Preliminary Geotechnical Engineering Report

Georgia Historic Heartland Mega Site
Newton/Walton County, Georgia
April 21, 2015
Terracon Project No. 49155023

Prepared For:
Thomas & Hutton
Savannah, Georgia

Prepared By:
Terracon Consultants, Inc.
Atlanta, Georgia

1965 | 2015

April 21, 2015

Terracon

Thomas & Hutton
50 Park of Commerce Way
Savannah, Georgia 31405

Mr. Ralph Forbes, Vice President/Regional Director

Re: Preliminary Geotechnical Engineering Report
Georgia Historic Heartland Mega Site
Newton/Walton County, Georgia
Terracon Project No. 49155023

Dear Mr. Forbes:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. These services were performed in general accordance with our proposal number P49140514R2 dated February 27, 2015, and authorized by you on March 2, 2015.

This report presents the results of the subsurface exploration and provides preliminary geotechnical recommendations for the proposed site to be located in Newton/Walton County, Georgia.

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

Sincerely,
Terracon Consultants, Inc.

Veronica Finol, E.I.T.
Staff Geotechnical Engineer

John D. Lawrence, P.E.
Principal/ Geotechnical Manager

GEORGIA REGISTERED No 17098 PROFESSIONAL ENGINEER JOHN DAVIES LAWRENCE 4/21/15

Copies to: Addressee (1 via e-mail)

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EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the proposed Georgia Historic Heartland Mega Site located in Newton/Walton County, Georgia. Terracon's geotechnical scope of work included the advancement of eight soil test borings to depths of approximately 12 to 50 feet below existing site grades. Two of the originally proposed borings were not accessible due to the presence of two creeks.

Based on the information obtained from our subsurface exploration, the following geotechnical considerations were identified:

- In general the site is characterized by residual soils consisting of sandy silts and silty sands. Standard penetration resistance values in these "Residuum" soils ranged from 6 to 55 bpf (blows per foot). Groundwater was encountered in Boring B-16 at a depth of 15 feet below ground surface at the time of drilling.

- Partially weathered rock was encountered at a shallow depth of about two feet below the surface in the central portion of the property (B-7). Auger refusal occurred at 12 feet in this same boring. An offset boring encountered similar materials. Additionally, partially weathered rock was encountered much deeper in the two borings on the west side of the property (B-3/4, B-5)

- Site grading activities in the vicinity of B-7 and B-7A could encounter shallow partially weathered rock and auger refusal materials. You should anticipate that difficult excavation activities will be required, such as ripping and blasting, in order to excavate these materials.

- The site appears suitable for building construction consisting of shallow foundations for typically medium to large industrial type developments.

- On-site native soils typically appear suitable for use as general engineered fill; however, further testing should be performed during construction to assess specific conditions at that time.

- This geotechnical exploration is preliminary in nature, with very widely spaced borings. You should expect that conditions between borings will be different. Once the development plans are established, additional subsurface exploration and evaluation will be required.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
GEORGIA HISTORIC HEARTLAND MEGA SITE
NEWTON/WALTON COUNTY, GEORGIA

Terracon Project No. 49155023
April 21, 2015

1.0 INTRODUCTION

A preliminary geotechnical exploration has been performed for the proposed Georgia Historic Heartland Mega Site located in Newton/Walton County, Georgia. Terracon's geotechnical scope of work included the advancement of eight soil test borings to depths of approximately 12 to 50 feet below existing site grades. Two of the proposed borings were not accessible due to the presence of two creeks. Boring Logs along with a Site Location Plan and Boring Location Plan are included in Appendix A of this report.

The purpose of these services is to provide preliminary information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork considerations
- lateral earth pressure
- foundation design and construction
- pavement considerations

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	Refer to the Site Location Plan and Boring Location Plan (Exhibits A-1 and A-2 in Appendix A)
Structures	The site will likely be developed with medium to large industrial type developments.
Building construction, Assumed	Structures used for industrial applications are typically constructed of either concrete masonry wall or concrete panels with steel columns and steel joist girders for roof loads
Finished floor elevation	Unknown
Maximum loads	For purposes of this report, we have estimated the heavy to medium-duty industrial facilities will produce the following loads: ■ Walls: 6 klf (assumed) ■ Columns: 150-200 kips (assumed) ■ Slabs: 250 psf max (assumed)
Grading	A grading plan was not available when this report was prepared.
Cut and Fill Slopes	Assumed to be no steeper than 2H:1V and less than 20 feet (Horizontal to Vertical)
Free-standing retaining walls	None anticipated at this time

2.2 Site Location and Description

Item	Description
Location	This site is located in Newton/Walton counties, Georgia, generally southwest of Social Circle. Approximate coordinates for the project are: 33° 37' 59" N; 83° 44' 27" W
Existing Improvements	There is an abandoned house located near the existing gate by Hollis Road. Another abandoned house/shed is located on the northeast side of the property.
Current ground cover	A large portion of the property is wooded.
Existing topography	In general, the site slopes downward to creeks that cross the property. A few ponds are also shown on the site. Specific site topography and elevations are not available at this time.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

The project site is located in the Piedmont Physiographic Province of Georgia which is characterized by medium to high grade metamorphic rocks and scattered igneous intrusions. The term metamorphic describes rocks that have been subjected to high temperatures and/or pressures, usually deep within the earth's crust. These high temperatures and pressures cause the textural and mineralogical characteristics of the original rock to be altered and can also cause certain rock types to fully melt, becoming what is known as magma. Magma is less dense than the surrounding solidified rock and tends to move upward through fractures and joints, displacing the surrounding rock. This rock type is known as an igneous intrusion. Metamorphic rocks are predominant in this region but, due to erosion and uplift, both of these rocks will eventually become exposed at the land surface.

The subsurface bedrock in this region has undergone differing rates of weathering, which often produces a considerable variation in depth to competent rock over short horizontal distances. It is also not unusual for lenses and boulders of hard rock and zones of partially weathered rock to be present within the soil mantle above the general bedrock level. The typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands, which often consist of saprolites (native soils which maintain the original fabric of the parent rock). Generally the soil becomes harder with depth to the top of parent crystalline rock or "massive bedrock" which occurs at depth.

The boundary between soil and rock is typically not sharply defined. A transitional zone termed "partially weathered rock" is normally found overlying bedrock. Partially weathered rock (PWR) is defined for engineering purposes as residual material with a standard penetration resistance exceeding 100 blows per foot (bpf).

3.2 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1	2 to 10 inches	Topsoil	----
Stratum 2	2 to 48 feet, and to Below boring termination depth	Residuum- Sandy SILT Silty SAND	Medium Stiff to Very Stiff Loose to Very Dense
Stratum 3	Below boring termination[1] Encountered at 2 feet[2]	Partially Weathered Rock	
Stratum 4	12 to 17 feet	Auger Refusal[2]	----

[1] Only encountered in Borings B-5, B-3/4
[2] Only encountered in Borings B-7 and B-7A

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B and on the individual boring logs. Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs included in Appendix A of this report.

3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes are noted on the attached boring logs, and are summarized below:

Boring Number	Depth to groundwater while drilling, ft
B-16	15

Groundwater was not observed in the remaining borings while drilling, or for the short duration that the borings were allowed to remain open. However, this does not necessarily mean the borings terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials.

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

3.4 Laboratory Results

Select soil samples were subject to natural moisture content tests. The testing procedures are described in the Appendix. Natural moisture content of the tested samples varied from 14 to 41 percent. Please refer to boring record B-8 and B-16 for specific results.

Moisture-Density Relationships (standard Proctors) were also performed on selected samples of possible cut materials that might be used for fill.

Sample Location, Depth	Maximum Dry Density	Optimum Water Content	Percent Fines
B-5 (10-15 ft)	105.3 PCF	17.7 %	52.8%
B-15 (10-15 ft)	104.1 PCF	17.9 %	46.1%

4.0 PRELIMINARY RECOMMENDATIONS

4.1 Geotechnical Considerations

The purpose of this study was to provide general foundation and other geotechnical considerations for future structures constructed in the industrial park. We expect typical industrial/warehouse structures to be able to use conventional shallow foundations such as spread footings, strip footings, and/or a turndown slab bearing on the existing residual soils or structural fill placed according to the recommendations outlined in the text of this report.

You should anticipate difficult excavation processes such as ripping and blasting will be required when working in the central portion of the site.

The preliminary recommendations contained in this report are based upon the results of data presented herein, engineering analyses, and our current understanding of the proposed project.

4.2 Earthwork

The actual construction means and methods are the responsibility of the contractor(s). The following construction related items pertain to general site preparation for the foundation and roadway support and are not intended to address all possible construction related concerns.

4.2.1 Site Preparation

We anticipate construction will be initiated by demolition of existing structures, stripping vegetation, and loose, soft or otherwise unsuitable material, and by removing stumps/root systems of tress. Stripped materials consisting of vegetation and organic materials should be wasted off site, or used to vegetate landscaped areas or exposed slopes after completion of grading operations.

Once stripping is completed, we recommend that at grade areas and areas to receive fill soils be evaluated by visual inspection and proofrolling. Proofrolling includes traversing the site in overlapping patterns with a fully loaded tandem axle dump truck during a period of dry weather and under the observation of the geotechnical engineer. Any areas which "pump" or "rut" excessively under the weight of the proofrolling vehicle should be further evaluated. Proofrolling can detect areas where weak surface conditions exist. Where encountered, these unsuitable soils should be undercut.

4.2.2 Excavation

Excavations within most of the on-site residual soils should be possible using conventional heavy earthmoving equipment such as dozers, scrapers and large tracked excavator. However, shallow partially weathered rock was encountered in the central portion of the site (B-7 and B-7A), which will require difficult excavation effort when encountered. In general, excavation of partially weathered rock from mass excavations may require the use of single ripper bars pulled behind a large dozer such as a Caterpillar D-8 or larger. Removal of harder zones of PWR and auger refusal materials will likely require blasting.

Once these dense partially weathered rock materials are excavated, they may be adaptable for re-use as engineered fill provided they can be pulverized with heavy compaction equipment. Maximum particle size should be three inches. A well-graded fill material should be produced by the fill placement and compaction process. Typically large compaction equipment such as a Caterpillar 815 is required to properly compact and break down very dense soil and PWR, if possible. Harder pieces may not pulverize, and may not be usable as soil fill. It may be possible to reuse boulder-size pieces of partially weathered rock and rock in certain situations. Additional evaluation and comment should be provided in a supplemental geotechnical evaluation.

As a precaution, we recommend a rock excavation definition be included in the grading contract for clarity. Rock excavation can be defined in many ways. A method specification based on the grading equipment commonly used in the project area is typical. The following is a guideline rock definition and excavation specification for your consideration.

In Mass Excavation: Any material occupying an original volume of more than 1 cubic yard which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 56,000 pounds usable pull (Caterpillar D-8K or larger) or the excavator listed below.

In Trench Excavation: Any material occupying an original volume of more than 1/2 cubic yard which cannot be excavated with a track excavator having a bucket curling rate of not less than 25,700 pounds, using a rock bucket and rock teeth (Caterpillar 225 or larger).

Once the development plans are further stablished, additional exploration and assessment of the hard materials is recommended.

4.2.3 Materials Types

Based upon the information obtained during our exploration, much of the on-site soils encountered within the limits of this exploration appear to be suitable for the use as structural fill. Engineered fill should consist of approved materials, free of organic material, debris and particles larger than about 3 inches. Soils for use as engineered fill material should conform to the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Fine Grain Soils	CL and ML (LL<45; PI<25)	All locations and elevations
Granular Soils	SP, SM, SC, SW	All locations and elevations
On-site soils[2]	SP, SM	All locations and elevations

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. A large portion of the existing fill is expected to be suitable for use as engineered fill provided the fill is free of organics, debris and unsuitable materials. It appears the fill is wet and will require drying prior to use. Terracon should field evaluate fill materials for use.

4.2.3 Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location[1, 2]	Per the Standard Proctor Test (ASTM D 698)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction[3]	
		Minimum	Maximum
Acceptable soil or approved imported fill soils:			
Beneath foundations and slabs:	95	-2%	+3%
Beneath pavements:	95	-2%	+3%
12 inches directly below pavements:	98	-2%	+3%
	Per the Modified Proctor Test (ASTM D 1557)		
Aggregate base (beneath slabs)	95	-3%	+3%
Aggregate base (beneath pavements)	98	-3%	+3%

1. Engineered fill materials should be placed in horizontal, loose lifts not exceeding 9 inches in thickness and should be thoroughly compacted. Where light compaction equipment is used, as is customary within a few feet of retaining walls and in utility trenches, the lift thickness may need to be reduced to achieve the desired degree of compaction. Soils removed which will be used as engineered fill should be protected to aid in preventing an increase in moisture content due to rain.
2. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without pumping when proofrolled.

4.2.4 Grading and Drainage

Adequate positive drainage should be provided during construction and maintained throughout the life of the development to prevent an increase in moisture content of the foundation, pavement and backfill materials. Surface water drainage should be controlled to prevent undermining of fill slopes and structures during and after construction. Vehicular traffic should be avoided or minimized on exposed surface. Based on the nature of the site and the soil types encountered, soil erosion measures will be a critical aspect of the construction design.

It is recommended that all exposed earth slopes be seeded to provide protection against erosion as soon as possible after completion. Seeded slopes should be protected until the vegetation is established. Sprinkler systems should not be installed behind or in front of walls without the approval of the civil engineer and wall designer.

4.2.5 Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction and observed by Terracon.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

As a minimum, all excavations should be sloped or braced as required by OSHA regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current Occupational Health and Safety Administration (OSHA) Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied or inferred.

4.3 Slope Design

During construction, temporary slopes should be regularly inspected for signs of movements or unsafe conditions. Soil slopes should be covered for protection from rain and surface runoff should be diverted away from the slopes. For erosion protection, a protective cover of grass or other vegetation should be established on the slopes as soon as possible.

Our investigation did not include a detailed analysis of slope stability for any temporary or permanent condition. However, in the Piedmont Physiographic Province slopes up to 15 to 20-foot tall are regularly built at inclinations of 2(H):1(V) and perform satisfactory if properly constructed

4.4 Preliminary Foundation Recommendations

In our opinion, typical medium to large duty industrial structures may be supported by shallow foundation systems such as spread footings, strip footings and/or a turndown slab bearing on the existing residual soils or structural fill.

Depending on the location of the building foundations, net allowable soil bearing pressures in the range of 2,000 psf up to 3,500 psf may be available, with the higher end of this range restricted to direct bearing by high consistency soil. Anticipated settlement will be highly dependent on the planned construction.

4.5 Preliminary Floor Slab Design Recommendations

DESCRIPTION	VALUE
Floor slab subgrade support	Minimum 12 inches of approved on-site or imported soils placed and compacted in accordance with Earthwork section of this report[1]
Aggregate base course/capillary break	4-inch compacted layer of free draining, granular subbase material

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation. Narrower, turned-down slab-on-grade foundations may be utilized at the approval of the structural engineer. The slabs should be appropriately reinforced to support the proposed loads.
2. We recommend subgrades be maintained at the proper moisture condition until floor slabs and pavements are constructed. If the subgrade should become desiccated prior to construction of floor slabs and pavements, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
3. The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material, at least 4 inches thick.

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks in pavement areas that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

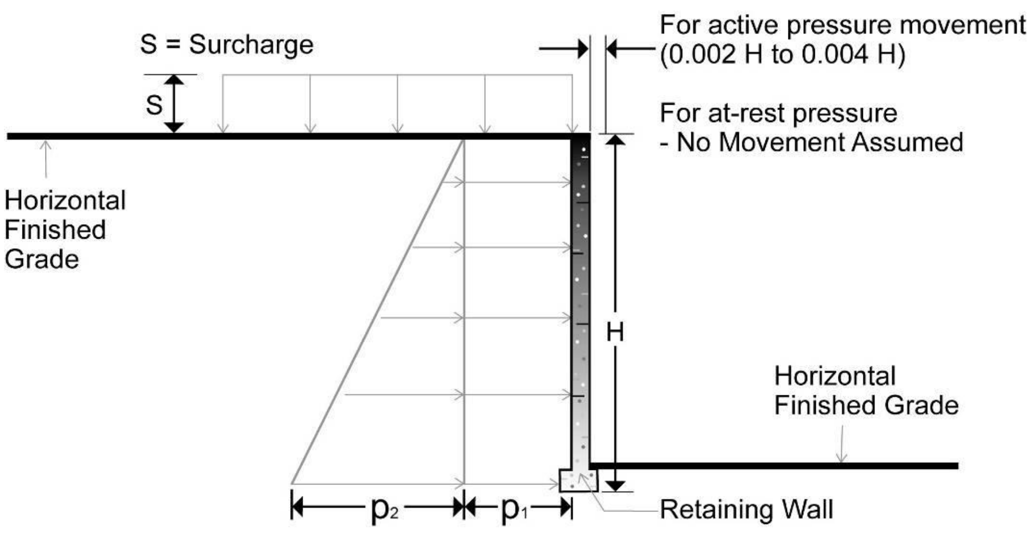
The use of a vapor retarder or barrier should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder/barrier.

4.6 Preliminary Lateral Earth Pressures

4.6.1 Lateral Earth Pressure Design Recommendations

Retaining walls are typically chosen based on the application and economics. All retaining walls should be designed by a professional engineer licensed in the State of Georgia with expertise in the design of retaining systems. Earth pressure will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the material being restrained. The lateral earth pressure recommendations herein are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls. Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop recommendations for the design of such wall systems upon request.

Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free standing cantilever retaining walls and assumes wall movement. The "at rest" condition assumes no wall movement. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls. Additional triaxial testing should be performed to confirm soil lateral earth pressure parameters prior to finalizing designs.



EARTH PRESSURE COEFFICIENTS

Earth Pressure Conditions	Coefficient For Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (Ka)	Granular - 0.29	35	(0.29)S	(35)H
	Sandy silt/Silty Sand - 0.36	45	(0.36)S	(45)H
At-Rest (Ko)	Granular - 0.46	55	(0.46)S	(55)H
	Sandy silt/Silty Sand - 0.53	65	(0.53)S	(65)H
Passive (Kp)	Granular - 3.4	400	---	---
	Sandy silt/Silty Sand – 2.8	330	---	---

<u>Applicable conditions to the above include:</u>

- PROVIDED FOR ESTIMATING PURPOSES ONLY
- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 **H** to 0.004 **H**, where **H** is wall height
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance
- Uniform surcharge, where S is surcharge pressure
- In-situ soil backfill weight a maximum of 120 pcf
- Horizontal backfill, compacted between 95 and 98 percent of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No hydrostatic pressures acting on wall
- No dynamic loading
- No safety factor included in soil parameters
- Ignore passive pressure in frost zone

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.35 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

To aid in reducing the potential for hydrostatic pressure behind walls, we recommend a perimeter drain be installed at the foundation wall with a collection pipe leading to a reliable discharge. If adequate drainage is not possible, then combined hydrostatic and lateral earth pressures should be calculated for granular backfill using an equivalent fluid weighing 80 and 90 pcf for active and at-rest conditions, respectively. For silty backfill, an equivalent fluid weighing 85 and 95 pcf should be used for active and at-rest, respectively. These pressures do not include the influence of surcharge, equipment or floor loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

Dampproofing of the walls below the ground surface is also recommended to aid in preventing seepage of water into the structure during situations of heavy rains and or temporary high water table conditions above the bedrock surface that may not drain immediately.

4.7 Pavements

4.7.1 Pavement Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic, trash traffic and other service vehicles. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Pavement design requires knowledge of the proposed soil subgrade strength and anticipated traffic conditions. Soil strength is typically expressed in terms of California Bearing Ratio (CBR) for flexible pavement design and Modulus of Subgrade reaction (K) for rigid pavement design. The optimum design of pavements should be based on the results of testing performed in-place on the actual subgrade soils or in the laboratory on the soils that will provide subgrade support for the pavements. We believe the sandy soils at this site will provide a favorable pavement subgrade.

Pavements for the roadways and infrastructure can consist of flexible pavements (asphalt) or rigid pavement systems (concrete). Rigid pavement systems are typically preferred in areas where the pavements are subjected to parked or slow moving heavy truck loads or turning movements are applied. In industrial type applications Roller Compacted Concrete (RCC) paving can be a viable option.

Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Terracon can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;

- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;
- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., garden centers, wash racks);
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on low permeability subgrade soils rather than on unbound granular base course materials.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

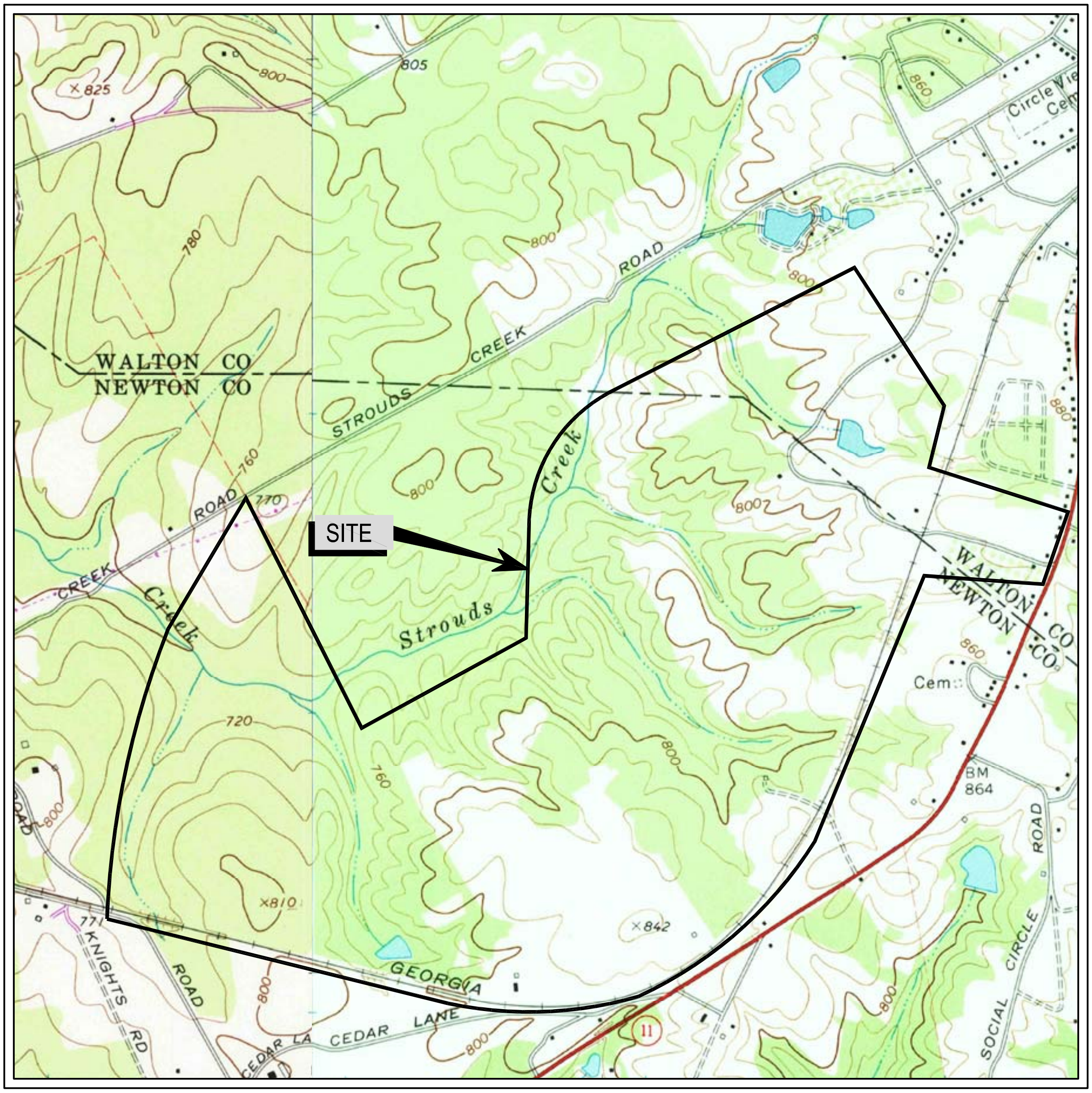
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential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

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING

UNITED STATES — DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY



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1 .5 0 KILOMETERS 1 2

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MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000

FEET

CONTOUR INTERVAL 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

JERSEY, GA SOCIAL CIRCLE, GA

1964 PR1985

1971 PR1981

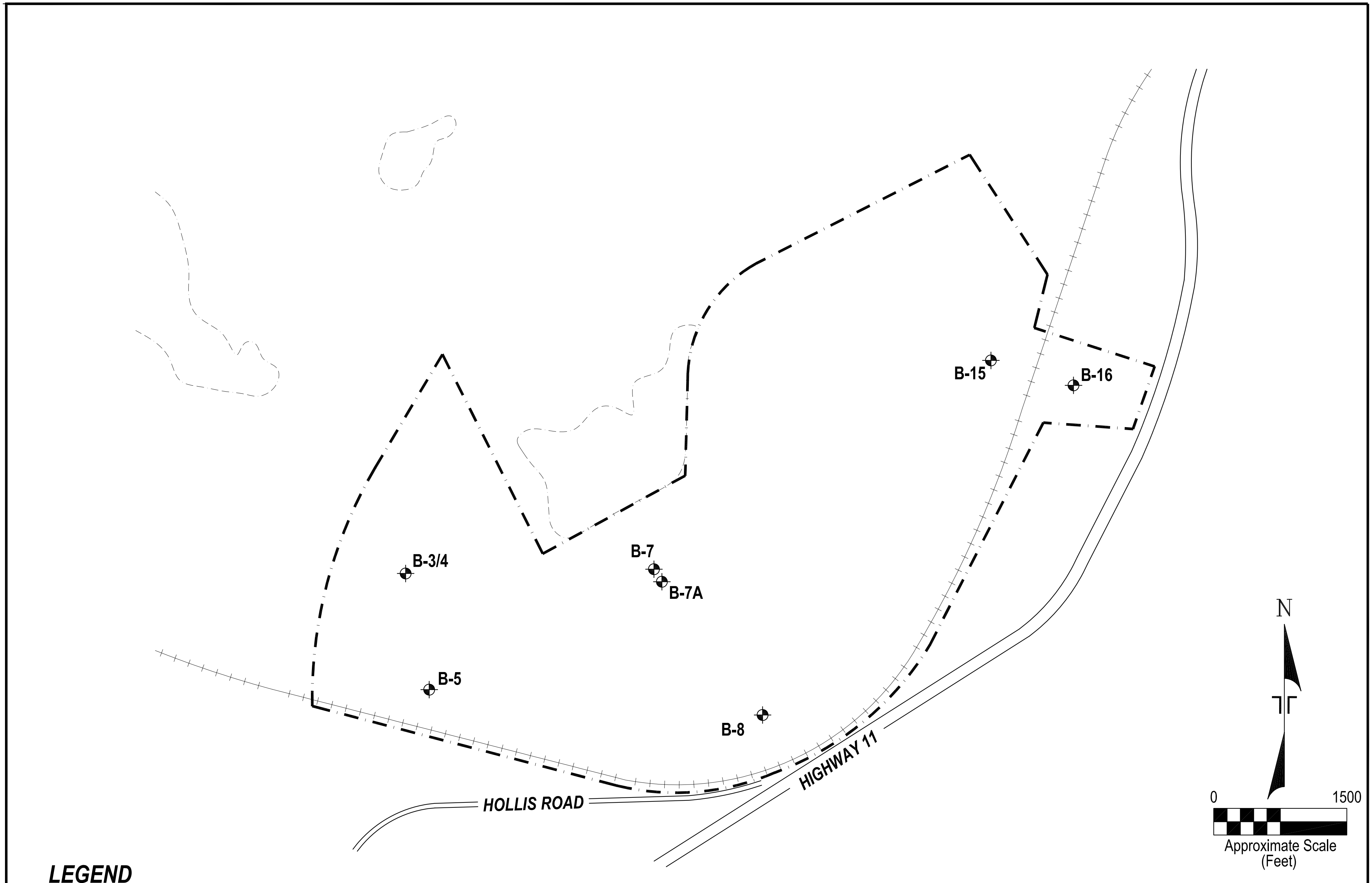
7.5 MINUTE SERIES (TOPOGRAPHIC)

N

Project Mngr: VF	Project No. 49155023	Terracon Consulting Engineers and Scientists	SITE LOCATION PLAN
Drawn By: TLY	Scale: AS SHOWN	2855 Premiere Parkway, Suite C Duluth, GA 30097	GEOTECHNICAL ENGINEERING REPORT
Checked By: VF/MRF	File No. GEO49155023-1	(770) 623-0755 (770) 623-9628	GEORGIA HISTORIC HEARTLAND MEGA SITE HIGHWAY 11 AND HOLLIS ROAD
Approved By: VF	Date: APRIL 2015		SOCIAL CIRCLE, GA

EXHIBIT

A-1



LEGEND

- SITE
- APPROXIMATE BORING LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	VF
Drawn By:	TLY
Checked By:	VF/MRF
Approved By:	VF

Project No.	49155023
Scale:	AS SHOWN
File No.	GEO49155023-2
Date:	APRIL 2015

Terracon
Consulting Engineers and Scientists
2855 Premiere Parkway, Suite C Duluth, GA 30097
(770) 623-0755 (770) 623-9628

BORING LOCATION PLAN
GEOTECHNICAL ENGINEERING REPORT
GEORGIA HISTORIC HEARTLAND MEGA SITE
HIGHWAY 11 AND HOLLIS ROAD
SOCIAL CIRCLE, GA

EXHIBIT
A-2

Field Exploration Description

The boring locations were staked by Terracon personnel. Distances from these locations to the reference features indicated on the attached diagram are approximate and were estimated with a hand held GPS (not submeter). The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them

The borings were drilled with an ATV-mounted rotary drill rig using hollow stem augers to advance the boreholes. Representative soil samples were obtained by the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). These values are indicted on the borings logs at the depths of occurrence. This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs. The samples were sealed and taken to the laboratory for testing and classification.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

The samples were classified in the laboratory based on visual observation, texture and plasticity. The descriptions of the soils indicated on the boring logs are in general accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are given on the boring logs. A brief description of this classification system is attached to this report.

Laboratory Testing

As part of the testing program, all samples were examined in the laboratory by experienced personnel and classified in accordance with the attached General Notes and the Unified Soil Classification System based on the texture and plasticity of the soils. The group symbol for the Unified Soil Classification System is shown in the appropriate column on the boring logs and a brief description of the classification system is included with this report in the Appendix.

At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

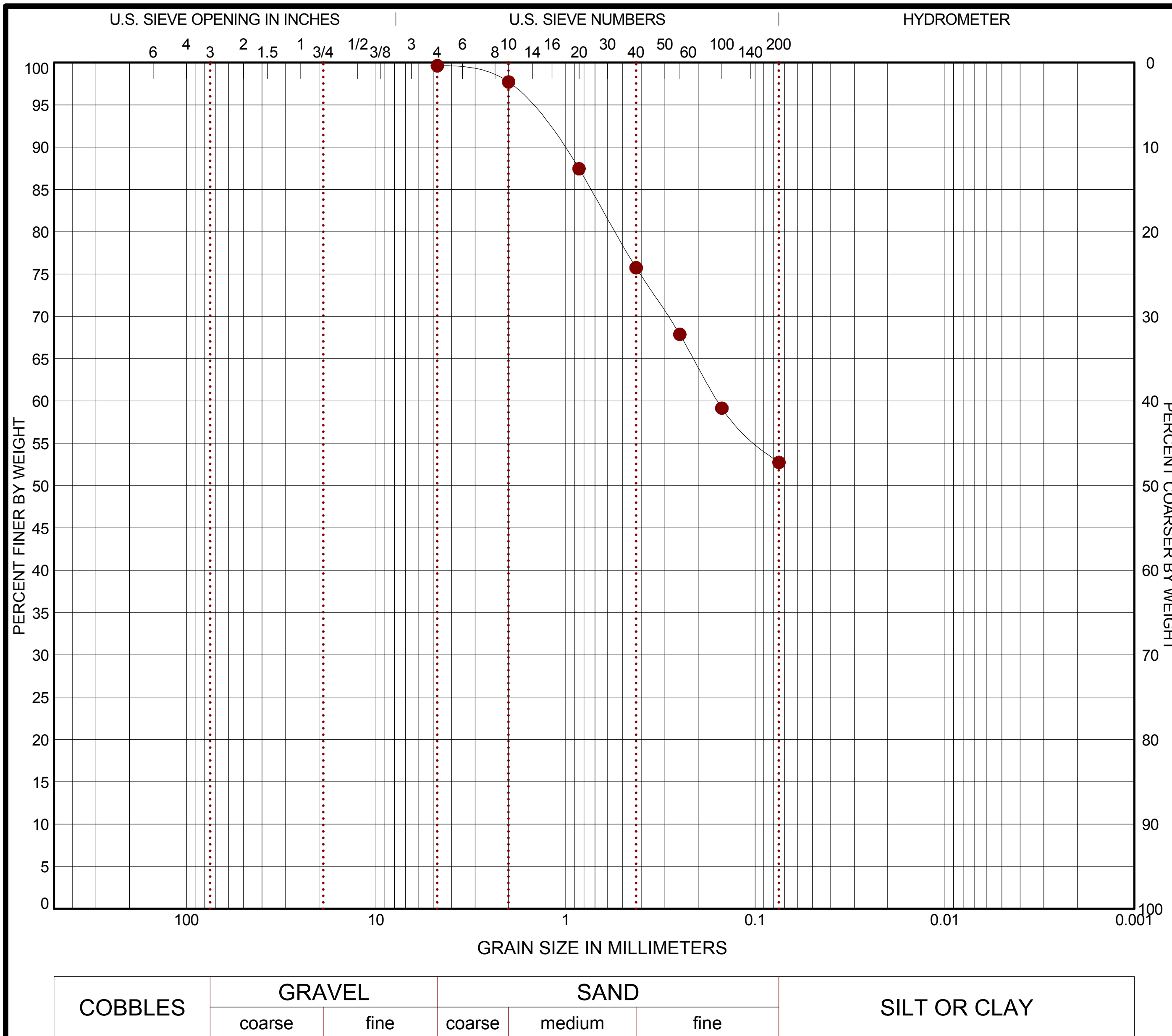
Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Standard Proctor
- Sieve Analysis
- In-Situ Water Content

GRAIN SIZE DISTRIBUTION

ASTM D422



	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-5 Bulk**	**10 - 15**			**46.9**		**52.8**		

	GRAIN SIZE		
	●		
D_{60}	**0.158**		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE (size)	PERCENT FINER ●		
1 1/2"			
1"			
3/4"			
1/2"			
3/8"			
#4	**99.62**		
#10	**97.71**		
#20	**87.46**		
#40	**75.75**		
#60	**67.88**		
#100	**59.16**		
#200	**52.75**		

SOIL DESCRIPTION
● SANDY SILT, micaceous, red-brown

REMARKS
●

PROJECT: Georgia Historic Heartland Mega Site

SITE: Highway 11 & Hollis Road
Social Circle, Georgia

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

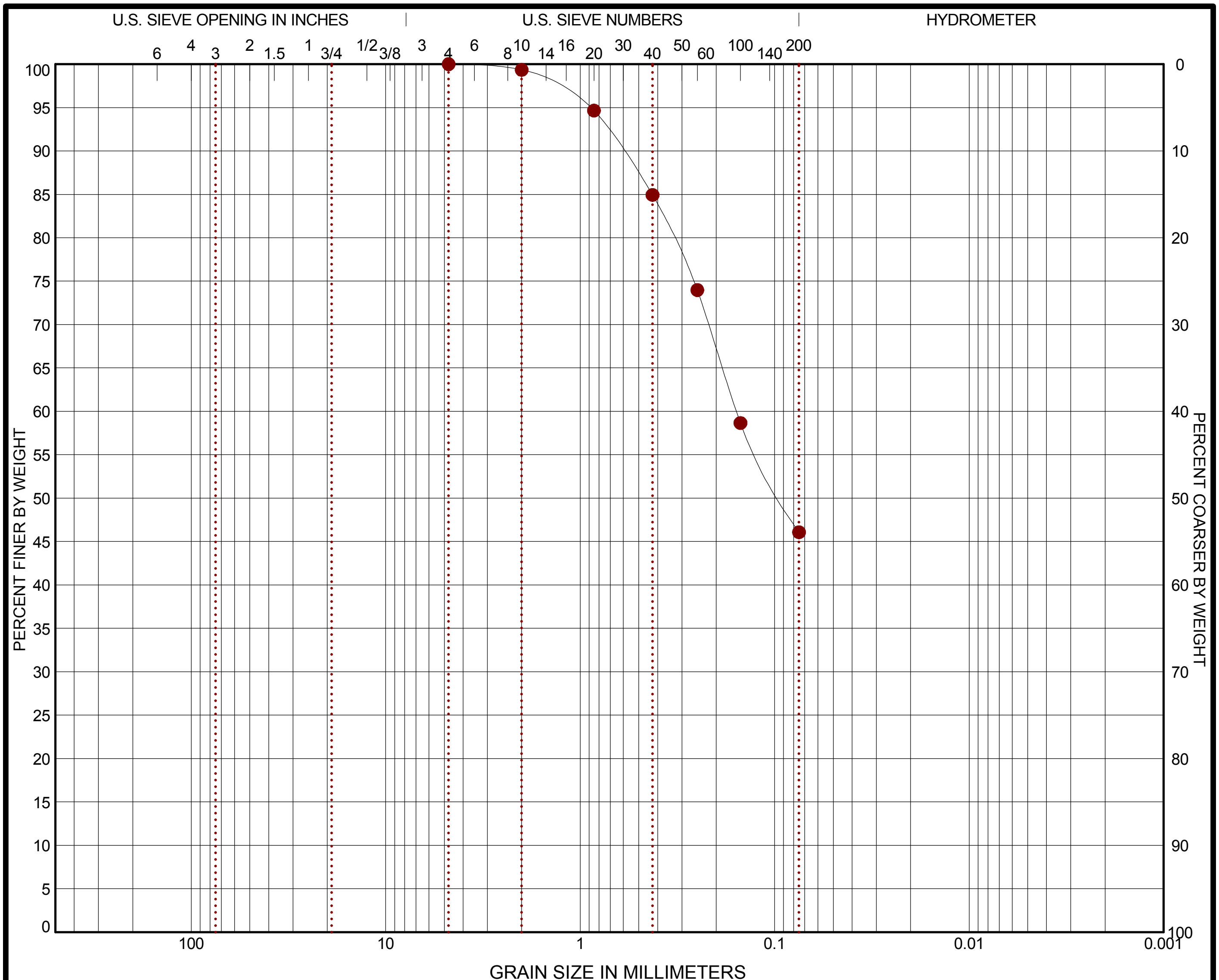
PROJECT NUMBER: 49155023

CLIENT: Thomas and Hutton

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 49155023.GPJ TERRACON2012.GDT 16/4/15

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-15 Bulk**	**10 - 15**	**0.0**	**0.0**	**53.9**		**46.1**		

	GRAIN SIZE		
	●		
D_{60}	**0.157**		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE (size)	PERCENT FINER ●		
1 1/2"			
1"			
3/4"			
1/2"			
3/8"			
#4	**100.0**		
#10	**99.34**		
#20	**94.65**		
#40	**84.93**		
#60	**73.97**		
#100	**58.66**		
#200	**46.08**		

SOIL DESCRIPTION

● SILTY SAND, micaceous, tan

REMARKS

●

PROJECT: Georgia Historic Heartland Mega Site

SITE: Highway 11 & Hollis Road
Social Circle, Georgia

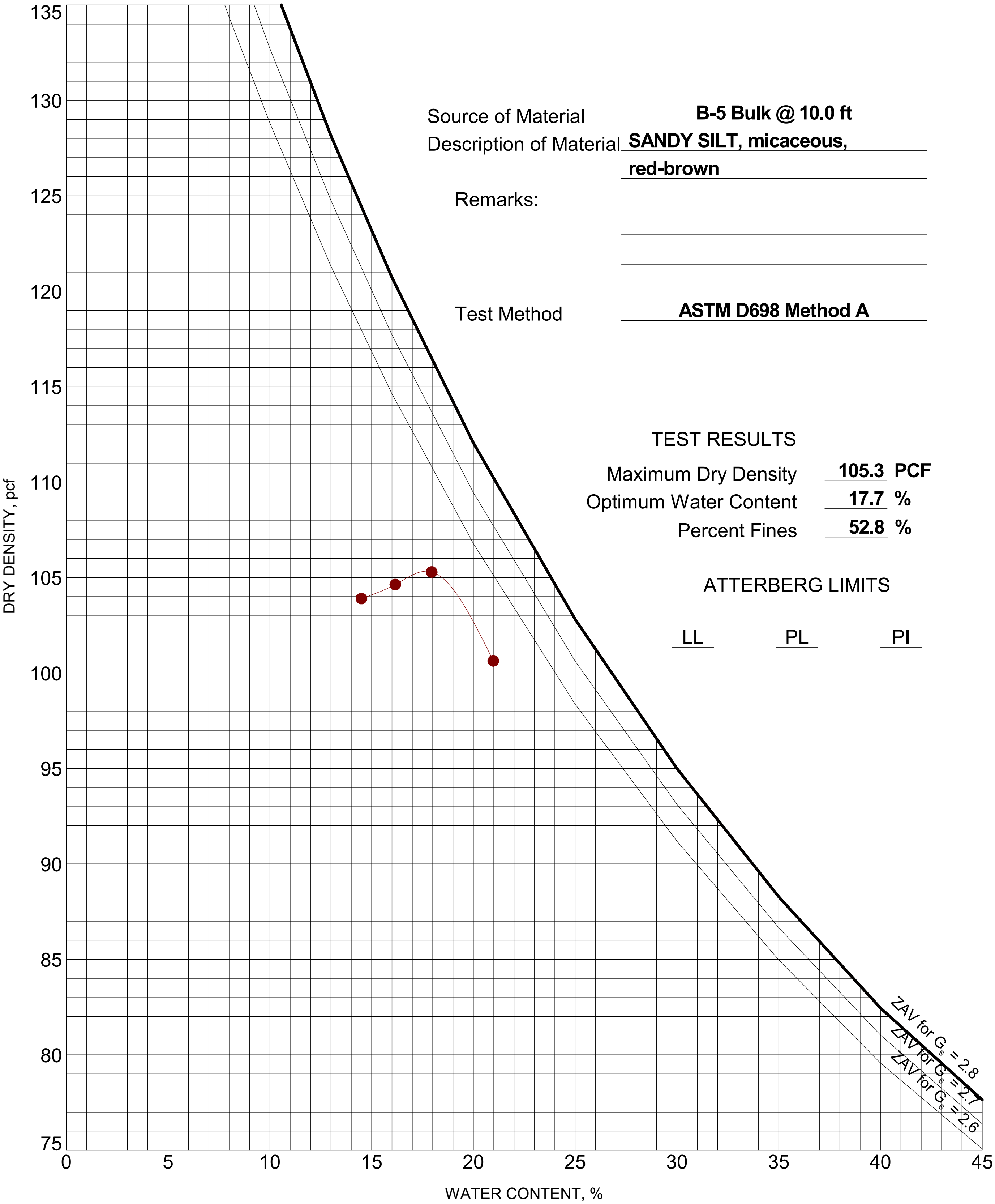
Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

PROJECT NUMBER: 49155023

CLIENT: Thomas and Hutton

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-5 Bulk @ 10.0 ft**

Description of Material: **SANDY SILT, micaceous, red-brown**

Remarks:

Test Method: **ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density **105.3 PCF**

Optimum Water Content **17.7 %**

Percent Fines **52.8 %**

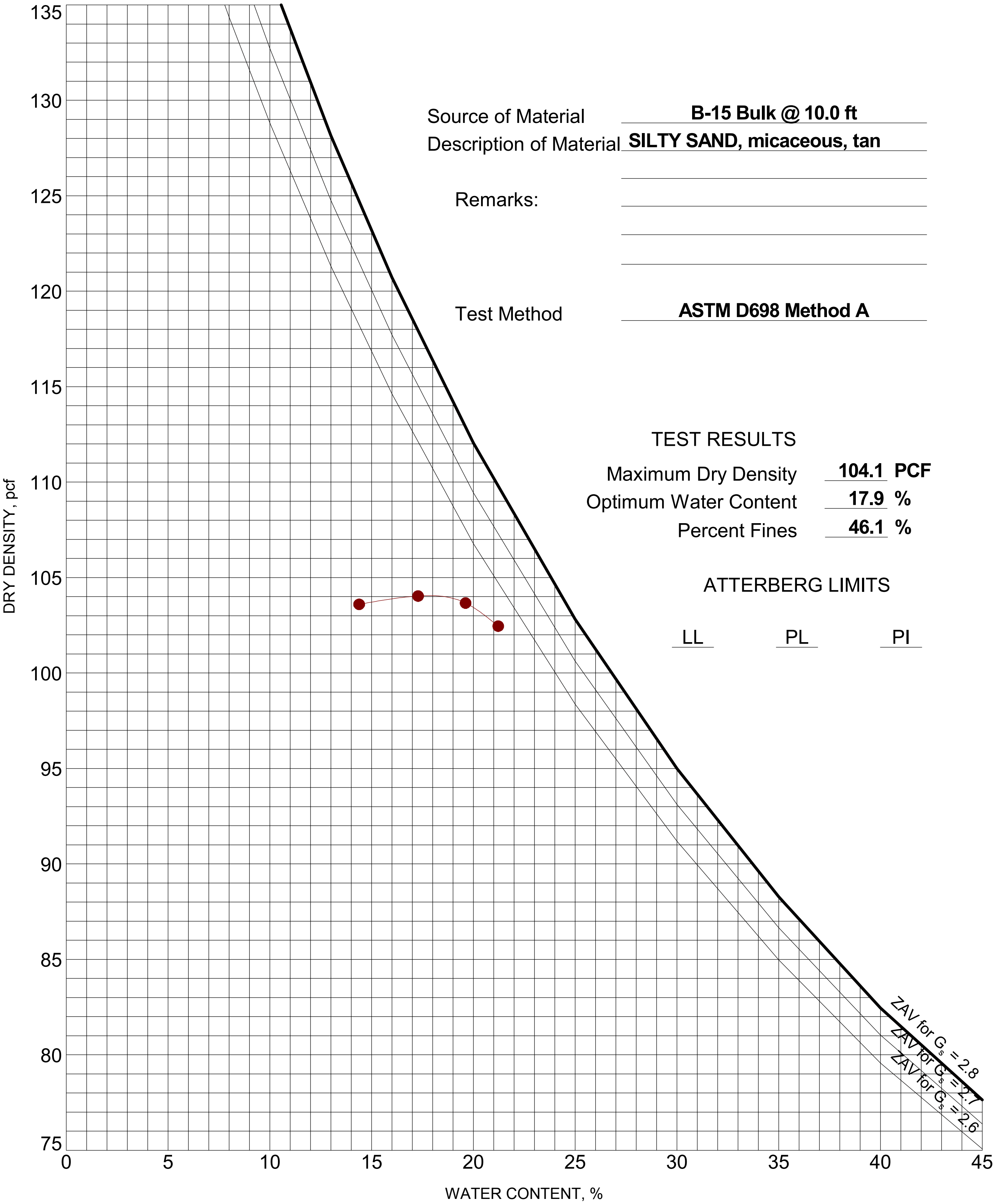
ATTERBERG LIMITS

LL	PL	PI

PROJECT: Georgia Historic Heartland Mega Site	Terracon 2855 Premiere Parkway, Suite C Duluth, Georgia	PROJECT NUMBER: 49155023
SITE: Highway 11 & Hollis Road Social Circle, Georgia		CLIENT: Thomas and Hutton

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material **B-15 Bulk @ 10.0 ft**

Description of Material **SILTY SAND, micaceous, tan**

Remarks:

Test Method **ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**104.1**	**PCF**
Optimum Water Content	**17.9**	**%**
Percent Fines	**46.1**	**%**

ATTERBERG LIMITS

LL	PL	PI

PROJECT: Georgia Historic Heartland Mega Site	Terracon 2855 Premiere Parkway, Suite C Duluth, Georgia	PROJECT NUMBER: 49155023
SITE: Highway 11 & Hollis Road Social Circle, Georgia		CLIENT: Thomas and Hutton

BORING LOG NO. B-3/4

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road, Social Circle, Georgia

DEPTH	LOCATION / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
0.8	**TOPSOIL**, 10 Inches				X	3-5-6 N=11			
2.0	**RESIDUUM - SANDY SILT (ML)**, trace clay, red-brown, stiff								
	SILTY SAND (SM), fine to medium grained, some mica, orange, yellow, brown, medium dense to dense		5		X	13-11-12 N=23			
					X	4-6-7 N=13			
			10		X	9-17-21 N=38			
	- with mica, brown, orange and gray, medium dense		15		X	9-10-12 N=22			
			20		X	12-14-14 N=28			
	- dark gray and brown, dense		25		X	11-14-21 N=35			
	- white and gray, very dense		30		X	8-17-35 N=52			

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-3/4

PROJECT: Georgia Historic Heartland Mega Site | **CLIENT: Thomas and Hutton**

**SITE: Highway 11 & Hollis Road
Social Circle, Georgia**

GRAPHIC LOG	LOCATION / DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	33.0								
	PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to medium grained, with mica, gray, very dense				X	50/3"			
			35						
					X	50/1"			
	40.0		40						
	Boring Terminated at 40 Feet								

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

Hammer Type: Automatic

Advancement Method: Hollow Stem Auger	See Exhibit A-3 for description of field procedures	Notes:
Abandonment Method: Backfilled with soil cuttings	See Appendix B for explanation of symbols and abbreviations.	

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-5

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road
Social Circle, Georgia

DEPTH	LOCATION / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
0.2	**TOPSOIL**, 2 Inches								
	RESIDUUM - SANDY SILT (ML), trace clay, trace quartz fragments, red-brown, stiff				X	3-4-6 N=10			
	- less clay		5		X	3-5-7 N=12			
					X	3-4-5 N=9			
	- with mica, purple, orange, stiff		10		X	3-3-6 N=9			
	- very stiff				X	4-8-9 N=17			
15.0	**SILTY SAND (SM)**, fine to medium grained, with mica, purple, orange, brown loose to medium dense		15						
			20		X	8-11-10 N=21			
	- black, brown, purple, medium dense to dense		25		X	6-10-11 N=21			
			30		X	8-15-18 N=33			

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-5

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road, Social Circle, Georgia

GRAPHIC LOG	LOCATION / DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	SILTY SAND (SM), fine to medium grained, with mica, purple, orange, brown loose to medium dense *(continued)*								
			35		X	9-14-20 N=34			
	- very dense to dense		40		X	19-29-26 N=55			
			45		X	10-15-20 N=35			
	48.0								
	PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to medium grained, with mica, black, brown, orange, very dense				X	13-20-50/3" 70/9"			
	50.0		50						
	Boring Terminated at 50 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-7

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road, Social Circle, Georgia

GRAPHIC LOG	LOCATION / DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	0.2 **TOPSOIL**, 2 Inches				X	2-2-3 N=5			
	RESIDUUM - SANDY SILT (ML), trace clay, with roots, red-brown, medium stiff 2.0								
	PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to medium grained, with mica, orange, brown, black				X	38-50/4" 50/4"			
			5		X	9-27-50/2" 77/8"			
					X	50/1"			
	12.0		10						

Auger Refusal at 12 Feet

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-7A

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

**SITE: Highway 11 & Hollis Road
Social Circle, Georgia**

GRAPHIC LOG	LOCATION / DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	0.2 **TOPSOIL**, 2 Inches								
	Refer to Boring B-7 for Soil Description								
	12.0 **PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, with mica, orange, brown, black					32-50/2" 50/2"			
	17.0								
	Auger Refusal at 17 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:
Offset 15' South of B-7

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-8

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road
Social Circle, Georgia

GRAPHIC LOG	LOCATION / DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	0.3 **TOPSOIL**, 3 Inches								
	RESIDUUM - SANDY SILT (ML), trace clay, trace quartz fragments, trace roots, red-brown, stiff				X	3-5-7 N=12			30
	- less clay, less quartz fragments, less roots, orange-brown, purple, very stiff		5		X	7-7-11 N=18			26
	6.0								
	SILTY SAND (SM), fine to medium grained, with mica, orange-brown, black, medium dense				X	7-10-9 N=19			16
			10		X	5-6-8 N=14			22
			15		X	9-11-18 N=29			18
			20		X	5-7-8 N=15			21
			25		X	5-10-14 N=24			17
	- dense		30		X	7-15-17 N=32			14

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-8

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

**SITE: Highway 11 & Hollis Road
Social Circle, Georgia**

GRAPHIC LOG	LOCATION / DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
	SILTY SAND (SM), fine to medium grained, with mica, orange-brown, black, medium dense *(continued)*							
	- medium dense	35		X	6-8-15 N=23			23
	40.0	40		X	7-12-15 N=27			
	Boring Terminated at 40 Feet							

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/8/2015	Boring Completed: 4/8/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-15

PROJECT: Georgia Historic Heartland Mega Site	CLIENT: Thomas and Hutton
SITE: Highway 11 & Hollis Road, Social Circle, Georgia	

LOCATION

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
0.2	**TOPSOIL**, 2 Inches				X	2-3-4 N=7			
2.0	**RESIDUUM - SANDY SILT (ML)**, trace clay, with roots, red-brown, medium stiff								
	SILTY SAND (SM), fine to medium grained, orange, yellow, medium dense		5		X	9-11-12 N=23			
	- medium grained, light orange				X	4-5-6 N=11			
			10		X	4-6-5 N=11			
	- fine grained, orange, brown		15		X	6-9-10 N=19			
	- with rock fragments, some mica, gray, brown, orange, dense		20		X	22-30-25 N=55			
	- medium dense		25		X	11-13-14 N=27			
30.0	- less rock fragments, orange, brown		30		X	8-9-9 N=18			
	Boring Terminated at 30 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/9/2015	Boring Completed: 4/9/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

BORING LOG NO. B-16

PROJECT: Georgia Historic Heartland Mega Site

CLIENT: Thomas and Hutton

SITE: Highway 11 & Hollis Road Social Circle, Georgia

LOCATION

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)
0.3	**TOPSOIL**, 3 Inches								
	RESIDUUM - SANDY SILT (ML), trace clay, some roots, red-brown, medium stiff				X	3-3-3 N=6			18
	- less clay, less roots, trace quartz fragments, yellow, orange-brown, very stiff to stiff		5		X	6-11-13 N=24			22
					X	4-7-8 N=15			34
			10		X	8-5-6 N=11			41
13.0	**SILTY SAND (SM)**, fine grained, with mica, red-brown, black, brown, loose to medium dense								
			15	▽	X	3-4-5 N=9			33
			20		X	6-7-12 N=19			23
	- tan, medium dense		25		X	6-12-14 N=26			21
30.0			30		X	7-11-11 N=22			23
	Boring Terminated at 30 Feet								

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *15 Feet While Drilling*

Terracon
2855 Premiere Parkway, Suite C
Duluth, Georgia

Boring Started: 4/9/2015	Boring Completed: 4/9/2015
Drill Rig: CME-45	Driller: Jorge
Project No.: 49155023	

APPENDIX B

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING		WATER LEVEL		FIELD TESTS	
	Standard Penetration Test		Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)
			Water Level After a Specified Period of Time	(HP)	Hand Penetrometer
			Water Level After a Specified Period of Time	(T)	Torvane
			Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(DCP)	Dynamic Cone Penetrometer
				(PID)	Photo-Ionization Detector
				(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psi)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 3.50	0 - 1
Loose	4 - 9	Soft	3.5 to 7.0	2 - 3
Medium Dense	10 - 29	Medium Stiff	7.0 to 14.0	4 - 7
Dense	30 - 50	Stiff	14.0 to 28.0	8 - 15
Very Dense	> 50	Very Stiff	28.0 to 55.5	16 - 30
		Hard	> 55.5	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

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

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

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

PLASTICITY DESCRIPTION

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

UNIFIED SOIL CLASSIFICATION SYSTEM

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

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

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

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

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

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

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

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

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

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

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

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

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

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

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.