REPORT OF GEOTECHNICAL EXPLORATION

SPRING LAKE STORMSEWER AND OUTFALL
TAMPA, FLORIDA

AREHNA PROJECT NO. B-15-038

October 15, 2015

Prepared For:
Campo Engineering, Inc.
1725 East 5th Avenue
Tampa, FL 33605

Prepared By:
AREHNA Engineering, Inc.
5012 West Lemon Street
Tampa, Florida 33609

5012 West Lemon Street
Tampa, Florida 33609
Ph 813.944.3464 | Fax 813.944.4959

October 15, 2015

Mr. Matthew D. Campo, P.E.
Campo Engineering, Inc.
1725 East 5th Avenue
Tampa, FL 33609

Phone: (813) 215-7372
matthew@campoengineering.com

Subject: **Report of Geotechnical Exploration**
Spring Lake Stormsewer and Outfall
Tampa, Florida
AREHNA Project B-15-038

Dear Mr. Campo

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 Prop-14-106 dated June 9, 2014. The purpose of our geotechnical study was to obtain information on the general subsurface conditions for the proposed construction of a new stormwater sewer system in a neighborhood of Tampa, Florida.

This report presents our understanding of the project, outlines our exploratory procedures, documents the field data obtained, and provides our recommendations for site preparation and foundation design.

AREHNA appreciates the opportunity to have assisted Campo Engineering, 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

Grover S. Long
Geotechnical Engineer

Joseph E. Prendergast, P.E.
Principal Geotechnical Engineer
Florida Registration 50774

Distribution: 3 – Addressee
1 – File

TABLE OF CONTENTS

Page

1.0 EXECUTIVE SUMMARY 1
2.0 PROJECT INFORMATION AND SCOPE OF WORK 2
2.1 Site Description and Project Characteristics 2
2.2 Scope of Work 2
3.0 FIELD EXPLORATION 3
4.0 LABORATORY TESTING 4
5.0 SUBSURFACE CONDITIONS 5
5.1 USGS Topographic Data 5
5.2 USDA Natural Resources Conservation Service Data 5
5.3 Subsurface Conditions 5
5.4 Groundwater Conditions 6
5.5 Estimated Seasonal High Ground Water Level 6
6.0 DESIGN RECOMMENDATIONS 7
6.1 General 7
6.2 Soil Parameters for Below Grade Construction 7
6.3 Pavements 7
7.0 GENERAL SITE PREPARATION 9
7.1 General 9
7.2 Excavation Slopes 9
7.3 Dewatering 9
7.4 Undercutting 9
7.5 Structural Filling and Backfilling 9
7.6 On-Site Soil Suitability 10
8.0 BASIS FOR RECOMMENDATIONS 11

LIST OF APPENDICES

APPENDIX A
Project Site Location Map – Figure 1
USGS Topographic Survey – Figure 2
USDA Soil Survey - Figure 3

APPENDIX B
Report of Core Borings – Sheets 1 through 23
Table 1 – Summary of Laboratory Test Results
Field and Laboratory Test Procedures

1.0 EXECUTIVE SUMMARY

The purpose of this geotechnical exploration was to obtain information concerning the site and subsurface soil conditions at the site of the proposed construction of a new stormwater sewer system in a neighborhood of Tampa, Florida. The project is located in a residential area encompassing W. Bay to Bay Boulevard to the north and El Prado Boulevard to the south between S. West Shore Boulevard to the west and S. Church Street to the east. An outfall structure is planned 160 feet north of Cherokee Road about 150 feet east of S. West Shore Boulevard.

The SPT borings typically encountered a pavement section approximately one foot in thickness consisting of an asphalt surface course and a base course. Below the pavement section, the borings generally encountered fine sand and slightly clayey fine sand (A-3) to depths of approximately of 10 feet. Below this, the borings typically encountered clayey fine sand (A-2-7) and high plasticity clay (A-7) to the termination depth of 15 feet. Some of the borings encountered weathered limestone between 10 and 15 feet. The groundwater level was encountered in the soil borings at depths of 1 to 3 feet below the existing ground surface.

The boring results indicate that sandy soils classified as A-3 are present at the site to depths of up to 10 feet and are suitable for use as backfill material.

Soil parameters for design of the outfall structure and general site preparation recommendations are presented in this report.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 Site Description and Project Characteristics

The project consist of a of a new stormwater sewer system in a neighborhood of Tampa, Florida. The project site is located in a residential area bounded by W. Bay to Bay Boulevard to the north, El Prado Boulevard to the south, S. West Shore Boulevard to the west, and S. Church Street to the east. A new outfall structure will be located approximately 160 feet north of Cherokee Road and 150 feet east of S. West Shore Boulevard.

2.2 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. In this regard, engineering assessments for the following items were formulated:

- Identification of the existing ground water levels and estimated normal seasonal high ground water fluctuations.
- General location and description of potentially deleterious materials encountered in the borings which may have impact on the proposed construction.
- General site preparation recommendations including the suitability of excavated soils for use as backfill

The following services were performed to achieve the above-outlined objectives:

- Requested utility location services from Sunshine State One-Call.
- Performed a total of 52 soil borings to a depth of 15 feet along the proposed sewer system alignment. Samples were collected and Standard Penetration Test resistances were measured at approximate intervals of two feet for the top ten feet and at an approximate interval of five feet thereafter.
- Visual classification and stratification of soil samples in the laboratory using the AASHTO Soil Classification System and laboratory testing of representative samples.
- Report 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.

3.0 FIELD EXPLORATION

Our scope included a total of 52 soil borings performed to a depth of 15 feet along the proposed sewer system alignment.

The borings were performed with the use of a Power Drill Rig using Bentonite "Mud" drilling procedures. Samples were collected and Standard Penetration Test resistances were measured at approximate intervals of two feet for the top ten feet and at approximate intervals of five feet thereafter. The soil sampling was performed in general accordance with ASTM Test Designation D-1586, entitled "Penetration Test and Split-Barrel Sampling of Soils."

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

The Report of Core Borings pages in **Appendix B** provide boring location plans showing the relationship of the soil borings to the existing roadways. The borings were located in the field by measuring from existing features.

4.0 LABORATORY TESTING

Laboratory tests were performed on representative soil samples in order to classify the soil and to evaluate its engineering properties. Laboratory testing was performed in general accordance with ASTM Standards and included moisture content and single sieve (#200) grain size.

Laboratory testing was also performed to assess the corrosion potential of soils at the location of the proposed outfall structure. The results indicate the soils are Slightly Aggressive for steel and concrete (per the current FDOT structures design guidelines).

The results of the laboratory testing are presented in **Table 1** in **Appendix B**.

5.0 SUBSURFACE CONDITIONS

5.1 USGS Topographic Data

The topographic survey map published by the United States Geological Survey was reviewed for ground surface features at the proposed project location (**Figure 3**, **Appendix A**). Based on this review, natural ground surface elevations at the project site range between approximately +5 and +15 feet National Geodetic Vertical Datum of 1929 (NGVD).

5.2 USDA Natural Resources Conservation Service Data

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) survey for Hillsborough 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)
22	Immokalee–Urban land complex	0.5 – 1.5
27	Malabar fine sand	0 – 1.0
32	Myakka–Urban land complex	0.5 – 1.5

The soil survey also indicates that the average annual precipitation is 48 to 56 inches. The water table depths shown occur in naturally drained areas. However, urban areas such as the project site are typically artificially drained by storm sewers, gutters, and surface ditches.

The soils encountered in our borings are consistent with the listed soil units. The USDA Soil Survey map for the project site is attached as **Figure 4**.

5.3 Subsurface Conditions

A pictorial representation of the subsurface conditions encountered by the borings is shown in the Report of Core Borings in **Appendix B**. These profiles and the following soil conditions highlight the general subsurface stratification. When reviewing the subsurface profiles, it should be understood that soil conditions may vary between and away from boring locations.

The SPT borings typically encountered a pavement section approximately one foot in thickness consisting of an asphalt surface course and a base course. Below the pavement section, the borings generally encountered fine sand and slightly clayey fine sand (A-3) to depths of approximately of 10 feet. Below this, the borings typically encountered clayey fine sand (A-2-7) and high plasticity clay (A-7) to the termination depth of 15 feet. Some of the borings encountered weathered limestone between 10 and 15 feet. Standard penetration test resistances (N-values) ranged from 1 to 56 blows per foot.

A page defining the terms and classification symbols used in the boring profiles is included in **Appendix B** of this report.

5.4 Groundwater Conditions

The ground water level was encountered in the soil borings at depths of 1 to 4 feet below the existing ground surface. Fluctuation in ground water levels should be expected due to tidal as well as seasonal climatic 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.

5.5 Estimated Seasonal High Ground Water 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 ground water level will be encountered at depths of 1 to 2 feet below prevailing grades.

6.0 DESIGN RECOMMENDATIONS

6.1 General

Our geotechnical evaluation is based upon the previously presented project information as well as the field data obtained during this geotechnical exploration. If final structure location, design details, or construction methods are significantly different from those described, or if the subsurface conditions during construction are different from those revealed by our boring, we should be notified immediately so that we might review our recommendations presented in this report.

Subgrade soils supporting structures, including sewer pipes, junction boxes, and box culverts, should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) to a minimum depth of 12 inches below the bottom of the structure. Unsuitable soils should be undercut to a depth of 12 inches below the bottom of the structure and backfilled in accordance with the recommendations presented in the Site Preparation section of this report.

Our recommended site preparation is presented in Section 7.0, General Site Preparation.

6.2 Soil Parameters for Below Grade Construction

Structures bearing on compacted acceptable existing soils or compacted structural fill soils may be designed using an allowable net soil bearing pressure of 2,500 psf and a modulus of subgrade reaction of 50 psi/in. The table below presents recommended values for use in design of the proposed outfall structure.

Boring No.	Depth range, ft	SPT "N" Value Range	AASHTO Soil Classification	Approximate Soil Unit Weight (pcf)		Soil Angle of Friction (degrees)	Earth Pressure Coefficient		
				saturated	submerged		Active (Ka)	At-rest (Ko)	Passive (Kp)
B-01	0-15	4-13	A-3	110	47.6	30	0.33	0.50	3.0

6.3 Pavements

Sandy existing soils and sandy engineered fill soils should be acceptable for construction and support of a flexible pavement section after proper site preparation.

Base: Due to the relatively shallow water table at this site, we recommend using crushed concrete for the base. Crushed concrete should have a minimum Limerock Bearing Ratio (LBR) value of 100 and be graded in accordance with Florida Department of Transportation (FDOT) Standard Specification Section 204. If a limerock base is used, it should meet FDOT requirements, including compaction to 98 percent of its maximum dry density as determined by the Modified Proctor Test (ASTM D-1557) and a minimum LBR of 100.

Asphaltic Concrete: The asphaltic concrete structural course should consist of Type SP-9.5 or Type SP – 12.5 asphaltic concrete material. The asphaltic concrete should meet standard FDOT material requirements and placement procedures as outlined in the 2010 Edition of the FDOT Standard Specifications for Road and Bridge Construction.

7.0 GENERAL SITE PREPARATION

7.1 General

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

7.2 Excavation Slopes

Generally, for excavations less than 3 feet deep, the sides of the excavation can temporarily stand with vertical cut slopes as a result of the apparent cohesion from soil moisture. For excavations greater than 3 feet deep, however, temporary side slopes in the sandy soils of 2:1 (H:V) or flatter should be maintained or the excavation properly braced or shored.

7.3 Dewatering

Groundwater was encountered in the soil borings at depths of approximately 1 to 4 feet below the existing ground surface. Therefore, dewatering may be required for deeper excavations. Dewatering can be accomplished using a wellpoint system or through the use of perimeter ditches draining toward a sump pump in order to maintain ground water levels at a depth of at least 2 feet below the bottom of the excavation. 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.

7.4 Undercutting

In approximately half of the soil borings, clayey fine sand (A-2-7), clay (A-7) and weathered limestone (WLS) were encountered at depths below approximately 10 to 13 feet. These soils are not suitable to provide adequate support for sewer pipes, junction boxes, box culverts, and other structures. These soils should be undercut to a depth of 12 inches below the bottom of structures and backfilled in accordance with the recommendations presented in this report

7.5 Structural Filling and Backfilling

Structural fill and backfill beneath and adjacent to box culverts, junction boxes, and other structures may be placed in lifts not exceeding 12 inches in loose thickness. Fill placed in restrictive work areas where only hand guided compaction equipment can be used should be placed in lifts not exceeding 6 inches in loose thickness. Fill in pipe trenches should be placed in lifts not exceeding 6 inches in loose thickness below the haunches of the pipe and to 1 foot above the top of the pipe. The remainder of the trench can be backfilled with suitable structural fill in lifts not exceeding 12 inches in loose thickness. Mechanical tampers should be used to compact the fill material beneath the haunches of the pipe and above any bedding material. Each lift should be thoroughly compacted with the appropriate equipment until densities equivalent to at least 95 percent of the Modified Proctor maximum dry density are uniformly obtained. The upper foot of subgrade soils beneath pavement areas should be compacted to at least 98 percent of the Modified Proctor maximum dry density. A moisture content within 3 percentage points of the optimum indicated by the Modified Proctor Test (ASTM D-1557) is recommended prior to compaction of the fill. Structural fill should consist of an inorganic, non-plastic, granular soil containing less than 10 percent material passing the No. 200 mesh sieve (relatively clean sand) with an AASHTO Soil Classification of A-3.

7.6 On-Site Soil Suitability

The borings indicate that sandy soils classified as A-3 based on the AASHTO Soil Classification System are present at the site to depths of up to 10 feet and are suitable for use as backfill material. Soils excavated from below the water table will require drying prior to placing and compacting. Any off-site materials used as fill should be approved by AREHNA prior to acquisition.

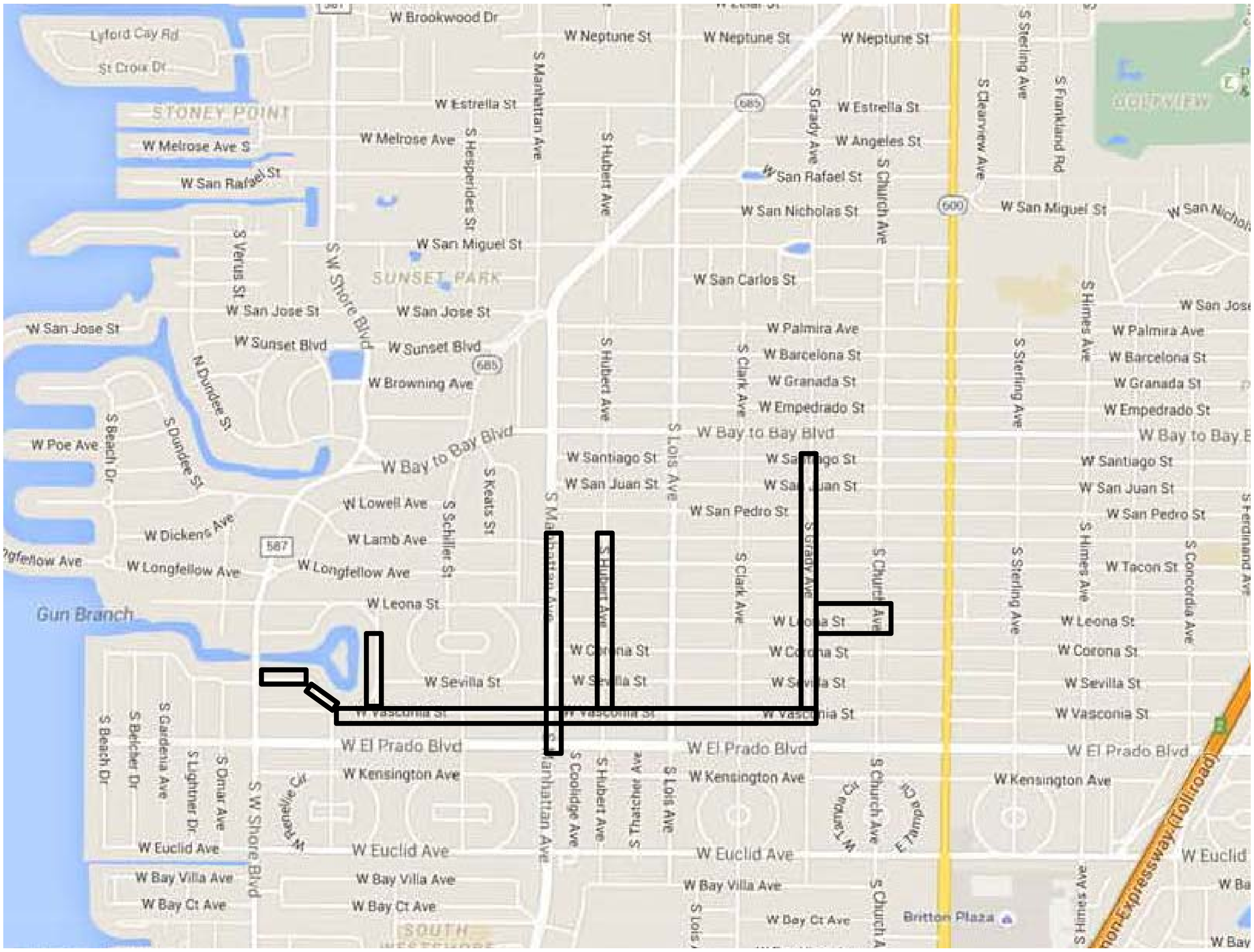
Suitable backfill materials should consist of fine to medium sand with less than 10 percent passing the No. 200 sieve, and be free of organic matter, muck or marl, clay, rocks exceeding 2-1/2 inches in diameter, and other unsuitable material, and shall not contain broken concrete, masonry, rubble, or other similar materials. Any off-site materials used as backfill should be approved by AREHNA prior to acquisition.

8.0 BASIS FOR RECOMMENDATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the soil boring 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 drilled, 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.

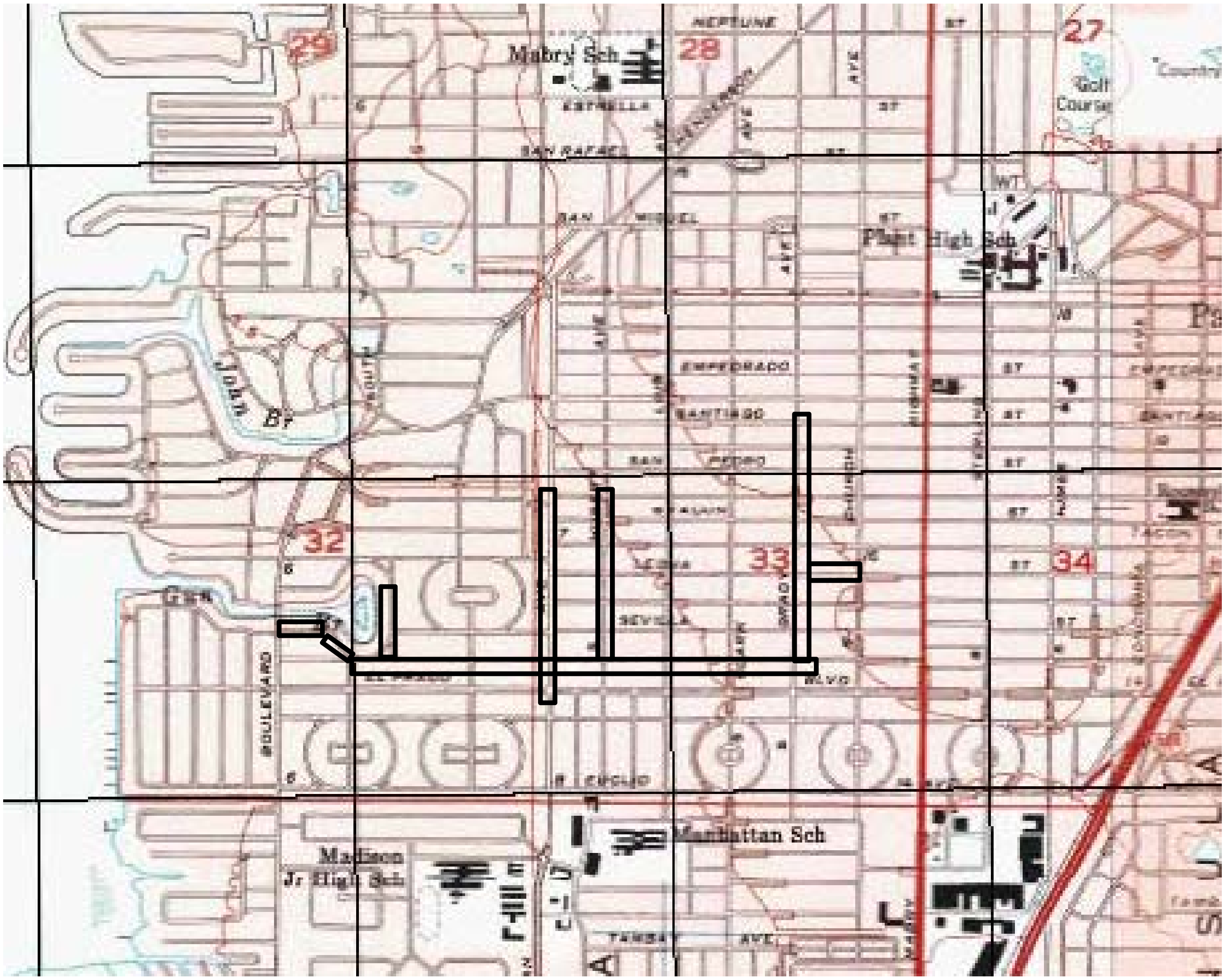
APPENDIX A

Project Site Location Map – Figure 1
USGS Topographic Survey – Figure 2
USDA Soil Survey Map - Figure 3



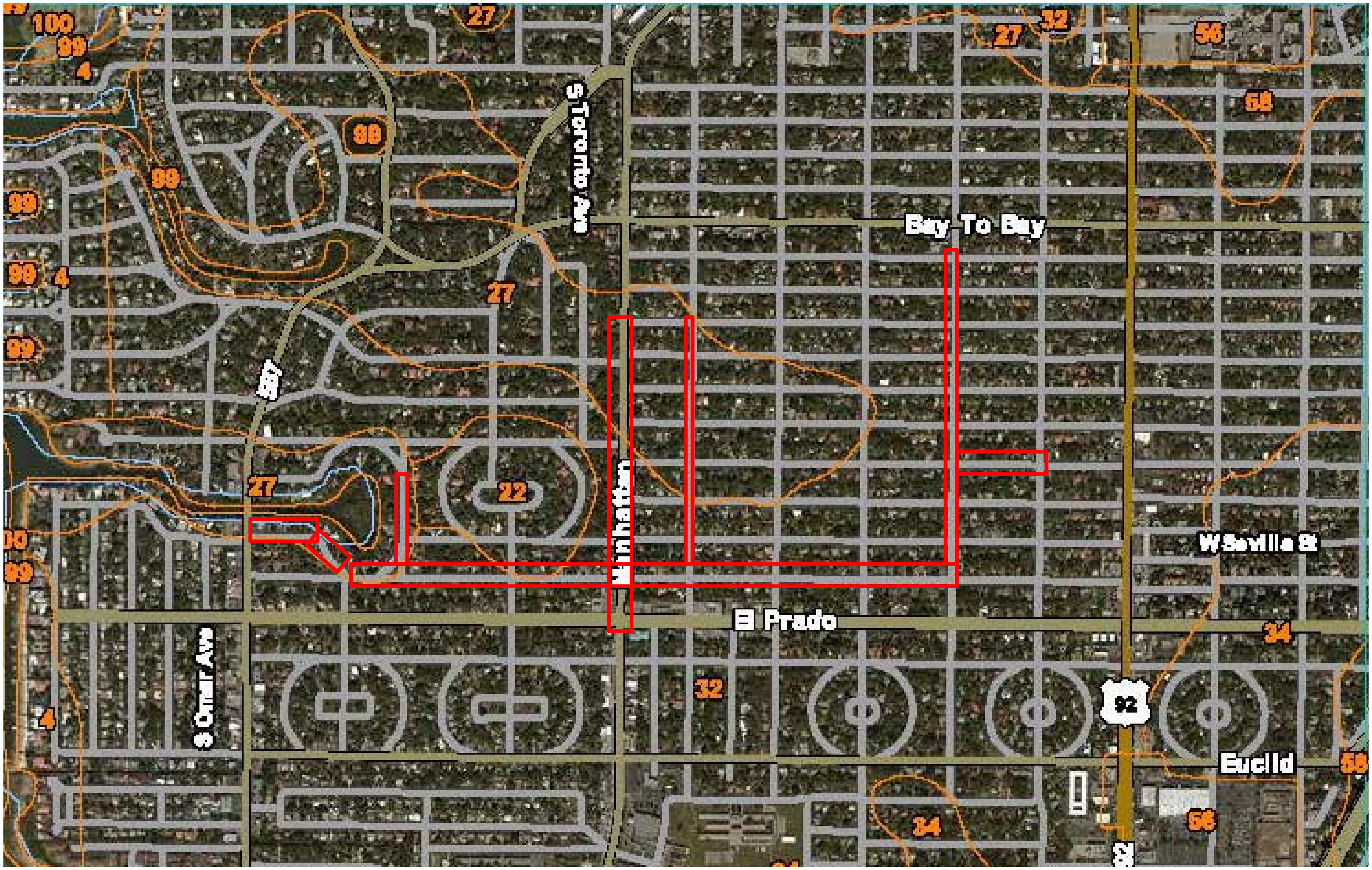
Project Limits

Spring Lake Stormsewer and Outfall Tampa, Florida	AREHNA Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	PROJECT SITE LOCATION MAP
Client: Campo Engineering, Inc. Project No.: B-15-038 Date: August 19, 2015		Designed By: JAM Checked By: JEP Drawn By: KSL FIGURE 1



Project Limits

Spring Lake Stormsewer and Outfall Tampa, Florida	ARENHA Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	USGS TOPOGRAPHIC SURVEY	
Client: Campo Engineering, Inc. Project No.: B-15-038 Date: August 19, 2015		Designed By: JAM Checked By: JEP Drawn By: KSL	FIGURE 2



Soil Mapping Unit

22 – Immokalee-Urban land complex
27 – Malabar fine sand
32 – Myakka-Urban land complex

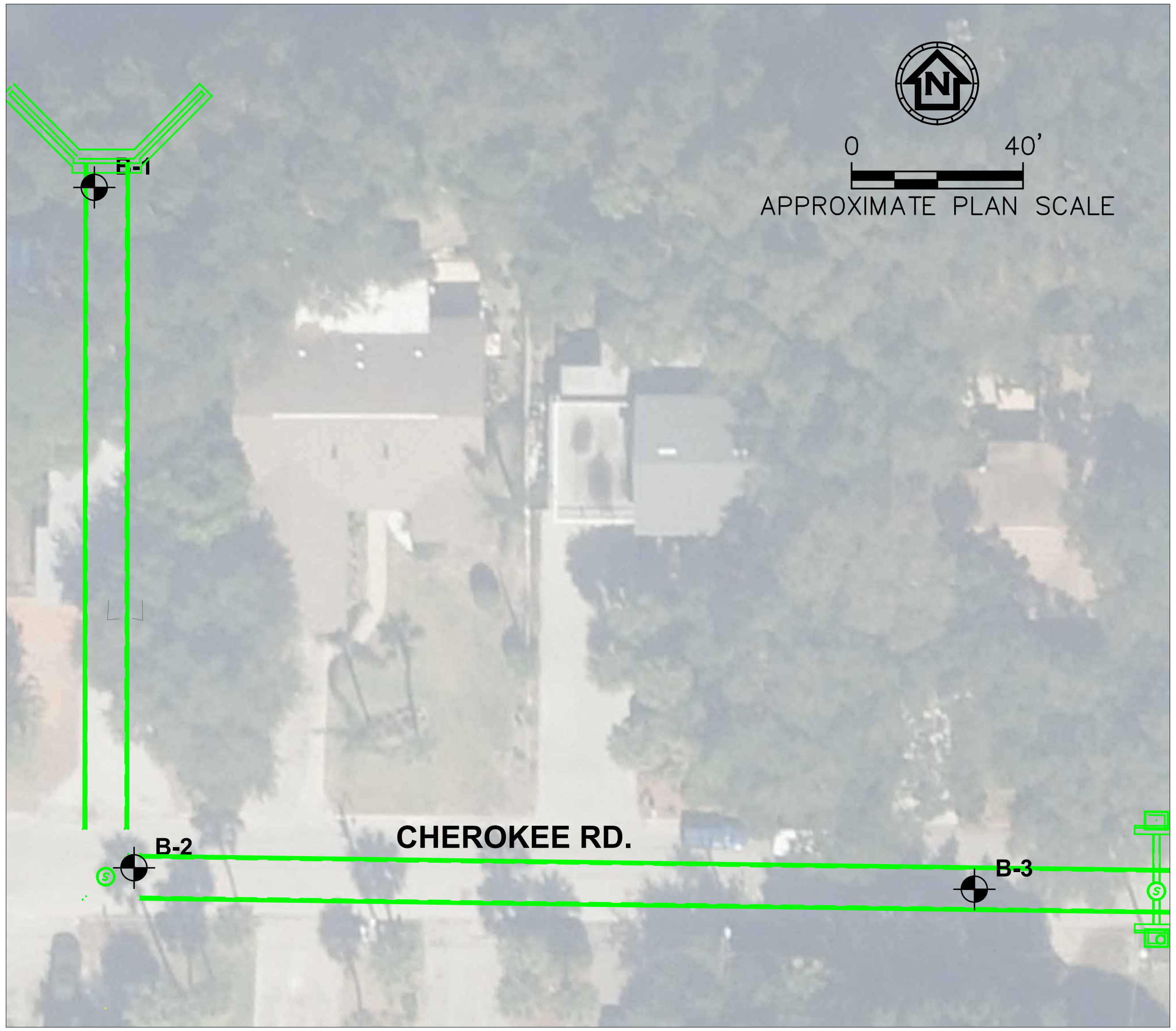
N

Spring Lake Stormsewer and Outfall Tampa, Florida	AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	USDA SOIL SURVEY
Client: Campo Engineering, Inc. Project: B-15-038 Date: August 19, 2015		Designed By: JAM Checked By: JEP Drawn By: KSL
		FIGURE 3

APPENDIX B

Report of Core Borings – Sheets 1 through 23
Table 1 – Summary of Laboratory Test Results
Field and Laboratory Test Procedures

BORING LOCATION PLAN



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

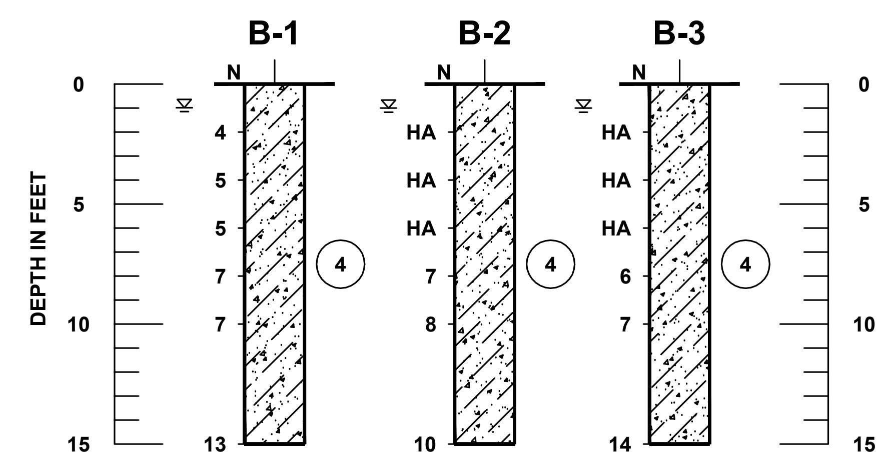
Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

SOIL PROFILES



REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
ARESHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

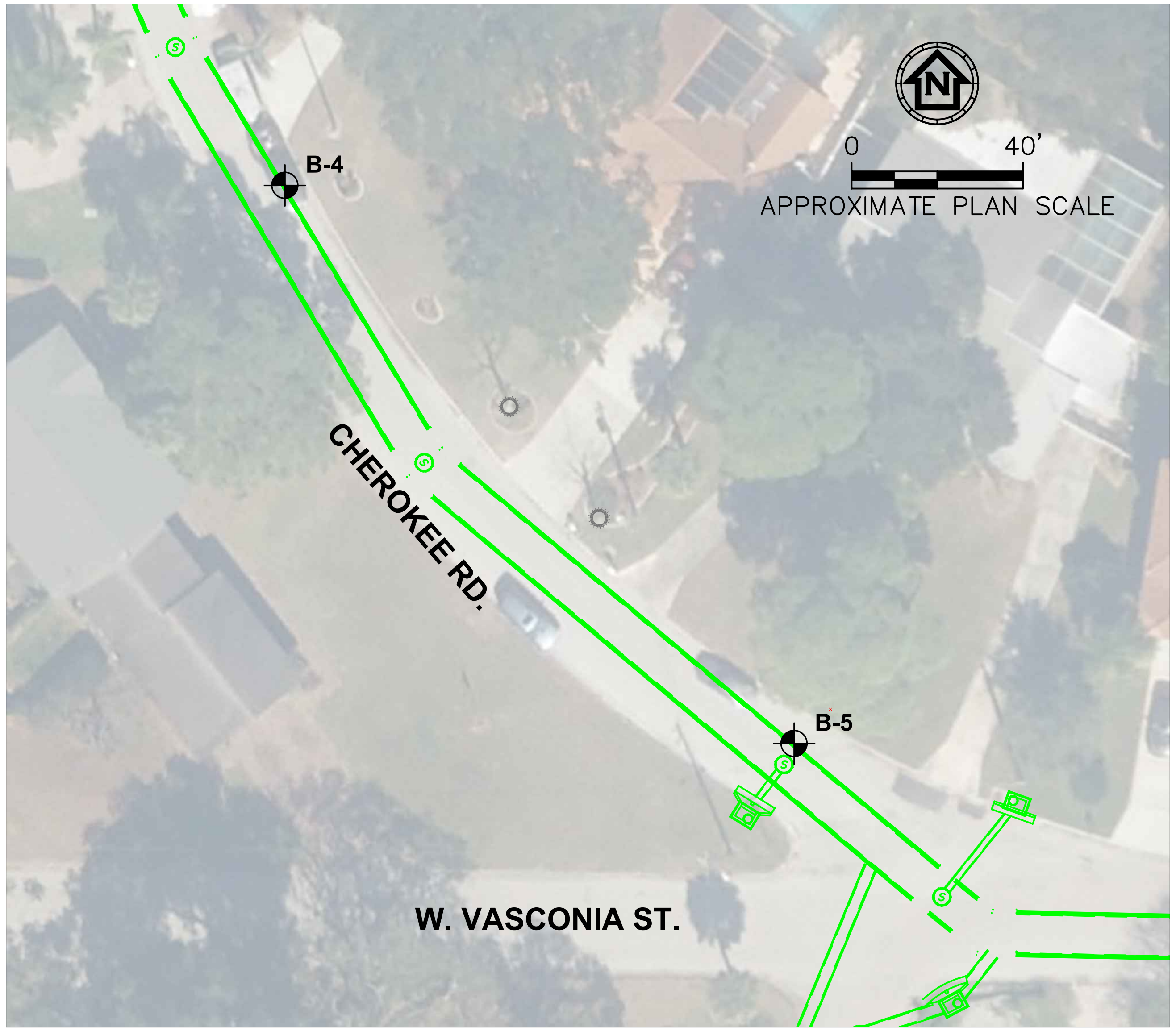
CITY OF TAMPA FLORIDA — ORGANIZED JULY 15 1887

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	1

BORING LOCATION PLAN



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

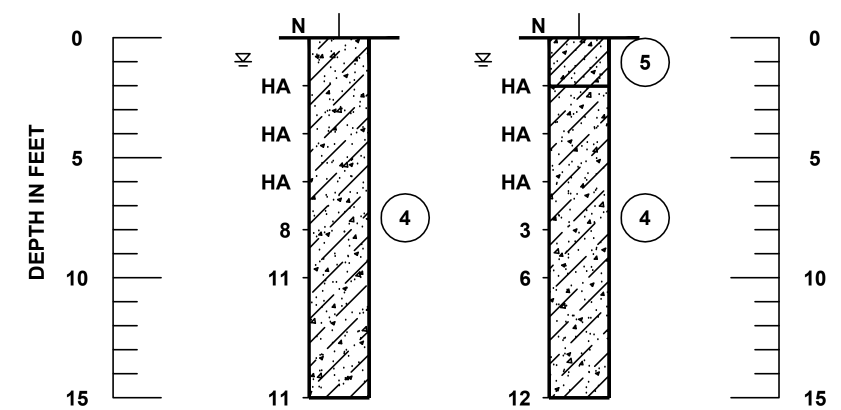
Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

SOIL PROFILES



REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

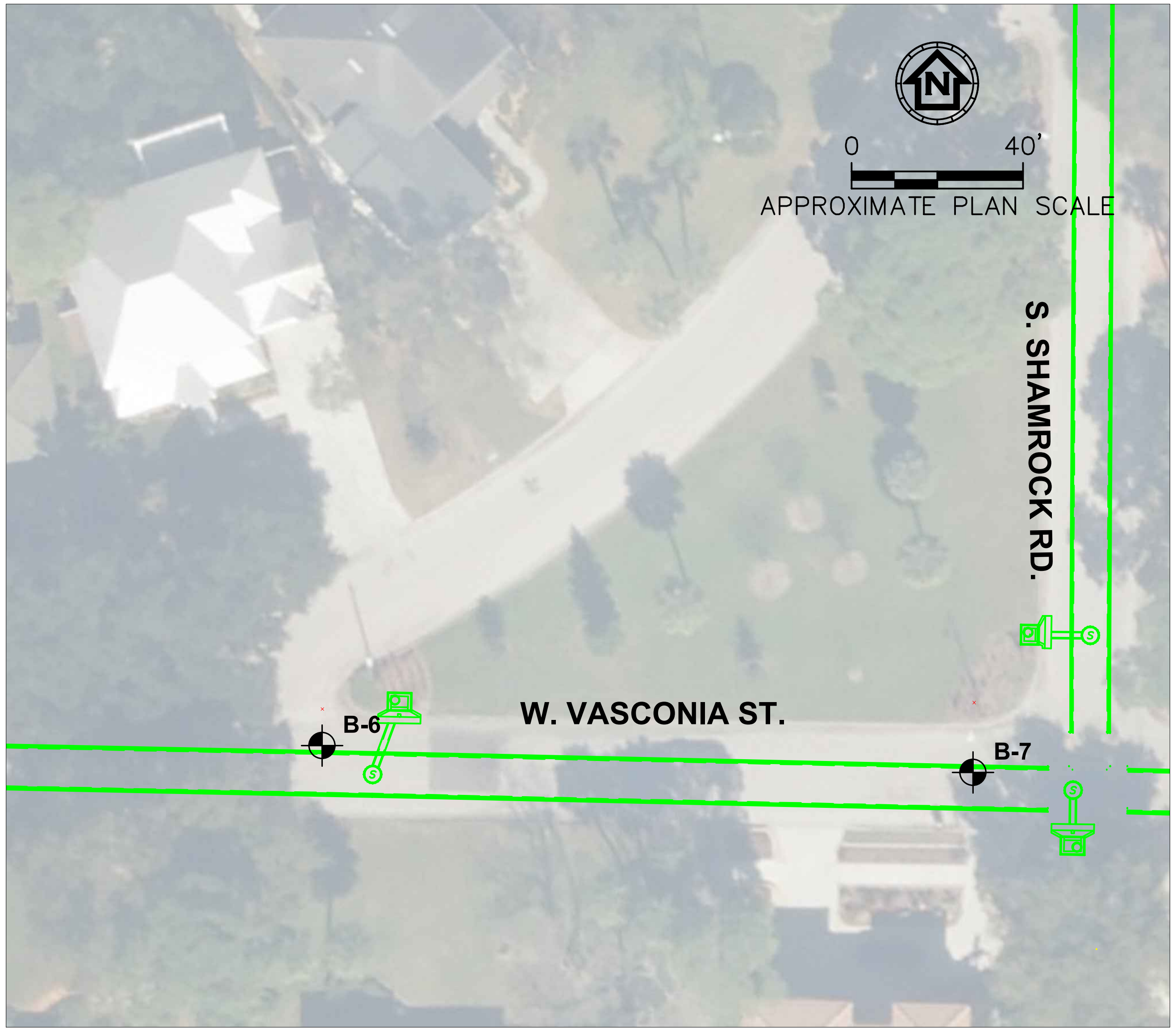
ARREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY: Joseph Prendergast, P.E.		

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	2

BORING LOCATION PLAN



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

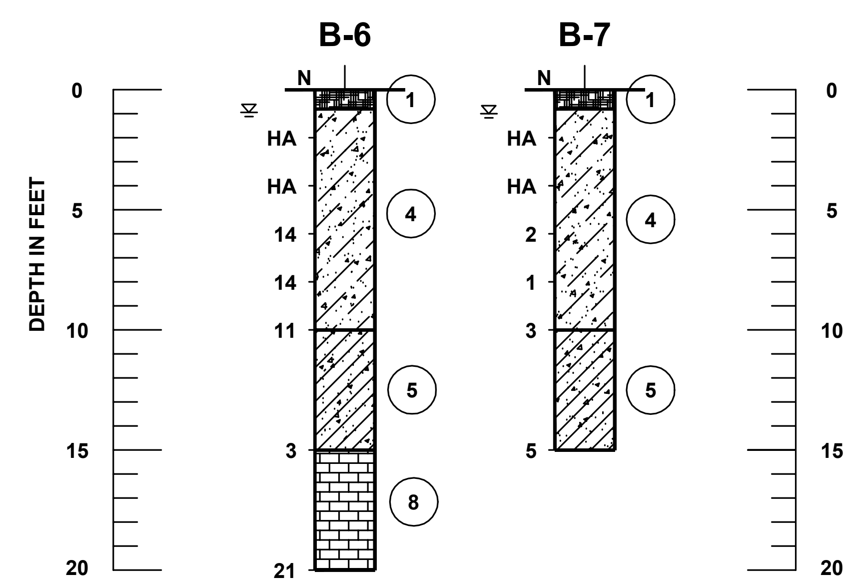
Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

SOIL PROFILES



REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

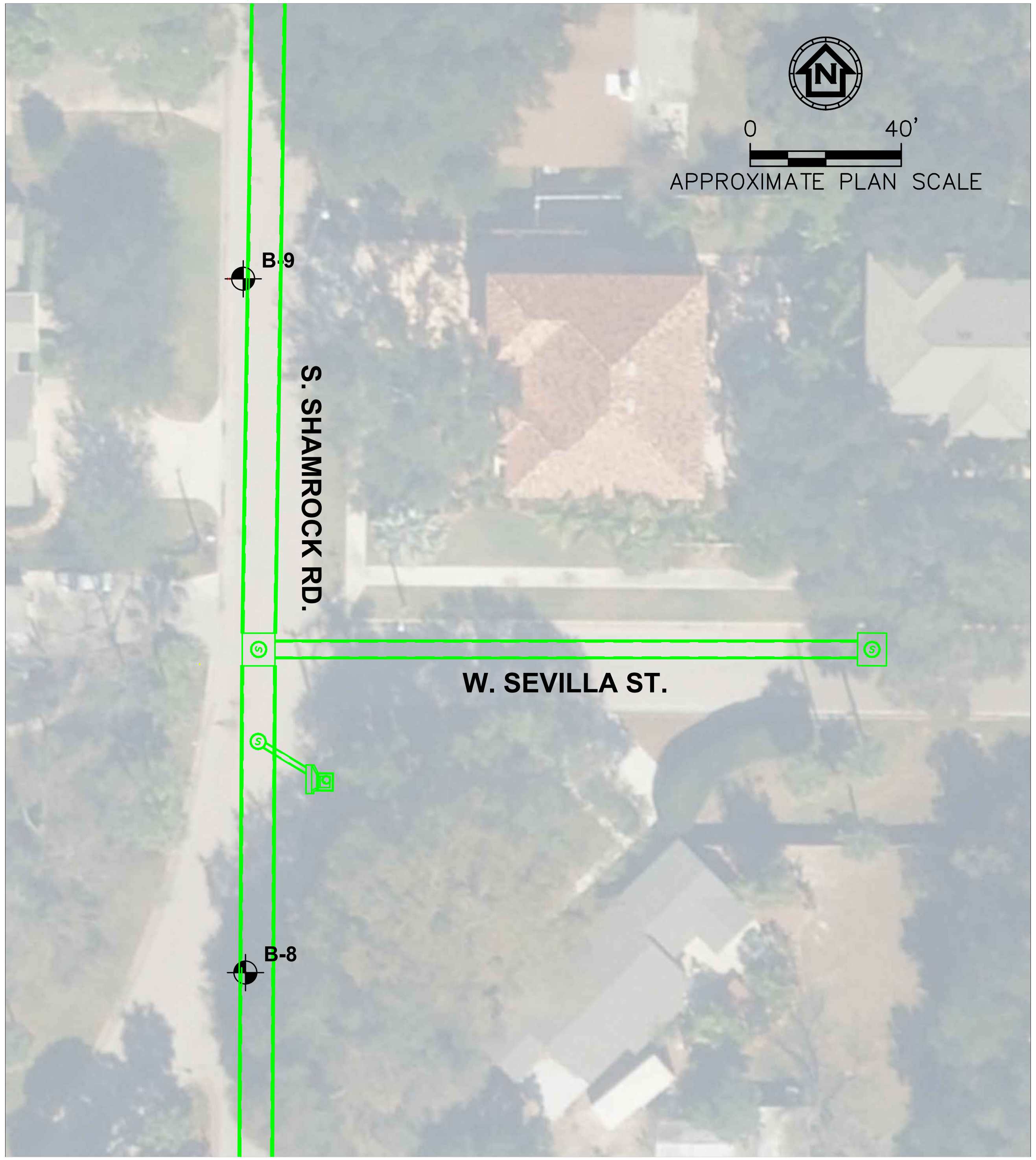
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	3

BORING LOCATION PLAN



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

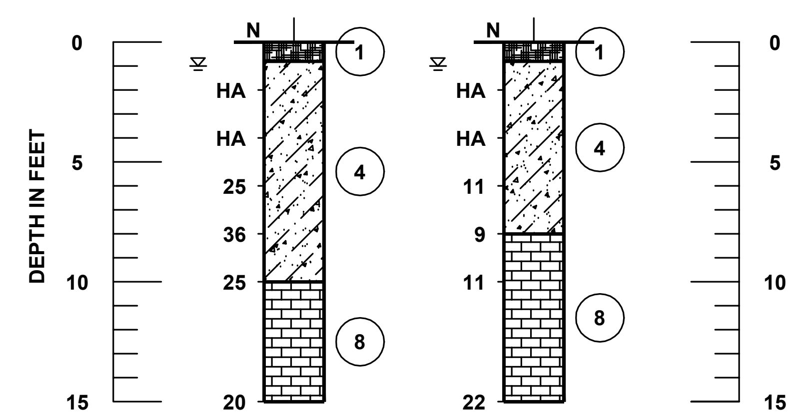
Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

SOIL PROFILES



REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

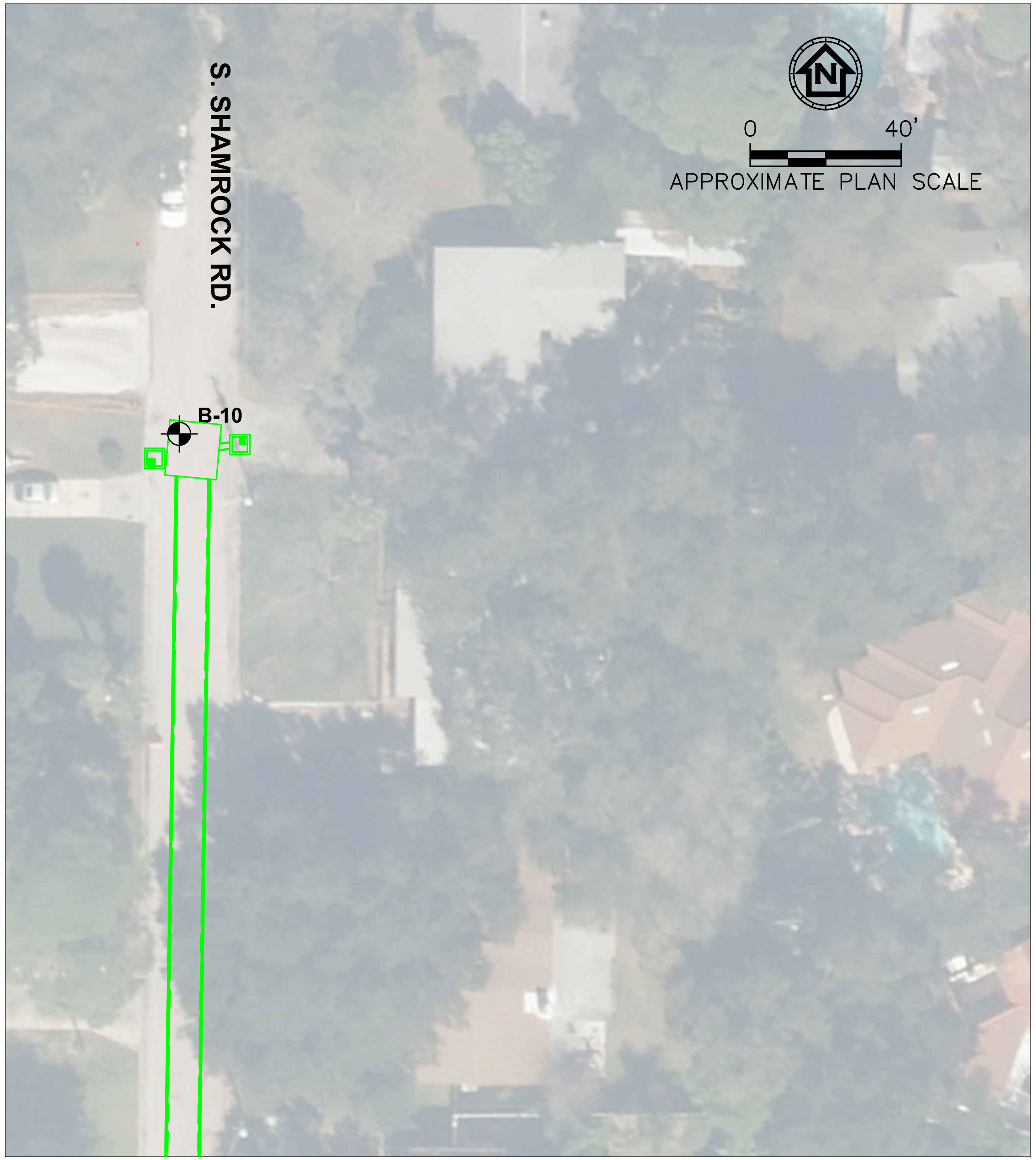
PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY: Joseph Prendergast, P.E.		

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	4

BORING LOCATION PLAN



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

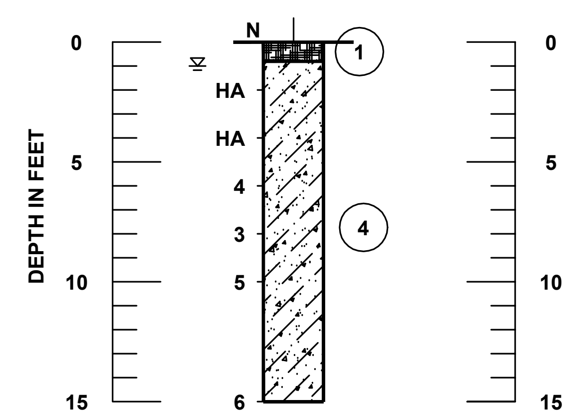
N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

SOIL PROFILES

B-10



REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

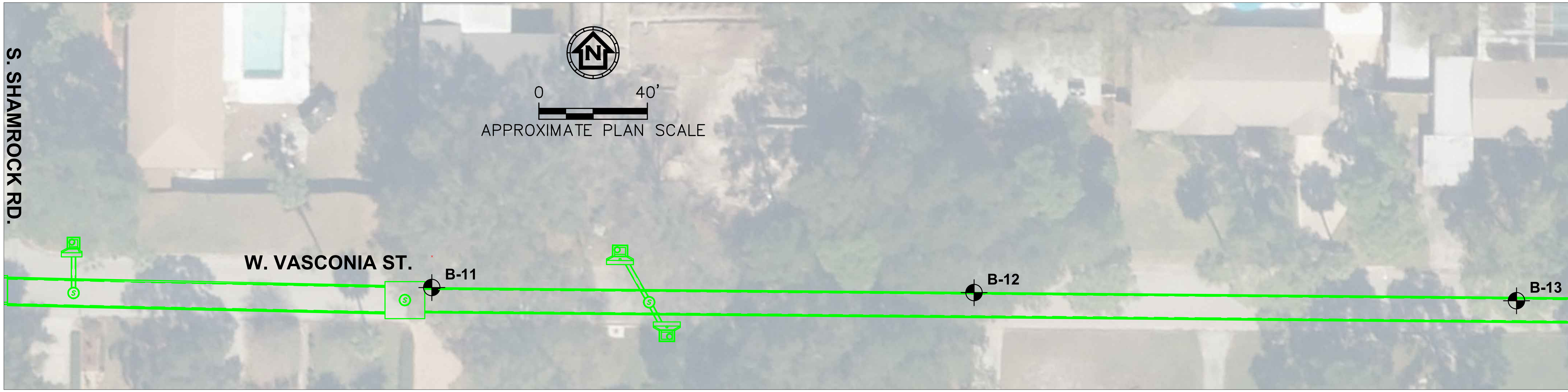
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

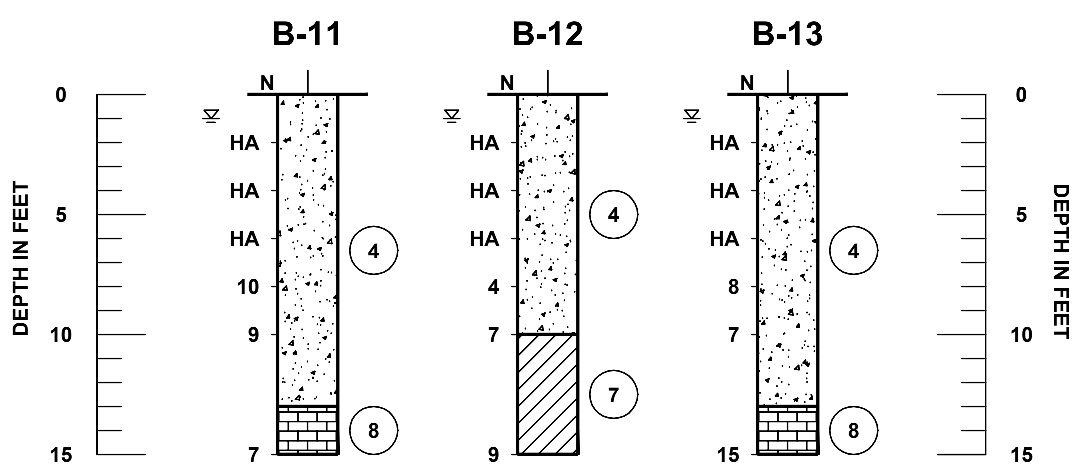
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	5

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1	Asphalt and Sand/Shell Base Pavement
2	Asphalt and Limerock Base Pavement
3	Asphalt and Concrete Base Pavement
4	Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5	Gray Clayey Fine SAND (A-2-7)
6	Greenish Gray High Plasticity CLAY (A-7)
7	Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8	Weathered LIMESTONE (WLS)
9	No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

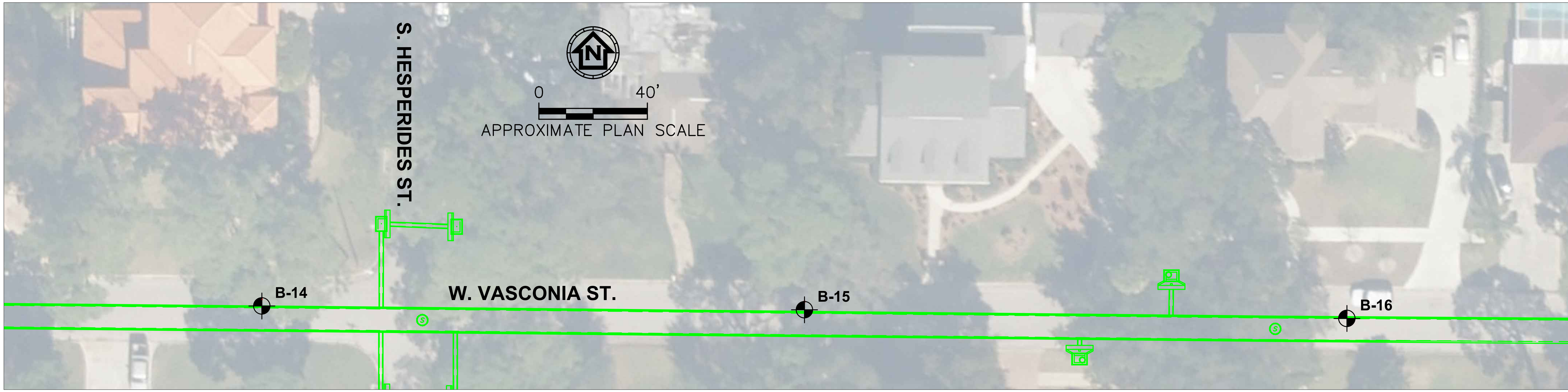
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

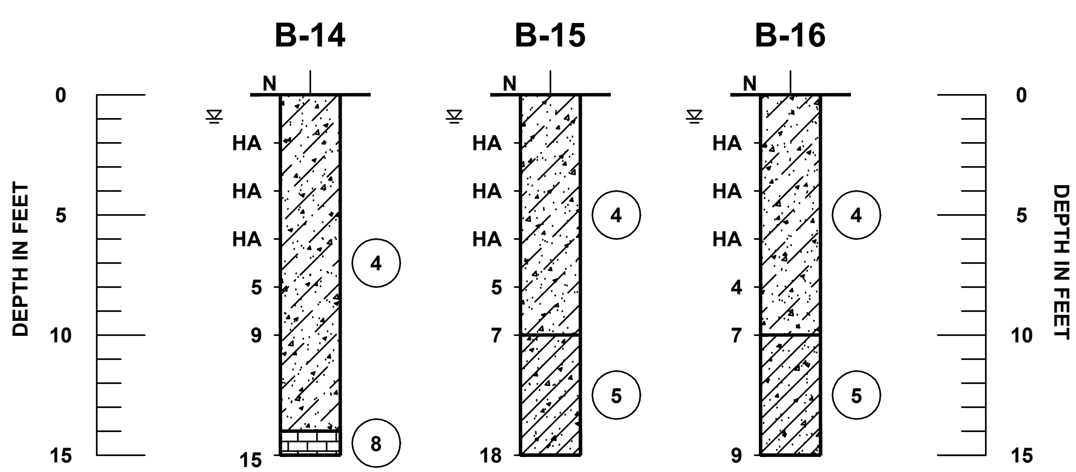
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	6

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

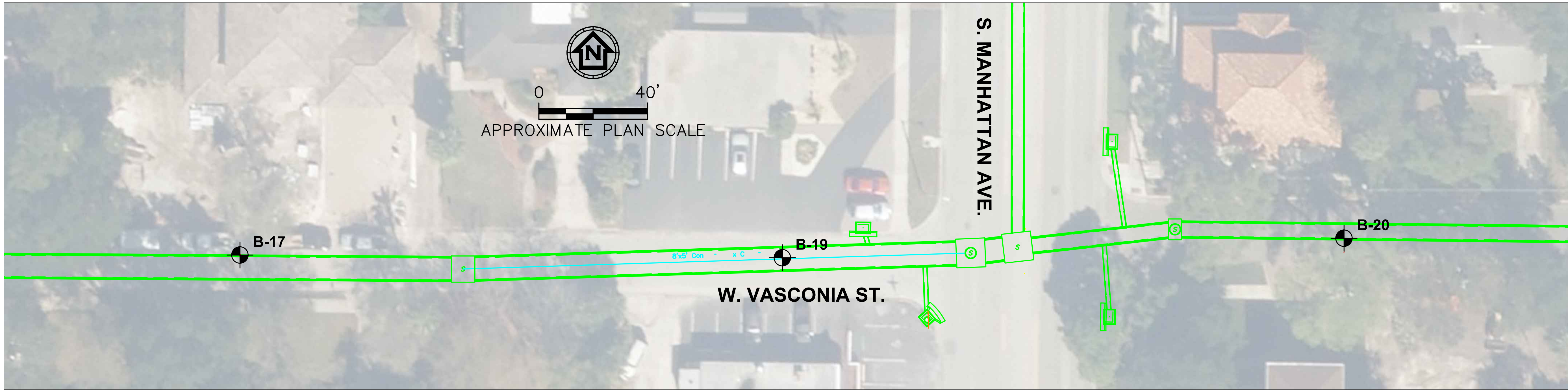
PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

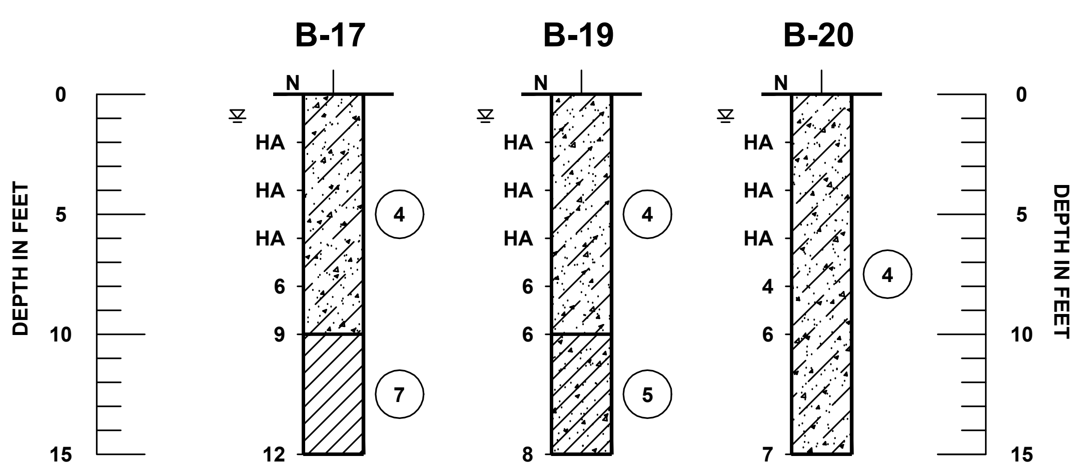
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	7

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1 Asphalt and Sand/Shell Base Pavement

2 Asphalt and Limerock Base Pavement

3 Asphalt and Concrete Base Pavement

4 Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 Gray Clayey Fine SAND (A-2-7)

6 Greenish Gray High Plasticity CLAY (A-7)

7 Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 Weathered LIMESTONE (WLS)

9 No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

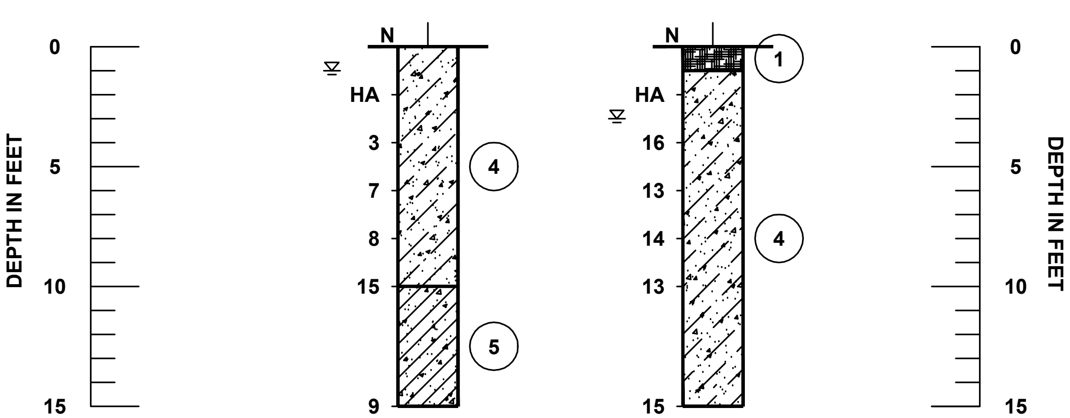
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	8

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA — ORGANIZED JULY 15 1887

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

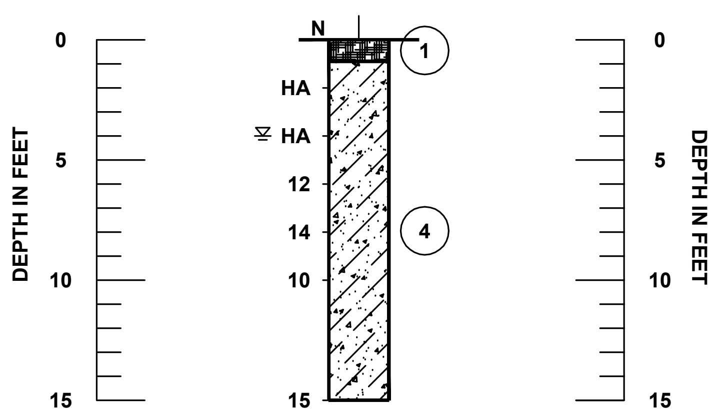
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	9

BORING LOCATION PLAN

SOIL PROFILES

HA-1



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

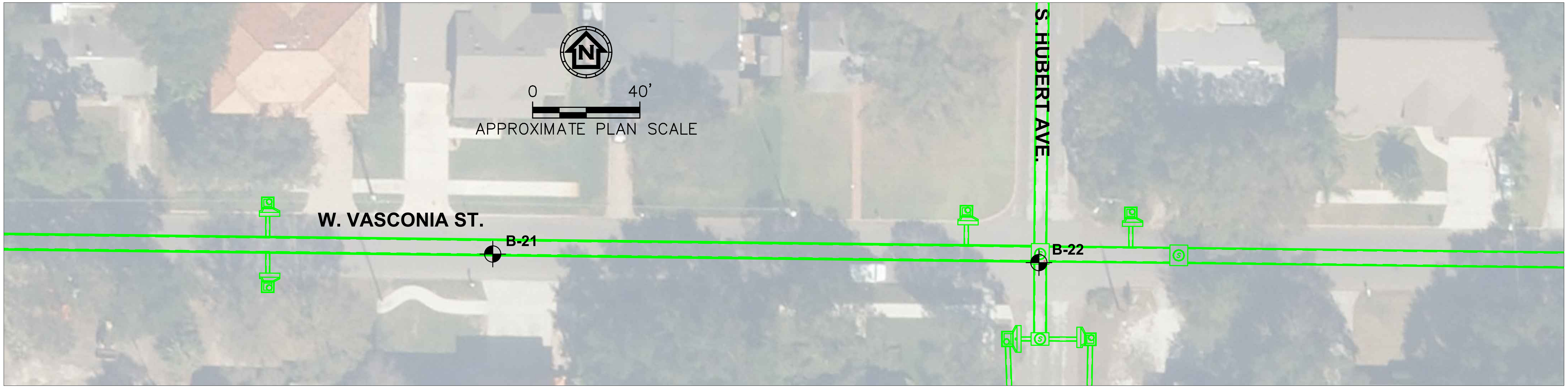
CITY OF TAMPA FLORIDA — ORGANIZED JULY 15 1887

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

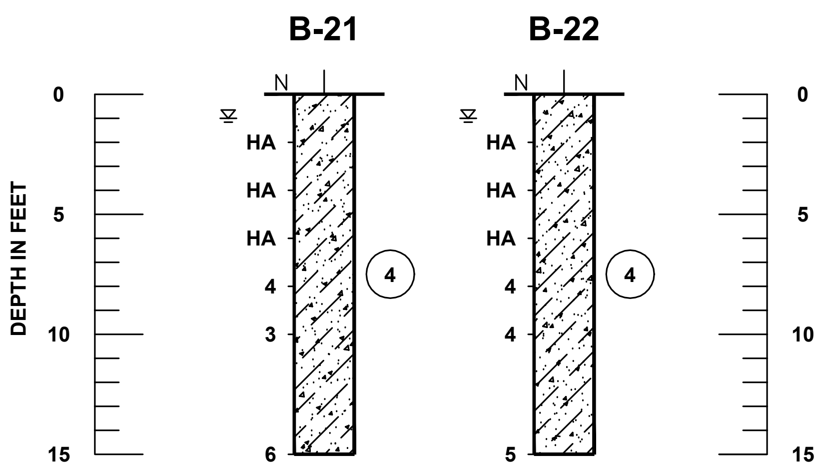
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	10

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

▽ Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

⌖ Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

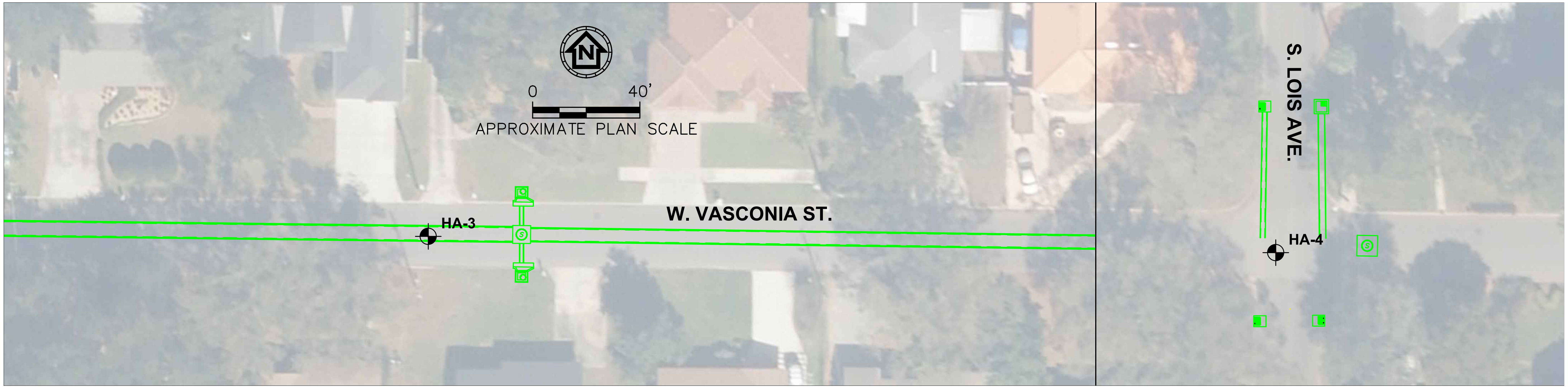
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA — ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

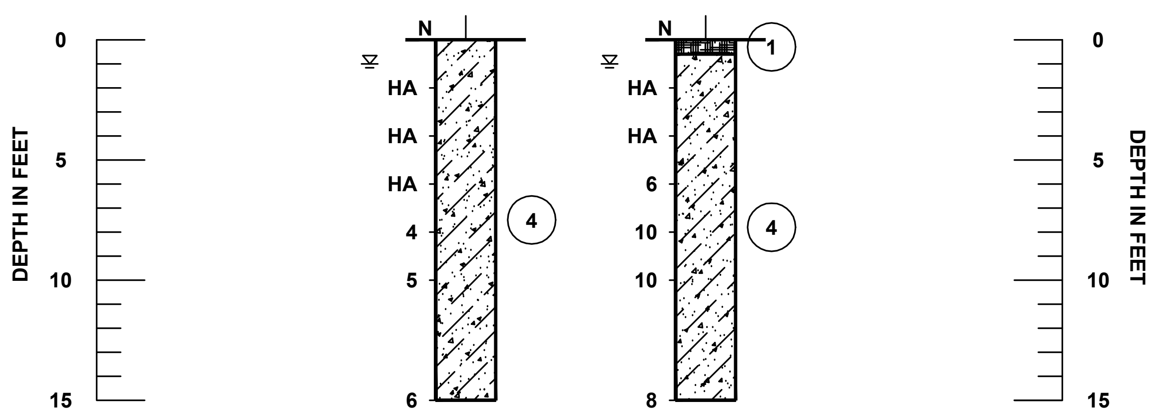
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	11

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1 Asphalt and Sand/Shell Base Pavement

2 Asphalt and Limerock Base Pavement

3 Asphalt and Concrete Base Pavement

4 Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 Gray Clayey Fine SAND (A-2-7)

6 Greenish Gray High Plasticity CLAY (A-7)

7 Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 Weathered LIMESTONE (WLS)

9 No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

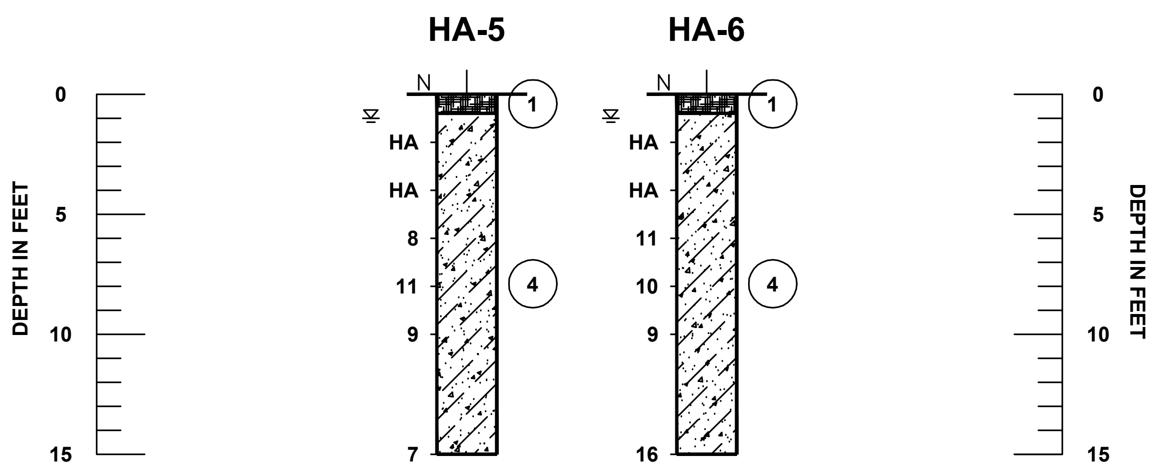
CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	12

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

(1) Asphalt and Sand/Shell Base Pavement

(2) Asphalt and Limerock Base Pavement

(3) Asphalt and Concrete Base Pavement

(4) Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

(5) Gray Clayey Fine SAND (A-2-7)

(6) Greenish Gray High Plasticity CLAY (A-7)

(7) Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

(8) Weathered LIMESTONE (WLS)

(9) No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

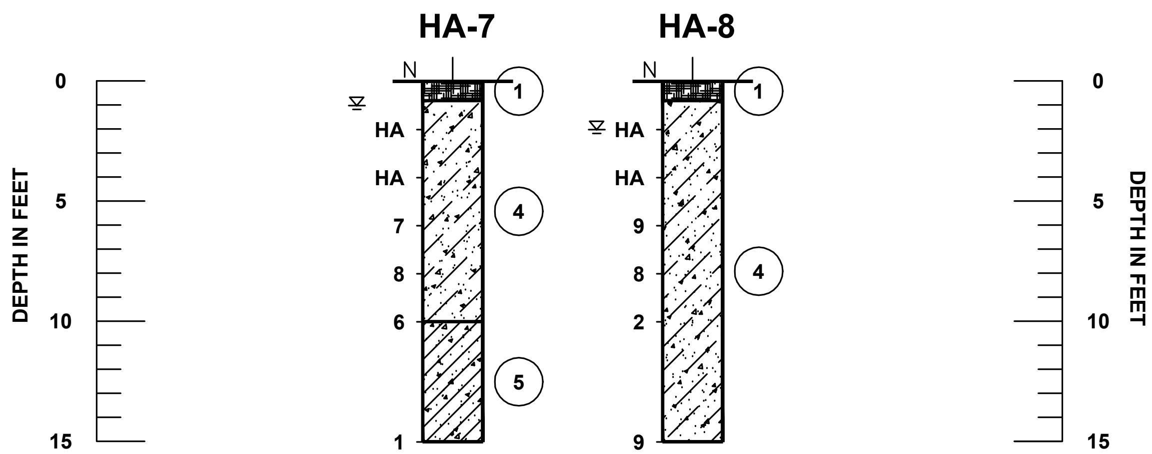
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	13

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

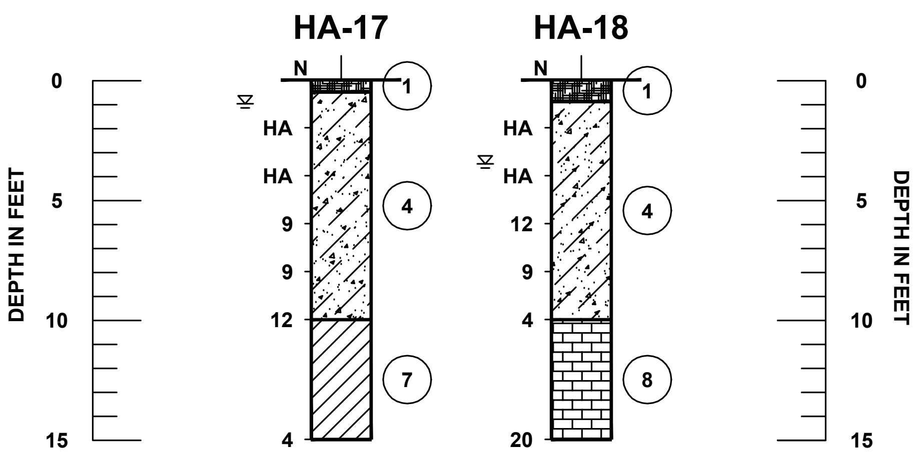
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	14

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

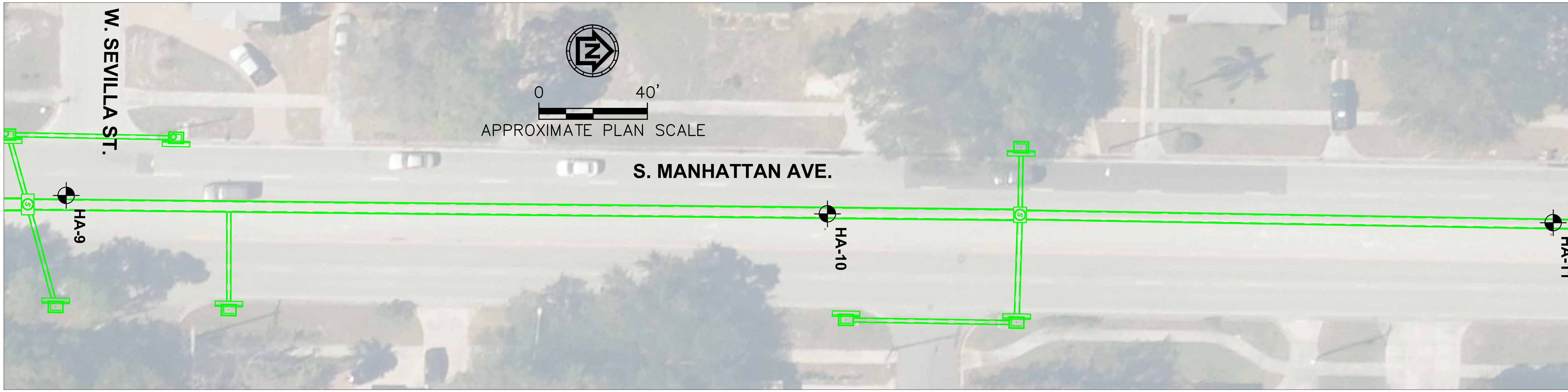
CITY OF TAMPA FLORIDA – ORGANIZED JULY 15 1887

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

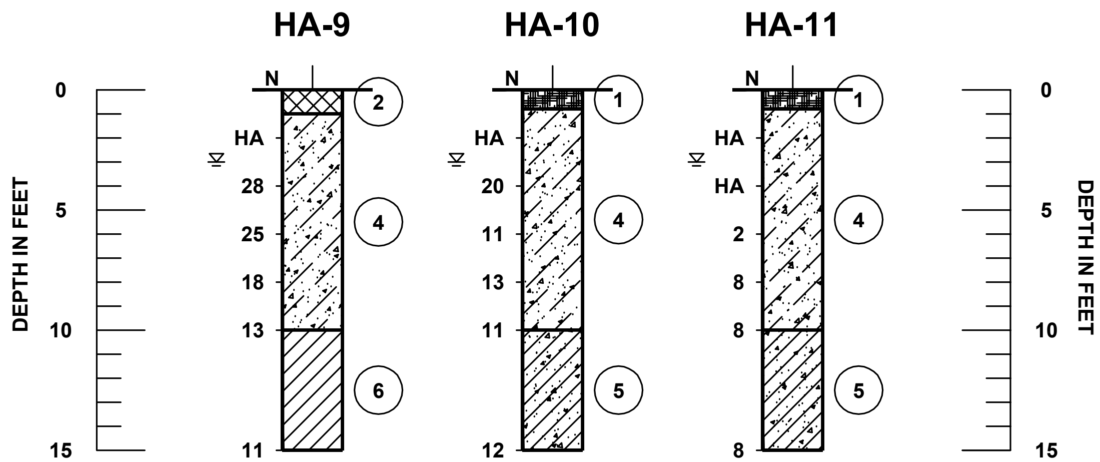
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	15

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

ARЕHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

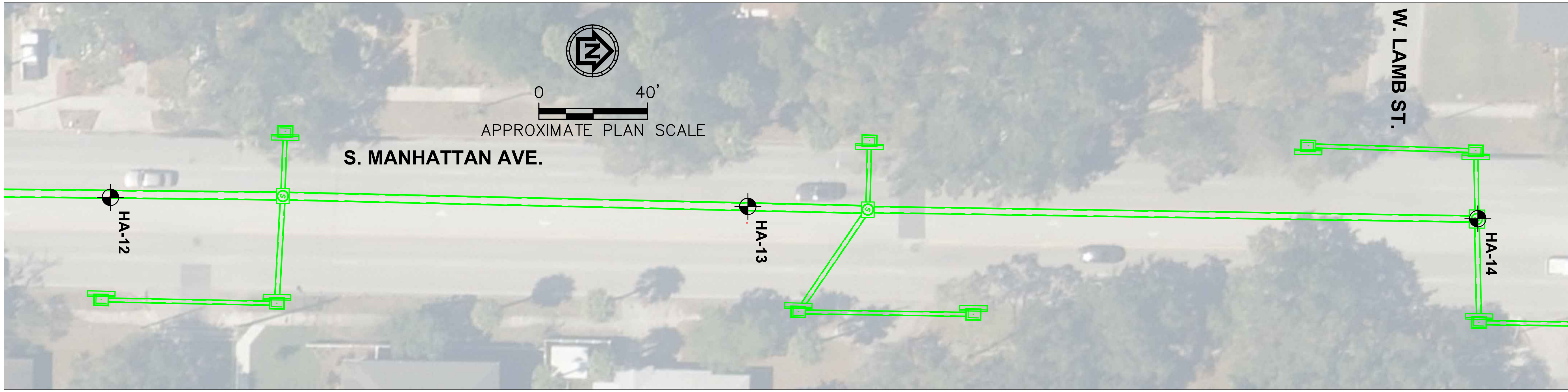
CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

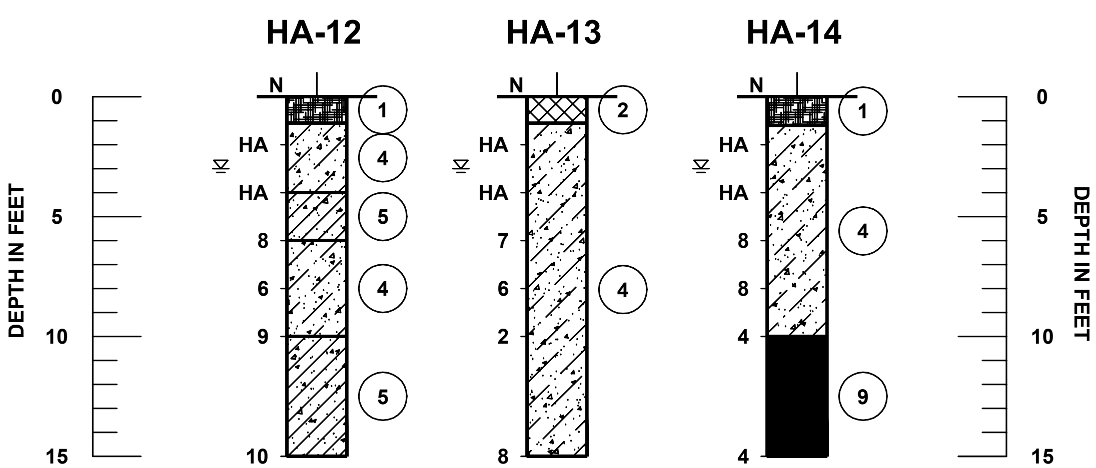
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	16

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1 — Asphalt and Sand/Shell Base Pavement

2 — Asphalt and Limerock Base Pavement

3 — Asphalt and Concrete Base Pavement

4 — Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 — Gray Clayey Fine SAND (A-2-7)

6 — Greenish Gray High Plasticity CLAY (A-7)

7 — Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 — Weathered LIMESTONE (WLS)

9 — No recovery

A3 — AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

▽ — Groundwater Level At Time Of Drilling

N — SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA — Hand Augered To Avoid Utility Conflicts and Safety Reasons

⊕ — Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

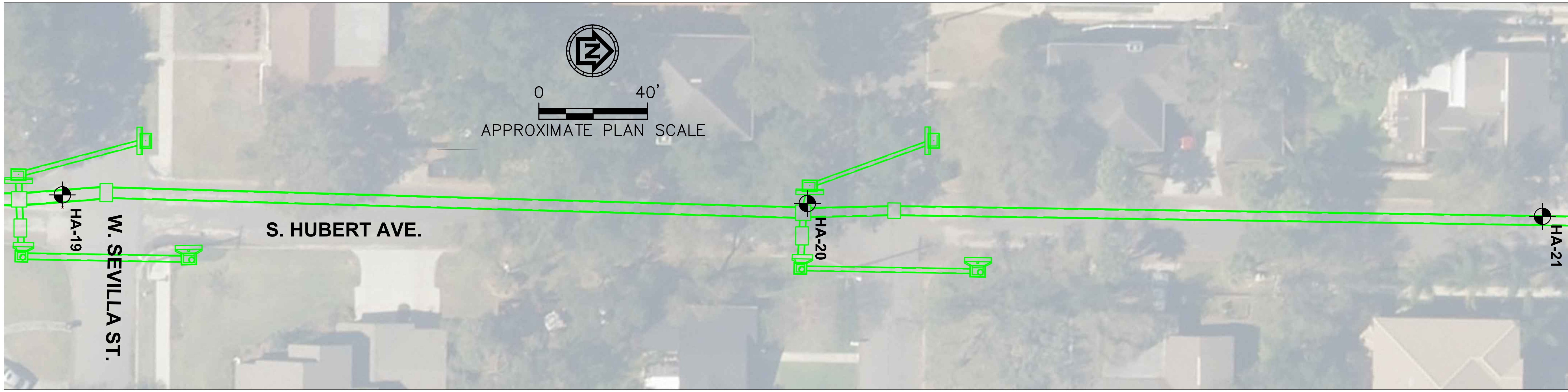
PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA — ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

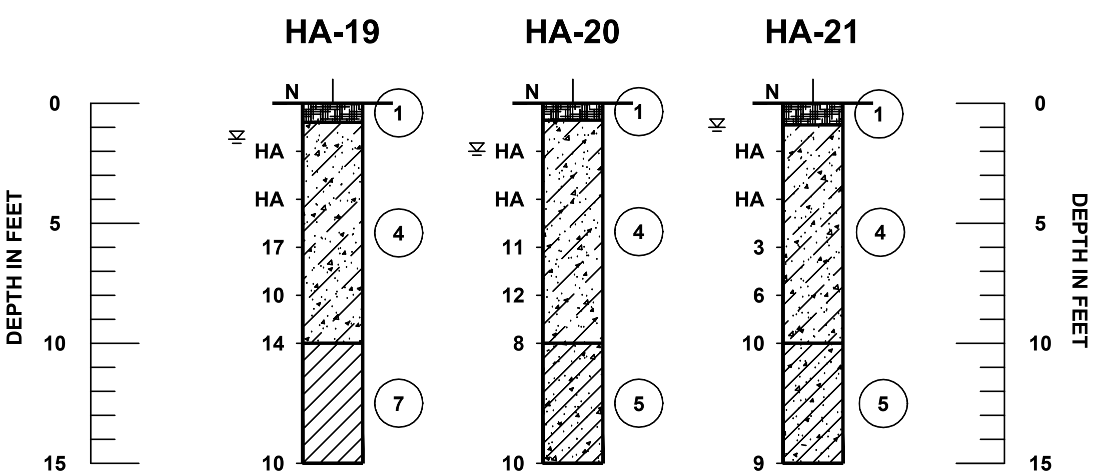
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	17

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1	Asphalt and Sand/Shell Base Pavement
2	Asphalt and Limerock Base Pavement
3	Asphalt and Concrete Base Pavement
4	Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5	Gray Clayey Fine SAND (A-2-7)
6	Greenish Gray High Plasticity CLAY (A-7)
7	Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8	Weathered LIMESTONE (WLS)
9	No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

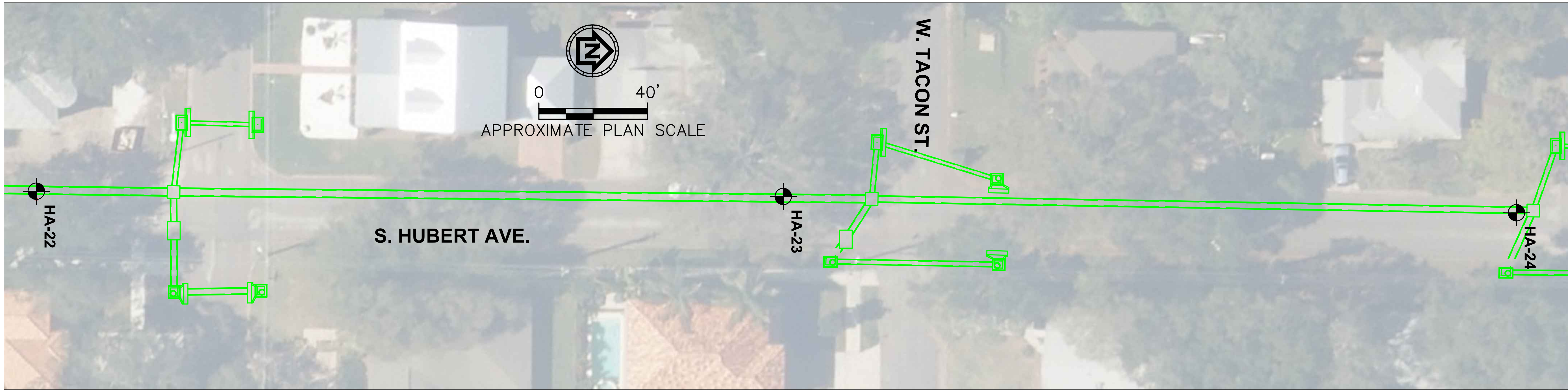
ARERHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

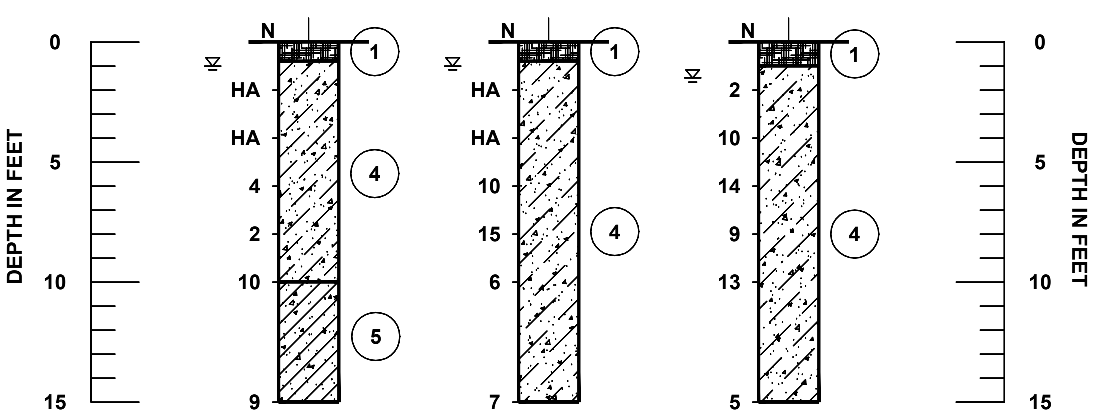
	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	18

BORING LOCATION PLAN



SOIL PROFILES



LEGEND

1	Asphalt and Sand/Shell Base Pavement
2	Asphalt and Limerock Base Pavement
3	Asphalt and Concrete Base Pavement
4	Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5	Gray Clayey Fine SAND (A-2-7)
6	Greenish Gray High Plasticity CLAY (A-7)
7	Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8	Weathered LIMESTONE (WLS)
9	No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

▽ Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

⊕ Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

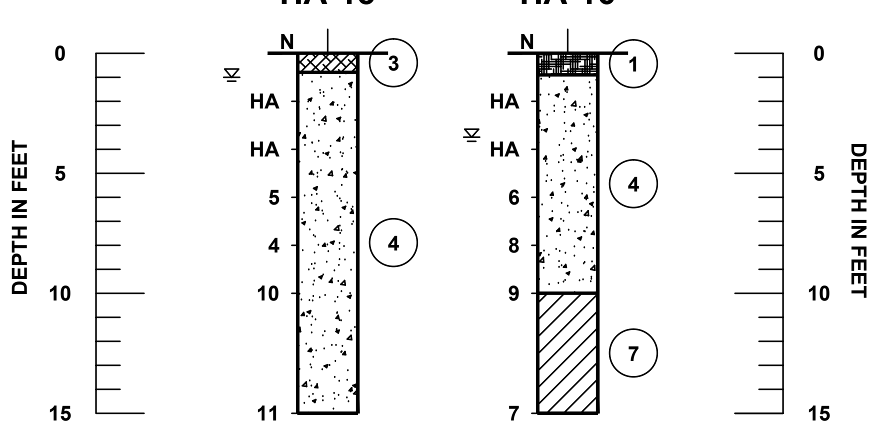
CITY OF TAMPA FLORIDA
ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	19

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1. Asphalt and Sand/Shell Base Pavement
2. Asphalt and Limerock Base Pavement
3. Asphalt and Concrete Base Pavement
4. Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)
5. Gray Clayey Fine SAND (A-2-7)
6. Greenish Gray High Plasticity CLAY (A-7)
7. Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)
8. Weathered LIMESTONE (WLS)
9. No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

▽ Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

⌖ Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

ARERHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

City of Tampa Florida — Organized July 15 1887

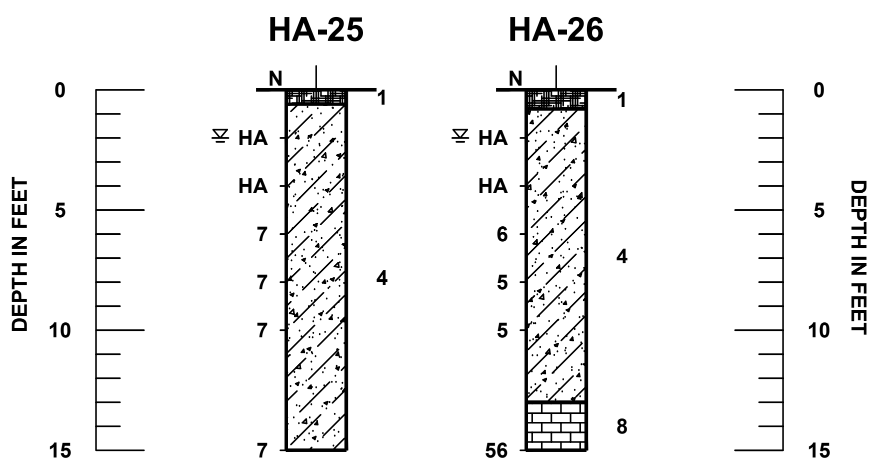
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	20

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1 Asphalt and Sand/Shell Base Pavement

2 Asphalt and Limerock Base Pavement

3 Asphalt and Concrete Base Pavement

4 Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 Gray Clayey Fine SAND (A-2-7)

6 Greenish Gray High Plasticity CLAY (A-7)

7 Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 Weathered LIMESTONE (WLS)

9 No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

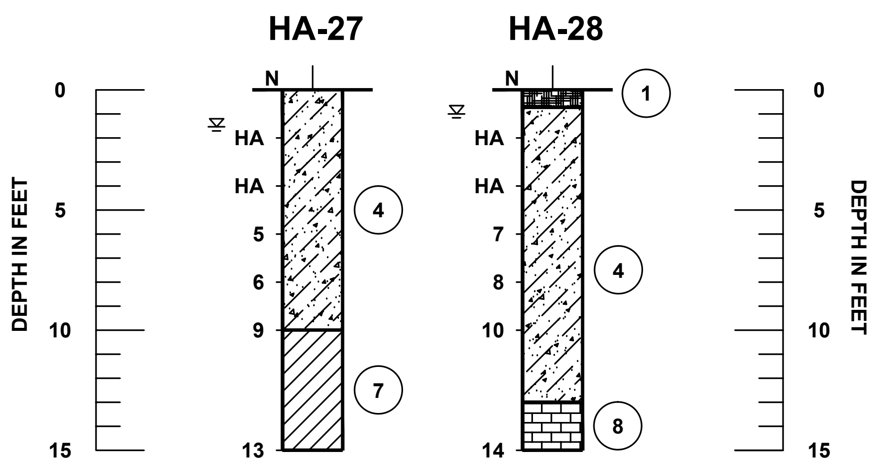
CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	21

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1 Asphalt and Sand/Shell Base Pavement

2 Asphalt and Limerock Base Pavement

3 Asphalt and Concrete Base Pavement

4 Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 Gray Clayey Fine SAND (A-2-7)

6 Greenish Gray High Plasticity CLAY (A-7)

7 Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 Weathered LIMESTONE (WLS)

9 No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887

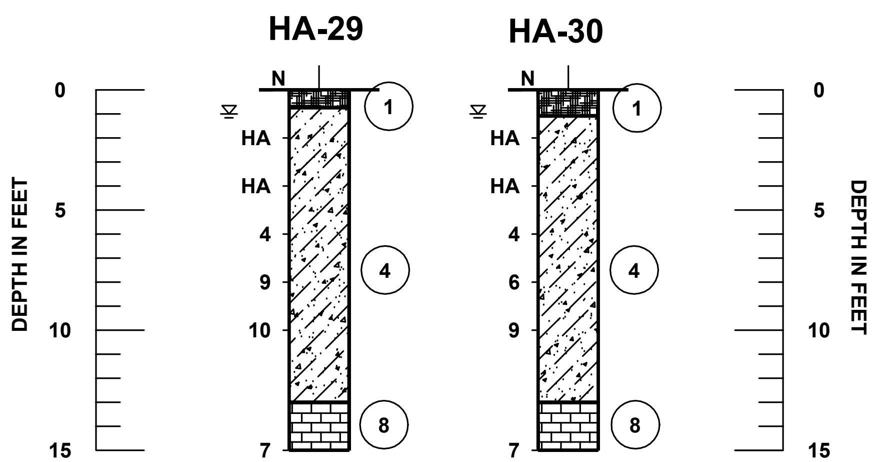
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	22

BORING LOCATION PLAN

SOIL PROFILES



LEGEND

1 Asphalt and Sand/Shell Base Pavement

2 Asphalt and Limerock Base Pavement

3 Asphalt and Concrete Base Pavement

4 Tan to Light Brown to Dark Brown and Light Gray to Gray Fine SAND and Slightly Clayey Fine SAND (A-3)

5 Gray Clayey Fine SAND (A-2-7)

6 Greenish Gray High Plasticity CLAY (A-7)

7 Greenish Gray High Plasticity CLAY with Limestone fragments (A-7)

8 Weathered LIMESTONE (WLS)

9 No recovery

A3 AASHTO Soil Classification System (ASTM D 3282) Group Symbol As Determined By Visual Review And/Or Laboratory Testing

Groundwater Level At Time Of Drilling

N SPT N-Value In Blows/Foot For 12 Inches Of Penetration Utilizing Automatic Hammer (unless otherwise noted)

HA Hand Augered To Avoid Utility Conflicts and Safety Reasons

Approximate Location of SPT Boring

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:
AREHNA Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 | Fax 813.944.4959
Certificate of Authorization No. 28410

CITY OF TAMPA FLORIDA ORGANIZED JULY 15 1887
306 EAST JACKSON STREET
TAMPA, FLORIDA 33602
813.274.8211

	NAME	DATE
DESIGNED BY:	LMC	08/2015
DRAWN BY:	LMC	08/2015
CHECKED BY:	JP	08/2015
SUPERVISED BY:	Joseph Prendergast, P.E.	

REPORT OF CORE BORINGS	PROJECT NO.	SHEET NO.
Spring Lake Stormwater and Outfall Tampa, FL	B-15-038	23

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Spring Lake Stormsewer and Outfall
Tampa, Florida

AREHNA Project No.: B-15-038

Boring No.	Sample Depth (feet)	Percent Moisture Content	Percent Finer (-200 sieve)
B-1	4.0 – 6.0	24.4	2.8
B-2	6.0 – 8.0	22.8	3.5
B-5	0.0 – 2.0	11.7	30.8
B-6	13.5 – 15.0	22.5	25.2
B-7	13.5 – 15.0	19.7	16.4
B-13	0.0 – 2.0	23.1	5.4
B-13	4.0 – 6.0	24.5	3.3
B-15	0.0 – 2.0	26.4	4.1
B-15	13.5 – 15.0	20.6	12.3
B-18	13.5 – 15.0	18.5	20.5
B-20	13.5 – 15.0	19.5	8.8
B-22	0.0 – 2.0	22.1	2.8
HA-3	0.0 – 2.0	20.4	3.5
HA-7	13.5 – 15.0	29.2	26.2
HA-21	13.5 – 15.0	19.6	17.5
HA-22	13.5 – 15.0	23.0	10.8

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS (continued)

Spring Lake Stormsewer and Outfall
Tampa, Florida

AREHNA Project No.: B-15-038

Sample ID	Sample Depth (feet)	pH FM5-550	Resistivity (ohm-cm) FM5-551	Chlorides (ppm) FM5-552	Sulfates (ppm) FM5-553	Environmental Classification for Soils and Water	
						Steel	Concrete
B-01 (1)	0.0 – 2.0	8.7	29,000	189	6	Slightly Aggressive	Slightly Aggressive
B-01 (2)	2.0 – 4.0	8.0	24,000	159	12	Slightly Aggressive	Slightly Aggressive

FIELD PROCEDURES

Soil Borings

The soil borings are performed in general accordance with ASTM D-1586, "Penetration Test and Split-Barrel Sampling of Soils." A rotary drilling process is used and bentonite drilling fluid is circulated in the boreholes to stabilize the sides and flush the cuttings. At regular intervals, the drilling tools are removed and soil samples are obtained with a standard 2-feet long, 2-inch diameter split-tube sampler. The sampler is first seated 6 inches and then driven an additional foot with blows of a 140-pound automatically tripped hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance." The penetration resistance, when properly interpreted, is an index to the soil strength and density.

LABORATORY PROCEDURES

Moisture Content

The moisture content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test is conducted in general accordance with FM 1-T265.

Fines Content

In this test, the sample is dried and then washed over a No. 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test is conducted in general accordance with ASTM D-1140.

pH

The pH is an expression of the concentration of dissociated hydrogen ions present in aqueous solution. pH values range from 1 to 14 with values below 7 indicating acidic conditions and values above 7 indicating alkaline conditions. This test is performed using a calibrated electronic pH meter with a sensing probe. The meter is calibrated by immersing the probe in a solution with a known pH. The soil pH is determined by mixing equal weights soil and distilled water and testing the supernatant solution with the pH probe. These tests were conducted in general accordance with FM 5-550.

Electrical Resistivity

Resistivity is a measure of the resistance to flow of electrical current through the soil. Resistive, the inverse of conductivity is measured in units of ohms-centimeters. This test was conducted using a soil box and a resistance meter. These tests were performed in general accordance with FM 5-551.

Chloride Content

The chloride content of the soil sample was determined by titration with silver nitrate. The soil was rinsed with an amount of distilled water equal in weight to the dry soil. The soil was then removed from the water (which consisted of distilled water and natural soil moisture) and the silver nitrate titration was performed on the water. These tests were performed in general accordance with FM 5-552.

Sulfate Content

The sulfate content of the soil sample was determined turbid metrically. The soil was rinsed with an amount of distilled water equal to the weight of the dry soil. The soil was then removed from the water (which consisted of distilled water and natural soil moisture) and the turbidity of the water was determined using a spectrophotometer. The turbidity gives an indirect indication of the sulfate content. This test was conducted in general accordance with FM 5-553.