44th Avenue East (45th Street East to 44th Avenue Plaza East)

Manatee County Project No. 6086960

Final Geotechnical Report

AECOM

7650 West Courtney Campbell Causeway
Tampa, Florida 33607-1462

December 2016

FINAL GEOTECHNICAL REPORT

for

44TH AVENUE EAST EXTENSION
(45TH STREET EAST TO 44TH AVENUE PLAZA EAST)

PROJECT No.: 6086960

MANATEE COUNTY, FLORIDA

By

AECOM TECHNICAL SERVICES, INC.

Tampa, Florida

December 20, 2016

December 20, 2016

MANATEE COUNTY PUBLIC WORKS DEPARTMENT
1522 26th Street East
Bradenton, FL 34208

Attn: Mr. Eric Shroyer, PE.
Project Manager

RE: Final Geotechnical Report
44th Avenue East Extension (45th Street East to 44th Avenue Plaza East)
Project Number 6086960
Manatee County, Florida

Dear Mr. Shroyer:

AECOM Technical Services, Inc. is pleased to submit this Final Geotechnical Report related to the above referenced project. The report provides a summary of our existing data review, and up-to-date site exploration and laboratory testing programs. It also includes results of our engineering analyses and recommendations for the foundation of the proposed 44th Avenue Bridge over the Braden River and other site structure foundations, including mast arm signals and water pipe supports. The report also presents a general assessment of the impacts of subsurface conditions on the proposed roadway alignments, including the high-fill approach embankment, with respect to stability and potential settlements, and an assessment of soil conditions encountered in the stormwater management areas.

There are still some borings for the bridge on the west side of the river (end bent 1, interior piers 2 and 3), high fill area embankment borings, and borings for Stormwater Management Facility number 3, which were not performed due to site access restriction. We recommend these borings be performed after all land acquisition has been completed and the subsurface conditions in these borings be assessed and analyzed. Design and construction recommendations for the bridge foundation, high fill embankment and Stormwater Management Facility number 3 within the restricted access area can then be reviewed and amended as necessary.

We appreciate the opportunity to be of service to Manatee County on the proposed 44th Avenue East project. If you have any questions concerning this report or require additional information, please contact us at your convenience.

Respectfully submitted,

AECOM TECHNICAL SERVICES, INC.

Keith Q. Giang, P. E.
Geotechnical Engineer

Charles H. Evans, P.E.
Geotechnical Group Manager

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File

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Respectfully submitted,

AECOM Technical Services, Inc.

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Project Engineer
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1 PROJECT INFORMATION

1.1 Project Description

The proposed project consists of the extension / reconstruction of 44th Avenue East, from 45th Street East to 44th Avenue Plaza East. The project includes a new bridge over the Braden River. The project is located in south-central Manatee County and will provide an alternate east/west route through the county to the west of existing Interstate Highway 75. The approximate limits of the project are shown on the **Project Location Map (Figure 1).**

Preliminary plans indicate that the roadway will be constructed almost entirely on new fill material with maximum fill heights of about 5 feet to 12 feet at the approaches to the bridge structure. Earth fill embankment with armored riprap as protection is planned for the bridge end bents. The project will also include the relocation of a 36-in diameter potable water pipe onto the bridge, roadway lighting, signs/signalization, and stormwater management facilities.

1.2 General Site Description

The existing 44th Avenue is a two-lane rural section with housing developments lining the majority of the road. The current 44th Avenue terminates at the Braden River's edges. Parallel open drainage ditches occur along most of the project's length. There exists a high power transmission line on the south side of the existing road. The proposed roadway and bridge alignments were designed to avoid conflict with the power transmission line. On the west side of the river, the roadway alignment shifts south of the existing 44th Avenue alignment such that the proposed bridge is approximately 100 feet south of the power transmission line when crossing the river.

2 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to provide an evaluation of subsurface conditions along the proposed 44th Avenue extension and reconstruction, and at the bridge location, to assess feasible embankment and foundation alternatives for the proposed roadway and structure, and to provide final design and construction recommendations for the project. To accomplish these objectives, the following tasks have been completed, in general compliance with the FDOT "Soils and Foundations Manual," and the Federal Highway Administration (FHWA) "Checklist and Guidelines for Review of Geotechnical Reports and Preliminary Plans and Specifications" (included in **Appendix P** of the report):

1. Reviewed readily available published topographic and soils information. This information was obtained from the "Soil Survey of Manatee County, Florida" published by the United States Department of Agriculture (USDA) Soil Conservation Services (SCS). Also, reviewed the "Potentiometric Surface of the Upper Floridan Aquifer, West Central Florida, September 2010" published by the United States Geological Survey (USGS).

2. Conducted a visual reconnaissance of the project site and coordinated a geotechnical field exploration and laboratory testing program for the project.

3. Evaluated foundation criteria and performed engineering analyses to develop geotechnical design and construction recommendations for the chosen bridge foundation alternative.

4. Performed engineering analyses and developed geotechnical design and construction recommendation for other project components such as roadway embankments, stormwarter management areas, etc.

5. Prepared this engineering report, which summarizes the course of study pursued, the field and laboratory data generated, the subsurface conditions encountered and the geotechnical recommendations for the design and construction of the proposed 44th Avenue East Extension and the proposed bridge over Braden River.

3 REVIEW OF AVAILABLE DATA

3.1 Review of USGS Quadrangle Map

A review of the Bradenton and Lorraine USGS quadrangle maps does not indicate any features along the proposed project alignment that may be problematic for the project. The site is shown as being relatively flat with existing elevations ranging from about +5 feet to +15 feet, National Geodetic Vertical Datum 29 (NGVD 29). A copy of the relevant portion of the USGS Quadrangle Maps, with the approximate project alignment and limits shown, is provided in **Figure 2, USGS Quadrangle Map.**

It should be noted that the proposed project design utilizes the North American Vertical Datum 1988 (NAVD 88) as elevation reference. The NGVD 29 elevations shown in the Quadrangle Maps are approximately 0.85 feet higher than the corresponding NAVD 88 elevation at the project site.

3.2 Review of USDA Soil Survey, Manatee County, Florida

The Manatee County SCS (Soil Conservation Service) Soil Survey maps indicate that the site is comprised of the following mapping units listed in order of approximate predominance:

20 - EauGallie Fine Sand
48 - Wabasso Fine Sand
11 - Cassia Fine Sand
26 - Floridana-Immokalee-Okeelanta Association
38 - Palmetto Fine Sand
34 - Okeelanta Muck
16 - Delray Complex
31 - Myakka Fine Sand, 2 to 5 Percent Slopes

A copy of the relevant portion of the SCS maps, with the approximate project alignment and limits shown, is provided in **Figure 3, SCS Soil Survey Map**.

As shown in the Figure, the majority of the proposed roadway alignment lies within the EauGallie Fine Sand mapping unit, which is described as consisting of nearly level, poorly drained soil in broad areas of flatwoods. Typically, the soils consist of fine sands to a depth of about 42 inches underlain by sandy clay to a depth of 50 inches. Below the sandy clay layer is a substratum consisting of grayish brown fine sand, loamy fine sand, and fine sandy loam to a depth of 65 inches. In most years, the water table within this soil mapping unit is at a depth of less than 15 inches for two to four months during the wet season.

Wabasso Fine Sand is present at the beginning and end of the corridor. This mapping unit is described as poorly drained soil of broad flatwoods. Ground slope is less than 2 percent. The soils are typically described as sands extending to a depth of about 37 inches. Organic stained fine sand is present in the upper 28 inches of the soil unit. Loamy materials are found below the sand layer to a depth of 65 inches. Below that, fine sand with shell fragments is found to a depth of 80 inches. The water table is at a depth as shallow as 15 inches in the wet season. The water table is found mostly from 15 to 40 inches depth for about six months of the year.

Cassia Fine Sand is present along the south side of the river. This mapping unit is described as somewhat poorly drained soil on low ridges and knolls that are slightly higher than the adjacent flatwoods. The soils are typically described as sands extending to a depth of about 80 inches. The water table is at a depth as shallow as 15 inches for about six months of the year.

Small percentages of the other soil units are found along the corridor. These soil units are mostly sandy in nature. The Okeelanta Muck mapping units are located within the river and will be spanned over by the bridge structure.

A tabulation of engineering properties for soil types described in the SCS Soil map along the 44th Avenue project is shown in **Table 1.** From **Table 1**, the seasonal high groundwater level is shown to be within approximately 1 foot of the existing ground surface for up to 6 months of the year.

3.3 Review of Potentiometric Surface Map

Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, September 2010" map published by the USGS, the potentiometric surface elevation of the Upper Floridan Aquifer appears to be in the order of +20 feet, NGVD 29 (**Figure 4**).

During the field explorations, two (2) SPT bridge borings encountered an artesian flow condition at depths of approximately 65 to 75 feet below ground surface. Based on the pile foundation analysis and design, the proposed bridge foundation piles will be terminated above the depths where the artesian conditions were encountered. As such, breaching the artesian layer is unlikely to occur, however, the contractor should be prepared to handle artesian conditions during pile driving, if encountered.

3.4 Sinkhole Potential

From a regional standpoint, the west central and central Florida regions are prone to sinkhole development. However, the reconnaissance and the borings performed for the project did not indicate the presence of any current sinkholes or sinkhole remnants. It should be noted that sinkhole assessment for the area is beyond the scope of this report. The discussion included herein is intended to bring out the awareness of sinkhole potential at the site.

3.5 Subsurface Soil Conditions of Nearby Structures

Currently, the County is constructing the Fort Hamer Road Bridge over Manatee River several miles from the proposed 44th Avenue bridge location. AECOM was the designer of record for the project. Similar subsurface soil conditions were encountered for both projects. In the Fort Hamer bridge project, preformed pile holes were utilized for most of the bridge foundation piles to assist pile driving through the near surface hard cemented silt and cemented clay layer. Preformed holes were drilled with a 30-in diameter auger, conforming to the FDOT Specification Section 455. The pile driving hammer for the Fort Hamer Road Bridge project has a maximum energy greater than 150,000 ft-lbs. Pile driving resistance was recorded through the preformed soil strata and the required pile capacity was achieved with only a few feet of pile embedment into the lower cemented silt and cemented clay layers. These experiences were considered and applied in the pile design for this project. Sample production pile driving records with and without preformed pile holes are included in **Attachment A** at the end of this report.

4 SUBSURFACE EXPLORATION

4.1 General

An initial site exploration program for the preliminary bridge structure and roadway alignment design was completed in October 2015 and December 2015. Following the initial investigation, a second phase of the subsurface investigation was planned and performed along the 60% design roadway alignment and 30% design bridge alignment. The second phase of the investigations was performed from June to September 2016. A third phase of subsurface investigations was performed from September to December 2016 for mast arm signal foundations. Additional borings were planned for the Phase 3 investigation for areas in the vicinity of Stormwater Management Facility (SMF) number 2, high fill embankments, and bridge structure at the west side of the river. However, access to the private properties was not granted and these borings were not performed for this report.

The site exploration and laboratory testing were performed by Universal Engineering Sciences, Inc. (UES), as a sub-consultant to AECOM. The exploration was performed in general accordance with guidelines provided in the FDOT "Soils and Foundations Handbook" 2016 (SFHB).

4.2 Boring Location Plan

Boring locationa were selected based on several generations of roadway and bridge alignments as well as proposed bridge pier locations, accessibility to the site, underground utilities, our engineering judgment and the guidelines indicated in the FDOT “Soils and Foundations Handbook”. The borings were field located using hand-held Global Positioning System (GPS) equipment at the time of the field activities and the location of each boring was staked. Utility clearances were obtained prior to drilling. Where accessibility or utility constraints occurred, the boring locations were adjusted and the relocated GPS coordinates were recorded on the field boring logs and later transcribed by AECOM personnel to the boring location plans presented in this report. Boring elevations were determined from the existing topographic survey map, proposed roadway’s profile and cross sections, or were field surveyed by AECOM.

Boring Location Plans are shown in **Appendix A.**

4.3 Roadway Soil Borings

A roadway soil survey was performed in order to identify engineering properties and determine the extents of the various soil strata within the project limits. Methods and intervals for the roadway borings were generally determined using the criteria specified in the SFHB based on proposed cut depths, fill heights, and embankment configurations. Roadway cross-sections and plan views provided by Hardesty & Hanover, Inc., an AECOM sub-consultant, were used to develop the roadway exploration plan.

The roadway exploration consisted of both auger borings and Standard Penetration Test (SPT) borings. The auger borings were located at approximately 300-foot intervals, while the SPT borings were located at approximately 100 to 150 feet apart. Auger borings were typically performed in areas where minimal cuts or fills are planned. Auger boring depths ranged from a minimum of five feet to about 10 feet below existing grade. In areas of higher fills, SPT borings were performed and were generally extended to twice the fill height or until competent material was encountered. Roadway SPT boring depths ranged from about 15 feet to 40 feet below existing grade.

All auger borings were performed in general accordance with procedures described in ASTM D 1452. Due to the close proximity of the active road, groundwater conditions were noted just after the completion of each auger boring and the auger hole was backfilled immediately. All bore holes were backfilled in accordance with the SFHB guidelines. Soil strata encountered were visually field classified and samples of the soils encountered in the borings were recovered for additional visual examination and laboratory testing. The SPT borings were performed in general accordance with procedures described in ASTM D1586 using a truck-mounted drill rig. Penetration tests were typically performed at depth intervals of approximately two feet in the upper 10 feet of each boring and at five-foot intervals thereafter. The SPT borings were advanced to the test depths using rotary wash methods. Soil samples extracted from SPT borings, using a split spoon sampler, were visually examined and classified in the field. Representative samples of the materials were retained for subsequent laboratory testing to verify field classifications

The locations and stratigraphies encountered in the auger borings are shown on the Report of Roadway Borings sheets included in **Appendix B.** The strata numbers shown on the auger boring logs relate to the strata descriptions shown on the Soil Survey Sheet, also included in **Appendix B.**

In addition, a muck probe survey was performed in those parallel ditches where new fill will be placed for roadway construction or widening. The muck probes were performed to delineate the approximate horizontal and vertical extents of organic or soft, compressible materials encountered in these parallel ditches. Results of the muck probe survey are included in **Appendix C.**

Subsurface information shown on the auger boring log, muck delineation tables and core boring sheets represent conditions encountered only at each boring location. Varying degrees of non-uniformity of the horizontal and vertical soil conditions are likely to exist between boring locations.

4.4 Stormwater Management Facilities (SMFs)

Due to access restrictions, SPT borings were performed in only two of the three planned SMFs. The borings were generally extended to depths below the proposed pond/mitigation site bottom elevations and ranged in depth from about 10 feet to 25 feet below existing grade. We understand the SMFs are being designed to function as "wet" ponds. The estimated seasonal high groundwater elevations for the SMFs are also included in **Table 3**.

The stratigraphies encountered in the borings are shown on the Report of SMF Borings sheets included in **Appendix D.** Subsurface information shown on the Report of SMF Boring sheets represents conditions encountered only at each boring location. Varying degrees of non-uniformity of the horizontal and vertical soil conditions are likely to exist between boring locations.

4.5 Bridge Structure Over Braden River

The preliminary site exploration for the originally proposed bridge alignment over the Braden River, performed in 2015, consisted of two (2) land-based SPT borings in the areas of the bridge end bents and three (3) SPT borings at representative locations along the planned bridge alignment within the river. The second phase detailed site exploration for the planned bridge consisted of one SPT boring at each end bent and at each intermediate bent location, resulting in a total of 16 borings. Due to access restrictions, bridge borings for end bent number 1 and intermediate bents numbers 2 and 3 were not performed. The boring locations were field located by UES using a handheld GPS unit, and the borings were drilled after the locations were cleared for above and underground utilities. The boring GPS locations were converted to State Plane Coordinates or tied to the project construction baseline, and their corresponding ground surface elevations were surveyed in the field by AECOM or interpolated from topographic survey. All bridge borings were drilled to depths ranging from 85 to 100 feet below existing grade.

After the borings were drilled, the proposed bridge was shifted approximately 35 feet to the east to provide extra clearance from the overhead power line. Thus, each drilled boring is approximately 35 feet offset from the intended bridge bent location. However, it is judged that the boring locations and the information they provide are acceptable for use in analysis and design.

The SPT borings were performed in general accordance with procedures described in ASTM D1586 using either a truck-mounted (land borings) or barge-mounted (water borings) drill rig. Penetration tests were typically performed at a depth interval of approximately two feet in the upper 10 feet of each boring and at five-foot intervals thereafter. The SPT borings were advanced to the test depths using rotary wash methods. Disturbed samples retrieved from the borings were visually examined and classified in the field. Representative samples of the materials were retained for subsequent laboratory testing to verify field classifications. All boring were grouted in accordance with the SFHB procedures upon completion.

The approximate boring locations and SPT boring logs are provided on the Report of Core Borings sheets included in **Appendix E.** In addition to the 13 borings completed as part of the most recent site exploration, logs of borings completed during the previously referenced preliminary site exploration are also included in **Appendix E**. The soil classifications shown are in general accordance with the ASTM D 2487 Unified Soil Classification System (USCS) based on observed soil characteristics and limited laboratory classification testing. Subsurface information shown on these sheets represents conditions encountered only at each boring location. Varying degrees of non-uniformity of the horizontal and vertical soil conditions are likely to exist between boring locations.

4.6 Mast Arm Signal Foundations

A site exploration was performed for the proposed mast arm signal foundations at the four corners of the intersection of 44^{th} Avenue and Caruso Road. The investigation consists of 4 SPT borings to 45-foot depth below ground surface. The boring locations were field located by UES using handheld GPS unit, and the boring were drilled after the locations were cleared for above and underground utilities. The boring locations and their corresponding ground surface elevations were surveyed in the field by AECOM.

The SPT borings were performed in general accordance with procedures described in ASTM - D1586 using a truck-mounted drill rig. Penetration tests were typically performed at a depth interval of approximately two feet in the upper 10 feet of each boring and at five-foot intervals thereafter. The SPT borings were advanced to the test depths using rotary wash methods. Disturbed samples retrieved from the borings were visually examined and classified in the field. Representative samples of the materials were retained for subsequent laboratory testing to verify field classifications.

The approximate boring locations and SPT boring logs are provided on the Report of Core Borings sheets included in **Appendix F.** The soil classifications shown are in general accordance with the ASTM D 2487 Unified Soil Classification System (USCS) based on observed soil characteristics and limited laboratory classification testing. Subsurface information shown on these sheets represents conditions encountered only at each boring location. Varying degrees of non-uniformity of the horizontal and vertical soil conditions are likely to exist between boring locations.

5 LABORATORY TESTING

5.1 General

Laboratory testing was performed on selected samples to assist in soil classification and to estimate engineering properties of the materials encountered. Laboratory index property testing consisting of grain size analyses, Atterberg Limits, organic contents and moisture contents were performed on representative materials encountered. In addition, environmental corrosion tests were performed to evaluate the corrosive nature of the soils and the water in the river. A summary of the results obtained from the laboratory tests is presented in **Appendix G**.

All laboratory testing was performed in general accordance with ASTM and/or FM (Florida Methods) procedures.

The following list summarizes the types and numbers of tests performed.

Types of Test	Number of Test
Grain Size Analysis (Full Sieve)	13
Grain Size Analysis (Wash -200)	30
Atterberg Limits	13
Natural Moisture Content	44
Organic Content	1
Environmental Corrosion Series	6 (4 soil and 2 water sample)

5.2 Grain Size Analysis

The grain size analysis test measures the percentage by weight of a dry soil sample passing a series of U.S. Standard sieves, including the percent passing the No. 200 sieve. In this manner, the grain size distribution of the soil is obtained. The percentage passing the No. 200 sieve constitutes the silt and clay content of the sample. The percentage by weight of silt and clay in a soil affects its engineering properties, including permeability, suitability as roadway subgrade, and suitability as general fill material. The tests were performed in general accordance with ASTM D422.

5.3 Atterberg Limits

Atterberg Limits testing was performed on soil samples believed to be cohesive in nature. The Atterberg Limits tests include of the liquid limit, the plastic limit and the shrinkage limit. However, for classification purposes, the term Atterberg Limits generally refers to the liquid and plastic limits only. The results are generally reported as liquid limit and plasticity index (liquid limit minus plastic limit), which are useful in soil classification and have been correlated with many engineering properties. The tests for liquid and plastic limits were performed in general accordance with ASTM D4318.

5.4 Natural Moisture Content

The laboratory natural moisture content test consists of determining the percentage of watrer by weight with respect to the soil mass. The test was performed on selected samples in general accordance with AASHTO test designation T-265 (ASTM test designation D2216).

5.5 Organic Content

Organic soils exhibit very poor engineering characteristics, most notably low strength and high compressibility. The laboratory natural organic content test consists of determining the percentage of mass that burns off when placed in a muffle furnace. The results are presented as a percentage of the total sample mass. The test is performed in general accordance with AASHTO test designation T-267 (ASTM test designation D2974).

5.6 Environmental Corrosion Tests

Environmental corrosion tests were conducted in accordance with the FDOT test designations FM 5-550, FM 5-551, FM 5-552, FM 5-553. These tests were performed on four recovered soil sample obtained from borings drilled near the bridge end bents and two water samples collected in the river. Environmental corrosion tests measure parameters such as pH, resistivity, sulfate content and chloride content. The results obtained are presented in the Corrosion Test Results table in **Appendix G.**

Based on the laboratory test results and the FDOT Structures Design Guidelines, the bridge substructure environment varies from slightly to extremely aggressive conditions and therefore should be considered extremely aggressive for design purposes. The extremely aggressive condition is attributed to the low pH of the soil.

6 RESULTS OF SUBSURFACE EXPLORATION

6.1 General

The roadway alignment and approaches to the bridge generally consist of developed residential areas on both sides of the river. The bridge alignment will cross the Braden River as well as a wooded peninsula marshland area inside the river. Available topographic data indicates that the site is generally relatively flat with ground surface elevations typically ranging from about -6 feet in the river to about +15 feet on the banks of the river. The water depths measured in the river ranged from about three feet to six feet. The descriptions and classifications associated with typical soils encountered in this project are listed in **Table 2** (next page).

6.2 General Soil Conditions

Results of the SPT borings indicate that subsurface conditions along the structure alignment typically consist of a surficial layer of loose to dense fine sand to silty sand and silt (SP, SP-SM, SM, ML) extending to depths of about 15 feet below existing grade (to approximate elevation -5.0). The surficial sand layer is typically underlain by about 15 to 30 feet of loose to very dense clayey, silty sand (SC, SM) and soft to very hard (CL, CH) layers. Below these sand/silt/clay layers, the borings encountered very stiff to hard cemented clays, cemented silt layers with occasional stiff to very stiff silt and clay seams, and interbedded layers of dense to very dense fine sands to silty sands and silt. The cemented soil layers were found to extend to the termination depths of the borings. Soft silt sediment of several feet thickness was found in the river borings overlaying a hard cemented silt, cemented clay layer. Most of this soft sediment is in the scourable zone.

The SPT bridge boring at the west end bent of the bridge, performed during the preliminary site exploration, encountered artesian conditions at a depth of approximately 65 feet below surface. The SPT boring located near the bridge interior bent number #13 encountered artesian conditions at a depth approximately 75 feet below surface. The borings were terminated at or just below these depths.

No voids or significant loss of circulation was encountered during the site exploration and there were no surface indications of sinkhole activity noted during our site reconnaissance or drilling activities. As in all areas underlain by limestone which is susceptible to solutioning activity, there is a potential risk of future sinkhole activity. However, based on the results of our data review and site exploration, the potential for sinkhole activity at this site does not appear to be any greater than for the region as a whole.

The above referenced stratigraphic description is based on our interpretation of subsurface conditions encountered at the boring locations only. Boundaries between soil layers shown on the logs are approximate. Variations in soil and rock conditions in both the horizontal and vertical directions are likely to exist between boring locations.

Table 2: Typical Soil Descriptions

Typical Soil Descriptions	Unified Soil Classification System
Dark Gray Brown to Light Brown Fine SAND to Slightly Silty Fine SAND	SP/SP-SM
Gray to Olive to Blue Green CLAY	CL/CH
Gray to Brown Silty Fine SAND	SM
Gray to Brown Clayey Fine SAND	SC
Tan to Gray Clayey SILT, Cemented	ML/MH

6.3 Groundwater

Groundwater was encountered in the hand auger borings along 44th Avenue and in the land-based bridge and embankment borings at depths of approximately three to five feet below the ground surface during our field investigation. From boring elevations, groundwater in the borings occurs at approximate elevations of 9.5 to 11.5 feet, except for borings near the edge of the river. The estimated seasonal high groundwater along the proposed 44th Avenue alignment varies from elevations 10 to 13.5 feet NAVD.

Groundwater was encountered from 2 to 4 feet below ground surface along the proposed Caruso Road extension as well as at Stormwater Management Facility 3. From boring elevations, groundwater in the borings occurred at approximate elevations 9.5 to 13 feet NAVD. The estimated seasonal high groundwater along the Caruso Road and the Stormwater Management Facility 3 varies from elevations 11 to 12 feet NAVD.

Evaluation of estimated seasonal high groundwater levels is provided in **Appendix H** and summarized in **Table 3**. The estimated seasonal high groundwater level was in line with the seasonal high groundwater indicated in the SCS Soil Survey Map for the area. Seasonal fluctuations in the groundwater level should be anticipated.

7 EVALUATIONS OF BRIDGE FOUNDATION ALTERNATIVES

Typical foundation alternatives for similar size bridges include the following:

- Shallow Foundations
- Steel Piles, including H-Pile and Pipe Sections
- Pre-cast Pre-stressed Square Concrete (PPSC) Piles
- Drilled Shafts

A brief discussion of each alternative follows:

7.1 Shallow Foundations

Based on the results of the borings, our analyses and experience on similar projects, it appears that shallow foundations are not appropriate for this project. At this project location, shallow foundations are more susceptible to differential settlements when compared to deep foundation systems. Additionally, the potential for scour within the river bed could undermine shallow footings. Therefore, spread footing type foundations are not recommended for the planned structure.

7.2 Steel Piles

The use of steel piles is generally not considered appropriate for these site conditions. Since steel H-piles derive most of their capacity from side friction rather than end bearing, the required lengths to achieve adequate design capacities may be excessive. Depending on the pipe size, closed-end steel pipe piles may achieve adequate capacities at less penetration than H-piles; however, the required pipe size and wall thickness to handle driving stresses may not result in an economical foundation system. Additionally, the extremely aggressive environment would require special treatment for steel substructures and would increase the overall cost of the foundation. Therefore, steel pile foundations are not recommended for the planned structure.

7.3 Drilled Shafts

Drilled, cast-in-place, straight-sided, concrete shafts have the ability to develop high axial and lateral capacities. One drilled shaft could potentially take the place of several driven piles. However, the quality control of drilled shaft installation requires more engineering judgment and precautions compared with driven piles to ensure that the construction is in accordance with the specifications. Because of the environmental sensitivity of the site, the use of drilled shafts is not considered appropriate for this project. Construction of drilled shafts would require handling, containment, and disposal of spoils, as well as slurry and excess concrete, all of which have the potential for adverse environmental impacts. Therefore, drilled shafts were discarded as a foundation alternative for this bridge location.

7.4 Pre-Cast Pre-stressed Square Concrete (PPSC) Piles

PPSC pile foundations are a feasible foundation alternative. They are widely used and a proven foundation system in central Florida. PPSC pile foundations are readily available and generally have a lower cost per ton of capacity than other pile types. Based on the advantages listed above, PPSC piles are recommended for use in this project. Preliminary pile axial capacities and other design parameters for 18-inches, 24-inch and 30-inch PPSC piles were analyzed, and the results were presented in the Preliminary Geotechnical Report, dated January 30, 2016.

Based on structural design consideration, 24-inch PPSC piles were selected for the final design of the new bridge foundations. Therefore, detailed analyses for 24-inch PPSC were performed for this report.

Axial capacities for the proposed 24-inches PPSC piles were analyzed using the subsurface conditions encountered in each boring and the FDOT program FB-Deep. The Load and Resistance Factor Design (LRFD) method and the Florida Structures Design Guidelines were used to estimate the required driving resistance and the estimated pile tip elevations for this report. The following sections present the results of our engineering analyses for the selected deep foundation alternative.

FB-Deep capacity curves and sample FB-Deep output files for the selected PPSC pile are included in **Appendix I.**

8 PILE FOUNDATION ANALYSES AND DESIGN RECOMMENDATIONS

8.1 General

The proposed new bridge for 44th Avenue over the Braden River consists of fifteen (15) spans with approximate span length of 100 feet each. From the project design information, additional fill thickness of approximately 12 and 5 feet will be placed on the existing ground at the bridge End Bent 1 and End Bent 16, respectively. Sloped embankment with protective stone riprap will be used at the end bents to retain the approximately 120-foot wide embankment.

8.2 Downdrag (Negative Skin Friction)

The approximately 5 and 12 foot high embankments are estimated to generate approximately 5 to 7 inches of settlement, which in turn will create downdrag forces on the new abutment piles.

Embankment settlement is discussed in a subsequent section of this report. Discussions regarding embankment settlement included herein were intended for the consideration of downdrag forces on pile foundations.

The overall capacity loss due to downdrag was estimated using the ultimate skin friction of a pile above a compressible soil layer. The ultimate skin friction values were derived from the results of the FB-Deep analyses. From the boring logs and the preliminary settlement analyses, compressible soil zones were encountered at approximately 20 to 25 feet below the existing ground surface at end bent locations.

Based on the above information, the downdrag forces on 24-inch PPSC piles without any remedial measures were estimated to be approximately 80 tons. These downdrag forces may have adverse effects on the bridge foundations. Therefore, remedial provisions are recommended to reduce these forces. Several options frequently used as remedial measures are listed below.

- Use two layers of polyethylene sheeting wrapped around the pile in the embankment portion to reduce the extra downdrag force from the embankment. The procedures shall be in conformance with FDOT Specifications Section 459.

- Apply bituminous coating in the upper portion of the pile where embankment settlement is anticipated. However, with the materials present at the project site, the bituminous coating will likely be stripped from the pile during pile driving and the effectiveness of this measure will be limited.

- Drive the pile to a greater capacity to accommodate the anticipated load from downdrag forces.

- Install oversized corrugated pipe at the pile locations during backfill operations and install settlement plates in the backfill area to monitor the settlement of the ground. Pile installation can take place after most settlement has occurred.

- Drill preformed pile holes from the surface to beyond the compressible layer. The preformed pile hole should alleviate stresses on the piles associated with pile driving and somewhat reduce downdrag forces. Preformed pile holes also help reducing the vibration generated during pile installation.

A combination of driving the pile to a greater capacity, utilizing preformed pile holes, and using the double polyethylene sheeting for the exposed portion of the piles is recommended for this project. Preformed pile holes to elevation -10.0 feet NAVD is recommended for both end bents of the proposed bridge. Residual downdrag force for 24-inch piles was conservatively estimated at 35 tons for each end bent.

To accommodate the relocated water force main previously mentioned and its sensitivity to movement, the embankment will be surcharged to limit ground settlements as recommended later in the report. The bridge abutment piles should be installed through preformed pile holes after the surcharge is completed thus would minimizing all downdrag concerns.

It should be noted that if the embankment height information changes significantly from the information received to date, we should be afforded the opportunity to review the recommendations included herein and amend them as necessary.

8.3 Scour

Scour at intermediate pier locations was analyzed based on hydraulic engineering considerations using the encountered soil profile and mean particle diameters, $D_{50,}$ from samples of river bottom soils included in **Appendix G**. Preliminary scour analysis indicates scour elevation ranges from -2.0 to -15.5 feet NAVD, depending on bent location.

Most of the scour occurs within the river sediment layer. Additionally, the majority of the pile locations will be preformed to facilitate pile driving achieving the factored design load and the minimum tip elevation for lateral load resistance. These factors contribute to near zero loss in pile resistance due to scourable soil. Therefore, net scour resistance value to be used in the pile capacity equation is estimated to zero.

8.4 Axial Capacity

As indicated in the 20016 FDOT Structures Design Guidelines (SDG), the required Nominal Bearing Resistance (NBR) is calculated using the following equation:

$$\mathbf{NBR} = \frac{\textbf{(Factored Design Load) + (Downdrag) + (Net Scour Resistance)}}{\mathbf{f}}$$

Where f = 0.65; assuming dynamic load testing, with PDA monitoring and CAPWAP analysis, will be performed for all test piles.

As previously indicated, downdrag loads acting on the piles will be mitigated with preformed holes and other techniques. The residual downdrag force on the piles was conservatively assumed as 35 tons. When the surcharge program is implemented as discussed later in the report, zero downdrag loss could be considered for the end bent piles. The net scour resistance is zero due to minimal capacity loss in the river sediments as discussed above.

Table 4 summarizes the design loading and the estimated pile tip elevations required to reach the NBR values. The Pile Data Table, conforming to the Structures Design Guidelines, is presented in **Appendix J.**

The test pile lengths indicated in the Pile Data Table were based on the pile length from the estimated cut-off elevation to the estimated pile tip elevation plus 15 feet.

The indicated pile capacities were based on several feet of penetration into the hard cemented silt layer. Because the FB-Deep program is conservative in computing end bearing capacity when piles penetrate into cemented soil layers, driving refusal and design capacities may be achieved at penetrations less than those indicated in **Table 4** during actual pile installation.

8.5 Axial Tension Capacity

From preliminary structural design, axial tension load on the piles is not anticipated. However, should pile tension capacity be needed in the design, preliminary factored design tension loads of approximately 30 to 40 tons can be used. Detailed tension capacity analysis can be performed if required during the final design.

8.6 Lateral Load Capacity

Lateral load analyses should be performed using the FB-MultiPier program to evaluate loading effects on the bridge superstructure and substructure. The analyses should be performed considering 24-inch PPSC piles and lengths that satisfy the axial capacity requirements as provided in **Table 4.** Soil strength and deformation parameters for use in FB-MultiPier analyses are as provided in **Appendix K**.

8.7 Pile Group Action

No reductions of the individual pile capacities will be required if piles are spaced center-to-center at 3 times their width or greater.

8.8 Pile Settlement

Settlement of pile supported bridge piers should be small and tolerable for a typical single row pile group. However, the tolerance should be confirmed by the structural engineer. Based on previous experience with similar projects, individual pile head settlements are estimated to be on the order of 1/2 inch or less. Group settlements are estimated to be on the same order of magnitude for a single row group pattern, but will increase slightly for other pile group configurations.

8.9 Environmental Classification

Results from corrosion tests performed on recovered soil samples are shown on the Report of Core Borings – Soil Profiles and in **Appendix G.** Based on the laboratory test results and the FDOT Structures Design Guidelines, the environment of the superstructure for the proposed bridge is classified as slightly aggressive. As described in Section 5.6, the bridge substructure is classified as extremely aggressive due to the low pH of the soils.

9 BRIDGE FOUNDATION CONSTRUCTION RECOMMENDATIONS

9.1 General

Based on the FDOT Structures Design Guidelines, a higher soil resistance factor can be used in estimating the Nominal Bearing Requirement (which provides a higher Factored Design Load for structural design) when static pile load tests are implemented. There is an approximately 15 percent increase in the soil resistance factor for piles with static load testing compared to piles with only dynamic testing. The use of static load testing and higher pile capacities may warrant further consideration, if justified from a structural or economic standpoint.

We recommend that the center-to-center spacing of the piles be at least 3 times the width of the pile, in accordance with the FDOT Structures Design Guidelines, to prevent pile capacity reductions and tip settlements caused by group effects. Should the pile spacing be reduced, we should be contacted for re-evaluating the pile group efficiency.

Due to the non-uniformity of the subsurface soils, there may be variation in pile tip elevations between adjacent piers, and within each pile group. Predetermining exact pile lengths will not be possible; therefore, pile cut-offs and splices should be anticipated. Although the prestressed concrete piles can be readily spliced, our experience shows that splicing could cost as much as four times the cost of cutting off the excess pile length. Therefore, pile casting lengths for the prestressed concrete piles should be conservatively estimated. A splice allowance of about 10 percent of the total number of piles is recommended to be included in the construction plans.

It is recommended that preformed pile holes be utilized to facilitate pile driving through near surface hard layers. Since partial lateral capacity of the pile will be derived from the residual soil/pile interface contact, the preformed auger size must not exceed the maximum allowable size for the 24-inch piles, as indicated in the FDOT Specification Section 455.

It is recommended that one test pile be driven at each bridge end bent/intermediate bent to better determine approximate pile lengths before ordering piles. A detailed test pile program is outlined in a subsequent section of this report.

9.2 Pile Installation Recommendations

The Pile Data Table (**Appendix J**) was compiled following the FDOT Structures Design Guidelines and should be included in the construction documents. Additional pile installation notes outlined in the Design Guidelines should be reviewed and included in the construction documents, if applicable. All piles to be used in this project should conform to the FDOT specifications and, in particular, to the latest version of FDOT Specification Section 455. Pile installation procedures, protection of existing facilities, monitoring programs, and other related topics shall also be in accordance with the specifications.

Piles should be driven to a depth that will achieve the "Nominal Bearing Resistance", as established using the results of the dynamically tested piles and the results of wave equation analyses recommended in the following sections. High driving resistance is anticipated in the majority of the piles while penetrating through the existing embankment and the near surface hard cemented silt, cemented clay layers. Constructing preformed pile holes through these dense/hard soil layers will be required for the majority of the piles. Preformed pile holes shall be made and backfilled according to the requirements outlined in FDOT Specification Sections 455.

Compatibility of the pile driving equipment with the pile type being driven is an essential element in achieving the required penetration and a satisfactory pile foundation. The geotechnical engineer should review all equipment proposed for use. The hammer should be selected with respect to size, weight, and type of pile specified. The pile hammer should be capable of operating at reduced energy levels (approximately one-half of its rated energy or less). The contractor should be required to reduce the energy being delivered to the pile to prevent high driving stresses and possible damage to the pile when pile driving tip resistances are relatively low (i.e. driving through preformed pile holes, through soft or loose soil layer, etc.) The Nominal Bearing Resistance recommended in the **Pile Data Table** should be used to establish pile driving criteria. During pile driving operations, driving records should be kept for each pile, detailing pertinent information such as the pile type, length, date driven, hammer energy level, and blow counts. The capacity of each pile should be reviewed based on its final tip elevation and driving record.

9.3 Wave Equation Analysis

A preliminary wave equation analysis was performed to verify that the 24-inch piles can be installed to the necessary capacities within the requirements of the FDOT Standard Specifications. Section 455 of the FDOT Standard Specifications requires that the pile driving hammer be capable of installing the piles to a resistance equal to at least 2.0 times the factored design load plus the scour and downdrag resistance without overstressing the piling in compression or tension, and without reaching practical refusal (20 blows per inch). In addition, the hammer should provide the required ultimate resistance at a blow count ranging from 36 blows per foot to 120 blows per foot.

The analysis was performed using soil conditions from borings for the two end bents and soil conditions at intermediate pier boring B3-13. The piles at the end bents require driving through high SPT blowcounts in the near surface sandy material, then through lower SPT blowcount cohesive materials, and finally into the hard bearing layer. The intermediate bent will have pile cutoff elevations above the river. The pile will go through some soft river bottom materials and into the bearing layer. Intermediate bent piles will have relatively long unsupported pile length during driving. Results of the preliminary wave equation analyses indicate that the piles can be installed to the required capacities within the limitations of the FDOT Standard Specifications using an APE D62-42 Single Acting Diesel Impact hammer (maximum rated energy = 153,799 foot-pounds) or similar driving hammer. A summary of the analysis results is included in **Appendix L.**

9.4 Dynamic Load Testing

We recommend a program of unloaded test piles, with one pile driven at each bent/pier location, be implemented for the project. The test pile lengths indicated in the Pile Data Table (**Appendix J**) are approximately 15 feet longer than the estimated pile length required to achieve the Nominal Bearing Resistance. We recommend that test piles be dynamically monitored using the Pile Driving Analyzer (PDA). This monitoring will ensure allowable stress levels are not exceeded during hard driving and provide documentation regarding allowable design loadings. CAPWAP analyses should also be performed on selected hammer blow data during evaluation of the PDA results. The installation of the test piles should be carried out in accordance with FDOT Specification, Section 455.

During pile installation, the contractor should exercise caution so as not to overstress the piles. Piles should not be driven beyond practical refusal (as defined in the FDOT Specification, Section 455) to meet the bearing requirements. Penetration aids such as preformed pile holes will be required if piles cannot be driven to the required penetration without reaching practical refusal. Some variations in pile lengths should be expected due to normal variations in subsurface conditions.

9.5 Pre-Condition Survey and Vibration Monitoring

At the time of this report, there were no sensitive building structures present in the area of the bridge construction. However, prior to any field construction operations, we recommend that a survey be performed (including photographic and video documentation with date logging) of any existing building structures located adjacent to and within 100 feet of the proposed improvements. Documentation should be made of any foundation problems or cracking noted by the owners. If any problems are evident or substantial objections voiced by the property owners, consideration should be given to monitoring vibrations on the building structure during pile driving operations. It is also recommended that a follow-up photographic survey be performed after each construction operation subject to vibration concerns. The pre-condition survey and vibration monitoring program shall be performed in accordance with FDOT Specification Section 455.

It is our recommendation that the County's personnel perform vibration monitoring on existing adjacent structures, including the nearby power line poles, during pile driving operations. Should the vibrations exceed the tolerable level, the County can require the pile driving to be performed with lower energy or driving strokes to reduce the vibration on the existing structures. Preforming pile holes may also be used as an option to reduce the ground vibration during pile driving.

The following notes are recommended to be included in the **Pile Data Table (Appendix J).**

1. The pile hammer may be required to operate at reduced strokes or energy lower than normal in order to reduce the vibration level at the existing structures in the vicinity. The County's personnel will perform vibration monitoring at the existing structures. The Contractor shall notify the County at least two weeks prior to commencing pile driving so that the County's personnel can schedule the vibration monitoring activities. Costs associated with any decrease in production rate for installing piles to meet the vibration limit requirement in accordance with Section 455-1.1 of the FDOT Standard Specifications shall be included in the unit bid price for Pre-stressed Concrete Piling, Pay Item No. 455-34.

2. The Contractor shall anticipate the use of specialized equipment and/or methods including, but not limited to, core barrels, rock augers, punches, drill bits, etc. to complete predrilling and/or preforming. If drilling equipment with a taper end is used to construct the preformed pile holes or predrilled pile holes, the maximum diameter of the drilling equipment shall not exceed the maximum size allowed for the 24-inch prestressed concrete pile indicated in the FDOT Specification Section 455.

3. The Contractor shall anticipate encountering variable soil conditions during the pile driving which will require pile splices at some of the pile locations.

10 MAST ARM SIGNAL FOUNDATIONS

As previously discussed, new signalization is proposed for the intersection of 44^{th} Avenue and Caruso Road. Four mast arms are planned at the intersection.

Foundation for the proposed signalization will be required to resist torsional, overturning and axial loads, and will likely consist of a single drilled shaft at each signal pole location. Using a generalized subsurface stratigraphy generated for each signal location soil boring, as well as results of laboratory tests and published correlations with SPT N-values, recommended soil parameters for use by others in the design of the foundations were developed. The subsurface stratigraphies are shown on the Report of Core Boring Sheets included in **Appendix F**. The recommended soil parameters for drilled shaft foundation design are summarized in **Table 5**.

11 PIPE SUPPORT FOUNDATIONS

As previously discussed, relocation of a 36-in diameter potable water pipe is part of this project. The relocated water pipe will be supported on the proposed bridge and transitioning to the ground at the bridge approach embankments. The pipe requires a very large thrust block at each transition to resist uplift. Due to the sensitivity to settlement, the large thrust blocks will be pipe supported.

Foundation for the proposed pipe supports will be required to resist the nominal axial load from the weight of the thrust block, which is approximately 75 tons, each. From experience, 18-in prestressed concrete square pile driven to the hard cemented silty layer would provide sufficient capacity for the support.

From results of FB-Deep analysis (**Appendix M**), the available capacity for factored design axial load of the 18-in concrete piles ranges from 220 tons to 230 tons for thrust blocks at the west and east side of the river, respectively. The anticipated pile tip elevations for the thrust blocks at the west and east side of the river are -36.0 and -40.0, respectively. From discussion with the structural engineer, the piles for the support thrust block will be installed to these minimum tip elevations.

12 ROADWAY EMBANKMENT

12.1 General

As previously discussed, the proposed bridge approaches consist predominantly of fill sections with typical maximum heights ranging from approximately 5 feet to 12 feet above existing grade. It is our understanding that embankment fills armored with protective riprap will be used at the bridge abutments. The riprap will be extended to elevations below the potential scour depth.

From the results of the investigations, there are no conditions that would preclude the proposed embankment construction. Materials used as fill for the roadway embankment should satisfy the requirements of FDOT Standard Index 505 and should be compacted in accordance with Section 120-9 of the FDOT Standard Specifications. Clearing and grubbing for construction of roads along with any removal of plastic, high plastic and muck material shall be in accordance with FDOT Standard Index 500. Any cut and fill in the embankment areas shall be in accordance with Standard Index 505.

It is recommended that the existing ditches be cleared and grubbed to depths of no less than 12 inches below ground surface to remove all topsoil and vegetation. The stripped surface should be compacted with sheepsfoot rollers in accordance with Standard Specification Section 129-9 to identify areas with underlying soft and yielding materials. Where encountered, the soft / yielding materials shall be removed as plastic material in accordance with Standard Index 500. The limits of soft materials removal and replacement shall be field determined or directed by the County representative or the Geotechnical Engineer.

The results of the soil tests indicate the LBR value of the existing subgrade soils ranges from 28 to 50 at optimum moisture content. The high LBR values are attributed to the abundance of shell fragments in the near surface soils. The results of the LBR tests are presented in **Appendix G.** The test results show the LBR and density values of the tested soil samples are highly sensitive to moisture content. Using the LBR values derived from the +/- 2% optimum moisture content, a conservative design LBR value of 20 may be appropriate for preliminary pavement design.

Based on experience with projects in the vicinity, imported fill for roadway embankment construction often has LBR values greater than 20 (typical assigned value for A-3 materials); therefore, using a design value of 20 for the elevated sections of the roadways is considered a reasonable and conservative assumption. For pavement design purpose, a design LBR value of 20 is recommended. Once borrow sources are identified, additional LBR tests on the material are recommended to confirm the appropriateness of this design value.

12.2 Embankment Settlement

Settlement analyses were performed using methodology described in the FHWA, “Soils and Foundations Workshop Manual,” November, 1982. The analyses were based on the estimated compressibility characteristics of the underlying soils derived from the SPT N-values and soil types for the appropriate soil borings.

With the exception of the bridge approach embankments, roadway fills will generally be about five feet or less. As such, assuming proper subgrade preparation (i.e., clearing and grubbing with removal and replacement of any unsuitable soils), settlements are estimated to less than one inch and should occur largely during construction.

Settlements are anticipated to be higher for the areas of the bridge approaches. The bridge approaches are to be constructed on undeveloped natural ground and the embankment heights are anticipated to be 12 and 5 feet above existing ground for the west and east bridge approach, respectively. From the results of the analysis, settlements of 6 to 8 inches should be anticipated at the bridge approaches. The settlement occurs in the clayey, silty sand layer at approximately 20 to 25 feet below ground surface. It is anticipated that most consolidation will occur within 6 to 12 months after the embankment is in place. Therefore, it is recommended that the pavement structures or other settlement-sensitive structures not to be constructed immediately after the embankment is placed. Since the relocated water force main previously mentioned can only tolerate very small amount of movement, the embankment will be surcharge to remove ground settlements. It is therefore recommended a settlement monitoring program be implemented to monitor the rate of settlement at the approaches. The monitoring program should consist of settlement plates in conformance to the FDOT Standard Index 540. Settlement readings should be performed weekly during embankment construction and for several weeks after completion. The settlement reading should be performed by a qualified surveyor and reviewed and interpreted by a geotechnical engineer.

The recommended surcharge program is included in **Appendix N**.

12.3 Embankment Stability

Stability analysis was performed using the most severe cross section geometry along the bridge approaches where the embankment is highest. The embankment width and height were based on information provided in the roadway plans for the project. Generalized subsurface stratigraphy from the closest and most appropriate borings was used in the analysis.

Embankment stability analysis was performed using the computer program STABL5M. The safety factors for the proposed slopes were computed using the Modified Bishop method. The results of the analysis indicate safety factors of at least 1.5 for embankment stability. Results of stability analyses are presented in **Appendix O.**

13 STORMWATER MANAGEMENT FACILITIES (SMFs)

The subsurface investigations for the SMFs included soil borings, seasonal high groundwater determination/evaluation, as well as laboratory tests for soil classification characteristics. As indicated in earlier sections, subsurface investigations were performed for Stormwater Management Facilities No. 1 and No. 3, while restricted access to SMF No. 2 has delayed its investigation. In general, subsurface soils in SMFs 1 and 3 consist of clean fine sand to fine silty, clayey sand. Some borings contain trace to some shell fragments and phosphate nodules. It is anticipated that the majority of the excavated materials in these SMFs can be reused as embankment fills.

The following are general comments and recommendations for SMFs site construction.

13.1 Site Preparation

Prior to the excavation/grading process, the proposed construction limits shall be cleared and grubbed. The work operations will generally consist of removal of all structures, fences, rubble, and debris from the site, and clearing and grubbing of all trees, stumps from fallen trees, major root systems, and vegetation.

13.2 Excavation

Excavation and grading can be performed with conventional equipment such as pans, backhoes, and dozers. Topsoil should be removed and stockpiled prior to excavation. Qualified inspectors should monitor excavated materials to direct selective sorting of highly plastic soils and muck from suitable sandy soils. All different materials should be stored separately for later use. The storage areas should be cleared and grubbed to remove all rubble and debris, as well as grass and roots.

13.3 Material Usage

Excavated materials from the Stormwater Management Areas should be classified and sorted for reuse in embankment construction. The classifications of these materials are as follows:

- Select materials are those complying with AASHTO soil classification groups A-3 and A-2-4 or a combination thereof having not more than 15 percent by weight finer than the No. 200 sieve when tested in accordance with ASTM D 1140. Select materials are suitable for construction of roadway embankments when utilized in accordance with the FDOT Standard Index 505.

- Topsoils and unsuitable materials are those containing organic material regardless of classification. Topsoil and unsuitable materials are not recommended for construction of roadway embankment. They may be suitable for use as a muck blanket where landscaping and grassing will be introduced.

- Non-select soil materials are those not meeting the above definitions. These materials consist of FDOT defined plastic and high plastic materials (A-2-6, A-6, A-7, etc.) or a combination thereof. Non-select materials can be used in roadway embankments when utilized in accordance with the FDOT Standard Index 505. However, they may be difficult to dry, spread, and/or compact.

Prior to using select material for roadway construction, additional LBR tests are recommended. Samples for testing should be collected at random locations within the borrow/stockpile areas.

14 EMBANKMENT CONSTRUCTION CONSIDERATIONS

14.1 General

Topsoil and sod shall be stripped from the site in all areas of embankment fill. The site preparation should be performed according to FDOT Standard Indices No. 500 and No. 505. Topsoil should be removed completely and stockpiled for reuse, if practical. The stripped surface shall be inspected by County representatives or by a geotechnical engineer. The subgrade shall be compacted to at least 98 percent of the maximum dry density as determined by AASHTO T-99 method prior to placing any fill. The fill shall be FDOT-select material and contain no muck, stumps, roots, debris or other deleterious material and shall conform to FDOT Standard Indices No. 500 and No. 505. The backfill should be spread evenly in thin lifts and compacted according to Section 120-9 of FDOT Standard Specifications.

As embankment construction progresses, the slopes shall be shaped and dressed to conform to the cross-section and grades, as directed, and within the tolerances stated in the FDOT Standard Specifications for Road and Bridge Construction.

14.2 Groundwater Control

The need for groundwater control may arise depending on the design elevations of the SMFs and other utilities along with groundwater elevations at the time of construction. Fluctuations in groundwater level are caused by numerous factors throughout the year. Therefore, groundwater levels should be determined immediately prior to construction for effective controlling measures. Generally, the groundwater level should be maintained at least one foot below planned excavation levels and two feet below compaction surfaces. Proper sediment, erosion, and pollution control measures will need to be incorporated into the contract documents. Discharge of dewatering effluent should be in accordance with state and local laws.

14.3 Temporary Side Slopes

Side slopes for temporary excavations may stand near 1H:1V for short dry periods of time; however, it is recommended that temporary excavations that are deeper than 4 feet be cut on slopes of 2H:1V or flatter. All excavations should be properly dewatered. Where restrictions will not permit slopes to be laid back as recommended above, the excavation should be shored and braced in accordance with OSHA requirements. Shoring and bracing plans shall be designed or approved by a professional engineer licensed in the State of Florida. During foundation construction, excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

15 REPORT LIMITATIONS

Generally accepted soil mechanics and foundation engineering practices were used in the preparation of this report. This report has been prepared solely for our use in design and may not contain sufficient information for other uses or the purposes of other parties. If conclusions or recommendations based upon this data are made by others, such conclusions or recommendations are not our responsibility. No other warranty, either expressed or implied, is made as to the professional advice included in this report.

The depth of the groundwater table, where indicated, was measured in the borings at the time of investigation. Fluctuations in the level of the groundwater will occur due to seasonal and rainfall variations. Furthermore, other factors neither evident at the time of our investigation, nor reported herein, may significantly affect the level of the groundwater table. The engineering evaluations, opinions, conclusions, and recommendations presented in this report are based upon the data obtained from the subsurface investigation program.

Manmade variations in the site conditions in this urban area should be expected. This report does not reflect any variations that occur between boring locations except as discussed in this report. The nature and extent of subsurface variations between borings may not become evident until the construction phase. If variations then appear evident, performing additional on-site observations will be necessary during the construction phase to note the nature of the variations in order to reevaluate and, if necessary, modify, the recommendations presented in this report.

TABLES

Table 1: SCS Soil Properties

USDA MAP UNIT	SOIL CLASSIFICATION			PERMEABILITY	pH	SEASONAL HIGH GROUNDWATER	
	DEPTH (in)	USCS	AASHTO	(in/hr)		DEPTH (ft)	Months of Year
20 EauGallie Fine Sand	0 - 28 28 - 42 42 - 50 50 - 65	SP, SP-SM SP-SM, SM SM, SM-SC, SC SP-SM, SM	A-3 A-3, A-2-4 A-2-4, A-2-6 A-3, A-2-4	6.0 - 20.0 0.6 - 6.0 0.6 - 6.0 2.0 - 6.0	4.5 - 6.0 5.1 - 6.5 5.6 - 7.8 5.6 - 7.8	0 - 1.0	June to October
48 Wabasso Fine Sand	0 - 21 21 - 31 31 - 37 37 - 65 65 - 80	SP, SP-SM SP-SM, SM SP, SP-SM SM-SC, SC SP-SM, SM	A-3 A-3, A-2-4 A-3 A-2-4, A-2-6 A-3, A-2-4	6.0 - 20 0.6 - 2.0 6.0 - 20 <0.2 6.0 - 20	4.5 - 6.5 4.5 - 7.3 5.1 - 8.4 5.1 - 8.4 7.4 - 8.4	0 - 1.0	June to October
11 Cassia Fine Sand	0 - 24 24 - 33 33 - 80	SP, SP-SM SP-SM, SM SP, SP-SM	A-3 A-3, A-2-4 A-3	6.0 - 20 0.6 - 6.0 6.0 - 20	4.5 - 6.0 4.5 - 6.0 4.5 - 6.0	1.5 - 3.5	July to January
26 Floridana-Immokalee- Okeelanta Association	0 - 19 19 - 36 36 - 63	SP-SM, SM SP, SP-SM SM-SC, SC	A-3, A-2-4 A-3 A-2-4, A-2-6	6.0 - 20 6.0 - 20 <0.2	5.6 - 8.4 5.6 - 8.4 5.6 - 8.4	+2 - 1	June to February
38 Palmetto Fine Sand	0 - 25 25 - 45 45 - 64 64 - 68	SP, SP-SM SP-SM SM-SC, SC SP-SM, SM	A-3, A-2-4 A-3, A-2-4 A-2-4, A-2-6 A-3, A-2-4	6.0 - 20 6.0 - 20 0.2 - 0.6 2.0 - 6.0	3.6 - 5.5 3.6 - 5.5 4.5 - 5.5 4.5 - 5.5	0 - 1.0	June to November
34 Okeelanta Muck	0 - 39 39 - 60	PT SP, SP-SM	A-8 A-3	6.0 - 20 6.0 - 20	7.4 - 8.4 7.4 - 8.4	0 - 1.0	January to December
16 Deray Complex	0 - 15 15 - 55 55 - 80	SP-SM, SM, SM-SC SP-SM SM, SM-SC, SC	A-3, A-2-4 A-3, A-2-4 A-2-4, A-2-6	6.0 - 20 6.0 - 20 0.6 - 6.0	5.6 - 7.3 6.1 - 7.3 6.6 - 7.8	0 - 1.0	June to March
31 Myakka Fine Sand, 2 to 5 Percent Slope	0 - 12 12 - 33 33 - 80	SP, SP-SM SP-SM, SM SP, SP-SM	A-3 A-3, A-2-4 A-3	6.0 - 20 0.6 - 6.0 6.0 - 20	3.6 - 6.5 3.6 - 6.5 3.6 - 6.5	0 - 1.0	June to November

TABLE 3: ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATIONS

FACILITY *	NEAREST BORINGS	GROUNDWATER ENCOUNTERED IN BORING (FT - BGS)	SHGW (FT - BGS)	APPROXIMATE EXISITING GROUND ELEVATION (FT - NAVD 88)	REMARKS
SMF - 1	P1-01 P1-02	4 4	3 3	15 15	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88
SMF - 2	HA-11 HA-12	3.5 4	2 2	8.0 7.9	BORINGS FOR SMF - 2 HAVE NOT BEEN PERFORMED. BORINGS DRILLED ALONG 44TH AVENUE ALIGNMENT WERE USED FOR PRELIMINARY SHGW ASSESSMENT. THESE BORINGS ARE LOCATED AT APPROXIMATELY 200 TO 300 FEET NORTH OF THE SMF -2 AND APPROXIMATELY 200 TO 300 FEET FROM RIVER EDGE. GROUNDWATER AT THESE BORINGS COULD BE AFFECTED BY TIDE CYCLES
SMF - 3	P3-10 TO P3 - 21	2.25 TO 2.6	2	13 TO 14	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88
CARUSO ROAD	H2-1 TO H2-15	2 TO 3.25	1 TO 2	13 TO 14	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88

* Table 3A shows the Estimate Seasonal HighGroundwater along 44th Avenue.

SMF = STORMWATER MANAGEMENT FACILITY
BGS = BELOW GROUND SURFACE

TABLE 3A: ESTIMATED SEASONAL HIGH GROUNDWATER ALONG 44TH AVENUE

NAVD 88 Elevations

Boring	Approx. Ground Elevation	Comment	Approx. ESHW Elevation (3' depth)
HA01	15.1	pavement	12.1
HA02	15.5	Ground	12.5
HA03	16.0	pavement	13.0
HA04	16.0	Ground	13.0
HA05	15.9	pavement	12.9
HA06	15.6	pavement	12.6
HA07	16.2	pavement	13.2
HA08	15.5	Ground	12.5
HA09	14.5	Ground	11.5
HA10	13.7	Ground	10.7
HA11	7.9	pavement	4.9
HA12	2.4	? Near river bank	-0.6
HA13	3.6	? Near river bank	0.6
HA14	12.0	Ground	9.0
HA15	13.1	Ground	10.1
HA16	12.8	Ground	9.8
HA17	13.6	Ground	10.6
HA18	13.7	Ground	10.7
HA19	14.3	pavement	11.3
HA20	14.3	Ground	11.3
HA21	15.0	pavement	12.0
HA22	14.1	Ground	11.1
HA23	15.5	pavement	12.5
HA24	13.4	Ground	10.4
HA25	15.8	pavement	12.8
HA26	14.9	Ground	11.9
HA27	16.2	pavement	13.2
HA28	16.6	Ground	13.6
HA29	16.5	Ground	13.5
HA30	21.2	pavement	18.2
HA31	N/A	no elevations available	N/A

Note that HA11, HA12 and HA 13 may be influenced significantly by normal water levels of base flow in the river. Borings HA30 and HA31 elevations are outside of the norms. The ESHW elevation for these locations is ignored.

Recommend the ESHW elevation be no lower than 12 feet for design.

Table 4: Anticipated Pile Tip Elevations

Axial Analyses of Driven 24-Inches PPSC Piles								
Bent / Pier Location	Nearest Boring	Factored Design Load (Tons)	Downdrag (Tons) (4)	Net Scour (Tons)	(1) Preformed Elevation (Feet-NAVD)	(2) Nominal Bearing Resistance (Tons)	(3) Calculated Pile Tip Elevation (Feet-NAVD)	Anticipated Pile Tip Elevation (Feet-NAVD)
End Bent 1 (Wing Wall)	B-5	180	35	N/A	-10	330	-37	-40 to -45
End Bent 1 (Abutment)	B-5	225	35	N/A	-10	400	-42	-45 to -50
Pier 2	B-5	215	N/A	N/A	N/A	330	-37	-40 to -45
Pier 3	B-5	215	N/A	N/A	N/A	330	-37	-40 to -45
Pier 4	B2-4	215	N/A	0	-26	330	-56	-55 to -60
Pier 5	B2-5	215	N/A	0	-30	330	-58	-50 to -60
Pier 6	B2-6	215	N/A	0	-28	330	-54	-50 to -55
Pier 7	B2-7	215	N/A	0	-28	330	-50	-50 to -55
Pier 8	B2-8	215	N/A	0	-29	330	-50	-50 to -55
Pier 9	B2-9	215	N/A	0	-35	330	-58	-55 to -60
Pier 10	B2-10	215	N/A	0	N/A	330	-47	-45 to -50
Pier 11	B2-11	215	N/A	0	N/A	330	-44	-40 to -45
Pier 12	B2-12	215	N/A	0	N/A	330	-40	-40 to -45
Pier 13	B2-13	215	N/A	0	-30	330	-54	-50 to -55
Pier 14	B2-14	215	N/A	0	-30	330	-54	-50 to -55
Pier 15	B2-15	215	N/A	0	N/A	330	-49	-45 to -50
End Bent 16 (Abutment)	B2-16	225	35	N/A	-10	400	-46	-45 to -50
End Bent 16 (Wing Wall)	B2-16	180	35	N/A	-10	330	-40	-40 to -45

Notes:
1) Through near surface dense silty sand / silty clayey layers
2) Rounded to the nearest 5 tons
3) From FB-Deep
4) With preformed pile holes and pile above exisiting ground wrapped with two layers of polythylene sheets

TABLE 5: ESTIMATED SOIL PARAMETERS FOR MAST ARM FOUNDATION DESIGN

BORING NUMBER	DEPTH (FEET)	SPT (N) RANGE	APPROXIMATE SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	UNDRAINED SHEAR STRENGTH (PSF)
			SATURATED	SUBMERGED		
MA-01 Station 218+55.5, 59' Left	0 - 13.5	8 - 23	107	112	32	0
	13.5 - 18.5	3	102	107	29	0
	18.5 - 23.5	3	102	107	0	500
	23.5 - 28.5	48	115	120	0	4000
	28.5 - 30.0	100	125	130	0	4000
MA-02 Station 219+74, 82.7' Left	0 - 4.0	AUGER	105	110	30	0
	4.0 - 13.5	20 - 28	110	115	35	0
	13.5 - 18.6	3	102	107	29	0
	18.5 - 23.6	10	107	112	0	1000
	23.5 - 28.6	100	120	125	0	4000
	28.5 - 30.1	100	125	130	0	4000
MA-03 Station 220+17, 55.0' Right	0 - 8.0	11 - 26	110	115	32	0
	8.0 - 13.5	28-29	110	115	35	0
	13.5 - 18.5	2	102	107	29	0
	18.5 - 23.5	6	107	112	0	800
	23.5 - 28.5	100	120	125	0	4000
	28.5 - 30.0	100	125	130	0	4000
MA-04 Station 219+02, 72.7' Right	0 - 13.5	8 - 18	107	112	32	0
	13.5 - 18.5	3	102	107	29	0
	183.5 - 23.5	9	107	112	31	0
	23.5 - 30.0	100	125	130	0	4000

NOTES:
1. Existing ground surface elevation varies from 12.5 to 13.5 feet -NAVD
2. Groundwater was encountered at 3 to 3.5 feet below existing ground surface.

FIGURES

44TH AVE EAST - BRADEN RIVER SEGMENT (45TH AVE EAST TO 44TH AVE PLAZA EAST)

COUNTY PROJECT NUMBER 6086960

MANATEE COUNTY

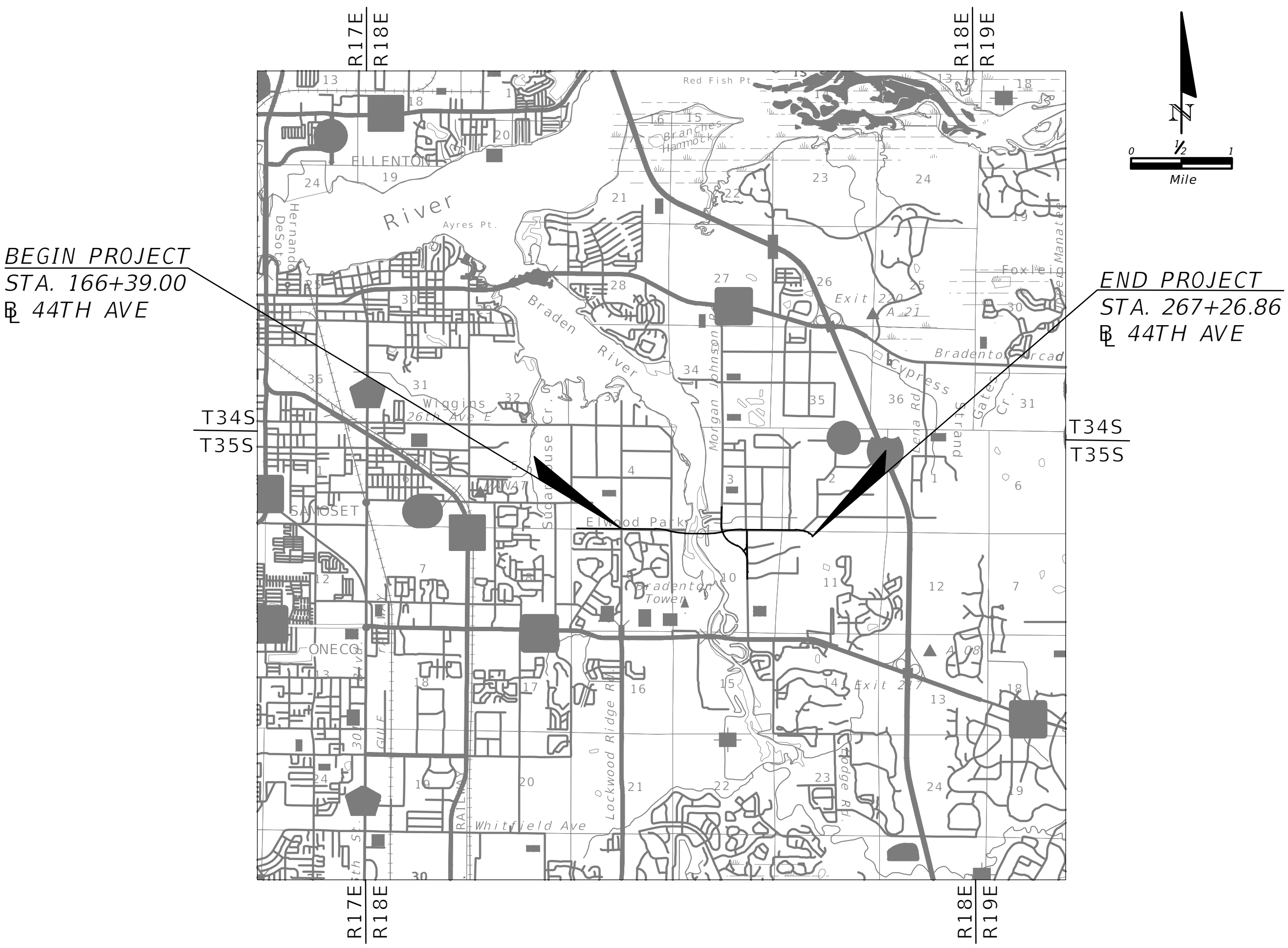


FIGURE 1: PROJECT LOCATION MAP

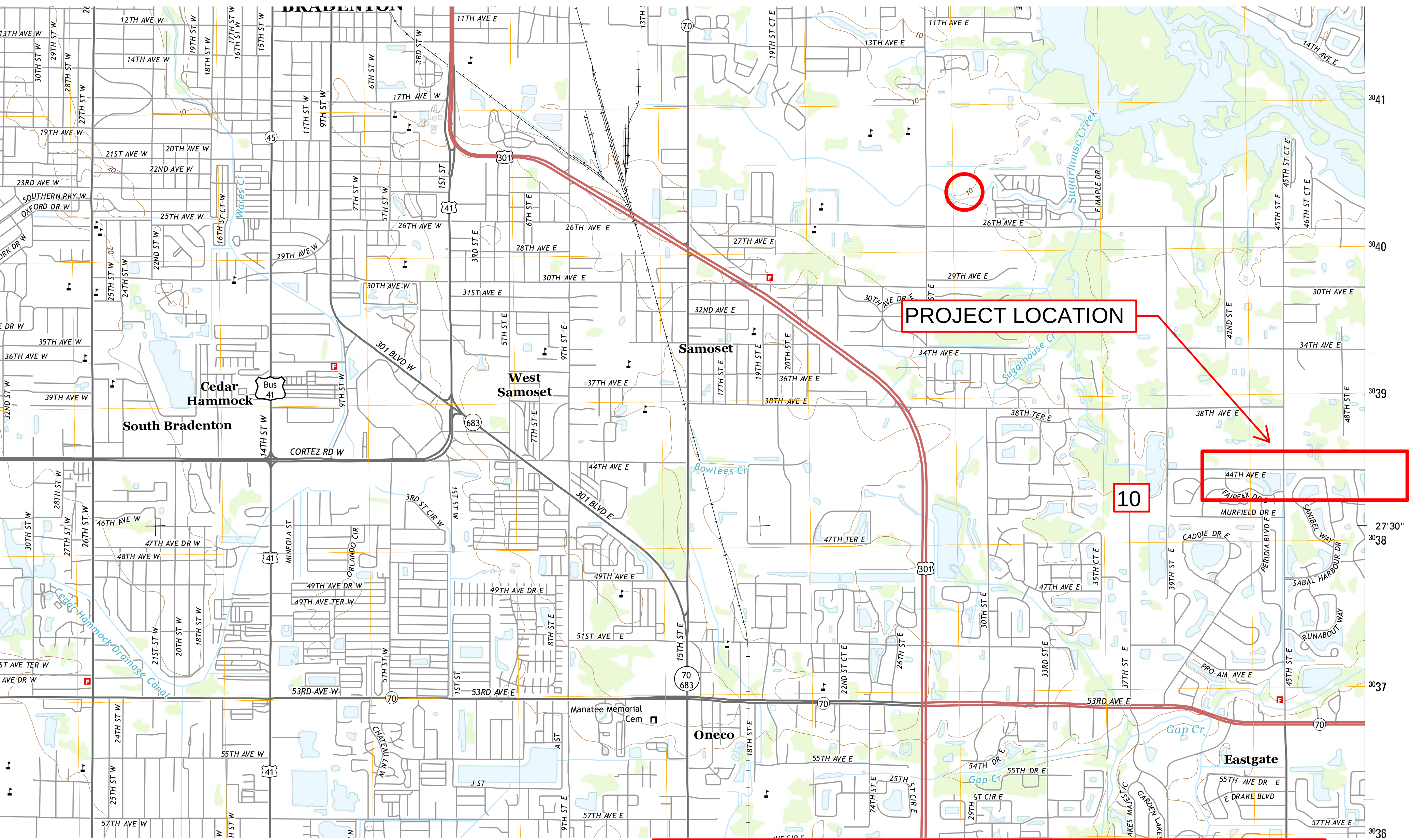


FIGURE 2: USGS QUADRANGLE MAP (1 OF 2)

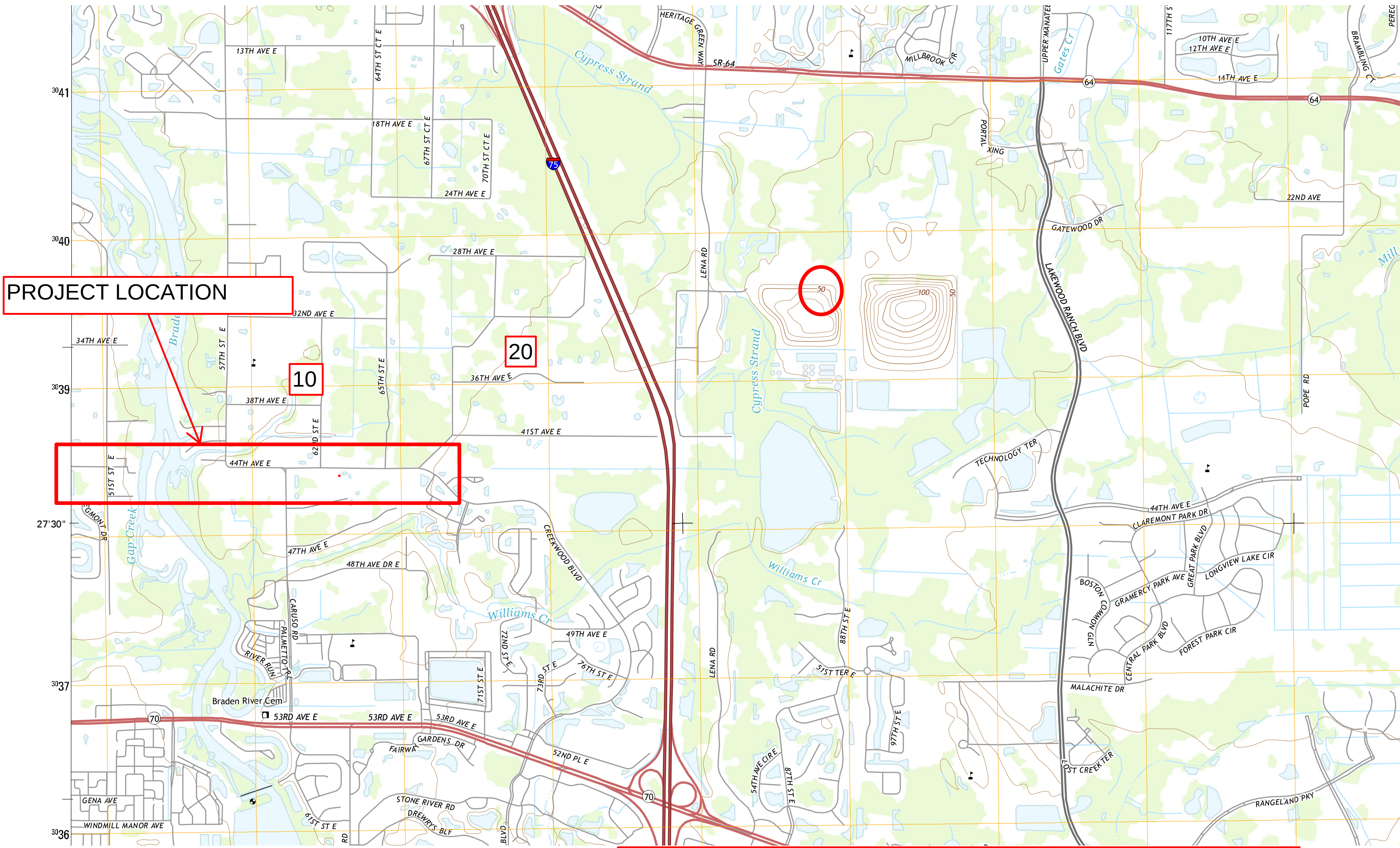


FIGURE 2: USGS QUADRANGLE MAP (2 OF 2)

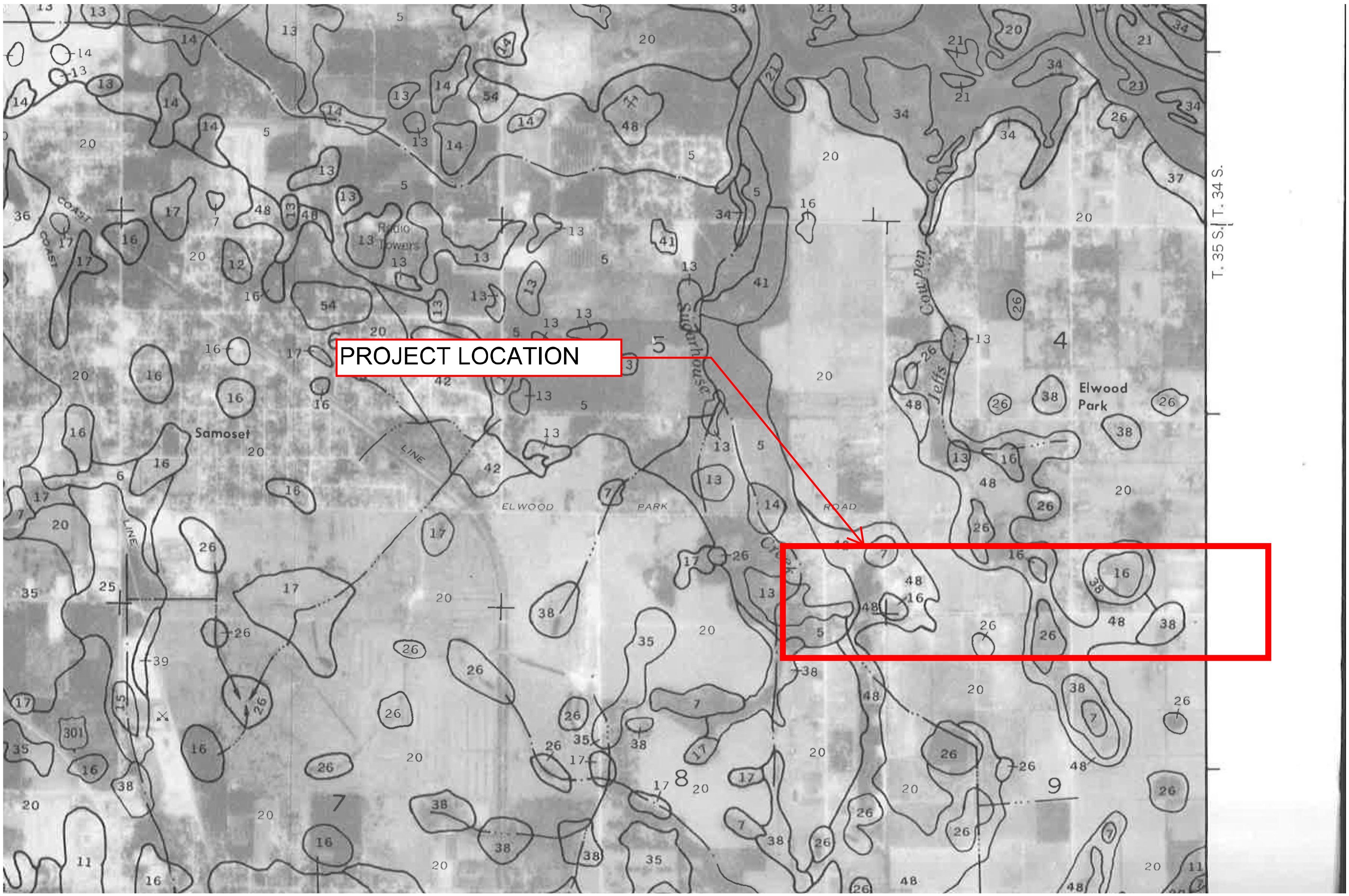


FIGURE 3: SCS SOIL SURVEY MAP (1 OF 2)

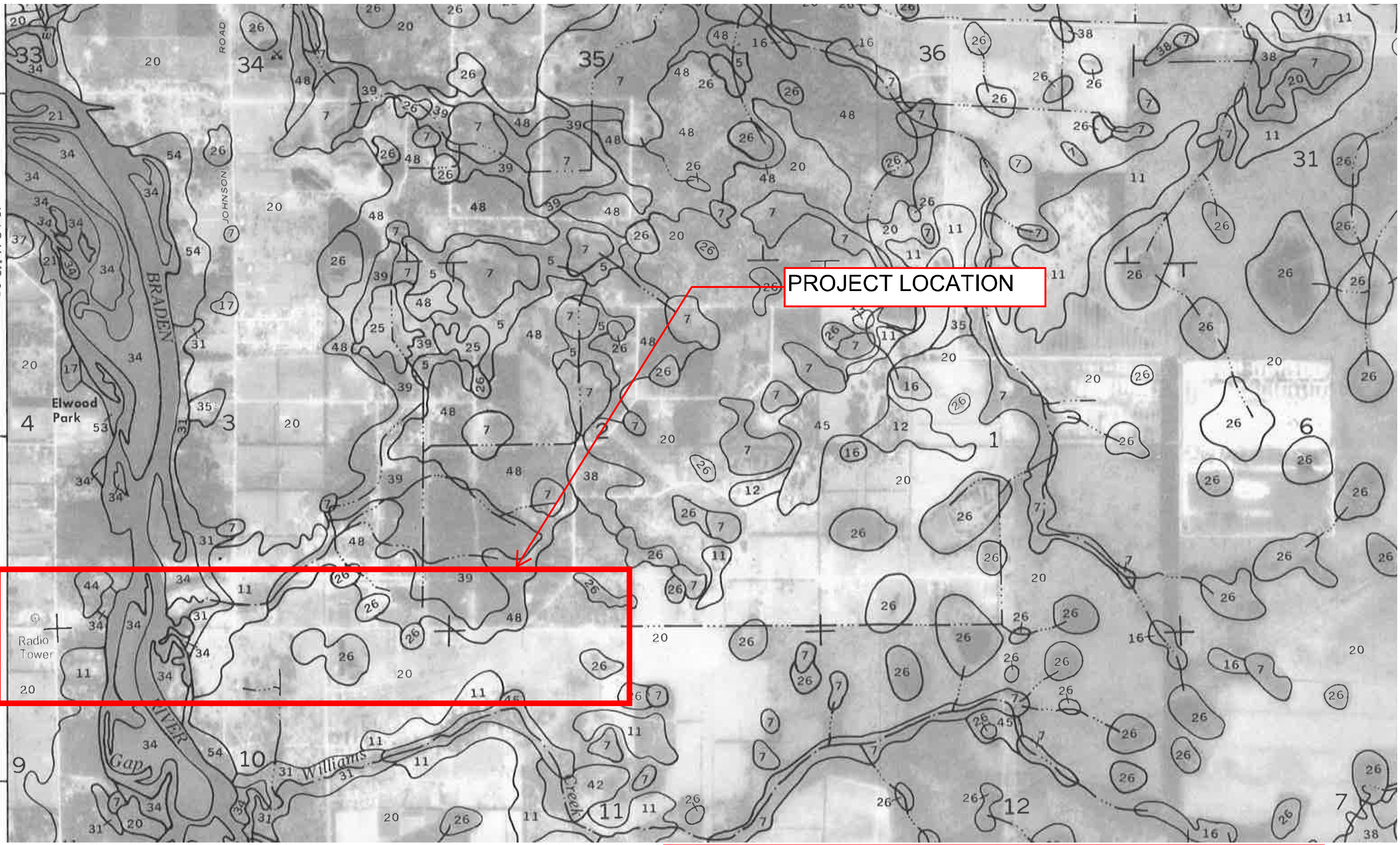


FIGURE 3: SCS SOIL SURVEY MAP (2 OF 2)

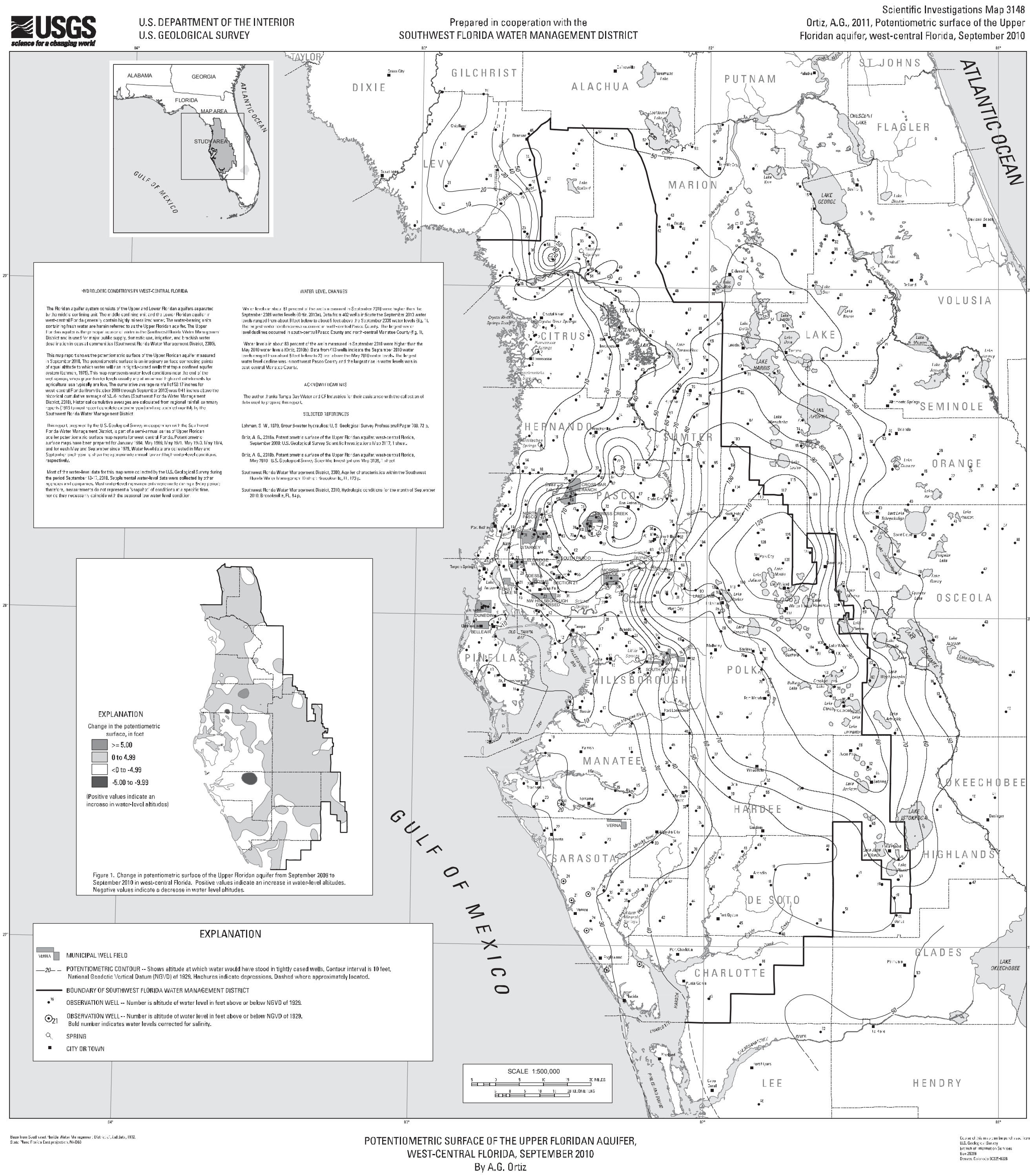


FIGURE 4: POTENTIOMETRIC SURFACE OF UPPER FLORIDAN AQUIFER WEST-CENTRAL FLORIDA, SEPTEMBER 2010

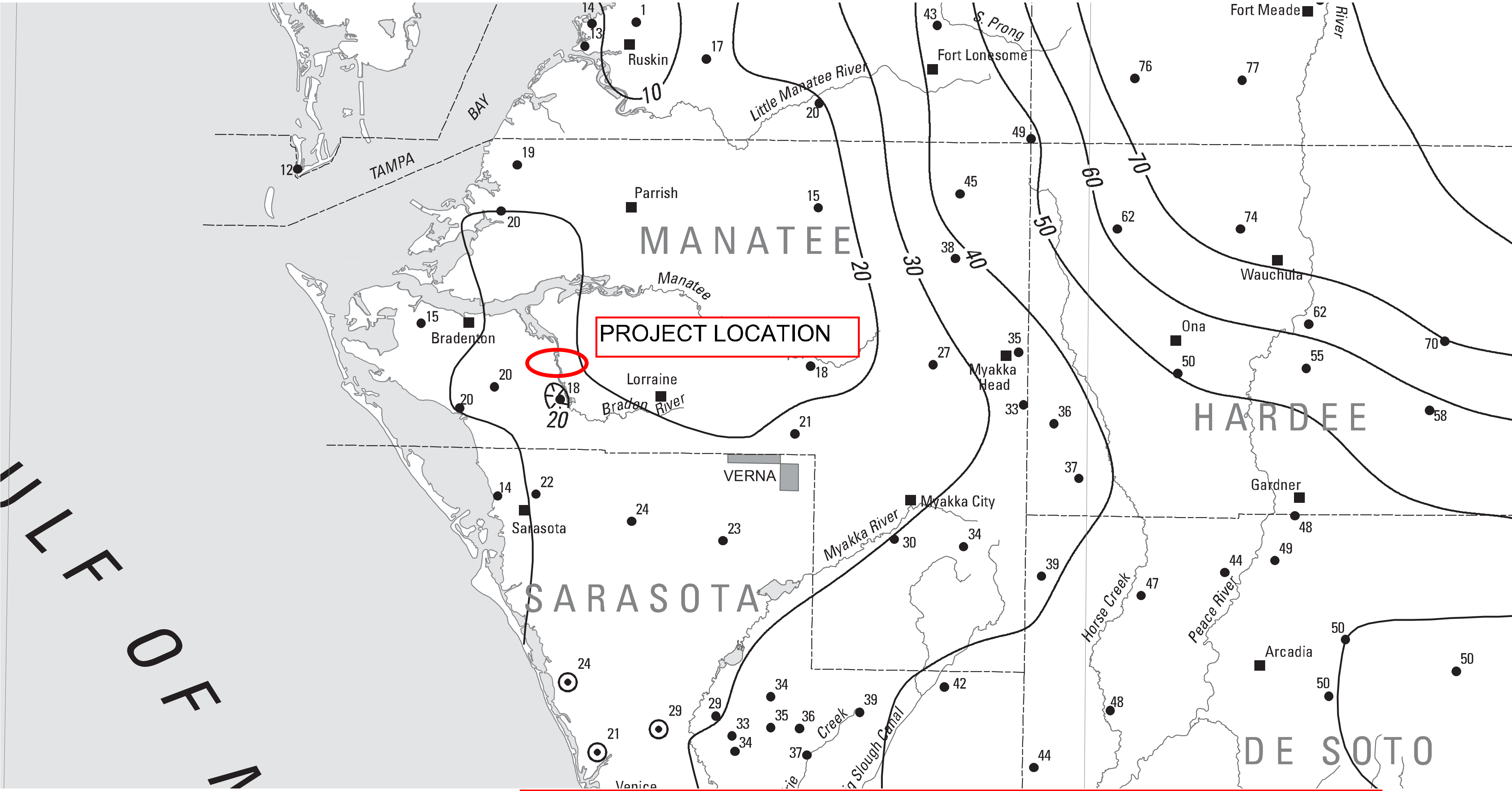
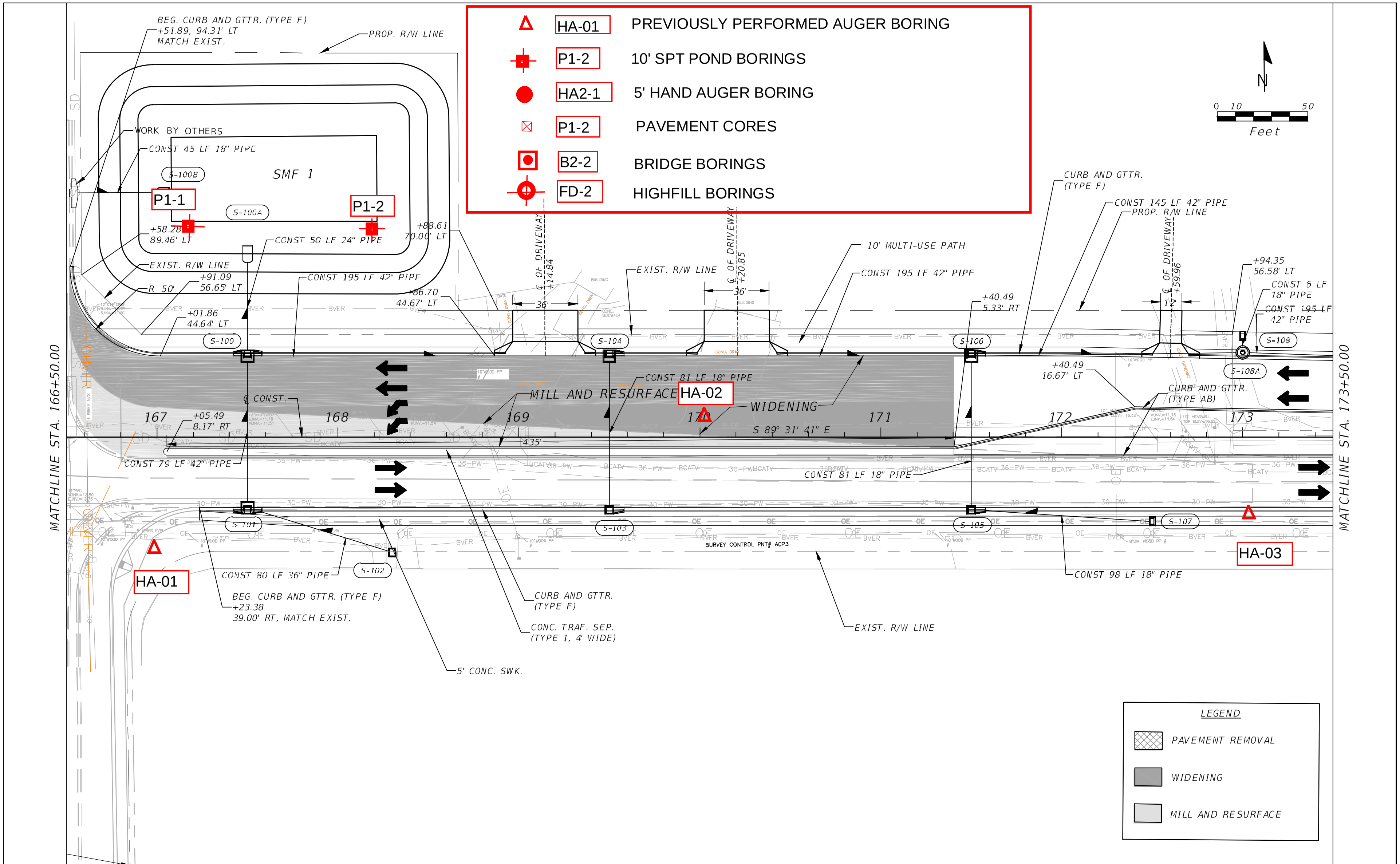


FIGURE 4: POTENTIOMETRIC SURFACE OF UPPER FLORIDAN AQUIFER WEST-CENTRAL FLORIDA, SEPTEMBER 2010 - MANATEE COUTY, FLORIDA

APPENDIX A

Boring Location Plans



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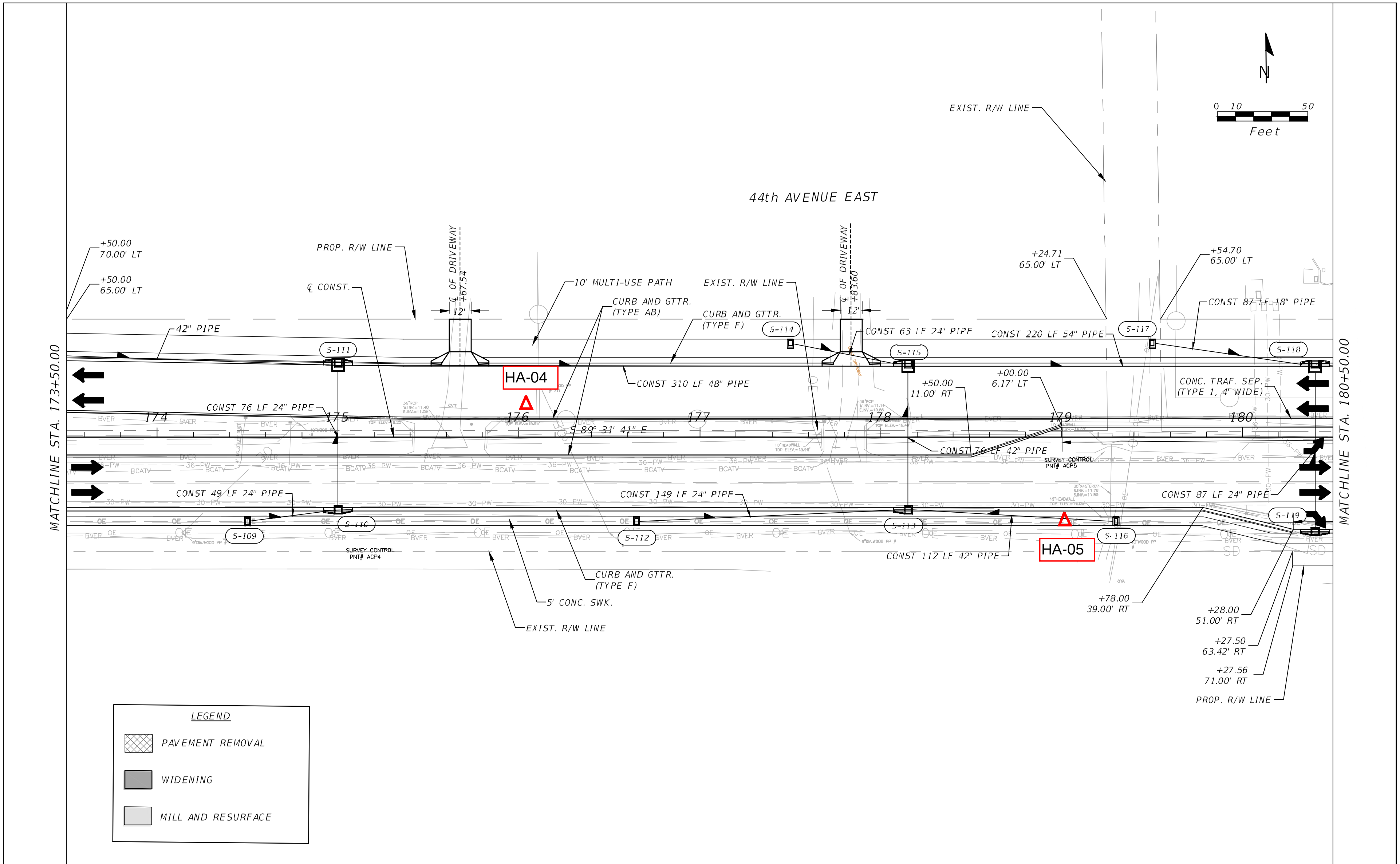

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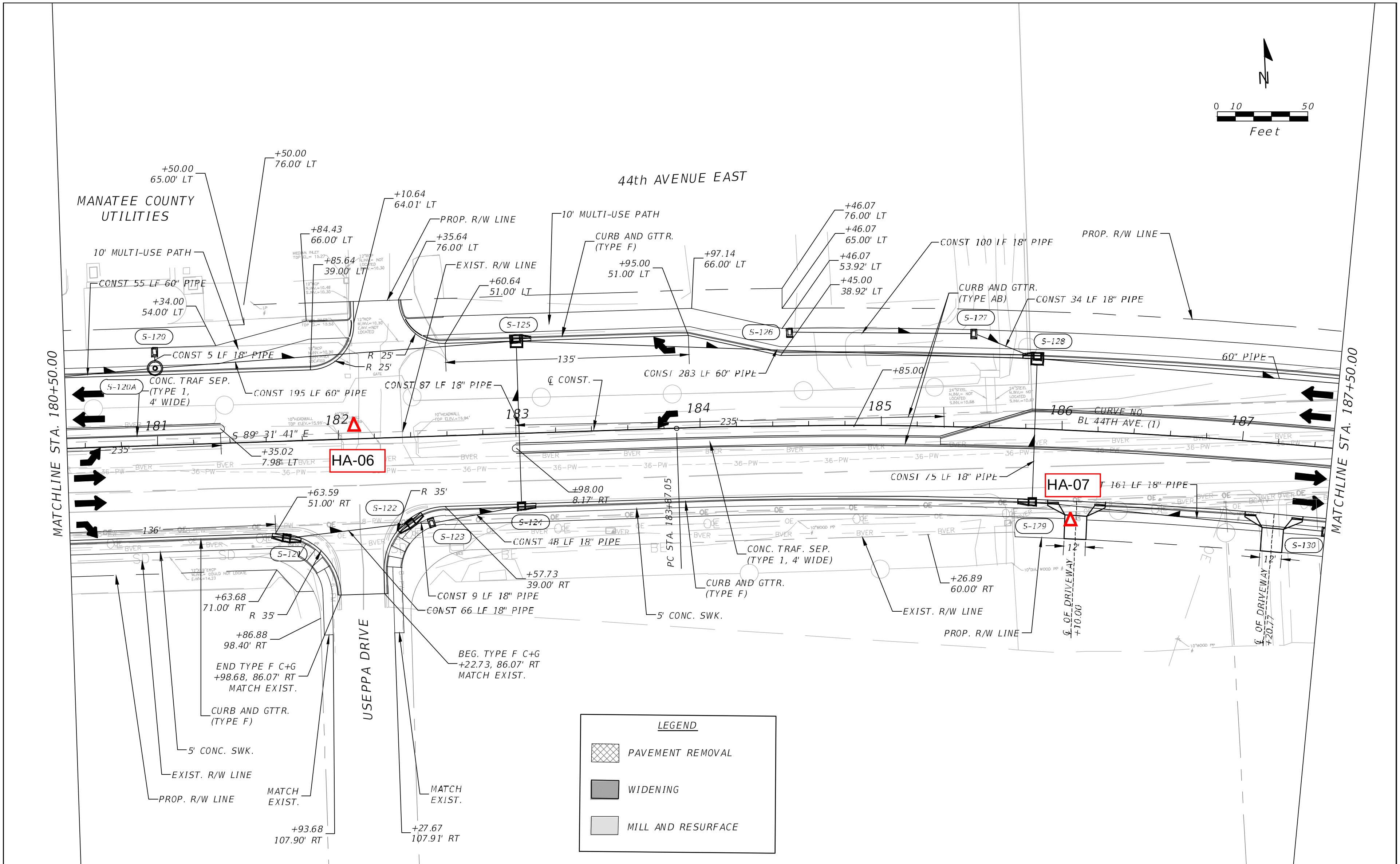

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ROADWAY PLANS (4)

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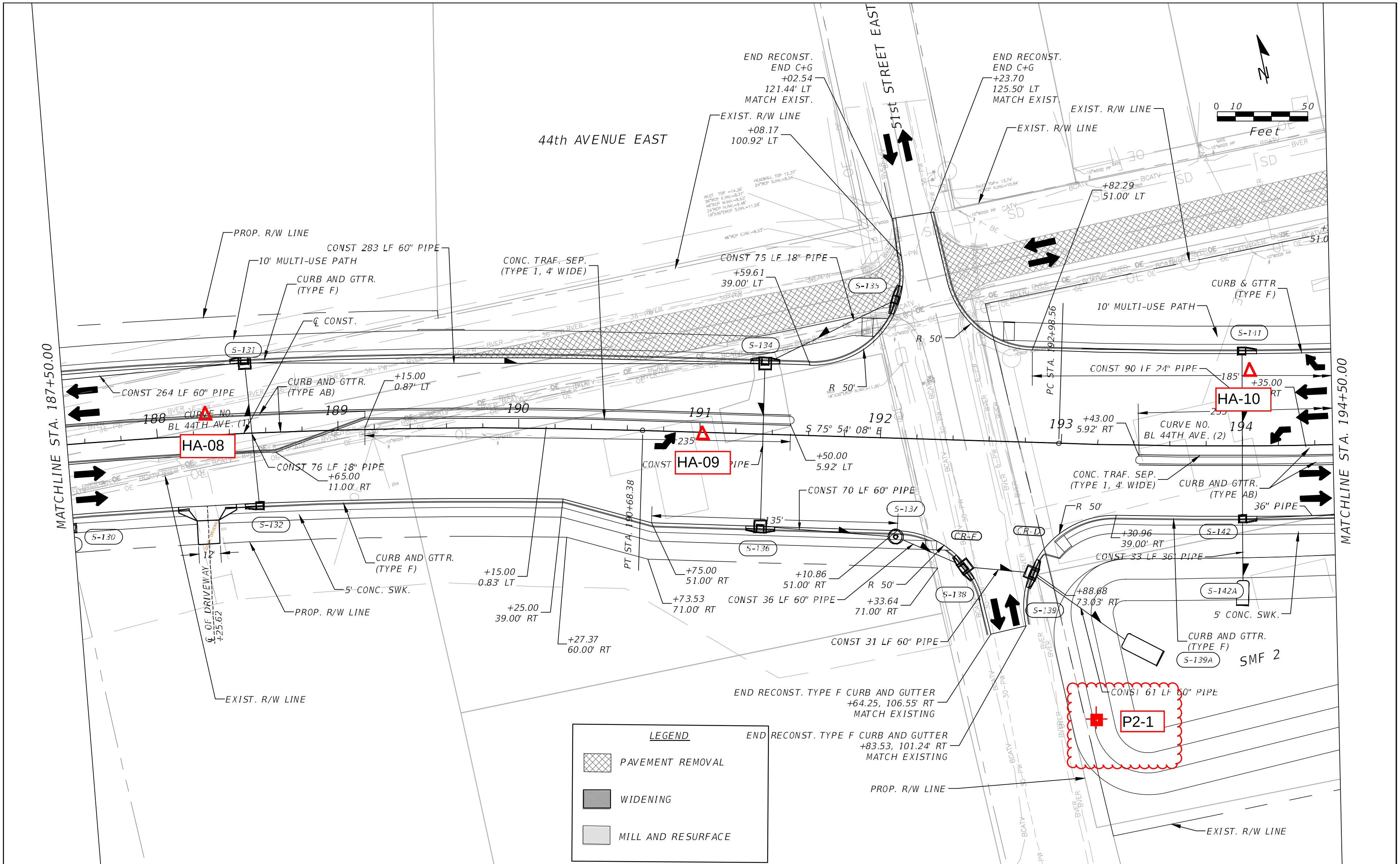

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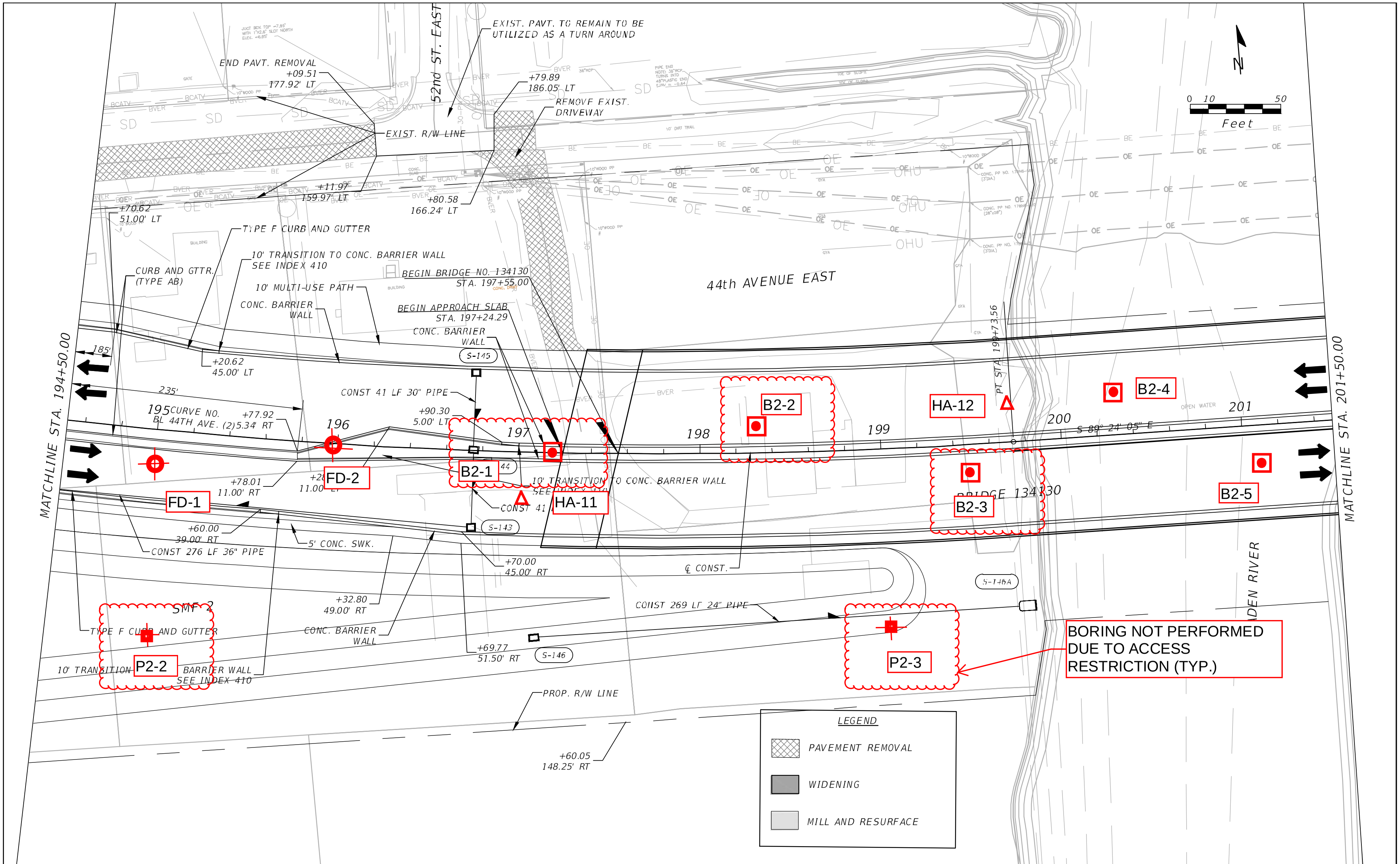

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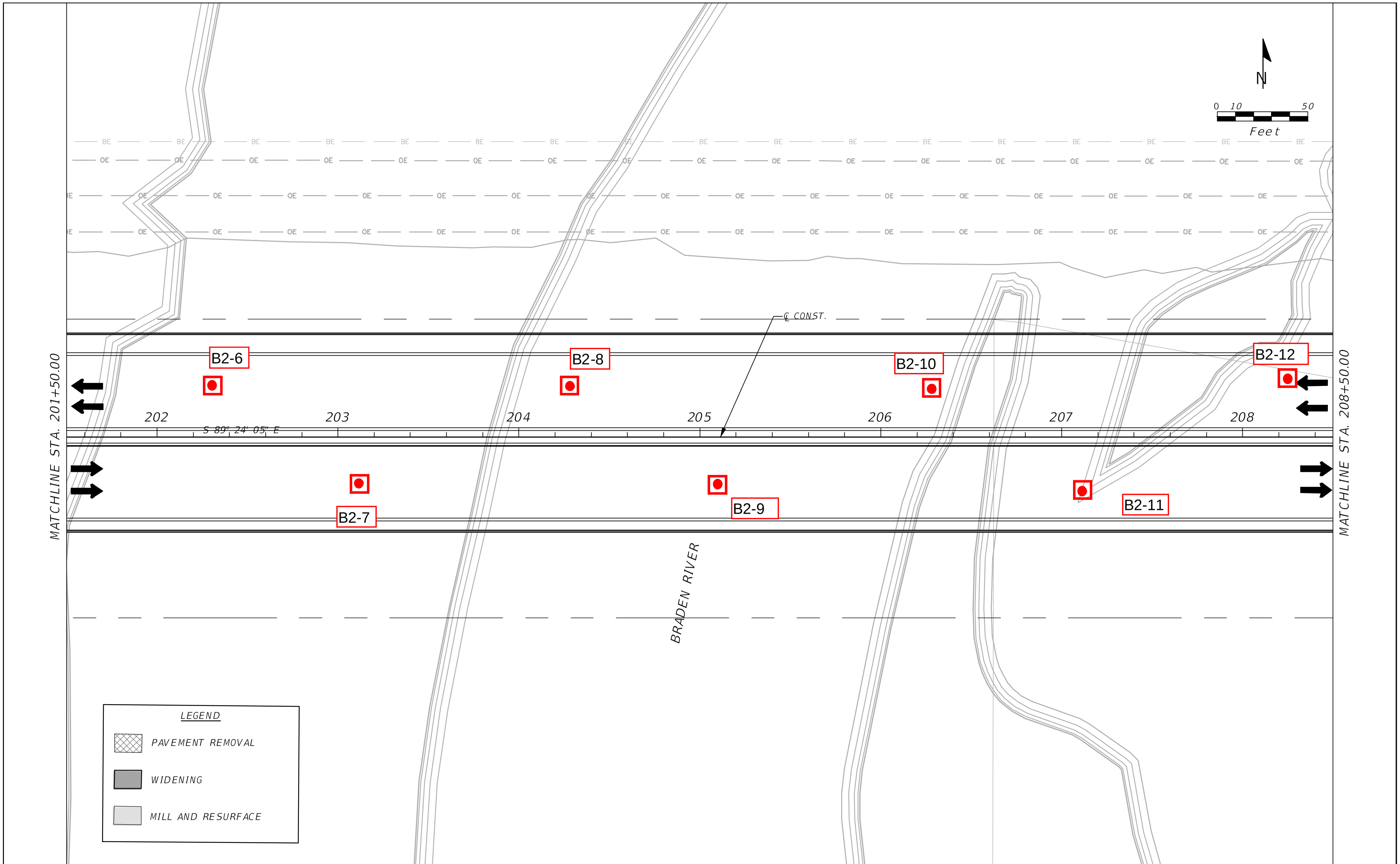

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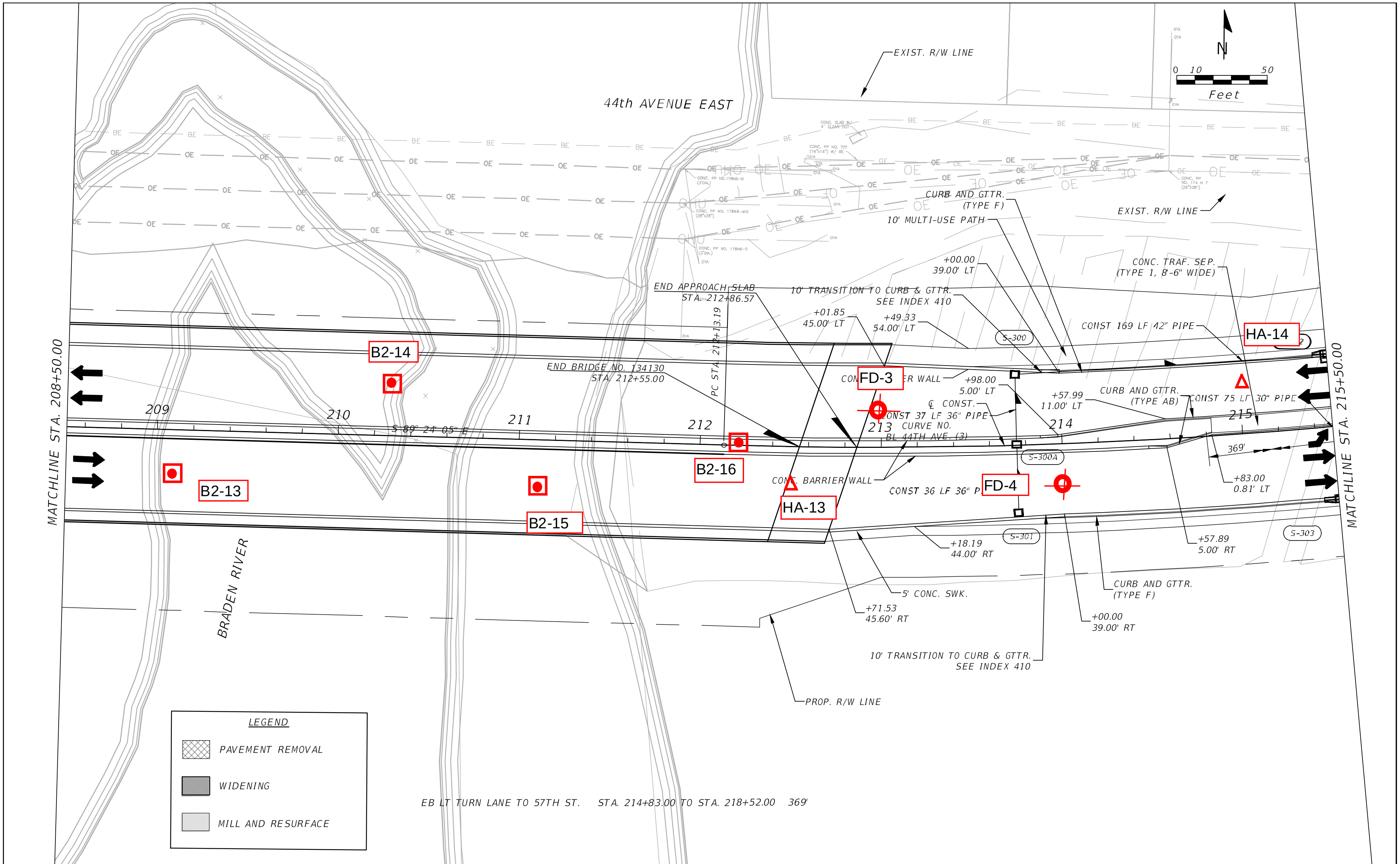

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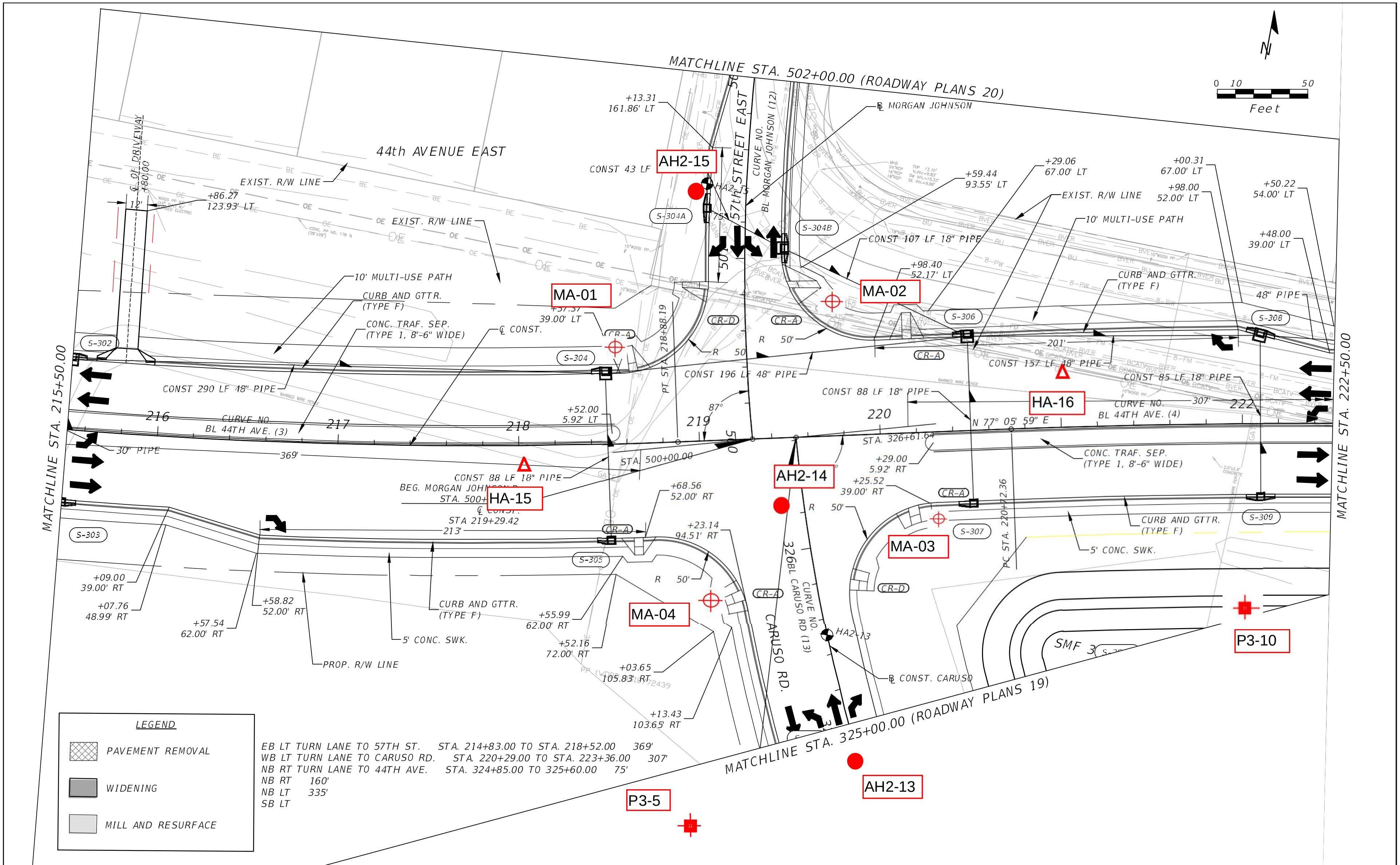

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ROADWAY PLANS (9)

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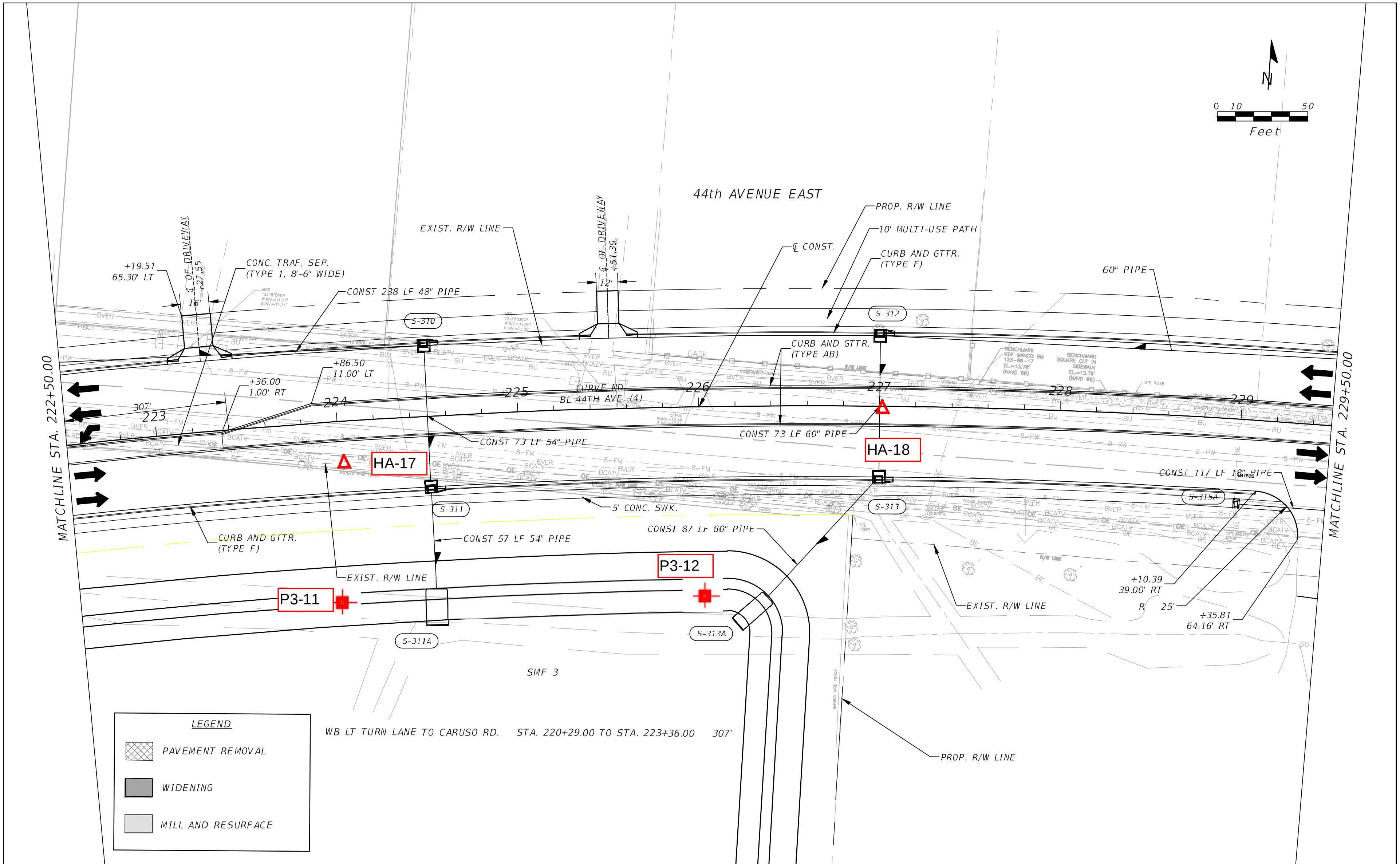

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ROADWAY PLANS (10)

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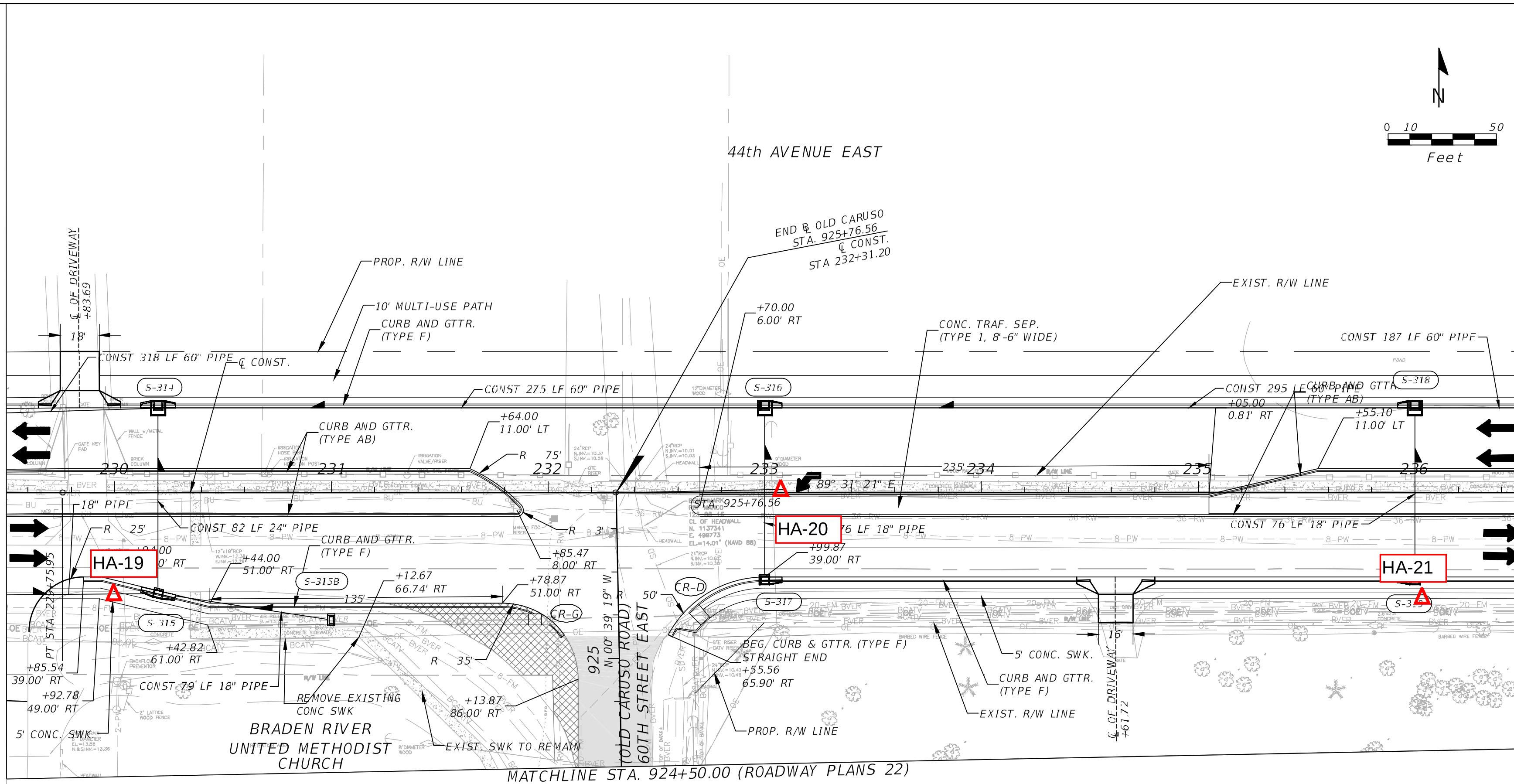

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ROADWAY PLANS (11)

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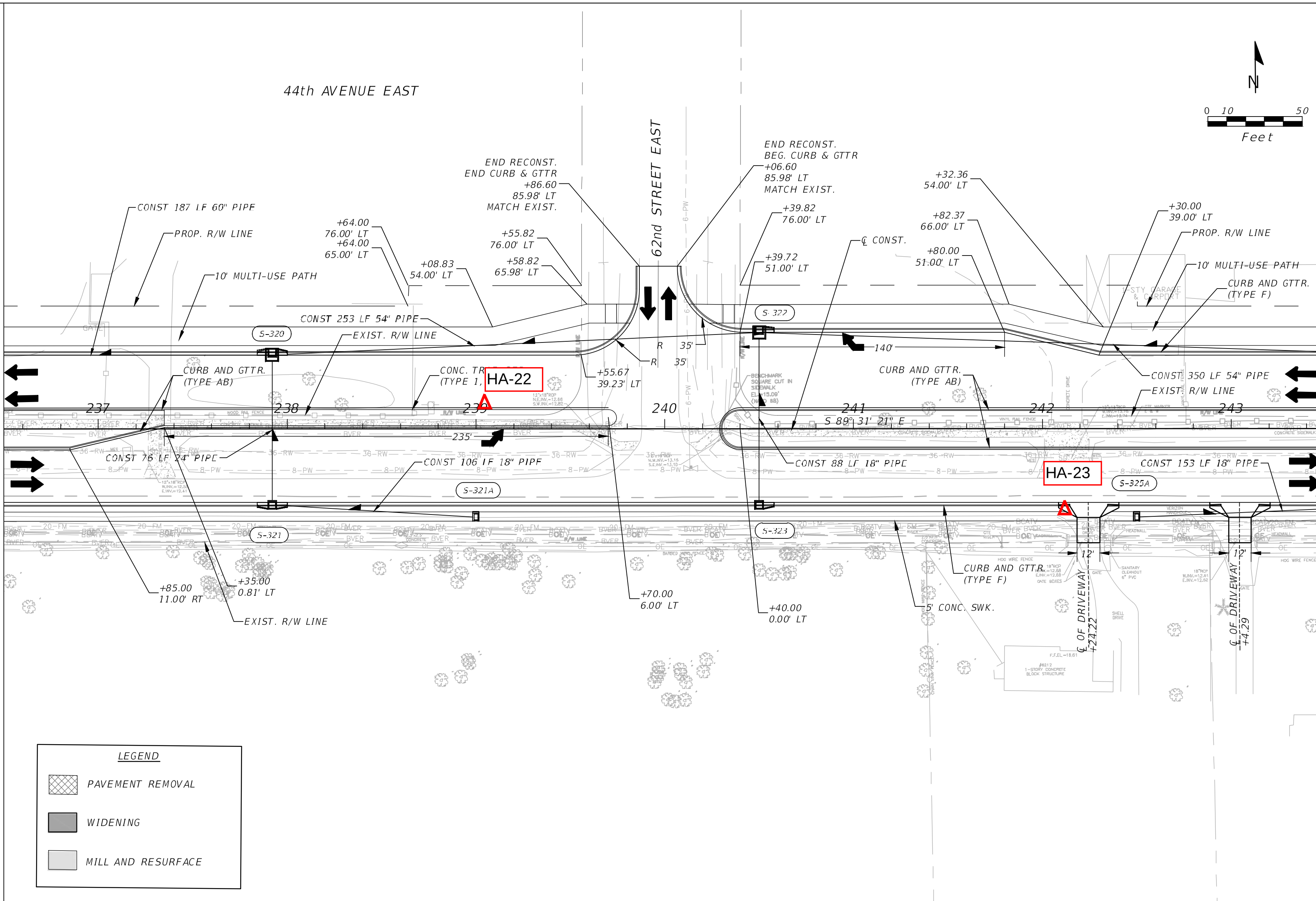

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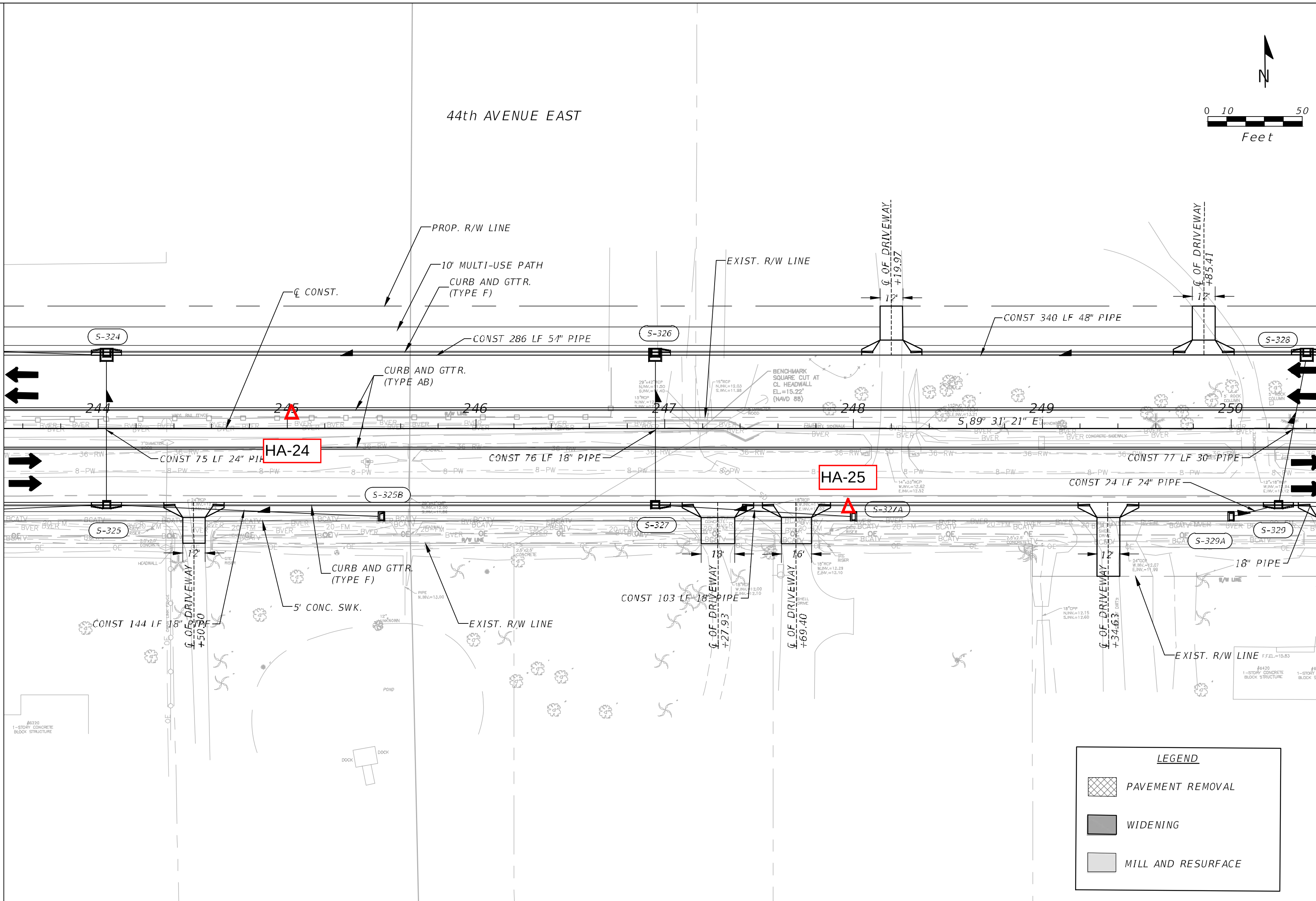

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ROADWAY PLANS (15)

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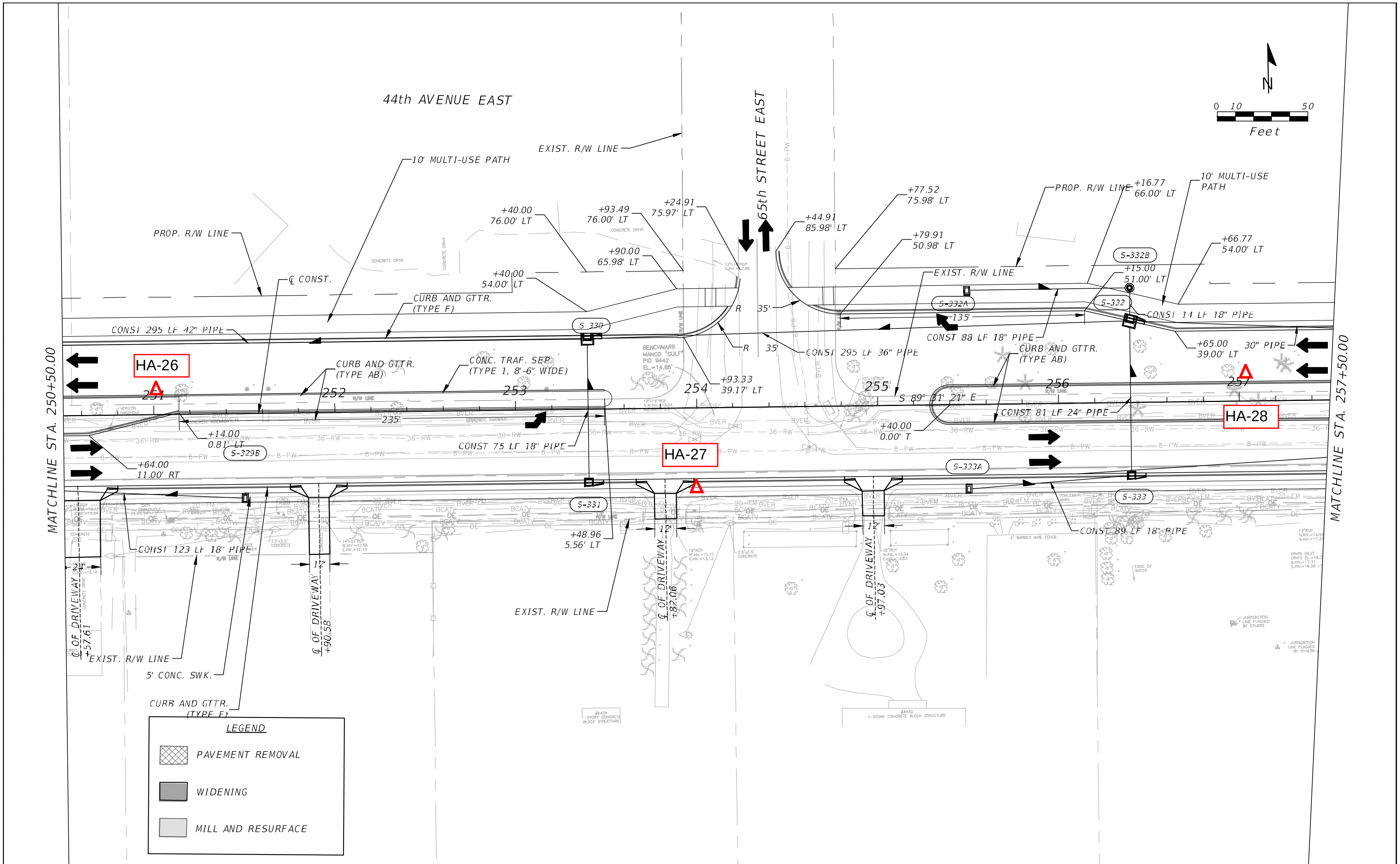

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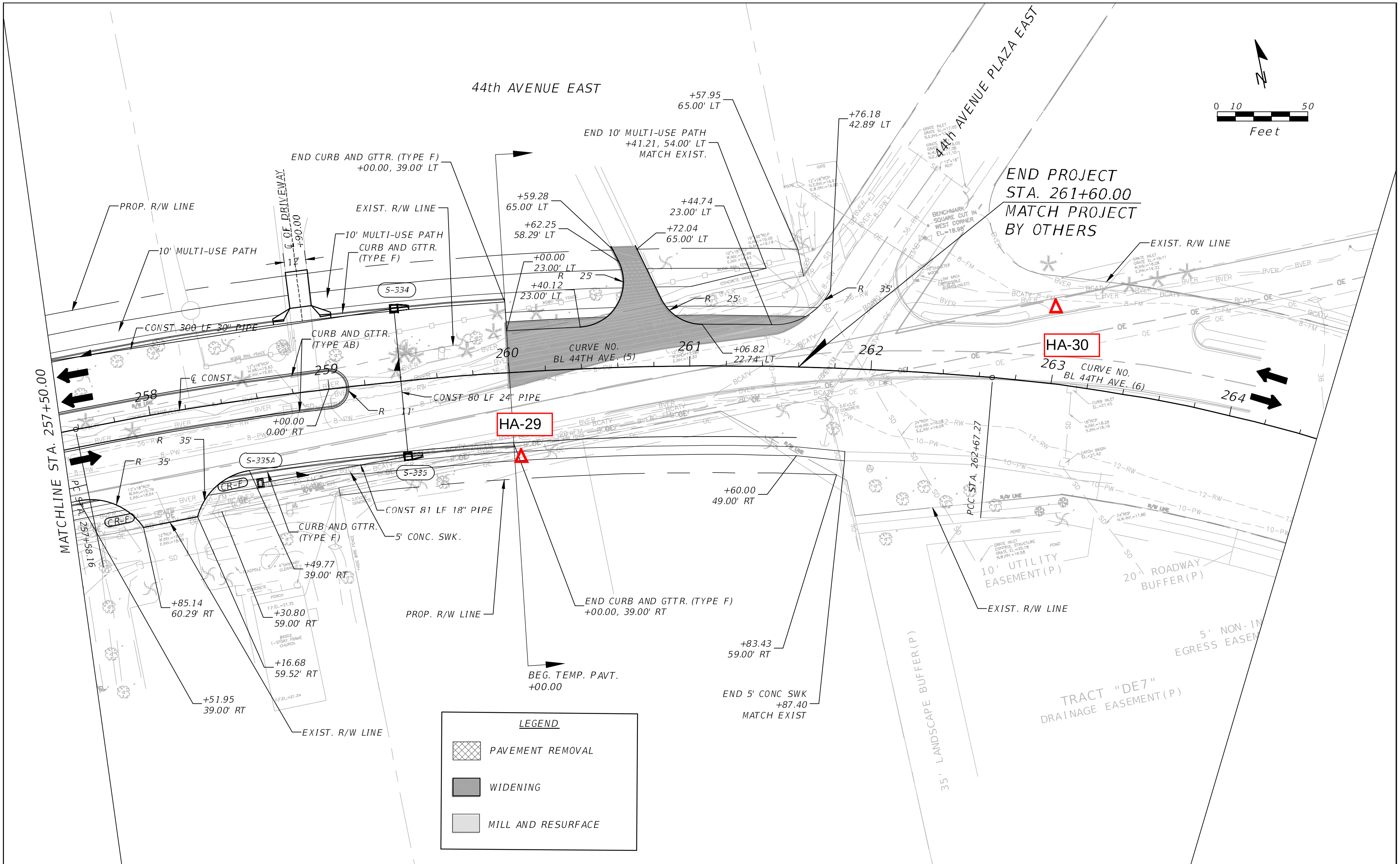

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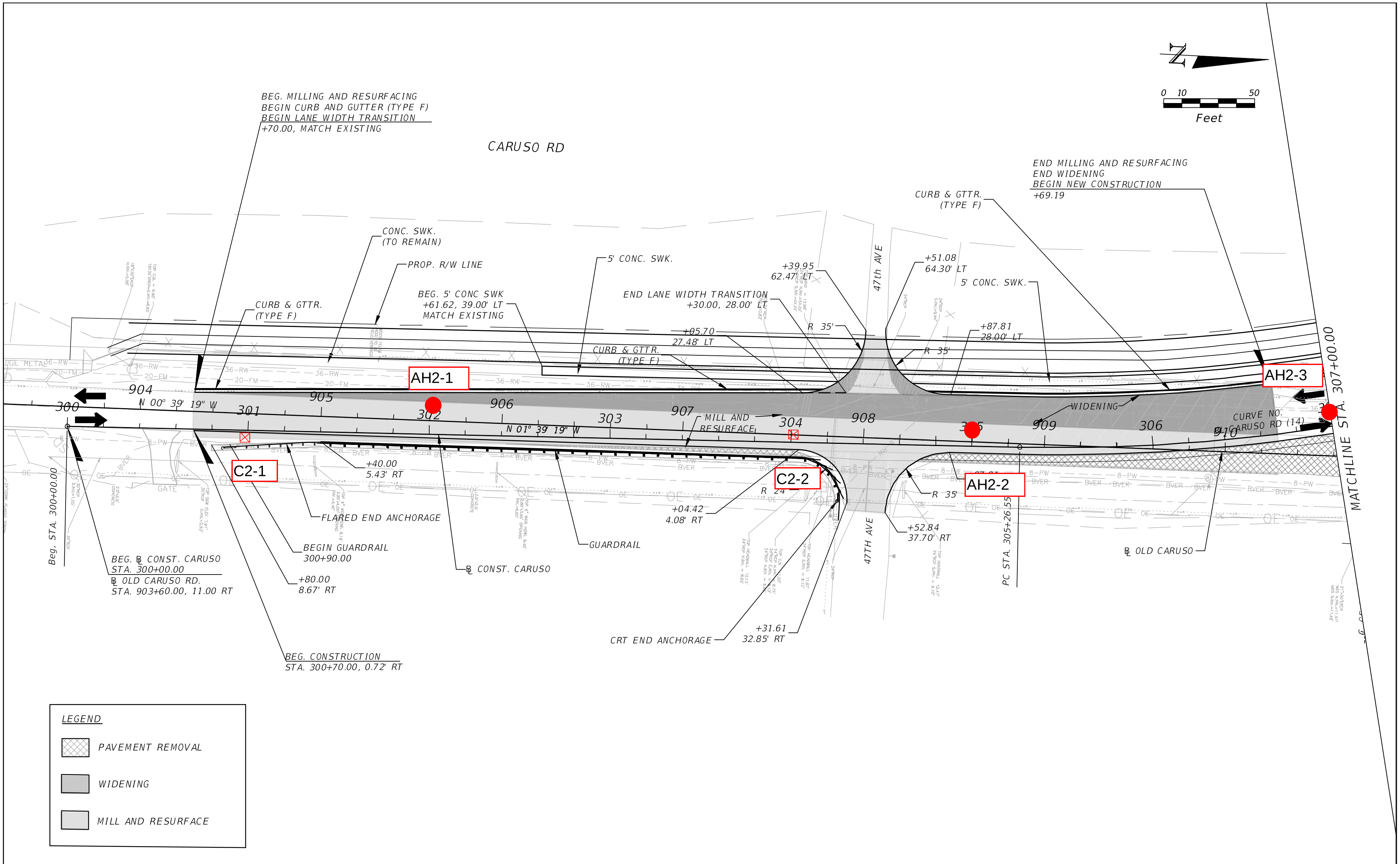

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				AS NOTED	ROBERT EDWARD HIDECK, P.E. P.E. NO. 67495 HARDESTY & HANOVER, LLC 5461 W. WATERS AVE, SUITE 910 TAMPA, FL 33634 (813) 749-0823 CERTIFICATE OF AUTHORIZATION: 29741	11/21/2016 PROJECT NO. 6086960	Manatee County FLORIDA PUBLIC WORKS DEPARTMENT ENGINEERING SERVICES 1022 26th Avenue East, Bradenton, FL 34208	ROBERT EDWARD HIDECK, P.E. FL. LICENSE NO. 67495	ROADWAY PLANS (16)	

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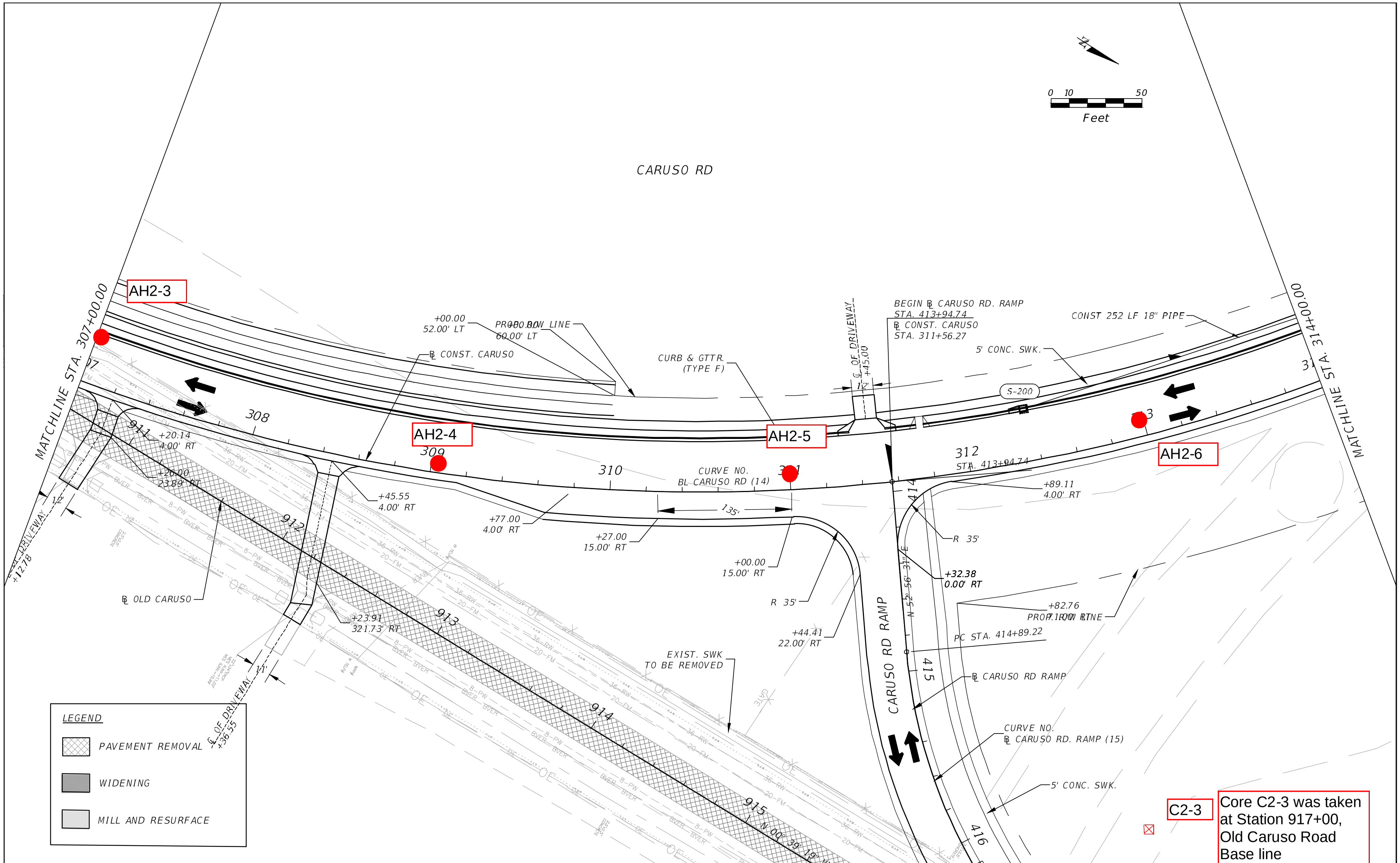

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
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CHECKED BY

ROBERT EDWARD HIDECK, P.E.
P.E. NO. 67495
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TAMPA, FL 33634
(813) 749-0823
CERTIFICATE OF AUTHORIZATION: 29741

DATE: 11/21/2016
PROJECT NO.: 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208
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FL. LICENSE NO.: 67495

ROADWAY PLANS (17)

SHEET NO.

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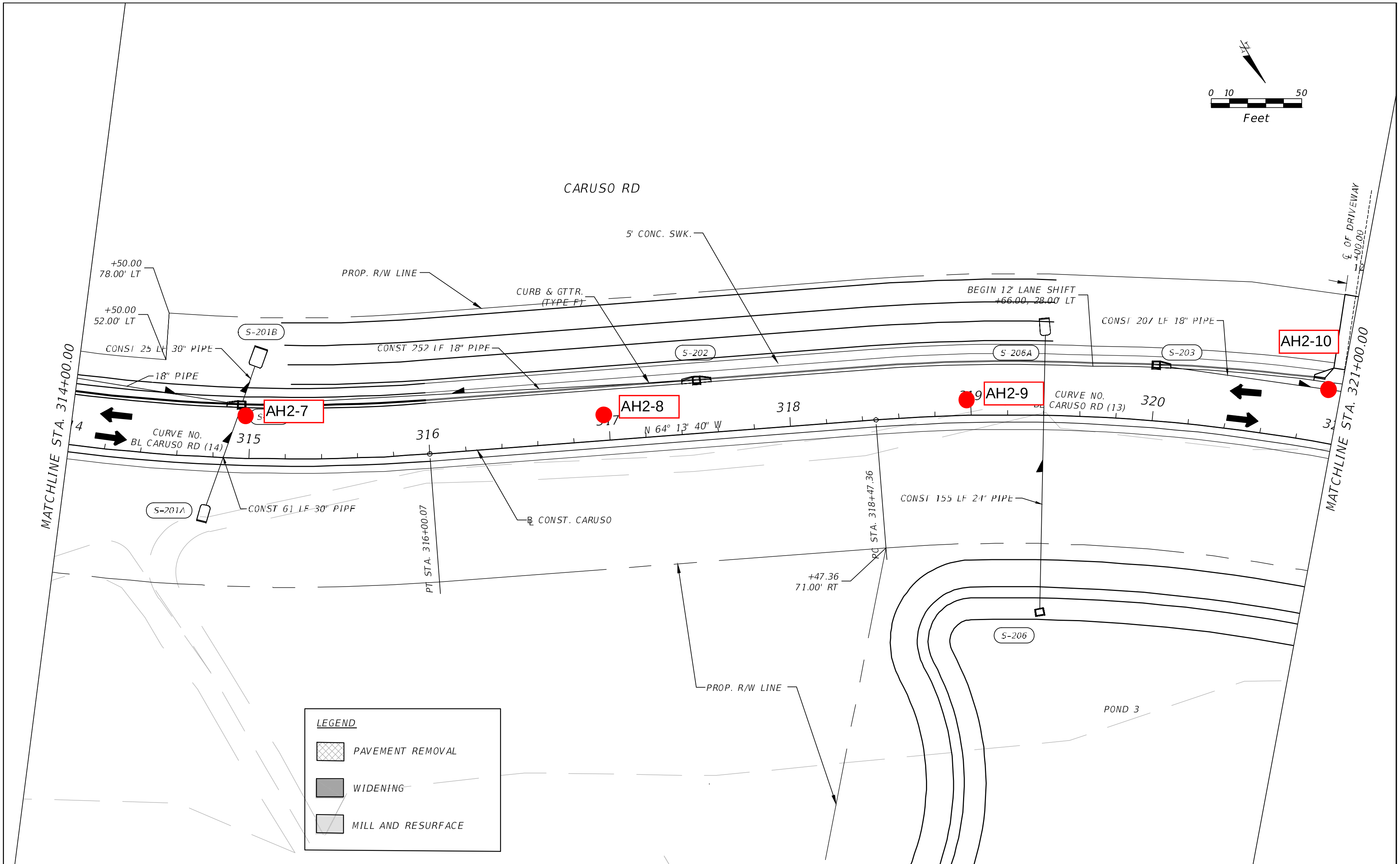

No.	REVISIONS	DATE	BY

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P.E. NO. 67495
HARDESTY & HANOVER, LLC
5461 W. WATERS AVE, SUITE 910
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(813) 749-0823
CERTIFICATE OF AUTHORIZATION: 29741

DATE: 11/21/2016
PROJECT NO.: 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
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1022 26th Avenue East, Bradenton, FL 34208

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ROADWAY PLANS (18)

SHEET NO.

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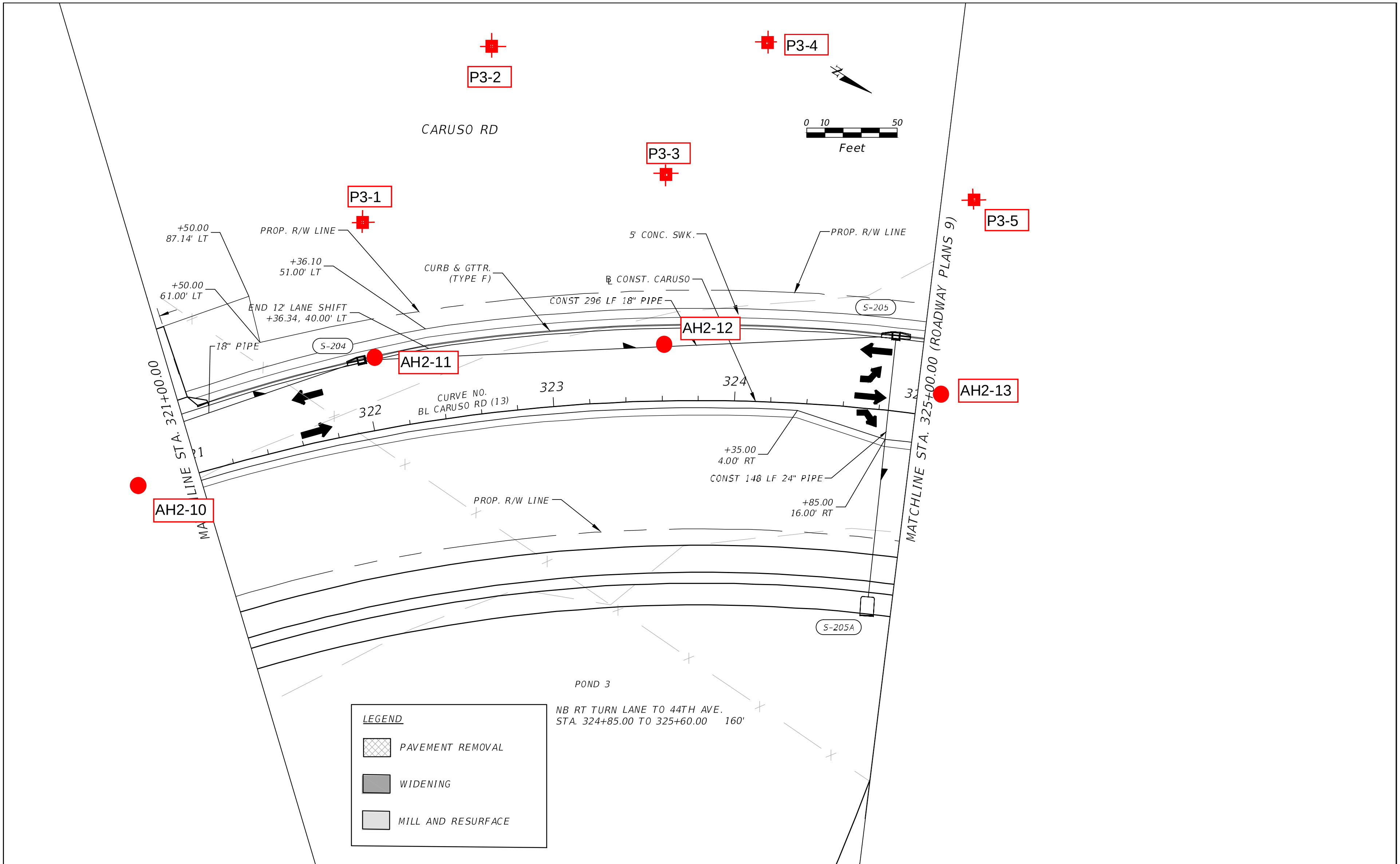

No.	REVISIONS	DATE	BY

SCALE AS NOTED

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ROBERT EDWARD HIDECK, P.E.
P.E. NO. 67495
HARDESTY & HANOVER, LLC
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TAMPA, FL 33634
(813) 749-0823
CERTIFICATE OF AUTHORIZATION: 29741

DATE 11/21/2016

PROJECT NO. 6086960

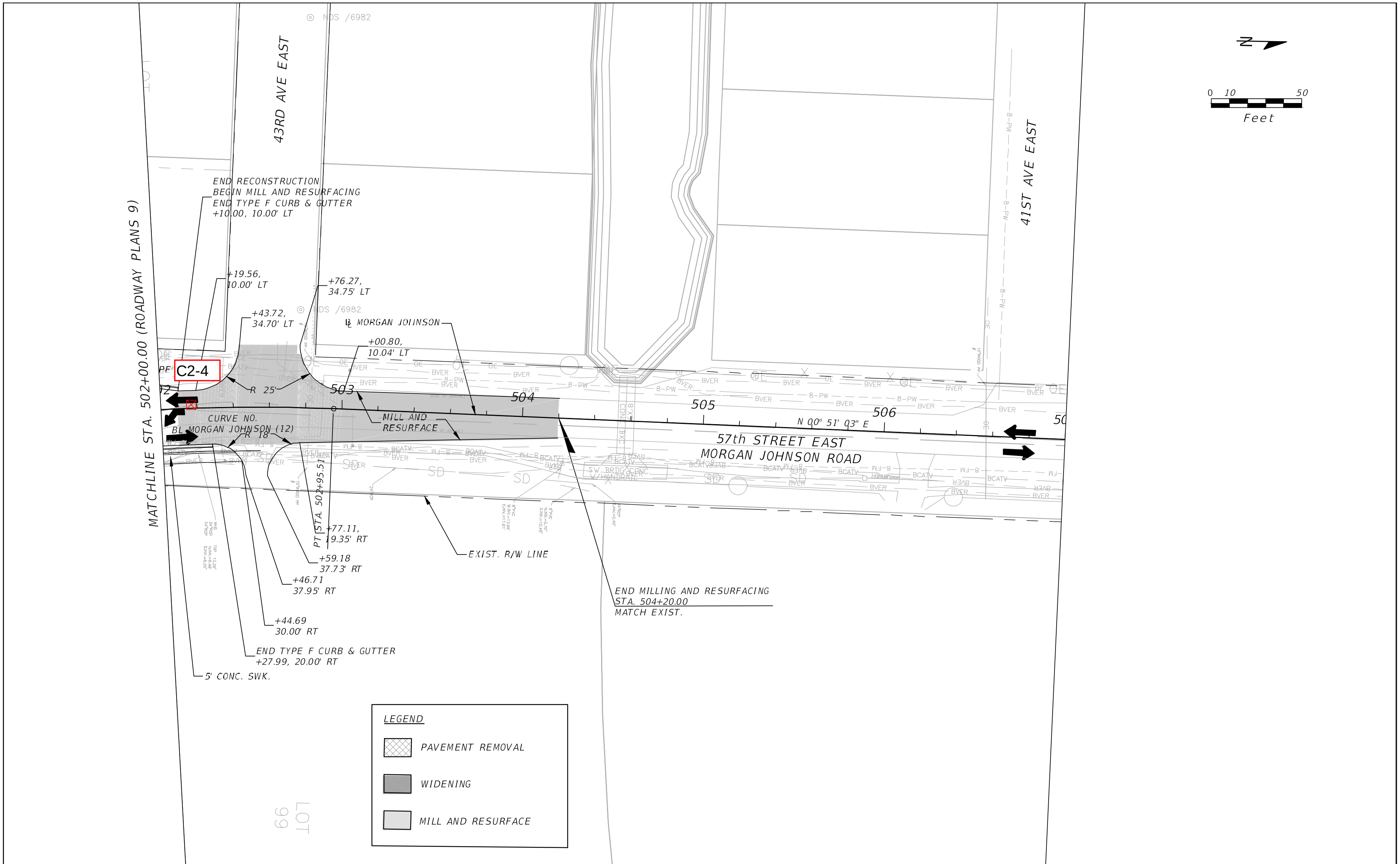
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER
ROBERT EDWARD HIDECK, P.E.
FL. LICENSE NO.
67495

ROADWAY PLANS (19)

SHEET NO.

Mitch Johnson 11/21/2016 8:55:56 AM J:\PROJECTS - CADD\Manatee County\6086960000\roadway\PLANRD02.dwg



No.	REVISIONS	DATE	BY

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TAMPA, FL 33634
(813) 749-0823
CERTIFICATE OF AUTHORIZATION: 29741

DATE: 11/21/2016
PROJECT NO.: 6086960

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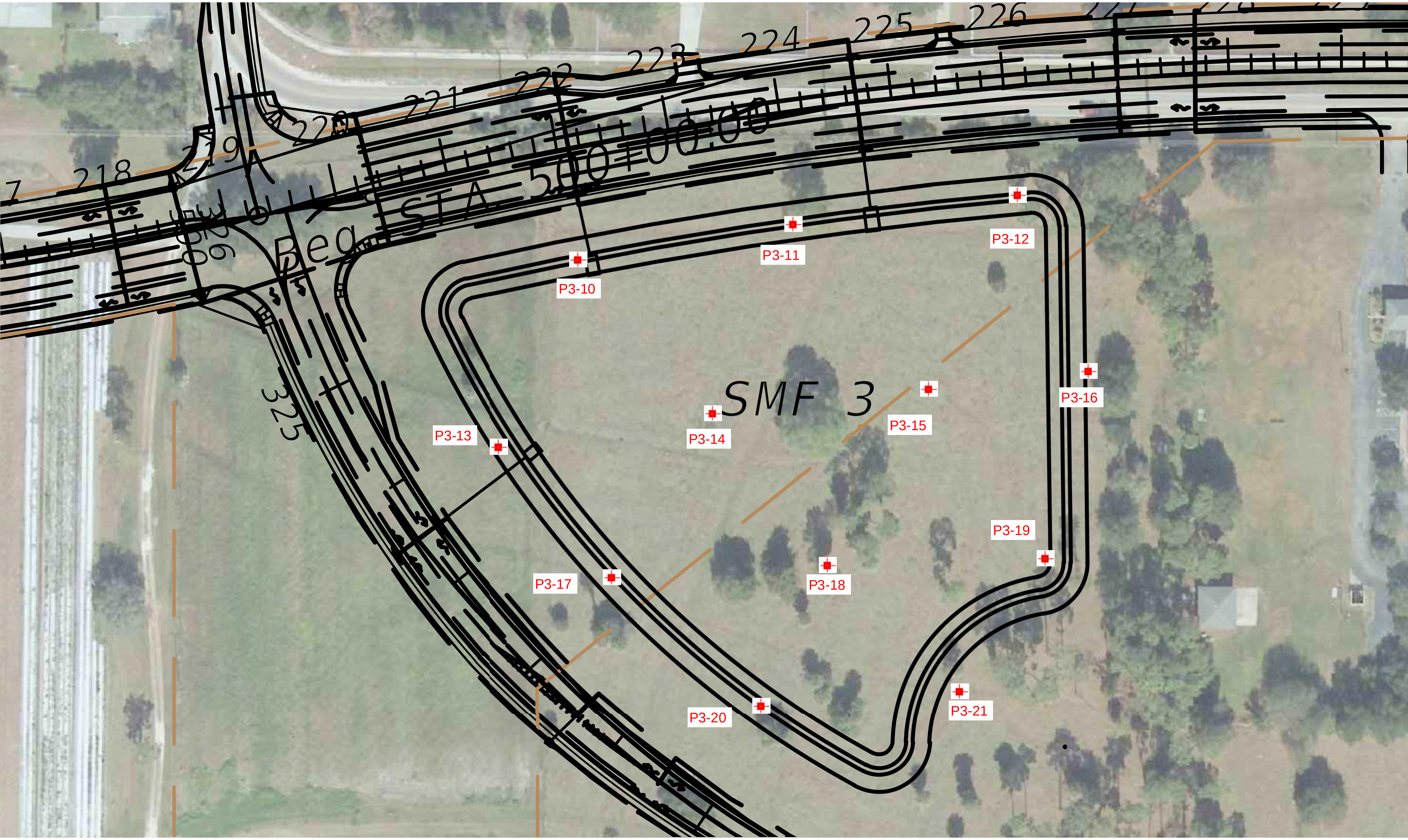
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER
ROBERT
EDWARD
HIDECK, P.E.
FL. LICENSE NO.
67495

ROADWAY PLANS (20)

SHEET NO.

Mitch Johnson 11/21/2016 8:56:57 AM J:\PROJECTS - CADD\Manatee County\60869600000\roadway\PLANRD02.dwg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P3-10
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APPENDIX B

Soil Survey Summary Sheet
and
Roadway Borings

MANATEE COUNTY, FLORIDA
44th Avenue East Extension
PROJECT NO. 6086960

DATE OF SURVEY: 12/15/2015 - 9/16/2016
SURVEY MADE BY: AECOM TECHNICAL SERVICES / UNIVERSAL ENGINEERING SCIENCES, INC.
SUBMITTED BY: KEITH Q. GIANG, P. E.

ROAD: 44TH AVENUE
COUNTY: MANATEE

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

STRATUM NO.	ORGANIC AND MOISTURE CONTENT: NO. OF TESTS	% ORGANIC	MOISTURE CONTENT	SIEVE ANALYSIS % PASSING: NO. OF TESTS	#4 MESH	#8 MESH	#10 MESH	#40 MESH	#60 MESH	#200 MESH	ATTERBERG LIMITS (%): NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION
1	21	--	25.9 - 11.7	21	100 - 97	100 - 96	100 - 96	97 - 87	88 - 50	7.2 - 1	--	--	--	A-3	GRAY TO BROWN FINE SAND w/ trace SILT & SHELL
2	5	--	44.9 - 17.5	5	100	100	100	95	84	25.1 - 10.3	3	NP	NP	A-3 / A-2-4	GRAY TO DARK BROWN FINE SAND w/ some SILT and CLAY
3	1	--	29.5	1	99	96	95	87	76	29.5	1	27.0	4.3	A-2-4 / A-2-6	GRAY to DARK BROWN FINE SAND to SILTY, CLAYEY SAND
4	2	--	37.9 - 24.5	2	--	--	--	--	--	36.5 - 35.8	--	--	--	A-2-6 / A-2-7	GRAY TO BROWN CLAYEY FINE SAND
5	2	--	72.2 - 30.4	2	100	100	100	98	97	89 -68.1	--	--	--	A-4 / A-5	GRAY TO BROWN SANDY SILT TO SILT, CLAYEY SILT
6	6	--	93.1 - 23	6	100	100	100	98	97	90 - 59.2	3	39 - 25.5	14 - 9	A-7-5	GRAY TO BROWN SANDY CLAY
7	5	--	150 - 33	5	--	--	--	--	--	98.8 - 56	4	299.1 - 54.6	263 - 36.4	A-7-6	GRAY TO OLIVE TO GREEN TO DARK BROWN SILTY CLAY
8	1	13.6	45	2	100	100	100	96	75	10 - 5	--	--	--	A-8	DARK BROWN TO BLACK SAND w/ SILT, ROOTS AND ORGANICS
9	--	--	--	--	--	--	--	--	--	--	--	--	--	- -	LIMEROCK BASE
10	--	--	--	--	--	--	--	--	--	--	--	--	--	- -	ASPHALT PAVEMENT

STRATUM NO.	Corrosion Test Results: NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1	3	20800 - 4610	11.8 - 3.64	29.5 - 3.49	8.31 - 7.25
8	1	750	6.11	1717	4.72

EMBANKMENT AND SUBGRADE MATERIAL

▼ --- WATER TABLE ENCOUNTERED

GNE --- GROUND WATER NOT ENCOUNTERED

1. THE MATERIAL FROM STRATA NUMBERS **1** AND **2** APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH INDEX 505.
2. THE MATERIAL FROM STRATA NUMBERS **3** AND **4** APPEARS SATIFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH INDEX 505. HOWEVER, THESE MATERIADL ARE LIKELY TO RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT. IT SHOULD BE USED IN THE EMBANKMENT ABOVE THE WATER LEVEL EXISTING AT THE TIME OF CONSTRUCTION.
3. THE MATERIAL FROM STRATUM NUMBER **8** SHALL BE TREATED AS MUCK (A-8 MATERIAL) AND SHALL BE REMOVED WITHIN THE LIMITS OF THE HATCHED AREAS SHOWN ON THE ROADWAY CROSS SECTIONS.
4. THE MATERIAL FROM STRATUM NUMBER **5** IS PLASTIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH INDEX 500. IT MAY BE PLACED ABOVE THE EXISTING WATER LEVEL (AT THE TIME OF CONSTRUCTION) TO WITHIN 4 FEET OF THE PROPOSED BASE. IT SHOULD BE PLACED UNIFORMLY IN THE LOWER PORTION OF THE EMBANKMENT FOR SOME DISTANCE ALONG THE PROJECT RATHER THAN FULL-DEPTH FOR SHORTER DISTANCES.
5. THE MATERIAL FROM STRATA NUMBERS **6** AND **7** IS HIGH PLASTIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH INDEX 500. IT MAY BE USED WITHIN THE PROJECT LIMITS AS INDICATED IN INDEX 505 ONLY WHEN EXCAVATED WITHIN THE PROJECT LIMITS AND IS NOT TO BE USED WHEN OBTAINED FROM OUTSIDE THE PROJECT LIMITS.
6. THE MATERIAL FROM STRATUM NUMBER **9** IS ASPHALT CONCRETE.
7. THE MATERIAL FROM STRATUM NUMBER **10** IS LIMEROCK BASE.
8. IN ADDITION TO SOILS DATA ON THE ROADWAY CROSS SECTIONS, PLEASE REFER TO CORE BORING SHEETS FOR ADDITIONAL SOILS INFORMATION IN SIGNIFICANT FILL AREAS.
9. OTHER ISOLATED AREAS OF ORGANIC MATERIAL OR OTHER DELETERIOUS MATERIAL MAY EXIST BETWEEN BORING LOCATIONS. IF ADDITIONAL UNSUITABLE MATERIALS ARE ENCOUNTERED DURING CONSTRUCTION, THEY SHOULD BE REMOVED AND REPLACED IN ACCORDANCE WITH INDEX 500.
10. STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: KEITH GIANG
DRAWN BY: IRA ZICHLIN
CHECKED BY: KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

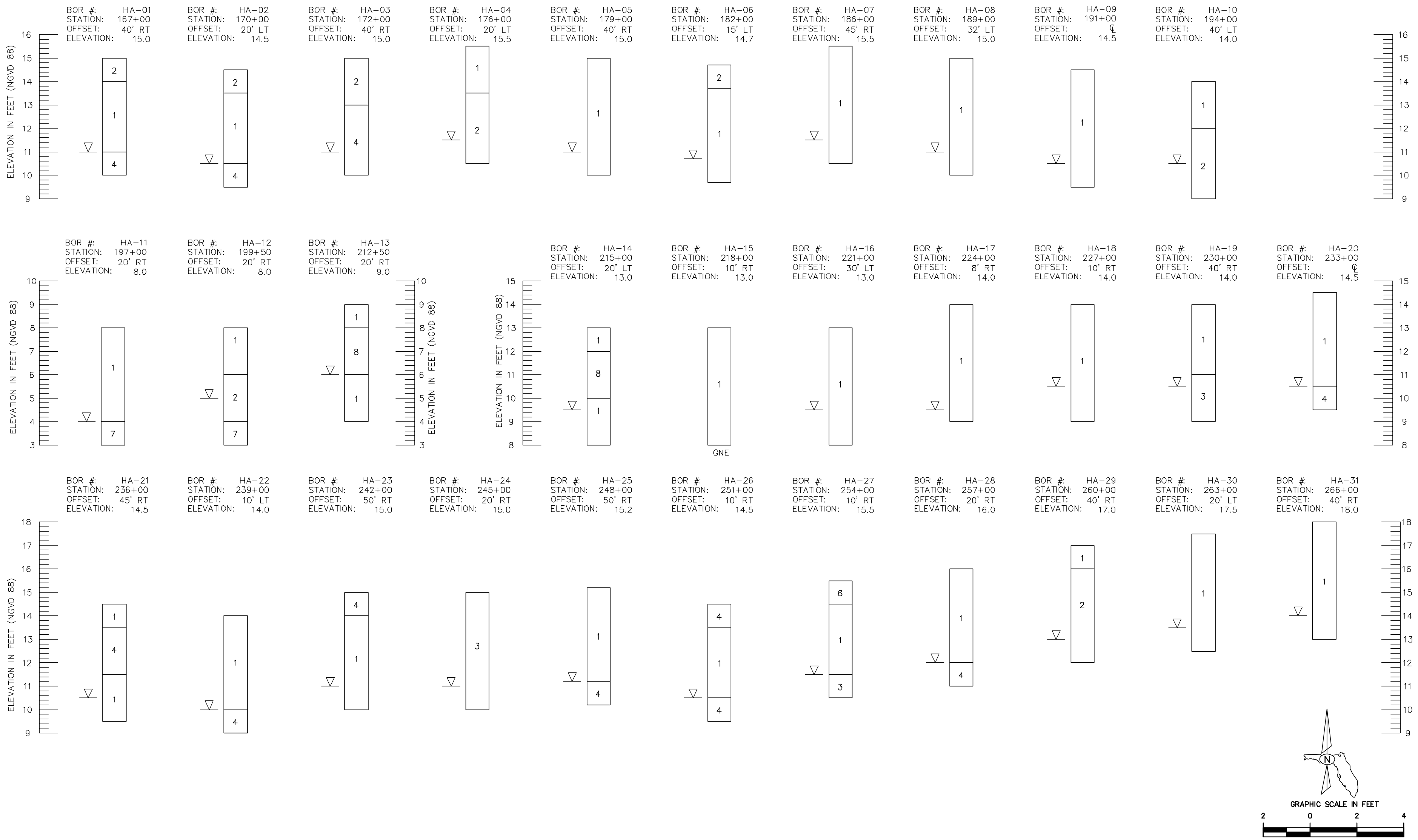
DATE: 10/20/2016
PROJECT NO.: 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH Q. GIANG, P.E.
FL. LICENSE NO.: 49510

SHEET TITLE: SOIL SURVEY SUMMARY SHEET
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO.

FILE NAME: S:\Projects_GeoGovDocs\Manatee County\44th Ave Over Braden River\9 - PROJECT DRAWINGS_44TH AVE AUGER BORING LOGS 1 OF 2.dwg LAYOUT NAME: SHEET 1 PLOTTED: Tuesday, December 20, 2016 - 4:56pm USER: ira.zichlin



No.	REVISIONS	DATE	BY

SCALE: AS VOTED
DESIGNED BY: KEITH GIANG
DRAWN BY: IRA ZICHLIN
CHECKED BY: KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE: 10/20/2016
PROJECT NO.: 6086960

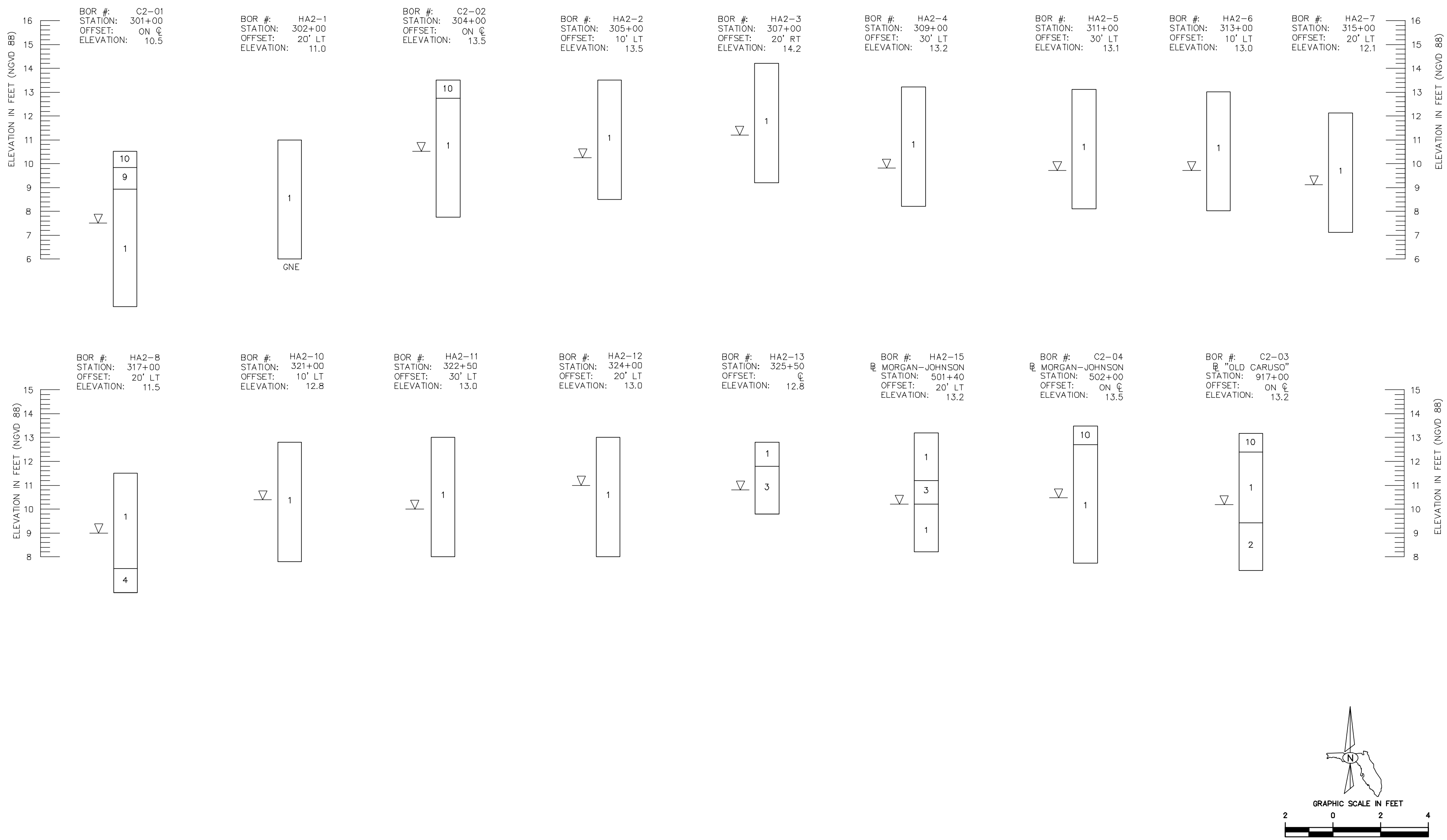
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH Q. GIANG, P.E.
FL. LICENSE NO.: 49510

SHEET TITLE: REPORT OF ROADWAY BORINGS (1 OF 3)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

SHEET NO.

FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVE AUGER BORING LOGS 1 OF 2.dwg LAYOUT NAME: SHEET 2 PLOTTED: Tuesday, December 20, 2016 - 4:59pm USER: ira.zichlin



No.	REVISIONS	DATE	BY

SCALE: AS VOTED
DESIGNED BY: KEITH GIANG
DRAWN BY: IRA ZICHLIN
CHECKED BY: KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE: 10/20/2016
PROJECT NO.: 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH Q. GIANG, P.E.
FL. LICENSE NO.: 49510

SHEET TITLE: REPORT OF ROADWAY BORINGS (2 OF 3)

PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

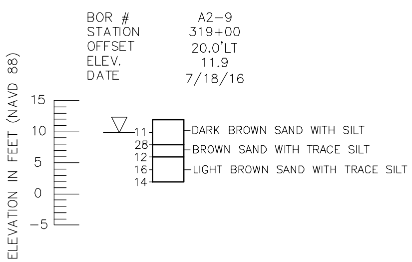
SHEET NO.

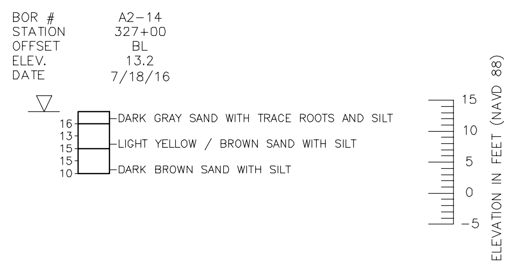
FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVE AUGER BORING LOGS 1 OF 2.dwg LAYOUT NAME: SHEET 3 PLOTTED: Tuesday, December 20, 2016 - 5:00pm USER: ira.zichlin

NOTES:

1. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
2. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45





LEGEND

SAND
SILT
CLAY
SAND WITH SOME SILT
CLAY WITH SOME SAND
CLAYEY SAND
SAND WITH SOME CLAY
SANDY SILT
SANDY CLAY
SILTY SAND
SILTY CLAY
HARD LIMESTONE
CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION
GROUNDWATER TABLE
NR NO RECOVERY
CASING
B/L BASELINE

No.	REVISIONS	DATE	BY

AS NOTED
KEITH GIANG
IRA ZICHLIN
KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE
PROJECT NO. 6086960

PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER KEITH O. GIANG, PE
FL. LICENSE NO. 49510

SHEET TITLE: REPORT OF ROADWAY BORINGS (3 OF 3)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

SHEET NO. x

FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVE AUGER BORING LOGS 2 OF 2.dwg LAYOUT NAME: Layout1 (8) PLOTTED: Tuesday, December 20, 2016 - 5:00pm USER: ira.zichlin

APPENDIX C

Muck Probes

MUCK PROBES -44TH AVE						
AREA No. 1 - SOUTH DITCH FROM 45th ST TO RIVER						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	22	6	22	6	29	6
2	20.5	4	21.5	4	24	6
3	35	4	24	6	34	4
4	23.5	4	31.5	6	30	6
5	24.2	4	30.3	6	29.5	4
6	23	4	25	6	23	4
7	20	4	22.5	6	22	4
8	25.3	4	30.3	4	27	4
9	23	4	17.2	6	14	4
10	25.5	4	25.5	4	17	4
11	23	4	23	4	27	4
12	22	4	21	4	21	4
13	22	4	19	4	25	4
14	22	4	17	4	25	4
15	12	2	17	2	20	2
16	13	2	15	3	20	2
17	11	2	14	3	17	2
18	7	2	7	2	9	2
19	7	2	5	2	9	2
20	9	6	4	0	9	0
21	7	0	5	0	5	0
22	27	0	7	0	21	0

MUCK PROBES -44TH AVE						
AREA No. 2- NORTH DITCH FROM 45TH ST TO RIVER						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	2	2	9	2	2	2
2	3	2	10	2	4	2
3	2	2	8	4	3	3
4	5	2	7	3	3	3
5	2	2	7	3	4	2
6	2	2	6	4	2	3
7	3	2	9	2	2	4
8	3	2	11	4	3	3
9	6	2	6	2	6	4
10	7	2	6	3	6	2
11	2	2	7	3	4	2
12	2	2	5	2	2	4
13	3	2	6	2	5	4
14	2	2	7	4	3	4
15	4	2	10	2	2	3
16	2	2	6	4	3	3
17	2	2	9	2	4	2
18	3	2	9	3	3	4
19	2	2	8	3	5	4
20	3	2	9	3	3	3

MUCK PROBES -44TH AVE						
AREA NO. 3 -SOUTH DITCH FROM MJ RD TO CARUSO RD						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	3	0	3	0	6	0
2	13	0	13	0	4	0
3	16	2	9	2	15	2
4	17	2	36	2	14	2
1	2	4	18	5	18	4
2	24	4	30	4	18	4
3	15.5	4	12.5	5	16	4
4	20	3	22	4	21.5	4
5	18	2	27	3	30	3
6	25.5	3	29.5	3	24	3
7	19	4	21	4	16	5
8	37	3	33	5	35	3
9	23	2	21	3	20	2
10	17	3	19	3	15.5	4
11	23	4	25	6	22	4
12	29	3	24	3	26	3
13	17.5	3	21	2	19	2
14	14	5	16.5	5	14	5
15	26	3	26	3	23	3
16	32	4	30	5	30	3
17	30.5	2	35	3	28	2
18	28	3	34	4	33	3
1	21	0	9	0	36	0
2	14	0	27	0	25	0
3	9	0	8	0	12	0
4	11.5	0	15	0	10	0
5	12	0	8	0	14	0

PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
6	13.5	0	14	0	18	0
7	24.5	0	9	1	15	0
8	20.5	1	15	1	18.5	1
9	22	2	12	2	17	2
10	22	3	23.5	4	25	3
11	16	3	14	3	16	3
12	11	2	13	2	16	2
13	9.5	1	13	1	12	1
14	12	0	12.5	2	13	0
15	13	1	13	2	11.5	1
16	11	2	11.5	2	13	2
17	6	2	14	3	13	3
18	15	3	13	4	12	3
19	7	2	6	3	7	3
20	33	3	12	3	15	2

MUCK PROBES -44TH AVE						
AREA NO. 4-NORTH DITCH FROM MJ RD TO 44TH AVE PLAZA						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	9	2	10	3	9	2
2	6	1	7	2	5.5	2
3	5	1	7	1	5	1
4	8	3	24	4	17	2
5	9	4	9	4	6.5	4
6	6	2	15	3	11	2
7	8.5	2	9	3	8	2
8	6	1	10	2	5	1
9	6.5	0	7	1	6	0
10	8	2	8	2	11.5	1
11	6.5	0	9.5	0	9	0
12	4.5	0	6	0	4.5	0
13	3	0	3	0	3	0
14	2.5	0	3	0	2	0
15	4	1	5	2	5	2
16	8	1	9	2	8	2
17	8	2	8	2	8	3
18	5	1	7	1	8	1
19	11	1	9	1	6	1
20	8.5	1	9	1	9	1
21	15	4	11.5	4	12	4
22	6	3	12	3	9	3
23	6	2	9	2	7	1
24	7.5	1	9	1	9	1
25	7	2	17	2	14.5	2
26	78	3	10	2	7.5	2
27	12	3	9	4	12	4
28	48	6	48	7	48	4
29	35	4	10	4	9	4

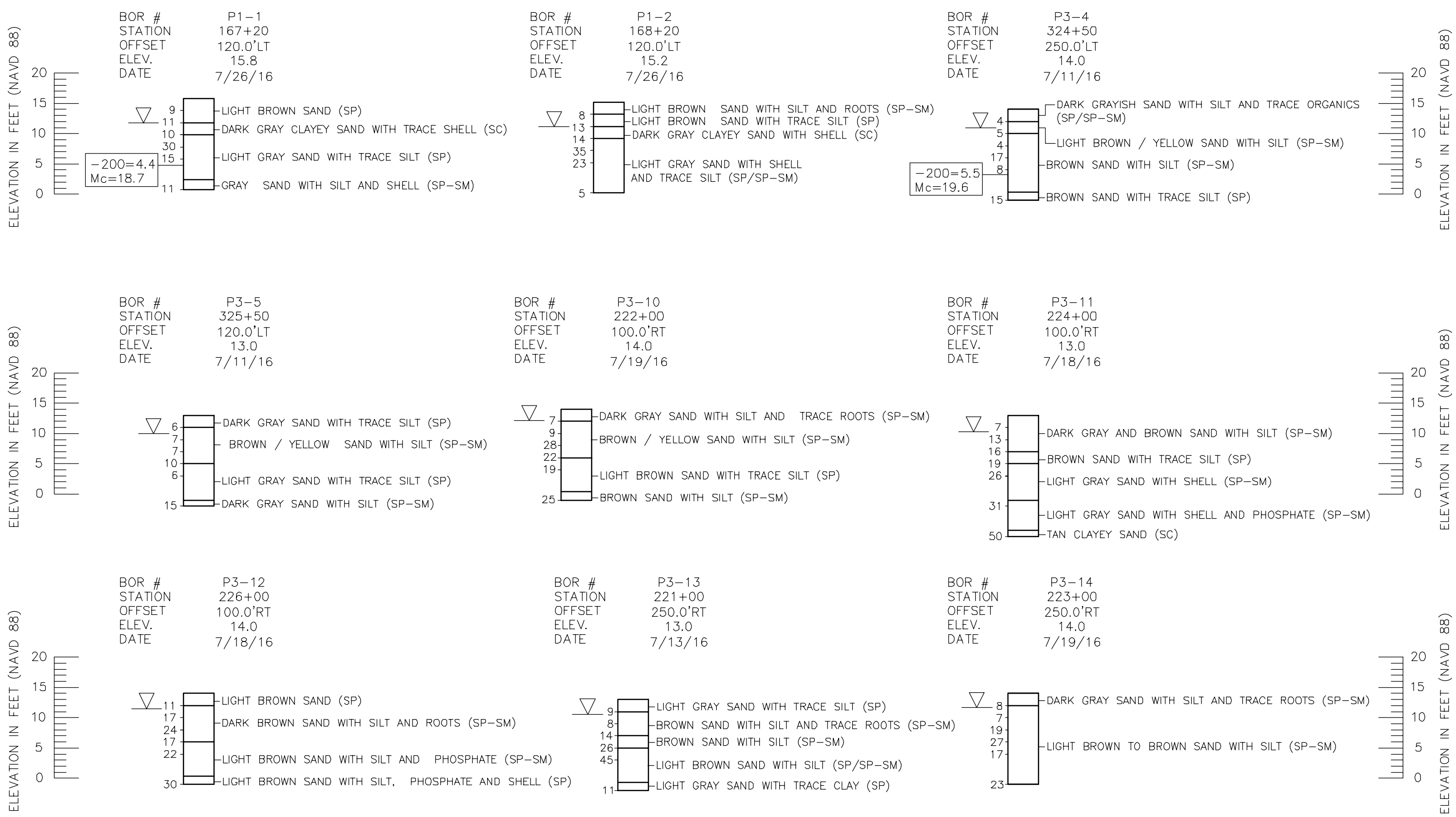
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
30	8	2	8.5	2	8.5	2
31	7	2	8	3	8	2
32	6	1	10	2	6	1
33	8	1	12	2	12	2
34	9	3	10	3	9	3
35	12	3	11	2	11	2
36	6	1	7	1	5	1
37	5	0	5	1	5	0
38	6	2	5	2	6	2
39	4	0	3	1	6	1
40	5	3	7	3	4	2
41	7	2	10	2	11	2
42	12	3	8	4	12	2
43	10	3	13	2	11	3
44	9	0	10	2	8.5	1
45	8	6	9	0	11.5	1
46	7.5	2	10	2	6	1
47	5	1	3	2	3	2
48	6	3	4	3	3.5	3
49	9	2	8.5	2	7	2
50	4.5	2	6	2	4	2

MUCK PROBES -44TH AVE						
AREA NO. 5-EAST DITCH OF CARUSO RD						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	14	7	16	3	14	3
2	19	3	19	4	18	3
3	10	3	10	4	9	3
4	10	3	15	5	11	3
5	11	2	17	4	11	2
6	8.5	2	15	4	9.5	2
7	12	2	10	4	13	2
8	11	2	18	4	9.5	3
9	7	2	13	4	8	3
10	8	2	10	5	11	3
11	10	2	17	3	7.5	2
12	6.5	2	16	3	6	2
13	8	2	20	3	8	2
14	11.5	1	10	4	7	2
15	13	2	9	3	10	2
16	10	2	10	2	6	2
17	11	2	11	4	6	2
18	7	2	12	3	7.5	2
19	10	2	12	3	8	2
20	6.5	2	14	3	7	3

MUCK PROBES -44TH AVE						
AREA NO.6- WEST DITCH OF CARUSO RD						
	TOE		MIDDLE		TOE	
PROBE NO.	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)	THICKNESS OF SOFT SOILS (IN)	MUCK THICKNESS (IN)
1	19	3	19	4	48	3
2	5	4	44	6	5	4
3	10	3	1	4	6	3
4	10.5	4	10.5	6	6	3
5	7	4	12.5	4	7	4
6	6.5	3	9	4	9	3
7	4	1	8	2	2	1
8	6	3	8.5	4	5	3
9	3	0	2	0	2	0
10	15	2	19.5	3	0	2
11	8	2	9.5	3	9	2
12	13	2	8	2	7	2
13	7	2	7.5	2	10	2
14	7	2	10	2	8	2
15	6	1	6.5	2	6	1
16	3.5	1	4	2	3	1
17	5	0	9	0	8	0
18	10	0	8	0	13.5	0
19	7	0	13	0	9	0
20	7.5	0	9.5	0	8	0
21	4	2	7	3	8	2
22	11	2	10	3	12	2
23	36	3	20	4	12	2
24	7	0	6	0	8	0
25	4	0	5	0	6	0
26	3	0	4	0	3	0
27	8	0	8	0	6	0
28	3	0	2	0	4	0
29	2	0	2	0	2	0
30	2	0	2	0	2	0

APPENDIX D

Stormwater Management Facility Borings



NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45

LEGEND

- SAND
- SILT
- CLAY
- SAND WITH SOME SILT
- CLAY WITH SOME SAND
- CLAYEY SAND
- SAND WITH SOME CLAY
- SANDY SILT
- SANDY CLAY
- SILTY SAND
- SILTY CLAY
- HARD LIMESTONE
- CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	SPT N–VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

LAND	
CHLORIDE	11.8 - 3.64
SULFATE	1717 - 3.49
RESISTIVITY	20,800 - 750
pH	8.31 - 4.72

STORMWATER MANAGEMENT FACILITY BORINGS

No.	REVISIONS	DATE	BY

SCALE
DESIGNED BY
DRAWN BY
CHECKED BY

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A. No. 8115

DATE
PROJECT NO. 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH Q. GIANG, PE
FL. LICENSE NO. 49510

SHEET TITLE: REPORT OF CORE BORINGS (1 OF 2)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO. x

NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

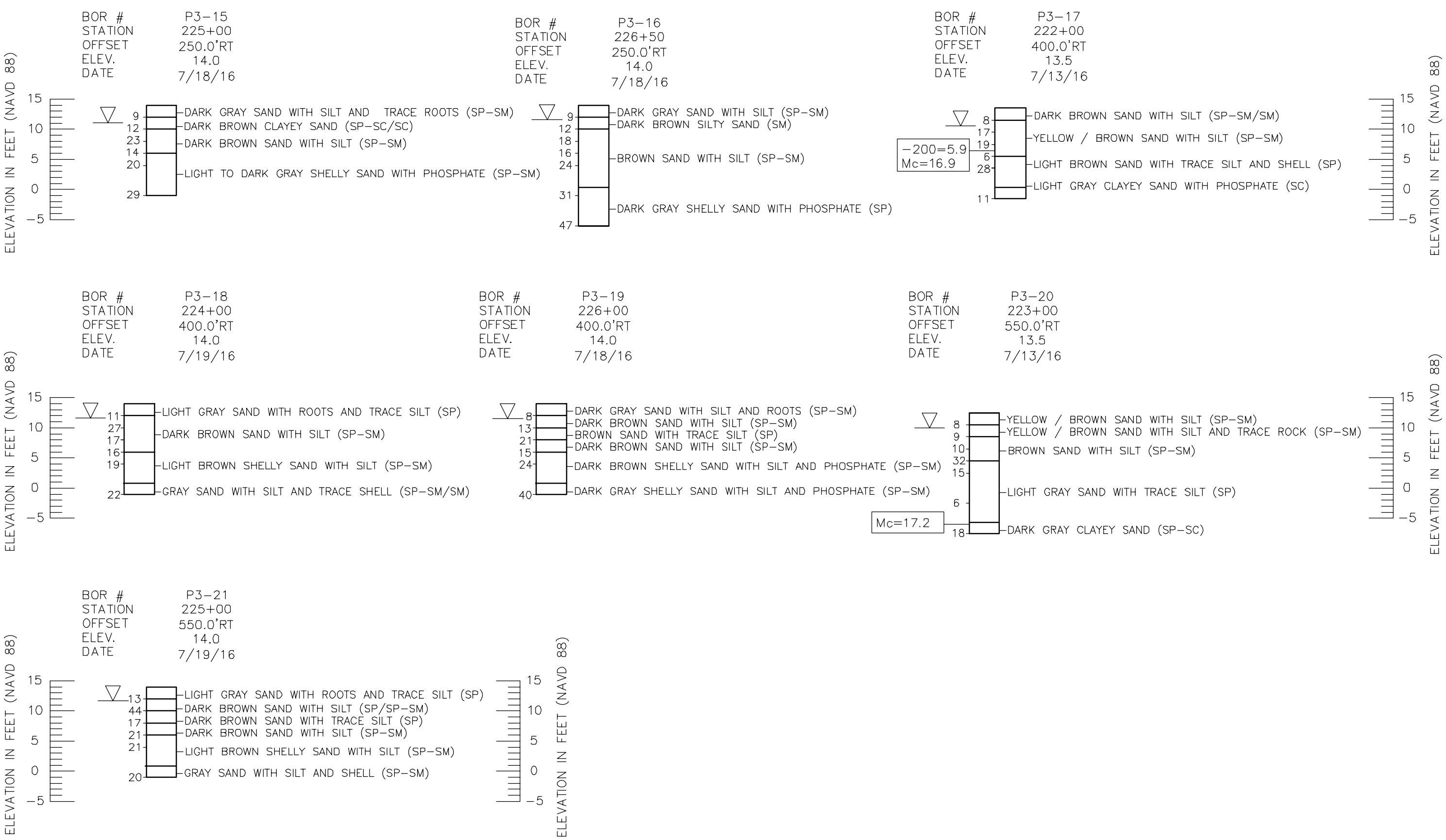
DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45

LEGEND

SAND · SILT · CLAY · SAND WITH SOME SILT · CLAY WITH SOME SAND · CLAYEY SAND · SAND WITH SOME CLAY · SANDY SILT · SANDY CLAY · SILTY SAND · SILTY CLAY · HARD LIMESTONE · CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP — UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N — NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4 — NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH — FELL UNDER WEIGHT OF ROD AND HAMMER
WR — FELL UNDER WEIGHT OF ROD
−200 — PERCENT PASSING #200 SIEVE
LL — LIQUID LIMIT (%)
PI — PLASTICITY INDEX (%)
WC — WATER CONTENT (%)
NGVD 88 — NATIONAL GEODETIC VERTICAL DATUM OF 1988
APPROXIMATE SPT BORING LOCATION
GROUNDWATER TABLE
NR — NO RECOVERY
CASING
B/L — BASELINE



ENVIRONMENTAL CLASSIFICATION

LAND	
CHLORIDE	11.8 - 3.64
SULFATE	1717 - 3.49
RESISTIVITY	20,800 - 750
pH	8.31 - 4.72

STORMWATER MANAGEMENT FACILITY BORINGS

No.	REVISIONS	DATE	BY

SCALE / DESIGNED BY / DRAWN BY / CHECKED BY

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607–1462
C.A. No. 8115

DATE
PROJECT NO. 6086960

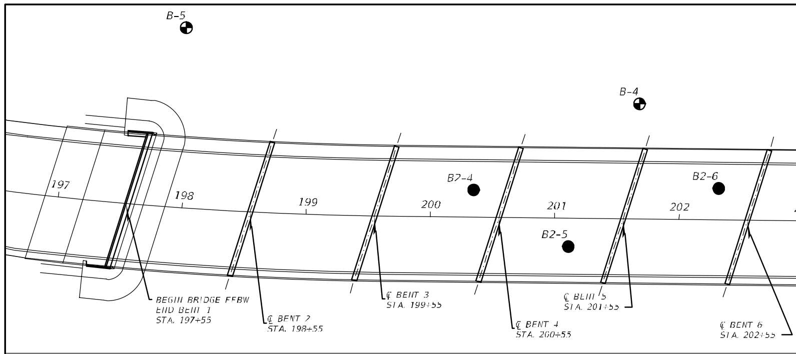
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH Q. GIANG, PE
FL. LICENSE NO. 49510

SHEET TITLE: REPORT OF CORE BORINGS (2 OF 2)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO. x

APPENDIX E

Bridge Foundation Borings



GRAPHIC SCALE IN FEET

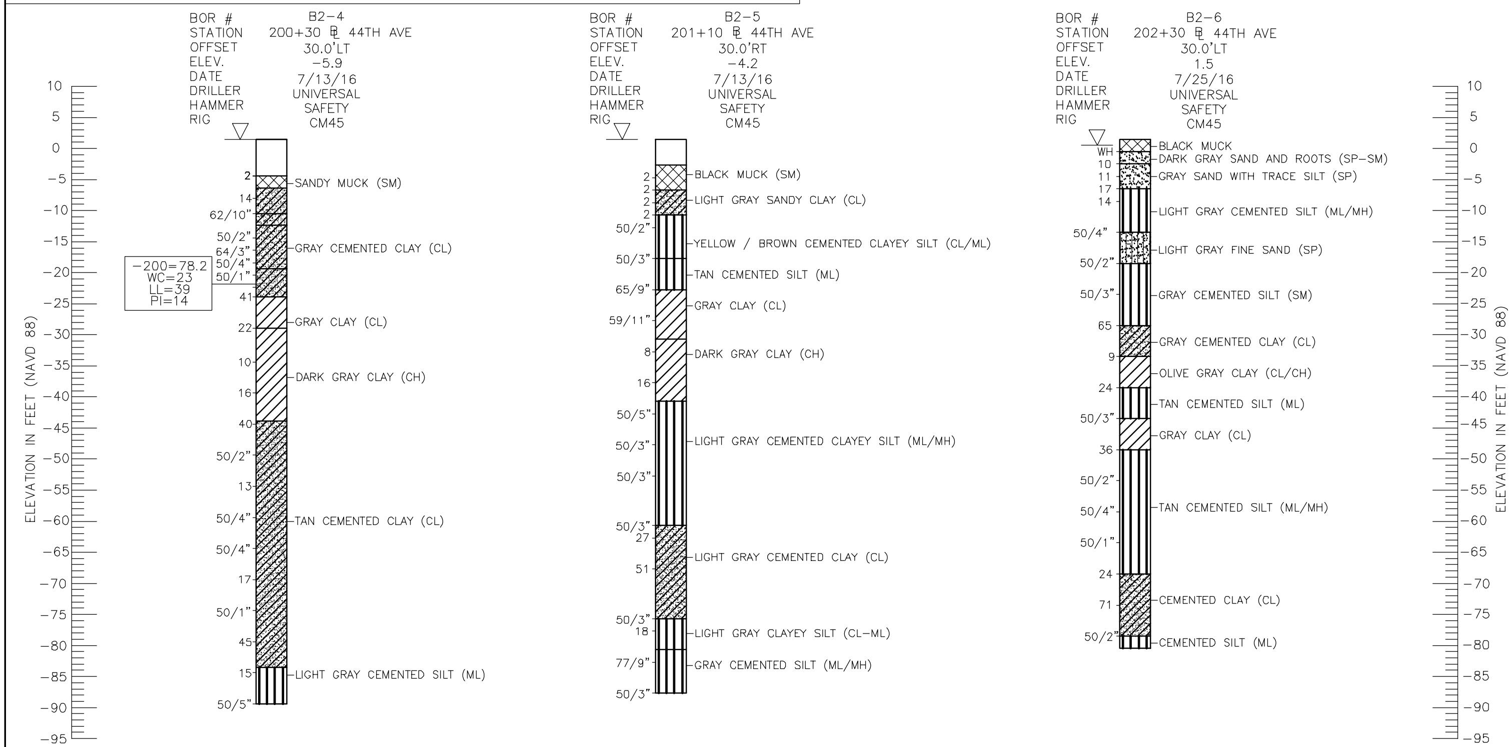
50 0 50 100

SCALE 1" = 50'

NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER:	UNIVERSAL
HAMMER:	SAFETY
RIG:	CME 45



LEGEND

SAND · SILT · CLAY · SAND WITH SOME SILT · CLAY WITH SOME SAND · CLAYEY SAND · SAND WITH SOME CLAY · SANDY SILT · SANDY CLAY · SILTY SAND · SILTY CLAY · HARD LIMESTONE · CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	SPT N–VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200 LL PI WC	PERCENT PASSING #200 SIEVE LIQUID LIMIT (%) PLASTICITY INDEX (%) WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	KEITH GIANG
DRAWN BY	IRA ZICHLIN
CHECKED BY	KEITH GIANG

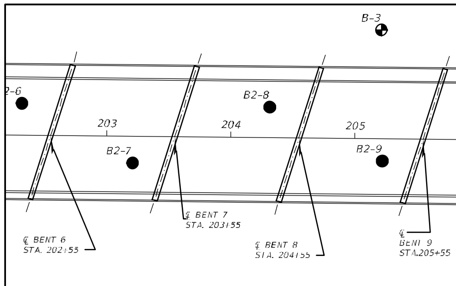
AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

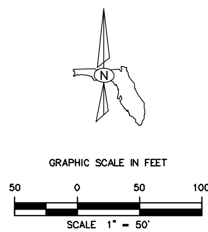
DATE	12/20/2016
PROJECT NO.	6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER	KEITH O. GIANG, PE
FL. LICENSE NO.	49510

SHEET TITLE:	REPORT OF SPT BORINGS (1 OF 7)
PROJECT NAME:	44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO.	B-13





NOTES:

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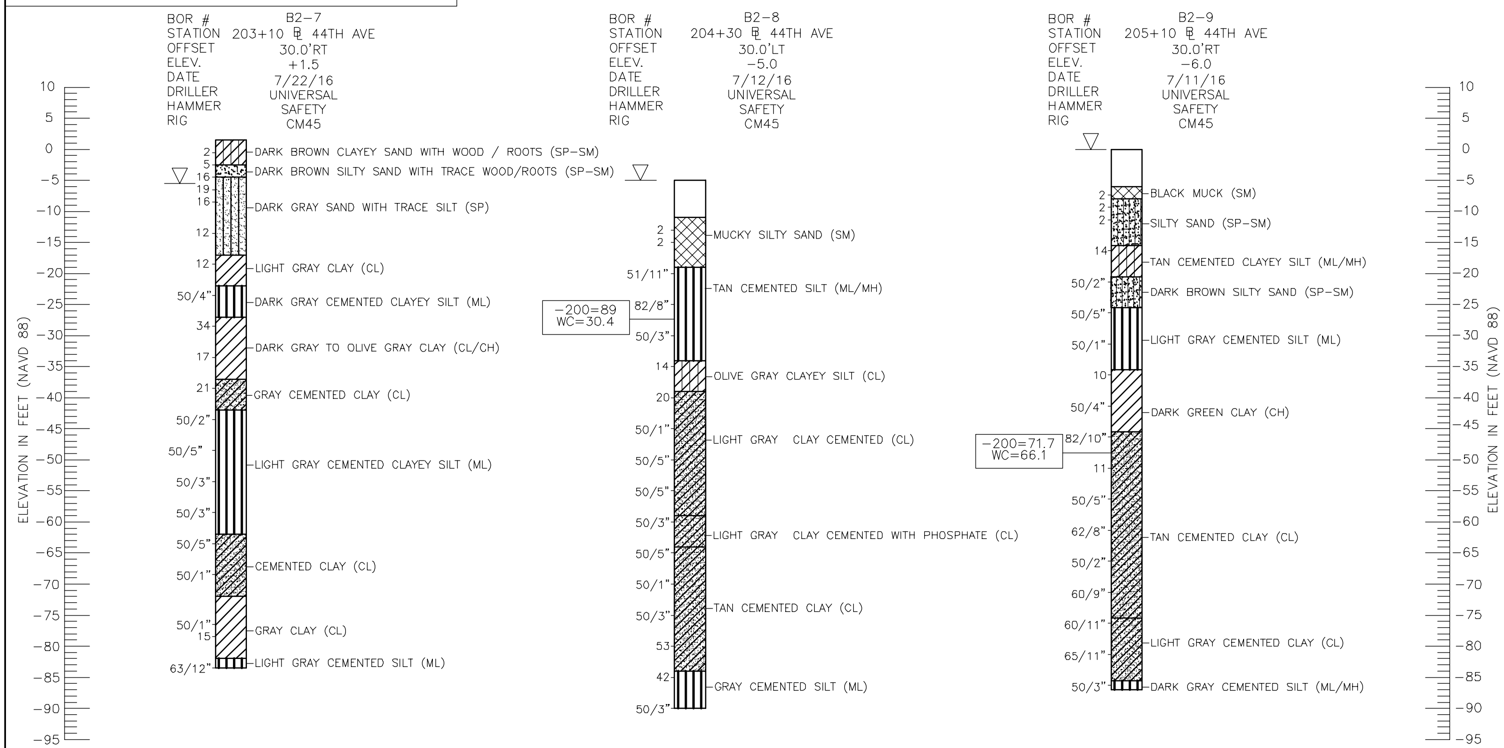
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45



LEGEND

SAND
SILT
CLAY
SAND WITH SOME SILT
CLAY WITH SOME SAND
CLAYEY SAND
SAND WITH SOME CLAY
SANDY SILT
SANDY CLAY
SILTY SAND
SILTY CLAY
HARD LIMESTONE
CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
CHECKED BY: KEITH GIANG
DRAWN BY: IRA ZICHLIN
SPEC. CHK. BY: KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

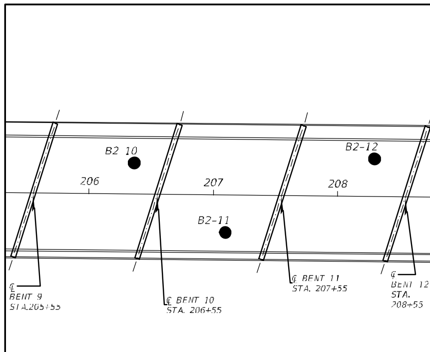
DATE: 12/20/2016
PROJECT NO.: 6086960

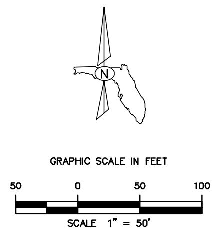
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH O. GIANG, PE
FL. LICENSE NO.: 49510

SHEET TITLE: REPORT OF SPT BORINGS (2 OF 7)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO.: B-14

FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVENUE BRIDGE BORINGS 1.dwg LAYOUT NAME: Layout1 (2) PLOTTED: Tuesday, December 20, 2016 - 5:00pm USER: ira.zichlin





NOTES:

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2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45

LEGEND

SAND
SILT
CLAY
SAND WITH SOME SILT
CLAY WITH SOME SAND
CLAYEY SAND
SAND WITH SOME CLAY
SANDY SILT
SANDY CLAY
SILTY SAND
SILTY CLAY
HARD LIMESTONE
CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

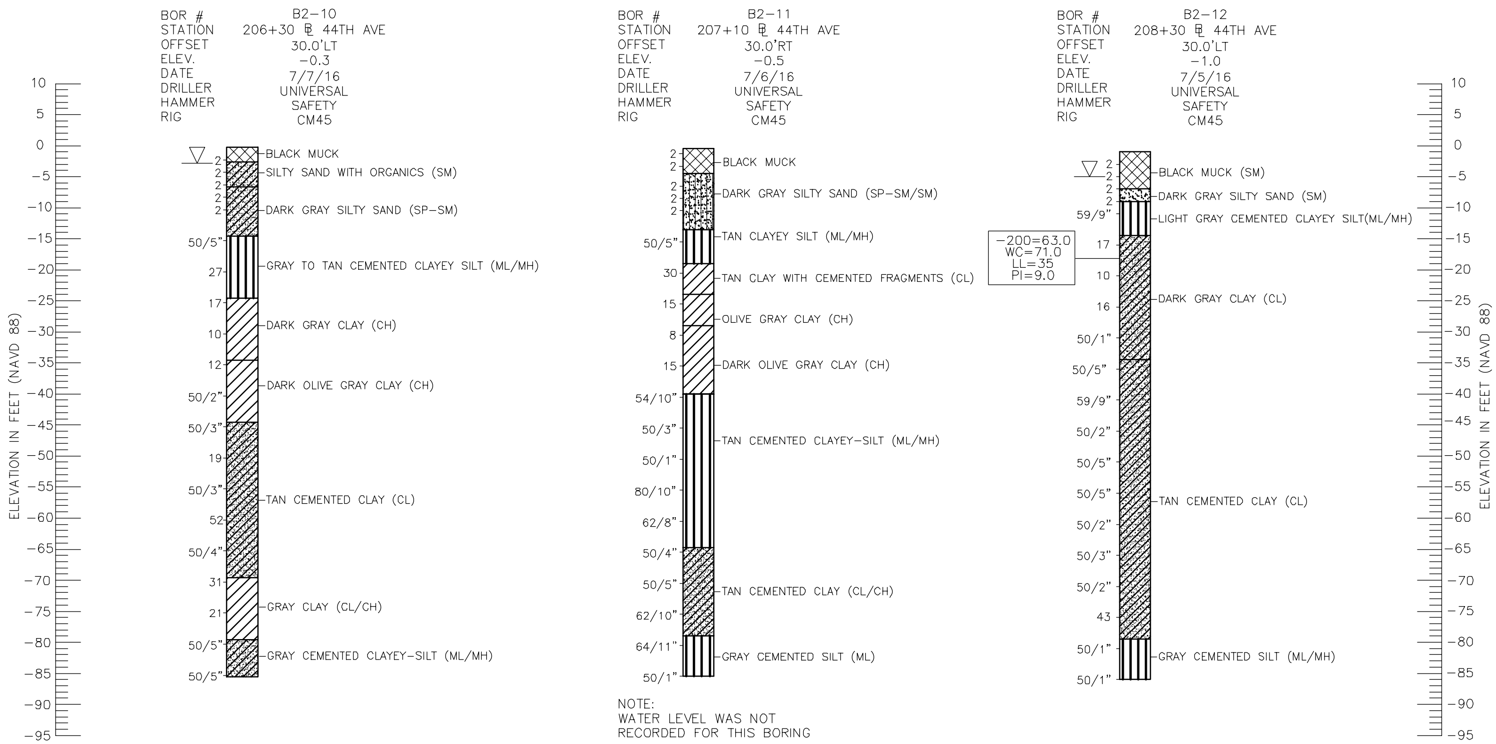
ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72



BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	KEITH GIANG
DRAWN BY	IRA ZICHLIN
CHECKED BY	KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE	12/20/2016
PROJECT NO.	6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

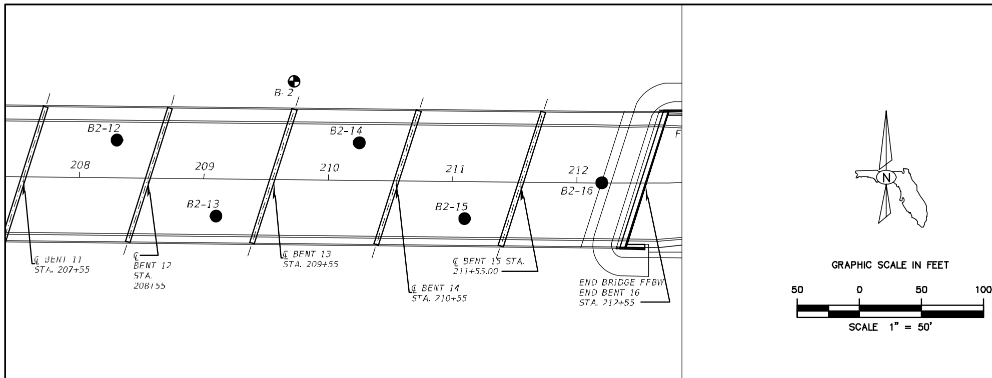
DESIGN ENGINEER	KEITH O. GIANG, PE
FL. LICENSE NO.	49510

SHEET TITLE: REPORT OF SPT BORINGS (3 OF 7)

PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

SHEET NO. B-15

FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVENUE BRIDGE BORINGS 1.dwg LAYOUT NAME: Layout1 (3) PLOTTED: Tuesday, December 20, 2016 - 5:00pm USER: ira.zichlin



NOTES:

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2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45

LEGEND

SAND; SILT; CLAY; SAND WITH SOME SILT; CLAY WITH SOME SAND; CLAYEY SAND; SAND WITH SOME CLAY; SANDY SILT; SANDY CLAY; SILTY SAND; SILTY CLAY; HARD LIMESTONE; CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
–200 LL PI WC	PERCENT PASSING #200 SIEVE LIQUID LIMIT (%) PLASTICITY INDEX (%) WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE
100%	LOSS OF DRILLING FLUID (%)

ENVIRONMENTAL CLASSIFICATION

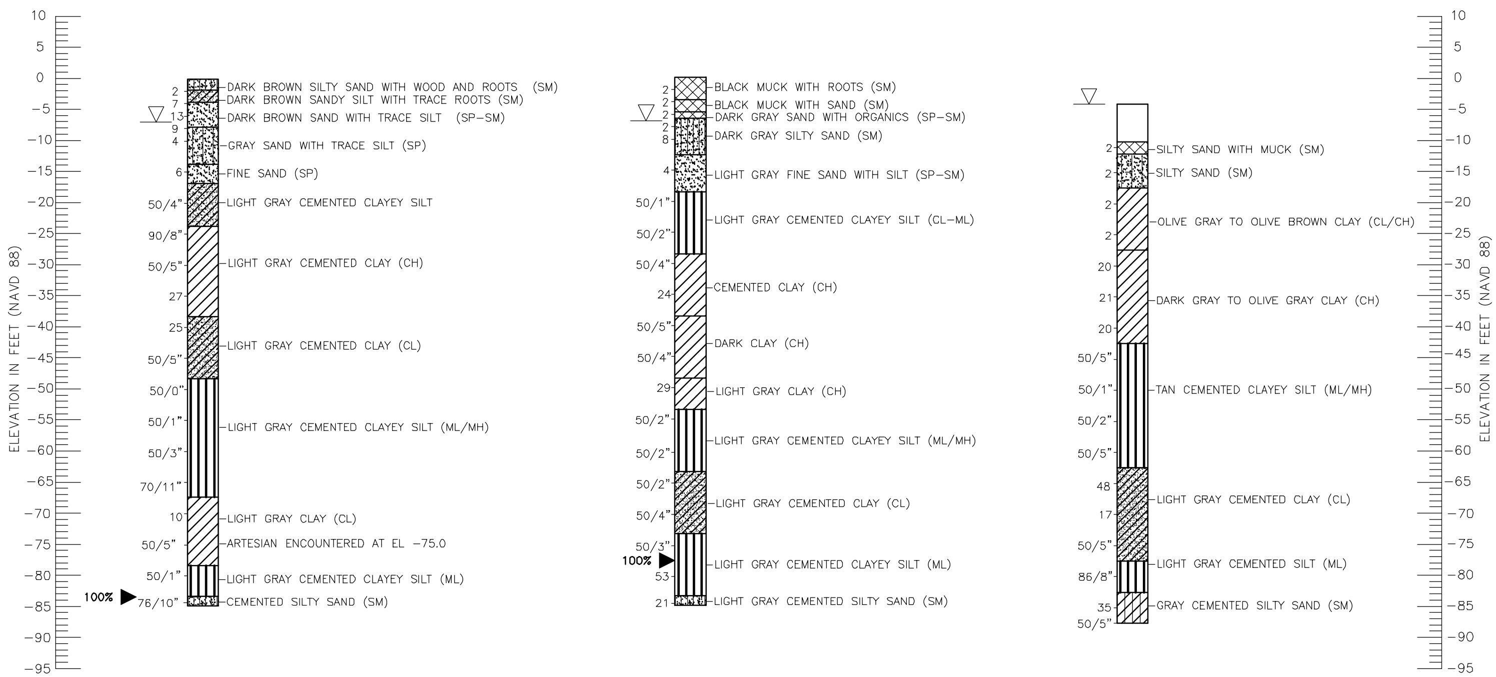
SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

	B2-13	B2-14	B2-15
BOR #	B2–13	B2–14	B2–15
STATION	209+10 ℄ 44TH AVE	210+30 ℄ 44TH AVE	211+10 ℄ 44TH AVE
OFFSET	30.0'RT	30.0'LT	30.0'RT
ELEV.	0.1	0.2	–4.2
DATE	7/22/16	7/19/16	7/8/16
DRILLER	UNIVERSAL	UNIVERSAL	UNIVERSAL
HAMMER	SAFETY	SAFETY	SAFETY
RIG	CM45	CM45	CM45



BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	KEITH GIANG
DRAWN BY	IRA ZICHLIN
CHECKED BY	KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

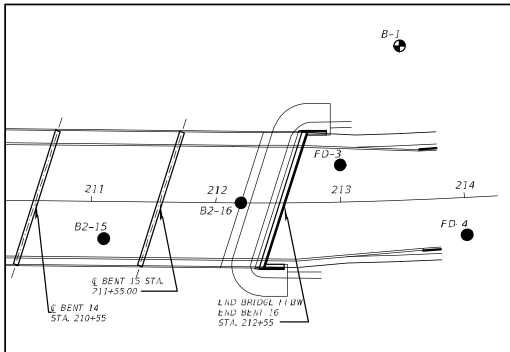
DATE: 12/20/2016
PROJECT NO.: 6086960

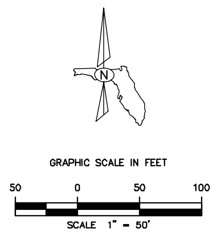
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH O. GIANG, PE
FL. LICENSE NO.: 49510

SHEET TITLE: REPORT OF SPT BORINGS (4 OF 7)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO.: B-16

FILE NAME: C:\Users\ira_zichlin\appdata\local\temp\AcPublish_11172_44TH AVENUE BRIDGE BORINGS 1.dwg LAYOUT NAME: Layout1 (4) PLOTTED: Tuesday, December 20, 2016 – 5:00pm USER: ira.zichlin

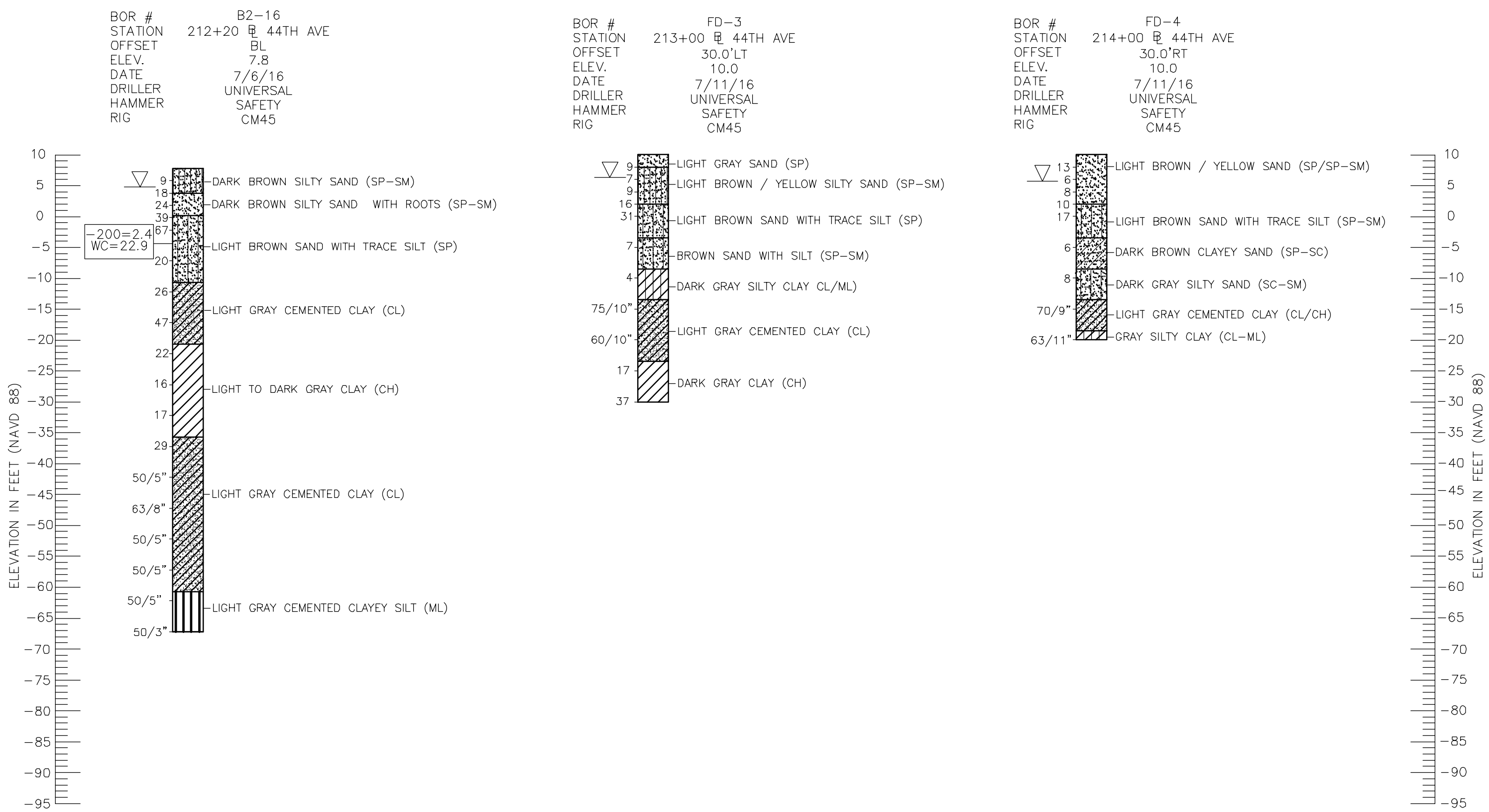




NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45



LEGEND

SAND
SILT
CLAY
SAND WITH SOME SILT
CLAY WITH SOME SAND
CLAYEY SAND
SAND WITH SOME CLAY
SANDY SILT
SANDY CLAY
SILTY SAND
SILTY CLAY
HARD LIMESTONE
CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	KEITH GIANG
DRAWN BY	IRA ZICHLIN
CHECKED BY	KEITH GIANG

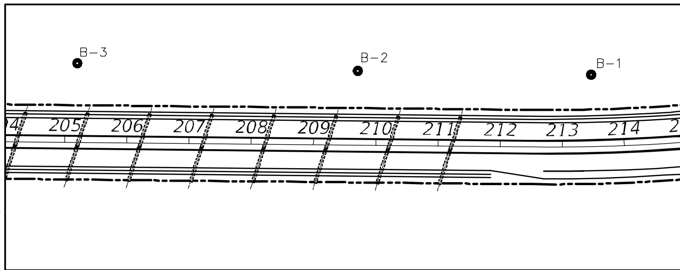
AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

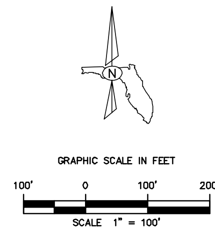
DATE 12/20/2016
PROJECT NO. 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER KEITH O. GIANG, PE
FL. LICENSE NO. 49510

SHEET TITLE: REPORT OF SPT BORINGS (5 OF 7)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER
SHEET NO. B-16A





NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

   DRILLER: UNIVERSAL
   HAMMER: SAFETY
   RIG: CME 45

LEGEND

SAND · SILT · CLAY · SAND WITH SOME SILT · CLAY WITH SOME SAND · CLAYEY SAND · SAND WITH SOME CLAY · SANDY SILT · SANDY CLAY · SILTY SAND · SILTY CLAY · HARD LIMESTONE · CEMENTED SILT

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
−200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

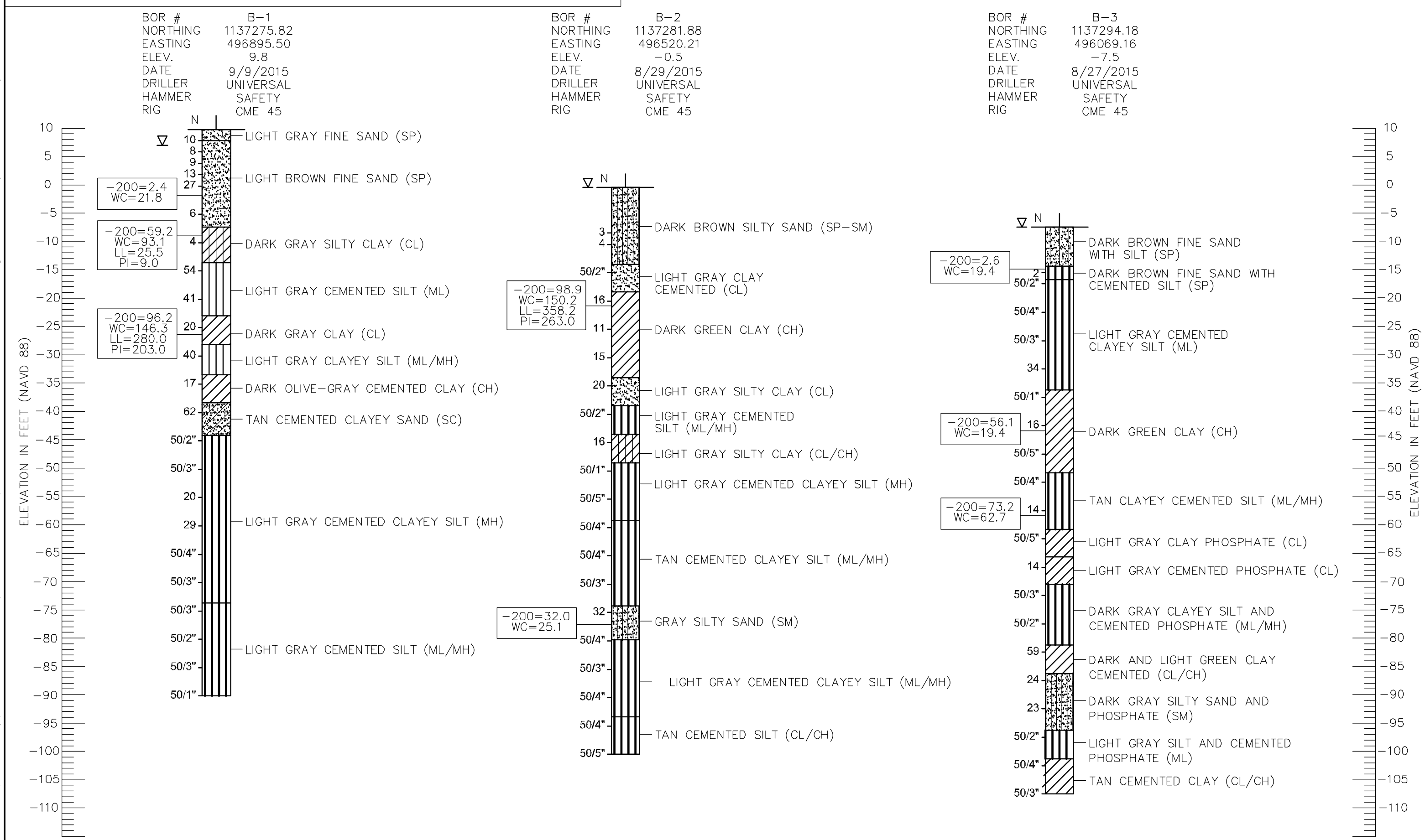
ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72



BRIDGE FOUNDATION BORINGS

Bridge No. 134130

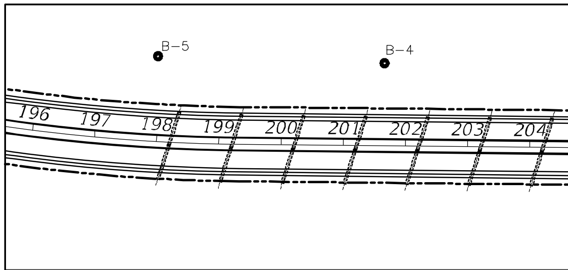
No.	REVISIONS	DATE	BY

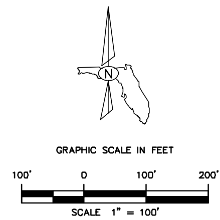
SCALE: AS NOTED	AECOM Technical Services, Inc. 7650 West Courtney Campbell Causeway Tampa, FL 33607-1462 C.A.No. 8115	DATE 12/20/2016
KEITH GIANG		PROJECT NO. 6086960
DRAWN BY: IRA ZICHLIN		
CHECKED BY: KEITH GIANG		

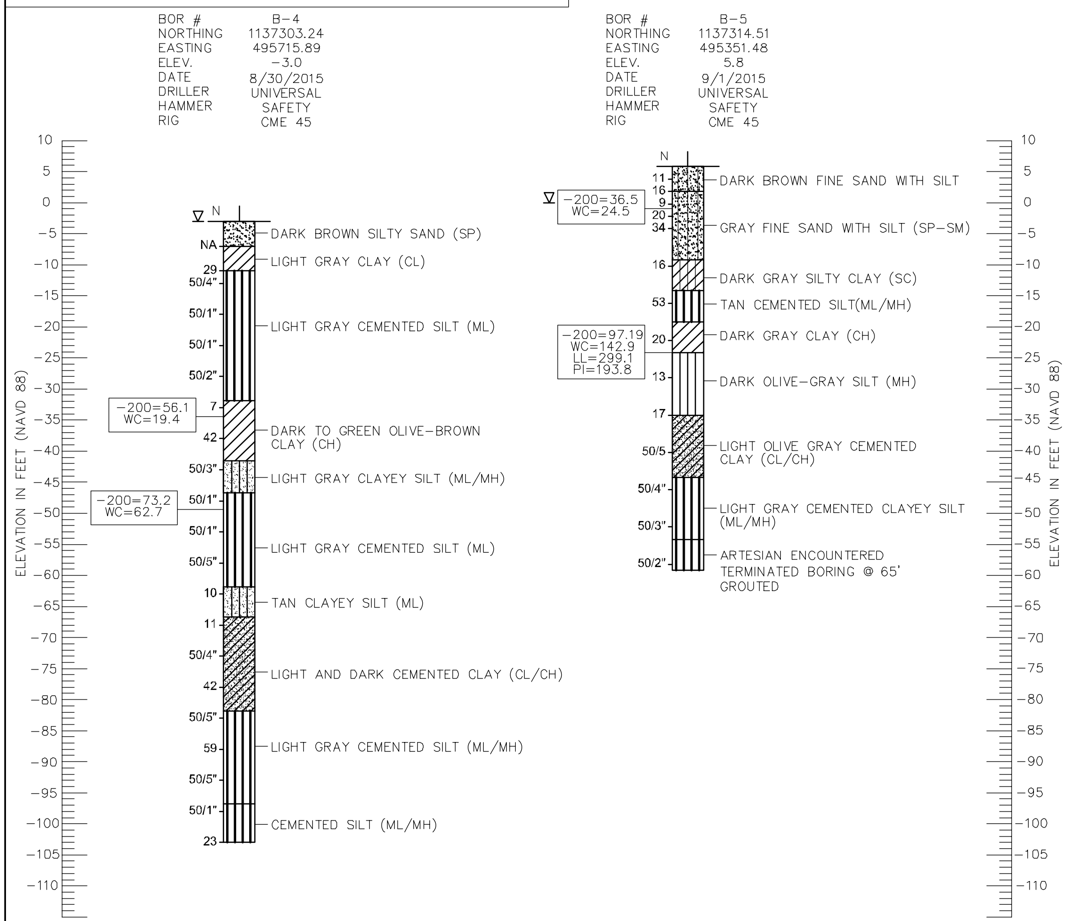
Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: KEITH O. GIANG, PE	SHEET TITLE: REPORT OF SPT BORINGS (6 OF 7)	SHEET NO.
FL. LICENSE NO. 49510	PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER	B-16B

FILE NAME: S:\Projects_GeoGovDocs\Manatee County\44th Ave Over Braden River\9 – PROJECT DRAWINGS_44TH AVENUE BRIDGE BORINGS OVER BRADEN RIVER.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, December 20, 2016 – 5:06pm USER: ira.zichlin







NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER: UNIVERSAL
HAMMER: SAFETY
RIG: CME 45

LEGEND

SAND
SILT
CLAY
SAND WITH SOME SILT
CLAY WITH SOME SAND
CLAYEY SAND
SAND WITH SOME CLAY
SANDY SILT
SANDY CLAY
SILTY SAND
SILTY CLAY
HARD LIMESTONE
CEMENTED SILT

GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200 LL PI WC	PERCENT PASSING #200 SIEVE LIQUID LIMIT (%) PLASTICITY INDEX (%) WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

BRIDGE FOUNDATION BORINGS

Bridge No. 134130

No.	REVISIONS	DATE	BY

AS NOTED
KEITH GIANG
IRA ZICHLIN
KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE 12/20/2016
PROJECT NO. 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

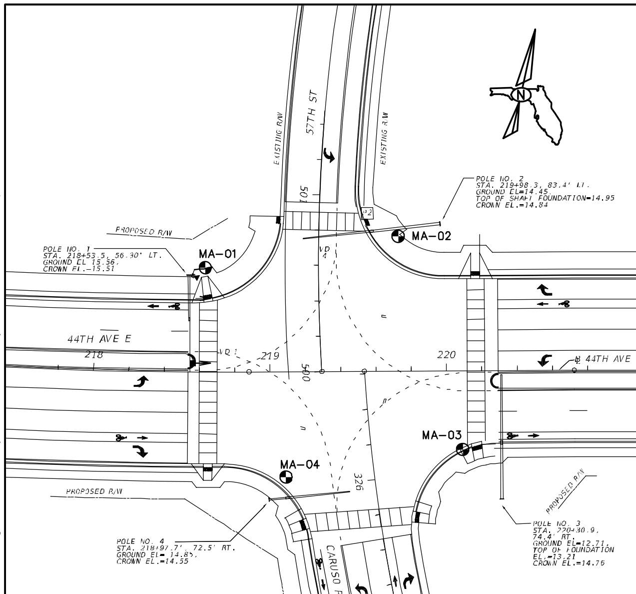
DESIGN ENGINEER KEITH O. GIANG, PE
FL. LICENSE NO. 49510

SHEET TITLE: REPORT OF SPT BORINGS (7 OF 7)
PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

SHEET NO. B-16C

APPENDIX F

Mast Arm Signal Foundation Borings



GRAPHIC SCALE IN FEET

40' 0 40' 80'

SCALE 1" = 40'

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER:	UNIVERSAL
HAMMER:	SAFETY
RIG:	CME 45

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE (pH<5.0)

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

(WATER SAMPLE FROM BRADEN RIVER)

CHLORIDE	48.7 - 50.2 PPM
SULFATE	45.3 - 56.0 PPM
RESISTIVITY	2500 OHM-CM
pH	7.4 - 7.6

LAND

CHLORIDE	11.8 - 3.64 PPM
SULFATE	1717 - 3.49 PPM
RESISTIVITY	20,800 - 750 OHM-CM
pH	8.31 - 4.72

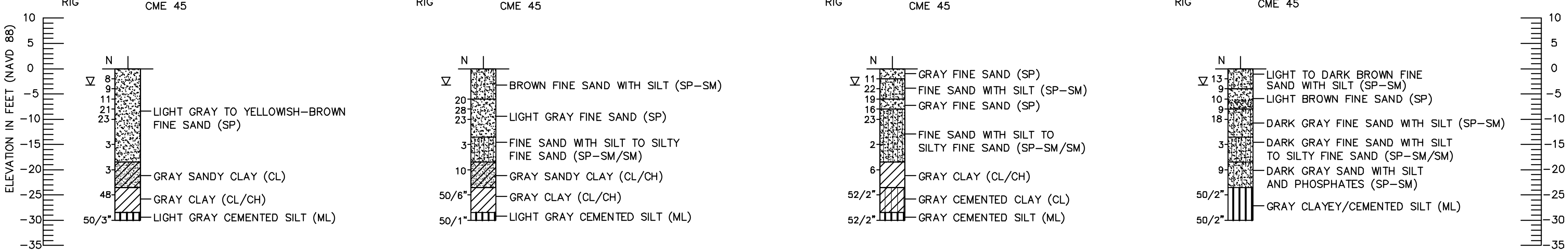
MAST ARM SIGNAL FOUDATION BORINGS

LEGEND

SAND; SILT; CLAY; SAND WITH SOME SILT; CLAY WITH SOME SAND; CLAYEY SAND; SAND WITH SOME CLAY; SANDY SILT; SANDY CLAY; SILTY SAND; SILTY CLAY; HARD LIMESTONE; CEMENTED SILT

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 88	NATIONAL GEODETIC VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

BOR #	MA-01	MA-02	MA-03	MA-04
STATION	218+55.5	219+74.8	220+17.4	219+02.5
OFFSET	59.29' LT	82.75' LT.	55.02' RT	72.74' RT
ELEV.	13.0'	14.0'	12.5'	13.0'
DATE	10/21/2016	10/21/2016	10/24/2016	10/24/2016
DRILLER	UNIVERSAL	UNIVERSAL	UNIVERSAL	UNIVERSAL
HAMMER	SAFETY	SAFETY	SAFETY	SAFETY
RIG	CME 45	CME 45	CME 45	CME 45



No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	KEITH GIANG
DRAWN BY	IRA ZICHLIN
CHECKED BY	KEITH GIANG

AECOM Technical Services, Inc.
7650 West Courtney Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE	12/20/2016
PROJECT NO.	6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER	KEITH Q. GIANG, PE
FL. LICENSE NO.	49510

SHEET TITLE: REPORT OF SPT BORINGS

PROJECT NAME: 44th AVENUE BRIDGE OVER BRADEN RIVER

SHEET NO. .

FILE NAME: S:\Projects_GeoGovDocs\Manatee County\44th Ave Over Braden River\9 - PROJECT DRAWINGS_44TH AVENUE BRIDGE SPT BORINGS OVER BRADEN RIVER.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, December 20, 2016 - 5:20pm USER: ira.zichlin

APPENDIX G

Summary of Laboratory Testing

UNIVERSAL
ENGINEERING SCIENCES
Consultants in: Geotechnical Engineering
Environmental Sciences • Construction Material Testing
1748 Independence Blvd., Suite B-1 • Sarasota, FL 34234 • (941) 358-7410

SUMMARY OF LABORATORY RESULTS

Project:	Proposed 44th Ave E. Bridge	**Project No.:**	1130.1500167.0000
Client:	URS	**Report No.:**	11358

Hand Auger No.	Depth (Ft)	Sample Description	No. 200, %	Water Content, %	LL	PL	PI	Org	USCS Classification	Sampling Method (ASTM)
HA-2	1	Dark gray fine sand with trace shell fragments (SP)	2.4	7.0					SP	ASTM D1452
HA-2	3	Dark brown fine sand with trace silt (SP)	2.4	17.6					SP	ASTM D1452
HA-4	2	Dark brown fine sand with clay (SP-SC)	5.8	11.7					SP-SC	ASTM D1452
HA-8	3	Dark brown fine sand with trace silt (SP)	4.7	12.1					SP	ASTM D1452
HA-10	3	Dark brown fine sand with clay (SP-SC)	11.1	17.8					SP-SC	ASTM D1452
HA-11	4	Light green clayey silt (MH)	56.0	33.0	54.6	18.2	36.4		MH	ASTM D1452
HA-12	3	Black silty clayey sand (SC-SM)	15.1	44.9	N.P	N.P			SC-SM	ASTM D1452
HA-14	2	Black silty sand with organics (SM)	14.2	45.0				13.6	SM	ASTM D1452
HA-14	3	Dark brown fine sand with trace silt and roots (SP)	4.0	23.8					SP	ASTM D1452
HA-17	2	Dark brown fine sand with trace silt and rock fragments (SP)	4.2	15.7					SP	ASTM D1452
HA-18	3	Black fine sand with silt (SP-SM)	7.3	25.9					SP-SM	ASTM D1452
HA-19	2	Tan fine sand (SP)	1.6	19.2					SP	ASTM D1452
HA-19	4	Light gray silty clayey sand (SM)	13.5	17.5	N.P	N.P			SC-SM	ASTM D1452
HA-24	2	Yellowish gray silty clayey sand (SC-SM)	29.2	25.6	27.0	22.7	4.3		SC-SM	ASTM D1452
HA-25	3	Dark brown fine sand with trace silt (SP)	3.6	20.1					SP	ASTM D1452
HA-29	2	Light brown fine sand with clay (SP-SC)	10.3	18.6	N.P	N.P			SP-SC	ASTM D1452
HA-30	2	Light brown fine sand with silt (SP-SM)	5.8	12.7					SP-SM	ASTM D1452
HA-30	3	Light gray fine sand with clay and roots (SP-SC)	7.2	17.7					SP-SC	ASTM D1452
HA-31	2	Dark brown fine sand with silt (SP-SM)	5.5	21.4					SP-SM	ASTM D1452

UNIVERSAL
ENGINEERING SCIENCES
Consultants In: Geotechnical Engineering
Environmental Sciences • Construction Material Testing
1748 Independence Blvd., Suite B-1 • Sarasota, FL 34234 • (941) 358-7410

SUMMARY OF LABORATORY RESULTS

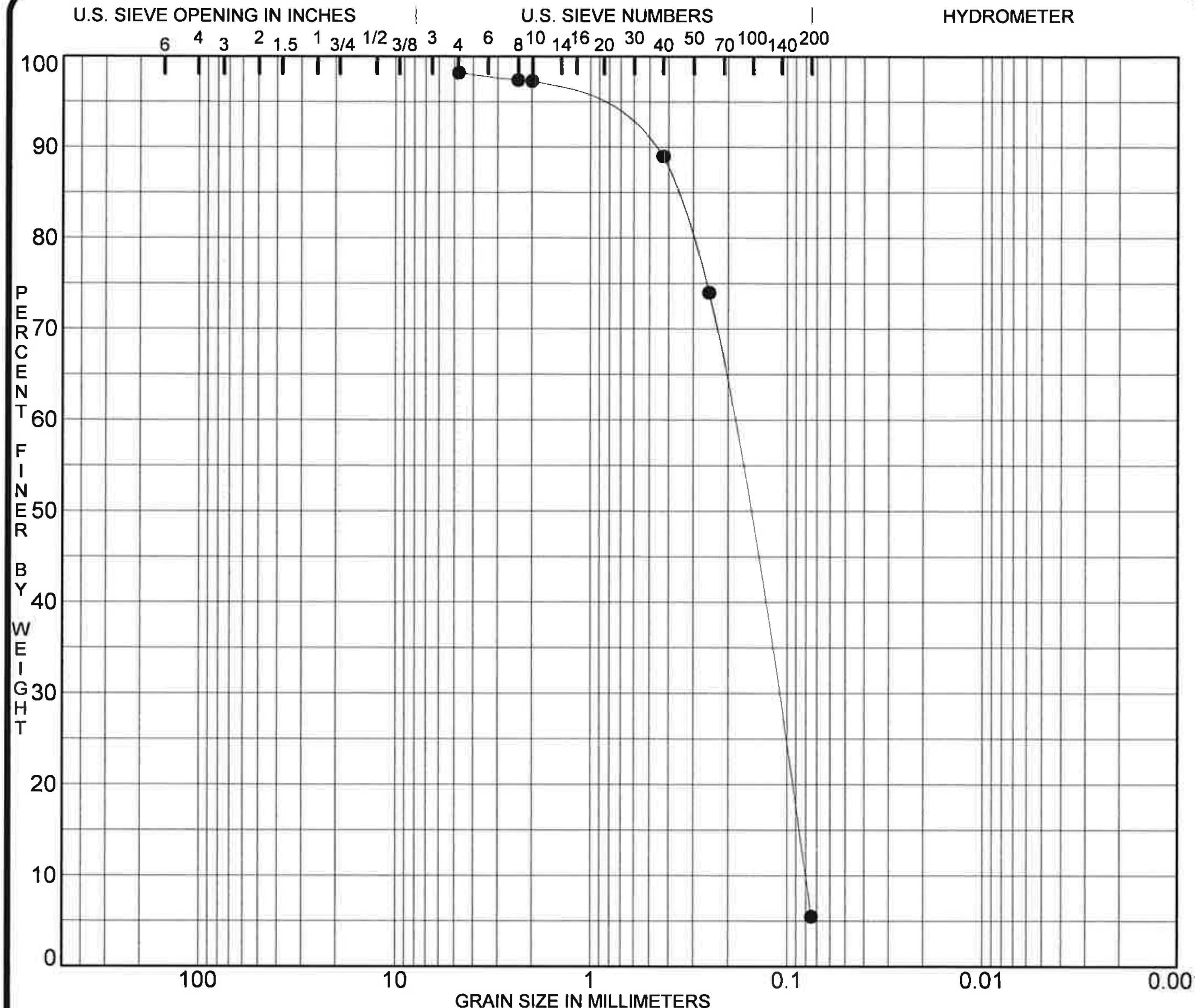
Project: Proposed 44th Ave E. Bridge

Project No.: 1130.1500167.0000

Client: URS

Report No.: 11358

Hand auger No.	Depth (Ft)	Sample Description	No. 200, %	Water Content, %	LL	PL	PI	Org	USCS Classification	Sampling Method (ASTM)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**HA-31**	**1'- 5'**	**POORLY GRADED SAND with SILT SP-SM**		**NP**	**NP**	**NP**	**0.84**	**2.4**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**HA-31**	**1'- 5'**	**4.75**	**0.20**	**0.115**	**0.0812**	**0.0**	**92.7**	**5.5**	

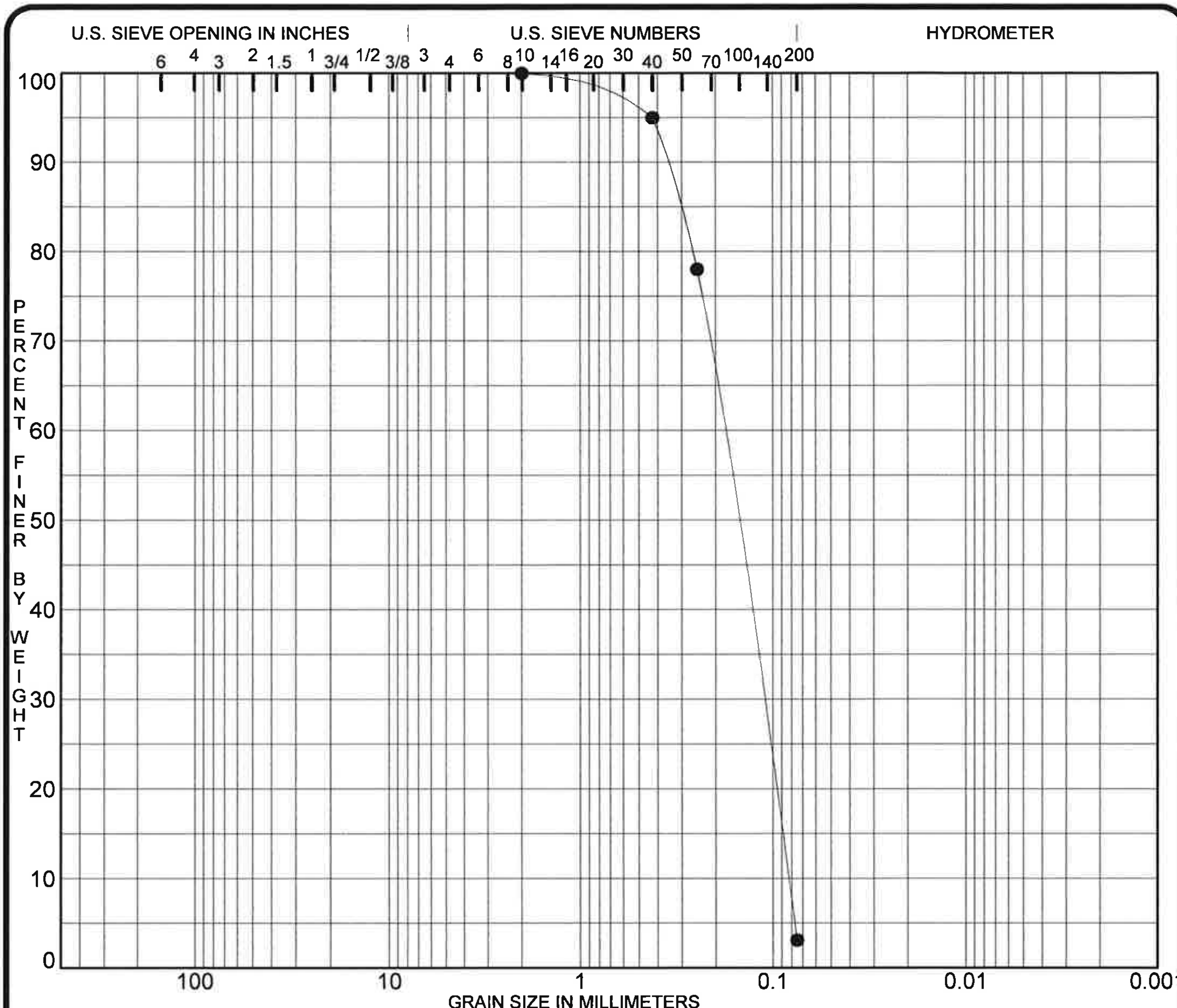
PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.

DATE **1/18/16**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**HA-02**	**2'- 4'**	**POORLY GRADED SAND SP**		**NP**	**NP**	**NP**	**0.85**	**2.2**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**HA-02**	**2'- 4'**	**2.00**	**0.19**	**0.116**	**0.0838**	**0.0**	**96.9**	**3.1**	

PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.

DATE **1/18/16**

GRADATION CURVES

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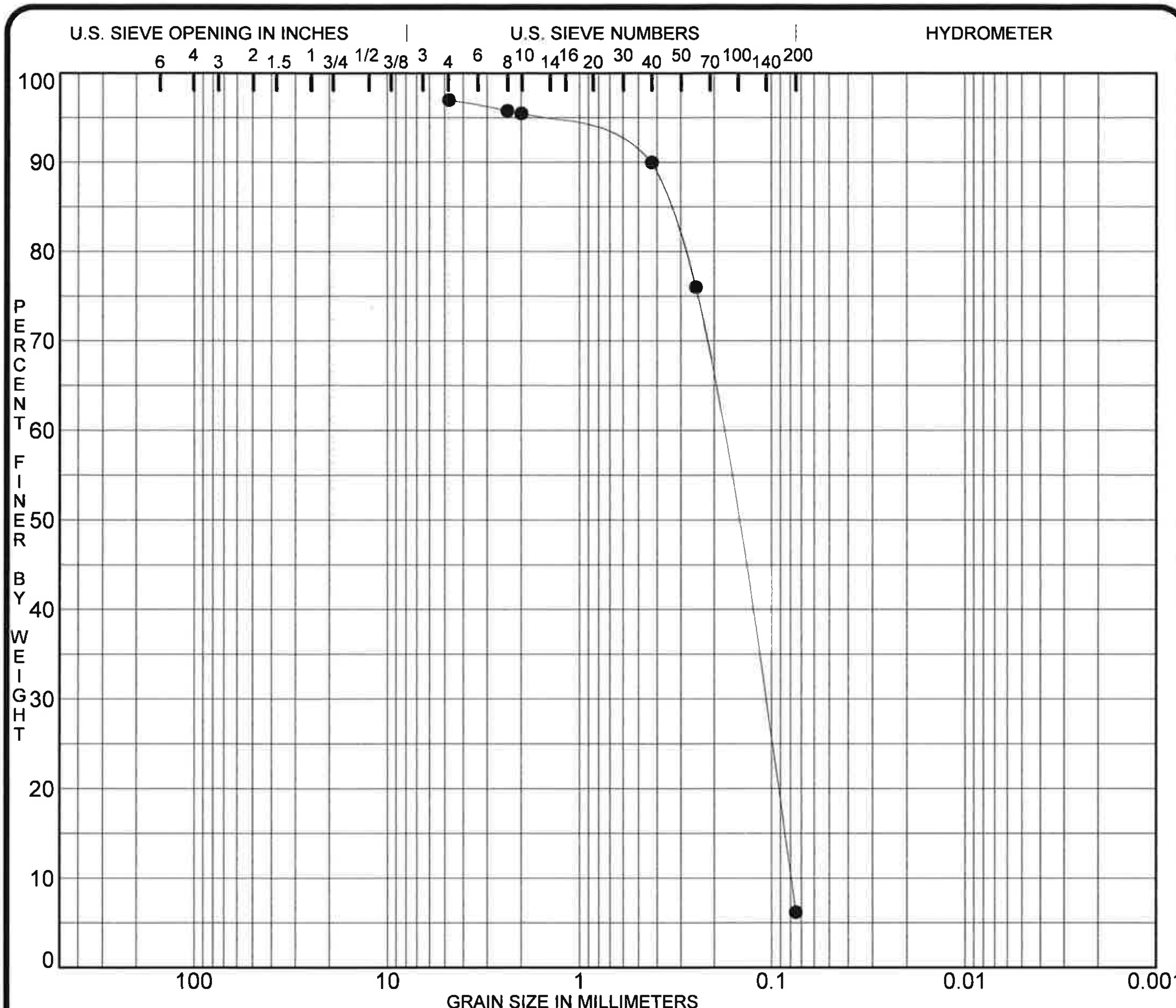

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	HA-04	2'- 5'	**POORLY GRADED SAND with SILT SP-SM**		**NP**	**NP**	**NP**	**0.84**	**2.4**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-04	2'- 5'	**4.75**	**0.19**	**0.113**	**0.0801**	**0.0**	**90.8**	**6.2**	

PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.

DATE **1/18/16**

GRADATION CURVES

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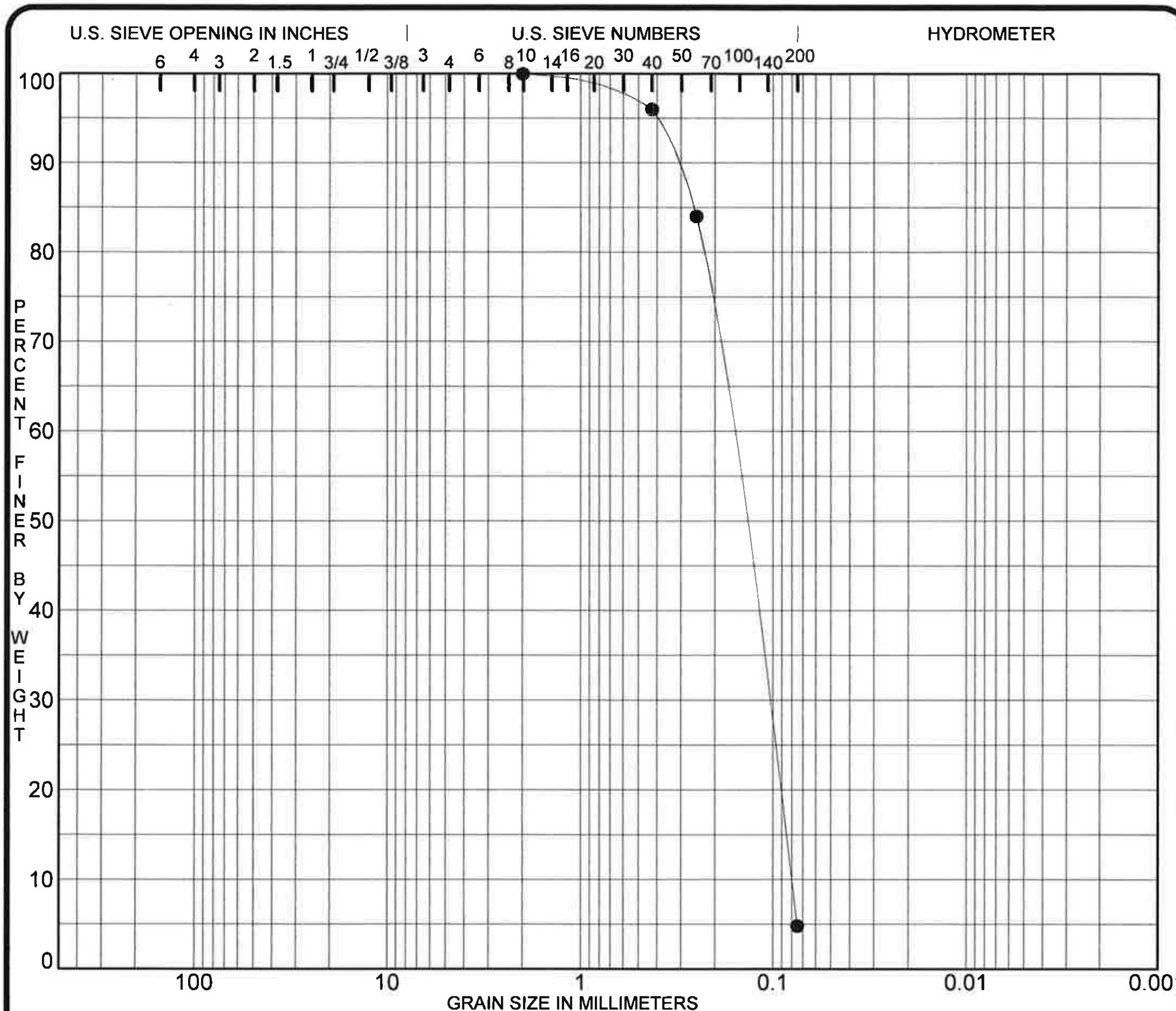

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● HA-17	1'- 3	**POORLY GRADED SAND SP**		**NP**	**NP**	**NP**	**0.86**	**2.1**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● HA-17	1'- 3'	**2.00**	**0.17**	**0.110**	**0.0812**	**0.0**	**95.2**	**4.8**	

PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.

DATE **1/18/16**

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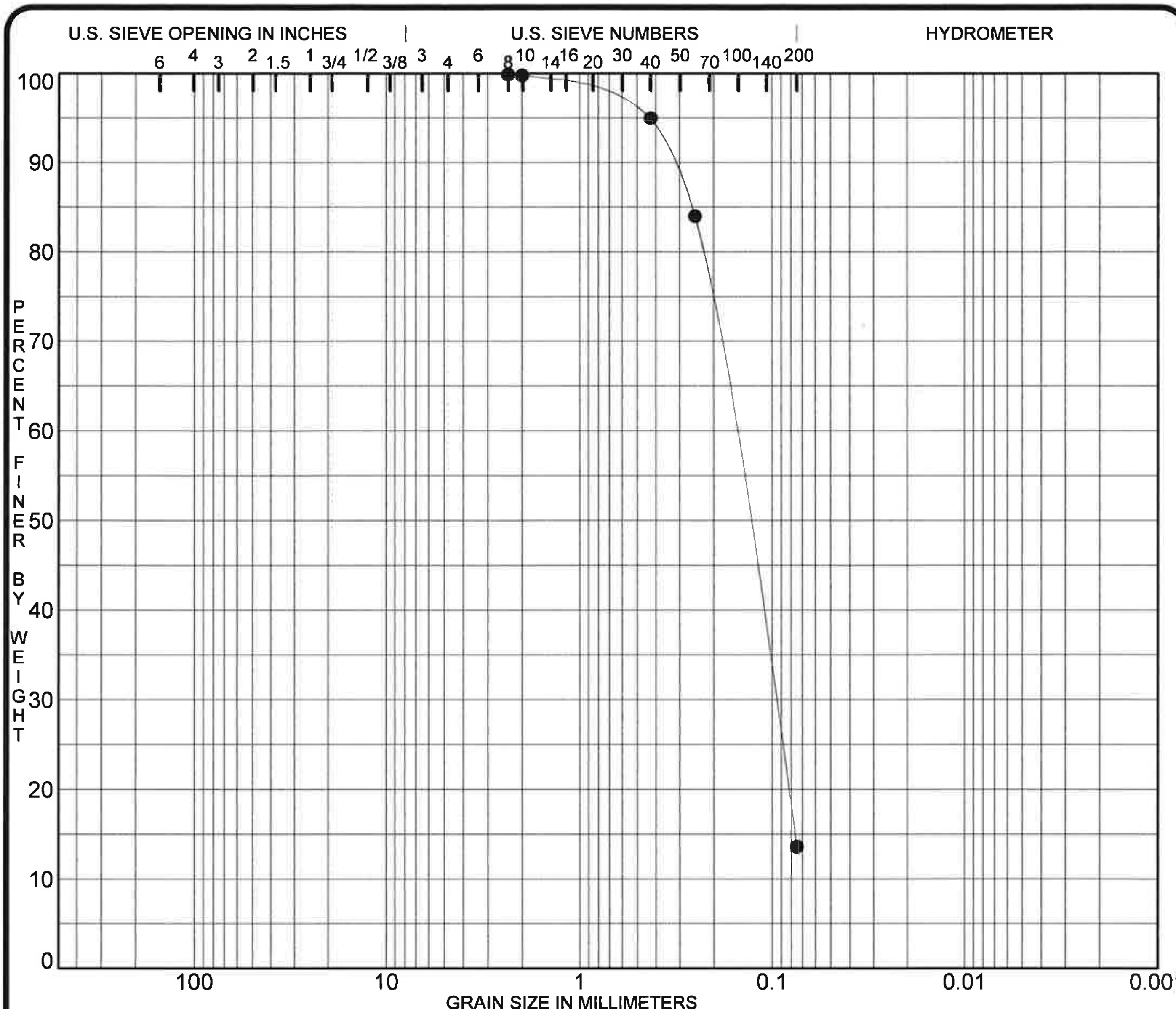

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**HA-19**	**3'- 5'**	**SILTY SAND SM**		**27**	**23**	**4**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**HA-19**	**3'- 5'**	**2.36**	**0.17**	**0.099**		**0.0**	**86.3**	**13.6**	

PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.
DATE **1/18/16**

GRADATION CURVES

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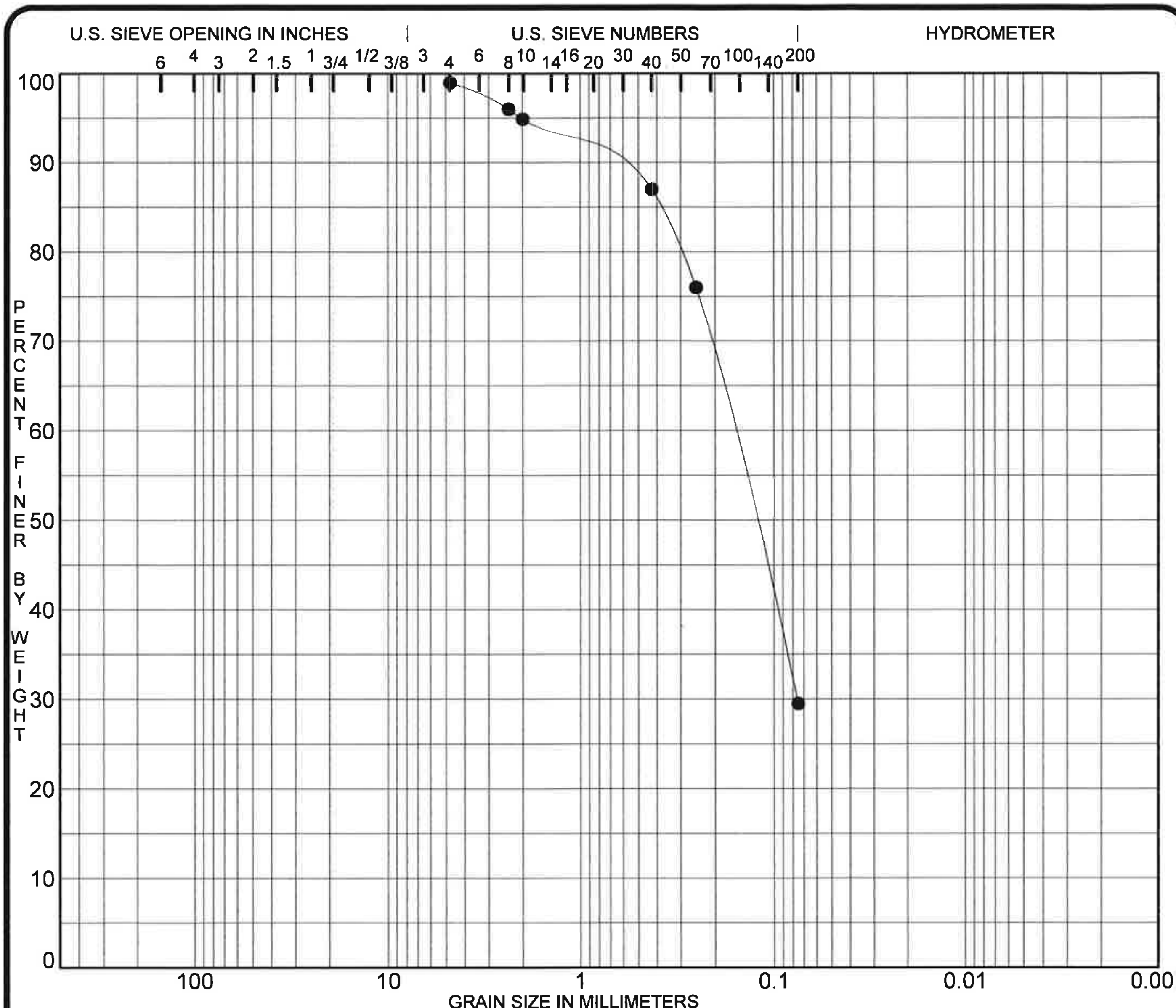

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	HA-24	1'- 5'	**SILTY SAND SM**		**NP**	**NP**	**NP**		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-24	1'- 5'	**4.75**	**0.17**	**0.076**		**0.0**	**69.5**	**29.5**	

PROJECT **Proposed 44th Ave E. Bridge -**

JOB NO.
DATE **1/18/16**

GRADATION CURVES

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Consultants In: Geotechnical Engineering
Environmental Sciences • Construction Material Testing
1748 Independence Blvd., Suite B-1 • Sarasota, FL 34234 • (941) 358-7410

SUMMARY OF LABORATORY RESULTS

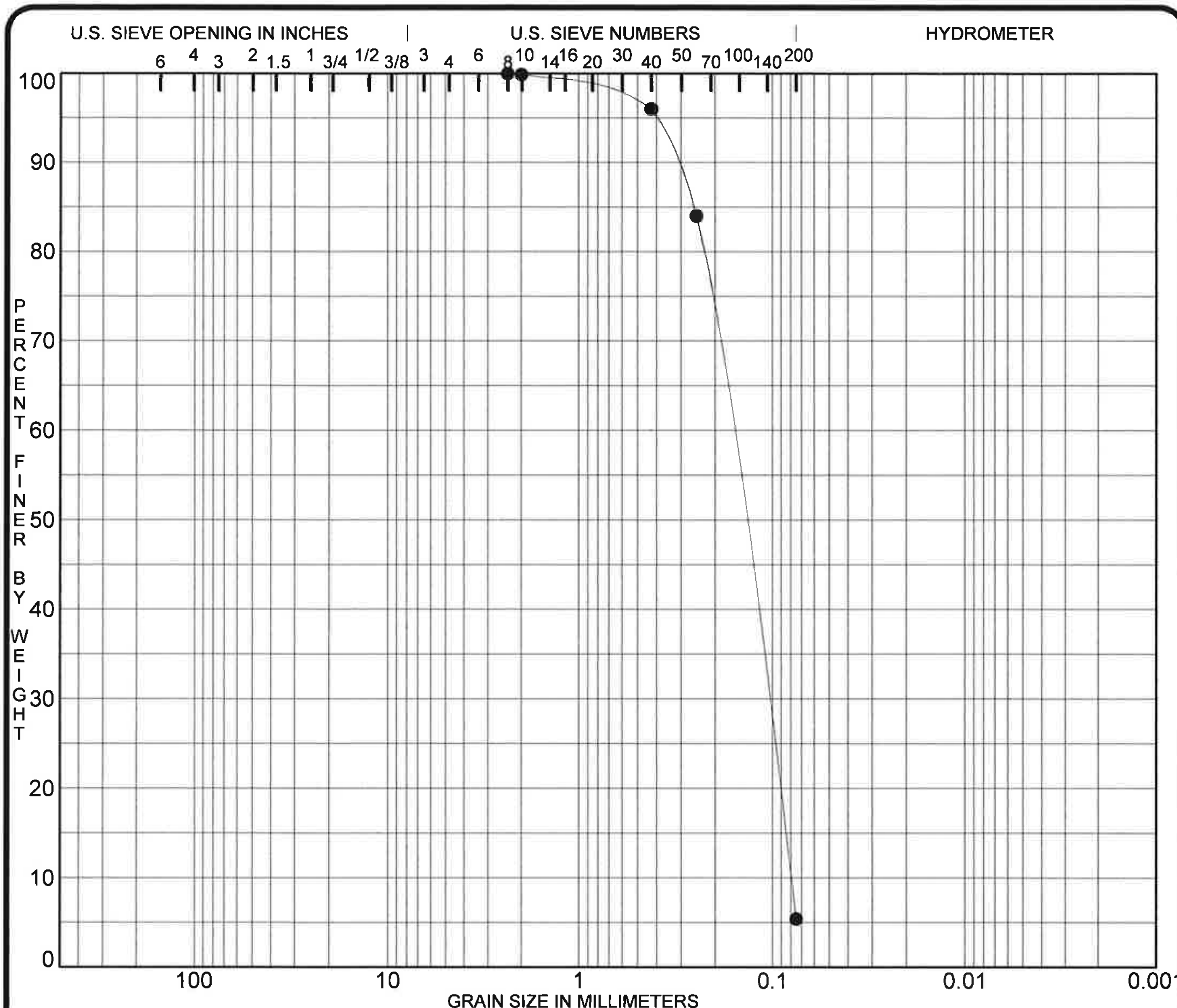
Project: Proposed 44th Ave E. Bridge

Project No.: 1130.1500167.0000

Client: URS

Report No.: 11358

Boring No.	Depth (Ft)	Sample Description	No. 200, %	Water Content, %	LL	PL	PI	Org	USCS Classification	Sampling Method (ASTM)
B-1	4	Light brown fine sand (SP)	2.4	21.8					SP	ASTM D1586
B-1	7	Dark gray clayey silt (CL)	59.2	93.1	25.5	16.5	9.0		CL	ASTM D1586
B-1	10	Dark gray clay (CH)	96.2	146.3	280.0	75.0	205.0		CH	ASTM D1586
B-1	14	Tan cemented clayey sand (SC)	35.8	37.9					SC	ASTM D1586
B-2	7	Dark green clay (CH)	98.9	150.2	358.0	95.0	263.0		CH	ASTM D1586
B-2	18	Gray cemented silty sand (SM)	32.0	25.1					SM	ASTM D1586
B-3	5	Dark brown cemented fine sand (SP)	2.6	19.4					SP	ASTM D1586
B-3	10	Dark green clay (CH)	56.1	75.6					CH	ASTM D1586
B-3	13	Light gray clay with phosphate (CL)	73.2	62.7					CL	ASTM D1586
B-4	2	Light gray clay (CL)	3.6	24.1					CL	ASTM D1586
B-4	16	Tan clayey silt (ML)	68.1	72.2					ML	ASTM D1586
B-5	3	Ligth gray clayey sand (SC)	36.5	24.5					SC	ASTM D1586
B-5	9	Dark olive gray silt (MH)	97.1	142.9	299.1	105.3	193.8		MH	ASTM D1586



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-1**	**2'-6'**						**0.86**	**2.2**
		8'-15'							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**2'-6'**	**2.36**	**0.17**	**0.109**	**0.0805**	**0.0**	**94.6**	**5.4**	
		8'-15'								

PROJECT **44th Ave. E. Bridge -**

JOB NO.

DATE **1/6/16**

GRADATION CURVES

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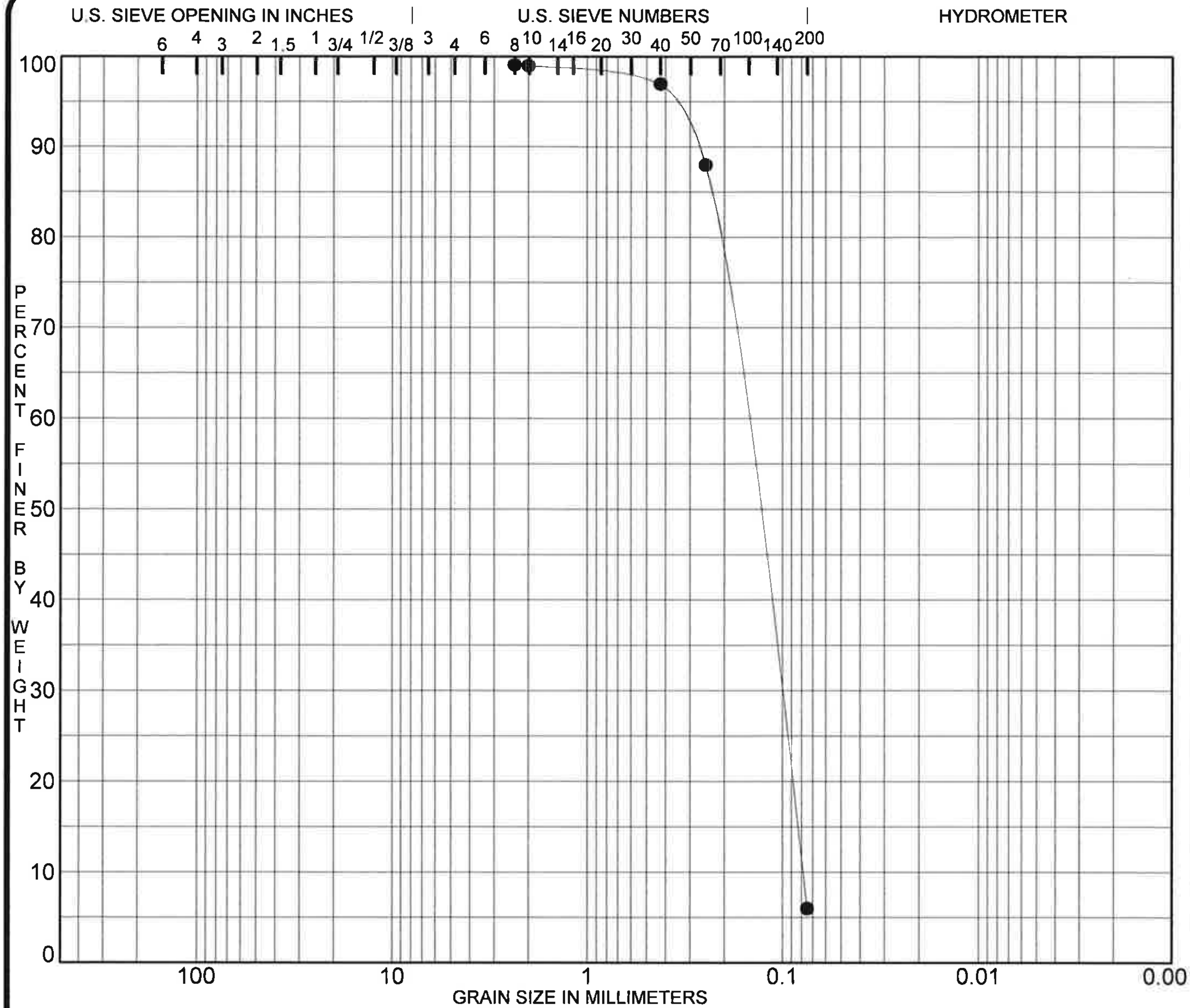

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-2**	**2'-10'**						**0.86**	**2.1**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**2'-10'**	**2.36**	**0.17**	**0.107**	**0.0795**	**0.0**	**93.1**	**6.0**	

PROJECT **44th Ave. E. Bridge -**

JOB NO.

DATE **1/6/16**

GRADATION CURVES

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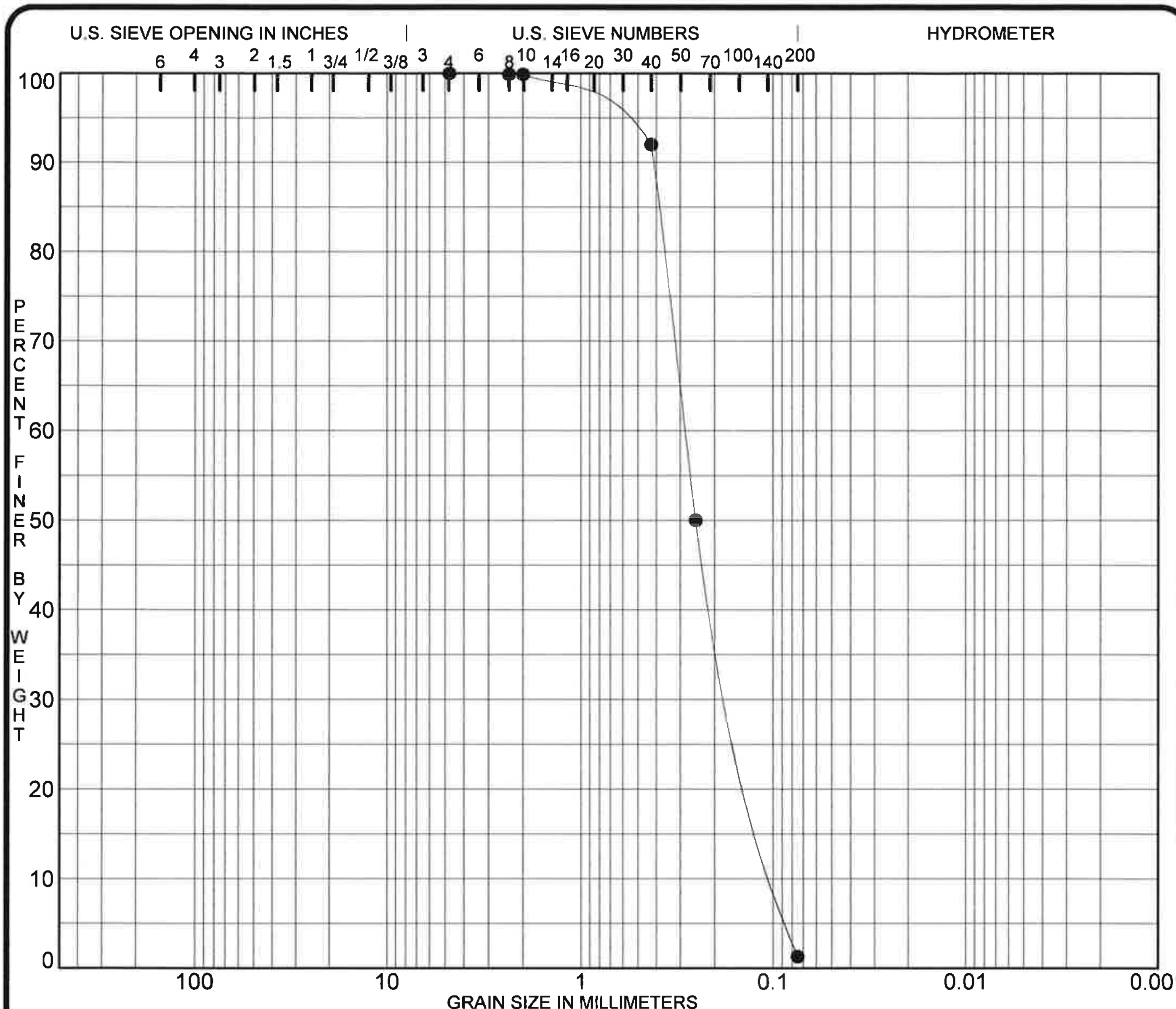

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-3**	**2'-8'**	**POORLY GRADED SAND SP**					**0.88**	**3.1**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-3**	**2'-8'**	**4.75**	**0.28**	**0.152**	**0.0930**	**0.0**	**98.7**	**1.3**	

PROJECT **44th Ave. E. Bridge -**

JOB NO.

DATE **1/6/16**

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1748 Independence Blvd., Suite B-1 • Sarasota, FL 34234 • (941) 358-7410

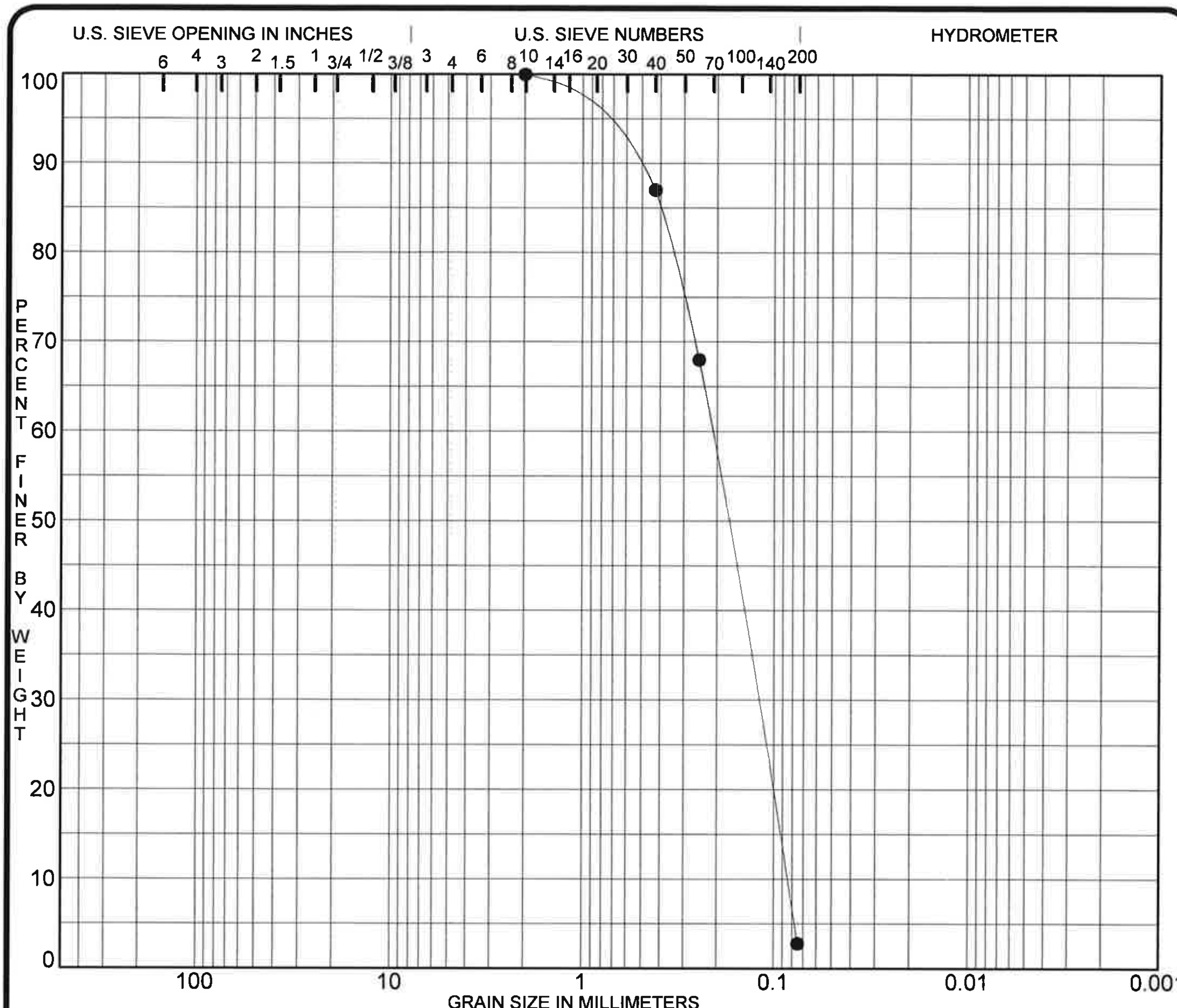
SUMMARY OF LABORATORY RESULTS

Project: 44th Ave. E.

Project No.: 1130.1500167.0000

Client: Aecom

Boring No.	Sample	Sample Description	No. 200, %	Water Content, %	LL	PL	PI	Org	USCS Classification
P1-1	5	Light gray fine sand with trace silt and shell fragments	4.4	18.7					SP
P3-4	6	Brown fine sand with silt	5.5	19.6					SP-SM
P3-17	3	Yellowish brown fine sand with silt	5.9	16.9					SP-SM
P3-20	6	Light gray fine sand with trace silt	2.8	17.2					SP
HA2-1	1	Dark gray fine sand with trace silt	4.3	1.6					SP
HA2-5	4	Brown fine sand with trace silt	1.0	14.9					SP
HA2-8	2	Light gray fine sand	1.3	14.8					SP
B2-4	6	Grey cemented clay	78.2	23.0	39.0	25.0	14.0		CL
B2-4	4	Grey cemented clay	90.0	19.2					CL
B2-8	4	Tan cemented silt	89.0	30.4					ML/MH
B2-9	11	Tan cemented clay	71.7	66.1					CL
B2-12	7	Dark grey clay	63.0	71.0	35.0	26.0	9.0		CL
B2-16	6	Light brown fine sand with trace silt	2.4	22.9					SP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**P3-20**	**6.0**	**POORLY GRADED SAND SP**					**0.83**	**2.5**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P3-20**	**6.0**	**2.00**	**0.22**	**0.124**	**0.0857**	**0.0**	**97.2**	**2.8**	

PROJECT **Proposed 44th Ave E. Extension Phase II -**

JOB NO.
DATE **9/26/16**

GRADATION CURVES

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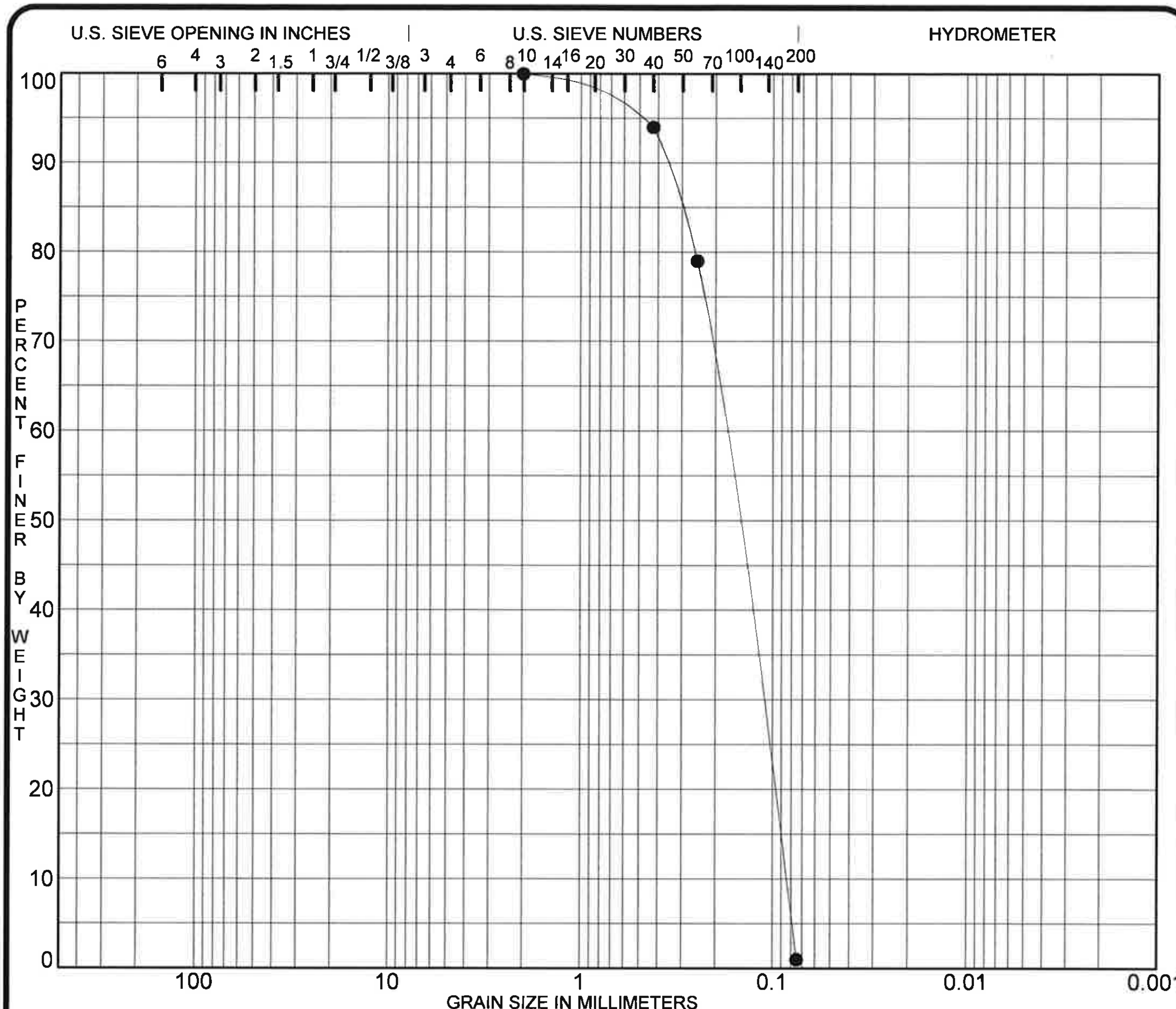

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● HA2-05	4.0	POORLY GRADED SAND SP					0.86	2.2

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● HA2-05	4.0	2.00	0.19	0.117	0.0862	0.0	99.0	1.0	

PROJECT **Proposed 44th Ave E. Extension Phase II -**

JOB NO.

DATE **9/26/16**

GRADATION CURVES

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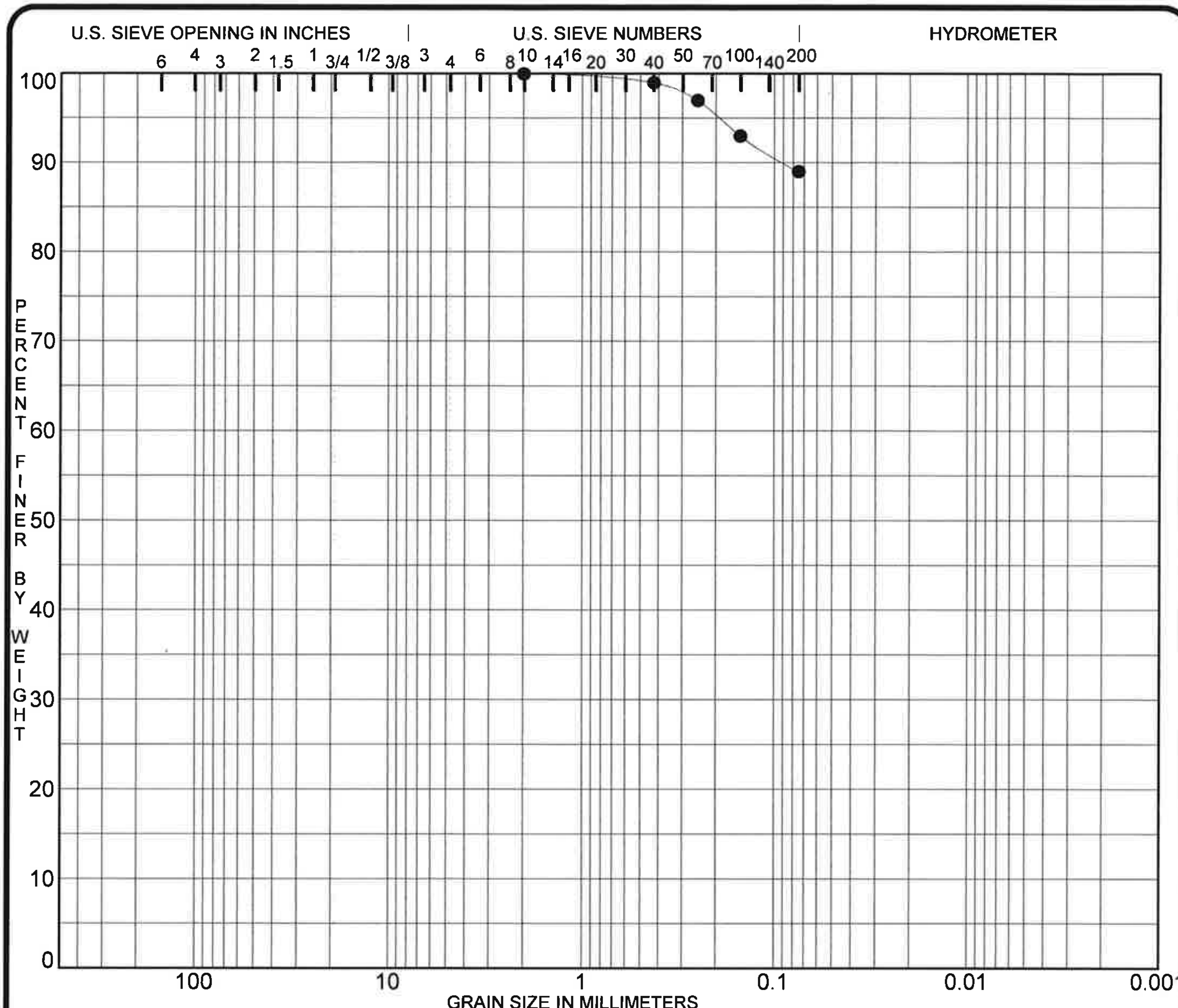

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B2-08**	**4.0**							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B2-08**	**4.0**	**2.00**				**0.0**	**11.0**	**89.0**	

PROJECT **Proposed 44th Ave E. Extension Phase II -**

JOB NO.

DATE **9/26/16**

GRADATION CURVES

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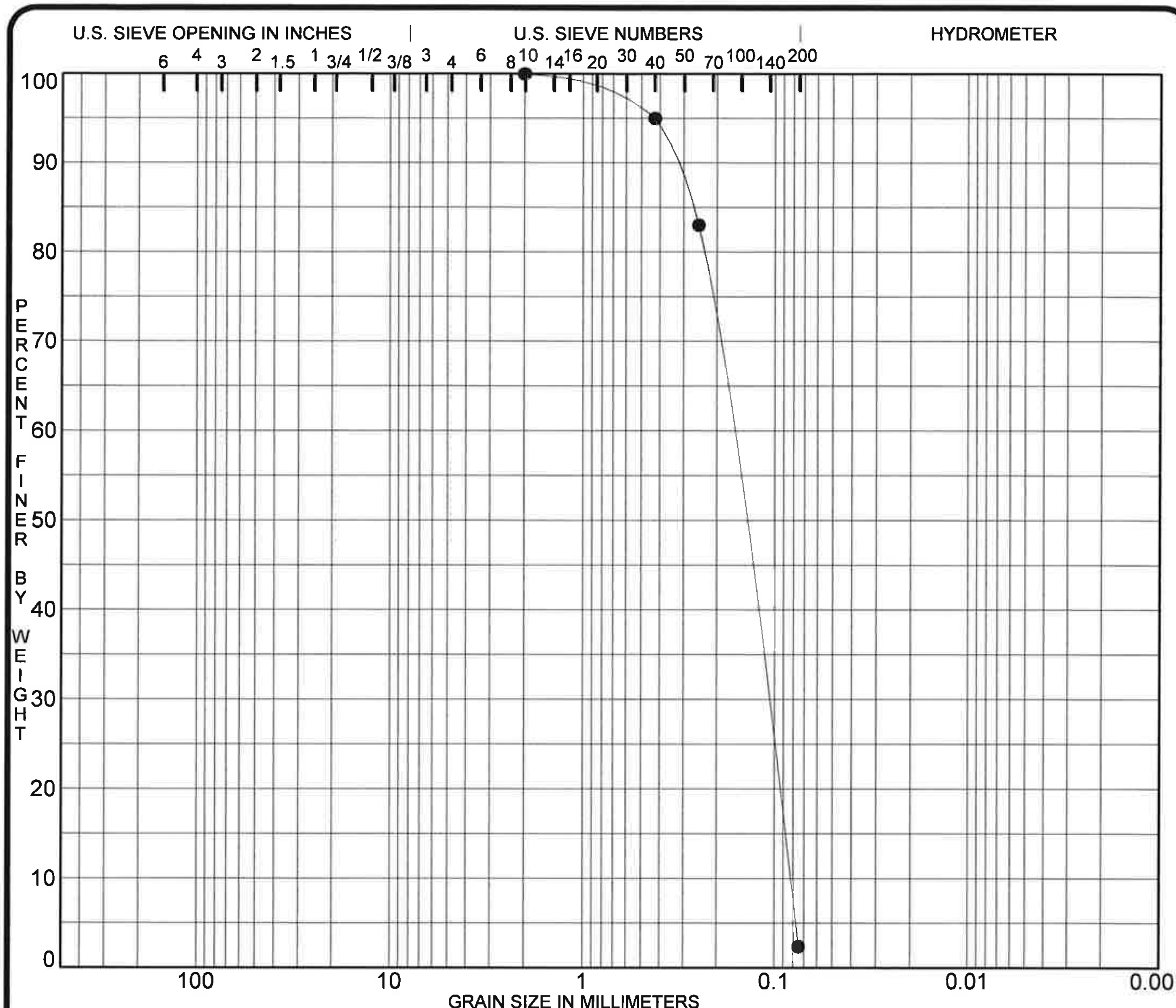

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	B2-16	6.0	POORLY GRADED SAND SP					0.86	2.1

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B2-16	6.0	2.00	0.18	0.113	0.0840	0.0	97.6	2.4	

PROJECT **Proposed 44th Ave E. Extension Phase II -**

JOB NO.

DATE **9/26/16**

GRADATION CURVES

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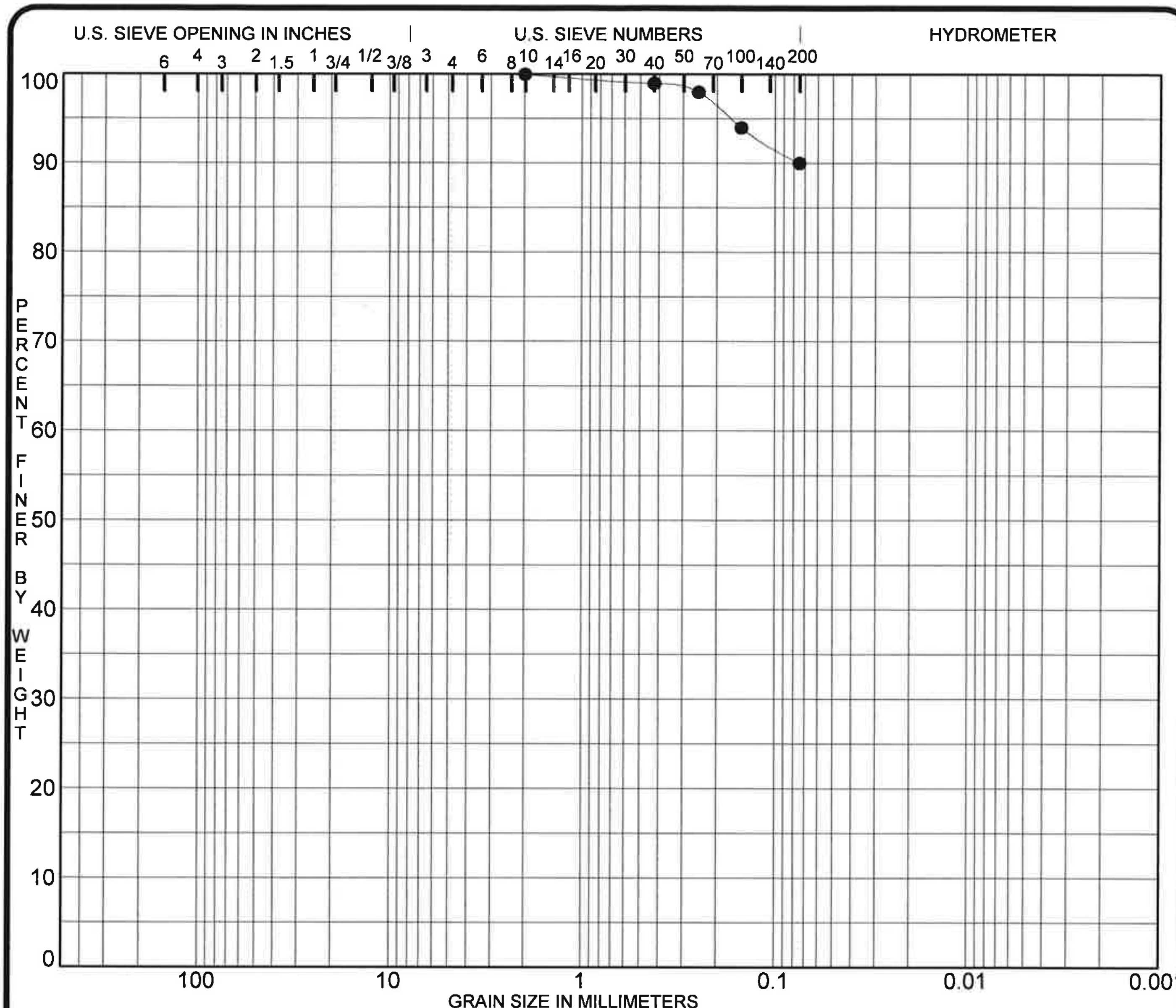

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B2-04	4.0							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B2-04	4.0	2.00				0.0	10.0	90.0	

PROJECT **Proposed 44th Ave E. Extension Phase II -**

JOB NO.

DATE **9/26/16**

GRADATION CURVES

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LIMEROCK BEARING RATIO

Client: AECOM
Project: 44th Ave East Roadway Project
Project No.: 1130.1500167.0000

Report Date: 1/25/2016
Report No.: L-MCPW-WA53-1
Technician: S. Dumbkowski

TEST DATA

SAMPLE

Description: Gray Brown sand trace shell
Location: HA-2

Source: Existing Ground
Passing #4: 91%

Date Sampled: 01/18/16

COMPACTION

Method: FM 5-515
Date: 01/23/16

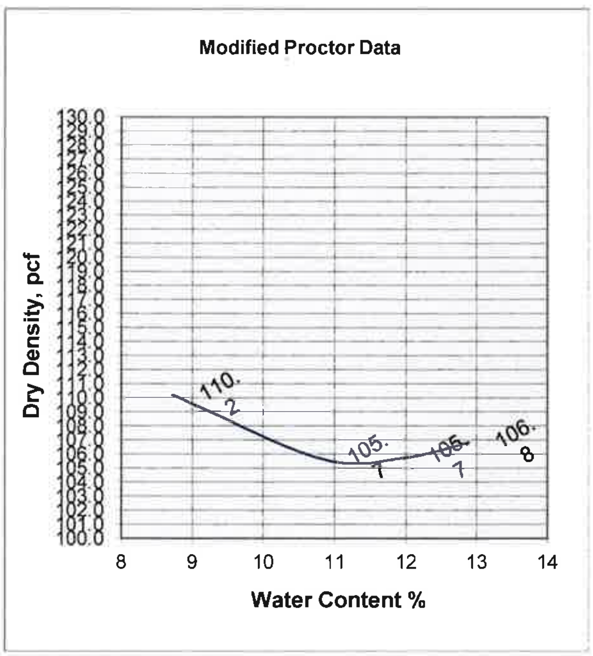
TESTING

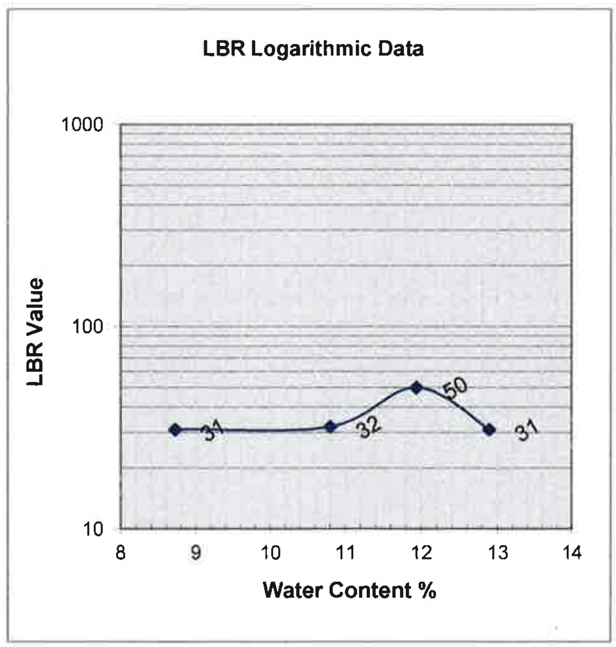
Surcharge:
Soak time: 48 +/- 4 hrs
Date: 01/25/16

REPORT DATA

Max. Dry Density:	**110**	**%Passing**
Optimum Water %:	**9**	**#200 Sieve**
		0.0%

Maximum LBR: 50





Universal Engineering Sciences, Inc.
Reviewed By

Matthew Janney
Lab Manager

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Consultants In: Geotechnical Engineering
Environmental Sciences • Construction Material Testing

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LIMEROCK BEARING RATIO

Client: AECOM
Project: 44th Ave East Roadway Project
Project No.: 1130.1500167.0000

Report Date: 1/25/2016
Report No.: L-MCPW-WA53-2
Technician: S. Dumbkowski

TEST DATA

SAMPLE

Description: Gray Brown sand trace shell/ silt
Location: HA-8
Source: Existing Ground
Passing #4: 82%

Date Sampled: 01/18/16

COMPACTION

Method: FM 5-515
Date: 01/23/16

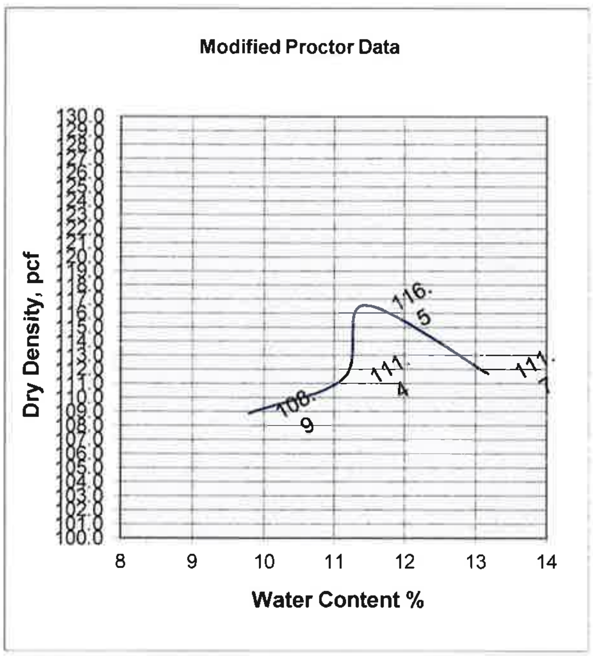
TESTING

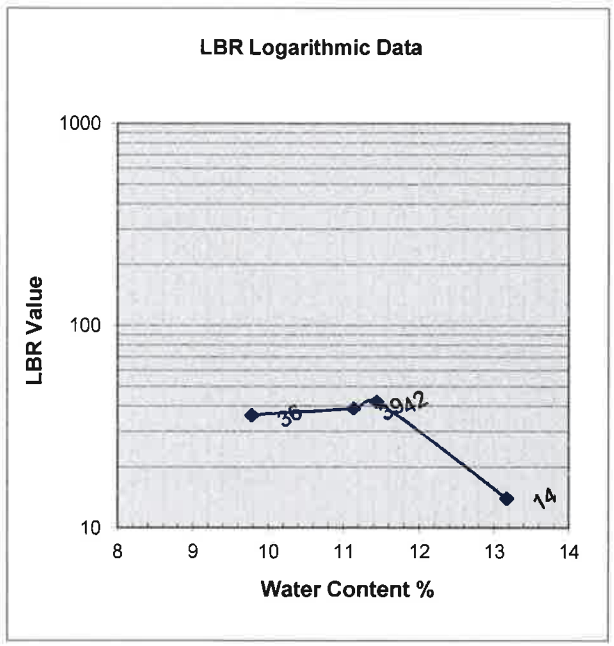
Surcharge:
Soak time: 48 +/- 4 hrs
Date: 01/25/16

REPORT DATA

Max. Dry Density:	117	%Passing
Optimum Water %:	12	#200 Sieve
		1.8%

Maximum LBR: 42





Universal Engineering Sciences, Inc.
Reviewed By

Matthew Janney
Lab Manager

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LIMEROCK BEARING RATIO

Client: AECOM
Project: 44th Ave East Roadway Project
Project No.: 1130.1500167.0000

Report Date: 1/25/2016
Report No.: L-MCPW-WA53-3
Technician: S. Dumbkowski

TEST DATA

SAMPLE

Description: Gray Brown sand trace silt
Location: HA-18
Source: Existing Ground
Passing #4: 100%

Date Sampled: 01/18/16

COMPACTION

Method: FM 5-515
Date: 01/23/16

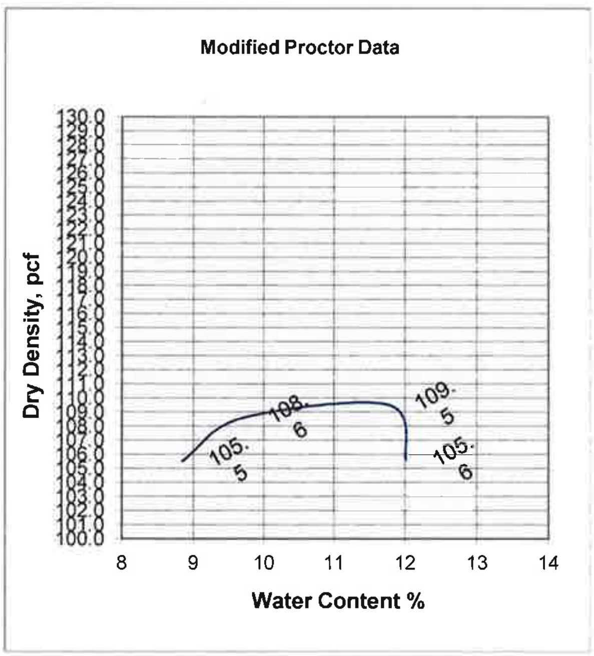
TESTING

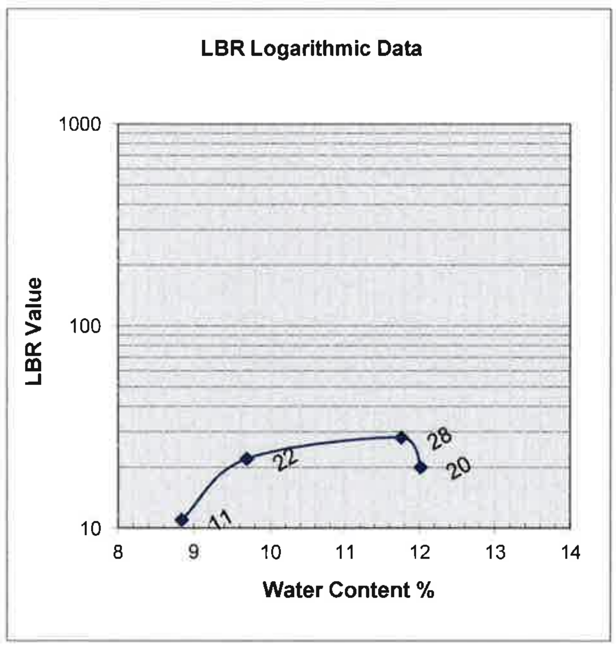
Surcharge:
Soak time: 48 +/- 4 hrs
Date: 01/25/16

REPORT DATA

Max. Dry Density:	**110**	**%Passing #200 Sieve**
Optimum Water %:	**12**	**1.2%**

Maximum LBR: 28





Universal Engineering Sciences, Inc.
Reviewed By

Matthew Janney
Lab Manager

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Consultants In: Geotechnical Engineering
Environmental Sciences • Construction Material Testing

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LIMEROCK BEARING RATIO

Client: AECOM
Project: 44th Ave East Roadway Project
Project No.: 1130.1500167.0000

Report Date: 1/25/2016
Report No.: L-MCPW-WA53-4
Technician: S. Dumbkowski

TEST DATA

SAMPLE

Description: Medium Brown sand trace silt
Location: HA-30
Source: Existing Ground
Passing #4: 100%

Date Sampled: 01/18/16

COMPACTION

Method: FM 5-515
Date: 01/23/16

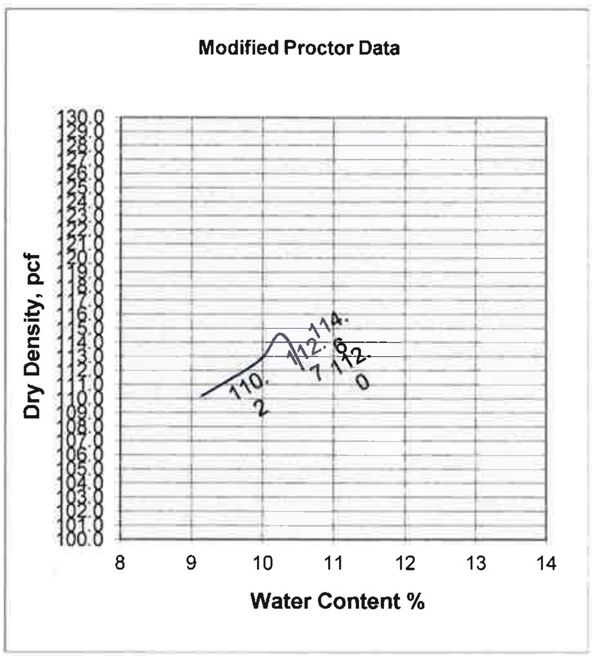
TESTING

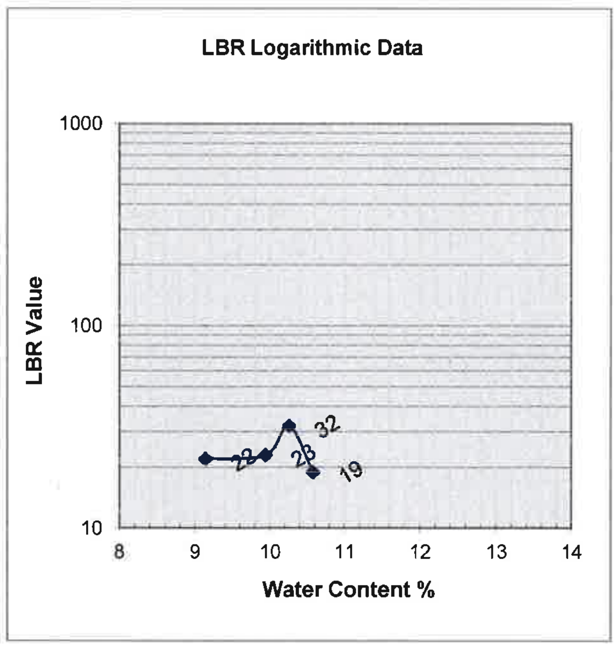
Surcharge:
Soak time: 48 +/- 4 hrs
Date: 01/25/16

REPORT DATA

Max. Dry Density:	115	%Passing #200 Sieve
Optimum Water %:	10	4.6%

Maximum LBR: 32





Universal Engineering Sciences, Inc.
Reviewed By

Matthew Janney
Lab Manager

SUMMARY OF CORROSION SERIES TESTS

SAMPLE	DATE TESTED	CHLORIDE PPM	SULFATE PPM	pH	RESISTIVITY OHM-CM
SOIL - BORING HA-11	1/15/2016	3.88	3.73	7.25	20800
SOIL - BORING HA-12	1/15/2016	11.81	29.5	8.31	4610
SOIL - BORING HA-13	1/15/2016	6.21	1717	4.72	750
SOIL - BORING HA-15	1/15/2016	3.64	3.49	7.76	13250
RANGE		**3.64 - 11.81**	**3.49 - 1717**	**4.72 - 8.31**	**750 - 20800**
WATER - BRADEN RIVER 1	1/29/2016	48.7	45.3	7.6	
WATER - BRADEN RIVER 2	10/12/2016	50.2	56	7.4	2500
RANGE		**48.7 - 50.2**	**45.3 - 56**	**7.4 - 7.6**	**25000**

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification #E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 16010289

Universal Engineering Sciences
1748 Independence Blvd. Ste B-1
Sarasota, FL 34234

Bruce Glasberg

Project Name : 44TH AVE. EAST EXTENSION
Date Received : 01/11/2016
Time Received : 1140

Submission Number: 16010289
Sample Number: 001
Sample Description: HA-11

Sample Date: 01/07/2016
Sample Time: N/A
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
CALCIUM	370	MG/KG	0.717	2.868	6010	01/27/2016 15:38	KC
PH	7.25 Q	UNITS			9045	01/11/2016 14:59	KP
CHLORIDE	3.88 U	MG/KG	3.88	15.52	9056	01/15/2016 10:00	DN
SULFATE	3.73 U	MG/KG	3.73	14.92	9056	01/15/2016 10:00	DN
TOTAL ALKALINITY (CACO3)	0.002 U	MG/KG	0.002	0.008	SM2320B	01/15/2016 09:00	DW
TOTAL SOLIDS	90.9	% DRY WT	0.1	0.4	SM2540G	01/12/2016 09:38	JG

Submission Number: 16010289
Sample Number: 002
Sample Description: HA-12

Sample Date: 01/07/2016
Sample Time: N/A
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
CALCIUM	4278	MG/KG	0.721	2.884	6010	01/27/2016 15:43	KC
PH	8.31 Q	UNITS			9045	01/11/2016 14:59	KP
CHLORIDE	11.8 I	MG/KG	4.34	17.36	9056	01/15/2016 10:00	DN
SULFATE	29.5	MG/KG	4.17	16.68	9056	01/15/2016 10:00	DN
TOTAL ALKALINITY (CACO3)	1500	MG/KG	0.002	0.008	SM2320B	01/15/2016 09:00	DW
TOTAL SOLIDS	81.4	% DRY WT	0.1	0.4	SM2540G	01/12/2016 09:38	JG

Submission Number: 16010289
Sample Number: 003
Sample Description: HA-13

Sample Date: 01/07/2016
Sample Time: N/A
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst

CALCIUM	872	MG/KG	0.724	2.896	6010	01/27/2016 15:47	KC
PH	4.72 Q	UNITS			9045	01/11/2016 14:59	KP
CHLORIDE	6.21 I	MG/KG	4.43	17.72	9056	01/15/2016 10:00	DN
SULFATE	1717	MG/KG	4.25	17.00	9056	01/15/2016 10:00	DN
TOTAL ALKALINITY (CACO3)	500	MG/KG	0.002	0.008	SM2320B	01/15/2016 09:00	DW
TOTAL SOLIDS	79.7	% DRY WT	0.1	0.4	SM2540G	01/12/2016 09:38	JG

Submission Number: 16010289 **Sample Date:** 01/07/2016
Sample Number: 004 **Sample Time:** N/A
Sample Description: HA-15 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
CALCIUM	320	MG/KG	0.711	2.844	6010	01/27/2016 15:52	KC
PH	7.76 Q	UNITS			9045	01/11/2016 14:59	KP
CHLORIDE	3.64 U	MG/KG	3.64	14.56	9056	01/15/2016 10:00	DN
SULFATE	3.49 U	MG/KG	3.49	13.96	9056	01/15/2016 10:00	DN
TOTAL ALKALINITY (CACO3)	0.002 U	MG/KG	0.002	0.008	SM2320B	01/15/2016 09:00	DW
TOTAL SOLIDS	97.1	% DRY WT	0.1	0.4	SM2540G	01/12/2016 09:38	JG

Tulay Tanrisever

Dale D. Dixon / Laboratory Director 02/05/2016 Date
Tülay Tanrisever / QC Officer
Deborah A. Murphy / Project Manager

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.
B = Results based upon colony counts outside the ideal range..
H = Value based on field kit determination. Results may not be accurate.
I = Reported value is between the laboratory MDL and the PQL.
J1 = Estimated value. Surrogate recovery limits exceeded.
J2 = Estimated value. No quality control criteria exists for component.
J3 = Estimated value. Quality control criteria for precision or accuracy not met.
J4 = Estimated value. Sample matrix interference suspected.
J5 = Estimated value. Data questionable due to improper lab or field protocols.
K = Off-scale low. Value is known to be < the value reported.
L = Off-scale high. Value is known to be > the value reported.
N = Presumptive evidence of presence of material.
O = Sampled, but analysis lost or not performed.
Q = Sample held beyond accepted hold time.
T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.
U = Analyte analyzed but not detected at the value indicated.
V = Analyte detected in sample and method blank. Results for this analyte in associated samples may be biased high. Standard, Duplicate and Spike values are within control limits. Reported data are usable.
Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.
Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.
! = Data deviate from historically established concentration ranges.
? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the presence or absence of the analyte cannot be determined from the data.
* = Not reported due to interference.

NOTES:

MBAS calculated as LAS; molecular weight = 340.
PQL = 4xMDL.
ND = Not detected at or above the adjusted reporting limit.
X = Value exceeds MCL.

COMMENTS:

For questions or comments regarding these results, please contact us at (941) 723-9986.
Results relate only to the samples.

RESISTIVITY TESTING

PROJECT:	Benchmark Enviro Analytical
CLIENT:	Benchmark Enviro Analytical, Inc.
DATE PERFORMED:	01/15/16
DATE REPORTED:	02/04/16
FILE NUMBER:	L159846
REPORT NUMBER:	03
PAGE NUMBER:	1 of 2

As requested, resistivity tests were performed on materials that were delivered to our Clearwater laboratory from the above referenced project on this date.

Technician performed resistivity testing with results on the attached data sheet.

If you should have any questions please do not hesitate to contact our Clearwater office.

S. Farthing
Scott Farthing, Technician

Nicholas T. Korecki
Nicholas T. Korecki, P.E.
Senior Geotechnical Engineer
FL Registration No. 45529

NICHOLAS T. KORECKI
LICENSE
No. 45529
STATE OF FLORIDA
PROFESSIONAL ENGINEER

SF:FJD/ljm
Copy: (3) Benchmark Enviro Analytical, Inc.

Sarasota
Phone: 727.471.6655
Fax: 941.371.8962
saroffice@driggers-eng.com

Clearwater
P.O. Box 17839 • Clearwater, Florida 33762
Phone: 727.571.1313 • Fax: 727.471.6653
clwoffice@driggers-eng.com

Spring Hill
Phone: 727.471.6657
Fax: 727.471.6653
sphilloffice@driggers-eng.com

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	SPL NO.	DEPTH (ft)	DESCRIPTION	W %	γ_d (pcf)	G_s	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON	** G.S. -200	ORG (%)	pH	Cl. (ppm)	SO_4 (ppm)	RESISTIVITY (Ohm-cm)
							LL	PL	PI									
HA-11	#2	1' - 2'	Brown Fine SAND															20800 ohm-cm
HA-12	#2	1' - 2'	Brown and Dark Gray Slightly Silty Fine SAND															4610 ohm-cm
HA-13	#2	1' - 3'	Dark Gray Slightly Organic Fine SAND with Roots															750 ohm-cm
HA-15	#2	1' - 2'	Gray Fine SAND															13250 ohm-cm

W % = Water Content
Y_d(pcf) = Dry Density
G_S = Specific Gravity
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
P.P. (tsf) = Pocket Penetrometer
U.C. = Unconfined Compression

Con. = Consolidation Test
G.S. (H) = Grainsize Analysis (Hydrometer)
ORG. (%) = Organic Content
Cl. (ppm) = Total Chloride
SO_4 (ppm) = Total Sulfate
RES. (ohm-cm) = Lab Resistivity
* = See Test Curves
** = Percent Passing No. 200 Sieve

CLIENT: Benchmark Enviro Analytical, Inc.

PROJECT: Benchmark Enviro Analytical

FILE-REPORT: L159846-03

PAGE: 2 of 2

Benchmark EnviroAnalytical,Inc
1711 12th Street East
Palmetto, Fl 34221
941-723-9986
941-723-6061 Fax
www.benchmarkea.com

Client Information: **Universal Engineering Sciences, Inc.**
1748 Independence Blvd., B-1
Sarasota, FL 34234
Office: 941-358-7410
Mobile: 941- 526-7304 - Bruce
FAX: 941-358-7353

Project Name: 44th Ave. East Extension
PO # 1130.1500167

Laboratory Submission # 16010289 *

Sample Name	Sample Depth	Sample Type[1] / Sample Matrix[2]	Collection Date	Collection Time	Container Qty	Container Capacity	Container Type[3]	Preservative[4]	Parameters for Analysis	Laboratory Sample #
HA-11	1-2'	Grab / ~~Sand~~* Soil	01/07/~~15~~ 16 *	N/A	1	~~12oz.~~* Ziploc	P	Plain	*Corrosion Test: SO4 Cl pH T-Alka. * ~~TDS~~ *TSS TS Ca	1
					1	12oz.	P	Plain	Resistivity**	
HA-12	1-2'			N/A	1	~~12oz.~~* Ziploc	P	Plain	*Corrosion Test: SO4 Cl pH T-Alka. * ~~TDS~~ *TSS TS Ca	2
					1	12oz.	P	Plain	Resistivity**	
HA-13	1-3'			N/A	1	~~12oz.~~* Ziploc	P	Plain	*Corrosion Test: SO4 Cl pH T-Alka. * ~~TDS~~ *TSS TS Ca	3
					1	12oz.	P	Plain	Resistivity**	
HA-15	1-2'			N/A	1	~~12oz.~~* Ziploc	P	Plain	*Corrosion Test: SO4 Cl pH T-Alka. * ~~TDS~~ *TSS TS Ca	4
					1	12oz.	P	Plain	Resistivity**	

*No COC received with sample, all information taken from attached paper.
**Majority of sample sent to subcontract lab, they require more volume for analysis.

unable to analyze in soil BB 02/05/16.
*[illegible] 01/11/16

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), fresh surface water (FSW), saline surface water (SSW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).**
Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability:
pH <2 : ☐
BEA Temperature: 18.2°c

1	Collected By:	Date 1/11/16	Time	Received By:	01/08/16 1140

INTERLABORATORY SAMPLE TRANSMITTAL FORM

Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221
(941) 723-9986
(941) 723-6061 fax
WWW.Benchmarkea.com
Office QC Check: ________
Bottle Check: ________

Date:	01/11/16		
# of Samples:	4	Total # of Bottles:	4
Method of Shipment:	UPS Standard		
Subcontract Laboratory:	Driggers Engineering Services Inc 6185 Danner Drive Sarasota, FL 34240 941-371-3949		
Page	1	of	1

Laboratory Submission #	Collection		Sample Matrix*	Collection Method**	Preservative	Container			Parameters	Comments
	Date	Time				Qty	Capacity	Type***		
16010298-1	01/07/16	N/A	Sediment	Grab	Plain	1	12 oz.	P	Resistivity	
16010298-2	01/07/16	N/A	Sediment	Grab	Plain	1	12 oz.	P	Resistivity	
16010298-3	01/07/16	N/A	Sediment	Grab	Plain	1	12 oz.	P	Resistivity	
16010298-4	01/07/16	N/A	Sediment	Grab	Plain	1	12 oz.	P	Resistivity	

* Sample Matrix abbreviations: Groundwater (GW), Surface Water (SW), Saline Surface Water (SSW), Fresh Surface Water(FSW), Drinking Water (DW), Sludge (Sldg), Solid (Sol), Soil (Soil), Domestic Effluent (Dom Eff), Industrial Effluent (Ind Eff).
** Sample Method abbreviations: Grab (G), Composite (C), 24 Hour Composite (24HR Comp.).
*** Container Type abbreviations: Plastic (P), Glass (G).

Relinquished By: (Benchmark)	Sign Name:		Date:	01/11/16	Received By:		Date:	01/11/16
	Print Name:	Annah Jensen	Time:	1600		UPS	Time:	1600
Relinquished By:	Sign Name:		Date:		Received By:		Date:	
	Print Name:		Time:				Time:	

Analytical Summary - Water

Facility Name: **44th ST. Bridge** Facility ID:

Sample ID	Date Collected	Chloride	Specific Conductance @ 25C	Sulfate	Temperature, Water (C)	pH at 25 Degrees C
		ug/L	umhos/cm	ug/L	deg C	Std. Units
GCTL		250000		250000		
NADSC		2500000		2500000		
Braden River	01/29/2016	**48700**	**506**	**45300**	**20.0**	**7.6**

Test being redone

Pace Analytical Services, Inc.
5460 Beaumont Center Blvd - Suite 520
Tampa, FL 33634
(813)881-9401

February 05, 2016

Bruce Glasberg
Universal Engineering Sciences
1748 Independence Blvd.
Suite B-1
Sarasota, FL 34234

RE: Project: 44th ST. Bridge
Pace Project No.: 35227546

Dear Bruce Glasberg:

Enclosed are the analytical results for sample(s) received by the laboratory on February 01, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Mike Valder
mike.valder@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
5460 Beaumont Center Blvd - Suite 520
Tampa, FL 33634
(813)881-9401

CERTIFICATIONS

Project:	44th ST. Bridge
Pace Project No.:	35227546

Ormond Beach Certification IDs

8 East Tower Circle, Ormond Beach, FL 32174
Alabama Certification #: 41320
Connecticut Certification #: PH-0216
Delaware Certification: FL NELAC Reciprocity
Florida Certification #: E83079
Georgia Certification #: 955
Guam Certification: FL NELAC Reciprocity
Hawaii Certification: FL NELAC Reciprocity
Illinois Certification #: 200068
Indiana Certification: FL NELAC Reciprocity
Kansas Certification #: E-10383
Kentucky Certification #: 90050
Louisiana Certification #: FL NELAC Reciprocity
Louisiana Environmental Certificate #: 05007
Maryland Certification: #346
Michigan Certification #: 9911
Mississippi Certification: FL NELAC Reciprocity
Missouri Certification #: 236
Montana Certification #: Cert 0074
Nebraska Certification: NE-OS-28-14
Nevada Certification: FL NELAC Reciprocity
New Hampshire Certification #: 2958
New York Certification #: 11608
North Carolina Environmental Certificate #: 667
North Carolina Certification #: 12710
North Dakota Certification #: R-216
Oklahoma Certification #: D9947
Pennsylvania Certification #: 68-00547
Puerto Rico Certification #: FL01264
South Carolina Certification: #96042001
Tennessee Certification #: TN02974
Texas Certification: FL NELAC Reciprocity
US Virgin Islands Certification: FL NELAC Reciprocity
Virginia Environmental Certification #: 460165
West Virginia Certification #: 9962C
Wisconsin Certification #: 399079670
Wyoming (EPA Region 8): FL NELAC Reciprocity

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Tampa, FL 33634
(813)881-9401

SAMPLE SUMMARY

Project: 44th ST. Bridge
Pace Project No.: 35227546

Lab ID	Sample ID	Matrix	Date Collected	Date Received
35227546001	**Braden River**	Water	01/29/16 10:00	02/01/16 08:30

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SAMPLE ANALYTE COUNT

Project: 44th ST. Bridge
Pace Project No.: 35227546

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
35227546001	**Braden River**	SM 2510B	KAM	1	PASI-O
		SM 4500-H+B	KAM	2	PASI-O
		EPA 300.0	CMB	2	PASI-O

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SUMMARY OF DETECTION

Project: 44th ST. Bridge
Pace Project No.: 35227546

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
35227546001	**Braden River**					
SM 2510B	Specific Conductance @ 25C	506	umhos/cm	10.0	02/03/16 09:55	
SM 4500-H+B	Temperature, Water (C)	20.0	deg C	0.010	02/04/16 12:30	Q
SM 4500-H+B	pH at 25 Degrees C	7.6	Std. Units	0.10	02/04/16 12:30	Q
EPA 300.0	Chloride	48.7	mg/L	5.0	02/03/16 20:07	
EPA 300.0	Sulfate	45.3	mg/L	5.0	02/03/16 20:07	

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Tampa, FL 33634
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ANALYTICAL RESULTS

Project: 44th ST. Bridge
Pace Project No.: 35227546

Sample: Braden River **Lab ID: 35227546001** Collected: 01/29/16 10:00 Received: 02/01/16 08:30 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
2510B Specific Conductance	Analytical Method: SM 2510B								
Specific Conductance @ 25C	**506**	umhos/cm	10.0	10.0	1		02/03/16 09:55		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B								
Temperature, Water (C)	**20.0**	deg C	0.010	0.010	1		02/04/16 12:30		Q
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.10	1		02/04/16 12:30		Q
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**48.7**	mg/L	5.0	2.5	1		02/03/16 20:07	16887-00-6	
Sulfate	**45.3**	mg/L	5.0	2.5	1		02/03/16 20:07	14808-79-8	

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Tampa, FL 33634
(813)881-9401

QUALITY CONTROL DATA

Project: 44th ST. Bridge
Pace Project No.: 35227546

QC Batch: WET/35669 | Analysis Method: SM 2510B
QC Batch Method: SM 2510B | Analysis Description: 2510B Specific Conductance
Associated Lab Samples: 35227546001

METHOD BLANK: 1467745 | Matrix: Water
Associated Lab Samples: 35227546001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Specific Conductance @ 25C	umhos/cm	10.0 U	10.0	10.0	02/03/16 09:55	

LABORATORY CONTROL SAMPLE: 1467746

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Specific Conductance @ 25C	umhos/cm	1410	1410	100	95-105	

SAMPLE DUPLICATE: 1467747

Parameter	Units	35227291001 Result	Dup Result	RPD	Max RPD	Qualifiers
Specific Conductance @ 25C	umhos/cm	ND	10.0 U		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 44th ST. Bridge
Pace Project No.: 35227546

QC Batch: WETA/54605 | Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 | Analysis Description: 300.0 IC Anions
Associated Lab Samples: 35227546001

METHOD BLANK: 1468407 | Matrix: Water
Associated Lab Samples: 35227546001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	2.5 U	5.0	2.5	02/03/16 17:59	
Sulfate	mg/L	2.5 U	5.0	2.5	02/03/16 17:59	

LABORATORY CONTROL SAMPLE: 1468408

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	50	48.2	96	90-110	
Sulfate	mg/L	50	48.3	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1468409 1468410

Parameter	Units	35227574001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	419	250	250	692	695	109	110	90-110	0	20	L
Sulfate	mg/L	66.9	250	250	309	309	97	97	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1468411 1468412

Parameter	Units	35227575002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	1650	2500	2500	4190	4190	101	102	90-110	0	20	
Sulfate	mg/L	297	2500	2500	2600	2590	92	92	90-110	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Tampa, FL 33634
(813)881-9401

QUALIFIERS

Project:	44th ST. Bridge
Pace Project No.:	35227546

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-O	Pace Analytical Services - Ormond Beach

ANALYTE QUALIFIERS

U	Compound was analyzed for but not detected.
L	Off-scale high. Actual value is known to be greater than value given.
Q	Sample held beyond the accepted holding time. Analysis initiated more than 15 minutes after sample collection.
Q	Sample held beyond the accepted holding time. Sample was received outside EPA method holding time.

Pace Analytical Services, Inc.
5460 Beaumont Center Blvd - Suite 520
Tampa, FL 33634
(813)881-9401

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 44th ST. Bridge
Pace Project No.: 35227546

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
35227546001	**Braden River**	SM 2510B	WET/35669		
35227546001	**Braden River**	SM 4500-H+B	WET/35711		
35227546001	**Braden River**	EPA 300.0	WETA/54605		

Pace Analytical

WO# : 35227546

35227546

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

6577 Lc 31

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Universal Engineering Sciences - Sarasota	Report To:	Bruce Glasberg	Attention:	
Address:	1748 Independence Blvd.	Copy To:		Company Name:	
Sarasota, FL 34234				Address:	
Email:	bglasberg@uesorl.com	Purchase Order #:	1130 - 1500169	Pace Quote:	
Phone:	(941) 358-7410 Fax:	Project Name:	44th ST. Bridge	Pace Project Manager:	mike.valder@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	

Regulatory Agency:

State / Location: FL

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	pH, Cl, SO_4, Cond	Residual Chlorine (Y/N)
1	Braden River			1/29	10Am														✓	
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

Requested Analysis Filtered (Y/N)

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
Empty Containers	[signature] Pace	4/27/16	1312	[signature]			
				[signature] Pace	2/1/16	0830	

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed:

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: August 11, 2014
	Document No.: F-FL-C-007 rev. 06	Issuing Authority: Pace Florida Quality Office

Sample Condition Upon Receipt Form (SCUR)

Table Number: ______

Client Name: UES SRQ Project # 35227546

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace ☐ Other ______

Tracking # ______

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other ______

Thermometer Used TPA-14 Type of Ice: Wet Blue None

Cooler Temperature°C 0.9 (Visual) 0.1 (Correction Factor) 1.0 (Actual)

(Temp should be above freezing to 6°C). If below 0°C, then was sample frozen? ☐ Yes ☐ No

Date and Initials of person examining contents: 2/1/16 CLG

Receipt of samples satisfactory: ☒ Yes ☐ No

Rush TAT requested on COC:

If yes, then all conditions below were met:	If no, then mark box & describe issue (use comments area if necessary):
Chain of Custody Present	☐
Chain of Custody Filled Out	☐
Relinquished Signature & Sampler Name COC	☐
Samples Arrived within Hold Time	☐
Sufficient Volume	☐
Correct Containers Used	☐
Containers Intact	☐
Sample Labels match COC (sample IDs & date/time of collection)	☐ No Labels: ☐ No Time/Date on Labels: ☐
All containers needing preservation are found to be in compliance with EPA recommendation.	☐
No Headspace in VOA Vials (>6mm):	☐

Client Notification/ Resolution:

Person Contacted: ______ Date/Time: ______

Comments/ Resolution (use back for additional comments): ______

Project Manager Review: ______ **Date:** ______

Finished Product Information Only

F.P. Sample ID: ______

Production Code: ______

Date/Time Opened: ______

Number of Unopened Bottles Remaining: ______

Extra Sample in Shed: Yes No

Size & Qty of Bottles Received

- ______ x 5 Gal
- ______ x 2.5 Gal
- ______ x 1 Gal
- ______ x 1 Liter
- ______ x 500 mL
- ______ x 250 mL
- ______ x Other: ______

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification #E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 16100211

Universal Engineering Sciences
1748 Independence Blvd. Ste B-1
Sarasota, FL 34234

Bruce Glasberg

Project Name : 44TH AVE. BRIDGE 1130.1500167
Date Received : 10/07/2016
Time Received : 1548

Submission Number:	16100211	**Sample Date:**	10/06/2016
Sample Number:	002	**Sample Time:**	N/A
Sample Description:	Sample 1A	**Sample Method:**	Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
CHLORIDE	50.2	MG/L	0.353	1.412	300.0	10/12/2016 16:30	DN
SULFATE	56.0	MG/L	0.339	1.356	300.0	10/12/2016 16:30	DN
PH	7.40 Q	UNITS			SM4500H+B	10/07/2016 13:54	BLB

1711 12th Street East * Palmetto, FL 34221 * Phone (941) 723-9986 * Fax (941) 723-6061

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification #E84167

Dale D. Dixon / Laboratory Director — 10/24/2016 Date

Tülay Tanrisever / QC Officer

Deborah A. Murphy / Project Manager

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.
B = Results based upon colony counts outside the ideal range.
H = Value based on field kit determination. Results may not be accurate.
I = Reported value is between the laboratory MDL and the PQL.
J1 = Estimated value. Surrogate recovery limits exceeded.
J2 = Estimated value. No quality control criteria exists for component.
J3 = Estimated value. Quality control criteria for precision or accuracy not met.
J4 = Estimated value. Sample matrix interference suspected.
J5 = Estimated value. Data questionable due to improper lab or field protocols.
K = Off-scale low. Value is known to be < the value reported.
L = Off-scale high. Value is known to be > the value reported.
N = Presumptive evidence of presence of material.
O = Sampled, but analysis lost or not performed.
Q = Sample held beyond accepted hold time.
T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.
U = Analyte analyzed but not detected at the value indicated.
V = Analyte detected in sample and method blank. Results for this analyte in associated samples may be biased high. Standard, Duplicate and Spike values are within control limits. Reported data are usable.
Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.
Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.
! = Data deviate from historically established concentration ranges.
? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the presence or absence of the analyte cannot be determined from the data.
* = Not reported due to interference.

NOTES:

MBAS calculated as LAS; molecular weight = 340.
PQL = 4xMDL.
ND = Not detected at or above the adjusted reporting limit.
X = Value exceeds MCL.
G1 = Accuracy standards does not meet method control limits, but does meet lab control limits that are in agreement with USEPA generated data. USEPA letter available upon request.

COMMENTS:

For questions or comments regarding these results, please contact us at (941) 723-9986.

Results relate only to the samples.

DRIGGERS ENGINEERING SERVICES INCORPORATED
Geotechnical Engineering & Construction Materials Testing

RESISTIVITY TESTING

PROJECT:	Benchmark Enviro Analytical
CLIENT:	Benchmark Enviro Analytical, Inc.
DATE PERFORMED:	10/12/16
DATE REPORTED:	10/18/16
FILE NUMBER:	L159846
REPORT NUMBER:	05
PAGE NUMBER:	1 of 2

As requested, a resistivity test was performed on materials that were delivered to our Clearwater laboratory from the above referenced project on this date.

Technician performed resistivity testing FM 5-551 with results on the attached data sheet.

If you should have any questions please do not hesitate to contact our Clearwater office.

S. Farthing

Scott Farthing, Technician

F. Jaime Driggers, P.E.
President
Registration No.: 16989

JAIME DRIGGERS LICENSE No. 16989 STATE OF FLORIDA PROFESSIONAL ENGINEER

SF:FJD/ljm

Copy: (3) Benchmark Enviro Analytical, Inc.

Sarasota
Phone: 727.471.6655
Fax: 941.371.8962
saroffice@driggers-eng.com

Clearwater
P.O. Box 17839 • Clearwater, Florida 33762
Phone: 727.571.1313 • Fax: 727.471.6653
clwoffice@driggers-eng.com

Spring Hill
Phone: 727.471.6657
Fax: 727.471.6653
sphilloffice@driggers-eng.com

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY SUBMISSION NUMBER	DEPTH (ft)	DESCRIPTION	W %	γ_d (pcf)	G_s	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON	** G.S. -200	ORG (%)	pH	Cl. (ppm)	SO_4 (ppm)	RESISTIVITY (Ohm-cm)
						LL	PL	PI									
16100211-1		Water Sample															2500 ohm-cm

W % = Water Content
γ_d (pcf) = Dry Density
Gs = Specific Gravity
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
P.P. (tsf) = Pocket Penetrometer
U.C. = Unconfined Compression

Con. = Consolidation Test
G.S. (H) = Grainsize Analysis (Hydrometer)
ORG. (%) = Organic Content
Cl. (ppm) = Total Chloride
SO_4 (ppm) = Total Sulfate
RES. (ohm-cm) = Lab Resistivity
* = See Test Curves
** = Percent Passing No. 200 Sieve

CLIENT: Benchmark Enviro Analytical, Inc.

PROJECT: Benchmark Enviro Analytical

FILE-REPORT: L159846-05

PAGE: 2 of 2

INTERLABORATORY SAMPLE TRANSMITTAL FORM

Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221
(941) 723-9986
(941) 723-6061 fax
WWW.Benchmarkea.com
Office QC Check: ________
Bottle Check: ________

Date:	10/05/16		
# of Samples:	1	Total # of Bottles:	1
Method of Shipment:	UPS Standard		
Subcontract Laboratory:	Driggers Engineering Services Inc 6185 Danner Drive Sarasota, FL 34240 941-371-3949		
Page	1	of	1

Laboratory Submission #	Collection		Sample Matrix*	Collection Method**	Preservative	Container			Parameters	Comments
	Date	Time				Qty	Capacity	Type***		
16100211-1	10/05/16	N/A	SW	Grab	Plain	1	2 Qt.	P	Resistivity	

* Sample Matrix abbreviations: Groundwater (GW), Surface Water (SW), Saline Surface Water (SSW), Fresh Surface Water(FSW), Drinking Water (DW), Sludge (Sldg), Solid (Sol), Soil (Soil), Domestic Effluent (Dom Eff), Industrial Effluent (Ind Eff).
** Sample Method abbreviations: Grab (G), Composite (C), 24 Hour Composite (24HR Comp.).
*** Container Type abbreviations: Plastic (P), Glass (G).

					Received By:			
Relinquished By: (Benchmark)	Sign Name:		Date:	10/06/16	Received By:	S Pedblet	Date:	10/6/16
	Print Name:	Annah Jensen	Time:				Time:	0745
Relinquished By:	Sign Name:	S Pedblet	Date:	10/6/16	Received By:	[illegible signature]	Date:	
	Print Name:		Time:	0745			Time:	

APPENDIX H

Seasonal High Groundwater Estimation

TABLE 3: ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATIONS

FACILITY *	NEAREST BORINGS	GROUNDWATER ENCOUNTERED IN BORING (FT - BGS)	SHGW (FT - BGS)	APPROXIMATE EXISITING GROUND ELEVATION (FT - NAVD 88)	REMARKS
SMF - 1	P1-01 P1-02	4 4	3 3	15 15	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88
SMF - 2	HA-11 HA-12	3.5 4	2 2	8.0 7.9	BORINGS FOR SMF - 2 HAVE NOT BEEN PERFORMED. BORINGS DRILLED ALONG 44TH AVENUE ALIGNMENT WERE USED FOR PRELIMINARY SHGW ASSESSMENT. THESE BORINGS ARE LOCATED AT APPROXIMATELY 200 TO 300 FEET NORTH OF THE SMF -2 AND APPROXIMATELY 200 TO 300 FEET FROM RIVER EDGE. GROUNDWATER AT THESE BORINGS COULD BE AFFECTED BY TIDE CYCLES
SMF - 3	P3-10 TO P3 - 21	2.25 TO 2.6	2	13 TO 14	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88
CARUSO ROAD	H2-1 TO H2-15	2 TO 3.25	1 TO 2	13 TO 14	RECOMMEND SHGW BE SET AT NO LOWER THAN ELEVATION 12.0 NAVD 88

* Table 3A shows the Estimate Seasonal HighGroundwater along 44th Avenue.

SMF = STORMWATER MANAGEMENT FACILITY
BGS = BELOW GROUND SURFACE

STORMWATER MANAGEMENT FACILITY NUMBER 3

BORINGS	H2O	SHGW-B	GSE	SHGW-E
P3-4	3	2	14	12
P3-5	3	2	13	11
P3-10	2.5	2	14	12
P3-11	2.25	2	13	11
P3-12	2.6	2	14	12
P3-13	2.4	2	13	11
P3-14	2.3	2	14	12
P3-15	2.4	2	14	12
P3-16	2.4	2	14	12
P3-17	2.5	2	13.5	11.5
P3-18	2.4	2	14	12
P3-19	2.5	2	14	12
P3-20	2.5	2	13.5	11.5
P3-21	2.4	2	14	12
			AVERAGE	11.69

NOTE: GROUND SURFACE ELEVATION DERIVED FROM TOPOGRAPHIC SURVEY OF SMF NUMBER 3.

SEASONAL HIGH GROUNDWATER ESTIMATE BASED ON CHANGING SOIL STRATA AND SOIL DESCRIPTIONS

CARUSO ROAD BORINGS

BORINGS	H2O	SHGW-B	GSE	SHGW-E
H2-1	5	3	11	8 (IGNORE)
H2-2	3.25	1.5	13.6	12.1
H2-3	3	1	13.25	12.25
H2-4	2.5	2	13.4	11.4
H2-5	3.4	1.5	13.4	11.9
H2-6	3.3	1.5	13.3	11.8
H2-7	3	2	12	10
H2-8	2.5	1	13.2	12.2
H2-9	2.4	2	13.5	11.5
H2-10				
H2-11	3	2	13.5	11.5
H2-12	2	1	13.5	12.5
H2-13	2	1	13.5	12.5
H2-14				
H2-15	3	1	13.5	12.5
			AVERAGE	11.85

NOTE: GROUND SURFACE ELEVATION DERIVED FROM ROADWAY PROFILE AND CROSS SECTIONS.

SEASONAL HIGH GROUNDWATER ESTIMATE BASED ON CHANGING SOIL STRATA AND SOIL DESCRIPTIONS

NAVD 88 Elevations

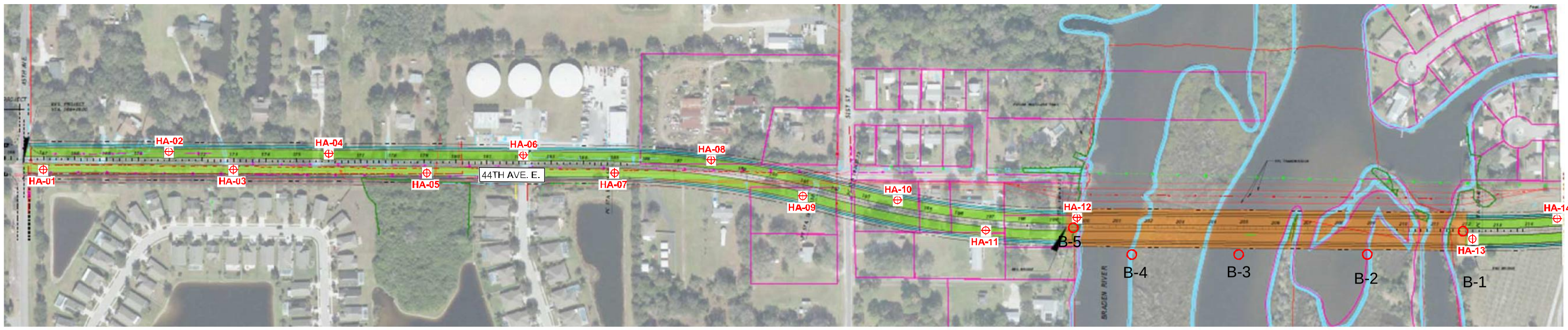
Boring	Approx. Ground Elevation	Comment	Approx. ESHW Elevation (3' depth)
HA01	15.1	pavement	12.1
HA02	15.5	Ground	12.5
HA03	16.0	pavement	13.0
HA04	16.0	Ground	13.0
HA05	15.9	pavement	12.9
HA06	15.6	pavement	12.6
HA07	16.2	pavement	13.2
HA08	15.5	Ground	12.5
HA09	14.5	Ground	11.5
HA10	13.7	Ground	10.7
HA11	7.9	pavement	4.9
HA12	2.4	? Near river bank	-0.6
HA13	3.6	? Near river bank	0.6
HA14	12.0	Ground	9.0
HA15	13.1	Ground	10.1
HA16	12.8	Ground	9.8
HA17	13.6	Ground	10.6
HA18	13.7	Ground	10.7
HA19	14.3	pavement	11.3
HA20	14.3	Ground	11.3
HA21	15.0	pavement	12.0
HA22	14.1	Ground	11.1
HA23	15.5	pavement	12.5
HA24	13.4	Ground	10.4
HA25	15.8	pavement	12.8
HA26	14.9	Ground	11.9
HA27	16.2	pavement	13.2
HA28	16.6	Ground	13.6
HA29	16.5	Ground	13.5
HA30	21.2	pavement	18.2
HA31	N/A	no elevations available	N/A

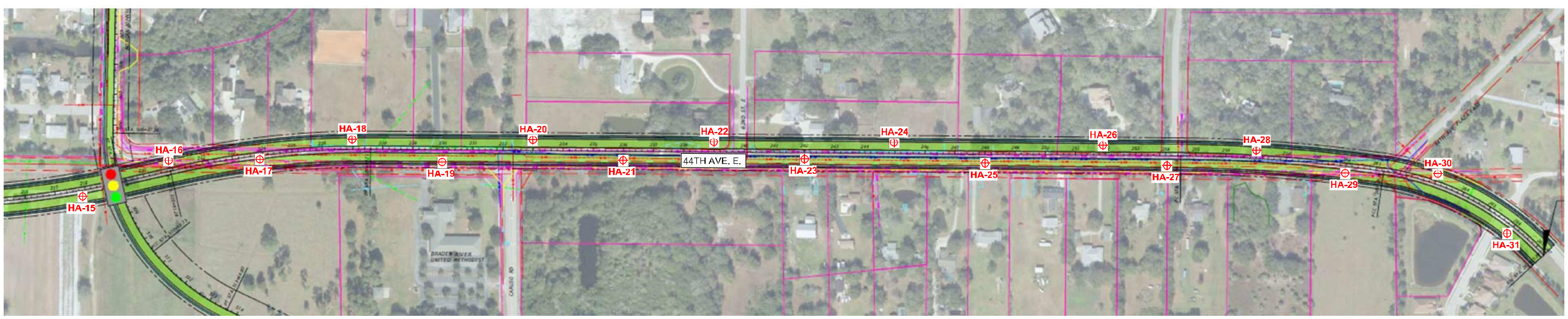
Note that HA12 and HA 13 may be influenced significantly by normal water levels of base flow in the river.

SEASONAL HIGH GROUNDWATER ASSESSMENT

Hand auger borings were performed along the edges of the existing 44th Avenue roadway embankment. From field observation, top of the borings are estimated to be approximately 1 to 2 feet below the edge of the roadway pavement. The borings encountered groundwater at approximately three (3) to five (5) feet below the ground surface. The borings encountered soil mottling, a sign of wet-dry zone of the subsurface soil, at approximately 0.5 to 1.0 feet above the encountered groundwater level. It is reasonably concluded that the seasonal high groundwater is at 3 feet below the edge of the existing roadway pavement. A more defined seasonal high groundwater elevation will be determined once the borings, and their encountered groundwater conditions, are plotted onto the roadways' cross sections.

Since the stormwater management areas and the wetland mitigation areas have not been sited and the extension of Morgan Johnson Road, through the King's property, has not been finalized. Borings for these areas have not been performed and the subsurface groundwater conditions have not been assessed. We anticipate the SHGW for these areas will be determined shortly once their locations are finalized and after the borings for these areas are performed.





LEGEND	
APPROXIMATE LOCATION	
⌖	HAND AUGER

PROPOSED 44TH AVE. BRIDGE

44TH AVE. E.

BRADENRON, MANATEE COUNTY, FLORIDA

BORING LOCATION PLAN

FOR: URS

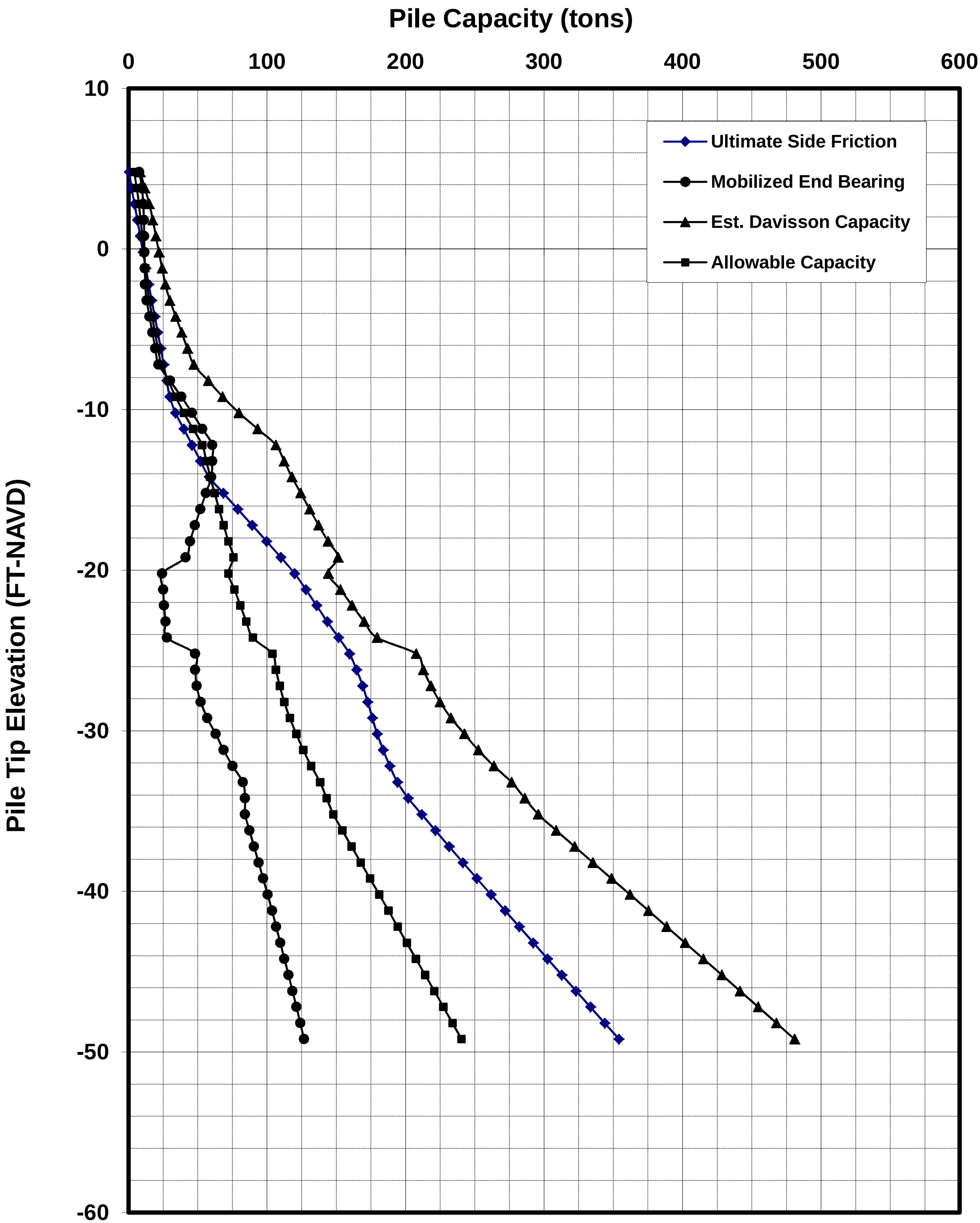
DRAWN BY:	DATE: DECEMBER 2015
CHECKED BY:	DATE: DECEMBER 2015
REPORT NO: 11358	SCALE:
PROJECT NO: 1130.1500174.0000	

UNIVERSAL
ENGINEERING SCIENCES

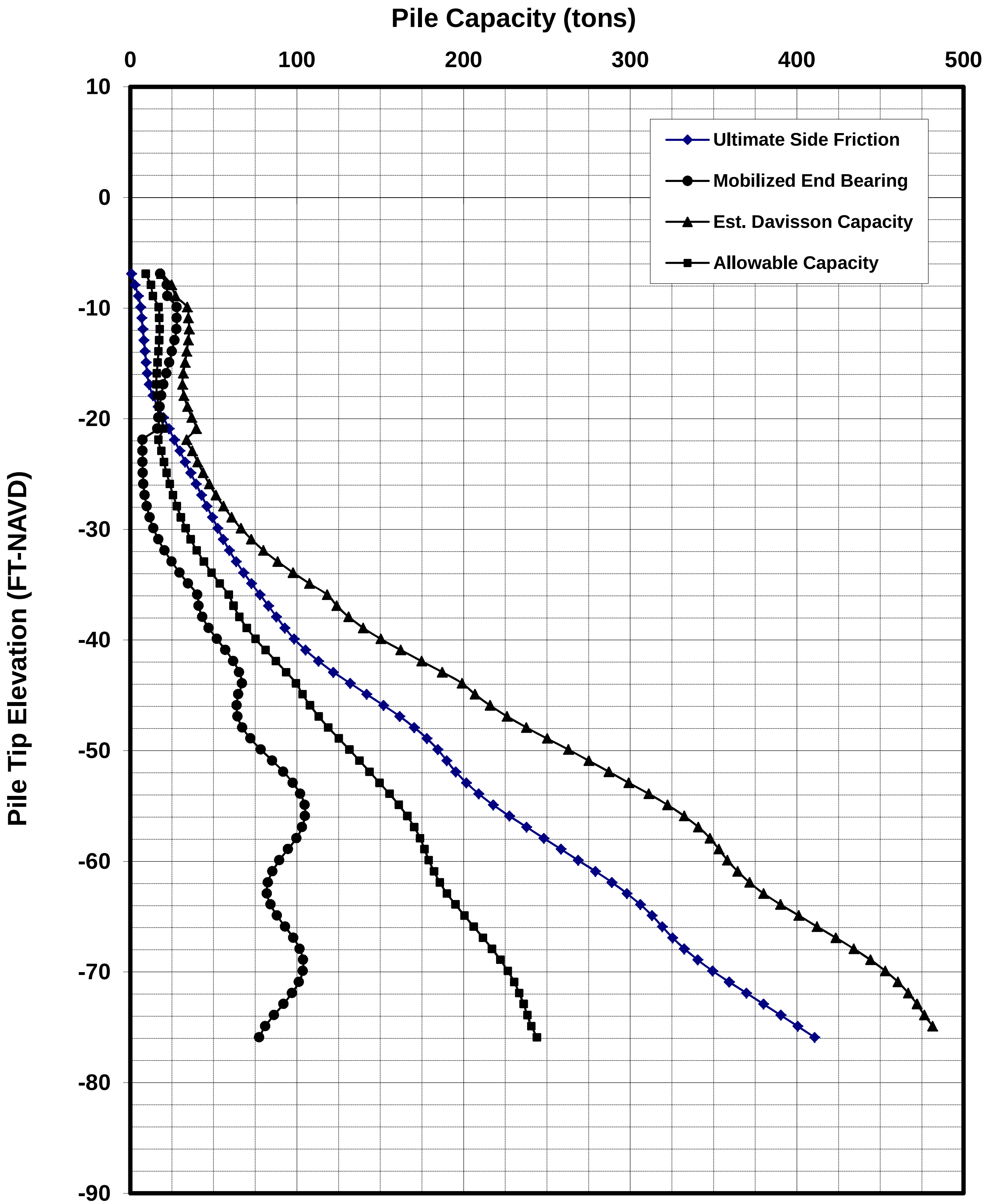
PAGE NO: A-2

APPENDIX I

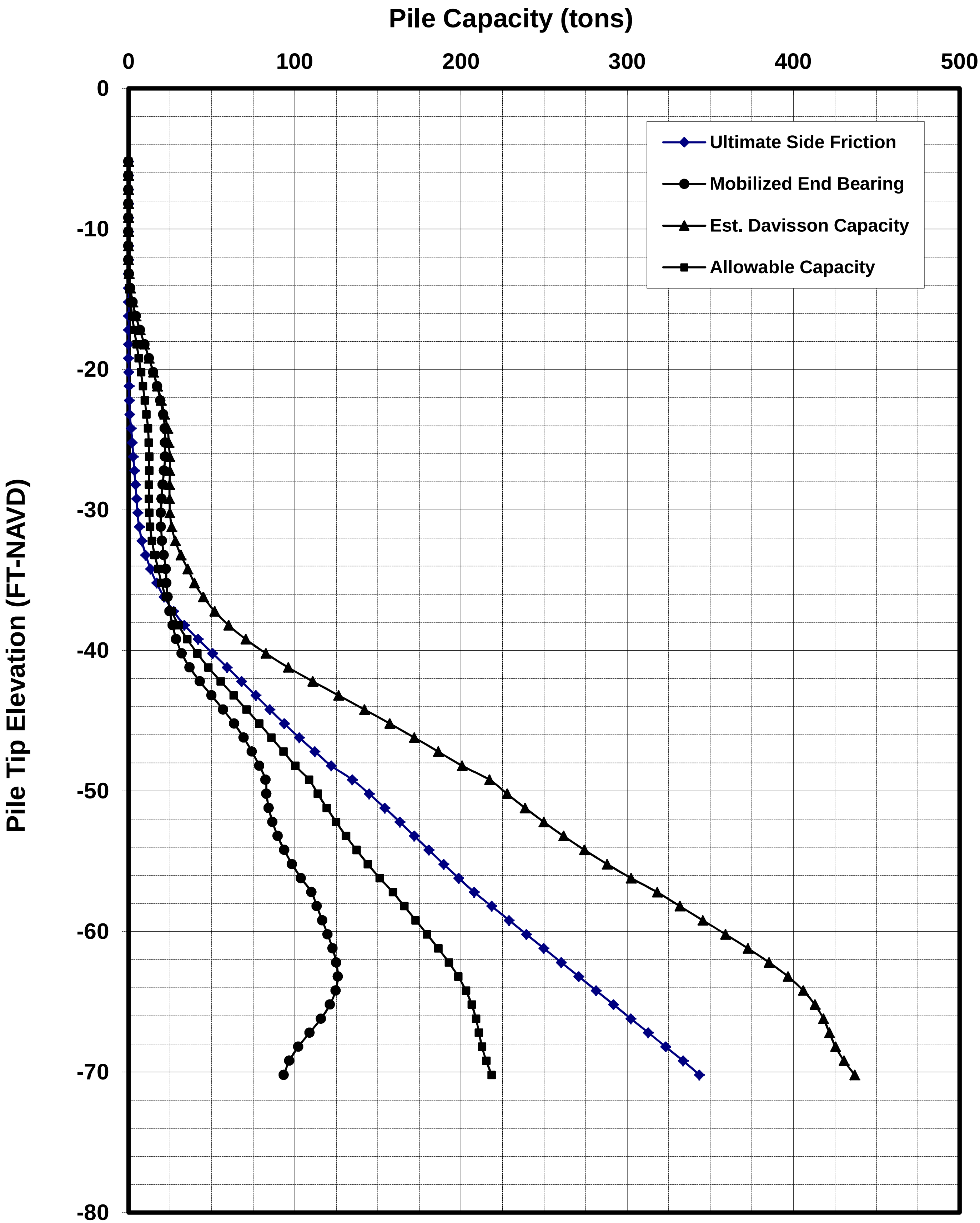
PPSC Pile Axial Capacity Curves
and
Sample FB-Deep Output Files



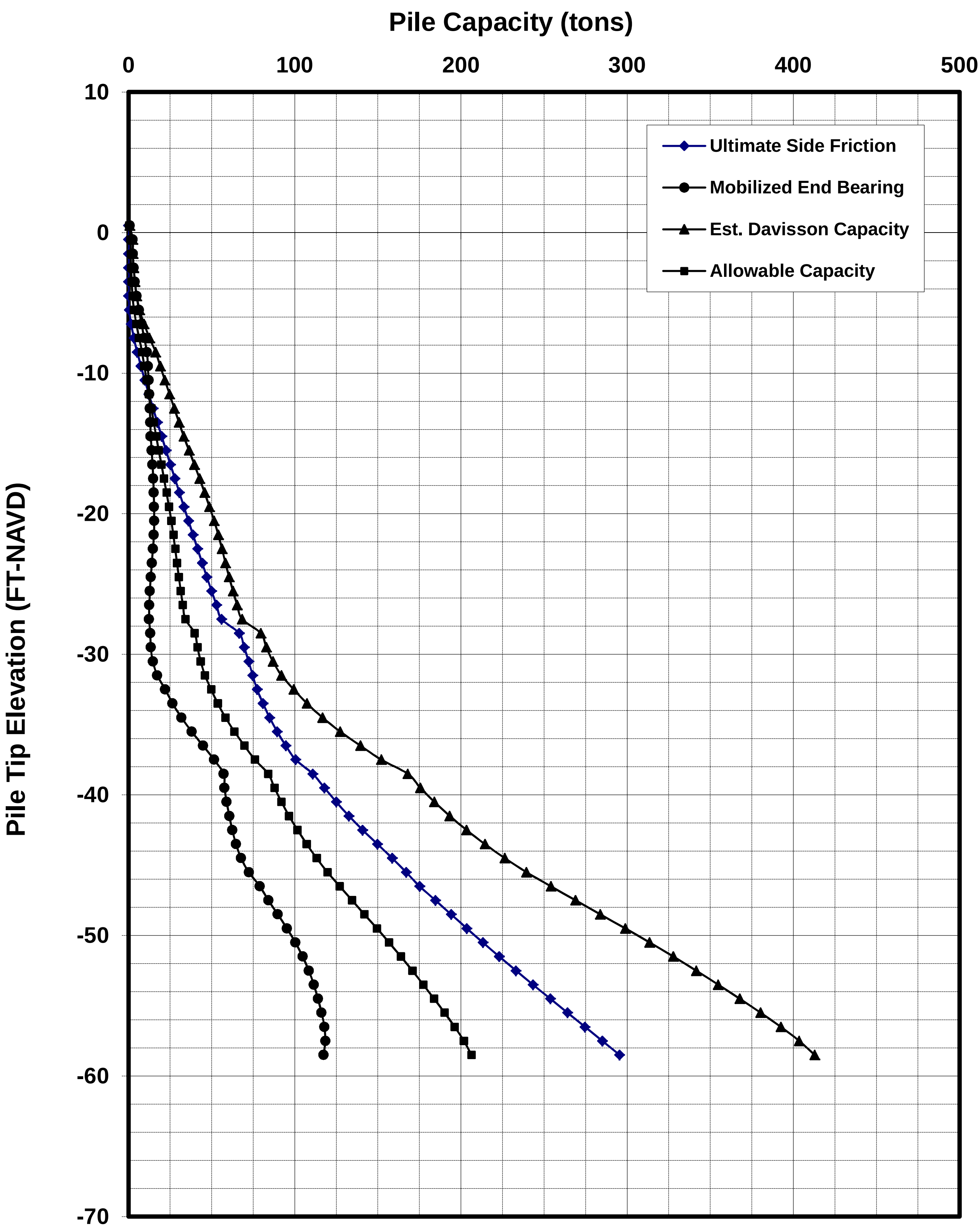
44th Avenue Bridge Over Braden River
Boring B5 (Preformed Hole to El -10.0)
Ground Surface Elevation 5.8 FT- NAVD 88
No Scour
24-Inch Prestressed Concrete Pile



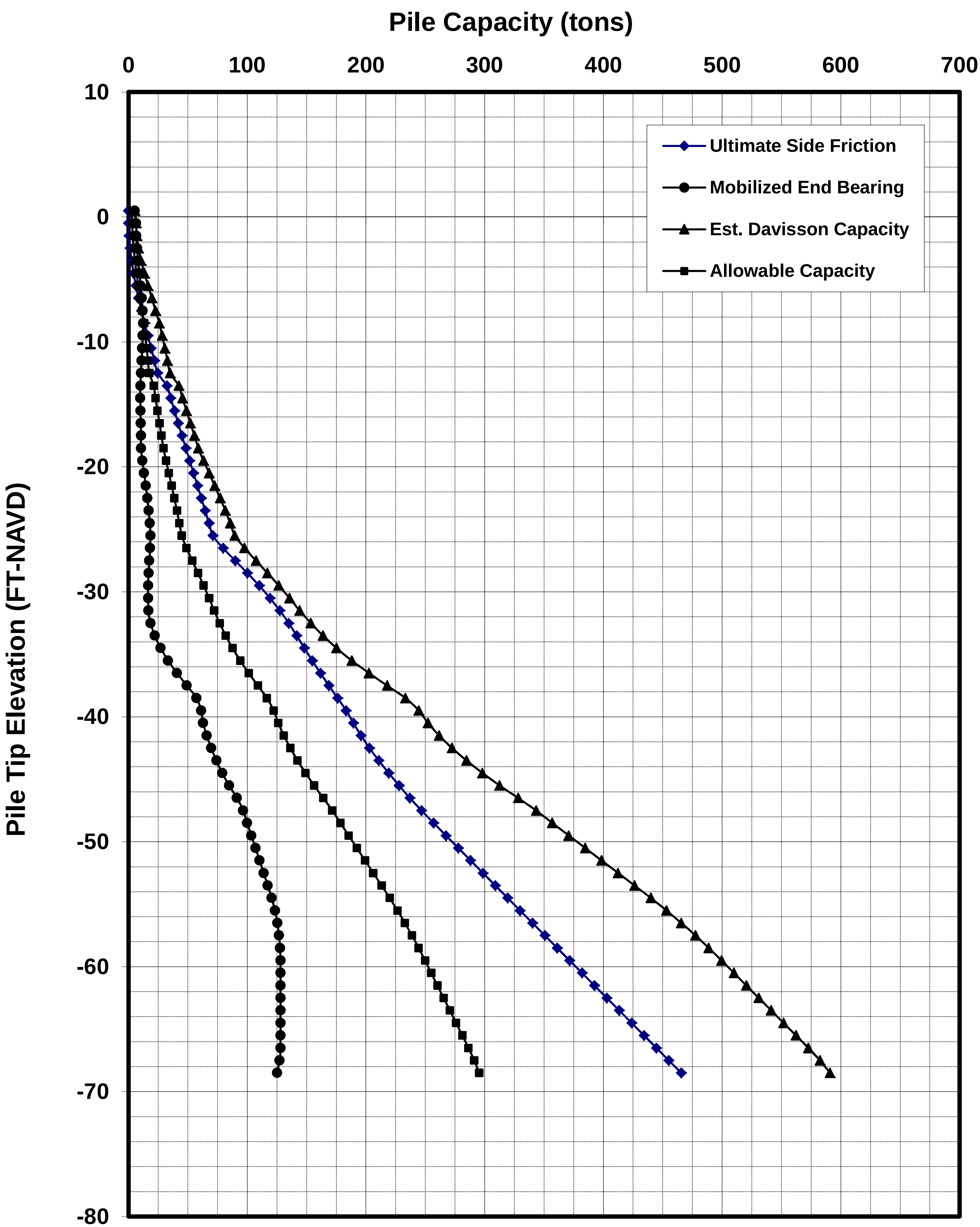
44th Avenue Bridge Over Braden River
Boring B2-4 Predrilled to -26.0
Scour Elevation -15.4
Ground Surface Elevation -5.9 FT- NAVD 88
24-Inch Prestressed Concrete Pile



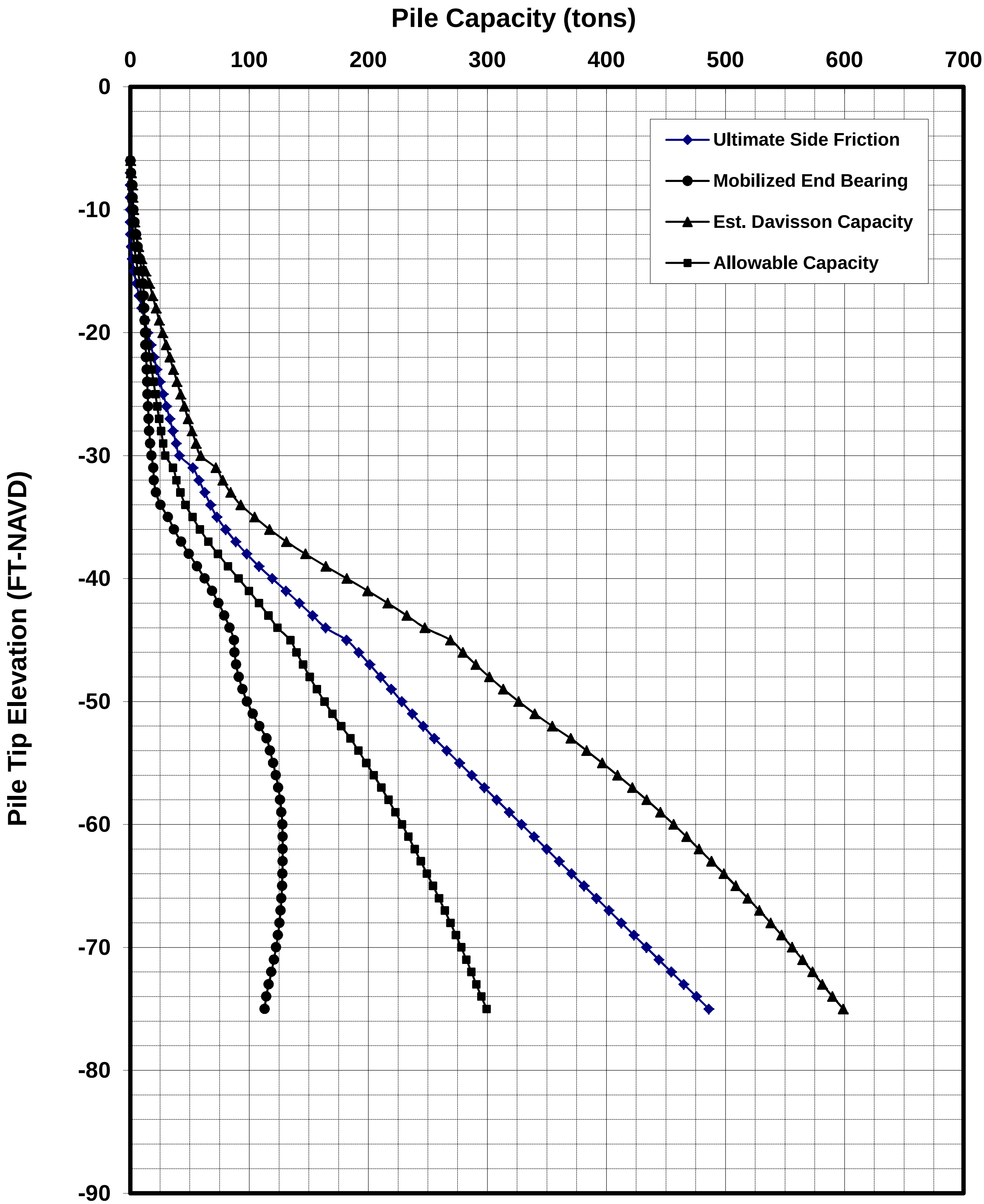
44th Avenue Bridge Over Braden River
Boring B2-5 (Preformed Hole to Elevation -30)
Ground Surface Elevation -4.2 FT- NAVD 88
Scour Elevation -14.5 FT- NAVD
24-Inch Prestressed Concrete Pile



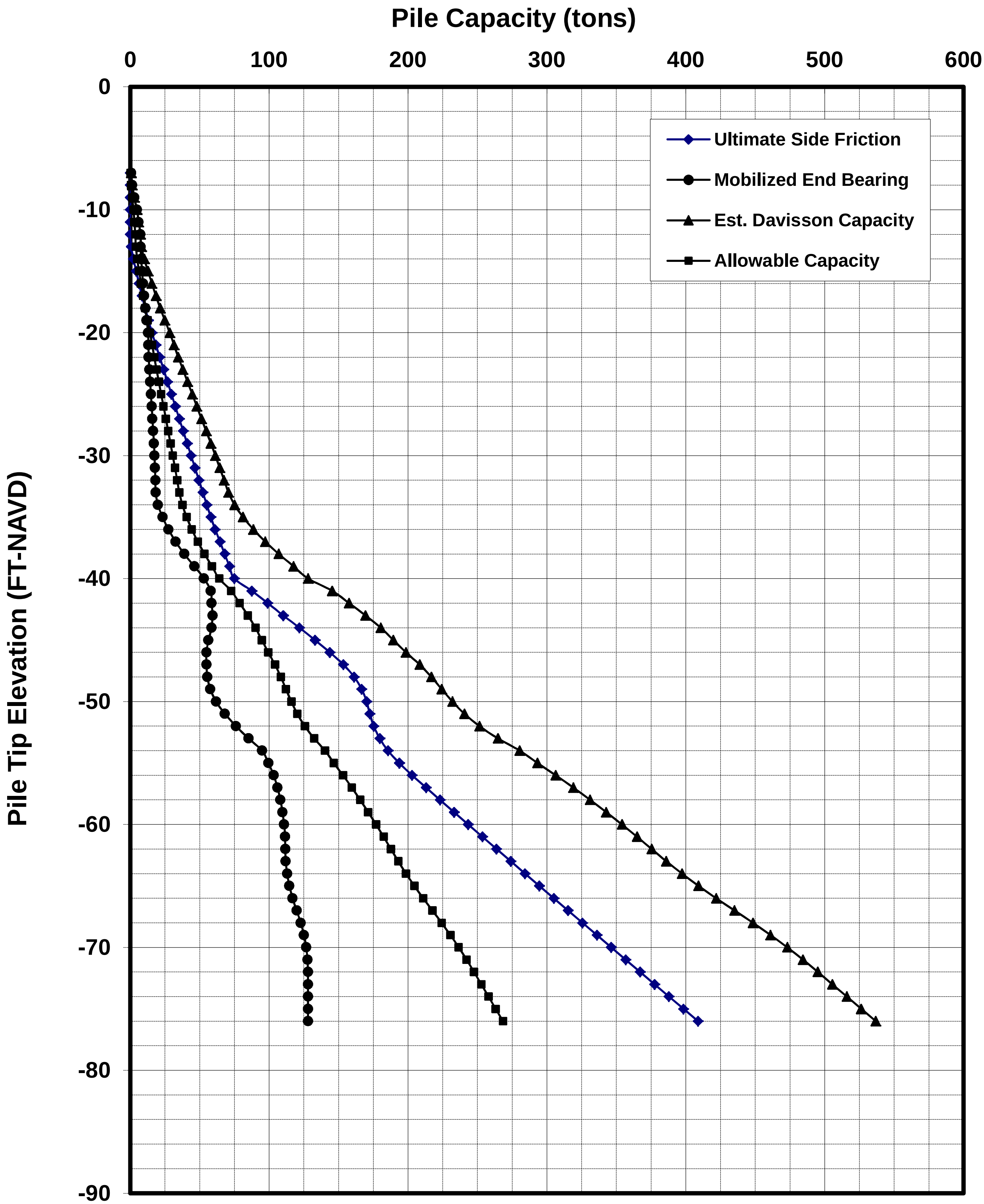
44th Avenue Bridge Over Braden River
Boring B2-6 (Preformed Hole to Elevation -28)
Ground Surface Elevation +1.5 FT- NAVD 88
Scour Elevation -5.3 FT-NAVD
24-Inch Prestressed Concrete Pile



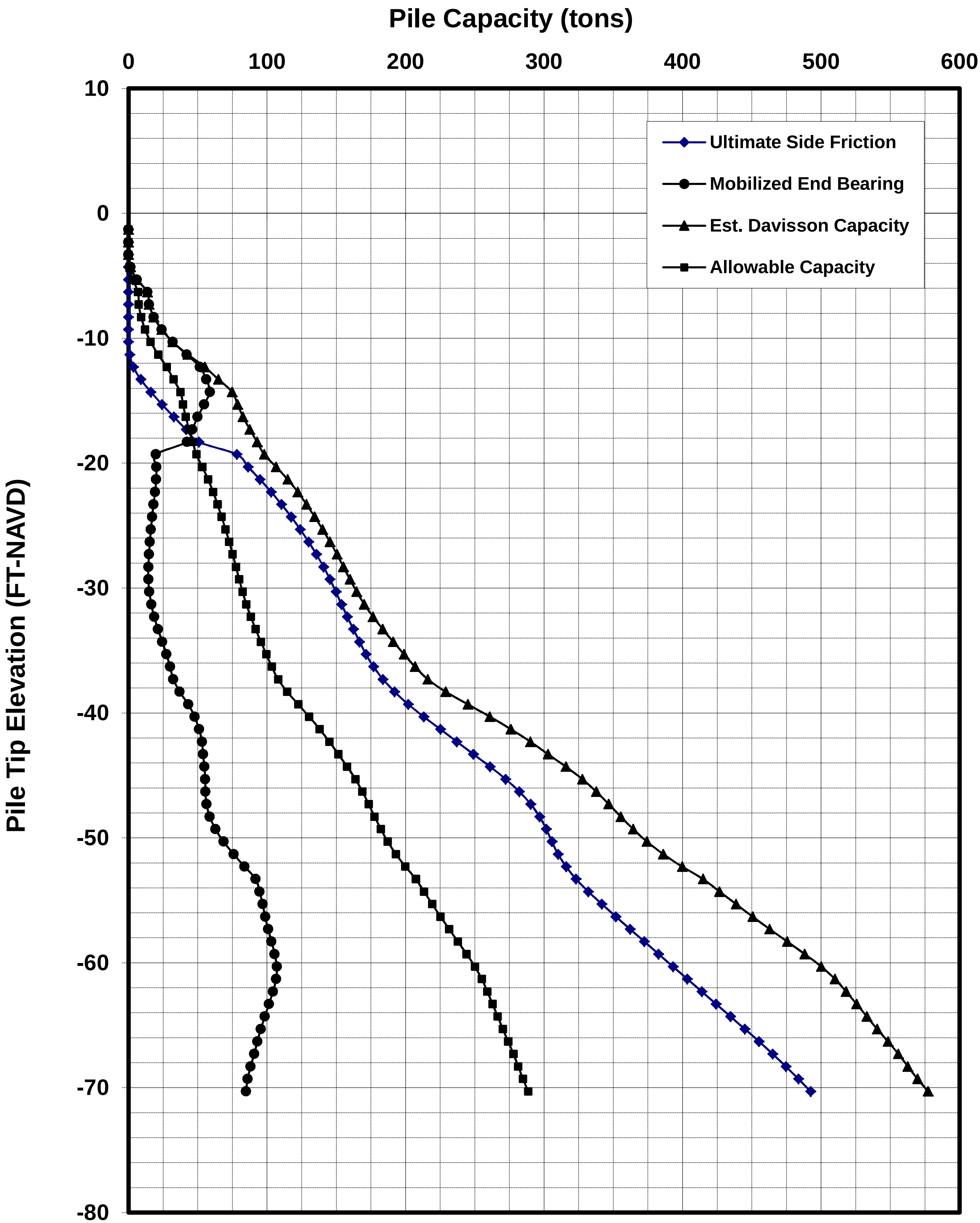
44th Avenue Bridge Over Braden River
Boring B2-7 (Preformed Hole to EL -28.0)
Scour Elevation -4.8 FT-NAVD
Ground Surface Elevation +1.5 FT- NAVD 88
24-Inch Prestressed Concrete Pile



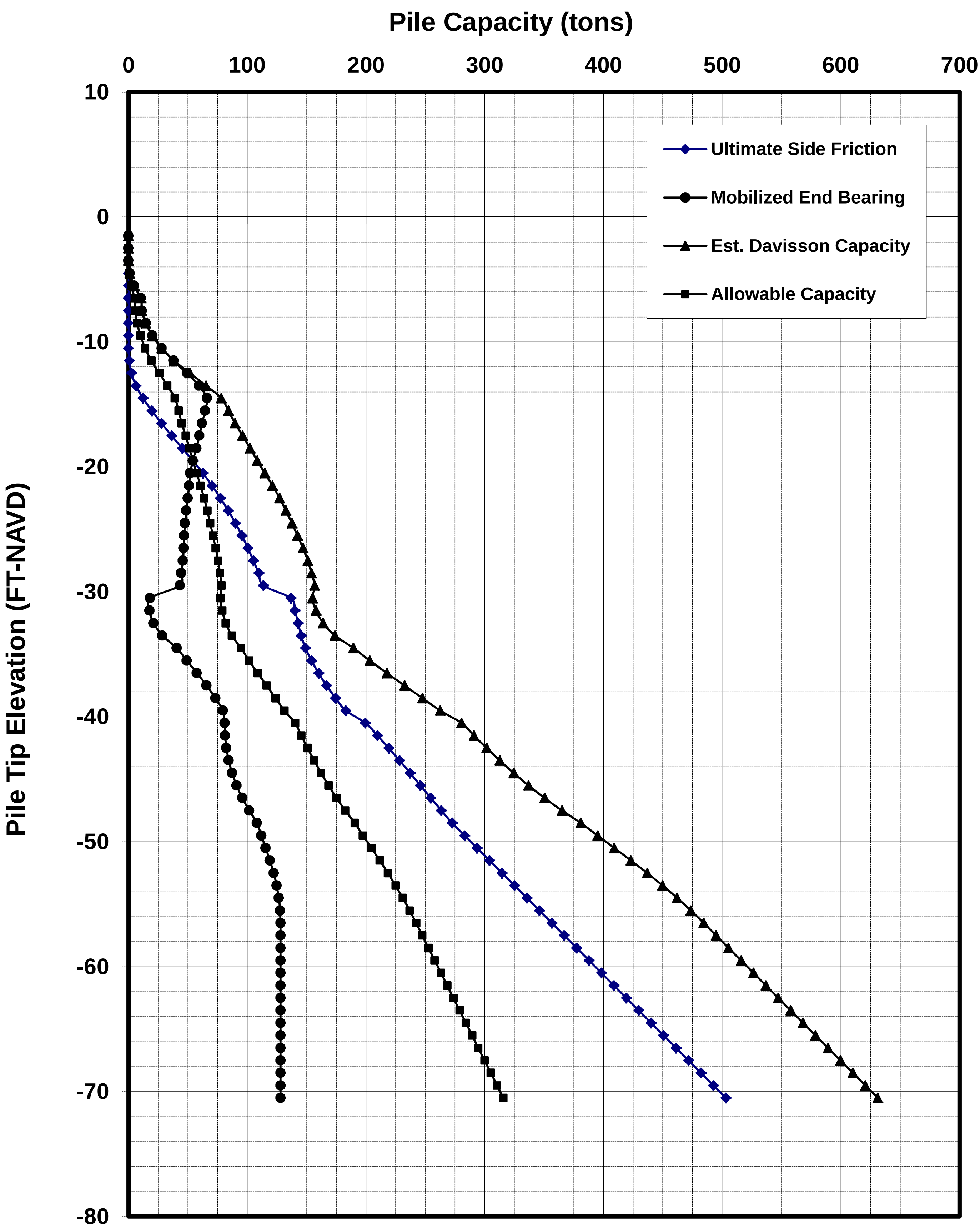
44th Avenue Bridge Over Braden River
Boring B2-8 (Preformed Hole to Elevation -29.0)
Ground Surface Elevation -5.0 FT- NAVD 88
Scour Elevation -11.4 FT- NAVD 88
24-Inch Prestressed Concrete Pile



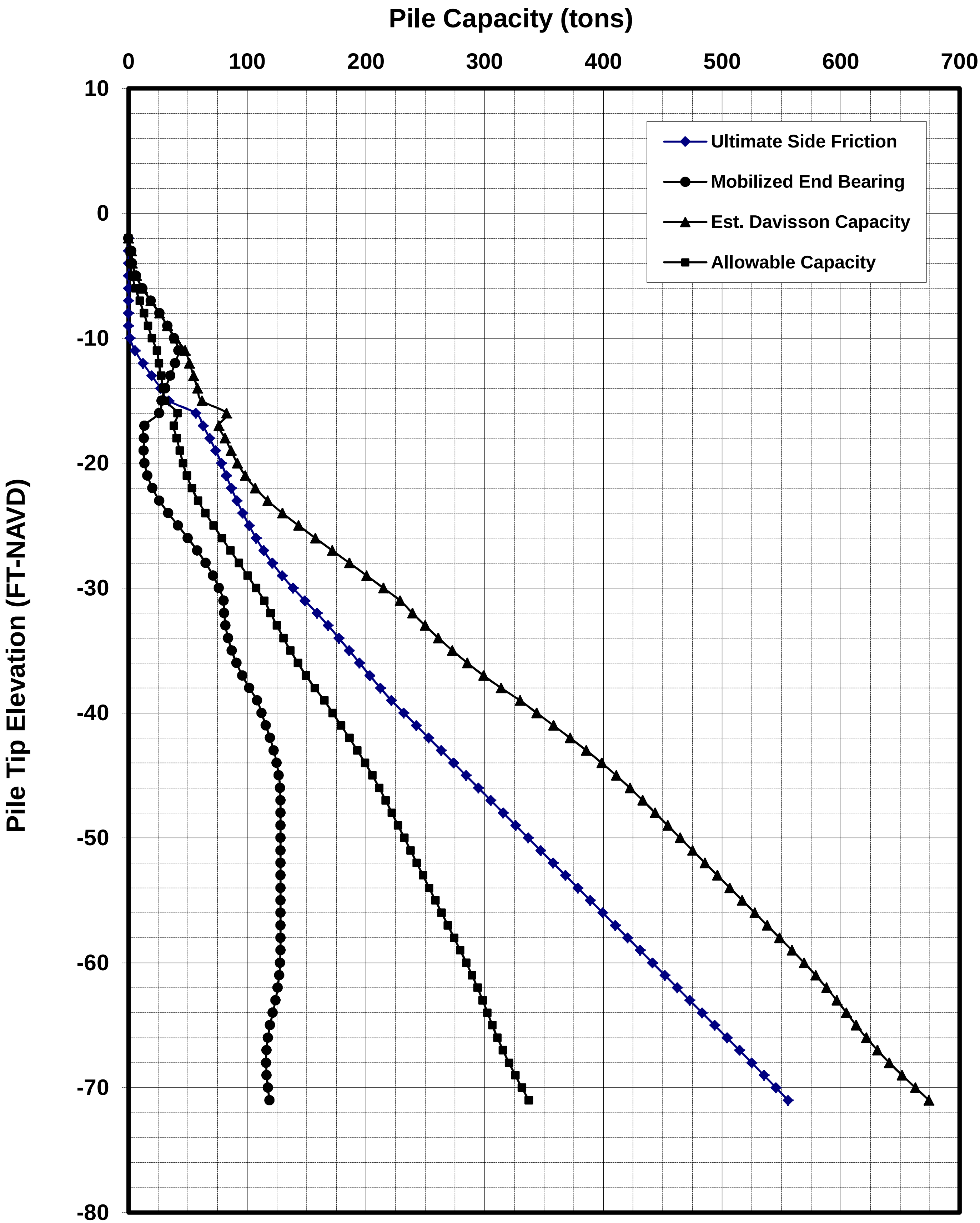
44th Avenue Bridge Over Braden River
Boring B2-9 (Preformed Hole to Elevation -35.0)
Ground Surface Elevation -6.0 FT- NAVD 88
Scour Elevation -11.7 FT - NAVD 88
24-Inch Prestressed Concrete Pile



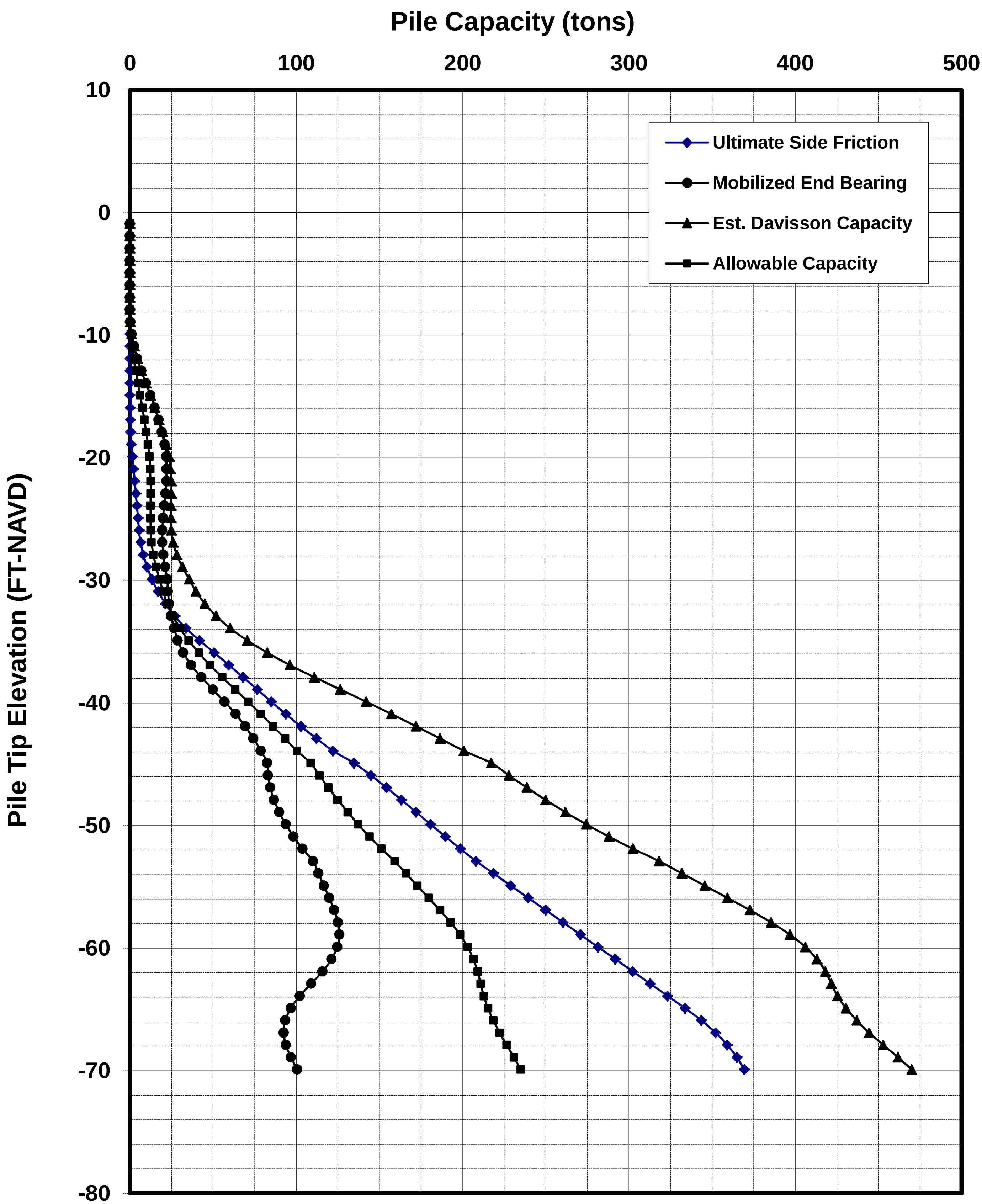
44th Avenue Bridge Over Braden River
Boring B2-10 (No Preformed Hole)
Ground Surface Elevation -0.3 FT- NAVD 88
Scour Elevation -8.0 FT - NAVD 88
24-Inch Prestressed Concrete Pile



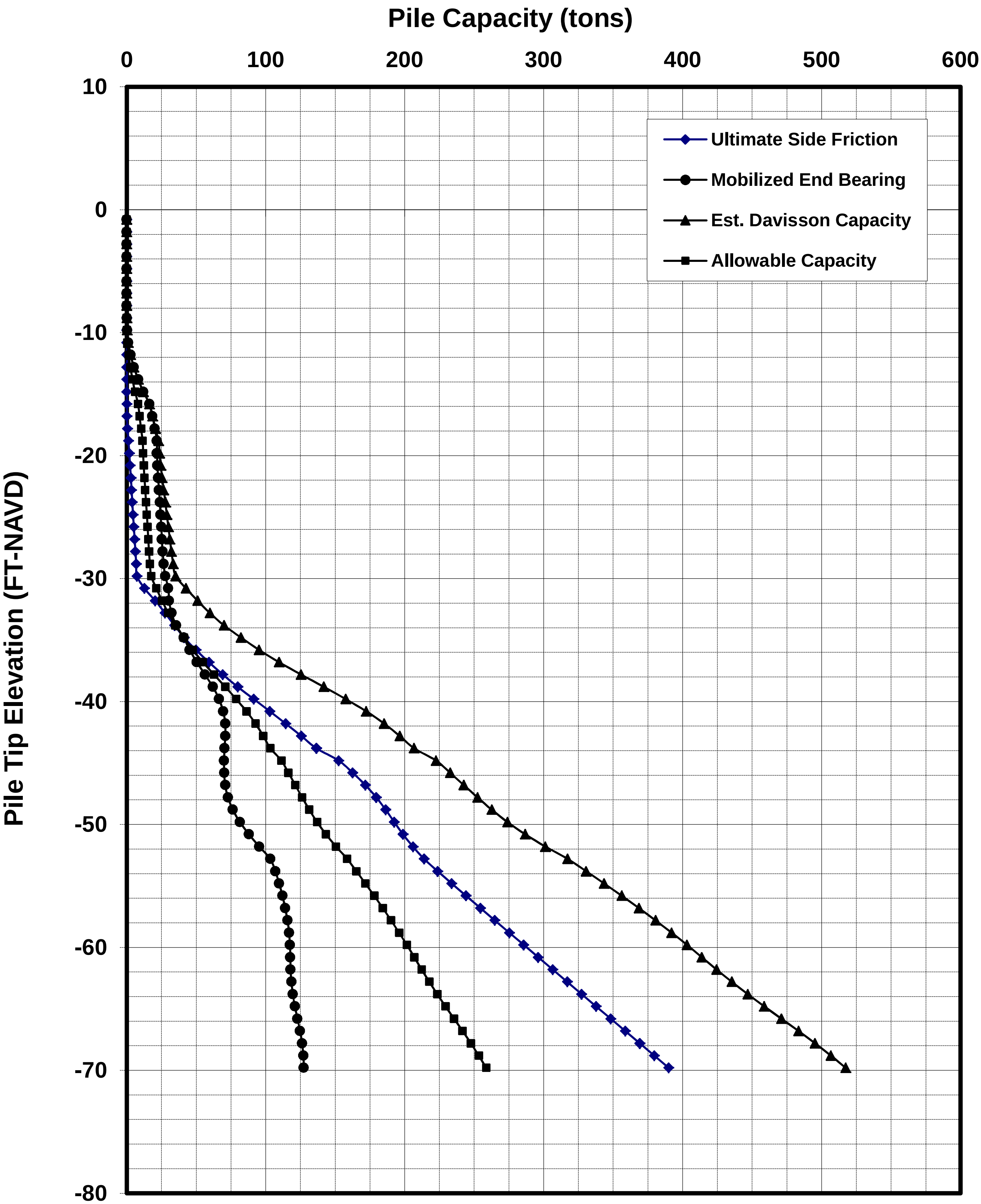
44th Avenue Bridge Over Braden River
Boring B2-11 (No Preformed Hole)
Ground Surface Elevation -0.5 FT- NAVD 88
Scour Elevation -6.6 FT - NAVD 88
24-Inch Prestressed Concrete Pile



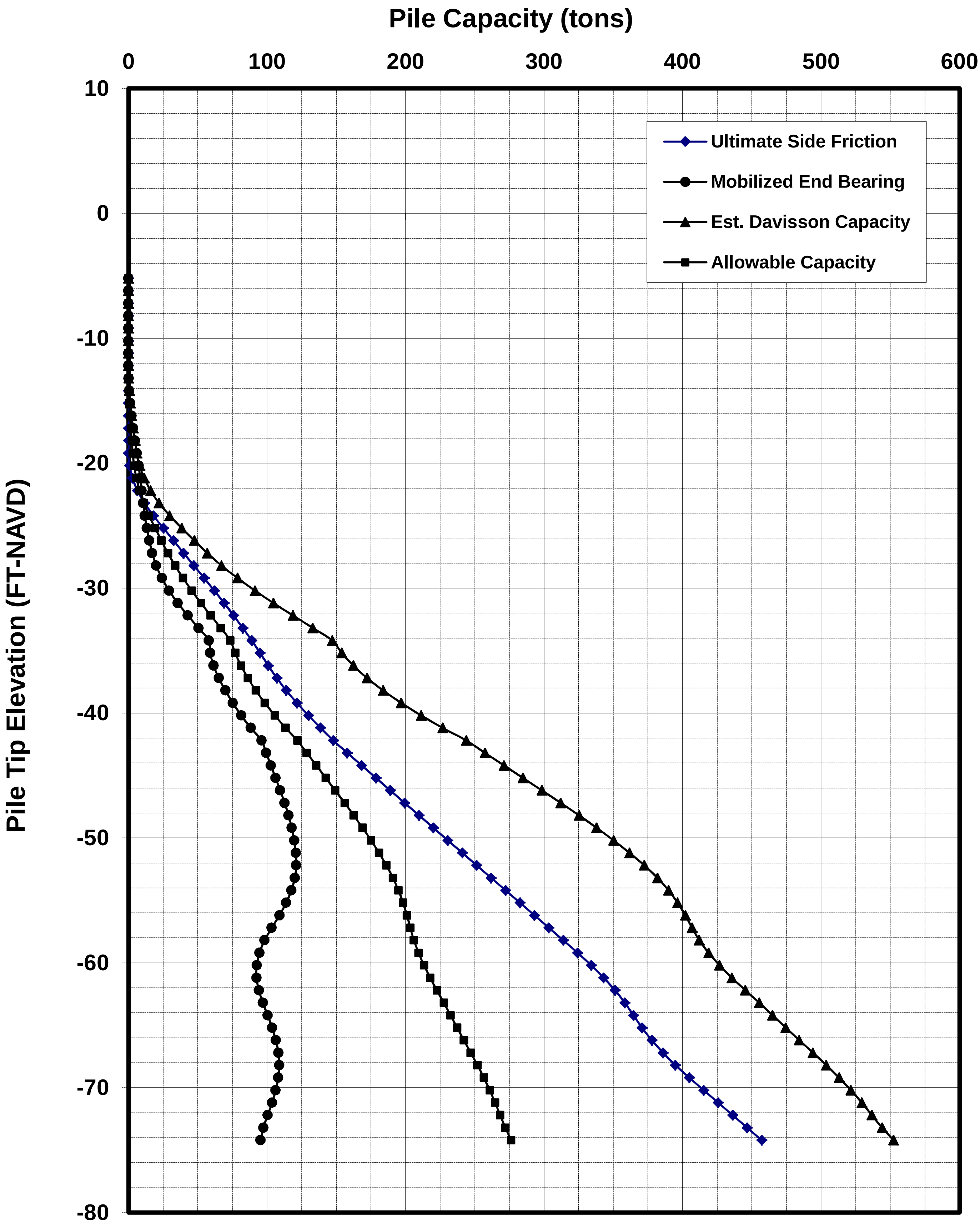
44th Avenue Bridge Over Braden River
Boring B2-12 (No Preformed Hole)
Ground Surface Elevation -1.0 FT- NAVD 88
Scour Elevation -6.9 FT - NAVD 88
24-Inch Prestressed Concrete Pile



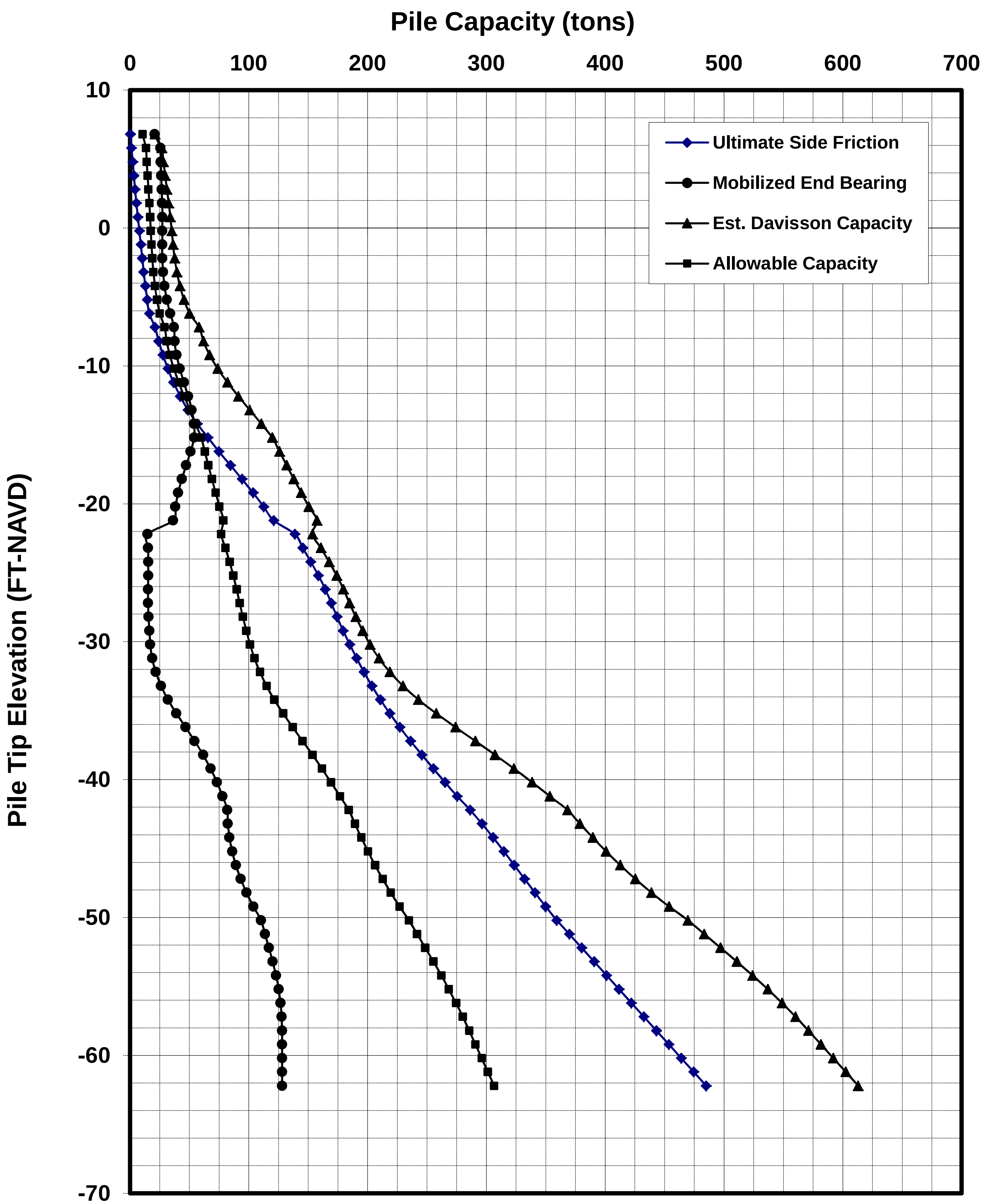
44th Avenue Bridge Over Braden River
Boring B2-13 (Preformed to Elevation -30.0)
Ground Surface Elevation +0.1 FT- NAVD 88
Scour Elevation -6.9 FT - NAVD 88
24-Inch Prestressed Concrete Pile



44th Avenue Bridge Over Braden River
Boring B2-14 (Preformed Hole to Elevation -30.0)
Ground Surface Elevation +0.2 FT- NAVD 88
Scour Elevation -5.7 FT - NAVD 88
24-Inch Prestressed Concrete Pile



44th Avenue Bridge Over Braden River
Boring B2-15 (No Preformed Hole)
Ground Surface Elevation -4.2 FT- NAVD 88
Scour Elevation -10.8 FT - NAVD 88
24-Inch Prestressed Concrete Pile



44th Avenue Bridge Over Braden River
Boring B2-16 (Preformed Hole to Elevation -10.0)
Ground Surface Elevation +7.8 FT- NAVD 88
No Scour
24-Inch Prestressed Concrete Pile

B2-7 (PF -27).out

Florida Bridge Software Institute   Date: September 21, 2016
Shaft and Pile Analysis (FB-Deep v.2.04)   Time: 14:35:27

General Information:
====================
Input file: .....\90% Submittal\1. FB-Deep\Boring B2-7\9-7-16\B2-7 (PF -25).spc
Project number: 6086960
Job name: 44th Avenue Bridge Extension
Engineer: AECOM
Units: English

Analysis Information:
=====================
Analysis Type: SPT

Soil Information:
=================
Boring date: July 22, 2016,   Boring Number: B2-7
Station number: 203+10 Offset: +30

Ground Elevation: 1.500(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	0.00	1- Plastic Clay
2	2.00	2.00	2- Clay and silty sand
3	4.00	5.00	2- Clay and silty sand
4	6.00	8.00	2- Clay and silty sand
5	8.00	8.00	2- Clay and silty sand
6	10.00	8.00	2- Clay and silty sand
7	14.50	8.00	2- Clay and silty sand
8	15.00	8.00	1- Plastic Clay
9	20.00	8.00	1- Plastic Clay
10	20.50	8.00	1- Plastic Clay
11	27.00	8.00	1- Plastic Clay
12	27.50	34.00	1- Plastic Clay
13	30.00	34.00	1- Plastic Clay
14	35.00	17.00	1- Plastic Clay
15	40.00	21.00	1- Plastic Clay
16	40.50	21.00	2- Clay and silty sand
17	45.00	100.00	2- Clay and silty sand
18	50.00	100.00	2- Clay and silty sand
19	55.00	100.00	2- Clay and silty sand
20	60.00	100.00	2- Clay and silty sand
21	65.00	100.00	2- Clay and silty sand
22	70.00	100.00	2- Clay and silty sand
23	75.00	100.00	2- Clay and silty sand
24	80.00	15.00	2- Clay and silty sand
25	85.00	100.00	2- Clay and silty sand
26	86.00	0.00	5- Cavity layer

PREFORMED HOLE
TO EL -28

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	1.50	-0.50	2.00	0.00	1-Plastic Clay
2	-0.50	-13.50	13.00	6.62	2-Clay and Silty Sand
3	-13.50	-39.00	25.50	17.67	1-Plastic Clay
4	-39.00	-84.50	45.50	82.85	2-Clay and Silty Sand
5	-84.50	-84.50	0.00	0.00	5-

Driven Pile Data:
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Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
24.00	1.00	0.50
24.00	2.00	-0.50
24.00	3.00	-1.50
24.00	4.00	-2.50
24.00	5.00	-3.50
24.00	6.00	-4.50
24.00	7.00	-5.50
24.00	8.00	-6.50
24.00	9.00	-7.50
24.00	10.00	-8.50
24.00	11.00	-9.50
24.00	12.00	-10.50
24.00	13.00	-11.50
24.00	14.00	-12.50
24.00	15.00	-13.50
24.00	16.00	-14.50
24.00	17.00	-15.50
24.00	18.00	-16.50
24.00	19.00	-17.50
24.00	20.00	-18.50
24.00	21.00	-19.50
24.00	22.00	-20.50
24.00	23.00	-21.50
24.00	24.00	-22.50
24.00	25.00	-23.50
24.00	26.00	-24.50
24.00	27.00	-25.50
24.00	28.00	-26.50
24.00	29.00	-27.50
24.00	30.00	-28.50
24.00	31.00	-29.50
24.00	32.00	-30.50
24.00	33.00	-31.50
24.00	34.00	-32.50
24.00	35.00	-33.50
24.00	36.00	-34.50
24.00	37.00	-35.50
24.00	38.00	-36.50
24.00	39.00	-37.50
24.00	40.00	-38.50

24.00	41.00	-39.50
24.00	42.00	-40.50
24.00	43.00	-41.50
24.00	44.00	-42.50
24.00	45.00	-43.50
24.00	46.00	-44.50
24.00	47.00	-45.50
24.00	48.00	-46.50
24.00	49.00	-47.50
24.00	50.00	-48.50
24.00	51.00	-49.50
24.00	52.00	-50.50
24.00	53.00	-51.50
24.00	54.00	-52.50
24.00	55.00	-53.50
24.00	56.00	-54.50
24.00	57.00	-55.50
24.00	58.00	-56.50
24.00	59.00	-57.50
24.00	60.00	-58.50
24.00	61.00	-59.50
24.00	62.00	-60.50
24.00	63.00	-61.50
24.00	64.00	-62.50
24.00	65.00	-63.50
24.00	66.00	-64.50
24.00	67.00	-65.50
24.00	68.00	-66.50
24.00	69.00	-67.50
24.00	70.00	-68.50

Driven Pile Capacity:
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Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	24.0	0.00	5.18	5.18	2.59	15.54
2.00	24.0	0.00	6.40	6.40	3.20	19.20
3.00	24.0	0.38	6.58	6.96	3.48	20.13
4.00	24.0	1.32	7.15	8.47	4.24	22.78
5.00	24.0	2.64	8.02	10.65	5.33	26.69
6.00	24.0	4.29	9.07	13.36	6.68	31.49
7.00	24.0	6.22	10.21	16.43	8.22	36.85
8.00	24.0	8.37	11.27	19.64	9.82	42.18
9.00	24.0	10.87	11.87	22.75	11.37	46.49
10.00	24.0	13.60	12.32	25.93	12.96	50.58
11.00	24.0	16.32	11.93	28.25	14.13	52.11
12.00	24.0	19.07	11.49	30.55	15.28	53.52
13.00	24.0	21.83	11.01	32.84	16.42	54.85
14.00	24.0	24.61	10.50	35.10	17.55	56.09
15.00	24.0	32.25	10.05	42.31	21.15	62.41
16.00	24.0	35.51	9.89	45.40	22.70	65.19
17.00	24.0	38.74	10.09	48.83	24.41	69.00
18.00	24.0	41.85	10.28	52.13	26.07	72.70
19.00	24.0	45.01	10.51	55.51	27.76	76.53
20.00	24.0	48.26	10.49	58.76	29.38	79.74
21.00	24.0	51.52	11.64	63.17	31.58	86.45

22.00	24.0	54.78	13.12	67.91	33.95	94.16
23.00	24.0	58.04	14.56	72.60	36.30	101.72
24.00	24.0	61.30	15.88	77.18	38.59	108.93
25.00	24.0	64.56	16.97	81.53	40.76	115.47
26.00	24.0	67.82	17.84	85.66	42.83	121.33
27.00	24.0	71.08	18.48	89.55	44.78	126.51
28.00	24.0	79.59	18.16	97.75	48.88	134.08
29.00	24.0	89.87	17.51	107.38	53.69	142.41
30.00	24.0	100.16	16.92	117.07	58.54	150.91
31.00	24.0	110.04	16.51	126.56	63.28	159.59
32.00	24.0	119.14	16.52	135.66	67.83	168.69
33.00	24.0	127.44	16.70	144.14	72.07	177.54
34.00	24.0	134.95	18.55	153.50	76.75	190.61
35.00	24.0	141.65	22.14	163.79	81.90	208.07
36.00	24.0	148.08	27.10	175.18	87.59	229.37
37.00	24.0	154.73	33.34	188.08	94.04	254.76
38.00	24.0	161.62	40.88	202.50	101.25	284.25
39.00	24.0	168.73	49.05	217.78	108.89	315.87
40.00	24.0	176.07	57.18	233.26	116.63	347.62
41.00	24.0	183.27	61.21	244.47	122.24	366.89
42.00	24.0	189.49	62.83	252.32	126.16	377.99
43.00	24.0	195.87	65.82	261.69	130.85	393.33
44.00	24.0	202.89	69.64	272.52	136.26	411.80
45.00	24.0	210.75	74.01	284.76	142.38	432.78
46.00	24.0	219.19	78.97	298.16	149.08	456.10
47.00	24.0	227.88	84.72	312.60	156.30	482.05
48.00	24.0	236.90	91.33	328.24	164.12	510.91
49.00	24.0	246.71	96.61	343.33	171.66	536.55
50.00	24.0	257.03	99.97	357.00	178.50	556.94
51.00	24.0	267.37	103.42	370.80	185.40	577.65
52.00	24.0	277.74	106.92	384.66	192.33	598.49
53.00	24.0	288.13	110.39	398.51	199.26	619.28
54.00	24.0	298.52	113.83	412.35	206.18	640.02
55.00	24.0	308.93	117.25	426.18	213.09	660.69
56.00	24.0	319.35	120.65	440.00	220.00	681.31
57.00	24.0	329.77	123.38	453.15	226.57	699.90
58.00	24.0	340.20	125.40	465.60	232.80	716.40
59.00	24.0	350.63	126.84	477.48	238.74	731.17
60.00	24.0	361.07	127.71	488.78	244.39	744.20
61.00	24.0	371.51	128.00	499.51	249.76	755.51
62.00	24.0	381.95	128.00	509.95	254.98	765.95
63.00	24.0	392.40	128.00	520.40	260.20	776.40
64.00	24.0	402.85	128.00	530.85	265.42	786.85
65.00	24.0	413.30	128.00	541.30	270.65	797.30
66.00	24.0	423.75	128.00	551.75	275.88	807.75
67.00	24.0	434.21	128.00	562.21	281.10	818.21
68.00	24.0	444.66	128.00	572.66	286.33	828.66
69.00	24.0	455.12	127.31	582.43	291.22	837.06
70.00	24.0	465.58	125.26	590.83	295.42	841.35

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING.
   EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS

2 x THE MOBILIZED END BEARING.

Florida Bridge Software Institute Date: September 06, 2016
Shaft and Pile Analysis (FB-Deep v.2.04) Time: 19:58:53

General Information:
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Input file: .....s\90% Submittal\1. FB-Deep\Boring B2-14\8-30-16\B2-14 (PD).spc
Project number: 6086960
Job name: 44th Avenue Bridge Extension
Engineer: AECOM
Units: English

Analysis Information:
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Analysis Type: SPT

Soil Information:
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Boring date: July 19, 2016, Boring Number: B2-14
Station number: 210+30 Offset: -30

Ground Elevation: 0.200(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	0.00	1- Plastic Clay
2	2.00	0.00	2- Clay and silty sand
3	4.00	0.00	2- Clay and silty sand
4	6.00	0.00	2- Clay and silty sand
5	7.00	2.00	1- Plastic Clay
6	8.00	2.00	2- Clay and silty sand
7	10.00	2.00	2- Clay and silty sand
8	15.00	2.00	2- Clay and silty sand
9	19.00	8.00	4- Lime Stone/Very shelly sand
10	20.00	8.00	4- Lime Stone/Very shelly sand
11	25.00	8.00	4- Lime Stone/Very shelly sand
12	30.00	8.00	4- Lime Stone/Very shelly sand
13	31.00	24.00	1- Plastic Clay
14	35.00	24.00	1- Plastic Clay
15	40.00	100.00	1- Plastic Clay
16	45.00	100.00	2- Clay and silty sand
17	50.00	29.00	2- Clay and silty sand
18	55.00	100.00	2- Clay and silty sand
19	60.00	100.00	2- Clay and silty sand
20	65.00	100.00	2- Clay and silty sand
21	70.00	100.00	2- Clay and silty sand
22	75.00	100.00	2- Clay and silty sand
23	80.00	53.00	2- Clay and silty sand
24	81.00	0.00	5- Cavity layer

SCOUR EL -6 (+/-)

PREFORMED HOLE
TO EL -30

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation	Bottom Elevation	Thickness	Average Blowcount	Soil Type

	(ft)	(ft)	(ft)	(Blows/ft)	
1	0.20	-1.80	2.00	0.00	1-Plastic Clay
2	-1.80	-6.80	5.00	0.00	2-Clay and Silty Sand
3	-6.80	-7.80	1.00	2.00	1-Plastic Clay
4	-7.80	-18.80	11.00	2.00	2-Clay and Silty Sand
5	-18.80	-30.80	12.00	8.00	4-Limestone, Very Shelly Sand
6	-30.80	-44.80	14.00	51.14	1-Plastic Clay
7	-44.80	-80.80	36.00	88.83	2-Clay and Silty Sand
8	-80.80	-80.80	0.00	0.00	5-

Driven Pile Data:
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Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
24.00	1.00	-0.80
24.00	2.00	-1.80
24.00	3.00	-2.80
24.00	4.00	-3.80
24.00	5.00	-4.80
24.00	6.00	-5.80
24.00	7.00	-6.80
24.00	8.00	-7.80
24.00	9.00	-8.80
24.00	10.00	-9.80
24.00	11.00	-10.80
24.00	12.00	-11.80
24.00	13.00	-12.80
24.00	14.00	-13.80
24.00	15.00	-14.80
24.00	16.00	-15.80
24.00	17.00	-16.80
24.00	18.00	-17.80
24.00	19.00	-18.80
24.00	20.00	-19.80
24.00	21.00	-20.80
24.00	22.00	-21.80
24.00	23.00	-22.80
24.00	24.00	-23.80
24.00	25.00	-24.80
24.00	26.00	-25.80
24.00	27.00	-26.80
24.00	28.00	-27.80
24.00	29.00	-28.80
24.00	30.00	-29.80
24.00	31.00	-30.80
24.00	32.00	-31.80
24.00	33.00	-32.80
24.00	34.00	-33.80
24.00	35.00	-34.80
24.00	36.00	-35.80
24.00	37.00	-36.80

24.00	38.00	-37.80
24.00	39.00	-38.80
24.00	40.00	-39.80
24.00	41.00	-40.80
24.00	42.00	-41.80
24.00	43.00	-42.80
24.00	44.00	-43.80
24.00	45.00	-44.80
24.00	46.00	-45.80
24.00	47.00	-46.80
24.00	48.00	-47.80
24.00	49.00	-48.80
24.00	50.00	-49.80
24.00	51.00	-50.80
24.00	52.00	-51.80
24.00	53.00	-52.80
24.00	54.00	-53.80
24.00	55.00	-54.80
24.00	56.00	-55.80
24.00	57.00	-56.80
24.00	58.00	-57.80
24.00	59.00	-58.80
24.00	60.00	-59.80
24.00	61.00	-60.80
24.00	62.00	-61.80
24.00	63.00	-62.80
24.00	64.00	-63.80
24.00	65.00	-64.80
24.00	66.00	-65.80
24.00	67.00	-66.80
24.00	68.00	-67.80
24.00	69.00	-68.80
24.00	70.00	-69.80

Driven Pile Capacity:
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Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	24.0	0.00	0.00	0.00	0.00	0.00
2.00	24.0	0.00	0.00	0.00	0.00	0.00
3.00	24.0	0.00	0.00	0.00	0.00	0.00
4.00	24.0	0.00	0.00	0.00	0.00	0.00
5.00	24.0	0.00	0.00	0.00	0.00	0.00
6.00	24.0	0.00	0.00	0.00	0.00	0.00
7.00	24.0	0.00	0.00	0.00	0.00	0.00
8.00	24.0	0.00	0.00	0.00	0.00	0.00
9.00	24.0	0.00	0.04	0.04	0.02	0.13
10.00	24.0	0.00	0.34	0.34	0.17	1.03
11.00	24.0	0.00	1.16	1.16	0.58	3.47
12.00	24.0	0.00	2.74	2.74	1.37	8.23
13.00	24.0	0.00	5.14	5.14	2.57	15.43
14.00	24.0	0.00	8.23	8.23	4.11	24.69
15.00	24.0	0.00	12.00	12.00	6.00	36.00
16.00	24.0	0.04	16.26	16.30	8.15	48.83
17.00	24.0	0.18	18.43	18.61	9.30	55.46
18.00	24.0	0.43	20.21	20.64	10.32	61.05

19.00	24.0	1.28	21.60	22.88	11.44	66.08
20.00	24.0	1.89	21.70	23.59	11.79	66.99
21.00	24.0	2.44	22.00	24.44	12.22	68.44
22.00	24.0	2.96	22.50	25.46	12.73	70.46
23.00	24.0	3.45	23.20	26.65	13.33	73.05
24.00	24.0	3.97	23.86	27.83	13.92	75.56
25.00	24.0	4.54	24.34	28.88	14.44	77.57
26.00	24.0	5.11	24.83	29.95	14.97	79.61
27.00	24.0	5.70	25.33	31.03	15.52	81.70
28.00	24.0	6.29	25.84	32.14	16.07	83.82
29.00	24.0	6.87	26.56	33.44	16.72	86.56
30.00	24.0	7.41	27.77	35.18	17.59	90.73
31.00	24.0	12.76	29.91	42.67	21.34	102.49
32.00	24.0	20.50	30.47	50.97	25.49	111.91
33.00	24.0	27.59	32.23	59.82	29.91	124.28
34.00	24.0	34.39	35.54	69.93	34.96	141.00
35.00	24.0	41.27	41.01	82.28	41.14	164.29
36.00	24.0	49.85	45.34	95.19	47.59	185.88
37.00	24.0	59.11	50.44	109.55	54.78	210.43
38.00	24.0	69.10	56.29	125.39	62.70	237.98
39.00	24.0	79.82	61.92	141.73	70.87	265.57
40.00	24.0	91.26	66.33	157.59	78.80	290.25
41.00	24.0	102.96	69.37	172.33	86.16	311.07
42.00	24.0	114.39	70.89	185.27	92.64	327.05
43.00	24.0	125.54	70.88	196.43	98.21	338.19
44.00	24.0	136.42	70.30	206.72	103.36	347.32
45.00	24.0	152.42	70.08	222.50	111.25	362.67
46.00	24.0	162.57	70.17	232.74	116.37	373.08
47.00	24.0	171.71	70.87	242.57	121.29	384.30
48.00	24.0	179.54	72.82	252.36	126.18	397.99
49.00	24.0	186.35	76.31	262.65	131.33	415.27
50.00	24.0	192.50	81.42	273.92	136.96	436.77
51.00	24.0	198.79	87.96	286.75	143.37	462.66
52.00	24.0	205.91	95.36	301.26	150.63	491.98
53.00	24.0	213.96	103.28	317.25	158.62	523.81
54.00	24.0	223.66	106.86	330.52	165.26	544.23
55.00	24.0	233.78	109.69	343.47	171.73	562.84
56.00	24.0	244.12	112.04	356.16	178.08	580.24
57.00	24.0	254.48	114.07	368.55	184.27	596.68
58.00	24.0	264.86	115.64	380.50	190.25	611.79
59.00	24.0	275.25	116.77	392.02	196.01	625.55
60.00	24.0	285.66	117.44	403.10	201.55	637.98
61.00	24.0	296.07	117.67	413.74	206.87	649.07
62.00	24.0	306.49	117.87	424.36	212.18	660.11
63.00	24.0	316.91	118.49	435.41	217.70	672.39
64.00	24.0	327.34	119.53	446.87	223.43	685.92
65.00	24.0	337.78	120.97	458.75	229.38	700.70
66.00	24.0	348.22	122.83	471.05	235.52	716.72
67.00	24.0	358.66	124.69	483.35	241.67	732.74
68.00	24.0	369.10	126.14	495.24	247.62	747.52
69.00	24.0	379.55	127.07	506.61	253.31	760.75
70.00	24.0	390.00	127.37	517.36	258.68	772.10

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS

3 x THE MOBILIZED END BEARING.
EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE
ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS
2 x THE MOBILIZED END BEARING.

APPENDIX J

Pile Data Table

PILE DATA TABLE

LOCATION	PILE NUMBER	PILE SIZE (IN)	NOMINAL BEARING RESISTANCE (TONS)	NOMINAL UPLIFT RESISTANCE (TONS)	MINIMUM TIP ELEVATION (FT)	TEST PILE LENGTH (FT)	REQUIRED JET ELEVATION (FT)	REQUIRED PREFORM ELEVATION (FT)	FACTORED DESIGN LOAD (TONS)	FACTORED DESIGN UPLIFT LOAD (TONS)	DOWN DRAG (TONS)	TOTAL SCOUR RESIST (TONS)	NET SCOUR RESIST. (TONS)	100 YEAR SCOUR ELEVATION (FT)	Ø COMPRESSION	Ø UPLIFT
INSTALLATION CRITERIA									DESIGN CRITERIA							
END BENT 1	1 & 12	24	330	0	-36	N/A	N/A	-10	180	0	35	N/A	N/A	9.0	0.65	N/A
	2 THRU 11	24	400	0	-36	58	N/A	-10	225	0	35	N/A	N/A	9.0	0.65	N/A
INTER. BENT 2	1 THRU 15	24	330	0	-37	60	N/A	N/A	215	0	N/A	N/A	N/A	6.0	0.65	N/A
INTER. BENT 3	1 THRU 15	24	330	0	-36	78	N/A	N/A	215	0	N/A	0	0	-5.0	0.65	N/A
INTER. BENT 4	1 THRU 15	24	330	0	-45	84	N/A	-26	215	0	N/A	63.6	0	-15.4	0.65	N/A
INTER. BENT 5	1 THRU 15	24	330	0	-45	88	N/A	-30	215	0	N/A	0	0	-9.7	0.65	N/A
INTER. BENT 6	1 THRU 15	24	330	0	-44	83	N/A	-28	215	0	N/A	7.0	0	-5.0	0.65	N/A
INTER. BENT 7	1 THRU 15	24	330	0	-45	80	N/A	-28	215	0	N/A	9.6	0	-5.4	0.65	N/A
INTER. BENT 8	1 THRU 15	24	330	0	-45	79	N/A	-29	215	0	N/A	2.1	0	-12.3	0.65	N/A
INTER. BENT 9	1 THRU 15	24	330	0	-51	86	N/A	-35	215	0	N/A	0	0	-10.9	0.65	N/A
INTER. BENT 10	1 THRU 15	24	330	0	-37	74	N/A	N/A	215	0	N/A	0	0	-4.4	0.65	N/A
INTER. BENT 11	1 THRU 15	24	330	0	-42	71	N/A	N/A	215	0	N/A	0	0	-7.1	0.65	N/A
INTER. BENT 12	1 THRU 15	24	330	0	-38	65	N/A	N/A	215	0	N/A	0	0	-7.5	0.65	N/A
INTER. BENT 13	1 THRU 15	24	330	0	-44	79	N/A	-30	215	0	N/A	8.1	0	-5.4	0.65	N/A
INTER. BENT 14	1 THRU 15	24	330	0	-45	78	N/A	-30	215	0	N/A	0	0	-7.6	0.65	N/A
INTER. BENT 15	1 THRU 15	24	330	0	-45	72	N/A	N/A	215	0	N/A	0	0	-2.6	0.65	N/A
END BENT 16	1 THRU 10	24	400	0	-40	58	N/A	-10	225	0	35	N/A	N/A	6.8	0.65	N/A
	11 & 12	24	330	0	-40	N/A	N/A	-10	180	0	35	N/A	N/A	6.8	0.65	N/A

$$\frac{\text{Factored Design Load + Net Scour Resistance + Down Drag}}{Ø} \leq \text{Nominal Bearing Resistance}$$

UPLIFT RESISTANCE – The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires uplift capacity).

TOTAL SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the scourable soil.

NET SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-YEAR SCOUR ELEVATION – Estimated elevation of scour due to the 100 year storm event.

NOTE: For Pile Installation Notes see Sheet B-21A.

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE NTS
DESIGNED BY AR
DRAWN BY KAC
CHECKED BY BWJ

AECOM Technical Services, Inc.
7650 West Courtney
Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE December 2016
PROJECT NO. 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER Mark S. Eicholtz, P.E.
FL. LICENSE NO. 36078

PILE INSTALLATION TABLE

SHEET NO. B-21

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PILE INSTALLATION NOTES

1. Contractor to verify location of all utilities prior to any pile installation activities.

2. Minimum Tip Elevation is required for lateral stability for Intermediate Bents. Minimum Tip Elevation is set below the compressible soil layers at End Bents.

3. When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pile driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

4. No jetting will be allowed without the approval of the Engineer. The Contractor should not anticipate being allowed to jet piles below the 100-year scour elevation or required jet elevation, whichever is deeper. At each Bent, pile driving is to commence at the center of the Bentand proceed outward.

5. The pile hammer may be required to operate at reduced strokes or energy lower than normal in order to reduce the vibration level at the existing structures in the vicinity. The County's personnel will perform vibration monitoring at the existing structures. The Contractor shall notify the County at least two weeks prior to commencing pile driving so that the County's personnel can schedule the vibration monitoring activities. Costs associated with any decrease in production rate for installing piles to meet the vibration limit requirement in accordance with Section 455-1.1 of the FDOT Standard Specifications shall be included in the unit bid price for Pre-stressed Concrete Piling, Pay Item No. 455-34.

6. The Contractor shall anticipate the use of specialized equipment and/or methods including, but not limited to, core barrels, rock augers, punches, drill bits, etc. to complete predrilling and/or preforming. If drilling equipment with a taper end is used to construct the preformed pile holes or predrilled pile holes, the maximum diameter of the drilling equipment shall not exceed the maximum size allowed for the 24-inch prestressed concrete pile indicated in the FDOT Specification Section 455.

7. The Contractor shall anticipate encountering variable soil conditions during the pile driving which will require pile splices at some of the pile locations.

8. Preloading/Surcharging and Settlement monitoring is required at both end bents 1 and 16. For details, see Roadway Plans.

9. It is preferred that End Bent 1 & 16 piles are installed after soil preloading/surcharging and settlement monitoring is complete.

10. If the End Bent piles are installed after soil preloading/surcharaging and settlement monitoring is complete, the piles shall be installed with predrilled holes through the completed embankment. No downdrag loss will be added to the pile driving resistance. In this case, Nominal Bearing Resistance of piles at these end bents will be reduced but shall not be less than 346 Tons. Nominal Bearing Resistance of piles at end bent wing walls shall not be less than 280 Tons. Minimum Tip Elevations shall be as shown in the Pile Data Table.

11. If piles are installed prior to preloading/surcharging, the exposed portion of the piles shall be wrapped in two layers of polyethylene sheeting in accordance with FDOT Specifications section 459 prior to fill placement.

Bridge No. 134130

No.	REVISIONS	DATE	BY

SCALE: NTS
DESIGNED BY: AR
DRAWN BY: KAC
CHECKED BY: BWJ

AECOM Technical Services, Inc.
7650 West Courtney
Campbell Causeway
Tampa, FL 33607-1462
C.A.No. 8115

DATE: December 2016
PROJECT NO.: 6086960

Manatee County FLORIDA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES
1022 26th Avenue East, Bradenton, FL 34208

DESIGN ENGINEER: Mark S. Eicholtz, P.E.
FL. LICENSE NO.: 36078

PILE INSTALLATION NOTES

SHEET NO.: B-21A

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APPENDIX K

FB-MultiPier Soil Design Parameters

SUMMARY TABLE: SOIL DESIGN PARAMETERS FOR FB-MULTIPIER

BENT NUMBER	BORING NUMBER	SOIL LAYER DESCRIPTIONS	TOP BOUNDARY ELEVATION (FT-NAVD)	BOTTOM BOUNDARY ELEVATION (FT-NAVD)	CORRECTED BLOW COUNTS (RANGE) (NOTE 1)	TOTAL UNIT WEIGHT (pcf)	PHI ANGLE (Degrees)	UNDRAINED SHEAR STRENGTH (C - ksf)	SUBGRADE MODULUS (K - pci)	YOUNG MODULUS (E - ksf)	POISSON RATIO (NU)	SHEAR MODULUS (G - ksf)	E50	VERTICAL FAILURE SHEAR (ksf)	AXIAL BEARING FAILURE (ksf)	TORSIONAL SHEAR STRESS (ksf)	REMARKS	
																	SCOUR ELEVATION	PREFORMED ELEVATION
1	B5 (Prel.)	Sand	5.8	-9.0	9 - 34	110	32	0	45	380	0.25	150.0	- -	1.48	20.0	1.48	7.7	N/A
		Clayey Sand	-9.0	-14.0	20 - 22	110	33	0	45	400	0.25	160.0	- -	0.40	40.0	0.40		
		Cemented Clay	-14.0	-19.0	53	125	0	4.0	250	1,500	0.50	500.0	0.001	2.00	125.0	2.00		
		Sandy Clay	-19.0	-34.0	13 - 20	110	0	1.5	45	160	0.40	60.0	0.05	1.50	7.5	1.50		
		Cemented Clay	-34.0	-60.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
2	B5 (Prel.)	Sand	5.8	-9.0	9 - 34	110	32	0	45	380	0.25	150.0	- -	1.48	20.0	1.48	7.7	N/A
		Clayey Sand	-9.0	-14.0	20 - 22	110	33	0	45	400	0.25	160.0	- -	0.40	40.0	0.40		
		Cemented Clay	-14.0	-19.0	53	125	0	4.0	250	1,500	0.50	500.0	0.001	2.00	125.0	2.00		
		Sandy Clay	-19.0	-34.0	13 - 20	110	0	1.5	45	160	0.40	60.0	0.05	1.50	7.5	1.50		
		Cemented Clay	-34.0	-60.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
3	B5 (Prel.)	Sand	5.8	2.6	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	2.6	N/A
		Sand	2.6	-9.0	9 - 34	110	32	0	45	380	0.25	150.0	- -	1.48	20.0	1.48		
		Clayey Sand	-9.0	-14.0	20 - 22	110	33	0	45	400	0.25	160.0	- -	0.40	40.0	0.40		
		Cemented Clay	-14.0	-19.0	53	125	0	4.0	250	1,500	0.50	500.0	0.001	2.00	125.0	2.00		
		Sandy Clay	-19.0	-34.0	13 - 20	110	0	1.5	45	160	0.40	60.0	0.05	1.50	7.5	1.50		
		Cemented Clay	-34.0	-60.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
4	B2-4	Sand	-5.9	-11.9	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-11.4	-20
		Cemented Clay	-11.9	-19.9	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sandy Clay	-19.9	-34.9	10 - 22	110	0	1.5	40	150	0.40	40.0	0.05	1.40	6.0	1.40		
		Cemented Clay	-34.9	-88.5	13 - 100	120	0	3.5	200	2,000	0.50	500.0	0.001	2.60	160.0	2.50		
5	B2-5	Sand	-0.5	-10.5	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-14.2	-30
		Cemented Clay	-10.5	-23.7	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sandy Clay	-23.7	-30.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sandy Clay	-30.0	-39.2	8 - 16	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Cemented Clay	-39.2	-85.0	18 - 100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
6	B2-6	Sand	1.5	-6.5	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-5.0	-28
		Cemented Clay	-6.5	-13.5	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sand	-13.5	-18.5	10	110	31	0	55	250	0.25	100.0	- -	1.00	14.0	1.00		
		Cemented Clay	-18.5	-33.5	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sandy Clay	-33.5	-38.5	24	110	0	2.5	65	240	0.40	85.0	0.05	2.00	11.0	2.00		
		Cemented Clay	-38.5	-43.5	24 - 100	115	0	2.5	65	720	0.50	240.0	0.001	1.00	60.0	1.00		
		Sandy Clay	-43.5	-48.5	36	115	0	4	100	360	0.40	125.0	0.004	2.60	15.0	2.60		
		Cemented Clay	-48.5	-85.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
7	B2-7	Sand	1.5	-4.5	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-5.0	N/A
		Sand	-4.5	-13.5	14 - 25	110	33	0	30	290	0.25	110.0	- -	1.20	15.0	1.20		
		Sandy Clay	-13.5	-18.5	12	110	0	1	33	120	0.40	40.0	0.007	1.20	5.6	1.20		
		Cemented Clay	-18.5	-28.5	12 - 100	110	0	3	33	360	0.50	120.0	0.001	0.50	30.0	0.50		
		Sandy Clay	-28.5	-38.5	17 - 34	110	0	3.5	50	175	0.40	60.0	0.004	1.75	9.0	1.75		
		Cemented Clay	-38.5	-68.5	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
		Sandy Clay	-68.5	-78.5	>100	120	0	4	125	1,000	0.40	350.0	0.004	1.00	45.0	1.00		
		Cemented Clay	-78.5	-85.0	15 - >100	125	0	3	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		

SUMMARY TABLE: SOIL DESIGN PARAMETERS FOR FB-MULTIPIER

BENT NUMBER	BORING NUMBER	SOIL LAYER DESCRIPTIONS	TOP BOUNDARY ELEVATION (FT-NAVD)	BOTTOM BOUNDARY ELEVATION (FT-NAVD)	CORRECTED BLOW COUNTS (RANGE) (NOTE 1)	TOTAL UNIT WEIGHT (pcf)	PHI ANGLE (Degrees)	UNDRAINED SHEAR STRENGTH (C - ksf)	SUBGRADE MODULUS (K - pci)	YOUNG MODULUS (E - ksf)	POISSON RATIO (NU)	SHEAR MODULUS (G - ksf)	E50	VERTICAL FAILURE SHEAR (ksf)	AXIAL BEARING FAILURE (ksf)	TORSIONAL SHEAR STRESS (ksf)	REMARKS SCOUR ELEVATION	REMARKS PREFORMED ELEVATION
8	B2-8	Sand	-5.0	-11.5	0	0	0	0	0	0	0.00	0	- -	0.00	0.0	0.00	-11.4	-29
		Cemented Sand	-11.5	-16.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sand	-16.0	-21.0	10	110	31	0	55	250	0.25	100.0	- -	1.00	14.0	1.00		
		Cemented Clay	-21.0	-30.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Clay	-30.0	-40.0	14	110	0	1.0	39	140	0.40	50.0	0.05	1.30	6.0	1.30		
		Cemented Clay	-40.0	-85.0	18 - 100	125	0	4	250	3,000	0.50	1,000	0.001	3.90	240.0	3.90		
9	B2-9	Sand	-6.0	-12.0	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-11.7	-35
		Sand	-6.0	-17.0	2	102	29	0	6	40	0.25	16.0	- -	0.18	2.1	0.18		
		Cemented Clay	-17.0	-22.0	5	105	0	0.8	14	150	0.50	50.0	0.001	0.19	12.0	0.19		
		Sand	-22.0	-27.0	7	105	30	0	14	140	0.25	56.0	0	0.60	7.5	0.60		
		Cemented Clay	-27.0	-37.0	20	110	0	2.5	55	600	0.50	200.0	0.001	0.78	48.0	0.78		
		Sandy Clay	-37.0	-47.0	10	105	0	1	28	100	0.40	35.0	0.007	1.00	4.5	1.00		
		Cemented Clay	-47.0	-85.0	11 - 100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
10	B2-10	Sand	-0.3	-10.3	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-8.0	N/A
		Cemented Clay	-10.3	-20.3	27 - 100	115	0	2.5	80	80	0.50	300.0	0.001	1.50	100.0	1.50		
		Sandy Clay	-20.3	-39.3	10 - 17	110	0	1.3	35	120	0.40	40.0	0.007	1.20	6.0	1.20		
		Cemented Clay	-39.3	-65.3	19 - >100	125	0	4	250	1,000	0.50	500.0	0.001	2.20	150.0	2.20		
		Sandy Clay	-65.3	-75.3	21 - 31	110	0	4	60	250	0.40	75.0	0.005	2.20	10.0	2.20		
		Cemented Clay	-75.3	-85.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
11	B2-11	Sand	-0.5	-6.5	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-6.6	N/A
		Sand	-6.5	-16.5	2	102	29	0	6	40	0.25	16.0	- -	0.18	2.1	0.18		
		Cemented Clay	-16.5	-20.5	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
		Sandy Clay	-20.5	-39.5	8 - 30	110	0	1	40	150	0.40	50.0	0.05	1.20	7.0	1.20		
		Cemented Clay	-39.5	-85.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
12	B2-12	Sand	-1.0	-9.0	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.0	-6.9	N/A
		Cemented Clay	-9.0	-11.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.9		
		Sandy Clay	-11.0	-32.0	10 - 17	110	0	2	40	150	0.40	50.0	0.05	1.20	6.0	1.2		
		Cemented Clay	-32.0	-85.0	43 - >100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.9		
13	B2-13	Sand	0.1	-7.0	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-6.9	-30
		Sand	-7.0	-15.0	2 - 3	102	29	0	6	40	0.25	16.0	- -	0.18	2.1	0.18		
		Cemented Silt	-15.0	-20.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Cemented Clay	-20.0	-30.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Cemented Clay	-30.0	-35.0	20	110	0	2.5	55	600	0.50	200.0	0.001	0.80	48.0	0.80		
		Sandy Clay	-35.0	-45.0	25 - 27	110	0	2.5	70	250	0.40	90.0	0.05	2.10	12.0	2.10		
		Cemented Clay	-45.0	-85.0	10 - >100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
14	B2-14	Sand	0.1	-6.0	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-6.0	-30
		Sand	-6.0	-15.0	2 - 5	102	29	0	6	40	0.25	16.0	- -	0.18	2.0	0.18		
		Cemented Clay	-15.0	-20.0	4	102	0	0.5	10	120	0.50	40.0	0.001	0.15	9.0	0.15		
		Cemented Clay	-20.0	-31.0	10	107	0	1.0	28	300	0.50	100.0	0.02	0.40	24.0	0.40		
		Sandy Clay	-31.0	-40.0	24	110	0	2.5	65	240	0.40	80.0	0.05	2.00	11.0	2.00		
		Cemented Clay	-40.0	-45.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
		Sandy Clay	-45.0	-55.0	29	110	0	2.5	80	290	0.40	100.0	0.05	2.30	7.5	2.30		
		Cemented Clay	-55.0	-85.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
15	B2-15	Sand	-4.2	-11.0	0	0	0	0	0	0	0.00	0.0	- -	0.00	0.0	0.00	-10.8	N/A
		Sand	-11.0	-13.0	2	102	29	0	6	40	0.25	16.0	- -	0.20	2.1	0.20		
		Sandy Clay	-13.0	-24.2	2	102	0	0.2	6	20	0.40	7.0	0.02	0.20	0.9	0.20		
		Sandy Clay	-24.2	-40.2	20 - 21	110	0	2.5	55	200	0.40	70.0	0.05	1.80	9.0	1.80		
		Cemented Clay	-40.2	-85.0	17 - >100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		
16	B2-16	Sand	7.8	-3.0	10	110	31	0	55	250	0.25	100.0	- -	1.00	14.0	1.00	7.7	-3
		Sand	-3.0	-8.2	20 - 25	110	33	0	30	290	0.25	110.0	- -	1.20	15.0	1.20		
		Sandy Clay	-8.2	-33.2	17 - 47	110	0	2.5	60	250	0.40	60.0	0.05	1.50	8.0	1.50		
		Cemented Clay	-33.2	-85.0	>100	125	0	4	250	3,000	0.50	1000.0	0.001	3.90	240.0	3.90		

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

44th Avenue Over Braden River

Boring B-5 **Interior Bent 2**

Date = 09/01/15
GSE = 5.8
GWT = 5

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Gamma (PCF)		Soil Parameters Phi (Degree)		C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)
5.8	0.0	2	0	0	0	0.0	0		28		0	SP/SM	0		0		0.25	0.0		- -	0.000		0.0		0.000
3.8	2.0	2	11	11	220.0	95.2	110		31		0.0	SP/SM	30		220,000		0.25	88.0		0.000	0.950		11.7		0.950
1.8	4.0	2	16	16	440.0	190.4	110		32		0.0	SP/SM	44		320,000		0.25	128.0		0.000	1.313		17.1		1.313
-0.2	6.0	2	9	9	654.0	279.6	107	110.27	30	32.83	0.0	SP/SM	25	48.04	180,000	386666.67	0.25	72.0	154.67	0.000	0.793	1.48	9.6	20.62	0.793
-2.2	8.0	2	20	20	874.0	374.8	110		33		0.0	SP/SM	55		400,000		0.25	160.0		0.000	1.571		21.3		1.571
-4.2	10.0	2	34	34	1104.0	480.0	115		37		0.0	SP/SM	94		680,000		0.25	272.0		0.000	2.255		36.3		2.255
-9.2	15.0	2	16	22	1654.0	718.0	110		34		0.0	SP/SM	44		440,000		0.25	176.0		0.000	1.690		23.5		1.690
-9.3	15.1	3	16	22	1665.0	722.8	110		34		0.0	SC	44		440,000		0.25	176.0		0.000	0.440		46.9		0.440
-14.1	19.9	3	16	20	2193.0	951.2	110		33		0.0	SC	44		400,000		0.25	160.0		0.000	0.400		42.7		0.400
-14.2	20.0	5	53	53	2205.5	957.5	125		0		4.0	Cemented Silt/Clay	250		1,590,000		0.50	530.0		0.001	2.067		127.2		2.067
-18.2	24.0	5	53	53	2705.5	1207.9	125		0		4.0	Cemented Silt/Clay	250		1,590,000		0.50	530.0		0.001	2.067		127.2		2.067
-19.2	25.0	4	20	20	2815.5	1255.5	110		0		2.5	CL/CH	55		200,000		0.40	71.4		0.050	1.797		9.3		1.797
-24.2	30.0	4	20	20	3365.5	1493.5	110		0		2.5	CL/CH	55		200,000		0.40	71.4		0.050	1.797		9.3		1.797
-29.2	35.0	4	13	13	3915.5	1731.5	110		0		1.0	CL/CH	36	46.77	130,000	168750.00	0.40	46.4	60.27	0.007	1.259	1.56	6.1	7.88	1.259
-34.2	40.0	4	17	17	4465.5	1969.5	110		0		2.5	CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578
-35.2	41.0	5	100	100	4590.5	2032.1	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-39.2	45.0	5	100	100	5090.5	2282.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-44.2	50.0	5	100	100	5715.5	2595.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-49.2	55.0	5	100	100	6340.5	2908.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-54.2	60.0	5	100	100	6965.5	3221.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-59.2	65.0	5	100	100	7590.5	3534.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-64.2	70.0	5	100	100	8215.5	3847.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-79.2	85.0	5	100	100	10090.5	4786.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-84.2	90.0	5	100	100	10715.5	5099.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-89.2	95.0	5	100	100	11340.5	5412.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-94.2	100.0	5	100	100	11965.5	5725.5	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900

44th Avenue Over Braden River

Boring B-5 — Interior Bent 3

Date = 09/01/15
GSE = 5.8
GWT = 5

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Gamma (PCF)		Soil Parameters Phi (Degree)		C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	Vertical Shear Failure Stress (ksf)		FB-Deep --- Concrete Piles End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)
5.8	0.0	2	0	0	0	0.0	0		0		0	SP/SM	0		0		0.00	0.0		- -	0.000		0.0		0.000
3.8	2.0	2	0	0	0.0	0.0	0		0		0.0	SP/SM	0		0		0.00	0.0		0.000	0.000		0.0		0.000
2.8	3.0	2	0	0	0.0	0.0	0		0		0.0	SP/SM	0		0		0.00	0.0		0.000	0.000		0.0		0.000
1.8	4.0	2	16	16	110.0	47.6	110		32		0.0	SP/SM	44		320,000		0.25	128.0		0.000	1.313		17.1		1.313
-0.2	6.0	2	9	9	324.0	136.8	107		30		0.0	SP/SM	25		180,000		0.25	72.0		0.000	0.793		9.6		0.793
-2.2	8.0	2	20	20	544.0	232.0	110	110.33	33	33.35	0.0	SP/SM	55	51.27	400,000	428333.33	0.25	160.0	171.33	0.000	1.571	1.61	21.3	22.84	1.571
-4.2	10.0	2	34	34	774.0	337.2	115		37		0.0	SP/SM	94		680,000		0.25	272.0		0.000	2.255		36.3		2.255
-9.2	15.0	2	16	23	1324.0	575.2	110		34		0.0	SP/SM	44		460,000		0.25	184.0		0.000	1.746		24.5		1.746
-9.3	15.1	3	16	23	1335.0	580.0	110		34		0.0	SC	44		460,000		0.25	184.0		0.000	0.460		49.1		0.460
-14.1	19.9	3	16	21	1863.0	808.4	110		33		0.0	SC	44		420,000		0.25	168.0		0.000	0.420		44.8		0.420
-14.2	20.0	5	53	53	1875.5	814.7	125		0		4.0	Cemented Silt/Clay	250		1,590,000		0.50	530.0		0.001	2.067		127.2		2.067
-18.2	24.0	5	53	53	2375.5	1065.1	125		0		4.0	Cemented Silt/Clay	250		1,590,000		0.50	530.0		0.001	2.067		127.2		2.067
-19.2	25.0	4	20	20	2485.5	1112.7	110		0		2.5	CL/CH	55		200,000		0.40	71.4		0.050	1.797		9.3		1.797
-24.2	30.0	4	20	20	3035.5	1350.7	110		0		2.5	CL/CH	55		200,000		0.40	71.4		0.050	1.797		9.3		1.797
-29.2	35.0	4	13	13	3585.5	1588.7	110		0		1.0	CL/CH	36	46.77	130,000	168750.00	0.40	46.4	60.27	0.007	1.259	1.56	6.1	7.88	1.259
-34.2	40.0	4	17	17	4135.5	1826.7	110		0		2.5	CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578
-35.2	41.0	5	100	100	4260.5	1889.3	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-39.2	45.0	5	100	100	4760.5	2139.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-44.2	50.0	5	100	100	5385.5	2452.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-49.2	55.0	5	100	100	6010.5	2765.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-54.2	60.0	5	100	100	6635.5	3078.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-59.2	65.0	5	100	100	7260.5	3391.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-64.2	70.0	5	100	100	7885.5	3704.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-79.2	85.0	5	100	100	9760.5	4643.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-84.2	90.0	5	100	100	10385.5	4956.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-89.2	95.0	5	100	100	11010.5	5269.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900
-94.2	100.0	5	100	100	11635.5	5582.7	125		0		4.0	Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

44th Avenue Over Braden River

Boring B2-4

Date = 07/13/16
GSE = 1.5
GWT = -5.9

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Phi (Degree)	C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)	End Bearing Failure Stress (ksf)	Torsional Shear Failure Stress (ksf)
1.5	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000
-0.5	2.0	1	1	1	204.0	204.0	102	28	0.0	SP	3	20,000	0.25	8.0	0.000	0.095	1.1	0.095
-2.5	4.0	1	1	1	408.0	408.0	102	28	0.0	SP	3	20,000	0.25	8.0	0.000	0.095	1.1	0.095
-4.5	6.0	1	1	1	612.0	612.0	102	28	0.0	SP	3	20,000	0.25	8.0	0.000	0.095	1.1	0.095
-6.5	8.0	5	2	2	816.0	691.2	102	0	0.2	Cemented Silt/Clay	6	60,000	0.50	20.0	0.001	0.078	4.8	0.078
-8.5	10.0	5	100	100	1066.0	816.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-10.5	12.0	5	100	100	1316.0	941.6	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-12.5	14.0	5	100	100	1566.0	1066.8	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-14.5	16.0	5	100	100	1816.0	1192.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-16.5	18.0	5	100	100	2066.0	1317.2	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-18.0	19.5	5	100	100	2253.5	1411.1	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-18.5	20.0	4	41	41	2311.0	1437.4	115	0	4.0	CL/CH	114	410,000	0.40	146.4	0.004	2.824	19.1	2.824
-23.5	25.0	4	22	22	2861.0	1675.4	110	0	2.5	CL/CH	61	220,000	0.40	78.6	0.050	1.933	10.3	1.933
-28.5	30.0	4	10	10	3396.0	1898.4	107	0	1.0	CL/CH	28	100,000	0.40	35.7	0.007	0.998	4.7	0.998
-32.5	34.0	4	16	16	3836.0	2088.8	110	0	2.5	CL/CH	44	160,000	0.40	57.1	0.050	1.502	7.5	1.502
-33.5	35.0	5	16	16	3946.0	2136.4	110	0	2.5	Cemented Silt/Clay	44	480,000	0.50	160.0	0.001	0.624	38.4	0.624
-38.5	40.0	5	40	40	4571.0	2449.4	125	0	4.0	Cemented Silt/Clay	250	1,200,000	0.50	400.0	0.001	1.560	96.0	1.560
-43.5	45.0	5	100	100	5196.0	2762.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-48.5	50.0	5	13	13	5746.0	3000.4	110	0	1.0	Cemented Silt/Clay	36	390,000	0.50	130.0	0.001	0.507	31.2	0.507
-53.5	55.0	5	100	100	6371.0	3313.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-58.5	60.0	5	100	100	6996.0	3626.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-63.5	65.0	5	17	17	7546.0	3864.4	110	0	2.5	Cemented Silt/Clay	47	510,000	0.50	170.0	0.001	0.663	40.8	0.663
-68.5	70.0	5	100	100	8171.0	4177.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-73.5	75.0	5	45	45	8796.0	4490.4	125	0	4.0	Cemented Silt/Clay	250	1,350,000	0.50	450.0	0.001	1.755	108.0	1.755
-78.5	80.0	5	15	15	9346.0	4728.4	110	0	1.0	Cemented Silt/Clay	42	450,000	0.50	150.0	0.001	0.585	36.0	0.585
-83.5	85.0	5	100	100	9971.0	5041.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900
-88.5	90.0	5	100	100	10596.0	5354.4	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900

Notes

Phi =	N/4 + 28 for Sand / Sandy materials	
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone	
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand
	N x 0.039	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay
	3.2 x N / 3	Sand, Silt & Caly mixtures
	6.4 x N / 3	Clean Sand
	7.2 x N / 3	Limestones, Very Shelly sand

k (pci) =	30 to 120 for sand higher for limestone	(FB-Multpier Manual, COM624P or LPILE)
Poison Ratio (v) =	0.2 to 0.3 for sand 0.4 to 0.5 for clay	(FB-Multpier Manual, COM624P or LPILE)
E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 20,000	Clean Sand
	N x 30,000	Limestones, Very Shelly sand
G =	E / (2 x (1+v))	

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-4
Date = 07/13/16
GSE = -5.9
GWT = -5.9

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters: Gamma (PCF)	Soil Parameters: Phi (Degree)	Soil Parameters: C (KSF)	C AVER. (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	k (AVER.)	Young Modulus, E (psf)	E (AVER.)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	G (AVER.)	E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)	VS (AVER.)	End Bearing Failure Stress (ksf)	EB (AVER.)	Torsional Shear Failure Stress (ksf)	
-5.9	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-7.9	2.0	1	0	0	204.0	79.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-9.9	4.0	5	0	0	408.0	158.4	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	
-11.9	6.0	5	0	0	612.0	237.6	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	SCOUR ELEVATION
-13.9	8.0	5	10	10	826.0	326.8	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-15.9	10.0	5	10	10	1040.0	416.0	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-17.9	12.0	5	10	10	1254.0	505.2	107	0	1.0	1.00	Cemented Silt/Clay	28	27.72	300,000	300000.00	0.50	100.0	100.00	0.001	0.390	0.39	24.0	24.00	0.390	
-19.9	14.0	5	10	10	1468.0	594.4	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	PREFORMED EL.
-21.9	16.0	4	22	22	1688.0	689.6	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-23.9	18.0	4	22	22	1908.0	784.8	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-25.4	19.5	4	22	22	2073.0	856.2	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-25.9	20.0	4	22	22	2128.0	880.0	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-30.9	25.0	4	10	10	2663.0	1103.0	107	0	1.0	1.60	CL/CH	28	41.02	100,000	148000.00	0.40	35.7	52.86	0.007	0.998	1.37	4.7	6.91	0.998	
-34.9	29.0	4	10	10	3091.0	1281.4	107	0	1.0		CL/CH	28		100,000		0.40	35.7		0.007	0.998		4.7		0.998	
-35.9	30.0	5	16	16	3201.0	1329.0	110	0	2.5		Cemented Silt/Clay	44		480,000		0.50	160.0		0.001	0.624		38.4		0.624	
-40.9	35.0	5	40	40	3826.0	1642.0	125	0	4.0		Cemented Silt/Clay	250		1,200,000		0.50	400.0		0.001	1.560		96.0		1.560	
-45.9	40.0	5	100	100	4451.0	1955.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-50.9	45.0	5	13	13	5001.0	2193.0	110	0	1.0		Cemented Silt/Clay	36		390,000		0.50	130.0		0.001	0.507		31.2		0.507	
-55.9	50.0	5	100	100	5626.0	2506.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-60.9	55.0	5	100	100	6251.0	2819.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-65.9	60.0	5	17	17	6801.0	3057.0	110	0	2.5	3.45	Cemented Silt/Clay	47	197.74	510,000	2040545.45	0.50	170.0	680.18	0.001	0.663	2.65	40.8	163.24	0.663	
-70.9	65.0	5	100	100	7426.0	3370.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-75.9	70.0	5	45	45	8051.0	3683.0	125	0	4.0		Cemented Silt/Clay	250		1,350,000		0.50	450.0		0.001	1.755		108.0		1.755	
-80.9	75.0	5	15	15	8601.0	3921.0	110	0	1.0		Cemented Silt/Clay	42		450,000		0.50	150.0		0.001	0.585		36.0		0.585	
-85.9	80.0	5	15	15	9151.0	4159.0	110	0	1.0		Cemented Silt/Clay	42		450,000		0.50	150.0		0.001	0.585		36.0		0.585	
-90.9	85.0	5	100	100	9776.0	4472.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-95.9	90.0	5	100	100	10401.0	4785.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)	
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone		
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)	
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay		
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures	
	N x 0.02	Clean Sand		N x 20,000	Clean Sand	
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand	
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))		
	3.2 x N / 3	Sand, Silt & Caly mixtures				
	6.4 x N / 3	Clean Sand				
	7.2 x N / 3	Limestones, Very Shelly sand				

Blow counts from surface to elevation -20 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-4

Date = 07/13/16
GSE = -5.9
GWT = -5.9

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)	C AVER. (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	k (AVER.)	Young Modulus, E (psf)	E (AVER.)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	G (AVER.)	E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)	VS (AVER.)	End Bearing Failure Stress (ksf)	EB (AVER.)	Torsional Shear Failure Stress (ksf)	
-5.9	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-7.9	2.0	1	0	0	204.0	79.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-9.9	4.0	5	0	0	408.0	158.4	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	
-11.9	6.0	5	0	0	612.0	237.6	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	SCOUR ELEVATION
-13.9	8.0	5	10	10	826.0	326.8	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-15.9	10.0	5	10	10	1040.0	416.0	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-17.9	12.0	5	10	10	1254.0	505.2	107	0	1.0	1.00	Cemented Silt/Clay	28	27.72	300,000	300000.00	0.50	100.0	100.00	0.001	0.390	0.39	24.0	24.00	0.390	
-19.9	14.0	5	10	10	1468.0	594.4	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	PREFORMED EL.
-21.9	16.0	4	22	22	1688.0	689.6	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-23.9	18.0	4	22	22	1908.0	784.8	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-25.4	19.5	4	22	22	2073.0	856.2	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-25.9	20.0	4	22	22	2128.0	880.0	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-30.9	25.0	4	10	10	2663.0	1103.0	107	0	1.0	1.60	CL/CH	28	41.02	100,000	148000.00	0.40	35.7	52.86	0.007	0.998	1.37	4.7	6.91	0.998	
-34.9	29.0	4	10	10	3091.0	1281.4	107	0	1.0		CL/CH	28		100,000		0.40	35.7		0.007	0.998		4.7		0.998	
-35.9	30.0	5	16	16	3201.0	1329.0	110	0	2.5		Cemented Silt/Clay	44		480,000		0.50	160.0		0.001	0.624		38.4		0.624	
-40.9	35.0	5	40	40	3826.0	1642.0	125	0	4.0		Cemented Silt/Clay	250		1,200,000		0.50	400.0		0.001	1.560		96.0		1.560	
-45.9	40.0	5	100	100	4451.0	1955.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-50.9	45.0	5	13	13	5001.0	2193.0	110	0	1.0		Cemented Silt/Clay	36		390,000		0.50	130.0		0.001	0.507		31.2		0.507	
-55.9	50.0	5	100	100	5626.0	2506.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-60.9	55.0	5	100	100	6251.0	2819.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-65.9	60.0	5	17	17	6801.0	3057.0	110	0	2.5	3.45	Cemented Silt/Clay	47	197.74	510,000	2040545.45	0.50	170.0	680.18	0.001	0.663	2.65	40.8	163.24	0.663	
-70.9	65.0	5	100	100	7426.0	3370.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-75.9	70.0	5	45	45	8051.0	3683.0	125	0	4.0		Cemented Silt/Clay	250		1,350,000		0.50	450.0		0.001	1.755		108.0		1.755	
-80.9	75.0	5	15	15	8601.0	3921.0	110	0	1.0		Cemented Silt/Clay	42		450,000		0.50	150.0		0.001	0.585		36.0		0.585	
-85.9	80.0	5	15	15	9151.0	4159.0	110	0	1.0		Cemented Silt/Clay	42		450,000		0.50	150.0		0.001	0.585		36.0		0.585	
-90.9	85.0	5	100	100	9776.0	4472.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-95.9	90.0	5	100	100	10401.0	4785.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)	
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone		
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)	
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay		
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures	
	N x 0.02	Clean Sand		N x 20,000	Clean Sand	
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand	
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))		
	3.2 x N / 3	Sand, Silt & Caly mixtures				
	6.4 x N / 3	Clean Sand				
	7.2 x N / 3	Limestones, Very Shelly sand				

Blow counts from surface to elevation -20 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-5

Date = 07/13/16
GSE = -4.2
GWT = -5.9

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
-4.2	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-6.2	2.0	1	0	0	204.0	79.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-8.2	4.0	4	0	0	408.0	158.4	102	0	0.2		CL/CH	0		0		0.40	0.0		0.020	0.000		0.0		0.000	
-10.2	6.0	4	0	0	612.0	237.6	102	0	0.2		CL/CH	0		0		0.40	0.0		0.020	0.000		0.0		0.000	
-12.2	8.0	5	0	0	816.0	316.8	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	
-14.2	10.0	5	0	0	1020.0	396.0	102	0	0.2		Cemented Silt/Clay	0		0		0.50	0.0		0.001	0.000		0.0		0.000	SCOUR EL.
-16.2	12.0	5	2	2	1224.0	475.2	102	0	0.2	0.50	Cemented Silt/Clay	6	12.93	60,000	140000.00	0.50	20.0	2.33	0.001	0.078	0.18	4.8	11.20	0.078	
-18.2	14.0	5	2	2	1428.0	554.4	102	0	0.2		Cemented Silt/Clay	6		60,000		0.50	20.0		0.001	0.078		4.8		0.078	
-19.2	15.0	5	10	10	1535.0	599.0	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-23.7	19.5	5	10	10	2016.5	799.7	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-24.2	20.0	4	10	10	2070.0	822.0	107	0	1.0		CL/CH	28		100,000		0.40	35.7		0.007	0.998		4.7		0.998	
-29.2	25.0	4	10	10	2605.0	1045.0	107	0	1.0	1.40	CL/CH	28	31.29	100,000	112903.23	0.40	35.7	5.65	0.007	0.998	1.10	4.7	5.27	0.998	PREFORMED EL.
-34.2	30.0	4	8	8	3140.0	1268.0	107	0	0.8		CL/CH	22		80,000		0.40	28.6		0.007	0.815		3.7		0.815	
-39.2	35.0	4	16	16	3690.0	1506.0	110	0	2.5		CL/CH	44		160,000		0.40	57.1		0.050	1.502		7.5		1.502	
-40.2	36.0	5	100	100	3815.0	1568.6	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-44.2	40.0	5	100	100	4315.0	1819.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-49.2	45.0	5	100	100	4940.0	2132.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-54.2	50.0	5	100	100	5565.0	2445.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-59.2	55.0	5	100	100	6190.0	2758.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-64.2	60.0	5	27	27	6740.0	2996.0	110	0	2.5	3.75	Cemented Silt/Clay	75	218.20	810,000	2481355.93	0.50	270.0	18.52	0.001	1.053	3.23	64.8	198.51	1.053	
-69.2	65.0	5	51	51	7365.0	3309.0	125	0	4.0		Cemented Silt/Clay	250		1,530,000		0.50	510.0		0.001	1.989		122.4		1.989	
-74.2	70.0	5	100	100	7990.0	3622.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-79.2	75.0	5	18	18	8540.0	3860.0	110	0	2.5		Cemented Silt/Clay	50		540,000		0.50	180.0		0.001	0.702		43.2		0.702	
-84.2	80.0	5	100	100	9165.0	4173.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-89.2	85.0	5	100	100	9790.0	4486.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-94.2	90.0	5	100	100	10415.0	4799.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-99.2	95.0	5	100	100	11040.0	5112.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay	
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand		N x 20,000	Clean Sand
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))	
	3.2 x N / 3	Sand, Silt & Caly mixtures			
	6.4 x N / 3	Clean Sand			
	7.2 x N / 3	Limestones, Very Shelly sand			

Blow counts from surface to elevation -30 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-6

Date = 07/25/16
GSE = 1.5
GWT = 2

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
1.5	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-0.5	2.0	1	0	0	204.0	79.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-2.5	4.0	1	0	0	408.0	158.4	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-4.5	6.0	1	0	0	612.0	237.6	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	SCOUR EL.
-6.5	8.0	5	10	10	826.0	326.8	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-8.5	10.0	5	10	10	1040.0	416.0	107	0	1.0	1.00	Cemented Silt/Clay	28	27.72	300,000	300000.00	0.50	100.0	5.00	0.001	0.390	0.39	24.0	24.00	0.390	
-12.5	14.0	5	10	10	1468.0	594.4	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-13.5	15.0	1	10	14	1575.0	639.0	107	32	0.0		SP	28		280,000		0.25	112.0		0.000	1.173		14.9		1.173	
-17.5	19.0	1	10	13	2003.0	817.4	107	31	0.0	0.00	SP	28	27.72	260,000	264000.00	0.25	104.0	6.60	0.000	1.101	1.12	13.9	14.08	1.101	
-18.5	20.0	5	10	10	2110.0	862.0	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	
-23.5	25.0	5	10	10	2645.0	1085.0	107	0	1.0	1.00	Cemented Silt/Clay	28	26.98	300,000	292000.00	0.50	100.0	4.87	0.001	0.390	0.38	24.0	23.36	0.390	
-28.5	30.0	5	10	10	3180.0	1308.0	107	0	1.0		Cemented Silt/Clay	28		300,000		0.50	100.0		0.001	0.390		24.0		0.390	PREFORMED EL
-32.5	34.0	5	9	9	3608.0	1486.4	107	0	1.0		Cemented Silt/Clay	25		270,000		0.50	90.0		0.001	0.351		21.6		0.351	
-33.5	35.0	4	24	24	3718.0	1534.0	110	0	2.5		CL/CH	67		240,000		0.40	85.7		0.050	2.061		11.2		2.061	
-37.5	39.0	4	24	24	4158.0	1724.4	110	0	2.5	2.50	CL/CH	67	66.52	240,000	240000.00	0.40	85.7	12.00	0.050	2.061	2.06	11.2	11.20	2.061	
-38.5	40.0	5	24	24	4268.0	1772.0	110	0	2.5		Cemented Silt/Clay	67		720,000		0.50	240.0		0.001	0.936		57.6		0.936	
-42.5	44.0	5	100	100	4768.0	2022.4	125	0	4.0	3.70	Cemented Silt/Clay	250	213.30	3,000,000	2544000.00	0.50	1,000.0	18.40	0.001	3.900	3.31	240.0	203.52	3.900	
-43.5	45.0	4	36	36	4883.0	2075.0	115	0	4.0		CL/CH	100		360,000		0.40	128.6		0.004	2.660		16.8		2.660	
-47.5	49.0	4	36	36	5343.0	2285.4	115	0	4.0	4.00	CL/CH	100	99.78	360,000	360000.00	0.40	128.6	18.00	0.004	2.660	2.66	16.8	16.80	2.660	
-48.5	50.0	5	100	100	5468.0	2348.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-53.5	55.0	5	100	100	6093.0	2661.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-58.5	60.0	5	100	100	6718.0	2974.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-63.5	65.0	5	100	100	7343.0	3287.0	125	0	4.0	3.44	Cemented Silt/Clay	250	215.28	3,000,000	2583333.33	0.50	1,000.0	17.22	0.001	3.900	3.36	240.0	206.67	3.900	
-68.5	70.0	5	100	100	7968.0	3600.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-73.5	75.0	5	100	100	8593.0	3913.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-78.5	80.0	5	100	100	9218.0	4226.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-83.5	85.0	5	100	100	9843.0	4539.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone
Side Shear Stress (ksf) = 4 x N x (110 - N) / 4006.6 — Plastic Clay
4 x N x (110 - N) / 4583.3 — Sand, Silt & Caly mixtures
N x 0.02 — Clean Sand
N x 0.039 — Limestones, Very Shelly sand
End Bearing Stress = 1.4 x N / 3 — Plastic Clay
3.2 x N / 3 — Sand, Silt & Caly mixtures
6.4 x N / 3 — Clean Sand
7.2 x N / 3 — Limestones, Very Shelly sand

k (pci) = 30 to 120 for sand; higher for limestone — (FB-Multpier Manual, COM624P or LPILE)
Poison Ratio (v) = 0.2 to 0.3 for sand; 0.4 to 0.5 for clay — (FB-Multpier Manual, COM624P or LPILE)
E (psf) = N x 10,000 — Sand, Silt & Caly mixtures
N x 20,000 — Clean Sand
N x 30,000 — Limestones, Very Shelly sand
G = E / (2 x (1+v))

Blow counts from surface to elevation -28 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-7
Date = 07/22/16
GSE = 1.5
GWT = -7

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Gamma (PCF)	Soil Parameters Phi (Degree)		C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
1.5	0.0	1	0	0	0	0.0	0	28		0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-0.5	2.0	1	0	0	204.0	204.0	102	28	28.00	0.0	0.00	SP	0	0.00	0	0.00	0.25	0.0	0.00	0.000	0.000	0.00	0.0	0.00	0.000	
-2.5	4.0	1	0	0	408.0	408.0	102	28		0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-4.5	6.0	1	0	0	612.0	612.0	102	28	31.79	0.0	0.00	SP	0	32.73	0	302857.14	0.25	0.0	121.14	0.000	0.000	1.19	0.0	16.15	0.000	SCOUR EL.
-6.5	8.0	1	19	25	832.0	832.0	110	34		0.0		SP	53		500,000		0.25	200.0		0.000	1.855		26.7		1.855	
-8.0	9.5	1	16	21	997.0	903.4	110	33		0.0		SP	44		420,000		0.25	168.0		0.000	1.631		22.4		1.631	
-8.5	10.0	1	16	20	1052.0	927.2	110	33		0.0		SP	44		400,000		0.25	160.0		0.000	1.571		21.3		1.571	
-13.0	14.5	1	12	15	1547.0	1141.4	110	32		0.0		SP	33		300,000		0.25	120.0		0.000	1.244		16.0		1.244	
-13.5	15.0	4	12	12	1602.0	1165.2	110	0		1.0		CL/CH	33		120,000		0.40	42.9		0.007	1.174		5.6		1.174	
-18.0	19.5	4	12	12	2097.0	1379.4	110	0	0.00	1.0	1.00	CL/CH	33	33.26	120,000	120000.00	0.40	42.9	42.86	0.007	1.174	1.17	5.6	5.60	1.174	
-18.5	20.0	5	12	12	2152.0	1403.2	110	0		1.0		Cemented Silt/Clay	33		360,000		0.50	120.0		0.001	0.468		28.8		0.468	
-23.0	24.5	5	12	12	2647.0	1617.4	110	0	0.00	1.0	1.27	Cemented Silt/Clay	33	52.96	360,000	600000.00	0.50	120.0	200.00	0.001	0.468	0.78	28.8	48.00	0.468	
-23.5	25.0	5	100	100	2709.5	1648.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-28.5	30.0	4	34	34	3284.5	1911.7	115	0		4.0		CL/CH	94		340,000		0.40	121.4		0.004	2.580		15.9		2.580	
-33.5	35.0	4	17	17	3834.5	2149.7	110	0	0.00	2.5	3.04	CL/CH	47	67.11	170,000	242142.86	0.40	60.7	86.48	0.050	1.578	2.02	7.9	11.30	1.578	
-37.5	39.0	4	21	21	4274.5	2340.1	110	0		2.5		CL/CH	58		210,000		0.40	75.0		0.050	1.866		9.8		1.866	
-38.5	40.0	5	100	100	4399.5	2402.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-43.5	45.0	5	100	100	5024.5	2715.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-48.5	50.0	5	100	100	5649.5	3028.7	125	0	0.00	4.0	3.85	Cemented Silt/Clay	250	240.38	3,000,000	2884615.38	0.50	1,000.0	961.54	0.001	3.900	3.75	240.0	240.00	3.900	
-53.5	55.0	5	100	100	6274.5	3341.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-58.5	60.0	5	100	100	6899.5	3654.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-63.5	65.0	5	100	100	7524.5	3967.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-68.5	70.0	4	100	100	8124.5	4255.7	120	0		4.0		CL/CH	125		1,000,000		0.40	357.1		0.004	0.998		46.7		0.998	
-73.5	75.0	4	100	100	8724.5	4543.7	120	0	0.00	4.0	4.00	CL/CH	125	125.00	1,000,000	1000000.00	0.40	357.1	357.14	0.004	0.998	1.00	46.7	46.67	0.998	
-78.5	80.0	5	100	100	9349.5	4856.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-83.5	85.0	5	15	15	9899.5	5094.7	110	0	0.00	1.0	3.00	Cemented Silt/Clay	42	180.52	450,000	2150000.00	0.50	150.0	716.67	0.001	0.585	2.80	36.0	172.00	0.585	
-88.5	90.0	5	100	100	10524.5	5407.7	125	0		4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone
Side Shear Stress (ksf) = 4 x N x (110 - N) / 4006.6 — Plastic Clay
4 x N x (110 - N) / 4583.3 — Sand, Silt & Caly mixtures
N x 0.02 — Clean Sand
N x 0.039 — Limestones, Very Shelly sand
End Bearing Stress = 1.4 x N / 3 — Plastic Clay
3.2 x N / 3 — Sand, Silt & Caly mixtures
6.4 x N / 3 — Clean Sand
7.2 x N / 3 — Limestones, Very Shelly sand

k (pci) = 30 to 120 for sand; higher for limestone — (FB-Multpier Manual, COM624P or LPILE)
Poison Ratio (v) = 0.2 to 0.3 for sand; 0.4 to 0.5 for clay — (FB-Multpier Manual, COM624P or LPILE)
E (psf) = N x 10,000 — Sand, Silt & Caly mixtures
N x 20,000 — Clean Sand
N x 30,000 — Limestones, Very Shelly sand
G = E / (2 x (1+v))

Based on SPT blowcounts and soil type descriptions, Preformed Pile Hole is not anticipated for this location.

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-8

Date = 07/12/16
GSE = -5
GWT = 2

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)	End Bearing Failure Stress (ksf)	Torsional Shear Failure Stress (ksf)	
-5.0	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000	
-7.0	2.0	1	0	0	204.0	79.2	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-9.0	4.0	1	0	0	408.0	158.4	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-11.0	6.0	1	0	0	612.0	237.6	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	SCOUR EL.
-13.0	8.0	1	2	2	816.0	316.8	102	29	0.0	SP	6	40,000	0.25	16.0	0.000	0.189	2.1	0.189	
-15.0	10.0	1	2	2	1020.0	396.0	102	29	0.0	SP	6	40,000	0.25	16.0	0.000	0.189	2.1	0.189	
-16.0	11.0	5	10	10	1127.0	440.6	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-20.0	15.0	5	10	10	1555.0	619.0	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-25.0	20.0	5	10	10	2090.0	842.0	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-29.0	24.0	5	10	10	2518.0	1020.4	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	PREFORMED EL.
-30.0	25.0	4	14	14	2628.0	1068.0	110	0	1.0	CL/CH	39	140,000	0.40	50.0	0.007	1.342	6.5	1.342	
-34.0	29.0	4	14	14	3068.0	1258.4	110	0	1.0	CL/CH	39	140,000	0.40	50.0	0.007	1.342	6.5	1.342	
-35.0	30.0	5	20	20	3178.0	1306.0	110	0	2.5	Cemented Silt/Clay	55	600,000	0.50	200.0	0.001	0.780	48.0	0.780	
-40.0	35.0	5	20	20	3728.0	1544.0	110	0	2.5	Cemented Silt/Clay	55	600,000	0.50	200.0	0.001	0.780	48.0	0.780	
-45.0	40.0	5	100	100	4353.0	1857.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-50.0	45.0	5	100	100	4978.0	2170.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-55.0	50.0	5	100	100	5603.0	2483.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-60.0	55.0	5	100	100	6228.0	2796.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-65.0	60.0	5	100	100	6853.0	3109.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-70.0	65.0	5	100	100	7478.0	3422.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-75.0	70.0	5	100	100	8103.0	3735.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-80.0	75.0	5	100	100	8728.0	4048.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-85.0	80.0	5	100	100	9353.0	4361.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-90.0	85.0	5	100	100	9978.0	4674.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-95.0	90.0	5	100	100	10603.0	4987.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-100.0	95.0	5	100	100	11228.0	5300.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-105.0	100.0	5	100	100	11853.0	5613.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone

Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand
	N x 0.039	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay
	3.2 x N / 3	Sand, Silt & Caly mixtures
	6.4 x N / 3	Clean Sand
	7.2 x N / 3	Limestones, Very Shelly sand

k (pci) =	30 to 120 for sand higher for limestone	(FB-Multpier Manual, COM624P or LPILE)
Poison Ratio (v) =	0.2 to 0.3 for sand 0.4 to 0.5 for clay	(FB-Multpier Manual, COM624P or LPILE)
E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 20,000	Clean Sand
	N x 30,000	Limestones, Very Shelly sand
G =	E / (2 x (1+v))	

Blow counts from surface to elevation -29 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-9

Date = 07/11/16
GSE = -6
GWT = 0

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)	End Bearing Failure Stress (ksf)	Torsional Shear Failure Stress (ksf)	
-6.0	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000	
-8.0	2.0	1	0	0	204.0	79.2	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-10.0	4.0	1	0	0	408.0	158.4	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-12.0	6.0	1	0	0	612.0	237.6	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	SCOUR EL.
-14.0	8.0	5	10	10	826.0	326.8	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-16.0	10.0	5	10	10	1040.0	416.0	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-17.0	11.0	1	10	10	1147.0	460.6	107	31	0.0	SP	28	200,000	0.25	80.0	0.000	0.873	10.7	0.873	
-21.0	15.0	1	10	14	1575.0	639.0	107	32	0.0	SP	28	280,000	0.25	112.0	0.000	1.173	14.9	1.173	
-22.0	16.0	5	10	10	1682.0	683.6	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-26.0	20.0	5	10	10	2110.0	862.0	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-31.0	25.0	5	10	10	2645.0	1085.0	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	PREFORMED EL.
-32.0	26.0	4	10	10	2752.0	1129.6	107	0	1.0	CL/CH	28	100,000	0.40	35.7	0.007	0.998	4.7	0.998	
-36.0	30.0	4	10	10	3180.0	1308.0	107	0	1.0	CL/CH	28	100,000	0.40	35.7	0.007	0.998	4.7	0.998	
-40.0	34.0	4	10	10	3608.0	1486.4	107	0	1.0	CL/CH	28	100,000	0.40	35.7	0.007	0.998	4.7	0.998	
-41.0	35.0	5	100	100	3733.0	1549.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-46.0	40.0	5	100	100	4358.0	1862.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-47.0	41.0	5	11	11	4468.0	1909.6	110	0	1.0	Cemented Silt/Clay	30	330,000	0.50	110.0	0.001	0.429	26.4	0.429	
-51.0	45.0	5	100	100	4968.0	2160.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-56.0	50.0	5	100	100	5593.0	2473.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-61.0	55.0	5	100	100	6218.0	2786.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-66.0	60.0	5	100	100	6843.0	3099.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-71.0	65.0	5	100	100	7468.0	3412.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-76.0	70.0	5	100	100	8093.0	3725.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-81.0	75.0	5	100	100	8718.0	4038.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-86.0	80.0	5	100	100	9343.0	4351.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-91.0	85.0	5	100	100	9968.0	4664.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-96.0	90.0	5	100	100	10593.0	4977.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone

Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand
	N x 0.039	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay
	3.2 x N / 3	Sand, Silt & Caly mixtures
	6.4 x N / 3	Clean Sand
	7.2 x N / 3	Limestones, Very Shelly sand

k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
	higher for limestone	
Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
	0.4 to 0.5 for clay	
E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 20,000	Clean Sand
	N x 30,000	Limestones, Very Shelly sand
G =	E / (2 x (1+v))	

Blow counts from surface to elevation -31 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-10
Date = 07/07/16
GSE = -0.3
GWT = -4

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Phi (Degree)	C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	Vertical Shear Failure Stress (ksf)	FB-Deep --- Concrete Piles	End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
-0.3	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-2.3	2.0	1	0	0	204.0	204.0	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-4.3	4.0	1	0	0	408.0	283.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-6.3	6.0	1	0	0	612.0	362.4	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-8.3	8.0	1	0	0	816.0	441.6	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	SCOUR EL.
-9.8	9.5	1	2	3	969.0	501.0	102	29	0.0		SP	6		60,000		0.25	24.0		0.000	0.280		3.2		0.280	
-10.3	10.0	5	100	100	1031.5	532.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-15.3	15.0	5	100	100	1656.5	845.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-19.8	19.5	5	27	27	2151.5	1059.5	110	0	2.5		Cemented Silt/Clay	75		810,000		0.50	270.0		0.001	1.053		64.8		1.053	
-20.3	20.0	4	17	17	2206.5	1083.3	110	0	2.5		CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578	
-25.3	25.0	4	17	17	2756.5	1321.3	110	0	2.5		CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578	
-30.3	30.0	4	10	10	3291.5	1544.3	107	0	1.0	1.36	CL/CH	28	34.54	100,000	124615.38	0.40	35.7	6.23	0.007	0.998	1.20	4.7	5.82	0.998	
-35.3	35.0	4	12	12	3841.5	1782.3	110	0	1.0		CL/CH	33		120,000		0.40	42.9		0.007	1.174		5.6		1.174	
-39.3	39.0	4	12	12	4281.5	1972.7	110	0	1.0		CL/CH	33		120,000		0.40	42.9		0.007	1.174		5.6		1.174	
-40.3	40.0	5	100	100	4406.5	2035.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-45.3	45.0	5	100	100	5031.5	2348.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-50.3	50.0	5	19	19	5581.5	2586.3	110	0	2.5		Cemented Silt/Clay	53		570,000		0.50	190.0		0.001	0.741		45.6		0.741	
-55.3	55.0	5	100	100	6206.5	2899.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-60.3	60.0	5	52	52	6831.5	3212.3	125	0	4.0		Cemented Silt/Clay	250		1,560,000		0.50	520.0		0.001	2.028		124.8		2.028	
-65.3	65.0	5	100	100	7456.5	3525.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-70.3	70.0	4	31	31	8031.5	3788.3	115	0	4.0		CL/CH	86		310,000		0.40	110.7		0.004	2.445		14.5		2.445	
-75.3	75.0	4	21	21	8581.5	4026.3	110	0	2.5	3.25	CL/CH	58	72.06	210,000	260000.00	0.40	75.0	13.00	0.050	1.866	2.16	9.8	12.13	1.866	
-80.3	80.0	5	100	100	9206.5	4339.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-85.3	85.0	5	100	100	9831.5	4652.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-90.3	90.0	5	100	100	10456.5	4965.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-95.3	95.0	5	100	100	11081.5	5278.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-100.3	100.0	5	100	100	11706.5	5591.3	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay	
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand		N x 20,000	Clean Sand
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))	
	3.2 x N / 3	Sand, Silt & Caly mixtures			
	6.4 x N / 3	Clean Sand			
	7.2 x N / 3	Limestones, Very Shelly sand			

Based on SPT blowcounts and soil type descriptions, Preformed Pile Hole is not anticipated for this location.

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-11
Date = 07/06/16
GSE = -0.5
GWT = 4

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Gamma (PCF)		Soil Parameters Phi (Degree)	C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	Vertical Shear Failure Stress (ksf)		FB-Deep --- Concrete Piles End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
-0.5	0.0	1	0	0	0	0.0	0		28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-2.5	2.0	1	0	0	204.0	79.2	102		28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-4.5	4.0	1	0	0	408.0	158.4	102		28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-6.5	6.0	1	0	0	612.0	237.6	102		28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	SCOUR EL.
-8.5	8.0	1	2	2	816.0	316.8	102		29	0.0		SP	6		40,000		0.25	16.0		0.000	0.189		2.1		0.189	
-10.5	10.0	1	2	2	1020.0	396.0	102		29	0.0		SP	6		40,000		0.25	16.0		0.000	0.189		2.1		0.189	
-12.5	12.0	1	2	2	1224.0	475.2	102		29	0.0		SP	6		40,000		0.25	16.0		0.000	0.189		2.1		0.189	
-15.5	15.0	1	2	3	1530.0	594.0	102		29	0.0		SP	6		60,000		0.25	24.0		0.000	0.280		3.2		0.280	
-16.5	16.0	5	100	100	1655.0	656.6	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-20.5	20.0	5	100	100	2155.0	907.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-21.5	21.0	4	30	30	2265.0	954.6	110		0	2.5		CL/CH	83		300,000		0.40	107.1		0.001	2.396		14.0		2.396	
-25.5	25.0	4	15	15	2705.0	1145.0	110		0	1.0		CL/CH	42		150,000		0.40	53.6		0.050	1.423		7.0		1.423	
-30.5	30.0	4	8	8	3240.0	1368.0	107	103.42	0	0.8	0.88	CL/CH	22	34.28	80,000	123684.21	0.40	28.6	6.18	0.007	0.815	1.19	3.7	5.77	0.815	
-35.5	35.0	4	15	15	3790.0	1606.0	110		0	1.0		CL/CH	42		150,000		0.40	53.6		0.050	1.423		7.0		1.423	
-39.5	39.0	4	15	15	4230.0	1796.4	110		0	1.0		CL/CH	42		150,000		0.40	53.6		0.050	1.423		7.0		1.423	
-40.5	40.0	5	100	100	4355.0	1859.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-45.5	45.0	5	100	100	4980.0	2172.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-50.5	50.0	5	100	100	5605.0	2485.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-55.5	55.0	5	100	100	6230.0	2798.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-60.5	60.0	5	100	100	6855.0	3111.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-65.5	65.0	5	100	100	7480.0	3424.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-70.5	70.0	5	100	100	8105.0	3737.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-75.5	75.0	5	100	100	8730.0	4050.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-80.5	80.0	5	100	100	9355.0	4363.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-85.5	85.0	5	100	100	9980.0	4676.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-90.5	90.0	5	100	100	10605.0	4989.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-95.5	95.0	5	100	100	11230.0	5302.0	125		0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone
Side Shear Stress (ksf) = 4 x N x (110 - N) / 4006.6 — Plastic Clay
4 x N x (110 - N) / 4583.3 — Sand, Silt & Caly mixtures
N x 0.02 — Clean Sand
N x 0.039 — Limestones, Very Shelly sand
End Bearing Stress = 1.4 x N / 3 — Plastic Clay
3.2 x N / 3 — Sand, Silt & Caly mixtures
6.4 x N / 3 — Clean Sand
7.2 x N / 3 — Limestones, Very Shelly sand

k (pci) = 30 to 120 for sand; higher for limestone (FB-Multpier Manual, COM624P or LPILE)
Poison Ratio (v) = 0.2 to 0.3 for sand; 0.4 to 0.5 for clay (FB-Multpier Manual, COM624P or LPILE)
E (psf) = N x 10,000 — Sand, Silt & Caly mixtures
N x 20,000 — Clean Sand
N x 30,000 — Limestones, Very Shelly sand
G = E / (2 x (1+v))

Based on SPT blowcounts and soil type descriptions, Preformed Pile Hole is not anticipated for this location.

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-12
Date = 07/05/16
GSE = -1
GWT = 4

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
-1.0	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	
-3.0	2.0	1	0	0	204.0	79.2	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-5.0	4.0	1	0	0	408.0	158.4	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	
-7.0	6.0	1	0	0	612.0	237.6	102	28	0.0		SP	0		0		0.25	0.0		0.000	0.000		0.0		0.000	SCOUR EL.
-9.0	8.0	5	100	100	862.0	362.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-11.0	10.0	4	17	17	1082.0	458.0	110	0	2.5		CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578	
-16.0	15.0	4	17	17	1632.0	696.0	110	0	2.5		CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578	
-21.0	20.0	4	10	10	2167.0	919.0	107	0	1.0	1.93	CL/CH	28	37.16	100,000	134090.91	0.40	35.7	6.70	0.007	0.998	1.27	4.7	6.26	0.998	
-26.0	25.0	4	16	16	2717.0	1157.0	110	0	2.5		CL/CH	44		160,000		0.40	57.1		0.050	1.502		7.5		1.502	
-31.0	30.0	4	16	16	3267.0	1395.0	110	0	2.5		CL/CH	44		160,000		0.40	57.1		0.050	1.502		7.5		1.502	
-32.0	31.0	5	100	100	3392.0	1457.6	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-36.0	35.0	5	100	100	3892.0	1708.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-41.0	40.0	5	100	100	4517.0	2021.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-46.0	45.0	5	100	100	5142.0	2334.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-51.0	50.0	5	100	100	5767.0	2647.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-56.0	55.0	5	100	100	6392.0	2960.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-61.0	60.0	5	100	100	7017.0	3273.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-66.0	65.0	5	100	100	7642.0	3586.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-71.0	70.0	5	100	100	8267.0	3899.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-76.0	75.0	5	43	43	8892.0	4212.0	125	0	4.0		Cemented Silt/Clay	250		1,290,000		0.50	430.0		0.001	1.677		103.2		1.677	
-81.0	80.0	5	100	100	9517.0	4525.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-86.0	85.0	5	100	100	10142.0	4838.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-91.0	90.0	5	100	100	10767.0	5151.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-96.0	95.0	5	100	100	11392.0	5464.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-101.0	100.0	5	100	100	12017.0	5777.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-106.0	105.0	5	100	100	12642.0	6090.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-111.0	110.0	5	100	100	13267.0	6403.0	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay	
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand		N x 20,000	Clean Sand
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))	
	3.2 x N / 3	Sand, Silt & Caly mixtures			
	6.4 x N / 3	Clean Sand			
	7.2 x N / 3	Limestones, Very Shelly sand			

Based on SPT blowcounts and soil type descriptions, Preformed Pile Hole is not anticipated for this location.

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-13
Date = 07/20/16
GSE = 0.1
GWT = -7

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters: Gamma (PCF)	Phi (Degree)	C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)	End Bearing Failure Stress (ksf)	Torsional Shear Failure Stress (ksf)	
0.1	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000	
-1.9	2.0	1	0	0	204.0	204.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-3.9	4.0	1	0	0	408.0	408.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-5.9	6.0	1	0	0	612.0	612.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-7.9	8.0	1	0	0	816.0	691.2	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	SCOUR EL.
-9.9	10.0	1	2	3	1020.0	770.4	102	29	0.0	SP	6	60,000	0.25	24.0	0.000	0.280	3.2	0.280	
-14.9	15.0	1	2	3	1530.0	968.4	102	29	0.0	SP	6	60,000	0.25	24.0	0.000	0.280	3.2	0.280	
-15.0	15.1	5	2	2	1540.2	972.4	102	0	0.2	Cemented Silt/Clay	6	60,000	0.50	20.0	0.001	0.078	4.8	0.078	
-19.4	19.5	5	2	2	1989.0	1146.6	102	0	0.2	Cemented Silt/Clay	6	60,000	0.50	20.0	0.001	0.078	4.8	0.078	
-19.9	20.0	5	10	10	2042.5	1168.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-24.9	25.0	5	10	10	2577.5	1391.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-29.9	30.0	5	10	10	3112.5	1614.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	PREFORMED EL.
-34.9	35.0	4	27	27	3662.5	1852.9	110	0	2.5	CL/CH	75	270,000	0.40	96.4	0.050	2.237	12.6	2.237	
-39.9	40.0	4	25	25	4212.5	2090.9	110	0	2.5	CL/CH	69	250,000	0.40	89.3	0.050	2.121	11.7	2.121	
-43.9	44.0	4	25	25	4652.5	2281.3	110	0	2.5	CL/CH	69	250,000	0.40	89.3	0.050	2.121	11.7	2.121	
-44.9	45.0	5	100	100	4777.5	2343.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-49.9	50.0	5	100	100	5402.5	2656.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-54.9	55.0	5	100	100	6027.5	2969.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-59.9	60.0	5	100	100	6652.5	3282.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-64.9	65.0	5	100	100	7277.5	3595.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-69.9	70.0	4	10	10	7812.5	3818.9	107	0	1.0	CL/CH	28	100,000	0.40	35.7	0.007	0.998	4.7	0.998	
-74.9	75.0	5	100	100	8437.5	4131.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-79.9	80.0	5	100	100	9062.5	4444.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-84.9	85.0	5	100	100	9687.5	4757.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-89.9	90.0	5	100	100	10312.5	5070.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-94.9	95.0	5	100	100	10937.5	5383.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-99.9	100.0	5	100	100	11562.5	5696.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone

Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand
	N x 0.039	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay
	3.2 x N / 3	Sand, Silt & Caly mixtures
	6.4 x N / 3	Clean Sand
	7.2 x N / 3	Limestones, Very Shelly sand

k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
	higher for limestone	
Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
	0.4 to 0.5 for clay	
E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 20,000	Clean Sand
	N x 30,000	Limestones, Very Shelly sand
G =	E / (2 x (1+v))	

Blow counts from surface to elevation -30 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-14

Date = 07/19/16
GSE = 0.1
GWT = -7

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)	FB-Deep --- Concrete Piles End Bearing Failure Stress (ksf)	FB-Deep --- Concrete Piles Torsional Shear Failure Stress (ksf)	
0.1	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000	
-1.9	2.0	1	0	0	204.0	204.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-3.9	4.0	1	0	0	408.0	408.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-5.9	6.0	1	0	0	612.0	612.0	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	SCOUR EL.
-7.9	8.0	1	2	3	816.0	691.2	102	29	0.0	SP	6	60,000	0.25	24.0	0.000	0.280	3.2	0.280	
-9.9	10.0	1	2	3	1020.0	770.4	102	29	0.0	SP	6	60,000	0.25	24.0	0.000	0.280	3.2	0.280	
-14.9	15.0	1	4	5	1530.0	968.4	102	29	0.0	SP	11	100,000	0.25	40.0	0.000	0.458	5.3	0.458	
-15.0	15.1	5	4	4	1540.2	972.4	102	0	0.5	Cemented Silt/Clay	11	120,000	0.50	40.0	0.001	0.156	9.6	0.156	
-19.4	19.5	5	4	4	1989.0	1146.6	102	0	0.5	Cemented Silt/Clay	11	120,000	0.50	40.0	0.001	0.156	9.6	0.156	
-19.9	20.0	5	10	10	2042.5	1168.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-24.9	25.0	5	10	10	2577.5	1391.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	
-29.9	30.0	5	10	10	3112.5	1614.9	107	0	1.0	Cemented Silt/Clay	28	300,000	0.50	100.0	0.001	0.390	24.0	0.390	PREFORMED EL.
-30.9	31.0	4	24	24	3222.5	1662.5	110	0	2.5	CL/CH	67	240,000	0.40	85.7	0.050	2.061	11.2	2.061	
-34.9	35.0	4	24	24	3662.5	1852.9	110	0	2.5	CL/CH	67	240,000	0.40	85.7	0.050	2.061	11.2	2.061	
-38.9	39.0	4	24	24	4102.5	2043.3	110	0	2.5	CL/CH	67	240,000	0.40	85.7	0.050	2.061	11.2	2.061	
-39.9	40.0	5	100	100	4227.5	2105.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-43.9	44.0	5	100	100	4727.5	2356.3	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-44.9	45.0	4	29	29	4837.5	2403.9	110	0	2.5	CL/CH	80	290,000	0.40	103.6	0.050	2.345	13.5	2.345	
-49.9	50.0	4	29	29	5387.5	2641.9	110	0	2.5	CL/CH	80	290,000	0.40	103.6	0.050	2.345	13.5	2.345	
-53.9	54.0	4	29	29	5827.5	2832.3	110	0	2.5	CL/CH	80	290,000	0.40	103.6	0.050	2.345	13.5	2.345	
-54.9	55.0	5	100	100	5952.5	2894.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-59.9	60.0	5	100	100	6577.5	3207.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-64.9	65.0	5	100	100	7202.5	3520.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-69.9	70.0	5	100	100	7827.5	3833.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-74.9	75.0	5	100	100	8452.5	4146.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-79.9	80.0	5	100	100	9077.5	4459.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-84.9	85.0	5	100	100	9702.5	4772.9	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
Side Shear Stress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay	
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand		N x 20,000	Clean Sand
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand
End Bearing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))	
	3.2 x N / 3	Sand, Silt & Caly mixtures			
	6.4 x N / 3	Clean Sand			
	7.2 x N / 3	Limestones, Very Shelly sand			

Blow counts from surface to elevation -30 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

Geotechnical Parameters for FB-MultiPier Inputs

44th Avenue Bridge Over Braden River, Manatee County

Boring B2-15

Date = 07/08/16
GSE = -4.2
GWT = 7

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)	Unified Soil Classification	Subgrade Modulus k (pci)	Young Modulus, E (psf)	Poisson Ratio	Shear Modulus, G (ksf) (with E & v)	E50	FB-Deep --- Concrete Piles: Vertical Shear Failure Stress (ksf)	FB-Deep --- Concrete Piles: End Bearing Failure Stress (ksf)	FB-Deep --- Concrete Piles: Torsional Shear Failure Stress (ksf)	
-4.2	0.0	1	0	0	0	0.0	0	28	0	SP	0	0	0.25	0.0	- -	0.000	0.0	0.000	
-6.2	2.0	1	0	0	204.0	79.2	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-8.2	4.0	1	0	0	408.0	158.4	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	
-10.2	6.0	1	0	0	612.0	237.6	102	28	0.0	SP	0	0	0.25	0.0	0.000	0.000	0.0	0.000	SCOUR EL.
-12.2	8.0	1	2	2	816.0	316.8	102	29	0.0	SP	6	40,000	0.25	16.0	0.000	0.189	2.1	0.189	
-14.2	10.0	4	2	2	1020.0	396.0	102	0	0.2	CL/CH	6	20,000	0.40	7.1	0.020	0.216	0.9	0.216	
-19.2	15.0	4	2	2	1530.0	594.0	102	0	0.2	CL/CH	6	20,000	0.40	7.1	0.020	0.216	0.9	0.216	
-24.2	20.0	4	2	2	2040.0	792.0	102	0	0.2	CL/CH	6	20,000	0.40	7.1	0.020	0.216	0.9	0.216	
-29.2	25.0	4	20	20	2590.0	1030.0	110	0	2.5	CL/CH	55	200,000	0.40	71.4	0.050	1.797	9.3	1.797	
-34.2	30.0	4	21	21	3140.0	1268.0	110	0	2.5	CL/CH	58	210,000	0.40	75.0	0.050	1.866	9.8	1.866	
-39.2	35.0	4	20	20	3690.0	1506.0	110	0	2.5	CL/CH	55	200,000	0.40	71.4	0.050	1.797	9.3	1.797	
-40.2	36.0	5	100	100	3815.0	1568.6	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-44.2	40.0	5	100	100	4315.0	1819.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-49.2	45.0	5	100	100	4940.0	2132.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-54.2	50.0	5	100	100	5565.0	2445.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-59.2	55.0	5	100	100	6190.0	2758.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-64.2	60.0	5	48	48	6815.0	3071.0	125	0	4.0	Cemented Silt/Clay	250	1,440,000	0.50	480.0	0.001	1.872	115.2	1.872	
-69.2	65.0	5	17	17	7365.0	3309.0	110	0	2.5	Cemented Silt/Clay	47	510,000	0.50	170.0	0.001	0.663	40.8	0.663	
-74.2	70.0	5	100	100	7990.0	3622.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-79.2	75.0	5	100	100	8615.0	3935.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-84.2	80.0	5	35	35	9240.0	4248.0	125	0	4.0	Cemented Silt/Clay	250	1,050,000	0.50	350.0	0.001	1.365	84.0	1.365	
-89.2	85.0	5	100	100	9865.0	4561.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-94.2	90.0	5	100	100	10490.0	4874.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-99.2	95.0	5	100	100	11115.0	5187.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-104.2	100.0	5	100	100	11740.0	5500.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-109.2	105.0	5	100	100	12365.0	5813.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	
-114.2	110.0	5	100	100	12990.0	6126.0	125	0	4.0	Cemented Silt/Clay	250	3,000,000	0.50	1,000.0	0.001	3.900	240.0	3.900	

Notes

Phi =	N/4 + 28 for Sand / Sandy materials		k (pci) =	30 to 120 for sand	(FB-Multpier Manual, COM624P or LPILE)
Phi =	N/4 + 33 for Limestone / Sandy Gravel materials			higher for limestone	
Gamma =	105 x Phi / 30 for sand and 125 for Limestone		Poison Ratio (v) =	0.2 to 0.3 for sand	(FB-Multpier Manual, COM624P or LPILE)
tress (ksf) =	4 x N x (110 - N) / 4006.6	Plastic Clay		0.4 to 0.5 for clay	
	4 x N x (110 - N) / 4583.3	Sand, Silt & Caly mixtures	E (psf) =	N x 10,000	Sand, Silt & Caly mixtures
	N x 0.02	Clean Sand		N x 20,000	Clean Sand
	N x 0.039	Limestones, Very Shelly sand		N x 30,000	Limestones, Very Shelly sand
ing Stress =	1.4 x N / 3	Plastic Clay	G =	E / (2 x (1+v))	
	3.2 x N / 3	Sand, Silt & Caly mixtures			
	6.4 x N / 3	Clean Sand			
	7.2 x N / 3	Limestones, Very Shelly sand			

Based on SPT blowcounts and soil type descriptions, Preformed Pile Hole is not anticipated for this location.

Geotechnical Parameters for FB-MultiPier Inputs
44th Avenue Bridge Over Braden River, Manatee County

Boring B2-16
Date = 07/06/16
GSE = 7.8
GWT = 4

Elevation (Ft.)	Depth (Ft.)	Soil Type	N-Value Raw	N-Value Corrected	Vertical Pressure	Effective Vertical Pressure	Soil Parameters Gamma (PCF)	Soil Parameters Phi (Degree)	Soil Parameters C (KSF)		Unified Soil Classification	Subgrade Modulus k (pci)		Young Modulus, E (psf)		Poisson Ratio	Shear Modulus, G (ksf) (with E & v)		E50	FB-Deep --- Concrete Piles Vertical Shear Failure Stress (ksf)		End Bearing Failure Stress (ksf)		Torsional Shear Failure Stress (ksf)	
7.8	0.0	1	0	0	0	0.0	0	28	0		SP	0		0		0.25	0.0		- -	0.000		0.0		0.000	SCOUR EL.
5.8	2.0	1	10	10	214.0	214.0	107	31	0.0		SP	28		200,000		0.25	80.0		0.000	0.873		10.7		0.873	
3.8	4.0	1	10	10	428.0	303.2	107	31	0.0		SP	28		200,000		0.25	80.0		0.000	0.873		10.7		0.873	
1.8	6.0	1	10	10	642.0	392.4	107	31	0.0		SP	28		200,000		0.25	80.0		0.000	0.873		10.7		0.873	
-0.2	8.0	1	10	10	856.0	481.6	107	31	0.0		SP	28		200,000		0.25	80.0		0.000	0.873		10.7		0.873	
-2.2	10.0	1	10	14	1070.0	570.8	107	32	0.0		SP	28		280,000		0.25	112.0		0.000	1.173		14.9		1.173	PREFORMED EL.
-7.2	15.0	1	20	26	1620.0	808.8	110	35	0.0		SP	55		520,000		0.25	208.0		0.000	1.906		27.7		1.906	
-8.2	16.0	4	20	20	1730.0	856.4	110	0	2.5		CL/CH	55		200,000		0.40	71.4		0.050	1.797		9.3		1.797	
-12.2	20.0	4	26	26	2170.0	1046.8	110	0	2.5		CL/CH	72		260,000		0.40	92.9		0.050	2.180		12.1		2.180	
-17.2	25.0	4	47	47	2745.0	1309.8	115	0	4.0	2.70	CL/CH	125	67.02	470,000	245600.00	0.40	167.9	11.58	0.004	2.956	1.94	21.9	11.46	2.956	
-22.2	30.0	4	22	22	3295.0	1547.8	110	0	2.5		CL/CH	61		220,000		0.40	78.6		0.050	1.933		10.3		1.933	
-27.2	35.0	4	16	16	3845.0	1785.8	110	0	2.5		CL/CH	44		160,000		0.40	57.1		0.050	1.502		7.5		1.502	
-32.2	40.0	4	17	17	4395.0	2023.8	110	0	2.5		CL/CH	47		170,000		0.40	60.7		0.050	1.578		7.9		1.578	
-33.2	41.0	5	17	17	4505.0	2071.4	110	0	2.5		Cemented Silt/Clay	47		510,000		0.50	170.0		0.001	0.663		40.8		0.663	
-37.2	45.0	5	29	29	4945.0	2261.8	110	0	2.5		Cemented Silt/Clay	80		870,000		0.50	290.0		0.001	1.131		69.6		1.131	
-42.2	50.0	5	100	100	5570.0	2574.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-47.2	55.0	5	100	100	6195.0	2887.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-52.2	60.0	5	100	100	6820.0	3200.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-57.2	65.0	5	100	100	7445.0	3513.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-62.2	70.0	5	100	100	8070.0	3826.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-67.2	75.0	5	100	100	8695.0	4139.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-72.2	80.0	5	100	100	9320.0	4452.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-77.2	85.0	5	100	100	9945.0	4765.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-82.2	90.0	5	100	100	10570.0	5078.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-87.2	95.0	5	100	100	11195.0	5391.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-92.2	100.0	5	100	100	11820.0	5704.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	
-97.2	105.0	5	100	100	12445.0	6017.8	125	0	4.0		Cemented Silt/Clay	250		3,000,000		0.50	1,000.0		0.001	3.900		240.0		3.900	

Notes

Phi = N/4 + 28 for Sand / Sandy materials
Phi = N/4 + 33 for Limestone / Sandy Gravel materials
Gamma = 105 x Phi / 30 for sand and 125 for Limestone
Stress (ksf) = 4 x N x (110 - N) / 4006.6 Plastic Clay
4 x N x (110 - N) / 4583.3 Sand, Silt & Caly mixtures
N x 0.02 Clean Sand
N x 0.039 Limestones, Very Shelly sand
ring Stress = 1.4 x N / 3 Plastic Clay
3.2 x N / 3 Sand, Silt & Caly mixtures
6.4 x N / 3 Clean Sand
7.2 x N / 3 Limestones, Very Shelly sand

k (pci) = 30 to 120 for sand (FB-Multpier Manual, COM624P or LPILE)
higher for limestone
Poison Ratio (v) = 0.2 to 0.3 for sand (FB-Multpier Manual, COM624P or LPILE)
0.4 to 0.5 for clay
E (psf) = N x 10,000 Sand, Silt & Caly mixtures
N x 20,000 Clean Sand
N x 30,000 Limestones, Very Shelly sand
G = E / (2 x (1+v))

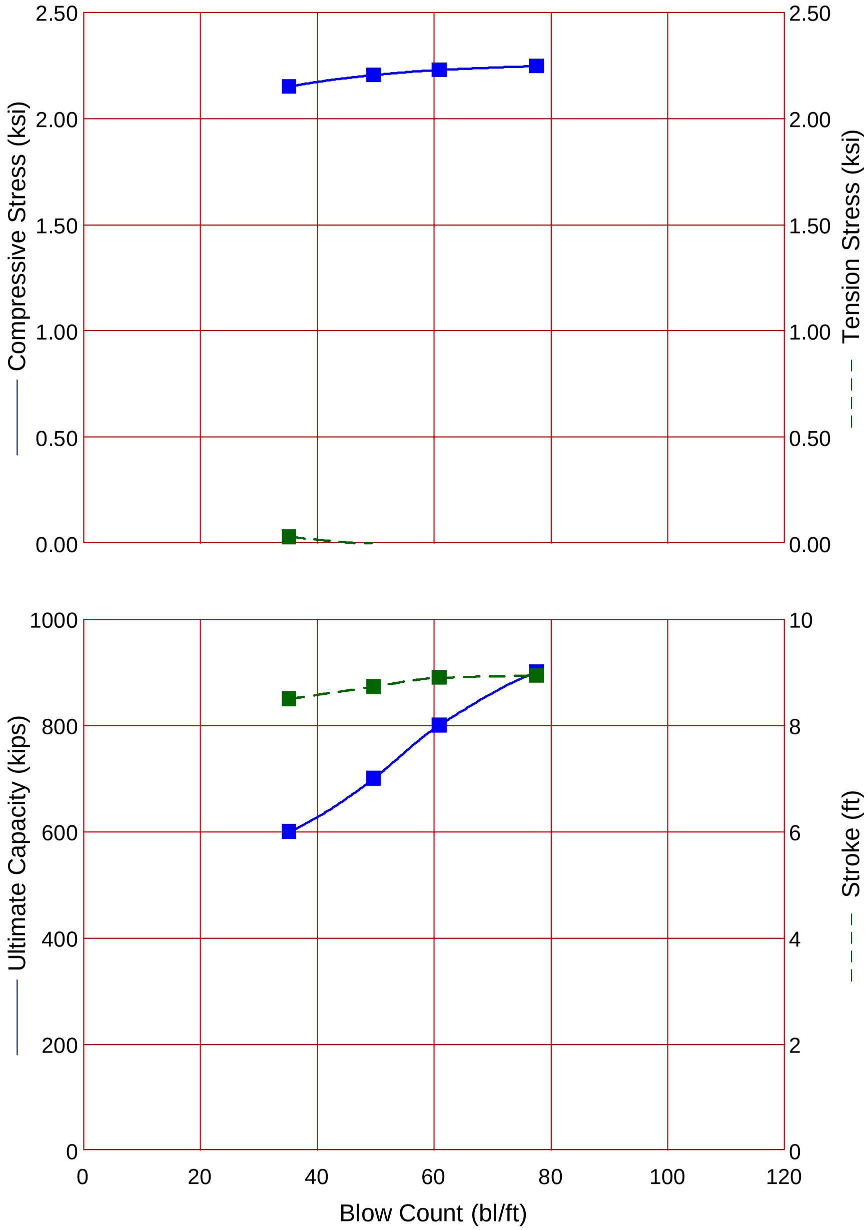
Blow counts from surface to elevation -5 are as anticipated based on residual soil strength after preformed hole. This assessment is based on conditions encountered in Fort Hammer project

APPENDIX L

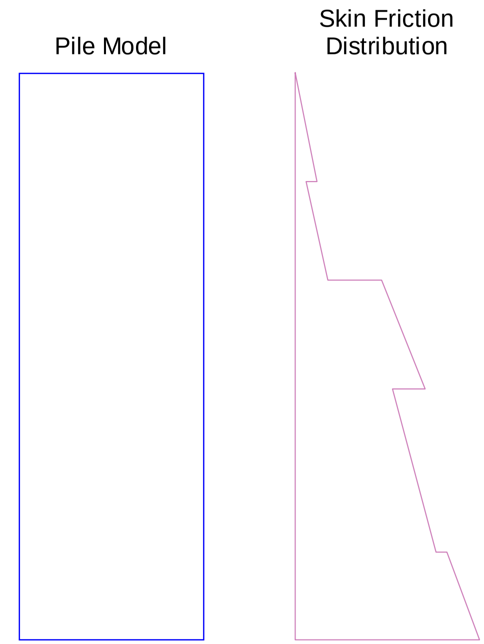
Sample Files for Wave Equation Analysis for Pile

URS Corporation
44th Avenue Bridge Over Braden River

26-Sep-2016
GRLWEAP Version 2010



APE	D 62-42	
Ram Weight	13.67	kips
Efficiency	0.800	
Pressure	1375 (100%)	psi
Helmet Weight	1.04	kips
Hammer Cushion	39900	kips/in
Pile Cushion	2880	kips/in
COR of P.C.	0.500	
Skin Quake	0.100	in
Toe Quake	0.200	in
Skin Damping	0.190	sec/ft
Toe Damping	0.150	sec/ft
Pile Length	52.00	ft
Pile Penetration	52.00	ft
Pile Top Area	576.00	in2



Res. Shaft = 42 %
(Proportional)

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 1130.1500167.0000
REPORT NO.: 11804
PAGE: 13

PROJECT: Proposed 44th Ave E. Extension Phase II
44th Ave E and Caruso Road
Bradenton, Manatee County, Florida

BORING DESIGNATION: **B2-16**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT: Aeco
LOCATION: See Boring Location Plan
REMARKS: Bridge

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.0
DATE OF READING: 7-6-2016
EST. W.S.W.T. (ft):

DATE STARTED: 7/6/16
DATE FINISHED: 7/6/16
DRILLED BY: M.B/T.B/T.H
TYPE OF SAMPLING: ASTM D1586

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	UCS (TSF)	ORG. CONT. (%)
0	3-4-5-5	9	▽	Loose to medium dense dark brown fine sand with silt to silty sand (SP-SM/SM)						
	7-9-9-11	18								
5	14-13-11-15	24		Medium dense dark brown fine sand with silt and roots (SP-SM)						
	8-16-23-30	39		Dense brown fine sand with silt (SP-SM)						
10	14-30-37-23	67		Very dense light brown fine sand with trace silt (SP)						
15	7-10-10	20		Medium dense light brown fine sand (SP)						
20	1-6-20	26		Very stiff to hard tan cemented clay (CL)						
25	28-20-27	47								
30	9-18-12	22		Very stiff grey clay (CH)						
35	4-6-6	16								
40	4-7-10	17								
45	12-11-18	29		Very stiff to very hard light grey cemented clay (CL)						
50	50/5"	50/5"								
55	5-13-50/2"	50/2"								
60	50/5"	50/5"								
65	50/5"	50/5"								
70	17-50/5"	50/5"		Very hard light grey cemented clayey silt (ML)						
75	50/3"	50/3"		**Boring Terminated at 75 Feet**						
80										
85										
90										

Predrilled - Loose Sand model.

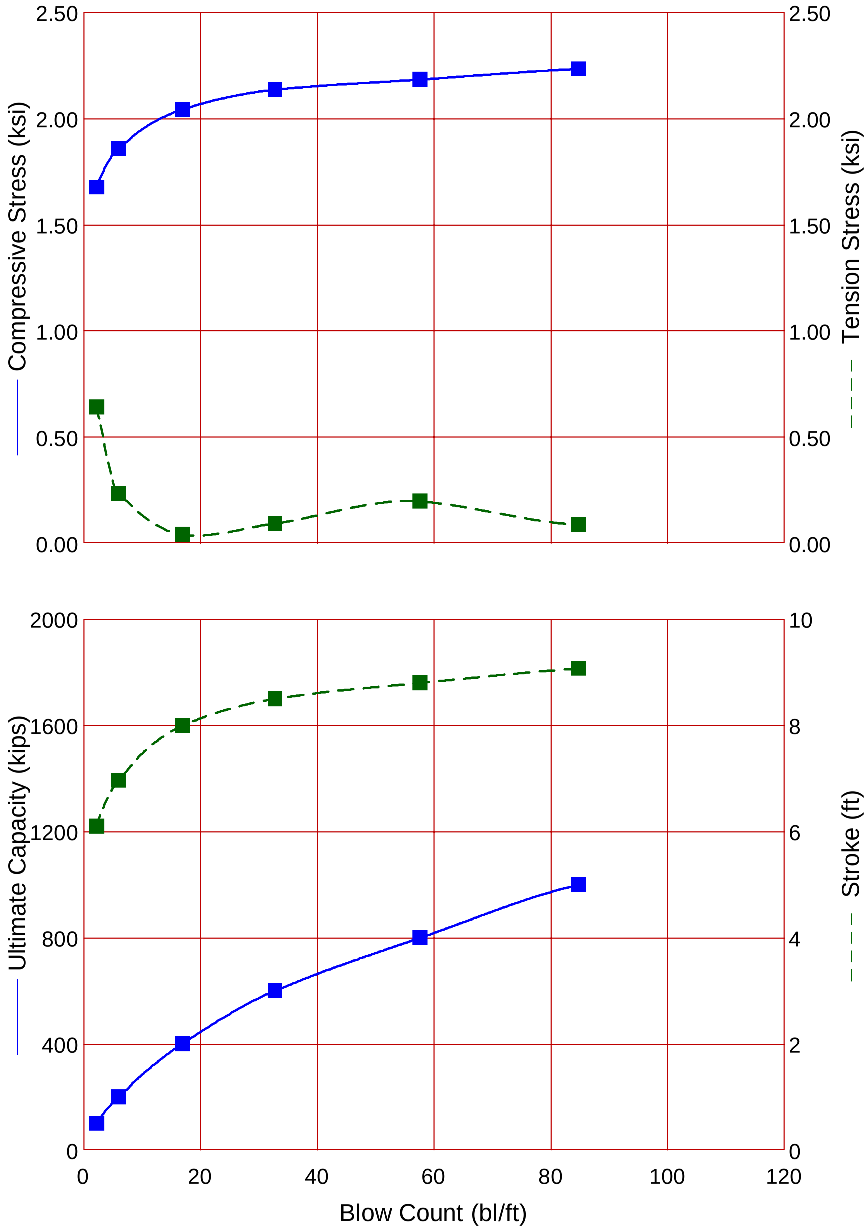
Medium Sand model.

Very Stiff Clay model.

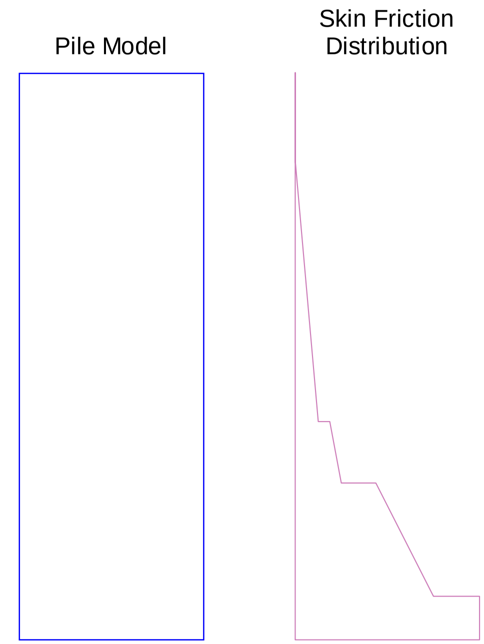
Stiff Clay model.

Projected Pile Tip El.

Hard silt model.



APE	D 62-42	
Ram Weight	13.67	kips
Efficiency	0.800	
Pressure	1375 (100%)	psi
Helmet Weight	1.04	kips
Hammer Cushion	39900	kips/in
Pile Cushion	2880	kips/in
COR of P.C.	0.500	
Skin Quake	0.100	in
Toe Quake	0.200	in
Skin Damping	0.180	sec/ft
Toe Damping	0.150	sec/ft
Pile Length	65.00	ft
Pile Penetration	55.00	ft
Pile Top Area	576.00	in2



Res. Shaft = 44 %
(Proportional)

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	1130.1500167.0000
REPORT NO.:	11804
PAGE:	10

PROJECT: Proposed 44th Ave E. Extension Phase II
44th Ave E and Caruso Road
Bradenton, Manatee County, Florida

BORING DESIGNATION: **B2-13** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:	Aeco	G.S. ELEVATION (ft):	
LOCATION:	See Boring Location Plan	WATER TABLE (ft):	7.0
REMARKS:	Bridge	DATE OF READING:	7-20-2016
		EST. W.S.W.T. (ft):	
DATE STARTED:	7/20/16	DATE FINISHED:	7/20/16
DRILLED BY:	AmDrill	TYPE OF SAMPLING:	ASTM D1586

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	UCS (TSF)	ORG. CONT. (%)
0	7-1-1-1	2		Very loose dark brown clayey silty sand with roots and wood pieces (SM)						
	4-4-3-4	7		Loose dark brown fine sand with silt to silty sand and trace roots (SP/SP-SM)						
5	6-6-7-9	13	▽							
	6-3-6-5	9		Medium dense to loose fine sand with trace silt (SP)						
10	4-2-2-2	4		Very loose dark brown fine sand with silt (SP-SM)						
15				Loose gray fine sand with trace silt (SP)						
20	50/4"	50/4"		Very hrad light gray cemented clayey silt (ML)						
25	43-50/2"	50/2"		Very hrade to very stiff light gray cemented clay (CL)						
30	11-50/5"	50/5"								
35	4-4-13	22								
40	7-12-13	25		Very stiff olive gray clay (CL/CH)						
45	50/5"	50/5"		Very hrad light gray cemented clay (CL)						
50	50/0"	50/0"		Very hard light gray cemented clayey silt (ML/MH)						
55	50/1"	50/1"								
60	50/3"	50/3"								
65	18-20-50/5"	50/5"		Very hard to stiff clay (CL)						
70	4-3-7	10		Artisian encountered at 75 feet						
75	8-50/5"	50/5"								
80	50/1"	50/1"		Very hard light gray cemented clayey silt (ML)						
85	25-26-50/4"	50/4"		100 % Loss of circulation at 81 feet						
				Very dense light gray cemented silty sand (SM)						
				Boring Terminated at 85 Feet						
90										

SCOUR EL -6.9

LOOSE SAND MODEL

PREFORMED TO EL -30

SOFT CLAY MODEL

MINIMUM TIP EL -49

PROJECTED TIP ELEVATION -54

VERY STIFF CLAY MODEL

HARD CLAY MODEL

VERY DENSE SILT MODEL

APE Model D62-42 Single Acting Diesel Impact Hammer

D62-42 in a stand-off driving Kingpile.

MODEL D62-42 (6.2 metric ton ram)

SPECIFICATIONS

Stroke at maximum rated energy	135 in (343 cm)
Maximum rated energy (Setting 4)	153,799 ft-lbs (207.63 kNm)
Setting 3	127,653 ft-lbs (172.33 kNm)
Setting 2	101,507 ft-lbs (137.03 kNm)
Minimum rated energy (Setting 1)	76,899 ft-lbs (103.81 kNm)
(Variable throttle allows for infinite fuel settings)	
Maximum obtainable stroke	150 in (381 cm)
Maximum obtainable energy	178,862 ft-lbs (243 kNm)
Speed (blows per minute)	34-53

WEIGHTS (Approximate)

Ram	13,671 lbs (6,200 kg)
Anvil	2,425 lbs (1,100 kg)
Anvil cross sectional area	367.94 in² (2373.80 cm²)
Hammer weight (includes trip device)	29,100 lbs (13,300 kg)
Typical operating (weight with DB32 and pipe insert)	34,402 lbs (15,602 kg)

CAPACITIES

Fuel tank (runs on diesel or bio-diesel)	25.5 gal (96.52 liters)
Oil tank	8.2 gal (31 liters)

CONSUMPTION

Diesel or Bio-diesel fuel	5.2 gal/hr (19.68 liters/hr)
Lubrication	0.52 gal/hr (1.96 liters/hr)
Grease	8 to 10 pumps every 20 minutes of operation time.

Optional Variable Throttle Control.

Drive Base Assembly.

STRIKER PLATE

Weight	1,036 lbs (470 kg)
Diameter	25 in (63.5 cm)
Area	491 in² (3167.74 cm²)
Thickness	8 in (20.32 cm)

CUSHION MATERIAL

Type/Qty	Micarta / 2 each
Diameter	25 in (63.5 cm)
Thickness	1 in (25.4 mm)
Type/Qty	Aluminum / 3 each
Thickness	1/2 in (12.7 mm)
Diameter	25 in (63.5 cm)
Total Combined Thickness	3.5 in (8.89 cm)
Area	491 in² (3167.74 cm²)
Elastic-modulus	285 ksi (1,965 mpa)
Coeff. of restitution	0.8

DRIVE CAP

DB 32:	2,436 lbs (1,104 kg)

INSERT WEIGHT

H-Beam insert for 12” (305 mm) and 14” (355 mm):	948 lbs (430 kg)
Large pipe insert for sizes 12” to 24” diameter:	1,830 lbs (830 kg)

MINIMUM BOX LEAD SIZE/OPERATING LENGTH

Minimum box leader size	8 in x 32 in (20.32 cm x 81.28 cm)
Operating length as described above	374 in (949.96 cm)

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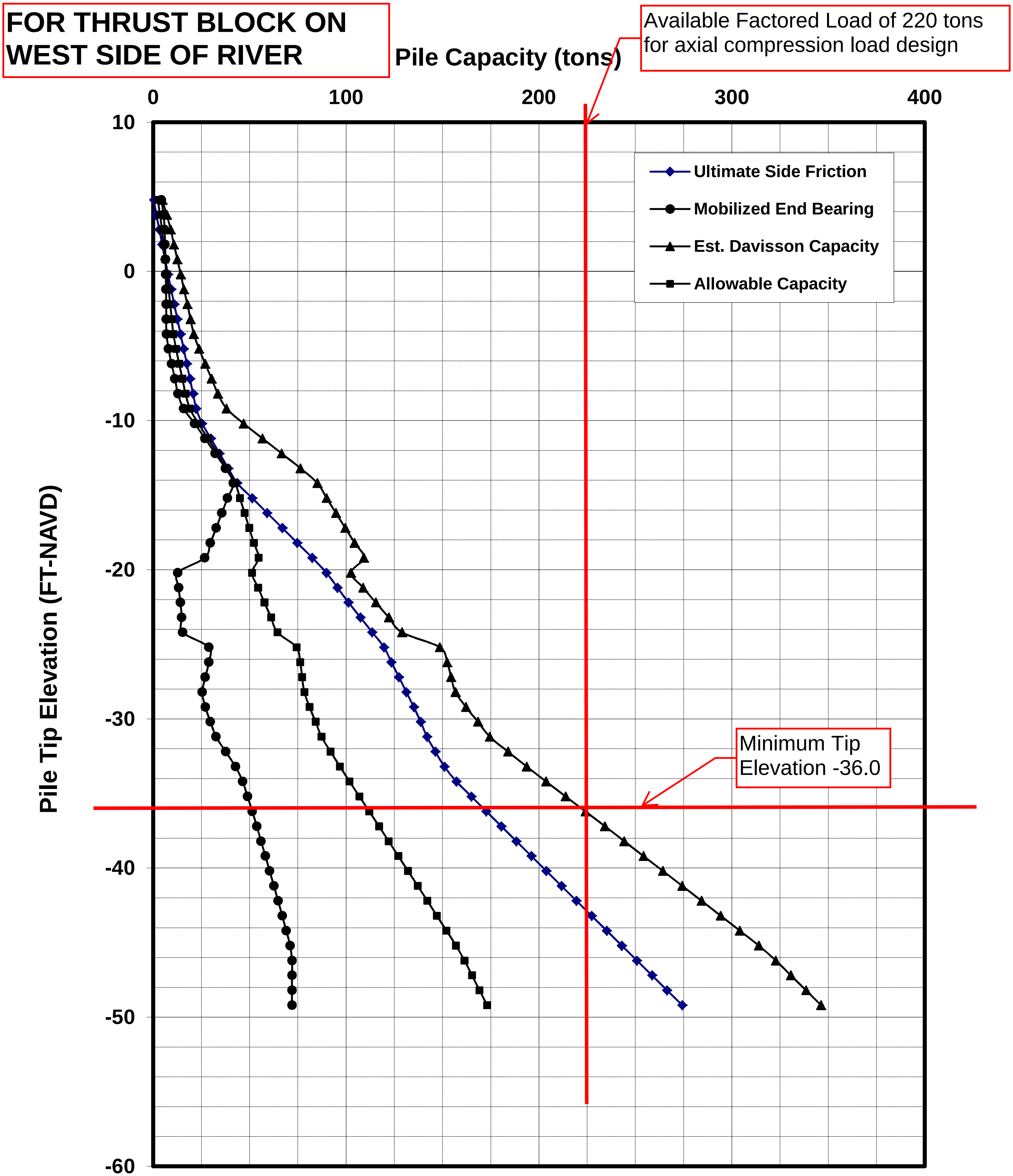
APPENDIX M

Pile Capacity Curves for Pipe Support Structure



44th Avenue Bridge Over Braden River
Boring B5 (Preformed Hole to El -10.0)
Ground Surface Elevation 5.8 FT- NAVD 88
No Scour
18-Inch Prestressed Concrete Pile

Florida Bridge Software Institute Date: December 07, 2016
Shaft and Pile Analysis (FB-Deep v.2.04) Time: 18:44:15

General Information:

Input file: .....nalyses\90% Submittal\1. FB-Deep\Boring B5\B-5 (PD_18 int).spc
Project number:
Job name: 44th Bridge, Manatee County
Engineer: AECOM
Units: English

Analysis Information:

Analysis Type: SPT

Soil Information:

Boring date: 9/1//2015, Boring Number: B-5 (Silt Model)
Station number: 1137314 Offset: 49535

Ground Elevation: 5.800(ft)

Hammer type: Automatic Hammer, Correction factor = 1.20

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	0.00	2- Clay and silty sand
2	2.00	5.00	2- Clay and silty sand
3	4.00	5.00	2- Clay and silty sand
4	6.00	5.00	2- Clay and silty sand
5	8.00	5.00	2- Clay and silty sand
6	10.00	5.00	2- Clay and silty sand
7	11.00	5.00	2- Clay and silty sand
8	15.00	5.00	2- Clay and silty sand
9	16.00	16.00	2- Clay and silty sand
10	19.90	16.00	2- Clay and silty sand
11	20.00	53.00	2- Clay and silty sand
12	25.00	53.00	2- Clay and silty sand
13	25.10	20.00	1- Plastic Clay
14	30.00	20.00	1- Plastic Clay
15	31.00	13.00	2- Clay and silty sand
16	35.00	13.00	2- Clay and silty sand
17	39.00	17.00	2- Clay and silty sand

18	40.00	100.00	2- Clay and silty sand
19	45.00	100.00	2- Clay and silty sand
20	50.00	100.00	2- Clay and silty sand
21	55.00	100.00	2- Clay and silty sand
22	60.00	100.00	2- Clay and silty sand
23	65.00	100.00	2- Clay and silty sand
24	66.00	0.00	5- Cavity layer

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	5.80	-19.30	25.10	16.11	2-Clay and Silty Sand
2	-19.30	-25.20	5.90	20.00	1-Plastic Clay
3	-25.20	-60.20	35.00	77.74	2-Clay and Silty Sand
4	-60.20	-60.20	0.00	0.00	5-

Driven Pile Data:
=================

Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
18.00	1.00	4.80
18.00	2.00	3.80
18.00	3.00	2.80
18.00	4.00	1.80
18.00	5.00	0.80
18.00	6.00	-0.20
18.00	7.00	-1.20
18.00	8.00	-2.20
18.00	9.00	-3.20
18.00	10.00	-4.20
18.00	11.00	-5.20
18.00	12.00	-6.20
18.00	13.00	-7.20
18.00	14.00	-8.20

18.00	15.00	-9.20
18.00	16.00	-10.20
18.00	17.00	-11.20
18.00	18.00	-12.20
18.00	19.00	-13.20
18.00	20.00	-14.20
18.00	21.00	-15.20
18.00	22.00	-16.20
18.00	23.00	-17.20
18.00	24.00	-18.20
18.00	25.00	-19.20
18.00	26.00	-20.20
18.00	27.00	-21.20
18.00	28.00	-22.20
18.00	29.00	-23.20
18.00	30.00	-24.20
18.00	31.00	-25.20
18.00	32.00	-26.20
18.00	33.00	-27.20
18.00	34.00	-28.20
18.00	35.00	-29.20
18.00	36.00	-30.20
18.00	37.00	-31.20
18.00	38.00	-32.20
18.00	39.00	-33.20
18.00	40.00	-34.20
18.00	41.00	-35.20
18.00	42.00	-36.20
18.00	43.00	-37.20
18.00	44.00	-38.20
18.00	45.00	-39.20
18.00	46.00	-40.20
18.00	47.00	-41.20
18.00	48.00	-42.20
18.00	49.00	-43.20
18.00	50.00	-44.20
18.00	51.00	-45.20
18.00	52.00	-46.20
18.00	53.00	-47.20
18.00	54.00	-48.20
18.00	55.00	-49.20

Driven Pile Capacity:
=====================

Test Pile	Pile Width	Ultimate Side	Mobilized End	Estimated Davisson	Allowable Pile	Ultimate Pile

Length (ft)	(in)	Friction (tons)	Bearing (tons)	Capacity (tons)	Capacity (tons)	Capacity (tons)
1.00	18.0	0.41	4.33	4.74	2.37	13.39
2.00	18.0	1.63	5.40	7.03	3.52	17.83
3.00	18.0	3.20	5.91	9.11	4.56	20.94
4.00	18.0	4.66	6.14	10.80	5.40	23.09
5.00	18.0	6.15	6.37	12.52	6.26	25.27
6.00	18.0	7.69	6.60	14.29	7.15	27.49
7.00	18.0	9.31	6.69	16.00	8.00	29.37
8.00	18.0	10.94	6.75	17.69	8.84	31.19
9.00	18.0	12.56	6.80	19.36	9.68	32.96
10.00	18.0	14.19	6.89	21.08	10.54	34.85
11.00	18.0	15.82	8.00	23.82	11.91	39.83
12.00	18.0	17.45	9.54	26.99	13.49	46.07
13.00	18.0	19.08	11.27	30.35	15.17	52.90
14.00	18.0	20.71	12.86	33.56	16.78	59.28
15.00	18.0	22.34	15.76	38.10	19.05	69.63
16.00	18.0	25.40	21.51	46.91	23.46	89.94
17.00	18.0	29.91	26.83	56.74	28.37	110.41
18.00	18.0	34.42	32.16	66.57	33.29	130.89
19.00	18.0	38.93	37.48	76.41	38.21	151.37
20.00	18.0	43.62	41.54	85.16	42.58	168.24
21.00	18.0	51.38	38.58	89.96	44.98	167.13
22.00	18.0	59.15	35.63	94.77	47.39	166.02
23.00	18.0	66.92	32.67	99.59	49.80	164.93

24.00	18.0	74.70	29.71	104.42	52.21	163.84
25.00	18.0	82.49	26.77	109.27	54.63	162.81
26.00	18.0	89.80	12.78	102.58	51.29	128.14
27.00	18.0	95.56	13.27	108.83	54.41	135.37
28.00	18.0	101.30	14.15	115.45	57.72	143.75
29.00	18.0	107.44	14.79	122.23	61.11	151.80
30.00	18.0	113.63	15.37	129.00	64.50	159.74
31.00	18.0	119.68	28.93	148.61	74.30	206.47
32.00	18.0	123.53	28.89	152.42	76.21	210.20
33.00	18.0	127.39	27.05	154.44	77.22	208.53
34.00	18.0	131.25	25.48	156.72	78.36	207.68
35.00	18.0	135.10	27.06	162.16	81.08	216.28
36.00	18.0	138.72	29.72	168.43	84.22	227.87
37.00	18.0	141.95	32.61	174.56	87.28	239.78
38.00	18.0	146.36	37.63	183.98	91.99	259.23
39.00	18.0	151.00	42.68	193.68	96.84	279.05
40.00	18.0	157.24	46.43	203.67	101.83	296.53
41.00	18.0	164.97	48.91	213.88	106.94	311.69
42.00	18.0	172.73	51.38	224.11	112.06	326.88
43.00	18.0	180.50	53.73	234.23	117.12	341.69
44.00	18.0	188.29	55.95	244.24	122.12	356.14
45.00	18.0	196.08	58.17	254.25	127.13	370.59
46.00	18.0	203.89	60.39	264.28	132.14	385.06
47.00	18.0	211.70	62.61	274.31	137.15	399.53
48.00	18.0	219.51	64.80	284.31	142.16	413.91
49.00	18.0	227.33	66.93	294.26	147.13	428.12

50.00	18.0	235.15	69.00	304.15	152.08	442.15
51.00	18.0	242.98	71.01	313.99	157.00	456.01
52.00	18.0	250.81	72.00	322.81	161.40	466.81
53.00	18.0	258.64	72.00	330.64	165.32	474.64
54.00	18.0	266.47	72.00	338.47	169.24	482.47
55.00	18.0	274.31	72.00	346.31	173.15	490.31

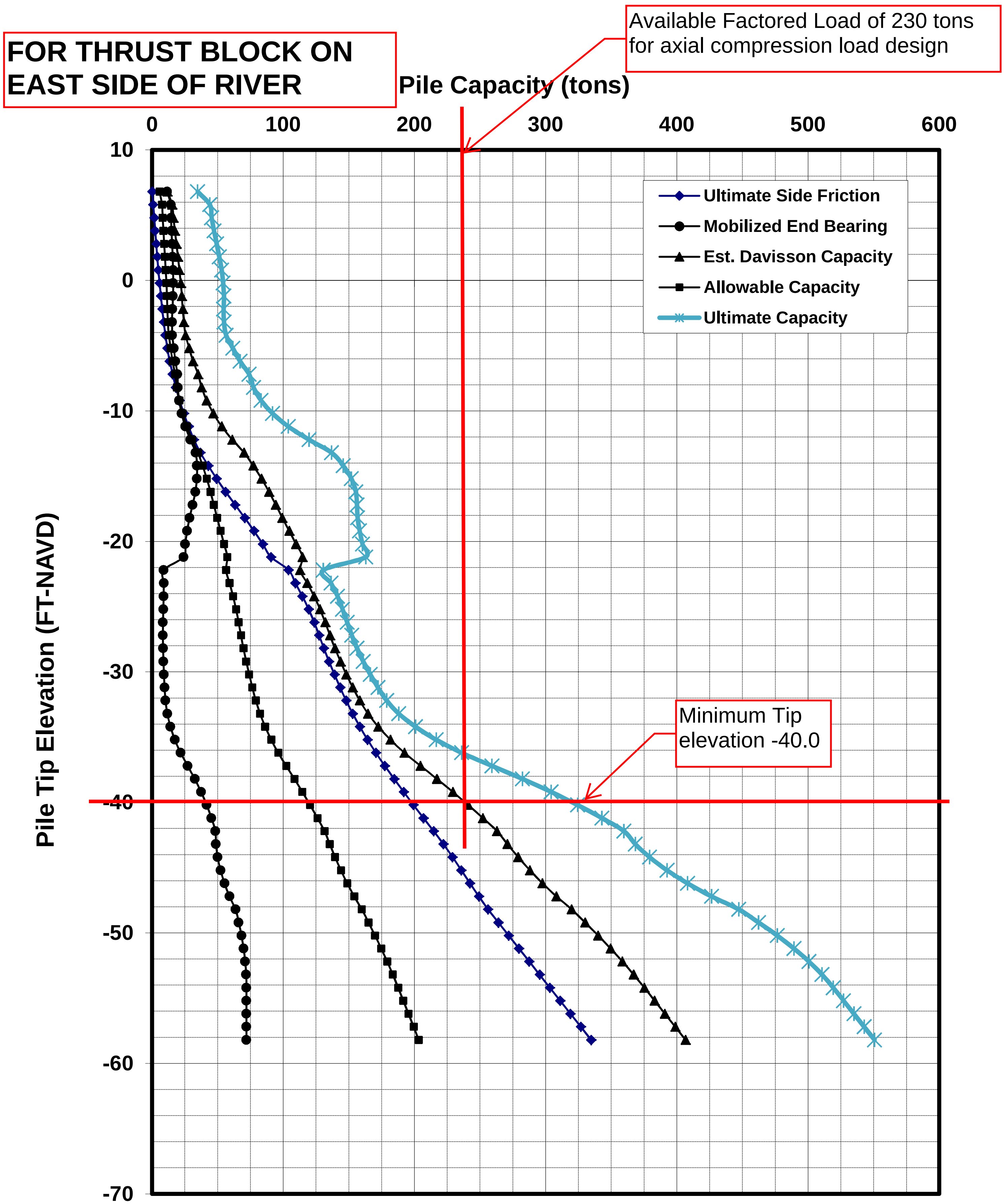
NOTES
----

1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING. EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 2 x THE MOBILIZED END BEARING.



44th Avenue Bridge Over Braden River
Boring B2-16 Predrilled to -10.0
Ground Surface Elevation +7.8 FT- NAVD 88
18-Inch Prestressed Concrete Pile

Florida Bridge Software Institute Date: December 07, 2016
Shaft and Pile Analysis (FB-Deep v.2.04) Time: 18:34:16

General Information:

Input file: .....0% Submittal\1. FB-Deep\Boring B2-16\8-30-16\B2-16 (PD_18).spc
Project number: 6086960
Job name: 44th Avenue Bridge Extension
Engineer: AECOM
Units: English

Analysis Information:

Analysis Type: SPT

Soil Information:

Boring date: July 6, 2016, Boring Number: B2-16
Station number: 212+30 Offset: on center

Ground Elevation: 7.800(ft)

Hammer type: Safety Hammer

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	0.00	1- Plastic Clay
2	2.00	8.00	3- Clean sand
3	4.00	8.00	3- Clean sand
4	6.00	8.00	3- Clean sand
5	8.00	8.00	3- Clean sand
6	10.00	8.00	3- Clean sand
7	15.00	8.00	2- Clay and silty sand
8	18.00	20.00	2- Clay and silty sand
9	20.00	26.00	2- Clay and silty sand
10	25.00	47.00	2- Clay and silty sand
11	30.00	22.00	1- Plastic Clay
12	35.00	12.00	1- Plastic Clay
13	40.00	17.00	1- Plastic Clay
14	45.00	29.00	1- Plastic Clay
15	50.00	100.00	2- Clay and silty sand
16	55.00	100.00	2- Clay and silty sand
17	60.00	100.00	2- Clay and silty sand

18	65.00	100.00	2- Clay and silty sand
19	70.00	100.00	2- Clay and silty sand
20	75.00	100.00	2- Clay and silty sand
21	80.00	100.00	2- Clay and silty sand
22	81.00	0.00	5- Cavity layer

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	7.80	5.80	2.00	0.00	1-Plastic Clay
2	5.80	-7.20	13.00	8.00	3-Clean Sand
3	-7.20	-22.20	15.00	28.60	2-Clay and Silty Sand
4	-22.20	-42.20	20.00	20.00	1-Plastic Clay
5	-42.20	-73.20	31.00	100.00	2-Clay and Silty Sand
6	-73.20	-73.20	0.00	0.00	5-

Driven Pile Data:
=================
Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
18.00	1.00	6.80
18.00	2.00	5.80
18.00	3.00	4.80
18.00	4.00	3.80
18.00	5.00	2.80
18.00	6.00	1.80
18.00	7.00	0.80
18.00	8.00	-0.20
18.00	9.00	-1.20
18.00	10.00	-2.20
18.00	11.00	-3.20
18.00	12.00	-4.20

18.00	13.00	-5.20
18.00	14.00	-6.20
18.00	15.00	-7.20
18.00	16.00	-8.20
18.00	17.00	-9.20
18.00	18.00	-10.20
18.00	19.00	-11.20
18.00	20.00	-12.20
18.00	21.00	-13.20
18.00	22.00	-14.20
18.00	23.00	-15.20
18.00	24.00	-16.20
18.00	25.00	-17.20
18.00	26.00	-18.20
18.00	27.00	-19.20
18.00	28.00	-20.20
18.00	29.00	-21.20
18.00	30.00	-22.20
18.00	31.00	-23.20
18.00	32.00	-24.20
18.00	33.00	-25.20
18.00	34.00	-26.20
18.00	35.00	-27.20
18.00	36.00	-28.20
18.00	37.00	-29.20
18.00	38.00	-30.20
18.00	39.00	-31.20
18.00	40.00	-32.20
18.00	41.00	-33.20
18.00	42.00	-34.20
18.00	43.00	-35.20
18.00	44.00	-36.20
18.00	45.00	-37.20
18.00	46.00	-38.20
18.00	47.00	-39.20
18.00	48.00	-40.20
18.00	49.00	-41.20
18.00	50.00	-42.20
18.00	51.00	-43.20
18.00	52.00	-44.20
18.00	53.00	-45.20
18.00	54.00	-46.20
18.00	55.00	-47.20
18.00	56.00	-48.20
18.00	57.00	-49.20
18.00	58.00	-50.20
18.00	59.00	-51.20
18.00	60.00	-52.20
18.00	61.00	-53.20
18.00	62.00	-54.20
18.00	63.00	-55.20
18.00	64.00	-56.20

18.00	65.00	-57.20
18.00	66.00	-58.20
18.00	67.00	-59.20
18.00	68.00	-60.20
18.00	69.00	-61.20
18.00	70.00	-62.20

Driven Pile Capacity:
====================

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	18.0	0.23	11.54	11.77	5.89	34.86
2.00	18.0	0.91	14.40	15.31	7.66	44.11
3.00	18.0	1.74	14.58	16.32	8.16	45.47
4.00	18.0	2.50	14.93	17.44	8.72	47.30
5.00	18.0	3.27	15.36	18.63	9.31	49.34
6.00	18.0	4.06	15.76	19.82	9.91	51.34
7.00	18.0	4.91	16.05	20.96	10.48	53.05
8.00	18.0	5.82	16.16	21.98	10.99	54.29
9.00	18.0	6.80	16.02	22.82	11.41	54.86
10.00	18.0	7.86	15.59	23.45	11.73	54.64
11.00	18.0	9.00	15.30	24.30	12.15	54.91
12.00	18.0	10.27	15.42	25.69	12.84	56.53
13.00	18.0	11.78	16.62	28.39	14.20	61.63
14.00	18.0	13.53	17.89	31.42	15.71	67.20
15.00	18.0	15.83	19.42	35.24	17.62	

```
74.07
  16.00   18.0      18.19      19.73      37.92      18.96
77.38
  17.00   18.0      20.97      20.75      41.72      20.86
83.21
  18.00   18.0      24.21      22.58      46.79      23.39
91.95
  19.00   18.0      27.87      25.36      53.23      26.62
103.96
  20.00   18.0      31.98      29.21      61.19      30.60
119.62
  21.00   18.0      36.90      33.30      70.20      35.10
136.80
  22.00   18.0      42.90      34.30      77.19      38.60
145.79
  23.00   18.0      49.31      34.21      83.53      41.76
151.95
  24.00   18.0      56.15      33.08      89.24      44.62
155.41
  25.00   18.0      63.41      30.94      94.34      47.17
156.21
  26.00   18.0      70.72      28.66      99.38      49.69
156.70
  27.00   18.0      77.73      26.84     104.57      52.29
158.26
  28.00   18.0      84.41      25.35     109.76      54.88
160.45
  29.00   18.0      90.74      24.03     114.78      57.39
162.85
  30.00   18.0     104.09       8.80     112.89      56.45
130.50
  31.00   18.0     109.32       9.04     118.35      59.18
136.43
  32.00   18.0     114.64       8.92     123.56      61.78
141.39
  33.00   18.0     119.43       8.60     128.04      64.02
145.24
  34.00   18.0     123.64       8.38     132.02      66.01
148.77
  35.00   18.0     127.39       8.30     135.69      67.85
152.30
  36.00   18.0     131.03       8.42     139.45      69.73
156.30
  37.00   18.0     134.92       8.70     143.62      71.81
161.03
  38.00   18.0     139.05       9.11     148.16      74.08
166.39
  39.00   18.0     143.42       9.63     153.05      76.53
172.32
  40.00   18.0     148.03      10.28     158.31      79.16
178.87
  41.00   18.0     153.00      11.69     164.69      82.34
```

```
188.07
  42.00   18.0     158.42      14.10     172.53      86.26
200.74
  43.00   18.0     164.31      17.42     181.73      90.87
216.57
  44.00   18.0     170.65      21.80     192.45      96.23
236.04
  45.00   18.0     177.46      27.20     204.66     102.33
259.05
  46.00   18.0     184.58      32.61     217.18     108.59
282.39
  47.00   18.0     191.86      37.45     229.31     114.65
304.21
  48.00   18.0     199.30      41.70     241.00     120.50
324.40
  49.00   18.0     206.91      45.31     252.23     126.11
342.86
  50.00   18.0     214.68      48.30     262.99     131.49
359.59
  51.00   18.0     222.16      48.75     270.91     135.45
368.40
  52.00   18.0     229.10      50.07     279.17     139.58
379.30
  53.00   18.0     235.76      52.25     288.02     144.01
392.52
  54.00   18.0     242.38      55.27     297.65     148.82
408.18
  55.00   18.0     249.11      59.09     308.21     154.10
426.39
  56.00   18.0     256.12      63.69     319.81     159.91
447.20
  57.00   18.0     263.97      66.09     330.06     165.03
462.23
  58.00   18.0     271.83      68.22     340.04     170.02
476.47
  59.00   18.0     279.68      69.87     349.55     174.78
489.29
  60.00   18.0     287.54      71.05     358.59     179.29
500.70
  61.00   18.0     295.39      71.76     367.15     183.58
510.68
  62.00   18.0     303.24      72.00     375.24     187.62
519.24
  63.00   18.0     311.10      72.00     383.10     191.55
527.10
  64.00   18.0     318.95      72.00     390.95     195.48
534.95
  65.00   18.0     326.81      72.00     398.81     199.40
542.81
  66.00   18.0     334.66      72.00     406.66     203.33
550.66
  67.00   18.0     342.52      72.00     414.52     207.26
```

```
558.52
  68.00   18.0     350.37      72.00     422.37     211.19
566.37
  69.00   18.0     358.23      72.00     430.23     215.11
574.23
  70.00   18.0     366.08      72.00     438.08     219.04
582.08
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NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING. EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 2 x THE MOBILIZED END BEARING.

APPENDIX N

Surcharge Program Recommendations

SETTLEMENT MONITORING PROGRAM NOTES:

1. THE PRELOADING / SURCHARGING AREAS SHALL BE PREPARED IN ACCORDANCE WITH FDOT SPECIFICATIONS SECTION 120, EXCAVATION AND EMBANKMENT. THE PREPARED SURFACE SHALL BE COMPACTED TO AT LEAST 98 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY AASHTO T-99 METHOD PRIOR TO PLACING ANY FILL. SURCHARGE AND EMBANKMENT MATERIALS SHALL BE SELECT MATERIALS AS INDICATED IN FDOT DESIGN STANDARD INDEX 505 AND SHALL BE COMPACTED IN THIN LIFTS IN ACCORDANCE WITH SECTION 120-9 OF THE FDOT STANDARD SPECIFICATIONS.

2. EROSION AND SEDIMENT CONTROL MEASURES FOR THE PRELOADING AND SURCHARGE EMANKMENT SHALL BE CONTRACTOR'S SELECTION AND SHALL BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL RULES AND REGULATIONS.

3. SETTLEMENT PLATE ASSEMBLIES SHALL BE IN ACCORDANCE WITH FDOT DESIGN STANDARD INDEX 540. INSTALL SETTLEMENT PLATES AT LOCATION INDICATED.

4. PROTECT THE SETTLEMENT PLATE ASSEMBLIES DURING CONSTRUCTION. REMOVE AND REPLACE ANY DAMAGED ASSEMBLIES AND RECONSTRUCT THE PRELOADING / SURCHARGE EMBANKMENT AT NO ADDITIONAL COST TO THE COUNTY.

5. PERFORM SETTLEMENT READING ON A REGULAR INTERVAL, BUT NO LESS THAN THE FOLLOWING SCHEDULE. REPORT THE RESULTS OF READING ON AN APPROVED MONITORING LOG AND PROVIDE THE RESULTS INCLUDING ALL DATA REDUCTION AND GRAPHICALPRESENTATION OF RESULTS TO THE COUNTY WITHIN 24-HOURS OF READING.

   - EXISTING SITE CONDITION AFTER CLEARING AND GRUBBING
   - WEEKLY DURING EMBANKMENT AND SURCHARGE PLACEMENT AND REMOVAL
   - WHEN FINISHED GRADE IS REACHED
   - WHEN SURCHARGE EMBANKMENT IS AT ONE-HALF HEIGHT
   - WHEN SURCHARGE EMBANKMENT IS AT FULL HEIGHT
   - WEEKLY READINGS, FOR UP TO 14 WEEKS, AFTER THE SURCHARGE EMBANKMENT REACHES FULL HEIGHT
   - IMMEDIATELY AFTER THE SURCHARGE EMBANKMENT IS REMOVED

6. THE CONTRACTOR SHALL ANTICIPATE THAT AFTER REACHING THE FULL HEIGHT, THE SURCHARGE WILL NEED TO REMAIN IN PLACE FOR UP TO THE EXPECTED 14 WEEKS DURATION. THE CONTRACTOR'S NETWORK ANALYSIS SCHEDULE AND EFFORTS SHALL BE BASED ON THE SURCHARGE REMAINING IN PLACE FOR THE FULL EXPECTED DURATION. BASED ON THE RECORDED SETTLEMENT, THE COUNTY MAY RELEASE THE SURCHARGE EARLY.

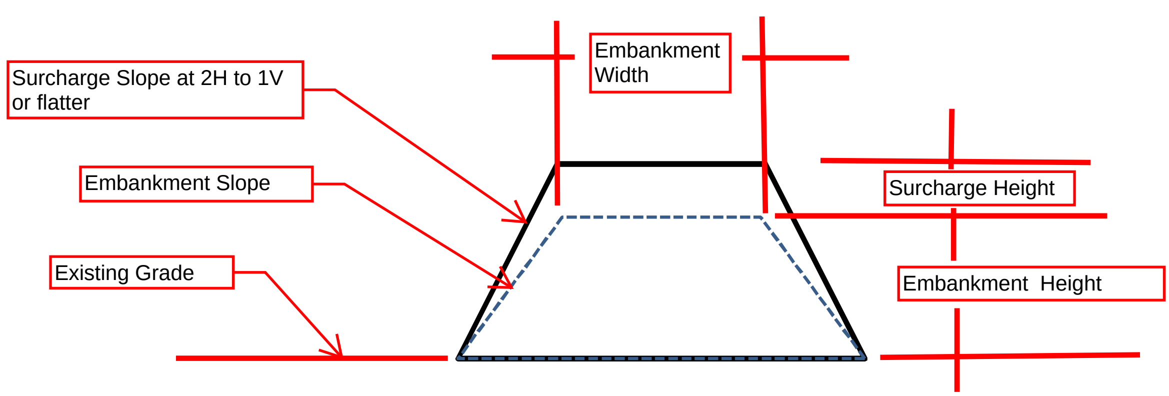
7. IT IS ANTICIPATED THAT THE TOTAL GROUND SETTLEMENT AT THE COMPLETION OF THE SURCHARGE PROGRAM WILL BE ON THE ORDER OF 4 TO 10 INCHES, DEPENDING ON LOCATIONS. THE CONTRACTOR SHALL CONSIDER THE ANTICIPATED SETTLEMENT IN ESTIMATING THE EARTHWORK QUANTITIES AND PLANNING CONSTRUCTION ACTIVITIES. IT IS ESTIMATED ADDITIONAL SETTLEMENT OF LESS THAN 1 INCH WILL OCCUR AFTER THE SURCHARGE REMOVAL.

8. IF THE ABUTMENT PILES ARE INSTALLED AFTER THE SURCHARGE PROGRAM HAS BEEN COMPLETED AND ACCEPTED, THE ABUTMENT PILES SHALL BE INSTALLED WITH PREDRILLED HOLES THROUGH THE COMPLETED EMBANKMENT. NO DOWNDRAG LOSS WILL BE ADDED TO THE PILE DRIVING RESISTANCE.

9. IF THE ABUTMENT PILES ARE INSTALLED PRIOR TO PLACEMENT OF THE EMBANKMENT AND SURCHARGE FILLS, ADDITIONAL DOWNDRAG LOSS WILL BE ADDED TO THE REQUIRED PILE DRIVING RESISTANCE. THE EXPOSED PORTION OF THE PILES SHALL BE WRAPPED WITH TWO LAYERS OF POLYETHYLENE SHEETING IN ACCORDANCE WITH FDOT SPECIFICATIONS SECTION 459 PRIOR TO FILL PLACEMENT.

10. COORDINATE WITH THE STRUCTURAL PLANS FOR ADDITIONAL REQUIREMENTS REGARDING ABUTMENT PILES INSTALLATION. UNDERGROUND UTILITIES SHALL NOT BE INSTALLED WITHIN THE SURCHARGE FOOTPRINT PRIOR TO THE COMPLETION OF THE SURCHARGE PROGRAM.

PRELOADING / SURCHARGE EMBANKMENT				
ZONE	**HEIGHT ABOVE FINISHED GRADE** (FEET)	**SETLEMENT PLATE DESIGNATION**	**SETTLEMENT PLATE LOCATION**	
			STATION	**OFFSET**
STATION 193+00 TO STATON 197+65	8	SP-1	193+50	ON CENTER
		SP-2	195+00	40’ RT
		SP-3	196+30	60’ LT
		SP-4	197+30	ON CENTER
STATION 212+50 TO STATON 216+00	5	SP-5	212+80	ON CENTER
		SP-6	214+00	40’RT
		SP-7	215+50	ON CENTER

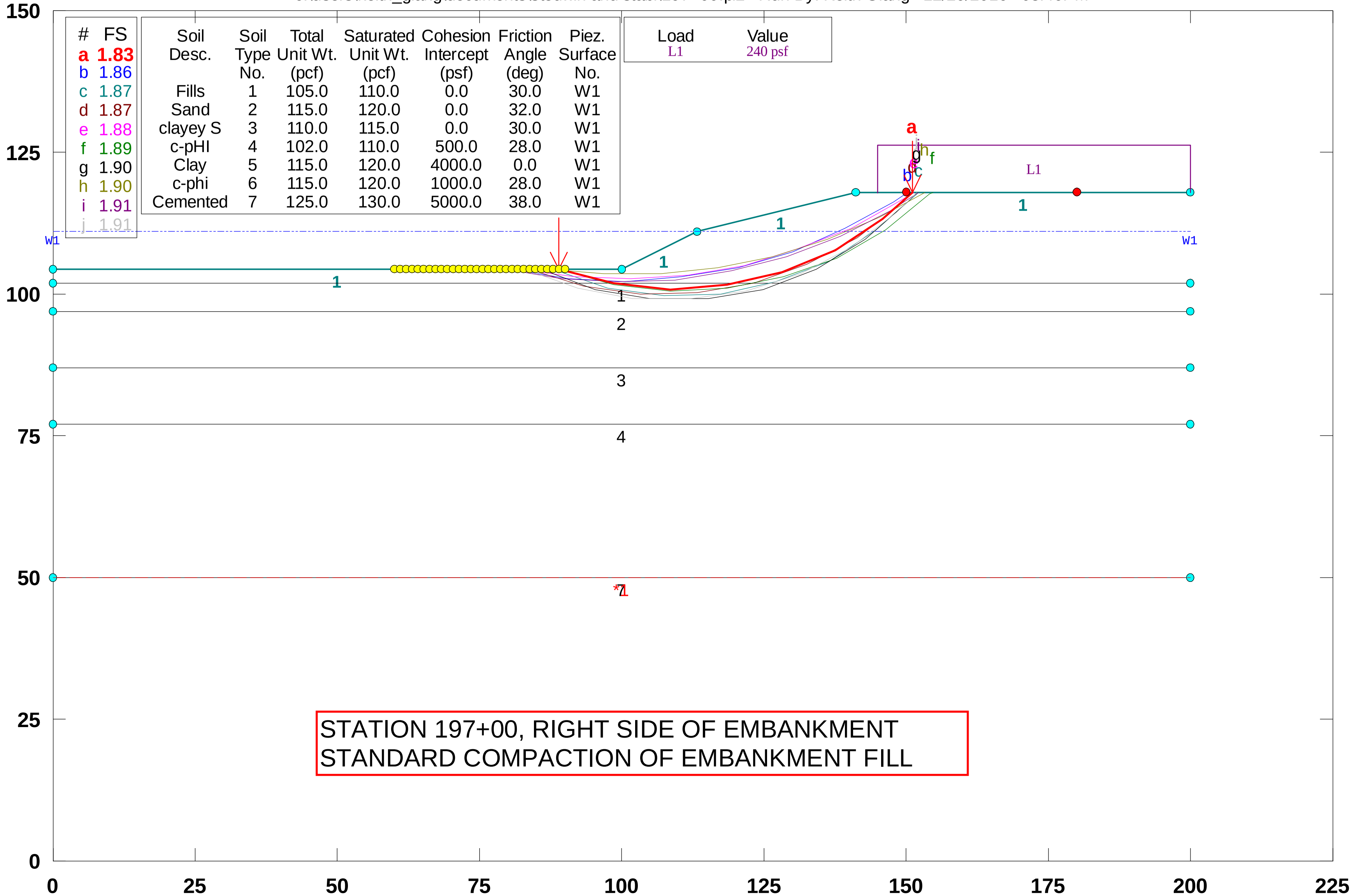


APPENDIX O

Embankment Stability Analyses

PCSTABL5M PROBLEM WITH JANBU'S COEF TEST 5

c:\users\keith_giang\documents\stedwin and stabl\197+00.pl2   Run By: Keith Giang   12/20/2016   08:46PM



PCSTABL5M/si FSmin=1.83

Safety Factors Are Calculated By The Modified Bishop Method

**** PCSTABL5M ****
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 12/20/2016
Time of Run: 08:46PM
Run By: Keith Giang
Input Data Filename: C:197+00.in
Output Filename: C:197+00.OUT
Unit: ENGLISH
Plotted Output Filename: C:197+00.PLT
PROBLEM DESCRIPTION PCSTABL5M PROBLEM WITH JANBU'S COEF
TEST 5

BOUNDARY COORDINATES
4 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.40	100.00	104.40	1
2	100.00	104.40	113.20	111.00	1
3	113.20	111.00	141.20	118.00	1
4	141.20	118.00	200.00	118.00	1
5	0.00	102.00	200.00	102.00	1
6	0.00	97.00	200.00	97.00	2
7	0.00	87.00	200.00	87.00	3
8	0.00	77.00	200.00	77.00	4
9	0.00	50.00	200.00	50.00	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	110.0	0.0	30.0	0.00	0.0	1
2	115.0	120.0	0.0	32.0	0.00	0.0	1
3	110.0	115.0	0.0	30.0	0.00	0.0	1
4	102.0	110.0	500.0	28.0	0.00	0.0	1
5	115.0	120.0	4000.0	0.0	0.00	0.0	1
6	115.0	120.0	1000.0	28.0	0.00	0.0	1
7	125.0	130.0	5000.0	38.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	111.00
2	200.00	111.00

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	145.00	200.00	240.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	50.00	200.00	50.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
900 Trial Surfaces Have Been Generated.
30 Surfaces Initiate From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 60.00 ft.
and X = 90.00 ft.
Each Surface Terminates Between X = 150.00 ft.
and X = 180.00 ft.
Unless Further Limitations Were Imposed, The Minimum Elevation

At Which A Surface Extends Is Y = 0.00 ft.
10.00 ft. Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.97	104.40
2	98.63	101.81
3	108.58	100.86
4	118.56	101.57
5	128.28	103.91
6	137.47	107.84
7	145.90	113.23
8	151.17	118.00

Circle Center At X = 109.3 ; Y = 160.6 and Radius,   59.7
*** 1.831 ***

Individual data on the 14 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.0	1183.0	3691.0	4515.8	0.0	0.0	0.0	0.0	0.0
2	0.7	191.3	287.2	409.6	0.0	0.0	0.0	0.0	0.0
3	1.4	401.0	566.0	797.1	0.0	0.0	0.0	0.0	0.0
4	8.6	4977.9	2666.7	5232.8	0.0	0.0	0.0	0.0	0.0
5	4.6	4482.8	372.2	2883.1	0.0	0.0	0.0	0.0	0.0
6	5.4	6045.0	0.0	3223.7	0.0	0.0	0.0	0.0	0.0
7	1.8	2114.3	0.0	1061.9	0.0	0.0	0.0	0.0	0.0
8	7.9	9324.5	0.0	4092.3	0.0	0.0	0.0	0.0	0.0
9	9.2	9936.6	0.0	3198.1	0.0	0.0	0.0	0.0	0.0
10	3.7	3364.2	0.0	544.2	0.0	0.0	0.0	0.0	0.0
11	1.2	947.8	0.0	35.2	0.0	0.0	0.0	0.0	0.0
12	2.6	1673.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.9	476.9	0.0	0.0	0.0	0.0	0.0	0.0	215.4
14	5.3	1322.3	0.0	0.0	0.0	0.0	0.0	0.0	1266.2

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.69	104.40
2	90.56	102.80
3	100.55	102.32
4	110.53	102.96
5	120.37	104.71
6	129.96	107.56
7	139.17	111.46
8	147.88	116.37
9	150.13	118.00

Circle Center At X =   99.9 ; Y = 191.4 and Radius,   89.1
*** 1.863 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.93	104.40
2	97.41	101.22
3	107.30	99.76
4	117.30	100.06
5	127.08	102.13
6	136.35	105.90
7	144.80	111.23
8	152.18	117.98
9	152.20	118.00

Circle Center At X = 110.6 ; Y = 156.1 and Radius,   56.4
*** 1.867 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.79	104.40

```
    2         93.34      101.43
    3        103.24      100.02
    4        113.24      100.20
    5        123.09      101.96
    6        132.53      105.26
    7        141.32      110.02
    8        149.25      116.11
    9        151.03      118.00
Circle Center At X =  107.1 ; Y =  162.7  and Radius,   62.8
      ***     1.870   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         81.72      104.40
    2         91.62      102.97
    3        101.62      102.61
    4        111.59      103.31
    5        121.43      105.07
    6        131.03      107.88
    7        140.28      111.68
    8        149.07      116.45
    9        151.31      118.00
Circle Center At X =  100.0 ; Y =  196.3  and Radius,   93.7
      ***     1.877   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         88.97      104.40
    2         98.59      101.69
    3        108.53      100.53
    4        118.52      100.95
    5        128.32      102.93
    6        137.69      106.42
    7        146.39      111.34
    8        154.22      117.57
    9        154.61      118.00
Circle Center At X =  110.9 ; Y =  164.0  and Radius,   63.5
      ***     1.890   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         85.86      104.40
    2         95.22      100.87
    3        105.06       99.07
    4        115.06       99.07
    5        124.89      100.86
    6        134.25      104.39
    7        142.82      109.54
    8        150.33      116.14
    9        151.80      118.00
Circle Center At X =  110.1 ; Y =  154.4  and Radius,   55.5
      ***     1.899   ***
Failure Surface Specified By  8 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         86.90      104.40
    2         96.85      103.47
    3        106.85      103.53
    4        116.80      104.60
    5        126.58      106.65
    6        136.12      109.67
    7        145.30      113.62
    8        153.19      118.00
Circle Center At X =  101.2 ; Y =  203.0  and Radius,   99.7
      ***     1.899   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         79.66      104.40
    2         89.51      102.71
```

3	99.49	102.09
4	109.48	102.53
5	119.37	104.04
6	129.04	106.59
7	138.38	110.17
8	147.28	114.72
9	152.29	118.00

Circle Center At X = 100.3 ; Y = 195.6 and Radius,   93.5

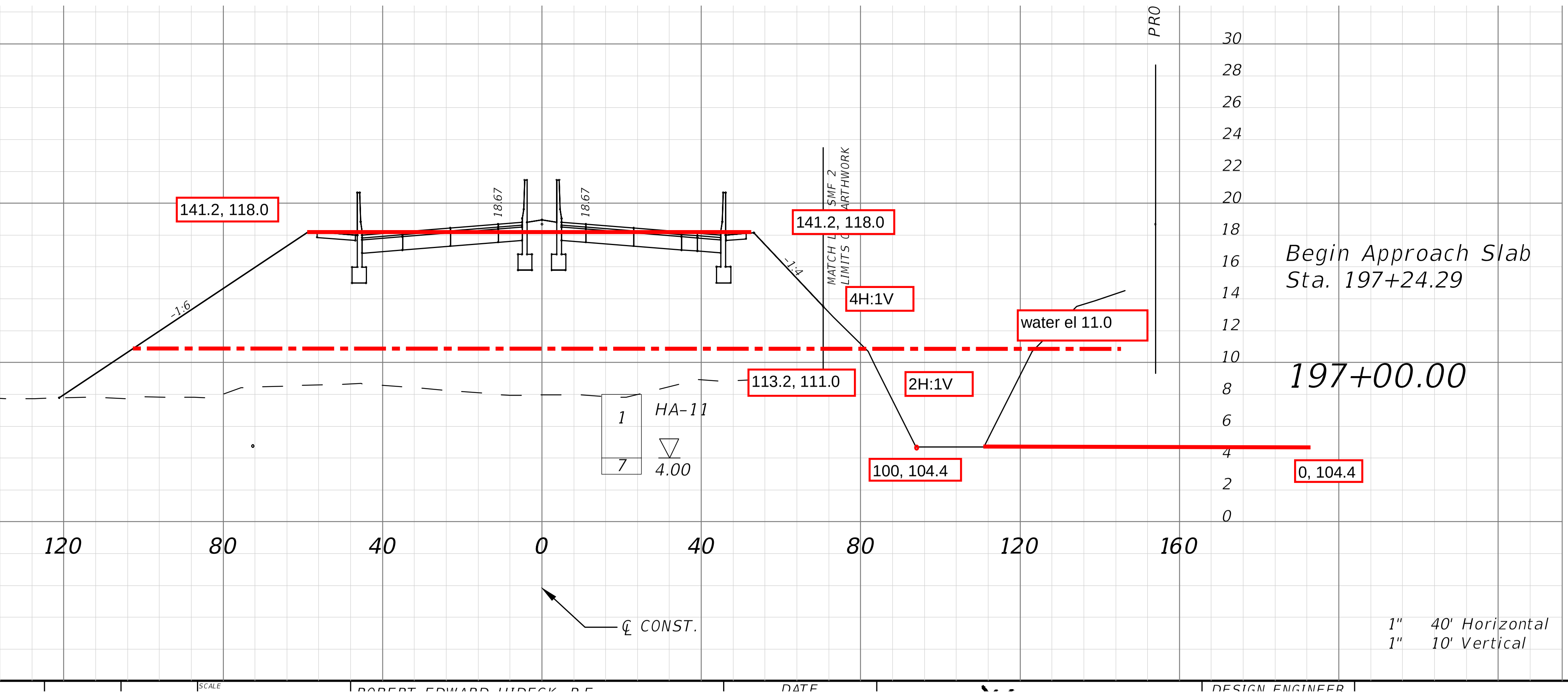
*** 1.906 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.76	104.40
2	92.18	101.04
3	102.02	99.26
4	112.02	99.12
5	121.91	100.61
6	131.42	103.70
7	140.30	108.29
8	148.31	114.28
9	151.87	118.00

Circle Center At X = 107.9 ; Y = 160.0 and Radius,   61.0

*** 1.910 ***



PRO
Begin Approach Slab
Sta. 197+24.29
197+00.00
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
141.2, 118.0
141.2, 118.0
18.67
18.67
-1:6
-1:4
MATCH L SMF 2
LIMITS OF EARTHWORK
4H:1V
water el 11.0
113.2, 111.0
2H:1V
100, 104.4
0, 104.4
HA-11
1
7
4.00
120
80
40
0
40
80
120
160
℄ CONST.
1" 40' Horizontal
1" 10' Vertical
SCALE
DATE
DESIGN ENGINEER

PCSTABL5M PROBLEM WITH JANBU'S COEF TEST 5

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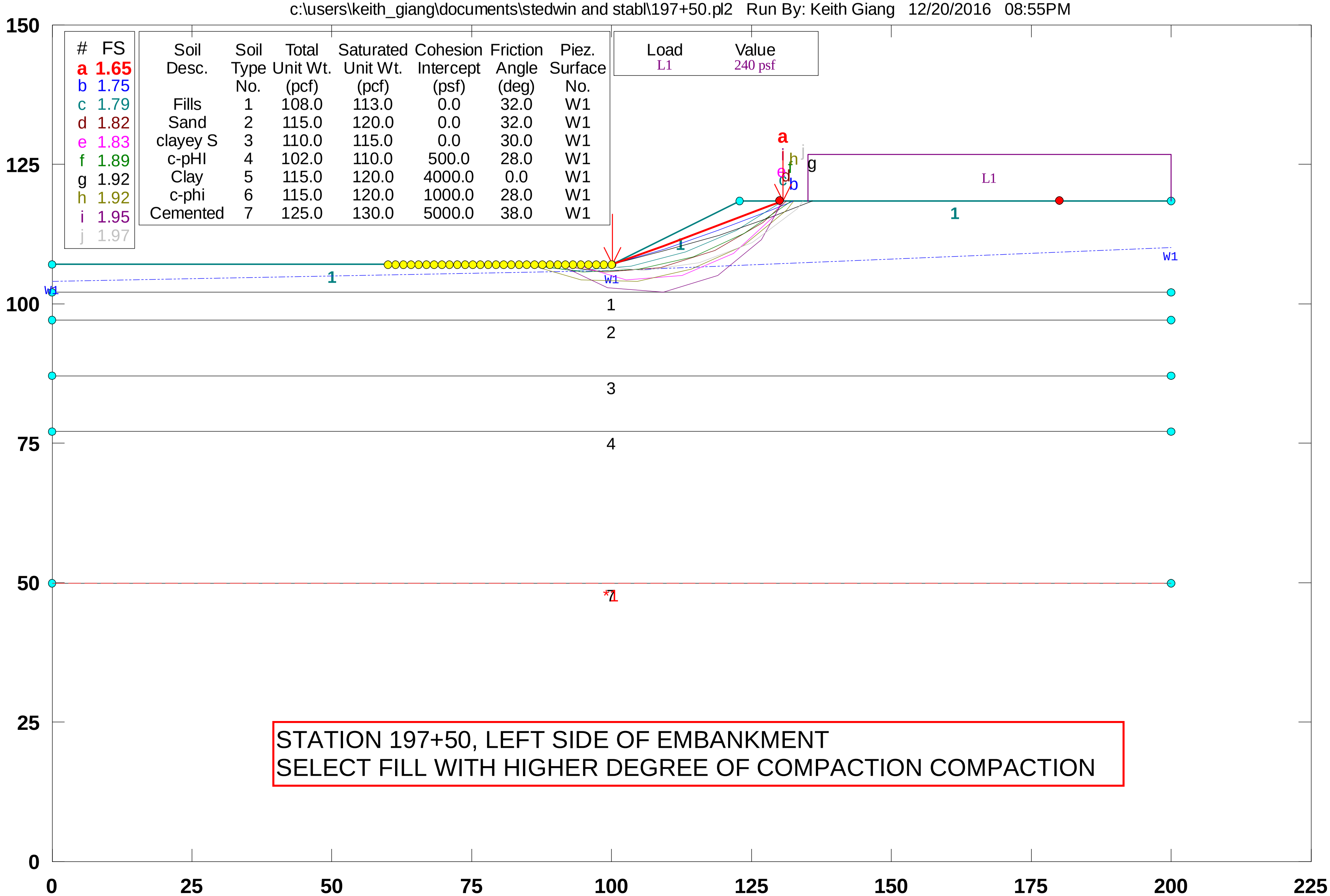


PCSTABL5M/si FSmin=1.65

Safety Factors Are Calculated By The Modified Bishop Method

**** PCSTABL5M ****
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 12/20/2016
Time of Run: 08:55PM
Run By: Keith Giang
Input Data Filename: C:197+50.in
Output Filename: C:197+50.OUT
Unit: ENGLISH
Plotted Output Filename: C:197+50.PLT
PROBLEM DESCRIPTION PCSTABL5M PROBLEM WITH JANBU'S COEF
TEST 5

BOUNDARY COORDINATES
3 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	107.00	100.00	107.00	1
2	100.00	107.00	123.00	118.50	1
3	123.00	118.50	200.00	118.50	1
4	0.00	102.00	200.00	102.00	1
5	0.00	97.00	200.00	97.00	2
6	0.00	87.00	200.00	87.00	3
7	0.00	77.00	200.00	77.00	4
8	0.00	50.00	200.00	50.00	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	108.0	113.0	0.0	32.0	0.00	0.0	1
2	115.0	120.0	0.0	32.0	0.00	0.0	1
3	110.0	115.0	0.0	30.0	0.00	0.0	1
4	102.0	110.0	500.0	28.0	0.00	0.0	1
5	115.0	120.0	4000.0	0.0	0.00	0.0	1
6	115.0	120.0	1000.0	28.0	0.00	0.0	1
7	125.0	130.0	5000.0	38.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	104.00
2	100.00	106.00
3	200.00	110.00

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	135.00	200.00	240.0	0.0

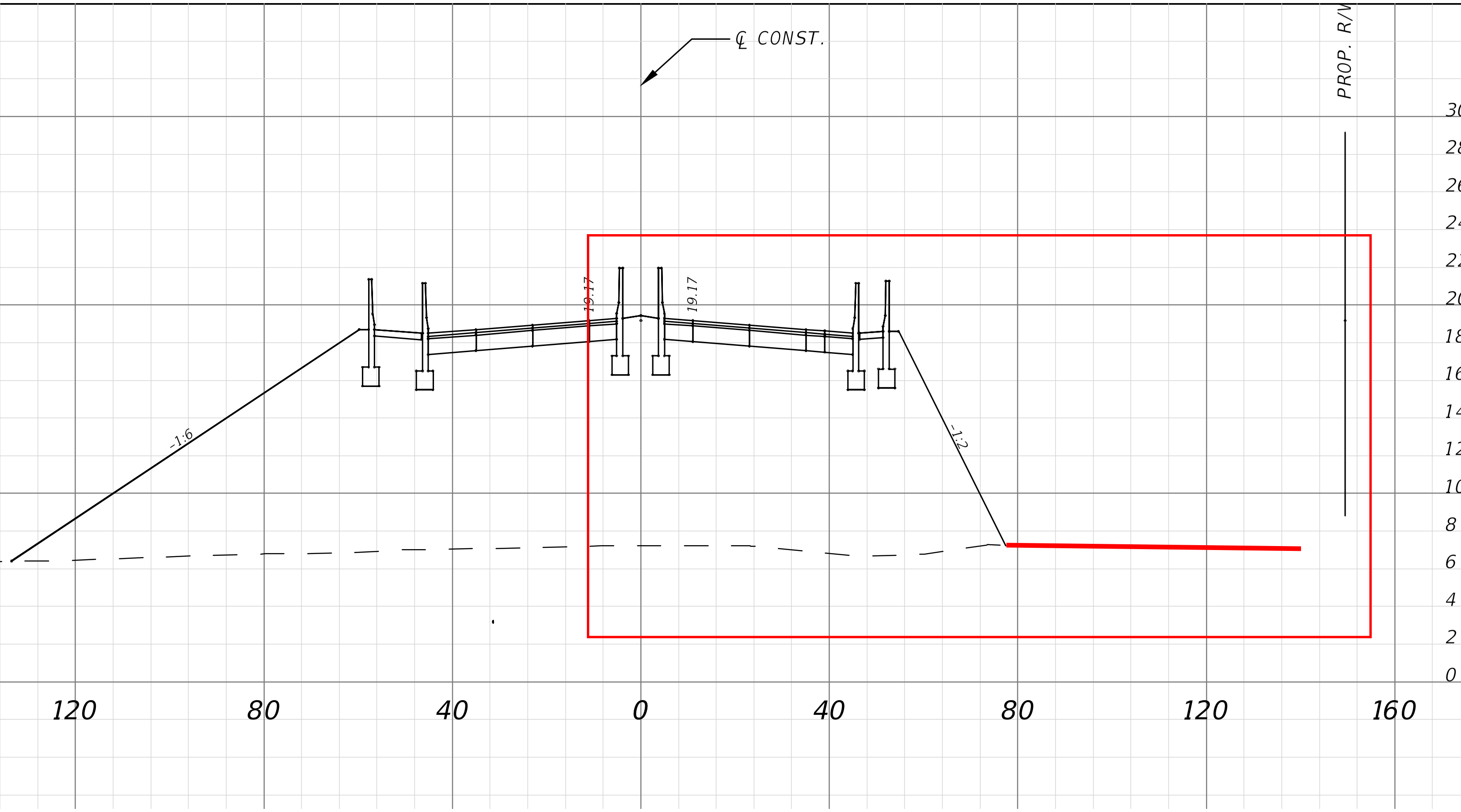
NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	50.00	200.00	50.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
900 Trial Surfaces Have Been Generated.
30 Surfaces Initiate From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 60.00 ft.
and X = 100.00 ft.
Each Surface Terminates Between X = 130.00 ft.
and X = 180.00 ft.
Unless Further Limitations Were Imposed, The Minimum Elevation

```
At Which A Surface Extends Is  Y =  0.00 ft.
10.00 ft. Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Examined.  They Are Ordered - Most Critical
      First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Failure Surface Specified By  5 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        100.00      107.00
          2        109.39      110.44
          3        118.75      113.95
          4        128.09      117.53
          5        130.56      118.50
      Circle Center At X = -368.9 ; Y = 1400.3  and Radius, 1375.7
            ***     1.652   ***
             Individual data on the     5  slices
                       Water  Water     Tie     Tie     Earthquake
                       Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1      9.4    634.8     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  2      9.4   1858.6     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  3      4.2   1225.4     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  4      5.1   1068.9     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  5      2.5    129.4     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      Failure Surface Specified By  5 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        100.00      107.00
          2        109.56      109.92
          3        119.03      113.16
          4        128.37      116.71
          5        132.65      118.50
      Circle Center At X =   16.9 ; Y =  396.0  and Radius,  300.7
            ***     1.746   ***
      Failure Surface Specified By  6 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1         83.45      107.00
          2         93.41      106.07
          3        103.38      106.80
          4        113.09      109.17
          5        122.28      113.12
          6        130.65      118.50
      Circle Center At X =   94.0 ; Y =  166.3  and Radius,   60.2
            ***     1.787   ***
      Failure Surface Specified By  6 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1         88.97      107.00
          2         98.86      105.57
          3        108.83      106.41
          4        118.35      109.46
          5        126.95      114.57
          6        131.06      118.50
      Circle Center At X =  100.2 ; Y =  148.8  and Radius,   43.3
            ***     1.819   ***
      Failure Surface Specified By  6 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1         93.10      107.00
          2        102.74      104.34
          3        112.72      105.07
          4        121.87      109.10
          5        129.13      115.98
          6        130.41      118.50
      Circle Center At X =  105.6 ; Y =  132.9  and Radius,   28.7
            ***     1.834   ***
      Failure Surface Specified By  7 Coordinate Points
```

```
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         84.83      107.00
    2         94.74      105.66
    3        104.73      106.16
    4        114.45      108.48
    5        123.59      112.55
    6        131.83      118.22
    7        132.11      118.50
Circle Center At X =   97.0 ; Y =  160.0  and Radius,   54.3
      ***     1.888   ***
Failure Surface Specified By  5 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        100.00      107.00
    2        109.69      109.49
    3        119.26      112.37
    4        128.71      115.64
    5        136.02      118.50
Circle Center At X =   43.6 ; Y =  346.6  and Radius,  246.2
      ***     1.920   ***
Failure Surface Specified By  7 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         84.83      107.00
    2         94.48      104.37
    3        104.47      104.08
    4        114.26      106.12
    5        123.30      110.40
    6        131.09      116.68
    7        132.49      118.50
Circle Center At X =  100.7 ; Y =  146.4  and Radius,   42.5
      ***     1.922   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         90.35      107.00
    2         99.41      102.77
    3        109.39      102.13
    4        118.91      105.16
    5        126.69      111.46
    6        130.70      118.50
Circle Center At X =  106.0 ; Y =  128.6  and Radius,   26.7
      ***     1.946   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         95.86      107.00
    2        105.80      105.88
    3        115.70      107.26
    4        124.96      111.05
    5        132.99      117.01
    6        134.19      118.50
Circle Center At X =  105.3 ; Y =  145.2  and Radius,   39.4
      ***     1.966   ***
```



SUMMARY OF EARTHWORK
℄ CONST.
WEST OF BRIDGE

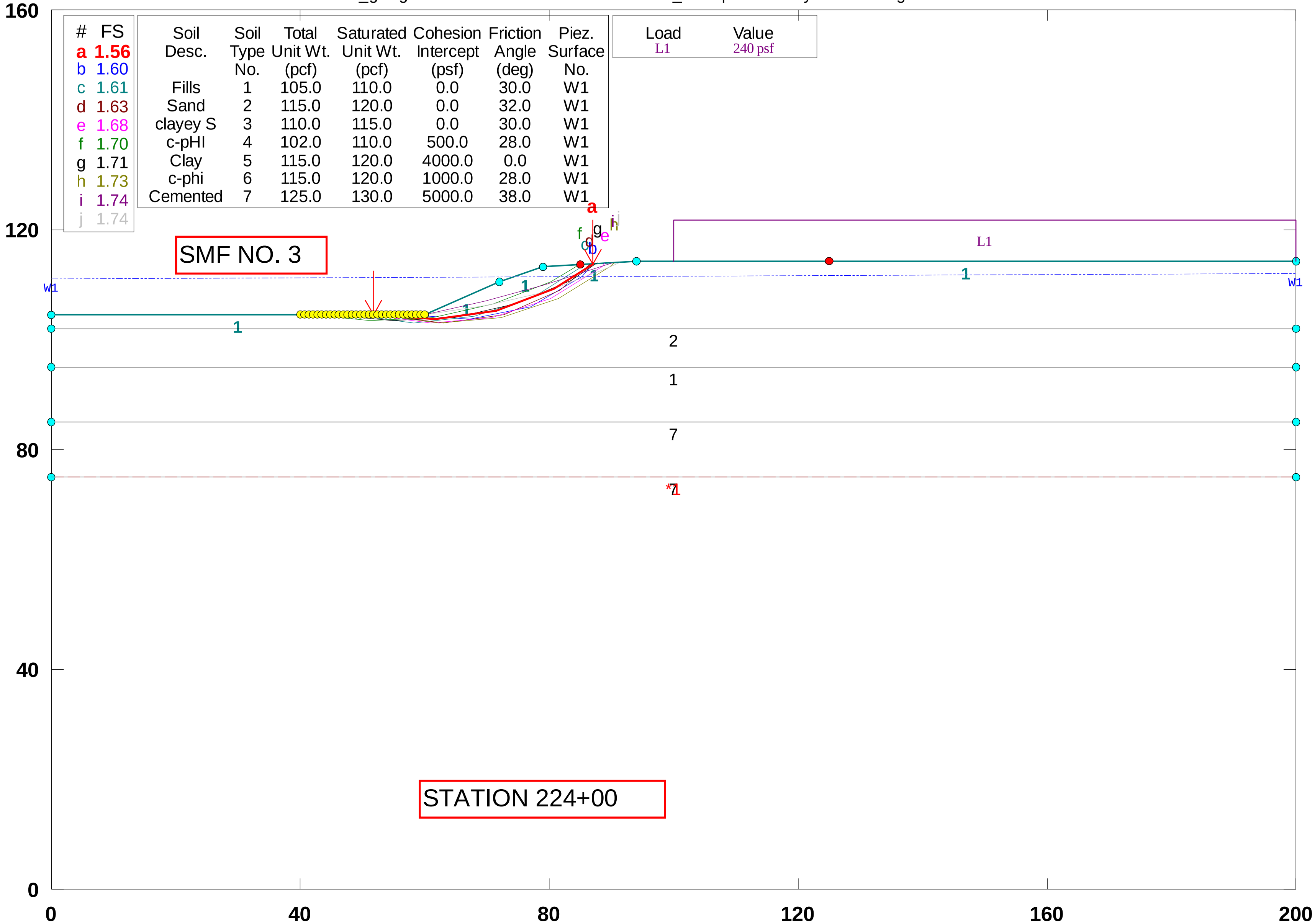
SUBSOIL EXC.	579.6 CY
EXCAVATION	1,559.7 CY
EMBANKMENT	25,195.8 CY

Begin Bridge No. 13413
Sta. 197+55.00

197+50.00

PCSTABL5M PROBLEM WITH JANBU'S COEF TEST 6

c:\users\keith_giang\documents\stedwin and stabl\44east_test6.pl2   Run By: Keith Giang   12/19/2016   05:12PM



#	FS
a	1.56
b	1.60
c	1.61
d	1.63
e	1.68
f	1.70
g	1.71
h	1.73
i	1.74
j	1.74

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Fills	1	105.0	110.0	0.0	30.0	W1
Sand	2	115.0	120.0	0.0	32.0	W1
clayey S	3	110.0	115.0	0.0	30.0	W1
c-pHI	4	102.0	110.0	500.0	28.0	W1
Clay	5	115.0	120.0	4000.0	0.0	W1
c-phi	6	115.0	120.0	1000.0	28.0	W1
Cemented	7	125.0	130.0	5000.0	38.0	W1

Load	Value
L1	240 psf

PCSTABL5M/si FSmin=1.56

Safety Factors Are Calculated By The Modified Bishop Method

**** PCSTABL5M ****

by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

```
 Run Date:                 12/19/2016
 Time of Run:              05:12PM
 Run By:                   Keith Giang
 Input Data Filename:      C:44east_test6.in
 Output Filename:          C:44east_test6.OUT
 Unit:                     ENGLISH
 Plotted Output Filename:  C:44east_test6.PLT
 PROBLEM DESCRIPTION   PCSTABL5M PROBLEM WITH JANBU'S COEF
                       TEST 6
 BOUNDARY COORDINATES
     5 Top   Boundaries
     9 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     104.60      60.00     104.60        1
     2         60.00     104.60      72.00     110.60        1
     3         72.00     110.60      79.00     113.30        1
     4         79.00     113.30      94.00     114.30        1
     5         94.00     114.30     200.00     114.30        1
     6          0.00     102.00     200.00     102.00        2
     7          0.00      95.00     200.00      95.00        1
     8          0.00      85.00     200.00      85.00        7
     9          0.00      75.00     200.00      75.00        7
ISOTROPIC SOIL PARAMETERS
  7 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)    No.
   1   105.0    110.0       0.0     30.0    0.00       0.0      1
   2   115.0    120.0       0.0     32.0    0.00       0.0      1
   3   110.0    115.0       0.0     30.0    0.00       0.0      1
   4   102.0    110.0     500.0     28.0    0.00       0.0      1
   5   115.0    120.0    4000.0      0.0    0.00       0.0      1
   6   115.0    120.0    1000.0     28.0    0.00       0.0      1
   7   125.0    130.0    5000.0     38.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
 Unit Weight of Water =  62.40
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
   Point      X-Water     Y-Water
    No.        (ft)        (ft)
     1          0.00      111.00
     2        200.00      112.00
BOUNDARY LOAD(S)
     1 Load(s) Specified
 Load        X-Left      X-Right     Intensity     Deflection
  No.         (ft)         (ft)       (psf)        (deg)
   1         100.00       200.00        240.0           0.0
 NOTE - Intensity Is Specified As A Uniformly Distributed
        Force Acting On A Horizontally Projected Surface.
Searching Routine Will Be Limited To An Area Defined By  1 Boundaries
 Of Which The First  1 Boundaries Will Deflect Surfaces Upward
 Boundary     X-Left     Y-Left    X-Right    Y-Right
    No.        (ft)       (ft)       (ft)       (ft)
     1          0.00      75.00     200.00      75.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 900 Trial Surfaces Have Been Generated.
  30 Surfaces Initiate From Each Of 30 Points Equally Spaced
 Along The Ground Surface Between  X =  40.00 ft.
                              and  X =  60.00 ft.
 Each Surface Terminates Between   X =  85.00 ft.
                             and   X = 125.00 ft.
 Unless Further Limitations Were Imposed, The Minimum Elevation
```

At Which A Surface Extends Is Y = 0.00 ft.
10.00 ft. Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.72	104.60
2	61.68	103.67
3	71.56	105.21
4	80.76	109.13
5	86.93	113.83

Circle Center At X = 60.4 ; Y = 144.1 and Radius, 40.4
*** 1.562 ***
Individual data on the 8 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.3	351.8	3449.0	3664.5	0.0	0.0	0.0	0.0	0.0
2	1.7	235.2	737.1	796.1	0.0	0.0	0.0	0.0	0.0
3	9.9	3771.1	2359.0	4300.6	0.0	0.0	0.0	0.0	0.0
4	0.4	250.0	26.6	180.0	0.0	0.0	0.0	0.0	0.0
5	7.0	3876.2	0.0	2130.6	0.0	0.0	0.0	0.0	0.0
6	1.8	874.5	0.0	315.8	0.0	0.0	0.0	0.0	0.0
7	3.0	1039.9	0.0	267.7	0.0	0.0	0.0	0.0	0.0
8	3.2	365.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.24	104.60
2	67.20	103.67
3	76.90	106.09
4	85.25	111.60
5	86.94	113.83

Circle Center At X = 65.0 ; Y = 133.3 and Radius, 29.7
*** 1.602 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.28	104.60
2	58.16	103.09
3	68.10	104.15
4	77.45	107.71
5	85.57	113.55
6	85.74	113.75

Circle Center At X = 59.0 ; Y = 141.8 and Radius, 38.7
*** 1.605 ***
Failure Surface Specified By 5 Coordinate Points

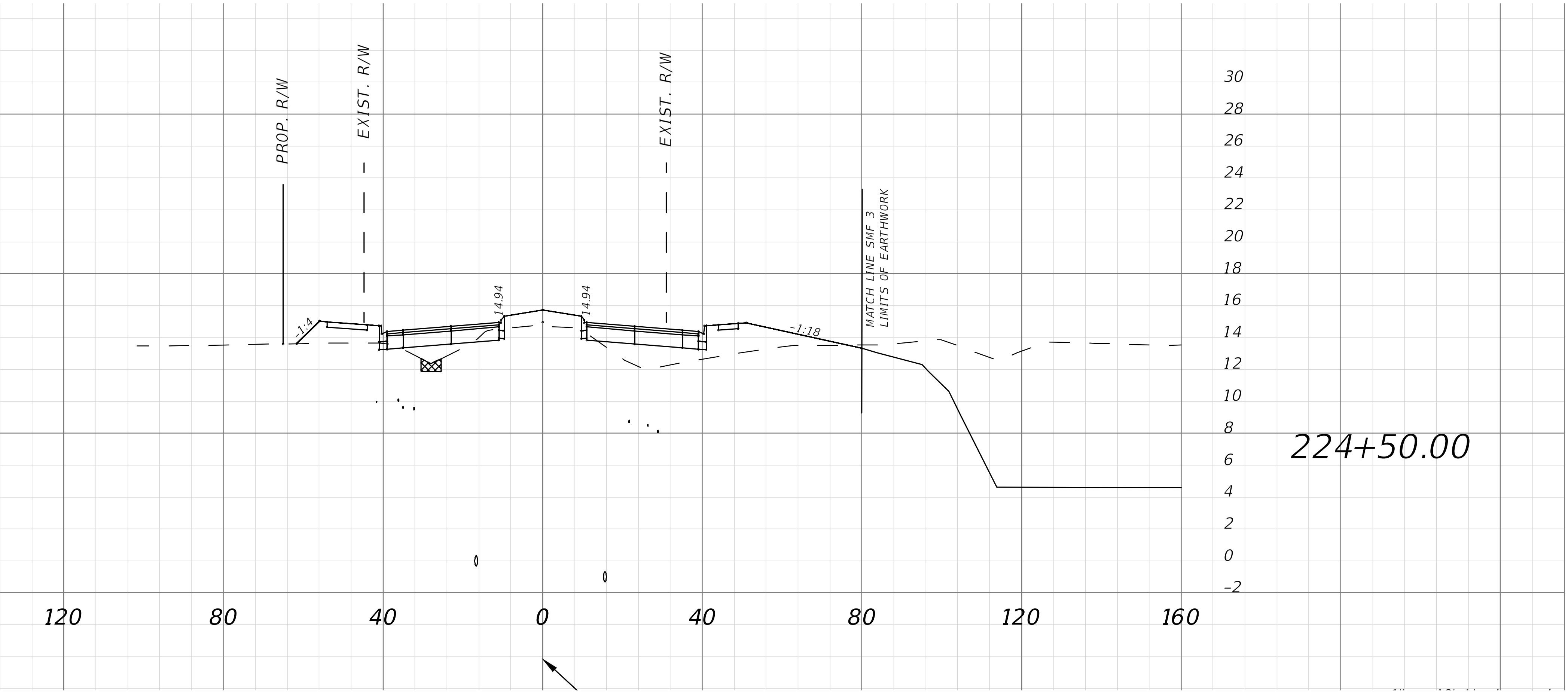
Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.10	104.60
2	62.96	102.91
3	72.85	104.42
4	81.75	108.98
5	86.49	113.80

Circle Center At X = 63.2 ; Y = 134.2 and Radius, 31.3
*** 1.628 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.03	104.60
2	60.91	103.04
3	70.86	104.04
4	80.23	107.53
5	88.41	113.29
6	88.98	113.97

Circle Center At X = 62.0 ; Y = 141.7 and Radius, 38.7

```
      ***     1.682   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         41.38      104.60
    2         51.31      103.44
    3         61.29      104.05
    4         71.02      106.39
    5         80.17      110.40
    6         85.11      113.71
Circle Center At X =   52.9 ; Y =  159.0  and Radius,   55.6
      ***     1.696   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         44.83      104.60
    2         54.76      103.44
    3         64.74      104.12
    4         74.42      106.62
    5         83.48      110.86
    6         87.68      113.88
Circle Center At X =   56.0 ; Y =  156.4  and Radius,   53.0
      ***     1.707   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         52.41      104.60
    2         62.30      103.08
    3         72.25      104.10
    4         81.62      107.59
    5         89.81      113.32
    6         90.44      114.06
Circle Center At X =   63.3 ; Y =  142.0  and Radius,   39.0
      ***     1.729   ***
Failure Surface Specified By  5 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         60.00      104.60
    2         69.69      107.09
    3         79.25      110.02
    4         88.66      113.39
    5         90.27      114.05
Circle Center At X =   10.8 ; Y =  316.1  and Radius,  217.2
      ***     1.739   ***
Failure Surface Specified By  5 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         60.00      104.60
    2         69.88      106.16
    3         79.50      108.87
    4         88.75      112.69
    5         91.30      114.12
Circle Center At X =   51.7 ; Y =  189.1  and Radius,   84.9
      ***     1.744   ***
```



PROP. R/W
EXIST. R/W
EXIST. R/W
MATCH LINE SMF 3
LIMITS OF EARTHWORK
-1:4
-1:18
14.94
14.94
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
120
80
40
0
40
80
120
160
224+50.00

APPENDIX P

FHWA Checklist

GTR REVIEW CHECKLIST FOR SITE INVESTIGATION

A. Site Investigation Information

Since the most important step in the geotechnical design process is to conduct an adequate site investigation, presentation of the subsurface information in the geotechnical report and on the plans deserves careful attention.

Geotechnical Report Text (Introduction) (Pgs. 10-1 to 10-4)	Yes	No	Unknown or N/A
1. Is the general location of the investigation described and/or a vicinity map included?	✓	___	___
2. Is scope and purpose of the investigation summarized?	✓	___	___
3. Is concise description given of geologic setting and topography of area?	✓	___	___
4. Are the field explorations and laboratory tests on which the report is based listed?	✓	___	___
5. Is the general description of subsurface soil, rock, and groundwater conditions given?	✓	___	___
*6. Is the following information included with the geotechnical report (typically included in the report appendices):			
a. Test hole logs? (Pgs. 2-24 to 2-32)	✓	___	___
b. Field test data?	✓	___	___
c. Laboratory test data? (Pgs. 4-22 to 4-23)	✓	___	___
d. Photographs (if pertinent)?	___	___	✓
Plan and Subsurface Profile (Pgs. 2-19, 3-9 to 3-12, 10-13)			
*7. Is a plan and subsurface profile of the investigation site provided?	✓	___	___
8. Are the field explorations located on the plan view?	✓	___	___

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

A.	Site Investigation Information (Cont.)	Yes	No	Unknown or N/A
*9.	Does the conducted site investigation meet minimum criteria outlined in Table 2?	✓	___	___
10.	Are the explorations plotted and correctly numbered on the profile at their true elevation and location?	___	___	✓
11.	Does the subsurface profile contain a word description and/or graphic depiction of soil and rock types?	✓	___	___
12.	Are groundwater levels and date measured shown on the subsurface profile?	✓	___	___
	Subsurface Profile or Field Boring Log (Pgs. 2-14, 2-15, 2-24 to 2-31)			
13.	Are sample types and depths recorded?	✓	___	___
*14.	Are SPT blow count, percent core recovery, and RQD values shown?	✓	___	___
15.	If cone penetration tests were made, are plots of cone resistance and friction ratio shown with depth?			
	Laboratory Test Data (Pgs. 4-6, 4-22, 4-23)			
*16.	Were lab soil classification tests such as natural moisture content, gradation, Atterberg limits, performed on selected representative samples to verify field visual soil identification?	✓	___	___
17.	Are laboratory test results such as shear strength (Pg. 4-14), consolidation (Pg. 4-9), etc., included and/or summarized?	___	___	✓

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

E. Retaining Structures (See "Earth Retaining Structures" FHWA NHI-99-025)

In addition to the basic information listed in Section A, is the following information provided in the project geotechnical report?

		Yes	No	Unknown or N/A
*1.	Recommended soil strength parameters and groundwater elevations for use in computing wall design lateral earth pressures and factor of safety for overturning, sliding, and external slope stability.			✓
2.	Is it proposed to bid alternate wall designs?			✓
*3.	Are acceptable reasons given for the choice and/or exclusion of certain wall types?			✓
*4.	Is an analysis of the wall stability included with minimum acceptable factors of safety against overturning (F.S. = 2.0), sliding (F.S. = 1.5), and external slope stability (F.S. = 1.5)?			✓
5.	If wall will be placed on compressible foundation soils, is estimated total, differential and time rate of settlement given?			✓
6.	Will wall types selected for compressible foundation soils allow differential movement without distress?			✓
7.	Are wall drainage details, including materials and compaction, provided?			✓
	Construction Considerations			
8.	Are excavation requirements covered including safe slopes for open excavations or need for sheeting or shoring?	✓		
9.	Fluctuation of groundwater table?	✓		

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST FOR SPREAD FOOTINGS

F. Structure Foundations – Spread Footings (Pgs. 7-1 to 7-17)

In addition to the basic information listed in Section A, is the following information provided in the project foundation report?

		Yes	No	Unknown or N/A
*1.	Are spread footing recommended for foundation support? If not, are reasons for not using them discussed?	✓		
	If spread footing supports are recommended, are conclusions and recommendations given for the following:			
*2.	Is recommended bottom of footing elevation and reason for recommendation (e.g., based on frost depth, estimated scour depth, or depth to competent bearing material) given?			✓
*3.	Is recommended allowable soil or rock bearing pressure given?			✓
*4.	Is estimated footing settlement and time given?			✓
*5.	Where spread footings are recommended to support abutments placed in the bridge end fill, are special gradation and compaction requirements provided for select end fill and backwall drainage material (Pgs. 6-1 to 6-4)			✓
	Construction Considerations			
6.	Have the materials been adequately described on which the footing is to be placed so the project inspector can verify that material is as expected?			✓
7.	Have excavation requirements been included for safe slopes in open excavations, need for sheeting or shoring, etc.?			✓
8.	Has fluctuation of the groundwater table been addressed?			✓

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST FOR DRIVEN PILES

G. Structure Foundations – Driven Piles (Pgs. 8-1 to 8-29, 9-1 to 9-35)

In addition to the basic information listed in Section A, if pile support is recommended or given as an alternative, conclusions/recommendations should be provided in the project geotechnical report for the following:

		Yes	No	Unknown or N/A
*1.	Is the recommended pile type given (displacement, non-displacement, steel pipe, concrete, H-pile, etc.) with valid reasons given for choice and/or exclusion? (Pgs. 8-1 to 8-3)	✓		
2.	Do you consider the recommended pile type(s) to be the most suitable and economical?	✓		
*3.	Are estimated pile lengths and estimated tip elevations given for the recommended allowable pile design loads?			✓
4.	Do you consider the recommended design loads to be reasonable?	✓		
5.	Has pile group settlement been estimated (only of practical significance for friction pile groups ending in cohesive soil)? (Pgs. 8-20 to 8-22)			✓
6.	If a specified or minimum pile tip elevation is recommended, is a clear reason given for the required tip elevation, such as underlying soft layers, scour, downdrag, piles uneconomically long, etc.?			✓
*7.	Has design analysis (wave equation analysis) verified that the recommended pile section can be driven to the estimated or specified tip elevation without damage (especially applicable where dense gravel-cobble-boulder layers or other obstructions have to be penetrated)?			✓
8.	Where scour piles are required, have pile design and driving criteria been established based on mobilizing the full pile design capacity below the scour zone?			✓

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

G.	Structure Foundations – Driven Piles (Cont.)	Yes	No	Unknown or N/A
9.	Where lateral load capacity of large diameter piles is an important design consideration, are p-y curves (load vs. deflection) or soil parameters given in the geotechnical report to allow the structural engineer to evaluate lateral load capacity of all piles?	___	___	✓
*10.	For pile supported bridge abutments over soft ground:			
a.	Has abutment downdrag load been estimated and solutions such bitumen coating been considered in design? Not generally required if surcharging of the fill is being performed. (Pgs. 8-21, 8-23)	___	___	✓
b.	Is bridge approach slab recommended to moderate differential settlement between bridge ends and fill?	___	___	✓
c.	If the majority of subsoil settlement will not be removed prior to abutment construction (by surcharging), has estimate been made of abutment rotation that can occur due to lateral squeeze of soil subsoil? (Pgs. 5-25, 5-26)	___	___	✓
d.	Does the geotechnical report specifically alert the structural designer to the estimated horizontal abutment movement?	___	___	✓
11.	If bridge project is large, has pile load test program been recommended? (Pgs. 9-23 to 9-26)	✓	___	___
12.	For major structure in high seismic risk area, has assessment been made of liquefaction potential of foundation soil during design earthquake (only loose saturated sands and silts are susceptible to liquefaction)? (See GEC No. 3, FHWA SA-97-076)	___	___	✓

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

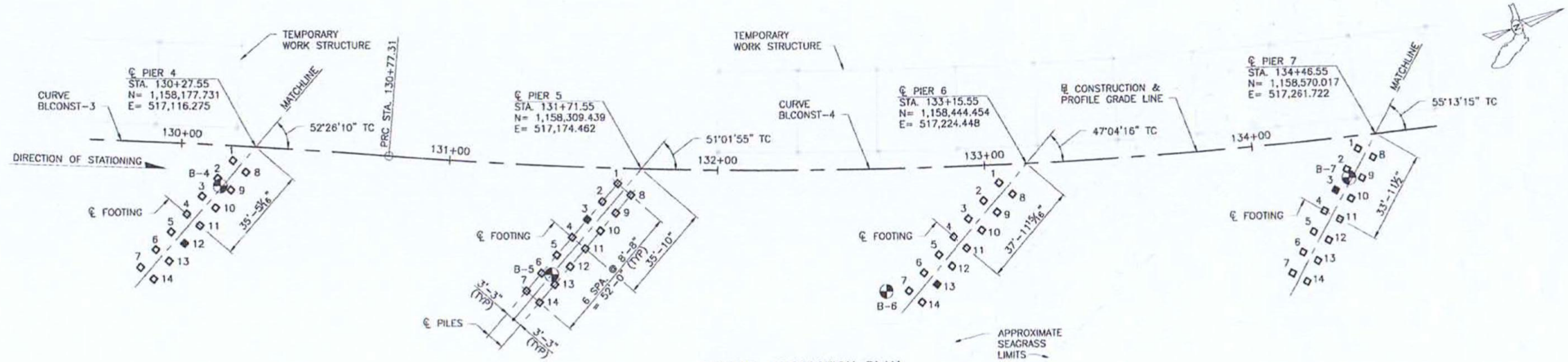
G. Structure Foundations – Driven Piles (Cont.)

Construction Considerations (Pgs. 9-4 to 9-35)	Yes	No	Unknown or N/A
13. Pile driving details such as: boulders or obstructions which may be encountered during driving; need for preaugering, jetting, spudding; need for pile tip reinforcement; driving shoes, etc.?	✓		
14. Excavation requirements: safe slope for open excavations; need for sheeting or shoring; fluctuation of groundwater table?	✓		
15. Have effects of pile driving operation on adjacent structures been evaluated such as protection against damage caused by footing excavation or pile driving vibrations?	✓		
16. Is preconstruction condition survey to be made of adjacent structures to prevent unwarranted damage claims?	✓		
17. On large pile driving projects, have other methods of pile driving control been considered such as dynamic testing or wave equation analysis?	✓		

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

ATTACHMENT A

Pile Driving Records from Fort Hamer Project



PARTIAL FOUNDATION PLAN

PILE DATA TABLE

LOCATION	INSTALLATION CRITERIA							DESIGN CRITERIA						
	PILE SIZE (IN)	NOMINAL BEARING RESISTANCE (TONS) (A)	TENSION RESISTANCE (TONS)	MIN. TIP ELEV. (FT) (B)	TEST PILE: PILE NUMBER	TEST PILE: LENGTH (FT)	REQ'D JET ELEV. (FT) (D)	REQ'D PREFORM ELEV. (FT) (D)	FACTORED DESIGN LOAD (TONS)	DOWN DRAG (TONS)	TOTAL SCOUR RESIST. (TONS)	NET SCOUR RESIST. (TONS)	100 YEAR SCOUR ELEV. (FT)	LONG TERM SCOUR ELEV. (FT)	RESISTANCE FACTOR Φ (C)
END BENT 1	24	343	N/A	N/A	3	75	N/A	-17	198	25	N/A	N/A	4.80	4.75	0.65
PIER 2	24	285	N/A	N/A	8	50	N/A	N/A	185	N/A	N/A	N/A	2.10	2.11	0.65
PIER 3	24	285	N/A	N/A	5	60	N/A	-17	185	N/A	70	0	-16.70	-0.80	0.65
PIER 4	24	325	N/A	N/A	12	77	N/A	-25	193	N/A	105	18	-28.60	-10.20	0.65
PIER 5	24	365	N/A	N/A	3	72	N/A	-20	215	N/A	80	22	-24.10	-5.70	0.65
PIER 6	24	345	N/A	N/A	13	73	N/A	-30	224	N/A	16	0	-17.90	0.23	0.65
PIER 7	24	345	N/A	N/A	3	62	N/A	-17	224	N/A	50	0	-17.30	0.81	0.65
PIER 8	24	358	N/A	N/A	8	55	N/A	N/A	[illegible]	N/A	N/A	N/A	-2.30	1.17	0.65
PIER 9	24	358	N/A	N/A	2	55	N/A	N/A -10	[illegible]	N/A	N/A	N/A	-2.30	1.20	0.65
PIER 10	24	362	N/A	N/A	11	55	N/A	N/A	227	N/A	8	8	-9.50	-0.50	0.65
PIER 11	24	372	N/A	N/A	5	55	N/A	N/A -10	[illegible]	N/A	15	15	-10.40	-0.23	0.65
PIER 12	24	365	N/A	N/A	8	65	N/A	N/A	[illegible]	N/A	8	8	-11.40	-1.15	0.65
PIER 13	24	371	N/A	N/A	2	65	N/A	N/A	233	N/A	8	8	-11.20	-2.16	0.65
PIER 14	24	358	N/A	N/A	11	65	N/A	N/A -30	[illegible]	N/A	N/A	N/A	-11.90	-2.86	0.65
PIER 15	24	358	N/A	N/A	5	65	N/A	N/A	[illegible]	N/A	N/A	N/A	-10.90	-3.46	0.65
PIER 16	24	358	N/A	N/A	8	65	N/A	N/A	233	N/A	N/A	N/A	-10.50	-0.88	0.65
PIER 17	24	358	N/A	N/A	2	60	N/A	N/A	233	N/A	N/A	N/A	5.00	5.00	0.65
PIER 18	24	358	N/A	N/A	11	55	N/A	N/A	233	N/A	N/A	N/A	7.00	7.00	0.65
END BENT 19	24	406	N/A	N/A	3	80	N/A	N/A	238	26	N/A	N/A	8.00	8.00	0.65

(A) $\frac{\text{FACTORED DESIGN LOAD + NET SCOUR RESISTANCE + DOWNDRAG}}{\Phi} <$ NOMINAL BEARING RESISTANCE

(B) MINIMUM TIP ELEVATION SHALL BE THE LOWER ELEVATION AS SHOWN IN THE TABLE OR DETERMINED IN ACCORDANCE WITH SECTION 455-5.8 OF THE SPECIFICATIONS.

(C) Φ IS BASED ON THE USE OF PILE DRIVING ANALYZER (PDA) AND CASE PILE WAVE ANALYSIS PROGRAM (CAPWAP).

(D) WHEN A REQUIRED JETTING OR PREFORMED ELEVATION IS NOT SHOWN IN THE TABLE, DO NOT JET OR PREFORM PILE LOCATIONS WITHOUT PRIOR WRITTEN APPROVAL OF THE GEOTECHNICAL ENGINEER. DO NOT ADVANCE JETS OR PREFORMED PILE HOLES DEEPER THAN THE JETTING OR PREFORMED ELEVATIONS SHOWN IN THE TABLE WITHOUT THE PRIOR APPROVAL OF THE GEOTECHNICAL ENGINEER. IF ACTUAL JETTING OR PREFORMING ELEVATIONS DIFFER FROM THOSE SHOWN IN THE TABLE, THE GEOTECHNICAL ENGINEER WILL DETERMINE THE REQUIRED DRIVING RESISTANCE.

PILE CUT-OFF ELEVATIONS

LOCATION	PILE NO.	ELEVATION
END BENT 1	1	19.64
	2	19.44
	3	19.23
	4	19.03
	5	18.82
PIER 2	1 THRU 12	-0.25
PIER 3	1 THRU 12	-0.25
PIER 4	1 THRU 14	-0.25
PIER 5	1 THRU 14	-0.25
PIER 6	1 THRU 14	-0.25
PIER 7	1 THRU 14	-0.25
PIER 8	1 THRU 12	-0.25
PIER 9	1 THRU 12	-0.25
PIER 10	1 THRU 12	-0.25
PIER 11	1 THRU 12	-0.25
PIER 12	1 THRU 12	-0.25
PIER 13	1 THRU 12	-0.25
PIER 14	1 THRU 12	-0.25
PIER 15	1 THRU 12	-0.25
PIER 16	1 THRU 12	-0.25
PIER 17	1 THRU 12	-0.25
PIER 18	1 THRU 12	0.50
END BENT 19	1	23.69
	2	23.49
	3	23.28
	4	23.08
	5	23.87

BRIDGE NO. 134123

REVISIONS					
Date	By	Description	Date	By	Description

Drawn By: CJK 11-10
Checked By: AOS 11-10
Designed By: AOS 11-10
Checked By: CC 11-10

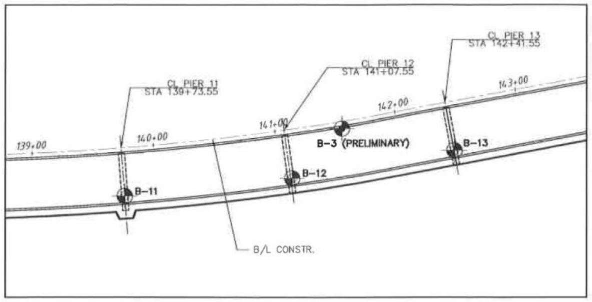
URS
URS Corporation Southern
7650 West Courtney Campbell Causeway
Tampa, Florida 33607-1462
C.A. No. 00000002

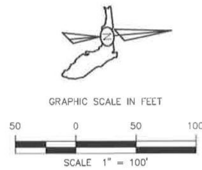
MANATEE COUNTY GOVERNMENT
MANATEE COUNTY, FLORIDA

ENGINEER OF RECORD
Mark E. Eichholtz
9/5/14
MARK S. EICHOLTZ
P.E. NO. 36078

SHEET TITLE: FOUNDATION LAYOUT (2 OF 6)
PROJECT NAME: FORT HAMER BRIDGE OVER MANATEE RIVER
REF. DWG. NO.
SHEET NO. B-15

FILENAME: e:\oulecad\2014\fort_hamer\dwg\sheets\bfoundlay02.dwg LAYOUT NAME: foundation layout (2 of 6) PLOTTED: Friday, August 29, 2014 6:25:34 AM USER: kathy_compton





NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

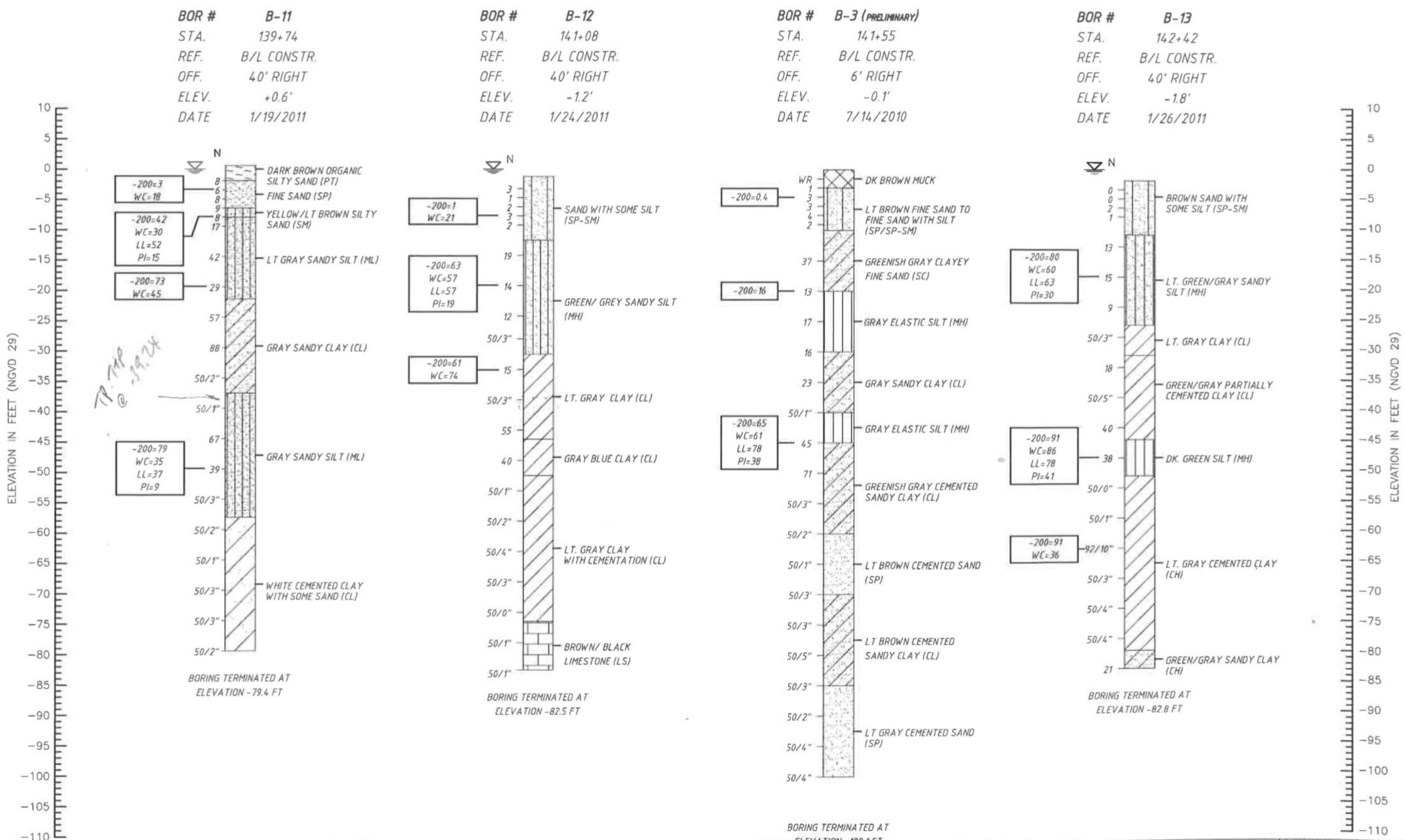
DRILLER:	UNIVERSAL
HAMMER:	SAFETY
RIG:	CME 45

LEGEND

- SAND
- SILT
- CLAY
- SAND WITH SOME SILT
- CLAY WITH SOME SAND
- CLAYEY SAND
- SAND WITH SOME CLAY
- SANDY SILT
- SANDY CLAY
- SILTY SAND
- SILTY CLAY
- HARD LIMESTONE

GRANULAR MATERIALS– RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200	PERCENT PASSING #200 SIEVE
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
WC	WATER CONTENT (%)
NGVD 29	NATIONAL GEODETIC VERTICAL DATUM OF 1929
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE



ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE

SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

(WATER CHLORIDE CONTENT = 9100 ppm)

BRIDGE FOUNDATION BORINGS

REVISIONS					
Date	By	Description	Date	By	Description

Drawn By:	CER 11-10
Checked By:	CER 11-10
Designed By:	CER 11-10
Checked By:	CER 11-10

URS Corporation Southern
7650 West Courtney
Campbell Causeway
Tampa, Florida 33607-1462
C.A. No. 00000002

MANATEE COUNTY GOVERNMENT

MANATEE COUNTY, FLORIDA

ENGINEER OF RECORD

MICHAEL R. SHARP
P.E. NO. 41205

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: FORT HAMER BRIDGE OVER MANATEE RIVER

REF. DWG. NO.

SHEET NO.

FILENAME: n:\geotech-dm\1200 tampa projects\9000\9385 – ft hamer bridge\8 acad\final borings\ft hamer – bridge borings.dwg LAYOUT NAME: layout4 PLOTTED: Tuesday, May 27, 2014 10:34:08 AM USER: michael_sharp

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19-20/16 STATION NO. 141+07.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH 45' / 45' ~~BENT~~/PIER NO. 12 PILE NO. 1

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FTLBS OPERATING RATE N/A

REF. ELEV 2.60 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC w/ LT BRZ / PC w/ LT BRZ TEMP 87° / 82° START TIME 14:15 / 10:35 STOP TIME 14:35 / 10:55

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-99 H.I. ______ PILE HEAD ELEV. 6.18

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.82

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.9 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	27.42'	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' INDICATES FUEL SETTING #. #3) DRIVING STOPPED UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING LOG

Structure No. 134123	Bent/Pier No. 12	Pile No. 1

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	26	7.16									
1-2				34-35	40	7.50									
2-3				35-36	52	8.44	FS#2								
3-4				36-37	63	9.73	FS#3								
4-5				37-38	58	10.8	FS#4								
5-6				38-39	36	10.7									
6-7				39-40	31	10.7									
7-8			#1	40-41	34	11.1						Monitor	For		
8-9	11	5.39	FS#1	41-42	61	10.6	FS#3					PRACT		REFUSAL	
9-10	17	6.67		42-43	1/5"		#4								
10-11	18	6.47		43-44		41.42' BELOW						3-4	14		
11-12	16	6.24		44-45		REF. ELEV.						4-5	21		
12-13	10	5.98													
13-14	11	6.07													
14-15	20	6.64													
15-16	25	6.45													
16-17	18	6.29													
17-18	16	5.19													
18-19	13	6.29													
19-20	18	5.50													
20-21	16	6.18													
21-22	18	6.24													
22-23	19	6.44													
23-24	21	6.41													
24-25	24	6.42													
25-26	24	6.72													
26-27	21	7.00													
27-28	18	7.02 6.65	#3												
28-29	19	6.87	FS#1												
29-30	19	6.85													
30-31	20	6.89													
31-32	20	7.02													
32-33	24	7.07													

Pile driving without Preformed hole. Typical all piles in Pier 12.

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19-20/16 STATION NO. 141+07.55

PILE SIZE 24"▢ ACTUAL/AUTH LENGTH 45'/45' ~~BENT~~/PIER NO. 12 PILE NO. 2

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 Ft LBS OPERATING RATE N/A

REF. ELEV 2.54 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 80 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC W/ Lt Breeze TEMP 88° / 86 START TIME 13:35 / 11:00 STOP TIME 13:50 / 11:25

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-94 H.I. ______ PILE HEAD ELEV. 6.21

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.79

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.8 (Scour = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: Kenneth L. Wright TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH		PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP	
										ORIGINAL FURNISHED	TOTAL LENGTH WITH EXTENSION		AUTHORIZED	ACTUAL
∅	∅	∅	∅	∅	∅	∅	∅	1	∅	45.0	45.0	27.39	∅	∅

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL TEMPLATE FRAME IS REMOVED #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING LOG

Structure No. 134123	Bent/Pier No. 12	Pile No. 2

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	27	7.54									
1-2				34-35	45	7.84									
2-3				35-36	49	8.59	FS#2								
3-4				36-37	70	9.94	FS#3,4								
4-5				37-38	58	10.2									
5-6				38-39	43	9.99									
6-7				39-40	39	10.8									
7-8			#1	40-41	46	11.3									
8-9	13	6.54	FS#1	41-42	64/	10.8	FS#3					Monitor	For		
9-10	15	6.37		42-43	4"		#4					Pract	Refusal		
10-11	14	6.45		43-44		41.33' Below Ref. Elev.						0-1	11		
11-12	13	6.43		44-45								1-2	15		
12-13	10	5.91										2-3	19		
13-14	9	5.75										3-4	21	10.8	
14-15	13	6.55													
15-16	42	7.12													
16-17	43	7.28	FS#2												
17-18	20	6.90													
18-19	16	6.52	FS#1												
19-20	17	6.67													
20-21	16	6.55													
21-22	17	6.63													
22-23	17	6.68													
23-24	19	6.68													
24-25	18	6.74													
25-26	22	6.84													
26-27	23	6.88	#3												
27-28	20	6.46	FS#1												
28-29	20	7.13													
29-30	21	7.17													
30-31	23	7.13													
31-32	21	7.19													
32-33	26	7.27													

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19-20/16 STATION NO. 141+07.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH /45' ~~BENT~~/PIER NO. 12 PILE NO. 3

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.74 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/2" & 2 ALUM @ 1/2"

WEATHER PC w/ Lt BRZ TEMP 88 START TIME 15:55 STOP TIME 16:10
PC w/ Lt BRZ 86° 11:35 11:50

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-93 H.I. ______ PILE HEAD ELEV. 6.32

PILE HEAD CHAMFER 3/4" X 3" PILE TIP ELEV. -38.68

PILE TIP CHAMFER 3/4" X 3" GROUND ELEV. -2.7 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	27.23'	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

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PILE DRIVING LOG

Structure No. 13423	~~Bent~~/Pier No. 12	Pile No. 3

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	29	7.44									
1-2				34-35	41	7.72									
2-3				35-36	44	8.39	FS#2								
3-4				36-37	48	9.71	FS#3								
4-5				37-38	68	9.56									
5-6				38-39	36	10.4	FS#4								
6-7				39-40	29	10.8									
7-8				40-41	38	11.2						Monitor for			
8-9				41-42	68	10.7	FS#3					Proj. Ref			
9-10			#1	42-43	/5"		#4					2-3	12		
10-11	12	6.38	FS#1	43-44	1.42' Below Ref. Elev.							3-4	17		
11-12	11	5.86		44-45								4-5	21		
12-13	8	5.73													
13-14	9	6.54													
14-15	17	6.10													
15-16	27	6.24													
16-17	25	6.30													
17-18	19	5.88													
18-19	13	5.91													
19-20	11	5.98													
20-21	12	6.02													
21-22	13	6.08													
22-23	13	6.11													
23-24	13	6.09													
24-25	17	6.35													
25-26	16	6.51													
26-27	17	6.59													
27-28	17	6.57	#3												
28-29	24	7.15	FS#1												
29-30	23	7.11													
30-31	23	7.21													
31-32	21	7.09													
32-33	24	7.18													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 4/19/20/16 STATION NO. 141+07.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH /45' ~~BENT~~/PIER NO. 12 PILE NO. 4

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FTLBS OPERATING RATE N/A

REF. ELEV 2.54 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC w/ LT BRZ PC TEMP 88 81 START TIME 15:00 09:05 STOP TIME 15:15 09:30

PILE DATA

PAY ITEM NO. 455-34.5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-100 H.I. ______ PILE HEAD ELEV. 6.56'

PILE HEAD CHAMFER 3/4" X 3" PILE TIP ELEV. -38.44

PILE TIP CHAMFER 3/4" X 3" GROUND ELEV. -2.7' (SCOUR -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
∅	∅	∅	∅	∅	∅	∅	∅	1	∅	45.0	45.0	27.04	∅	∅

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

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PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 12	Pile No. 4

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	35	7.15									
1-2				34-35	60	8.06	FS#2								
2-3				35-36	40	8.94	FS#3								
3-4				36-37	68	10.1	FS#4					MONITOR		FOR	
4-5				37-38	56	9.94							PRACT. REFUSAL		
5-6				38-39	40	10.2									
6-7			#1	39-40	30	10.1						10-11	14		
7-8	10	6.15	FS#1	40-41	56	11.2						11-12	14	11.2	
8-9	16	6.29		41-42	26 #4	10.9	FS#3	41.08' BELOW				0-1	24	10.9	
9-10	18	6.46		42-43			#4	REF. ELEV							
10-11	15	6.05		43-44											
11-12	12	5.81		44-45											
12-13	11	4.88													
13-14	10	6.32													
14-15	23	6.32													
15-16	19	6.25													
16-17	17	5.14													
17-18	14	5.89													
18-19	18	5.89													
19-20	21	6.25													
20-21	18	6.26													
21-22	19	6.27													
22-23	22	6.39													
23-24	24	5.76													
24-25	29	6.35													
25-26	30	6.63													
26-27	24	6.77													
27-28	14 14	6.88 (calc)	#3												
28-29	23	6.65	FS#1												
29-30	22	6.91													
30-31	28	6.91													
31-32	26	6.91													
32-33	27	6.90													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 603556 0 DATE 5/19-20/16 STATION NO. 141+07.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH 45' ~~BENT~~/PIER NO. 12 PILE NO. 5

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.58 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 100' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC W/ LT BRZ TEMP 88° START TIME 15:35 STOP TIME 15:45

PC 82° 09:35 09:55

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-90 H.I. ______ PILE HEAD ELEV. 6.42

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.58

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.8 (SCOUR ~ -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
∅	∅	∅	∅	∅	∅	∅	∅	1	∅	45.0	45.0	27.19	∅	∅

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS #2) 'FS# X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

PILE DRIVING LOG

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Structure No. 134123 | **Bent/Pier No.** 12 | **Pile No.** 5

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	28	7.58									
1-2				34-35	45	7.95									
2-3				35-36	44	8.25	FS#2								
3-4				36-37	69	9.73	FS#3								
4-5				37-38	53	10.7	FS#4								
5-6				38-39	31	9.30									
6-7			#1	39-40	36	8.79	FS#3					MONITOR FOR			
7-8	15	5.21	FS#1	40-41	69	10.2						PRACT. REFUSAL			
8-9	16	6.36		41-42	39	11.1	#4					0-1	18		
9-10	17	6.47		42-43	1/2"			41.17' BELOW				1-2	24	11.1	
10-11	14	6.22		43-44				REF ELEV.							
11-12	14	5.88		44-45											
12-13	10	5.77													
13-14	11	5.93													
14-15	21	6.26													
15-16	20	6.09													
16-17	21	6.07													
17-18	17	5.15													
18-19	17	6.26													
19-20	18	6.37													
20-21	18	6.28													
21-22	13	6.43													
22-23	23	6.54													
23-24	19	6.49													
24-25	19	6.65													
25-26	22	6.66													
26-27	21	6.74	#3												
27-28	20	7.28	FS#1												
28-29	20	7.16													
29-30	22	7.29													
30-31	21	7.35													
31-32	22	7.39													
32-33	24	7.47													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 0035560 DATE 5/19-20/16 STATION NO. K1+07.55

PILE SIZE 24" ⊡ ACTUAL/AUTH LENGTH 45'/45' ~~BENT~~/PIER NO. 12 PILE NO. 6

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT-LBS OPERATING RATE N/A

REF. ELEV 2.81 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2¼" & 2 ALUM @ ½"

WEATHER PC w/ Lt. BRZ / PC TEMP 88 / 82 START TIME 16:30 / 10:05 STOP TIME 16:50 / 10:25

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO.

MANUFACTURED BY SCP T.B.M./B.M. ELEV GROUND ROD READ

DATE CAST 5/10/16 ROD READ PILE HEAD ROD READ

MANUFACTURER'S PILE NO. AMA-95 H.I. PILE HEAD ELEV. 6.85

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.15

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.6 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	26.75'	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL PILE TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

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PILE DRIVING LOG

Structure No. 13423	Bent/Pier No. 12	Pile No. 6

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	29	7.41									
1-2				34-35	45	7.73	FS#2								
2-3				35-36	40	8.30									
3-4				36-37	74	9.74	FS#3								
4-5				37-38	61	9.53	FS#4								
5-6				38-39	33	10.5									
6-7			#1	39-40	29	10.5						Monitor		For	
7-8	17	6.49	FS#1	40-41	102	10.4	FS#3	40.96' Below				Permit.		Refusal	
8-9	20	5.60		41-42	/	11.5'	#4	Ref. Elev.				10	15		
9-10	17	6.43		42-43								10-11	19		
10-11	14	6.20		43-44								11-12	21	10.4	
11-12	8	6.06		44-45											
12-13	13	4.92		45-46											
13-14	9	6.29													
14-15	14	6.32													
15-16	11	6.16													
16-17	13	6.34													
17-18	10	6.32													
18-19	13	6.36													
19-20	10	6.36													
20-21	12	6.39													
21-22	13	6.48													
22-23	13	6.52													
23-24	16	6.56													
24-25	15	6.65													
25-26	18	6.70													
26-27	18	6.76													
27-28	10 17	6.71 7.22	#3												
28-29	23	7.18	FS#1												
29-30	22	7.18													
30-31	21	7.07													
31-32	22	7.12													
32-33	23	7.09													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19/2016 STATION NO. 141+07.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH 45'/45' BENT/PIER NO. 12 PILE NO. 7

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.84 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS / FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2¼" & 2 ALUM @ ½"

WEATHER MC & HUMID 07:55 TEMP 73° START TIME 07:55 STOP TIME 08:25

MC & WINDY 88° 12:55 13:15

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-91 H.I. ______ PILE HEAD ELEV. 4.34

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.66

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.6' (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
∅	∅	∅	∅	∅	∅	∅	∅	1	∅	45.0	45.0	27.26	∅	∅

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL PILE TEMPLATE IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

PILE DRIVING LOG

Structure No. 13423	~~Bent~~/Pier No. 12	Pile No. 7

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	24	7.13									
1-2				34-35	34	7.36									
2-3				35-36	47	8.18	FS#2								
3-4				36-37	43	9.48	FS#3								
4-5				37-38	51	10.1	FS#4								
5-6				38-39	36	11.0									
6-7	4			39-40	29	10.9									
7-8			#1	40-41	43	10.0	FS#3					MONITOR FOR			
8-9	11	5.13	FS#1	41-42	64	10.3	#4	41.50' BELOW				REACT REFUSAL			
9-10	14	6.03		42-43	/6"			REF. ELEV.				4.5	16		
10-11	13	6.04		43-44								5.6	20		
11-12	9	5.94		44-45											
12-13	11	5.66													
13-14	12	5.72													
14-15	8	6.69													
15-16	22	6.48													
16-17	16	6.21													
17-18	15	5.99													
18-19	10	6.05													
19-20	11	6.02													
20-21	11	6.03													
21-22	12	6.20													
22-23	13	6.22													
23-24	15	6.36													
24-25	17	6.50													
25-26	18	6.41													
26-27	17	6.59	#3												
27-28	28	5.26	FS#1												
28-29	18	6.76													
29-30	21	7.04													
30-31	23	7.05													
31-32	23	7.07													
32-33	25	7.11													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19-20/16 STATION NO. 14H0755

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH /45' BENT/PIER NO. 12 PILE NO. 9

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT-LBS OPERATING RATE N/A

REF. ELEV 2.76 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC w/ LT BRZE TEMP 80° START TIME 09:40 STOP TIME 10:10
PC 89° 14:30 15:10

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-92 H.I. ______ PILE HEAD ELEV. 6.26

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.74

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.4 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	27.34	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL PILE TEMPLATE IS REMOVED. #4) HAMMER RAN OUT OF FUEL #5) PILE ACHIEVED PRACTICAL REFUSAL DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

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Construction
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PILE DRIVING LOG

Structure No. 134123 | **~~Bent~~/Pier No.** 12 | **Pile No.** 9

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	28	7.23									
1-2				34-35	45	7.66									
2-3				35-36	47	8.62	FS#2								
3-4				36-37	61	9.69	FS#3								
4-5				37-38	48	11.0	FS#4								
5-6				38-39	34	11.0									
6-7				39-40	30	10.8									
7-8			#1	40-41	38	10.5						MONITOR		FOR	
8-9	6	5.86	FS#1	41-42	67/	10.3	FS#3	41.50	BELOW			POINT.		REFUSAL	
9-10	12	6.03		42-43		6"	HS	REF.	ELEV.			3-5	14		
10-11	10	6.13		43-44								4-5	15		
11-12	10	5.98		44-45								5-6	21	10.3	
12-13	7	5.87													
13-14	6	6.58													
14-15	11	6.02													
15-16	16	6.31													
16-17	12	6.09													
17-18	12	5.92													
18-19	9	5.94													
19-20	9	6.00													
20-21	10	6.00													
21-22	10	5.97													
22-23	11	6.09													
23-24	13	6.25													
24-25	12	6.35													
25-26	16	6.41													
26-27	17	6.74	#3												
27-28	20	7.11	FS#1												
28-29	18	7.12													
29-30	20	7.29													
30-31	21	7.31													
31-32	20	7.30													
32-33	40	6.36	#4												

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 3/19/2016 STATION NO. 141+07.55

PILE SIZE 24"▢ ACTUAL/AUTH LENGTH /45' ~~BENT~~/PIER NO. 12 PILE NO. 10

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.88 MIN. TIP ELEV PER SPECS PILE CUTOFF ELEV ______

DRIVING CRITERIA 50 BLOWS/FT @ 10.0 'STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/2" & 2 ALUM @ 1/2"

WEATHER MC & HUMID TEMP 86 START TIME 13:55 STOP TIME 14:30

RAIN IN AREA MC & WINDY 88 13:25 13:50

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-98 H.I. ______ PILE HEAD ELEV. 6.71

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.29

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.6 (Scour = -11.4)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: Kenneth L. Wright TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	450	450	26.89	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS # X' IDENTIFIES FUEL SETTING #. #3) DRIVING STOPPED UNTIL PILE TEMPLATE IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

700-010-60
Construction
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PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 12	Pile No. 10

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	36	7.64									
1-2				34-35	47	8.39	FS#2								
2-3				35-36	42	9.31	FS#3								
3-4				36-37	89	9.99	FS#4	3							
4-5				37-38	72	9.62									
5-6			#1	38-39	50	9.96									
6-7	2		FS#1	39-40	42	9.45									
7-8	5	6.17		40-41	74	10.1									
8-9	9	6.93		41-42	39	10.6	#4	41.17' BELOW				N			
9-10	9	6.16		42-43	1/2"			REF. ELEV.				MONITOR FOR			
10-11	10	6.14		43-44								PRACT. REFUSAL			
11-12	14	5.90		44-45								11-12	14	10.1	
12-13	11	5.95										0-1	19		
13-14	7	7.11										1-2	20	10.6	
14-15	9	6.63													
15-16	35	6.50													
16-17	22	6.91	FS#2												
17-18	12	6.83													
18-19	10	7.05													
19-20	11	7.25													
20-21	9	7.09													
21-22	11	7.71	FS#4												
22-23	12	6.46													
23-24	17	6.36													
24-25	20	6.49													
25-26	20	6.58													
26-27	19	6.67													
27-28	16	6.66	#3												
28-29	25	7.17	FS#1												
29-30	24	7.41													
30-31	21	7.31													
31-32	23	7.35													
32-33	23	7.35													

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 5/19-20/16 STATION NO. 141+07.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH /45' BENT/PIER NO. 12 PILE NO. 11

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.88 MIN. TIP ELEV PER SPECS. PILE CUTOFF ELEV -0.25'

DRIVING CRITERIA 50 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC & HUMID / PC & WINDY TEMP 75 / 88° START TIME 08:30 / 14:00 STOP TIME 08:55 / 14:20

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 5/10/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA96 H.I. ______ PILE HEAD ELEV. 6.38

PILE HEAD CHAMFER 3/4" X 3" PILE TIP ELEV. -38.62

PILE TIP CHAMFER 3/4" X 3" GROUND ELEV. -2.5 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	27.22	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) STOPPED DRIVING UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

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PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 12	Pile No. 11

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	32	7.21									
1-2				34-35	39	8.10	FS#2								
2-3				35-36	33	9.04	FS#3								
3-4				36-37	56	9.71									
4-5				37-38	68	9.71									
5-6				38-39	33	10.8	FS#4								
6-7				39-40	31	10.9									
7-8			#1	40-41	34	11.1									
8-9	9	5.86	FS#1	41-42	66	10.0	FS#3	41.50' BELOW							
9-10	11	5.92		42-43	/6"		#4	REF. ELEV.				MONITOR FOR			
10-11	11	5.91		43-44								PRACT. REFUSAL			
11-12	10	5.82		44-45								4-5	15		
12-13	7	6.24										5-6	20	10.0	
13-14	7	6.20													
14-15	17	6.48													
15-16	20	6.34													
16-17	16	6.22													
17-18	15	6.16													
18-19	12	6.31													
19-20	12	6.23													
20-21	12	6.20													
21-22	12	6.32													
22-23	14	6.34													
23-24	15	6.27													
24-25	17	6.49													
25-26	20	6.65													
26-27	19	6.60	#3												
27-28	30	6.63	FS#1												
28-29	24	6.83													
29-30	24	6.90													
30-31	24	6.97													
31-32	26	7.01													
32-33	28	7.05													

Page No. ______

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Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 4035560 DATE 5/19/2016 STATION NO. 141+07.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH /45 ~~BENT~~/PIER NO. 12 PILE NO. 12

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 2.81 MIN. TIP ELEV PER SPECS. PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 50 BLOWS / FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 2 NYLON @ 2 1/4" & 2 ALUM @ 1/2"

WEATHER PC w/ L BREEZE TEMP 77 START TIME 0920 STOP TIME 09:45

PC w/ Lt Breeze 88' 15:20 15:40

PILE DATA

PAY ITEM NO. 455-34-8 WORK ORDER NO.

MANUFACTURED BY SCP T.B.M./B.M. ELEV GROUND ROD READ

DATE CAST 5/10/16 ROD READ PILE HEAD ROD READ

MANUFACTURER'S PILE NO. HMA-97 H.I. PILE HEAD ELEV. 6.64

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -38.36

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -27 (SCOUR = -11.40)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	45.0	45.0	26.96	Ø	Ø

NOTES: #1) STOOD PILE IN TEMPLATE, SET HAMMER & ALL WEIGHTS. #2) 'FS#X' IDENTIFIES FUEL SETTING #. #3) STOPPED DRIVING UNTIL TEMPLATE FRAME IS REMOVED. #4) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______________________

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

____

Qualified Inspector (Signature)

Page No. ______

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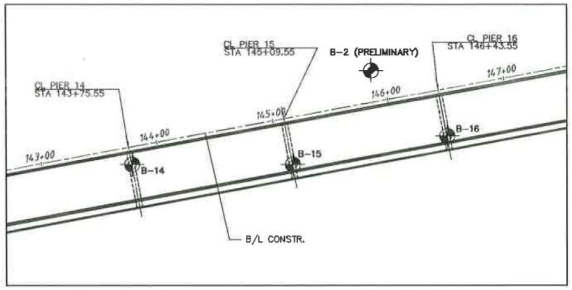
PILE DRIVING LOG

Structure No. 134123	Bent/Pier No. 12	Pile No. 12

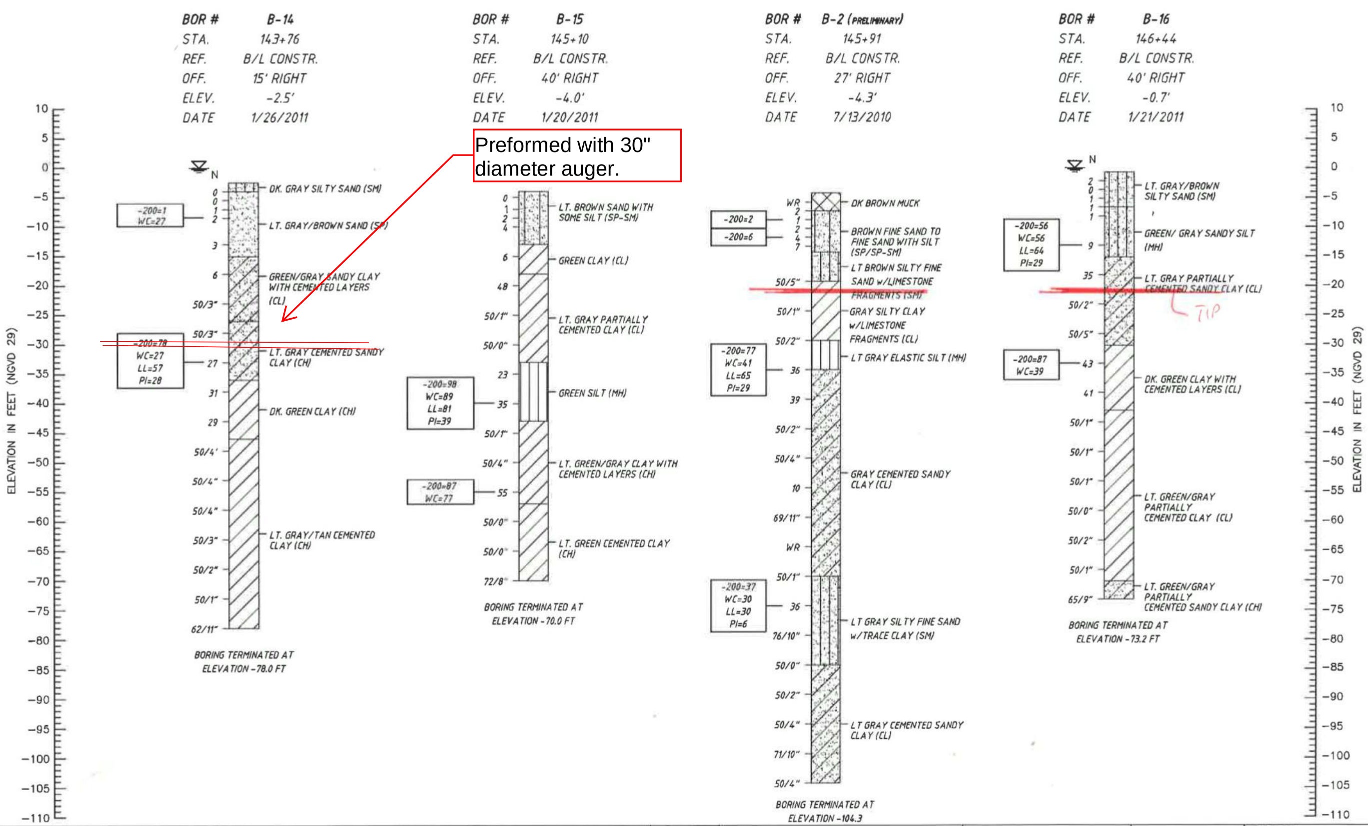
Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
0-1				33-34	29	7.54									
1-2				34-35	46	7.91									
2-3				35-36	46	8.80	FS#2								
3-4				36-37	75	9.98	FS#3								
4-5				37-38	62	9.76									
5-6				38-39	40	10.5	FS#4								
6-7				39-40	30	11.0									
7-8				40-41	73	10.6	FS#3								
8-9			#1	41-42	34	10.1	#4	41.17' BELOW							
9-10	11	6.16	FS#1	42-43		2"		REF. ELEV.				MONITOR FOR			
10-11	11	6.07		43-44								PRACT. REFUSAL			
11-12	11	5.90		44-45								0-1	13		
12-13	8	5.72										1-2	21	10.1	
13-14	8	5.87													
14-15	11	6.04													
15-16	12	6.09													
16-17	12	5.95													
17-18	11	6.06													
18-19	10	5.74													
19-20	10	5.82													
20-21	10	5.86													
21-22	10	5.82													
22-23	10	5.99													
23-24	11	5.99													
24-25	13	6.11													
25-26	13	6.24													
26-27	13	6.35	#3												
27-28	25	6.94	FS1												
28-29	19	7.28													
29-30	20	7.03													
30-31	20	7.40													
31-32	21	7.29													
32-33	21	7.32													



GRAPHIC SCALE IN FEET

50 0 50 100

SCALE 1" = 100'



NOTES:

1. PLAN VIEW IS FOR SHOWING APPROXIMATE BORING LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF FINAL PLANS.
2. LABORATORY TEST RESULTS HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER.
3. THE FOLLOWING APPLY TO ALL BORINGS:

DRILLER:	UNIVERSAL
HAMMER:	SAFETY
RIG:	CME 45

LEGEND

SAND — SILT — CLAY — SAND WITH SOME SILT — CLAY WITH SOME SAND — CLAYEY SAND — SAND WITH SOME CLAY — SANDY SILT — SANDY CLAY — SILTY SAND — SILTY CLAY — HARD LIMESTONE

GRANULAR MATERIALS–RELATIVE DENSITY	SPT N–VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4
LOOSE	4 to 10
MEDIUM DENSE	10 to 30
DENSE	30 to 50
VERY DENSE	GREATER THAN 50
SILTS AND CLAYS CONSISTENCY	**SPT N–VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2
SOFT	2 to 4
FIRM	4 to 8
STIFF	8 to 15
VERY STIFF	16 to 30
HARD	GREATER THAN 30

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
WR	FELL UNDER WEIGHT OF ROD
-200 LL PI WC	PERCENT PASSING #200 SIEVE LIQUID LIMIT (%) PLASTICITY INDEX (%) WATER CONTENT (%)
NGVD 29	NATIONAL GEODETIC VERTICAL DATUM OF 1929
	APPROXIMATE SPT BORING LOCATION
	GROUNDWATER TABLE
NR	NO RECOVERY
	CASING
B/L	BASELINE

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE: EXTREMELY AGGRESSIVE
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE
(WATER CHLORIDE CONTENT = 9100 ppm)

BRIDGE FOUNDATION BORINGS

REVISIONS							
Date	By	Description	Date	By	Description		

Drawn By: CER 11-10 · Checked By: CER 11-10 · Designed By: CER 11-10 · Checked By: CER 11-10

URS Corporation Southern
7650 West Courtney Campbell Causeway
Tampa, Florida 33607-1462
C.A. No. 00000002

MANATEE COUNTY GOVERNMENT
MANATEE COUNTY, FLORIDA

ENGINEER OF RECORD
MICHAEL R. SHARP
P.E. NO. 41205

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: FORT HAMER BRIDGE OVER MANATEE RIVER

REF. DWG. NO.

SHEET NO.

FILENAME: n:\geotech-dm\1200 tampa projects\9000\9385 – ft hamer bridge\8 acad\final borings\ft hamer – bridge borings.dwg LAYOUT NAME: layout5 PLOTTED: Tuesday, May 27, 2014 10:34:56 AM USER: michael_sharp

Page No. ______

700-010-60
Construction
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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 2/16/16 STATION NO. 143+75.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH 52' / 52' ~~BENT~~/PIER NO. 14 PILE NO. 1

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT-LBS OPERATING RATE N/A

REF. ELEV 4.06 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" New Pine Plywood

HAMMER CUSHION THICKNESS AND MATERIAL 4" Nylon & Alum

WEATHER PC w/ Lt Breeze TEMP 72 START TIME 13:10 STOP TIME 13:40

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-71 H.I. ______ PILE HEAD ELEV. 9.23

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.77

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.40 (Scour = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: Kenneth L. Wright TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ Scour	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0'	52.0'	30.87	Ø	Ø

NOTES: #1) Preformed Pile Hole to -30.0' Elev. #2) Stood Pile in Template
#3) Set Hammer on Pile & All Weights #4) 'F.S. # X' identifies Fuel Setting #
#5) R = Pile experienced Rebound of greater than 1/4" During Driving
#6) Pile Achieved Pract Refusal. Driving Stopped.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

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PILE DRIVING LOG

Structure No. 134123 **~~Bent/~~Pier No.** 14 **Pile No.** 1

el. -20 (+/-)

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21			#2												
21-22															
22-23			#3												
23-24	5	5.97	FS#1												
24-25	4	4.57													
25-26	5	5.60						Monitor For Pract. Refusal							
26-27	3	5.81													
27-28	6	5.94						8-9	16						
28-29	10	6.12						9-10	21	11.1					
29-30	13	6.03													
30-31	66	6.74													
31-32	66	7.75	FS#2												
32-33	46	8.22	FS#3												
33-34	16	7.37	FS#2												
34-35	29	7.41	R												
35-36	40	7.60	R												
36-37	45	7.58	R												
37-38	50	8.01	FS#3												
38-39	67	8.11	R												
39-40	39	9.24	FS#4												
40-41	37	9.42	R												
41-42	37	9.52	R												
42-43			R												
43-44	38	9.63	R												
44-45	36	9.69	R												
45-46	37	9.87	R												
46-47	55	11.1	/	46.83' Below Ref. Line											
47-48			10"												
48-49															
49-50															
50-51															
51-52															
52-53															

Preformed to el. -30

Tip Ele. @ -42.67

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05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 60355160 DATE 2/16/16 STATION NO. 143+75.55

PILE SIZE 24" ▢ ACTUAL/AUTH LENGTH 52' / 52' ~~BENT~~/PIER NO. 14 PILE NO. 3

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FtLBS OPERATING RATE N/A

REF. ELEV 4.11 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25'

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM.

WEATHER PC w/ LT. BREEZE TEMP 92 START TIME 14:00 STOP TIME 14:20

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-75 H.I. ______ PILE HEAD ELEV. 9.28

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.72

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -24.4 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512670

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW GROUND SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.82	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV -30.0. #2) STOOD PILE IN TEMPLATE
#3) SET HAMMER ON PILE & ALL WEIGHTS #4) 'FS# X' IDENTIFIED FUEL SETTING #
#5) R = PILE EXPERIENCED REBOUND OF GREATER THAN 1/4" DURING DRIVING
#6) PILE ACHIEVED PRACT. REFUSAL. DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

700-010-60
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PILE DRIVING LOG

Structure No. 134123	~~Bent/~~Pier No. 14	Pile No. 3

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21															
21-22			#2												
22-23															
23-24			#3												
24-25	14	6.13	FS#1												
25-26	12	6.29						Monitor for		Pract. Refusal					
26-27	7	5.69													
27-28	8	5.87						7-8	14						
28-29	9	6.12						8-9	17						
29-30	22	6.85						9-10	21	11.7	#6				
30-31	95	8.09	FS#2												
31-32	38	9.41	FS#3												
32-33															
33-34	33	8.67													
34-35	17	8.31	FS#2												
35-36	20	7.90													
36-37	29	7.92	R												
37-38	38	8.09	R												
38-39	34	8.82	FS#3												
39-40	38	9.13	R												
40-41	36	9.06	R												
41-42	38	9.21	FS#4												
42-43	30	9.98	R												
43-44	30	10.3	R												
44-45	31	10.4	R												
45-46	30	10.5													
46-47	80	11.7	#6												
47-48			10"	46.83' Below			Ref	Line							
48-49															
49-50															
50-51															
51-52															
52-53															

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

Preformed to El. -30

Tip Ele. @ -42.72

Page No. ______

700-010-60
Construction
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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 2/16/16 STATION NO. 143+75.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH 52' / 52' BENT/PIER NO. 14 PILE NO. 4

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT LBS OPERATING RATE N/A

REF. ELEV 4.43 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 70 BLOWS / FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM

WEATHER PC w/ Lt BREEZE TEMP 64° START TIME 10:15 STOP TIME 10:50

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-69 H.I. ______ PILE HEAD ELEV. 9.26

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.74

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.41 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.84	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV -30.0. #2) STOOD PILE IN TEMPLATE #3) SET HAMMER ON PILE & ALL WEIGHTS #4) 'FS# X' IDENTIFIES FUEL SETTING # #5) R= PILE EXPERIENCED REBOUND OF GREATER THAN 1/4" DURING DRIVING #6) PILE ACHIEVED PRACTICAL REFUSAL, DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

PILE DRIVING LOG

700-010-60
Construction
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Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 4

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21															
21-22															
22-23			#2												
23-24	5	6.03	#3												
24-25	10	5.17	FS1												
25-26			Run												
26-27															
27-28															
28-29															
29-30	6	5.20													
30-31	20	6.45													
31-32	33	6.66													
32-33	14	6.33													
33-34	[illegible]	5.79						Monitor for Pract. Refusal							
34-35	4														
35-36	4							0-1	16						
36-37	13	7.50						1-2	20	11.8	#6				
37-38	21	7.90	R												
38-39	30	7.97	R												
39-40	41	8.31	FS#2												
40-41	30	9.43	R												
41-42	44	8.25	FS#3												
42-43	53	8.56	R												
43-44	53	9.24	FS#4												
44-45	44	9.87	R												
45-46	42	9.89	R												
46-47	53	9.77													
47-48	37	11.8 / 2"	#6	47.17' Below Ref Line											
48-49															
49-50															
50-51															
51-52															
52-53															

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

700-010-60
Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE ______ STATION NO. 143+75.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH 52'/52' ~~BENT~~/PIER NO. 14 PILE NO. 5

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 Ft Lbs OPERATING RATE N/A

REF. ELEV 4.45 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 70 BLOWS /FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" New Pine Plywood

HAMMER CUSHION THICKNESS AND MATERIAL 4" Nylon & Alum

WEATHER PC w/ Lt. Breeze TEMP 66° START TIME 11:10 STOP TIME 11:25

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. AMA-72 H.I. ______ PILE HEAD ELEV. 9.37

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.63

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. 2.38 (Scour = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: Kenneth L. Wright TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ Scour	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.73	Ø	Ø

NOTES: #1) Preformed Pile Hole to Elev. -30.0 #2) Good Pile in Template
#3) Set Hammer on Pile & All Weights #4) 'FS#X' Identifies Fuel Setting #
#5) R = Pile Experienced Rebound of Greater Than 1/4" During Driving
#6) Pile Achieved Practical Refusal. Driving Stopped.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

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Construction
05/13

PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 5

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21			#2												
21-22															
22-23															
23-24															
24-25			3												
25-26	3	5.54	FS#1												
26-27	3							MONITORING FOR PRACT. REFUSAL							
27-28	2														
28-29	3	6.70						0-1	21	11.7					
29-30	2														
30-31	8	5.88													
31-32	20	6.89													
32-33	23	7.15													
33-34	16	6.98													
34-35	10	6.58													
35-36	8	6.32													
36-37	8	6.16													
37-38	17	6.73	R												
38-39	35	7.00	FS#2												
39-40	56	7.51	FS#3												
40-41	43	8.30	R												
41-42	44	8.54	FS#4												
42-43	33	9.35	R												
43-44	34	9.51	R												
44-45	33	9.61	R												
45-46	32	9.67	R												
46-47	45	10.5													
47-48	21	11.7	#6	47.08' BELOW											
48-49			1"	REF. LINE											
49-50															
50-51															
51-52															
52-53															

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

700-010-60
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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE ______ STATION NO. 143+75.55

PILE SIZE 24" ▢ ACTUAL/AUTH LENGTH 52' / 52' ~~BENT~~/PIER NO. 14 PILE NO. 6

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 ft LBS OPERATING RATE N/A

REF. ELEV 3.95 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25'

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM

WEATHER PC & L BREEZE TEMP 68 START TIME 11:50 STOP TIME 12:10

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-76 H.I. ______ PILE HEAD ELEV. 9.28

PILE HEAD CHAMFER 3/4" X 3" PILE TIP ELEV. -42.72

PILE TIP CHAMFER 3/4" X 3" GROUND ELEV. -2.41 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.82	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV. -20.0 #2) STOOD PILE IN TEMPLATE
#3) SET HAMMER ONTO PILE & ALL WEIGHTS #4) 'FSAX' IDENTIFIES FUEL SETTING #
#5) R= PILE EXPERIENCED REBOUND OF GREATER THAN 1/4" DURING DRIVING.
#6) PILE ACHIEVED PRACTICAL REFUSAL, DRIVING STOPPED.

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

700-010-60
Construction
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PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 6

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
9-10				42-43	47	8.69	FS#4								
10-11				43-44	32	8.65	R								
11-12				44-45	33	9.71	R								
12-13				45-46	35	9.15									
13-14			#2	46-47	65	10.8	/ #6	46.67' BELOW							
14-15			#3	47-48			/8"	REF. LINE							
15-16	4			48-49											
16-17	4	5.58		49-50											
17-18	3			50-51											
18-19	3			51-52											
19-20	3														
20-21	3														
21-22	2														
22-23	2	7.05													
23-24	2														
24-25	7	6.06													
25-26	11	6.01													
26-27	10	6.12													
27-28	9	5.60													
28-29	4	6.40						MONITOR FOR PRACT. REFUSAL							
29-30	6	5.11													
30-31	28	6.81						6-7	16						
31-32	55	7.72	FS#2					7-8	21	10.8	#6				
32-33	47	8.01													
33-34	29	8.47	FS#3												
34-35	24	8.33													
35-36	11	7.79	FS#2												
36-37	25	7.54													
37-38	32	7.63	R												
38-39	43	7.96	R												
39-40	37	8.57	FS#3												
40-41	40	8.48	R												
41-42	39	8.56	R												

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

Page No. ______

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PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE 2/16/16 STATION NO. 143+75.55

PILE SIZE 24"☐ ACTUAL/AUTH LENGTH 52' / 52' ~~BENT~~/PIER NO. 14 PILE NO. 7

HAMMER Make/Model ICE J-62 RATED ENERGY 165,000 FT-LBS OPERATING RATE N/A

REF. ELEV 4.16 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM

WEATHER PC w/ Lt BREEZE TEMP 72 START TIME 14:40 STOP TIME 15:00

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA-70 H.I. ______ PILE HEAD ELEV. 9.41

PILE HEAD CHAMFER 3/4" X 3" PILE TIP ELEV. -42.59

PILE TIP CHAMFER 3/4" X 3" GROUND ELEV. -2.38 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.69	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV -30.0 #2) SET PILE IN TEMPLATE
#3) SET HAMMER ON PILE & ALL WEIGHTS. #4) 'FSAX' IDENTIFIES FUEL SETTING #
#5) R = PILE EXPERIENCED REBOUND OF GREATER THAN 1/4" DURING DRIVING

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______

CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______

Qualified Inspector (Signature)

Page No. ______

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Construction
05/13

PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 7

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21															
21-22			#2												
22-23															
23-24			#3					Monitor for Practical Refusal							
24-25	5	4.87	FS#1												
25-26	6	5.83						6-7	14						
26-27	5	7.06						7-8	17						
27-28	6							8-9	21	11.5					
28-29	↓														
29-30	14	6.30													
30-31	24	7.05													
31-32	25	6.31													
32-33	13	5.29													
33-34	15	6.28													
34-35	10	7.13													
35-36	16	6.60													
36-37	14	7.21													
37-38	20	7.03	R												
38-39	34	7.38	R												
39-40	48	7.73	FS#2												
40-41	43	8.17	R												
41-42	31	8.73	FS#3												
42-43	34	9.03	R												
43-44	41	9.09	R												
44-45	39	8.43													
45-46	44	8.58													
46-47	81	11.5	FS#4	46.75' Below											
47-48		/9"			Ref. Line										
48-49															
49-50															
50-51															
51-52															
52-53															

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

700-010-60
Construction
05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 6035560 DATE ______ STATION NO. 143+75.55

PILE SIZE 24" Ø ACTUAL/AUTH LENGTH 52' / 52' ~~BENT~~/PIER NO. 14 PILE NO. 8

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 Ft LBS OPERATING RATE N/A

REF. ELEV 4.18 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.26

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM

WEATHER PC w/ Lt. Breeze TEMP 72° START TIME 15:10 STOP TIME 15:30

PILE DATA

PAY ITEM NO. 455-34 5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA 74 H.I. ______ PILE HEAD ELEV. 9.35

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.65

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. 2.39 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.75	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV -30.0. #2) STOOD PILE IN TEMPLATE
#3) SET HAMMER ON PILE & ALL WEIGHTS #4) FS#X' IDENTIFIES FUEL SETTING #
#5) R = PILE EXPERIENCED REBOUND OF GREATER THAN 1/4" DURING DRIVING.
#6) PILE ACHIEVED PRACT. REFUSAL. DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 8

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
9-10				42-43	40	7.92	R								
10-11				43-44	44	8.64	R								
11-12				44-45	44	8.75	R								
12-13			#2	45-46	34	8.07	FS#4								
13-14			#3	46-47	61	11.0	#6	46.83' BELOW							
14-15	3		FS#1	47-48		10"		REF. LINE							
15-16	4			48-49											
16-17		RUN		49-50											
17-18				50-51											
18-19				51-52											
19-20	5	6.28													
20-21	3														
21-22	2														
22-23	2														
23-24	6							MONITOR FOR PRACT. REFUSAL							
24-25	7														
25-26	7	5.44						8-9	14						
26-27	6							9-10	21	11.0	#6				
27-28	5														
28-29	5	4.37													
29-30	12	6.06													
30-31	9	6.83													
31-32	8	6.54													
32-33	8														
33-34	8														
34-35	7														
35-36	5	4.62													
36-37	8	4.76													
37-38	14	5.77													
38-39	34	6.89	R												
39-40	38	7.51	FS#2												
40-41	42	7.62	R												
41-42	38	8.17	FS#3												

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

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05/13

PILE DRIVING INFORMATION

Structure Number: 134123

FIN PROJ. ID # 60 35560 DATE 2/16/16 STATION NO. 143+75.55

PILE SIZE 24" ☐ ACTUAL/AUTH LENGTH 52'/52' ~~BENT~~/PIER NO. 14 PILE NO. 9

HAMMER Make/Model ICE I-62 RATED ENERGY 165,000 FT-LBS OPERATING RATE N/A

REF. ELEV 4.20 MIN. TIP ELEV N/A PILE CUTOFF ELEV -0.25

DRIVING CRITERIA 70 BLOWS/FT @ 10.0' STROKE

PILE CUSHION THICKNESS AND MATERIAL 13" NEW PINE PLYWOOD

HAMMER CUSHION THICKNESS AND MATERIAL 4" NYLON & ALUM

WEATHER PC w/ Lt. Breeze TEMP 70 START TIME 15:50 STOP TIME 16:05

PILE DATA

PAY ITEM NO. 455-34-5 WORK ORDER NO. ______

MANUFACTURED BY SCP T.B.M./B.M. ELEV ______ GROUND ROD READ ______

DATE CAST 2/4/16 ROD READ ______ PILE HEAD ROD READ ______

MANUFACTURER'S PILE NO. HMA 73 H.I. ______ PILE HEAD ELEV. 9.28

PILE HEAD CHAMFER 3/4" x 3" PILE TIP ELEV. -42.72

PILE TIP CHAMFER 3/4" x 3" GROUND ELEV. -2.40 (SCOUR = -11.9)

FOR OPEN ENDED PIPE PILES, DEPTH TO SOIL PLUG FROM TOP OF PILE (ft.) N/A

QUALIFED INSPECTOR'S NAME: KENNETH L. WRIGHT TIN #: W623512620

SPLICE / EACH	PREFORMED HOLE	DYNAMIC LOAD TEST	PAY SET CHECK	NO PAY SET CHECK	REDRIVE	EXTRACTION	DRIVING OF SPLICE	PILE TYPE CODE	BATTER	PILE LENGTH: ORIGINAL FURNISHED	PILE LENGTH: TOTAL LENGTH WITH EXTENSION	PENETRATION BELOW ~~GROUND~~ SCOUR	EXTENSION / BUILD UP: AUTHORIZED	EXTENSION / BUILD UP: ACTUAL
Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	52.0	52.0	30.82	Ø	Ø

NOTES: #1) PREFORMED PILE HOLE TO ELEV -30.0. #2) STOOD PILE IN TEMPLATE.
#3) SET HAMMER ON PILE & ALL WEIGHTS #4) 'FS#X' IDENTIFIES FUEL SETTING #
#5) R=PILE EXPERIENCES REBOUND OF GREATER THAN 1/4" DURING DRIVING
#6) PILE ACHIEVED PRACTICAL REFUSAL. DRIVING STOPPED

For Trainee experience evidence only:
Name of CTQP Trainee being supervised by the Qualified Inspector: ______
CTQP Trainee

I certify the Pile Driving Record accuracy and that the named above Trainee has observed the full pile installation:

______
Qualified Inspector (Signature)

Page No. ______

700-010-60
Construction
05/13

PILE DRIVING LOG

Structure No. 134123	~~Bent~~/Pier No. 14	Pile No. 9

Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.	Depth	Blows	Stroke/ Pressure	Note No.
20-21															
21-22															
22-23			#2												
23-24			#3												
24-25	11	6.08	FS#1					Monitor for Pract. Refusal							
25-26	6														
26-27	7	6.11													
27-28	8	4.96						9-10	16						
28-29	6	4.79						10-11	20	60.9					
29-30	21	6.73													
30-31	38	7.45													
31-32	23	7.25													
32-33	19	6.86													
33-34	14	6.71													
34-35	15	6.59													
35-36	23	7.24													
36-37	25	7.03													
37-38	36	7.09	R												
38-39	40	7.29	FS#2												
39-40	48	8.03	R												
40-41	38	8.68	FS#3												
41-42	34	8.95	R												
42-43	36	8.96	R												
43-44	43	8.91	R												
44-45	33	9.66	FS#4												
45-46	33	10.1	R												
46-47	83	10.9	#6	46.92' Below											
47-48			/11"	Ref. Line											
48-49															
49-50															
50-51															
51-52															
52-53															

Pile driving thru 30" diameter preformed hole. Typical to all production piles in pier 14.

ATTACHMENT B

County's Review Comments and Responses

44th Avenue East 30% Comments/Responses
Comments Received 5/13/16

Comments from Todd E. Boyle, Survey Division Manager on 30% Roadway Plans

Comment 1 – Page 9, General Note #1 of the plans indicates that the vertical datum is NGVD '29 but 2.2 of the Conceptual Bridge Design Report references NAVD '88. The various documents of this project need to be consistent in the vertical datum or vert clear regarding the relationship of these two datums. With the new flood maps for Manatee County being effective since March 2014, and mean high water surveys both utilizing NAVD '88 for the vertical datum, the use of NGVD '29 does not seem appropriate, however, the relationship of NGVD '29 and NAVD '88 should be included in the plans to be able to compare historic elevations (the Quad maps and adjacent older projects). Request a copy of the underlying topographic survey used for the final design.
Response – The project utilizes the NAVD '88 datum. The conversion from NVGD '29 to NAVD'88 is as follows: NGVD '29 – 0.97' = NAVD '88. The note will be revised.

Comments from Chris Mowbray on 30% Roadway Plans and Technical Reports

Comment 1 – North leg of Morgan Johnson do not have turn lanes proposed. Is there information to support this? See attachment regarding traffic study.
Response – During the 15% Line and Grade meeting, one of the County's concerns was to avoid taking any R/W from the properties along 43rd Ave. East and to avoid the existing box culvert. The addition of turn lanes would require R/W acquisition to at least one of those properties, or would require realignment of the existing roadway, which would force the limits of construction north of the existing box culvert between 41st and 43rd Ave. Based on the Highway Capacity Manual (HCM) signalized intersection run using 2010 traffic numbers, the intersection as currently designed will operate at Level of Service (LOS) C.

Comment 2 – Separation between 44 Ave Pl E and 67 St E is 350'; 67 St E to 44 Terrace E is 320' feet; and 44 Terrace E to 69 St E is 650'. Crossing Creek Village is less than 100 units with two means of full access so should 67 St E be cul-de-sac'd and disconnected from 44th Ave E, or have this a right in/out?
Response – AECOM's project limits extend to 44th Ave Pl E. The roads described in this comment are part of HDR's adjacent design section.

Comment 3 – Typical Section's sub-base should be LBR 60.
Response – Will revise to LBR 60.

Comment 4 – Recommend showing construction of other's signing and marking information on Sheet 10 to confirm the alignment through the intersection works. Same for profile views.
Response – Agree, will coordinate with the adjacent project designer to obtain those additional files.

Comment 5 – Not all driveways shown. Alignment and location to their respective property line should be per county standards. Example… some driveways may lie or encroach upon neighbor's lot so the designer should be cautious to correct side yard setbacks where possible.
Response – Will review driveways shown. Assume reference is to driveways at Sta 169+00 and 170+00. Will check against county standards for compliance.

Comment 6 - Connect 44th's sidewalk to existing sidewalks at Useppa Drive.
Response – Agree, will connect to match existing.

Comment 7 – Are utilities planned in this corridor other than the waterline and shown on next phase submittal?
Response – Typical drainage conflict resolution/relocation will be required at specific locations. The project will also include a new 36" waterline facility on either side of the river. Also, our designers are coordinating with County representatives for a potential new sewer line.

Comment 8 – Are right turns really needed at 62/65th St E? Station 241+00, left, the ROW is ½ way into garage. Does the median need to be minimal to avoid such takes? Is the ROW maximized as the south ROW line is approximately 12' south of the south edge of the sidewalk, presumed due to FPL. Should FPL poles be shown on the cross section?
Response – See Notes to Reviewers 4.a. Per previous direction from the County, AECOM was asked to provide turn lanes at all feasible locations for County feedback. The County was to provide a consolidated needs list. (FOLLOW UP)

Comment 9 – Cross sections show work outside of ROW. Example are sheets 49-51; 78-84; 116-119 +/-.
Response – See Note to Reviewers 4.c. Design team will rectify the slopes and tie down areas as well as anticipated R/W needs for the 60% submittal.

Comment 10 – Geotech not reporting ESHWT on hand augers report, but the Base Clearance Water Elevation references one which appears to be exactly one foot above the observed water table of the hand augers. How was this determined without geotech input? Were impacts evaluated of filling of ditches and where the water table may rise after the natural drawdown is removed? Will the geotech specify and road designer show on the cross sections the unsuitable material removal, placement of embankment per FDOT's 500 and 505 series, and indicate where underdrain is needed?
Response – (a) The assessment of the ESHWT occurred in the boring performed along the existing 44th Ave. was included in the report. Additional borings and ESHWT will be performed for the remaining portion of the project. The results will be included in the next submittal. (b) Rise in the groundwater table after the ditches are filled is not expected due to other bodies of water in the area. (c) Where encountered, the unsuitable materials will be removed and replaced in accordance with FDOT Standard Index 505. We will perform muck probes in the existing ditches to be filled for the new roadway embankment.

Comment 11 – Attached comments from Alignment Technical Memorandum addressed?
Response – Yes.

Comment 12 – On the Typical Section Package, there was discussion of striping a bike lane on the east side of the proposed two lanes (future south bound lanes).
Response – Assume comment is for Caruso. The design team is not aware of discussions for a bike lane on the east side; however, it is possible to stripe for this by possibly utilizing 10' travel lanes. Further discussion with the County may be required to resolve this issue.

Comments from Sunny Fu on the Alignment Technical Memorandum

Comment 1 – The alignment exhibits need to include the locations of retention ponds and the impacted parcels to evaluate the costs of each alignment.
Response – Ponds can be added to the referenced exhibit.

Comment 2 – For the southerly alignment option, besides 3 transmission poles on the west of the river, it appears that 2 more transmission poles on the east side of the river will be impacted due to the transition from Segment A to Segment B. The cost of transmission poles cannot be neglected.
Response – Will be included.

Comment 3 – Please provide the traffic study for signalized intersection option for 44th Ave E at Morgan Johnson/Caruso Road.
Response – The Traffic Study has been added to the Memo.

Comment 4 – It appears that the realigned Caruso Road is not right angled with 44th Ave E. What is the deflection angle? The deflection shall meet FDOT PPM minimum requirement.
Response – The County has recommended this alignment be reconfigured.

Comment 5 – For the typical section of Caruso Road, please label the median width for the future 4 lane construction. Please label the proposed R/W and dimension on all preliminary alignment sheets. Should County acquire 120' full R/W for the future build out of Caruso Road?
Response – Proper labeling will be included. Proposed R/W will be based on future needs.

Comment 6 – For the typical section of 44th Ave E, please add the thickness of the asphalt and base, meeting current County standards. County standard requires LBR 60 minimum for the sub-base of thoroughfare.
Response – Pavement thicknesses and LBR 60 will be added.

Comments from Vishal Kakkad on the 30% Roadway Plans and Technical Reports

Comment 1 – Add 2-2" conduit with 96 count single-mode fiber optic cable between the project limits.
Response – Conduits will be included.

Comment 2, Sheet 14 – Add eastbound and westbound Right Turn lane at the intersection of 44th Avenue East and 51st Street East.
Response – EB turn lane could be added. However, for WB, the right turn to the existing 44th Ave E is to allow access for a possible kayak facility as mentioned in the scope. If a right turn lane was added, this movement would not be possible, and the access would need to be moved elsewhere.

Comment 3, Sheet 18 – Add southbound Right Turn and Left Turn lanes at the intersection of 44th Avenue East and 57th Street East.
Response - During the 15% Line and Grade meeting, one of the County's concerns was to avoid taking any R/W from the properties along 43rd Ave. East and to avoid the existing box culvert. The addition of turn lanes would require R/W acquisition to at least one of those properties, or would require realignment of the existing roadway, which would force the limits of construction north of the existing box culvert between 41st and 43rd Ave.

Comment 4, Sheet 20 – Add eastbound Right Turn lane at the intersection of 44th Avenue East and 60th Street east (Old Caruso Road).
Response – This can be added, but may require R/W for the property on the SE corner.

Comment 5, Sheet 5 – Caruso Road Typical Section: Consider moving bike lane to the east side (right side).
Response – Another reviewer (Chris Mowbray) requested that a bike lane be included on the east side. These comments need to be reconciled.

Comment 6, Sheets 10 & 11 – Consider roundabout for the intersection of 44th Avenue Plaza @ 44th Avenue E.
Response – A roundabout at this location was not previously mentioned for consideration. Application of a roundabout at this location is not apparent. Further discussion with the County will be required to more fully consider this option.

Comment 7, Sheet 13 – Align north and south approaches of the intersection of 44th Avenue E and Useppa Drive.
Response – The area on the north side is an existing driveway entrance into the County Pump station.

Comment 8, Sheet 13 – Add Microwave Vehicle Detection System (Wavetronix HD) between stations 186 and 187.
Response – MVDS will be included.

Comment 9, Sheet 26 – Keep the Old Caruso Road open with intersections (see attached concept).
Response – This concept will be explored.

Comments from Mukunda Gopalakrishna on the 30% Roadway Plans

Comment 1, General – Add fiber optic infrastructure as part of this project to provide communication to future ITS devices.
Response – Fiber optic infrastructure will be included.

Comment 2, General – Provide ITS devices along the proposed alignment.
Response – ITS devices will be included.

Comment 3, Sheet 14 – Add eastbound and westbound Right Turn lanes at the intersection of 44^{th} Avenue East and 51^{st} Street East.
Response – EB Right Turn lane can be added, but will require additional R/W. . However, for WB, the right turn to the existing 44^{th} Ave E is to allow access for a possible kayak facility as mentioned in the scope. If a right turn lane was added, this movement would not be possible, and the access would need to be moved elsewhere.

Comment 4, Sheet 18 – Add southbound Right Turn and Left Turn lanes at the intersection of 44^{th} Avenue East and 57^{th} Street East.
Response - During the 15% Line and Grade meeting, one of the County's concerns was to avoid taking any R/W from the properties along 43^{rd} Ave. East and to avoid the existing box culvert. The addition of turn lanes would require R/W acquisition to at least one of those properties, or would require realignment of the existing roadway, which would force the limits of construction north of the existing box culvert between 41^{st} and 43^{rd} Ave.

Comment 5, Sheet 20 – Add eastbound Right Turn lane at the intersection of 44^{th} Avenue East and 60^{th} Street East (Old Caruso Road).
Response – This can be added, but will require additional R/W.

Comment 6, Sheet 5 – Revise the Typical Section with 11' lanes and 6' shoulders.
Response – All Typical Sections are consistent with Manatee County Public Works Standards.

Comment 7, Sheet 13 – Align north and south approaches of the intersection of 44^{th} Avenue East and Useppa Drive.
Response - The area on the north side is an existing driveway entrance into the County Pump station.

Comment 8, Sheet 13 – Add Microwave Vehicle Detection System (Wavetronix HD) between stations 186 and 187.
Response – MVDS will be included.

Comment 9, Sheet 19 - Add Microwave Vehicle Detection System (Wavetronix HD) between stations 227 and 228.
Response – MVDS will be included.

Comment 10, Sheet 26 – Keep Old Caruso Road open.
Response – This response will require further discussion with the County.

Comments from David Branning on the 30% Roadway Plans and Technical Reports

Technical Memorandum – Water Main Crossing Alternatives Analysis:

Comment 1 – Part 2.1.3 – Maintenance and Reliability: The last sentence of paragraph #1 needs to include the County's pressure test of 180 psi for potable water mains. The same is true under Part 2.2.3.
Response – Added this reference.

Comment 2 – In line #2 of the 3rd paragraph of Part 2.1.7 is a spelling error – "tuck" instead of "truck".
Response – This was corrected.

Comment 3 – In the cost preparations, an allowance for more 36" DIP is required to cross the eastbound lanes on each side of the river. For full comparison, the bridge attachment option only requires the westbound lane crossings.
Response – The cost estimate and discussions were changed accordingly.

30% Roadway Plans:

Comment 1 – the legibility of the County's utility main identifications and valve are too small to read at this scale. At the 60% and later plan submittals, these must be legible and included in the cross sections.
Response – Will address for future submittals.

Comment 2 – On Sheet 14 (Roadway Plan Sheet 5), the existing 36" PCCP water main on 51st Street East from the north and 30" DIP water main on 51st Street East from the south are not identified or shown on the plans. All that can be seen is a hydrant assembly that will be required to be relocated.
Response – Lines are shown, just small and faint. Will be more prominent in future submittals.

Comment 3 – On Sheets #18 to #20, the existing 8" force main is illegible from Morgan-Johnson Road east to Caruso Road. The same is true for the 20" force main on Sheets #20 to #24 and the 8" water line and 36" DIP reclaimed water main.
Response – In future submittals these will be more visible.

Comment 4 – Sheet #24 will need to show the road transition to existing pavement as well as the tie-ins for all utility mains.
Response – See Notes to Reviewer on Sheet 2 4.b. Coordination for the timeframe and tie-in between this project and HDR's project is pending.

Comments from Bill Kersey on the 30% Roadway Plans and Technical Reports

Comment 1 – Manatee County's BCC/INET as well as School Board/SBMC Fiber/Conduit systems are not in conflict with this project.
Response – Comment acknowledged.

Comments from Steve Laney on the 30% Roadway Plans and Technical Reports

Conceptual Bridge Design Report:

Comment 1 – The ends of the bridge at both ends to have rip rap slope protection? The geotech report indicated the west end is to have MSE walls.
Response – the west end is not proposed to have riprap. Our structural and geotech engineers will coordinate and reconcile this.

Comment 2 – Scour is shown to be 3.5 feet for 100year scour and 3.8 feet for the 500 year scour for 18", 24", or 30" piles in the main channel. Not sure how this data was calculated but assume to be a preliminary estimate. Note that Bridge 130144 has 7' scour for the 500-yr storm.
Response – Preliminary numbers were used for the report. Designer will coordinate with hydraulics for more refined scour.

Comment 3 – Does the vertical clearance allow for the addition of a lane along the outside?
Response – There has been no discussion for the widening of either the roadway or bridge for this project. Any future widening would be extremely difficult/expensive, as R/W and powerline constraints exist along the entire corridor. The bridges as currently designed meet the vertical requirements.

Cost Estimate:

Comment 1 – Suggest providing data on the development of the quantities.
Response – Quantities are based on the configurations in section 2 of the report with final quantities listed in the alternative costs.

Roadway Plans:

Comment 1 – Should the roadway widths match the bridge widths up to the intersections on each side versus constricting down and the tapering back out for the turn lanes?
Response – This will be reviewed for the 60% submittal.

Preliminary Geotech Report:

Comment 1 - No ground or water surface elevations provided for the borings? However, elevations were provided in the FB-Deep program runs. Are these accurate for the borings?
Response – The boring elevations will be indicated on the report of core boring sheets in the next submittal. The elevations used in the FB-Deep analysis were correct.

Comment 2 – For boring B-3, was there no water depth before hitting mudline?
Response – The boring elevations will be indicated on the report of core boring sheets in the next submittal.

Comment 3 – For borings B-2 and B-4, a remark indicates that these were water borings, however, did the borings begin at ground level?
Response - The boring elevations will be indicated on the report of core boring sheets in the next submittal.

Comment 4 – Since no soil parameters provided for pier lateral analysis, assume there will be provided and coordinated with bridge engineers during design for 60% bridge plans in the "Final" Preliminary Geotechnical Report.
Response – Yes. The soil parameters for pile lateral capacity analysis and design will be included in the next report submittal.

Comment 5 – Should scour also be evaluated for the MSE wall location at the west end or will scour protection be provided?
Response – We will coordinate and reconcile. We will include scour analysis for MSE, if they are utilized in the project.

Typical Section:

Comment 1 – Bridge Typical Section not included.
Response – If a Bridge Typical Section is required, it will be included in the next submittal.

Base Clearance Water Elevation Memorandum:

Comment 1 – No other comments.
Response – Comment acknowledged.

Stormwater Alternative Site Evaluation Memorandum:

Comment 1 – Was the runoff from the bridge included with the pond siting calculations?
Response – Yes, the runoff from the bridge is included in the basin area for the appropriate pond(s).

Technical Memorandum Water Main River Crossing Alternative Analysis:

Comment 1 – To provide the best protection for the water main located along the median of the bridge and lesson distraction to drivers, recommend using 42” Type F median barriers but also consider using the latest FDOT single slope shaped barriers for the 42” height. May also want to consider a 1’ or 2’ higher barrier, if necessary, to conceal the pipe more.
Response – Bridge barrier types will be further evaluated throughout the process, although the Type F 32” barrier proposed is considered as adequate protection. The pipe could be painted the same color as the barrier coating so as to make is less noticeable.

Comments from Taha Ataya for Roadway Plans and Technical reports:

General:

Comment 1 – Please update or field check aerials for recent residential construction. Please make sure to account for, and show all new construction after date of aerial utilized.
Response – Current available FDOT aerials (2014) are utilized. More current photography will be investigated.

Comment 2 – Please review tie in with old 44th Avenue (Sheet 14). Acute angle shown. Please indicate deflection and conform to Plan Prep Manual requirements.
Response – The Old 44th Ave is shown as to remain as a drivewat access for a possible kayak facility.

Comment 3 – NGVD 29 and NAVD 88 are both used in the plans and reports, please reconcile.
Response – The project is in NAVD 88. The conversion from NVGD 29 to NAVD 88 is as follows: NGVD 29 – 0.97' = NAVD 88. This will be revised.

Comment 4 – Front Cover – Please switch AECOM font size with Hardesty, county contract is with AECOM.
Response – Font size will be adjusted.

Comment 5 – Please re-examine the deflection angle of the intersection alignment at 44th Avenue and Morgan Johnson Road. The intersection may be realigned to be square, by shifting the southern leg slightly further west. Please indicate deflection, again conform to current standards.
Response – Caruso Road was initially designed to reduce the impacts to the King family parcel. Based on this comment and others, we will review realigning the southern leg to conform to the County's comments.

Comment 6 – Please include a new sheet in the 60% plan set to summarize right of way requirements, parcel ID, owner name, address, total parcel area in acres and square feet, nature of take, amount of take again in both units, remainder, notes. Please also break out the full takes on a separate table under the complete list.
Response – This information will be provided on subsequent submittals.

Comment 7 – Please reference Traffic Engineering's comments concerning the cul-de-sac and alignment at Old Caruso Road.
Response – The alignment of Caruso Road and the use of a cul-de-sac will need to be further discussed with County representatives.

Roadway Plans:

Comment 8 – comment CIII – "County's" not "Counties".
Response – Agree, will revise.

Comment 9 – Clarify Caruso Road cul-de-sac condition. Reconcile with Traffic Engineering's comments; or cross hatch, label or legend segment of Caruso Road to be removed.
Response – Comment acknowledged.

Comment 10 – Sheet 3 – Check on new residential construction.
Response – Impacts to the new residence will be reviewed and evaluated for possible alternatives.

Comment 11 – Sheet 5 – Typical section station listed as 197+20.00, while Begin Bridge on sheet 2 is listed as 197+40.00.
Response – Will review callouts for consistency.

Comment 12 – Sheet 5 – Typical section end station 261+60.00 while end of project is 264+00.00.
Response – Will review callouts for consistency. Follow-up coordination with HDR regarding project limits and construction timeframes.

Comment 13 – Sheet 5 – Please check Typical Section LBR with County's design requirements.
Response – Will revise to LBR 60.

Comment 14 – Sheet 5A – Please also show a Bridge Typical Section from 197+20.00 to 21+20.00 on sheet 5 or a Sheet 5A.
Response – A bridge typical section will be included on the structural plans.

Comment 15 – Sheet 6 – Sheet 2 lists begin project at 166+50.00. Please duplicate curve data from sheet 8 in small scale or add a note that curve data is on sheet 8.
Response – Will review callouts for consistency. Reason to include curve data in a table on Sheet 8 is to keep layout sheets clean. Will add note.

Comment 16 – Sheet 9 – Note 15: "…with requests from property owners, and county coordination".
Response – Will revise note.

Comment 17 – Sheet 10 – Remove Match line 159+50.00.
Response – Will remove.

Comment 18 – Sheet 14 – Tie in with old 44th Avenue needs revision. Sight distance triangles, acute angle connection, safety, stop condition, etc.
Response – Old 44th Ave is shown to remain as a driveway for a possible kayak facility. Further discussions with County representatives are needed.

Comment 19 – Sheet 18 – Match Line Sta 325+50.00, add note "Sheet 28".
Response – Will revise.

Comment 20 – Sheet 18 – Match Line 502+00.00, add note "Sheet 29".
Response – Will revise.

Comment 21 – Sheet 24 – Remove Match line 264+50.00.
Response – Will revise.

Comment 22 – Rotate 314+00.00 text.
Response – Will revise.

Comment 23 – Match Line Sta 321+00.00, add note "Sheet 27".
Response – Will revise.

Comment 24 – Sheet 28 – Match Line Sta 325+50.00, add note "Sheet 18".
Response – Will revise.

Comment 25 – Sheet 29 – Match Line Sta 502+00.00, add note "Sheet 19".
Response – Will revise.

Comment 26 – Sheet 30 – Match Line Sta 307+00 is on sheets 25 and 26. If the intent is to show cul-de-sac treatment at 45th Avenue Drive East, revise label. One M.L. cannot be on more than 2 sheets (for clarity).
Response – Will revise.

Comment 27 – Sheet 31 – Match Line 924+50.00? (Beyond project limits).
Response – Will revise to callout matching to sheet 20.

Comment 28 – Sheet 32 – 48 – Please reorder profile sheets to follow plan sheets. You may renumber all sheets or use 10 and 10A, 11 and 11A, etc. Please keep the structure of Plan & Profile.
Response – Agree, will number sheets to match plan views.

Comment 29 – Sheet 65 – Check cross section 182+50.00. (182+00 & 182+50 should be similar).
Response – Sta 182+00 Rt is Useppa Dr. Sta 182+50 is outside of the limits of Useppa Drive.

Comment 30 – Sheet 75 – Similarly check section 193+00 (PC 192+98.56). Perform cursory check (QA/QC) for all remainder sections.
Response – With so many variables still up in the air, including the requirements/needs for right turn lanes, the designer felt that providing a preliminary run of cross sections at 30% would be sufficient to show enough information to the reviewers to generate comments and further direction to move ahead to 60% plans.

Comment 31 – Sheet 152 (a) Note 1 – "…latest version of the MUTCD"; (b) Note 5 – Index 600, Sheets xx to xx (if applicable), a little more specific; (c) Note 13 - …Nighttime hours, if applicable,… Do not wish to give the impression that nighttime work will be permitted, without County's and Engineer's prior consent.
Response – (a) Agree, will revise; (b) will revise to include sheet 12 of 12; (c) will revise note to state "Nightime work shall not be permitted without the County and Engineer's prior consent. The contractor shall provide adequate lighting for construction operations as determined by the Engineer. No additional compensation will be allowed for nighttime work."

Comment 32 – Sheet 153 - …properties and side streets. Access to all properties shall be maintained…
Response – Will revise.

Comment 33 – Sheet 155 – Please incorporate a full traffic control plan with next submittal.
Response – Agree, FDOT PPM requirements for 30% only require a TCP concept.

Base Clearance Water Elevation Report:

Comment 34 – Page 2* - Description – location map is in appendix B not A.
Response – Description will be revised accordingly.

Comment 35 – Page 2 – Please add "…one foot, Table 2.6.3 Criteria for Grade Datum." When referencing PPM.
Response – Text will be added as requested.

Comment 36 – Page 3 – Is "attachment A" referenced Appendix A? Please reorder the appendices reference. A, B, then C.
Response – Reference to "Attachment A" will be corrected to refer to Appendix A. Appendices will be ordered as referenced in the Narrative.

Comment 37 – Page 3 – List Table 1's Title, in recommendation and attachments.
Response – Title of Table will be added as requested.

Comment 38 – Page 5 – Table 1 – Sta 167+00 LEOP, Please add 166+39.00 Match Exist. Check grades between 166+39 and recommended 167+00.
Response – 166+39 will be added, and interim grade verified as requested.

Comment 39 – Page 5 – Note only – ESHGWT and GSE do correspond to page 156 soils report.
Response – Comment noted. Final boring data will be reviewed to ensure consistency between Soils report and drainage design reports.

Comment 40 – Page 7 – Please trim project location box at east end. We end at Plaza East diagonal.
Response – Project location box will be trimmed to more accurately reflect precise project limits.

Comment 41 – Pages 9, 10 – superfluous. Please remove.
Response – The Geotech report was originally included for reference, but has been submitted under separate cover. To reduce the final size of the BCWE (and SASE), this appendix will be

restricted to the excerpts of the actual data used in the applicable design elements. "Superfluous" sheets will be removed as noted.

Comment 42 – Page 13 – reference to "Pinellas County".
Response – The reference on page 1 of the Geotech report (Purpose and Scope of Work – page 13 of the BCWE) will be corrected to reference the Manatee County Soil Conservation Service.

Conceptual Bridge Design Report:

Comment 43 – Page 1 – "…electrical transmission line…" please indicate north or south side.
Response – Will reference the north side.

Comment 44 – Page 6 – Consider moving paragraph on water main options "…water main option 3…" to section 2.5 after Table 1. Keep "Alternative A5 with water main option 3…" in section 2.6.
Response – Will revise.

Flexible Pavement Design Report:

Comment 45 – Page 1 – Classification – "…4-lane divided urban…?" Collector, Minor Arterial, Principal Arterial, Local?
Response – Will add requested designation.

Comment 46 – Page 1 – Please add Caruso classification.
Response – Will add requested designation.

Comment 47 – Page 1 – ESAL calculations, please reference Appendix C.
Response – Will add reference to Appendix C.

Comment 48 – Page 1 – Table 5.1 cited FBDM.
Response – Will clarify.

Comment 49 – Page 2 – Plans list design year 2040, report states 2036. Opening years are also 2020 and 2036. Please reconcile all.
Response – Design and opening years will be reconciled.

Comment 50 – Page 2 – SHWGBC – 3 and 5 feet below existing pavement, please add clearance to base to correspond to that report (1').
Response – Will add.

Comment 51 – Structural number shown 4.45. Design Sn 4.52. Caruso 4.10 and 4.30. However, please check LBR county standards.
Response – Will check County LBR standards.

Comment 52 – Page 30 – Unsigned QA sheet…please sign and date.
Response – Will add signature and date.

Stormwater Alternative Sites Report:

Comment 53 – Please review pond siting recommendations with updated aerial data (new construction).
Response – Updated aerial data will be reviewed as noted, and recommendations reviewed and revised as necessary to account for any new construction.

Comment 54 – Please move pond siting exhibits to front of Appendix B, before the reports.
Response – Appendices will be re-ordered as noted.

Comment 55 – SMF-2C seems to have a very high projected cost per acre. Please update for recent construction and review as a preferred option.
Response – Note that the acquisition cost is driven by the total parcel size, and includes the portion of the parcel already impacted by the proposed roadway alignment. The current roadway alignment renders 2 of these 3 parcels unusable (also wiping out the buildings), necessitating a total take. While the 3rd could theoretically be used, the construction of the road in a relatively high fill places the proposed R/W in close proximity to the existing dwelling, rendering this parcel problematic. The acquisition cost to assign a "pro-rata" portion to the cost to the pond acquisition, to more accurately reflect the cost of the portion of the property used for the actual pond construction. This will be done for each alternative as appropriate (i.e. Alt 2B). Aerials will be reviewed as noted, and estimates of R/W acquisition costs updated as appropriate, but this is not expected to change the proposed "preferred alternative" for Basin 2, for the reasons noted above.

Comment 56 – Page 11 – Please add the underlined "…an estimate of right of way acquisition, listed in Table 1…". This is to clarify why the costs listed in tables 1 and 3 do not match (due to construction costs).
Response – Text will be added to Section 7.1 (page 11) as requested.

Comment 57 – Please update summary tables in light of new data for SMF-2C.
Response – Tables will be updated as requested, and as noted in the response to comment #55.

Comment 58 – Please add 20% to 25% to "Zillow" values or consult a real estate valuation professional for an appropriate safety factor.
Response – A 25% "safety factor" will be added to the estimated of R/W acquisition cost as requested.

Comment 59 – Please update pond sizing calculations after response to various comments and readjustments.
Response – Pond sizing calculations and exhibits will be updated as appropriate upon incorporation of comments by all reviewers.

Geotech Report:

Comment 60 – Please indicate criteria (expound) for bridge foundation to achieve design capacity above artesian conditions.
Response – The FDOT maximum allowable driving resistances for 18-inch, 24-inch, and 30-inch piles are 300, 450, and 600 tons, respectively. The results of the FB-Deep analysis indicated the maximum allowable driving resistance would be achieved at approximate elevation -40.0, which is higher than the artesian-encountered elevation of -60.0. The factored design load for the piles would not be higher than the maximum allowable driving resistance; therefore the design pile tip elevation will be at a higher elevation than the elevation where the artesian condition was encountered. No breaching is anticipated.

Comment 61 – Please indicate that foundation loads have not yet been determined in the beginning pages' bullets.
Response – We anticipate the design loads will be available prior to the next submittal.

Comment 62 – Please provide scour analysis in upcoming reports (60% - Final).
Response – We will include scour analysis in the next report submittal.

Comment 63 – Recommendation for Pre-construction vibration monitoring and documentation (crack and damage) within the zone of influence for pile driving should be listed (in the front page bullets).
Response – We will add the vibration monitoring requirements.