REPORT OF SUBSURFACE EXPLORATION
PROJECT CARRIER
STATE ROUTE 82 SITE
PENDERGRASS, GEORGIA
S&ME JOB NO. 1801-13-201, REPORT NO. 423930

Prepared For:

TJX Companies, Inc.
770 Cochituate Road
Framingham, MA 01701

Prepared By:

S&ME, Inc.
11420 Johns Creek Parkway
Duluth, Georgia 30097

May 23, 2013

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APPENDIX

May 23, 2013

TJX Companies, Inc.
770 Cochituate Road
Framingham, MA 01701

Attention: Mr. Jon K. Nelson

Subject: Report of Subsurface Exploration
Project Carrier
State Route 82 Site
Pendergrass, Georgia
S&ME Job No. 1801-13-201, Report No. 423930

Gentlemen:

1.0 INTRODUCTION

S&ME, Inc. has completed a subsurface exploration and seismic shear wave determination for the subject project. Our work was performed in general accordance with our Proposal No. AG1-13-175, revised April 29, 2013 as authorized by Mr. Jon Nelson. The purpose of the exploration was to obtain subsurface data so that we could evaluate foundation systems, general rock and groundwater levels, earthwork procedures, excavation conditions, pavement support, lateral earth pressures, and IBC 2006 Seismic Site Class. This report describes our understanding of the project and the subsurface conditions encountered, and it contains our recommendations regarding geotechnical aspects of site development and building and pavement construction. Reports of Phase I Environmental Site Assessment and Jurisdiction Waters Assessment were submitted under separate cover.

2.0 PROJECT INFORMATION

Project Carrier is considering purchasing the property indicated on the provided site plan, west of the intersection of State Route 82 and Logistics Center Parkway in Pendergrass, Georgia. The property is divided into two tracts of land, one currently owned by RACO and the other by IDI, totaling approximately 124 acres. We understand plans are to develop the two tracts as an 800,772 square-foot warehouse/distribution center with associated parking and truck docks. Site Plan Option No. 5 indicates an area for a 194,400 square-foot expansion to the east of the currently planned building footprint. That building expansion was deleted in Site Plan Option No. 6, and the recommendations of this report were formulated based on that area being pavement or other non-structural areas.

The planned building will have an area of 800,772 square feet and will have a finished floor elevation of about 904± feet. Site Plan Option 6 indicates a high bay rack area in

the eastern portion of the building with an area of 130,226 square feet. The central portion of the low bay area will have an option for a mezzanine to be constructed in the future. The west side of the building will have three "legs", each with shipping docks on both sides. Receiving docks will be along the north and south sides of the central warehouse area.

Concrete pavement is planned for truck aprons along all of the areas with truck docks and throughout the driveways between each of the western "legs". There will be a trailer parking yard north of the warehouse building with 189 spaces; northeast of the building with 236 spaces; west of the building with 206 spaces; and a row of trailer parking south of the building with 31 spaces. Initial plans are for all of the truck parking yards to be concrete pavement. We understand there is a bid contingency to construct the truck parking yard as asphalt pavement with concrete dolly pads. East of the office and high bay area will be asphaltic parking for automobiles.

We were informed by the project architect, MacGregor Associates Architects, and the project structural engineer, Browder + LeGuizamon &Associates, Inc. the maximum building loads are:

- Roof columns – 100 kips;
- Future mezzanine columns – 200 kips;
- Tilt wall loads – 5 kips per lineal foot;
- Floor slab loads – 300 psf.

Truck driveway access into the facility will be from Raco Parkway on the west side of the site. That driveway will be about 700 feet long, of concrete pavement construction, and will have a security building at its north end. Access to automobile parking will be from Georgia State Route 82 south of the office building, and from a driveway on Logistics Center Parkway. There will also be a driveway from Logistics Center Parkway connecting with the truck parking area northeast of the building.

3.0 EXISTING SITE CONDITIONS

The existing conditions of the site divide it into three sections from east to west. The eastern and western sections of the site have been pre-graded. Based on Google Earth™ aerial images, the western and eastern parcels were cleared and graded sometime between December 2007 and April 2008. The central portion of the property appears to be in its natural ground surface condition. However, structures shown on this parcel on the earlier photographs are not present in the February 2009 image.

The western section of the property is graded to an elevation of about 896 feet for the majority of the area. Slopes exist on each side of this section. The north slope is approximately 70 feet in height and it appears to have been filled in the past. At the bottom of that slope is a storm water detention pond. The slope along Georgia State Route 82 and Raco Parkway in the south and west portions of the site appears to have been excavated to achieve current elevations The approximate boundary between the

central and western portion of the site is an excavated slope with a maximum height of about 30 feet. That slope transitions to the north to a filled slope about 20 feet tall. That filled slope transitions into the 70-foot filled slope on the north side of the site. Vegetation in the western portion of the site is sparse grass. More dense grass grows from the slopes along the perimeter of that section.

The central portion of this property, in general, appears to be in its natural condition. Historical aerial photographs give evidence that this portion of the site was farmed. The ground surface elevation along Georgia State Route 82 is roughly equivalent to road grades of about 904 feet. The site slopes up towards the north to a maximum elevation of 936 feet. From the highest point in the central portion of the property, ground surface elevations slope downward moving to the north to an elevation of about 820 feet near the boundaries of a creek and/or wetland area. In the southeast portion of the "ungraded" central portion of the property, there is a lowland pond-type feature with a bottom elevation of about 880 feet. That pond feature is bounded on its east side by a fill slope approximately 8 feet tall, a flat area, then another fill slope about 14 feet tall at the edge of the eastern pre-graded portion of the site. Ground coverage in the central portion of the site is thick grass with widely spaced mature hardwood trees. The northernmost portions of the site are wooded

The eastern portion of the property has also been pre-graded. The section of that area bounded by Logistics Center Parkway roughly matches road grades of about 912 feet. The "building pad" section of this portion of the site is at elevation 914 feet. The west side of the pad has been filled where a 14-foot tall slope exists. That filled slope extends along that western area and continues along the north side of the pre-graded "pad". The northern slope has a maximum height of about 40 feet. A storm water management pond had been constructed as the bottom of that slope. Along the eastern and northeastern corner of the pre-graded "pad", maximum topographic relief is about 54 to 70 feet. Ground coverage in the eastern portion of the site is sparse grass with thicker grass growing in sloped areas. Thick hardwood trees are growing in the eastern undisturbed area long a creek.

A storm sewer pipe and sanitary sewer force main easement cross the east and central sections of the property and portions of the planned building area. We understand plans are to remove and relocate these lines from within building areas.

A site retaining wall is planned north of the building in the narrow portion of the site. The wall will be about 200 feet long and will have a maximum height of 30 feet. We do not know of what type of construction the wall will be built.

4.0 EXPLORATION AND TESTING PROCEDURES

Field sampling and testing by S&ME, Inc. are in general accordance with ASTM procedures and established geotechnical engineering practice. The Appendix contains brief descriptions of field procedures as well as the data obtained.

Our project engineer made a brief site reconnaissance to observe pertinent site and topographic features as well as surface indications of the site geology. He located the boring by estimating right angles and pacing from features identified on the provided topographic site plan. A consumer-grade handheld GPS device was also used to locate select borings. Ground surface elevations at the borings were interpolated from the provided topographic map. Because of the methods used, the boring locations shown on the Boring Location Plan and the elevations shown on the test boring records in the Appendix are approximate. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to obtain them.

The exploratory borings were made by mechanically twisting hollow-stem augers into the soil. Soil samples were obtained at $2^1/_2$- or 5-foot depth intervals with a standard 1.4-inch I.D., 2-inch O.D. split-barrel sampler. The sampler was first seated 6 inches and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "standard penetration resistance" with units of blows per foot (bpf). Very dense residual materials described as partially weathered rock were encountered within borings of this exploration. In these materials, 50 hammer blows drove the sampler less than 6 inches, and the Test Boring Records in the Appendix show the penetration for 50 blows as 50/3", 50/5", etc.

Soil samples obtained during the exploration were returned to our laboratory and reviewed by the project engineer. The purposes of this review were to check the field descriptions, visually estimate the percentages of the soils' constituents (sand, clay, etc.), identify pertinent structural features such as foliation planes and slickensides, etc., and observe evidence of soil origin. The stratification lines shown on the boring records represent the approximate boundaries between soil, but the transitions may be more gradual.

Field sampling and testing by S&ME, Inc. are in general accordance with ASTM procedures and established geotechnical engineering practice. The Appendix contains brief descriptions of field procedures as well as the data obtained. In addition to the field exploration, S&ME subcontracted with GeoWave Solutions, Inc. to perform microtremor arrays to develop the shear wave velocity profile within the building area.

5.0 AREA GEOLOGY

The project site is in Georgia's Piedmont physiographic province. Geologic mapping indicates that the site is underlain by parent rocks comprised of undifferentiated granitic gneiss. The soil overburden of this area is residuum formed by in-place weathering of the parent rocks. A typical upland soil profile consists of thin topsoil underlain by a few feet of clayey soils that transition with increasing depth into less clayey, coarser grained silts and sands with varying mica content. Separating the completely weathered soil overburden from the unaltered parent rock is a transition zone of residuum with penetration resistances of more than 100 bpf which is locally described as *partially weathered rock*. Partially weathered rock retains much of the appearance and fabric of the

parent rock formations, and may consist of thinly interlayered very hard or dense soil and rock.

The weathering processes that formed the overburden soils and partially weathered rock were extremely variable, depending on such factors as rock mineralogy, past groundwater conditions, and the tectonic history (joints, faults, and igneous intrusions) of the specific area. Differential weathering of the rock mass has resulted in erratically varying subsurface conditions, evidenced by abrupt changes in soil type and consistency in relatively short horizontal and vertical distances. Depths to rock can be irregular and isolated boulders, discontinuous rock layers, or rock pinnacles can be present within the overburden and transition zones.

Fill soils have been placed by man in conjunction with construction grading, farming, utility installation, or waste disposal. Fill can be composed of different soil types from various sources and can also contain debris from building demolition, organics, topsoil, trash, etc. The engineering properties of fill depend primarily on its composition, density, and moisture content. It is likely that the fill placed in the eastern and western portions of property were placed as engineered fill. However, we have not been provided with records of the fill construction at this site. If such data exist, they should be furnished to us for evaluation.

6.0 SUBSURFACE CONDITIONS

6.1 Topsoil

Topsoil was encountered at most all of the borings that were located in the central portion of the site. The topsoil thicknesses ranged from 1 inch to about 1 foot, but it was generally about 3 to 6 inches thick. Our drillers noted 1 inch of topsoil at the location of Boring P-8, which was located in the easternmost section of the site in an area of planned truck parking.

6.2 Fill

Fill soils were encountered in several of the borings of this exploration. In the central portion of the site, fill was penetrated in six borings and measured to be 2 ½ feet thick or less. Those fill soils were described as red-brown sandy silts or clayey silts and exhibited 6 to 13 blows per foot during standard penetration testing, which correlate to firm to stiff consistency.

In the western and eastern portions of property where earthwork had been done in the past, fill was encountered at ten boring locations. Three of those borings were located within future building areas and the remaining seven in future parking areas.

Borings B-1, B-10, P-9, P-13, P-15, and P-17 were located in the western pre-graded portion of the site and penetrated fills soils. Fill depths within those borings ranged from 2 to 8 feet. Those fill soils were generally brown or red-brown sandy silts. Standard penetration test values ranged from 8 to 12 bpf, which indicate firm to stiff consistencies. Borings B-6, P-8, P-11, and P-14 were located in the eastern pre-graded portion of the

property. With the exception of Boring B-6, fill soils were typically brown and red-brown sandy silts with standard penetration test values of 8 to 14 bpf, or tan and white silty sands with blow counts ranging from 10 to 30 bpf. At Borings P-11 and P-14, the fill was noted by the drillers as being "rocky". Both of those borings encountered refusal to further auger advancement within the fill at depths of 8 feet and 14 ½ feet. At Boring P-14, an offset boring encountered auger refusal at 14 ½ feet after the initial boring encountered auger refusal at 13 feet.

Fill soils were penetrated to a depth of about 17 feet in Boring B-6. From beneath the surficial topsoil layer to a depth of 6 feet, the fill was described as red-brown stiff (6 to 10 bpf) clayey silt with some roots and was estimated to be wet of its optimum moisture content. Topsoil fill was penetrated from 6 to 10 feet. The topsoil fill was estimated to be wet and exhibited stiff penetration resistance values of 13 to 33 bpf. Beneath the topsoil fill and to a depth of 17 feet, fill soil was again penetrated. The deeper fill soil was described as orange-brown firm (7 bpf) micaceous sandy silt and was also assessed to be wet.

6.3 Residual Soil

With the exception of Borings P-11 and P-14 that did not penetrate the fill mass, residual soils were encountered beneath the fill or topsoil, or from the ground surface. The residual soils were generally comprised of red-brown or orange-brown clayey silts, sandy silts, or silty sands, or tan or white sandy silts or silty sands. Standard penetration resistance values in the residual soils ranged from 5 to 65 bpf, but were commonly between 8 and 23 bpf. Six borings within the planned building area and ten borings in planned pavement areas were terminated in residual soil without encountering partially weathered rock or hard rock.

6.4 Partially Weathered Rock

Partially weathered rock was encountered in seventeen of the borings of this exploration. Depths of partially weathered rock varied from 0 feet at Borings B-11 and B-16 to as deep as 53 feet in Boring B-14. Approximate elevations at which partially weathered rock was sampled ranged from about 912 feet (Borings B-8 and P-10) to about 854 feet at Boring B-14 (Boring B-14 was drilled to greater depths for the purpose of determining the IBC Seismic Site Class). The majority of the partially weathered rock samples were taken at Elevation 877 feet or higher.

6.5 Auger Refusal Materials

Auger refusal materials were encountered in seventeen of the borings of this exploration. As noted above, the auger refusal materials encountered in Borings P-11 and P-14 are inferred to be boulders or pieces of rock within the fill mass. The auger refusal materials encountered in the remaining fifteen borings are inferred to be rock. The depth to auger refusal materials ranged from 1 to 39 feet at elevations ranging from 885 feet to 916 feet for most of those borings. Auger refusal was encountered in Boring B-14 at a depth of 71 feet (Elevation 837).

6.6 Groundwater

Stabilized groundwater levels were measured in Borings B-2, B-10, B-14, B-20, B-21, P-9, and P-19 at depths ranging from 3 inches to 44 feet. Groundwater depths correlate to elevations ranging from 864 to 897 feet and 865 feet at Boring B-14. Shallow groundwater (less than about 4 feet from the ground surface) was measured in Borings P-9, B-10, B-20, and B-21. We note that the shallow groundwater levels were likely the result of surface water entering the borehole. This exploration was done during a particularly rainy period, and there was standing water in portions of the pre-graded areas of the site during various times of our field work. Groundwater levels fluctuate with seasonal and yearly rainfall variation, and water levels may be either higher or lower at other times.

7.0 LIMITATIONS OF CONCLUSIONS AND RECOMMENDATIONS

This report is for the exclusive use of TJX Companies, Inc. for specific application to the referenced project. Our conclusions and recommendations have been prepared using generally accepted standards of geotechnical engineering practice in the State of Georgia. No other warranty is expressed or implied. This company is not responsible for the conclusions, opinions, or recommendations of others based on these data.

Our conclusions and recommendations are based on the project information furnished to us, the data obtained from this subsurface exploration, the assumptions stated herein, and our past experience. They do not reflect variations in the subsurface conditions that may exist between our borings and in unexplored areas of the site due to past land use, grading, and local geologic conditions. If such variations become apparent during construction, it will be necessary for us to re-evaluate our conclusions and recommendations based upon on-site observation of the conditions.

If the overall design and/or location of the proposed building and site improvements are changed, the recommendations contained in this report must not be considered valid unless the changes are reviewed by our firm and our recommendations modified or verified in writing. When the design is finalized, we should be given the opportunity to review the foundation plan, grading plan, and applicable portions of the project specifications. This review will allow us to check whether these documents are consistent with the intent of our recommendations.

Subsequent report sections include discussions regarding excavation difficulty; dewatering; foundation design construction; earthwork, and other related geotechnical engineering aspects of the proposed construction. The recommendations contained herein are not intended to dictate construction methods or sequences. They are based on findings from this subsurface exploration and are furnished solely to help designers understand subsurface conditions related to foundation and earthwork plans and specifications.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of the geotechnical design. We recommend that

the owner retain these services and that we be allowed to continue our involvement in the project through these phases of construction. Our firm is not responsible for interpretation of the data contained in this report by others, nor do we accept any responsibility for job site safety which is the sole responsibility of the contractor.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary

The following is a summary of what we believe are the key issues regarding project development. Design or construction should not rely only on the contents of this summary. Subsequent report sections must be read.

- Four borings of this exploration encountered auger refusal above planned finished grades at elevations ranging from 909 feet to 916 feet. Blasting is typically required to excavate refusal materials.
- At Borings P-11 and P-14, auger refusal was encountered on what we inferred to be boulders within the fill mass at approximately Elevation 898 feet; finished grades in the areas of those borings are 902 to 904 feet. Excavation difficulty will likely be encountered due to rock fill.
- Topsoil fill was encountered within Boring B-6 (ground surface elevation of about 890 feet) to a depth of 10 feet. Fill soils were penetrated beneath the topsoil fill to a depth of about 17 feet. The groundwater level was at 11 feet. The fill should be removed from within the building area.
- Dewatering techniques (as discussed in Report Section 8.2.2) will need to be implemented for excavation below the groundwater level.
- Up to about 30 feet of fill will be required to reach finished grades. We expect both fill induced settlement of underlying soils and settlement of soils within the fill mass. Settlement monitoring points should be established after the fill mass has reached finished subgrade elevations.
- The building foundation system can be designed as conventional shallow footings bearing on residual soil or newly placed structural fill.
- A Seismic Site Class “C” can be used for design purposes.
- Most of the excavated soil materials will be suitable for reuse as structural fill. Blast rock and boulders may be wasted in deep fills in non-structural areas.

8.2 Earthwork Recommendations

8.2.1 Stripping

Topsoil, organics, stumps, and large root systems should be stripped to prepare the site for construction. After stripping, the site should be observed by a representative of our firm, and any remaining pockets of organics should be undercut and stockpiled for future

use in landscaped areas. The existing underground utilities in the eastern portion of the planned building area should be removed and rerouted away from the building area. The topsoil fill that was encountered in Boring B-6 of this exploration and any remaining utility trench backfill should be removed to expose residual soils. Abandoned buried utilities and utility trench backfill should also be removed. We note that some structures exist on site and care should be taken to identify and remove any remnants (foundations, slabs, basements, etc.) of the previous construction. Where possible, stripping should extend at least 10 feet beyond the construction limits. After our representative has observed the subgrade, proofrolling and placement of structural fill may commence.

Clean topsoil can remain in place in parking areas that will receive at least 7 feet of compacted fill. However, the topsoil must be thoroughly root-raked, and concentrations of fibrous materials should be completely removed and wasted. The topsoil layer should be consolidated in place prior to fill placement. Where less than 7 feet of fill is placed, the topsoil should be stripped as previously recommended.

8.2.2 Dewatering

Groundwater may be encountered during undercutting of existing fill soils in the eastern and northeastern areas of the building. Drainage trenches and/or pumping from shallow sumps may be required for temporary dewatering of those excavations during undercutting operations.

Surface water will need to be drained away from construction areas in the pre-graded portions of the site if it exists at the time of construction. This can be done by excavating a series of trenches or by pumping water from shallow sump pits.

8.2.3 Subgrade Evaluation

After the site is stripped, at-grade areas and areas to receive fill should be evaluated by a member of our staff by observing proofrolling with a heavily loaded dump truck, earthmoving scraper, or similar piece of rubber-tired equipment. Proofrolling consists of applying repeated passes to the subgrade with this equipment. Topsoil in the pavement areas that has been root-raked should also be proofrolled. Any materials judged to deflect excessively under the wheel loads and which cannot be densified by continued rolling should be undercut to more stable soils or stabilized in place before placing fill. Undercutting should extend to at least 10 feet beyond the construction limits.

The topsoil is particularly susceptible to changes in moisture content. During periods of wet weather, these materials will not perform satisfactorily during proofrolling and may have to be undercut to firm residual soils or aerated and compacted prior to placing compacted fill. Topsoil which is free of excessive organic matter may be wasted in deep fills in non-structural areas or to dress slopes.

8.2.4 Subgrade Stabilization

The exposed subgrade soils, after undercutting in the eastern portion of the building, will likely be wet and soft. A stone stabilization blanket could provide a stable base for placing compacted soil. We suggest the use of No. 57 stone. The necessary thickness of

the crushed stone blanket must be determined in the field at the time of construction, but previous experience indicates that approximately 2 feet of stone should perform satisfactorily. The stone should be dumped in a stable area and then pushed out over the exposed subgrade with a light bulldozer. Because the satisfactory performance of the foundation system depends on effective stabilization, placement of the stone blanket must be monitored on a full-time basis by a representative of our firm.

8.2.5 Earth Material Utilization

After subgrade evaluation/preparation and any remediation as discussed above, the pavement and building areas that are to receive fill may be brought to their design subgrade levels using structural fill (except where topsoil fill is permissible). For this project, structural fill is defined as inorganic natural soil with maximum particle sizes of 3 inches and plasticity indexes (PI) of 30 or less. Structural fill should be placed in relatively thin (4- to 8-inch) layers and compacted to at least 95 percent of the soil's maximum dry density, as determined by the standard Proctor compaction test (ASTM D698). Since pavement and floor slab support characterisitcs of Piedmont soils are generally enhanced by an increased degree of compaction, we recommend that the upper 1 foot of fill beneath planned pavements and the building floor slab be compacted to at least 98 percent of the standard Proctor maximum dry density. In our opinion, the overburden soils, old fill (less organics and debris), and the majority of partially weathered rock can be used as structural fill.

Soil moisture contents could vary considerably with weather conditions during construction. Drying or wetting of the soils may be necessary to achieve the recommended compaction criterion. If grading occurs during wet weather, these materials likely cannot be dried sufficiently to obtain the recommended degree of compaction. We note that undercutting in the eastern portion of the site will extend to near or below the groundwater table. Therefore, the need for drying or wasting these materials should be expected.

The deeper parts of fills beneath pavement and in non-structural areas can include a variety of materials including topsoil, very coarse graded partially weathered rock, boulders and shot rock. Topsoil should be relatively free of root mat and other fibrous materials and should be capable of being compacted to at least 90 percent of its standard Proctor maximum dry density. This compaction criterion also applies to topsoil if left in place after the root mat has been removed. If the topsoil is wet, the 90 percent compaction criterion is difficult to achieve and the materials may be slow to dry. From a practical viewpoint, wet topsoil can be stockpiled for landscaping or should be discarded off site. As previously discussed, we recommend that at least 7 feet of compacted structural fill be placed between topsoil fill and the pavement subgrade.

Partially weathered rock should be compacted with a heavy self-propelled sheepsfoot roller such as a Caterpillar Model 815. This device usually can break down partially weathered rock to a gradation compatible with both the maximum particle size criterion for structural fill and in-place density testing. Partially weathered rock should be compacted to at least 95 percent of its standard Proctor maximum dry density.

Partially weathered rock that does not break down to 6 inches or less maximum particle size can be used as fill in deeper parts of pavement area fills or in non-structural areas. A maximum lift thickness of one foot is recommended for partially weathered rock with particles larger than 6 inches. If the partially weathered rock does not break down to a gradation compatible with in-place density testing, then compactive effort should be applied until there is no perceptible increase in fragmentation of the particles or observable consolidation of the fill during repeated passes of the compaction equipment. Qualified geotechnical personnel should be present to assess when this condition has been achieved.

We recommend that qualified geotechnical personnel be present during grading to provide guidance for material placement and to monitor the gradation of partially weathered rock placed as fill. In some cases, our maximum particle size guidelines can be relaxed if the material can be compacted into a dense mass free of significant voids.

Shot rock can be placed at the base of parking area or non-structural fills. A recommended maximum lift thickness for shot rock is 2 feet if the gradation of the shot rock has a broad range and even distribution of particle sizes. This material should be compacted with a heavy bulldozer (D8K Caterpillar or large) until there is no further consolidation beneath the equipment. Our representative must be present to assess when this condition has been achieved. Our shot rock fill placement recommendations may vary at the time of construction based on the gradation properties of the material in the field.

8.2.6 Fill Density Testing

In-place density testing must be performed as a check that the previously recommended compaction criteria have been achieved. We further recommend that these tests be performed on a full-time basis during mass grading. Part-time testing may suffice for utility trench backfills. During full-time density testing, the test frequency can be determined by our personnel based on the area to be tested, the grading equipment used, and construction schedule. A suggested part-time testing frequency is one test for every 7,000 to 10,000 square feet of in-place fill for the parking area, and one test for every 100 to 150 linear feet of fill behind retaining walls and in utility trenches. Tests should be performed at vertical intervals of 2 feet of less as the fill is being placed. We recommend density testing by a technician working under the direction of our project engineer.

8.2.7 Excavation Conditions

In mass-graded areas, self-loading scrapers or pusher-assisted scrapers can be used to excavate overburden soils. Our experience is that loosening with a tractor-mounted ripper may be necessary to facilitate scraper loading soils with penetration resistances of more than 30 bpf. Loosening of partially weathered rock will likely require use of a large bulldozer, such as a Caterpillar Model D8K, equipped with a single-tooth ripper. This equipment also can often dislodge relatively large boulders that cannot be excavated by the scrapers. In limited excavation areas, a large-front-end loader, such as a Caterpillar Model 977, may be used to excavate partially weathered rock.

Rubber-tired backhoes are customarily used to excavate trenches in overburden soils. However, because partially weathered rock and potentially massive rock were encountered at a relatively shallow depth at this site, we recommend trench excavation with a large, tracked backhoe, such as a Caterpillar Model 320. This device is generally able to excavate a significant thickness of partially weathered rock.

Mass grading with a Caterpillar Model D8K bulldozer/ripper or limited excavation with a Caterpillar Model 977 front-end loader will typically extend to near the borings' auger refusal depths. Trench excavation with a Caterpillar Model 320 backhoe can generally extend to within several feet of the refusal depth. Deeper excavation typically requires blasting or the use of pneumatic tools. Because of the geologic conditions in this area, it is possible to encounter large boulders, extensive rock lenses and rock pinnacles between our borings. These materials may be too large or competent to be excavated by the previously cited equipment and will likely require excavation by blasting or pneumatic tools.

Rock excavation can be defined in many ways. In our opinion, rock excavation should be defined in a method specification based on the grading equipment commonly used in the project's area. The Appendix contains a sample rock excavation specification for your consideration.

8.3 Foundation Recommendations

The exploration findings indicate that the planned building can be supported by footings bearing on residual soil or new compacted structural fill. We recommend use of a maximum allowable net soil bearing pressure of 3,500 psf for total load to size column and strip footings supported by these materials. Even though computed footing dimensions may be less, column footings should be at least 24 inches wide and strip footings should be at least 18 inches wide. These dimensions facilitate densification and/or hand cleaning of footing subgrades disturbed by the excavation process. They also reduce the potential for localized punching shear failure. All exterior footing bottoms should be at least 12 inches below the lowest adjacent exterior grade for protection against frost penetration.

As much as 30 feet of fill will be placed after undercutting is completed in the eastern and northeastern building area, and as much as 16 feet of fill will be placed in the northwest building area. Some settlement will occur in the underlying residual soils and within the fill mass. Therefore, we recommend a waiting period on the order of 25 to 40 days between completion of site grading and building construction to allow most of the settlement to take place. After fill completion, the actual rate of settlement should be determined by making level readings two to three times per week on monitoring points on the surface of the fill pad. The monitoring points can consist of No. 4 reinforcing bars, 4 feet long, driven into the soil, and spaced 150 to 200 feet apart. Based on these readings, we can assess when construction of the superstructure can commence. Footing installation in other parts of the building can commence during the waiting period. If

footing installation in the deep fill areas cannot be sufficiently delayed, provisions should be made to shim columns and tilt panels.

All footing excavations must be evaluated by a representative of our firm to observe field conditions in light of our design recommendations. We can also provide geotechnical guidance to the owner's design team if any unforeseen foundation conditions are encountered during construction.

Footing excavation often produces a thin veneer of disturbed soil at the footing subgrade. We recommend that this disturbed soil be hand cleaned prior to placing reinforcing steel. Furthermore, the footing bottom should be free of all fall-in prior to placing concrete.

The strength properties of soil exposed at the footing subgrade will change if exposed to wetting, drying, or freezing. Whenever possible, concrete should be placed during the day the excavation is completed. If subgrades will be left open for more than one day, they should be covered with polyethylene sheeting. If inclement weather is expected, a lean (1,000 psi) concrete veneer about 3 inches thick should be placed on the exposed subgrade. Excavation of disturbed soil may be required if these protective measures are not implemented.

8.4 Floor Slabs

The floor slabs can be supported by residual soil or new structural fill. Because some minor differential settlement is possible, the floor slabs should be structurally separate from the building column and wall foundations to reduce the chance for slab cracking to occur. Alternately, the transition from the slab-on-grade to these structural elements can be reinforced.

Since shallow groundwater was encountered at least 10 feet below planned finished floor elevations in the borings, we believe that an underslab drainage layer is optional. The floor slab should, however, be underlain by an effective and durable vapor barrier, which will reduce the possibility of slab dampness due to upward migration of soil moisture. If a moisture-sensitive floor covering will be installed on the concrete slab-on-ground, a conventional vapor barrier alone may not be sufficient to allow needed moisture vapor emission rates or concrete relative humidity to be achieved or maintained over the life of the structure.

8.5 Conventionally Designed Retaining Walls

This report section addresses the design of cantilever concrete retaining walls, and does not apply to Mechanically Stabilized Earth (MSE) walls. We suggest any MSE walls for this project be constructed on a design-build basis as is typically done in the Atlanta Metropolitan area.

Loading dock and ramp walls will act as retaining wall. Also, there may be a need for site retaining walls to facilitate grade changes. Any wall that is free to deflect or rotate should be designed for the "active" earth pressure condition. Walls that will be laterally restrained and not free to deflect or rotate should be designed using the "at-rest" earth

pressure condition. Loading dock walls will be restrained and should be designed for the "at-rest" condition. Site and ramp walls which are free to deflect should be designed for the "active" condition. Retaining walls can be designed with shallow foundations dimensioned based upon an assumed maximum allowable toe pressure of up to 3,500 psf. Applicability of this bearing pressure should be assessed in the field prior to concrete placement.

The soil behind the wall is assumed to exert a triangular stress distribution which can be modeled in terms of an "equivalent fluid" for both the "active" and "at-rest" cases. If a uniform area surcharge acts behind the wall, a portion of the surcharge is transferred to the wall in the form of a uniform or rectangular stress distribution. The magnitude of the surcharge load transferred to the wall is a function of the soil's strength and the degree of deflection or rotation permissible and is computed by multiplying the soil's "earth pressure coefficient" by the magnitude of the surcharge. The following table presents values of earth pressure coefficients and equivalent fluid unit weights for both the active and at-rest earth pressure conditions.

Table 8.5.1 – Retaining Wall Design Parameters

Earth Pressure Condition	Earth Pressure Coefficient	Recommended Equivalent Fluid Unit Weight, pcf
Active, Horizontal Backfill	0.36	40
At-Rest, Horizontal Backfill	0.53	60

Passive earth pressure of soil adjacent to the footing as well as soil friction at the footing base may be used to resist sliding. An ultimate friction coefficient between the concrete footing and soil can be assumed as 0.4. (This friction coefficient also applies to other building footings.) For computations, the ultimate passive soil resistance may be assumed to act as a fluid with an equivalent unit weight of 300 pcf, assuming a horizontal ground surface configuration at the front face of the wall. If walls are constructed near slopes, the foundation should be lowered so as to maintain at least 8 feet between the leading edge of the footing and the slope face.

For computing soil friction at the footing base, compacted soil placed above the footing can be assumed to have a unit weight of 115 pcf. We suggest that a safety factor of at least 2.0 be used to determine restraining forces because no strength tests have been performed on the soils and because the simplified earth pressure theory (Rankine) was used to estimate the soil's passive resistance.

The recommended earth pressure coefficients assume that there are level ground surfaces on both sides of the walls and that constantly functioning drainage systems will be installed between any walls and soil backfill to prevent the build-up of hydrostatic pressures and lateral stresses in excess of those calculated for drained conditions. If sloping backfill is required or a slope is located near the toe of the wall, the presented lateral earth pressure coefficients and equivalent fluid weights will need to be modified.

Again, the recommendations in this report section do not apply to design of mechanically stabilized earth (MSE) walls.

Wall drainage systems should consist of a filtered granular backfill (No. 57 size crushed stone) or a manufactured material such as Enkadrain or Miradrain. The drainage medium should extend to within 2 feet of the ground surface in exterior areas. Silty or clayey compacted structural fill should be placed over the drainage medium to prevent direct surface water inflow. The drainage medium should be connected to a positive draining footing drain or weepholes. If a crushed stone drainage medium is used, we recommend that it be separated from the surrounding soil by a non-woven geotextile filter cloth such as Mirafi 140NL. A non-woven geotextile filter cloth should also be placed between the weephole openings and crushed stone.

Other than the granular backfill or manufactured drainage material immediately behind the walls, compacted structural fill may be used as backfill behind the retaining walls. We recommend that these materials be compacted to at least 95 percent of their standard Proctor maximum dry density. Light, hand-operated compaction equipment should be used within about 6 feet of walls to reduce the risk of over-stressing the walls, or the walls must be designed to resist the stresses imposed by large compaction equipment.

8.6 Earth Slopes

Generally, permanent cut and fill slopes should be no steeper than 2H:1V and temporary slopes no steeper than 1 ½H:1V. These slope recommendations are based on our previous experience with similar conditions since no detailed slope stability analysis was performed to justify steeper slopes.

We recommend a building setback of at least 10 feet from the tops of all slopes of up to 20 feet in height and a setback of at least 20 feet from higher slopes. A setback for pavement area curbs of at least 3 feet from slope crests is advised. Drop inlets or storm sewers should not be installed at the crests of slopes because leakage can result in maintenance problems or possible slope failure. Crest areas should be sloped to prevent surface runoff from flowing over the slope faces.

The possibility of utilizing topsoil as fill in slopes was discussed in the “Earth Material Utilization” Report Section 8.2.5. If topsoil fill is to be used in slopes compacted to only 90 percent of the standard Proctor maximum dry density, it would be preferable to reduce the slope inclination to 21/2H:1V or flatter. If a 2H:1V slope inclination is chosen and topsoil fill is to be placed, the risk associated with a potential decrease in slope stability must be accepted by the owner.

It is difficult to construct fill at the recommended inclinations without leaving a loose, poorly compacted zone on the slope face. For this reason, we recommend that any fill slopes be slightly over-built, then cut back to firm, well compacted soils prior to applying a vegetative cover. If the slopes cannot be slightly over-built and cut back, we recommend that finished soil slopes be compacted to reduce, as much as practical, the

thickness of this soft surficial veneer. The compaction may be done by making several coverages from top to bottom of the slopes using a bulldozer.

8.7 Pavements

We have performed pavement thickness designs for both concrete pavement and optional asphaltic pavement for the truck lots and for asphalt pavement for the associate vehicle parking lot. Our design was based on the following parameters which were provided to us via e-mail on May 20, 2013 and our experience with soils in this area:

- The provided peak truck move count of 8,000 moves per month, with the assumption that half of those moves will be in one direction for any travel lane. This corresponds to a daily truck count per lane of 133;
- The provided automobile count of 1,650 vehicles per day;
- An assumed CBR value of 6;
- Coefficient of Terminal Serviceability of 2.5 for concrete pavements, and 2.0 for asphalt pavements;
- Assumed gross truck weights of 27 tons; and
- 20-year design life.

Our recommended pavement section thicknesses are as follows:

Table 8.7.1 – Material Specifications

Pavement Component	General Specification	Percent Compaction Requirement
Subgrade	Upper 12 inches of existing soil or compacted structural fill	98% of standard Proctor (ASTM D698), ±2% of optimum moisture content
Base Course	GA DOT Section 815 and Section 310	100% modified Proctor (ASTM D1557)
Prime Coat (if specified)	GA DOT Section 412	N/A
Tack Coat	GA DOT Section 413	N/A
Asphaltic Concrete Binder	GA DOT Section 828, 19 mm GA DOT Section 400, maximum lift thickness of 3 inches	92% of theoretical voidless density (AASHTO T209)
Heavy-Duty Asphaltic Concrete Wearing Surface	GA DOT Section 828, 12.5 mm GA DOT Section 400	92% of theoretical voidless density (AASHTO T209)
Light-Duty Asphaltic Concrete Wearing Surface	GA DOT Section 828, 9.5 mm	

Table 8.7.2 – Recommended Pavement Section Thicknesses

Pavement Component	Heavy-Duty Concrete Pavement Section Thickness (in.)	Optional Heavy-Duty Asphalt Pavement Section Thickness (in.)	Automobile Parking Asphalt Pavement Section Thickness (in.)
Base Course	4	10	6
Portland Cement Concrete	8	--	--
Asphaltic Concrete Binder Course – 19 mm Superpave	--	5*	2
Asphaltic Concrete Surface – 12.5 mm Superpave	--	1 ½	--
Light-Duty Asphaltic Concrete Surface – 9.5 mm Superpave	--	--	1 ½

*Maximum allowable lift thickness for 19 mm Superpave mix is 3 inches. Two lifts will be required.

All Portland cement concrete pavements should contain 4 to 6 percent entrained air, assuming the mix will contain 3/4- to 1-inch nominal maximum size aggregate. Concrete slump should be no more than 4 inches. A set of four test cylinders should be cast in accordance with ASTM C31 for each 100 cubic yards of concrete placed. At least one set of four test cylinders should be cast for each day's placement. The cylinders should be cured in accordance with ASTM C31 and tested at 7 and 28 days in accordance with ASTM C39. (Optionally, flexural strength testing can be specified.)

Joints should be installed to limit stresses resulting from pavement expansion and contraction. We recommend that contraction joints be formed by sawing as soon as the concrete has hardened sufficiently that the joint will not ravel. These joints should be cut at least one-quarter of the pavement slab thickness and no more than 15 feet apart. The panels should be as nearly square as feasible to minimize random shrinkage cracking. We suggest that ACI or PCA guidelines for jointing be followed. If reinforcing steel is used, it should not continue through the joints. If the reinforcing steel is intended to increase joint spacing then dowel baskets should be used at all joints. The minimum concrete thickness listed in Table 8.7.2 will remain the same even with use of reinforcing steel. All pavement joints should be sealed with a highway grade polyurethane or silicone sealant.

Expansion joints should be used where pavement sections abut all stationary objects such as curbs, lighting supports, bollards, and drainage structures, and where the rigid pavements abut any asphaltic concrete. Additionally, slab sections should be thickened at free edges (when subject to traffic), then tapered to design thickness within 5 feet.

We recommend that the Georgia Department of Transportation's Standard Specifications for Construction of Roads and Bridges, 2001 be used as reference specifications for this project. As with any pavements, a continued regular maintenance program should be

implemented to maintain a satisfactory serviceability level over the design period. The maintenance program should include sealing cracks and repairing minor deficiencies before they become major problems.

8.8 Final Floor Slab and Pavement Subgrade Preparation

Between the completion of grading and the time of slab or pavement construction, soil subgrades often are disturbed by exposure to the elements, footing and utility installation, or other construction activities. For this reason, the subgrades should be evaluated by a representative of the geotechnical engineer immediately prior to constructing the floor slab or placing the base course for the pavement. During this evaluation, accessible portions of the subgrades should be proofrolled with a loaded tandem-axle dump truck in the presence of our representative. Areas inaccessible to the proofrolling truck should be evaluated by other appropriate means. Areas judged to be unsatisfactory should be undercut to expose adequately firm soil and backfilled with compacted crushed stone or soil fill compacted to at least 95 percent of the material's standard Proctor maximum dry density in the building area, or to at least 98 percent in pavement areas.

9.0 SEISMIC SITE CLASS

We have performed a seismic shear wave investigation for the subject site. We have determined that the Seismic Site Class value of "C" can be used for design of the warehouse building. The following table provides additional seismic design parameters:

Table 9.1 – Seismic Design Paramaters

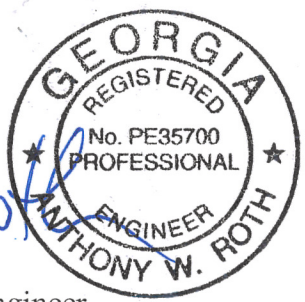
Site Class	S_S	S_1	F_a	F_v	SM_S	SM_1	SD_S	SD_1	T_S	T_0
C	0.262	0.093	1.2	1.7	0.315	0.158	0.210	0.105	0.500	0.100

10.0 ACKNOWLEDGEMENT

S&ME, Inc. appreciates the opportunity to provide our services relative to geotechnical design issues for your project. We look forward to the opportunity to continue our involvement during construction by providing materials testing and Special Inspection services. Please contact us if you have any questions regarding this report.

Respectfully submitted,

S&ME, Inc.



Anthony W. Roth, P.E.
Project Geotechnical Engineer
Reg. Ga. 35700

Richard Mockridge, P.E.
Principal Geotechnical Engineer
Reg. Ga. 12692

Enclosures

APPENDIX

BORING LOCATION PLAN

TEST BORING RECORDS

ROCK DEFINITION

PROCEDURES

IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

S:\ENVIRONMENTAL\PROJECTS\DULUTH CAD\1801-13-201\1801-13-201\1801-13-201.DWG

N

P-1 P-2 P-3 P-4 P-5 P-6 P-7 P-8 P-9 P-10 P-11 P-12 P-13 P-14 P-15 P-16 P-17 P-18 P-19

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22 B23 B24

ASSUMED FFE = 904.17

800,772 SF

RACO PARKWAY (EX. R/W 100' & VARIES)

STATE ROUTE 82
A.K.A. HOLLY SPRINGS ROAD

WAYNE POULTRY ROAD (EX. R/W 100')

GEORGIA S. R.-82 (EX R/W 100' & VARIES)

TEMPLE-INLAND ZONED: A-2

JACKSON-85 DISTRIBUTION CENTER ZONED: LI

JEFFERSON DISTRICT DRIVE (EX R/W 60' & VARIES)

N/F ABRAHAM CHOI ZONED: A2

N/F ARUMPRASAD KANCHERLA DB 91, PAGE 464 & DB 9, PAGE 69 ZONED A-2

SCALE
300 150 0 300
1"=300'

LEGEND

APPROXIMATE SOIL TEST BORING LOCATION

S&ME

BORING LOCATION PLAN

PROJECT CARRIER
STATE ROUTE 82
PENDERGRASS, JACKSON COUNTY, GEORGIA

FILE NAME: 1801-13-201	DRAWN BY: CLH	CHK'D BY: TR	
JOB NO: 1801-13-201	DATE: 5-23-13	FIGURE NO: 1	

SOURCE: PRELIMINARY ENGINEERING PLAN, TDK ENGINEERS. DATED MAY 11, 2013

BORING NUMBER B-1

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/6/13 **COMPLETED** 5/6/13 **GROUND ELEVATION** 896 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES Auger refusal initially encountered at 9 ft. Boring was offset 30 ft west of drilled

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	896.0		SANDY SILT, red - brown, stiff, rock fragments, micaceous, FILL, moist	SS 1		3-5-6 (11)		
	894.0		SILTY SAND, orange, black, and white, medium to coarse grained, medium dense, rock fragments, very micaceous, moist	SS 2		25-10-7 (17)		
	890.0		SILTY SAND, orange - brown, fine to medium grained, medium dense, micaceous, moist	SS 3		8-9-9 (18)		
	888.0		SILTY SAND, tan and orange - brown, PARTIALLY WEATHERED ROCK, no recovery	SS 4		50/0"		
10								
	883.0		SILTY SAND, orange - brown and tan, fine to coarse grained, very dense, very micaceous, PARTIALLY WEATHERED ROCK	SS 5		50/5"		
20				SS 6		50/3"		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 20.0 feet.

BORING NUMBER B-2

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 885 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING 15.00 ft / Elev 870.00 ft
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING 15.00 ft / Elev 870.00 ft
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	885.0						
	884.0	TOPSOIL (1 foot)	SS 1		4-4-4 (8)		
		CLAYEY SILT, brown, firm to stiff, with some rock fragments, RESIDUUM, very moist	SS 2		5-3-3 (6)		
			SS 3		5-5-5 (10)		
	877.0	SANDY SILT, brown, very stiff, with some clay	SS 4		26-20-10 (30)		
10	875.0	SANDY SILT, orange - brown, black, and white, very stiff, wet	SS 5		3-4-13 (17)		
20			SS 6		6-10-8 (18)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 20.0 feet.

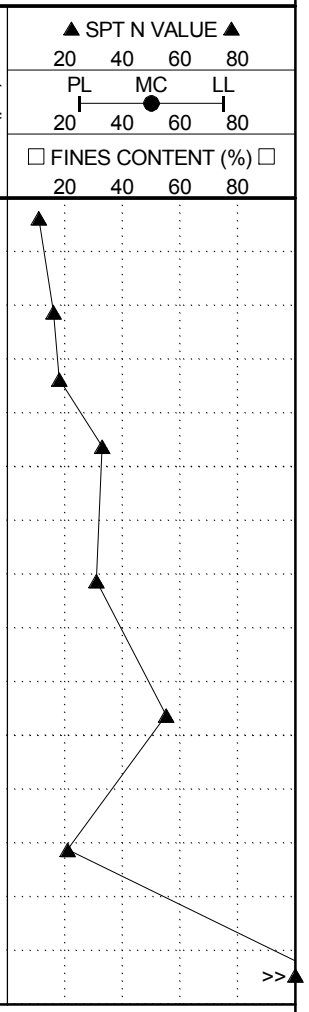
BORING NUMBER B-3

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/3/13 **COMPLETED** 5/3/13
GROUND ELEVATION 916 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	916.0	TOPSOIL (6 inches)	SS 1		3-5-6 (11)		
		CLAYEY SILT, dark red - brown, stiff, some roots, RESIDUUM					
	913.0	SANDY SILT, red - brown, very stiff to hard, some clay	SS 2		7-8-8 (16)		
			SS 3		7-9-9 (18)		
10	906.0		SS 4		11-20-13 (33)		
		SILTY SAND, black and tan, coarse grained, medium dense to very dense, very micaceous, with rock fragments	SS 5		10-10-21 (31)		
20			SS 6		20-20-35 (55)		
	893.0	SANDY SILT, tan and gray, fine to medium grained, medium dense, micaceous	SS 7		10-10-11 (21)		
30	887.0	SILTY SAND, tan and gray, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK	SS 8		32-50/4"		

Refusal at 30.0 feet.
Bottom of borehole at 30.0 feet.



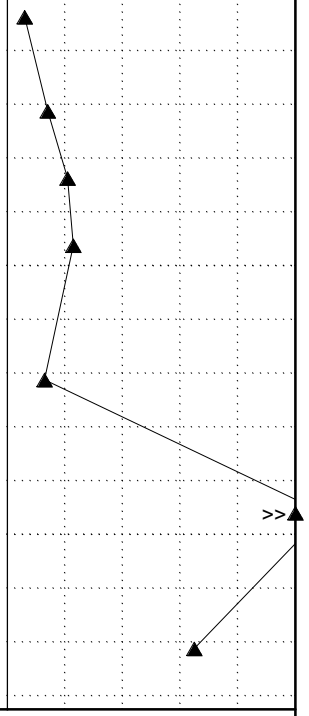
BORING NUMBER B-4

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/1/13 **COMPLETED** 5/1/13
GROUND ELEVATION 918 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	918.0						
	917.2	TOPSOIL (10 inches)					
		CLAYEY SILT, red - brown, firm, some roots, RESIDUUM, wet	SS 1		4-3-3 (6)		
	915.0	SANDY SILT, red - brown, stiff	SS 2		10-8-6 (14)		
			SS 3		9-11-10 (21)		
	910.0	SILTY SAND, white and orange - brown, coarse grained, medium dense, with a trace of mica	SS 4		10-11-12 (23)		
10							
	905.0	SILTY SAND, black brown, fine grained, medium dense, micaceous, with partially weathered rock lenses	SS 5		6-6-7 (13)		
			SS 6		10-22-50/5"		
20							
	895.0	SILTY SAND, gray - tan, coarse grained, very dense, micaceous	SS 7		17-25-40 (65)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



Refusal at 26.5 feet.
Bottom of borehole at 26.5 feet.

BORING NUMBER B-5

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 908 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	SPT N VALUE / PL MC LL / FINES CONTENT (%)
0	908.0	TOPSOIL (3 inches)	SS 1		4-4-4 (8)			
		CLAYEY SILT, dark red - brown, firm, some roots, FILL, wet						
	905.5	CLAYEY SILT, red - brown, very stiff, RESIDUUM	SS 2		7-9-11 (20)			
	903.0	SANDY SILT, dark red - brown, very hard, rock fragments	SS 3		11-22-28 (50)			
	900.0	SILTY SAND, brown - tan, fine to medium grained, medium dense, rock fragments	SS 4		13-12-13 (25)			
10								
	895.0	SILTY SAND, tan and orange - brown, medium to coarse grained, very dense, PARTIALLY WEATHERED ROCK	SS 5		20-50/2"			

Refusal at 14.0 feet.
Bottom of borehole at 14.0 feet.

SPT N VALUE: 20 40 60 80
PL MC LL: 20 40 60 80
FINES CONTENT (%): 20 40 60 80

BORING NUMBER B-6

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 890 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** 11.00 ft / Elev 879.00 ft

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	890.0		TOPSOIL (6 inches)	SS 1		4-4-6 (10)		
			CLAYEY SILT, red - brown, stiff, with roots, wet, FILL	SS 2		2-3-3 (6)		
	884.0		SANDY SILT, black and gray, stiff to hard, with roots and organic odor, TOPSOIL FILL, wet	SS 3		4-8-5 (13)		
10	880.0		SANDY SILT, orange - brown, firm, micaceous, micaceous, FILL, wet	SS 4		7-13-20 (33)		
				SS 5		4-4-3 (7)		
	873.0		CLAYEY SAND, tan, medium dense, RESIDUUM, wet					
20				SS 6		15-15-15 (30)		

Bottom of borehole at 20.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

S&ME, Inc.

BORING NUMBER B-7

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 920 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES Auger refusal initially encountered at 3 ft, offset 12 ft to the south.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	920.0		TOPSOIL (4 inches)	SS 1		3-3-7 (10)			
			SILTY CLAY, red brown, stiff, roots, RESIDUUM						
				SS 2		50/0"			
			Refusal at 4.0 feet. Bottom of borehole at 4.0 feet.						

BORING NUMBER B-8

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/1/13 **COMPLETED** 5/1/13 **GROUND ELEVATION** 926 ft **HOLE SIZE** 6 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Caved at 12 ft

NOTES Auger refusal intially encountered at 11 1/2 ft, offset 12 ft toward B-12.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	926.0		TOPSOIL (3 inches)						
			SANDY CLAY, dark red - brown, firm, RESIDUUM, moist	SS 1		4-4-4 (8)			
	923.0		CLAYEY SAND, dark red - brown, medium to coarse grained, medium dense to dense, rock fragments, wet	SS 2		12-13-25 (38)			
				SS 3		6-7-7 (14)			
	918.0		SILTY SAND, dark red - brown, fine to coarse grained, medium dense, rock fragments, wet	SS 4		7-8-8 (16)			
10									
	912.5		PARTIALLY WEATHERED ROCK, no recovery	SS 5		50/0"			>>

Refusal at 15.0 feet.
Bottom of borehole at 15.0 feet.

BORING NUMBER B-9

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 922 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	922.0	TOPSOIL (6 inches)	SS 1		4-5-5 (10)		
		CLAYEY SILT, red - brown, stiff to very stiff, RESIDUUM	SS 2		7-10-10 (20)		
	917.0	SANDY SILT, red - brown and tan, very stiff, micaceous	SS 3		7-12-12 (24)		
	914.0	SILTY SAND, white and orange - brown, fine to medium grained, medium dense	SS 4		5-9-10 (19)		
10	911.0	SANDY SILT, dark red - brown, very stiff, very micaceous	SS 5		10-10-10 (20)		
	904.0	SAND, gray, white, and tan, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK	SS 6		23-38-50/4"		
20	899.0	PARTIALLY WEATHERED ROCK, no recovery	SS 7		50/0"		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

>>
>>

Refusal at 27.5 feet.
Bottom of borehole at 27.5 feet.

BORING NUMBER B-10

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 898 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING 0.25 ft / Elev 897.75 ft
NOTES Hole likely filled with water from the surface.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	898.0		SANDY SILT, brown, stiff, rock fragments, micaceous, FILL, moist	SS 1		3-5-5 (10)		
				SS 2		7-5-7 (12)		
	893.0		CLAYEY SILT, red - brown, very stiff, roots, RESIDUUM	SS 3		7-9-9 (18)		
	890.0		SANDY SILT, red, brown and black, very stiff	SS 4		25-10-20 (30)		
10								

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Refusal at 13.0 feet.
Bottom of borehole at 13.0 feet.

S&ME, Inc.

BORING NUMBER B-11

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 898 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES Auger refusal intially encountered at 1 ft, offset 50 ft away from B-16.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	898.0								
			SILTY SAND, brown and tan, medium to coarse grained, very dense, some mica, PARTIALLY WEATHERED ROCK	SS 1		5-50/5"			>>▲

Refusal at 3.0 feet.
Bottom of borehole at 3.0 feet.

BORING NUMBER B-12

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/1/13 **COMPLETED** 5/1/13
GROUND ELEVATION 830 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	830.0	TOPSOIL (6 inches)					
		CLAYEY SILT, dark red - brown, stiff, RESIDUUM, moist	SS 1		4-5-6 (11)		
			SS 2		3-4-6 (10)		
			SS 3		4-6-6 (12)		
	822.0	SANDY SILT, red - brown, hard, very micaceous, moist	SS 4		12-14-18 (32)		
10							
	817.0	SANDY SILT, red - brown, stiff to very stiff, very micaceous	SS 5		6-6-8 (14)		
			SS 6		7-10-11 (21)		
20							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Refusal at 22.0 feet.
Bottom of borehole at 22.0 feet.

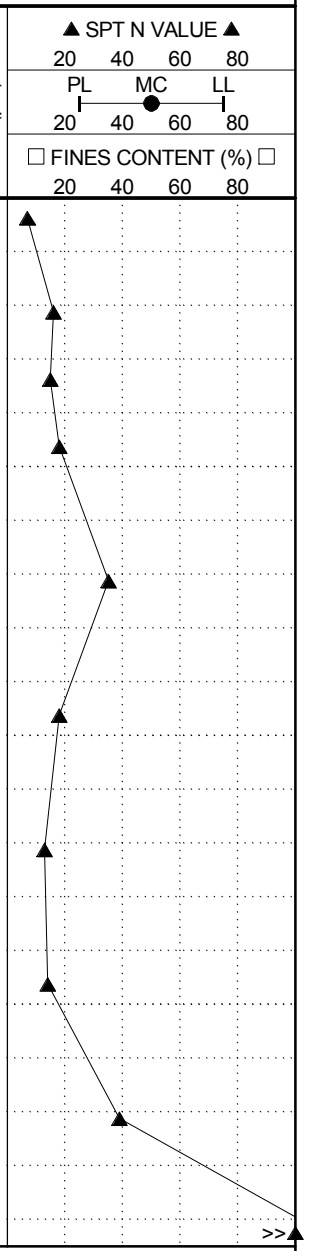
BORING NUMBER B-13

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/1/13 **COMPLETED** 5/1/13
GROUND ELEVATION 932 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	932.0	TOPSOIL (3 inches)	SS 1		3-3-4 (7)		
		SANDY CLAYEY SILT, red - brown, firm, RESIDUUM, very moist					
	929.0	SANDY SILT, red - brown, stiff to very stiff, some mica, moist	SS 2		6-8-8 (16)		
			SS 3		7-8-7 (15)		
	924.0	SAND, pink and tan, medium to coarse grained, medium dense to dense, rock fragments	SS 4		9-9-9 (18)		
10			SS 5		13-20-15 (35)		
20	912.0	SANDY SILT, brown tan, and black, stiff, very micaceous, moist	SS 6		21-11-7 (18)		
			SS 7		5-6-7 (13)		
30	902.0	SANDY SILT, tan, very hard, very micaceous	SS 8		6-7-7 (14)		
			SS 9		10-18-21 (39)		
	894.0	PARTIALLY WEATHERED ROCK, no recovery	SS 10		50/0"		

Refusal at 39.0 feet.
Bottom of borehole at 39.0 feet.



BORING NUMBER B-14

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/2/13 **COMPLETED** 5/2/13 **GROUND ELEVATION** 908 ft **HOLE SIZE** 6 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

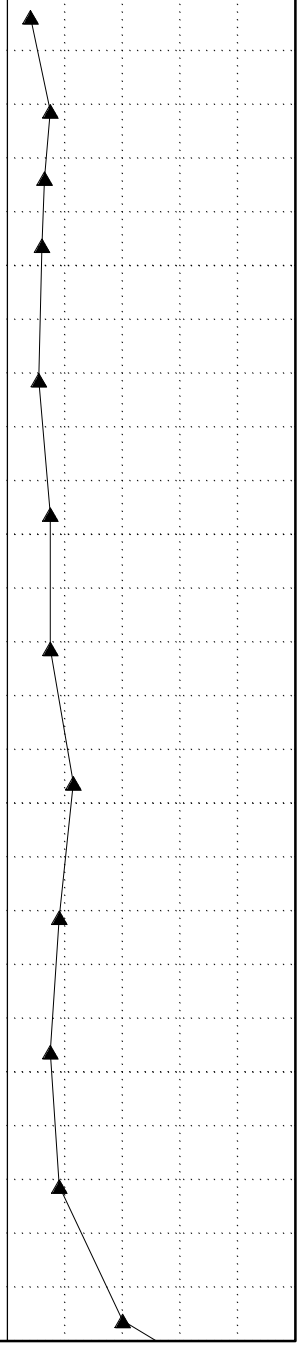
DRILLING METHOD Hollow Stem Auger, Rope and Cathead ▽ **AT TIME OF DRILLING** 43.00 ft / Elev 865.00 ft

LOGGED BY Driller **CHECKED BY** Tony Roth ▼ **24hrs AFTER DRILLING** 24.00 ft / Elev 884.00 ft

NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	908.0						
	907.0	TOPSOIL (6 inches)	SS 1		4-4-4 (8)		
		CLAYEY SILT, red - brown, firm, FILL					
		SANDY SILT, orange - brown, firm to stiff, some clay, some mica, RESIDUUM	SS 2		5-7-8 (15)		
			SS 3		6-7-6 (13)		
	900.0	SILTY SAND, red - tan, fine to medium grained, medium dense, some mica	SS 4		5-6-6 (12)		
10							
	895.0	SANDY SILT, tan - brown, stiff to very stiff, very micaceous	SS 5		4-5-6 (11)		
			SS 6		6-6-9 (15)		
20							
			SS 7		6-7-8 (15)		
			SS 8		10-11-12 (23)		
30							
			SS 9		8-8-10 (18)		
			SS 10		8-7-8 (15)		
40							
	865.0	SILTY SAND, white, fine to medium grained, dense, wet	SS 11		9-9-9 (18)		
			SS		11-18-22		
50							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



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CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
50			SILTY SAND, white, fine to medium grained, dense, wet *(continued)*	12		(40)			
	855.0		SANDY SILT, white, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK, wet	SS 13		50/5"			>>
	850.0		PARTIALLY WEATHERED ROCK, no recovery	SS 14		50/0"			>>
60	845.0		SANDY SILT, white, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK, wet	SS 15		50/1"			>>
	840.0		PARTIALLY WEATHERED ROCK, no recovery	SS 16		50/0"			>>
70									

Refusal at 71.0 feet.
Bottom of borehole at 71.0 feet.

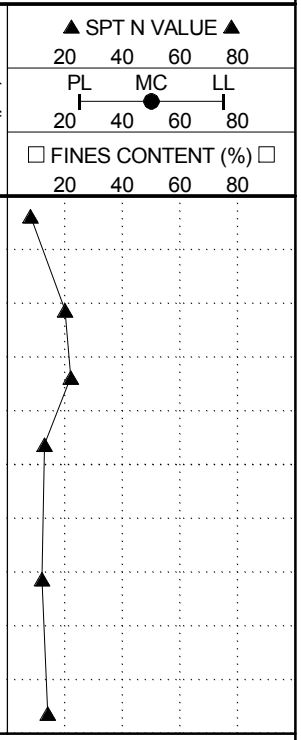
BORING NUMBER B-15

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 888 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	888.0	CLAYEY SILT, red - brown, firm, some roots, RESIDUUM, moist	SS 1		4-4-4 (8)		
	885.5	CLAYEY SILT, red - brown, very stiff	SS 2		8-10-10 (20)		
	882.0	SANDY SILT, red - brown and white, very stiff, some clay	SS 3		7-9-13 (22)		
	880.0	SANDY SILT, brown and red - brown, stiff, very moist	SS 4		6-6-7 (13)		
10			SS 5		5-6-6 (12)		
	872.0	SILTY SAND, red - brown, gray, and tan, fine to medium grained, medium dense, moist	SS 6		5-6-8 (14)		
20							

Bottom of borehole at 20.0 feet.



S&ME, Inc.

BORING NUMBER B-16

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 898 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES Offset 50 ft toward B-11, Auger Refusal at 2 1/2 ft.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	898.0		SILTY SAND, gray, fine to coarse grained, very dense, with a trace of mica, PARTIALLY WEATHERED ROCK	SS 1		50/5"			>>

Refusal at 2.0 feet.
Bottom of borehole at 2.0 feet.

BORING NUMBER B-17

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/1/13 **COMPLETED** 5/1/13
GROUND ELEVATION 929 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	929.0	TOPSOIL (3 inches)	SS 1		3-4-4 (8)		
		CLAYEY SILT, red - brown and tan, firm, RESIDUUM					
	926.0	CLAYEY SANDY SILT, red - brown, stiff, some mica	SS 2		5-6-4 (10)		
	924.0	SANDY SILT, red - brown, stiff, very micaceous	SS 3		4-5-5 (10)		
10			SS 4		4-5-5 (10)		
			SS 5		5-6-7 (13)		
	911.0	SILTY SAND, tan, fine to medium grained, loose to medium dense	SS 6		4-4-4 (8)		
20			SS 7		22-13-10 (23)		
	902.0	SILTY SAND, brown, fine to medium grained, very dense, very micaceous, PARTIALLY WEATHERED ROCK	SS 8		22-50/5"		
30							
	896.0	PARTIALLY WEATHERED ROCK, no recovery	SS 9		50/0"		
	894.0	SILTY SAND, brown, fine to medium grained, very dense, very micaceous, PARTIALLY WEATHERED ROCK					
40			SS 10		50/5"		

SPT N VALUE: 20 40 60 80
PL MC LL: 20 40 60 80
FINES CONTENT (%): 20 40 60 80

Refusal at 40.0 feet.
Bottom of borehole at 40.0 feet.

BORING LOG PLOTS - GINT STD US LAB.GDT - 5/23/13 15:38 - S:\ADMIN\LISAE\GINT\WPROJECTS\1801-13-201 PROJECT CARRIER - BORING LOGS.GPJ

BORING NUMBER B-18

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 918 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	918.0	TOPSOIL (6 inches)	SS 1		3-4-5 (9)		
	916.0	SILTY CLAY, red - brown, stiff, RESIDUUM, dry SANDY SILT, orange - brown and tan, stiff, some mica	SS 2		5-7-6 (13)		
			SS 3		6-7-7 (14)		
10			SS 4		5-6-6 (12)		
			SS 5		5-5-7 (12)		
20			SS 6		9-10-10 (20)		
	893.0	SANDY SILT, brown and gray, stiff to very stiff, very micaceous	SS 7		6-8-13 (21)		
30			SS 8		5-6-6 (12)		
			SS 9		8-11-11 (22)		

Bottom of borehole at 35.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

BORING NUMBER B-19

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 899 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	899.0	TOPSOIL (1 inch)	SS 1		3-4-4 (8)		
	897.5	CLAYEY SILT, dark brown, firm, FILL CLAYEY SILT, red - brown, stiff to very stiff, RESIDUUM	SS 2		4-5-6 (11)		
			SS 3		8-8-9 (17)		
10	889.0	SANDY SILT, tan and brown, stiff to very stiff, very micaceous, moist	SS 4		8-9-11 (20)		
			SS 5		5-6-6 (12)		
20			SS 6		5-7-11 (18)		

▲ SPT N VALUE ▲
20 40 60 80

PL MC LL
20 40 60 80

☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 20.0 feet.

BORING NUMBER B-20

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 898 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING 4.00 ft / Elev 894.00 ft
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	898.0								
	895.0		SILTY SAND, black and orange - brown, fine to coarse grained, medium dense, micaceous, RESIDUUM, moist	SS 1		3-5-7 (12)			
			SILTY SAND, gray and orange - brown, very dense, micaceous, PARTIALLY WEATHERED ROCK	SS 2		15-50/5"			>>
				SS 3		50/5"			>>
10				SS 4		50/0"			>>

Refusal at 12.0 feet.
Bottom of borehole at 12.0 feet.

BORING NUMBER B-21

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/6/13 **COMPLETED** 5/6/13 **GROUND ELEVATION** 898 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES Auger refusal initially encountered at 1 ft, offset 50 ft toward B-20.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	898.0		SILTY SAND, tan and gray, fine to medium grained, very dense, micaceous, PARTIALLY WEATHERED ROCK	SS 1		18-22-28 (50)			
				SS 2		50/5"			>>
				SS 3		50/0"			>>

Refusal at 8.5 feet.
Bottom of borehole at 8.5 feet.

BORING NUMBER B-22

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/1/13 **COMPLETED** 5/1/13 **GROUND ELEVATION** 922 ft **HOLE SIZE** 6 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	922.0	TOPSOIL (3 inches)	SS 1		4-3-5 (8)		
		CLAYEY SILT, red - brown, firm, RESIDUUM, wet at about 4 ft	SS 2		4-4-4 (8)		
	917.0	SANDY SILT, red - brown, stiff, very micaceous	SS 3		4-7-6 (13)		
10	913.5	SANDY SILT, dark brown and tan, stiff to very stiff, very micaceous	SS 4		6-8-9 (17)		
	907.0	SAND, white, gray, and black, medium grained, dense	SS 5		6-6-5 (11)		
20	902.0	SANDY SILT, dark brown, stiff, very micaceous	SS 6		8-22-26 (48)		
	897.0	SANDY SILT, tan - brown, very hard, very micaceous, PARTIALLY WEATHERED ROCK	SS 7		10-7-7 (14)		
30			SS 8		7-15-50/3"		
	888.5	PARTIALLY WEATHERED ROCK, no recovery	SS 9		50/0"		

Bottom of borehole at 35.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

>>
>>

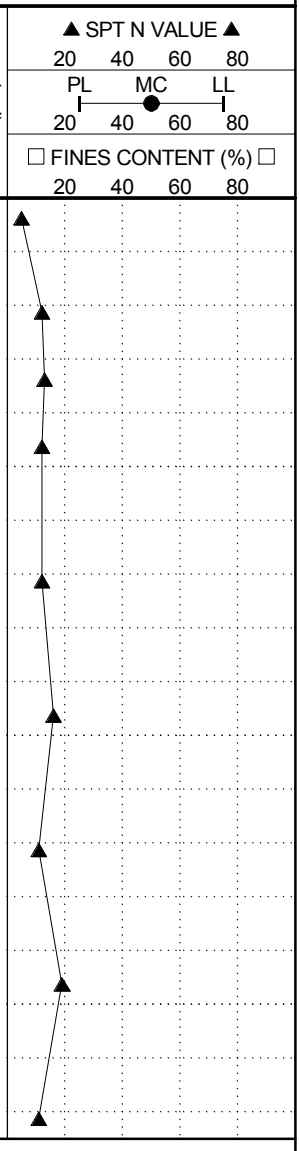
BORING NUMBER B-23

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/1/13 **COMPLETED** 5/1/13
GROUND ELEVATION 915 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	915.0	TOPSOIL (2 inches)	SS 1		2-2-3 (5)		
		CLAYEY SILT, red - brown, firm, RESIDUUM					
	912.0	SANDY SILT, red - brown, stiff, very micaceous	SS 2		5-5-7 (12)		
			SS 3		5-6-7 (13)		
	906.5	SILTY SAND, tan, fine grained, medium dense	SS 4		5-6-6 (12)		
10							
	903.0	SILTY SAND, white and yellow, fine to medium grained, medium dense, some mica, moist to wet	SS 5		5-6-6 (12)		
20			SS 6		6-7-9 (16)		
			SS 7		7-6-5 (11)		
30			SS 8		9-8-11 (19)		
			SS 9		8-5-6 (11)		

Bottom of borehole at 35.0 feet.

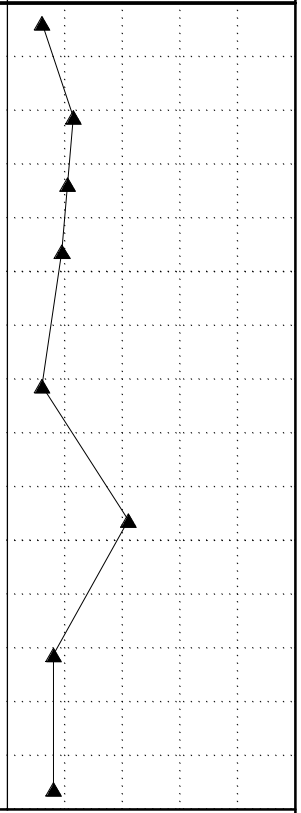


BORING NUMBER B-24

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 908 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	908.0	TOPSOIL (1 inch)	SS 1		4-6-6 (12)		
	906.5	CLAYEY SILT, dark red - brown, stiff, FILL CLAYEY SILT, red - brown, very stiff, RESIDUUM	SS 2		6-10-13 (23)		
			SS 3		8-9-12 (21)		
10	898.0	SANDY SILT, orange - brown, stiff to hard	SS 4		8-9-10 (19)		
			SS 5		5-6-6 (12)		
	890.0	SANDY SILT, red - brown and orange - brown, very stiff to hard	SS 6		13-20-22 (42)		
20			SS 7		8-8-8 (16)		
	880.0	SILTY SAND, red - brown, yellow and black, very stiff	SS 8		6-8-8 (16)		
30		Bottom of borehole at 30.0 feet.					



S&ME, Inc.

BORING NUMBER P-1

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 853 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	853.0		TOPSOIL (6 inches)	SS 1		3-3-3 (6)			
			SANDY SILT, brown, firm, roots, some clay, FILL						
	850.5		SANDY SILT, black and red - brown, stiff, very micaceous, RESIDUUM	SS 2		3-5-7 (12)			
10				SS 3		6-6-6 (12)			

Bottom of borehole at 10.0 feet.

BORING NUMBER P-2

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/2/13 **COMPLETED** 5/2/13 **GROUND ELEVATION** 871 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	871.0		TOPSOIL (6 inches)	SS 1		4-6-7 (13)			
	869.0		SILTY SAND, red - brown, medium to coarse grained, medium dense, FILL						
			SANDY SILT, red - brown, very stiff, very micaceous, RESIDUUM	SS 2		40-10-15 (25)			
	865.0		SILTY SAND, gray and white, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK						
10				SS 3		50/5"			>>

Bottom of borehole at 10.0 feet.

S&ME, Inc.

BORING NUMBER P-3

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 870 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	870.0		TOPSOIL (6 inches)					
			CLAYEY SILT, red - brown, stiff, roots, RESIDUUM	SS 1		4-4-5 (9)		
	867.0		SANDY SILT, red - brown, very stiff, very micaceous	SS 2		6-8-8 (16)		
10				SS 3		7-8-13 (21)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 10.0 feet.

BORING NUMBER P-4

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/2/13 **COMPLETED** 5/2/13
GROUND ELEVATION 884 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80
0	884.0		TOPSOIL (6 inches)	SS 1		3-4-5 (9)			PL MC LL 20 40 60 80
	882.0		CLAYEY SILT, red - brown, stiff, roots, RESIDUUM						☐ FINES CONTENT (%) ☐ 20 40 60 80
			SILTY SAND, red - brown, medium grained, medium dense, some mica, some clay	SS 2		18-11-13 (24)			
	879.0		SILTY SAND, brown and tan, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK						
10				SS 3		15-5/5"			>>

Bottom of borehole at 10.0 feet.

BORING NUMBER P-5

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/2/13 **COMPLETED** 5/2/13 **GROUND ELEVATION** 896 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Caved at 7 ft

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	896.0		TOPSOIL (3 inches)	SS 1		6-7-7 (14)			
			CLAYEY SILT, dark red - brown, stiff, roots, RESIDUUM						
	893.5		CLAYEY SANDY SILT, red - brown and white, hard	SS 2		14-20-20 (40)			
	890.0		PARTIALLY WEATHERED ROCK, no recovery						
10				SS 3		50/0"			>>

Bottom of borehole at 10.0 feet.

S&ME, Inc.

BORING NUMBER P-6

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 882 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	SPT N VALUE / PL MC LL / FINES CONTENT (%)
0	882.0		SANDY SILT, red - brown and orange - brown, firm to stiff, some mica, some roots, RESIDUUM	SS 1		3-4-3 (7)			
				SS 2		4-6-4 (10)			
	876.0		SILTY SAND, white and tan, fine to medium grained, medium dense, micaceous						
10				SS 3		6-7-7 (14)			

Bottom of borehole at 10.0 feet.

S&ME, Inc.

BORING NUMBER P-7

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 882 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	882.0		SILTY SAND, tan and pink, fine to medium grained, loose to medium dense, micaceous, RESIDUUM	SS 1		3-4-5 (9)			
				SS 2		4-6-6 (12)			
10				SS 3		5-5-6 (11)			

Bottom of borehole at 10.0 feet.

BORING NUMBER P-8

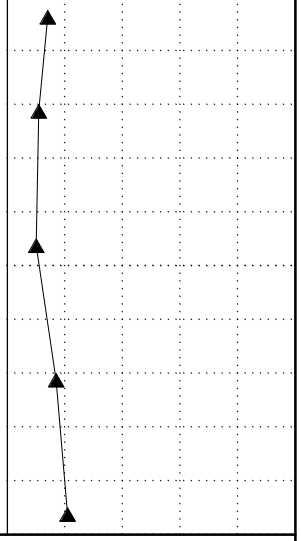
S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 910 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	910.0		TOPSOIL (1 inch)					
			SANDY SILT, dark brown and red, stiff, some roots, FILL	SS 1		6-6-8 (14)		
				SS 2		5-6-5 (11)		
	901.5		SILTY SAND, tan and white, fine to medium grained, loose, very micaceous, RESIDUUM	SS 3		5-5-5 (10)		
10	897.0		SANDY SILT, tan - brown, stiff, very micaceous	SS 4		5-6-11 (17)		
	895.0		SILTY SAND, white and tan, fine to medium grained, medium dense					
20				SS 5		10-11-10 (21)		

Bottom of borehole at 20.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



S&ME, Inc.

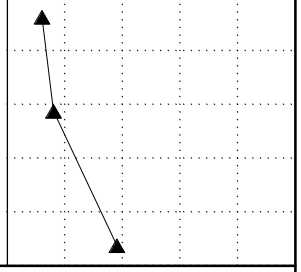
BORING NUMBER P-9

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 896 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING 3.50 ft / Elev 892.50 ft
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	896.0		SANDY SILT, brown, stiff, some mica, FILL	SS 1		5-6-6 (12)		
	894.0		SILTY SAND, tan - white, medium to coarse grained, medium dense, micaceous, RESIDUUM	SS 2		11-8-8 (16)		
	891.0		SANDY SILT, tan - brown, very hard, very micaceous					
10				SS 3		17-17-21 (38)		

Bottom of borehole at 10.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



BORING NUMBER P-10

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 914 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES Auger refusal intitally encountered at 3 ft, offset 20 ft southeast.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	914.0		SILTY SAND, red, white tan, fine to coarse grained, medium dense, rock fragments, RESIDUUM	SS 1		9-11-9 (20)			
	911.0		PARTIALLY WEATHERED ROCK, no recovery	SS 2		50/0"			>>

Refusal at 5.0 feet.
Bottom of borehole at 5.0 feet.

BORING NUMBER P-11

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 4/30/13 **COMPLETED** 4/30/13
GROUND ELEVATION 913 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	913.0		SANDY SILT, brown, firm to stiff, rock fragments, FILL	SS 1		3-5-3 (8)		
				SS 2		7-7-5 (12)		
	905.0		SILTY SAND, white and tan, medium to coarse grained, medium dense, rock fragments, organics, FILL	SS 3		11-17-13 (30)		
10				SS 4		6-7-6 (13)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Refusal at 15.0 feet.
Bottom of borehole at 15.0 feet.

BORING NUMBER P-12

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 914 ft **HOLE SIZE** 6 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	914.0		SANDY SILT, red - brown, stiff, some mica, RESIDUUM	SS 1		4-5-7 (12)		
				SS 2		6-7-7 (14)		
	908.0		SILTY SAND, tan, white and pink, fine to medium grained, loose to medium dense, micaceous					
10				SS 3		3-4-5 (9)		
				SS 4		8-8-8 (16)		
20				SS 5		8-8-10 (18)		
	891.0		SILTY SAND, gray, fine to medium grained, medium dense, very micaceous	SS 6		10-8-8 (16)		

Bottom of borehole at 25.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

BORING NUMBER P-13

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/6/13 **COMPLETED** 5/6/13
GROUND ELEVATION 898 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING Not encountered
NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	898.0								
	896.0		SANDY SILT, red - brown and orange - brown, stiff, some clay, FILL	SS 1		4-4-5 (9)			
			SANDY SILT, brown - red, firm, very micaceous, FILL	SS 2		5-4-4 (8)			
	890.0								
10			SANDY SILT, red - brown, very stiff, some clay, micaceous, RESIDUUM	SS 3		13-13-13 (26)			

Bottom of borehole at 10.0 feet.

S&ME, Inc.

BORING NUMBER P-14

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 913 ft **HOLE SIZE** 6 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES Auger refusal intially encountered at 13 ft, offset 12 ft northwest; Sample 4, blow counts likely amplified by rocks within the fill.

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	913.0		SANDY SILT, brown and white, soft, FILL	SS 1		2-2-2 (4)		
	911.0		SANDY SILT, dark brown and red - brown, stiff, some rock fragments, some clay, FILL	SS 2		3-5-5 (10)		
	907.0		SILTY SAND, brown, fine to medium grained, medium dense, some gravel, micaceous, FILL	SS 3		9-11-17 (28)		
10	903.0		SANDY SILT, red - brown, very hard, some gravel, trace amounts of roots, FILL	SS 4		4-50/2"		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

>>

Refusal at 14.5 feet.
Bottom of borehole at 14.5 feet.

BORING NUMBER P-15

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/6/13 **COMPLETED** 5/6/13 **GROUND ELEVATION** 895 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	895.0								
			SANDY SILT, red - brown, firm, roots, some clay, FILL	SS 1		5-4-4 (8)			
	892.0		SILTY SAND, orange - brown, fine to medium grained, dense, RESIDUUM	SS 2		17-21-15 (36)			
	887.0								
10			SILTY SAND, white and gray, fine to medium grained, dense, some mica	SS 3		18-18-17 (35)			

Bottom of borehole at 10.0 feet.

BORING NUMBER P-16

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 4/30/13 **COMPLETED** 4/30/13 **GROUND ELEVATION** 902 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	902.0		CLAYEY SILT, red - brown, very stiff, RESIDUUM	SS 1		3-8-8 (16)		
	899.0		SANDY SILT, orange - brown, firm to stiff, some mica	SS 2		6-8-5 (13)		
10	892.0		SILTY SAND, light brown - pink, fine grained, loose	SS 3		2-3-4 (7)		
				SS 4		4-4-4 (8)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 15.0 feet.

BORING NUMBER P-17

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/6/13 **COMPLETED** 5/6/13 **GROUND ELEVATION** 897 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0	897.0								
	895.0		SANDY SILT, dark brown, stiff, very micaceous, FILL	SS 1		3-4-5 (9)			
			SILTY SAND, black, fine to medium grained, very dense, PARTIALLY WEATHERED ROCK	SS 2		25-50/5"			>>
	889.0		PARTIALLY WEATHERED ROCK, no recovery	SS 3		50/0"			>>
10									

Bottom of borehole at 13.0 feet.

BORING NUMBER P-18

S&ME, Inc.

CLIENT Studley **PROJECT NAME** Project Carrier

PROJECT NUMBER 1801-13-201 **PROJECT LOCATION** State Route 82, Pendergrass, GA

DATE STARTED 5/6/13 **COMPLETED** 5/6/13 **GROUND ELEVATION** 898 ft **HOLE SIZE** 4 inches

DRILLING CONTRACTOR Sunrise Drilling Company **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem Auger, Rope and Cathead **AT TIME OF DRILLING** Not encountered

LOGGED BY Driller **CHECKED BY** Tony Roth **24hrs AFTER DRILLING** Not encountered

NOTES

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80
0	898.0								PL MC LL 20 40 60 80
	896.0		SILTY SAND, gray and white, medium to coarse grained, medium dense, RESIDUUM	SS 1		5-6-10 (16)			☐ FINES CONTENT (%) ☐ 20 40 60 80
			SANDY SILT, tan - brown, very stiff, very micaceous	SS 2		8-8-9 (17)			
10				SS 3		7-10-11 (21)			

Bottom of borehole at 10.0 feet.

BORING NUMBER P-19

S&ME, Inc.

CLIENT Studley
PROJECT NAME Project Carrier
PROJECT NUMBER 1801-13-201
PROJECT LOCATION State Route 82, Pendergrass, GA
DATE STARTED 5/3/13 **COMPLETED** 5/3/13
GROUND ELEVATION 909 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Sunrise Drilling Company
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger, Rope and Cathead
AT TIME OF DRILLING Not encountered
LOGGED BY Driller **CHECKED BY** Tony Roth
24hrs AFTER DRILLING 12.00 ft / Elev 897.00 ft
NOTES

DEPTH (ft)	ELEV. (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	909.0	TOPSOIL (6 inches)	SS 1		4-5-5 (10)		
	907.0	CLAYEY SILT, red - brown, stiff, RESIDUUM					
		SANDY SILT, red - brown and orange - brown, very stiff, some mica	SS 2		7-10-10 (20)		
	901.0	SILTY SAND, red - brown, white and tan, fine to coarse grained, medium dense, micaceous	SS 3		8-9-10 (19)		
10							
	894.0	SANDY SILT, orange - brown and black, very stiff	SS 4		7-8-9 (17)		
20			SS 5		10-14-16 (30)		

Bottom of borehole at 20.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

ROCK DEFINITION

We suggest that *Rock* be defined as the following:

General Excavation:

Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a draw bar pull rated at not less than 56,000 pounds (Caterpillar D8K or equivalent) or excavated by a front-end loader with a minimum bucket breakout force of 25,600 pounds (Caterpillar 977 or equivalent).

Trench Excavation:

Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 33,010 pounds (Caterpillar 225B or equivalent).

INTRODUCTION

S&ME, Inc. performs most all tests in general accordance with the American Society for Testing and Materials (ASTM) or the United States Army Corps of Engineers procedures. These procedures are generally recognized as the basis for uniformity and consistency of test results in the geotechnical engineering profession. All work is initiated and supervised by qualified engineers. Our tests are performed by skilled technicians trained in either ASTM or Corps procedures. Our equipment is well maintained, and our laboratory equipment is calibrated at least yearly.

Subsequent portions of this Appendix present brief descriptions of our testing procedures. Where applicable, we have referenced these procedures to either ASTM or the Corps of Engineers. Reference should be made to the following publications for specific descriptions of apparatus, procedures, reporting, etc.

Annual Book of ASTM Standards, Section 4, Volume 4.08: Soil and Rock: Building Stones. American Society for Testing and Materials, Latest Edition

EM 1110-2-1803. Subsurface Investigations, Soils, Chapter 3. U.S. Army Corps of Engineers, 1972.

EM 1110-1-1801, Geological Investigations. U.S. Army Corps of Engineers, 1978.

EM 1110-2-1907, Soil Sampling. U.S. Army Corps of Engineers, 1972.

EM 1110-1-1802, Geophysical Exploration. U.S. Army Corps of Engineers, 1979.

EM 1110-2-1906, Laboratory Soils Testing. U.S. Army Corps of Engineers, 1970.

PROCEDURES

SOIL TEST BORING PROCEDURES, ASTM D-1586

The borings were advanced by a hollow stem auger which was mechanically driven by a 125-horsepower drill rig. At regular intervals, soil samples were obtained through the hollow central portion of the augers with a standard 1.4 inch I.D., 2.0 inch O.D. split tube sampler.

The sampler was initially seated six inches to penetrate any loose cuttings; then driven an additional foot with blows of a 140 pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated as the *standard penetration resistance*. Penetration resistance, when properly evaluated, is an index to the soil's strength and density.

The samples were classified in the field by the driller as they were obtained. Representative portions of each soil sample were then sealed in containers and transported to our laboratory. The samples were examined by a graduate geotechnical engineer or engineering geologist to visually check the field classifications. All boring data, including sampling intervals, penetration resistances, soil classifications, and groundwater level are presented on the attached Test Boring Records.

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)


Fill


Asphalt


Concrete


Topsoil


Gravel


Sand


Silt


Clay


Sandstone


Silty Sand


Interbedded Sandstone/Shale


Shale


Clayey Silt


Sandy Clay


Silty Clay


Partially Weathered Rock


Mine Spoil

WATER LEVELS

(Shown in Water Level Column)

▽ = Water Level At Termination of Boring
▼ = Water Level Taken After 24 Hours
◄ = Loss of Drilling Water
HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

■ Shelby Tube

⊠ Split Spoon

I Rock Core

□ No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES

Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

Portion obtained with permission from "Important Information About Your Geotechnical Engineering Report", ASFE, 2004