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GEOTECHNICAL CONSULTING SERVICES

COAL COMBUSTION RESIDUALS (CCR) ABUTMENT AND BASE SURFACE IMPOUNDMENT SYSTEM PERIODIC STRUCTURAL STABILITY ASSESSMENT

DEERHAVEN GENERATING STATION (DGS)
10001 NW 13th STREET
GAINESVILLE, ALACHUA COUNTY, FLORIDA

PROJECT NO. 0230.1500077
REPORT NO. 1892167

Prepared For:

Gainesville Regional Utilities
Deerhaven Generating Station (DGS)
10001 NW 13th Street
Gainesville, Florida 32653
(352) 393-6200

Prepared By:

Universal Engineering Sciences
4475 SW 35th Terrace
Gainesville, Florida 32608
(352) 372-3392

September 29, 2021

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September 29, 2021

Gainesville Regional Utilities-Deerhaven Generating Station (DGS)
10001 NW 13th Street
Gainesville, Florida 32653

Attention: Ms. Regina Embry

Reference: **Report of Geotechnical Consulting Services**
Deerhaven Generating Station -CCR Abutment and Base Impoundment
Periodic Structural Stability Assessment
10001 NW 13th Street
Gainesville, Alachua County, Florida
UES Project No. 0230.1500077 UES Report No. 1892167

Dear Ms. Embry:

Universal Engineering Sciences, LLC (UES) has completed the geotechnical engineering services for the subject project in Gainesville, Alachua County, Florida. This geotechnical Report is submitted in satisfaction of the contracted scope of services as summarized in UES Proposal No. 1705557, dated August 27, 2019.

The following report presents the results of our Periodic Structural Stability Assessment for the coal combustion residuals (CCR) abutment and base of the surface impoundment system at the Deerhaven Generating Station. This plan was prepared under the supervision, direction and control of the undersigned registered professional engineer (PE). The undersigned PE is familiar with the requirements of 40 CFR 257.73(d). This document certify that the CCR impoundment system meets the requirements of 40 CFR 257.73(d) with respect to periodic structural stability assessment.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please contact us if you have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,
UNIVERSAL ENGINEERING SCIENCES, LLC
Certificate of Authorization Number 549

TIMOTHY E. KWIATKOWSKI LICENSE No 86444 STATE OF FLORIDA PROFESSIONAL ENGINEER

EDUARDO SUAREZ LICENSE No 60272 STATE OF FLORIDA PROFESSIONAL ENGINEER

Eduardo Suarez
2021.09.29
09:37:38 -04'00'

Timothy E. Kwiatkowski, P.E.
Staff Geotechnical Engineer
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Senior Geotechnical Engineer
Florida P.E. No. 60272

This item has been electronically signed and sealed by Eduardo Suarez, PE on the date adjacent to the seal using Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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LIST OF APPENDICES

EXECUTIVE SUMMARY

We have prepared this executive summary as a general overview. Please refer to, and rely on, the full report for information about findings, recommendations, and other considerations.

The Deerhaven Generating Station is located in Gainesville, Alachua County, Florida. The Deerhaven process water ponds include a coal combustion residuals (CCR) surface impoundment system (i.e., Ash Cell #1, Ash Cell #2), two pump back ponds (i.e., Pump Back Cell #1, Pump Back Cell #2), and two front-end treatment lime sludge ponds.

The structural stability of the surface impoundment system appears to be satisfactory and meets the requirements of 40 CFR 257.73(d), based on the following:

- A slope stability analysis showing satisfactory factors of safety as required by 40 CFR 257.73(e).
- Based on the previous geotechnical exploration, in-situ testing prepared by UES, and considering the adequate structural performance of the embankments over the last 40 years, we conclude that the foundation and dikes have been mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR impoundment system.
- The slopes are vegetated with grass along the exterior, and covered with rock/rip-rap along the interior slopes. No scarps, sloughs, major depressions, bulging, sags, tension cracks, or other signs of significant settlement or mass soil movement or slope instability were observed outside or inside the dike slopes.
    - Slope protection appears adequate to protect against surface erosion and wave action.
    - Vegetation on the exterior slope was less than 6 inches high.
    - The grades immediately surrounding the surface impoundment system are flat and there are no water bodies adjacent to the embankments encompassing the surface impoundment system and other vicinity process ponds that could affect the structural stability of the surface impoundment system.

The surface impoundment system were constructed primarily with compacted fine silty sands with a clay blanket within the interior, to prevent seepage through the embankment slopes of CCR surface Impoundment System embankments. Below the clay blanket, each embankment has a clay slurry wall that connects to the top of a natural clay layer. This slurry wall prevents water from seeping below the embankments to the exterior slopes of the surface impoundment system.

Based on the History of Construction (IWCS, 2016) and subsurface information detailed by Burns & McDonnell (B&M, 1978), the CCR impoundment system was constructed to form an impervious surface that prevents intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuation in groundwater elevation, as required by 40 CFR 257.60.

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) issued the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule to regulate the management of coal combustion residuals and surface impoundments. Section 257.73 (b) of the CCR rules requires owners or operators to conduct initial and periodic structural stability assessment in accordance with section 257.73 (d). The owner or operator of the CCR unit must conduct and complete the assessments every five years. The initial structural stability assessment was completed in 2016, in line with the requirements outlined in CCR Rule. This report provides the quinquennial periodic structural stability for the CCR surface impoundment system at the Deerhaven Generating Station (DGS) in Gainesville, Alachua County, Florida.

2.0 PROJECT CONSIDERATIONS

The subject site is located within Sections 26 and 27, Township 8 South, Range 19 East in Gainesville, Alachua County, Florida. DGS is located approximately 1.25 miles north of NW 43rd Street along the north side of US HWY 441, in Gainesville, Alachua County, Florida. More specifically, the property is an approximately 930-acre parcel of land located at 10001 NW 13th Street in Gainesville, Alachua County, Florida.

The surface impoundment system is situated just northwest of the facility's main power generating infrastructure. The surface impoundment system is connected to the main plant by asphalt roads. The surface impoundment system studied in this analysis is approximately 5.2 acres and is located in close proximity to wooded areas. Moderately dense wooded areas surround much of DGS. There are some stormwater management areas/swales on the south side of the surface impoundment system. An aerial site location and USGS map are included in **Appendix A.**

If any of the above information is incorrect or changes, please contact UES immediately so that revisions to the recommendations contained in this report can be made, as necessary.

3.0 PURPOSE AND SCOPE OF SERVICES

The purposes of this evaluation were to:

1. Perform a structural stability assessment which meets the requirements of 40 CFR 257.73(d) to document whether the CCR surface impoundment system has been designed, constructed, operated, and maintained with:

    a. Stable foundations and abutments
    b. Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown
    c. Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR impoundment system
    d. Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection
    e. Hydraulic structures passing through the dike of the CCR impoundment system that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure

f. For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.
g. Identification of any structural stability deficiency associated with the CCR unit and provide recommendations for corrective measures.

This evaluation included several site visits, a review of information submitted by Gainesville Regional Utilities (GRU) and Innovative Waste Consulting Services (IWCS) and any relevant publicly available information from state or federal agencies regarding the structural stability of the surface impoundment system and any hydraulic connection between the base of the CCR unit and the uppermost aquifer.

4.0 STRUCTURAL STABILITY ASSESSMENT

4.1 Background information - Document review

The following documents were available for the stability assessment;

- Report of Geotechnical Consulting Services – Initial Structural Stability Assessment CCR Surface Impoundment (UES, 2016).

- Report of Geotechnical Consulting Services – Slope Stability and Liquefaction Potential Analysis – Process Pond Impoundment Dikes (*UES, 2020*).

- History of Construction – Coal Combustion Residuals Surface Impoundment (*IWCS, 2016*).

As previously described, the surface impoundment system are impounded by an earthen embankment system consisting of a dike configuration. The top of the CCR Surface Impoundment System embankments are at or near elevation +195 feet, National Geodetic Vertical Datum of 1929 (NGVD 29), which is nearly 150 feet above the Floridan Aquifer potentiometric surface level. The slopes vary in steepness from 3H: 1V to 4H: 1V throughout the sides of the CCR Surface Impoundment System area. The slopes are vegetated with grass along the exterior, and covered with rock/rip-rap along the interior slopes.

The total perimeter of the embankment adjacent to the surface impoundment system is 1,070 feet with a crest width of 25 feet. The height of the embankments adjacent to the surface impoundment system varies from about 9 to 16 feet above the surrounding ground surface. An aerial photograph of the surface impoundment system and embankments is included in **Appendix B.**

4.2 Periodic Structural Stability Assessment

UES visited the site on August 11, 2021 and August 23, 2021 to inspect the conditions of the CCR surface impoundment system regulated by the CCR Rule.

An initial structural stability was completed by UES in 2016. IWCS has prepared CCR Units Annual Inspection Reports from 2015 to 2020. Annual inspection reports were reviewed to develop an understanding of the operation and maintenance history of the CCR units. The summary inspection checklist for the annual inspections is included in **Appendix F.**

4.2.1 Stable Foundation and Abutment

The construction specification, plans and as-built documents for the original design and construction have been reviewed.

The initial structural stability analysis for the foundation have also been reviewed. Results of the Initial Slope Stability Analysis indicate that appropriate slope stability factors of safety are met for the embankment of the Impoundments. Embankments have also been in place for over 40 years. *The results of our previous evaluation indicated that factors of safety against shear failure of the existing slope areas exceeded the required values of 1.5 for the long-term maximum storage pool loading condition, 1.4 for the maximum surcharge pool loading condition, and required value of 1 for seismic event with 2% probability of exceedance in 50 years and horizontal acceleration of 1 second-period. More details are presented in the UES (2020) report.*

There has been no indication of foundation instability in annual site inspections and stability evaluation indicate that foundations are considered stable.

4.2.2 Adequate Slope Protection

The adequacy of the slope protection was evaluated by reviewing construction drawings, operation and maintenance procedures and conditions observed in the field.

The slopes vary in steepness from 3H: 1V to 4H: 1V throughout the sides of the surface impoundment system. The slopes are vegetated with grass along the exterior, and covered with rock/rip-rap along the interior slopes.

Exterior Slope: No scarps, sloughs, major depressions, bulging, sags, tension cracks, or other signs of significant settlement or mass soil movement or slope instability were observed inside or outside the embankment slope. During our August 11^{th} site visit, the grass on the exterior slope was generally observed, to be taller than 6 inches, as shown in **Photos 1 and 2**. Minor erosion was observed from mowing equipment, as shown in **Photos 3 and 4**. Animal burrows were not encountered on the exterior slopes at the time of our observation. Some localized areas of minor surface erosion were observed, as shown in **Photos 5 and 6**. During a following visit, the grass along the exterior embankments was observed to be mowed, and less than 6 inches in height.

Wet/moist soils were observed along the toe of the dike at the west exterior embankment, slightly south of Ash Cell # 1, but no seepage or flowing water appeared to be associated with this wet area. No indication of seepage flow or erosion was observed on the outside surface of dikes.

Interior slope: The interior slopes of the surface impoundment system were observed to be lined with riprap with moderate amounts of dormant vegetation, including algae and grass, as shown in **Photos 9 and 10**. Due to the high water levels observed in the Ash Cell and Pump Back Cell ponds, the bottom slope of the embankments were not visible.

The inside slope toe and much of the slope is covered with ash, particularly along the center of the northeastern slope of Ash Cell #1, and the center of the southwestern slope of Ash Cell #2. See **Photos 11 and 12** where ash is accumulated over the slope of the surface impoundment system. No slumps, slides or other signs of shear failure were observed in the visible part of the slope above the ash and water levels. No significant erosion was noted.

A pile of Ash sediment was observed in cell #2, as shown in **Photographs 13 and 14.** We understand that the pile contain mostly deposited material previously vacuumed out of the L.P. Sump, and that this practice is no longer allowed. Discharge structures in Ash Cells #1 and #2 were observed to be buttressed with riprap, or stone, as shown in **Photos 15 and 16**.

Photographs taken during our field assessment are provided in **Appendix C.** Overall slope protection for interior and exterior slopes appears to be adequate to protect against surface erosion and wave action.

No evidence of significant areas of erosion or wave action were observed. Existing slopes have been inspected annually for erosion, seepage, animal burrows, sloughing and plants that could negatively impact the embankment. The 2020 CCR Units Annual Inspection Report did identify items relating to slope protection that required repair or further action. These repairs were addressed and completed as described in Annual inspection Report published on August 27, 2021.

The existing slope protection measures are considered adequate to provide protection against surface erosion, wave action and adverse effects of sudden drawdown.

4.2.3 Dikes Mechanically Compacted

The crest of the CCR Surface Impoundment System dikes is accessible with vehicles. The crest had no signs of depression, tension cracking or other indications of settlement or shear failure. The pavement surface was generally observed to be in fair condition. Some localized areas of distress were noted along the pavement surface (**Photos 17 through 19**). Asphalt surface cracks typically associated with shrinkage of the asphalt (longitudinal/transverse cracks – **Photo 17**) and weakened subgrade near the edge of pavement (edge cracking), were encountered along the service road at the top of the embankments in some areas. See **Photograph 20** for a typical view of the crest/pavement edge cracking, with areas of patching.

Soil borings logs and in-situ testing conducted during the initial structural stability assessment are presented in **Appendix D.** Based on the previous geotechnical exploration, in-situ testing, and considering the adequate structural performance of the embankments over the last 40 years, we conclude that the dikes and foundation have been mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR surface impoundment system.

4.2.4 Vegetated Slopes Inspection

During our August 11, 2021 site visit, visual observations showed that the exterior embankment slopes were covered with grass vegetation which appeared to be more than 6 inches in height. Subsequent visit (August 23, 2021), indicated that grass vegetation was mowed, well maintained with less than 6 inches in height (**Photos 7 and 8**).

The interior slope of the surface impoundment system was observed to be lined with riprap, which serves as slope protection, with moderate amounts of dormant vegetation (see **Photo 23**). The exterior slope has a grass cover and does not have signs of significant dips, sags or other visual evidence of distress (see **Photo 24**). See **Appendix C** for the aforementioned photos.

Riprap armor on the interior slopes serves as an adequate form of slope protection.

Based on this evaluation, the vegetation on the exterior is adequate as not substantial bare or overgrown areas were observed during our second visit.

4.2.5 Hydraulic Structures Inspection

The outlets of Ash Cell #1 and Ash Cell #2 consist of concrete drop structures (**Photos 21 and 22**) with stop logs that provide ash containment. The concrete drop structures hydraulically connect to Pump Back Cells #1 and #2. Water flows from the surface impoundment system to the pump pack ponds via a 12" butterfly valve located in the stop log structure in the ponds through a 12" filament-wound glass-fiber reinforced plastic culvert pipe to an outfall in the pump back pond. The elevation of the 12" butterfly valve is 177 feet, NGVD 29, and the outfall elevation is 175 feet, NGVD 29. Water from the Pump Back Cells gets pumped back to the plant for reuse in plant operations; the plant is a zero-discharge facility.

Section 257.73 (d)(vi) of the CCR Rule requires that any hydraulic structure underling the base of the CCR Unit or passing through the dike of the CCR unit maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation and debris that may negatively affect the operation of the hydraulics structure. If a deficiency or a release is identified during the periodic assessment, the owner or operator must remedy the deficiency or release as soon as possible and prepare documentation detailing the corrective measure taken.

Because of the water levels, the butterfly valves and stop log culvert pipes connecting to the pump back ponds were not visible at the time of our assessment.

During the pipe inspections, we interviewed Gale Fillinger, the Process Plant Supervisor for DGS. He informed us that normal flow through the stop log pipes is approximately 350,000 to 500,000 gallons per day through the stop log pipes, and that abnormal discharges have not been observed nor have been reported on the surface impoundment weekly inspections forms.

Based on weekly inspection performed by GRU, site personnel have not observed or encountered surficial subsidence, discolored discharge or other indication that the discharge pipe is corroding or failing in any way. There has been no reported observed settlement or change in grade above the installed culvert pipe that Site personnel would imply compromise.

Based on information provided by GRU, the valve located at Ash Cell #2 is currently not functioning, and that the operating linkage appears to have failed below the waterline. GRU is implementing a repair plan which includes isolating the inlet and outlet of the stop log structure to facilitate drainage and to repair the valve. Currently, a diesel driven power prime pump is being utilized to move water out of that impoundment, as needed to control level and to provide water to feed the plant. See **Photo 22 showing** the water level of Ash Cell #2 just below the stop log structure platform.

On August 28, 2020, the EPA issued revisions to the CCR rule that require the owner/operator of an existing unlined CCR surface impoundment to cease placing CCR and non-CCR wastestreams into such CCR surface impoundments as soon as technically feasible, but no later than April 11, 2021 (§257.101(a)).

GRU submitted a closure initiation deadline extension request to the EPA in November 2020 allowing GRU to continue using the existing CCR surface impoundment system until June 15, 2023, under the provisions of §257.103(f)(1). Based on information provided by GRU-IWCS, the ash cells will be drained separately to remove the ash and to inspect valve, culverts hydraulics structures.

As a follow up, we recommend including a periodic interior inspection of the connecting pipes between the CCR surface impoundment system and pump back cells, as part of the periodic excavation of the accumulated ash within the CCR surface Impoundment System.

4.2.6 Downstream Slope Sudden Drawdown Evaluation

The surface impoundment system are impounded by an earthen embankment system. The site is wide and flat, and there are no downstream channels and no adjacent water bodies that could affect the CCR unit.

4.2.7 Structural Stability Deficiency

The overall structural integrity of the slopes appears to be stable. Due to the water levels observed, observations of the interior slopes within the CCR Surface Impoundment System were limited. No signs of erosion were otherwise observed. If erosion deepening occurs, additional rock (rip-rap) placement would be necessary for preventative maintenance.

4.3 <u>Conclusion</u>

The structural stability of the surface impoundment system appears to be satisfactory and meets the requirements of 40 CFR 257.73(d), based on the following:

- A slope stability analysis showing satisfactory factors of safety as required by 40 CFR 257.73(e).

- Based on the previous geotechnical exploration and in-situ testing prepared by UES, and considering the adequate structural performance of the embankments over the last 40 years, we conclude that the dikes and its foundation have been mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR impoundment system.

- The slopes are vegetated with grass along the exterior, and covered with rock/rip-rap along the interior slopes. No scarps, sloughs, major depressions, bulging, sags, tension cracks, or other signs of significant settlement or mass soil movement or slope instability were observed inside or outside the dike slopes.

    - The slope protection appears adequate to protect against surface erosion and wave action.

    - Vegetation on the exterior slope was less than 6 inches high.

- The grades immediately surrounding the surface impoundment system are flat and there are no water bodies adjacent to the embankments encompassing the surface impoundment system and other vicinity process ponds that could affect the structural stability of the surface impoundment system.

Considering the adequate structural performance of the impoundments over the last 40 years, we conclude that the embankment and foundation had been adequately designed, constructed, operated and maintained.

5.0 LIMITATIONS

This report has been prepared for the exclusive use of IWCS and GRU. The scope is limited to the specific project and locations described herein. Our description of the project's design parameters represents our understanding of the significant aspects relevant to soil and foundation characteristics. In the event that any changes in the design or location of the CCR surface impoundment system as outlined in this report are planned, we should be informed so the changes can be reviewed and the conclusions of this report modified, if required, and approved in writing by UES.

For a further description of the scope and limitations of this report please review the document attached within **Appendix G**, "Important Information About Your Geotechnical Engineering Report" prepared by Geoprofessional Business Association (GBA).

6.0 REFERENCES

IWCS, 2016 -Innovative Waste Consulting Services, LLC. (2016). *History of Construction - Coal Combustion Residual Surface Impoundment System*. Gainesville, FL.

B&M, 1978 -Subsurface Information for the Deerhaven Generating Station Site Near Hague, Florida, prepared by Burns & McDonnell, Dated 1978

Thomas, 1985- Thomas, B., & Cummings, E. (1985). *Soil survey of Alachua County, Florida* (pp. 6-7). Place of publication not identified, Florida: U.S. Dept. of Agriculture, Soil Conservation Service in cooperation with University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Dept. ;.

UES, 2020- Universal Engineering Sciences. (2020). *Slope Stability And Liquefaction Potential Analysis Process Pond Impoundment Dikes,*. Deerhaven Generating Station, Gainesville, FL.

UES, 2016-Universal Engineering Sciences. (2016). CCR Landfill and Impoundment Evaluation. Deerhaven Generating Station,. Gainesville, FL.

UES, 2006- Report of Geotechnical Consulting Services – Air Quality Control Retrofit, prepared by Universal Engineering Sciences, Inc., Dated 2006.

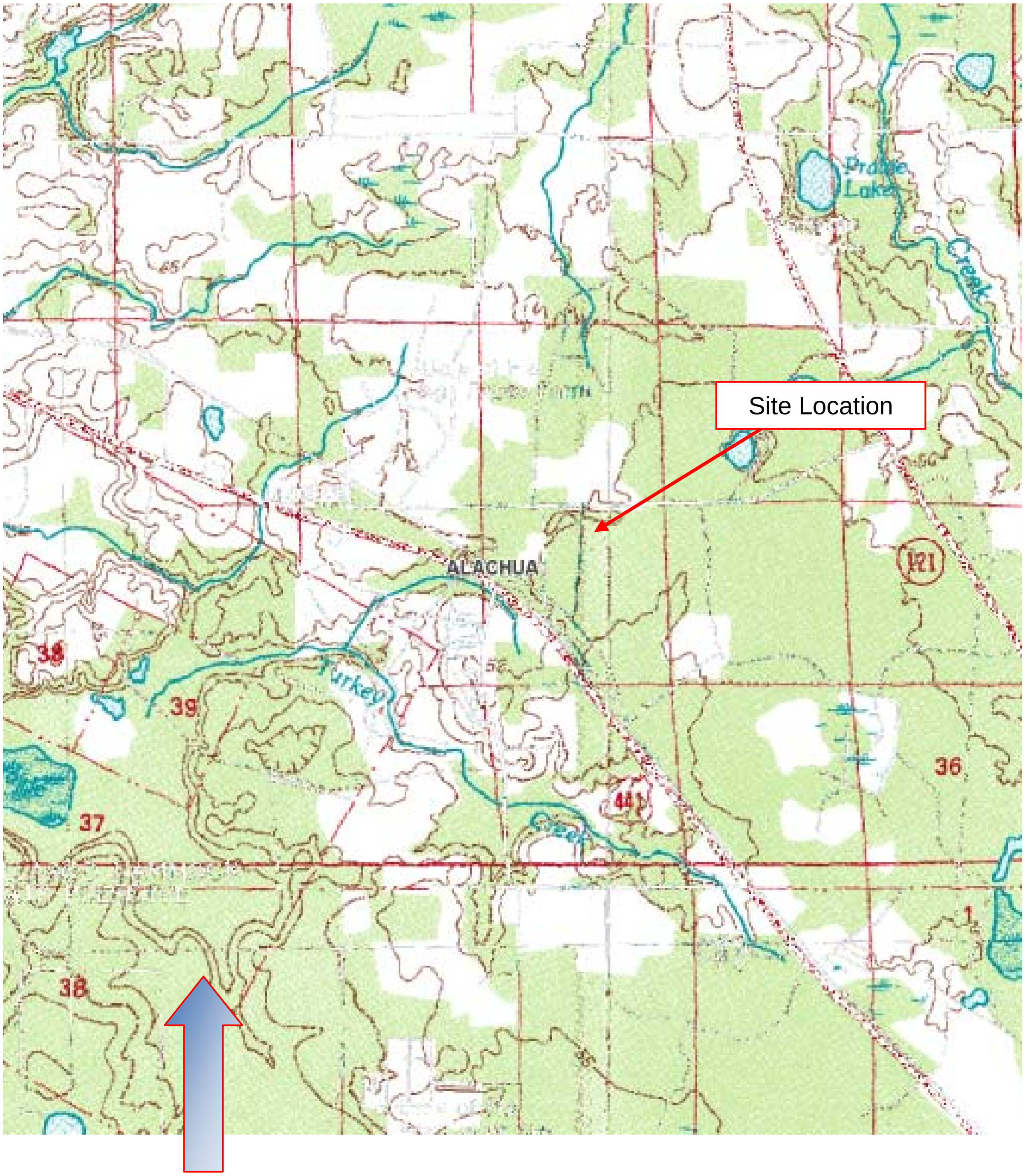
UES, 2013- Report of Geotechnical Consulting Services – Coal Yard Lighting Poles, prepared by Universal Engineering Sciences, Inc., Dated 2013.

APPENDIX A

SITE AERIAL MAP

U.S.G.S. MAP

UNIVERSAL ENGINEERING SCIENCES	GRU Deerhaven Generating Station Gainesville, Alachua County, Florida		
	Site Location Map		
	DATE: 09-01-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: A
	SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.:A 1



UNIVERSAL ENGINEERING SCIENCES	**GRU Deerhaven Generating Station Gainesville, Alachua County, Florida**		
	U.S.G.S. Map		
	DATE: 09-01-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: A
	SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.:A 2

APPENDIX B

CCR SURFACE IMPOUNDMENT SYSTEM AND DIKES AERIAL MAP

GRU – Deerhaven Generating Station
CCR Surface Impoundment System Embankments Stability
10001 NW U.S. Highway 441
Gainesville, Alachua County, Florida

CCR Surface Impoundment System and Dikes Aerial

DATE: 09-01-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: B
SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: B 1

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APPENDIX C

PHOTHOGRAPHS

Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5

Photograph 6

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GRU – Deerhaven Generating Station
CCR Surface Impoundment System Embankment Stability
10001 NW U.S. Highway 441
Gainesville, Alachua County, Florida

Site Photographs

DATE: 08-30-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: C
SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: C 1

Photograph 7

Photograph 8

Photograph 9

Photograph 10

UNIVERSAL ENGINEERING SCIENCES	**GRU – Deerhaven Generating Station** **CCR Surface Impoundment System Embankment Stability** **10001 NW U.S. Highway 441** **Gainesville, Alachua County, Florida**	
	Site Photographs	
DATE: 08-30-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: C
SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: C 2

Photograph 11

Photograph 12

Photograph 13

Photograph 14

Photograph 15

Photograph 16

UNIVERSAL ENGINEERING SCIENCES	**GRU – Deerhaven Generating Station CCR Surface Impoundment System Embankment Stability 10001 NW U.S. Highway 441 Gainesville, Alachua County, Florida**		
	Site Photographs		
	DATE: 08-30-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: C
	SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: C 3

 Photograph 17	 Photograph 18
 Photograph 19	 Photograph 20
 Photograph 21	 Photograph 22

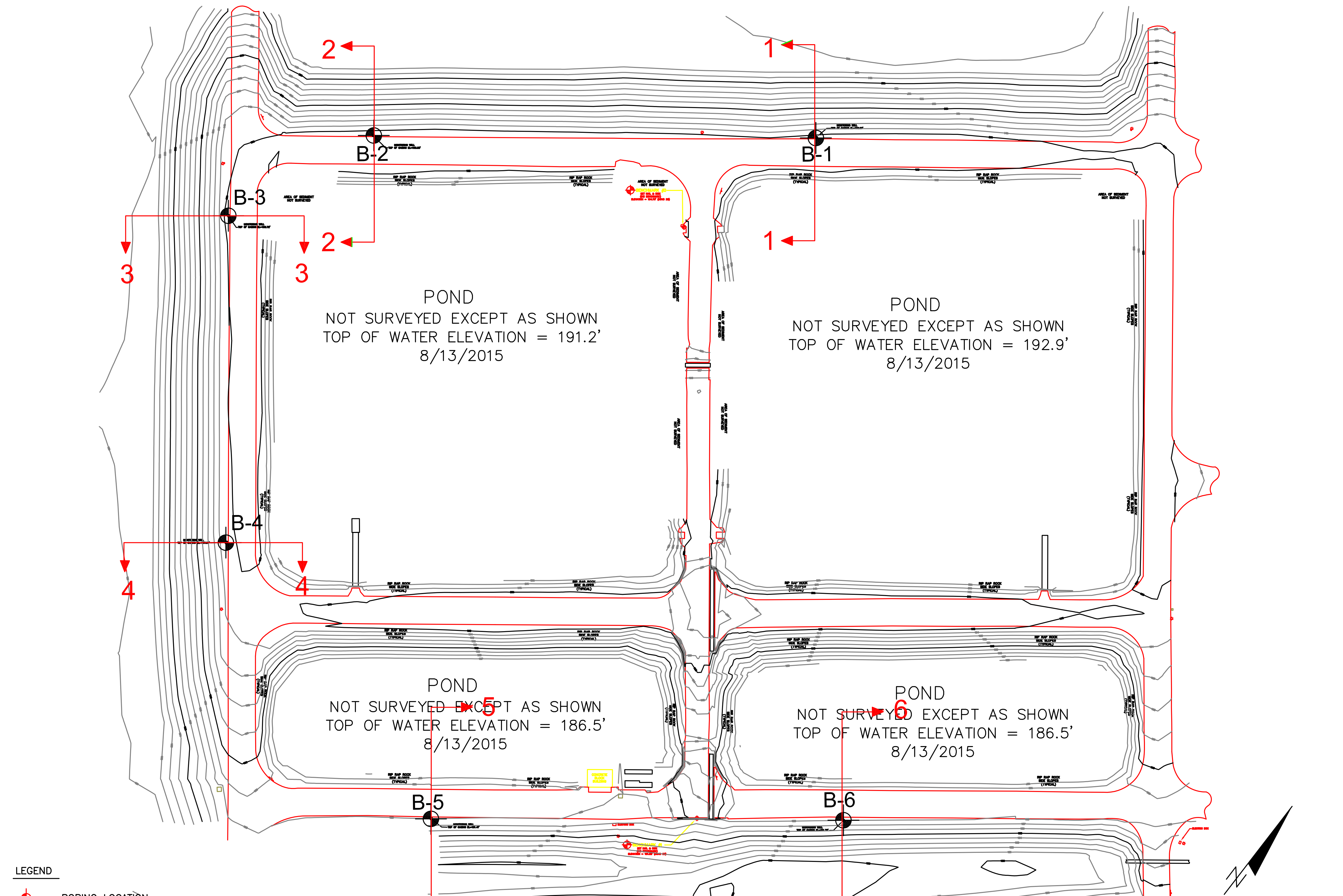
UNIVERSAL ENGINEERING SCIENCES	GRU – Deerhaven Generating Station CCR Surface Impoundment System Embankment Stability 10001 NW U.S. Highway 441 Gainesville, Alachua County, Florida		
	Site Photographs		
	DATE: 08-30-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: C
	SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: C 4

 Photograph 23	 Photograph 24

UNIVERSAL ENGINEERING SCIENCES	GRU – Deerhaven Generating Station CCR Surface Impoundment System Embankment Stability 10001 NW U.S. Highway 441 Gainesville, Alachua County, Florida		
	Site Photographs		
	DATE: 08-30-21	UES PROJECT NO.: 0230.1500077	APPENDIX NO.: C
	SCALE: N.T.S.	REPORT NO.: 1892167	FIGURE NO.: C 5

APPENDIX D

SOIL TEST BORING LOGS - COMPACTION TEST RESULTS



LEGEND

BORING LOCATION

NOTE: ALL SOIL TEST BORING LOCATIONS SHOWN ARE APPROXIMATE.

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES

DRAWN BY: KD | DATE: 8/2/16

CHECKED BY: ES | DATE: 8/2/16

SCALE: 1"=80' | ACADFILE:0230.1500077-D

PROJECT NO: 0230.1500077.0000 | REPORT NO : 1892167

GRU DEERHAVEN POWER PLANT-POND EMBANKMENT

10001 NW 13TH STREET

GAINESVILLE, FLORIDA

CROSS SECTION FOR SLOPE STABILITY

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PAGE NO: D - 1

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.1500077.0000
REPORT NO.:	1892167
PAGE:	D-2

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-1** SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

GS ELEVATION(ft): 195
WATER TABLE (ft): 3.28
DATE OF READING: 7/17/15
EST. WSWT (ft):

DATE STARTED: 7/9/15
DATE FINISHED: 7/9/15
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG CONT. (%)
0						Medium dense brown silty SAND [SM]						
1–2.5	X	3-5-5	10									
2.5–4	X	6-5-5	10	▼ (3.28)		Medium dense brown and gray sand, with silt [SP-SM]						
4–5.5	X	5-6-5	11									
5.5–7	X	6-3-4	7				10	13				
7–8.5	X	4-2-2	4			Loose brown silty SAND [SM]						
8.5–10	X	2-3-3	6				14	17				
13.5–15	X	2-4-7	11			Medium dense gray-brown silty clayey SAND [SM-SC]						
18.5–20	X	6-7-7	14									
23.5–25	X	2-3-4	7			Loose brown SAND, with trace of silt [SP-SM]						
25						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.1500077.0000
REPORT NO.:	1892167
PAGE:	D-3

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-2**

SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

GS ELEVATION(ft): 195

WATER TABLE (ft): 8.07

DATE OF READING: 7/17/15

EST. WSWT (ft):

DATE STARTED: 7/10/15

DATE FINISHED: 7/10/15

DRILLED BY: R. WOODARD

TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/DAY)	ORG CONT. (%)
0					SM	Medium dense brown, gray and tan silty SAND, with trace of clay [SM]						
2	X	3-4-7	11									
3.5	X	8-9-10	19									
5	X	9-10-11	21									
6.5	X	11-9-9	18									
7.5					SC	Medium dense gray very clayey SAND [SC]						
8	X	8-8-6	14	▼								
9.3					SM	Medium dense gray silty SAND [SM]						
10	X	10-6-6	12									
15	X	8-10-6	16									
17					SP-SM	Medium dense light gray SAND, with silt [SP-SM]						
20	X	5-8-10	18									
21					SM	Medium dense brown silty SAND [SM]						
25	X	4-8-17	25			Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0230.1500077.0000
REPORT NO.: 1892167
PAGE: D-4

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-3** SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHELBY TUBE SAMPLE TAKEN FROM 12' TO 14'

GS ELEVATION(ft): 195
WATER TABLE (ft): 9.4
DATE OF READING: 7/17/15
EST. WSWT (ft):

DATE STARTED: 7/10/15
DATE FINISHED: 7/10/15
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG CONT. (%)
0						Medium dense brown and gray silty SAND, with trace of clay [SM]						
2	X	4-6-10	16									
4	X	9-10-12	22									
5	X	11-14-15	29									
7	X	19-14-12	26				14	7				
8	X	14-14-9	23									
9				▼		Medium dense gray and orange clayey SAND [SC]						
10	X	7-4-6	10				32	20	40	22		
12–14	Shelby tube											
15	X	3-4-10	14									
18.5						Medium dense brown silty SAND [SM]						
20	X	10-11-17	28									
22						Medium dense white and light brown silty clayey SAND [SM-SC]						
25	X	2-3-7	10									
25						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.1500077.0000
REPORT NO.:	1892167
PAGE:	D-5

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-4** SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHELBY TUBE SAMPLE TAKEN FROM 10' TO 12'

GS ELEVATION(ft): 195
WATER TABLE (ft): 7.95
DATE OF READING: 7/17/15
EST. WSWT (ft):

DATE STARTED: 7/9/15
DATE FINISHED: 7/10/15
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/DAY)	ORG CONT. (%)
0						Loose to medium dense brown and tan silty SAND [SM]						
2		4-4-5	9				13	9				
4		8-9-10	19									
5		11-15-19	34									
7		17-14-12	26									
8		13-13-7	20	▼ (7.95)								
9						Loose gray and green clayey SAND [SC]						
10		5-4-4	8				27	21	25	10		
10–12	Shelby tube											
14						Loose to medium dense brown and light gray silty SAND [SM]						
15		1-2-4	6									
20		7-7-17	24									
25		3-5-7	12									
25						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0230.1500077.0000
REPORT NO.: 1892167
PAGE: D-6

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-5** SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHELBY TUBE SAMPLE TAKEN FROM 5' TO 7'

GS ELEVATION(ft): 188
WATER TABLE (ft): 3.14
DATE OF READING: 7/17/15
EST. WSWT (ft):

DATE STARTED: 7/9/15
DATE FINISHED: 7/9/15
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/DAY)	ORG CONT. (%)
0						Loose light brown SAND, with trace of silt [SP-SM]						
2		2-3-2	5									
3				▼		Loose gray and orange clayey SAND [SC]						
4		1-2-3	5									
5		1-2-2	4				26	18	26	12		
7		2-3-4	7			Medium dense to dense brown and tan silty SAND [SM]						
8		10-14-13	27									
10		15-16-19	35									
12						Medium dense gray silty SAND [SM]						
15		5-7-11	18									
16.5						Loose brown SAND, with silt [SP-SM]						
20		3-2-2	4				6	18				
21.5						Medium dense white SAND [SP]						
25		7-9-12	21									
25						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0230.1500077.0000
REPORT NO.: 1892167
PAGE: D-7

PROJECT: GRU DEERHAVEN POWER PLANT-POND EMBANKMENT
10001 NW 13TH STREET
GAINESVILLE, FLORIDA

BORING NO: **B-6** SHEET: 1 of 1

SECTION: TOWNSHIP: RANGE:

CLIENT: INNOVATIVE WASTE CONSULTING SERVICES
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHELBY TUBE SAMPLE TAKEN FROM 4' TO 6'

GS ELEVATION(ft): 188
WATER TABLE (ft): 6
DATE OF READING: 7/17/15
EST. WSWT (ft):

DATE STARTED: 7/9/15
DATE FINISHED: 7/9/15
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/DAY)	ORG CONT. (%)
0–2.5		3-4-5	9			Loose brown silty SAND, with trace of clay [SM]						
2.5–6.5		4-3-3	6			Loose dark gray clayey SAND [SC]	24	13	23	9		
	Shelby tube (4–6)	4-3-5	8	▼ (6)								
6.5–12.5		6-4-5	9			Loose to dense brown and tan silty SAND, with trace of clay [SM]						
		7-8-12	20									
		15-18-18	36									
12.5–18		5-4-4	8			Loose light brown SAND, with silt [SP-SM]	11	18				
18–25		4-9-9	18			Medium dense white SAND [SP]						
		4-9-12	21									
25						Boring Terminated at 25'						

UNIVERSAL ENGINEERING SCIENCES

KEY TO BORING LOGS

SYMBOLS

22	Number of Blows of a 140-lb Weight Falling 30 in. Required to Drive Standard Spoon One Foot
WOR	Weight of Drill Rods
S	Thin-Wall Shelby Tube Undisturbed Sampler Used
90% Rec.	Percent Core Recovery from Rock Core-Drilling Operations
■	Sample Taken at this Level
□	Sample Not Taken at this Level
—	Change in Soil Strata
▼	Free Ground Water Level
▽	Seasonal High Ground Water Level

GRANULAR MATERIALS

Relative Density	Safety Hammer SPT N (Blows/Ft.)	Automatic Hammer SPT N (Blows/Ft.)
Very Loose	Less than 4	Less than 3
Loose	4-10	3-8
Medium Dense	10-30	8-24
Dense	30-50	24-40
Very Dense	>50	>40

COHESIVE MATERIALS

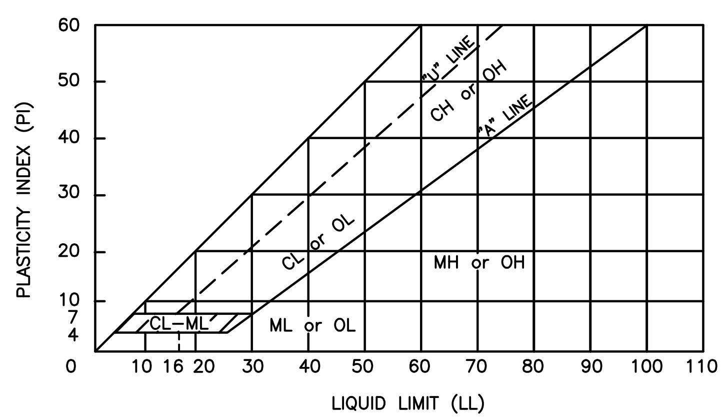
Consistency	Safety Hammer SPT N (Blows/Ft.)	Automatic Hammer SPT N (Blows/Ft.)
Very Soft	Less than 2	Less than 1
Soft	2-4	1-3
Firm	4-8	3-6
Stiff	8-15	6-12
Very Stiff	15-30	12-24
Hard	>30	>24

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 200 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomacaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75mm) sieve.

PLASTICITY CHART



STANDARD PROCTOR TEST RESULTS
(ASTM D 698)

TESTED FOR: Innovative Waste Consulting Services, LLC
6628 NW 9th Blvd., Suite 3
Gainesville, FL 32608

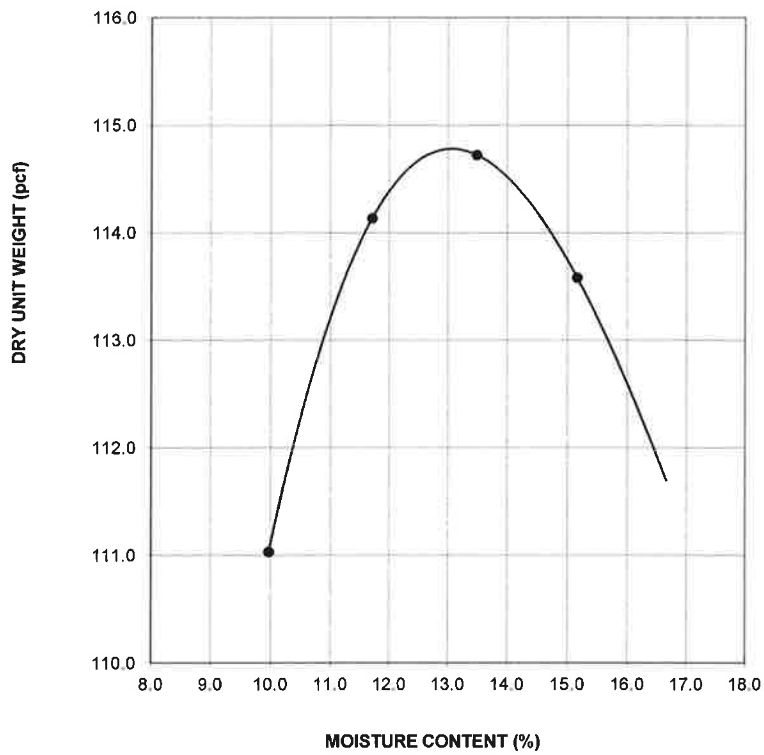
PROJECT: Deerhaven Generating Station
10001 US 441
Gainesville, FL

DATE TESTED: June 30, 2016

REPORT NO: 1892167

SAMPLE LOCATION: P-1

SOIL DESCRIPTION: Dark Brown Silty Sand w/ trace of rock



OPT MOISTURE: **13.0** MAX DENSITY: **114.5**

UNIVERSAL ENGINEERING SCIENCES
4475 S.W. 35TH TERRACE, GAINESVILLE, FL. 32608
(352)372-3392 (352)336-7914 (FAX)

UNIVERSAL
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Consultants In: Geotechnical Engineering, Environmental Sciences
Construction Materials Testing, Threshold Inspections, Private Provider Inspection
4475 SW 35th Terrace • Gainesville • FL• 32608 • P: (352) 372-3392 • F: (352) 336-7914
Certificate of Authorization No. 549

Project No: 230.1500077
Report No.: 1892167
Date: July 8, 2016

REPORT OF IN-PLACE DENSITY TESTS

Client: Innovative Waste Consultants, LLC **Project:** 34th Street HDPE

Area Tested
- [ ] Sanitary Pipe
- [ ] Sanitary Structure
- [ ] Storm Pipe
- [ ] Storm Structure
- [ ] Building Pad
- [ ] Footings
- [ ] Roadway
- [ ] Curb
- [x] Subgrade
- [ ] Other:

Material
- [ ] Fill
- [ ] Backfill
- [ ] Native
- [x] Embankment
- [ ] Limerock
- [ ] Stabilization
- [ ] Other:

Referenced From
- [x] Top
- [ ] Springline
- [ ] Bottom

"OF"
- [ ] Fill
- [ ] Native
- [ ] Footing
- [ ] Pipe
- [ ] Structure
- [ ] Berm
- [ ] Base Course
- [ ] Subgrade
- [x] Other: Slope surface

Field Test Performed
- [x] ASTM D-2937 Drive Cylinder Method
- [ ] ASTM D-6938 Nuclear Gauge Method
- [ ] ASTM D-1556 Sand Cone Method
- [ ] ASTM D-558 Soil Cement Field Proctor

Laboratory Testing
- [ ] ASTM D-1557 Modified Proctor
- [ ] ASTM D-698 Standard Proctor
- [ ] AASHTO T180 Modified Proctor
- [x] AASHTO T99 Standard Proctor
- [ ] FM 5-515 LBR
- [ ] ASTM D-1883 CBR

Report Left on Site?
- [ ] Yes (With Whom?) ____________
- [ ] No (Reason?) ____________

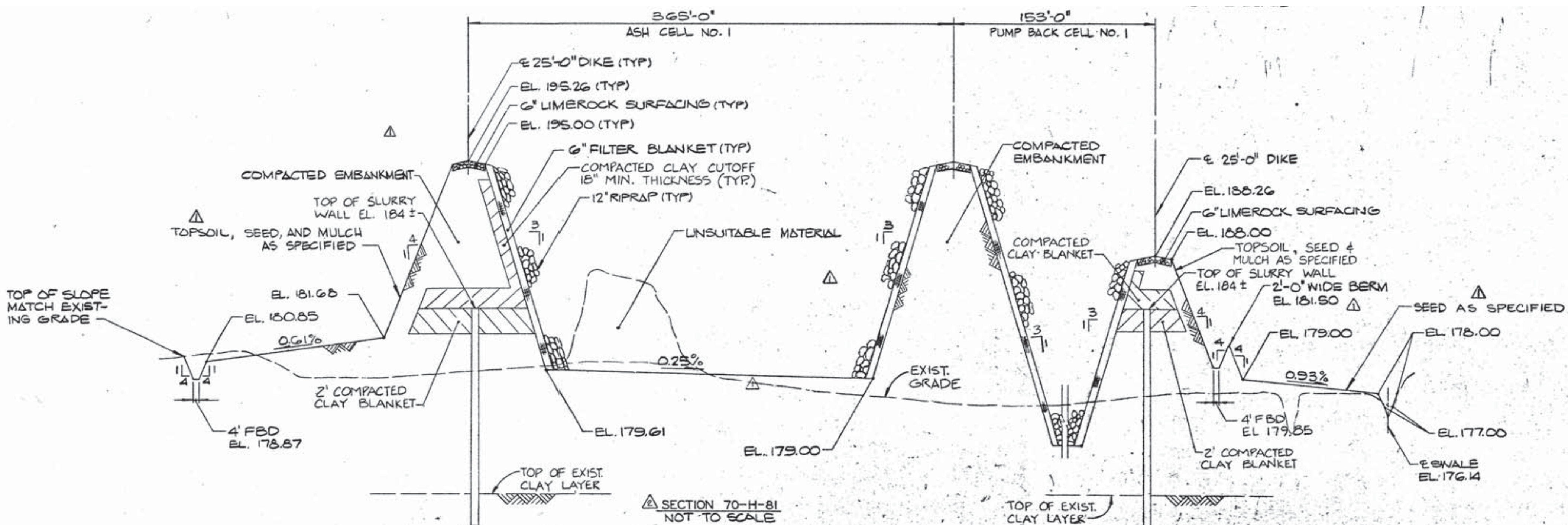
Compaction Requirement = 90%

Date Tested:

			Lab Test Results			Field Test Results				
Test No.	**Location of Test**	**Depth or Elevation**	**Sample Number**	**Maximum Density (pcf)**	**Optimum Moisture (%)**	**Wet Density (pcf)**	**Dry Density (pcf)**	**Field Moisture (%)**	**Compaction (%)**	**PASS FAIL**
B	Test #1	1 ft	-	114.5	13.0	106.0	101.9	4.0	89	
B	Test #2	1 ft	-	114.5	13.0	108.0	103.4	4.4	90	
C	Test #3	1 ft	-	114.5	13.0	111.0	102.7	8.1	90	

APPENDIX E

IMPOUNDMENT CROSS SECTIONS



SECTION 70-H-81
NOT TO SCALE

APPENDIX F

ITS ANNUAL INSPECTION REPORTS

INSPECTION CHECKLIST SUMMARY

ANNUAL INSPECTIONS

2015

- **Previous Condition**: Ash Cell #1 Butterfly Valve (Inoperative Valve)
    - **Remedial Action** : Valve Replaced (3/30/2016)
- **Previous Condition**: Northwest Exterior Slope of Ash Cell #1 and #2 (Animal Burrows)
    - **Remedial Action** : Burrows Inspected, Filled and Packed with Soils (Inspected – 1/29/2016, Filled and Packed – 2/11/2016)

2016

- **Previous Condition**: Inside Edge of Pavement On Outer Embankment Near Northern Corner of Ash Cell #1 (Damaged Pavement)
    - **Remedial Action** : Pavement Repaired (5/2/2017)
- **Previous Condition**: Eastern Extent of the Top of the External Slope of Ash Cell #2 (Animal Burrow)
    - **Remedial Action** : Burrows Inspected, Filled and Packed with Soil (3/2/2017)

2017

- **Previous Condition**: Western and Northern Internal Corners of Ash Cell #1, Northern Internal Corner of Ash Cell #2 (Erosion and Unarmored Slopes)
    - **Remedial Action** : Erosion repaired, slopes re-armored (3/8/2018)
- **Previous Condition**: External Slope of Ash Cell #2, Southwest External Slope of Pump Back #1, Near Light Post on Southeast External Slope Between Pump Back Ponds (Animal Forage Holes x3)
    - **Remedial Action** : Holes Inspected, Filled and Packed with Soil (1/5/2018)
- **Previous Condition**: Southern-most Splash Bock Ash Cell #2 (Erosion and Undercutting of Base Layer)
    - **Remedial Action** : Void space filled with flowable concrete (3/7/2018)

2018

- **Previous Condition**: Ash Cells #1 and 2 (Elevated water level)
    - **Remedial Action** : Water pumped to process water plant to provide 2 ft freeboard in Ash Cells 1 and 2 (12/26/2018)
- **Previous Condition**: External Slope of Ash Cell #1, Southside (Animal Forage Holes x1)
    - **Remedial Action** : Animal forage hole was filled in (12/26/2018)

2019

- N/A

2020

- **Previous Condition**: Southern Slope (Animal forage hole)
    - **Remedial Action** : IWCS inspected the CCR unit on 08/19/2021 and confirmed that the animal forage hole does not exist anymore. The details of the remedial action are unable due to a change in personnel/staff (NA)
- **Previous Condition**: Southern and Western Slopes (Grass was observed to be taller than 6 inches.)
    - **Remedial Action** : The grass was mowed to address the issue (12/23/2020)

APPENDIX G

GBA DOCUMENT

CONSTRAINTS AND RESTRICTIONS

CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client's exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing native observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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