GEOTECHNICAL INVESTIGATION

CANTEY STREET
SUMMERTON, SOUTH CAROLINA

PREPARED FOR, OR ON BEHALF OF:

CLARENDON COUNTY COUNCIL
MANNING, SOUTH CAROLINA

Project No. 121057

GEO-SYSTEMS DESIGN & TESTING, INC.
Geotechnical, Environmental, and Construction Services
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GEO-SYSTEMS DESIGN & TESTING, INC.
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

March 22, 2012

Clarendon County Council
P.O. Box 486
Manning, SC 29102

Attn.: Ms. Tamika Malone, Procurement Director

Re: Geotechnical Investigation
Cantey Street
Summerton, SC
Project Number: 121057

Dear Ms. Malone:

As authorized, Geo-Systems Design & Testing, Inc. has completed the requested subsurface exploration of the above referenced project. The report contains a description of the project information provided to us, general site and subsurface descriptions together with our recommendations for foundation design and construction considerations.

We are available to discuss our recommendations with you and to conduct any additional testing or inspections necessary during construction. We appreciate having the opportunity to serve you on this project and look forward to serving as your geotechnical consultant.

Respectively submitted,
GEO-SYSTEMS DESIGN & TESTING, INC.

Joe A. Smith, P.E.
President

I. PURPOSE AND SCOPE

The geotechnical study and report is concerned with definition of the existing site materials and analysis of the anticipated material performance during site construction and final long-term loading. Primary concerns to be addressed during the design phase of the project will be:

1) Availability and workability of site materials;
2) Foundation loading requirements;
3) Floor subgrade elevations

Within the scope of this report each of the above will be addressed in detail and recommendations provided. Other considerations pertinent to design and construction throughout the site will also be addressed.

II. DESCRIPTION OF PROJECT

The building site is located on Cantey Street north of Main Street in Summerton, South Carolina. We are investigating the southern half undeveloped portion of the property. The northern half is to remain residential property and is not part of this study. There is a concrete slab on-site and a shed offset the southern portion. Older neighborhoods such as this project could possibly have septic tanks and drain fields which my be uncovered during grading operations.

We understand the proposed building will be a steel frame structure with concrete floor slab construction. Maximum wall loads are anticipated to be 2 to 4 kips per lineal foot with anticipated column loads of 20 to 60 kips.

III. SUBSURFACE CONDITIONS

Soil Stratigraphy:

Two (2) soil test borings were performed to depths of fifteen (15) feet in the general location indicated on the Test Location Plan provided in the Appendix of this report.

The purpose of the test borings performed was to determine the consistency and possible load carrying capacities of the various soil strata, and to obtain information which might have an effect on foundation design and behavior as well as impact site development and construction procedures.

The county soil survey mapping classifies the surface soils as Lynchburg Sand (Ly) and Fuquay Fine Sand Soil Series.

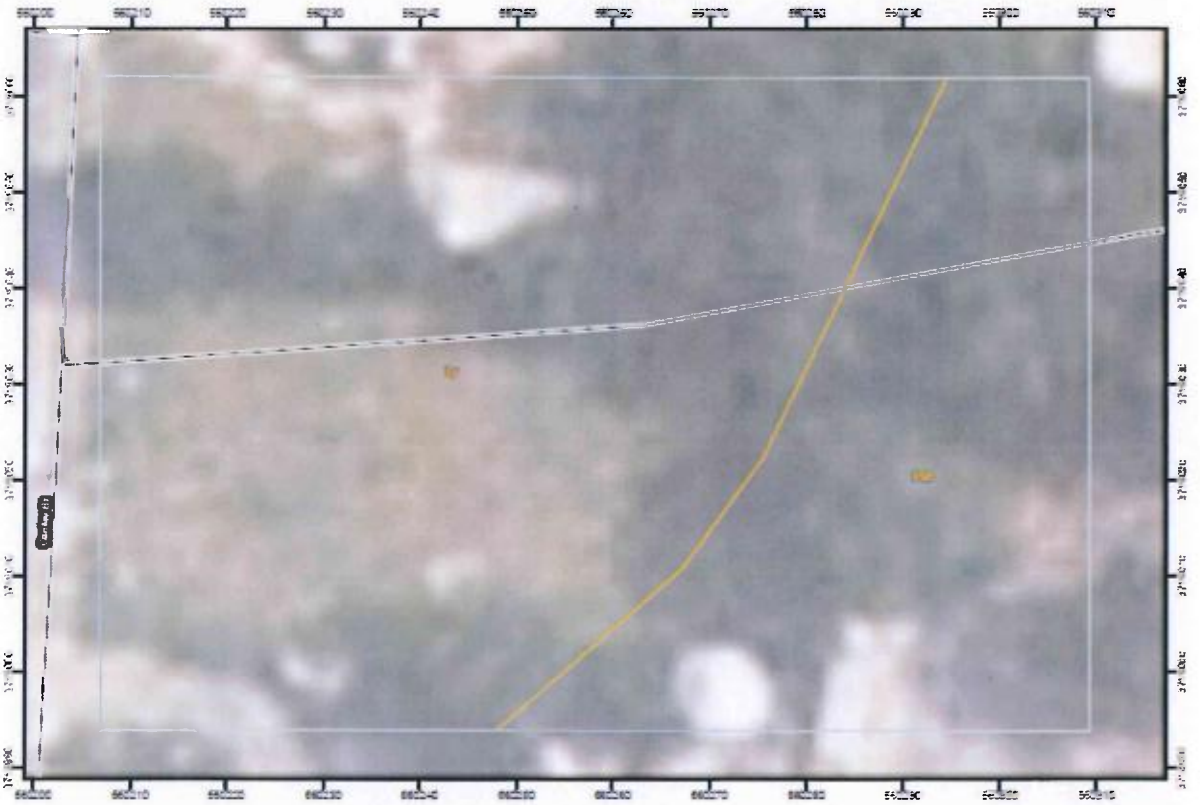
Ly—Lynchburg loamy sand, 0 to 2 percent slopes

Typical profile

- *0 to 9 inches:* Loamy sand
- *9 to 16 inches:* Sandy loam
- *16 to 72 inches:* Sandy clay loam

FuB—Fuquay fine sand, 0 to 6 percent slopes
Typical profile

- *0 to 7 inches:* Fine sand
- *7 to 27 inches:* Fine sand
- *27 to 52 inches:* Sandy clay loam
- *52 to 66 inches:* Sandy clay loam
- *66 to 72 inches:* Sandy clay loam



Two (2) predominant soil strata were typically profiled within the site area below an average of six (6) inches of topsoil as follows:

Strata I
- Tan Fine to Medium **SAND** (SM-SP)
- Depths of Twelve (12) Feet
- Loose

Strata II
- Tan Clayey **SAND** (SC)
- Depths below Twelve (12) Feet to Fifteen (15) Feet
- Very Firm to Dense

The 2003 IBC definition for the site soil profile is a "D" classification with the following seismic design parameters:

F_A = 1.083
F_v = 1.876
SDs = 0.752
SD1 = 0.327

Groundwater:

Groundwater was indicated in the soil borings at below seven (7) feet depths. The permeable sand soils at shallow depth are prone to "perch" surface rainfall waters and should be considered during construction to monitor positive surface drainage at all times.

IV. CONSTRUCTION RECOMMENDATIONS

Site Preparation:

All surface soils containing organic laden material, roots, asphalt surfacing and vegetation should be stripped from the site outwards a minimal five (5) feet from within the building area. These materials should be wasted from the site or used in areas to be landscaped. A minimum six (6) inch stripping depth should be required throughout the building area to remove any topsoils / pavements prior to additional excavation or 'fill' operations.

The base of stripping levels should be aerated, compacted and proofrolled with a loaded dump truck (20 + tons) after aeration and compaction. **Base of stripping levels to a depth of twelve (12) inches below stripping grades and all structural fill soils should be compacted to ninety-five percent (95%) the soils' Standard Proctor density value. Site soils are suitable for structural backfill with proper moisture conditioning.**

Exposed building subgrade soils should be well drained to minimize the accumulation of precipitation. If the exposed subgrade soils are not as anticipated, or become excessively wet, the geotechnical engineer should be consulted for guidance.

Utility Excavation:

Utility excavations should be backfilled in uniform 4 to 6 inch lifts compacted to ninety-five percent (95%) the soils' Standard Proctor density value. Excavation sidewalls should be no steeper than 1:1 (Horizontal:Vertical) for excavations within the upper four (4) feet. All excavation trenches should be protected from rainfall if to be opened for longer than a one (1) day period.

Earthen Fill:

No deleterious debris, organics or highly plastic soils should be placed in fill embankments. The following site area soil classifications can be utilized as suitable fill (SM, SC, SP) according to the Unified Soil Classification System (ASTM D-2487).

Foundation Design and Construction:

The natural 'on-site' soils and any compacted site or acceptable borrow fill soils should be suitable for supporting shallow spread footings for the proposed building if constructed and inspected according to the above requirements. **An allowable design soil bearing pressure of 2,500 psf may be used for foundations bearing in compacted natural or fill soils within the upper thirty (30) inches of existing grades.**

Settlements within the virgin and/or compacted fill soils are expected to be within the tolerable limits of 0.4 inches for properly proofrolled upper surface soils. Differential settlements throughout the building structure will be principally controlled by the spacing and loading variances of individual columns but should not exceed 0.2 inch for the bearing pressures recommended throughout the structural area. Fill soils could experience greater settlements depending upon uniformity and control of fill placement during construction and stabilization of footing excavations prior to concrete placement.

We recommend minimum column and continuous wall footing widths should be 20 and 16 inches, respectively, to mitigate concern for a localized punching failure of footings into the foundation soils. The foundations should bear at a minimum depth of 12 inches below external grades to adequately extend below frost penetration depths and provide sufficient cover to safeguard against erosion.

The foundation bearing area should be free of loose or soft soil, ponded water and debris. Foundation concrete should not be placed on soils that have been softened by precipitation or from frost heave.

Grade Slab:

The grade slab may be "floated", supported by compacted subgrade soils in accordance with the site preparation recommendations contained in this report. A vapor barrier consisting of six (6) mil polyethylene moisture sheeting between the concrete slab and site sandy soils is recommended. This drainage layer will serve to minimize any build-up of capillary moisture and breakup any long-term hydrostatic pressure due to the capillary attraction of moisture beneath the slab.

Floor or other 'flat' concrete slabs should be designed based upon a recommended subgrade soil modulus of 170 psi/in for compacted grade level site soils.

V. PAVEMENT ANALYSIS AND CONSTRUCTION

We recommend that SCDOT Type I Bituminous Asphalt be used for flexible pavement structures. The required thickness of Base Course material should be placed over a compacted subgrade of fill or virgin soils with the following recommended pavement section for the anticipated truck traffic use estimated at four (4) equivalent axle loads per day.

Drive Areas: Flexible

2.0 Inches Asphaltic Surface Course Type 1 (SCDOT, Sec. 403)
6.0 Inches Macadam Base (SCDOT, Section 305)

Compaction of subgrade soils should meet 100 percent of the standard Proctor (ASTM D-698) maximum dry density. Base course materials should meet 95 percent of their modified Proctor (ASTM D-1557) maximum dry density. All materials should be within the latest version of the South Carolina State Highway Department of Transportation specifications. Any paved areas adjacent to sprinkler systems should be designed with an underdrain system to prevent wetting or saturation of the subgrade soils. Positive drainage and pavement sealers should be provided throughout pavement areas subjected to wetting cycles. Construction operations should not be performed without proper quality control inspection and testing by experienced engineering technicians working under the supervision of a geotechnical engineer. These services should include field density testing of subgrade and base course materials as well as field inspection of asphalt paving operations to check conformance with project plans and specifications.

Periodic inspections should be required throughout the life of the pavement to seal minor surface cracks as to be expected in any pavement structure with time. Unattended surface deterioration cracks will decrease the life of a pavement structure significantly.

VI. CONSTRUCTION CONSIDERATIONS

Foundations:

Exposure of the bearing soil to the environment may weaken the soils at the footing bearing level if the foundation excavation remains open for long periods of time during construction. Therefore, we recommend that each building site be concreted soon after footing excavations are completed to minimize potential damage to the baring soils. The foundation area should be free of loose or soft soil, ponded water, and debris. Foundation concrete should not be placed on soils that have been softened by precipitation or from frost heave.

If bearing soils are softened by surface water intrusion or from frost heave, the softened soils must be removed from the foundation excavation bottom prior to the placement of concrete. If the excavation must remain open and rainfall becomes imminent while the bearing soils are exposed, either a plastic membrane can be placed across the excavation or a 2 to 4 inch thick "mud mat" of 'lean' (2,000 psi) concrete can be placed on the bearing soils for protection.

We recommend that a qualified geotechnical engineer using hand auger/cone penetrometer testing equipment examine the base of footing excavations. This is necessary to document that the actual disturbed soils due to excavation have been re-compacted and acceptable for the recommended design allowable soil bearing pressure. Any unsuitable soil detected during the examination should be 'under-cut' or treated as directed by the geotechnical engineer. The resulting excavation can be backfilled with suitable structural fill or may be concreted.

VII. BASIS FOR RECOMMENDATIONS

The recommendations provided are based on our understanding of the project information as presented in this report and our interpretation of the data collected during this subsurface exploration. We have made recommendations based on our experience with similar subsurface conditions under similar loading conditions. The soil penetration tests and laboratory test data have been used to estimate allowable soil strengths and evaluate the anticipated behavioral performance of the soils during construction and long-term loading for this particular project. Any deviation of grades and/or loads other than those presented in this report should be provided to us so that we may review our conclusion and recommendations.

Regardless of the thoroughness of geotechnical exploration, there is always a possibility that subsurface conditions between borings may be different from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered soil conditions. Therefore, experienced geotechnical personnel should evaluate the earthwork and foundation construction to document that the conditions anticipated in design actually exist. The owner should retain Geo-Systems Design & Testing, Inc. for this evaluation, as we are already familiar with the project, subsurface conditions and the intent of the recommendations.

APPENDIX A

SITE/TEST PLAN LOCATION

PROJECT NO. 121057

Cantey Street
Summerton, South Carolina

Site Location Plan

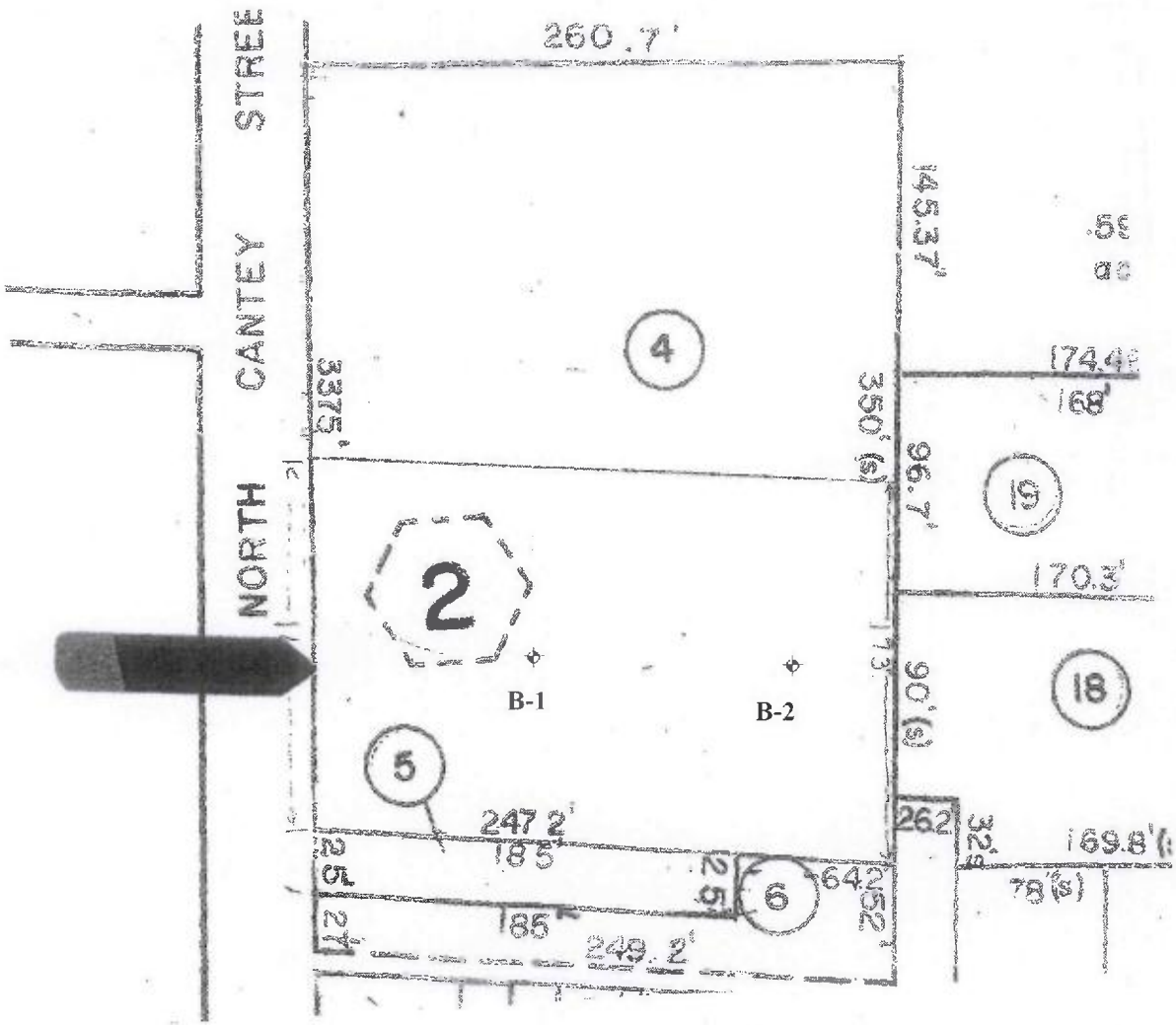
GEO-SYSTEMS DESIGN & TESTING, INC.
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING

Post Office Box 2656
West Columbia, S.C. 29171
(803) 791-7528

JOB NAME:	Date	APPROVED BY:	SCALE:	Drawing No.:	DRAWN BY:
Cantey Street	3/20/12	JAS	NTS		REVISED:

ARCHITECTS STANDARD FORM

MADE IN U.S.A.



TEST LOCATION PLAN

GEO-SYSTEMS DESIGN & TESTING, INC.
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING

Post Office Box 2656
West Columbia, S.C. 29171
(803) 791-7528

JOB NAME:	Date	APPROVED BY:	SCALE:	Drawing No.	DRAWN BY:
Cantey Street	3/20/12	JAS	NTS		REVISED:

ARCHITECTS STANDARD FORM

MADE IN U.S.A.

APPENDIX B

FIELD TEST DATA

PROJECT NO. 121057

Cantey Street
Summerton, South Carolina

Geo-Systems Design & Testing, Inc.
Geotechnical& Environmental Engineering
Construction Testing

Date Drilled: 3/20/2012	Project Name: Cantey Street
Project Number: 121057	Boring Log Number: B-1

Elevation	Depth (ft.)	Soil Classification	Sample Depth	Blow Counts
	0.0	Ground Surface		
	0.6	Brown Loamy **SAND** (Topsoil)		
		Loose Tan Fine to medium **SAND** (SM)	2.0	5
			4.0	7
-5.0			6.0	8
	-7			
		Stiff Tan Sandy **CLAY** (CL)	9.0	16
-10.0				
			14.0	19
-15.0	-15			
		Boring Terminated @ 15 FEET		
-20.0				
-25.0				
-30.0				

Penetration Resistance (Blows Per Foot)

1 5 10 20 30 50

Groundwater at Time of Boring: 14.0 Feet	Groundwater at 24 Hrs: N/A
Sampler Type	Drilling Method : HAS
SS-Split Spoon NQ- Rock Core 1-7/8"	HAS- Hollow Stem Auger RW-Rotary Wash
ST- Shelby Tube CU-Cuttings	CFA-Continuous Flight Augers DP - Direct Push
AWG-Rock Core 1 1/8" CT-Continuous Tube	DC-Driving Casing HA- Hand Auger

Geo-Systems Design & Testing, Inc .
Geotechnical& Environmental Engineering
Construction Testing

Date Drilled:	3/20/2012	Project Name: Cantey Street
Project Number: 121057		Boring Log Number: B-2

Elevation	Depth (ft.)	Soil Classification	Sample Depth	Blow Counts	Penetration Resistance (Blows Per Foot)
	0.0	Ground Surface			1 5 10 20 30 50
	0.6	Brown Loamy **SAND** (Topsoil)			
		Loose Light Tan Fine to Medium **SAND** (SM-SP)	2.0	5	
			4.0	7	
-5.0			6.0	10	
	-7				
		Stiff Tan Sandy **CLAY** (CL)	9.0	17	
-10.0					
			14.0	18	
-15.0	-15				
		Boring Terminated @ 15 FEET			
-20.0					
-25.0					
-30.0					

Groundwater at Time of Boring: 14.0 Feet	Groundwater at 24 Hrs: N/A
Sampler Type	Drilling Method: HAS
SS-Split Spoon NQ- Rock Core 1-7/8"	HAS- Hollow Stem Auger RW-Rotary Wash
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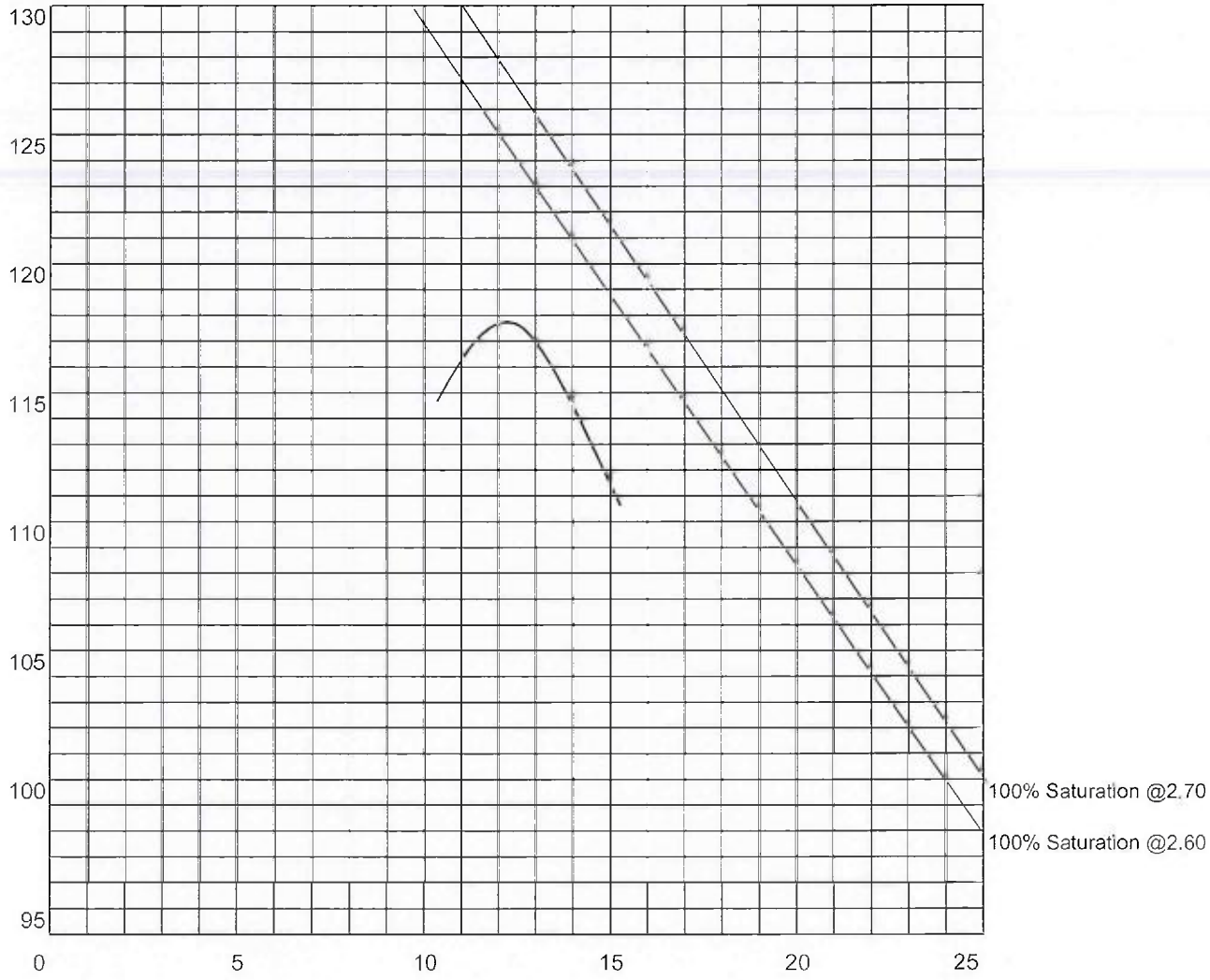
APPENDIX C

LABORATORY DATA

PROJECT NO. 121057

Cantey Street
Summerton, South Carolina

STANDARD PROCTOR (ASTM D-698)



TEST RESULTS	SOIL DESCRIPTION
Optimum Moisture: 12.4 Maximum Dry Density 118.7	Tan Silty Clayey **SAND**
Project: Cantey Street	Sample No.: Bulk # 1
Location: Summerton, SC	Client: Clarendon County Council
Date: 3/20/2012	Project Number: 121057

GEO-SYSTEMS DESIGN & TESTING, INC.

Geotechnical Services and Material Testing

APPENDIX D

STEPS FOR CLASSIFYING A SITE

PROJECT NO. 121057

Cantey Street
Summerton, South Carolina

Step 1: Check for the four categories of Site Class F requiring site-specific evaluation. If the site corresponds to any of these categories, classify the site as Site Class F and conduct a site-specific evaluation.

Step 2: Check for the existence of a total thickness of soft clay > 10 ft (3 m) where a soft clay layer is defined by: $s_u < 500$ psf (25 kPa), $w \geq 40$ percent, and $PI > 20$. If these criteria are satisfied, classify the site as Site Class E.

Step 3: Categorize the site using one of the following three methods with $\overline{v}_s$, $\overline{N}$ and $\overline{s}_u$ computed in all cases as specified in Sec. 3.5.1:

a. $\overline{v}_s$ for the top 100 ft (30 m) ($\overline{v}_s$ method)

b. $\overline{N}$ for the top 100 ft (30 m) ($\overline{N}$ method)

c. $\overline{N}_{ch}$ for cohesionless soil layers ($PI < 20$) in the top 100 ft (30 m) and average $\overline{s}_u$ for cohesive soil layers ($PI > 20$) in the top 100 ft (30 m) ($\overline{s}_u$ method)

Table 3.5-1 Site Classification

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$ [a]
E	< 600 fps (< 180 m/s)	< 15	< 1,000 psf (< 50 kPa)
D	600 to 1,200 fps (180 to 360 m/s)	15 to 50	1,000 to 2,000 psf (50 to 100 kPa)
C	> 1,200 to 2,500 fps (360 to 760 m/s)	> 50	> 2,000 (> 100 kPa)

[a] If the $\overline{s}_u$ method is used and the $\overline{N}_{ch}$ and $\overline{s}_u$ criteria differ, select the category with the softer soils (for example, use Site Class E instead of D).