CITY OF TAMPA

Bob Buckhorn, Mayor **CONTRACT ADMINISTRATION DEPARTMENT**

David L. Vaughn, AIA, Director

ADDENDUM NO. 2

DATE: June 28, 2013

Contract 13-C-00033; Fire Station 19 Improvements

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: Attached for your referenced is the Geotechnical Report for the above referenced project.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Management Supervisor

306 E. Jackson Street, 4N • Tampa, Florida 33602 • (813) 274-8456 • FAX: (813) 274-8080

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REPORT OF GEOTECHNICAL EXPLORATION AND ENGINEERING ANALYSIS

CITY OF TAMPA FIRE STATION
TAMPA, FLORIDA

AREHNA PROJECT NO. B-12-027

December 20, 2012

Prepared For:
5M Civil LLC
12315 Wycliff Place
Tampa, Florida 33626

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

AREHNA | Engineering, Inc.

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

December 20, 2012

Mr. Jesús Merly, P.E.
5M Civil LLC
12315 Wycliff Place
Tampa, Florida 33626

813.404.8872 Direct
Jesus.merly@5mcivil.com

Subject: Report of Geotechnical Exploration and Engineering Analysis
City of Tampa Fire Station
Tampa, Florida
AREHNA Project B-12-027

Dear Mr. Merly,

AREHNA Engineering, Inc. (AREHNA) is pleased to submit this report of our geotechnical exploration and engineering analysis for the proposed project. Services were conducted in general accordance with AREHNA Proposal Prop-12-013 dated March 19, 2012. The purpose of our geotechnical study was to obtain information on the general subsurface conditions for the proposed fire station structure, associated pavements, and retention pond.

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

AREHNA appreciates the opportunity to have assisted 5M Civil LLC 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

Richard J. Hessler, E.I.
Geotechnical Engineer

Amanda S. Pereira, P.E.
Senior Geotechnical Engineer
Florida Registration 67784

Distribution: 3 – Addressee
1 – File

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1.0 EXECUTIVE SUMMARY

The purpose of this geotechnical exploration was to obtain information regarding the site and general subsurface conditions at the proposed project site. The planned development includes a new fire station structure, associated pavements, and a storm water retention area. We assume that maximum column loads, for the fire station structure, will not exceed 70 kips, and the maximum wall loads will be on the order of 2 to 3 klf. We also assume that no more than two feet of fill, and no significant cuts will be needed to achieve the planned finished building grades.

AREHNA recommends that after properly stripping, proofrolling and filling the site, the building be supported on conventional shallow foundations. Shallow foundations which bear on densified existing soils or structural fill may be designed for a net maximum allowable bearing pressure of 2,000 pounds per square foot (psf).

Groundwater levels were recorded during our field exploration. At the time of exploration, 24 hour groundwater readings ranged from approximately 4.0 to 4.3 feet below land surface. The results of our Double Ring Infiltration test, which was performed at a depth of 2 feet below existing grade, indicate an infiltration rate of 20 inches per hour.

Boring B-01, which was located within the proposed footprint of the fire station structure, indicated a zone of very loose soils at a depth extending from approximately 23.5 feet to 31 feet. This is consistent with a soil-filled slot in the limestone formation, or a weak zone just above the limestone formation. These zones are common in Tampa. There is no sign of upward raveling above this zone.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 Site Description and Project Characteristics

The project site is currently under consideration for construction of new facilities for a City of Tampa Fire Station. The planned development includes a new fire station structure, paved areas, and a retention area. Detailed structural information was unavailable at the time of this report. We assume that maximum column loads, for the fire station structure, will not exceed 70 kips with maximum wall loads on the order of 2 to 3 klf. We also assume that no more than two feet of fill, and no significant cuts will be needed to achieve the planned finished building grades.

The area of the fire station structure, retention area, and paved areas is currently partially wooded; the site is also covered with grass and low brush, and has some areas of pavements from the previous development. The site location is enclosed with chain-link fence.

2.2 Scope of Work

The purpose of our geotechnical study was to obtain information on the general subsurface conditions at the project site. The subsurface materials encountered were then evaluated with respect to the available project characteristics. In this regard, engineering assessments for the following items were formulated:

- Identification of existing ground water levels and estimated normal seasonal high ground water fluctuations.
- Field permeability results using a Double Ring Infiltration (DRI) test.
- Recommendations for new pavement sections.
- General site preparation recommendations.
- General location and description of potentially deleterious materials encountered in the borings, which may have an impact on the proposed construction.
- Allowable bearing capacity and foundation settlement for foundations supporting the new structure.

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

- Coordinated site access, as necessary.
- Requested utility location services from Sunshine State One-Call.
- Performed 5 Standard Penetration Test (SPT) borings utilizing a track-mounted rig for the fire station structure to 25 and 35 feet (B-01 and B-02), pavement areas to 10 feet (A-01 and A-02), and the retention area to 15 feet (P-01). Samples were collected and Standard Penetration Test resistances were recorded at approximate intervals of two feet for the top ten feet and at approximate intervals of five feet thereafter.
- Performed one Double Ring Infiltration (DRI) Test at a depth of 2 feet below grade in the proposed retention area.

- Collected a sample for Limerock Bearing Ratio (LBR) testing for use in pavement recommendations.
- Visually classified and stratified soil samples in the laboratory using the Unified Soil Classification System and conducted a laboratory testing program on representative samples, as deemed necessary.
- Reported the results of the field exploration and engineering analysis. The results of the subsurface exploration are presented in this written report, signed and sealed by a professional engineer specializing in geotechnical engineering.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Field Exploration

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. 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 testing and classification.

The DRI test was performed for a total duration of four hours in general accordance with ASTM Test Designation D-3385, titled "Infiltration Rate of Soils in Field Using Double-Ring Infiltrometers." The DRI test was performed at a depth of approximately two feet below the existing ground surface, and resulted in an infiltration rate of 20 inches per hour. The results are attached in **Appendix C** of this report.

3.2 Laboratory Testing

The soil samples were transported to AREHNA's soil laboratory and were classified by the Geotechnical Engineer using the USCS in general accordance with the ASTM Test Designation D-2488. Laboratory tests performed included a Limerock Bearing Ratio (LBR) test, Atterberg limits, sieve analysis, and moisture content.

Boring No.	Sample Depth (feet)	Percent Moisture Content	Percent Finer (-200 sieve)	Liquid Limit	Plastic Limit	Plasticity Index
B-01	13.5 – 15.0	29.6	46.3	44	28	16

A LBR of 37 was obtained on the tested sample. Results are included in **Appendix C** of this report.

4.0 SUBSURFACE CONDITIONS

4.1 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, attached as **Figure 4**, indicates that the soils in the vicinity of the project site consists of Myakka-Urban land complex (mapping unit 32). The NRCS published profiles typically reports soils extending to 80 inches below the ground surface. Excerpts from the published Soil Survey are provided below for reference.

Myakka Urban land complex [32]: - Typically the surface layer is dark gray fine sand about 5 inches thick. The subsurface layer to a depth of 20 inches is light gray fine sand. The upper part of the subsoil, to a depth of about 24 inches is very dark grayish brown fine sand. The middle part to a depth of about 30 inches is dark brown fine sand. The lower part to a depth of 44 inches is yellowish brown fine sand. The substratum to a depth of about 80 inches is pale brown fine sand. In some areas the surface layer is more than 8 inches thick. In places the upper part of the subsoil is at a depth of 20 inches.

The Urban land part of this complex is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils so that their identification is not feasible.

4.2 USGS Topographic Data

The topographic survey map published by the United States Geological Survey was reviewed for ground surface features at the proposed project locations (**Figure 4**, **Appendix A**). Based on this review, the natural ground surface elevations at the project site are approximately + 5 to +10 feet National Geodetic Vertical Datum of 1929 (NGVD).

4.3 Subsurface Conditions

A pictorial representation of the subsurface conditions encountered in the borings is shown on the General Subsurface Profile, **Figure 5** in **Appendix B**. These profiles and the following soil conditions highlight the general subsurface stratification. The Soil Test Boring Records in **Appendix B** should be consulted for a detailed description of the subsurface conditions encountered at each boring location. When reviewing the boring records and the subsurface profiles, it should be understood that soil conditions may vary between and away from boring locations.

The borings, B-02, A-01, A-02 and P-01, generally encountered similar soil types consisting of loose to medium dense fine sand (SP) and clayey fine sand (SC) at depths ranging from 10 to 25 feet. Boring B-01, encountered loose to medium dense fine sand (SP) to 23 feet, followed by a very loose interval of clayey fine sand with an N-value of weight of hammer (WOH) for 7-feet, to a depth of 31 feet. Very soft weathered limestone (WLS) was then encountered to the termination depth of the boring at 35 feet. No losses of drilling fluid circulation were encountered within any of the borings performed.

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

4.4 Groundwater Conditions

The 24-hour groundwater table was encountered at depths ranging from approximately 4.0 to 4.3 feet below the existing ground surface at the time of drilling.

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. 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.

4.5 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 is approximately 18-inches below grade, with higher levels after severe storm events.

5.0 DESIGN RECOMMENDATIONS

5.1 General

Our geotechnical evaluation is based upon the previously presented project information as well as the field and laboratory test 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. The assessment of site environmental conditions or the presence of pollutants in the soil, rock, or groundwater of the site is beyond the proposed scope of this geotechnical exploration.

Boring B-01, which was located within the proposed footprint of the fire station structure, indicated a zone of very loose soils at a depth extending from approximately 23.5 feet to 31 feet. This is consistent with a soil-filled slot in the limestone formation, or a weak zone just above the limestone formation. These zones are common in Tampa. There is no sign of upward raveling above this zone.

5.2 Foundation Recommendations

Following our recommended General Site Preparations, the proposed building can be constructed on a system of conventional shallow spread or strip footings. Shallow foundations which bear on densified existing soils or structural fill may be designed for a net maximum allowable bearing pressure of 2,000 pounds per square foot (psf). All footings should be embedded so that the bottom of the foundation is a minimum of 16 inches below the adjacent compacted grades on all sides. Strip or wall footings should be a minimum of 18 inches wide and pad or column footings should be a minimum of 24 inches wide. These minimum footing sizes should be used regardless of whether the maximum allowable bearing pressures may not be 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. The subgrade soils should be compacted to a density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). This compaction requirement should be uniformly obtained at the bearing level. 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 existing ground.

5.3 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 1/2-inch.

5.4 Floor Slab Design

After proofrolling the existing soils, it is expected that the floor slab will be supported on compacted structural fill. The floor slab subgrade soils should be compacted to a minimum dry density equal to 95 percent of the Modified Proctor maximum dry density. A modulus of subgrade reaction of 150 pci is available at this compaction.

5.5 Pavement Design

AREHNA's pavement recommendations presented herein are considered minimum for the site, soil and traffic conditions expected. We have assumed that the pavement loading will be 100,000 18-kip Equivalent Single Axle Loads (ESALs) over a 20-year design life. If a different traffic loading is appropriate by the City of Tampa Fire Stations, please provide us with values so that we may update our recommendations.

5.5.1 Subgrade

Sufficient fill should be placed so the bottom of the subgrade is always above the ground water level. Any fill utilized to elevate the pavement areas to subgrade elevation should consist of reasonably clean fine sands, uniformly compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557).

The upper 12-inches of pavement subgrade should also be stabilized with limerock or crushed concrete so that a Limerock Bearing Ratio of 40 is achieved. This stabilized subgrade should be compacted to at least 98 percent of Modified Proctor.

5.5.2 Base

For flexible pavements, we recommend that you consider either limerock or crushed concrete 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. Crushed concrete should have an LBR value of 100 and be graded in accordance with Florida Department of Transportation (FDOT) Standard Specification Section 204.

We recommend that the base material be a minimum of six inches thick under automobile parking areas and eight inches thick elsewhere.

5.5.3 Asphaltic Concrete Pavement

The asphaltic concrete structural course should consist of at least 3-inches of Type SP – 12.5 asphaltic concrete material, except in automobile parking areas where it needs to be only 1.5 inches thick. 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.

5.5.4 Rigid Concrete Pavement

The concrete pavement should be at least 5 inches thick. Proper jointing controls should be used. We recommend a maximum longitudinal to transverse pattern ratio of 1.2 to 1. We further recommend that the jointed section area ideally be on the order of 250 square feet but no more than 400 square feet. Joints that intersect the edge should do so perpendicular to the edge. The joints should have a minimum cut depth of at least 1 inch or 1/5 of the slab thickness, whichever is greater. The joints should be cut within 8 hours of concrete placement.

It is suggested that a rigid pavement be utilized where fire trucks will be washed or stored for extended periods. Rigid pavement is also recommended in dumpster areas, including the areas in which dumpster trucks or other large vehicles load, backup and turn around.

6.0 GENERAL SITE PREPARATION

6.1 General

The initial step in site preparation for the fire station structure and paved areas should be the complete removal of all topsoil, root, debris, wood fragments and other deleterious materials from beneath and preferably five feet beyond the development perimeter. The structure areas 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 building and pavement areas should be proofrolled with a heavy weight vibratory roller with a 5-foot diameter drum. At least 10 complete coverages (5 in each perpendicular direction) should be performed over the entire building and pavement areas 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. Fill should generally consist of fine sand with less than 12 percent passing the No. 200 sieve, 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. 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 may need to be controlled 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.

- The upper 12-inches of pavement subgrade should also be stabilized with limerock or crushed concrete so that a Limerock Bearing Ratio of 40 is achieved. This stabilized subgrade should be compacted to at least 98 percent of Modified Proctor.

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

- A materials testing laboratory should be retained with to provide on-site observation of earthwork 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.

6.2 Ground Water Control

Ground water levels should be determined immediately prior to construction. Shallow ground water should be kept at least 24 inches below the lowest working area to facilitate proper material placement and compaction. It is anticipated that surface water could be handled by ditching and pumping from sumps. 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.

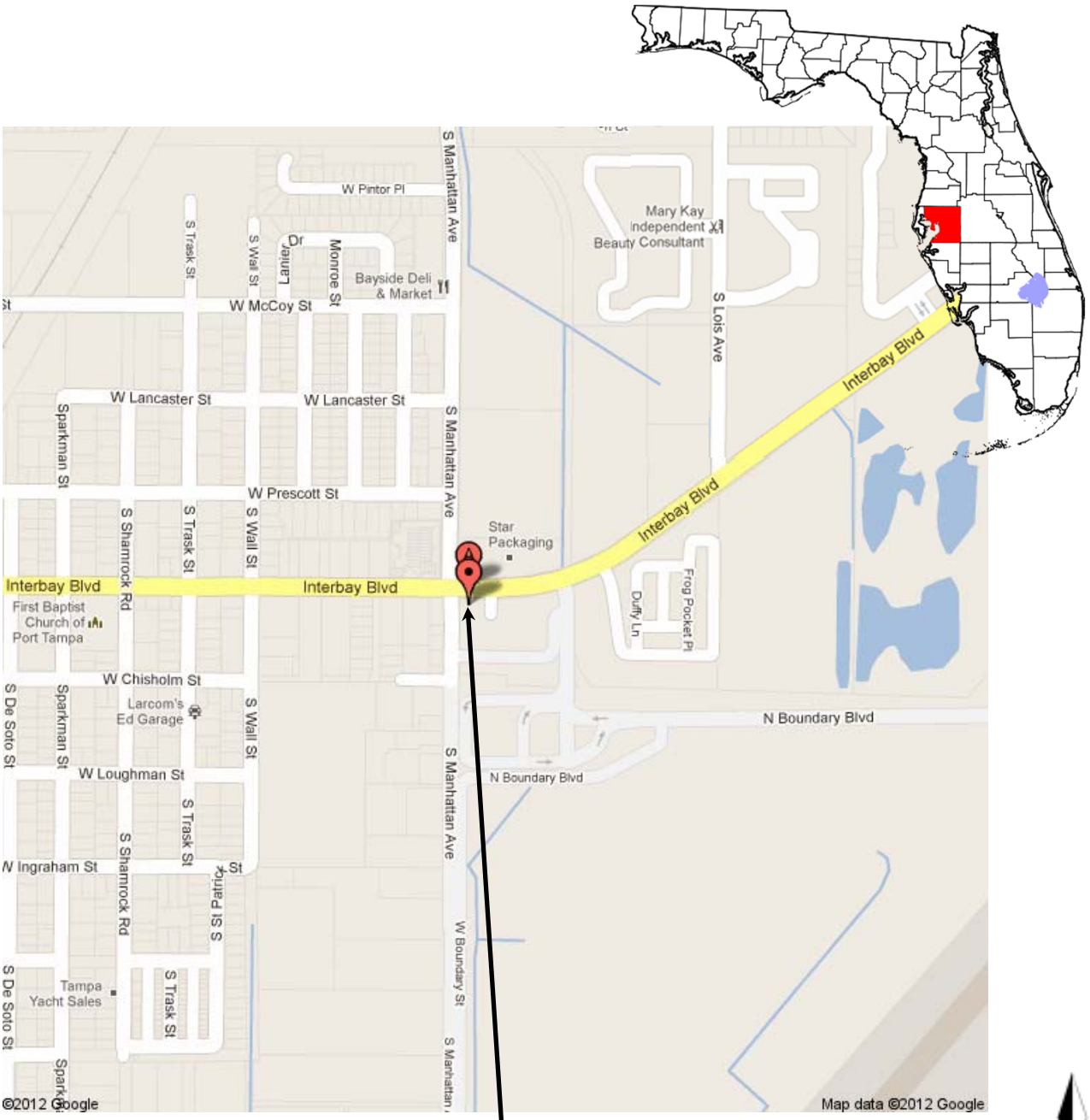
6.3 On-Site Soil Suitability

The borings indicate that the majority of the soils encountered should be generally suitable for fill. Classification indicates the upper site soils at this site consist of coarse grained soils classified as SP, based on the Unified Soil Classification System (USCS). 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.

7.0 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 A

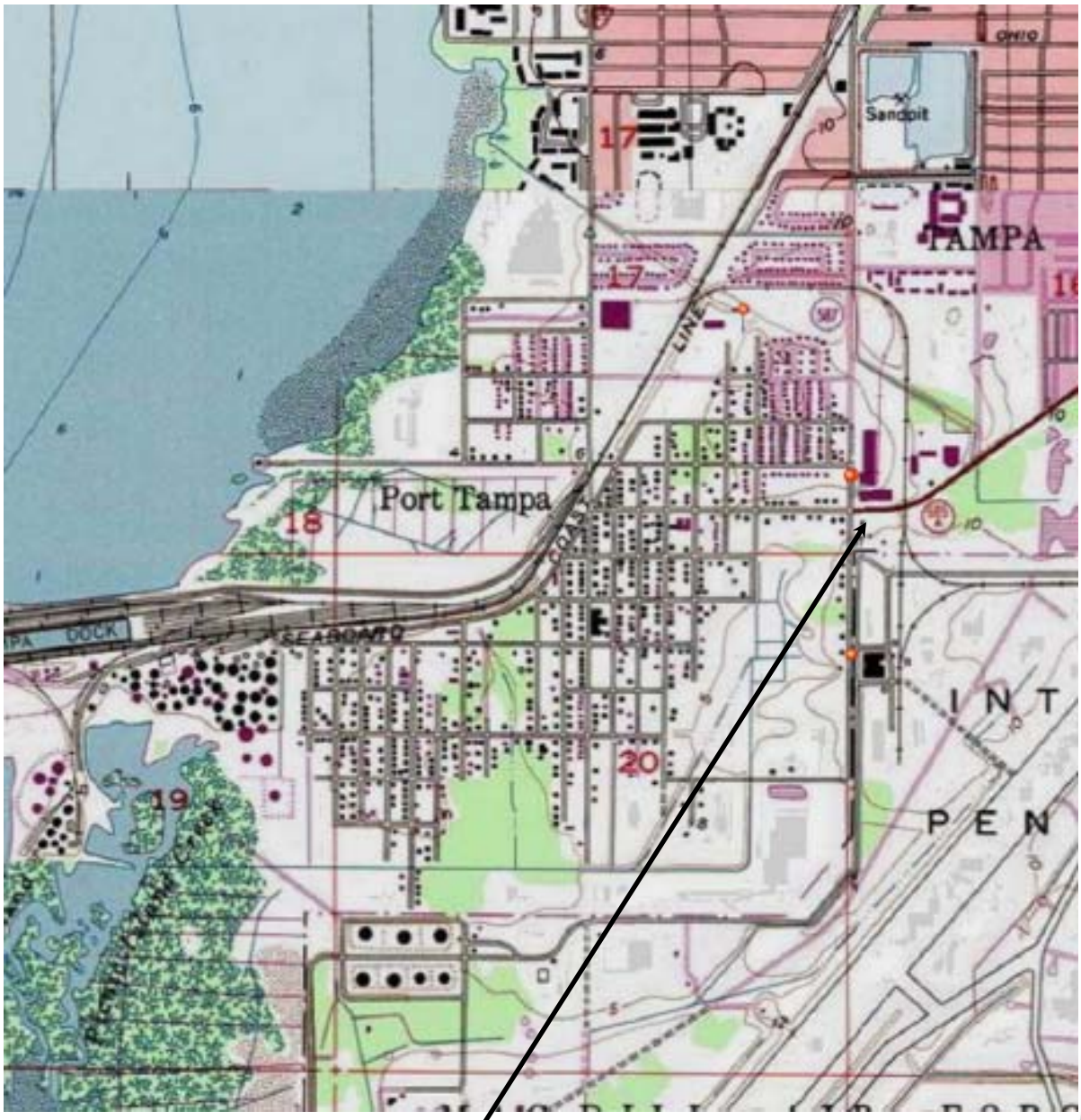


City of Tampa Fire Station **Tampa, Florida**	AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	PROJECT SITE LOCATION MAP
Client: 5M Civil LLC Project: B-12-027 Date: December 12, 2012	Checked By: ASP Drawn By: RJH	FIGURE **1**

LEGEND

- Standard Penetration Test Boring Location
- Double Ring Infiltration Test Location

City of Tampa Fire Station **Tampa, Florida**	AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	FIELD EXPLORATION PLAN
Client: 5M Civil LLC Project: B-12-027 Date: December 12, 2012	Checked By: ASP Drawn By: RJH	FIGURE **2**



Source: USGS Topographic Map, Tampa, FL

City of Tampa Fire Station **Tampa, Florida**	AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	USGS TOPOGRAPHIC SURVEY
Client: 5M Civil LLC Project: B-12-027 Date: December 12, 2012	Checked By: ASP Drawn By: RJH	FIGURE **3**

Project Site

Soil Mapping Unit
32 – Myakka-Urban land complex

N

Source: USDA NRCS Soil Survey, Hillsborough County, FL

City of Tampa Fire Station **Tampa, Florida**		USDA SOIL SURVEY
Client: 5M Civil LLC Project: B-12-027 Date: December 12, 2012	AREHNA | Engineering, Inc. 5012 West Lemon Street, Tampa, FL 33609 Phone 813.944.3464 ▪ Fax 813.944.4959	Checked By: ASP Drawn By: RJH FIGURE **4**

APPENDIX B

TABLE 1
SUMMARY OF GPS COORDINATES

City of Tampa Fire Station
Tampa, Florida
AREHNA Report No. B-12-027

Boring No.	Latitude	Longitude
A-01	27°51'56.27"N	82°31'5.09"W
A-02	27°51'54.30"N	82°31'4.99"W
B-01	27°51'55.48"N	82°31'5.10"W
B-02	27°51'55.09"N	82°31'4.93"W
P-01	27°51'54.79"N	82°31'6.42"W

ARENHA | Engineering, Inc.
5012 W. Lemon Street
Tampa, FL 33609

Date: 12/12/2012
Drawn By: KSL
Checked By: RH

COT Fire Station

Tampa, FL

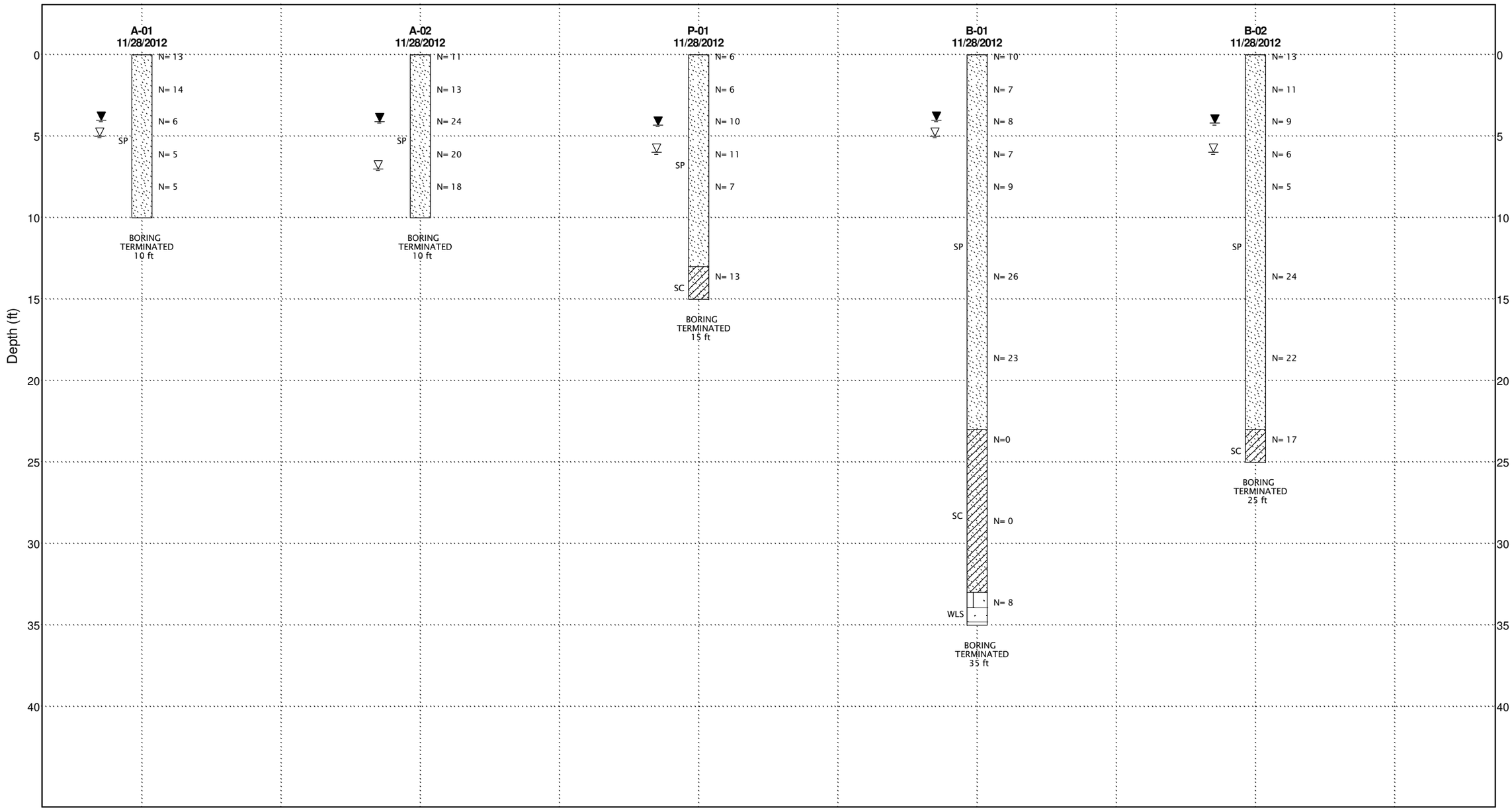
Prepared for
5M Civil LLC

Project No.: B-12-027

GENERALIZED SUBSURFACE PROFILE
Figure 5

Poorly-graded Sand
Clayey Sand
Weathered Limestone

Soil Classification Key



DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE	SPT N VALUE / FINES CONTENT (%)
0	Loose to medium dense light brown to dark brown fine SAND (SP)	▼		SPT	6-7-6-6	13	
				SPT	5-7-7-6	14	
				SPT	3-3-3-3	6	
				SPT	2-3-2-3	5	
10				SPT	2-2-3-2	5	

SPT N VALUE: 20 40 60 80
PL MC LL
20 40 60 80
▲ FINES CONTENT (%) ▲
20 40 60 80

Bottom of borehole at 10.0 feet.

Date Drilled: 11/28/12
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:

▽ At Time of Drilling: 5 ft below existing grade
▼ 24 Hrs. After Drilling: 4 ft below existing grade

Remarks:

COT FIRE STATION
TAMPA, FL
AREHNA Project No.: B-12-027
5M Civil LLC

AREHNA | Engineering, Inc.

SOIL BORING LOG

Drawn By: KSL
Checked By: RH
Date: 12/12/2012

Boring A-01

DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
0	Medium dense light gray to brown fine SAND (SP)			SPT	2-5-6-6	11
		▼		SPT	5-6-7-8	13
				SPT	11-11-13-11	24
		▽		SPT	5-9-11-13	20
10				SPT	7-10-8-6	18

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
▲ FINES CONTENT (%) ▲
20 40 60 80

Bottom of borehole at 10.0 feet.

Date Drilled: 11/28/12
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:

▽ At Time of Drilling: 7 ft below existing grade
▼ 24 Hrs. After Drilling: 4.1 ft below existing grade

Remarks:

COT FIRE STATION
TAMPA, FL
AREHNA Project No.: B-12-027
5M Civil LLC

AREHNA | Engineering, Inc.

SOIL BORING LOG

Drawn By: KSL
Checked By: RH
Date: 12/12/2012

Boring A-02

DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
0	Loose to medium dense light brown to dark gray fine SAND (SP)			SPT	2-7-3-3	10
				SPT	3-3-4-4	7
				SPT	3-4-4-7	8
				SPT	3-3-4-7	7
10				SPT	4-4-5-9	9
				SPT	14-13-13	26
20				SPT	13-14-9	23
	Very loose gray/blue clayey fine SAND (SC) with trace limestone fragments WOR for 6-inches at 23.5 feet WOH for 7 feet at 24 feet			SPT	WOR-WOH-WOH	0
30				SPT	0-0-0	0
	Very soft weathered LIMESTONE (WLS) with some clay			SPT	2-3-5	8

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
▲ FINES CONTENT (%) ▲
20 40 60 80

Bottom of borehole at 35.0 feet.

Date Drilled: 11/28/12
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:
▽ At Time of Drilling: 5 ft below existing grade
▼ 24 Hrs. After Drilling: 4 ft below existing grade

Remarks:

COT FIRE STATION
TAMPA, FL
AREHNA Project No.: B-12-027
5M Civil LLC

AREHNA | Engineering, Inc.

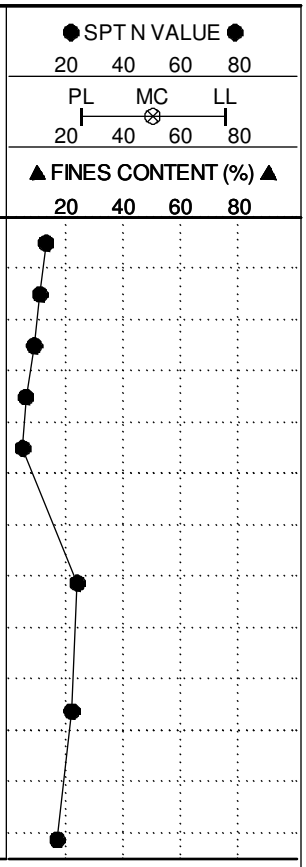
SOIL BORING LOG

Drawn By: KSL
Checked By: RH
Date: 12/12/2012

Boring B-01

DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
0	Loose to medium dense brown and gray fine SAND (SP)			SPT	16-7-6-7	13
				SPT	4-5-6-7	11
		▼		SPT	4-4-5-5	9
		▽		SPT	3-3-3-5	6
10				SPT	3-2-3-5	5
				SPT	8-12-12	24
20				SPT	10-12-10	22
	Medium dense gray clayey fine SAND (SC)			SPT	8-7-10	17

Bottom of borehole at 25.0 feet.



Date Drilled: 11/28/12
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:

▽ At Time of Drilling: 6 ft below existing grade
▼ 24 Hrs. After Drilling: 4.2 ft below existing grade

Remarks:

COT FIRE STATION
TAMPA, FL
AREHNA Project No.: B-12-027
5M Civil LLC

AREHNA | Engineering, Inc.

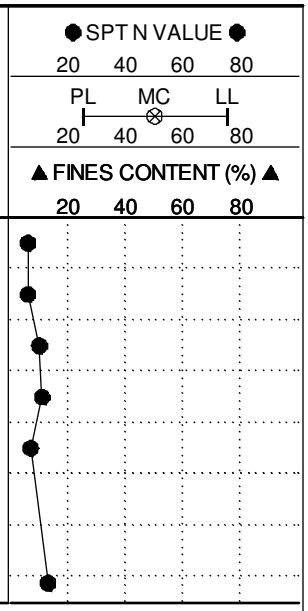
SOIL BORING LOG

Drawn By: KSL
Checked By: RH
Date: 12/12/2012

Boring B-02

DEPTH (ft)	SOIL DESCRIPTION AND REMARKS	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	SPT BLOW COUNTS	N-VALUE
0	Loose to medium dense light brown to dark gray fine SAND (SP)			SPT	3-3-3-4	6
				SPT	3-3-3-4	6
		▼		SPT	4-5-5-5	10
		▽		SPT	4-5-6-6	11
10				SPT	3-3-4-8	7
	Medium dense gray clayey fine SAND (SC)			SPT	9-5-8	13

Bottom of borehole at 15.0 feet.



Date Drilled: 11/28/12
Drilled By: AREHNA
Method: ASTM D-1586, Standard Penetration Test Boring

Ground Water Level:

▽ At Time of Drilling: 6 ft below existing grade
▼ 24 Hrs. After Drilling: 4.3 ft below existing grade

Remarks:

COT FIRE STATION
TAMPA, FL
AREHNA Project No.: B-12-027
5M Civil LLC

AREHNA | Engineering, Inc.

SOIL BORING LOG

Drawn By: KSL
Checked By: RH
Date: 12/12/2012

Boring P-01

KEY TO SYMBOLS

AREHNA | Engineering, Inc.

CLIENT 5M Civil LLC **PROJECT NAME** COT Fire Station

PROJECT NUMBER B-12-027 **PROJECT LOCATION** Tampa, FL

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


SP: Poorly-graded Sand


SC: Clayey Sand


WLS: Weathered Limestone

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

Static (Push) Cone Penetration Test

Bearing Capacity (Qc) kg/cm^2	Soil Consistency Cohesionless Soils	Soil Consistency Cohesive Soils
0 - 16	Very Loose	Soft to Firm
17 - 40	Loose	Stiff
41 - 120	Medium Dense	Very Stiff

Ground Water Level Measurements

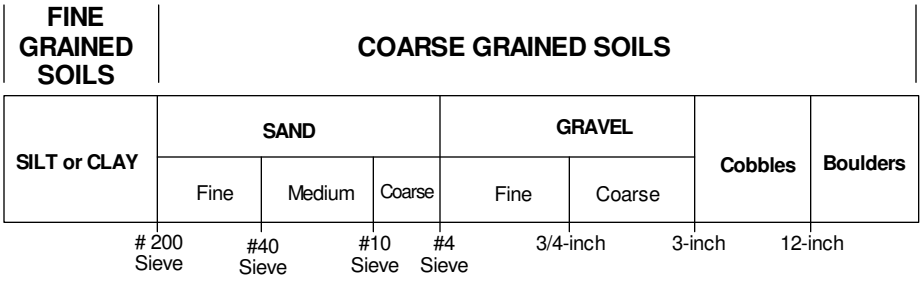
▽ Water Level at Time Drilling, or as Shown

▼ 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

SOIL BOUNDARY CLASSIFICATIONS



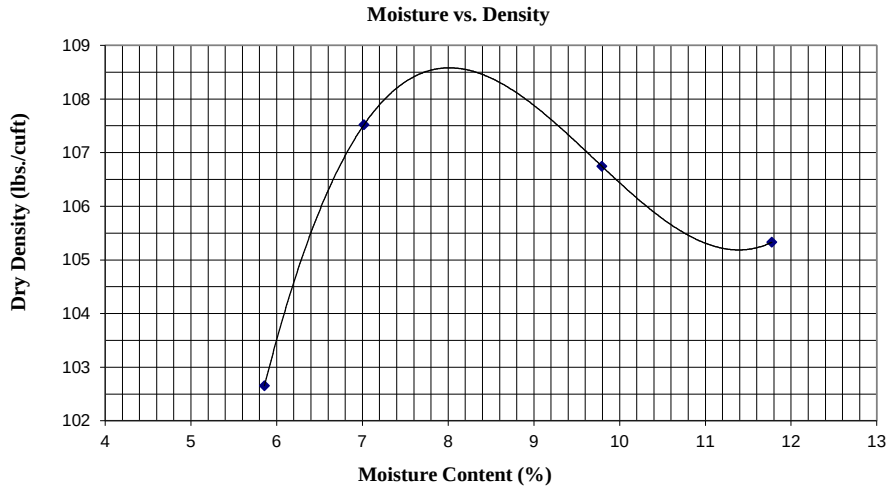
APPENDIX C

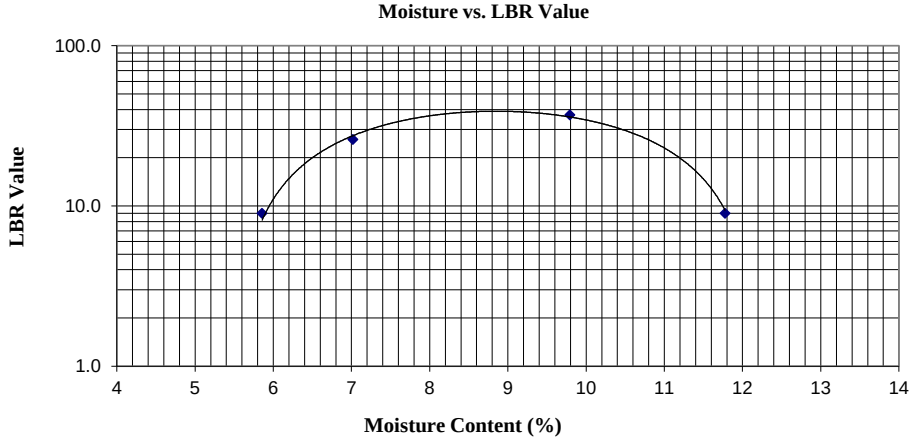
AREHNA | Engineering, Inc.

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

PROJECT NAME:	**COT FS - S. Manhattan Ave.**	**PROJECT NO.:**	**AREHNA B-12-027**
CLIENT:	**5M Civil, LLC**	**DATE TESTED:**	**12/3/2012**
SAMPLE No.:	**LBR No. AS-0002**	**TEST METHOD:**	**FM5-515**
LOCATION:	**Proposed parking Area**	**PERFORMED BY:**	**ga**

LIMEROCK BEARING RATIO TEST RESULTS





Material Description: **Existing Material - Dark Brown Fine Sand with trace Limerock**

Test Results

Optimum Moisture (%):	**109**
Maximum Dry Density (pcf):	**8**
Maximum LBR Value:	**37**
Liquid Limit:	**NP**
Plastic Limit:	**NP**

Reviewed and Submitted by:
AREHNA Engineering, Inc.

TABLE 2
SUMMARY OF LABORATORY TEST RESULTS

City of Tampa Fire Station
Tampa, Florida

AREHNA Project No.: B-12-027

Boring No.	Sample Depth (feet)	Percent Moisture Content	Percent Finer (-200 sieve)	Liquid Limit	Plastic Limit	Plasticity Index
P-01	13.5 – 15.0	29.6	46.3	44	28	16

SUMMARY OF DOUBLE RING INFILTRATION TEST RESULTS

City of Tampa Fire Station
Tampa , Florida

AREHNA Project No.: B-12-027

Date of Test: December 12, 2012

Test Depth: 2 feet below ground surface

Test Procedure: ASTM D-3385

Outer Ring Diameter: 24 inches

Ground Water Level: 4 feet

Inner Ring Diameter: 12 inches

Head: 12 inches

Test Duration: 4 hrs

Time Increments (Minutes)	Infiltration per Time Period (Inches)
15	5
15	5
15	5 3/4
15	5 1/2
30	10
30	9
30	10
30	11
30	10
30	10

Infiltration Rate: 20 inches per hour

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 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.

Double Ring Infiltration 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.