SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

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Anchor CEI
450 Magnolia Avenue
Panama City, FL 32401
Attn: Ms. Elizabeth Moore, PE

May 22, 2024
File No.: P24-157

Subject: Geotechnical Services for the Proposed 15th Street Pedestrian Bridge in Mexico Beach, Bay County, Florida

Dear Ms. Moore:

Southern Earth Sciences, Inc., has completed the geotechnical services for the proposed pedestrian bridge on 15th Street in Mexico Beach, Florida. Our services were performed in general accordance with proposal number XP24-2.5.24-2, dated February 5, 2024. This report presents the results of our field and laboratory testing and includes recommendations with regard to the design and construction of the foundations.

FIELD INVESTIGATIVE PROCEDURES:

Prior to our field testing, boring locations were marked, and underground utilities were located by contacting Sunshine State One Call of Florida. On March 20 and 22, 2024, personnel with our firm traveled to the project site and completed the field testing for the above referenced project. For our geotechnical investigation, two (2) cone soundings were performed to depths ranging from approximately 60 to 70 feet below the existing ground surface. The cone penetrometer is truck mounted and rather than sampling and testing at five foot intervals, as normally done with standard penetration borings, the cone penetrometer is an electronic device that provides continuous evaluation of the soils bearing capacity through point and frictional resistances. The cone penetrometer is hydraulically pushed into the soil with point and frictional resistances obtained continuously on a computer printout. This testing equipment provides an accurate definition of the soil strength characteristics and the changes in stratification. The cone soundings were performed in general accordance with ASTM D5778.

Direct push borings were performed at test location B-1 to a depth of approximately 10 feet below existing ground surface. The direct push samples were obtained with our Geoprobe 6622 and the DT22 soil sampling system. This is a closed-piston sampler, with an inner piston rod and outer drive casing, and is driven to the top of the sampling interval. The inner piston rod is removed, and the sampler is driven to collect a soil sample. The soil samples are collected in a clear 5-foot PVC liner and were delivered back to our laboratory for soil classification.

Additionally, a hand auger boring was performed to a depth of approximately five feet at test location B-2.

Test locations were established in the field by using a handheld GPS and estimating right angles with reference to existing landmarks; therefore, our test locations should be considered approximate. See the attached Figure for our approximate test locations.

LABORATORY TESTING PROCEDURES:

Laboratory investigative work consisted of physical examination of samples obtained during the soil test boring operation. Soil samples were visually classified in the laboratory in accordance with the Unified Soil Classification System. Evaluation of the samples, in conjunction with standard penetration resistances, have been used to estimate soil characteristics.

Natural Moisture: Four (4) samples were selected for determination of their natural moisture content. In the laboratory, each sample was weighed, dried, and its moisture content was calculated in general accordance with ASTM D2216.

Percent Passing 200 Mesh Sieve: Three (3) samples were selected to determine their percent of materials, by dry weight, finer than the U.S. Number 200 Mesh Sieve. This test was performed in general accordance with ASTM D1140.

Organic Content: One (1) sample was selected to determine its percent organic matter in general accordance with ASTM D2974.

The laboratory test results are shown on the boring logs at the depth of the tested sample. Abbreviations of laboratory data are shown below:

NM = Natural Moisture Content (%)
-200 = Percent Finer than the U.S. No. 200 Mesh Sieve
ORG = Organic Content (%)

CONE SOUNDINGS:

CPT Log graphically indicates the cone tip resistance, friction ratio, equivalent N-value, and interpreted soil type at each sounding location. Soil classifications and data were interpreted from methods recommended by Robertson and Campanella and/or the Swedish Geotechnical Institute Information Publication No. 15E. Correlations between Cone Resistance values and Standard Penetration Testing “N” values were performed according to the methods developed by Robertson, Campanella and Wightman.

The soil types and stratigraphy shown on the CPT Log sheets are based upon material parameters measured and evaluated as the cone is advanced. The CPT Log sheets were developed for general information only.

SITE AND SOIL CONDITIONS:

The proposed pedestrian bridge will be constructed to cross a drainage ditch and will be located on the west side of the existing bridge/roadway. The pedestrian bridge will be located approximately 900 feet north of US Hwy 98. The pedestrian bridge will be a metal frame structure supported on 14-inch pre-stressed concrete piles with a single span of approximately 100 lineal feet. The metal bridge will span the length between the two abutments, on each side of the ditch. Based upon the provided topographic information, the existing bridge elevation is near +15 to +16 Feet. Along the edge of the drainage ditch, the elevations slope downward towards +2 to +3 Feet at the water's edge. The elevations of our test locations appear to be in the range of +11 to +13 Feet, based upon the provided topographic information. The logs of our cone soundings and borings are attached. The elevations of our test locations have been interpolated from the topographic information provided to us; therefore, the elevations of our test locations should be considered approximate.

The soils encountered within the depth of our soundings were sands. The sands varied in color and texture, ranging from clayey sands and slightly silty to clean sands. We encountered variations in the top ten feet between the two cone soundings. Generally, at both test locations, the sands within the top one to two feet are loose slightly silty to clean sands. At test location B-1, the sands within the top ten feet are very loose to loose, outside of medium dense sands encountered from approximately 1.5 to 3.5 feet. We encountered loose slightly silty sands from approximately 3.5 to 7 feet, but from 5 to 7 feet the sands are very loose and contain various amounts of wood and organics. The sands then become medium dense to dense to an average depth of 35 feet. At this depth, the sands return medium dense to approximately 55 feet. For the remaining depth, the sands are dense to very dense to approximately 60 feet. At test location B-2, the sands are medium dense to dense at depths ranging from approximately 1 to 35 feet below existing ground surface. The sands then become loose to approximately 41 feet. At this depth, the sands then become medium dense to dense for the remaining extent at this location, with the exception of a loose clayey sand layer from 67 to 69 feet below existing ground surface. At test location B-2, various amounts of organics were encountered within the top 1.8 feet of our hand auger boring.

On the date of our field testing (March 20, 2024), the groundwater level was measured at the depths shown on the attached logs which ranged from approximately 4.5 to 4.6 feet below the existing ground surface. Fluctuations in the water table depths will occur due to seasonal precipitation/evapotranspiration differences, tidal/wetland influences, and any neighboring drainage influences. Therefore, it is highly recommended the groundwater levels be verified prior to any excavations on the site.

STRUCTURAL INFORMATION:

We understand the pedestrian bridge will be a metal frame structure supported on a prestressed pile foundation with a single span having a total length of approximately 100 feet. At this time, we do not have a plan showing the location of the abutments on either side of the ditch, however, abutments will generally be near the end of the span length. The bridge will be supported by prestressed concrete piles behind the abutments. We understand pile size may be 12-inch or 14-inch square prestressed piles. At this time the number of piles at each abutment is unknown, however we anticipate will be two. We understand that the total axial load at each abutment will be approximately 34 kips (17 tons) in compression and maximum horizontal loading of 32 kips (16 tons).

DEEP (PILE) FOUNDATION RECOMMENDATIONS:

Our evaluation of foundation conditions has been based on structural information presented in this report and subsurface data obtained during our investigation. In evaluating standard penetration borings, we have used correlations that were previously made between penetration resistances and foundation stabilities observed in soil conditions similar to those encountered at your site.

For deep (pile) foundations, we have calculated allowable compressive and tensile capacities for 12 inch and 14-inch square prestressed concrete piles at an embedment depth of approximately 15, 20, and 25 feet below existing ground surface. Currently, we understand there are no specified scour depths, however, we have not accounted any skin friction within the top four (4) feet of our calculations, nor have we included any skin friction from the fill soils that may be installed at the abutment locations. The embedment depths below are below existing ground surface; therefore, any cantilever above existing grade should be added to the pile length. Allowable compressive capacities include a factor of safety of two (2), in compression, and three (3), in tension. Skin friction has been reduced ten (10) percent for jetting/pre-drilling during pile installation, however we recommend at least the final five (5) feet of pile embedment is driven without jetting. The allowable pile capacities are based upon a soil/pile interaction and do not consider the structural aspects of the pile.

The tabulated pile capacities will provide the information required by the Structural Engineer to select the pile lengths consistent with the design loads and based upon economic considerations for each pile length. Allowable stresses in the piles shall conform to the Florida Building Code.

The Table below provides the estimated allowable compressive and tensile capacities for 12-inch and 14-inch square prestressed concrete piles with an embedment depth of 15, 20, and 25 feet below existing ground surface at location B-2, which is approximately +12 Ft.

TABLE I:

Prestressed Concrete - Allowable Pile Capacities

Embedment Depth (ft.)	**12-inch Sq. Prestressed**		**14-inch Sq. Prestressed**	
	Compressive (tons)	**Tensile (tons)**	**Compressive (tons)**	**Tensile (tons)**
15 ft	12	5	16	7
20 ft	21	7	27	10
25 ft	25	11	32	13

Vibrations from the installation of driven piles may adversely affect the adjacent structures/utilities causing detrimental effects. If driven piles are used we recommend performing vibration monitoring during all pile driving activities. If monitoring determines vibrations are excessive, pile driving should be stopped immediately and pile installation procedures should be re-evaluated. We also suggest performing a pre and post driving survey of the adjacent structures to evaluate existing damages/defects.

Prior to the installation of production piling, we recommend performing a pile load test at or near test location B-2. The test pile shall be installed with the same equipment and in the same manner as the foundation piling. The test pile shall be loaded to twice the design pile capacity in accordance with ASTM D-1143 using the standard loading procedure. A pile load test for a driven pile can also be performed in accordance with ASTM D-4945. Depending upon the results of the pile load test and/or CAPWAP analysis, adjustments in the pile lengths or capacities may be required. It is also recommended the installation of all production piling be monitored by Southern Earth Sciences, Inc., employed by the Owner, to verify production piles are installed in accordance with the pile load test program.

Additional Comments:

An additional/supplemental report will be submitted with the L-Pile analysis from lateral loading information provided above, using the soil parameters obtained from our borings/soundings.

CONSTRUCTION TESTING SERVICES:

The effectiveness of the foundation will depend significantly on the proper preparation of the soils, as indicated previously. Therefore, we recommend the owner employ Southern Earth Sciences, Inc., as the testing laboratory to perform construction testing services. If we are not employed to provide construction testing services, Southern Earth Sciences, Inc., can not accept any responsibility for any conditions, which deviate from those described in this geotechnical report. Southern Earth Sciences, Inc., should be invited to the pre-construction conference to discuss the project with all interested parties so that the project may be completed expeditiously and to the intent of our geotechnical report. We would be pleased to review the plans and specifications as they relate to the soil preparation and provide a fee proposal for construction testing.

GENERAL COMMENTS:

Professional judgments on design criteria are presented in this letter. These are based partly on our evaluations of technical information provided, partly on our understanding of the characteristics of the project being planned, and partly on our general experience with subsurface conditions in the area. We do not guarantee performance of the project in any respect, only that our judgments meet the standard of care of our profession.

This information is exclusively for the use and benefit of the addressee(s) identified on the first page of this report and is not for the use or benefit of, nor may it be relied upon by any other person or entity. The contents of this letter may not be quoted in whole or in part or distributed to any person or entity other than the addressee(s) hereof without, in each case, the advance written consent of the undersigned.

This report has been prepared in order to aid in the evaluation of this property and to assist the architects and engineers in the foundation design. It is intended for use with regard to the specific project discussed herein, and any substantial changes in the bridge, loads, locations, or assumed (or reported) grades shall be brought to our attention immediately so that we may determine how such changes may affect our conclusions and recommendations. We would appreciate the opportunity to review the plans and specifications for the foundation and floor construction to verify that our conclusions and recommendations are interpreted correctly. Our report does not address environmental issues which may be associated with the subject property.

While the soundings and borings performed for this project are representative of subsurface soil conditions at their respective locations and for their respective vertical reaches, local variations of the subsurface materials are anticipated and may be encountered. The boring logs and related information are based on the driller’s logs and visual examination of selected samples in the laboratory. Delineation between soil types shown on the boring logs is approximate, and soil descriptions represent our interpretation of subsurface conditions at the designated boring location on the particular date drilled.

We appreciate the opportunity to assist you. If you have any questions or if we may be of further assistance, please call at your convenience.

Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Rebecca L. McNac

Rebecca L. McNac
Project Manager

Logan A. Fowler, P.E.
Eng. Reg. No. 82343
State of Florida

LOGAN A. FOWLER
No. 82343
5/22/24

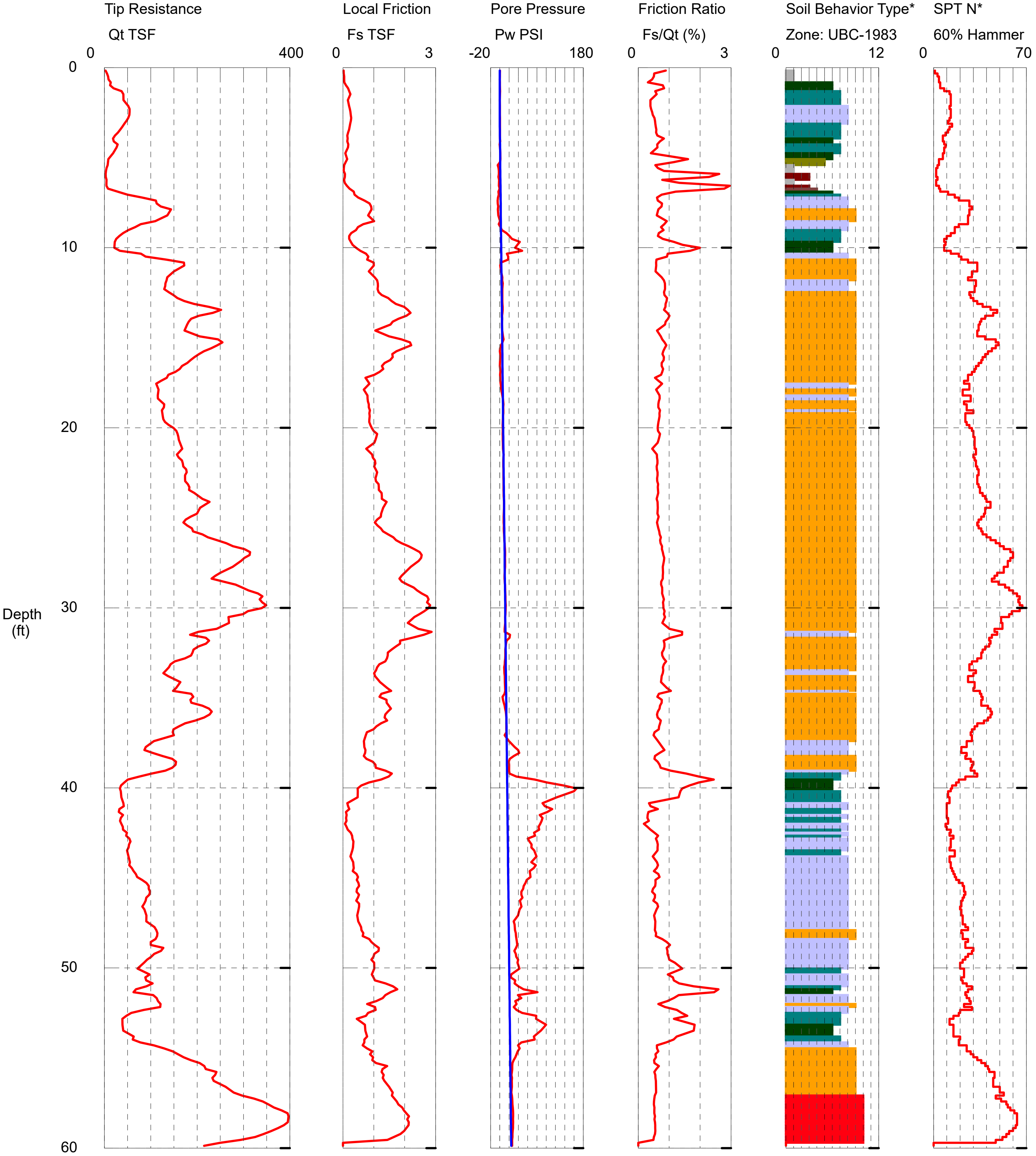
cc: Mr. Greg Preble, P.E.

SESI FILE NO: P24-157	SOUTHERN EARTH SCIENCES	DRAWN BY:	HL	FIGURE I
		CHECKED BY:	LF	
15th Street Pedestrian Bridge Mexico Beach, FL		DATE:	5/21/24	APPROXIMATE TEST LOCATIONS
		SCALE:	1:70	

Southern Earth Sciences Inc.

Operator: Pat Conroy
Sounding: B-1
Cone Used: DDG1485
Groundwater: 4.5 feet

CPT Date/Time: 3/20/2024 10:59:01 AM
Location: 15th Street Pedestrian Bridge
Job Number: P24-157
Elevation: +13 Feet (Approx.)



Maximum Depth = 59.88 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
3 clay

4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt

7 silty sand to sandy silt
8 sand to silty sand
9 sand

10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

ctG1485 @$e
N 29.942584W85.405291

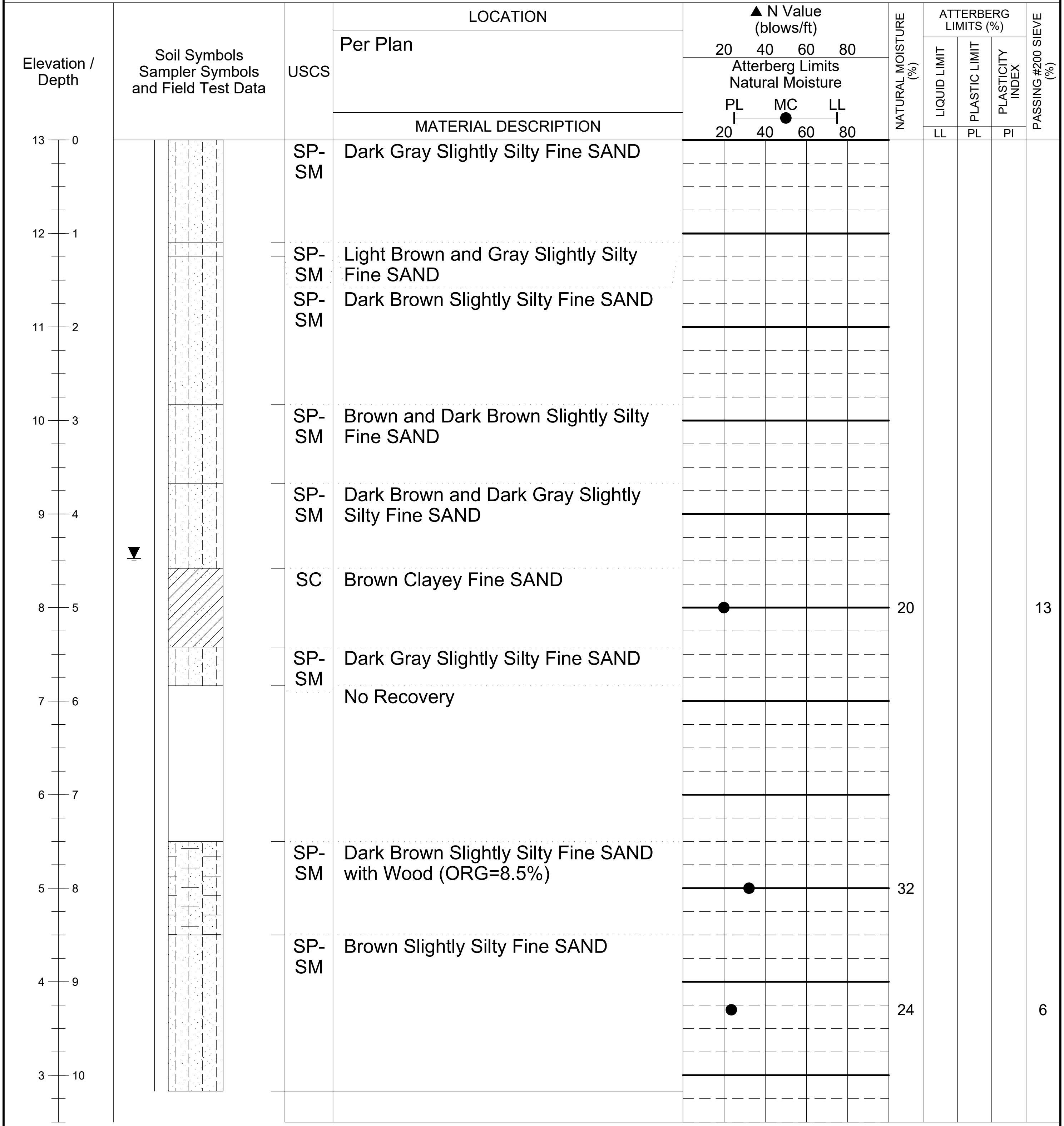
Changenroy

*Soil behavior type and SPT based on data from UBC-1983

LOG OF BORING B-1

PROJECT: 15th Street Pedestrian Bridge
LOCATION: Mexico Beach, FL
PROJECT NO.: P24-157
DATE: 03/20/24
METHOD: Direct Push
DRILLER: PC
ENGR / GEOL: LF
SURFACE ELEVATION: +13 ft

LOCATION: Per Plan



USCS	MATERIAL DESCRIPTION	NATURAL MOISTURE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PASSING #200 SIEVE (%)
SP-SM	Dark Gray Slightly Silty Fine SAND					
SP-SM	Light Brown and Gray Slightly Silty Fine SAND					
SP-SM	Dark Brown Slightly Silty Fine SAND					
SP-SM	Brown and Dark Brown Slightly Silty Fine SAND					
SP-SM	Dark Brown and Dark Gray Slightly Silty Fine SAND					
SC	Brown Clayey Fine SAND	20				13
SP-SM	Dark Gray Slightly Silty Fine SAND					
	No Recovery					
SP-SM	Dark Brown Slightly Silty Fine SAND with Wood (ORG=8.5%)	32				
SP-SM	Brown Slightly Silty Fine SAND	24				6

Water Level Est. Seasonal High GWL: ▽ Measured: ▼ Perched: ▼

Water Observations: Groundwater Measured at 4.5 Feet Below Existing Ground Surface

Notes:
-Elevations Should Be Considered Approximate

N - SPT Data (Blows/Ft) P - Pocket Penetrometer (tsf)

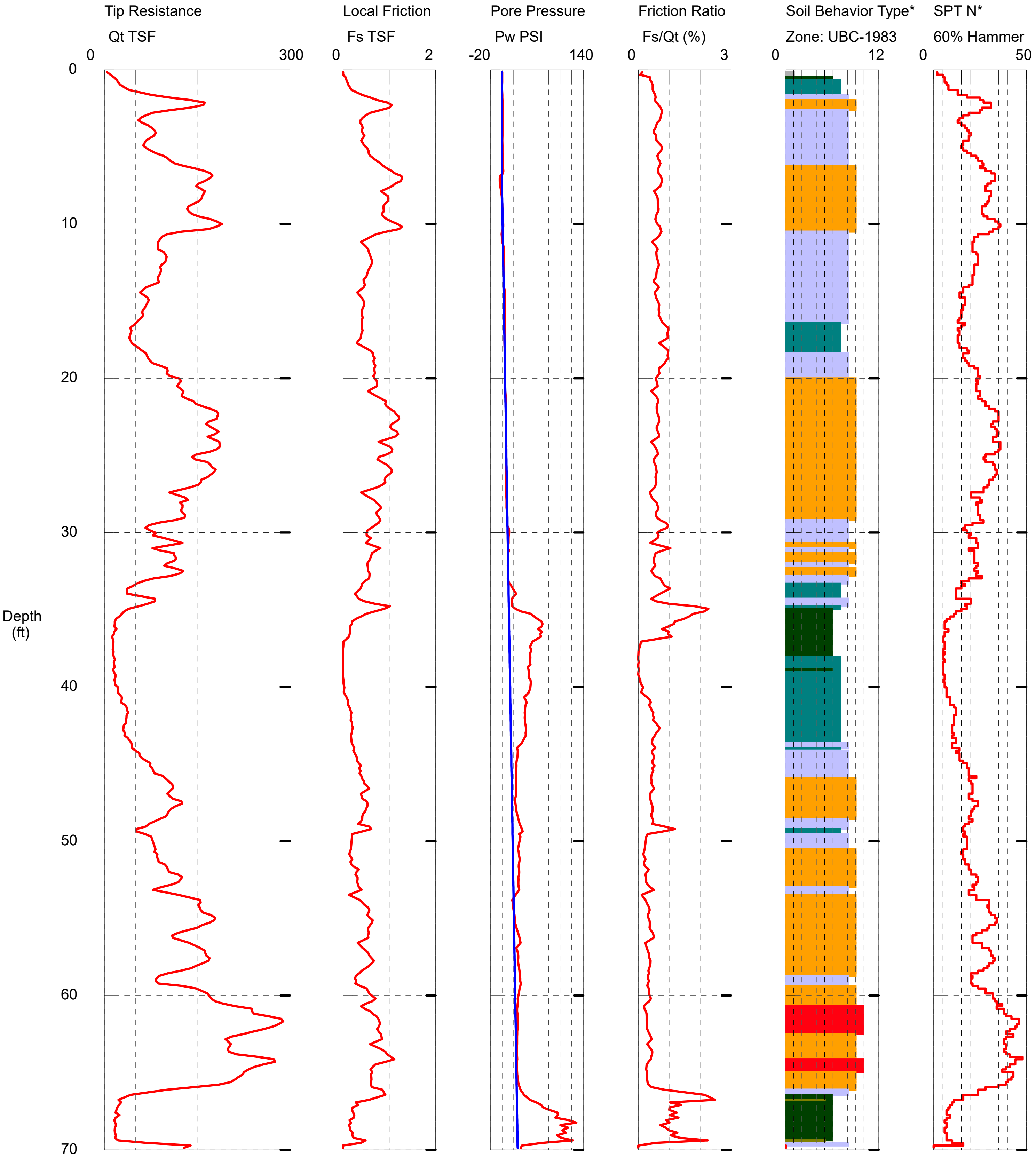
Sample Key: ◪ SPT ■ Shelby Tube

SOUTHERN EARTH SCIENCES, inc.

Southern Earth Sciences Inc.

Operator: Pat Conroy
Sounding: B-2
Cone Used: DDG1485
Groundwater: 4.6 feet

CPT Date/Time: 3/20/2024 12:03:02 PM
Location: 15th Street Pedestrian Bridge
Job Number: P24-157
Elevation: +12 Feet (Approx.)



Maximum Depth = 69.88 feet

Depth Increment = 0.164 feet

- ▨ 1 sensitive fine grained
- ▨ 2 organic material
- ▨ 3 clay
- ▨ 4 silty clay to clay
- ▨ 5 clayey silt to silty clay
- ▨ 6 sandy silt to clayey silt
- ▨ 7 silty sand to sandy silt
- ▨ 8 sand to silty sand
- ▨ 9 sand
- 🟥 10 gravelly sand to sand
- ▨ 11 very stiff fine grained (*)
- ▨ 12 sand to clayey sand (*)

ctG1485 @$e
N 29.942474W85.405687

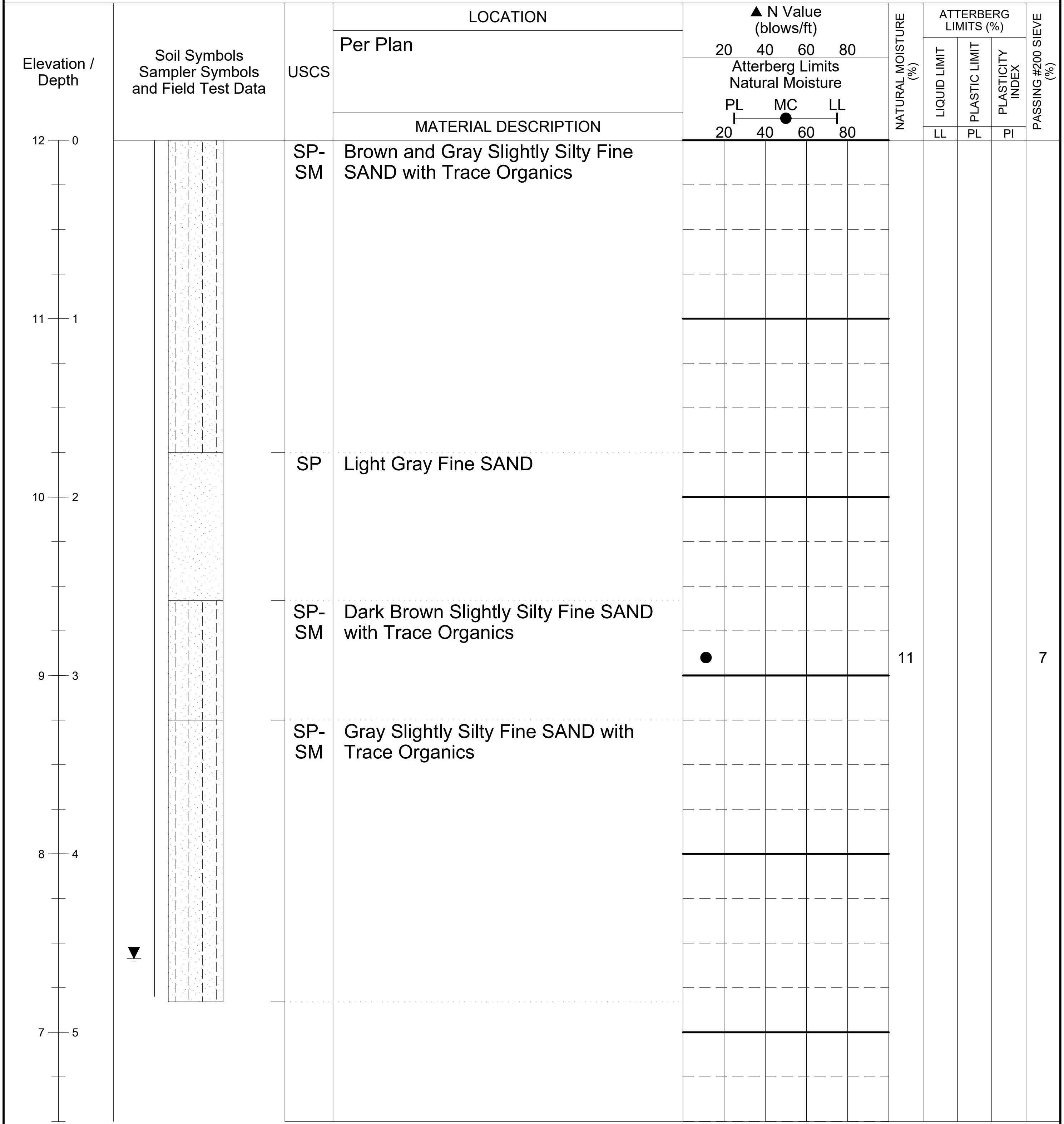
Changenroy

*Soil behavior type and SPT based on data from UBC-1983

LOG OF BORING B-2

PROJECT: 15th Street Pedestrian Bridge
LOCATION: Mexico Beach, FL
PROJECT NO.: P24-157
DATE: 03/20/24

METHOD: Hand Auger
DRILLER: PC/KK
ENGR / GEOL: LF
SURFACE ELEVATION: +12 ft



LOCATION: Per Plan

SP-SM Brown and Gray Slightly Silty Fine SAND with Trace Organics

SP Light Gray Fine SAND

SP-SM Dark Brown Slightly Silty Fine SAND with Trace Organics — Natural Moisture 11; Passing #200 Sieve 7

SP-SM Gray Slightly Silty Fine SAND with Trace Organics

Water Level Est. Seasonal High GWL: ▽ Measured: ▼ Perched: ▼

Water Observations: Groundwater Measured at 4.6 Feet Below Existing Ground Surface

Notes:
-Elevations Should Be Considered Approximate

N - SPT Data (Blows/Ft) P - Pocket Penetrometer (tsf)
Sample Key: ◪ SPT ▮ Shelby Tube

SOUTHERN EARTH SCIENCES, inc.

Important Information About Your
Geotechnical Engineering Report

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

The following information is provided to help you manage your risks.

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 you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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