Geotechnical Engineering Report

Brunswick-Glynn County North Mainland Water Loops
Brunswick, Georgia

January 11, 2022
Terracon Project No. ES215271

Prepared for:
Four Waters Engineering, Inc.
Greenville, South Carolina

Prepared by:
Terracon Consultants, Inc.
Savannah, Georgia

January 11, 2022

Four Waters Engineering, Inc.
150 Milestone Way
Greenville, South Carolina 29615

Attn: Mr. Dwaine R. Falls
P: (864) 569 6145
E: dfalls@4weng.com

Re: Geotechnical Engineering Report
Brunswick-Glynn County North Mainland Water Loops
Brunswick, Georgia
Terracon Project No. ES215271

Dear Mr. Falls:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PES215271, dated September 28, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning the earthwork for the proposed project.

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

Sincerely,
Terracon Consultants, Inc.

Matthew L. Bemis, E.I.T.
Staff Geotechnical Engineer

Guoming Lin, Ph.D., P.E., D.GE
Senior Consultant

REPORT TOPICS

EXHIBITS

Note: Refer to each Attachment for a listing of contents.

REPORT SUMMARY

Topic	Overview Statement
Proposed Construction	The project consists of installing three water main loops at three different locations around Brunswick, Georgia.
Geotechnical Characterization	▪ The hand auger logs show approximately **7** inches of topsoil. The topsoil thickness may be deeper than 7 inches below the ground surface (BGS) in some areas. ▪ In general, the subsurface conditions are consistent throughout the project site. ▪ The site at Old Jesup Road consists of silty sand to depths of approximately 2 to 6 feet BGS, followed by clayey sand to depths of approximately 6 to 10 feet BGS. Below the clayey sand layer is silty sand to approximately 25 feet BGS. Hautala Drive and Perry Lane Road largely contains silty sands to depths of approximately 25 feet BGS. Please refer to the **Geotechnical Characterization** section for details. ▪ Depth to groundwater was measured at 3 to 7 feet BGS in the SPT and hand auger borings.
Earthwork	▪ Install a site drainage system. ▪ Strip/grub topsoil when encountered Level and densify subgrade during subgrade preparation. If any soft/weak areas are detected repair subgrade by undercut and backfill.
Seismic Considerations	For seismic design purposes, the subject site is classified as **Site Class D** in accordance with the International Building Code (IBC) 2018 and ASCE 7-16 Section 11.4.2.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

Geotechnical Engineering Report

Brunswick-Glynn County North Mainland Water Loops

Brunswick, Georgia

Terracon Project No. ES215271

January 11, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed utility installation to be located off Old Jesup Road, Hautala Drive, and Perry Lane Road in Brunswick, Georgia. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and the earthwork
- Seismic site classification per IBC

The geotechnical engineering Scope of Services for this project included the advancement of 9 Standard Penetration Test (SPT) borings to a maximum depth of 25 feet below ground surface (BGS) and 18 Hand Auger (HA) borings to depths of approximately 5 feet BGS. Maps showing the site and boring locations are shown in **Exhibit A.**

SITE CONDITIONS

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

Item	Description
Parcel Information	The project consists of three (3) different site locations located in Brunswick, Georgia: ▪ 3,000 feet section of Old Jesup Rd and 1,100 feet section of Bailey Rd Latitude: 31.2366°, Longitude: -81.5291° ▪ 1,100 feet section of Hautala Dr Latitude: 31.2299°, Longitude: -81.5165° ▪ 500 feet section of Perry Lane Road Latitude: 31.2461°, Longitude: -81.5048° See **Site Location Plan** in **Exhibit A-1**
Existing Improvements	The site locations include asphalt paved roads.
Current Ground Cover	Asphalt pavement with grassy shoulders.
Existing Topography	Relatively variable with a maximum elevation change of 2 to 3 feet.

PROJECT DESCRIPTION

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

Item	Description
Information Provided	A request for proposal and map exhibits created by Brunswick-Glynn County Joint Water and Sewer Commission was provided by Dwaine Falls of Four Waters Engineering via email on September 21, 2021.
Proposed Structure	The project involves the design and installation of three water main loops to provide more reliable and dependable water access.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation and earthwork recommendations. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Old Jesup Road

Stratum	Approximate Depth to Bottom of Stratum (feet) Below Ground Surface	Material Description Based on CPT Soundings and Hand Auger Borings	Consistency/ Relative Density
Surface	0.6[1]	Topsoil	-
1	2 to 6	Sand/Silty sands	Very loose to loose
2	6 to 10	Clayey sands	Loose
3	25	Silty sand	Loose to medium dense

Note:

1. The thickness of the topsoil at the project site may reach deeper than 7 inches. The depth/thickness of topsoil will vary, depending upon the near-surface soil disturbance during the site preparation.

Hautala Drive

Stratum	Approximate Depth to Bottom of Stratum (feet) Below Ground Surface	Material Description Based on CPT Soundings and Hand Auger Borings	Consistency/ Relative Density
Surface	0.6[1]	Topsoil	-
1	25	Silty sands	Loose to very dense

Note:

2. The thickness of the topsoil at the project site may reach deeper than 7 inches. The depth/thickness of topsoil will vary, depending upon the near-surface soil disturbance during the site preparation.

Perry Lane Road

Stratum	Approximate Depth to Bottom of Stratum (feet) Below Ground Surface	Material Description Based on CPT Soundings and Hand Auger Borings	Consistency/ Relative Density
Surface	0.6[1]	Topsoil	-
1	25	Silty sands	Loose to very dense

Note:

3. The thickness of the topsoil at the project site may reach deeper than 7 inches. The depth/thickness of topsoil will vary, depending upon the near-surface soil disturbance during the site preparation.

Conditions encountered at each exploration location are indicated on the individual exploration logs shown in **Exhibit B-2** attached to this report. Stratification boundaries on the logs represent the approximate location of changes in native soil types; in situ, **the transition between materials may be gradual**.

Groundwater Conditions

The SPT and hand auger borings were observed while drilling and after completion for the presence and level of groundwater. Groundwater was measured in eight SPT borings and eleven hand auger borings at depths of approximately 3 to 7 feet BGS. The water levels observed in the borings can be found on the SPT and hand auger logs in **Exhibit B-2** and **Exhibit B-3** respectively. The measured and observed water levels are summarized in the following table:

Boring Number	Measured Groundwater Depth (ft)
B01	6.00
B02	7.00
B03	4.50
B04	4.00

Boring Number	Measured Groundwater Depth (ft)
B05	3.25
B06	3.00
B07	4.00
B08	4.00
HA01	4.00
HA04	3.00
HA05	5.00
HA07	4.00
HA08	5.00
HA09	5.00
HA13	4.00
HA14	5.00
HA16	5.00
HA17	4.00
HA18	5.00

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs.

Mottling, as a strong indicator of water seepage during seasonal high groundwater levels, was noted on hand auger boring locations ranging from 0.8 to 2 feet BGS.

Laboratory Testing

Laboratory testing procedures were performed on soil samples collected from throughout the site. Bag samples were obtained at multiple depths ranging from 2 to 20 feet below the existing grade surface and shipped to Terracon's laboratory for the following testing procedures:

- **Moisture Content:** ASTM D2216 - Standard Test Methods for Laboratory Determination of Water Content of Soil and Rock by Mass
- **Grain Size Analysis:** ASTM D422 - Standard Test Method for Particle Size Distribution of Soils
- **Atterberg Limits:** ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Our laboratory testing results are represented in individual graphs and tables in more detail in **Exhibit B-4** through **Exhibit B-6**.

Natural Moisture Content: The natural moisture contents of the samples ranged from 6.7 percent to 33.0 percent. Based on our experience, we believe the subgrade soils with moisture content above 20 percent may not be stable judged by proofrolling. Therefore, the soils may need to be dried by scarifying or discing. Apparently, the effectiveness of the soil drying will be largely affected by the weather. The months from May to October typically have more favorable weather due to the drying effect from the sun.

Fine Content: The soil samples from the shallow depth of upper 10 feet have a percentage of fine passing the No.200 sieve between 7.2 percent and 45.9 percent. The specifications stipulate fines percentage less than 25 percent as structural fills. The majority of the tested samples had less than 25% fines but some are classified as clayey sand. Clayey soils tend to hold to moisture and become difficult to dry after they become wet. These materials are marginally suitable for fill but will require more effort to dry out prior to placement.

Soil Plasticity: Soils with liquid limits greater than 50 are classified as high plasticity clays or silts. The soils with the above plasticity may be difficult to work and have the potential to shrink and swell with the change of moisture. As such, these clayey soils are generally not suitable for structural fill.

RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The following evaluation and recommendations are based upon our understanding of the proposed construction and the results from our field exploration. **If the above-described project conditions are incorrect or changed after this report, or subsurface conditions encountered during construction are significantly different from those reported, Terracon should be notified** so we can re-evaluate our recommendations and make appropriate revisions.

Geotechnical Considerations

The subsurface conditions at this site are adaptable for the proposed construction. The generalized soil profile is presented in the **Geotechnical Characterization** section.

Based on the information available, we understand the proposed water main will be constructed using either the open trench or tunneling method. The depths of the trench or tunneling have not been determined at this time. The soils at the site are mostly very loose sands. The open-cut excavations for the water main and the entry and exit pits for directional drilling may require protective measures. The trench and drill pits can be made using open slopes or vertical cuts supported with sheet piles or other temporary retaining structures. Soldier piles with timber lagging shoring may be used in the construction of the trench supporting system. Trench boxes are commonly used for trench safety in open-cut excavations with vertical walls. The site has relatively shallow groundwater table. Dewatering or other forms of groundwater management may be required depending on the depth of excavation.

It is anticipated that excavations for the proposed construction can be accomplished with a conventional large excavator. **The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain the stability of both the excavation sides and bottom.** Excavations should be sloped or shored following local, and federal regulations, including current OSHA excavation and trench safety standards.

The selection of the appropriate method for directional drilling is the contractor's responsibility. The contractor should select the appropriate boring machine and excavation method for directional drilling based on the subsurface soils and groundwater conditions indicated in the soil boring logs.

Stockpiling of excavated material in proximity to the excavation is not recommended. In general, a distance of half the excavation depth on both sides of the trench should be kept clear of any excavated materials. If this is not possible due to the space limitations, the retaining wall design should take into consideration the surcharge loads from the excavated materials. This is an important consideration. A major slope failure occurred about ten years ago during a Pipemakers Canal improvement project as the excavated material was stockpiled along the canal bank.

Care should be taken during excavations as there is the possibility that sloughing or caving of the excavation trench or excavation slope may cause movement of the surrounding soils leading to a possible settlement of the neighboring structures or features.

Monitoring Despite our best efforts for the thorough geotechnical exploration, the actual subsurface conditions may vary from the anticipated conditions because the subsurface exploration records provided in **Appendix A** represent an interpretation of subsurface conditions at the boring locations and the subsurface conditions between the test locations may vary.

During excavation and pipeline installation, ground movements like settlement and lateral movement may occur and should be monitored and controlled. The monitoring program should include measurements of the groundwater table, ground vibration, lateral ground movements outside excavation, and monitoring of existing cracks at selected locations on the neighboring structures. Terracon can develop a more detailed plan for condition survey and monitoring as construction plans are developed.

We recommend Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; placement and compaction of controlled compacted fill; backfilling of excavations to the completed subgrade.

EARTHWORK

Site preparation should include the installation of a site drainage system, topsoil stripping and grubbing, subgrade preparation, and densification. **Please bear in mind,** due to the uneven

ground surface of the site, the volume of topsoil and organics may be significantly greater than the area times the topsoil/organics thickness indicated in the boring logs. Rutting of the subgrade can also cause the mixing of topsoil/organics with underlying soils, which will result in additional required topsoil/organics stripping. Deeper undercuts may be needed in some localized areas to remove unsuitable materials.

Site Drainage

An effective drainage system should be installed prior to the initiation of site preparation and grading activities to intercept surface water and to improve overall shallow drainage. The drainage system may consist of perimeter ditches supplemented with parallel ditches and swales. Pumping equipment should be used if the above ditch system cannot effectively drain water away from the site, especially during the rainy season. The site should be graded to shed water and avoid ponding over the subgrade.

Bore Pit Excavation

At this time, the extent and depth of the excavation for the entrance and exit pits has not been made available. Based on the soil borings performed to approximately 30 feet BGS, the soils encountered during the excavation will most likely be loose to dense silty/clayey sands. These soils are sensitive to moisture and erosion during construction. The contractor should provide methods to control site drainage and provide erosion control of the excavated slope face.

Depending upon the depth of excavation, dewatering should be planned for deep excavation. Groundwater depths vary significantly along the project length from 3 to 7 feet BGS due to the variation in site topography.

To support the excavation and dewatering activities, a temporary sheet pile wall or similar earth retaining structure should be constructed unless there is a space for a sloped excavation. Shoring may be required to support the temporary retaining structure in order to prevent slope sliding or collapse. If open-pit excavation methods are used for the construction of the entrance and exit pits, a slope inclination of 2 horizontal to 1 vertical or flatter is recommended for slope height less than seven feet due to the nature of the surface soils. A more detailed slope stability analysis should be performed for a slope higher than 7 feet based on the soil conditions and slope configurations. In all cases, excavations should conform to OSHA guidelines.

If the temporary retaining structures are required instead of the sloped open excavation, the temporary retaining walls should be designed for earth pressures equal to those provided in **Section 4.3**.

Please note: as the proposed water main is located underneath roadways, the contractor should take necessary precautions to avoid damages to the existing railways and roadways and other structures in the vicinity of the project area.

Pipe Bedding and Excavations

Care should be taken so that the soils at the base of excavations are not disturbed during construction. Disturbed or unstable materials should be removed before placing any granular bedding material. Where groundwater, lower strength soils, and unstable conditions are encountered, a greater thickness of bedding material should be provided. The minimum thickness of the bedding material should be 12 inches.

Groundwater varies along the project length. Please refer to the individual boring logs for the groundwater depth in each boring location. Depending upon the location, dewatering of the pipeline trench should be expected. We recommend the pipe excavation to be shored with trench boxes or other means to control erosion of the saturated sands into the trench during construction. Sloped excavation could be used for the pipeline trenching however the groundwater should be lowered to a minimum of 2 feet below the bottom of the excavation and the excavation side slopes should be 2 horizontal to 1 vertical or flatter. The excavations should conform to OSHA guidelines.

Fill Material Consideration

Structural fill should be placed over a stable or stabilized subgrade. The soils to be used as structural fill should be free of organics, roots, or other deleterious materials. Earthen materials used for structural fill should meet the following material property requirements:

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Less than 25% Passing No. 200 sieve

1. Structural should consist of approved materials free of organic matter and debris. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

Based on the findings from our hand auger borings, the subject site consists of soils that are mainly silty sands (SM), sand with silt (SP-SM), sand (SP), clayey sand (SC), and sandy clay (CL) in the upper 5 feet BGS. The silty sands (SM), sand with silt (SP-SM), and sand (SP) are generally considered suitable for structural fill, provided that the soils are free of roots, organics or other foreign materials. Clayey sands (SC) may be considered marginally suitable; sandy clays (CL) are deemed unsuitable for structural fill. See **Exhibit B-3** for the hand auger boring logs.

We define marginally suitable as the soils that may require extra effort to adjust the moisture before they can be compacted. The amount of effort required will be highly dependent on the season and the weather conditions during construction. We recommend Terracon be retained during construction to determine the suitability of the onsite soil as fill material.

Fill Compaction Requirements

Structural fill should meet the following compaction requirements.

Item	Structural Fill
Maximum Lift Thickness	8 to 10 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Minimum Compaction Requirements [1]	95% of max. below foundations and below finished pavement subgrade
Water Content Range [1]	Granular: -3% to +3% of optimum

1. Maximum density and optimum water content as determined by the modified Proctor test (ASTM D 1557).

Some manipulation of the moisture content (such as wetting, drying) will be required during the filling operations to obtain the required degree of compaction. The manipulation of the moisture content is highly dependent on weather conditions and site drainage conditions. Therefore, the contractor should prepare both dry and wet fill materials to obtain the specified compaction during grading. A sufficient number of density tests should be performed to confirm the required compaction of the fill material.

Earthwork Construction Considerations

Shallow excavations for the water main installation are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to the utility installation. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed.

If the subgrade becomes saturated or is disturbed, the affected material should be removed or be scarified, moisture conditioned, and recompacted prior to futility installation. The groundwater table could affect some excavation efforts, particularly over-excavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps could be necessary to achieve the recommended depth of over-excavation.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the

information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

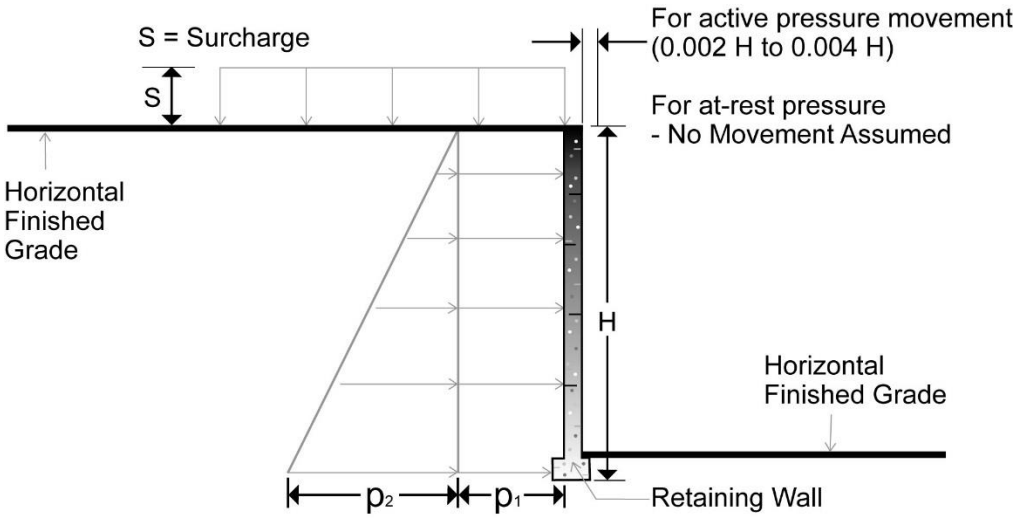
The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil and mitigation of areas of weak subgrade soil.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency provided by the project plan and specifications.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

LATERAL EARTH PRESSURE CONSIDERATIONS

This project does not include independent permanent retaining walls; however, the temporary entrance and exit pits for the bore process may require temporary shoring retaining walls. The temporary retaining walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. The earth pressure parameters are recommended based on the soil material obtained in the borings. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement. The recommended design lateral earth pressures do not include a factor of safety or possible hydrostatic pressure on the walls.



Earth Pressure Coefficients

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	*Earth Pressure, p_2 (psf)*
Active (K_a)	Granular - 0.36	42	*(0.36)S*	*(42)H*
At-Rest (K_o)	Granular - 0.53	62	(0.53)S	(62)H
Passive (K_p)	Granular - 2.77	319	---	---

Applicable conditions to the above include:

- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 **H** to 0.004 **H**, where **H** is wall height.
- For passive earth pressure to develop, wall must move horizontally against the fill to mobilize resistance.
- Uniform surcharge, where S is surcharge pressure.
- In situ soil backfill weight a maximum of 115 pcf.
- Horizontal backfill, compacted between 95 percent of modified Proctor maximum dry density. The excavation pit may require a design with sloped backfill depending on its proximity to the existing canal and roadway.
- Loading from heavy compaction equipment or dynamic loading not included.
- No hydrostatic pressures acting on wall.
- No safety factor included in soil parameters.

The above earth pressure parameters are based on the typical backfill materials available in this area. Backfill placed against structures should consist of granular soils. The granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.35 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

Depending on the depth of excavation and long-term groundwater conditions, the unbalanced hydrostatic pressure may be considered in the design of the retaining wall. Hydrostatic pressure should be added to the lateral earth pressures recommended above. These pressures do not include the influence of surcharge, equipment or floor loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

Due to the presence of the railways and roadways adjacent to the likely excavation areas, the effect of train and vehicular traffic may be considered while designing the lateral support system.

SEISMIC CONSIDERATIONS

According to the International Building Code (IBC) 2018 and ASCE 7-16, structures should be designed and constructed to withstand the effects of earthquakes and avoid failure during a maximum considered earthquake. The maximum considered earthquake (MCE) is a seismic event that has a 50-year exposure period with a 2% probability of exceedance. The 2,500-year earthquake has a Moment Magnitude (Mw) of 7.3 and a Site Class Adjusted Peak Ground Acceleration (PGA_M) of **0.132g**, as determined by data provided by the IBC-2018 and ASCE 7-16 Standards.

Based on our findings from the field exploration and our knowledge of the local geological formation in the project area, the site can be classified as **Site Class D** in accordance with International Building Code (IBC) 2018 and ASCE 7-16. The seismic design parameters obtained based on IBC-2018 and ASCE 7-16 are summarized in the table below.

The design response spectrum curve, as presented in **Exhibit C-1**, was developed based on the S_{DS} and S_{D1} values according to IBC-2018 and ASCE 7-16.

Summary of Seismic Design Parameters

Site Location (Latitude, Longitude)	Site Classification	S_s	S_1	F_a	F_v	S_{DS}	S_{D1}
31.2366°, -81.5291°	D	0.163g	0.074g	1.600	2.400	0.174g	0.119g

- In accordance with the 2018 International Building Code and ASCE 7-16.
- The 2018 IBC and ASCE 7-16 require a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope does not include 100-foot soil profile determination. Explorations for this project extended to a maximum depth of 32 feet BGS and this seismic site class definition was provided in consideration of the overall soil conditions as well as the general geology of the area.

GENERAL COMMENTS

As the project progresses, we address assumptions by incorporating information provided by the design team, if any. Revised project information that reflects actual conditions important to our services is reflected in the final report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations.

Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction.

Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

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

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and

are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended.

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

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost.

Any parties charged with estimating excavation / earthwork costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others.

If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

EXHIBITS

EXHIBIT A: Exploration Plan and Procedures

EXHIBIT B: Exploration and Testing Results

EXHIBIT C: Supporting Information

EXHIBIT A

EXPLORATION PLAN AND PROCEDURES

- **Exhibit A-1:** Site Location Plan
- **Exhibit A-2:** Exploration Plan
- **Exhibit A-3:** Exploration and Testing Procedures

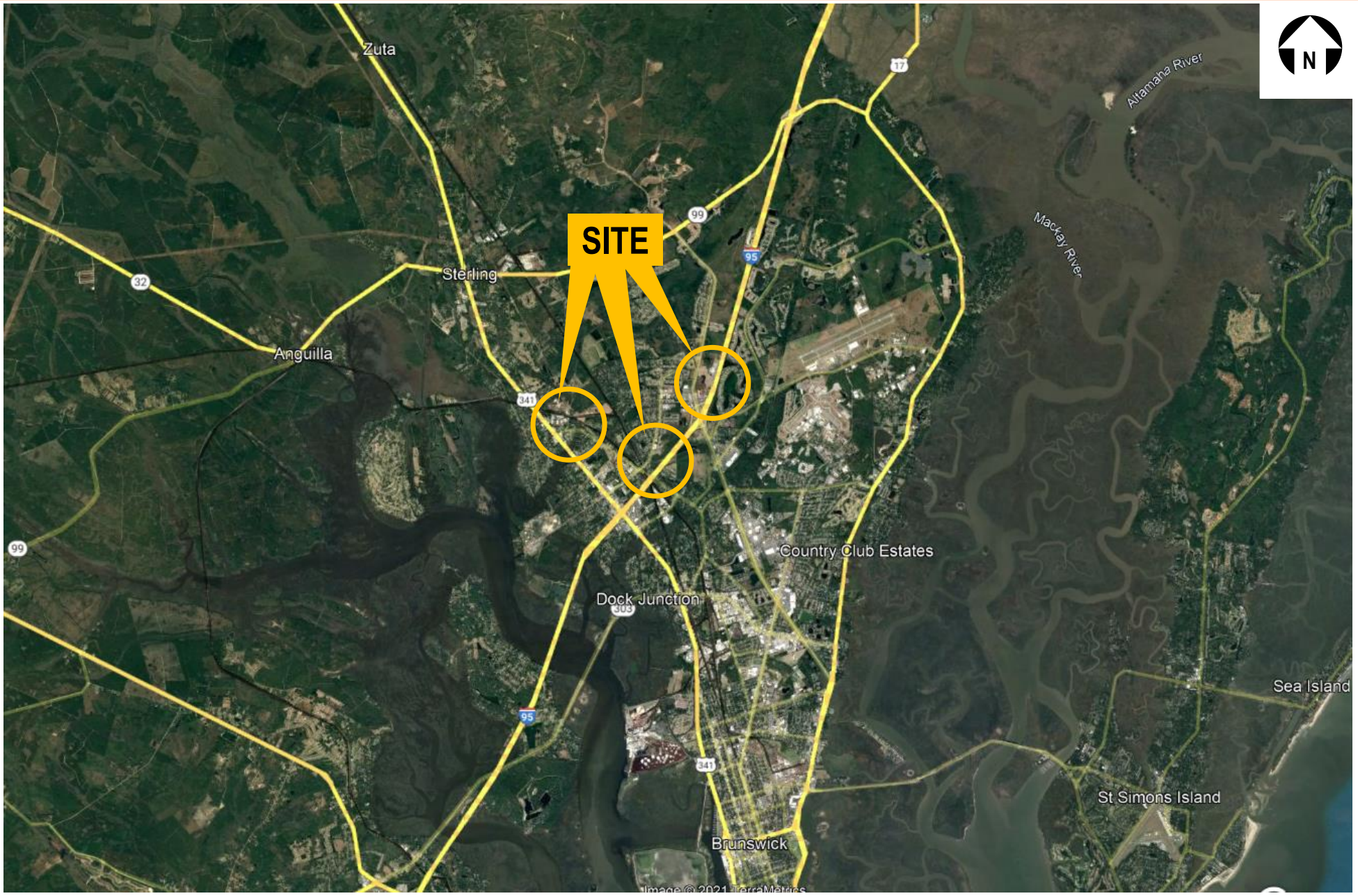


Image Courtesy of
Google Earth™

Project Manager:	MB
Drawn by:	MB
Checked by:	GL
Approved by:	GL

Project No.	ES215271
Scale:	As Shown.
File Name:	
Date:	11-2-2021

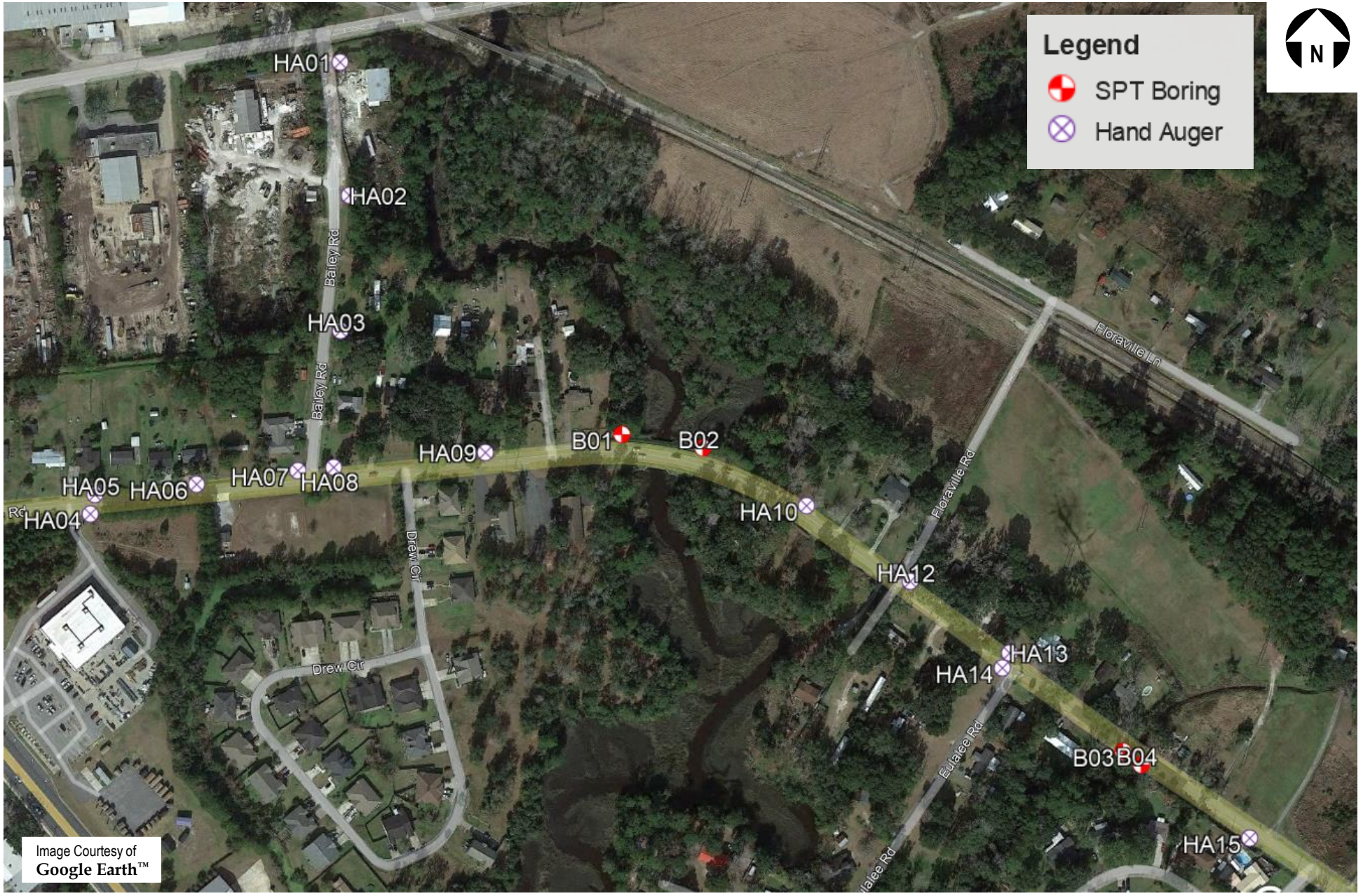
Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

SITE LOCATION MAP

Brunswick-Glynn County North Mainland Water Loops
Brunswick, Georgia

Exhibit:

A-1



NOTES:

ALL EXPLORATION LOCATIONS WERE LOCATED IN THE FIELD USING A GPS UNIT AND / OR SITE LANDMARKS. EXPLORATION LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. DIAGRAM IS FOR GENERAL LOCATION ONLY; NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Manager:	MB
Drawn by:	MB
Checked by:	GL
Approved by:	GL

Project No.	ES215271
Scale:	As Shown.
File Name:	
Date:	11-2-2021

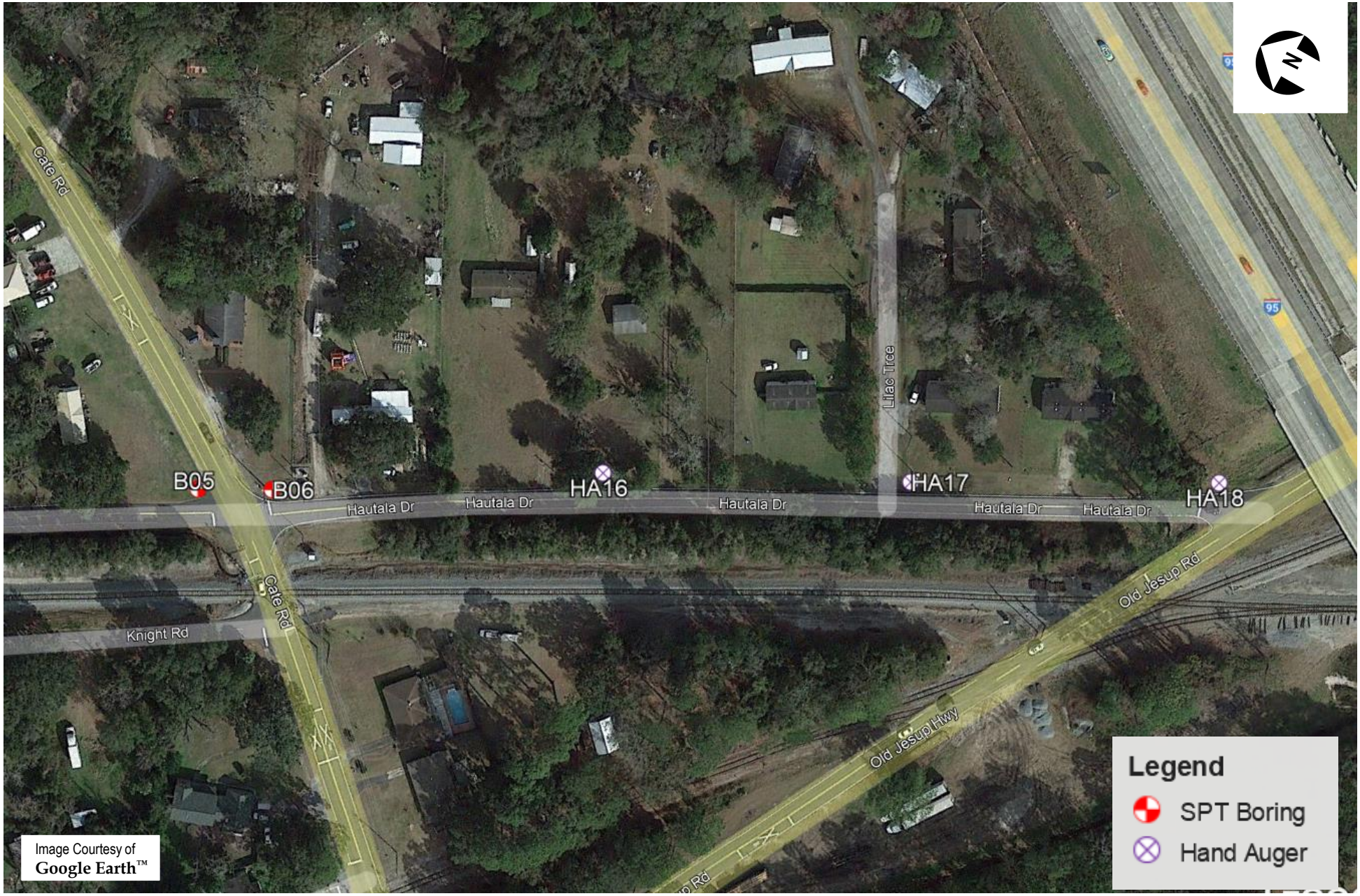
Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

EXPLORATION LOCATION PLAN

Brunswick-Glynn County North Mainland Water Loops
Old Jessup Road
Brunswick, Georgia

Exhibit:

A-2-1



NOTES:

ALL EXPLORATION LOCATIONS WERE LOCATED IN THE FIELD USING A GPS UNIT AND / OR SITE LANDMARKS. EXPLORATION LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. DIAGRAM IS FOR GENERAL LOCATION ONLY; NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Manager:	MB
Drawn by:	MB
Checked by:	GL
Approved by:	GL

Project No.	ES215271
Scale:	As Shown.
File Name:	
Date:	11-2-2021

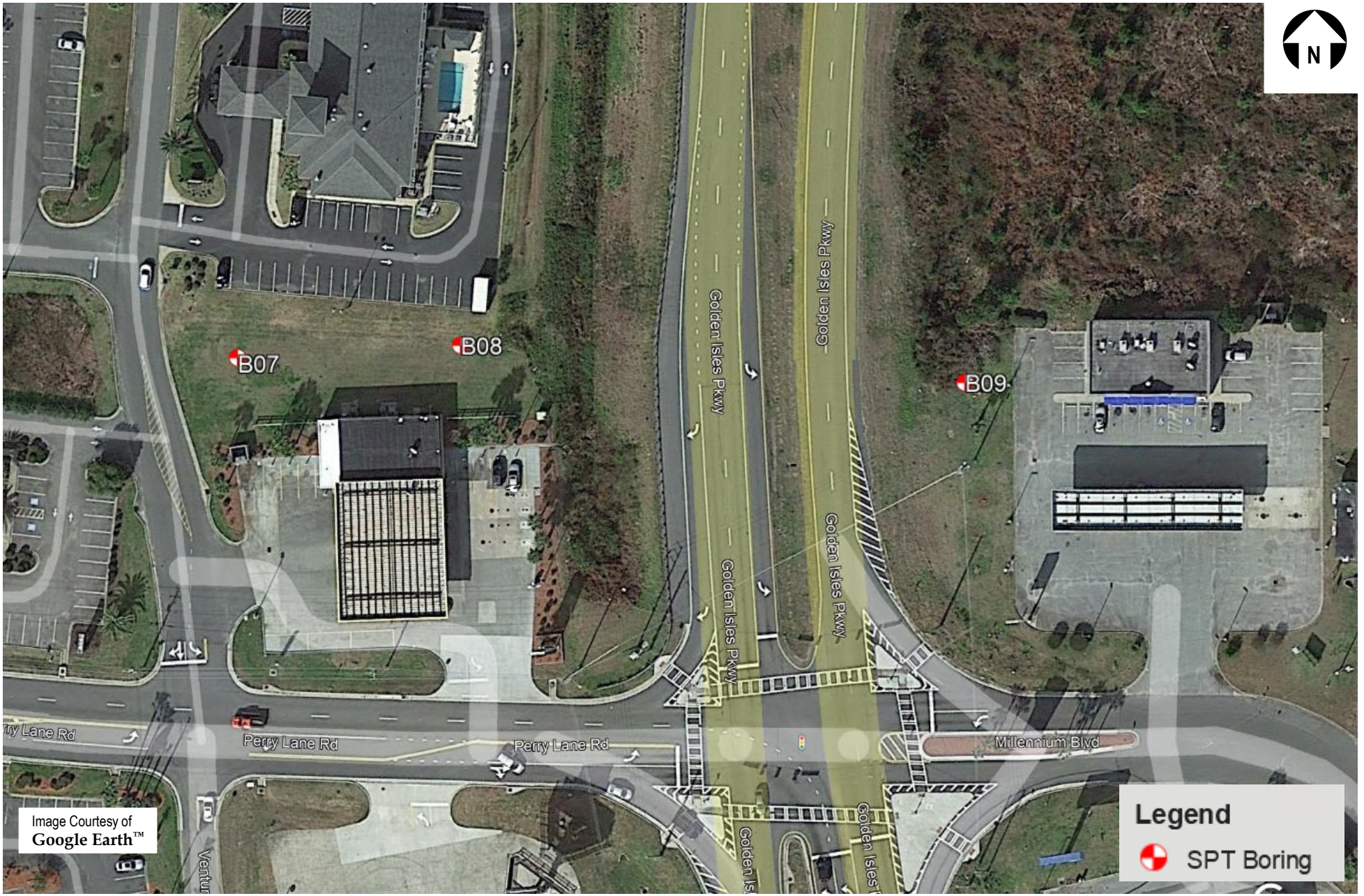
Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

EXPLORATION LOCATION PLAN

Brunswick-Glynn County North Mainland Water Loops
Hautala Drive
Brunswick, Georgia

Exhibit:

A-2-2



NOTES:

ALL EXPLORATION LOCATIONS WERE LOCATED IN THE FIELD USING A GPS UNIT AND / OR SITE LANDMARKS. EXPLORATION LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. DIAGRAM IS FOR GENERAL LOCATION ONLY; NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Manager:	MB
Drawn by:	MB
Checked by:	GL
Approved by:	GL

Project No.	ES215271
Scale:	As Shown.
File Name:	
Date:	11-2-2021

Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

EXPLORATION LOCATION PLAN

Brunswick-Glynn County North Mainland Water Loops

Perry Lane

Brunswick, Georgia

Exhibit:

A-2-3

Field Exploration

No. of Test	Type of Test	Location	Maximum Depth (feet, below ground surface)
9	Standard Penetration Test (SPT) Boring	Roadway shoulder	25
18	Hand Auger Borings	Roadway shoulder	5

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet). The elevations on the borings were interpreted from the topographic survey plan provided the client and should be considered approximate.

Subsurface Exploration Procedures:

Soil borings were advanced with a truck-mounted drill rig using mud rotary drilling techniques. Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was typically performed using thin-wall tube and/or split-barrel sampling procedures. The split-barrel samplers are driven in accordance with the standard penetration test (SPT). The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a Geotechnical Engineer. In addition, we will observe and record groundwater levels during drilling and sampling.

Hand auger borings were conducted in general accordance with ASTM D1452 to determine the subsurface conditions at shallow depths. In this test, the hand auger boring is drilled by rotating and advancing a bucket auger to the desired depths while periodically removing the auger from the hole to clear and examine the auger cuttings. The soils were visually classified by a geotechnical engineer or geologist in accordance with ASTM D2488.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples.

Laboratory Testing

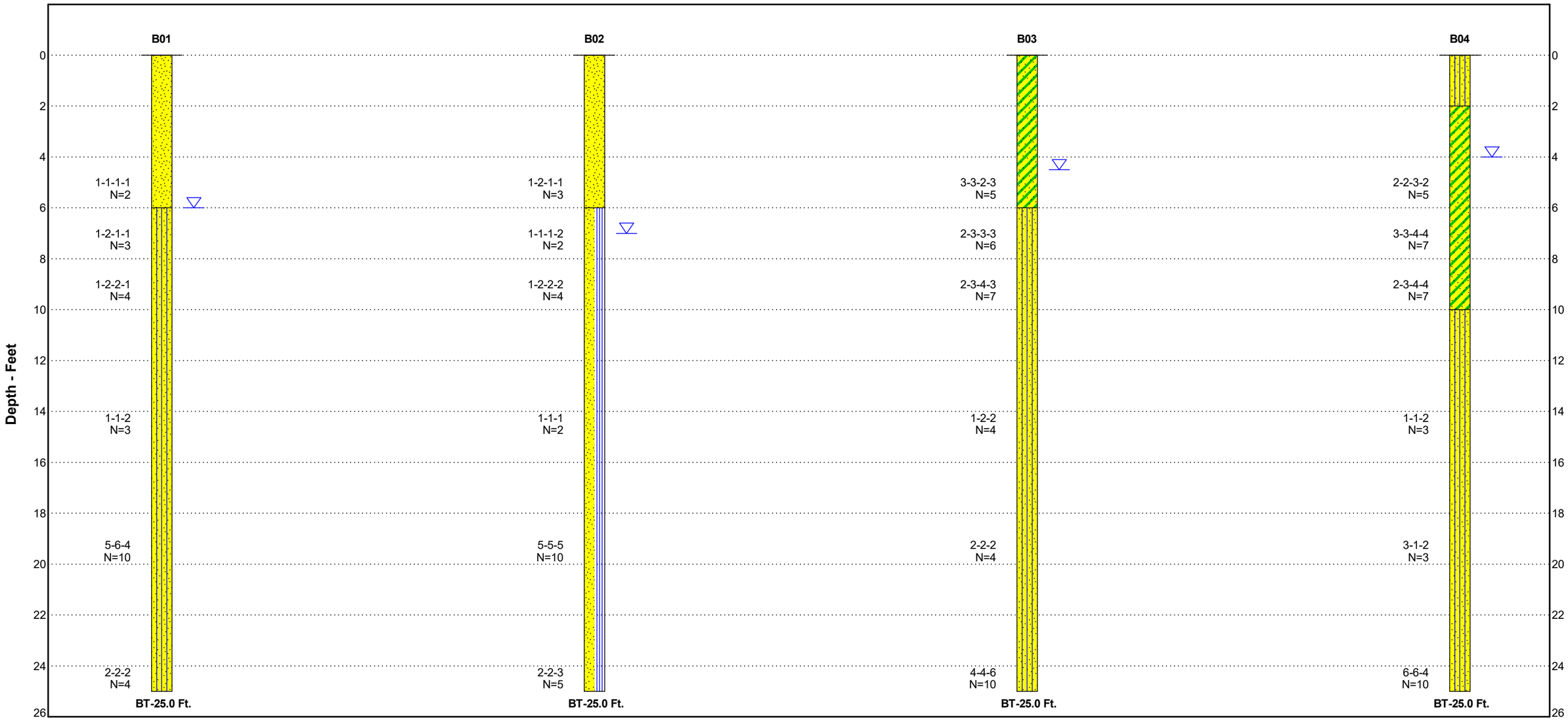
- **Moisture Content:** ASTM D2216 - Standard Test Methods for Laboratory Determination of Water Content of Soil and Rock by Mass
- **Grain Size Analysis:** ASTM D422 – Standard Test Method for Particle Size Distribution of Soils
- **Atterberg Limits:** ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

EXHIBIT B

EXPLORATION AND TESTING RESULTS

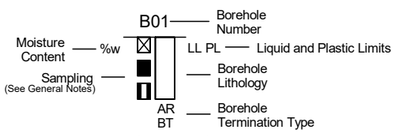
- **Exhibit B-1:** Subsurface Profile
- **Exhibit B-2:** SPT Boring Logs
- **Exhibit B-3:** Hand Auger Boring Log
- **Exhibit B-4:** Summary of Laboratory Test Results
- **Exhibit B-5:** Grain Size Distribution
- **Exhibit B-6:** Atterberg Limits

OLD JESSUP ROAD



Poorly-graded Sand | Silty Sand | Poorly-graded Sand with Silt | Clayey Sand

Explanation



Water Level Reading at time of drilling.

Water Level Reading after drilling.

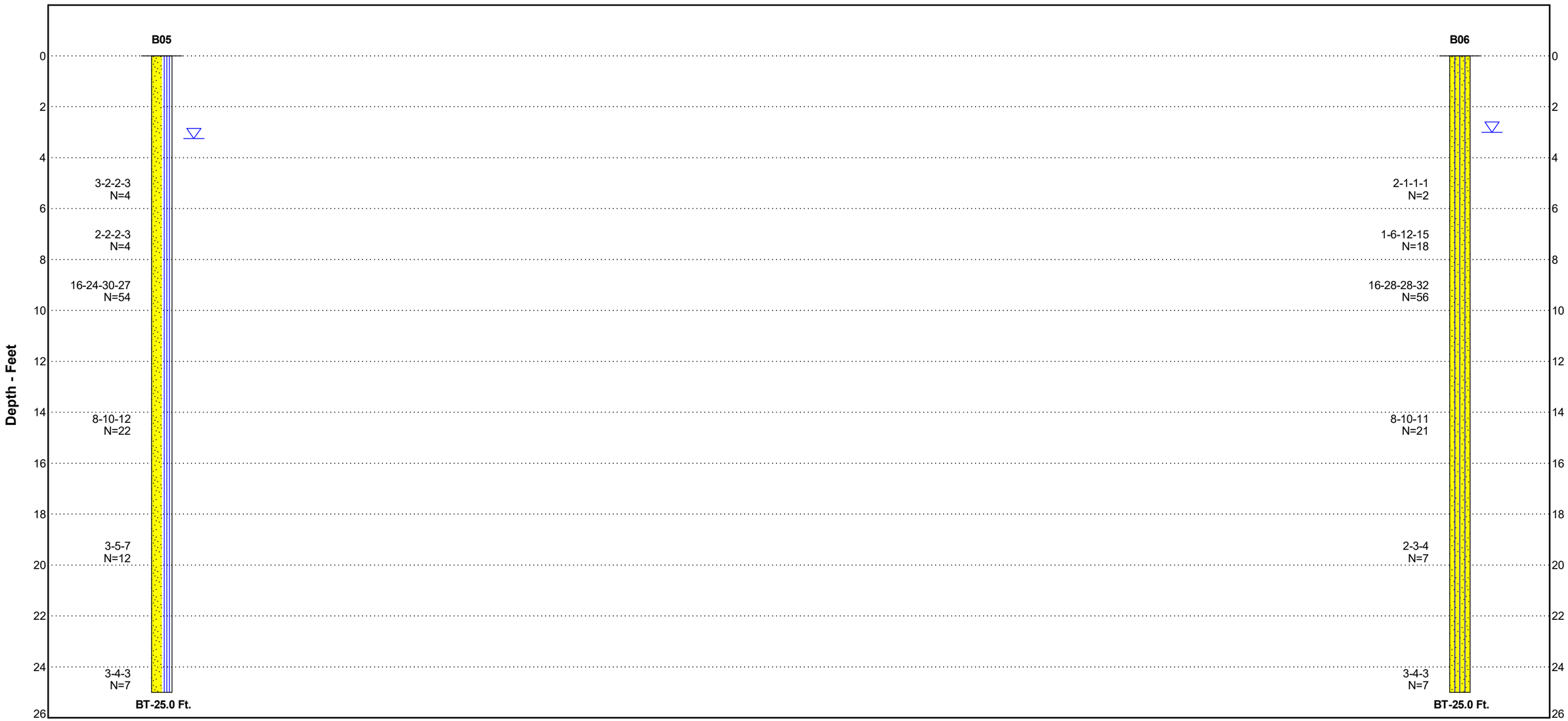
NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: ES215271	Terracon 2201 Rowland Ave Savannah, GA	**SUBSURFACE PROFILE** BRUNSWICK-GLYNN COUNTY NORTH MAINLAND WATER LOOPS BRUNSWICK, GA
Date: 1/7/2022		
Scale: N.T.S.		

Exhibit B-1-1

HAUTALA DRIVE



Poorly-graded Sand with Silt

Silty Sand

Explanation

B05 — Borehole Number

Moisture Content — %w

LL PL — Liquid and Plastic Limits

Sampling (See General Notes)

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

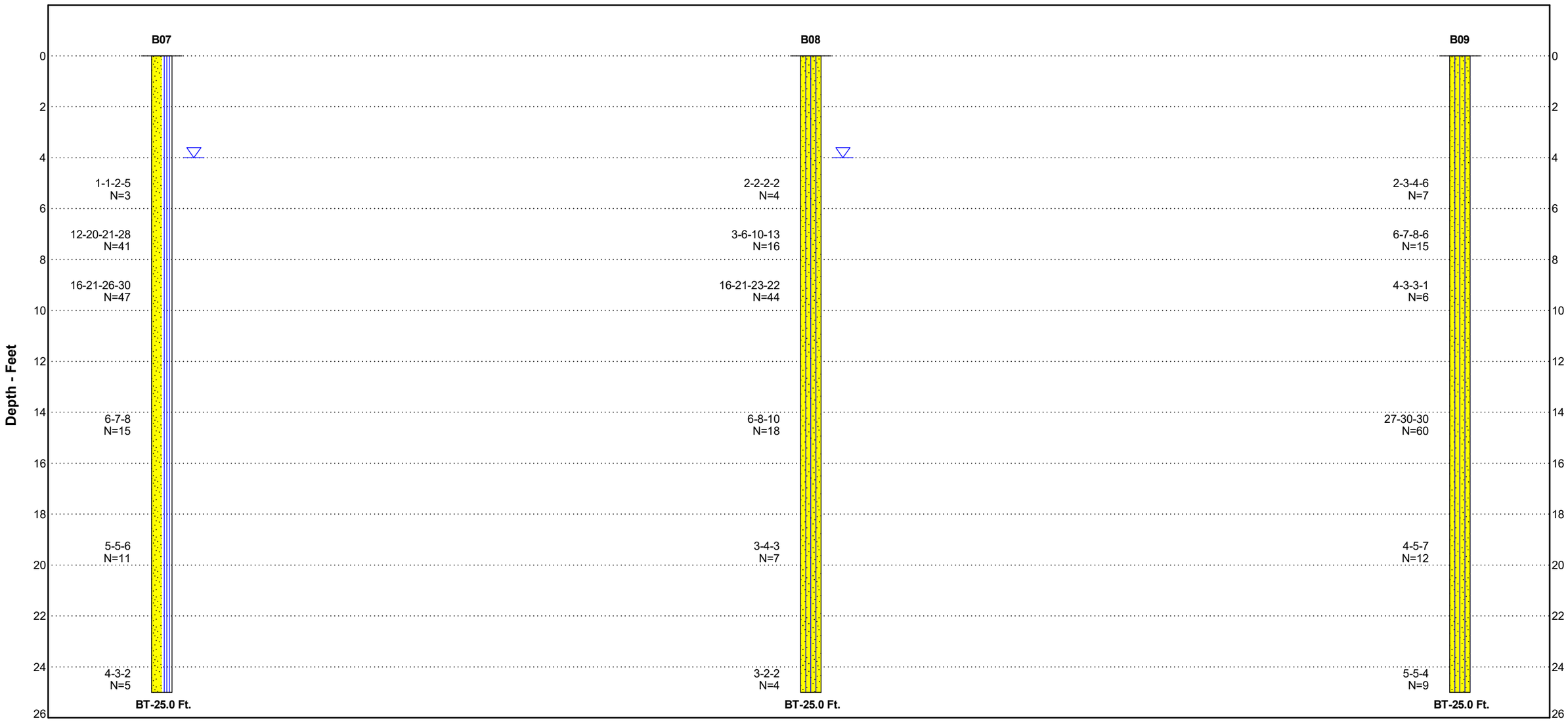
Water Level Reading after drilling.

NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: ES215271	Terracon 2201 Rowland Ave Savannah, GA	**SUBSURFACE PROFILE**
Date: 1/7/2022		BRUNSWICK-GLYNN COUNTY NORTH MAINLAND WATER LOOPS BRUNSWICK, GA
Scale: N.T.S.		

PERRY LANE



Poorly-graded Sand with Silt

Silty Sand

Explanation

B07 — Borehole Number

Moisture Content — %w

LL PL — Liquid and Plastic Limits

Sampling (See General Notes)

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: ES215271	Terracon 2201 Rowland Ave Savannah, GA	**SUBSURFACE PROFILE**
Date: 1/7/2022		BRUNSWICK-GLYNN COUNTY NORTH MAINLAND WATER LOOPS BRUNSWICK, GA
Scale: N.T.S.		

BORING LOG NO. B01

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2393° Longitude: -81.5342°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
		SAND (SP), fine grained, brown, very loose				
	6.0		5	▽		1-1-1-1 N=2
		SILTY SAND (SM), fine grained, brown, very loose to medium dense				1-2-1-1 N=3
		gray				1-2-2-1 N=4
			10			
						1-1-2 N=3
			15			
						5-6-4 N=10
			20			
						2-2-2 N=4
	25.0		25			
		Boring Terminated at 25 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 6' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-1

BORING LOG NO. B02

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2392° Longitude: -81.5336°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
	SAND (SP), fine grained, dark brown, very loose				
	brown	5			1-2-1-1 N=3
6.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, brown, very loose to medium dense		▽		1-1-1-2 N=2
	gray				1-2-2-2 N=4
		10			
					1-1-1 N=2
		15			
	trace rock				5-5-5 N=10
		20			
25.0					2-2-3 N=5
	Boring Terminated at 25 Feet	25			

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 7' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-2

BORING LOG NO. B03

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2374° Longitude: -81.5306°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
		CLAYEY SAND (SC), fine to medium grained, light brown, loose			
		fine grained, gray	▽		3-3-2-3 N=5
6.0		**SILTY SAND (SM)**, fine grained, gray, loose to medium dense			2-3-3-3 N=6
		fine to medium grained, dark gray			2-3-4-3 N=7
		fine grained, gray			1-2-2 N=4
					2-2-2 N=4
25.0					4-4-6 N=10
		Boring Terminated at 25 Feet			

5 10 15 20 25

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4.5' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-3

BORING LOG NO. B04

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2373° Longitude: -81.5305°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
		SILTY SAND (SM), fine grained, dark brown			
2.0		**CLAYEY SAND (SC)**, fine grained, dark brown, loose			
		light brown	▽		2-2-3-2 N=5
5					3-3-4-4 N=7
		light gray			2-3-4-4 N=7
10.0					
10		**SILTY SAND (SM)**, fine grained, gray, very loose to medium dense			1-1-2 N=3
15					
					3-1-2 N=3
20					
					6-6-4 N=10
25.0					
25		***Boring Terminated at 25 Feet***			

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-4

BORING LOG NO. B05

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2313° Longitude: -81.5170°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, dark brown, loose to very dense				
	dark brown and brown		▽		
	dark brown	5			3-2-2-3 N=4
					2-2-2-3 N=4
					16-24-30-27 N=54
	light brown	10			
					8-10-12 N=22
		15			
					3-5-7 N=12
	gray	20			
					3-4-3 N=7
25.0		25			
	Boring Terminated at 25 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 3.25' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-5

BORING LOG NO. B06

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2311° Longitude: -81.5169°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
SILTY SAND (SM), fine grained, dark brown, very loose to very dense					
light gray			▽		
dark brown		5			2-1-1-1 N=2
					1-6-12-15 N=18
					16-28-28-32 N=56
brown and orange		10			
					8-10-11 N=21
light brown		15			
					2-3-4 N=7
gray		20			
					3-4-3 N=7
25.0		25			
Boring Terminated at 25 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 3' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-6

BORING LOG NO. B07

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2467° Longitude: -81.5058°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, dark brown, very loose to dense		▽		
		5			1-1-2-5 N=3
					12-20-21-28 N=41
					16-21-26-30 N=47
	brown	10			
					6-7-8 N=15
		15			
					5-5-6 N=11
	gray	20			
					4-3-2 N=5
25.0	***Boring Terminated at 25 Feet***	25			

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021 | Boring Completed: 12-02-2021

Drill Rig: CME 45 | Driller: MS

Project No.: ES215271 | Exhibit: B-2-7

BORING LOG NO. B08

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2469° Longitude: -81.5054°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
	SILTY SAND (SM), fine grained, gray, loose to dense				
	dark brown		▽		
		5			2-2-2-2 N=4
					3-6-10-13 N=16
	brown				16-21-23-22 N=44
		10			
					6-8-10 N=18
		15			
					3-4-3 N=7
	gray	20			
					3-2-2 N=4
25.0		25			
	Boring Terminated at 25 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021 | Boring Completed: 12-02-2021

Drill Rig: CME 45 | Driller: MS

Project No.: ES215271 | Exhibit: B-2-8

BORING LOG NO. B09

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 31.2468° Longitude: -81.5045° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS
	SILTY SAND (SM), with organics (roots), fine grained, dark brown, loose to very dense				
	brown				
	dark brown and gray				2-3-4-6 N=7
	gray and brown	5			6-7-8-6 N=15
	gray				4-3-3-1 N=6
	dark brown	10			
	brown	15			27-30-30 N=60
	gray	20			4-5-7 N=12
	25.0				5-5-4 N=9
	Boring Terminated at 25 Feet	25			

Stratification lines are approximate. In-situ, the transition may be gradual.
First 4' of material removed via hand auger

Hammer Type: Automatic

Advancement Method:
Hollow stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-02-2021	Boring Completed: 12-02-2021
Drill Rig: CME 45	Driller: MS
Project No.: ES215271	Exhibit: B-2-9

BORING LOG NO. HA01

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2416° Longitude: -81.5362°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	2.3	**SILTY SAND (SM)**, fine grained, light brown	1 2		
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	3 4	▽	
		Boring Terminated at 5 Feet	5		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-1

BORING LOG NO. HA02

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2408° Longitude: -81.5362°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
		TOPSOIL, dark brown fine grained silty sand with grass			
	0.6				
		SILTY SAND (SM), fine grained, light brown	1		
			2		
			3		
			4		
	5.0		5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-2

BORING LOG NO. HA03

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2400° Longitude: -81.5362°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
		TOPSOIL, dark brown fine grained silty sand with grass			
	0.6				
		SILTY SAND (SM), fine grained, light brown	1		
			2		
			3		
			4		
	5.0		5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 1.5' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-3

BORING LOG NO. HA04

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2388° Longitude: -81.5380°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	1 2 3 4 5	▽	
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 3' BGS*

Mottling noted @ 1.67' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-4

BORING LOG NO. HA05

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2389° Longitude: -81.5380°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	1.5	**SILTY SAND (SM)**, fine grained, light brown	1		
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	2 3 4		
		Boring Terminated at 5 Feet	5	▽	

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-5

BORING LOG NO. HA06

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2390° Longitude: -81.5373°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**SANDY LEAN CLAY (CL)**, dark gray	1 2 3 4 5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 0.83' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-6

BORING LOG NO. HA07

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2391° Longitude: -81.5365°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**SILTY SAND (SM)**, fine grained, light brown	1 2 3 4	▽	
		Boring Terminated at 5 Feet	5		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-7

BORING LOG NO. HA08

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2391° Longitude: -81.5363°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**SILTY SAND (SM)**, fine grained, light brown	1 2 3 4 5	▽	
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-8

BORING LOG NO. HA09

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2392° Longitude: -81.5352°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	2.3	**SILTY SAND (SM)**, fine grained, light brown	1 2		
	5.0	**CLAYEY SAND (SC)**, fine grained, light brown/gray	3 4		
		Boring Terminated at 5 Feet	5	▽	

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-9

BORING LOG NO. HA10

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2389° Longitude: -81.5329°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, light brown	1 2 3 4 5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-10

BORING LOG NO. HA11

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2385° Longitude: -81.5322°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, dark brown/gray	1 2 3 4 5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 0.83' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-11

BORING LOG NO. HA12

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2384° Longitude: -81.5321°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**SILTY SAND (SM)**, fine grained, light brown	1 2 3 4 5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-12

BORING LOG NO. HA13

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2380° Longitude: -81.5314°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	2.0	**SILTY SAND (SM)**, fine grained, light brown	1 2		
	5.0	**SANDY LEAN CLAY (CL)**, dark gray	3 4	▽	
		Boring Terminated at 5 Feet	5		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-13

BORING LOG NO. HA14

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2379° Longitude: -81.5315°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, dark brown	1 2 3 4 5	▽	
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-14

BORING LOG NO. HA15

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc. Greenville, SC

SITE: Old Jesup Road Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2368° Longitude: -81.5297°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**SILTY SAND (SM)**, fine grained, dark brown	1 2 3 4 5		
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Mottling not noted

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-15

BORING LOG NO. HA16

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2303° Longitude: -81.5165°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	1 2 3 4 5	▽	
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 1.67' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-16

BORING LOG NO. HA17

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2295° Longitude: -81.5162°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	1.7	**SILTY SAND (SM)**, fine grained, light brown	1		
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	2 3 4	▽	
		Boring Terminated at 5 Feet	5		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 4' BGS*

Mottling noted @ 2' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-17

BORING LOG NO. HA18

PROJECT: Brunswick-Glynn County North Mainland Water Loops

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

SITE: Old Jesup Road
Brunswick, GA

LOCATION See Exploration Plan

Latitude: 31.2287° Longitude: -81.5159°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE
	0.6	**TOPSOIL**, dark brown fine grained silty sand with grass			
	5.0	**CLAYEY SAND (SC)**, fine grained, light gray	1 2 3 4 5	▽	
		Boring Terminated at 5 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Manual hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered @ 5' BGS*

Mottling noted @ 0.83' BGS

Terracon
2201 Rowland Ave
Savannah, GA

Boring Started: 12-01-2021	Boring Completed: 12-01-2021
Drill Rig: Hand Auger	Driller: CS
Project No.: ES215271	Exhibit: B-3-18

SUMMARY OF LABORATORY TEST RESULTS

BORING No.	Depth (ft.)	Matrial Description	USCS	Water Content (%)	Fine Grained Soil Classification			Coarse Grained Soil Classification				
					LL	PL	PI	% Gravel	% Sand	% Fine	Cc	Cu
B02	6-8	POORLY GRADED SAND WITH SILT	SP-SM	6.7	--	--	--	0.2	92.9	6.9	1.14	2.34
B03	4-6	CLAYEY SAND	SC	29.8	30	16	14	--	54.1	45.9	--	--
B04	6-8	CLAYEY SAND	SC	33.0	--	--	--	--	79.6	20.4	--	--
B05	8-10	POORLY GRADED SAND WITH SILT	SP-SM	23.7	--	--	--	--	93.3	6.7	0.87	2.18
B06	4-6	POORLY GRADED SAND	SP	27.4	--	--	--	--	95.7	4.3	0.95	2.1
B07	2-4	POORLY GRADED SAND WITH SILT	SP-SM	12.2	--	--	--	--	92.8	7.2	0.92	2.18
B08	13.5-15	POORLY GRADED SAND	SP	25.3	--	--	--	--	96.8	3.2	1.25	2.27
B09	18.5-20	POORLY GRADED SAND	SP	29.0	--	--	--	--	98.6	1.4	0.87	2.03

PROJECT: Brunswick-Glynn County North Mainland Water Loops

SITE: Brunswick, GA

Terracon

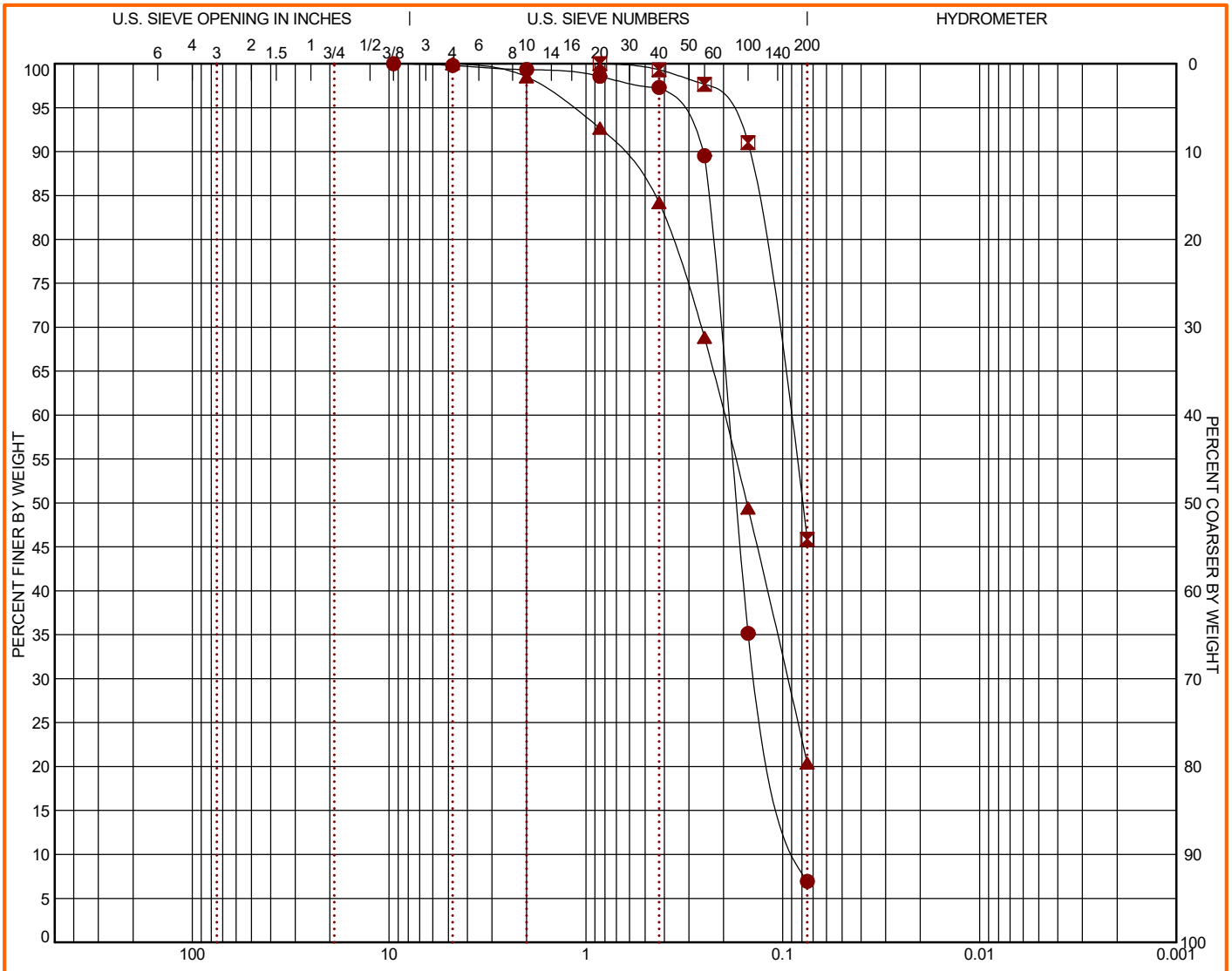
2201 Rowland Ave Savannah, GA

PROJECT NUMBER: ES215271

CLIENT: Four Waters Engineering, Inc.
Greenville, SC

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B02	6 - 8	0.0	0.2	92.9		6.9		SP-SM
⊠	B03	4 - 6	0.0	0.0	54.1		45.9		SC
▲	B04	6 - 8	0.0	0.0	79.6		20.4		SC

GRAIN SIZE	●	⊠	▲
D_{60}	0.189	0.093	0.198
D_{30}	0.132		0.094
D_{10}	0.081		

COEFFICIENTS	●	⊠	▲
C_C	1.14		
C_U	2.34		

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	#20	100.0	#4	100.0
#4	99.79	#40	99.31	#10	98.5
#10	99.35	#60	97.67	#20	92.67
#20	98.56	#100	91.01	#40	84.19
#40	97.3	#200	45.87	#60	68.84
#60	89.52			#100	49.43
#100	35.16			#200	20.39
#200	6.94				

SOIL DESCRIPTION	
●	POORLY GRADED SAND WITH SILT (SP-SM)
⊠	CLAYEY SAND (SC)
▲	CLAYEY SAND (SC)

REMARKS	
●	
⊠	
▲	

PROJECT: Brunswick-Glynn County North Mainland Water Loops

SITE: Old Jesup Road Brunswick, GA

Terracon
2201 Rowland Ave
Savannah, GA

PROJECT NUMBER: ES215271

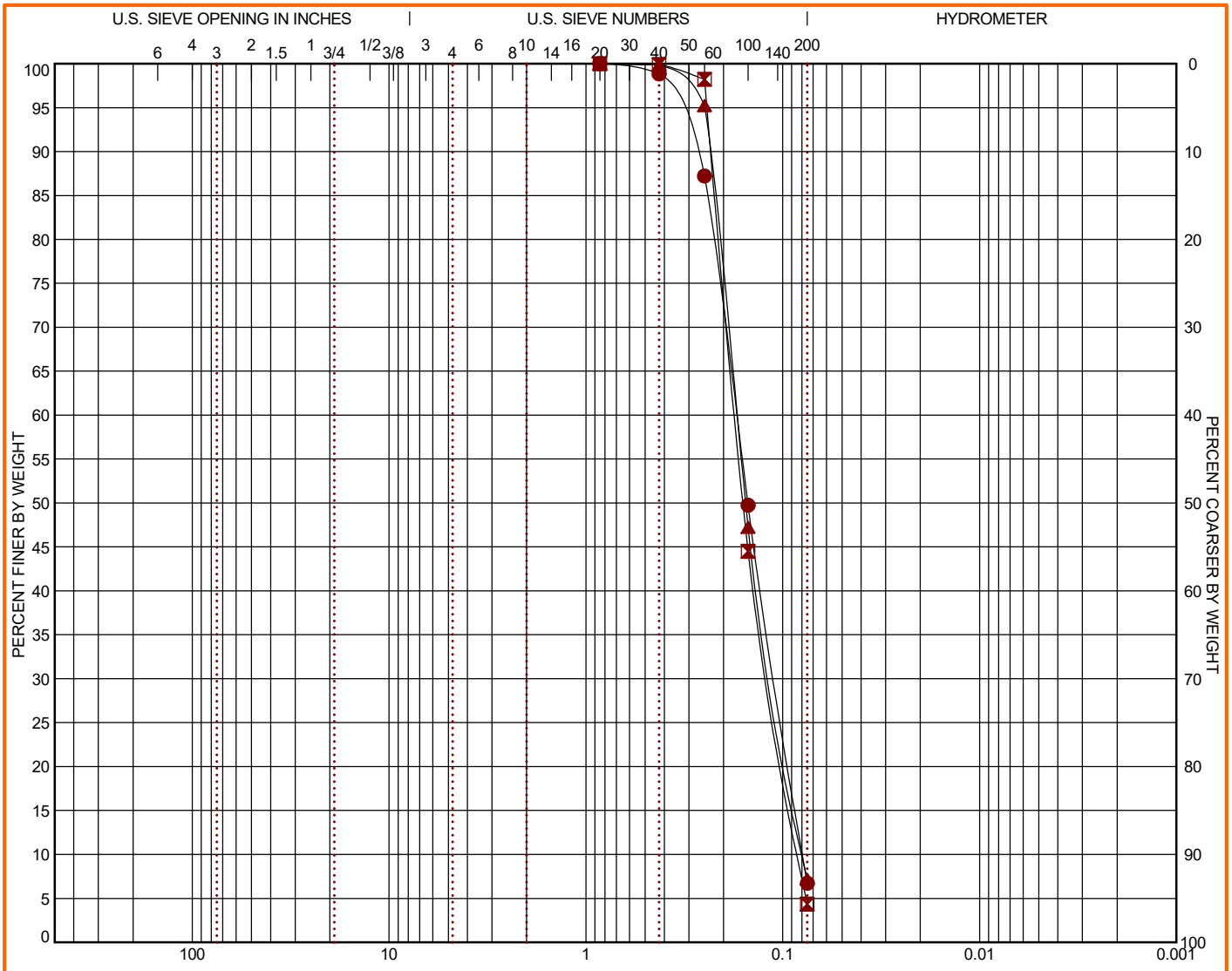
CLIENT: Four Waters Engineering, Inc. Greenville, SC

GRAIN SIZE: USCS 1 ES215271 BRUNSWICK-GLYNN C.GPJ TERRACON_DATATEMPLATE.GDT 12/22/21

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B05	8 - 10	0.0	0.0	93.3		6.7		SP-SM
⊠	B06	4 - 6	0.0	0.0	95.7		4.3		SP
▲	B07	2 - 4	0.0	0.0	92.8		7.2		SP-SM

GRAIN SIZE	●	⊠	▲
D_{60}	0.173	0.174	0.172
D_{30}	0.109	0.117	0.111
D_{10}	0.079	0.083	0.079

COEFFICIENTS	●	⊠	▲
C_C	0.87	0.95	0.92
C_U	2.18	2.10	2.18

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#20	100.0	#20	100.0	#20	100.0
#40	98.83	#40	99.9	#40	99.87
#60	87.21	#60	98.21	#60	95.24
#100	49.75	#100	44.51	#100	47.23
#200	6.72	#200	4.34	#200	7.19

SOIL DESCRIPTION	
●	POORLY GRADED SAND WITH SILT (SP-SM)
⊠	POORLY GRADED SAND (SP)
▲	POORLY GRADED SAND WITH SILT (SP-SM)

REMARKS	
●	
⊠	
▲	

PROJECT: Brunswick-Glynn County North Mainland Water Loops

SITE: Old Jesup Road Brunswick, GA

Terracon
2201 Rowland Ave
Savannah, GA

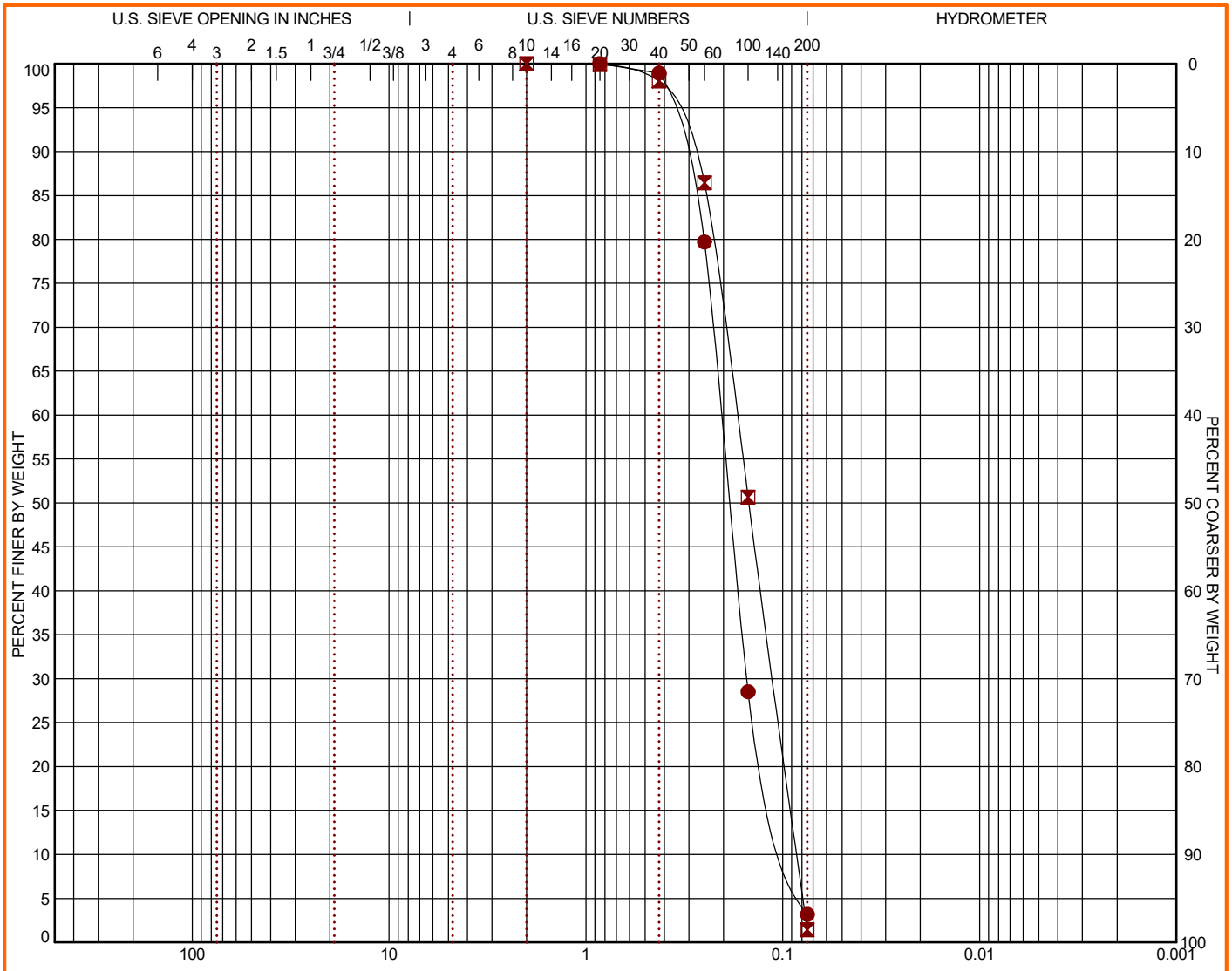
PROJECT NUMBER: ES215271

CLIENT: Four Waters Engineering, Inc. Greenville, SC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 ES215271 BRUNSWICK-GLYNN C.GPJ TERRACON_DATATEMPLATE.GDT 12/22/21

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B08	13.5 - 15	0.0	0.0	96.8		3.2		SP
⊠	B09	18.5 - 20	0.0	0.0	98.6		1.4		SP

GRAIN SIZE	●	⊠	
D_{60}	0.205	0.171	
D_{30}	0.152	0.112	
D_{10}	0.09	0.085	

COEFFICIENTS	●	⊠	
C_C	1.25	0.87	
C_U	2.27	2.03	

●		⊠			
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#20	100.0	#10	100.0		
#40	98.93	#20	99.89		
#60	79.71	#40	98.04		
#100	28.52	#60	86.45		
#200	3.18	#100	50.67		
		#200	1.42		

SOIL DESCRIPTION	
●	POORLY GRADED SAND (SP)
⊠	POORLY GRADED SAND (SP)

REMARKS	
●	
⊠	

PROJECT: Brunswick-Glynn County North Mainland Water Loops

SITE: Old Jesup Road Brunswick, GA

Terracon
2201 Rowland Ave
Savannah, GA

PROJECT NUMBER: ES215271

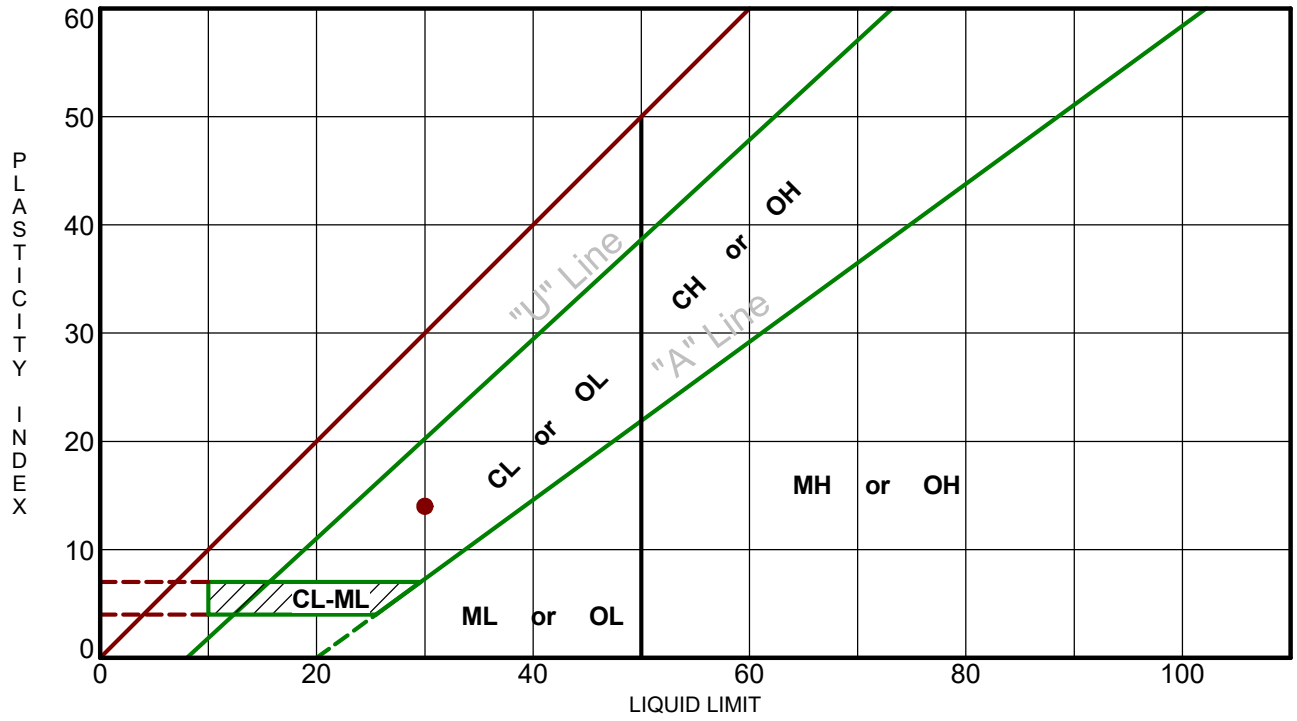
CLIENT: Four Waters Engineering, Inc. Greenville, SC

GRAIN SIZE: USCS 1 ES215271 BRUNSWICK-GLYNN C.GPJ TERRACON_DATATEMPLATE.GDT 12/22/21

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B03	4 - 6	30	16	14	45.9	SC	CLAYEY SAND

PROJECT: Brunswick-Glynn County North Mainland Water Loops

SITE: Old Jesup Road Brunswick, GA

Terracon
2201 Rowland Ave
Savannah, GA

PROJECT NUMBER: ES215271

CLIENT: Four Waters Engineering, Inc. Greenville, SC

EXHIBIT C

SUPPORTING INFORMATION

- **Exhibit C-1:** Seismic Design Parameters
- **Exhibit C-2:** General Notes
- **Exhibit C-3:** Unified Soil Classification System

Seismic Design Parameters Based on IBC2018 Code and ASCE 7-16 Standard

Terracon Project Name: Brunswick-Glynn County North Mainland Water Loops

Terracon Project No: ES215271

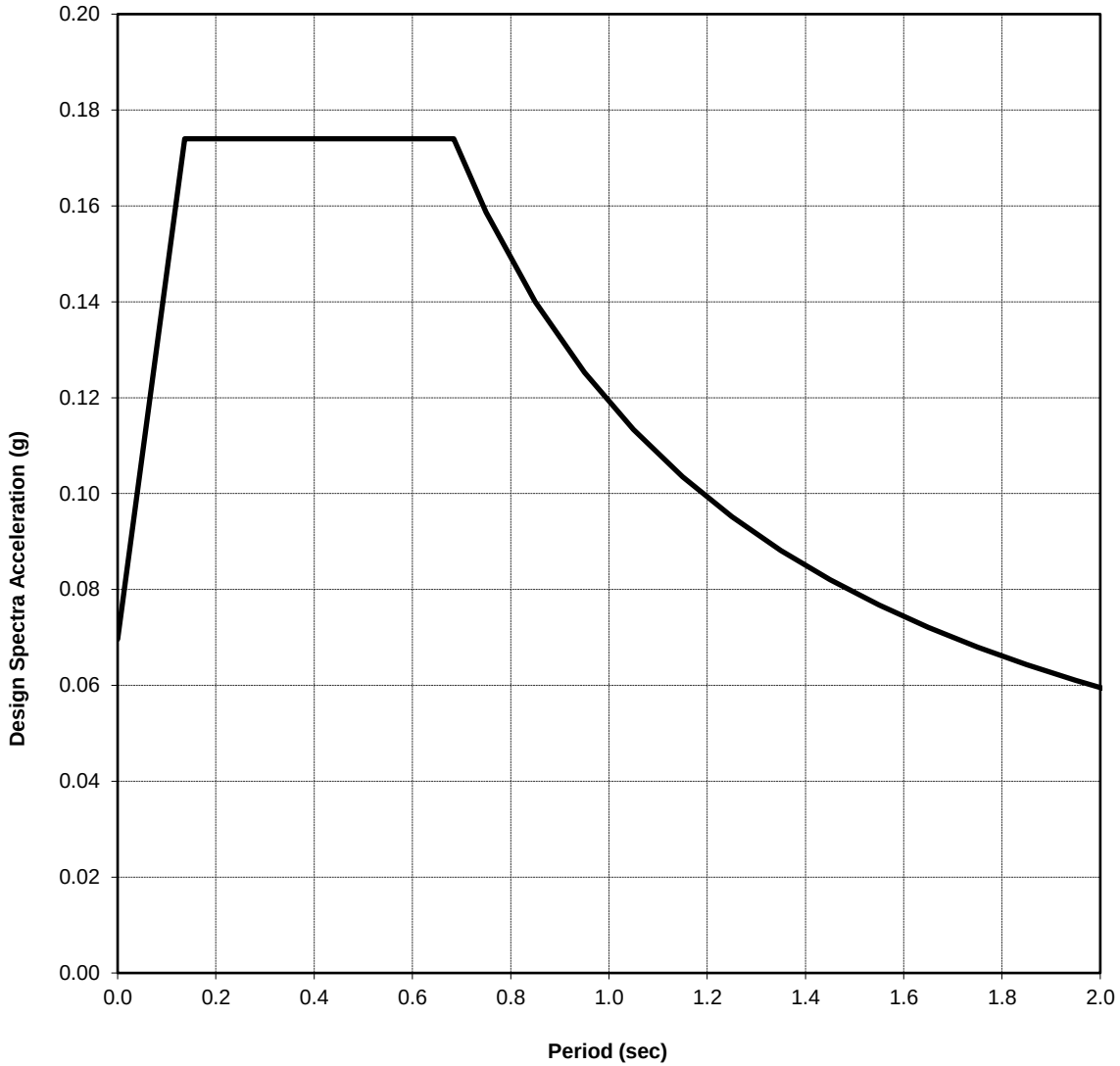
Site Location: Brunswick, GA
Latitude : 31.2366°
Longitude : -81.5291°

Site Class: **D**

Design Response Spectrum for the Site Class

S_s =	0.163	S_1 =	0.074
F_a =	1.600	F_v =	2.400
S_{MS} =	0.262	S_{M1} =	0.179
S_{DS} =	0.174	S_{D1} =	0.119

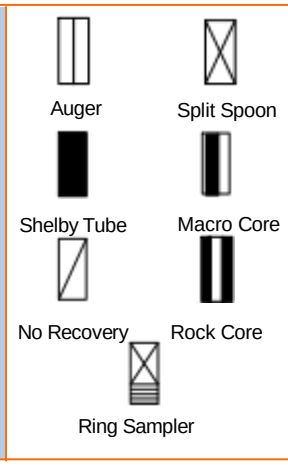
	Period (sec)	Sa (g)
	0.000	0.070
T_0 =	0.137	0.174
	0.200	0.174
T_S =	0.684	0.174
T =	0.750	0.159
	0.850	0.140
	0.950	0.125
	1.050	0.113
	1.150	0.103
	1.250	0.095
	1.350	0.088
	1.450	0.082
	1.550	0.077
	1.650	0.072
	1.750	0.068
	1.850	0.064
	1.950	0.061
	2.050	0.058
	2.150	0.055



GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



GROUNDWATER

- Groundwater Initially Encountered
- Groundwater Level After a Specified Period of Time
- Static Groundwater Level After a Specified Period of Time
- No Groundwater Observed

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

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	Std. Penetration Resistance (blows per foot)	Descriptive Term (Consistency)	Undrained Shear Strength (kips per square foot)	Std. Penetration Resistance (blows per foot)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium-Stiff	0.50 to 1.00	5 - 7
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 14
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	above 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Descriptive Term(s) of other constituents	Percent of Dry Weight
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ³ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.