ECS Southeast, LLC

Preliminary Geotechnical Engineering Report

Highway 321 Rail Site

Highway 321
Gaston, Lexington County, South Carolina

ECS Project Number 38:3162

August 18, 2025

August 18, 2025

Mr. Kyle Clampitt
Alliance Consulting Engineers
PO Box 8147
Columbia, South Carolina 29202-8147

ECS Project No. 38:3162

Reference: Preliminary Geotechnical Engineering Report
Highway 321 Rail Site
Highway 321
Gaston, Lexington County, South Carolina

Dear Mr. Clampitt:

ECS Southeast, LLC (ECS) has completed the subsurface exploration, laboratory testing, and preliminary geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 38:3841-GP, dated June 10, 2025. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration and laboratory services conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Alliance Consulting Engineers, Inc 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 document the subsurface conditions encountered in the exploration 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

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SOUTH CAROLINA PROFESSIONAL ENGINEER No. 26758 WINSLOW GOINS
8/18/2025

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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 entire geotechnical report.

- Lightly loaded structures (column loads less than 100 kips and wall loads less than 5 kips per linear foot) can likely be supported by shallow foundations bearing on evaluated natural soils or new engineered fill. Moderately loaded structures (column and wall loads of 100 to 300 kips and 5 to 8 kips per linear foot, respectively) will likely require additional testing and detailed settlement analyses to evaluate if shallow foundations are adequate.
- Relatively loose near surface soils were encountered in borings B-01, B-02, B-04, and B-05 and extended to depths ranging from approximately 3 to 5.5 feet below the existing ground surface Depending on the locations of the structures and final design subgrade elevations, in-place densification of near-surface loose soils and/or undercutting of very loose soils that cannot be adequately densified in place may be necessary. The extent of possible densification or undercutting should be further evaluated during a final geotechnical study.
- Due to variability of soil conditions with depth at each boring location and/or across the borings, and the varying existing ground surface elevations, the net allowable soil bearing pressures will likely vary depending on actual locations of the structures and the design foundation subgrade elevations. For preliminary design purposes, the footings can be sized using a presumptive net allowable bearing pressure of 2,000 psf. A higher net allowable bearing pressure could be achieved depending on the results of the recommended design-phase geotechnical exploration and/or locations of the structures at the site.
- An IBC Seismic Site Class D is recommended for the site.
- ECS should be retained to review the design documents for conformance with our recommendations.
- ECS should be retained for construction materials testing and special inspections to facilitate proper implementation of our recommendations.

Specific information regarding the subsurface exploration procedures, the site, and subsurface conditions at the time of our exploration, and our conclusions and recommendations concerning the geotechnical design and construction aspects of the project are discussed in detail in the subsequent sections of this report.

1.0 INTRODUCTION

The purpose of this study was to provide preliminary geotechnical information to evaluate the feasibility of the site for the proposed development. The recommendations developed for this report are based on project information supplied by you.

This report contains the results of our subsurface exploration and laboratory services programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project. The report includes the following items:

- Information on current site conditions.
- Description of the field exploration procedures.
- Final logs and records of the field exploration.
- Site location diagram and field exploration diagram.
- Evaluation of the on-site soil characteristics encountered at the test locations.
- Recommendations for site preparation.
- Preliminary recommendations regarding shallow foundations for future structures.
- Compaction requirements for fill and backfill areas.
- Preliminary recommendations for slab-on-grade design and construction.
- Preliminary pavement recommendations.
- Recommendations for seismic site classification.

2.0 PROJECT INFORMATION

2.1 SITE INFORMATION

The subject site is located along Highway 321 in Gaston, South Carolina, as shown below and on the Site Location Diagram in Appendix A. The proposed site is a combination of two parcels identified as Lexington County Tax Map Numbers 010100-02-004 and 010100-02-027, which are 67.85 and 5.38 acres, respectively. The site is currently undeveloped and is moderately to densely wooded.

According to available topographic information from the Lexington County GIS existing, site grades range from approximately 432 to 460 feet (NAVD 88).

The purpose of this study was to explore the site subsurface conditions and provide preliminary geotechnical recommendations for foundation systems and site grading procedures for evaluating the feasibility of the development at the site.

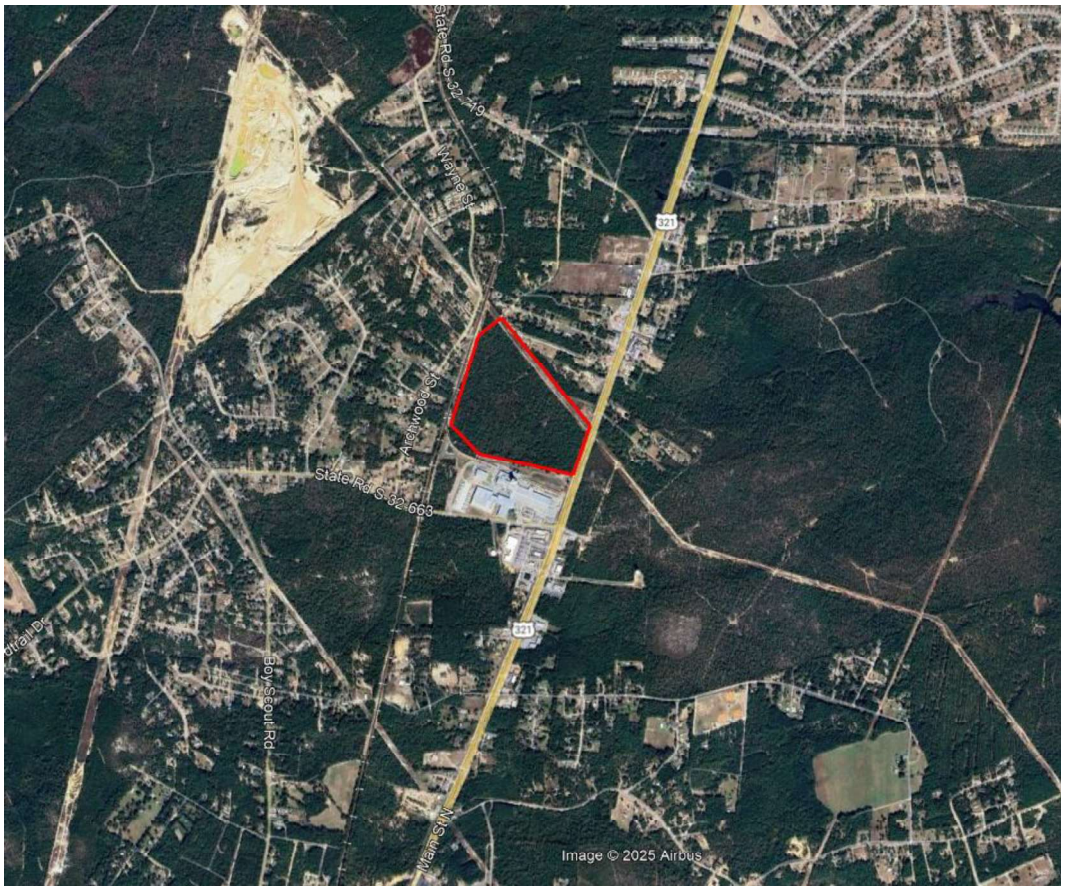


Figure 2-1 Site Location

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 SOIL TEST BORINGS

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the evaluation of geotechnical recommendations.

Five (5) soil test borings were drilled at the project site as shown on the Field Exploration Diagram in Appendix A. The borings were extended to depths of approximately 25 feet below the existing ground surface. The borings were located in the field with handheld GPS technology and their locations indicated on the Field Exploration Diagram should be considered approximate.

The soil test borings were performed using a track mounted Geoprobe 7822 drill rig utilizing hollow stem auger drilling techniques. Representative soil samples were obtained by means of the split-barrel (split-spoon) sampling procedure in accordance with ASTM D1586. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through the 2nd and 3rd 6-inch intervals is termed the Standard Penetration Test (SPT) N-value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can affect the standard penetration resistance value and prevent a direct correlation with drilling crews, equipment and procedures. Split-spoon samples were obtained at 2½-foot intervals within the upper 10 feet of the borings and at 5-foot intervals thereafter.

After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were then sealed in airtight containers and brought to our laboratory.

The drill rig was equipped with an auto-hammer spilt-spoon driving assembly. The auto-hammer generally delivers more energy downhole to the sampler than the standard cat-head driving assembly, therefore, the recorded SPT N-values are lower than the N_{60}-values recorded from using the cat-head assembly. Although the differences in energy will likely vary, it is common to estimate the auto-hammer delivers about 1.3 times the energy of the cat-head assembly. The N-values recorded in the field using the auto-hammer assembly are reported on the soil test boring logs which are included in Appendix B.

3.2 REFRACTION MICROTREMOR SURVEY

A Refraction Microtremor (ReMi) survey was performed at the project site along two (2) ReMi arrays as shown on the Field Exploration Diagram in Appendix A. The data was gathered in the field with standard seismic refraction equipment to measure site characteristics using ambient vibrations (microtremors) as a seismic source. Data was collected using a 24-channel exploration seismograph with 24 geophones at 10-foot spacing. Ten unfiltered 30-second records were recorded along the array. The ReMi array location indicated on the Field Exploration Diagram should be considered approximate.

The data was processed using proprietary SeisOpt® ReMi™ software to reveal a one-dimensional shear-wave (S-wave) velocity image of the subsurface materials beneath the array. The survey also provided the average shear wave velocity to a depth of 100 feet that was used to assess the seismic Site Class in accordance with the International Building Code (IBC). The ReMi Testing Results are included in Appendix B.

3.3 LABORATORY SERVICES

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples in accordance with ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). Classification and index property tests performed included natural moisture content (ASTM D2216) and percent passing sieve number 200 (ASTM D1140).

After identification and classification, the samples were grouped into the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

The laboratory testing was performed in general conformance with the referenced ASTM standards. The Laboratory Testing Summary is included in Appendix C.

4.0 SUBSURFACE CONDITIONS

4.1 REGIONAL/SITE GEOLOGY

The site is located in the Coastal Plain Physiographic Province of South 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 adjacent Piedmont Physiographic Province. 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.

4.2 SUBSURFACE CHARECTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following table provides generalized characterizations of the soil strata encountered during our subsurface exploration. For subsurface information at a specific location, refer to the logs presented in Appendix B.

Stratum	Approximate Bottom of Stratum Depth Range	Description	Range of Resistance Values
Surficial Materials	See Description	Topsoil: 2 to 3 inches	NA
Coastal Plain I	5.5 feet	USCS Classifications: SP and SP-SM.	SPT: 0 to 10 bpf
Coastal Plain II	End of Boring	USCS Classifications: SP, SP-SM, and SC.	SPT: 7 to 53 bpf

Notes: (1) Surficial materials are approximate and should not be relied upon for surficial material removal takeoffs. (2) Resistance Values: SPT – Standard Penetration Test N-values.

Please note that the ground surface elevations shown on the boring logs were not surveyed by a licensed surveyor. These elevations were interpolated using topographic information obtained from the Lexington County GIS website and they should be considered approximate.

4.3 GROUNDWATER OBSERVATIONS

Water levels were measured at the test locations during our field exploration as noted on the logs in Appendix B. Groundwater was not encountered within the termination depths of the borings performed.

Normally, the shallowest groundwater levels occur in late winter and spring and the deepest levels occur in late summer and fall. Groundwater elevations should be expected to vary depending on seasonal fluctuations in precipitation, surface water absorption characteristics, and other factors not readily apparent at the time of our exploration and may be higher or lower than inferred from the recent test boring data.

5.0 PRELIMINARY DESIGN RECOMMENDATIONS

5.1 FOUNDATIONS

Lightly loaded structures (column loads less than 100 kips and wall loads less than 5 kips per linear foot) can likely be supported by shallow foundations bearing on evaluated natural soils or new engineered fill. Moderately loaded structures (column and wall loads of 100 to 300 kips and 5 to 8 kips per linear foot, respectively) will likely require additional testing and detailed settlement analyses to evaluate if shallow foundations are adequate.

Due to variability of soil conditions with depth at each boring location and/or across the borings, and the varying existing ground surface elevations, the net allowable soil bearing pressures will likely vary depending on actual locations of the structures and the design foundation subgrade elevations. For preliminary design purposes, the footings can be sized using a presumptive net allowable bearing pressure of 2,000 psf. A higher net allowable bearing pressure could be achieved depending on the results of the recommended design-phase geotechnical exploration and/or locations of the structures at the site.

Once the final building locations, foundation layout, and foundation loads have been evaluated, this information should be provided to ECS. We may be able to modify these preliminary foundation recommendations once additional project information is available. Also, additional field testing and detailed settlement analyses may increase the recommended design bearing pressure. We request the preliminary unfactored loads and column/bearing wall foundation plans be provided before performing further testing.

5.2 FLOOR SLABS ON GRADE

ECS recommends ground floor slabs be designed as slabs-on-grade over evaluated natural soils or new compacted structural fills that are unyielding when proofrolled. A preliminary modulus of subgrade reaction of 150 psi/in (pci) is recommended for design of floor slabs bearing on firm natural soils and newly placed and properly compacted structural fill soils that can be successfully proofrolled according to the recommendations in this report. This modulus value is appropriate for point loads from vehicle wheels or point loads from equipment and rack posts, legs, and columns. A lower value should be used for distributed loads on floor slabs or equipment pads.

To allow for some relative displacement, the floor slabs should be structurally separated from both columns and load bearing walls. In addition, slabs should be provided with sufficient joints to control cracking associated with concrete volume changes. To help reduce curling of the slab and any resulting cracking, proper curing techniques should be used.

5.3 SEISMIC DESIGN CONSIDERATIONS

In accordance with the 2018 IBC, ASCE 7 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (Vs) method; the Standard Penetration Resistance (N-value) method; and the undrained shear strength (Su) method. The seismic site class definitions for the weighted average of shear wave velocity, SPT N-value, and undrained shear strength in the upper 100 feet of the soil profile are shown in the table below.

Site Class	Soil Profile Name	Shear Wave Velocity, V_s (ft/s)	N-value (bpf)	Undrained Shear Strength, S_u (psf)
A	Hard Rock	$V_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < V_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < V_s \leq 2{,}500$	$N > 50$	$S_u \geq 2000$
D	Stiff Soil Profile	$600 \leq V_s \leq 1{,}200$	$15 \leq N \leq 50$	$1000 \leq S_u \leq 2000$
E	Soft Soil Profile	$V_s < 600$	$N < 15$	$S_u < 1000$

Based on our interpretation of the subsurface conditions encountered, we recommend a preliminary Seismic Site Classification of “D” be used for this site.

5.4 PAVEMENTS

Undisturbed low-plasticity natural soils or newly placed engineered fill can provide adequate support for pavement structures designed for appropriate subgrade strength and traffic characteristics. For the design and construction of pavements, the subgrades should be prepared in accordance with the **Site Construction Recommendations** section of this report.

Based on the results of our soil test borings, it appears that the soils that will likely be exposed as pavement subgrades will likely consist of mainly SAND (SP) and SAND with Silt (SP-SM). A preliminary design CBR value of 6 is recommended for this project. CBR testing should be performed during a final geotechnical study.

The pavement at locations for refuse dumpsters should be properly designed for the high axial loads and twisting movements of the trucks. Consideration should be given to the use of Portland cement concrete (PCC) pavement for the dumpster and approach areas. We recommend that the refuse collector be consulted to evaluate the size and thickness of the concrete pads for dumpsters. At locations where delivery truck, semi-trailers, and/or buses will likely be turning and maneuvering, the flexible pavement section should be designed to resist the anticipated shear stress on the pavement throughout the required pavement service life.

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.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 SUBGRADE PREPARATION

6.1.1 Stripping and Grubbing

The first step in preparing the site for the proposed construction should be to remove existing vegetation or topsoil, and other soft, unsuitable, or deleterious material from the existing ground surface. The borings generally encountered 2 to 3 inches of topsoil. Deeper topsoil or organic laden soils are likely present in wet, low-lying, and poorly drained areas. In wooded areas, root balls may extend as deep as 2 feet or more and will likely require additional localized stripping. ECS should be retained to document that topsoil and other deleterious surficial materials have been removed prior to the placement of engineered fill or construction of structures.

Relatively loose near surface soils were encountered in borings B-01, B-02, B-04, and B-05 and extended to depths ranging from approximately 3 to 5.5 feet below the existing ground surface. As such, the identified soils should be densified in place after clearing, grubbing, and removal of surficial materials but prior to placement of new fill or other at-grade construction. Loose subgrade materials that cannot be adequately densified in-place will likely require undercutting and replacement with new structural fill.

6.1.2 Proofrolling

After removing unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be evaluated by ECS. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons (e.g., fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of ECS. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are yielding or “pumping” subgrade, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. As needed, test pits or hand augers with Dynamic Cone Penetrometer (DCP) testing can be used to further delineate the yielding material identified during proofrolling. Methods of subgrade repair, such as undercutting, moisture conditioning, or installation of geosynthetic fabric or geogrid should be discussed with ECS to evaluate the appropriate procedure with regard to the existing conditions causing the instability.

6.2 EARTHWORK OPERATIONS

6.2.1 Structural Fill Materials

Product Submittals: Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will likely 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.

Structural Fill Materials: Structural fill materials should consist of inorganic soils classified as SM, SC, SW, SP, GM, and GC, or a combination of these group symbols, per ASTM D2487. The materials should not contain organic matter, debris, and particle sizes greater than 3 inches in the largest dimension. Open graded materials, such as Gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Recommended structural fill material should have the properties shown in the table below.

Structural Fill Properties

Location with Respect to Final Grade	LL	PI	% Fines
Building and Pavement Areas	40 max	20 max	40 max

Unsatisfactory Materials: Unsatisfactory fill materials include materials which do not satisfy the requirements for recommended structural fill materials, as well as topsoil and organic materials (OH, OL), elastic Silt (MH), and high plasticity Clay (CH).

On-Site Borrow Materials: The on-site soils meeting the classifications for recommended suitable structural fill, plus meeting the restrictions on separation distances, organic content, and debris, may be used as structural fill. We anticipate that most of the soils encountered in the borings within the anticipated excavation depths can be reused as structural fill. On-site soils used as structural fill will likely require careful moisture control to achieve compaction and stability.

6.2.2 Compaction

Structural Fill Compaction: Structural fill should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -3 and +3% of the soil's optimum moisture content and be compacted to a dry density of at least 95% of the standard Proctor maximum dry density (ASTM D698). Within 24 inches of the finished soil subgrade elevation beneath foundations, slabs on grade, and pavements, structural fill should be compacted to at least 98% of its standard Proctor maximum dry density. ECS should be called to document that the specified fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined at the time of fill placement. Grade controls should be maintained throughout the filling operations. Filling operations should be observed on a full-time basis by ECS to evaluate that the minimum compaction requirements are being achieved. Field density testing of fills should be performed at the frequencies shown in the table below, but not less than 1 test per lift.

Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft. per lift
Pavement Areas	1 test per 5,000 sq. ft. per lift
Utility Trenches	1 test per 100 linear ft. per lift
Outparcels/SWM Facilities	1 test per 5,000 sq. ft. per lift
Other Non-Critical Areas	1 test per 10,000 sq. ft. per lift

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of structural fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned, prior to compaction.

Where fill materials will likely be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts.

6.3 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 2 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: It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to document that the bearing soils are what were anticipated. If loose, soft, or unsuitable soils are observed at the footing bearing elevations, these soils should be removed and replaced prior to concrete placement.

Slab Subgrade Observation: A representative of ECS should be called to observe slab subgrades prior to drainage layer placement to document that adequate subgrade preparation has been achieved. A proofroll using a loaded dump truck should be performed in their presence at that time.

6.4 GENERAL CONSTRUCTION CONSIDERATIONS

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structure and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading prepared subgrade soils and existing pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1% or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to reduce infiltration of surface water.

Excavation Safety: Excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not responsible for construction site safety or the contractor's activities; such responsibility by ECS is not being implied and should not be inferred.

7.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

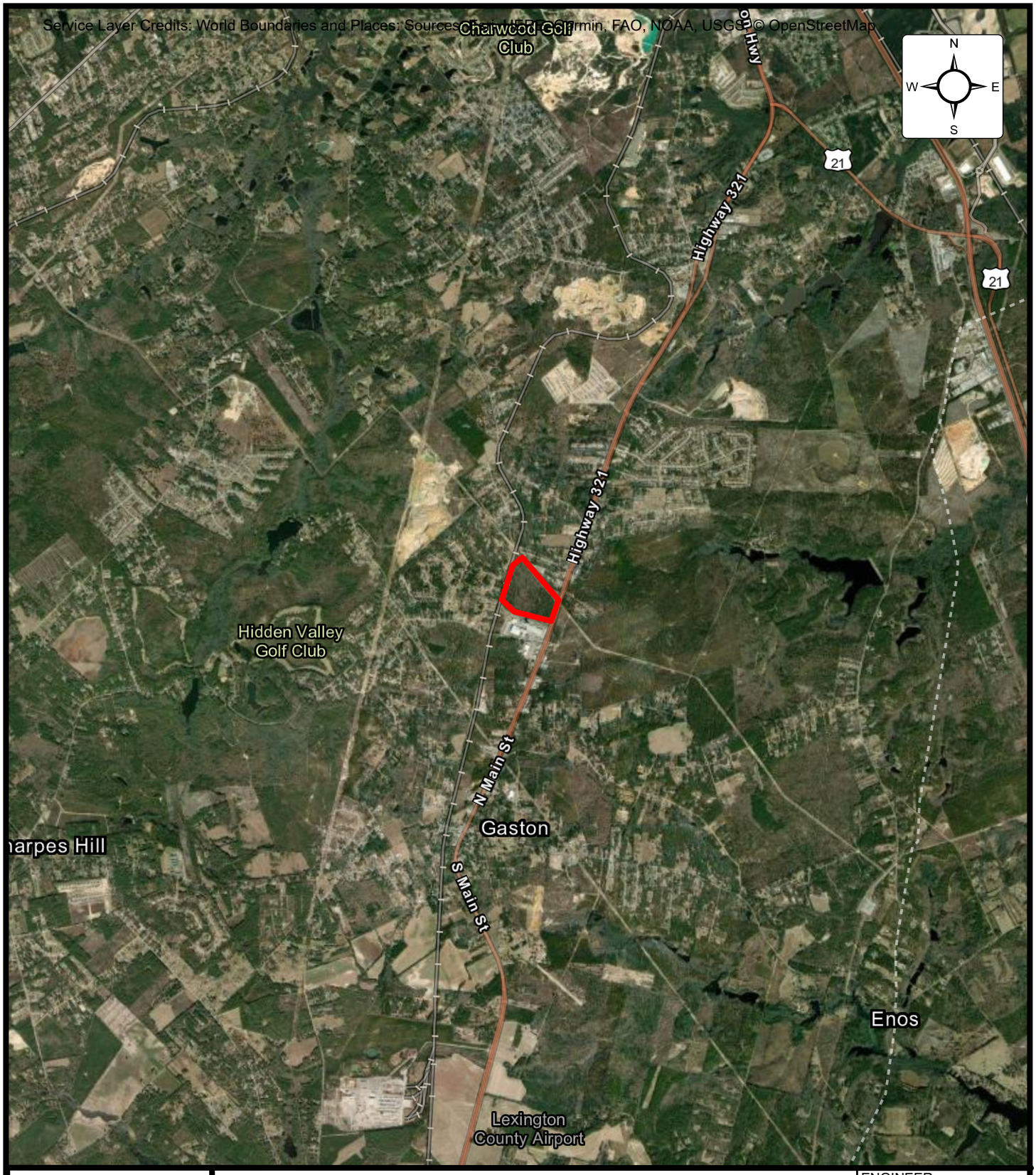
The description of the proposed project is based on information provided to ECS by you. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations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

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

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram
Field Exploration Diagram



SITE LOCATION DIAGRAM
Highway 321 Rail Site

Highway 321, Gaston, South Carolina

Alliance Consulting Engineers, Inc.

ENGINEER	WEG
SCALE	1" = 1mi
PROJECT NO.	38:3162
SHEET	1 of 2
DATE	8/4/2025

LEGEND

STB BORING LOCATION (APPROX)

SEISMIC ARRAY LOCATION (APPROX)

Highway 321 Rail Site

Gaston, SC

FIELD EXPLORATION DIAGRAM

Alliance Consulting Engineers, Inc.

ECS REVISIONS

ENGINEER	DRAFTING
WEG	MRM

SCALE: NTS

PROJECT NO.: 38:3162

SHEET: 2 of 2

DATE: 8/12/2025

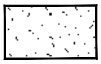
APPENDIX B – Field Operations

Reference Notes for Boring Logs
Soil Test Boring Logs
ReMi Testing Results

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]


ASPHALT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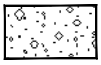
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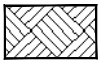
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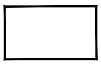
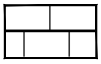
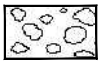
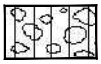

VOID


BRICK

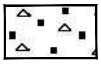

AGGREGATE BASE COURSE

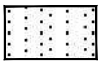

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

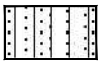

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

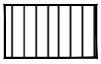

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

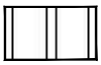

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

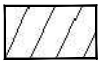

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

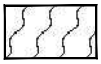

SC **CLAYEY SAND**
sand-clay mixtures

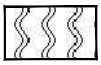

ML **SILT**
non-plastic to medium plasticity

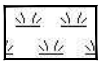

MH **ELASTIC SILT**
high plasticity


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, Q_P[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

GRAVELS, SANDS & NON-COHESIVE SILTS

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

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

WATER LEVELS[6]

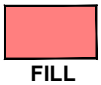

WL (First Encountered)


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.

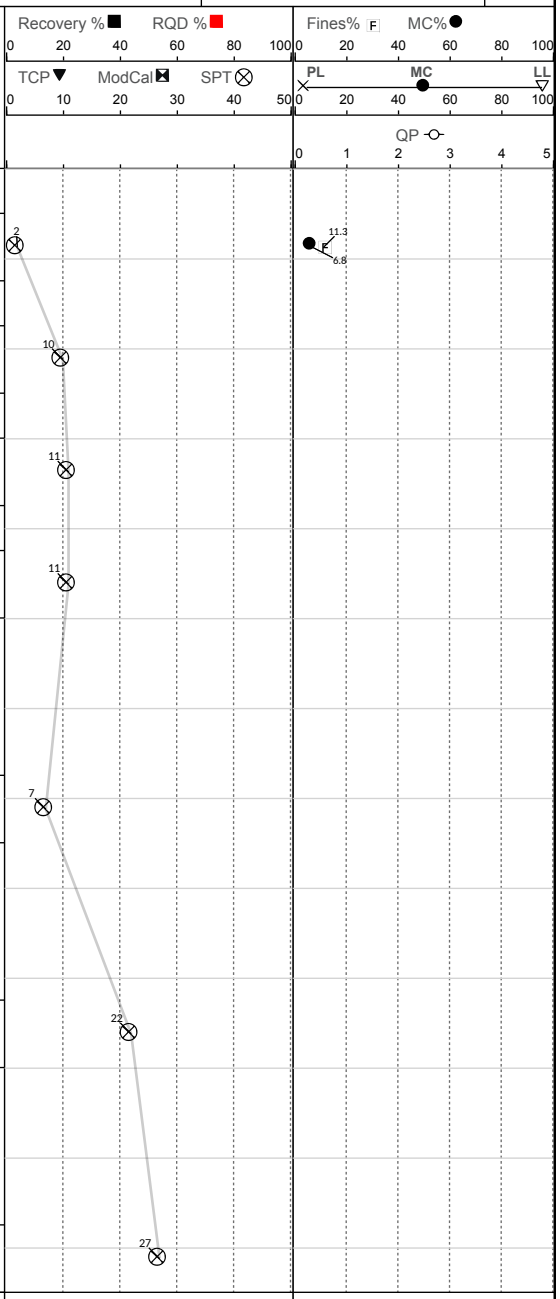
[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the 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:	PROJECT NO.:	BORING NO.:	SHEET:
Alliance Consulting Engineers, Inc.	**38:3162**	**B-01**	**1 OF 1**
PROJECT NAME: **Highway 321 Rail Site**	DRILLER/CONTRACTOR: **W. Walker Environmental**		
SITE LOCATION: **Highway 321, Gaston, South Carolina, 29053**			LOSS OF CIRCULATION: 100%
LATITUDE: **33.840413**	LONGITUDE: **-81.090850**	STRUCTURE:	SURFACE ELEVATION: **448**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT - N VALUE)*
					Topsoil [Thickness=2"].				
	S - 01	SS	18	18	(SP - SM) POORLY GRADED SAND WITH SILT - tan and grey, contains slight roots, moist, very loose to loose.				1 - 1 - 1 (2)
	S - 02	SS	18	18				445	3 - 5 - 5 (10)
5	S - 03	SS	18	18	(SP) POORLY GRADED SAND - orangish tan, moist, loose to medium dense.				3 - 5 - 6 (11)
	S - 04	SS	18	18				440	3 - 4 - 7 (11)
10	S - 05	SS	18	18				435	3 - 3 - 4 (7)
15	S - 06	SS	18	18	(SP - SM) POORLY GRADED SAND WITH SILT - orange, moist, loose to medium dense.			430	3 - 5 - 17 (22)
20	S - 07	SS	18	18	(SP - SM) POORLY GRADED SAND WITH SILT - trace clay, orangish tan, moist, medium dense.			425	9 - 12 - 15 (27)
					END OF BORING AT 25 Ft				



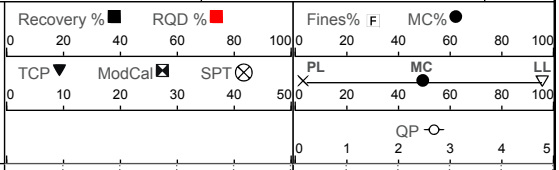
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	NE	BORING STARTED:	08/07/2025	CAVE IN DEPTH:	15FT
WL (Completion):		BORING COMPLETED:	08/07/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	
WL (Stabilized):		Geoprobe 7822	MRM	Hollow Stem Auger (0'-25')	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Alliance Consulting Engineers, Inc.**	PROJECT NO.: **38:3162**	BORING NO.: **B-02**	SHEET: **1 OF 1**
PROJECT NAME: **Highway 321 Rail Site**	DRILLER/CONTRACTOR: **W. Walker Environmental**		
SITE LOCATION: **Highway 321, Gaston, South Carolina, 29053**			LOSS OF CIRCULATION
LATITUDE: **33.842306**	LONGITUDE: **-81.091256**	STRUCTURE:	SURFACE ELEVATION: **432**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT - N VALUE)*
					Topsoil [Thickness=3"].				
	S - 01	SS	18	18	(SP - SM) POORLY GRADED SAND WITH SILT - tan and grey, contains slight roots, moist, very loose.			430	WoH - WoH - WoH
	S - 02	SS	18	18					1 - 2 - 2 (4)
5					(SP) POORLY GRADED SAND - orangish tan, moist, loose.				
	S - 03	SS	18	18				425	2 - 3 - 4 (7)
	S - 04	SS	18	18	(SP) POORLY GRADED SAND - tan and orange, contains slight rock fragments, moist, loose.				3 - 3 - 6 (9)
10								420	
	S - 05	SS	18	18					3 - 4 - 5 (9)
15					(SP) POORLY GRADED SAND - orangish tan and grey, moist, loose.			415	
	S - 06	SS	18	18					3 - 3 - 5 (8)
20								410	
	S - 07	SS	18	18					3 - 4 - 4 (8)
					END OF BORING AT 25 Ft				



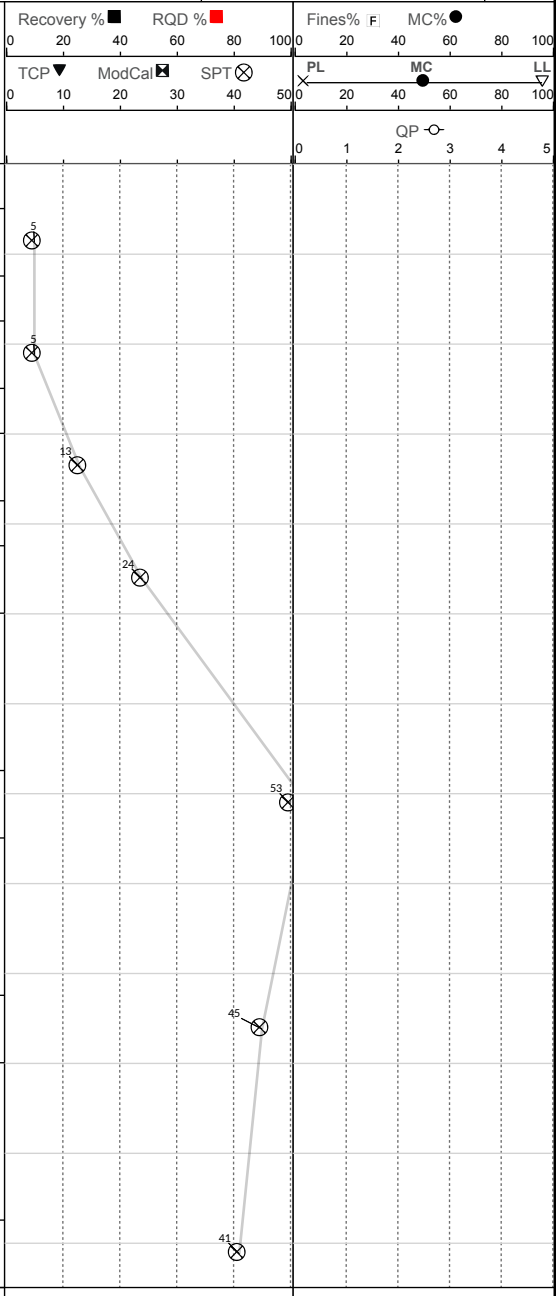
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	NE	BORING STARTED:	08/07/2025	CAVE IN DEPTH:	16FT
WL (Completion):		BORING COMPLETED:	08/07/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:		LOGGED BY:	DRILLING METHOD:
WL (Stabilized):		Geoprobe 7822		MRM	Hollow Stem Auger (0'-25')

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Alliance Consulting Engineers, Inc.	**38:3162**	**B-03**	**1 OF 1**
PROJECT NAME: **Highway 321 Rail Site**	DRILLER/CONTRACTOR: **W. Walker Environmental**		
SITE LOCATION: **Highway 321, Gaston, South Carolina, 29053**			LOSS OF CIRCULATION
LATITUDE: **33.841337**	LONGITUDE: **-81.094642**	STRUCTURE:	SURFACE ELEVATION: **450**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT - N VALUE)*
					Topsoil [Thickness=3"].				
	S - 01	SS	18	13	(SP - SM) POORLY GRADED SAND WITH SILT - tan and grey, contains roots, moist, loose.				2 - 2 - 3 (5)
	S - 02	SS	18	11	(SP - SM) POORLY GRADED SAND WITH SILT - tan, contains slight roots and rock fragments, moist, loose.				2 - 2 - 3 (5)
5	S - 03	SS	18	10	(SC) CLAYEY SAND - orange, moist, medium dense.			445	4 - 5 - 8 (13)
	S - 04	SS	18	12					9 - 11 - 13 (24)
10								440	
	S - 05	SS	18	18	(SP) POORLY GRADED SAND - tan and white and black, moist, dense to very dense.				15 - 23 - 30 (53)
15								435	
	S - 06	SS	18	15					8 - 20 - 25 (45)
20								430	
	S - 07	SS	18	16					6 - 18 - 23 (41)
					END OF BORING AT 25 Ft			425	



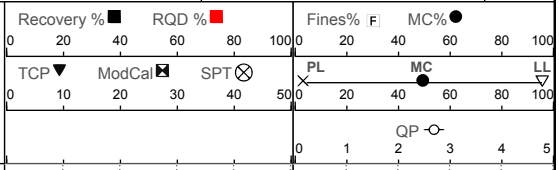
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

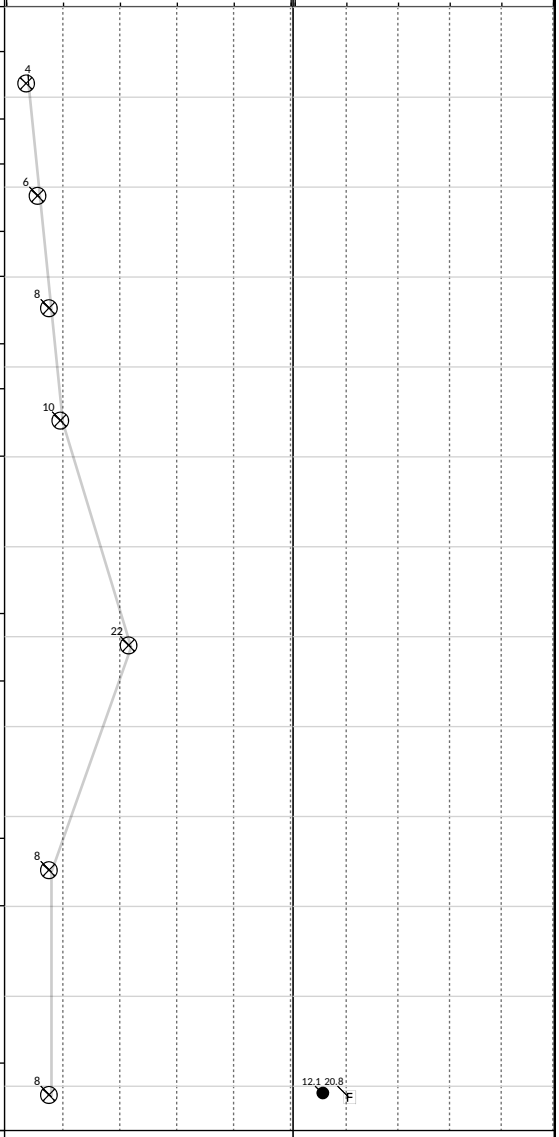
WL (First Encountered):	NE	BORING STARTED:	08/07/2025	CAVE IN DEPTH:	17FT
WL (Completion):		BORING COMPLETED:	08/07/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	
WL (Stabilized):		Geoprobe 7822	MRM	Hollow Stem Auger (0'-25')	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Alliance Consulting Engineers, Inc.**	PROJECT NO.: **38:3162**	BORING NO.: **B-04**	SHEET: **1 OF 1**
PROJECT NAME: **Highway 321 Rail Site**	DRILLER/CONTRACTOR: **W. Walker Environmental**		
SITE LOCATION: **Highway 321, Gaston, South Carolina, 29053**			LOSS OF CIRCULATION
LATITUDE: **33.842926**	LONGITUDE: **-81.093971**	STRUCTURE:	SURFACE ELEVATION: **456**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT - N VALUE)*
					Topsoil [Thickness=2"].				
	S - 01	SS	18	16	(SP) POORLY GRADED SAND - tan and grey, contains roots, moist, very loose to loose.			455	1 - 2 - 2 (4)
	S - 02	SS	18	17					1 - 3 - 3 (6)
5	S - 03	SS	18	18	(SP) POORLY GRADED SAND - tan and grey to orangish tan, moist, loose to medium dense.			450	2 - 4 - 4 (8)
	S - 04	SS	18	18					3 - 5 - 5 (10)
10								445	
	S - 05	SS	18	18					5 - 9 - 13 (22)
15								440	
	S - 06	SS	18	16					4 - 3 - 5 (8)
20								435	
	S - 07	SS	18	13	(SC) CLAYEY SAND - mottled reddish orange and tan, moist, loose.				3 - 4 - 4 (8)
					END OF BORING AT 25 Ft				





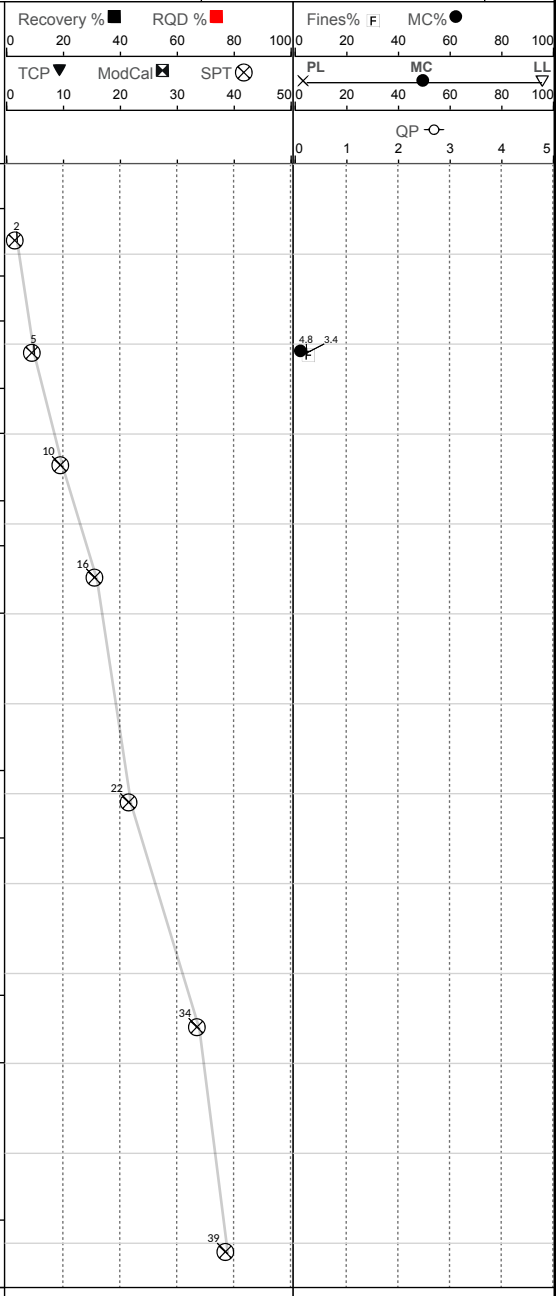
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	NE	BORING STARTED:	08/07/2025	CAVE IN DEPTH:	15FT
WL (Completion):		BORING COMPLETED:	08/07/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:		LOGGED BY:	DRILLING METHOD:
WL (Stabilized):		Geoprobe 7822		MRM	Hollow Stem Auger (0'-25')

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Alliance Consulting Engineers, Inc.**	PROJECT NO.: **38:3162**	BORING NO.: **B-05**	SHEET: **1 OF 1**
PROJECT NAME: **Highway 321 Rail Site**	DRILLER/CONTRACTOR: **W. Walker Environmental**		
SITE LOCATION: **Highway 321, Gaston, South Carolina, 29053**			LOSS OF CIRCULATION
LATITUDE: **33.844545**	LONGITUDE: **-81.093877**	STRUCTURE:	SURFACE ELEVATION: **446**	BOTTOM OF CASING

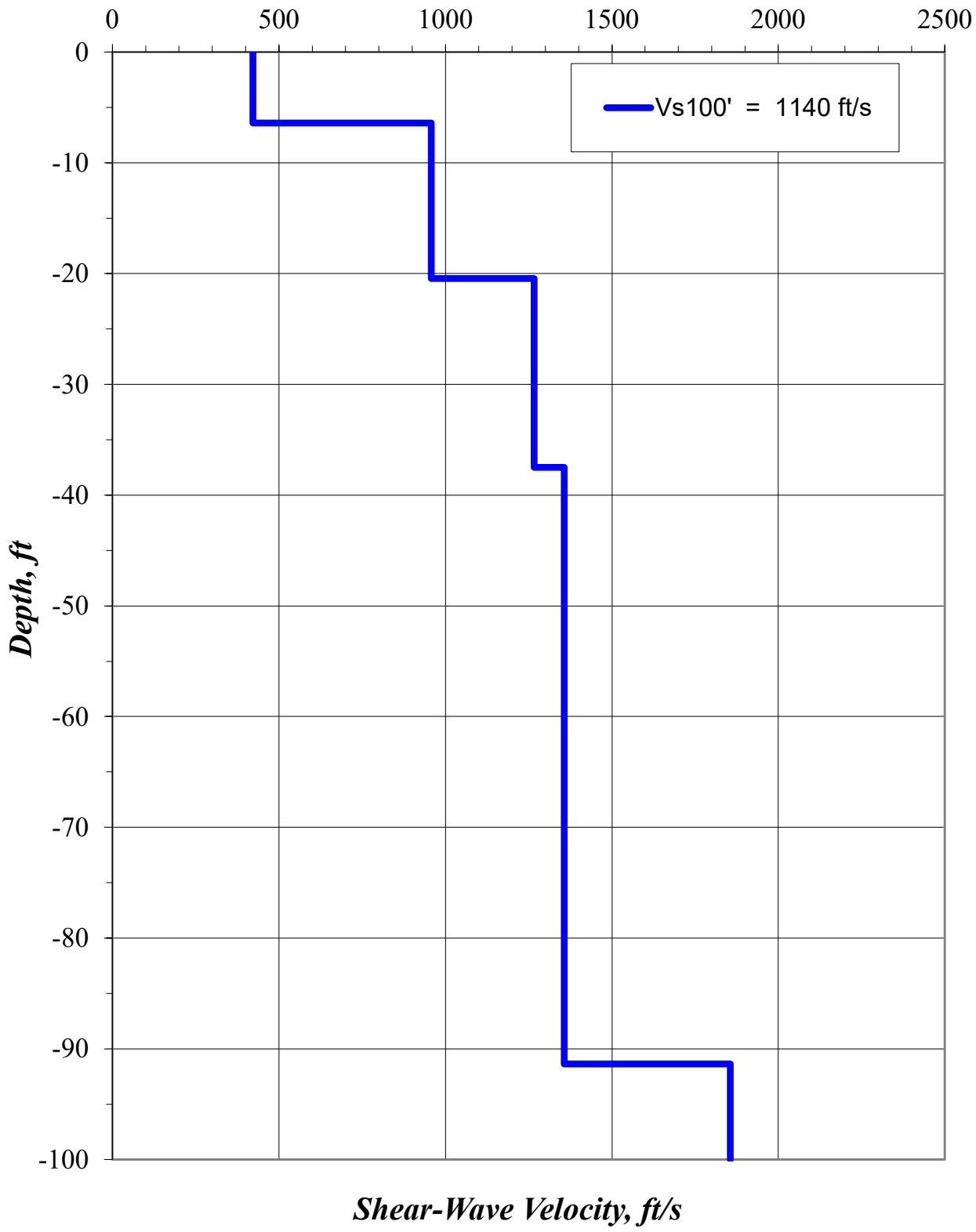
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT - N VALUE)*
					Topsoil [Thickness=2"].				
	S - 01	SS	18	0	(NR), (no recovery)			445	1 - 1 - 1 (2)
	S - 02	SS	18	9	(SP) POORLY GRADED SAND - tan, contains roots, moist, loose.				1 - 2 - 3 (5)
5	S - 03	SS	18	18	(SP) POORLY GRADED SAND - orangish tan and grey, moist, loose.			440	3 - 3 - 7 (10)
	S - 04	SS	18	15	(SP - SM) POORLY GRADED SAND WITH SILT - orangish tan, moist, medium dense.				5 - 6 - 10 (16)
10	S - 05	SS	18	18	(SP) POORLY GRADED SAND - tan and orange, moist, medium dense to dense.			435	8 - 10 - 12 (22)
15	S - 06	SS	18	18	(SP - SM) POORLY GRADED SAND WITH SILT - trace clay, orangish tan, moist, dense.			430	10 - 12 - 22 (34)
20	S - 07	SS	18	18				425	12 - 16 - 23 (39)
					END OF BORING AT 25 Ft				



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

WL (First Encountered):	NE	BORING STARTED:	08/07/2025	CAVE IN DEPTH:	15FT
WL (Completion):		BORING COMPLETED:	08/07/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:		LOGGED BY:	DRILLING METHOD:
WL (Stabilized):		Geoprobe 7822		MRM	Hollow Stem Auger (0'-25')

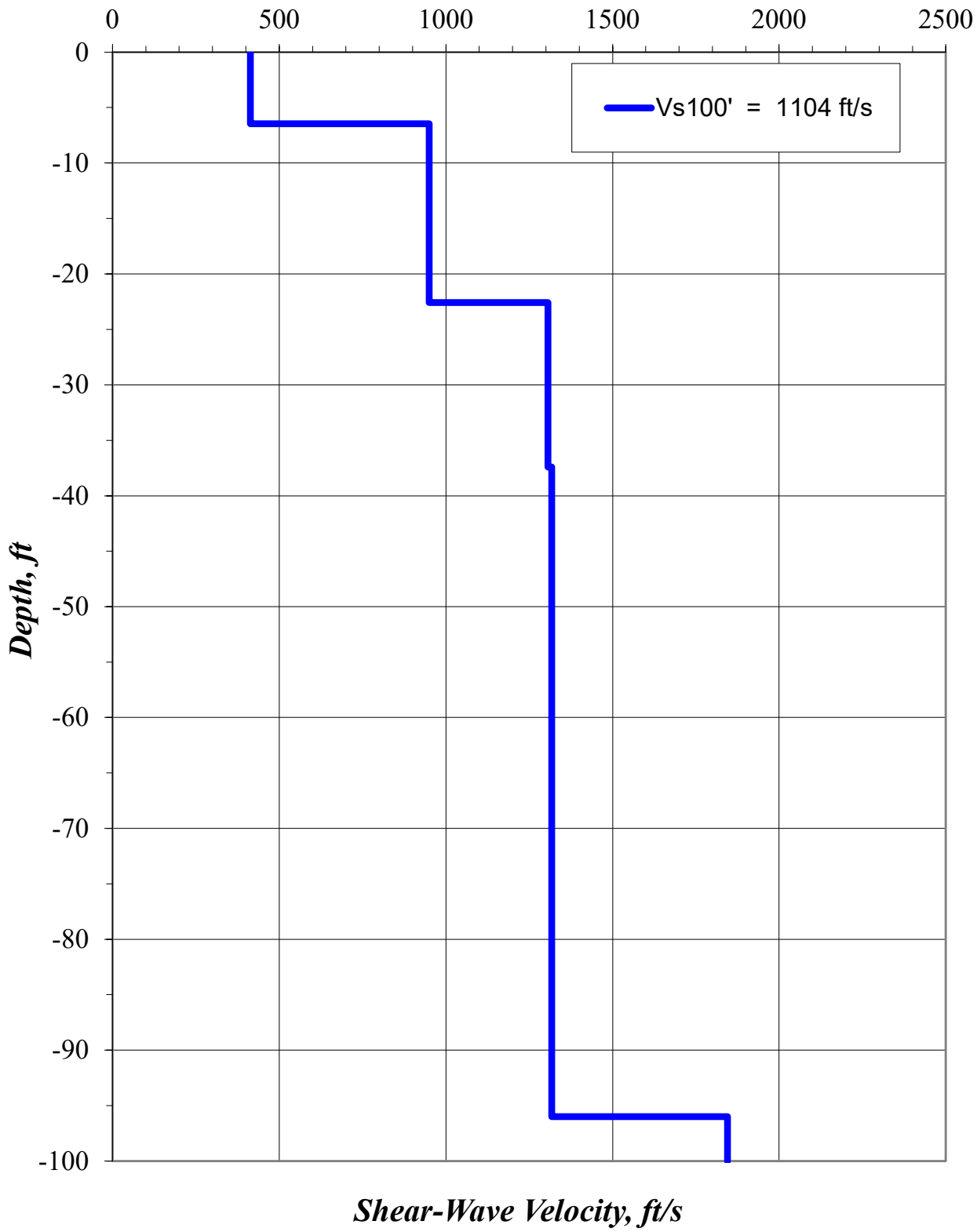
GEOTECHNICAL BOREHOLE LOG



Shear Wave Velocity Model – ReMi Survey

Seismic Testing Results
Array A-01
Site Class 'D'

Highway 321 Rail Site
Hwy 321
Gaston, SC
ECS Project: 38:3162



Shear Wave Velocity Model – ReMi Survey

Seismic Testing Results
Array A-02
Site Class 'D'

Highway 321 Rail Site
Hwy 321
Gaston, SC
ECS Project: 38:3162

APPENDIX C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-01	S-01	1.0-2.5	6.8	SP-SM				11.3					
B-02	S-04	8.5-10.0	5.3	SP-SM				7.5					
B-04	S-07	23.5-25.0	12.1	SC				20.8					
B-05	S-02	3.5-5.0	3.4	SP				4.8					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Highway 321 Rail Site
Client: Alliance Consulting Engineers, Inc.

Project No.: 38:3162
Date Reported: 8/13/2025

Office / Lab	Address	Office Number / Fax
ECS Southeast LLC - Columbia	2031 Industrial Blvd. Lexington, SC 29072	(803)250-3377 (803)750-3174

Tested by	Checked by	Approved by	Date Received
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