SEPI ENGINEERING & CONSTRUCTION

1025 Wade Avenue
Raleigh, NC 27605
919.789.9977

5960 Fairview Road
Suite 102
Charlotte, NC 28210
704.714.4880

5030 New Centre Dr.
Suite B
Wilmington, NC 28403
910.523.5715

sepiengineering.com

ADDENDUM NUMBER ONE

Westgate Road Modular Site
SCO ID: 12-09486-01A

ADDENDUM FOR BIDDING PURPOSES
June 11, 2014

Where any article, division or subparagraph of the original contract documents or other addenda is supplemented herein, the provisions of the original documents shall remain in effect. All the supplemental provisions shall be considered as added thereto. Where any such article, division or subparagraphs are amended, voided or superseded thereby, the provisions of such article, division or subparagraph not so specifically amended, voided or superseded shall remain in effect.

The attention of the Bidders is called to the following clarifications, additions to and changes in the plans and specifications dated October 7, 2011 on the above project. It will be the responsibility of each Bidder to call such clarifications, additions and changes in plans and specifications to the attention of any and all subcontractors concerned. The Owner and Engineer in no way assume any responsibility for notifying any subcontractor, material dealers or others not having received the original contract documents.

NOTE: Division, Section and Paragraph numbers refer to Specifications. Detail numbers refer to Drawings.

Site / Civil Clarifications / Modifications

ITEM 1: GENERAL SITE QUESTIONS FROM PRE-BID

1. The exterior lights that are shown on the Electrical Plans (E1 and E2) are to be normal lighting as well as emergency lighting in accordance with the Electrical Drawings and details.
2. The plumbing and mechanical for the modular buildings shall be operational and connected to the site utilities as part of the scope of this project.
3. The modular units are located at the NCDOT Beryl Road Yard located at 5105 Beryl Road, Raleigh, NC. The contractor is responsible for picking the units up from this yard and delivering them to the site.
4. An addendum to the original Geotechnical Report was performed by Terracon Consultants, Inc. on July 1, 2013 and has been included in this addendum.
5. Duke Energy Progress performed the lighting design for this project. It has been confirmed that they are responsible for the installation of all elements associated with the site lighting, including but not limited to, the installation of the light pole bases, light poles and lights as well as the underground electrical wiring associated with the lights. The General Contractor will be required to coordinate with Duke Energy Progress on the installation of any conduits that may be necessary for their installation. The Project Manager for Duke Progress is Gary Bryant and his information is as follows:
    - Phone: (919) 431-4753
    - Email: Gary.Bryant@duke-energy.com
6. PDFs of the construction documents can be downloaded from the NCDOT website noted below:
    - https://connect.ncdot.gov/letting/Pages/Letting-Details.aspx?let_type=5&let_date=2014-06-24

7. The excess material from excavations on the site during construction shall not be removed from the site until all excavation has been completed so that any suitable soils may be used to replace unsuitable soils. Only after all suitable soils from the spoil have been used will the Allowances be considered.
8. The excess material due to the proposed grading of the site, shall be hauled to an off-site location and shall be included in the bid package.
9. The topsoil that is excavated during grading operations shall be stockpiled on site to be used for landscaping operations, assuming that the topsoil is suitable for landscaping purposes. Otherwise the Contractor shall provide adequate topsoil from off-site sources at no additional charge to the North Carolina Department of Transportation (NCDOT).
10. PDF submittals of shop drawings are acceptable.
11. All HUBs that are associated with the project shall be certified by the North Carolina Department of Administration (NCDOA).
12. Unit Prices and Allowances have been added to the Contract Documents and Specification Sections 01200 and 01270 are included as attachments to this Addendum. Also, the Form of Proposal has been updated to account for the Unit Prices and Allowances.
13. A Site Visit has been set up for Monday June 16th at 2:00 pm. All interested parties are welcome to attend.
14. The foundation construction for the modular units is included in the scope of work for this project. The foundation plan and details can be found in the Modular Building Drawings dated 03/26/2007 as prepared by Design Space, Inc. and approved by HWCNC, PC on 04/23/2007.
15. The roof membrane shall be patched around the guardrails shown in detail 2/S2 on the Structural Drawing, S2 as appropriate for the membrane.
16. The roof connections between the modules shall be made as a part of the scope of this project and will include tying roof membranes together for a water-tight installation.
17. Electrical Plan E-1: Division 16 – Electrical, 2.2.C – The contractor may use tape to identify the grounded conductor and equipment grounding conductor only for conductors LARGER than #6 AWG, #4 and larger, 2011 NEC 200.6(B) and NEC 250.119 (A).
18. Electrical Plan E-2: The wood support rack for the service equipment shall be attached to the building.

ITEM 2: POST PRE-BID QUESTIONS FROM CONTRACTORS

1. **Question:** The site contractor has requested CAD drawings, is this doable?
   Answer: The Civil Designer will make the CAD base file available upon request.
2. **Question:** What is the approximate notice to proceed date?
   Answer: The notice-to-proceed date has not been set.
3. **Question:** What is the approximate construction budget?
   Answer: This information is not available to the contractors during the bidding process.

SEPI
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PRE-BID ATTENDANCE LIST — Monday, June 9, 2014

Name of Project: Westgate Road Modular Site

SEPI Project No: SC12.012.00

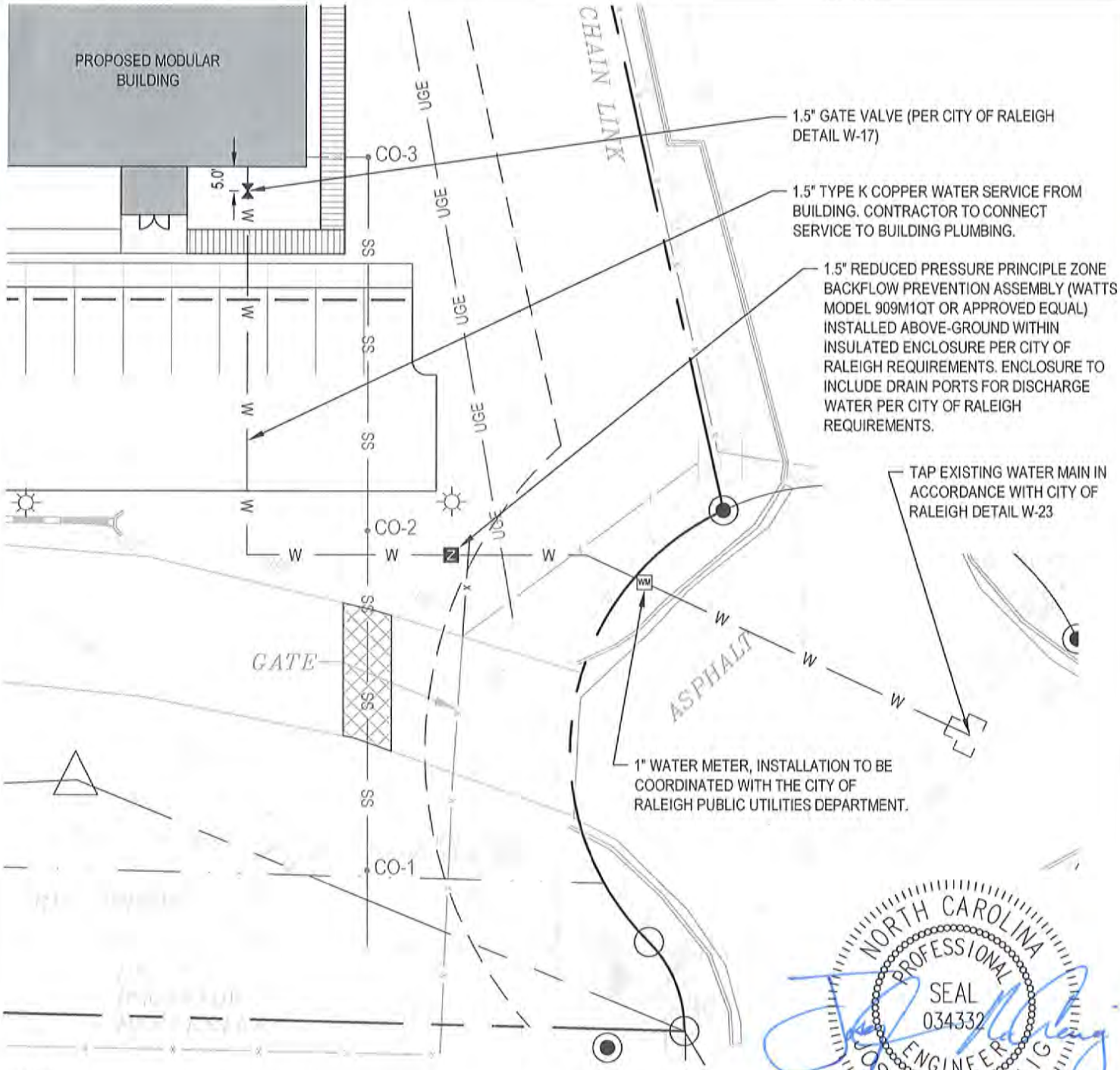
Date of Report: June 11, 2014

Date of Meeting: June 9, 2014

Time of Meeting: 10:00 AM

Location of Facilities Management Division Office – 1 South Wilmington Street – Room 521

Attendee Name/Company:	Email:	Phone:
Bonnie Tripp Simmons/NCDOT	btsimmons@ncdot.gov	(919) 707-4549
Mark Gibson, AIA/NCDOT	mdgibson1@ncdot.gov	(919) 707-4550
Mike Mountcastle/NCDOT	mdmountcastle@ncdot.gov	(919) 707-4547
Garrius Jones/Lanier Construction	garrius@lanierconstruction.com	(252) 747-8124
Jim Edwards/Inland Construction Company	jim@inlandconstructionco.com	(919) 821-1300
Ben Scruggs/Vistabution	amber@vistabution.com	(919) 844-9375
Amber/Vistabution	amber@vistabution.com	(919) 844-9375
James Richardson/Triangle Grading & Paving	sgriffin@trianglegradingpaving.com	(336) 584-1745
Matt Rountree/Moonlite Electric & Construction	mrountree@moonliteconstruction.com	(919) 468-8347
Brad Eckley/Erosion Supply Company	Beckley@erosionsupply.com	(919) 787-0334
Hal Stevens/ Scotia Construction	Scotiaco@bellsouth.net	(919) 467-0293
Anthony Eshere/Skyrock Construction, LLC	aeshere@skyrockconstructionllc.com	(919) 266-2446
Nana Manso/Skyrock Construction, LLC	nmanso@skyrockconstructionllc.com	(919) 266-2446
Richard Jones/RBS Grading, Inc.	rjones@rbsgrading.com	(919) 596-5669
Mitch Craig, PE/SEPI Engineering & Construction	mcraig@sepiengineering.com	(919) 573-9937



NORTH CAROLINA PROFESSIONAL SEAL 034332 ENGINEER JOSEPH M. CRAIG

06/11/14

NOTE:

WATER SUPPLY SHALL NOT BE PLACED INTO A SERVICE UNTIL BACTERIOLOGICAL TEST RESULTS OF REPRESENTATIVE WATER SAMPLES ANALYZED BY AN APPROVED LABORATORY ARE FOUND TO BE SATISFACTORY. CONTRACTOR SHALL RETAIN AN INDEPENDENT LABORATORY TO CONDUCT BACTERIOLOGICAL AND POST-CHLORINATION TEST CERTI- FYING THAT THE WATER MEETS EPA QUALITY OF THE DRINKING WATER. THE "WATER TEST REPORT FOR USE," AFTER ACCEPTED BY THE ENGINEER OF RECORDS, IS REQUIRED TO BE SUBMITTED TO SCO PRIOR SENDING RE- QUEST FOR FINAL INSPECTION AND OCCUPANCY PERMIT

WESTGATE ROAD MODULAR SITE

RALEIGH, NORTH CAROLINA

BULLETIN DRAWING #1

SCALE 0 15 30

SCALE: 1"=30'

SEPI ENGINEERING & CONSTRUCTION
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WILMINGTON, NORTH CAROLINA
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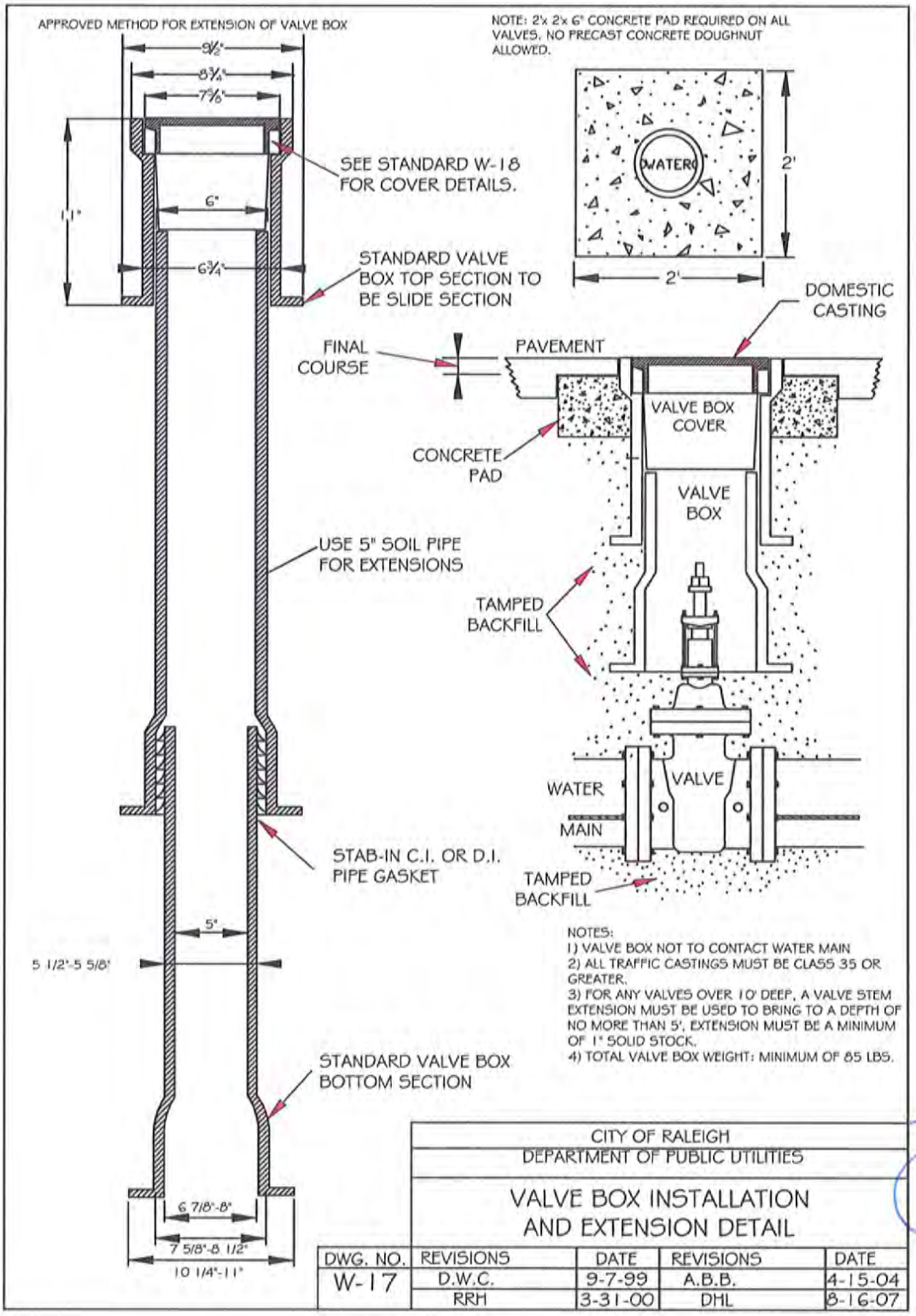
www.sepiengineering.com
info@sepiengineering.com

DRAWN BY:	CHECKED BY:	DATE	JOB NUMBER
B. MUELLER	M. CRAIG	2014-06-11	SC13.011.00



NOTES:
1) VALVE BOX NOT TO CONTACT WATER MAIN
2) ALL TRAFFIC CASTINGS MUST BE CLASS 35 OR GREATER.
3) FOR ANY VALVES OVER 10' DEEP, A VALVE STEM EXTENSION MUST BE USED TO BRING TO A DEPTH OF NO MORE THAN 5', EXTENSION MUST BE A MINIMUM OF 1" SOLID STOCK.
4) TOTAL VALVE BOX WEIGHT: MINIMUM OF 85 LBS.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

VALVE BOX INSTALLATION AND EXTENSION DETAIL

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-17	D.W.C.	9-7-99	A.B.B.	4-15-04
	RRH	3-31-00	DHL	8-16-07

NORTH CAROLINA PROFESSIONAL SEAL 034332 ENGINEER JOSEPH M. CRAIG

06/11/14

WESTGATE ROAD MODULAR SITE
RALEIGH, NORTH CAROLINA

BULLETIN DRAWING #1

SCALE 0 15 30
SCALE: 1"=30'

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www.sepiengineering.com
info@sepiengineering.com

DRAWN BY:	CHECKED BY:	DATE	JOB NUMBER
B. MUELLER	M. CRAIG	2014-06-11	SC13.011.00

F O R M O F P R O P O S A L

Westgate Road Modular Site

Facilities Management Division of the

NC Department of Transportation

SCO-ID #12-09486-01A

Contract: Single Prime

Bidder: _____

Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

.

The Bidder proposes and agrees if this proposal is accepted to contract with the

State of North Carolina through the North Carolina Department of Transportation

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Westgate Road Modular Site

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the State of North Carolina, and the

North Carolina Department of Transportation and SEPI Engineering and Construction, Inc.

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT: _____

GENERAL CONSTRUCTION CONTRACT:

Base Bid:

_____ Dollars($) _____

General Contractor: _____ Lic _____

Grading Subcontractor: _____ Lic _____

Paving Subcontractor: _____ Lic _____

Electrical Subcontractor: _____ Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALLOWANCES:

GENERAL CONSTRUCTION CONTRACT

Allowance #1

Unsuitable Soil Removal and Compacted Replacement (On-Site Fill): Include the off-site removal of 50 cubic yards of unsuitable soil including all necessary equipment, material and labor for excavation and removal as designated. Include Contractor overhead and profit. Provide the replacement of unsuitable soil with compacted fill from on-site in accordance with Division Twenty-Two requirements before off-site areas are considered. See Section 02200.

Unit Price: $26.00 Dollars ($): $1,300

Allowance #2

Open Rock Excavation and Removal (On-Site Fill): Include the off-site removal of 50 cubic yards of open rock including all necessary equipment, material and labor for open rock excavation and off-site removal as designated. Include Contractor overhead and profit. Provide the replacement of open rock with compacted fill from on-site in accordance with Division Twenty-Two requirements. See Section 02200.

Unit Price: $132.00 Dollars ($): $6,600.00

Allowance #3

Trench/Pit/Footing Rock Excavation and Removal (On-Site Fill): Include the off-site removal of 20 cubic yards of trench rock including all necessary equipment, material and labor for trench rock excavation and off-site removal as designated. Provide the replacement of trench rock with compacted fill from on-site in accordance with Division Twenty-Two requirements. See Section 02200.

Unit Price: $132.00 Dollars ($): $2,640.00

UNIT PRICES

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

GENERAL CONTRACT:

No. 1 Unsuitable Soil Removal (Manual Excavation) *CY* Unit Price ($)_____
No. 2 Unsuitable Soil Replacement *CY* Unit Price ($)_____
No. 3 Mass Rock *CY* Unit Price ($)_____
No. 4 Trench Rock *CY* Unit Price ($)_____

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 23. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 23.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar

value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of Affidavit (**A)** required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

Title _____
(Owner/Partner/Pres./V.Pres)

Address _____

_____

ATTEST:

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 6 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

Section 01200 - ALLOWANCES

Part 1 – GENERAL

1.1 SECTION INCLUDES

A. Cash allowances

1.2 RELATED REQUIREMENTS

A. Section 01270 – Unit Prices: Additional payment and modification procedures.

1.3 ALLOWANCES

A. Allowance Costs Included in the Contractor's Base Bid: Product handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage; and labor for installation, if noted and finishing, Contractor's overhead and profit and time for removal and replacement of rock and unsuitable soil in the quantities specified in the Allowance section.

B. Architect/Engineer Responsibilities:

1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
2. Select products in consultation with Owner and transmit decision to Contractor.
3. Review Change Order paperwork with Owner.

C. Contractor Responsibilities:

1. Assist Engineer/Architect in selection of products.
2. Obtain proposals from suppliers or subcontractors and offer recommendations.
3. On notification of selection by Architect/Engineer execute purchase agreement with designated supplier or subcontractor.
4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
6. Prepare Change Order.

D. Differences in costs will be adjusted by Change Order.

1.1 ALLOWANCE SCHEDULE

A. Allowance #1: Unsuitable Soil Removal and Compacted Replacement (On-Site Fill): Include the off-site removal of 50 cubic yards of unsuitable soil including all necessary equipment, material and labor for excavation and removal as

designated. Include Contractor overhead and profit. Provide the replacement of unsuitable soil with compacted fill from on-site in accordance with Division Twenty-Two requirements before off-site areas are considered. See Section 02200.

B. Allowance #2: Open Rock Excavation and Removal (On-Site Fill): Include the off-site removal of 50 cubic yards of open rock including all necessary equipment, material and labor for open rock excavation and off-site removal as designated. Include Contractor overhead and profit. Provide the replacement of open rock with compacted fill from on-site in accordance with Division Twenty-Two requirements. See Section 02200.

C. Allowance #3: Trench/Pit/Footing Rock Excavation and Removal (On-Site Fill): Include the off-site removal of 20 cubic yards of trench rock including all necessary equipment, material and labor for trench rock excavation and off-site removal as designated. Provide the replacement of trench rock with compacted fill from on-site in accordance with Division Twenty-Two requirements. See Section 02200.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01200

Section 01270 – UNIT PRICES

Part 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract Documents, including General and Supplementary General Conditions and other Division 1 Specifications Sections, apply to this section.

B. Related Sections include the following:

1. Division 2 Sections for procedures for measurement and payment for earthwork related unit prices.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Documents are increased or decreased, or unknown conditions are encountered.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: For unit cost work, payment for Work under this contract shall be only for the actual Work performed or materials furnished in accordance with the plans and specifications, and will be based on the Schedule of Line Items and Values indicated in the Bid form. The cost for each item shall include all labor, equipment, materials, tools, appliances, transportation, services, incidentals, taxes, and any associated construction expense for the complete installation of each unit of said item in full conformance with the contract documents for this project. No payments for Work under this contract will be made other than for those line items listed in the Schedule of Line Items and Values indicated in the Bid Form.

C. Owner reserves the right to reject Contractor’s measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner’s expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: UNSUITABLE SOIL REMOVAL
   1. Unit of Measurement: Cubic Yard
   2. Indicate price on form of proposal.
   3. Base bid shall include 50 cubic yards.

B. Unit Price No. 4: UNSUITABLE SOIL REPLACEMENT WITH ON-SITE ENGINEERED SOILS (Suitable Fill)
   1. Unit of Measurement: Cubic Yard
   2. Indicate price on form of proposal.

C. Unit Price No. 5: ROCK – ROCK EXCAVATION IN OPEN (MASS ROCK) AND DISPOSAL OFF-SITE
   1. Unit of Measurement: Cubic Yard
   2. Indicate price on form of proposal.
   3. Base bid shall include 50 cubic yards

D. Unit Price No. 6: ROCK – TRENCH/PIT/FOOTING ROCK EXCAVATION, REMOVAL AND DISPOSAL OFF-SITE
   1. Unit of Measurement: Cubic Yard
   2. Indicate price on form of proposal.
   3. Base bid shall include 20 cubic yards

END OF SECTION 01270

Geotechnical Engineering Report

Westgate Road Modular Site

8917 Midway West Road

Raleigh, North Carolina

July 1, 2013

Project No. 70135067

Prepared for:

North Carolina Department of Transportation
Facilities Management
Raleigh, North Carolina

Prepared by:

Terracon Consultants, Inc.
Raleigh, North Carolina

Terracon

July 1, 2013

North Carolina Department of Transportation
Facilities Management
1 South Wilmington Street
Raleigh, North Carolina 27601

Attn: Mr. Tim Johnson, P.E.
Deputy Director, Facilities Management
Email: tjohnson2@ncdot.gov

Re: Geotechnical Engineering Report
Westgate Road Modular Site
8917 Midway West Road
Raleigh, North Carolina
Terracon Project No. 70135067

Dear Mr. Johnson,

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the Westgate Road Modular Site. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design of foundations for the proposed modular building.

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.

NORTH CAROLINA PROFESSIONAL SEAL 034749 ENGINEER RAYMOND L. DENTON, II
7-1-13

Andrew A. Nash, P.E.
Senior Geotechnical Engineer
Registered, NC 031022

Raymond L. (Levi) Denton II, P.E.
Geotechnical Department Manager
Registered, NC 034749

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the proposed Westgate Road Modular Building site to be located at 8917 Midway West Road in Raleigh, North Carolina. Terracon's geotechnical scope of work included advancing three (3) soil test borings to approximate depths of 12.8 to 13.5 feet below existing site grades (auger refusal).

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the borings and our current understanding of the proposed development. The following geotechnical considerations were identified:

- The proposed structure will be a modular unit supported on a shallow foundation. We anticipate that some grading (cut depths between 2 to 7 feet) will be required to achieve finished grades across the site.

- Currently, the site is wooded with small pines. The existing topography slopes from the east to the west.

- An abandoned water line crosses the site in the vicinity of the proposed building. Existing utilities could include areas of deep and/or poorly compacted fill. These conditions, if encountered, can be best handled at the time of construction.

- Highly plastic soils were encountered near the existing ground surface on the site. These soils are not desirable at or near subgrades because of their potential to shrink and swell due to changes in moisture content. These soils should not be used within 2 feet of the design subgrade elevations and should be covered by a separation zone of low to moderate plasticity soil or removed. The separation zone and control of surface drainage is intended to reduce moisture fluctuation and associated shrink/swell behavior in the highly plastic clays. The site should be evaluated after rough grading to determine the extent of the highly plastic soils near proposed subgrade elevations.

- In our opinion, the soils at the site are suitable for support of shallow foundations. The existing soils should be evaluated carefully at the time of construction in order to allow the proposed structure to be supported on shallow foundations. A representative of the geotechnical engineer should use a combination of hand auger borings and dynamic cone penetrometer (DCP) testing to determine the suitability of the bearing materials for the design bearing pressure. Softer soils, where encountered, should be addressed through overexcavation (undercutting) and replacement with compacted fill, compacted crushed aggregate base course (NCDOT CABC), or lean concrete. Some localized undercutting should be anticipated.

- The soils on the site are moisture-sensitive. The exposed subgrades need to be protected during construction. Earthwork should be performed during drier times of the year if practical.

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.

GEOTECHNICAL ENGINEERING REPORT
PROPOSED WESTGATE MODULAR SITE
8917 MIDWAY WEST ROAD
RALEIGH, NORTH CAROLINA

Terracon Project No. 70135067
July 1, 2013

1.0 INTRODUCTION

Terracon has completed the geotechnical engineering report for the proposed Westgate Modular site to be located at 8917 Midway West Road in Raleigh, North Carolina. Three (3) soil test borings were performed to depths of approximately 12.8 to 13 feet below the existing ground surface at the approximate locations indicated on the Boring Location Plan in Appendix A.

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

- subsurface soil conditions
- groundwater conditions
- site preparation / earthwork
- foundation design and construction
- seismic considerations
- floor slab design and construction

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Building construction	Approximate 3,970-square foot modular unit supported on a shallow foundation system; possibly a slab-on-grade with a thickened turndown edge.
Finished floor elevation	Finished floor elevation (FFE) has been set at 455 feet.
Maximum loads, assumed	Building: Continuous Load-Bearing Wall Loads – less than 2 klf (assumed) Maximum Uniform Floor Slab Load – less than 100 psf (assumed)
Grading	Based on the provided FFE and grading plan, the site will be cut between 2 and 7 feet in the building footprint.
Cut and fill slopes	North and east of the proposed building, 10 maximum height.

The project information presented above was used in our geotechnical analysis. If any of this information or the design changes, Terracon requests the opportunity to review our recommendations

2.2 Site Location and Description

Item	Description
Location	8.86 acres located at 8917 Midway West Road in Raleigh, North Carolina
Existing improvements	An abandoned water line
Current ground cover	The current ground cover has small pines with some sparse grassed areas
Existing topography	The site topography slopes towards the east. Based on the provided topographic survey the existing ground surface elevations are approximately 461 feet in the east and 444 feet in the west.

3.0 SUBSURFACE CONDITIONS

A discussion of the subsurface conditions encountered during our subsurface exploration is presented in the following sections.

3.1 Site Geology

According to the *1985 Geologic Map of North Carolina*, the site is located within the Triassic Basin. The Triassic Basin is part of the Piedmont Physiographic Province and was created through the accumulation of eroded sediments in a deep basin that was formed through rift faulting. Over time, these sediments were compressed and partially cemented to form soft to moderately hard sedimentary rock. The soils that form the subsurface profiles are residual materials derived from the in-place weathering of these rocks. In residual materials the transition from soil to rock occurs gradually over a vertical distance ranging from a few feet to tens of feet. This transitional zone is termed “partially weathered rock” which is defined for engineering purposes as residual material that can be drilled with soil drilling methods and exhibits standard penetration test values in excess of 100 blows per foot. Soil materials derived from weathering in the Triassic Basin are generally moisture sensitive and can be highly plastic.

3.2 Typical 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
Surface	6 to 12 inches	Topsoil	N/A
Stratum 1	6 to 8 feet	Sandy Clay to Highly Plastic Clay	Medium Stiff to Hard (Clay)
Stratum 2	To Boring Termination Depth	Silty Sand	Medium Dense to Dense (Sand)
Stratum 3[1]	To Boring Termination Depth	Weathered Rock	N/A

1. Weathered rock encountered in B-2 and several of the previous NCDOT borings performed.

The upper soil encountered in the borings generally consisted of highly plastic clay. Highly plastic soils have the potential for volumetric changes (shrink/swell) when exposed to varying moisture conditions. Laboratory tests were conducted on selected soil samples and the test results are presented on the boring logs in Appendix A and in the table below.

Boring Number	Sample Depth (feet)	Liquid Limit (%)	Plasticity Index (%)	AASHTO Classification	Natural Moisture (%)
B-1	1.0 – 2.5	64	39	A-7-6 (33)	28.9
B-2	3.5 – 5.0	67	42	A-7-6 (35)	29.5
B-3	6.0 – 7.5	32	14	A-6 (5)	12.1

Conditions encountered at the boring locations are indicated on the 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. Further details of the borings can be found on the individual boring logs in the Appendix A of this report.

3.3 Groundwater

The boreholes were observed for the presence and level of groundwater. After completion of drilling and for the short duration they remained open, all boring locations were observed to be dry at the time of boring.

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. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define seasonal groundwater levels.

These water level observations provide an approximate indication of the groundwater conditions existing at the time the borings were drilled. Evaluation of the seasonal high groundwater level or infiltration rate of the near surface soil should be performed by a soil scientist if a stormwater management system is planned.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The near surface soils at the site are highly plastic clays and will likely require remedial work at the time of site preparation and earthwork. This report provides recommendations to help mitigate the effects of shrink and swell of these soils. The options discussed in this report are undercut and replacement of these clays. We recommend reducing the potential for shrink/swell behavior by creating a two-feet thick protective zone of low to moderate plasticity soil between the existing soils and the design subgrade elevation. This protective zone is intended to reduce moisture fluctuations in the underlying soil. The protective zone can be created by raising grades with approved soil fill, over-excavation and replacement of existing soils, or a combination of both these approaches.

Based on the site grading plan and the provided topographic survey, it appears that the final grades will require 2 to 7 feet of cut.

The soils on site are moisture sensitive. If exposed subgrades are not protected from the weather, subgrade soil conditions will deteriorate. Remedial measures of the near surface soils will depend upon the moisture condition and stability of the soils at the time of construction. The remedial measures will potentially include over-excavation and replacement or the use of subgrade stabilization fabric in conjunction with a clayey sand fill or crushed stone. We expect that less remedial work will be necessary if work is performed during warmer, drier times of the year.

The proposed building may be supported on a shallow foundation system sized for a net allowable bearing pressure of 3,000 pounds per square foot. The shallow foundation may consist of wall footings, turndown slabs, or thickened monolithic slabs.

A more complete discussion of these points and additional information is included in the following sections.

4.2 Earthwork

The near surface soils at the site are moisture sensitive and will lose strength and stiffness as their moisture contents increase. Earthwork should be performed during summer and early fall due to the improved drying conditions and shorter time periods of rainfall associated with these seasons. This does not preclude earthwork during other periods of the year. Rather, performing site earthwork during late fall, winter and spring increases the potential for needing to perform remedial subgrade work.

When reviewing the following recommendations, please note that an abandoned waterline crosses the site in the vicinity of the proposed building. Past experience with existing utilities often indicates that unforeseen conditions may exist. These may include areas of poorly compacted fill and deeper deposits of fill. These conditions, if encountered, can be best handled at the time of construction.

Site preparation should begin by stripping the existing surface vegetation, topsoil, and tree stumps from construction areas. Based on our field observations, we anticipate a topsoil stripping depth of about 6 inches will be required in some areas; however, stripping depths could vary and actual stripping depths should be evaluated by a Terracon representative. Deeper stripping depths should be anticipated with the removal of the root-mat associated with the trees.

After site stripping is completed, the exposed subgrade should be evaluated for the presence of highly plastic clay. These soils are not desirable at or near subgrades because of their potential to shrink and swell due to changes in moisture content. Where these soils are encountered, they should be removed to a minimum depth of 2 feet below the proposed subgrade elevation in order to create a separation zone of low volume change material. This separation zone, along with strict control of surface drainage, is intended to reduce moisture fluctuation in the highly plastic clays below. Highly plastic soils may be used as fill provided they are not placed with 2 feet of the planned subgrades and are sufficiently dry to achieve the required compaction.

After plasticity evaluation/remediation excavation is completed, we recommend proof-rolling the exposed soils in areas to receive fill and at subgrade in the cut areas. Proof-rolling should also be performed in areas where existing soil has been excavated to create the two-feet thick separation zone due to expansive clays. Proofrolling should be performed with a moderately loaded, tandem-axle dump truck or similar rubber-tired construction equipment. The proofrolling operations should be observed by a representative of the geotechnical engineer and should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade and to reduce the amount of additional undercutting required.

If excessive deflection or rutting is observed, it is likely the result of wet surface soils. In this case, the geotechnical engineer should be contacted for remediation options. Remediation options can potentially include over-excavation and replacement of the existing soils, the use of a subgrade

stabilization fabric and clay sand fill/crushed stone, or a combination of both. If fabric is to be considered, we recommend that the utilities be installed before fabric and clay sand fill/crushed stone is placed. The intent of this sequence is to avoid cutting through the fabric as trenching for the stormwater system or utilities is performed.

Engineered fill should meet the following material property requirements. Reference the NCDOT Standard Specifications for additional information.

Fill Type [1]	Material Classification	Acceptable Location for Placement
Low- to Moderate-Plasticity Soil	A-2, A-5, A-6 & A-7 (LL < 50 & PI < 25)	All locations and elevations Sand with between 10% and 35% fines (silt and clay) is recommended for use in conjunction with subgrade stabilization fabric.
Sand / Gravel with less than 10% fines (silt and clay)	Select Materials Class I, IV, VI	1. Washed, crushed stone (NCDOT No. 57) beneath floor slabs (Class VI). 2. NCDOT CABC (crushed aggregate base course) beneath pavements or as a replacement material in over-excavated areas (Class IV). 3. "Clean" sand (less than 10% silt and clay) should not be used as general site fill in building and pavement areas to reduce risk of perched water developing in the surface fill as water infiltrating the surface zone becomes trapped above the less permeable sandy clay and clayey sand zone (A-2, A-4) (Class I).
On-site soils	A-2, A-6 and (LL < 50 & PI < 25)	Generally suitable when at appropriate moisture content.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation. Highly plastic material is expected to be encountered in the excavations. When encountered, highly plastic materials should not reused as backfill within 2 feet of planned subgrade.

4.2.1 Compaction Requirements

Item	Description
Fill Lift Thickness	9-inches or less in loose thickness (4" to 6" lifts when hand-operated equipment is used)
Compaction Requirements [1]	Minimum of 95% of the materials maximum standard Proctor dry density (ASTM D698)
Moisture Content – Cohesive Soil	Within the range of -3% to +3% of optimum moisture content

	as determined by the standard Proctor test at the time of placement and compaction

1. Engineered fill should be tested for moisture content and compaction during placement. If in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the tests should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

4.2.2 Grading and Drainage

During construction, grades should be sloped to promote runoff away from the construction area. Final grades should be sloped away from the structure on all sides to prevent ponding of water. If gutters / downspouts do not discharge directly onto pavement, they should not discharge directly adjacent to the building in landscaped areas. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout if necessary. Flexible pipe should only be used if it is day-lighted in such a manner that it gravity-drains collected water. Splash-blocks should also be considered below hose bibs and water spigots. Paved surfaces which adjoin the building should be sealed with caulking or other sealant to prevent moisture infiltration at the building envelope; maintenance should be performed as necessary to maintain the seal.

With the presence of the highly plastic clay on site, control of water is important. Highly plastic clays have the potential to shrink/swell when exposed to varying moisture conditions. Landscaped areas with irrigation systems near the building are frequently a source of foundation problems. If a landscape irrigation system is planned, a drainage system should be installed to divert the irrigation water away for the building's foundations. This can be done by providing a moisture barrier and then piping the collected irrigation water away.

4.2.3 Construction Considerations

Soils at the site are very moisture-sensitive. Subgrades should be protected and the water control measures maintained. The site should 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. Should unstable subgrade conditions develop, stabilization measures should be employed.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; to monitor proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade; and to observe prior to placing reinforcing steel in the footing excavations.

4.2.4 Excavations

On-site materials can be excavated by routine earth moving equipment. Local excavations for shallow utility trenches and foundations can be accomplished by a conventional backhoe. All temporary excavations that may be required during construction should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards to provide stability and safe working conditions.

4.3 Foundation Recommendations

In our opinion, the proposed structure can be supported by a shallow, spread footing foundation system consisting of wall footings, turndown slabs or thickened monolithic slab mats.

Design recommendations for a shallow foundation system are presented in the following table and paragraphs.

Description	Value
Net allowable bearing pressure [1]	3,000 psf
Minimum embedment below lowest adjacent finished grade for frost protection and protective embedment [2]	18 inches
Minimum width for continuous wall footings	16 inches
Approximate total settlement [3]	Up to 1 inch
Estimated differential settlement [3]	Less than 3/4 inch between adjacent columns or over 40’ along wall footings

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. For perimeter footings and footings beneath unheated areas.
3. The actual magnitude of settlement that will occur beneath the foundations would depend upon the variations within the subsurface soil profile, the structural loading conditions and the quality of the foundation excavation. The estimated total and differential settlements listed assume that the foundation related earthwork and the foundation design are completed in accordance with our recommendations.

The foundation bearing materials should be evaluated at the time of the foundation excavation. A representative of the geotechnical engineer should use a combination of hand auger borings and dynamic cone penetrometer (DCP) testing to determine the suitability of the bearing materials for the design bearing pressure. Excessively soft, loose or wet bearing soils should be over-excavated to a depth recommended by the geotechnical engineer. The footings could then bear directly on these soils at the lower level or the excavated soils could be replaced with compacted soil fill, compacted crushed aggregate base course (NCDOT CABC), or lean concrete. Washed stone should not be used to backfill over highly plastic soils since it can store water. The availability of water from the stone can cause swelling of the soil.

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed as soon as practical after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively disturbed or saturated, the affected soil should be removed prior to placing concrete. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

4.4 Seismic Considerations

Code Used	Site Classification
2009 North Carolina Building Code[1]	C [2]

1. In general accordance with Table 1613.5.2 of the 2009 NCBC.
2. The 2009 NCBC site seismic classification is based on a site soil profile determination extending a depth of 100 feet. The scope of work authorized did not include a boring to a depth of 100 feet. The recommended seismic site classification is based on the geology of the area. A geophysical exploration to develop the shear wave velocity profile to a depth of 100 feet could be utilized to verify the seismic site class or as an attempt to justify a higher seismic site class.

4.5 Floor Slabs

4.5.1 Design Recommendations

Item	Description
Floor slab support	Approved/prepared site soils or new engineered fill
Modulus of subgrade reaction (k)	100 pounds per square inch per inch (psi/in) for point loading conditions
Washed Stone Base Course	4 inches of crushed, washed stone (NCDOT No. 57 or 67)

We recommend floor subgrades be maintained in a relatively moist yet stable condition until floor slabs are constructed. If the subgrade should become excessively desiccated or wet prior to construction of floor slabs and pavements, the affected material should be removed or the materials scarified, moisture conditioned, 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. The floor slab design should include a washed, crushed stone base course (NCDOT No. 57) approximately 4 inches thick. 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.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings. The slab

designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

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 across the site, or due to the modifying effects of 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

Field Exploration Description

The boring locations were located by measuring from existing site features. Ground surface elevations were not obtained. 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 using 3¼ inch hollow stem augers with a D-50 mounted on a track carrier equipped with an automatic hammer. Samples of the soil encountered in the borings were obtained using the split barrel sampling procedures.

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 safety hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils. Soil samples were taken at 2.5-foot intervals above a depth of 10 feet and at 5-foot intervals below 10 feet.

An 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 be 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.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings prior to the drill crew leaving the site.

A field log of each boring was 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 the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

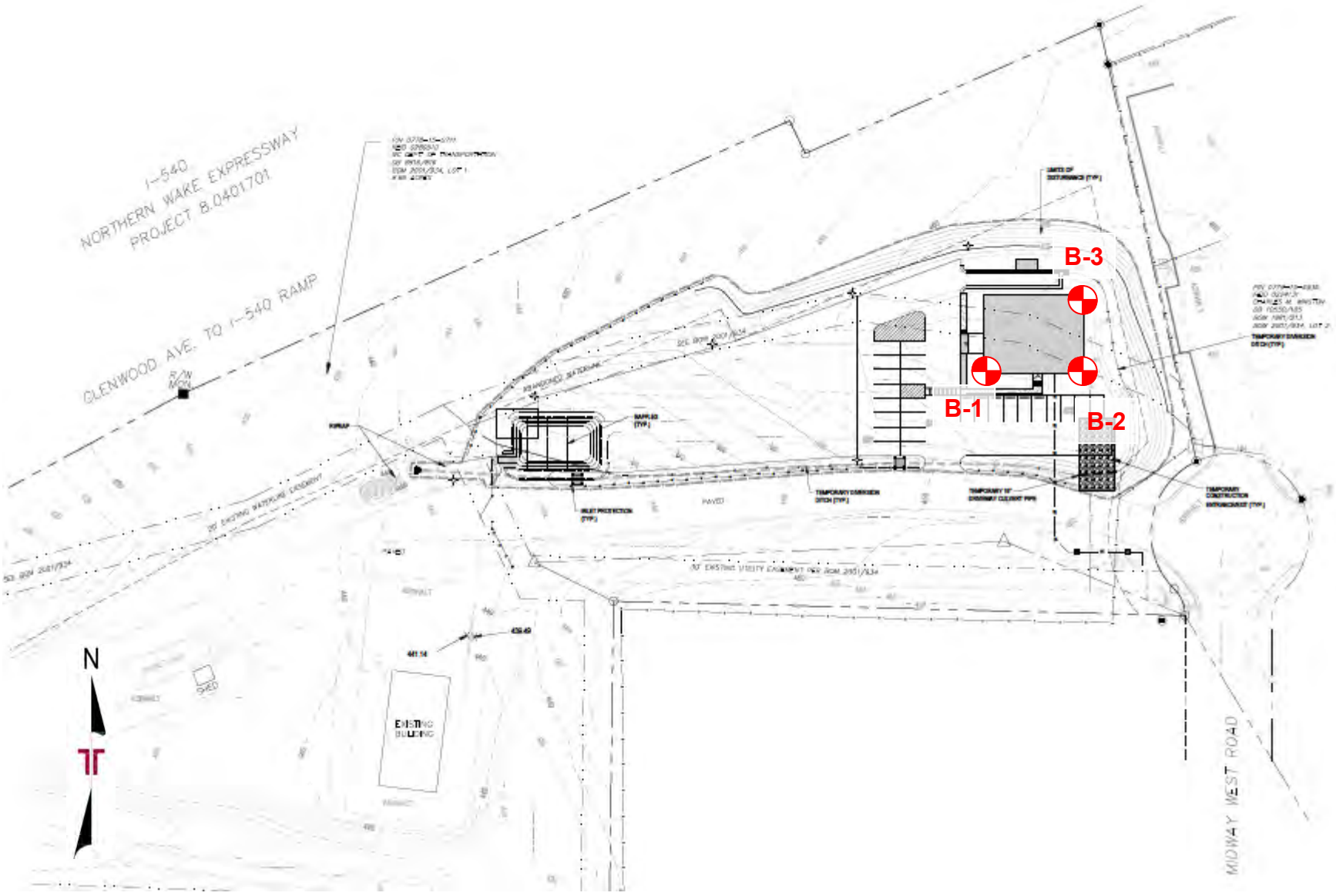

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: AAN	Project No. 70135067
Drawn by: AAN	Scale: N.T.S.
Checked by: RLD	File Name: 70135067_Fig1
Approved by: AAN	Date: 6/29/2013

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BORING LOCATION DIAGRAM

BORING LOCATION PLAN

WESTGATE ROAD MODULAR SITE

RALEIGH, NORTH CAROLINA

Exhibit

A-1

PROJECT REFERENCE NO.	SHEET NO.
	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING # 10 # 40 # 200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / OPT DMT / VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B- ___
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] D-50T (TER 255)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET NO.
	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FT.

NOTES:

REVISED 09/23/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS N/A	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Nash, A. A.	
SITE DESCRIPTION WESTGATE ROAD MODULAR SITE				**GROUND WTR (ft)**
BORING NO. B-1$_{TERRACON}$	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 457.0 ft	**TOTAL DEPTH** 13.0 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 91% 09/14/2012		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Duggins, W. T.	**START DATE** 06/10/13	**COMP. DATE** 06/10/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
460											
										457.0 GROUND SURFACE	0.0
	456.0	1.0								**TRIASSIC RESIDUAL** ORANGE AND TAN, HIGHLY PLASTIC CLAY	
455			2	3	5	8					
	453.5	3.5								453.5	3.5
			3	4	7	11				BROWN SANDY SILTY CLAY	
	451.0	6.0								451.0	6.0
450			6	9	10	19				BROWN SILTY FINE SAND, WITH WEATHERED ROCK FRAGMENTS	
	448.5	8.5									
			6	10	15	25					
445											
	444.0	13.0								444.0	13.0
			50/0							Boring Terminated BY AUGER REFUSAL at Elevation 444.0 ft	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS N/A	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Nash, A. A.	
SITE DESCRIPTION WESTGATE ROAD MODULAR SITE				**GROUND WTR (ft)**
BORING NO. B-2$_{TERRACON}$	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 457.5 ft	**TOTAL DEPTH** 12.8 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 91% 09/14/2012		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Duggins, W. T.	**START DATE** 06/10/13	**COMP. DATE** 06/10/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
460											
										457.5 GROUND SURFACE	0.0
	456.5	1.0								**TRIASSIC RESIDUAL** TAN COURSE TO FINE HIGHLY PLASTIC CLAY	
455			7	5	5	10					
	454.0	3.5	4	5	7	12					
	451.5	6.0									
450			5	13	20	33					
	449.0	8.5								449.5	8.0
			38	50/05						448.0 BROWN SILTY COARSE TO FINE SAND, TRACE WEATHERED ROCK FRAGMENTS	9.5
445										**WEATHERED ROCK** (BROWN TRIASSIC SILTSTONE)	
	444.7	12.8	50/0							444.7	12.8
										Boring Terminated BY AUGER REFUSAL at Elevation 444.7 ft	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS N/A	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Nash, A. A.	
SITE DESCRIPTION WESTGATE ROAD MODULAR SITE				**GROUND WTR (ft)**
BORING NO. B-3[TERRACON]	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 459.0 ft	**TOTAL DEPTH** 13.5 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 91% 09/14/2012		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Duggins, W. T.	**START DATE** 06/10/13	**COMP. DATE** 06/10/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
460											
										459.0 GROUND SURFACE	0.0
	458.0	1.0								**TRIASSIC RESIDUAL** ORANGE AND TAN HIGHLY PLASTIC CLAY	
			2	3	4	7					
455	455.5	3.5									
			2	4	6	10					
	453.0	6.0								453.0	6.0
			4	7	12	19				BROWN COARSE TO FINE SANDY CLAY	
450	450.5	8.5								451.0	8.0
			11	17	27	44				BROWN SILTY COARSE TO FINE SAND, TRACE WEATHERED ROCK FRAGMENTS	
	445.5	13.5								445.5	13.5
			50/0							Boring Terminated BY AUGER REFUSAL at Elevation 445.5 ft	

REPORT ON SOIL TEST RESULTS

PROJECT:	**70135067**			**COUNTY:**	
DATE SAMPLED:		**DATE RECEIVED:**	**6/20/2013**	**DATE REPORTED:**	**6/28/2013**
SAMPLED FROM:		**SAMPLED BY:**			
SUBMITTED BY:				**STANDARD SPECIFICATION**	
LABORATORY:	**Terracon Consultants, Inc. – Raleigh, NC**				

TEST RESULTS

Boring No.	B-1	B-3	B-2					
Sample No.	SS-1	SS-2	SS-3					
Retained #4 Sieve %	4	2	7					
Passing #10 Sieve %	95	95	91					
Passing #40 Sieve %	90	88	75					
Passing #200 Sieve %	79	79	55					

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	8.2	9.7	24.1					
Fine Sand - Ret. #270	12.1	11.3	19.7					
Silt 0.05-0.005 mm %	21.4	28.6	34.1					
Clay < 0.005 mm %	58.3	50.4	22.1					
Passing # 40 Sieve %								
Passing # 200 Sieve %								

Liquid Limit	64	67	32					
Plastic Index	39	42	14					
AASHTO Classification	A-7-6 (33)	A-7-6 (35)	A-6 (5)					
Select Granular Class								
Type								
Moisture Content (%)	28.9	29.5	12.1					
Hole No.								
Depth (ft) From:	1.0	3.5	6.0					
To:	2.5	5.0	7.5					

Remarks:

APPENDIX B

PREVIOUS NCDOT INVESTIGATION

(OCTOBER 2011)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	30000.13.2	1	9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. ***30000.13.2*** F.A. PROJ. ***N/A***

COUNTY ***WAKE***

PROJECT DESCRIPTION ***WESTGATE ROAD MODULAR LOCATIONS***

CONTENTS

PERSONNEL

N.D. MOHS

J.I. MILKOVITS JR.

H.R. CONLEY

J.R. TURNAGE

RECEIVED

NCDOT
GEOTECHNICAL ENGINEERING UNIT

RECEIVED

NCDOT
GEOTECHNICAL ENGINEERING UNIT

INVESTIGATED BY ***N.D. MOHS***

CHECKED BY ***N.T. ROBERSON***

SUBMITTED BY ***N.T. ROBERSON***

DATE ***OCTOBER 2011***

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA LICENSED SEAL 2124 GEOLOGIST NATHAN DANIEL MOHS

10/24/11

DRAWN BY: _____

PROJECT REFERENCE NO.	SHEET NO.
30000.13.2	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2			A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6 A-2-7				A-7-5 A-7-6			
SYMBOL													
% PASSING #10 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX	8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND			SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / CPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA. - MICACEOUS	WEA. - WEATHERED
CL. - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ_d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL
FRAGS. - FRAGMENTS	w - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HI. - HIGHLY	V - VERY	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [X] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET NO.
30000.13.2	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

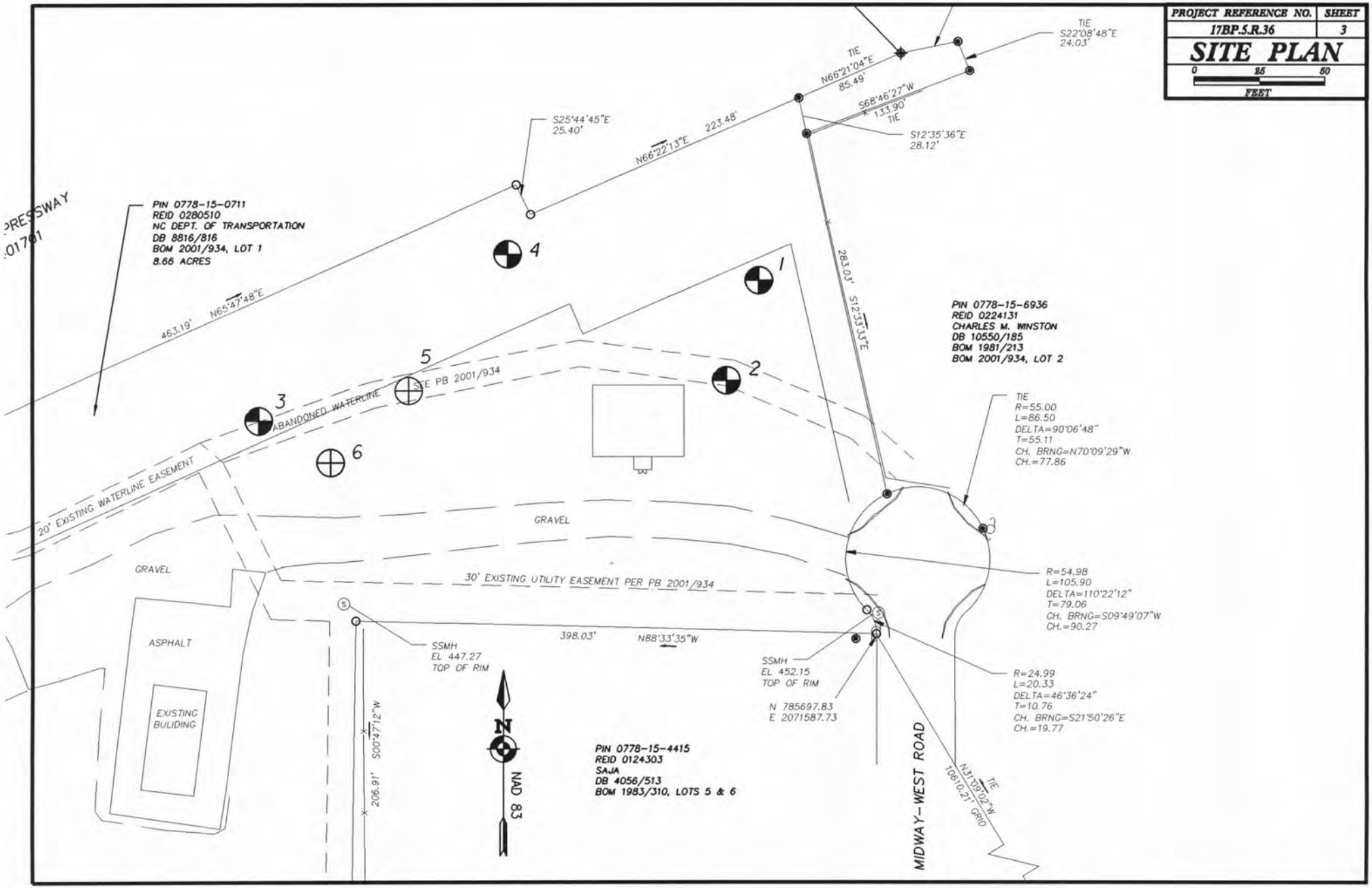
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FT.

NOTES:

REVISED 09/23/09


PROJECT REFERENCE NO.
17BP.5.R.36
SHEET
3
SITE PLAN
0 25 50
FEET
PRESSWAY
:01701
PIN 0778-15-0711
REID 0280510
NC DEPT. OF TRANSPORTATION
DB 8816/816
BOM 2001/934, LOT 1
8.66 ACRES
S25°44'45"E
25.40'
N66°22'13"E
223.48'
TIE
N66°21'04"E
85.49'
TIE
S22°08'48"E
24.03'
S68°46'27"W
133.90'
TIE
S12°35'36"E
28.12'
283.03'
S12°33'33"E
463.19'
N65°47'48"E
PIN 0778-15-6936
REID 0224131
CHARLES M. WINSTON
DB 10550/185
BOM 1981/213
BOM 2001/934, LOT 2
1
2
3
4
5
6
SEE PB 2001/934
ABANDONED WATERLINE
20' EXISTING WATERLINE EASEMENT
GRAVEL
GRAVEL
30' EXISTING UTILITY EASEMENT PER PB 2001/934
TIE
R=55.00
L=86.50
DELTA=90°06'48"
T=55.11
CH. BRNG=N70°09'29"W
CH.=77.86
R=54.98
L=105.90
DELTA=110°22'12"
T=79.06
CH. BRNG=S09°49'07"W
CH.=90.27
R=24.99
L=20.33
DELTA=46°36'24"
T=10.76
CH. BRNG=S21°50'26"E
CH.=19.77
398.03'
N88°33'35"W
SSMH
EL 447.27
TOP OF RIM
SSMH
EL 452.15
TOP OF RIM
N 785697.83
E 2071587.73
ASPHALT
EXISTING
BULIDING
206.91'
S00°47'12"W
N
NAD 83
PIN 0778-15-4415
REID 0124303
SAJA
DB 4056/513
BOM 1983/310, LOTS 5 & 6
MIDWAY-WEST ROAD
TIE
N31°09'02"W
10610.21' GRID

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 1	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 460.0 ft	**TOTAL DEPTH** 18.6 ft	**NORTHING** 785,969	**EASTING** 2,071,498	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 10/13/11	**COMP. DATE** 10/11/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
460										ELEV. (ft) DEPTH (ft)
	460.0	0.0								460.0 GROUND SURFACE 0.0
			2	6	5	11		M		459.5 **ARTIFICIAL FILL** 0.5
	457.5	2.5								458.0 RED-BROWN, SILTY CLAY 2.0
			6	5	10	15		M		TAN, SILTY SAND
455	455.0	5.0								**TRIASSIC RESIDUAL**
			4	5	7	12		D		RED, BROWN, AND WHITE, SAPROLITIC, SILTY CLAY
	452.5	7.5								
			5	8	11	19		M		
450	450.0	10.0								
			4	5	7	12		M		
	447.5	12.5								
			3	5	5	10		M		
445	445.0	15.0								
			5	11	20	31		M		
	442.5	17.5								442.0 18.0
			12	45	55/0.1	100/0.6				441.4 **WEATHERED ROCK** 18.6
										(TRIASSIC CONGLOMERATE)
										Boring Terminated at Elevation 441.4 ft IN WEATHERED ROCK (TRIASSIC CONGLOMERATE)
										ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.

NCDOT BORE SINGLE 092_GEO_BH.GPJ NC_DOT.GDT 10/14/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 459.5 ft	**TOTAL DEPTH** 16.4 ft	**NORTHING** 785,892	**EASTING** 2,071,473	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 10/13/11	**COMP. DATE** 10/11/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
460											
	459.5	0.0	1	2	3	5		M		459.5 GROUND SURFACE	0.0
	457.0	2.5	3	5	7	12		M		**ARTIFICIAL FILL** RED-BROWN, SANDY CLAY WITH SOME GRAVEL 457.5	2.0
455	454.5	5.0	3	4	9	13		M		**TRIASSIC RESIDUAL** TAN, RED, AND WHITE, SAPROLITIC, SILTY CLAY	
	452.0	7.5	7	9	11	20		M			
450	449.5	10.0	14	25	35	60		M		450.5 DARK RED, SAPROLITIC, SANDY CLAY	9.0
445	444.5	15.0	26	47	53/0.4	100/0.9				444.0 443.1 **WEATHERED ROCK** (TRIASSIC CONGLOMERATE)	15.5 16.4

Boring Terminated at Elevation 443.1 ft IN WEATHERED ROCK (TRIASSIC CONGLOMERATE)

ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 3	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 448.0 ft	**TOTAL DEPTH** 15.8 ft	**NORTHING** 785,861	**EASTING** 2,071,116	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 10/13/11	**COMP. DATE** 10/11/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
450										
	448.0	0.0								448.0 GROUND SURFACE 0.0
			3	7	5	12		M		**ARTIFICIAL FILL**
445	445.5	2.5								446.0 RED-BROWN, SILTY CLAY 2.0
			3	8	8	16		M		**TRIASSIC RESIDUAL**
	443.0	5.0								TAN, ORANGE, AND WHITE, SAPROLITIC,
			3	5	6	11		M		SILTY CLAY
440	440.5	7.5								
			4	7	10	17		M		
	438.0	10.0								
			7	26	26	52		M		
435										
	433.0	15.0								433.5 14.5
			39	61/0.3		100/0.8				432.2 **WEATHERED ROCK** 15.8
										(TRIASSIC CONGLOMERATE)
										Boring Terminated at Elevation 432.2 ft IN WEATHERED ROCK (TRIASSIC CONGLOMERATE)
										ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.

NCDOT BORE SINGLE_092_GEO_BH.GPJ NC_DOT.GDT 10/14/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 4	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 455.8 ft	**TOTAL DEPTH** 14.0 ft	**NORTHING** 785,989	**EASTING** 2,071,306	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 10/13/11	**COMP. DATE** 10/11/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
460										ELEV. (ft) / DEPTH (ft)
	455.8	0.0								455.8 GROUND SURFACE 0.0
455			1	4	5	9		M		**TRIASSIC RESIDUAL** RED-BROWN AND TAN, SAPROLITIC, SILTY CLAY
	453.3	2.5	5	7	8	15		M		
450										
	448.3	7.5	4	6	6	12		M		
445										
	443.3	12.5	3	3	6	9		M		441.8 14.0
										Boring Terminated at Elevation 441.8 ft IN SILTY CLAY
										ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Milkovits, J. I.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 5	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 444.9 ft	**TOTAL DEPTH** 5.0 ft	**NORTHING** 785,884	**EASTING** 2,071,230	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
DRILLER Conley, H. R.	**START DATE** 10/14/11	**COMP. DATE** 10/14/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
445										444.9 GROUND SURFACE	0.0
										443.9 **ARTIFICIAL FILL** BROWN, SLIGHTLY MICACEOUS, SANDY SILT	1.0
440										439.9 **TRIASSIC RESIDUAL** YELLOW, RED, AND WHITE, SILTY CLAY	5.0
										Boring Terminated at Elevation 439.9 ft IN SILTY CLAY	

ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 30000.13.2	**TIP** N/A	**COUNTY** WAKE	**GEOLOGIST** Milkovits, J. I.	
SITE DESCRIPTION WESTGATE ROAD MODULAR LOCATION				**GROUND WTR (ft)**
BORING NO. 6	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** N/A	**0 HR.** Dry
COLLAR ELEV. 445.2 ft	**TOTAL DEPTH** 4.0 ft	**NORTHING** 785,829	**EASTING** 2,071,171	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
DRILLER Conley, H. R.	**START DATE** 10/14/11	**COMP. DATE** 10/14/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
450										ELEV. (ft) DEPTH (ft)
445										445.2 GROUND SURFACE 0.0
										444.7 0.5
										TRIASSIC RESIDUAL TAN-BROWN, SILTY SAND
										RED-BROWN, CLAYEY SILT
										441.2 4.0
										Boring Terminated at Elevation 441.2 ft IN CLAYEY SILT
										ELEVATION INTERPRETED FROM CONTOUR LINES ON LOCATION MAP PROVIDED BY CRAIG MILLER ON 10/4/2011.