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Geotechnical Engineering Report

Proposed Townhome/Apartment Development
275 Harry Driggers Blvd.
Brunswick, Georgia
April 8, 2022
Project No. 04-08-22-5

Prepared For:

Surest Development, LLC
Atlanta, Georgia

Prepared By:

Whitaker Laboratory, Inc.
Savannah, GA

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April 8, 2022

Surest Development, LLC
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Care Of: Mr. Gary Buechler
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(470) 851-3797

Referencing: Report of Geotechnical Evaluation Services for
Proposed Townhome/Apartment Development
275 Harry Diggers Blvd.
Brunswick, Georgia
Project No. 04-08-22-5

Dear Mr. Buechler:

As requested, WHITAKER LABORATORY, INC. has conducted a geotechnical evaluation at the above referenced site. Authorization to perform this evaluation was provided by your acceptance of our proposal dated March 7, 2022. Our findings and recommendations for design and construction are attached and it is important that you read the report in its entirety.

It is a pleasure to provide our services to you and we look forward to further opportunities to assist you on this and other projects.

Respectfully submitted,
WHITAKER LABORATORY, INC.

GEORGIA REGISTERED No. 31031 PROFESSIONAL ENGINEER JASON H. FOLLO 4/8/2022

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REPORT OF GEOTECHNICAL EVALUATION
Proposed Townhome/Apartment Development
275 Harry Driggers Blvd.
Brunswick, Georgia

I. INTRODUCTION / SCOPE

WHITAKER LABORATORY, INC. has completed an evaluation of the surface and subsurface conditions at this site. The preliminary conditions found, and how those conditions could affect the design and construction of foundations for the structures planned, form the basis for this report. Regardless of the thoroughness of any geotechnical evaluation, there are limitations, and deviations from the conditions found in this evaluation could be subsequently disclosed. We recommend that this report be provided to all parties involved in the planned development to include but not necessarily limited to the Owner, Architect, Design Engineers, General Contractor and sub-contractors. Unanticipated circumstances often arise during sitework, earthwork and foundation construction. Accordingly, we recommend that our firm be retained to provide the construction surveillance, inspection, and testing on the project, thereby being readily available to assist in the evaluation of any conditions encountered that differ from those anticipated.

The site is located at 275 Harry Driggers Blvd in Brunswick, Georgia. We understand, a new development of either townhome structures or apartments structures with pavements are planned for construction on this site. In addition, one detention area is planned on this site. In an effort to evaluate subsurface soil conditions and their impact on the design and construction of the planned construction, a total of three standard penetration test (SPT) borings, twelve cone penetration test (CPT) soundings and five dynamic cone penetration (DCP) test auger borings were performed. Borings/soundings extended to depths ranging from 3 to 53 feet below existing grades.

Please note that soundings CPT-7 through CPT-12 were performed at a later date utilizing the site plan shown in the boring location plan. These additional CPT soundings (CPT-7 through CPT-12) were performed in an effort to determine the final areas that will require surcharge loading prior to foundation construction begins.

Please note that this evaluation only applies to the foundations and pavements planned for construction. This evaluation does not apply to any future improvements, which may be made to the site. In particular, if at any time should additional fill be placed, adjacent to or nearby the structures referenced in this report, additional geotechnical borings and a follow up geotechnical analysis will be required. Standard billing rates will apply for this work.

II. EXECUTIVE SUMMARY

The following recommendations shall be considered a summary of the recommendations contained within this report and utilized as such. This report shall be read in its entirety.

- The encountered near surface soils can be made suitable for support of the structures utilizing shallow spread pier and/or strip footing foundations with slab-on-grade flooring if our foundation loading assumptions are not exceeded and the recommendations contained within this report are performed and verified during construction.

- Groundwater was encountered at the ground surface within areas of the site during our evaluation. Temporary dewatering will be required during foundation and earthwork construction.

- Due to groundwater residing at or within close proximity to the ground surface on this site, Whitaker recommends raising site grades and/or permanently lowering the groundwater (permeant underdrain and/or ditches) to achieve 24-inch separation between bottom of pavement section elevations and the seasonal high groundwater (SHGW) table.

- Very loose to loose sands were encountered at the near ground surface and extending to a depth reaching 3 feet below the ground surface on this site. In an effort to mitigate potentially damaging immediate settlements occurring to structures and to achieve bearing capacity recommendations outlined in this report, these very loose sands will require being compacted in place below all footings prior to foundation construction. Dewatering will significantly improve the chance of successfully compacting these sands in place. Otherwise, undercutting and replacement will be required.

- All fill shall be placed first, prior to foundation construction begins. If finished grade elevations for the ground surface and/or slabs-on-grade require residing higher than 2 ½ feet above existing grade elevations, foundation construction shall not begin until the fill has been in place and allowed to sit for a minimum period of 30 days to allow for initial settlement to occur.

- **Due to weak/sensitive clayey soils bracketing elevation 9 to 13 feet below existing grades within the area of B-1 and CPT-2, highlighted buildings shown on the boring location plan shall be surcharge loaded prior to foundation construction begins regardless of finished grade elevations. Surcharge loading will mitigate potentially damaging settlements occurring to the structures within these highlighted areas of the site.**

At any time, we will be glad to discuss the contents of this report. This includes insuring that you fully consider potential problems for design and construction procedures in respect to interpretations of the data.

III. PROJECT INFORMATION & DESCRIPTION

We have not been provided foundation loads for the buildings, however for the purpose of this report we will assume that foundation loads will not exceed 75 kips for columns and/or 3.5 kips per linear foot for walls/strip loads and that all fill will be placed prior to foundation construction.

We will further assume that if finished grade elevations for the ground surface and/or slabs-on-grade require residing higher than 2 ½ feet above existing grade elevations, foundation construction will not begin until the fill has been in place and allowed to sit for a minimum period of 30 days to allow for initial settlement to occur.

In addition, regardless of finished grade elevations for the ground surface and/or slabs-on-grade, the highlighted structural areas shown on the attached boring location plan shall be surcharged loaded prior to foundation conditions begins to mitigate potentially damaging settlements occurring to the structures residing within these areas of the site.

Item	Description
Proposed Improvements	New Building Structures
Finished grade elevations for ground surface and/or slabs-on-grade	More than 2 ½ feet above existing grades, 30 day wait required. Highlighted areas shall be surcharged loaded (see boring location plan).
Maximum Foundation loads	Assume 75 kips for columns and 3.5 kips per linear foot for walls
Maximum Floor Loads for slabs-on-grade	Assume 75 pounds per square foot
Maximum allowable settlement	Assume 1 inch overall and ½ inch differential
Above information was assumed by Whitaker Laboratory, Inc.	

If our assumptions are incorrect, we should be contacted immediately, provided the correct information and allowed an opportunity to change and/or modify the recommendations contained within this report if necessary.

IV. SITE LOCATION & DESCRIPTION

Item	Description
Location	275 Harry Driggers Blvd., Brunswick, Georgia
Existing Structures	None
Current ground cover	Heavily wooded
Existing topography	Gently sloping downward toward Harry Diggers Blvd.

At the time of our site visit, the site was heavily wooded and contained low-lying areas. Clearing of pathways were required to gain access to the planned boring locations. A majority of the planned boring locations were accessible to our truck mounted drilling equipment within these cleared pathways. However, the additional soundings (CPT-7 through CPT-12) were not accessible to our truck mounted drilling equipment at the time of our evaluation and required the use of our rubber track mounted soundings equipment. Ground surface was gently sloping downward toward Harry Driggers Blvd.

V. AREA GEOLOGY

This project is located in Brunswick, Georgia. This overall project area lies near the eastern edge of the South Atlantic Coastal Plain. This broad, gently sloping region extends southeastward from the Fall Line (Chesterfield - Columbia - Augusta - Macon - Columbus) to the Atlantic Ocean. The soils encountered are sedimentary in origin, and consist of layered marine deposits of sands, silts, and clays. These deposits have since been subjected to successive erosion and re-deposition, by fluctuations of sea levels, storm tides, and winds. Many of the surface sands are the result of depositional forces along ancient beaches, which formed during the changing shoreline and river conditions. Intermittent deposits of shells occur within the strata at irregular intervals. The surface soils in a majority of this Coastal Plain area were deposited during the Pleistocene Era, however surface soils near the coast are likely of the Holocene Era.

VI. TEST BORINGS AND SUBSURFACE CONDITIONS

The field exploration to determine the characteristics of the subsurface materials included a reconnaissance of the project site, the drilling of soil test borings, the advancement of an electronic cone penetrometer and the advancement of dynamic cone penetration test auger borings.

Standard penetration test borings were performed using rotary head drilling equipment and advancing hollow stem augers. Sampling and Standard Penetration Testing, (SPT), was performed in accordance with ASTM D-1586. SPT samples were taken at 2.5-foot intervals of depth for the first 10 feet, and at 5.0-foot intervals thereafter. Standard Penetration Testing is done with a 140-pound hammer falling 30 inches and a 2-inch diameter sampling spoon.

Dynamic Cone Penetration testing (DCP) is done within hand augered holes. The DCP test is performed at regular intervals below the ground surface. DCP testing is performed with a hand held 15-pound hammer. The hammer falls 20-inches every blow. The hammer is attached to steel rods containing a conical driving tip that is 1.5-inches in diameter (ASTM STP-339).

The electric cone penetrometer is utilized to perform Cone Penetration Testing (CPT). An electric cone attached to the end of a series of rods is pushed into the ground at a constant rate and nearly continuous measurements are made of the resistance to penetration on the cone. Load cells (bonded strain gauges) build inside the electronic cone record end bearing, qc, and friction sleeve stress, fs as the cone is being pushed into the ground.

Results of Cone Penetration Testing (CPT), Standard Penetration Testing (SPT N values) and/or DCP testing provide an indication of the relative consistency, density and in-situ strengths of the tested soils.

Soil samples from SPT testing and from the auger cuttings have been used for identification and visual classification. The subsurface stratification and the profile as presented in the boring logs, represent approximate boundary lines between the strata and materials encountered. These boundary lines are usually gradual and not clearly defined, and it is sometimes difficult to record changes in stratification precisely. It should be noted that underlying soil conditions can, and do, vary considerably within short lateral distances. It is possible that conditions may be revealed between boring locations that are different from those found by our borings and used for our analysis.

Soil behavior types identified within CPT logs are generated from the data collected during the CPT test and are based upon the soil classification chart for standard electronic friction cone (adopted from Robertson and Campanella UBC - 1983). The chart can be viewed within Appendix IV of this report.

The approximate locations of SPT borings, DCP auger borings and CPT tests are shown on the attached BORING LOCATION PLAN. Our field crews based on landmarks and features available at the time of work have estimated the test locations in the field. If the precise test locations are critical, this can be determined by employing a land-surveying firm to plot the true locations. Such survey should be completed promptly and before any disturbance to the area has occurred. If desired, WHITAKER LABORATORY, INC. will be glad to coordinate surveying arrangements for an additional fee.

Below approximately 6 to 12 inches of organic topsoil, the near surface soils on this site predominately consist of very loose to very firm sands and silty sands (SP, SM and SP-SM) extending to depths reaching 35 feet below the ground surface. Below 35 feet, firm to stiff sand clays and clays were encountered and extended to the termination depth of the deepest sounding at 53 feet below the ground surface. Please note that weak/sensitive clay was encountered bracket elevation 9 to 13 feet below existing grades with CPT-2 and B-1.

The above description of the subsurface profile should be considered a general description intended to highlight the major strata encountered. More detailed profiles can be observed within the attached boring logs. Please note that boring logs are only representative of their location. Stratification transitions should be expected to occur outside and between boring locations. Taking into account that sampling was not performed on a continuous basis in the SPT borings, lines drawn representing elevations of stratification changes shown on the SPT boring logs were estimated.

VII. GROUNDWATER TABLE

The apparent groundwater table was measured for each boring location at the time of boring. Groundwater levels were measured to reside at the ground surface within areas of this site at the time of testing. The groundwater elevation can be expected to fluctuate with the season of the year, surrounding ground surface conditions, and with recent rainfall amounts. Thus, groundwater elevations shown on the boring logs should be considered valid only for the date of observation.

Boring Location	Groundwater Depth (Feet)
B-1	1
B-2	2
B-3	2
DCP-1	1
DCP-2	0.5
DCP-3	1
DCP-4	1
DCP-5	1

Due to groundwater residing at or within close proximity to the ground surface on this site, Whitaker recommends raising site grades and/or permanently lowering the groundwater (permeant underdrain and/or ditches) to achieve 24-inch separation between bottom of pavement section elevations and the seasonal high groundwater (SHGW) table.

Temporary dewatering will be required during earthwork and foundation construction. Typically, the groundwater level needs to be 24 inches below subgrade elevations to properly compact the subgrade and subsequent backfill materials. Due to anticipated stripping depths of 12 inches, combined with loose sands extending to depths reaching 3 feet below existing grades, dewatering **will be required to extend to a minimum depth of 5 feet below existing grades on this site prior to earthwork construction beginning.**

Although dewatering techniques consisting of well point systems, sump pits with pumps, and/or drainage ditches are typically effective methods to lower groundwater, the means and methods for dewatering should ultimately be the responsibility of the contractor.

Due to the sandy nature of the near surface soils on this site, well point systems should be considered.

Please note that lowering the groundwater table can negatively impact existing foundations of adjacent structures. In an effort to minimize this potential impact, dewatering measures on this site shall not lower the groundwater table at the property line by more than 4 feet. Temporary piezometers should be installed to monitor groundwater levels at the property line. Injection wells should be installed if groundwater levels require maintaining at recommended levels.

VIII. SEISMIC SITE CLASSIFICATION AND COEFFICIENTS

Liquefaction Potential:

Whitaker Laboratory, Inc. performed a liquefaction analysis on the soils encountered within sounding CPT-6. Liquefaction typically occurs when very loose to loose non-cohesive soils encountered below the groundwater table experience a significant loss of shear strength due to the increase in porewater pressure resulting from seismic vibrations.

The design earthquake utilized in our analysis (Charleston, SC earthquake with magnitude 7.3 and a 2% probability of exceedance in 50 years) yielded peak horizontal ground surface accelerations of 0.13g on this site. Based upon the design earthquake and characteristics of subsurface soils, the liquefaction analysis indicated that the encountered sand stratifications present below the groundwater table have potential to liquefy during the design seismic event. The amount of settlement estimated during and shortly after a seismic event of this magnitude approximated ¼ to ½ inch.

Settlements of this magnitude are not likely to cause damage to the structure, therefore liquefaction induced settlement should not be of concern in the design of the structure.

Seismic Parameters:

Assuming the structures have a period of vibration under 0.5 second and disregarding liquefaction potential, this site would be defined as a Site Class "D". The classification is determined by average soil properties in the top 100 feet of the soil profile, including standard penetration test N values, shear wave velocities, in-situ shear strengths and moisture contents, as specified by IBC 2018 /ASCE 7-16.

$S_s = 0.168$
$S_1 = 0.076$
$S_{MS} = 0.269$
$S_{M1} = 0.182$
$S_{DS} = 0.179$
$S_{D1} = 0.121$

A summary report is attached in Appendix III of this report. If the design of the structures justifies additional investigation, a Site Specific Geotechnical Investigation and dynamic site response analysis shall be performed. Our firm has the ability to provide our clients such testing and evaluation, and we will be available to discuss the cost, and potential benefit, if any, of such if you desire.

IX. EARTHWORK AND FOUNDATION DESIGN CONSIDERATIONS

The encountered near surface soils can be made suitable for support of the structures utilizing shallow spread pier and/or strip footing foundations with slab-on-grade flooring if our foundation loading assumptions are not exceeded and the recommendations contained within this report are performed and verified during construction.

Please note the following:

- Groundwater was encountered at the ground surface within areas of the site during our evaluation. Temporary dewatering will be required during foundation and earthwork construction.

- Due to groundwater residing at or within close proximity to the ground surface on this site, Whitaker recommends raising site grades and/or permanently lowering the groundwater (permeant underdrain and/or ditches) to achieve 24-inch separation between bottom of pavement section elevations and the seasonal high groundwater (SHGW) table.

- Very loose to loose sands were encountered at the near ground surface and extending to a depth reaching 3 feet below the ground surface on this site. In an effort to mitigate potentially damaging immediate settlements occurring to structures and to achieve bearing capacity recommendations outlined in this report, these very loose sands will require being compacted in place below all footings prior to foundation construction. Dewatering will significantly improve the chance of successfully compacting these sands in place. Otherwise, undercutting and replacement will be required.

- All fill shall be placed first, prior to foundation construction begins. If finished grade elevations for the ground surface and/or slabs-on-grade require residing higher than 2 ½ feet above existing grade elevations, foundation construction shall not begin until the fill has been in place and allowed to sit for a minimum period of 30 days to allow for initial settlement to occur.

- **Due to weak/sensitive clayey soils bracketing elevation 9 to 13 feet below existing grades within the area of B-1 and CPT-2, highlighted buildings shown on the boring location plan shall be surcharge loaded prior to foundation construction begins regardless of finished grade elevations. Surcharge loading will mitigate potentially damaging settlements occurring to the structures within these highlighted areas of the site.**

Earthwork:

The following shall be performed to achieve finished subgrade elevations on the site and be performed prior to foundation construction begins.

- **As recommended above, dewatering shall be performed prior to earthwork construction beginning and remain in-place until after footings have been constructed.** Dewatering measures shall lower groundwater to a minimum depth of 5 feet below existing grades within the planned build pad areas (plus 10-feet outside perimeter).

- After dewatering measures are in place and have been proved to be successful in lowering the groundwater to appropriate levels, we recommend that the structural areas plus a minimum of 10 feet beyond the perimeter of all structural areas be stripped of any organics, stumps, roots and unsuitable surface soils. **Stripping depths should be anticipated to extend 6 to 12 inches or more to effectively remove all surface organic materials.**

- After dewatering and stripping and prior to backfill/fill placement, all exposed subgrade soils should be thoroughly compacted in-place to 95% of ASTM-D-1557 and pass proof-rolling inspections prior to backfill/filling operations begin. Compaction efforts on exposed subgrade soils shall be made with a large vibratory smooth drum roller (Cat CS 74 or equivalent - centrifugal force range of 37,300 – 74,600 lb). Areas found to pump or deflect should be drained and compacted or if due to unsuitable soils, undercut to a competent material and backfilled with an approved compacted material. The exposed subgrade soils should be inspected, tested and approved by Whitaker Laboratory personnel prior to any fill placement begins.

- Backfill and/or fill material required to replace stripped areas, undercut areas, utility trenches etc. and to raise the pad areas to achieve finished subgrade elevations, should consist of, be placed, and compacted in accordance with the SITE WORK section of this report.

- All fill shall be placed first, prior to foundation construction begins. If finished grade elevations for the ground surface and/or slabs-on-grade require residing higher than 2 ½ feet above existing grade elevations, foundation construction shall not begin until the fill has been in place and allowed to sit for a minimum period of 30 days to allow for initial settlement to occur.

Surcharge Loading:

Due to weak/sensitive clayey soils bracketing elevation 9 to 13 feet below existing grades within the area of B-1 and CPT-2, highlighted buildings shown on the attached boring location plan shall be surcharge loaded prior to foundation construction begins regardless of finished grade elevations. Surcharge loading will mitigate potentially damaging settlements occurring to the structures within these highlighted areas of the site.

Surcharge loading, also known as "pre-loading", in general, consists of adding sufficient weight "surcharge" to the building pad area utilizing compacted, stockpiled soil prior to construction. This surcharge loading will be in addition to the weight of any permanent structural fill placed on the site. The weight of the stockpiled soil will allow the very soft soils to consolidate. Once it is determined that the subsurface soils have consolidated fully under the weight of the stockpiled soil, the stockpiled soil can be removed and the building can be constructed.

Site preparation performed in accordance with the above Earthwork and below SITE WORK RECOMMENDATIONS sections of this report shall precede all surcharge construction. Any permanent structural fill designed to remain beneath the completed structure shall be placed, compacted and tested also in accordance with the above Earthwork and below SITE WORK RECOMMENDATIONS sections of this report. **After completion of the permanent fill, an additional surcharge fill thickness of 5 feet shall then be constructed on top of the permanent fill.** This additional surcharge fill should extend a minimum of 10 feet outside the area deemed necessary for surcharge loading. Compaction of the surcharge fill shall be to 90% Standard Proctor Density (minimum of 100 pounds per cubic foot).

Settlement monitoring plates shall be installed within the mass of the permanent fill and extended above the surface of the surcharge fill (See attached detail). Settlement readings shall be made and recorded during the construction of the surcharge fill, and at one-week intervals after completion of fill.

The surcharge fill shall remain in-place until settlement readings indicate total consolidation of the site, and continuing rate of consolidation, has reached an acceptable level. The removal of the surcharge fill shall be when and as directed by the geotechnical engineer. It is estimated that the surcharge will remain in-place 45 to 60 days, but the decision to remove the fill will be based on the data collected from the settlement monitoring plates.

Once surcharge loading is deemed complete by the geotechnical engineer of record, the recommendations outlined within the below **Shallow Spread Footing Foundations** section of this report can be utilized.

Shallow Spread Footing Foundations:

After the above is completed and verified by Whitaker personnel during construction, excavation for footings can begin. Bottom of footing excavations should be thoroughly compacted to meet or exceed 95% of the soils modified proctor maximum dry density in accordance with ASTM-D-1557.

Verification footing inspections shall be conducted after footings are excavated by the foundation contractor by performing dynamic cone penetrometer testing within bottom of footing excavations to verify adequate bearing material is present. Subsurface bearing soils deemed unsuitable shall be addressed prior to proceeding with construction.

Individual spread footings, strip footings, or bearing edges of slabs-on-grade could be designed to bear in compacted and approved virgin soils or coarse grained structural backfill, as outlined above and soil bearing pressures of 1,500 psf may be used. Any individual or strip footing should have a minimum plan dimension of 24 inches. Bearing elevations of foundations should meet local building code requirements for depth below finished grade and reside above the groundwater table.

If the above recommendations are performed and verified, tolerable long term overall and differential settlements on the order of one inch and one-half inch respectively or less should be expected due to assumed maximum foundation loads and fill heights. Slabs-on-grade could be designed utilizing a modulus of subgrade reaction "K" value of 150 pci.

Lateral loads can be resisted by passive earth pressure due to compacted structural fill placed against the sides of the footings. The upper 1-foot of resistance should be neglected unless the fill is confined by a pavement or floor slab. A soil unit weight of 110 pcf and passive earth pressure coefficient of 3.0 can be utilized in the analysis. Additionally, a friction coefficient of 0.35 between the concrete footings and underlying soil can be used in combination with passive earth pressures to resist lateral loads. The coefficient of friction should be applied to dead normal loads only.

On-site Pond Excavation:

Boring B-1 was performed within the planned small pond area in the front of this site. SP and SP-SM soils were encountered immediately below the topsoil and extending to depths reaching 8 ½ (or more) feet below existing grades.

In addition, CPT-3 indicated SP and SP-SM extending to a depth reaching 21 feet below existing grades. CPT-3 was advanced within the large pond area residing in the middle of the site.

These encountered SP and SP-SM soils are suitable for use as structural fill/backfill on this site. These soil types typically exhibit good to fair drainage properties, which can typically be compacted without difficulty when drained and/or properly moisture conditioned.

Please note that due to groundwater residing as shallow as the ground surface on this site, dewatering will be required during pond excavation. Whitaker recommends that well points be installed around the perimeter of the large pond on this site. Well points installed around pond areas will help dewater adjacent structural areas.

X. SITE WORK RECOMMENDATIONS

We will be pleased to discuss these recommendations with the owner and the site work contractor selected to do the work. We believe it will be beneficial to the project, for the owner and the contractor to have a clear understanding of our recommendations.

1. Prior to construction, all building areas, plus at least 10 feet on each side and all areas to be paved, should be stripped of all vegetation, topsoil and root systems. Site drainage during construction should be considered prior to this clearing and stripping. Preventing the ponding of storm water is of particular importance.

2. Topsoil, organics, root-mat and other surface materials will likely vary across the site. Individual test borings may not accurately reflect the presence of, or the thickness of such materials due to site variability and/or surfacing clearing to facilitate access for drilling equipment. Site clearing and grubbing, when unsupervised, and particularly in areas of wet soils and times of wet weather, may push organic debris into otherwise stable soils. Undercutting and clearing with a track hoe in lieu of bulldozers can minimize this.

3. Any stump holes or other depressions should be cleared of loose material and debris, and should then be back-filled with approved fill. The backfill should be placed in 6-inch thick lifts and compacted to 95% density in accordance with ASTM D-1557.

4. Any existing utilities that underlie the site should be relocated and their trenches back-filled with approved soil. The backfill should be placed in 6-inch lifts and compacted to 95% density according to ASTM D-1557.

5. Prior to fill placement, the subgrade should be proof rolled with a loaded dump truck to locate unstable or soft areas. Any unstable areas should then be investigated to determine the cause of the instability. If due to unsuitable soils, such as highly organic soils or soft clays, the areas should be undercut to firm soil and replaced with approved fill compacted in 6-inch lifts to minimum density of 95% in accordance with ASTM D-1557. If the instability is due to excess moisture in otherwise stable soil, the area should be drained and compacted to 95% density.

6. Any fill or backfill required to level or raise the site should be placed in 8 to 10 inch thick, loose lifts and compacted by appropriate compaction equipment to 95% density in accordance with ASTM D-1557.

7. All of the fill and backfill (including utility line backfill) for this project should consist of clean, free draining granular soils. The fill should be free of objectionable roots, clay lumps, organics and other debris. The fill should be readily compactable during placement. Soils classified as SW, SP, SP-SM or SM with a maximum of 15% passing a #200 sieve may be acceptable. Soils with the minus #200 fraction classified as MH, CH, OH, ML, CL or SC may be rejected. Soils with a maximum plasticity index of 25 and a maximum liquid limit 40 may be acceptable for use only beneath building pads which are situated well above the groundwater table with approval from the geotechnical engineer. Soils classified as SC or CL, exhibiting moisture sensitivity, soils with excessive clay content, or excessive moisture should not be used without approval from the geotechnical engineer. Approved sands will also need to be moisture conditioned as necessary to facilitate proper compaction throughout its entire depth. If utility trenches cannot be sufficiently dewatered to readily allow compaction of the specified pipe bedding material, then a class I (ASTM-D-2321) gravel or gravel mixture will be required.

8. To assist in reducing moisture beneath the structure, and to reduce the potential for mold growth, the site shall be graded and filled as necessary to direct drainage away from the structure. If sub drains are installed, these alone may not prevent moisture vapor beneath the structure that can cause mold growth. (Also refer to paragraph 10 below). Care must be taken to not place concrete on top of wet soils. For example, if fill or natural soils experience heavy rain, the soils should be properly drained and dried, prior to placement of concrete. Otherwise moisture migration through the slab will occur.

9. Compact all footing excavations and slab subgrades to a minimum density of 95% in accordance with ASTM-D-1557, prior to placement on concrete. The footing excavations, and all prepared slab subgrade, should be maintained in a dry and compacted condition until the concrete is placed. Areas that are softened by water or that are disturbed by construction activity should be re-worked, re-compacted, or appropriately repaired to the required bearing and density. If necessary, stone backfill or other corrective measures may be implemented to stabilize footings.

10. All slabs-on-grade should be supported on a minimum of 4-inches of granular, free-draining gravel or coarse sand to reduce moisture migration by capillarity. A vapor retarding membrane, overlying this granular base, is recommended to further reduce moisture migration into finished areas of the structure. Note that the use of these measures will not totally prevent moisture under or on top of slabs or beneath structures. (Also refer to paragraph 8 above).

11. Any footing excavations that are directly adjacent to the existing foundations should be done in small increments to avoid undermining them and causing a loss of support to the existing structure. If necessary, the excavations should be sheeted and braced or grouting should stabilize the soil in the immediate area.

XI. PAVEMENT RECOMMENDATIONS

Subgrade for driveways and parking areas should consist of a minimum of 24-inches of approved subgrade compacted to a density of 95% of its maximum dry density as determined by ASTM-D-1557. Pavement designs should also provide a minimum of 24-inches separation between the bottom of the base course material and the seasonal high ground water table. Undercutting, re-compacting, and/or replacing of existing surface soils will be required unless subgrade consists of organic free, virgin sand clay soils that are proven to be compacted to a minimum depth of 24-inches, pass proof rolling and reside 24-inches above the seasonal high ground water table. Final grades and elevations will determine the extent of any filling, undercutting and backfilling that may be required.

Whitaker recommends raising site grades and/or permanently lowering the groundwater (permeant underdrain and/or ditches) to achieve 24-inch separation between bottom of pavement section elevation and the seasonal high groundwater (SHGW).

All proof rolling, construction observations, compaction testing of paved areas must be in accordance with the SITE WORK section above.

If a rain event of 0.5 inches or more, occurs after initial proof rolling and prior to subsequent placement of base or surface wearing course, the proof roll testing must be repeated just prior to additional work.

The below recommended pavement sections should be considered standard and typical for the area. We have not been provided traffic data and/or been instructed to perform CBR testing on subgrade soils, therefore these pavement sections should not be considered a pavement design. The below recommended pavement sections are based upon the assumption that the sandy subgrade soils will yield a minimum CBR value of 8 if compacted to 95% ASTM D-1557 for a full 24-inch depth. In addition, the below recommended light duty pavement sections should be considered for car traffic areas only. Below recommended heavy duty sections should be utilized for all areas receiving truck traffic (delivery trucks and garbage trucks with 18-kip axle loads). In addition the heavy duty sections recommended below are for low volume truck traffic (15 to 20 trucks per day).

LIGHT DUTY PAVEMENT (CARS & LIGHT TRUCKS)

SUBGRADE:	Minimum – 24-inches of drained, compacted, sandy soil
BASE COURSE:	Minimum - 6-inches of Graded Aggregate Construction
SURFACE COURSE:	Minimum - 2-inches of 12.5 mm Superpave

HEAVY DUTY PAVEMENT (LOADED TRUCKS WITH 18+ kip AXLE LOADS)

SUBGRADE:	Minimum – 24 inches of drained, compacted, sandy soil
BASE COURSE:	Minimum - 8-inches of Graded Aggregate Construction
BINDER COURSE:	Minimum - 2-inches of 19 mm Superpave
SURFACE COURSE:	Minimum - 2.0-inches of 9.5 mm Type II Superpave, or Minimum - 2.0-inches of 12.5 mm Superpave

In all projects, a minimum mat temperature of 185° F must be maintained through final roller pass.

Please note that specifications for the above mentioned base course and surface course can be found under Sections 310, 400, 815 and 828 of the Georgia Department of Transportation State of Georgia Standard Specifications Construction of Transportation Systems, 2001 Edition. The mix design must include "lime".

PORTLAND CEMENT CONCRETE PAVEMENT

SUBGRADE:	Minimum – 24 inches of drained, compacted, sandy soil
HEAVY DUTY:	8-inches of Portland cement concrete with minimum compressive strength of 4000 PSI.
LIGHT DUTY:	5-inches of Portland cement concrete with minimum compressive strength of 4000 PSI.

Whitaker Laboratory recommends incorporating a minimum of 4-inches of graded aggregate base course below the above concrete pavement sections for maintaining a smooth and level surface during placement of the pavement section.

Joints must be placed a MAXIMUM spacing in FEET of 2.5 times the pavement thickness in inches, and in no case more distant apart than 15 feet.

Pavement Design should include:

- Requirements to seal all pavement joints to prevent surface water entry into base / subgrade. Such provision should minimize pumping failures at joints.
- Requirements that pavement sections and panels subject to repetitive braking and/or acceleration should be designed with lug anchors or tie-bars to minimize separation or misalignment at the joints.
- Provisions for load transfer across construction joints by dowels or other acceptable means.
- In general, the design should follow the recommendations and practices for all components as described in ACI 330.1 and/or ACI 330R as applicable.

XII. QUALITY CONTROL AND TESTING

Documented inspections and/or testing performed by Whitaker Laboratory personnel, at the following critical milestones during construction, will be required for the recommendations contained within this report to be validated:

Earthwork:

- Verify dewatering measures are adequate prior to earthwork construction beginning.
- After stripping and prior to backfill/fill placement: Perform density testing and proofrolling on exposed subgrade soil to verify exposed subgrade soils are compacted and stable enough to begin receiving fill.
- Collect sample of proposed fill material, perform laboratory testing and determine suitability for use (approve or disapprove).
- During backfill/fill placement: Perform density testing on each lift of backfill and/or fill soil.
- Verify all fill on this site shall be placed first.
- If finished grades resides more than 2 ½ feet above existing grades, verify fill has been in place and allowed to sit for a minimum period of 30 days prior to foundation construction.

Surcharge Loading: (required for the highlighted areas denoted on the attached boring location plan)

- During installation of surcharge fill: Install settlement-monitoring plates
- After surcharge fill is in place: Monitor settlement and provide recommendation when foundation construction can begin.

Footings:

- Once footings are excavated: Perform inspection on bearing subgrade soils within bottom of footing excavations to depths reaching 3 feet below bottom of footing elevations prior to placement of reinforcing steel or concrete. Provide recommendations for undercutting and replacement if deemed necessary.

At the appropriate time, please contact Whitaker Laboratory, Inc. for budgetary and scheduling purposes for the performance of the above required inspection and testing services.

At the appropriate time, please contact Whitaker Laboratory, Inc. for budgetary and scheduling purposes for the performance of the above required inspection and testing services.

We further offer concrete, asphalt, masonry, and structural steel inspections and testing. Whitaker Laboratory, Inc. also performs observational services for mold mitigation, including observation of installation of vapor retarding membranes, subdrains, overall site drainage, and regularly scheduled observations after construction of site and landscape drainage, and monitoring of humidity and moisture in slabs and basement walls.

XIII. QUALIFICATIONS OF REPORT

Any recommendations or opinions offered in this report are based on our interpretation of the data obtained from this investigation. It should be noted that underlying subsurface and soil conditions can, and do, vary considerably within short lateral distances. Regardless of the thoroughness of any subsurface investigation, it is possible that conditions may be revealed between boring locations that are different from those found by our borings and used for our analysis. For this reason, we recommend that the site preparation and foundation construction for this project be monitored closely. If deviations of the soil conditions from those presented in this report appear, we will be glad to furnish any additional analyses and recommendations that may be required.

This report was made to investigate subsurface properties of the site and is not intended to serve as a wetlands survey, toxic mold assessment, or environmental site assessment. No effort has been made to define, delineate, or designate any area as wetlands or an area of environmental concern or contamination. Any references to low areas, poorly drained areas, etc. are related to geotechnical applications. Any recommendations regarding drainage and earthwork are made on the basis that such work can be permitted and performed in accordance with the current laws pertaining to wetlands, storm water runoff, and environmental contamination.

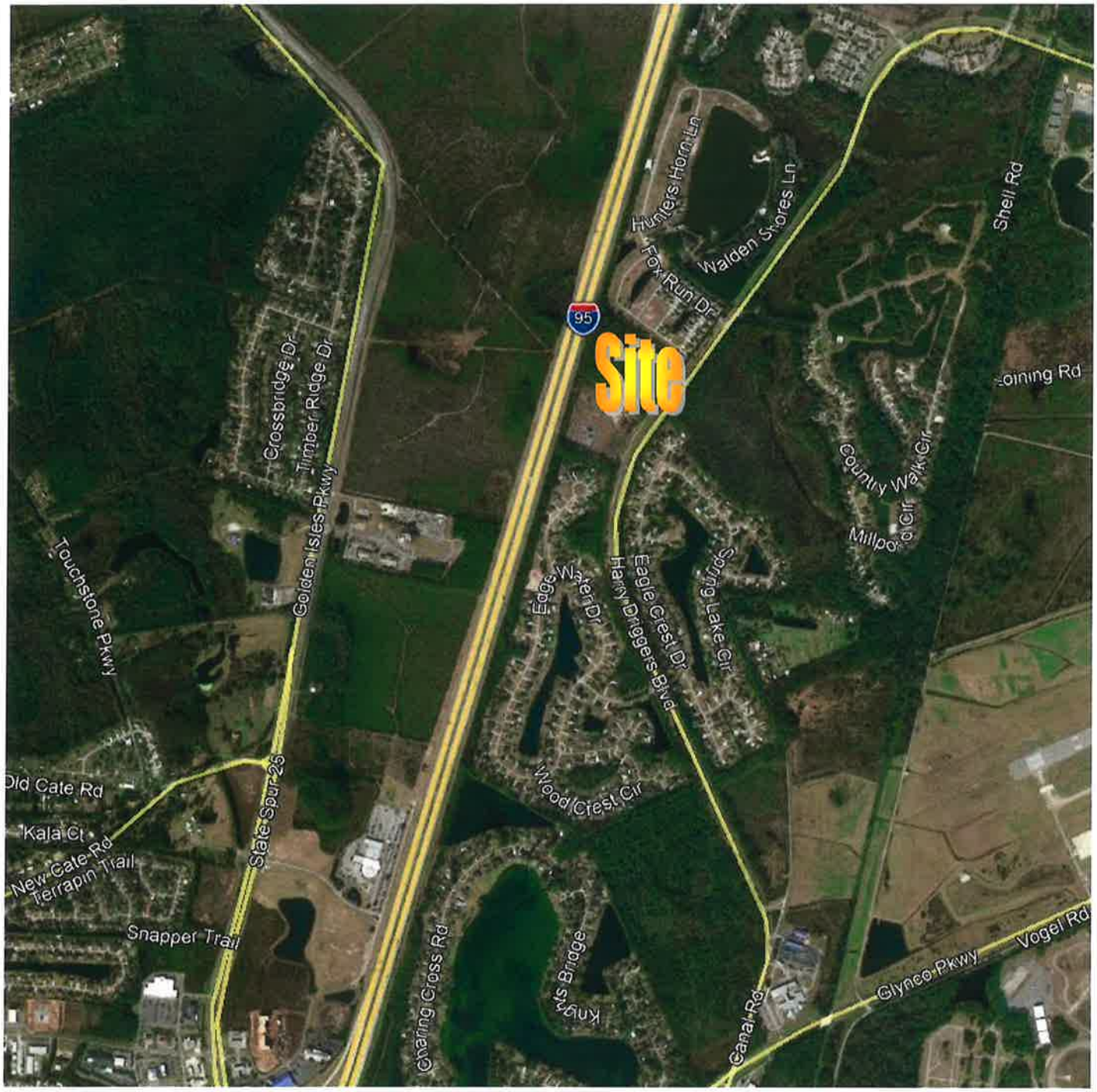
This report does not attempt to define or represent any FEMA, or otherwise designated, flood, erosion, scour, or other hazardous zones; nor does it presume to reflect that governmental or other authorities will grant approval of the project and issue appropriate permits.

WARRANT: WHITAKER LABORATORY, INC. and its professional engineers strive to perform all services in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering profession practicing in the same locality and under similar conditions. No other warranty or representation, expressed or implied, is included or intended in this agreement, in any report, opinion, document, or otherwise. We carry commercial general liability insurance, including completed operations, and professional liability insurance in aggregate amounts deemed adequate, and we comply with the statutory requirements for workmen's compensation insurance. Accordingly, by accepting and relying on the contents of this report, the liability of WHITAKER LABORATORY, INC. and its professional engineers, to the client, owner, or any other party, for any loss or damage, resulting from any cause, including professional acts, errors, omissions, negligence, toxic mold and other environmental claims, breach of warranty or breach of contract, shall not exceed the total compensation received by us for services related to this project; and client will defend, settle, and discharge any claims or allegations of liability for same against us by others. If client desires higher monetary limits of our liability, we will be pleased to discuss such higher limits and the impact on liability and fees. In the event the client makes a claim against us, at law or otherwise, for any alleged act, error, omission, negligence, breach of warranty or breach of contract, arising from the performance of our services, it is mutually agreed that initially, the client and Whitaker Laboratory, Inc. will attempt to resolve such dispute through direct negotiations between the appropriate representatives of each party. Secondly, if such negotiations are not fully successful, the parties agree to resolve any remaining disputes by formal nonbinding arbitration mediation in accordance with the rules and procedures to be agreed upon by the parties. Mediation is a pre-condition to litigation. The exclusive venue for any disputes relating to Whitaker Laboratory's service shall be in Chatham County, GA. Furthermore, if the client fails to prove such claim, then client shall pay all costs accrued by us in defending ourselves.

TITLE: The ownership of opinions, technical ideas, methods and means, drawings, calculations, and other data developed by us during the course of preparing proposals or rendering engineering services remains exclusively with us. It is a condition of this report or proposal that the client agrees not to use the opinions, technical ideas, methods and means, drawings, calculations or any other data for projects or locations, other than those specifically addressed in the report, and that no one other than the client may use this report, without the written permission of WHITAKER LABORATORY, INC.

APPENDIX I

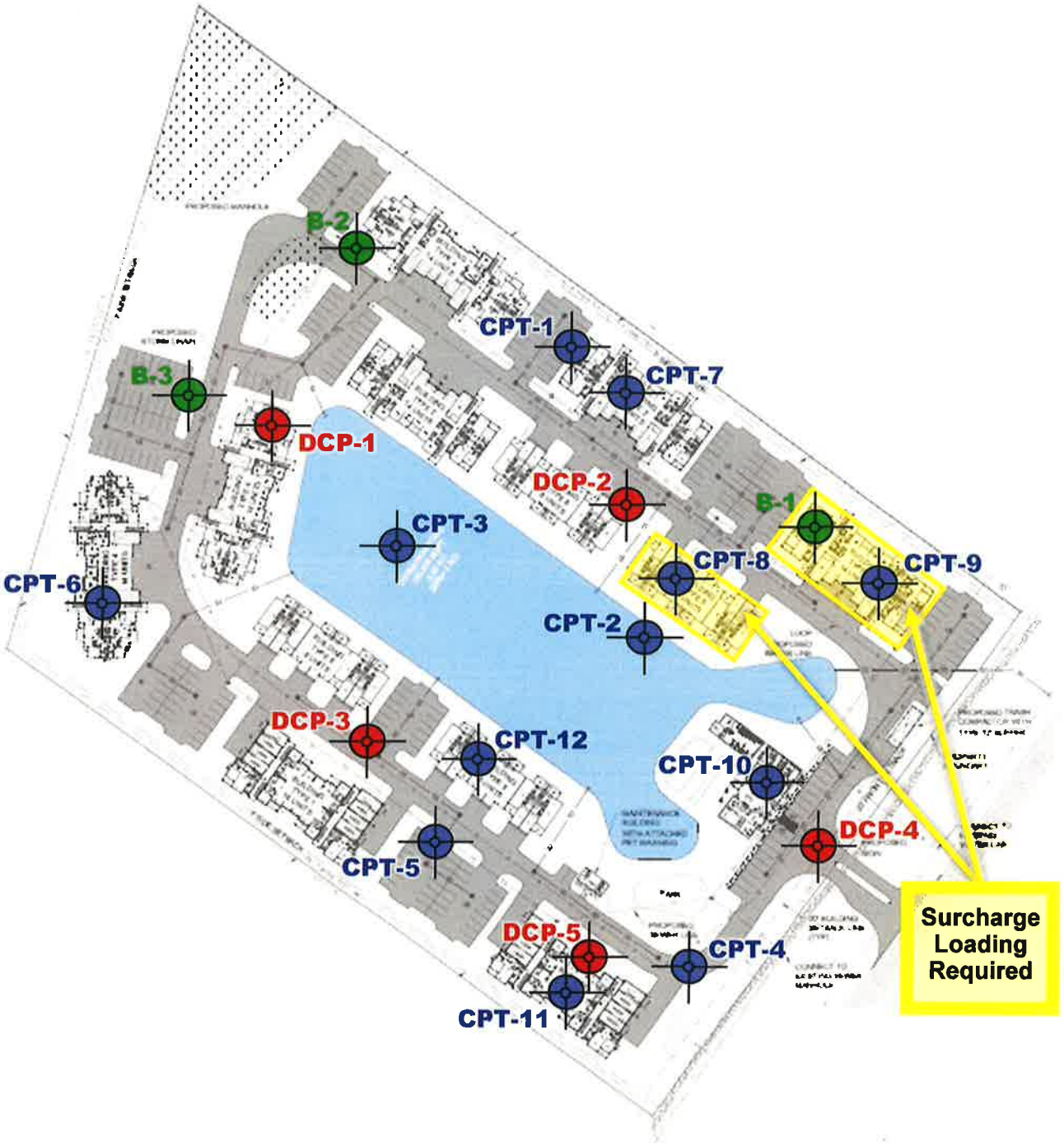
SITE VICINITY & BORING LOCATION PLANS



Site Vicinity Map

Southern Land Partners, LLC.
275 Harry Driggers Boulevard
Brunswick, Georgia

N



Boring Location Plan

Southern Land Partners, LLC.
275 Harry Driggers Boulevard
Brunswick, Georgia

N

ALL BORING LOCATIONS ARE APPROXIMATE, & ARE BASED ONLY ON FIELD ESTIMATES.

APPENDIX II

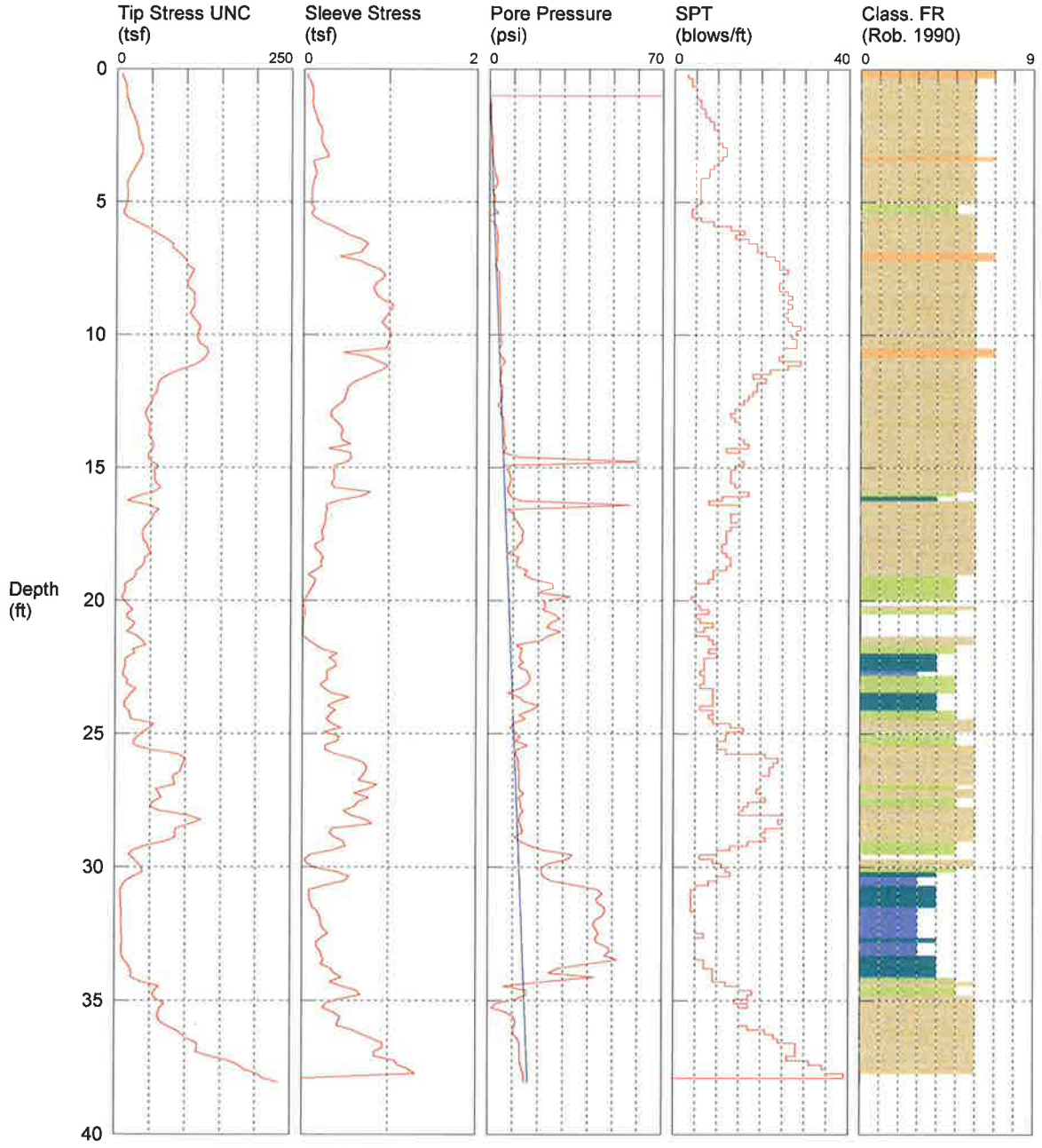
BORING RECORDS

CPT-1

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG0862
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT-1
TEST DATE: 3/1/2021 11:26:55 AM
SOUNDING

TOTAL DEPTH: 38.058 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy sil
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

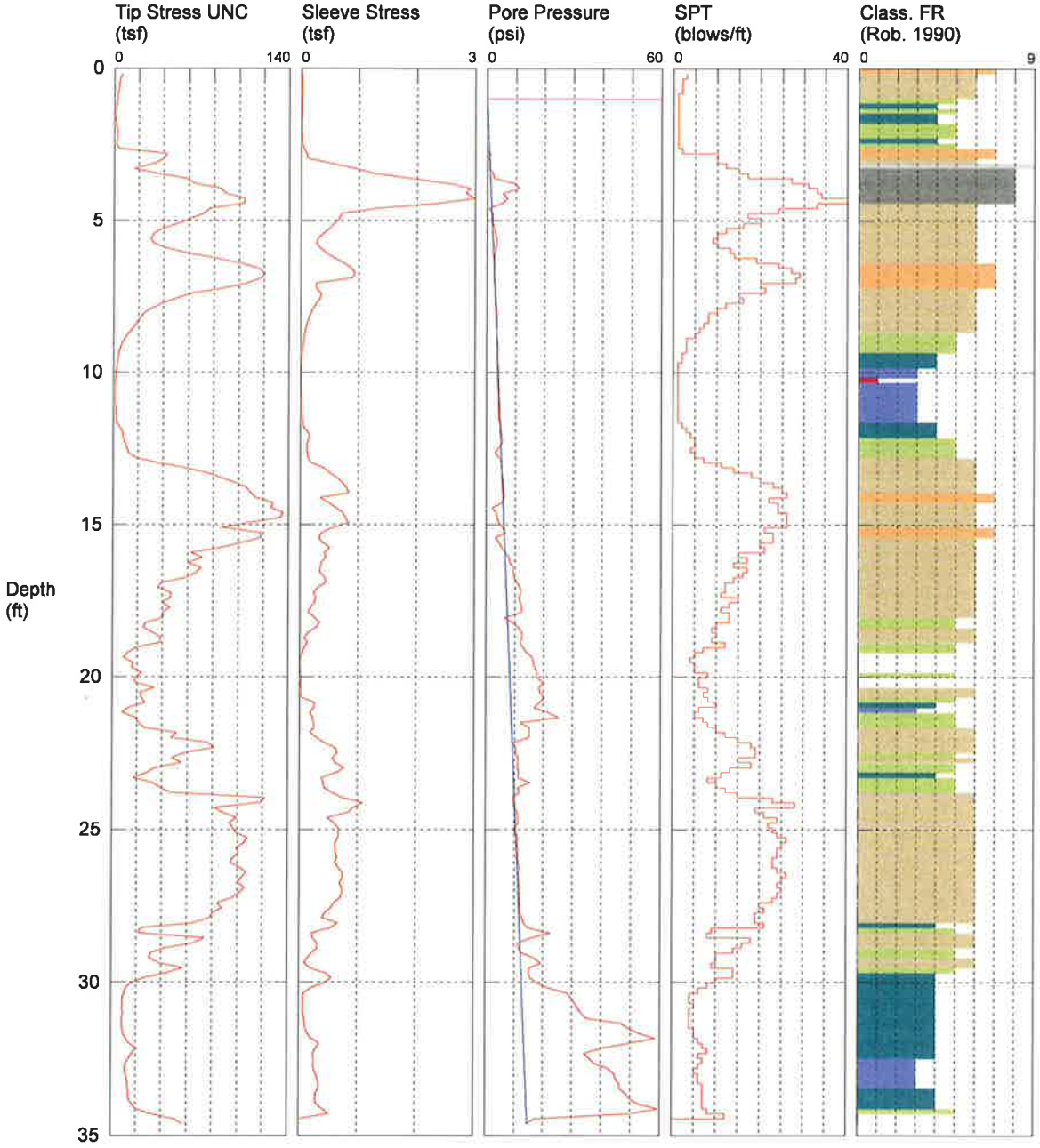
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT-2

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG0862
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT-2
TEST DATE: 3/1/2021 12:15:58 PM
SOUNDING

TOTAL DEPTH: 34.613 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy sil
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

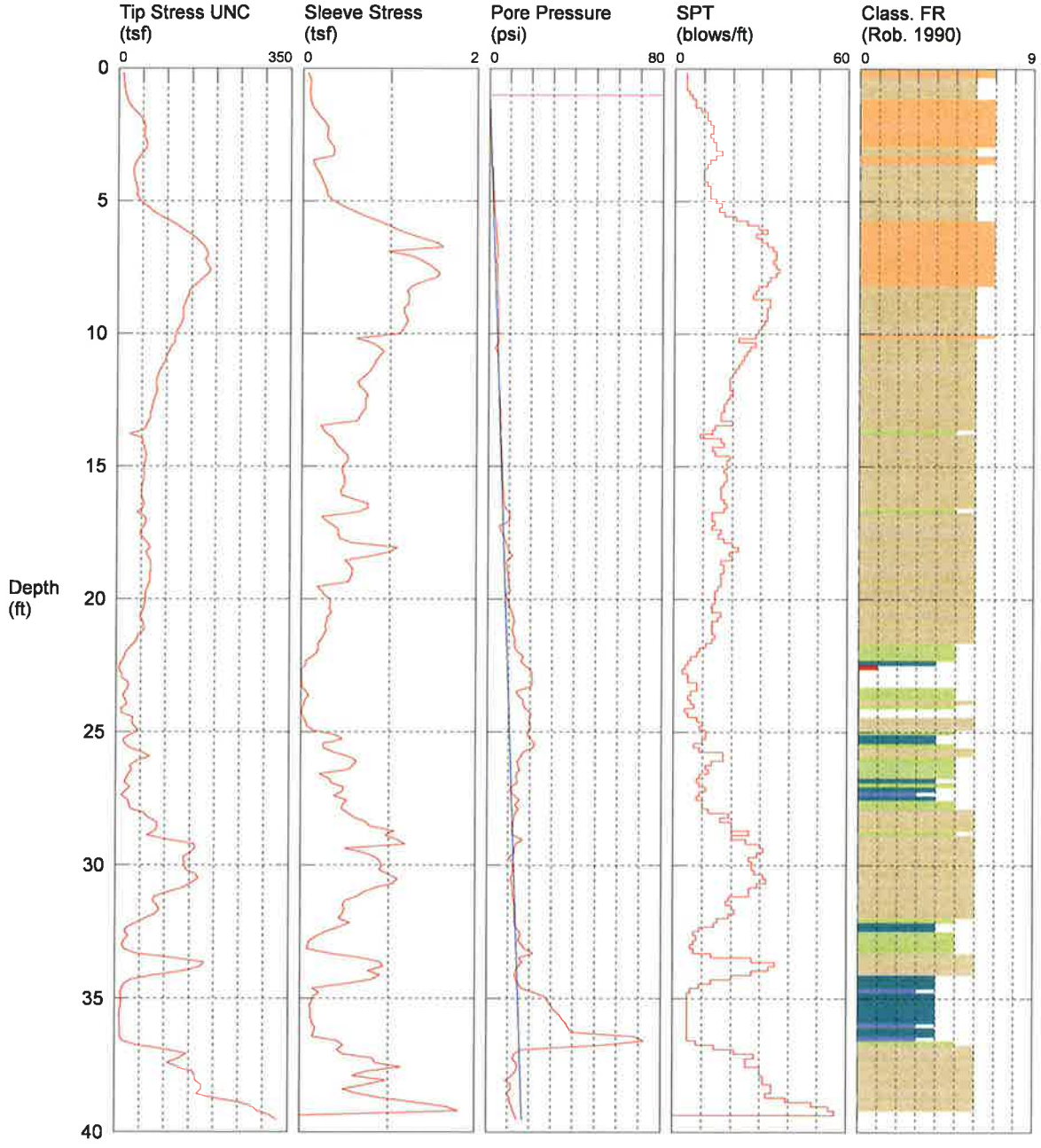
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT-3

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG0862
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT-3
TEST DATE: 3/1/2021 1:28:42 PM
SOUNDING

TOTAL DEPTH: 39.534 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy si
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

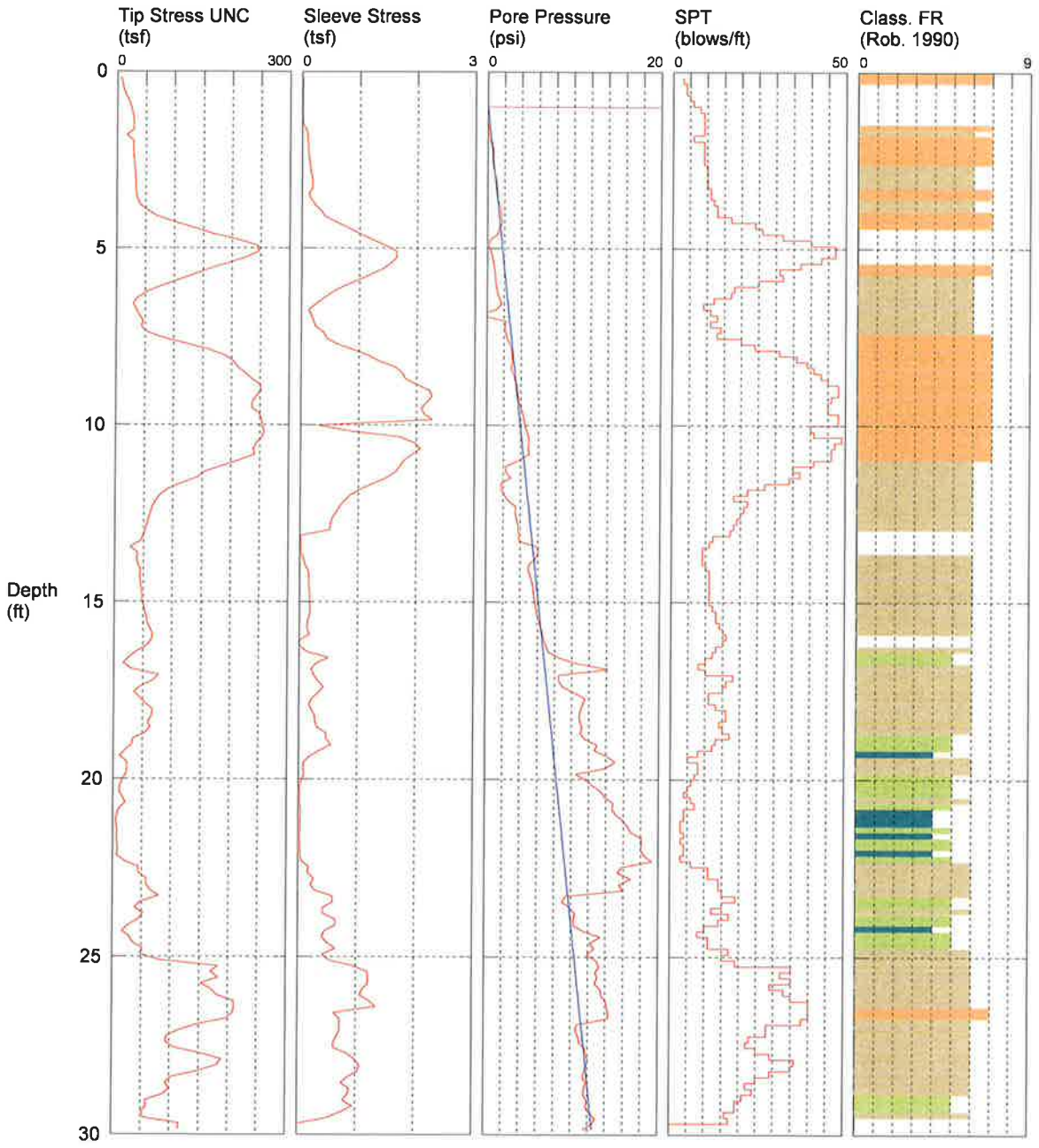
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT-4

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG0862
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT-4
TEST DATE: 3/1/2021 3:06:41 PM
SOUNDING

TOTAL DEPTH: 29.856 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy sil
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

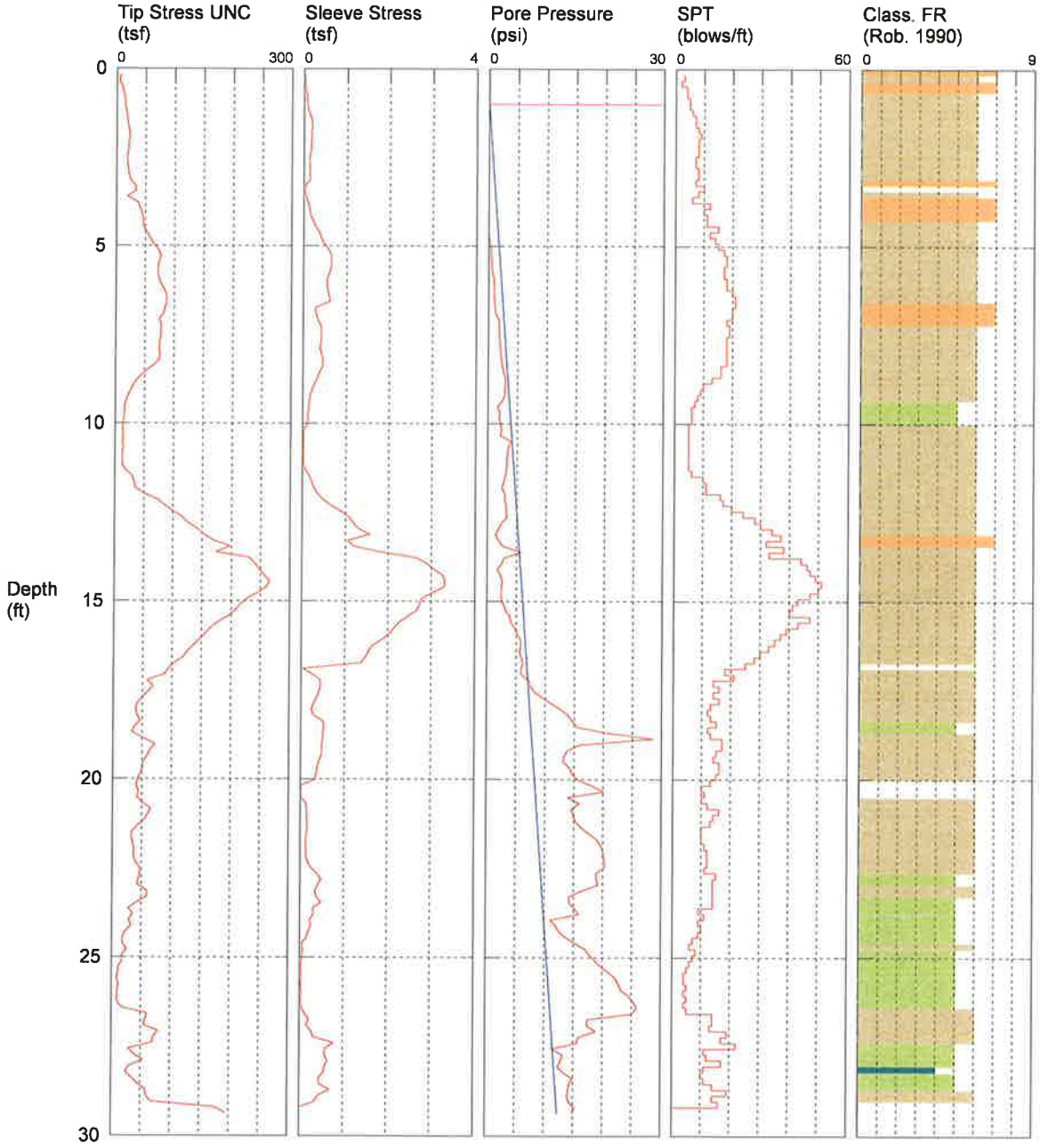
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT-5

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG0862
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT-5
TEST DATE: 3/1/2021 3:39:58 PM
SOUNDING

TOTAL DEPTH: 29.364 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy si
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

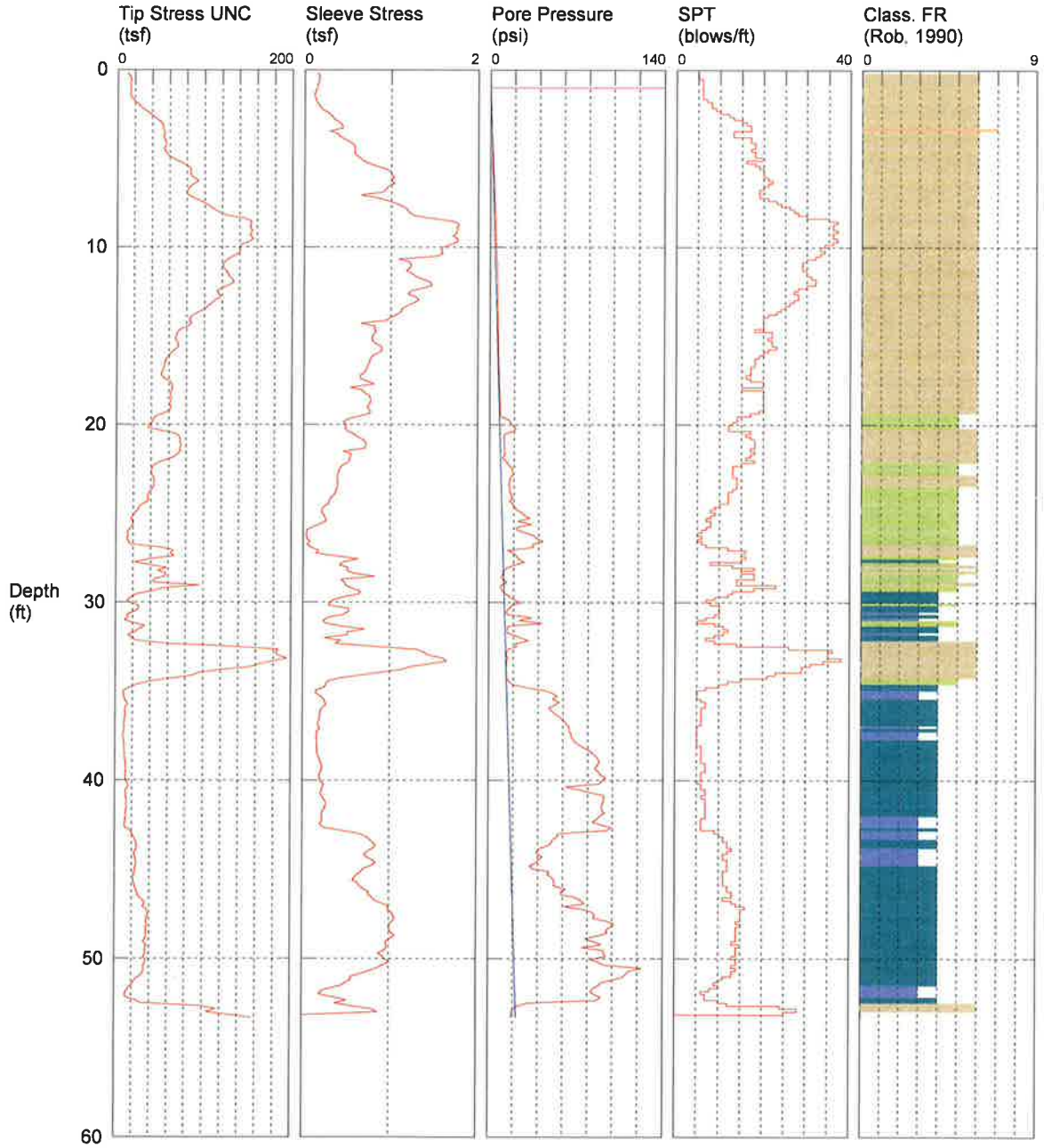
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT- 6

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DDG1565
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 6
TEST DATE: 3/9/2021 11:17:53 AM
SOUNDING

TOTAL DEPTH: 53.314 ft



1 Sensitive, fine grained
2 Organic soils - peats
3 Clays - clay to silty clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy sil
6 Sands - clean sand to silty sand
7 Gravelly sand to sand
8 Very stiff sand to clayey sand **
9 Very stiff, fine grained **

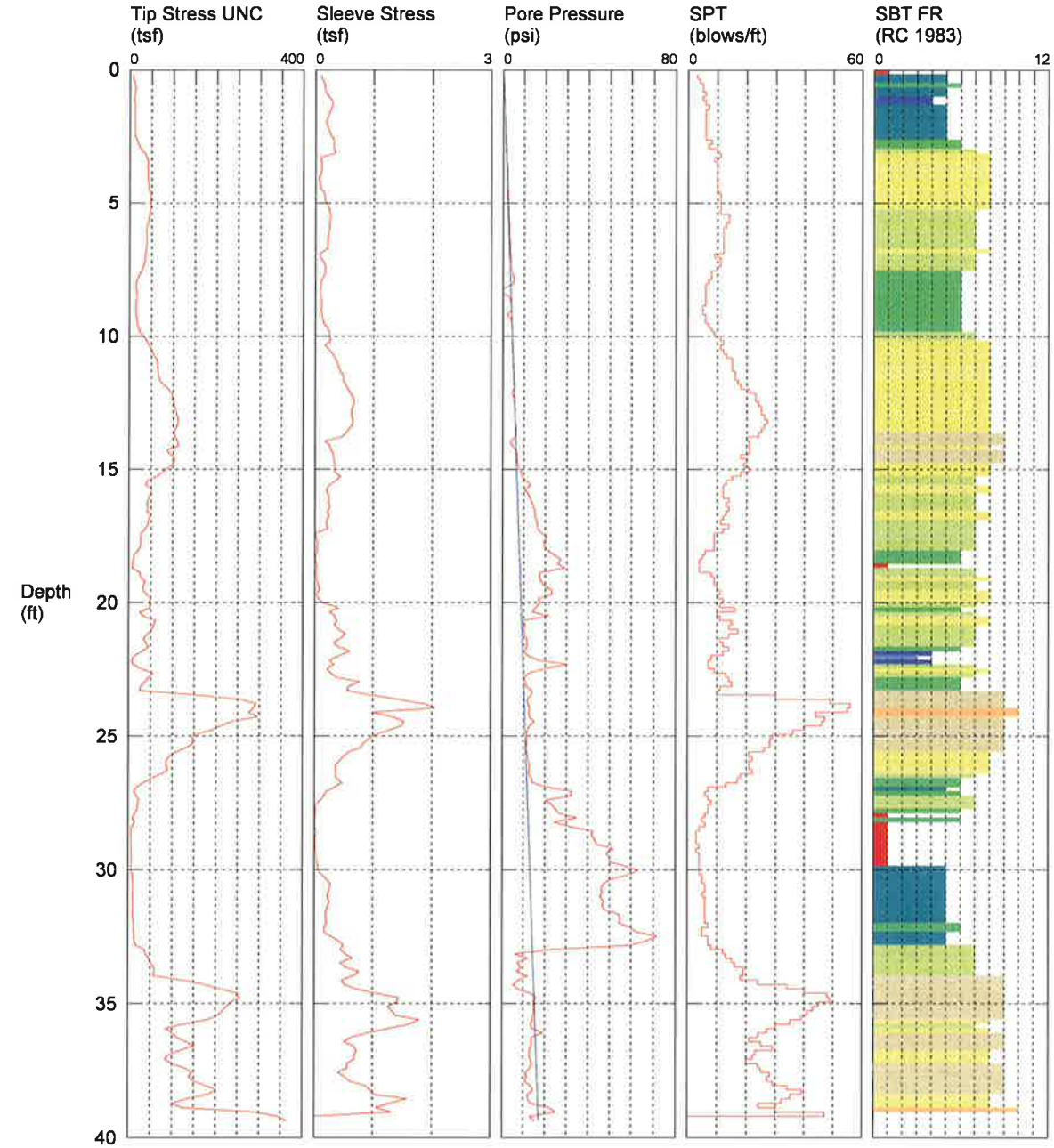
*SBT: Robertson 1990; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT- 7

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 7
TEST DATE: 3/28/2022 12:04:18 PM
SOUNDING

TOTAL DEPTH: 39.370 ft



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 (*)

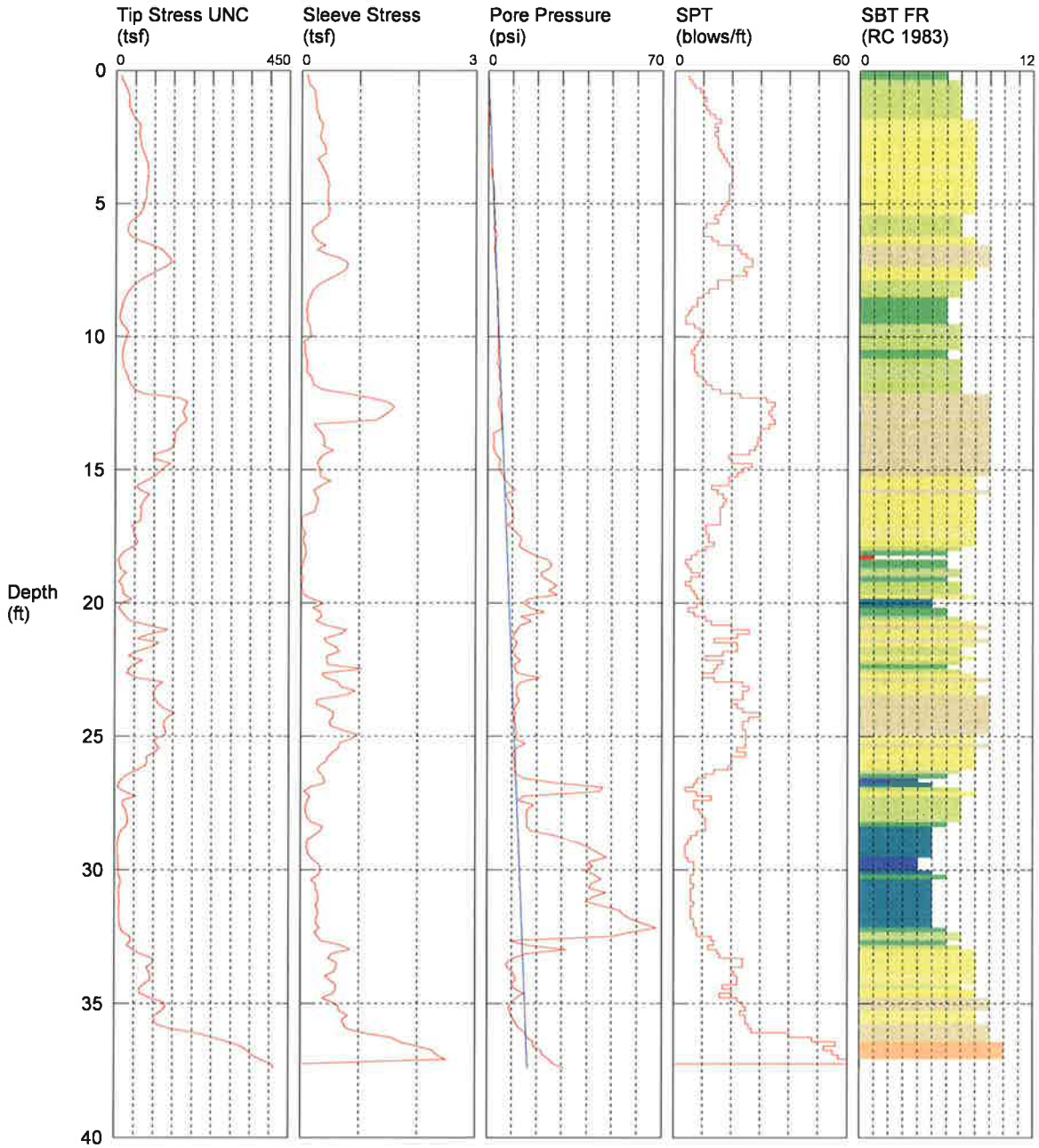
*SBT/SPT CORRELATION: UBC-1983

CPT- 8

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 8
TEST DATE: 3/28/2022 1:07:03 PM
SOUNDING

TOTAL DEPTH: 37.402 ft



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 (*)

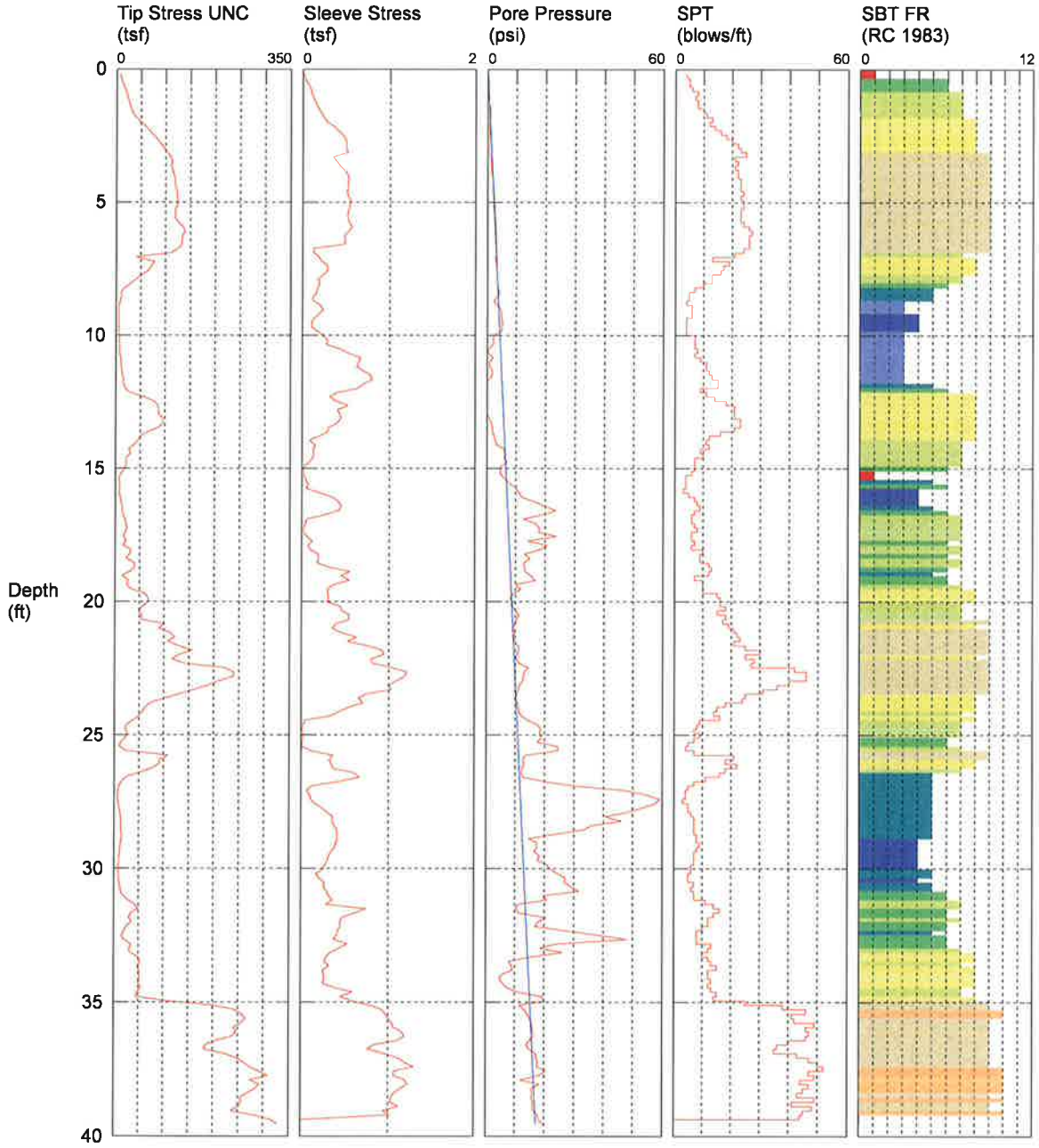
*SBT/SPT CORRELATION: UBC-1983

CPT- 9

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 9
TEST DATE: 3/28/2022 2:06:29 PM
SOUNDING

TOTAL DEPTH: 39.534 ft



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 (*)

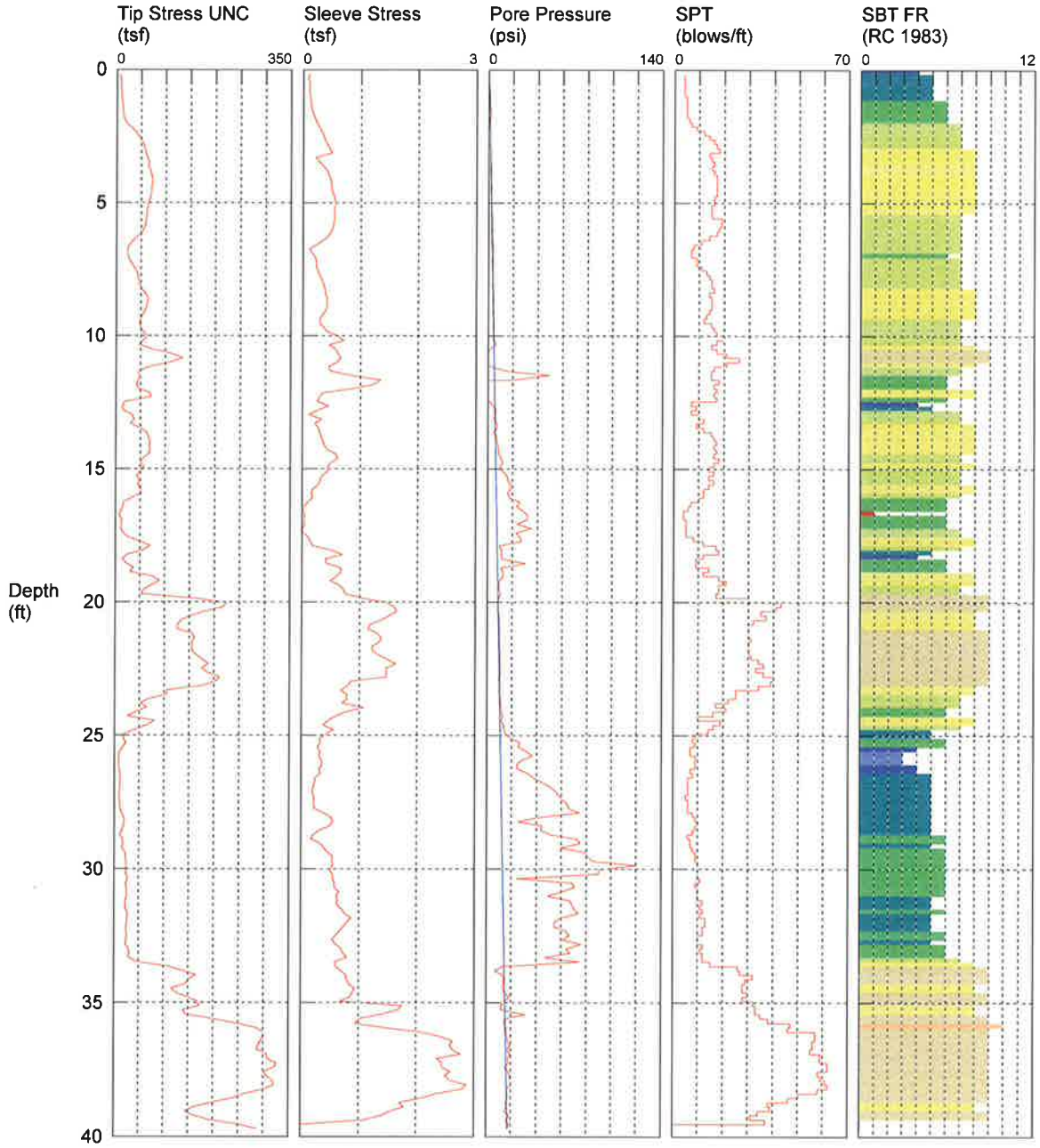
*SBT/SPT CORRELATION: UBC-1983

CPT- 10

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 10
TEST DATE: 3/29/2022 10:42:11 AM
SOUNDING

TOTAL DEPTH: 39.698 ft



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 (*)

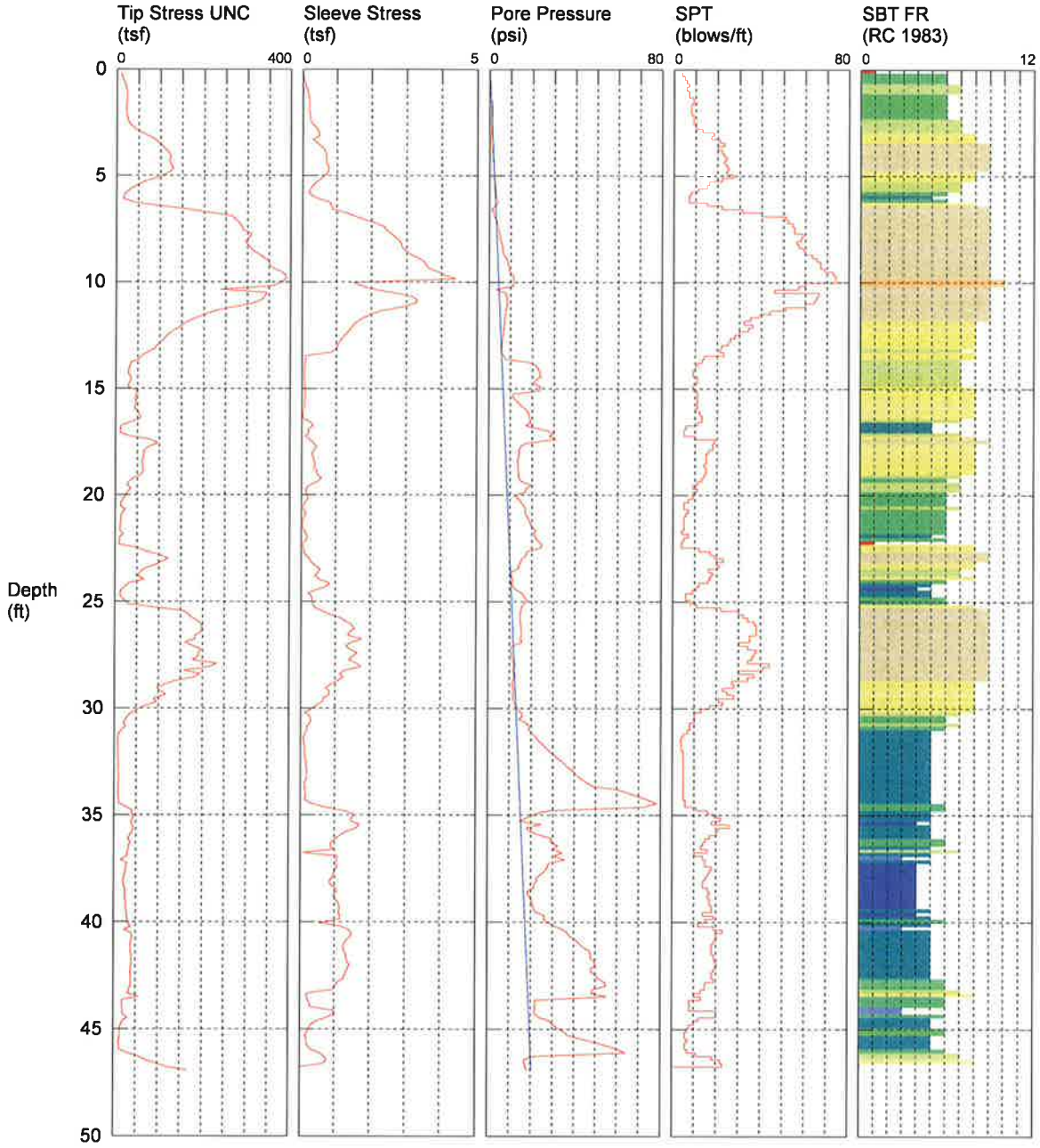
*SBT/SPT CORRELATION: UBC-1983

CPT- 11

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 11
TEST DATE: 3/29/2022 12:04:12 PM
SOUNDING

TOTAL DEPTH: 46.916 ft



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 (*)

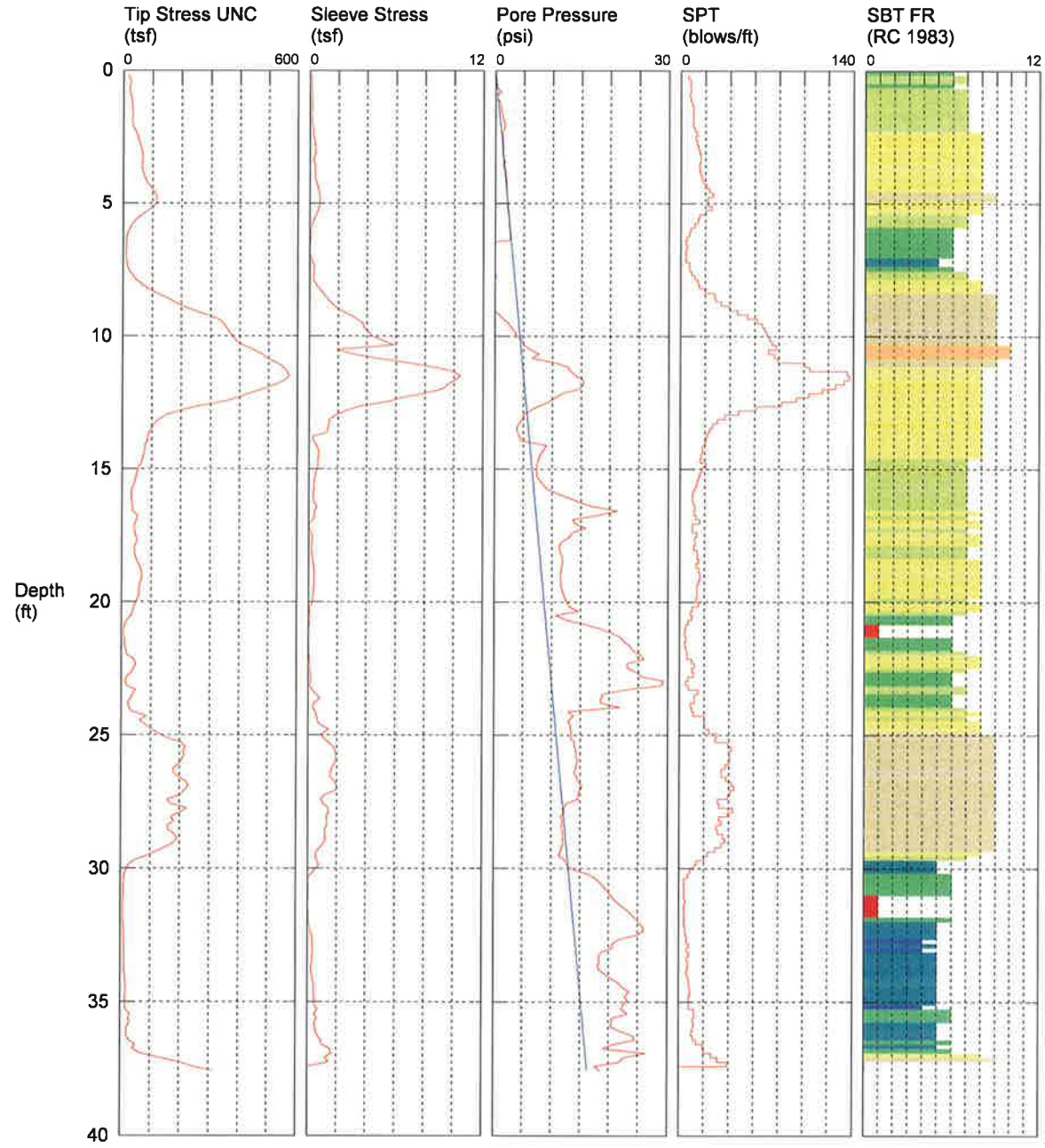
*SBT/SPT CORRELATION: UBC-1983

CPT- 12

SOUNDING
CUSTOMER: Customer
OPERATOR: Kicklighter
CONE ID: DSG1024
LOCATION: Brunswick GA

JOB NUMBER: 275 Harry Driggers Blvd
HOLE NUMBER: CPT- 12
TEST DATE: 3/29/2022 1:26:36 PM
SOUNDING

TOTAL DEPTH: 37.566 ft



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 (*)

*SBT/SPT CORRELATION: UBC-1983

Client: Southern Land Partners, LLC

Boring No. B-1

Project: Town Homes - 275 Harry Driggers Blvd.

Date: 3/1/21

Location: Brunswick, GA

Engineer: Follo

SUBSURFACE PROFILE		Sample			Standard Penetration Test blows/ft.(Corrected to N60) 10 20 30 40 50 60 70 80 90	Water Table	Remarks
Depth	Description	Depth	Number	Blows/ft			
0	Ground Surface	0					
	SP-SM Loose, brown fine sand		1	4			
			2	8			
	SP Firm to dense, gray fine sand	5	3	26			
			4	38			
	SM-SC Loose, gray fine clayey sand	10	5	4			
	SP-SM Loose, gray fine sand						
15		15	6	8			
	SM Firm, gray fine silty sand						
20	End of Borehole	20	7	17			
25		25					

Drilled By: Wilkerson

Drill Method: H. S. Auger

Drill Date: 3/1/21

WHITAKER LABORATORY, INC.
2500 Tremont Road
Savannah, GA 31405

Hole Size: 6.5"

Datum:

Sheet: 1 of 1

Client: Southern Land Partners, LLC

Boring No. B-2

Project: Town Homes - 275 Harry Driggers Blvd.

Date: 3/9/21

Location: Brunswick, GA

Engineer: Follo

SUBSURFACE PROFILE		Sample			Standard Penetration Test blows/ft.(Corrected to N60) 10 20 30 40 50 60 70 80 90	Water Table	Remarks
Depth	Description	Depth	Number	Blows/ft			
0	Ground Surface	0					
	SM-PT Topsoil		1	6			
	SM Loose to firm, dark brown fine silty sand		2	12			
5	***SP*** Firm to dense, tan-brown to tan fine sand	5	3	18			
			4	33			
10		10	5	100			
15		15	6	12			
	SP-SM Firm, gray fine sand						
20		20	7	13			
	SM Loose, gray fine silty sand						
25	End of Borehole	25	8	9			
30		30					

Drilled By: Wilkerson

Drill Method: H. S. Auger

Drill Date: 3/9/21

WHITAKER LABORATORY, INC.
2500 Tremont Road
Savannah, GA 31405

Hole Size: 6.5"

Datum:

Sheet: 1 of 1

Client: Southern Land Partners, LLC

Boring No. B-3

Project: Town Homes - 275 Harry Driggers Blvd.

Date: 3/9/21

Location: Brunswick, GA

Engineer: Follo

SUBSURFACE PROFILE		Sample			Standard Penetration Test blows/ft.(Corrected to N60) 10 20 30 40 50 60 70 80 90	Water Table	Remarks
Depth	Description	Depth	Number	Blows/ft			
0	Ground Surface	0					
	SM-PT Topsoil		1	6			
	SM Loose, dark brown fine silty sand		2	10			
5	**SP** Firm to dense, brown to tan fine sand	5	3	21			
			4	30			
10		10	5	100			
15		15	6	11			
	SP Firm, gray fine sand						
20		20	7	13			
	SM Loose, gray fine silty sand						
25	End of Borehole	25	8	9			
30		30					

Drilled By: Wilkerson

Drill Method: H. S. Auger

Drill Date: 3/9/21

WHITAKER LABORATORY, INC.
2500 Tremont Road
Savannah, GA 31405

Hole Size: 6.5"

Datum:

Sheet: 1 of 1

WHITAKER LABORATORY, INC.
P.O. BOX 7078
SAVANNAH, GEORGIA 31418

Project Name Planned Development at 275 Harry Driggers Blvd. **Date** 3/1/2021

Project Location Brunswick, Georgia

Boring Number _____ **Field Engineer** Josh Kicklighter

Ground Surface Elevation _____ **Ground Water Elevation** _____

Sample No.	Sample		Stratum		Visual Field Classification	Blows/Foot
	From	To	From	To		
DCP-1			0	10"	Brown Topsoil	-1' – 3-4-4
			10"	48"	Very Loose to Firm Tan Fine Sand (SP-SM)	-2' – 4-4-6
					Groundwater Encountered at 1 Foot	-3' – 8-8-10
						-4' – 14-25+
DCP-2			0	9"	Brown Topsoil	-1' – 4-4-5
			9"	36"	Very Loose to Firm Gray/Brown Fine Sand (SP-SM)	-2' – 3-5-7
					Groundwater Encountered at 0.5 Feet	-3' – 7-13-22
					Hole Collapse at 3 Feet	
DCP-3			0	6"	Brown Topsoil	-1' – 2-3-5
			6"	36"	Very Loose to Firm Brown/Tan Fine Sand (SP-SM)	-2' – 4-5-8
			36"	48"	Firm Brown Fine Sand (SP-SM)	-3' – 8-8-12
					Groundwater Encountered at 1 Foot	-4' – 9-14-25+
DCP-4			0	10"	Brown Topsoil	-1' – 5-5-5
			10"	18"	Loose Gray/Brown Fine Sand (SP-SM)	-2' – 4-4-8
			18"	36"	Loose to Firm Brown/Tan Fine Sand (SP-SM)	-3' – 8-18-25+
					Groundwater Encountered at 1 Foot	
					Hole Collapse at 3 Feet	
DCP-5			0	11"	Brown Topsoil	-1' – 5-5-6
			11"	36"	Loose to Firm Brown/Tan Fine Sand (SP-SM)	-2' – 4-6-8
					Groundwater Encountered at 1 Foot	-3' – 6-12-19
					Hole Collapse at 3 Feet	

APPENDIX III

SEISMIC PARAMETERS

LIQUEFACTION ANALYSIS

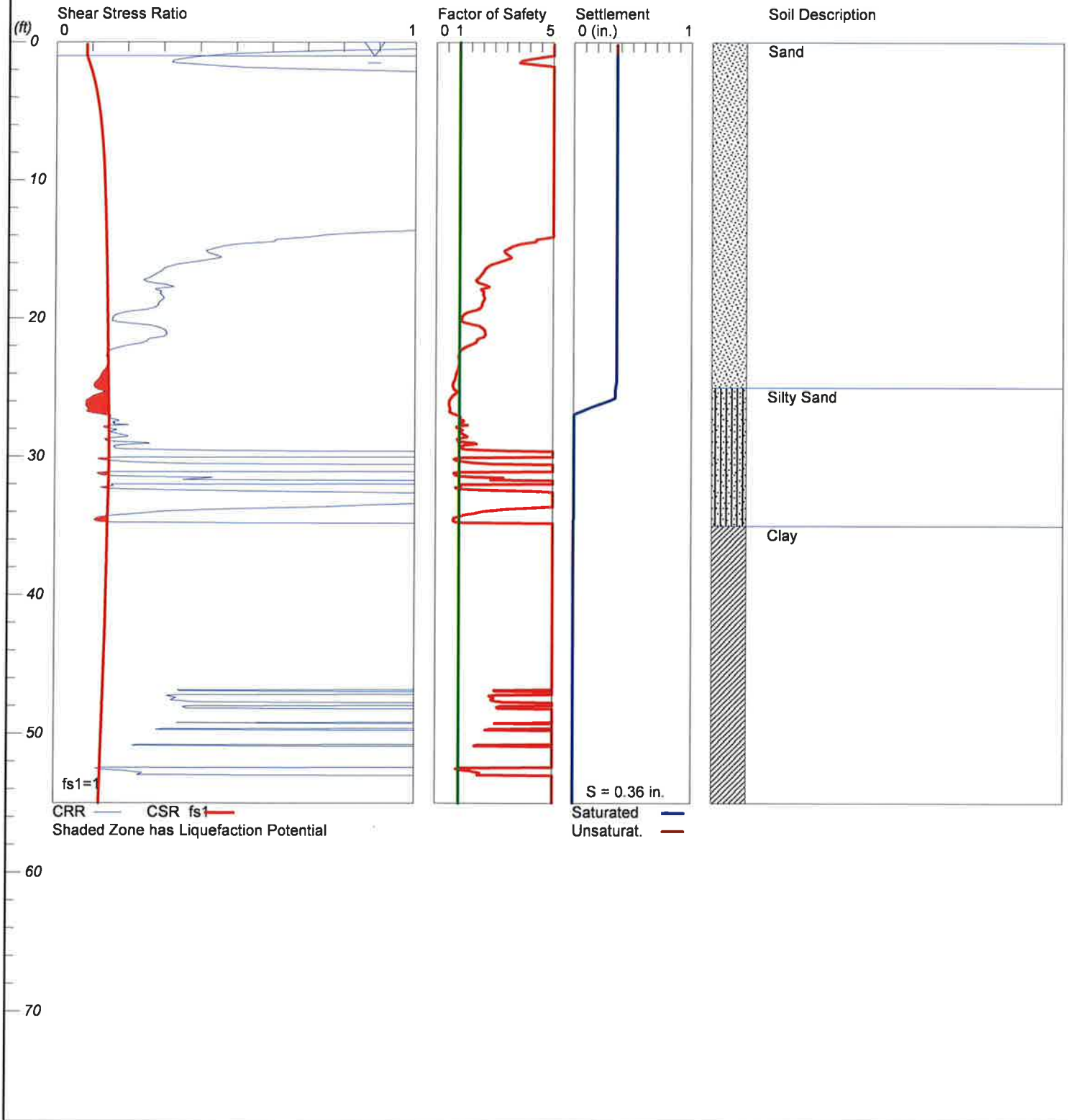
275 Harry Driggers Blvd

Hole No.=CPT-6 Water Depth=1 ft

Ground Improvement of Fill=2 ft

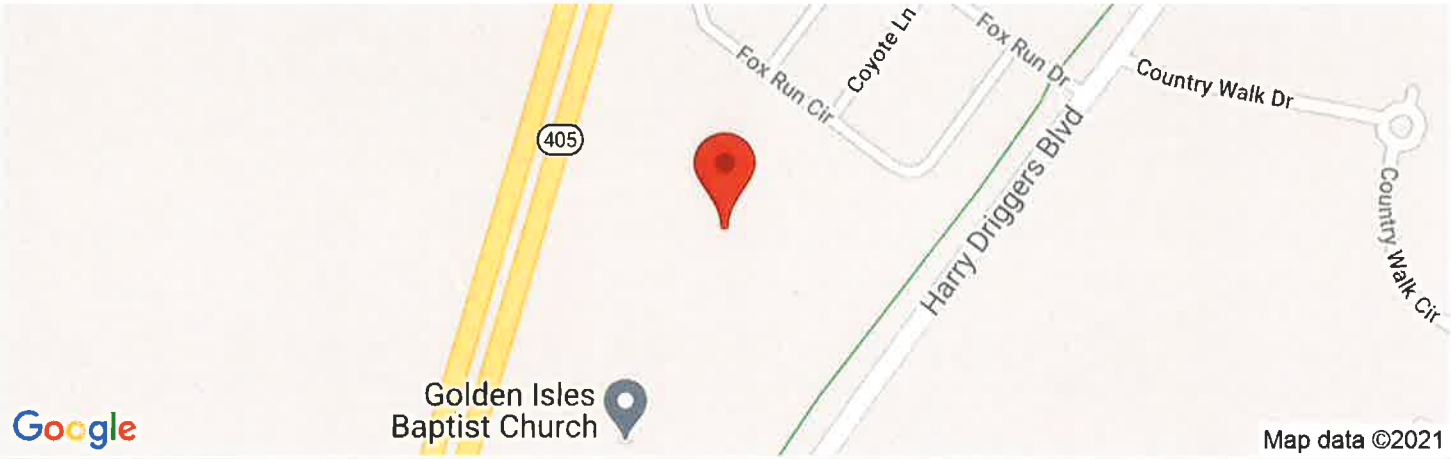
Magnitude=7.3

Acceleration=0.13g



275 Harry Driggers Blvd, Brunswick, Georgia

Latitude, Longitude: 31.2658, -81.4914



Date	3/10/2021, 9:16:09 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.168	MCE_R ground motion. (for 0.2 second period)
S_1	0.076	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.269	Site-modified spectral acceleration value
S_{M1}	0.182	Site-modified spectral acceleration value
S_{DS}	0.179	Numeric seismic design value at 0.2 second SA
S_{D1}	0.121	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	B	Seismic design category
F_a	1.6	Site amplification factor at 0.2 second
F_v	2.4	Site amplification factor at 1.0 second
PGA	0.085	MCE_G peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.136	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	0.168	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.192	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.076	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.086	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.875	Mapped value of the risk coefficient at short periods
C_{R1}	0.88	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

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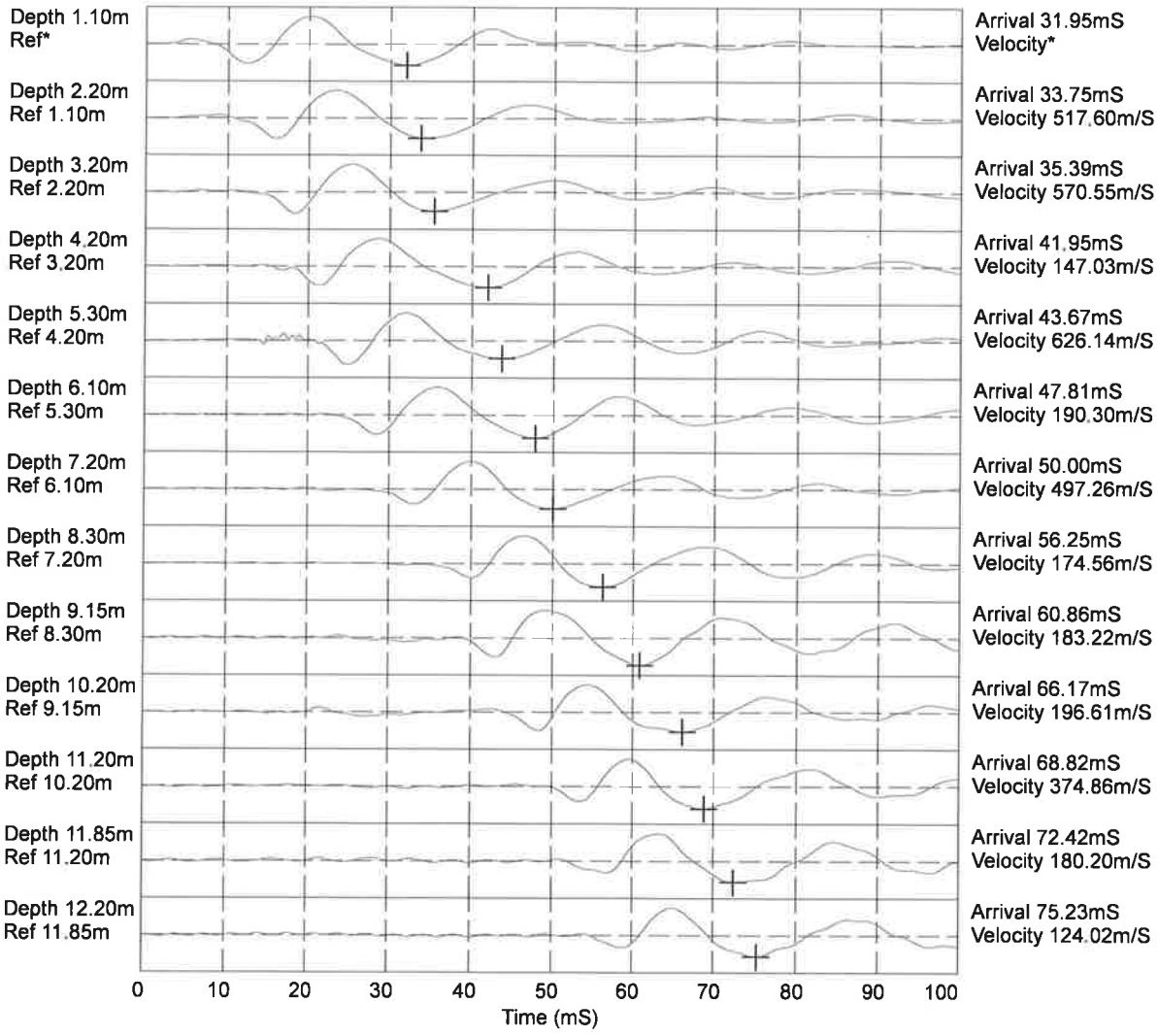
HOLE NUMBER: CPT-3



Hammer to Rod String Distance (m): 1.00
* = Not Determined

275 Harry Driggers Blvd, Brunswick, GA
Shear wave IBC Site Class

CPT-3 *ft*	VS *ft/sec*	Di/vs
4	650	0.00507692
7	1696	0.00194603
11	1870	0.00176508
14	482	0.00684420
17	2053	0.00160718
21	623	0.00529525
24	1630	0.00202434
27	571	0.00578217
30	600	0.00549780
34	643	0.00513315
37	1227	0.00269010
40	590	0.00558943
44	407	0.00811369
47	700	0.00471429
50	700	0.00471429
54	700	0.00471429
57	700	0.00471429
60	700	0.00471429
63	700	0.00471429
67	700	0.00471429
70	800	0.00412500
73	800	0.00412500
77	800	0.00412500
80	800	0.00412500
83	800	0.00412500
87	800	0.00412500
90	800	0.00412500
93	800	0.00412500
96	800	0.00412500
100	800	0.00412500

0.13161536

Weighted 760

Red values were conservatively assumed
Weighted VS between 600 - 1200 is site D

APPENDIX IV

IMPORTANT GENERAL NOTES

GENERAL NOTES

The "standard" penetration resistance is an indication of the density of cohesion less soils and of the strength of cohesive soils. The "standard" penetration test is measured with a 1.4 inch I.D., 2 inch O.D., sampler driven one (1) foot with a 140 pound hammer falling 30 inches.

RELATIVE DENSITY OF SOIL THAT IS PRIMARILY SAND

Number of Blows	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 20	Firm
21 - 30	Very firm
31 - 50	Dense
Over 51	Very dense

CONSISTENCY OF SOIL THAT IS PRIMARILY SILT OR CLAY

Number of Blows	Consistency
0 - 2	Very soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very stiff
Over 31	Hard

While individual test boring records are considered to be representative of subsurface conditions at the respective boring locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

The subsoil stratification shown on these profiles is not warranted but is estimated based on accepted soil engineering principles and practices and reasonable engineering judgment.

Unless notified, samples will be disposed of after 60 days.

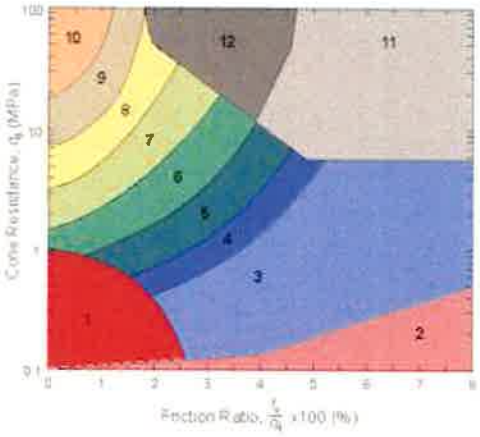
GROUP

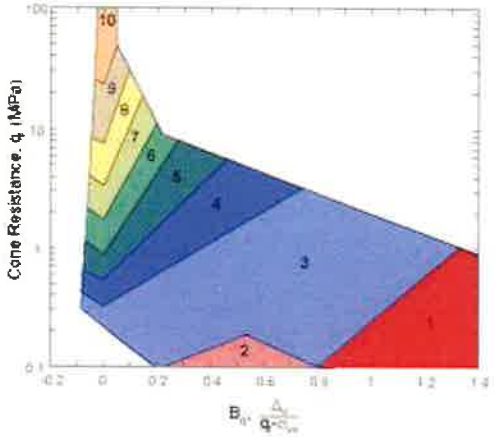
MAJOR DIVISIONS	SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS		
More than 50% retained on No. 200 Sieve*		
GRAVELS		
50% or more of coarse fraction retained on No. 4 sieve		
CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silty mixtures
	GC	Clayey gravels, gravel sand clay mixtures
SANDS		
More than 50% of coarse fraction passes No. 4 sieve		
CLEAN SANDS	SW	Well graded sand and gravelly sands, little or no fines
	SP	Poor graded sands and gravelly sands, little or no fines
SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand clay mixtures
FINE GRAINED SOILS		
50% or more passes No. 200 Sieve*		
SILTS AND CLAYS		
Liquid Limit 50% or less		
	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS		
Liquid Limit greater than 50%		
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	PT	Peat, muck and other highly organic soils

*Based on the material passing the 3 in. (75 mm) sieve.

CPT Soil Behavior Type Legend

Robertson et al. 1986

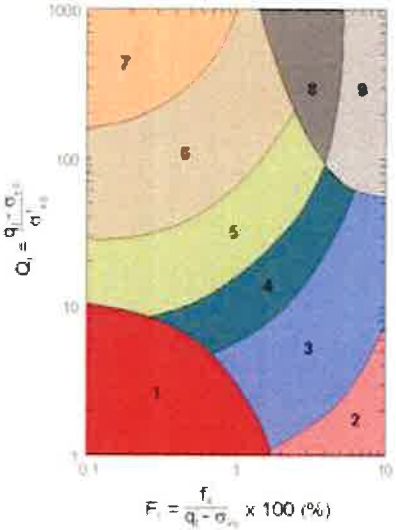


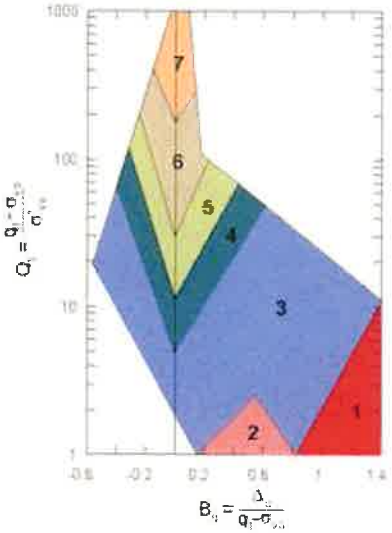


Zone	Soil Behavior Type
1	Sensitive, Fine Grained
2	Organic Material
3	Clay
4	Silty Clay to Clay
5	Clayey Silt to Silty Clay
6	Sandy Silt to Clayey Silt
7	Silty Sand to Sandy Silt
8	Sand to Silty Sand
9	Sand
10	Gravelly Sand to Sand
11	Very Stiff Fine Grained*
12	Sand to Clayey Sand*

*Overconsolidated or Cemented

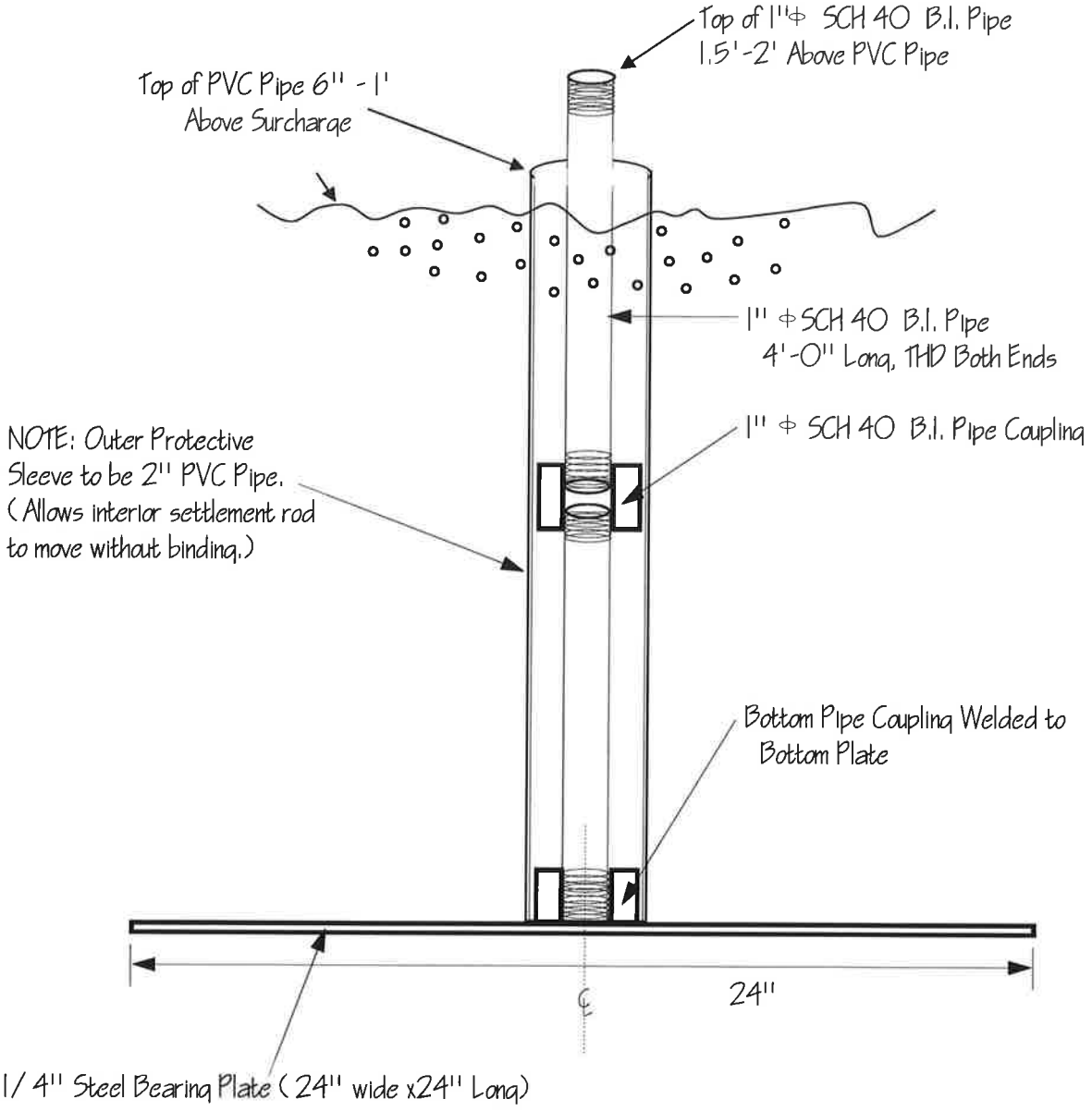
Robertson et al. 1990





Zone	Soil Behavior Type
1	Sensitive, Fine Grained
2	Organic Soils-Peats
3	Clays: Clay to Silty Clay
4	Silt Mixtures: Clayey Silt to Silty Clay
5	Sand Mixtures: Silty Sand to Sandy Silt
6	Sands: Clean Sands to Silty Sands
7	Gravelly Sand to Sand
8	Very Stiff Sand to Clayey Sand*
9	Very Stiff Fine Grained*

*Overconsolidated or Cemented



Typical Settlement Plate

Detail - Not to Scale