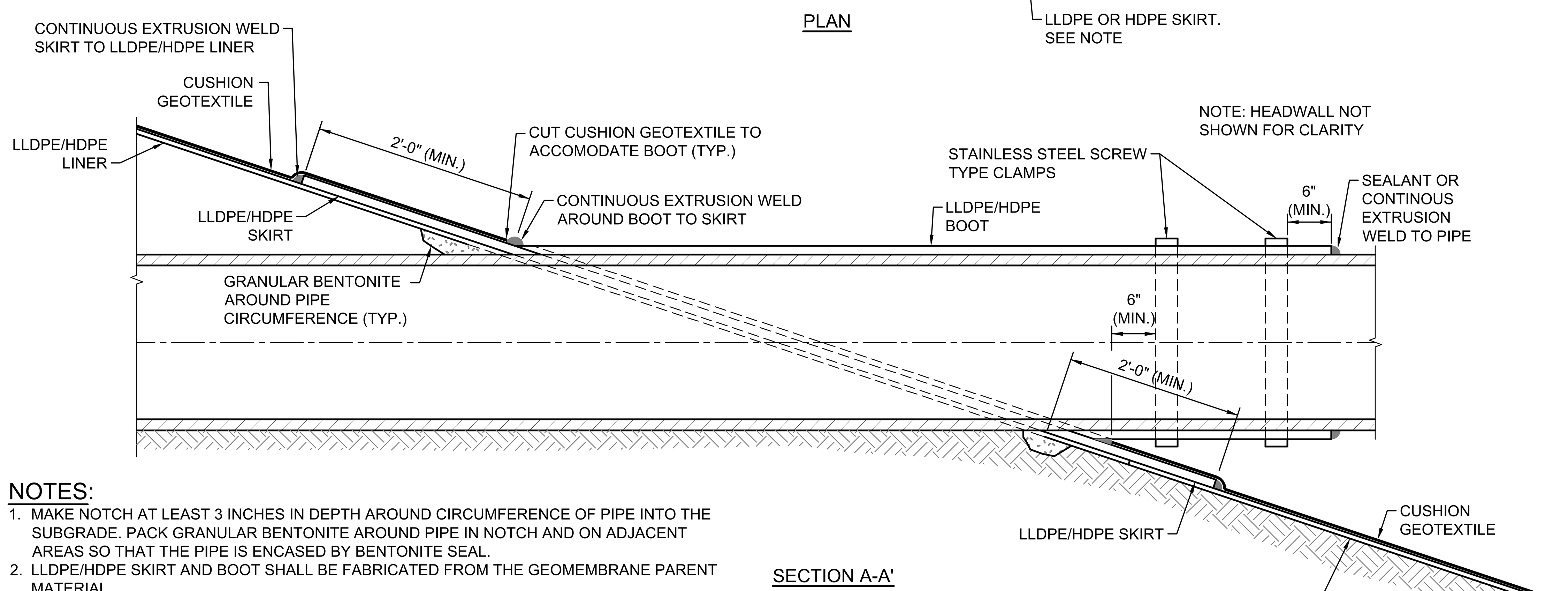


3 / 14 DETAIL - TEMPORARY ANCHOR TRENCH
NOT TO SCALE



4 / 13 DETAIL - TYPE II ANCHOR TRENCH
SCALE: 1"=20'

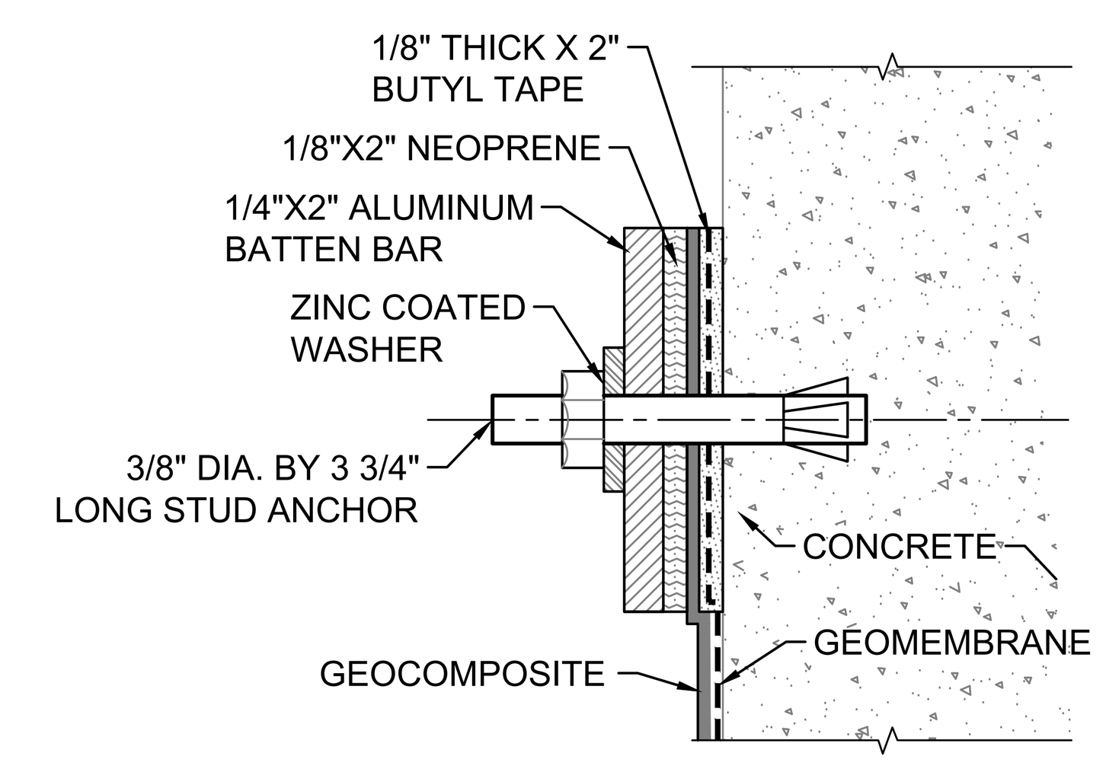




SECTION A-A'

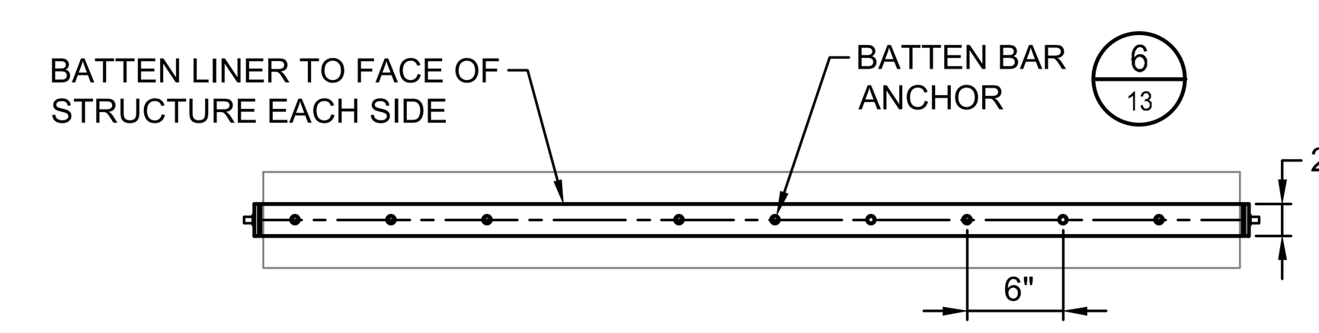
NOTES:
1. MAKE NOTCH AT LEAST 3 INCHES IN DEPTH AROUND CIRCUMFERENCE OF PIPE INTO THE SUBGRADE. PACK GRANULAR BENTONITE AROUND PIPE IN NOTCH AND ON ADJACENT AREAS SO THAT THE PIPE IS ENCASED BY BENTONITE SEAL.
2. LLDPE/HDPE SKIRT AND BOOT SHALL BE FABRICATED FROM THE GEOMEMBRANE PARENT MATERIAL.
3. FIELD FABRICATED ASSEMBLIES SHALL BE FABRICATED WITH COPPER WIRE IN THE EXTRUDATE WELD CONNECTING THE BOOT TO THE SKIRT, AND THE WELD ALONG THE LENGTH OF THE BOOT. SPARK TESTING SHALL BE PERFORMED FOLLOWING INSTALLATION.
4. INSTALL GEOTEXTILE AROUND PENETRATION AS NECESSARY, OR AS DIRECTED BY THE CQA MANAGER, TO PROVIDE PROTECTION FOR THE INSTALLED LINER SYSTEM.

5 / 13 DETAIL - LINER BOOT/CLAMP ASSEMBLY
NOT TO SCALE



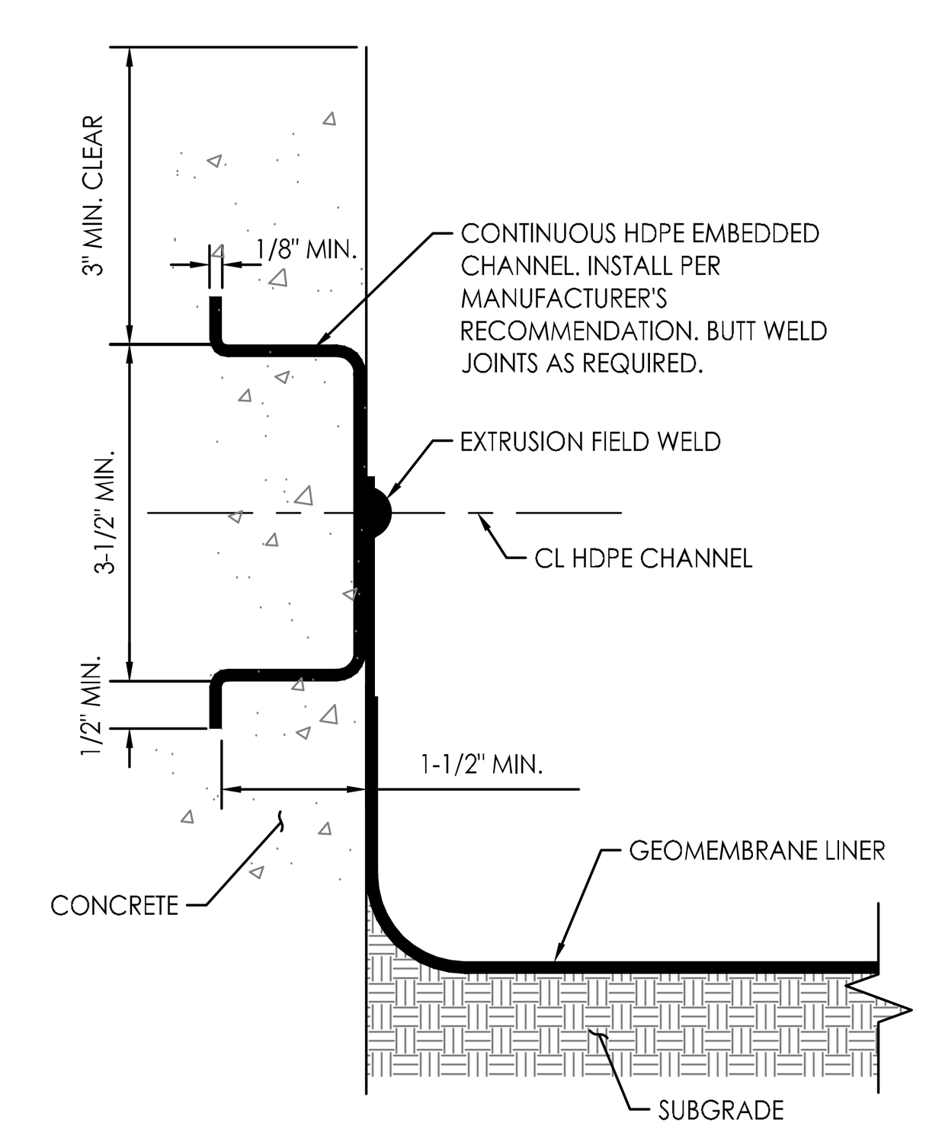
NOTES:
1. ANCHORS SHALL BE INSTALLED ON SIX INCH CENTERS ALONG THE BATTEN BAR.
2. ANCHORS SHALL FEATURE A BOLT BODY AND EXPANDER PLUG.

6 / 13 DETAIL - BATTEN BAR ANCHOR
NOT TO SCALE



NOTES:
1. BATTEN BAR AND ANCHORS TO BE USED AT INTERSECTION OF LINER SYSTEM AND LVWTS STRUCTURES.
2. FOR BATTEN BAR AND ANCHOR ATTACHMENTS BETWEEN LINER SYSTEM AND BSHS TANKS, SEE CONTRACT 5.8220 DRAWINGS BY BURNS AND MCDONNELL

7 / 13 DETAIL - BATTEN BAR ATTACHMENT
NOT TO SCALE



NOTE:
LINER EMBEDMENT STRIP MAY BE USED AS AN ALTERNATIVE TO A BATTEN BAR ANCHOR.

8 / 13 DETAIL - LINER EMBEDMENT STRIP (OPTIONAL)
NOT TO SCALE

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

Stantec

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Notes

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Permit/Seal

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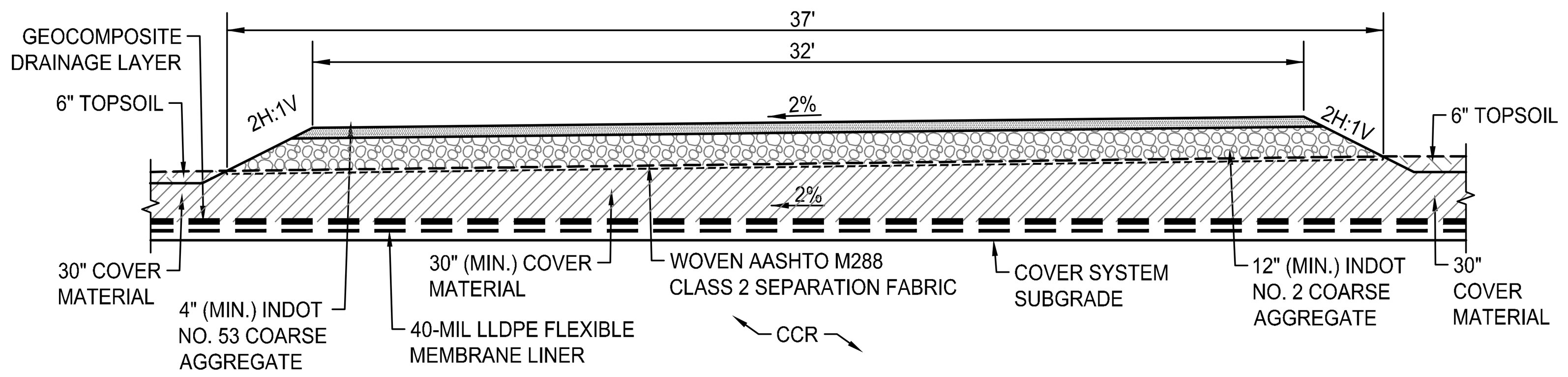
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

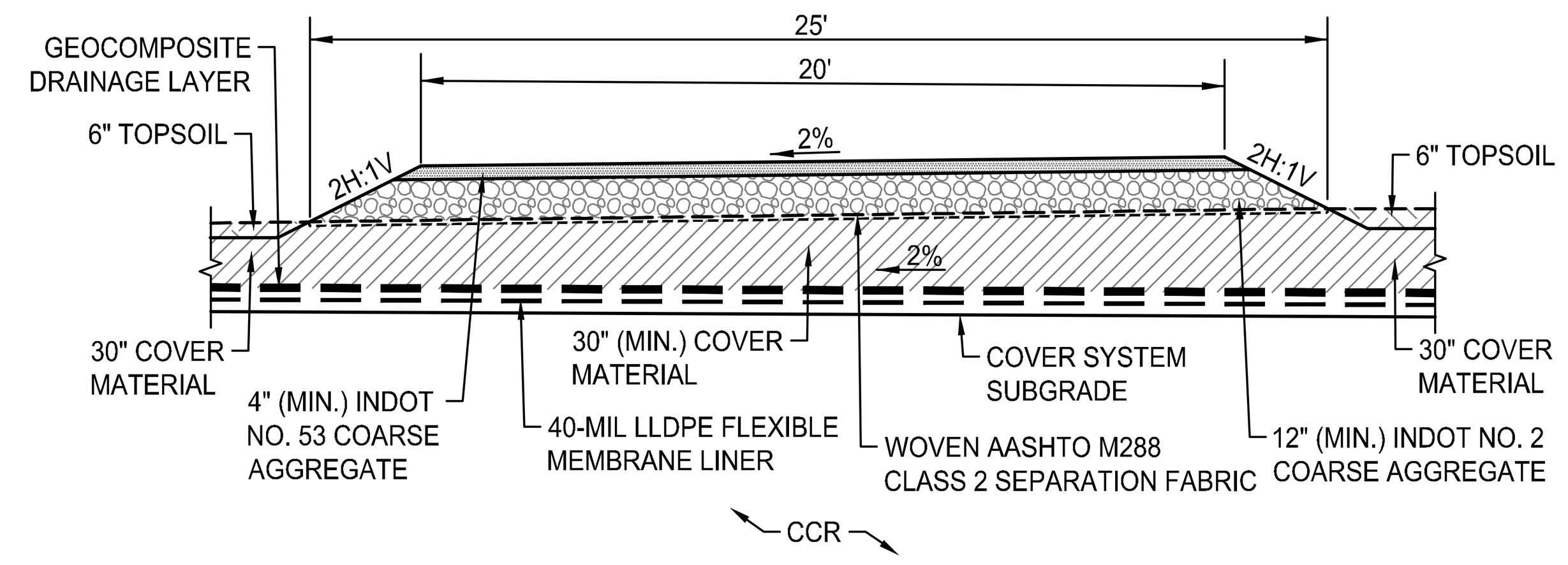
Title
DETAILS

Project No.	Scale
175539026	AS SHOWN

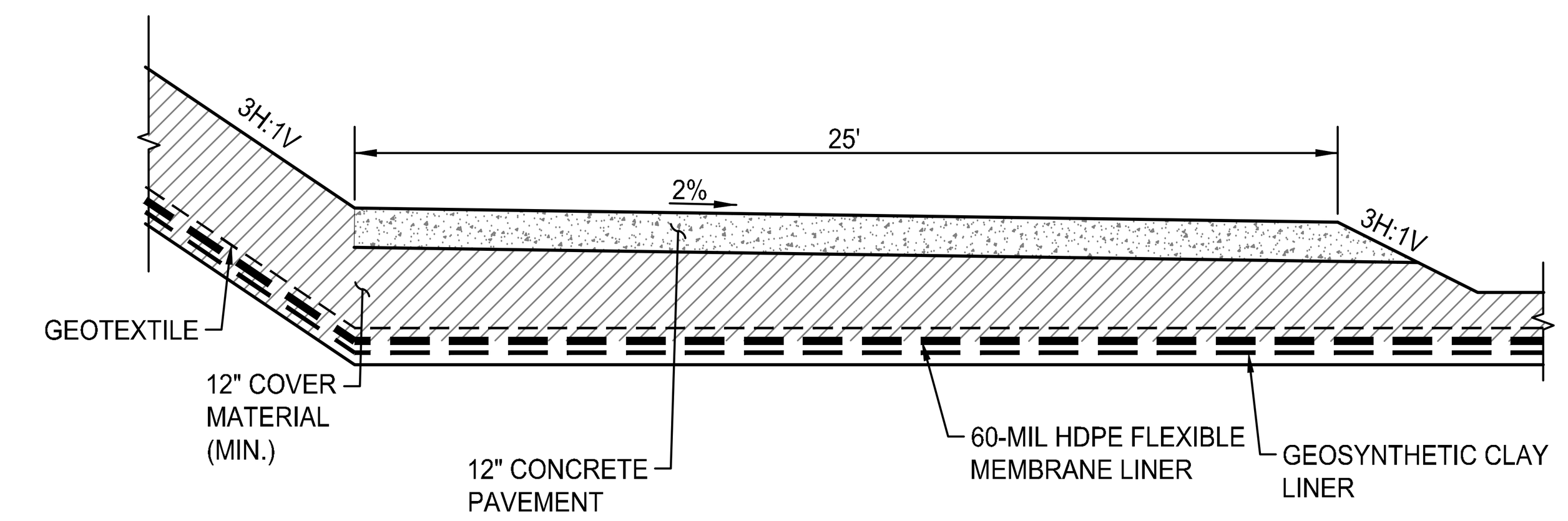
Revision	Sheet	Drawing No.
A	13	P-WBSP2-503-DT3



1/14 DETAIL - HAUL ROAD
SCALE:1/4"=1'-0"

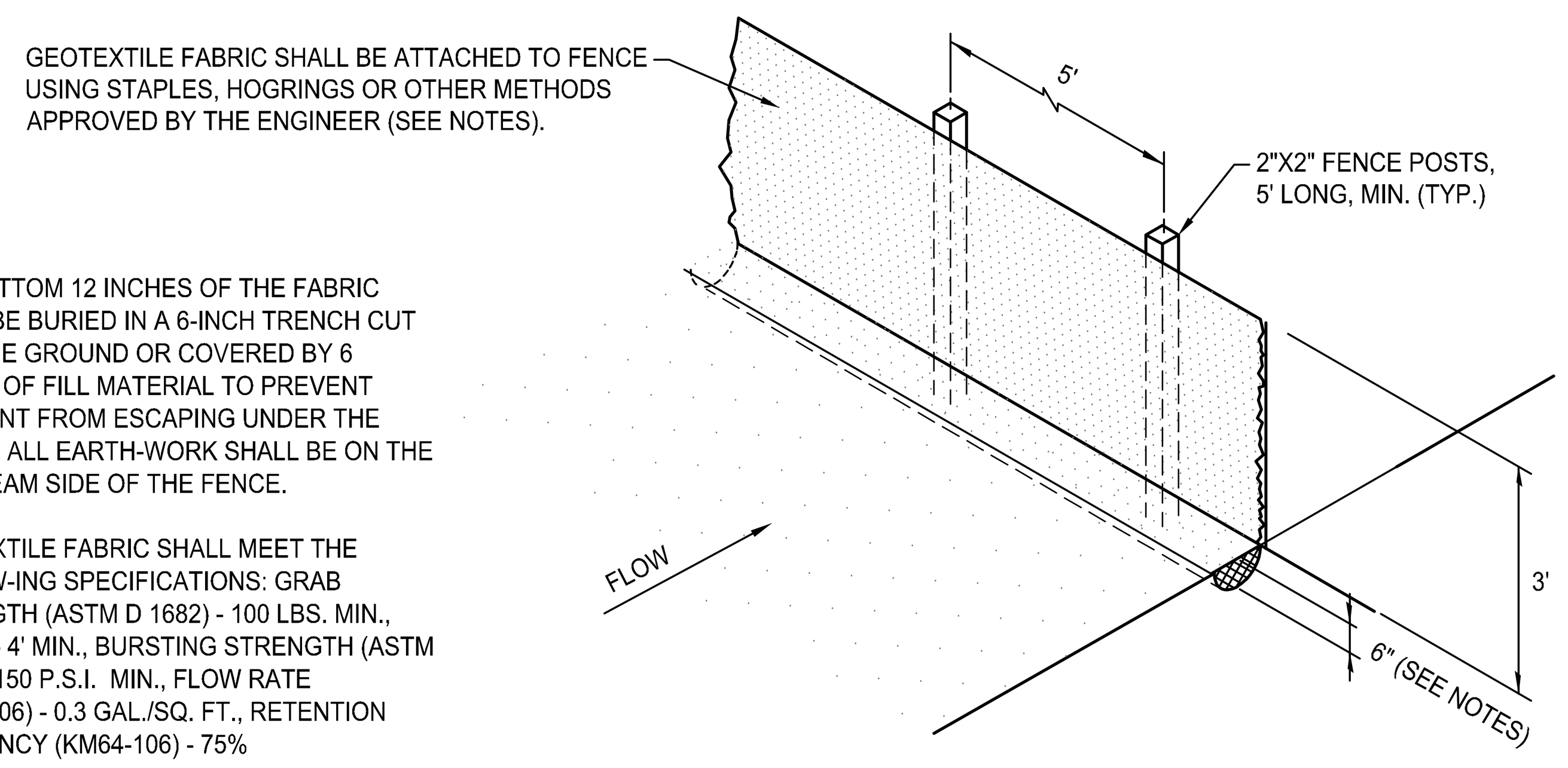


2/14 DETAIL - ACCESS ROAD
SCALE:1/4"=1'-0"

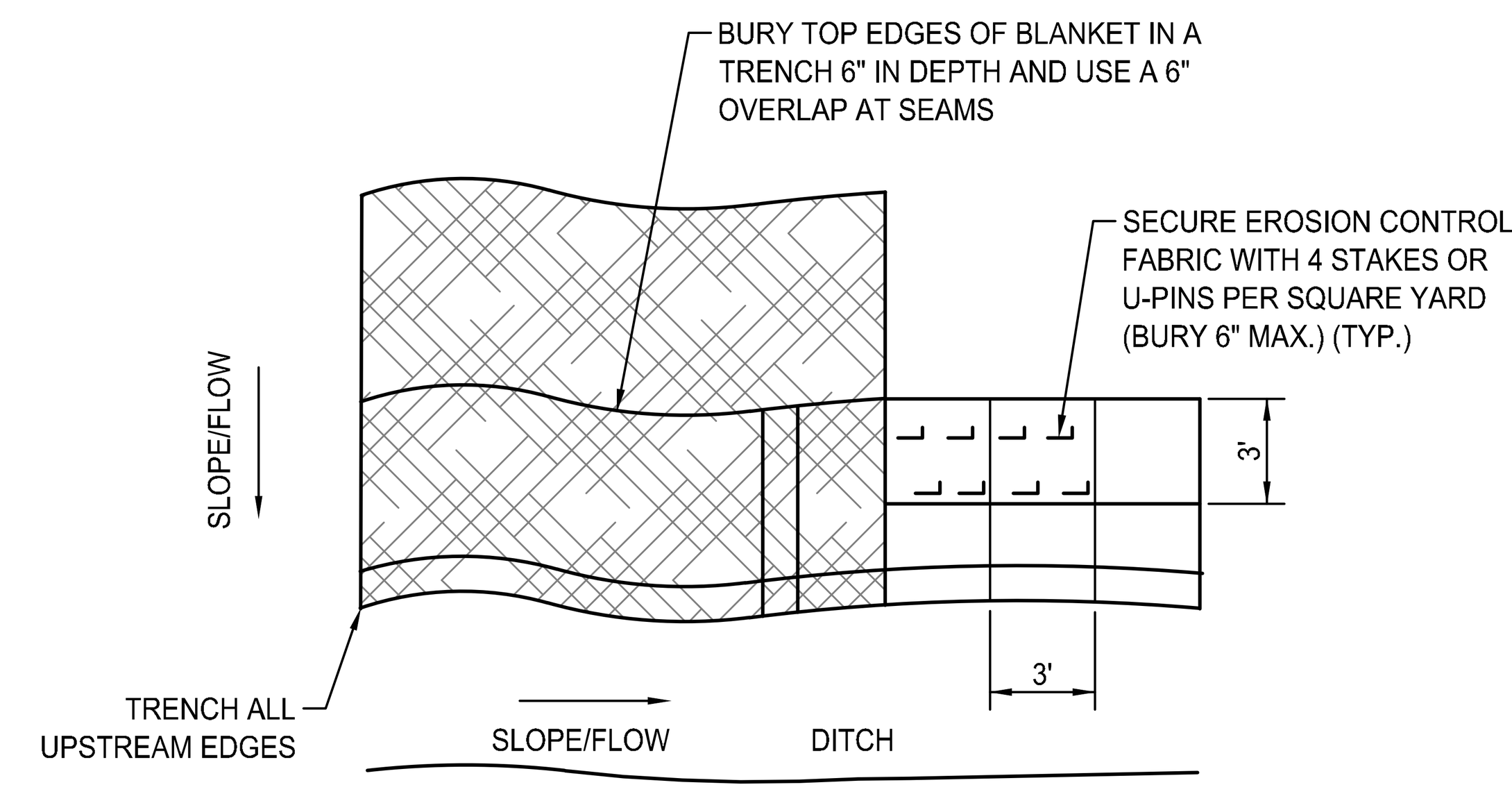


3/14 DETAIL - LVWTS BASIN ACCESS RAMP
SCALE:1/4"=1'-0"

NOTES:
1. THE BOTTOM 12 INCHES OF THE FABRIC SHALL BE BURIED IN A 6-INCH TRENCH CUT INTO THE GROUND OR COVERED BY 6 INCHES OF FILL MATERIAL TO PREVENT SEDIMENT FROM ESCAPING UNDER THE FENCE. ALL EARTH-WORK SHALL BE ON THE UPSTREAM SIDE OF THE FENCE.
2. GEOTEXTILE FABRIC SHALL MEET THE FOLLOW-ING SPECIFICATIONS: GRAB STRENGTH (ASTM D 1682) - 100 LBS. MIN., WIDTH - 4' MIN., BURSTING STRENGTH (ASTM D751) - 150 P.S.I. MIN., FLOW RATE (KM64-106) - 0.3 GAL./SQ. FT., RETENTION EFFICIENCY (KM64-106) - 75%



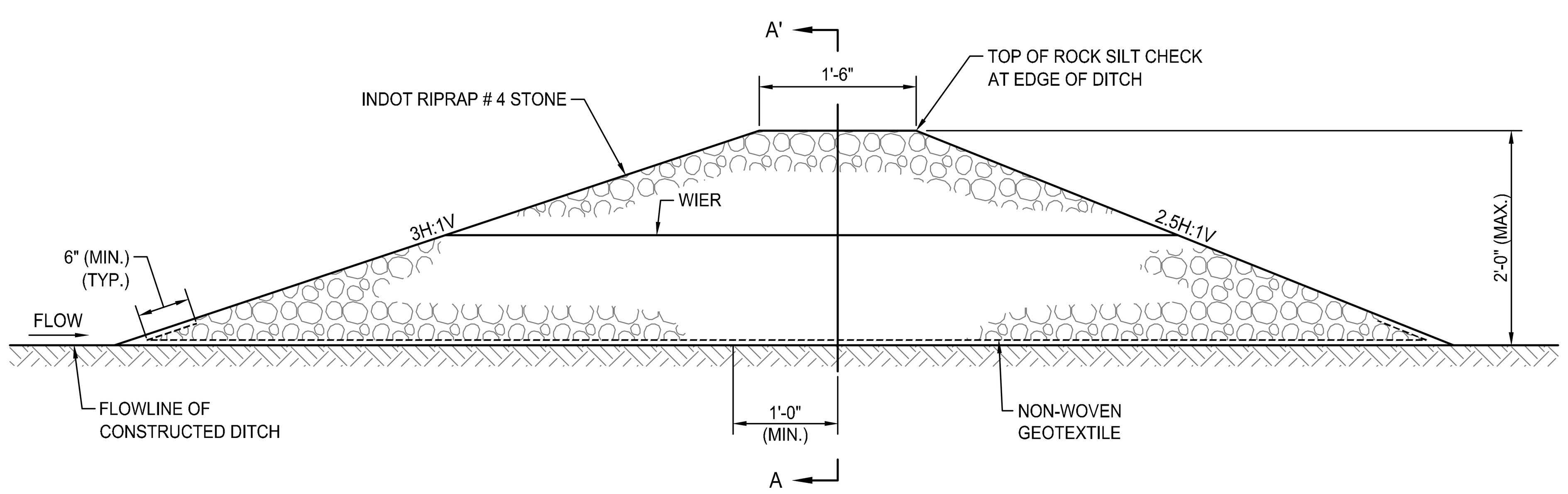
4/14 DETAIL - SILT FENCE
NOT TO SCALE



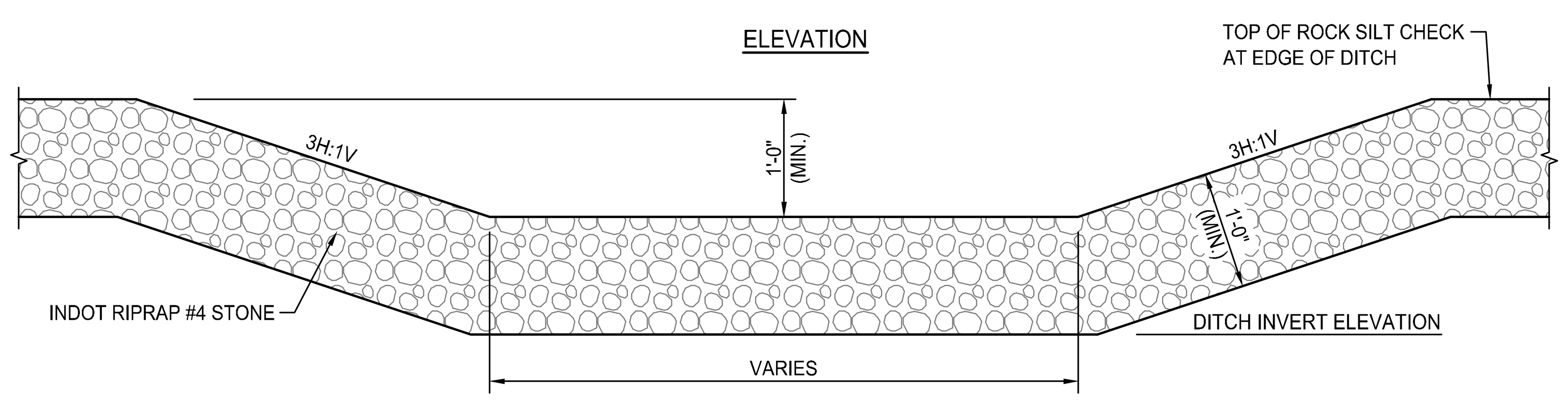
TYPICAL PLAN

NOTES:
1. PLACE SEED PRIOR TO INSTALLING EROSION CONTROL BLANKETS.
2. FOR USE AS TEMPORARY EROSION PROTECTION ON SLOPES AND VEGETATED DITCHES UNTIL PERMANENT VEGETATION, SOD, OR TURF REINFORCEMENT MAT IS INSTALLED AND VEGETATION IS ESTABLISHED.

5/14 DETAIL - EROSION CONTROL BLANKET
NOT TO SCALE



ELEVATION



SECTION A-A'

6/14 DETAIL - ROCK SILT CHECK
SCALE: 1"=1'-0"

SECTION OR DETAIL NO.
TARGET DRAWING
REFERENCE KEY

ISSUED FOR PERMIT

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Permit/Seal

Client/Project Logo

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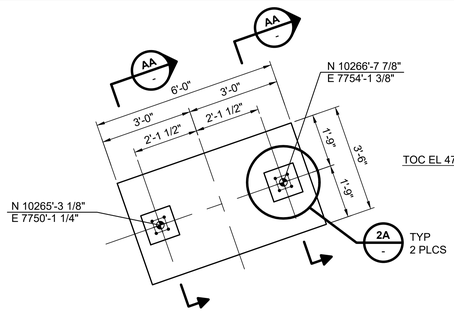
OHIO VALLEY ELECTRIC CORPORATION
INDIANA-KENTUCKY ELECTRIC CORPORATION

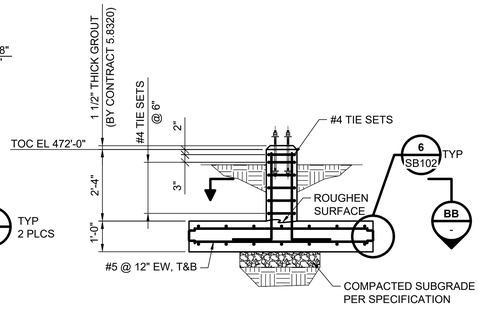
PHASE 2 - 4 WBSP CLOSURE AND LVWTS
CLIFTY CREEK STATION

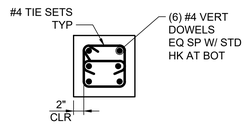
MADISON TOWNSHIP, JEFFERSON COUNTY, INDIANA

Title
DETAILS

Project No. 175539026
Scale AS SHOWN
Revision A
Sheet 14
Drawing No. P-WBSP2-504-DT4



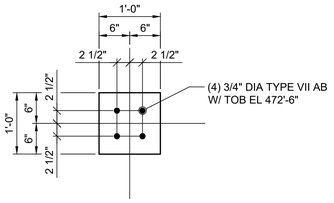




DETAIL 1A — SCALE IN FEET: 0, 1', 2', 4'

SECTION AA — SCALE IN FEET: 0, 1', 2', 4'

SECTION BB — SCALE IN FEET: 0, 1/2', 1', 2'



DETAIL 2A — SCALE IN FEET: 0, 1/2', 1', 2'

FOUNDATION PLAN
RECYCLE AND SETTLING TANKS
SCALE IN FEET: 0, 8', 16', 32'

NORTH

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 THROUGH SB004.
2. ALL CONCRETE TO BE SULFATE RESISTANT USING TYPE II CEMENT WITH A MINIMUM OF 20% CLASS F FLY ASH, MAXIMUM WATER/CEMEMT RATIO OF 0.40, AND SHALL HAVE A f'c OF 5000 PSI AT 28 DAYS.
3. CONTRACTOR TO MAINTAIN GROUND WATER LEVEL BELOW THE LOWEST EXCAVATION ELEVATION AT ALL TIMES DURING CONSTRUCTION.
4. PROVIDE SLAB AND WALL CONSTRUCTION JOINTS AS SHOWN. POUR IN CHECKERED BOARD PATTERN AND ALLOW NO LESS THAN 7 DAYS BETWEEN POURS. ALL CONSTRUCTION JOINTS TO HAVE PVC WATERSTOP.
5. DO NOT USE CURING COMPOUNDS. COMMENCE CURING WITHIN THREE HOURS OF FINISHING. USE BURLAP OR CARPET COVER KEPT CONTINUOUSLY WET FOR SEVEN DAYS MINIMUM WITH REWETTING EVERY OTHER DAY FOR FOUR ADDITIONAL DAYS.
6. FOR ALL SEALANTS AND FILLER, CONTRACTOR SHALL FOLLOW MANUFACTURIER'S RECOMMENDATIONS. USE FOAM FILLERS AND BACKER RODS AS REQUIRED.
7. EXPANSION JOINT FILLER SHALL BE PREFORMED ASPHALT IMPREGNATED FIBER CONFORMING TO ASTM D1751.
8. PVC WATER STOP SHALL BE SERRATED VIRGIN POLYVINYL CHLORIDE. ALL JOINTS AND SPLICES FOR PVC WATER STOP SHALL BE 100% FUSED. JOINTS SHALL BE MITERED AS REQUIRED SO THAT THE RIBS ARE CONTINUOUS. WHERE SLAB WATER STOPS ALIGN WITH WALL WATER STOPS REFER TO CONSTRUCTION JOINT INTERSECTION DETAIL.
9. FORM TIES SHALL BE WATER-SEAL COIL TYPE WITH CONICAL WALL DEPRESSIONS.
10. PROVIDE BROOM FINISH ON TANK FLOORS AND STACKOUT PAD.
11. SETTLING TANKS, RECYCLE TANK AND STACKOUT PAD DESIGNED AS WATER RETAINING STRUCTURES WITH NORMAL ENVIRONMENTAL EXPOSURE PER ACI 350.

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	04/14/21	NSH	SSP	ISSUED FOR PRELIMINARY REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
Certificate of Authority No. 01557

designed: S. PAWAR | detailed: N. HATALKAR

OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

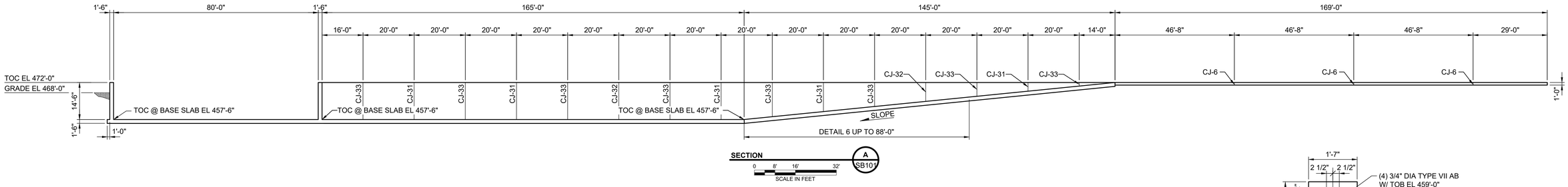
CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION

JEFFERSON COUNTY, INDIANA

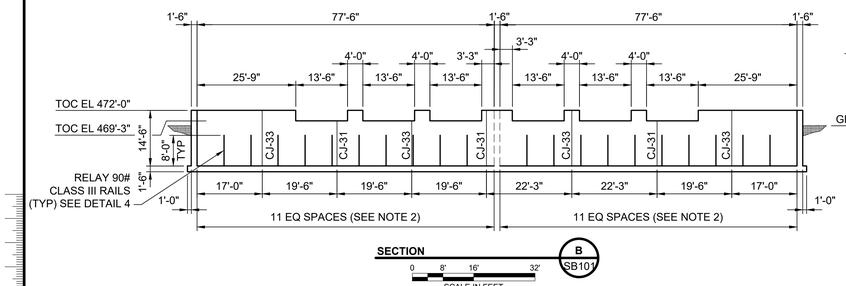
FOUNDATION PLAN
RECYCLE AND SETTLING TANKS

project: 128991 | contract: 5.8220
drawing: **SB101 – A** | rev.
sheet | of | sheets
file: 128991SB101.dwg

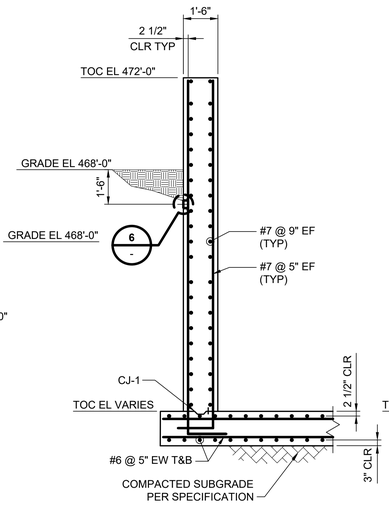
Scale For Microfilming: Millimeters / Inches



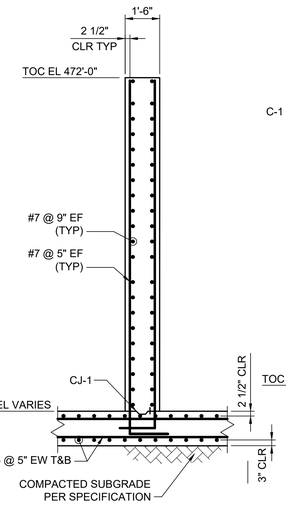
SECTION A SB101
0 8' 16' 32'
SCALE IN FEET



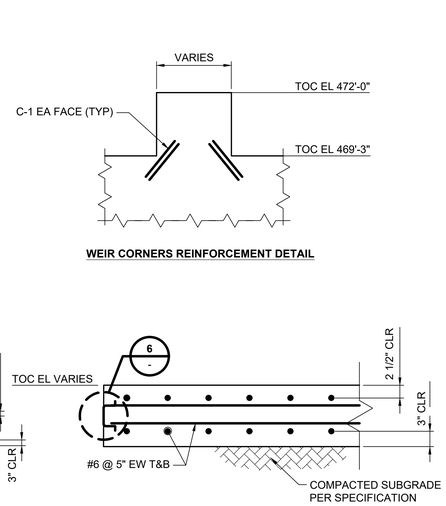
SECTION B SB101
0 8' 16' 32'
SCALE IN FEET



SECTION C SB101
0 2' 4' 6'
SCALE IN FEET

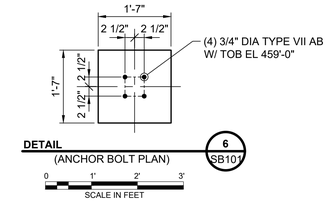


SECTION D SB101
0 2' 4' 6'
SCALE IN FEET

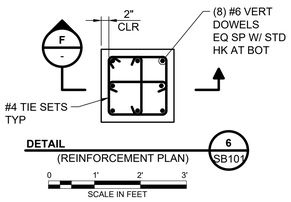


WEIR CORNERS REINFORCEMENT DETAIL

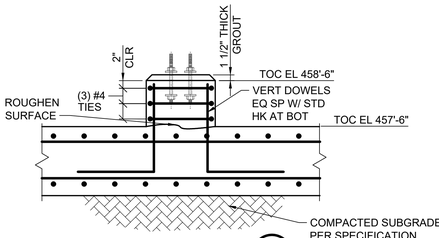
SECTION E SB101
0 1/2' 1' 2'
SCALE IN FEET



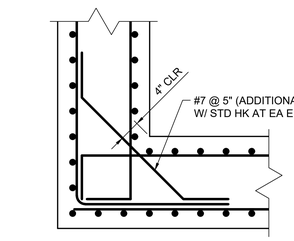
DETAIL (ANCHOR BOLT PLAN) 6 SB101
0 1' 2' 3'
SCALE IN FEET



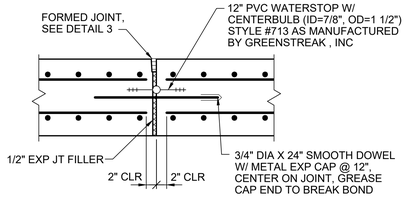
DETAIL (REINFORCEMENT PLAN) 6 SB101
0 1' 2' 3'
SCALE IN FEET



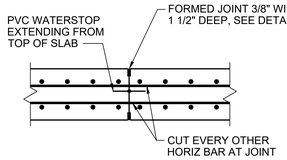
SECTION F -
0 1' 2' 3'
SCALE IN FEET



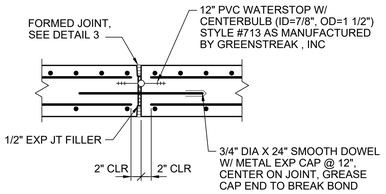
DETAIL 1 SB101
0 1/2' 1' 2'
SCALE IN FEET



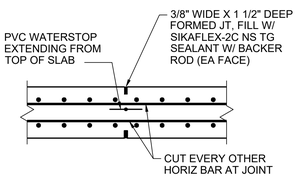
TYPICAL EXPANSION JOINT TANK BASE SLAB (CJ-22)
0 1/2' 1' 2'
SCALE IN FEET



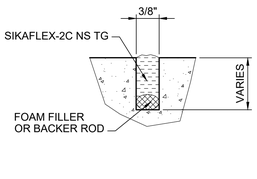
TYPICAL CONSTRUCTION JOINT TANK WALL (CJ-31)
0 1/2' 1' 2'
SCALE IN FEET



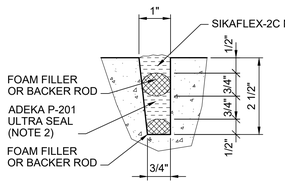
TYPICAL EXPANSION JOINT TANK WALL (CJ-32)
0 1/2' 1' 2'
SCALE IN FEET



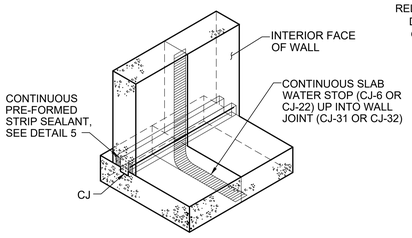
TYPICAL CONTROL JOINT TANK WALL (CJ-33)
0 1/2' 1' 2'
SCALE IN FEET



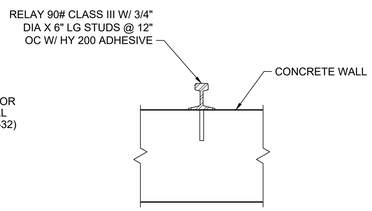
DETAIL (NTS) 2 -



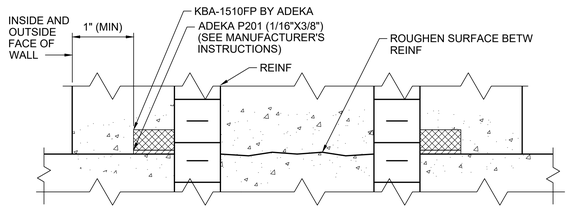
DETAIL (NTS) 3 -



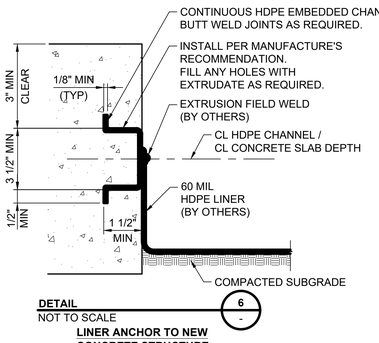
SLAB TO WALL WATER STOP DETAIL



DETAIL 4 -
0 1/2' 1' 2'
SCALE IN FEET



DETAIL (NTS) 5 -



DETAIL NOT TO SCALE 6 -
LINER ANCHOR TO NEW CONCRETE STRUCTURE
NOT TO SCALE

NOTES:
1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 THROUGH SB004.
2. SUBCONTRACTOR TO AVOID CUTTING THROUGH VERTICAL WALL REINFORCING WHEN DRILLING ANCHOR HOLES. SPACING OF RAILS CAN BE ADJUSTED +/- 6" TO AVOID INTERFERING WITH THE VERTICAL REINFORCING.

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	04/14/21	NSH	SSP	ISSUED FOR PRELIMINARY REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
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Burns & McDonnell Engineering Co, Inc.
Certificate of Authority No. 01557
designed S. PAWAR | detailed N. HATALKAR

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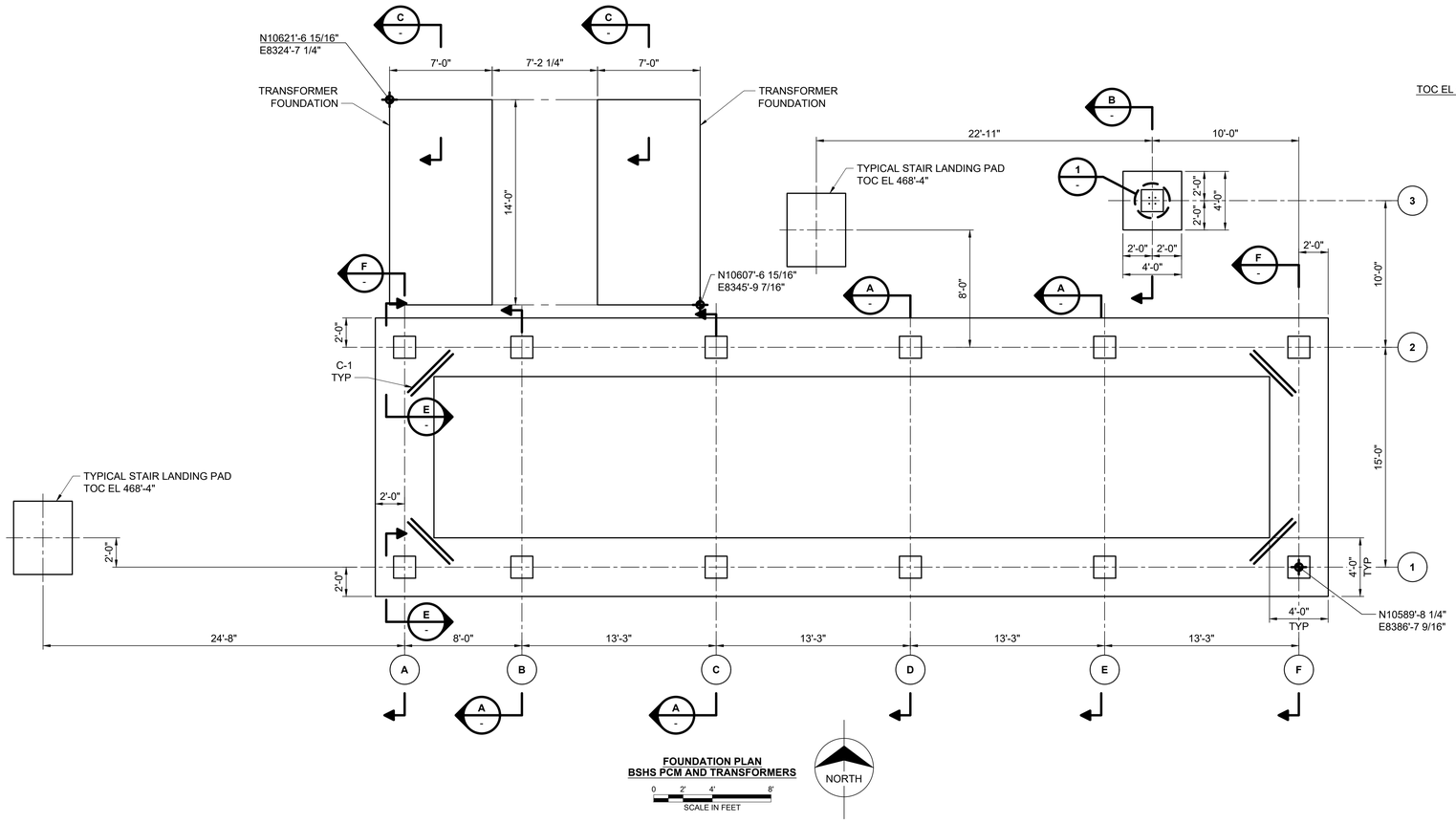
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION
JEFFERSON COUNTY, INDIANA

FOUNDATION
SECTIONS & DETAILS
RECYCLE & SETTLING TANKS

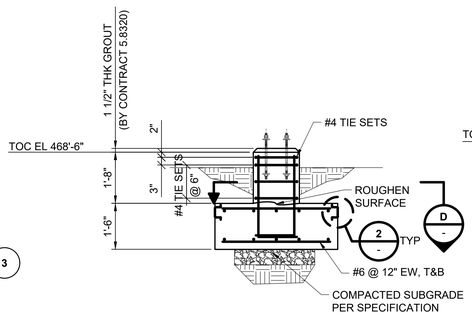
project 128991 | contract 5.8220
drawing SB102 – rev. A
sheet of sheets
file 128991SB102.dwg

Scale For Microfilming
Millimeters
Inches



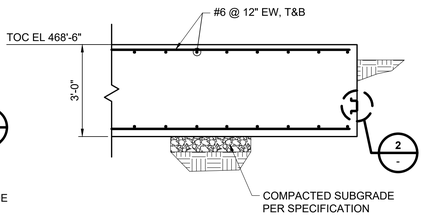
FOUNDATION PLAN
BSHS PCM AND TRANSFORMERS

SCALE IN FEET



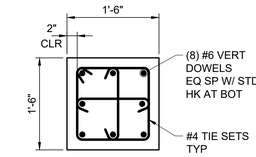
SECTION B

SCALE IN FEET



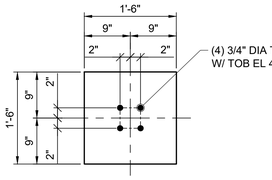
SECTION C

SCALE IN FEET



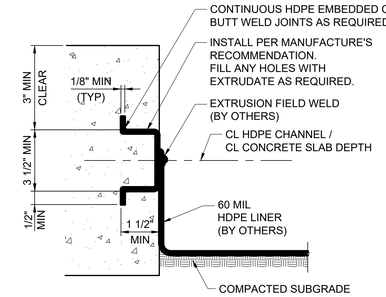
SECTION D

SCALE IN FEET



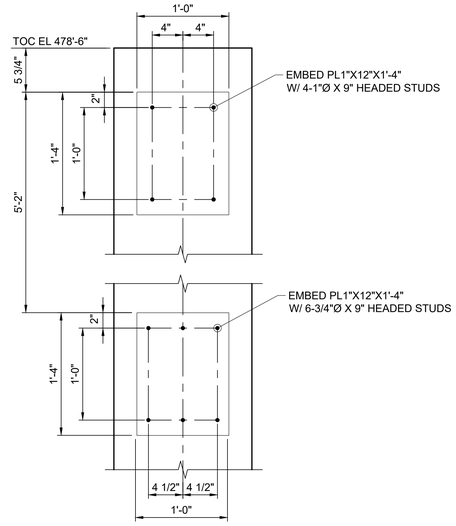
DETAIL 1

SCALE IN FEET



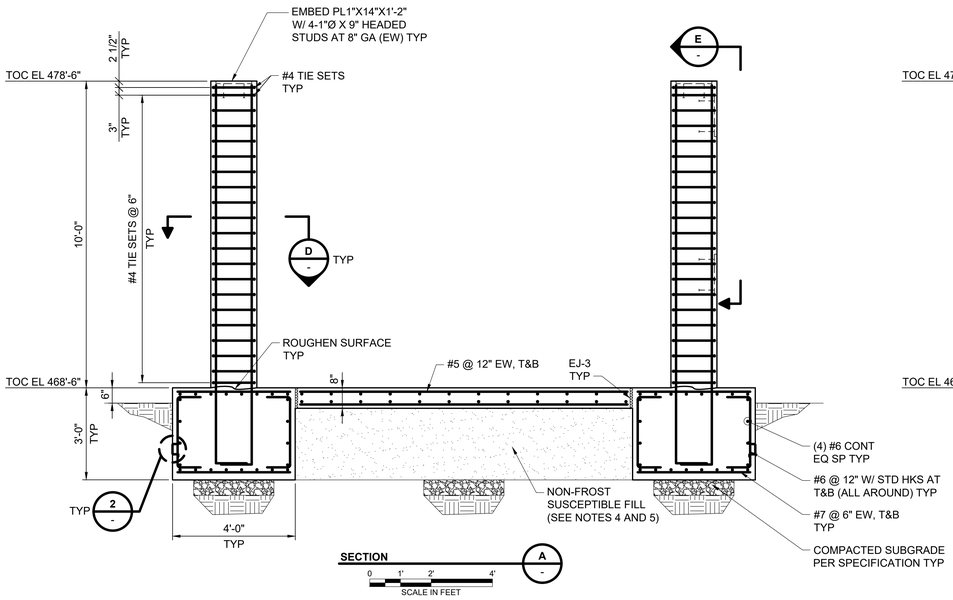
DETAIL 2
NOT TO SCALE

LINER ANCHOR TO NEW CONCRETE STRUCTURE
NOT TO SCALE



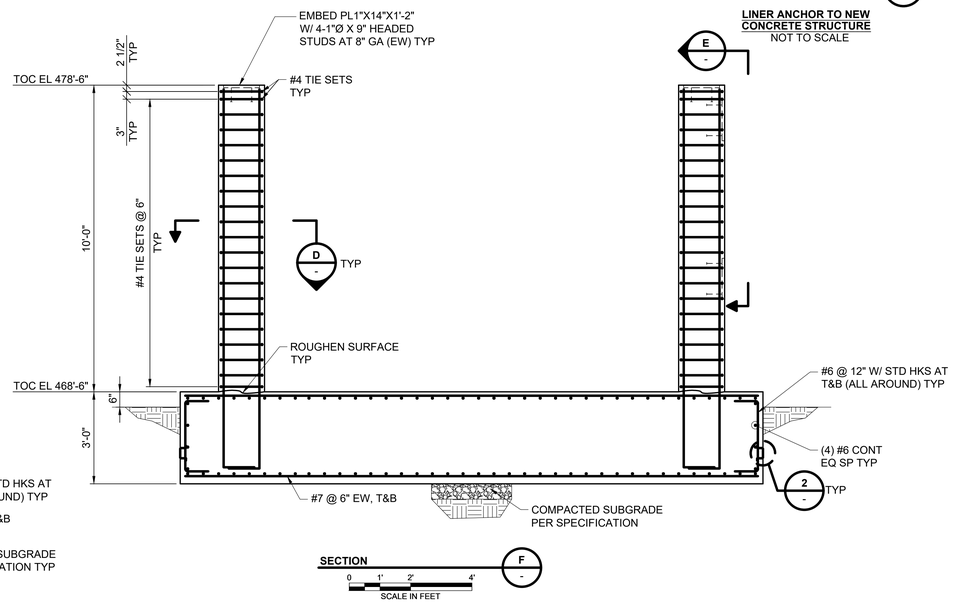
SECTION E

SCALE IN FEET



SECTION A

SCALE IN FEET



SECTION F

SCALE IN FEET

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 TO SB004.
2. FOR OVERALL FOUNDATION LAYOUT DETAILS SEE DRAWINGS SB100.
3. UNLESS OTHERWISE NOTED, ALL COORDINATES SHOWN ARE IN THE PLANT COORDINATE SYSTEM.
4. NON-FROST SUSCEPTIBLE MATERIAL SHALL BE FREE-DRAINING GRAVEL OR CRUSHED STONE WITH A MAXIMUM OF 5% PASSING A NUMBER 200 SIEVE (0.074 MM).
5. COMPACT NON-FROST SUSCEPTIBLE MATERIAL WITH A MINIMUM OF FOUR PASSES WITH A VIBRATORY ROLLER. STRUCTURAL GRANUAR FILL MATERIAL SHALL BE COMPACTED TO 85% MINIMUM RELATIVE DENSITY, AS DETERMINED BY ASTM D4253 AND ASTM D4254. LIFTS NOT TO EXCEED EIGHT INCHES

PRELIMINARY - NOT FOR CONSTRUCTION

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Burns & McDonnell Engineering Company, Inc.
Certificate of Authority No. 01557
designed S. PAWAR | detailed N. HATALKAR

OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION

JEFFERSON COUNTY, INDIANA

STRUCTURAL FOUNDATIONS
BSHS PCM AND TRANSFORMERS
FOUNDATION PLAN, SECTIONS AND DETAILS

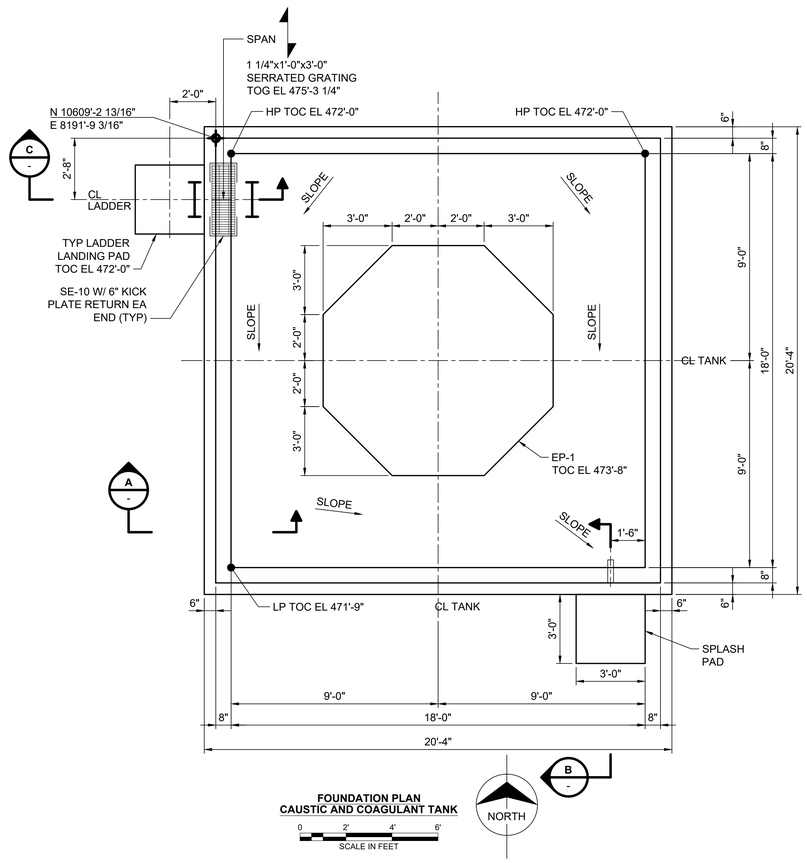
project	contract
128991	5.8220

drawing **SB103 – A** rev.

sheet of sheets

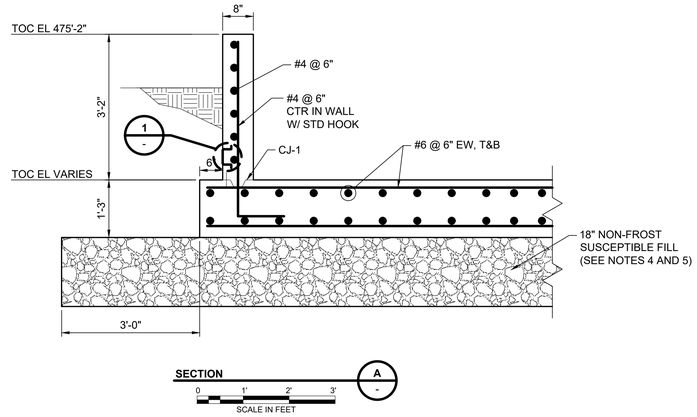
file 128991SB103.dwg

Scale For Microfilming
Millimeters
Inches



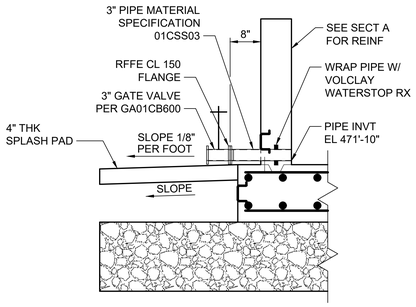
FOUNDATION PLAN
CAUSTIC AND COAGULANT TANK

0 2' 4' 6'
SCALE IN FEET



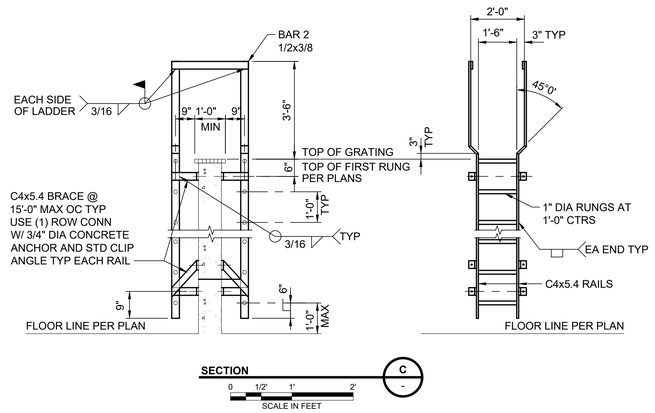
SECTION A

0 1' 2' 3'
SCALE IN FEET



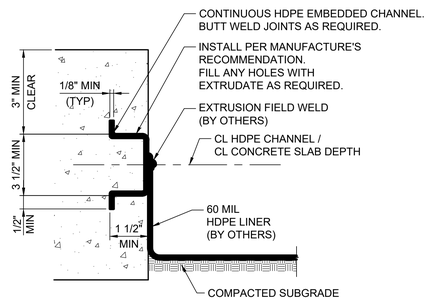
SECTION B

0 1' 2' 3'
SCALE IN FEET



SECTION C

0 1/2" 1' 2'
SCALE IN FEET



DETAIL
NOT TO SCALE

LINER ANCHOR TO NEW CONCRETE STRUCTURE
NOT TO SCALE

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 TO SB004.
2. FOR OVERALL FOUNDATION LAYOUT DETAILS SEE DRAWINGS SB100.
3. UNLESS OTHERWISE NOTED, ALL COORDINATES SHOWN ARE IN THE PLANT COORDINATE SYSTEM.
4. NON-FROST SUSCEPTIBLE MATERIAL SHALL BE FREE-DRAINING GRAVEL OR CRUSHED STONE WITH A MAXIMUM OF 5% PASSING A NUMBER 200 SIEVE (0.074 MM).
5. COMPACT NON-FROST SUSCEPTIBLE MATERIAL WITH A MINIMUM OF FOUR PASSES WITH A VIBRATORY ROLLER. STRUCTURAL GRANUAR FILL MATERIAL SHALL BE COMPACTED TO 85% MINIMUM RELATIVE DENSITY, AS DETERMINED BY ASTM D4253 AND ASTM D4254. LIFTS NOT TO EXCEED EIGHT INCHES

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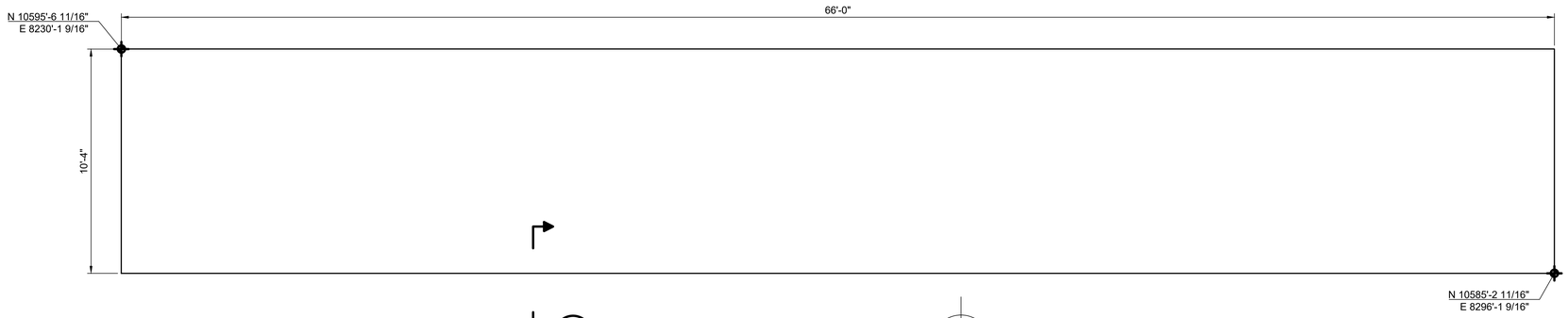
CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION

JEFFERSON COUNTY, INDIANA

STRUCTURAL FOUNDATIONS
CAUSTIC AND COAGULANT TANK
PLAN AND SECTIONS

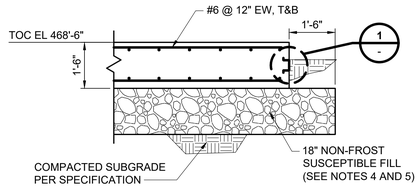
project 128991 | contract 5.8220
drawing **SB104 – A** | rev.
sheet | of | sheets
file 128991SB104.dwg

Millimeters
Scale For Microfilming
Inches

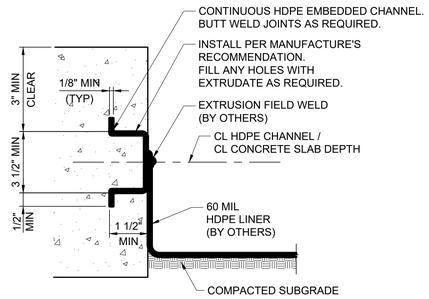


FOUNDATION PLAN
CHEMICAL FEED BUILDING
0 2' 4' 6'
SCALE IN FEET

NORTH



SECTION A -
0 1' 2' 4'
SCALE IN FEET



DETAIL 1 -
NOT TO SCALE

LINER ANCHOR TO NEW
CONCRETE STRUCTURE
NOT TO SCALE

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 TO SB004.
2. FOR OVERALL FOUNDATION LAYOUT DETAILS SEE DRAWINGS SB100.
3. UNLESS OTHERWISE NOTED, ALL COORDINATES SHOWN ARE IN THE PLANT COORDINATE SYSTEM.
4. NON-FROST SUSCEPTIBLE MATERIAL SHALL BE FREE-DRAINING GRAVEL OR CRUSHED STONE WITH A MAXIMUM OF 5% PASSING A NUMBER 200 SIEVE (0.074 MM).
5. COMPACT NON-FROST SUSCEPTIBLE MATERIAL WITH A MINIMUM OF FOUR PASSES WITH A VIBRATORY ROLLER. STRUCTURAL GRANUAR FILL MATERIAL SHALL BE COMPACTED TO 85% MINIMUM RELATIVE DENSITY, AS DETERMINED BY ASTM D4253 AND ASTM D4254. LIFTS NOT TO EXCEED EIGHT INCHES

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Certificate of Authority No. 01557
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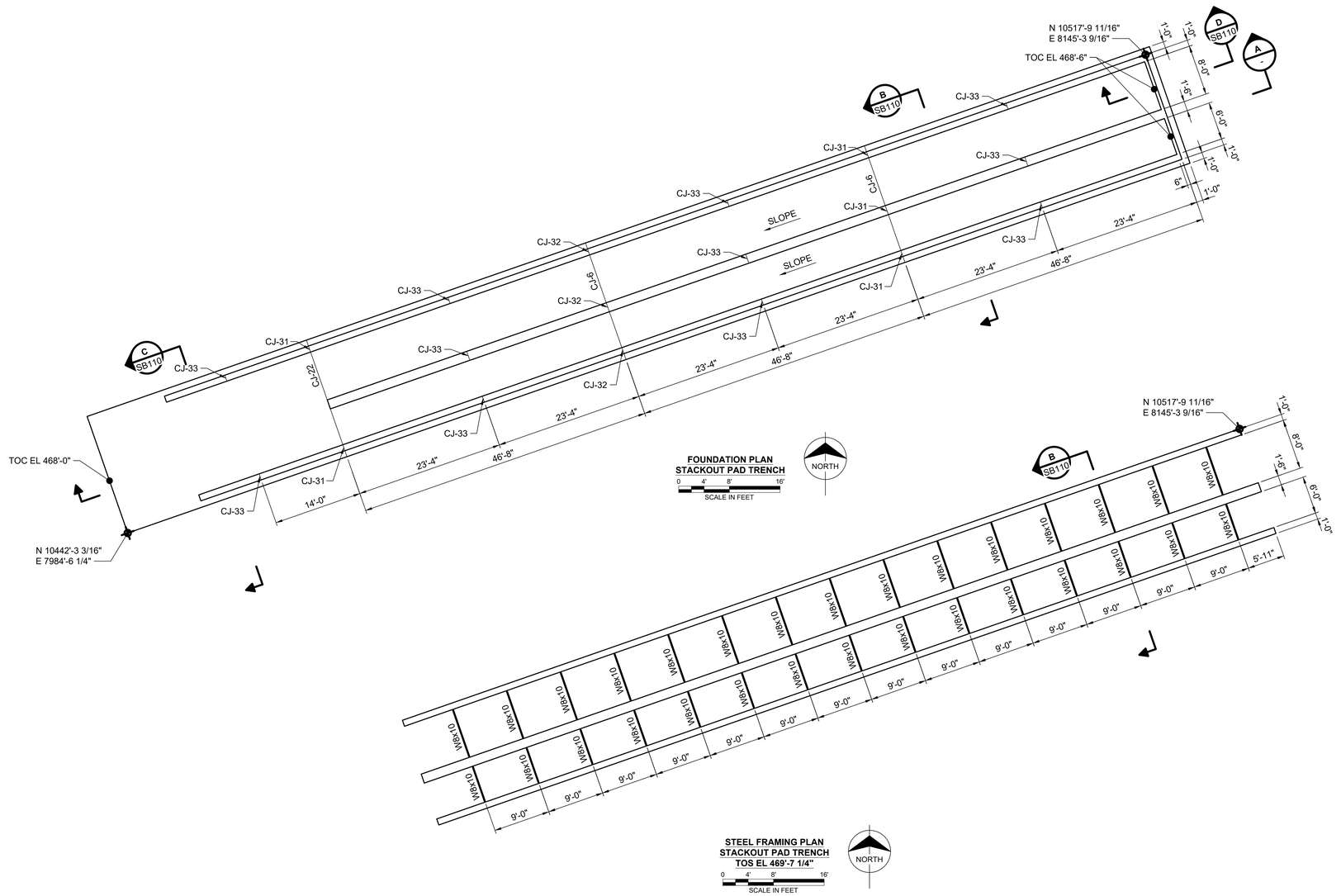
OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION
JEFFERSON COUNTY, INDIANA

STRUCTURAL FOUNDATIONS
CHEM FEED BUILDING
PLAN AND SECTION

project 128991 | contract 5.8220
drawing **SB105** – rev. **A**
sheet of sheets
file 128991SB105.dwg

Scale For Microfilming
Millimeters
Inches

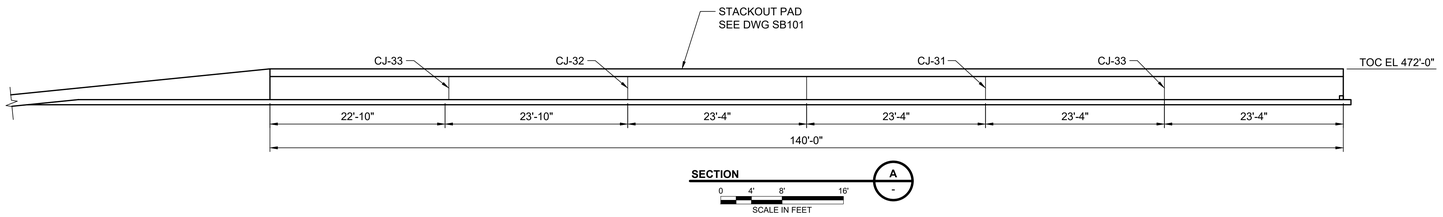


FOUNDATION PLAN
STACKOUT PAD TRENCH
0 4' 8' 16'
SCALE IN FEET

NORTH

STEEL FRAMING PLAN
STACKOUT PAD TRENCH
TOS EL 469'-7 1/4"
0 4' 8' 16'
SCALE IN FEET

NORTH



SECTION A -
0 4' 8' 16'
SCALE IN FEET

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 THROUGH SB004.
2. ALL CONCRETE TO BE SULFATE RESISTANT USING TYPE II CEMENT WITH A MINIMUM OF 20% CLASS F FLY ASH, MAXIMUM WATER/CEMEMT RATIO OF 0.40, AND SHALL HAVE A f'c OF 5000 PSI AT 28 DAYS.
3. CONTRACTOR TO MAINTAIN GROUND WATER LEVEL BELOW THE LOWEST EXCAVATION ELEVATION AT ALL TIMES DURING CONSTRUCTION.
4. PROVIDE SLAB AND WALL CONSTRUCTION JOINTS AS SHOWN. POUR IN CHECKERED BOARD PATTERN AND ALLOW NO LESS THAN 7 DAYS BETWEEN POURS. ALL CONSTRUCTION JOINTS TO HAVE PVC WATERSTOP.
5. DO NOT USE CURING COMPOUNDS. COMMENCE CURING WITHIN THREE HOURS OF FINISHING. USE BURLAP OR CARPET COVER KEPT CONTINUOUSLY WET FOR SEVEN DAYS MINIMUM WITH REWETTING EVERY OTHER DAY FOR FOUR ADDITIONAL DAYS.
6. FOR ALL SEALANTS AND FILLER, CONTRACTOR SHALL FOLLOW MANUFACTURIER'S RECOMMENDATIONS. USE FOAM FILLERS AND BACKER RODS AS REQUIRED.
7. EXPANSION JOINT FILLER SHALL BE PREFORMED ASPHALT IMPREGNATED FIBER CONFORMING TO ASTM D1751.
8. PVC WATER STOP SHALL BE SERRATED VIRGIN POLYVINYL CHLORIDE. ALL JOINTS AND SPLICES FOR PVC WATER STOP SHALL BE 100% FUSED. JOINTS SHALL BE MITERED AS REQUIRED SO THAT THE RIBS ARE CONTINUOUS. WHERE SLAB WATER STOPS ALIGN WITH WALL WATER STOPS REFER TO CONSTRUCTION JOINT INTERSECTION DETAIL.
9. FORM TIES SHALL BE WATER-SEAL COIL TYPE WITH CONICAL WALL DEPRESSIONS.
10. PROVIDE BROOM FINISH ON TANK FLOORS AND STACKOUT PAD.

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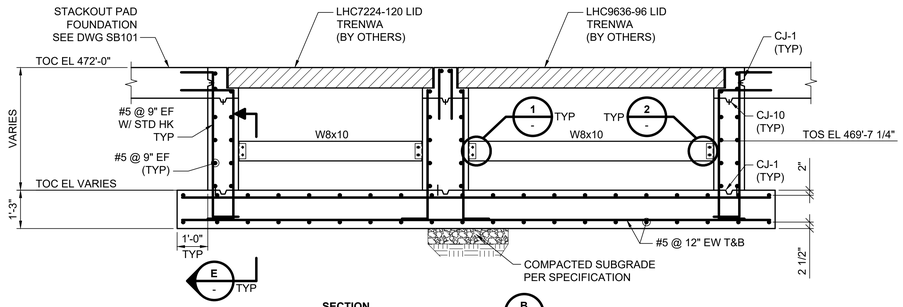
CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION
JEFFERSON COUNTY, INDIANA

FOUNDATION PLAN
TRENCH SETTLING TANK

project 128991 | contract 5.8220
drawing **SB109 – A** | rev.
sheet of sheets
file 128991SB109.dwg

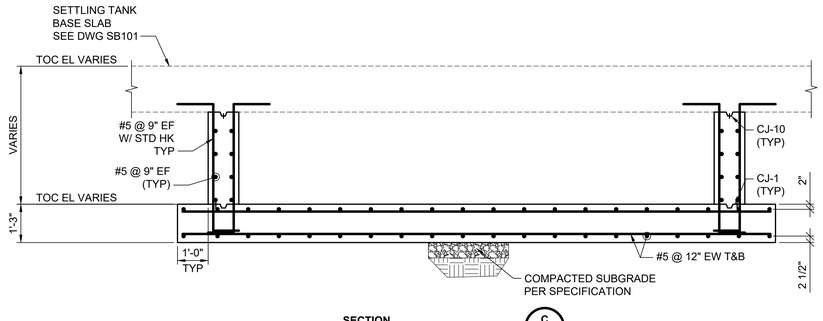
Scale For Microfilming
Millimeters
Inches



SECTION B SB109

SCALE IN FEET

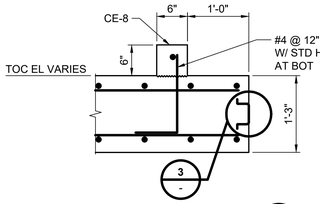
STACKOUT PAD REINFORCEMENT
NOT SHOWN FOR CLARITY



SECTION C SB109

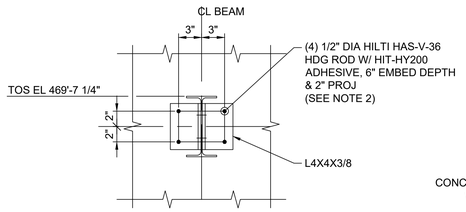
SCALE IN FEET

SETTLING TANK REINFORCEMENT
NOT SHOWN FOR CLARITY



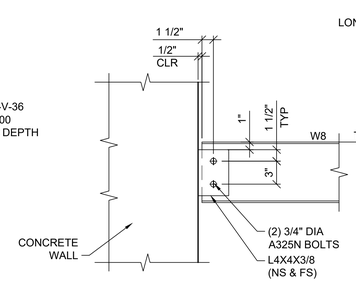
SECTION D SB109

SCALE IN FEET



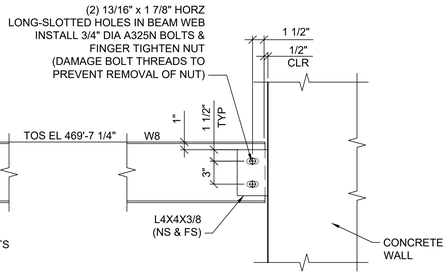
SECTION E -

SCALE IN FEET



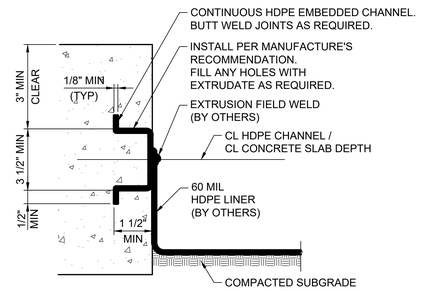
DETAIL 1 -

SCALE IN FEET



DETAIL 2 -

SCALE IN FEET



DETAIL 3 -
NOT TO SCALE

LINER ANCHOR TO NEW CONCRETE STRUCTURE
NOT TO SCALE

NOTES:

1. FOR GENERAL NOTES AND STANDARD DETAILS, SEE DRAWINGS SB001 THROUGH SB004.
2. ALL POST-INSTALLED ADHESIVE ANCHOR BOLTS SHOWN ON THIS DRAWING SHALL BE INSTALLED USING HILTI SAFE SET SYSTEM WITH HOLLOW DRILL BIT (TE-CD OR TE-YD) AND VC 150/300 VACUUM SYSTEM. VERIFY OVERALL EQUIPMENT LOCATION AND DIMENSIONS BETWEEN ANCHORS WITH APPROPRIATE EQUIPMENT DRAWINGS & ACTUAL EQUIPMENT IN THE FIELD BEFORE INSTALLING ANCHORS.

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	04/14/21	NSH	SSP	ISSUED FOR PRELIMINARY REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
Certificate of Authority No. 01557

designed S. PAWAR | detailed N. HATALKAR

OVEC IKEC
Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation

CCR/ELG PROJECT
CLIFTY CREEK GENERATING STATION

JEFFERSON COUNTY, INDIANA

FOUNDATION PLAN
TRENCH SETTLING TANK
SECTIONS AND DETAILS

project 128991 | contract 5.8220

drawing **SB110 – A** | rev.

sheet | of | sheets

file 128991SB110.dwg

Millimeters
Scale For Microfilming
Inches

APPENDIX H

Ditch Sizing Calculations

Ohio Valley Electric Corporation / Indiana-Kentucky Electric Corporation Madison Township, Indiana	**Clifty Creek Station** **Phase 2-4 Closure – West Boiler Slag Pond**

Stantec

Hydrologic and Hydraulic Analysis Ditch Sizing Calculations

Purpose:

- Calculations to determine sizing of drainage ditches on the final grade closure plan

Methods:

PCSWMM was used to size and model the stormwater ditch network and simulate the peak discharges in the ditches. The model was simulated using the Curve Number Infiltration method and dynamic wave flow routing.

Table 1 - Design Standards and References

Parameter	Design Standard/Method/Source
Design Storm	25-Year, 24-Hour Recurrence Interval
Curve Number	TR-55, SCS CN methodology
Rainfall Temporal Distribution	Soil Conservation Service (SCS) Type II (USDA, 1986)
Rainfall Intensity	NOAA Atlas 14 Precipitation Frequency Data Server
Subbasin Area	Delineation based on Permit Drawings Dated 04.16.2021

Parameters:

Climatological Data:

The 25-year, 24-hour storm was used to determine ditch capacity. Peak rainfall depths for the design storm were taken from NOAA Atlas 14 Precipitation Frequency Data Server specific to the geographic location of the Clifty Creek Plant. The selected Point Precipitation depth is shown in Table 1. An SCS Type II temporal distribution was used to model the rainfall hyetograph over the 24-hour duration.

Table 1 - NOAA Atlas 14 PFDS Rainfall Depths

Storm Return Interval and Duration	Rainfall depth (inches)
25-year, 24-hour	5.30

Watershed Delineation:

Subcatchment delineations were completed in PCSWMM based on the permit design final grade surface. Table 2 provides a breakdown of the subcatchment areas. Subcatchment delineations are shown in Appendix A

Curve Numbers

The NRCS curve number method was used to estimate infiltration during the design storm event. A composite curve number was generated for the watershed using SCS hydrologic soil group data and land use data determined from aerial imagery. Curve number values for each land use and soil type combination were assigned based on the values published in Tables 2-2a through 2-2d in TR-55 (NRCS, 1986). To model the final closed conditions, land uses of "Meadow" (CN = 78) was assumed for the cap liner system and land use of "Open spaces – Fair" (CN = 84) was assumed for regraded areas around the cap. A summary of curve numbers used in this analysis is provided in Table 2

Table 2 – Subbasin Drainage Areas and Curve Numbers

Subbasin	Area (acres)	Composite Curve Number
Primary_Basin	3.44	92
R4	12.41	89
S6	0.49	84
S7	1.29	80
SB12	11.88	83
SB23A	12.73	90
SB24	9.38	79
SB25_2	3.28	85
SB26	6.82	76
Secondary_Basin	13.79	95
WBAP_01	0.06	78
WBAP_02	0.05	78
WBAP_03	1.23	79
WBAP_05	1.46	78
WBAP_06	0.41	79
WBAP_07	0.6	81
WBAP_08	0.51	81
WBAP_09	0.84	79
WBAP_1	0.39	80
WBAP_10	0.95	80
WBAP_11	1	80
WBAP_12	0.44	79
WBAP_13	2.23	78
WBAP_14	0.99	79
WBAP_15	1.19	78
WBAP_16	0.6	78
WBAP_17	1.19	80
WBAP_19	1.71	78
WBAP_2	0.24	80

Table 2 – Subbasin Drainage Areas and Curve Numbers, cont'd

Subbasin	Area (acres)	Composite Curve Number
WBAP_20	1.2	78
WBAP_21	8.63	77
WBAP_22	0.32	78
WBAP_23	0.93	78
WBAP_24	5.46	78
WBAP_25	4.54	77
WBAP_3	4.5	80
WBAP_4	8.11	78
WBAP_5	1.44	79
WBAP_6	3.17	79
WBAP_7	0.76	79
WBAP_8	3.6	82
WBAP_9	4	80
WBAP_CL_01	0.87	85
WBAP_CL_02	0.88	83
WBAP_CL_03	5.33	85
WBAP_CL_04	1.1	78
WBAP_CL_05	4.01	85
WBAP_CL_06	4.31	83
WBAP_CL_08	2.18	80
WBAP_CL_09	1.2	84
WBAP_CL_1	1.65	78
WBAP_CL_3	1.79	78
WBAP_CL_4	1.27	78

Calculations/Results:

Peak Discharges were calculated in the dynamic PCSWMM model. Peak discharges for each ditch type are shown in the table below

Table 3 – Peak Discharge Calculations

Ditch	Peak 25-year Q (cfs)
West Stormwater Ditch	184.02
East Stormwater Ditch	77.92
Overflow Ditch	119.5
Ditch 10	58.92
Ditch 11	39.2
Ditch 12	44.66

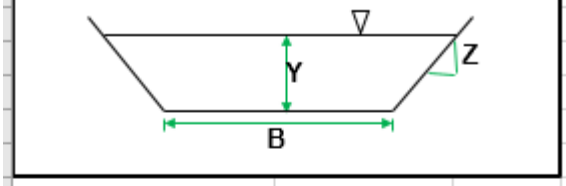
Peak discharges were used to calculate normal depth in the final cover ditches. Ditches were sized to convey the peak discharge accordingly.

Methods:

Hydraulic calculations were performed to determine minimum ditch size required to convey the peak discharges. Manning's equation was used to estimate flow depth in each ditch. The peak flow calculated was used to size all ditches.

West Stormwater Ditch Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	184.02
Bottom Width (ft)	B	6
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0050
Manning's Roughness	n	0.017

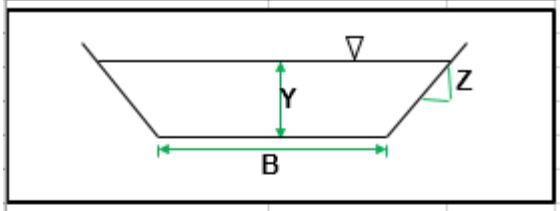
Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	2.04
Calculated Flow (cfs)	Q_C	184.0
Flow Area (ft^2)	A	24.8
Wetted Perimeter (ft)	P_W	18.9
Hydraulic Radius (ft)	R_H	1.31
Top Width (ft)	TW	18
Average Velocity (ft/s)	V_{Avg}	7.42
Specific Energy (ft)	E	2.90
Froude Number	FN	1.12

The maximum estimated depth in the channel is 2.04 feet and is less than the design depth of 4 feet.

East Stormwater Ditch Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	77.92
Bottom Width (ft)	B	6
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0050
Manning's Roughness	n	0.017

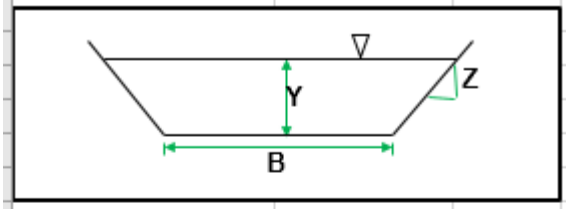
Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	1.33
Calculated Flow (cfs)	Q_C	77.9
Flow Area (ft^2)	A	13.3
Wetted Perimeter (ft)	P_W	14.4
Hydraulic Radius (ft)	R_H	0.92
Top Width (ft)	TW	14
Average Velocity (ft/s)	V_{Avg}	5.87
Specific Energy (ft)	E	1.86
Froude Number	FN	1.06

The maximum estimated depth in the channel is 1.33 feet and is less than the design depth of 4 feet.

Overflow Ditch Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	119.5
Bottom Width (ft)	B	10
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0050
Manning's Roughness	n	0.03

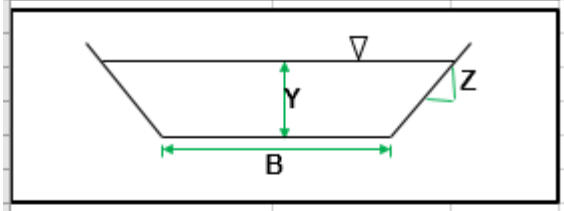
Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	1.83
Calculated Flow (cfs)	Q_C	119.5
Flow Area (ft^2)	A	28.4
Wetted Perimeter (ft)	P_W	21.6
Hydraulic Radius (ft)	R_H	1.31
Top Width (ft)	TW	21
Average Velocity (ft/s)	V_{Avg}	4.21
Specific Energy (ft)	E	2.11
Froude Number	FN	0.64

The maximum estimated depth in the channel is 1.83 feet and is less than the design depth of 2 feet.

Ditch 10 Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	58.92
Bottom Width (ft)	B	4
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0100
Manning's Roughness	n	0.03

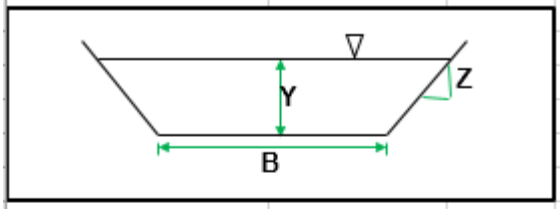
Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	1.48
Calculated Flow (cfs)	Q_C	58.9
Flow Area (ft^2)	A	12.4
Wetted Perimeter (ft)	P_W	13.3
Hydraulic Radius (ft)	R_H	0.93
Top Width (ft)	TW	13
Average Velocity (ft/s)	V_{Avg}	4.74
Specific Energy (ft)	E	1.82
Froude Number	FN	0.85

The maximum estimated depth in the channel is 1.48 feet and is less than the design depth of 2 feet.

Ditch 11 Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	39.2
Bottom Width (ft)	B	4
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0050
Manning's Roughness	n	0.03

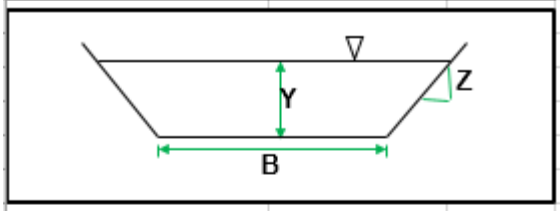
Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	1.43
Calculated Flow (cfs)	Q_C	39.2
Flow Area (ft^2)	A	11.9
Wetted Perimeter (ft)	P_W	13.1
Hydraulic Radius (ft)	R_H	0.91
Top Width (ft)	TW	13
Average Velocity (ft/s)	V_{Avg}	3.30
Specific Energy (ft)	E	1.60
Froude Number	FN	0.60

The maximum estimated depth in the channel is 1.43 feet and is less than the design depth of 2 feet.

Ditch 12 Calculations – 25-year, 24-hour storm

Normal Depth - Trapezoidal Channel



User Input		
Discharge (cfs)	Q	44.66
Bottom Width (ft)	B	10
Side Slope 1 (ft/ft)	Z_1	3
Side Slope 2 (ft/ft)	Z_2	3
Channel Slope (ft/ft)	S_o	0.0050
Manning's Roughness	n	0.03

Evaluate Normal Depth

Normal Depth Output		
Normal Depth (ft)	Y	1.07
Calculated Flow (cfs)	Q_C	44.7
Flow Area (ft^2)	A	14.2
Wetted Perimeter (ft)	P_W	16.8
Hydraulic Radius (ft)	R_H	0.85
Top Width (ft)	TW	16
Average Velocity (ft/s)	V_{Avg}	3.14
Specific Energy (ft)	E	1.23
Froude Number	FN	0.60

The maximum estimated depth in the channel is 1.07 feet and is less than the design depth of 2 feet.

References:

NOAA. (2013). *NOAA Atlas 14 Point Precipitation Frequency Estimates*. Retrieved July, 2015, from http://dipper.nws.noaa.gov/hdsc/pfds/

USDA. (1986). Urban Hydrology for Small Watersheds, TR-55. United States Department of Agriculture.

Indiana Department of Transportation – 2013 Design Manual, Chapter 202 Hydrology, Revision Date Feb. 2014

Attachments:

Attachment A: Final Grade Subbasin Boundaries

Calculation Performed by: Stantec Consulting Services Inc.	
Prepared by: Brenton Newswanger	*Reviewed by: Nick Mueller*
Revisions:R0	

Appendix A - Subbasin Boundaries

APPENDIX I

Final Cover Soil Loss

The Universal Soil Loss Equation (USLE) is:

A = (R)(LS)(P)(K)(C)

where: A = soil loss in tons/acre/year,
R = rainfall erosion index,
LS = slope length and steepness factor,
P = erosion control practice factor,
K = soil erodibility factor, and
C = vegetative cover factor.

Under 329 IAC 10-30-2, the final cover must have a maximum erosion rate of five tons per acre per year. Therefore, A ≤ 5.0 tons/acre/year.

R = 180 (southeastern Indiana in Figure 54)

LS = 0.34
for a 275-foot distance at 2.5% slope (such as a drainage channel).
Assuming bare earth prior to riprap/geotextile placement.
(USDA, AH537, 1981 - attached)

P = 1.00
K = 0.43
C = 0.01
(Indiana State Board of Health, 1986 – memorandum attached)

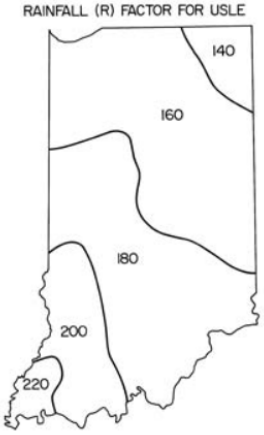


Fig 54. Map of Indiana showing rainfall intensity values (R factor).

1 - https://www.agry.purdue.edu/soils_judging/new_manual/ch6-water.html

A = (180)(0.34)(1.00)(0.43)(0.01) = 0.26 tons/acre/year for a slope length of 275 feet at 2.5%.

For Phases 2, 3, and 4, the steepest slope (excluding the 2.3:1 and 3:1 ditch sideslopes) is 2.5% with a maximum flow path of approximately 275 feet (less than the above calculation). The longest flow path on the surface is roughly 1,900 feet with a slope of 0.5%.

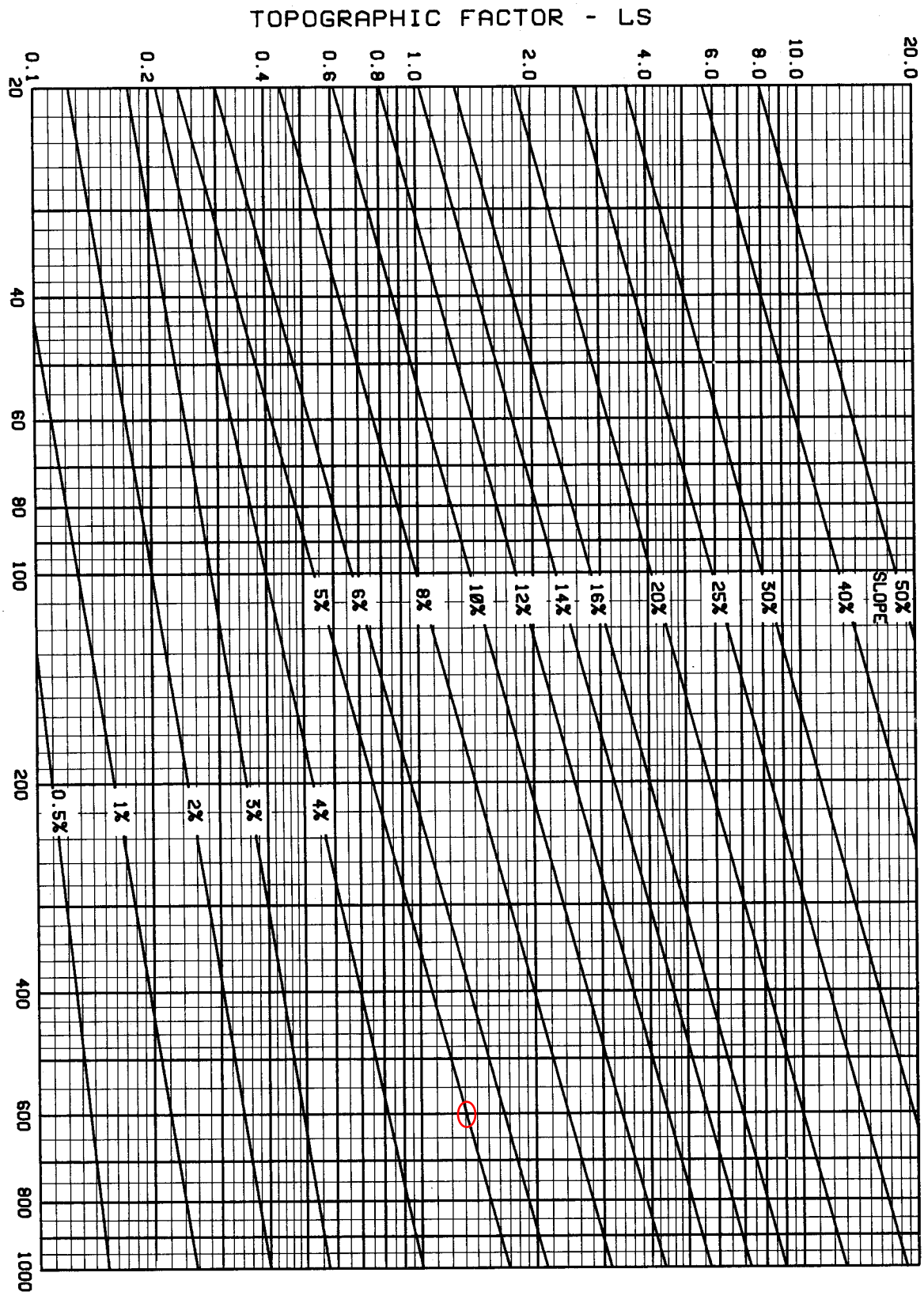


FIGURE 4.—Slope-effect chart (topographic factor, LS). $LS = (\lambda/72.6)^m$ (65.41 $\sin^2\theta + 4.56 \sin\theta + 0.065$) where λ = slope length in feet; θ = angle of slope; and $m = 0.2$ for gradients < 1 percent, 0.3 for 1 to 3 percent slopes, 0.4 for 3.5 to 4.5 percent slopes, and 0.5 for slopes of 5 percent or steeper.

Form 4336

STATE BOARD OF HEALTH

INDIANAPOLIS

OFFICE MEMORANDUM

DATE: January 3, 1986

TO: James E. Traylor
Technical Support Branch

THRU: Bruce Palin

FROM: Duane Leith
Engineering Section

SUBJECT: Guideline for the Evaluation of the Erosion Potential of Landfill Covers

Sanitary landfill covers should be designed for erosion control in order to avoid later exposure of the refuse and infiltration into the refuse. The design standards which are used can be controlling factors for the size and steepness of a landfill and are therefore often the basis for deciding when a landfill will have to close. It is therefore important to have reasonable and defensible standards. The most recent guidance available to staff in this regard is a memo by Mr. Larry Dunbar dated October 17, 1984, entitled "Evaluation of Design of Final Cover for Landfills." Certain publications recently available to staff and conversations with staff of the Soil Conservation Service have led to the conclusion that the guidance contained herein would be more appropriate than the previously-mentioned memo.

The Governor's Soil Resource Study Commission has proposed goals for erosion and sediment reduction as set forth in their report "Indiana's Erosion and Sedimentation Situation." Briefly, these goals are to reduce erosion on all land to an average annual rate denoted as "T" or the tolerable limit, which prevents depletion of the soil resource and to control all off-site sedimentation by application of best available technology. "T" is the rate at which the soil replaces itself. It is based on factors such as soil depth, texture, and permeability; its value is a matter of judgment rather than being quantifiable. The value of "T" is reported to range between two and five plus tons/acre/year. A value of five tons/acre/year is recommended as a standard under this guideline with an exception as noted.

The currently accepted method for determining the erosion potential of landfill covers is found in Agriculture Handbook 537, "Predicting Rainfall Erosion Losses," which is available from SCS offices. Application of the Universal Soil Loss Equation (USLE) from Agriculture Handbook 537 is conducted as follows:

A = RKLSCP, where:

A is the average soil loss in tons per acre calculated on an annual basis for landfill design.

R is the rainfall and runoff factor as obtained from the map Figure 1, inserted between pages 6 and 7 of the handbook, copy is attached to this document. This value ranges from 130 to 225 depending on location.

K is the soil erodibility factor as obtained from Figure 3 on page 11 of the handbook (copy attached), for the composition, structure and permeability of the surface soil as replaced over the landfill. This generally ranges from .30 to .50. If the soil source or characteristics are unknown, it has been recommended that a value of 0.43 be used for landfills.[1]

LS is the combined topographic factor for the length and slope which can be found from Table 3 on page 12, or the chart on page 13 of the handbook, copies of which are attached. Most landfills will have irregular convex slopes. The LS value for irregular slopes is determined by the procedures specified on page 16 of the handbook. The slope is divided into successive equal length segments of uniform slope. The LS factor is obtained for each segment at its respective slope and at a length equal to the total slope length. This LS factor is then adjusted by the "fraction of soil loss" figures shown under the column M = 0.5 in Table 4 on page 15 of the handbook, copies attached. Alternatively, this figure can be obtained from the equation

$$\text{Soil loss fraction} = \frac{i^{m+1} - (i-1)^{m+1}}{N^{m+1}}$$

where: i = segment sequence number, m = slope length exponent of 0.5 for slopes greater than or equal to five percent. N = the number of equal length segments into which the slope was divided. The sum of the adjusted LS values is the LS value to be used for the entire slope.

C is the cover and management factor which can be found from Table 10 on page 32 of the handbook, or the copy attached. For properly prepared and seeded landfill covers which will be maintained in sod, use a value of 0.01. If a different vegetative cover is planned, adjust the value to reflect the anticipated conditions using Tables 5 through 12 of the handbook. A value of C lower than 0.01 should be allowed only with very intensive specifications regarding cover preparation, fertilization, seeding, and management. In order to establish high productivity, staff of the Soil Conservation Service discussed fertilization rates of 1,000 lbs/acre and contractor prices for fertilization, mulching, and seeding of $700 to $1,000 per acre.

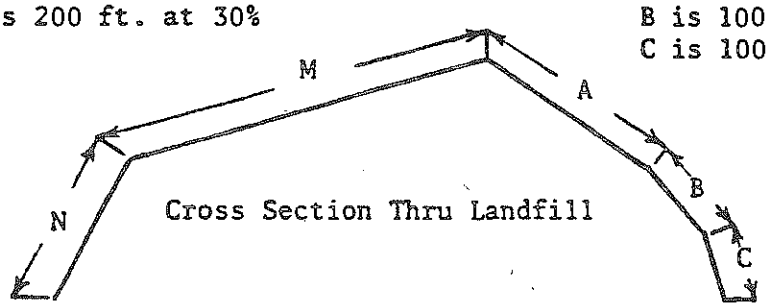
[1] Verbal communication with Mr. Raymond Sinclair of the Soil Conservation Service on October 7, 1985.

P is the supporting practices factor. For landfills, the value of P is 1.00, unless the site is to be used as cropland. Use the figures from Table 13 on page 35 and Table 14 on page 36 of the handbook as required for landfills used for cropland.

Sample calculation:

M is 800 ft. at 6%
N is 200 ft. at 30%

A is 300 ft. at 4%
B is 100 ft. at 10%
C is 100 ft. at 25%



Cross Section Thru Landfill

To determine A values for slopes A, B, C, and M, N:

For slopes A, B, and C

1. R = 175, for Marion County location on the rainfall and runoff map.

2. K = 0.43, assumed typical value since actual soil samples have not been tested.

3. LS determination:

Total Slope Length	Segment	Slope	LS Value from Figure 4	Adjustment Factor from Table 4	Revised LS Value
500 ft	A1	4%	.76	.09	.07
(5	A2	4%	.76	.16	.12
segments	A3	4%	.76	.21	.16
of 100 ft	B4	10%	3.06	.25	.77
each)	C5	25%	13.20	.28	3.70
					Total 4.82

4. C = 0.01, from grass sod, well maintained.

5. P = 1.0, since it is not tilled cropland.

Following the USLE: A = RKLSCP

A = 175 x .43 x 4.82 x .01 x 1.00, for slope A, B, C

A = 3.63 tons per acre

Since A is less than or equal to five tons per acre, this slope is acceptable.

For slopes M and N

1000 ft	M1	6%	2.13	.09	.19
(5	M2	6%	2.13	.16	.34
segments	M3	6%	2.13	.21	.45
of 200 ft	M4	6%	2.13	.25	.53
each)	M5	30%	25.57	.28	7.16
				Total	8.67

A = 175 x .43 x 8.67 x .01 x 1.00, for slope MN

A = 6.52 tons per acre

Since A is greater than five tons per acre, this slope is not acceptable.

It has been suggested that a possible way for a facility to have a cover with an A value higher than five would be to increase the cover depth on the lower slopes. The increased depth can allow for the formation of gullies which can then be stone-lined or similarly stabilized. Whether the increased A value should be allowed and the calculation of the necessary depth increase is not within the scope of this guidance. Erosion control is not the only factor to be considered in cover design. Other factors, such as prevention of ponding, slope stability, drainage, and feasibility of maintenance, will need to be considered.

In conclusion, it is recommended that sanitary landfill covers be designed for an A value not greater than five tons/acre/year, as determined by the Universal Soil Loss Equation from Agriculture Handbook 537. It is further recommended that a K value of 0.43 be used in calculating the A value for typical landfill soils.

References and documents.

1. Predicting Rainfall Erosion Losses, 1978, Agricultural Handbook 537, U.S.D.A.

2. Indiana's Erosion and Sediment Situation, 1984, Governor's Soil Resources Study Commission.

3. Dunbar, Larry, Office Memo to Engineering Staff, October 17, 1984.

4. Design and Construction of Covers for Solid Waste Landfills, 1979, EPA-600/2-79-165, U.S. EPA.

Guideline No. _____

Comment period ends _____.

APPENDIX J

WBSP Phases 2-4 Quality Management Plan (QMP)

Construction Quality Management Plan (QMP)

West Boiler Slag Pond Closure Phases 2-4 and Low Volume Waste Treatment System

Clifty Creek Plant
Jefferson County, Madison, Indiana

Issued for Bid – 60% Design

Prepared for:

Indiana-Kentucky Electric Corporation

Prepared by:

Stantec Consulting Services Inc.

May 21, 2021

Abbreviations

CCR	Coal Combustion Residuals
CM	Construction Manager
CQA	Construction Quality Assurance
CQC	Construction Quality Control
EDC	Engineering during Construction
EOR	Engineer of Record
EM	Engineering Manager
FR	Field Representative
FTP	File Transfer Protocol
IKEC	Indiana-Kentucky Electric Corporation
LVWTS	Low Volume Wastewater Treatment System
NCR	Nonconformance Reports
OD	Observed Deficiency
POD	Plan of the Day
QMP	Quality Management Plan
RFI	Request for Information
WBSP	West Boiler Slag Pond

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of the Construction Quality Management Plan (QMP) is to promote quality of the constructed work. It consists of three main components, namely, Construction Quality Control (CQC), Construction Quality Assurance (CQA), and Engineering during Construction (EDC). The CQC activities are the Subcontractor's responsibility. The CQA activities are an audit process, performed by the CQA Team, to make sure that the Subcontractor's CQC plan is implemented and on track. EDC activities consist primarily of reviewing and responding to Subcontractor submittals and requests for information (RFIs), and general design support throughout construction.

This Construction QMP provides guidance to the project team and establishes assessment, reporting, and documentation procedures to be implemented throughout the project. Where conflict arises between the requirements of this QMP and the contract documents, the most stringent requirements shall govern.

This QMP describes the CQC and CQA management structure, personnel requirements, and minimum project requirements. This QMP also serves as an outline to develop site-specific protocols based on conditions encountered during the work.

1.2 SCOPE OF WORK

This Construction QMP has been prepared for the West Boiler Slag Pond (WBSP) Closure Phases 2-4 and Low Volume Wastewater Treatment System (LVWTS) project.

This project is the final three of four total phases of closure at the WBSP. Phases 2-4 generally consist of the following activities:

- Grading existing coal combustion residuals (CCR) to proposed subgrade elevations.
- Constructing settling tanks and the primary and secondary treatment basins.
- Constructing drainage ditches and a new outfall.
- Installing a final cover system consisting of an LLDPE geomembrane, geocomposite drainage layer, and cover soil.
- Constructing access roads and ramps.

1.3 CONSTRUCTION QUALITY CONTROL AND QUALITY ASSURANCE

The QMP establishes the requirements for CQC and CQA. It outlines roles, responsibilities, CQC and CQA activities, and establishes project processes and procedures. The CQC/CQA Program structure is shown below as Figure 1-1.

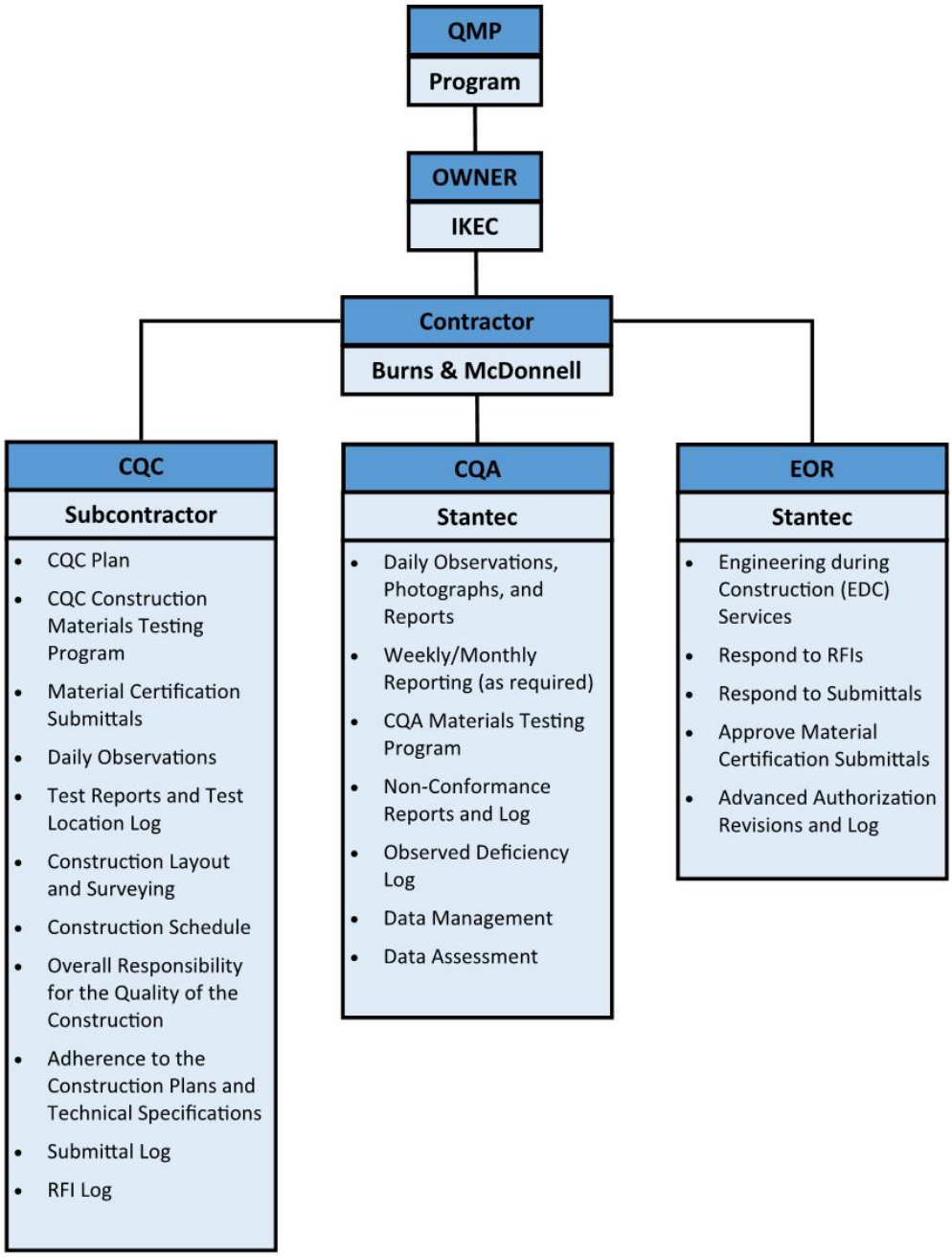

Figure 1-1. General Program Structure for CQC/CQA Program

1.4 SURVEY REQUIREMENTS

The Subcontractor shall provide construction layout services to execute the work according to the contract documents. Final as-built surveys and CQC surveys will be conducted by the Subcontractor and may be supplemented with surveys conducted by the Owner, Contractor, CQA Manager, or identified representative. As-built surveys shall be performed under the supervision of a professional surveyor licensed in the state of Indiana.

1.5 LIMITATIONS

The QMP does not include any facility elements outside the limits of construction designated on the Plans for Construction.

1.6 WORKING ON ASH

The Subcontractor shall be aware that there are inherent risks associated with working on CCR, including but not limited to, soft bearing conditions and unstable slopes. failures and instabilities may occur on apparently firm surfaces when loaded, or during active drawdown and dewatering. It is the Subcontractor's responsibility to actively manage their equipment and personnel to safely execute the work. the Subcontractor shall provide an access and excavation work plan that outlines their means and methods for working on CCR surfaces. The plan shall include sequencing of work and note the equipment and materials used.

Subcontractor is responsible for maintaining the stability of the CCR surfaces and perimeter dikes during construction. Subcontractor shall develop a monitoring plan detailing the type of monitoring to be performed (visual, installation of geotechnical instrumentation, or other methods). The plan shall also include, at a minimum, the potential for sloughing or instability of the perimeter dikes due to groundwater levels, how the risks will be mitigated, and how progressive failures along the perimeter dikes will be reduced and mitigated. the monitoring plan shall be submitted to the owner and their representative for review and approval.

The Subcontractor is responsible for all site safety and near surface ash stability at the site and shall follow all OSHA, Contractor, and owner safety requirements including but not limited to man on the ground exclusion zones. Furthermore, the Subcontractor shall provide to the owner a slope stability analysis prepared by a Registered Engineer in the State of Indiana for all excavations 10-feet or greater located outside of the exclusion zones or as directed by the Contractor. All evaluated excavations will require a minimum factor of safety of 1.3. The Subcontractor shall also prepare and provide to the owner for review a plan outlining all exclusion zones to include, but not limited to, barriers, setbacks, signage, and guidelines for entry.

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 PROGRAM ROLES AND RESPONSIBILITIES

The major participants in the project are listed below along with a description of their roles. An organizational chart is provided in Figure 1-1.

2.1.1 Owner

The plant and its ancillary functions are owned and operated by the Indiana-Kentucky Electric Corporation (IKEC). The Owner will administer communication with any regulatory agencies, including any related permit modifications. The Owner has contracted with the Contractor to serve as the Construction Manager (CM) who shall approve any design and/or QMP revisions.

2.1.1.1 Construction Manager (CM)

The Construction Manager (CM) is responsible for coordinating with the Subcontractor regarding contractual issues, including scope, budget, and schedule. In addition, the CM will provide daily oversight of the construction activities. The CM has the authority to stop work that is not in conformance with the Plans for Construction and Technical Specifications. The CM is responsible for tracking submittals and RFIs. The CM will then distribute the submittals and RFIs, as needed, to the appropriate party.

In addition, the CM or qualified representative shall perform at least monthly inspections of the WBSP facility. These inspections shall include observations of all outslopes for indications of slope instability including tension cracks, sloughs, and excessive seepage. These inspections shall be documented and retained within the project records. Any suspect site conditions shall be promptly reported to the Owner.

2.1.2 Engineer of Record (EOR)

The Engineer of Record (EOR) is responsible for development of the technical components of the project. During field implementation, the Engineer will provide support to the CQA Team for construction observation and CQA services.

Specific examples of Engineer responsibilities include responding to technical RFIs and submittals, supporting the CQA team, and review of field-testing data.

2.1.3 CQA Manager

The Construction Quality Assurance (CQA) Manager shall be responsible for the execution of the CQA program and related documentation as outlined in the QMP for all work performed. The CQA Manager shall be a Professional Engineer licensed in the state of Indiana.

2.1.4 Contractor

The Prime Contractor (Contractor) holds the Engineering, Procurement, and Construction contract directly with the Owner. The Contractor is responsible for coordinating the design, procurement, and construction work to complete the project. The Subcontractor (CQC Team), CQA Team and Engineer are contracted with the Prime Contractor for execution of the project.

2.1.5 Subcontractor

The Subcontractor is responsible for execution of the work in accordance with the contract documents. The Subcontractor is solely responsible for field implementation activities, including instrumentation and monitoring. The Subcontractor will collaborate with the CM to propose adjustments (if needed) to the scope of work depending on encountered conditions. Review and approval of scope of work adjustments shall be made by the Engineer.

Specific examples of Subcontractor responsibilities include, but are not limited to, data collection and providing that data to the Owner; development and implementation of the CQC Plan, including development of applicable procedures, processes, and work plans; reporting in accordance with the Technical Specifications; CQC materials testing; quantity tracking; conformance to the Technical Specifications; and structure and ground movement monitoring data collection and reporting.

2.1.5.1 Construction Quality Control Manager

The Subcontractor's CQC Manager shall have a minimum of five years of construction experience and be a full-time on-site employee of the Subcontractor. The Subcontractor CQC Manager is responsible for the Subcontractor's tests, inspections, processes, and related actions during and after construction execution to evaluate that both the actual products used, and the completed construction comply with the requirements of the Plans for Construction and Technical Specifications. The CQC Manager shall report to the Subcontractor's principal officers and the CM.

2.2 STOP WORK AUTHORITY

The EOR, CQA Manager, CM, and CQC Manager may exercise stop work authority when concerns related to quality are identified. In situations where personnel safety is concerned, any project personnel may stop work at any time.

3.0 QUALITY ASSURANCE

Construction Quality Assurance (CQA) is the responsibility of the Contractor, Engineer, and CQA Team. CQA includes assessments, observations, and reporting to document that the implementation of the work performed by the Subcontractor meets the requirements of the Plans for Construction and Technical Specifications. The CQA Team functions as the field representative for the Engineer through performance of assessments, verifications, and observations. Specific CQA responsibilities are listed as follows:

- Daily field report of construction activities including photographs.
- Noting observed deficiencies (ODs) during construction that require correction.
- Reviewing applicable Subcontractor submittals and Requests for Information (RFIs) related to quality for adherence to project requirements.
- Reviewing test data for compliance with project requirements and specifications.
- Performing assessments of the Subcontractor CQC Plan to ensure adherence to the QMP.

- Reviewing the Subcontractor documentation deliverables for conformance with project requirements.
- Periodic material testing to audit CQC test results.
- Reporting of test results.
- Special testing requested by the Owner.

3.1 QUALITY ASSURANCE TEAM

3.1.1 Roles and Responsibilities

The CQA Team serves as observers of field implementation of the construction documents and to provide CQA documentation. The CQA Team is responsible for the execution of the CQA Plan and related documentation as outlined herein. Individual roles and responsibilities for the CQA Team members are defined below. Personnel assignments are subject to change, if qualification requirements are met and approved by IKEC.

3.1.1.1 Construction Quality Assurance (CQA) Manager

A professional engineer licensed in the State of Indiana shall be designated as the CQA Manager. The CQA Manager shall be responsible for administering the CQA program and advising the CQA Team.

The CQA Manager will be responsible for the following tasks:

- Observing conformance with the QMP by reviewing and documenting project records and activities;
- Managing overall implementation of the CQA program;
- Evaluating the testing results of the CQC program;
- Evaluating work for conformance with the project plans and specifications and notifying the CM if work is non-compliant with the contract documents;
- Managing the documentation of all CQA activities;
- Reviewing progress of the work and reports prepared by the Subcontractor as part of the CQC Plan;
- Verify the appropriate test standards are used for the methods to conduct assessments and field and laboratory testing for CQA testing;
- Evaluating and auditing the results of CQC and CQA assessments and testing; and
- Review daily field reports prior to submittal to the CM and EOR.

3.1.1.2 Construction Quality Assurance (CQA) Supervisor

The Construction Quality Assurance (CQA) Supervisor provides oversight for the CQA Field Representative(s) on site. The CQA Supervisor is familiar with the materials to be used, the observations and testing to be done, and the functional intent of the QMP. The CQA Supervisor has responsibility for:

- Coordination of the periodic CQA construction testing in the field;
- Coordination of other testing with a commercial laboratory (as needed);
- Provides support to field CQA staff;
- Plans and directs the activities of CQA field representative(s); and
- Reviews Daily Field Reports.

In conjunction with their staff, the CQA Supervisor reviews daily field reports and directives, and reports to the CQA Manager any situation where the Plans for Construction and Technical Specifications do not appear to be appropriate for the conditions encountered.

The CQA Supervisor reviews Nonconformance Reports and has authority to stop work due to adverse quality conditions or potentially unsafe work practices. The CQA Supervisor reports to the CQA Manager. The CQA Supervisor will be on-site an average of one day per month for the duration of construction, or as necessary to observe key construction activities to support the CQA team.

3.1.1.3 Construction Quality Assurance (CQA) Field Representative (FR)

The Construction Quality Assurance Field Representative (CQA FR) staff shall consist of qualified personnel working under the direct supervision of the CQA Manager and CQA Supervisor. The CQA Supervisor will be responsible for the day-to-day coordination and management of the CQA FRs.

The CQA FR is responsible for performing quality assurance in the field, and for performing observations of conformance with the Plans for Construction and Technical Specifications. The CQA FR will document the results of the required CQA observations and testing and inform responsible personnel about unsatisfactory items. The CQA FR is also responsible for documenting that corrective actions are taken to resolve the conditions. For defective work, the site-specific CQA FR will initiate a Nonconformance Report and submit the report to the CQA Supervisor.

The duties of the CQA FR are listed below:

- Daily observations of construction activities to verify conformance with project Plans for Construction and Technical Specifications;
- Observe on-site testing performed by CQC team members;
- Perform periodic on-site CQA testing to verify CQC procedures and test results;
- Coordinate required sampling with commercial laboratory for other quality control testing (as needed);

- Prepare and submit daily field report of observations, testing results, and photographs;
- Conduct periodic inspection of specific construction items;
- Instrumentation monitoring (as needed);
- Verification that testing is performed and that results meet the Technical Specifications;
- Verification of Subcontractor's CQC surveying;
- Reporting of nonconformances; and
- Reporting of observed deficiencies.

3.1.2 Materials Testing

The CQA Team will perform selected CQA sampling and material testing to audit CQC procedures and test results. The material testing schedule is included in Attachment A. The schedule specifies the anticipated types and minimum number of tests for each material subject to testing and required frequency of testing. The CQA Manager or identified representative is responsible for reviewing the material testing and results and manufacturer's supplied information for conformance to the Technical Specifications.

3.2 QUALITY ASSURANCE DAILY FIELD OBSERVATIONS

3.2.1 General

The CQA Team shall review the Plans for Construction and Technical Specifications for each day's construction activities. After observation of the day's activities, they shall document whether the work that was observed has been done in accordance with the Plans for Construction and Technical Specifications. The CQA Team's observation of work serves as an audit function. It is not to be considered a verification that all work performed was in accordance with the Plans for Construction and Technical Specifications. That responsibility remains with the CQC Team.

Daily observations are to be documented in a CQA daily field report.

Any suspect conditions shall be promptly reported to the CM. Each observation shall be documented on the Daily Field Report form for inclusion with the project records.

3.2.2 Conformance Verification

Conformance verification shall consist of observing and documenting testing performed by the Subcontractor to ensure that the required tests and evaluation of materials and construction products are performed. The CQA Team shall confirm that testing is performed at frequencies specified in this QMP. The CQA Team shall perform periodic testing to verify the results of the Subcontractor. Additional or supplementary conformance testing may be added at the discretion of the CQA Manager. Results shall be reviewed by the CQA Manager to assess conformance with project requirements. Copies of all conformance results shall be included on a CQC testing log and with the project records.

The NCR process shall be used, as needed, to immediately report deficiencies, remediation required, and resolution to the Contractor and Engineer. NCRs may be submitted to the CQA Manager by the CQA Team or Subcontractor. The CM will maintain a log as a record of the non-conformances encountered and the final resolution. A detailed description of the NCR process is provided in Subsection 5.2.5.

4.0 QUALITY CONTROL

Construction Quality Control (CQC) and overall construction/material quality is the responsibility of the Subcontractor. CQC includes establishing procedures and work plans, performing observations, documenting construction processes and performance, and performing materials testing to demonstrate the quality of the constructed elements. Specific CQC items are as follows:

- Ensuring that the Subcontractor's work complies in all respects to the Plans for Construction, Technical Specifications, other contract documents, and any approved changes to the contract documents.
- Developing the CQC Plan.
- Developing work plans, procedures, and submittals related to the work.
- Preparing a daily log of observations and activities.
- Providing data collected during this project to the Contractor.
- Demonstrating the means and methods for complying with the Plans for Construction and the Technical Specifications.
- Performing construction staking and layout.
- Performing construction materials quality control testing and reporting.
- Maintaining an updated construction schedule with CQC/CQA hold point milestones represented.
- Maintaining calibrations on measuring and testing equipment.
- Providing final as-built surveys and drawings.
- Testing logs, timely submittal of required deliverables, reporting nonconforming conditions to the Engineer, and data management.

4.1 SURVEY REQUIREMENTS

The Subcontractor shall provide field layout services for the purposes of executing the work according to the contract documents. The work shall be laid out and constructed to the elevations shown in the Plans for Construction and in accordance with the Technical Specifications. Tolerances shall be as defined in the Technical Specifications.

Final as-built surveys and CQC surveys will be conducted by the Subcontractor and may be supplemented with surveys conducted by the Contractor or identified representative.

4.2 CQC EXECUTION AND PLAN PREPARATION

The Subcontractor shall prepare a CQC Plan meeting the requirements of this QMP and the project specifications. The CQC Plan must be approved by the Contractor, CM, and Engineer prior to the start of construction. The Subcontractor shall execute CQC activities in accordance with the approved CQC Plan.

4.3 CQC PLAN REQUIREMENTS

The Subcontractor is responsible for establishing and maintaining a CQC Plan for the project to ensure that the project is executed, and items are installed in accordance with the Plans for Construction and Technical Specifications. The objective of the CQC Plan is to provide a framework where a quality product will be produced. The details of the CQC system will be described in the CQC Plan document, which will establish procedures to ensure uniformity and provide a standard by which comparisons can be made.

The CQC Plan shall include, at a minimum, the following to cover all operations, both on-site and off-site, including work by subcontractors and suppliers:

- Organizational Structure: Chart showing the CQC organizational structure, including line of authority.
- Personnel: Names and qualifications, in resume format, for each person in the QC organization.
- Duties, Responsibilities, and Authorities: Duties, responsibilities, and authorities of each person in the QC organization.
- Outside Organizations: List of outside organizations, such as consulting engineering firms, that will be employed by the Subcontractor and a description of services these firms will provide, including decision-making authority (if any).
- Scope of Work: Scope, including testing laboratory information and accreditations and materials testing schedule.
- Submittals: Procedures for reviewing, approving, and managing submittals. Include the name(s) of the person(s) in the QC organization authorized to prepare required submittals, and the initial submittal of the submittal register as specified in the section entitled “Submittal Procedures.”
- Completing Rework Items: Procedures for addressing nonconformance, deficient, and rework items.
- Measuring and Testing Equipment: Copies of current certifications for monitoring and testing equipment.
- Documentation Procedures: Documentation procedures, including proposed report/forms formats.
- Training Requirements: Documentation of personnel trained in specifics of the CQC Plan.
- Work Plans and Quality Process Documents.

4.4 TESTING SCHEDULE

It is the responsibility of the Subcontractor to perform tests specified in the Technical Specifications and verify that control measures are adequate to provide a product that conforms to the requirements of the project documents. A material testing schedule outlining minimum CQC and CQA testing frequencies is included in Attachment A. The schedule specifies the anticipated types and minimum number of tests for each material subject to testing. The CQC Manager or identified representative is responsible for verifying that material testing and results conform to the Technical Specifications. The Subcontractor shall maintain a log of all CQC material test results.

4.5 SUBMITTALS AND REQUEST FOR INFORMATION

4.5.1 Submittals

Subcontractor submittals shall be provided to the CM, consistent with the requirements of the Technical Specifications. For material submittals, the Subcontractor shall review and certify that the material conforms to the Plans for Construction and Technical Specifications prior to submittal to the CM.

4.5.2 Request for Information

The Subcontractor shall communicate issues such as constructability, discrepancies in the plans, and requests for Engineer support during field implementation, etc., using the RFI form. RFIs shall be submitted by the Subcontractor to the CM. The CM routes the RFI to the Engineer. The Engineer will prepare a response to the RFI and submit it to the CM. The CM then sends the completed RFI response to the Subcontractor.

The CM, or representative, shall document each RFI in an RFI log and in the project records. The RFI log will be maintained by the CM, or representative, and will be reviewed at the weekly project progress meetings. The Subcontractor is encouraged to engage the Engineer and the Engineering Team prior to RFI submittal in efforts to streamline the RFI process. The Engineer has seven calendar days upon receipt of the RFI to provide a response to the CM. If a quicker response is required by the Subcontractor, this should be noted in the RFI and in the correspondence to the CM.

Any changes to the project that result from the RFI process shall be documented and communicated to the CQA Team and the Subcontractor. Communications shall include discussion of the issue that led to the RFI, the intent of the RFI response, and any resulting changes to the project.

It should be noted that, because of the nature of the project, the RFI process may not be suitable for some of the day-to-day adjustments that will be necessary. Instead, daily collaboration between the CM, Engineer, and Subcontractor field staff will be essential to successfully meet the intent of the project. Such daily adjustments shall be documented in both the CQC daily field report and the CQA daily field report.

4.6 MEETINGS

4.6.1 Orientation Meeting

An orientation meeting (i.e., kickoff meeting) shall be held before field implementation of the QMP. At a minimum, those present will include the CM, the Contractor, the Subcontractor's PM, the CQC Manager,

the CQA Manager, CQA FR, IDEM, and others as needed. This meeting will include a review of the project document objectives, quality management processes, hold points, and special project requirements. The Subcontractor will prepare meeting minutes and distribute them for review. The Owner shall notify the IDEM permit manager 10 working days prior to the meeting.

Other kickoff meetings may be required before the start of discrete phases of the work.

4.6.2 Daily Meetings

Daily plan-of-the-day (POD) meetings related to safety and construction activities for the day's work shall be conducted by the CM or designated representative. Attendees shall include the CQA FR and the CQC Manager. Other key participants from IKEC, the Engineer, and the Subcontractor will be included in these meetings as appropriate.

4.6.3 Weekly Meetings

The CM will hold weekly on-site meetings with the project team during active construction. Portions of these meeting will be allotted to discuss quality and engineering. Those present shall include the CM; CQA FR; and the CQC Manager and on-site representative. Other key participants from IKEC, the Engineer, Contractor, and the Subcontractor will be included in these meetings as appropriate.

The primary purpose of the weekly meetings shall be to confirm that all parties involved with field activities are familiar with the design, required procedures, and associated quality objectives, along with any issues (e.g., safety, environmental) related to field implementation. Topics to be addressed at this meeting shall include a review of the schedule, any outstanding RFIs, outstanding change orders, status of Subcontractor submittals, and quality issues. The CM, or representative, shall provide minutes of each meeting for inclusion in the project records.

4.6.4 Additional Meetings

Other on-site meetings will be organized to address site-specific issues that need quick resolution but are not conducive to the weekly or other regularly scheduled meetings or that require specific personnel to be present and to work through specific issues as they arise. Such meetings will be documented on the CQC and CQA daily field reports.

5.0 QUALITY MANAGEMENT DOCUMENTATION

5.1 PROJECT DOCUMENTATION

Project CQA documentation shall be obtained and maintained by the CQA Manager and copied to the Engineer during all phases of field implementation. Project CQC documentation shall be obtained and maintained by the CM or identified representative and copied to the Engineer. The Subcontractor is required to submit all data collected, both raw and processed, to the Contractor. Transfer of these data should be through Procore.

Distribution of the project documentation shall be in accordance with Table 5-1.

Table 5-1. Reporting Responsibility

Item	Originator	Primary Recipients	Secondary Recipients
Daily CQA Report	CQA FR	CQA Supervisor	CM, EOR, CQA Manager, Subcontractor
Daily CQC Report	CQC Team	CM	CQA Manager, EOR
Request for Information (RFI): Submittal	Subcontractor	CM	EOR CQA Manager
Request for Information (RFI): Approval and RFI Log	CM	EOR	CQA Supervisor CQA Manager
Observed Deficiency Log	CQA FR, CQA Supervisor	CM, CQA Manager	Subcontractor
Nonconformance Reports and Log	CQA Supervisor, CQA Manager	CM, EOR	Subcontractor
Subcontractor Submittals	Subcontractor	CM	EOR, CQA Supervisor
Subcontractor Submittal Approval and Log	Subcontractor	CM	EOR, CQA Manager
CQC Testing Results and Log	CQC Team	CM	CQA Manager, EOR
CQC Correspondence and Log	Subcontractor	CM	CQA Manager, EOR
Design Revisions and Log	EOR	CQA Manager	Subcontractor, CM
Subcontractor Daily Production Report	Subcontractor	CM	EOR
Weekly Meeting Minutes	CM	All Present	N/A
Construction Certification Report	CQA Manager	EOR	CM

5.2 CQA DOCUMENTATION

The CQA documentation shall include, but is not limited to, the following:

- Daily field report;
- RFI responses;
- ODs;
- NCRs;
- CQA correspondence (i.e., memos, letters);
- Photographic documentation; and
- Plans for Construction and Technical Specifications revisions and log.

5.2.1 CQA Daily Field Report

The CQA Team shall maintain daily field reports to document daily observations, investigations, and analyses of the construction, as well as to document the progress of the work. These reports shall include photographic documentation, where applicable. The CM will provide daily tracking of quantities, consistent with the Subcontractor pay items (hard quantities, standby hours tracked separately by CM). This daily tracking will allow independent assessment of the Subcontractor quantities in the team's daily field report.

5.2.2 Photographs

The CQA Team shall maintain a photographic record of the field implementation, documenting the progress of project construction. For the purpose of construction, photographs will be taken as needed to document processes, procedures, and any deficiencies or nonconformance, and will provide a photographic record for inclusion in the project record. Each photograph shall have the date recorded, the name of the person taking the photo (if by someone other than the daily field report author), and the location of photographs. This information shall be noted in the daily field report or the photographic log.

5.2.3 Material Testing Reports

CQA material testing reports will be compiled and distributed to the project team. Daily summaries and off-site test CQA results will be included in the CQA Daily Field Report. Reports shall include CQA testing results for both laboratory and field testing.

5.2.4 Observed Deficiencies (ODs)

Observed Deficiencies (ODs) shall identify and document deficiencies in quality, workmanship, materials, equipment, or supplies and unauthorized deviations from Plans for Construction or the Technical Specifications. The OD log is used to track and rectify deficient events that do not need to be escalated to the NCR level. The following procedures shall be used to document ODs:

- When the Subcontractor, Engineer, or CM notices an observed deficiency, the CQA FR records it in the corresponding CQA daily report.

- The CQA Supervisor will enter the OD into the Observations tool in Procore along with the following information: referenced daily report number, observed date, deficiency description, reference to the corresponding requirement (if applicable), hold point (if applicable), and responsible party.

- The CQA Team, CM, and the Subcontractor will work to establish a resolution and corresponding timeframe for the OD.

- Once a corrective action for the OD has been agreed upon by all involved parties, it will be implemented by the responsible party (if necessary).

- After the OD is verified to be resolved, the CQA FR will record it in the corresponding CQA daily report.

- The CQA Supervisor will enter the following information into the Observations tool in Procore: referenced daily report number, the resolved date, and corrective action description.

- The Observations tool in Procore will be maintained by the CQA Supervisor for tracking the status of OD events.

5.2.5 Nonconformance Reports

Nonconformance Reports (NCRs) shall identify, report, and document a nonconforming event in quality, workmanship, materials, equipment, or supplies and unauthorized deviations from Plans for Construction or the Technical Specifications. The following procedures shall be used to report nonconformance:

- When a nonconformance is observed, whether by the Engineer, Subcontractor, or CM, the CQA FR prepares an NCR that describes deficiencies noted (including time, actions, locations, etc.) and references to the corresponding requirements. Additionally, a list of corrective actions is identified for the Subcontractor to complete, or meet, to the satisfaction of the Engineer.

- The NCR form is then routed to the Engineer for assessment, with a disposition on the installed work/materials that need to be replaced, if any. The form is then routed to the CM for finalization.

- The CM then routes the NCR package to the Engineer for final review and signature and returns it to the CM, if acceptable. Once that process is complete, the CM issues the NCR to the Subcontractor.

- The Subcontractor provides a list of proposed corrective actions on the form and returns it to the CM for processing and issuance to the CQA Manager. If the proposed corrective action is acceptable, the CQA Manager signs the NCR and includes a list of required documentation to be provided by the Subcontractor to confirm completion of the corrective action. The NCR is then returned to the CM for processing and issued to the Engineer for final approval and signature. The form is then routed to the CM for issuance to the Subcontractor for implementation. If the proposed corrective action is not deemed acceptable, the CQA Manager returns the form to the CM with additional comments for issuance to the Subcontractor for review and revision.

- The process is repeated until the Subcontractor's proposed corrective actions are acceptable to the CQA Manager.
- On completion of the rework identified as deficient or nonconforming, the CQA Manager will conduct a reassessment of the items noted in the NCR. If the reworked items are found acceptable, it will be so noted on the NCR. If, however, the items are still not acceptable to the CQA Manager, the items will be rejected and must be reworked before it is resubmitted for further assessment.
- The CM and the CQA Manager will periodically review the status of NCRs and will work with the Subcontractor to establish a timetable for the final resolution of all deficiencies.
- A Nonconformance Log will be maintained by the CM for tracking the status of nonconforming items.

5.3 PLANS AND TECHNICAL SPECIFICATIONS REVISIONS

Periodically during construction, changes to the Plans for Construction and/or Technical Specifications may be required. These changes will be reviewed and drafted by the Engineer and approved by the Engineer prior to field implementation. Any deviations and changes to the Plans for Construction and Specifications require review and concurrence from the Contractor. The revisions will be included on a revision log and in the project records.

5.4 CQC DOCUMENTATION

The CQC documentation shall include, but not be limited to, the following:

- CQC Daily Field Report;
- Field Observation Logs and Test Data Sheets;
- Subcontractor Submittals and Shop Drawings;
- Material Conformance Test Results;
- Construction Problem and Solution Reports;
- Photographic Documentation;
- Design and/or Specification Modifications; and
- Meeting Minutes.

5.4.1 CQC Daily Report

The CQC report shall include a summary of work performed for the day; CQC tests performed; test results; and a "remarks" section that will contain pertinent information, including significant observations, problems encountered during field implementation, and delays encountered. The following CQC data is to be provided in the report:

- Date.
- Weather.
- Quantities of material received on-site with corresponding delivery tickets.
- Quantities of materials used.
- List of CQC tests performed.
- Remarks section outlining any issues, delays, etc., that were encountered during the day.
- Updated drawings, mapping, and graphical representations of field work.
- Quantities of materials and/or debris to be hauled off-site and disposed of at locations not owned, operated, or maintained by the Owner, including proper chain of custody, required haul tickets, and scale tickets.
- Daily hold points.
- Photographs of daily construction activities.

In addition to this reporting, refer to the Technical Specifications for more detailed requirements.

ATTACHMENT A

Material Testing Schedule

Materials Testing Schedule

MATERIAL	PROPERTY	TEST	VALUE	QC FREQUENCY	QA FREQUENCY
Concrete					
Cast-in-Place Concrete	Compressive Strength	ASTM C39	4,500 psi	1 / 50 CY placed or 1 / day whichever is more frequent	1 / 200 CY placed. Also review QC laboratory reports
	Entrained Air Content	ASTM C231	2.5 - 6.0 %	1 / delivery	Observe Only
	Slump	ASTM C143	3 ± 1	1 / delivery	Observe Only
CCR Fill					
	Standard Proctor	ASTM D698	laboratory test	1 / change in material	Review laboratory reports
	Field Density and Moisture	ASTM D6938	Min. 85%, within 2% of optimum moisture content	5 / acre per lift	1 / acre per lift
Phase 4 CCR Removal Verification					
	CCR Removal Verification	Visual Observation	Visual observations and use of the Munsell Soil Color Chart will be used to confirm that all visible CCR has been excavated from the footprint.[3]	Observations at each point on a staked 100'x100' grid across the footprint. Observations will include taking photographs and describing soil color.[3]	Observations at each point on a staked 100'x100' grid across the footprint. Observations will include taking photographs and describing soil color.[3]
Geosynthetic Clay Liner (GCL)					
GCL	Bentonite Mass/Area	ASTM D5993	≥ 0.75	1 / 40,000 SF	Review Only
	Average Peel Strength	ASTM D6496	3.5 lbs/in minimum	1 / 100,000 SF	Review Only
	Average Tensile Strength	ASTM D6768	45 lb/in minimum	1 / 100,000 SF	Review Only
	Permeability	ASTM D5887	less than or equal to 5 x 10^-9 cm/sec	Per LOT	Review Only
	Large scale direct shear testing	ASTM D5321	laboratory test	1 test per material interface	review laboratory reports provided by CQC Manager

Materials Testing Schedule

MATERIAL	PROPERTY	TEST	VALUE	QC FREQUENCY	QA FREQUENCY
Flexible Membrane Liner (FML)					
40 mil LLDPE Geomembrane	Large scale direct shear testing	ASTM D5321	laboratory test	1 test per material interface	review laboratory reports provided by CQC Manager
	Seam Properties - Shear Strength	ASTM D6392	Fusion - 60 lbs/in , Extrusion - 60 lbs/in	Cut 1 sample / 500 linear feet of weld	1 / destructive test sample provided by CQC Manager
	Seam Properties - Peel Strength	ASTM D6392	Fusion - 50 lbs/in , Extrusion - 44 lbs/in	Cut 1 sample / 500 linear feet of weld	1 / destructive test sample provided by CQC Manager
	Trial Welds	ASTM D6392	Fusion: 50 lbs/in peel; 60 lbs/in shear Extrusion: 44 lbs/in peel; 60 lbs/in shear	2 / operator / machine / day (morning and mid-shift, max 4 hr work intervals)	Observation Only
	Vacuum Testing	ASTM D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.	1 / extrusion weld and repair location	Observation Only
	Air Pressure Testing	ASTM D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes	1 / wedge weld and repair location	Observation Only
60 mil HDPE Geomembrane	Large scale direct shear testing	ASTM D5321	laboratory test	1 test per material interface	review laboratory reports provided by CQC Manager
	Seam Properties - Shear Strength	ASTM D6392	Fusion - 120 lbs/in , Extrusion - 120 lbs/in	Cut 1 sample / 500 linear feet of weld	1 / destructive test sample provided by CQC Manager
	Seam Properties - Peel Strength	ASTM D6392	Fusion - 91 lbs/in , Extrusion - 78 lbs/in	Cut 1 sample / 500 linear feet of weld	1 / destructive test sample provided by CQC Manager
	Trial Welds	ASTM D6392	Fusion: 91 lbs/in peel; 120 lbs/in shear Extrusion: 78 lbs/in peel; 120 lbs/in shear	2 / operator / machine / day (morning and mid-shift, max 4 hr work intervals)	Observation Only
	Vacuum Testing	ASTM D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.	1 / extrusion weld and repair location	Observation Only
	Air Pressure Testing	ASTM D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes	1 / wedge weld and repair location	Observation Only

Materials Testing Schedule

MATERIAL	PROPERTY	TEST	VALUE	QC FREQUENCY	QA FREQUENCY
Soils					
Cover Soil	Soil Classification	ASTM D2487	CL, CH, MH, or ML, CL-ML, SC, or SM-SC according to the Unified Soil Classification System, or a combination of these groups	1 / source / change in material	Review laboratory reports
	Standard Proctor	ASTM D698	laboratory test	1 / source / change in material	Review laboratory reports
	Field Density and Moisture	ASTM D6938	Min. 92%, within 2% of optimum moisture content	5 / acre / lift	1 / acre / lift
Vegetative Cover	Soil Classification	ASTM D5268	Soils used for vegetative cover shall conform to the requirements set forth in ASTM D5268, unless otherwise approved based on the soils ability to sustain vegetation	1 / source / change in material	Review laboratory reports
	Agronomic Testing	-	laboratory test	1 / 10 acres	Review laboratory reports
Clay Berm Soil	Soil Classification	ASTM D2487	CL, CH, MH, or ML, CL-ML, SC, or SM-SC according to the Unified Soil Classification System, or a combination of these groups	1 / source / change in material	Review laboratory reports
	Standard Proctor	ASTM D698	laboratory test	1 / source / change in material	Review laboratory reports
	Field Density and Moisture	ASTM D6938	Min. 95%, within 2% of optimum moisture content	5 / acre / lift	1 / acre / lift
Anchor Trench Backfill					
	Standard Proctor	ASTM D698	laboratory test	1 / source / change in material	Review laboratory reports
	Field Density and Moisture	ASTM D6938	Compact each layer of material with at least three passes of a vibratory plate compactor with in-place moisture within -2% to +2% of optimum moisture content	1 / 100 linear feet of trench	1 / 500 linear feet of trench

Materials Testing Schedule

MATERIAL	PROPERTY	TEST	VALUE	QC FREQUENCY	QA FREQUENCY
Utility/Pipe Trench Backfill	Standard Proctor	ASTM D698	laboratory test	1 / source / change in material	Review laboratory reports
	Field Density and Moisture	ASTM D6938	Min. 95%, within 2% of optimum moisture content	1 / 100 linear feet of trench	1 / 500 linear feet of trench
HDPE Pipe					
HDPE Gravity Pipe	Low Pressure Air Test	ASTM F1417	Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air	1 / pipe run	Observation Only
Slide Gates					
Slide Gates	Leak Testing	AWWA C560	AWWA Standard for Cast-Iron Slide Gates	1 / slide gate	Observation Only
Materials Delivered to Site	Defects	Visual Observation	no defects	1 / material delivery	1 / material delivery
	Conformance to Submittals	Visual Observation	conforms to plans	1 / material delivery	1 / material delivery

Notes:
(1) Testing frequency may be adjusted as directed by the CQA Manager
(2) This table does not include all required quality control testing. The Subontractor shall be solely responsible for the proper implementation of its Quality Control Program.
(3) Once CCR removal verification procedures are completed and documented, an additional 6 inches of soil will be excavated across the footprint.

APPENDIX K

Post Closure Plan

Post-closure Plan

CFR 257.104(d)

West Boiler Slag Pond

Clifty Creek Station

Madison, Indiana

April 2021

Prepared by: Indiana-Kentucky Electric Corporation

3932 U.S. Route 23

Piketon, OH 45661

OVEC IKEC

Ohio Valley Electric Corporation Indiana-Kentucky Electric Corporation

Table of Contents

1.0 OBJECTIVE

This report has been prepared to fulfill the requirements of 40 CFR 257.102(b) of the Coal Combustion Residuals (CCR) Rule to develop a Closure Plan for the Clifty Creek Station's West Boiler Slag Pond.

2.0 DESCRIPTION OF THE CCR UNIT

The Clifty Creek Station is located on the shore of the Ohio River near Madison, Indiana and consists of six coal-fired electric generating units; each nominally rated at 217 megawatts, that began producing electricity in 1955 to support the Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant located near Piketon, Ohio. The West Boiler Slag Pond is located immediately west of the Station and south of Clifty Hollow Rd. Upon commencing operation, the Clifty Creek Station began sluicing CCRs into the West Boiler Slag Pond for purposes of storage.

The West Boiler Slag Pond embankment is approximately 2,500 feet long, and encompasses approximately 75 acres, with about 35 acres of surface water. The top of the dike is located at elevation 475 feet, and varies in height above the adjacent plant grades, with a maximum height of approximately 41 feet.

3.0 DESCRIPTION OF THE POST-CLOSURE PLAN 257.102(b)(1)(i)

[A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed]

3.1 Section 257.104(b)(1)

[Maintaining the integrity and effectiveness of the final cover system including making repairs to the final cover as necessary to correct the effects of the settlement, subsidence, erosion, or other events and preventing run-on and run-off from eroding or otherwise damaging the final cover.]

Inspections are performed for the items noted below. The inspection frequencies are scheduled to properly detect any issues so that repairs can be performed before significant harm occurs.

- Embankment: The waste embankment will be inspected for slides, settlement, subsidence, displacement, and cover condition (see below).

- Final Cover Surface: The Final Cover surface will be inspected for any ponding of water or flat areas. Due to the design contours required to achieve the final cap grade, special attention will be focused to ensure that no settlement, subsidence, erosion, depressions or flat areas exist and that no water is allowed to pond above the cap system. Condition of the vegetation will be observed for maintenance needs (i.e., gaps in vegetation, presence of undesirable trees or brush).

- Stormwater Management System: The stormwater management system, including channels, culverts, slope drains, etc., will be inspected for erosion, integrity of channel lining, ponding, and accumulated sediment.

Maintenance during the post-closure care period will be performed as discussed below following the facility inspections.

- Embankment: Embankments will be inspected for slides, settlement, subsidence, displacement, and cover condition. Any areas exhibiting any such conditions will be repaired by reworking, replacing and/or compacting the material to design grade/specifications.

- Erosion Damage Repair: Any areas exhibiting erosion will be repaired by reworking, replacing and/or compacting the material to design grade/specifications, and reseeding the area. Applications of additional fertilizer, selective herbicides, rodent control measures, etc. will be implemented as necessary. The selection of fertilizers and herbicides, will strive to minimize their impact on groundwater. Follow-up monitoring of the repaired area will be conducted.

- Settlement, Subsidence, Displacement: Any areas at the closed site exhibiting evidence of settlement, subsidence, or displacement will be examined to determine the cause of the movement. If backfilling or placing additional fill material is needed to maintain the integrity of the closed structure, it will be performed in accordance with the site/closure specifications, including seeding. If the condition reoccurs or persists, or if the severity of the condition initially is judged to warrant it, a detailed investigation of the cause will be performed and remedial action will be performed. Repairs will be made as necessary. Follow-up monitoring of the area will be performed.

- Closure Cap Surface: Any areas that show signs of ponding water or flat contours will be observed and addressed. Due to the design contours required to achieve the final cap grade, special attention will be focused on the cap surface to promote drainage, re-seeded to support vegetative growth, and maintained to minimize the ponding of water.

- Stormwater Drainage System: The channel linings are specified for design velocities. Maintenance of the stormwater management system will consist of removing sediment build up and/or undesirable vegetation from the stormwater management system's channels, culverts, and sediment basins as required. Eroded areas will be repaired by back-filling and reseeding in accordance with the specifications. Damage to culverts will be repaired; structure replacement will be performed if needed.

- Primary and Secondary Treatment Basins: Maintenance of the treatment basins will primarily consist of periodic inspections of the discharge structures and piping to ensure proper operation. Accumulated sediment will be removed from the basins as needed to maintain capacity requirements.

3.2 SECTION 257.104(b)(3)

[Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of §§257.90 through 257.98.]

The groundwater monitoring system will be observed for the general integrity of the wells, well casings and well protective casings. Any damaged portions of the monitoring wells and/or their protective casings will be replaced in-kind.

Monitoring the groundwater will be in accordance with the groundwater monitoring plan for this facility and in accordance with the requirements of §§257.90 through 257.98.

4.0 POST-CLOSURE CONTACT 257.104 (d)(1)(ii)

[The name, address, telephone number and email address of the person or office to contact about the facility during the post-closure care period.]

The name, address, telephone number, and email address of the person to contact about the facility during the post-closure period will be provided upon notification of closure.

5.0 POST-CLOSURE PLANNED USE 257.104 (d)(1)(iii)

[A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this subpart…]

The post-closure use of the property will be undisturbed vacant land space, except for commercial purposes, such as the barge loading facility located on the southeastern corner or industrial uses associated with Clifty Creek Station processes. The activities occurring on the closed CCR unit will be related to the Post-Closure care activities and access to the barge loading facility. All other activities will be prohibited.

Stantec Consulting Services Inc.
11687 Lebanon Road, Cincinnati OH 45241

October 11, 2016
File: 175534018
Revision 0

Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

RE: Closure and Post-Closure Plans
West Boiler Slag Pond
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana

1.0 PURPOSE

This letter documents Stantec's certification of the EPA Final CCR Rule closure and post-closure plans for the Indiana-Kentucky (IKEC) Clifty Creek Station's West Boiler Slag Pond.

2.0 CLOSURE AND POST-CLOSURE PLAN

The closure plans describe the steps necessary to close the CCR units at any time during the life of the unit and is subject to the requirements described in 40 CFR 257.102(b). The post-closure plans describe the monitoring and maintenance activities to be performed during the post-closure period of the unit and is subject to the requirements of 40 CFR 257.104(d).

3.0 SUMMARY OF FINDINGS

The EPA Final CCR Rule closure and post-closure plans are conceptual and subject to the completion of all necessary environmental reviews. They are therefore subject to change at any time. The attached closure and post-closure plans demonstrate compliance with the requirements set forth in 40 CFR 257.102(b) and 257.104(d).

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stan A. Harris, being a Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

2. that the information contained herein is accurate as of the date of my signature below;

RE: Closure and Post-Closure Plans
West Boiler Slag Pond
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana

3. that the closure plan for the IKEC Clifty Creek Station's West Boiler Slag Pond meets the requirements described in 40 CFR 257.102(b); and

4. that the post-closure plan for the IKEC Clifty Creek Station's West Boiler Slag Pond meets the requirements of 40 CFR 257.104(d).

SIGNATURE _____ DATE 10/11/16

ADDRESS: Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, OH 45241

TELEPHONE: (513) 842-8200

ATTACHMENT: Clifty Creek West Boiler Slag Pond Closure and Post-Closure Plans

STAN A. HARRIS
REGISTERED
NO.
PE-19700150
STATE OF
INDIANA
PROFESSIONAL ENGINEER

10/11/16

APPENDIX L

Closure and Post-Closure Cost Estimate

Opinion of Closure Costs
West Boiler Slag Pond
Clifty Creek Plant
Indiana-Kentucky Electric Corporation
Madison, Jefferson County, Indiana

Facility Name:	**Clifty Creek West Boiler Slag Pond**	
Facility Location:	**Madison, Indiana**	
Facility County:	**Jefferson**	
Total Waste Fill Acreage:	**89.6**	**Acres**
Total Grading Acreage:	**93.9**	**Acres**
Closure Year:	**2020-2025**	
Phase 2 - 4 Acreage for Closure	**80.4**	**Acres**

(Based on MSW Landfill Closure Plan State Form 50391, Sections III and VI.)

III. LABOR, MATERIALS, & TESTING (Provide a listing of items necessary to close the facility. For items that will vary depending upon the number of acres to be closed, the quantities should be indicated on a per-acre basis.

A. Item	B. Quantity		C. Units (per acre)
Geosynthetic materials (geomembrane, geotextile, geocomposite drainage layer)	73.9	$	88,761.60
Uncompacted 30-inch soil layer	73.9	$	35,717.53
6-inch vegetative soil layer	73.9	$	12,524.64
Vegetative cover	73.9	$	3,288.19
Surveying	73.9	$	850.00
Engineering certification	73.9	$	1,392.86
Additional items	lump sump		#REF!
Deed notation	lump sump	$	10,000.00

V. COST PER ACRE FOR FINAL COVER & VEGETATION

A. What Percent of Final Cover and Topsoil is Available from Areas that are Controlled, and will be Controlled through Post-Closure, by the Permittee?

1. % of final cover:	0%
2. Describe location of sources:	Offsite borrow sources are being assessed.
3. % of topsoil:	0%
4. Describe the location of sources:	Offsite borrow sources are being assessed.

B. Cost per Acre for Acquisition and Placement of 30-inch Soil Layer

1. Acquisition			
a. Quantity of soil needed per acre (cubic yard (yd^3)/acre)		4,033	
b. Excavation unit cost ($/$yd^3$) (if obtained onsite)		N/A	
c. Purchase unit cost ($/$yd^3$) (if obtained offsite)	$	0.50	
d. Delivery unit cost ($/$yd^3$) (if obtained offsite)	$	5.50	
e. Acquisition cost ($/acre)	$	24,198.00	[1a * (1c+1d)]
2. Placement and Compaction			
a. Placement/spreading unit cost	$	2.41	
b. Compaction unit cost ($/$yd^3$)	$	-	
c. Placement and compaction cost ($/acre)	$	9,719.53	[1a * (2a+2b)]
3. Testing			
a. Soil classification (if soil source is of variable quality) ($/acre)	$	500.00	
b. Survey control for cover thickness and proper slopes ($/acre)	$	1,300.00	
c. Density testing (if planned) ($/acre)		N/A	
d. Testing cost ($/acre)	$	1,800.00	
4. TOTAL COST, SOIL COVER ($/acre)	**$**	**35,717.53**	[1e + 2c + 3d]

C. Cost per Acre for Acquisition and Placement of Geosynthetic Materials			
1. Acquisition			
a. Quantity of material needed per acre (square yards, yd^2)		4,840	
b. Purchase and install geomembrane ($/$yd^2$)	$	5.67	
c. Purchase and install nonwoven geotextile ($/$yd^2$)	$	2.19	
d. Purchase and install composite drainage layer ($/$yd^2$)	$	7.38	
e. Delivery unit cost ($/$yd^2$) (if applicable)	$	-	
f. Acquisition cost ($/acre)	$	73,761.60	[1a * (1b+1c+1d)]
2. Placement			
Placement cost ($/acre) (if applicable and not included in purchasing unit cost)	$	-	
3. Testing and QA/QC			
a. Fingerprinting, destructive (shear and peel tests) & nondestructive seam test ($/acre)	$	10,000.00	
b. Other testing ($/acre)	$	5,000.00	
c. Testing cost ($/acre) (if applicable)	$	15,000.00	[3a + 3b]
4. TOTAL COST, GEOSYNTHETIC LAYERS ($/acre)	**$**	**88,761.60**	[1f + 2 +3c]
D. Cost per Acre for Acquisition & Placement of Topsoil			
1. Acquisition			
a. Quantity of topsoil needed per acre (yd^3/acre)		807	
b. Excavation unit cost ($/$yd^3$) (if obtained onsite)		N/A	
c. Purchase unit cost ($/$yd^3$) (if obtained offsite)	$	7.61	
d. Delivery unit cost ($/$yd^3$) (if obtained offsite)	$	5.50	
e. Acquisition cost ($/$yd^3$)	$	10,579.77	[1a * (1c+1d)]
2. Placement			
a. Spreading unit cost ($/$yd^3$)	$	2.41	
b. Placement cost ($/acre)	$	1,944.87	[1a * 2a]
3. Topsoil Cost ($/acre)	$	12,524.64	[1e + 2b]
F. Cost per Acre to Establish Vegetation			
1. Vegetation			
a. Seeding unit cost ($/acre)			
b. Fertilization unit cost ($/acre)			
c. Mulching unit cost ($/acre)			
d. Vegetation Establishment Cost ($/acre)	$	3,288.19	[1a + 1b + 1c]
G. Cost per Acre to Certify Closure			
1. Registered Professional Engineer			
a. Initial review of closure plan (hours)		80	
b. Total number of inspections		30	
c. Inspection time required (hours/visit)		24	
d. Total inspection time (hours)		720	[1b * 1c]
e. Prepare final documentation (hours)		240	
f. Total engineer time (hours)		1,040	[1a + 1d + 1e]
g. Engineer unit labor cost ($/hour)	$	120.00	
h. Professional engineer cost ($)	$	124,800.00	[1f * 1g]
i. Area of site permitted for filling (acres)		89.6	
j. Closure Certification Cost ($/acre)	$	1,392.86	[1h/1i]

H. Other Costs per Acre for Final Cover and Vegetation			
1. Other Costs ($/acre)		850	soil thickness survey
I. Total of Items B through F (must not be less than $5,000/acre)			
WBSP Closure	$	140,291.96	per acre
VI. OTHER CLOSURE COSTS (total facility basis, not per acre)			
A. Notation of Property Deed	$	10,000.00	
B. Other Costs - such as drainage feature, installation of gas vents, etc.			
Activity		**Cost**	
Phase 2 BSHS Settling Tanks	$	69,000,000.00	
Phase 3 Primary and Secondary Basins	$	10,990,000.00	
C. Total	$	80,000,000.00	[A + B]
VII. CLOSURE COST ESTIMATE	**$**	**90,367,575.84**	[(Acreage * VI) + VI.C]
10% Contingency (per IDEM)	**$**	**9,036,757.58**	
Total	**$**	**99,404,333.43**	
VIII. ADDITIONAL INFORMATION REQUIRED FOR FACILITIES PROVIDING FINANCIAL ASSURANCE ON AN INCREMENTAL BASIS			
A. Will Closure Financial Assurance be Provided on an Incremental Basis?		No	

Opinion of Post-Closure Costs
West Boiler Slag Pond
Clifty Creek Plant
Indiana-Kentucky Electric Corporation
Madison, Jefferson County, Indiana

Facility Name:	**Clifty Creek West Boiler Slag Pond**	
Facility Location:	**Madison, Indiana**	
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Total Grading Acreage:	**93.9**	**Acres**
Closure Year:	**2020-2025**	
Phase 2 - 4 Acreage for Closure	**80.4**	**Acres**

(Based on MSW Landfill Closure Plan State Form 50391, Section VI.)

A. Cost for Semi-Annual Inspections and Reports			
1. Inspection			
a. Number of inspections during post-closure period (semi-annual inspections for 30 years		60	
b. Inspector time required (hours/insp)		30	
c. Inspector time labor cost ($/hour)	$	90.00	
d. Inspection cost ($)	$	162,000.00	[1a * 1b * 1c]
2. Report Preparation			
a. Number of reports during post-closure period		60	
b. Cost per report ($)	$	5,000.00	
c. Report cost	$	300,000.00	[2a * 2b]
3. TOTAL COST, INSPECTIONS AND REPORTS ($)	**$**	**462,000.00**	[1d + 2c]
B. Cost for Maintenance of Final Cover and Vegetation/Vegetation Control			
1. Final Cover Maintenance - The cost for cover maintenance and vegetation shall be 10% of the cost per are calculated for final cover and vegetation in the closure plan (329 IAC 10-23-3(c)(5)(A)).			
a. 10% of cost for placement of final cover and vegetation (0.10 * cost given in Item VII.I of the closure plan)	$	3,571.75	
b. Total permitted fill acreage		89.6	
c. Total Cost, Maintenance of Final Cover and Vegetation Cover	$	320,029.07	[1a * 1b]
2. Vegetation Control Costs			
a. Mowing frequency (visits/30 years)		60	
b. Area to be mowed (acres/visit)		93.9	
c. Mowing unit cost ($/acre)	$	296.63	
d. Total mowing cost ($)	$	1,671,213.42	[2a * 2b * 2c]
e. Other ($) - specify below (weed control for well access, etc.)	$	-	
f. Vegetation Control Costs	$	1,671,213.42	[2d + 2e]
3. TOTAL COST FOR MAINTENANCE OF FINAL COVER AND VEGETATION	**$**	**1,991,242.49**	[1c + 2f]
C. Cost for Leachate Treatment and Disposal		N/A	
D. Cost for Leachate Collection System Monitoring and Maintenance		N/A	

E. Cost for Groundwater Water Monitoring and Well Maintenance			
1. Monitoring Well Maintenance Labor Cost			
a. Maintenance frequency (visits/30 years)		60	
b. Number of monitoring wells needing maintenance per visit		2	(estimated)
c. Maintenance time required (hours/well)		4	
d. Unit labor cost ($/hour)	$	81.00	
e. Monitoring well maintenance labor cost ($)	$	38,880.00	[1a * 1b * 1c * 1d]
2. Monitoring Well Parts and Sampling Equipment Replacement Cost			
a. Number of wells needing replacement during post-closure period		0	
b. Existing monitoring well abandonment unit cost ($)	$	-	
c. New monitoring well construction unit cost ($)	$	-	(drilling charged by foot)
d. Monitoring well replacement cost ($)	$	-	
e. Number of pumps/bailers needing replacement during post-closure period		5	
f. Pump/bailer unit cost ($/pump)	$	2,000.00	
g. Pump/bailer replacement cost ($)	$	10,000.00	[2e * 2f]
h. Monitoring Maintenance and Pump/bailer Replacement Cost ($)	$	48,880.00	[1e + 2d + 2g]
3. Cost for Groundwater Monitoring			
a. Number of required monitoring wells		10	
b. Monitoring frequency (semi-annual sampling for 30 years)		60	
c. Sampling cost ($/well)	$	1,100.00	
d. Laboratory testing cost ($/well)	$	400.00	
e. Statistical Analyses and Report ($/well)	$	300.00	
d. Groundwater Monitoring Cost ($)	$	1,080,000.00	[3a * 3b * (3c+3d+3e)]
4. TOTAL, GROUNDWATER MONITORING AND WELL MAINTENANCE COST	$	1,128,880.00	[2h + 3d]
F. Cost for Methane Monitoring and Maintenance		N/A	
G. Cost for Drainage and Erosion Control Maintenance			
1. Drainage and erosion control maintenance frequency (visits/30 years)		60	
2. Cost for materials to repair per visit	$	500.00	
3. Total material cost ($)	$	30,000.00	[1 * 2]
4. Maintenance time required per visit (hours)		10	
5. Unit labor cost	$	140.00	
6. Total labor costs ($)	$	84,000.00	[1 * 4 * 5]
7. TOTAL, DRAINAGE AND EROSION CONTROL MAINTENANCE COST	**$**	**114,000.00**	[3 + 6]
H. Cost for Access Control and Benchmark Maintenance			
4. Fencing material cost ($)	$	-	Facility is fenced.
7. Total labor costs ($)	$	-	
8. Benchmark maintenance cost (if applicable ($)	$	5,000.00	
9. Other ($)	$	-	
10. TOTAL, ACCESS CONTROL/BENCHMARK MAINTENANCE COST	**$**	**5,000.00**	[4 + 7 + 8 + 9]
I. Optional - Maintenance of dike(s) required for facilities constructed in floodplain/floodway			
J. Other costs - Costs not included in the above items should be listed here. They may include such items as access road maintenance, lift station power costs, etc. Please enter "N/A" if you do not have additional costs to place here.	**N/A**		
K. TOTAL POST-CLOSURE COST	**$**	**3,701,122.49**	[A3 + B3 + C4 + D3 + E4 + F3 + G7 + H10 + I7 + J]
10% Contingency (per IDEM)	**$**	**370,112.25**	
Total	**$**	**4,071,234.74**	