

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45354.1.28(BD-5108AA)	1	7

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

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 45354.1.28 F.A. PROJ. BRZ-1801(4)
 COUNTY RICHMOND
 PROJECT DESCRIPTION BRIDGE NO.13 ON SR 1801
(GREEN CHAPEL RD) OVER JOES CREEK

 SITE DESCRIPTION _____

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INVESTIGATED BY S&ME, INC.
 CHECKED BY A.F. RIGGS, JR.
 SUBMITTED BY S&ME, INC.
 DATE JANUARY, 2014

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

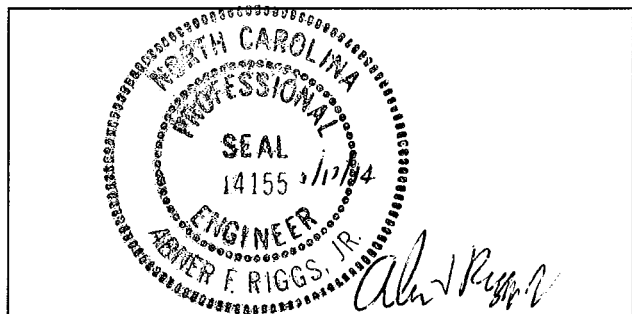
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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 BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS 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 THIS 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.

DRAWN BY: B. RATTI



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 BLDWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM 0-1586). 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, DARK SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

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.

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-4, A-5	
SYMBOL	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-7-5	A-7-6	A-1, A-2	A-3	A-4, A-5
% PASSING	50 MX	30 MX	50 MX	51 MN	10 MX	35 MX	35 MX	35 MX	35 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX	NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	41 MN	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS	
PLASTIC INDEX	0	0	0	0	4 MX	0 MX	12 MX	16 MX	0	0	0	0			
GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0			
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

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELOSIPAR, 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
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F 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

MISCELLANEOUS SYMBOLS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	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					

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
HL. - HIGHLY	V - VERY	

SOIL MOISTURE - CORRELATION OF TERMS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> MOBILE B-	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input type="checkbox"/> BK-51	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input type="checkbox"/> CME-45C	<input type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B
<input type="checkbox"/> CME-550X	<input type="checkbox"/> HARD FACED FINGER BITS	<input type="checkbox"/> -N
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG.-CARBIDE INSERTS	<input type="checkbox"/> -H
	<input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
	<input type="checkbox"/> TRICONE 3-1/8" STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
	<input type="checkbox"/> TRICONE " TUNG.-CARB.	<input type="checkbox"/> HAND AUGER
	<input type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
		<input type="checkbox"/> VANE SHEAR TEST

PLASTICITY

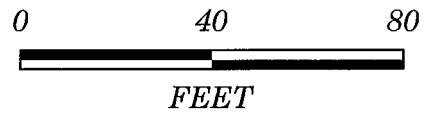
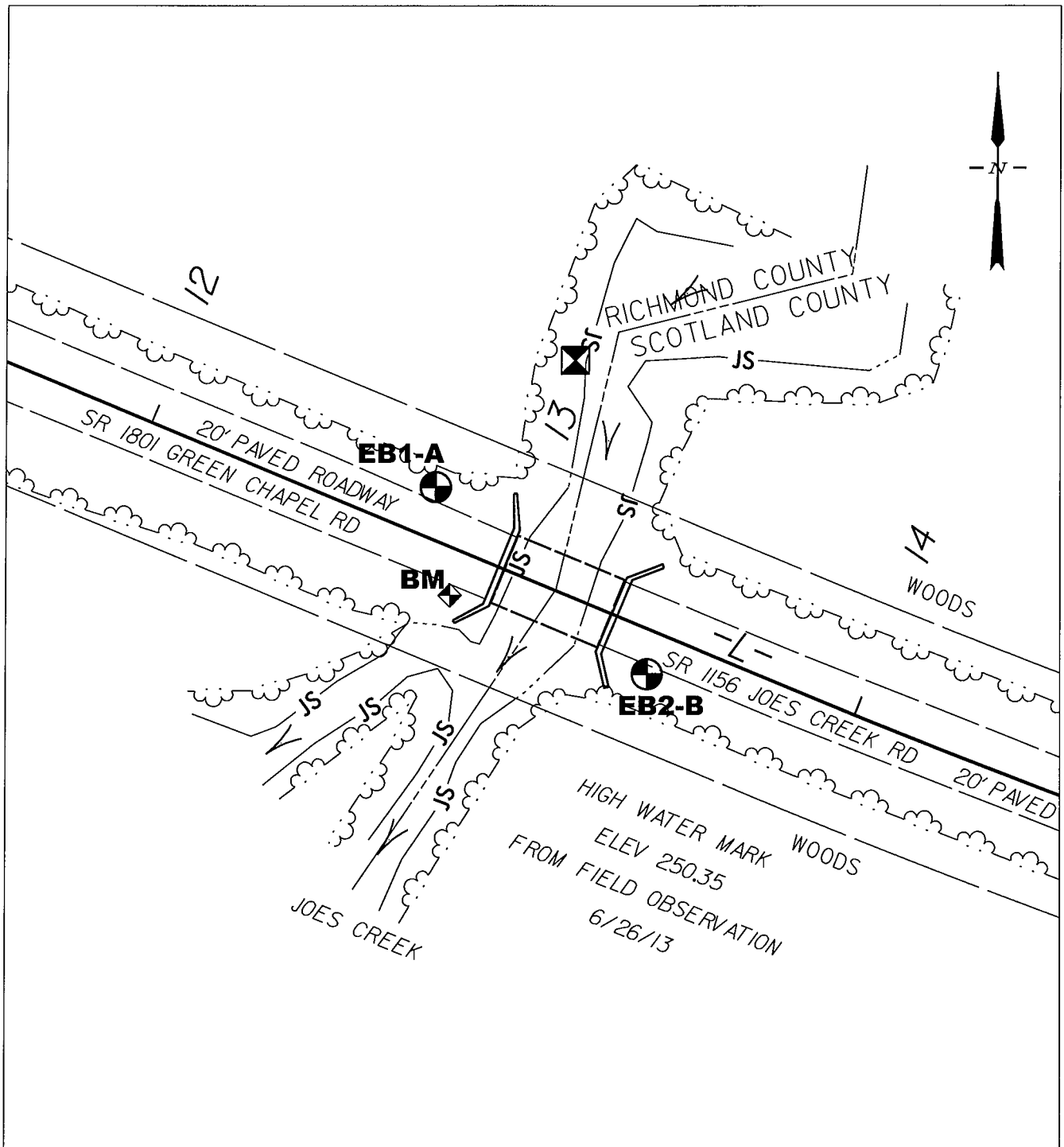
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH
LOW PLASTICITY	0-5	VERY LOW
MED. PLASTICITY	6-15	SLIGHT
HIGH PLASTICITY	16-25	MEDIUM
	26 OR MORE	HIGH

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.

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ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>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:</p>		<p>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 DISLOGGED 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 IN 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.</p>	
<p>WEATHERED ROCK (WR)</p> 	<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p>		
<p>CRYSTALLINE ROCK (CR)</p> 	<p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>		
<p>NON-CRYSTALLINE ROCK (NCR)</p> 	<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>		
<p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p> 	<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>		
WEATHERING			
<p>FRESH</p> <p>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p>			
<p>VERY SLIGHT (V SL.)</p> <p>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.</p>			
<p>SLIGHT (SL.)</p> <p>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.</p>			
<p>MODERATE (MOD.)</p> <p>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.</p>			
<p>MODERATELY SEVERE (MOD. SEV.)</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p>			
<p>SEVERE (SEV.)</p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i></p>			
<p>VERY SEVERE (V SEV.)</p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i></p>			
<p>COMPLETE</p> <p>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.</p>			
ROCK HARDNESS			
<p>VERY HARD</p> <p>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p>			
<p>HARD</p> <p>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p>			
<p>MODERATELY HARD</p> <p>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.</p>			
<p>MEDIUM HARD</p> <p>CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p>			
<p>SOFT</p> <p>CAN BE GROUDED 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.</p>			
<p>VERY SOFT</p> <p>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 FINGER NAIL.</p>			
FRACTURE SPACING		BEDDING	
<p>TERM</p> <p>VERY WIDE WIDE MODERATELY CLOSE CLOSE VERY CLOSE</p>	<p>SPACING</p> <p>MORE THAN 10 FEET 3 TO 10 FEET 1 TO 3 FEET 0.15 TO 1 FEET LESS THAN 0.16 FEET</p>	<p>TERM</p> <p>VERY THICKLY BEDDED THICKLY BEDDED THINLY BEDDED VERY THINLY BEDDED THICKLY LAMINATED THINLY LAMINATED</p>	<p>THICKNESS</p> <p>> 4 FEET 1.5 - 4 FEET 0.15 - 1.5 FEET 0.03 - 0.16 FEET 0.008 - 0.03 FEET < 0.008 FEET</p>
INDURATION			
<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>			
<p>FRIABLE</p>	<p>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p>		
<p>MODERATELY INDURATED</p>	<p>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p>		
<p>INDURATED</p>	<p>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p>		
<p>EXTREMELY INDURATED</p>	<p>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>		
		<p>BENCH MARK: REBAR CAP (BL-102) STA. 7+90.52 N 399247.852 E 1813350.310 ELEVATION: 250.96 FT.</p>	
		<p>NOTES:  BM - BENCH MARK</p>	



SCALE: 1" = 40'

DATE: JAN. 2014

DRAWN BY: BTR

PROJECT NO:
45354.1.28



S&ME

WWW.SMEINC.COM

NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

BORING LOCATION MAP

BRIDGE NO. 13

ON SR1801 OVER JOES CREEK

STATE PROJ NO. 45354.1.28

RICHMOND COUNTY, NORTH CAROLINA

FIGURE NO.

3



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45354.1.28	TIP BD-5108AA	COUNTY RICHMOND	GEOLOGIST Keatts, M.
SITE DESCRIPTION Bridge No. 13 on SR 1801 Over Joes Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+75	OFFSET 13 ft LT	ALIGNMENT -L-
COLLAR ELEV. 251.8 ft	TOTAL DEPTH 70.0 ft	NORTHING 399,276	EASTING 1,813,347
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 89% 11/18/2013		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER J. White	START DATE 12/11/13	COMP. DATE 12/11/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
255																	
	250.8	1.0	2	2	2										251.8	GROUND SURFACE	0.0
250	248.3	3.5	WOH	WOH	1											ROADWAY EMBANKMENT Brown Tan Gray Silty Fine to Coarse SAND with Trace of Organics	
	245.8	6.0	WOH	WOH	1										247.0		4.8
245	243.3	8.5	1	WOH	3										244.8	ALLUVIAL Black Gray Silty CLAY with Little Organics (Organic Odor)	7.0
	238.3	13.5	6	7	7										239.8	ALLUVIAL Dark Brown Black Fine Sandy CLAY, Little Organics, Little Wood Fragments (Organic Odor)	12.0
240	233.3	18.5	4	5	4											COASTAL PLAIN (MIDDENDORF FORMATION) Tan Gray and Orange Silty Fine to Coarse SAND with Trace of Gravel	
235	228.3	23.5	5	5	3										229.8	Tan- White Purple and Pink Clayey Fine to Coarse SAND	22.0
230	223.3	28.5	3	4	4												
225	218.3	33.5	25	58	42/0.3										219.3	Tan Fine to Coarse Sandy CLAY	32.5
220	213.3	38.5	10	12	14										214.8	Tan Fine to Coarse Sandy CLAY	37.0
215	208.3	43.5	6	6	5										209.8	Tan White Purple Clayey Fine to Coarse SAND	42.0
210	203.3	48.5	5	20	60										203.0	Tan White Purple Fine to Coarse Sandy CLAY with Trace of Mica	48.8
205	198.3	53.5	20	65	35/0.3												
200	193.3	58.5	20	27	30												
195	188.3	63.5	5	8	10										189.8	White-Tan Orange and Purple Clayey Fine to Coarse SAND	62.0
190	183.3	68.5	5	8	10										181.8	Boring Terminated at Elevation 181.8 ft in Clayey SAND	70.0

NCDOT BORE SINGLE BD5108AA_GEO_BRDGG0013_GINTLOGS.GPJ NC_DOT_GDT 1/15/14

- 1) Advanced H Casing to 20.0 ft.
- 2) Advanced Tricone to 68.5 ft.
- 3) Creek Water and Bentonite Drilling Fluid



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45354.1.28	TIP BD-5108AA	COUNTY RICHMOND	GEOLOGIST Keatts, M.
SITE DESCRIPTION Bridge No. 13 on SR 1801 Over Joes Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 13+45	OFFSET 11 ft RT	ALIGNMENT -L-
COLLAR ELEV. 250.8 ft	TOTAL DEPTH 60.0 ft	NORTHING 399,227	EASTING 1,813,402
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 89% 11/18/2013		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER J. White	START DATE 12/10/13	COMP. DATE 12/10/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
255														
250	249.8	1.0											GROUND SURFACE	0.0
													ROADWAY EMBANKMENT	
	247.3	3.5											Brown Tan Silty Fine to Coarse SAND	3.0
245	244.8	6.0	WOH	WOH	1								ALLUVIAL	
													Black Gray Silty CLAY with Trace of Organics and Mica (Organic Odor)	5.5
	242.3	8.5	WOH	WOH	WOH								ALLUVIAL	
240													Dark Brown Black Highly Organic Fine Sandy CLAY (Muck) with Some Wood Fragments (Organic Odor)	12.0
	237.3	13.5	9	9	10								COASTAL PLAIN (MIDDENDORF FORMATION)	
235													Gray White Silty Fine to Coarse SAND with Trace of Gravel and Mica	17.0
	232.3	18.5	7	3	4								Tan White Pink Clayey Fine to Coarse SAND	
230														
	227.3	23.5	5	14	19								Tan White Silty CLAY	24.0
225													Tan White and Pink Clayey Fine to Coarse SAND with Trace of Gravel	25.0
	222.3	28.5	5	4	5									
220														
	217.3	33.5	19	37	63								Tan White Fine Sandy CLAY	32.0
215														
	212.3	38.5	6	9	10								Tan Orange and Purple Clayey Fine to Coarse SAND	37.0
210														
	207.3	43.5	5	5	8									
205														
	202.3	48.5	80	20/0.1									Tan Fine to Coarse Sandy CLAY	47.0
200														
	197.3	53.5	32	43	54								Tan Brown and Pink Clayey Fine to Coarse SAND	52.5
195														
	192.3	58.5	12	15	17								Tan Brown and Pink Fine to Coarse Sandy CLAY	57.0
													Boring Terminated at Elevation 190.8 ft in Sandy CLAY	60.0

NCDOT BORE SINGLE BD5108AA_GEO_BRDGG0013_GINTLOGS.GPJ NC_DOT_GDT 1/15/14

- 1) Advanced H Casing to 20.0 ft.
- 2) Advanced Tricone to 58.5 ft.
- 3) Creek Water and Bentonite Used as Drilling Fluid

SITE PHOTOGRAPHS

Project No. 45354.1.28 Bridge No. 13 on SR 1801 over Joes Creek (BD-5108AA)



Photograph No. 1: This photograph was taken from the West approach of the -L- alignment, looking East



Photograph No. 2: This photograph was taken from the East approach of the -L- alignment, looking West