



ECS Southeast, LLP

Geotechnical Engineering Report

Rooms to Go Expansion

901 Rooms To Go Way
Dunn, Harnett County, NC

ECS Project No. 33:6505

October 24, 2023





ECS SOUTHEAST, LLP

Geotechnical • Construction Materials • Environmental • Facilities

"One Firm. One Mission."

October 24, 2023

Mr. Will Martin
R.T.G. Furniture Corp.
4004 Summit Boulevard Northeast
Atlanta, GA 30319

ECS Project No. 33:6505

Reference: Geotechnical Engineering Report
Rooms to Go Expansion
901 Rooms To Go Way
Dunn, Harnett County, NC

Dear Mr. Martin:

ECS Southeast, LLP (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to R.T.G. Furniture Corp. during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

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- Site Location Diagram
- Boring Location Plan
- Generalized Subsurface Profile

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EXECUTIVE SUMMARY

This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from this Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- Based on the soil test borings, we anticipate undercutting of existing fill and very soft to soft or very loose near-surface natural soils will likely be necessary in the proposed building and pavement areas. If site earthwork is performed during the typically cooler, wetter months of the year, additional undercutting is anticipated due to excessively wet unstable soils.
- We anticipate that some of the soils encountered in the soundings within the anticipated excavation depths will likely be suitable for use as engineered fill. The existing fill soils should be further evaluated to evaluate suitability.
- Groundwater depths measured at the time of drilling ranged from 7 to 9 feet below the existing ground surface in soundings B-03, B-09, P-01, and SCM-02.
- The based on the SHWT indicators encountered in the SCM areas, we recommend using 62 inches below existing grade surface for analysis.
- A waiting period to allow settlement to occur from the new pond fill should be planned prior to construction activities for the proposed building.
- The planned building should be supported by conventional shallow foundations consisting of column and/or strip footings bearing on engineered fill or natural soils or approved existing fill. The footings should be sized using a net allowable soil bearing pressure of 3,000 psf.
- Based on the N-values measured in the borings, a Seismic Site Class D designation is appropriate for seismic design of the proposed building.
- ECS should be retained to review the design documents for conformance with our recommendations and should be retained for construction materials testing and special inspections to facilitate proper implementation of our recommendations.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information for the design of the proposed building foundations, floor slab, parking lot and driveway areas.

The recommendations developed for this report are based on the results of our subsurface exploration and project information provided by R.T.G Furniture Group. This report contains the results of our subsurface exploration and laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of the planned development.

1.2 SCOPE OF SERVICES

The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the proposed project.

We accomplished the purposes of the study by:

- Reviewing the available publications concerning local geology of the site and performing a general site reconnaissance.
- Drilling borings to explore the subsurface soil and groundwater conditions.
- Performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties.
- Evaluating the field and laboratory data to develop appropriate engineering recommendations.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 33:5825, dated June 12, 2023, as authorized by Will Martin with R.T.G. Furniture Corp. on June 13, 2023, which includes our Terms and Conditions of Service

2.0 PROJECT INFORMATION

This report is based on the following sources of information:

- Emails between Will Martin with Rooms to Go and Nathan Nallainathan with ECS on May 31, 2023.
- Geotechnical Engineering Report by ECS dated March 19, 2013.
- Site Plan with requested boring locations prepared by The Site Group (not dated).
- Google Earth aerial photos dated between 1985 and 2022.
- Site and topographic information obtained from the Harnett County GIS website.
- United States Geologic Survey Quadrangle Map (Google Earth overlay .kmz file).
- Geologic Map of North Carolina.
- Web Soil Survey Soil Map and soils data.

2.1 SITE INFORMATION

The site is located at 901 Rooms To Go Way in Dunn, North Carolina, at the approximate location shown in the following figure.



Current Site Condition

Based on historic aerial photographs dating back to 1985, the site appears to have mainly used as agricultural fields. Between 2013 and 2016, the existing Room To Go facility was constructed which included the construction of three stormwater control ponds on the side of the property around the proposed expansion area. During this time, it is highly likely that the excavated material for the ponds was spread in an uncontrolled manner on the southern side of the site. The site appears to have remained relatively unchanged from 2016 to current day.

2.2 PROPOSED CONSTRUCTION

The following information explains our understanding of the planned development including proposed buildings and related infrastructure.

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
Building Footprint	Approximately 336,000 square feet in plan view
# of Stories	One-story above grade
Usage	Distribution Center
Framing	Steel framed with tilt-up panel walls
Column Loads	150 kips, maximum unfactored
Wall Loads	5 kips per linear foot (klf), maximum unfactored

The structural engineer should verify these assumptions and notify ECS if the actual unfactored foundation design loads exceed or are significantly less than these assumed values.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

To explore the subsurface conditions at this site, a total of 10 soil test borings were performed in the proposed development areas. The borings have been performed in the proposed developed areas to depths below existing grades as shown below.

Boring No.	Proposed Structure/Site Feature	Boring Depth (feet)
B-01 through B-04	Building	20
P-01 through P-04	Pavement	10
SCM-01 and SCM-02	Stormwater Pond	15

The soundings were located by an ECS representative who used a handheld GPS unit, and their approximate locations are shown on the Boring Location Plan (Figure 2) in Appendix A. Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedure: Cone Penetration Testing (CPT).

In addition to the soundings, direct push MacroCore samples were obtained at each test location to a depth of 5 feet below existing grade surface to further assist in classifying and stratifying the surficial soil profile. A continuous steel barrel is advanced using hydraulic down pressure and repetitive impacts from a hydraulically operated percussive hammer. As the core barrel is advanced, a soil core is collected inside of a lexan tube which lines the inside of the core barrel.

Please note that the ground surface elevations shown on the boring logs were not surveyed by a licensed surveyor. These elevations were interpolated using topographic information obtained from Google Earth. They should be considered approximate.

3.1 SUBSURFACE CHARACTERIZATION

3.1.1 Regional Geology

The site is located within the Coastal Plain physiographic province. The Coastal Plain is typically characterized by marine, alluvial, and aeolian sediments that were deposited during periods of fluctuating sea levels and moving shorelines. Basal formations are typical of those laid down in a shallow sloping sea bottom; dense sand, consolidated clay, limestone, chalk, marl, claystone, and sandstone. Overburden soils include marine interbedded gravel, sand, silt, and clay. Many of the clays have been preconsolidated by desiccation from frequent rising and lowering of the sea level and groundwater table. Alluvial gravel, sand, silt, and clay are typically present near rivers and creeks.

The top of the coastal formations on the geologic map are typically on the order of 30 to 100 feet below the ground surface but can be less in the upper Coastal Plain near the fall line between the Piedmont and Coastal Plain. They represent basal, relatively hard formations with consistency over large areas.

According to the *1985 Geologic Map of North Carolina*, the site is underlain by the Middendorf of Cretaceous age (Km). This formation consists of sand, sandstone, and mudstone; gray to pale gray with an orange cast; clay balls and iron concretions common; beds laterally discontinuous, cross-bedding common.

It is important to note that the natural geology within portions of the site has been modified in the past that included the placement of fill materials. The quality of man-made fills can vary significantly, and it is often difficult to assess the engineering properties of existing fills.

3.1.2 Soil Conditions

Data from the soil test borings is included in Appendix B. The subsurface conditions discussed in the following paragraphs and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. We note that the transition between different soil strata is usually less distinct than those shown on the boring logs. Please refer to individual boring logs that are contained in Appendix B.

The following sections provide additional information about the soil strata encountered during our subsurface exploration.

Surficial Material: Most of the borings performed encountered approximately 4 to 6 inches of topsoil material.

Existing Fill: Existing/Possible fill soils consisting of Silty SAND (SM) with trace to moderate amounts of organic material and rock fragments was encountered across most of the site. It is important to note that inclusions of rock fragments were noted in the fill material. N-values obtained, especially higher values, were possibly influenced by these inclusions and are not an accurate indicator of the soil density or consistency in the upper 5 feet of the soil profile.

Natural Soils: The natural soils encountered below the existing surficial/fill material generally consisted of Sands (SC/SM) and Silts/Clays (ML, CL). The equivalent N-values for these soils ranged from 10 to 30 bpf, indicating a consistency of stiff to very stiff and a relative density of loose to medium dense.

Cemented Sands: Cemented Sands equivalent N-values ranging between 30 to 90 bpf was encountered approximately 6 to 8 feet below existing grades surfaces before transitioning back into the natural soils approximately 10 to 15 feet below existing grade surface.

3.2 GROUNDWATER OBSERVATIONS

Water levels were measured in our soundings in Appendix B. Groundwater depths measured at the time of drilling ranged from 7 to 9 feet below the existing ground surface in soundings B-03, B-09, P-01, and SCM-02. Groundwater seepage was not encountered at the time of exploration in the remaining locations. Cave in depths were measured ranging between 4 to 17 feet below existing grade surface, which may be an indicator of groundwater seepage.

Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.2.1 Seasonal High-Water Table (SHWT)

The SHWT was evaluated at test locations SCM-01 and SCM-02 in the stormwater control measure area by obtaining direct push MacroCores to a depth of 10 feet below existing grade surface at each location. The soils generally consisted of a brown Silty SAND (SM) to a depth of approximately 5 feet below existing grade surfaces before transiting to a grayish-brown Sandy CLAY (CL) to the termination depth. Indicators for the SHWT were present approximately 5.2 feet (62 inches) and 5.6 feet (67 inches) in SCM-01 and SCM-02, respectively. We recommend using 62 inches as the SHWT for analysis.

3.3 LABORATORY TESTING

Classification and index property tests were performed by ECS on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties. Laboratory testing included moisture content testing, Atterberg Limits, and washed sieve gradation analyses. The results of the laboratory testing program are included in Appendix C.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 DESIGN RECOMMENDATIONS

4.1 IMPACTS ON SITE DEVELOPMENT AND DESIGN

The proposed layout of the site development is shown in Appendix A. Geotechnical related concerns identified during this study that may impact the project include:

- Undocumented Fill
- Deep Pond Fills

Each of these concerns are discussed in more detail in the following sections of this report.

4.1.1 Design Implications of Undocumented Fill

As previously noted, existing undocumented fill materials was encountered in the majority of the borings. The undocumented fill contained generally consisted of Silty SAND (SM) with rock fragments/cemented sand and organics in the upper 5 feet of the soil profile on site.

If very soft soils or pockets of debris, organics, stumps, etc., exist within the fill and are not removed during construction, then localized excessive differential settlements could occur in response to new structural loads and the on-going process of volume change which may still occur in the fill. If such non-uniform settlements occur, then moderate distress could result. For preliminary design purposes we do **not** recommend new structures be supported on the existing fill material. We recommend that the fill materials be further evaluated via test pits and additional lab testing prior to construction.

4.1.2 New Pond Fill Settlement & Waiting Period

From the design concept provided and assumed design grades, it appears part planned building expansion will likely be in the existing pond area. At the time of this report, it is unknown how much fill be required in the pond area. The mass weight of new fill in excess of 5 feet will likely cause natural foundation soils and lower/deeper parts of the new fill to undergo settlement.

It is our recommendation that this settlement be monitored and be evaluated to be substantially complete prior to construction of foundations and structural elements. Otherwise, foundations could experience additional (detrimental) settlement, over and above movements from the new building loads.

To monitor deep fill settlements (areas with >5 feet of new fill), we recommend the installation of settlement survey hubs immediately after filling is complete. Survey hubs should be established in the portions of each fill area and their movement monitored by a registered land surveyor at regular intervals. The survey hubs should consist of a size no. 8 or larger rebar embedded in a 1-ft square or round concrete monument poured flush with the ground that is embedded at least 1 foot deep. The rebar should stick up a minimum of 4 inches above the final subgrade elevation.

The survey hubs should be appropriately flagged for visibility and protected with barricades or precast pipe or other obstructions during construction. The hubs should be established immediately once rough grading of the fill area is complete, and measurements should be made twice per week or as deemed appropriate by ECS at the time of construction. This information should be furnished to ECS for review as it is gathered.

From experience, we expect significant settlement will likely take place during or shortly after completion of grading. Based on experience with filling existing ponds/lakes, we recommend that an initial waiting period of 3 to 6 weeks be allowed between substantial completion of the fill placement in the pond areas and initial superstructure construction.

The survey hub monitoring data may indicate the construction can take place in the former pond area in a shorter time period, but we recommend that this waiting period and work sequence be incorporated into the construction schedule. While settlement monitoring of the pond area is underway, utility installation and other site grading may occur.

4.2 FOUNDATIONS

Provided subgrades and Engineered Fills are prepared as recommended in this report, the proposed structure can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameter:

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure ⁽¹⁾	3,000 psf	3,000 psf
Acceptable Bearing Soil Material	New Engineered fill and competent natural soils	
Minimum Width	24 inches	24 inches
Minimum Footing Embedment Depth (Below slab or outside finished grade)	24 inches	12 inches
Estimated Total Settlement ⁽²⁾	Less than 1 inch	Less than 1 inch
Estimated Differential Settlement ⁽³⁾	Less than ½-inch	Less than ½-inch

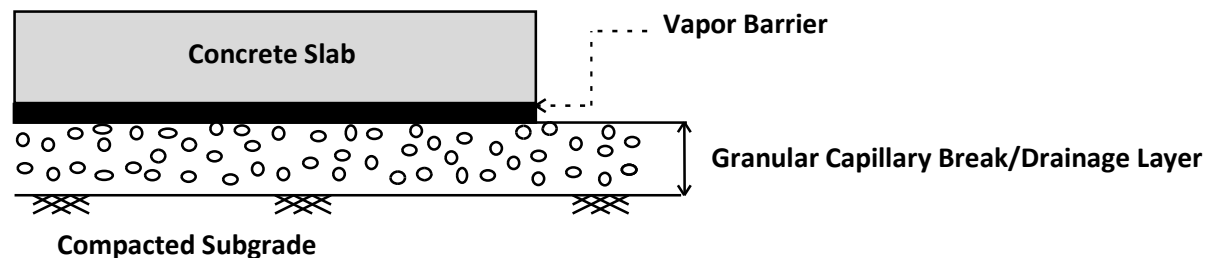
Notes:

- (1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
- (2) Based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
- (3) Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.

Potential Undercuts: Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Undercut should be backfilled with lean concrete ($f'_c \geq 1,000$ psi at 28 days) or ABC stone up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete or ABC stone. **We anticipate undercuts up to 5 feet may be necessary throughout the proposed building pad area due to the presence of undocumented fill containing debris and soft clays.**

4.3 SLABS ON GRADE

We do not recommend the floor slabs be directly supported on the existing fill material without further evaluation. We have assumed the floor slabs will likely be support on new engineered fill. Within the building footprint there may be areas of soft or yielding existing fill or natural soils that should be removed and replaced with compacted engineered fill in accordance with the recommendations included in this report. The following graphic depicts our soil-supported slab recommendations:



1. Drainage Layer Thickness: 4 inches
2. Drainage Layer Material: A compactable granular fill that will remain stable and support construction traffic. At least 10% to 30% of the material should pass a No. 100 sieve with a maximum aggregate size of $\frac{1}{4}$ inch. Suitable materials are GRAVEL (ABC, GW, GW-SM), SAND (SP-SM, SW-SM), and SILTY SAND (SM) with less than 30% fines.
3. Subgrade compacted to 98% maximum dry density per ASTM D698

Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted Engineered Fill in accordance with the recommendations included in this report.

Subgrade Modulus: Provided the Engineered Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 100 pci (lbs./cu. inch).

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture vapor penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.

High Floor Load Areas: Areas with high floor loads, such as storage rack systems or systems with limited slab tolerances will likely require special floor slab subgrade preparation or support. These areas should be brought to the attention of ECS for further evaluation and recommendations. The above modulus of subgrade reaction value should not be used for wide area storage areas, such as uniform or rack storage systems. Instead, the modulus of subgrade reaction (K) used to design heavily loaded areas should be reduced to approximately one-half to one-third of the above value, depending upon the severity of loading.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration restricts the use of a free-floating slab such as in a drop-down footing/monolithic slab configuration, the slab should be designed with adequate reinforcement and load transfer devices to reduce overstressing of the slab.

The above should be considered general guidance to assist the Owner/Developer and design team. Project specific designs, plan details or other input from the Structural Engineer of Record should control.

4.4 BUILDING RETAINING WALLS

If the proposed structures include basements, they should be designed and constructed in accordance with the following recommendations.

Lateral Earth Pressures: Below grade building retaining walls and cast-in-place basement walls should be designed to withstand the lateral earth pressures exerted by the backfill. It is anticipated that retaining walls associated with the building will likely be rigid walls restrained from rotation by the floor slab. For rigid walls, the "At Rest" (K_o) soil condition should be used in the wall design and evaluation. For walls that are free to deflect at their tops, the "Active" (K_a) soil condition should be used in the wall design and evaluation.

Soil Parameters: In the design of retaining wall structures, the following soil parameters were estimated based on local experience. These parameters anticipate that Granular Soils meeting the requirements recommended herein for Retaining Wall Backfill will likely comprise the backfill in the Critical Zone. The Critical Zone is defined as the area between the back of the retaining wall structure and an imaginary line projected upward and rearward from the bottom back edge of the wall footing at a 45-degree angle.

Retaining Wall Backfill in the Critical Zone

Soil Parameter	Estimated value
Coefficient of Earth Pressure at Rest (K_o)	0.58
Coefficient of Active Earth Pressure (K_a)	0.33
Retained Soil Moist Unit Weight (γ)	120 pcf
Cohesion (C)	0 psf
Angle of Internal Friction (ϕ)	30°

Retaining Wall Backfill: Soils used as select granular backfill within the Critical Zone behind retaining walls should have USCS classifications of SP, SP-SM, SW, or SW-SM with a maximum of 12% fines (i.e., % passing No. 200 Sieve size), and minimum angle of internal friction of 30 degrees when compacted to a minimum of 95% of its maximum dry density per ASTM D 698. Any existing soil not meeting these criteria should be removed from the Critical Zone of the walls, as evaluated by ECS personnel at the time of construction.

Foundation Drains: Below-grade building retaining walls should be provided with damp proofing and a foundation drainage system to relieve hydrostatic pressures which may develop in the wall backfill. This system should consist of weep holes through the wall and/or a 4-inch perforated, closed joint drain line located along the backside of the walls above the top of the footing. The drain line should be surrounded by a minimum of 6 inches of AASHTO Size No. 57 Stone wrapped with an approved nonwoven filter fabric, such as Mirafi 140-N or equivalent.

4.5 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The International Building Code (IBC) requires site classification for seismic design based on the upper 100 feet of a soil profile. Two primary methods are utilized in classifying sites, namely the shear wave velocity (v_s) method and the Standard Penetration Resistance (N-value) method, as indicated in the following table. The N-value method was used for this project.

SEISMIC SITE CLASSIFICATION			
Site Class	Soil Profile Name	Shear Wave Velocity, V_s , (ft./s)	N value (bpf)
A	Hard Rock	$V_s > 5,000$ fps	N/A
B	Rock	$2,500 < V_s \leq 5,000$ fps	N/A
C	Very dense soil and soft rock	$1,200 < V_s \leq 2,500$ fps	>50
D	Stiff Soil Profile	$600 \leq V_s \leq 1,200$ fps	15 to 50
E	Soft Soil Profile	$V_s < 600$ fps	<15

The Site Class for the site was evaluated by calculating a weighted average SPT N-value for the top 100 feet of the subsurface profile. Based on the conditions encountered in the borings, we recommend that a Site Class "D" be used for design of the proposed building.

4.6 PAVEMENTS

Design Traffic Loading: Design traffic loading information for the pavements has not been provided to us. Based on our experience with similar projects, we assume that the proposed private pavements will likely be subjected to a mix of traffic consisting of passenger cars, pickups, vans, SUV's, delivery trucks, garbage trucks, and tractor-trailer trucks. Unless actual design traffic loading conditions are provided, we will estimate the 20-year 18-kip Equivalent Single Axle Loads (ESALS) for assumed vehicle types and average daily traffic. Based on these assumptions, we estimate a pavement design traffic load of 20,000 and 500,000 ESALS in 20 years light duty and heavy-duty pavements, respectively. The civil engineer should verify these assumptions and notify ECS if the actual pavement design traffic loading conditions exceed or are significantly less than these assumed values.

If the project will likely include any public pavements (NCDOT or local municipality), we need the projected average daily traffic, % dual axle trucks, and % tractor trailer trucks in order to provide recommended pavement sections for the public pavements.

Subgrade Characteristics: Based on the results of our soil test borings and anticipated site grading, we anticipate that the soils that will likely be exposed as pavement subgrades, exposed in cuts and placed as fill, will likely consist mainly of engineered fill material.

For preliminary design purposes we recommend that a design CBR value of 5 be using for the pavement sections.

No traffic data was available; therefore, we have made assumptions in order to provide preliminary pavement sections. The pavement sections below are guidelines and may or may not comply with local jurisdictional minimums but can be adjusted with more complete traffic data.

MINIMUM PAVEMENT SECTIONS				
MATERIAL	FLEXIBLE PAVEMENT			RIGID PAVEMENT
	Light Duty	Medium Duty	Heavy Duty	Heavy Duty
Portland Cement Concrete Air-Entrained ($f'_c = 4,000$ psi)	-	-	-	8 in.
Asphalt Surface Course (S9.5B)	1 in	-	2 in	-
Asphalt Intermediate Course (I19.0C)	2.5 in	-	3 in	-
Aggregate Base Course (ABC)	8 in	-	8 in	8 in

In general, heavy-duty sections should be used in areas that will likely be subjected to trucks, buses, or other similar vehicles including main drive lanes of the development. Light duty sections are appropriate for automobile traffic and parking areas.

Concrete Pavements: Concentrated front-wheel loads are frequently imposed on pavements in trash dumpster and truck loading dock areas. This type of loading typically results in rutting and scuffing of bituminous pavements and pavement failures and costly repairs. Therefore, we recommend that the pavements in trash pickup and loading dock aprons areas utilize the Portland Cement Concrete (PCC) pavement section. It may be prudent to use rigid pavement sections in areas planned for heavy truck traffic.

The Portland cement concrete pavement section should consist of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 psi. The rigid pavement section should be provided with construction joints and saw-cut control joints at appropriate intervals per Portland Cement Association (PCA) requirements. The construction joints should be reinforced with dowels to transfer loads across the joints. Wire mesh should be included to control shrinkage cracking of the concrete. The concrete pavement section thickness for plain jointed concrete pavement is with reinforcement dowels only at construction joints.

Construction Traffic: It is important to note that the design sections do not account for construction traffic loading. An incomplete pavement section without the final 1 inch of surface course asphalt can be used for temporary construction traffic, such as concrete trucks and tractor trailer material delivery trucks. Please note, however, that damage to the asphalt already placed is likely to occur in localized areas, and it should be repaired by removal and replacement with new asphalt at or near the end of construction, prior to placement of the surface course.

Alternatively, heavy construction vehicles and traffic should be limited to a temporary pavement section consisting of 12 inches of compacted ABC overlying a high-strength woven geotextile (Tencate Mirafi HP270 or equivalent). The temporary pavement section could then be graded and covered with asphalt to achieve the final design heavy duty pavement section.

Public Streets/Roads: It should also be noted that these design recommendations may not satisfy the local municipality or North Carolina Department of Transportation guidelines. Any roadways constructed for public use and to be dedicated to the local municipality or State for repair and maintenance must be designed in accordance with the local municipality or State requirements.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping vegetation, rootmat, topsoil, existing fill, and soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits, and 5 feet beyond the toe of Engineered Fills. Borings performed in “undisturbed” areas of the site contained an observed 4 or 6 inches of topsoil. Deeper topsoil or organic laden soils may be present in wet, low-lying, and poorly drained areas. ECS should be retained to verify that topsoil and unsuitable surficial materials have been removed prior to the placement of engineered fill or construction of structures.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by ECS. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 15 tons [e.g., fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of ECS. This procedure is intended to assist in identifying localized yielding materials.

Where proofrolling identifies areas that are yielding or “pumping” subgrade those areas should be repaired prior to the placement of subsequent Engineered Fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to evaluate the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in evaluating the cause of the observed yielding materials, and to assist in the evaluation of appropriate remedial actions to create a firm and unyielding subgrade.

5.1.3 Site Temporary Dewatering

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil sampling is not continuous, and thus soil and groundwater conditions may vary between sampling intervals (typically 5 feet). If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to evaluate dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from the site dewatering system shall be discharged in accordance with local, state and federal requirements.

5.1.4 Existing Pond Area

To the extent practical, surface water runoff should be diverted from the pond area during construction. The existing saturated and very soft sediments should be removed. Based on experience, we anticipated 1 to 3 feet of soft alluvial materials will likely need to be removed. This estimate should be confirmed with additional exploration prior to construction.

Prior to backfilling the pond area with engineered fill, placement of a single layer of Tensar BX1100 on the exposed bottom and placement of a 24-inch-thick working lift may be necessary to provide a stable working platform. If the pond bottom is wet, an 8- to 12-inch-thick lift of #34 stone on top of the geogrid may be needed to provide a moisture break. We also anticipate groundwater control consisting of rim ditches and sumps will likely be needed during preparation of the pond bottom for new fill placement.

Depending on final site grades, installing settlement monitoring plates in the former pond area prior to fill placement is recommended. Please see the section on waiting period and settlement monitoring in section 4.1.2 in this report.

5.2 EARTHWORK OPERATIONS

5.2.1 Excavation Considerations

Excavation Safety: Excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and

federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Excavability: Based on the assumed design grades, we anticipate that most of the natural soils encountered in the test borings can be removed with conventional earth excavation equipment such as track-mounted backhoes, loaders, or bulldozers.

5.2.2 Existing Man-Placed Fill

Existing fill (SM with trace to moderate amounts of organics) should be undercut to a minimum depth of 2 foot in pavement areas. In building areas, the depth and extent of undercut for the existing fill should be evaluated by ECS based on actual field conditions. The subgrade should then be proofrolled to evaluate if additional undercuts are needed. ECS personnel should confirm that fill removal has been suitably accomplished.

Fill Removal in Building Areas - Fill should be removed from below the planned pavement and building areas or possibly densified in place. We anticipate undercuts up to 5 feet may be necessary throughout the building pad area.

5.2.3 Suitability of On-Site Soils for Reuse as Engineered Fill

On-Site Borrow Suitability: The on-site soils meeting the classifications for recommended engineered fill, plus meeting the restrictions on separation distances, organic content, and debris, may be used as engineered fill. We anticipate that most of the soils encountered in the borings within the anticipated excavation depths to be suitable for use as engineered fill.

Engineered Fill Materials: Materials for use as Engineered Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

ENGINEERED FILL SOIL INDEX PROPERTIES	
Subject	Property
Soil Classification	CL, ML, SM, SC, SW, SP, GW, GM or GC
Max. Particle Size	3 inches
LL and PI for Fill in Building and Pavement Areas	$LL \leq 40$, $PI \leq 20$
Minimum dry unit weight (in place)	≥ 95 pcf
Max. organic content	4% by dry weight

ENGINEERED FILL COMPACTION REQUIREMENTS	
Subject	Requirement
Compaction Standard	Standard Proctor, ASTM D698
Required Compaction	95% of Max. Dry Density (98% in the top 1 foot)
Moisture Content	± 3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

Poor Quality Fill Materials: Poor quality fill materials include materials which do not satisfy the requirements for engineered materials, such as topsoil, organic materials, debris, debris-laden fill and highly elastic/plastic soils such as ELASTIC SILT (ML) and FAT CLAY (CH).

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of Engineered Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned. Fill material should be placed in horizontal lifts. Proper drainage should be maintained during the earthwork phases of construction to avoid ponding of water which can lead to degradation of the subgrade soils.

Subgrade Benching: In fill areas, new soil embankments should be constructed from the bottom up. End dumping from the top of the slope should not be permitted. Fill should not be placed on ground with a slope steeper than 5H:1V. Where steeper slopes exist, the ground should be benched to allow for fill placement on a horizontal surface. Each fill layer should be benched into the existing slope for stability.

5.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: We anticipate that most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It is important to have the Geotechnical Engineer of Record (ECS), or their authorized representative, observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated.

Slab Subgrade Verification: Prior to placement of a drainage layer, the subgrade should be prepared in accordance with the recommendations found in **Section 5.1.2 Proofrolling**.

5.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Loose or unsuitable materials encountered should be removed and replaced with suitable compacted Engineered Fill, or pipe stone bedding material.

Utility Backfilling: The granular bedding material should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Engineered Fill and Fill Placement.

5.5 ADDITIONAL CONSIDERATIONS

During the cooler and wetter periods of the year, delays and additional earthwork costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas.

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are dug. If surface water intrusion or exposure softens the bearing soils, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that the foundations be covered or otherwise protected.

Positive site drainage should be maintained during earthwork operations, which should help maintain the integrity of the soil. Placement of fill on the near surface soils, which have become saturated, could be difficult. When wet, these soils will likely degrade quickly with disturbance from contractor operations and will likely be extremely difficult to stabilize for fill placement.

Where unacceptable materials are encountered, they must be evaluated and may need to be undercut and replaced or improved by re-compaction.

The surface of the site should be kept properly graded to enhance drainage of the surface water away from the proposed structure areas during the construction phase. We recommend that an attempt be made to enhance the natural drainage without interrupting its pattern.

6.0 ADDITIONAL EXPLORATION

As previously mentioned, the existing on-site fill material may be detrimental to overall site development. We recommend performing an additional study that includes test pits across the site and additional laboratory testing to evaluate the suitability of reuse of this material.

7.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

The description of the proposed project is based on information provided to ECS by R.T.G. Furniture Corp. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the final project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. We would be pleased to provide an estimated cost for these services at the appropriate time.

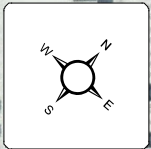
This report is provided for the exclusive use of R.T.G. Furniture Corp. and their project specific design team. This report is not intended to be used or relied upon in connection with other projects or by other third parties. ECS disclaims liability for any such third-party use or reliance without express written permission.

Appendix A - Drawings and Reports

Site Location Diagram

Boring Location Diagram(s)

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors



Legend

-  Approximate Building Boring Locations
-  Approximate Pavement Boring Locations
-  Approximate Stormwater Pond Boring Locations



**BORING LOCATION DIAGRAM
ROOMS TO GO EXPANSION - DUNN, NC**

**901 ROOMS TO GO WAY, DUNN, NORTH CAROLINA
ROOMS TO GO**

ENGINEER
WEG
SCALE
AS NOTED
PROJECT NO.
33:6505
FIGURE
2 OF 2
DATE
7/14/2023

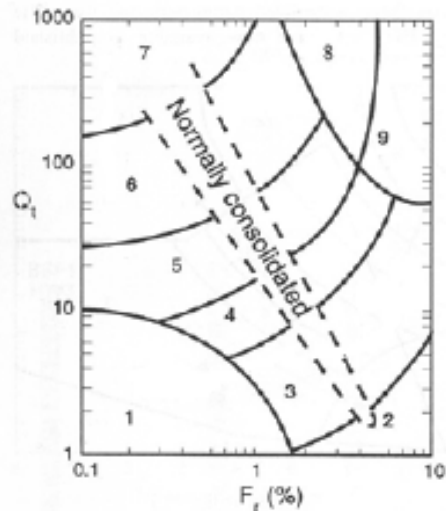
Appendix B – Field Operations

Reference Notes

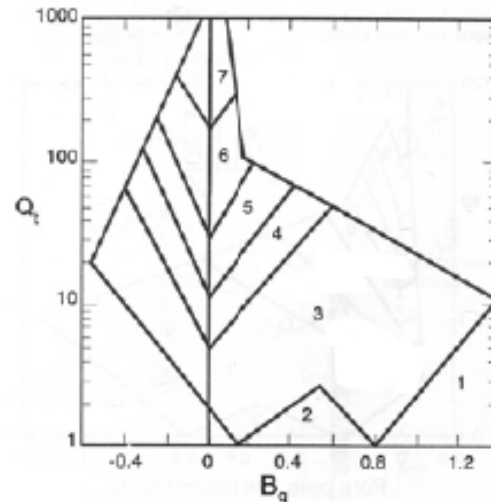
Exploration Procedures

Cone Penetration Testing (CPT)

In the CPT sounding procedure (ASTM-D-5778), an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (q_c), pore water pressure (U_2), and sleeve friction (F_s). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, preconsolidation pressure, and undrained shear strength. The graphs below represent one of the accepted methods of CPT soil behavior classification (Robertson, 1990).



1. Sensitive, Fine Grained
2. Organic Soils-Peats
3. Clays; Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt



6. Clean Sands to Silty Sands
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff Fine Grained

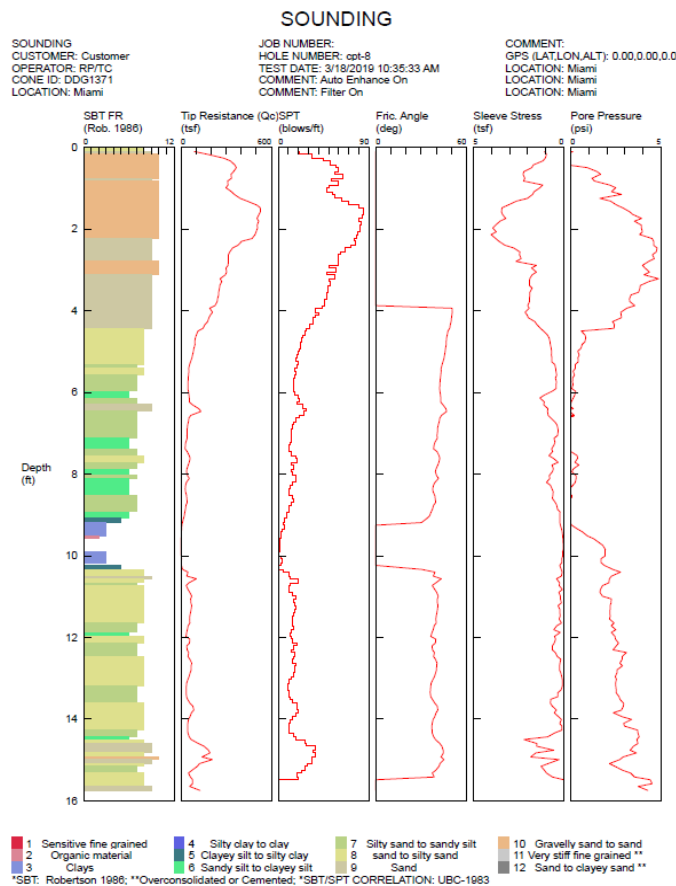
The following table presents a correlation of corrected cone tip resistance (q_c) to soil consistency or relative density:

SAND		SILT/CLAY	
Corrected Cone Tip Resistance (q_c) (tsf)	Relative Density	Corrected Cone Tip Resistance (q_c) (tsf)	Relative Density
<20	Very Loose	<5	Very Soft
20-40	Loose	5-10	Soft
40-120	Medium Dense	10-15	Firm
		15-30	Stiff
120-200	Dense	30-60	Very Stiff
<200	Very Dense	30-60	Hard
		<60	Very Hard



SUBSURFACE EXPLORATION PROCEDURE: CONE PENETRATION TESTING (CPT) ASTM D 5778

In the CPT sounding procedure, an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (q_c), pore water pressure (U_2), and sleeve friction (f_s). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, pre-consolidation pressure, and undrained shear strength.



CPT Procedure:

- Involves the direct push of an electronically instrumented cone penetrometer* through the soil
- Values are recorded continuously
- CPT data is corrected and correlated to soil parameters

*CPT Penetrometer Size May Vary

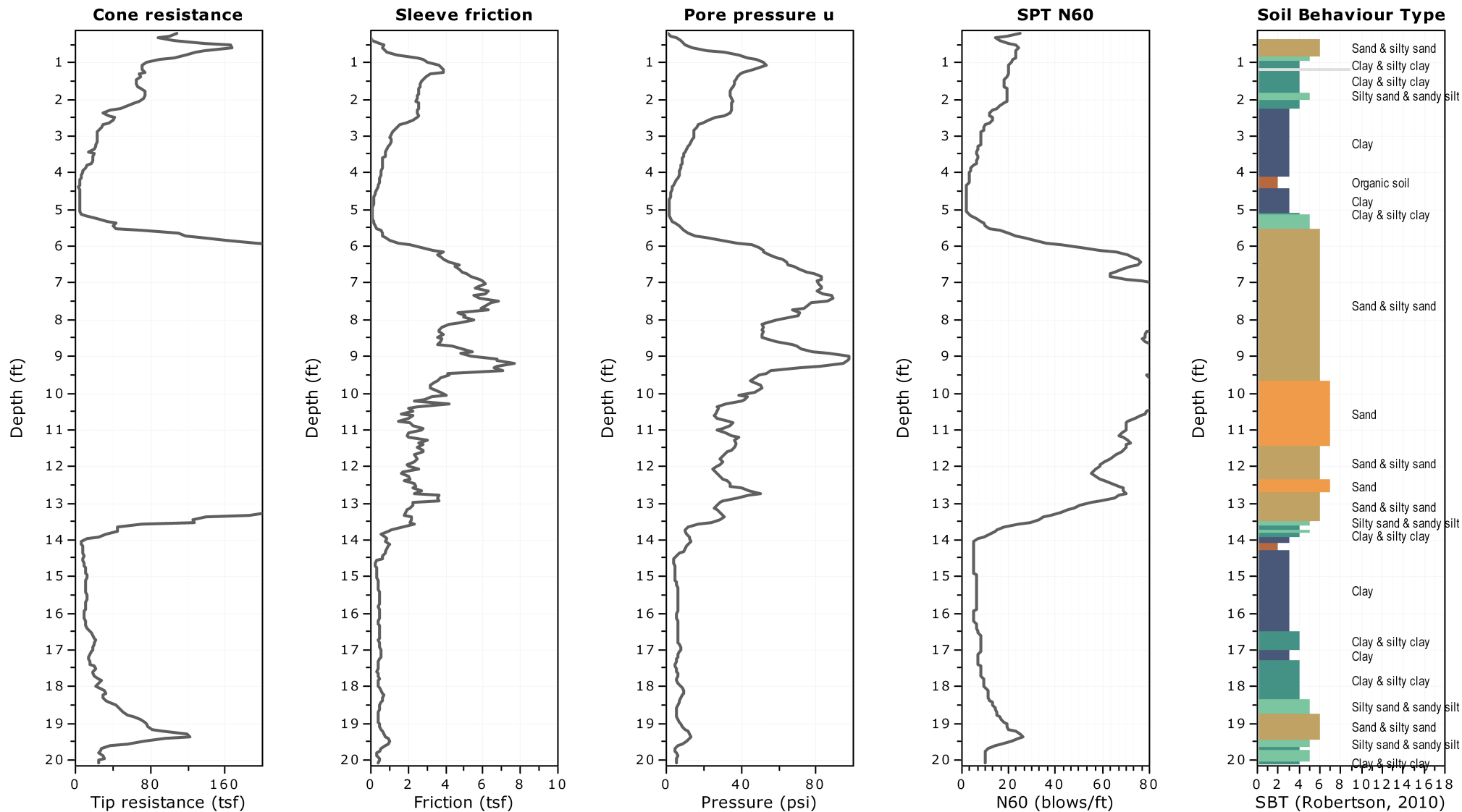


ECS Southeast, LLP
5260 Greens Dairy Road
Raleigh, NC 27616
www.ecslimited.com

CPT: B-01

Total depth: 20.08 ft, Date: 6/23/2023
Surface Elevation: 187.00 ft
Coords: lat 35.303435° lon -78.584004°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



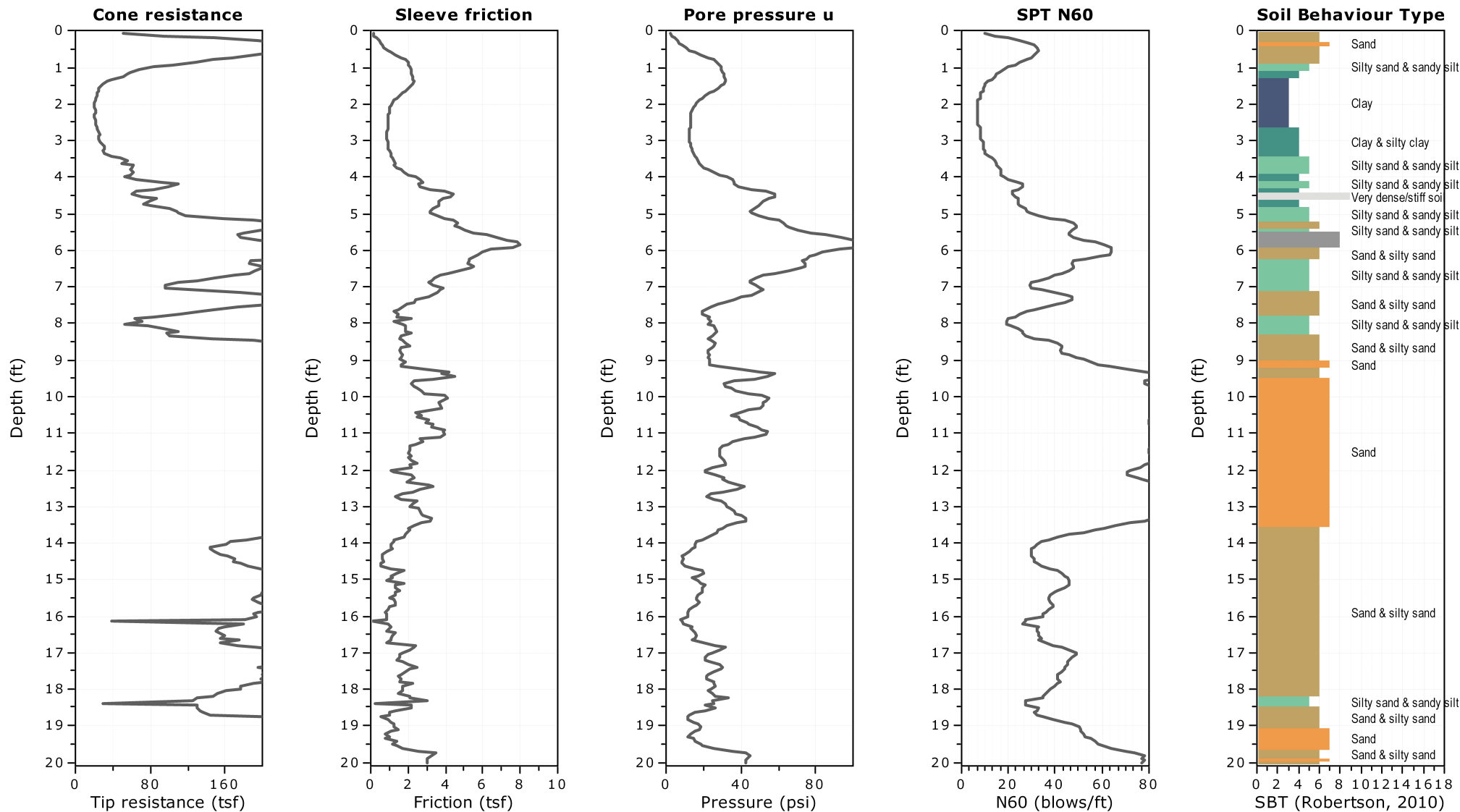


ECS Southeast, LLP
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CPT: B-02

Total depth: 20.01 ft, Date: 6/23/2023
Surface Elevation: 189.00 ft
Coords: lat 35.303829° lon -78.582974°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC





ECS Southeast, LLP
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CPT: B-03

Total depth: 20.01 ft, Date: 6/23/2023

Surface Elevation: 193.00 ft

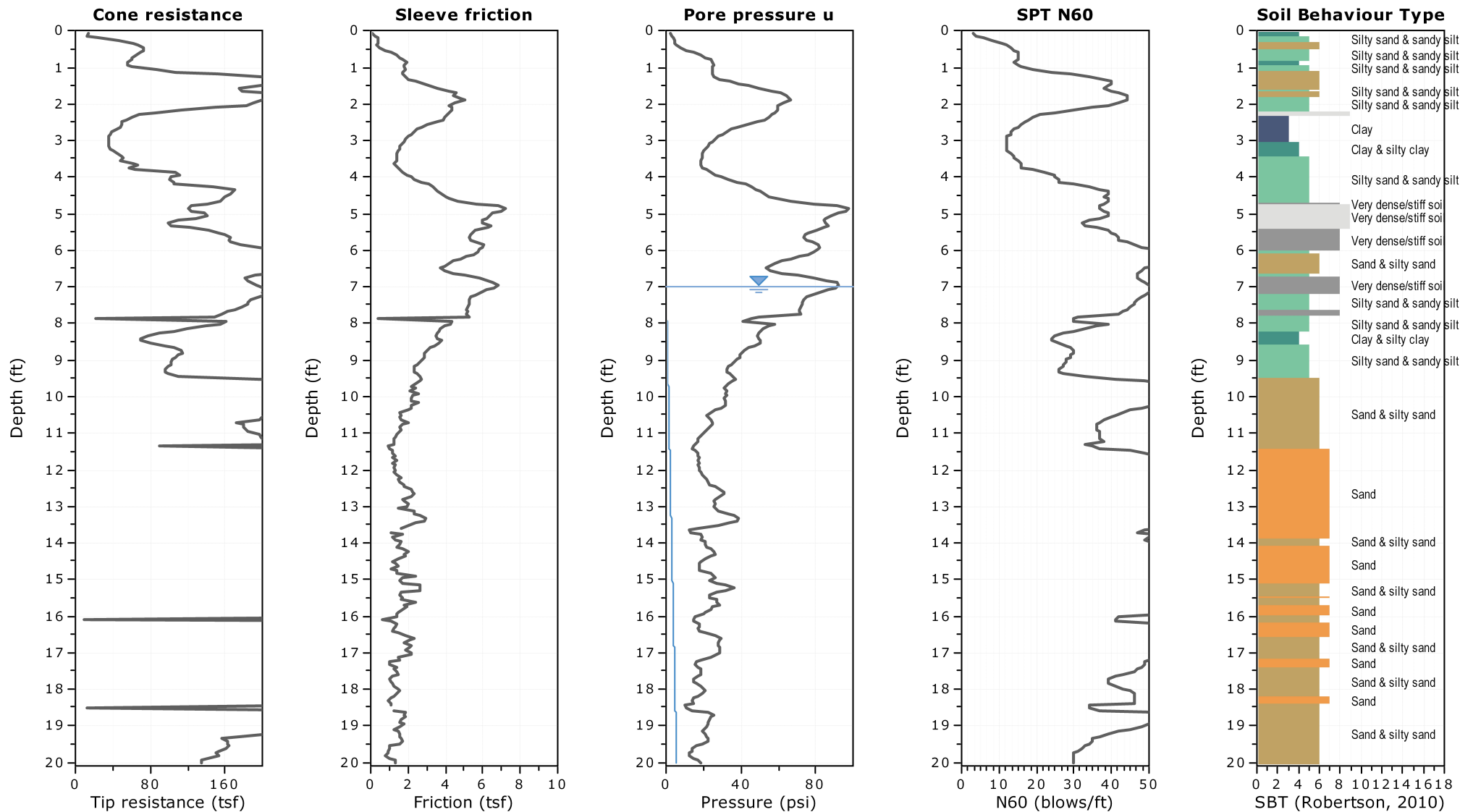
Coords: lat 35.304521° lon -78.582481°

Cone Type: Standard

Cone Operator: Radu

Project: Rooms to Go Expansion

Location: 901 Rooms To Go Way, Dunn, NC



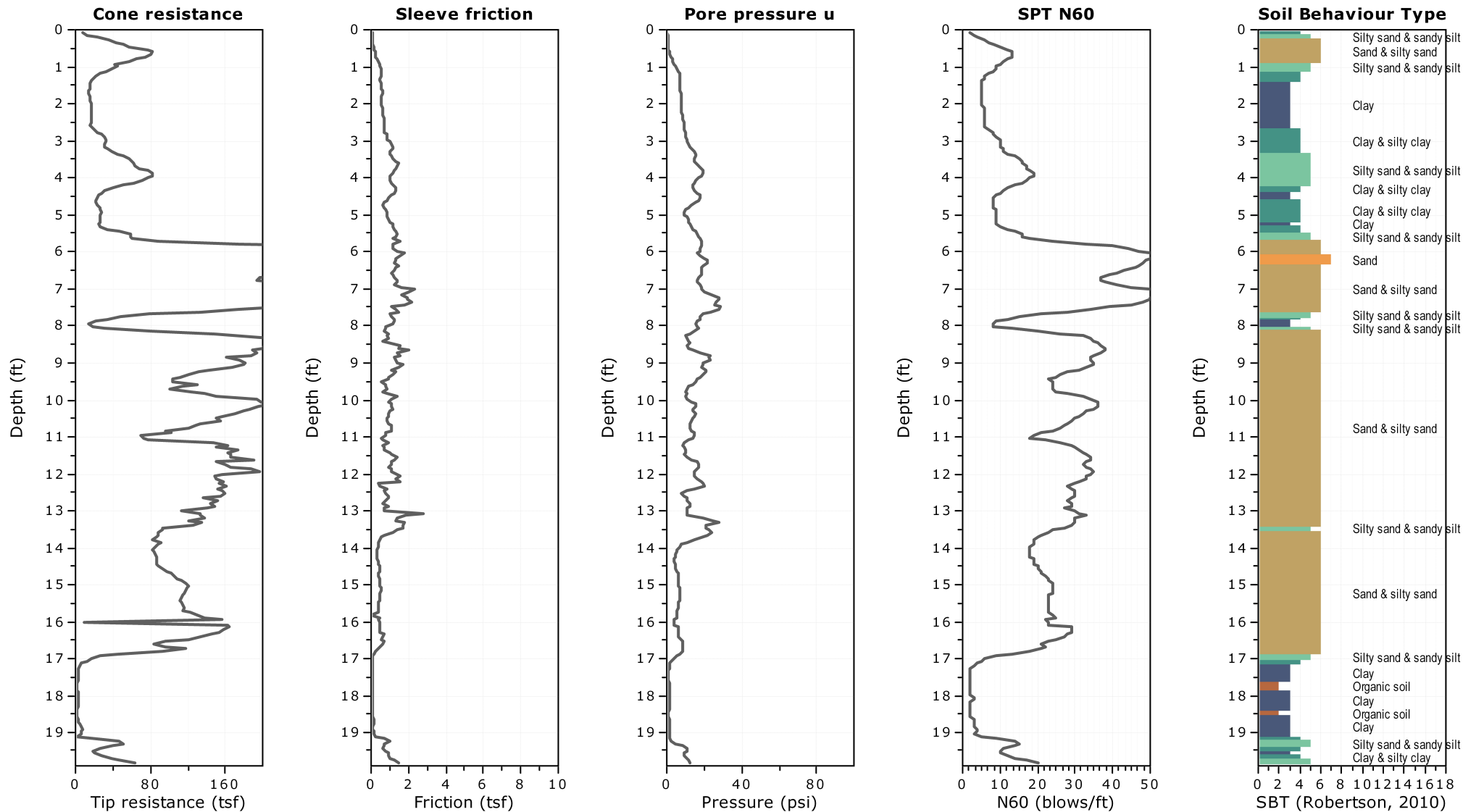


ECS Southeast, LLP
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CPT: B-04

Total depth: 19.82 ft, Date: 6/23/2023
Surface Elevation: 193.00 ft
Coords: lat 35.303567° lon -78.58158°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



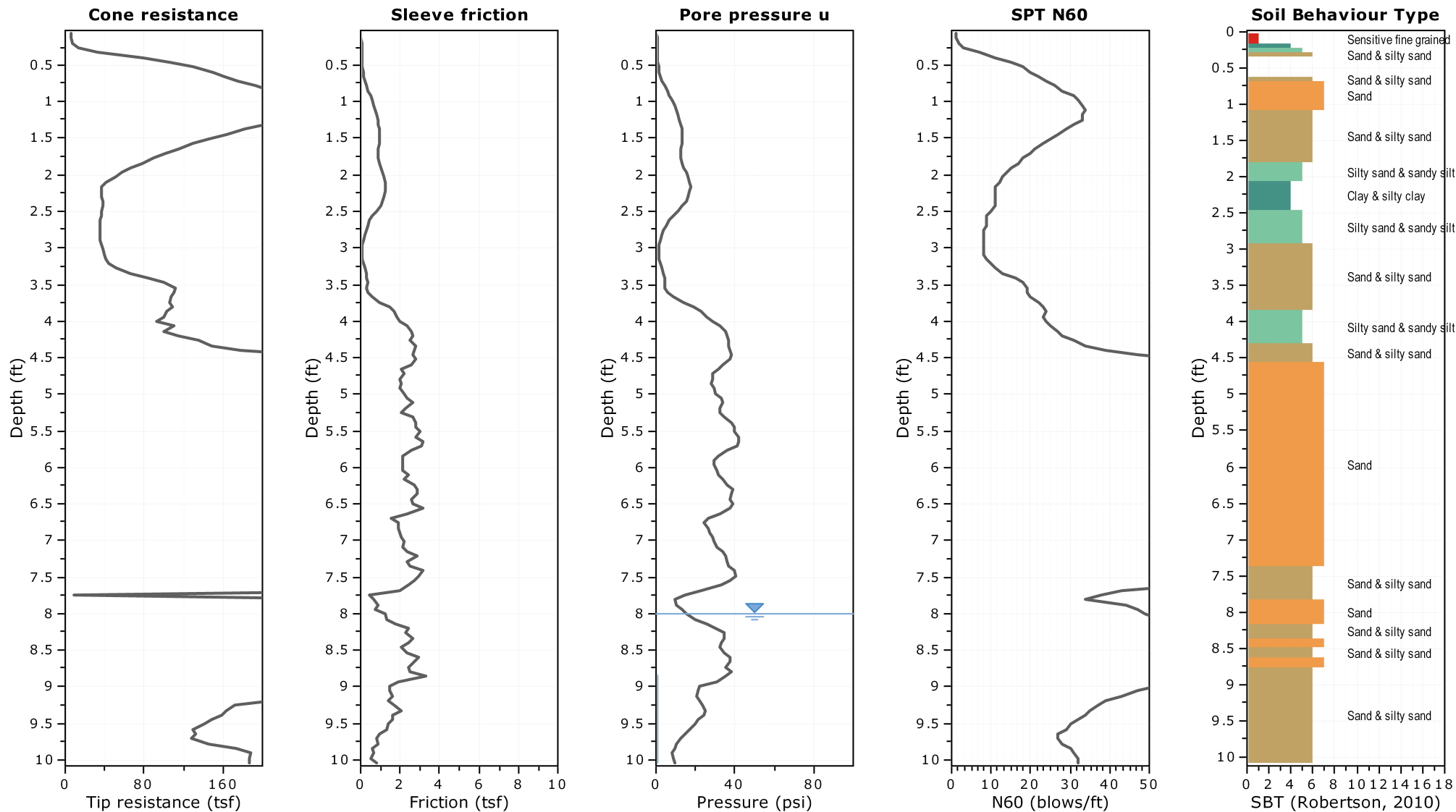


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CPT: P-01

Total depth: 10.04 ft, Date: 6/23/2023
Surface Elevation: 187.00 ft
Coords: lat 35.303803° lon -78.580893°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



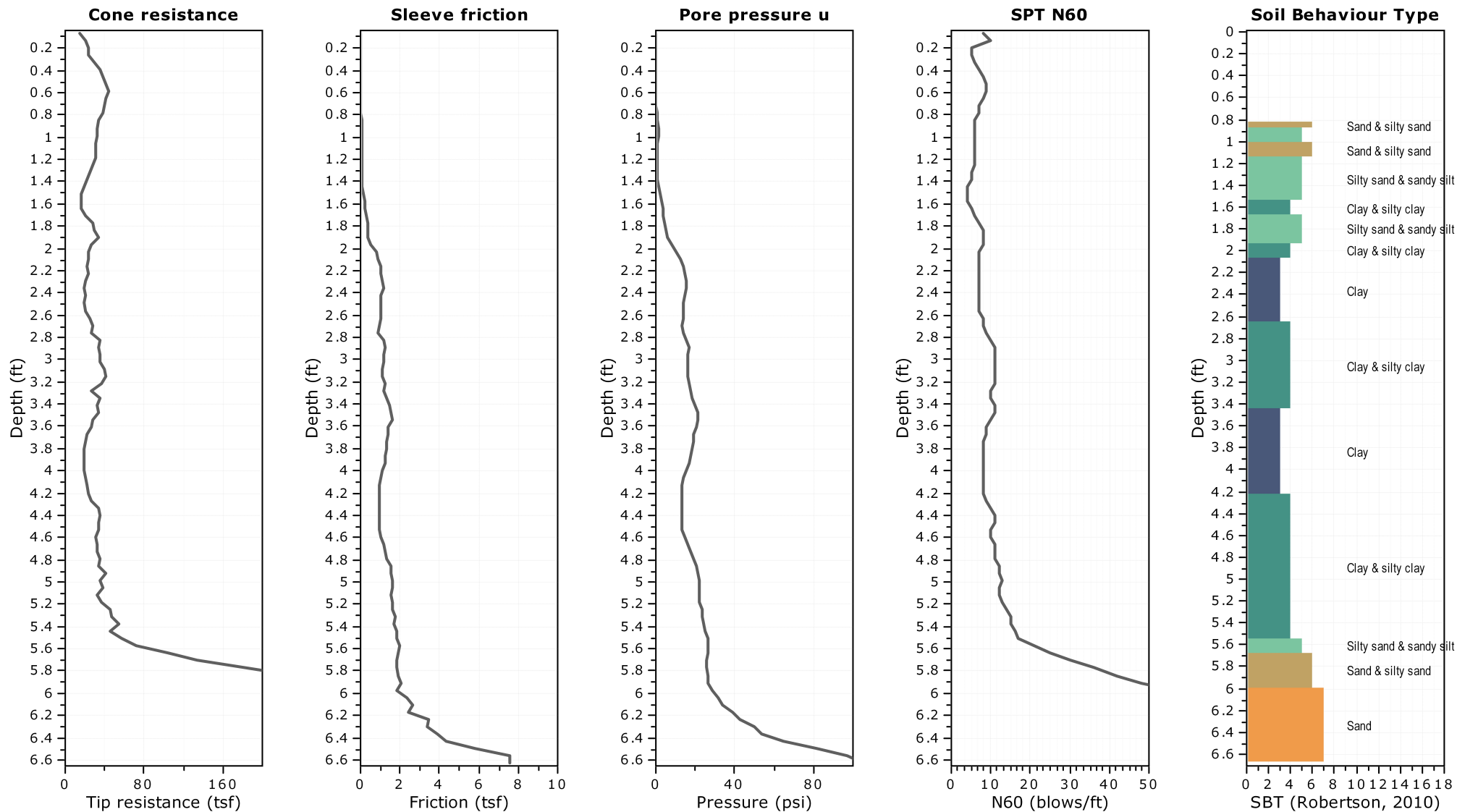


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CPT: P-02

Total depth: 6.63 ft, Date: 6/23/2023
Surface Elevation: 185.00 ft
Coords: lat 35.302017° lon -78.583178°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



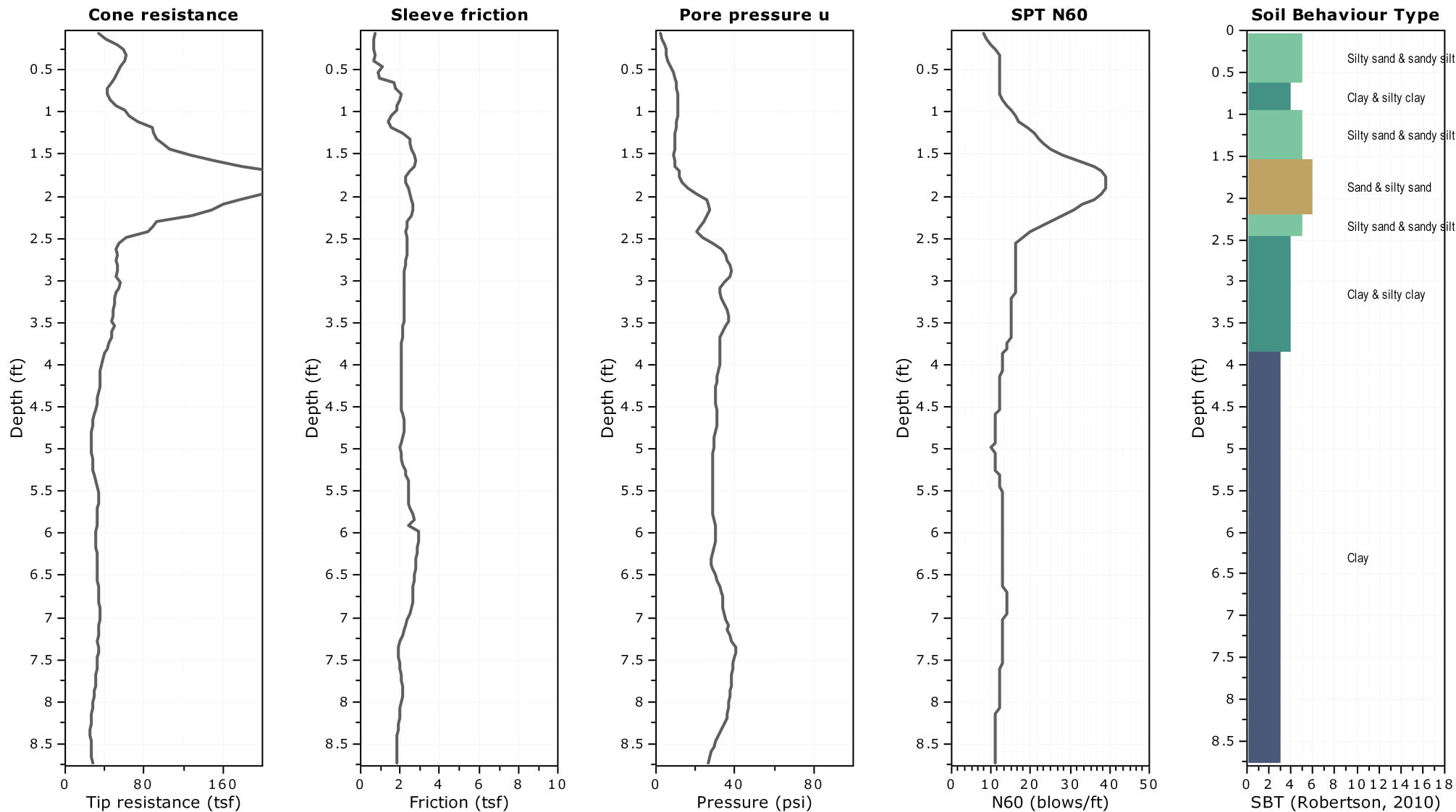


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CPT: P-03

Total depth: 8.73 ft, Date: 6/23/2023
Surface Elevation: 177.00 ft
Coords: lat 35.301325° lon -78.58423°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



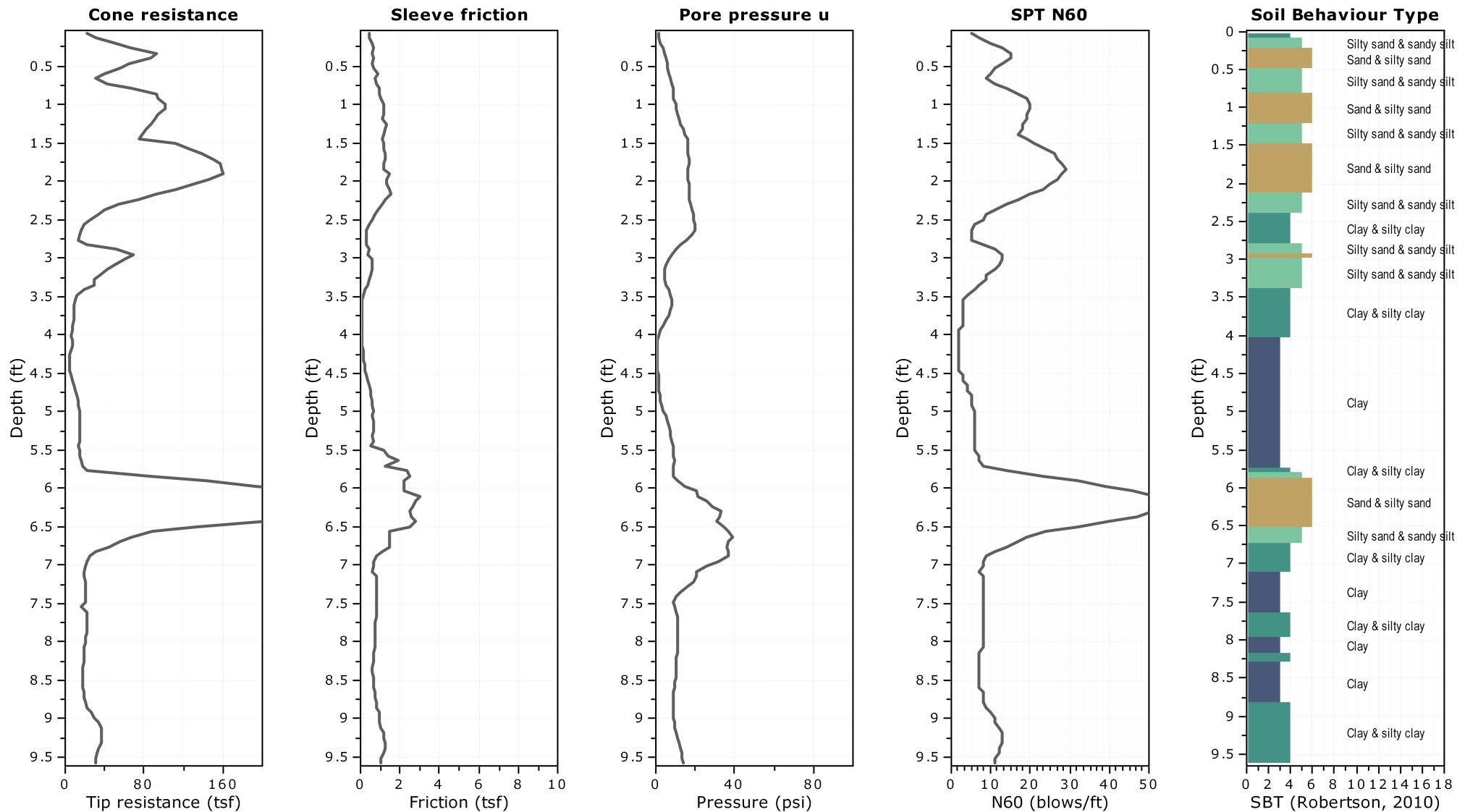


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CPT: P-04

Total depth: 9.58 ft, Date: 6/23/2023
Surface Elevation: 166.00 ft
Coords: lat 35.300581° lon -78.584315°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC



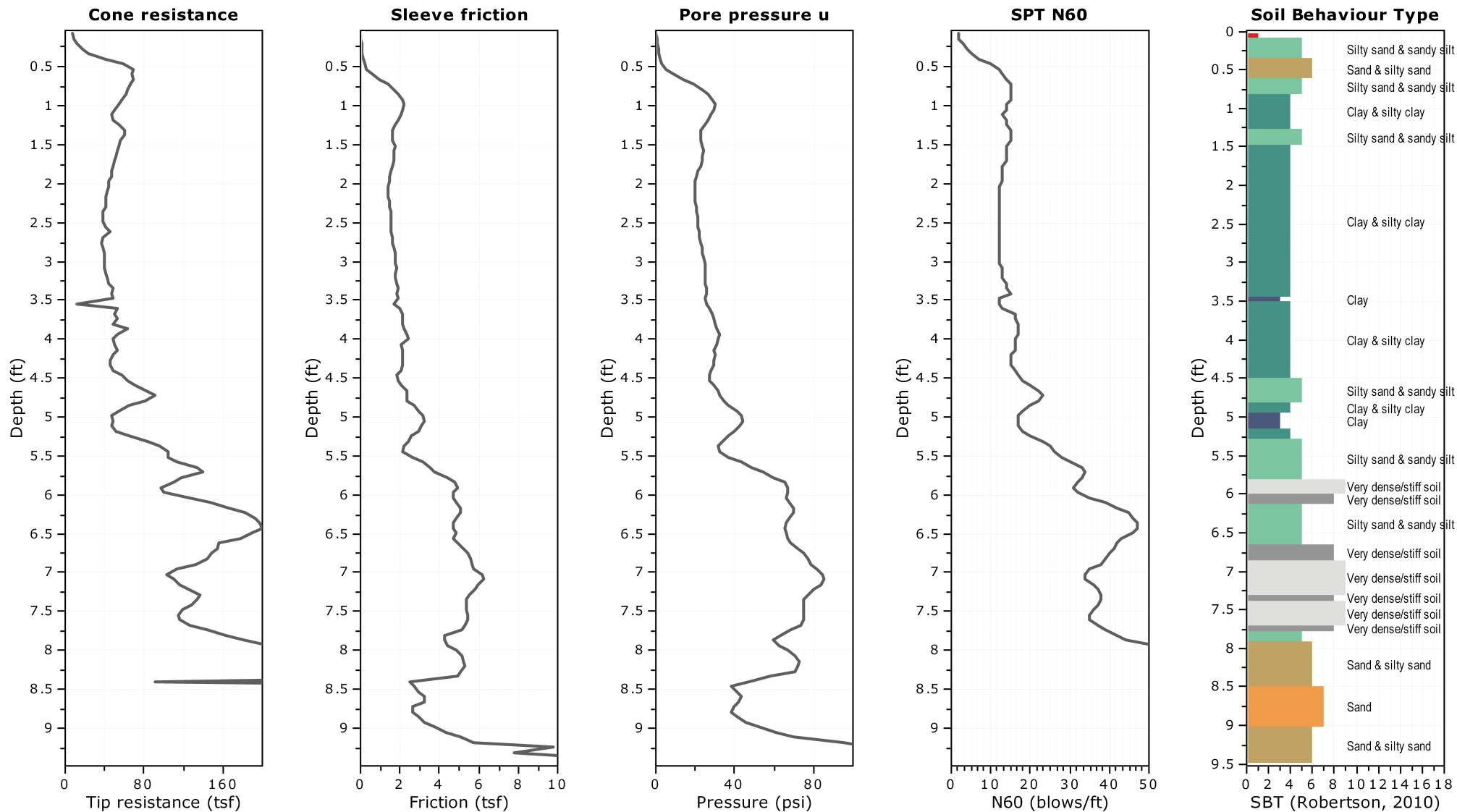


ECS Southeast, LLP
5260 Greens Dairy Road
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CPT: SCM-01

Total depth: 9.45 ft, Date: 6/23/2023
Surface Elevation: 183.00 ft
Coords: lat 35.302315° lon -78.584541°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC





ECS Southeast, LLP
5260 Greens Dairy Road
Raleigh, NC 27616
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CPT: SCM-02

Total depth: 15.09 ft, Date: 6/23/2023
Surface Elevation: 184.00 ft
Coords: lat 35.301912° lon -78.584058°
Cone Type: Standard
Cone Operator: Radu

Project: Rooms to Go Expansion
Location: 901 Rooms To Go Way, Dunn, NC

