

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 17BP.8.R.66 (SF-180061) F.A. PROJ. N/A  
 COUNTY CHATHAM  
 PROJECT DESCRIPTION BRIDGE NO. 61 ON NC 87 /902 OVER  
ROBERSON CREEK

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 DATE JULY 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.

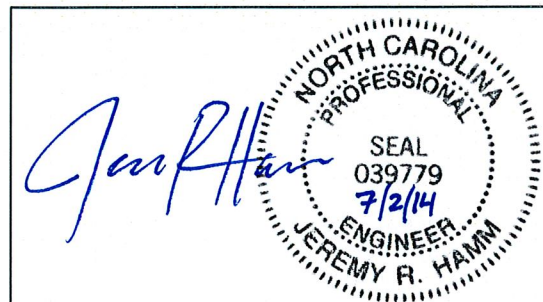
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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 IS IT 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: HUNSBERGER, W. S.



**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, GRN, SILTY CLAY, MOIST 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		
	A-1		A-2		A-3			A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7
GROUP CLASS.	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-1, A-2	A-3	A-4, A-5	A-6, A-7
SYMBOL														
% PASSING	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100	10 30 50 60 75 100
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		
GROUP INDEX	0		0	4 MX			8 MX	12 MX	16 MX	No MX	HIGHLY ORGANIC SOILS			
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, 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

**CONSISTENCY OR DENSENESS**

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

**GROUND WATER**

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

STATIC WATER LEVEL AFTER 24 HOURS

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

SPRING OR SEEP

**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				

**MISCELLANEOUS SYMBOLS**

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

**SOIL MOISTURE - CORRELATION OF TERMS**

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT PL - PLASTIC LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	- 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

**ABBREVIATIONS**

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED
CL - CLAY	MOD. - MODERATELY	W - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ <sub>d</sub> - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	<b>SAMPLE ABBREVIATIONS</b>
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	

**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.

**EQUIPMENT USED ON SUBJECT PROJECT**

<b>DRILL UNITS:</b>	<b>ADVANCING TOOLS:</b>	<b>HAMMER TYPE:</b>
<input checked="" type="checkbox"/> MOBILE B-57	<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	<b>CORE SIZE:</b>
<input type="checkbox"/> CME-45C	<input checked="" type="checkbox"/> 8' HOLLOW AUGERS	<input type="checkbox"/> -B
<input type="checkbox"/> CME-550	<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 type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	<b>HAND TOOLS:</b>
	<input type="checkbox"/> TRICONE _____ 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

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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><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p><b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.</p> <p><b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p><b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p><b>ARTESIAN</b> - 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 CALCULATED SURFACE.</p> <p><b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p><b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p><b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p><b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p><b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p><b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p><b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p><b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p><b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p><b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p><b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p><b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p><b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p><b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p><b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p><b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p><b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (ROD)</b> - 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.</p> <p><b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p><b>SILL</b> - 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.</p> <p><b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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.</p> <p><b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p><b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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.</p> <p><b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
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 YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLITE, 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 SL.)	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 (SL.)	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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>		
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. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i>		
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. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i>		
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 GROUVED 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.		
SOFT	CAN BE GROUVED 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		BEDDING	
<b>TERM</b>	<b>SPACING</b>	<b>TERM</b>	
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	
WIDE	3 TO 10 FEET	THICKLY BEDDED	
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	
		THINLY LAMINATED	
		<b>THICKNESS</b>	
		> 4 FEET	
		1.5 - 4 FEET	
		0.16 - 1.5 FEET	
		0.03 - 0.16 FEET	
		0.008 - 0.03 FEET	
		< 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.		
		<p><b>BENCH MARK:</b> BL-102: BASELINE MONUMENT @ STA. 12+93, 15' LT -L-  N= 714491 E= 1944119  ELEVATION: 369.10 FT.</p>	
		<p><b>NOTES:</b>  F.I.A.D. - FILLED IMMEDIATELY AFTER DRILLING  CI @ X.X' - CAVED IN AT X.X'</p>	

12

13

14

NAD 83/ NSRS 2007

-BL- 102

EB1-A

EB2-A

NC HWY 87/902

BRIDGE #61

-L-

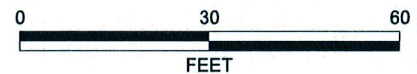
EB1-B

EB2-B

WOODS

ROBERSON CREEK

S & G DRIVE



NOTES:

- PLANS ADOPTED FROM ELECTRONIC SURVEY FILES RECEIVED FROM NCDOT GEOTECHNICAL ENGINEERING UNIT DATED JUNE, 2014.
- BRIDGE SKEW: 135°



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BORING LOCATION PLAN

BRIDGE NO. 61 ON NC 87 / 902  
OVER ROBERSON CREEK  
CHATHAM COUNTY, NC  
WBS NO.: 17BP.8.R.66 & TIP NO.: SF-180061



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.8.R.66	TIP SF-180061	COUNTY CHATHAM	GEOLOGIST Hunsberger, W. S.
SITE DESCRIPTION BRIDGE NO. 61 ON NC 87/902 OVER ROBERSON CREEK			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+84	OFFSET 10 ft LT	ALIGNMENT -L-
COLLAR ELEV. 369.8 ft	TOTAL DEPTH 21.9 ft	NORTHING 714,481	EASTING 1,944,122
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 92% 02/07/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Toothman, R. E.	START DATE 06/24/14	COMP. DATE 06/24/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION					
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)			
370																		
	368.4	1.4	8	4	5													
	366.6	3.2	5	3	7													
365	363.8	6.0	1	3	2													
	361.6	8.2	2	2	2													
360																		
	356.6	13.2	WOH	1	2													
355																		
	351.6	18.2	5	11	20													
350																		
	347.9	21.9	60/0.0															

NCDOT BORE SINGLE SF-180061\_GEO\_BRDG0061\_GINT.GPJ NC\_DOT.GDT 7/1/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.8.R.66	TIP SF-180061	COUNTY CHATHAM	GEOLOGIST Hunsberger, W. S.
SITE DESCRIPTION BRIDGE NO. 61 ON NC 87/902 OVER ROBERSON CREEK			GROUND WTR (ft)
BORING NO. EB1-B	STATION 12+62	OFFSET 9 ft RT	ALIGNMENT -L-
			0 HR. CI @ 6.3'
COLLAR ELEV. 370.0 ft	TOTAL DEPTH 22.7 ft	NORTHING 714,455	EASTING 1,944,136
			24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 92% 02/07/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Toothman, R. E.	START DATE 06/24/14	COMP. DATE 06/24/14	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)		
370															370.0	0.0	
	368.9	1.1													369.1	0.9	0.4' BITUMINOUS CONCRETE 0.5' CEMENT TREATED BASE
	367.4	2.6	5	4	2												ROADWAY EMBANKMENT
	366.7	3.3	3	2	2												ORANGE AND TAN, F. TO MED. SANDY SILT (A-4) W/ GRAVEL
365			2	3	1												LOW RECOVERY FROM SAMPLE AT 2.6' (GRAVEL LODGED IN SAMPLER)
	364.0	6.0	2	1	2												CLAYEY LAYER FROM 7.1' TO 7.5'
	361.6	8.4	1	1	2												
360																	
	356.6	13.4	WOH	WOH	1										357.0	13.0	ALLUVIAL GRAY, SI. CLAY (A-7) W/ TRACE ORGANICS
355																	
	351.6	18.4	2	7	14										351.3	18.7	GRAY, CLAYEY MED. SAND (A-2-6)
350															350.9	19.1	RESIDUAL ORANGE, SI. F. SAND (A-2-4) SAP.
	347.4	22.6	60/0.1												347.4	22.6	CRYSTALLINE ROCK GRAY AND TAN, METAVOLCANIC ROCK
															347.3	22.7	Boring Terminated with Standard Penetration Test Refusal at Elevation 347.3 ft in CR: FELSIC METAVOLCANIC ROCK

NCDOT BORE SINGLE SF180061\_GEO\_BRDG0061\_GINT.GPJ NC\_DOT.GDT 7/1/14



WBS 17BP.8.R.66	TIP SF-180061	COUNTY CHATHAM	GEOLOGIST Hunsberger, W. S.
SITE DESCRIPTION BRIDGE NO. 61 ON NC 87/902 OVER ROBERSON CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 13+87	OFFSET 9 ft LT	ALIGNMENT -L-
COLLAR ELEV. 369.3 ft	TOTAL DEPTH 19.9 ft	NORTHING 714,581	EASTING 1,944,147
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 92% 02/07/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Toothman, R. E.	START DATE 06/24/14	COMP. DATE 06/24/14	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					ELEV. (ft)
370															
	368.0	1.3												0.5 BITUMINOUS CONCRETE	0.0
														0.6 CEMENT TREATED BASE	1.1
365	366.1	3.2	4	5	5									ROADWAY EMBANKMENT	
			4	8	3									RED-ORANGE AND TAN, F. SANDY SILT (A-4) W/ GRAVEL	
	363.4	5.9	1	2	2										
360	361.1	8.2	2	2	4										
	356.1	13.2	11	11	12									ALLUVIAL BROWN, SI. CLAY (A-7) W/ TRACE ORGANICS	9.2
355														RESIDUAL TAN ORANGE AND BROWN, SI. SAND (A-2-4) W/ ROCK FRAGS.	12.0
	351.1	18.2	64	36/0.2											
350	349.4	19.9												WEATHERED ROCK	18.2
														GRAY BROWN AND TAN, METAVOLCANIC ROCK	19.9
														Boring Terminated with Standard Penetration Test Refusal at Elevation 349.4 ft on CR: FELSIC METAVOLCANIC ROCK	

NCDOT BORE SINGLE SF180061\_GEO\_BRDG0061\_GINT.GPJ NC\_DOT.GDT 7/1/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT

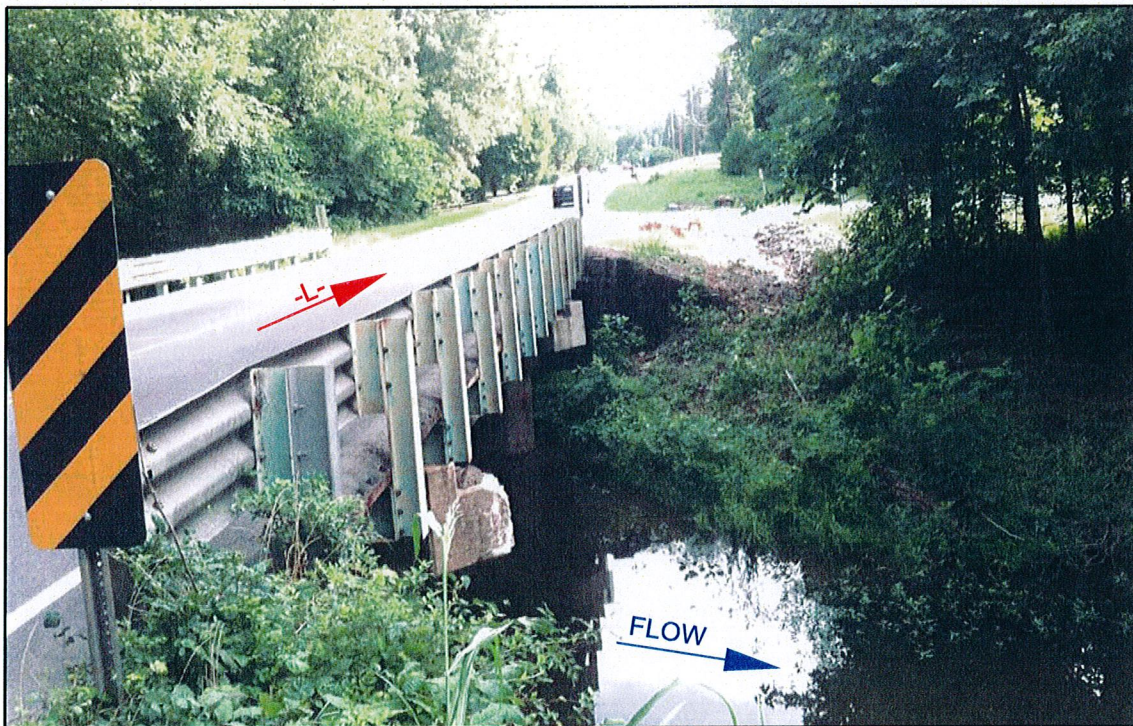
## BORELOG REPORT

WBS 17BP.8.R.66	TIP SF-180061	COUNTY CHATHAM	GEOLOGIST Hunsberger, W. S.
SITE DESCRIPTION BRIDGE NO. 61 ON NC 87/902 OVER ROBERSON CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 13+62	OFFSET 15 ft RT	ALIGNMENT -L-
COLLAR ELEV. 369.2 ft	TOTAL DEPTH 21.1 ft	NORTHING 714,550	EASTING 1,944,165
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 92% 02/07/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Toothman, R. E.	START DATE 06/24/14	COMP. DATE 06/24/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
370															369.2	GROUND SURFACE: 0.3' TOPSOIL	0.0
	368.4	0.8	6	3	3											ROADWAY EMBANKMENT	
	366.0	3.2	2	1	2										366.2	TAN ORANGE AND GRAY, SI. SAND (A-2-4) W/ GRAVEL	3.0
365																TAN AND ORANGE, F. SANDY SILT (A-4)	
	361.4	7.8	2	6	1										360.6	ALLUVIAL	8.6
360																TAN AND GRAY, SI. CLAY (A-7) W/ TRACE ORGANICS	
	359.0	10.2	2	2	2												
	355.8	13.4	2	2	3										356.2	RESIDUAL	13.0
355																GRAY AND TAN, F. SANDY SILT (A-4)	
	350.8	18.4	100/0.4												351.7	WEATHERED ROCK	17.5
350																BROWN AND TAN, METAVOLCANIC ROCK	
	348.1	21.1	60/0.0												348.1		21.1
																Boring Terminated with Standard Penetration Test Refusal at Elevation 348.1 ft on CR: FELSIC METAVOLCANIC ROCK	

NCDOT BORE SINGLE\_SF180061\_GEO\_BRDG0061\_GINT.GPJ\_NC\_DOT.GDT\_7/1/14





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SITE PHOTOGRAPHS

BRIDGE NO. 61 ON NC 87 / 902  
OVER ROBERSON CREEK  
CHATHAM COUNTY, NC  
WBS NO.: 17BP.8.R.66 TIP NO.: SF-180061