

REFERENCE: SF-080197

PROJECT: 17BP.6.PE.1

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-080197	1	7

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY BLADEN

PROJECT DESCRIPTION BRIDGE NO. 197 ON -L-
(SR 1534) OVER KELLY CREEK

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-7	BORE LOGS

PERSONNEL
C.J. CORNETTE
S.N. ZIMARINO
J.M. EDMONDSON

INVESTIGATED BY T.C. BOTTOMS
DRAWN BY T.C. BOTTOMS
CHECKED BY D.N. ARGENBRIGHT
SUBMITTED BY D.N. ARGENBRIGHT
DATE JULY 2018

CAUTION NOTICE

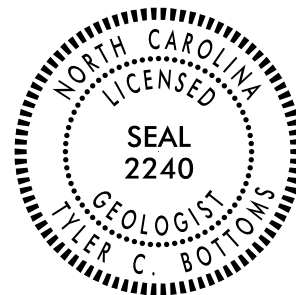
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING 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:

- 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.
- BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.



DocuSigned by:

Tyler Bottoms

7/31/2018

48A2D3BD086F3A6A

DATE

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

SF-080197

2

**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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

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-3	A-4, A-5	A-6, A-7				
SYMBOL															
% PASSING															
#10	50 MX	30 MX	50 MX	51 MN	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
#40	15 MX	25 MX	10 MX												
#200															
MATERIAL PASSING #40															
LL															
PI															
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 MX	NO MX							
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND												
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR						FAIR TO POOR	POOR	UNSATURABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

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

TEXTURE OR GRAIN SIZE

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
BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE, SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL		
PLASTIC RANGE (PI)		
PL		
OM		
SL		
	- 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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	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.

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	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

GROUND WATER

▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
▼ STATIC WATER LEVEL AFTER 24 HOURS
▽PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
○ SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES	SLOPE INDICATOR INSTALLATION
SOIL SYMBOL	SPT DMT VST PMT TEST BORING	CONE PENETROMETER TEST
ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	AUGER BORING	SOUNDING ROD
INFERRED SOIL BOUNDARY	CORE BORING	TEST BORING WITH CORE
INFERRED ROCK LINE	MONITORING WELL	SPT N-VALUE
ALLUVIAL SOIL BOUNDARY	PIEZOMETER INSTALLATION	

RECOMMENDATION SYMBOLS

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	

ABBREVIATIONS

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED
CL - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ _d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACT TRIAXIAL
FRAGS. - FRAGMENTS	w - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HL - HIGHLY	V - VERY	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
☒ CME-45C	☒ CLAY BITS	☒ AUTOMATIC ☐ MANUAL
☐ CME-55	☐ 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
☐ CME-550	☐ 8" HOLLOW AUGERS	☐ -B ☐ -H
☐ VANE SHEAR TEST	☐ HARD FACED FINGER BITS	☐ -N
☐ PORTABLE HOIST	☐ TUNG-CARBIDE INSERTS	HAND TOOLS:
☐	☒ CASING ☐ W/ ADVANCER	☐ POST HOLE DIGGER
☐	☒ TRICONE 2 15/16" STEEL TEETH	☐ HAND AUGER
☐	☐ TRICONE " TUNG-CARB.	☐ SOUNDING ROD
☐	☐ CORE BIT	☐ VANE SHEAR TEST
☐		

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

SUBSURFACE INVESTIGATION

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

ROCK DESCRIPTION			TERMS AND DEFINITIONS	
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:			<u>ALLUVIUM (ALLUV.)</u> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.	
WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	<u>AQUIFER</u> - A WATER BEARING FORMATION OR STRATA.	
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.	<u>ARENACEOUS</u> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.	
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.	<u>ARGILLACEOUS</u> - 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.	
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	<u>ARTESIAN</u> - 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.	
WEATHERING			<u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.	
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		<u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.	
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.		<u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.	
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.		<u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.	
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.		<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.	
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>		<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.	
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. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>		<u>FAULT</u> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.	
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>		<u>FISSILE</u> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.	
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		<u>FLOAT</u> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.	
ROCK HARDNESS			<u>FLOOD PLAIN (FP)</u> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.	
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.		<u>FORMATION (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.	
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		<u>JOINT</u> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.	
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.		<u>LEDGE</u> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.	
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.		<u>LENS</u> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.	
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.		<u>MOTTLED (MOT.)</u> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTILING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.	
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.		<u>PERCHED WATER</u> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.	
FRACTURE SPACING			<u>RESIDUAL (RES.) SOIL</u> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.	
TERM	SPACING		<u>ROCK QUALITY DESIGNATION (RQD)</u> - 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.	
VERY WIDE	MORE THAN 10 FEET		<u>SAPROLITE (SAP.)</u> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.	
WIDE	3 TO 10 FEET		<u>SILL</u> - 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.	
MODERATELY CLOSE	1 TO 3 FEET		<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.	
CLOSE	0.16 TO 1 FOOT		<u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</u> - 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.	
VERY CLOSE	LESS THAN 0.16 FEET		<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.	
BEDDING			<u>STRATA ROCK QUALITY DESIGNATION (SROD)</u> - 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.	
TERM	THICKNESS		<u>TOPSOIL (TS.)</u> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
VERY THICKLY BEDDED	4 FEET		BENCH MARK: TBM-1	
THICKLY BEDDED	1.5 - 4 FEET		N: 271918.7461 E: 2197819.7694	
THINLY BEDDED	0.16 - 1.5 FEET		ELEVATION: 100.0 FEET	
VERY THINLY BEDDED	0.03 - 0.16 FEET		NOTES:	
THICKLY LAMINATED	0.008 - 0.03 FEET			
THINLY LAMINATED	< 0.008 FEET			
INDURATION				
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.				
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.			
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.			
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.			
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.			

PROJECT REFERENCE NO.	SHEET NO.
SF-080197	3
SITE PLAN	
0 20 40  FEET	



GEOTECHNICAL BORING REPORT

BORE LOG

SHEET 4 OF 7

WBS 17BP.6.PE.1			TIP SF-080197			COUNTY BLADEN			GEOLOGIST Cornette, C. J.						
SITE DESCRIPTION BRIDGE NO. 197 ON -L- (SR 1534) OVER KELLY CREEK									GROUND WTR (ft)						
BORING NO. EB1-A			STATION 9+86			OFFSET 16 ft LT			ALIGNMENT -L-						
COLLAR ELEV. 100.5 ft			TOTAL DEPTH 78.7 ft			NORTHING 271,914			EASTING 2,197,799						
0 HR. N/A			24 HR. 7.6												
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017						DRILL METHOD Mud Rotary			HAMMER TYPE Automatic						
DRILLER Edmondson, J. M.			START DATE 07/24/18			COMP. DATE 07/25/18			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)
105															
100	100.5	0.0												100.5	0.0
			2	2	2									GROUND SURFACE	
														ROADWAY EMBANKMENT	
														BROWN SAND, MOIST	
95	96.4	4.1	5	4	6									94.5	6.0
														ALLUVIAL	
														BROWN AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)	
90	92.5	8.0	7	12	17										
85	87.5	13.0	5	5	6									84.5	16.0
														COASTAL PLAIN	
														GRAY SANDY AND SILTY CLAY WITH SHELL FRAGMENTS, WET (PEEDEE FORMATION)	
80	82.5	18.0	2	1	3									79.5	21.0
75	77.5	23.0	4	4	6									74.5	26.0
														COASTAL PLAIN	
														GRAY SAND WITH SHELL FRAGMENTS AND LIMESTONE LAYERS, SATURATED	
70	72.5	28.0	4	5	7										
65	67.5	33.0	3	5	7										
60	62.5	38.0	18	36	24									61.5	39.0
														61.2	39.3
55	57.5	43.0	6	9	14										
50	52.5	48.0	7	7	10									54.5	46.0
														54.2	46.3
														COASTAL PLAIN	
														GRAY AND GREEN SANDY CLAY WITH WOOD FRAGMENTS, WET	
45	47.5	53.0	6	9	18									49.5	51.0
														COASTAL PLAIN	
														GRAY AND GREEN SAND WITH WOOD FRAGMENTS AND LIMESTONE LAYERS, SATURATED	
40	42.5	58.0	16	27	23										
35	37.5	63.0	12	100/0.3											
30	32.5	68.0	20	30	44										
25	27.5	73.0	13	19	33										

NCDOT BORE SINGLE SF-080197_GEO_BRDG.GPJ NC DOT.GDT 7/30/18

GEOTECHNICAL BORING REPORT

BORE LOG

SHEET 4 OF 7

WBS 17BP.6.PE.1			TIP SF-080197			COUNTY BLADEN			GEOLOGIST Cornette, C. J.				
SITE DESCRIPTION BRIDGE NO. 197 ON -L- (SR 1534) OVER KELLY CREEK										GROUND WTR (ft)			
BORING NO. EB1-A			STATION 9+86			OFFSET 16 ft LT			ALIGNMENT -L-				
COLLAR ELEV. 100.5 ft			TOTAL DEPTH 78.7 ft			NORTHING 271,914			EASTING 2,197,799				
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017										DRILL METHOD Mud Rotary			
DRILLER Edmondson, J. M.										START DATE 07/24/18			
COMP. DATE 07/25/18										SURFACE WATER DEPTH N/A			
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft) DEPTH (ft)
25						Match Line							
	22.5	78.0	15	100/0.2									21.8 78.7
													Boring Terminated at Elevation 21.8 ft in Very Dense Sand

GEOTECHNICAL BORING REPORT

BORE LOG

SHEET 6 OF 7

WBS 17BP.6.PE.1			TIP SF-080197			COUNTY BLADEN			GEOLOGIST Cornette, C. J.					
SITE DESCRIPTION BRIDGE NO. 197 ON -L- (SR 1534) OVER KELLY CREEK									GROUND WTR (ft)					
BORING NO. EB2-A			STATION 10+73			OFFSET 18 ft LT			ALIGNMENT -L-					
COLLAR ELEV. 100.1 ft			TOTAL DEPTH 79.5 ft			NORTHING 271,992			EASTING 2,197,838					
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017						DRILL METHOD Mud Rotary			HAMMER TYPE Automatic					
DRILLER Edmondson, J. M.			START DATE 07/24/18			COMP. DATE 07/24/18			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)
105														
100	100.1	0.0											100.1	0.0
			1	2	2									GROUND SURFACE
														ROADWAY EMBANKMENT
														BROWN AND TAN SAND, MOIST
95	96.0	4.1	2	1	3								94.1	6.0
														ALLUVIAL
														BROWN MUCK, MOIST TO WET
90	92.1	8.0	1	2	3								91.8	8.3
														ALLUVIAL
														TAN SAND, SATURATED
85	87.1	13.0	3	4	6								84.1	16.0
														COASTAL PLAIN
														GRAY SILTY CLAY, WET (PEEDEE FORMATION)
80	82.1	18.0	2	2	40								80.9	19.2
														COASTAL PLAIN
														GRAY SAND AND CLAYEY SAND WITH SHELL FRAGMENTS AND LIMESTONE LAYERS, SATURATED
75	77.1	23.0	3	3	3								79.1	21.0
70	72.1	28.0	4	4	8								64.1	36.0
														COASTAL PLAIN
														GRAY AND GREEN SILTY CLAY WITH WOOD AND SHELL FRAGMENTS, WET
65	67.1	33.0	4	6	10								64.1	36.0
60	62.1	38.0	4	5	4								50.9	49.2
														COASTAL PLAIN
														GRAY SAND WITH SHELL FRAGMENTS AND LIMESTONE LAYERS, SATURATED
55	57.1	43.0	4	6	8									
50	52.1	48.0	6	6	12									
45	47.1	53.0	14	17	24									
40	42.1	58.0	13	16	84/0.3									

NCDOT BORE SINGLE SF-080197_GEO_BRDG.GPJ NC_DOT.GDT 7/30/18

GEOTECHNICAL BORING REPORT

BORE LOG

SHEET 6 OF 7

WBS 17BP.6.PE.1			TIP SF-080197			COUNTY BLADEN			GEOLOGIST Cornette, C. J.						
SITE DESCRIPTION BRIDGE NO. 197 ON -L- (SR 1534) OVER KELLY CREEK									GROUND WTR (ft)						
BORING NO. EB2-A			STATION 10+73			OFFSET 18 ft LT			ALIGNMENT -L-						
COLLAR ELEV. 100.1 ft			TOTAL DEPTH 79.5 ft			NORTHING 271,992			EASTING 2,197,838						
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017									DRILL METHOD Mud Rotary			HAMMER TYPE Automatic			
DRILLER Edmondson, J. M.			START DATE 07/24/18			COMP. DATE 07/24/18			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)
25						Match Line									
	22.1	78.0	12	14	15									24.1	76.0