

REFERENCE: B-4775

PROJECT: 38546

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY MACON  
 PROJECT DESCRIPTION BRIDGE NO. 17 ON SR 1309  
(CRAWFORD RD.) OVER WAYAH CREEK

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-9	BORE LOGS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4775	1	10

**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:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
  2. 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.

PERSONNEL

S&ME, Inc.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

INVESTIGATED BY R.E. KRAL  
 DRAWN BY J.R. SWARTLEY  
 CHECKED BY S.S. LANEY  
 SUBMITTED BY R.E. KRAL  
 DATE MAY 2017



DocuSigned by:  
Robert E Kral 02/22/2018  
 8F44867067294AF...  
 SIGNATURE DATE

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION					ROCK DESCRIPTION					TERMS AND DEFINITIONS				
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 208, 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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										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.					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 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: WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)					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 DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (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.				
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b>					<b>WEATHERING</b>									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.					FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.									
<b>MINERALOGICAL COMPOSITION</b>										<b>COMPRESSION</b>					<b>PERCENTAGE OF MATERIAL</b>									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50					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									
<b>GROUND WATER</b>										<b>MISCELLANEOUS SYMBOLS</b>					<b>ROCK HARDNESS</b>									
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										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 SPT DMT 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					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 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. 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 FINGER NAIL.				
<b>TEXTURE OR GRAIN SIZE</b>										<b>RECOMMENDATION SYMBOLS</b>					<b>FRACTURE SPACING</b>					<b>BEDDING</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										UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK					VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET					VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET				
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>ABBREVIATIONS</b>					<b>INDURATION</b>									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA - MICACEOUS WEA. - WEATHERED CL. - CLAY MOD. - MODERATELY NP - NON PLASTIC U - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC W - DRY UNIT WEIGHT CSE - COARSE ORG. - ORGANIC PMT - PRESSUREMETER TEST DPT - DILATOMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY e - VOID RATIO SL. - SILTY, SILTY F - FINE FOSS. - FOSSILIFEROUS TCR - TRICONE REFUSAL FRAC. - FRACTURED, FRACTURES W - MOISTURE CONTENT FRAGS. - FRAGMENTS w - MOISTURE CONTENT HI. - HIGHLY V - VERY					S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO					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.				
<b>PLASTICITY</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>														
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC										DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -H -N Q2 HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST														
<b>COLOR</b>																								
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																								

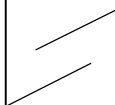
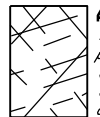
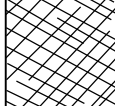

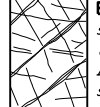



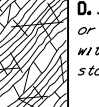

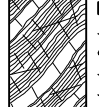

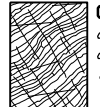

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

**SUBSURFACE INVESTIGATION**

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

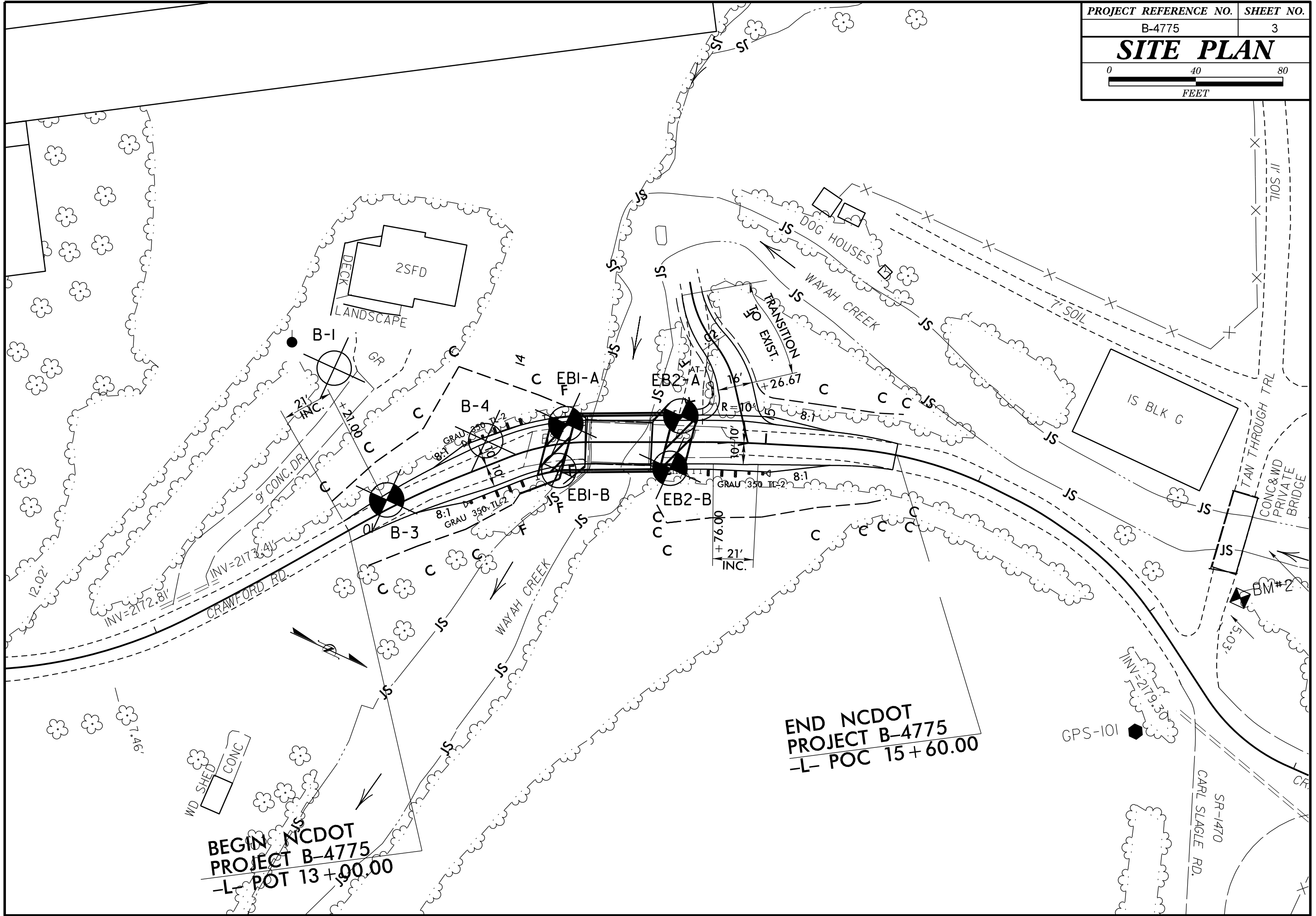
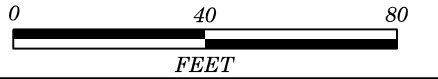
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	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.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		70						
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80					<i>A. Thick bedded, very blocky sandstone</i> 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.	60	A					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70							50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60								40			
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			50								30		
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes			40									20	
				30			<i>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.</i>							10
				20										
				10										
		N/A	N/A											

→ Means deformation after tectonic disturbance

SITE PLAN



BEGIN NCDOT PROJECT B-4775 -L- POT 13+00.00

END NCDOT PROJECT B-4775 -L- POC 15+60.00

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 14+09		OFFSET 9 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,177.5 ft		TOTAL DEPTH 15.5 ft		NORTHING 541,398		EASTING 658,583									
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER Contract Driller		START DATE 05/19/17		COMP. DATE 05/19/17		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					
2180															
2175	2,174.0	3.5	8	23	770.4									2,177.5	0.0
														2,173.5	4.0
2170														2,170.8	6.7
2165														2,162.0	15.5

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

## CORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist						
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)					
BORING NO. EB1-A		STATION 14+09		OFFSET 9 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 2,177.5 ft		TOTAL DEPTH 15.5 ft		NORTHING 541,398		EASTING 658,583						
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Contract Driller		START DATE 05/19/17		COMP. DATE 05/19/17		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2			TOTAL RUN 8.8 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2170.82												
2170	2,170.8	6.7	3.8	1:36/0.8 1:50/1.0 1:50/1.0	(3.8) 100%	(3.5) 92%					Begin Coring @ 6.7 ft <b>CRYSTALLINE ROCK</b>	6.7
2165	2,167.0	10.5	5.0	1:50/1.0 2:00/1.0 1:45/1.0 1:30/1.0 1:45/1.0 2:15/1.0	(4.9) 98%	(4.9) 98%					GRAY AND BLACK, FRESH TO SLIGHTLY WEATHERED, VERY HARD TO HARD, CLOSE TO WIDE FRACTURE SPACING, BIOTITE GNEISS	
	2,162.0	15.5									REC = 99% RQD = 96% GSI = 80-85	
											Boring Terminated at Elevation 2,162.0 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	15.5
											1) Gravel Encountered at Ground Surface Elevation (3")	

NCDOT CORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist										
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 14+03		OFFSET 12 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,177.6 ft		TOTAL DEPTH 3.0 ft		NORTHING 541,404		EASTING 658,604										
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		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						
2180														2,177.6	0.0	GROUND SURFACE
2175														2,174.6	3.0	ROADWAY EMBANKMENT TAN AND BROWN, SILTY SAND
																Boring Terminated BY AUGER REFUSAL at Elevation 2,174.6 ft ON BIOTITE GNEISS (CRYSTALLINE ROCK)
																1) Gravel Encountered at Ground Surface Elevation (3")

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist										
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 14+61		OFFSET 12 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,176.7 ft		TOTAL DEPTH 19.0 ft		NORTHING 541,445		EASTING 658,558										
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		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						
2180														2,176.7	0.0	GROUND SURFACE
2175														2,174.6	3.0	ROADWAY EMBANKMENT (PAVEMENT) BROWN, SILTY SAND
														2,170.7	6.0	RESIDUAL BROWN AND TAN, CLAYEY SAND
														2,168.2	8.5	
														2,163.2	13.5	
														2,158.2	18.5	
														2,157.7	19.0	WEATHERED ROCK (BIOTITE GNEISS) CRYSTALLINE ROCK (BIOTITE GNEISS)
																Boring Terminated BY AUGER REFUSAL at Elevation 2,157.7 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)								
BORING NO. EB2-B		STATION 14+56		OFFSET 12 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,177.4 ft		TOTAL DEPTH 25.4 ft		NORTHING 541,450		EASTING 658,582									
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER Contract Driller		START DATE 05/22/17		COMP. DATE 05/22/17		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					
2180															
2175	2,173.9	3.5	2	2	2									2,177.4	GROUND SURFACE (PAVEMENT)
2170	2,168.9	8.5	6	3	2									2,170.4	ROADWAY EMBANKMENT BROWN, SILTY SAND
2165	2,163.9	13.5	6	13	21									2,170.4	RESIDUAL BROWN AND TAN, SANDY SILT
2160														2,159.9	CRYSTALLINE ROCK GRAY AND BLACK, FRESH TO VERY SEVERELY WEATHERED, VERY HARD TO HARD, CLOSE FRACTURE SPACING, BIOTITE GNEISS
2155														2,152.0	CRYSTALLINE ROCK GRAY AND BLACK, FRESH TO VERY SEVERELY WEATHERED, VERY HARD TO HARD, CLOSE FRACTURE SPACING, BIOTITE GNEISS
														2,152.0	REC = 92% RQD = 73% GSI = 55-60 Boring Terminated at Elevation 2,152.0 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

# CORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist						
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)					
BORING NO. EB2-B		STATION 14+56		OFFSET 12 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,177.4 ft		TOTAL DEPTH 25.4 ft		NORTHING 541,450		EASTING 658,582						
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Contract Driller		START DATE 05/22/17		COMP. DATE 05/22/17		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2			TOTAL RUN 7.9 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2159.9	2,159.9	17.5	2.9	1:30/0.9 1:45/1.0 1:45/1.0	(2.9) 100%	(2.5) 86%					Begin Coring @ 17.5 ft	
2155	2,157.0	20.4	5.0	1:00/1.0 1:15/1.0 1:15/1.0	(4.4) 88%	(3.3) 66%					CRYSTALLINE ROCK GRAY AND BLACK, FRESH TO VERY SEVERELY WEATHERED, VERY HARD TO HARD, CLOSE FRACTURE SPACING, BIOTITE GNEISS	17.5
	2,152.0	25.4									REC = 92% RQD = 73% GSI = 55-60	25.4
											Boring Terminated at Elevation 2,152.0 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	

NCDOT CORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)								
BORING NO. B-1		STATION 13+27		OFFSET 69 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,201.7 ft		TOTAL DEPTH 10.0 ft		NORTHING 541,291		EASTING 658,604									
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		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					
2205															
2200														2,201.7 GROUND SURFACE 0.0	
														2,200.7 ROADWAY EMBANKMENT 1.0	
														2,195.7 ROADWAY EMBANKMENT BROWN, SILTY SAND 1.0	
														2,191.7 CRYSTALLINE ROCK 10.0	
2195														2,191.7 GRAY AND BLACK, MODERATELY TO COMPLETELY WEATHERED, HARD TO SOFT, CLOSE FRACTURE SPACING, BIOTITE GNEISS 10.0	
														REC = 83% RQD = 21% GSI = 25-30	
														Boring Terminated at Elevation 2,191.7 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	
														1) Gravel Encountered at Ground Surface Elevation (1")	

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

# CORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist						
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)					
BORING NO. B-1		STATION 13+27		OFFSET 69 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 2,201.7 ft		TOTAL DEPTH 10.0 ft		NORTHING 541,291		EASTING 658,604						
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2			TOTAL RUN 9.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2200.7	2,200.7	1.0	5.0	2:30/1.0 1:00/1.0 1:00/1.0 1:00/1.0	(3.7) 74%	(0.0) 0%					Begin Coring @ 1.0 ft	
	2,195.7	6.0	4.0	1:30/1.0 1:00/1.0 1:00/1.0	(3.8) 95%	(1.9) 48%					CRYSTALLINE ROCK GRAY AND BLACK, MODERATELY TO COMPLETELY WEATHERED, HARD TO SOFT, CLOSE FRACTURE SPACING, BIOTITE GNEISS	1.0
	2,191.7	10.0									REC = 83% RQD = 21% GSI = 25-30	
											Boring Terminated at Elevation 2,191.7 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	10.0
											1) Gravel Encountered at Ground Surface Elevation (1")	

NCDOT CORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17



# GEOTECHNICAL BORING REPORT BORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)								
BORING NO. B-3		STATION 13+22		OFFSET 4 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,176.4 ft		TOTAL DEPTH 10.5 ft		NORTHING 541,338		EASTING 658,649									
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		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					
2180															
2175														2,176.4	0.0
2170	2,172.9	3.5		2	2	3								2,170.9	5.5
														2,165.9	10.5

# CORE LOG

WBS 38546.1.1		TIP B-4775		COUNTY MACON		GEOLOGIST Contract Geologist						
SITE DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							GROUND WTR (ft)					
BORING NO. B-3		STATION 13+22		OFFSET 4 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 2,176.4 ft		TOTAL DEPTH 10.5 ft		NORTHING 541,338		EASTING 658,649						
DRILL RIG/HAMMER EFF./DATE SME6573 CME-550 77% 05/16/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Contract Driller		START DATE 05/18/17		COMP. DATE 05/18/17		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2			TOTAL RUN 5.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2170.9												
2170	2,170.9	5.5	5.0	2:00/1.0 2:00/1.0 1:45/1.0 2:00/1.0 2:00/1.0	(4.9) 98%	(3.0) 60%					Begin Coring @ 5.5 ft <b>CRYSTALLINE ROCK</b> GRAY AND BLACK, FRESH TO SLIGHTLY WEATHERED, VERY HARD TO HARD, MODERATELY CLOSE FRACTURE SPACING, BIOTITE GNEISS	5.5
	2,165.9	10.5									REC = 98% RQD = 60% GSI = 55-60 Boring Terminated at Elevation 2,165.9 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	10.5

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

NCDOT CORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

**GEOTECHNICAL BORING REPORT  
BORE LOG**

**CORE LOG**

<b>WBS</b> 38546.1.1		<b>TIP</b> B-4775		<b>COUNTY</b> MACON		<b>GEOLOGIST</b> Contract Geologist										
<b>SITE DESCRIPTION</b> BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B-4		<b>STATION</b> 13+74		<b>OFFSET</b> 11 ft LT		<b>ALIGNMENT</b> -L-										
<b>COLLAR ELEV.</b> 2,178.1 ft		<b>TOTAL DEPTH</b> 10.5 ft		<b>NORTHING</b> 541,368		<b>EASTING</b> 658,605										
<b>DRILL RIG/HAMMER EFF./DATE</b> SME6573 CME-550 77% 05/16/2017			<b>DRILL METHOD</b> H.S. Augers			<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> Contract Driller		<b>START DATE</b> 05/18/17		<b>COMP. DATE</b> 05/18/17		<b>SURFACE WATER DEPTH</b> 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)	
2180																
														2,178.1	GROUND SURFACE	0.0
														2,176.9	<b>ROADWAY EMBANKMENT</b> BROWN, SILTY SAND	1.2
2175															<b>CRYSTALLINE ROCK</b> GRAY AND BLACK, SLIGHTLY TO MODERATELY WEATHERED, HARD, CLOSE FRACTURE SPACING, BIOTITE GNEISS	
															REC = 94% RQD = 29% GSI = 35-40	
2170														2,167.6	Boring Terminated BY AUGER REFUSAL at Elevation 2,167.6 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)	10.5
															1) Gravel Encountered at Ground Surface Elevation (3")	

NCDOT BORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17

<b>WBS</b> 38546.1.1		<b>TIP</b> B-4775		<b>COUNTY</b> MACON		<b>GEOLOGIST</b> Contract Geologist						
<b>SITE DESCRIPTION</b> BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK							<b>GROUND WTR (ft)</b>					
<b>BORING NO.</b> B-4		<b>STATION</b> 13+74		<b>OFFSET</b> 11 ft LT		<b>ALIGNMENT</b> -L-						
<b>COLLAR ELEV.</b> 2,178.1 ft		<b>TOTAL DEPTH</b> 10.5 ft		<b>NORTHING</b> 541,368		<b>EASTING</b> 658,605						
<b>DRILL RIG/HAMMER EFF./DATE</b> SME6573 CME-550 77% 05/16/2017			<b>DRILL METHOD</b> H.S. Augers			<b>HAMMER TYPE</b> Automatic						
<b>DRILLER</b> Contract Driller		<b>START DATE</b> 05/18/17		<b>COMP. DATE</b> 05/18/17		<b>SURFACE WATER DEPTH</b> N/A						
<b>CORE SIZE</b> NQ2		<b>TOTAL RUN</b> 9.3 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			ELEV. (ft)
											Begin Coring @ 1.2 ft	
	2,176.9	1.2	4.3	0:20/0.3 1:00/1.0 1:00/1.0 1:00/1.0	(3.7) 86%	(0.8) 19%					2,176.9	<b>CRYSTALLINE ROCK</b> GRAY AND BLACK, SLIGHTLY TO MODERATELY WEATHERED, HARD, CLOSE TO WIDE FRACTURE SPACING, BIOTITE GNEISS
2175												REC = 94% RQD = 29% GSI = 35-40
		5.5										
			5.0	1:15/1.0 1:00/1.0 1:00/1.0 0:45/1.0 1:00/1.0	(5.0) 100%	(1.9) 38%						
2170											2,167.6	Boring Terminated BY AUGER REFUSAL at Elevation 2,167.6 ft IN BIOTITE GNEISS (CRYSTALLINE ROCK)
												1) Gravel Encountered at Ground Surface Elevation (3")

NCDOT CORE DOUBLE B4775\_GEO\_BRDG\_SPT\_BORINGS.GPJ NC\_DOT.GDT 6/2/17