ADDENDUM ONE to Bid #17-01

Labor, Equipment and Materials to Install Sports Field Lighting Hillsborough County Countywide Soccer Complex

1. The Report of Geotechnical Exploration for the Stormwater Pond prepared by AREHNA Engineering dated September 5, 2017 is attached and incorporated into the Bid Documents.

2. The Report of Geotechnical Exploration for the general subsurface soil conditions prepared by AREHNA Engineering dated October 24, 2016 is attached and incorporated into the Bid Documents.

The following questions were received, answers follow each question

3. For providing the sports lighting and poles which fields is part of the quote? Lighting of all fields (15) is included in the bid

4. When will the soil information be available? And will this be sent out? Attached for use

5. Is there any pre-bid meetings? No

END OF ADDENDUM

AREHNA | Engineering, Inc.

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

September 5, 2017

Ms. Lauren Campo, P.E.
Campo Engineering, Inc.
1725 East 5th Avenue
Tampa, FL 33605

813.215.7372
lauren@campoengineering.com

Subject: **Report of Geotechnical Exploration**
Hillsborough County - Countywide Soccer Complex – Storwater Pond
1617 – 1929 E. Columbus Drive
Tampa, Florida
AREHNA Project B-17-088

Dear Ms. Campo,

AREHNA Engineering, Inc. is pleased to submit this letter summarizing our geotechnical exploration for the proposed project. The purpose of our geotechnical study was to obtain information on the general subsurface soil conditions at the site for stormwater pond design.

PROJECT INFORMATION

The sports complex will include numerous athletic fields, a concession building and maintenance building with adjacent observation tower, as well as parking areas, access roadways, lighting, and stormwater retention areas. This letter presents the results of soil borings performed within the proposed pond.

FIELD EXPLORATION AND SITE CONDITIONS

The purpose of this geotechnical exploration was to obtain information concerning the site and subsurface soil conditions for the stormwater retenton area in the southwest corner of the site. The subsurface materials encountered were evaluated with respect to the available project characteristics. The scope of work included two Standard Penetration Test (SPT) borings performed to depths of 20 feet within the proposed pond. The approximate locations of the borings are indicated on the attached Boring Location Plan. At the time of our investigation the site was completely inundated with water due to frequent and heavy recent rains.

SUBSURFACE SOIL CONDITIONS

The attached Soil Boring Logs should be consulted for a detailed description of the subsurface conditions encountered at the boring locations. These records represent our interpretation of the subsurface conditions based on the field logs and visual examination of field samples by a geotechnical engineer. The profiles illustrate the visual characteristics of the soil strata encountered using the USCS Soil Classification System. When reviewing the boring records, it should be understood that soil conditions may vary between and away from the boring locations.

The SPT borings encountered variable fill soils (FILL) consisting of clayey fine sand, calcareous clay, and limerock fragments to depths of approximately 4 feet. Standard penetration test resistances (N-values) ranged from 7 to 29 blows per foot. Below the fill, the borings encountered very loose to medium dense fine sand (SP), slightly silty fine sand (SP-SM), silty fine sand (SM), and clayey fine sand (SC) to depths of approximately 10 to 12 feet. N-values varied from 4 to 21 blows per foot. A layer of peat (PT) with an N-value of 5 blows per foot was observed in boring B-02 between approximate depths of 6 and 8 feet. At depths of 10 to 12 feet, the borings encountered firm to stiff high plasticity clay (CH) to the boring termination depths of 20 feet. N-values varied between 5 and 20 blows per foot.

GROUND WATER CONDITIONS

The groundwater level was perched on top of the relatively impermeable clayey fill. The borings were performed during a period of extended heavy rainfall. Fluctuation in groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors. Since groundwater 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.

ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL

Based on the NRCS data, 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 a depth of approximately 4 feet below the prevailing grades. Ground water may temporarily perch at a higher level during periods of extended heavy rainfall due to the presence of the relatively impermeable clayey fill soils.

CLOSING

AREHNA appreciates the opportunity to have assisted you 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.

Respectfully Submitted,

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

No 68440

Digitally signed by
Jessica A McRory
Date: 2017.09.05
14:47:13 -04'00'

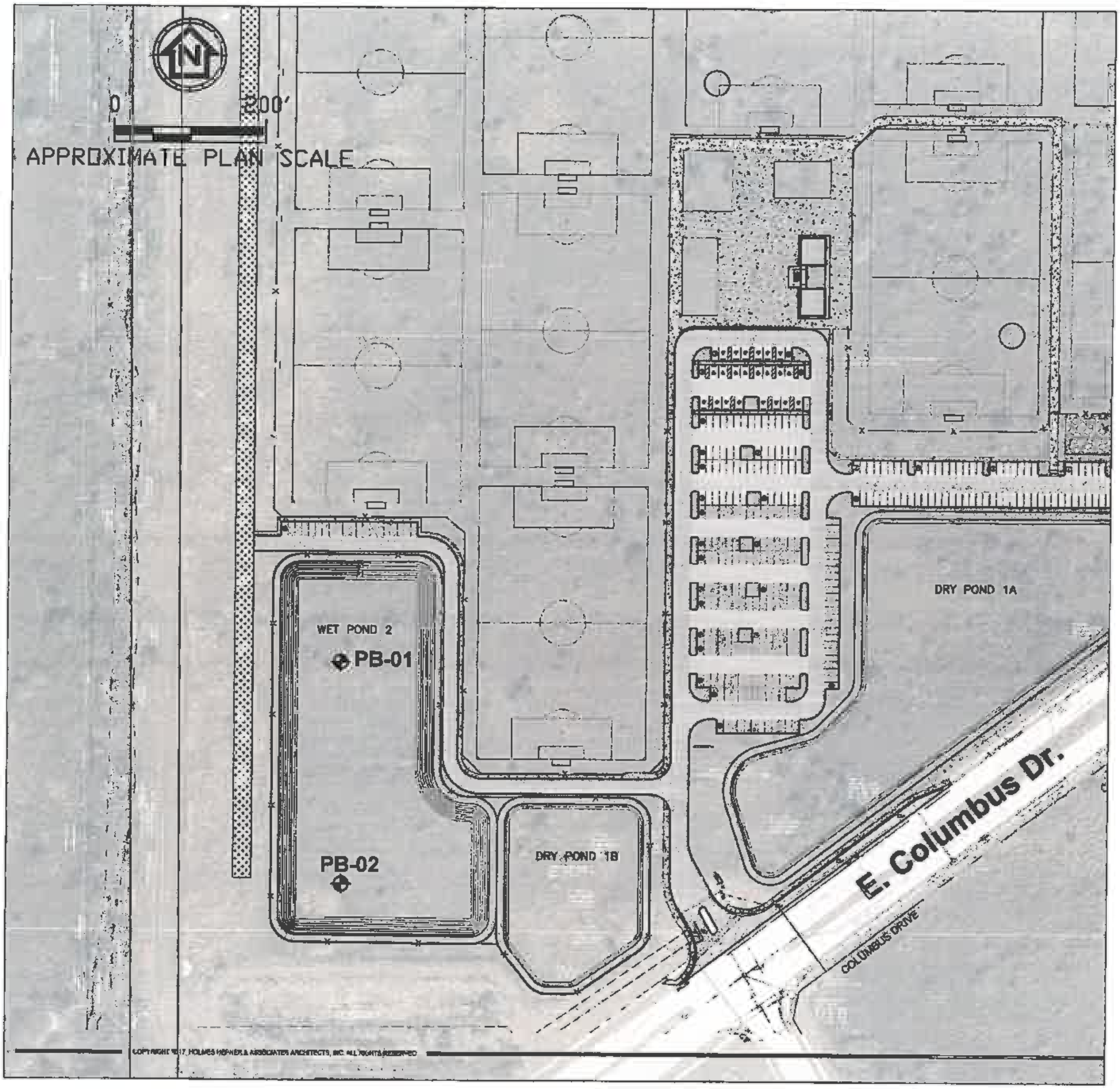
Joseph E. Prendergast, P.E.
Senior Geotechnical Engineer
Florida Registration 50774

Jessica McRory, P.E.
Principal Geotechnical Engineer
Florida Registration 68440

Attachments:

- Boring Location Plan – Figure 1
- Soil Boring Logs
- Key to Soil Classification Symbols

BORING LOCATION PLAN

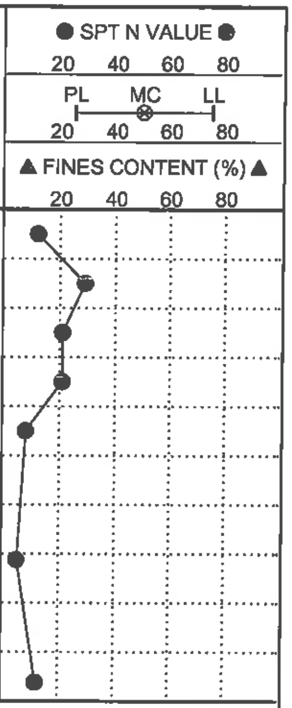


LEGEND

⊕ Approximate Location of Standard Penetration Test (SPT) Boring

	DATE	PROJECT NAME	PROJECT NO.	SHEET NO.
AREHNA | Engineering,Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 | Fax 813.944.4959 Certificate of Authorization No. 28410	09/2017	Countywide Sports Complex Hillsborough County, FL	B-17-088	1

DEPTH (ft) 0	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
	Light gray calcareous CLAY with sand with limerock fragments (FILL)		▩	SPT	2-3-9-9	12
			▩	SPT	9-18-11-17	29
	Medium dense dark gray silty fine SAND (SM) with limerock fragments		▤	SPT	11-12-9-8	21
			▤	SPT	7-12-9-6	21
10	Medium dense light gray fine SAND (SP) with roots		░	SPT	4-4-4-6	8
	Loose dark gray clayey fine SAND (SC)		▨			
	Firm to stiff gray to green high plasticity CLAY (CH)		▨	SPT	2-2-3	5
20			▨	SPT	4-6-6	12



Bottom of borehole at 20.0 feet.

Date Drilled: 9/2/17
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:
Groundwater perched on the ground surface.

Remarks:

COUNTYWIDE SOCCER COMPLEX - POND
TAMPA, FL
AREHNA Project No.: B-17-088
Holmes Hepner & Associates Architects

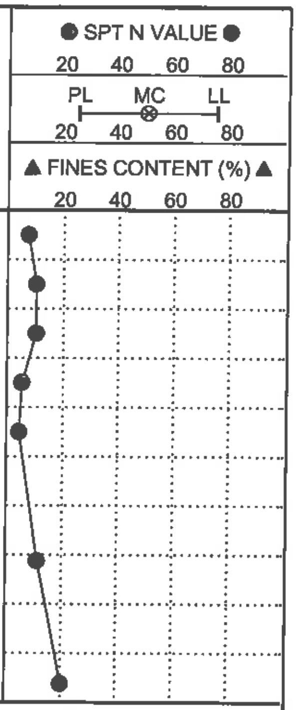
AREHNA | Engineering, Inc.

SOIL BORING LOG

Drawn By: LEF
Checked By: JAM
Date: 9/5/2017

Boring PB-01

DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
0	Gray clayey fine clayey SAND with limerock fragments (FILL)			SPT	2-3-4-6	7
	Gray calcareous CLAY with limerock fragments (FILL)			SPT	3-4-6-6	10
	Medium dense gray clayey SAND (SC) with limerock fragments			SPT	5-5-5-4	10
	Loose dark brown organic soil PEAT (PT)			SPT	1-2-3-3	5
10	Very loose gray slightly silty fine SAND (SP-SM)			SPT	1-2-2-6	4
	Very loose gray clayey fine SAND (SC)					
	Firm to stiff gray to green high plasticity CLAY (CH)			SPT	2-5-6	11
20				SPT	4-10-10	20



Bottom of borehole at 20.0 feet.

Date Drilled: 9/2/17
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:
Groundwater perched on the ground surface.

Remarks:

COUNTYWIDE SOCCER COMPLEX - POND
TAMPA, FL
AREHNA Project No.: B-17-088
Holmes Hepner & Associates Architects

AREHNA | Engineering, Inc.

SOIL BORING LOG

Drawn By: LEF
Checked By: JAM
Date: 9/5/2017

Boring PB-02

KEY TO SYMBOLS

AREHNA | Engineering, Inc.

CLIENT Holmes Hepner & Associates Architects

PROJECT NAME Countywide Soccer Complex-Pond

PROJECT NUMBER B-17-088

PROJECT LOCATION Tampa, FL

LITHOLOGIC SYMBOLS (Unified Soil Classification System)

▩	FILL: Fill
▥	SM: Silty Sand
░	SP: Poorly-graded Sand
▨	SC: Clayey Sand
▨	CH: High Plasticity Clay
▤	PT: Peat
▥	SP-SM: Poorly-graded Sand with Silt

SAMPLER SYMBOLS

☒	Standard Penetration Test

Standard Penetration Resistances

SAND & GRAVEL

No. of Blows	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
Greater than 50	Very Dense

SILT & CLAY

No. of Blows	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
Greater than 30	Hard

LIMESTONE

No. of Blows	Consistency
10 - 20	Soft
21 - 50	Medium
51 - 50/3"	Hard
Greater than 50/3"	Very Hard

WOR = Weight of Rod

WOH = Weight of Hammer

Ground Water Level Measurements

▽	Water Level at Time Drilling, or as Shown
▼	Water Level After 24 Hours, or as Shown

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTICITY INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200- PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

SOIL BOUNDARY CLASSIFICATIONS

FINE GRAINED SOILS	COARSE GRAINED SOILS						
SILT or CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

200 Sieve | #40 Sieve | #10 Sieve | #4 Sieve | 3/4-inch | 3-inch | 12-inch

AREHNA | Engineering, Inc.

REPORT OF GEOTECHNICAL EXPLORATION

HILLSBOROUGH COUNTY SPORTS COMPLEX
HILLSBOROUGH COUNTY, FLORIDA

AREHNA PROJECT NO. B-16-058

October 25, 2016

Prepared For:
Stantec
777 S. Harbour Island Boulevard, Suite 600
Tampa, FL 33602

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

AREHNA | Engineering, Inc.

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

October 25, 2016

Mr. Hamid Sahebkar, PE
Stantec
777 S. Harbour Island Boulevard, Suite 600
Tampa, FL 33602

Subject:
Report of Geotechnical Exploration
Hillsborough County Sports Complex
Hillsborough County, Florida
AREHNA Project B-16-058

Dear Mr. Sahebkar,

AREHNA Engineering, Inc. (AREHNA) is pleased to submit this report of our geotechnical exploration for the proposed project. The purpose of our geotechnical study was to obtain information on the general subsurface soil conditions for a proposed sports complex in Hillsborough County, Florida.

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

AREHNA appreciates the opportunity to have assisted Nelson Construction and Stantec 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

Jessica McRory
Jessica A. McRory, P.E.
Senior Geotechnical Engineer
Florida Registration 68440

Joseph E
Prendergast
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Joseph E. Prendergast, P.E.
Principal Geotechnical Engineer
Florida Registration 50744

Distribution: 3 – Addressee
1 – File

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LIST OF APPENDICES

1.0 EXECUTIVE SUMMARY

The purpose of this geotechnical exploration was to obtain information concerning the site and subsurface soil conditions for a proposed sports complex. The sports complex will include numerous athletic fields, a concession building and maintenance building with adjacent observation tower, as well as parking areas, access roadways, lighting, and two stormwater retention areas. The one story concession building will be approximately 30 by 60 feet in plan. A three story tower with an open deck on the third level will be constructed adjacent to the concession building and maintenance building. The project is located west of the Hillsborough County Public Safety Operations Center (PSOC) Complex between East Columbus Drive and East Broadway Avenue in Hillsborough County, Florida. We have assumed that structural loads will not exceed 100 kips for columns and 6 kips per linear foot for walls. Further, up to approximately 3 feet of fill will be placed to raise site elevations.

The borings generally encountered variable fill soils (FILL) consisting of slightly clayey fine sand and clayey fine sand with clay lenses and limestone fragments to depths of approximately 4 to 6 feet. It should be noted that these fill soils are not homogeneous and as such the soils properties may vary significantly. Below the fill, the borings encountered fine sand (SP), slightly silty fine sand (SP-SM), and silty fine sand (SM) to depths of approximately 6 to 20 feet. The borings then encountered slightly clayey fine sand (SP-SC), clayey fine sand (SC), sandy clay (CL), and high plasticity clay (CH) to the boring termination depths of 20 to 30 feet. The ground water level was encountered in the borings at depths of approximately 1.5 to 5.3 feet below the existing ground surface. The ground water table was measured in 14 test pits excavated across the site by Nelson Construction at depths between 4.5 and 7.5 feet. We estimate that the seasonal high ground water level will be encountered at a depth of approximately 4 feet below the prevailing grades. Perched water tables are anticipated in areas of the relatively clayey fill soils.

AREHNA recommends that after proper stripping, proofrolling and filling of the site, the buildings be supported on conventional shallow foundations. The foundations should bear on acceptable existing soils or structural fill soils compacted to a density of at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557). Foundation bearing soils that cannot be adequately compacted should be undercut to a depth of one foot below the bottom of the foundation and backfilled with compacted fill in accordance with the recommendations presented in this report. Shallow foundations which bear on suitable existing soils or structural fill may be designed for a net maximum allowable bearing pressure of 2,500 pounds per square foot (psf).

General recommendations for site development as well as foundation, pavement, and stormwater pond design are presented in this report.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 Site Description and Project Characteristics

The project consists of the design and construction of a new sports complex to include athletic fields, a concession building and maintenance building with adjacent observation tower, parking areas, access roadways, lighting, and stormwater retention areas. We have assumed that structural loads will not exceed 100 kips for columns and 6 kips per linear foot for walls. Up to approximately 3 feet of fill will be placed to raise site elevations.

The site is located west of the Hillsborough County Public Safety Operations Center (PSOC) Complex between East Columbus Drive and East Broadway Avenue in Hillsborough County, Florida. The property is currently undeveloped. A borrow pit area that was excavated in conjunction with construction of the PSOC is located in the northeastern portion of the site.

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 an impact on the proposed construction.
- Allowable capacities and foundation settlement for foundations supporting the structures.
- Foundation installation and testing recommendations.
- General pavement and site preparation recommendations.
- Field permeability results using Double Ring Infiltration (DRI) testing.

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

- Requested utility location services from Sunshine811.
- Performed 14 Standard Penetration Test (SPT) borings to depths of 20 to 30 feet within the proposed building, stormwater pond, and light pole areas. 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.

- Performed 19 hand auger borings to a depth of 5 feet within the proposed paved parking and driveway areas.
- Performed two double ring infiltration (DRI) tests at depths of approximately 2.3 and 2.5 feet within the proposed stormwater pond area.
- Visual classification and stratification of soil samples in the laboratory using the Unified Soil Classification System (USCS). A laboratory testing program consisting of natural moisture content, single sieve (#200) gradation, and Atterberg limits was performed on representative samples.
- 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 professional engineers specializing in geotechnical engineering.

3.0 FIELD EXPLORATION

Our scope included 14 Standard Penetration Test (SPT) borings performed within the proposed building, stormwater pond, and light pole areas to depths of 20 to 30 feet and 19 hand auger borings performed to a depth of 5 feet within the proposed paved parking and driveway areas. Two Double Ring Infiltration (DRI) tests were performed within the proposed stormwater pond areas.

The SPT 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. Boring 20023 was manually augered to a depth of approximately 4 feet to avoid a possible conflict with underground utilities. The soil sampling was performed in general accordance with ASTM Test Designation D-1586, entitled "Penetration Test and Split-Barrel Sampling of Soils."

The hand auger borings were performed by manually advancing a 3-inch diameter, 6-inch long sampler into the soil until the sampler was full. The sampler was then retrieved and the soils in the sampler were removed and visually classified. The soil sampling was performed in general accordance with ASTM Test Designation D-1452, entitled "Soil Investigation and Sampling by Auger Borings." The holes were backfilled after the borings were completed.

The DRI tests were performed by installing a 12-inch diameter steel ring and a 24-inch diameter steel ring concentrically into the ground to the desired test depth. Water was then added to a desired level in both rings and held constant. The amount of water added to the inner ring versus time was then recorded. This procedure was repeated every 15 minutes for the first hour and every 30 minutes for ensuing hours for a total of 4 hours or until a stabilized infiltration rate was achieved. The DRI tests were performed in general accordance with ASTM D-3385, entitled "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer."

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

A Boring and Test Location Plan indicating the approximate locations of the soil borings and DRI tests is presented on **Figure 2** in **Appendix A**. The borings and DRI tests were located in the field by measuring from existing features.

4.0 LABORATORY TESTING

The laboratory testing program consisted of natural moisture content, single sieve (#200) gradation, and Atterberg limits tests. The results are presented in the Appendix.

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, the natural ground surface elevation at the project site is approximately +25 feet National Geodetic Vertical Datum of 1929 (NGVD).

5.2 USDA Natural Resources Conservation Service Data

A review of 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	Approximate Depth to Seasonal High Water Table (feet)
5	Basinger, Holopaw, and Samsula soils, depressional	**0.0**
29	Myakka fine sand, 0 to 2 percent slopes	0.5 – 1.5
46	St. Johns fine sand	0.0 – 1.0
52	Smyrna fine sand, 0 to 2 percent slopes	0.5 – 1.5

The soil survey also indicates that the average annual precipitation is 38 to 62 inches. The water table depths shown occur in naturally drained areas.

The USDA Soil Survey map for the project site is attached as **Figure 4**.

5.3 Subsurface Conditions

The results of the SPT and hand auger borings are presented in the Soil Profiles, **Figure 2** in **Appendix A**. The profiles indicate the general subsurface soil stratification. When reviewing the profiles, it should be understood that soil conditions may vary between and away from boring locations.

The soil borings encountered variable fill soils (FILL) consisting of slightly clayey fine sand and clayey fine sand with clay lenses and limestone fragments to depths of approximately 4 to 6 feet. Standard penetration test resistances (N-values) in the SPT borings ranged from 1 to 28 blows per foot, indicating the relative density is very loose to medium dense. Below the fill, the borings encountered very loose to dense fine sand (SP), slightly silty fine sand (SP-SM) and silty fine sand (SM) to depths of approximately 6 to 20 feet. N-values varied from 1 to 34 blows per foot. The borings then encountered very loose to very dense slightly clayey fine sand (SP-SC) and clayey fine sand (SC) and soft to very stiff sandy clay (CL) and high plasticity clay (CH) to the boring termination depths of 20 to 30 feet. N-values ranging from 2 to 63 blows per foot were recorded.

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 SPT and auger borings at depths of approximately 1.5 to 5.3 feet below the existing ground surface. The measured groundwater levels may not represent a stabilized condition due to previous heavy rainfall, the introduction of drilling fluid into the borehole, and the presence of the relatively clayey fill soils between the ground surface and approximate depths of 4 and 6 feet. The ground water level was measured in 14 test pits excavated across the site by Nelson Construction on September 26, 2016. The purpose of the test pits was to observe and measure the ground water level in a stabilized condition. The depth to ground water measured by AREHNA and Nelson varied from approximately 4.5 to 7.5 feet below the existing ground surface. Fluctuation in ground water levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors. It is anticipated that ground water will perch on the relatively clayey fill soils during periods of extended heavy rainfall. 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 Double Ring Infiltration (DRI) Test Results

The DRI tests were performed within the relatively impermeable fill soils that, based on the results of laboratory testing, contain up to approximately 34 percent clay-sized particles. The following table summarizes the DRI test results:

Test Location	Depth Below Ground Surface (feet)	Final Vertical Infiltration Rate, (in/hr)	Unsaturated Vertical Infiltration, K_V (in/hr)	Estimated Horizontal Hydraulic Conductivity, K_H (in/hr)
DRI-1	2.5	0	0	0
DRI-2	2.3	0	0	0

The DRI tests were designated as 20005 and 20007, and the locations are indicated on **Figure 2** in **Appendix A**.

5.6 Estimated Seasonal High Ground Water Level

Based on the NRCS data, soils information obtained from the site, and our experience in the area, we estimate that the seasonal high ground water level, including within the proposed stormwater retention areas

in the northwest corner of the site and on the south side of the site, will be encountered at a depth of approximately 4 feet below the prevailing grades, which range from approximately +24 to +26 feet. Based on this, the estimated seasonal high groundwater elevation is approximately +21 feet. Ground water may temporarily perch at a higher level during periods of extended heavy rainfall due to the presence of the relatively clayey fill soils.

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 locations or foundation loads are significantly different from those described or if the subsurface conditions during construction are different from those revealed by our borings, we should be notified immediately so that we might review our recommendations presented in this report.

After clearing and stripping to remove vegetation, root systems, and other deleterious materials, the site should be proofrolled and compacted. Any areas that appear unstable under proofrolling should be replaced with compacted fill. Our recommended site preparation is presented in Section 6.0, General Site Preparation.

6.2 Shallow Foundation Design

Following our recommended General Site Preparations, the proposed buildings can be constructed on a system of conventional shallow spread or strip footings and interior slab supported on grade. The foundation system should bear on acceptable existing soils or structural fill soils compacted to a density of at least 95 percent of the modified Proctor maximum dry density (ASTM D-1557). The results of laboratory testing suggest that the existing soils will be difficult to compact to 95 percent of the modified Proctor maximum dry density due to relatively high moisture contents. Foundation bearing soils that cannot be adequately compacted should be undercut to a depth of one foot below the bottom of the foundation and backfilled with compacted fill in accordance with the recommendations presented in Section 7.0 of this report. Shallow foundations may be designed using an allowable net soil bearing pressure of 2,500 psf. Our bearing capacity evaluation was based on correlations between N-values and the successful performance of similar structures on similar soil conditions.

All footings should be embedded so that the bottom of the foundation is a minimum of 12 inches below the adjacent compacted grades on all sides. Strip or wall footings should be a minimum of 24 inches wide and pad or column footings should be a minimum of 30 inches wide. However, the pad or column footings should be sized to maintain similar bearing pressures as the wall footings. These minimum footing sizes should be used regardless of whether the maximum allowable bearing pressures are fully developed in all loading conditions. These minimum footing sizes tend to provide adequate load bearing area to develop overall bearing capacity and account for minor variations in the bearing materials.

6.3 Floor Slab Design

It is expected that the floor slab will be supported on compacted existing soils or structural fill. The floor slab subgrade soils should be compacted to a minimum dry density equal to 98 percent of the Modified

Proctor maximum dry density. Any soils supporting the slab that cannot be adequately compacted should be undercut to a depth of one foot below the bottom of the slab and backfilled with compacted fill in accordance with the recommendations presented in Section 7.0 of this report.

Based upon the soil conditions encountered at the site and the recommendations for site preparation presented in this report, a modulus of vertical subgrade reaction (k) value of 150 pounds per square inch per inch of vertical deflection (psi/in) may be used for floor slab design. Our evaluation is based on satisfactory performance of our recommended approach with other structures and similar soil conditions.

The floor slab should be appropriately jointed to control the location of shrinkage cracking, and to allow for some differential movement between different sections of the slab.

6.4 Light Pole Design

The following table presents our recommended soil parameters for various depths below existing grade.

Depth range, ft	SPT "N" Value Range	Unified Soil Classification	Approximate Soil Unit Weight (pcf)		Soil Angle of Friction (degrees)	Earth Pressure Coefficient		
			Total	Effective		Active (Ka)	At-rest (Ko)	Passive (Kp)
0-5	3-31	FILL	100	–	29	0.35	0.52	2.9
5-10	1-20	SP, SP-SM, SM	--	50	30	0.33	0.50	3.0
10-20	1-28	SP-SC, SC, CL, CH	--	60	32	0.31	0.47	3.3

6.5 Settlement

The settlement of shallow foundations supported on sandy soils should occur rapidly during construction as dead loads are imposed at the footing locations. Provided that the recommended subsurface preparation operations are properly performed, the total settlements of isolated columns and wall footings should be on the order of 1 inch, with differential settlements on the order of 50 percent of the total settlements.

Up to 3 feet of fill will be placed to achieve final finished grades for the project. Settlement of the existing soils should occur relatively rapidly as the fill soils are placed. Assuming the recommendations presented in Section 7.0 of this report are followed, long-term settlements in the athletic field areas will be negligible.

6.6 Stormwater Pond

The soil borings performed in the area of the proposed stormwater pond indicate that relatively impermeable fill soils containing excessive clay contents extend to depths of approximately 4 to 6 feet below the existing ground surface. Below this, the borings generally encountered sandy soils to a depth of 10 feet and clayey soils to the termination depth of 20 feet. DRI tests performed within the fill soils resulted in an infiltration rate of zero. The fill soils should be removed and replaced with relatively clean sandy fill conforming to recommendations presented in Section 7.0 of this report. The soils should be placed and graded using as little compaction as possible. Assuming these recommendations are followed, estimated vertical and horizontal infiltration rates of 6 and 9 inches per hour, respectively, may be used for design of the pond.

6.7 Pavements

Sandy existing soils and sandy engineered fill soils should be acceptable for construction and support of flexible and rigid pavement sections after proper proofrolling and subsurface preparation.

Flexible: We recommend that either limerock or crushed concrete be used for the base. Limerock base material 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 Limerock Bearing Ratio (LBR) of 100. A minimum separation of 18 inches is recommended between the bottom of the limerock base and the seasonal high ground water level. Crushed concrete should have an LBR value of 100 and be graded in accordance with Florida Department of Transportation (FDOT) Standard Specification Section 204. A minimum separation of 12 inches is recommended between the bottom of the crushed concrete base and the seasonal high ground water level. The asphaltic concrete structural course should consist of Type SP – 12.5 asphaltic concrete material. Should a mix with a smaller aggregate be preferred, Type SP-9.5 may also be used. 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. A stabilized subgrade with a minimum LBR of 40 and compacted to at least 98 percent of ASTM D-1557 is recommended. The following minimum flexible pavement layer thicknesses are recommended for light and heavy duty pavements:

Pavement Layer	Pavement Thickness (inches)	
	Light Duty	Heavy Duty
Surface Course	1½	2
Base Course	6	8
Stabilized Subgrade	6	12

Rigid: We suggest that concrete with an unconfined compressive strength of at least 4,000 lb/in^2 be placed over properly compacted subgrade soils. We recommend that a minimum thickness of 5 inches be utilized in areas of light duty applications and a minimum thickness of 6 inches be utilized in areas with moderate to heavy duty applications. The maximum spacing between control joints should be limited to 10 feet for light duty pavements and 12 feet for heavy duty pavements. Rigid pavement is recommended in the vicinity of dumpster pads. The pad should be large enough to support the dumpster and the front wheels of the vehicle servicing the dumpster. Subgrade soils supporting rigid pavements should be compacted to a minimum of 98 percent of the Modified Proctor maximum dry density (ASTM D-1557) to a minimum depth of 12 inches.

7.0 GENERAL SITE PREPARATION

7.1 General

The initial step in site preparation should be the complete removal of all existing vegetation, topsoil, root systems, debris, and other deleterious materials from beneath and to a minimum of five feet beyond the development perimeter. Also, prior to construction, the location of any existing foundations, underground irrigation, septic tanks, drainage, or other utility lines within the construction area should be established. In this regard it should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which subsequently may result in excessive settlements. The project area should then be inspected and thoroughly proofrolled as directed by a Geotechnical Engineer. Our recommendations listed in this section should be used as a guideline for the project general specifications prepared by the Design Engineer:

- The entire site should be proofrolled with a large vibratory roller with a 4-foot diameter drum and a static weight of at least 8 tons. At least 8 complete coverages (4 in each perpendicular direction) should be performed over the entire project area prior to raising site grades. Careful observations should be made during proofrolling to help identify any areas of soft-yielding soils that may require over excavation and replacement.

- Following satisfactory completion proofrolling, additional fill should be placed and compacted as needed to achieve the desired grades. 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). The upper foot of pavement and slab and foundation subgrade should be compacted to at least 98 percent of Modified Proctor. Density tests to confirm compaction should be performed in each fill lift before the next lift is placed.

- 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 natural ground and fill.

- Immediately prior to reinforcing steel placement, it is suggested that the bearing surfaces of all footing and floor slab areas be compacted using hand-operated mechanical tampers. In this manner, any localized areas which have been loosened by excavation operations should be adequately recompacted.

- A materials testing laboratory should be retained to provide on-site observation of earthwork and ground modification activities. Density tests should be performed in the top one foot of compacted existing ground, in each fill lift, and at the bottom of foundation excavations and utility trenches.

7.2 Ground Water Control

Depending upon the seasonal conditions, runoff from adjoined sites and pavements may cause significant surface water until drainage structures are emplaced. Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in conditions, such as physical disturbance or rain. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, all footing concrete should be placed the same day that the footing excavation is made. If this is not possible, the footing excavations should be adequately protected.

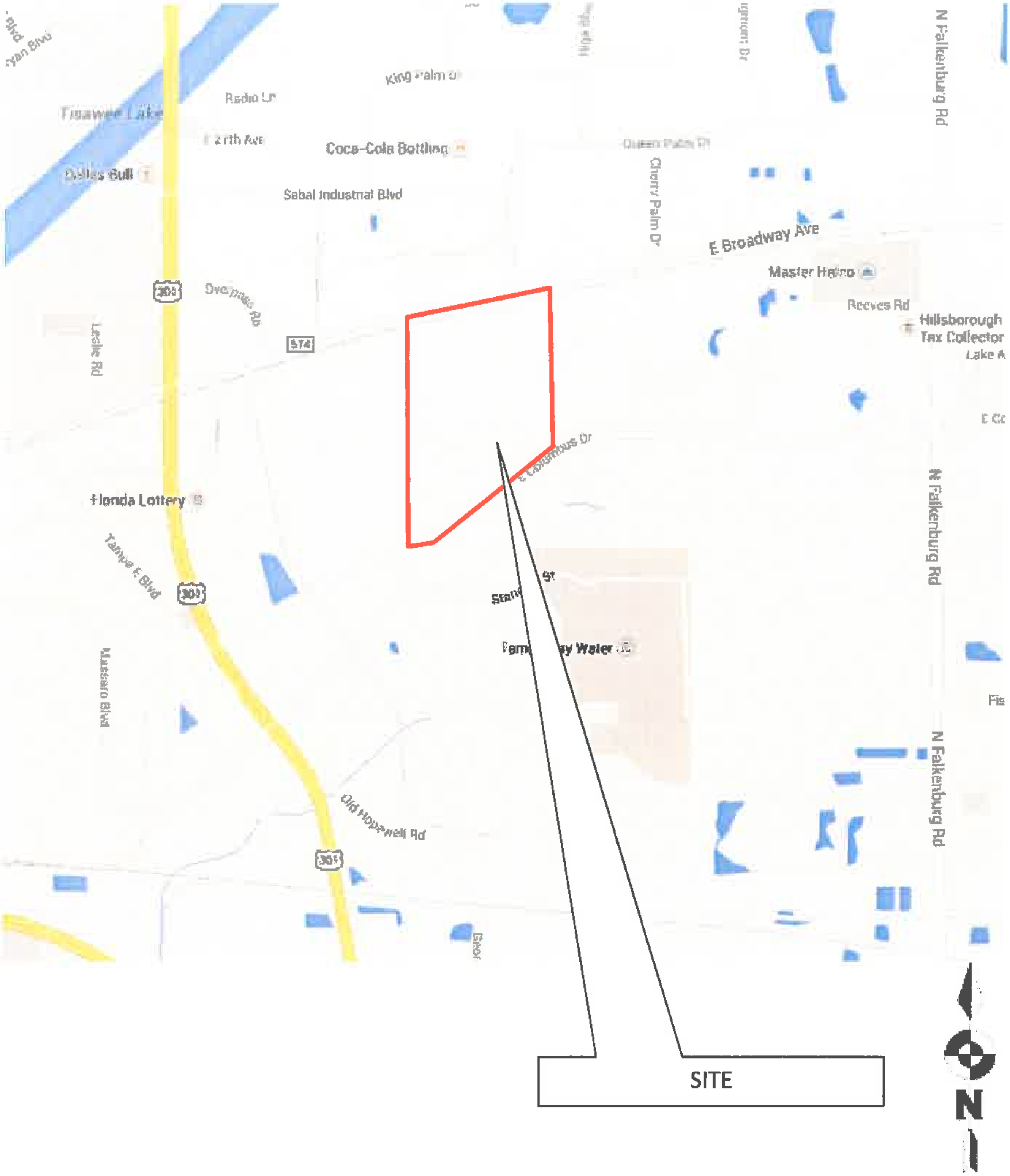
7.3 On-Site Soil Suitability

The borings indicate that fill soils classified as FILL are present at the site to depths of approximately 4 to 6 feet. These soils generally consist of slightly clayey fine sand and clayey fine sand with clay lenses and limestone fragments and are not suitable for use as structural fill. Below the fill to depths of up to 10 feet or more, sandy soils classified as SP and SP-SM based on the Unified Soil Classification System (USCS) were encountered and are generally suitable for use as structural fill. Clayey soils classified as SC, CL, and CH were typically encountered below a depth of approximately 10 feet and are not suitable for use as structural fill. 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.

8.0 BASIS FOR RECOMMENDATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between borings will be different from those at specific boring locations 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



Hillsborough County Sports Complex
E Columbus Drive

Client: Stantec
Project: B-16-058
Date: 10/11/2016

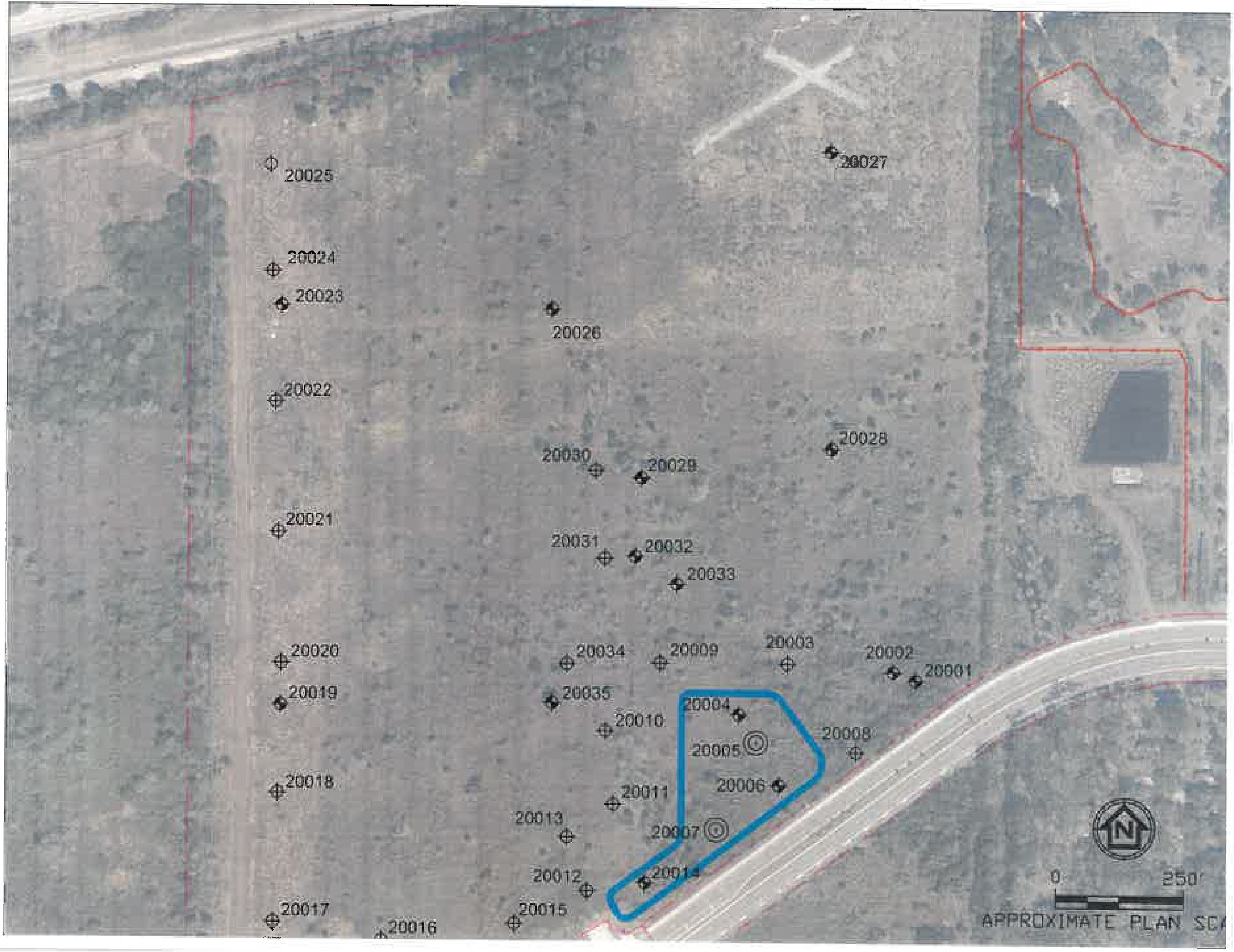
AREHNA | Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 ▪ Fax 813.944.4959

PROJECT SITE LOCATION MAP

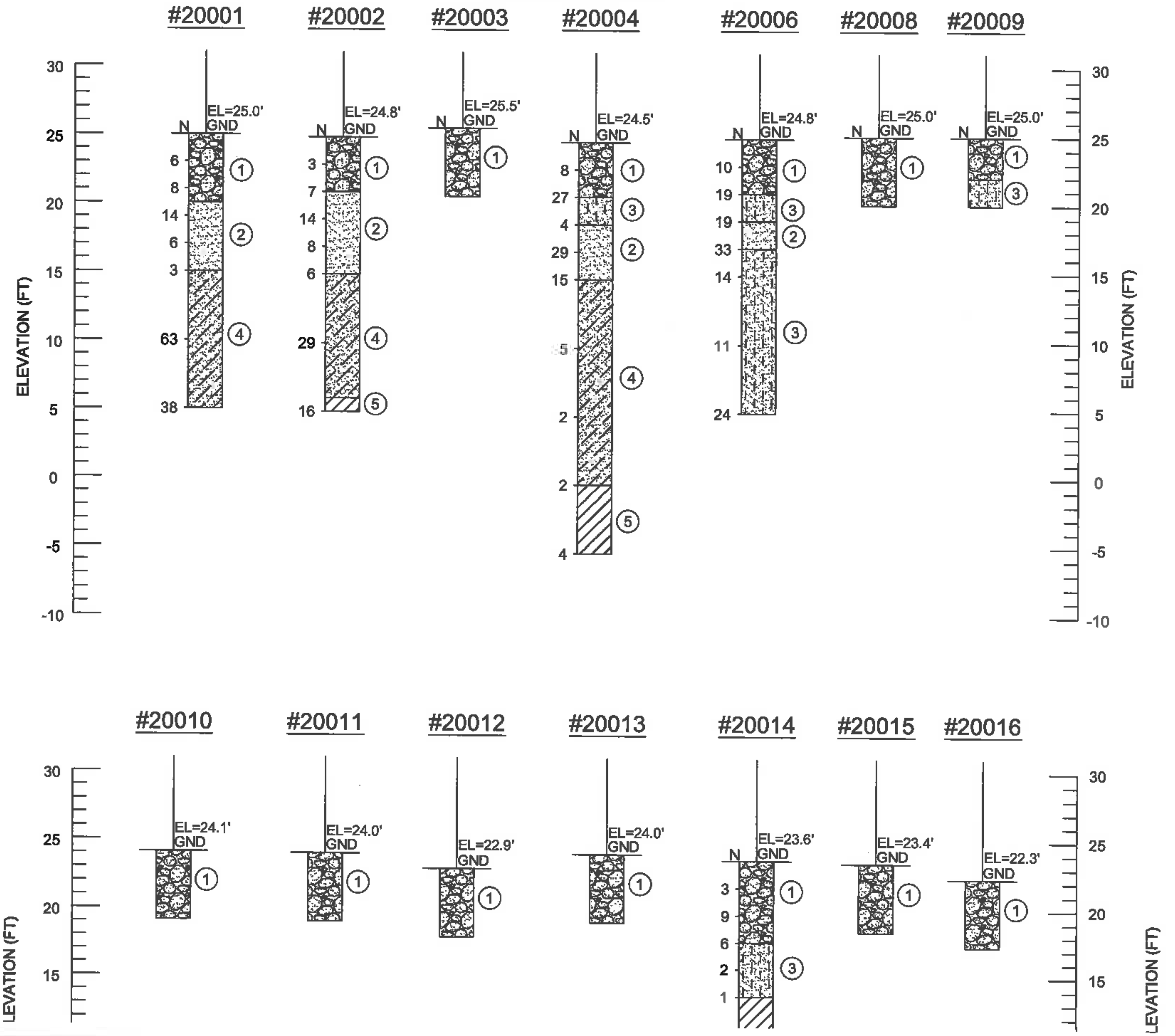
Designed By:	KSL
Checked By:	JEP
Drawn By:	KCA

FIGURE
1

BORING AND TEST LOCATIONS



SOIL PROFILES



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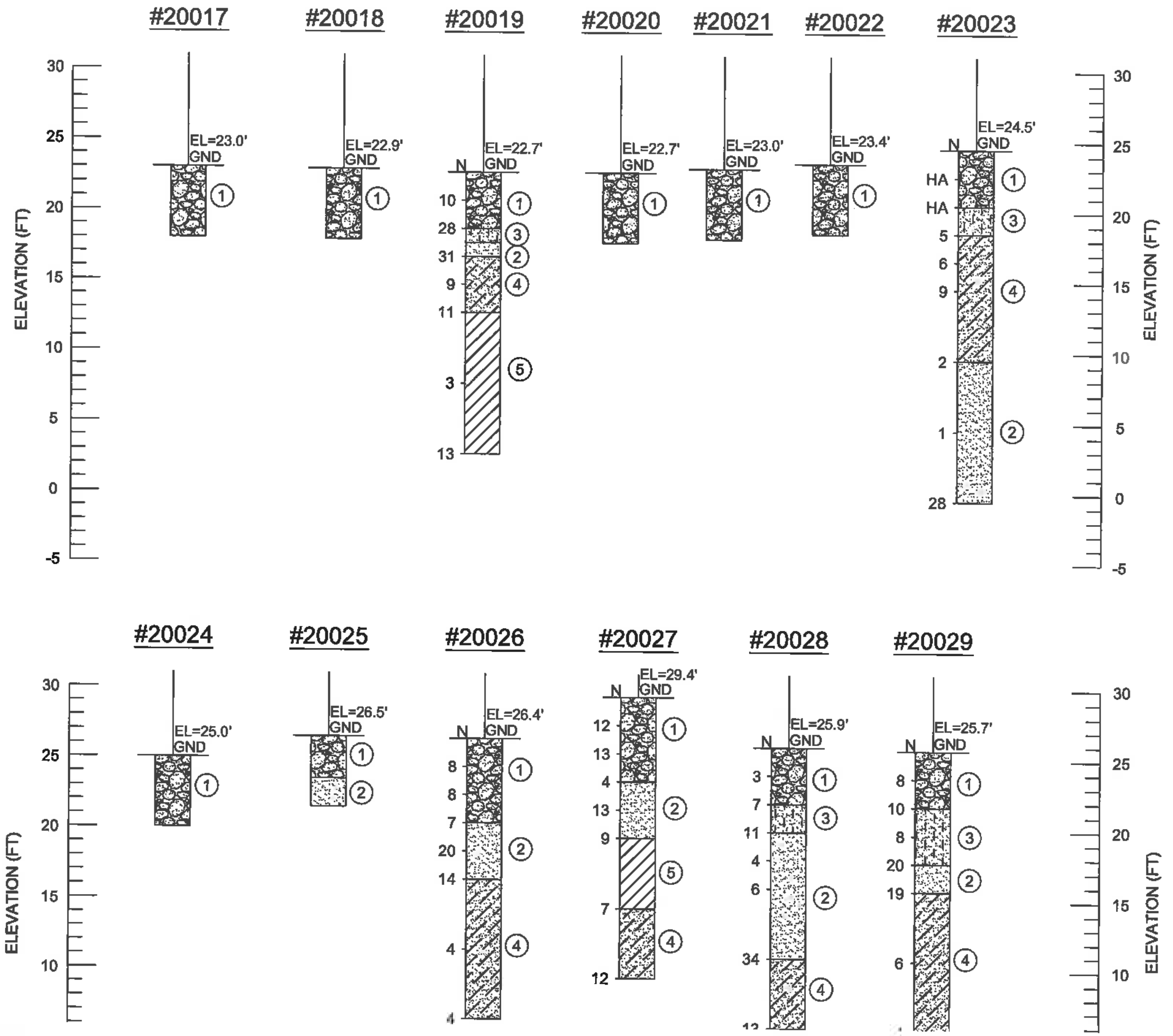
SOIL PROFILES



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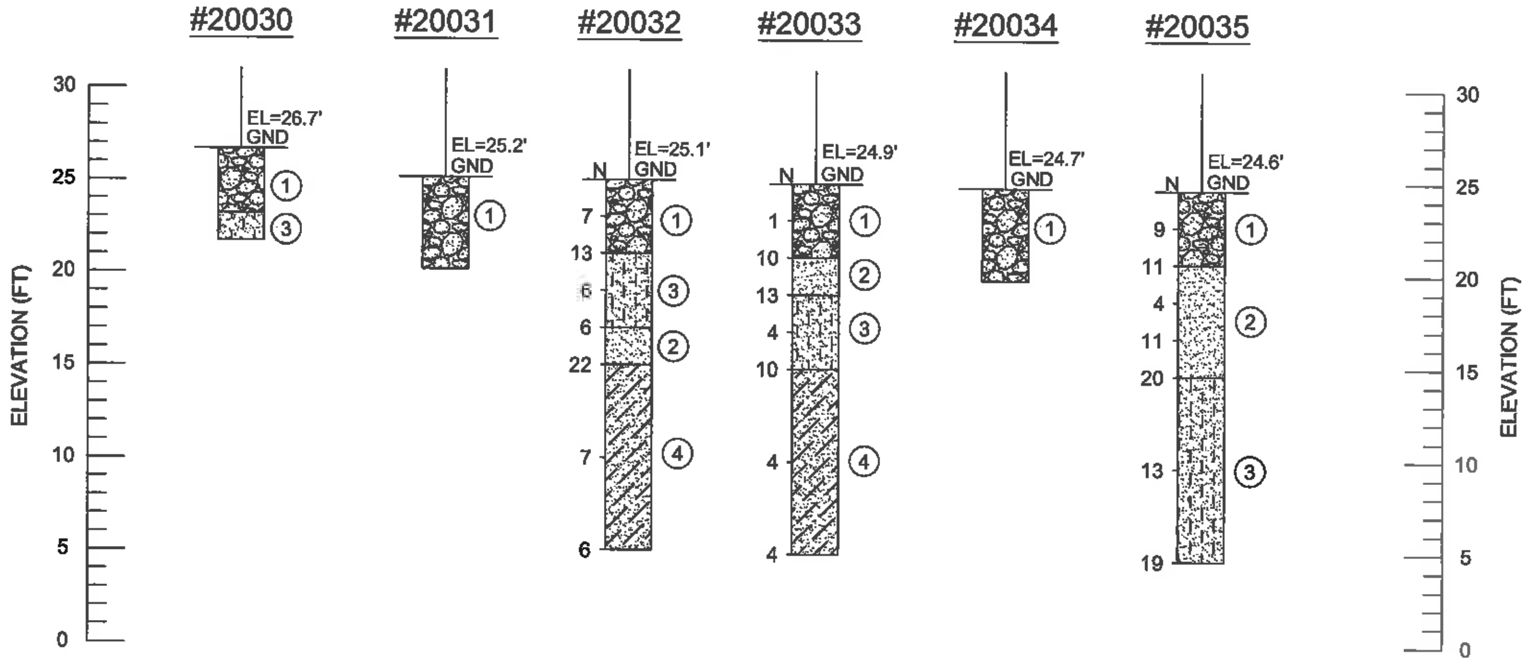
SOIL PROFILES



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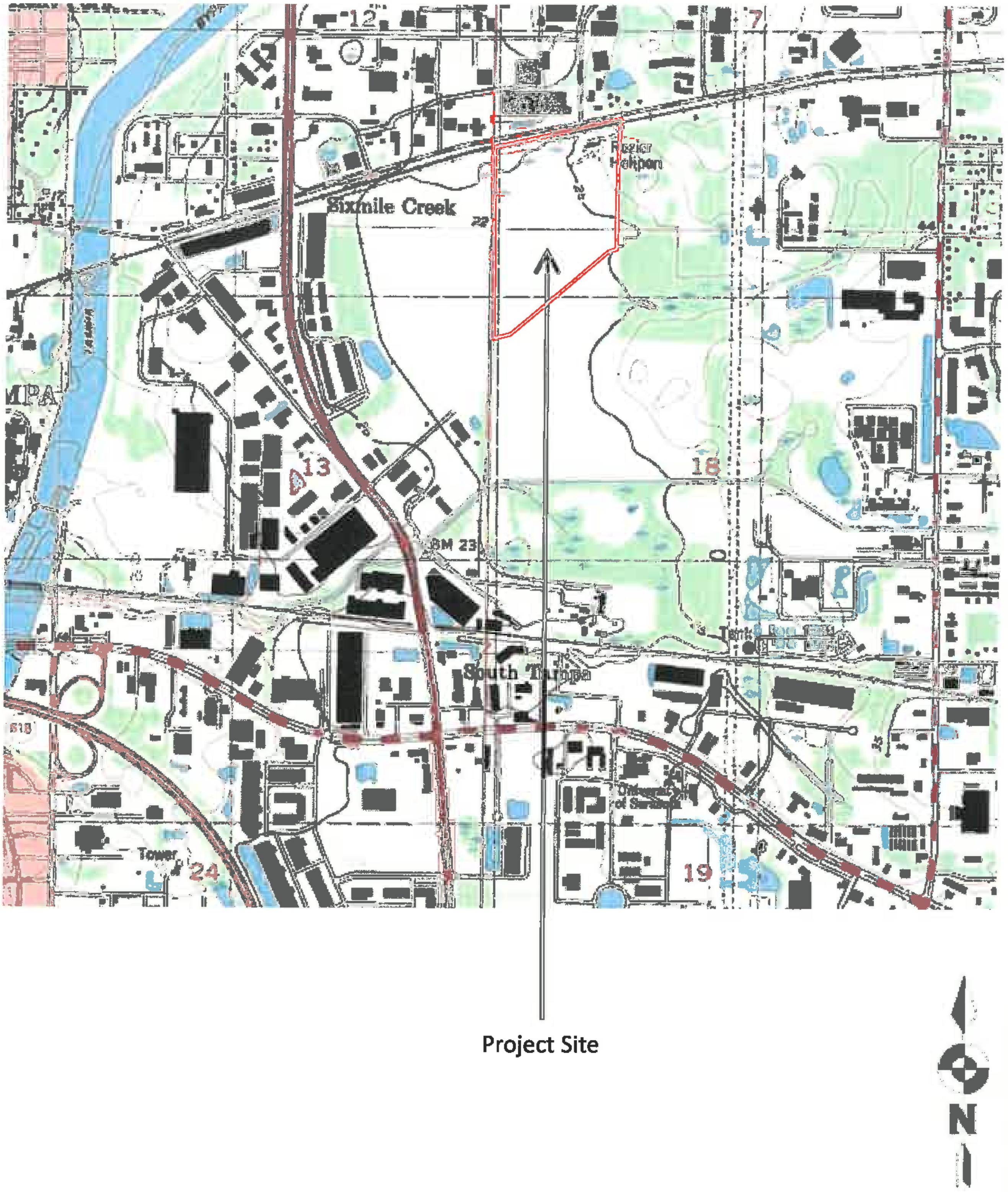

Project Site

Hillsborough County Sports Complex
E Columbus Drive

Client: Stantec
Project: B-16-058
Date: 10/11/2016

AREHNA | Engineering, Inc.
5012 West Lemon Street, Tampa, FL 33609
Phone 813.944.3464 • Fax 813.944.4959

USGS TOPOGRAPHIC
SURVEY

Designed By:	KSL
Checked By:	JEP
Drawn By:	KCA

FIGURE
3

Soil Mapping Unit

5 – Basinger, Holopaw & Samsula soils
29 – Myakka fine sand
46 – St. Johns fine sand
52 – Smyrna fine sand

N

Hillsborough County Sports Complex E Columbus Drive	AREHNA Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	USDA SOIL SURVEY	
Client: Stantec Project: B-16-058 Date: 10/11/2016		Designed By: KSL Checked By: JEP Drawn By: KCA	FIGURE 4

TABLE 1
Summary of Laboratory Test Results

Hillsborough County Sports Complex
Hillsborough County, Florida
AREHNA Project B-16-058

Boring No.	Sample Depth (feet)	Percent Moisture Content	Percent Finer (-200 sieve)	Liquid Limit	Plasticity Index
20004	4.0 – 6.0	47.9	18.4	--	--
20026	2.0 – 4.0	12.9	14.1	--	--
20027	0.0 – 2.0	12.5	20.9	--	--
20028	2.0 – 4.0	33.5	33.8	40	20
20029	0.0 – 2.0	20.9	28.6	--	--
20029	2.0 – 4.0	23.2	32.2	36	20
20032	2.0 – 4.0	18.1	23.1	--	--
20032	4.0 – 6.0	45.6	17.0	--	--
20033	6.0 – 8.0	38.0	10.1	--	--

-- Parameter not tested.

FIELD PROCEDURES

Standard Penetration Test (SPT) Borings

The SPT 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 hammer falling under its own weight a distance of 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.

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.

Double Ring Infiltration (DRI) Testing

The DRI tests are performed in general accordance with ASTM D3385 "Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer". The 24-inch diameter outer ring is set on the prepared and roughened surface and is driven into the soil to a depth of 6-inches. Care is taken not to disturb the soil adjacent to ring walls. The ring is then checked visually for levelness. The 12-inch diameter inner ring is then set concentrically within the outer ring and pushed and/or driven into the soil using methods described in the above paragraph to set the inner ring into the soil. The inner ring is then checked visually for level and location within the outer ring. Water is poured into both rings using a splash guard to reduce scouring of the soil surface during the testing. The inner ring and annular space is then simultaneously filled with water to a depth of 12 inches. Water is added during the testing to maintain the 12-inch depth and volume that is added during specific intervals is recorded. This water volume represents the volume infiltrated into the soils, and is converted to an infiltration velocity.

LABORATORY PROCEDURES

Water Content

The water 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.

Atterberg Limits (Plasticity)

A soil's Plasticity Index (PI) is the numerical difference between the Liquid Limit (LL) and the Plastic limit (PL). The LL is the moisture content at which the soil will flow as a heavy viscous fluid and is determined in general accordance with ASTM D-4318. The PL is the moisture content at which the soil begins to crumble when rolled into a small thread and is also determined in general accordance with FM 1-T 90.

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.