Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
Police Department Building
S. Orlando Avenue
Cocoa Beach, Florida

Ardaman & Associates, Inc.

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Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

August 23, 2018
File No. 18-23-5244

City of Cocoa Beach
Public Works Department
1600 Minutemen Causeway
Cocoa Beach, Florida 32931

Attention: Mr. Wayne Carragino

Subject: Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
Proposed Police Department Building
S. Orlando Avenue
Cocoa Beach, Florida

Dear Mr. Carragino:

As requested, we have completed a subsurface soil exploration and geotechnical engineering evaluation for the subject project. The purposes of performing this exploration were to evaluate the general subsurface conditions within the proposed building and pavement areas and to provide recommendations for site preparation, foundation support, and pavement construction. This report documents our findings and presents our engineering recommendations.

SITE LOCATION AND SITE DESCRIPTION

The site for the proposed Police Department building is located on the east side of S. Orlando Avenue just north of 1st Street in Cocoa Beach, Brevard County, Florida (Section 15, Township 25 South, Range 37 East). The general site location is shown superimposed on the Cocoa Beach, Florida USGS quadrangle map presented on Figure 1.

The project site is grassed and sparsely wooded. No structures currently exist on the site.

PROPOSED CONSTRUCTION AND GRADING

It is our understanding that the proposed construction consists of a 3-story, concrete and steel building. The structure will have plan dimensions of approximately 155 feet by 130 feet. Design foundation loads for the building were not available at the time of this evaluation. For the purposes of our analysis, we have therefore assumed the maximum loading conditions for the structure to be on the order of 4 to 5 kips per linear foot for wall foundations, 350 kips for individual column foundations, and 100 pounds per square foot (psf) for slab-on-grade floors. Additionally, a small asphalt paved parking area will be located at the northeast corner of the facility.

Grading plans are not complete at this time. However, we have assumed that this project site will require no more than approximately 1 foot of fill to raise the building and pavement areas to final elevation(s), similar to the adjacent proposed parking garage site to the north. If actual structure

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loads or fill height exceed our assumptions, then the recommendations in this report may not be valid.

REVIEW OF SOIL SURVEY MAPS

Based on the 1974 Soil Survey for Brevard County, Florida, as prepared by the U.S. Department of Agriculture Soil Conservation Service, the project site is located in an area mapped as the "Urban land" soil series. A description of this soil type, as obtained from the Soil Survey, is provided below.

Urban land (Ur):

Urban land consists of areas that are 60 to more than 75 percent covered with streets, buildings, large parking lots, shopping centers, industrial parks, airports and related facilities. Unoccupied areas, mostly lawns, parks, vacant lots, and playgrounds, are Astatula, Paola, Myakka, St. Lucie, Immokalee, Pomello, Cocoa, and Canaveral soils in tracts too small to be mapped separately.

FIELD EXPLORATION PROGRAM

SPT Borings

The field exploration program included performing three Standard Penetration Test (SPT) borings and two auger borings. The SPT borings were drilled within the proposed "footprint" of the Police Department building. Due to the potential presence of underground utilities on the project site, the top 4.5 feet of the borings were drilled with a hand-held bucket auger. Below a depth of 4.5 feet, the borings were advanced to depths of 40 and 60 feet below the ground surface using the methodology outlined in ASTM D-1586. A summary of this field procedure is included in Appendix I. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory in sealed sample jars.

During performance of the borings, relatively undisturbed Shelby tube samples of soft clay soils were collected from depths ranging from 47 to 49 feet below existing ground surface in Borings TH-1 and TH-3. These Shelby tube samples were returned to our laboratory for further analysis and testing.

The auger borings were performed in the proposed parking area. They were drilled using a hand-held, 3-inch diameter bucket auger to a depth of 5 feet below existing ground surface. Representative soil samples were recovered from the auger borings and transported to our laboratory for further analysis.

The groundwater level at the boring locations was measured during drilling. Upon completion, the SPT borings were grouted with neat cement grout and the auger borings were backfilled with soil cuttings.

Test Locations

The approximate locations of the borings are schematically illustrated on a site plan shown on Figure 2. These locations were determined in the field by estimating distances from existing site features and should be considered accurate only to the degree implied by the method of measurement used.

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488). The resulting soil descriptions are shown on the soil boring profiles presented in Appendix II.

In addition, we conducted four percent fines analyses (ASTM D1140), four natural moisture content tests (ASTM D2216), and two Atterberg limits tests (ASTM D4318) on selected soil samples obtained from the borings. The results of these tests are presented adjacent to the sample depths on the boring profiles in Appendix II. A consolidation test was performed in our laboratory on a subsample of the clay soils collected from a depth of 47 to 49 feet below existing ground surface in Boring TH-3 (Undisturbed Sample US-1). The results of the consolidation test are shown graphically in Appendix III.

GENERAL SUBSURFACE CONDITIONS

General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the soil boring profiles presented in Appendix II. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory examinations of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

The results of the SPT borings indicate the following general soil profile at the proposed building location:

Depth Below Ground Surface (feet)	Description (Unified Soil Classification)
0 to 4.5	Fine sand (SP)
4.5 to 9.5	Medium dense fine sand (SP)
9.5 to 37.5	Medium dense to dense fine sand (SP)
37.5 to 60	Very soft clay (CH) and very loose clayey fine sand (SC)

The auger borings performed in the proposed parking area encountered fine sand (SP) from existing ground surface to a depth of 5 feet below ground surface. Various amounts of shell were encountered in the soil samples collected from the borings. The above soil profiles are outlined in general terms only. Please refer to Appendix II for soil profile details.

Groundwater Level

The groundwater level was measured in the boreholes on the day drilled. As shown on the soil boring profiles in Appendix II, groundwater was encountered in the borings at depths ranging from 4.2 to 4.5 feet below the existing ground surface on the date indicated. Fluctuations in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

NORMAL SEASONAL HIGH GROUNDWATER LEVEL

The normal seasonal high groundwater level each year is the level in the August-September period at the end of the rainy season during a year of normal (average) rainfall. The water table elevations associated with a higher than normal rainfall and in the extreme case, flood, would be higher to much higher than the normal seasonal high groundwater level. The normal high water levels would more approximate the normal seasonal high groundwater levels.

The seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils, the land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

In addition to evaluating the conditions above, we have reviewed annual precipitation data available from the Melbourne Office of the National Weather Service. Based on this data, the annual rainfall to date in Brevard County is approximately 17.2 inches, which is approximately 2.3 inches above normal for this time of year.

Based on our interpretation of the site conditions using our boring logs, we estimate the normal seasonal high groundwater level at the boring locations to be approximately ½ foot above the groundwater levels measured at the time of our field exploration.

ENGINEERING EVALUATION AND RECOMMENDATIONS

General

The results of our exploration indicate that, with proper site preparation as recommended in this report, the existing soils are suitable for supporting the proposed Police Department Building on conventional shallow spread foundations, provided that the calculated settlement, as presented in a subsequent report section, is deemed acceptable by the owner and design team. If so, spread footings should provide an adequate support system for the structure. If the calculated settlement is deemed unacceptable, then an alternative deep foundation system (i.e. piles) may be required.

The following are our recommendations for overall site preparation, foundation support, and pavement construction which we feel are best suited for the proposed facility and existing soil conditions. The recommendations are made as a guide for the design engineer and/or architect, parts of which should be incorporated into the project's specifications.

Stripping and Grubbing

The "footprints" of the proposed building and parking areas, plus a minimum margin of 5 feet, should be stripped of all surface vegetation, stumps, debris, asphalt, concrete, organic topsoil or other deleterious materials, as encountered. Buried utilities should be removed or plugged to eliminate conduits into which surrounding soils could erode.

After stripping, the site should be grubbed or root-raked such that roots with a diameter greater than ½ inch, stumps, or small roots in a dense state, are completely removed. The actual depth(s) of stripping and grubbing must be determined by visual observation and judgment during the earthwork operation.

Proof-rolling

We recommend proof-rolling the cleared surface to locate any unforeseen soft areas or unsuitable surface or near-surface soils, to increase the density of the upper soils, and to prepare the existing surface for the addition of the fill soils (as required). Proof-rolling of the building area should consist of at least 10 passes of a compactor capable of achieving the density requirements described in the next paragraph. Each pass should overlap the preceding pass by 30 percent to achieve complete coverage. If deemed necessary, in areas that continue to "yield", remove all deleterious material and replace with clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling. The number of passes can be reduced to three within the proposed parking area.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 2 feet in the building area and 1 foot in the proposed parking area must be achieved beneath the stripped and grubbed ground surface. Additional passes and/or overexcavation and recompaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e. cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory compaction equipment should not be used within 200 feet of existing structures. Ardaman & Associates, Inc. would be pleased to provide vibration monitoring during compaction activities at the project site.

Suitable Fill Material and the Compaction of Fill Soils

All fill soil should be free of organic materials, such as roots and vegetation. We recommend using fill with less than 12 percent by dry weight of material passing the U.S. Standard No. 200 sieve size. The fine sand (Stratum No. 1 without roots, as shown on the soil boring profiles presented in Appendix II) is suitable for use as fill soil and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 12 percent passing the No. 200 sieve can be used in some applications but will be more difficult to compact due to their inherent nature to retain soil moisture.

All structural fill should be placed in level lifts not to exceed 12 inches in uncompacted thickness. Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. The filling and compaction operations should continue in lifts until the desired elevation(s) is achieved. If hand-held compaction equipment is used, the lift thickness should be reduced to no more than 6 inches.

Foundation Support by Shallow Spread Footings and Foundation Compaction Criteria

An evaluation of foundation settlement for the Police Department Building was performed using the assumed, maximum individual column foundation load of 350 kips and a maximum bearing pressure of 3,500 psf for the foundations. The analyses were performed using the computer program SETTLE3D. A maximum fill thickness of 1 foot and a depth to the bottom of the foundations of 2 feet. For the sandy soils encountered, published correlations relying on SPT N-values were used to estimate the elastic moduli. Consolidation test data for Sample US-1 collected from Boring TH-3 was used to model the clay. The Westergard stress distribution method was used for calculating the stress changes caused by the estimated foundation load in the underlying foundation soils.

Settlement calculated under the assumed loading conditions consisted of up to roughly 1½ inches of total settlement for individual column foundations. It is estimated that approximately 40 percent of the calculated settlement will occur during construction as the loads are applied due to the compression of the surface sand strata. The remaining settlement may be attributed to consolidation of the clay that will occur over a much longer time period.

It is noted that our evaluation of foundation settlement was performed for a single isolated column foundation using the assumed load. Once the building foundation plan and design foundation loads are available, we should be provided with this information in order to perform a more in-depth evaluation of foundation settlement.

The following recommendations are contingent upon the magnitude of calculated settlement being acceptable to the design team. If not acceptable, then pile foundations may be required.

Excavate the foundations to the proposed bottom of footing elevations and, thereafter, verify the in-place compaction for a depth of 2 feet below the footing bottoms. If necessary, compact the soils at the bottom of the excavations to at least 95 percent of the modified Proctor maximum dry density (ASTM D-1557) for a depth of 2 feet below the footing bottoms. Based on the existing soil conditions and, assuming the above outlined proof-rolling and compaction criteria are implemented, an allowable soil bearing pressure of 3,500 pounds per square foot (psf) may be used in the foundation design for the Police Department Building.

Slab Moisture Reducer and Slab Compaction Requirements

Compaction beneath all slabs on grade should be verified for a depth of 12 inches and meet the 95 percent criteria (modified Proctor, ASTM D-1557).

Precautions should be taken during the slab construction to reduce moisture entry from the underlying subgrade soils. Moisture entry can be reduced by installing a membrane between the subgrade soils and floor slab. Care should be exercised when placing the reinforcing steel (or mesh) and slab concrete such that the membrane is not punctured. We note that the membrane alone does not prevent moisture from occurring beneath or on top of the slab.

If interior columns are isolated from the floor slab, an expansion joint should be provided around the columns and sealed with a water-proof sealant

Dewatering

If the control of groundwater is required to achieve the necessary stripping, excavation, proof-rolling, filling, compaction, and any other earthwork, sitework, and/or foundation subgrade preparation operations required for the project, the actual method(s) of dewatering should be determined by the contractor. Dewatering should be performed to lower the groundwater level to depths that are adequately below excavations and compaction surfaces. Adequate groundwater level depths below excavations and compaction surfaces vary depending on soil type and construction method, and are usually 2 feet or more. Dewatering solely with sump pumps may not achieve the desired results.

Typical Asphaltic Concrete Surface Pavement Section

<u>Site Preparation</u>

All areas to be paved should be prepared as previously outlined. Prior to pavement base installation, the subgrade soil compaction should be verified for a depth of 12 inches (i.e.; compacted to at least 95 percent of the modified Proctor (ASTM D-1557, AASHTO T-180) maximum dry density value).

<u>Limerock/Cemented Coquina Base</u>

A limerock/cemented coquina base course 6 inches thick overlying an 8-inch thick stabilized subbase may be used provided that grading and drainage plans preclude periodic saturation of the base material. The periodic saturation of a limerock/cemented coquina base material could lead to premature pavement distress. A minimum clearance of 18 inches must be maintained between the bottom of the limerock/cemented coquina base and the seasonal high groundwater table. For truck parking and drive areas, the base thickness should be a minimum of 8 inches.

The limerock/cemented coquina should have a minimum Limerock Bearing Ratio (LBR) value of 100 and should be compacted to at least 98 percent of the modified Proctor (ASTM D-1557, AASHTO T-180) maximum density value.

An 8-inch thick subbase having a minimum LBR value of 40 must be achieved beneath the limerock/cemented coquina base. The natural soils may have to be stabilized with suitable clayey soil in order to achieve the required LBR value. The stabilized subbase must be compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180).

Crushed Concrete Base (Optional)

Crushed concrete base supported by a free-draining subgrade may be used. Six inches of crushed concrete base should be used in automobile parking areas and 8 inches of crushed concrete base should be used in truck parking and drive areas. A minimum clearance of 12 inches should be maintained between the bottom of the crushed concrete base and the seasonal high groundwater table.

The crushed concrete base should have a minimum Limerock/cemented coquina Bearing Ratio (LBR) value of 100 and should be compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180). The crushed concrete should meet Graded Aggregate Base gradation requirements according to Section 204, of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition. The subgrade beneath the crushed concrete base should consist of free draining sand compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180).

We note that if the contractor's means and methods include stabilizing soils beneath the crushed concrete base, then the stabilizing material should be coarse material (e.g; gravel). Low permeability soils (e.g; silt and/or clay) should not be used as stabilizing material beneath crushed concrete base.

Wearing Surface

A minimum 1½ inch layer of Type SP-9.5 or SP-12.5 asphaltic concrete should be used for a wearing surface in automobile parking areas. For truck parking and drive areas, 2 inches of Type SP-9.5 or SP-12.5 asphaltic concrete should be used.

The Type SP asphalt should include Asphalt Binder Grade PG67-22 and no more than 15 percent Recycled Asphalt Pavement (RAP) aggregate. Other requirements for the Type-*SP* asphaltic concrete wearing surface are outlined in Section 334 in the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, latest edition. Equivalent Type S asphaltic concrete may be substituted for Type SP-9.5 or SP-12.5; however, we recommend a minimum Marshall stability of 2,200 pounds if Type S is used.

The latest specifications of Florida Department of Transportation shall govern the placement of the base and asphaltic concrete wearing surface. The above minimum requirements will satisfactorily support Traffic Level A*. If a heavier traffic pattern is anticipated, the design section should be increased accordingly.

QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation and foundation and pavement construction is conducted in accordance with the

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* Reference: "Flexible Pavement Design Manual", Florida Department of Transportation. (2008)

appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that all deleterious materials have been removed and should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade. In-situ density tests should be conducted during filling activities and below all footings, floor slabs and pavement areas to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

Additionally for the pavements, Limerock/cemented coquina Bearing Ratio tests should be performed. The base course(s) should be tested for density and thickness. We recommend that Ardaman & Associates be retained to review the asphalt pavement mix design proposed for use on the project prior to pavement placement. During asphalt pavement construction, samples of the asphaltic concrete should be obtained and tested in the laboratory to verify compliance with the mix design, including testing Marshall Stability (if Type S asphalt is used), flow, asphalt content, and aggregate gradation. We also recommend full-time monitoring/testing in the batch plant and on the site during pavement placement. The asphaltic concrete thickness should be verified in the field.

Finally, we recommend inspecting and testing the construction materials for the foundations and other structural components.

IN-PLACE DENSITY TESTING FREQUENCY

In Central Florida, earthwork testing is typically performed on an on-call basis when the contractor has completed a portion of the work. The test result from a specific location is only representative of a larger area if the contractor has used consistent means and methods and the soils are practically uniform throughout. The frequency of testing can be increased and full-time construction inspection can be provided to account for variations. We recommend that the following minimum testing frequencies be utilized.

In proposed parking areas, a minimum frequency of one in-place density test for each 5,000 square feet of area (minimum of three test locations per area) should be used. The existing, natural ground should be tested to a depth of 12 inches at the prescribed frequency. Each 12-inch lift of fill, as well as the stabilized subgrade (where applicable) and base should be tested at this frequency. Utility backfill should be tested at a minimum frequency of one in-place density test for each 12-inch lift for each 200 linear feet of pipe. Additional tests should be performed in backfill for manholes, inlets, etc.

In proposed structural areas, the minimum frequency of in-place density testing should be reduced to one test for each 2,500 square feet of structural area. In-place density testing should be performed at this minimum frequency for a depth of 2 feet below natural ground and for every 1-foot lift of fill placed in the structural area. In addition, density tests should be performed in each column footing for a depth of 2 feet below the bearing surface. For continuous or wall footings, density tests should be performed at a minimum frequency of one test for every 50 linear feet of footing, and for a depth of 2 feet below the bearing surface.

Representative samples of the various natural ground and fill soils, as well as stabilized subgrade (where applicable) and base materials should be obtained and transported to our laboratory for Proctor compaction tests. These tests will determine the maximum dry density and optimum moisture content for the materials tested and will be used in conjunction with the results of the in-place density tests to determine the degree of compaction achieved.

CLOSURE

The analyses and recommendations submitted herein are based on the data obtained from the soil borings presented on Figure 2 and in Appendix II, and on the assumed loading conditions. This report does not reflect any variations which may occur adjacent to or between the boring locations. The nature and extent of the variations between the boring locations may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

This report has been prepared for the exclusive use of the City of Cocoa Beach in accordance with generally accepted geotechnical engineering practices. In the event any changes occur in the design, nature, or location of the proposed structure or pavement, we should review the applicability of conclusions and recommendations in this report. We recommend a general review of final design and specifications by our office to verify that earthwork, foundation, and pavement recommendations are properly interpreted and implemented in the design specifications. Ardaman & Associates should attend the pre-bid and preconstruction meetings to verify that the bidders/contractor understand the recommendations contained in this report.

We are pleased to be of assistance to you on this phase of the project. When we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Certificate of Authorization No. 5950

Ross T. McGillivray, P.E.
Senior Consultant
Florida License No. 17920

Jason P. Manning, P.E.
B/ranch Manager
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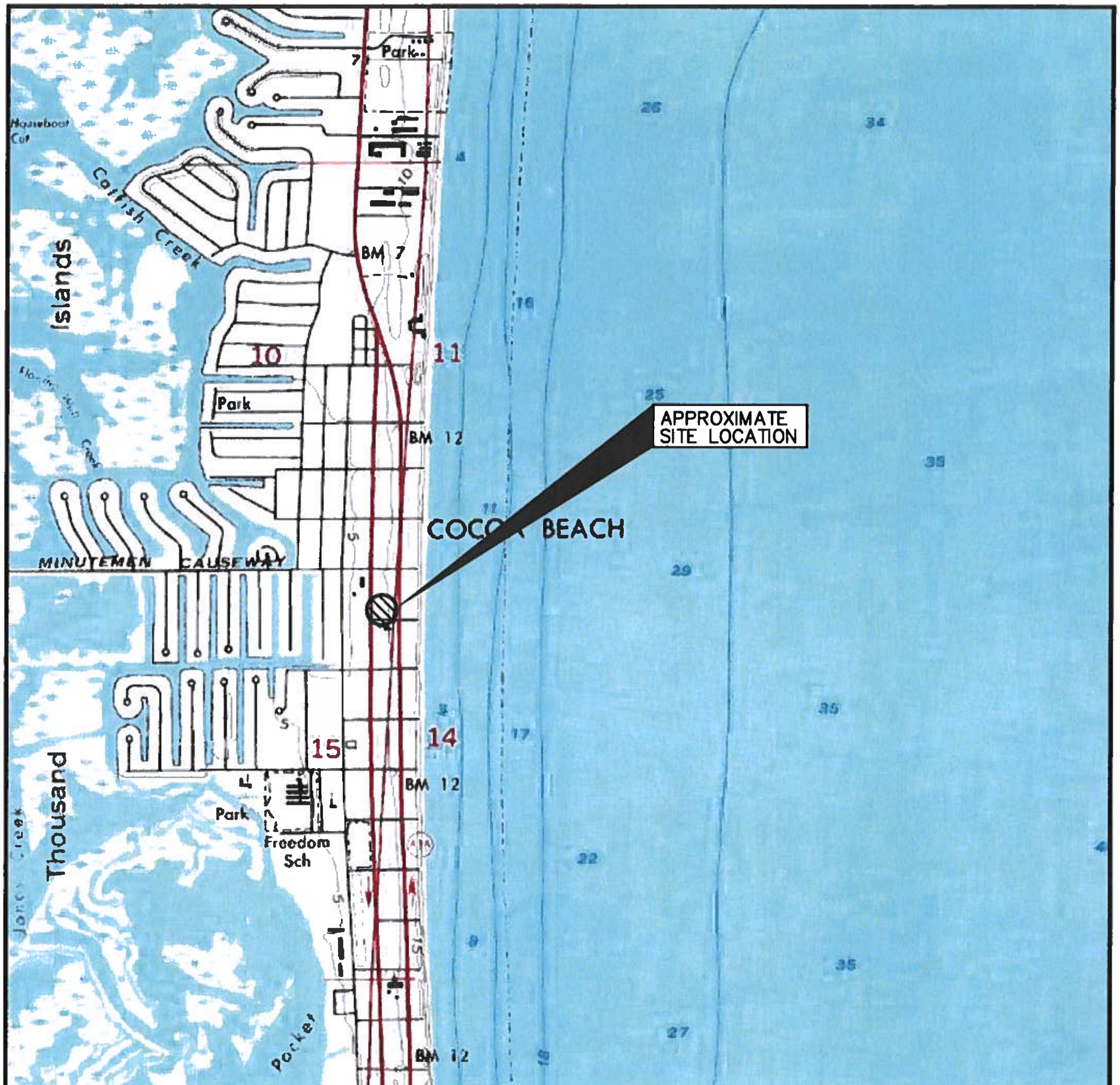
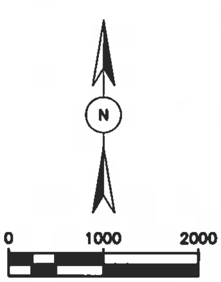
RTM/JPM/dk



SECTION 15
TOWNSHIP 25 SOUTH
RANGE 37 EAST

OBTAINED FROM U.S.G.S. QUAD MAPS: COCOA BEACH, FLORIDA



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QUADRANGLE LOCATION

SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED POLICE DEPARTMENT FACILITY
COCOA BEACH, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 6/14/18
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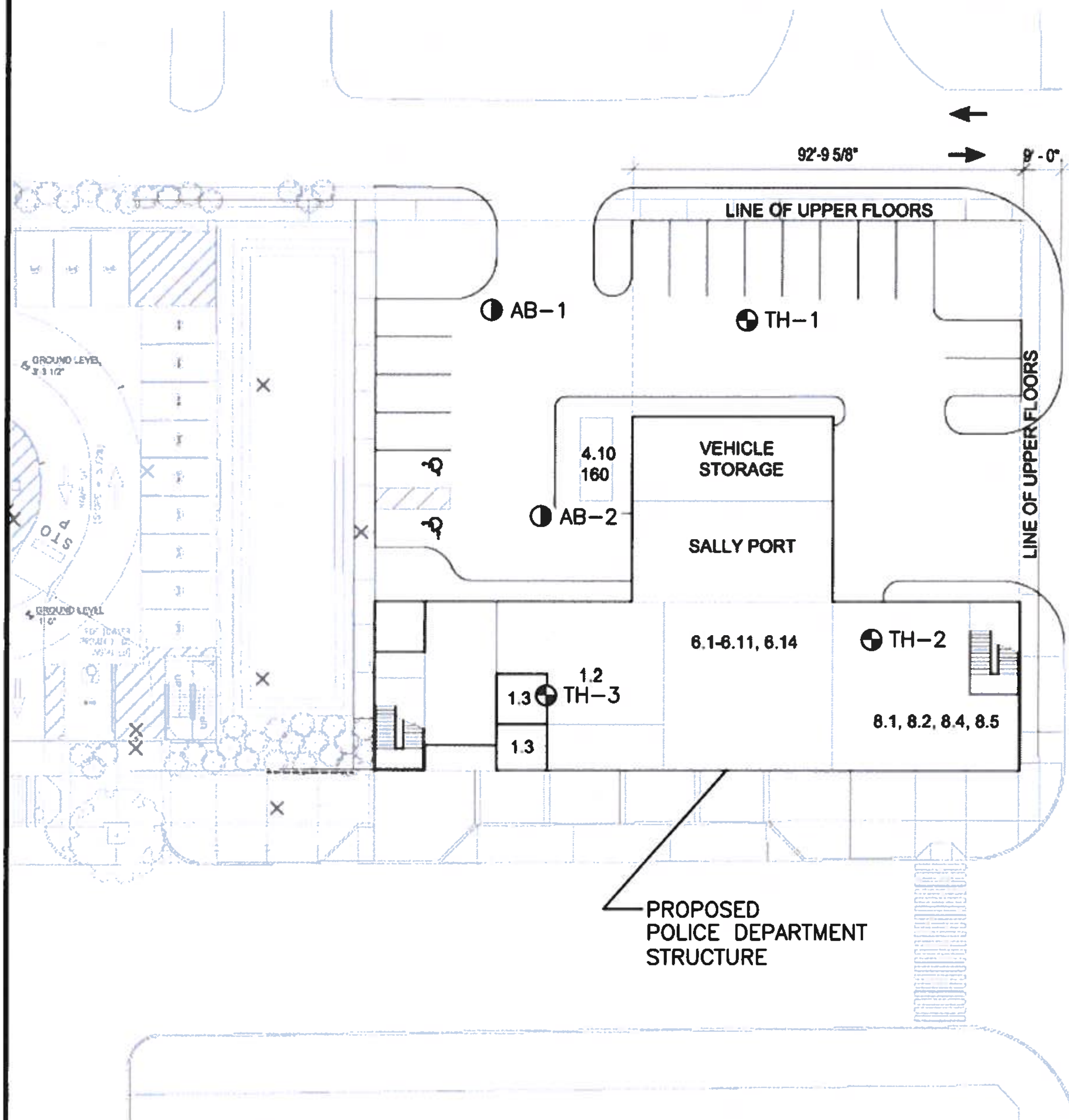
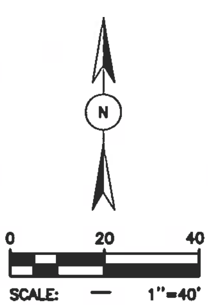


LEGEND

TH STANDARD PENETRATION TEST (SPT) BORING LOCATION

AB AUGER BORING LOCATION



BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED POLICE DEPARTMENT FACILITY
COCOA BEACH, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 6/14/18
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APPENDIX I

Standard Penetration Test Boring Procedure

STANDARD PENETRATION TEST

The standard penetration test is a widely accepted test method of *in situ* testing of foundation soils (ASTM D 1586). A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load.

The tests are usually performed at 5-foot intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, NX-size flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils at every 5 feet of drilled depth and from every different stratum are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary. Samples not used in testing are stored for 30 days prior to being discarded. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed, if necessary, and backfilled.

APPENDIX II

Soil Boring Profiles

LEGEND

SOIL DESCRIPTIONS

1. FINE SAND (SP)
2. SILTY FINE SAND (SM)
3. CLAYEY FINE SAND (SC)
4. CLAY (CH)

COLORS

- (A) LIGHT BROWN TO BROWN
- (B) GRAYISH-BROWN
- (C) LIGHT GRAY TO GRAY
- (D) DARK BROWN

TH	STANDARD PENETRATION TEST (SPT) BORING
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
▽	GROUNDWATER LEVEL MEASURED ON DATE DRILLED
US-1 ■	UNDISTURBED SAMPLE OBTAINED WITH A 3-INCH DIA. SHELBY TUBE
-200	PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
LL	LIQUID LIMIT IN PERCENT (ASTM D-423)
PI	PLASTICITY INDEX IN PERCENT (ASTM D-424)
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
WOH	SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS ONLY
SP,SP-SM SM,SC,CH	UNIFIED SOIL CLASSIFICATION SYSTEM

NOTE: ALL SPT BORINGS WERE PERFORMED USING AN AUTOMATIC HAMMER TO THE BORING TERMINATION DEPTH.
ALL REPORTED N-VAULES ARE AUTOMATIC HAMMER.

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
MEDIUM STIFF	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

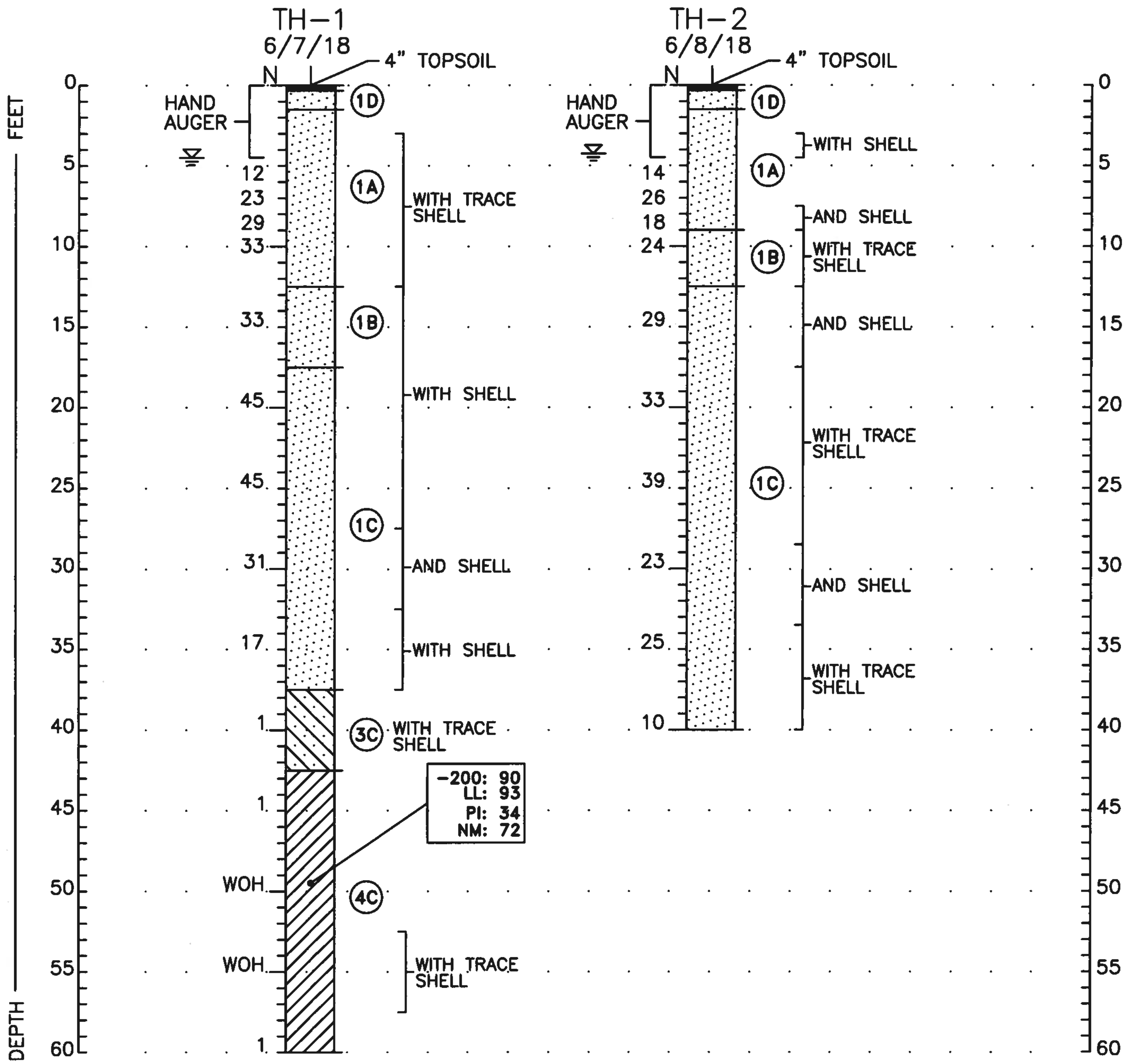
GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

SOIL PROFILES LEGEND

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED POLICE DEPARTMENT FACILITY
COCOA BEACH, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 6/14/18	
FILE NO. 18-5244	APPROVED BY:		FIGURE:



SOIL BORING PROFILES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED POLICE DEPARTMENT FACILITY
COCOA BEACH, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 6/14/18
FILE NO. 18-5244	APPROVED BY:	FIGURE:

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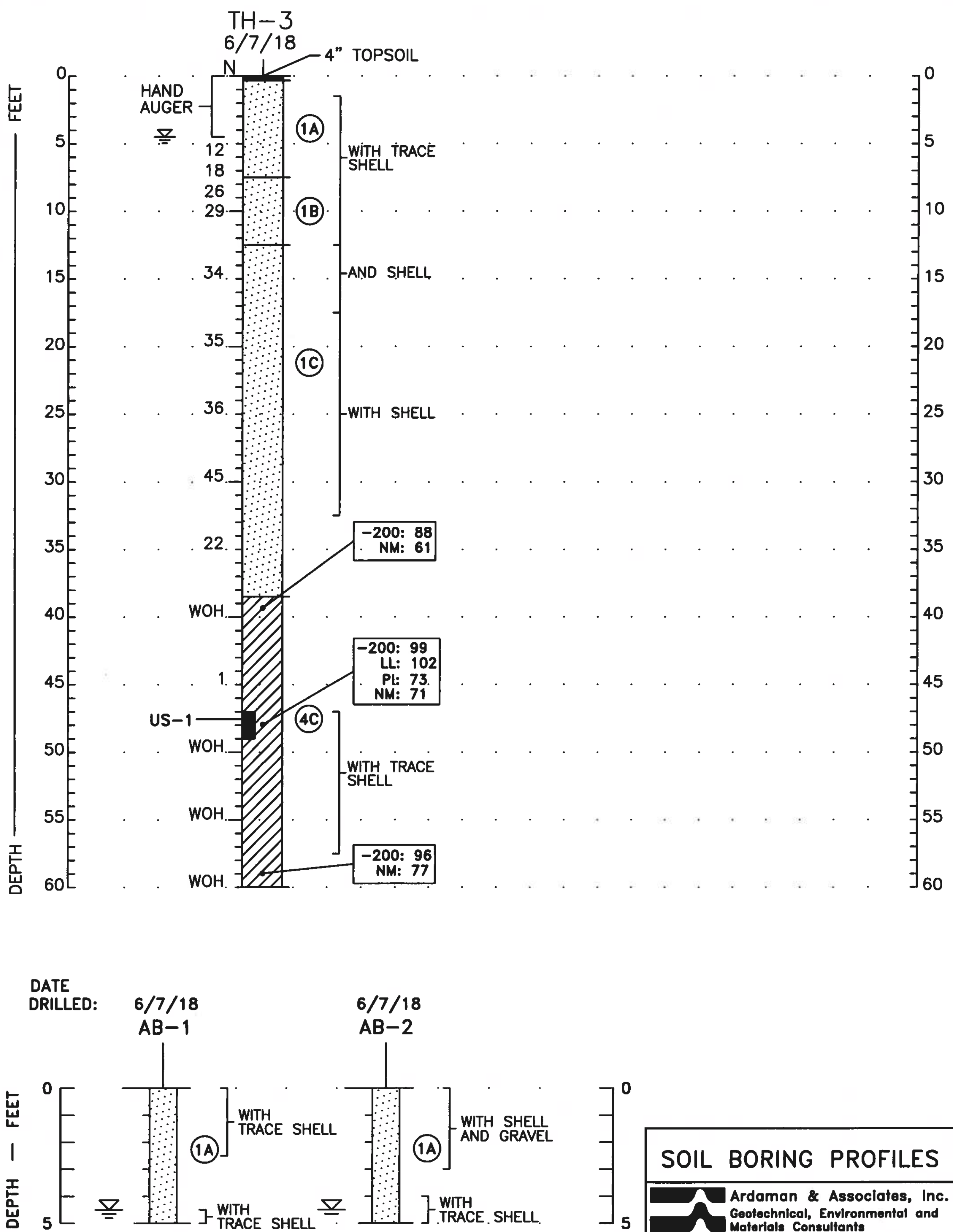

SOIL BORING PROFILES

Ardaman & Associates, Inc.
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SUBSURFACE SOIL EXPLORATION
PROPOSED POLICE DEPARTMENT FACILITY
COCOA BEACH, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 6/14/18
FILE NO. 18-5244	APPROVED BY:	FIGURE:

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APPENDIX III

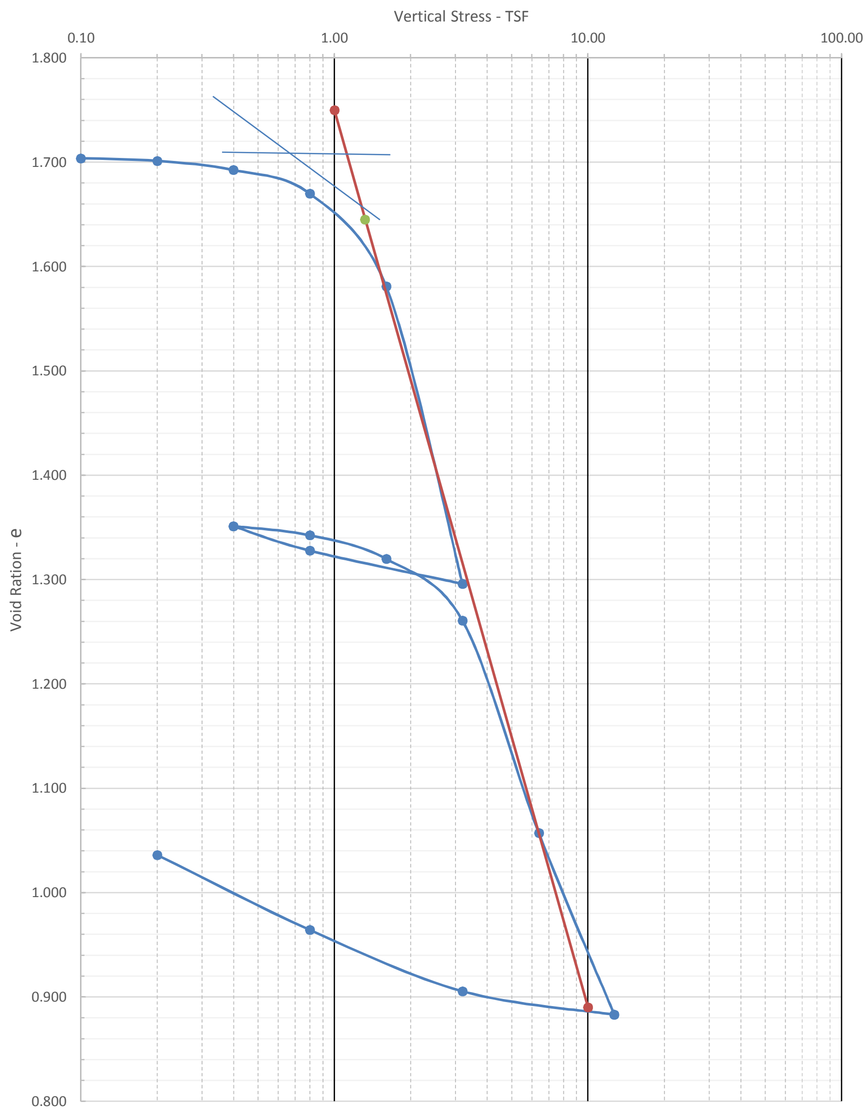
Consolidation Test Results

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST REPORT

CLIENT: CITY OF COCOA BEACH
PROJECT: COCOA BEACH POLICE DEPT
FILE NO.: 18-23-5244

INCOMING SAMPLE NO.: -----
BORING: **TH-3** SAMPLE: **US-1**
DEPTH: 47.0 - 49.0 ☑ ft; ☐ m
LAB IDENTIFICATION NO.:
SAMPLE DESCRIPTION.: GRAY CLAY (CH) -200:99%

DATE SAMPLE RECEIVED:
DATE SAMPLE SET-UP:
DATE REPORTED:



Test Methods & Procedures

ASTM Standard D2435
☐ Method A
☑ Method B

C_v Interpretation Method
☐ c_v [Log Time]
☑ c_v [Sq. Root Time]

Trimming Method
☑ cutting shoe
☐ other

Initial Sample Diameter 7.30 (cm)

Test Conditions

☐ Tested at Natural Moisture Content
☑ Specimen Tested Inundated
Inundated at σ'_{vc} 0.05 (tsf)

Inundation Fluid:
☑ tap water
☐ other

Specimen Conditions

Parameter	Initial	Final
D (cm)	5.00	5.00
H (cm)	1.905	
w_c (%)		
γ_d (pcf)		
e		
S (%)		

G_s: ☐ Assumed ☑ Measured

Index Properties

LL	102
PL	29
PI	73

Particle-Size Analysis ☐ ASTM D422 ☑ ASTM D1140-Method	U.S. Standard Sieve Size	Gravel			Coarse Sand	Medium Sand		Fine Sand			
		3/4"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
Dry Mass(g):	Soil Passing (%, dry mass basis)	-----	-----	-----	-----	-----	-----	-----	-----	-----	

Where: H=Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; e = Void ratio; S = Saturation; G_s= Specific gravity; c_v = Coefficient of consolidation; and $C_{\alpha e}$ = Secondary compression index.

Checked By: Date: