

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.14.R.155 F.A. PROJ. N/A
 COUNTY MACON
 PROJECT DESCRIPTION DIVISION 14 - LOW IMPACT BRIDGE
REPLACEMENT PROGRAM
 SITE DESCRIPTION BRIDGE NO. 550231 ON SR 1001
(ELLIJAY ROAD) OVER NORTH PRONG ELLIJAY CREEK.

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PERSONNEL

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INVESTIGATED BY STV ENGINEERS
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 SUBMITTED BY STV ENGINEERS
 DATE JULY, 2017

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DRAWN BY: J. SKYTТА, P.E.



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

SOIL LEGEND AND AASHTO CLASSIFICATION												
GENERAL CLASS.	GRANULAR MATERIALS (<= 30% PASSING #200)				SILT-CLAY MATERIALS (> 30% 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	A-6, A-7		
SYMBOL												
% PASSING	100				75				60			
48	100				75				60			
200	100				75				60			
LIQUID LIMIT	≤ 40				40 - 50				≥ 50			
PLASTIC INDEX	≤ 6				6 - 10				≥ 10			
GROUP INDEX	0				0 - 10				≥ 10			
USUAL TYPE OF MAJOR MATERIALS	SAND		FINE SAND		SILT OR CLAYEY GRAVEL AND SAND		SILT SOILS		CLAYEY SOILS		MUCK, PEAT	
BEHAVIOR AS A SURFACE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR			

PI OF A-7-B SUBGROUP IS ≤ LL - 30 ; PI OF A-7-C SUBGROUP IS > LL - 30

GRADATION			
WELL-GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.			
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. ALSO POORLY GRADED.			
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.			
ANGULARITY OF GRAINS			
THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.			
MINERALOGICAL COMPOSITION			
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, ILLITE, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.			
COMPRESSIBILITY			
SLIGHTLY COMPRESSIBLE		LIQUID LIMIT LESS THAN 30	
MODERATELY COMPRESSIBLE		LIQUID LIMIT EQUAL TO 31-50	
HIGHLY COMPRESSIBLE		LIQUID LIMIT GREATER THAN 50	
PERCENTAGE OF MATERIAL			
ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	>10%	>20%	HIGHLY
			30% 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 (SPT-BLUE)	RANGE OF UNCOMFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	44 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	0-2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

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

TEXTURE OR GRAIN SIZE						
U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.75	2.00	0.425	0.25	0.075	0.053
BOULDER (BLR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSF. SD.)	FINE SAND (F. SD.)	SILT (SL.)	CLAY (CL.)
GRAIN SIZE	MM 305 IN 12	75 3	2.0	0.25	0.05	0.005

ABBREVIATIONS		
AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED
CL - CLAY	MOL. - MODERATELY	W - UNIT WEIGHT
CPT - CORE PENETRATION TEST	NP - NON PLASTIC	W _d - DRY UNIT WEIGHT
CSE - COARSE	ORG. - ORGANIC	
DNT - 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. - SILTY, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL
FRAG. - FRAGMENTS	w - MOISTURE CONTENT	CR - CALIFORNIA BEARING RATIO
HL - HIGHLY	V - VERY	

SOIL MOISTURE - CORRELATION OF TERMS		
SOIL MOISTURE SCALE (WATERBURY LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL 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
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

EQUIPMENT USED ON SUBJECT PROJECT		
DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> MOBILE B-___	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input type="checkbox"/> BK-SH	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input type="checkbox"/> CHE-40C	<input type="checkbox"/> 6" HOLLOW AUGERS	<input type="checkbox"/> 8"
<input type="checkbox"/> CHE-500	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> N-1-7/8"
<input type="checkbox"/> CHE-500	<input type="checkbox"/> TURC-CARBIDE INSERTS	<input type="checkbox"/> H-___
<input type="checkbox"/> PORTABLE MOIST	<input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
<input checked="" type="checkbox"/> CME-55	<input type="checkbox"/> TRICONE ___ " STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
<input type="checkbox"/> ___	<input type="checkbox"/> TRICONE ___ " TURC-CARB.	<input type="checkbox"/> HAND AUGER
	<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
	<input checked="" type="checkbox"/> 3-1/4" HSA	<input type="checkbox"/> VANE SHEAR TEST

PLASTICITY		
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH
LOW PLASTICITY	0-5	VERY LOW
MED. PLASTICITY	6-15	SLIGHT
HIGH PLASTICITY	16-25	MEDIUM
	26 OR MORE	HIGH
COLOR		
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STRAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		

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ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 50 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)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CPS)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SL)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SL)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD SEV)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLANK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i>
SEVERE (SEV)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF.</i>
VERY SEVERE (V SEV)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 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 DICES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HARD 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 HARD 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, HARD SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.50 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 FINGER NAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.5 TO 1 FEET
VERY CLOSE	LESS THAN 0.5 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.5 - 1.5 FEET
VERY THINLY BEDDED	0.25 - 0.5 FEET
THICKLY LAMINATED	0.005 - 0.25 FEET
THINLY LAMINATED	< 0.005 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRAGILE	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.

TERMS AND DEFINITIONS

ALLUVIUM (ALU): - 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, 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 PLANNAR 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 (RQD): - 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 INTRUSED 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 OFF 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 50 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SRC): - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD): - 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.

BENCH MARK: BL-2
ELEVATION: 2542.46 feet

NOTES:
Boring elevations determined by normal surveying techniques with reference to BL-2, Elev. 2542.46 feet.



Boring Locations

Bridge No. 550231
over N. Prong Ellijay Creek
on SR 1001 (Ellijay Rd.)
Macon Co., North Carolina

State Project No. 17BP.14.R.155



STV Engineers, Inc.

Scale: 1"= 40' (approx.)

Date: June 2017

Project: 4017927-1001

SHEET 3



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+46	OFFSET 4 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,542.4 ft	TOTAL DEPTH 11.2 ft	NORTHING 729,541	EASTING 558,812
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/22/16	COMP. DATE 06/22/16	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						
2545																
	2,541.4	1.0														
2540	2,538.9	3.5	1	1	1											
	2,536.4	6.0	1	2	3											
2535	2,533.9	8.5	1	2	6											
	2,531.2	11.2	3	7	13											
			50/0.0													

	<p style="text-align: center;">GROUND SURFACE 0.0</p> <p style="text-align: center;">PAVEMENT 0.6</p> <p style="text-align: center;">3 inches asphalt on 3 inches stone</p> <p style="text-align: center;">ROADWAY EMBANKMENT</p> <p style="text-align: center;">Very soft orange brown slightly clayey fine to medium sandy SILT, trace organics, fine gravel</p> <p style="text-align: center;">ROADWAY EMBANKMENT 6.0</p> <p style="text-align: center;">Soft dark brown fine to coarse sandy clayey SILT, with organics, fine gravel 6.5</p> <p style="text-align: center;">ARTIFICIAL FILL 7.5</p> <p style="text-align: center;">Wood</p> <p style="text-align: center;">RESIDUAL</p> <p style="text-align: center;">Medium dense brown silty fine to coarse SAND and FRAGMENTED ROCK</p> <p style="text-align: center;">Boring Terminated by Auger Refusal at Elevation 2,531.2 ft</p>
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NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 14+30	OFFSET 22 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,542.1 ft	TOTAL DEPTH 18.5 ft	NORTHING 729,527	EASTING 558,792
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/22/16	COMP. DATE 06/22/16	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)	
2545																
2540	2,541.1	1.0	2	2	2									2,542.1	0.0	GROUND SURFACE
	2,538.6	3.5	2	2	2									2,541.3	0.0	PAVEMENT 5 inches asphalt on 2 inches stone
2535	2,536.1	6.0	8	11	7									2,537.1	5.0	ROADWAY EMBANKMENT Soft dark brown slightly clayey fine to coarse sandy SILT, with fine gravel
	2,533.6	8.5	4	5	4											RESIDUAL Medium dense orange brown silty fine to coarse SAND, with rock pieces
2530	2,528.6	13.5	4	6	6									2,531.1	11.0	Medium dense brown white gray silty medium to coarse SAND
2525	2,523.6	18.5												2,523.6	18.5	Boring Terminated by Auger Refusal at Elevation 2,523.6 ft

NCDOT BORE SINGLE DIV 14 BR 231.GPJ NC DOT.GDT 4/5/17



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+10	OFFSET 5 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,543.6 ft	TOTAL DEPTH 8.1 ft	NORTHING 729,594	EASTING 558,836
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/22/16	COMP. DATE 06/22/16	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					
2545															
	2,542.6	1.0	2	1	2									GROUND SURFACE	0.0
	2,540.1	3.5	WOH	1	2						SS-1	M		PAVEMENT 4 inches asphalt on 2 inches stone	0.9
2540	2,537.6	6.0									SS-2	Sat.		ROADWAY EMBANKMENT Soft dark olive brown fine to medium sandy clayey SILT, with rock fragments	5.7
	2,535.5	8.1	50/0.4								SS-3	M		WEATHERED ROCK Weathered rock sampled as gray FRAGMENTED ROCK	8.1
			50/0.0											Boring Terminated by Auger Refusal at Elevation 2,535.5 ft	



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 14+91	OFFSET 23 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,543.3 ft	TOTAL DEPTH 8.5 ft	NORTHING 729,582	EASTING 558,814
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/22/16	COMP. DATE 06/22/16	SURFACE WATER DEPTH N/A

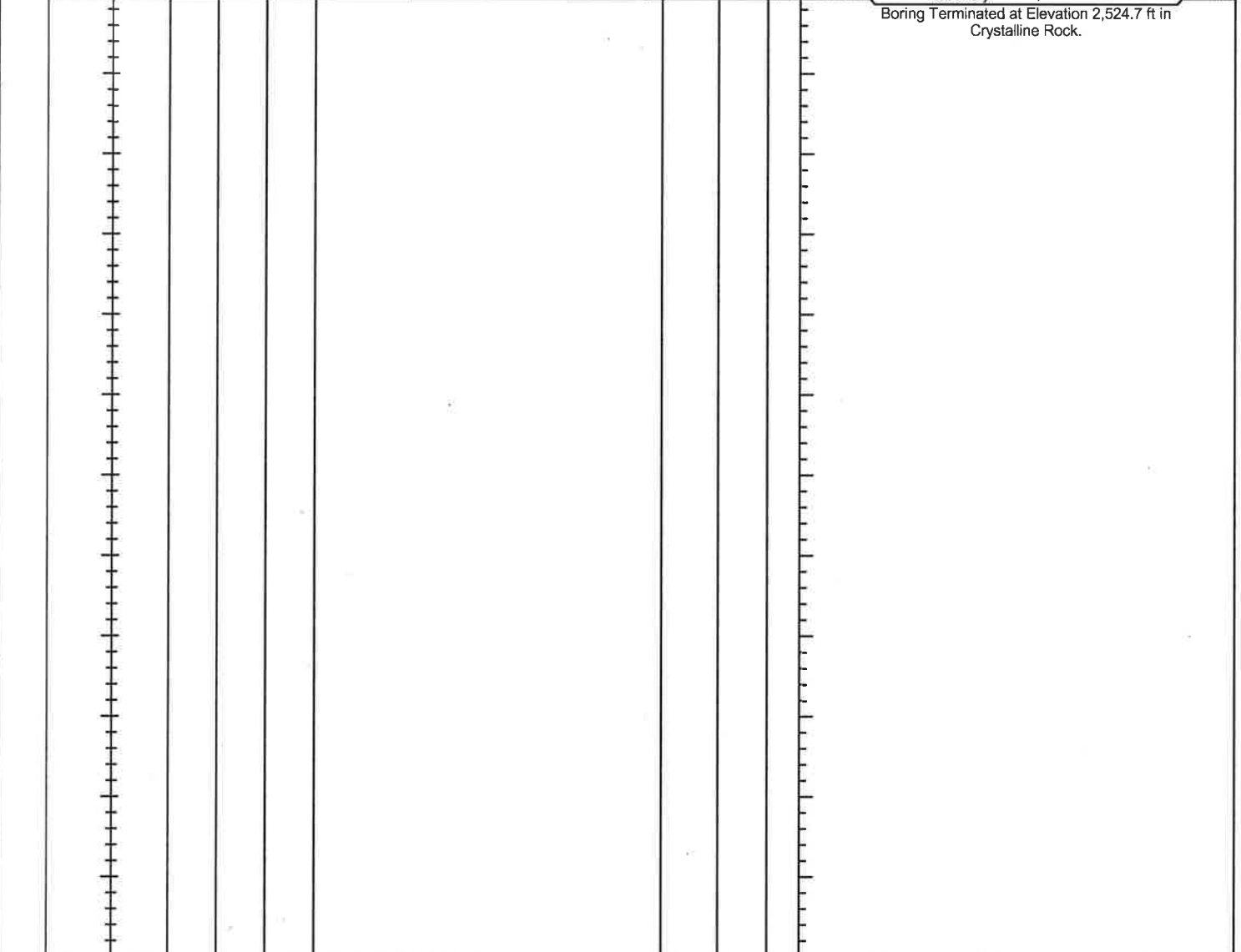
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2545															
	2542.3	1.0	6	8	6									GROUND SURFACE	0.0
	2539.8	3.5	3	3	10									PAVEMENT	0.5
2540	2537.3	6.0	4	2	2									ROADWAY EMBANKMENT	
	2534.8	8.5												Stiff orange brown fine to medium sandy clayey SILT	5.5
														ARTIFICIAL FILL	
2535														Wood	7.5
														WEATHERED ROCK	8.5
														Weathered rock sampled as gray FRAGMENTED ROCK	
														Boring Terminated by Auger Refusal at Elevation 2,534.8 ft	



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. RW-1	STATION 15+28	OFFSET 8 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,543.2 ft	TOTAL DEPTH 18.5 ft	NORTHING 729,603	EASTING 558,849
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 04/10/17	COMP. DATE 04/10/17	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)		
2545																	
	2542.2	1.0													2543.2	GROUND SURFACE	0.0
															2541.2	ROADWAY EMBANKMENT Brown slightly clayey silty fine to coarse SAND, intermixed with fragmented rock (SPT blowcount inflated due to rock pieces)	2.0
2540	2539.7	3.5	100	0.4							SS-1	M			2537.2	ROADWAY EMBANKMENT Dense brown gray slightly clayey silty fine to medium SAND, micaceous, some weathered rock pieces	6.0
	2537.2	6.0	15	15	22						SS-2	M			2534.7	RESIDUAL Dense dark gray slightly silty fine to coarse SAND, with weathered rock pieces	11.7
2535	2534.8	8.5	4	10	32						SS-3	M			2531.5	CRYSTALLINE ROCK Recovery = 82%, RQD = 43%	
			30	0.0							SS-4				2524.7	CRYSTALLINE ROCK Recovery = 73%, RQD = 19%	18.5
2530																	
2525																	





NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.14.R.155	TIP N/A	COUNTY Macon	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek			GROUND WTR (ft)
BORING NO. RW-1	STATION 15+28	OFFSET 8 ft LT	ALIGNMENT -L- 0 HR. 6.0
COLLAR ELEV. 2,543.2 ft	TOTAL DEPTH 18.5 ft	NORTHING 729,603	EASTING 558,849 24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 04/10/17	COMP. DATE 04/10/17	SURFACE WATER DEPTH N/A
CORE SIZE 1.875		TOTAL RUN 10.0 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) %	ROD (ft) %		REC. (ft) %	ROD (ft) %			
2534.7											Begin Coring @ 8.5 ft	
	2,534.7	8.5	3.0	2:24/1.0	(2.5)	(1.3)		(2.5)	(1.3)		2,534.7	8.5
	2,531.7	11.5		2:41/1.0 3:09/1.0	82%	43%		77%	41%		2,531.5	11.7
2530			5.0	2:05/1.0	(3.8)	(1.4)		(5.1)	(2.7)		2,531.5	
				2:08/1.0 2:21/1.0 3:15/1.0 4:08/1.0	76%	27%		75%	39%		2,524.7	18.5
2525	2,524.7	18.5	2.0	3:56/1.0 2:22/1.0	(1.3)	(0.0)		65%	0%			
											Boring Terminated at Elevation 2,524.7 ft in Crystalline Rock.	

NCDOT CORE SINGLE DIV 14 BR 231.GPJ NC_DOT.GDT 8/16/17

Cores Photographs

**Bridge No. 231 over N. Prong Ellijay Creek
on SR 1001 (Ellijay Rd.)
Macon County, North Carolina
(17BP.14.R.155)**

Boring RW-1 (Core Runs 1, 2 and 3)





NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.155		TIP N/A		COUNTY Macon		GEOLOGIST J. Skytta, PE										
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek							GROUND WTR (ft) 0 HR. 6.5 24 HR. FIAD									
BORING NO. RW-2		STATION 15+67		OFFSET 8 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,544.2 ft		TOTAL DEPTH 20.1 ft		NORTHING 729,625		EASTING 558,869										
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER AmeriDrill		START DATE 04/10/17		COMP. DATE 04/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
2545														2,544.2	0.0	GROUND SURFACE
	2,543.2	1.0	2	4	3											ROADWAY EMBANKMENT
	2,540.7	3.5	1	1	1						SS-1	M				Firm to very soft brown slightly clayey fine to coarse sandy SILT, with gravel, roots, wood
2540	2,538.2	6.0	2	10	16						SS-2	M				
	2,535.7	8.5	60	16	84/0.4						SS-3	D		2,538.2	6.0	RESIDUAL
2535	2,534.1	10.1	30/0.0								SS-4	M		2,534.7	9.5	Medium dense brown slightly silty medium to coarse SAND, with weathered rock pieces
														2,534.1	10.1	WEATHERED ROCK
																Sampled as brown slightly silty medium to coarse SAND, with weathered rock pieces
2530																CRYSTALLINE ROCK
																Recovery = 83%, RQD = 28%
2525														2,524.1	20.1	Boring Terminated at Elevation 2,524.1 ft in Crystalline Rock.



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.14.R.155				TIP N/A				COUNTY Macon				GEOLOGIST J. Skytta, PE			
SITE DESCRIPTION Bridge 550231 on SR 1001 (Ellijay Road) over N. Prong Ellijay Creek												GROUND WTR (ft)			
BORING NO. RW-2				STATION 15+67				OFFSET 8 ft LT				ALIGNMENT -L-		0 HR. 6.5	
COLLAR ELEV. 2,544.2 ft				TOTAL DEPTH 20.1 ft				NORTHING 729,625				EASTING 558,869		24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15								DRILL METHOD H.S. Augers				HAMMER TYPE Automatic			
DRILLER AmeriDrill				START DATE 04/10/17				COMP. DATE 04/10/17				SURFACE WATER DEPTH N/A			
CORE SIZE 1.875				TOTAL RUN 10.0 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)	DEPTH (ft)			
2534.1											Begin Coring @ 10.1 ft				
	2,534.1	10.1	5.0	N=30/0.0 03:11/1.0 02:48/1.0 03:30/1.0 02:05/1.0 02:25/1.0	(4.4) 88%	(1.8) 35%		(8.3) 83%	(2.8) 28%	CRYSTALLINE ROCK	2,534.1	10.1			
2530	2,529.1	15.1									Dark gray to black with light gray to white inclusions, intensely fractured, moderately soft, moderately weathered, medium to coarse grained BIOTITE GNEISS				
			5.0	02:41/1.0 03:34/1.0 03:50/1.0 03:42/1.0 03:50/1.0	(3.9) 78%	(1.0) 20%									
2525	2,524.1	20.1									2,524.1	20.1			
Boring Terminated at Elevation 2,524.1 ft in Crystalline Rock.															

NCDOT CORE SINGLE DIV 14 BR 231.GPJ NC_DOT_GDT 8/16/17

Cores Photographs

**Bridge No. 231 over N. Prong Ellijay Creek
on SR 1001 (Ellijay Rd.)
Macon County, North Carolina
(17BP.14.R.155)**

Boring RW-2 (Core Runs 1 and 2)

