PRELIMINARY
GEOTECHNICAL EXPLORATION

EARLY BRANCH INDUSTRIAL PARK
HAMPTON COUNTY, SOUTH CAROLINA
S&ME PROJECT NO. 1131-09-247

Prepared For:
BP Barber & Associates
Post Office Box 1116
Columbia, South Carolina 29202

Prepared By:

7604 Waters Avenue
Savannah, Georgia 31406

June 24, 2009
June 24, 2009

BP Barber & Associates
Post Office Box 1116
Columbia, South Carolina 29202

Attention: Mr. Brad Sanderson, P.E.

Reference: PRELIMINARY GEOTECHNICAL EXPLORATION
Early Branch Industrial Park
Hampton County, South Carolina
S&ME Project No. 1131-09-247

Dear Mr. Sanderson:

We have completed our Preliminary Geotechnical Exploration of the Early Branch Industrial Park in Hampton County, South Carolina. Our services were performed in general accordance with S&ME proposal No. 31-09-144 dated June 2, 2009. The purpose of our Preliminary Geotechnical Exploration was to determine the general site subsurface conditions at widely-spaced locations, and then to evaluate the major geotechnical considerations these conditions will have on site development. This report presents our understanding of the proposed project, the site and subsurface conditions we encountered, and our preliminary conclusions and recommendations.

PROJECT INFORMATION

The project site consists of approximately 1,415 acres along South Carolina Highway 68 near Early Branch in Hampton County, South Carolina. The site is currently used for forestry activities. We understand development plans are preliminary at this time and the purpose of this work is for site certification with the South Carolina Department of Commerce.

This project information is based on information provided to Mr. Marty Baltzegar, P.E. with S&ME in a meeting on May 28, 2009, with Mr. Brad Sanderson with BP Barber.
FIELD EXPLORATION

Subsurface conditions were explored by performing 10 widely-spaced cone penetration test (CPT) soundings to depths from 25 to 40 ft below the existing ground surface. Shear wave velocity measurements were recorded at 5-ft intervals in sounding C-6 to assist in determination of seismic site class. To further evaluate the near-surface soils, we drilled a hand-auger boring to depths of 3 to 4 ft adjacent to each sounding location. The soundings were located in the field by S&ME personnel along accessible roadways, paths, and open areas. Figure 1 in the Appendix depicts the approximate boring locations.

In a CPT sounding (ASTM D 5778), an electronically instrumented cone penetrometer is hydraulically pushed through the soil to measure point stress, pore water pressure, and sleeve friction. The CPT data is used to determine soil stratigraphy and to estimate soil parameters such as preconsolidation stress, friction angle, and undrained shear strength.

The hand-auger borings were drilled by manually turning a steel auger into the ground. The soils encountered were classified in the field by a Geotechnical Professional using the Unified Soil Classification System (USCS).

A more detailed description of our field testing procedures, the CPT Sounding Logs, Hand-Auger Boring Logs, and Shear Wave Velocity Data are included in the Appendix.

SITE AND SUBSURFACE CONDITIONS

Site Conditions

The site is located along South Carolina Highway 68 and is bordered by a utility easement to the north, SC Highway 68 and a CSX railroad to the south, and woods to the east and west. At the time of our exploration, the site was mostly wooded with several areas cleared of trees. These cleared areas were covered with moderate underbrush. Several dirt roads ran north to south across the property, and two roads ran from east to west across the site. These roads were bordered by ditches up to 5 ft deep. Ponded water was observed in several of the deeper ditches and in low lying areas of the site. The site appeared relatively level at the time of our exploration. The provided topographic map indicated elevations ranging from about 23 ft in the northwest corner of the site to about 25 ft along the southern edge.

Geology

The property is located in the lower Coastal Plain physiographic province of South Carolina. Pliocene and Pleistocene age units consisting of sands, silts, and clays overlie the Parachucla and Marks Head marls of the Hawthorne Formation. Beneath the Hawthorne Group lies the Cooper Group deposited during the Oligocene epoch. The Cooper Group acts as the primary confining layer to the surficial aquifer. The groundwater in the surficial aquifer normally occurs in unconfined (water table) conditions, as is the case at the subject site. Topographic features such
as tidal creek tributaries, wetlands and marshes control the surface contours and flow directions of the surficial aquifer.

The major source of groundwater recharge to the surficial aquifer is the infiltration of surface water, which leaves this aquifer exposed to contamination from surficial spills. The overall water quality of this aquifer is considered poor and is generally used for irrigation, and not human consumption. The Cooper Group serves as the confining layer between the surficial aquifer and the Floridan Aquifer that underlies the Hawthorne Formation. The Floridan Aquifer system is composed of an upper unit of fossiliferous, calcitized, moderately indurated limestone, argillaceous limestone, and marl. This aquifer is one of the principal sources of drinking water in the region.

**Soil Survey Data**

The USDA Soil Conservation Service’s (SCS) soil surveys provide useful information about the shallow soils across a site. Soil surveys map the near surface soils within about 6 ft of the ground surface and provide general descriptions. The data is not intended to replace geotechnical evaluations and testing, but it can help identify trends. The SCS *Soil Survey of Hampton County, South Carolina*, dated January 2009 indicates that soils present at the site are predominantly Byars, Lynchburg, Ocilla, Pelham, Rutledge, and Seagate series. These series are generally classified as fine sands, fine silty sands, low plasticity silts, and low plasticity clays. A summary of relevant data from the soil survey is shown in Table 1, and a Soil Survey Map is present as Figure 2 in the appendix.

These soils are fairly typical of the soil conditions in the site vicinity. In general, the difference between the “fair” and “poor” descriptions is the fines (silt and clay) content of the soils. The greater the fines content, the more moisture sensitive the soil and the more difficult to work during construction. The difference between “slight” and “severe” limitations for foundations is the potential for flooding and associated strength and wetness. Again, we emphasize that the soil survey data is qualitative in nature. Furthermore, the SCS evaluations are based solely on the characteristics of the shallow (<6 ft deep) soil stratigraphy and do not consider deeper soil conditions which can control foundation design.

1 http://websoilsurvey.nrcs.usda.gov
Table 1: Summary of Soil Conservation Service (SCS) Survey Data

Hampton County, South Carolina
Soils Present in Upper 6 ft of the Early Branch Site

<table>
<thead>
<tr>
<th>SCS Designation</th>
<th>Classification</th>
<th>Depth to Seasonal High Water Table (ft)</th>
<th>Permeability (in/hr)</th>
<th>Suitability as source of road fill</th>
<th>Estimated limitations for foundations for dwellings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byars (By)</td>
<td>CL, CH</td>
<td>A-6, A-7-6</td>
<td>1.0-6.0</td>
<td>0.2 - 2.0</td>
<td>Poor: wetness</td>
</tr>
<tr>
<td>Lynchburg (Ly)</td>
<td>SM, SP-SM, SM-SC, SC, CL, CL-ML</td>
<td>A-2, A-4, A-6</td>
<td>0.5-3.5</td>
<td>0.6 - 20.0</td>
<td>Poor: wetness</td>
</tr>
<tr>
<td>Ocilla (OcA)</td>
<td>SM, SP-SM, CL, SC</td>
<td>A-2, A-3, A-4, A-6</td>
<td>1.0-2.5</td>
<td>0.6 - 20.0</td>
<td>Fair: wetness</td>
</tr>
<tr>
<td>Pelham (Pe)</td>
<td>SM, SC, SM-SC</td>
<td>A-2, A-4, A-6</td>
<td>0.5-1.5</td>
<td>0.6 - 20.0</td>
<td>Poor: wetness</td>
</tr>
<tr>
<td>Rutledge (Ru)</td>
<td>SM, SP-SM</td>
<td>A-2-4, A-3</td>
<td>1.0-6.0</td>
<td>7.0 - 20.0</td>
<td>Poor: wetness</td>
</tr>
<tr>
<td>Seagate (Se)</td>
<td>SM, SP-SM, SM-SC</td>
<td>A-2, A-4, A-6, A-7</td>
<td>0 - 1.0</td>
<td>0.6 - 6.0</td>
<td>Poor: wetness</td>
</tr>
</tbody>
</table>

Subsurface Conditions

Details of the subsurface conditions encountered by the soundings and hand-auger borings are shown on the logs in the Appendix. These logs represent our interpretation of the subsurface conditions based upon field data. Stratification lines on the sounding logs represent approximate boundaries between soil behavior types\(^2\); however, the actual transition may be gradual. Subsurface conditions will also vary between the widely-spaced soundings. The general subsurface conditions and their pertinent characteristics are discussed in the following paragraphs.

The exploration initially penetrated a surficial layer of organic laden topsoil approximately 2 to 5 in. thick. Our experience indicates these topsoil thicknesses are typical for this area; however, one would expect the topsoil thicknesses to increase in low, wet areas of the site.

Below the topsoil, the soundings encountered soils typical of the Coastal Plan Geologic Province. The soils consist of interbedded layers of sands, silty sands, and clayey sands.

\(^2\) Soil Behavior Type is calculated based on empirical correlations which use the three fundamental penetrometer measurements (i.e., tip resistance, sleeve friction, and pore pressure). A CPT may define a soil based on its behavior as one type, while its grain size and plasticity (the traditional basis for soil classification) may define it as a different type.
Relatively thin layers of fine-grained soils (silt and clay) were encountered at somewhat random depths and locations in most of the soundings, and the Marks Head marl formation was encountered in sounding C-2 at a depth of about 30 ft below the existing ground surface. The cone tip resistance \( (q_t) \) varied from less than 10 tsf to over 200 tsf. These \( q_t \) values indicate a very loose to dense relative density for sands and a soft to hard consistency for silts and clays.

**Groundwater**

Groundwater was measured in the soundings at depths of approximately 3 to 6 ½ ft below the existing ground surface at the time of our exploration. Subsurface water levels at the site will fluctuate during the year due to such things as seasonal and climatic variations and with construction activity in the area.

**PRELIMINARY COMMENTS AND CONCLUSIONS**

The preliminary analyses and conclusions submitted in this report are based, in part, upon data obtained from our widely-spaced test locations. Subsurface conditions between the test locations will vary, as will grading and construction details. Therefore, we can only provide general comments about the suitability of the property for the proposed construction, and this information should not be used for design. Once final site development plans have been established, additional geotechnical exploration and analysis will be required to provide design level recommendations for specific project sites.

Based on the findings of our field exploration, we make the following preliminary comments and conclusions:

1. **Site Drainage.** In general, site preparation will require establishing positive site drainage prior to mass clearing and grading. Drainage can typically be established by excavating gravity drained ditches. Ditches should be excavated as deep as practical and as far in advance of general site work as possible.

2. **Site Preparation.** Site preparation would then continue with the removal of unsuitable surface materials. This should include clearing and grubbing all vegetation and roots, stripping organic laden topsoil, and undercutting any unsuitable surface soils. Prior to fill placement, the exposed subgrade in proposed building areas will require thorough evaluation by a Geotechnical Engineer to confirm that unsuitable materials are removed and that suitable soils are not over excavated.

   In the higher sandy areas, we do not anticipate that extensive undercutting will be required. In lower, wet areas with clayey soils, undercutting should be anticipated, especially in wet weather. The need for undercutting will be dependent on final grades, prevailing weather conditions, the aggressiveness of earthwork schedules, and contractor’s means and methods.
3. **Foundations.** The exploration indicates the subsurface conditions at this site are capable of supporting structural loads on the order of 200 kips or less using conventional shallow spread footings. Available bearing pressures would typically vary from 1500 to 2500 pounds per square foot (psf) for foundations bearing in the natural soils and well-compacted fill. Settlement due to the structural loads would be on the order of 1 ½ in. or less.

Building foundations typically bear at least 18 in. below grade to develop the design bearing pressure. Continuous wall footings should be a minimum of 24 in. wide, and isolated column footings should be a minimum of 36 in. wide. This recommendation is made to help prevent a "localized" or "punching" shear failure condition, which could exist with very narrow footings.

Heavy structures with column loads greater than 200 kips may require ground improvement such as surcharging or stone columns to support structures on shallow foundations. Heavy structures can also be supported on deep foundations such as driven piles or drilled shafts. The need for ground improvement or deep foundations will be project and site specific.

4. **Seismic Considerations.** While the IBC requires a 100-ft boring or sounding to determine Seismic Site Class, a shallower sounding may be used if the geotechnical engineers are familiar with the area soils. It may also be assumed that the shear wave velocities will increase with depth. Based on our preliminary analysis, there appears to be some risk of liquefaction\(^3\) due to the 2006 International Building Code (IBC) design earthquake\(^4\). Ground surface disruptions (sand boils) and liquefaction-induced settlements are theoretically possible; however our preliminary analysis indicates the risk of significant sand boil development or large liquefaction-induced settlements is low. The IBC 2006 classifies a site as Seismic Site Class F if there is a possibility of liquefaction; however the code allows the design spectral response accelerations for a site to be determined without regard to liquefaction provided the buildings have a fundamental period of less than or equal to 0.5 seconds and the risks of liquefaction are considered in design. Therefore, if future structures meet these criteria, it is our interpretation the site would be considered a Seismic Site Class D.

5. **Controlled Fill.** Controlled fill material should be soil containing no more than 20% fines (material passing the No. 200 sieve) by weight, having a maximum dry density (ASTM D 1557) of at least 100 pcf, and having a Liquid Limit and Plastic Index of less than 40 and 5, respectively. The soil should be relatively free of organics, deleterious matter and elongated or flat particles susceptible to degradation. All fill should be placed in uniform lifts of 10 in. or less (loose measure), and compacted to at least 95% of the modified Proctor maximum dry density (ASTM D 1557).

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3 Liquefaction, the loss of a soil’s shear strength due to the increase in porewater pressure resulting from seismic vibrations, is always a potential concern in coastal South Carolina.

4 The IBC design earthquake has a 98% probability of non-exceedance in 50 years. Our liquefaction analysis was based on an earthquake with a magnitude of 7.3 and ground surface acceleration of 0.22g.
The compaction requirements for fill soils will be dependent upon the soil’s compacted strength and structural loading requirements. Typically, these soils are compacted to at least 95 percent of their modified Proctor maximum dry density for building, floor slab, and pavement support.

6. **Use of Excavation Soils as Structural Fill.** Soils meeting the requirements for Controlled Fill as discussed above are preferred for use as structural fill and are most commonly used in this geographic area. The sandy soils at this site generally meet these requirements, though some moisture adjustment may be necessary to achieve the required compaction.

The natural clayey soils at this site are also adaptable for use as structural fill to support the buildings and pavements. The feasible use of the clayey soils will be very dependent upon prevailing weather conditions and the Grading Contractor’s experience, means, and methods. These soils may comprise a large portion of the soils at a specific project site; consequently, they may not be undercut in mass economically. When handled properly, these soils can be suitably used, but the measures discussed below are recommended:

- The soils will require more drying than typically expected during grading. This should be taken into consideration during the bidding phase of the project. Prevailing weather will greatly affect the use of the more clayey soils. During extended cool, wet weather conditions, the use of these soils may not be feasible.

- Grading contractors must have the proper equipment such as disc harrows and sheepsfoot compaction equipment to properly work these soils.

- The subgrade soils for slabs should not be allowed to dry significantly. This could require wetting and reworking the surface soils prior to slab installation.

- Consideration should be given to separating the floor slabs from the subgrade soils with a 6-in. thick layer of granular material. The granular material will serve as a capillary break, but it will also provide a more durable working surface during construction.

7. **Grade Slabs and Pavements.** Subsurface conditions are adaptable for typical slab and pavement design with proper site preparation and fill placement and compaction. Based on the exploration data and our experience, we would expect a soil modulus of subgrade reaction (k), based on the 30-in. diameter plate method, to be on the order of 150 to 200 pci. California Bearing Ratio (CBR) values on the order of 5 to 10 percent can be considered reasonable for conceptual design of flexible pavements. A vapor barrier may be required for the slab-on-grade depending on the floor covering design.

Flexible asphalt pavements typically are a minimum of about 8 in. thick (2 in. of asphalt and 6 in. of graded aggregate base) for automobile parking areas. Service drives are typically a minimum of about 11 in. thick (3 in. of asphalt and 8 in. of graded aggregate base). Rigid
concrete pavements are typically used for dumpster pads and other heavy truck traffic areas, and they are typically at least 5 to 7 in. thick. We note that pavement thickness design is heavily dependent on the expected traffic type and volume, which is unknown at this point.

LIMITATIONS OF REPORT

This preliminary report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The preliminary 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 warranty, express or implied, is made.

Again, we note that the information provided in this report is preliminary and should not be used for design. A final geotechnical exploration tailored to the actual development specifics must be performed before final recommendations for foundations and pavements can be provided.

CLOSURE

We appreciate the opportunity to be of service on this project. If you have any questions concerning this preliminary report, please call.

Sincerely,

S&ME, Inc.

Maria E. Vaughn
Geotechnical Professional

Reviewed by: Angela S. Musselwhite, P.E.; Vice President

Michael S. Ulmer, P.E.
Office Manager
APPENDIX

Test Location Plan (Figure No. 1)
Soil Survey Map (Figure No. 2)
CPT Sounding Logs
Hand-Auger Boring Logs
Shear Wave Velocity Data
Field Testing Procedures
Source: BP Barber dated May 1, 2008

LEGEND

/APPROXIMATE TEST LOCATION

Note: All test locations are approximate and should not be used to determine distance.

S&ME
ENGINEERING TESTING ENVIRONMENTAL SERVICES

TEST LOCATION PLAN
GEOTECHNICAL EXPLORATION
EARLY BRANCH INDUSTRIAL PARK
HAMPTON COUNTY, SOUTH CAROLINA

FIGURE NO. 1

SCALE: AS SHOWN
APPROVED BY:
DRAWN BY: LAJ
DATE: 6–19–09
JOB NO: 1131–09–247
Note: Property boundaries are approximate.
Early Branch Industrial Park
Hampton County, SC
S&ME Project No: 1131-09-247

Date: Jun. 11, 2009
Estimated Water Depth: 3.5 ft
Rig/Operator: 7 ATV/A. Feix

Total Depth: 25.0 ft
Termination Criteria: 7 Target Depth
Cone Size: 7 1.44x

C-1f
Cone Penetration Test

Date: Jun. 11, 2009
Estimated Water Depth: 6 ft
Rig/Operator: ATV/A. Feix

Total Depth: 29.7 ft
Termination Criteria: 7 Target Depthx
Cone Size: 7 1.44x

Depth (ft)

Tip Resistance
$q_t$ (lbf/ft$^2$)

1x 2x 3x 4x

Sleeve Friction
$f_s$ (lbf/ft$^2$)

1x 2x 3x 4x

Pore Pressure
$u_p$ (lbf/ft$^2$)
$u_d$

2x 4x 6x 8x

Friction Ratio
$R_f$ (%)

1x 10 100x

Equivalent
$N_{eq}$

$SBT_{eq}$

MAI = 5x

Depth (ft)

5 10 15 20 25x

Sand Mixtures-Silty Sand to Sandy Silt

Sands-Clean Sand to Silty Sand

Gravelly Sand to Sand

Sands-Clean Sand to Silty Sand
Cone Penetration Test C-9

Date: Jun. 11, 2009
Estimated Water Depth: 6 ft
Rig/Operator: 7 ATV/A. Feix

Total Depth: 30.0 ft
Termination Criteria: 7 Target Depth
Cone Size: 7 1.44x

Depth (ft) Tip Resistance $q_t$ (tsf)
40x 80x 120x 160x

Depth (ft) Sleeve Friction $f_s$ (tsf)
1x 2x 3x 4x

Depth (ft) Pore Pressure $u$ (tsf)$u_s$
-0.6x 0.8x 2.2x 3.6x

Depth (ft) Friction Ratio $R_f$ (%)
2x 4x 6x 8x

Depth (ft) Equivalent $N_{eq}$
1x 10 100x

$SBT_{eq}$
MAI = 5x

Material:
- Silt Mi tunes-Cay Silty Clay
- Silty Clay
- Sand Mi tunes-Silty Sand to Sandy Silt
- Sand Mi tunes-Silty Sand to Sandy Silt
- Sands-Clean Sand to Silty Sand
- Sands-Clean Sand to Silty Sand
- Sand Mi tunes-Silty Sand to Sandy Silt
- Sand Mi tunes-Silty Sand to Sandy Silt
- Silt Mi tunes-Cay Silt to Silty Clay
- Sands-Clean Sand to Silty Sand
- Sands-Clean Sand to Silty Sand
- Sand Mi tunes-Silty Sand to Sandy Silt
- Sand Mi tunes-Silty Sand to Sandy Silt
- Silt Mi tunes-Cay Silt to Silty Clay
- Sands-Clean Sand to Silty Sand
- Sands-Clean Sand to Silty Sand
**Early Branch Industrial Parku**

*Ampton County, South Carolina*

**1131-09-247u**

**AND AUGER uOG: C-1u**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>PERFORMANCE</td>
<td>Auger</td>
<td>PERFORMED BY:</td>
<td>T. Meltonu</td>
</tr>
<tr>
<td>WATER LEVEL:</td>
<td>No ground water encountered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DEPTH (feet) | GRAPHIC LOGS | MATERIAL DESCRIPTIONS | ELEVATIONS | US WATER LEVELS | DYNAMIC CONES | PENETRATION RESISTANCES |
<table>
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<th></th>
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</thead>
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<tr>
<td>1S</td>
<td></td>
<td>SAND WITH TURBIDITY (SP-SM) - Mostly fine sand, low to medium plasticity, tan to gray, moderate to high moisture content.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2S</td>
<td></td>
<td>POORLY GRADED SAND (SP) - Mostly fine sand, trace low to medium plasticity, light tan/brownish, moderate to high moisture content.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3S</td>
<td></td>
<td>Hand auger boring terminated at 4 t.s.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4S</td>
<td></td>
<td></td>
<td></td>
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**Hand Auger Log: C-2u**

**Project:** Early Branch Industrial Park
**Location:** Hampton County, South Carolina
**Address:** 1131-09-247u

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<tr>
<th>Date Started:</th>
<th>Date Finished:</th>
<th>Notes:</th>
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<tbody>
<tr>
<td>6/3/09u</td>
<td>6/3/09u</td>
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</tbody>
</table>

**Sampling Method:** Hand Augeru | **Performed By:** T. Meltonu

**Water Level:** None encounteredu

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Graphic Logs</th>
<th>Material Description</th>
<th>Elevations (ft)</th>
<th>Water Levels</th>
<th>Dynamic Coneis</th>
<th>Penetration Resistanceis</th>
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</thead>
<tbody>
<tr>
<td>1S</td>
<td></td>
<td>Poorly Graded Sand (SP) - Mostly fine sand, trace low toS medium plasticity fines, orangish brown/tan/light gray, moist.S</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>2S</td>
<td></td>
<td></td>
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<tr>
<td>3S</td>
<td></td>
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<td>-</td>
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<td>-</td>
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<tr>
<td>4S</td>
<td></td>
<td>Hand auger terminated at 4 ftS</td>
<td>-</td>
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**S&ME Engineering - Testing Environmental Services**
7604 Waters Avenue
Savannah, Georgia 31406
<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>MATERIAL DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td>CuAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, tan/orangish tan; moist</td>
</tr>
<tr>
<td>2S</td>
<td>POORuY GRADED SAND (SP) - Mostly S shell, trace low toS medium plasticity Shells, gray, moist S</td>
</tr>
<tr>
<td>3S</td>
<td>Hand auger term noted at 4 3S</td>
</tr>
<tr>
<td>4S</td>
<td></td>
</tr>
<tr>
<td>DEPTH (feet)</td>
<td>GRAPHIC LOGS</td>
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<td>DEPTH (feet)</td>
<td>GRAPHIC LOGS</td>
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<td>1S</td>
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</tr>
<tr>
<td>3S</td>
<td></td>
</tr>
<tr>
<td>4S</td>
<td></td>
</tr>
</tbody>
</table>

No groundwater encountered
**PROJECT:** Early Branch Industrial Park  
**ampton County, South Carolina**  
1131-09-247

**DATE STARTED:** 6/3/09  
**DATE FINISHED:** 6/3/09

**AMPLING METHOD:** auger  
**PERFORMED BY:** T. Melton

**WATER:** no ground water encountered

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTIONS</th>
<th>ELEVATIONS</th>
<th>DYNAMIC CONES</th>
<th>PENETRATION RESISTANCES</th>
</tr>
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<tbody>
<tr>
<td>ORGANIC uADEN TOPSOIL-</td>
<td>approximately 5 ft</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>POORLY GRADED SAND (SP)</td>
<td>Mostly sand, trace low to medium plasticity, brown, moist</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CuAYEY SAND (SC)</td>
<td>Mostly to medium sand, some low to medium plasticity, gray mottled with orange, moist</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Hand auger term nated at 4 ft</td>
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</tr>
</tbody>
</table>

**SOME適當**

7604 Waf, rv Avenu  
Savannah, G o gie 31406  
**Pag 1 of 1**
**Early Branch Industrial Parku**  
Aampton County, South Carolinu  
1131-09-247u

| PROJECT: | Early Branch Industrial Parku  
Aampton County, South Carolinu  
1131-09-247u |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE STARTED:</td>
<td>6/3/09u</td>
</tr>
<tr>
<td>DATE FINISHED:</td>
<td>6/3/09u</td>
</tr>
<tr>
<td>NOTES:</td>
<td></td>
</tr>
<tr>
<td>AMPLING METHOD:</td>
<td>and Augeru</td>
</tr>
<tr>
<td>PERFORMED BY:</td>
<td>T. Meltonu</td>
</tr>
<tr>
<td>WATER uEVE:</td>
<td>No ground water encounteredu</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>GRAPHIC LOGS</th>
<th>MATERIAL DESCRIPTIONS</th>
<th>ELEVATIONS (US)</th>
<th>WATER LEVELS</th>
<th>DYNAMIC CONES PENETRATION RESISTANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td></td>
<td>ORGANIC uADEN TOPSOIL: Approximately 5 nS</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2S</td>
<td></td>
<td>POORLY GRADED SAND (SP): Mostly fine sand, trace low to medium plasticity, orangish tan, moist S</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3S</td>
<td></td>
<td>Hand auger terminated at 4 S</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4S</td>
<td></td>
<td></td>
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</tbody>
</table>
**PROJECT:** Early Branch Industrial Park  
Hampton County, South Carolina  
1131-09-247u  

**HAND AUGER LOG: C-8u**

<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>MATERIAL DESCRIPTIONS</th>
<th>ELEVATIONS</th>
<th>DYNAMIC CONEIS PENETRATION RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td>Poorly Graded Sand (SP) - Mostly fine sand, trace low to S medium plasticity fines, tan mottled with orange, moist. S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4S</td>
<td>Hand auger terminated at 4 ftS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DATE STARTED:** 6/3/09u  
**DATE FINISHED:** 6/3/09u  
**PERFORMED BY:** T. Meltonu  

**WATER LEVEL:** No ground water encountered
**PROJECT:** Early Branch Industrial Parku  
**ampton County, South Carolina**  
1131-09-247u  

**AND AUGER uOG: C-9u**

<table>
<thead>
<tr>
<th>DATE STARTED:</th>
<th>6/3/09u</th>
<th>DATE FINISHED:</th>
<th>6/3/09u</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPLING METHOD:</td>
<td>and Augeru</td>
<td>PERFORMED BY:</td>
<td>T. Meltonu</td>
<td></td>
</tr>
<tr>
<td>WATER uEVEu</td>
<td>No ground water encounteredu</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>GRAPHIC LOGS</th>
<th>MATERIAL DESCRIPTIONS</th>
<th>ELEVATIONS</th>
<th>DYNAMIC CONES PENETRATION RESISTANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td></td>
<td>POORuY GRADED SAND (SP) - Mostly She sand, trace low toS med um plast cty Shes, orang sh brown, mo st.S</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2S</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3S</td>
<td></td>
<td>Hand auger re used at 3 1S</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4S</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Material Descriptions

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td>TOPSOIL - Approximately 2 nS</td>
</tr>
<tr>
<td>2S</td>
<td>SANDY CLAY (C) - Mostly low to medium plasticity Silt, some fine to medium sand, black/dark gray, most S</td>
</tr>
<tr>
<td>3S</td>
<td>Hand auger reused at 3 3S</td>
</tr>
</tbody>
</table>

### Dynamic Cones

<table>
<thead>
<tr>
<th>Elevations</th>
<th>Water Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Notes
- No ground water encountered.
IBC 2006 Criteria
Average Measured Soil Shear Wave Velocity, $v_s$: 781 ft/s
Site Class: D

* Site Class based on 2006 International Building Code - Table 1615.1 - SITE CLASS DEFINITIONS
FIELD TESTING PROCEDURES

Hand-auger Borings

Hand-auger borings are performed by manually turning a steel auger into the ground. The soils encountered are visually classified in the field using the Unified Soil Classification System (USCS). If encountered, subsurface water level depths are measured from the existing ground surface at the time of boring. Upon completion, the bore hole was immediately backfilled with the cuttings.

Cone Penetrometer Test (CPT) Sounding

The cone penetrometer test soundings (ASTM D 5778) were performed by hydraulically pushing an electronically instrumented cone penetrometer through the soil at a constant rate. As the cone penetrometer tip was advanced through the soil, nearly continuous readings of point stress, sleeve friction and pore water pressure were recorded and stored in the on-site computers. Using theoretical and empirical relationships, CPT data can be used to determine soil stratigraphy and estimate soil properties and parameters such as effective stress, friction angle, Young’s Modulus and undrained shear strength.

The consistency and relative density designations, which are based on the cone tip resistance, \( q_t \) for sands and cohesive soils (silts and clays) are as follows:

<table>
<thead>
<tr>
<th>SANDS</th>
<th>SILTS AND CLAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone Tip Resistance, ( q_t ) (tsf)</td>
<td>Relative Density</td>
</tr>
<tr>
<td>&lt;20</td>
<td>Very Loose</td>
</tr>
<tr>
<td>20 - 40</td>
<td>Loose</td>
</tr>
<tr>
<td>40 - 120</td>
<td>Medium Dense</td>
</tr>
<tr>
<td>120 - 200</td>
<td>Dense</td>
</tr>
<tr>
<td>&gt;200</td>
<td>Very Dense</td>
</tr>
</tbody>
</table>

CPT Correlations

References are in parenthesis next to the appropriate equation.

General

\( p_a = \) atmospheric pressure (for unit normalization)  
\( q_t = \) corrected cone tip resistance (tsf)  
\( f_s = \) friction sleeve resistance (tsf)  
\( R_f = 100\% \times \left( \frac{f_s}{q_t} \right) \)  
\( u_2 = \) pore pressure behind cone tip (tsf)  
\( u_0 = \) hydrostatic pressure  
\( B_q = \frac{(u_2-u_0)/(q_t-\sigma_v)}{q_t/(\sigma_v+\sigma_0)} \)  
\( Q_t = \frac{(q_t-\sigma_v)}{\sigma_v} \)  
\( F_r = 100\% \times \frac{f_s}{(q_t-\sigma_v)} \)  
\( I_c = ((3.47-\log Q_t) + (\log F_r + 1.22) / 2) ^ {0.5} \)

N-Value

\[ N_{60} = \left( \frac{q_t}{p_a} \right) / [8.5(1-I_c/4.6)] \]  