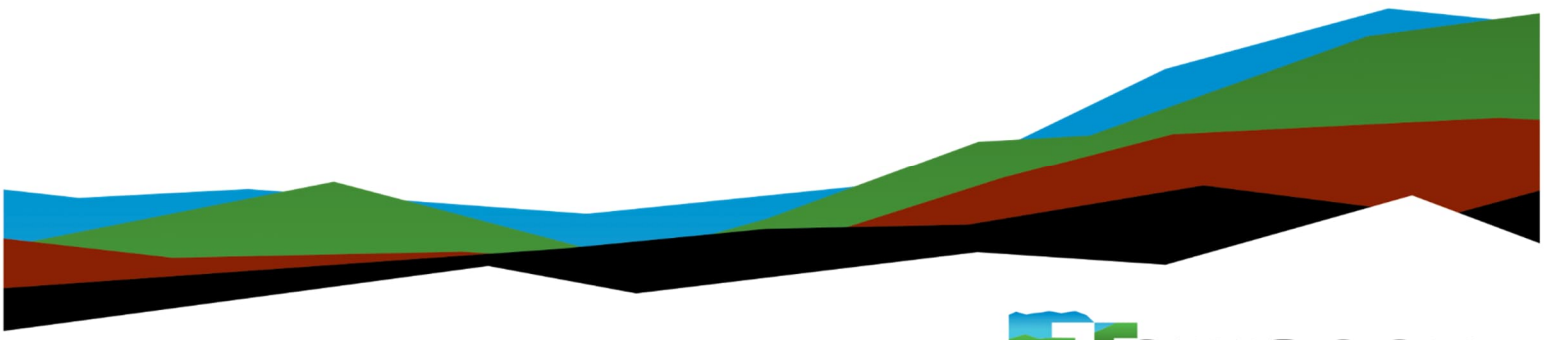
Putnam County Port Development

Geotechnical Engineering Report

December 17, 2024 | Terracon Project No. EQ245026

Prepared for:

Burns & McDonnell
495 North Keller Road, Suite 155
Maitland, Florida 32751



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Jacksonville, Florida
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December 17, 2024

Burns & McDonnell
495 North Keller Road, Suite 155
Maitland, Florida 32751

Attn: Mr. Mason Norberg, MSEE
P: (816) 601-2538
E: MNorberg@BurnsMcD.com

Re: Geotechnical Engineering Report
Putnam County Port Development
100 Port Road
Palatka, Florida
Terracon Project No. EQ245026

Dear Mr. Norberg:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PEQ245026 dated July 1, 2024. This report presents the results of the subsurface exploration and provides geotechnical parameters for use in the design of a new waterfront bulkhead.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Thomas D. Hallahan
Geotechnical Project Manager

THOMAS E. SELFRIDGE LICENSE No. 41196 STATE OF FLORIDA PROFESSIONAL ENGINEER

Thomas E. Selfridge, PE
Senior Engineer
Florida PE No. 41196

12/17/2024

Table of Contents

Figures

Attachments

Note: This report was originally delivered in a web-based format. Blue Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that. For more interactive features, please view your project online at client.terracon.com.

Refer to each individual Attachment for a listing of contents.

Report Summary

Topic	Overview Statement [1]
Project Description	The project includes re-development of the Putnam County Port facility, located on the west bank of the St Johns River north of Palatka, Florida. This preliminary exploration is to assist B&M in the evaluation of the existing barge berth waterfront bulkhead.
Geotechnical Characterization	For this project, two Standard Penetration Test (SPT) borings, B-01, and B-02, were conducted through the existing surface pavement, adjacent to the bulkhead. The borings initially encountered 2-inches of asphalt in B-01 and 6-inches of concrete in B-02, followed by approximately 2 feet of probable fill material, consisting of medium dense sand with limerock fragments. This was followed by layers of medium dense sandy soil with varying fines content (SP, SP-SM) to an approximate depth of 13 feet. The borings then encountered layers of very loose to loose fine sand and fine sand with silt (SP, SP-SM) to an approximate depth of 33 to 38 feet. Boring B-01 then encountered very dense fine sand (SP) from 33 feet to a depth of approximately 68 feet, followed by medium dense fine sand with silt (SP-SM) to the termination depth of approximately 80 feet below the existing ground. In boring B-02, very dense fine sand (SP) was then encountered from approximately 38 feet to the termination depth of approximately 79 feet. Groundwater was encountered at depths of approximately 6 to 6.5 feet. The groundwater level in this area is likely tidally influenced due to the proximity of the St. John River.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed development of the Putnam County Port facility, located at 100 Port Road in Palatka, Florida. The purpose of these services was to provide subsurface information and recommend preliminary geotechnical engineering properties for use in design of the port by Burns & McDonnell (B&M).

The geotechnical engineering Scope of Services for this project included drilling test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the Topographic and Soils Map and Exploration Location Plan in the Attachments. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as tabulated in the Exploration and Laboratory Results section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Initial information provided by electronic mail from Christopher Martin of B&M on February 19, 2024, with additional information shared in subsequent meetings since the project was authorized in November 2024.
Project Description	The Palatka Barge Port opened in 1961 with a 400-ft bulkhead designed to support commercial barge traffic on the St Johns River. A reduction in waterborne commercial traffic has led to a cutback in commercial activity at the port facility which has deteriorated over the years. Local transportation improvements are expected to increase the number of vessels able to navigate the St johns River in the near future, and the re-development of the port facility is intended to accommodate the expected increase in commercial activity.

Item	Description
Proposed Structures	At this preliminary stage of the project, we do not have details of any proposed structures, however we assume the construction of a new bulkhead will be required which will likely consist of an anchored steel sheet pile wall.

Terracon should be notified if any of the above information is inconsistent with the planned construction, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at the location of the existing Putnam County Port facility in Palatka, Florida. Latitude: 29.686878° Longitude: -81.653523° (approximate) See Site Location
Existing Improvements	The site is an existing port facility with an existing sheet pile bulkhead system, which has deteriorated over time to the extent some of the bulkhead and crane equipment has been fenced off for safety concerns. The landside area behind the existing bulkhead includes concrete and asphalt paved driveways and laydown and parking areas for adjacent shipping and/or warehouse structures.

Soil Survey

The Soil Survey for Putnam County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (now renamed the Natural Resource Conservation Service - NRCS), identifies one soil type at the subject site as shown below.

The Web Soil Survey (WSS) map of the project area was reviewed and a map encompassing the project area is included as Soils Map in the attachments. The WSS presents shallow (typically upper 80 inches) soil stratification information produced and compiled by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Soils Map identifies the soil map units documented by the NRCS in the project area.

U.S.G.S. Topographic Quadrangle Map

Based on the United States Geological Survey (USGS) “Palatka, Florida,” topographic quadrangle maps (issued in 1992) the natural ground surface in the proposed project area appears to be approximately +5 feet NGVD. Excerpts of the USGS Quadrangle Map of the project area are shown as Topographic Vicinity Map in the Attachments.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the Exploration and Laboratory Results and the GeoModel can be found in the Figures attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	PAVEMENT	PCC concrete or asphaltic concrete pavement
2	FILL MATERIAL	Medium dense fine sand with few limestone fragments
3	DENSE SAND	Medium dense to very dense fine sand and fine sand with silt (SP, SP-SM)
4	LOOSE SAND	Very loose to loose fine sand and fine sand with silt (SP, SP-SM)

Groundwater depths in the land borings ranged from about 6 to 6½ feet and groundwater is likely tidally influenced by the nearby St. John River. Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall including flood events resulting from tropical storms, runoff, and other conditions not apparent at the time of drilling.

Preliminary Geotechnical Engineering Properties for Bulkhead Design

This project included the development of soil properties for use by the structural engineer for bulkhead design. Each boring was subdivided into layers of similar material classification and relative density. Soil properties were based on correlations between material type/classification and Standard Penetration Test (SPT) “N-values” which were corrected with a calibration factor to include the effects of automatic hammer efficiency, given that most soil property correlations in soil mechanics are based on use of a manually operated (motorized cathead and rope assisted) SPT hammer with an average efficiency of 60 percent (resulting in theoretical SPT “N_{60}“ values).

We have tabulated geotechnical properties with depth for use in determining lateral earth pressures for design of the new sheet pile bulkhead structure for Boring Nos. B-01 and B-02. These tabulated properties are presented in the Geotechnical Design Parameters to this report and include active and passive earth pressure coefficients determined using Coulomb theory, which includes the effects of wall friction assuming natural soil against steel sheet pile sections. Resulting active and passive earth pressures calculated using these properties should include appropriate factors of safety. Soil properties from the borings may be considered for design of sheet pile wall anchorage, if necessary, given design top-of-wall elevations and required dredge depths in front of the walls.

Geophysical Survey

It is understood that very little documentation of the existing bulkhead design or construction exists to aid in the redevelopment of the site. As part of this preliminary exploration, Terracon performed a geophysical survey using Ground Penetrating Radar (GPR) around the general bulkhead area. The aim of this survey was to try to identify underground elements of the existing bulkhead such as tie-backs, and other features under the existing apron.

Exploration Method

Terracon used a GPR system consisting of a 350-Megahertz (MHz) cart-mounted antenna manufactured by Geophysical Survey Systems Inc. (GSSI) to perform a non-invasive geophysical survey. The GPR field collection was performed in general accordance with ASTM D6432-”Standard Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation”. The purpose of the GPR survey was to identify the presence of suspected tiebacks behind an existing seawall and suspected depths, if possible.

GPR utilizes electromagnetic (radio) waves to detect changes in the subsurface of the area being scanned. Changes in the signal generally indicate material property changes such as, but not limited to, electromagnetic conductivity and the dielectric constant, which in some cases can be qualitatively linked to material properties such as density, moisture, or material type. The results can be effective in identifying the presence and location of items such as concrete thickness, reinforcement, voids, buried debris, underground utilities, buried tanks and geologic features such as soil bedding, stratigraphy, and sinkholes, etc.

The geophysical survey was conducted as follows:

- A free scan method was used to calibrate the equipment and determine the optimum field settings for on-site data collection and interpretation.
- The GPR survey consisted of an area approximately 50 feet by 180 feet in plan dimension.
- The GPR survey was performed along a series of parallel and perpendicular transects. The transects were spaced approximately 5 feet apart in the east/west direction and 10 feet apart in the north/south direction, where access allowed. The approximate GPR survey is shown on Exhibit A.
- The GPR survey data was collected using the Juniper Geode GNS3 capable of submeter accuracy.
- Based on the GPR survey data, the maximum depth of investigation ranged from approximately 13 to 15 feet below ground surface at the site.
- The GPR data was processed and analyzed using *RADAN 7* software, created by GSSI.

The results of the GPR survey are shown in the Geophysical Survey Results.

Preliminary GPR Findings

A Terracon representative scanned accessible areas within the survey area as shown in the attached exhibits. Based on the GPR survey, we noted several hyperbolic GPR responses at the site consistent with suspected tiebacks (Figure B). The suspected tiebacks were observed spaced approximately 10 feet apart and started at a depth of approximately 5.5 to 6 feet in depth near the seawall. Approximately 30 feet west of the seawall we observed the suspected tiebacks extending down to a depth of approximately 12 to 12.5 feet. Apparent tiebacks were evident up to 30 feet away from the sheet pile bulkhead. There was no apparent evidence of tie back anchorage at the approximate 30-foot setback distance, however, we suspect that the anchors terminate at concrete deadman or steel sheet anchorage systems. The results of the GPR findings are included in the Geophysical Survey Results.

Please note that this GPR survey was only effective within the limits of the survey area and the effective depth of the GPR equipment. Tiebacks extending below the depth of investigation would not have been detected by the GPR survey. Additionally, the locations

of the tiebacks provided are approximate and not intended for construction or design purposes. The locations noted are only intended to show the presence, estimated depth, and spacing of the suspected tiebacks. For a more detailed location of the tiebacks, we would recommend the tiebacks be located in the field and marked using GPS. Additional underground utilities were observed at the site.

GPR Survey Limitations

These non-destructive testing processes rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, including, but not limited to existing surface conditions, soil types, soil moisture, water table, buried debris, underground utilities and/or buried obstructions that may limit the effectiveness of the geophysical survey. Features occurring below the effective depth of GPR penetration would not be detected by the geophysical survey. Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysicist evaluating the results. Our interpretation of the GPR dataset should be confirmation-based and can be refined when physical observations (i.e., test pits, borings, and/or excavation) are available. Geophysics provides a level of confidence but should not be considered absolute.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is

solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damage due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

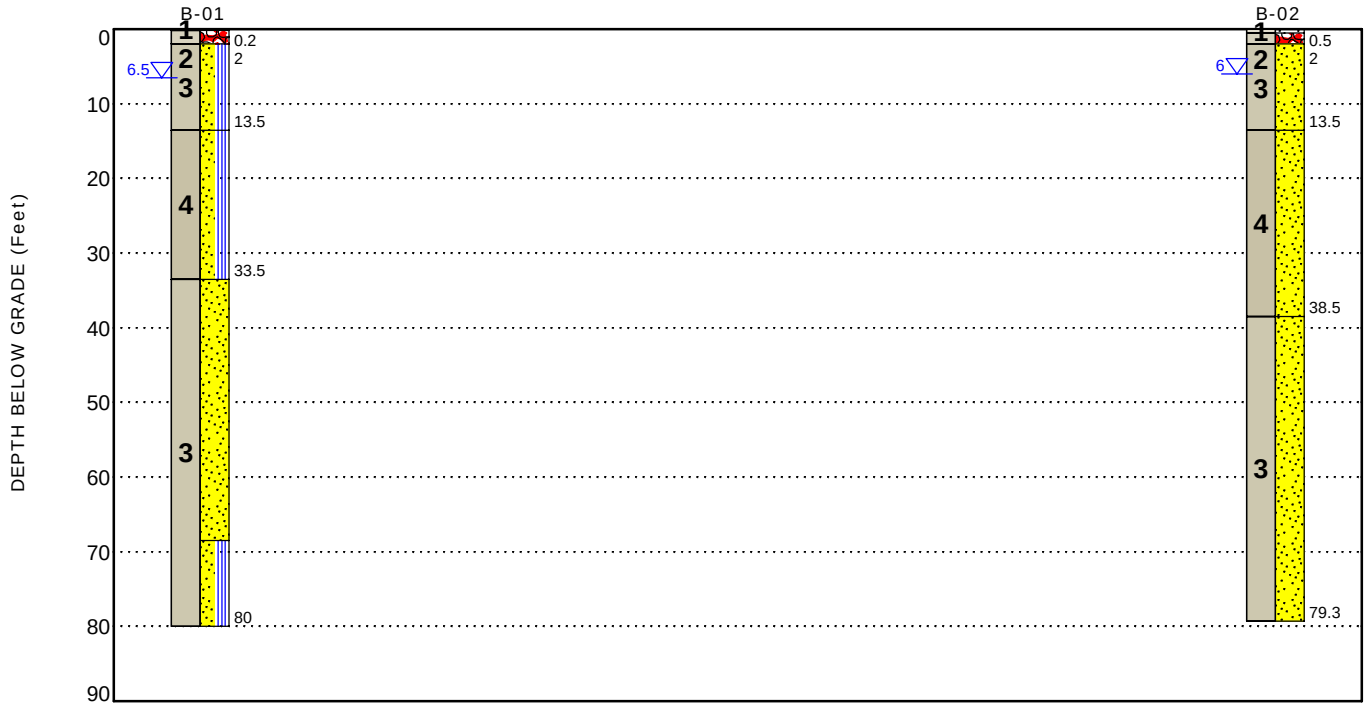
Figures

Contents:

Putnam County Port Development
100 Port Road | Palatka, Florida
Terracon Project No. EQ245026

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	PAVEMENT	Concrete or asphalt pavement
2	FILL MATERIAL	Medium dense fine sand with few limestone fragments (SP)
3	DENSE SAND	Medium dense to very dense fine sand and fine sand with silt (SP, SP-SM)
4	LOOSE SAND	Very loose to loose fine sand and fine sand with silt (SP, SP-SM)

Legend

- Asphalt
- Fill
- Poorly-graded Sand with Silt
- Poorly-graded Sand
- Concrete

▽ First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
2	80	Vicinity of Bulkhead

Boring Layout and Elevations: Terracon personnel performed the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±20 feet).

Subsurface Exploration Procedures: The borings were advanced with a track-mounted D-50 drill rig using mud rotary drilling techniques. In the mud rotary drilling procedure, drilling fluid was circulated in the boreholes to stabilize the borehole walls and flush soil cuttings to the work surface. Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a calibrated 140-pound automatically lifted and tripped hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon is recorded at an interval of 6 inches. The sum of blows in the second and third interval of a normal 18-inch or 24-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels and water depths during drilling and sampling. For safety purposes, all borings were backfilled with tremied cement bentonite grout following completion.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. Groundwater was observed at approximates depths of 6 and 6.5 feet in the boreholes. The groundwater levels for these borings are shown on the attached boring logs.

Log Recording: The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Organic Content
- Fines Content

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY

SCALE 1"=1000'

FEET

500 0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000

N

PALATKA, FLORIDA
ISSUED: 1992
7.5 MINUTE SERIES (QUADRANGLE)

N:\Projects--Other Offices\Jacksonville\2024\EQ245026\Cad\EQ245026 Topo Map.dwg

Project Mngr:	TDH
Drawn By:	AS
Checked By:	TDH
Approved By:	TES

Project No.	EQ245026
Scale:	AS SHOWN
File No.	EQ245026
Date:	12-6-24

Terracon
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8001 BAYMEADOWS WAY - SUITE 1
JACKSONVILLE, FLORIDA 32256
PH. (904) 900-6494 FAX. (904) 268-5255

TOPOGRAPHIC VICINITY MAP

GEOTECHNICAL ENGINEERING REPORT
PUTNAM COUNTY PORT DEVELOPMENT

100 PORT ROAD
PALATKA, PUTNAM COUNTY, FLORIDA

EXHIBIT

SCALE 1"=1000'

FEET

500 0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000

U.S.D.A. SOIL SURVEY FOR PUTNAM COUNTY, FLORIDA

N

SOIL LEGEND

8 ARENTS, 0 TO 2 PERCENT SLOPES

Project Mngr:	TDH
Drawn By:	AS
Checked By:	TDH
Approved By:	TES

Project No.	EQ245026
Scale:	AS SHOWN
File No.	EQ245026
Date:	12-6-24

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SOILS MAP

GEOTECHNICAL ENGINEERING REPORT
PUTNAM COUNTY PORT DEVELOPMENT
100 PORT ROAD
PALATKA, PUTNAM COUNTY, FLORIDA

EXHIBIT

N:\Projects—Other Offices\Jacksonville\2024\EQ245026\Cad\EQ245026 Soil Map.dwg

LEGEND

APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

N

APPROXIMATE SCALE IN FEET

0 40 80

Project Mngr:	TDH
Drawn By:	AS
Checked By:	TDH
Approved By:	TES

Project No.	EQ245026
Scale:	AS SHOWN
File No.	EQ245026
Date:	12-6-24

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EXPLORATION LOCATION PLAN

GEOTECHNICAL ENGINEERING REPORT
PUTNAM COUNTY PORT DEVELOPMENT

100 PORT ROAD
PALATKA, PUTNAM COUNTY, FLORIDA

EXHIBIT

N:\Projects--Other Offices\Jacksonville\2024\EQ245026\Cad\EQ245026 Loc Plan.dwg

Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

Boring Logs

Putnam County Port Development
100 Port Road | Palatka, Florida
Terracon Project No. EQ245026

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 29.6871° Longitude: -81.6532°

Depth (Ft.)	Material Description	Field Test Results	Water Content (%)	Percent Fines
0.2	**ASPHALT - 2" THICK**			
2.0	**POORLY GRADED SAND (SP)**, fine grained, light brown, medium dense, few limerock fragments (probable fill)	10-10-13 N=23		
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, brown to gray, dense	16-15-17-20 N=32		
	below 4 feet - medium dense	15-13-15-16 N=28	19.0	12
		6-9-9-17 N=18		
		8-10-11-14 N=21		
13.5	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark brown to gray, very loose	1-1-1 N=2	26.6	8
		1-1-2 N=3		
	below 23.5 feet - loose	1-1-3 N=4		
		2-2-3 N=5	32.0	5
33.5	**POORLY GRADED SAND (SP)**, fine grained, light brown to light gray, dense	10-17-22 N=39		
	below 38.5 feet - very dense	13-28-50/4" N>100		

Water Level Observations: ▽ Groundwater encountered a 6.5 feet at time of drilling

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
-Automatic Hammer Efficiency - 93.7%

Advancement Method
Mud rotary

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
D-50

Hammer Type
Automatic

Driller
M.Waller

Logged by
D. Bell

Boring Started
11-04-2024

Boring Completed
11-04-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 29.6871° Longitude: -81.6532°

Depth (Ft.)	Graphic Log	Material Description	Water Level Observations	Sample Type	Field Test Results	ORGANIC CONTENT (%)	Water Content (%)	Percent Fines
		POORLY GRADED SAND (SP), fine grained, light brown to light gray, dense *(continued)*						
45					15-27-46 N=73			
50					36-50/5" N>100			
55					20-25-35 N=60			
60					21-33-42 N=75		24.0	3
65					17-20-30 N=50			
68.5		**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, gray, medium dense						
70					5-5-8 N=13			
75					7-8-8 N=16			
80.0					8-10-10 N=20			
80		***Boring Terminated at 80 Feet***						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater encountered a 6.5 feet at time of drilling

Drill Rig
D-50

Hammer Type
Automatic

Driller
M.Waller

Notes

Advancement Method
Mud rotary

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
D. Bell

Boring Started
11-04-2024

Boring Completed
11-04-2024

Putnam County Port Development
100 Port Road | Palatka, Florida
Terracon Project No. EQ245026

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-02

Location: See Exploration Plan

Latitude: 29.6869° Longitude: -81.6532°

Depth (Ft.)	Graphic Log	Material Description	Water Level Observations	Sample Type	Field Test Results	ORGANIC CONTENT (%)	Water Content (%)	Percent Fines
0.5		**CONCRETE - 6" THICK**						
2.0		**POORLY GRADED SAND (SP)**, fine grained, tan, medium dense, few limerock fragments (probable fill)			5-10-10 N=20			
		POORLY GRADED SAND (SP), fine grained, brown to gray, medium dense			10-10-11-11 N=21			
5			▽		7-8-7-7 N=15		24.0	3
		below 6 feet - loose			3-4-5-7 N=9			
		below 8 feet - medium dense			5-6-8-9 N=14			
10								
13.5								
		POORLY GRADED SAND (SP), brown to light gray, very loose			1-1-2 N=3			
15								
		below 18.5 feet - loose			2-2-2 N=4		32.3	1
20								
					2-4-4 N=8			
25								
					2-3-5 N=8			
30								
					2-1-5 N=6			
35								
38.5								
		POORLY GRADED SAND (SP), fine grained, light brown to light gray, dense			12-20-30 N=50		22.0	5
40								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ Groundwater encountered a 6.0 feet at time of drilling

Drill Rig
D-50

Hammer Type
Automatic

Driller
M.Waller

Notes
-Automatic Hammer Efficiency - 93.7%

Advancement Method
Mud rotary

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
D. Bell

Boring Started
11-05-2024

Boring Completed
11-05-2024

Putnam County Port Development
100 Port Road | Palatka, Florida
Terracon Project No. EQ245026

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-02

Location: See Exploration Plan

Latitude: 29.6869° Longitude: -81.6532°

Depth (Ft.)	Graphic Log	Water Level Observations	Sample Type	Field Test Results	ORGANIC CONTENT (%)	Water Content (%)	Percent Fines
	POORLY GRADED SAND (SP), fine grained, light brown to light gray, dense *(continued)*						
	below 43.5 feet - medium dense			11-7-9 N=16			
45							
	below 48.5 feet - very dense			27-50/5" N>100			
50							
				20-50/5" N>100			
55							
				50/5" N>100			
60							
				50/5" N>100		23.2	3
65							
				41-50/3" N>100			
70							
				38-50/4" N>100			
75							
79.3				39-50/3" N>100			
	Boring Terminated at 79.3 Feet						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ Groundwater encountered a 6.0 feet at time of drilling

Drill Rig
D-50

Hammer Type
Automatic

Driller
M.Waller

Notes

Advancement Method
Mud rotary

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
D. Bell

Boring Started
11-05-2024

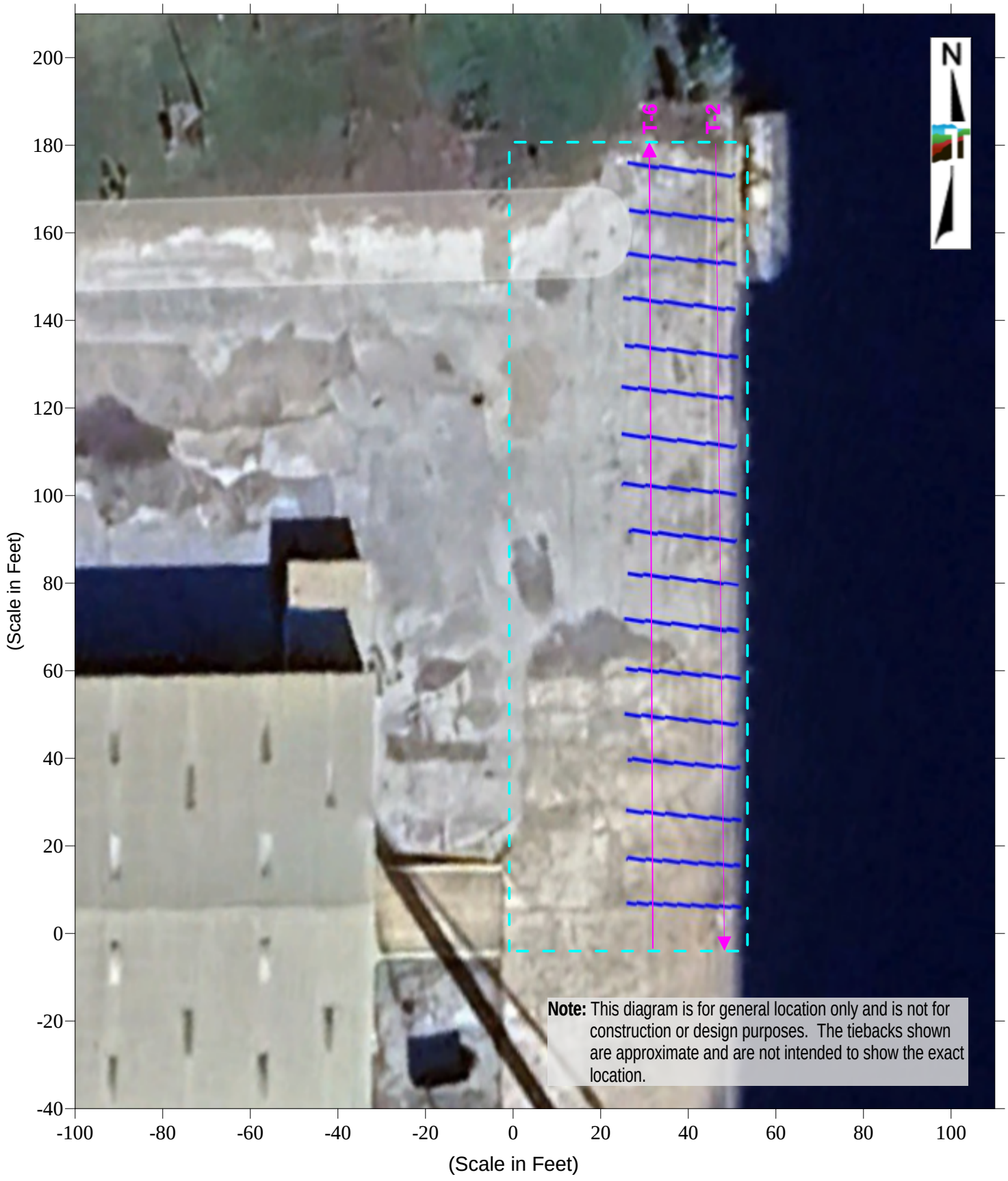
Boring Completed
11-05-2024

Tabulated Laboratory Classification Testing Results

Summary of Laboratory Classification Testing						
Boring No.	Depth Range (feet)	Moisture Content (%)	Fines Content (%)	Organic Content (%)	Atterberg (LL/PL/PI)	USCS Classification
B-01	4.0 – 6.0	19.0	11.8	-	-	SP-SM
	13.5- 15.0	26.6	8.0	1.6	-	SP-SM
	28.5 – 30.0	32.0	5.1	-	-	SP-SM
	58.5 – 60.0	24.0	3.2	-	-	SP
B-02	4.0 – 6.0	24.0	2.5	-	-	SP
	18.5 – 20.0	32.3	1.4	-	-	SP
	38.5 – 40.0	22.0	4.5	-	-	SP
	63.5 – 65.0	23.2	3.2	-	-	SP

Geophysical Survey Results

Contents:



Legend

- Approximate GPR Survey Area
- Approximate GPR Transect Profile
- Suspected Tiebacks

Notes:

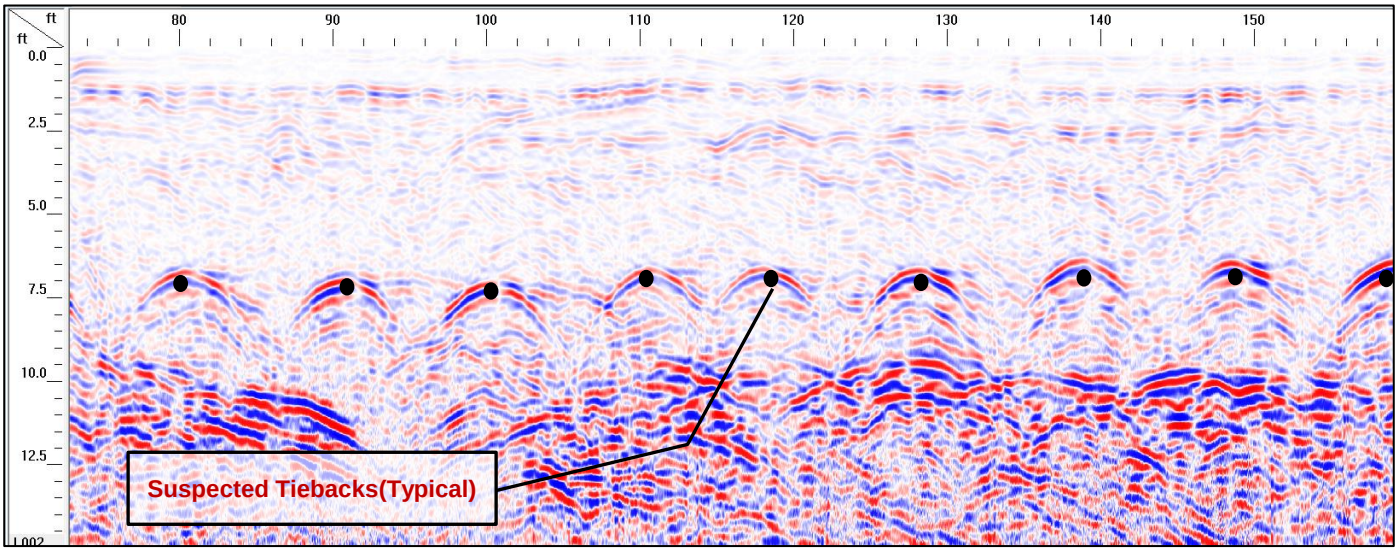
1. 2024 aerial image acquired from Google Earth and may not reflect current site conditions.
2. Map scale: Map measurements shown in feet.

Exhibit A - Geophysical Exploration Results

Project: Putnam County Port Development
Patlaka, Florida
Client: Burns & McDonnell
Project No.: EQ245026
Date Performed: October 31, 2024

Exploration Results – GPR Cross-Sections

Transect T-2 - Example GPR profile approximately 10 feet west of the seawall (south to north direction). Tiebacks spaced approximately 10 feet on-center. The depth shown is approximate.



Transect T-6 - Example GPR profile approximately 25 feet west of the seawall (north to south direction). Tiebacks spaced approximately 10 feet on-center. The depth shown is approximate.

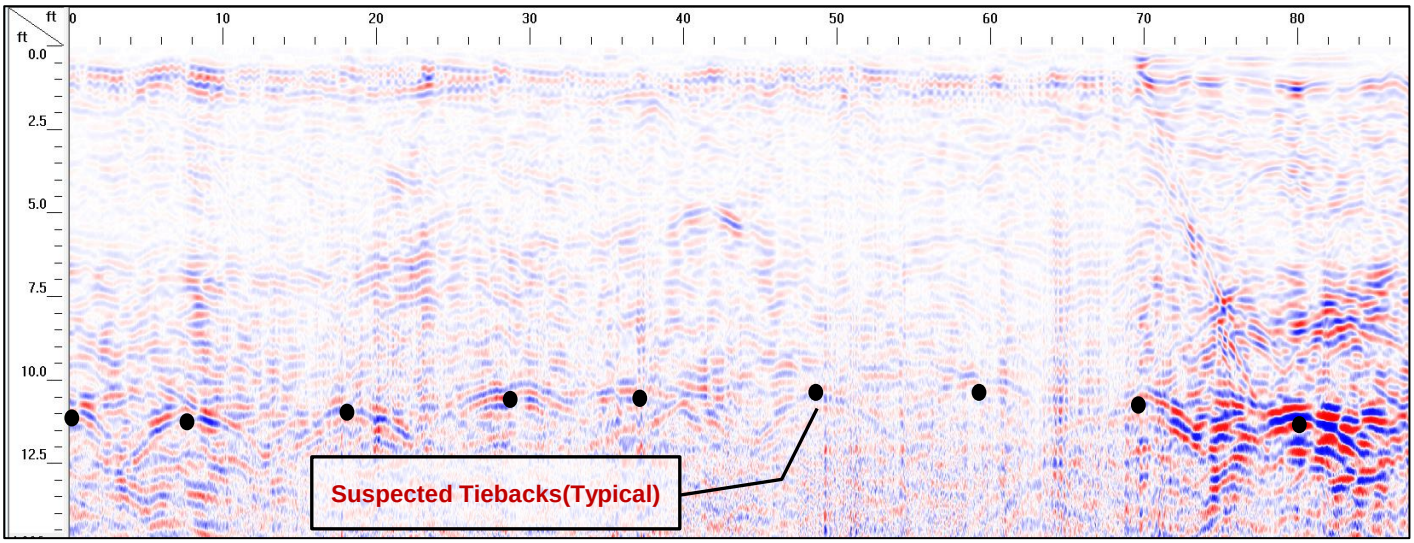


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Exhibit No.: B

Geotechnical Design Parameters

Contents:

Soil Properties for Sheet Pile wall Design

Soil Properties for Sheet Pile Wall Design

Summary of Soil Properties for Sheet Pile Wall Design
Boring No. B-01

Depth Interval (feet)	Soil Description	Effective Unit Weight (pcf)	Cohesion c' (psf)	Angle of Internal Friction, ϕ (degree)	Wall Friction Angle, δ (degrees)	Adhesion, α (psf)	Active Earth Pressure Coefficient[1] k_a	Passive Earth Pressure Coefficient[1] k_p
0.0 – 13.0	SAND	62.6	0	36	18	0	0.24	8.02
13.0 – 33.0	SAND	44.4	0	29	15	0	0.31	4.63
33.0 – 63.0	SAND	62.6	0	38	19	0	0.22	9.64
63.0 – 80.0	SAND	62.6	0	34	17	0	0.26	6.77

Notes:

1. Active and passive earth pressure coefficients determined using Coulomb theory and assuming level backfill condition behind the wall.

Summary of Soil Properties for Sheet Pile Wall Design
Boring No. B-02

Depth Interval (feet)	Soil Description	Effective Unit Weight (pcf)	Cohesion c' (psf)	Angle of Internal Friction, ϕ (degree)	Wall Friction Angle, δ (degrees)	Adhesion, α (psf)	Active Earth Pressure Coefficient[1] k_a	Passive Earth Pressure Coefficient[1] k_p
0.0 – 13.0	SAND	62.6	0	34	17	0	0.26	6.77
13.0 – 38.0	SAND	47.5	0	30	15	0	0.30	4.98
38.0 – 80.0	SAND	62.6	0	38	19	0	0.22	9.64

Notes:

1. Active and passive earth pressure coefficients determined using Coulomb theory and assuming level backfill condition behind the wall.

Supporting Information

Contents:

Terracon
8001 Baymeadows Way
Suite 1
Jacksonville, Florida

General Notes

Sampling

Standard Penetration Test

Water Level

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time
- Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	< 3	Very Soft	less than 0.25	0 - 1
Loose	3 - 8	Soft	0.25 to 0.50	1 - 3
Medium Dense	8 - 24	Medium Stiff	0.50 to 1.00	3 - 5
Dense	24 - 40	Stiff	1.00 to 2.00	6 - 12
Very Dense	> 40	Very Stiff	2.00 to 4.00	12 - 24
		Hard	> 4.00	> 24

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried}$ < 0.75	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried}$ < 0.75	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.