ENGINEERING REPORT FOR DESIGN OF PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED PONDS MODIFICATIONS

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Prepared for:

OUC The Reliable One®

ORLANDO UTILITIES COMMISSION
STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

August 25, 2014

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Stanton Energy Center
Orange County, Florida

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Orlando Utilities Commission
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Attention: Mr. Charles W. Doud, P.E.
Senior Environmental Engineer

Subject: Engineering Report for Design of Proposed Recycle Pond Expansion and Existing Lined Ponds Modifications, Orlando Utilities Commission Stanton Energy Center, Orange County, Florida

Gentlemen/Ladies:

As requested and authorized by Orlando Utilities Commission (OUC), Tetra Tech has completed an engineering study for the proposed expansion of the existing Recycle Pond and modifications of the existing lined Recycle Pond, the North Coal Storage Area Runoff Pond, and the South Coal Storage Area Runoff Pond at the OUC Stanton Energy Center (SEC), in Orange County, Florida. The objective of this study was to provide data and analyses to support detailed design and regulatory approval of the proposed Recycle Pond Expansion, and modifications of the three existing lined ponds. To achieve the project objective, Tetra Tech has reviewed relevant existing data; performed a field exploration program within the proposed Recycle Pond Expansion footprint and in the vicinity of the existing lined ponds; conducted laboratory testing on the recovered soil samples; and performed engineering evaluations and analyses for the proposed design.

Tetra Tech has prepared this report for the exclusive use of OUC for design of the proposed Recycle Pond Expansion and lined ponds modifications at the SEC in accordance with generally accepted engineering practice. No other warranty, expressed or implied, is made.

Tetra Tech appreciates the opportunity of being of service to OUC on this project and looks forward to a continuing relationship. If you have any questions or need additional information, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC. - A Tetra Tech Company
Certificate of Authorization No. 5950

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Enclosures

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1.0 INTRODUCTION

1.1 Project Objective and Scope

Tetra Tech was retained by Orlando Utilities Commission (OUC) to provide design and regulatory support for the proposed expansion of the existing Recycle Pond (Recycle Pond Expansion) and the proposed modifications of the existing lined Recycle Pond, the North Coal Storage Area Runoff Pond (NCSARP), and the South Coal Storage Area Runoff Pond (SCSARP) at the OUC Stanton Energy Center (SEC), in Orange County, Florida.

The existing Recycle Pond is used for storage of excess water from the recently expanded Combustion Waste Storage Area (CWSA) Runoff Pond, the NCSARP, and the SCSARP. The existing NCSARP and SCSARP are used for storage of stormwater runoff from the coal storage areas. In addition to the contact water from the coal storage areas, the contact water from the Stack Out Pad, as well as the water from the thickeners and the ash dewatering area also drain to the SCSARP. Construction of the Recycle Pond Expansion and modifications of the lined NCSARP and SCSARP will provide additional storage for the system. To facilitate the construction, the Recycle Pond Expansion will serve as a temporary water storage area during modification of the Recycle Pond.

Construction and operation of the SEC are governed by the Conditions of Certification (COC) approved under the Electrical Power Plant Siting Act (403.501-403.518, Florida Statutes), in accordance with the supporting regulations contained in Rule 62-17, Part I, Florida Administrative Code (F.A.C.). The COC supersedes and encompasses all state and local permits and approvals, but does not exempt the facility from any applicable federal permitting process. The COC for the SEC has been modified eleven times since the original certification of the first coal-fired generating unit on December 15, 1982. The latest version of the COC, which is titled "Orlando Utilities Commission Curtis H. Stanton Energy Center Units 1 & 2, Combined Cycle Units A and Unit B, PA 81-14K, Supplemental Conditions of Certification," was promulgated on July 24, 2008. The Florida Department of Environmental Protection (FDEP) has indicated that the proposed Recycle Pond Expansion and modification of the existing ponds at the SEC would require modification of the COC, but they are exempted from a formal permitting process.

The primary objective of our engineering study was to provide data and analyses to support design and regulatory approval of the proposed Recycle Pond Expansion and the modified Recycle Pond, the NCSARP, and the SCSARP. To achieve the project objective, Tetra Tech has reviewed relevant existing data, performed a subsurface exploration within the footprint of the proposed Recycle Pond Expansion and in the vicinity of the existing lined ponds, conducted laboratory testing on the recovered soil samples, and performed engineering evaluations and analyses in support of the proposed designs.

This Engineering Report provides the basis for development of detailed design drawings and technical specifications for designing the proposed Recycle Pond Expansion and the lined ponds modifications.

1.2 Site Location

The SEC property occupies an area of approximately 3,100 acres and lies within the Econlockhatchee River Basin. It is located within Sections 13, 14, 23, and 24 of Township 23 South, Range 31 East, and Sections 7, 18, and 19 of Township 23 South, Range 32, in

southeastern Orange County, Florida. The site is approximately 12 miles southeast of downtown Orlando, 6 miles northeast of the Orlando International Airport, north of the Beach Line Expressway (State Road 528), and immediately east of Innovation Way. The Orange County Landfill facility is located immediately west of Innovation Way. The street address of the SEC is 5100 South Alafaya Trail, Orlando, Florida, which is at the south end of Alafaya Trail. The property boundary of the SEC is superimposed on a site vicinity map in Figure 1.

1.3 **Facility Description**

Combined annotated March 2014 and January 2013 aerial photographs of the SEC are presented in Figure 2. The SEC operates two coal-fired generating units, designated Unit 1 and Unit 2, each with a capacity of approximately 445 megawatts, as well as two natural gas-fired combined cycle units designated Unit A and Unit B, with capacities of approximately 633 and 300 megawatts, respectively. Unit 1 was certified on December 15, 1982, and Unit 2 was certified on December 17, 1991. A 35-acre solar farm consisting of an array of photovoltaic panels that generate approximately 6 megawatts of electric power was constructed at the SEC site in December 2011.

In addition to the generating units, the SEC also includes a coal storage area; an unlined combustion waste storage area; a lined horizontal expansion to the combustion waste storage area; the expanded CWSA Runoff Pond; a newly constructed decant cell area; a Stack Out Pad for materials processing and stockpiling; and a number of process water, leachate, wastewater, and stormwater management ponds. Except for the Make-Up Pond which is located on the east side of the SEC, all other onsite ponds are lined. The Make-Up Pond receives water from the adjacent Orange County Eastern Water Reclamation Facility for use in equipment cooling. The SEC also recycles plant water and obtains stormwater from the adjacent Orange County Class I Landfill site for use in cooling. The SEC operates as a zero liquid discharge facility.

1.4 **Existing Recycle Pond**

The Recycle Pond is an approximately 14.6-acre L-shaped pond located south and west of the cooling towers, as shown on Figure 2. Excess water from the CWSA Runoff Pond, the NCSARP, and the SCSARP drains to the Recycle Pond through an inlet structure located on the west side of the pond. Figure 3 shows the existing Recycle Pond underdrain, manholes,headwalls, and inlet structure locations. The inlet structure, manhole, and headwalls details are displayed in Figure 4.

Excess water from the CWSA Runoff Pond, the NCSARP and South Coal Storage Area Runoff Ponds drains to the Recycle Pond. In addition, wastewater from the control center, administration and plant services buildings, neutralization basin, and an oil/water separator serving the water management, water storage pump and emergency generator buildings is also discharged into the Recycle Pond.

The existing liner systems installed in the lined ponds located at the SEC were previously evaluated by Tetra Tech. Results of the evaluation were presented in a report titled “Summary of Main Findings of Water Storage Ponds Liner Integrity Testing, Orlando Utilities Commission, Stanton Energy Center, Orlando, Florida,” dated July 12, 2010.

Reported pond water levels indicated that the Recycle Pond has been operated at times in the past, during severe weather conditions, with pond water elevations above the elevation of the

top of the HDPE liner resulting in leakage from the pond. In addition, during earlier site reconnaissance, several pipe vents in the Recycle Pond were observed to be partly or completely submerged. Liner integrity survey had revealed four general areas where there are potential leaks.

The July 2010 report recommended that repairs to the CWSA Runoff Pond and Recycle Pond be performed first. So as not to disrupt plant activities while work is being performed on the Recycle Pond, the report recommended dividing the existing Recycle Pond into two or more smaller cells using cofferdam(s) or constructing a new lined pond to maintain adequate water storage capacity.

Wastewater is discharged to the pond through three headwalls. HW-4, which is located on the north side of the east-west segment of the pond, discharges water from the control center and administration and plant services buildings. HW-5, which is located on the east side of the north-south leg of the pond, discharges water from the neutralization basin. HW-6, which is located on the west side of the north-south leg of the pond, discharges water from an oil/water separator serving the water management, water storage pump, and emergency generator buildings. As shown in Figure 3, in addition to the inlet structure and these headwalls, there are two other surface discharge points into the Recycle Pond. One discharge point is located on the north side of the east-west segment of the pond, directly south of the brine plant, and the other discharge point is located on the east side of the north-south segment of the pond, south of HW-5. As described above, water also discharges to the Recycle Pond from the Wastewater Return Pond, which is located immediately east of the Recycle Pond.

Two concrete manholes, located on the north side of the north-south segment of the pond and on the south side of the east-west segment of the pond, are connected to the underdrain system of the pond. PM-35 (i.e., the north manhole) is an inspection and cleanout manhole. PM-36 (i.e., the south manhole) discharges water collected in the underdrain to the adjacent ditch through an overflow pipe. It should be noted that the underdrain system only serves the part of the Recycle Pond west of PM-36. There is no underdrain east of PM-36.

Wastewater is pumped from the Recycle Pond to the flue gas desulfurization (FGD) system via the scrubber makeup water pump station located on the north side of the north-south segment of the pond.

1.4.1 Evaluation of Existing Recycle Pond Liner System

Findings from the July 12, 2010 liner integrity study related to the Recycle Pond are summarized below:

- Reported pond operating water levels indicate that the Recycle Pond has been operated at times, during severe weather conditions with pond water elevations above the elevation of the top of the HDPE liner resulting in leakage from the pond.

- Several pipe vents in the Recycle Pond were observed to be partly or completely submerged during the study. Water may leak from the pond through the open end of the pipe vents once the vents become sufficiently submerged.

- Significant damage to the concrete mat has occurred along the north and west slopes of the Recycle Pond when the abutting ground water table on the outside of the pond was sufficiently higher than the water level in the pond to cause uplift of the HDPE liner and slumping of the 3.0H:1.0V inside slope of the pond. Uplift pressure sufficient to locally destabilize the inside slopes of the ponds resulted because of the ineffective underdrain system. Extensive longitudinal cracking has also occurred throughout the concrete mats in the pond, with minor separation and/or displacement along the cracks occurring at some locations.

- The 60-mil smooth HDPE liner on the inside slope of the Recycle Pond has been displaced and wrinkled at several locations as a consequence of local slope instability resulting from uplift of the HDPE liner and slumping of the inside slope and/or sliding of cracked sections of concrete mat along the surface of the HDPE liner. Numerous liner pipe vents located along the top of the inside slope of the Recycle Pond have also been displaced and partly sheared-off as a result of slumping of the inside slope and/or sliding of cracked sections of concrete mat along the surface of the HDPE liner.

- The liner integrity survey indicated potential leaks in the Recycle Pond within two general areas in the northwest and southwest corners of the pond, and at two smaller areas at the east end of the pond and north end of the east wall.

1.4.2 Proposed Modifications

As shown in Figure 5, the modified Recycle Pond will occupy the footprint of the existing Recycle Pond area. The existing Recycle Pond and associated inlet and outlet structures will be completely demolished before construction of the modified Recycle Pond. The modified Recycle Pond will occupy a base area of approximately 14 acres, and will be surrounded by a perimeter dike that will be raised about 3 feet higher than the existing dike. The modified Recycle Pond will have a single liner system consisting of a layer of 80-mil thick HDPE geomembrane liner and a minimum 6-inch thick soil subbase with a design saturated hydraulic conductivity of less than or equal to $1x10^{-5}$ cm/sec. The HDPE geomembrane liner will extend to Elevation +80.8 feet (NAVD88), and the crest of the perimeter dike will be built to a minimum elevation of +83 feet (NAVD88). The HDPE geomembrane liner will be covered with a geocomposite drainage layer, an 18-inch thick compacted soil cover, and a minimum 8-inch thick soil-cement protective cover. The modified Recycle Pond will have a design storage volume of approximately 90 acre-feet between the proposed minimum and maximum operating water elevations of +70 and +79 feet (NAVD88), respectively.

The modified Recycle Pond will be provided with a seepage collection underdrain system along the toe of the pond slope so that the bottom of the liner system is not subject to fluctuations of the groundwater that could potentially adversely impact the integrity of the liner system.

1.5 **Proposed Recycle Pond Expansion**

The proposed Recycle Pond Expansion is to be located west of the existing Recycle Pond, as shown on Figure 2. The layout of the proposed Recycle Pond Expansion is presented in Figure 6. The proposed pond expansion will occupy a base area of approximately 9 acres, and will be constructed below grade. The proposed pond expansion will be surrounded by a perimeter dike and will be provided with a single liner system consisting of a layer of 80-mil thick HDPE geomembrane liner and a minimum 6-inch thick soil subbase with a design saturated hydraulic

conductivity of less than or equal to $1x10^{-5}$ cm/sec. The HDPE geomembrane liner will extend to Elevation +80.8 feet (NAVD88), and the crest of the perimeter dike will be built to a minimum elevation of +83 feet (NAVD88). The HDPE geomembrane liner will be covered with a geocomposite drainage layer, an 18-inch thick compacted soil cover and a minimum 8-inch thick soil-cement protective cover. The proposed Recycle Pond Expansion will have a design storage volume of approximately 60 acre-feet between the minimum and maximum operating water elevations of +70 and +79 feet (NAVD88), respectively.

The proposed Recycle Pond Expansion will also be provided with a seepage collection underdrain system along the toe of the pond slope so that the bottom of the liner system is not subject to fluctuations of the groundwater that could potentially adversely impact the integrity of the liner system.

1.6 **Existing North and South Coal Storage Area Runoff Ponds**

The existing NCSARP and SCSARP occupy areas of approximately 7.8 and 2.4 acres, and are located northeast and east of the coal storage area, respectively, as shown in Figure 2. Stormwater runoff from the coal storage areas is collected in both the NCSARP and SCSARP. A triple culvert carries runoff from the coal pile area into the SCSARP. A connecting box culvert allows water to flow freely between the NCSARP and the SCSARP. The underdrains, manholes, headwalls, and outlet structure of the two ponds are shown in Figure 7. Headwall HW-12, which is located on the east side of the NCSA Runoff Pond, receives water from the ammonia building and discharges it to the pond. In addition to runoff from the coal storage area, leachate and stormwater runoff from the Stack Out Pad and associated sumps, and water from the thickeners and the ash dewatering area drain to the SCSARP through headwall HW-8. A headwall on the west side of the SCSARP, HW-9, handles stormwater runoff draining from the coal transfer structures. Headwall HW-10, which is located on the east side of the SCSARP, collects drainage from the coal crusher building. Excess water in the SCSARP is transferred through a multi-stage gated weir in the outlet structure located near the southeastern corner of the pond via two 32-inch diameter gravity pipelines to the Recycle Pond.

Two concrete manholes that are located at the northwest and southeast corners of the NCSARP, are connected to the underdrain system of the pond. PM-34, the northwest manhole, discharges water collected in the underdrain to a short section of pipe buried under the road. PM-33, the southeast manhole, is connected to the underdrains of both the NCSARP and SCSARP and reportedly functions as a cleanout manhole. Manhole PM-32, which is located in the western portion of the south wall of the SCSARP, functions as a cleanout for the underdrain system of the SCSARP.

1.6.1 Evaluation of Existing NCSARP and SCSARP Liner System

Results of the July 12, 2010 existing liner evaluation related to the NCSARP and SCSARP are summarized below:

- Reported pond operating water levels indicate that the NCSARP and SCSARP have been operated at times, during severe weather conditions, with pond water elevations above the elevation of the top of the HDPE liner resulting in leakage from the ponds.

- The open end of numerous liner pipe vents displayed evidence of having been partly or completely submerged in the past (i.e., staining at the high water mark and or buried in

sediment). Water may leak from the ponds through the open end of the pipe vents once the vents become sufficiently submerged.

- Groundwater level measurements and inspection of the underdrain system manholes and outlets indicate that the existing liner underdrain system has not been functioning properly. Accordingly, the underdrain system is currently not effective in lowering groundwater levels around the perimeters and below the bottoms of the ponds to prevent side slope instability and uplift of the liner when pond water levels are low. The design drawings indicate that the manhole PM-34 at the NCSARP originally had a gravity outfall consisting of an outlet pipe extending from the manhole to a drainage ditch located north of the manhole. This outlet was later modified to discharge to a relatively short section of perforated corrugated HDPE tubing buried under the road. The modification of the outlet from manhole PM-34 from a gravity outfall to a short section of buried perforated tubing apparently rendered the underdrain system ineffective.

- The 60-mil smooth HDPE liner on the inside slope of the NCSARP has been displaced and wrinkled at several locations as a consequence of local slope instability resulting from uplift of the HDPE liner and slumping of the inside slope and/or sliding of cracked sections of concrete mat along the surface of the HDPE liner.

- The liner integrity survey indicated potential leaks in the NCSARP within two general areas clustered along the north wall and south end of the east wall and in the South Coal Storage Area Runoff Pond mostly clustered in an area at the southwest corner of the pond.

1.6.2 Proposed Modifications to the NCSARP and SCSARP

As shown in Figure 8, the modified NCSARP will occupy the footprint of the existing NCSARP area with the northern portion expanding approximately 100 feet west. A new drainage ditch will be constructed west of the existing ditch, as shown on Figure 8. The existing NCSARP and associated inlet and outlet structures will be completely demolished before construction of the modified NCSARP. The modified pond will occupy a base area of approximately 8.5 acres, and will be surrounded by a perimeter dike that will be raised about 3 feet higher than the existing dike. The modified NCSARP will have a single liner system consisting of a layer of 80-mil thick HDPE geomembrane liner and a minimum 6-inch thick soil subbase (with a design saturated hydraulic conductivity of less than or equal to $1x10^{-5}$ cm/sec). The HDPE geomembrane liner will extend to Elevation +80.8 feet (NAVD88) and the crest of the perimeter dike will be built to a minimum elevation of +83 feet (NAVD88). The HDPE geomembrane liner will be covered with a geocomposite drainage layer, 18-inch thick compacted soil cover and a minimum 8-inch thick soil-cement protective cover. The modified NCSARP will have a design storage volume of approximately 55 acre-feet between the proposed maximum and minimum operating water levels of +70 and +79 feet (NAVD88), respectively.

The modified NCSARP will be provided with a seepage collection underdrain system along the toe of the pond slope so that the bottom of the liner system is not subject to fluctuations of the groundwater that could potentially adversely impact the integrity of the liner system.

The modified SCSARP will occupy the footprint of the existing SCSARP area, as shown in Figure 9. The existing SCSARP and associated inlet and outlet structures will be completely demolished before construction of the modified SCSARP. The modified pond will occupy a base area of approximately 2.5 acres, and will be surrounded by a perimeter dike that will be raised about three feet higher than the existing dike. The modified SCSARP will have a single

liner system consisting of a layer of 80-mil thick HDPE geomembrane liner and a minimum 6-inch thick soil subbase with a design saturated hydraulic conductivity of less than or equal to $1x10^{-5}$ cm/sec. The HDPE geomembrane liner will extend to Elevation +80.8 feet (NAVD88) and the crest of the perimeter dike will be built to a minimum elevation of +83 feet (NAVD88). The HDPE geomembrane liner will be covered with a geocomposite drainage layer, 18-inch thick compacted soil cover and a minimum 10 to 12-inch thick reinforced concrete slab. The modified SCSARP which will function as a Sedimentation Pond will have a design storage volume of approximately 12 acre-feet between the proposed maximum and minimum operating water levels of +70 and +79 feet (NAVD88), respectively.

The SCSARP will also be provided with seepage collection underdrain system along the toe of the pond slope so that the bottom of the liner system is not subject to fluctuations of the groundwater that could potentially adversely impact the integrity of the liner system.

After modifications of the existing NCSARP and SCSARP, it is the intent of OUC to operate the modified NCSARP as the coal storage area runoff pond and to use the modified SCSARP as a sedimentation pond. After modifications, the existing NCSARP will be referred to as the Coal Storage Area Runoff Pond (CSARP), and the existing SCSARP will be referred to as the Sedimentation Pond.

2.0 REVIEW OF SOIL SURVEY INFORMATION

Based on the web soil survey prepared by the U.S. Department of Agriculture Natural Resources Conservation Service (http://websoilsurvey.nrcs.usda.gov/app/), the Recycle Pond Expansion, the existing Recycle Pond, and the NCSARP and SCSARP are generally located in areas identified as Smyrna fine sand and St. Johns fine sand. Smyrna fine sand is present in the central portion of the Recycle Pond Expansion and in the eastern part of the NCSARP and SCSARP. St. Johns fine sand is present in the eastern portion of the Recycle Pond Expansion and in the area between the NCSARP and SCSARP. Small areas on the southwest corner and western edge of the Recycle Pond Expansion are classified as Basinger fine sand, depressional and Pomello fine sand, 0 to 5 percent slopes, respectively. A thin strip east of the NCSARP and northeast part of the SCSARP is classified as Sanibel muck.

Smyrna and St. Johns fine sands are classified as poorly drained with typical depths to the seasonal high water table at 18 and 12 inches below land surface, respectively. Pomello fine sand is classified as a moderately well drained soil with typical depth to the seasonal high water table at 32 inches below land surface while Basinger fine sand is classified as very poorly drained with the seasonal high water table at land surface. Sanibel muck is also classified as very poorly drained with the seasonal high water table at land surface.

3.0 FIELD EXPLORATION PROGRAM

3.1 Previous Field Explorations by Others

In support of the design and permitting of the SEC prior to its operation, Black & Veatch performed two field exploration programs to evaluate the subsurface conditions on the OUC property. The first field exploration program, which was conducted in May and June 1980, consisted of eleven Standard Penetration Test (SPT) soil borings designated B-1 through B-11. The second field exploration program, which was conducted in November 1981, focused primarily on the CWSA. Of the soil borings performed by Black & Veatch, only one (B-8) was

drilled within the proposed Recycle Pond Expansion area. B-8 was drilled to a depth of 50 feet below land surface within the proposed footprint of the Recycle Pond Expansion. The soil boring location map and soil boring log for B-8 is included in Appendix 1.

Monitor wells were installed in the plant in July 1986. An auger boring was performed at the location of the wells at the time of installation. Existing monitor wells MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 are located in the vicinity of the existing Recycle Pond and the Recycle Pond Expansion. Existing monitor wells MW-5, MW-6 and MW-14 are located in the vicinity of the existing NCSARP and SCSARP. The well installation records and boring logs for MW-1 through MW-6, MW-3D, MW-14 and MW-21 are presented in Appendix 2.

3.2 **Soil Borings and Sampling by Tetra Tech**

As part of an evaluation of the existing pond liner systems performed in 2009, Tetra Tech performed three 60-foot deep SPT borings, designated TH-RP-1, TH-RP-2 and TH-RP-3, at the existing Recycle Pond and two 60-foot deep SPT borings, designated TH-CSA-1 and TH-CSA-2, at the existing NCSARP. The locations of these borings are shown in Figure 10. An observation well was installed to a depth of approximately 30 feet below land surface at each boring location. The boring logs for the 2009 borings and the installation records for the observation wells are included in Appendix 3.

A field exploration program for the proposed Recycle Pond Expansion and the existing lined ponds modifications was conducted by Tetra Tech between January 8 and February 12, 2014, and on June 17, 2014. The field exploration program consisted of advancing 19 SPT borings to depths of 20 to 96 feet below existing land surface within the proposed footprint of the Recycle Pond Expansion and in the vicinity of the existing lined ponds areas. The locations of these SPT borings are also identified in Figure 10.

The SPT soil borings were performed in general accordance with ASTM D1586. A description of this field procedure is included in Appendix 4. All recovered soil samples were visually classified by a geotechnical engineer or geologist in the field, and representative portions of the samples were returned to Tetra Tech's laboratory in sealed glass jars for further classification and laboratory testing. The density of sandy soils and the consistency of clayey soils can be inferred from the standard penetration resistance or blow count values, also referred to as N-values. A table that shows these correlations is included in Appendix 4.

Because of concerns for underground utilities at the boring locations, hand augering was performed in the upper 4.5 to 6 feet of each boring. Continuous SPTs and associated split-spoon soil sampling were performed for all SPT soil borings below this depth.

The coordinates and elevations of all SPT soil borings, except TH-CSAN-5 and TH-CSAN-6 (borings were located by a handheld GPS), were surveyed by TKW Consulting Engineers, Inc. The survey data, along with the soil boring depths, are summarized in Table 1. Results of the SPT soil borings performed in the proposed Recycle Pond Expansion, existing Recycle Pond, existing NCSARP and existing SCSA Area Runoff Pond are presented as individual soil boring logs in Appendices 5, 6, 7 and 8, respectively. The soil boring profiles generated from the soil boring logs performed in the vicinity of the Recycle Pond Expansion and the existing Recycle Pond are graphically presented in Appendix 9. The soil boring profiles generated from the soil boring logs performed in the vicinity of the NCSARP and SCSARP are graphically presented in Appendix 10. It should be noted that the stratification lines shown on the soil boring logs and

profiles were based on our interpretation of the field boring logs and results of laboratory classifications and testing of the recovered soil samples. The stratification lines represent only the approximate boundaries between soil types, whereas the actual transitions between soil types are often more gradual than implied.

In addition to the disturbed split-spoon soil samples obtained during performance of the SPTs, undisturbed soil samples were recovered from clayey soil strata encountered in the SPT soil borings. The undisturbed soil samples were retrieved using a 3-inch diameter thin-walled Shelby tube in accordance with ASTM D1587. A general description of the undisturbed soil sampling procedures is included in Appendix 4. A total of 12 undisturbed samples were obtained from 9 wash borings drilled adjacent to SPT boring locations. The borings and depths from which these undisturbed soil samples were recovered are listed in Table 2. The wash boring logs that show the depths from which the undisturbed soil samples were retrieved are included in Appendix 11.

Upon completion of drilling, all soil borings were abandoned by backfilling with a Portland cement grout.

3.3 **Observation Well Installation**

A total of eleven observation wells were installed within the footprint of the proposed Recycle Pond Expansion and in the vicinity of the existing Recycle Pond, and NCSARP and SCSARP. An auger boring was performed at the location of each well at the time of installation. The locations of the observation wells are shown in Figure 10. The well installation records and boring logs are presented in Appendix 12.

3.4 **Field Permeability Tests**

Field permeability tests were conducted using the eleven installed observation wells, to estimate the *in situ* horizontal hydraulic conductivity of the upper part of the surficial aquifer. Slug tests were performed in general accordance with ASTM D4044. A 5-foot long closed end PVC pipe was quickly inserted in the well casing to increase the water level and perform a falling head test. The PVC pipe was then quickly withdrawn to lower the water level and perform a rising head test. The time rate of recovery of the piezometric water levels during the tests was measured using a transducer and recorder. Rising head tests were also conducted by pumping down the water levels in the monitor well casings followed by measuring the time rate of recovery of the piezometric water levels using a transducer and recorder.

The test data, static water levels, along with the dimensions of the collection zone, were used to compute the horizontal hydraulic conductivity of the soils around the well screen using Hvorslev (1951)[1] solution. Results of the field hydraulic conductivity tests are summarized in Table 3. As shown, the measured horizontal hydraulic conductivity at the well locations ranged from 5.0×10^{-4} to 7.1×10^{-3} cm/sec with an average value of 2.3×10^{-3} cm/sec (i.e., about 7 feet per day). The highest hydraulic conductivity value was documented at OW-RP-4, which is located on the north side of the east-west segment of the existing Recycle Pond, and at OW-CSAS-2, which is located at southwest corner of the SCSARP. The lowest hydraulic conductivity value was measured at OW-RP-1, which is located on the west side of the north-south segment of the

[1] Hvorslev, M. J. (1949). Time Lag in the Observation of Groundwater Levels and Pressures. U.S. Army Waterways Experiment Station, Vicksburg, Mississippi.

existing Recycle Pond. These hydraulic conductivities are generally consistent with values previously obtained by Tetra Tech on the SEC property and from computer simulations of groundwater flow in the project region.

3.5 **Groundwater Level Measurement**

The depths to groundwater in the soil borings at the time of drilling in January, February, and June 2014 are shown on the individual soil boring logs in Appendices 5 through 8. The minimum groundwater elevation measured was +73.5 feet (NAVD88), corresponding to a water table depth of 5.5 feet, and the maximum groundwater elevation was +77.2 feet (NAVD88), corresponding to a water table depth of 3.2 feet.

The groundwater elevation at monitoring wells MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 near the vicinity of the existing Recycle Pond and the proposed Recycle Pond Expansion measured on December 2013 ranged from +69.6 to +75.2 feet (NAVD88), corresponding to water table depths of 12.6 and 6.4 feet, respectively.

The groundwater elevations at monitoring wells MW-5, MW-6 and MW-14 near the vicinity of the existing NCSARP and SCSARP measured on December 2013 ranged from +75.4 to +75.7 feet (NAVD88), corresponding to water table depths of 8.5 and 9.7 feet, respectively.

It should be noted that water table generally fluctuates throughout the year because of seasonal variations in rainfall and other factors (e.g., drainage characteristics of the soils, distance to nearby lakes, rivers, or swamps, and effectiveness of underdrain systems). The seasonal high water table in a normal rainfall year typically occurs in September-October, at the end of the rainy season.

4.0 **LABORATORY TESTING PROGRAM**

4.1 **Test Program**

All soil samples recovered from the field exploration programs were visually classified in our laboratory using the procedures outlined in ASTM D2487. Furthermore, index and classification tests were performed on selected representative SPT soil samples. These tests included moisture content determinations (ASTM D2216), fines content determinations (ASTM D1140), sieve analyses (ASTM D421 and D422), Atterberg limits determinations (ASTM D4318), and organic content determinations (ASTM D2974). The index and classification tests were used to characterize the materials encountered in the soil borings and to aid in establishing a generalized subsurface soil profile for engineering evaluations and analyses.

In addition to the index and classification tests, hydraulic conductivity tests (ASTM D5084), one-dimensional consolidation test (ASTM D2435) and unconsolidated-undrained (UU) triaxial tests (ASTM D2850) were performed on selected representative undisturbed Shelby tube soil samples to determine the hydraulic conductivity, compressibility, and strength of the clayey soils.

4.2 **Test Results**

Results of the laboratory index and classification tests performed on selected representative split-spoon and Shelby tube soil samples recovered from within the proposed Recycle Pond

Expansion footprint and in the vicinity of the existing lined ponds are summarized in Table 4. The laboratory test results are also shown on the individual soil boring logs and profiles next to the locations of the tested samples in Appendices 5 through 10. The test data documented during extrusion of the undisturbed soil samples from the Shelby tubes are included in Appendix 13. Results of the sieve analyses are depicted by individual grain size distribution curves in Appendix 14.

The standard penetration blow count (N-value) as well as the moisture content, fines content, and organic content of selected representative soil samples recovered from the proposed Recycle Pond Expansion and the existing Recycle Pond areas are plotted against elevation in Figure 11. Variations of moisture content and plasticity of the clayey soil samples with elevations are depicted in Figure 12.

The standard penetration blow count (N-value) as well as the moisture content, fines content, and organic content of selected representative soil samples recovered from the existing North and South Coal Storage Area Runoff Pond areas are plotted against elevation in Figure 13. Variations of moisture content and plasticity of the clayey soil samples with elevations are depicted in Figure 14.

The hydraulic conductivity test results and fines content for 10 undisturbed samples of clayey soils collected at various depths are presented in Table 5. The results of the one-dimensional consolidation tests are summarized in Table 6, and the test reports are presented in Appendix 15. The laboratory unconsolidated-undrained shear strength test results are summarized in Table 7 and the test reports are presented in Appendix 16.

5.0 SUBSURFACE CONDITIONS

5.1 Recycle Pond Area

A review of the June 2014 topographic survey performed by TKW Consulting Engineers, Inc. indicated that the existing land surface elevations within the existing Recycle Pond and proposed Recycle Pond Expansion areas varied from approximately +78 to +80 feet (NAVD88). A generalized subsurface soil profile extending from land surface at the highest elevation of approximately +80 feet (NAVD88) to a depth of 94 feet (i.e., the depth of most recent soil borings in this area) was developed based on current soil boring data obtained by Tetra Tech as well as previous soil boring data reported by Tetra Tech and Black & Veatch within and/or near the existing Recycle Pond and proposed Recycle Pond Expansion areas. The subsurface soil profile is relatively uniform across the area of interest, and the generalized soil profile was selected to represent the subsurface conditions beneath the Recycle Pond and Recycle Pond Expansion areas. The generalized soil profile, which was used for stability and seepage analyses, is depicted in Figure 15. As shown, the subsurface soil profile from land surface to a depth of 94 feet was divided into nine layers, designated Layers 1 through 9, with each layer having its own distinct soil characteristics and engineering properties.

Layers 1 through 3 combined represent an approximately 27-foot thick soil stratum consisting predominantly of sand (SP[1]), sand with silt (SP-SM) and silty sand (SM). Soil samples recovered from this upper 27 feet of the soil profile had typical fines contents of less than 25 percent, and had typical moisture contents in the range of 10 to 30 percent. The sandy soils in

[1] Soil material symbols in accordance with the Unified Soil Classification System (USCS).

Layer 1 could not be classified based on N-values because the upper 6 feet of the borings were hand-augered. Based on the standard penetration resistance, the sandy soils in Layer 2 could generally be described as very loose to very dense, having N-values typically between 2 and 74 blows per foot, and Layer 3 could generally be described as very loose to dense, having N-values typically between 2 and 35 blows per foot. Samples from Layer 2 had organic contents in the range of 1.8 to 5.3 percent.

Layer 4 was encountered from approximately 27 to 40 feet below land surface. This 13-foot thick soil layer consisted predominantly of sand (SP) and sand with silt (SP-SM) with silty sand (SM) or clayey sand (SC) inclusions. The tested soil samples recovered from this layer had typical moisture contents in the general range of 15 to 35 percent, and fines contents in the range of 8 to 31 percent. Based on the standard penetration resistance, the soil deposits in Layer 4 could generally be described as very loose to medium dense.

Layer 5 was encountered from 40 to 53 feet below land surface. This 13-foot thick soil layer consisted predominantly of clayey sand (SC) to clay (CH), and was the first substantial clayey stratum encountered at the site. Occasional interbedded sand and silty sand occurred within this soil layer, and the presence of shell fragments was observed in a few borings. The clay deposits had typical fines contents ranging from 60 to 98 percent, whereas the clayey sands had typical fines contents ranging from 13 to 41 percent. The clayey soils in this layer had typical plastic limits in the range of 14 to 28 percent, typical liquid limits in the range of 49 to 148 percent, and typical moisture contents in the range of 21 to 109 percent. The moisture content of a soil sample recovered from this layer was between its plastic limit and liquid limit. Laboratory strength measurements performed on three undisturbed samples of the clayey soils recovered from this layer exhibited undrained shear strengths ranging from about 1,200 to 2,700 lbs/ft^2. The shear strength values for this layer are generally consistent with strength values previously obtained by Tetra Tech on the SEC property. Laboratory hydraulic conductivity tests performed on undisturbed samples of the clayey soils recovered within the approximate depths of this layer typically ranged from about $1.4x10^{-8}$ to $4.4x10^{-7}$ cm/sec.

Layer 6 consisted of a 17-foot thick layer of sand (SP) and sand with silt (SP-SM), occasionally intermixed with deposits of clayey sand (SC). Some cementation and the presence of shell fragments in a few borings were observed within this soil layer. The soil samples recovered from this layer had typical moisture contents in the range of 20 to 30 percent. The sands in this soil layer could generally be described as loose to very dense.

Layer 7 was encountered from approximately 70 to 80 feet below land surface. This stratum consisted predominantly of clayey sand (SC). The fines contents of the soil samples recovered from this layer varied from 23 to 50 percent. The majority of the clayey soil samples recovered from this layer consisted of shell fragments. The clayey soil sample tested had a plastic limit of 16 percent and a liquid limit of 31 percent. Typical moisture contents of the clayey soils ranged from 30 to 35 percent.

Layer 8, which occurred from 80 to 86 feet below land surface, consisted of predominantly of sand with silt (SP-SM). Based on the standard penetration resistance, the soils in this soil stratum could generally be described as loose to medium dense.

Layer 9 was encountered from approximately 86 to 94 feet below existing grade, and consisted predominantly of clayey sand (SC). This soil layer had standard penetration resistance of 5 to 9

blows per foot and thus can be considered loose. The soil sample tested from this layer had a moisture content of 34 percent and a fines content of 29 percent.

As part of the site preparation procedures prior to dike construction and bottom liner system installation, the designated construction area will be cleared, grubbed, and stripped. Any deleterious materials near the surface will be excavated, and any loose surficial soils will be compacted to meet the requirements of the technical specifications.

5.2 **NCSARP AND SCSARP Areas**

A review of the July 2011 topographic survey performed by Tetra Tech indicated that the existing land surface elevations within the existing NCSARP and SCSARP typically varied from approximately +79 to +81 feet (NAVD88). A generalized subsurface soil profile extending from land surface at an average elevation of +80 feet (NAVD88) to a depth of 80 feet (i.e., the depth of most recent soil borings in this area) was developed based on current soil boring data obtained by Tetra Tech within the existing NCSARP and SCSARP as well as previous soil boring data reported by Tetra Tech and Black & Veatch within and near the existing NCSARP and SCSARP. The subsurface soil profile is relatively uniform across the area of interest, and the generalized soil profile was selected to represent the subsurface conditions. The generalized soil profile, which was used for stability and seepage analyses, is depicted in Figure 16. As shown, the subsurface soil profile from land surface to a depth of 80 feet was divided into seven layers, designated Layers 1 through 7, with each layer having its own distinct soil characteristics and engineering properties.

Layers 1 through 3 combined represent an approximately 34-foot thick soil stratum consisting predominantly of sand (SP), sand with silt (SP-SM) and silty sand (SM). Soil samples recovered from this upper 34 feet of the soil profile had typical fines contents of less than 20 percent. Soil samples recovered from the upper 4 feet of the soil profile (i.e., Layer 1) had moisture contents less than 20 percent, and soil samples recovered from Layers 2 and 3 had typical moisture contents in the range of 10 to 30 percent. The sandy soils in Layer 1 could not be classified based on N-values because the upper 6 feet of the borings were hand-augered. Based on the standard penetration resistance, the sandy soils in Layer 2 could generally be described as very loose to dense, having N-values typically between 1 and 40 blows per foot, and the sandy soils in Layer 3 could generally be described as loose to medium dense. Samples from Layer 2 had organic contents in the range of 1.6 to 2.4 percent.

Layer 4 was encountered from approximately 34 to 42 feet below land surface. This 8-foot thick soil layer consisted predominantly of sand with silt (SP-SM) with silty sand (SM) or clayey sand (SC) inclusions. The tested soil samples recovered from this layer had typical moisture contents in the range of 26 to 31 percent, and fines contents in the range of 9 to 21 percent. Based on the standard penetration resistance, the soil deposits in Layer 4 could generally be described as very loose to medium dense.

Layer 5 was encountered from 42 to 56 feet below land surface. This 14-foot thick soil layer consisted predominantly of clayey sand (SC) to clay (CH), and was the first substantially clayey stratum encountered at the site. Occasional interbedded sand to silty sand occurred within this soil layer, and the presence of shell fragments was observed in a few borings. The clay deposits had typical fines contents ranging from 66 to 98 percent, whereas the clayey sands had typical fines contents ranging from 17 to 31 percent. The clayey soils in this layer had typical plastic limits in the range of 14 to 23 percent, typical liquid limits in the range of 43 to 103

percent, and typical moisture contents in the range of 43 to 91 percent. The moisture content of a soil sample recovered from this layer was between its plastic limit and liquid limit. Laboratory strength measurement performed on an undisturbed sample of the clayey soils recovered from this layer exhibited an undrained shear strength of about 1,300 lbs/ft^2. The shear strength values for this layer are generally consistent with strength values previously obtained by Tetra Tech on the SEC property. Laboratory hydraulic conductivity tests performed on undisturbed samples of the clayey soils recovered within the approximate depths of this layer typically ranged from about 6.1×10^{-8} to 2.3×10^{-7} cm/sec.

Layer 6 consisted of a 14-foot thick layer of sand (SP) to silty sand (SM), occasionally intermixed with deposits of clayey sand (SC). Some cementation and the presence of shell fragments in a few borings were observed within this soil layer. The soil samples recovered from this layer had typical moisture contents in the range of 23 to 26 percent. The sands in this soil layer could generally be described as very loose to dense.

Layer 7 was encountered from approximately 70 to 80 feet below land surface. This stratum consisted predominantly of clayey sand (SC) and clay (CH). The fines contents of the soil samples recovered from this layer varied from 18 to 50 percent. The majority of the clayey soil samples recovered from this layer consisted of shell fragments. The clayey soil sample had a plastic limit of 18 percent and a liquid limit of 31 percent. Typical moisture contents ranged from 19 to 35 percent. Laboratory hydraulic conductivity test performed on an undisturbed sample of the clayey soil recovered within the approximate depths of this layer was about 6.3×10^{-7} cm/sec.

As part of the site preparation procedures prior to dike construction and bottom liner system installation, the designated construction area will be cleared, grubbed, and stripped. Any deleterious materials near the surface will be excavated, and any loose surficial soils will be compacted to meet the requirements of the technical specifications.

5.3 **Groundwater Elevations**

Groundwater levels have been measured in monitoring wells MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 approximately quarterly since August 1986 in conjunction with the groundwater monitoring program for the Recycle Pond. The hydrographs for groundwater elevations in MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 are presented in Figure 17. The maximum, minimum, and mean groundwater elevations in MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 for the period of record are +78.1, +66.8, and +74.1 feet (NAVD88), respectively.

Groundwater levels have been measured in monitoring wells MW-5, MW-6 and MW-14 for the same time period in conjunction with the groundwater monitoring program for the North and South Coal Storage Area Runoff Ponds. The hydrographs for groundwater elevations in MW-5, MW-6 and MW-14 are presented in Figure 18. The maximum, minimum, and mean groundwater elevations in MW-1, MW-2, MW-3, MW-3D, MW-4 and MW-21 for the period of record are +82.2, +66.38, and +76.3 feet (NAVD88), respectively.

The seasonal high water table elevation was judged to be +80 feet (NAVD88) within the proposed construction area.

6.0 SEISMIC POTENTIAL, FAULTS EVALUATION, AND SINKHOLE POTENTIAL

6.1 Seismic Potential

Title 40, Part 258.14 of the Code of Federal Regulations (CFR), which is incorporated by reference in Rule 62-701.410(2)(c), FAC, prohibits construction of new MSW landfill units in seismic impact zones unless the owner or operator demonstrates that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration induced by an earthquake. Seismic impact zones are defined as areas "… *with a ten percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 250 years*."

Based on the 2008 national seismic hazard maps and database prepared by the United States Geological Survey (USGS)[1], the peak horizontal ground acceleration at the SEC site, with a 2 percent probability of exceedance in 50 years, is approximately 0.036g. A reproduction of the USGS seismic map for the Florida area is presented in Figure 19. A 2 percent probability of occurrence in 50 years is equivalent to a 10 percent probability of occurrence in 250 years, which is referenced in Title 40, Part 258.14 of the CFR. Accordingly, the entire SEC, including the proposed construction area, is not located within a seismic impact zone and design for seismic activity is not necessary.

6.2 Fault Evaluation

Title 40 Part 258.13 of the CFR, which is incorporated by reference in Rule 62-701.410(2)(c), FAC, prohibits construction of new MSW landfill units within 200 feet of a fault that has had displacement in the Holocene epoch (i.e., within the past approximately 10,000 years).

The USGS[2] compiles information on active faults and associated folds in the United States that are believed to be sources of earthquakes with a magnitude of greater than 6 on the Richter scale during the Quaternary period (i.e., within the past 1,600,000 years). Maps of these geologic structures are linked to a database containing detailed descriptions and references. The database is intended to be USGS's archive for historic and ancient earthquake sources used in current and future probabilistic seismic hazard analyses. Based on the information published by the USGS, no such fault exists within the state of Florida. Accordingly, this factor is irrelevant for design of the proposed Recycle Pond Expansion and existing lined ponds modifications at the SEC.

6.3 Sinkhole Potential

Sinkholes are closed depressions formed in areas underlain by soluble rock such as limestone, dolostone, or gypsum. Sinkholes occur when surface sediments subside or collapse into underground voids previously created by the dissolving action of groundwater in the underlying bedrock. Other subterranean events may also cause holes, depressions, or subsidence of the

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1 Petersen, M.D., Frankel, A.D., Harmsen, S.C., Mueller, C.S., Haller, K.M., Wheeler, R.L., Wesson, R.L., Zeng, Y., Boyd, O.S., Perkins, D.M., Luco, N., Field, E.H., Wills, C.J., and Rukstales, K.S. 2008. Documentation for the 2008 Update of the United States National Seismic Hazard Maps. U.S. Geological Survey Open-File Report 2008–1128. 61 p.

2 http://earthquake.usgs.gov/hazards/qfaults/

land surface that are similar to those caused by sinkhole activities. These other causes include expansive clays or organic materials that compress as water is removed, collapsed or broken sewer and drain pipes, improperly compacted soils after excavation work, and buried trash, logs, debris, etc.

The Florida Geological Survey (FGS) maintains a database[1] of reported subsidence incidents state-wide. It should be noted that while the data may include some true sinkholes, the majority of the reported incidents have not been field-verified and the cause of subsidence has not been investigated. The current database includes subsidence incidents that have been reported to the FGS through August 10, 2011.

The reported subsidence incidents in the FGS database for Orange County and nearby adjoining counties are shown in Figure 20. As shown, a total of 194 subsidence incidents have been reported for Orange County. There is only one subsidence incident (75-593) reported in east Orange County. This reported depression was approximately 2 feet in diameter and had a depth of approximately 2 feet, and was located more than 4 miles east of the SEC.

According to the map prepared by Sinclair and Stewart (1985)[2], the SEC is located within an area of Florida where the soil cover over limestone is 30 to 200 feet thick and consists mainly of cohesionless soils and permeable sand. In this area of the state, sinkholes typically are few and, if developed, are mostly small cover-subsidence sinkholes.

Based on the above considerations, the potential for sinkhole occurrence in the proposed Recycle Pond Expansion and existing lined ponds at the SEC is judged to be very low.

7.0 ENGINEERING EVALUATIONS AND ANALYSES

As part of the engineering study, the conceptual layouts and designs of the proposed Recycle Pond Expansion and existing lined ponds modifications were developed by Tetra Tech based on a review of the data collected at the project site, periodic discussions with OUC, and a number of meetings with the FDEP.

As stated previously, the proposed Recycle Pond Expansion occupies a base area of approximately 9 acres and will be constructed below grade. The pond will be surrounded by a perimeter dike and will be provided with a seepage collection underdrain system along the toe of the pond slope to keep the groundwater elevation beneath the liner system.

The modified Recycle Pond and Sedimentation Pond will occupy the same footprint area as the existing Recycle Pond and the SCSARP, respectively. The CSARP will occupy the same footprint as the north-south segment of the existing NCSARP, and the east-west segment will be expanded to the west by approximately 100 feet. These ponds will be surrounded by perimeter dikes that will be approximately 3 feet higher than the existing dikes. All three ponds will be provided with a seepage collection underdrain system to keep the groundwater elevation beneath the liner system. A new drainage ditch will also be constructed on the west side of the CSARP to facilitate the runoff flow from the Coal Storage Area.

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1 http://www.dep.state.fl.us/geology/gisdatamaps/SIRs_database.htm

2 Sinclair, W.C. and Stewart, J.W. 1985. Sinkhole Type, Development and Distribution in Florida. U.S. Geological Survey Map Series No. 110. Tallahassee, Florida.

Engineering evaluations and analyses were performed to document that the proposed design would achieve the project objectives, would have adequate factors of safety for stability, and meet applicable regulatory requirements. Results of the engineering evaluations and analyses were used to guide developments of detailed design drawings and technical specifications, as well as to support regulatory approval of the proposed designs. Engineering evaluation associated with the proposed Recycle Pond Expansion and existing lined ponds modifications included seepage analyses and stability analyses to determine the factors of safety against circular arc and sliding block modes of failure within the foundation soils and along the different material interfaces of the bottom liner systems and to estimate seepage rate for design of the underdrain system.

7.1 **Design of Bottom Liner Systems**

7.1.1 Recycle Pond Expansion, Modified Recycle Pond, and CSARP

The proposed Recycle Pond Expansion, modified Recycle Pond, and CSARP will consist of the following key components in descending order:

- An 8-inch thick layer of soil-cement to facilitate the maintenance of the ponds and to provide protection for the liner system.
- An 18-inch thick layer of protective soil cover to act as a cushion between the soil-cement and liner system and to provide protection for the liner system.
- A geocomposite drainage layer to provide conveyance for the contact water and to reduce the hydraulic head below the soil-cement layer.
- An 80-mil thick textured HDPE geomembrane liner to serve as a primary seepage barrier.
- A 6-inch thick layer of compacted soil subbase with a maximum saturated hydraulic conductivity of $1.0x10^{-5}$ cm/sec to further curtail migration of any contact water that passes through hypothetical HDPE liner defects.
- A geocomposite gas venting system to release gas pressure that may be generated from fluctuation of the water table below the liner system.
- A prepared liner subgrade that is free of deleterious materials and meets the compaction requirements in the technical specifications.

The liner subgrade is designed to allow positive gravity drainage of contact water to the collection sump through the geocomposite drainage layer. To provide increased frictional resistance against sliding along the liner system by eliminating “plastic to plastic” interface, the geocomposite in the drainage layer above the HDPE liner will consist of a double-sided geocomposite on the pond slope that extends to a distance of approximately 25 feet from the toe of the pond slope, and a single-sided geocomposite within the interior portions of the ponds.

The proposed Recycle Pond Expansion, the modified Recycle Pond, and the CSARP (i.e., the modified NCSARP) will be provided with an approximately 2,100-foot, 4,200-foot, and 2,400-foot long seepage collection underdrain system along the toe of the pond slope, respectively. The underdrain system consists of a 6-inch diameter slotted HDPE pipe surrounded by a gravel

pack, which in turn will be wrapped by a geotextile. Continous geocomposite layer will be extended from the pipe and gravel pack along the pond slope to an approximate elevation of +78 feet (NAVD88). The design invert elevation of the underdrain pipe is approximately +62 feet (NAVD88). A pumping system will be utilized to control the water elevation within the underdrain system. The removed seepage water from the Recycle Pond Expansion and the modified Recycle Pond underdrain systems will be discharged into the Make-Up Pond via an existing stormwater runoff ditch that runs along the south side. The collected groundwater seepage in the CSARP underdrain system will be discharged into the CSARP.

7.1.2 Sedimentation Pond

The Sedimentation Pond will consist of the following key components in descending order (from top to bottom):

- A 10-inch[1] thick layer of reinforced concrete slab to facilitate the removal of sedimentation deposits and provide protection for the HDPE liner system.
- A 24-inch thick layer of protective soil cover to act as a cushion between the reinforced concrete slab and the liner, and to provide protection for the liner.
- A geocomposite drainage layer to collect and convey any contact water that passes through the reinforced concrete slab and to reduce the hydraulic head below the concrete slab.
- A 80-mil thick textured HDPE geomembrane liner to serve as the primary seepage barrier.
- A 6-inch thick layer of compacted soil subbase with a maximum saturated hydraulic conductivity of 1.0×10^{-5} cm/sec to further curtail migration of any contact water that passes through hypothetical HDPE liner defects.
- A geocomposite gas venting system to release gas pressure that may be generated from fluctuation of the water table below the liner system.
- A prepared liner subgrade that is free of deleterious materials and meets the compaction requirements in the technical specifications.

As shown on Figure 9, the Sedimentation Pond will be divided into compartments for sedimentation, filtration, and clarification by 12-inch[2] thick reinforced concrete walls. It will be constructed with an approximately 2,000-foot long seepage collection underdrain system along the toe of the pond slope so that the bottom of the liner system is not subject to fluctuations of the groundwater that could adversely impact the integrity of the liner system. It consists of a 6-inch diameter slotted HDPE pipe surrounded by a gravel pack, which in turn will be wrapped by a geocomposite. The geocomposite will be extended along the toe of the pond slope to an approximate elevation of +78 feet (NAVD88). The design invert elevation of the underdrain pipe is at approximately +62 feet (NAVD88). A pumping system will be utilized to control the water

[1] The thickness of the reinforced concrete slab has not yet been designed/selected, but is expected to have a minimum thickness of 10 inches.

[2] The thickness of the reinforced concrete walls has not yet been designed/selected, but is expected to have a minimum thickness of 12 inches

elevation within the underdrain system. The removed seepage water from the underdrain system will be discharged into the existing conveyance system for the lined ponds.

7.2 Design of Recycle Pond Expansion, Modified Recycle Pond, and CSARP

Based on the June 2014 topographic survey, the ground surface elevations in the footprint of the proposed Recycle Pond Expansion area and in the vicinity of the existing Recycle Pond and NCSARP footprint typically varied from approximately +78 to +81 feet (NAVD88). The seasonal high water table elevation was judged to be approximately +80 feet (NAVD88).

The proposed Recycle Pond Expansion and the modified Recycle Pond are designed to have liner base grade elevations that vary from approximately +68 feet (NAVD88) just outside the sump areas to approximately +70 feet (NAVD88) along the toe of the west perimeter dike of the proposed Recycle Pond expansion, along the toe of the east perimeter dike of the east-west segment of the modified Recycle Pond and along the toe of the west perimeter dike of the east-west segment of the CSARP. Accordingly, the base area will be located approximately 10 to 12 feet below the estimated seasonal high water table. The liner base grade elevation at the bottom of the sump areas is established at approximately +65 feet (NAVD88), corresponding to approximately 15 feet below the estimated seasonal high water table elevation. As stated previously, all three ponds will be provided with a seepage collection underdrain system with an invert elevation of +62 feet (NAVD88), corresponding to approximately 18 feet below the estimated seasonal high water table elevation. Accordingly, if construction occurs during the wet season, the proposed Recycle Pond Expansion and the modified Recycle Pond constructions will require the groundwater to be lowered by as much as 21 feet.

The proposed Recycle Pond Expansion will be surrounded by a perimeter dike with crest widths of 20 feet, while the modified Recycle Pond and the CSARP will be surrounded by perimeter dikes with crest widths of 10 feet. The crest elevation of the perimeter dikes for all three ponds will be established at +83 feet (NAVD88). The perimeter dikes will have side slopes of 4.0H:1.0V. The HDPE liner system for all three ponds will be anchored along the perimeter dike at an elevation +80.8 feet (NAVD88), corresponding to approximately 2 feet below the dike crest.

The proposed Recycle Pond Expansion will be provided with two 32-inch and one 24-inch diameter HDPE inlet pipes with an approximate invert elevation of +71.4 feet (NAVD88) and a 24-inch diameter HDPE outlet pipe with an approximate invert elevation of +70 feet (NAVD88) connected to the existing Recycle Pond. The modified Recycle Pond and the CSARP will be provided with HDPE inlet and outlet pipes and associated distribution boxes to replace all the existing inlet and outlet features. The CSARP outlet pipe will be connected to the Recycle Pond via the existing conveyance system. The proposed Recycle Pond Expansion and the modified Recycle Pond will also be provided with two 12-inch diameter HDPE emergency overflow pipes with an approximate invert elevation of +80.6 feet (NAVD88). The emergency overflow pipes will discharge to the existing stormwater drainage ditch south of the proposed Recycle Pond Expansion and the modified Recycle Pond.

The minimum and maximum operating water elevations of the proposed Recycle Pond Expansion, modified Recycle Pond, and CSARP will be set at +72 and +79 feet (NAVD88), respectively. The minimum elevation difference between the maximum operating water level and the elevation of the liner system on the slope will be at least 1.8 feet. The maximum

operating water level and the design crest elevation of the perimeter dike will provide a minimum freeboard of 4 feet.

7.3 Design of Sedimentation Pond

Based on the June 2014 topographic survey, the ground surface elevation in the vicinity of the existing SCSARP (i.e., the proposed Sedimentation Pond) area was approximately +79 to +81 feet (NAVD88). The seasonal high water table elevation was judged to be approximately +80 feet (NAVD88).

The Sedimentation Pond area is designed to have liner base grade elevations that vary from approximately +65.5 feet (NAVD88) just outside the sump area located on the south side to approximately +66 feet (NAVD88) along the toe of the north perimeter dike. Accordingly, the base area will be located approximately 14 to 14.5 feet below the estimated seasonal high water table. The liner base grade elevation at the bottom of the sump area is established at approximately +62.5 feet (NAVD88), corresponding to approximately 17.5 feet below the estimated seasonal high water table elevation. As stated previously, the Sedimentation Pond will be provided with a seepage collection underdrain system with invert elevation of +62 feet (NAVD88), corresponding to approximately 18 feet below the estimated seasonal high water table elevation. Accordingly, if construction occurs during the wet season, the proposed Recycle Pond Expansion and the modified Recycle Pond constructions will require the groundwater to be lowered by as much as 21 feet.

As shown in Figure 9, the Sedimentation Pond will be surrounded by a perimeter dike with a crest width of 15 feet and a crest elevation of +83 feet (NAVD88). The perimeter dike will have an outside slope of 4.0H:1.0V and an inside slope of 2.5H:1.0V. The HDPE liner system for the Sedimentation Pond will be anchored along the perimeter dike at an elevation +80.8 feet (NAVD88). As stated previously, the Sedimentation Pond will be provided with a 10-inch[1] thick reinforced concrete slab and associated reinforced concrete walls to facilitate operation and maintenance of the pond.

Except for the inlet pipes from the south coal storage area and the NCSARP, all other existing inlet pipes of the existing SCSARP will be replaced with HDPE inlet and outlet pipes and associated distribution boxes. Inlet pipes from the south coal storage area and the NCSARP will be completely removed. The inlet pipes from the south coal storage area will be rerouted to the CSARP via new HDPE pipes. The Sedimentation Pond will be provided with a riser pipe and a pumping system to transfer the water into the existing conveyance system for the lined ponds.

The minimum and maximum operating water levels of the Sedimentaion Pond will be set at +72 and +79 feet (NAVD88), respectively. The minimum elevation difference between the maximum operating water level and the elevation of the liner system will be at least 1.8 feet. The maximum operating water level and the design crest elevation of the perimeter dike will provide a minimum freeboard of 4 feet.

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[1] The thickness of the reinforced concrete slab has not yet been designed/selected, but is expected to have a minimum thickness of 10 inches.

7.4 Seepage Analyses

As stated previously, the proposed Recycle Pond Expansion and the modified lined ponds (i.e., Recycle Pond, North and South Coal Storage Area Runoff Ponds) will be provided with a seepage collection underdrain system so that the bottom of the liner system is not subject to fluctuations of the groundwater that could adversely impact the integrity of the liner system. In order to estimate the seepage flow rate into the underdrain system, Tetra Tech performed seepage analyses using the computer program SEEP/W developed by GEO-SLOPE International of Calgary, Alberta, Canada. The seepage analyses were performed for representative cross sections. The Recycle Pond cross section was analyzed as representative of the proposed Recycle Pond Expansion and the modified Recycle Pond. The South Coal Storage Area Runoff Pond cross section was analyzed as representative of the North and South Coal Storage Area Runoff Ponds. The subsurface soil layers and selected material properties used in the seepage analyses are presented in Figures 15 and 16. The seepage collection underdrain system was included in the seepage analyses with head elevations at +65 feet and +70 feet (NAVD88).

The seepage analyses for the modified Recycle Pond with head elevations of +65 and +70 feet (NAVD88) for the underdrain system are presented in Figures 21 and 22, respectively. The seepage analyses for the modified Recycle Pond indicated that the estimated steady state seepage flow rates would be $1.0x10^{-4}$ and $9.0x10^{-5}$ cubic feet per second per foot of seepage collection drain with head elevations of +65 feet and +70 feet (NAVD88), respectively. Considering approximately 4,200 feet of underdrain system, the total seepage flow rates into the underdrain system with head elevations of +65 feet and +70 feet (NAVD88) were estimated at about 188 and 170 gallons per minute, respectively.

The seepage analyses for the Sedimentation Pond with the underdrain system having head elevations of +65 feet and +70 feet (NAVD88) are presented in Figures 23 and 24, respectively. The seepage analyses for the modified Recycle Pond indicated that the estimated steady state seepage flow rates would be $1.2x10^{-4}$ and $1.0x10^{-4}$ cubic feet per second per foot of seepage collection drain with head elevations of +65 feet and +70 feet (NAVD88), respectively. Considering approximately 2,000 feet of underdrain system, the total seepage flow rate into the underdrain system with head elevations at +65 feet and +70 feet (NAVD88) were estimated at about 108 and 90 gallons per minute, respectively.

The total seepage flow rates into the underdrain system with head elevations at +65 feet and +70 feet (NAVD88) for each pond are summarized in Table 8.

7.5 Stability Analyses

Stability of the proposed Recycle Pond Expansion and the modified lined ponds design sections were analyzed considering both the circular arc and sliding block modes of failure through the foundation soils. The analyses were performed using the computer program SLOPE/W developed by GEO-SLOPE International of Calgary, Alberta, Canada. The program employs an iteration scheme to determine the critical slip surface and the corresponding minimum factors of safety.

The stability analyses were performed for the most critical cross sections. The Recycle Pond cross section was analyzed as representative of the proposed Recycle Pond Expansion and the modified Recycle Pond. The Sedimentation Pond cross section was analyzed as representative

of the both the Sedimentation Pond and CSARP. The subsurface soil layers and selected material properties used in the stability analyses are displayed in Figures 15 and 16. Specifically, the following key material properties were used in the stability analyses:

- The internal friction angles of the sandy deposits in the different soil layers were selected based on the standard penetration blow count values.

- The shallow and deep clay layers (Layers 5 and 7) were considered to have an undrained shear strength of 1,100 psf.

- The water table was considered to be at the seasonal high elevation of +80 feet (NAVD88).

As shown on Figures 25 and 26, stability analyses for the modified Recycle Pond cross section yielded minimum factors of safety of 2.6 and 4.0 for the circular arc mode of failure through the foundation soils and sliding block mode of failure through the shallow clay layer, respectively. As shown on Figures 27 and 28, stability analyses for the Sedimentation Pond cross section yielded minimum factors of safety of 2.4 and 4.0 for the circular arc mode of failure through the foundation soils and sliding block mode of failure through the shallow clay layer, respectively. Results of the stability analyses for the modified Recycle Pond and the Sedimentation Pond are summarized in Table 9.

Stability analysis along the weakest material interface in the liner system on the sideslope of the perimeter dike was also performed without considering any passive wedge resistance at the toe of the dike. The weakest material interface is expected to occur between the geocomposite and textured HDPE liner, with a typical interface friction angle in the range of 21 to 28 degrees. To be conservative, an interface friction angle of 21 degrees was used to represent the weakest interface of the liner system. Based on our calculation, the stability analysis yielded a factor of safety of 1.54 against sliding along the liner system interface.

The computed factors of safety for all analyzed scenarios were greater than 1.5, which is considered adequate for these types of analyses. As indicated previously, an interface friction angle of 21 degrees for the liner system, as used in the stability analysis, represents a somewhat conservative value. It should further be noted that the stability analyses were performed based on the lower bound of the existing measured undrained shear strength values documented for the shallow clay layer (Layer 5).

8.0 VOLUMETRIC ANALYSIS OF COAL STORAGE AREA

8.1 Introduction

The modified Coal Storage Area Runoff Pond is being designed to handle runoff from the Coal Yard and the Stack Out Pad areas. Calculations were performed to evaluate the volumetric capacity of the modified Coal Storage Area Runoff Pond for containing the 100-year 24-hour storm event. This section presents the results and summarizes the methodologies used to evaluate the hydrologic and hydraulic conditions of the modified Coal Storage Area Runoff Pond with its corresponding watershed.

8.2 Methodology

A total watershed area of about 44.5 acres will report to the modified Coal Storage Area Runoff Pond. This watershed is comprised of 31.3 acres from the Coal Yard, 4.2 acres from the Stack Out Pad and the 9.0 acres area of the modified Coal Storage Area Runoff Pond.

Basin Delineations were derived from the 2014 topographic and aerial photography in combination with the footprint of the modified Coal Storage Area Runoff Pond (Refer to Figure 17-1 in Appendix 17). Basins were assigned model parameter values to describe their hydrologic characteristics which were based upon existing and proposed topography, land use and soils conditions.

Land use categories were used along with soil types to define runoff potential. The Coal Yard and Stack Out Pad areas were classified as Industrial while the modified Coal Storage Area Runoff Pond was classified as Holding Pond.

Soils are classified into hydrologic soil groups, depending on their infiltration rate and rate of water transmission that relate to runoff potential. The hydrologic soil group used for this evaluation is D.

Combinations of land use and soils were then used to define weighted curve numbers within each basin. Runoff curve numbers that were used in this analysis are representative of average antecedent moisture conditions (AMC-II) and were adapted from tables provided by the National Resource Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), publication, TR-55. The resulting weighted Curve Number (CN) of 94.41 was used to compute the potential runoff depth.

The selected design storm event used in these analyses is the 100-year 24-hour event. According to the St. John's River Water Management District 24-hour Isohyetal Maps, the 100-year 24-hour storm event will produce 11.4 inches of rainfall in 24 hours.

Based on Curve Number and rainfall depth parameters, the calculated runoff from the 100-year 24-hour storm event is about 10.7 inches corresponding to a runoff volume from the 44.5 acres watershed of about 40 acre-feet.

8.3 Summary of Proposed Stormwater Management System

As shown in Figure 17-2 in Appendix 17 (modified Coal Storage Area Runoff Pond Stage Storage Relationship), the Modified Coal Storage Area Runoff Pond is capable of containing the runoff volume produced by the 100-year 24-hour storm event over its corresponding watershed. The pond has a capacity of 45 acre-feet between the minimum operation level of +72 feet (NAVD88) and the maximum operation level of +79 feet (NAVD88) (i.e., 2 feet below the top of the HDPE liner and 4 feet below the top of the perimeter dike), while the potential runoff from the watershed is about 40 acre-feet. After a storm event, the pond's normal operational water level will be restored, by transferring runoff water to the Recycle Pond or the Recycle Pond Expansion for storage and consumption by the plant and by natural evaporation.

Table 1

Soil Boring Locations and Depths

Location	Florida State Plane Coordinates (NAD83)		Ground Surface Elevation (feet, NAVD88)	Depth (feet)
	Northing (feet)	Easting (feet)		
Borings within the Proposed Recycle Pond Expansion				
TH-RPE-1	1507151.5	601935.2	+80.2	25.5
TH-RPE-2	1506956.1	602316.8	+79.4	52.5
TH-RPE-3	1506746.4	601929.2	+78.3	51.0
TH-RPE-4	1506950.1	601544.5	+79.0	55.5
TH-RPE-5	1506951.7	601826.7	+79.9	25.5
TH-RPE-6	1506951.0	602024.0	+79.6	96.0
Borings in Vicinity of Existing Recycle Pond				
TH-RP-4	1507033.5	603354.1	+79.1	75.0
TH-RP-5	1507084.0	602842.8	+79.2	25.5
TH-RP-6	1507680.8	602771.6	+79.3	54.0
TH-RP-7	1506721.7	603928.1	+79.3	55.5
Borings in Vicinity of Existing North Coal Storage Area Runoff Pond				
TH-CSAN-1	1508616.6	600778.3	+80.8	25.5
TH-CSAN-2	1508923.8	600889.9	+79.1	25.5
TH-CSAN-3	1509327.1	601169.3	+80.3	78.0
TH-CSAN-4	1509112.2	601520.8	+79.5	25.5
TH-CSAN-5	1509095.1	600606.4	N/A	20.0
TH-CSAN-6	1508812.5	600585.9	N/A	20.0
Borings in Vicinity of Existing South Coal Storage Area Runoff Pond				
TH-CSAS-1	1507794.8	601361.3	+79.1	25.5
TH-CSAS-2	1507809.2	601101.3	+80.2	25.5
TH-CSAS-3	1508169.3	601384.7	+79.8	81.0

Table 2

Undisturbed Sample Locations and Depths

Location	Sample Number	Depth (feet)
TH-RPE-02	US-1	42.0 – 44.0
TH-RPE-03	US-1	40.5 – 42.5
TH-RPE-04	US-1	48.0 – 50.0
TH-RPE-06	US-1	45.0 – 47.0
TH-RP-04	US-1	45.5 - 47.5
TH-RP-06	US-1	43.0 – 45.0
TH-RP-07	US-1	43.0 – 45.0
TH-CSAN-03	US-1	49.0 – 51.0
TH-CSAN-03	US-2	73.0 – 75.0
TH-CSAS-03	US-1	50.0 – 52.0
TH-CSAS-03	US-2	74.0 – 76.0

Table 3

Results of Field Hydraulic Conductivity Tests
Performed at Observation Wells Located Around Recycle Pond

Monitor Well	OW-RP-1	OW-RP-1	OW-RP-2	OW-RP-2	OW-RP-4	OW-RP-4
Date of Test	03/03/2014	03/03/2014	03/03/2014	03/03/2014	03/03/2014	03/03/2014
Type of Test	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head
Depth, feet BTOC	32.0	32.0	32.0	32.0	27.0	27.0
Initial Depth to Water, feet BTOC	5.57	5.57	9.38	9.38	6.62	6.62
Stickup, feet	2.0	2.0	2.0	2.0	2.0	2.0
Screened Interval, feet	10	10	10	10	10	10
D, inches	4.0	4.0	4.0	4.0	4.0	4.0
d, inches	2	2	2	2	2	2
L, feet	10.0	10.0	10.0	10.0	10.0	10.0
T, seconds	17	36.5	17.5	14.5	6.5	10
t_2, seconds	64	91	50	51.5	21.5	25.5
m	1.0	1.0	1.0	1.0	1.0	1.0
mL/D	2.5	2.5	2.5	2.5	2.5	2.5
Hydraulic Conductivity Computed from t_2						
k_h, cm/sec	$0.7x10^{-3}$	$0.5x10^{-3}$	$0.9x10^{-3}$	$0.9x10^{-3}$	$2.2x10^{-3}$	$1.8x10^{-3}$
k_h, feet/day	2.1	1.4	2.6	2.6	6.1	5.1
Hydraulic Conductivity Computed from T						
k_h, cm/sec	$2.7x10^{-3}$	$1.3x10^{-3}$	$2.6x10^{-3}$	$3.2x10^{-3}$	$7.1x10^{-3}$	$4.6x10^{-3}$
k_h, feet/day	7.7	3.6	7.5	9.0	20.2	13.1

D = Effective diameter of the well (i.e. diameter of the filter pack), d = Inside diameter of the PVC well casing, L = Saturated length of the screened interval, T = Lag time = Time to $h/h_0 = 1/e \approx 0.368$, t_2 = Time to $h/h_0 = 0.1$, m = Square root of the ratio of horizontal to vertical hydraulic conductivity, k_h = Horizontal hydraulic conductivity, BTOC – Below top of casing

Table 3 (Continued)

Results of Field Hydraulic Conductivity Tests
Performed at Observation Wells Located Around Recycle Pond Expansion

Monitor Well	OW-RPE-1	OW-RPE-1	OW-RPE-2	OW-RPE-2	OW-RPE-3	OW-RPE-3	OW-RPE-4	OW-RPE-4
Date of Test	03/03/2014	03/03/2014	03/03/2014	03/03/2014	03/04/2014	03/04/2014	03/03/2014	03/03/2014
Type of Test	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head
Depth, feet BTOC	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Initial Depth to Water, feet BTOC	5.87	5.87	6.18	6.18	4.60	4.60	4.55	4.55
Stickup, feet	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Screened Interval, feet	10	10	10	10	10	10	10	10
D, inches	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
d, inches	2	2	2	2	2	2	2	2
L, feet	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
T, seconds	9	9.5	12.5	20	16	20	15	18
t_2, seconds	29.5	33	38	48	46.5	52	61.5	77
m	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
mL/D	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hydraulic Conductivity Computed from t_2								
k_h, cm/sec	$1.6x10^{-3}$	$1.4x10^{-3}$	$1.2x10^{-3}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$0.9x10^{-3}$	$0.7x10^{-3}$	$0.6x10^{-3}$
k_h, feet/day	4.5	4.0	3.	2.7	2.8	2.5	2.1	1.7
Hydraulic Conductivity Computed from T								
k_h, cm/sec	$5.2x10^{-3}$	$4.9x10^{-3}$	$3.7x10^{-3}$	$2.3x10^{-3}$	$2.9x10^{-3}$	$2.3x10^{-3}$	$3.1x10^{-3}$	$2.6x10^{-3}$
k_h, feet/day	14.6	13.8	10.5	6.6	8.2	6.6	8.7	7.3

D = Effective diameter of the well (i.e. diameter of the filter pack), d = Inside diameter of the PVC well casing, L = Saturated length of the screened interval, T = Lag time = Time to $h/h_0 = 1/e \approx 0.368$, t_2 = Time to $h/h_0 = 0.1$, m = Square root of the ratio of horizontal to vertical hydraulic conductivity, k_h = Horizontal hydraulic conductivity, BTOC – Below top of casing

Table 3 (Continued)

Results of Field Hydraulic Conductivity Tests
Performed at Observation Wells Located Around SCSARP

Monitor Well	OW-CSAS-1	OW-CSAS-1	OW-CSAS-2	OW-CSAS-2
Date of Test	03/04/2014	03/04/2014	03/04/2014	03/04/2014
Type of Test	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head
Depth, feet BTOC	27.0	27.0	27.0	27.0
Initial Depth to Water, feet BTOC	4.61	4.61	5.36	5.36
Stickup, feet	2.0	2.0	2.0	2.0
Screened Interval, feet	10	10	10	10
D, inches	4.0	4.0	4.0	4.0
d, inches	2	2	2	2
L, feet	10.0	10.0	10.0	10.0
T, seconds	18	21.5	6.5	14
t_2, seconds	48	65	25.5	35.5
m	1.0	1.0	1.0	1.0
mL/D	2.5	2.5	2.5	2.5
Hydraulic Conductivity Computed from t_2				
k_h, cm/sec	$1.0x10^{-3}$	$0.7x10^{-3}$	$1.8x10^{-3}$	$1.3x10^{-3}$
k_h, feet/day	2.7	2.0	5.1	3.7
Hydraulic Conductivity Computed from T				
k_h, cm/sec	$2.6x10^{-3}$	$2.2x10^{-3}$	$7.1x10^{-3}$	$3.3x10^{-3}$
k_h, feet/day	7.3	6.1	20.2	9.4

D = Effective diameter of the well (i.e. diameter of the filter pack), d = Inside diameter of the PVC well casing, L = Saturated length of the screened interval, T = Lag time = Time to $h/h_0 = 1/e \approx 0.368$, t_2 = Time to $h/h_0 = 0.1$, m = Square root of the ratio of horizontal to vertical hydraulic conductivity, k_h = Horizontal hydraulic conductivity, BTOC – Below top of casing

Table 3 (Continued)

Results of Field Hydraulic Conductivity Tests
Performed at Observation Wells Located Around NCSARP

Monitor Well	OW-CSA-1	OW-CSA-1	OW-CSA-2	OW-CSA-2
Date of Test	03/03/2014	03/03/2014	02/20/2014	02/20/2014
Type of Test	5' PVC Slug Falling Head	5' PVC Slug Rising Head	5' PVC Slug Falling Head	5' PVC Slug Rising Head
Depth, feet BTOC	32.0	32.0	32.0	32.0
Initial Depth to Water, feet BTOC	5.37	5.37	5.38	5.38
Stickup, feet	2.0	2.0	2.0	2.0
Screened Interval, feet	10	10	10	10
D, inches	4.0	4.0	4.0	4.0
d, inches	2	2	2	2
L, feet	10.0	10.0	10.0	10.0
T, seconds	10.5	15.5	12	20
t_2, seconds	32.5	39	46	55.5
m	1.0	1.0	1.0	1.0
mL/D	2.5	2.5	2.5	2.5
Hydraulic Conductivity Computed from t_2				
k_h, cm/sec	$1.4x10^{-3}$	$1.2x10^{-3}$	$1.0x10^{-3}$	$0.8x10^{-3}$
k_h, feet/day	4.0	3.4	2.8	2.4
Hydraulic Conductivity Computed from T				
k_h, cm/sec	$4.4x10^{-3}$	$3.0x10^{-3}$	$3.8x10^{-3}$	$2.3x10^{-3}$
k_h, feet/day	12.5	8.5	10.9	6.6

D = Effective diameter of the well (i.e. diameter of the filter pack), d = Inside diameter of the PVC well casing, L = Saturated length of the screened interval, T = Lag time = Time to $h/h_0 = 1/e \approx 0.368$, t_2 = Time to $h/h_0 = 0.1$, m = Square root of the ratio of horizontal to vertical hydraulic conductivity, k_h = Horizontal hydraulic conductivity, BTOC – Below top of casing

Table 4

Index Test Results for Soil Samples
Recovered from Proposed Recycle Pond Expansion

Location	Sample Number	Depth (feet)	USCS Soil Type	SPT N-value (blows/ft)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg Limits (%)		
								Liquid Limit	Plastic Limit	Plasticity Index
TH-RPE-01	3	3.0 - 4.5	SP	-	26	3	-	-	-	-
	6	7.5 – 9.0	SP-SM	39	22	10	-	-	-	-
	11	15.0 – 16.5	SM	15	21	20	-	-	-	-
	16	22.5 – 24.0	SP-SM	5	26	8	-	-	-	-
TH-RPE-02	3	3.0 – 4.5	SP	-	22	5	-	-	-	-
	5	6.0 – 7.5	SP-SM	51	26	9	3.6	-	-	-
	10	13.5 – 15.0	SP-SM	24	26	7	-	-	-	-
	17	24.0 – 25.5	SP-SM	13	25	9	-	-	-	-
	20	28.5 – 30.0	SM	2	26	14	-	-	-	-
	22	31.5 – 33.0	SC	4	24	25	-	-	-	-
	24	34.5 – 36.0	SP-SM	12	15	9	-	-	-	-
	27	39.0 – 40.5	CH	5	71	95	-	96	20	76
	31	45.0 – 46.5	CH	2	67	91	-	78	18	60
	33	48.0 – 49.5	CH	3	51	61	-	84	19	65
	35	51.0 – 52.5	SP-SM	30	21	8	-	-	-	-
	US-1	42.0 – 44.0	CH	-	110	96	-	141	28	113
TH-RPE-03	1	0.0 – 1.5	SP-SM	-	14	7	3.4	-	-	-
	3	3.0 – 4.5	SP	-	98	2	16.9	-	-	-
	4	4.5 – 6.0	SP	16	25	-	3.0	-	-	-
	9	12.0 – 13.5	SP-SM	4	28	8	-	-	-	-
	17	24.0 – 25.5	SP-SM	WOH	31	11	-	-	-	-
	19	27.0 – 28.5	SP-SM	1	32	11	-	-	-	-
	22	31.5 – 33.0	SC	11	21	19	-	-	-	-
	28	40.5 – 42.0	CH	2	109	98	-	148	28	120
	30	43.5 – 45.0	CH	3	57	86	-	72	17	55
	32	46.5 – 48.0	CH	4	58	75	-	65	13	52
	34	49.5 – 51.0	SC	6	23	13	-	-	-	-
	US-1	40.5 – 42.5	CH	-	92	99	-	129	26	103
TH-RPE-04	2	1.5 – 3.0	SP	-	11	3	-	-	-	-
	5	6.0 – 7.5	SP-SM	21	24	6	3.6	-	-	-
	7	9.0 – 10.5	SP-SM	51	25	11	5.3	-	-	-
	10	13.5 – 15.0	SM	18	20	18	-	-	-	-
	13	18.0 – 19.5	SP-SM	18	26	5	-	-	-	-

USCS – Unified Soil Classification System, SPT – Standard Penetration Test, HA – Hand Auger, WOR – Weight of Rod, WOH – Weight of Hammer , US – Undisturbed Sample

Table 4 (Continued)

Index Test Results for Soil Samples
Recovered from Proposed Recycle Pond Expansion

Location	Sample Number	Depth (feet)	USCS Soil Type	SPT N-value (blows/ft)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg Limits (%)		
								Liquid Limit	Plastic Limit	Plasticity Index
TH-RPE-04	20	28.5 – 30.0	SP-SM	7	25	8	-	-	-	-
	22	31.5 – 33.0	SC	WOH	28	17	-	-	-	-
	24	34.5 – 36.0	SC	5	34	31	-	-	-	-
	29	42.0 – 43.5	SM	21	21	15	-	-	-	-
	31	45.0 – 46.5	CH	5	69	82	-	94	21	73
	33	48.0 – 49.5	CH	3	47	73	-	71	17	54
	36	52.5 – 54.0	CH	3	55	62	-	69	14	55
	US-1	48.0 – 50.0	CH	-	49	83	-	74	24	50
TH-RPE-05	2	1.5 – 3.0	SP-SM	-	24	6	5.9	-	-	-
	6	7.5 – 9.0	SP-SM	60	27	10	-	-	-	-
	11	15.0 – 16.5	SP-SM	23	23	12	-	-	-	-
	15	21.0 – 22.5	SP-SM	15	31	5	-	-	-	-
TH-RPE-06	1	0.0 – 1.5	SP-SM	-	8	5	1.2	-	-	-
	5	6.0 – 7.5	SP-SM	24	28	9	-	-	-	-
	6	7.5 – 9.0	SP-SM	31	22	-	2.9	-	-	-
	9	12.0 – 13.5	SM	14	20	17	-	-	-	-
	16	22.5 – 24.0	SP-SM	9	27	9	-	-	-	-
	21	30.0 – 31.5	SP-SM	2	23	11	-	-	-	-
	23	33.0 – 34.5	SC	10	28	28	-	-	-	-
	29	42.0 – 43.5	CH	2	77	88	-	90	23	67
	32	46.5 – 48.0	CH	2	57	83	-	70	17	53
	34-1	49.5 – 51.0	SC	46	34	35	-	-	-	-
	39	57.0 – 58.5	SP-SM	68	22	10	-	-	-	-
	45	66.0 – 67.5	SP-SM	20	29	11	-	-	-	-
	48	70.5 – 72.0	SC	6	34	32	-	-	-	-
	50	73.5 – 75.0	SC	6	34	31	-	-	-	-
	52	76.5 – 78.0	CL	9	35	50	-	-	-	-
	56	82.5 – 84.0	SP-SM	10	38	12	-	-	-	-
	59	87.0 – 88.5	SC	9	34	29	-	-	-	-
	US-1	45.0 – 47.0	CH	-	57	90	-	84	18	66
	US-2	75.5 – 77.5	SC	-	30	41	-	38	17	21

USCS – Unified Soil Classification System, SPT – Standard Penetration Test, HA – Hand Auger, WOR – Weight of Rod, WOH – Weight of Hammer , US – Undisturbed Sample

Table 4 (Continued)

Index Test Results for Soil Samples Recovered from Recycle Pond

Location	Sample Number	Depth (feet)	USCS Soil Type	SPT N-value (blows/ft)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg Limits (%)		
								Liquid Limit	Plastic Limit	Plasticity Index
TH-RP-04	3	3.0 – 4.5	SP	-	10	3	0.8	-	-	-
	9	12.0 – 13.5	SP-SM	54	25	10	-	-	-	-
	15	21.0 – 22.5	SP-SM	19	23	9	-	-	-	-
	19	27.0 – 28.5	SP-SM	17	24	12	-	-	-	-
	22	31.5 – 33.0	SP-SM	2	26	10	-	-	-	-
	27	39.0 – 40.5	SC	2	33	39	-	110	23	87
	33	48.0 – 49.5	SC	4	43	41	-	87	21	66
	43	63.0 – 64.5	SP-SM	22	29	10	-	-	-	-
	45	66.0 – 67.5	SC	18	31	19	-	-	-	-
	49	72.0 – 73.5	SC	5	30	23	-	31	16	15
	US-1	45.5 47.5	SC	-	38	41	-	-	-	-
TH-RP-05	4	4.5-6.0	SM	5	25	13	1.9	-	-	-
	12	16.5 – 18.0	SP-SM	7	25	9	-	-	-	-
	16	22.5 – 24.0	SP-SM	6	26	8	-	-	-	-
TH-RP-06	2	1.5 – 3.0	SP	-	23	4	-	-	-	-
	6	7.5 – 9.0	SP	2	26	4	-	-	-	-
	10	13.5 – 15.0	SP	4	28	4	-	-	-	-
	14	19.5 – 21.0	SP-SM	3	26	7	-	-	-	-
	18	25.5 – 27.0	SP-SM	3	26	7	-	-	-	-
	25	36.0 – 37.5	SM	11	22	20	-	-	-	-
	29	42.0 – 43.5	CH	2	87	94	-	111	26	85
	34	49.5 – 51.0	SC	2	42	34	-	49	14	35
	US-1	43.0 – 45.0	CH	-	101	84	-	139	30	109
TH-RP-07	2	1.5 – 3.0	SM	-	13	18	-	-	-	-
	6	7.5 – 9.0	SP-SM	55	12	8	1.8	-	-	-
	11	15.0 – 16.5	SC	15	14	23	-	-	-	-
	13	18.0 – 19.5	SC	15	18	24	-	-	-	-
	17	24.0 – 25.5	SM	12	24	13	-	-	-	-
	22	31.5 – 33.0	SC	WOH	30	19	-	-	-	-
	29	42.0 – 43.5	CH	WOH	-	-	-	60	17	43
	32	46.5 – 48.0	CH	1	64	69	-	61	17	44
	35	51.0 – 52.5	SC	3	39	25	-	-	-	-
	36	52.5 – 54.0	SC	8	29	22	-	-	-	-
	US-1	43.0 – 45.0	CH	-	46	65	-	56	17	39

USCS – Unified Soil Classification System, SPT – Standard Penetration Test, HA – Hand Auger, WOR – Weight of Rod, WOH – Weight of Hammer , US – Undisturbed Sample

Table 4 (Continued)

Index Test Results for Soil Samples Recovered from NCSARP

Location	Sample Number	Depth (feet)	USCS Soil Type	SPT N-value (blows/ft)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg Limits (%)		
								Liquid Limit	Plastic Limit	Plasticity Index
TH-CSAN-01	3	4.5 – 3.0	SP	-	12	4	2.4	-	-	-
	7	9.0 – 10.5	SP-SM	19	27	9	-	-	-	-
	15	21.0 – 22.5	SP-SM	6	26	6	-	-	-	-
TH-CSAN-02	5	6.0 – 7.5	SP-SM	15	21	5	2.4	-	-	-
	9	12.0 – 13.5	SM	25	27	13	-	-	-	-
	12	16.5 – 18.0	SP-SM	34	22	11	-	-	-	-
TH-CSAN-03	4	4.5 – 6.0	SP	20	19	4	-	-	-	-
	10	13.5 – 15.0	SP-SM	7	29	5	1.6	-	-	-
	14	19.5 – 21.0	SM	8	19	21	-	-	-	-
	18	25.5 – 27.0	SP-SM	11	27	8	-	-	-	-
	26	37.5 – 39.0	SC	9	26	21	-	-	-	-
	30	43.5 – 45.0	CH	3	43	86	-	-	-	-
	32	46.5 – 48.0	CH	2	67	81	-	74	17	57
	35	51.0 – 52.5	CH	WOH	91	98	-	103	23	80
	39	57.0 – 58.5	SC	4	36	27	-	42	15	27
	44	64.5 – 66.0	SC	18	34	43	-	-	-	-
	51	75.0 – 76.5	CH	6	32	50	-	-	-	-
	US-1	49.0 – 51.0	CH	-	62	95	-	82	18	64
	US-2	73.0 – 75.0	SC	-	37	48	-	41	15	26
TH-CSAN-04	2	1.5 – 3.0	SP	-	16	4	-	-	-	-
	7	9.0 – 10.5	SP-SM	4	39	5	-	-	-	-
	11	15.0 – 16.5	SM	7	21	19	-	19	17	2
	15	21.0 – 22.5	SP-SM	11	25	8	-	-	-	-
TH-CSAN-05	2	1.5 – 3.0	SP	-	19	5	-	-	-	-
	6	7.5 – 9.0	SP-SM	53	27	8	3.7	-	-	-
	10	13.5 – 15.0	SP-SM	20	25	6	-	-	-	-
TH-CSAN-06	4	4.5 – 6.0	SP-SM	49	17	8	1.8	-	-	-
	8	10.5 – 12.0	SP-SM	60	26	7	2.7	-	-	-
	12	16.5 – 18.0	SP	19	22	5	-	-	-	-

USCS – Unified Soil Classification System, SPT – Standard Penetration Test, HA – Hand Auger, WOR – Weight of Rod, WOH – Weight of Hammer , US – Undisturbed Sample

Table 4 (Continued)

Index Test Results for Soil Samples Recovered from SCSARP

Location	Sample Number	Depth (feet)	USCS Soil Type	SPT N-value (blows/ft)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg Limits (%)		
								Liquid Limit	Plastic Limit	Plasticity Index
TH-CSAS-01	2	1.5 – 3.0	SP	-	21	3	-	-	-	-
	7	9.0 – 10.5	SP-SM	32	24	7	-	-	-	-
	12	16.5 – 18.0	SP	11	24	4	-	-	-	-
	16	22.5 – 23.0	SP-SM	8	27	7	-	-	-	-
TH-CSAS-02	2	1.5 – 3.0	SP	-	14	3	-	-	-	-
	3	3.0 – 4.5	SP	-	22	-	0.9	-	-	-
	6	7.5 – 9.0	SP-SM	24	19	10	2.1	-	-	-
	9	12.0 – 13.5	SP-SM	27	25	7	4.1	-	-	-
	14	19.5 – 21.0	SP	4	23	4	-	-	-	-
TH-CSAS-03	1	0.0 – 1.5	SP-SM	-	7	7	-	-	-	-
	4	4.5 – 6.0	SP-SM	11	11	6	-	-	-	-
	9	12.0 – 13.5	SP-SM	4	31	10	-	-	-	-
	12	16.5 – 18.0	SP-SM	20	30	10	-	-	-	-
	20	28.5 – 30.0	SP-SM	7	26	7	-	-	-	-
	25	36.0 – 37.5	SP-SM	4	31	9	-	-	-	-
	29	42.0 – 43.5	SM	5	27	17	-	-	-	-
	33	48.0 – 49.5	CH	1	56	71	-	56	15	41
	36	52.5 – 54.0	CH	WOR	56	66	-	53	14	39
	38	55.5 – 57.0	SC	4	35	31	-	43	14	29
	44	64.5 – 66.0	SC	8	33	17	-	30	17	13
	46	67.5 – 69.0	SM	8	35	20	-	-	-	-
	48	70.5 – 72.0	SC	6	35	18	-	-	-	-
	49	72.0 – 73.5	SC	4	19	-	-	31	18	13
	53	78.0 – 79.5	SC	7	33	44	-	-	-	-
	US-1	50.0 – 52.0	SC	-	31	44	-	65	17	48
	US-2	74.0 – 76.0	SC	-	31	-	-	34	14	20

USCS – Unified Soil Classification System, SPT – Standard Penetration Test, HA – Hand Auger, WOR – Weight of Rod, WOH – Weight of Hammer , US – Undisturbed Sample

Table 5

Laboratory Hydraulic Conductivity Test Results for Clayey Soils

Boring	Sample Number	Depth (feet)	Fines Content (%)	Hydraulic Conductivity (cm/sec)
TH-RPE-2	US-1/B3	42.0 – 44.0	96.0	4.4×10^{-7}
TH-RPE-3	US-1/B1	40.5 – 42.5	99.4	2.2×10^{-8}
TH-RPE-4	US-1/B2	48.0 – 50.0	83.4	5.5×10^{-8}
TH-RPE-6	US-1/B1	45.0 – 47.0	74.4	1.4×10^{-8}
TH-RP-4	US-1/B3	45.5 – 47.5	41.2	1.1×10^{-7}
TH-RP-6	US-1/B2	43.0 – 45.0	84.3	9.9×10^{-8}
TH-RP-7	US-1/B1	43.0 – 45.0	65.1	9.2×10^{-8}
TH-CSAS-3	US-1/B3	50.0 – 52.0	43.8	2.3×10^{-7}
TH-CSAN-3	US-1/B2	49.0 – 51.0	94.5	6.1×10^{-8}
TH-CSAN-3	US-2/B3	73.0 – 75.0	47.9	6.3×10^{-7}

Table 6

Laboratory One-Dimensional Consolidation Test Results

Borehole	Depth (feet)	Soil Description	Fines Content (%)	Initial Moisture Content (%)	Initial Dry Density γ_d (pcf)	Initial Void Ratio e_o	Maximum Past Consolidation Pressure σ'_{vm} (psf)	Virgin Compression Ratio CR	Recompression Ratio RR***	Normally Consolidated Vertical Coefficient of Consolidation* c_v (cm^2/sec)
TH-RPE-03-US	40.5-42.5	CLAY, with trace shell fragments, gray (CH)	99.6	111.8	41.9	3.009	4,000	0.398	0.0525	1×10^{-4}
TH-RPE-06-US	45.0-47.0	CLAY, greenish gray (CH)	98.4	61.4	64.0	1.694	10,000	0.272	0.0351	7×10^{-3}
TH-CSAN-03-US	49.0-51.0	CLAY, greenish gray (CH)	97.6	68.8	58.9	1.852	6,000	0.377	0.0437	2×10^{-4}

* Vertical coefficient of consolidation for stress range ($\sigma'_{vc}/\sigma'_{vm}$) of 1 to 2.
** Coefficient of secondary compression (($C_{\alpha e}/(1+e_0)$) for stress range ($\sigma'_{vc}/\sigma'_{vm}$) of 1 to 2.
*** Recompression ratio for OCR of 5 to 10.

Table 7

Laboratory Unconsolidated-Undrained Triaxial Test Results

Test Boring	Sample No.	Depth (feet)	Soil Description	Fines Content (%)	Assumed Specific Gravity, G_s	Final Moisture Content (%)	Final Dry Density, γ_d (pcf)	Degree of Saturation (%)	Cell Pressure, σ_c (psf)	at $(\sigma_1-\sigma_3)_{max}$	
										Axial Strain, ε_a (%)	Undrained Shear Strength (psf)
TH-RP-6	US-1	43.0 – 45.0	CLAY, (CH)	98.5	2.75	93.2	47.7	99	3,318	2.12	1,434
TH-RPE-4	US-1	48.0 – 50.0	CLAY, (CH)	89.3	2.75	43.6	71.3	85	3,892	3.55	2,714
TH-RPE-6	US-1	45.0 – 47.0	CLAY, (CH)	94.6	2.75	61.1	63.9	100	3,461	2.30	1,208
TH-CSAN-3	US-1	49.0 – 51.0	CLAY, (CH)	98.6	2.75	71.3	57.2	98	3,892	1.62	1,311

Table 8

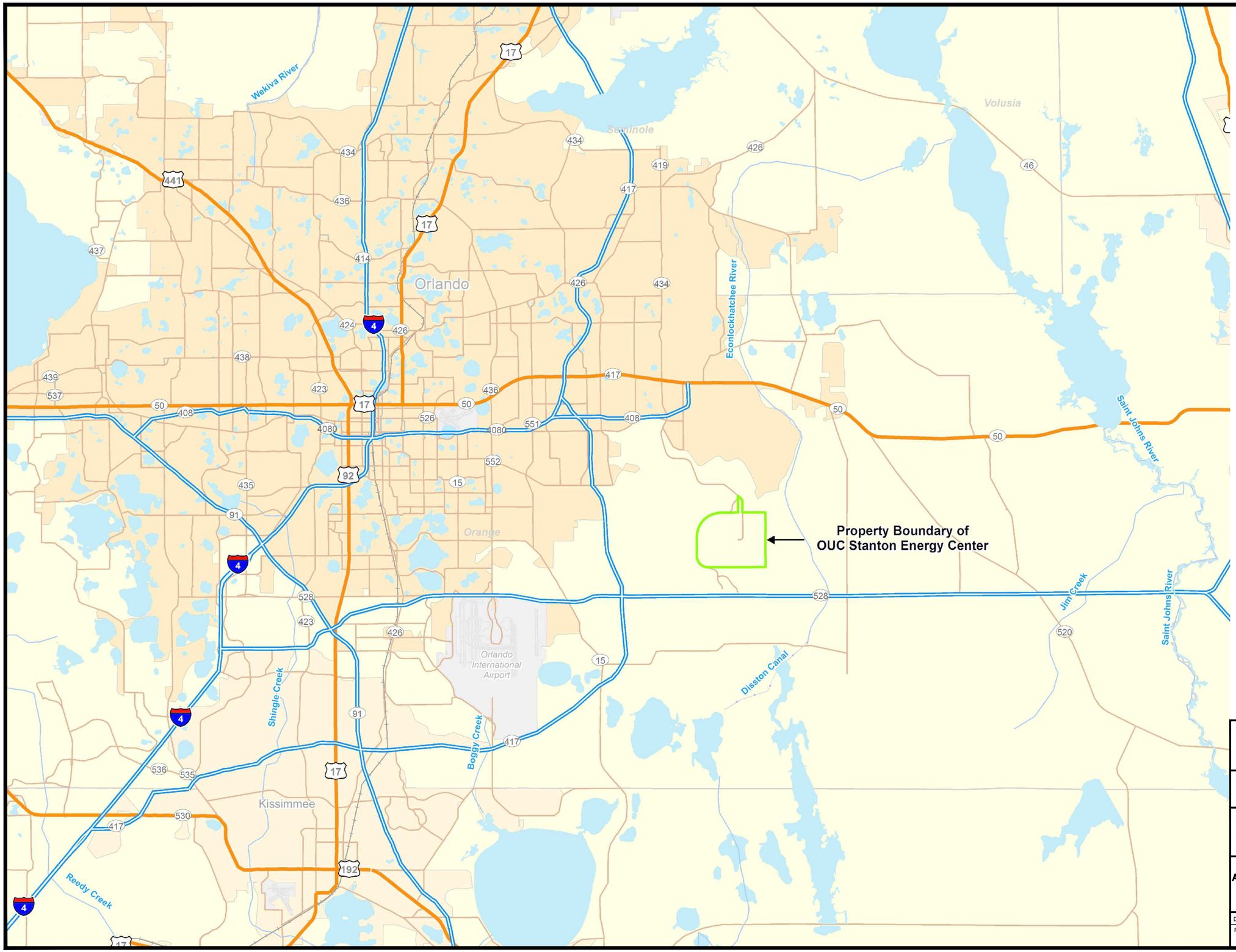
Summary of Underdrain Seepage Flow Rates

Pond	Underdrain Invert Elevation (feet, NAVD88)	Flow Rate per Linear Foot of Underdrain (ft^3/sec)	Underdrain Length (feet)	Total Flow Rate (gal/min)
Recycle Pond Expansion	65	1.0×10^{-4}	2,100	94
	70	9.0×10^{-5}		85
Recycle Pond	65	1.0×10^{-4}	4,200	188
	70	9.0×10^{-5}		169
North Coal Storage Area Runoff Pond	65	1.2×10^{-4}	2,400	129
	70	1.0×10^{-4}		107
South Coal Storage Area Runoff Pond	65	1.2×10^{-4}	2,000	108
	70	1.0×10^{-4}		90

Table 9

Summary of Results of Stability Analyses

Pond	Underdrain Invert Elevation (feet, NAVD88)	Method of Analysis		
		Circular Arc Search	Grid and Radius Search	Block Failure through Clay
Recycle Pond and Recycle Pond Expansion	65	3.07	2.98	4.37
	70	2.63	2.55	4.00
North and South Coal Storage Area Runoff Ponds	65	2.69	2.68	4.15
	70	2.39	2.39	3.95



N

0 9,000 18,000'

SCALE: 1"=18000'

SOURCE: ESRI

LEGEND

SEC PROPERTY BOUNDARY

SITE LOCATION MAP

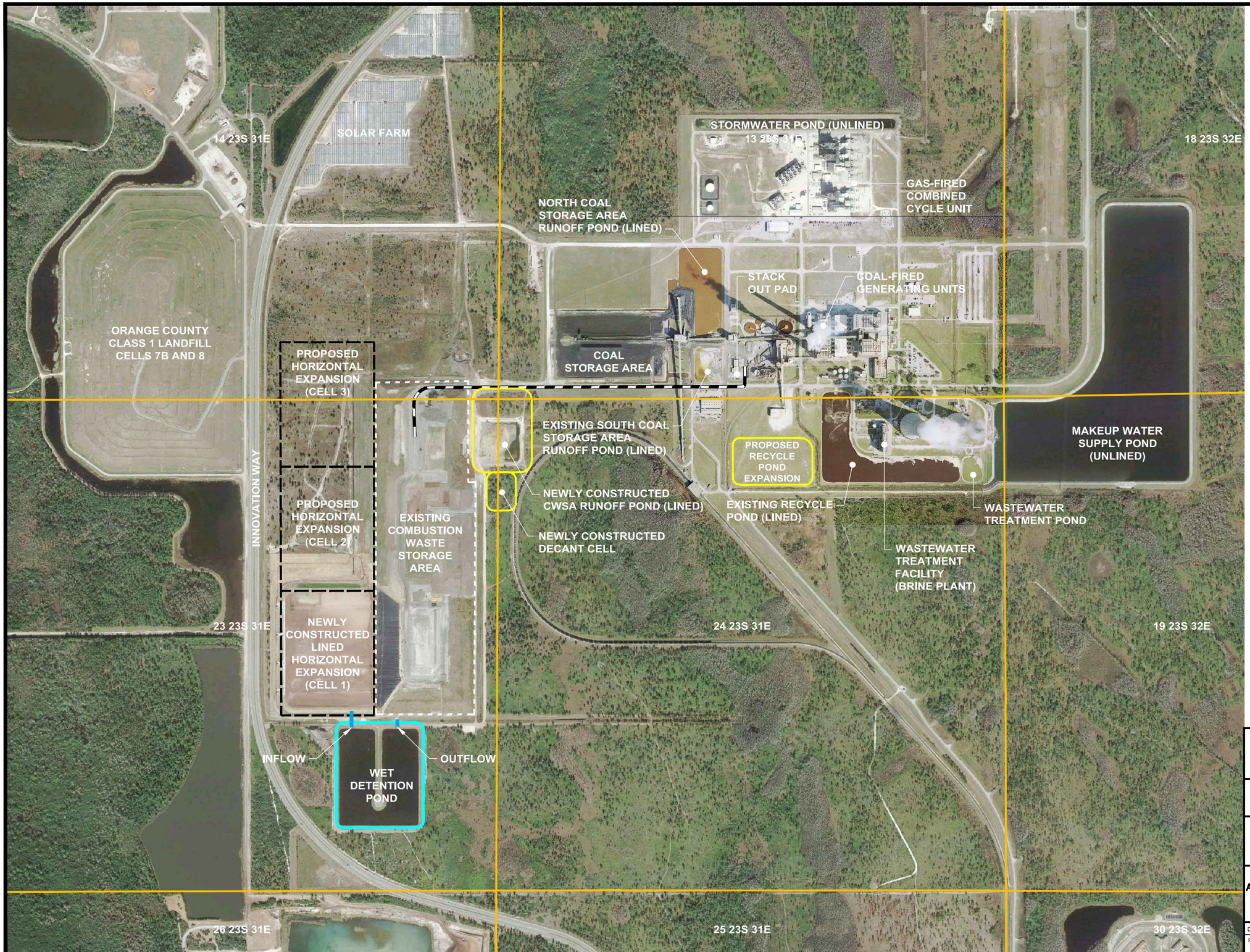
Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	08/21/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	1

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\1 SITE LOCATION MAP.dwg 8/26/2014 11:05:30 AM, ron.ortiz



N

0 500 1000

SCALE:—1"=1000'

AERIAL PHOTOGRAPH SOURCE:
TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE MARCH 10, 2014

AND

GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

- CURRENT CWSA LIMITS
- EXISTING HAUL ROAD
- HORIZONTAL EXPANSION OF CWSA
- PUBLIC LAND SURVEY SYSTEM

AERIAL PHOTOGRAPH OF OUC STANTON ENERGY CENTER

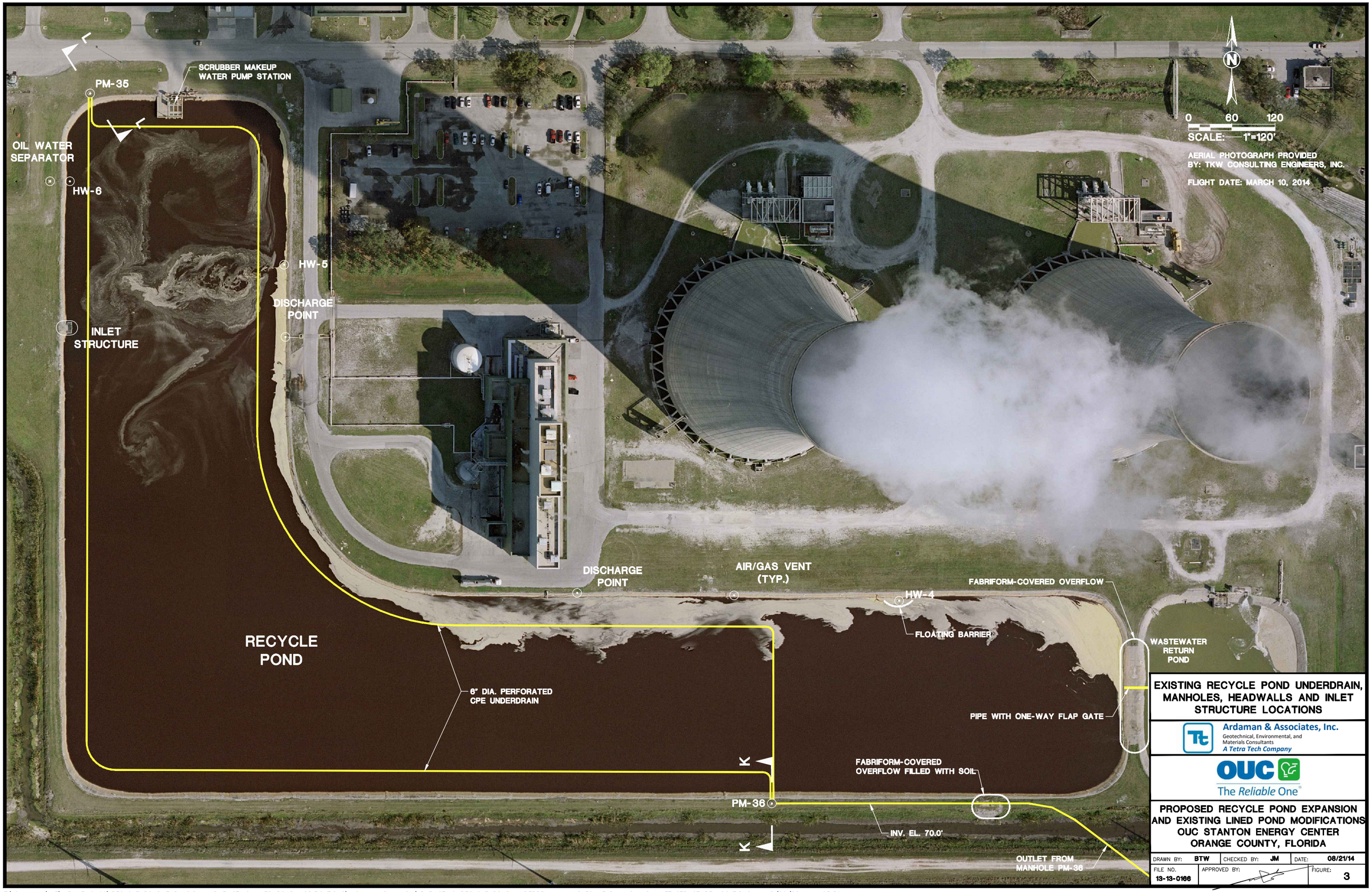
Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	08/21/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	2

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\2 AERIAL PHOTOGRAPH OF OUC STANTON ENERGY CENTER.dwg 8/26/2014 11:05:47 AM, ron.ortiz



EXISTING RECYCLE POND UNDERDRAIN, MANHOLES, HEADWALLS AND INLET STRUCTURE LOCATIONS

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

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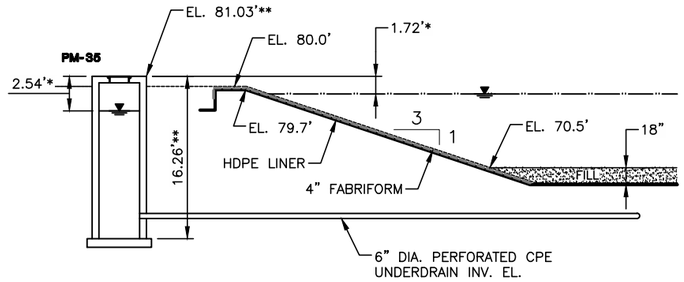
PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	08/21/14
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 3

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\3 EXISTING RECYCLE POND UNDERDRAIN MANHOLES HEADWALLS AND INLET STRUCTURE LOCATIONS.dwg 8/26/2014 11:05:59 AM, ron.ortiz

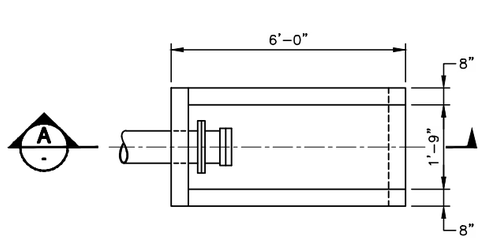


L
-

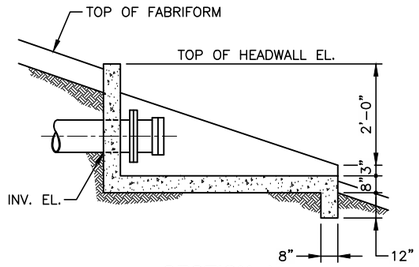
MANHOLE PM-35

NOT TO SCALE

* BASED ON ARDAMAN 10/21/11 LASER SURVEY
** BASED ON MACTEC SURVEY



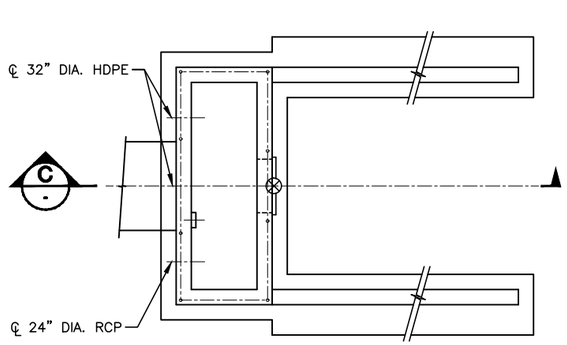
PLAN



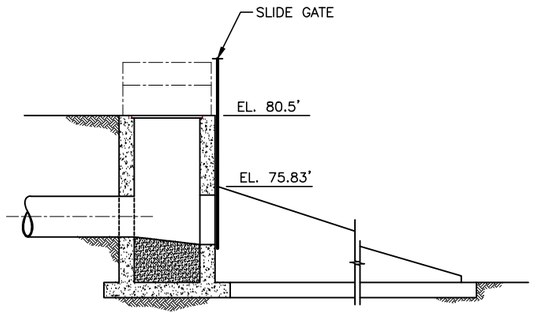
SECTION A

HW-6

NOT TO SCALE



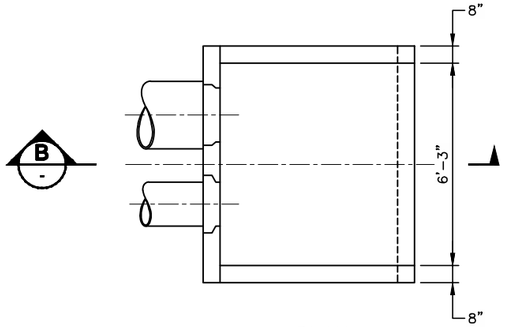
PLAN



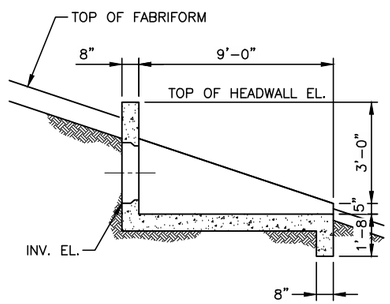
SECTION C

RECYCLE POND INLET STRUCTURE

SCALE: 1" = 10'



PLAN



SECTION B

HW-5

NOT TO SCALE

EXISTING RECYCLE POND MANHOLE, HEADWALLS AND STRUCTURE DETAILS

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	08/21/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		4

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\4 EXISTING RECYCLE POND MANHOLE, HEADWALL AND STRUCTURE DETAILS.dwg 8/26/2014 11:06:04 AM, ron.ortiz

(2) DUCT BANKS
EXISTING 4" PVC
EXISTING 4" PVC
EXISTING MANHOLE
EXISTING 6" PIPE
PIPE INV. EL. 74.15'
EL. 70.1'
EL. 70.1'
EXISTING 4" FRP
EXISTING 6" FRP
EXISTING 20" DIP
EXISTING 12" FRP
PROPOSED THREE 24" DIA. HDPE DR 17 OUTLET PIPES (INV. EL. 70.5')
PROPOSED TWO 24" DIA. HDPE DR 17 OUTLET PIPES W/ INV. EL. 74.2'
PROPOSED 5'x11' CONCRETE ACCESS BOX
PROPOSED TWO 32" DIA. HDPE DR 17 PIPES (TO BE CONNECTED TO EXISTING PIPES)
INV. EL. 71.2'
INV. EL. 71.2'
℄ OF PERIMETER DIKE FOR NEW RECYCLE POND
PROPOSED 24" DIA. HDPE DR 17 PIPE (TO BE CONNECTED TO EXISTING PIPE)
HDPE PIPE ENCASEMENT
WASTE WATER TREATMENT FACILITY
S. ALAFAYA TRAIL
COOLING TOWER
COOLING TOWER
PROPOSED CONSTRUCTION LIMITS OF RECYCLE POND
PROPOSED CONSTRUCTION LIMITS OF RECYCLE POND
EXISTING 18" RCP
EXISTING 12" DIP
PROPOSED 12" DIA. HDPE DR 17 PIPE (INV. EL. 74.4')
EXISTING PM-19
EXISTING 18" RCP
EXISTING 12" DIP
℄ OF PERIMETER DIKE FOR NEW RECYCLE POND
EXISTING BLOWDOWN VALVE PIT
EXISTING PM-20
EXISTING 18" RCP
EXISTING 12" DIP
EXISTING HW-2
EXISTING HW-3
EXISTING HW-5
EL. 71.2'
24" DIA. HDPE DR 17 CONNECTOR PIPE TO BE CONNECTED TO NEW RECYCLE POND (INV. EL. 71.0')
NEW RECYCLE POND
EXISTING WASTE WATER TREATMENT POND (LINED)
EXISTING STORMWATER DRAINAGE DITCH
℄ OF PERIMETER DIKE FOR NEW RECYCLE POND
EL. 71.1'
INV. EL. 80.6
PROPOSED TWO 12" DIA. HDPE DR 17 EMERGENCY OVERFLOW PIPES
INV. EL. 80.6
EL. 72.6'
EL. 72.6'
PROPOSED 8" HDPE DR 17 PIPE TO BE CONNECTED TO EXISTING PIPE (INVERT ELEVATION OF EXISTING PIPE TO BE FIELD-VERIFIED)
EXISTING STORMWATER DRAINAGE DITCH
INV. EL. 73.0'
PROPOSED TWO 12" DIA. HDPE DR 17 EMERGENCY OVERFLOW PIPES
INV. EL. 73.0'

N

0 75 150

SCALE: 1"=150'

TOPOGRAPHIC SURVEY PERFORMED BY:
TKW CONSULTING ENGINEERS, INC.

SURVEY DATE: 06/13/14

DATUM: NAVD88

TOPOGRAPHIC CONTOUR INTERVAL: 1 FT.

AERIAL PHOTOGRAPH SOURCE:
TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE: MARCH 10, 2014

APPROXIMATE UTILITY LOCATIONS AND PIPE'S INVERT ELEVATIONS WERE OBTAINED FROM OUC'S MASTER UTILITY LOCATION PLAN.

LAYOUT OF MODIFIED RECYCLE POND

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY: BTW	CHECKED BY: JM	DATE: 08/21/14
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 5

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\5 LAYOUT OF MODIFIED RECYCLE POND.dwg 8/26/2014 11:06:28 AM, ron.ortiz

APPROXIMATE LOCATION OF EXISTING HDPE PIPE ENCASEMENT
INV. EL. 71.9'
INV. EL. 72.1'
LOCATION OF EXISTING MANHOLE (PM-8)
APPROXIMATE LOCATION OF TWO EXISTING 32" DIA. HDPE BELOW-GRADE PIPES
APPROXIMATE LOCATION OF EXISTING 24" DIA. HDPE BELOW-GRADE PIPE
17'x18' REINFORCED CONC. DISTRIBUTION BOX
N. 1507391.73
E. 601966.76
N. 1507391.73
E. 601983.76
TWO 8'x19' REINFORCED CONC. VALVE ACCESS BOXES
LOCATION OF EXISTING MANHOLE (PM-9)
INV. EL. 71.2'
INV. EL. 70.8'
APPROXIMATE LOCATION OF EXISTING HDPE PIPE ENCASEMENT
APPROXIMATE LOCATION OF TWO EXISTING 32" DIA. HDPE BELOW-GRADE PIPES
APPROXIMATE LOCATION OF EXISTING 24" DIA. HDPE BELOW-GRADE PIPE
PROPOSED CONSTRUCTION LIMIT OF RECYCLE POND EXPANSION
24" DIA. HDPE DR 17 INLET PIPE (INV. EL. 71.4')
TWO 32" DIA. HDPE DR 17 INLET PIPES (INV. EL. 71.4')
COLD BEND 200'R (MIN.)
COLD BEND 200'R (MIN.)
PROPOSED PUMP STATION
HOLD
HOLD
EXISTING RAILROAD TRACKS
℄ OF PERIMETER DIKE
M.E.G.
83.0
83.0
80.0
75.0
4:1
4:1
20.0'
EL. 72.28'
EL. 70.67'
72.0
71.5
71.0
70.5
S=0.5%
S=0.5%
S=0.5%
20.0'
20.0'
M.E.G.
80.0
83.0
83.0
80.0
75.0
4:1
4:1
71.5
70.0
75.0
80.0
83.0
M.E.G.
4:1
4:1
70.0
67.0
4:1
70.1
71.5
6'x6' CONC. ACCESS BOX WITH 24" DIA. GATE VALVE
24" DIA. HDPE DR 17 OUTLET PIPE INV. EL. 70.0'
PIPE ENCASEMENT
EXISTING 6" CPT UNDERDRAIN W/ INV. EL. 65.95'
EXISTING STORMWATER DRAINAGE DITCH
EXISTING STORMWATER DRAINAGE DITCH
EXISTING RECYCLE POND (LINED)
EL. 80.6'
EL. 80.6'
80.0
83.0
83.0
80.0
M.E.G.
4:1
4:1
20.0'
12" DIA. HDPE DR 17 EMERGENCY OVERFLOW PIPE W/ INV. EL. 80.63' AT INLET
12" DIA. HDPE DR 17 EMERGENCY OVERFLOW PIPE W/ INV. EL. 80.63' AT INLET
EL. 74.9'
EL. 74.9'
EXISTING STORMWATER DRAINAGE DITCH
INV. 74.1'
INV. 74.2'
INV. 74.3'
INV. 73.9'
INV. 74.0'
INV. 74.7'

N

0 40 80

SCALE: 1"=80'

TOPOGRAPHIC SURVEY PERFORMED BY: TKW CONSULTING ENGINEERS, INC.

SURVEY DATE: 06/13/14

DATUM: NAVD88

TOPOGRAPHIC CONTOUR INTERVAL: 1 FT.

AERIAL PHOTOGRAPH SOURCE: TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE: MARCH 10, 2014

APPROXIMATE UTILITY LOCATIONS PROVIDED BY OUC.

LAYOUT OF PROPOSED RECYCLE POND EXPANSION

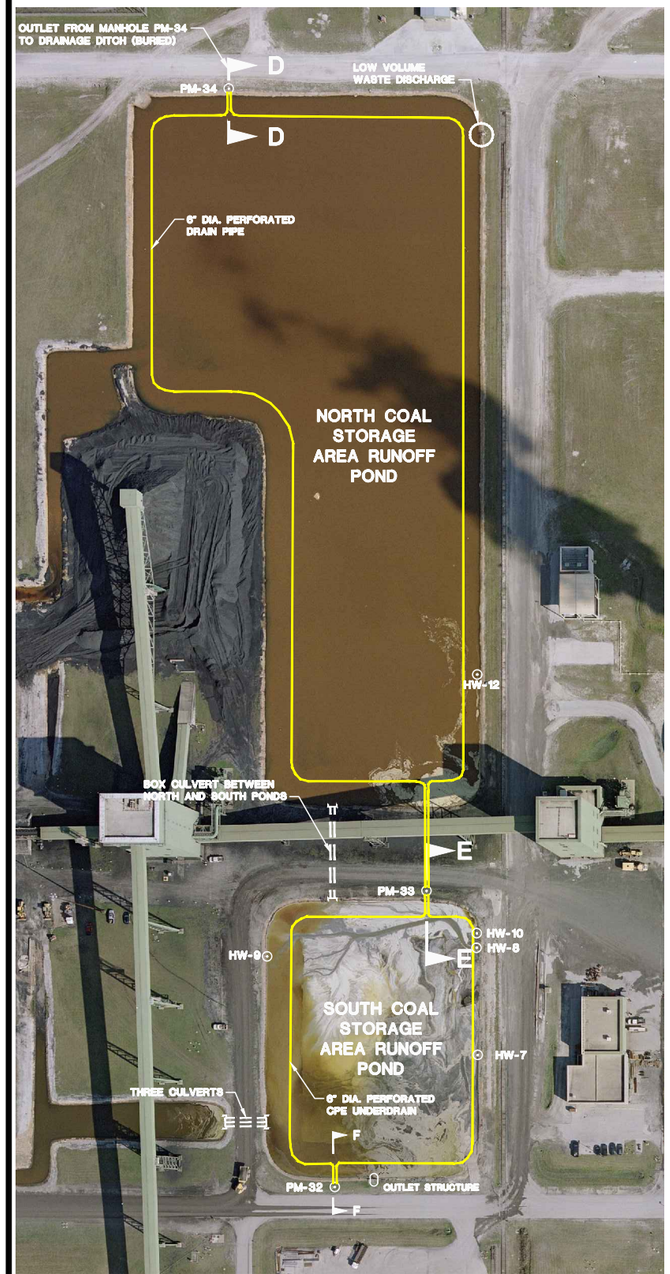
Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	08/21/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	6

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\6 LAYOUT OF PROPOSED RECYCLE POND EXPANSION.dwg 8/26/2014 11:06:53 AM, ron.ortiz



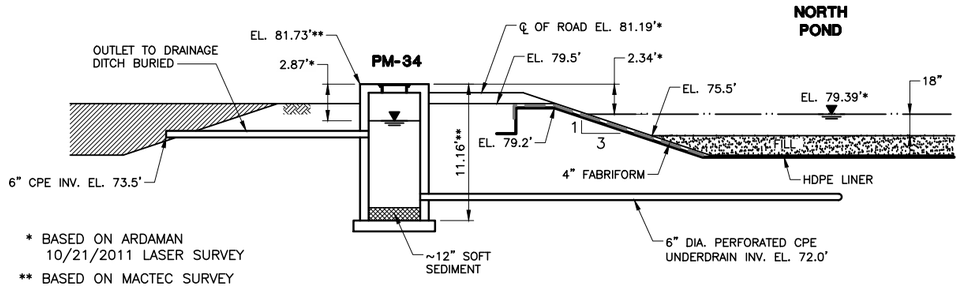
N

0 100 200

SCALE: 1"=200'

AERIAL PHOTOGRAPH PROVIDED BY: TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE: MARCH 10, 2014

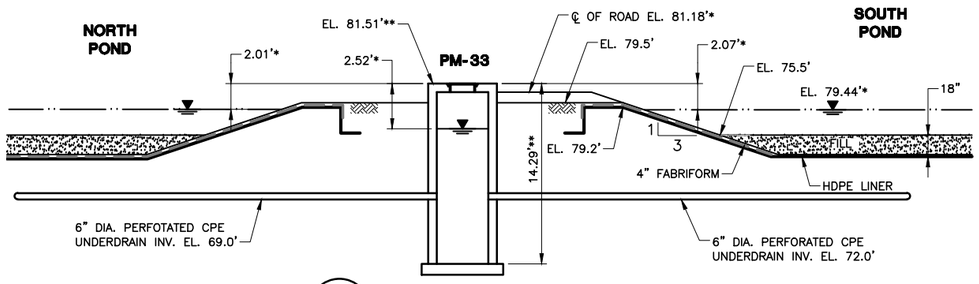


* BASED ON ARDAMAN 10/21/2011 LASER SURVEY

** BASED ON MACTEC SURVEY

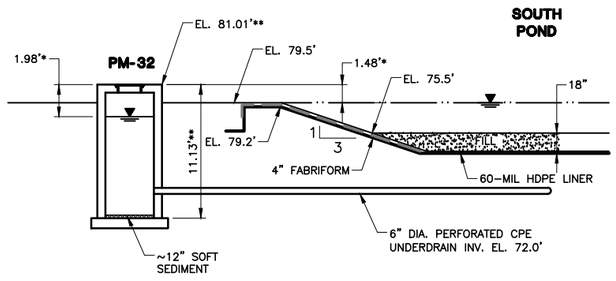
D - MANHOLE PM-34

NOT TO SCALE



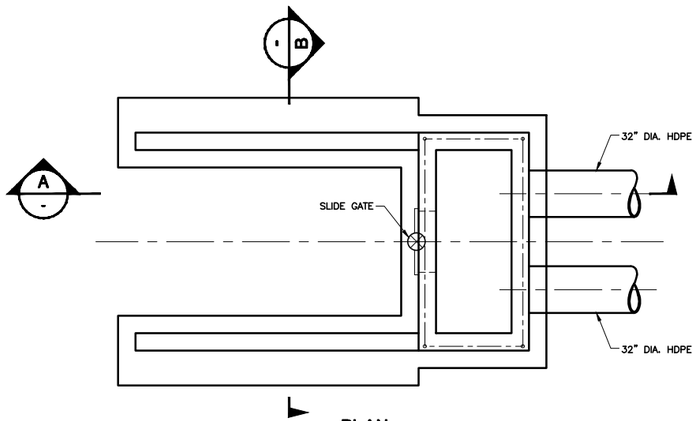
E - MANHOLE PM-33

NOT TO SCALE

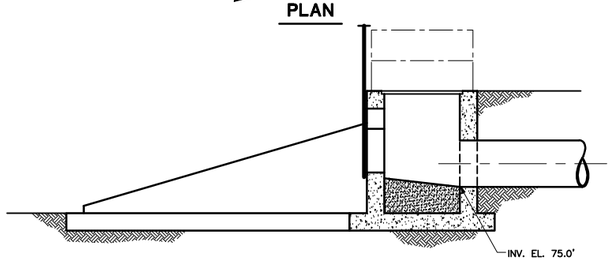


F - MANHOLE PM-32

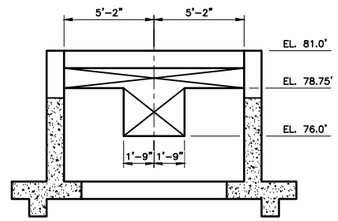
NOT TO SCALE



PLAN



SECTION A



SECTION B

SOUTH COAL STORAGE AREA RUNOFF POND OUTLET STRUCTURE

NOT TO SCALE

EXISTING NORTH & SOUTH COAL STORAGE AREA RUNOFF PONDS UNDERDRAINS, MANHOLES, HEADWALLS AND OUTLET STRUCTURE

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

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PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

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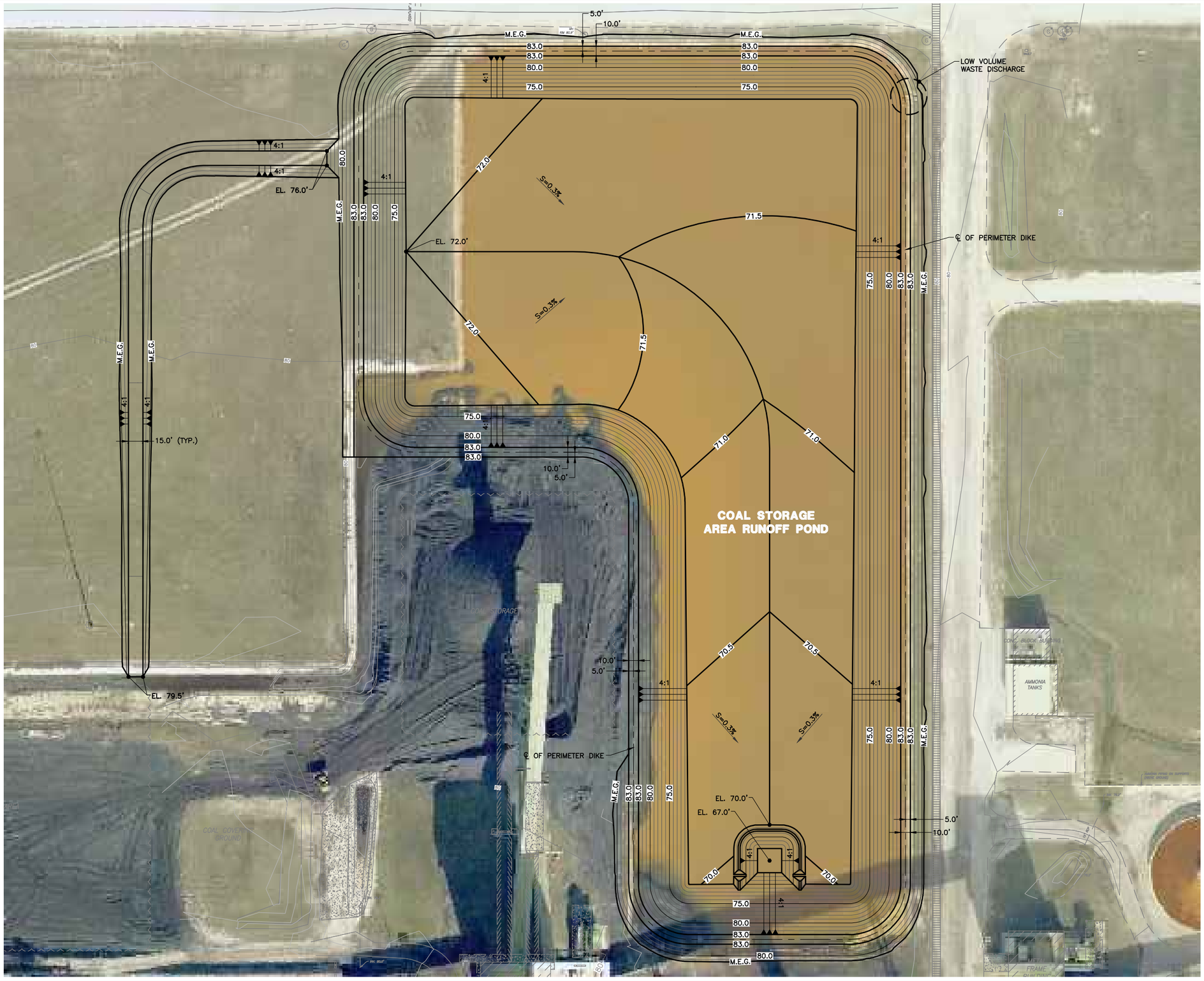
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 7

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\7 EXISTING NORTH & SOUTH COAL STORAGE AREA RUNOFF PONDS UNDERDRAINS, MANHOLES, HEADWALLS AND OUTLET STRUCTURE.dwg 8/26/2014 11:07:07 AM, ron.ortiz



0 50 100

SCALE: 1"=100'

TOPOGRAPHIC SURVEY PERFORMED BY:
TKW CONSULTING ENGINEERS, INC.

SURVEY DATE: 06/13/14

DATUM: NAVD88

TOPOGRAPHIC CONTOUR INTERVAL: 1 FT.

AERIAL PHOTOGRAPH SOURCE:
TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE: MARCH 10, 2014

APPROXIMATE UTILITY LOCATIONS
PROVIDED BY OUC.

NOTE:
COAL STORAGE AREA RUNOFF POND WAS ORIGINALLY REFERRED TO AS NORTH COAL STORAGE AREA RUNOFF POND (NCSARP)

LAYOUT OF COAL STORAGE AREA RUNOFF POND

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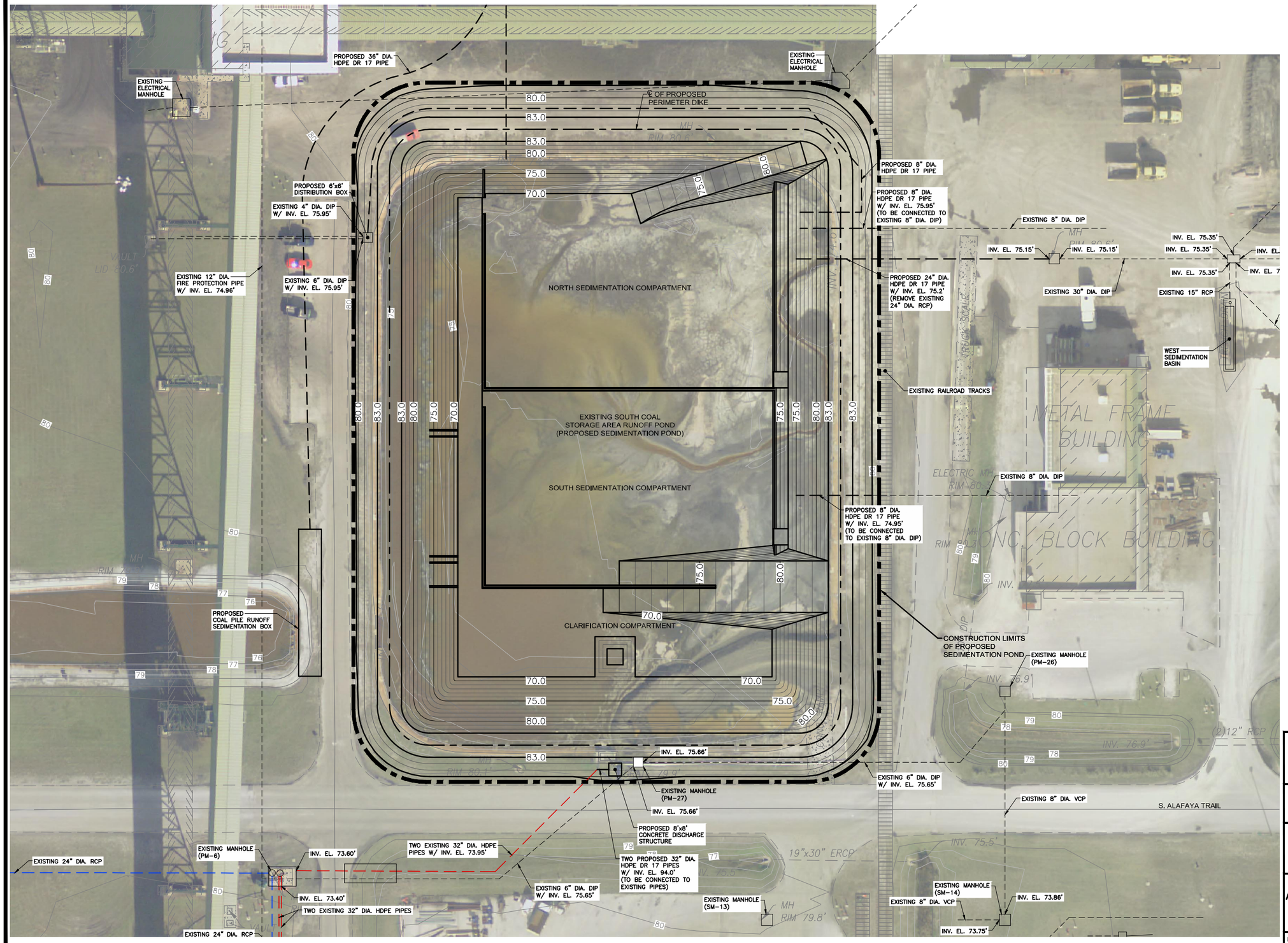
PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	08/21/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	8

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\8 LAYOUT OF NORTH COAL STORAGE AREA RUNOFF POND.dwg 8/26/2014 11:07:36 AM, ron.ortiz



0 30 60

SCALE: 1"=60'

TOPOGRAPHIC SURVEY PERFORMED BY: TKW CONSULTING ENGINEERS, INC.

SURVEY DATE: 06/13/14

DATUM: NAVD88

TOPOGRAPHIC CONTOUR INTERVAL: 1 FT.

AERIAL PHOTOGRAPH SOURCE: TKW CONSULTING ENGINEERS, INC.

FLIGHT DATE: MARCH 10, 2014

APPROXIMATE UTILITY LOCATIONS PROVIDED BY OUC.

NOTE:
SEDIMENTATION POND WAS ORIGINALLY REFERRED TO AS SOUTH COAL STORAGE AREA RUNOFF POND (SCSARP)

LAYOUT OF SEDIMENTATION POND

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

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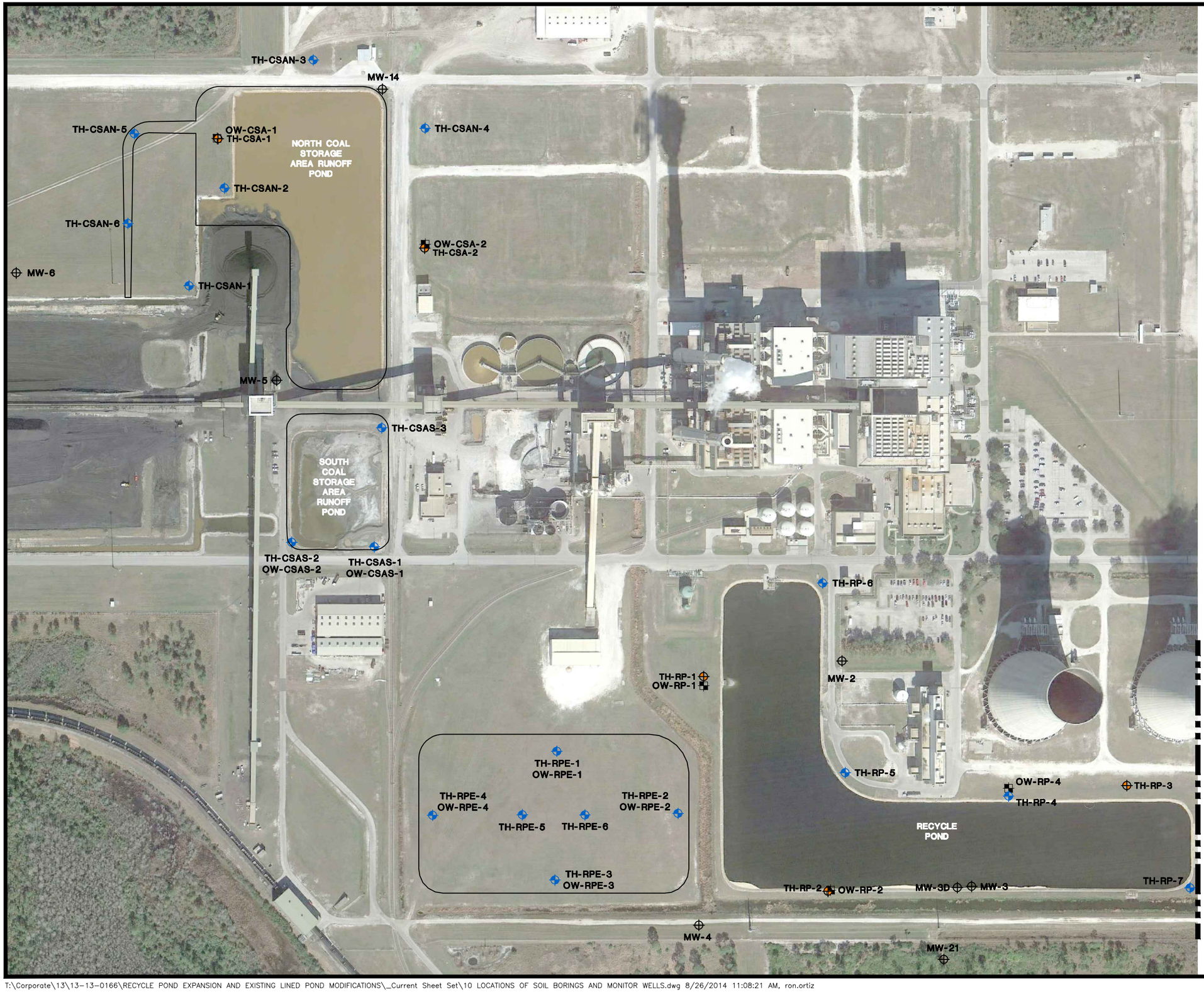
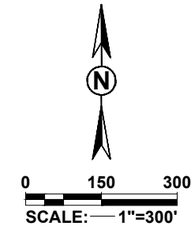
PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	05/12/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	9

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\9 LAYOUT OF SEDIMENTATION POND.dwg 8/26/2014 11:08:08 AM, ron.ortiz





AERIAL PHOTOGRAPH SOURCE: GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

TH-CSAS-1	STANDARD PENETRATION TEST (SPT) BORING LOCATION
OW-CSAS-1	OBSERVATION WELL
TH-RP-1	2009 SPT BORING LOCATION
MW-2	EXISTING SURFICIAL AQUIFER MONITOR WELL

LOCATIONS OF SOIL BORINGS AND MONITOR WELLS

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

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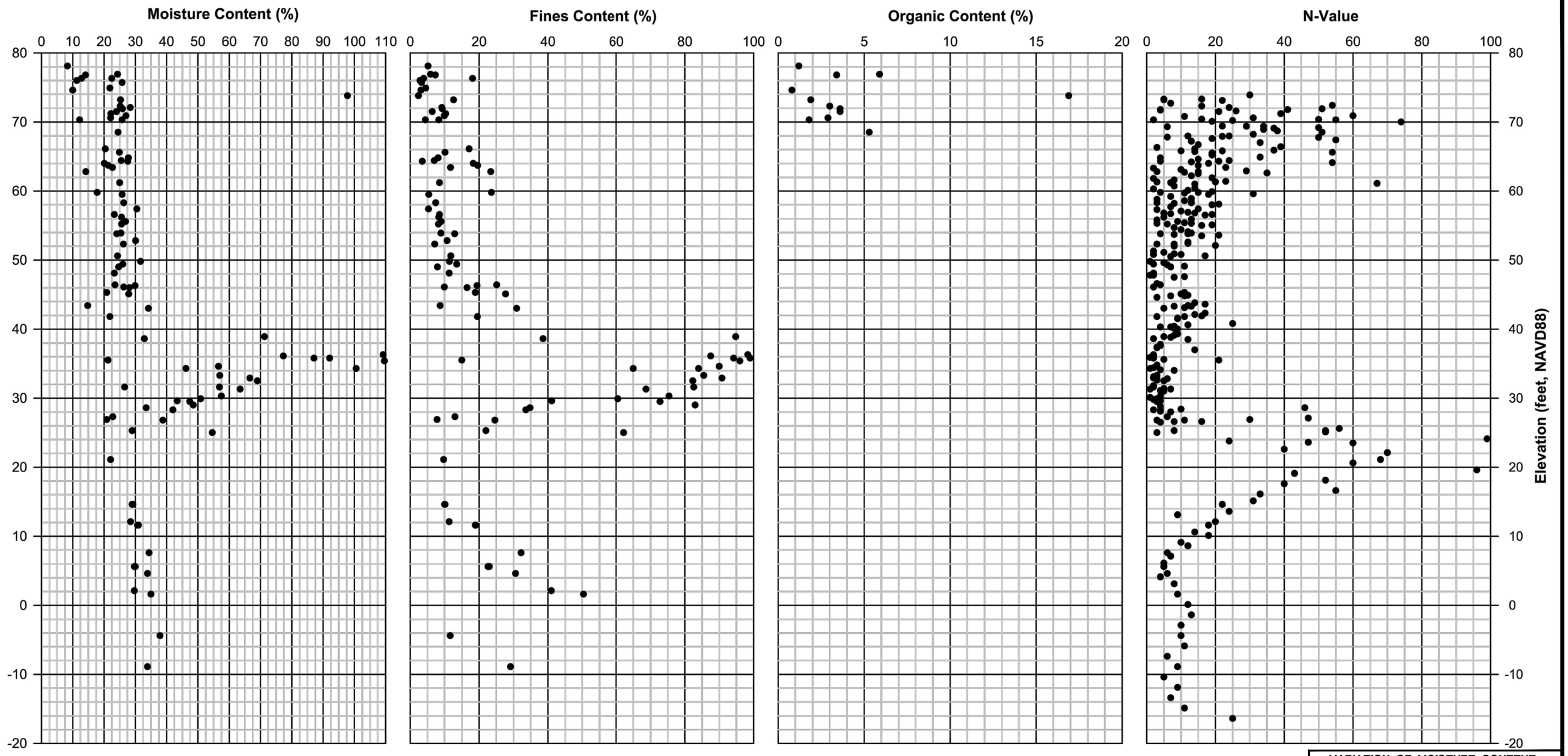
PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY: **BTW**	CHECKED BY: **JM**	DATE: **08/21/14**	
FILE NO. **13-13-0166**	APPROVED BY:	FIGURE: **10**	

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\10 LOCATIONS OF SOIL BORINGS AND MONITOR WELLS.dwg 8/26/2014 11:08:21 AM, ron.ortiz



VARIATION OF MOISTURE CONTENT, FINES CONTENT, ORGANIC CONTENT AND N-VALUE WITH ELEVATION FOR MODIFIED RECYCLE POND AND RECYCLE POND EXPANSION

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

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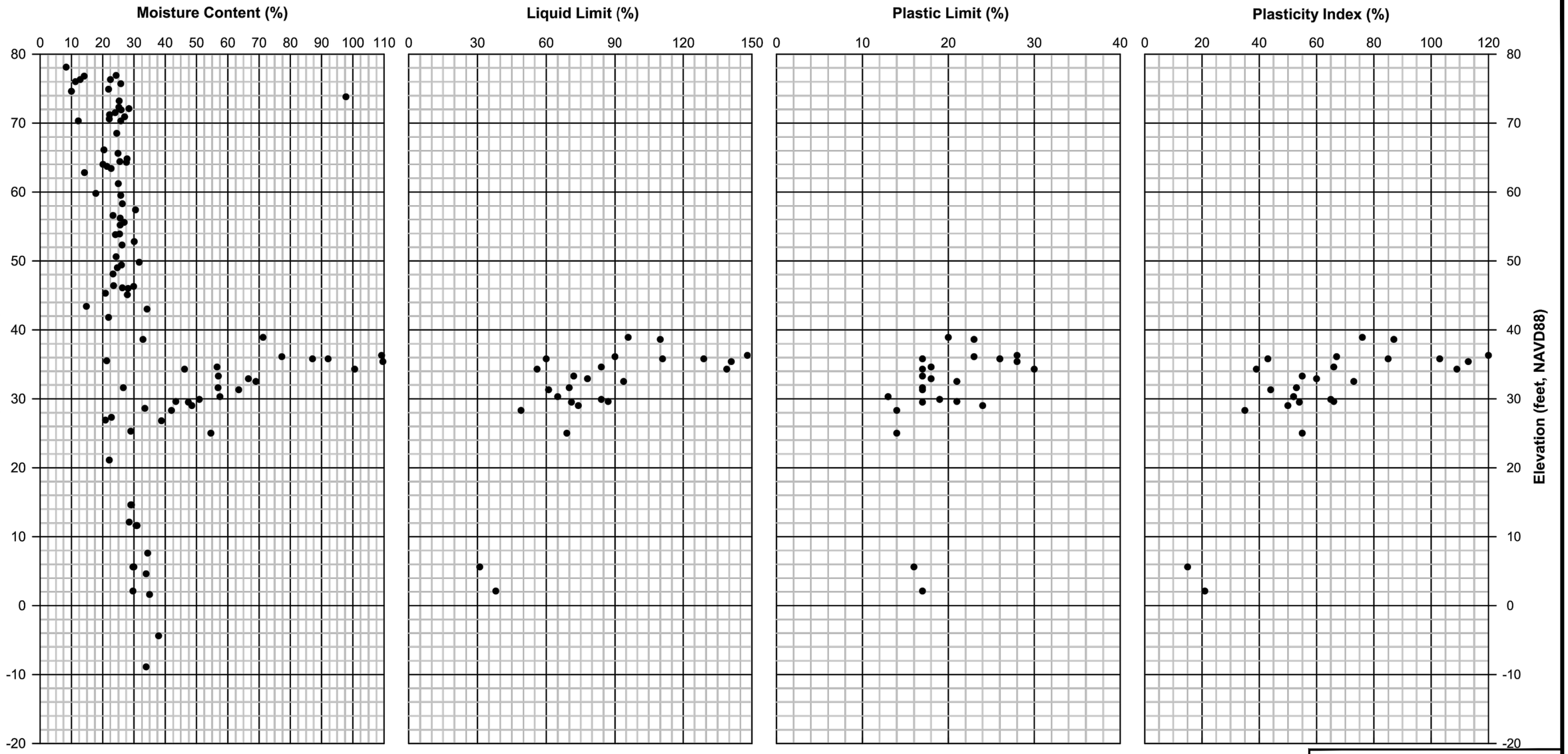
PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY: BTW	CHECKED BY: JM	DATE: 08/21/14
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 11

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\11 VARIATION OF MOISTURE CONTENT, FINES CONTENT, ORGANIC CONTENT AND N-VALUE WITH EL FOR MOD RECYCLE POND AND RECYCLE POND EXPAN.dw 8/26/2014 11:08:30 AM, ron.ortiz



VARIATION OF MOISTURE CONTENT, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX WITH ELEVATION FOR MODIFIED RECYCLE POND AND RECYCLE POND EXPANSION

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

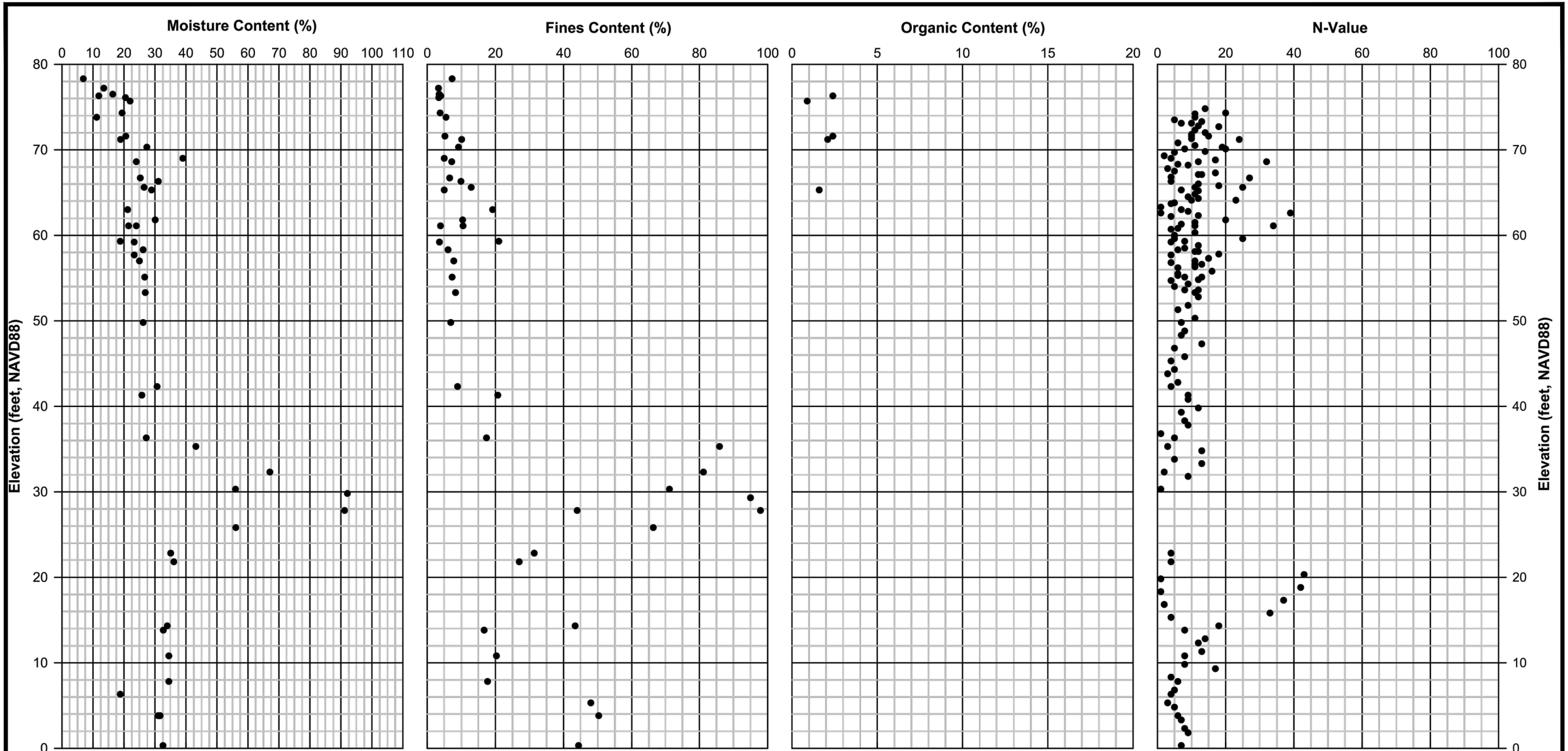
OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	05/12/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		12

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\12 VARIATION OF MOISTURE CONTENT AND PLASTICITY LIMIT AND PLASTICITY INDEX WITH EL FOR MOD RECYCLE POND AND RECYCLE POND EXPAN.dwg 8/26/2014 11:08:34 AM, ron.ortiz



VARIATION OF MOISTURE CONTENT, FINES CONTENT, ORGANIC CONTENT AND N-VALUE WITH ELEVATION FOR COAL STORAGE AREA RUNOFF POND AND SEDIMENTATION POND

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OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	08/21/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		13

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\13 VARIATION OF MOISTURE CONTENT, FINES CONTENT, ORGANIC CONTENT AND N-VALUE WITH ELEVATIONS IN NORTH-SOUTH COAL STORAGE AREA POND. 8/26/2014 11:08:39 AM, ron.ortiz

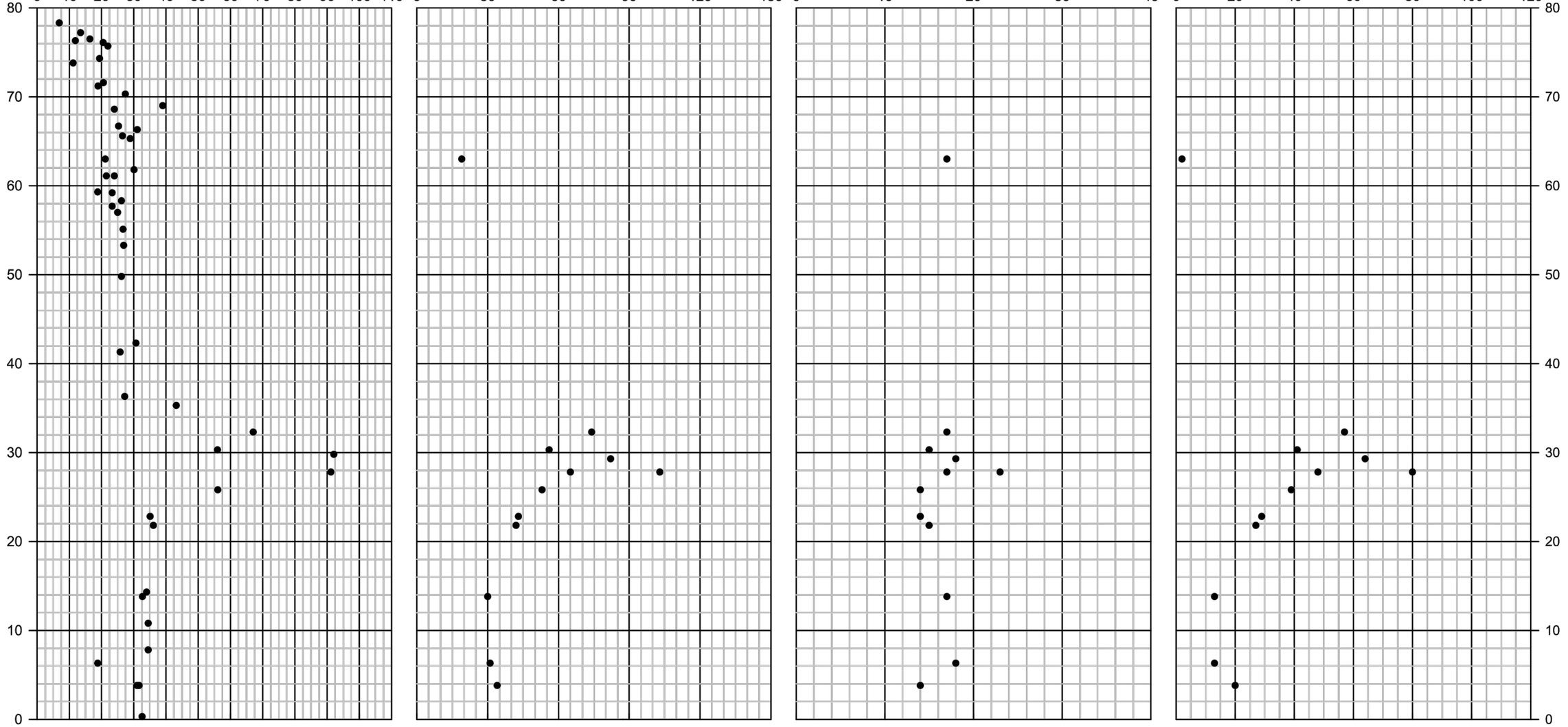
Moisture Content (%)

Liquid Limit (%)

Plastic Limit (%)

Plasticity Index (%)

Elevation (feet, NAVD88)



VARIATION OF MOISTURE CONTENT, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX WITH ELEVATION FOR COAL STORAGE AREA RUNOFF POND AND SEDIMENTATION POND

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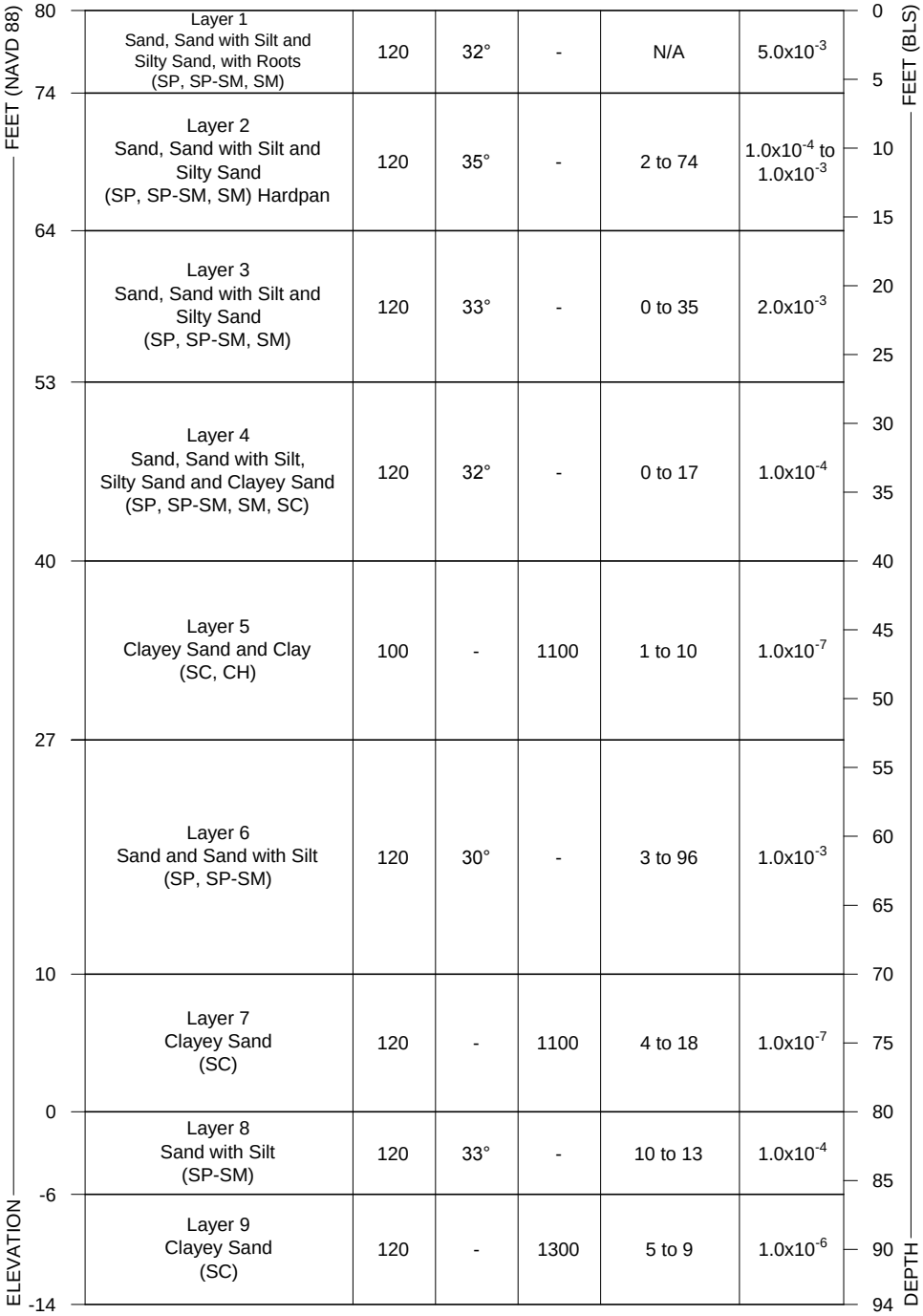
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 14

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\14 VARIATION OF MOISTURE CONTENT, LIQUID LIMIT, PLASTIC LIMIT AND P.dwg 8/26/2014 11:08:44 AM, ron.ortiz

SOIL CHARACTERISTICS

SOIL DESCRIPTION	γ_{SAT} (pcf)	$\bar{\phi}$ (Deg.)	Su (psf)	TYPICAL N-VALUE (blows/foot)	k (cm/sec)
Layer 1 Sand, Sand with Silt and Silty Sand, with Roots (SP, SP-SM, SM)	120	32°	-	N/A	$5.0x10^{-3}$
Layer 2 Sand, Sand with Silt and Silty Sand (SP, SP-SM, SM) Hardpan	120	35°	-	2 to 74	$1.0x10^{-4}$ to $1.0x10^{-3}$
Layer 3 Sand, Sand with Silt and Silty Sand (SP, SP-SM, SM)	120	33°	-	0 to 35	$2.0x10^{-3}$
Layer 4 Sand, Sand with Silt, Silty Sand and Clayey Sand (SP, SP-SM, SM, SC)	120	32°	-	0 to 17	$1.0x10^{-4}$
Layer 5 Clayey Sand and Clay (SC, CH)	100	-	1100	1 to 10	$1.0x10^{-7}$
Layer 6 Sand and Sand with Silt (SP, SP-SM)	120	30°	-	3 to 96	$1.0x10^{-3}$
Layer 7 Clayey Sand (SC)	120	-	1100	4 to 18	$1.0x10^{-7}$
Layer 8 Sand with Silt (SP-SM)	120	33°	-	10 to 13	$1.0x10^{-4}$
Layer 9 Clayey Sand (SC)	120	-	1300	5 to 9	$1.0x10^{-6}$



NOTE:

γ_{SAT} TOTAL UNIT WEIGHT

$\bar{\phi}$ INTERNAL FRICTION ANGLE

Su UNDRAINED SHEAR STRENGTH

k HYDRAULIC CONDUCTIVITY

GENERALIZED SOIL PROFILE FOR MODIFIED RECYCLE POND AND RECYCLE POND EXPANSION

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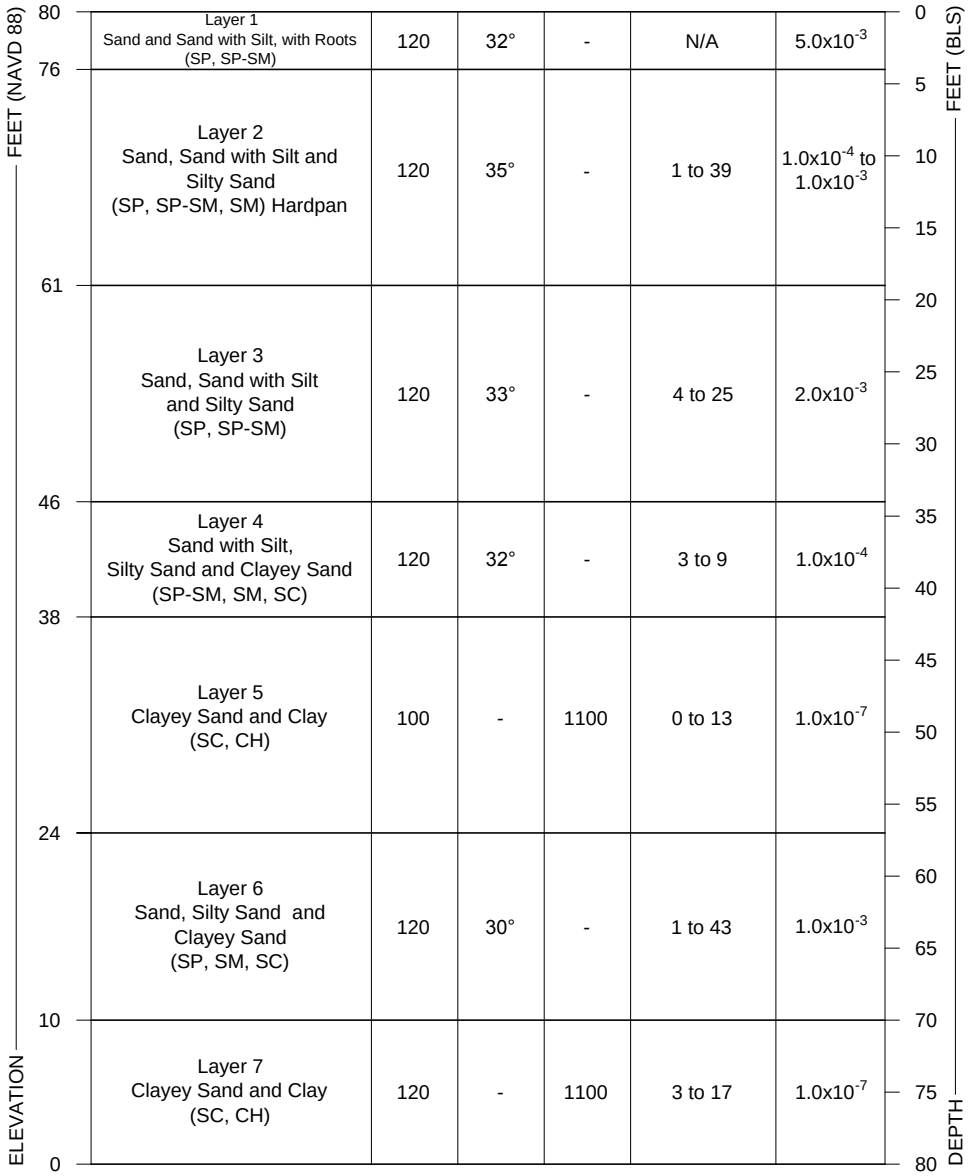
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 15

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\15 GENERALIZED SOIL PROFILE RECYCLE POND AND RECYCLE POND EXPANSION.dwg 8/26/2014 11:08:49 AM, ron.ortiz

SOIL CHARACTERISTICS

SOIL DESCRIPTION	γ_{SAT} (pcf)	$\overline{\phi}$ (Deg.)	Su (psf)	TYPICAL N-VALUE (blows/foot)	k (cm/sec)
Layer 1 Sand and Sand with Silt, with Roots (SP, SP-SM)	120	32°	-	N/A	$5.0x10^{-3}$
Layer 2 Sand, Sand with Silt and Silty Sand (SP, SP-SM, SM) Hardpan	120	35°	-	1 to 39	$1.0x10^{-4}$ to $1.0x10^{-3}$
Layer 3 Sand, Sand with Silt and Silty Sand (SP, SP-SM)	120	33°	-	4 to 25	$2.0x10^{-3}$
Layer 4 Sand with Silt, Silty Sand and Clayey Sand (SP-SM, SM, SC)	120	32°	-	3 to 9	$1.0x10^{-4}$
Layer 5 Clayey Sand and Clay (SC, CH)	100	-	1100	0 to 13	$1.0x10^{-7}$
Layer 6 Sand, Silty Sand and Clayey Sand (SP, SM, SC)	120	30°	-	1 to 43	$1.0x10^{-3}$
Layer 7 Clayey Sand and Clay (SC, CH)	120	-	1100	3 to 17	$1.0x10^{-7}$



NOTE:

γ_{SAT} TOTAL UNIT WEIGHT

$\overline{\phi}$ INTERNAL FRICTION ANGLE

Su UNDRAINED SHEAR STRENGTH

k HYDRAULIC CONDUCTIVITY

GENERALIZED SOIL PROFILE FOR COAL STORAGE AREA RUNOFF POND AND SEDIMENTATION POND

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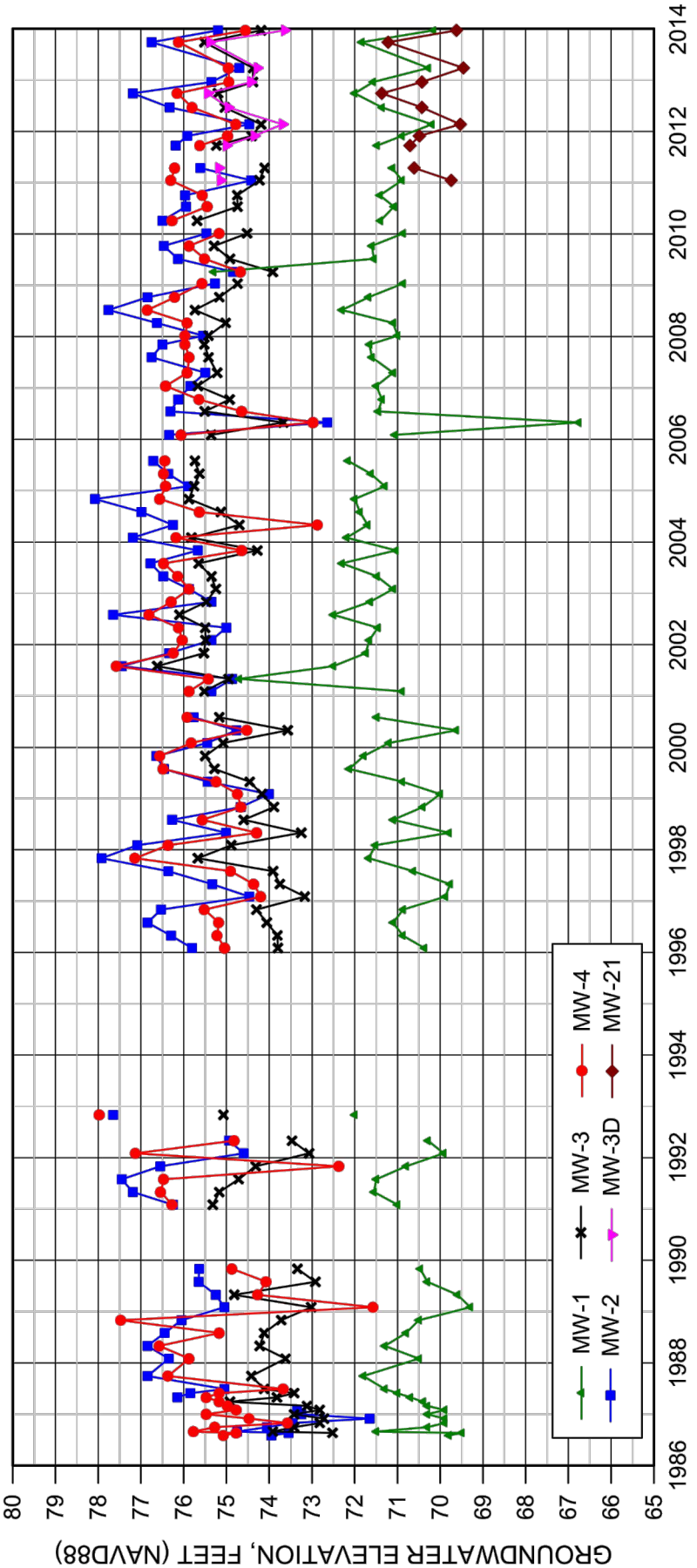
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 16

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\16 GENERALIZED SOIL PROFILE NORTH & SOUTH COAL STORAGE AREA RUNOFF PONDS.dwg 8/26/2014 11:08:54 AM, ron.ortiz



HYDROGRAPHS OF GROUNDWATER ELEVATIONS IN EXISTING RECYCLE POND

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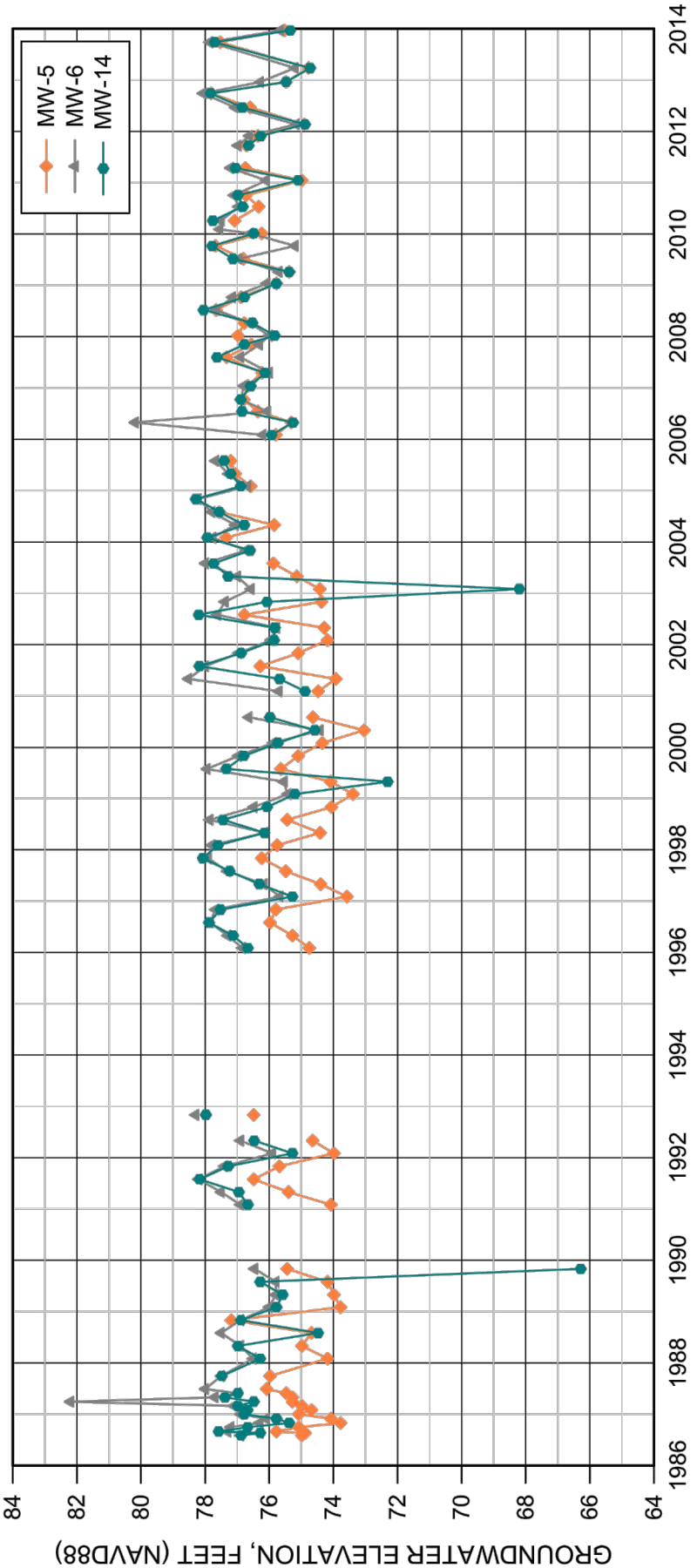
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 17

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\17 HYDROGRAPHS OF GROUNDWATER ELEVATIONS IN RECYCLE POND.dwg 8/26/2014 11:08:59 AM, ron.ortiz



HYDROGRAPHS OF GROUNDWATER ELEVATIONS IN EXISTING NORTH COAL STORAGE AREA RUNOFF POND

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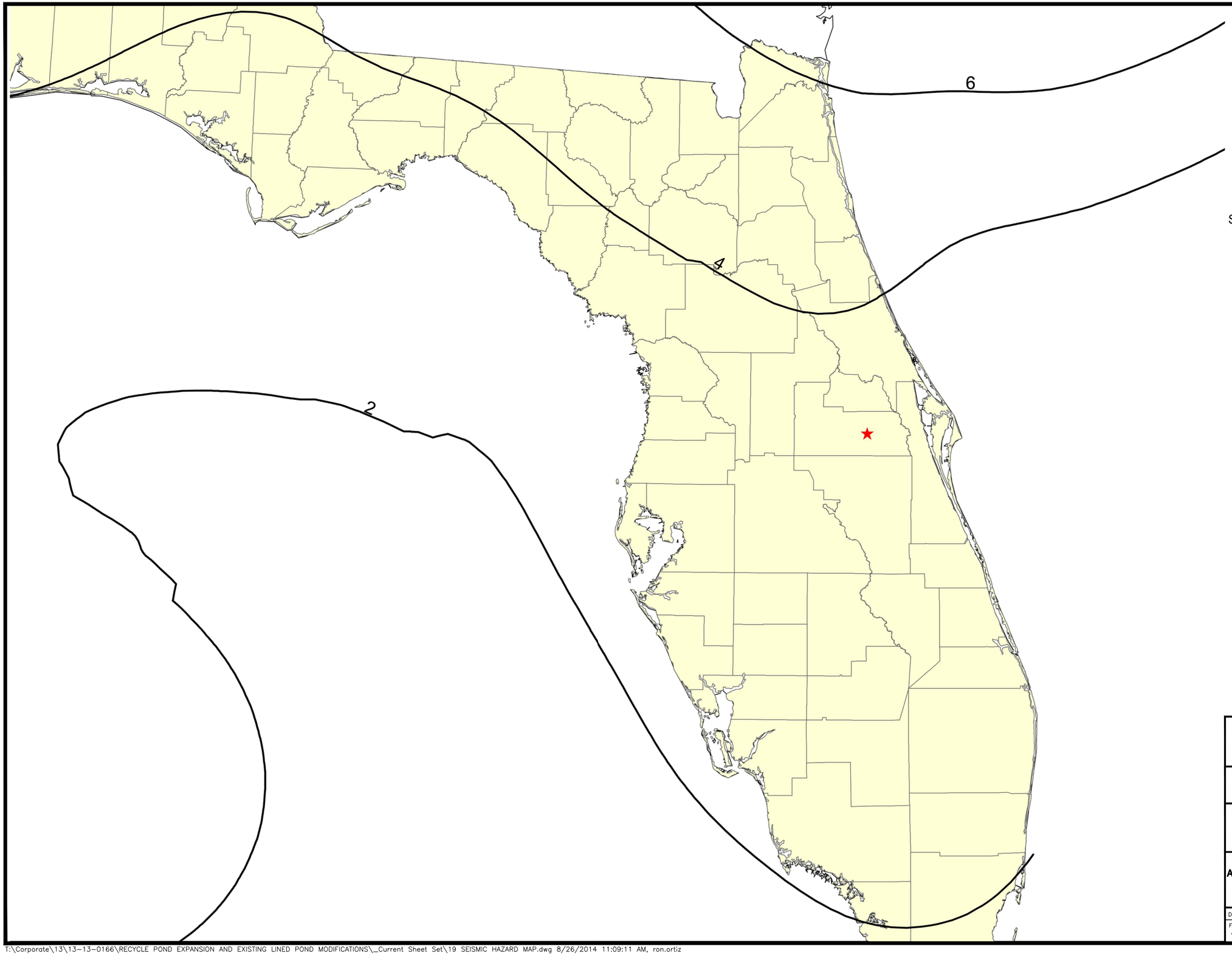
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 18

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\18 HYDROGRAPHS OF GROUNDWATER ELEVATIONS IN COAL STORAGE AREA RUNOFF POND.dwg 8/26/2014 11:09:04 AM, ron.ortiz



N

0 100,000 200,000

SCALE: 1"=200,000'

Source: 2008 U.S. Geological Survey
National Seismic Hazard Maps
Open-File Report 2008–1128

Legend

2 Peak Ground Acceleration in %g

★ SEC Site Location

Note:
Peak Horizontal Ground Acceleration with 2% Probability of Exceedance in 50 Years

SEISMIC HAZARD MAP

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ORANGE COUNTY, FLORIDA**

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FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 19

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\19 SEISMIC HAZARD MAP.dwg 8/26/2014 11:09:11 AM, ron.ortiz

LAKE

SEMINOLE

VOLUSIA

BREVARD

ORANGE

OSCEOLA

POLK

75-593

N

0 100,000 200,000

SCALE: 1"=200,000'

SOURCE: FLORIDA GEOLOGICAL SURVEY (FGS)

Legend

- Reported Subsidence Incident
- SEC Property Boundary
- WMD Boundaries
- County Boundary

LOCATIONS OF REPORTED SUBSIDENCE INCIDENTS

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PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

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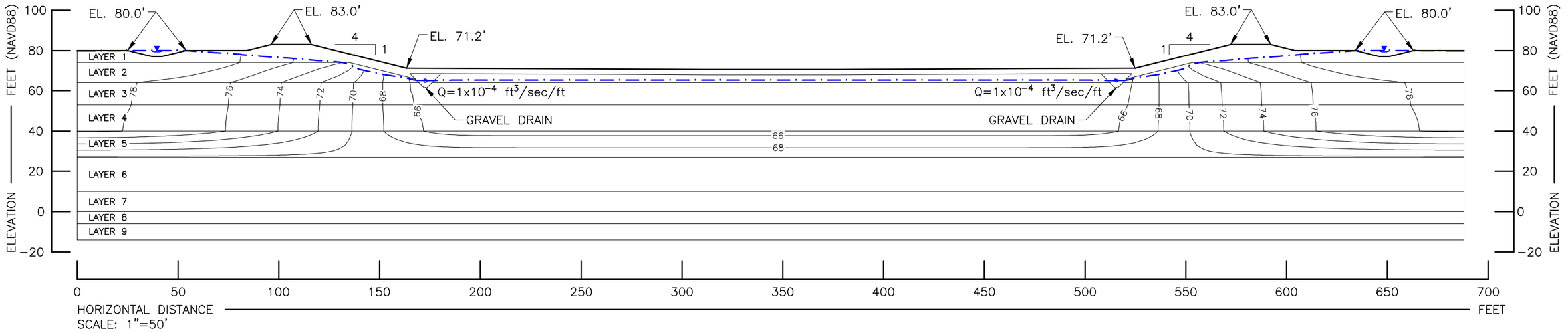
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 20

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\20 LOCATIONS OF REPORTED SUBSIDENCE INCIDENTS.dwg 8/26/2014 11:09:20 AM, ron.ortiz



LEGEND

70 EQUIPOTENTIAL CONTOURS (FEET)

PHREATIC SURFACE/WATER LEVEL

ENGINEERING SOIL PARAMETERS FOR SEEPAGE ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	MODEL	PERMEABILITY (cm/sec)
GRAVEL DRAIN	–	GP	SATURATED/UNSATURATED	0.05
LAYER 1	0–6	SP, SP–SM, SM	SATURATED/UNSATURATED	5.0×10^{-3}
LAYER 2	6–16	SP, SP–SM, SM	SATURATED/UNSATURATED	1.0×10^{-4}
LAYER 3	16–27	SP, SP–SM, SM	SATURATED	2.0×10^{-3}
LAYER 4	27–40	SP, SP–SM, SM, SC	SATURATED	1.0×10^{-4}
LAYER 5	40–53	SC, CH	SATURATED	1.0×10^{-7}
LAYER 6	53–70	SP, SP–SM	SATURATED	1.0×10^{-3}
LAYER 7	70–80	SC	SATURATED	1.0×10^{-7}
LAYER 8	80–86	SP–SM	SATURATED	1.0×10^{-4}
LAYER 9	86–94	SC	SATURATED	1.0×10^{-6}

RESULTS OF SEEPAGE ANALYSIS FOR MODIFIED RECYCLE POND WITH HEAD = 65 FT AT GRAVEL DRAIN

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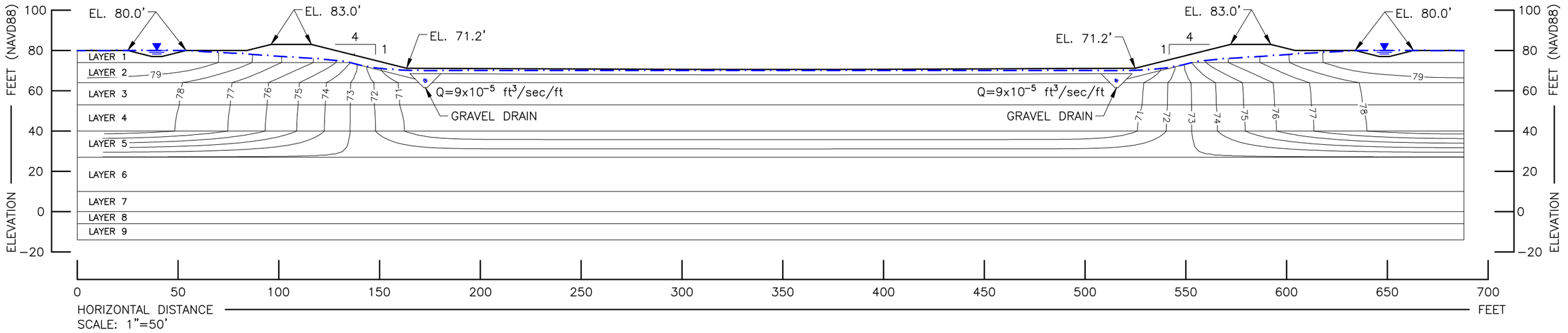
FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		21

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\21 RESULTS OF SEEPAGE ANALYSIS FOR MODIFIED RECYCLE POND WITH HEAD .dwg 8/26/2014 11:09:26 AM, ron.ortiz



LEGEND

75 EQUIPOTENTIAL CONTOURS (FEET)

PHREATIC SURFACE/WATER LEVEL

ENGINEERING SOIL PARAMETERS FOR SEEPAGE ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	MODEL	PERMEABILITY (cm/sec)
GRAVEL DRAIN	–	GP	SATURATED/UNSATURATED	0.05
LAYER 1	0–6	SP, SP–SM, SM	SATURATED/UNSATURATED	5.0×10^{-3}
LAYER 2	6–16	SP, SP–SM, SM	SATURATED/UNSATURATED	1.0×10^{-4}
LAYER 3	16–27	SP, SP–SM, SM	SATURATED	2.0×10^{-3}
LAYER 4	27–40	SP, SP–SM, SM, SC	SATURATED	1.0×10^{-4}
LAYER 5	40–53	SC, CH	SATURATED	1.0×10^{-7}
LAYER 6	53–70	SP, SP–SM	SATURATED	1.0×10^{-3}
LAYER 7	70–80	SC	SATURATED	1.0×10^{-7}
LAYER 8	80–86	SP–SM	SATURATED	1.0×10^{-4}
LAYER 9	86–94	SC	SATURATED	1.0×10^{-6}

RESULTS OF SEEPAGE ANALYSIS FOR MODIFIED RECYCLE POND WITH HEAD = 70 FT AT GRAVEL DRAIN

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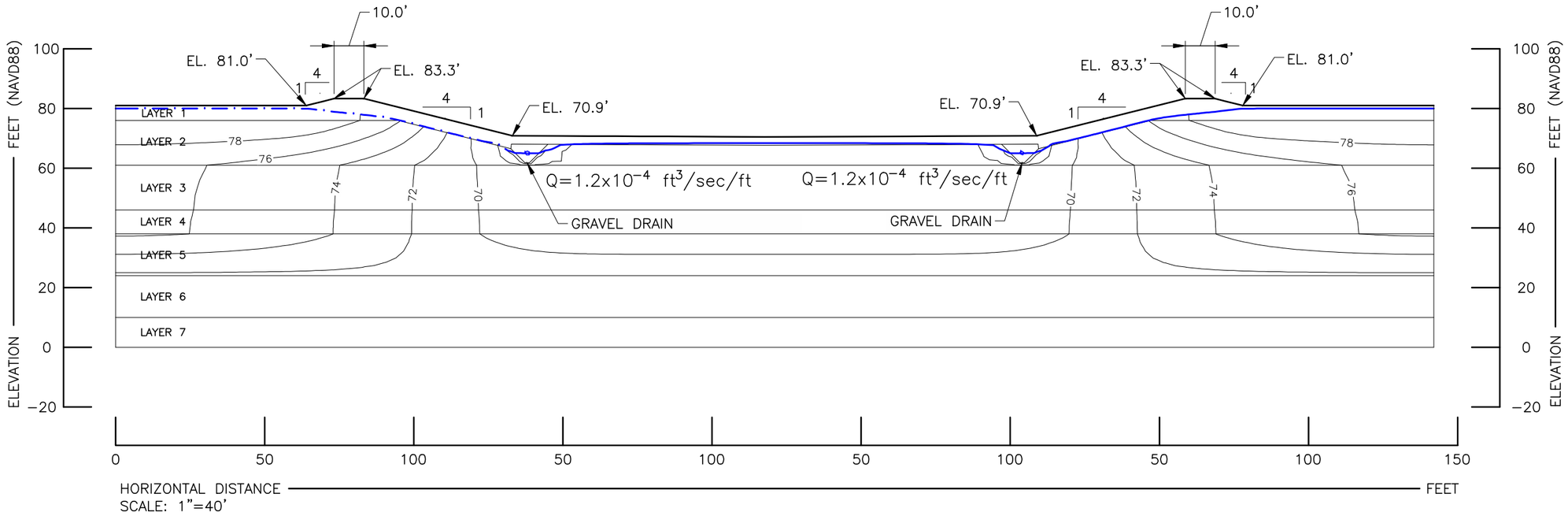
FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		22

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\22 RESULTS OF SEEPAGE ANALYSIS FOR MODIFIED RECYCLE POND WITH HEAD .dwg 8/26/2014 11:09:35 AM, ron.ortiz



LEGEND

72 EQUIPOTENTIAL CONTOURS (FEET)

PHREATIC SURFACE/WATER LEVEL

ENGINEERING SOIL PARAMETERS FOR SLOPE SEEPAGE ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	MODEL	PERMEABILITY (cm/sec)
GRAVEL DRAIN	–	GP	SATURATED/UNSATURATED	0.05
LAYER 1	0–4	SP, SP–SM	SATURATED/UNSATURATED	5.0×10^{-3}
LAYER 2	4–19	SP, SP–SM, SM	SATURATED/UNSATURATED	1.0×10^{-4}
LAYER 3	19–34	SP, SP–SM	SATURATED	2.0×10^{-3}
LAYER 4	34–42	SP–SM, SM, SC	SATURATED	1.0×10^{-4}
LAYER 5	42–56	SC, CH	SATURATED	1.0×10^{-7}
LAYER 6	56–70	SP, SM, SC	SATURATED	1.0×10^{-3}
LAYER 7	70–80	SC, CH	SATURATED	1.0×10^{-7}

RESULTS OF SEEPAGE ANALYSIS FOR SEDIMENTATION POND WITH HEAD = 65 FT AT GRAVEL DRAIN

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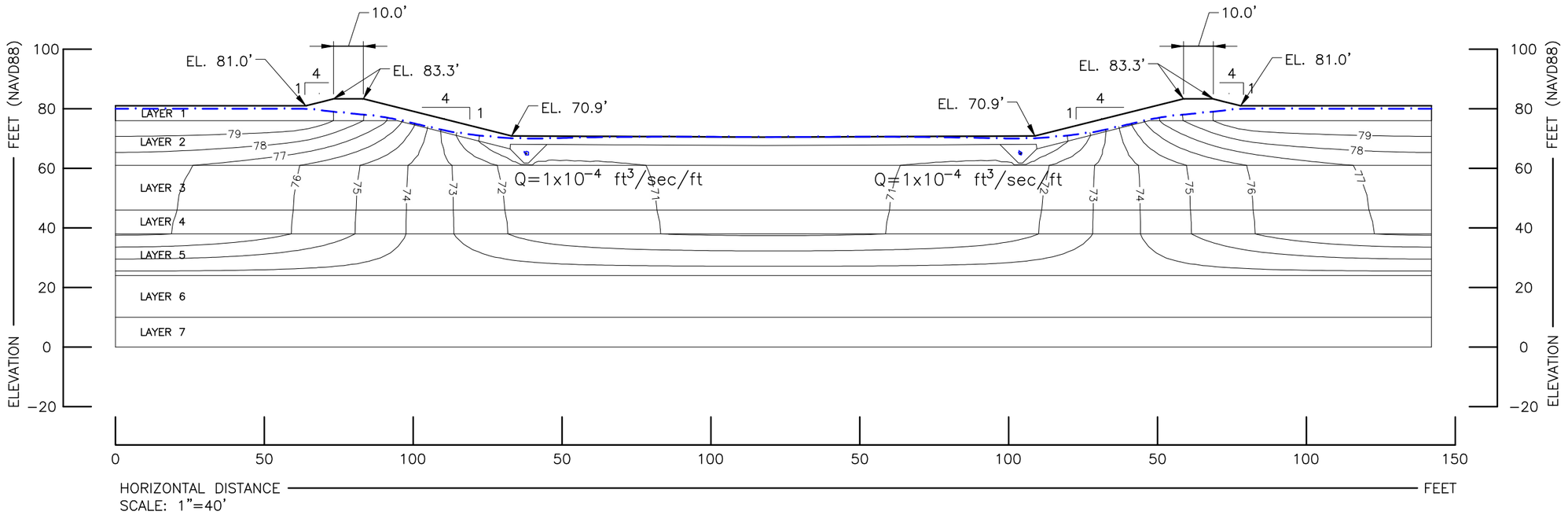
FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		23

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\23 RESULTS OF SEEPAGE ANALYSIS FOR SEDIMENTATION POND WITH HEAD.dwg 8/26/2014 11:09:40 AM, ron.ortiz



LEGEND

72 EQUIPOTENTIAL CONTOURS (FEET)

PHREATIC SURFACE/WATER LEVEL

ENGINEERING SOIL PARAMETERS FOR SLOPE SEEPAGE ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	MODEL	PERMEABILITY (cm/sec)
GRAVEL DRAIN	–	GP	SATURATED/UNSATURATED	0.05
LAYER 1	0–4	SP, SP–SM	SATURATED/UNSATURATED	5.0×10^{-3}
LAYER 2	4–19	SP, SP–SM, SM	SATURATED/UNSATURATED	1.0×10^{-4}
LAYER 3	19–34	SP, SP–SM	SATURATED	2.0×10^{-3}
LAYER 4	34–42	SP–SM, SM, SC	SATURATED	1.0×10^{-4}
LAYER 5	42–56	SC, CH	SATURATED	1.0×10^{-7}
LAYER 6	56–70	SP, SM, SC	SATURATED	1.0×10^{-3}
LAYER 7	70–80	SC, CH	SATURATED	1.0×10^{-7}

RESULTS OF SEEPAGE ANALYSIS FOR SEDIMENTATION POND WITH HEAD = 70 FT AT GRAVEL DRAIN

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OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

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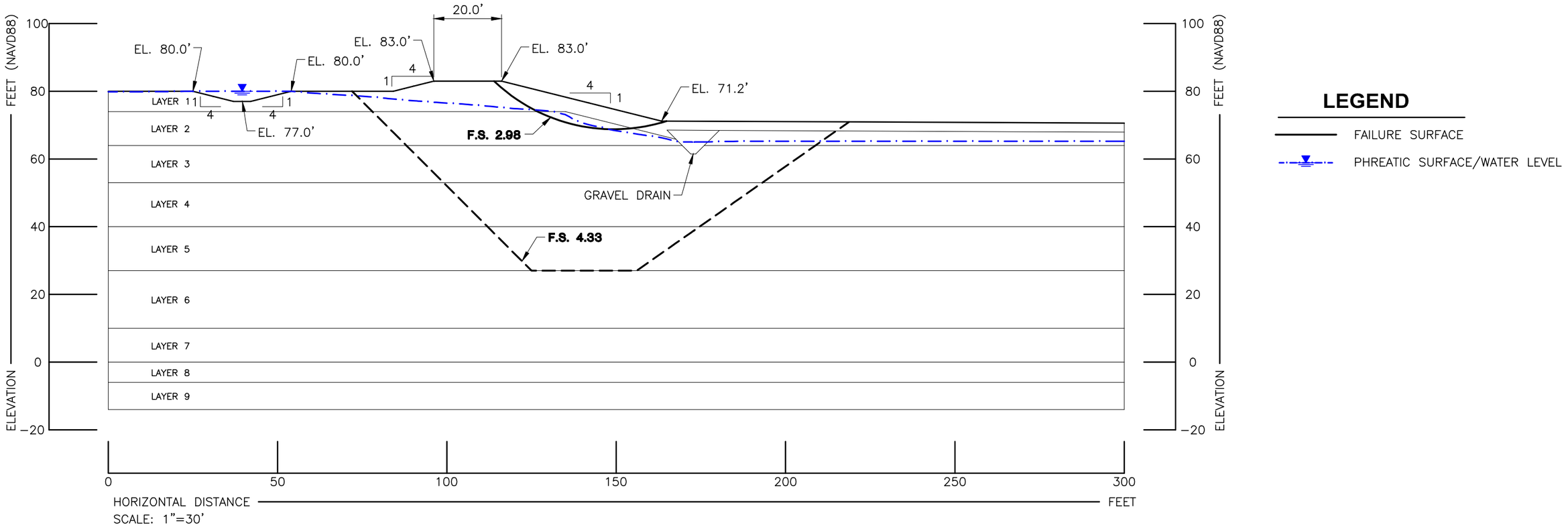
BTW	JM	08/21/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		24

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\24 RESULTS OF SEEPAGE ANALYSIS FOR SEDIMENTATION POND WITH HEAD.dwg 8/26/2014 11:09:45 AM, ron.ortiz



ENGINEERING SOIL PARAMETERS FOR SLOPE STABILITY ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	SATURATED UNIT WEIGHT (pcf)	SHEAR STRENGTH PARAMETERS	
				FRICTION ANGLE (DEGREES)	COHESION (psf)
GRAVEL DRAIN	–	GP	130	ϕ=35°	0
LAYER 1	0–6	SP, SP–SM, SM	120	ϕ=32°	0
LAYER 2	6–16	SP, SP–SM, SM	120	ϕ=35°	0
LAYER 3	16–27	SP, SP–SM, SM	120	ϕ=33°	0
LAYER 4	27–40	SP, SP–SM, SM, SC	120	ϕ=32°	0
LAYER 5	40–53	SC, CH	100	ϕ=0°	1,100
LAYER 6	53–70	SP, SP–SM	120	ϕ=30°	0
LAYER 7	70–80	SC	120	ϕ=0°	1,100
LAYER 8	80–86	SP–SM	120	ϕ=33°	0
LAYER 9	86–94	SC	120	ϕ=0°	1,300

RESULTS OF STABILITY ANALYSES FOR RECYCLE POND EXPANSION WITH HEAD = 65 FT AT GRAVEL DRAIN

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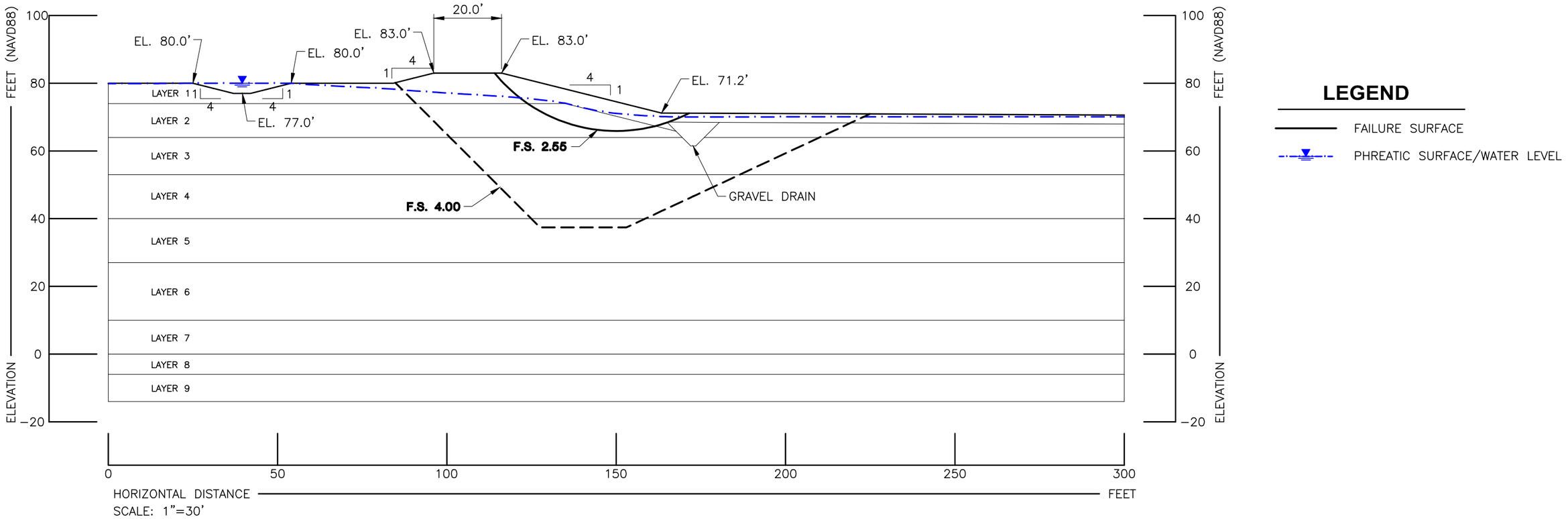
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 25

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\25 RESULTS OF STABILITY ANALYSES FOR RECYCLE POND EXPANSION WITH HE.dwg 8/26/2014 11:09:50 AM, ron.ortiz



ENGINEERING SOIL PARAMETERS FOR SLOPE STABILITY ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	SATURATED UNIT WEIGHT (pcf)	SHEAR STRENGTH PARAMETERS	
				FRICTION ANGLE (DEGREES)	COHESION (psf)
GRAVEL DRAIN	–	GP	130	ϕ=35°	0
LAYER 1	0–6	SP, SP–SM, SM	120	ϕ=32°	0
LAYER 2	6–16	SP, SP–SM, SM	120	ϕ=35°	0
LAYER 3	16–27	SP, SP–SM, SM	120	ϕ=33°	0
LAYER 4	27–40	SP, SP–SM, SM, SC	120	ϕ=32°	0
LAYER 5	40–53	SC, CH	100	ϕ=0°	1,100
LAYER 6	53–70	SP, SP–SM	120	ϕ=30°	0
LAYER 7	70–80	SC	120	ϕ=0°	1,100
LAYER 8	80–86	SP–SM	120	ϕ=33°	0
LAYER 9	86–94	SC	120	ϕ=0°	1,300

RESULTS OF STABILITY ANALYSES FOR RECYCLE POND EXPANSION WITH HEAD = 70 FT AT GRAVEL DRAIN

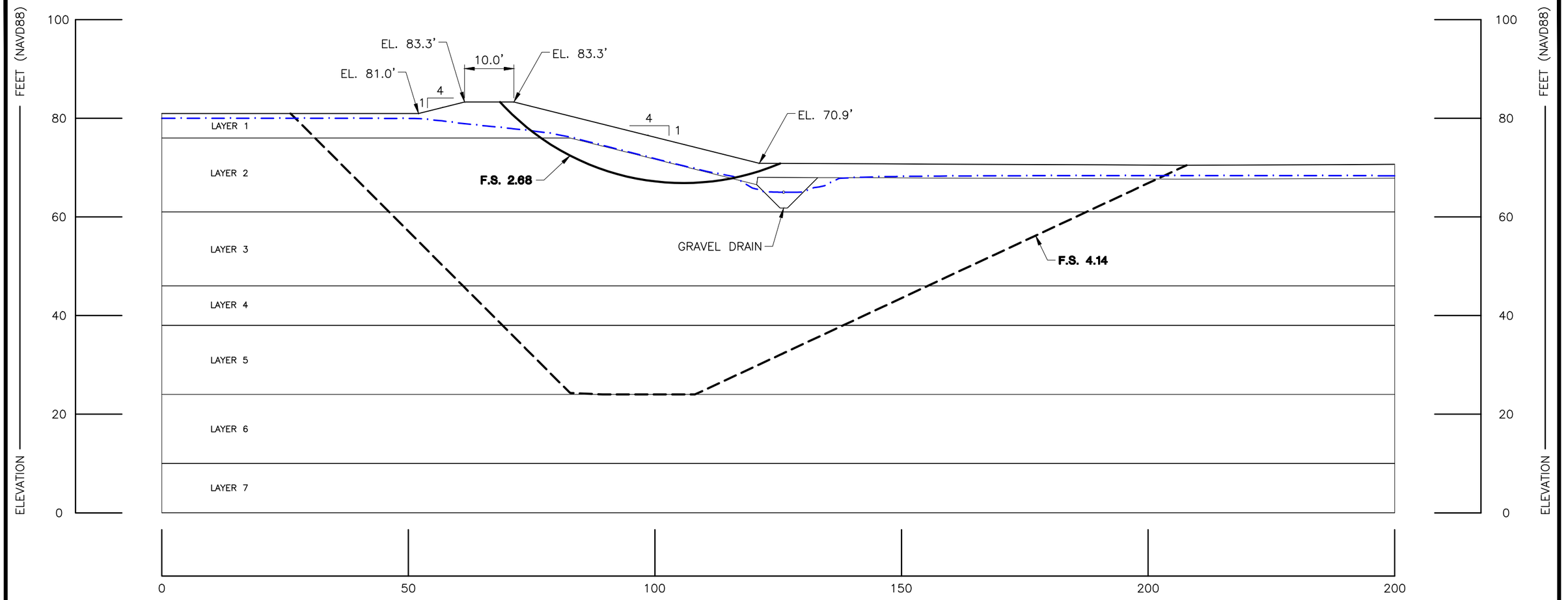
Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY: BTW	CHECKED BY: JM	DATE: 08/21/14
FILE NO. 13-13-0166	APPROVED BY:	FIGURE: 26

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\26 RESULTS OF STABILITY ANALYSES FOR RECYCLE POND EXPANSION WITH HE.dwg 8/26/2014 11:09:55 AM, ron.ortiz



ENGINEERING SOIL PARAMETERS FOR SLOPE STABILITY ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	SATURATED UNIT WEIGHT (pcf)	SHEAR STRENGTH PARAMETERS	
				FRICTION ANGLE (DEGREES)	COHESION (psf)
GRAVEL DRAIN	–	GP	130	ϕ=35°	0
LAYER 1	0–4	SP, SP–SM	120	ϕ=32°	0
LAYER 2	4–19	SP, SP–SM, SM	120	ϕ=35°	0
LAYER 3	19–34	SP, SP–SM	120	ϕ=33°	0
LAYER 4	34–42	SP–SM, SM, SC	120	ϕ=32°	0
LAYER 5	42–56	SC, CH	100	ϕ=0°	1,100
LAYER 6	56–70	SP, SM, SC	120	ϕ=30°	0
LAYER 7	70–80	SC, CH	120	ϕ=0°	1,100

LEGEND

FAILURE SURFACE

PHREATIC SURFACE/WATER LEVEL

RESULTS OF STABILITY ANALYSES FOR SEDIMENTATION POND WITH HEAD = 65 FT AT GRAVEL DRAIN

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

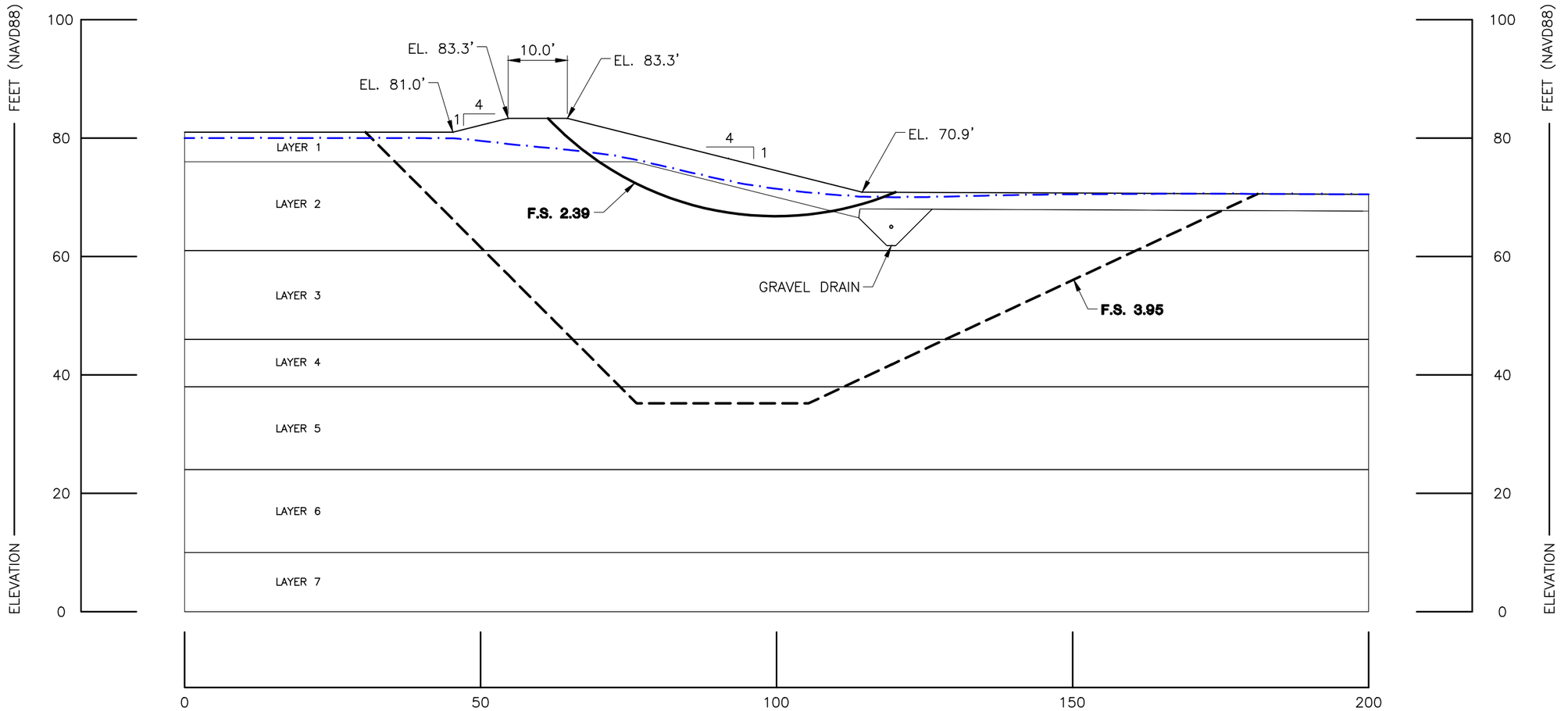
OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	08/21/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		27

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\27 RESULTS OF STABILITY ANALYSES FOR SEDIMENTATION POND WITH HEAD.dwg 8/26/2014 11:09:59 AM, ron.ortiz



ENGINEERING SOIL PARAMETERS FOR SLOPE STABILITY ANALYSIS

MATERIALS	DEPTH (ft)	DESCRIPTION	SATURATED UNIT WEIGHT (pcf)	SHEAR STRENGTH PARAMETERS	
				FRICTION ANGLE (DEGREES)	COHESION (psf)
GRAVEL DRAIN	–	GP	130	ϕ=35°	0
LAYER 1	0–4	SP, SP–SM	120	ϕ=32°	0
LAYER 2	4–19	SP, SP–SM, SM	120	ϕ=35°	0
LAYER 3	19–34	SP, SP–SM	120	ϕ=33°	0
LAYER 4	34–42	SP–SM, SM, SC	120	ϕ=32°	0
LAYER 5	42–56	SC, CH	100	ϕ=0°	1,100
LAYER 6	56–70	SP, SM, SC	120	ϕ=30°	0
LAYER 7	70–80	SC, CH	120	ϕ=0°	1,100

LEGEND

FAILURE SURFACE

PHREATIC SURFACE/WATER LEVEL

RESULTS OF STABILITY ANALYSES FOR SEDIMENTATION POND WITH HEAD = 70 FT AT GRAVEL DRAIN

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	08/21/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		28

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\28 RESULTS OF STABILITY ANALYSES FOR SEDIMENTATION POND WITH HEAD.dwg 8/26/2014 11:10:04 AM, ron.ortiz

Appendix 1

Soil Boring Log B-8 by Black & Veatch

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-8

CLIENT	PROJECT NO.	ELEVATION	SHEET OF
Orlando Utilities Commission	8927	77.4	1 2

PROJECT	LOCATION	DATE: START FINISH
Stanton Energy Center	N-1,506,756.0E-445,310.0	6-12-80 6-12-80

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sand; very dark brown; loose; fine grained; wet; w/numerous roots & organics		SP	Boring drilled w/3-7/8" diameter tricone roller bit using bentonite mud as drilling fluid Water encountered @ 2.8'
1									
2			7				75.9		
3						Sand; very dark brown; loose; fine grained; wet; w/some roots; trace silt		SP	
4							74.4		
5			9			Sand; black; loose; fine grained; wet; w/some silt; trace roots		SP	
6							71.9		
7			45			Sand; dark reddish-brown; dense; fine grained; moist; w/trace silt & roots			
8									
9			29					SP	
10						grading w/some black; medium dense			
11							66.9		
12			32			Sand; light yellowish-brown; dense; fine grained; wet; w/some silt			
13								SP-SM	
14			26			grading yellowish-brown; medium dense; w/trace clay			
15									
16			16				61.3		
17						Sand; light gray; medium dense; fine grained; wet			
18									
19			14						
20									
21									
22			13					SP	
23									
24			15						
25									
26									
27									
28							50.4		
29						Sand; light olive gray; medium dense; fine grained; wet; w/trace silt			
30			13						
31								SP	
32									
33							45.4		
34						Sand; light gray; medium dense; fine to medium grained; wet; calcareous; partially cemented; w/phosphate; some silt			
35			15						
36								SP-SM	
37									
38									
39									
40			25						

Continued on next page

P-ST-036A

FIGURE 24

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-8

CLIENT	PROJECT NO.	ELEVATION	SHEET OF
Orlando Utilites Commission	8927	77.4	2 2

PROJECT	LOCATION	DATE: START FINISH
Stanton Energy Center	N-1,506,756.0E-445.310.0	6-12-80 6-12-80

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40									
1									
2							34.9		
3						Clay; gray; soft; moist; calcar-			
4						eous; w/numerous large (>0.1')			
5						shells		CH	
6									
7									
8									
9			5			grading dry; shells grade out			
50							27.4		Bottom of boring @ 50.0'
1									Water level not recorded
2									
3									
4									
5									
6									
7									
8									
9									
60									
1									
2									
3									
4									
5									
6									
7									
8									
9									
70									

P-ST-036A

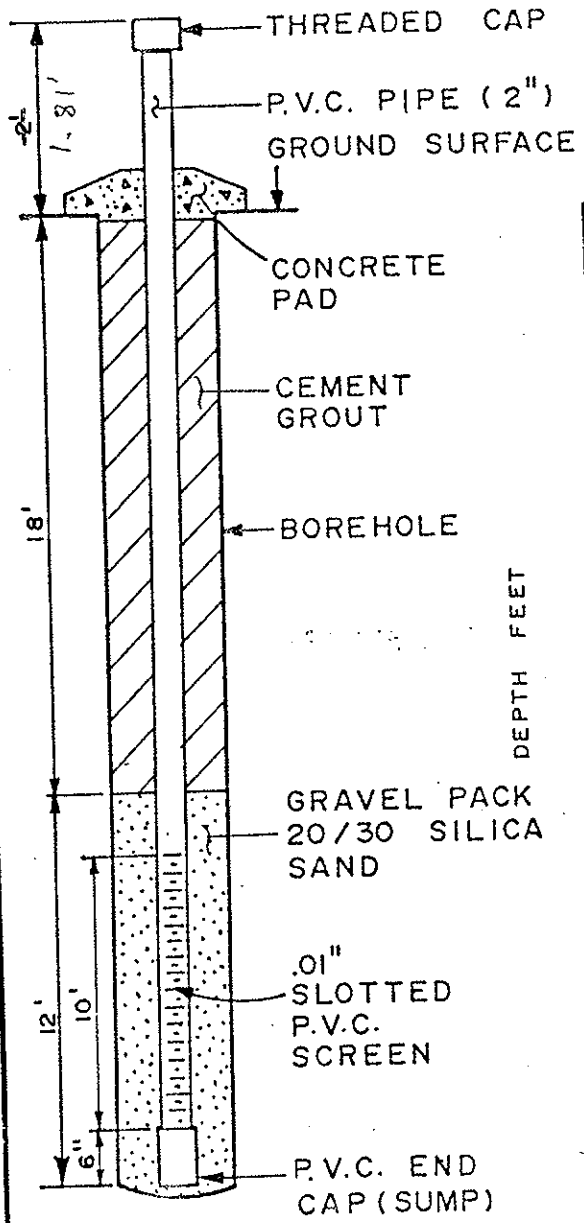
FIGURE 25

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
1/4 COR.
1/4 COR.
1/4 COR.
N 1,514,000
N 1,512,000
N 1,510,000
N 1,508,000
N 1,507,000
N 1,506,000
N 1,505,000
N 1,504,000
N 1,503,000
N 1,502,000
A
B
C
D
E
F
G
LEGEND

Appendix 2

Soil Boring Logs and Installation Records for
MW-1
MW-2
MW-3
MW-3D
MW-4
MW-5
MW-6
MW-14
MW-21

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0-5.5	Dark reddish-brown to gray fine sand to clayey fine sand with cemented sands (fill)
5.5-7.6	Brown to reddish-brown fine sand (fill)
7.6-13.5	Dark reddish-brown to grayish-brown fine sand with cemented sands (fill)
13.5-18.5	Dark grayish-brown silty fine sand with traces of sandy clay
18.5-23.5	Greenish-gray sandy clay
23.5-28.5	Light gray to grayish-brown fine sand
28.5-30.0	Light greenish-gray slightly silty fine sand

WELL NO : MW-1

GROUND SURFACE ELEVATION 82.46 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

MONITORING WELL INSTALLATION REPORT

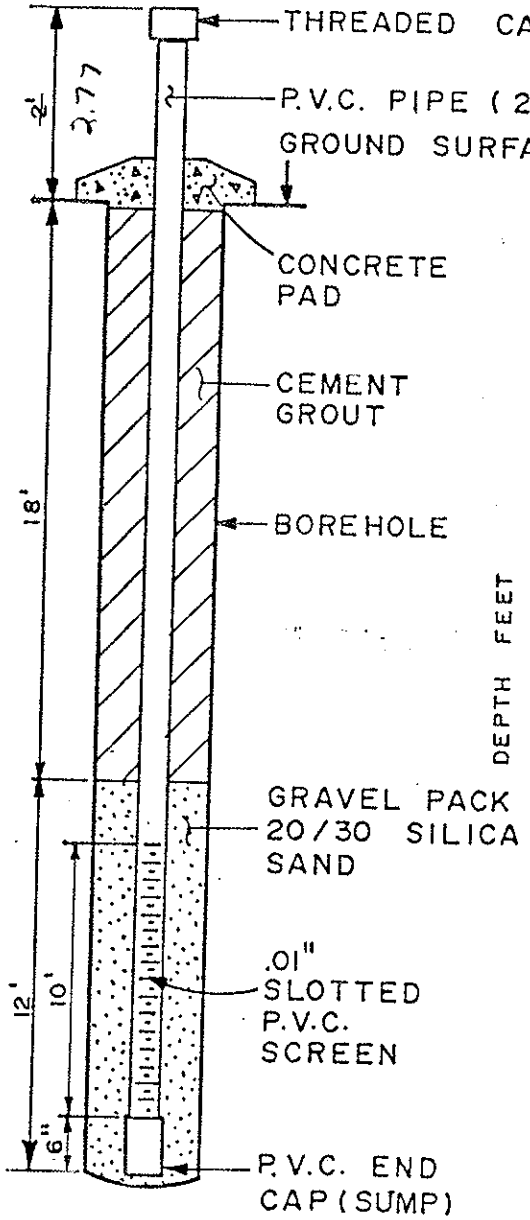
ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT

ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: ECW	SCALE: N.T.S.	PROJ NO. 81-522-1
CHKD. DWB	DATE: 7/23/86	PLATE: 1 of 14

AF 380378



DEPTH	SOIL DESCRIPTION
0.0-3.5	Grayish-brown slightly silty fine sand (fill)
3.5-5.0	Brown slightly silty fine sand
5.0-8.5	Grayish-brown slightly silty fine sand
8.5-14.5	Dark reddish-brown silty fine sand (hardpan type)
14.5-23.5	Light brown fine sand
23.5-28.5	Light gray fine sand
28.5-30.0	Light greenish-gray slightly silty fine sand

WELL No : MW-2

GROUND SURFACE ELEVATION 83.20 Ft. 79.42

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

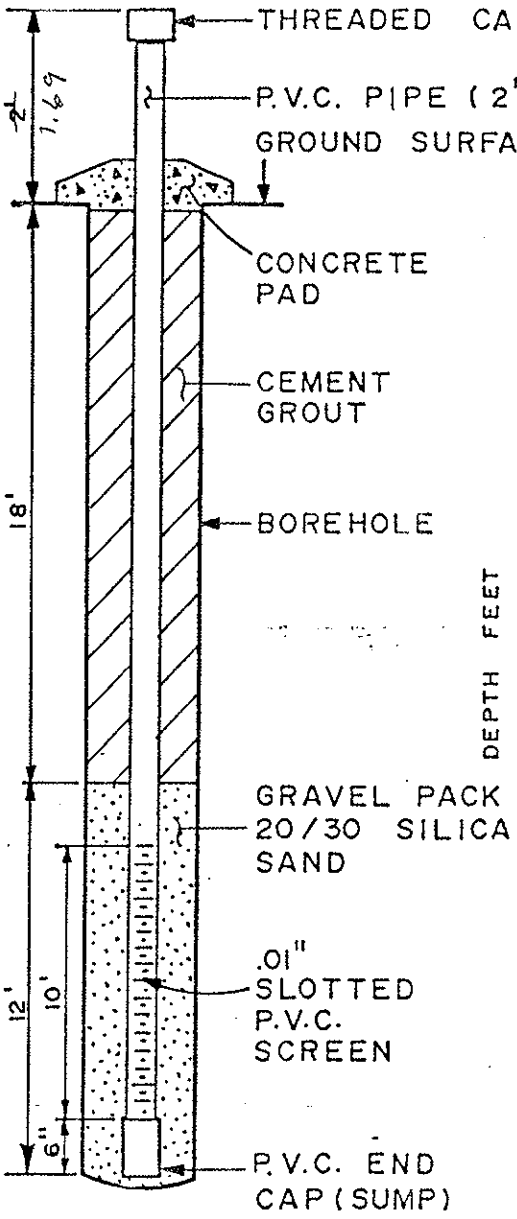
MONITORING WELL INSTALLATION REPORT

ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT
ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN:	ECW	SCALE:	N.T.S.	PROJ NO:	81-522-1
CHKD	DWB	DATE:	7/23/86	PLATE:	2 of 14

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0-5.0	Reddish-brown to grayish-brown fine sand (fill)
5.0-7.0	Dark reddish-brown silty fine sand
7.0-13.5	Dark reddish-brown silty fine sand (hardpan type)
13.5-18.5	Reddish-brown fine sand with cemented sands (hardpan type)
18.5-23.5	Light brown fine sand
23.5-28.5	Light grayish-brown fine sand
28.5-30.0	Light greenish-gray fine sand

WELL NO : MW-3

GROUND SURFACE ELEVATION 81.55 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

MONITORING WELL INSTALLATION REPORT

ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT
ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: ECW	SCALE: N.T.S.	PROJ NO: 81-522-1
CHKD: DWB	DATE: 7/23/86	PLATE: 3 of 14

DEP Form # 62-520.900(3)

Form Title MONITORING WELL COMPLETION REPORT

Effective Date July 12, 2009

DEP Application No. _____ (Filled in by DEP)

Florida Department of Environmental Protection

Bob Martinez Center, 2600 Blair Stone Road Tallahassee, Florida 32399-2400

MONITORING WELL COMPLETION REPORT

PART I: GENERAL INFORMATION

Well ID: MW-3D	Site Name: Stanton Energy Center		Well Install Date May 3, 2010
Facility ID 97663	Alternate ID (Testsite ID) 26320	FLUWID #	WMD Permit # 100301
Well Purpose ☐ Background ☐ Intermediate ☐ Compliance ☒ Other (explain) Vertical Extent			
Latitude (to nearest 0.1 seconds) 1506722.6 (Northing) FL State Plane East Zone 901		Longitude (to nearest 0.1 seconds) 603195.8 (Easting) FL State Plane East Zone 901	
Latitude and Longitude collection method: ☐ DGPS ☐ AGPS ☐ MAP ☐ ZIPCODE ☐ DPHO ☐ UNKNOWN ☒ OTHER (Survey)			

PART II: WELL CONSTRUCTION DETAILS

Contractor Name Scott A. Hague				Contractor License # 11172
Company Name Boart Longyear				
Construction Method: ☐ Hollow Stem Auger ☐ Solid Stem Auger ☐ Water/Mud Rotary ☐ Air Rotary ☐ Cable Tool ☐ Direct Push ☒ Sonic ☐ Other (describe)				Aquifer Monitored Surficial
Top of Casing Elevation (NVGD or NAVD) 82.19 feet, NAVD 88			Ground Surface Elevation (NVGD or NAVD)	

Casing

Material	Inside Diameter	Outside Diameter	Depth (ft.) From	Depth (ft.) To
PVC, Schedule 40		2-in	0	49

Screen

Material	Inside Diameter	Outside Diameter	Depth (ft.) From	Depth (ft.) To	Slot Size
PVC, Schedule 40		2-in	49	59	10-slot

Annulus

Material including additives for sealant	Size of Material	Amount (# of bags)	Depth (ft.) From	Depth (ft.) To	Installation Method
Grout	n/a	4	0	46	Gravity
Fine Sand	30-65	½	46	48	Gravity
Sand	20-40	6	48	59	Gravity

PART III: WELL DEVELOPMENT DETAILS

Well Development Date	Well Development Method: ☐ Surge/Pump ☒ Pump ☐ Compressed Air ☐ Other (explain)		
Development Duration			
Pumping Rate	Maximum Drawdown	Well Purged Dry ☐ yes ☒ no	Pumping Condition ☒ continuous ☐ intermittent
Turbidity (if Measured):			Stabilized Water Level (BLS)
Start:	End:		
Water appearance (color and odor) at start of development:			
Water appearance (color and odor) at end of development:			

Report Prepared By:	Date
Title/Company	License #

PLEASE ATTACH BORING LOG

Remarks

PROJECT NUMBER	BORING NUMBER
334959.GW.05.02	MW-3D

SOIL BORING LOG

PROJECT : OUC Stanton Energy Center — LOCATION : OUC Stanton Energy Center, Orange County, Flo

ELEVATION : N/A — DRILLING CONTRACTOR : Boart Longyear

DRILLING METHOD AND EQUIPMENT USED : Sonic

WATER LEVELS : N/A — START : 9/14/10 @ 1530 — END : 9/14/10 @ 1630 — LOGGER : G. Bulman (20-Jan-2011)

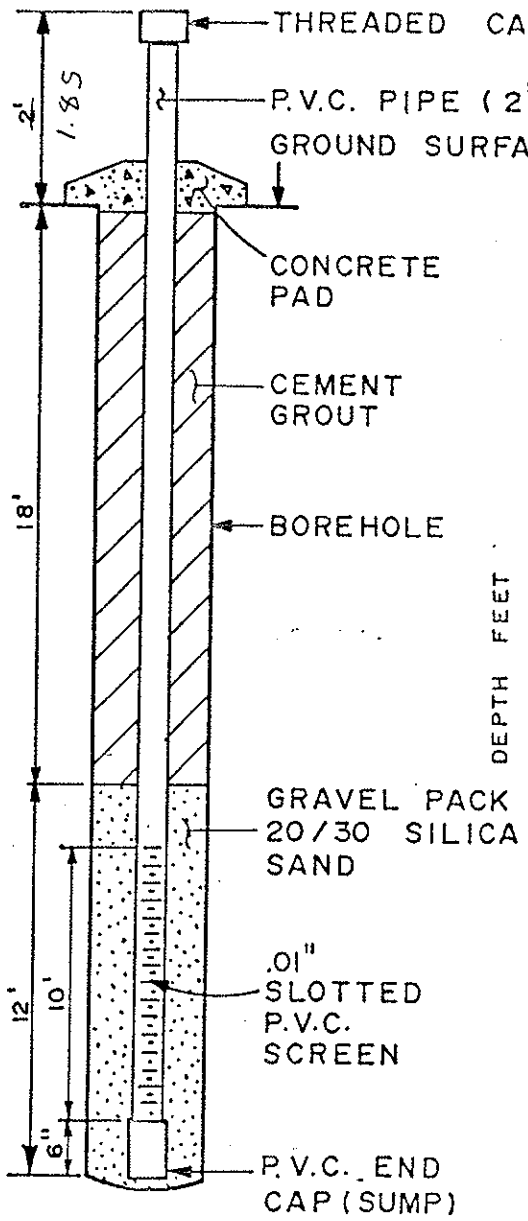
DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DRILLER COMMENTS
5						
10		10			**FINE SAND,** well sorted, Moderate Brown (5YR 3/4), loose to very densely packed.	
15						
20		10			**VERY FINE SAND,** sub-rounded, well-sorted, Very Pale Orange (10YR 8/2) loosely compacted.	
25						
30		5			**VERY FINE SAND,** sub-rounded, well-sorted, Yellowish Gray (5Y 8/1), moderately compacted.	
		5			**COQUINA and FOSSILIFEROUS LIMESTONE,** Light Gray (N7), consolidated, with coarse **SHELL**	

PROJECT NUMBER	BORING NUMBER
334959.GW.05.02	MW-3D

SOIL BORING LOG

		5			Gray (N7), consolidated, with coarse **SHELL FRAGMENTS**, Yellowish Gray (5Y 8/1) to White (N9).	
35						
40		10			**CLAY,** Dark Greenish Gray (5G 4/1), very dense, high plasticity.	
45						
		5			**CLAY,** Dark Greenish Gray (5G 4/1), very dense, moderate to high plasticity, and **SHELL FRAGMENTS**, large, Yellowish Gray (5Y 8/1).	
50						
55		10			**FINE SAND,** subrounded, Light Olive Gray (5Y 6/1) to Light Gray (N7), with **SHELL FRAGMENTS**, coarse, Yellowish Gray (5Y 8/1), loosely consolidated.	
60						

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0-1.0	Grayish-brown fine sand
1.0-2.5	Dark reddish-brown silty fine sand
2.5-3.5	Light brown fine sand
3.5-4.5	Reddish-brown fine sand
4.5-13.5	Reddish-brown silty fine sand (hardpan type)
13.5-18.5	Light brown fine sand
18.5-28.5	Light grayish-brown fine sand
28.5-30.0	Dark greenish-gray silty fine sand

WELL No : MW-4

GROUND SURFACE ELEVATION 82.46 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

MONITORING WELL INSTALLATION REPORT

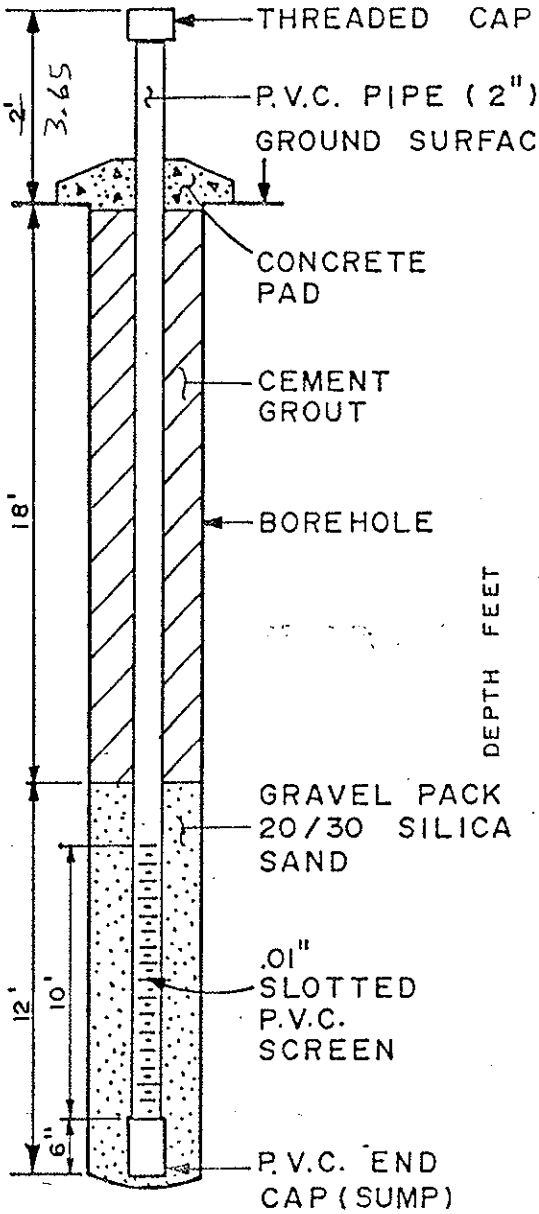
ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT

ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: ECW	SCALE. N.T.S.	PROJ NO. 81-522-1
CHKD. DWB	DATE. 7/23/86	PLATE: 4 of 14

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0- 7.0	Reddish-brown to grayish-brown slightly silty fine sand (fill)
7.0-18.5	Dark reddish-brown silty fine sand (hardpan type)
18.5-23.5	Light reddish-brown silty fine sand to clayey fine sand
23.5-28.5	Grayish-brown fine sand
28.5-30.0	Light grayish-brown fine sand

WELL Nº : MW-5

GROUND SURFACE ELEVATION 80.36 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

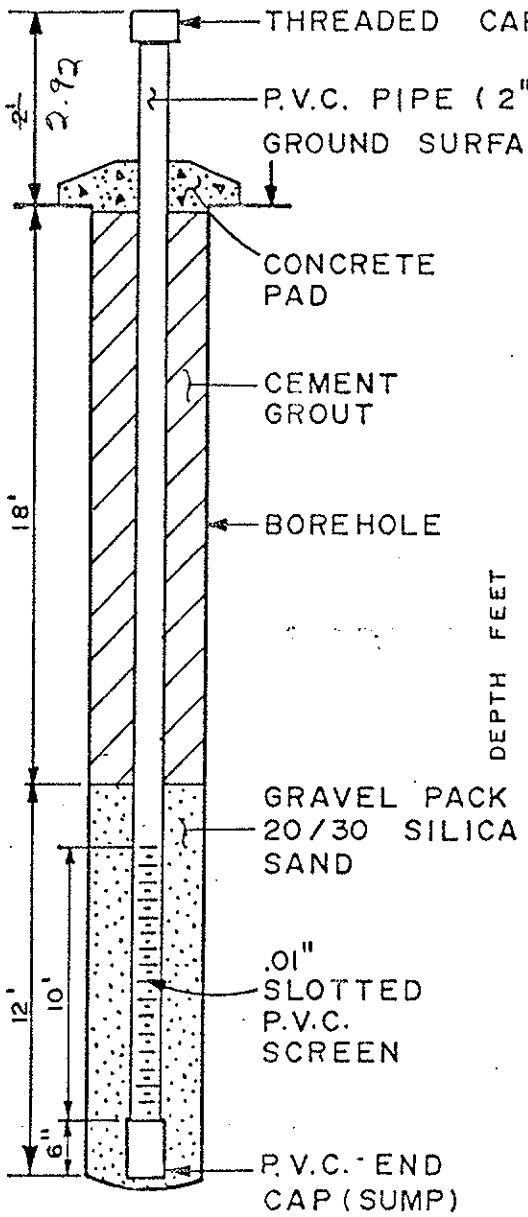
MONITORING WELL INSTALLATION REPORT

ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT
ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: ECW	SCALE: N.T.S.	PROJ NO: 81-522-1
CHKD: DWB	DATE: 7/23/86	PLATE: 5 of 14

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0-5.5	Reddish-brown to grayish-brown fine sand (fill)
5.5-7.6	Dark gray highly organic fine sand with roots
7.6-13.5	Dark reddish-brown silty fine sand (hardpan type)
13.5-18.5	Reddish-brown slightly silty fine sand
18.5-23.5	Light reddish-brown fine sand
23.5-30.0	Light grayish-brown fine sand

WELL NO : MW-6

GROUND SURFACE ELEVATION 82.21 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

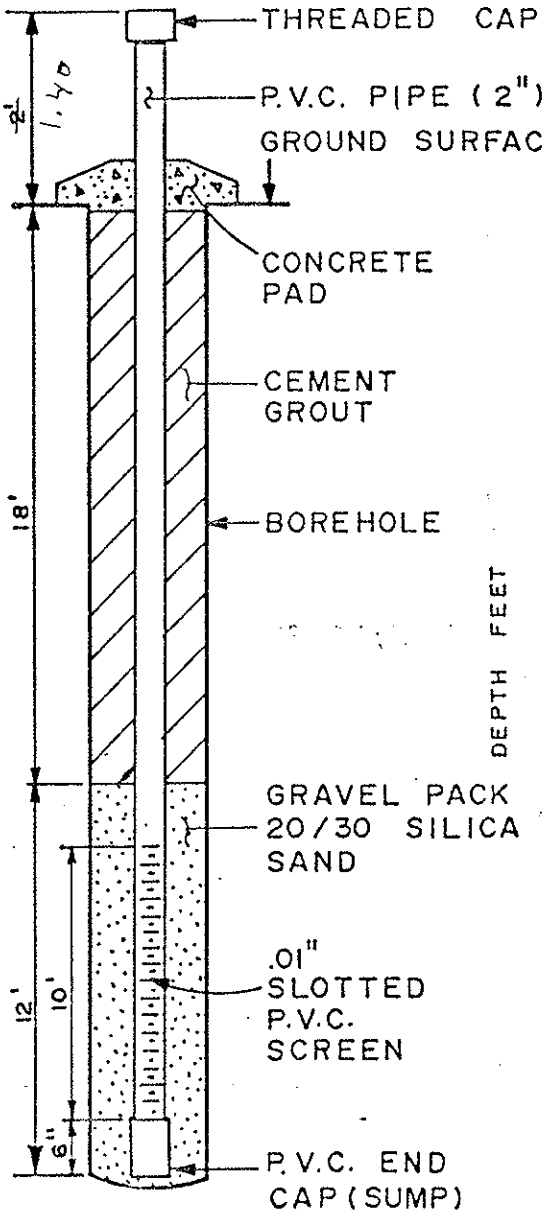
MONITORING WELL INSTALLATION REPORT

ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT
ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: ECW	SCALE: N.T.S.	PROJ NO: 81-522-1
CHKD: DWB	DATE: 7/23/86	PLATE: 6 of 14

AF 38037B



DEPTH	SOIL DESCRIPTION
0.0-13.5	Grayish-brown slightly silty fine sand
13.5-28.5	Dark grayish-brown silty fine sand
28.5-30.0	Light brown slightly silty fine sand

WELL Nº : MW-14

GROUND SURFACE ELEVATION 81.78 Ft.

DATE	WATER LEVEL BELOW GROUND SURFACE, FT.

MONITORING WELL INSTALLATION REPORT

ORLANDO UTILITIES COMM.
STANTON ENERGY PLANT
ORANGE COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN:	ECW	SCALE:	N.T.S.	PROJ NO.	81-522-1
CHKD	DWB	DATE:	7/23/86	PLATE:	14 of 14

DEP Form # 62-520.900(3)

Form Title MONITORING WELL COMPLETION REPORT

Effective Date July 12, 2009

DEP Application No. _____ (Filled in by DEP)

Florida Department of Environmental Protection

Bob Martinez Center, 2600 Blair Stone Road Tallahassee, Florida 32399-2400

MONITORING WELL COMPLETION REPORT

PART I: GENERAL INFORMATION

Well ID: MW-21	Site Name: Stanton Energy Center		Well Install Date September 15, 2010
Facility ID 97663	Alternate ID (Testsite ID) 26327	FLUWID #	WMD Permit # 100342
Well Purpose ☐ Background ☒ Intermediate ☐ Compliance ☐ Other (explain) Site Reference			
Latitude (to nearest 0.1 seconds) 150496.6 (Northing) FL State Plane East Zone 901		Longitude (to nearest 0.1 seconds) 603152.9 (Easting) FL State Plane East Zone 901	
Latitude and Longitude collection method: ☐ DGPS ☐ AGPS ☐ MAP ☐ ZIPCODE ☐ DPHO ☐ UNKNOWN ☒ OTHER (Survey)			

PART II: WELL CONSTRUCTION DETAILS

Contractor Name Michael Johnson					Contractor License # 9271
Company Name Custom Drilling, Corp.					
Construction Method: ☒ Hollow Stem Auger ☐ Solid Stem Auger ☐ Water/Mud Rotary ☐ Air Rotary ☐ Cable Tool ☐ Direct Push ☐ Sonic ☐ Other (describe)					Aquifer Monitored Surficial
Top of Casing Elevation (NVGD or NAVD) 80.68 feet, NAVD 88			Ground Surface Elevation (NVGD or NAVD)		
Casing					
Material	Inside Diameter	Outside Diameter	Depth (ft.) From	Depth (ft.) To	
PVC, Schedule 40		2-in	0	20	
Screen					
Material	Inside Diameter	Outside Diameter	Depth (ft.) From	Depth (ft.) To	Slot Size
PVC, Schedule 40		2-in	20	30	10-slot
Annulus					
Material including additives for sealant	Size of Material	Amount (# of bags)	Depth (ft.) From	Depth (ft.) To	Installation Method
Neat Cement Grout	n/a	2	0	16	Gravity
Fine Sand	30-65	1	16	18	Gravity
Sand	20-40	6	18	30	Gravity

PART III: WELL DEVELOPMENT DETAILS

Well Development Date	Well Development Method: ☐ Surge/Pump ☒ Pump ☐ Compressed Air ☐ Other (explain)		
Development Duration	1.33 hours		
Pumping Rate	Maximum Drawdown	Well Purged Dry ☐ yes ☒ no	Pumping Condition ☒ continuous ☐ intermittent
Turbidity (if Measured):			Stabilized Water Level (BLS)
Start:	End:		
Water appearance (color and odor) at start of development:			
Water appearance (color and odor) at end of development:			

Report Prepared By:	Date
Title/Company	License #

PLEASE ATTACH BORING LOG

Remarks

PROJECT NUMBER	BORING NUMBER	
334959.GW.05.02	MW-21	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : OUC Stanton Energy Center — LOCATION : OUC Stanton Energy Center, Orange County, Florida

ELEVATION : N/A — DRILLING CONTRACTOR : Custom Drilling

DRILLING METHOD AND EQUIPMENT USED : Split Spoon/Geoprobe

WATER LEVELS : N/A — START : 9/15/10 @ 0925 — END : 9/15/10 @ 1015 — LOGGER : M. Schilling

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DRILLER COMMENTS
	4	2.33			1 ft (top) - **FINE SAND,** rounded, well-sorted; Brownish Black (5 YR 2/1) and 1.3 ft (bottom) - **FINE SAND**, rounded, well-sorted; Moderate Yellowish Brown (10 YR 5/4)	Fairly Soft
5	0.8				4' to 4.8' - **FINE SAND**, rounded, well-sorted; Moderate Yellowish Brown (10 YR 5/4)	
	1.2				4.8' to 6.0' - **FINE SAND**, rounded, well-sorted; Dusky Yellowish Brown (10 YR 2/2)	Slightly Harder
	2				**VERY FINE SAND**, densely packed, dry: Moderate Brown (5YR 3/4)	Very Hard
	2.5				**FINE SAND**, rounded, well-sorted; Moderate Yellowish Brown (10 YR 5/4)	
10						Fairly Hard
	2.5				**FINE SAND**, rounded, well-sorted; Light Brown (5 YR 5/6)	
	0.75				12' to 12.75' - **FINE SAND**, rounded, well-sorted; Grayish Brown (5 YR 3/2)	
	0.5				12.75' to 13.25' - **FINE SAND**, rounded, well-	
	1.5				13.25' to 14.75' - **FINE SAND,** rounded, well-sorted; Very Pale Orange (10 YR 8/2)	Same as 8' to 12' interval
15	1.25				14.75' to 16' - **FINE SAND**, Grayish Orange (10 YR 7/4)	
	1.5				**FINE SAND**, rounded, well-sorted; Light Brown (5 YR 5/6)	
	2.5				**FINE SAND**, rounded, well-sorted; Very Pale Orange (10 YR 8/2)	Slightly Softer than 8' to 12' interval
20	1				**FINE SAND**, rounded, well-sorted; Dark Yellowish Orange (10 YR 6/6)	
	4				**VERY FINE SAND**, rounded, well-sorted; Yellowish Gray (5 YR 8/1)	Same as 16' to 20' interval
25	2.5				**FINE SAND**, rounded, well-sorted; Moderate Brown (5 YR 3/4)	
	2.5				**SILTY FINE SAND**, rounded, well-sorted; Yellowish Gray (5Y 7/2)	Same as 16' to 20' interval
30						

Appendix 3

Soil Boring Logs of 2009 Exploration Borings and Installation Records for 2009 Observation Wells

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-1
TOTAL DEPTH: 60.0 ft.
SHEET 1 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT
COUNTY ORANGE
STATE Florida
CASING TYPE None
DATE STARTED 12/9/2009
COMPLETED 12/9/09
DRILLER/RIG Bowden/CME-45
WATER TABLE ATD: 2.92 ft
DATE 12/09/2009
TIME ---
WATER TABLE AD: --
DATE --
TIME --
REMARKS

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
				1							SAND, fine grained, brown (SP)		
				2	22.4	4.2							
				3									
	5			4									
											SAND, with silt, fine grained, brown (SP-SM)		
		1-3-3	6	5							SAND, with silt, with roots, fine grained, very dark brown (SP-SM)		
		2-4-5	9	6									
	10	6-11-20	31	7	26.7	8.2					SAND, with silt, hardpan, fine grained, very dark brown (SP-SM)		
	15	13-16-27	43	8							SAND, silty, fine grained, brown (SM)		
	20	6-7-8	15	9									
											SAND, with silt, fine grained, gray (SP-SM)		
	25	6-9-7	16	10	31.1	11.2							
	30	5-1-1	2	11									
											SAND, silty, fine grained, greenish gray (SM)		
	35	2-6-4	10	12	37.5	20.0					SAND, clayey, fine grained, greenish gray (SC)		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-1
TOTAL DEPTH: 60.0 ft.
SHEET 2 OF 2

PROJECT OUC Ponds
CLIENT Orlando Utilities Commission
BORING LOCATION OUC Stanton Energy Center, Orlando

FILE NO. 09-062
ELEVATION
BORING TYPE SPT

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/ 6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
											SAND, clayey, fine grained, greenish gray (SC) *(continued)*		
	40	1-1-2	3	13							CLAY, fat, greenish gray (CH)		
	45	1-1-3	4	14	72.7	89.9	81	57					
	50	5-8-11	19	15							SAND, clayey, with some shell, fine grained, greenish gray (SC)		
	55	50/1"	50/1"	16							Broken SHELL with sand		
	60	50/4"	50/4"	17							SAND, silty, with some shell, fine grained, greenish gray (SM)		
											BORING TERMINATED AT 60.0 FEET BELOW GROUND SURFACE		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-2
TOTAL DEPTH: 60.0 ft.
SHEET 1 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT
COUNTY ORANGE
STATE Florida
CASING TYPE None
DATE STARTED 12/9/2009
COMPLETED 12/9/09
DRILLER/RIG Bowden/CME-45
WATER TABLE ATD: 3.75 ft
DATE 12/09/2009
TIME ---
WATER TABLE AD: --
DATE --
TIME --
REMARKS

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
				1							SAND, fine grained, gray (SP)		
				2	26.5								
				3	26.5	4.9					SAND, with organics, fine grained, very dark brown (SP) Organic Content = 3.7% (1.5'-3')	▼	
	5			4									
		4-5-6	11	5									
		7-29-50/5"	50/5"	6									
	10	43-50/5"	50/5"	7							SAND, with silt, hardpan, fine grained, dark to very dark brown (SP-SM)		
	15	17-28-23	51	8	24.4	12.9					SAND, silty, fine grained, brown (SM)		
	20	6-9-10	19	9	27.0	10.8					SAND, with clay, fine grained, gray (SP-SC)		
	25	10-14-15	29	10							SAND, with silt, fine grained, gray (SP-SM)		
	30	9-4-3	7	11	30.1	14.5					SAND, clayey, fine grained, greenish gray (SC)		
	35	50/6"	50/6"	12							Broken SHELL with sand		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-2
TOTAL DEPTH: 60.0 ft.
SHEET 2 OF 2

PROJECT OUC Ponds
CLIENT Orlando Utilities Commission
BORING LOCATION OUC Stanton Energy Center, Orlando
FILE NO. 09-062
ELEVATION
BORING TYPE SPT

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
											Broken SHELL with sand *(continued)*		
	40	1-1-2	3	13	88.5	91.0					CLAY, fat, greenish gray (CH)		
	45	2-5-7	12	14	59.5						CLAY, very dark greenish gray (CH) Organic Content = 5.3%		
	50	2-2-5	7	15	44.3	42.1	64	50			SAND, clayey, fine grained, gray (SC)		
	55	50/5"	50/5"	16							Broken SHELL with sand		
	60	50/4"	50/4"	17							SAND, silty, with some shell, fine grained, greenish gray (SM)		
											BORING TERMINATED AT 60.0 FEET BELOW GROUND SURFACE		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-3
TOTAL DEPTH: 60.0 ft.
SHEET 1 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT
COUNTY ORANGE
STATE Florida
CASING TYPE None
DATE STARTED 12/9/2009
COMPLETED 12/9/09
DRILLER/RIG Bowden/CME-45
WATER TABLE ATD: 7.25 ft
DATE 12/09/2009
TIME ---
WATER TABLE AD: --
DATE --
TIME --
REMARKS

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
				1							SAND, fine grained, brown (SP)		
				2	12.1	3.9					SAND, fine grained, very dark brown (SP)		
	5			3									
				4									
		6-11-12	23	5	10.9	4.8					SAND, fine grained, brown (SP)	▼	
		12-16-17	33	6							SAND, fine grained, gray (SP)		
	10	8-8-9	17	7									
											SAND, silty, fine grained, very dark brown (SM)		
	15	4-8-9	17	8	20.6	27.0					SAND, clayey, fine grained, brown (SC)		
	20	8-12-13	25	9	31.2	11.3					SAND, with silt, fine grained, brown (SP-SM)		
	25	8-10-11	21	10							SAND, fine grained, gray (SP)		
	30	3-2-1	3	11	34.7	19.0					SAND, silty, fine grained, greenish gray (SM)		
	35	5-6-4	10	12							SAND, with silt, with sandstone fragments to 1.5" size, fine grained, greenish gray (SP-SM)		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-RP-3
TOTAL DEPTH: 60.0 ft.
SHEET 2 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/ 6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
	40	1-2-3	5	13							SAND, with silt, with sandstone fragments to 1.5" size, fine grained, greenish gray (SP-SM) *(continued)*		
	45	19-11-6	17	14							SAND, with silt, with trace shell, fine grained, greenish gray (SP-SM)		
	50	2-4-4	8	15	51.8	65.6					CLAY, sandy, fat, greenish gray (CH)		
	55	22-50/4"	50/4"	16							Broken SHELL with sand		
	60	50/4"	50/4"	17							SAND, silty, with some shell, fine grained, greenish gray (SM)		
											BORING TERMINATED AT 60.0 FEET BELOW GROUND SURFACE		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-CSA-1
TOTAL DEPTH: 60.0 ft.
SHEET 1 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT
COUNTY ORANGE
STATE Florida
CASING TYPE None
DATE STARTED 12/8/2009
COMPLETED 12/8/09
DRILLER/RIG Bowden/CME-45
WATER TABLE ATD: 2.75 ft
DATE 12/08/2009
TIME ---
WATER TABLE AD: --
DATE --
TIME --
REMARKS

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
				1							SAND, with silt, with trace wood, fine grained, very dark brown (SP-SM)	▼	
				2									
				3									
	5	4-8-11	19	4	26.1								
		9-14-14	28	5	18.8	4.1					SAND, hardpan, fine grained, very dark brown (SP) Organic Content = 4.1% (5'-6')		
		14-13-11	24	6									
	10	4-8-10	18	7									
	15	6-9-10	19	8									
											SAND, with silt, hardpan, fine grained, very dark brown (SP-SM)		
	20	33-17-10	27	9	27.0	7.1							
	25	2-5-6	11	10							SAND, fine grained, orange brown (SP)		
	30	5-6-7	13	11	24.9	8.9							
											SAND, with silt, fine grained, brown (SP-SM)		
	35	5-7-5	12	12							SAND, clayey, fine grained, brown (SC)		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-CSA-1
TOTAL DEPTH: 60.0 ft.
SHEET 2 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
											SAND, clayey, fine grained, brown (SC) *(continued)*		
	40	5-6-7	13	13	29.4	12.6					SAND, silty, fine grained, brown (SM)		
	45	4-5-7	12	14	28.9	16.2							
	50	4-5-9	14	15							SAND, silty, fine grained, greenish gray (SM)		
	55	1-2-2	4	16	52.4	52.3					CLAY, sandy, fat, dark greenish gray (CH)		
	60	5-13-22	35	17							SAND, silty, with clay lenses, fine grained, greenish gray (SM)		
											BORING TERMINATED AT 60.0 FEET BELOW GROUND SURFACE		

Ardaman & Associates, Inc.

BORING LOG

BORING NO: TH-CSA-2
TOTAL DEPTH: 60.0 ft.
SHEET 1 OF 2

PROJECT OUC Ponds
FILE NO. 09-062
CLIENT Orlando Utilities Commission
ELEVATION
BORING LOCATION OUC Stanton Energy Center, Orlando
BORING TYPE SPT
COUNTY ORANGE
STATE Florida
CASING TYPE None
DATE STARTED 12/9/2009
COMPLETED 12/9/09
DRILLER/RIG Bowden/CME-45
WATER TABLE ATD: --
DATE 12/09/2009
TIME ---
WATER TABLE AD: --
DATE --
TIME --
REMARKS

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
				1							SAND, fine grained, gray (SP)		
				2									
				3	14.1	4.3							
	5			4							SAND, fine grained, very dark brown (SP)		
		3-4-4	8	5									
		3-6-8	14	6	27.3	1.3					SAND, fine grained, brown (SP)		
	10	3-7-10	17	7									
											SAND, fine grained, pale gray (SP)		
	15	6-8-9	17	8							SAND, with silt, fine grained, brown (SP-SM)		
	20	5-7-8	15	9	21.4	16.7					SAND, clayey, fine grained, brown (SC)		
	25	7-7-9	16	10	25.4	10.1							
											SAND, with silt, fine grained, brown (SP-SM)		
	30	8-7-8	15	11									
	35	12-17-22	39	12	24.2	5.5					SAND, with silt, fine grained, greenish gray to dark greenish gray (SP-SM)		

Ardaman & Associates, Inc.

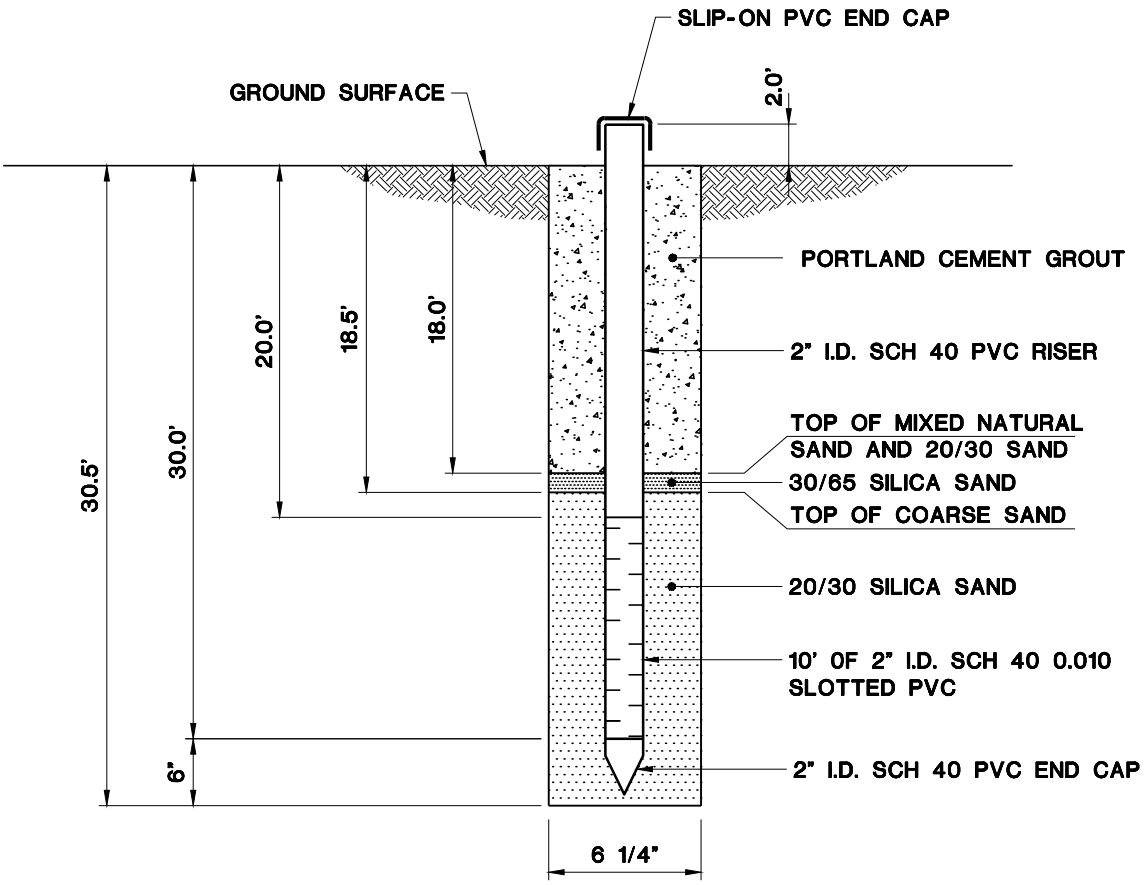
BORING LOG

BORING NO: TH-CSA-2
TOTAL DEPTH: 60.0 ft.
SHEET 2 OF 2

PROJECT OUC Ponds
CLIENT Orlando Utilities Commission
BORING LOCATION OUC Stanton Energy Center, Orlando

FILE NO. 09-062
ELEVATION
BORING TYPE SPT

Elevation	Depth (ft)	Standard Pen. Test ASTM D-1586 Blows/ 6 in	N Value	Sample Number	Lab Data NM (%)	-200 (%)	LL (%)	PI (%)	Dry Den. (pcf)	qu (PP) (tsf)	Soils Descriptions and Remarks	Depth (ft)	Graphic Log
	40	4-4-10	14	13							SAND, with silt, fine grained, greenish gray to dark greenish gray (SP-SM) *(continued)*		
	45	11-7-7	14	14	21.9	5.6							
	50	2-2-1	3	15	63.1	88.2	64	46			CLAY, fat, greenish gray (CH)		
	55	1-2-3	5	16									
	60	3-4-7	11	17							Broken SHELL with sand		
											BORING TERMINATED AT 60.0 FEET BELOW GROUND SURFACE		



OBSERVATION WELL NO. OW-RP-1

NOT TO SCALE

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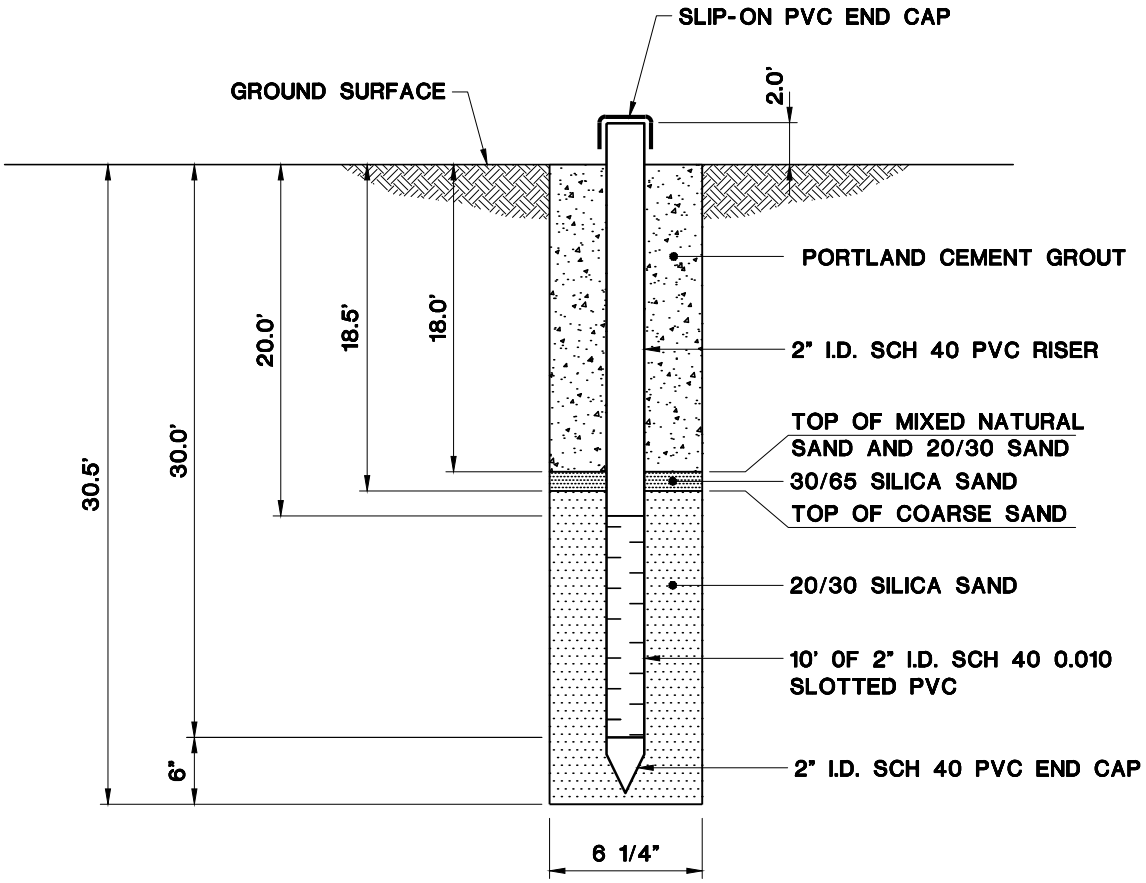
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OBSERVATION WELL
OUC, STANTON ENERGY CENTER
ORLANDO, FLORIDA

DRAWN BY: AOA	CHECKED BY: APC	DATE: 03/30/10
FILE NO. 09-062	APPROVED BY:	FIGURE: C-1



OBSERVATION WELL NO. OW-RP-2

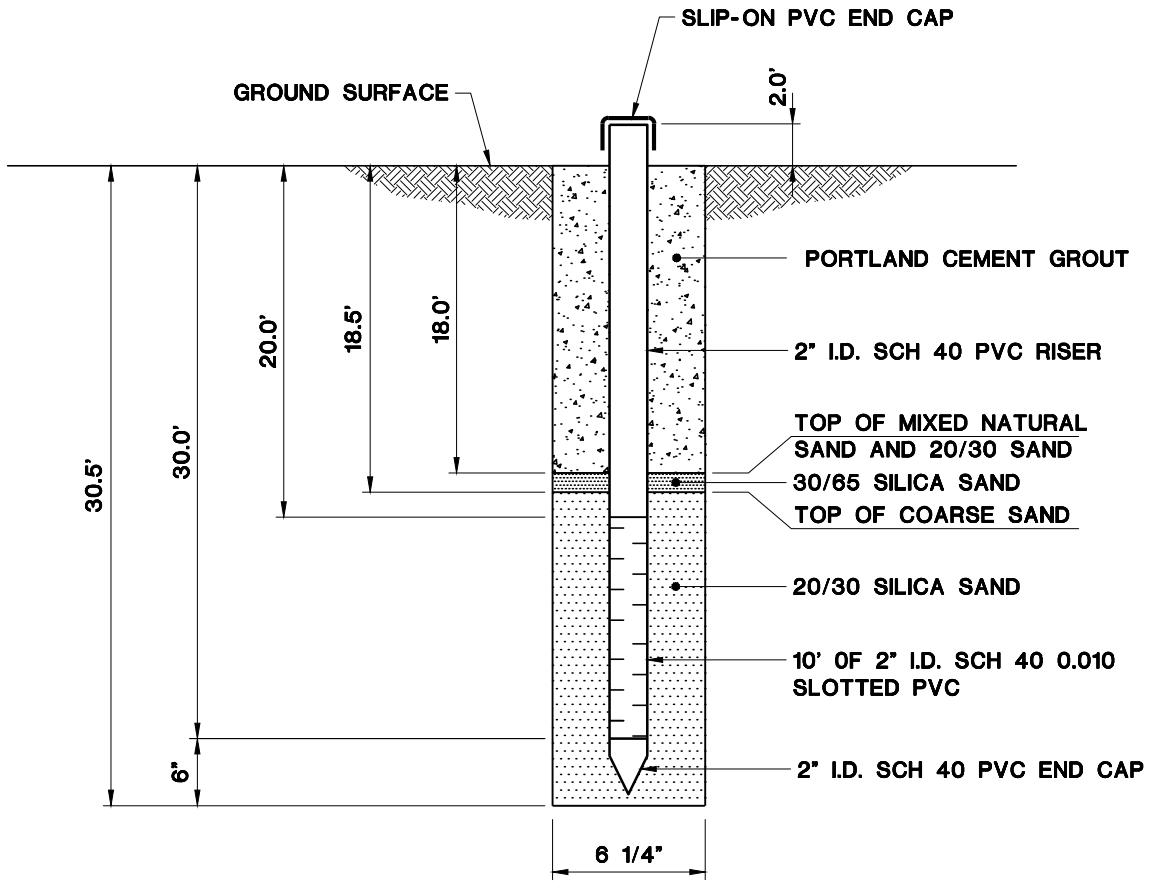
NOT TO SCALE

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OBSERVATION WELL
OUC, STANTON ENERGY CENTER
ORLANDO, FLORIDA

DRAWN BY: AOA	CHECKED BY: APC	DATE: 03/30/10
FILE NO. 09-062	APPROVED BY:	FIGURE: C-2

T:\Corporate\09\09-062\OBSERVATION WELLS.dwg 8/05/2014 4:02:15 PM, Paula.Soto



OBSERVATION WELL NO. OW-CSA-1

NOT TO SCALE

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OBSERVATION WELL
OUC, STANTON ENERGY CENTER
ORLANDO, FLORIDA

DRAWN BY: AOA	CHECKED BY: APC	DATE: 03/30/10
FILE NO. 09-062	APPROVED BY:	FIGURE: C-5

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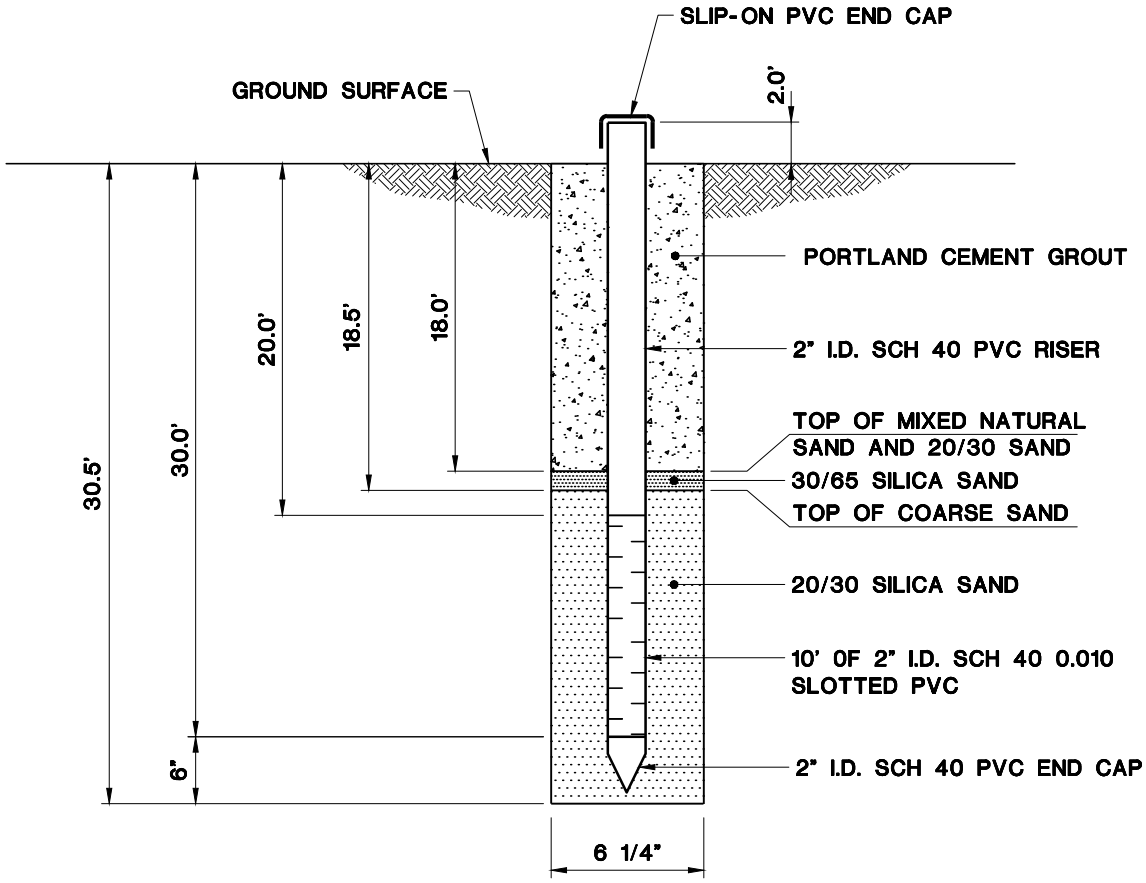

OBSERVATION WELL NO. OW-CSA-2

NOT TO SCALE

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Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OBSERVATION WELL
OUC, STANTON ENERGY CENTER
ORLANDO, FLORIDA

DRAWN BY: AOA	CHECKED BY: APC	DATE: 03/30/10
FILE NO. 09-062	APPROVED BY:	FIGURE: C-6

Appendix 4

Field Exploration and Sampling Procedures

STANDARD PENETRATION TEST

The Standard Penetration Test is a widely accepted method of *in situ* testing of foundation soils (ASTM D1586). A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated to various soil properties allowing conservative estimate of behavior of soils under load.

The tests are usually performed at 5-foot intervals. However, more frequent or continuous testing is performed through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonite drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, NX-size flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or to prevent the loss of circulating fluid. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed, if necessary, and backfilled.

Representative split-spoon samples from the soils at every 5 feet of drilled depth and from every different stratum are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary. Samples not used in testing are stored for at least 6 months prior to being discarded.

STANDARD PENETRATION RESISTANCE CORRELATIONS

Relative Density of Cohesionless Soil Based on Standard Penetration Test		Consistency and Undrained Shear Strength of Cohesive Soil Based on Standard Penetration Test		
N-Value (blows/foot)	Relative Density	N-Value (blows/foot)	Consistency	Undrained Shear Strength (psf)
0-4	Very Loose	< 2	Very Soft	< 250
4-10	Loose	2-4	Soft	250-500
10-30	Medium	4-8	Medium Stiff	500-1,000
30-50	Dense	8-15	Stiff	1,000-2,000
> 50	Very Dense	15-30	Very Stiff	2,000-4,000

UNDISTURBED SAMPLING

Undisturbed sampling implies the recovery of soil samples in a state as close to their natural condition as possible. Complete preservation of *in situ* conditions cannot be realized; however, with careful handling and proper sampling techniques, disturbance during sampling can be minimized for most geotechnical engineering purposes. Examination and testing of undisturbed samples gives a more accurate estimate of *in situ* soil behavior than is possible with disturbed samples.

Normally, we obtain undisturbed samples by pushing a 2.875-inch I.D., thin wall seamless steel tube, 24 inches into the soil with a single stroke of a hydraulic ram. The sampler, which is a Shelby tube, is 30 inches long. After the sampler is retrieved, the ends are sealed in the field and it is transported to our laboratory for further examination and testing, as needed.

In some instances, when even less disturbed samples are required, a fixed-piston sampling device is used. The fixed-piston sampler is a 2.875-inch I.D. Shelby tube with a piston inside it. While the sampler is lowered into the bore hole, the piston is located at the lower end of the sampling tube. The piston is then placed at the bottom of the hole on top of the soil to be sampled, and is held stationary while the tube is smoothly pushed past the piston 24 inches into the soil. The sample is sheared from the parent soil by rotating the sampling device. After the sampler is brought out of the hole, the ends of the tube are sealed and the sample is brought back to our laboratory.

Four major improvements over our conventional undisturbed sampling procedures are achieved with the piston sampler; a larger sample is obtained; no soil enters the tube as the sampler is lowered to the sampling depth; excess soil does not enter the tube during sampling operation; and a vacuum is generated between the piston and the sample as the sampler is being retrieved, thus helping to retain the sample in the tube.

Appendix 5

Soil Boring Logs for Proposed Recycle Pond Expansion

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT	OUC LINED POND MODIFICATION
2. HOLE NUMBER	**TH-RPE-01**
LOCATION COORDINATES	N 1,507,151.5 E 601,935.2
3. DRILLING AGENCY	Tetra Tech - AAI
4. NAME OF DRILLER	Lee Tate and Tom Foster
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG FROM VERTICAL	---
BEARING	
6. THICKNESS OF OVERBURDEN	
7. DEPTH DRILLED INTO ROCK	
8. TOTAL DEPTH OF BORING (ft)	25.5
9. COORDINATE SYSTEM	State Plane
HORIZONTAL	NAD83
VERTICAL	NAVD88
10. SIZE AND TYPE OF BIT	2 15/16" Tricone
11. MANUFACTURER'S DESIGNATION OF DRILL	CME-45
12. TOTAL SAMPLES	DISTURBED 17 / UNDISTURBED 0
13. TOTAL NUMBER CORE BOXES	0
14. ELEVATION GROUND WATER (ft)	75.5
15. DATE BORING	STARTED 1/13/14 / COMPLETED 1/13/14
16. ELEVATION TOP OF BORING (ft)	80.2
17. TOTAL CORE RECOVERY FOR BORING	N/A
18. SIGNATURE AND TITLE OF INSPECTOR	David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.7	1.5					**0' to 1.5':** SAND, fine, brown (SP)		1								
77.2	3.0					**1.5' to 3':** SAND, fine, light gray (SP)		2								
						3' to 6': SAND, fine, brown (SP)		3	0	97	3			26	SP	
74.2	6.0							4								
72.7	7.5	3 3 4	7			**6' to 7.5':** SAND, with silt, fine, trace organics, dark brown (SP-SM)	100	5								
		6 17 22	39			**7.5' to 10.5':** SAND, with silt, fine, hardpan, dark brown (SP-SM)	100	6			10			22	SP-SM	
69.7	10.5	32 50 /4"	50 /4"				100	7								
		16 16 15	31			**10.5' to 16.5':** SAND, silty, fine, brown (SM)	80	8								
		4 6 9	15				80	9								
		6 9 10	19				50	10								
63.7	16.5	4 7 8	15				50	11			20			21	SM	
		6 6 7	13			**16.5' to 25.5':** SAND, with silt, fine, grayish brown (SP-SM)	30	12								
		4 4 4	8				50	13								
		2 3 4	7				50	14								
		2 2 5	7				50	15								
		2 2 3	5				50	16			8			26	SP-SM	
54.7	25.5	2 4 4	8				50	17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT	OUC LINED POND MODIFICATION
2. HOLE NUMBER	**TH-RPE-02**
LOCATION COORDINATES	N 1,506,956.1 E 602,316.8
3. DRILLING AGENCY	Tetra Tech - AAI
4. NAME OF DRILLER	Mason Brackins and Coy Jones
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG FROM VERTICAL	---
BEARING	
6. THICKNESS OF OVERBURDEN	
7. DEPTH DRILLED INTO ROCK	
8. TOTAL DEPTH OF BORING (ft)	52.5
9. COORDINATE SYSTEM	State Plane
HORIZONTAL	NAD83
VERTICAL	NAVD88
10. SIZE AND TYPE OF BIT	2 15/16" Tricone
11. MANUFACTURER'S DESIGNATION OF DRILL	CME-45
12. TOTAL SAMPLES	DISTURBED 35 / UNDISTURBED 0
13. TOTAL NUMBER CORE BOXES	0
14. ELEVATION GROUND WATER (ft)	75.9
15. DATE BORING	STARTED 1/9/14 / COMPLETED 1/9/14
16. ELEVATION TOP OF BORING (ft)	79.4
17. TOTAL CORE RECOVERY FOR BORING	N/A
18. SIGNATURE AND TITLE OF INSPECTOR	Alexandra Aydelotte Assistant Project Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
77.9	1.5					**0' to 1.5':** SAND, fine, with roots, light grayish brown (SP)		1								
76.4	3.0					**1.5' to 3':** SAND, fine, light brown (SP)		2								
						3' to 6': SAND, fine, brown (SP)		3			5			22	SP	
73.4	6.0							4								
		21 32 19	51			**6' to 12':** SAND, with silt, fine, hardpan, dark reddish brown (SP-SM)		5			9			26	SP-SM	Organic Content: 3.6%
		5 7 9	16					6								
		9 13 21	34					7								
67.4	12.0	21 25 30	55					8								
		14 16 21	37			**12' to 21':** SAND, with silt, fine, brown (SP-SM)		9								
		9 12 12	24					10			7			26	SP-SM	
		9 13 16	29					11								
		8 12 11	23					12								
		5 9 10	19					13								
58.4	21.0	5 6 7	13					14								
		5 6 6	12			**21' to 28.5':** SAND, with silt, fine, light brown (SP-SM)		15								
		4 5 6	11					16								
		5 6 7	13					17			9			25	SP-SM	
		8 6 6	12					18								
50.9	28.5	4 4 4	8					19								
		4 1 1	2			**28.5' to 31.5':** SAND, silty, fine, light grayish brown (SM)		20			14			26	SM	

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,956.1 E 602,316.8

ELEVATION TOP OF BORING (ft): 79.4

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
47.9	31.5	0 0 0	WOH			**28.5' to 31.5':** SAND, silty, fine, light grayish brown (SM) *(continued)*		21								
46.4	33.0	0 1 3	4			**31.5' to 33':** SAND, clayey, fine, gray (SC)		22			25			24	SC	
		2 5 7	12			**33' to 36':** SAND, with silt, fine, with coquina and shell fragments, gray (SP-SM)		23								
43.4	36.0	7 5 7	12					24			9			15	SP-SM	
		8 7 9	16			**36' to 39':** SAND, with silt, fine, with shell fragments, light gray (SP-SM)		25								
40.4	39.0	10 4 4	8					26								
38.9	40.5	5 3 2	5			**39' to 40.5':** CLAY, greenish gray (CH)		27			95	96	76	71	CH	
37.4	42.0	1 2 1	3			**40.5' to 42':** CLAY, sandy, trace shell fragments, greenish gray (CH)		28								
		0 0 1	1			**42' to 46.5':** CLAY, greenish gray (CH)		29								
		0 1 1	2					30								
32.9	46.5	1 1 1	2					31			91	78	60	67	CH	
		2 3 2	5			**46.5' to 50.5':** CLAY, sandy, greenish gray (CH)		32								
		1 1 2	3					33			61	84	65	51	CH	
28.9	50.5	2 4 6	10					34								
26.9	52.5	11 13 17	30			**50.5' to 52.5':** SAND, with silt, fine, some shell fragments, greenish gray (SP-SM)		35			8			21	SP-SM	

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH: weight of hammer

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RPE-03**; LOCATION COORDINATES: N 1,506,746.4 E 601,929.2	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 34; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Mike Baker	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 75.0
	15. DATE BORING: STARTED 1/9/14; COMPLETED 1/10/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 78.3
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 51.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
76.8	1.5					**0' to 1.5':** SAND, with silt, fine, dark brown (SP-SM)		1			7			14	SP-SM	Organic Content: 3.4%
75.3	3.0					**1.5' to 3':** SAND, fine, trace organics, with roots, dark brown (SP)		2								
73.8	4.5					**3' to 4.5':** SAND, organic, dark reddish brown (SP)		3			2			98	SP	Organic Content: 16.9%
72.3	6.0	10 9 7	16			**4.5' to 6':** SAND, fine, trace organics, dark reddish brown (SP)	100	4						25	SP	Organic Content: 3.0%
		5 6 5	11			**6' to 9':** SAND, fine, brown (SP)	100	5								
69.3	9.0	3 3 3	6				100	6								
		3 3 3	6			**9' to 19.5':** SAND, with silt, fine, light brown (SP-SM)	100	7								
		1 1 2	3				10	8								
		1 2 2	4					9	0	92	8			28	SP-SM	
		1 1 1	2					10								
		1 1 1	2				30	11								
		1 1 1	2				30	12								
58.8	19.5	1 1 2	3				30	13								
		1 2 1	3			**19.5' to 22.5':** SAND, fine, light brown to light gray (SP)	30	14								
55.8	22.5	2 2 1	3				50	15								
54.3	24.0	0 0 0	WOR			**22.5' to 24':** No Return	0	16								
		0 0 0	WOH			**24' to 28.5':** SAND, with silt, fine, light brown (SP-SM)	50	17			11			31	SP-SM	
		1 1 1	2				30	18								
49.8	28.5	1 0 1	1				50	19			11			32	SP-SM	
		0 0 0	WOH			**28.5' to 32':** No Recovery	50	20								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,746.4 E 601,929.2

ELEVATION TOP OF BORING (ft): 78.3

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		0 0 0	WOR			**28.5' to 32':** No Recovery *(continued)*	0	21								
46.3	32.0															
		0 3 8	11			**32' to 33':** SAND, clayey, fine, with shell fragments, dark gray (SC)	70	22			19			21	SC	
45.3	33.0															
		10 12 2	14			**33' to 38.5':** MOSTLY SHELL, fragments, gray to light brown	40	23								
		1 6 11	17				60	24								
		4 12 13	25				60	25								
39.8	38.5	2 6 3	9				80	26								
38.8	39.5	0 2 2	4			**38.5' to 39.5':** SAND, clayey, gray (SC)	100	27								
		1 1 1	2			**39.5' to 46.5':** CLAY, trace shell fragments, greenish gray (CH)	100	28			98	148	120	91	CH	
		0 2 1	3				80	29								
		1 1 2	3				100	30			86	72	55	57	CH	
31.8	46.5	0 0 2	2				80	31								
		0 2 2	4			**46.5' to 50':** CLAY, with sand, trace shell fragments, dark gray (CH)	80	32			75	65	52	58	CH	
		0 2 2	4					33								
28.3	50.0	1 2 4	6			**50' to 51':** SAND, clayey, dark gray (SC)		34			13			23	SC	
27.3	51.0															

30.0 / 32.5 / 35.0 / 37.5 / 40.0 / 42.5 / 45.0 / 47.5 / 50.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH: weight of hammer.
5. WOR: weight of rod.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

Boring Designation TH-RPE-04

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION

2. HOLE NUMBER: **TH-RPE-04**

LOCATION COORDINATES: N 1,506,950.1 E 601,544.5

3. DRILLING AGENCY: Tetra Tech - AAI

4. NAME OF DRILLER: Mason Brackins and Coy Jones

5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:

6. THICKNESS OF OVERBURDEN:

7. DEPTH DRILLED INTO ROCK:

8. TOTAL DEPTH OF BORING (ft): 55.5

9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88

10. SIZE AND TYPE OF BIT: 2 15/16" Tricone

11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45

12. TOTAL SAMPLES: DISTURBED: 37; UNDISTURBED: 0

13. TOTAL NUMBER CORE BOXES: 0

14. ELEVATION GROUND WATER (ft): 73.5

15. DATE BORING: STARTED: 1/10/14; COMPLETED: 1/10/14

16. ELEVATION TOP OF BORING (ft): 79.0

17. TOTAL CORE RECOVERY FOR BORING: N/A

18. SIGNATURE AND TITLE OF INSPECTOR: Alexandra Aydelotte Assistant Project Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
77.5	1.5					**0' to 1.5':** SAND, with silt, fine, dark brown (SP-SM)		1								
76.0	3.0					**1.5' to 3':** SAND, fine, dark grayish brown (SP)		2			3			11	SP	
74.5	4.5					**3' to 4.5':** SAND, with silt, fine, brown (SP-SM)		3								
73.0	6.0					**4.5' to 6':** SAND, silty, fine, dark brown (SM)		4								
		8 12 9	21			**6' to 10.5':** SAND, with silt, fine, with organics, hardpan, very dark reddish brown (SP-SM)		5			6			24	SP-SM	Organic Content: 3.6%
		21 31 43	74					6								
68.5	10.5	19 23 28	51					7			11			25	SP-SM	Organic Content: 5.3%
67.0	12.0	11 15 18	33			**10.5' to 12':** SAND, fine, orangish brown (SP)		8								
65.5	13.5	7 9 10	19			**12' to 13.5':** SAND, fine, light brown (SP)		9								
64.0	15.0	5 8 10	18			**13.5' to 15':** SAND, silty, fine, light brown (SM)		10			18			20	SM	
		5 8 7	15			**15' to 30':** SAND, with silt, fine, light brown (SP-SM)		11								
		4 6 8	14					12								
		5 8 10	18					13	0	95	5			26	SP-SM	
		6 9 10	19					14								
		5 8 9	17					15								
		6 8 8	16					16								
		5 6 10	16					17								
		4 4 4	8					18								
		2 4 3	7					19								
49.0	30.0	3 2 5	7					20	0	92	8			25	SP-SM	

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

SPK FORM 1836-A SEP 05

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,950.1 E 601,544.5

ELEVATION TOP OF BORING (ft): 79.0

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
47.5	31.5	5 4 4	8			**30' to 31.5':** SAND, fine, light greenish gray (SP)		21								
44.5	34.5	3 0 0	WOH			**31.5' to 34.5':** SAND, clayey, fine, light grayish brown (SC)		22			17			28	SC	
		0 0 0	WOH					23								
43.5	35.5	1 2	5			**34.5' to 35.5':** SAND, clayey, light greenish gray (SC)		24			31			34	SC	
43.0	36.0	3				**35.5' to 36':** SAND, fine, light greenish gray (SP)										
		5 5 4	9			**36' to 40.5':** SAND, fine, cemented, calcareous, light greenish gray (SP)		25								
		3 4 5	9					26								
38.5	40.5	5 6 6	12					27								
		5 8 6	14			**40.5' to 43.5':** SAND, silty, fine, cemented, calcareous, light greenish gray (SM)		28								
35.5	43.5	7 11 10	21					29			15			21	SM	Carbonate Content: 87.1%
34.0	45.0	5 4 4	8			**43.5' to 45':** CLAY, trace shell fragments, gray (CH)		30								
		1 2 3	5			**45' to 52.5':** CLAY, with sand, with shell fragments, greenish gray (CH)		31			82	94	73	69	CH	
		2 2 3	5					32								
		2 1 2	3					33			73	71	54	47	CH	
		2 4 3	7					34								
26.5	52.5	2 2 2	4					35								
25.0	54.0	1 1 2	3			**52.5' to 54':** CLAY, sandy, trace shell fragments, greenish gray (CH)		36			62	69	55	55	CH	
23.5	55.5	7 23 37	60			**54' to 55.5':** SAND, fine, with shell fragments, calcareous, grayish brown (SP)		37								

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH: weight of hammer

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT	OUC LINED POND MODIFICATION
2. HOLE NUMBER	**TH-RPE-05**
LOCATION COORDINATES	N 1,506,951.7 E 601,826.7
3. DRILLING AGENCY	Tetra Tech - AAI
4. NAME OF DRILLER	Lee Tate and Mike Baker
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG FROM VERTICAL	---
BEARING	
6. THICKNESS OF OVERBURDEN	
7. DEPTH DRILLED INTO ROCK	
8. TOTAL DEPTH OF BORING (ft)	25.5
9. COORDINATE SYSTEM	State Plane
HORIZONTAL	NAD83
VERTICAL	NAVD88
10. SIZE AND TYPE OF BIT	2 15/16" Tricone
11. MANUFACTURER'S DESIGNATION OF DRILL	CME-45
12. TOTAL SAMPLES	DISTURBED 17 / UNDISTURBED 0
13. TOTAL NUMBER CORE BOXES	0
14. ELEVATION GROUND WATER (ft)	74.2
15. DATE BORING	STARTED 1/10/14 / COMPLETED 1/10/14
16. ELEVATION TOP OF BORING (ft)	79.9
17. TOTAL CORE RECOVERY FOR BORING	N/A
18. SIGNATURE AND TITLE OF INSPECTOR	David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.4	1.5					**0' to 1.5':** SAND, fine, brown (SP)		1								
76.9	3.0					**1.5' to 3':** SAND, with silt, fine, with organics, with roots, dark brown (SP-SM)		2			6			24	SP-SM	Organic Content: 5.9%
75.4	4.5					**3' to 4.5':** SAND, fine, brown (SP)		3								
		10 20	30			**4.5' to 9':** SAND, with silt, hardpan, dark reddish brown (SP-SM)		4								
		17 23 31	54				100	5								
70.9	9.0	19 28 32	60				70	6			10			27	SP-SM	
		10 10 12	22			**9' to 15':** SAND, fine, brown to dark brown (SP)	80	7								
		7 9 13	22				100	8								
		3 15 24	39				80	9								
64.9	15.0	10 12 21	33				50	10								
		8 11 12	23			**15' to 25.5':** SAND, with silt, fine, light brown (SP-SM)	30	11			12			23	SP-SM	
		6 8 11	19				50	12								
		4 6 8	14				50	13								
		4 5 8	13				50	14								
		5 6 9	15				30	15			5			31	SP-SM	
		4 6 7	13				30	16								
54.4	25.5	6 5 5	10					17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RPE-06**; LOCATION COORDINATES: N 1,506,951.0 E 602,024.0	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 64; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Mike Baker	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 74.6
	15. DATE BORING: STARTED 1/8/14; COMPLETED 1/9/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.6
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 96.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.1	1.5					**0' to 1.5':** SAND, with silt, dark brown (SP-SM)		1			5			8	SP-SM	Organic Content: 1.2%
						1.5' to 4.5': SAND, trace roots, brown (SP)		2								
75.1	4.5							3								
						4.5' to 9': SAND, with silt, trace organics, hardpan, dark reddish brown (SP-SM)		4								
		13 13 11	24					5			9			28	SP-SM	
70.6	9.0	5 11 20	31					6						22	SP-SM	Organic Content: 2.9%
		16 19 18	37			**9' to 18':** SAND, silty, brown (SM)		7								
		5 9 10	19					8								
		5 7 7	14					9			17			20	SM	
		5 7 8	15					10								
		4 4 6	10					11								
61.6	18.0	3 4 4	8					12								
		4 6 6	12			**18' to 30':** SAND, with silt, light brown (SP-SM)		13								
		3 6 5	11					14								
		3 5 5	10					15								
		3 4 5	9					16			9			27	SP-SM	
		5 5 7	12					17								
		5 5 7	12					18								
		4 3 2	5					19								
49.6	30.0	2 1 4	5					20								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,951.0 E 602,024.0

ELEVATION TOP OF BORING (ft): 79.6

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		2 1 1	2			**30' to 33':** SAND, with silt, greenish gray (SP-SM)		21			11			23	SP-SM	
46.6	33.0	2 1 2	3					22								
45.1	34.5	4 3 7	10			**33' to 34.5':** SAND, clayey, with shell fragments, calcareous, greenish gray (SC)		23			28			28	SC	
		7 7 10	17			**34.5' to 41':** SAND, with silt, cemented, calcareous, greenish gray (SP-SM)		24								
		5 7 7	14					25								
		5 5 7	12					26								
		3 3 5	8					27								
38.6	41.0	4														
37.6	42.0	2 2	4			**41' to 42':** CLAY, some shell fragments, greenish gray (CH)		28								
36.1	43.5	0 0 2	2			**42' to 43.5':** CLAY, trace shell fragments, greenish gray (CH)		29			88	90	67	77	CH	
34.6	45.0	0 2 1	3			**43.5' to 45':** No Recovery		30								
33.1	46.5	0 1 1	2			**45' to 46.5':** CLAY, trace shell fragments, greenish gray (CH)		31								
		0 0 2	2			**46.5' to 49.5':** CLAY, with sand, trace shell fragments, greenish gray (CH)		32			83	70	53	57	CH	
30.1	49.5	0 0 1	1					33								
28.6	51.0	1 23 23	46			**49.5' to 51':** SAND, clayey, some shell fragments, grayish brown (SC)		34			35			34	SC	
		12 24 23	47			**51' to 54':** SAND, some shell fragments, grayish brown (SP)		35								
25.6	54.0	5 21 35	56					36								
		37 47 52	99			**54' to 57':** MOSTLY SHELL, fragments, with brown sand		37								
22.6	57.0	31 22 18	40					38								
21.1	58.5	20 28 40	68			**57' to 58.5':** SAND, with silt, some shell fragments, brown (SP-SM)		39	0	90	10			22	SP-SM	
		29 46 50	96			**58.5' to 60.5':** MOSTLY SHELL, fragments		40								
19.1	60.5	10														
		21 31	52			**60.5' to 70.5':** SAND, with silt, trace shell fragments, brown (SP-SM)		41								
		27 31 24	55					42								
		11 14 17	31					43								
		5 9 15	24					44								
		6														

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,951.0 E 602,024.0

ELEVATION TOP OF BORING (ft): 79.6

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		10 10	20			**60.5' to 70.5':** SAND, with silt, trace shell fragments, brown (SP-SM) *(continued)*		45			11			29	SP-SM	
		5 7 7	14					46								
9.1	70.5	5 4 6	10					47								
		4 3 3	6			**70.5' to 76.5':** SAND, clayey, with shell fragments, brown (SC)		48			32			34	SC	
		3 2 3	5					49								
		2 3 3	6					50			31			34	SC	
3.1	76.5	2 4 4	8					51								
		3 4 5	9			**76.5' to 81':** CLAY, calcareous, brown (CL)		52			50			35	CL	
		4 4 8	12					53								
-1.4	81.0	4 7 6	13					54								
		5 4 6	10			**81' to 85.5':** SAND, with silt, trace shell fragments, brown (SP-SM)		55								
		6 5 5	10					56			12			38	SP-SM	
-5.9	85.5	6 5 6	11					57								
		5 3 3	6			**85.5' to 93':** SAND, clayey, with shell fragments, gray (SC)		58								
		3 5 4	9					59			29			34	SC	
		3 2 3	5					60								
		3 4 5	9					61								
-13.4	93.0	2 3 4	7					62								
		3 5 6	11			**93' to 96':** SAND, fine, gray (SP)		63								
-16.4	96.0	4 10 15	25					64								

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/26/14

Appendix 6

Soil Boring Logs for Proposed Existing Recycle Pond Modifications

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RP-04**; LOCATION COORDINATES: N 1,507,033.5 E 603,354.1	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 50; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Tom Foster	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 73.6
	15. DATE BORING: STARTED 1/17/14; COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.1
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 75.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 3': SAND, fine, dark brown (SP)		1								
								2								
76.1	3.0					**3' to 6':** SAND, fine, with roots, trace organics, gray to dark brown (SP)		3			3			10	SP	Organic Content = 0.8%
		8 14	22					4								
73.1	6.0					**6' to 7.5':** SAND, fine, dark brown (SP)		5								
		10 13 13	26													
71.6	7.5					**7.5' to 9':** SAND, fine, with roots, dark brown (SP)	100	6								
		9 9 10	19													
70.1	9.0					**9' to 16.5':** SAND, with silt, fine, very dark brown (SP-SM)	50	7								
		12 50/5"	50/5"													
		35 50/4"	50/4"				30	8								
		15 26 28	54				70	9			10			25	SP-SM	
		20 25 29	54				70	10								
		7 17 18	35				70	11								
62.6	16.5					**16.5' to 19.5':** SAND, with silt, fine, slightly cemented, dark brown (SP-SM)	70	12								
		16 33 34	67													
		13 16 15	31				50	13								
59.6	19.5					**19.5' to 30':** SAND, with silt, fine, brown (SP-SM)	30	14								
		5 8 13	21													
		4 9 10	19				30	15			9			23	SP-SM	
		5 7 12	19				30	16								
		7 9 12	21				30	17								
		6 7 13	20				50	18								
		6 8 9	17				50	19			12			24	SP-SM	
		6 5 6	11				50	20								
49.1	30.0															

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,507,033.5 E 603,354.1

ELEVATION TOP OF BORING (ft): 79.1

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		4 5 6	11			**30' to 34.5':** SAND, with silt, fine, light to dark gray (SP-SM)	50	21								
		2 1 1	2				30	22			10			26	SP-SM	
44.6	34.5	1 1 2	3				40	23								
		0 5 6	11			**34.5' to 36.5':** SAND, cemented, with shell fragments, calcareous, gray (SP)	30	24								
42.6	36.5	3 4 5	9			**36.5' to 38.5':** SAND, with silt, with shell fragments, calcareous, dark gray (SP-SM)	70	25								
40.6	38.5	5 6 2	8				80	26								
		1 1 1	2			**38.5' to 52':** SAND, clayey, with shell fragments, greenish gray (SC)	30	27			39	110	87	33	SC	
		0 0 0	WOH				100	28								
		0 2 3	5				30	29								
		2 2 2	4				30	30								
		1 1 2	3				10	31								
		2 2 2	4				30	32								
		2 2 2	4				50	33			41	87	66	43	SC	
		2 2 2	4				60	34								
27.1	52.0	2 2 6	8				60	35								
26.6	52.5	18 27 25	52			**52' to 52.5':** SAND, slightly cemented, trace shell fragments, brown (SP) **52.5' to 54':** SAND, fine, slightly cemented, gray (SP)	100	36								
25.1	54.0	7 23 24	47			**54' to 58.5':** SAND, fine, slightly cemented, with shell fragments, gray (SP)	80	37								
		15 28 42	70				80	38								
20.6	58.5	23 30 30	60				80	39								
		13 18 25	43			**58.5' to 61.5':** SAND, fine, slightly cemented, trace shell fragments, gray (SP)	90	40								
17.6	61.5	8 16 24	40				60	41								
		16 17 16	33			**61.5' to 65':** SAND, with silt, with shell fragments, gray (SP-SM)	50	42								
		9 12 10	22				30	43			10			29	SP-SM	
14.1	65.0	4 3 6	9			**65' to 66.5':** SAND, clayey, fine, trace shell fragments, gray (SC)	50	44								
12.6	66.5	6														

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,507,033.5 E 603,354.1

ELEVATION TOP OF BORING (ft): 79.1

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		8 10	18			**66.5' to 71':** SAND, fine, with shell fragments, gray (SP)	50	45			19			31	SC	
		2 8 10	18				50	46								
		6 5 7	12				50	47								
8.1	71.0	3 3 4	7				75	48								
		2 2 3	5			**71' to 75':** SAND, clayey, with shell fragments, gray (SC)	100	49			23	31	15	30	SC	
4.1	75.0	2 2 2	4				100	50								

67.5

70.0

72.5

75.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH: weight of hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Boring Designation TH-RP-05

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM State Plane	HORIZONTAL NAD83	VERTICAL NAVD88
		10. SIZE AND TYPE OF BIT 2 15/16" Tricone		
2. HOLE NUMBER **TH-RP-05**	LOCATION COORDINATES N 1,507,084.0 E 602,842.8	11. MANUFACTURER'S DESIGNATION OF DRILL CME-45		
3. DRILLING AGENCY Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED 17	UNDISTURBED 0
4. NAME OF DRILLER Lee Tate and Tom Foster		13. TOTAL NUMBER CORE BOXES 0		
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL ---	BEARING	14. ELEVATION GROUND WATER (ft) 75.2	
		15. DATE BORING	STARTED 1/17/14	COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft) 79.2		
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING N/A		
8. TOTAL DEPTH OF BORING (ft) 25.5		18. SIGNATURE AND TITLE OF INSPECTOR Shandesh Shrestha Staff Engineer		

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
77.7	1.5					**0' to 1.5':** SAND, fine, light gray (SP)		1								
						1.5' to 4.5': SAND, silty, fine, gray to dark brown (SM)		2								
74.7	4.5							3								
		2 3	5			**4.5' to 9':** SAND, silty, fine, roots, dark brown (SM)		4			13			25	SM	Organic Content = 1.9%
		1 1 3	4					5								
70.2	9.0	6 10 15	25				100	6								
		10 17 21	38			**9' to 12':** SAND, silty, fine, brown to orange (SM)	50	7								
67.2	12.0	2 5 8	13				50	8								
		7 6 8	14			**12' to 25.5':** SAND, with silt, fine, brown to light brown (SP-SM)	50	9								
		4 5 8	13				50	10								
		5 6 5	11				70	11								
		1 3 4	7				30	12			9			25	SP-SM	
		3 5 6	11				30	13								
		4 4 4	8				50	14								
		1 3 4	7				50	15								
		2 3 3	6				50	16			8			26	SP-SM	
53.7	25.5	3 5 3	8				50	17								

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/22/14

Boring Designation TH-RP-06

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM: State Plane	HORIZONTAL: NAD83 / VERTICAL: NAVD88
		10. SIZE AND TYPE OF BIT: 2 15/16" Tricone	
2. HOLE NUMBER: **TH-RP-06**	LOCATION COORDINATES: N 1,507,680.8 E 602,771.6	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45	
3. DRILLING AGENCY: Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED: 36 / UNDISTURBED: 0
4. NAME OF DRILLER: Lee Tate and Tom Foster		13. TOTAL NUMBER CORE BOXES: 0	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL: --- / BEARING	14. ELEVATION GROUND WATER (ft): 74.9	
		15. DATE BORING	STARTED: 1/16/14 / COMPLETED: 1/16/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft): 79.3	
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING: N/A	
8. TOTAL DEPTH OF BORING (ft): 54.0		18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
77.8	1.5					**0' to 1.5':** SAND, fine, dark brown (SP)		1								
76.3	3.0					**1.5' to 3':** SAND, fine, light gray (SP)		2			4			23	SP	
74.8 ▼	4.5					**3' to 4.5':** SAND, fine, dark brown (SP)		3								
73.3	6.0	2 3	5			**4.5' to 6':** SAND, fine, trace roots, dark brown (SP)		4								
		2 2 2	4			**6' to 12':** SAND, fine, light to dark brown (SP)		5								
		2 1 1	2				70	6			4			26	SP	
		3 10 19	29				50	7								
67.3	12.0	1 6 6	12				50	8								
		2 5 5	10			**12' to 15':** SAND, fine, brown to dark brown (SP)	30	9								
64.3	15.0	1 2 2	4				25	10			4			28	SP	
		1 1 2	3			**15' to 30':** SAND, with silt, fine, light brown (SP-SM)	30	11								
		1 1 2	3				50	12								
		2 2 2	4				50	13								
		1 1 2	3				50	14			7			26	SP-SM	
		1 3 2	5				50	15								
		3 2 1	3				50	16								
		2 2 2	4				30	17								
		1 2 1	3				50	18			7			26	SP-SM	
		3 1 1	2				30	19								
49.3	30.0	0 0 0	WOH				50	20								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,507,680.8 E 602,771.6

ELEVATION TOP OF BORING (ft): 79.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
48.3	31.0	1 1 1	2			**30' to 31':** SAND, fine, dark gray (SP)	70	21								
46.3	33.0	0 0 0	WOR			**31' to 33':** SAND, silty, fine, dark gray (SM)	0	22								
45.3	34.0	1 2 5	7			**33' to 34':** SAND, coarse, with silt, dark gray (SP-SM)	50	23								
44.3	35.0	5 4 4	8			**34' to 35':** SAND, with silt, cemented, with shell fragments, gray (SP-SM)	70	24								
		7 7 4	11			**35' to 39':** SAND, silty, coarse, with shell fragments, calcareous, light gray (SM)	70	25			20			22	SM	
40.3	39.0	4 3 1	4				30	26								
		3 3 4	7			**39' to 42':** SAND, cemented, with shell fragments, calcareous, dark gray (SP)	30	27								
37.3	42.0	3 2 1	3				5	28								
35.8	43.5	1 1 1	2			**42' to 43.5':** CLAY, greenish gray (CH)	100	29			94	111	85	87	CH	
		0 1 0	1			**43.5' to 46.5':** CLAY, trace shell fragments, greenish gray (CH)	100	30								
32.8	46.5	2 3 3	6				100	31								
		2 3 4	7			**46.5' to 52.5':** SAND, clayey, few shell fragments, greenish brown (SC)	100	32								
		2 2 1	3				0	33								
		1 1 1	2				100	34			34	49	35	42	SC	
26.8	52.5	1 3 8	11				100	35								
25.3	54.0	4 16 36	52			**52.5' to 54':** SAND, coarse, with shell fragments, light brown (SP)	70	36								

30.0 / 32.5 / 35.0 / 37.5 / 40.0 / 42.5 / 45.0 / 47.5 / 50.0 / 52.5

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOR: weight of rod.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/22/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT	OUC LINED POND MODIFICATION
2. HOLE NUMBER	**TH-RP-07**
LOCATION COORDINATES	N 1,506,721.7 E 603,928.1
3. DRILLING AGENCY	Tetra Tech - AAI
4. NAME OF DRILLER	Lee Tate and Tom Foster
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG FROM VERTICAL	---
BEARING	
6. THICKNESS OF OVERBURDEN	
7. DEPTH DRILLED INTO ROCK	
8. TOTAL DEPTH OF BORING (ft)	55.5
9. COORDINATE SYSTEM	State Plane
HORIZONTAL	NAD83
VERTICAL	NAVD88
10. SIZE AND TYPE OF BIT	2 15/16" Tricone
11. MANUFACTURER'S DESIGNATION OF DRILL	CME-45
12. TOTAL SAMPLES	DISTURBED 37 / UNDISTURBED 0
13. TOTAL NUMBER CORE BOXES	0
14. ELEVATION GROUND WATER (ft)	
15. DATE BORING	STARTED 1/21/14 / COMPLETED 1/21/14
16. ELEVATION TOP OF BORING (ft)	79.3
17. TOTAL CORE RECOVERY FOR BORING	N/A
18. SIGNATURE AND TITLE OF INSPECTOR	Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
77.8	1.5					**0' to 1.5':** SAND, fine, dark brown (SP)		1								
76.3	3.0					**1.5' to 3':** SAND, silty, fine, dark brown (SM)		2			18			13	SM	
						3' to 10.5': SAND, with silt, fine, reddish brown to dark brown (SP-SM)		3								
		5 11	16					4								
		18 21 20	41					5								
		17 24 31	55					6			8			12	SP-SM	Organic Content = 1.8%
68.8	10.5	9 16 18	34					7								
67.3	12.0	9 13 11	24			**10.5' to 12':** SAND, with silt, fine, light brown to brown (SP-SM)	30	8								
65.8	13.5	3 9 13	22			**12' to 13.5':** SAND, with silt, fine, grayish brown (SP-SM)	50	9								
64.3	15.0	7 11 10	21			**13.5' to 15':** SAND, silty, fine, dark gray (SM)	50	10								
		4 7 8	15			**15' to 18':** SAND, clayey, fine, dark gray (SC)	50	11			23			14	SC	
61.3	18.0	5 9 11	20				50	12								
59.8	19.5	5 7 8	15			**18' to 19.5':** SAND, clayey, fine, greenish gray (SC)	50	13			24			18	SC	
58.3	21.0	7 7 6	13			**19.5' to 21':** SAND, with clay, fine, greenish gray (SP-SC)	50	14								
56.8	22.5	4 7 7	14			**21' to 22.5':** SAND, with clay, fine, light gray to gray (SP-SC)	50	15								
		5 7 6	13			**22.5' to 28.5':** SAND, silty, fine, light gray (SM)	70	16								
		6 6 6	12				70	17			13			24	SM	
		5 5 3	8				70	18								
50.8	28.5	5 5 5	10				50	19								
49.3	30.0	5 3 3	6			**28.5' to 30':** SAND, with clay, fine, greenish gray (SP-SC)	70	20								

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,721.7 E 603,928.1

ELEVATION TOP OF BORING (ft): 79.3

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
47.8	31.5	1 1 0	1			**30' to 31.5':** SAND, with clay, fine, dark gray (SP-SC)	30	21								
46.3	33.0	0 0 0	WOH			**31.5' to 33':** SAND, clayey, fine, greenish gray (SC)	60	22			19			30	SC	
44.8	34.5	3 5 6	11			**33' to 34.5':** SAND, cemented, gray (SP)	10	23								
		8 9 4	13			**34.5' to 39':** SAND, with clay, cemented, calcareous, gray (SP-SC)	50	24								
		4 1 2	3				10	25								
40.3	39.0	4 6 1	7				20	26								
		0 0 0	WOH			**39' to 42':** CLAY, trace cemented sand, greenish gray (CH)	100	27								
37.3	42.0	0 0 0	WOH				0	28								
		0 0 0	WOH			**42' to 45':** CLAY, greenish gray (CH)	60	29				60	43		CH	
34.3	45.0	1 0 0	WOH				100	30								
32.8	46.5	0 0 3	3			**45' to 46.5':** CLAY, trace cemented sand, greenish gray (CH)	5	31								
31.3	48.0	1 0 1	1			**46.5' to 48':** CLAY, sandy, greenish gray (CH)	100	32			69	61	44	64	CH	
		1 1 1	2			**48' to 52.5':** SAND, clayey, trace cemented sand, greenish gray (SC)	100	33								
		1 2 2	4				100	34								
26.8	52.5	2 2 1	3				100	35			25			39	SC	
		2 4 4	8			**52.5' to 55':** SAND, clayey, with shell fragments, greenish gray (SC)	100	36			22			29	SC	
24.3	55.0	2 8	24				100	37								
23.8	55.5	16				**55' to 55.5':** SAND, with shell fragments, light brown (SP)										

30.0 / 32.5 / 35.0 / 37.5 / 40.0 / 42.5 / 45.0 / 47.5 / 50.0 / 52.5 / 55.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH : weight of hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Appendix 7

Soil Boring Logs for
Proposed Existing North Coal Storage Area Runoff Pond Modifications

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM: State Plane	HORIZONTAL: NAD83 / VERTICAL: NAVD88
		10. SIZE AND TYPE OF BIT: 2 15/16" Tricone	
2. HOLE NUMBER: TH-CSAN-01	LOCATION COORDINATES: N 1,508,616.6 E 600,778.3	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45	
3. DRILLING AGENCY: Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED: 17 / UNDISTURBED: 0
4. NAME OF DRILLER: Lee Tate and Tom Foster		13. TOTAL NUMBER CORE BOXES: 0	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL: --- / BEARING	14. ELEVATION GROUND WATER (ft): 75.0	
		15. DATE BORING	STARTED: 1/24/14 / COMPLETED: 1/24/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft): 80.8	
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING: N/A	
8. TOTAL DEPTH OF BORING (ft): 25.5		18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
79.3	1.5					**0' to 1.5':** SAND, fine, dark gray (SP)		1								
						1.5' to 4.5': SAND, fine, trace roots and organics, dark gray (SP)		2								
76.3	4.5							3	0	96	4			12	SP	Organic Content: 2.4%
74.8 ▼	6.0	7 7	14			**4.5' to 6':** SAND, with silt, fine, gray to dark gray (SP-SM)		4								
		5 6 7	13			**6' to 9':** SAND, with silt, fine, trace roots (SP-SM)		5								
71.8	9.0	4 4 6	10					6								
		4 7 12	19			**9' to 12':** SAND, with silt, fine, reddish brown (SP-SM)		7			9			27	SP-SM	
68.8	12.0	4 8 9	17				70	8								
67.3	13.5	4 7 10	17			**12' to 13.5':** SAND, with silt, fine, trace roots, brown (SP-SM)	50	9								
		6 7 11	18			**13.5' to 25.5':** SAND, with silt, fine, light brown (SP-SM)	50	10								
		3 6 6	12				40	11								
		3 4 5	9				40	12								
		2 3 4	7				50	13								
		2 2 3	5				50	14								
		2 3 3	6				50	15			6			26	SP-SM	
		2 2 2	4				50	16								
55.3	25.5	2 3 3	6				50	17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-02**; LOCATION COORDINATES: N 1,508,923.8 E 600,889.9	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 17; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Tom Foster	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 74.9
	15. DATE BORING: STARTED 1/21/14; COMPLETED 1/21/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.1
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 25.5	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 3': SAND, with silt, fine, trace roots, dark brown (SP-SM)		1								
76.1	3.0							2								
						3' to 6': SAND, with silt, fine, dark gray (SP-SM)		3								
73.1	6.0	3 4	7					4								
		5 6 9	15			**6' to 12':** SAND, with silt, fine, trace roots and organics, dark brown (SP-SM)		5			5			21	SP-SM	Organic Content: 2.4%
		7 10 10	20				80	6								
		3 5 7	12				40	7								
67.1	12.0	3 5 7	12				50	8								
		6 8 17	25			**12' to 15':** SAND, silty, fine, dark reddish brown (SM)	70	9			13			27	SM	
64.1	15.0	8 12 11	23				70	10								
		14 25 14	39			**15' to 18':** SAND, with silt, fine, dark reddish brown (SP-SM)	100	11								
61.1	18.0	9 14 20	34				70	12			11			22	SP-SM	
		9 12 13	25			**18' to 25.5':** SAND, with silt, fine, brown to light brown (SP-SM)	70	13								
		3 5 7	12				60	14								
		4 5 8	13				60	15								
		4 6 7	13				50	16								
53.6	25.5	4 6 6	12				50	17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-03**; LOCATION COORDINATES: N 1,509,327.1 E 601,169.3	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 52; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Mike Baker	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 75.4
	15. DATE BORING: STARTED 2/10/14; COMPLETED 2/10/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 80.3
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 78.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 12': SAND, fine, light brown to brown (SP)		1								
								2								
								3								
		6 11 9	20				100	4			4			19	SP	
		5 6 6	12				100	5								
		3 4 6	10				100	6								
		7 7 7	14				50	7								
68.3	12.0	2 3 3	6				40	8								
		1 2 2	4			**12' to 19.5':** SAND, with silt, fine, trace organics, dark brown (SP-SM)	30	9								
		2 3 4	7				30	10			5			29	SP-SM	Organic Content: 1.6%
		1 2 3	5				30	11								
		2 5 7	12				30	12								
60.8	19.5	0 0 6	6				10	13								
59.3	21.0	5 4 4	8			**19.5' to 21':** SAND, silty, fine, brown (SM)	50	14			21			19	SM	
		7 8 10	18			**21' to 36':** SAND, with silt, fine, light brown (SP-SM)	50	15								
		7 6 5	11				50	16								
		1 5 7	12				40	17								
		4 5 6	11				30	18			8			27	SP-SM	
		3 4 5	9				30	19								
		1 5 6	11				30	20								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,509,327.1 E 601,169.3

ELEVATION TOP OF BORING (ft): 80.3

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		3 5 3	8			**21' to 36':** SAND, with silt, fine, light brown (SP-SM) *(continued)*	40	21								
		5 7 6	13				40	22								
		3 3 5	8				60	23								
44.3	36.0	3 2 3	5				60	24								
		2 3 3	6			**36' to 42':** SAND, clayey, fine, dark gray (SC)	50	25								
		4 4 5	9				50	26			21			26	SC	
		2 6 6	12				30	27								
38.3	42.0	3 5 3	8				20	28								
		0 0 1	1			**42' to 46.5':** CLAY, dark greenish gray (CH)	100	29								
		0 1 2	3				80	30			86			43	CH	
33.8	46.5	0 1 4	5				90	31								
		1 1 1	2			**46.5' to 49':** CLAY, with sand, trace shell fragments, dark greenish gray (CH)	90	32			81	74	57	67	CH	
31.3	49.0	0 0 0	WOH				100	33								
		0 0 0	WOH			**49' to 56':** CLAY, trace shell fragments, greenish gray to dark gray (CH)	100	34								
		0 0 0	WOH				30	35			98	103	80	91	CH	
		0 0 0	WOH				100	36								
		0 0 0	WOH				100	37								
24.3	56.0	0 0 0	WOH				100	38								
		0 1 3	4			**56' to 58.5':** SAND, clayey, with shell fragments, dark gray (SC)	100	39			27	42	27	36	SC	
21.8	58.5	6 17 26	43			**58.5' to 60':** SAND, with clay, fine, with shell fragments, dark gray (SP-SC)	30	40								
20.3	60.0	15 20 22	42			**60' to 64.5':** SAND, fine, cemented, with shell fragments, dark gray (SP)	60	41								
		10 16 21	37				50	42								
15.8	64.5	11 16 17	33				75	43								
		7 8 10	18			**64.5' to 66':** SAND, clayey, fine, trace shell fragments, dark gray (SC)	75	44			43			34	SC	
14.3	66.0	6														

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,509,327.1 E 601,169.3

ELEVATION TOP OF BORING (ft): 80.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS	
		7 7	14			**66' to 70.5':** SAND, fine, with shell fragments, gray (SP) *(continued)*	60	45									
		3 5 8	13				50	46									67.5
9.8	70.5	4 4 4	8				50	47									70.0
8.3	72.0	4 2 2	4			**70.5' to 72':** SAND, with clay, fine, with shell fragments, gray (SP-SC)	70	48									
6.8	73.5	2 2 3	5			**72' to 73.5':** SAND, clayey, with shell fragments, gray (SC)	90	49									72.5
		2 1 2	3			**73.5' to 78':** CLAY, sandy, trace shell fragments, gray (CH)	0	50									
		5 3 3	6				100	51			50			32	CH		75.0
2.3	78.0	2 4 4	8				100	52									77.5

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOH: weight of hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-04**; LOCATION COORDINATES: N 1,509,112.2 E 601,520.8	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 17; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Mike Baker	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 75.5
	15. DATE BORING: STARTED 2/11/14; COMPLETED 2/11/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.5
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 25.5	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.0	1.5					**0' to 1.5':** SAND, trace roots, dark brown (SP)		1								
						1.5' to 4.5': SAND, fine, dark brown to brown (SP)		2			4			16	SP	
75.0	4.5							3								
		1 2 3	5			**4.5' to 9':** SAND, with silt, fine, dark brown (SP-SM)	30	4								
		4 7 7	14				30	5								
70.5	9.0	5 5 6	11				100	6								
		1 2 2	4			**9' to 13.5':** SAND, with silt, fine, trace roots, dark brown (SP-SM)	25	7			5			39	SP-SM	
		1 2 3	5				50	8								
66.0	13.5	3 5 7	12				50	9								
		5 5 4	9			**13.5' to 17.5':** SAND, silty, fine, trace roots, light brown to grayish brown (SM)	50	10								
		8 3 4	7				50	11			19	19	2	21	SM	
62.0	17.5	3 6 5	11				50	12								
		2 2 3	5			**17.5' to 25.5':** SAND, with silt, fine, light brown (SP-SM)	50	13								
		2 3 5	8				50	14								
		4 5 6	11				50	15			8			25	SP-SM	
		2 3 3	6				50	16								
54.0	25.5	2 2 3	5					17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-05**; LOCATION COORDINATES: N 1,509,095.1 E 600,606.4	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 13; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Graham Bowder	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 76.4
	15. DATE BORING: STARTED 6/17/14; COMPLETED 6/17/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.5
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 20.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.0	1.5					**0' to 1.5':** SAND, with roots, dark brown (SP)		1								
76.5	3.0					**1.5' to 3':** SAND, fine, with roots, dark brown to brown (SP)		2			5			19	SP	
75.0	4.5					**3' to 4.5':** SAND, with silt, fine, with roots, dark brown (SP-SM)		3								
73.5	6.0	1 3 3	6			**4.5' to 6':** SAND, fine, brown (SP)		4								
72.0	7.5	4 5 5	10			**6' to 7.5':** SAND, with silt, fine, dark grayish brown (SP-SM)		5								
70.5	9.0	10 15 38	53			**7.5' to 9':** SAND, with silt, fine, dark brown (SP-SM)		6			8			27	SP-SM	Organic Content: 3.7%
69.0	10.5	38 50 /5"	50 /5"			**9' to 10.5':** SAND, with silt, fine, dark reddish brown (SP-SM)	70	7								
67.5	12.0	9 13 13	26			**10.5' to 12':** SAND, fine, light brown (SP)	50	8								
66.0	13.5	7 10 13	23			**12' to 13.5':** SAND, with silt, fine, light brown (SP-SM)	50	9								
64.5	15.0	6 10 10	20			**13.5' to 15':** SAND, with silt, fine, slightly cemented, light brown (SP-SM)	50	10			6			25	SP-SM	
		4 6 9	15			**15' to 18':** SAND, with silt, fine, light brown (SP-SM)	50	11								
61.5	18.0	2 5 7	12				50	12								
59.5	20.0	3 4 4 5	8			**18' to 20':** SAND, with silt, light brown to light gray (SP-SM)	70	13								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-06**; LOCATION COORDINATES: N 1,508,812.5 E 600,585.9	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 13; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Graham Bowder	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft): 77.2
	15. DATE BORING: STARTED 6/17/14; COMPLETED 6/17/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 80.4
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 20.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.9	1.5					**0' to 1.5':** SAND, with silt, fine, trace roots, dark brown (SP-SM)		1								
						1.5' to 3': SAND, with silt, fine, with roots, dark brown (SP-SM)		2								
77.4	3.0															
75.9	4.5					**3' to 4.5':** SAND, with silt, fine, dark brown (SP-SM)		3								
74.4	6.0	7 21 28	49			**4.5' to 6':** SAND, with silt, fine, with roots, dark gray (SP-SM)		4			8			17	SP-SM	Organic Content: 1.8%
72.9	7.5	29 24 31	55			**6' to 7.5':** SAND, with silt, fine, with roots, gray to dark brown (SP-SM)		5								
71.4	9.0	19 15 15	30			**7.5' to 9':** SAND, with silt, fine, dark brown (SP-SM)		6								
69.9	10.5	20 50 /5"	50 /5"			**9' to 10.5':** SAND, with silt, fine, trace roots, dark brown (SP-SM)	100	7								
68.4	12.0	20 27 33	60			**10.5' to 12':** SAND, with silt, fine, orangish brown (SP-SM)	80	8			7			26	SP-SM	Organic Content: 2.7%
66.9	13.5	24 28 27	55			**12' to 13.5':** SAND, silty, fine, slightly cemented, orangish brown (SM)	70	9								
65.4	15.0	7 10 12	22			**13.5' to 15':** SAND, fine, brown (SP)	50	10								
		5 10 11	21			**15' to 20':** SAND, fine, light brown (SP)	80	11								
		4 6 13	19				50	12			5			22	SP	
		9 7 8	15				70	13								
60.4	20.0	11														

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Appendix 8

Soil Boring Logs for
Proposed Existing South Coal Storage Area Runoff Pond Modifications

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM: State Plane	HORIZONTAL: NAD83 / VERTICAL: NAVD88
		10. SIZE AND TYPE OF BIT: 2 15/16" Tricone	
2. HOLE NUMBER: TH-CSAS-01	LOCATION COORDINATES: N 1,507,794.8 E 601,361.3	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45	
3. DRILLING AGENCY: Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED: 17 / UNDISTURBED: 0
4. NAME OF DRILLER: Lee Tate and Tom Foster		13. TOTAL NUMBER CORE BOXES: 0	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL: --- / BEARING	14. ELEVATION GROUND WATER (ft): 75.8	
		15. DATE BORING	STARTED: 1/14/14 / COMPLETED: 1/14/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft): 79.1	
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING: N/A	
8. TOTAL DEPTH OF BORING (ft): 25.5		18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 5': SAND, fine, dark brown (SP)		1								
								2			3			21	SP	
								3								
74.1	5.0	5 5	10			**5' to 9':** SAND, with silt, fine, dark brown (SP-SM)	80	4								
		4 5 5	10				70	5								
70.1	9.0	2 3 5	8				100	6								
		12 16 16	32			**9' to 12':** SAND, with silt, fine, dark brown to orange (SP-SM)	60	7			7			24	SP-SM	
67.1	12.0	7 7 6	13				30	8								
65.6	13.5	4 5 6	11			**12' to 13.5':** SAND, fine, light brown (SP)	30	9								
		3 6 4	10			**13.5' to 21':** SAND, fine, light gray to brown (SP)	30	10								
		0 0 1	1					11								
		4 5 6	11				50	12			4			24	SP	
		2 2 3	5				50	13								
58.1	21.0	3 5 6	11				50	14								
		3 5 6	11			**21' to 25.5':** SAND, with silt, fine, light gray (SP-SM)	50	15								
		2 3 5	8				50	16			7			27	SP-SM	
53.6	25.5	2 4 4	8				50	17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Boring Designation TH-CSAS-02

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM: State Plane	HORIZONTAL: NAD83 / VERTICAL: NAVD88
		10. SIZE AND TYPE OF BIT: 2 15/16" Tricone	
2. HOLE NUMBER: **TH-CSAS-02**	LOCATION COORDINATES: N 1,507,809.2 E 601,101.3	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45	
3. DRILLING AGENCY: Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED: 17 / UNDISTURBED: 0
4. NAME OF DRILLER: Lee Tate and Tom Foster		13. TOTAL NUMBER CORE BOXES: 0	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL: --- / BEARING	14. ELEVATION GROUND WATER (ft): 75.7	
		15. DATE BORING	STARTED: 1/14/14 / COMPLETED: 1/14/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft): 80.2	
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING: N/A	
8. TOTAL DEPTH OF BORING (ft): 25.5		18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
78.7	1.5					**0' to 1.5':** SAND, fine, brown (SP)		1								
						1.5' to 5': SAND, fine, trace organics, brown (SP)		2			3			14	SP	
								3						22	SP	Organic Content: 0.9%
75.2	5.0	5 6	11					4								
		2 8 10	18			**5' to 9':** SAND, with silt, fine, trace organics, dark gray to brown (SP-SM)		5								
71.2	9.0	10 13 11	24				70	6			10			19	SP-SM	Organic Content: 2.1%
		2 3 2	5			**9' to 13.5':** SAND, with silt, fine, dark brown (SP-SM)	50	7								
		3 3 6	9				60	8								
66.7	13.5	5 12 15	27				50	9			7			25	SP-SM	Organic Content: 4.1%
65.2	15.0	3 6 6	12			**13.5' to 15':** SAND, fine, orangish brown (SP)	30	10								
		2 2 2	4			**15' to 25.5':** SAND, fine, light brown to brown (SP)	30	11								
		1 1 3	4				25	12								
		1 2 2	4				50	13								
		1 2 2	4				25	14			4			23	SP	
		2 1 3	4				30	15								
		1 3 3	6				50	16								
54.7	25.5	1 2 2	4				40	17								

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAS-03**; LOCATION COORDINATES: N 1,508,169.3 E 601,384.7	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 54; UNDISTURBED 0
4. NAME OF DRILLER: Lee Tate and Tom Foster	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED 1/15/14; COMPLETED 1/15/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.8
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 81.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 9': SAND, with silt, fine, dark brown (SP-SM)		1			7			7	SP-SM	
								2								
								3								
		3 8	11					4			6			11	SP-SM	
		7 6 5	11					5								
70.8	9.0	2 3 3	6					6								
		2 1 1	2			**9' to 11':** SAND, with silt, fine, with wood fragments, dark brown to gray (SP-SM)		7								
68.8	11.0	1 2 1	3			**11' to 13.5':** SAND, with silt, fine, trace organics, dark brown (SP-SM)		8								
66.3	13.5	1 2 2	4				30	9			10			31	SP-SM	
		4 6 5	11			**13.5' to 19.25':** SAND, with silt, fine, dark brown (SP-SM)	30	10								
		1 0 1	1				30	11								
		6 10 10	20				40	12			10			30	SP-SM	
60.6	19.3	3 4 7	11				50	13								
		5 5 7	12			**19.25' to 27':** SAND, fine, light brown to gray (SP)	25	14								
		5 7 8	15				50	15								
		7 8 8	16				30	16								
		2 4 5	9				40	17								
52.8	27.0	5 6 6	12				30	18								
		4 3 3	6			**27' to 42':** SAND, with silt, fine, light brown to gray (SP-SM)	25	19								
		3 3 4	7				40	20			7			26	SP-SM	

0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,508,169.3 E 601,384.7

ELEVATION TOP OF BORING (ft): 79.8

ELEV (ft)	DEPTH (ft)	Blows/0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
		3 3 4	7			**27' to 42':** SAND, with silt, fine, light brown to gray (SP-SM) *(continued)*	40	21								
		3 2 3	5				25	22								
		2 2 2	4				30	23								
		1 1 2	3				50	24								
		2 2 2	4				50	25			9			31	SP-SM	
		2 4 5	9				50	26								
		4 4 3	7				30	27								
37.8	42.0	5 4 5	9				50	28								
		4 3 2	5			**42' to 48':** SAND, silty, fine, gray to dark gray (SM)	60	29			17			27	SM	
		3 6 7	13				50	30								
		2 5 8	13				50	31								
31.8	48.0	5 5 4	9				20	32								
		0 0 1	1			**48' to 51':** CLAY, with sand, trace shell fragments, dark gray (CH)	100	33			71	56	41	56	CH	
28.8	51.0	0 0 0	WOR				100	34								
		0 0 0	WOH			**51' to 56':** CLAY, sandy, dark gray (CH)	100	35								
		0 0 0	WOR				40	36			66	53	39	56	CH	
		0 0 0	WOH				70	37								
23.8	56.0	0 2 2	4			**56' to 67':** SAND, clayey, with shell fragments, dark gray (SC)	80	38			31	43	29	35	SC	
		0 0 0	WOR				0	39								
		1 0 1	1				60	40								
		0 1 0	1				40	41								
		0 1 1	2				80	42								
		1 2 2	4				100	43								
		1 3 5	8				100	44			17	30	13	33	SC	
		6														

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,508,169.3 E 601,384.7

ELEVATION TOP OF BORING (ft): 79.8

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
12.8	67.0	6 6	12				50	45								
		2 3 5	8			**67' to 69.5':** SAND, silty, fine, dark gray (SM)	20	46			20			35	SM	
10.3	69.5	4 9 8	17			**69.5' to 70':** MOSTLY SHELL, fragments, light brown	50	47								
9.8	70.0	3 3 3	6			**70' to 81':** SAND, clayey, some shell fragments, gray (SC)	100	48			18			35	SC	
		3 2 2	4				50	49				31	13	19	SC	
		2 3 2	5				60	50								
		3 3 4	7				80	51								
		4 4 5	9				50	52								
		4 4 3	7				80	53			44			33	SC	
		4 4 6	10				80	54								
-1.2	81.0															

67.5 70.0 72.5 75.0 77.5 80.0

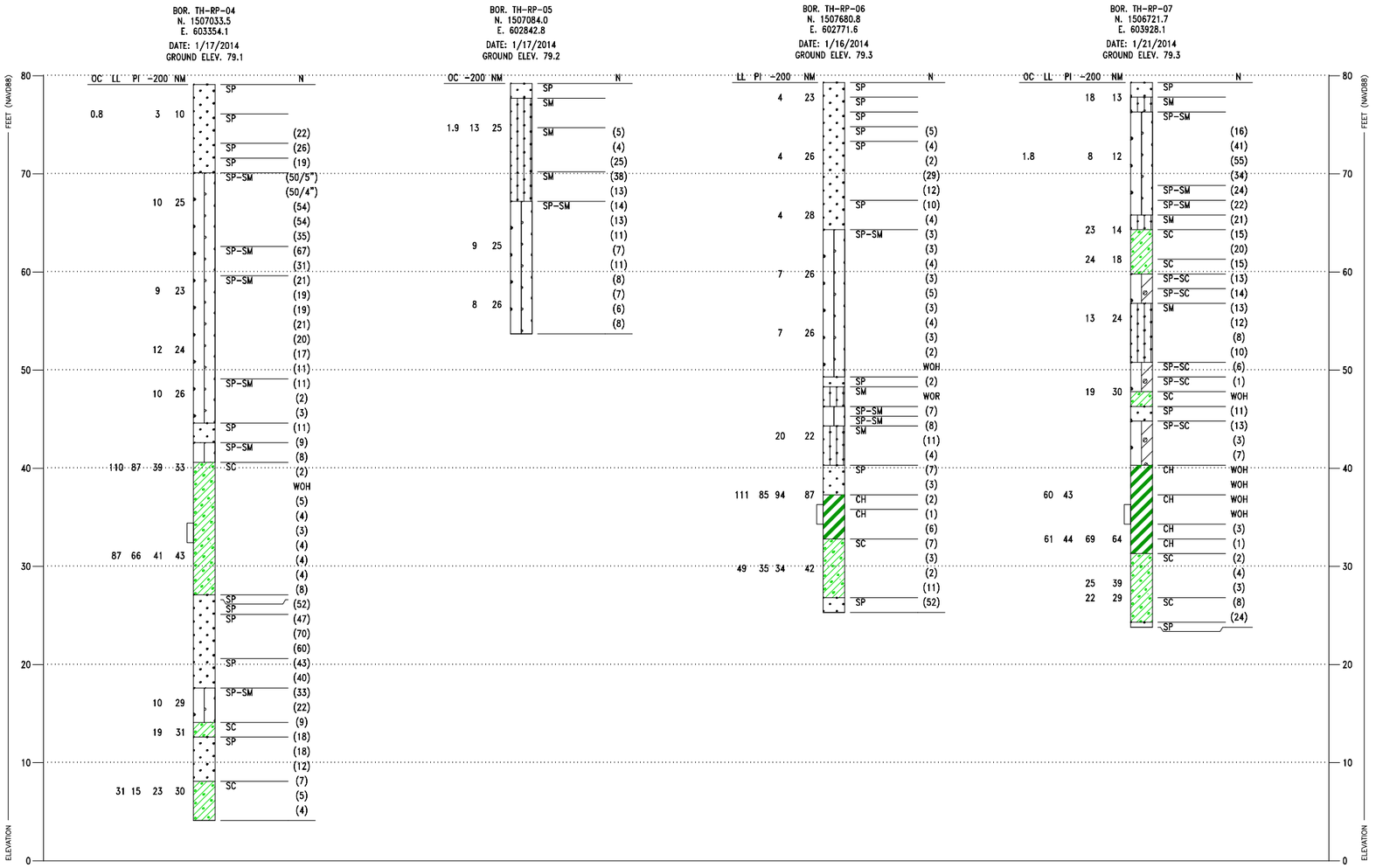
NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.
4. WOR: weight of rod.
5. WOH: weight of hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Appendix 9

Soil Boring Profiles for
Proposed Recycle Pond Expansion and Existing Recycle Pond



SOIL BORING PROFILES

VERTICAL SCALE: 1" = 6'
HORIZONTAL SCALE: NOT TO SCALE

0 100 200
SCALE: 1"=200'

AERIAL PHOTOGRAPH SOURCE: GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

- SP – SAND
- SP-SM – SAND WITH SILT
- SP-SC – SAND WITH CLAY
- SM – SILTY SAND
- SC – CLAYEY SAND
- CH – FAT CLAY
- N — STANDARD PENETRATION TEST (SPT) RESISTANCE IN BLOWS PER FOOT
- NM — NATURAL MOISTURE CONTENT IN PERCENT (ASTM D2216)
- -200 — PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D1140)
- OC — ORGANIC CONTENT IN PERCENT (ASTM D2974)
- LL — LIQUID LIMIT IN PERCENT (ASTM D423)
- PI — PLASTICITY INDEX IN PERCENT (ASTM D424)
- WOH — SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS
- WOR — SAMPLER ADVANCED BY STATIC WEIGHT OF RODS ONLY
- k_v — LABORATORY PERMEABILITY (cm/sec) ON SHELBY TUBE SAMPLE FROM A VERTICAL ORIENTATION
- UNDISTURBED SAMPLE OBTAINED WITH A 3-INCH DIA. SHELBY TUBE

NOTE:

1. N VALUES REPORTED ARE FROM CONTINUOUS SPTs.

SOIL BORING PROFILES IN RECYCLE POND

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	05/12/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		-

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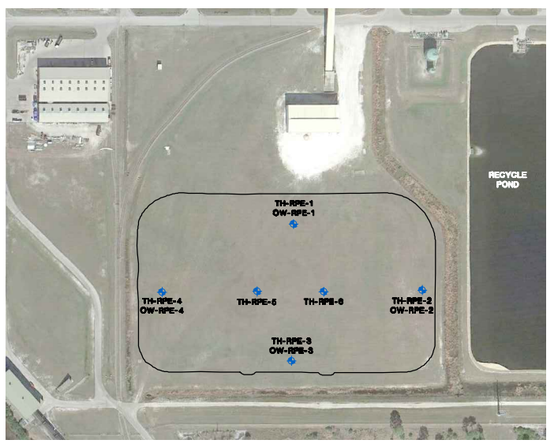

AERIAL PHOTOGRAPH SOURCE: GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

- SP – SAND
- SP-SM – SAND WITH SILT
- SM – SILTY SAND
- SC – CLAYEY SAND
- CL – LEAN CLAY
- CH – FAT CLAY
- SHELL
- NS – NO SAMPLE

- N — STANDARD PENETRATION TEST (SPT) RESISTANCE IN BLOWS PER FOOT
- NM — NATURAL MOISTURE CONTENT IN PERCENT (ASTM D2216)
- -200 — PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D1140)
- OC — ORGANIC CONTENT IN PERCENT (ASTM D2974)
- LL — LIQUID LIMIT IN PERCENT (ASTM D423)
- PI — PLASTICITY INDEX IN PERCENT (ASTM D424)
- ▽ — GROUNDWATER LEVEL (FEET, NAVD 88)
- WOH — SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS
- WOR — SAMPLER ADVANCED BY STATIC WEIGHT OF RODS ONLY
- k_v — LABORATORY PERMEABILITY (cm/sec) ON SHELBY TUBE SAMPLE FROM A VERTICAL ORIENTATION
- UNDISTURBED SAMPLE OBTAINED WITH A 3-INCH DIA. SHELBY TUBE

NOTE:

1. N VALUES REPORTED ARE FROM CONTINUOUS SPTs.

SOIL BORING PROFILES OF RECYCLE POND EXPANSION

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	05/12/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	-

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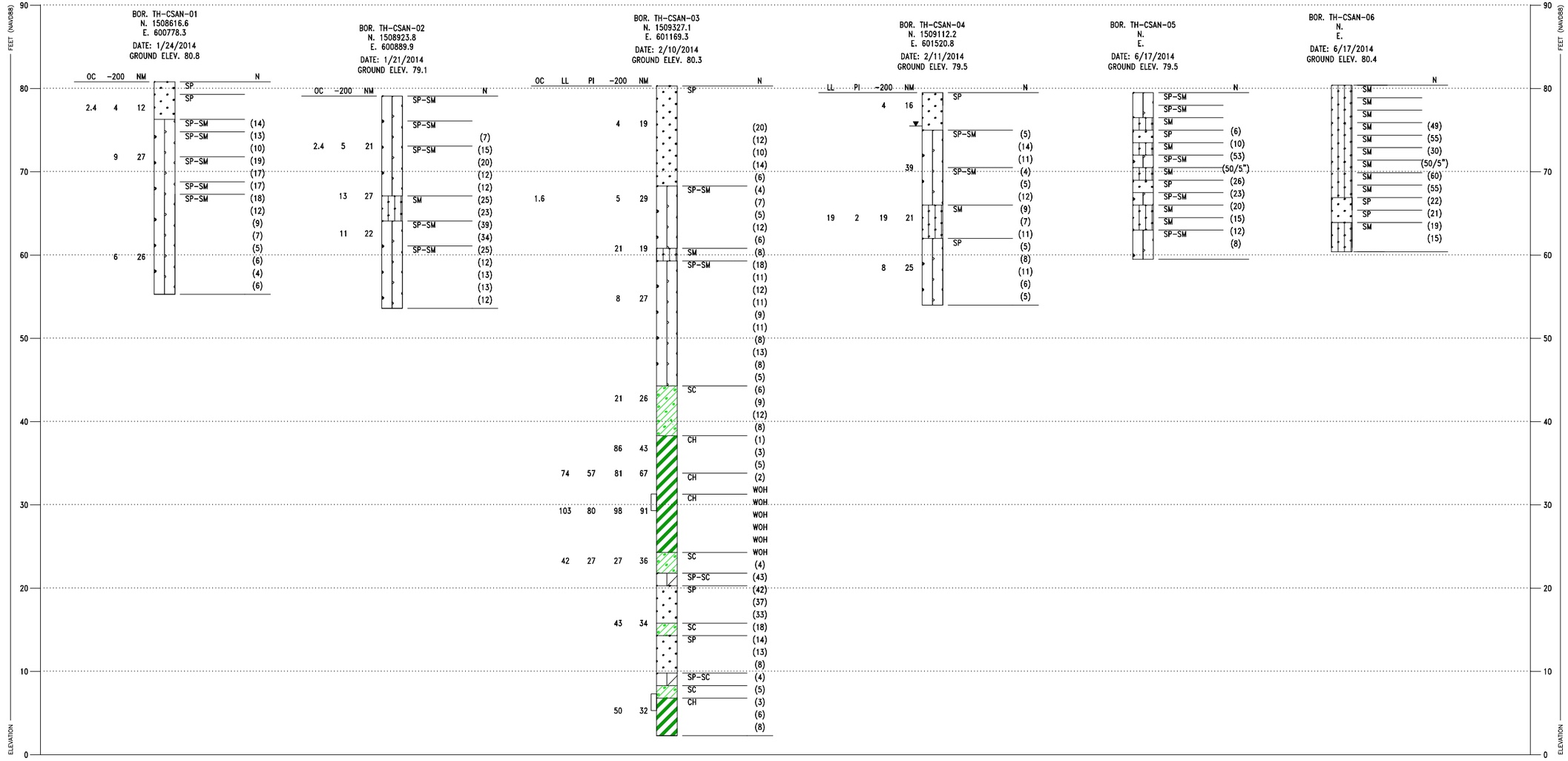
Appendix 10

Soil Boring Profiles for
Existing North and South Coal Storage Area Runoff Ponds



SOIL BORING PROFILES

VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: NOT TO SCALE

0 100 200
SCALE: 1"=200'

AERIAL PHOTOGRAPH SOURCE: GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

- SP – SAND
- SP-SM – SAND WITH SILT
- SP-SC – SAND WITH CLAY
- SM – SILTY SAND
- SC – CLAYEY SAND
- CH – FAT CLAY
- N — STANDARD PENETRATION TEST (SPT) RESISTANCE IN BLOWS PER FOOT
- NM — NATURAL MOISTURE CONTENT IN PERCENT (ASTM D2216)
- -200 — PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D1140)
- OC — ORGANIC CONTENT IN PERCENT (ASTM D2974)
- LL — LIQUID LIMIT IN PERCENT (ASTM D423)
- PI — PLASTICITY INDEX IN PERCENT (ASTM D424)
- ▼ — GROUNDWATER LEVEL (FEET, NAVD 88)
- WOH — SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS
- k_v — LABORATORY PERMEABILITY (cm/sec) ON SHELBY TUBE SAMPLE FROM A VERTICAL ORIENTATION
- UNDISTURBED SAMPLE OBTAINED WITH A 3-INCH DIA. SHELBY TUBE

NOTE:

1. N VALUES REPORTED ARE FROM CONTINUOUS SPTs.

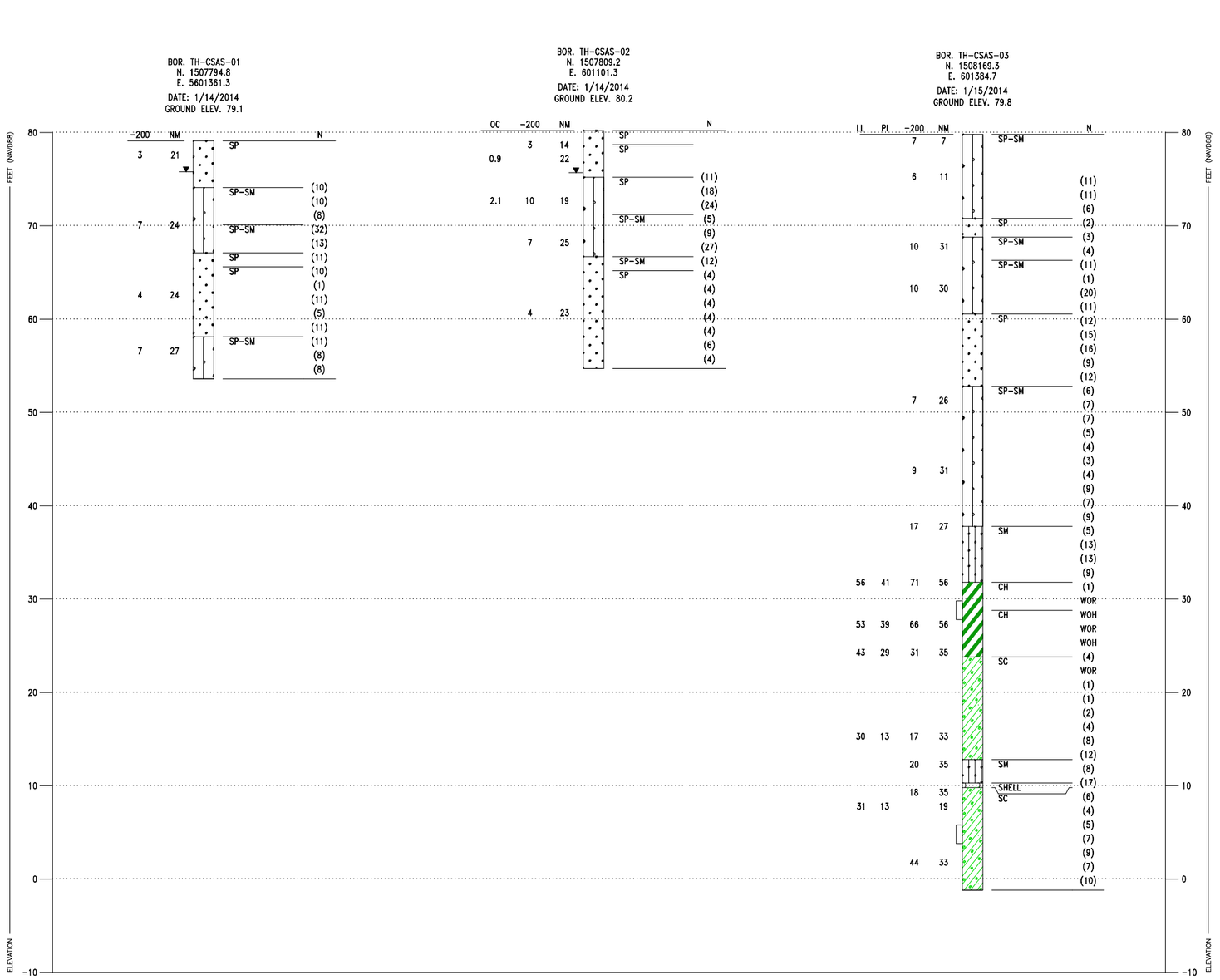
SOIL BORING PROFILES IN NORTH COAL STORAGE AREA RUNOFF POND

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	BTW	CHECKED BY:	JM	DATE:	05/12/14
FILE NO.	13-13-0166	APPROVED BY:		FIGURE:	-



SOIL BORING PROFILES

VERTICAL SCALE: 1" = 6'
HORIZONTAL SCALE: NOT TO SCALE

0 100 200
SCALE: 1"=200'

AERIAL PHOTOGRAPH SOURCE: GOOGLE, INC. UNDER LICENSE BY TETRA TECH, INC. USING GOOGLE EARTH PROFESSIONAL

FLIGHT DATE: JANUARY 2013

LEGEND

- SP – SAND
- SP-SM – SAND WITH SILT
- SM – SILTY SAND
- SC – CLAYEY SAND
- CH – FAT CLAY
- SHELL
- N — STANDARD PENETRATION TEST (SPT) RESISTANCE IN BLOWS PER FOOT
- NM — NATURAL MOISTURE CONTENT IN PERCENT (ASTM D2216)
- -200 — PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D1140)
- OC — ORGANIC CONTENT IN PERCENT (ASTM D2974)
- LL — LIQUID LIMIT IN PERCENT (ASTM D423)
- PI — PLASTICITY INDEX IN PERCENT (ASTM D424)
- ▼ — GROUNDWATER LEVEL (FEET, NAVD 88)
- WOH — SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS
- WOR — SAMPLER ADVANCED BY STATIC WEIGHT OF RODS ONLY
- k_v — LABORATORY PERMEABILITY (cm/sec) ON SHELBY TUBE SAMPLE FROM A VERTICAL ORIENTATION
- UNDISTURBED SAMPLE OBTAINED WITH A 3-INCH DIA. SHELBY TUBE

NOTE:

1. N VALUES REPORTED ARE FROM CONTINUOUS SPTs.

SOIL BORING PROFILES IN SOUTH COAL STORAGE AREA RUNOFF POND

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS OUC STANTON ENERGY CENTER ORANGE COUNTY, FLORIDA

DRAWN BY:	CHECKED BY:	DATE:
BTW	JM	05/12/14

FILE NO.	APPROVED BY:	FIGURE:
13-13-0166		-

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Appendix 11

Wash Boring Logs

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RP-06-US**; LOCATION COORDINATES: N 1,507,680.8 E 602,771.6	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED: 0; UNDISTURBED: 1
4. NAME OF DRILLER: Lee Tate and Tom Foster	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED: 1/24/14; COMPLETED: 1/24/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.3
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 45.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 43': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,507,680.8 E 602,771.6

ELEVATION TOP OF BORING (ft): 79.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 43': WASH *(continued)*										
36.3	43.0					**43' to 45':** CLAY, with sand, trace shell, greenish gray (CH)		US-1			84	139	109	92	CH	
34.3	45.0															

30.0 32.5 35.0 37.5 40.0 42.5 45.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Boring Designation TH-RP-07-US

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RP-07-US**; LOCATION COORDINATES: N 1,506,721.7 E 603,928.1	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED: 0; UNDISTURBED: 1
4. NAME OF DRILLER: Lee Tate and Tom Foster	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED: 1/24/14; COMPLETED: 1/24/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.3
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 45.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 43': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

SPK FORM 1836-A
SEP 05

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,721.7 E 603,928.1

ELEVATION TOP OF BORING (ft): 79.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 43': WASH *(continued)*										
36.3	43.0					**43' to 45':** CLAY, sandy, greenish gray (CH)		US-1			55	56	39	54	CH	
34.3	45.0															

30.0 32.5 35.0 37.5 40.0 42.5 45.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Boring Designation TH-RPE-02-US

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS

1. PROJECT OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM State Plane	HORIZONTAL NAD83 / VERTICAL NAVD88
		10. SIZE AND TYPE OF BIT	2 15/16" Tricone
2. HOLE NUMBER **TH-RPE-02-US**	LOCATION COORDINATES N 1,506,956.1 E 602,316.8	11. MANUFACTURER'S DESIGNATION OF DRILL CME-45	
3. DRILLING AGENCY Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED 0 / UNDISTURBED 1
4. NAME OF DRILLER Mason Brackins and Coy Jones		13. TOTAL NUMBER CORE BOXES	0
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	14. ELEVATION GROUND WATER (ft)	
		15. DATE BORING	STARTED 1/17/14 / COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft)	79.4
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING	N/A
8. TOTAL DEPTH OF BORING (ft)	44.0	18. SIGNATURE AND TITLE OF INSPECTOR David Morris Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 42': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,956.1 E 602,316.8

ELEVATION TOP OF BORING (ft): 79.4

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 42': WASH *(continued)*										
37.4	42.0					**42' to 44':** CLAY, greenish gray (CH)	90	US-1			96	141	113	100	CH	
35.4	44.0															

30.0 32.5 35.0 37.5 40.0 42.5

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Boring Designation TH-RPE-03-US

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS

1. PROJECT OUC LINED POND MODIFICATION		9. COORDINATE SYSTEM State Plane	HORIZONTAL NAD83 / VERTICAL NAVD88
		10. SIZE AND TYPE OF BIT	2 15/16" Tricone
2. HOLE NUMBER **TH-RPE-03-US**	LOCATION COORDINATES N 1,506,746.4 E 601,929.2	11. MANUFACTURER'S DESIGNATION OF DRILL CME-45	
3. DRILLING AGENCY Tetra Tech - AAI		12. TOTAL SAMPLES	DISTURBED 0 / UNDISTURBED 1
4. NAME OF DRILLER Mason Brackins and Coy Jones		13. TOTAL NUMBER CORE BOXES	0
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	14. ELEVATION GROUND WATER (ft)	
		15. DATE BORING	STARTED 1/17/14 / COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN		16. ELEVATION TOP OF BORING (ft)	78.3
7. DEPTH DRILLED INTO ROCK		17. TOTAL CORE RECOVERY FOR BORING	N/A
8. TOTAL DEPTH OF BORING (ft)	42.5	18. SIGNATURE AND TITLE OF INSPECTOR David Morris Staff Engineer	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 40.5': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,746.4 E 601,929.2

ELEVATION TOP OF BORING (ft): 78.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 40.5': WASH *(continued)*										
37.8	40.5															
						40.5' to 42.5': CLAY, trace shell fragments, gray (CH)		US-1			99	129	103	91	CH	
35.8	42.5															

30.0
32.5
35.0
37.5
40.0
42.5

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 2 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RPE-04-US**; LOCATION COORDINATES: N 1,506,950.1 E 601,544.5	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 0; UNDISTURBED 1
4. NAME OF DRILLER: Mason Brackins and Coy Jones	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED 1/17/14; COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.0
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 50.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 48': WASH										

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 2 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,950.1 E 601,544.5

ELEVATION TOP OF BORING (ft): 79.0

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 48': WASH *(continued)*										
31.0	48.0															
						48' to 50': CLAY, with sand, with shell fragments, greenish gray (CH)	70	US-1			83	74	50	50	CH	
29.0	50.0															

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE.MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-RPE-06-US**; LOCATION COORDINATES: N 1,506,951.0 E 602,024.0	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 0; UNDISTURBED 2
4. NAME OF DRILLER: Mason Brackins and Coy Jones	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED 1/17/14; COMPLETED 1/17/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.6
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 77.5	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 45': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,951.0 E 602,024.0

ELEVATION TOP OF BORING (ft): 79.6

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 45': WASH *(continued)*										
34.6	45.0															
						45' to 47': CLAY, greenish gray (CH)		US-1			74	84	66	65	CH	
32.6	47.0															
						47' to 75.5': WASH										

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,506,951.0 E 602,024.0

ELEVATION TOP OF BORING (ft): 79.6

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						47' to 75.5': WASH *(continued)*										
4.1	75.5															
						75.5' to 77.5': SAND, clayey, with shell fragments, brown (SC)		US-2			41	38	21	30	SC	
2.1	77.5															

67.5 70.0 72.5 75.0 77.5

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAN-03-US**; LOCATION COORDINATES: N 1,509,327.1 E 601,169.3	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 0; UNDISTURBED 2
4. NAME OF DRILLER: Lee Tate and Mike Baker	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED 2/12/14; COMPLETED 2/12/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 80.3
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 75.0	18. SIGNATURE AND TITLE OF INSPECTOR: Shandesh Shrestha Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 49': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,509,327.1 E 601,169.3

ELEVATION TOP OF BORING (ft): 80.3

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 49': WASH *(continued)*										
31.3	49.0															
						49' to 51': CLAY, greenish gray (CH)		US-1			95	82	64	62	CH	
29.3	51.0					**51' to 73':** WASH										

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION		SHEET 3 OF 3 SHEETS
PROJECT: OUC LINED POND MODIFICATION	COORDINATE SYSTEM: State Plane / HORIZONTAL: NAD83 / VERTICAL: NAVD88	
LOCATION COORDINATES: N 1,509,327.1 E 601,169.3	ELEVATION TOP OF BORING (ft): 80.3	

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
7.3	73.0					**51' to 73':** WASH *(continued)*										
5.3	75.0					**73' to 75':** SAND, clayey, with shell fragments, greenish gray (SC)		US-2			48	41	26	37	SC	

67.5
70.0
72.5
75.0

NOTES:

1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 3 SHEETS

1. PROJECT: OUC LINED POND MODIFICATION	9. COORDINATE SYSTEM: State Plane; HORIZONTAL: NAD83; VERTICAL: NAVD88
	10. SIZE AND TYPE OF BIT: 2 15/16" Tricone
2. HOLE NUMBER: **TH-CSAS-03-US**; LOCATION COORDINATES: N 1,508,169.3 E 601,384.7	11. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
3. DRILLING AGENCY: Tetra Tech - AAI	12. TOTAL SAMPLES: DISTURBED 0; UNDISTURBED 2
4. NAME OF DRILLER: Lee Tate and Gabe Bair	13. TOTAL NUMBER CORE BOXES: 0
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL: ---; BEARING:	14. ELEVATION GROUND WATER (ft)
	15. DATE BORING: STARTED 1/30/14; COMPLETED 1/30/14
6. THICKNESS OF OVERBURDEN	16. ELEVATION TOP OF BORING (ft): 79.8
7. DEPTH DRILLED INTO ROCK	17. TOTAL CORE RECOVERY FOR BORING: N/A
8. TOTAL DEPTH OF BORING (ft): 76.0	18. SIGNATURE AND TITLE OF INSPECTOR: David Morris Staff Engineer

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 50': WASH										

0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 2 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,508,169.3 E 601,384.7

ELEVATION TOP OF BORING (ft): 79.8

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						0' to 50': WASH *(continued)*										
29.8	50.0															
						50' to 52': SAND, clayey, with shell, dark gray (SC)		US-1			44	65	48	31	SC	
27.8	52.0															
						52' to 74': WASH										

30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

DRILLING LOG (Cont Sheet)

INSTALLATION

SHEET 3 OF 3 SHEETS

PROJECT: OUC LINED POND MODIFICATION

COORDINATE SYSTEM: State Plane | HORIZONTAL: NAD83 | VERTICAL: NAVD88

LOCATION COORDINATES: N 1,508,169.3 E 601,384.7

ELEVATION TOP OF BORING (ft): 79.8

ELEV (ft)	DEPTH (ft)	Blows/ 0.5 ft	N_f	N_{60}	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	Samp No.	Laboratory: Gravel	Sand	Fines	LL	PI	MC	ASTM Class	REMARKS
						52' to 74': WASH *(continued)*										
5.8	74.0															
						74' to 76': SAND, clayey, dark gray (SC)		US-2				34	20	31	SC	
3.8	76.0															

67.5

70.0

72.5

75.0

NOTES:

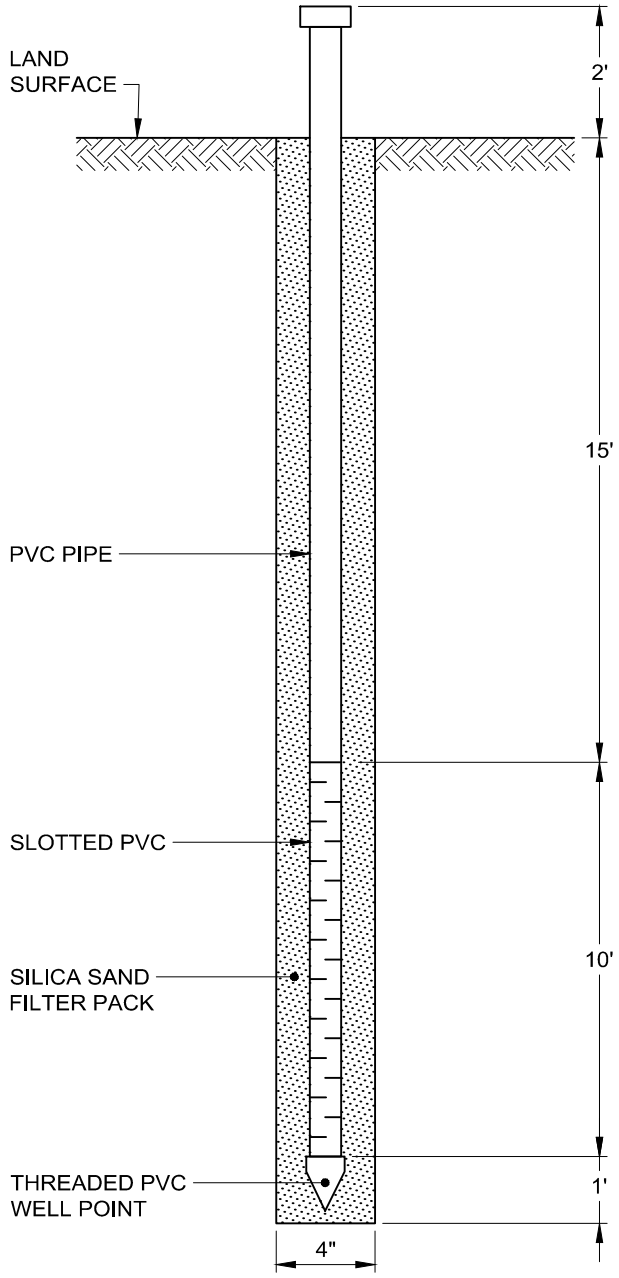
1. BLOWS/FOOT: number required to drive 1 3/8" ID splitspoon with a 140 lb. hammer falling 30 inches.
2. Soils are classified in accordance with the Unified Soil Classification System.
3. SPT boring performed using automatic hammer.

ACE 1836-A OUC CWSA 13-0166 OUC LINED POND MODIFICATION BORINGS.GPJ ACE MVD WITH RAPID CPT 06-09-08.GDT 8/20/14

Appendix 12

Observation Well Installation Details

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RPE-1
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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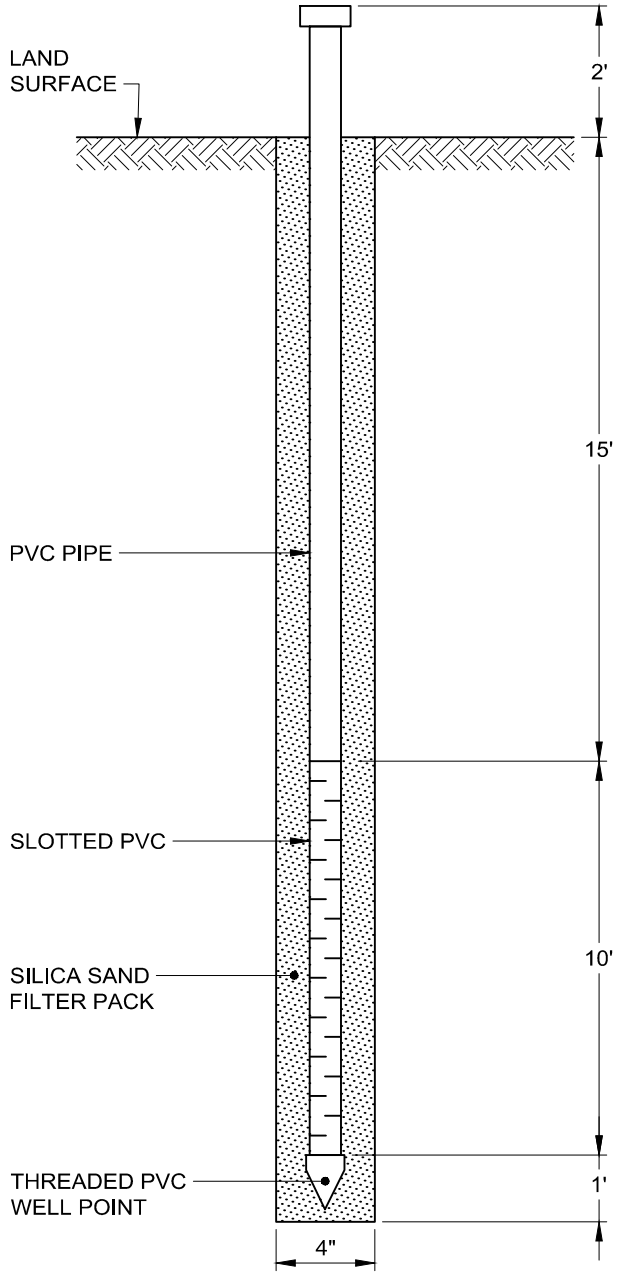
Geotechnical, Environmental and Materials Consultants

FIGURE 2-1

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RPE-2
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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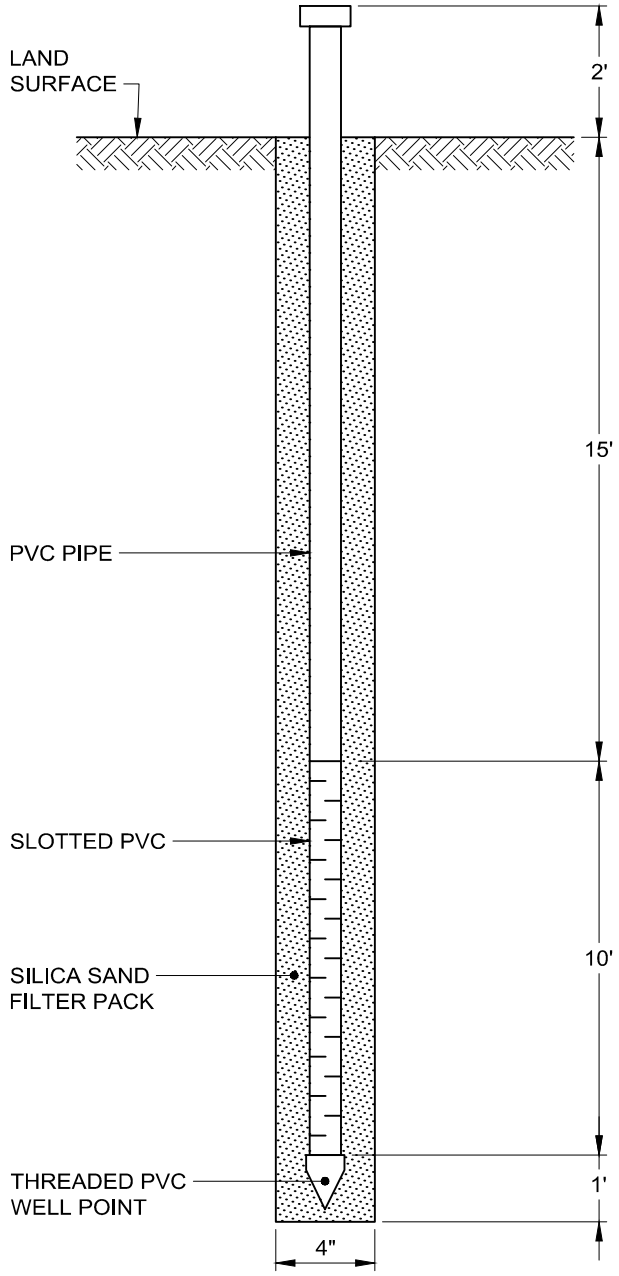
Geotechnical, Environmental and Materials Consultants

FIGURE 2-2

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RPE-3
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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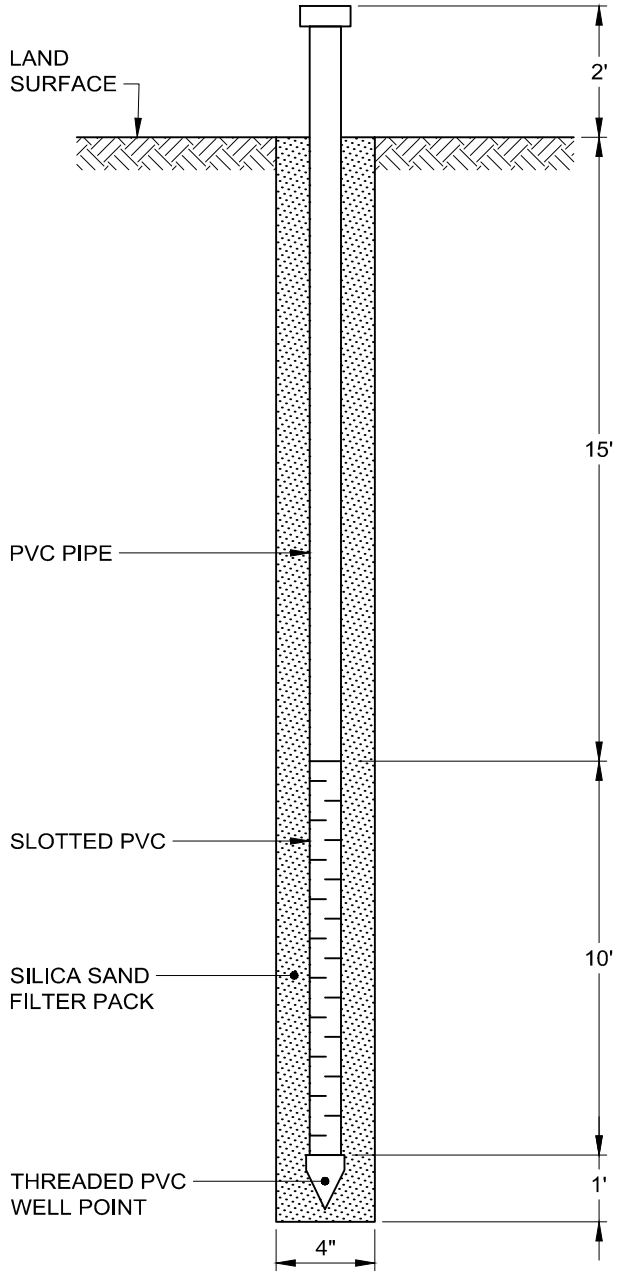
FIGURE 2-3

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RPE-4
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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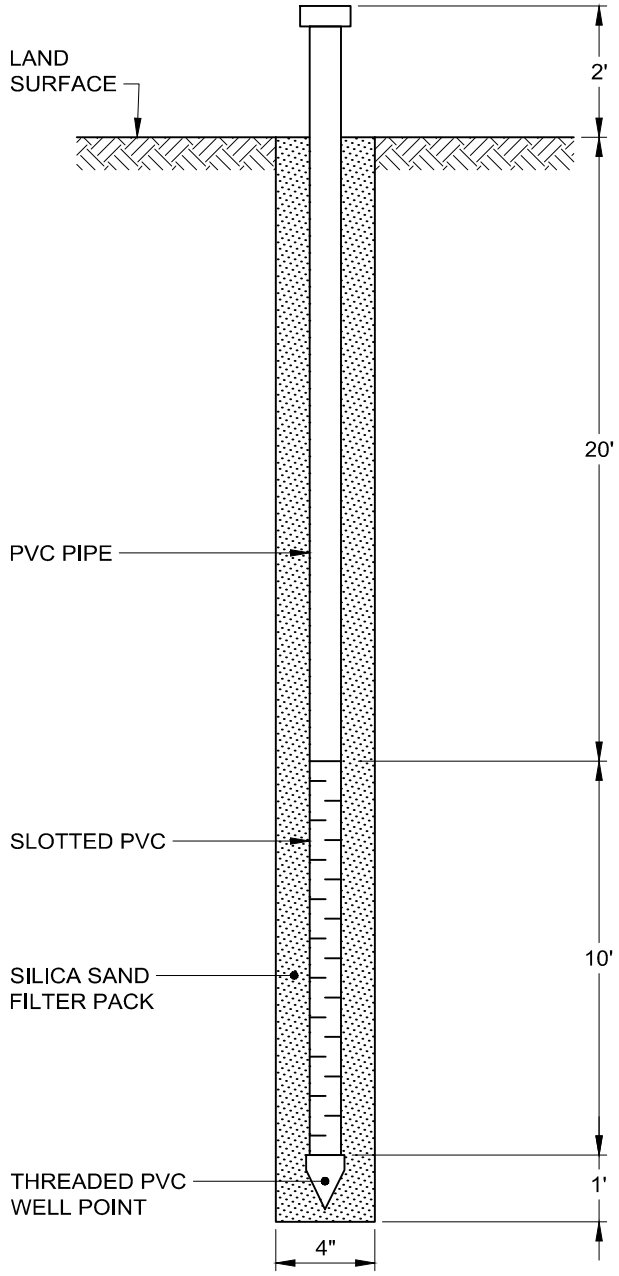
FIGURE 2-4

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RP-1
Date Installed: 02-11-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 20 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 30 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2.5
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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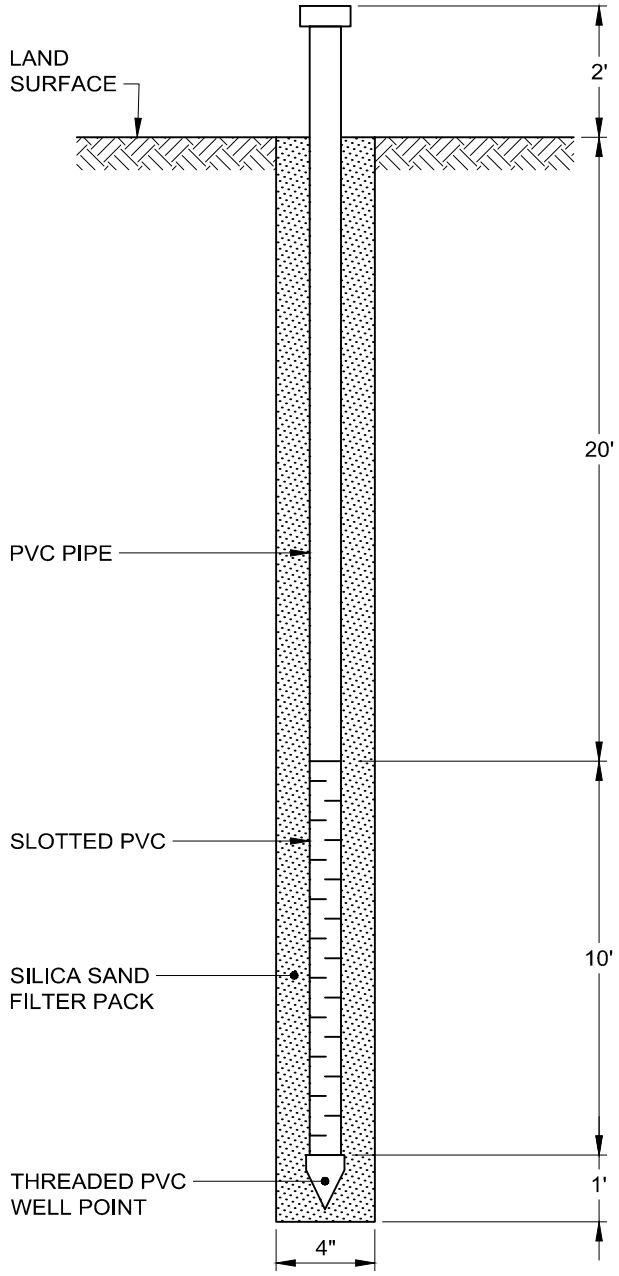
Geotechnical, Environmental and Materials Consultants

FIGURE 3-1

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RP-2
Date Installed: 02-11-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 20 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 30 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2.5
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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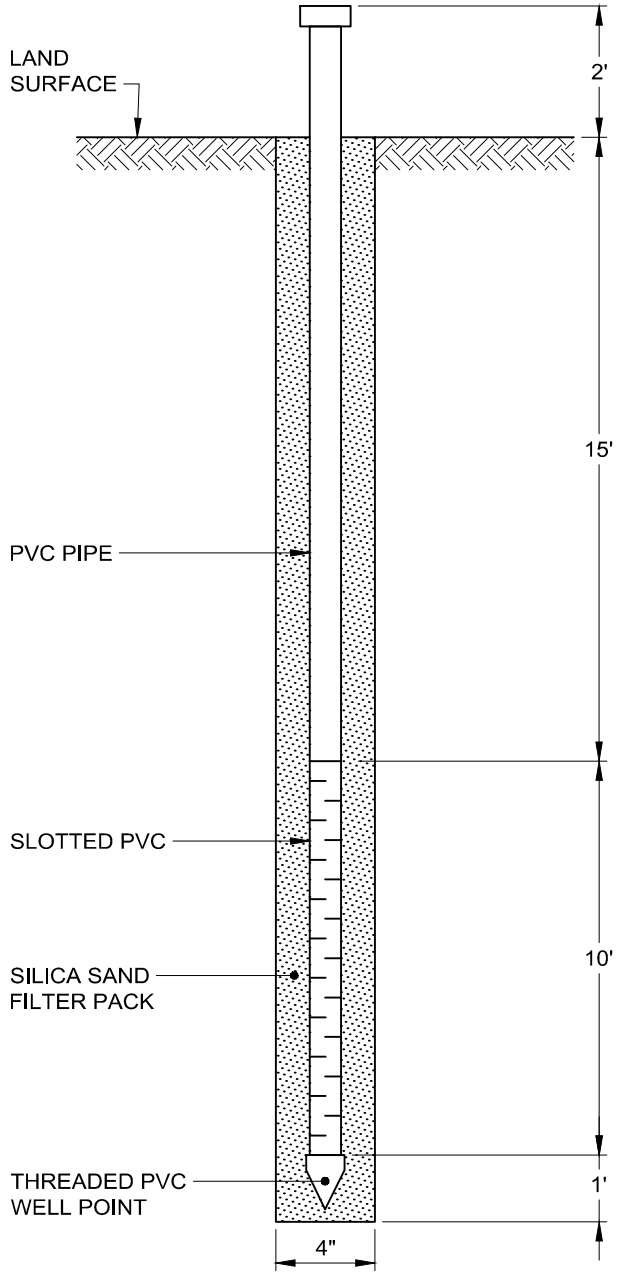
FIGURE 3-2

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-RP-1
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

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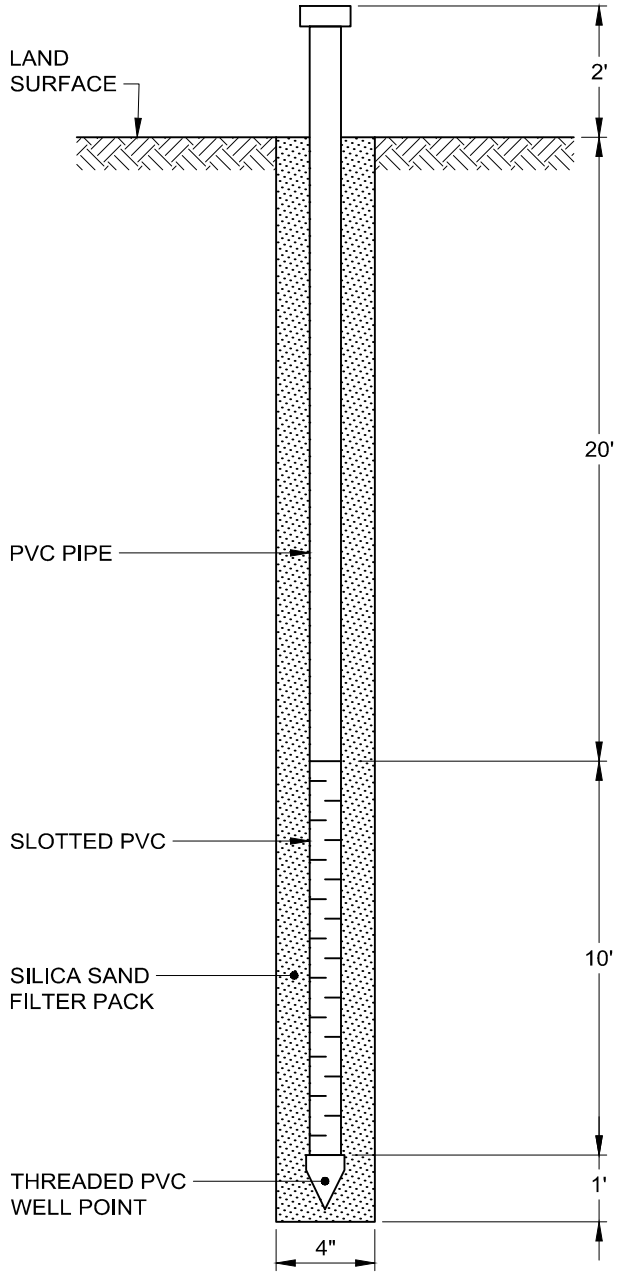
Geotechnical, Environmental and Materials Consultants

FIGURE 3-3

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-CSA-1
Date Installed: 02-11-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 20 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 30 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2.5
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

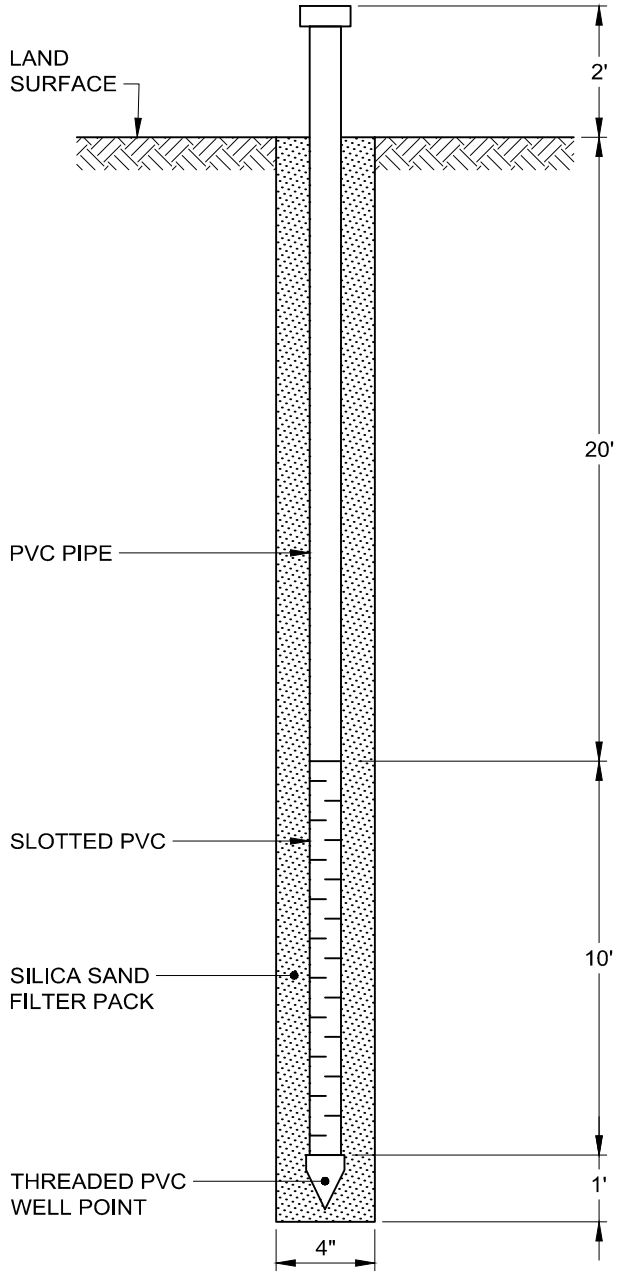
BLS = Below Land Surface
BTOC = Below Top of Casing

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

FIGURE 4-1

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-CSA-2
Date Installed: 02-11-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 20 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 30 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2.5
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

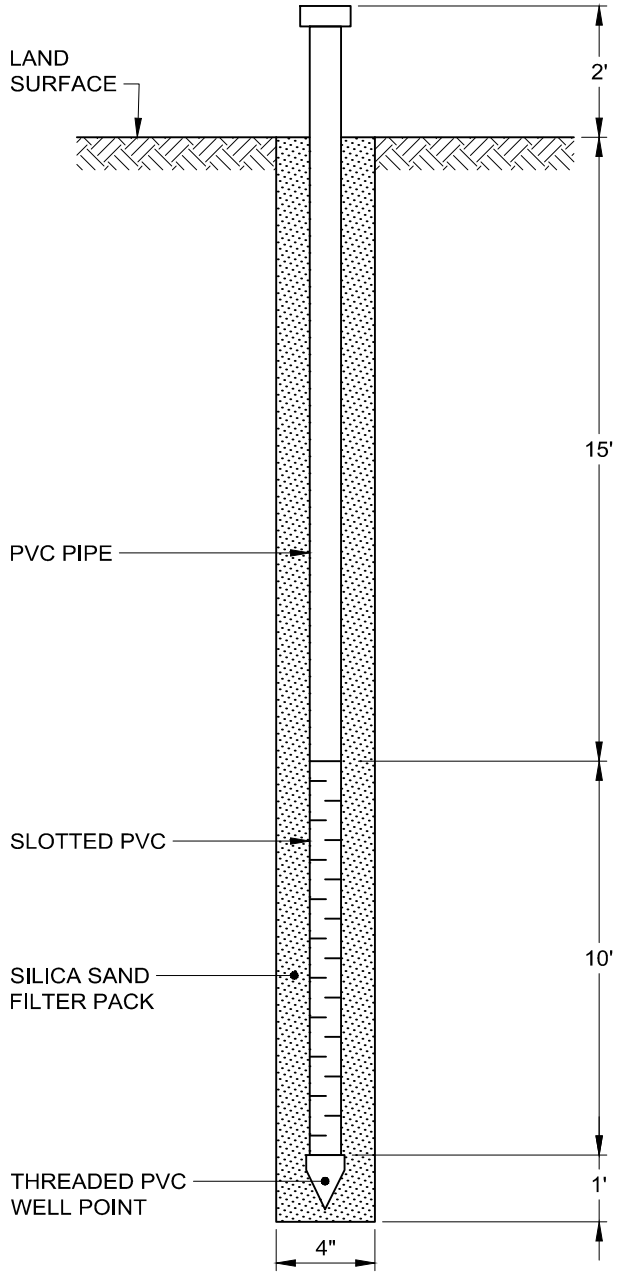
BLS = Below Land Surface
BTOC = Below Top of Casing

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

FIGURE 4-2

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-CSAS-1
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

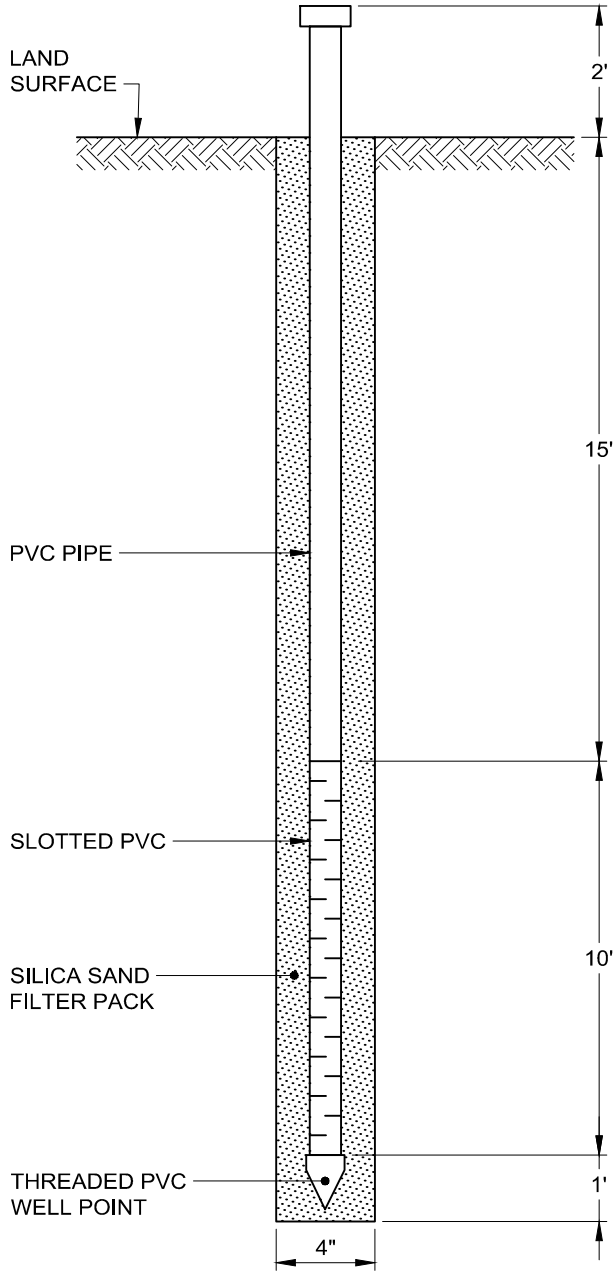
BLS = Below Land Surface
BTOC = Below Top of Casing

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

FIGURE 4-3

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

PIEZOMETER INSTALLATION RECORD



File No.: 13-13-0166
Project: OUC LINED POND MODIFICATIONS
Client: OUC

Well No.: OW-CSAS-2
Date Installed: 01-13-14
Crew Supervisor: L. TATE
Well Location: SEE PIEZOMETER LOCATION PLAN

Protective Casing: (size and type) N/A

Concrete Pad: (size) N/A
PVC Pipe: (size and type) 2" DIA.
SCHEDULE 40, THREADED PVC
Seal: (type)
Filter Pack: (type) 20/30 SILICA SAND
Slotted PVC: (size and type) 2" DIA.
SCHEDULE 40, 0.010 INCH SLOTTED PVC
Centralizers: (number and location(s)) BLS N/A

Total Length of PVC Pipe: 15 ft(BLS)
Total Length of Slotted PVC: 10 ft(BLS)
Total Length of Tailpipe: ft(BLS)
Total Depth of Well: 25 ft(BLS)

No. Bags of Cement: N/A
No. Bags of Filter Pack: 2
Amount of Seal: N/A

Remarks:

Water Level Readings:
Date:
Depth BTOC: Depth BLS:
Date:
Depth BTOC: Depth BLS:

BLS = Below Land Surface
BTOC = Below Top of Casing

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

FIGURE 4-4

T:\Corporate\13\13-13-0166\RECYCLE POND EXPANSION AND EXISTING LINED POND MODIFICATIONS_Current Sheet Set\PIEZOMETER INSTALLATION RECORDS.dwg 06/02/2014 11:23:09 AM, White, Brandon

Appendix 13

Undisturbed Sample Extrusion Test Reports

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/21/2014
DATE REPORTED: 05/19/2014

BORING TH-CSAN-03-US SAMPLE US-1
DEPTH 49.0 – 51.0 ☒ ft; ☐ m
DATE SAMPLED: 02/12/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	6.3	0.0	23.7	23.7	4008	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
23.7	CLAY, greenish gray (CH)	73.8 63.3 61.6 57.0 72.9 74.2	94.5	82 82	18 23	64 59	-	-	68.2	99.0

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: Date: S:\Projects\2013\13-13-0166\Tube Extrusion Data\ST Extrusion Report.doc

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/21/2014
DATE REPORTED: 05/19/2014

BORING TH-CSAN-03-US SAMPLE US-2
DEPTH 73.0 – 75.0 ☒ ft; ☐ m
DATE SAMPLED: 02/12/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	7.4	3.1	19.5	19.0	3718	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
19.5	SAND, clayey, with shell fragments, greenish gray (SC)	26.8 34.3 46.0 36.7 39.7	47.9	41	15	26	-	-	36.7	111.7

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/06/2014
DATE REPORTED: 05/19/2014

BORING TH-CSAS-03-US SAMPLE US-1
DEPTH 50.0 – 52.0 ☒ ft; ☐ m
DATE SAMPLED: 01/30/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	6.3	1.1	22.5	22.4	4466	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
22.5	SAND, clayey, with shell, dark gray (SC)	24.3 31.1 31.7 31.1 34.3 25.0	43.8	65	17	48	-	-	29.3	116.3

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: Date: S:\Projects\2013\13-13-0166\Tube Extrusion Data\ST Extrusion Report.doc

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/06/2014
DATE REPORTED: 05/19/2014

BORING TH-CSAS-03-US SAMPLE US-2
DEPTH 74.0 – 76.0 ☒ ft; ☐ m
DATE SAMPLED: 01/30/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	6.1	1.0	22.8	22.8	4613	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
22.8	SAND, clayey, dark gray (SC)	19.9 28.7 30.9 31.4 36.3 26.1	-	34	14	20	-	-	28.4	118.5

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/06/2014
DATE REPORTED: 05/19/2014

BORING TH-RP-04 SAMPLE US-1
DEPTH 45.5 – 47.5 ☒ ft; ☐ m
DATE SAMPLED: 01/23/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	6.8	3.5	19.7	19.3	3633	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
19.7	SAND, clayey, with shell fragments, greenish gray (SC)	25.4 32.1 42.2 38.4 48.1 53.8	41.2	-	-	-	-	-	40.3	108.0

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By: _____ Date: _____ S:\Projects\2013\13-13-0166\Tube Extrusion Data\ST Extrusion Report.doc

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/06/2014
DATE REPORTED: 05/19/2014

BORING TH-RP-06-US SAMPLE US-1
DEPTH 43.0 – 45.0 ☒ ft; ☐ m
DATE SAMPLED: 01/24/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	11.3	0.6	18.1	18.1	2904	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
18.1	CLAY, with sand, trace shell fragments, greenish gray (CH)	40.5 87.0 91.6 89.4 61.5	84.3	139	30	109	-	-	69.6	94.2

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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Checked By: Date: S:\Projects\2013\13-13-0166\Tube Extrusion Data\ST Extrusion Report.doc

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 02/05/2014
DATE REPORTED: 05/19/2014

BORING TH-RP-07-US SAMPLE US-1
DEPTH 43.0 – 45.0 ☒ ft; ☐ m
DATE SAMPLED: 01/24/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	5.8	0.9	23.3	23.1	4153	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
23.3	CLAY, sandy, greenish gray (CH)	33.1 54.1 56.9 61.7 49.4 44.9	55.4	56	17	39	-	-	49.2	104.3

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 01/23/2014
DATE REPORTED: 05/19/2014

BORING TH-RPE-02-US SAMPLE US-1
DEPTH 42.0 – 44.0 ☒ ft; ☐ m
DATE SAMPLED: 01/17/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	5.9	0.9	23.2	23.0	3562	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
23.2	CLAY, greenish gray (CH)	20.9 115.6 98.8 100.4 101.2 90.7	96.0	141	28	113	-	-	101.6	90.1

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 01/23/2014
DATE REPORTED: 05/19/2014

BORING TH-RPE-03-US SAMPLE US-1
DEPTH 40.5 – 42.5 ☒ ft; ☐ m
DATE SAMPLED: 01/17/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	5.8	0.2	24.0	23.7	3750	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
24.0	CLAY, trace shell fragments, gray (CH)	58.4 91.1 92.4 91.1 88.3 106.3	99.4	129	26	103	-	-	87.3	91.6

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 01/23/2014
DATE REPORTED: 05/19/2014

BORING TH-RPE-04-US SAMPLE US-1
DEPTH 48.0 – 50.0 ☒ ft; ☐ m
DATE SAMPLED: 01/17/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	11.5	0.6	17.9	18.0	3283	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
17.9	CLAY, with sand, with shell fragments, greenish gray (CH)	33.5 49.9 49.5 46.2 47.9 41.5	83.4	74	24	50	-	-	43.8	107.5

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: Proposed CWSA Runoff Pond and Decant Cell
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 01/23/2014
DATE REPORTED: 05/19/2014

BORING TH-RPE-06-US SAMPLE US-1
DEPTH 45.0 – 47.0 ☒ ft; ☐ m
DATE SAMPLED: 01/17/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Bent
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	5.9	1.3	22.9	23.0	4008	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
22.9	CLAY, greenish gray (CH)	46.1 65.3 66.7 54.6 58.3 59.9 62.5	74.4	84	18	66	-	-	58.0	102.6

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNDISTURBED TUBE SAMPLE EXTRUSION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: Proposed CWSA Runoff Pond and Decant Cell
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE SAMPLE EXTRUDED: 01/23/2014
DATE REPORTED: 08/22/2014

BORING TH-RPE-06-US SAMPLE US-2
DEPTH 75.5 – 77.5 ☒ ft; ☐ m
DATE SAMPLED: 01/17/2014
TUBE TYPE: ☒ Steel ☐ SS ☐ Brass
SEAL TYPE: ☐ Wax ☒ Plugs ☒ Caps ☐ Other
TUBE CONDITION: Good
TUBE INSIDE DIAMETER (inch): 2.88
PHOTOGRAPHS TAKEN: ☒ Yes ☐ No

Tube Length (inch)	Top Void (inch)	Bottom Void (inch)	Sample Length Inside Tube (inch)	Extruded Sample Length (inch)	Total WWS (grams)	Disturbed Soil Removed from Sample: ☐ Yes ☒ No		
						WWS (grams)	Length (inch)	Percentage of Total WWS (%)
30.0	2.5	14.8	12.7	11.4	2451	-	-	-

Length (inch)	Description	w_c (%)	-200 (%)	Atterberg Limits (%)			OC (%)	G_s	Tube Average	
				LL	PL	PI			w_c (%)	γ_t (pcf)
12.7	SAND, clayey, with shell fragments, brown (SC)	22.2 29.7 36.8 37.2 43.9	41.0	38	17	21	-	-	35.0	113.3

Where: WWS = Weight of wet solids; w_c = Moisture content (ASTM D 2216); LL = Liquid limit; PL = Plastic limit; PI = Plasticity index (ASTM D 4318 wet preparation with LL by Method A); -200 = Fines content (ASTM D 422 or D 1140); OC = Organic content (ASTM D 2974-Method C); G_s = Specific gravity (ASTM D 854); and γ_t = Total unit weight.

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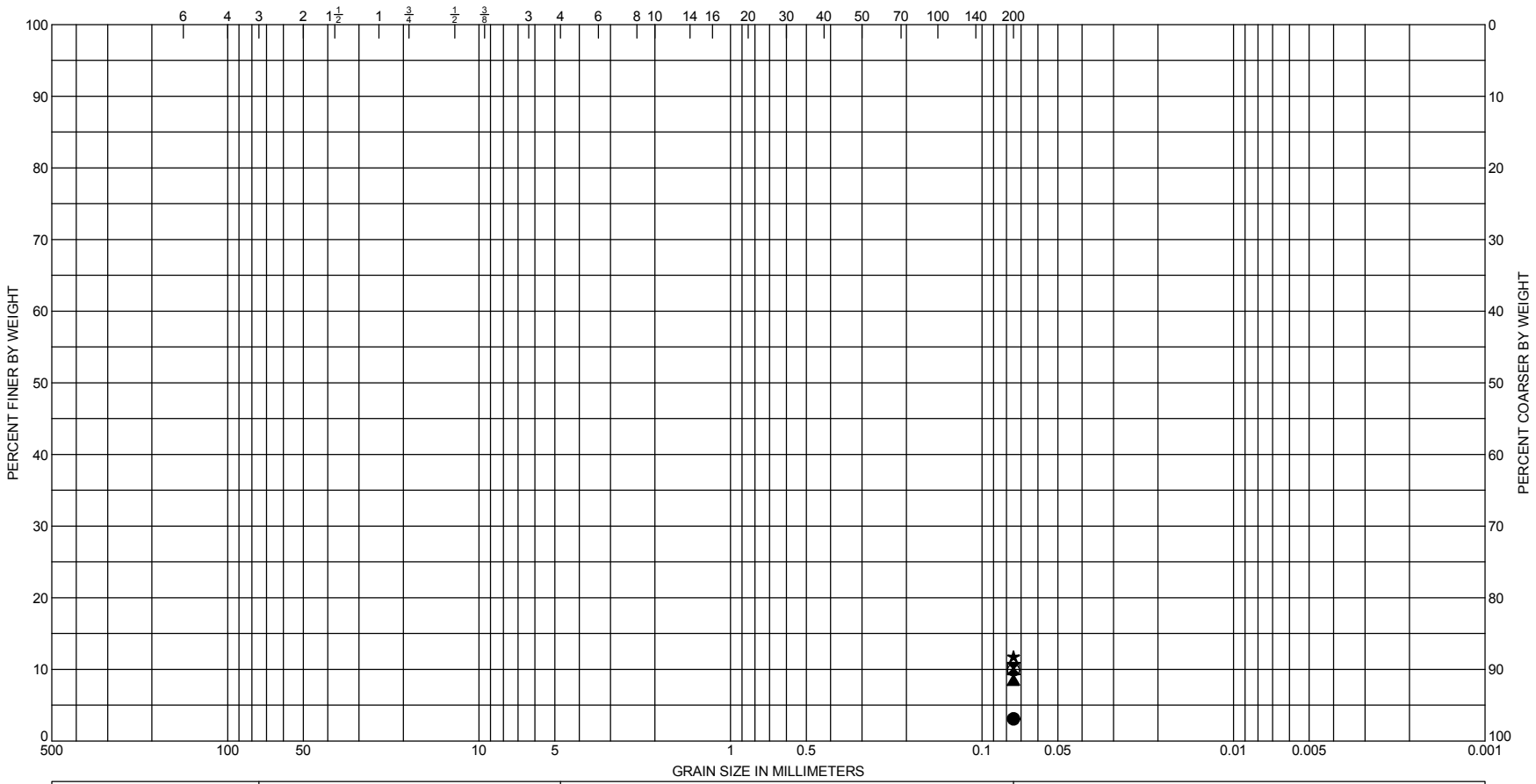
Appendix 14

Grain Size Distribution Curves



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	3	76.1 / 3.0		10.0			
⊠	9	67.1 / 12.0		24.9			
▲	15	58.1 / 21.0		23.3			
★	19	52.1 / 27.0		24.3			
⊙	22	47.6 / 31.5		26.3			

GRADATION CURVES

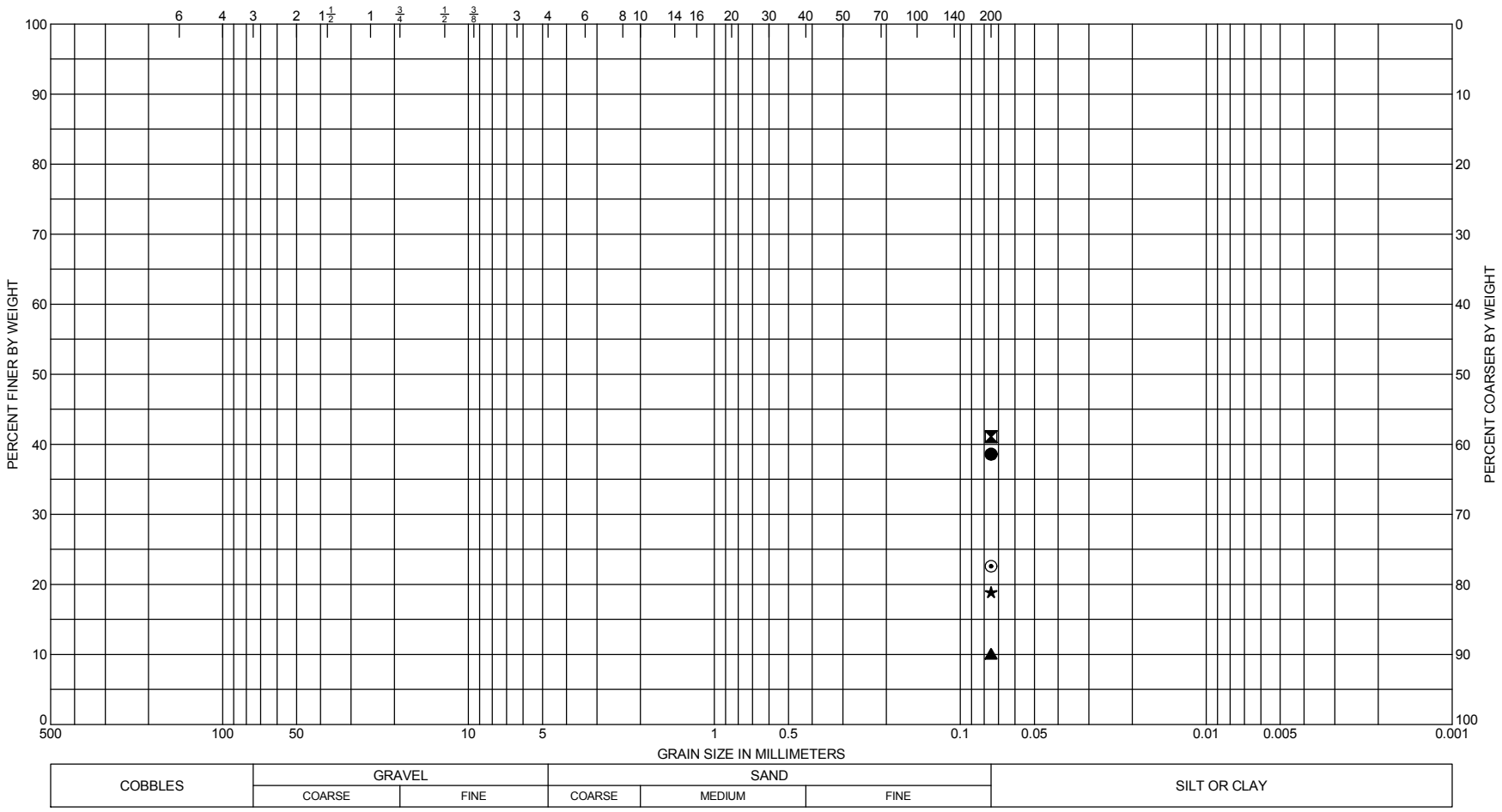
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	27	40.1 / 39.0	CLAYEY SAND(SC)	32.9	110	23	87
⊠	33	31.1 / 48.0	CLAYEY SAND(SC)	43.4	87	21	66
▲	9	16.1 / 63.0		29.2			
★	11	13.1 / 66.0		30.7			
⊙	15	7.1 / 72.0	CLAYEY SAND(SC)	29.7	31	16	15

GRADATION CURVES

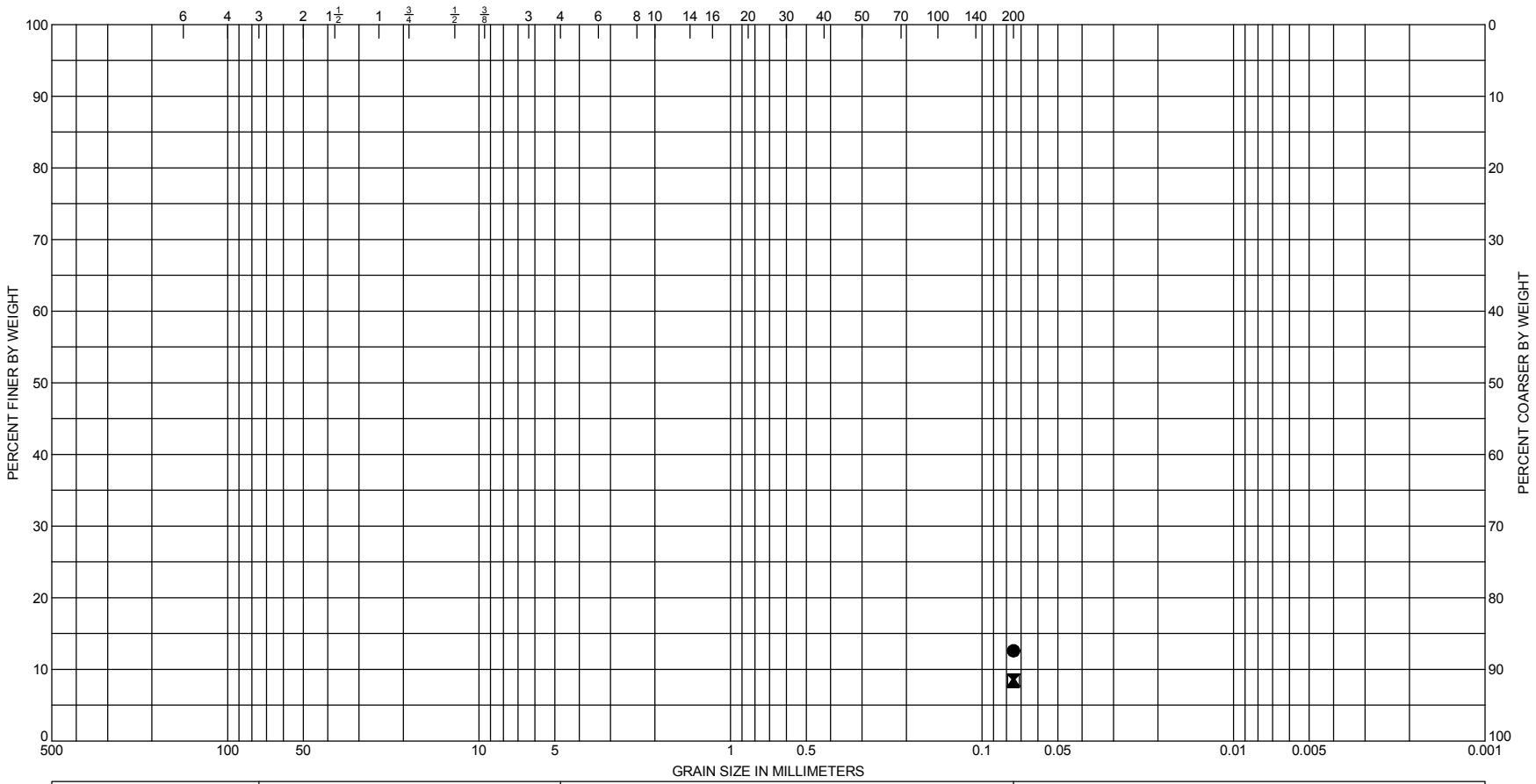
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	4	74.7 / 4.5		25.3			
⊠	12	62.7 / 16.5		25.0			
▲	16	56.7 / 22.5		25.6			

GRADATION CURVES

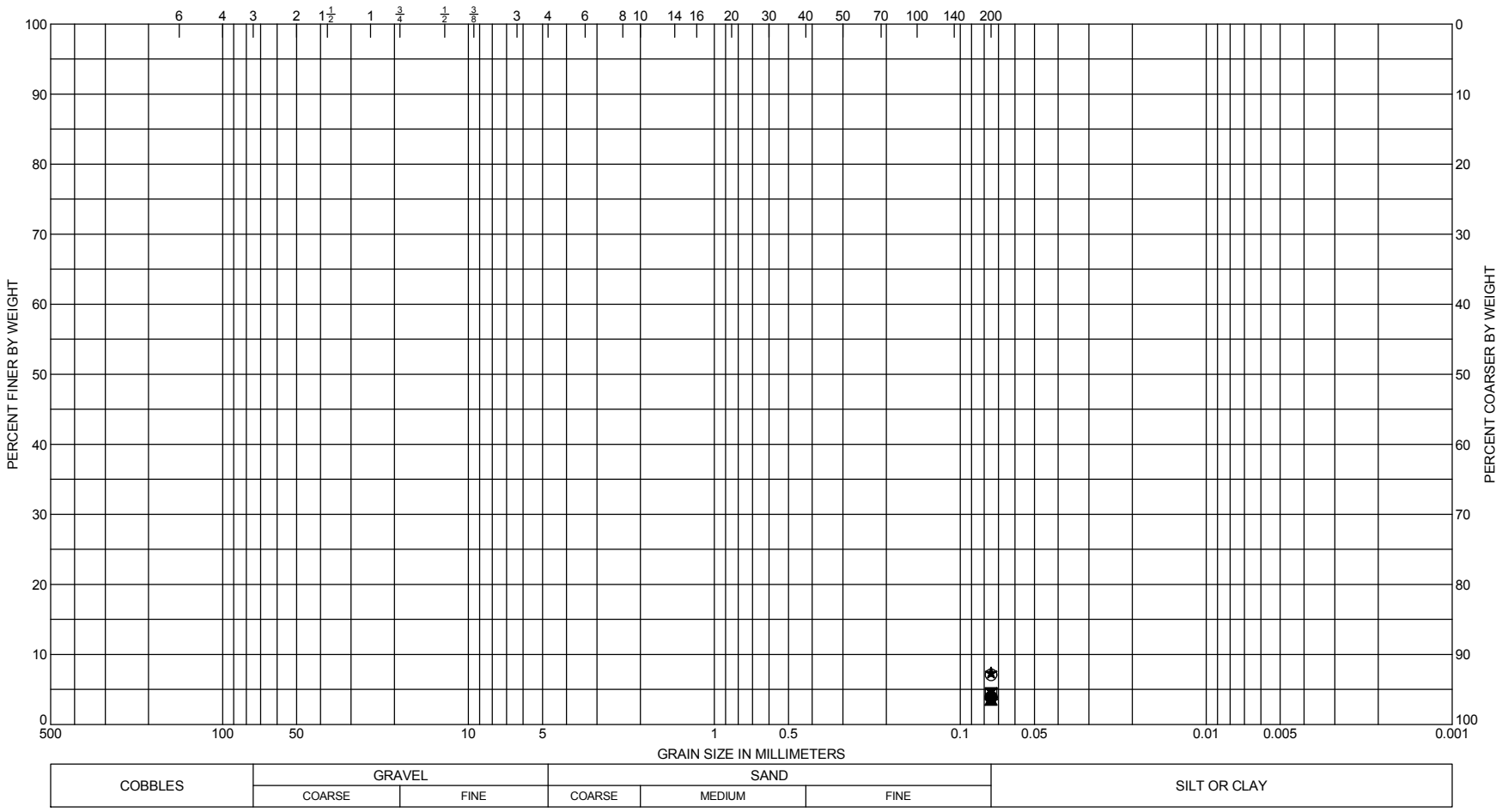
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-05

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	77.8 / 1.5		22.5			
⊠	6	71.8 / 7.5		25.8			
▲	10	65.8 / 13.5		27.6			
★	14	59.8 / 19.5		26.3			
⊙	18	53.8 / 25.5		26.2			

GRADATION CURVES

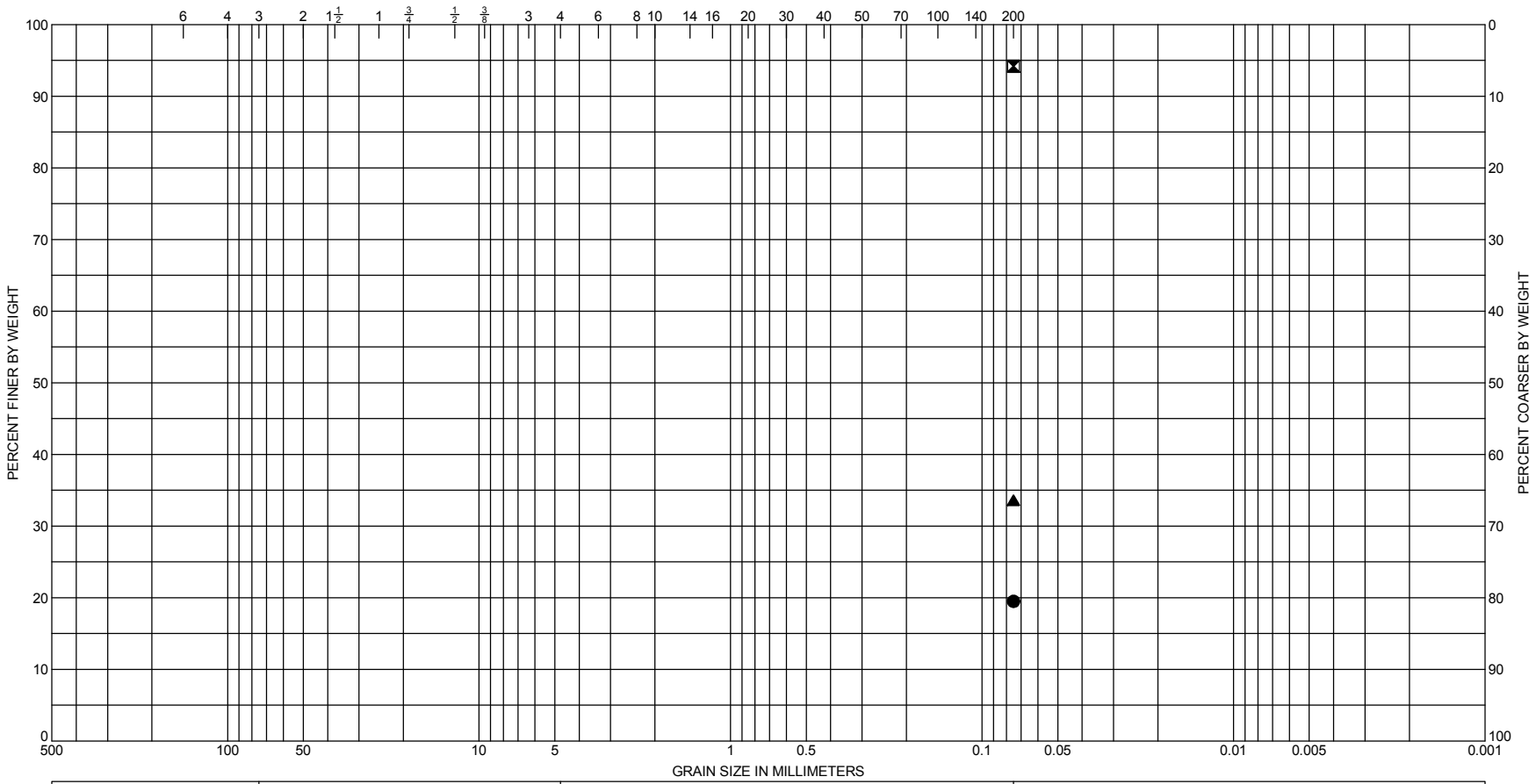
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	25	43.3 / 36.0		21.9			
⊠	29	37.3 / 42.0	FAT CLAY(CH)	87.1	111	26	85
▲	34	29.8 / 49.5	CLAYEY SAND(SC)	42.0	49	14	35

GRADATION CURVES

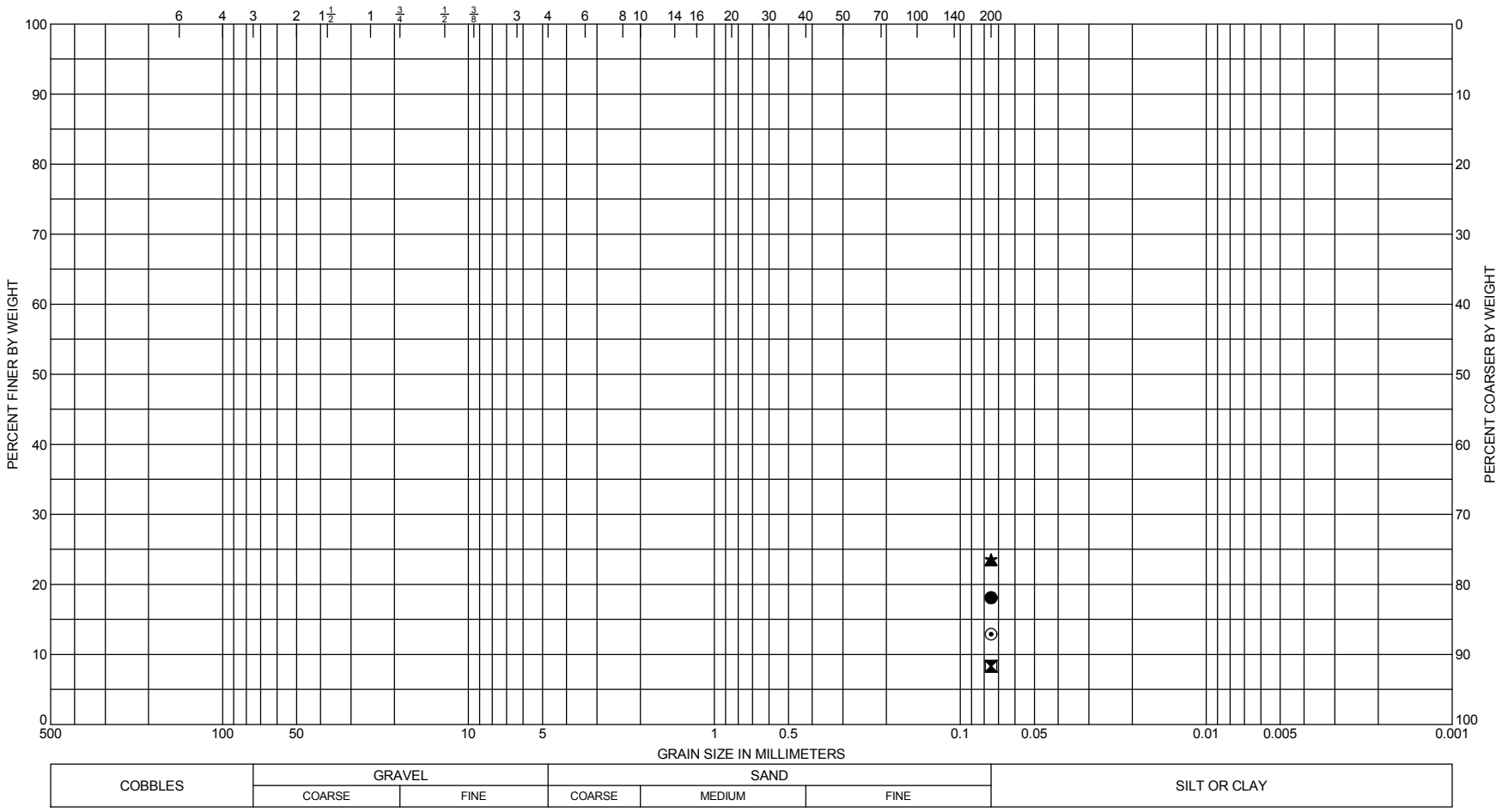
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	77.8 / 1.5		12.8			
⊠	6	71.8 / 7.5		12.2			
▲	11	64.3 / 15.0		14.2			
★	13	61.3 / 18.0		17.8			
⊙	17	55.3 / 24.0		24.1			

GRADATION CURVES

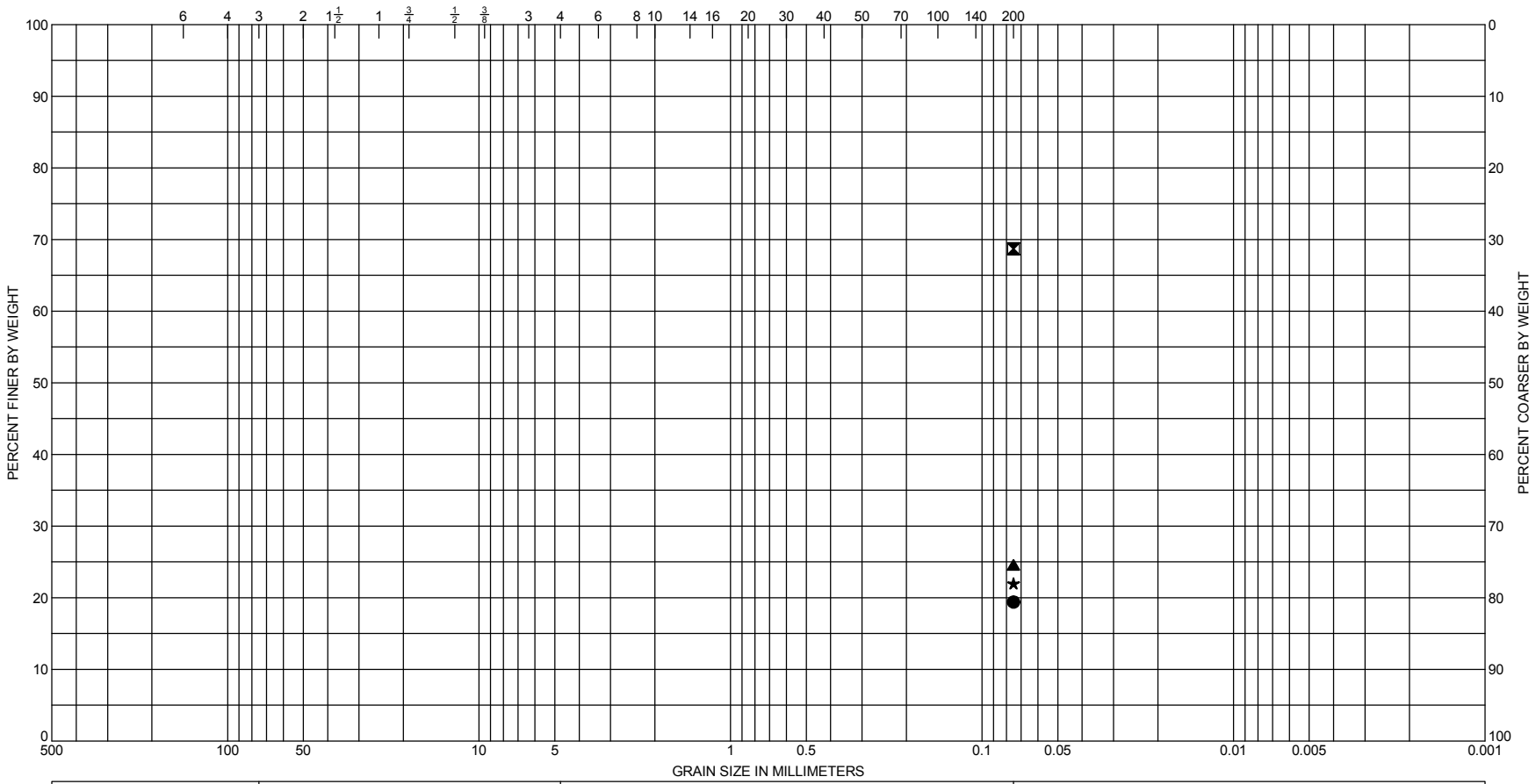
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-07

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	22	47.8 / 31.5		29.9			
⊠	32	32.8 / 46.5	SANDY FAT CLAY(CH)	63.5	61	17	44
▲	35	28.3 / 51.0		38.8			
★	36	26.8 / 52.5		29.0			

GRADATION CURVES

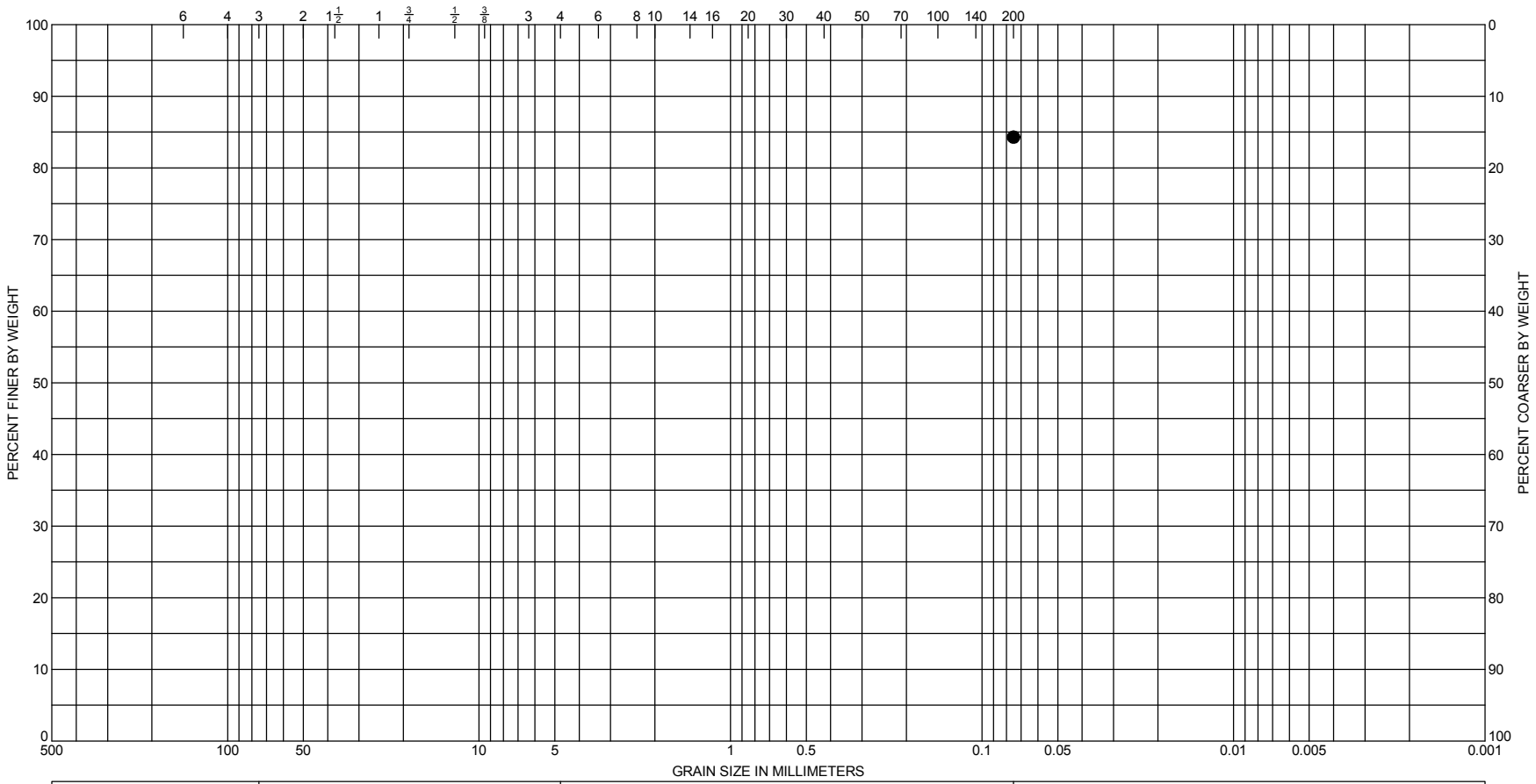
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-07

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	36.3 / 43.0	FAT CLAY with SAND(CH)	92.0	139	30	109

GRADATION CURVES

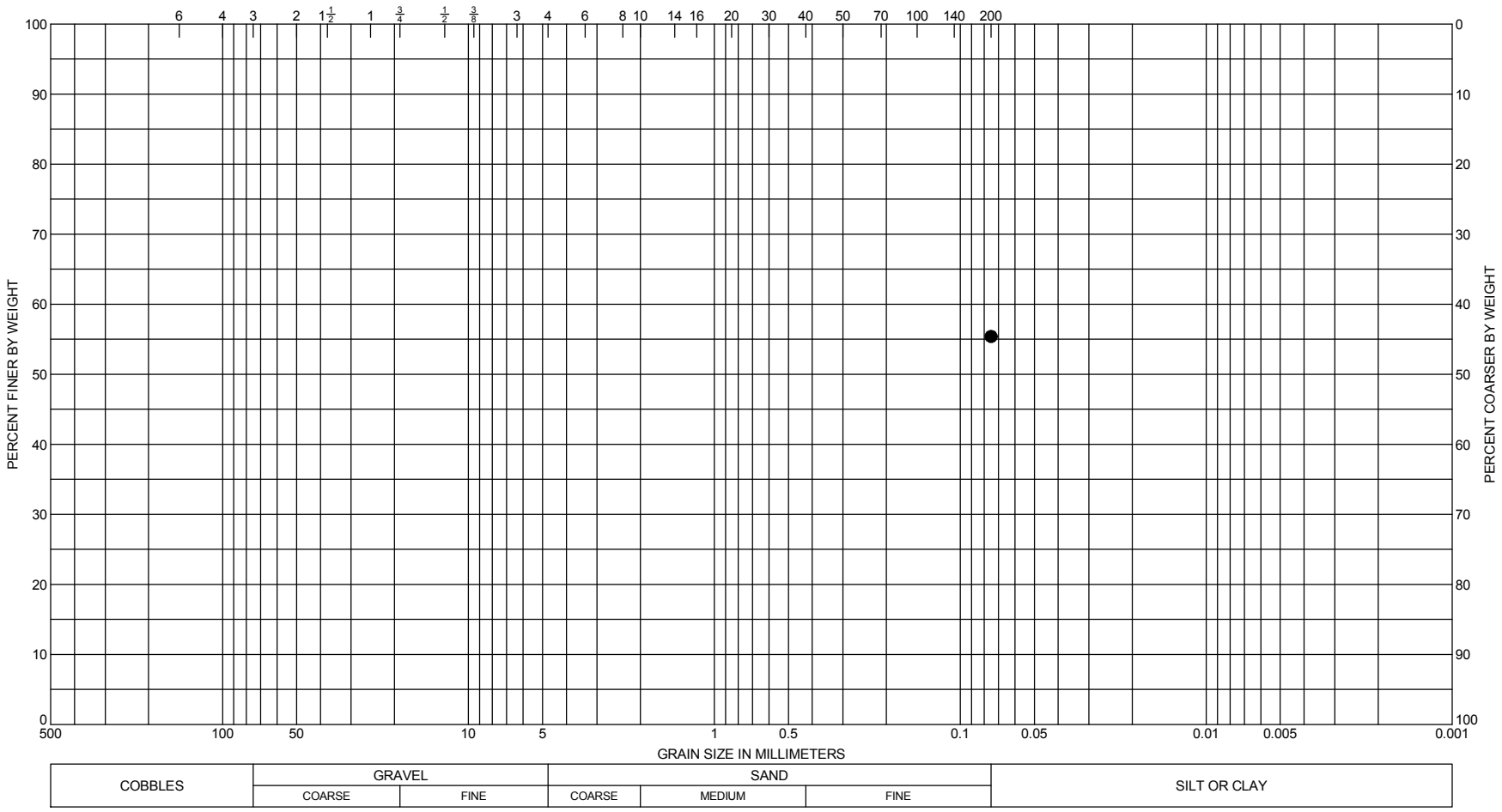
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RP-06-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	36.3 / 43.0	SANDY FAT CLAY(CH)	54.1	56	17	39

GRADATION CURVES

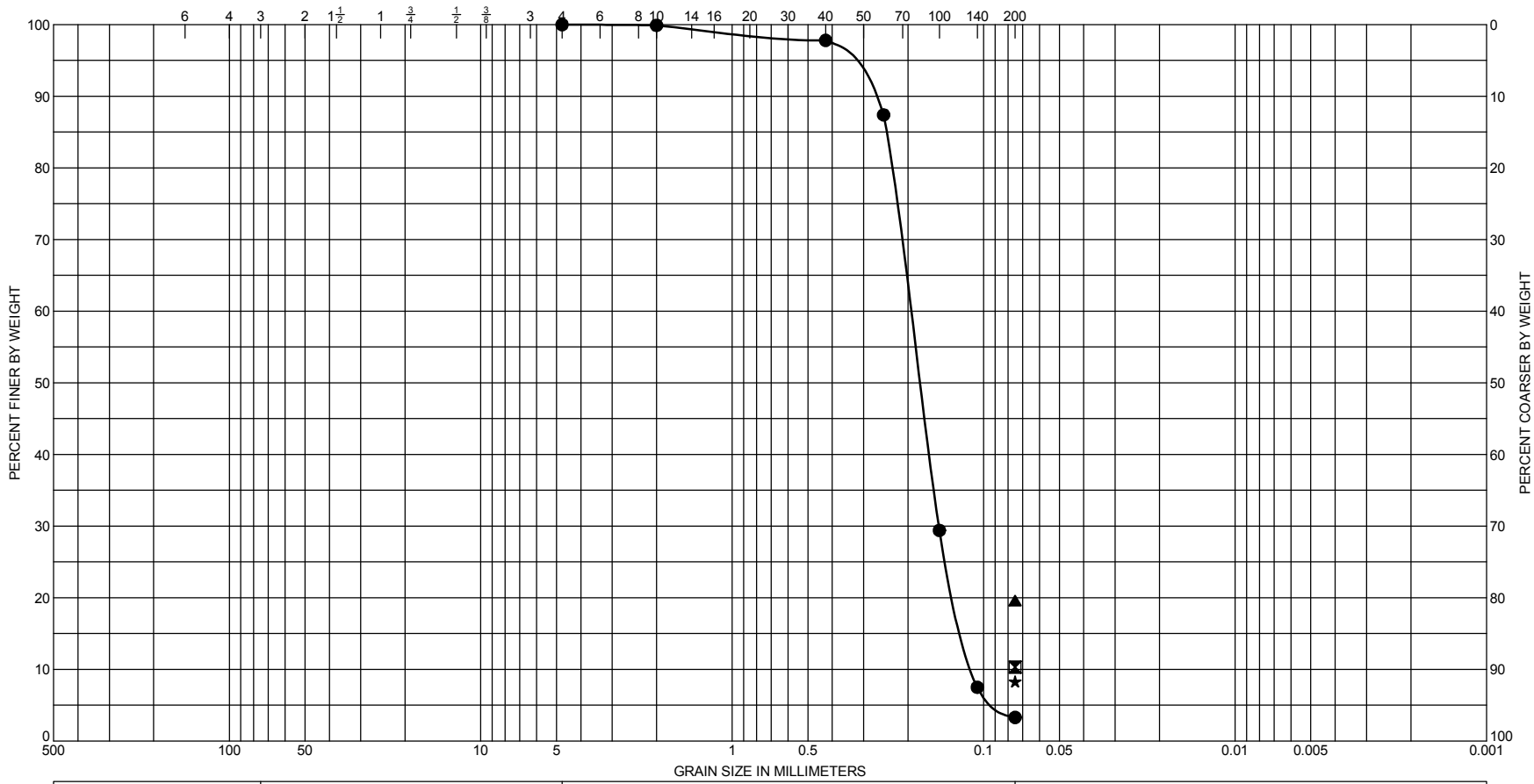
Project OUC LINED POND MODIFICATION

Area

Boring No. TH-RP-07-US

Date 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
● 3	77.2 / 3.0	POORLY GRADED SAND(SP)	25.8			
⊠	72.7 / 7.5		22.2			
▲ 11	65.2 / 15.0		21.4			
★ 16	57.7 / 22.5		25.6			

GRADATION CURVES

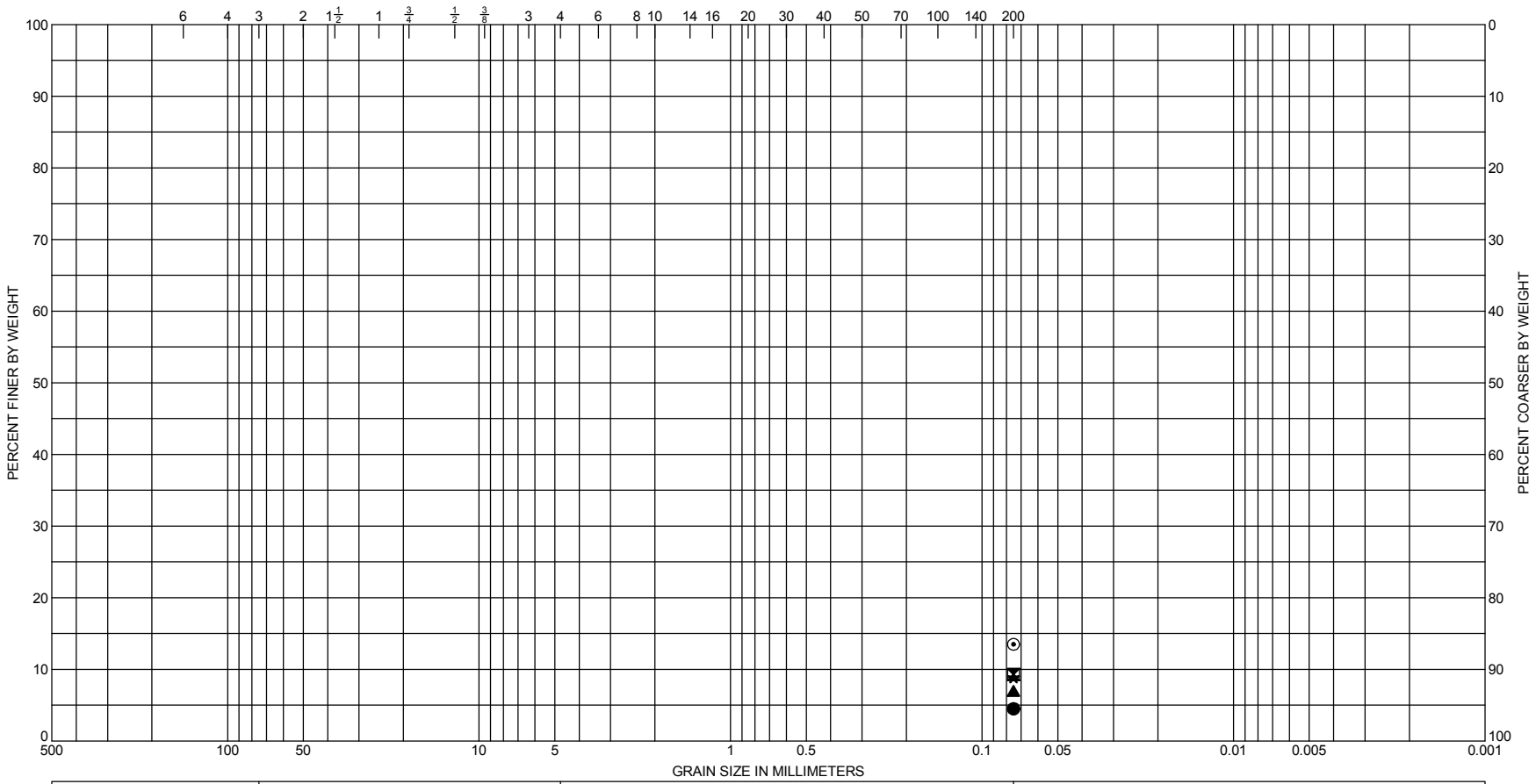
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-01

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	76.4 / 3.0		21.9			
⊠	73.4 / 6.0		25.9			
▲	65.9 / 13.5		25.5			
★	55.4 / 24.0		25.4			
⊙	50.9 / 28.5		26.0			

GRADATION CURVES

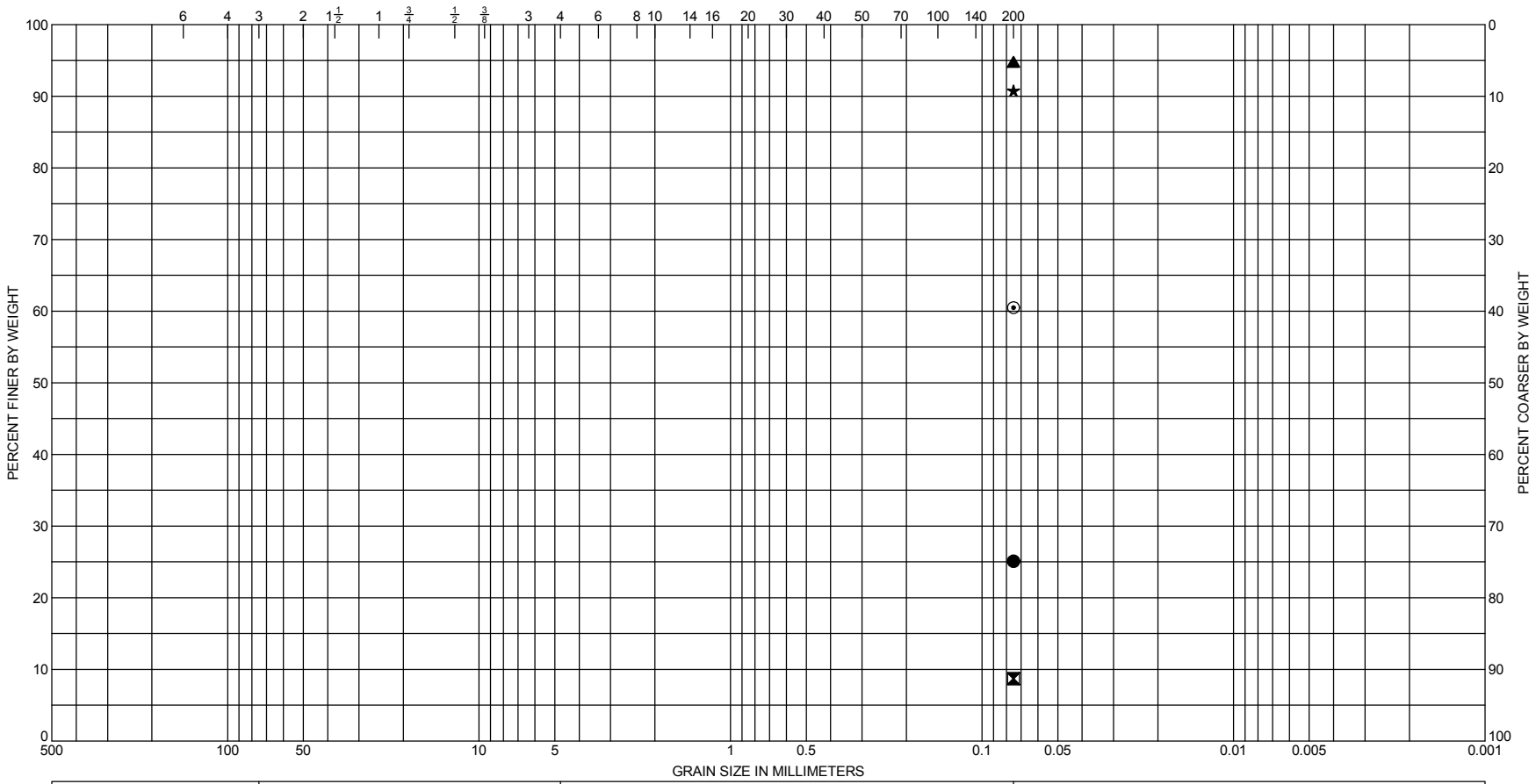
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-02

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	47.9 / 31.5		23.5			
⊠	44.9 / 34.5		14.8			
▲	40.4 / 39.0	FAT CLAY(CH)	71.3	96	20	76
★	34.4 / 45.0	FAT CLAY(CH)	66.6	78	18	60
⊙	31.4 / 48.0	SANDY FAT CLAY(CH)	50.9	84	19	65

GRADATION CURVES

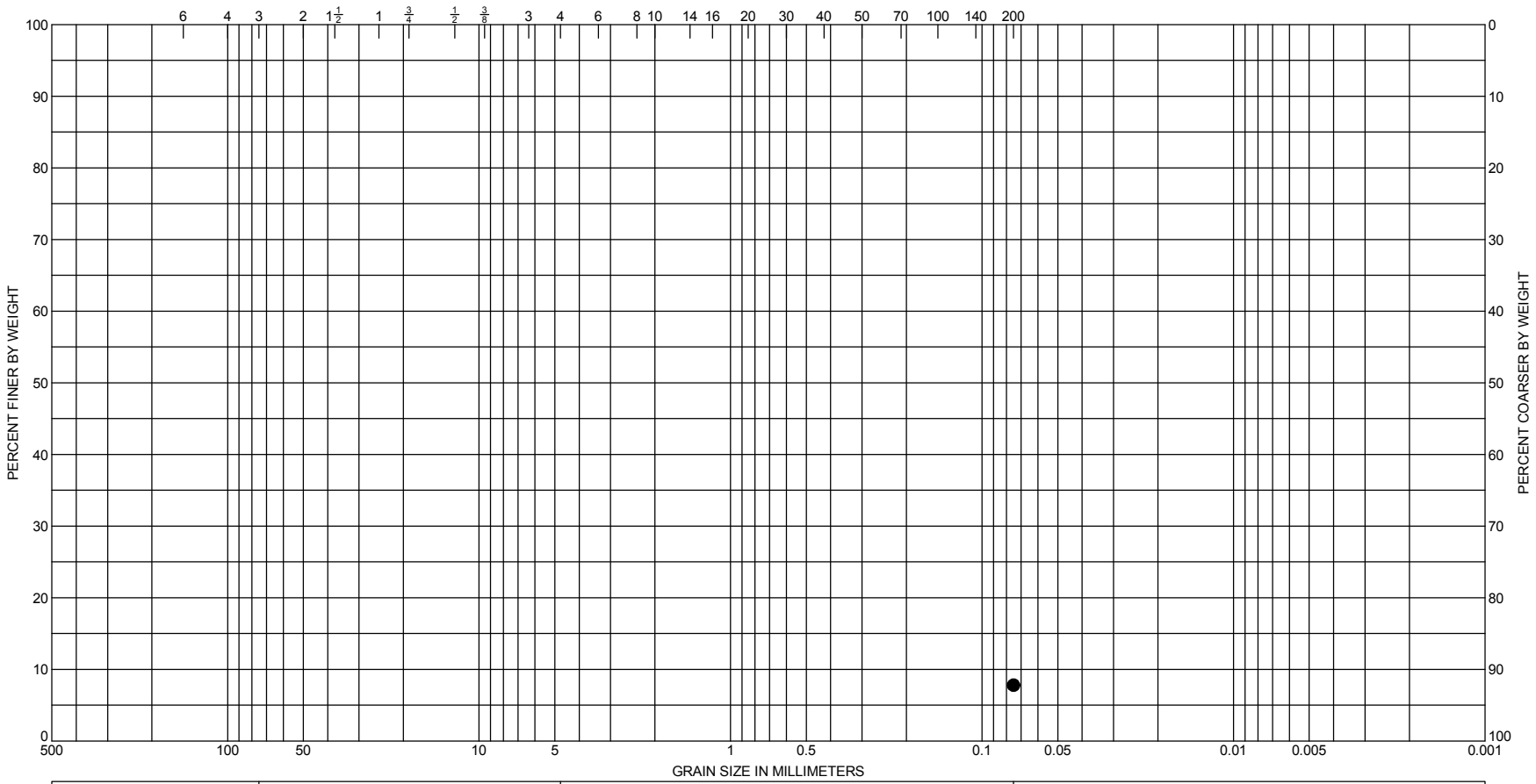
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-02

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	28.4 / 51.0		20.9			

GRADATION CURVES

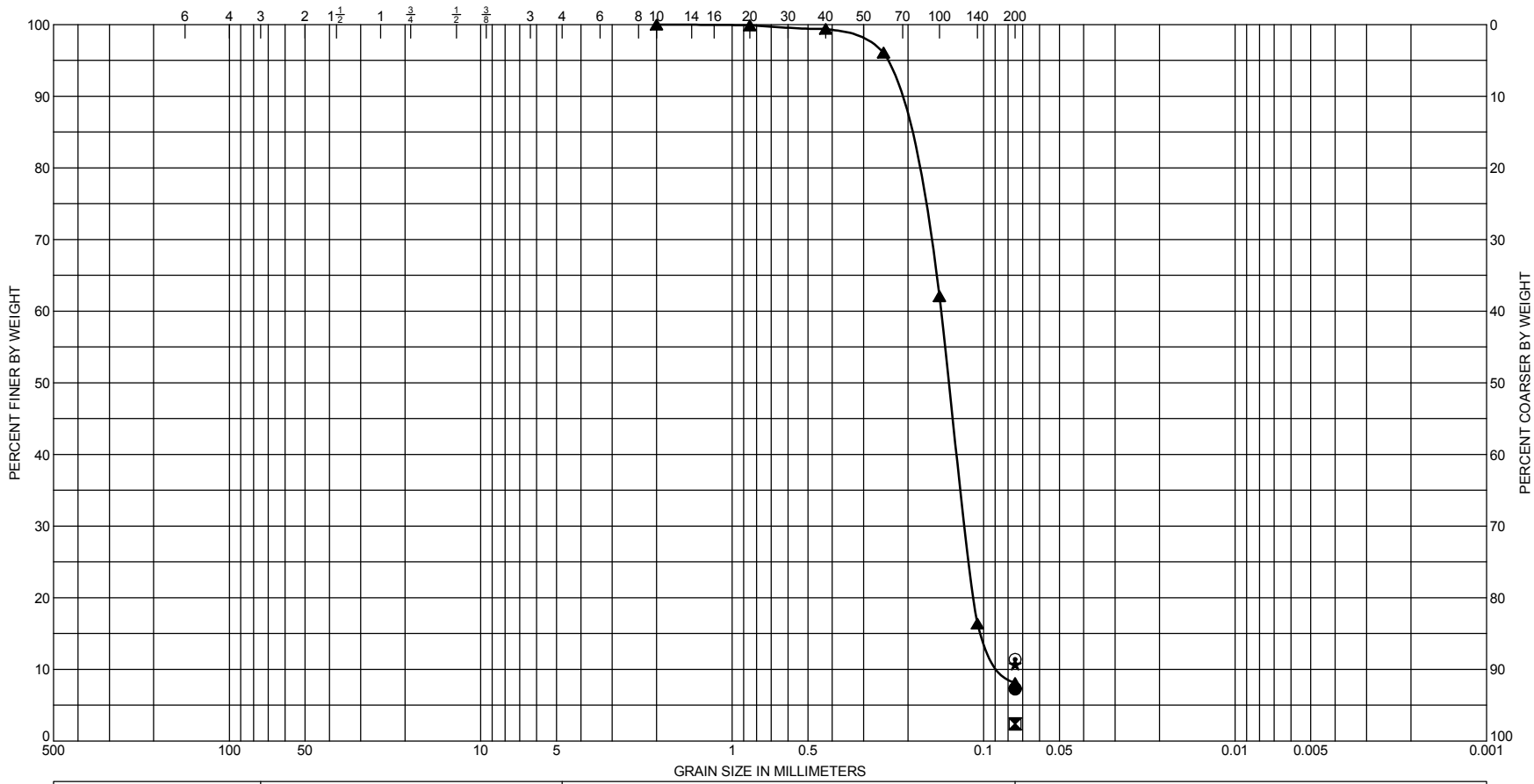
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-02

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	78.3 / 0.0		14.1			
⊠	75.3 / 3.0		97.8			
▲ 9	66.3 / 12.0		27.8			
★	54.3 / 24.0		31.0			
⊙	51.3 / 27.0		31.7			

GRADATION CURVES

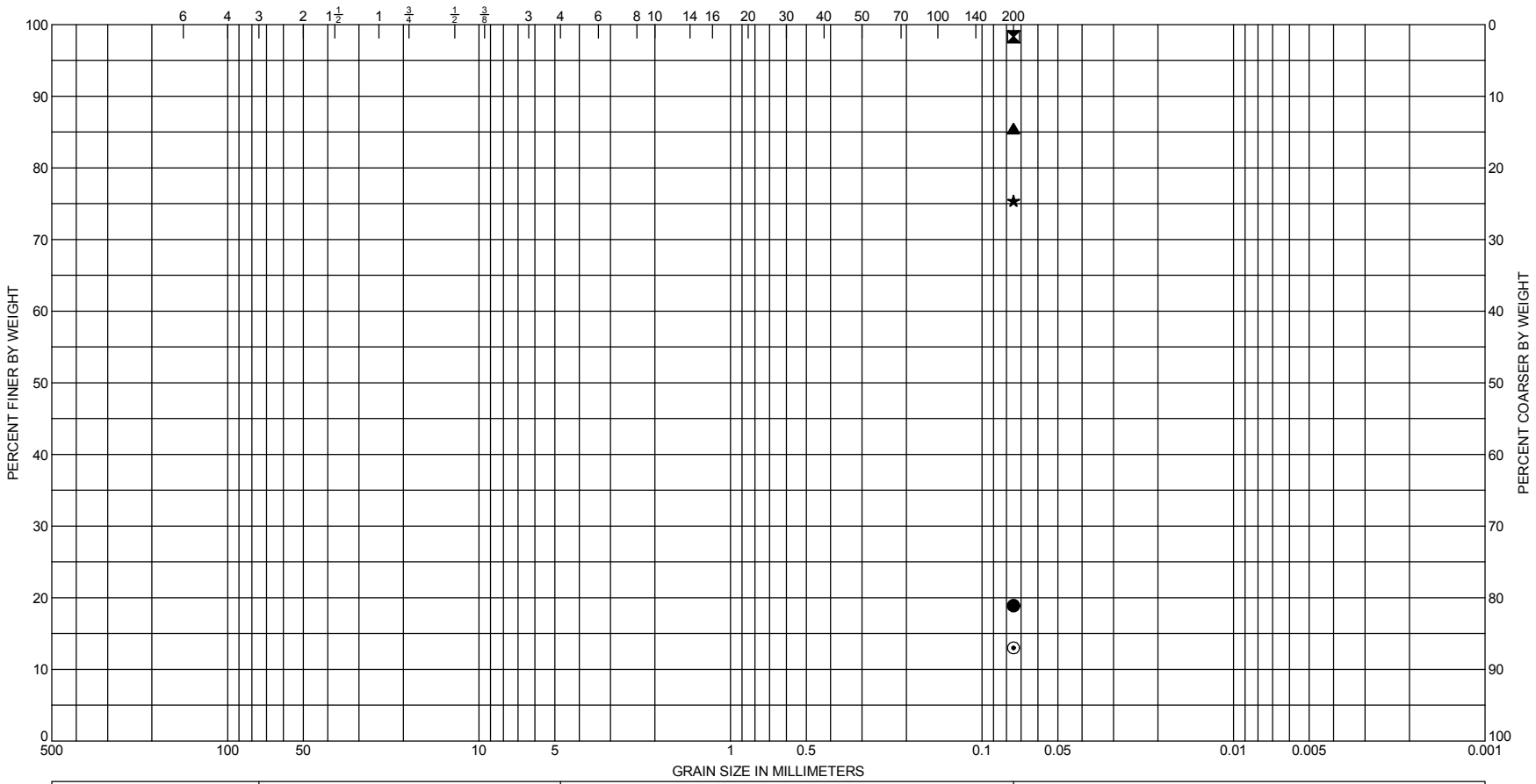
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	46.8 / 31.5		20.9			
⊠	37.8 / 40.5	FAT CLAY(CH)	91.1	148	28	120
▲	34.8 / 43.5	FAT CLAY(CH)	57.0	72	17	55
★	31.8 / 46.5	FAT CLAY with SAND(CH)	57.5	65	13	52
⊙	28.8 / 49.5		22.8			

GRADATION CURVES

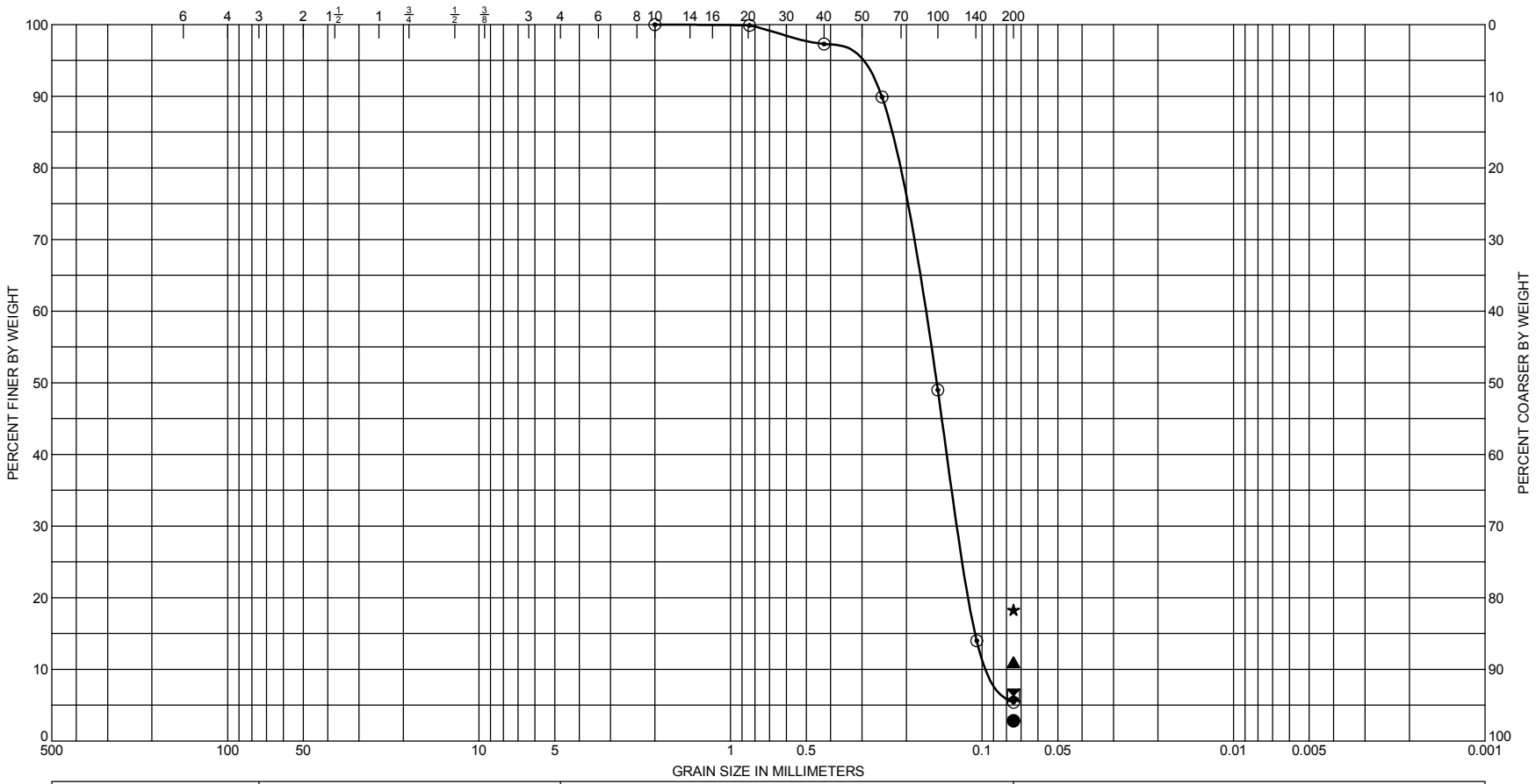
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	77.5 / 1.5		11.3			
⊠	73.0 / 6.0		24.0			
▲	70.0 / 9.0		24.5			
★	65.5 / 13.5		20.1			
⊙	61.0 / 18.0		25.8			

GRADATION CURVES

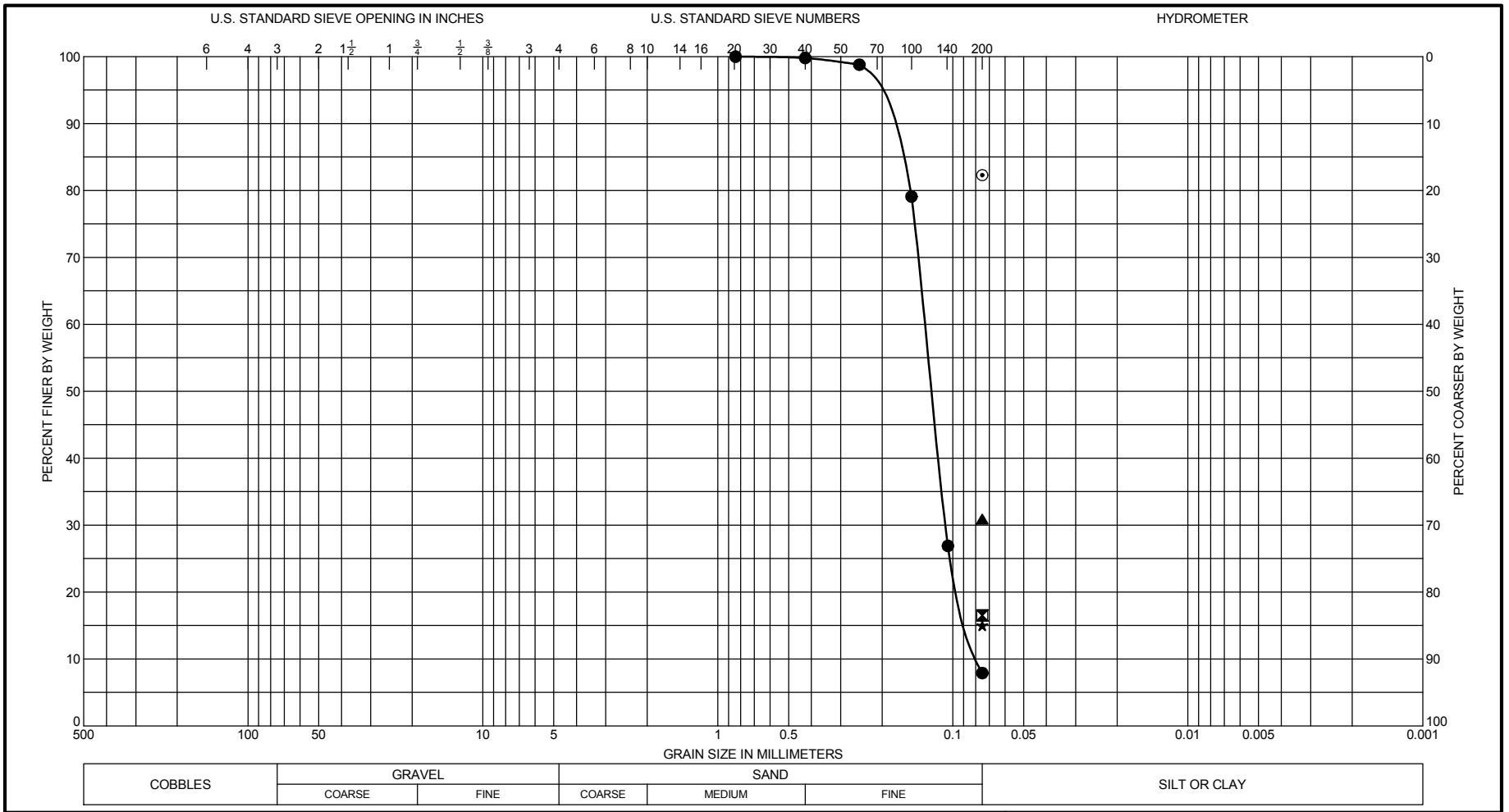
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	50.5 / 28.5		24.7			
⊠	47.5 / 31.5		28.1			
▲	44.5 / 34.5		34.2			
★	37.0 / 42.0		21.3			
⊙	34.0 / 45.0	FAT CLAY with SAND(CH)	69.0	94	21	73

GRADATION CURVES

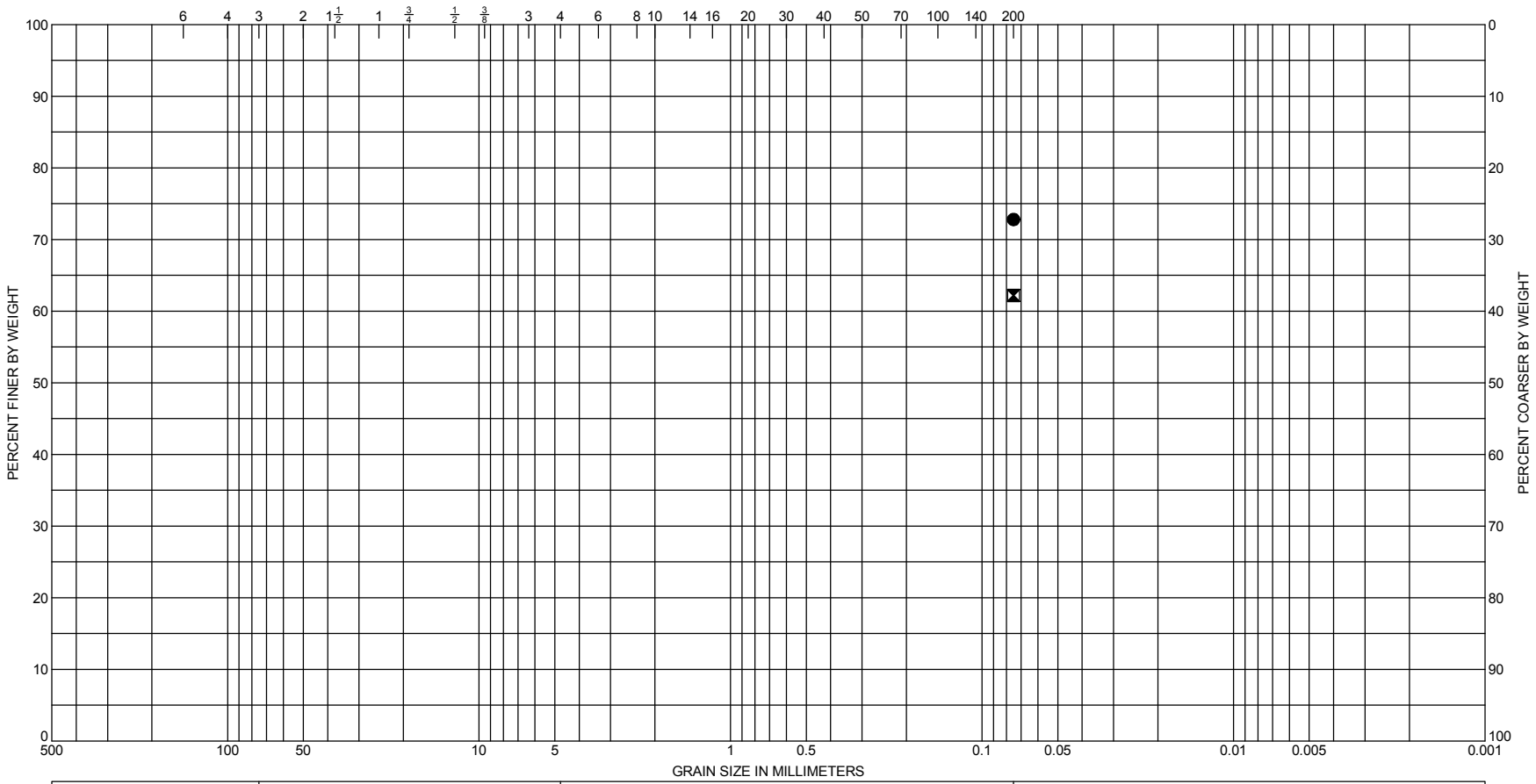
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	31.0 / 48.0	FAT CLAY with SAND(CH)	47.4	71	17	54
⊠	26.5 / 52.5	SANDY FAT CLAY(CH)	54.6	69	14	55

GRADATION CURVES

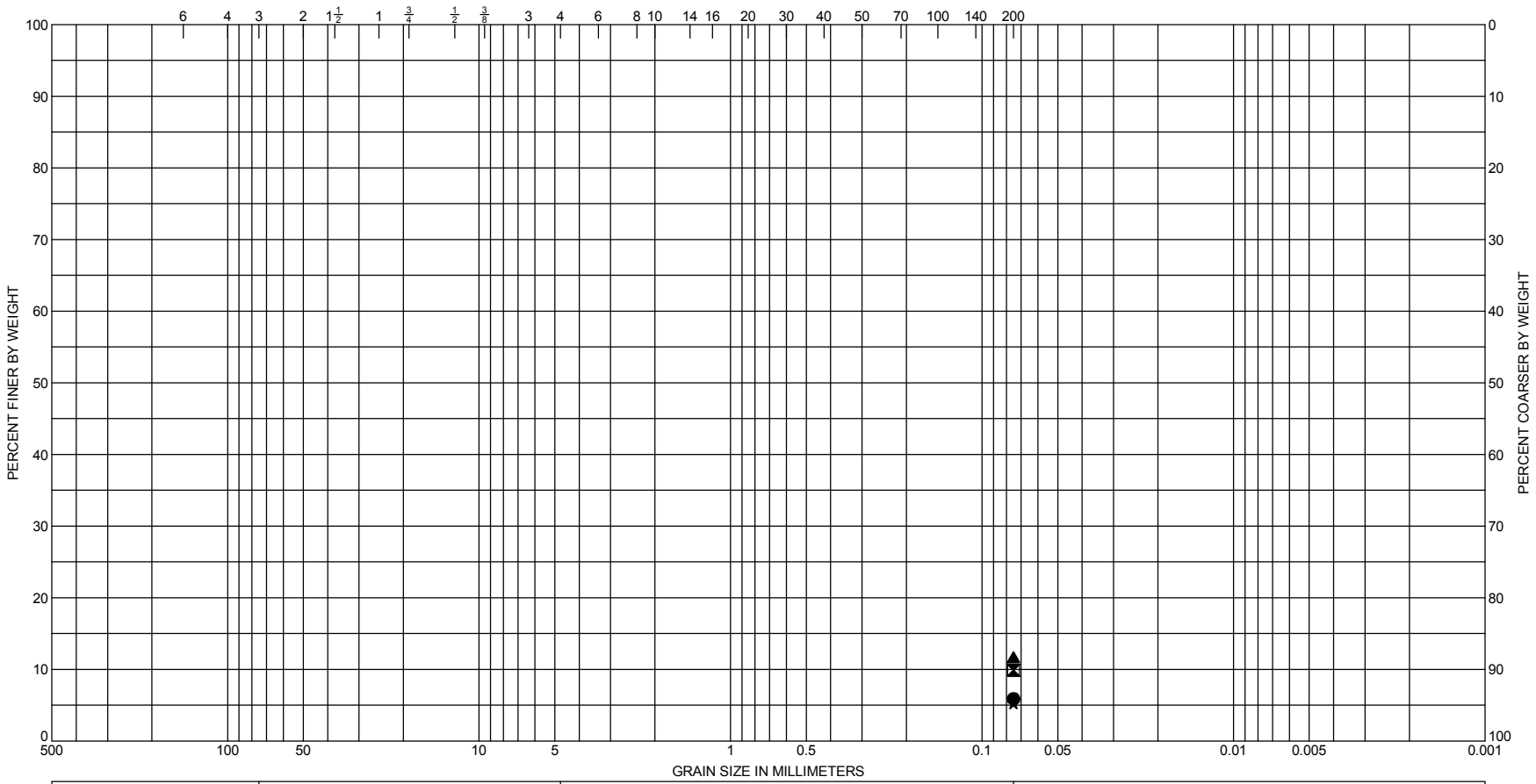
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	78.4 / 1.5		24.3			
⊠	72.4 / 7.5		27.0			
▲	64.9 / 15.0		22.7			
★	58.9 / 21.0		30.5			

GRADATION CURVES

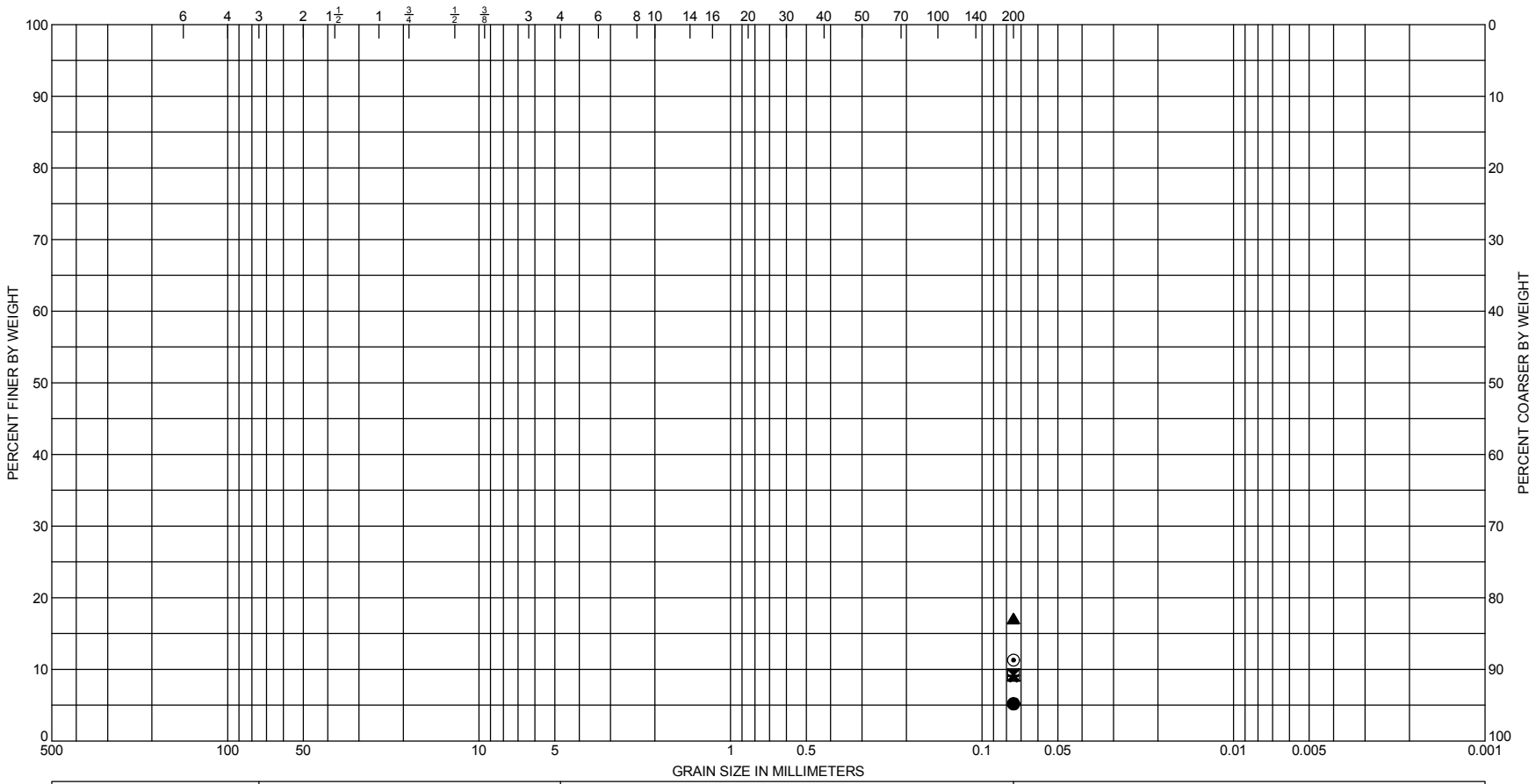
Project OUC LINED POND MODIFICATION

Area

Boring No. TH-RPE-05

Date 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	79.6 / 0.0		8.3			
⊠	73.6 / 6.0		28.4			
▲	67.6 / 12.0		20.4			
★	57.1 / 22.5		26.9			
⊙	49.6 / 30.0		23.3			

GRADATION CURVES

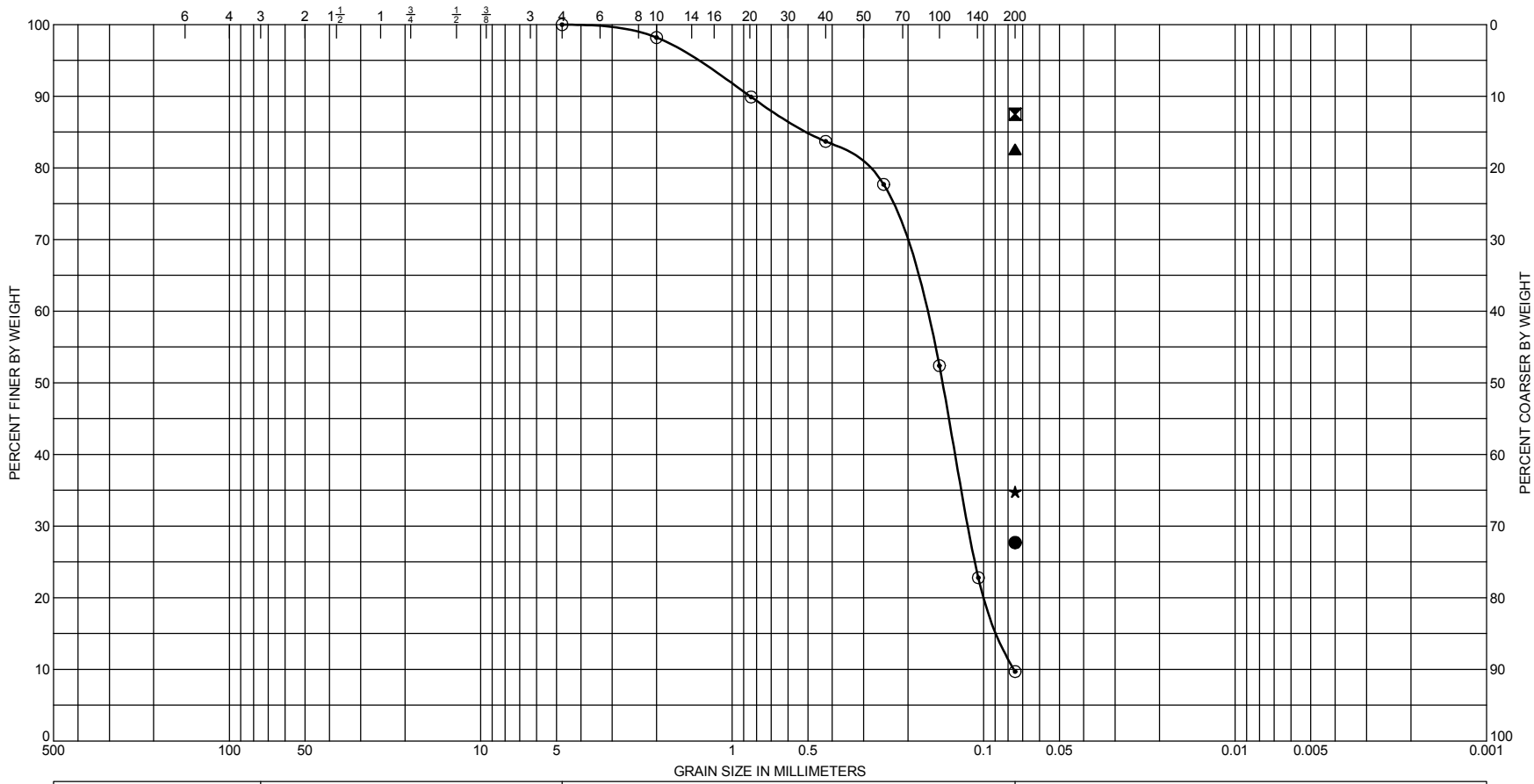
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	46.6 / 33.0		27.9			
⊠	37.6 / 42.0	FAT CLAY(CH)	77.3	90	23	67
▲	33.1 / 46.5	FAT CLAY with SAND(CH)	56.9	70	17	53
★	30.1 / 49.5		33.5			
⊙	22.6 / 57.0		22.1			

GRADATION CURVES

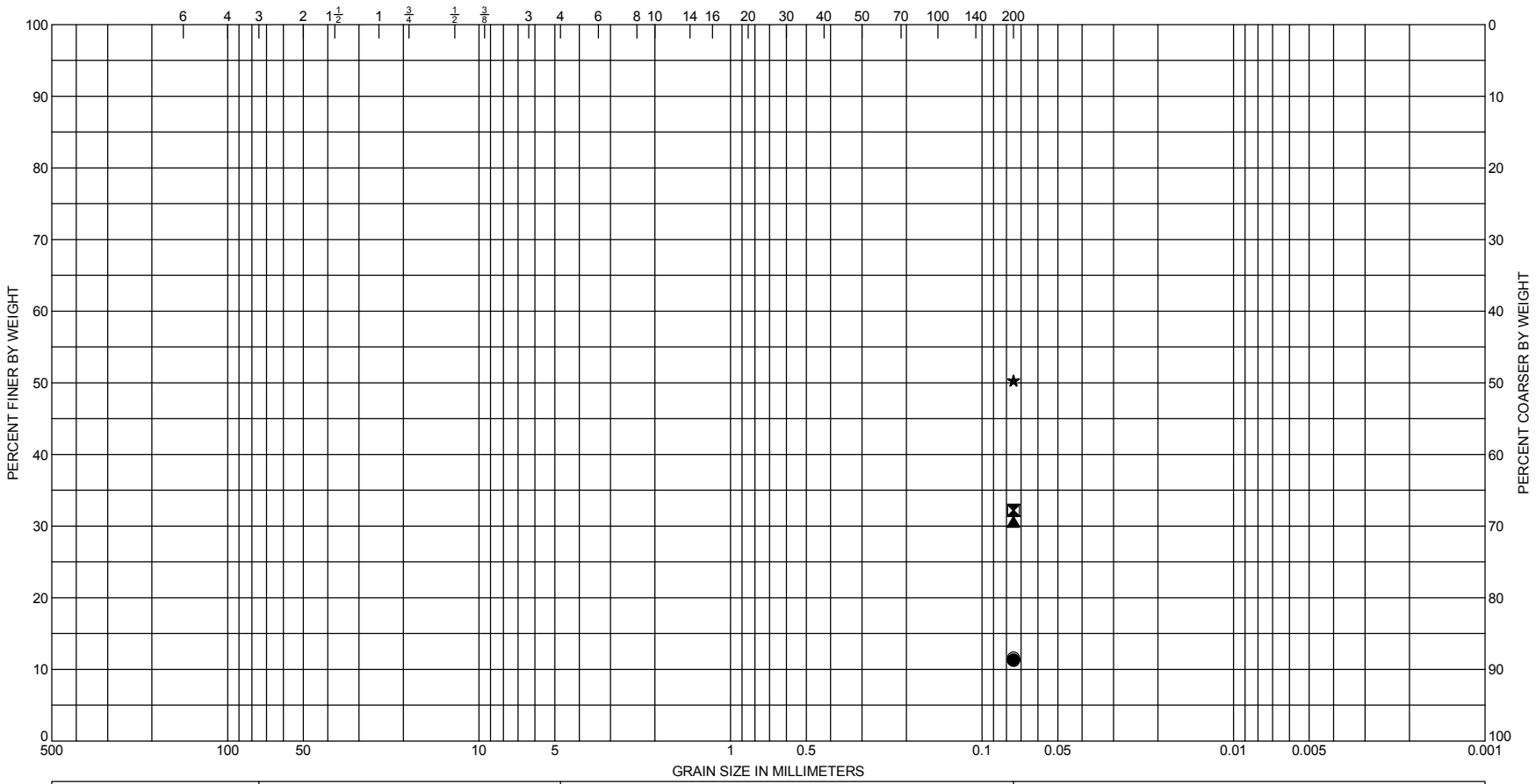
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	13.6 / 66.0		28.5			
⊠	9.1 / 70.5		34.4			
▲	6.1 / 73.5		33.9			
★ 52	3.1 / 76.5		35.0			
⊙	-2.9 / 82.5		37.9			

GRADATION CURVES

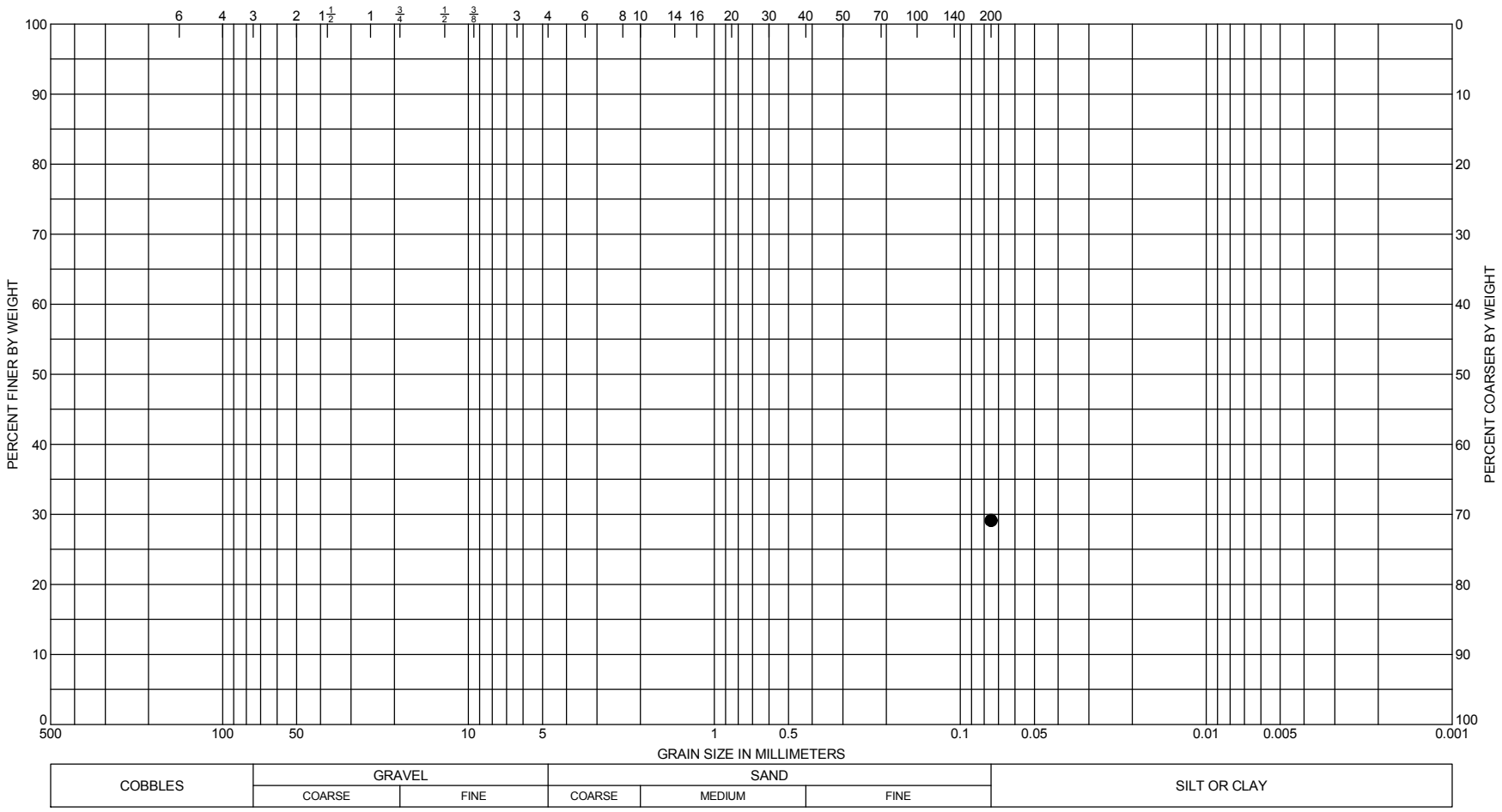
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
● 59	-7.4 / 87.0		33.9			

GRADATION CURVES

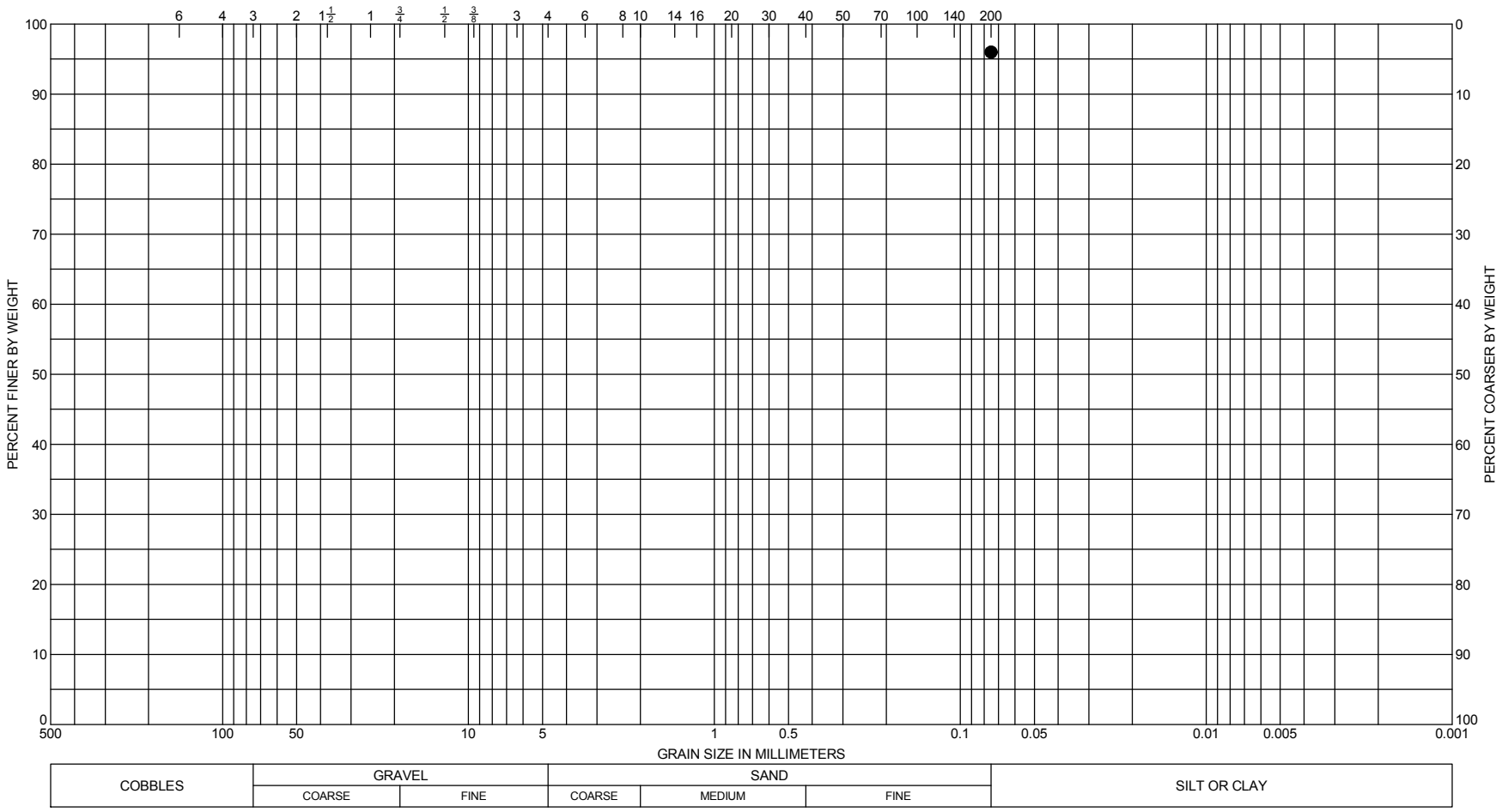
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	37.4 / 42.0	FAT CLAY(CH)	100.0	141	28	113

GRADATION CURVES

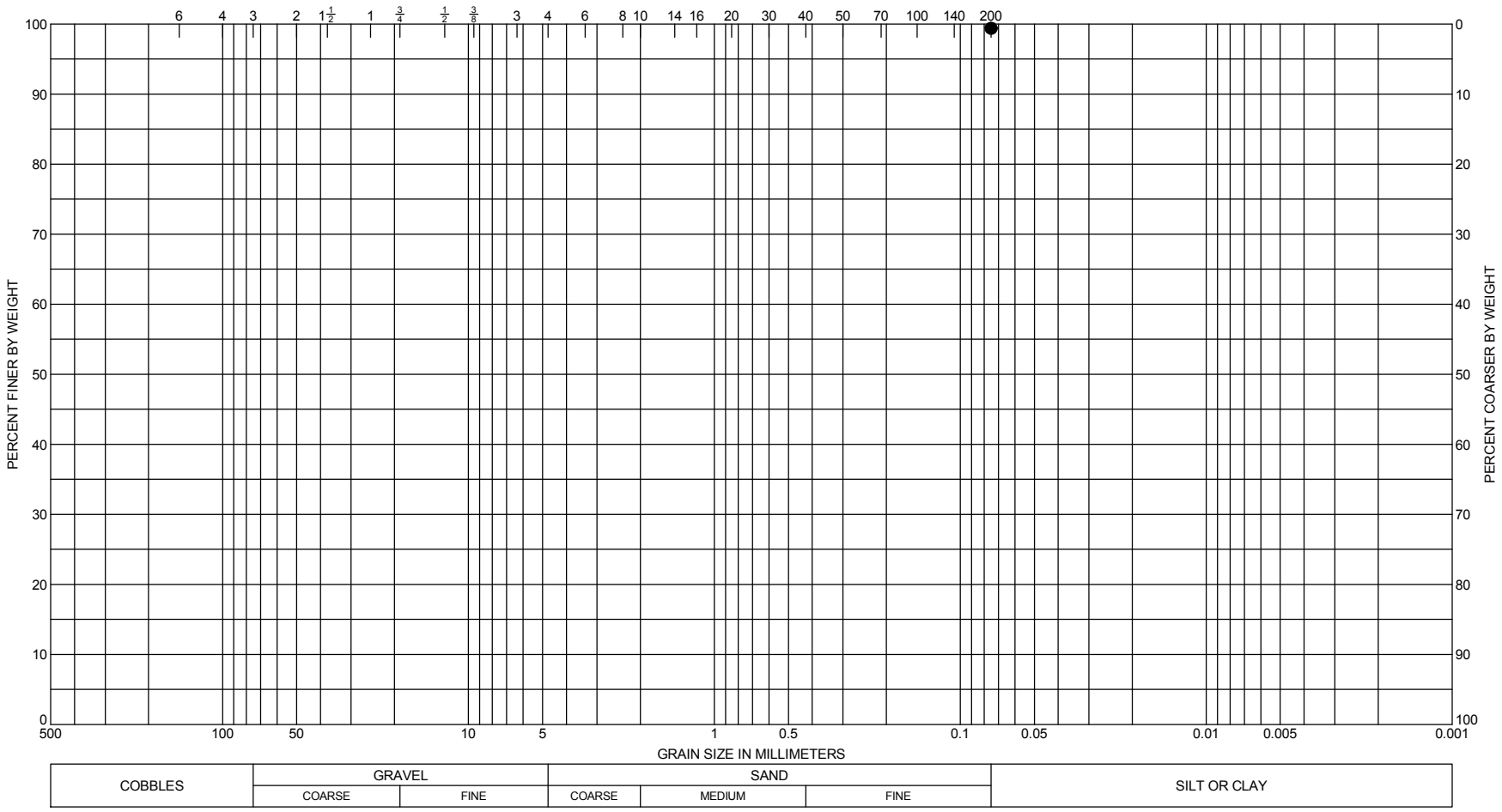
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-02-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	37.8 / 40.5	FAT CLAY(CH)	91.1	129	26	103

GRADATION CURVES

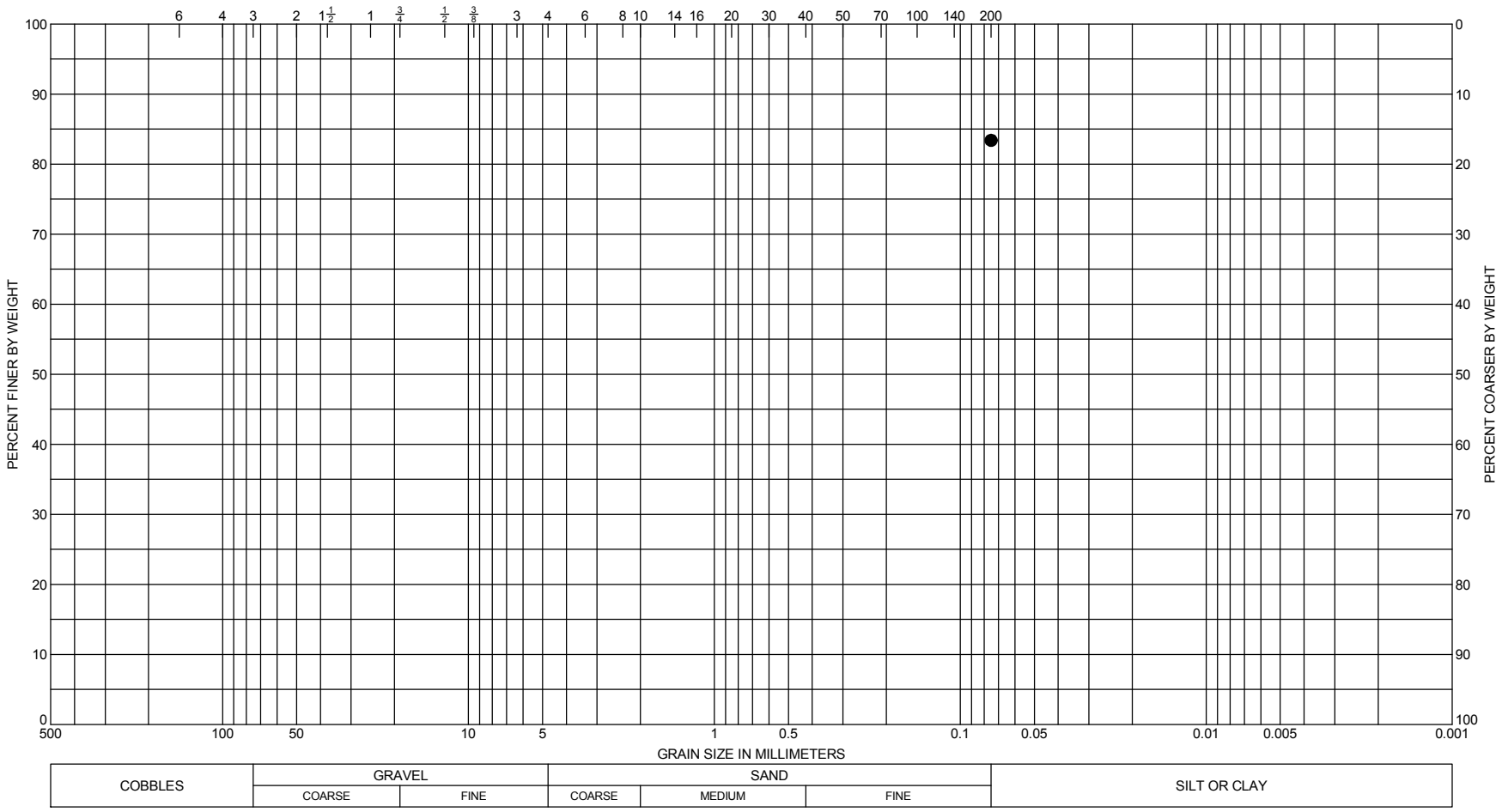
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-03-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	31.0 / 48.0	FAT CLAY with SAND(CH)	50.0	74	24	50

GRADATION CURVES

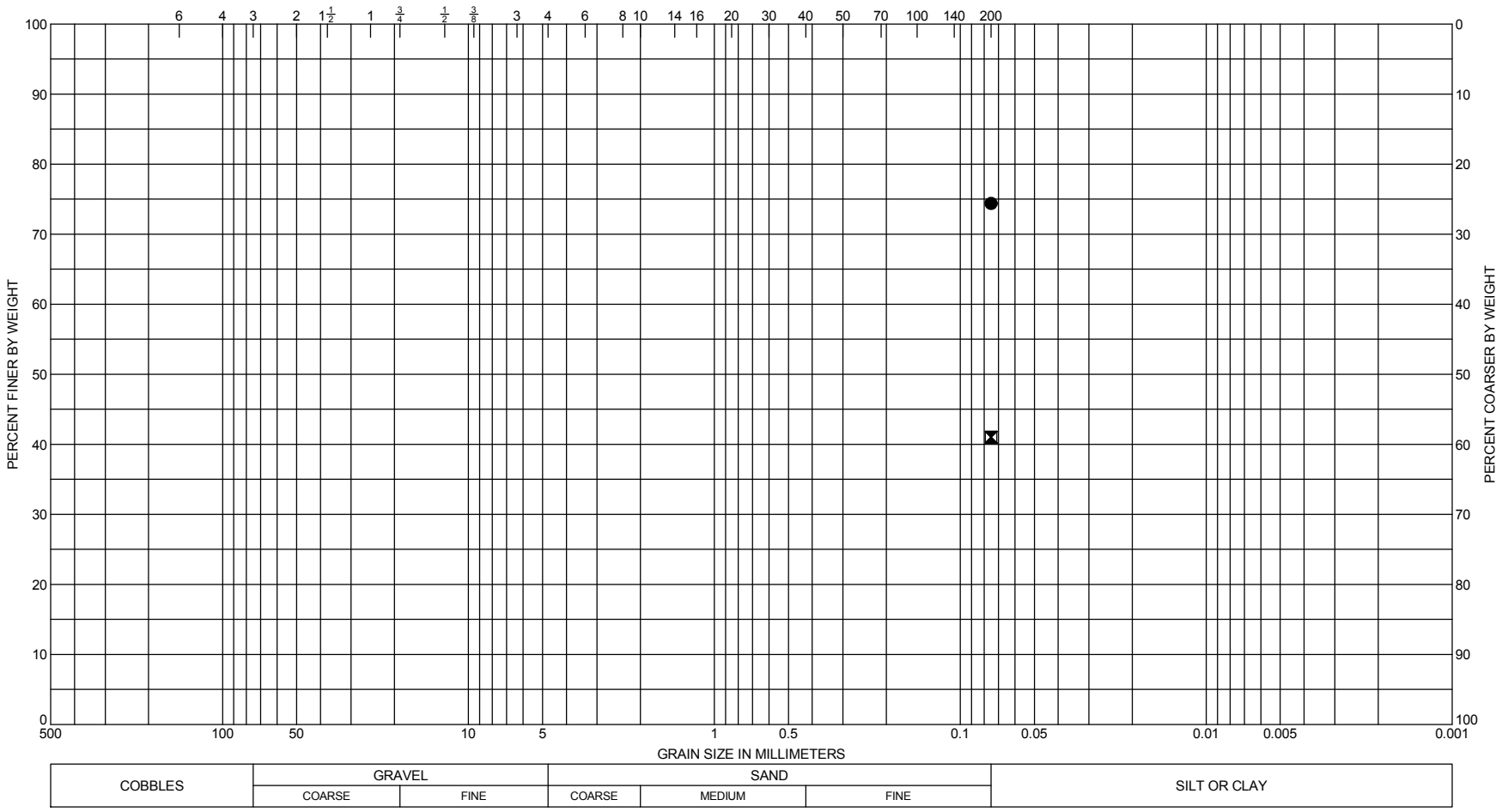
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-04-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	34.6 / 45.0	FAT CLAY with SAND(CH)	65.3	84	18	66
⊠	4.1 / 75.5	CLAYEY SAND(SC)	29.7	38	17	21

GRADATION CURVES

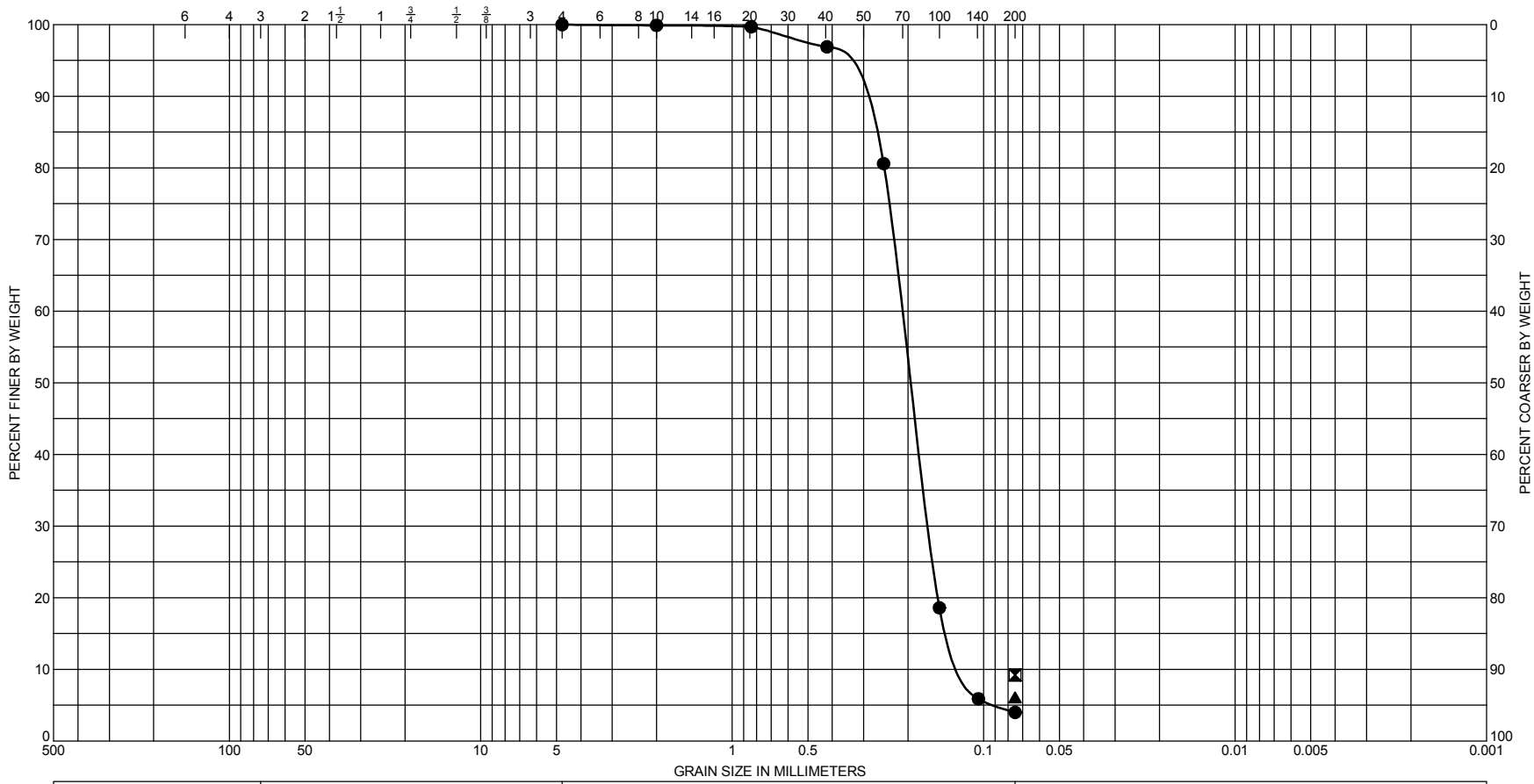
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-RPE-06-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	77.8 / 3.0	POORLY GRADED SAND(SP)	11.9			
⊠	71.8 / 9.0		27.4			
▲	59.8 / 21.0		26.2			

GRADATION CURVES

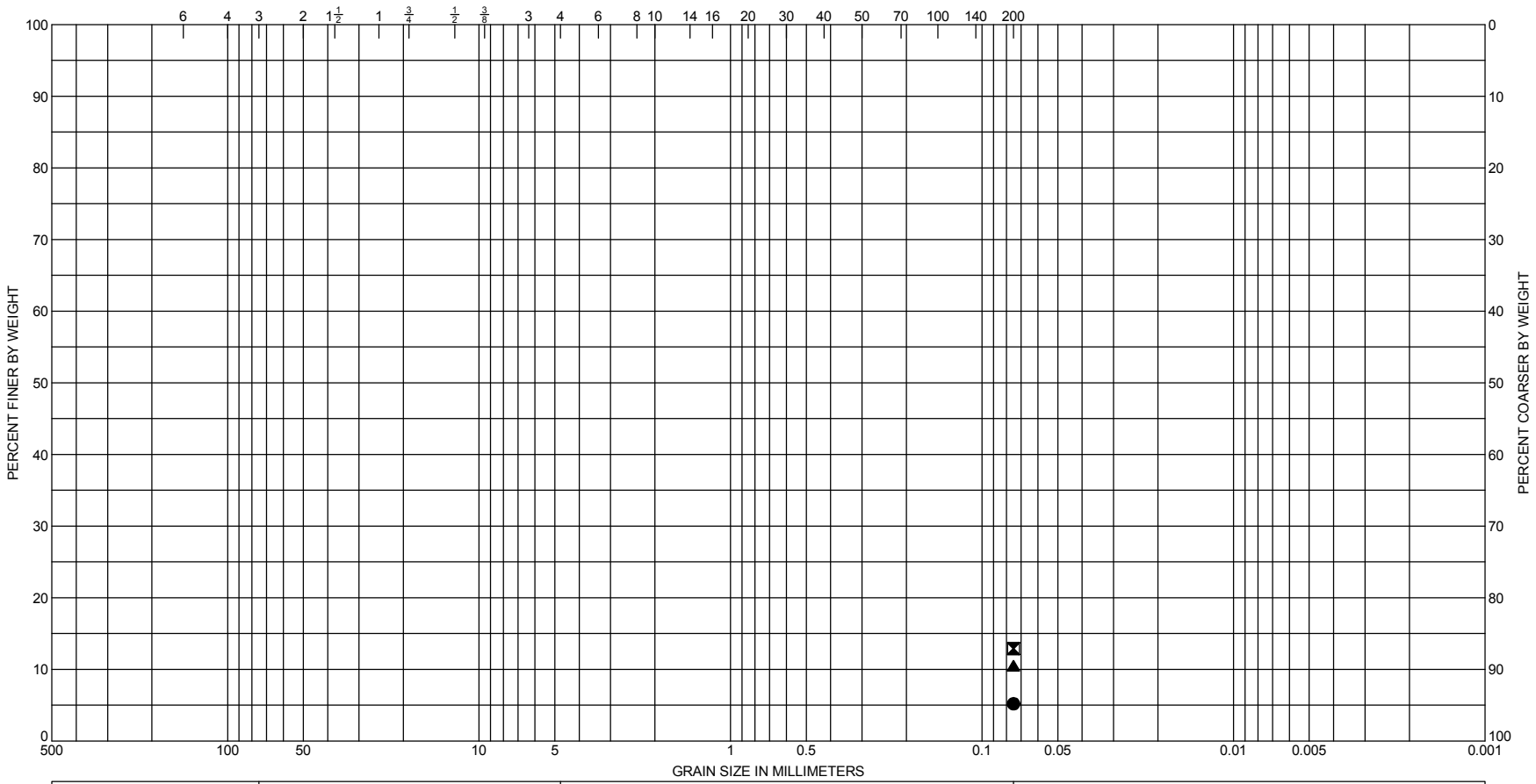
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-01

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	73.1 / 6.0		20.6			
⊠	67.1 / 12.0		26.5			
▲	62.6 / 16.5		21.5			

GRADATION CURVES

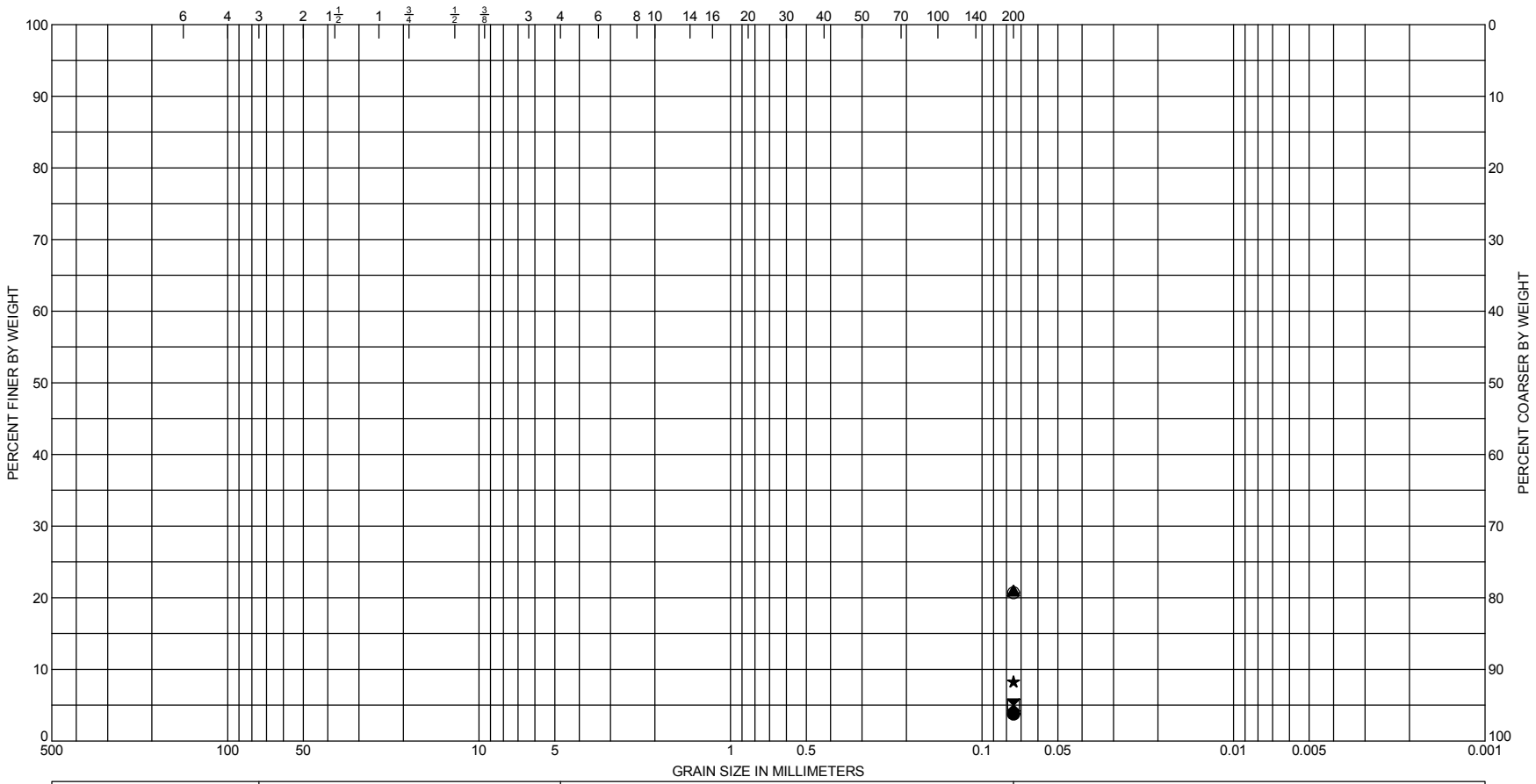
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-02

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	75.8 / 4.5		19.4			
⊠	66.8 / 13.5		28.9			
▲	60.8 / 19.5		18.8			
★	54.8 / 25.5		26.9			
⊙	42.8 / 37.5		25.8			

GRADATION CURVES

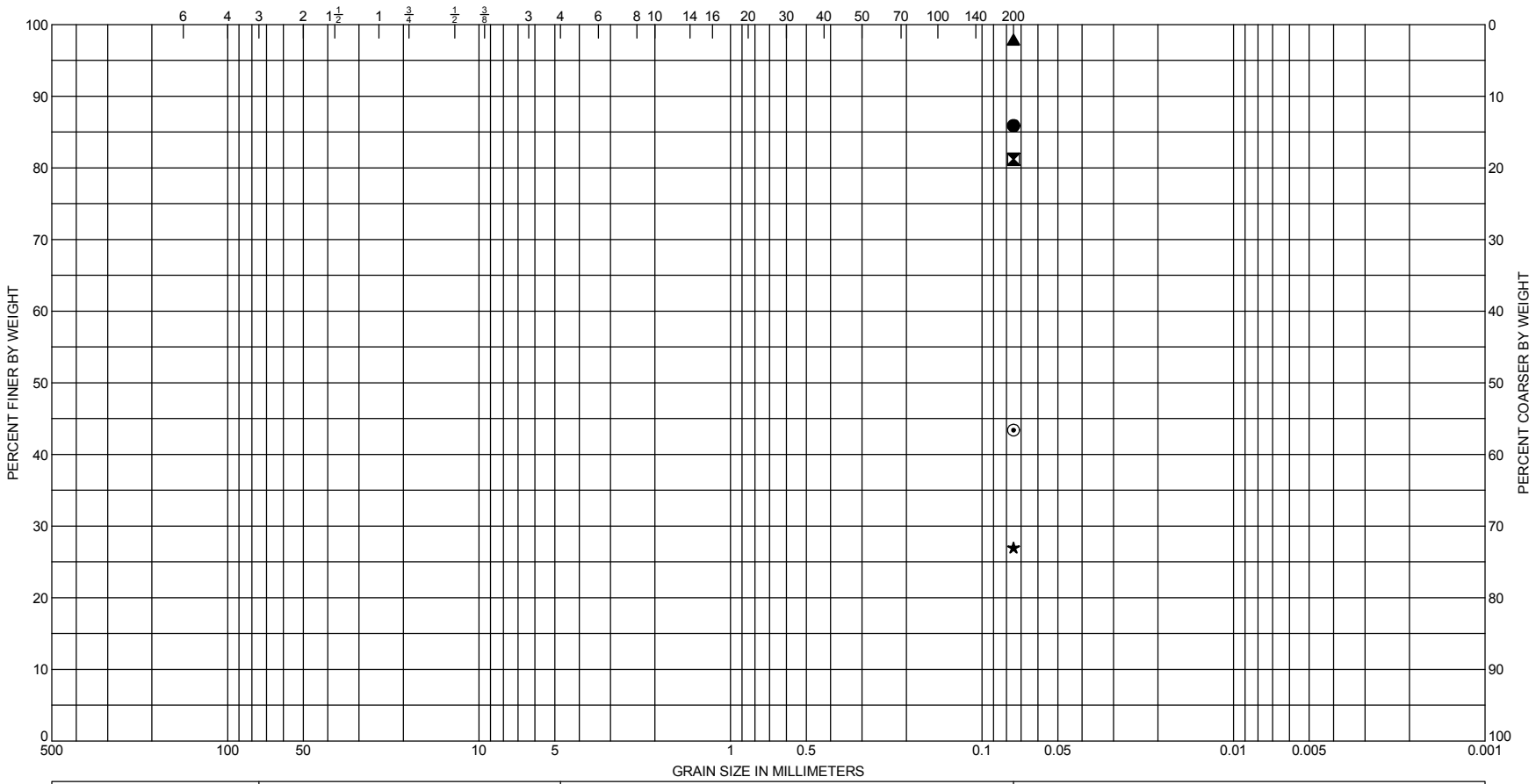
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	36.8 / 43.5		43.2			
⊠	33.8 / 46.5	FAT CLAY with SAND(CH)	67.1	74	17	57
▲	29.3 / 51.0	FAT CLAY(CH)	91.2	103	23	80
★	23.3 / 57.0	CLAYEY SAND(SC)	36.1	42	15	27
⊙	15.8 / 64.5		34.0			

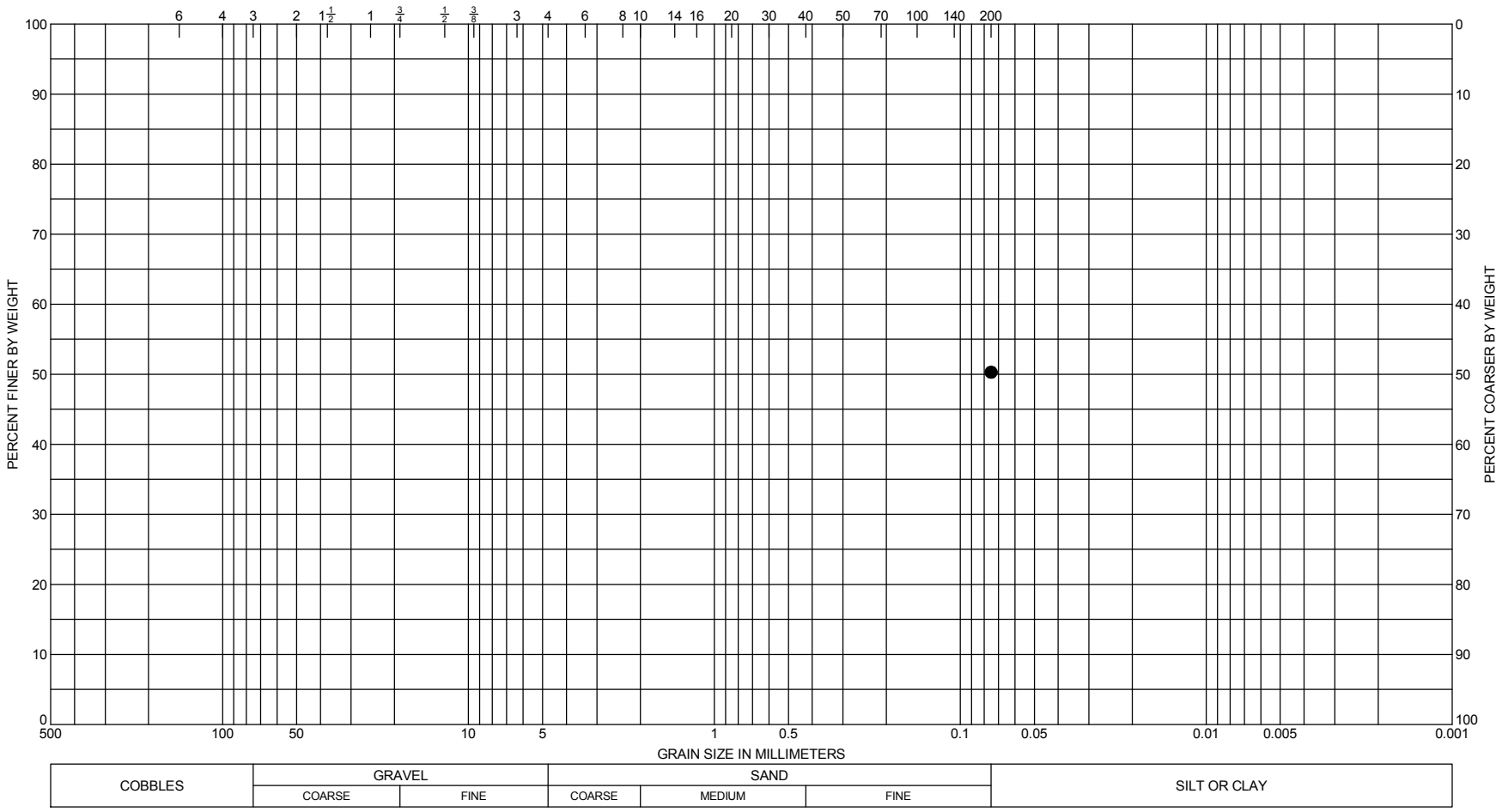
GRADATION CURVES

Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-03

Date: 8/20/14



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	5.3 / 75.0		31.7			

GRADATION CURVES

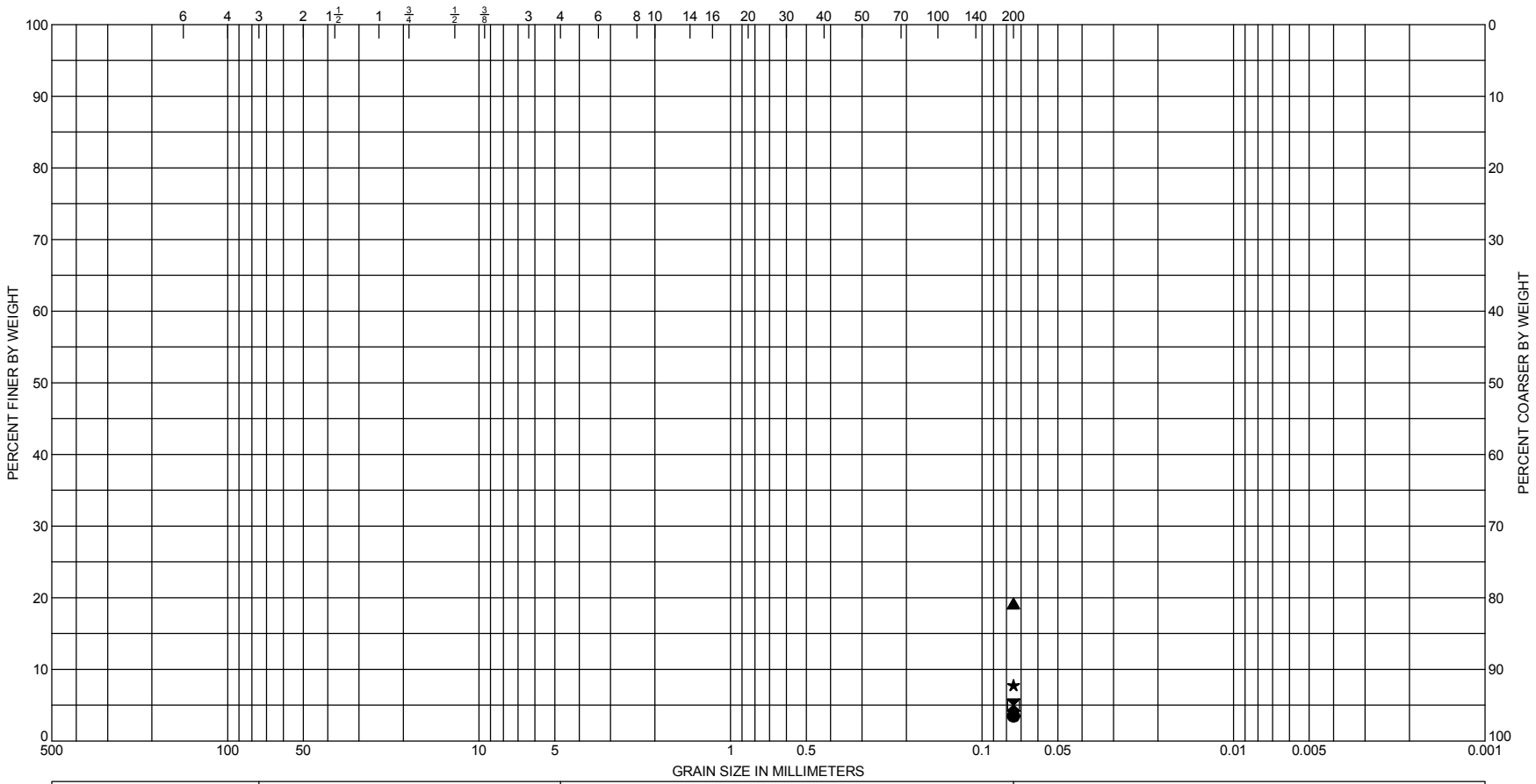
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	78.0 / 1.5		16.4			
⊠	7	70.5 / 9.0		39.0			
▲	11	64.5 / 15.0	SILTY SAND(SM)	21.2	19	17	2
★	15	58.5 / 21.0		25.0			

GRADATION CURVES

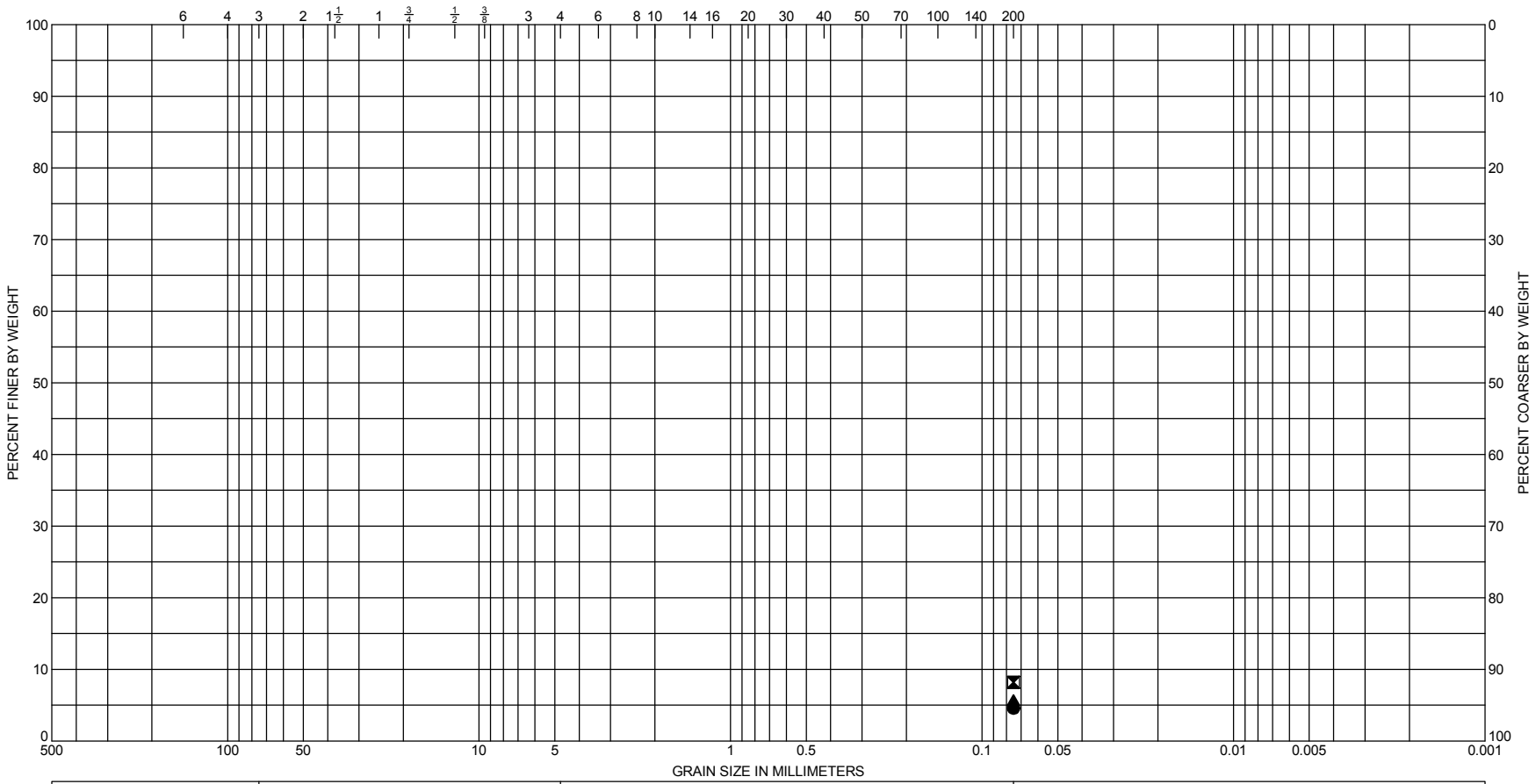
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-04

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	78.0 / 1.5		18.9			
⊠	6	72.0 / 7.5		27.0			
▲	10	66.0 / 13.5		24.9			

GRADATION CURVES

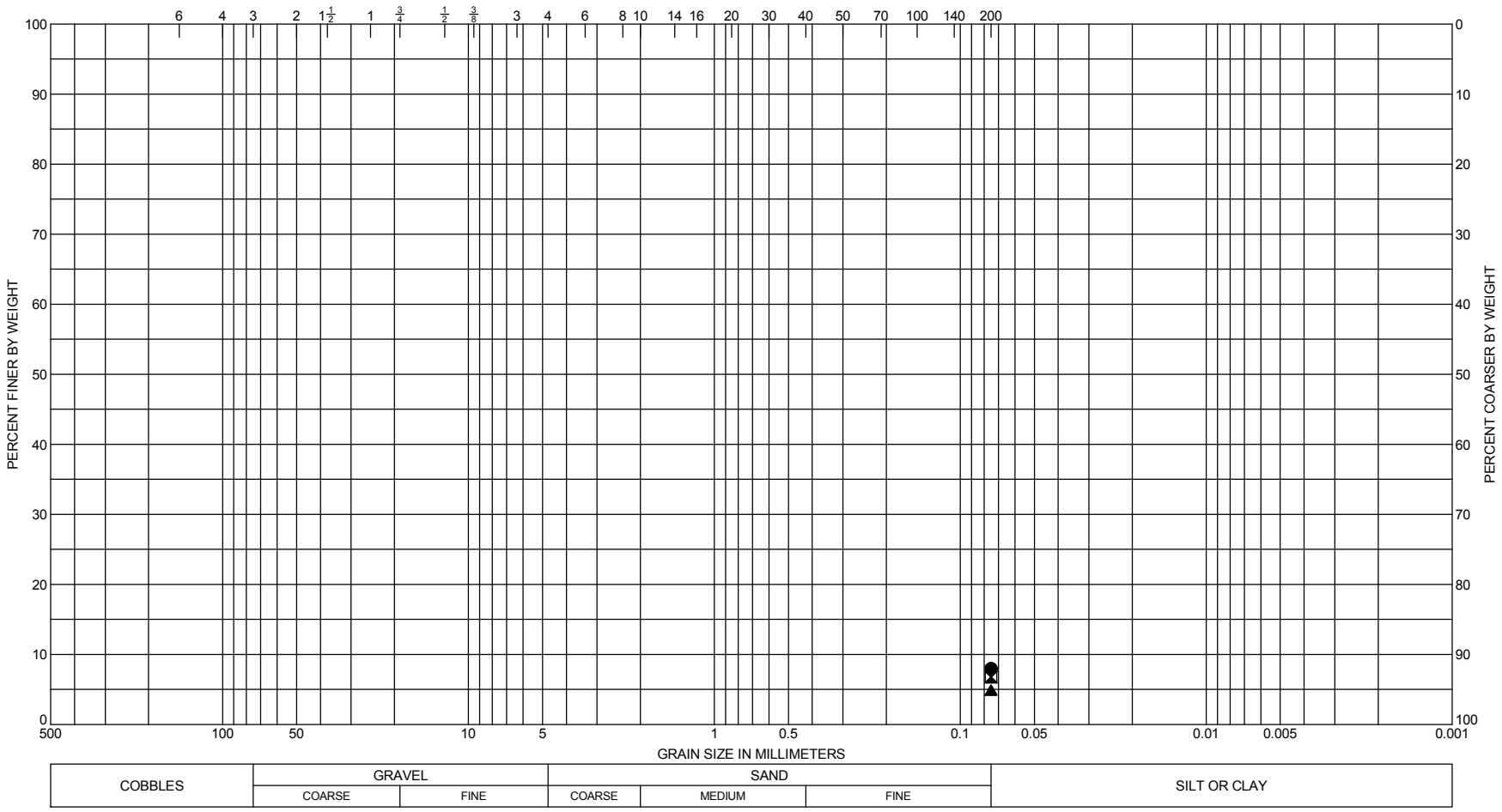
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-05

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
● 4	75.9 / 4.5		17.0			
⊠ 8	69.9 / 10.5		25.7			
▲ 12	63.9 / 16.5		22.0			

GRADATION CURVES

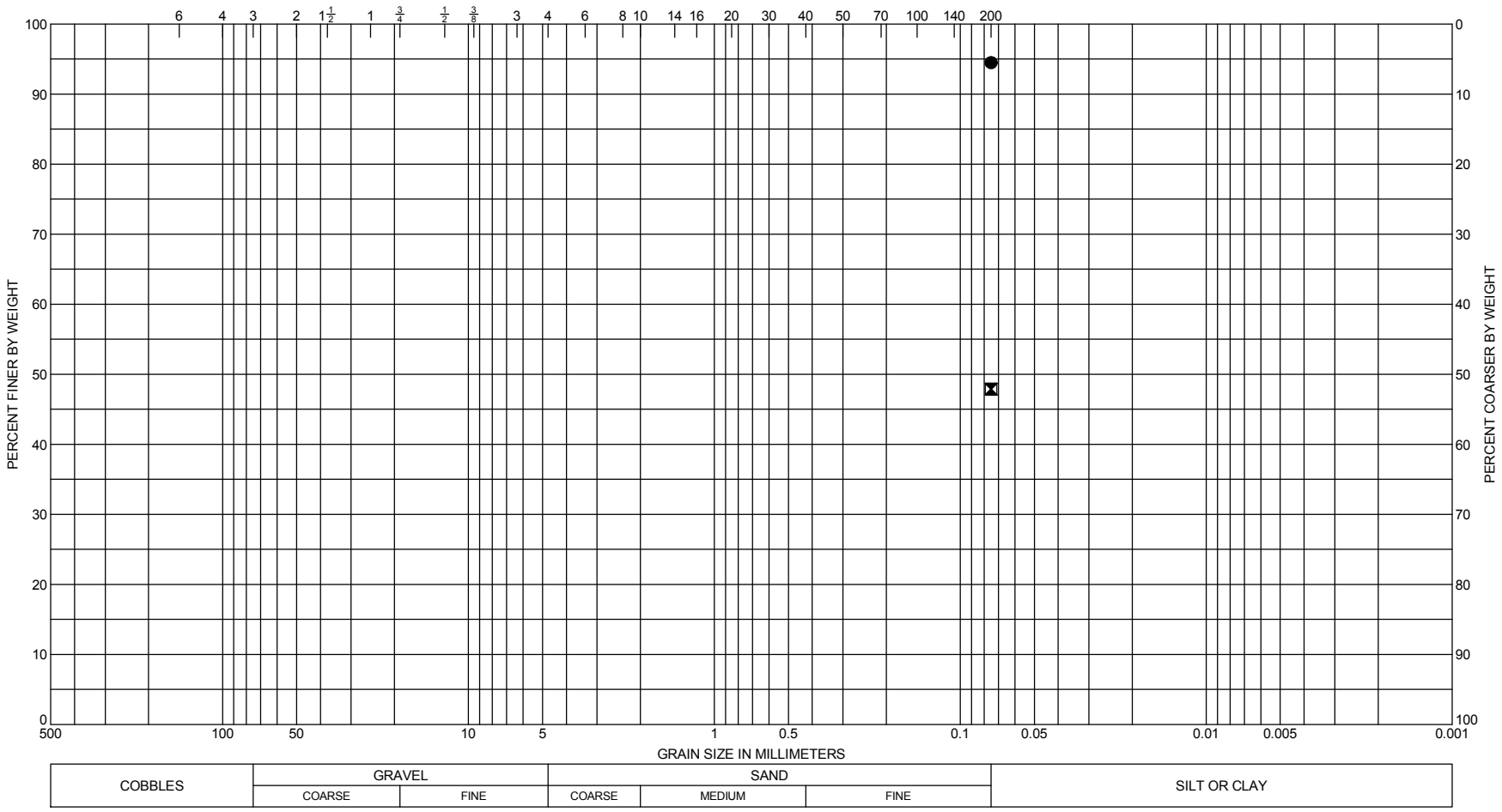
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-06

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
● US-1	31.3 / 49.0	FAT CLAY(CH)	61.6	82	18	64
⊠ US-2	7.3 / 73.0	CLAYEY SAND(SC)	36.7	41	15	26

GRADATION CURVES

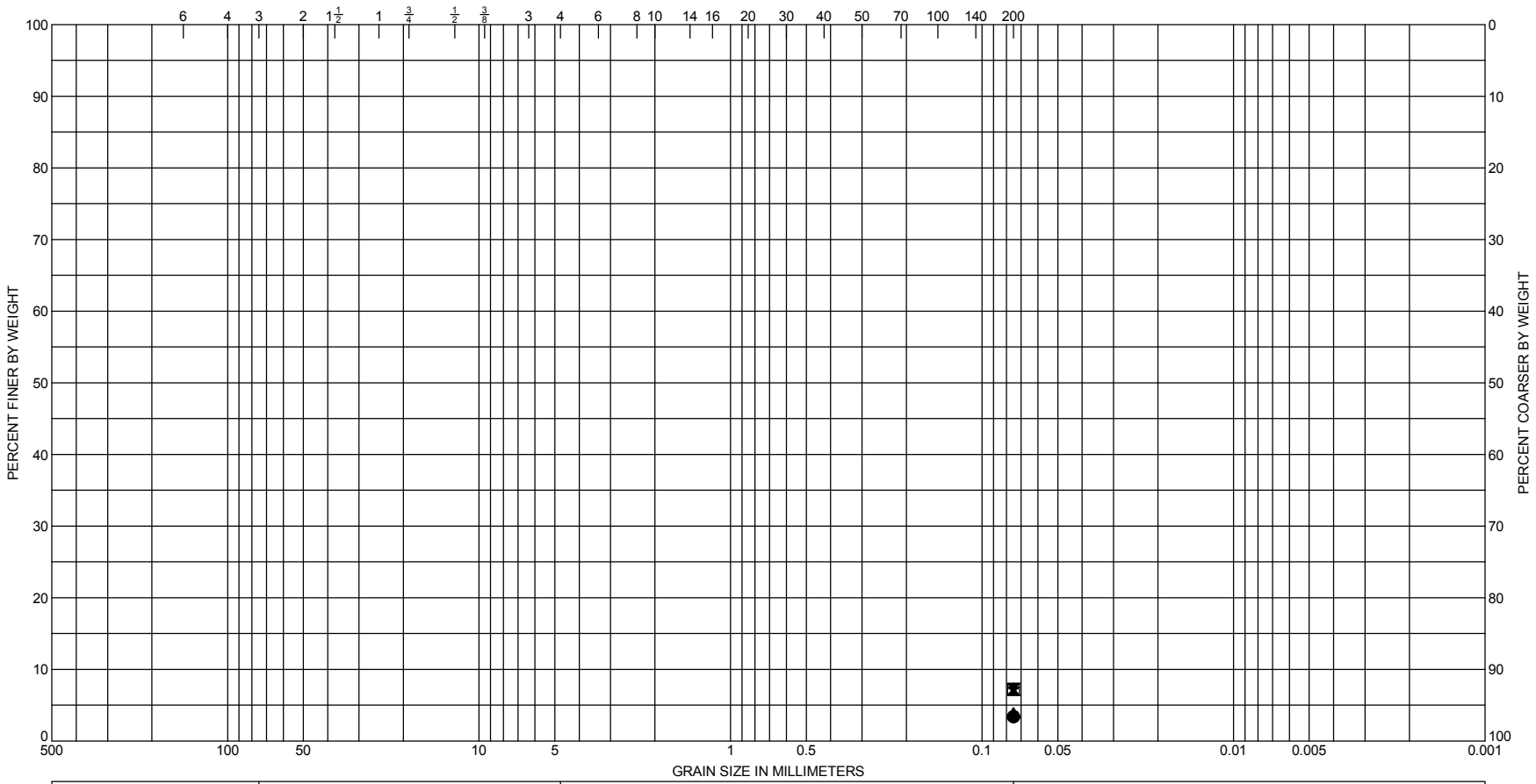
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAN-03-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	77.6 / 1.5		20.5			
⊠	7	70.1 / 9.0		24.0			
▲	12	62.6 / 16.5		24.0			
★	16	56.6 / 22.5		26.7			

GRADATION CURVES

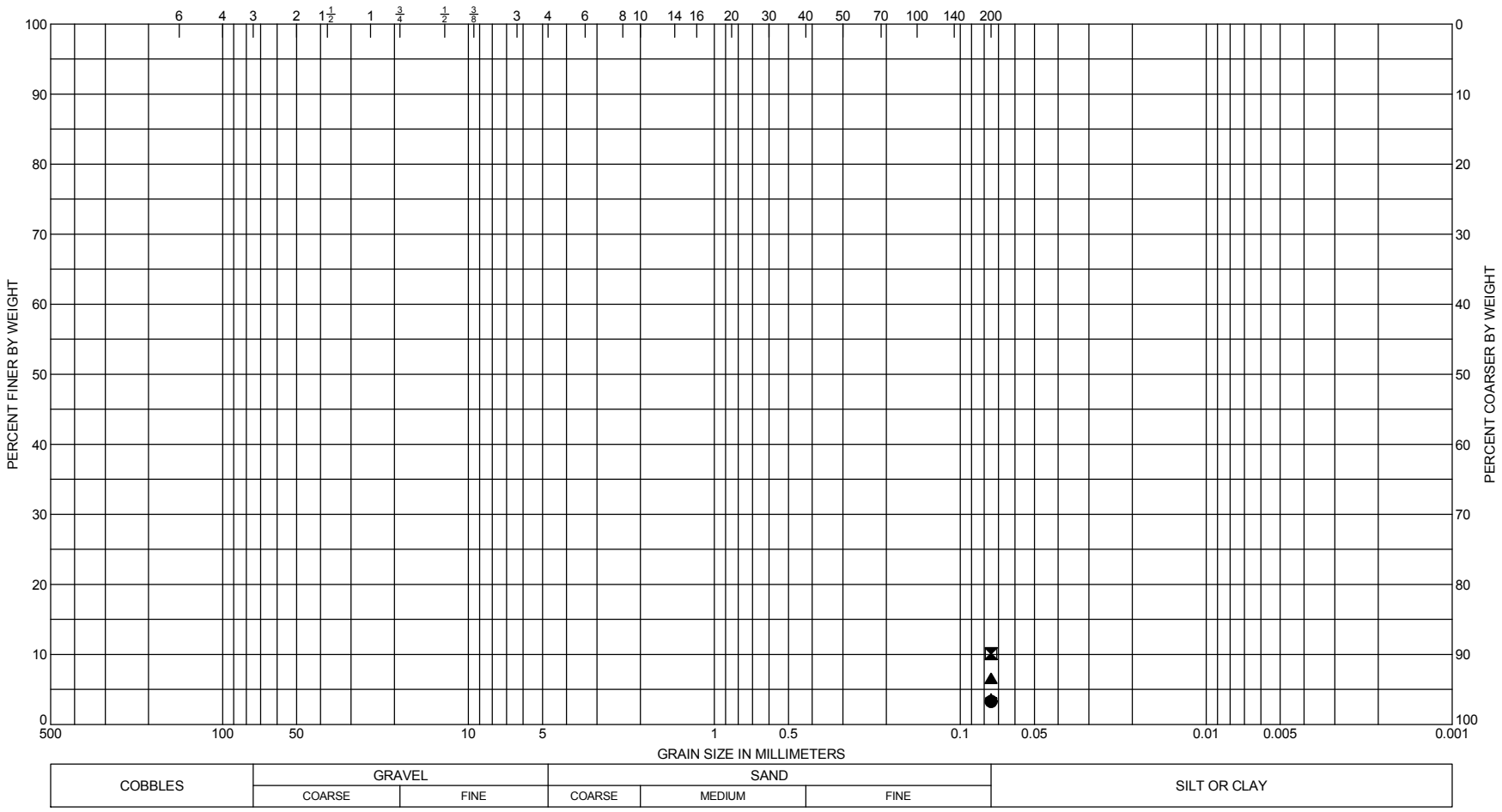
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-01

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	2	78.7 / 1.5		13.5			
⊠	6	72.7 / 7.5		18.9			
▲	9	68.2 / 12.0		25.3			
★	14	60.7 / 19.5		23.3			

GRADATION CURVES

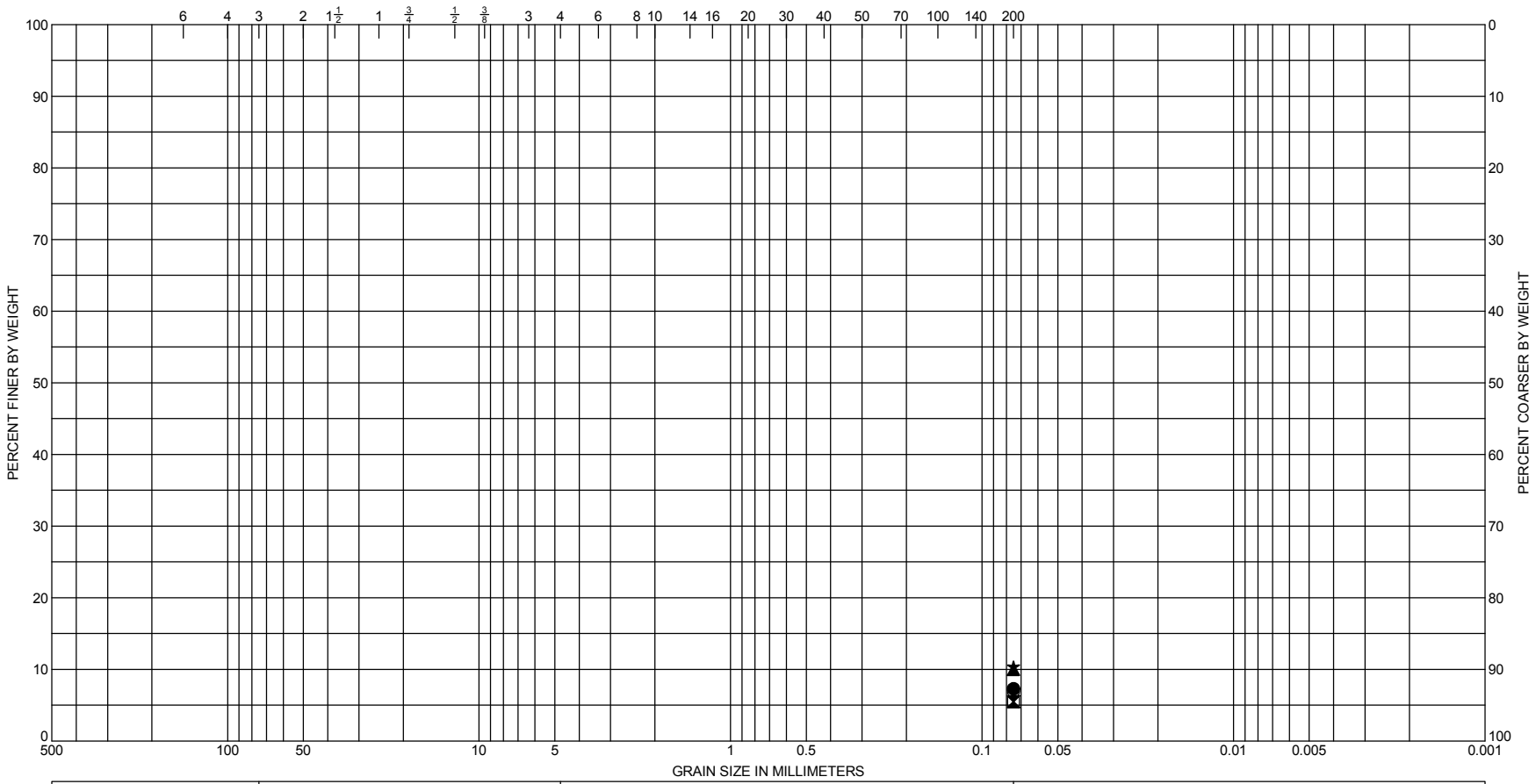
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-02

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	1	79.8 / 0.0		6.9			
⊠	4	75.3 / 4.5		11.2			
▲	9	67.8 / 12.0		31.1			
★	12	63.3 / 16.5		30.1			
⊙	20	51.3 / 28.5		26.2			

GRADATION CURVES

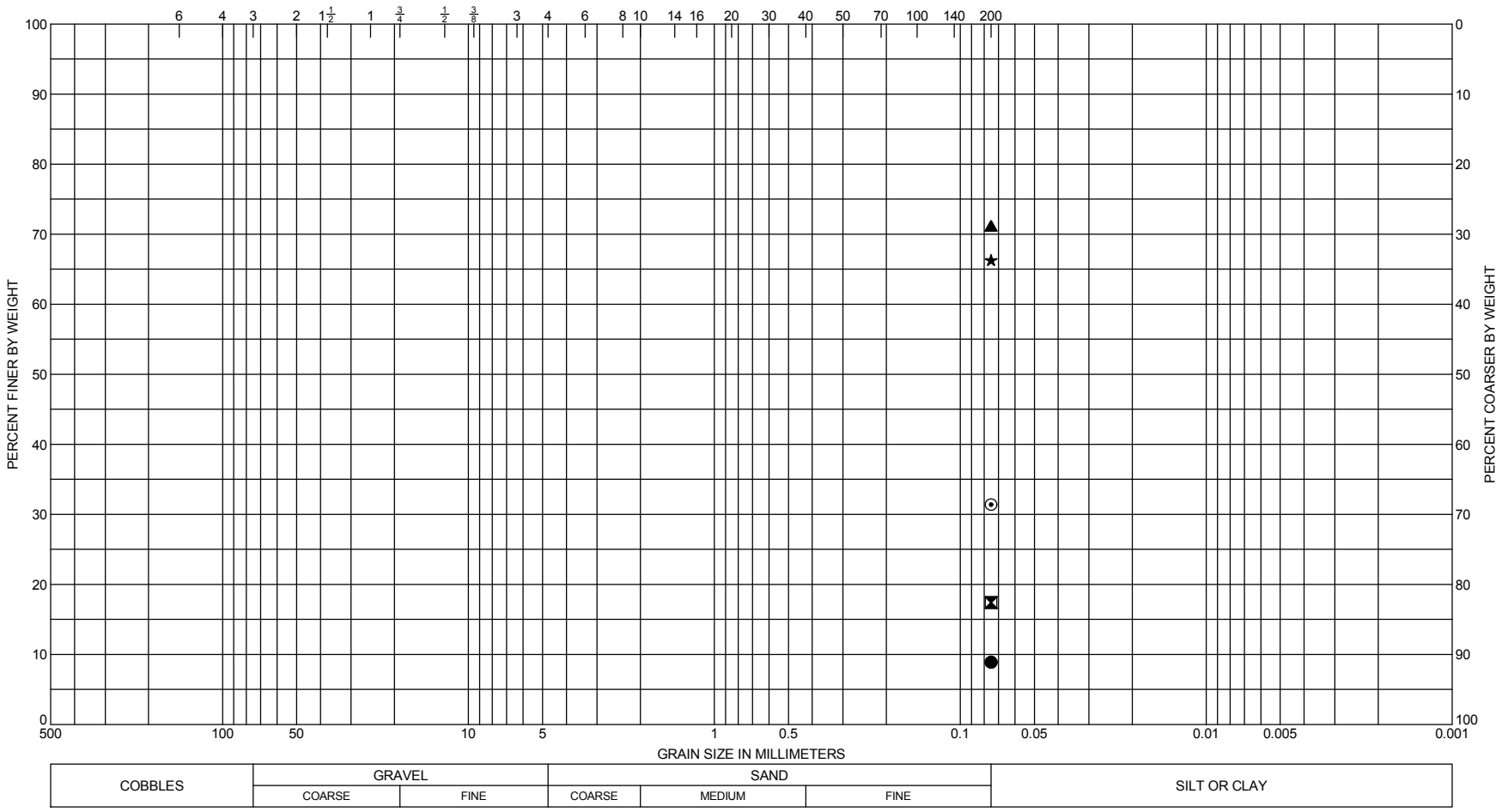
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



	Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	25	43.8 / 36.0		30.7			
⊠	29	37.8 / 42.0		27.2			
▲	33	31.8 / 48.0	FAT CLAY with SAND(CH)	56.0	56	15	41
★	36	27.3 / 52.5	SANDY FAT CLAY(CH)	56.1	53	14	39
⊙	38	24.3 / 55.5	CLAYEY SAND(SC)	35.1	43	14	29

GRADATION CURVES

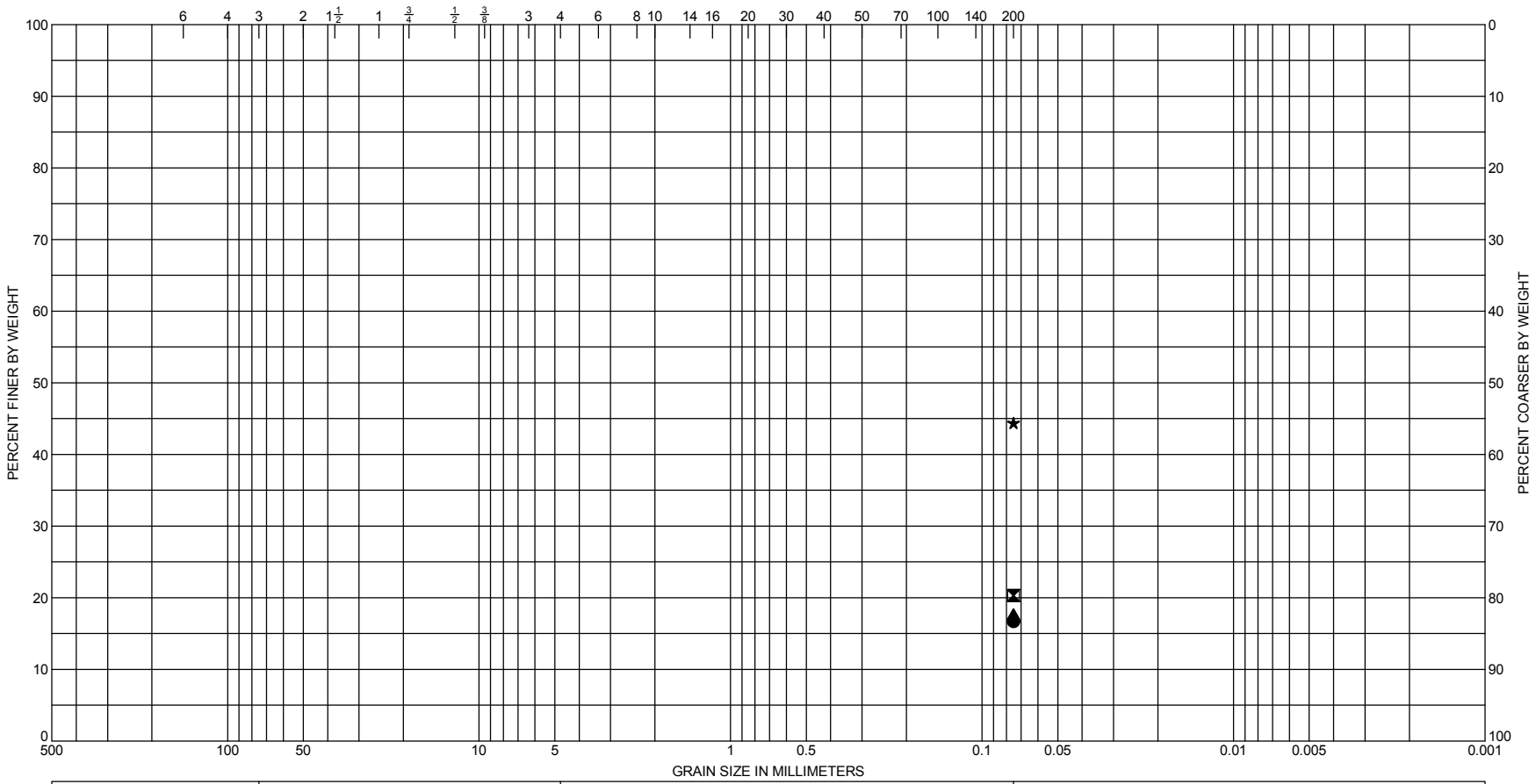
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
● 44	15.3 / 64.5	CLAYEY SAND(SC)	32.7	30	17	13
⊠ 46	12.3 / 67.5		34.5			
▲ 48	9.3 / 70.5		34.5			
★ 53	1.8 / 78.0		32.6			

GRADATION CURVES

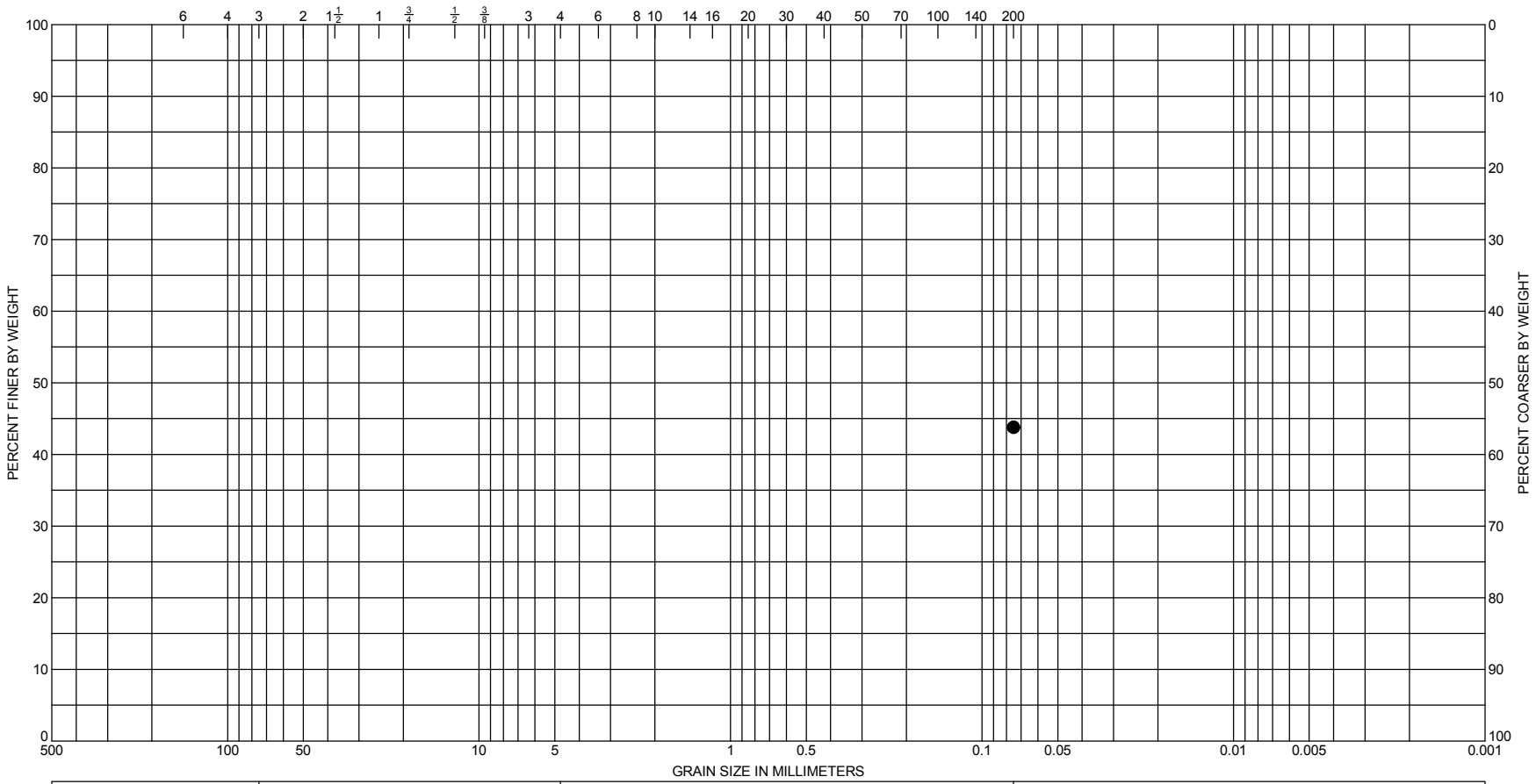
Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-03

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**



Sample No.	Elev / Depth	Classification	Nat w %	LL	PL	PI
●	29.8 / 50.0	CLAYEY SAND(SC)	31.1	65	17	48

GRADATION CURVES

Project: OUC LINED POND MODIFICATION

Area:

Boring No.: TH-CSAS-03-US

Date: 8/20/14

ENG FORM 1 MAY 63 **2087**

Appendix 15

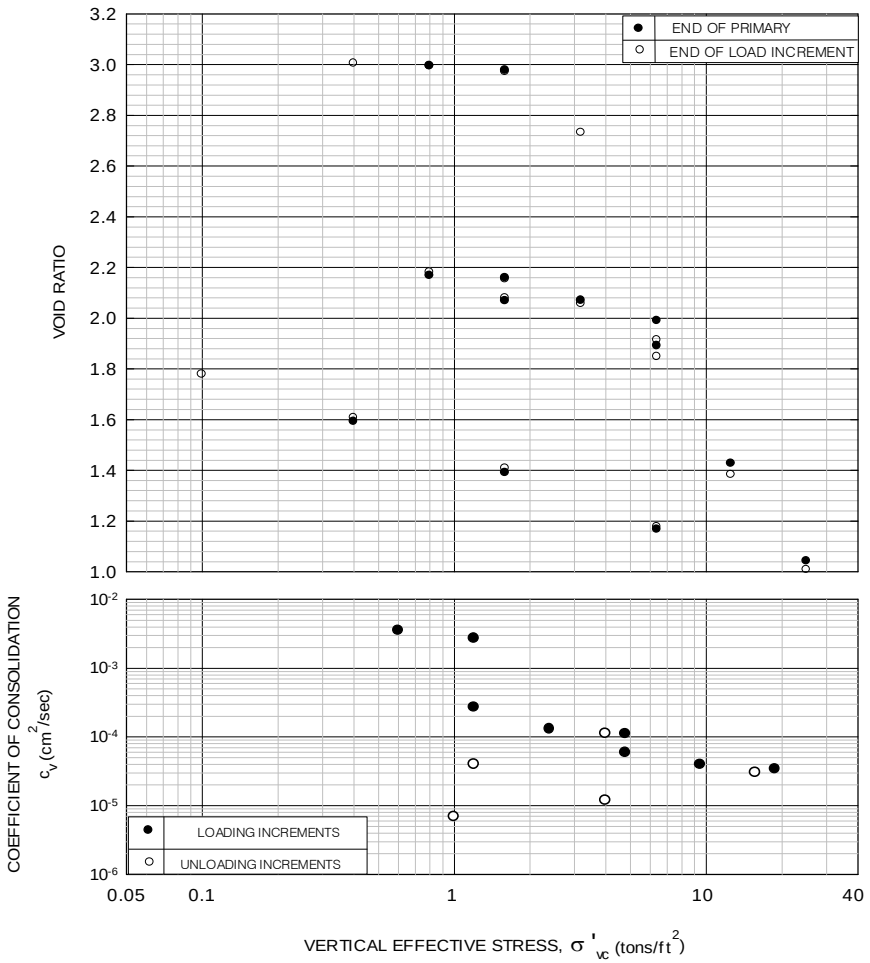
One-Dimensional Consolidation Test Results

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

INCOMING SAMPLE NO.: ---------
BORING: **TH-RPE-03-US** SAMPLE: **US-1**
DEPTH: 40.5-42.5 ☑ ft; ☐ m
LAB IDENTIFICATION NO.: 130166/RPE3
SAMPLE DESCRIPTION.: CLAY, with trace shell fragments, gray (CH)

DATE SAMPLE RECEIVED: --
DATE SAMPLE SET-UP: 02/27/14
DATE REPORTED: 04/25/14



Test Methods & Procedures

ASTM Standard D2435
- ☐ Method A
- ☑ Method B

c_v Interpretation Method
- ☑ c_v [Log Time]
- ☐ c_v [Sq. Root Time]

Trimming Method
- ☑ cutting shoe
- ☐ other _____

Initial Sample Diameter 7.3 (cm)

Test Conditions

- ☐ Tested at Natural Moisture Content
- ☑ Specimen Tested Inundated
  Inundated at σ'_{vc} 0.05 (tsf)
  Inundation Fluid:
  - ☑ tap water
  - ☐ other _____

Specimen Conditions

Parameter	Initial	Final
D (cm)	5.000	5.000
H (cm)	1.908	1.364
w_c (%)	111.8	69.4
γ_d (pcf)	41.9	58.6
e	3.009	1.866
S (%)	100	100

G_s: 2.69 ☐ Assumed ☑ Measured

Index Properties

LL	
PL	
PI	

Particle-Size Analysis
☐ ASTM D422
☑ ASTM D1140-Method

Dry Mass(g): 25.13

U.S. Standard Sieve Size	Gravel			Coarse Sand	Medium Sand		Fine Sand			
	3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Soil Passing (%, dry mass basis)	-----	-----	-----	-----	-----	-----	-----	-----	-----	99.6

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H=Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; e = Void ratio; S = Saturation; G_s= Specific gravity; c_v = Coefficient of consolidation; and $C_{\alpha e}$ = Secondary compression index.

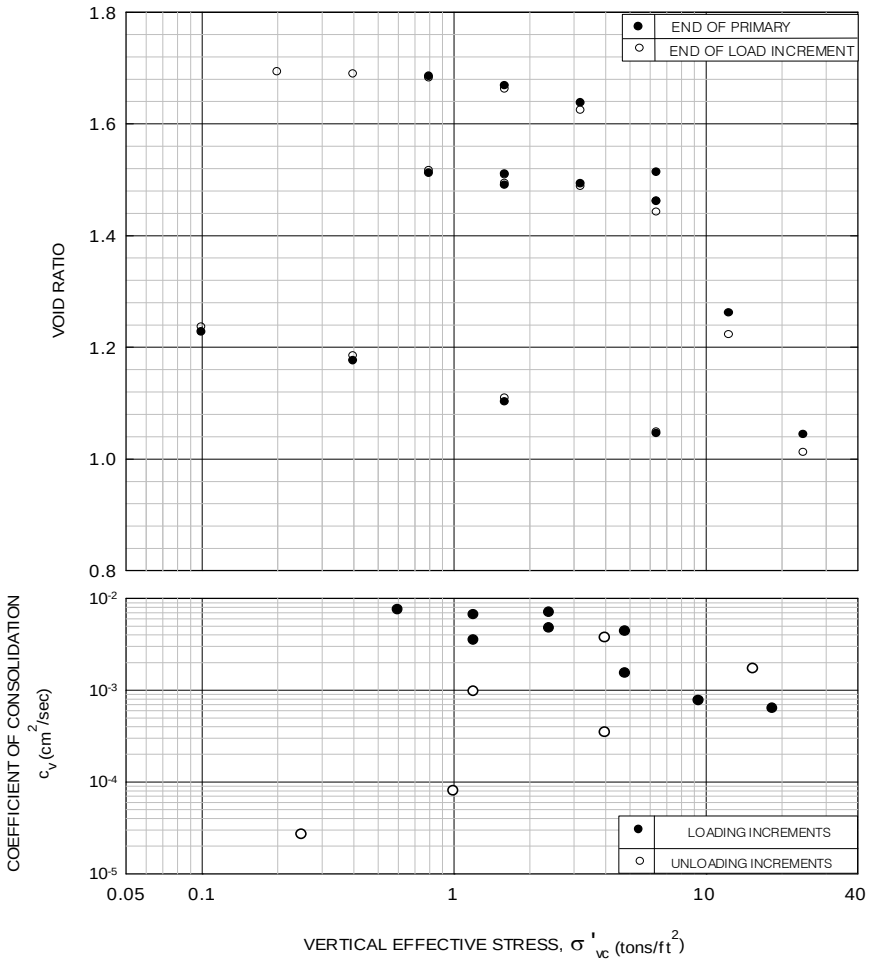
Checked By: _____ Date: _____ S:\Projects\2013\13-13-0166\Laboratory Tests\OUC-2-Report.xlsm

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: --
DATE SAMPLE SET-UP: 02/27/14
DATE REPORTED: 04/28/14

INCOMING SAMPLE NO.: ---------
BORING: **TH-RPE-06-US** SAMPLE: **US-1**
DEPTH: 45.0-47.0 ☑ ft; ☐ m
LAB IDENTIFICATION NO.: 130166/RPE6
SAMPLE DESCRIPTION.: CLAY, greenish gray (CH)



Test Methods & Procedures

ASTM Standard D2435
- ☐ Method A
- ☑ Method B

c_v Interpretation Method
- ☑ c_v [Log Time]
- ☐ c_v [Sq. Root Time]

Trimming Method
- ☑ cutting shoe
- ☐ other _____

Initial Sample Diameter 7.3 (cm)

Test Conditions

- ☐ Tested at Natural Moisture Content
- ☑ Specimen Tested Inundated
  Inundated at σ'_{vc} 0.05 (tsf)
  Inundation Fluid:
  - ☑ tap water
  - ☐ other _____

Specimen Conditions

Parameter	Initial	Final
D (cm)	5.000	5.000
H (cm)	1.911	1.623
w_c (%)	61.4	46.6
γ_d (pcf)	64.0	75.3
e	1.694	1.288
S (%)	100	100

G_s: 2.76 ☐ Assumed ☑ Measured

Index Properties

LL	
PL	
PI	

Particle-Size Analysis
☐ ASTM D422
☑ ASTM D1140-Method

Dry Mass(g): 38.45

U.S. Standard Sieve Size	Gravel			Coarse Sand	Medium Sand		Fine Sand			
	3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Soil Passing (%, dry mass basis)	-----	-----	-----	-----	-----	-----	-----	-----	-----	98.4

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H=Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; e = Void ratio; S = Saturation; G_s= Specific gravity; c_v = Coefficient of consolidation; and $C_{\alpha e}$ = Secondary compression index.

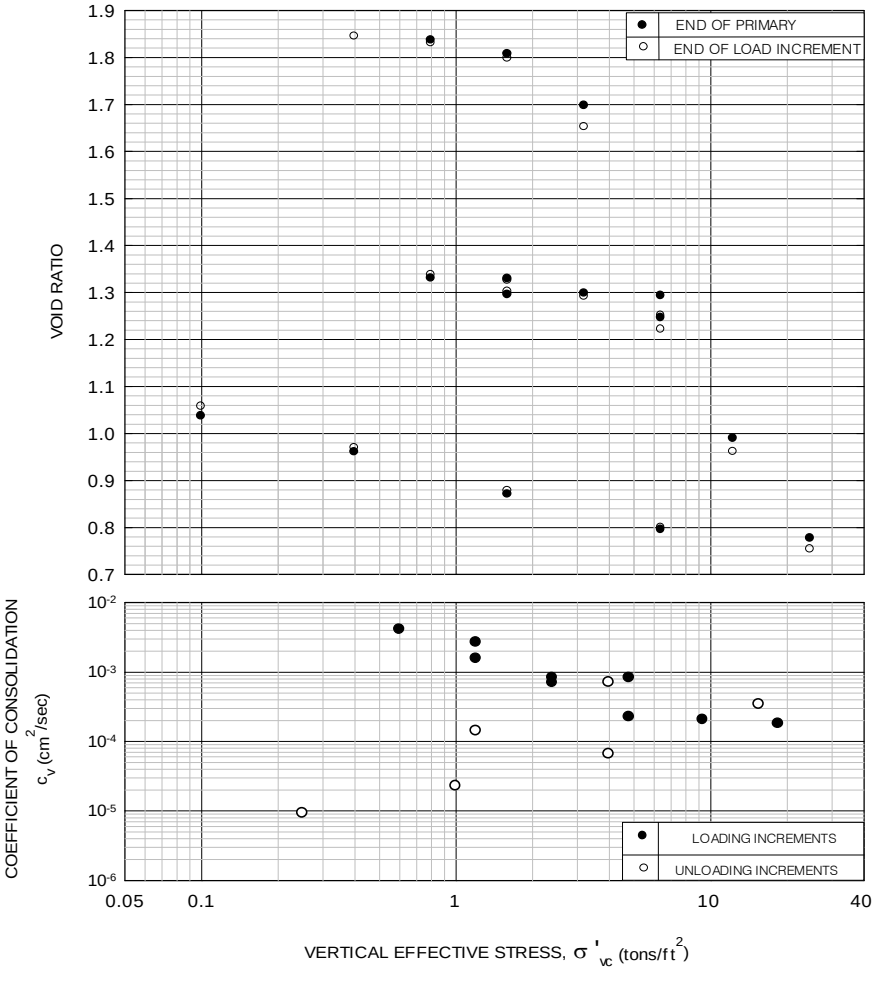
Checked By: _____ Date: _____ S:\Projects\2013\13-13-0166\Laboratory Tests\OUC-3-Report.xlsm

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST REPORT

CLIENT: Orlando Utilities Commission
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

INCOMING SAMPLE NO.: ---------
BORING: **TH-CSAN-03-US** SAMPLE: **US-1**
DEPTH: 49.0-51.0 ☑ ft; ☐ m
LAB IDENTIFICATION NO.: 130166/CSAV3
SAMPLE DESCRIPTION.: CLAY, greenish gray (CH)

DATE SAMPLE RECEIVED: --
DATE SAMPLE SET-UP: 02/27/14
DATE REPORTED: 04/25/14



Test Methods & Procedures

ASTM Standard D2435
- ☐ Method A
- ☑ Method B

c_v Interpretation Method
- ☑ c_v [Log Time]
- ☐ c_v [Sq. Root Time]

Trimming Method
- ☑ cutting shoe
- ☐ other _____

Initial Sample Diameter 7.3 (cm)

Test Conditions

- ☐ Tested at Natural Moisture Content
- ☑ Specimen Tested Inundated

Inundated at σ'_{vc} 0.05 (tsf)

Inundation Fluid:
- ☑ tap water
- ☐ other _____

Specimen Conditions

Parameter	Initial	Final
D (cm)	5.000	5.000
H (cm)	1.910	1.402
w_c (%)	68.8	40.7
γ_d (pcf)	58.9	80.2
e	1.852	1.094
S (%)	100	100

G_s: 2.69 ☐ Assumed ☑ Measured

Index Properties

LL	
PL	
PI	

Particle-Size Analysis
☐ ASTM D422
☑ ASTM D1140-Method

Dry Mass(g): 35.37

U.S. Standard Sieve Size	Gravel			Coarse Sand	Medium Sand		Fine Sand			
	3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Soil Passing (%, dry mass basis)	-----	-----	-----	-----	-----	-----	-----	-----	-----	97.6

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H=Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; e = Void ratio; S = Saturation; G_s= Specific gravity; c_v = Coefficient of consolidation; and $C_{\alpha e}$ = Secondary compression index.

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Appendix 16

Unconsolidated-Undrained Triaxial Test Reports

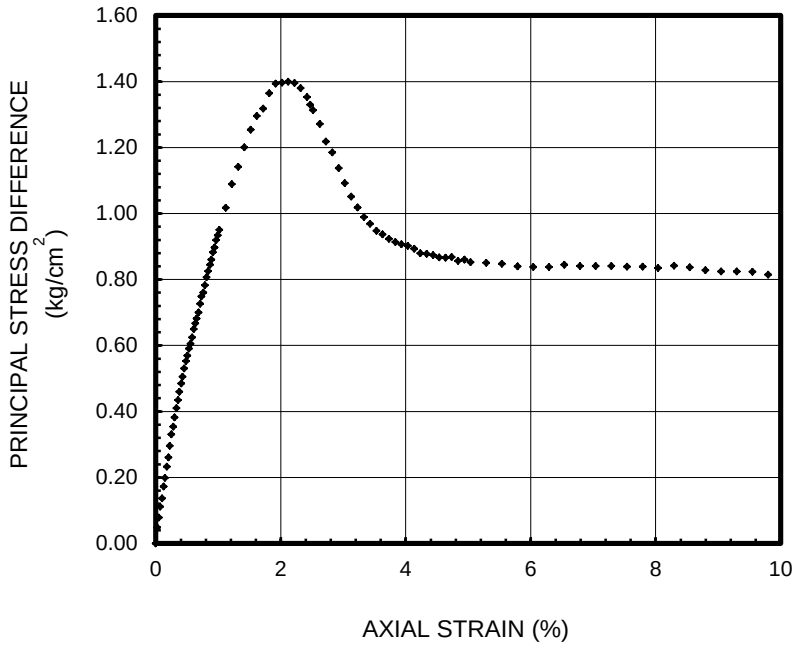
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT

CLIENT: Orlando Utilities Commission Center
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE TEST SET-UP: 05/08/14
DATE REPORTED: 05/23/14

INCOMING SAMPLE NO.: -
BORING: TH-RP-06-US SAMPLE: US-1/B-3
DEPTH: 43.0-45.0 ☒ft; ☐ m
LABORATORY IDENTIFICATION NO.:
SAMPLE DESCRIPTION: Clay, with sand, trace shell, greenish gray (CH)

Specimen Dimensions			Initial Conditions			Test Conditions			at $(\sigma_1-\sigma_3)_{max}$			
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	σ_c (kg/cm^2)	$\dot{\varepsilon}$ (cm/min)	$\dot{\varepsilon}$ (%/min)	ε_a (%)	Compressive Strength (kg/cm^2)	σ_1 (kg/cm^2)	σ_3 (kg/cm^2)
7.07	3.59	2.0	93.2	47.7	99	1.62	0.07	1.0	2.12	1.40	3.02	1.62
									Membrane Correction Made: ☐ Yes ☒ No			



SAMPLE TYPE

Type	Diameter (inch)
☒ Undisturbed	3
☐ Rock Core	
☐ Compacted	

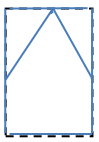
☐ Tamped Uniform Lifts
No. of Lifts:

☐ Kneading
No. of Lifts:
Spring:
Blows per Lift:

G_s: 2.75 ☒ Assumed ☐ Measured

FAILURE SKETCH

☒ Diagonal Plane
☐ Bulging
☐ Combination
☐ Other



Particle-Size Analysis		Fine Sand	Gravel			Coarse Sand	Medium Sand		Fine Sand			
☒ ASTM D422 ☐ ASTM D1140-Method B			3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Dry Mass (g)	54.42	Soil Passing (%, dry mass basis)	-	-	-	-	-	-	-	-	-	98.5

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.

Checked By: Date:

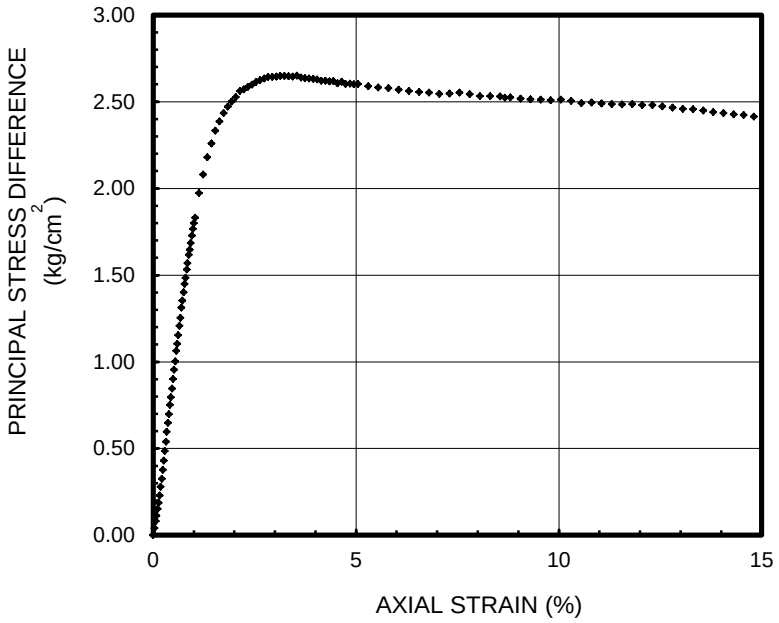
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT

CLIENT: Orlando Utilities Commission Center
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE TEST SET-UP: 05/08/14
DATE REPORTED: 05/27/14

INCOMING SAMPLE NO.: -
BORING: TH-RPE-04-US SAMPLE: US-1/B-4
DEPTH: 48.0-50.0 ☒ft; ☐ m
LABORATORY IDENTIFICATION NO.:
SAMPLE DESCRIPTION: Clay, with sand, with shell fragments, greenish gray (CH)

Specimen Dimensions			Initial Conditions			Test Conditions			at $(\sigma_1-\sigma_3)_{max}$			
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	σ_c (kg/cm^2)	$\dot{\varepsilon}$ (cm/min)	$\dot{\varepsilon}$ (%/min)	ε_a (%)	Compressive Strength (kg/cm^2)	σ_1 (kg/cm^2)	σ_3 (kg/cm^2)
7.09	3.58	2.0	43.6	71.3	85	1.90	0.07	1.0	3.55	2.65	4.55	1.90
									Membrane Correction Made: ☐ Yes ☒ No			



SAMPLE TYPE

Type	Diameter (inch)
☒ Undisturbed	3
☐ Rock Core	
☐ Compacted	

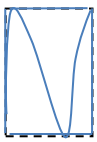
☐ Tamped Uniform Lifts
No. of Lifts:

☐ Kneading
No. of Lifts:
Spring:
Blows per Lift:

G_s: 2.75 ☒ Assumed ☐ Measured

FAILURE SKETCH

☐ Diagonal Plane
☐ Bulging
☒ Combination
☐ Other



Particle-Size Analysis		Fine Sand	Gravel			Coarse Sand	Medium Sand		Fine Sand			
☒ ASTM D422 ☐ ASTM D1140-Method B			3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Dry Mass (g)	80.54	Soil Passing (%, dry mass basis)	-	-	-	-	-	-	-	-	-	89.3

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.

Checked By: Date:

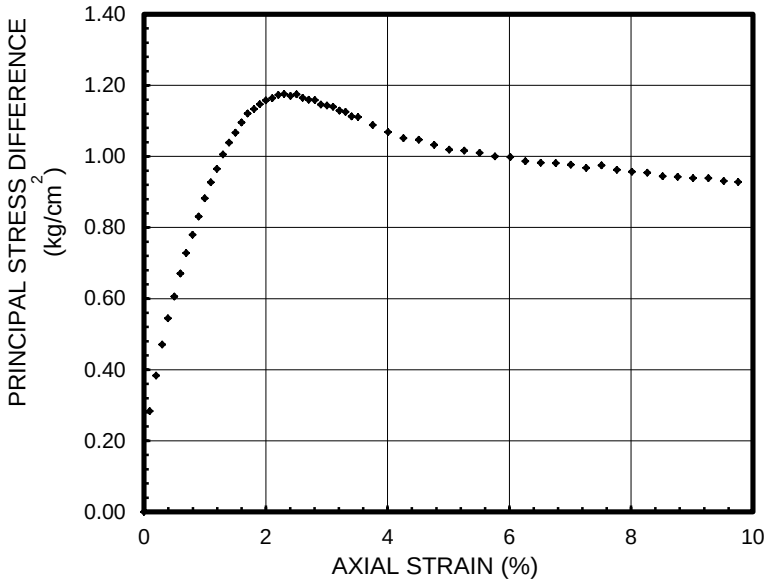
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT

CLIENT: Orlando Utilities Commission Center
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE TEST SET-UP: 05/08/14
DATE REPORTED: 05/27/14

INCOMING SAMPLE NO.: -
BORING: TH-RPE-06-US SAMPLE: US-1/B-5
DEPTH: 45.0-47.0 ☒ft; ☐ m
LABORATORY IDENTIFICATION NO.:
SAMPLE DESCRIPTION: Clay, greenish gray (CH)

Specimen Dimensions			Initial Conditions			Test Conditions			at $(\sigma_1-\sigma_3)_{max}$			
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	σ_c (kg/cm^2)	$\dot{\varepsilon}$ (cm/min)	$\dot{\varepsilon}$ (%/min)	ε_a (%)	Compressive Strength (kg/cm^2)	σ_1 (kg/cm^2)	σ_3 (kg/cm^2)
7.05	3.58	2.0	61.1	63.9	100	1.69	0.07	1.0	2.3	1.18	2.87	1.69
									Membrane Correction Made: ☐ Yes ☒ No			



SAMPLE TYPE

Type	Diameter (inch)
☒ Undisturbed	3
☐ Rock Core	
☐ Compacted	

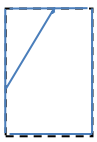
☐ Tamped Uniform Lifts
No. of Lifts:

☐ Kneading
No. of Lifts:
Spring:
Blows per Lift:

G_s: 2.75 ☒ Assumed ☐ Measured

FAILURE SKETCH

☒ Diagonal Plane
☐ Bulging
☐ Combination
☐ Other



Particle-Size Analysis ☒ ASTM D422 ☐ ASTM D1140-Method B		Fine Sand	Gravel			Coarse Sand	Medium Sand		Fine Sand			
			3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Dry Mass (g)	72.60	Soil Passing (%, dry mass basis)	-	-	-	-	-	-	-	-	-	94.6

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.

Checked By: Date:

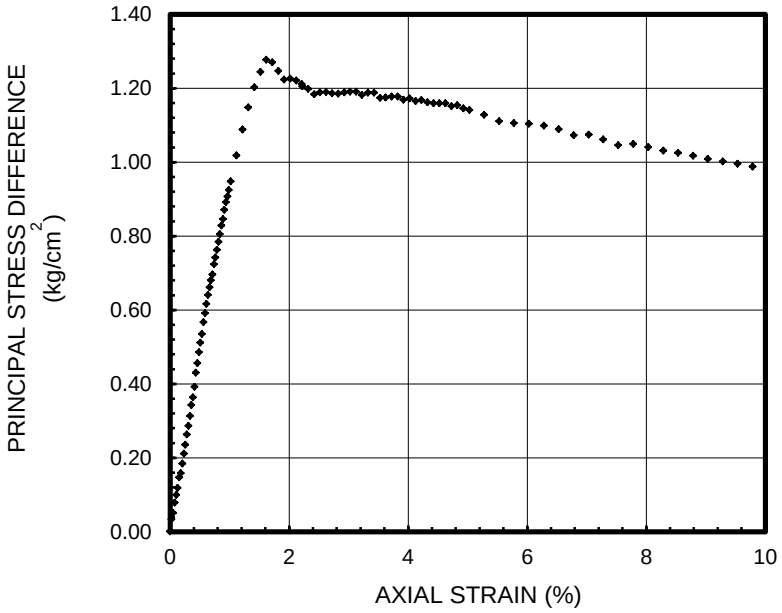
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT

CLIENT: Orlando Utilities Commission Center
PROJECT: OUC Lined Pond Modification
FILE NO.: 13-13-0166

DATE SAMPLE RECEIVED: -
DATE TEST SET-UP: 05/08/14
DATE REPORTED: 05/27/14

INCOMING SAMPLE NO.: -
BORING: TH-CSAN-03-US SAMPLE: US-1/B-3
DEPTH: 49.0-51.0 ☒ft; ☐ m
LABORATORY IDENTIFICATION NO.:
SAMPLE DESCRIPTION: Clay, greenish gray (CH)

Specimen Dimensions			Initial Conditions			Test Conditions			at $(\sigma_1-\sigma_3)_{max}$			
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	σ_c (kg/cm^2)	$\dot{\varepsilon}$ (cm/min)	$\dot{\varepsilon}$ (%/min)	ε_a (%)	Compressive Strength (kg/cm^2)	σ_1 (kg/cm^2)	σ_3 (kg/cm^2)
7.06	3.56	2.0	71.3	57.2	98	1.90	0.07	1.0	1.62	1.28	3.18	1.90
									Membrane Correction Made: ☐ Yes ☒ No			



SAMPLE TYPE

Type	Diameter (inch)
☒ Undisturbed	3
☐ Rock Core	
☐ Compacted	

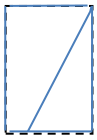
☐ Tamped Uniform Lifts
No. of Lifts:

☐ Kneading
No. of Lifts:
Spring:
Blows per Lift:

G_s: 2.75 ☒ Assumed ☐ Measured

FAILURE SKETCH

☒ Diagonal Plane
☐ Bulging
☐ Combination
☐ Other



Particle-Size Analysis		Fine Sand	Gravel			Coarse Sand	Medium Sand		Fine Sand			
☒ ASTM D422 ☐ ASTM D1140-Method B			3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Dry Mass (g)	64.48	Soil Passing (%, dry mass basis)	-	-	-	-	-	-	-	-	-	98.6

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.

Checked By: Date:

Appendix 17

Hydraulic and Hydrogeological Evaluation Supporting documents

COAL STORAGE AREA RUNOFF POND
VOLUMETRIC ANALYSIS

Total Contributing Area:

- Coal Yard = 31.25 acre
- Stack Out Pad = 4.20 acre
- North Coal Pond = 8.92 acre

Total = 44.37 acres

Curve Number Assumptions:

- Land Use (Florida Land Use and Forms Classification System)
  - Coal Yard = 150 (Industrial)
  - Stack Out Pad = 150 (Industrial)
  - North Coal Pond = 166 (Holding Pond)

- Soils: Hydrologic Group = D (AMC_II)

Curve Number, CN (SCS TR-55):

- Coal Yard = 93
- Stack Out Pad = 93
- North Coal Pond = 100

Weighted Curve Number:

$$CN = \frac{93(31.25 + 4.2) + 100(8.92)}{44.37}$$

$$CN = 94.41$$

Rainfall (100yr/24hr) depth = 11.4 inches (St. John's River Water Management District 24hr Isohyetal Map)

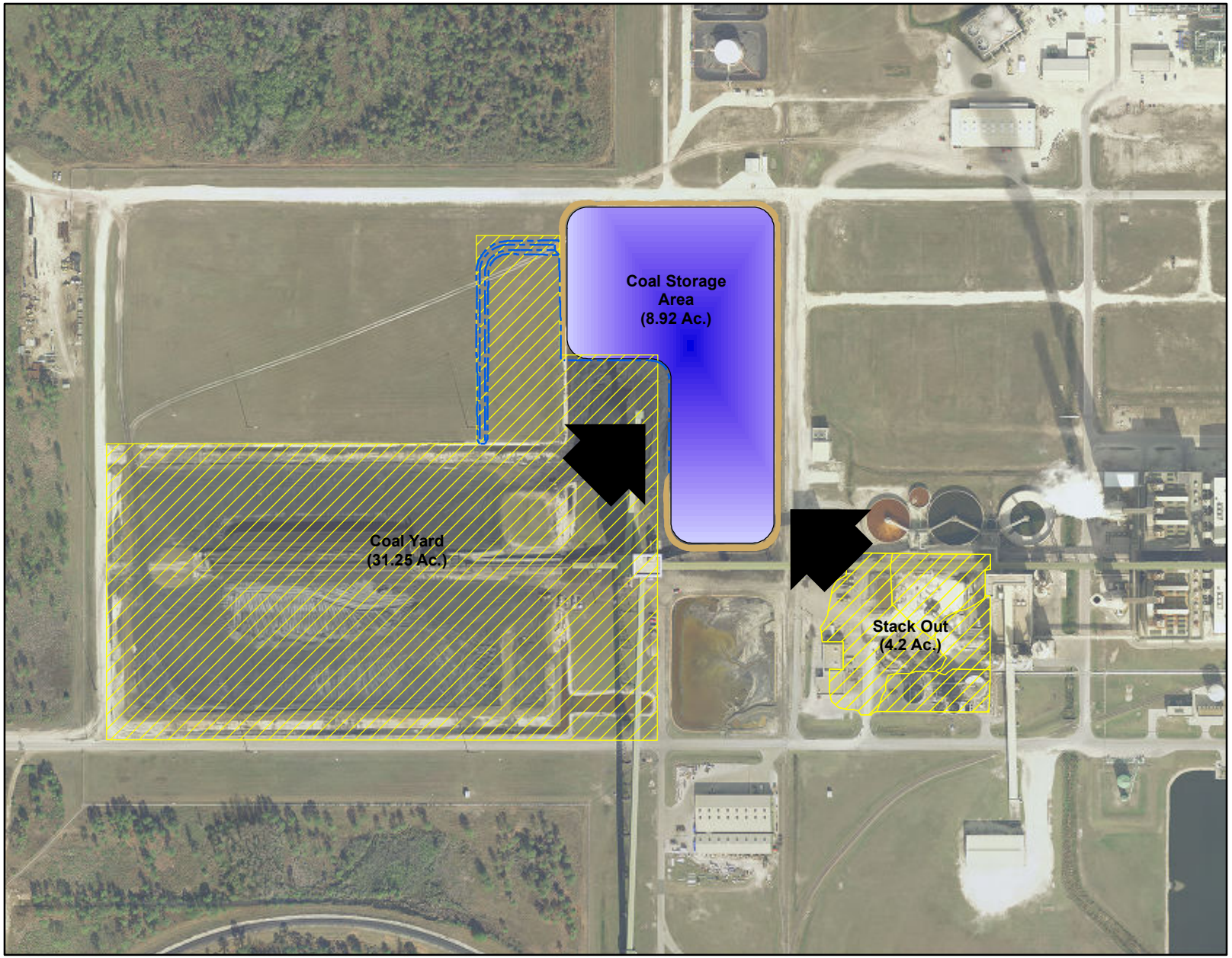
Soil Conservation Service (SCS) Runoff Volume:

$$S = \frac{1000}{94.41} - 10 = 0.59"$$

$$Q = \frac{[11.4 - (0.2 \text{ x } 0.59)]^2}{11.4 + (0.8 \text{ x } 0.59)} = 10.72 \text{ inches}$$

Total Runoff Volume = 44.37 acres x 10.72 inches x 1 ft/12 inches = 39.64 acre-ft

North Pond Capacity at EL. 81 = 66.7 acre-ft. > Total Runoff Volume



N

Scale: 1" = 400'

0 100 200 400

Feet

Pond

Contributing Area

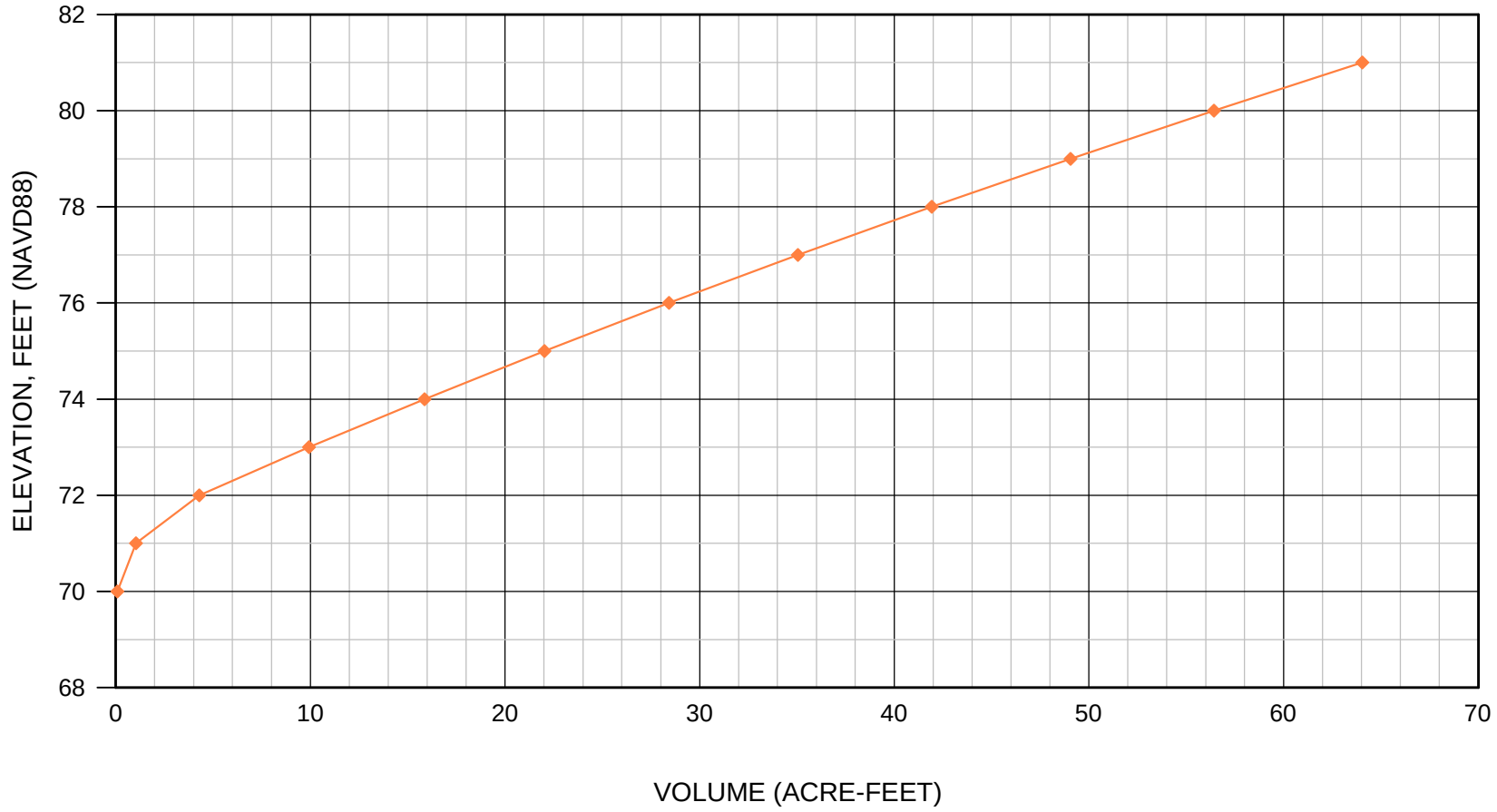
FIGURE 17-1

Project: 13-13-0166	Date: 8-18-14
Projection: State Plane Florida East	
Horizontal Datum: NAD83	Vertical Datum: N/A
File: \\ArcGIS\ArcLayouts\Coal Storage Area.mxd	

COAL STORAGE AREA

OUC STANTON ENERGY CENTER

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants



NORTH COAL RUNOFF POND
STAGE STORAGE VOLUME

Ardaman & Associates, Inc.
Geotechnical, Environmental, and Materials Consultants
A Tetra Tech Company

OUC The Reliable One

PROPOSED RECYCLE POND EXPANSION
AND EXISTING LINED POND MODIFICATIONS
OUC STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA

DRAWN BY: JR	CHECKED BY:	DATE: 08/18/14
FILE NO: 13-13-0166	APPROVED BY:	FIGURE: 17-2

S:\Projects\2013\13-13-0166 OUC Ponds Modification\Report\Hydrology