

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.14.R.18	1	9

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.14.R.18 F.A. PROJ. _____
COUNTY HENDERSON
PROJECT DESCRIPTION DIVISION 14 GROUP X
17BP BRIDGE REPLACEMENTS
SITE DESCRIPTION BRIDGE NO. 261 OVER BEARWALLOW CREEK
ON SR 1507 (LITTLE BEARWALLOW ROAD)

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PERSONNEL
W. DUGGINS
B. EDWARDS
P. MC CLOUD
J. MANKE

INVESTIGATED BY TERRACON CONSULTANTS

CHECKED BY D. CORLEY

SUBMITTED BY TERRACON CONSULTANTS

DATE JULY 2012

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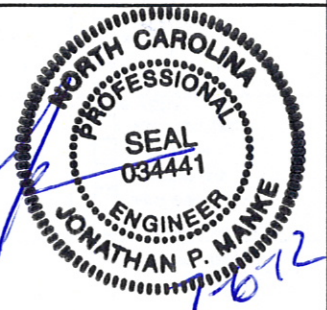
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DRAWN BY: J. MANKE

Terracon

2020 STARITA ROAD, SUITE E CHARLOTTE, NC 28206
PH. (704) 509-1777 FAX. (704) 509-1888



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

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

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.

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	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-7-B	A-7-E	A-3	A-6, A-7				
% PASSING	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT	
LIQUID LIMIT	6 MX		NP	40 MX 10 MX	41 MN 10 MX	41 MN 11 MN	41 MN 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			
GROUP INDEX	0	0	0	0	4 MX	8 MX	12 MX	16 MX	No MX		HIGHLY ORGANIC SOILS			
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 A 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

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF 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

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/F 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 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

MISCELLANEOUS SYMBOLS

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

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 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	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ _d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	SD. - SAND, SANDY	SAMPLE ABBREVIATIONS
DPT - DYNAMIC PENETRATION TEST	SL. - SILT, SILTY	S - BULK
e - VOID RATIO	SLI. - SLIGHTLY	SS - SPLIT SPOON
F - FINE	TCR - TRICONE REFUSAL	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	w - MOISTURE CONTENT	RS - ROCK
FRAC. - FRACTURED, FRACTURES		RT - RECOMPACTED TRIAXIAL
FRAGS. - FRAGMENTS		CBR - CALIFORNIA BEARING RATIO
HI. - HIGHLY		

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL LIQUID RANGE (PI) PL	LIQUID LIMIT	- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	PLASTIC LIMIT	- WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM	OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE
SL		- 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-51	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input type="checkbox"/> CME-45C	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B___
<input type="checkbox"/> CME-550	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> -N_02
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG.-CARBIDE INSERTS	<input type="checkbox"/> -H___
<input checked="" type="checkbox"/> TER255 D-50	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
	<input type="checkbox"/> TRICONE ___' STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
	<input checked="" type="checkbox"/> TRICONE 2-15/16" TUNG.-CARB.	<input type="checkbox"/> HAND AUGER
	<input type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
		<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, STREAKED, 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 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)		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 SLI.)	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 (SLI.)	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 "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, 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 DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 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 FINGERNAIL.

FRACTURE SPACING		BEDDING	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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.

TERMS AND DEFINITIONS

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, 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.

FISSELE - 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 (ROQ) - 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 (N 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 (SRC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

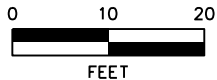
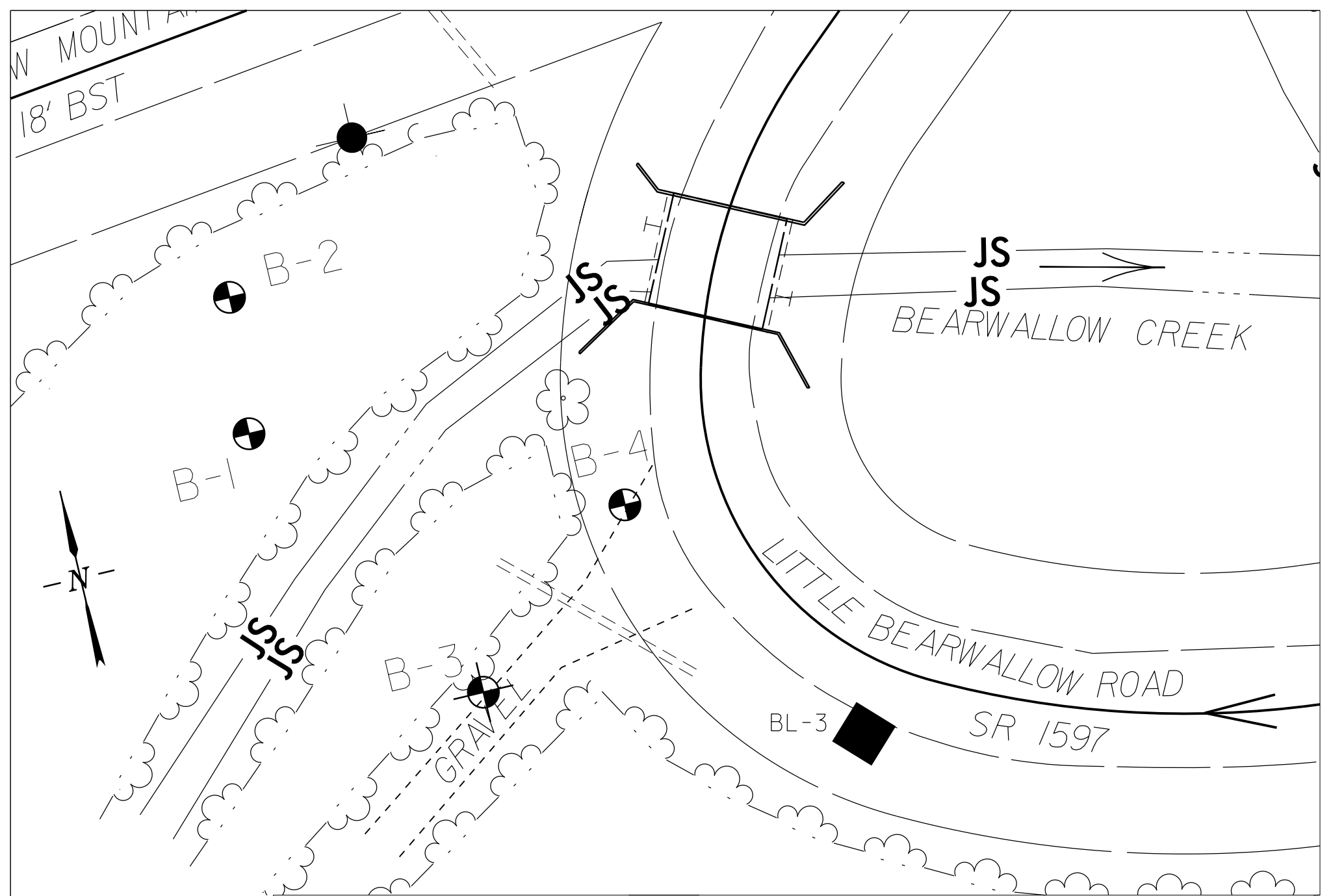
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-3 (N: 645553.4230, E: 1001934.7990)

ELEVATION: 2762.24 FT.

NOTES:
 FIAD - FILLED IN AFTER DRILLING



SCALE: 1 : 20
 DATE: JULY 2012
 DRAWN BY: JPM
 APPROVED BY: DJC

PROJ. REFERENCE NUMBER: 17.BP.14.R.18
 TIP NUMBER: GROUP X
 COUNTY: HENDERSON
 TERRACON PROJECT: 71125015

Terracon
 2020 STARITA ROAD, SUITE E CHARLOTTE, NC 28206
 PH. (704) 509-1777 FAX. (704) 509-1888

BORING LOCATION DIAGRAM
BRIDGE NO. 261 OVER BEARWALLOW CREEK
ON SR 1597 (LITTLE BEARWALLOW ROAD)

SHEET
3



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.18		TIP 17BP.14.R.18		COUNTY HENDERSON		GEOLOGIST Mccloud, P.D.												
SITE DESCRIPTION Bridge No. 261 on State Route 1597 over Bearallow Creek							GROUND WTR (ft)											
BORING NO. B-1		STATION 13+45		OFFSET 73 ft LT		ALIGNMENT EL	0 HR. N/A											
COLLAR ELEV. 2,771.4 ft		TOTAL DEPTH 32.5 ft		NORTHING 645,623		EASTING 1,001,850	24 HR. FIAD											
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011				DRILL METHOD Wash Boring		HAMMER TYPE Automatic												
DRILLER Duggins, W.T.		START DATE 06/12/12		COMP. DATE 06/12/12		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)			
2775															2,771.4	GROUND SURFACE	0.0	
2770	2,770.4	1.0	18	24	4										2,770.4	Topsoil and rootmat	1.0	
	2,767.9	3.5	3	2	4										2,768.4	COLLUVIAL Brown and gray, GRAVEL, some clay, little silt, little sand, trace organics	3.0	
2765	2,765.4	6.0	5	8	15										2,765.9	RESIDUAL Brown-orange, sandy SILT	5.5	
	2,762.9	8.5	11	16	16											Brown-orange and white, sandy SILT, little gravel		
2760																		
	2,757.9	13.5	15	21	32													
2755																		
	2,752.9	18.5	66	100/0.3											2,752.4	WEATHERED ROCK (Tan Henderson Gneiss)	19.0	
2750																		
	2,747.9	23.5	100/0.3															
2745																		
	2,742.9	28.5	100/0.3															
2740																		
	2,738.9	32.5	60/0												2,738.9		32.5	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 2,738.9 ft on Crystalline Rock 1)Advanced with 2-15/16" tricone bit to 32.5 feet.			

NCDOT BORE SINGLE BRIDGE 440261.GPJ NC_DOT.GDT 7/6/12



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.18	TIP 17BP.14.R.18	COUNTY HENDERSON	GEOLOGIST Mccloud, P.D.
SITE DESCRIPTION Bridge No. 261 on State Route 1597 over Bearwallow Creek			GROUND WTR (ft)
BORING NO. B-2	STATION 13+55	OFFSET 76 ft LT	ALIGNMENT EL
COLLAR ELEV. 2,774.9 ft	TOTAL DEPTH 28.6 ft	NORTHING 645,645	EASTING 1,001,852
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Duggins, W.T.	START DATE 06/12/12	COMP. DATE 06/12/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2775														2,774.9	GROUND SURFACE	0.0
	2,773.9	1.0	9	16	9								M	2,773.9	Topsoil and rootmat	1.0
	2,771.4	3.5	3	3	4								M	2,771.9	COLLUVIAL Brown and tan with white, silty SAND, some gravel, little clay	3.0
2770	2,768.9	6.0	3	4	5								M	2,769.4	Tan with white, SILT, some sand	5.5
	2,766.4	8.5	3	4	5								M		RESIDUAL Brown-orange, sandy SILT	
2765													M			
	2,761.4	13.5	2	8	10								M			
2760													M			
	2,756.4	18.5	6	12	18								M			
2755													M			
	2,751.4	23.5	52	78	22/0.2								M	2,752.9	WEATHERED ROCK (Tan Henderson Gneiss)	22.0
2750																
	2,746.4	28.5	60/0.1											2,746.3	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,746.3 ft on Crystalline Rock	28.6
																1)Advanced with HSA to 28.5 feet

NCDOT BORE SINGLE BRIDGE 440261.GPJ NC_DOT.GDT 7/6/12



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.18	TIP 17BP.14.R.18	COUNTY HENDERSON	GEOLOGIST Mccloud, P.D.
SITE DESCRIPTION Bridge No. 261 on State Route 1597 over Bearwallow Creek			GROUND WTR (ft)
BORING NO. B-3	STATION 13+22	OFFSET 49 ft LT	ALIGNMENT EL
COLLAR ELEV. 2,761.0 ft	TOTAL DEPTH 16.0 ft	NORTHING 645,574	EASTING 1,001,877
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Duggins, W.T.	START DATE 06/13/12	COMP. DATE 06/13/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2765																
2760	2,760.0	1.0	16	22	78/0.3									2,761.0	0.0	GROUND SURFACE
														2,760.5	0.5	Topsoil and rootmat
	2,757.5	3.5								100/0.9				2,759.0	2.0	RESIDUAL Red-brown, SILT, little sand, some gravel
2755	2,755.0	6.0								100/0.3						WEATHERED ROCK (Tan Henderson Gneiss)
	2,752.5	8.5								100/0.1						
2750										60/0				2,752.5	8.5	CRYSTALLINE ROCK Dark Gray Henderson Gneiss
2745														2,745.0	16.0	
<p>Boring Terminated at Elevation 2,745.0 ft in Crystalline Rock (Henderson Gneiss)</p> <p>1)Advanced with HSA to 8.5 feet 2)Advanced with NQ2 core barrel from 8.5 to 16 feet 3)Used creek water as drilling fluid.</p>																

NCDOT BORE SINGLE BRIDGE 440261.GPJ NC_DOT.GDT 7/6/12

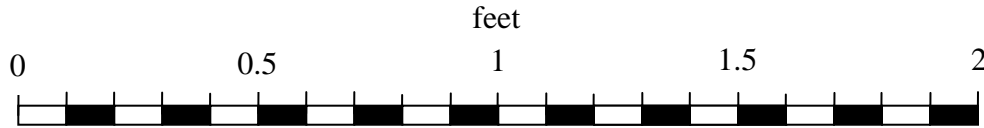


NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.14.R.18		TIP 17BP.14.R.18		COUNTY HENDERSON		GEOLOGIST Mccloud, P.D.						
SITE DESCRIPTION Bridge No. 261 on State Route 1597 over Bearwallow Creek									GROUND WTR (ft)			
BORING NO. B-3		STATION 13+22		OFFSET 49 ft LT		ALIGNMENT EL		0 HR. N/A				
COLLAR ELEV. 2,761.0 ft		TOTAL DEPTH 16.0 ft		NORTHING 645,574		EASTING 1,001,877		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Duggins, W.T.		START DATE 06/13/12		COMP. DATE 06/13/12		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 7.5 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %				
2752.48										Begin Coring @ 8.5 ft		
	2,752.5	8.5	2.5	2:08/0.5	(2.4)	(1.7)	(7.1)	(6.5)		2,752.5	8.5	
	2,750.0	11.0		3:30/1.0	96%	68%	95%	87%		Dark gray, slight weathering, hard, moderately close fracture spacing, Henderson Gneiss		
			5.0	3:03/1.0								
				3:42/1.0	(4.7)	(4.8)						
				3:31/1.0	94%	96%						
				3:12/1.0								
				3:16/1.0								
2745	2,745.0	16.0		3:00/1.0						2,745.0	16.0	
Boring Terminated at Elevation 2,745.0 ft in Crystalline Rock (Henderson Gneiss)												
1)Advanced with HSA to 8.5 feet 2)Advanced with NQ2 core barrel from 8.5 to 16 feet 3)Used creek water as drilling fluid.												

North Carolina Department of Transportation
 Geotechnical Unit
 Rock Core Photo

<i>Project No.:</i> 17BP.14.R.18	<i>I.D. No.:</i> N/A	<i>County:</i> HENDERSON	<i>Boring Location:</i> B-3
<i>Site Description:</i> Bridge #261 ON STATE ROUTE 1597 OVER BEARWALLOW CREEK			
<i>Driller:</i> W. Duggins	<i>Core Size:</i> NQ2WL	<i>Drill Machine:</i> Diedrich D-50	
<i>Geologist / Engineer:</i> P. Mccloud	<i>Total Run Length:</i> 7.5 feet	<i>Date:</i> 6/13/12	



Notes:

- 1) Used NQ2 core barrel with wire line



Terracon Consultants, Inc.
 2020 Starita Road, Suite E
 Charlotte, North Carolina 28206
 www.terracon.com



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.14.R.18	TIP 17BP.14.R.18	COUNTY HENDERSON	GEOLOGIST Mccloud, P.D.
SITE DESCRIPTION Bridge No. 261 on State Route 1597 over Bearwallow Creek			GROUND WTR (ft)
BORING NO. B-4	STATION 13+33	OFFSET 15 ft LT	ALIGNMENT EL
COLLAR ELEV. 2,760.0 ft	TOTAL DEPTH 16.5 ft	NORTHING 645,598	EASTING 1,001,906
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Duggins, W.T.	START DATE 06/12/12	COMP. DATE 06/12/12	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)			
2760															2,760.0	GROUND SURFACE	0.0	
	2,759.0	1.0	5	14	8										2,759.5	Topsoil and rootmat	0.5	
	2,756.5	3.5	3	2	6											COLLUVIAL Brown and gray, SILT, some sand, little clay		
2755	2,754.0	6.0	5	4	4										2,754.5	Brown and tan, SAND, some gravel, little silt	5.5	
	2,751.5	8.5	19	13	11										2,752.0	Dark brown and gray, GRAVEL, some sand, little silt	8.0	
2750																		
	2,746.5	13.5	100/0.2												2,748.0	WEATHERED ROCK (Tan Henderson Gneiss)	12.0	
2745	2,743.5	16.5	60/0												2,743.5	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,743.5 ft on Crystalline Rock	16.5	
																1)Advanced with HSA to 16.5 feet		

NCDOT BORE SINGLE BRIDGE 440261.GPJ NC_DOT.GDT 7/6/12