

GEO TECHNICAL REPORT

TIERRA

December 12, 2022

Arcadis
4300 W Cypress St Suite 450
Tampa, FL 33607

Attn: Mr. Alex Spektor, P.E.

**RE: Report of Geotechnical Engineering Services
Home Depot Master Pump Station and Force Main Project
Sarasota County, Florida
Tierra Project No.: 6511-19-278**

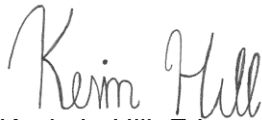
Mr. Spektor:

Tierra, Inc. (Tierra) has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Should there be any questions regarding the report, please do not hesitate to contact our office at (813) 989-1354. Tierra would be pleased to continue providing geotechnical services throughout the implementation of the project. We look forward to working with you and your organization on this and future projects.

Respectfully Submitted,

TIERRA, INC.



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PROJECT DESCRIPTION

Project Information

The project is located in Sarasota County, Florida. Sarasota County Utilities is proposing a new Force Main (FM) approximately 4,000 LF long to begin at the Home Depot Master Pump Station (MPS). From the MPS the FM will proceed east under I-75 (by Horizontal Directional Drilling (HDD) methods) and connect to the existing force main on Bee Ridge Road near Mauna Loa Boulevard. This geotechnical report has been developed to provide soils and groundwater information support for engineering services associated with the design and construction of the proposed Force Main.

Scope of Services

The objective of our study was to identify existing soils and groundwater conditions along the proposed force main alignment. Geotechnical services were provided as follows:

1. Reviewed published soils and topographic information. This published information was obtained from the appropriate Florida Quadrangle Map published by the United States Geological Survey (USGS) and the Soil Survey for Sarasota County published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).
2. Conducted a visual reconnaissance of the project site and coordinated utility clearance.
3. Performed a seven (7) Standard Penetration Test (SPT) borings to depths ranging from approximately 25 to 50 feet below existing grades, at the requested locations.
4. Measured the groundwater table levels encountered in the field.
5. Visually classified the samples in the laboratory using the Unified Soil Classification System (USCS). Identified soil conditions at each boring location and performed laboratory testing on representative samples.
6. Prepared this engineering report that summarizes the course of study pursued, the field data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. The scope of our services did not include determination of the potential for sinkhole activity. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client.

SITE AND SUBSURFACE CONDITIONS

General Site Information

Land use in the project areas consists mostly of developed land including roadways, residential and commercial developments.

USGS Quadrangle Maps

Based on a review of the "Bee Ridge, Florida" USGS Quadrangle Maps, it appears that the natural elevation at the site is on the order of +20 to +25 feet, National Geodetic Vertical Datum of 1929 (NGVD 29).

Potentiometric Surface Maps

Based on a review of the "Upper Floridan Aquifer Potentiometric Surface" maps published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer at the project site ranges up to approximately +25 feet, NGVD 29.

Sarasota County Soil Survey

The Sarasota County Soil Survey published by the USDA NRCS was reviewed along the force main alignment. Three (3) primary soil mapping units were identified, and the soil information is provided in the following paragraphs and table.

EauGallie-Myakka fine sands-Urban land complex, 0 to 2 percent slopes (Unit 55): The EauGallie component makes up 31 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded, nor ponded. A seasonal zone of water saturation is at 12 inches during June, July, August, September, October, and November. Organic matter content in the surface horizon is about 3 percent.

Felda fine sand, ponded-Urban land complex, 0 to 1 percent slopes (Unit 57): The Felda component makes up 45 percent of the map unit. Slopes are 0 to 1 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded, but it is frequently ponded. A seasonal zone of water saturation is at or above natural ground surface during July, August, September, and October. Organic matter content in the surface horizon is about 2 percent.

Pineda fine sand-Urban land complex, 0 to 2 percent slopes (Unit 69): The Pineda component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded, nor is it

ponded. A seasonal zone of water saturation is at 12 inches during June, July, August, September, October, and November. Organic matter content in the surface horizon is about 3 percent.

Summary of USDA Soil Survey Sarasota County, Florida								
USDA Map Symbol and Soil Name		Soil Classification				pH	Seasonal High Water Table	
		Depth (in)	USCS	AASHTO	Permeability (in/hr)		Depth (feet)	Months
55	Eaugallie Myakka, Urban land	0-6	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-6.0	0.5-1.5	Jun-Nov
		6-22	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-6.0		
		22-44	SP-SM, SM	A-2-4, A-3	0.6 - 2.0	4.5-7.3		
		44-48	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.8		
		48-66	SC-SM, CL, SC	A-2-4, A-4, A-7-6	0.1 - 0.6	4.5-7.8		
		66-80	SM	A-2-4, A-4	0.6 - 2.0	4.5-7.8	0.5-1.5	Jun-Nov
		0-6	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-6.5		
		6-24	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-6.5		
		24-42	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	3.5-6.5		
		42-60	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-6.5		
60-80	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-6.5	USDA does not provide information for Urban Land			
57	Felda Urban land	0-7	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-7.8	+2.0-0.0	Jul-Oct
		7-24	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	3.5-7.8		
		24-36	SC-SM, CL, SC	A-2-4, A-4, A-7-6	0.6 - 6.0	5.1-7.8		
		36-80	SP-SM, SM	A-2-4	6.0 - 20.0	6.1-8.4		
		USDA does not provide information for Urban Land						
69	Pineda Urban land	0-1	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3	0.5-1.5	Jun-Nov
		1-5	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3		
		5-36	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3		
		36-54	SC-SM, CL, SC	A-2-4, A-4, A-6	2.0 - 6.0	4.5-7.8		
		54-80	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	5.1-7.8		
		USDA does not provide information for Urban Land						

It should be noted that information contained in the USDA/NRCS Soil Survey may not be reflective of current subsurface conditions, particularly if recent development in the project vicinity has modified existing soils or surface/subsurface drainage.

Subsurface Conditions

Tierra performed seven (7) SPT borings at requested locations to depths ranging from 25 to 50 feet below grade to identify the subsurface conditions. Tierra understands HDD installation of the force main is proposed under I-75. Borings B-1 and B-2 were performed to a depth of 50 feet on either side of I-75 to collect soils data within the HDD influence area.

The borings were located in the field using hand-held Garmin Global Positioning System (GPS) equipment with a reported accuracy of ±10 feet. The approximate boring locations are presented on the **Boring Location Plan** sheet in the **Appendix**.

The SPT borings were performed with the use of a drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586. The initial 6 feet of the SPT borings were manually advanced by hand auger to verify utility clearance. Thereafter, SPT resistance N-values were recorded continuously to a depth of 10 feet and at 5-foot intervals thereafter. The soil samples were classified in the field and transported to our laboratory for review and stratification.

The soil strata encountered in the SPT borings performed at the project site are summarized in the following table:

Stratum Number	Soil Description	USCS Symbol
1	Brown to Gray Sand to Sand with Silt	SP/SP-SM
2	Gray to Brown Silty Sand	SM
3	Gray to Brown Clayey Sand	SC
4	Gray to Brown to Green Silt to Clay	ML/MH/CL/CH

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The **Soil Profiles** included in the **Appendix** should be reviewed for specific information at the boring locations. The profile includes soil description, stratification, and penetration resistances. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations did occur and should be expected within the project area. The stratification represents the approximate boundary between subsurface soils and the actual transition may be gradual.

Groundwater Information

The groundwater level encountered in the borings were measured at depths ranging from approximately 4½ feet to 8 feet below the existing ground surface. The encountered groundwater levels are depicted adjacent to the soil profiles on the **Soil Profiles** sheet in the **Appendix**.

It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. Groundwater levels along the proposed force main alignment may be affected by tidal influences. A seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons.

EVALUATION AND RECOMMENDATIONS

General

The results of the borings performed are presented on the **Soil Profiles** sheet in the **Appendix**. Tierra recommends that the design team review the data provided as it pertains to the force main installations. The contractor should review the soil profiles and evaluate the soil types as they relate to their installation methods for the project.

Potentiometric Surface

Based on a review of the "Upper Floridan Aquifer Potentiometric Surface" maps published by the USGS, Tierra recommends the following note be included in the plans:

Based on a review of the "Upper Floridan Aquifer Potentiometric Surface" maps published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer at the project site ranges up to +25 feet, NGVD 29. The natural ground elevation at the project site is approximately +20 to +25 feet, NGVD 29. The Contractor's tools and construction methods should be equipped to handle potentiometric surface levels up to +25 feet, NGVD 29, at no additional cost to the owner.

Pipe Bedding

In general, the soils of Stratum 1 (SP/SP-SM) may be moved and used for pipe bedding, provided it is free of organic materials, clay, debris or any other material deemed unsuitable for construction. The appropriate FDOT (Specification 125) and/or jurisdictional requirements should be consulted to determine the specific use/suitability of the soil types encountered during construction.

Stratum 2 soils (SM) will retain excess moisture and may be difficult to dry and compact. They should be used as pipe backfill above the water level existing at time of construction. SM material placed below the existing water level must be non-plastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

Horizontal Directional Drilling Locations

Tierra performed two (2) SPT borings (B-1 and B-2) in the vicinity of proposed Horizontal Directional Drilling locations under I-75 and a third SPT boring to a depth of 50 feet at the location of B-3, as requested. The results of the borings performed are presented for the HDD borings are provided on **Soil Profiles** sheet of this report.

Difficult Installation/Hard Material

Hard indurated clay to silt material (observed by SPT N-values greater than 24) was encountered within the SPT borings at depths anticipated to be encountered during HDD installations. The Contractor should anticipate that drilling and reaming through and within this material will be difficult and may require non-conventional construction techniques and specialized equipment. The depth and consistency of this material does vary.

Dewatering

The contractor's means and methods for dewatering should be performed to a depth sufficient to achieve compaction at the lowest levels of the pipe bedding (i.e. maintain a dry working condition). Tierra anticipates the required dewatering depth will be a minimum of 1 foot below the lowest excavation elevation. However, the actual dewatering depth required may be deeper in order to obtain the required compaction.

Excavations

Excavations and temporary side slopes should comply with the Occupational Safety and Health Administration's (OSHA) trench safety standards, 29 C.F.R., s. 1926.650, Subpart P, all subsequent revisions or updates of OSHA's referenced standard adopted by the Department of Labor and Employment Security and Florida's Trench Safety Act, Section 553.62, Florida Statutes.

We are providing this information solely as a service to our client. Tierra does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal safety or other regulations.

REPORT LIMITATIONS

The information contained in this report are opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the borings. If, during construction, subsurface conditions different from those encountered in the exploratory boring are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if conditions or project layout are changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

This report was prepared for the exclusive use of Arcadis and their clients for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

APPENDIX

Boring Plan Location

Soil Profiles



BORING LOCATION PLAN



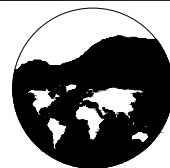
LEGEND

 APPROXIMATE LOCATION OF SPT BORING

DRAWN BY:
SW
CHECKED BY:
KH

APPROVED BY:
DRR
DATE:
DEC 2022

ENGINEER OF RECORD:
DANIEL R. RUEL, P.E.
FLORIDA LICENSE NO.:
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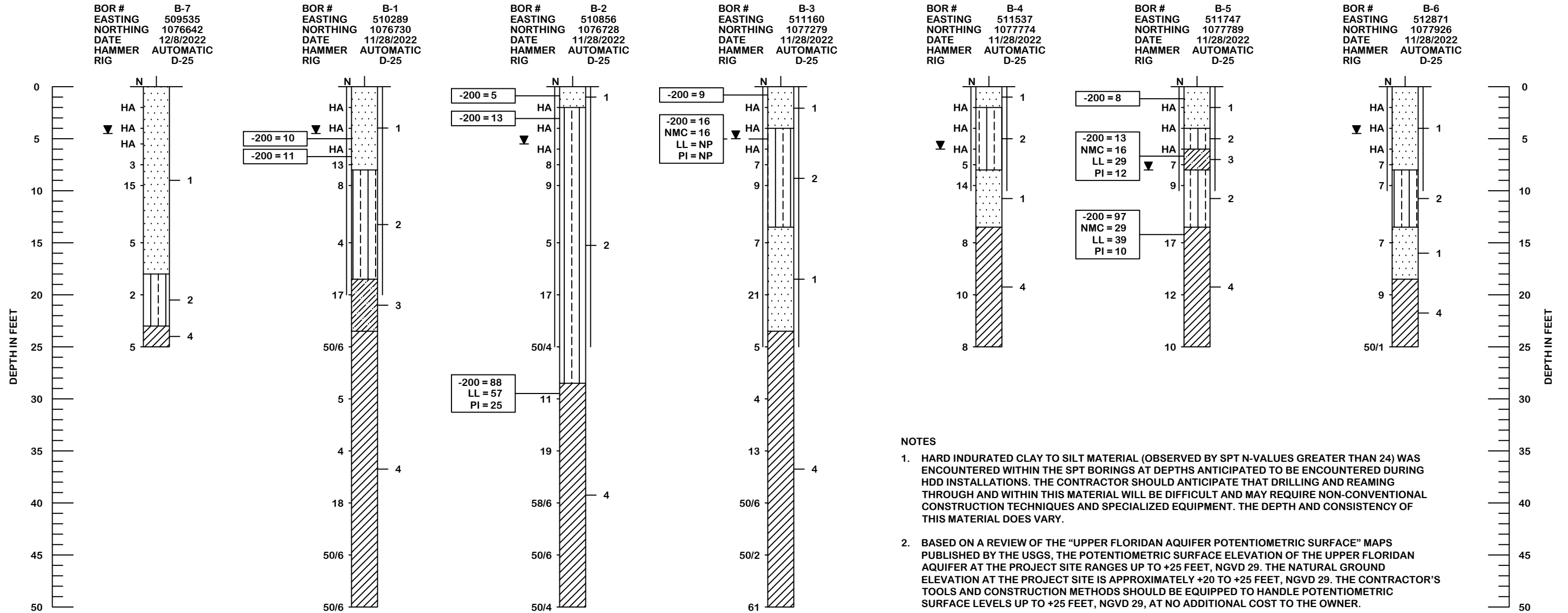
SCALE:
NOTED

PROJECT NUMBER:
6511-19-278

**GEOTECHNICAL ENGINEERING SERVICES
HOME DEPOT MASTER PUMP STATION
AND FORCE MAIN
SARASOTA COUNTY, FLORIDA**

SHEET 1

SOIL PROFILES



NOTES

- HARD INDURATED CLAY TO SILT MATERIAL (OBSERVED BY SPT N-VALUES GREATER THAN 24) WAS ENCOUNTERED WITHIN THE SPT BORINGS AT DEPTHS ANTICIPATED TO BE ENCOUNTERED DURING HDD INSTALLATIONS. THE CONTRACTOR SHOULD ANTICIPATE THAT DRILLING AND REAMING THROUGH AND WITHIN THIS MATERIAL WILL BE DIFFICULT AND MAY REQUIRE NON-CONVENTIONAL CONSTRUCTION TECHNIQUES AND SPECIALIZED EQUIPMENT. THE DEPTH AND CONSISTENCY OF THIS MATERIAL DOES VARY.
- BASED ON A REVIEW OF THE "UPPER FLORIDAN AQUIFER POTENTIOMETRIC SURFACE" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE PROJECT SITE RANGES UP TO +25 FEET, NGVD 29. THE NATURAL GROUND ELEVATION AT THE PROJECT SITE IS APPROXIMATELY +20 TO +25 FEET, NGVD 29. THE CONTRACTOR'S TOOLS AND CONSTRUCTION METHODS SHOULD BE EQUIPPED TO HANDLE POTENTIOMETRIC SURFACE LEVELS UP TO +25 FEET, NGVD 29, AT NO ADDITIONAL COST TO THE OWNER.

LEGEND

- | | |
|---|---|
| <p>1 </p> <p>2 </p> <p>3 </p> <p>4 </p> | <p>▼ GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION</p> <p>N SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)</p> <p>SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW</p> <p>50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION</p> <p>HA HAND AUGERED TO VERIFY UTILITY CLEARANCES</p> <p> CASING</p> |
|---|---|

- EASTING** EASTING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN ETREX GPS EQUIPMENT WITH A REPORTED ACCURACY OF +/- 10 FEET
- NORTHING** NORTHING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN ETREX GPS EQUIPMENT WITH A REPORTED ACCURACY OF +/- 10 FEET
- 200** PERCENT PASSING #200 SIEVE
- NMC** NATURAL MOISTURE CONTENT (%)
- LL** LIQUID LIMIT (%)
- PI** PLASTICITY INDEX (%)
- NP** NON PLASTIC

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

DRAWN BY:
SW

CHECKED BY:
KH

APPROVED BY:
DRR

DATE:
DEC 2022

ENGINEER OF RECORD:
DANIEL R. RUEL, P.E.
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**GEOTECHNICAL ENGINEERING SERVICES
HOME DEPOT MASTER PUMP STATION
AND FORCE MAIN
SARASOTA COUNTY, FLORIDA**

SHEET 2