

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	67051.1.1	1	17

REFERENCE: BR-0051

PROJECT: 67051.1.1

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY YADKIN  
PROJECT DESCRIPTION BRIDGE NO. 90 ON SR 1711  
(SPEER BRIDGE RD.) OVER US 421

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2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-6	CROSS SECTION(S)
7-16	BORE LOG(S) & CORE REPORT(S) & CORE PHOTOGRAPHS)
17	SITE PHOTOGRAPHS)

PERSONNEL  
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CHECKED BY J.E. BEVERLY  
SUBMITTED BY K.B. MILLER  
DATE OCTOBER 2019

**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. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 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.

NOTES:

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- 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.



DocuSigned by:  
  
957A789AED7003  
10/29/2019

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

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


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**SUBSURFACE INVESTIGATION**  


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**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**  
 (PAGE 1 OF 2)

SOIL DESCRIPTION																						
SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>																						
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-2		A-3		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		#40		#200																	
MATERIAL PASSING #40	LL		PI																			
GROUP INDEX	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		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS									
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR		POOR		UNSATURABLE							
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																						

GRADATION																																					
WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.																																					
COMPRESSIBILITY																																					
SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50																																					
PERCENTAGE OF MATERIAL																																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY</td> </tr> <tr> <td></td> <td></td> <td></td> <td>1 - 10%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>10 - 20%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>20 - 35%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35% AND ABOVE</td> </tr> </table>		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				1 - 10%				10 - 20%				20 - 35%				35% AND ABOVE
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			10 - 20%																																		
			20 - 35%																																		
			35% AND ABOVE																																		
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																																					

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 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 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

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 DMT VST PMT TEST BORING
	AUGER BORING
	CORE BORING
	MONITORING WELL
	PIEZOMETER INSTALLATION
	SLOPE INDICATOR INSTALLATION
	CONE PENETROMETER TEST
	SOUNDING ROD
	TEST BORING WITH CORE
	SPT N-VALUE

TEXTURE OR GRAIN SIZE							
U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270	
	4.75	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					

RECOMMENDATION SYMBOLS		
	UNDERCUT	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
	SHALLOW UNDERCUT	UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
	UNCLASSIFIED EXCAVATION - ACCEPTABLE	UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

SOIL MOISTURE - CORRELATION OF TERMS		
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL LIQUID LIMIT PLASTIC RANGE (PI) PL	- 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 SHRINKAGE LIMIT SL	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- 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	γ - 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	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	

PLASTICITY	
PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5
SLIGHTLY PLASTIC	6-15
MODERATELY PLASTIC	16-25
HIGHLY PLASTIC	26 OR MORE
	VERY LOW
	SLIGHT
	MEDIUM
	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> <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> CME-550X	<b>ADVANCING TOOLS:</b> <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6' CONTINUOUS FLIGHT AUGER <input checked="" 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 checked="" type="checkbox"/> TRICONE _____ * TUNG.-CARB. <input checked="" type="checkbox"/> CORE BIT	<b>HAMMER TYPE:</b> <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <b>CORE SIZE:</b> <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input checked="" type="checkbox"/> -N Q _____ <b>HAND TOOLS:</b> <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST





67051.1.1

2A

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
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# SUBSURFACE INVESTIGATION

## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, 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, SUCH 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 GROUND 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 DISLOGGED 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>	
<p><b>WEATHERED ROCK (WR)</b>  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p> <p><b>CRYSTALLINE ROCK (CR)</b>  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 (INCR)</b>  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 (CP)</b>  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>			
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 GLAZE. 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, WOULD YIELD SPT N VALUES &gt; 100 BPF</i>		
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD 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 GROOVED 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 GROOVED 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	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET
INDURATION			
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF 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.		
		BENCH MARK: BL-3= N: 864,828.78, E: 1,543,721.43	
		ELEVATION: 779.56 FEET	
<b>NOTES:</b>			
FIAD= FILLED IMMEDIATELY AFTER DRILLING			



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

**SUBSURFACE INVESTIGATION**

**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES  
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)**

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces

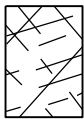
GOOD - Rough, slightly weathered surfaces

FAIR - Smooth, moderately weathered and altered surfaces

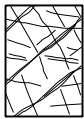
POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

COMPOSITION AND STRUCTURE



**A. Thick bedded, very blocky sandstone**  
 The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.



**B. Sandstone with thin inter-layers of siltstone**



**C. Sandstone and siltstone in similar amounts**



**D. Siltstone or silty shale with sandstone layers**



**E. Weak siltstone or clayey shale with sandstone layers**

**C, D, E, and G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H**.



**F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure**

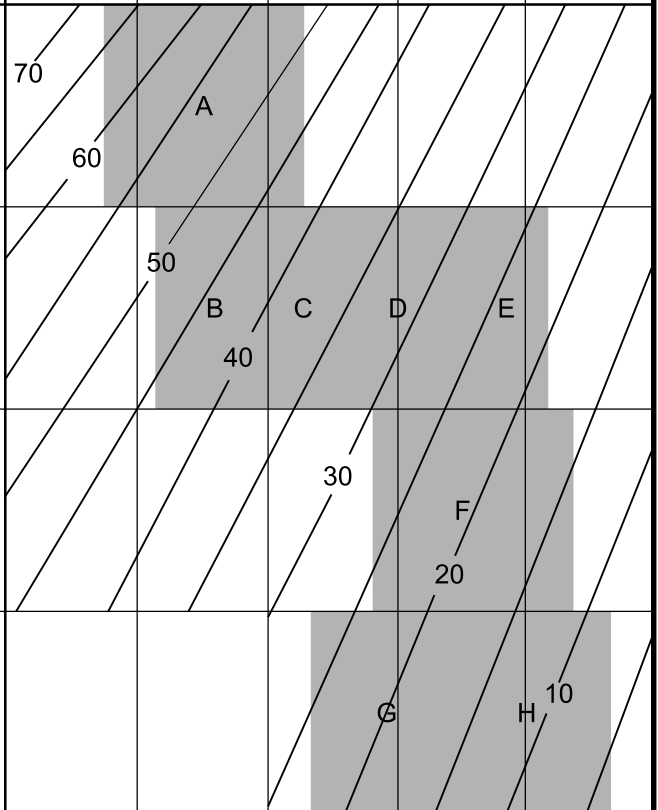


**G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers**

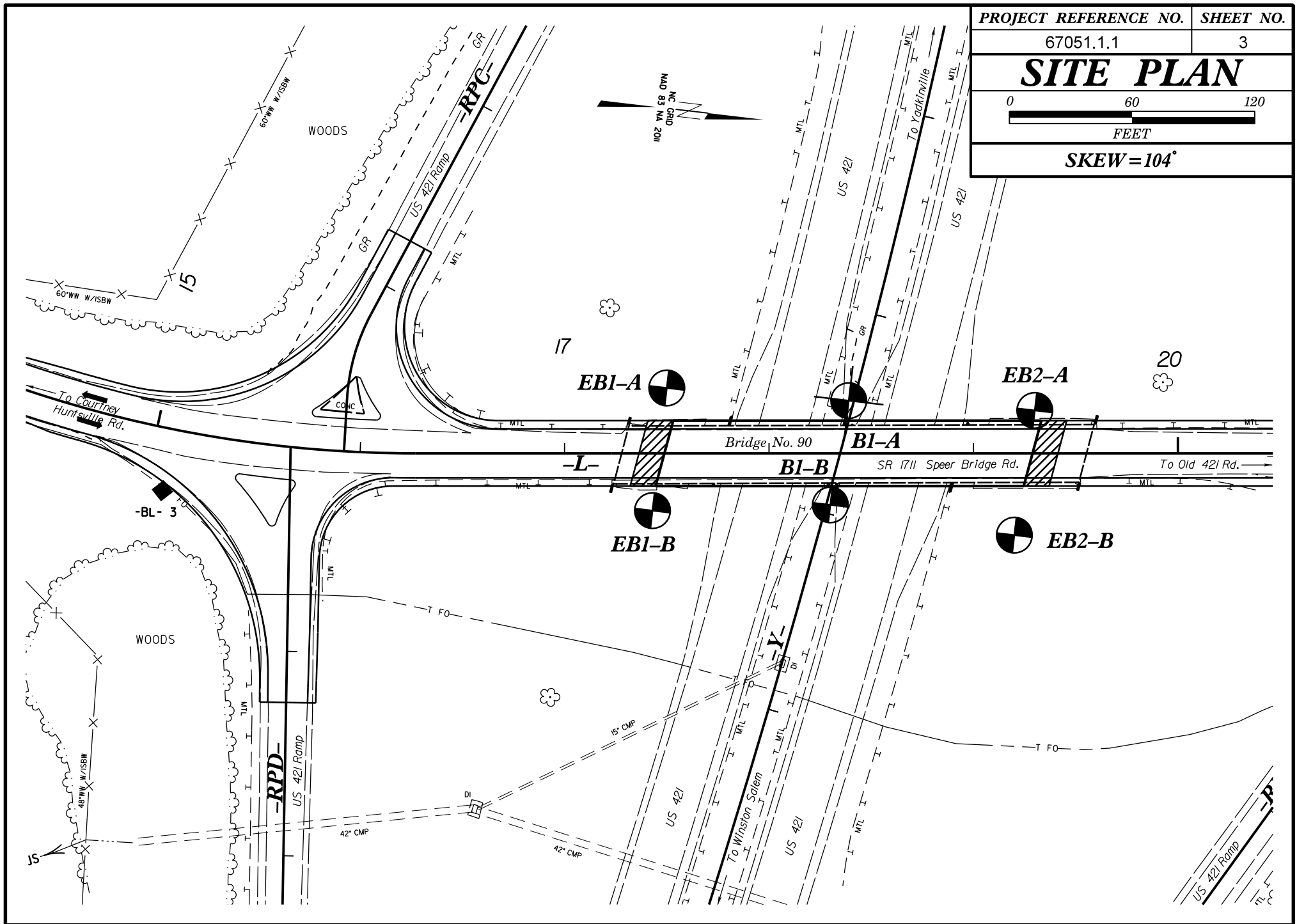


**H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.**

➡ Means deformation after tectonic disturbance



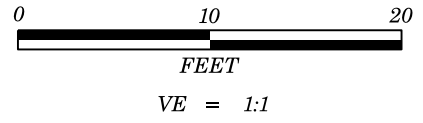
PROJECT REFERENCE NO.	SHEET NO.
67051.1.1	3
<b>SITE PLAN</b>	
 0                      60                      120 FEET	
<b>SKEW = 104°</b>	



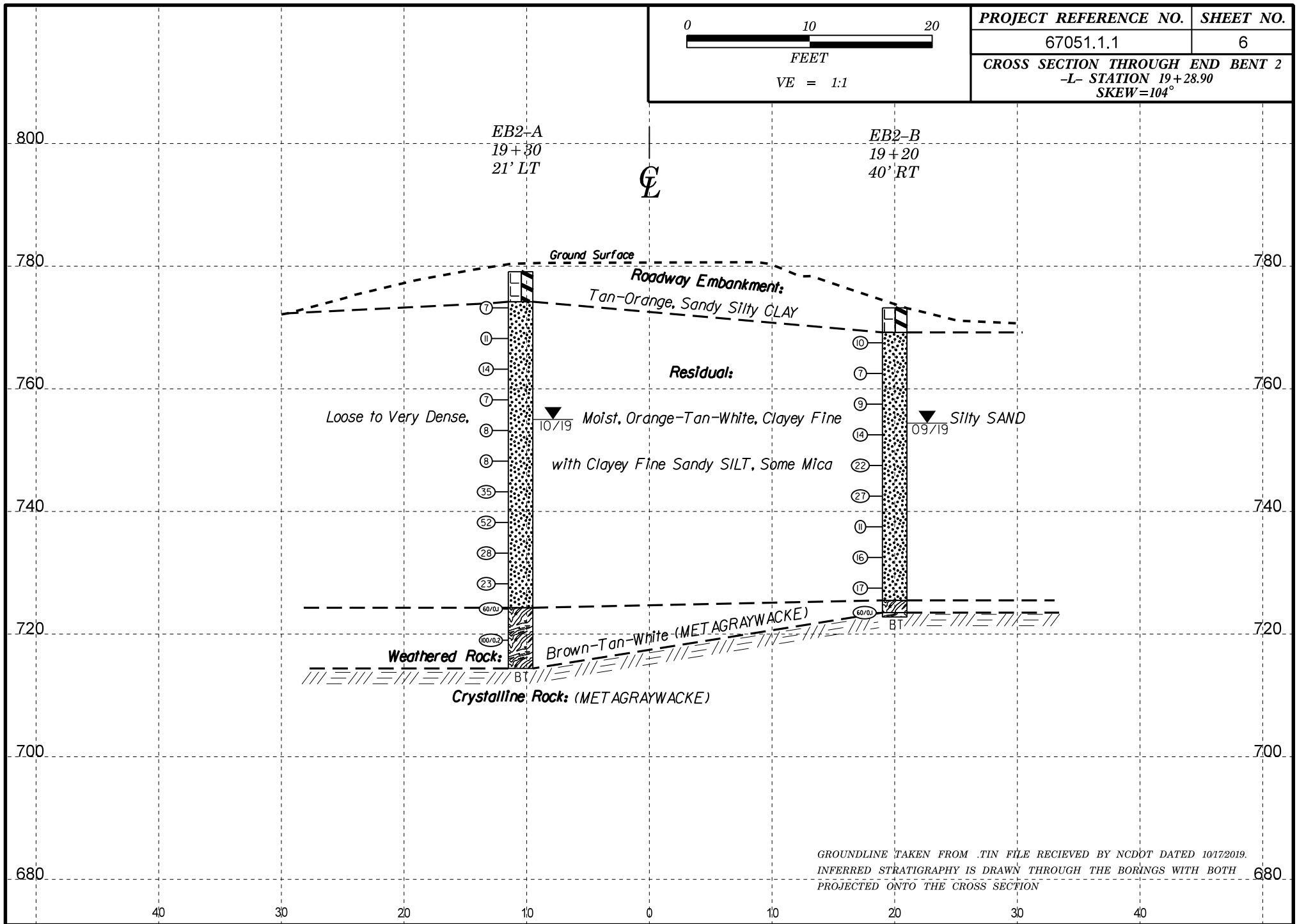








<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
67051.1.1	6
<b>CROSS SECTION THROUGH END BENT 2</b>	
-L- STATION 19+28.90	
SKEW=104°	



GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 10/17/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION





# GEOTECHNICAL BORING REPORT

## BORE LOG


WBS 67051.1.1	TIP BR-0051	COUNTY YADKIN	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION Bridge No. 90 on SR 1711 (Speer Bridge Road) over US 421			GROUND WTR (ft)
BORING NO. EB1-B	STATION 17+43	OFFSET 28 ft RT	ALIGNMENT -L-
COLLAR ELEV. 772.7 ft	TOTAL DEPTH 74.7 ft	NORTHING 865,068	EASTING 1,543,703
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 10/07/19	COMP. DATE 10/07/19	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						
785																
780																
775																
770														772.7	GROUND SURFACE	0.0
															<b>ROADWAY EMBANKMENT</b> Tan-Orange, Sandy Silty CLAY	
765	768.1	4.6	3	4	5								M			
760	763.1	9.6	4	4	6								M	763.1	<b>RESIDUAL</b> Gray-White-Black, Sandy Clayey SILT	9.6
755	758.1	14.6	5	4	6								M			
750	753.1	19.6	2	3	5								M			
745	748.1	24.6	9	7	8								M			
740	743.1	29.6	6	7	7								M			
735	738.1	34.6	4	6	5								M			
730	733.1	39.6	13	7	9								M			
725	728.1	44.6	7	8	8								M			
720	723.1	49.6	6	7	13								M			
715	718.1	54.6	7	11	9								M	718.7	Tan-Brown-White, Clayey Silty SAND	54.0
710	713.1	59.6	17	16	18								M			
705	708.1	64.6	43	57/0.4									M	708.1	<b>WEATHERED ROCK</b> Dark Brown-Gray-White (METAGRAYWACKE)	64.6

NCDOT BORE SINGLE BR0051\_GEO\_BH\_BRD0090.GPJ\_NC\_DOT.GDT 10/24/19

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67051.1.1			TIP BR-0051			COUNTY YADKIN			GEOLOGIST Stickney, J. K.							
SITE DESCRIPTION Bridge No. 90 on SR 1711 (Speer Bridge Road) over US 421										GROUND WTR (ft)						
BORING NO. EB1-B			STATION 17+43			OFFSET 28 ft RT			ALIGNMENT -L-							
COLLAR ELEV. 772.7 ft			TOTAL DEPTH 74.7 ft			NORTHING 865,068			EASTING 1,543,703							
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018						DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic							
DRILLER Smith, C. L.			START DATE 10/07/19			COMP. DATE 10/07/19			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
705						Match Line										
	703.1	69.6														
700			18	82/0.5						100/1.0		M		<b>WEATHERED ROCK</b> Dark Brown-Gray-White (METAGRAYWACKE) (continued)		
	698.1	74.6								60/0.1		M		<b>CRYSTALLINE ROCK</b> (METAGRAYWACKE)  Boring Terminated with Standard Penetration Test Refusal at Elevation 698.0 ft in Crystalline Rock (MTEAGRAYWACKE)	698.1 698.0	74.6 74.7

NCDOT BORE SINGLE BR0051\_GEO\_BH\_BRD0090.GPJ NC\_DOT\_GDT 10/24/19

# GEOTECHNICAL BORING REPORT

## BORE LOG


WBS 67051.1.1	TIP BR-0051	COUNTY YADKIN	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION Bridge No. 90 on SR 1711 (Speer Bridge Road) over US 421			GROUND WTR (ft)
BORING NO. B1-A	STATION 18+39	OFFSET 26 ft LT	ALIGNMENT -L-
COLLAR ELEV. 769.0 ft	TOTAL DEPTH 71.1 ft	NORTHING 865,157	EASTING 1,543,638
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 09/25/19	COMP. DATE 09/25/19	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						ELEV. (ft)		
770															769.0	GROUND SURFACE	0.0	
765	764.4	4.6	4	6	6											RESIDUAL Orange-White-Tan, Silty Clayey Fine SAND		
760	759.4	9.6	5	7	7													
755	754.4	14.6	4	5	6													
750	749.4	19.6	5	10	16													
745	744.4	24.6	8	11	15													
740	739.4	29.6	4	5	7													
735	734.4	34.6	5	7	11													
730	729.4	39.6	8	30	39													
725	724.4	44.6	23	13	56													
720	719.4	49.6	100/0.2												719.4		WEATHERED ROCK Tan-White (METAGRAYWACKE)	49.6
715	714.4	54.6	100/0.2												713.8		CRYSTALLINE ROCK Tan-White (METAGRAYWACKE)	55.2
710																		
705																		
700															697.9	Boring Terminated at Elevation 697.9 ft in Crystalline Rock (MTEAGRAYWACKE)	71.1	

NCDOT BORE SINGLE BR0051\_GEO\_BH\_BRD0090.GPJ\_NC\_DOT.GDT 10/24/19

# GEOTECHNICAL BORING REPORT

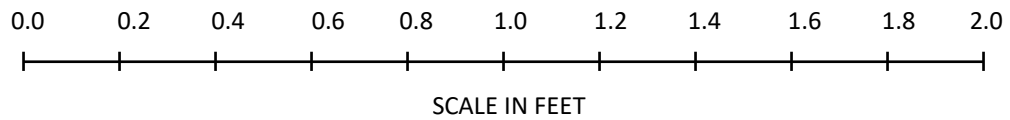
## CORE LOG

WBS 67051.1.1			TIP BR-0051			COUNTY YADKIN			GEOLOGIST Stickney, J. K.		
SITE DESCRIPTION Bridge No. 90 on SR 1711 (Speer Bridge Road) over US 421										GROUND WTR (ft)	
BORING NO. B1-A			STATION 18+39			OFFSET 26 ft LT			ALIGNMENT -L-		
COLLAR ELEV. 769.0 ft			TOTAL DEPTH 71.1 ft			NORTHING 865,157			EASTING 1,543,638		
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018						DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic		
DRILLER Smith, C. L.			START DATE 09/25/19			COMP. DATE 09/25/19			SURFACE WATER DEPTH N/A		
CORE SIZE NQ			TOTAL RUN 15.9 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
713.8	713.8	55.2	0.9		(0.9)	(0.0)	(10.5)	(0.4)		Begin Coring @ 55.2 ft <b>CRYSTALLINE ROCK</b> Brown-White-Gray, Very Severely Weathered to Moderately Weathered, Soft to Hard, METAGRAYWACKE with Very Close to Close Fracture Spacing GSI=25-30	55.2
710	712.9	56.1	5.0		100%	0%	66%	3%			713.8
705	707.9	61.1	5.0		(2.1)	(0.0)					
700	702.9	66.1	5.0		(3.8)	(0.0)					
	702.9	66.1	5.0		(3.7)	(0.4)					
	697.9	71.1								697.9	71.1
Boring Terminated at Elevation 697.9 ft in Crystalline Rock (MTEAGRAYWACKE)											

NCDOT CORE SINGLE BR0051\_GEO\_BH\_BRDC0090.GPJ NC\_DOT.GDT 10/24/19

**CORE PHOTOGRAPH:**  
**Bridge No. 90 on SR 1711 (Speer Bridge Rd.) over US 421**  
**B1-A: -L- Station 18+39, 26 ft LT**

**Begin**  
**55.2 feet**





# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67051.1.1		TIP BR-0051		COUNTY YADKIN		GEOLOGIST Stickney, J. K.											
SITE DESCRIPTION Bridge No. 90 on SR 1711 (Speer Bridge Road) over US 421							GROUND WTR (ft)										
BORING NO. B1-B		STATION 18+30		OFFSET 25 ft RT		ALIGNMENT -L-	0 HR. 11.7										
COLLAR ELEV. 769.6 ft		TOTAL DEPTH 69.0 ft		NORTHING 865,154		EASTING 1,543,690	24 HR. 16.3										
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Smith, C. L.		START DATE 09/26/19		COMP. DATE 09/26/19		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							
770															769.6	GROUND SURFACE	0.0
765	765.4	4.2	5	8	10											RESIDUAL Orange-Tan-Gray-White, Clayey Silty SAND, Micaeous	
760	760.4	9.2	4	7	8												
755	755.4	14.2	3	6	5												
750	750.4	19.2	6	9	9												
745	745.4	24.2	6	12	14												
740	740.4	29.2	4	9	9												
735	735.4	34.2	5	8	11												
730	730.4	39.2	12	10	21												
725	725.4	44.2	7	20	49												
720	720.4	49.2	12	24	76/0.3												
715	716.0	53.6	22	43	57/0.4										719.4	WEATHERED ROCK Tan-Gray-White (METAGRAYWACKE)	50.2
710	711.0	58.6	100/0.2														
705	706.0	63.6	100/0.2														
	701.0	68.6	100/0.4												700.6	Boring Terminated with Casing Advancer Refusal at Elevation 700.6 ft in Weathered Rock (MTEAGRAYWACKE)	69.0

NCDOT BORE SINGLE BR0051\_GEO\_BH\_BRD0090.GPJ\_NC\_DOT.GDT 10/24/19





**Bridge No. 90 on SR 1711 (Speer Bridge Rd.) over US 421**  
**SITE PHOTOGRAPHS**



**Photograph No. 1:** At End Bent 1 looking towards End Bent 2