March 22, 2022

Development Resource Group, LLC
4703 Oleander Drive
Myrtle Beach, South Carolina 29577

Attention: W. Austin Graham, P.E.

Reference: **Report of Geotechnical Exploration**
New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

Dear Austin:

Our geotechnical exploration was performed pursuant to S&ME Proposal No. 14-1900077-R3, dated February 22, 2022, and authorized by Rob Wilfong on February 22, 2022. This letter report presents the findings of our exploration for the project site, along with our conclusions and recommendations for site preparation, subgrade stabilization, pavement section thickness design, and pavement section construction.

♦ Project Information

Project information was initially provided to Ron Forest, Jr. (S&ME) in an email and telephone call from Austin Graham (DRG) on October 21, 2020. Mr. Graham informed us that Horry County Board of Education plans to purchase a parcel for a bus parking lot, with one small building to be established somewhere on site. An updated site plan was provided to us on February 18, 2022, showing most of the construction at the rear of the site with some future expansion areas toward the front of the site. We understand that any office buildings proposed on site will be portable structures and recommendations for them are not provided in this report.

Site Description

The parcel is approximately 40 acres in land area, TMS# 180-00-01-053, and is located off of George Bishop Parkway in Myrtle Beach, South Carolina. A *Site Vicinity Map* is included in Appendix I as Figure 1.

♦ Exploration and Testing Procedures

Field Exploration

Representatives of S&ME visited the site on February 25, 2022, to observe and test the soil conditions within the planned pavement areas. Using the information provided, we performed the following tasks:

1. We performed a site walkover, observing general features of topography, existing structures, ground cover, and surface conditions at the project site.

2. We established the locations of twelve (12) soil penetration test (SPT) boring locations labeled P-1 through P-12 and advanced each boring to a target depth of 10 feet below the existing ground surface. These borings were advanced using mud rotary drilling techniques in general accordance with geotechnical standard practices.
3. Two composite bulk samples and several small grab samples were collected from the borings for laboratory analysis.
4. Groundwater was measured where encountered within the boreholes at the time of drilling. The boreholes were allowed to stand open over the weekend; upon our return the following Monday, stabilized water levels were measured. After the delayed groundwater levels were measured, the borings were backfilled with soil cuttings to the existing ground surface.

A *Test Location Sketch* which illustrates approximate boring locations is attached as Figure 2 in Appendix I. A brief description of the field exploration procedures performed, as well as a soil classification legend, and soil boring logs are attached in Appendix II.

Laboratory Testing

After the recovered soil samples were transported to our laboratory, a geotechnical professional examined and/or tested each sample to estimate its distribution of grain sizes, plasticity, and moisture condition. The resulting soil classifications are presented on the hand auger boring logs included in Appendix II.

We performed the following quantitative ASTM-standardized laboratory tests to help classify the soil and formulate our conclusions and recommendations. The laboratory tests performed included the following:

- Two composite bulk samples and four split spoon samples were tested in general accordance with ASTM D 2216, "*Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*", to measure the in-situ moisture content of the soil.
- Two composite bulk samples were tested in general accordance with ASTM D 4318, *"Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils"*, to measure the plastic behavior of the soil.
- Two composite bulk samples were tested in general accordance with ASTM D 1140, "*Standard Test Methods for Determining the Amount of Material Finer than No. 200 Sieve by Washing*", to measure the silt/clay fines content of the soil.
- Two composite bulk samples were tested in general accordance with ASTM D 1557, *"Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))"*, to measure the maximum dry density and optimum moisture content of the native soil.
- Two composite bulk samples were tested in general accordance with ASTM D 1883, *"Standard Test Methods for California Bearing Ratio (CBR) of Laboratory-Compacted Soils",* to measure the pavement support value of the native soil.

The laboratory test results are attached in Appendix III. Brief descriptions of the procedures for the above listed tests are also attached to this report in Appendix III.

◆ Surface Conditions

This section of the report describes the general site and surface conditions observed at the time of our exploration.

Ground Coverage and Vegetation

At the time of our exploration, the site primarily consisted of large trees with some smaller interspersed trees. There were also dense shrubs located throughout the site. There were several paths cut throughout the site that contained fallen trees and saplings. The trees ranged from a few feet in height to over 50 feet in height, and were typically larger in the southern portion of the site. The area of the property near the newly developed roadway, Investors Boulevard, appears to have acquired some new fill during the construction of the road.

Topography

Ground surface elevations were not directly surveyed, and no site specific topographic plan was made available to us. Based on visual observation only, the majority of the site appears to be approximately level with surrounding parking lots and drives. There are three ditches on site; one traveling east-west near location P-2 and P-3 on the southern portion of the site, one near location P-1 traveling north-south on the southern portion of the site, and one between P-9 and P-10 traveling east-west on the northern portion of the site. The ditch near P-2 and P-3 appears to be approximately 5 to 6 feet in depth and approximately 15 to 20 feet wide from crest to crest. The ditch near P-1 appears to be approximately 3 feet in depth and approximately 8 to 10 feet wide from crest to crest. The ditch between P-9 and P-10 separates approximately one-fourth of the property closest to George Bishop Parkway from the section further from the main roadway. This ditch appears to be approximately 10 feet in depth and approximately 50 feet wide from crest to crest. A few inches to a few feet of standing water was observed in each ditch at the time of our exploration.

Topsoil

The site surface at the test locations was covered with organic topsoil or rootmat ranging from about 1 inch to 9 inches in thickness, averaging approximately 5 inches across the site. The contractor should expect that stripping and grubbing depths may significantly exceed the average topsoil thickness in some areas. Topsoil thicknesses may vary in unexplored areas of the site and between test locations.

◆ Subsurface Conditions

The generalized subsurface conditions encountered within the borings are described below. For more detailed descriptions and stratifications at a test location, the respective boring logs should be reviewed in Appendix II.

Undocumented Fill Sands

Undocumented fill sands were encountered beneath the topsoil at test locations P-6 and P-8 to a depth of approximately 2 feet. These soils were classified as poorly graded sand (USCS Classification “SP”). These soils were typically brown in coloration and moist upon recovery. Where measured, SPT N values were 5 and 7 blows per foot (bpf), indicating a loose relative density. Bulk Sample BS-2 was obtained from these fill soils.

The CBR result of 12.7 percent was measured in the soils recovered from BS-2, which indicates that the undocumented sandy fill soils should be suitable for direct support of the proposed pavements where at least 18 inches of these soils are exposed upon stripping. Modified Proctor testing indicates that the bulk sample obtained from these soils has an optimum moisture content of 12.2 percent, and moisture content testing indicates that the sample had a natural moisture content of 12.4 percent, indicating that it was very near the optimum moisture content for compaction at the time of our exploration. An additional sample, collected in boring P-8 from a depth of 1 foot to 2 feet, was measured to have a natural moisture content of 14.8 percent, indicating that it was 2.8 percent wet of optimum for compaction.

Coastal Plain Clays and Clayey Sands

Underlying the undocumented fill at test location P-6 and P-8 and beneath the topsoil at each of the other test locations, Coastal Plain deposits generally consisting of lean clay with sand (CL), sandy lean clay (CL), fat clay (CH), and clayey sand (SC) were encountered to the maximum exploration depth of 10 feet. There were also a few seams of silty sand (SM), poorly graded sand with silt (SP-SM), and poorly graded sand with clay (SP-SC), encountered slightly deeper in the borings, typically below depths of 6 to 8 feet. The soils of this stratum were generally a combination of gray, orange, tan, red, or yellow in color and were moist to wet upon recovery.

SPT N values in the clay soils ranged from WOH[1] (weight of hammer) to 11 bpf, indicating very soft to stiff consistency soils. Within the sands, SPT N values ranged from WOH to 12 bpf, indicating a very loose to medium dense relative density.

A CBR value of 4.3 percent was measured in the soils recovered from BS-1, which indicates that these native clayey soils are not typically suitable for direct support of the proposed pavements, so a sandy subbase layer with better strength characteristics is needed where the native clays are exposed upon stripping.

Modified Proctor testing indicates that the bulk sample obtained from these soils has an optimum moisture content of 12.0 percent, and moisture content testing indicates that the sample had a natural moisture content of 20.4 percent, indicating that it was approximately 8.4 percent wet of optimum at the time of our exploration. Several additional samples of this stratum obtained from various locations throughout the site from depths of 1 to 2.5 feet were measured to have natural moisture contents ranging from 21.1 percent to 29.1 percent, indicating that these samples ranged from approximately 9.1 to 17.1 percent wet of the optimum moisture content for compaction.

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[1] Weight-of-hammer, or WOH, indicates that the split-barrel sampler that we use to measure penetration resistance advanced its entire sampling interval under just the static dead weight of the hammer itself, requiring no blows of the hammer to advance the sampler. This indicates a very soft consistency in silty and clayey soils, and a very loose relative density in sandy soils.

Summary of Laboratory Test Results

We performed laboratory testing upon two composite bulk samples and four split spoon samples to confirm the field soil classifications and assess the engineering properties of the subsurface soils, as discussed in the preceding sections of this report. The individual laboratory soil index test results are presented in Appendix III, and the results are summarized in the following table.

Table 1: Summary of Laboratory Testing Results

Boring/ (Sample No.)	Sample Depth (Feet)	Natural Moisture Content (%)	Silt/Clay Fines Content (%)	Atterberg Plasticity Limits (%)			USCS Classification
				LL	PL	PI	
P-1 to P-4/ (BS-1)	0-2.5	20.4	74.4	46	21	25	CL
P-6 & P-8/ (BS-2)	0-2	12.4	3.8	NP	NP	NP	SP
P-1/(SS-1)	1-2.5	21.1	--	--	--	--	CL*
P-5/(SS-1)	1-2.5	28.2	--	--	--	--	CL*
P-8/(SS-1)	1-2	14.8	--	--	--	--	SP
P-10/(SS-1)	1-2.5	29.1	--	--	--	--	CL*

-- Not Tested
* Visually Classified

Table 2: Moisture-Density and CBR Test Results

Sample No.	Modified Proctor (ASTM D 1557)		Natural Moisture Content (%)	CBR at 0.1 in. Penetration and 95% Compaction (%)	Swell upon Saturation (%)
	Maximum Dry Density (pcf)	Optimum Moisture Content (%)			
P-1 to P-4/ (BS-1)	118.2	12.0	20.4	4.3	0.9
P-6 & P-8/ (BS-2)	110.0	12.2	12.4	12.7	0.0

Groundwater

Groundwater was encountered in each of the SPT borings at time of drilling at depths ranging from 1.5 feet to 5 feet. After a period of at least 24 hours, groundwater levels ranged from 3.3 feet to 7 feet below the surface. Due to the mud-rotary drilling method used to advance these borings, the 24-hour water levels may be more representative of actual groundwater levels at the site.

Groundwater levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence water elevations.

The near-surface soil types encountered and their relative low permeability and slow infiltration capacity indicate that this site is susceptible to development of a shallow perched water table during the wet times of the year. Ponded water was observed in a few areas on the site surface.

♦ Conclusions and Recommendations

The conclusions and recommendations included in this section are based on the project information outlined previously and the data obtained during our limited exploration. If conditions are encountered during construction that differ from those encountered at our test locations, then S&ME, Inc. should be retained to review the following recommendations based upon the new information and make any necessary changes.

Based on our exploration results and past experience with similar projects, our recommendations generally relate to site and subgrade preparation to improve available soil support, and construction of new pavement sections comprised of flexible asphalt or rigid concrete pavements, with a graded aggregate base course (GABC) atop properly prepared subgrade soils.

Site and Subgrade Preparation with Geosynthetic Reinforcement

Based on the findings of our exploration, we offer the following recommendations regarding stabilization of the subgrade soil conditions within the site.

1. Drainage should be implemented and maintained as soon as possible prior to construction. Surface and subsurface water conditions at the time of construction, largely influenced by prevailing weather patterns, will determine the need for and extent of drainage measures. Water conditions can change with construction activities and precipitation effects.
    - This site is susceptible to the development of perched groundwater conditions during wet times of the year, and after the vegetation is cleared which will eliminate the vegetation demand for water.
2. Strip surface vegetation, root mat, and organic-laden or debris-laden soils where encountered and dispose of outside the building and pavement footprints.
    - We recommend that you assume an average topsoil stripping depth of at least 6 inches for budgeting purposes. Topsoil stripping to a greater depth will likely need to be performed in the northern end of the site.
3. Because of the poor pavement support capacity of the native clayey soils, we recommend that a subbase layer of sand at least 18 inches thick be constructed within all pavement areas, in order to facilitate proper drainage and support of the pavements.
    A. Subbase soils should consist of imported select sandy fill materials as described in the “Fill Placement and Compaction Requirements” section of this report below.

   B. If design elevations require undercutting in order to achieve the 18-inch sandy subbase zone, care should be taken by the civil designer to provide sufficient drainage paths such as permanent underdrains, so that a "bathtub" situation will not be created within the sandy subbase zone if it is surrounded by the impermeable native clays.

4. **In areas where at least 18 inches of fill sand already exists (near our test locations P-6 and P-8):** After removal of the topsoil, the exposed subgrade at the cut surface grade should be densified in place using a heavy roller making multiple passes under dry surface conditions.

   A. Recompact the previously placed fill soils in place to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557).
   B. It is typically preferable to use a vibratory smooth drum roller on sands; however, if water begins to seep up through the subgrade, cease vibratory compaction and operate the roller on static mode only.

5. After the surface densification has been performed in existing sandy fill areas, and after the ground has been cut to grade to accommodate the new subbase fill zone in the native clay areas, but *prior to the placement of any new fill or base materials*, have a representative of the Geotechnical Engineer observe the prepared surface for stability. This may consist of a visual observation of a proofroll, performed by the contractor, in all areas to receive fill or base. Where needed based upon the results of the proofroll, it may become necessary to perform additional selective undercutting or further stabilization prior to fill placement by other means as determined by the Geotechnical Engineer. This should be a decision made at the time of construction in consultation with the Geotechnical Engineer based upon the conditions observed.

   A. Proofrolling should be conducted only during dry weather and after drainage has been allowed time to function.
   B. Earthwork should be observed by a representative of the Geotechnical Engineer, so that recommendations regarding the undercut depth can be made at the time of construction.
   C. We recommend that you establish a unit price for undercut of unstable subgrade soils and replacement with select imported fill on a per cubic yard basis in advance of the work, and establish a contract mechanism to allow for undercut/replace in the event that unstable areas are identified during the proofroll and the Engineer recommends the removal and replacement of the unstable materials.
   D. If a suitable, stable subgrade condition cannot be achieved using the site preparation techniques described above, then a soil-reinforcing geosynthetic may be required to be placed on the cut subgrade in order to help stabilize the native soils sufficiently to allow the first lift of fill material to be placed and compacted into the excavation. We recommend that you obtain a unit price for the following geotextiles and their installation from the contractor at bid time, to prepare for this contingency. If it is desired to reduce the risk of change orders during construction, you may wish to go ahead and incorporate the installation costs of one of these geosynthetics into the base design and bid quantity for the project:

- TenCate Mirafi woven soil-reinforcing geotextile model HP-370, or TerraTex model HPG-37, used for moderate instability applications.
- TenCate Mirafi woven soil-reinforcing geotextile model HP-570, or TerraTex model HPG-57, used for moderate to moderately severe instability applications.
- Tensar Corp. soil-reinforcing bi-axial geogrid model BX-1200, used for severe instability applications.

Fill Placement and Compaction Requirements

The contractor should plan to import all borrow from offsite. Where new fill soils are placed on this project site, the following recommendations apply:

1. Imported fill soils that are used to build up the ground for pavements should meet the following minimum requirements:

   A. Plasticity index of 6 percent or less (ASTM D 4318).
   B. Clay/silt fines content of not greater than 15 percent by weight (ASTM D 1140).
   C. Natural moisture content within plus or minus 2 percent of the optimum moisture content at the time of delivery (ASTM D 1557). Note: Imported fills outside of this moisture range may need to be moisture-conditioned prior to placement or compaction.
   D. Soaked California Bearing Ratio (ASTM D 1883) of at least 10 percent when remolded in the laboratory to 95 percent of the soil's modified Proctor maximum dry density (ASTM D 1557).
   E. Acceptable fill materials may include soils from the following ASTM soil classifications: SC, SM, SW, SP, SW-SM, SP-SM, SW-SC, and or SP-SC. However, not all soils in these categories will comply with the requirements of A through D above, so each soil must be tested.

2. Structural fill placed under pavements should be compacted to at least **95 percent** of the maximum dry density as defined by ASTM D1557 *"Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))"*.

   A. Compacted soils must not exhibit pumping or rutting under equipment traffic.
   B. Loose lifts of fill should be no more than 10 inches in thickness prior to compaction (limited to 6 inches if using small, hand-operated equipment such as a walk-behind vibrating plate tamp or pneumatic "jumping jack" tamp).
   C. At the discretion of the Geotechnical Engineer, it may be acceptable to place a somewhat thicker lift of fill as the first lift of material over top of a soil-stabilizing geosynthetic, where applicable. This should be a field decision made at the time of construction based upon the circumstances observed at the time.

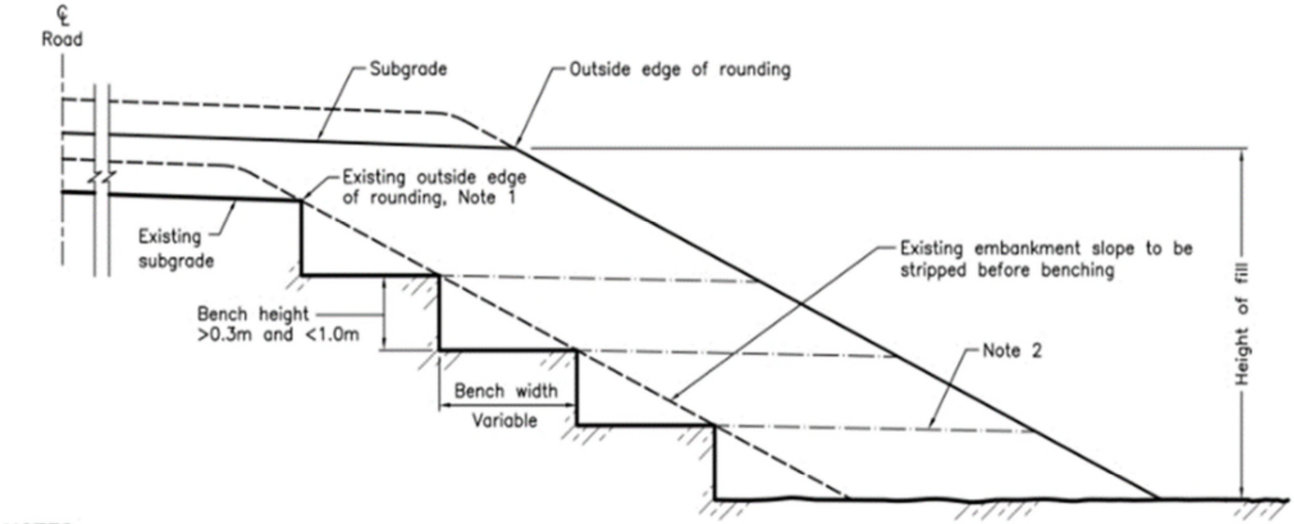
3. Fill placement should be observed by an S&ME soils testing technician working under the guidance of the Geotechnical Engineer.

   A. At least one field density (compaction) test should be performed at least once per 10,000 square feet in parking lot areas, with a minimum of 2 tests per lift per area.

Ditch Filling

The ditches that traverse the site will need to be mucked of all soft sediments prior to fill placement in this area. The side slopes of any ditches must also be properly benched to accommodate the placement of new fill in horizontal lifts. Fill placed within these areas should be notched into the embankment using a benching procedure as shown in Figure 1 below, and the fill lifts shall be placed horizontally into the benches or notches. It is not recommended to place the fill in diagonal lifts parallel to the embankment slope, because this method decreases the stability of the fill and could create a slip plane. Once prepared, have a representative of the Geotechnical Engineer observe ditch excavations prior to backfilling, to confirm that they are in a suitable condition to receive new fill.

Figure 1: Example Benching Diagram for Slopes <3H:1V



NOTES:

1. When the subgrade is below the existing outside edge of rounding, benching shall be carried out below the point where the subgrade intersects the existing slope.
2. Benches are to be excavated one level at a time and the fill placed and compacted before the next bench is excavated.

Pavement Section Design and Construction

We understand that the new site pavements will consist of either flexible pavements using hot-mixed asphalt (HMA) or rigid pavements using Portland cement concrete (PCC) and may or may not be joint reinforced.

Flexible pavement design assumes an initial serviceability of 4.2 and a terminal serviceability index of 2.0, and a reliability factor of 90 percent. ESALs per axle were estimated using data provided in AASHTO literature. Assuming that only SCDOT approved source materials will be used in flexible pavement section construction, we used a structural layer coefficient of 0.44 for the HMA layers and a coefficient of 0.18 for the graded aggregate base course (GABC). A sub-base drainage factor of 1 and a CBR value of 10 percent was used under the assumption that at least 18 inches of structural sandy subbase fill will be supporting the pavement section.

Rigid pavement design assumes an initial serviceability of 4.5 and a terminal serviceability index of 2.5, and a reliability factor of 80 percent. For the reinforced sections, we have assumed that appropriately designed load transfer devices (dowel baskets) will be used at the construction joints, resulting in an average load transfer coefficient (J) value of 3.2. For the unreinforced sections, we have assumed that load transfer devices will not be used at the construction joints, resulting in an average J value of 3.8. We also assumed a minimum 28-day design compressive strength of at least 4,000 psi for the PCC. A sub-base drainage factor of 1.0 was assigned, based upon the assumption that that at least 18 inches of structural sandy subbase fill will be supporting the pavement section

For the ‘all weather gravel access road’ indicated on the site plan, the gravel thickness computations were made using the AASHTO method, assuming an initial serviceability of 4.2 and a terminal serviceability index of 2.0, and a reliability factor of 80 percent. Assuming that only SCDOT approved source materials will be used in the construction of the fire drive, we used a structural layer coefficient of 0.18 for the graded aggregate base course (GABC).

Traffic frequency and loading data was not provided prior to our issuing this report; however, based on our experience with similar projects and the provided site plan, we estimate that site pavements may experience traffic as follows:

- Up to 215 unloaded school buses, each with 10 one-way trips per week, for 40 weeks per year, for 20 years. The average vehicle factor used in this calculation was 1.65, 18-kip Equivalent Single Axle Loads (ESALs) per pass, which represents empty buses carrying no students, and results in approximately 2,838,000 ESALs over the 20 year lifespan.
- Up to 1 fuel truck with 5 one-way trip per week, for 40 weeks per year, for 20 years. The average vehicle factor used in this calculation was 3.00, 18-kip ESALs per pass, resulting in approximately 12,000 ESALs over the 20 year life span.
- Up to 1 garbage truck with 1 one-way trip per week, for 40 weeks per year, for 20 years. The average vehicle factor used in this calculation was 4.00, 18-kip ESALs per pass, resulting in approximately 3,200 ESALs over the 20 year life span.
- Up to 208 passenger cars and light trucks, each with 10 one-way trips per week, for 40 weeks per year, for 20 years. The average vehicle factor used in this calculation was 0.004, 18-kip ESALs per pass, resulting in approximately 6,700 ESALs over the 20 year life span.

Based on the estimated total service life demand of about 2,860,000 ESALs, we estimate that the pavement sections shown in Table 3 below should be sufficient to carry the anticipated traffic loading with reasonable factors of safety. For the bus parking stalls and parking row lanes, the total ESAL demand has been reduced by 50 percent to account for distributed traffic under the assumption that no single parking lane would experience the entire traffic flow regime.

Table 3: Pavement Section Alternatives for 20 Year Design Life[(a)]

Pavement Area	Pavement Type	Theoretical Available Traffic Capacity (ESALs)	HMA Surface Course (inches)	HMA Intermediate Course (inches)	4,000 PSI Concrete Pavement (inches)	SCDOT Section 305 Graded Aggregate Base Course (inches)	Minimum Select Sandy Subbase Fill Layer (inches)
Employee Parking Only	Light Duty Flexible (HMA)	77,000	2.0 (Type C)	---	---	6.0	18
	Light Duty Rigid (Unreinforced)	131,000	---	---	5.0	4.0	18
Bus Parking Row Lanes and Stalls (50% traffic)	Standard Duty Flexible (HMA)	2,321,000	1.5 (Type B)	2.0 (Type B)	---	10.0	18
	Standard Duty Rigid (Unreinforced)	1,601,000	---	---	8.0	4.0	18
	Standard Duty Rigid (Doweled Joints)	1,391,000	---	---	7.0	4.0	18
Primary Bus Travel Lanes (100% traffic)	Heavy Duty Flexible (HMA)	3,567,000	2.0 (Type B)	2.0 (Type B)	---	10.0	18
	Heavy Duty Rigid (Unreinforced)	3,192,000	---	---	9.0	4.0	18
	Heavy Duty Rigid (Doweled Joints)	2,881,000	---	---	8.0	4.0	18
All Weather Access Road	Light Duty Gravel	4,900	---	---	---	6.0[(b)]	18

(a)Single-stage construction and soil compaction as recommended is assumed; S&ME, Inc. must observe pavement subgrade preparations and pavement installation operations.
(b)It is recommended to install a layer of TenCate Mirafi HP-370 woven geotextile on top of the subgrade beneath the base course layer of the all-weather access road to help maintain the integrity of the gravel section long term and to help prevent rutting under the load of a fire truck.

If the actual ESAL demand is found to be greater than the theoretical ESAL capacity values shown in Table 3, then the pavement section thicknesses may need to be adjusted and we should be contacted to perform further calculations.

There may be other ways to reduce the pavement section thickness for the rigid pavement options, including increasing the design compressive strength of the concrete, and/or including continuous steel bar reinforcement in the slabs. Please contact us if you would like these alternative approaches evaluated further.

It must be recognized that the traffic values assumed, including the vehicle types and trip frequencies, are assumed values based upon our experience and the information you provided to us, and are not based upon any known traffic studies. If the actual traffic demand is greater than the number of ESALs described herein, then the pavement section(s) may need to be thickened as a result.

Permanent Underdrains

1. In order to provide permanent stabilization for pavements and mitigate perched groundwater, underdrain systems are recommended to be designed for the pavement area subgrades (parking lots and roadways).
2. The site civil engineer should be consulted regarding the type and location of the underdrains. Our experience is that two types of underdrain systems are commonly used in this locality, depending upon the traffic application and the preferences of the civil engineer. One commonly used system is a gravel-filled, fabric-wrapped trench containing an embedded perforated plastic HDPE pipe. Another type of system that we see used is an edge drain product such as AdvanEdge by ADS, Inc. This is a fabric-wrapped, perforated HDPE slot style drain. Some engineers have used a combination of these two systems. Typically, the underdrains are tied into the storm water system to maintain positive gravity flow.
3. Do not fill any landscaped islands in the parking lot with clayey or silty (impermeable) spoils that may impede the movement of water into the underdrains.

See Figure 3 in Appendix I for an example of an underdrain detail for your consideration.

General Soil Recommendations for Pavement Areas

1. At least one laboratory California Bearing Ratio (CBR) test should be performed upon a representative soil sample of each soil type which is planned to be used as pavement subgrade material. This is to establish the relationship between relative compaction and CBR for the soil in question.
2. All new fill placed in pavement areas should be compacted as recommended in the *"Fill Placement and Compaction Requirements"* section.
3. All pavements should have a subbase layer under the GABC. The subbase layer shall consist of a minimum of 18 inches of sandy fill material meeting the requirements described in Item 1 of the "*Fill Placement and Compaction Requirements*" section of this report, including that the soil must exhibit a CBR value of at least 10 percent when properly compacted.

Base Course and Pavement Section Construction

The following recommendations are provided for base course and pavement section construction:

1. Prior to placement of base course stone, all exposed pavement subgrades should be methodically proofrolled at final soil subgrade (FSG) elevation by the contractor under the observation of the Geotechnical Engineer (S&ME), and any identified unstable areas should be repaired as directed. Pavement subgrades should not exhibit significant rutting or pumping under the proofroll load. Unstable areas shall be undercut and replaced and/or otherwise stabilized as directed by the engineer.
2. Crushed stone aggregate base material used in pavement section construction should consist of graded aggregate base course (GABC) as defined by Section 305 of the South Carolina Department of

Transportation Standard Specifications for Highway Construction (2007). The base course should be compacted to at least 100 percent of the modified Proctor maximum dry density (SC-T-140).

- Do not substitute Coquina shell style base course or recycled Portland cement concrete for the specified GABC material.

3. After placement of the GABC layer, the surface should be methodically proofrolled at final base grade (FBG) elevation by the contractor under the observation of the Geotechnical Engineer (S&ME). The base course material should not exhibit pumping or rutting under equipment traffic. Rutting or pumping areas shall be removed and replaced as directed by the engineer.
4. Heavy compaction equipment is likely to be required in order to achieve the required degree of base course compaction, and the moisture content of the material will likely need to be maintained near its optimum moisture content in order to facilitate proper compaction.
5. Construct the surface and intermediate course HMA in accordance with the specifications of Sections 401, 402, and 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction (2007 edition).
6. Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed.
7. Experience indicates that a thin surface overlay of asphalt pavement may be required in about 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding, and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.
8. For rigid pavements, we recommend air-entrained ASTM C 94 joint-reinforced Portland cement concrete that achieves a minimum compressive strength of at least 4,000 psi at 28 days after placement, as measured by ASTM C 39. We also recommend that the pavement concrete be constructed in a manner which at least meets the minimum standards recommended by the American Concrete Institute (ACI).
9. We recommend that at least 1 set of 5 cylinder test specimens be cast by S&ME per every 100 cubic yards of pavement concrete placed, or at least once per placement event, in order to measure achievement of the design compressive strength. We also recommend that a certified S&ME concrete technician be present on site to observe the concrete placement activities.

◆ Limitations of this Report

This report has been prepared in accordance with generally accepted engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, pavement, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and pavement construction activities.

Closure

S&ME, Inc. appreciates the opportunity to have provided our services on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

S&ME, Inc.

Jeremy Lighthall, E.I.T.
Staff Professional

S&ME, INC.
No. C00473

Ronald P. Forest, Jr., P.E.
Principal Engineer
Registration No. SC 21248

No. 21248
3/22/22
RON FOREST JR.

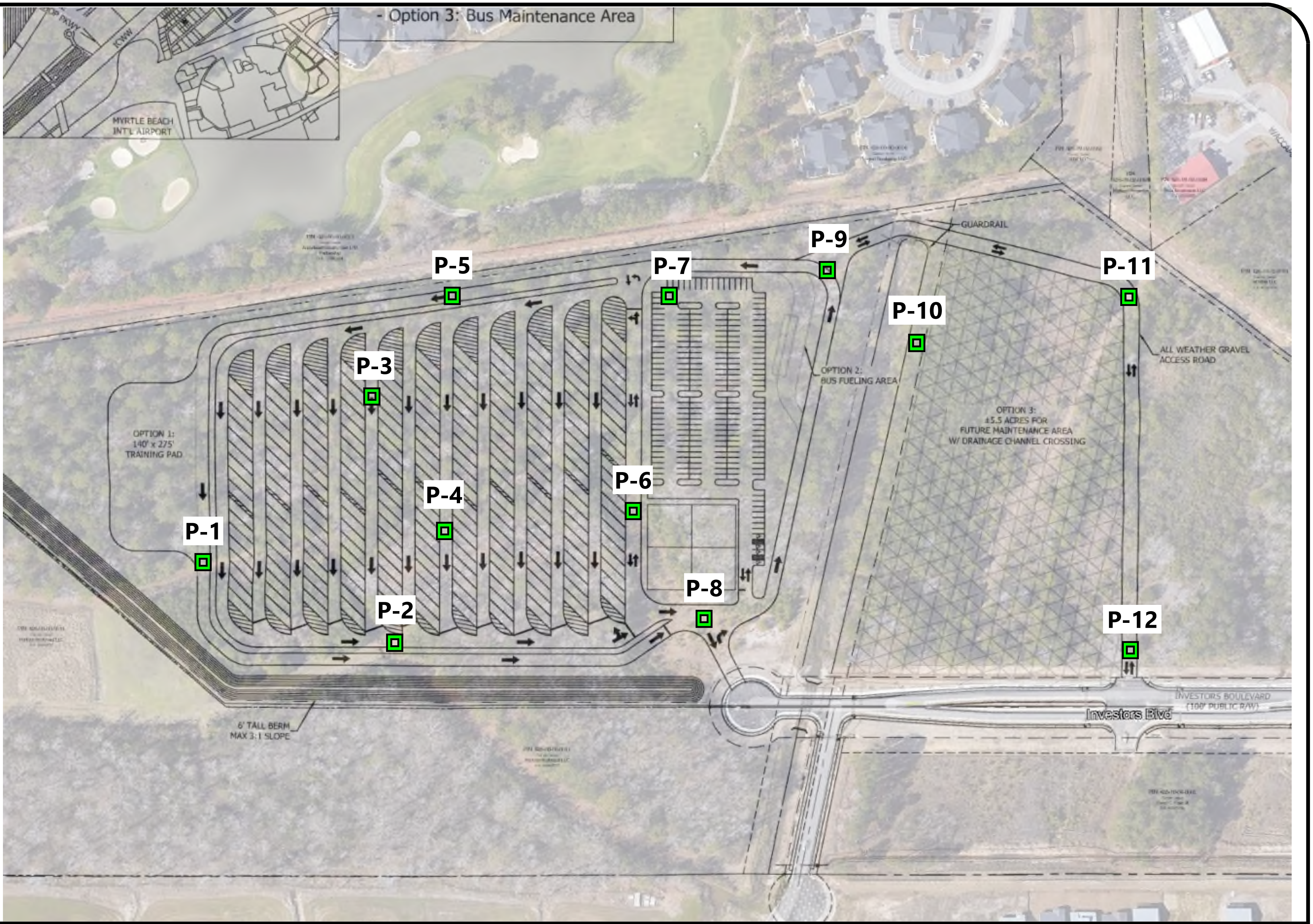
Attachments: Appendices I, II, and III

Appendix I – Figures

Site Vicinity Map

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina

SCALE:	AS SHOWN
DATE:	3-7-2022
PROJECT NO.	206209
FIGURE NO.	1



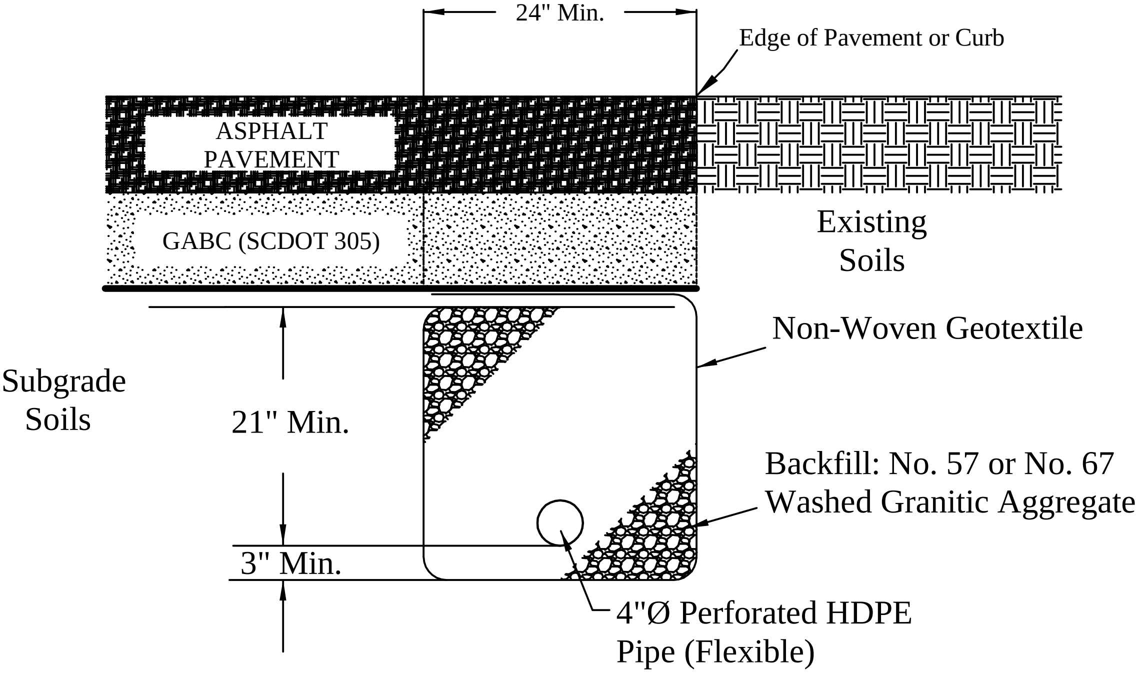
LEGEND

🟩 **10' SPT Boring**

Test Location Sketch

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina

SCALE: AS SHOWN
DATE: 3-7-2022
PROJECT NO. 206209
FIGURE NO. 2



Scale: NTS	**Typical Underdrain Detail** **Bus Parking Lot for HCS** **Myrtle Beach, South Carolina**	FIGURE NO. **3**
Checked By: RPF		
Drawn By: KEF	**Project Number: 206209**	
Date: March 15, 2022		

Appendix II – Field Exploration Procedures and Results

◆ Summary of Exploration Procedures

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-18, "*Standard Guide for Site Characterization for Engineering Design and Construction Purposes*." The boring and sampling plan must consider the geologic or topographic setting. It must consider the proposed construction. It must also allow for the background, training, and experience of the geotechnical engineer. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- Reconnaissance of the Project Area
- Preparation of Exploration Plan
- Layout and Access to Field Sampling Locations
- Field Sampling and Testing of Earth Materials
- Laboratory Evaluation of Recovered Field Samples
- Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

◆ Reconnaissance of the Project Area

We walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

Checks for Hazardous Conditions - State law requires that we notify the South Carolina (SC 811) before we drill or excavate at any site. SC 811 is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. SC 811 forwarded our location request to the participating utilities. Location crews then marked buried lines with colored flags within 72 hours. They did not mark utility lines beyond junction boxes or meters. We checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

◆ Boring and Sampling

Soil Test Boring with Mud Rotary Drilling

Soil sampling and penetration testing were performed in general accordance with ASTM D1586, "Standard Test Method for Penetration Test and Split Barrel Sampling of Soils. Rotary drilling processes were used to advance the hole and a heavy drilling fluid was circulated in the bore holes to stabilize the sides and flush the cuttings. At regular intervals, drilling tools were removed and soil samples were obtained with a standard 1.4 inch I. D., two-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Water Level Measurement

Subsurface water levels in the boreholes were measured during the onsite exploration and after a period of 24 hours by measuring depths from the existing grade to the current water level using a tape, where encountered.

Backfilling of Boreholes

Upon completion of the boreholes and measurement of the water level in the hole, borings were backfilled to the existing ground surface.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

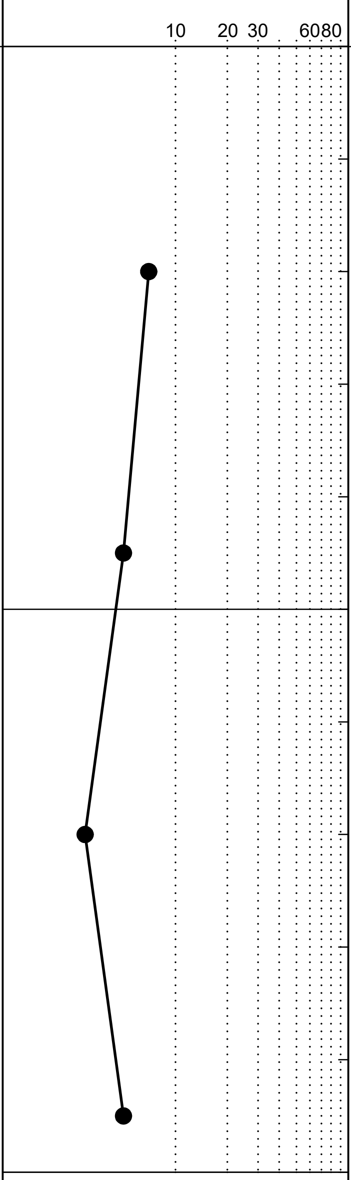
MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	●	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			○	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	⁘	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			⁖	SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	⁝	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▤	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			〰	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			■	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-1

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **3.5' ATD, 4.5' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**



DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 6 inches thick.								
	▨	**LEAN CLAY WITH SAND (CL)** - Mostly low to medium plasticity fines, few fine sand, trace organics, gray and orange, moist, firm.			SS-1		2	3	4	7
	▨	- - - - Gray, orange, and red.	▽ ▼		SS-2		1	2	3	5
5	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some medium to high plasticity fines, gray, wet, very loose.			SS-3		WOH	1	2	3
	▨	**POORLY GRADED SAND WITH SILT (SP-SM)** - Mostly fine to medium sand, few non plastic fines, gray, wet, loose.			SS-4		1	2	3	5
10		Boring terminated at 10 ft Target Depth								

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3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-2

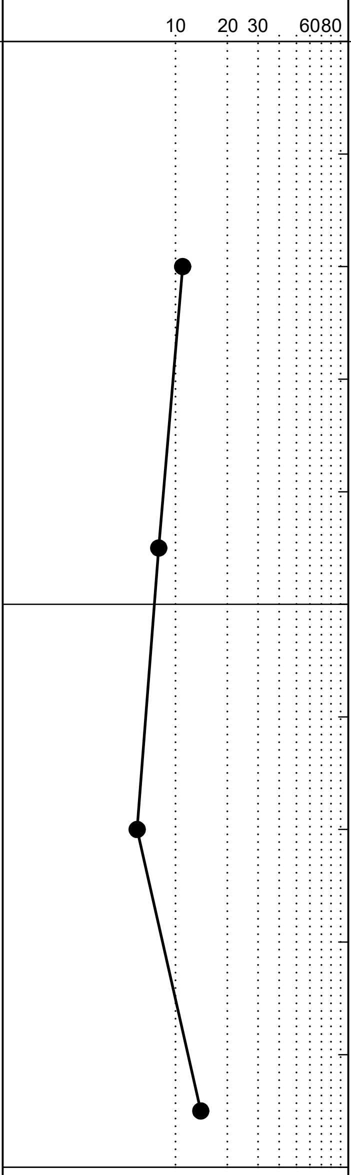
DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **2' ATD, 5.25' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL
	ROOTMAT - Approximately 1 inch thick.	
	LEAN CLAY WITH SAND (CL) - Mostly low to medium plasticity fines, few fine sand, trace organics, gray, orange, and red, moist, stiff.	▽
5	**CLAYEY SAND (SC)** - Mostly fine sand, some low to medium plasticity fines, gray, moist, loose.	▼
	POORLY GRADED SAND WITH CLAY (SP-SC) - Mostly fine sand, few low to medium plasticity fines, gray, wet, loose.	
10	**POORLY GRADED SAND WITH SILT (SP-SM)** - Mostly fine to medium sand, few non plastic fines, gray, wet, medium dense.	
	Boring terminated at 10 ft Target Depth	

SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
SS-1	3	6	5	11
SS-2	1	4	4	8
SS-3	1	3	3	6
SS-4	3	6	8	14

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

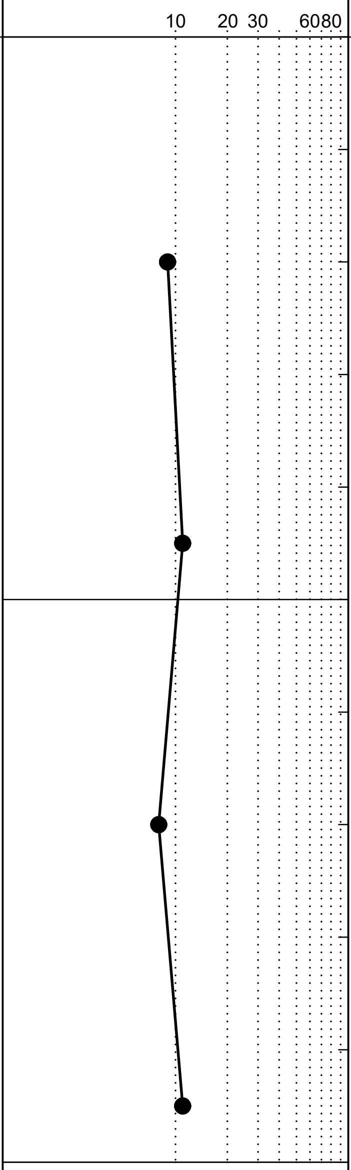
BORING LOG P-3

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **3' ATD, 6.5' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 6 inches thick.								
	▨	**LEAN CLAY WITH SAND (CL)** - Mostly low to medium plasticity fines, few fine sand, dark gray, orange, and red, moist, stiff.			SS-1	⧗	3	4	5	9
	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some low to medium plasticity fines, orange and red, moist, medium dense.	▽		SS-2	⧗	3	5	6	11
5	▨	- - - - Gray and red, wet, loose.	▼		SS-3	⧗	1	3	5	8
	⁘	**POORLY GRADED SAND WITH SILT (SP-SM)** - Mostly fine to medium sand, few non plastic fines, gray, wet, medium dense.			SS-4	⧗	1	5	6	11
10		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

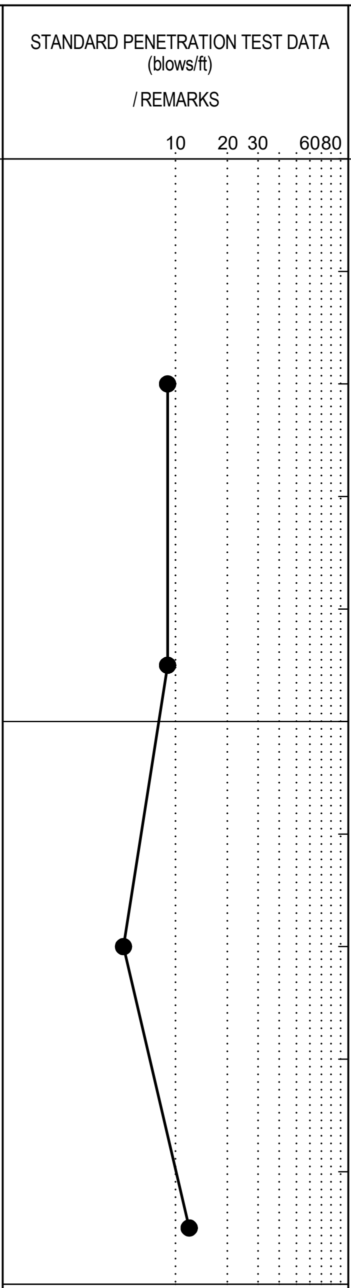
BORING LOG P-4

DATE DRILLED: **2/25/22**	ELEVATION:	NOTES: **Elevation unknown.**
DRILL RIG: **CME 45**	BORING DEPTH: **10.0 ft**	
DRILLER: **B. Powell**	WATER LEVEL: **3' ATD, 4.75' 24hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **J. Lighthall**	
SAMPLING METHOD: **Split Spoon**		
DRILLING METHOD: **Mud Rotary**		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	 2nd 6in / REC	 3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 5 inches thick.								
	▨	**LEAN CLAY WITH SAND (CL)** - Mostly low to medium plasticity fines, few fine sand, gray and orange, moist, stiff.			SS-1	⧗	2	4	5	9
			∇							
			▼		SS-2	⧗	1	4	5	9
5										
	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some low to medium plasticity fines, gray, wet, loose.			SS-3	⧗	1	2	3	5
	▨	**POORLY GRADED SAND WITH CLAY (SP-SC)** - Mostly fine to medium sand, few low to medium plasticity fines, gray, wet, medium dense.			SS-4	⧗	2	5	7	12
10		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft)

/ REMARKS



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New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

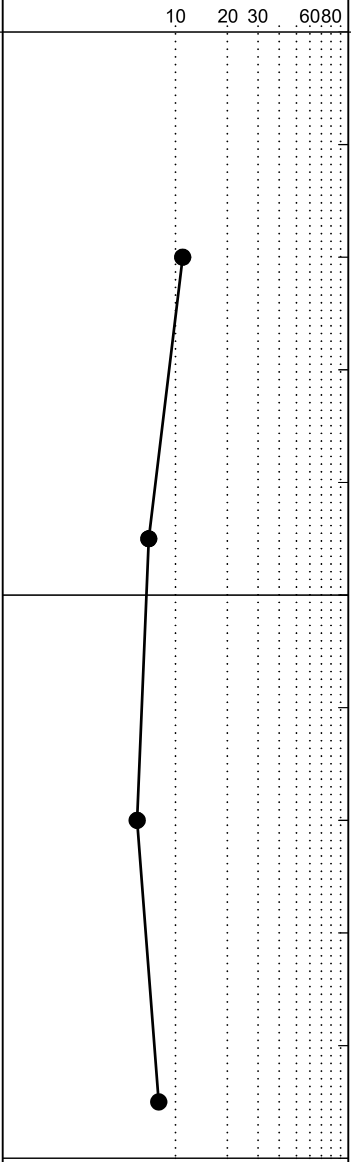
BORING LOG P-5

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **4' ATD, 5.5' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	TOPSOIL - Approximately 4 inches thick.							
	LEAN CLAY WITH SAND (CL) - Mostly low to medium plasticity fines, few fine sand, gray and orange, moist, stiff.			SS-1	3	5	6	11
	- - - - Light gray, firm.	∇		SS-2	1	3	4	7
5		▼						
	CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, gray, wet, loose.			SS-3	1	3	3	6
	POORLY GRADED SAND WITH SILT (SP-SM) - Mostly fine to medium sand, few non plastic fines, gray, wet, loose.			SS-4	3	3	5	8
10	Boring terminated at 10 ft Target Depth							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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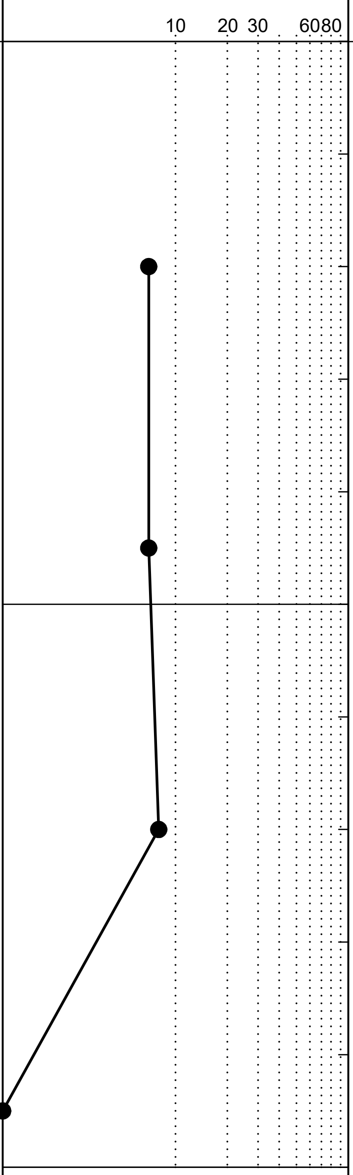
New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-6

DATE DRILLED: **2/25/22**	ELEVATION:	NOTES: **Elevation unknown.**
DRILL RIG: **CME 45**	BORING DEPTH: **10.0 ft**	
DRILLER: **B. Powell**	WATER LEVEL: **2.5' ATD, 6' 24hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **J. Lighthall**	
SAMPLING METHOD: **Split Spoon**		
DRILLING METHOD: **Mud Rotary**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	TOPSOIL - Approximately 4 inches thick.							
	FILL **POORLY GRADED SAND(SP)** - Mostly fine to medium sand, trace non plastic fines, dark brown, moist, loose.			SS-1	2	3	4	7
	SANDY LEAN CLAY (CL) - Mostly low to medium plasticity fines, some fine sand, gray, moist, firm. - - - - Gray orange and red.	∇						
	- - - - Wood fragments at 4.5 feet.			SS-2	1	3	4	7
5		▼						
	CLAYEY SAND (SC) - Mostly fine to medium sand, some medium to high plasticity fines, gray, wet, loose.			SS-3	1	3	5	8
	- - - - Gray and brown, very loose.			SS-4	WOH	WOH	WOH	WOH
10	Boring terminated at 10 ft Target Depth							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

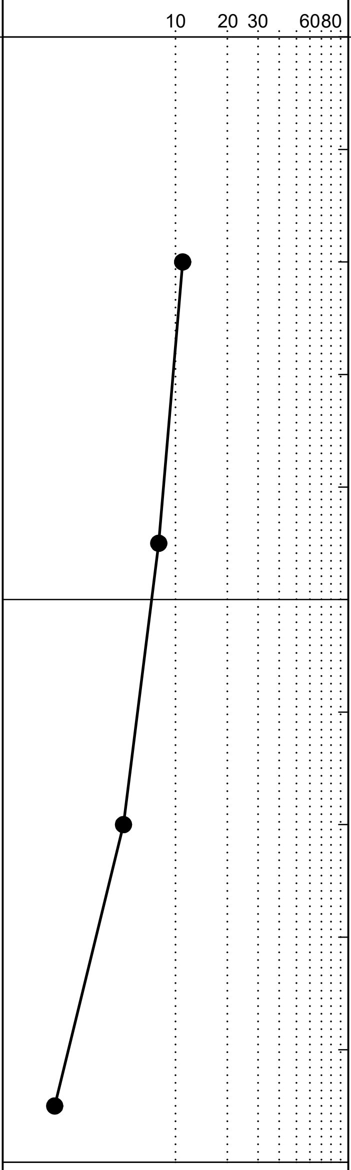
BORING LOG P-7

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **4' ATD, 6.5' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 8 inches thick.								
	▨	**SANDY LEAN CLAY (CL)** - Mostly low to medium plasticity fines, some fine sand, gray and orange, moist, stiff.			SS-1	⧗	3	4	7	11
5	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some low to medium plasticity fines, gray and orange, moist, loose.	▽		SS-2	⧗	2	3	5	8
	▨	**SILTY SAND (SM)** - Mostly fine sand, some non plastic fines, light gray, wet, loose.	▼		SS-3	⧗	2	3	2	5
	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some medium to high plasticity fines, gray, wet, very loose.			SS-4	⧗	WOH	WOH	2	2
10		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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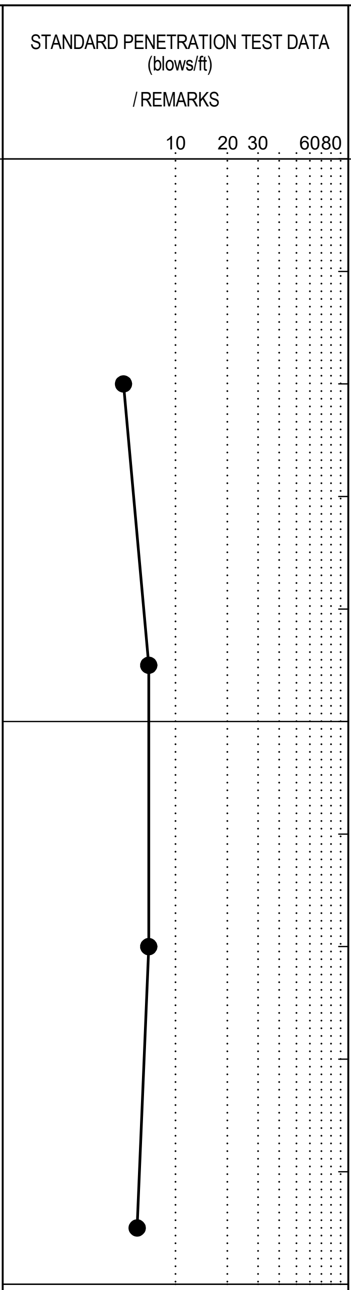
New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-8

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **2' ATD, 6.25' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	TOPSOIL - Approximately 4 inches thick.							
	FILL **POORLY GRADED SAND(SP)** - Mostly fine to medium sand, trace non plastic fines, dark brown, moist, loose.	▽		SS-1	2	2	3	5
	SANDY LEAN CLAY (CL) - Mostly low to medium plasticity fines, some fine sand, gray, moist, firm. - - - - Some organics from 2 feet to 2.25 feet. - - - - Gray, orange, and red.			SS-2	2	3	4	7
5	- - - - Gray, wet.	▼		SS-3	1	3	4	7
	CLAYEY SAND (SC) - Mostly fine to medium sand, some medium to high plasticity fines, gray, wet, loose.			SS-4	2	3	3	6
10	Boring terminated at 10 ft Target Depth							



NOTES:

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2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

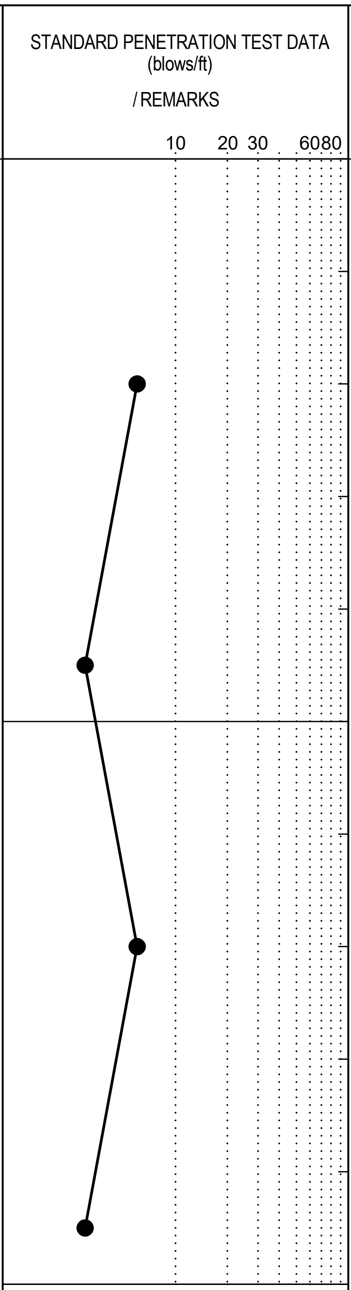
New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-9

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **5' ATD, 6' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	TOPSOIL - Approximately 9 inches thick.							
	LEAN CLAY WITH SAND (CL) - Mostly low to medium plasticity fines, few fine to medium sand, gray and orange, moist, firm.			SS-1	1	3	3	6
	- - - - Soft.			SS-2	WOH	1	2	3
5		∇						
	CLAYEY SAND (SC) - Mostly fine sand, some medium to high plasticity fines, light gray and tan, wet, loose.	▼		SS-3	1	3	3	6
	SILTY SAND (SM) - Mostly fine to medium sand, some non plastic fines, some shell, gray, wet, very loose.			SS-4	1	1	2	3
10	Boring terminated at 10 ft Target Depth							



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3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

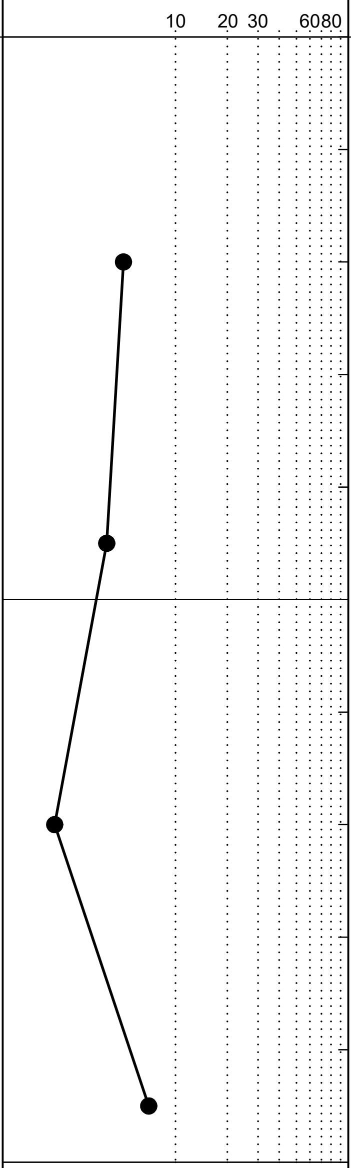
BORING LOG P-10

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **2.25' ATD, 5.5' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 5 inches thick.								
	▨	**SANDY LEAN CLAY (CL)** - Mostly low to medium plasticity fines, some fine sand, gray and yellow, moist, firm.								
	▨		▽		SS-1	⧗	1	2	3	5
	▨	- - - - Tan and light gray, wet, soft.								
	▨				SS-2	⧗	1	1	3	4
5	▨		▼							
	▨	- - - - Very soft.								
	▨				SS-3	⧗	1	1	1	2
	▨	**CLAYEY SAND (SC)** - Mostly fine to medium sand, some low to medium plasticity fines, gray, wet, loose.								
	▨				SS-4	⧗	3	4	3	7
10		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



S&ME BORING LOG \ SPT.GPJ \ LIBRARY 2011_06_28.GDT \ 3/15/22

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2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

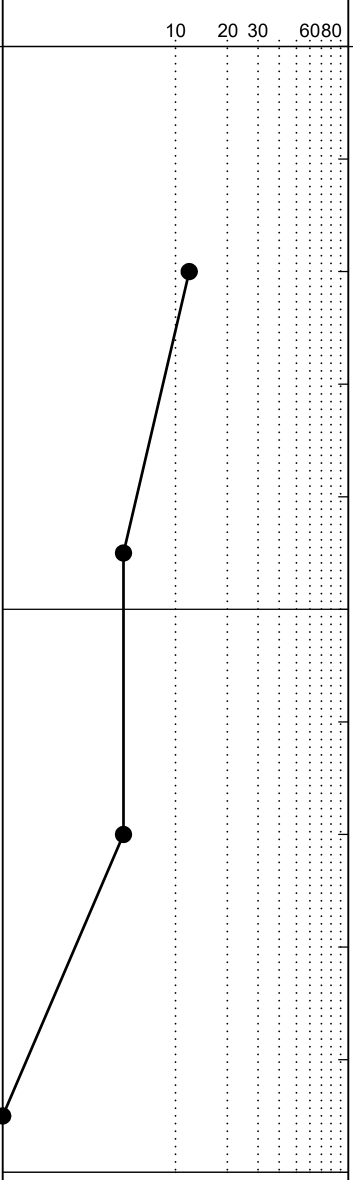
New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

BORING LOG P-11

DATE DRILLED: **2/25/22**	ELEVATION:	NOTES: **Elevation unknown.**
DRILL RIG: **CME 45**	BORING DEPTH: **10.0 ft**	
DRILLER: **B. Powell**	WATER LEVEL: **3' ATD, 7' 24hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **J. Lighthall**	
SAMPLING METHOD: **Split Spoon**		
DRILLING METHOD: **Mud Rotary**		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 3 inches thick.								
	▨	**CLAYEY SAND (SC)** - Mostly fine to medium sand, some low to medium plasticity fines, trace shell, gray, moist, medium dense. Disturbed soil, possible fill. - - - - Brick encountered at 1 foot.			SS-1	⧗	5	6	6	12
	▨	**SANDY LEAN CLAY (CL)** - Mostly low to medium plasticity fines, some fine sand, gray and yellow, moist, firm.	∇		SS-2	⧗	1	2	3	5
5										
	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some medium to high plasticity fines, gray, wet, loose.	▼		SS-3	⧗	WOH	2	3	5
	▨	**FAT CLAY (CH)** - Mostly high plasticity fines, some shell, trace fine sand, gray, wet, very soft.			SS-4	⧗	WOH	WOH	WOH	WOH
10		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

New Bus Parking Lot for HCS
Myrtle Beach, South Carolina
S&ME Project No. 206209

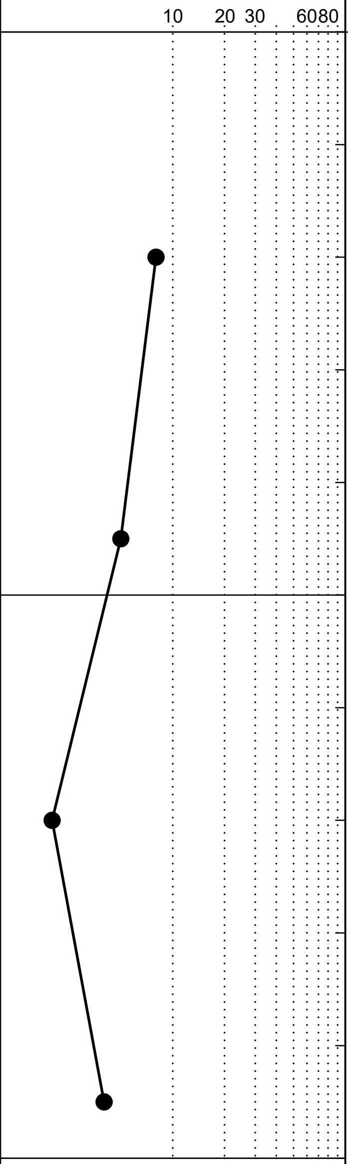
BORING LOG P-12

DATE DRILLED: **2/25/22**
ELEVATION:
DRILL RIG: **CME 45**
BORING DEPTH: **10.0 ft**
DRILLER: **B. Powell**
WATER LEVEL: **1.5' ATD, 3.3' 24hr**
HAMMER TYPE: **Auto**
LOGGED BY: **J. Lighthall**
SAMPLING METHOD: **Split Spoon**
DRILLING METHOD: **Mud Rotary**

NOTES: **Elevation unknown.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	🟩	**TOPSOIL** - Approximately 5 inches thick.								
	▨	**CLAYEY SAND (SC)** - Mostly fine sand, some low to medium plasticity fines, gray and orange, moist, loose.	▽		SS-1	⧗	2	4	4	8
	▨	**SANDY LEAN CLAY (CL)** - Mostly low to medium plasticity fines, some fine sand, gray, wet, firm.	▼		SS-2	⧗	1	2	3	5
5										
	▨	- - - - Very soft.			SS-3	⧗	WOH	1	1	2
	▨	**SILTY SAND (SM)** - Mostly fine to medium sand, some non plastic fines, some shell, gray, wet, very loose.			SS-4	⧗	WOH	2	2	4
10										
		Boring terminated at 10 ft Target Depth								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



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Appendix III – Laboratory Test Procedures and Results

♦ Summary of Laboratory Procedures

Examination of Recovered Soil Samples

Soil and field records were reviewed in the laboratory by the geotechnical professional. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, "*Standard Practice for Description and Identification of Soils (Visual-Manual Method)*". Representative soil samples were selected for classification testing to provide grain size and plasticity data to allow classification of the samples in general accordance with the Unified Soil Classification System method described in ASTM D 2487, "*Standard Practice for Classification of Soils for Engineering Purposes*". The geotechnical professional also prepared the final boring and sounding records enclosed with this report.

Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D 2216, "*Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass*." This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D 2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent.   No attempt was made to exclude any particular particle size from the portion split from the sample.

Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D 1140, "*Standard Test Method for Amount of Material Finer Than the No. 200 Sieve*." Method B, using a hexametaphosphate solution to pre-soak the specimen for at least 2 hours, was used to prepare the sample. The sample is then washed through the No. 200 sieve the percentage by weight of material washed through the sieve was deemed the "percent fines" or percent clay and silt fraction.

Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D 4318, "*Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.*" Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the *liquid lim*it of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The *plastic limit* defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The *plasticity index* (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D 4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semi-log paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D 4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D 2216.

Compaction Tests of Soils Using Modified Effort

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 1557,"*Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lbf/ft^3).*"

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 10 lbf rammer dropped from a height of 18 inches, producing a compactive effort of 56,000 lbf/ft^3. ASTM D 1557 provides three alternative procedures depending on material gradation:

Method A

All material passes No. 4 sieve size
4 inch diameter mold
Shall be used if 20 percent or less by weight is retained on No. 4 sieve
Soil in 5 layers with 25 blows per layer

Method B

All material passes 3/8 inch sieve
4 inch diameter mold
Shall be used if 20 percent by weight is retained on the No. 4 sieve and 20 percent or less by weight is retained on the 3/8 Inch sieve.
Soil in 5 layers with 25 blows per layer

Method C

All material passes ¾ inch sieve
6-inch diameter mold
Shall be used if more than 20 percent by weight is retained on the 3/8 inch sieve and less than 30 percent is retained on the ¾inch sieve.
Soil in 5 layers with 56 blows per layer

Soil was compacted in the mold in five layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the *maximum dry density* and *optimum moisture content* to be determined from the resulting curvilinear relationship.

Laboratory California Bearing Ratio Tests of Compacted Samples

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D 1883, "*Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils*." Specimens were prepared in standard molds using two different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold, each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.10 inches, the test was repeated by reversing the specimen and shearing the opposite end surface.

Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #: 206209 Report Date: 3/14/2022
Project Name: New Bus Parking Lot for HCS Test Date(s): 3/2/2022
Client Name: Development Resource Group, LLC
Client Address: 4703 Oleander Drive, Myrtle Beach, South Carolina
Sample by: J. Lighthall Sample Date(s): 2/25/2022

Method: **A (1%)** ☐ **B (0.1%)** ☑
Balance ID. 19608 Calibration Date: 2/28/21
Oven ID. 17745 Calibration Date: 4/5/21

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft. or m.		grams	grams	grams	grams	%	
P-1 to P-4	BS-1	0-2.5'	UUU	81.2	167.9	153.2	14.70	20.4%	
P-6 to P-8	BS-2	0-2'	Debbie	98.1	307.8	284.7	23.10	12.4%	
P-1	SS-1	1-2.5'	GHI	83.3	229.7	204.2	25.50	21.1%	
P-5	SS-1	1-2.5'	TTT	82.1	150.3	135.3	15.00	28.2%	
P-8	SS-1	1-2'	SSS	84.5	294.2	267.2	27.00	14.8%	
P-10	SS-1	1-2.5'	Puce	85.2	267.4	226.3	41.10	29.1%	

Notes / Deviations / References

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Ron Forest, P.E. — *Technical Responsibility*
RPF — *Signature*
Principal Engineer — *Position*
3/15/2022 — *Date*

Form No: TR-D1140-1
Revision No. 1
Revision Date: 8/2/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s):	3/2/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		
Sample by:	J. Lighthall	**LAB#**	524
		Sample Dates:	2/25/2022

Method; A ☐ **B** ☑ Soaked ☑ Soak Time 2 Hrs

Boring #	Sample #	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
		ft. or m.		grams	grams	grams	grams	%
P-1 to P-4	BS-1	0-2.5'	UUU	81.2	167.9	153.2	99.6	**74.4%**
P-6 to P-8	BS-2	0-2'	Debbie	98.1	307.8	284.7	277.7	**3.8%**

Balance ID. 19608 *Calibration Date:* 2/25/21 *#200 Sieve* 18775 *Calibration Date:* 2/25/21

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

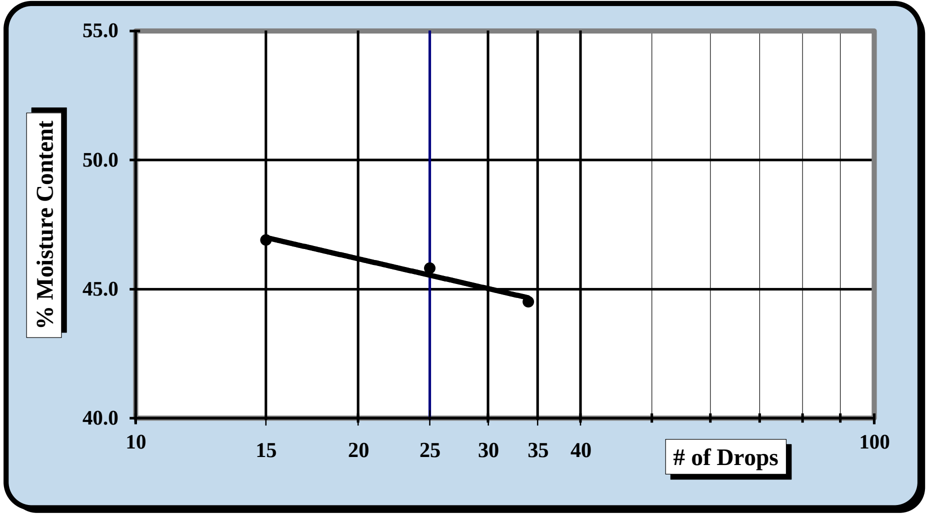
Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s)	3/11/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		

Boring #:	P-1 to P-4	Sample #:	BS-1	Sample Date:	2/25/2022
Location:	Pavement Areas	LAB #:	524	Depth:	0-2.5'

Sample Description: Gray, Orange, and Red, Lean Clay with Sand (CL)

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	00401	2/25/2022	Grooving tool	11368	9/1/2021
LL Apparatus	18801	9/1/2021			
Oven	17745	4/8/2021			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	12	19	82				51	66	
A	Tare Weight	14.58	14.62	14.58				14.52	14.53	
B	Wet Soil Weight + A	31.25	31.33	31.39				21.55	21.59	
C	Dry Soil Weight + A	26.12	26.08	26.02				20.34	20.39	
D	Water Weight (B-C)	5.13	5.25	5.37				1.21	1.20	
E	Dry Soil Weight (C-A)	11.54	11.46	11.44				5.82	5.86	
F	% Moisture (D/E)*100	44.5%	45.8%	46.9%				20.8%	20.5%	
N	# OF DROPS	34	25	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**20.7%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**46**
Plastic Limit	**21**
Plastic Index	**25**
Group Symbol	**CL**

Multipoint Method ☐
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

Quality Assurance

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

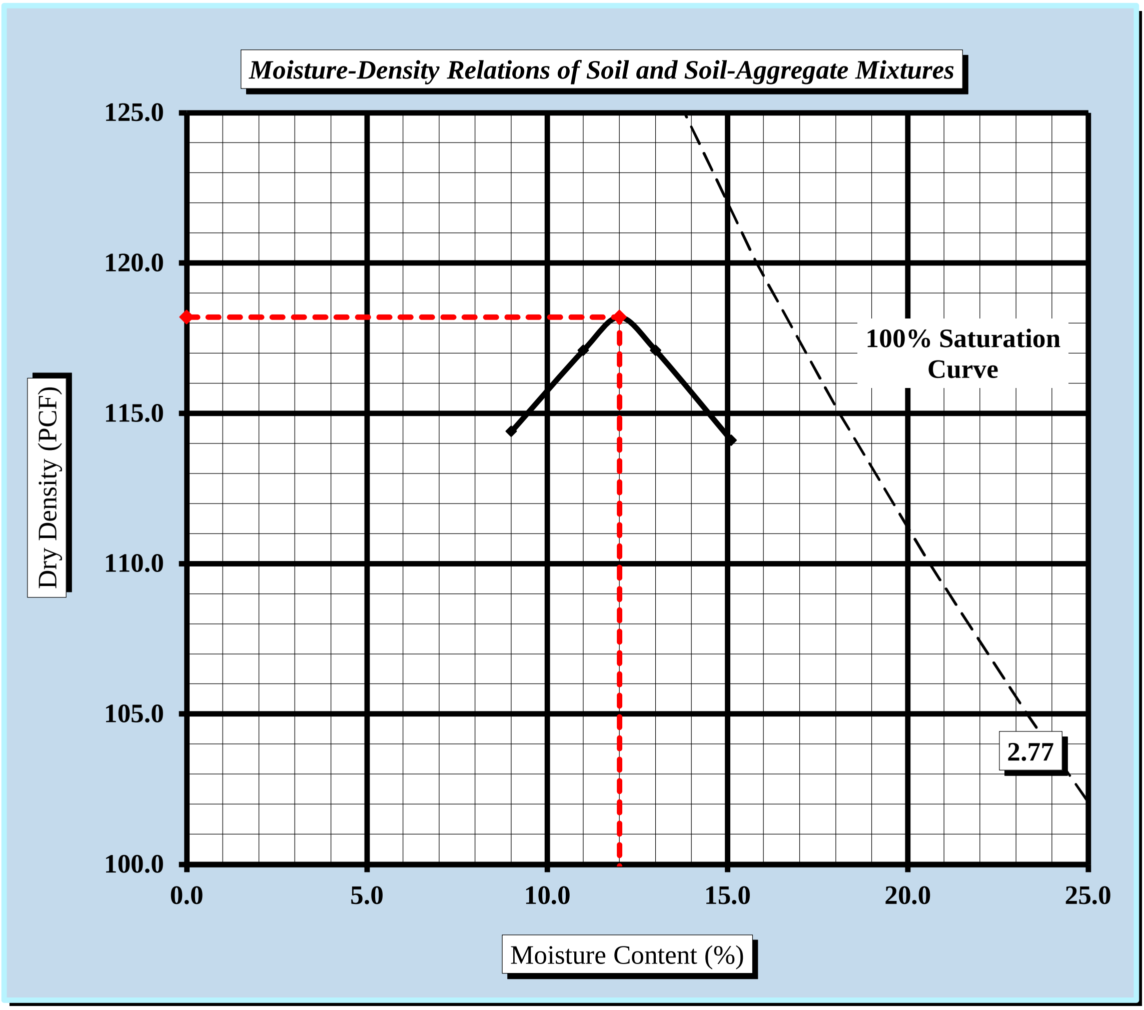
S&ME Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s):	3/2/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		

Boring #:	P-1 to P-4	Sample #:	BS-1	Sample Date:	2/25/2022
Location:	Pavement Areas	Lab #:	524	Depth:	0-2.5'

Sample Description: Gray, Orange, and Red, Lean Clay with Sand (CL)

Maximum Dry Density **118.2** **PCF.** **Optimum Moisture Content** **12.0%**

ASTM D1557 - - Method A



Soil Properties

Natural Moisture Content	20.4%
Specific Gravity of Soil	--
Liquid Limit	46
Plastic Limit	21
Plastic Index	25

% Passing

3/4"	--
3/8"	--
#4	--
#10	--
#40	--
#60	--
#200	74.4%

Oversize Fraction

Bulk Gravity	--
% Moisture	--
% Oversize	--
MDD	--
Opt. MC	--

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 1557: Laboratory Compaction Characteristics of Soil Using Modified Effort

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s)	3/7/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		

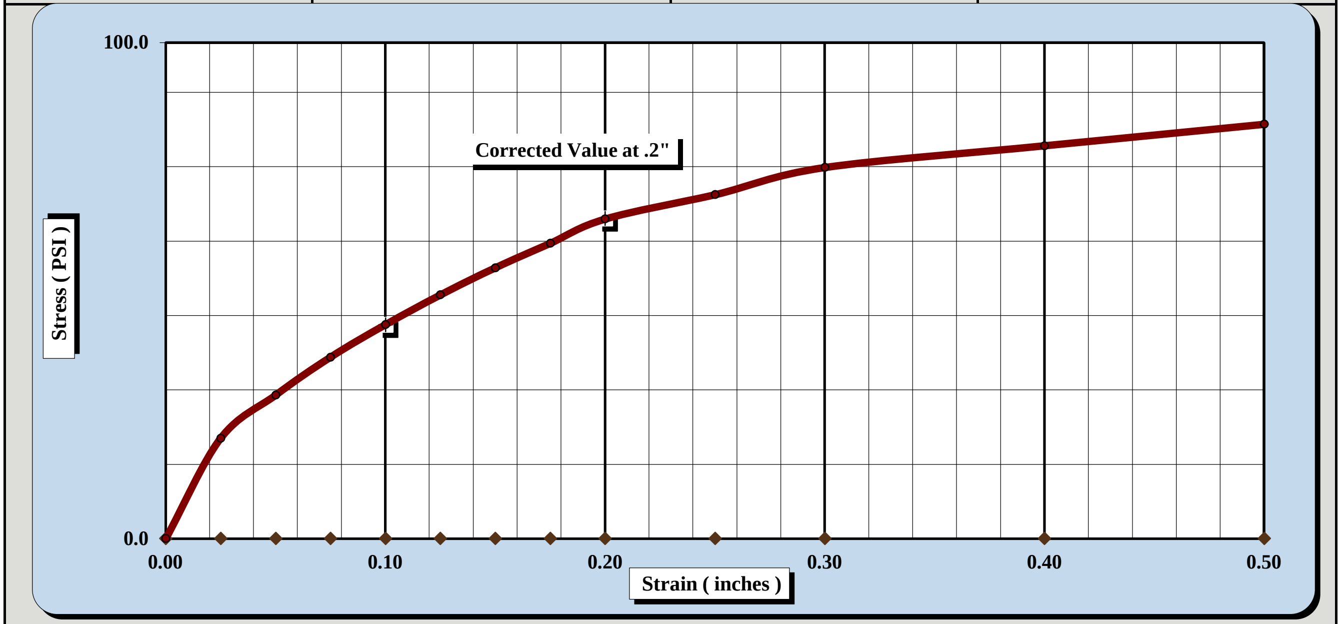
Boring #:	P-1 to P-4	Sample #:	BS-1	Sample Date:	2/25/2022
Location:	Pavement Areas	LAB #:	524	Depth:	0-2.5'

Sample Description: Gray, Orange, and Red, Lean Clay with Sand (CL)

ASTM D1557 *Method A* Maximum Dry Density: 118.2 PCF Optimum Moisture Content: 12.0%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 1.0%

Uncorrected CBR Values				**Corrected CBR Values**			
CBR at 0.1 in.	4.3	CBR at 0.2 in.	4.3	CBR at 0.1 in.	4.3	CBR at 0.2 in.	4.3



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	25		
Initial Dry Density (PCF)	112.8	Final Dry Density (PCF)	111.9
Moisture Content of the Compacted Specimen	14.0%	Moisture Content (top 1" after soaking)	17.6%
Percent Compaction	95.4%	Percent Swell	0.9%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.8
Liquid Limit	46	Plastic Index	25	Apparent Relative Density	--

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

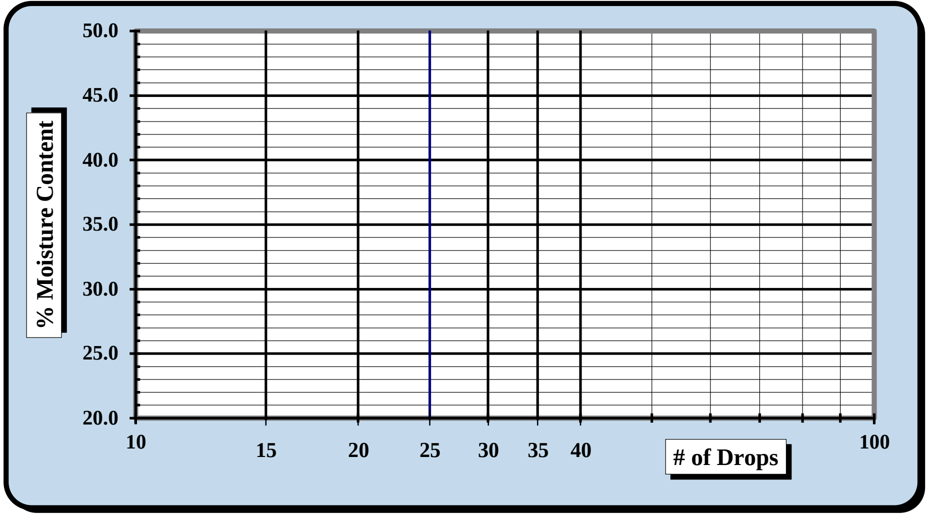
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #: 206209 Report Date: 3/14/2022
Project Name: New Bus Parking Lot for HCS Test Date(s) 3//11/2022
Client Name: Development Resource Group, LLC
Client Address: 4703 Oleander Drive, Myrtle Beach, South Carolina
Boring #: P-6 to P-8 Sample #: BS-2 Sample Date: 2/25/2022
Location: Pavement Areas LAB #: 524 Depth: 0-2'
Sample Description: Dark Brown Poorly Graded Sand (SP)

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	00401	2/25/2022	Grooving tool	11368	9/1/2021
LL Apparatus	18801	9/1/2021			
Oven	17745	4/8/2021			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:									
A	Tare Weight									
B	Wet Soil Weight + A								NP	
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*									



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit	
Plastic Limit	**NP**
Plastic Index	
Group Symbol	**SP**

Multipoint Method ☐
One-point Method ☑

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

Quality Assurance

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

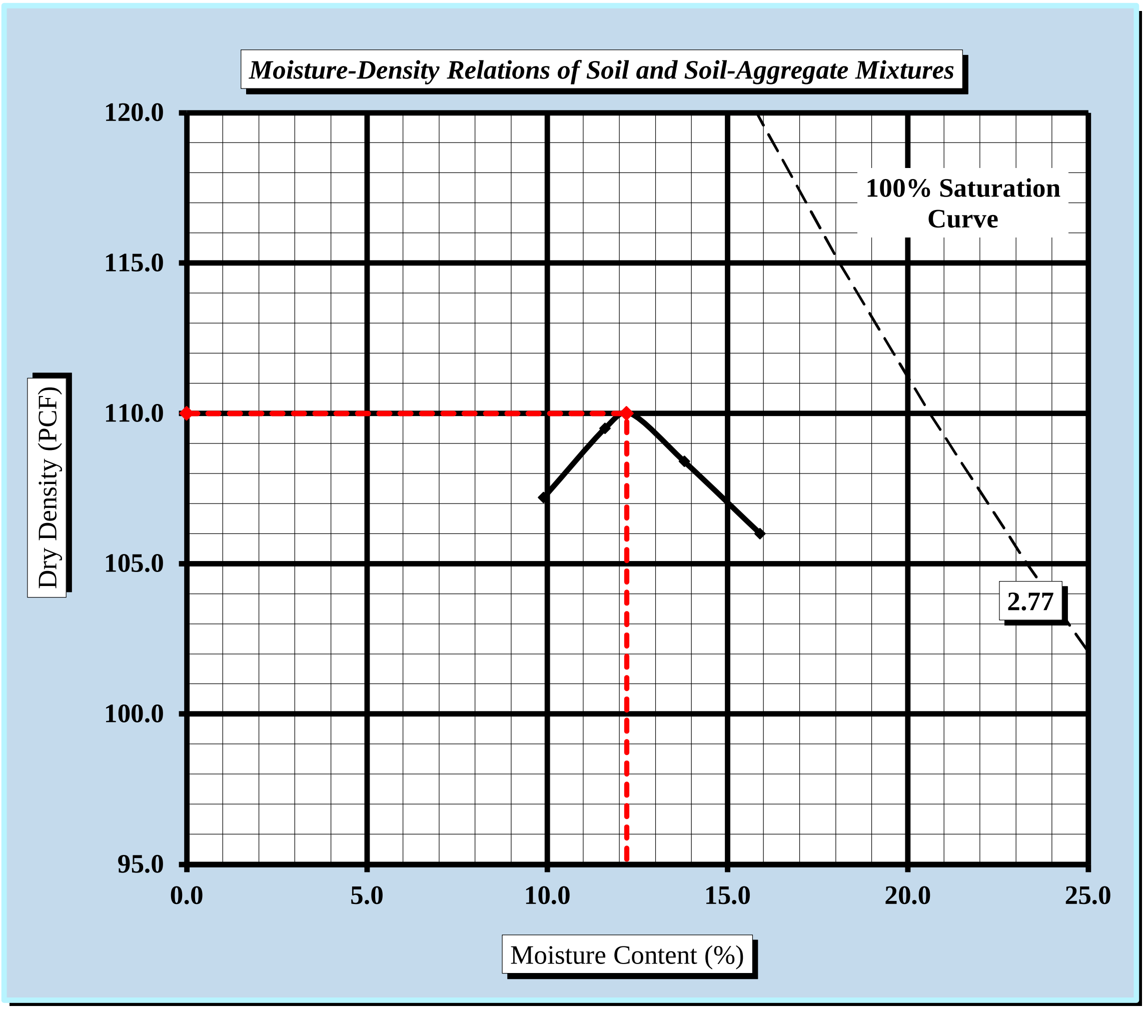
S&ME Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s):	3/2/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		

Boring #:	P-6 to P-8	Sample #:	BS-2	Sample Date:	2/25/2022
Location:	Pavement Areas	Lab #:	524	Depth:	0-2'

Sample Description: Dark Brown Poorly Graded Sand (SP)

Maximum Dry Density 110.0 PCF. Optimum Moisture Content 12.2%

ASTM D1557 - - Method A



Soil Properties

Natural Moisture Content	12.4%
Specific Gravity of Soil	--
Liquid Limit	--
Plastic Limit	NP
Plastic Index	--

% Passing

3/4"	--
3/8"	--
#4	--
#10	--
#40	--
#60	--
#200	3.8%

Oversize Fraction

Bulk Gravity	--
% Moisture	--
% Oversize	--
MDD	--
Opt. MC	--

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 1557: Laboratory Compaction Characteristics of Soil Using Modified Effort

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	206209	Report Date:	3/14/2022
Project Name:	New Bus Parking Lot for HCS	Test Date(s)	3/7/2022
Client Name:	Development Resource Group, LLC		
Client Address:	4703 Oleander Drive, Myrtle Beach, South Carolina		

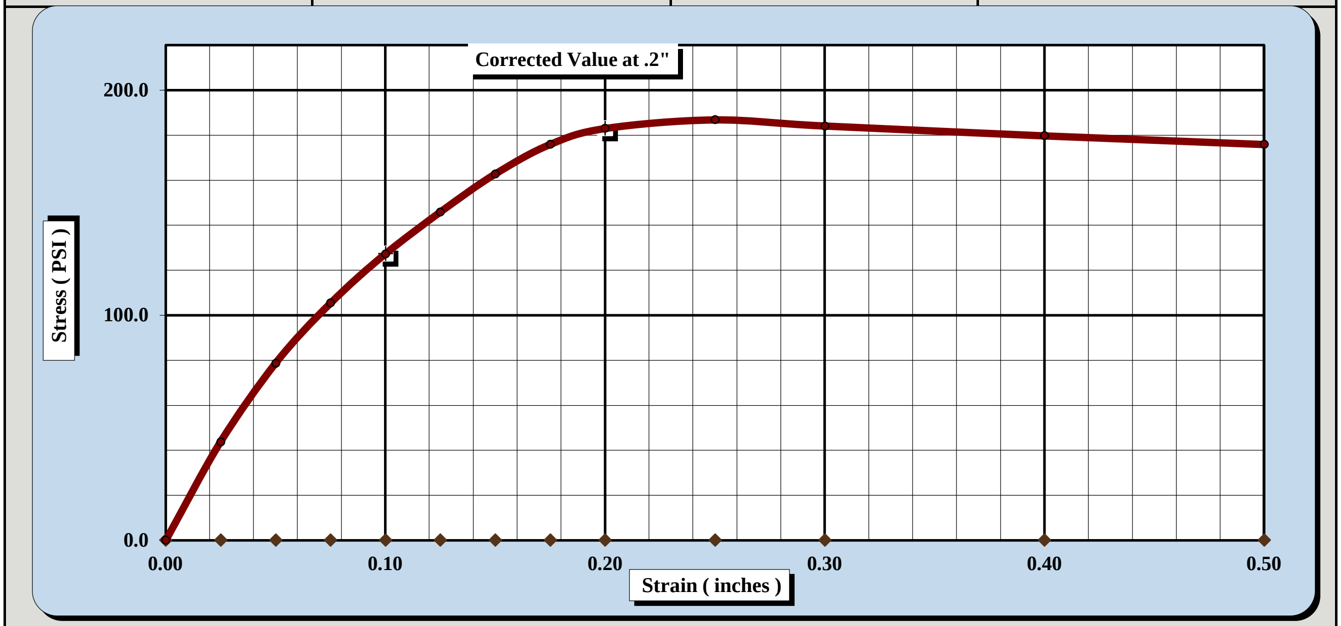
Boring #:	P-6 to P-8	Sample #:	BS-2	Sample Date:	2/25/2022
Location:	Pavement Areas	LAB #:	524	Depth:	0-2'

Sample Description:

ASTM D1557 *Method A* Maximum Dry Density: 110.0 PCF Optimum Moisture Content: 12.2%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 1.0%

Uncorrected CBR Values				**Corrected CBR Values**			
CBR at 0.1 in.	12.7	CBR at 0.2 in.	12.2	CBR at 0.1 in.	12.7	CBR at 0.2 in.	12.2



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	25		
Initial Dry Density (PCF)	104.0	Final Dry Density (PCF)	104.0
Moisture Content of the Compacted Specimen	12.1%	Moisture Content (top 1" after soaking)	12.9%
Percent Compaction	94.6%	Percent Swell	0.0%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.9
Liquid Limit		Plastic Index		Apparent Relative Density	--

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Ron Forest, P.E.	RPF	Principal Engineer	3/15/2022
Technical Responsibility	*Signature*	*Position*	*Date*

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