SUBSURFACE SOIL EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION STONEBRIDGE COUNTRY CLUB NEW MAINTENANCE AND OPERATIONS CENTER BOCA RATON, MARTIN COUNTY, FLORIDA

AACE FILE NO. 21-255

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Stonebridge County Club
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Attention: Mr. James Colucci
President

**SUBSURFACE SOIL EXPLORATION AND
GEOTECHNICAL ENGINEERING EVALUATION
STONEBRIDGE COUNTRY CLUB
NEW MAINTENANCE AND OPERATIONS CENTER
BOCA RATON, MARTIN COUNTY, FLORIDA**

1.0 INTRODUCTION

In accordance with your request and authorization, Andersen Andre Consulting Engineers, Inc. (AACE) has completed a subsurface exploration and geotechnical engineering analyses for the above referenced project. The purpose of performing this exploration was to explore shallow soil types and groundwater levels as they relate to the proposed construction, and restrictions which these soil and groundwater conditions may place on the proposed site development. Our work included Standard Penetration Test (SPT) borings, hand auger borings, soil hydraulic conductivity testing, laboratory testing, and engineering analysis. This report documents our explorations and tests, presents our findings, and summarizes our conclusions and recommendations.

2.0 EXECUTIVE SUMMARY

The following summary is intended to provide a brief overview of our findings and recommendations; however, the report should be read in its entirety by the project design team members.

- The proposed building site, at the locations explored, were found to be underlain by soils which are generally satisfactory to support the proposed construction on conventional spread foundations. A maximum design foundation bearing pressure of 2,500 pounds per square foot (psf) is recommended for the proposed structure.

- Typical pavement sections consisting of an asphaltic or rigid concrete wearing surface atop a calcareous base, followed by a stabilized subgrade on compacted natural soils is considered appropriate for the project.

- Site preparation procedures will include clearing, stripping and grubbing of all surface vegetation and organic topsoil, followed by proofrolling of building and pavement areas.

- The groundwater table was encountered in our borings at depths ranging from about 3-4 feet below the existing grades.

3.0 SITE INFORMATION AND PROJECT UNDERSTANDING

3.1 Site Location and Description

The existing Stonebridge Country Club maintenance compound (i.e. the site) is located at 17501 South State Road 7 in Boca Raton, Palm Beach County, Florida (within Section 36, Township 46 South, Range 41 East), and is identified by the Palm Beach County Property Appraiser with Parcel ID 00-41-46-36-03-001-0000.

The location of the subject site is graphically depicted on the Site Vicinity Map (2021 aerial photograph) as well as on a reproduction of the USGS Topographic Quadrangle Map of "University Park, Florida", both presented on Figure No. 1. The USGS Topo-Quad Map depicts the subject property as undeveloped and having an approximate surface elevation of 19 feet relative to the National Geodetic Vertical Datum of 1929.

Generally, the subject site is bordered by the Stonebridge Country Club golf course and residences to the north and west, by a Palm Beach County Sheriff's Substation (District 7 West Boca) to the east, and by a drainage canal and then Pinewood Park to the south.

The subject site is currently an active golf course maintenance compound with a single-story metal building used for offices and equipment/golf cart repair and maintenance, minor auxiliary structures and bins, a vegetation waste stockpile, above-ground storage tanks, and paved parking/drive aisles. Representative photographs of the current site conditions are presented below.

View of proposed building area (looking northeast)

View of proposed building area (looking west)

3.2 Review of USDA Soil Survey

According to the USDA NRCS Web Soil Survey, the predominant surficial soil type within the site boundary is the Oldsmar sand, 0 to 2 percent slopes (USDA Map Unit 25) with a minor presence of the Riviera fine sand, frequently flooded, 0 to 1 percent slopes (USDA Map Unit 37) near the southeastern portion of the site. These soil types are described by the USDA NRCS to consist of sandy and loamy marine deposits originating from within flatwoods and depressions within historic marine terraces, with sands, sandy clay loam, fine sands and fine sandy loam present to depths in excess of 80 inches below grade.

The approximate location of the subject site was superimposed on an aerial photograph obtained from the USDA Web Soil Survey and is shown on Figure No. 1. Further, excerpts from the USDA Web Soil Survey summary report are included in Appendix I.

3.3 Project Understanding

Based on our review of the forwarded project-related information, we understand that it is proposed to construct a new single-story, ±13,000SF Maintenance and Operations Center metal building within the existing Stonebridge maintenance compound. For construction of this type we expect maximum wall loads of 1-2 kips per lineal foot and maximum column loads of 150 kips. We expect that a maximum of 1-2 feet of fill will be needed to raise the building grades. Additional project components include surface pavement for new parking spaces and drive aisles, plus drainage improvements.

4.0 FIELD EXPLORATION PROGRAM

To explore subsurface conditions at the site, the exploration program summarized in Table 1 below was completed:

Table 1 - Field Exploration Program

Field Work Type	Standard	# of Borings	Depth Below Grade [feet]	Location
Standard Penetration Test (SPT)	ASTM D1586	3	20	Refer to Figure No. 2
Auger	ASTM D1452	5	4-5	Refer to Figure No. 2
Soil Hydraulic Conductivity Test	SFWMD ERPIM(1)	1	6	Refer to Figure No. 2

Note to Table 1: (1) SFWMD Environmental Resource Permit Information Manual, Volume IV

Our site visits and field exploration program were completed in the period September 10-16, 2021. The field work locations shown on Figure No. 2 were determined in the field by our field crew using the provided site plan, aerial photographs, existing site features, and a hand-held GPS instrument. The locations should be considered accurate only to the degree implied by the method of measurement used. We preliminarily anticipate that the actual locations are within 15 feet of those shown on Figure No. 2.

Summaries of AACE's field procedures are presented in Appendix II and the individual boring profiles are presented on the attached on Sheet No. 1. Samples obtained 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 for further classification. The soil samples recovered from our explorations will be kept in our laboratory for 60 days, then discarded unless you specifically request otherwise.

5.0 OBSERVED SUBSURFACE CONDITIONS

5.1 General Soil Conditions

Detailed subsurface conditions are illustrated on the soil boring profiles presented on the attached Sheet No. 1. 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.

In general, at the locations and depths explored, the majority of our soil borings encountered a thin mantle of topsoil (sands with roots/organics) followed by fine sands (SP) and occasionally slightly clayey fine sands (SP-SC) to depths of about 4-5 feet below grade. At this depth, loose to medium dense sandy limestone fragments (L) and fine sands (SP) with limestone fragments were encountered reaching the termination depths of our borings.

The above soil profile is outlined in general terms only. Please refer to the attached Sheet No. 1 for individual soil profile details.

5.2 Measured Groundwater Level

The groundwater table depth as encountered in the borings during the field investigations is shown adjacent to the soil profiles on the attached Sheet No. 1. As can be seen, the groundwater table was generally encountered at depths of about 3-4 feet below the existing ground surface. 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.

5.3 Estimated Normal Seasonal High Groundwater Table

The groundwater table will fluctuate seasonally, primarily based on rainfall. The normal seasonal high groundwater level is likely during the rainy season in Southeast Florida, typically between June and September of each year. The water table elevations associated with a 100-year flood level (or during an extreme storm event) would be much higher than the normal seasonal high water table elevation. The normal seasonal high groundwater table can also be influenced by the presence of relief points such as canals, lakes, ponds, swamps, etc., as well as by the drainage characteristics of the in-situ soils.

Based upon our field exploration, our observation of recovered soil samples and on review of the soil survey, we estimate that the normal seasonal high groundwater level at the boring locations is about 1 foot above the levels encountered in the borings, with the potential for the lower portions of the site to experience standing/ponded water after prolonged or significant storm events.

The estimated normal seasonal high groundwater levels do not provide any assurance that the groundwater levels will not exceed these estimated levels during any given year in the future. Drainage impediments, storm events or other such occurrences may result in groundwater levels exceeding our estimates.

If a more accurate determination of the seasonal groundwater level variations on this site is prudent for the design of the project, we would recommend installing a number of piezometers and performing periodic monitoring of the ambient groundwater levels.

5.4 Soil Hydraulic Conductivity Testing

One (1) soil hydraulic conductivity test was performed at the location shown on Figure No. 2. In general, the test was performed in substantial accordance with methods described in the South Florida Water Management District (SFWMD) Environmental Resource Permit Information Manual (ERPIM), Volume IV, and yielded the following results.

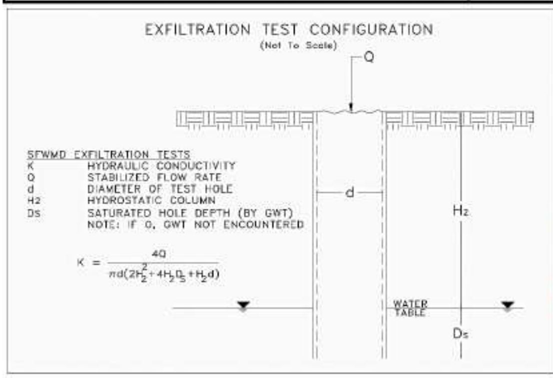
Table 2 - Soil Hydraulic Conductivity Test Results

Test No.	Groundwater Depth (ft-bls)	Flow Rate, Q (cfs)	Hydraulic Conductivity, K (cfs/sqf - ft head)
EX-1	3.5	9.8×10^{-3}	4.1×10^{-4}

The soil hydraulic conductivity test report is presented on the following page.

Test Number	**EX-1**	Project Name	Stonebridge Country Club	Weather Conditions	Overcast
		Project Number	21-255	Temperature	85F
		Test Location	Refer to Figure No. 2	Technician	CL
		Date	09/16/2021	Engineer	PA

DIAMETER OF TEST HOLE (FEET): **d** =	0.5	
DEPTH OF TEST HOLE (FEET): H_1 =	6	
DEPTH TO WATER TABLE (FEET): H_2 =	3.5	
SATURATED HOLE DEPTH (FEET): D_s =	2.5	
METER READING (Gallons): V_I =	0	@ 0.00 MIN
METER READING (Gallons): V_F =	44	@ 10.00 MIN
AVERAGE FLOW RATE (GPM) =	4.40	
"STABILIZED" FLOW RATE (CFS): Q =	9.8E-03	
HYDRAULIC CONDUCTIVITY (CFS / FT² - FT. HEAD): K =	**4.1E-04**	



Soil Profile	
Depth (in-bls)	**Description**
0-48	Gray fine sand (SP)
48-72	Tan fine sand (SP) with limestone fragments
Groundwater encountered 42 inches below grade	

NOTES:
The hydraulic conductivity test was performed in general accordance with the methods described in the South Florida Water Management District (SFWMD) Environmental Resource Permit Information Manual (Volume IV).
The K-value was calculated based on the exfiltration test procedure as shown hereon.
The presented hydraulic conductivity (K) value is applicable for an exfiltration trench installed at the same depth as the borehole test. The K-value represents an ultimate value. The designer should decide on the required factor of safety (minimum of 2, per SFWMD).

6.0 LABORATORY TESTING PROGRAM

Our drillers observed the soil recovered from the SPT sampler and the augers, placed the recovered soil samples in moisture proof containers, and maintained a log for each boring. The recovered soil samples, along with the field boring logs, were transported to our Port St. Lucie soils laboratory where they were visually examined by AACE's project engineer to determine their engineering classification. The visual classification of the samples was performed in accordance with the Unified Soil Classification System, USCS. The results of our classifications and laboratory analyses are presented on the soil boring profiles presented on Sheet No. 1.

7.0 GEOTECHNICAL ENGINEERING EVALUATION

7.1 General

Based on the findings of our site exploration, our evaluation of subsurface conditions, and judgment based on our experience with similar projects, we conclude that the soils underlying this site are generally satisfactory to support the proposed single-story golf maintenance facility construction on conventional spread foundations. However, in our opinion, the bearing capacity of the loose near-surface soils should be improved in order to reduce the risk of unsatisfactory foundation performance. The general soil improvement we recommend includes proofrolling the building site site with a heavy vibratory roller.

Following are specific recommendations for site preparation procedures, foundation design, and pavement systems for the project.

7.2 Site Preparation Recommendations

7.2.1 Clearing

The site surface should be cleared, grubbed and stripped of all vegetation, topsoil, trash and debris (if any). Tree stumps should be removed entirely, and their excavations backfilled with clean granular soils, compacted to the specifications noted below. Similarly, remnants of former development features (foundations, utilities, drainage, etc.) should be removed from within the proposed building and pavement areas.

7.2.2 Compaction Procedures

Following clearing, the proposed building and pavement areas should be proofrolled with a 10 ton (minimum) vibratory roller; any soft, yielding soils detected should be excavated and replaced with clean, compacted backfill that conforms with the recommendations below. Sufficient passes should be made during the proofrolling operations to produce dry densities not less than 95 percent of the modified Proctor (ASTM D1557) maximum dry density of the compacted material to depths of 2 feet below the compacted surface, or 2 feet below the bottom of footings, whichever is lower. In any case, the building and pavement areas should receive not less than 10 overlapping passes, half of them in each of two perpendicular directions.

We recommend that the site preparation contractor closely monitor the vibrations produced during the proofrolling operations so that they do not adversely affect any nearby structures.

After the exposed surface has been proofrolled and tested to verify that the desired dry density has been obtained, the building and pavement areas may be filled to the desired grades. All fill material should conform to the recommendations below. It should be placed in uniform layers not exceeding 12 inches in loose thickness. Each layer should be compacted to a dry density not less than 95 percent of its modified Proctor (ASTM D1557) maximum value.

After completion of the general site preparations discussed above, the bottom of foundation excavations dug through the compacted natural ground, fill or backfill, should be compacted so as to densify soils loosened during or after the excavation process, or washed or sloughed into the excavation prior to the placement of forms. A vibratory, walk-behind plate compactor can be used for this final densification immediately prior to the placement of reinforcing steel, with previously described density requirements to be maintained below the foundation level.

We note that medium dense sandy limestone fragments were encountered starting at depths of 4-5 feet below the existing grades. While these soils may not affect the excavation for building foundations, deeper utility and/or drainage installations may require heavy-duty excavation equipment. Further, this sandy limestone formation may be more cemented (i.e. denser/harder) in areas not explored.

Following removal of foundation forms, backfill around foundations should be placed in lifts six inches or less in thickness, with each lift individually compacted with a plate tamper. The backfill should be compacted to a dry density of at least 95 percent of the modified Proctor (ASTM D1557) maximum dry density.

7.2.3 Fill Material

All fill material under the building and pavement should consist of clean sands free of organics and other deleterious materials. The fill material should have not more than 12 percent by dry weight passing the U.S. No. 200 sieve, and no particle larger than 3 inches in diameter. Backfill behind walls, if any, should be particularly pervious, with not more than 4 percent by dry weight passing the U.S. #200 sieve.

7.3 Building Foundation and Slab Design

After the foundation soils have been prepared as recommended above, the site should be suitable for supporting the proposed single-story golf maintenance facility construction on conventional shallow foundations (or a thickenedproportioned for an allowable bearing stress of 2,500 pounds per square foot [psf], or less.

To provide an adequate factor of safety against a shearing failure in the subsoils, all continuous foundations should be at least 18 inches wide, and all individual column footings should have a minimum width of 36 inches. Exterior foundations should bear at least 24 inches below adjacent outside final grades.

Based upon the boring information and the assumed loading conditions, we estimate that the recommended allowable bearing stress will provide a minimum factor of safety in excess of two against bearing capacity failure. With the site prepared and the foundations designed and constructed as recommended, we anticipate total settlements of one inch or less, and differential settlement between adjacent similarly loaded footings of less than one-quarter of an inch. Because of the granular nature of the subsurface soils, the majority of the settlements should occur during construction; post-construction settlement should be minimal.

We recommend that representatives of AACE inspect all footing excavations in order to verify that footing bearing conditions are consistent with expectations. Foundation concrete should not be cast over a foundation surface containing topsoil or organic soils, trash of any kind, surface made muddy by rainfall runoff, or groundwater rise, or loose soil caused by excavation or other construction work. Reinforcing steel should also be clean at the time of concrete casting. If such conditions develop during construction, the reinforcing steel must be lifted out and the foundation surface reconditioned and approved by AACE.

After the ground surface is proofrolled and filled, if necessary, as recommended in this report, the floor slab can be placed directly on the prepared subgrade. For design purposes, we recommend using a subgrade reaction modulus of 150 pounds per cubic inch (pci) for the compacted shallow sands. In our opinion, a highly porous base material is not necessary. We recommend to use a minimum of 10 mil polyolefin film as the main component of a vapor barrier system.

8.0 PAVEMENT RECOMMENDATIONS

8.1 General

Actual pavement section thickness should be provided by the project civil engineer based on traffic loads, volume, and the owners design life requirements. The following sections represent minimum thicknesses representative of typical load and construction practices and as such periodic maintenance should be anticipated. In addition, recommendations for a rigid pavement design are presented for use in delivery areas, dumpster pads, etc.

We recommend that the pavement sections be installed late in construction when most heavy construction traffic has ceased. If base material is placed during construction to provide a working surface it should be proofrolled, leveled, and thickened as required prior to paving at the end of construction.

8.2 Flexible Pavement Sections

We recommend a pavement section consisting of an asphaltic concrete wearing surface on a calcareous base course supported on stabilized subbase over well-compacted subgrade.

After clearing and proofrolling the site surface as previously recommended, the surficial soils should be suitable to support the pavement sections. The embankment material should be compacted to a dry density of 98 percent of the modified Proctor (ASTM D1557/AASHTO T-180) maximum dry density of the compacted soil to a depth of one foot below the surface.

8.2.1 Stabilized Subgrade

The subbase material to a depth of 12 inches should have a minimum Limerock Bearing Ratio (LBR) value (FDOT FM 5-515) of 40 and it should be compacted to at least 98 percent of its modified Proctor (ASTM D1557 or AASHTO T-180) maximum dry density.

8.2.2 Base Course

The base course may consist of crushed limerock or coquina and should have a minimum Limerock Bearing Ratio (LBR) value (FDOT FM 5-515) of 100 and a minimum carbonate content (FDOT FM 5-514) of 70 percent (limerock) or 50 percent (coquina). We recommend a base course at least 6 inches thick for standard pavements and a base course of 10 inches for heavy-duty pavements. The 6-inch base course may be placed and compacted in a single layer, however, the 10-inch base course should be placed and compacted in two layers. All base course material should be compacted to at least 98 percent of its modified Proctor maximum dry density.

8.2.3 Asphalt Surface

We recommend an FDOT Type SP-9.5 or SP-12.5 asphaltic wearing surface. We recommend a wearing surface 1.5 inches thick on standard pavement and 2.5 inches thick on heavy-duty pavement. The 2.5-inch wearing surface should be placed and compacted in two layers. Care must be exercised to place the asphalt over dry, well primed base material.

8.2.4 Flexible Pavement Summary

The above recommendations should provide high quality pavement. If greater risk of more frequent pavement maintenance and repair is acceptable, then the above recommendations could be relaxed somewhat. Table 3 summarizes the recommended flexible pavement sections.

Table 3 - Flexible Pavement Summary

Traffic Group	Thickness [inches]			Structural Number
	Stabilized Subgrade	Base Course	Asphalt Surface	
Light Duty (interior roads): Auto parking area, light panel and pickup trucks; average gross vehicle weight of 4,000 lbs.	12	6	1.5	2.7
Heavy Duty: Bus drop-off areas, delivery trucks; average gross vehicle weight of 25,000 lbs	12	10	2.5	3.8

8.3 Rigid Pavement Sections

After clearing and proofrolling the site surface as previously recommended, the surficial soils should be suitable to support the pavement sections. The subgrade material should be compacted to a dry density of 98 percent of the modified Proctor (ASTM D1557 or AASHTO T-180) maximum dry density of the compacted soil to a depth of two feet below the surface. The subgrade surface should be saturated immediately prior to concrete placement to provide adequate moisture for curing of the concrete.

We recommend a six-inch thick pavement section of Portland cement concrete. The concrete should have a minimum 28-day compressive strength of 4,000 psi. Construction control joints should be placed no more than 15 feet apart in either direction and should be at least one-quarter of the thickness of the concrete. They should be cut as soon as the concrete will support the crew and equipment (8 to 12 hours). The concrete should be cured by moist curing or by application of a liquid curing compound. The steel reinforcement within the concrete pavement should be designed by the project civil or structural engineer.

8.4 Curbing

The curbing around landscaped areas adjacent to pavement should be constructed with full-depth curb sections. Use of extruded curb sections that lie directly above the final asphalt surface, or omission of the curbing, can allow migration of irrigation water from the landscaped areas. The excess water often causes separation of the asphalt wearing surface from the base and softening of the base material, resulting in early deterioration of the pavement.

9.0 QUALITY CONTROL PROGRAM

We recommend establishing a robust quality control program to verify that all site preparation and foundation and pavement construction is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Andersen Andre Consulting Engineers, Inc.

An experienced engineering technician should monitor all stripping and grubbing operations on a full-time basis to verify that deleterious materials have been removed. The technician should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade and that the subgrade soils exhibit an appropriate response to the compaction efforts. 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. As such, 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.

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

10.0 CLOSURE

The geotechnical evaluation submitted herein is based on the data obtained from the soil boring and test profiles presented on Sheet No. 1, and our understanding of the project as previously described. Limitations and conditions to this report are presented in Appendix III.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices for the exclusive use of Stonebridge Country Club. No other warranty, expressed or implied, is made.

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

Sincerely,
ANDERSEN ANDRE CONSULTING ENGINEERS, INC.

PETER GREGORY ANDERSEN LICENSE No. 57956 STATE OF FLORIDA PROFESSIONAL ENGINEER
9-21-2021

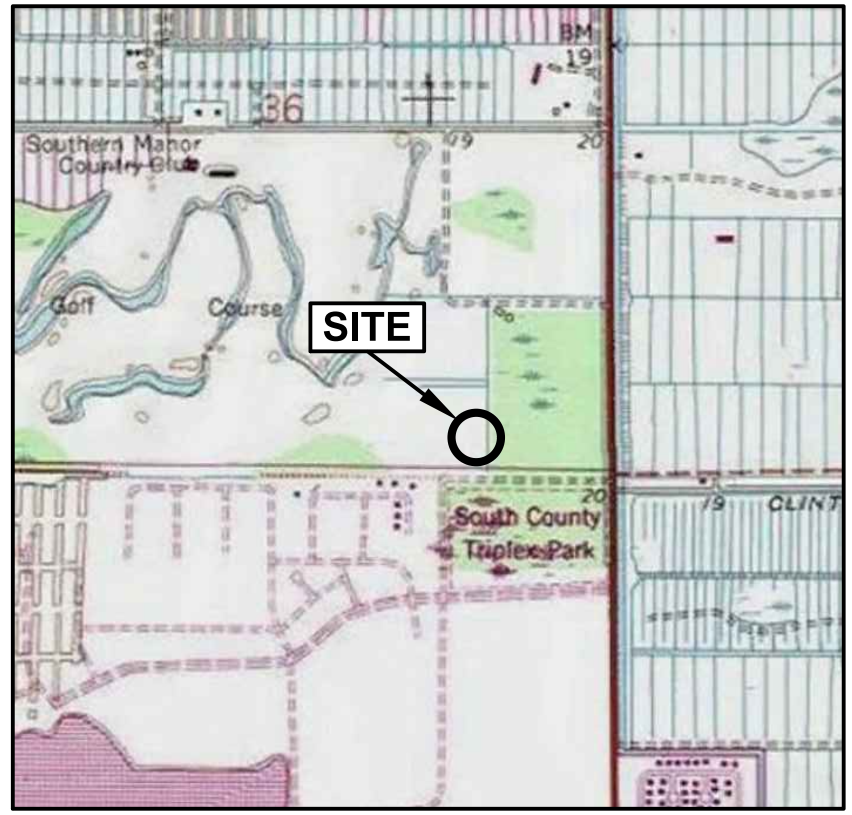
Peter G. Andersen, P.E.
Principal Engineer
Fla. Reg. No. 57956

David P. Andre, P.E.
Principal Engineer
Fla. Reg. No. 53969
9/21/21

cc: Ms. Elizabeth Levesque - Johnston Group Development & Construction, Inc.

2021 AERIAL PHOTOGRAPH

USGS TOPOGRAPHIC QUADRANGLE MAP
OF "UNIVERSITY PARK, FL"



USDA SOIL SURVEY MAP

PALM BEACH COUNTY PROPERTY APPRAISER

Parcel ID 00-41-46-36-03-001-0000

PUBLIC LAND SURVEY SYSTEM

Section 36, Township 46 South, Range 41 East

USDA NRCS SOIL TYPE WITHIN SITE BOUNDARY

25: Oldsmar sand, 0 to 2 percent slopes
37: Riviera fine sand, frequently ponded, 0 to 1 ppercent slopes

NORTH

NOT TO SCALE

Graphical sources:
- Google Earth Pro
- QUADS/Earth Survey
- USDA NRCS Web Soil Survey

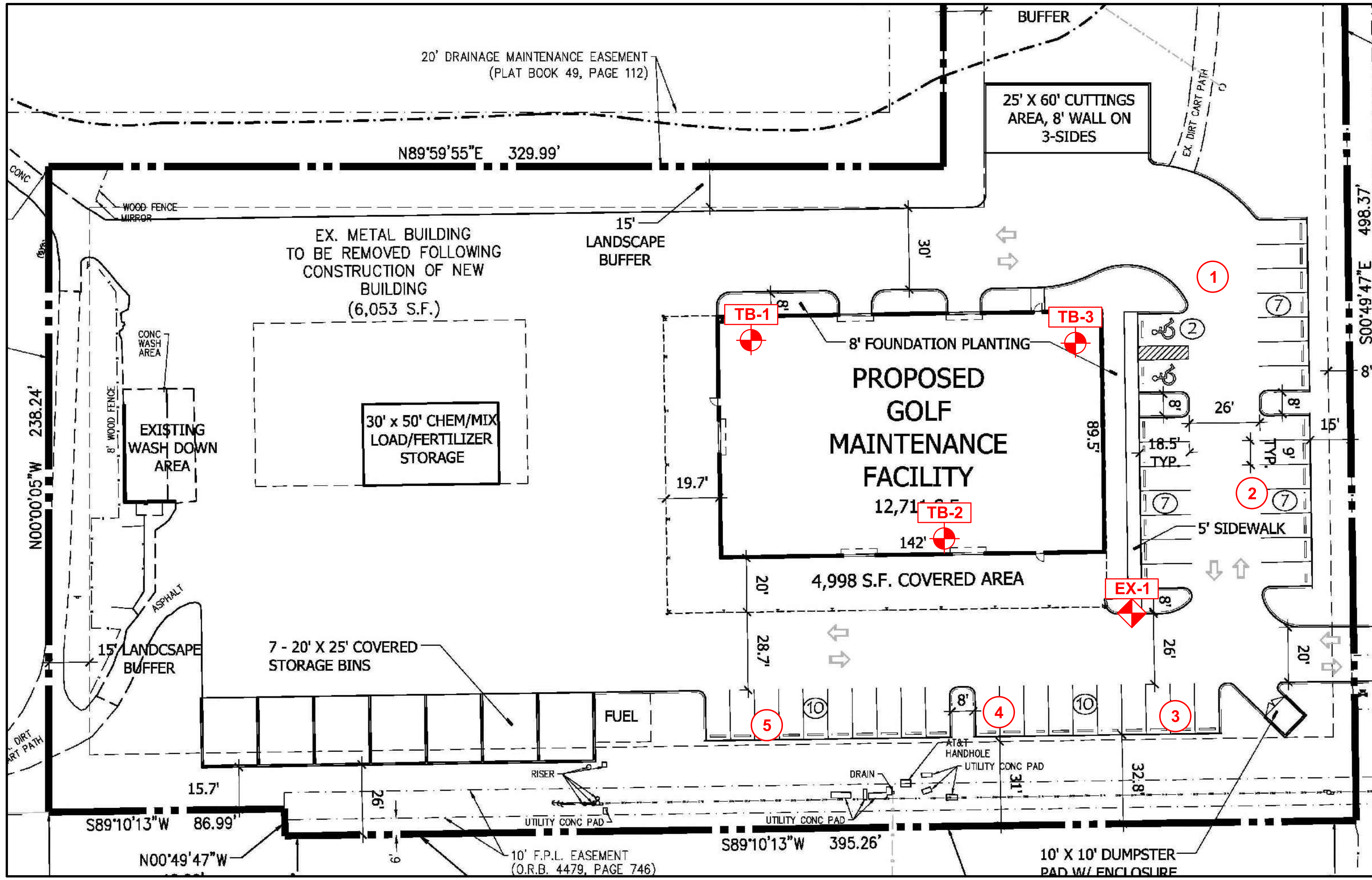
ANDERSEN ANDRE CONSULTING ENGINEERS, INC. 834 SW Swan Avenue, Port St. Lucie, FL 34983 772-807-9191 www.AACEinc.com	SITE VICINITY MAPS	SUBSURFACE SOIL EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION STONEBRIDGE COUNTRY CLUB NEW MAINTENANCE AND OPERATIONS CENTER BOCA RATON, PALM BEACH COUNTY, FLORIDA	Drawn by: PGA	Date: September 2021
			Checked by: DPA	Date: September 2021
			AACE File No: 21-255	Figure No. 1

LEGEND

- TB-# — Standard Penetration Test Boring
- ## — Hand Auger Boring (HAB-#)
- EX-# — Exfiltration Test

NOTES

Shown and noted field work locations are approximate, and were located using the provided site plan, aerial photographs, existing site features, and a hand-held GPS instrument. Atmospheric disturbances, forest canopy cover, local weather conditions, etc. may affect the accuracy of the GPS instrument readings. The shown field work locations should be considered accurate only to the degree implied by the method of measurement used.

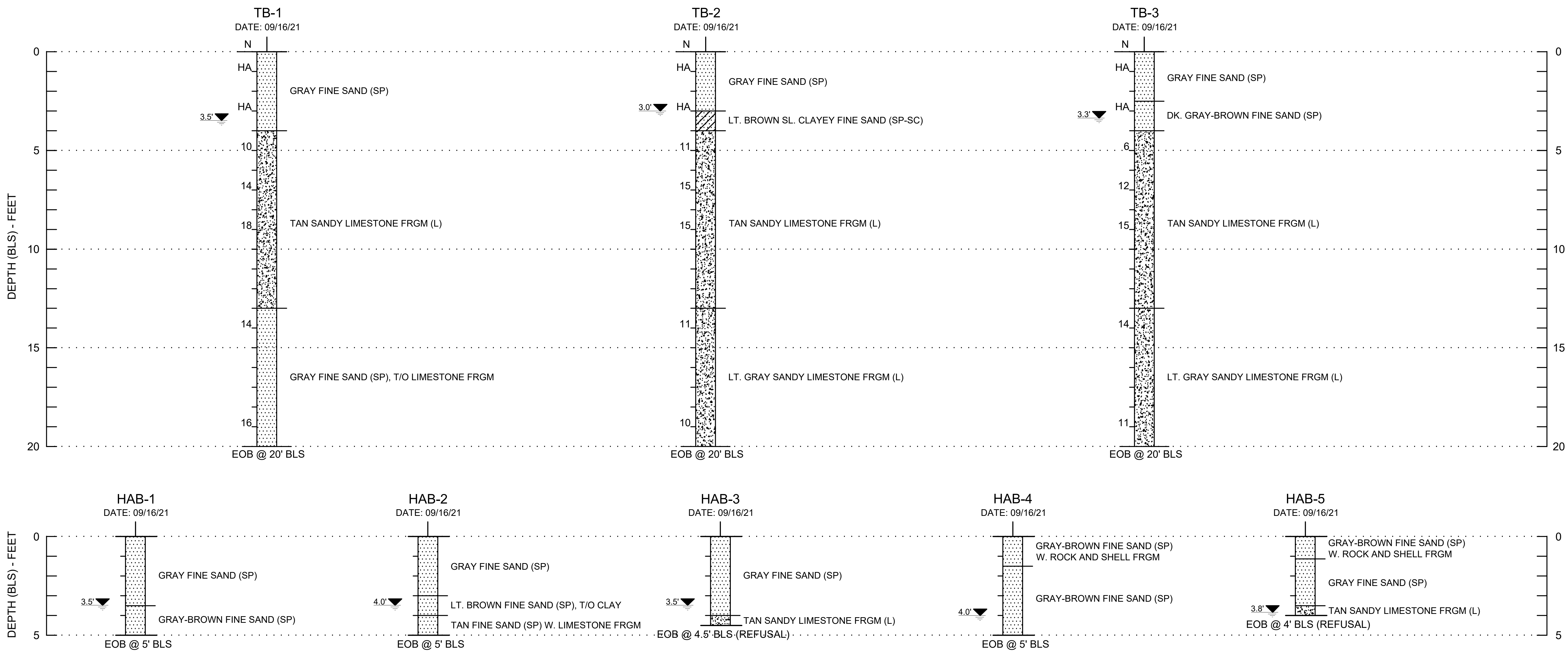


NORTH

NOT TO SCALE

Graphical source:
- Preliminary Site Plan provided by Litterick Landscape Architecture

ANDERSEN ANDRE CONSULTING ENGINEERS, INC. 834 SW Swan Avenue, Port St. Lucie, FL 34983 772-807-9191 www.AACEinc.com	**FIELD WORK LOCATION PLAN**	SUBSURFACE SOIL EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION STONEBRIDGE COUNTRY CLUB NEW MAINTENANCE AND OPERATIONS CENTER BOCA RATON, PALM BEACH COUNTY, FLORIDA	Drawn by: PGA Checked by: DPA AACE File No: 21-255	Date: September 2021 Date: September 2021 **Figure No. 2**



SOIL GRAPHICAL LEGEND:

- FINE SAND (SP)
- SLIGHTLY CLAYEY FINE SAND (SP-SC)
- SANDY LIMESTONE FRAGMENTS (L)

NOTE: 3"-6" of topsoil (sands w. roots/organics) encountered in some borings (not shown on boring profiles)

DRILLING NOTES:

TB-#	STANDARD PENETRATION TEST [SPT] BORING (ASTM D1586)	DRILL CREW CHIEF: DB
N	SPT RESISTANCE IN BLOWS PER FOOT	DRILL RIG: CME-45
HAB-#	HAND AUGER BORING (ASTM D1452)	DRILLING METHOD: ROTARY-WASH/BENTONITE SLURRY
X.X'	GROUNDWATER TABLE (FT-BLS) AT TIME OF DRILLING	CASING: NONE
HA	HAND AUGER FOR UTILITY CLEARANCE	SPLIT-SPOON SAMPLER:
EOB	END OF BORING	LENGTH: 24"
BLS	BELOW LAND SURFACE	OUTSIDE DIAMETER: 2.0"
FRGM	FRAGMENTS	SPT HAMMER:
		AVERAGE DROP: 30"
SP	UNIFIED SOIL CLASSIFICATION SYSTEM [USCS]	WEIGHT: 140 LBS
SP-SC	USCS GROUPS DETERMINED BY VISUAL CLASSIFICATION	TYPE: SAFETY/MANUAL
(L	LIMESTONE/SANDY LIMESTONE)	

AACE

ANDERSEN ANDRE CONSULTING ENGINEERS, INC.

834 SW Swan Avenue, Port St. Lucie, FL 34983 772-807-9191 www.AACEinc.com

SOIL BORING PROFILES

**SUBSURFACE SOIL EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION
STONEBRIDGE COUNTRY CLUB
NEW MAINTENANCE AND OPERATIONS CENTER
BOCA RATON, PALM BEACH COUNTY, FLORIDA**

Drawn by: PGA	Date: September 2021
Checked by: DPA	Date: September 2021
AACE File No: 21-255	Sheet No. 1

APPENDIX I

USDA Soil Survey Information

United States
Department of
Agriculture

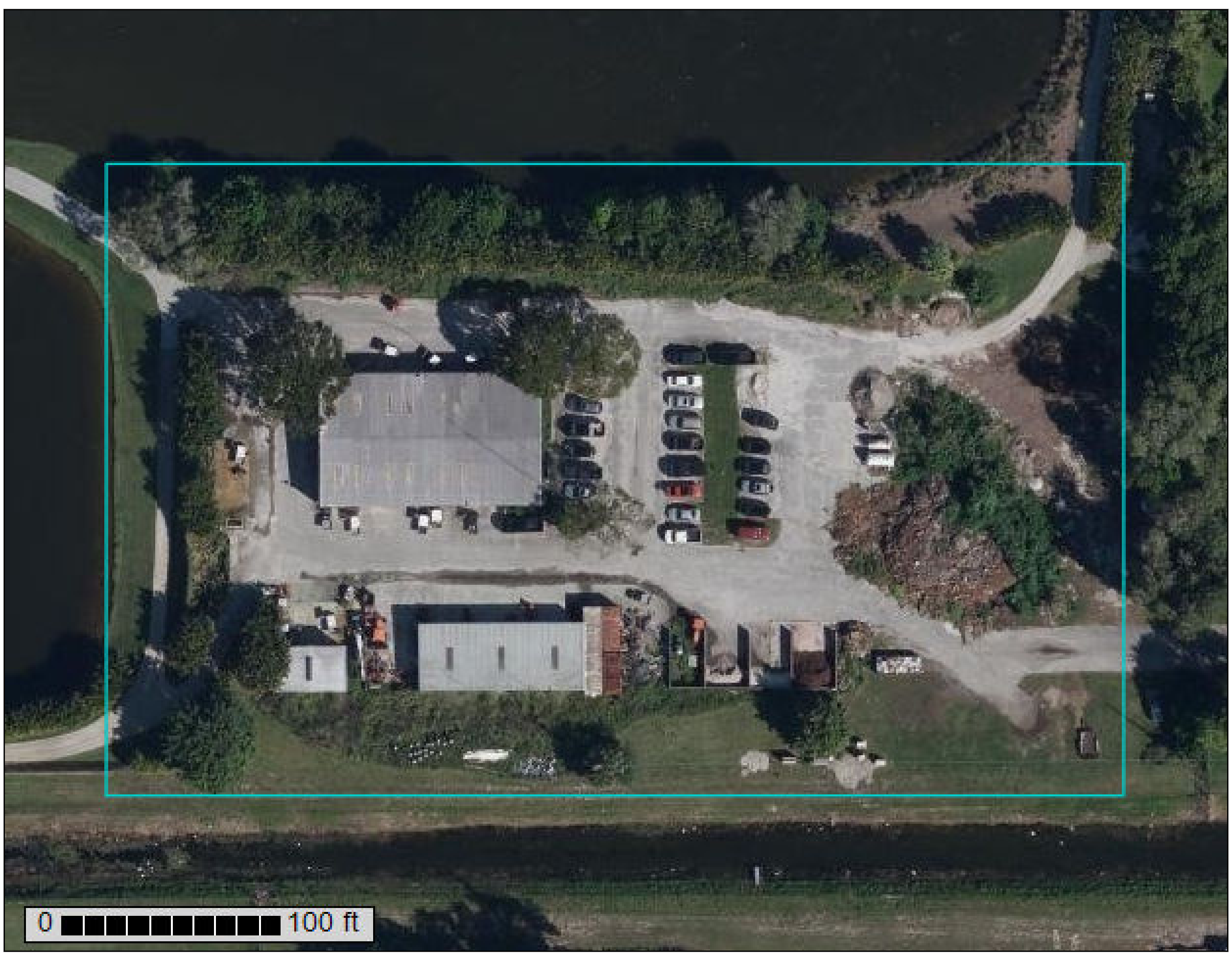
NRCS

Natural
Resources
Conservation
Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Palm Beach County Area, Florida

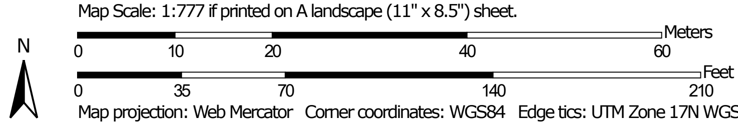
Stonebridge CC



September 17, 2021

Custom Soil Resource Report
Soil Map (Stonebridge CC)

Map Scale: 1:777 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Palm Beach County Area, Florida
Survey Area Data: Version 17, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 7, 2020—Mar 26, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Stonebridge CC)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
25	Oldsmar sand, 0 to 2 percent slopes	3.0	98.0%
37	Riviera fine sand, frequently ponded, 0 to 1 percent slopes	0.1	2.0%
Totals for Area of Interest		**3.1**	**100.0%**

Map Unit Descriptions (Stonebridge CC)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Palm Beach County Area, Florida

25—Oldsmar sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2sm4p
Elevation: 0 to 80 feet
Mean annual precipitation: 42 to 56 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Oldsmar and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oldsmar

Setting

Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy and loamy marine deposits

Typical profile

A - 0 to 6 inches: sand
E - 6 to 38 inches: sand
Bh - 38 to 50 inches: sand
Btg - 50 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Forage suitability group: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Minor Components

Immokalee

Percent of map unit: 6 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex, linear
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Holopaw

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces, drainageways on marine terraces
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Convex, linear
Across-slope shape: Linear, concave
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Basinger

Percent of map unit: 3 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Boca

Percent of map unit: 2 percent
Landform: Flats on marine terraces, drainageways on marine terraces
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Convex, linear
Across-slope shape: Linear, concave
Ecological site: R155XY003FL - South Florida Flatwoods
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy over loamy soils on flats of hydric or mesic lowlands (G155XB241FL)
Hydric soil rating: Yes

Tequesta

Percent of map unit: 1 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R156BY010FL), Organic soils in depressions and on flood plains (G156AC645FL)
Hydric soil rating: Yes

37—Riviera fine sand, frequently ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2tzwl
Elevation: 0 to 80 feet
Mean annual precipitation: 44 to 64 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Farmland of local importance

Map Unit Composition

Riviera and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riviera

Setting

Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and loamy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 36 inches: fine sand
Bt/E - 36 to 42 inches: fine sandy loam
Cg1 - 42 to 56 inches: fine sand
Cg2 - 56 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D

Forage suitability group: Sandy over loamy soils on stream terraces, flood plains, or in depressions (G155XB245FL)
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy over loamy soils on stream terraces, flood plains, or in depressions (G155XB245FL)
Hydric soil rating: Yes

Minor Components

Chobee

Percent of map unit: 7 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R156BY010FL), Loamy and clayey soils on stream terraces, flood plains, or in depressions (G156BC345FL)
Hydric soil rating: Yes

Tequesta

Percent of map unit: 4 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R156BY010FL), Organic soils in depressions and on flood plains (G156AC645FL)
Hydric soil rating: Yes

Wabasso

Percent of map unit: 4 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex, linear
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

APPENDIX II

General Notes

(Soil Borings, Sampling and Testing Methods)

ANDERSEN ANDRE CONSULTING ENGINEERS, INC.
SOIL BORING, SAMPLING AND TESTING METHODS

GENERAL

Andersen Andre Consulting Engineers, Inc. (AACE) borings describe subsurface conditions only at the locations drilled and at the time drilled. They provide no information about subsurface conditions below the bottom of the boreholes. At locations not explored, surface conditions that differ from those observed in the borings may exist and should be anticipated.

The information reported on our boring logs is based on our drillers' logs and on visual examination in our laboratory of disturbed soil samples recovered from the borings. The distinction shown on the logs between soil types is approximate only. The actual transition from one soil to another may be gradual and indistinct.

The groundwater depth shown on our boring logs is the water level the driller observed in the borehole when it was drilled. These water levels may have been influenced by the drilling procedures, especially in borings made by rotary drilling with bentonitic drilling mud. An accurate determination of groundwater level requires long-term observation of suitable monitoring wells. Fluctuations in groundwater levels throughout the year should be anticipated.

The absence of a groundwater level on certain logs indicates that no groundwater data is available. It does not mean that groundwater will not be encountered at that boring location at some other point in time.

STANDARD PENETRATION TEST

The Standard Penetration Test (SPT) is a widely accepted method of in situ testing of foundation soils (ASTM D-1586). A 2-foot (0.6m) long, 2-inch (50mm) O.D. split-barrell sampler attached to the end of a string of drilling rods is driven 24 inches (0.60m) into the ground by successive blows of a 140-pound (63.5 Kg) hammer freely dropping 30 inches (0.76m). The number of blows needed for each 6 inches (0.15m) increments penetration is recorded. The sum of the blows required for penetration of the middle two 6-inch (0.15m) increments of penetration constitutes the test result of N-value. After the test, the sampler is extracted from the ground and opened to allow visual description 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 following tables relate N-values to a qualitative description of soil density and, for cohesive soils, an approximate unconfined compressive strength (Qu):

Cohesionless Soils:	N-Value	Description
	0 to 4	Very loose
	4 to 10	Loose
	10 to 30	Medium dense
	30 to 50	Dense
	Above 50	Very dense

Cohesive Soils:	N-Value	Description	Qu
	0 to 2	Very soft	Below 0.25 tsf (25 kPa)
	2 to 4	Soft	0.25 to 0.50 tsf (25 to 50 kPa)
	4 to 8	Medium stiff	0.50 to 1.0 tsf (50 to 100 kPa)
	8 to 15	Stiff	1.0 to 2.0 tsf (100 to 200 kPa)
	15 to 30	Very stiff	2.0 to 4.0 tsf (200 to 400 kPa)
	Above 30	Hard	Above 4.0 tsf (400 kPa)

The tests are usually performed at 5 foot (1.5m) intervals. However, more frequent or continuous testing is done by AACE 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 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, 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. After completion of a test borings, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed by backfilling, either with accumulated cuttings or lean cement.

Representative split-spoon samples from each sampling interval and from different strata are brought to our laboratory in air-tight jars for classification and testing, if necessary. Afterwards, the samples are discarded unless prior arrangement have been made.

POWER AUGER BORINGS

Auger borings (ASTM D-1452) are used when a relatively large, continuous sampling of soil strata close to the ground surface is desired. A 4-inch (100 mm) diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot (1.5m) sections. It is powered by the rotary drill rig. The sample is recovered by withdrawing the auger our of the ground without rotating it. The soil sample so obtained, is classified in the field and representative samples placed in bags or jars and returned to the AACE soils laboratory for classification and testing, if necessary.

HAND AUGER BORINGS

Hand auger borings are used, if soil conditions are favorable, when the soil strata are to be determined within a shallow (approximately 5-foot [1.5m]) depth or when access is not available to power drilling equipment. A 3-inch (75mm) diameter hand bucket auger with a cutting head is simultaneously turned and pressed into the ground. The bucket auger is retrieved at approximately 6-inch (0.15m) interval and its contents emptied for inspection. On occasion post-hole diggers are used, especially in the upper 3 feet (1m) or so. Penetrometer probings can be used in the upper 5 feet (1.5m) to determine the relative density of the soils. The soil sample obtained is described and representative samples put in bags or jars and transported to the AACE soils laboratory for classification and testing, if necessary.

UNDISTURBED SAMPLING

Undisturbed sampling (ASTM D-1587) implies the recovery of soil samples in a state as close to their natural condition as possible. Complete preservation of in situ conditions cannot be realized; however, with careful handling and proper sampling techniques, disturbance during sampling can be minimized for most geotechnical engineering purposes. Testing of undisturbed samples gives a more accurate estimate of in situ behavior than is possible with disturbed samples.

Normally, we obtain undisturbed samples by pushing a 2.875-inch (73 mm) I.D., thin wall seamless steel tube 24 inches (0.6 m) into the soil with a single stoke of a hydraulic ram. The sampler, which is a Shelby tube, is 30 (0.8 m) inches long. After the sampler is retrieved, the ends are sealed in the field and it is transported to our laboratory for visual description and testing, as needed.

ROCK CORING

In case rock strata is encountered and rock strength/continuity/composition information is needed for foundation or mining purposes, the rock can be cored (ASTM D-2113) and 2-inch to 4-inch diameter rock core samples be obtained for further laboratory analyses. The rock coring is performed through flush-joint steel casing temporarily installed through the overburden soils above the rock formation and also installed into the rock. The double- or triple-tube core barrels are advanced into the rock typically in 5-foot intervals and then retrieved to the surface. The barrel is then opened so that the core sample can be extruded. Preliminary field measurements of the recovered rock cores include percent recovery and Rock Quality Designation (RQD) values. The rock cores are placed in secure core boxes and then transported to our laboratory for further inspection and testing, as needed.

SFWMD EXFILTRATION TESTS

In order to estimate the hydraulic conductivity of the upper soils, constant head or falling head exfiltration tests can be performed. These tests are performed in accordance with methods described in the South Florida Water Management District (SFWMD) Permit Information Manual, Volume IV. In brief, a 6 to 9 inch diameter hole is augered to depths of about 5 to 7 feet; the bottom one foot is filled with 57-stone; and a 6-foot long slotted PVC pipe is lowered into the hole. The distance from the groundwater table and to the ground surface is recordedand the hole is then saturated for 10 minutes with the water level maintained at the ground surface.

If a constant head test is performed, the rate of pumping will be recorded at fixed intervals of 1 minute for a total of 10 minutes, following the saturation period.

LABORATORY TEST METHODS

Soil samples returned to the AACE soils laboratory are visually observed by a geotechnical engineer or a trained technician to obtain more accurate description of the soil strata. Laboratory testing is performed on selected samples as deemed necessary to aid in soil classification and to help define engineering properties of the soils. The test results are presented on the soil boring logs at the depths at which the respective sample was recovered, except that grain size distributions or selected other test results may be presented on separate tables, figures or plates as discussed in this report.

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHEAST FLORIDA
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

The soil descriptions shown on the logs are based upon visual-manual procedures in accordance with local practice. Soil classification is performed in general accordance with the United Soil Classification System and is also based on visual-manual procedures.

BOULDERS (>12" [300 MM]) and COBBLES (3" [75 MM] TO 12" [300 MM]):

GRAVEL: Coarse Gravel: 3/4" (19 mm) to 3" (75 mm)
Fine Gravel: No. 4 (4.75 mm) Sieve to 3/4" (19 mm)

Descriptive adjectives:

0 - 5%	– no mention of gravel in description
5 - 15%	– trace
15 - 29%	– some
30 - 49%	– gravelly (shell, limerock, cemented sands)

SANDS:

COARSE SAND: No. 10 (2 mm) Sieve to No. 4 (4.75 mm) Sieve
MEDIUM SAND: No. 40 (425 µm) Sieve to No. 10 (2 mm) Sieve
FINE SAND: No. 200 (75 µm) Sieve to No. 40 (425 µm) Sieve

Descriptive adjectives:

0 - 5%	– no mention of sand in description
5 - 15%	– trace
15 - 29%	– some
30 - 49%	– sandy

SILT/CLAY: < #200 (75µM) Sieve

SILTY OR SILT: $PI < 4$
SILTY CLAYEY OR SILTY CLAY: $4 \leq PI \leq 7$
CLAYEY OR CLAY: $PI > 7$

Descriptive adjectives:

< - 5%	– clean (no mention of silt or clay in description)
5 - 15%	– slightly
16 - 35%	– clayey, silty, or silty clayey
36 - 49%	– very

ORGANIC SOILS:

Organic Content	Descriptive Adjectives	Classification
0 - 2.5%	Usually no mention of organics in description	See Above
2.6 - 5%	slightly organic	add "with organic fines" to group name
5 - 30%	organic	SM with organic fines
		Organic Silt (OL)
		Organic Clay (OL)
		Organic Silt (OH)

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHEAST FLORIDA

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

Organic Clay (OH)

HIGHLY ORGANIC SOILS AND MATTER:

Organic Content	Descriptive Adjectives	Classification
30 - 75%	sandy peat	Peat (PT)
	silty peat	Peat (PT)
> 75%	amorphous peat	Peat (PT)
	fibrous peat	Peat (PT)

STRATIFICATION AND STRUCTURE:

Descriptive Term		Thickness
with interbedded		
seam	--	less than ½ inch (13 mm) thick
layer	--	½ to 12-inches (300 mm) thick
stratum	--	more than 12-inches (300 mm) thick
pocket	--	small, erratic deposit, usually less than 1-foot
lens	--	lenticular deposits
occasional	--	one or less per foot of thickness
frequent	--	more than one per foot of thickness
calcareous	--	containing calcium carbonate (reaction to diluted HCL)
hardpan	--	spodic horizon usually medium dense
marl	--	mixture of carbonate clays, silts, shells and sands

ROCK CLASSIFICATION (FLORIDA) CHART:

Symbol	Typical Description
LS	Hard Bedded Limestone or Caprock
WLS	Fractured or Weathered Limestone
LR	Limerock (gravel, sand, silt and clay mixture)
SLS	Stratified Limestone and Soils

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHEAST FLORIDA
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

LEGEND FOR BORING LOGS

N:	Number of blows to drive a 2-inch OD split spoon sampler 12 inches using a 140-pound hammer dropped 30 inches
R:	Refusal (less than six inches advance of the split spoon after 50 hammer blows)
MC:	Moisture content (percent of dry weight)
OC:	Organic content (percent of dry weight)
PL:	Moisture content at the plastic limit
LL:	Moisture content at the liquid limit
PI:	Plasticity index (LL-PL)
qu:	Unconfined compressive strength (tons per square foot, unless otherwise noted)
-200:	Percent passing a No. 200 sieve (200 wash)
+40:	Percent retained above a No. 40 sieve
US:	Undisturbed sample obtained with a thin-wall Shelby tube
k:	Permeability (feet per minute, unless otherwise noted)
DD:	Dry density (pounds per cubic foot)
TW:	Total unit weight (pounds per cubic foot)

APPENDIX III

AACE Project Limitations and Conditions

ANDERSEN ANDRE CONSULTING ENGINEERS, INC.

Project Limitations and Conditions

Andersen Andre Consulting Engineers, Inc. has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made herein. Further, the report, in all cases, is subject to the following limitations and conditions:

VARIABLE/UNANTICIPATED SUBSURFACE CONDITIONS

The engineering analysis, evaluation and subsequent recommendations presented herein are based on the data obtained from our field explorations, at the specific locations explored on the dates indicated in the report. This report does not reflect any subsurface variations (e.g. soil types, groundwater levels, etc.) which may occur adjacent or between borings.

The nature and extent of any such variations may not become evident until construction/excavation commences. In the event such variations are encountered, Andersen Andre Consulting Engineers, Inc. may find it necessary to (1) perform additional subsurface explorations, (2) conduct in-the-field observations of encountered variations, and/or re-evaluate the conclusions and recommendations presented herein.

We at Andersen Andre Consulting Engineers, Inc. recommend that the project specifications necessitate the contractor immediately notifying Andersen Andre Consulting Engineers, Inc., the owner and the design engineer (if applicable) if subsurface conditions are encountered that are different from those presented in this report.

No claim by the contractor for any conditions differing from those expected in the plans and specifications, or presented in this report, should be allowed unless the contractor notifies the owner and Andersen Andre Consulting Engineers, Inc. of such differing site conditions. Additionally, we recommend that all foundation work and site improvements be observed by an Andersen Andre Consulting Engineers, Inc. representative.

SOIL STRATA CHANGES

Soil strata changes are indicated by a horizontal line on the soil boring profiles (boring logs) presented within this report. However, the actual strata's changes may be more gradual and indistinct. Where changes occur between soil samples, the locations of the changes must be estimated using the available information and may not be at the exact depth indicated.

SINKHOLE POTENTIAL

Unless specifically requested in writing, a subsurface exploration performed by Andersen Andre Consulting Engineers, Inc. is not intended to be an evaluation for sinkhole potential.

MISINTERPRETATION OF SUBSURFACE SOIL EXPLORATION REPORT

Andersen Andre Consulting Engineers, Inc. is responsible for the conclusions and recommendations presented herein, based upon the subsurface data obtained during this project. If others render conclusions or opinions, or make recommendations based upon the data presented in this report, those conclusions, opinions and/or recommendations are not the responsibility of Andersen Andre Consulting Engineers, Inc.

CHANGED STRUCTURE OR LOCATION

This report was prepared to assist the owner, architect and/or civil engineer in the design of the subject project. If any changes in the construction, design and/or location of the structures as discussed in this report are planned, or if any structures are included or added that are not discussed in this report, the conclusions and recommendations contained in this report may not be valid. All such changes in the project plans should be made known to Andersen Andre Consulting Engineers, Inc. for our subsequent re-evaluation.

USE OF REPORT BY BIDDERS

Bidders who are reviewing this report prior to submission of a bid are cautioned that this report was prepared to assist the owners and project designers. Bidders should coordinate their own subsurface explorations (e.g.; soil borings, test pits, etc.) for the purpose of determining any conditions that may affect construction operations. Andersen Andre Consulting Engineers, Inc. cannot be held responsible for any interpretations made using this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which may affect construction operations.

IN-THE-FIELD OBSERVATIONS

Andersen Andre Consulting Engineers, Inc. attempts to identify subsurface conditions, including soil stratigraphy, water levels, zones of lost circulation, “hard” or “soft” drilling, subsurface obstructions, etc. However, lack of mention in the report does not preclude the presence of such conditions.

LOCATION OF BURIED OBJECTS

Users of this report are cautioned that there was no requirement for Andersen Andre Consulting Engineers, Inc. to attempt to locate any man-made, underground objects during the course of this exploration, and that no attempts to locate any such objects were performed. Andersen Andre Consulting Engineers, Inc. cannot be responsible for any buried man-made objects which are subsequently encountered during construction.

PASSAGE OF TIME

This report reflects subsurface conditions that were encountered at the time/date indicated in the report. Significant changes can occur at the site during the passage of time. The user of the report recognizes the inherent risk in using the information presented herein after a reasonable amount of time has passed. We recommend the user of the report contact Andersen Andre Consulting Engineers, Inc. with any questions or concerns regarding this issue.

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

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