PROJECT MANUAL

UNIVERSITY OF NORTH CAROLINA
AT WILMINGTON

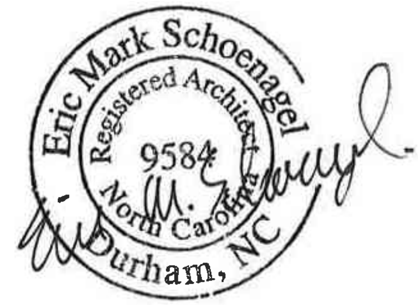
HOUSING VILLAGE PHASE 3

601 SOUTH COLLEGE ROAD
WILMINGTON, NORTH CAROLINA 28403

COMPLETE PACKAGE
CONSTRUCTION DOCUMENTS

5142301800 / SCO 22-29053-02D

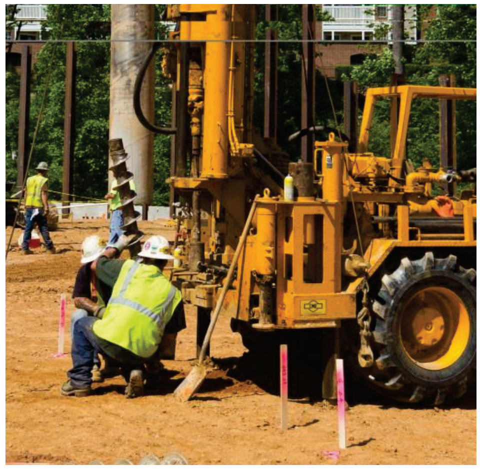
JANUARY 15, 2026



01·15·2026

LITTLE
DIVERSIFIED ARCHITECTURAL CONSULTING

This page intentionally left blank



ECS Southeast, LLC

Preliminary Geotechnical Engineering Report

UNCW Student Village – Galloway Report

Wilmington, New Hanover County, North Carolina

ECS Project No. 22:36206

June 17, 2025

June 17, 2025

Mr. Craig Brackens
University of North Carolina at Wilmington
601 S. College Road
Wilmington, NC 28403

ECS Project No. 22:36206

Reference: Geotechnical Engineering Report
UNCW Student Village – Galloway Site
Wilmington, New Hanover County, North Carolina

Dear Mr. Brackens:

ECS Southeast, LLC (ECS) has finished the subsurface exploration 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 our design and construction recommendations.

It has been our pleasure to be of service to UNC Wilmington (UNCW) 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 the subsurface conditions encountered in the exploration 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,

ECS Southeast, LLC

Annemarie Crumrine

Annemarie Crumrine, PE
Geotechnical Department Manager
ACrumrine@ecslimited.com

DocuSigned by:
Winslow Goins
2D745DA276044AF...

Winslow Goins, PE
Principal Engineer
WGoins@ecslimited.com

Signed by:
NORTH CAROLINA PROFESSIONAL SEAL 033751 ENGINEER WINSLOW E. GOINS
6/17/2025

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the Executive Summary should not be utilized in lieu of reading the geotechnical report.

- The geotechnical exploration performed for the site included five (5) electronic cone penetration test (CPT) soundings drilled to termination and refusal depths of approximately 68.4 to 77.6 feet and five (5) hand auger borings adjacent to the CPT sounding locations to depths of approximately 4 feet.

- Provided the subgrades are prepared as recommended in this report and the anticipated maximum column and wall loads and final grades, provided in the table in **Section 2.2**, are not exceeded, the planned structure may be supported by conventional shallow foundations consisting of column or strip footings bearing on compacted structural fill and natural soils using a net allowable soil bearing pressure of 3,000 psf.

- Alternatively, if greater bearing capacity and higher loads are evaluated to be needed or beneficial for the proposed project, a ground improvement system consisting of rigid inclusions combined with conventional shallow foundations can be used to support the proposed structure.

- Groundwater was encountered in the soundings at depths ranging from approximately 10.24 feet to 14.67 feet below existing grade.

Please note this Executive Summary is an important part of this report and should be considered a ***"summary"*** only. The subsequent sections of this report constitute our findings, conclusions, and recommendations in their entirety.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design of foundations for the proposed residential building located off of Riegel Road on the UNCW campus in Wilmington, North Carolina. The recommendations developed for this report are based on project information supplied by Mr. Craig Brackens with UNCW and Balfour Beatty.

Our services were provided in accordance with our Proposal No. 22:29800, dated May 21, 2025, as authorized by UNCW on May 27, 2025, with Purchase Order P0205260.

This report contains the procedures and results of our subsurface exploration programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items.

- A brief review and description of our field test procedures and the results of testing conducted;
- A review of surface topographical features and site conditions;
- A review of subsurface soil stratigraphy with pertinent available physical properties;
- Foundation recommendations;
  - Allowable bearing pressure;
  - Settlement estimates (total and differential);
- Site development recommendations;
- Reusability of soils for use as fill material;
- Discussion of groundwater impact;
- Compaction recommendations;
- Site vicinity map;
- Exploration location plan; and
- CPT sounding logs.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The proposed site is located at the old Galloway Hall site off of Riegel Road on the UNCW campus in Wilmington, North Carolina. The site is bounded on the west by Riegel Road, on the north by Belk Hall, on the east by the existing student housing village, and on the south by The Hub building and parking lot. Figure 2.1.1 below shows an image of where the sites are located.

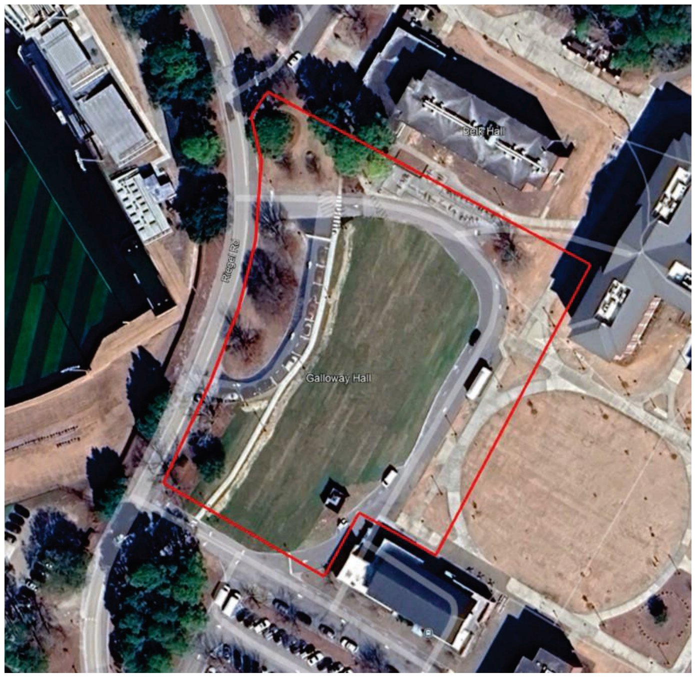


Figure 2.1.1 Site Location

At the time of our exploration, the site currently consisted of open grass fields with existing paved drives and sidewalks. ECS understands the site previously consisted of the Galloway Hall building that appears to have been demolished in 2024. Based on our site visit and approximate elevations from Google Earth, the site is slightly sloped up toward the eastern side of the site with typical elevations on sites ranging from approximately 38 to 46 feet.

2.2 PROPOSED CONSTRUCTION

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

SUBJECT	DESIGN INFORMATION / ESTIMATIONS
Usage	Residential
Column Loads	Up to 650 kips
Wall Loads	Up to 12 kips per linear foot (klf)
Finish Floor Elevation	within +/- 4 feet of existing grades

ECS understands the project consists of construction of a new five-story residential building for student housing.

3.0 FIELD EXPLORATION TESTING

Our exploration procedures are explained in greater detail in Appendix B including the Reference Notes for Cone Penetration Soundings. Our scope of work included performing five (5) CPT soundings and five (5) hand auger borings. Our approximate CPT sounding locations are shown on the Exploration Location Diagram in Appendix A.

3.1 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil. Please refer to the CPT sounding logs in Appendix B.

The site is located in the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain is composed of seven terraces, each representing a former level of the Atlantic Ocean. Soils in this area generally consist of sedimentary materials transported from other areas by the ocean or rivers. These deposits vary in thickness from a thin veneer along the western edge of the region to more than 10,000 feet near the coast. The sedimentary deposits of the Coastal Plain rest upon consolidated rocks similar to those underlying the Piedmont and Mountain Physiographic Provinces. In general, shallow unconfined groundwater movement within the overlying soils is largely controlled by topographic gradients. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation.

Table 3.1.1 Subsurface Stratigraphy

Approximate Depth Range	Stratum	Description	Ranges of N*-Values(1) blows per foot (bpf)
0 to (0.1-0.33)	N/A	The soundings and borings performed in undisturbed areas encountered approximately 1 to 4 inches of topsoil on the site. Deeper topsoil or organic laden soils are likely present in wet, poorly drained areas and potentially unexplored areas of the site.	N/A
(0.1-0.33) to 3.5	I	Loose to Medium Dense, SILTY TO CLEAN SAND (SM, SP), moist to saturated. FILL was encountered in the upper 1.5 to 3.5 feet in the hand auger borings at S-2 and S-5.	5 to 28
3.5 to 19	II	Very Loose to Dense, CLAYEY, SILTY and CLEAN SAND (SC, SM, SP) with interbedded layers of Soft to Stiff, SILTY, SANDY LEAN, and LEAN CLAY (CL-ML, CL), moist to saturated	4 to 46
19 to 52	III	Medium Dense to Very Dense, SILTY TO CLEAN SAND (SM, SP), saturated	13 to 72
52 to 77.6	IV	Soft to Very Stiff, SILTY, SANDY LEAN, and LEAN CLAY (CL-ML, CL) and ORGANICS (OL/OH) and Medium Dense to Very Dense, SILTY TO CLEAN SAND (SM, SP), saturated. Refusal was encountered in the soundings in Stratum IV at depths ranging from 68.4 to 77.6 feet.	4 to in excess of 100

Notes: (1) Equivalent Corrected Standard Penetration Test Resistances

3.2 GROUNDWATER OBSERVATIONS

Water levels were encountered in our CPT soundings and are shown in Appendix B. Groundwater depths measured at the time of exploration in our CPT soundings ranged from approximately 10.25 to 14.67 feet below the ground surface. Hand auger boring S-5 encountered groundwater at a depth of approximately 2 feet below existing grades. The groundwater encountered in hand auger boring may have been perched in the Fill soils from recent rain events. 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.

4.0 PRELIMINARY DESIGN RECOMMENDATIONS

4.1 PRELIMINARY SHALLOW FOUNDATIONS

Provided subgrades and structural fills are prepared as recommended in this report and the anticipated maximum column and wall loads, provided in the tables in **Section 2.2**, are not exceeded, the proposed residential building can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters***:***

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure(1)	3,000 psf	3,000 psf
Recommended Bearing Soil Material	Stratum I Soils or Structural Fill	Stratum I Soils or Structural Fill
Minimum Width	30 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade) (2)	12 inches	12 inches
Minimum Exterior Frost Depth (below final exterior grade)	6 inches	6 inches
Estimated Total Settlement (3)	Less than 1- inch	Less than 1- inch
Estimated Differential Settlement (4)	Less than ½ inches between columns	Less than ½ inches

Notes:

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

Potential Undercuts: Most of the soils at the estimated foundation bearing elevation are anticipated to be adequate for support of the proposed structures. If soft or loose soils are observed at the footing bearing elevations, the soils should be undercut and removed. Undercut should be backfilled with structural fill up to the original design bottom of footing elevation; the original footing may be constructed on top of the structural fill.

4.2 SLABS ON GRADE

The on-site natural soils are generally considered adequate for support of the slab-on-grade floor slabs. Based on the estimation that the finished floor elevation is around current grades, it appears that the slabs for the structure will likely bear on the Stratum I SAND (SM, SP) or Structural Fill. The following graphic depicts our soil-supported slab recommendations:

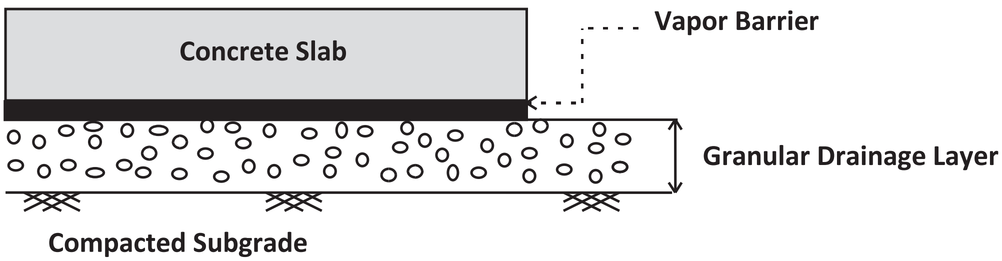


Figure 4.2.1

1. Drainage Layer Thickness: 6 inches
2. Drainage Layer Material: GRAVEL (GP) or SAND containing <5% fines passing #200 sieve (SP, SW)

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

Subgrade Modulus: Provided the Structural Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed estimating a modulus of subgrade reaction, k_1 of 175 pci (lbs./cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

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. Curing of the slab should be performed in accordance with ACI specifications 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 do away with the vapor barrier.

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 inhibits the use of a free-floating slab such as in a drop down footing/monolithic slab configuration, the slab should be designed to avoid overstressing of the slab.

4.3 INTERMEDIATE FOUNDATIONS

Alternatively, if greater bearing capacity and higher loads are evaluated to be needed or beneficial for the proposed project, a ground improvement system consisting of rigid inclusions combined with conventional shallow foundations can be used to support the proposed structures.

A ground improvement system consisting of rigid inclusion can be used to transfer the stress of a shallow foundation system to stiffer soils at the site. Rigid inclusion systems general consist of cement treated aggregate, grouted aggregate or concrete column elements and a load transfer platform below the foundation. The elements installed with a displacement tool mounted on a tracked carrier system. As the tool is advanced to the designed bear stratum elevation, granular soil layers in the upper stratums are densified by the displacement tool. Once the design bearing stratum elevation is encountered by the displacement tool, grout is pumped through the tool out of a port at the tip of the tool. The tool is extracted at a designed rate and grout pressure to maintain a positive grout head during extraction. Depending on the soil conditions at the foundation subgrade elevation, a load transfer platform consisting of the existing granular soil or granular fill consisting of sand or gravel will likely need to be installed after foundation excavation is performed. This may result in additional excavation of the foundations, and the foundation contractor should be aware of this and account for it in the bidding process.

The element is terminated at a design elevation below the foundation elevation. Typically, gravel or stone is placed in the remaining space between the top of the element and the site subgrade to mark the element location to deter grading contractors or utility contractors from excavating and damaging the elements after installation.

Detailed design of the rigid inclusion ground improvement program is performed by a design/build specialty geotechnical contractor because of the proprietary nature of the various methods used to construct them. The various methods result in different diameters, depths, and capacity for the elements.

Specifications for rigid inclusion foundation systems should be prepared by the design-build foundation contractor. The specifications should include a provision for at least one load test of a completed element to confirm that the installation can produce elements with a capacity equal to or greater than that used for design.

Elements should be installed after the site is filled to final grade. Care should be taken to minimize vibrations when installing elements near existing structures.

We recommend that ECS be retained to monitor the rigid inclusion installer’s operations as a Quality Assurance service. ECS’ services will supplement the installer’s internal Quality Control program. Together, the QA and QC programs will monitor installation depths, element lengths, installation procedures, concrete/grout properties and cylinder breaks. These items will be documented for each element installed, to provide a complete installation report.

4.4 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The ASCE7-16 standard requires site classification for seismic design based on the upper 100 feet of a soil profile. At least two methods are utilized in classifying sites, namely the shear wave velocity (v_s) method and the Standard Penetration Resistance (N-value) method. The first method (shear wave velocity) was used in classifying this site.

Based upon our interpretation of the subsurface conditions, the appropriate Seismic Site Classification is "D."

Liquefaction: When a saturated soil with little to approximately no cohesion liquefies during a major earthquake, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, differential settlement, loss of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction.

The potential for liquefaction at the site is considered low based upon the CPT results and the liquefaction index procedure developed by Iwasaki (1982). Based on our CPT results and our evaluation using a site peak ground acceleration of 0.12 (PGA_m) per ASCE7-16, an earthquake event with a magnitude of 7.3 and procedures developed by Robertson (2009), Moss et al. (2006), and Boulanger & Idriss (2014), the liquefaction induced settlement at the subject site is estimated to be approximately 0.6 inches or less. The max differential settlement is estimated to be 0.6 inches over a distance of 120 feet.

Ground Motion Parameters: The design spectral response acceleration parameters can be based on a Seismic Site Classification "D" based on the weighted average shear wave velocity at the site. ECS has evaluated the design spectral response acceleration parameters following the ASCE7-16 methodology. The mapped responses were estimated from the ATC Hazards by Location Tool available from the USGS website (https://ascehazardtool.org). The design responses for the short (0.2 sec, SDS) and 1-second period (SD1) are noted in bold at the far right end of the following table.

GROUND MOTION PARAMETERS – SITE CLASS D [ASCE7-16 Method]								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_S	0.152	F_a	1.6	$S_{MS}=F_aS_s$	0.244	$S_{DS}=2/3\ S_{MS}$	**0.163**
1.0	S_1	0.067	F_v	2.4	$S_{M1}=F_vS_1$	0.161	$S_{D1}=2/3\ S_{M1}$	**0.107**

The Site Class definition should not be confused with the Seismic Design Category designation which the Structural Engineer typically assesses.

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, existing foundations, existing pavements, and soft or loose materials from the 10-foot expanded building and 5-foot expanded pavement limits. The soundings and borings performed encountered approximately 1 to 4 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, existing foundations and pavements, construction debris, and substandard surficial materials have been removed prior to the placement of structural fill or construction of structures. Rocks, wood, gravel and brick fragments were encountered in the near surface sands in hand auger borings S-2 and S-5 in the upper 1.5 to 3.9 feet below existing grades. The soils are estimated to be fill from previous development on site. It should be anticipated that the soils need to be stripped and screened to remove debris prior to placement in structure and pavement areas.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be proofrolled with construction equipment having a minimum axle load of 10 tons [e.g., tandem-axle dump truck loaded to capacity]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying localized yielding materials.

Where proofrolling identifies areas that are unsteady or "pumping" subgrade those areas should be repaired prior to the placement of subsequent Structural Fill or other construction materials. Methods of stabilization include undercutting and moisture conditioning. 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 unsteady materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

5.2 EARTHWORK OPERATIONS

5.2.1 Existing Man-Placed Fill

Risk Associated with Undocumented Fill: Undocumented fill poses risks associated with undetected deleterious inclusions or soft zones within the fill and/or deleterious materials at the virgin ground/fill interface that are covered by the fill. The site has been modified previously therefore there is possible fill on the site and the fill must be considered undocumented as we have not been provided with in-place density test results for the fill or documentation of the preparation of the soil subgrade prior to fill placement. Undocumented fill poses risks associated with undetected deleterious inclusions or soft zones within the fill and/or deleterious materials at the virgin ground/fill interface that are covered by the fill. Due to the previous development on the site, Possible Fill soils may be on the site. Hand auger borings S-1 and S-5 encountered fill soils containing rocks, wood, gravel, and brick fragments in the upper 1.5 to 3.9 feet.

The magnitude of settlement or subsidence associated with undocumented fill is generally related to the degree of compaction applied to the fill, inclusions of deleterious materials, and previous loadings. The only way to eliminate the risk associated with undocumented fill is to remove it, exposing the original ground and allowing evaluation of the quality of the material in the fill volume. We are not necessarily recommending the complete removal and replacement of the existing fill. However, the owner should understand that there is an inherent risk of constructing over undocumented fill, as localized areas of compressible soils, nested boulders, or buried debris can be present between the boring locations and can go unnoticed during the geotechnical study or during construction. Ultimately, the decision to build on undocumented fill is an economic decision that only the owner can make relative to the level of risk they consider acceptable should the new construction experience subgrade-related distress (e.g., building settlement, premature pavement distress, etc.). It has been our experience on similar sites that this risk can be managed by performing monitoring and testing during construction, as described in this report.

If the owner elects to leave the existing fill in-place, careful evaluations of the subgrade during construction should be considered critical to reducing the risk of unwanted post construction settlement. These evaluations may include proofrolling the subgrade soils, performing hand auger borings, and excavating test pits within previously filled areas. Localized remedial subgrade repairs should be anticipated. The mentioned evaluations would help in identifying soft, loose, or otherwise unsuitable areas of the fill, which would require remedial activities. Once the relevant facts to the nature of the undocumented fill are disclosed, the level of appropriate risk becomes a business decision that only the client can make.

5.2.2 Structural Fill

Prior to placement of Structural Fill, bulk samples (about 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to evaluate if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

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

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Building and Pavement Areas	LL < 40, PI<10
Max. Particle Size	3 inches
Fines Content	Max. 20 % < #200 sieve
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Standard Proctor, ASTM D698
Required Compaction (upper 1 foot)	98% of Max. Dry Density
Required Compaction (depths greater than 1 foot)	95% of Max. Dry Density
Dry Unit Weight	>100 pcf
Moisture Content	-2 to +2 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

On-Site Borrow Suitability: Possible fill material are present near surface on the site. The on-site near surface sands (SP, SM) with fines contents less than 20 percent and free of deleterious material should meet the recommendations for re-use as Structural Fill. However, moisture conditioning should be anticipated for the soil to achieve the optimum moisture content for fill placement.

Fill Placement: 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 structural fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

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: Most of the soils encountered on site at the foundation bearing elevation are anticipated to be adequate for support of the proposed structures. It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what has been specified.

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 adequate for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Loose or unsteady materials encountered should be removed and replaced with compacted Structural Fill, or pipe stone bedding material.

Utility Backfilling: The granular bedding material (AASHTO #57 stone) should be 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 meet the requirements for Structural Fill and fill placement.

Excavation Safety: Excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. 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. The slope height, slope inclination, and excavation depth, including utility trench excavation depth, should not 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 responsible for construction site safety or the contractor's activities; such responsibility by ECS is not being implied and should not be inferred.

6.0 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.

The description of the proposed project is based on information provided to ECS by Mr. Craig Brackens with UNCW and Balfour Beatty. If this information is untrue 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.

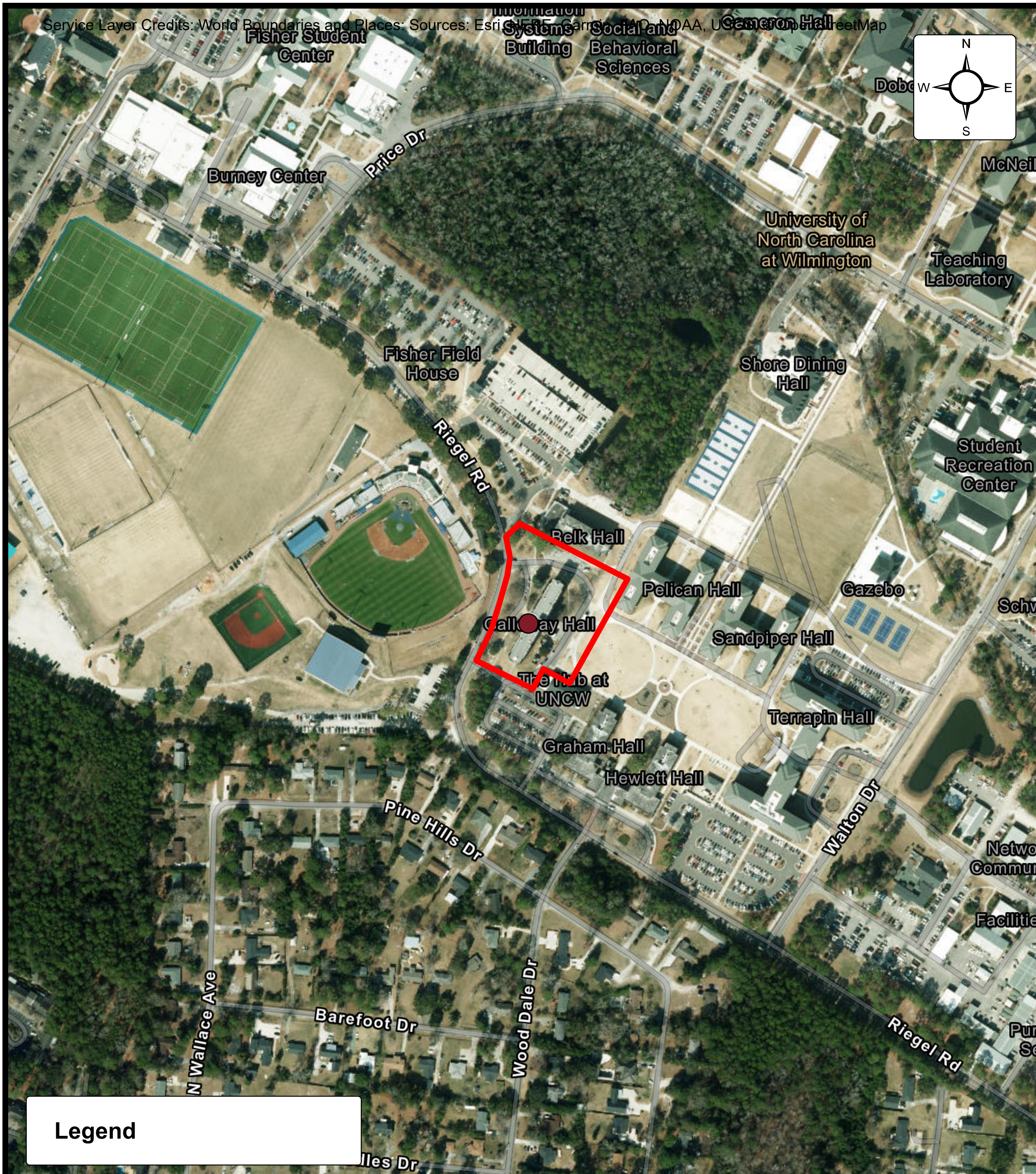
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

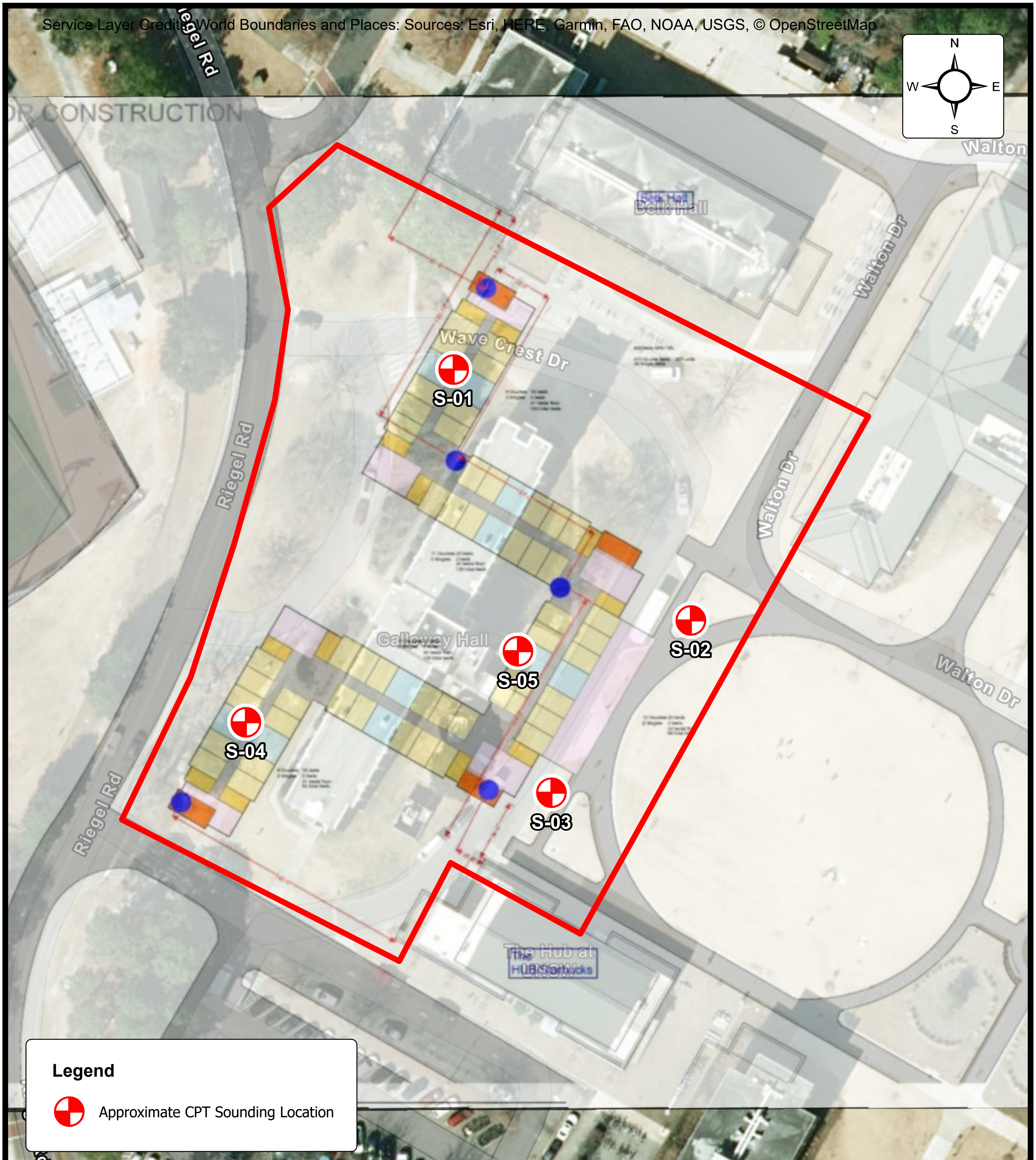
ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams & Reports

Site Location Diagram
Exploration Location Diagram



SITE LOCATION DIAGRAM **UNCW Student Village - Galloway Site** **4941 Riegel Road, Wilmington, NC** **UNC Wilmington**	ENGINEER: WEG SCALE: 1" = 400' PROJECT NO.: 22:36206 SHEET: 1 of 2 DATE: 6/17/2025



BORING LOCATION DIAGRAM
UNCW Student Village - Galloway Site

4941 Riegel Road, Wilmington, NC

UNC Wilmington

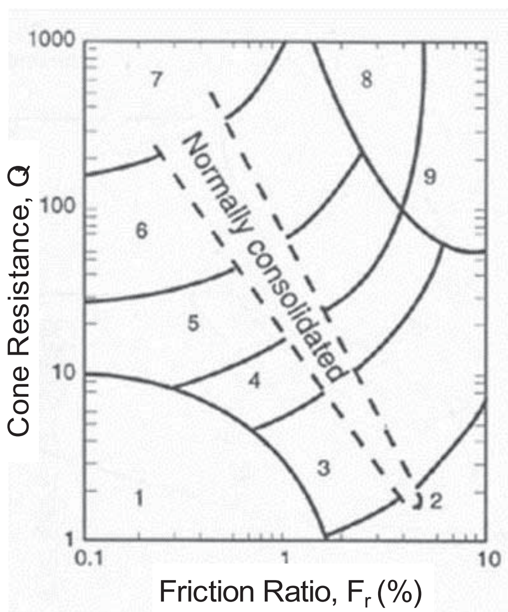
ENGINEER	WEG
SCALE	1" = 80'
PROJECT NO.	22:36206
SHEET	2 of 2
DATE	6/17/2025

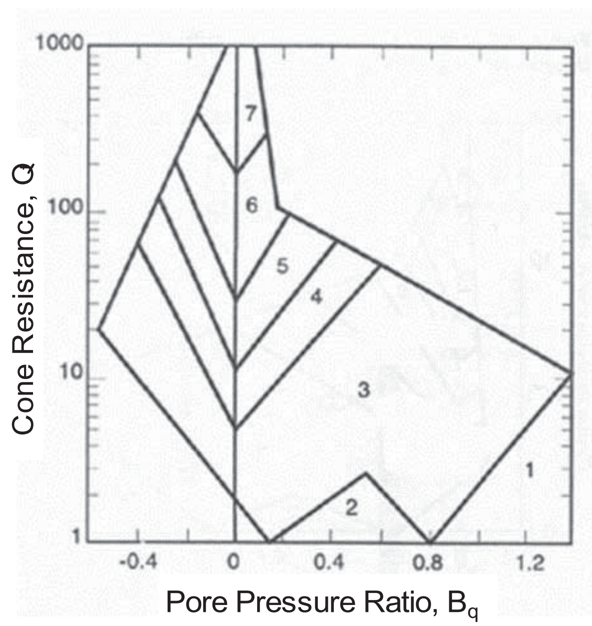
APPENDIX B – Field Operations

Reference Notes for CPT Sounding Logs
Cone Penetration Test Sounding Logs (S-1 through S-5)
Reference Notes for Boring Logs
Hand Auger Boring Logs (S-1 through S-5)

REFERENCE NOTES FOR CONE PENETRATION TEST (CPT) SOUNDINGS

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).





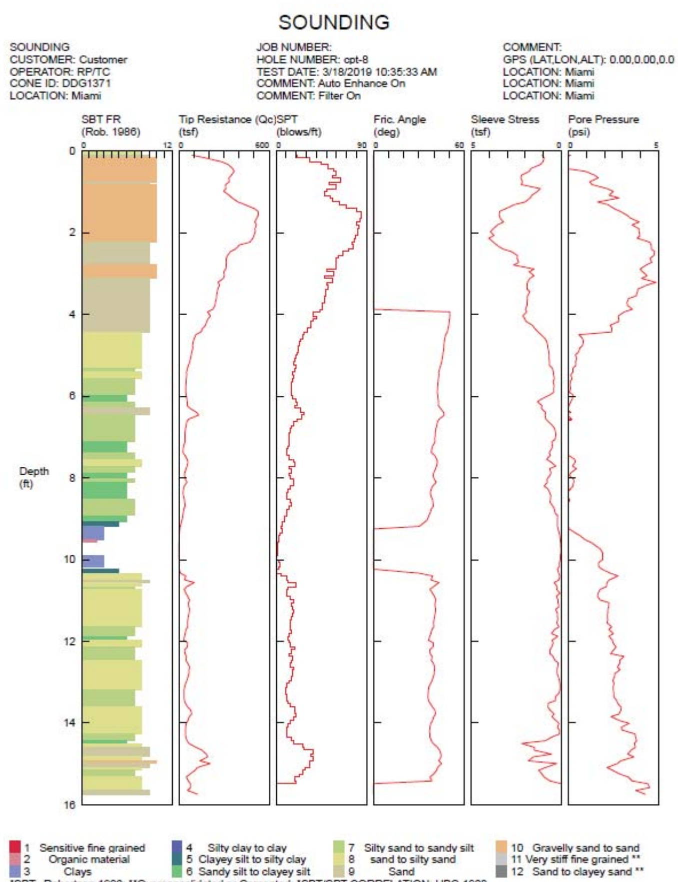
1. Sensitive, Fine Grained
2. Organic Soils-Peats
3. Clays; Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt
6. Clean Sands to Silty Sands
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff Fine Grained

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

SAND		SILT/CLAY	
Corrected Cone Tip Resistance (q_t) (tsf)	Relative Density	Corrected Cone Tip Resistance (q_t) (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	30-45	Very Stiff
>200	Very Dense	45-60	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 (qc), pore water pressure (U2), and sleeve friction (fs). 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

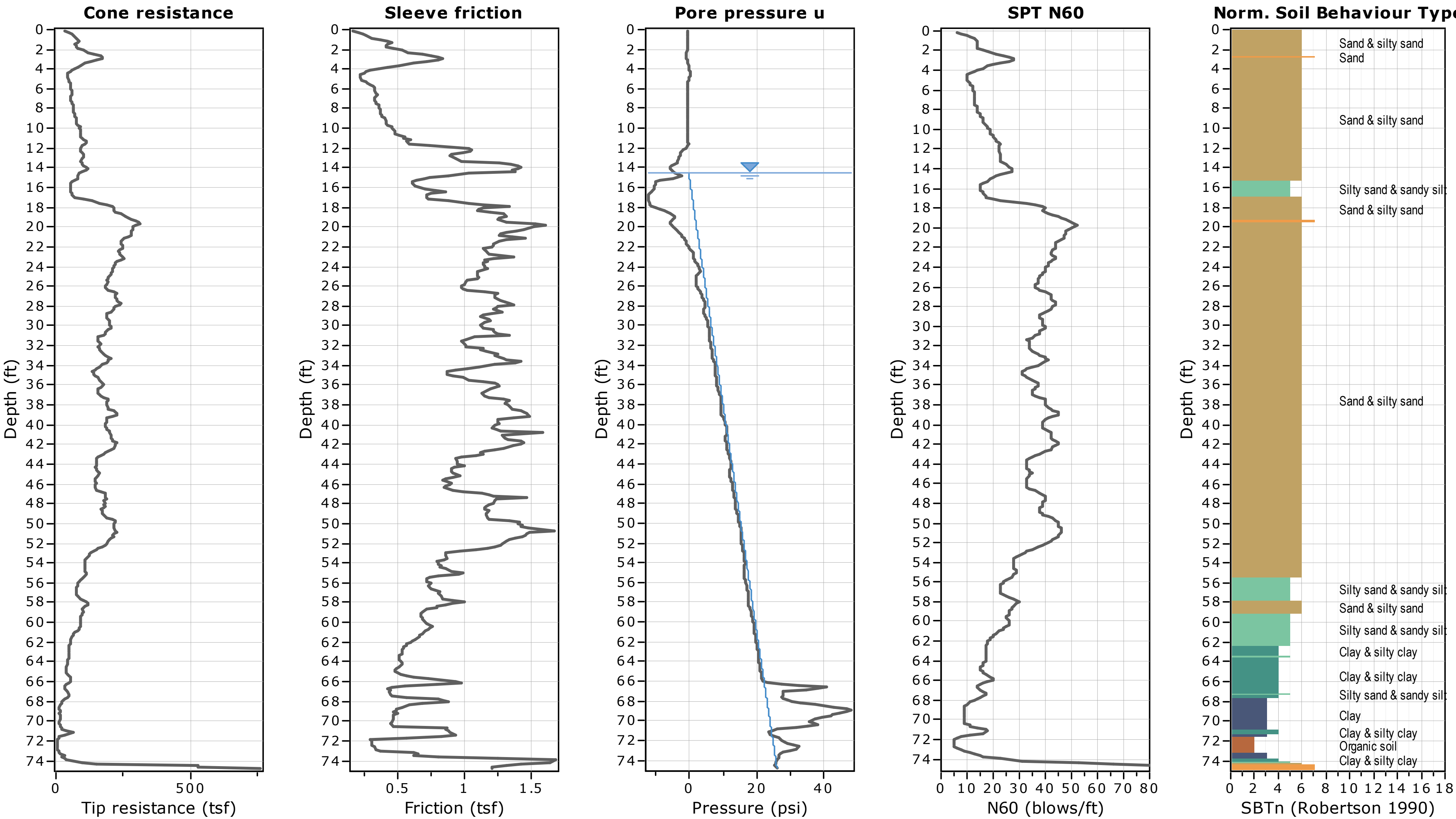
**CPT Penetrometer Size May Vary*

ECS Southeast, LLC
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-36206

CPT: S-1

Project: **UNCW Student Village - Galloway Site**
Location: **Wilmington, New Hanover County, North Carolina**

Total depth: 74.80 ft, Date: 5/29/2025
Cone Operator: Jared Duffy



ECS Southeast, LLC
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-36206

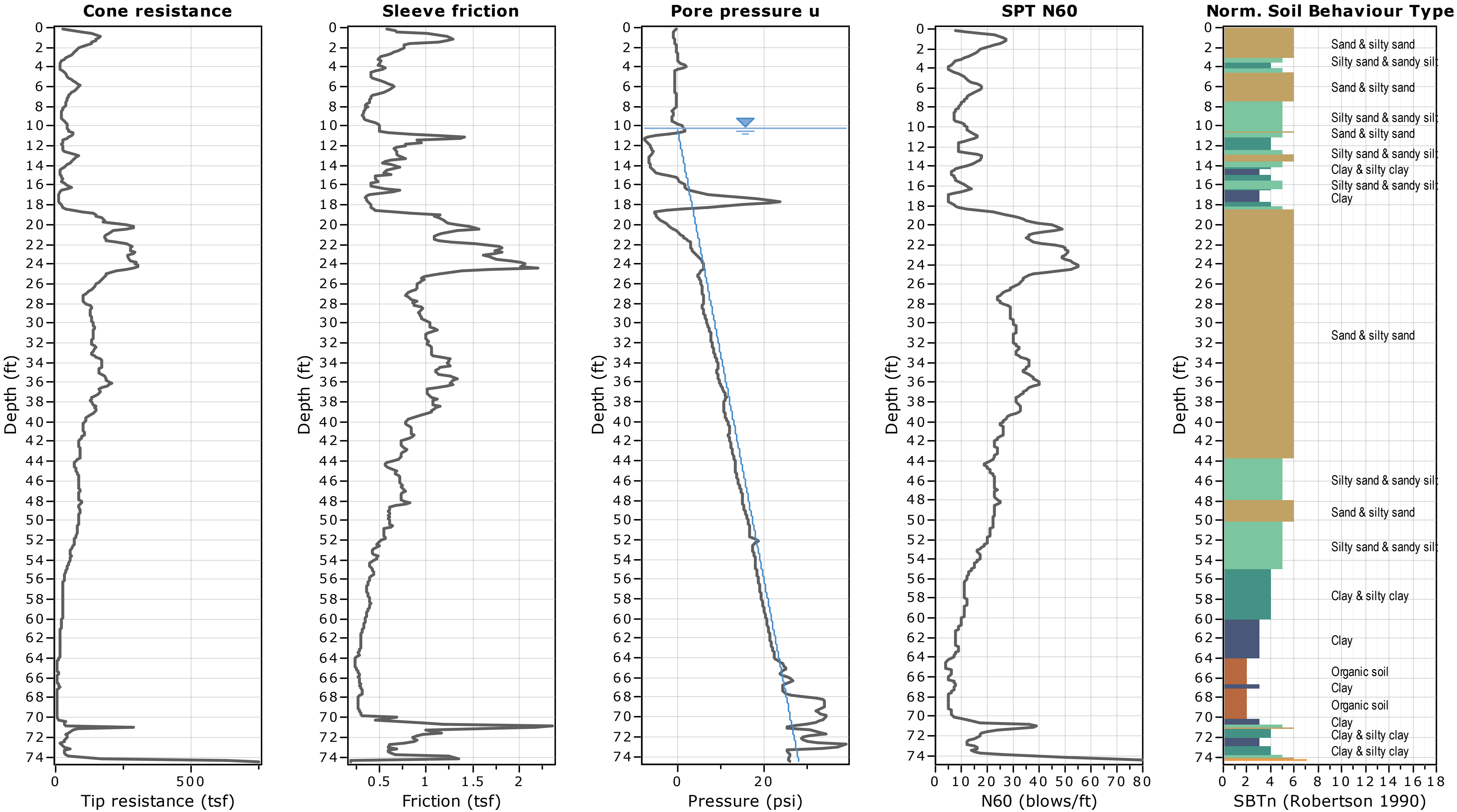
CPT: S-2

Project: UNCW Student Village - Galloway Site

Location: Wilmington, New Hanover County, North Carolina

Total depth: 74.51 ft, Date: 5/29/2025

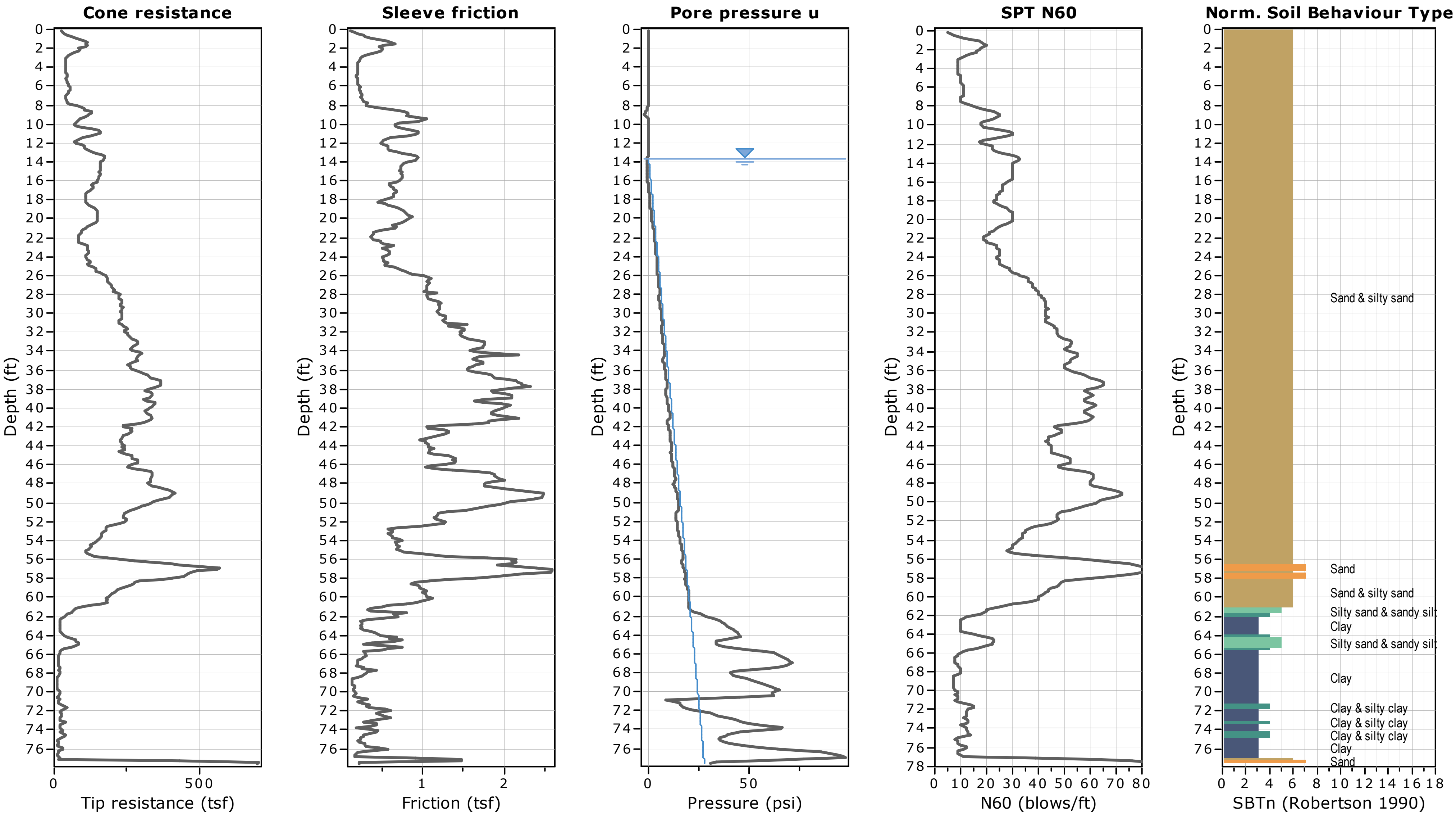
Cone Operator: Jared Duffy



ECS Southeast, LLC
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-36206

CPT: S-3
Total depth: 77.59 ft, Date: 5/29/2025
Cone Operator: Jared Duffy

Project: **UNCW Student Village - Galloway Site**
Location: **Wilmington, New Hanover County, North Carolina**

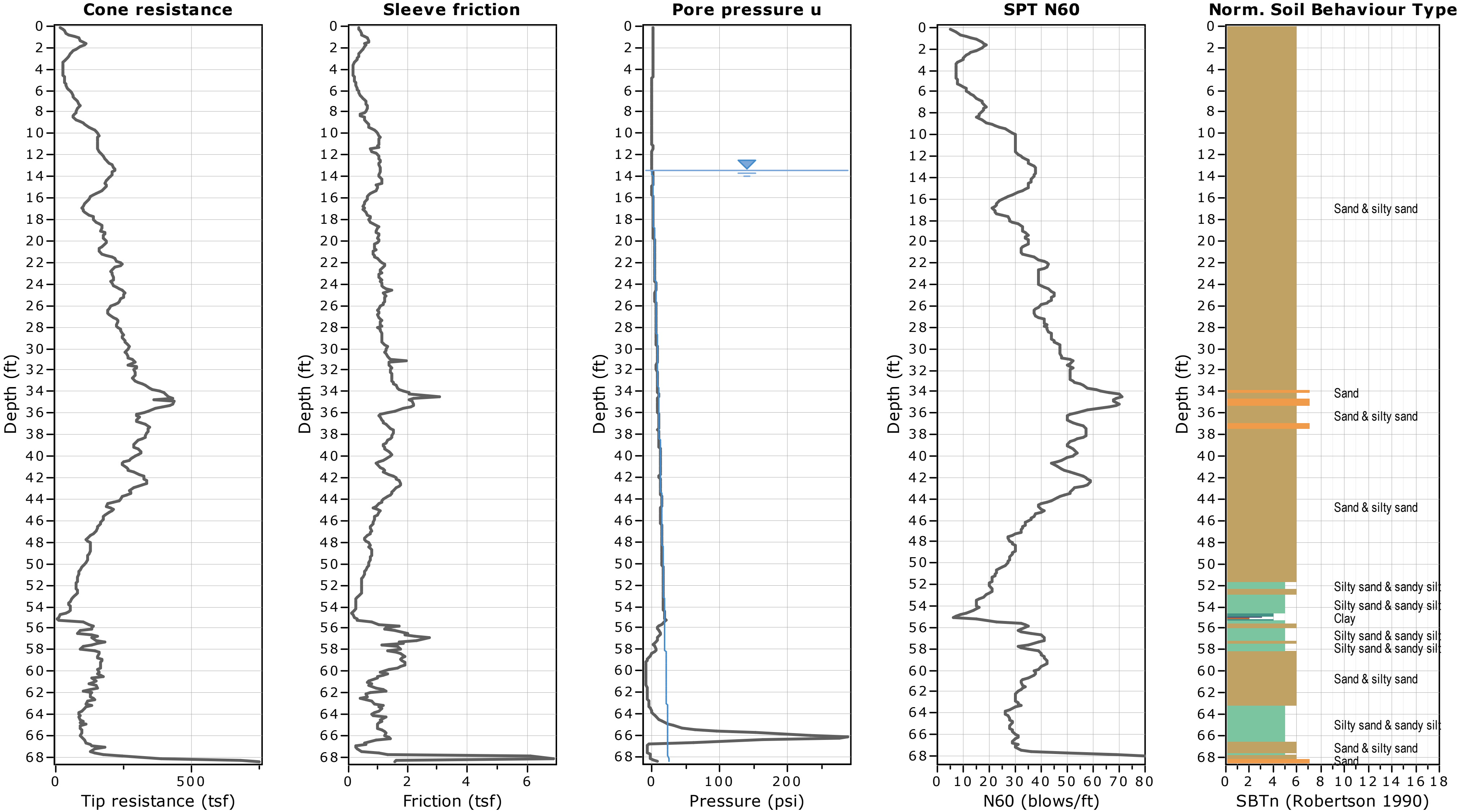


ECS Southeast, LLC
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-36206

CPT: S-4

Project: **UNCW Student Village - Galloway Site**
Location: **Wilmington, New Hanover County, North Carolina**

Total depth: 68.41 ft, Date: 5/29/2025
Cone Operator: Jared Duffy



ECS Southeast, LLC
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-36206

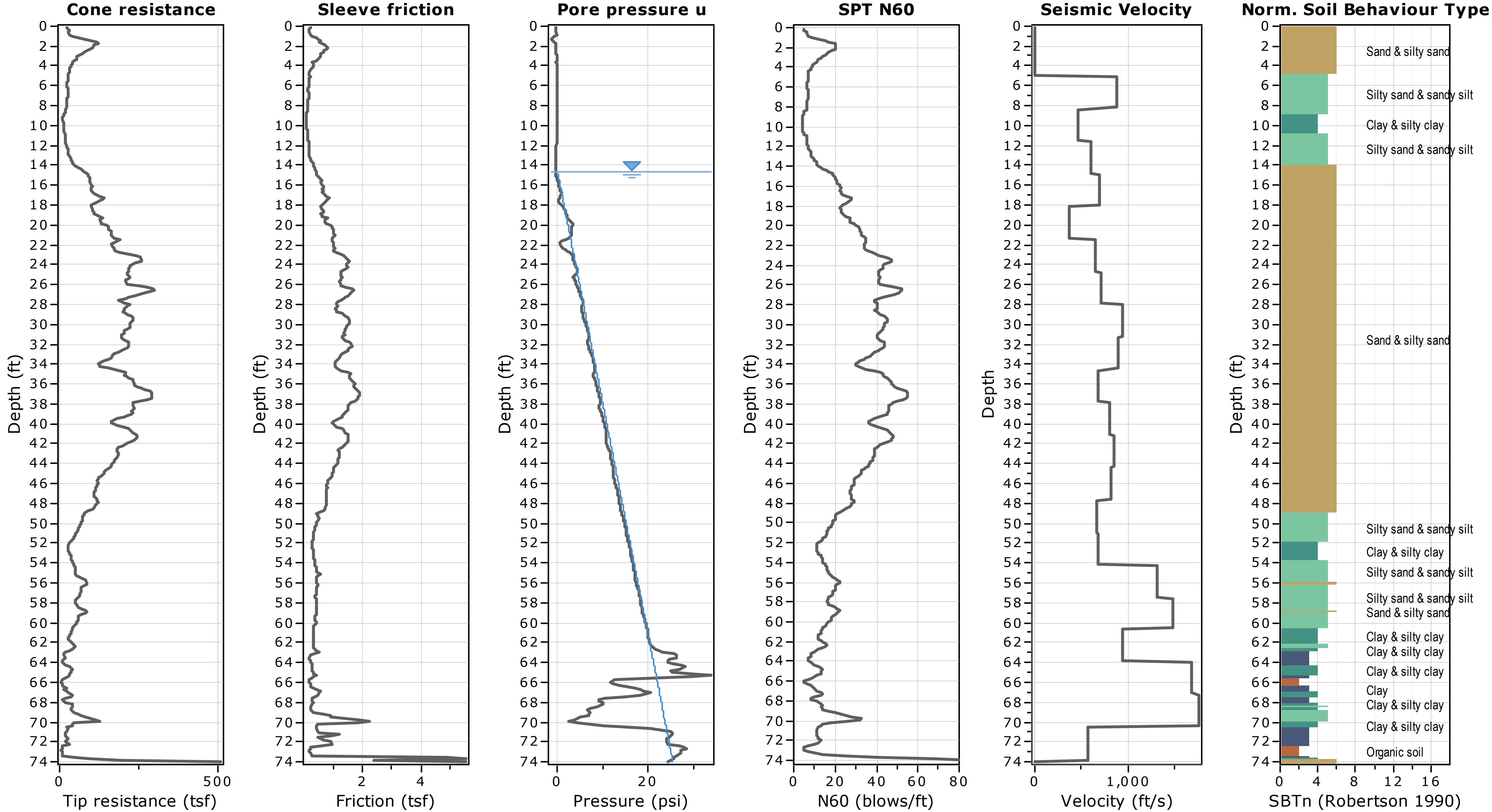
CPT: S-5

Project: **UNCW Student Village - Galloway Site**

Location: **Wilmington, New Hanover County, North Carolina**

Total depth: 73.98 ft, Date: 5/29/2025

Cone Operator: Jared Duffy



REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]		
	ASPHALT	
	CONCRETE	
	GRAVEL	
	TOPSOIL	
	VOID	
	BRICK	
	AGGREGATE BASE COURSE	
GW	WELL-GRADED GRAVEL	gravel-sand mixtures, little or no fines
GP	POORLY-GRADED GRAVEL	gravel-sand mixtures, little or no fines
GM	SILTY GRAVEL	gravel-sand-silt mixtures
GC	CLAYEY GRAVEL	gravel-sand-clay mixtures
SW	WELL-GRADED SAND	gravelly sand, little or no fines
SP	POORLY-GRADED SAND	gravelly sand, little or no fines
SM	SILTY SAND	sand-silt mixtures
SC	CLAYEY SAND	sand-clay mixtures
ML	SILT	non-plastic to medium plasticity
MH	ELASTIC SILT	high plasticity
CL	LEAN CLAY	low to medium plasticity
CH	FAT CLAY	high plasticity
OL	ORGANIC SILT or CLAY	non-plastic to low plasticity
OH	ORGANIC SILT or CLAY	high plasticity
PT	PEAT	highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

- ▽ WL (First Encountered)
- ▼ WL (Completion)
- WL (Seasonal High Water)
- WL (Stabilized)

FILL AND ROCK

FILL · POSSIBLE FILL · PROBABLE FILL · ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

CLIENT: **UNC Wilmington**	PROJECT NO.: **22:36206**	HAND AUGER NO.: **S-01**	SHEET: **1 OF 1**
PROJECT NAME: **UNCW Student Village - Galloway Site**	SITE LOCATION: **4941 Riegel Road, Wilmington, North Carolina, 28403**		

LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION: **0**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DCP	EXCAVATION EFFORT	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
		0	Topsoil [Thickness=2"].						
			(SP) POORLY GRADED SAND - fine sand, brown, moist.						
1									
2									
3			(SP) POORLY GRADED SAND - fine sand, white/tan, moist.						
			END OF HAND AUGER AT 4ft						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered):	**WL (Seasonal High Water):**	**ECS REP:**	**DATE COMPLETED:**	**UNITS:**	**CAVE-IN-DEPTH:**
WL (Completion):		**LGQ**	**05/29/2025**	**English**	**Not Observed**

HAND AUGER LOG

CLIENT: **UNC Wilmington**	PROJECT NO.: **22:36206**	HAND AUGER NO.: **S-02**	SHEET: **1 OF 1**
PROJECT NAME: **UNCW Student Village - Galloway Site**	SITE LOCATION: **4941 Riegel Road, Wilmington, North Carolina, 28403**		

LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION: **0**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DCP	EXCAVATION EFFORT	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
		0	Topsoil [Thickness=4"].						
			FILL - (SP) POORLY GRADED SAND - fine sand, brown, moist, With rocks and wood.						
1			FILL - (SP) POORLY GRADED SAND - fine sand, tan, moist, with gravel.						
2									
3									
			(SC) CLAYEY SAND - fine sand, tan, moist.						

END OF HAND AUGER AT 4ft

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered):	WL (Seasonal High Water):	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
WL (Completion):		LGQ	05/29/2025	English	Not Observed

HAND AUGER LOG

CLIENT: **UNC Wilmington**		PROJECT NO.: **22:36206**	HAND AUGER NO.: **S-03**	SHEET: **1 OF 1**
PROJECT NAME: **UNCW Student Village - Galloway Site**		SITE LOCATION: **4941 Riegel Road, Wilmington, North Carolina, 28403**		
LATITUDE:	LONGITUDE:	STATION:		SURFACE ELEVATION: **0**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DCP	EXCAVATION EFFORT	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
		0	Topsoil [Thickness=4"].						
			(SP) POORLY GRADED SAND - fine sand, brown/gray, moist.						
1			(SP) POORLY GRADED SAND - fine sand, tan to white, moist.						
2									
3									
			END OF HAND AUGER AT 4ft						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered):	WL (Seasonal High Water):	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
WL (Completion):		LGQ	05/29/2025	English	Not Observed

HAND AUGER LOG

CLIENT:	PROJECT NO.:	HAND AUGER NO.:	SHEET:
UNC Wilmington	**22:36206**	**S-04**	**1 OF 1**

PROJECT NAME:	SITE LOCATION:
UNCW Student Village - Galloway Site	**4941 Riegel Road, Wilmington, North Carolina, 28403**

LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
			0

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DCP	EXCAVATION EFFORT	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
		0	Topsoil [Thickness=1"].						
1			(SP) POORLY GRADED SAND - fine sand, brown, moist.						
2			(SP) POORLY GRADED SAND - fine sand, white, moist.						
3			(SP) POORLY GRADED SAND - fine sand, tan, moist.						
			END OF HAND AUGER AT 4ft						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered):	WL (Seasonal High Water):	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
WL (Completion):		LGQ	05/29/2025	English	Not Observed

HAND AUGER LOG

CLIENT:	PROJECT NO.:	HAND AUGER NO.:	SHEET:
UNC Wilmington	**22:36206**	**S-05**	**1 OF 1**
PROJECT NAME: **UNCW Student Village - Galloway Site**	SITE LOCATION: **4941 Riegel Road, Wilmington, North Carolina, 28403**		
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DCP	EXCAVATION EFFORT	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil [Thickness=2"].						
1			FILL - (SP) POORLY GRADED SAND - fine sand, tan/brown, moist, with brick fragments.						
2	▼		(SM) SILTY SAND - fine sand, dark brown, moist to saturated, with rocks.						
3			(SP) POORLY GRADED SAND - fine sand, brown/tan, saturated, with rocks.						
			END OF HAND AUGER AT 4Ft						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

▽ **WL (First Encountered):**	▼ **WL (Seasonal High Water):**	**ECS REP:**	**DATE COMPLETED:**	**UNITS:**	**CAVE-IN-DEPTH:**
▼ **WL (Completion):** **2 Ft**		**LGQ**	**05/29/2025**	**English**	**Not Observed**

HAND AUGER LOG

APPENDIX C – Supplemental Report Documents

GBA Document

Important Information about This

Geotechnical-Engineering Report

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

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

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

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

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

ECS SOUTHEAST, LLC
NC Engineering License No. F-1519
Geotechnical • Construction Materials • Environmental • Facilities

October 6, 2025

Mr. Craig Brackens
University of North Carolina at Wilmington
601 S. College Road
Wilmington, NC 28403

ECS Project No. 22:36206.A1

Reference: Geotechnical Engineering Report Addendum
UNCW Student Village – Galloway Site
Wilmington, New Hanover County, North Carolina

Dear Mr. Brackens:

ECS Southeast, LLC (ECS) understands the project consists of construction of a new five-story residential building for student housing with associated pavements. ECS was requested to provided flexible, rigid, and pervious pavement recommendations.

PAVEMENTS

Subgrade Characteristics: Based on the results of our subsurface exploration in June 2025, it appears that the pavement subgrades will likely consist mainly of SAND (SP) FILL SAND (SP FILL) or Structural Fill. Due to the wood and brick fragments encountered in the FILL SANDs in hand auger borings S-1 and S-5, undercutting to remove the debris should be anticipated prior to construction of pavements, or placement of structural fill. The SANDS (SP) can be screened and reused on site.

California Bearing Ratio (CBR) values were estimated from the Kessler DCP tests performed on site adjacent to the hand auger borings. For preliminary design purposes, provided subgrade preparation recommendations provided in the report are followed, we recommend estimating a preliminary CBR value of 10.

We were not provided traffic loading information, so we have estimated loadings typical of this type of project. Our recommended pavement sections are based on up to 25,000 ESALs over a 20 year design life for light duty and up to 80,000 ESALs over a 20 year design life for heavy duty.

The preliminary pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.

PRELIMINARY PAVEMENT SECTIONS					
	FLEXIBLE PAVEMENT		RIGID PAVEMENT		PERVIOUS PAVEMENT
MATERIAL	Heavy Duty	Light Duty	Heavy Duty	Light Duty	Light Duty
Asphalt Surface Course	3 in.	2 in.	-	-	-
Portland Cement Concrete (f'_c = 4,500 psi)	-	-	6 in.	5 in.	-
Pervious Concrete	-	-	-	-	6 in.
Aggregate Base Course (ABC)	6 in.	6 in.	4 in.	4 in.	6 in.

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

Due to the granular nature of subgrade soils, a non-woven geotextile separation fabric such as Mirafi 140N is recommended between the stone and the soil to prevent migration of the stone into the subgrade soil for the pervious pavement sections. The subgrade soil is recommended to be compacted between 88 to 92 percent of the maximum dry unit weight as evaluated by the Standard Proctor method (ASTM D-698) for the pervious pavement subgrades. These recommended sections are for structural support and do not include the requirements for stormwater infiltration/storage for the site.

It is imperative that pervious pavement area be kept free of soil, rocks, leaves, and other debris. Landscaping materials such as mulch, sand, and topsoil should not be present, even temporarily. It is not advisable to place traditional flexible asphalt adjacent to pervious pavement without the installation of a concrete curb that extends below the pervious pavement section to protect the convention pavement subgrade. Pervious pavements installed should meet the requirements of the NCDEQ Stormwater BMP Manual.

Large, front loading trash dumpsters frequently impose concentrated front wheel loads on pavements during loading. This type of loading typically results in rutting of asphalt pavement and ultimately pavement failures. For preliminary design purposes, we recommend that the pavement in trash pickup areas consist of a 6-inch thick, 4,500 psi, reinforced concrete slab underlain by 4 inches of aggregate base course. When traffic loading becomes available, ECS or the Civil Engineer can design the pavements.

Prior to subbase placement and paving, CBR testing of the subgrade soils (both natural and fill soils) should be performed to evaluate the soil engineering properties for final pavement design. A minimum distance of 18 inches should be maintained between the bottom of the pavement section and the groundwater table.

The soil subgrade should be smooth-rolled and proofrolled prior to ABC placement. Areas that pump, rut, or are otherwise unstable should be re-compacted or undercut and replaced. The ABC should conform to the gradation, liquid limit, plasticity index, resistance to abrasion, and soundness per Section 1005 of the 2024 NCDOT Standard Specifications for Roads and Structures.

The ABC should be placed and be compacted in accordance with Section 520 of the 2024 NCDOT Standard Specifications for Roads and Structures. The ABC should be placed in a single lift. It should be spread after end-dumping on previously-placed ABC to deter rutting and degradation of the relatively clean sand subgrade soils by rubber-tired dump trucks. The ABC should be compacted to at least 98 percent of its Modified Proctor maximum dry unit weight per ASTM D1557 or AASHTO T180 (as modified by NCDOT), provided nuclear density testing is performed. Otherwise, at least 100 percent compaction is recommended.

To confirm that the specified degree of compaction is being obtained, field compaction testing should be performed in each ABC lift by ECS' representative. We recommend that compaction tests be performed at a minimum frequency of one test per 5,000 square feet per lift in pavement areas.

Minimum Material Lift Thickness: The minimum lift thickness for asphalt surface course mix S9.5B is 1.0 inch and the maximum lift thickness for S9.5B is 1.5 inches. For sections with more than 1.5 inches of S9.5B surface asphalt, it should be placed in two lifts. Asphalt pavement S9.5B should be compacted to least 90.0 percent of the material's specific gravity G_{mm}.

Drainage: An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the aggregate base course layer, softening of the subgrades and other problems related to the deterioration of the pavement can be expected. This is particularly important at the site due to the moisture sensitive near-surface soils. Furthermore, good drainage should help reduce the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

<u>**Closing**</u>

It has been our pleasure to be of service to UNCW 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 the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,
ECS Southeast, LLC

Annemarie Crumrine

Annemarie Crumrine, PE
Geotechnical Department Manager
ACrumrine@ecslimited.com

DocuSigned by:
Winslow Goins
2D745DA276044AF...

Signed by:

Winslow Goins, PE
Principal Engineer
WGoins@ecslimited.com

NORTH CAROLINA PROFESSIONAL SEAL 023751 ENGINEER WINSLOW E. GOINS

10/6/2025

December 19, 2025

Mr. Craig Brackens
University of North Carolina at Wilmington
5179 Lionfish Drive
Wilmington, North Carolina 28403

Reference: Report of Seasonal High Water Table Estimation and Infiltration Testing
UNCW Housing Village Ph. 3
Wilmington, New Hanover County, North Carolina
ECS Project No. 49.26893

Dear Mr. Brackens:

ECS Southeast, LLC (ECS) recently conducted a seasonal high water table (SHWT) estimation and infiltration testing within the stormwater control measure (SCM) area(s) off of Riegel Road in Wilmington, New Hanover County, North Carolina. This letter, with attachments, is the report of our testing.

Field Testing

On December 18, 2025, ECS conducted an exploration of the subsurface soil conditions, in accordance with the NCDEQ Stormwater Design Manual section A-2, at six requested locations shown on the attached Boring Location Plan (Figure 1). ECS used GPS equipment in order to determine the boring locations. The purpose of this exploration was to obtain subsurface information of the in situ soils for the SCM area(s). ECS explored the subsurface soil conditions by advancing one hand auger boring into the existing ground surface at each of the requested boring locations. ECS visually classified the subsurface soils and obtained representative samples of each soil type encountered. ECS also recorded the SHWT elevation observed at the time of the hand auger borings. The attached Infiltration Testing Form provides a summary of the subsurface conditions encountered at the hand auger boring locations.

The SHWT elevation was estimated at the boring locations below the existing grade elevation. A summary of the findings are as follows:

Location	SHWT
I-1	55 inches
I-2	54 inches
I-3	55 inches
I-4	58 inches
SHWT-5	54 inches
SHWT-6	54 inches

ECS has conducted four requested infiltration tests utilizing a compact constant head permeameter near the hand auger borings in order to estimate the infiltration rate for the subsurface soils. The infiltration tests were conducted at the approximate subgrade elevation for a proposed pervious pavement section.

Field Test Results

Below is a summary of the infiltration test results:

Location	Description	Depth	Inches/ hour
I-1	Tan/orange fine SAND w/ clay	24 inches	6.38
I-2	Tan/orange fine SAND w/ clay	18 inches	4.79
I-3	Tan/orange fine SAND w/ clay	18 inches	2.62
I-4	Tan/orange fine SAND w/ clay	20 inches	3.93

Infiltration rates and SHWT may vary within the proposed site due to changes in elevation, soil classification and subsurface conditions. ECS recommends that a licensed surveyor provide the elevations of the boring locations.

Closure

ECS's analysis of the site has been based on our understanding of the site, the project information provided to us, and the data obtained during our exploration. If the project information provided to us is changed, please contact us so that our recommendations can be reviewed and appropriate revisions provided, if necessary. The discovery of any site or subsurface conditions during construction which deviate from the data outlined in this exploration should be reported to us for our review, analysis and revision of our recommendations, if necessary. The assessment of site environmental conditions for the presence of pollutants in the soil and groundwater of the site is beyond the scope of this geotechnical exploration.

ECS appreciates the opportunity to provide our services to you on this project. If you have any questions concerning this report or this project, please contact us.

Respectfully,

ECS SOUTHEAST, LLC

K. Brooks Wall
Senior Project Manager
bwall@ecslimited.com
910-686-9114

W. Brandon Fulton, PSC, PWS, LSS
Environmental Department Manager
bfulton@ecslimited.com
704-525-5152

Attachments: Figure 1 - Boring Location Plan
Infiltration Testing Form
GBA Document

APPROXIMATE BORING LOCATIONS

SCALE SHOWN ABOVE

N
W E
S

UNCW Housing Village Ph.3
Wilmington, New Hanover County, North Carolina

ECS Project # 49.26893
December 19, 2025
KBW

Figure 1– Boring Location Plan

Provided by: Google Earth and Litlle

Infiltration Testing Form
UNCW Housing Village Ph.3
Wilmington, New Hanover County, North Carolina
ECS Project No. 49.26893
December 18, 2025

Location	Depth	USCS	Soil Description
I-1	0-24”	SM	Brown silty SAND w/ gravel (fill)
	24”-55”	SM	Tan/orange fine SAND w/ clay
	55”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 55 inches below the existing grade elevation.
Test was conducted at 24 inches below existing grade elevation
Infiltration Rate: 6.38 inches per hour

Location	Depth	USCS	Soil Description
I-2	0-18”	SM	Brown silty SAND w/ gravel (fill)
	18”-54”	SM	Tan/orange fine SAND w/ clay
	54”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 54 inches below the existing grade elevation.
Test was conducted at 18 inches below existing grade elevation
Infiltration Rate: 4.79 inches per hour

Location	Depth	USCS	Soil Description
I-3	0-18”	SM	Brown silty SAND w/ gravel (fill)
	18”-55”	SM	Tan/orange fine SAND w/ clay
	55”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 55 inches below the existing grade elevation.
Test was conducted at 18 inches below existing grade elevation
Infiltration Rate: 2.62 inches per hour

Infiltration Testing Form
UNCW Housing Village Ph.3
Wilmington, New Hanover County, North Carolina
ECS Project No. 49.26893
December 18, 2025

Location	Depth	USCS	Soil Description
I-4	0-20”	SM	Brown silty SAND w/ gravel (fill)
	20”-58”	SM	Tan/orange fine SAND w/ clay
	58”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 58 inches below the existing grade elevation.
Test was conducted at 20 inches below existing grade elevation
Infiltration Rate: 3.93 inches per hour

Location	Depth	USCS	Soil Description
SHWT-5	0-12”	SM	Brown silty SAND w/ gravel (fill)
	12”-54”	SM	Tan/orange fine SAND w/ clay
	54”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 54 inches below the existing grade elevation.

Location	Depth	USCS	Soil Description
SHWT-6	0-18”	SM	Brown silty SAND w/ gravel (fill)
	18”-54”	SM	Tan/orange fine SAND w/ clay
	54”-66”	SM	Tan/orange/gray fine SAND w/ clay

Seasonal High Water Table was estimated to be at 54 inches below the existing grade elevation.

Important Information about This

Geotechnical-Engineering Report

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

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

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

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

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733

e-mail: info@geoprofessional.org   www.geoprofessional.org