

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	WBS NO. 17BP.14.R.48	1	8

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

**STRUCTURE  
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. WBS NO. 17BP.14.R.48 F.A. PROJ. \_\_\_\_\_

COUNTY MACON

PROJECT DESCRIPTION DIVISION 14  
LOW IMPACT BRIDGE REPLACEMENT

SITE DESCRIPTION BRIDGE NO. 308 ON SR 1500 (WATAUGA ROAD)  
OVER WATAUGA CREEK

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**PERSONNEL**

M. GRAGG  
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B. SMITH  
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S. GOWER  
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INVESTIGATED BY F&H  
CHECKED BY S. PROVANCE  
SUBMITTED BY F&H  
DATE 10/14/2011

**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 ON-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.

DRAWN BY: T. RIDEOUT



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

SOIL DESCRIPTION										GRADATION									
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 1000 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (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: <i>VERY STIFF, GRN, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										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.									
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>MINERALOGICAL COMPOSITION</b>									
GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.									
GROUP CLASS. A-1, A-1-b, A-2, 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-3, A-4, A-5, A-6, A-7										<b>COMPRESSIBILITY</b>									
SYMBOL										SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE									
% PASSING # 10 # 40 # 200										LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50									
LIQUID LIMIT PLASTIC INDEX										<b>PERCENTAGE OF MATERIAL</b>									
GROUP INDEX										ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL									
USUAL TYPES OF MAJOR MATERIALS										TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC >10%									
GEN. RATING AS A SUBGRADE										TRACE OF ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC >10%									
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30										<b>GROUND WATER</b>									
EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE										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									
<b>CONSISTENCY OR DENSENESS</b>										<b>MISCELLANEOUS SYMBOLS</b>									
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (IN-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES									
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE										TEST BORING WITH SOIL DESCRIPTION AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD									
VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD										SPT OPT DMT VST PHT TEST BORING SPT N-VALUE SPT REFUSAL									
<4 4 TO 10 10 TO 30 30 TO 50 >50										N/A									
<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									
<b>TEXTURE OR GRAIN SIZE</b>										<b>ABBREVIATIONS</b>									
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										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 HL - 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									
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										VST - VANE SHEAR TEST WEA. - WEATHERED γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT									
GRAIN MM 305 75 2.0 0.25 0.05 0.005										SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO									
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:									
LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE										<input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST									
PLASTIC RANGE (PI) - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE										<input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ ' STEEL TEETH <input type="checkbox"/> TRICONE _____ ' TUNG.-CARB. <input type="checkbox"/> CORE BIT									
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE										<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL									
SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE										<input type="checkbox"/> -B _____ <input type="checkbox"/> -N _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST									
<b>PLASTICITY</b>										<b>COLOR</b>									
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY										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.									
PLASTICITY INDEX (PI) DRY STRENGTH										REVISED 09/23/09									
0-5 VERY LOW 5-15 SLIGHT 16-25 MEDIUM 26 OR MORE HIGH																			

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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 8.1 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.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <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.  <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 GROUND SURFACE.  <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <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.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <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.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL.  <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (RQD)</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.  <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  <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.  <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  <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 8.1 FOOT PER 60 BLOWS.  <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</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.  <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<p><b>WEATHERED ROCK (WR)</b></p> 	<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p>		
<p><b>CRYSTALLINE ROCK (CR)</b></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><b>NON-CRYSTALLINE ROCK (NCR)</b></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><b>COASTAL PLAIN SEDIMENTARY ROCK (CPS)</b></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><b>FRESH</b></p>	<p>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p>		
<p><b>VERY SLIGHT (V SL.)</b></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><b>SLIGHT (SL.)</b></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><b>MODERATE (MOD.)</b></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><b>MODERATELY SEVERE (MOD. SEV.)</b></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><b>SEVERE (SEV.)</b></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 &gt; 100 BPF</i></p>		
<p><b>VERY SEVERE (V SEV.)</b></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 &lt; 100 BPF</i></p>		
<p><b>COMPLETE</b></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><b>VERY HARD</b></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><b>HARD</b></p>	<p>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p>		
<p><b>MODERATELY HARD</b></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><b>MEDIUM HARD</b></p>	<p>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.</p>		
<p><b>SOFT</b></p>	<p>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.</p>		
<p><b>VERY SOFT</b></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><b>TERM</b></p>	<p><b>SPACING</b></p>	<p><b>TERM</b></p>	<p><b>THICKNESS</b></p>
<p>VERY WIDE</p>	<p>MORE THAN 10 FEET</p>	<p>VERY THICKLY BEDDED</p>	<p>&gt; 4 FEET</p>
<p>WIDE</p>	<p>3 TO 10 FEET</p>	<p>THICKLY BEDDED</p>	<p>1.5 - 4 FEET</p>
<p>MODERATELY CLOSE</p>	<p>1 TO 3 FEET</p>	<p>THINLY BEDDED</p>	<p>0.16 - 1.5 FEET</p>
<p>CLOSE</p>	<p>0.16 TO 1 FEET</p>	<p>VERY THINLY BEDDED</p>	<p>0.03 - 0.16 FEET</p>
<p>VERY CLOSE</p>	<p>LESS THAN 0.16 FEET</p>	<p>THICKLY LAMINATED</p>	<p>0.008 - 0.03 FEET</p>
		<p>THINLY LAMINATED</p>	<p>&lt; 0.008 FEET</p>
INDURATION			
<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>			
<p><b>FRIABLE</b></p>	<p>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p>		
<p><b>MODERATELY INDURATED</b></p>	<p>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p>		
<p><b>INDURATED</b></p>	<p>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p>		
<p><b>EXTREMELY INDURATED</b></p>	<p>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>		
<p><b>BENCH MARK: ORANGE PAINT CIRCLE LABELED G</b></p> <p><b>SOUTH CORNER OF BRIDGE DECK (NEAREST EB1-B)</b></p>		<p>ELEVATION: 100 FT.</p>	
<p>NOTES:</p>			

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N.C.	WBS NO. 17BP.14.R.48	3	8



**BORING LOCATION MAP**  
**BRIDGE NO. 308**  
**ON SR 1500 (WATAUGA ROAD)**  
**OVER WATAUGA CREEK**  
**WBS NO. 17BP.14.R.48**

MACON COUNTY, NORTH CAROLINA

DRAWN BY:                     T. RIDEOUT



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.14.R.48	TIP 17BP.14.R.48	COUNTY 17BP.14.R.48	GEOLOGIST Smith, B. C.
SITE DESCRIPTION Bridge No. 308 on -L- (SR 1500, Watauga Road) over Watauga Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+03	OFFSET 10 ft LT	ALIGNMENT -L-
COLLAR ELEV. 99.7 ft	TOTAL DEPTH 50.5 ft	NORTHING 571,264	EASTING 711,796
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic
DRILLER Gower, S. D.	START DATE 10/08/11	COMP. DATE 10/08/11	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	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
100	99.7	0.0	5	5	5									GROUND SURFACE	0.0
														<b>ALLUVIAL</b> Brown, med. dense, f. grain sand (A-3).	3.0
95	94.2	5.5	7	8	9									<b>ALLUVIAL</b> Brown & black, med. dense, cse. grain sand and gravel (A-4).	8.0
90	89.2	10.5	2	3	4									<b>RESIDUAL</b> Brown & dark brown, soft to stiff, saprolitic, micaceous silt w/trace cse. sand and gravel (A-4).	
85	84.2	15.5	2	4	5										
80	79.2	20.5	2	2	2										
75	74.2	25.5	5	4	9										
70	69.2	30.5	3	10	15									<b>RESIDUAL</b> Brown w/some white, med. dense, saprolitic, silty, f. grain sand (A-3).	28.0
65	64.2	35.5	18	58	42/0.3					100/0.8				<b>WEATHERED ROCK</b> Weathered rock (Biotite Gneiss).	36.0
60	59.2	40.5	2	3	7									<b>RESIDUAL</b> Brown & black, stiff, saprolitic, f. sandy silt (A-4).	38.0
55	54.2	45.5	17	24	27										
50	49.2	50.5												Boring Terminated with Standard Penetration Test Refusal at Elevation 49.2 ft on Crystalline Rock (Biotite Gneiss).	50.5
			60/0.0							60/0.0					

NCDOT BORE SINGLE GEO\_BRDG0308.GPJ NC\_DOT\_GDT 10/14/11





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## BORELOG REPORT

WBS 17BP.14.R.48	TIP 17BP.14.R.48	COUNTY 17BP.14.R.48	GEOLOGIST Smith, B. C.
SITE DESCRIPTION Bridge No. 308 on -L- (SR 1500, Watauga Road) over Watauga Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 12+36	OFFSET 15 ft LT	ALIGNMENT -L-
COLLAR ELEV. 100.4 ft	TOTAL DEPTH 50.2 ft	NORTHING 571,281	EASTING 711,826
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic
DRILLER Gower, S. D.	START DATE 10/07/11	COMP. DATE 10/07/11	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
105														
100	100.4	0.0											GROUND SURFACE	0.0
95	95.4	5.0	5	3	2							M	ALLUVIAL Brown, loose, f. grain sand w/trace gravel (A-3).	2.5
90	90.4	10.0	2	8	13							Sat.	ALLUVIAL Brown, med. dense, f. to cse. grain sand and gravel (A-1-a).	7.5
85	85.4	15.0	4	1	3							Sat.	RESIDUAL Brown, soft, saprolitic, f. sandy, micaceous silt (A-4).	12.5
80	80.4	20.0	4	3	6							W	RESIDUAL Brown, dark brown, black & white, loose to v. dense, saprolitic, silty, f. grain, micaceous sand (A-3).	
75	75.4	25.0	4	7	9							W		
70	70.4	30.0	9	22	30							W		
65	65.4	35.0	30	52	48/0.4								WEATHERED ROCK Weathered rock (Biotite Gneiss).	27.5
60	60.4	40.0	30	52	48/0.4									
55	55.4	45.0	13	57	43/0.3								RESIDUAL Brown, black & white, v. dense, saprolitic, silty, f. grain, micaceous sand (A-3).	42.5
	50.4	50.0	23	39	51							M	WEATHERED ROCK Weathered rock (Biotite Gneiss).	47.5
													Boring Terminated at Elevation 50.2 ft in Weathered Rock (Biotite Gneiss). Bearing capacity reached around 30'.	50.2

NCDOT BORE SINGLE GEO\_BRD0308.GPJ NC\_DOT.GDT 10/14/11



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WBS 17BP.14.R.48		TIP 17BP.14.R.48		COUNTY 17BP.14.R.48		GEOLOGIST Smith, B. C.									
SITE DESCRIPTION Bridge No. 308 on -L- (SR 1500, Watauga Road) over Watauga Creek									GROUND WTR (ft)						
BORING NO. EB2-B		STATION 12+20		OFFSET 13 ft RT		ALIGNMENT -L-		0 HR. N.M.							
COLLAR ELEV. 100.1 ft		TOTAL DEPTH 29.8 ft		NORTHING 571,245		EASTING 711,825		24 HR. FIAD							
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011					DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic							
DRILLER Gower, S. D.		START DATE 10/09/11		COMP. DATE 10/09/11		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)
105															
100	100.1	0.0												100.1	GROUND SURFACE 0.0
95	95.3	4.8	5	5	3	8						M	97.1	ALLUVIAL Brown, loose, f. grain sand (A-3). 3.0	
90	90.3	9.8	4	2	12	14						Sat.		ALLUVIAL Brown & black, med. dense, cse. sand and gravel (A-1-a).	
85	85.3	14.8	5	5	5	10						Sat.	87.8	RESIDUAL Brown, black & white, med. dense, silty, f. grain, saprolitic, sand (A-3). 12.3	
80	80.3	19.8	8	10	13	23						W			
75	75.3	24.8	7	10	13	23						W			
	70.3	29.8	16	18	11	29						W			
			60/0.0											70.3	Boring Terminated with Standard Penetration Test Refusal at Elevation 70.3 ft on Crystalline Rock (Biotite Gneiss). 29.8

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