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GEOTECHNICAL ENGINEERING REPORT
G-6A PUMP STATION
WEST PALM BEACH, FLORIDA

UES PROJECT NO. 0630.2000012
UES REPORT NO. 17223

Prepared For:

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
Attn.: Ms. Holly Jarvinen

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August 6, 2020

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

Attention: Ms. Holly Jarvinen

Reference: Draft Geotechnical Engineering Report
G-6A Pump Station
West Palm Beach, Palm Beach County, FL
UES Project No. 0630.2000012; UES Report No. 17223

Dear Ms. Jarvinen:

Universal Engineering Sciences (UES) has completed geotechnical services for the above-referenced project in general accordance with Work Order Revision No. 4600003736-WO03R2 dated June 8, 2020. These services were performed in accordance with generally accepted soil and foundation engineering practices, no other warranty, expressed or implied, is made.

This report contains the results of the subsurface exploration, an engineering interpretation of the results with respect to the project characteristics as described, and recommendations for foundation design.

We appreciate the opportunity to work with you on this project and look forward to a continued association. If you have any questions please contact the undersigned.

Respectfully submitted,
UNIVERSAL ENGINEERING SCIENCES
Certificate of Authorization No. 549

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TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

This report contains the results of a geotechnical exploration conducted for the proposed pump station in West Palm Beach, Palm Beach County, Florida. A Site Location Map is included as Page A-1 in Appendix A. This report includes the following sections:

- SCOPE OF SERVICES - Defines what services were completed
- FINDINGS - Describes what was encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- SUMMARY - Reviews the material in this report
- APPENDICES - Presents support materials referenced in this report.

1.2 PROJECT DESCRIPTION

Our understanding of the proposed construction is based on review of a site plan provided by South Florida Water Management District (SFWMD) that was referenced for our subsurface exploration and geotechnical engineering report.

The project consists of design and construction of 1,100 CFS pump station at about 800 feet west from the existing S-6 pump station, bridge, and stilling well. The new pump station will be located within the West Palm Beach Field Station Area. The project is located at the intersection of L-15 Canal and STA-2 Inflow Canal I, about 20 miles southeast of the Town of Belle Glade in Palm Beach County. A Site Location Map is included as Page A-1 in Appendix A.

The recommendations contained herein are based upon the above considerations. If any of this information is incorrect or if you anticipate any changes, UES should be notified immediately to review and possibly amend the recommendations contained in this report.

2.0 SCOPE OF SERVICES

2.1 PURPOSE

The purposes of this geotechnical exploration were:

- to explore and evaluate the subsurface conditions at the site by advancing SPT (Standard Penetration Test) soil borings with special attention to potential geotechnical considerations that may affect the proposed design, construction, and serviceability of the proposed improvements; and

- to provide geotechnical engineering recommendations for groundwater considerations, and foundation design.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES would be pleased to perform these services, if you desire.

2.2 FIELD EXPLORATION

The subsurface conditions at the site were explored with a total of fifteen (15) Standard Penetration Test (SPT) borings designated B-1 through B-11, B-11A, and B-12 through B-14, drilled to depths of 30 to 100 feet. Borings B-1 and B-2 were drilled close to the center of canal. Borings B-3 through B-14 were drilled at the top of banks, and B-14 was drilled near the canal bank. The approximate locations of the soil borings are presented in Appendix B, Report of SPT Borings and Boring Location Plan.

The SPT borings were advanced to their respective depths using the rotary wash method; samples were collected while performing the SPT. We completed the SPT in general accordance with ASTM D-1586 guidelines, with continuous sampling to its full depth. The SPT test consists of driving a standard split-barrel sampler (split-spoon) into the subsurface using a 140-pound hammer free-falling 30 inches. The number of hammer blows required to drive the sampler 12 inches, after first seating it 6 inches, is designated the penetration resistance, or SPT-N value. This value is used as an index to soil strength and consistency.

Ten (10) 5-foot rock corings were performed at borings B-3 through B-6, B-9 through B-12, and B-11A. Rock cores were placed in a box and transported to our laboratory for inspection and testing. Soil samples collected during the SPT were placed in clean sample containers and transported to our laboratory where they were visually classified by a member of our geotechnical engineering staff in accordance with ASTM D-2488. These soil samples will be held in our laboratory for your inspection for 90 days, after which time they will be discarded unless we are otherwise notified.

2.3 LABORATORY TESTING

The soil samples recovered from the split-barrel sampler were classified in general accordance with ASTM D 2488. Representative soil samples were then selected from the retained soils and tested in our laboratory for sample specific classification in general accordance with the guidelines of ASTM D 2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). The samples will be retained for a period of six months from date of completion of field work. All laboratory data is summarized and report sheets included in Appendix B. The following is a summary of the laboratory tests performed for this study:

- Twenty-seven (27) Moisture Content Tests – ASTM D 2216 (Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

- Thirteen (13) Organic Content Tests – ASTM D 2974 (Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and other Organic Soils.

- Twenty (20) Grain Size Distribution – ASTM C 136 (Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- Fourteen (14) Wash #200 Fines Content Determinations – ASTM D 1140 (Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve).

- Two (2) Corrosion Series Tests FM 5-550 – Florida Method of Test for Determining pH of Soil and Water, FM 5-553 – Florida Method of Test for Determining Sulfate of Soil and Water, FM 5-552 – Florida Method of Test for Determining Chloride of Soil and Water, and FM 5-551 – Florida Method of Test for Determining Resistivity of Soil and Water

- Four (4) Unconfined Compressive Strength of Intact Rock Core Specimens – ASTM D 2938 – 95

- Four (4) Split Tensile Strength of Intact Rock Core Specimens – ASTM D 3967 – 08

3.0 FINDINGS

3.1 SURFACE CONDITIONS

The site lies on two dirt roads with an existing canal in between. Ground surface elevations of the soil borings ranged from +13.01 feet to 26.38 feet NAVD 88. The ground surface elevations were provided to us by SFWMD. Ground surface elevation of each boring is shown on the attached boring logs in Appendix B. Site photos are included in Appendix B. U.S.G.S topographic quadrangle maps and the USDA Soil Conservation Service Soil Survey of Palm Beach County were reviewed for relevant information about the site. Review of the Palm Beach County Soils Survey, indicates the site is mapped within Terra Ceia muck, drained, frequently ponded, 0 to 1 percent slopes and Water-Udorthents complex, 0 to 35 percent slopes.

Terra Ceia muck is a nearly level, very poorly drained, deep, organic soil. This soil is in broad, freshwater marsh areas. It formed in thick deposits of hydrophytic plant remains. It has the pedon described as representative of the series. Under natural conditions, this soil is covered by water, or the water table is within 10 inches of the surface for 6 to 12 months in most years, except during extended dry periods.

3.2 SUBSURFACE CONDITIONS

The results of our field exploration and laboratory analysis, together with pertinent information obtained from the SPT borings, such as soil profiles, penetration resistance and groundwater levels are shown on the boring logs included in Appendix B. The Key to Boring Logs is also included in Appendix B. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, and may not depict exact subsurface soil conditions. The actual soil boundaries may be more transitional than depicted. A generalized profile of the soils found at our boring locations is presented in Table 1. The soil profile was

prepared from field logs after the recovered soil samples were visually classified by a member of our geotechnical staff.

TABLE 1: GENERAL SOIL PROFILE

Approx. Stratum Elevation (feet)		Soil Description
From	To	
+26 to +5	+7 to 0	Loose to very dense limerock (FILL), very loose muck/peat, loose to very dense limestone, silty limestone [SP, PT, LS]
+7 to 0	-30 to -45	Very loose to very dense, limestone, silty sand with limestone, sand with silt and limestone, silty sand [LS, SM-LS, SP-SM, SM]
-30 to -45	-83.5*	Loose to very dense, sand with shell fragments [SP]
* Deepest Boring Termination depth		

Groundwater was measured at during the exploration at an approximate elevations of El. +5.6 feet to El. 14 feet. The difference in groundwater levels are most likely be attributed to the difference in ground surface elevations and groundwater levels at this site may also reflect the surface water level in the nearby L-15 and STA-2 Inflow Canals.

A notable feature found within the generalized subsurface soil profile is the presence of pockets of muck and peat layers found at an approximate elevation of El. +6.5 to El. 0 feet in the test borings.

Thirteen (13) soil samples were tested for organic and moisture content. The test results indicate moisture content of 25 to 188 percent, and organic content of 20.6 to 84 percent. Note that soils with an organic content equal to or greater than 10 percent are typically considered unsuitable for foundation support. Organic soils encountered in structural areas should be removed and replaced with good quality fill according to the specifications and procedures outlined in the Site Preparation section of this report.

3.3 SOIL CORROSION CHARACTERISTICS

UES performed pH, resistivity, sulfates and chloride tests for evaluation of corrosion potential of soils at borings B-11 and B-12 from elevations El. +2 feet to El. -4 feet of composite soil samples and boring B-1 from elevation El. +4.6 feet to El. -8.4 feet of composite soil samples. Collection of soil samples from 0 to 10 feet below grade for borings B-1 (bridge area), B-11 and B-12 (pump station area) was directed by SFWMD. According to the guidelines of the Florida Department of Transportation (FDOT) "Florida-Concrete Design, Environmental Classification and Construction Criteria" (based on the three tier scale of slightly, moderately, and extremely aggressive) the results of the pH, sulfate, chloride, and resistivity tests indicate that the sandy soils in the building area are “moderately aggressive” to steel and concrete.

Therefore, UES does not recommend special cement in concrete or special design or construction for below grade improvements. The results of these tests are listed on the Report of Corrosion Parameters sheet enclosed in Appendix B.

4.0 RECOMMENDATIONS

4.1 GENERAL

The following recommendations are made based on the attached test boring data, our stated understanding of the proposed construction, and our experience with similar projects and subsurface conditions. If subsurface conditions are encountered during construction which were not encountered in the borings, those conditions should be reported immediately to UES for evaluation and possible recommendations. In this section of the report, recommendations are presented for groundwater considerations, foundations and related services.

4.2 GROUNDWATER CONSIDERATIONS

The groundwater table will fluctuate seasonally depending upon local rainfall. The rainy season in South Florida is normally between May and October. Based upon the test boring data, a reasonable estimate for the seasonal high groundwater table is at an approximate elevation of El. +7.6 feet to +16 feet. The existing and estimated seasonal high groundwater table at each location appears on the boring logs in Appendix B.

Note that our estimate of seasonal high groundwater level is based on limited data and does not provide any assurance that groundwater levels will not exceed the estimated level during any given year in the future. If the rainfall intensity and duration or total rainfall quantities exceed those normally anticipated, then groundwater levels will likely exceed the seasonal high estimate.

The estimate of seasonal high groundwater level is made for the site at the present time. Future development of adjoining or nearby properties and development on a regional scale may affect the local seasonal high groundwater table. Universal makes no warranty on the estimate of the seasonal high groundwater table.

UES recommends that all foundation design incorporate assumption of the seasonal high groundwater condition. We recommend that positive drainage be established and maintained on the site during construction. UES further recommends that permanent measures be implemented to maintain positive drainage throughout the life of the project.

4.3 BUILDING FOUNDATIONS

4.3.1 SHALLOW FOUNDATIONS FOR PUMP STATION

After successful completion of the recommendations included in the Site Preparation section of this report, including removal of unsuitable organic soils and replacement with clean compacted granular fill, we anticipate that the proposed pump station can be supported on shallow foundations with a maximum allowable net soil bearing pressure of 4,000 pounds per square foot (psf).

Based on the soil borings, unsuitable organic soils will likely be present to depths of 20 feet or more below existing grade in the areas adjacent to the canal bank. These materials are not considered suitable for foundation support. Excavation of organic soils is feasible using track-mounted hydraulic backhoes. However, limestone layers will likely be present to depths of 10 feet or deeper; excavation through limestone layers will probably require at least the use of a rock toothed bucket, rock saw, or similar means. Excavations that extend below surface water and groundwater levels will require dewatering and sheet pile support (i.e. cofferdams).

Post-construction settlements of the structure will be influenced by several interrelated factors, including: (1) strength and compressibility characteristics of the subsurface; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundations; and (3) site preparation and earthwork construction techniques used by the contractor. Our settlement estimates for the structure are based on the use of site preparation/earthwork construction techniques as recommended above and in Section 4.5 of this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the structure.

Assuming all soils are properly prepared and using the recommended maximum bearing pressure, we estimate that total post construction settlements of the structure will be 1 inch or less.

Differential settlements result from differences in applied bearing pressures and variations in the compressibility characteristics of the subsurface soils. If the recommended site preparation and earthwork construction techniques outlined above and in Section 4.5 are followed, differential settlements of ½ inch or less should be anticipated.

4.3.2 DEEP FOUNDATION FOR BRIDGE

Driven Pre-stressed Precast Concrete Piles (PPC) piles are considered as viable foundation for support of the proposed bridge structure. Pre-stressed concrete piles are readily available and generally have lower unit cost per ton of pile capacity than other pile types. Based on the test borings B-11, B-12, and B-11A and our experience with similar projects, we expect that 18 and 24-inch square PPC piles will be sufficient for the proposed bridge. Pre-drilling may be required in the limestone layer.

4.3.3 AXIAL LOAD ANALYSIS FOR BRIDGE (END BENTS)

UES evaluated pile capacity versus tip elevation using the FBDeep computer program. Printouts of FBDeep Davisson Design Curves results are included in Appendix B. The estimated ultimate Davisson Capacity for 18 and 24-inch PPC piles for bridge end bents are shown in Tables 2 through 4 for borings B-11, B-12, and B-11A respectively.

TABLE 2: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-11)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	79	-4.5
18	109	-19.5
18	121	-29.5
18	121	-44.5
24	115	-4.5
24	171	-19.5
24	180	-29.5
24	171	-44.5

TABLE 3: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-12)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	83	-4.5
18	130	-19.5
18	165	-29.5
18	184	-44.5
24	131	-4.5
24	215	-19.5
24	244	-29.5
24	261	-44.5

TABLE 4: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-11A)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	75	-3.5
18	112	-18.5
18	116	-28.5
18	149	-43.5
18	189	-58.5
18	260	-73.5
24	127	-3.5
24	176	-18.5
24	181	-28.5
24	217	-43.5
24	284	-58.5
24	377	-73.5

4.3.4 AXIAL LOAD ANALYSIS FOR BRIDGE (INTERMEDIATE BENT)

UES evaluated pile capacity versus tip elevation using the FBDeep computer program. Printouts of FBDeep Davisson Design Curves results are included in Appendix B. The estimated ultimate Davisson Capacity for 18 and 24-inch PPC piles for bridge intermediate bent are shown in Tables 5 through 7 for boring B-11, B-12, and B-11A respectively. This analysis include a scour to a depth of elevation El. -5 feet.

TABLE 5: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-11)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	50	-15
18	88	-25
18	88	-35
18	97	-45
24	94	-15
24	144	-25
24	136	-35
24	144	-45

TABLE 6: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-12)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	78	-15
18	124	-25
18	137	-35
18	149	-45
24	130	-15
24	184	-25
24	216	-35
24	219	-45

TABLE 7: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS (B-11A)

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
18	75	-15
18	93	-25
18	92	-35
18	123	-45
18	150	-60
18	230	-75
24	126	-15
24	150	-25
24	144	-35
24	186	-45
24	235	-60
24	336	-75

4.3.5 DEEP FOUNDATION FOR STILLING WELL

Driven Pre-stressed Precast Concrete Piles (PPC) piles are considered as viable foundation for support of the proposed stilling well. Pre-stressed concrete piles are readily available and generally have lower unit cost per ton of pile capacity than other pile types. Based on the test boring B-13 and our experience with similar projects, we expect that 12-inch square PPC piles will be sufficient for the proposed stilling well.

4.3.6 AXIAL LOAD ANALYSIS FOR STILLING WELL

UES evaluated pile capacity versus tip elevation using the FBDeep computer program. Printouts of FBDeep Davisson Design Curves results are included in Appendix B. The estimated ultimate capacity for 12-inch PPC piles are shown in Table 8.

TABLE 8: ESTIMATED PILE CAPACITY & CORRESPONDING TIP ELEVATIONS

PCP Pile Width (Inches)	Estimated Ultimate Davisson Capacity (Tons)	Anticipated Pile Tip Elevation (Ft, NAVD 88)
12	27	20.4
12	48	14.4
12	63	6.4

4.3.7 GEOTECHNICAL PARAMETERS

Table No. 9 shows typical geotechnical design parameters for the materials found in the borings. Note that the specific parameters used for axial and lateral capacity analysis are dependant upon estimated soil density and effective stress conditions. Those estimates are based on Standard Penetration Test (SPT) 'N' values.

TABLE 9: RECOMMENDED SOIL DESIGN PARAMETERS							
Layer Depth (Feet)	Friction Angle (degrees)	Bearing Capacity (psf)	Recommended Earth Pressure Coefficients			Unit Weight (pcf)	
			Active k_a	Passive k_p	At Rest K_o	Saturated	Submerged
0 – 12	28	2,500	0.36	2.77	0.53	110	47.6
12 – 53	32	4,000	0.31	3.26	0.47	125	62.6
53 – 100	33	2,500	0.30	3.39	0.46	120	57.6

4.4 GENERAL PILE INSTALLATION ISSUES

4.4.1 PILE GROUPS

No reduction of the individual pile capacities will be required if piles are spaced center-to-center at three (3) times their width or greater. The pile caps for end bents usually contribute to the overall bearing capacity of the pile group provided they are supported on competent soil outside the outer perimeter of the group. However, we do not recommend including this additional capacity in design calculations due to the possible loss of soil cover at the pile cap.

4.4.2 PILE SETTLEMENT

Settlement of pile supported bridge piers should be small and tolerable for a typical single row pile group. For the typical axial load considered, settlement of a typical 18 and 24-inch square concrete pile is estimated to be on the order of ½ inch. Pile group settlements are estimated to be on an order of magnitude similar to a single row pile group pattern, but will increase slightly for other pile group configurations.

4.4.3 TEST PILES

We recommend a test pile program be conducted to verify driving conditions, determine pile driving criteria, evaluate the hammer system and pile capacities, and to refine production pile lengths. We recommend driving a minimum of 3 test piles at separate bent locations. The test piles should be located in permanent pile locations.

The test piles should be instrumented with the Pile Driving Analyzer (PDA) or equivalent in accordance with FDOT Specification 455. This monitoring will ensure allowable stress levels are not exceeded during driving and provide verification regarding pile capacity. CAPWAP analyses also be performed to confirm PDA results.

4.4.4 FB-MULTIPIER SOIL PARAMETERS

FB Pier soil parameters have been included in Appendix E to assist in lateral stability analysis. Input soil parameters are provided for borings B-11, B-11A, and B-12.

4.5 SITE PREPARATION

We recommend normal, good practice site preparation procedures for areas of planned construction. These procedures include: stripping the site of any deleterious material, proof-rolling, proof-compacting or preparing the subgrade as described below, and filling to grade with engineered fill. A general outline of the anticipated earthwork is as follows:

1. If required, perform remedial dewatering prior to any earthwork operations. We recommend performing earthwork in-the-dry.

2. Prior to construction, any existing underground utility lines within the construction area should be located. Provisions should be made to relocate interfering utilities. Note that underground pipes not properly removed or plugged may serve as conduits for subsurface erosion which may lead to excessive settlement of overlying structures.

3. The proposed construction limits should be stripped of vegetation, construction debris, and other deleterious materials within and 5 feet beyond the perimeter of the proposed building.

4. The site should be graded to direct surface water runoff away from the construction areas. Positive drainage must be maintained throughout the design life of the project.

5. Prepare the pavement subgrade to a minimum of 5-feet beyond the perimeter of the proposed pavement area. The prepared subgrade soils should be observed by a qualified geotechnical engineer or his representative to locate deposits of organic soils, vegetation, excessive roots or debris. Organic soils, vegetation, or deleterious material should be undercut until clean natural soils are encountered.

6. Prior to construction of improvements or placement of fill, the subgrade should be compacted using a smooth drum vibratory roller ***in the static mode***, having a minimum static, at-drum weight on the order of 10 tons and a drum diameter on the order of 3 to 4 feet making a minimum of eight overlapping passes with the second set of 4 passes perpendicular to the first set of 4 passes. Typically, the material should exhibit moisture content within +/- 2 percent of the Modified Proctor optimum moisture content (ASTM D-1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) have been uniformly achieved within the upper 12 inches of the compacted natural soil surface.

7. Place fill material, as required. The fill should consist of sand with less than 10 percent soil fines. Place fill in uniform 10- to 12-inch loose lifts and compact each lift to a minimum density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557). The last 6 inches of fill beneath pavement areas should be compacted to 98 percent of the Modified Proctor maximum dry density. Stabilize this zone with shell or limerock as required to meet the subgrade recommendations contained in the Pavements Section of this report.

8. Complete in-situ density tests on the subgrade and each lift of fill at a frequency of not less than one test per 2,500 square feet in the building area and one test per 10,000 square feet in paved areas.

9. In the lightly loaded structure areas, test compaction to a depth of 1 foot at the bottom of all column footings. We recommend conduct one test for every 50 lineal feet of wall footing.

10. If difficult compaction conditions are encountered during the site work operations, the compaction efforts should stop and the geotechnical engineer should be contacted. The geotechnical engineer or his representative should observe proof-rolling of the exposed subgrade to determine if additional compaction is warranted or if any material needs to be over-excavated and replaced.

If site preparation work is performed during the rainy season (May through October), special care should be taken to maintain positive drainage from the building pad and paved areas to drains or ditches around the site. Unexpected wet periods can also occur in Florida during the “dry” season. Such events can raise water tables to levels above seasonal highs without the associated high temperatures to evaporate ponded water. Therefore, the contractor should practice wet weather means and methods for earthwork during the “dry” season as well. Groundwater and surface water control, use of granular fill material and aeration are typical means to accomplish wet weather grading. All fill materials that are excavated from below the water table should be stockpiled for a sufficiently long period to allow drainage.

4.6 DEWATERING AND EXCAVATION CONSIDERATIONS

Based on the groundwater level conditions encountered, some temporary dewatering may be necessary for the successful construction of this project. Where excavations will extend only a few feet below the groundwater table, a sump pump may be sufficient to control the groundwater table. Deeper excavations may require well points and/or sock drains to control the groundwater table. Regardless of the method(s) used, we recommend drawing down the water level at least 2 feet below the bottom of the excavation. The actual method(s) of dewatering should be determined by the contractor. The design and discharge of the dewatering system must be performed in accordance with applicable regulatory criteria (i.e. water management district, etc.) and compliance with such criteria is the sole responsibility of the contractor.

Excavations should be sloped as necessary to prevent slope failure and to allow backfilling. As a minimum, temporary excavations below 4-foot depth should be sloped in accordance with OSHA regulations. Where lateral confinement will not permit slopes to be laid back, the excavation should be shored in accordance with OSHA requirements. During excavation, excavated material should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth. Provisions for maintaining workman safety within excavations is the sole responsibility of the contractor.

Limestone/Very dense soils (N>~50 bpf) were also found on site at the boring locations and could be encountered during excavations. We recommend the contract documents stipulate the site contractor is solely responsible for reviewing the geotechnical report and boring logs and for selecting their excavation equipment as appropriate without recourse for a change order. The contractor will need to use large excavator (>200,000 bls) with rock bucket and maybe a chisel hammer to break the rock to allow excavation without blasting. The excavated rock will require processing in order to meet gradation requirements.

4.7 CONSTRUCTION RELATED SERVICES

We recommend the owner retain UES to perform construction material testing and observations on this project. Field tests and observations could include items such as verification of foundation subgrade, monitoring of proof-rolling operations, and performing quality assurance tests on the placement of compacted structural fill.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

5.0 LIMITATIONS

Our field exploration found unsuitable materials (i.e., peat) in the test borings. The test borings completed for this report were widely spaced and are not considered sufficient for reliably detecting the presence of isolated, anomalous surface or subsurface conditions, or reliably estimating unsuitable or suitable material quantities.

Accordingly, UES does not recommend relying on our boring information to negate the presence of anomalous materials or for estimation of material quantities. Therefore, UES will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended.

During the early stages of this construction project, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix C, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix C: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

This report is for the exclusive use of our client and our client's design team for this specific project. Information contained in this report may not be used or relied on by others without the expressed written consent of UES.

6.0 SUMMARY

In summary, we have completed a geotechnical exploration for the proposed pump station, bridge, and stilling well at the subject site. Field and laboratory tests have been performed to provide geotechnical engineering recommendations for foundation design.

The soils encountered generally consist of loose to very dense limerock (FILL), very loose muck/peat, loose to very dense limestone, silty limestone [SP, PT, LS] from elevations El. +26 feet to elevations El. +7 feet followed by very loose to very dense, limestone, silty sand with limestone, sand with silt and limestone, silty sand [LS, SM-LS, SP-SM, SM] to elevations El. -30 to -45 feet underlain by loose to very dense, sand with shell fragments [SP] to elevation El. -83.5 feet.

Groundwater was measured at approximate elevation of El. +7.6 feet to +16 feet in the test borings. A reasonable estimate for an average wet seasonal high groundwater table is at an approximate elevation of El. +7.6 feet to +16 feet.

Estimates of allowable soil bearing values and estimates of settlement for the proposed construction are covered in detail within the body of this report. If the subgrade soils are prepared as recommended, the proposed pump station can be supported on a conventional shallow foundation system. The bridge and stilling well can be supported on a deep foundation system.

UES recommends normal, good practice site preparation procedures to prepare the subgrade to support the structures.

APPENDIX A

UNIVERSAL
ENGINEERING SCIENCES

UNIVERSAL
ENGINEERING SCIENCES

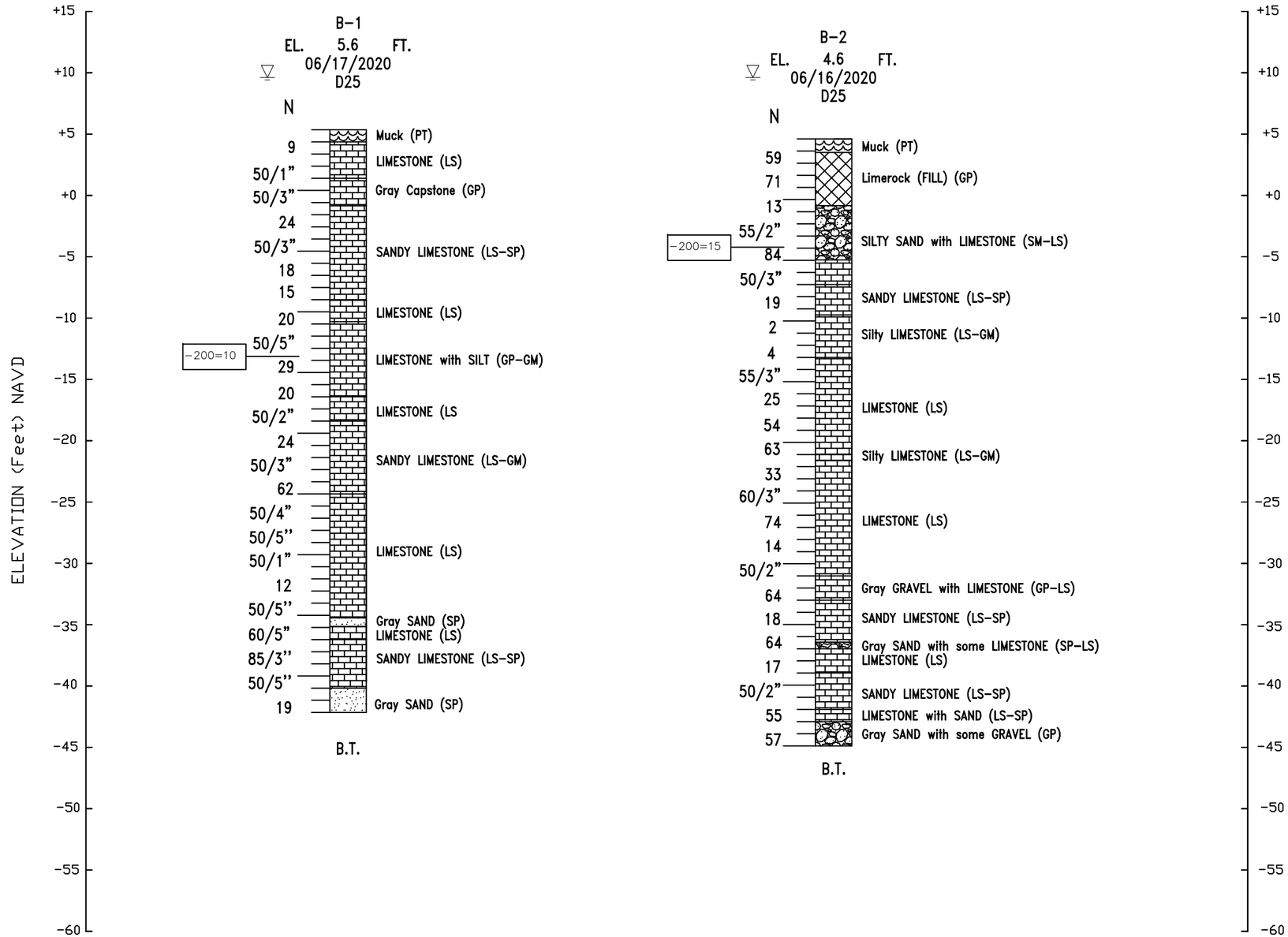
GEOTECHNICAL EXPLORATION SERVICES
G-6A PUMP STATION
WEST PALM BEACH, PALM BEACH COUNTY, FLORIDA

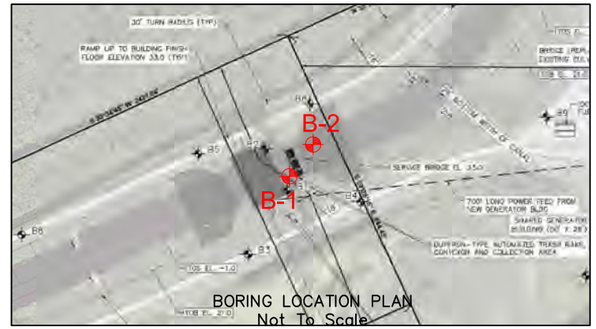
SITE LOCATION MAP

DRAWN BY:	A.G.A.	DATE:	06/08/2020	CHECKED BY:	P.G.R.	DATE:	06/08/2020
SCALE:	N.T.S.	PROJECT NO:	0630.2000012	REPORT NO:	17223	PAGE NO:	A–1

APPENDIX B

UNIVERSAL
ENGINEERING SCIENCES





BORING LOCATION PLAN
Not To Scale

BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE

APPROX. STANDARD PENETRATION TEST BORING LOCATION

B.T. BORING TERMINATED

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

ELEV: GROUND SURFACE ELEVATION IN FEET

WATER TABLE LEVEL AT TIME OF DRILLING

HAMMER TYPE: SAFETY HAMMER

(SP) Unified Soil Classification System Group Symbol based on visual examination

-200 PERCENT PASSING NO. 200 US STANDARD SIEVE

WC NATURAL MOISTURE CONTENT (%)

OC ORGANIC CONTENT (%)

Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)

Qst SPLITTING TENSILE STRENGTH (tsf)

% REC
% RQD ROCK CORING DATA

COHESIVE SOILS CONSISTENCY	SPT (Blows / foot)
Very Soft	less than 2
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	Greater than 30

GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS				Names	Dates
Date	By	Description	Drawn by	O.D.R.	06/22/2020
			Checked by	A.G.A.	06/23/2020
			Revised by	O.D.R.	07/28/2020
			Checked by	A.G.A.	07/28/2020
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
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1818 7TH AVENUE, UNIT 1
LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

UNIVERSAL ENGINEERING SCIENCES

DRAWN BY:
UNIVERSAL ENGINEERING SCIENCES
1818 7TH AVENUE NORTH, UNIT 1
LAKE WORTH, FL 33461
CERTIFICATE OF AUTHORIZATION #549

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

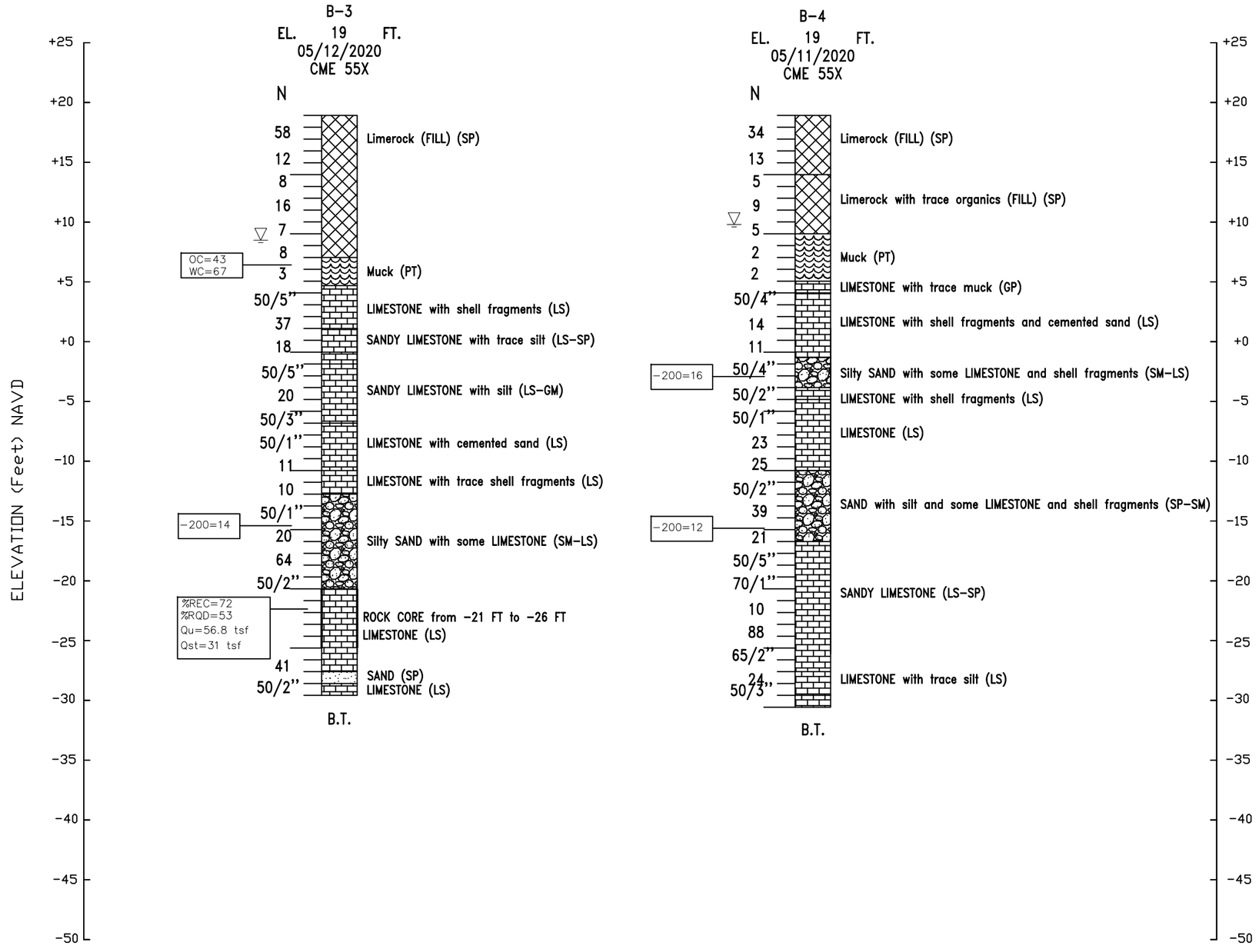
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-1

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE
- APPROX. STANDARD PENETRATION TEST BORING LOCATION
- B.T. BORING TERMINATED
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
- ELEV: GROUND SURFACE ELEVATION IN FEET
- WATER TABLE LEVEL AT TIME OF DRILLING
- HAMMER TYPE: SAFETY HAMMER
- (SP) Unified Soil Classification System Group Symbol based on visual examination
- -200 PERCENT PASSING NO. 200 US STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- OC ORGANIC CONTENT (%)
- Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)
- Qst SPLITTING TENSILE STRENGTH (tsf)
- % REC, % RQD ROCK CORING DATA

COHESIVE SOILS CONSISTENCY	SPT (Blows / foot)
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Hard	Greater than 30

GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS				Names	Dates
Date	By	Description	Drawn by	A.G.A.	05/04/2020
			Checked by	A.G.A.	05/04/2020
			Revised by	O.D.R.	07/28/2020
			Checked by	A.G.A.	07/28/2020
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
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LAKE WORTH, FL 33461
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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

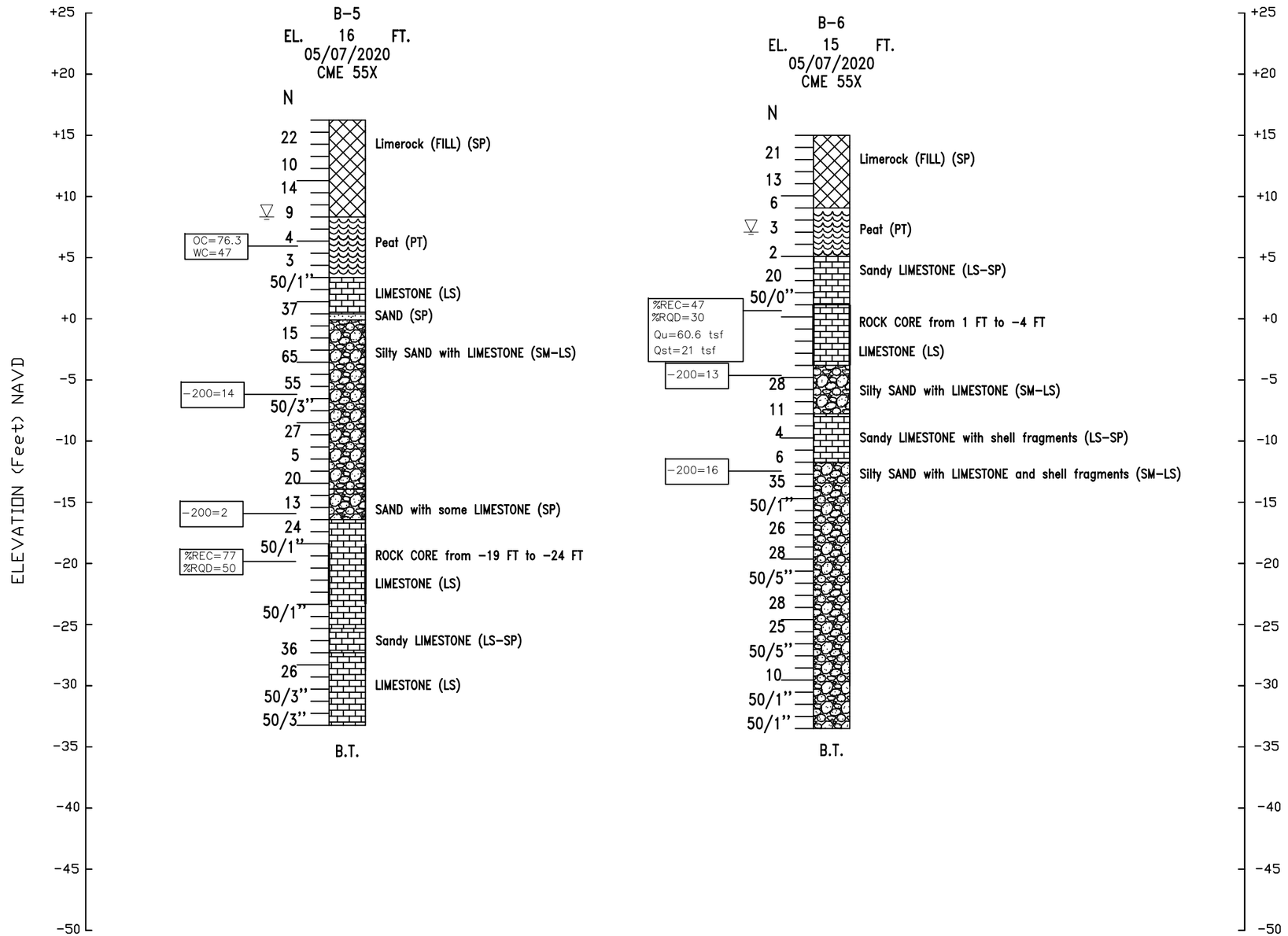
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-2

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE
- APPROX. STANDARD PENETRATION TEST BORING LOCATION
- B.T. BORING TERMINATED
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
- ELEV: GROUND SURFACE ELEVATION IN FEET
- WATER TABLE LEVEL AT TIME OF DRILLING
- HAMMER TYPE: SAFETY HAMMER
- (SP) Unified Soil Classification System Group Symbol based on visual examination
- -200 PERCENT PASSING NO. 200 US STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- OC ORGANIC CONTENT (%)
- Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)
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GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS

Date	By	Description

	Names	Dates
Drawn by	A.G.A.	05/04/2020
Checked by	A.G.A.	05/04/2020
Revised by	O.D.R.	07/28/2020
Checked by	A.G.A.	07/28/2020
Approved by	Peter G. Read, P.E.	

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

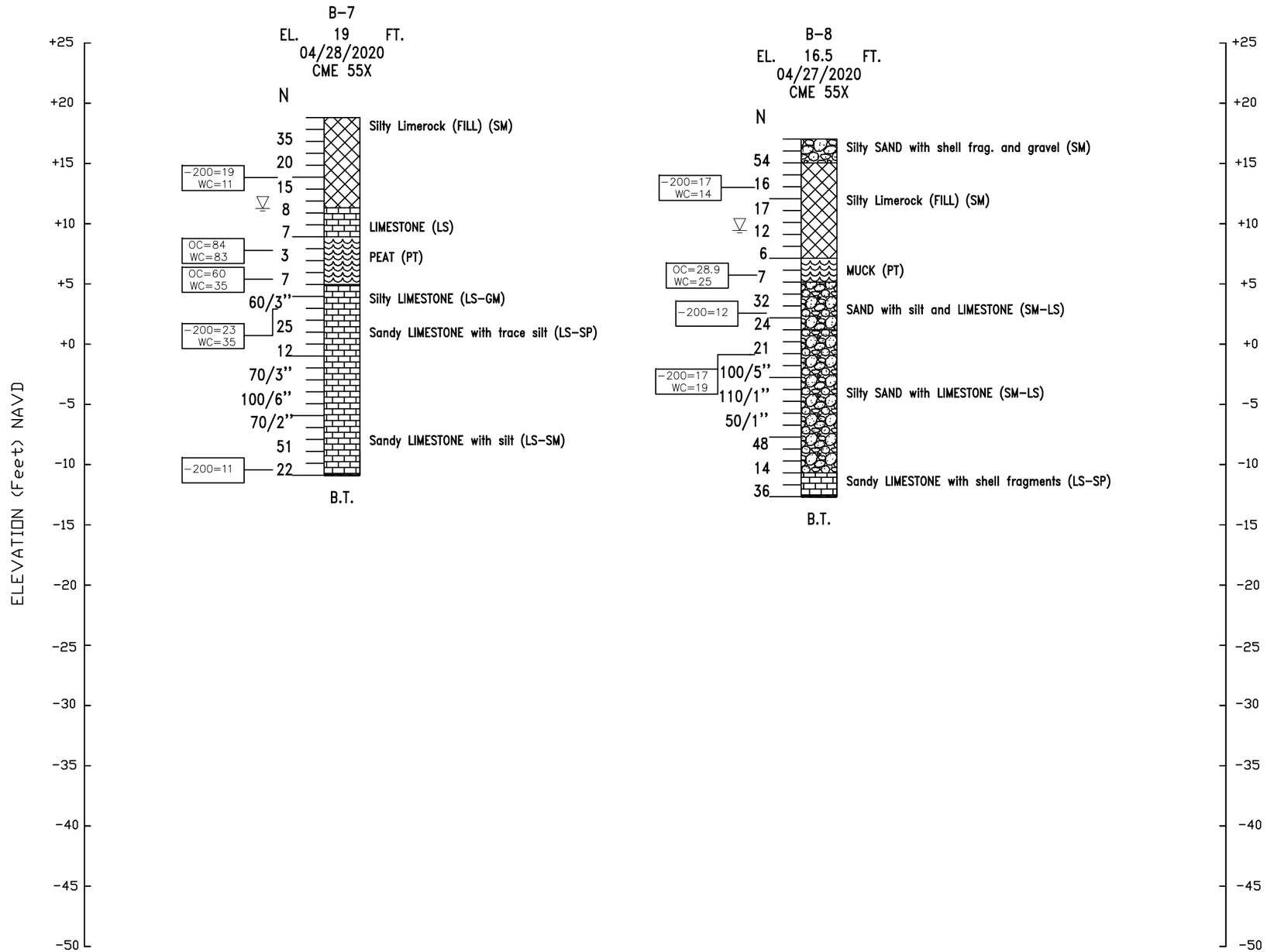
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

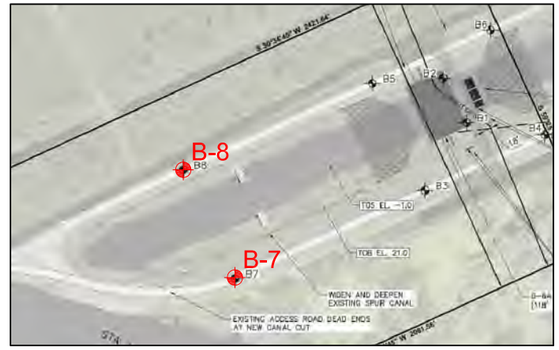
SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-3

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.





BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE, LIMESTONE WITH SILT

- APPROX. STANDARD PENETRATION TEST BORING LOCATION
- B.T. BORING TERMINATED
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
- ELEV: GROUND SURFACE ELEVATION IN FEET
- WATER TABLE LEVEL AT TIME OF DRILLING
- HAMMER TYPE: SAFETY HAMMER
- (SP) Unified Soil Classification System Group Symbol based on visual examination
- −200 PERCENT PASSING NO. 200 US STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- OC ORGANIC CONTENT (%)
- Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)
- Qst SPLITTING TENSILE STRENGTH (tsf)
- % REC, % RQD ROCK CORING DATA

COHESIVE SOILS CONSISTENCY	SPT (Blows / foot)
Very Soft	less than 2
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	Greater than 30

GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS

Date	By	Description

	Names	Dates
Drawn by	A.G.A.	05/04/2020
Checked by	A.G.A.	05/04/2020
Revised by	O.D.R.	07/28/2020
Checked by	A.G.A.	07/28/2020
Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

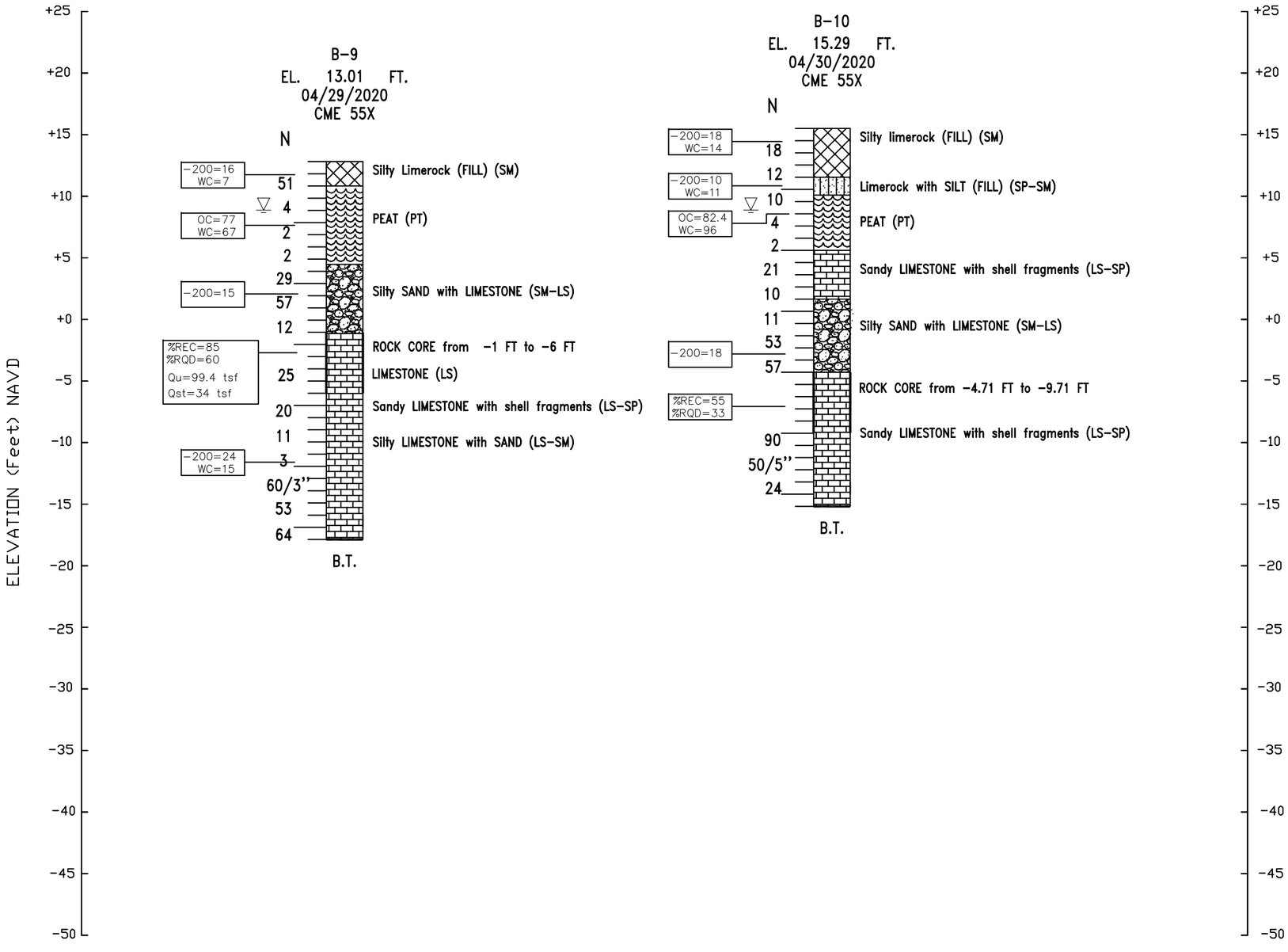
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

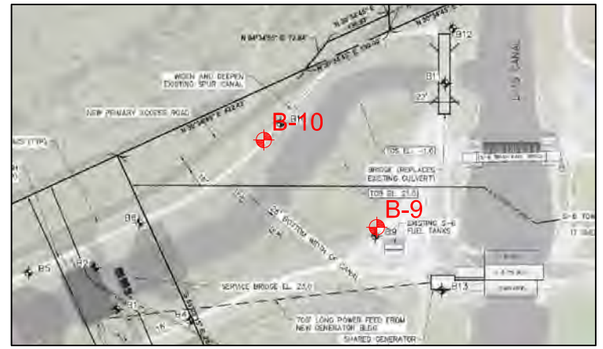
SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-4

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.





BORING LOCATION PLAN
Not To Scale

LEGEND:

SAND	PEAT
SAND WITH SILT	SAND WITH SHELLS
SILTY SAND	SAND OR SILTY SAND WITH LIMESTONE
FILL	
ROCK CORE	LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE

APPROX. STANDARD PENETRATION TEST BORING LOCATION

B.T. BORING TERMINATED

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

ELEV: GROUND SURFACE ELEVATION IN FEET

WATER TABLE LEVEL AT TIME OF DRILLING

HAMMER TYPE: SAFETY HAMMER

(SP) Unified Soil Classification System Group Symbol based on visual examination

-200 PERCENT PASSING NO. 200 US STANDARD SIEVE

WC NATURAL MOISTURE CONTENT (%)

OC ORGANIC CONTENT (%)

Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)

Qst SPLITTING TENSILE STRENGTH (tsf)

% REC
% RQD ROCK CORING DATA

COHESIVE SOILS CONSISTENCY	SPT (Blows / foot)
Very Soft	less than 2
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	Greater than 30

GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS				Names	Dates
Date	By	Description	Drawn by	A.G.A.	05/04/2020
			Checked by	A.G.A.	05/04/2020
			Revised by	O.D.R.	07/28/2020
			Checked by	A.G.A.	07/28/2020
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
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LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

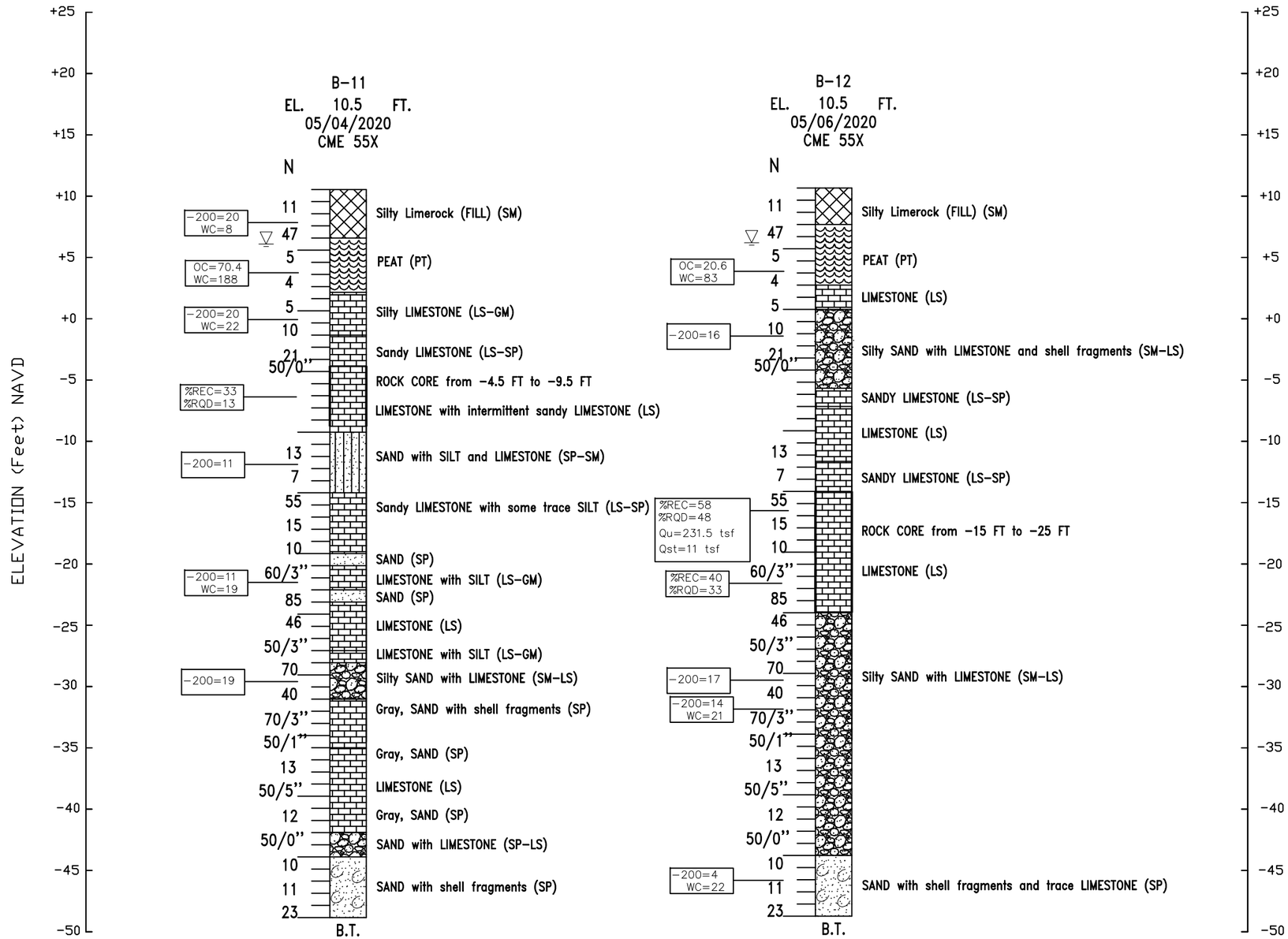
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

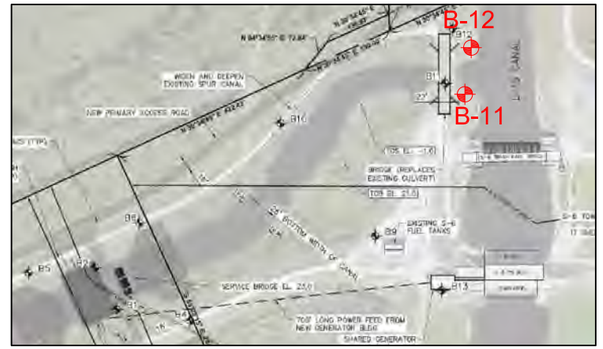
SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-5

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.





BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE

- APPROX. STANDARD PENETRATION TEST BORING LOCATION
- B.T. BORING TERMINATED
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
- ELEV: GROUND SURFACE ELEVATION IN FEET
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- HAMMER TYPE: SAFETY HAMMER
- (SP) Unified Soil Classification System Group Symbol based on visual examination
- -200 PERCENT PASSING NO. 200 US STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- OC ORGANIC CONTENT (%)
- Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)
- Qst SPLITTING TENSILE STRENGTH (tsf)
- % REC, % RQD ROCK CORING DATA

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Very Soft	less than 2
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GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
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REVISIONS		
Date	By	Description

	Names	Dates
Drawn by	A.G.A.	05/04/2020
Checked by	A.G.A.	05/04/2020
Revised by	O.D.R.	07/28/2020
Checked by	A.G.A.	07/28/2020
Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
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LAKE WORTH, FLORIDA 33461
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UNIVERSAL ENGINEERING SCIENCES

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

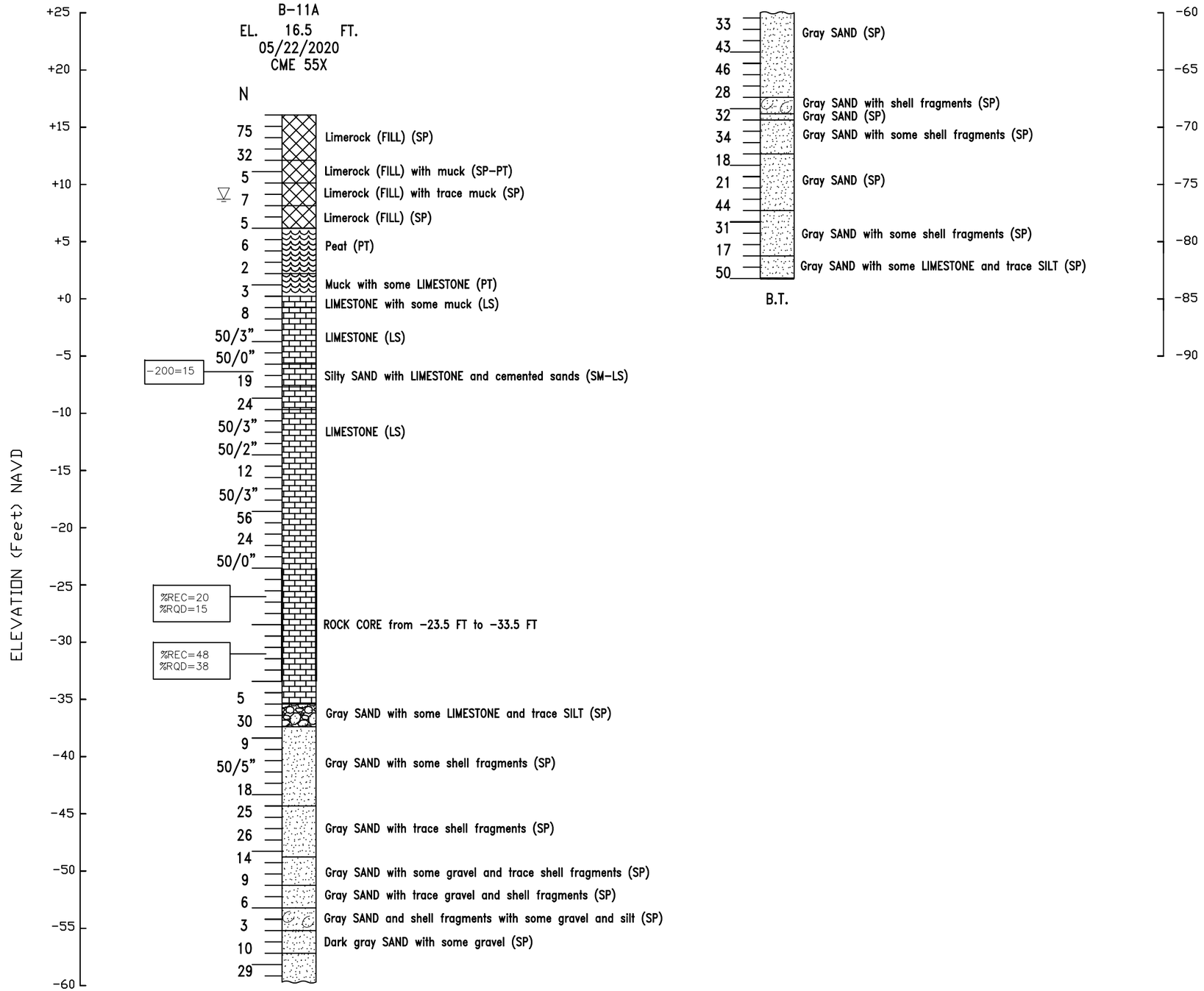
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-6

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



BORING LOCATION PLAN
Not To Scale

LEGEND:

SAND	PEAT
SAND WITH SILT	SAND WITH SHELLS
SILTY SAND	SAND OR SILTY SAND WITH LIMESTONE
FILL	
ROCK CORE	LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE

APPROX. STANDARD PENETRATION TEST BORING LOCATION

B.T. BORING TERMINATED

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

ELEV: GROUND SURFACE ELEVATION IN FEET

WATER TABLE LEVEL AT TIME OF DRILLING

HAMMER TYPE: SAFETY HAMMER

(SP) Unified Soil Classification System Group Symbol based on visual examination

-200 PERCENT PASSING NO. 200 US STANDARD SIEVE

WC NATURAL MOISTURE CONTENT (%)

OC ORGANIC CONTENT (%)

Qu UNCONFINED COMPRESSIVE STRENGTH (tsf)

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Very Loose	0-4
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REVISIONS

Date	By	Description

	Names	Dates
Drawn by	O.D.R.	06/10/2020
Checked by	A.G.A.	06/10/2020
Revised by	O.D.R.	07/28/2020
Checked by	A.G.A.	07/28/2020
Approved by	Peter G. Read, P.E.	

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

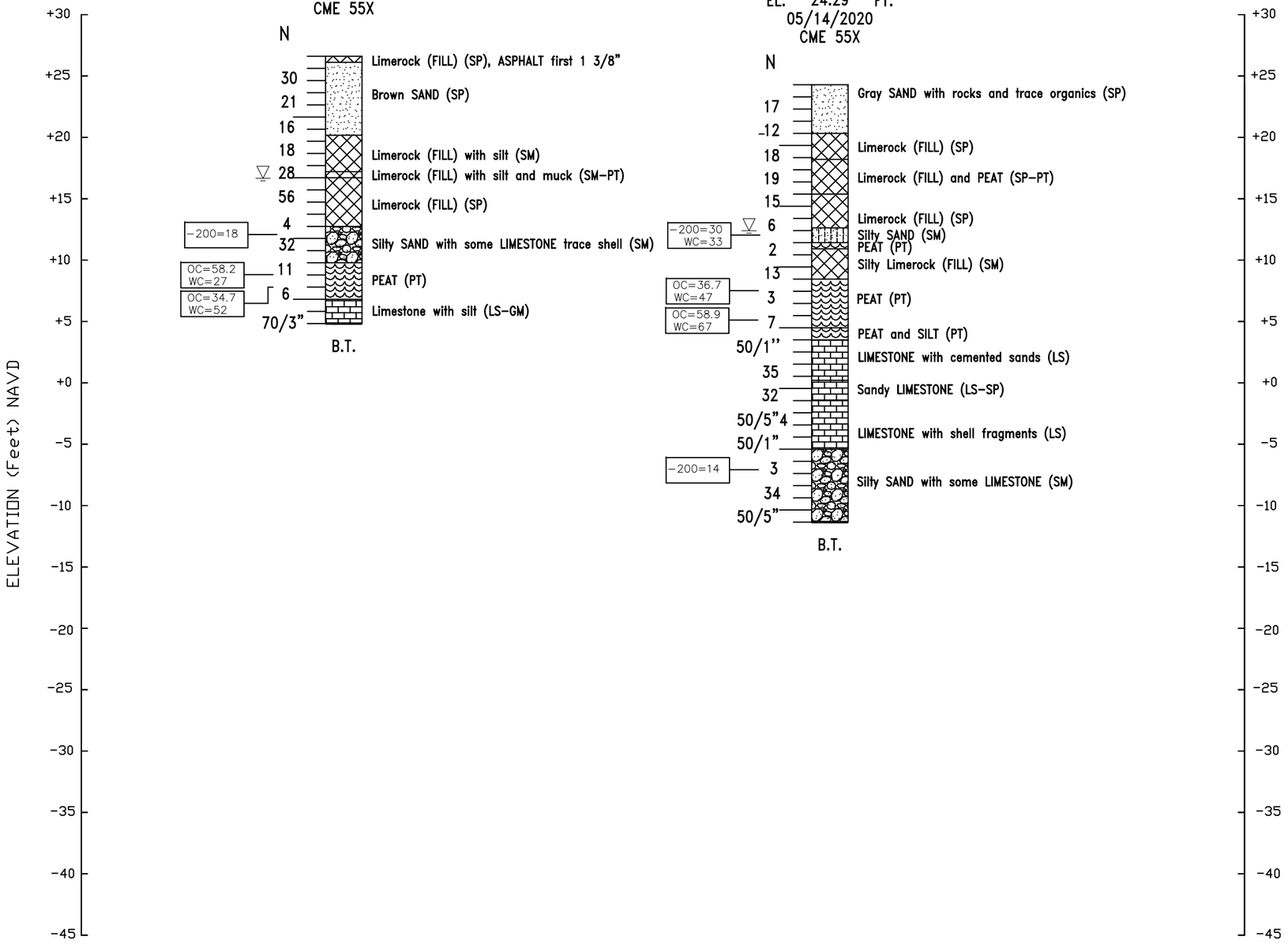
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-7

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



BORING LOCATION PLAN
Not To Scale

LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE, LIMESTONE WITH SILT

APPROX. STANDARD PENETRATION TEST BORING LOCATION

B.T. BORING TERMINATED

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-200 PERCENT PASSING NO. 200 US STANDARD SIEVE

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Hard	Greater than 30

GRANULAR MATERIALS RELATIVE DENSITY	SPT (Blows / foot)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

REVISIONS				Names	Dates
Date	By	Description	Drawn by	O.D.R.	05/20/2020
			Checked by	A.G.A.	05/20/2020
			Revised by	O.D.R.	07/28/2020
			Checked by	A.G.A.	07/28/2020
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
UNIVERSAL ENGINEERING SCIENCES, INC.
1818 7TH AVENUE, UNIT 1
LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

UNIVERSAL ENGINEERING SCIENCES

DRAWN BY:
UNIVERSAL ENGINEERING SCIENCES, INC.
1818 7TH AVENUE NORTH, UNIT 1
LAKE WORTH, FL 33461
CERTIFICATE OF AUTHORIZATION #549

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

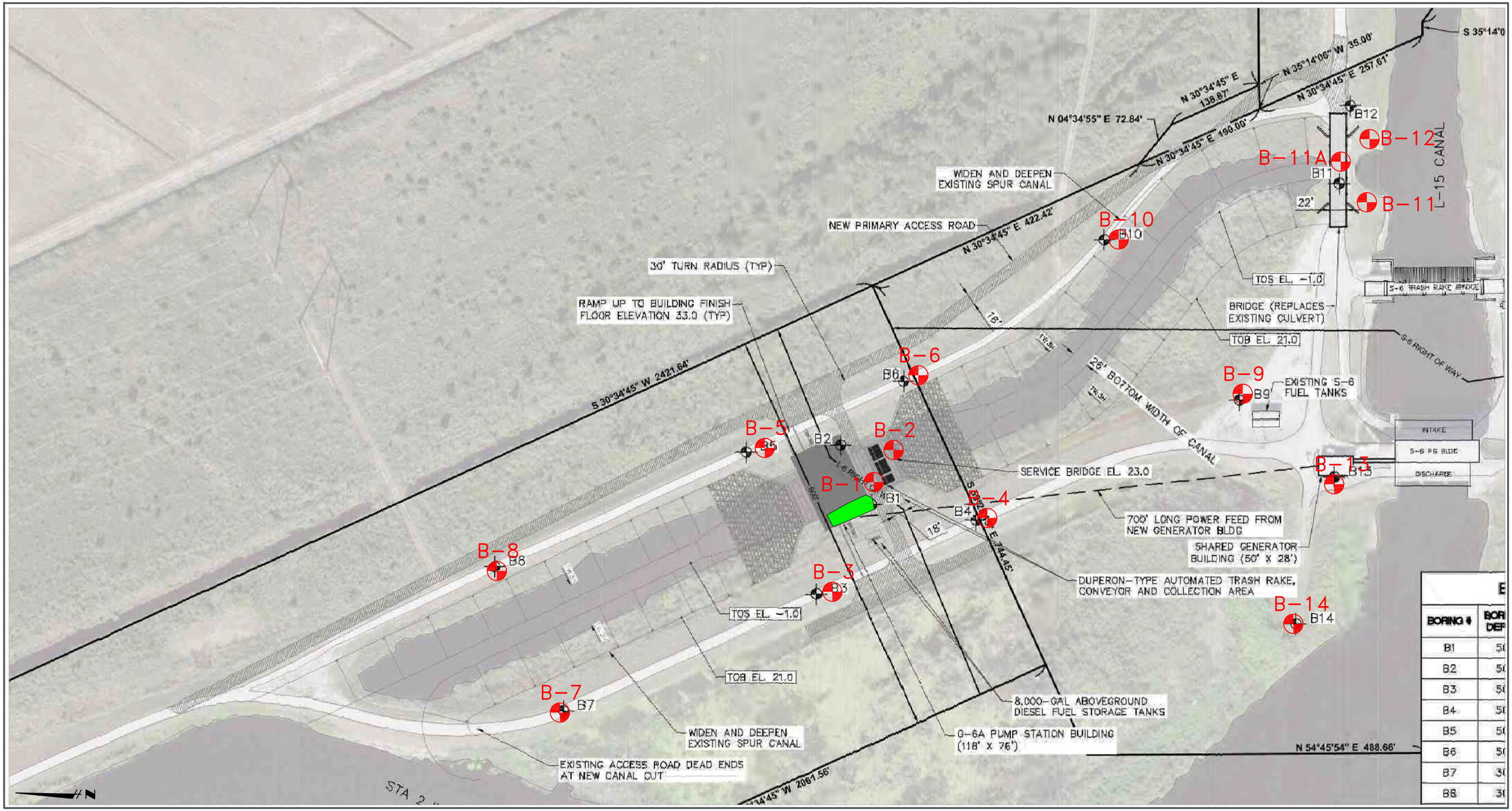
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: REPORT OF SPT BORINGS

DRAWING NO. B-8

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



LEGEND

INDICATES SPT BORING

TREELINE THAT OBSTRUCTED BARGE PLACEMENT

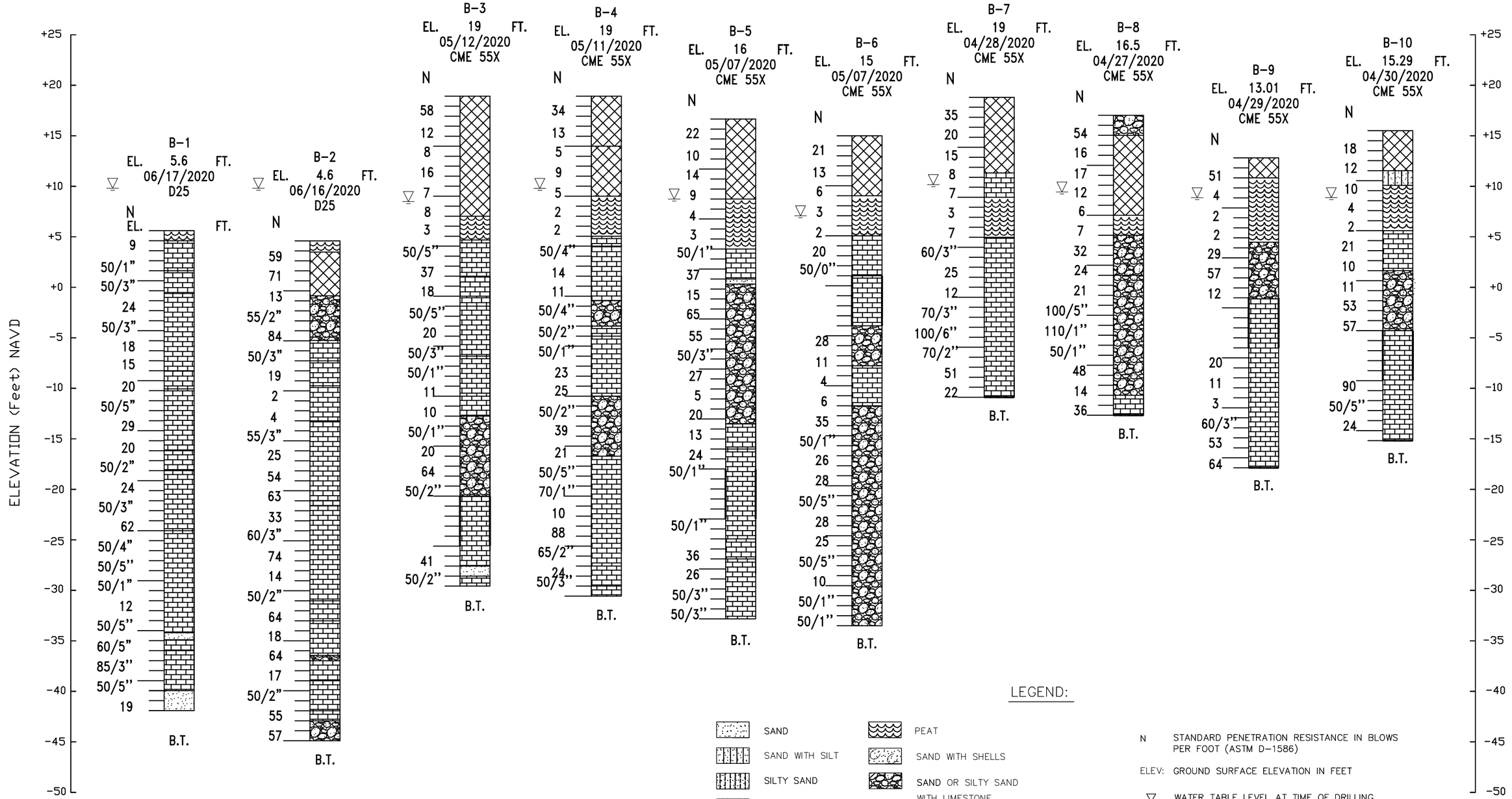
EXACT DRILLED BORING COORDINATES CAN BE FOUND ON THE RESPECTIVE LOGS

UNIVERSAL ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION SERVICES
G-6A PUMP STATION
WEST PALM BEACH, PALM BEACH COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY: O.D.R.	DATE: 06/23/20	CHECKED BY: P.G.R.	DATE: 06/23/20
SCALE: N.T.S.	PROJECT NO: 0630.2000012	REPORT NO: 17223	PAGE NO: B-9



LEGEND:

- SAND
- SAND WITH SILT
- SILTY SAND
- FILL
- ROCK CORE
- PEAT
- SAND WITH SHELLS
- SAND OR SILTY SAND WITH LIMESTONE
- LIMESTONE, SILTY LIMESTONE SANDY LIMESTONE

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

ELEV: GROUND SURFACE ELEVATION IN FEET

WATER TABLE LEVEL AT TIME OF DRILLING

REVISIONS				Names	Dates
Date	By	Description	Drawn by	A.G.A.	06/09/20
			Checked by	A.G.A.	06/09/20
			Revised by	O.D.R.	08/03/20
			Checked by	A.G.A.	08/03/20
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
UNIVERSAL ENGINEERING SCIENCES, INC.
1818 7TH AVENUE, UNIT 1
LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

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1818 7TH AVENUE NORTH, UNIT 1
LAKE WORTH, FL 33461
CERTIFICATE OF AUTHORIZATION #549

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

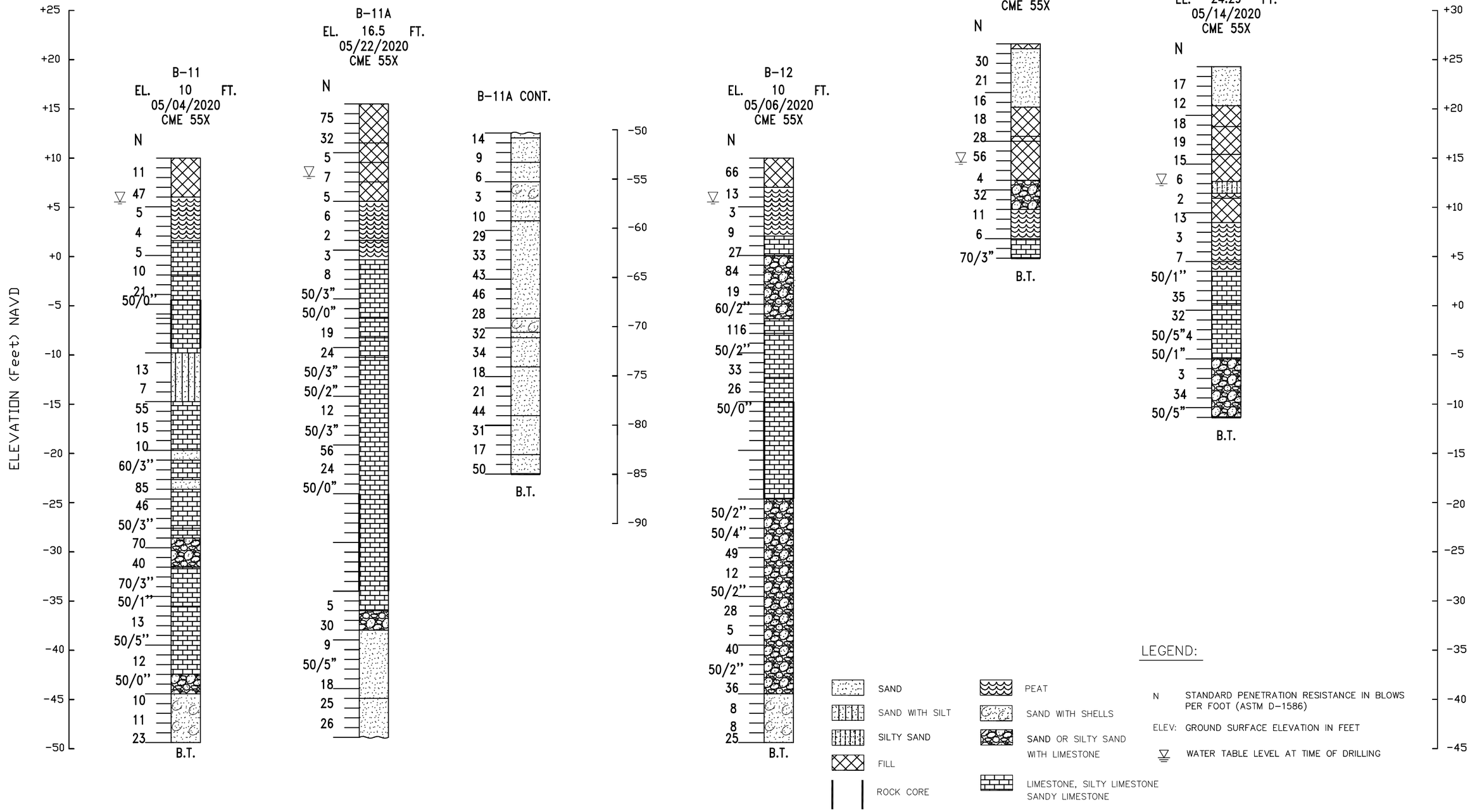
CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: SUBSURFACE PROFILES

DRAWING NO. B-10

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.



REVISIONS				Names	Dates
Date	By	Description	Drawn by	A.G.A.	06/09/20
			Checked by	A.G.A.	06/09/20
			Revised by	O.D.R.	08/03/20
			Checked by	A.G.A.	08/03/20
			Approved by	Peter G. Read, P.E.	

ENGINEER OF RECORD:
UNIVERSAL ENGINEERING SCIENCES, INC.
1818 7TH AVENUE, UNIT 1
LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

UNIVERSAL ENGINEERING SCIENCES

DRAWN BY:
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LAKE WORTH, FL 33461
CERTIFICATE OF AUTHORIZATION #549

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

CANAL NO.	COUNTY	U.E.S. PROJECT NUMBER
L-15	PALM BEACH	0630.2000012

SHEET TITLE: SUBSURFACE PROFILES

DRAWING NO. B-11

PROJECT NAME: G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

INDEX NO.

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-12

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.470577°, -80.447820°

REMARKS: SPT Boring was performed using safety hammer

G.S. ELEVATION (ft): 5.6' NAVD DATE STARTED: 6/17/20
WATER TABLE (ft): 9.6' NAVD DATE FINISHED: 6/19/20
DATE OF READING: 6/17/2020 DRILLED BY: JW/CD/DZ
EST. W.S.W.T. (ft): TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+5.6												
		1-3-6-50/2"	9			Loose, muck [PT]						
		50/1"	50/1"			Very dense, limestone [LS]						
+0.6		13-50/3"	50/3"			Very dense, gray capstone [GP]						
		36-15-9-50/2"	24			Medium dense, sandy limestone [LS]						
		50/3"	50/3"			...Very dense						
-4.4		24-8-10-16	18			...Medium dense						
		21-10-5-4	15									
-9.4		5-8-12-8	20			Medium dense, limestone [LS]						
		5-50/5"	50/5"			Very dense, Limestone with silt [LS]	10					
		19-14-15-14	29			...Medium dense						
-14.4		12-10-10-6	20									
		5/2"	50/2"			Very dense, limestone [LS]						
-19.4		6-19-5-32	24			Medium dense, sandy limestone [LS]						
		50/3"	50/3"			...Very dense						
-24.4		44-29-33-14	62									
		8-11-50/4"	50/4"			Very dense, limestone [GP]						
		50/5"	50/5"									
-29.4		50/1"	50/1"									
		12-7-5-8	12			...Medium dense						
		10-20-50/5"	50/5"			...Very dense						
-34.4		21-60/5"	60/5"			Very dense, gray sand [SP] Very dense, limestone [LS]						
		6-5-6-85/3"	85/3"			Very dense, sandy limestone [LS]						
-39.4		50/5"	50/5"									
		32-8-11-8	19			Medium dense, gray sand [SP]						
						Soil boring terminated at Elev. -42.4 Feet due to hole collapse.						
-44.4												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-13

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.470693°, -80.447879°

REMARKS: SPT Boring was performed using safety hammer

G.S. ELEVATION (ft): 4.6' NAVD DATE STARTED: 6/16/20
WATER TABLE (ft): 9.6' NAVD DATE FINISHED: 6/17/20
DATE OF READING: 6/16/2020 DRILLED BY: JW/CG/JD/CD/PG
EST. W.S.W.T. (ft): TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
4.6						Medium dense, muck [PT]						
		1-17-42-82/4"	59									
		14-24-47-10	71			Very dense, limerock [GP]						
-0.4		5-6-7-7	13			Very dense, silty sand with limestone [SM-LS]						
		6-43-55/2"	55/2"									
		5-27-57-44	84				15					
-5.4		50/3"	50/3"			Very dense, limestone [GP]						
		5-8-11-20	19			Medium dense, sandy limestone [LS]						
-10.4		3-1-1-30	2			Very loose, silty limestone [LS-SM]						
		3-2-2-10	4			...Loose						
		55/3"	55/3"			Very dense, limestone [LS]						
-15.4		42-15-10-22	25			...Medium dense						
		13-24-30-50/3"	54			...Very dense						
-20.4		30-55-8-10	63									
		6-7-26-52	33			Dense, silty limestone [LS-SM] Dense, limestone [LS]						
		60/3"	60/3"			...Very dense						
-25.4		40-54-20-20	74									
		9-8-6-28	14			...Medium dense						
-30.4		38-50/2"	50/2"			...Very dense						
		26-36-28-12	64			Very dense, gray stone with limestome [GP-LS]						
		12-9-9-15	18			Medium dense, sandy limestone [LS-SP]						
-35.4		22-25-39-16	64			...Very dense						
		6-8-9-10	17			Very dense, gray sand with some limestone [SP-LS] Medium dense, limestone [LS]						
-40.4		9-38-50/2"	50/2"			Very dense, sandy limestone [LS-SP]						
		14-24-31-23	55			Very dense, limestone with sand [LS-SP]						
		18-29-28-30	57			Very dense, gray sand with some gravel [SP]						
-45.4						Soil boring terminated at Elev. -44.4 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-14

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.470098°, -80.447706°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +19' NAVD DATE STARTED: 5/12/20
WATER TABLE (ft): +8.5' NAVD DATE FINISHED: 5/13/20
DATE OF READING: 5/14/2020 DRILLED BY: CG/JD/PG/JW/CD
EST. W.S.W.T. (ft): +10.5' NAVD TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+19												
		16-36-22-12	58			Dense, limerock fill [SP]						
		5-6-6-10	12			...medium dense						
+14		6-4-4-5	8			...loose						
		12-8-8-6	16			...medium dense						
		4-4-3-3	7	▽		...loose						
+9		5-6-2-2	8	▼								
		2-1-2-3	3			Very loose, muck [PT]		67				43
+4		20-12-50/45"	50/5"			Very dense, limestone with shell fragments [LS]						
		8-24-13--5	37			...dense						
		6-8-10-20	18			Medium dense, sandy limestone with trace silt [LS-SP]						
-1		10-50/5"	50/5"			Very dense, sandy limestone with silt [LS-SM]						
		7-13-7-6	20			Medium dense, limestone [LS]						
-6		12-40-50/3"	50/3"			...very dense						
		12-50-50/1"	50/1"			Very dense, limestone with cemented sand [LS]						
		7-5-6-12	11			...medium dense						
-11		5-5-5-7	10			Medium dense, limestone with trace shell fragments [LS]						
		50-50/1"	50/1"			Very dense, silty sand with some limestone [SM]						
-16		5-8-12-24	20			...medium dense	14					
		42-40-24-50/3"	64									
		50/2"	50/2"									
-21		2:11 min/ft 5:18 min/ft 3:37 min/ft 4:54 min/ft 4:42 min/ft				Limestone [GP] REC = 43"/60" = 72% RQD = 32"/60" = 53%						
-26		10-18-23-15	41			...dense						
		8-8-50/2"	50/2"			Medium dense, gray sand [SP] Very dense, limestone [LS]						
-31						SPT Soil Boring Terminated at Elev. -30 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-15

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.470683°, -80.447322°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +19' NAVD DATE STARTED: 5/11/20
WATER TABLE (ft): +9.8' NAVD DATE FINISHED: 5/11/20
DATE OF READING: 5/11/2020 DRILLED BY: CG/JD/PG/JW/CD
EST. W.S.W.T. (ft): +10.8' NAVD TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+19												
		11-11-23-12	34			Dense to medium dense, limerock (FILL) [SP]						
		10-10-3-3	13									
+14		4-3-2-2	5			Loose, limerock (FILL) with trace organics [SP]						
		3-7-2-2	9	▽								
		4-3-2-7	5	▼								
+9		3-1-1-1	2			Very loose, muck [PT]						
		1-1-1-5	2									
						Very dense, limestone with trace muck [LS]						
+4		3-1-50/4"	50/4"			Very dense to medium dense, limestone with shell fragments and cemented sand [LS]						
		8-4-10-7	14									
		4-4-7-27	11									
-1		40-10-50/4"	50/4"			Very dense, silty sand with some limestone and shell fragments [SM]	16					
		32-9-50/2"	50/2"			Very dense, limestone with shell fragments [LS]						
-6		50/1"	50/1"			Very dense to medium dense, limestone [LS]						
		11-7-16-11	23									
		6-11-14-8	25									
-11		30-50/2"	50/2"			Very dense to medium dense, sand with silt and some limestone with shell fragments [SP-SM]						
		23-7-32-13	39				12					
-16		13-9-12-8	21									
		6-8-50/5"	50/5"			Very dense, limestone [LS]						
		70/1"	70/1"									
-21		3-4-6-60/1"	10									
		61-51-37-50/5"	88									
-26		65/2"	65/2"									
		13-11-13-3	24			Medium dense, sandy limestone [LS-SP]						
		8-50/3"	50/3"			Very dense, limestone with trace silt [LS]						
-31						SPT Soil Boring Terminated at Elev. -31 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-16

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-5** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.470437°, -80.448300°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +16' NAVD DATE STARTED: 5/7/20
WATER TABLE (ft): +8.1' NAVD DATE FINISHED: 5/7/20
DATE OF READING: 5/7/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +10.1' NAVD TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+16												
		12-12-10-10	22			Medium dense to loose, limerock (FILL) [SP]						
		7-7-3-6	10									
+11		5-6-8-12	14	▽								
		13-5-4-3	9	▼								
		2-2-2-2	4			Loose to very loose, peat [PT]		47				76.3
+6		1-1-2-3	3									
		7-20-50/1"	50/1"			Very dense to dense, limestone [LS]						
+1		20-27-10-30	37									
		10-6-9-50/5"	15			Brown sand [SP] Medium dense to very dense, silty sand with limestone [SM-LS]						
		25-55-10-10	65									
-4		25-25-30-50/0"	55				14					
		50/3"	50/3"									
-9		8-21-6-5	27									
		3-3-2-1	5									
		3-4-16-12	20									
-14		3-3-10-28	13			Medium dense, sand with some limestone [SP]	2					
		3-8-16-24	24			Very dense, limestone [LS]						
		50-/1"	50/1"									
-19		7:35 min/ft 5:18 min/ft 6:37 min/ft 7:07 min/ft 4:28 min/ft				REC = 20"/60" = 77% RQD = 8"/60" = 50%						
-24		16-50-50/1"	50/1"									
		14-16-20-12	36			Dense, sandy limestone [LS-SP]						
-29		12-16-10-50/5"	26			Medium dense to very dense, limestone [LS]						
		50/3"	50/3"									
-34		50/3"	50/3"									
						SPT Soil Boring Terminated at Elev. -34 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-17

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-6** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.471028°, -80.447900°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +15' NAVD DATE STARTED: 5/6/20
WATER TABLE (ft): +7.5' NAVD DATE FINISHED: 5/7/20
DATE OF READING: 5/7/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +9.5' NAVD TYPE OF SAMPLING: SPT

ELEV. (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+15												
		17-11-10-11	21			Medium dense to loose, limerock (FILL) [SP]						
		5-7-6-8	13									
+10		3-3-3-3	6	▽								
		2-2-1-2	3	▼		Very loose, peat [PT]						
		1-1-1-1	2									
+5		5-12-8-12	20			Medium dense to very dense, sandy limestone [LS-SP]						
		12-24-26-50/0"	50									
0		0:34 min/ft 4:14 min/ft 5:21 min/ft 13:35 min/ft 10:01 min/ft				Limestone [LS] REC = 20"/60" = 47% RQD = 8"/60" = 30%						
-5		4-12-16-58	28			Medium dense, silty sand with limestone [SM-LS]	13					
		8-5-6-7	11									
		1-2-2-10	4			Loose, sandy limestone with shell fragments [LS-SP]						
-10		10-3-3-3	6									
		3-19-16-44	35			Dense to very dense, silty sand with limestone and shell fragments [SM-LS]	16					
-15		50/1"	50/1"									
		10-13-13-6	26									
		3-2-26-50/1"	28									
-20		50/5"	50/5"									
		4-8-20-14	28									
-25		12-16-9-40	25									
		50/5"	50/5"									
		3-4-6-8	10									
-30		50/1"	50/1"									
		16-50/1"	50/1"									
-35						SPT Soil Boring Terminated at Elev. -34 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-18

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-7** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.469061°, -80.448419°

REMARKS: SPT Boring was performed using safety hammer

G.S. ELEVATION (ft): +19' NAVD DATE STARTED: 4/28/20
WATER TABLE (ft): +10.2' NAVD DATE FINISHED: 4/28/20
DATE OF READING: 4/28/2020 DRILLED BY: CG/JD
EST. W.S.W.T. (ft): +12.2' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+19												
		22-20-15-13	35			Silty Limerock (FILL) [SM] .....dense						
		10-10-10-10	20			.....medium dense						
+14		8-8-7-7	15				19	11				
		5-5-3-5	8	▽								
		3-4-3-3	7	▼		Loose, gray limestone [LS]						
+9		1-1-2-2	3			Very loose to loose, peat [PT]		83				84
		1-1-7-60/2"	7					35				60
+4		16-25-60/3"	60/3"			Very dense, silty limestone [GM]	23	35				
		24-14-11-14	25			Medium dense, sandy limestone with trace silt [LS-SP]						
-1		7-5-7-8	12									
		10-70/3"	70/3"			.....very dense						
		100/6"	100/6"									
-6		37-8-70/2"	70/2"									
		6-17-34-38	51			Very dense, sandy limestone with silt [LS-SM]						
		17-12-10-36	22			.....medium dense	11					
-11						SPT Soil Boring Terminated at Elev. -11 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-19

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-8** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.469387°, -80.449002°

REMARKS: SPT Boring was performed using safety hammer

G.S. ELEVATION (ft): +16.5' NAVD DATE STARTED: 4/27/20
WATER TABLE (ft): +8.5' NAVD DATE FINISHED: 4/27/20
DATE OF READING: 4/27/2020 DRILLED BY: CG/JD
EST. W.S.W.T. (ft): +10.5' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+16.5												
		21-24-30-18	54			Very dense, gray silty sand with shell fragments and gravel [SM]						
		7-9-7-11	16			Medium dense, silty limerock (FILL) [SM]	17	14				
+11.5		17-11-6-10	17	▽								
		5-4-8-8	12	▼								
		7-3-3-3	6									
+6.5		2-3-4-7	7			Loose, dark brown muck [PT]		25				28.9
		2-8-24-17	32			Dense to medium dense, gray sand with silt and limestone [SM-LS]						
+1.5		4-14-10-25	24				12					
		8-10-11-10	21			Medium dense to very dense, gray silty sand with limestone [SM-LS]	17	19				
-3.5		100/5"	100/5"									
		110/1"	110/1"									
		55-83-50/1"	50/1"									
-8.5		7-25-23-12	48									
		12-7-7-8	14									
		11-20-16-18	36			Dense, gray sandy limestone with shell fragments [LS-SP]						
-13.5						SPT Soil Boring Terminated at Elev. -13.5 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-20

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-9** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.471692°, -80.446720°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +13.01' NAVD DATE STARTED: 4/29/20
WATER TABLE (ft): +9.01' NAVD DATE FINISHED: 4/29/20
DATE OF READING: 4/29/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +11.01 NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+13												
		7-24-27-23	51	▽		Very dense, silty limerock (FILL) [SM]	16	7				
		4-2-2-3	4	▼		Loose to very loose, peat [PT]						
+8		2-1-1-2	2									
		1-1-1-2	2					67				77
		5-12-17-44	29			Medium dense, very dense to medium dense, silty sand with limestone [SM-LS]						
+3		5-17-40-45	57				15					
		5-5-7-100/5"	12									
		9:22 min/ft 10:12 min/ft 9:57 min/ft 5:58 min/ft 5:04 min/ft				Limestone [LS] REC = 51"/60" = 85% RQD = 36"/60" = 60%						
-2												
		6-8-12-12	20			Medium dense, sandy limestone with shell fragments [LS-SP]						
-7		4-6-5-6	11			Medium dense to very dense, silty limestone with sand [LS-SM]						
		1-2-1-50/4"	3				24	15				
-12		60/3"	60/3"									
		17-30-23-50	53									
-17		22-24-40-27	64									
						Soil boring terminated at Elev. -17 feet						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-21

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-10** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.471916°, -80.447574°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +15.29' NAVD DATE STARTED: 4/30/20
WATER TABLE (ft): +8.57' NAVD DATE FINISHED: 5/1/20
DATE OF READING: 5/1/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +10.57' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+15.29												
		14-15-3-3	18			Medium dense, silty limerock (FILL) [SM]						
		5-6-6-5	12				18	14				
+10.29		2-5-5-5	10	▽		Loose, limerock (FILL) [SP-SM]	10	11				
		5-2-2-3	4	▼		Loose to very loose, peat [PT]		96				82.4
		1-1-1-2	2									
+5.29		3-4-17-64/2"	21			Medium dense, sandy limestone with shell fragments [LS-SP]						
		13-7-3-3	10									
+0.29		3-4-7-6	11			Medium dense to very dense, silty sand with limestone [SM-LS]						
		4-27-26-44	53									
		5-7-50-50/1"	57				18					
-4.71		7:22 min/ft 6:46 min/ft 4:14 min/ft 3:22 min/ft 1:44 min/ft				REC = 33"/60" = 55% RQD = 20"/60" = 33%						
-9.71		27-44-46-50	90			Very dense to medium dense, sandy limestone with shell fragments [LS-SP]						
		50/5"	50/5"									
-14.71		27-14-10-40	24									
						Soil boring terminated at Elev. -14.71 feet						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-22

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-11** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.472603°, -80.446750°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +10.5' NAVD DATE STARTED: 5/4/20
WATER TABLE (ft): +5.4' NAVD DATE FINISHED: 5/4/20
DATE OF READING: 5/4/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +7.4' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+10												
		1-4-7-17	11	▽		Medium dense to dense, silty limerock (FILL) [SM]						
		24-27-20-10	47	▼			20	8				
+5		4-3-2-2	5			Loose, peat [PT]						
		2-2-2-2	4					188				70.4
		2-2-3-6	5			Loose, silty limestone [LS-GM]						
0		4-7-3-7	10				20	22				
		20-6-15-10	21			Medium dense, sandy limestone [LS-SP]						
		60-50/0"	50/0"			Limestone with intermittent sandy limestone [LS-SP]						
-5		7:17 min/ft				REC = 20"/60" = 33%						
		7:04 min/ft										
		12:54 min/ft				RQD = 8"/60" = 13%						
		44:54 min/ft										
		4:50 min/ft										
-10		5-5-8-10	13			Medium dense to loose, sand with silt and limestone [SM-LS]						
		4-5-2-1	7				11					
-15		2-5-50-55	55			Very dense to medium dense, sandy limestone with some trace silt [LS-SP]						
		13-9-6-7	15									
		4-5-5-10	10			Loose, sandy limestone [LS-SP]						
-20		10-60/3"	60/3"			Gray sand [SP]						
		27-55-30-50/3"	85			Very dense, limestone with silt [LS-GM]	11	19				
		10-16-30-50/3"	46			Gray sand [SP]						
-25		50/3"	50/3"			Very dense, limestone [LS]						
		5-40-30-26	70			Limestone with silt [LS-GM]						
-30		24-20-20-12	40			Very dense to dense, silty sand with limestone [SM-LS]	19					
		70/3"	70/3"			Very dense, limestone [LS]						
-35		50/1"	50/1"									
		7-6-7-10	13			Medium dense to very dense, sandy limestone with shell fragments [LS-SP]						
-40		10-50/5"	50/5"									
		3-2-10-10	12									
		8-20-50/0"	50/0"			Very dense, sand with limestone [SP-LS]						
-45		42-6-4-6	10			Loose to medium dense, light gray sand with shell fragments [SP]						
		5-5-6-8	11									
		6-8-15-23	23									
-50						SPT Soil Boring Terminated at Elev. -50 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-23

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-11a** SHEET: **1 of 2**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.472678*, -80.496936*

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +16.5' NAVD DATE STARTED: 5/18/20
WATER TABLE (ft): +8.1' NAVD DATE FINISHED: 5/22/20
DATE OF READING: 5/18/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +10.1' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+16.5												
		9-35-40-42	75			Very dense to dense, limerock (FILL) [SP]						
		22-19-13-6	32									
+11.5		2-2-3-3	5	▽		Loose, limerock (FILL) with muck [SP-PT]						
		2-3-4-4	7	▼		Loose, limerock (FILL) with trace muck [SP]						
		2-2-3-3	5			Loose, limerock (FILL) [SP]						
+6.5		4-3-3-2	6			Loose to very loose, peat [PT]						
		2-1-1-1	2									
+1.5		1-2-1-1	3			Very loose, muck with some limestone [PT]						
		1-1-7-50/3"	8			Loose, limestone with some muck [LS]						
		50/3"	50/3"			Very dense, limestone [LS]						
-3.5		50-50/0"	50/0"									
		4-14-5-2	19			Medium dense, silty limestone with cemented sands [LS-GM]	15					
-8.5		9-16-8-8	24			Medium dense, silty limestone with cemented sands [LS-GM]						
		12-50/3"	50/3"			Very dense to medium dense, silty limestone [LS-GM]						
		50/2"	50/2"									
-13.5		4-6-6-15	12									
		50/3"	50/3"									
-18.5		28-26-30-36	56									
		16-12-12-13	24									
		50-50/3"	50/0"									
-23.5		1:02 min/ft 3:55 min/ft 2:36 min/ft 0:21 min/ft 1:24 min/ft				REC = 12"/60" = 20% RQD = 9"/60" = 15%						
-28.5		2:53 min/ft 1:47 min/ft 2:08 min/ft 0:01 min/ft 0:02 min/ft				REC = 29"/60" = 48% RQD = 23"/60" = 38%						
-33.5		2-2-3-5	5									
		20-20-10-7	30			Medium dense, gray sand with some limestone and trace silt [SP]						
-38.5		3-3-6-8	9			Loose to medium dense, gray sand with some shell fragments [SP]						
		50/5"	50/5"									
-43.5		8-12-6-6	18									
		8-10-15-18	25									

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-24

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-11a** SHEET: **2 of 2**
SECTION: TOWNSHIP: RANGE:

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
		8-12-14-18	26			Medium dense, gray sand with trace shell fragments [SP]						
-48.5		6-6-8-10	14			Loose, gray sand with some gravel and trace shell fragments [SP]						
		4-5-4-4	9			Loose, gray sand with trace gravel and shell fragments [SP]						
-53.5		3-2-4-6	6			Very loose, gray sand with shell fragments and trace silt [SP]						
		1-1-2-2	3			Loose, gray sand and shell fragments with some gravel and silt [SP]						
		3-5-5-5	10			Medium dense, dark gray sand with some gravel [SP]						
-58.5		10-27-12-12	29			Dense to medium dense, gray sand [SP]						
		8-13-20-20	33									
-63.5		8-16-27-37	43									
		20-20-26-26	46									
		8-12-16-22	28			Dense, gray sand with shell fragments [SP]						
-68.5		8-17-15-17	32			Dense, gray sand [SP]						
		16-18-16-18	34			Dense to medium dense, gray sand with some shell fragments [SP]						
		8-8-10-20	18									
-73.5		7-7-14-26	21			Medium dense to dense, gray sand [SP]						
		6-17-27-29	44									
-78.5		10-14-17-12	31			Dense to medium dense, gray sand with some shell fragments [SP]						
		5-7-10-16	17									
		12-20-30-20	50			Dense, gray sand with gravel and trace shell fragments [SP]						
-83.5						SPT Soil Boring Terminated at Elev. -83.5 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-25

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-12** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.472832°, -80.446883°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +10.5' NAVD DATE STARTED: 5/5/20
WATER TABLE (ft): +5.6' NAVD DATE FINISHED: 5/6/20
DATE OF READING: 5/6/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +7.6' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+10												
		12-22-44-20	66			Topsoil Very dense, limerock (FILL) [SP]						
		12-7-6-3	13	▽		Loose, peat [PT]						
+5		1-2-1-2	3	▼								
		1-2-7-7	9					83				20.6
		5-7-20-50/2"	27			Medium dense, limestone [LS]						
0		12-44-40-25	84			Very dense, gray silty sand with limestone and shell fragments [SM-LS]	16					
		5-7-12-36	19									
-5		60/2"	60/2"									
		50-60-56-35	116			Very dense, sandy limestone [LS-SP]						
		50/2"	50/2"			Very dense to dense, limestone [LS]						
-10		7-27-6-5	33									
		5-16-10-16	26			Medium dense to very dense, sandy limestone [LS-SP]						
		50-50/0"	50/0"									
-15		6:14 min/ft 4:14 min/ft 0:41 min/ft 8:17 min/ft 1:59 min/ft				REC = 35"/60" = 58% RQD = 29"/60" = 48%						
-20		7:15 min/ft 2:13 min/ft 0:42 min/ft 1:23 min/ft 5:28 min/ft				REC = 24"/60" = 40% RQD = 22"/60" = 33%						
-25		6-50/2"	50/2"			Very dense to medium dense, silty sand with limestone [SM-LS]						
		7-12-50/4"	50/4"				17					
-30		14-35-14-10	49									
		2-2-10-14	12				14	21				
		15-50/12"	50/12"									
-35		16-15-13-13	28									
		5-3-2-5	5									
-40		31-30-10-9	40									
		6-6-50/2"	50/2"									
		4-11-25-13	36									
-45		8-5-3-2	8			Loose to medium dense, gray sand with shell fragments and trace limestone [SP]						
		2-3-5-6	8				4	22				
-50		5-12-13-13	25									
						SPT Soil Boring Terminated at Elev. -50 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-26

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

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

CLIENT: South Florida Water Management District

LOCATION: 26.471598°, -80.446142°

REMARKS: SPT Boring was performed using safety hammer

G.S. ELEVATION (ft): +26.38' NAVD DATE STARTED: 5/13/20
WATER TABLE (ft): +14.38' NAVD DATE FINISHED: 5/13/20
DATE OF READING: 5/14/2020 DRILLED BY: CG/JD/PG/JW/CD
EST. W.S.W.T. (ft): +16.38' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+26.38						Asphalt 1 3/8" thick						
		9-16-14-12	30			Dense, limerock (FILL) [SP]						
		9-9-12-12	21			Medium dense, brown sand [SP]						
+21.38		9-10-6-5	16									
		4-6-12-8	18			Medium dense, limerock (FILL) with trace silt [SP]						
		17-17-11-15	28	▽								
+16.38		12-22-34-30	56	▼		Medium dense, limerock fill with trace silt and muck [GP]						
		17-17-30-30	4			Very dense, limerock (FILL) [SP] ...dense						
+11.38		14-18-14-17	32			Dense, silty sand with some limestone and trace shell fragments [SM]	18					
		11-7-4-4	11			Medium dense, peat [PT]		27				58.2
		3-3-3-12	6			...loose		52				34.7
+6.38		3-4-70/3"	70/3"			Very dense, limestone with some silt [LS] SPT Soil Boring Terminated at Elev. +6.38 Feet.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0630.2000012
REPORT NO.:	17223
PAGE:	B-27

PROJECT: G-6A Pump Station
West Palm Beach
West Palm Beach, Florida

BORING DESIGNATION: **B-14** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: South Florida Water Management District

LOCATION: 26.471105°, -80.445946°

REMARKS: SPT Boring was performed using auto hammer

G.S. ELEVATION (ft): +24.29' NAVD DATE STARTED: 5/14/20
WATER TABLE (ft): +11.79' NAVD DATE FINISHED: 5/14/20
DATE OF READING: 5/14/2020 DRILLED BY: CG/JD/PG
EST. W.S.W.T. (ft): +13.79' NAVD TYPE OF SAMPLING: SPT

ELEV (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%) (Term)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
+24.29												
		2-10-7-4	17			Medium dense, gray sand with gravel and trace organics [SP]						
		5-6-6-7	12									
+19.29		6-8-10-7	18			Medium dense, limerock (FILL) [SP]						
		10-9-10-8	19			Medium dense, limerock (FILL) with trace peat [SP]						
		7-8-7-10	15									
+14.29				▽		Medium dense to loose, limerock (FILL) [SP]						
		6-4-2-2	6	▼								
						Silty sand [SM]	30	33				
		WOH-WOH-2-3	2			Muck [PT]						
+9.29		7-7-6-3	13			Medium dense, silty limerock (FILL) [SM]						
		WOH-1-2-2	3			Very loose to loose, peat [PT]		47				36.7
		4-4-3-7	7					67				58.9
+4.29						Muck and silt [PT]						
		WOH-1-50/1"	50/1"			Very dense to dense, limestone with cemented sand [LS]						
		3-15-20-6	35									
-0.71		7-20-12-50/1"	32			Dense, sandy limestone [LS-SP]						
		50/5"	50/5"			Very dense, limestone with shell fragments [LS]						
		24-50/1"	50/1"									
-5.71		2-1-2-2	3			Very loose to very dense, silty sand with some limestone [SM]	14					
		2-12-22-6	34									
-10.71		4-6-50/5"	50/5"									
						SPT Soil Boring Terminated at Elev. -10.71 Feet.						

BL3

UNIVERSAL
ENGINEERING SCIENCES

KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
RQD	Rock Quality Designation
	Stabilized Groundwater Level
	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
NP	Non-Plastic (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve
** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY
(Sands and Gravels)
Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY
(Silts and Clays)
Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Firm – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS
(Limestone)
Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample
Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample
Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

LABORATORY TEST RESULTS

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

Location	Sample Elevation (feet)	Organic Content %	Moisture Content %	Sieve Analysis Results % Passing												USCS
				Sieve Sizes												
				1½ inch	3/4 inch	3/8 inch	No.4	No.8	No.10	No.16	No.30	No.40	No.50	No.100	No.200	
B-1	-12.4	--	--	100	76	61	48	44	36	31	26	24	21	17	10	GP-GM
B-2	-5.4	--	--	100	93	83	72	60	58	50	42	38	35	20	15	SM
B-3	+5	43	67	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-3	-17	--	--	100	93	79	65	53	51	44	36	33	31	23	14	SM
B-4	-4	--	--	100	95	82	70	58	56	47	39	35	31	21	16	SM
B-4	-16	--	--	100	84	69	58	48	46	40	34	31	29	21	12	SP-SM
B-5	+6	76.3	47	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-5	-6	--	--	88	88	84	73	62	60	51	40	35	33	20	14	SM
B-5	-17	--	--	100	93	73	57	46	44	37	31	28	26	15	2	SP
B-6	-6	--	--	100	87	78	69	63	58	56	48	43	36	20	13	SM
B-6	-14	--	--	100	98	87	75	64	62	54	46	43	40	27	16	SM
B-7	+13	--	11	--	--	--	--	--	--	--	--	--	--	--	19	SM
B-7	+7	84	83	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-7	+5	60	35	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-7	+3	--	35	--	--	--	--	--	--	--	--	--	--	--	23	GM
B-7	-11	--	--	100	86	--	52	40	38	32	26	24	22	16	11	GP-GM

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G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

Location	Sample Elevation (feet)	Organic Content %	Moisture Content %	Sieve Analysis Results % Passing												USCS
				Sieve Sizes												
				1½ inch	3/4 inch	3/8 inch	No.4	No.8	No.10	No.16	No.30	No.40	No.50	No.100	No.200	
B-8	+12.5	--	14	--	--	--	--	--	--	--	--	--	--	--	17	SM
B-8	+4.5	28.9	25	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-8	-2.5	--	19	--	--	--	--	--	--	--	--	--	--	--	17	SM
B-8	0.5	--	--	100	95	--	58	45	42	35	29	26	24	16	12	SP-SM
B-9	+11	--	7	--	--	--	--	--	--	--	--	--	--	--	16	SM
B-9	+5	77	67	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-9	+1	--	--	100	93	74	62	50	48	41	33	30	27	19	15	SM
B-9	-12	--	15	--	--	--	--	--	--	--	--	--	--	--	24	GM
B-10	+11.29	--	14	--	--	--	--	--	--	--	--	--	--	--	18	SM
B-10	+9.29	--	11	--	--	--	--	--	--	--	--	--	--	--	10	SP-SM
B-10	+7.29	82.4	96	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-10	-4.71	--	--	100	98	88	74	61	58	49	40	36	33	23	18	SM

LABORATORY TEST RESULTS

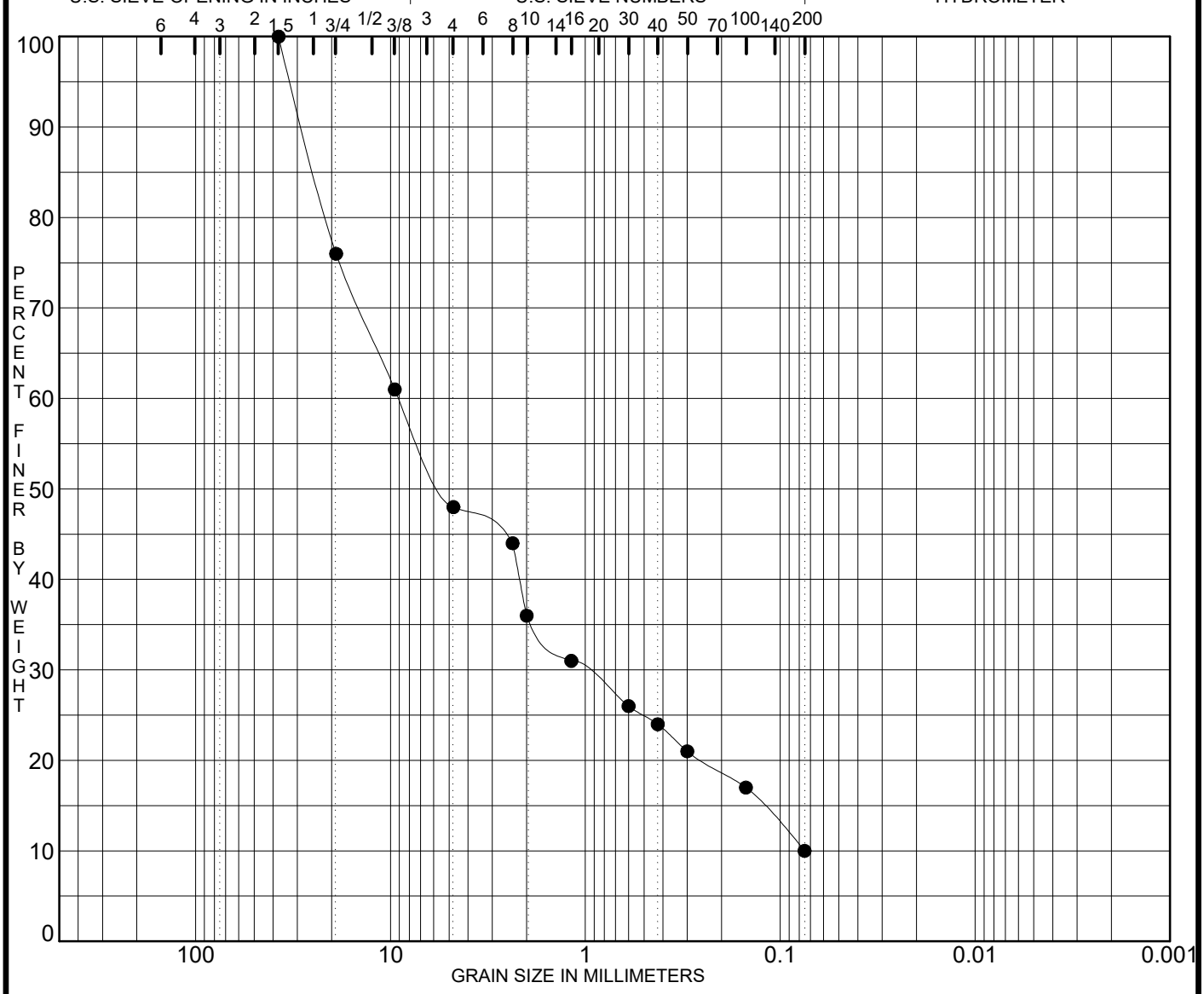
G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

Location	Sample Elevation (feet)	Organic Content %	Moisture Content %	Sieve Analysis Results % Passing												USCS
				Sieve Sizes												
				1½ inch	3/4 inch	3/8 inch	No.4	No.8	No.10	No.16	No.30	No.40	No.50	No.100	No.200	
B-11	+6	--	8	--	--	--	--	--	--	--	--	--	--	--	20	SM
B-11	+2	70.4	188	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-11	-2	--	22	--	--	--	--	--	--	--	--	--	--	--	20	GM
B-11	-13	--	--	100	92	76	59	46	44	36	29	26	23	17	11	SP-SM
B-11	-22	--	19	--	--	--	--	--	--	--	--	--	--	--	11	GP-GM
B-11	-32	--	--	100	99	86	73	63	61	55	48	46	43	31	19	SM
B-11A	-7.5	--	--	100	89	76	63	52	50	43	36	32	29	21	15	SM
B-12	+2	20.6	83	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-12	-2	--	--	100	100	90	77	64	61	53	45	42	39	23	16	SM
B-12	-30	--	--	100	93	78	64	54	51	45	39	36	34	26	17	SM
B-12	-33	--	21	--	--	--	--	--	--	--	--	--	--	--	14	SM
B-12	-49	--	22	--	--	--	--	--	--	--	--	--	--	--	4	SP
B-13	+10.38	--	--	100	95	81	68	57	55	48	41	38	35	24	18	SM
B-13	+8.38	58	27	--	--	--	--	--	--	--	--	--	--	--	--	PT
B-13	+6.38	34.7	52	--	--	--	--	--	--	--	--	--	--	--	--	PT

LABORATORY TEST RESULTS

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

Location	Sample Elevation (feet)	Organic Content %	Moisture Content %	Sieve Analysis Results % Passing												USCS
				Sieve Sizes												
				1½ inch	3/4 inch	3/8 inch	No.4	No.8	No.10	No.16	No.30	No.40	No.50	No.100	No.200	
B-14	+11.29	--	33	--	--	--	--	--	--	--	--	--	--	--	30	SM
B-14	+6.29	36.7	47	--	--	--	--	--	-	--	--	--	--	--	--	PT
B-14	+4.29	58.9	67	--	--	--	--	--	-	--	--	--	--	--	--	PT
B-14	-7.71	--	--	100	92	83	70	58	56	48	40	36	33	20	14	SM



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-1	**-12.4**	**Limestone with Silt [GP-GM]**	**18**				**1.57**	**120.1**

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-1	**-12.4**	**37.50**	**9.01**	**1.031**	**0.0750**	**52.0**	**38.0**	**10.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/23/20**

GRADATION CURVES

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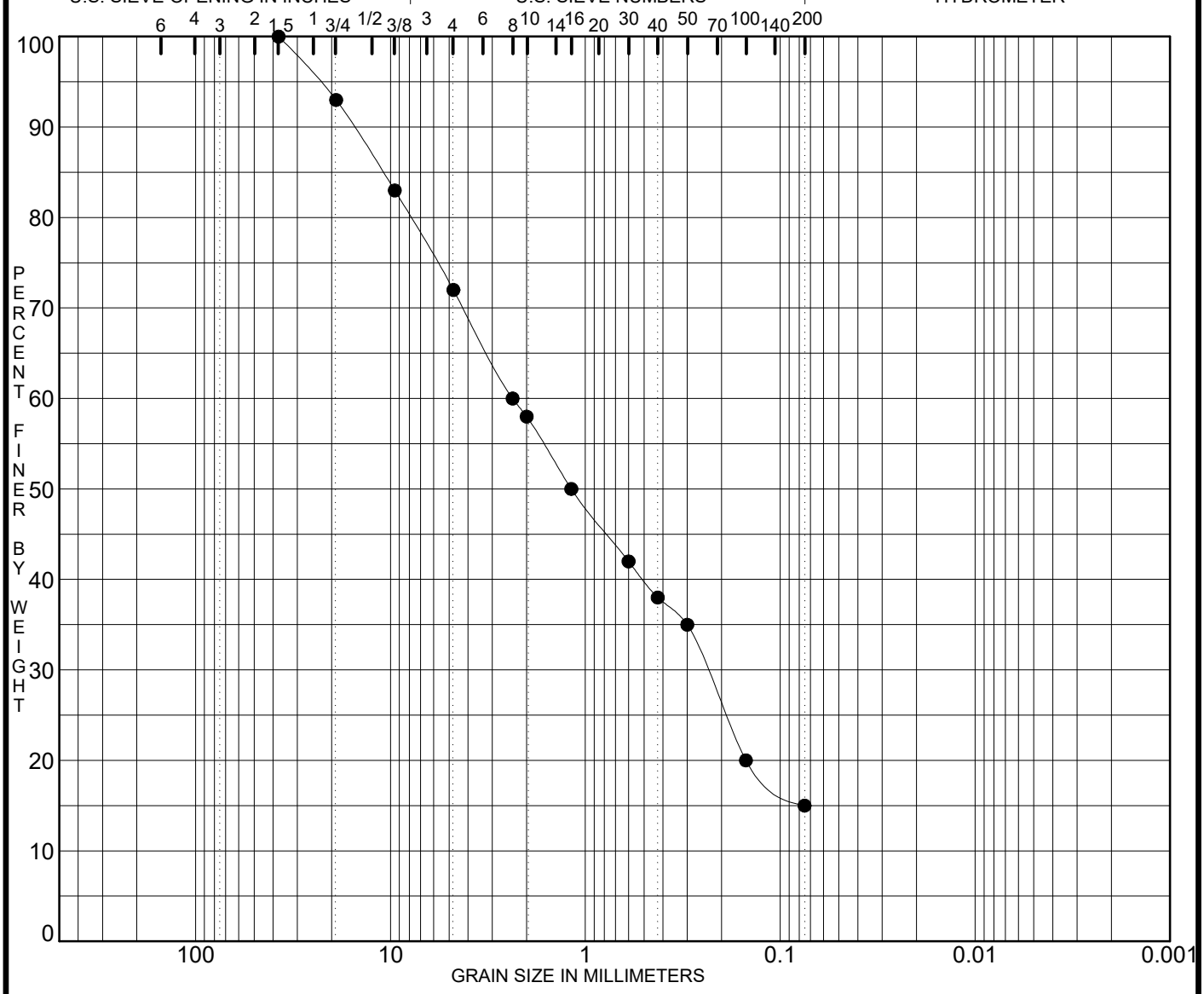

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-2	**-5.4**	**Silty Sand with Limestone [SM]**	**20**					

Boring Number	Elev.(Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-2	**-5.4**	**37.50**	**2.36**	**0.238**		**28.0**	**57.0**	**15.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/23/20**

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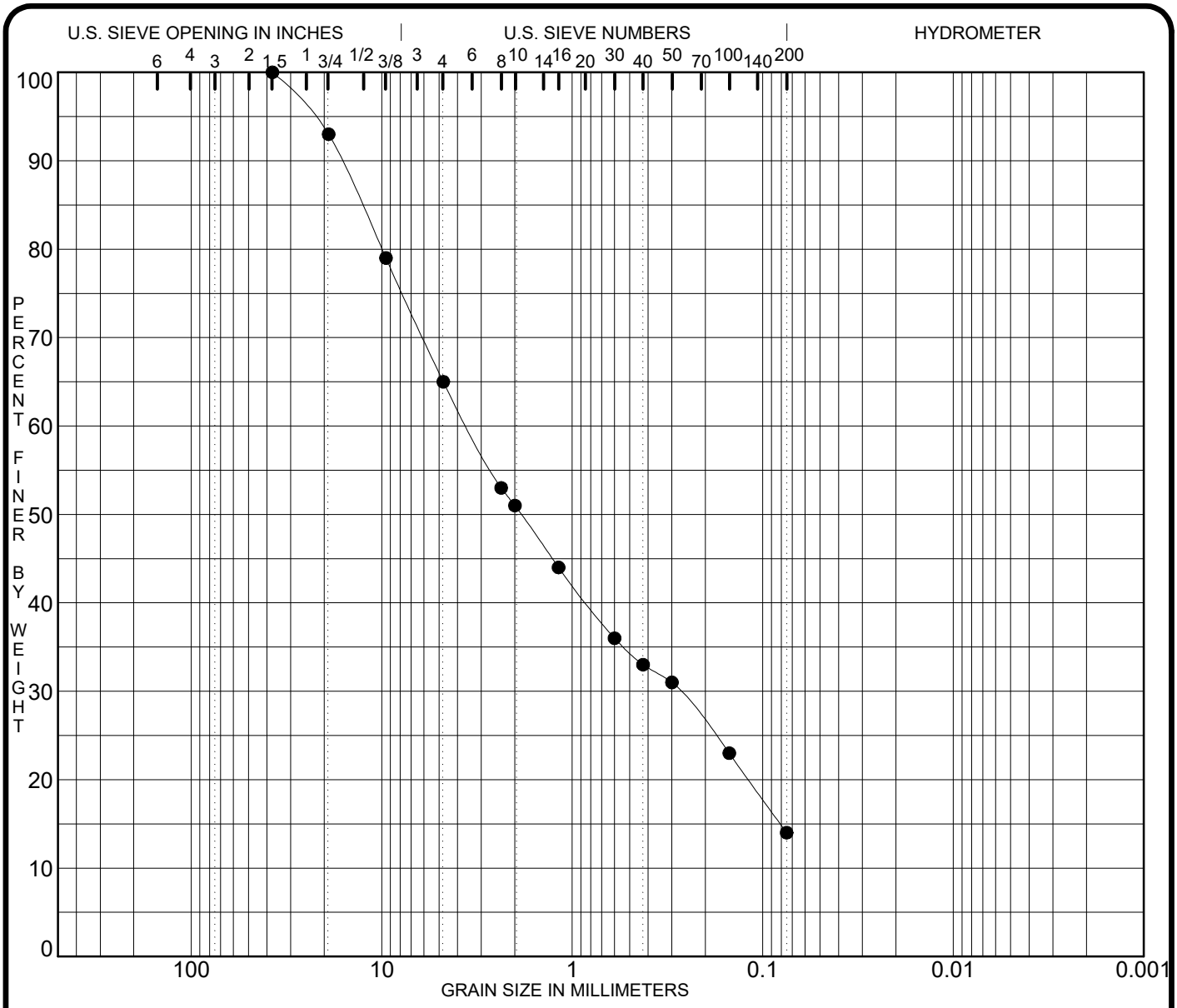

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-3	**-17.0**	**Silty sand with some limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-3	**-17.0**	**37.50**	**3.55**	**0.275**		**35.0**	**51.0**	**14.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

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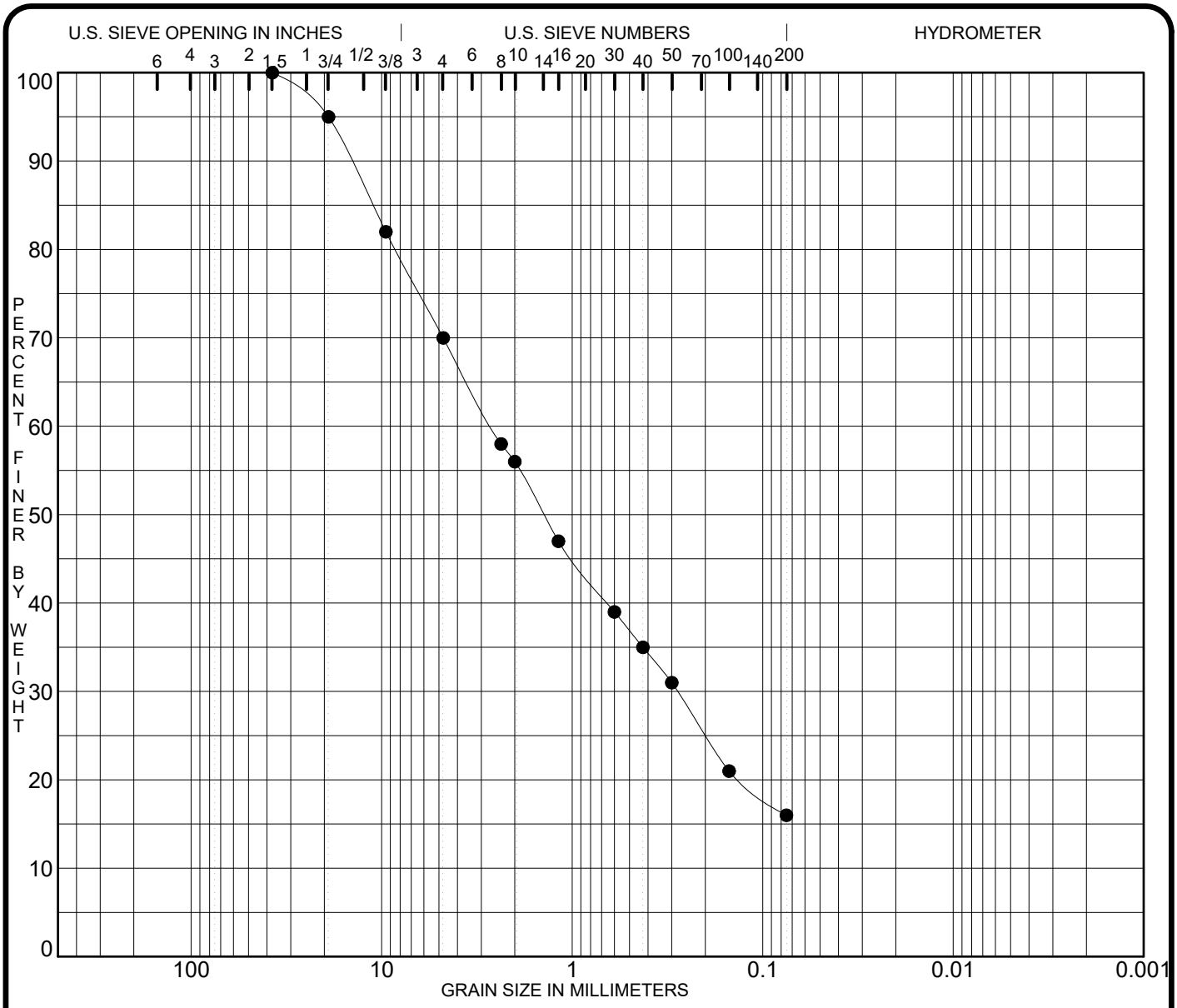

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-4	**-4.0**	**Silty sand with some limestone and shell fragments [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-4	**-4.0**	**37.50**	**2.65**	**0.280**		**30.0**	**54.0**	**16.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

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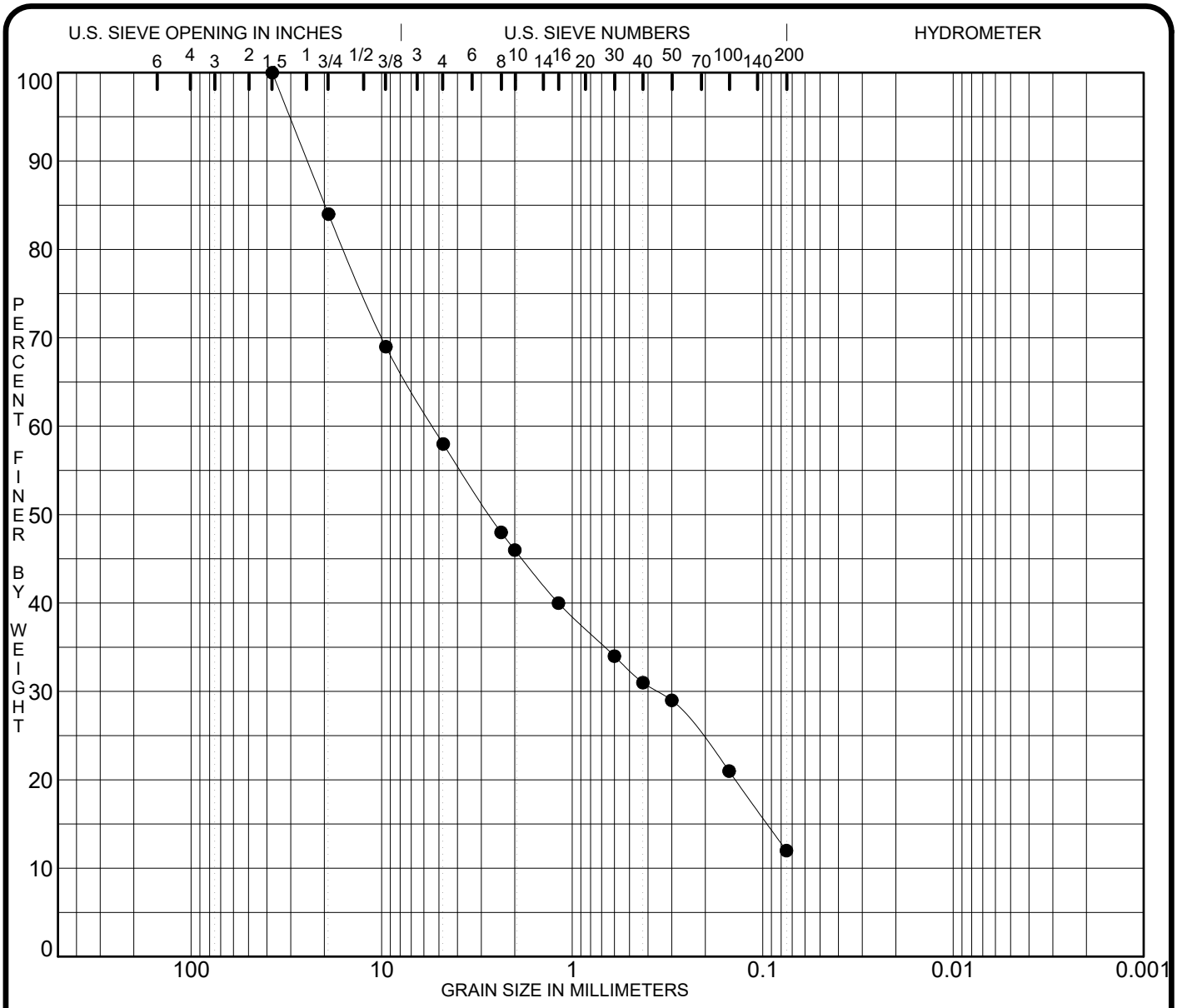

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-4	**-16.0**	**Sand with silt and some limestone with shell fragments [SP-SM]**					**0.37**	**83.8**

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-4	**-16.0**	**37.50**	**5.39**	**0.357**		**42.0**	**46.0**	**12.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

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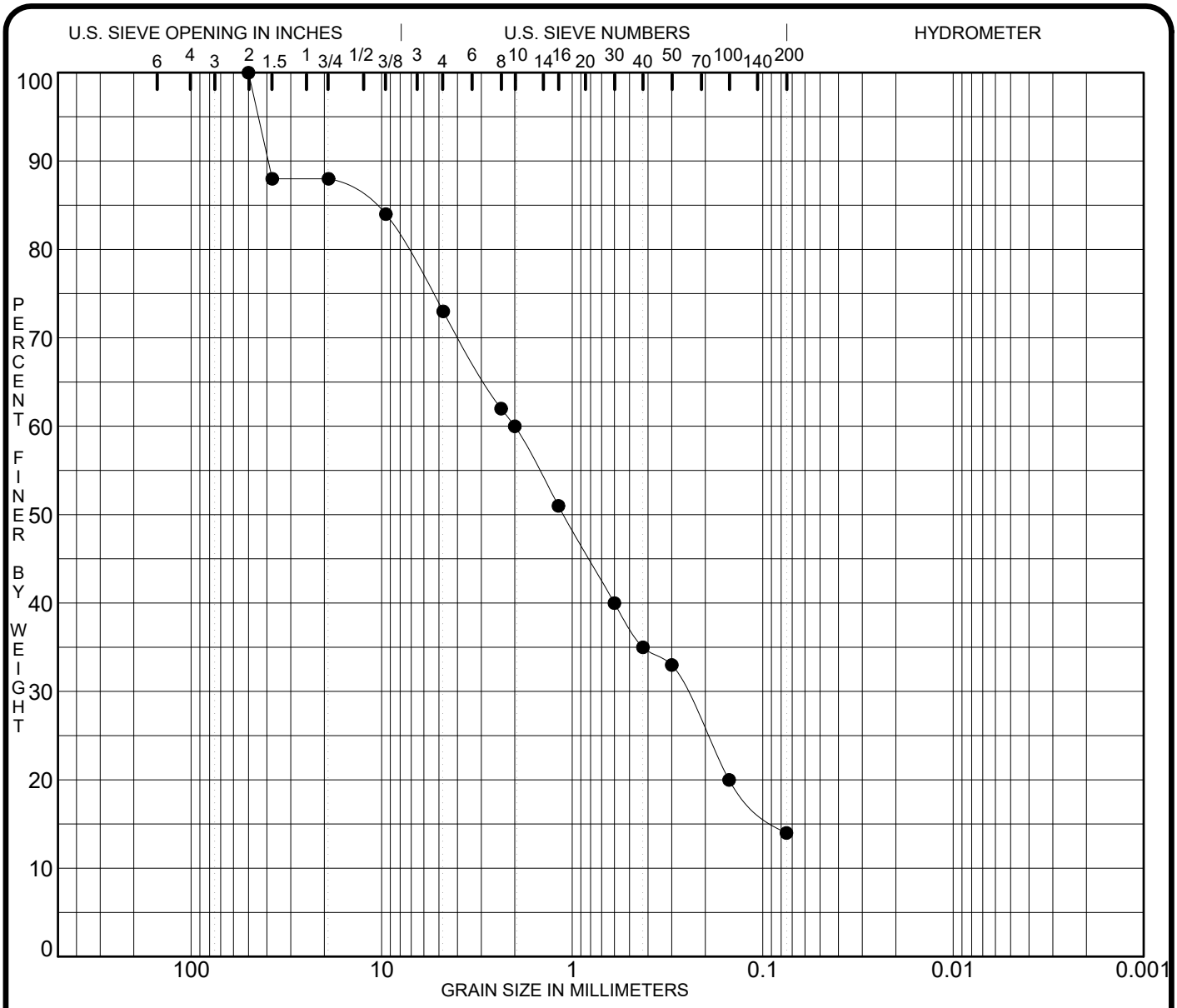

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-5	**-6.0**	**Silty sand with limestone [SM]**						

Boring Number	Elev.(Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-5	**-6.0**	**50.00**	**2.00**	**0.256**		**27.0**	**59.0**	**14.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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DATE **6/4/20**

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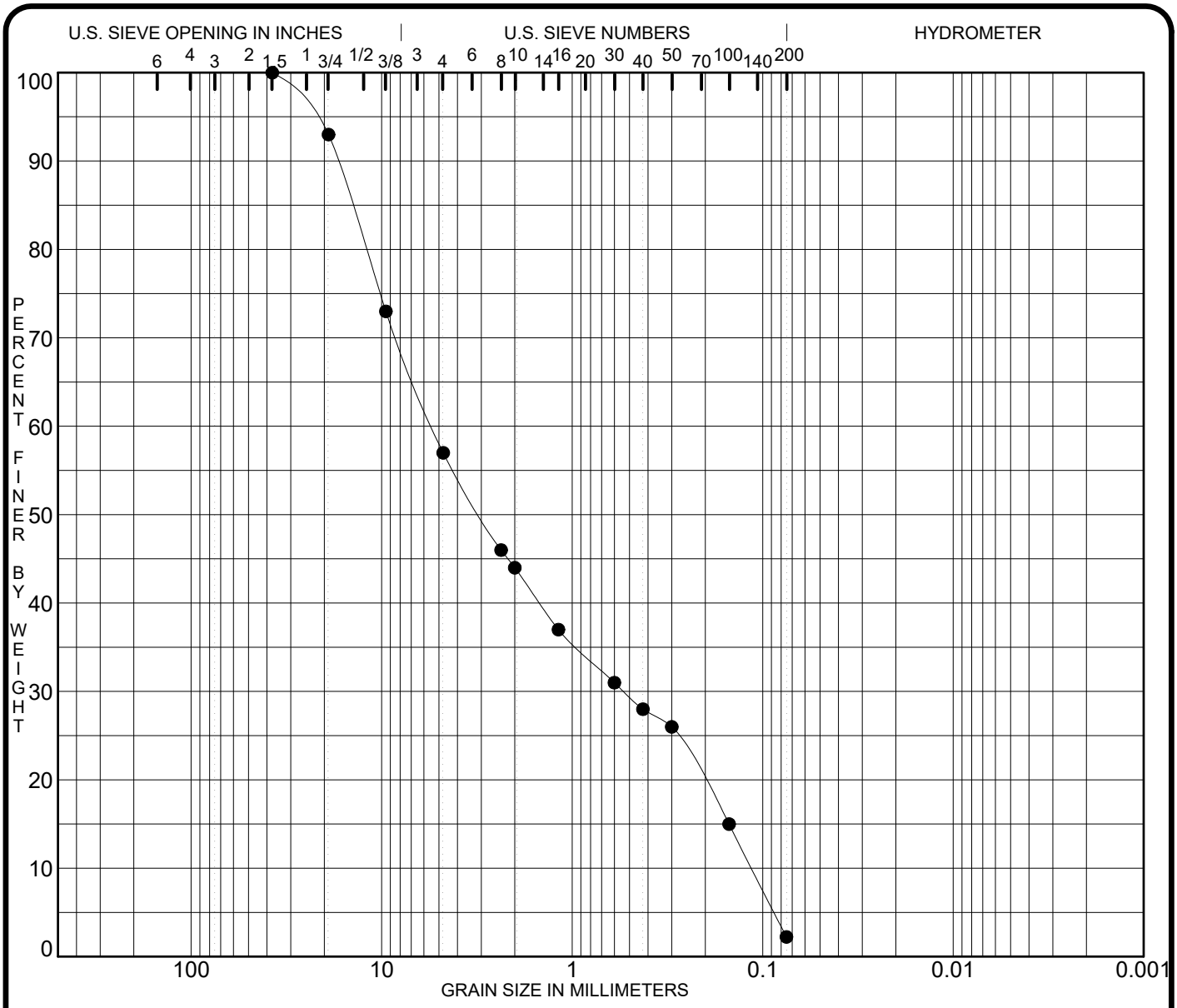

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-5	**-17.0**	**Sand with some limestone [SP]**					**0.46**	**47.3**

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-5	**-17.0**	**37.50**	**5.41**	**0.535**	**0.1143**	**43.0**	**54.8**	**2.2**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

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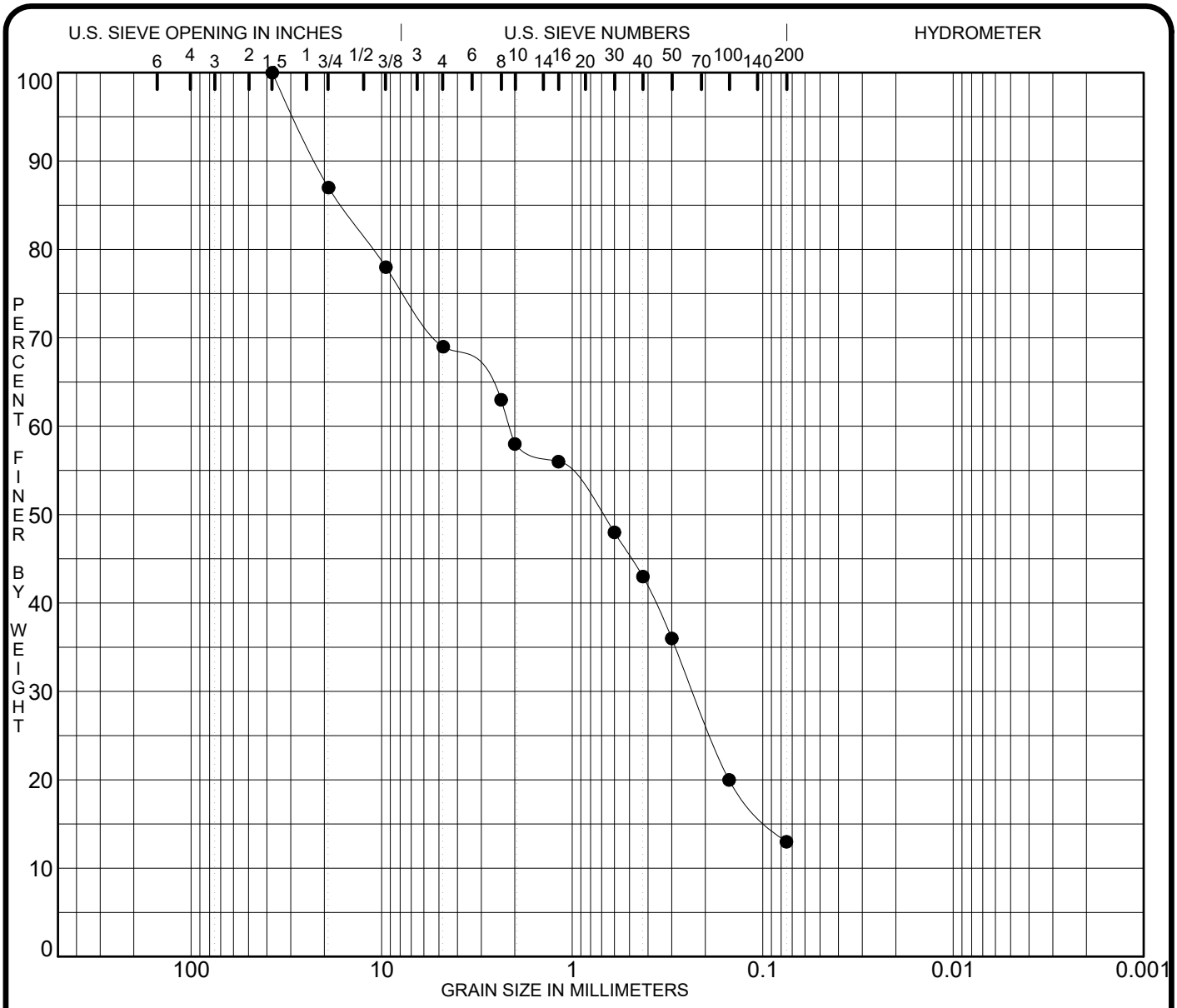

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-6	**-6.0**	**Silty sand with limestone [SM]**						

Boring Number	Elev.(Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-6	**-6.0**	**37.50**	**2.14**	**0.231**		**31.0**	**56.0**	**13.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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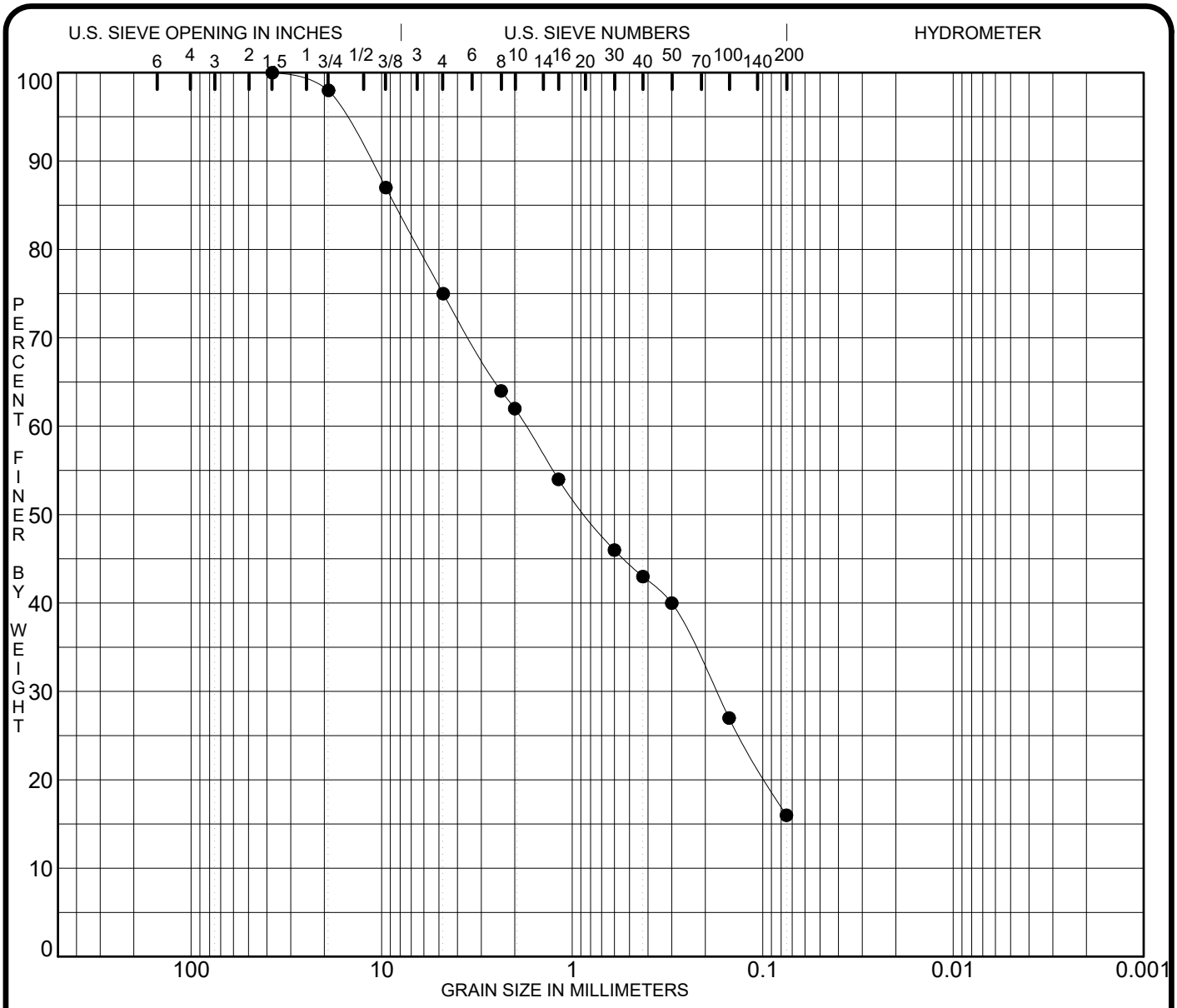

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev.(Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-6	**-14.0**	**Silty sand with limestone and shell fragments [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-6	**-14.0**	**37.50**	**1.75**	**0.176**		**25.0**	**59.0**	**16.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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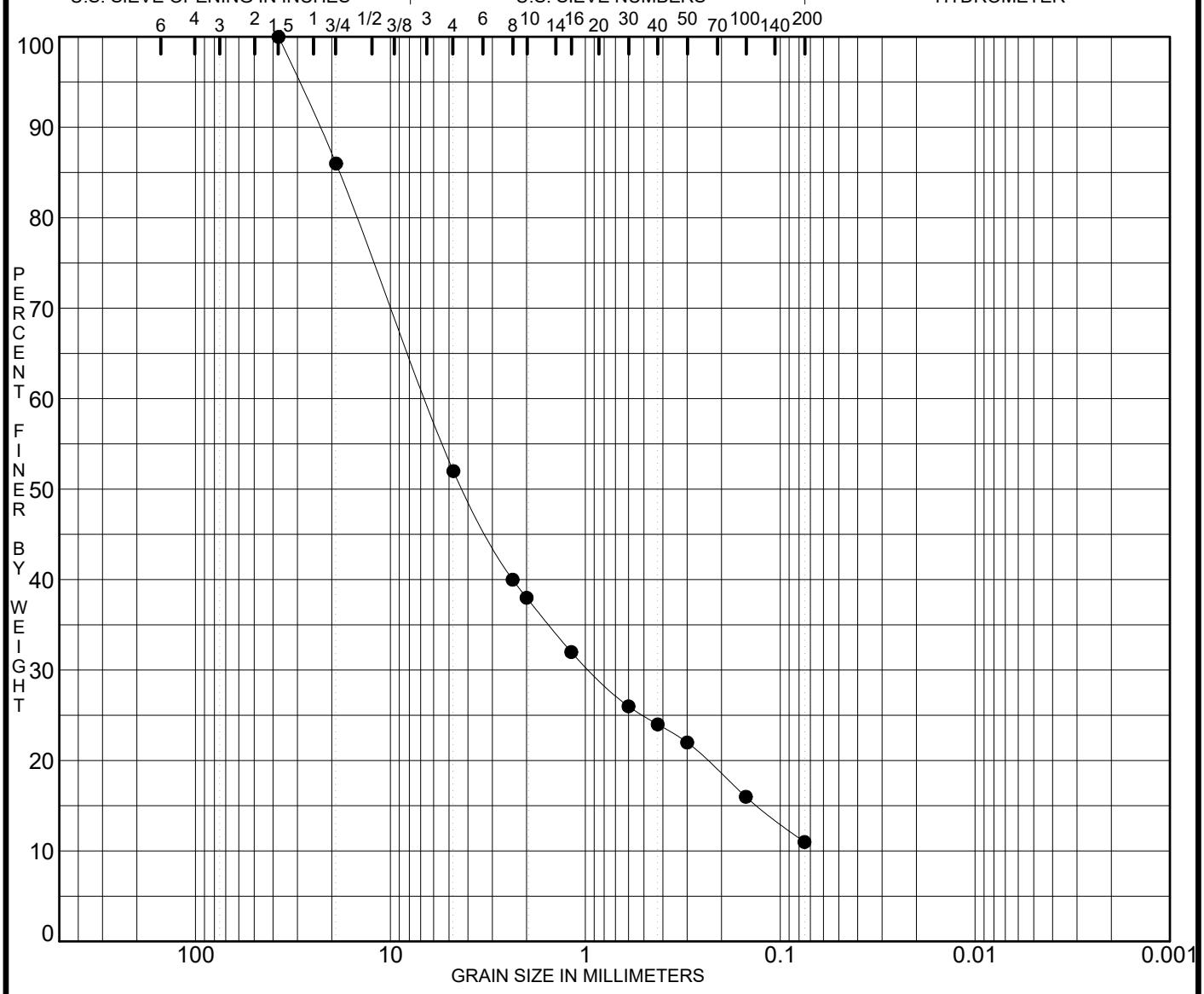

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev.(Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-7	**-11.0**	**Sandy limestone with silt [GP-GM]**					**2.06**	**100.8**

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-7	**-11.0**	**37.50**	**6.58**	**0.942**		**48.0**	**41.0**	**11.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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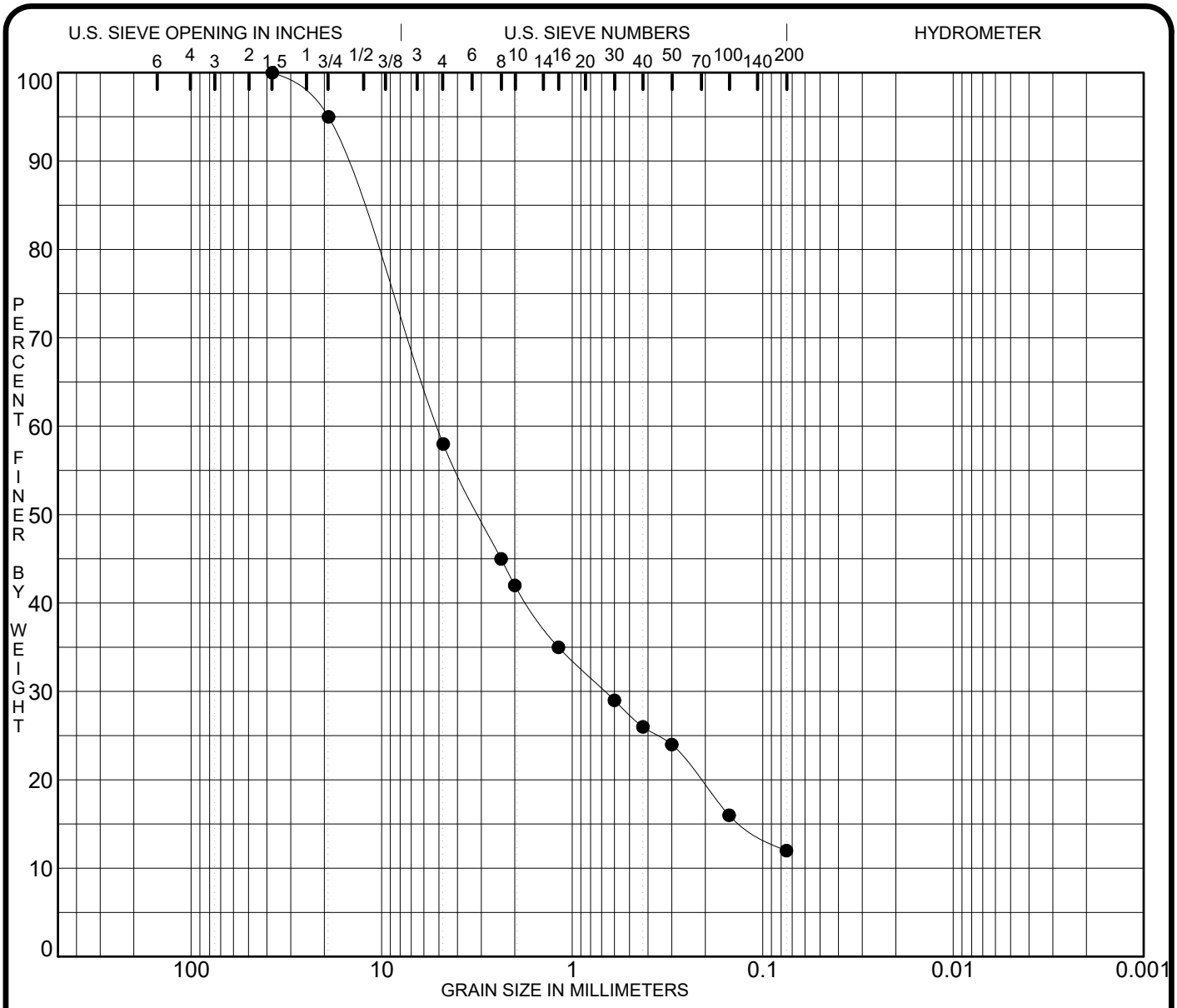

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Depth (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-8	**0.5**	**Sand with silt and limestone [SP-SM]**					**1.66**	**96.5**

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-8	**0.5**	**37.50**	**5.12**	**0.672**		**42.0**	**46.0**	**12.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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DATE **6/4/20**

GRADATION CURVES

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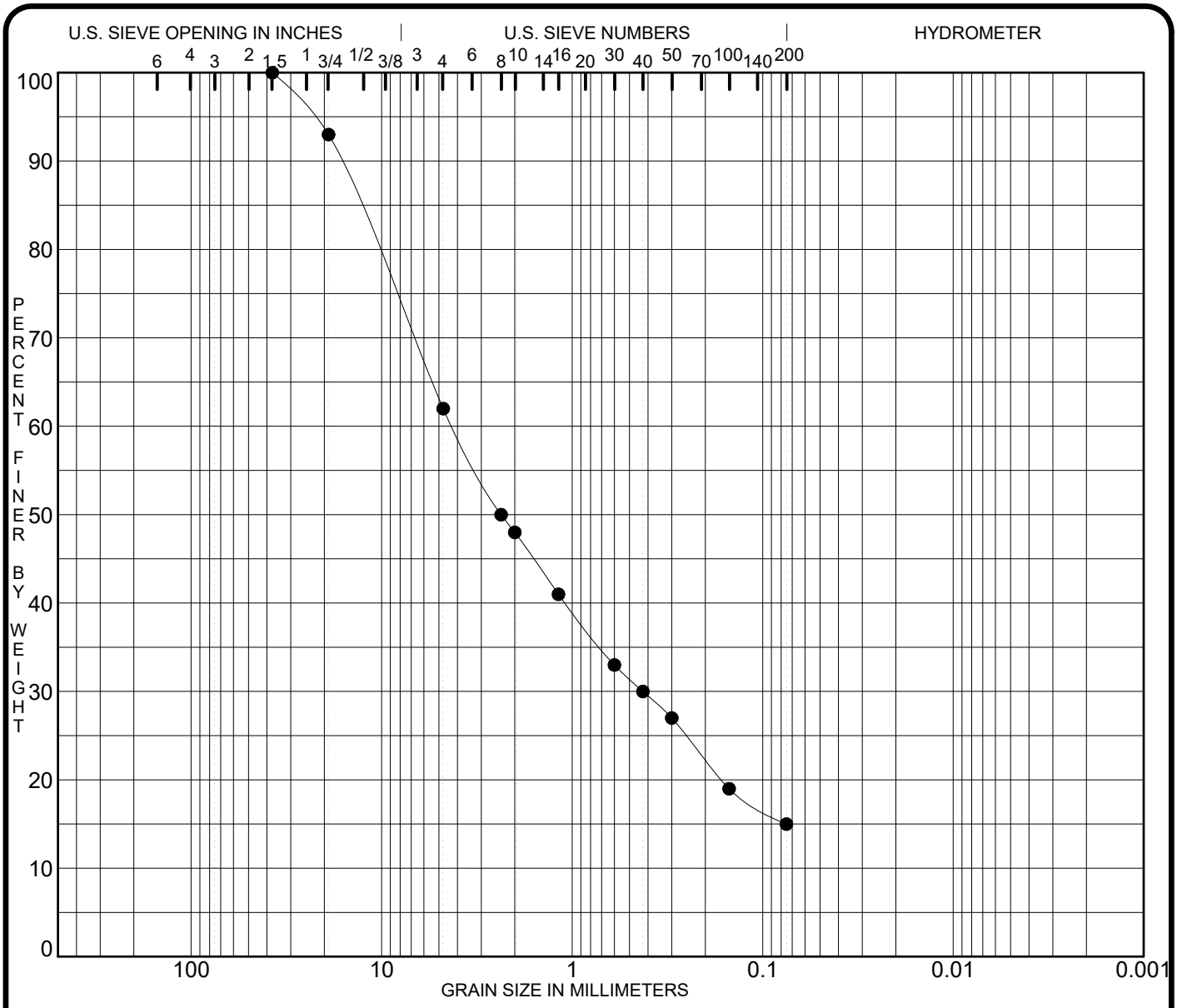

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-9	**+1.0**	**Silty sand with limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-9	**+1.0**	**37.50**	**4.23**	**0.425**		**38.0**	**47.0**	**15.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

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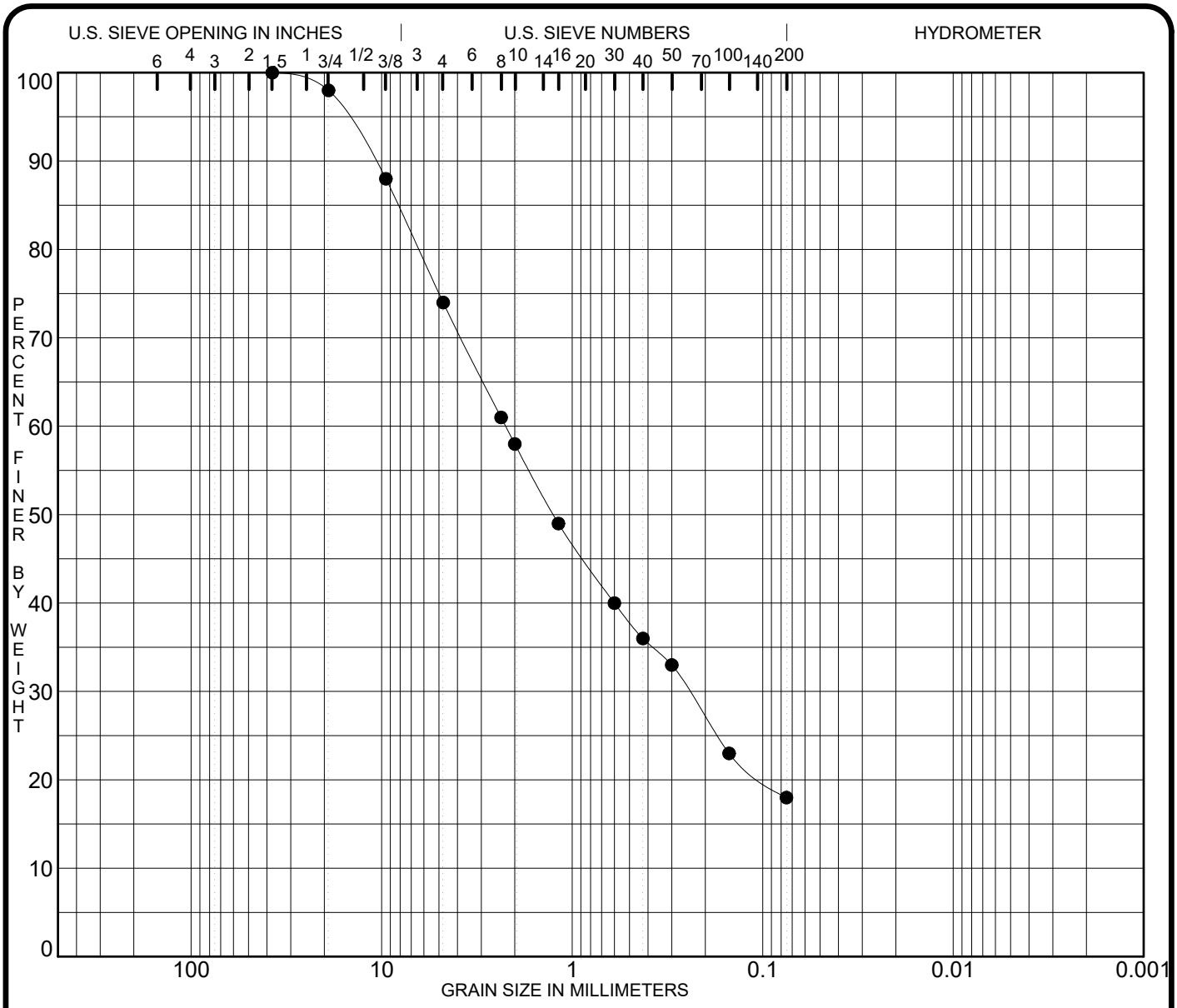
GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-10	**-4.71**	**Silty sand with limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-10	**-4.71**	**37.50**	**2.23**	**0.244**		**26.0**	**56.0**	**18.0**	

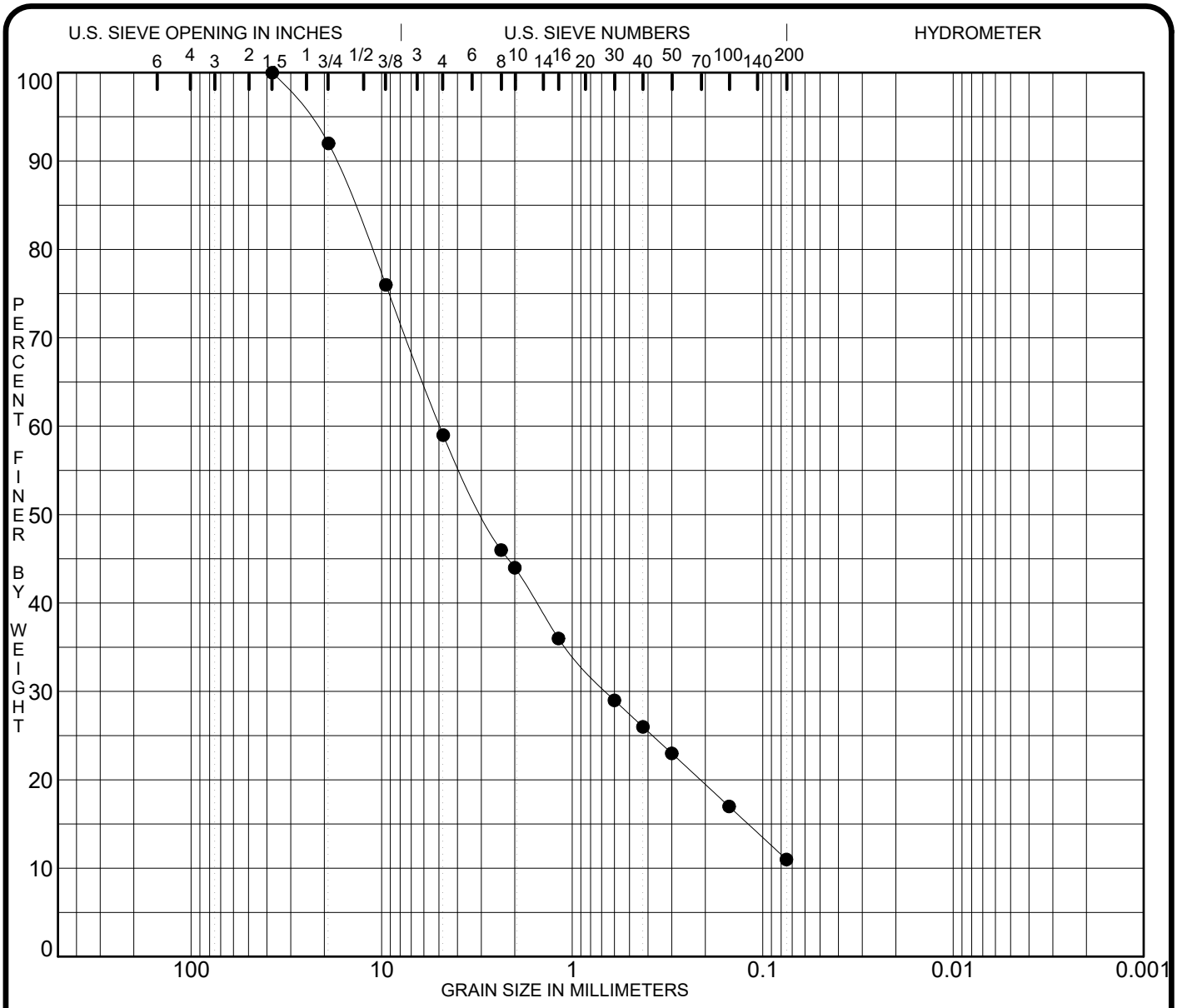
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-11	**-13.0**	**Sand with silt and limestone [SP-SM]**					**1.32**	**74.0**

Boring Number	Elev.(Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-11	**-13.0**	**37.50**	**4.95**	**0.661**		**41.0**	**48.0**	**11.0**	

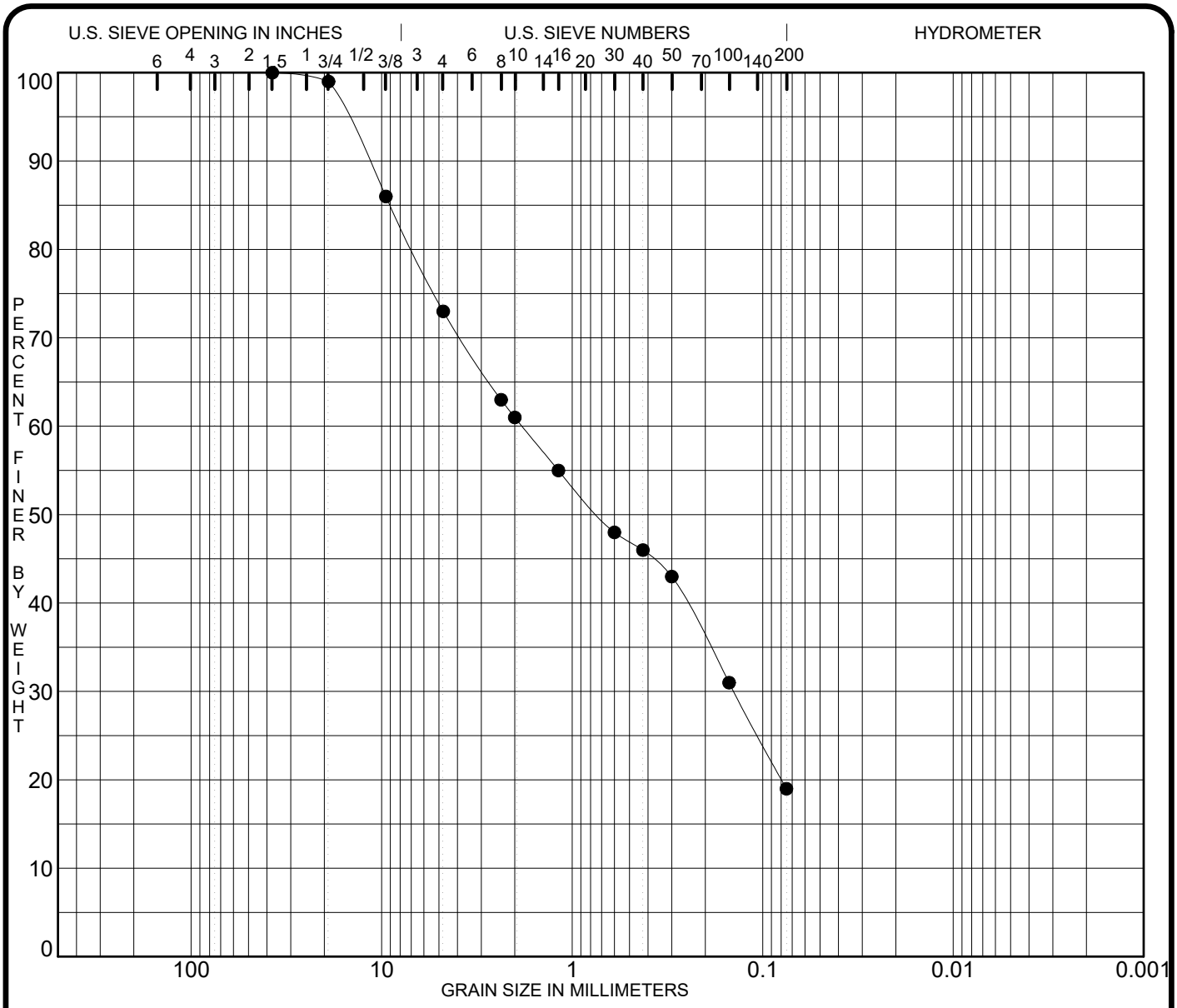
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev.(Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-11	**-32.0**	**Silty sand with limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-11	**-32.0**	**37.50**	**1.83**	**0.142**		**27.0**	**54.0**	**19.0**	

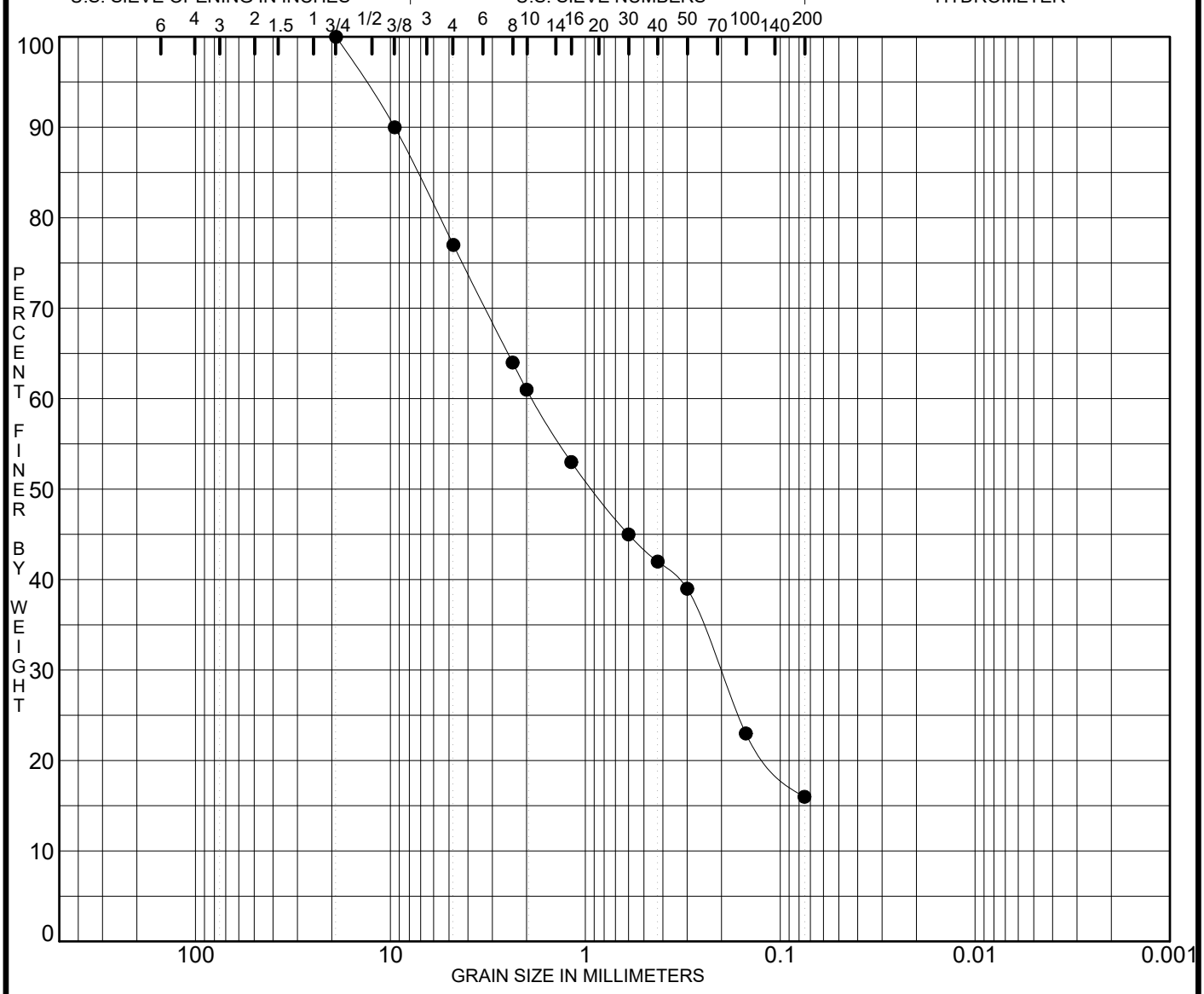
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-12	**-2.0**	**Silty sand with limestone and shell fragments [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-12	**-2.0**	**19.00**	**1.87**	**0.203**		**23.0**	**61.0**	**16.0**	

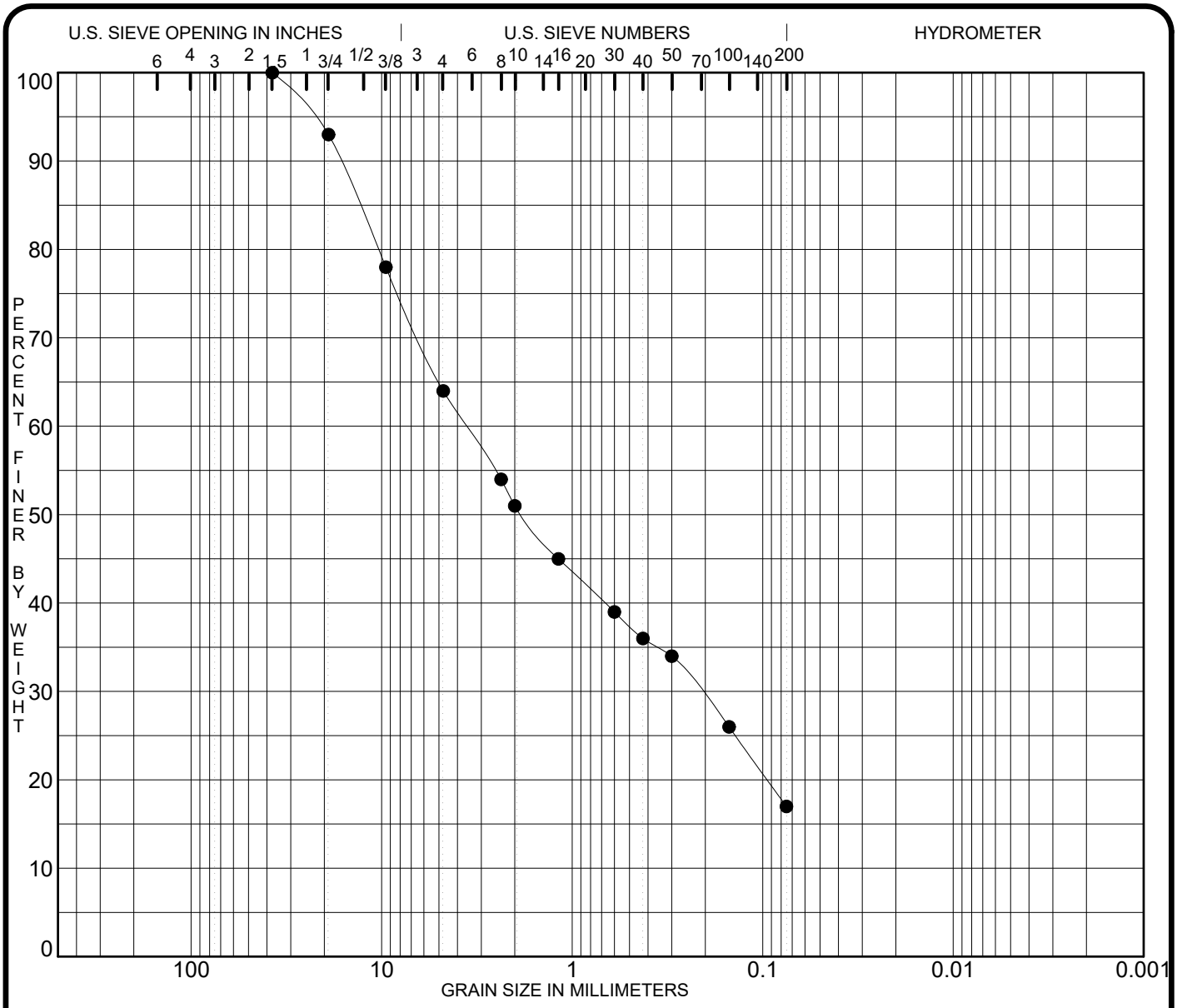
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-12	**-30.0**	**Silty sand with limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-12	**-30.0**	**37.50**	**3.59**	**0.212**		**36.0**	**47.0**	**17.0**	

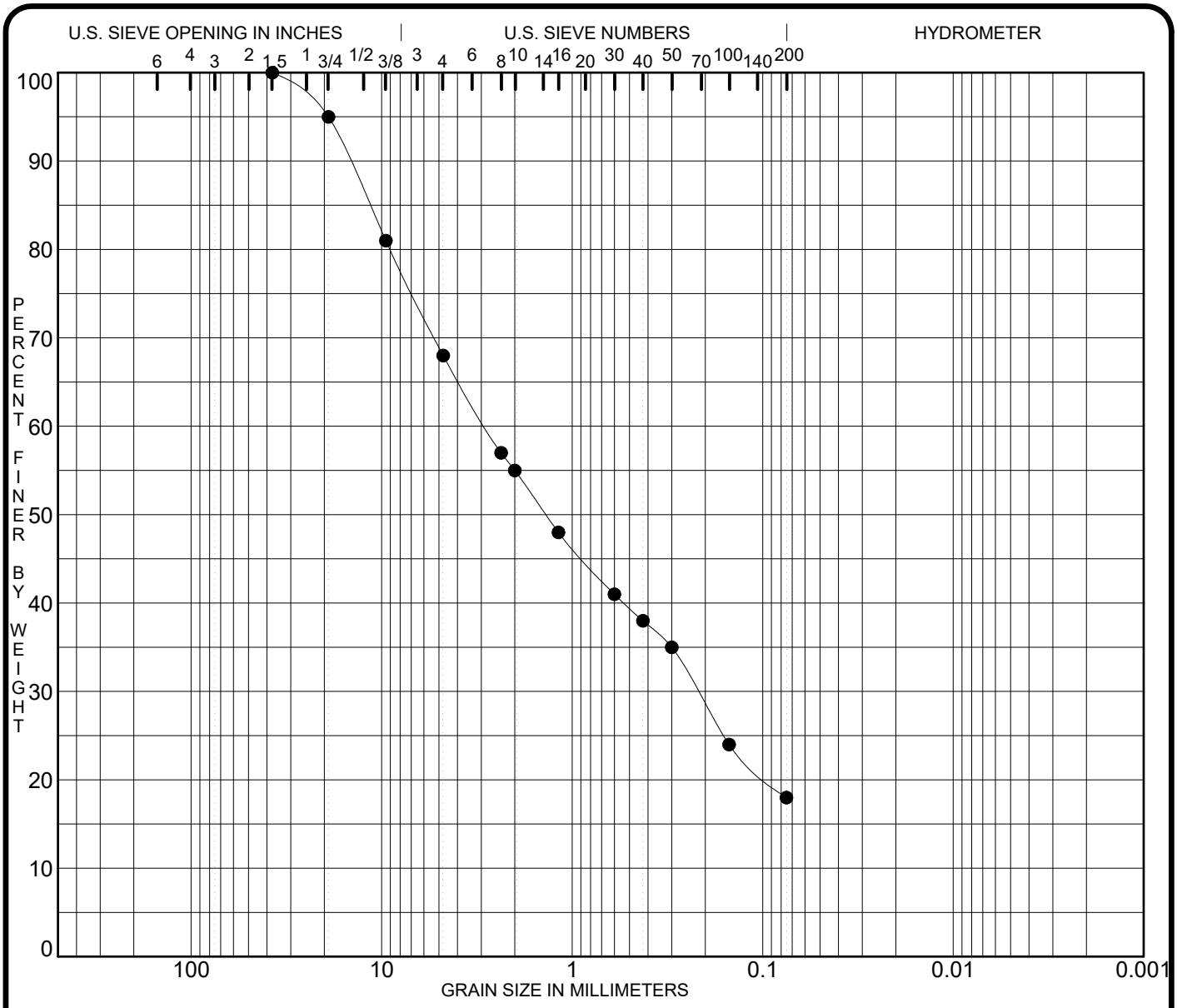
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev.(Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-13	**+10.38**	**Silty sand with some limestone and trace shell fragments [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-13	**+10.38**	**37.50**	**2.86**	**0.219**		**32.0**	**50.0**	**18.0**	

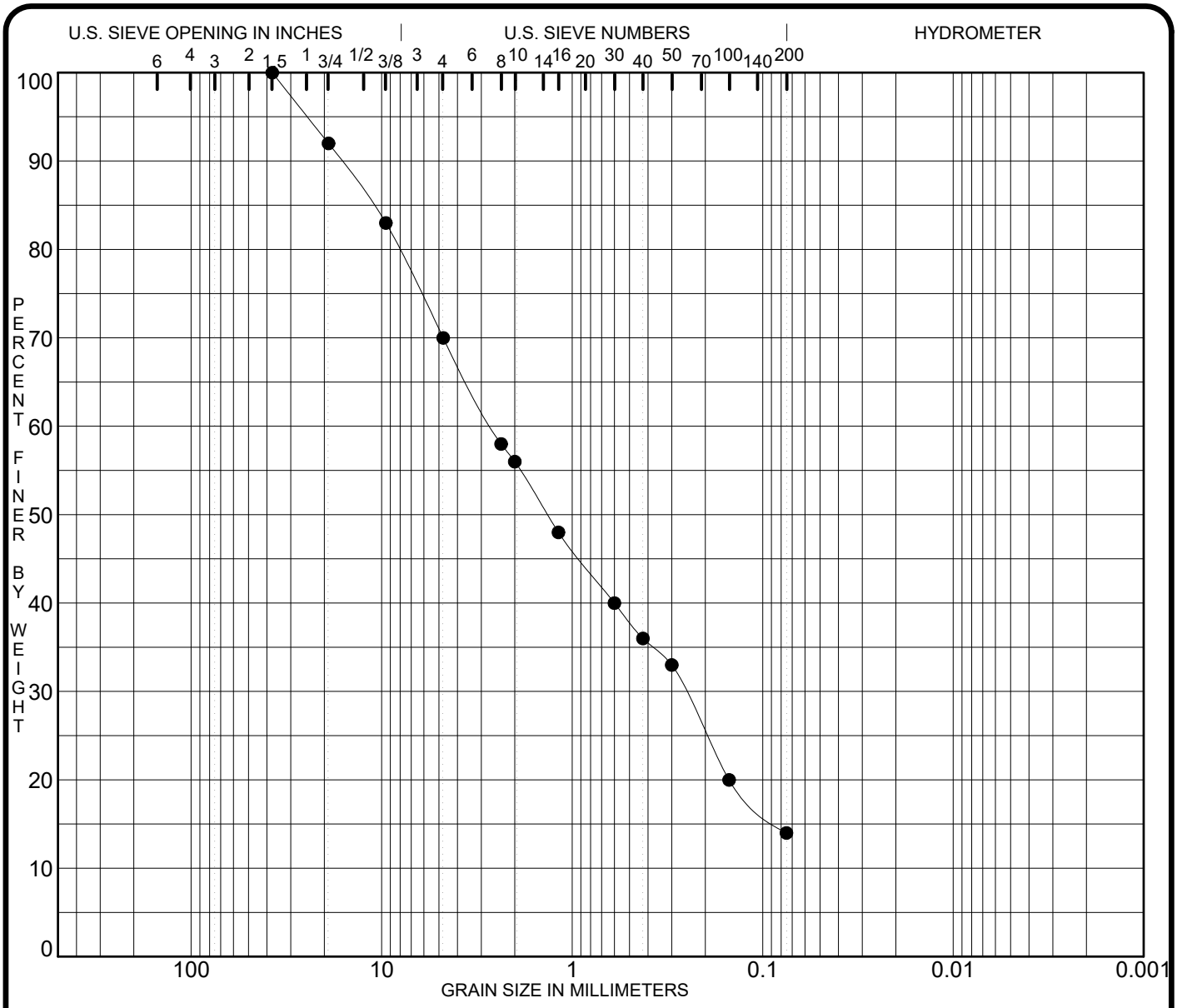
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-14	**-7.71**	**Silty sand with some limestone [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-14	**-7.71**	**37.50**	**2.65**	**0.256**		**30.0**	**56.0**	**14.0**	

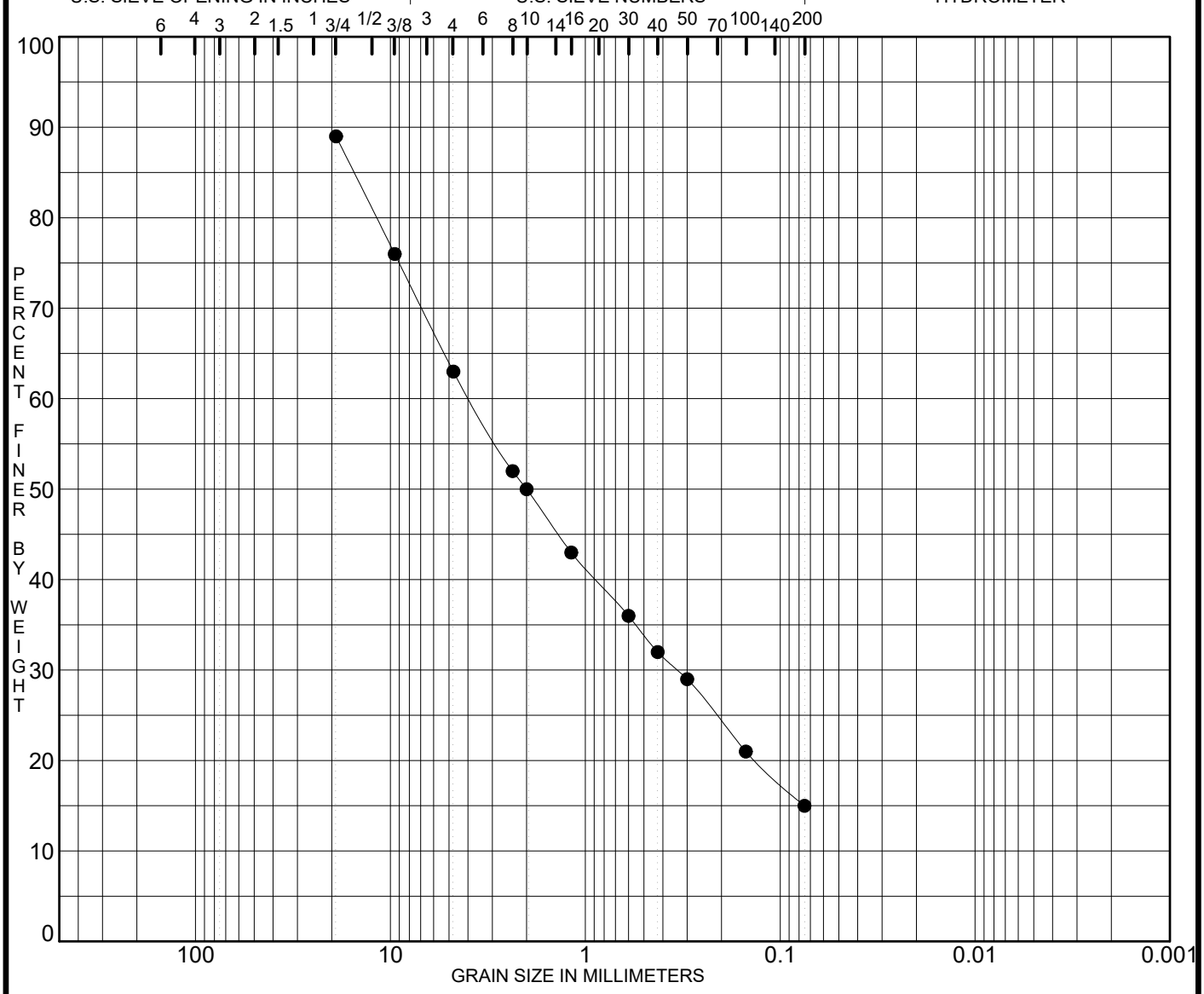
PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring Number	Elev. (Ft)	USCS Classification	MC%	LL	PL	PI	Cc	Cu
B-11a	**-7.5**	**Silty sand with limestone and cemented sand [SM]**						

Boring Number	Elev. (Ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-11a	**-7.5**	**19.00**	**3.93**	**0.337**		**26.0**	**48.0**	**15.0**	

PROJECT **G-6A Pump Station - West Palm Beach**

JOB NO. **0630.2000012**

DATE **6/4/20**

GRADATION CURVES

Universal Engineering Sciences

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

REPORT OF CORROSION PARAMETERS

Date Tested: May 15, 2020

Location: Bridge area. Borings B-11; El. +2 feet to El. -4 feet, B-12; El. +2 feet to El. -4 feet (combined samples of B-11 and B-12)

Location	Sample Description	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (Ohm-cm)	Environmental Classification
Bridge Area	Silty limestone, sandy limestone [GP]	8.67	177	30	2,520	Moderately Aggressive

Date Tested: June 26, 2020

Location: Pump Station. Borings B-1; elevation El. +4.6 feet to El. -8.4 feet (combined samples)

Location	Sample Description	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (Ohm-cm)	Environmental Classification
Building Area	Limestone, sandy limestone [GP]	8.73	135	15	2,260	Moderately Aggressive

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ENGINEERING SCIENCES
Consultants In: Geotechnical Engineering ● Environmental Engineering ●Construction Materials Testing ● Threshold Inspection ● Private Provider Inspection

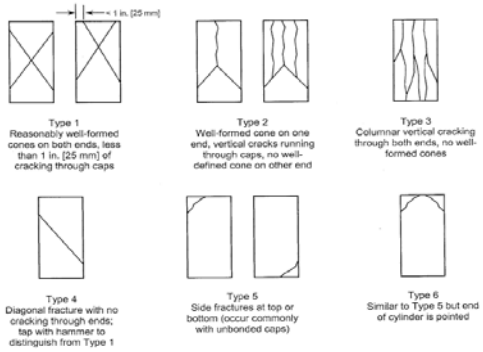
Client: SFWMD
Project Name: G-6A Pump Station
UES Project No. 0630.2000012.0000

Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D-2938

Boring Number	Sample Number	Core Elevation (Feet)	Diameter 1 (inch)	Diameter 2 (inch)	Average Diameter (inch)	Length of Specimen (inch)	Length of Specimen after Capping (in)	L/D	Failure Type	Unconfined Compressive Strength of Rock (lb)	Unconfined Compressive Strength of Rock (tsf)
B-3	S-1	-24.2 to -25	3.24	3.24	3.24	6.72	7.19	2.22	3	6,503	56.8
B-6	S-1	-2.9 to -3.5	3.25	3.25	3.25	5.21	5.91	1.82	3	6,984	60.6
B-9	S-1	-2 to -2.8	3.25	3.25	3.25	6.50	6.76	2.08	3	11,451	99.4
B-12	S-1	-15 to -15.8	3.25	3.25	3.25	6.50	6.71	2.06	3	26,671	231.5

Failure Type Legend



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ENGINEERING SCIENCES
Consultants In: Geotechnical Engineering ● Environmental Engineering ●Construction Materials Testing ● Threshold Inspection ● Private Provider Inspection

Client: SFWMD
Project Name: G-6A Pump Station
UES Project No. 0630.2000012.0000

Splitting Tensile Strength of Intact Rock Core Specimens

ASTM D-3967-05

Boring Number	Sample Number	Core Elevation (Feet)	Length 1 (inch)	Length 2 (inch)	Length 3 (inch)	Average Length (inch)	Diameter (inch)	L/D	Split Tensile Strength of Rock (lb)	Split Tensile Strength of Rock (tsf)
B-3	S-2	-25.4 to 26	5.95	5.94	5.95	5.95	3.24	1.84	13,122	31
B-6	S-2	-2 to -2.5	5.00	5.00	5.00	5.00	3.24	1.54	7,377	21
B-9	S-2	-4.2 to -4.8	6.94	6.94	6.93	6.94	3.24	2.14	16,661	34
B-12	S-2	-19.4 to -20	4.98	5.00	4.99	4.99	3.23	1.54	3,879	11

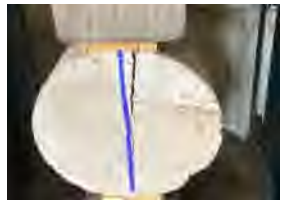
Fracture Sketch

B-3, S-2

B-6, S-2

Fracture Sketch

B-9, S-2



B-12, S-2

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida
UES Project No. 0630.2000012
UES Report No. 17223

Laboratory Testing Procedures

Natural Moisture Content

The water content of the sample tested was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of "pore" of "free" water in a given mass of material to the mass of solid material particles.

Organic Content Determination (ASTM D2974)

The organic content is obtained by selecting a representative soil sample and measuring its dry weight. The sample is then ignited in a muffle furnace to burn off all the organic material in the sample. After an allotted time period the after-ignition weight is obtained. The percentage of organic material within the sample is then calculated.

Percent Fines Content

The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

Soil Gradation Analysis (ASTM C 136)

The soil gradation test is performed by passing a representative soil sample over a standard set of nested sieves. The percentage of the soil grains (by dry weight basis) retained on each sieve is measured and a grain size distribution curve is plotted.

Resistivity Testing (FM 5-551)

The resistivity test is performed by preparing a sample with soil passing the No. 8 sieve, adding distilled water, and mixing. The sample is then placed in a soil box with electrodes, where it is connected to a resistivity meter. The resistivity is measured passing through the soil. The sample is removed from the box and further diluted with distilled water, and the procedure is repeated until a minimum resistivity is obtained.

pH (FM 5-550)

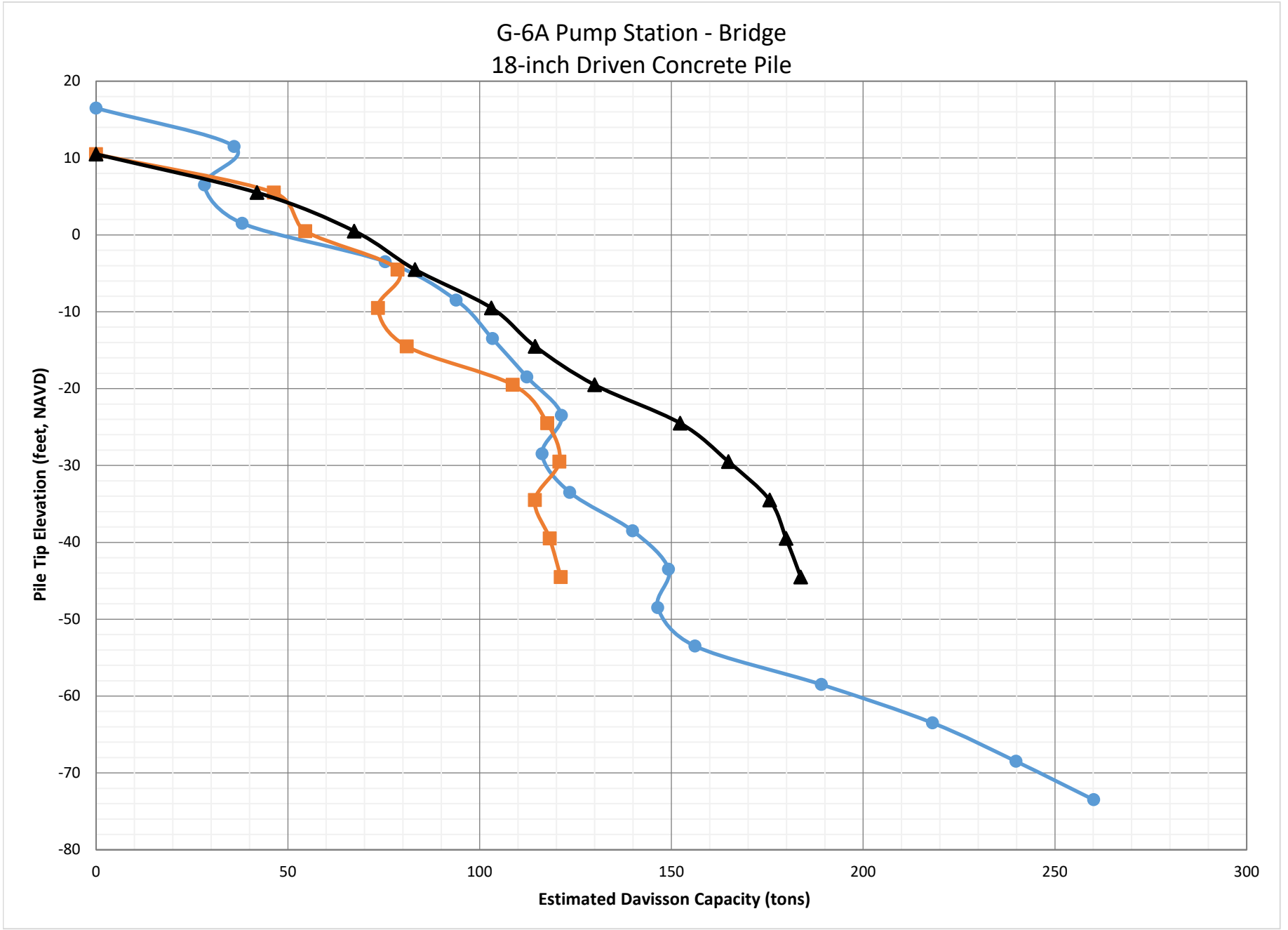
The pH is measured by mixing distilled water with a soil sample until the soil particles are dispersed. Then the sample is checked for pH, using a pH meter.

Sulfate (FM 5-553)

A representative sample is saturated with distilled water, agitated thoroughly and aspirated over a qualitative filter. A reagent is added to the retrieved liquid. The liquid is then placed in a nephelometer to measure concentration of sulfate.

Chloride (FM 5-552)

A representative sample is saturated with distilled water, agitated thoroughly and aspirated over a qualitative filter. The retrieved liquid is mixed with an indicator liquid. Change in color of the sample is monitored and converted to concentration of chlorides.


G-6A Pump Station - Bridge
18-inch Driven Concrete Pile
Pile Tip Elevation (feet, NAVD)
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0
50
100
150
200
250
300
Estimated Davisson Capacity (tons)

B-11A

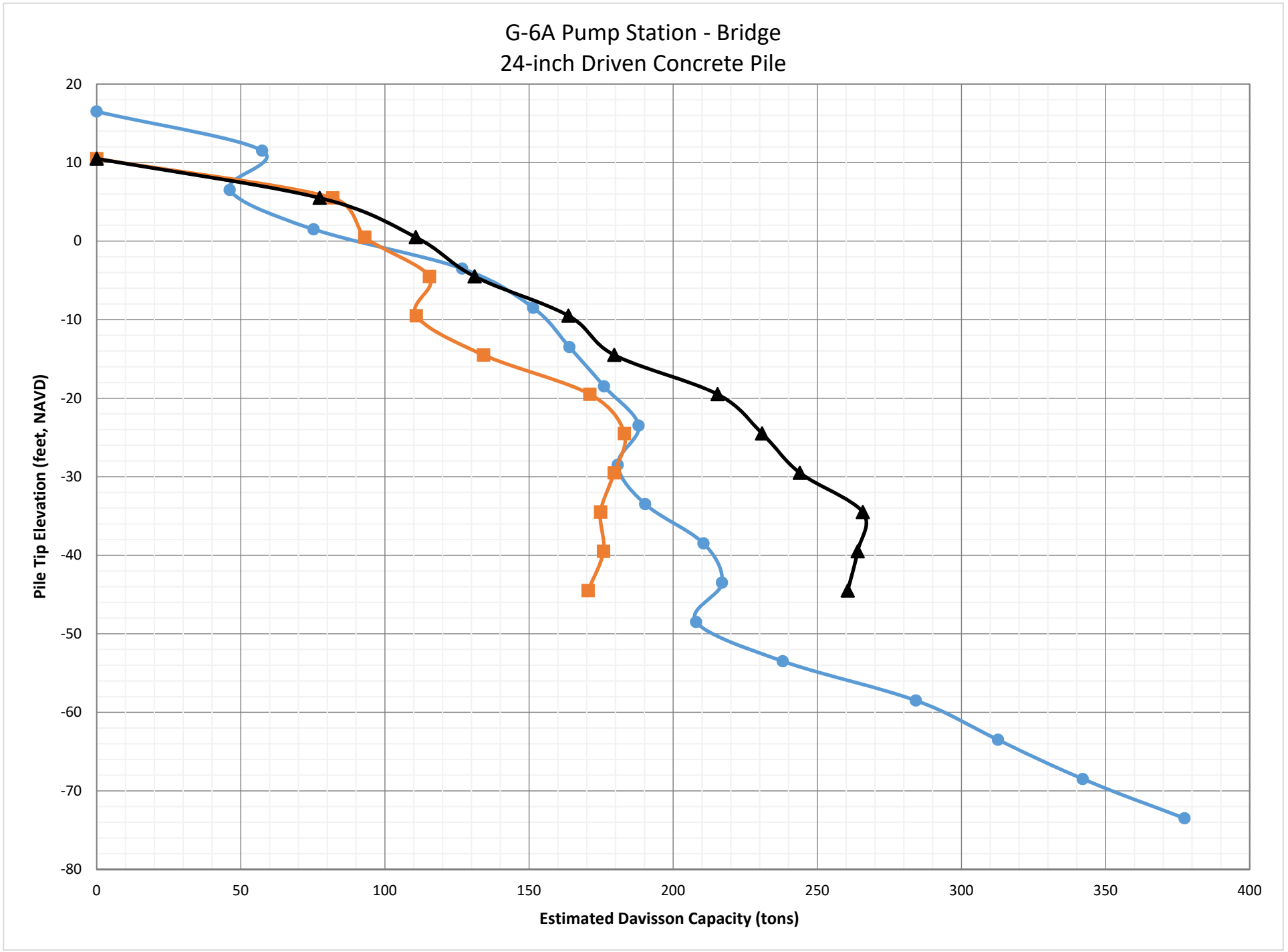
Tip Elevation (ft)	Estimated Davisson Capacity (tons)
16.5	0
11.50	36.01
6.50	28.27
1.50	38.12
-3.50	75.42
-8.50	93.91
-13.50	103.35
-18.50	112.35
-23.50	121.35
-28.50	116.30
-33.50	123.54
-38.50	139.89
-43.50	149.28
-48.50	146.47
-53.50	156.18
-58.50	189.09
-63.50	218.11
-68.50	239.85
-73.50	260.14

B-11

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
10.5	0
5.50	46.35
0.50	54.52
-4.50	78.61
-9.50	73.47
-14.50	80.99
-19.50	108.64
-24.50	117.64
-29.50	120.81
-34.50	114.43
-39.50	118.26
-44.50	121.15

B-12

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
10.5	0
5.50	41.95
0.50	67.30
-4.50	83.13
-9.50	103.07
-14.50	114.46
-19.50	129.95
-24.50	152.29
-29.50	164.86
-34.50	175.61
-39.50	179.92
-44.50	183.70


G-6A Pump Station - Bridge
24-inch Driven Concrete Pile
Pile Tip Elevation (feet, NAVD)
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0
50
100
150
200
250
300
350
400
Estimated Davisson Capacity (tons)

B-11A

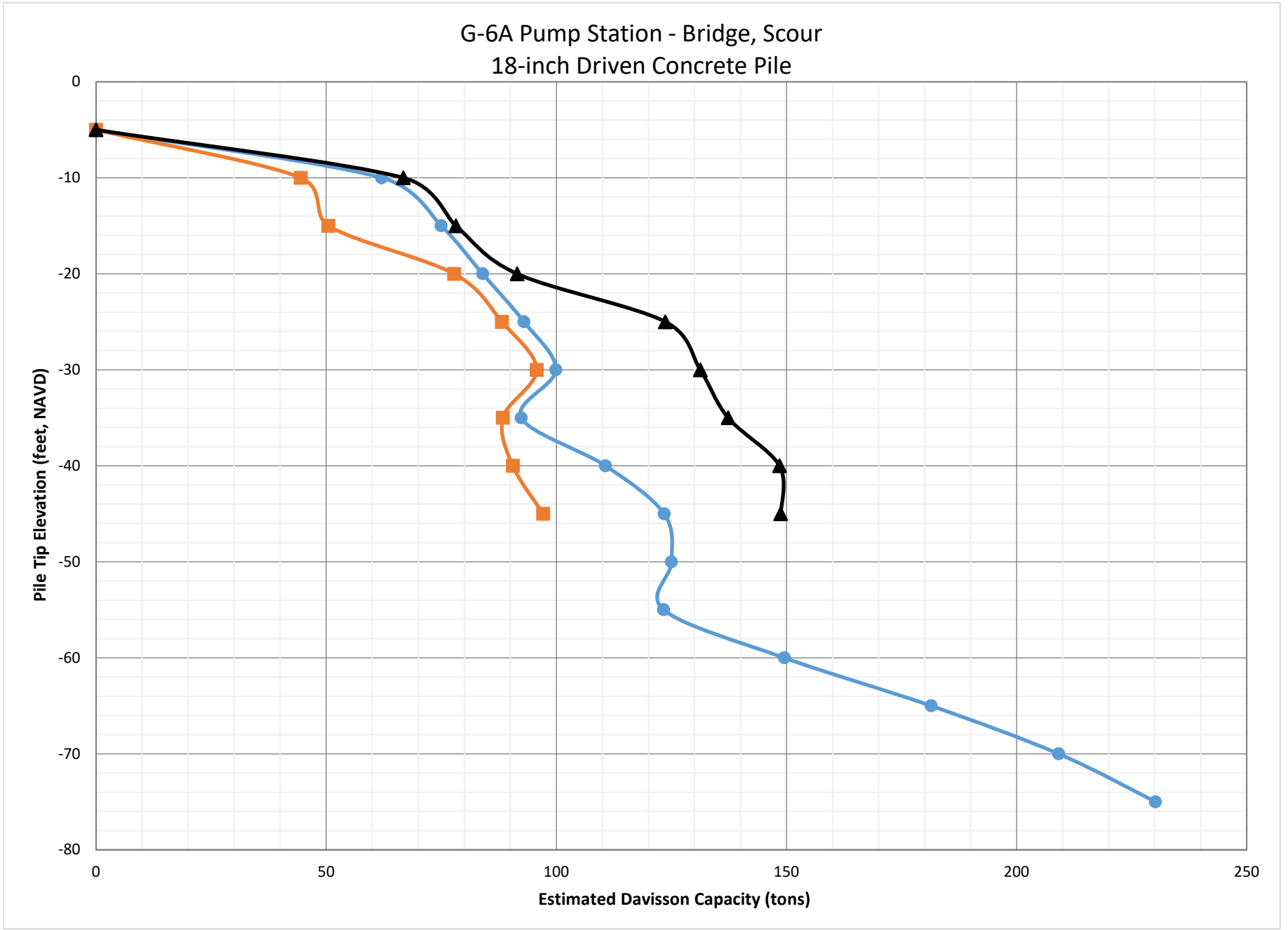
Tip Elevation (ft)	Estimated Davisson Capacity (tons)
16.5	0
11.50	57.44
6.50	46.20
1.50	75.28
-3.50	126.79
-8.50	151.44
-13.50	164.03
-18.50	176.03
-23.50	188.03
-28.50	180.77
-33.50	190.31
-38.50	210.54
-43.50	216.95
-48.50	207.99
-53.50	238.03
-58.50	284.22
-63.50	312.71
-68.50	342.11
-73.50	377.43

B-11

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
10.5	0
5.50	81.86
0.50	92.99
-4.50	115.42
-9.50	110.88
-14.50	134.22
-19.50	171.08
-24.50	183.08
-29.50	179.55
-34.50	174.81
-39.50	175.82
-44.50	170.50

B-12

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
10.5	0
5.50	77.34
0.50	110.69
-4.50	131.09
-9.50	163.65
-14.50	179.56
-19.50	215.40
-24.50	230.85
-29.50	243.91
-34.50	265.77
-39.50	263.99
-44.50	260.57


G-6A Pump Station - Bridge, Scour
18-inch Driven Concrete Pile
0
-10
-20
-30
-40
-50
-60
-70
-80
Pile Tip Elevation (feet, NAVD)
0
50
100
150
200
250
Estimated Davisson Capacity (tons)

B-11A

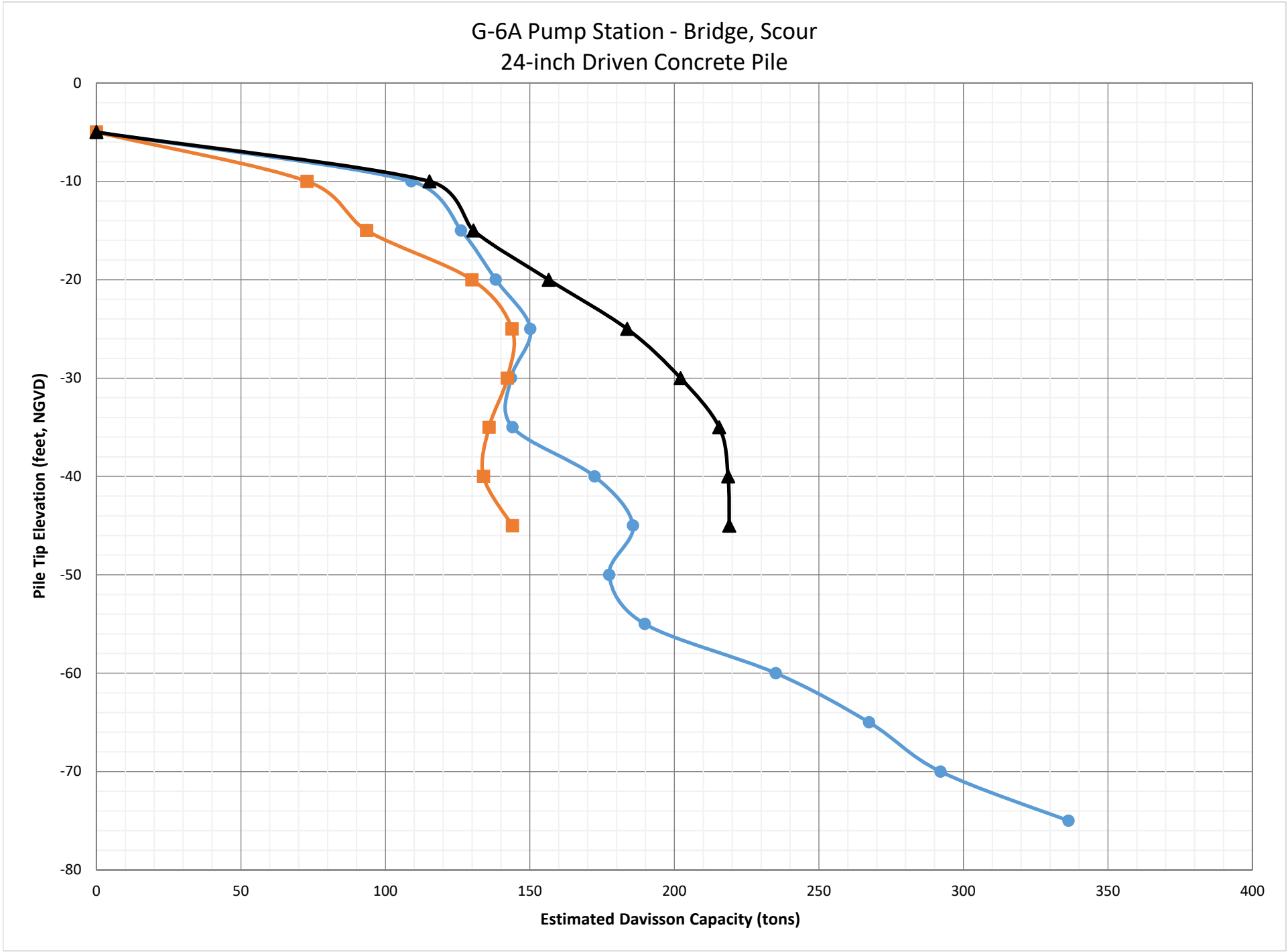
Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	62.07
-15.00	74.98
-20.00	83.98
-25.00	92.98
-30.00	99.89
-35.00	92.40
-40.00	110.70
-45.00	123.44
-50.00	125.03
-55.00	123.33
-60.00	149.55
-65.00	181.45
-70.00	209.15
-75.00	230.19

B-11

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	44.46
-15.00	50.46
-20.00	77.78
-25.00	88.18
-30.00	95.72
-35.00	88.38
-40.00	90.54
-45.00	97.16

B-12

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	66.77
-15.00	78.16
-20.00	91.48
-25.00	123.70
-30.00	131.27
-35.00	137.32
-40.00	148.49
-45.00	148.76


G-6A Pump Station - Bridge, Scour
24-inch Driven Concrete Pile
Pile Tip Elevation (feet, NGVD)
0
-10
-20
-30
-40
-50
-60
-70
-80
0
50
100
150
200
250
300
350
400
Estimated Davisson Capacity (tons)

B-11A

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	108.99
-15.00	126.20
-20.00	138.20
-25.00	150.20
-30.00	143.47
-35.00	144.00
-40.00	172.41
-45.00	185.67
-50.00	177.44
-55.00	189.80
-60.00	235.13
-65.00	267.38
-70.00	292.10
-75.00	336.42

B-11

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	72.89
-15.00	93.51
-20.00	129.94
-25.00	143.80
-30.00	142.20
-35.00	135.87
-40.00	133.92
-45.00	143.94

B-12

Tip Elevation (ft)	Estimated Davisson Capacity (tons)
-5	0
-10.00	115.25
-15.00	130.44
-20.00	156.51
-25.00	183.64
-30.00	202.13
-35.00	215.53
-40.00	218.58
-45.00	218.96

Photo No. 1: B-6 Facing southwest

Photo No. 2: B-8 Facing southwest

Photo No. 3: B-9 Facing north

Photo No. 4: B-11 Facing southeast

Photo No. 5: B-12 Facing northeast

Photo No. 9: B-1

Photo No. 10: B-2

APPENDIX C

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Important Information about This

Geotechnical-Engineering Report

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

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

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

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

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

UNANTICIPATED SOIL CONDITIONS

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

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

CHANGED CONDITIONS

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

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

MISINTERPRETATION OF SOIL ENGINEERING REPORT

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

CHANGED STRUCTURE OR LOCATION

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

USE OF REPORT BY BIDDERS

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

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

STRATA CHANGES

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

OBSERVATIONS DURING DRILLING

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

WATER LEVELS

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

LOCATION OF BURIED OBJECTS

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

TIME

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

UNIVERSAL
ENGINEERING SCIENCES

APPENDIX D

UNIVERSAL
ENGINEERING SCIENCES

Universal Engineering Sciences, Inc.

GENERAL CONDITIONS

SECTION 1: RESPONSIBILITIES

1.1 *Universal Engineering Sciences, LLC, Universal Engineering Inspections, LLC, and GFA International Inc. ("UES"), have the responsibility for providing the services described under the Scope of Services section. The work is to be performed according to accepted standards of care and is to be completed in a timely manner. The term "UES" as used herein includes all of Universal Engineering Sciences, LLC, Universal Engineering Inspections, LLC, GFA International, Inc., its' agents, employees, professional staff, and subcontractors.*

1.2 The Client or a duly authorized representative is responsible for providing UES with a clear understanding of the project nature and scope. The Client shall supply UES with sufficient and adequate information, including, but not limited to, maps, site plans, reports, surveys and designs, to allow UES to properly complete the specified services. The Client shall also communicate changes in the nature and scope of the project as soon as possible during performance of the work so that the changes can be incorporated into the work product.

1.3 The Client acknowledges that UES's responsibilities in providing the services described under the Scope of Services section is limited to those services described therein, and the Client hereby assumes any collateral or affiliated duties necessitated by or for those services. Such duties may include, but are not limited to, reporting requirements imposed by any third party such as federal, state, or local entities, the provision of any required notices to any third party, or the securing of necessary permits or permissions from any third parties required for UES's provision of the services so described, unless otherwise agreed upon by both parties.

1.4 Universal will not be responsible for scheduling our services and will not be responsible for tests or inspections that are not performed due to a failure to schedule our services on the project or any resulting damages.

1.5 **PURSUANT TO FLORIDA STATUTES §558.0035, ANY INDIVIDUAL EMPLOYEE OR AGENT OF UES MAY NOT BE HELD INDIVIDUALLY LIABLE FOR NEGLIGENCE.**

SECTION 2: STANDARD OF CARE

2.1 Services performed by UES under this Agreement will be conducted in a manner consistent with the level of care and skill ordinarily exercised by members of UES's profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty, express or implied, is made.

2.2 The Client recognizes that subsurface conditions may vary from those observed at locations where borings, surveys, or other explorations are made, and that site conditions may change with time. Data, interpretations, and recommendations by UES will be based solely on information available to UES at the time of service. UES is responsible for those data, interpretations, and recommendations, but will not be responsible for other parties' interpretations or use of the information developed.

2.3 Execution of this document by UES is not a representation that UES has visited the site, become generally familiar with local conditions under which the services are to be performed, or correlated personal observations with the requirements of the Scope of Services. It is the Client's responsibility to provide UES with all information necessary for UES to provide the services described under the Scope of Services, and the Client assumes all liability for information not provided to UES that may affect the quality or sufficiency of the services so described.

2.4 Should UES be retained to provide threshold inspection services under Florida Statutes §553.79, Client acknowledges that UES's services thereunder do not constitute a guarantee that the construction in question has been properly designed or constructed, and UES's services do not replace any of the obligations or liabilities associated with any architect, contractor, or structural engineer. Therefore it is explicitly agreed that the Client will not hold UES responsible for the proper performance of service by any architect, contractor, structural engineer or any other entity associated with the project.

SECTION 3: SITE ACCESS AND SITE CONDITIONS

3.1 Client will grant or obtain free access to the site for all equipment and personnel necessary for UES to perform the work set forth in this Agreement. The Client will notify any and all possessors of the project site that Client has granted UES free access to the site. UES will take reasonable precautions to minimize damage to the site, but it is understood by Client that, in the normal course of work, some damage may occur, and the correction of such damage is not part of this Agreement unless so specified in the Proposal.

3.2 The Client is responsible for the accuracy of locations for all subterranean structures and utilities. UES will take reasonable precautions to avoid known subterranean structures, and the Client waives any claim against UES, and agrees to defend, indemnify, and hold UES harmless from any claim or liability for injury or loss, including costs of defense, arising from damage done to subterranean structures and utilities not identified or accurately located. In addition, Client agrees to compensate UES for any time spent or expenses incurred by UES in defense of any such claim with compensation to be based upon UES's prevailing fee schedule and expense reimbursement policy.

SECTION 4: SAMPLE OWNERSHIP AND DISPOSAL

4.1 Soil or water samples obtained from the project during performance of the work shall remain the property of the Client.

4.2 UES will dispose of or return to Client all remaining soils and rock samples 60 days after submission of report covering those samples. Further storage or transfer of samples can be made at Client's expense upon Client's prior written request.

4.3 Samples which are contaminated by petroleum products or other chemical waste will be returned to Client for treatment or disposal, consistent with all appropriate federal, state, or local regulations.

SECTION 5: BILLING AND PAYMENT

5.1 UES will submit invoices to Client monthly or upon completion of services. Invoices will show charges for different personnel and expense classifications.

5.2 Payment is due 30 days after presentation of invoice and is past due 31 days from invoice date. Client agrees to pay a finance charge of one and one-half percent (1 ½ %) per month, or the maximum rate allowed by law, on past due accounts.

5.3 If UES incurs any expenses to collect overdue billings on invoices, the sums paid by UES for reasonable attorneys' fees, court costs, UES's time, UES's expenses, and interest will be due and owing by the Client.

SECTION 6: OWNERSHIP AND USE OF DOCUMENTS

6.1 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, as instruments of service, shall remain the property of UES.

6.2 Client agrees that all reports and other work furnished to the Client or his agents, which are not paid for, will be returned upon demand and will not be used by the Client for any purpose.

6.3 UES will retain all pertinent records relating to the services performed for a period of five years following submission of the report, during which period the records will be made available to the Client at all reasonable times.

6.4 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, are prepared for the sole and exclusive use of Client, and may not be given to any other party or used or relied upon by any such party without the express written consent of UES.

SECTION 7: DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS

7.1 Client warrants that a reasonable effort has been made to inform UES of known or suspected hazardous materials on or near the project site.

7.2 Under this agreement, the term hazardous materials include hazardous materials (40 CFR 172.01), hazardous wastes (40 CFR 261.2), hazardous substances (40 CFR 300.6), petroleum products, polychlorinated biphenyls, and asbestos.

7.3 Hazardous materials may exist at a site where there is no reason to believe they could or should be present. UES and Client agree that the discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work. UES and Client also agree that the discovery of unanticipated hazardous materials may make it necessary for UES to take immediate measures to protect health and safety. Client agrees to compensate UES for any equipment decontamination or other costs incident to the discovery of unanticipated hazardous waste.

7.4 UES agrees to notify Client when unanticipated hazardous materials or suspected hazardous materials are encountered. Client agrees to make any disclosures required by law to the appropriate governing agencies. Client also agrees to hold UES harmless for any and all consequences of disclosures made by UES which are required by governing law. In the event the project site is not owned by Client, Client recognizes that it is the Client's responsibility to inform the property owner of the discovery of unanticipated hazardous materials or suspected hazardous materials.

7.5 Notwithstanding any other provision of the Agreement, Client waives any claim against UES, and to the maximum extent permitted by law, agrees to defend, indemnify, and save UES harmless from any claim, liability, and/or defense costs for injury or loss arising from UES's discovery of unanticipated hazardous materials or suspected hazardous materials including any costs created by delay of the project and any cost associated with possible reduction of the property's value. Client will be responsible for ultimate disposal of any samples secured by UES which are found to be contaminated.

SECTION 8: RISK ALLOCATION

8.1 Client agrees that UES's liability for any damage on account of any breach of contract, error, omission or other professional negligence will be limited to a sum not to exceed $50,000 or UES's fee, whichever is greater. If Client prefers to have higher limits on contractual or professional liability, UES agrees to increase the limits up to a maximum of $1,000,000.00 upon Client's written request at the time of accepting our proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $400.00, whichever is greater. The additional charge for the higher liability limits is because of the greater risk assumed and is not strictly a charge for additional professional liability insurance.

SECTION 9: INSURANCE

9.1 UES represents and warrants that it and its agents, staff and consultants employed by it, is and are protected by worker's compensation insurance and that UES has such coverage under public liability and property damage insurance policies which UES deems to be adequate. Certificates for all such policies of insurance shall be provided to Client upon request in writing. Within the limits and conditions of such insurance, UES agrees to indemnify and save Client harmless from and against loss, damage, or liability arising from negligent acts by UES, its agents, staff, and consultants employed by it. UES shall not be responsible for any loss, damage or liability beyond the amounts, limits, and conditions of such insurance or the limits described in Section 8, whichever is less. The Client agrees to defend, indemnify and save UES harmless for loss, damage or liability arising from acts by Client, Client's agent, staff, and other UESs employed by Client.

SECTION 10: DISPUTE RESOLUTION

10.1 All claims, disputes, and other matters in controversy between UES and Client arising out of or in any way related to this Agreement will be submitted to alternative dispute resolution (ADR) such as mediation or arbitration, before and as a condition precedent to other remedies provided by law, including the commencement of litigation.

10.2 If a dispute arises related to the services provided under this Agreement and that dispute requires litigation instead of ADR as provided above, then:

(a) the claim will be brought and tried in judicial jurisdiction of the court of the county where UES's principal place of business is located and Client waives the right to remove the action to any other county or judicial jurisdiction, and

(b) The prevailing party will be entitled to recovery of all reasonable costs incurred, including staff time, court costs, attorneys' fees, and other claim related expenses.

SECTION 11: TERMINATION

11.1 This agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if that substantial failure has been remedied before expiration of the period specified in the written notice. In the event of termination, UES shall be paid for services performed to the termination notice date plus reasonable termination expenses.

11.2 In the event of termination, or suspension for more than three (3) months, prior to completion of all reports contemplated by the Agreement, UES may complete such analyses and records as are necessary to complete its files and may also complete a report on the services performed to the date of notice of termination or suspension. The expense of termination or suspension shall include all direct costs of UES in completing such analyses, records and reports.

SECTION 12: ASSIGNS

12.1 Neither the Client nor UES may delegate, assign, sublet or transfer their duties or interest in this Agreement without the written consent of the other party.

SECTION 13. GOVERNING LAW AND SURVIVAL

13.1 The laws of the State of Florida will govern the validity of these Terms, their interpretation and performance.

13.2 If any of the provisions contained in this Agreement are held illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired. Limitations of liability and indemnities will survive termination of this Agreement for any cause.

SECTION 14. INTEGRATION CLAUSE

14.1 This Agreement represents and contains the entire and only agreement and understanding among the parties with respect to the subject matter of this Agreement, and supersedes any and all prior and contemporaneous oral and written agreements, understandings, representations, inducements, promises, warranties, and conditions among the parties. No agreement, understanding, representation, inducement, promise, warranty, or condition of any kind with respect to the subject matter of this Agreement shall be relied upon by the parties unless expressly incorporated herein.

14.2 This Agreement may not be amended or modified except by an agreement in writing signed by the party against whom the enforcement of any modification or amendment is sought.

APPENDIX E

UNIVERSAL
ENGINEERING SCIENCES

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

FB-MULTIPIER SOIL PARAMETERS – 24" PSC Piles

G-6A Bridge – Boring B-11

	Soil Layer	1	2	3	4	5	6	7	8	9	10
General	Top of Soil Layer Elev., **ft**	GS[1]	+6	+2	-4	-10	-15	-20	-43		
	Bottom of Soil Layer Elev., **ft**	+6	+2	-4	-10	-15	-20	-43	-50		
	Soil Description	sand	sand	limestone	limestone	sand	limestone	limestone	sand		
	Soil Type	cohesionless	cohesionless	rock	rock	cohesionless	rock	rock	cohesionless		
	AVG. SPT N-value, **blows/ft** [2]	35	5	14	>50	12	33	>50	15		
Soil Parameters	Saturated Unit Weight (γ_{Sat}), **pcf**	115	100	120	120	110	120	120	110		
	Moist Unit Weight (γ_{Moist}), **pcf**	110	95	115	115	105	115	115	105		
	Effective Unit Weight (γ'), **pcf**	53	38	58	58	48	58	58	48		
	Internal Friction Angle (ϕ), **degrees**	34	25	36	40	30	40	40	31		
	Undrained Shear Strength (C_U), **psf**	0	0	N/A	N/A	0	N/A	N/A	0		
	Subgrade Modulus (k), **pci**	100	10	N/A	N/A	30	N/A	N/A	30		
	ε_{50} [3]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
	ε_{100} [4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
	Poisson's Ratio (ν)	0.37	0.20	0.23	0.23	0.26	0.23	0.23	0.27		
	Shear Modulus (G), **ksi**	2.73	0.24	48	48	1.32	48	48	1.53		
	Ultimate Skin Friction (τ_f), **psf**	2291	95	280	1000	456	660	1000	570		
	Ultimate End Bearing (q), **ksi**	0.8	0	0.7	2.5	0.5	1.7	2.5	0.7		
Soil Model	Lateral	Sand (Reese)	Sand (Reese)	Limestone[5]	Limestone[5]	Sand (Reese)	Limestone[5]	Limestone[5]	Sand (Reese)		
	Axial	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile		
	Torsional	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic		
	Tip	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile		

[1] GS = Ground Surface Elevation (approximately +10.5 feet)

[2] Avg N-value corrected for automatic hammer

[3] E_{50} denotes strain at 50%

[4] E_{100} denotes strain at 100%

[5] *Additional limestone strength parameters*

- Unconfined Compressive Strength (q_U) = 8,600 psf
- Splitting Tensile Strength (q_t) = 2,200 psf

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

FB-MULTIPIER SOIL PARAMETERS – 24" PSC Piles

G-6A Bridge – Boring B-11a

	Soil Layer	1	2	3	4	5	6	7	8	9	10
General	Top of Soil Layer Elev., **ft**	GS[1]	+10	0	-32	-58					
	Bottom of Soil Layer Elev., **ft**	+10	0	-32	-58	-83.5					
	Soil Description	sand	sand	limestone	sand	sand					
	Soil Type	cohesionless	cohesionless	rock	cohesionless	cohesionless					
	AVG. SPT N-value, **blows/ft** [2]	>35	5	>50	15	>35					
Soil Parameters	Saturated Unit Weight (γ_{Sat}), **pcf**	115	100	120	110	115					
	Moist Unit Weight (γ_{Moist}), **pcf**	110	95	115	105	110					
	Effective Unit Weight (γ'), **pcf**	53	38	58	48	53					
	Internal Friction Angle (ϕ), **degrees**	34	25	40	31	36					
	Undrained Shear Strength (C_U), **psf**	0	0	N/A	0	0					
	Subgrade Modulus (k), **pci**	100	10	N/A	30	100					
	ε_{50} [3]	N/A	N/A	N/A	N/A	N/A					
	ε_{100} [4]	N/A	N/A	N/A	N/A	N/A					
	Poisson's Ratio (ν)	0.37	0.20	0.23	0.27	0.37					
	Shear Modulus (G), **ksi**	2.73	0.24	48	1.53	2.73					
	Ultimate Skin Friction (τ_f), **psf**	2291	95	1000	570	1330					
	Ultimate End Bearing (q), **ksi**	0.8	0	2.5	0.7	1.6					
Soil Model	Lateral	Sand (Reese)	Sand (Reese)	Limestone[5]	Sand (Reese)	Sand (Reese)					
	Axial	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile					
	Torsional	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic					
	Tip	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile					

[1] GS = Ground Surface Elevation (approximately +16.5 feet)

[2] Avg N-value corrected for automatic hammer

[3] E_{50} denotes strain at 50%

[4] E_{100} denotes strain at 100%

[5] *Additional limestone strength parameters*

- Unconfined Compressive Strength (q_U) = 8,600 psf
- Splitting Tensile Strength (q_t) = 2,200 psf

G-6A Pump Station
West Palm Beach, Palm Beach County, Florida

FB-MULTIPIER SOIL PARAMETERS – 24" PSC Piles

G-6A Bridge – Boring B-12

	Soil Layer	1	2	3	4	5	6	7	8	9	10
General	Top of Soil Layer Elev., **ft**	GS[1]	+8	+2	-7	-24	-45				
	Bottom of Soil Layer Elev., **ft**	+8	+2	-7	-24	-45	-50				
	Soil Description	sand	sand	sand	limestone	sand	sand				
	Soil Type	cohesionless	cohesionless	cohesionless	rock	cohesionless	cohesionless				
	AVG. SPT N-value, **blows/ft** [2]	>35	9	>35	>50	>35	9				
Soil Parameters	Saturated Unit Weight (γ_{Sat}), **pcf**	115	100	115	120	115	105				
	Moist Unit Weight (γ_{Moist}), **pcf**	110	95	110	115	110	100				
	Effective Unit Weight (γ'), **pcf**	53	38	53	58	53	43				
	Internal Friction Angle ($\emptyset$), **degrees**	34	25	36	40	36	29				
	Undrained Shear Strength (C_U), **psf**	0	0	0	N/A	0	0				
	Subgrade Modulus (k), **pci**	100	10	100	N/A	100	20				
	ε_{50} [3]	N/A	N/A	N/A	N/A	N/A	N/A				
	ε_{100} [4]	N/A	N/A	N/A	N/A	N/A	N/A				
	Poisson's Ratio (ν)	0.37	0.20	0.37	0.23	0.37	0.24				
	Shear Modulus (G), **ksi**	2.73	0.24	2.73	48	2.73	1.08				
	Ultimate Skin Friction (τ_f), **psf**	2291	95	1330	1000	1330	342				
	Ultimate End Bearing (q), **ksi**	0.8	0	1.6	2.5	1.6	0.4				
Soil Model	Lateral	Sand (Reese)	Sand (Reese)	Sand (Reese)	Limestone[5]	Sand (Reese)	Sand (Reese)				
	Axial	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile				
	Torsional	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic	Hyperbolic				
	Tip	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile	Driven Pile				

[1] GS = Ground Surface Elevation (approximately +10.5 feet)

[2] Avg N-value corrected for automatic hammer

[3] E_{50} denotes strain at 50%

[4] E_{100} denotes strain at 100%

[5] *Additional limestone strength parameters*

- Unconfined Compressive Strength (q_U) = 8,600 psf
- Splitting Tensile Strength (q_t) = 2,200 psf