REPORT OF GEOTECHNICAL EXPLORATION

HAZELHURST SUBDIVISION WATER MAIN REPLACEMENT
MANATEE COUNTY, FLORIDA

AREHNA PROJECT NO. B-19-017.04

March 27, 2019

Prepared For:
Ayres & Associates, Inc.
8875 Hidden River Parkway, Suite 200
Tampa, FL 33637-1038

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March 27, 2019

Mr. Christopher Martin, P.E.
Ayres & Associates, Inc.
8875 Hidden River Parkway, Suite 200
Tampa, FL 33637-1038

MartinC@AyresAssociates.com

Subject: **Report of Geotechnical Exploration**
Hazelhurst Subdivision Water Main Replacement
Manatee County, Florida
Manatee County Project No. PW01105
AREHNA Project No. B-19-017.004

Dear Mr. Martin,

AREHNA Engineering, Inc. (AREHNA) is pleased to submit this report of our geotechnical exploration for the proposed project. Services were conducted in general accordance with AREHNA Proposal B-18-159 dated December 28, 2018. The purpose of our geotechnical study was to obtain information on the general subsurface conditions for the proposed replacement of approximately 2,800 linear feet of 4-inch water main.

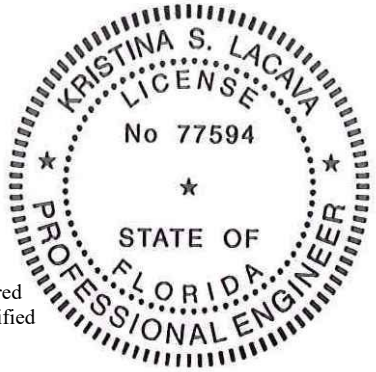
This report presents our understanding of the project, outlines our exploratory procedures, and documents the field data obtained.

AREHNA appreciates the opportunity to have assisted Ayres & Associates, Inc. on this project. Should you have any questions with regards to this report, or if we can be of any further assistance, please contact this office.

Best Regards,

AREHNA ENGINEERING, INC.
FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION NO. 28410

This item has been digitally signed and sealed by:
Digitally signed by Kristina S LaCava
Date: 2019.03.27 05:38:59 -04'00'



Kristina LaCava, P.E.
Geotechnical Engineer
Florida Registration 77594
on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Kirk M. Eastman, P.E.
Senior Geotechnical Engineer
Florida Registration 50733

Distribution: 1 – Electronic Submittal
1 – File

TABLE OF CONTENTS

Page

LIST OF APPENDICES

APPENDIX

1.0 PROJECT INFORMATION AND SCOPE OF WORK

1.1 SITE DESCRIPTION AND PROJECT CHARACTERISTICS

The project consists of the replacement of approximately 2,800 linear feet of 4-inch water main in order to provide fire protection and increase water quality to Hazelhurst Subdivision. The project site is located along 7th Street East and 8th Street Court East between 44th Avenue East and 37th Avenue Drive East in Bradenton, Florida; as indicated on the **Project Location Map, Figure 1** in the **Appendix**.

1.2 SCOPE OF WORK

The purpose of our geotechnical study was to obtain information on the general subsurface conditions at the proposed project site. The subsurface materials encountered were evaluated with respect to the available project characteristics. The following services were performed:

- Requested utility location services from Sunshine811.
- Performed 14 auger borings extending to approximate depths of 5 feet below the existing ground surface. Samples were collected and transported to our laboratory for appropriate classification.
- Visually classified and stratified the soil samples in the laboratory using the Unified Soil Classification System.
- Reported the results of the field exploration and engineering analysis. The results of the subsurface exploration are presented in this report signed and sealed by a professional engineer specializing in geotechnical engineering.

2.0 FIELD EXPLORATION

Our scope included performing 14 auger borings extending to approximated depths of 5 feet below the existing ground surface.

The auger borings are performed in general accordance with ASTM D-1452, "Standard Practice for Soil Investigation and Sampling by Auger Borings". Auger borings are advanced manually using a bucket-type hand auger. The soils encountered are identified, in the field, from cuttings brought to the surface by the augering process. Representative soil samples from the auger borings are placed in glass jars and transported to our laboratory where they are examined by an engineer for classification.

Representative portions of these soil samples were sealed in glass jars, labeled and transferred for appropriate classification.

The auger boring locations are shown on the **Field Exploration Location Plans, Figure 2** in the **Appendix** of this report**.** The hand auger borings were located in the field by measuring off of existing features and GPS Coordinates.

3.0 SUBSURFACE CONDITIONS

3.1 USGS TOPOGRAPHIC DATA

The topographic survey map published by the United States Geological Survey and the existing survey information of the site was reviewed for ground surface features at the proposed project location (**Figure 3**). Based on this review, natural ground surface elevations at the project site range between approximately +35 to +40 feet.

3.2 USDA NATURAL RESOURCES CONSERVATION SERVICE DATA

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) survey for Manatee County indicates that the soils at the project site consist of the following soil units:

Soil Unit Number	Soil Name	Depth to High Water Table (feet)
20	EauGallie fine sand, 0 to 2 percent slopes	0.5 – 1.5
36	Orlando fine sand, moderately wet, 0 to 2 percent slopes	3.5 – 6.0

The soil survey also indicates that the average annual precipitation is 42 to 58 inches. The soils encountered in our auger borings are generally consistent with the soil units listed above. The USDA Soil Survey map for the project site is attached as **Figure 4.**

3.3 SUBSURFACE CONDITIONS

The Soil Profiles on **Figures 5A and 5B** in the **Appendix** should be consulted for a detailed description of the subsurface conditions encountered at each boring location. When reviewing the boring records and the subsurface profiles, it should be understood that soil conditions may vary between and away from boring locations.

The auger borings generally encountered fine sand (SP) and fine sand with silt (SP-SM) occasionally with trace roots, limerock, and shell fragments from the existing ground surface to the termination depths of 5 feet.

3.4 GROUNDWATER CONDITIONS

The groundwater level was generally encountered in the auger borings at depths between 3 to 4 feet below the existing ground surface. Auger boring HA-11 did not encounter the groundwater table within the explored depth of 5 feet. Fluctuation in ground water levels should be expected due to seasonal climatic changes, tidal changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors. Since

ground water level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur.

3.5 ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL

Based on the mapping performed by the USDA, soils information obtained from the site and our experience in the area, we estimate that the seasonal high groundwater level will be encountered at an approximate depth of 2 feet along the project alignment.

4.0 GENERAL SITE PREPARATION

4.1 GENERAL

Site preparation includes stripping, excavation, backfilling, and compaction.

4.2 ON-SITE SOIL SUITABILITY

The borings indicate that sandy soils classified as SP and SP-SM based on the Unified Soil Classification System are present at the site from the existing ground surface to a depth of 5 feet. Suitable structural fill materials should consist of fine to medium sand with less than 12 percent passing the No. 200 sieve and be free of rubble, organics, clay, debris, and other unsuitable material. Any off-site materials used as fill should be approved by AREHNA prior to acquisition.

4.3 EXCAVATION AND BACKFILL

Excavations, whether they be utility trenches, basement excavations, or footing excavations, should be constructed in accordance with the new OSHA guidelines. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety-regulations.

The soils encountered are consistent with AASHTO Class C soils and will not stand vertically in an open excavation below the ground water level. Soil should not be stockpiled adjacent to excavations, unless the stockpile has been included in the analyses of the excavation stability.

Recommended Earth Pressure Parameters

Material Description	Saturated Unit Weight (pcf)	Cohesion (psf)	Angle of Internal Friction (degrees)	Earth Pressure Coefficients		
				Active (Ka)	At-Rest (Ko)	Passive (Kp)
Fine sand (SP) & Fine sand with silt (SP-SM)	110	0	30	0.33	0.5	3.0

Excavations below the groundwater level will likely require a combination of sanded wellpoints and pumping from filtered sumps.

Any and all excavations should be backfilled with compacted fill. Fill should generally consist of dry fine sand with less than 12 percent passing the No. 200 sieve and be free of rubble, organics, clay, debris and other unsuitable material. Fill should be tested and approved prior to acquisition. Approved sand fill

should be placed in loose lifts not exceeding 12 inches in thickness and should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). Prior to beginning compaction, soil moisture contents should be adjusted in order to facilitate proper compaction. A moisture content within 2 percentage points of the optimum indicated by the Modified Proctor Test (ASTM D-1557) is recommended prior to compaction of the fill.

4.4 DEWATERING

Construction activities should be accomplished in the "dry" with ground water levels maintained at least 1 foot below the deepest portion of any excavation. The groundwater level was encountered at depths between 3 and 4 feet in the auger borings performed. Therefore, depending on the time of year construction is performed, dewatering may be required for excavations deeper than 3 feet. Dewatering can be accomplished using a sanded wellpoint system supplemented by a gravel bottom layer and pumping from a sump. Actual dewatering means and methods should be the responsibility of the contractor.

Groundwater fluctuations will likely occur due to seasonal variations, runoff, and other factors and should be considered when planning earthwork activities. The impact of runoff from adjacent properties, nearby water bodies, and other site-specific conditions which may affect groundwater recharge are beyond the scope of this exploration and should be considered when planning and designing a dewatering system.

4.5 PIPELINE BEDDING

We recommend that the new 4-inch watermain be supported on a bedding layer consisting of at least 6 inches of granular soils meeting the previous requirements for structural fill. The bedding layer should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557).

4.6 GENERAL CONSTRUCTION MONITORING AND TESTING GUIDELINES

Prior to initiating compaction operations, we recommend that representative samples of the structural fill material to be used and acceptable exposed in-place soils be collected and tested to determine their compaction and classification characteristics. The maximum dry density, optimum moisture content, gradation and plasticity characteristics should be determined. These tests are needed for compaction quality control of the structural fill and existing soils and to determine if the fill material is acceptable.

A representative number of in-place field density tests should be performed in the compacted existing soils and in each lift of structural fill or backfill to confirm that the required degree of compaction has been obtained. We recommend that at least one density test be performed for every lift of backfill and for every 100 lineal feet of trench.

5.0 BASIS FOR RECOMMENDATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the location indicated. Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions across site will be different from those encountered where the boring was performed, and that conditions will not be as anticipated by the designers or contractors. In addition, the construction process itself may alter soil conditions. AREHNA is not responsible for the conclusions, opinions or recommendations made by others based on the data presented in this report.

APPENDIX

Project Location Map – Figure 1
Boring Location Plan – Figure 2
USGS Topographic Map – Figure 3
USDA Soil Survey Map - Figure 4
Soil Profiles – Figure 5
Field Procedures

PROJECT SITE LOCATION MAP

AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 | Fax 813.944.4959 Certificate of Authorization No. 28410	DATE	PROJECT NAME	PROJECT NO.	FIG NO.
	03/2019	MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	1

FIELD EXPLORATION LOCATION PLAN

N

0 200'

APPROXIMATE PLAN SCALE

LEGEND

HA-X ⊕ Approximate Location of Hand Auger Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

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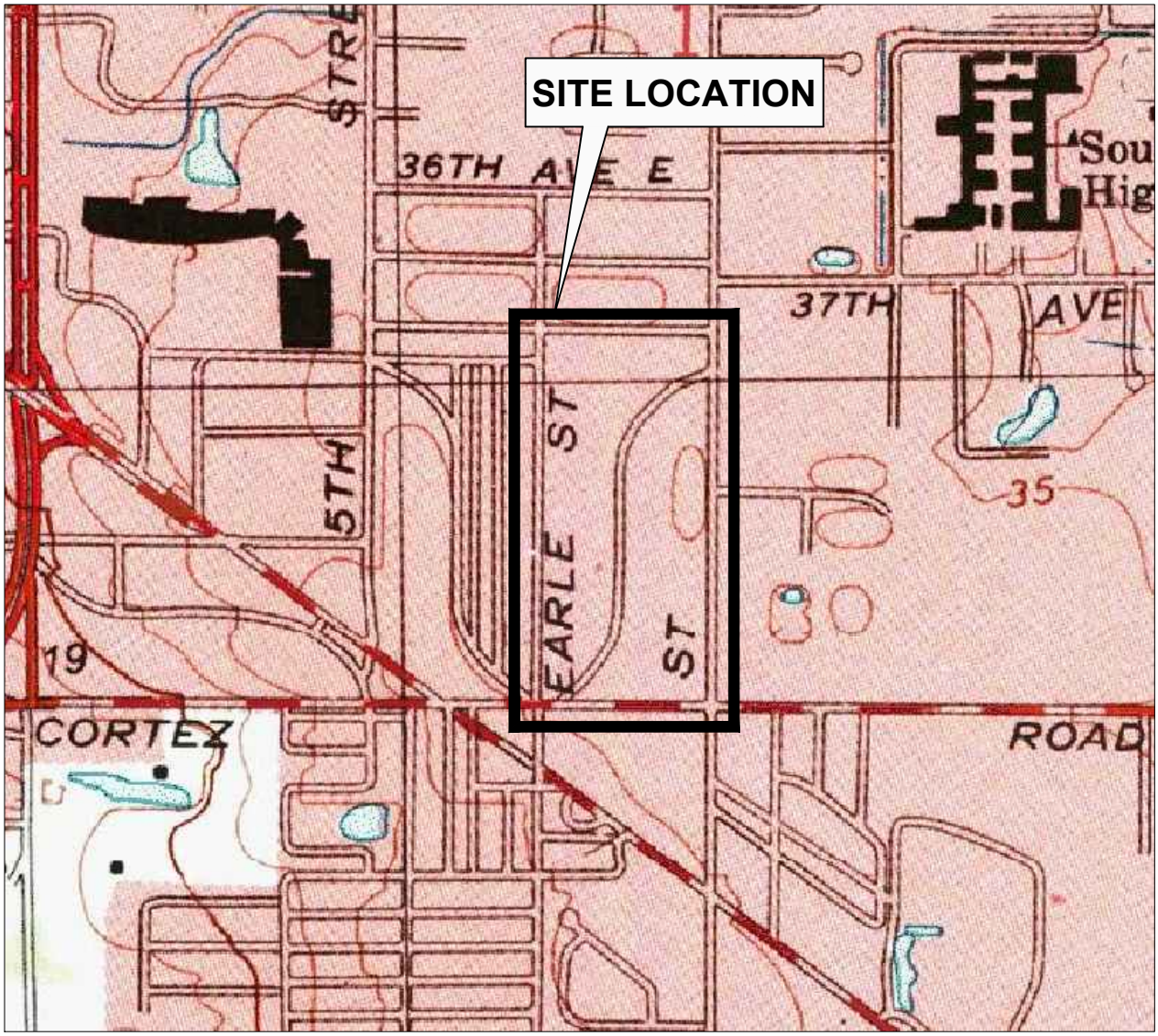
	NAME	DATE
DESIGNED BY:	BRH	03/2019
DRAWN BY:	BRH	03/2019
CHECKED BY:	AC	03/2019
SUPERVISED BY:	Kristina LaCava, P.E.	

PROJECT NAME	PROJECT NO.	FIGURE NO.
MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	2

USGS TOPOGRAPHIC SURVEY

0 N.T.S.

APPROXIMATE PLAN SCALE



	DATE	PROJECT NAME	PROJECT NO.	FIG NO.
AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 | Fax 813.944.4959 Certificate of Authorization No. 28410	03/2019	MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	3

USDA SOIL SURVEY

0 N.T.S.

APPROXIMATE PLAN SCALE

SOIL MAPPING UNITS

20—EauGallie fine sand, 0 to 2 percent slopes
36—Orlando fine sand, moderately wet, 0 to 2 percent slopes

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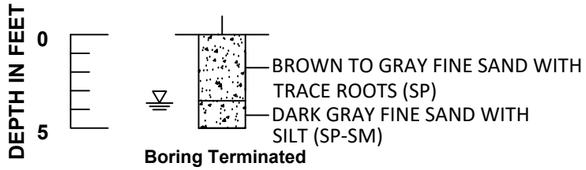
DATE	PROJECT NAME	PROJECT NO.	FIG NO.
03/2019	MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	4

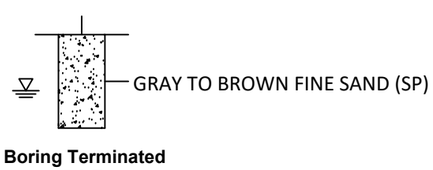
SOIL PROFILES

HA-01
03/5/19



Boring Terminated at 5.0 Feet

HA-02
03/5/19



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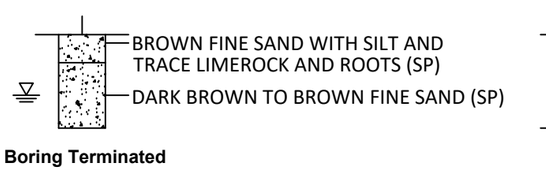
HA-03
03/5/19



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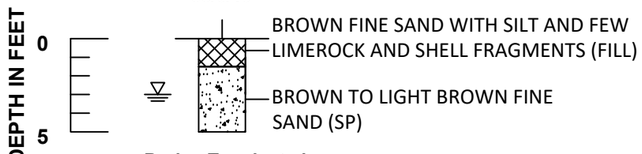
HA-04
03/5/19



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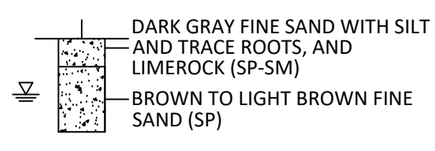
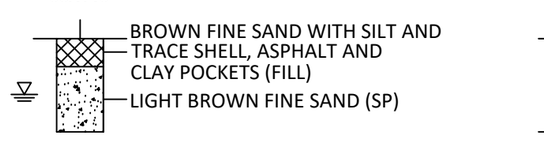
HA-05
03/5/19



Boring Terminated at 5.0 Feet

HA-06
03/7/19



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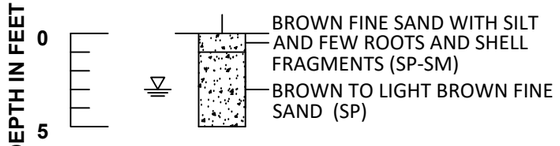
HA-07
03/7/19



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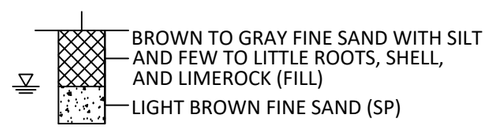
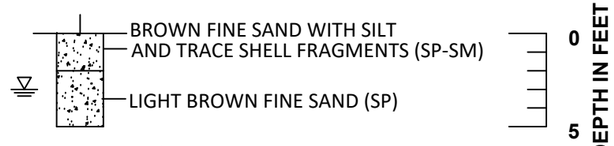
HA-08
03/7/19



Boring Terminated at 5.0 Feet

HA-09
03/7/19



Boring Terminated at 5.0 Feet

LEGEND

- Fine Sand (SP/SP-SM)
- FILL
- GNE — Groundwater Table Not Encountered
- Groundwater Level at Time of Drilling
- SP — Unified Soil Classification System (ASTM D 2488) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Coordinates (WGS84)		
Test #	**Latitude**	**Longitude**
HA-01	27.4659105	-82.5550193
HA-02	27.4655124	-82.5555049
HA-03	27.4651443	-82.5558907
HA-04	27.4645622	-82.5558031
HA-05	27.4640375	-82.5559385
HA-06	27.4635106	-82.5557995
HA-07	27.4629181	-82.5561418
HA-08	27.4625423	-82.5569609
HA-09	27.4631312	-82.5567695

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

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	NAME	DATE
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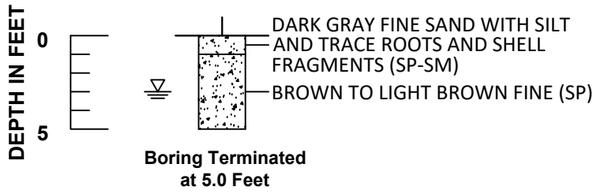
DRAWN BY:	BRH	03/2019
CHECKED BY:	AC	03/2019
SUPERVISED BY:	Kristina LaCava, P.E.	

BORING PROFILE	PROJECT NO.	FIGURE NO.
MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	5A

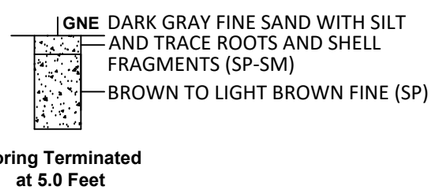
SOIL PROFILES

HA-10
03/7/19



Boring Terminated at 5.0 Feet

HA-11
03/7/19



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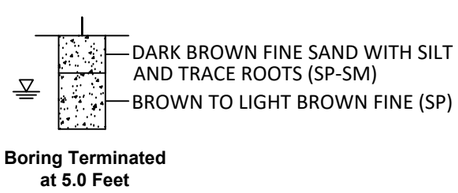
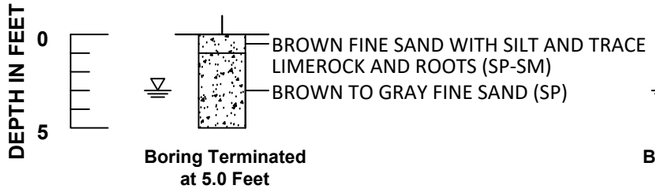
HA-12
03/7/19



Boring Terminated at 5.0 Feet

HA-13
03/7/19



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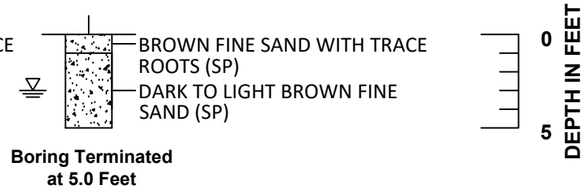
HA-14
03/7/19



Boring Terminated at 5.0 Feet

LEGEND

- Fine Sand (SP/SP-SM)
- FILL
- GNE — Groundwater Table Not Encountered
- Groundwater Level at Time of Drilling
- SP — Unified Soil Classification System (ASTM D 2488) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Coordinates (WGS84)

Test #	Latitude	Longitude
HA-10	27.4636780	-82.5569540
HA-11	27.4642325	-82.5567953
HA-12	27.4647277	-82.5569504
HA-13	27.4654970	-82.5567906
HA-14	27.4661584	-82.5569641

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BORING PROFILE	PROJECT NO.	FIGURE NO.
MANATEE COUNTY POTABLE WATER HAZELHURST SUBDIVISION BRADENTON, FLORIDA	B-19-017.004	5B

Auger Boring

The auger borings are performed in general accordance with ASTM D-1452, "Standard Practice for Soil Investigation and Sampling by Auger Borings". Auger borings are advanced manually using a bucket-type hand auger. The soils encountered are identified, in the field, from cuttings brought to the surface by the augering process. Representative soil samples from the auger borings are placed in glass jars and transported to our laboratory where they are examined by an engineer for classification.