

REFERENCE: DF18311.2095784

PROJECT: NA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	DF18311.2095784	1	

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY WATAUGA
PROJECT DESCRIPTION BRIDGE NO. 187 ON SR 1339
(HOPEWELL CHURCH RD) OVER MEAT CAMP
CREEK

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PERSONNEL
CG2 EXPLORATION
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SUBMITTED BY CG2, PLLC
DATE MAY 2025

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Prepared in the Office of:



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Signed by: Michael J. Walko 05/29/2025

42C62874D58466 SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5		
SYMBOL												
% PASSING	50 MX 30 MX 15 MX	50 MX 25 MX 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS
MATERIAL PASSING #40			40 MX	40 MX	40 MX	40 MX	40 MX	40 MX	40 MX	40 MX		
LL			10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN		
PI			6 MX	NP	4 MX		8 MX	12 MX	16 MX	NO MX		
GROUP INDEX	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 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												

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	
ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%	GRANULAR SOILS 2 - 3% 3 - 5% 5 - 10% > 10%
SILT - CLAY SOILS 3 - 5% 5 - 12% 12 - 20% > 20%	OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE
GROUND WATER	
	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
	STATIC WATER LEVEL AFTER 24 HOURS
	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 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 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

MISCELLANEOUS SYMBOLS			
	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		DIP & DIP DIRECTION OF ROCK STRUCTURES
	SOIL SYMBOL		TEST BORING
	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		AUGER BORING
	INFERRED SOIL BOUNDARY		CORE BORING
	INFERRED ROCK LINE		MONITORING WELL
	ALLUVIAL SOIL BOUNDARY		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	4	10	40	60	200	270	
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053	
BOULDER (BLDR.)							
COBBLE (COB.)							
GRAVEL (GR.)							
COARSE SAND (CSE, SD.)							
FINE SAND (F SD.)							
SILT (SL.)							
CLAY (CL.)							
GRAIN SIZE	305	75	2.0	0.25	0.05	0.005	
MM							
IN.	12	3					

RECOMMENDATION SYMBOLS		
	UNDERCUT	
	SHALLOW UNDERCUT	

SOIL MOISTURE - CORRELATION OF TERMS		
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT PL - PLASTIC LIMIT PI - PLASTICITY INDEX	- 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 - SHRINKAGE LIMIT	- 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	U - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	U _g - 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	SLL. - 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		
DRILL UNITS: <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"/> MOBILE B-29	ADVANCING TOOLS: <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 type="checkbox"/> TRICONE _____ * TUNG-CARB. <input type="checkbox"/> CORE BIT	HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> -N _____ HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST

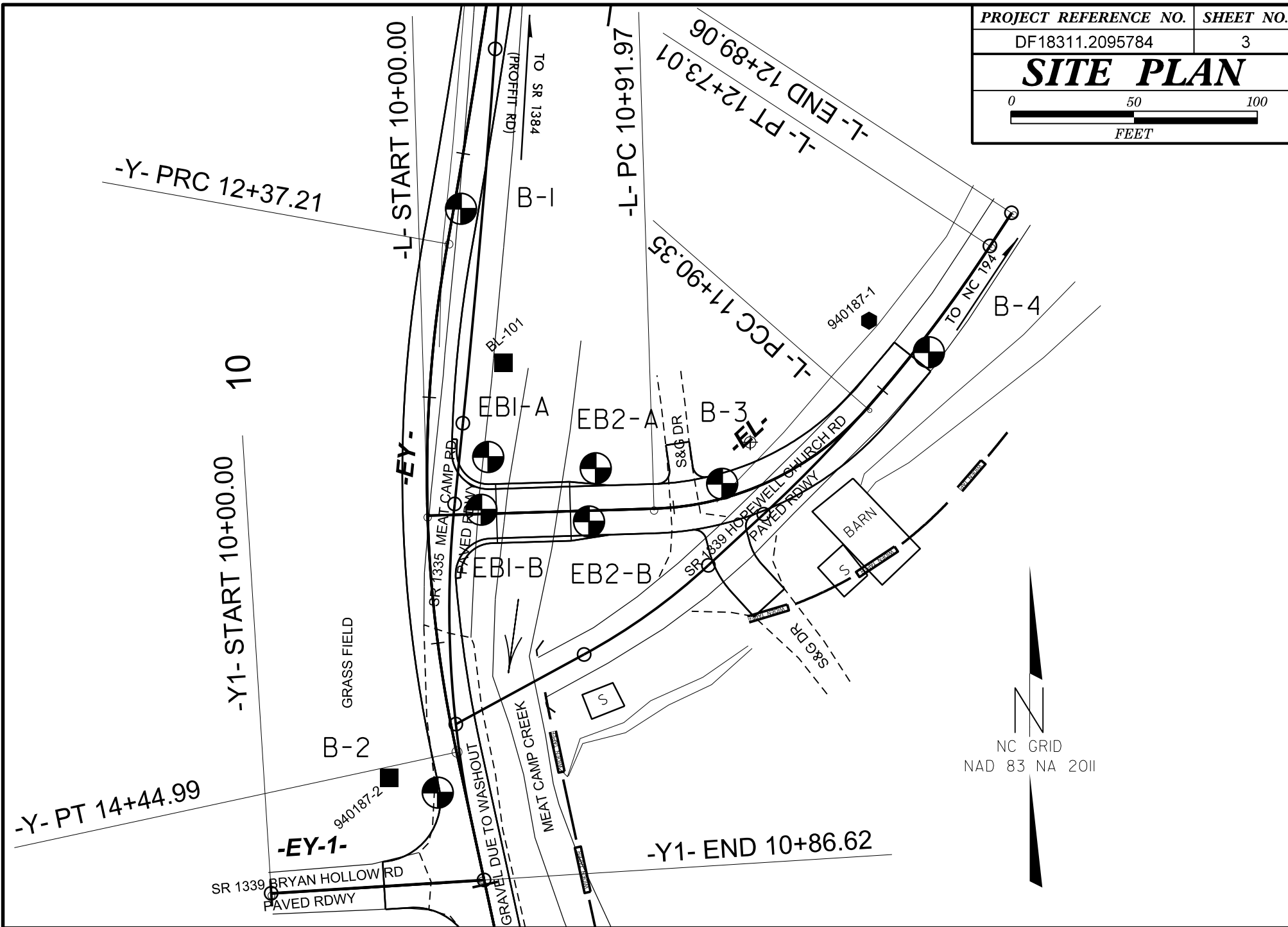
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ROCK DESCRIPTION		TERMS AND DEFINITIONS							
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS 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>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, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - 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 (SROD) - 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, WOULD YIELD 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 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 < 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 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.</p>								
<p>SOFT</p>	<p>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.</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 FINGERNAIL.</p>								
FRACTURE SPACING		BEDDING							
<p>TERM</p>	<p>SPACING</p>	<p>TERM</p>	<p>THICKNESS</p>						
<p>VERY WIDE</p>	<p>MORE THAN 10 FEET</p>	<p>VERY THICKLY BEDDED</p>	<p>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 FOOT</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>< 0.008 FEET</p>						
INDURATION									
<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:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 80%; border: none;"></td> <td style="width: 10%; border: none; text-align: center;">ELEVATION:</td> <td style="width: 10%; border: none;"></td> </tr> <tr> <td style="border: none;"></td> <td style="border: none; text-align: center;">FEET</td> <td style="border: none;"></td> </tr> </table>					ELEVATION:			FEET	
	ELEVATION:								
	FEET								
<p>NOTES: ROADWAY DESIGN FILES PROVIDED BY VHB DATED FEBRUARY 2025. BRIDGE BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX-7 (SURVEY GRADE GPS). FIAD = FILLED IMMEDIATELY AFTER DRILLING</p>									
<p>DATE: 8-15-14</p>									

PROJECT REFERENCE NO.	SHEET NO.
DF18311.2095784	3
SITE PLAN	



NC GRID
 NAD 83 NA 2011

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784		TIP N/A		COUNTY WATAUGA		GEOLOGIST R. Welch										
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek							GROUND WTR (ft)									
BORING NO. B-1		STATION 12+22		OFFSET 3 ft LT		ALIGNMENT -Y-	0 HR. 7.0									
COLLAR ELEV. 3,325.3 ft		TOTAL DEPTH 10.0 ft		NORTHING 936,047		EASTING 1,212,622	24 HR. FIAD									
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER M. Brewer		START DATE 03/07/25		COMP. DATE 03/07/25		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)	
3330																
3325	3,324.3	1.0	3	2	2										3,325.3	GROUND SURFACE 0.0
3320	3,321.8	3.5	12	14	20							M			3,322.3	ALLUVIAL Soft, Brown, Fine Sandy SILT (A-4), with trace gravel 3.0
	3,319.3	6.0	11	2	2							M				Loose to Dense, Gray-Brown, Fine to Coarse Gravelly SAND (A-1-b)
	3,316.8	8.5	1	2	3							W			3,317.3	8.0
												Sat.			3,315.3	RESIDUAL Medium Stiff, Orange, Fine Sandy SILT (A-4) 10.0 Boring Terminated at Elevation 3,315.3 ft in Residual Sandy SILT (A-4)

NCDOT BORE SINGLE GEO_BRDG187_GTM.GPJ NC_DOT_GDT_5/28/25

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784	TIP N/A	COUNTY WATAUGA	GEOLOGIST R. Welch
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 10+25	OFFSET 23 ft LT	ALIGNMENT -L-
COLLAR ELEV. 3,323.0 ft	TOTAL DEPTH 44.5 ft	NORTHING 935,946	EASTING 1,212,633
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic
DRILLER M. Brewer	START DATE 03/07/25	COMP. DATE 03/07/25	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)	
3325															3,323.0	0.0
	3,323.0	0.0	2	13	7										3,323.0	
3320															3,320.5	2.5
	3,319.0	4.0	5	6	9										3,320.5	
3315															3,315.0	8.0
	3,314.0	9.0	1	2	3										3,315.0	
3310															3,310.5	12.5
	3,309.0	14.0	6	11	13										3,310.5	
3305																
	3,303.5	19.5	25	26	27											
3300																
	3,298.5	24.5	30	38	51											
3295																
	3,293.5	29.5	70	30/0.2											3,293.5	29.5
3290																
	3,288.5	34.5	8	13	14										3,290.0	33.0
3285																
	3,283.5	39.5	21	16	17											
3280																
	3,278.5	44.5	60/0.0												3,280.0	43.0
															3,278.5	44.5

NCDOT BORE SINGLE GEO_BRDG187_GTM.GPJ NC_DOT_GDT_5/28/25

Notes:
 Switch to Wash Rotary at 16.0'
 Boulders Encountered within RE and Alluvial soils from 1.5 - 8.0'
 Difficult drilling encountered at 27.3' and 43.0'

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784	TIP N/A	COUNTY WATAUGA	GEOLOGIST R. Welch
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 10+22	OFFSET 2 ft LT	ALIGNMENT -L-
COLLAR ELEV. 3,322.6 ft	TOTAL DEPTH 44.5 ft	NORTHING 935,925	EASTING 1,212,630
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic
DRILLER M. Brewer	START DATE 03/07/25	COMP. DATE 03/07/25	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							
3325																	
	3,322.6	0.0													3,322.6	GROUND SURFACE	0.0
3320			4	5	7								M		ALLUVIAL Medium Dense, Brown-Gray, Fine to Coarse Gravelly SAND (A-1-b), with trace organics		
	3,318.1	4.5											W				
3315			9	10	10										RESIDUAL Soft, Orange-Tan, Fine Sandy SILT (A-4)		
	3,313.1	9.5	1	1	2								W				
3310			1	1	2										Very Stiff, Orange-Red, SILT (A-5)		
	3,308.1	14.5	6	10	14								M				
3305			6	10	14										Hard, Gray-Orange-White, Fine Sandy SILT (A-4)		
	3,303.1	19.5	7	12	22								M				
3300			7	12	22										Hard, Black-White, SILT (A-5)		
	3,298.1	24.5	17	25	46								M				
3295			17	25	46										Hard, Brown-Black, Fine Sandy SILT (A-4)		
	3,293.1	29.5	12	16	27								M				
3290			12	16	27										WEATHERED ROCK Gray-White, (Granitic Gneiss)		
	3,288.1	34.5	16	20	43								M				
3285			16	20	43										Boring Terminated with Standard Penetration Test Refusal at Elevation 3,278.1 ft On Crystalline Rock (Granitic Gneiss)		
	3,283.1	39.5	7	93/0.3													
3280			7	93/0.3											Notes: Boulders Encountered within Alluvial soils from 2.0 - 8.0'		
	3,278.1	44.5	60/0.0														

NCDOT BORE SINGLE GEO_BRDC187_GTM.GPJ_NC_DOT.GDT_5/28/25

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784	TIP N/A	COUNTY WATAUGA	GEOLOGIST R. Welch
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 10+69	OFFSET 17 ft LT	ALIGNMENT -L-
COLLAR ELEV. 3,323.5 ft	TOTAL DEPTH 35.2 ft	NORTHING 935,941	EASTING 1,212,677
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. Brewer	START DATE 03/06/25	COMP. DATE 03/06/25	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							
3325																	
	3,322.5	1.0													3,323.5	GROUND SURFACE	0.0
	3,320.0	3.5	3	3	1									M	3,320.5	ALLUVIAL Soft, Brown-Orange, Fine Sandy CLAY (A-6), with trace gravel and organics	3.0
	3,317.5	6.0	11	17	11									M		Medium Dense to Very Dense, Brown-Black, Fine to Coarse Gravelly SAND (A-1-b), with trace organics	
	3,315.0	8.5	18	38	30									W	3,315.5	RESIDUAL	8.0
	3,310.0	13.5	17	6	3									M		Medium Stiff to Stiff, Orange-Tan, SILT (A-5)	
	3,305.0	18.5	2	3	5									M	3,306.0	Loose, Orange-Tan, Silty Fine SAND (A-2-4)	17.5
	3,300.0	23.5	1	2	3									M	3,301.0	Medium Stiff to Stiff, Orange-Brown-Gray, Fine Sandy SILT (A-4)	22.5
	3,295.0	28.5	2	3	3									M			
	3,290.0	33.5	5	5	9									M	3,292.0	WEATHERED ROCK	31.5
	3,288.3	35.2	100/0.4												3,288.3	Orange-Tan, (Granitic Gneiss)	35.2
			60/0.0													Boring Terminated with Standard Penetration Test Refusal at Elevation 3,288.3 ft On Crystalline Rock (Granitic Gneiss)	

NCDOT BORE SINGLE GEO_BRDG187_GTM.GPJ NC_DOT_GDT_5/28/25

Notes:
Boulders Encountered within Alluvial soils
from 2.0 - 8.0'
Difficult drilling encountered at 31.5'

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784	TIP N/A	COUNTY WATAUGA	GEOLOGIST R. Welch
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 10+65	OFFSET 4 ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,322.4 ft	TOTAL DEPTH 40.5 ft	NORTHING 935,920	EASTING 1,212,674
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. Brewer	START DATE 03/06/25	COMP. DATE 03/06/25	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							
3325																	
	3,321.4	1.0	2	1	3										3,322.4	GROUND SURFACE	0.0
3320	3,318.9	3.5	10	14	14										3,319.4	ALLUVIAL Loose, Brown, Silty Fine SAND (A-2-4), with trace gravel	3.0
	3,316.4	6.0	28	29	23											Medium Dense to Very Dense, Brown-Orange-Black, Fine to Coarse Gravelly SAND (A-1-b)	
3315	3,313.9	8.5	2	0	1										3,314.4	RESIDUAL Very Soft to Very Stiff, White-Orange-Tan-Red-Black, Fine Sandy SILT (A-4)	8.0
3310	3,308.9	13.5	1	1	5												
3305	3,303.9	18.5	7	3	2												
3300	3,298.9	23.5	10	9	10												
3295	3,293.9	28.5	8	10	20										3,295.4	Medium Dense, Gray-White, Silty Fine SAND (A-2-4)	27.0
3290	3,288.9	33.5	35	60	40/0.1										3,288.4	WEATHERED ROCK Brown-Black, (Granitic Gneiss)	34.0
3285	3,283.9	38.5															
	3,282.4	40.0	11	89/0.3											3,282.0	CRYSTALLINE ROCK (Granitic Gneiss)	40.4
	3,282.0	40.4	100/0.4												3,281.9		40.5
			60/0.1														

NCDOT BORE SINGLE GEO_BRDC187_GTM.GPJ NC_DOT.GDT 5/28/25

Notes:
Boulders Encountered within Alluvial soils from 2.0 - 8.0'
Difficult drilling encountered at 32.5'

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784		TIP N/A		COUNTY WATAUGA		GEOLOGIST R. Welch											
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek							GROUND WTR (ft)										
BORING NO. B-3		STATION 11+22		OFFSET 6 ft LT		ALIGNMENT -L-	0 HR. 4.0										
COLLAR ELEV. 3,323.2 ft		TOTAL DEPTH 10.0 ft		NORTHING 935,935		EASTING 1,212,728	24 HR. 3.4										
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Brewer		START DATE 03/06/25		COMP. DATE 03/06/25		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							
3325																	
	3,322.2	1.0													3,323.2	GROUND SURFACE	0.0
3320	3,319.7	3.5	2	6	9	15							M		3,320.2	ALLUVIAL Medium Dense, Brown, Silty Fine SAND (A-2-4), with trace gravel and organics	3.0
	3,317.2	6.0	11	11	11	22							M			Medium Dense to Dense, Brown-Gray-Orange, Fine to Coarse Gravelly SAND (A-1-b)	
3315	3,314.7	8.5	22	17	25	42							Sat.		3,315.2		8.0
			5	5	15	20							M		3,313.2	RESIDUAL Medium Dense, Orange-Brown, Silty Fine SAND (A-2-4)	10.0
																Boring Terminated at Elevation 3,313.2 ft In Residual Silty SAND (A-2-4)	

NCDOT BORE SINGLE GEO_BRDG187_GTM.GPJ NC_DOT_GDT_5/28/25

GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18311.2095784		TIP N/A		COUNTY WATAUGA		GEOLOGIST R. Welch											
SITE DESCRIPTION Bridge No. 187 on SR 1339 (Hopewell Church Road) over Meat Camp Creek							GROUND WTR (ft)										
BORING NO. B-4		STATION 12+24		OFFSET 5 ft RT		ALIGNMENT -L-	0 HR. 3.7										
COLLAR ELEV. 3,325.8 ft		TOTAL DEPTH 10.0 ft		NORTHING 935,989		EASTING 1,212,812	24 HR. FIAD										
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Brewer		START DATE 03/06/25		COMP. DATE 03/06/25		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							
3330																	
3325	3,324.8	1.0	20	7	3										3,325.8	GROUND SURFACE	0.0
															3,324.8	ROADWAY EMBANKMENT Asphalt (0.4'), ABC (0.6')	1.0
	3,322.3	3.5	8	14	12											ALLUVIAL Loose to Medium Dense, Brown-Gray-Orange, Fine to Coarse Sandy GRAVEL (A-1-a)	5.5
3320	3,319.8	6.0	5	9	9										3,320.3	Medium Dense, Brown-Gray, Silty Fine SAND (A-2-4), with trace gravel	8.0
	3,317.3	8.5	16	16	11										3,317.8	Medium Dense, Black-Tan, Fine to Coarse Gravelly SAND (A-1-b)	10.0
															3,315.8	Boring Terminated at Elevation 3,315.8 ft In Alluvial Gravelly SAND (A-1-b)	

NCDOT BORE SINGLE GEO_BRDC187_GTM.GPJ NC_DOT_GDT_5/28/25

PROJECT REFERENCE NO.	SHEET NO.
DF18311.2095784	12

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
B-2	SS-35	11' RT	14+59 -L-	935810	1212613	1.0 - 2.5	A-1-a	NP	NP	41.7	34.2	18.1	6.0	40.5	28.9	11.9	14.6	ND
B-4	SS-1	5' RT	12+24 -L-	935989	1212812	1.0 - 2.5	A-1-a	19	4	42.3	30.7	21.0	6.0	38.6	27.1	12.4	9.0	ND



 AUTHORIZED SIGNATURE
 NCDOT CERT NO. 130-04-0212

Prepared in the Office of:
 F&ME CONSULTANTS, INC.
 COLUMBIA, SOUTH CAROLINA
 NCDOT LAB CERT. NO. 130-0212

WBS: DF18311.2095784
BRIDGE NO. 187 ON SR 1339 (HOPEWELL CHURCH ROAD) OVER MEAT CAMP CREEK



PHOTO #1: VIEW FACING EAST TOWARD END BENT NO. 2 FROM THE VICINITY OF END BENT NO. 1.



PHOTO #2: VIEW FACING SOUTHEAST UPSTREAM OF DAMAGED BRIDGE NO. 187.