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STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
I–5786	1	17
	state project reference no.	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY Johnston

PROJECT DESCRIPTION Bridge No. 108 on SR 1001 (Lizzie Mill Road) over I-95

CONTENTS

SHEET NO. **DESCRIPTION** TITLE SHEET 2,2A LEGEND (SOIL & ROCK) 2B, 2C SUPPLEMENTAL LEGEND (GSI) SITE PLAN 3 4-13 BORE LOG(S), CORE LOG(S), & CORE PHOTOGRAPH(S) ROCK TEST RESULTS 14

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 SOLT TEST DATA AVAILABLE MAY BE REVERWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, CEOTECHNICAL ENGINEERING UNIT AT (1991) 707-6800. 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 BORCHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU INN-FLACE)TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST WETHO. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI 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 PRELIMMARY 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 INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERNALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEN SUCESSARY TO SATISFY THINSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT, THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE AUDITIONAL COMPENSATION OF FOR AN THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES

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H. Riggs INVESTIGATED BY ______. Inc. DRAWN BY <u>T.T.</u> Walker CHECKED BY _P. Alton SUBMITTED BY ______ P. Alton DATE _June 2017 SINCE Prepared in the Office of: FROEHLING & ROBERTSON, INC. Engineering Stability Since 1881 310 Hubert Street Raleigh, North Carolina 27603-2302 USA T 919.828.3441 | F 919.828.5751 www.fandr.com 88 6/12/2017 b) 12/2017 H CARO OFESSION SEAL 033758 SEAL 033758 A TRICK W. Patrick Atton A270EE78A6DE442 SIGNATURE DATE **DOCUMENT NOT CONSIDERED FINAL** UNLESS ALL SIGNATURES COMPLETED

PERSONNEL

D. Racey

J. Cranston

S. Sequist

D. Aiello

D Williams

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SL	GEOTECHN	$\frac{1}{4CE}$	MENT OF TRANSPORTATION THIGHWAYS NGINEERING UNIT NVESTIGATION S, SYMBOLS, AND ABBREVIATION 1 OF 2)	
BE PENETRATED WITH A CONTINUOUS ACCORDING TO THE STANDARD PEN IS BASED ON THE AASHTO SYS CONSISTENCY, COLOR, TEXTURE, MOIS' AS MINERALOGICAL COMPOSI VERY STIFF,GRAY, SULTY CLAY, MA	SOIL DESCRIPTION TED, SEMI-CONSOLIDATED, OR WEATHERED EA S FLIGHT POWER AUGER AND VIELD LESS I ETRATION TEST (AASHTO T 206, ASTM DIS STEM, BASIC DESCRIPTIONS GENERALLY INCI ITURE, AASHTO CLASSIFICATION, AND OTHER TION, ANGULARITY, STRUCTURE, PLASTICITY, INGST WITH INTEREDOED FINE SAMO LAVERS, IN ND AND AASHTO CLASSIFIC(THAN 100 BLOWS PER FOOT 36, SOLL CLASSIFICATION LUDE THE FOLLOWING: PERTINENT FACTORS SUCH ETC. FOR EXAMPLE. GHLY PLASTIC,A-7-6	CRADATION <u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROX <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF T <u>ANGULARITY OF GRAINS</u> THE ANGULARITY OR ROUNDESS OF SOIL GRAINS IS DESIGNATED <u>ANGULAR, SUBANGULAR, SUBROUNDED</u> , OR <u>ROUNDED</u> .	IMATELY THE SAME SIZE WO OR MORE SIZES.
GENERAL CLASS. CRANULAR MATERI/ (≤ 35% PASSING *2 GROUP A·1 A·3 CLASS. A-1-a A-2-4 A-2-4	ALS SILT-CLAY MATERIALS 2001 (> 35%, PASSING * 2001) A-2 A-4 A-5 A-6 A-7 A-74 2-5 A-2-6 A-2-7 A-74 A-74 A-74 A-74	ORGANIC MATERIALS A-1, A-2 A-4, A-5 A-3 A-6, A-7	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOL ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF COMPRESSIBILITY	
		RANULAR SILT- CLAY SOILS SOILS PEAT	HIGHLY COMPRESSIBLE LL > 1 PERCENTAGE OF MATERIAL GRANULAR SILT - CLAY	31 - 50 50 HER MATERIAL
PI 6 Mx NP 10 Mx 10 II GROUP INDEX 0 0 0 0 0 USUAL TYPES STONE FRACS 0 <td>Hei 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN MX 11 HN 11 MN 18 MX 18 MX 11 MN 11 NN 4 MX 8 MX 12 MX 16 MX 10 MX</td> <td>SOILS WITH LITTLE OR HIGHLY MODERATE ORGANIC AMOUNTS OF SOILS ORGANIC SOILS</td> <td>INALE OF UNDAMIL MATTER 2 - 32 3 - 52 1784 INAL LITTLE ORGANIC MATTER 3 - 52 172 LITTL MODERATELY ORGANIC 5 - 10% 12 - 20% SOME HIGHLY ORGANIC 5 - 10% 12 - 20% SOME HIGHLY ORGANIC > 10% > 20% HIGHL GROUND WATER GROUND WATER V WATER LEVEL IN BORE HOLE IMMEDIATELY AFT</td> <td>LE 10 - 20% 20 - 35% LY 35% AND ABOVE</td>	Hei 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN MX 11 HN 11 MN 18 MX 18 MX 11 MN 11 NN 4 MX 8 MX 12 MX 16 MX 10 MX	SOILS WITH LITTLE OR HIGHLY MODERATE ORGANIC AMOUNTS OF SOILS ORGANIC SOILS	INALE OF UNDAMIL MATTER 2 - 32 3 - 52 1784 INAL LITTLE ORGANIC MATTER 3 - 52 172 LITTL MODERATELY ORGANIC 5 - 10% 12 - 20% SOME HIGHLY ORGANIC 5 - 10% 12 - 20% SOME HIGHLY ORGANIC > 10% > 20% HIGHL GROUND WATER GROUND WATER V WATER LEVEL IN BORE HOLE IMMEDIATELY AFT	LE 10 - 20% 20 - 35% LY 35% AND ABOVE
OF MAJOR GRAVEL, AND SAND SAND GRAVE MATERIALS SAND SAND GRAVE GEN, RATING AS SUBGRADE EXCELLENT TO GO		MATTER AIR TO POOR UNSUITABLE LL - 30	▼ STATIC WATER LEVEL AFTER <u>24</u> HOURS ▼ PERCHED WATER, SATURATED ZONE, OR WATER E ○	
CON PRIMARY SOIL TYPE COMPACTN CONSIST GENERALLY VERY L	TENCY PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	MISCELLANEOUS SYMBOLS	∽ slope indicator
GRANULAR LOOS MANULAR MEDIUM MATERIAL DENS (NON-COHESIVE) VERY D GENERALLY SOF	DENSE 10 TO 30 ISE 30 TO 50 DENSE > 50 SOFT < 2	N/A < 0.25 0.25 TO 0.5		INSTALLATION CONE PENETROMET TEST SOUNDING ROD
SILT-CLAY MEDIUM MATERIAL STIF (COHESIVE) VERY S HAR	STIFF 4 TO 8 FF 8 TO 15 STIFF 15 TO 30	0.5 TO 1.0 1 TO 2 2 TO 4 > 4	INFERRED ROCK LINE MONITORING WELL PIEZOMETER INSTALLATION RECOMMENDATION SYMBOLS	TEST BORING WITH CORE
U.S. STD. SIEVE SIZE OPENING (MM) 4 BOULDER COBBLE GR	4 10 40 60 200 4.76 2.00 0.42 0.25 0.075 AAVEL COARSE FINE GR SAND SAND	270 0.053 SILT CLAY (SL.) (CL.)	UNDERCUT UNCLASSIFIED EXCAVATION - UNCL UNSUITABLE WASTE UNCL SHALLOW UNCLASSIFIED EXCAVATION - USET UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBA	ASSIFIED EXCAVATION - EPTABLE, BUT NOT TO BE D IN THE TOP 3 FEET OF ANKMENT OR BACKFILL
GRAIN MM 305 75 SIZE IN. 12 3 SOIL MOIST SOIL MOISTURE SCALE	2.0 0.25 TURE - CORRELATION OF TI		BT - BORING TERMINATED MICA MICACEOUS WE CL CLAY MOD MODERATELY 7	T - VANE SHEAR TEST A WEATHERED '- UNIT WEIGHT d - DRY UNIT WEIGHT
	DESCRIPTION GUIDE FUR FIE - SATURATED - USUALLY LIQUI (SAT,) FROM BELOW 1	LD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S e - VOID RATIO SD SAND, SANDY SS F - FINE SL SLIT, SLIT, Y ST FOSS FOSSILIFEROUS SLI SLIGHTLY RS	SAMPLE ABBREVIATIONS - BULK - SPLIT SPOON - SHELBY TUBE - ROCK - RECOMPACTED TRIAXI
RANGE { (P1) PL PLASTIC LIMIT _ OM _ OPTIMUM MOISTURE SL SHRINKAGE LIMIT _	- WET - (W) ATTAIN OPTIMU	DUIRES ORYING TO M MOISTURE NEAR OPTIMUM MOISTURE	FRAGS FRAGMENTS <i>w</i> - MOISTURE CONTENT CB HI HIGHLY V VERY EQUIPMENT USED ON SUBJECT PROJ	R - CALIFORNIA BEARING RATIO
	- DRY - (D) REDUIRES ADD ATTAIN OPTIMU PLASTICITY PLASTICITY INDEX (PI)	ITIONAL WATER TO JM MOISTURE DRY STRENGTH	CME-45C CLAY BITS X X CME-55 6* CONTINUOUS FLICHT AUGER CORE X CME-550 X* HOLLOW AUGERS -E CME-550 HARD FACED FINGER BITS X -N	3 □.+
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC	PLASTICITY MOLE (17) 0-5 6-15 16-25 26 OR MORE COLOR	VERY LOW SLIGHT MEDIUM HIGH	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND YANE SHEAR TEST X CASING X VAU PORTABLE HOIST X TRICONE 3 ¹⁵ / ₁₆ STEEL TEETH	TOOLS: POST HOLE DIGGER HAND AUGER
	R OR COLOR COMBINATIONS (TAN, RED, YE DARK, STREAKED, ETC. ARE USED TO DES(Sounding Rod Vane Shear Test

SHEET NO.

2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

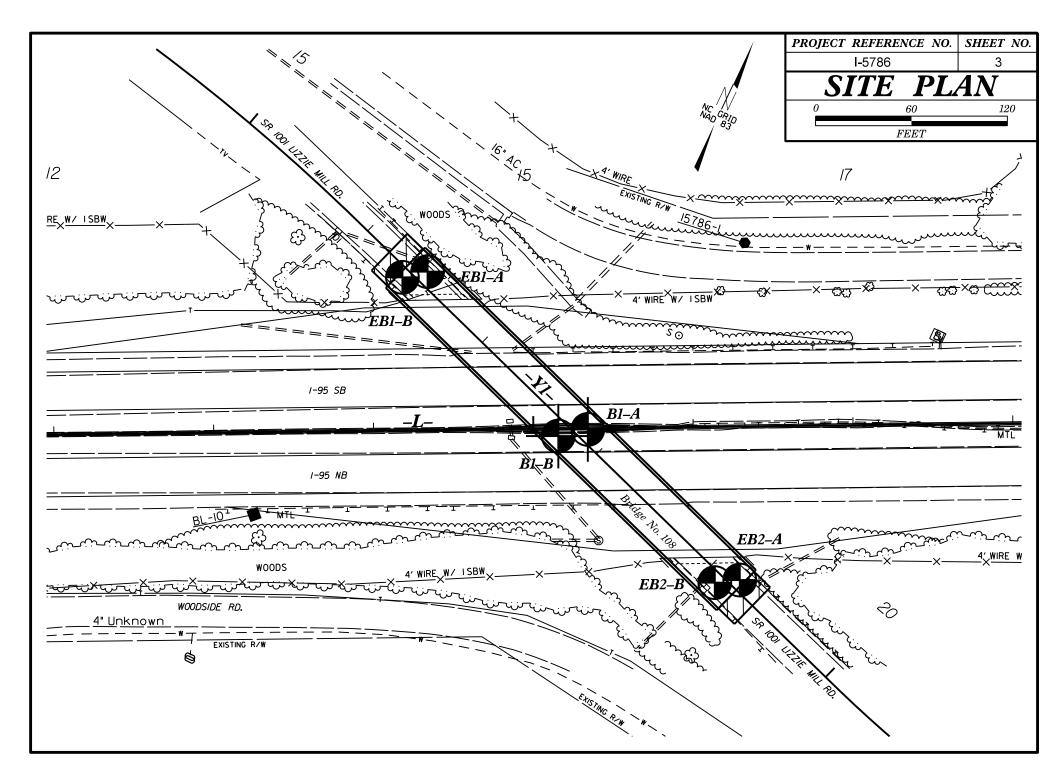
SUBSURFACE INVESTIGATION

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

			ROCK DES	SCRIPTION	TERMS AND DEFINITIONS
			N MATERIAL THAT W	OULD YIELD SPT REFUSAL IF TESTED. AN INFERRED STAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
SPT REFUSAL	. IS PE	NETRATION BY	A SPLIT SPOON SA	MPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	ADUIFER - A WATER BEARING FORMATION OR STRATA.
			NATERIAL, THE TRAN THERED ROCK.	NSITION BETWEEN SOIL AND ROCK IS OFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
			DIVIDED AS FOLLOW	5:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
WEATHERED				N MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ROCK (WR)			100 BLOWS PER FO		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
CRYSTALLINE		I P		RAIN IGNEOUS AND METAMORPHIC ROCK THAT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE.	SURFACE.
ROCK (CR)		XXX.	GNEISS, GABBRO, SC	HIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
NON-CRYSTAL ROCK (NCR)	LINE		SEDIMENTARY ROCK	RAIN METAMORPHIC AND NON-COASTAL PLAIN THAT WOULD YEILD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
COASTAL PLA			ROCK TYPE INCLUD	ES PHYLLITE, SLATE, SANDSTONE, ETC. DIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
SEDIMENTARY				TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
(CP)			SHELL BEDS, ETC. WEATH		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
					ROCKS OR CUTS MASSIVE ROCK.
FRESH		-RESH, CRYSTAL R IF CRYSTALL		S MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
VERY SLIGHT				SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
(V SLL)	CRYST	als on a brow	EN SPECIMEN FACE S	HINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP. MEASURED CLOCKWISE FROM NORTH.
a. 10.17		CRYSTALLINE N			FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
SLIGHT (SLI.)				AND DISCOLORATION EXTENDS INTO ROCK UP TO IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
				STALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MODERATE				COLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
(MOD.)				ULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS HOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
		RESH ROCK.			FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
MODERATELY				STAINED. IN GRANITOID ROCKS. ALL FELDSPARS DULL	<u>Formation (FM.)</u> - A mappable geologic unit that can be recognized and traced in the Field.
SEVERE (MOD. SEV.)				AOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH T'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	J <u>OINT</u> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
SHODI DE FII			ELD SPT REFUSAL	I TION NOR OTTED GEONG DUND WHEN DINUCK.	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
SEVERE				STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
(SEV.)				N GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED RONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
			ELD SPT N VALUES >		MOTTLED (MOT,) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
VERY				STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
SEVERE				DIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
(V SEV.)				NULK WEATHERED TO A DEGREE THAT UNLY MINUR	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
COMPLETE	ROCK I	REDUCED TO SO	DIL. ROCK FABRIC NOT	DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
			RATIONS. QUARTZ MAY	BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
	HL 5U 1	AN EXAMPLE.			RUN AND EXPRESSED AS A PERCENTAGE.
			ROCK H		SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
VERY HARD			D BY KNIFE OR SHAR OF THE GEOLOGIST"	P PICK. BREAKING OF HAND SPECIMENS REQUIRES 5 PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
HARD				LY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
		TACH HAND SPE			THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
				UGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	<u>Slickenside</u> - Polished and striated surface that results from friction along a fault or slip plane.
HARD		DERATE BLOWS.		T'S PICK. HAND SPECIMENS CAN BE DETACHED	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
MEDIUM				DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
HARD	CAN B	E EXCAVATED I	n small chips to p	EICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
COT 7		OF A GEOLOGI			TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
SOFT				NIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS BY MODERATE BLOWS OF A PICK POINT. SMALL.THIN	<u>STRATA LUNE RELOVERY (SREL.)</u> - TOTAL LENGTH OF STRATA MATERIAL RELOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
			EN BY FINGER PRESS		STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
VERY				WATED READILY WITH POINT OF PICK. PIECES 1 INCH	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.
SOFT	FINGEF		55 CAN BE BROKEN B	Y FINGER PRESSURE. CAN BE SCRATCHED READILY BY	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
F		TURE SPA		BEDDING	
TERM	1.170		SPACING	TERM THICKNESS	BENCH MARK: BL-IO, -BL- STA. 8+98.IG, N: 652283, E: 2224820
VERY WIDE	E	MORE	THAN 10 FEET	VERY THICKLY BEDDED 4 FEET	ELEVATION: 175.93 FEET
WIDE MODERATEI	1 7 0 0		TO 10 FEET TO 3 FEET	THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET	
CLOSE		0.16	5 TO 1 FOOT	VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
VERY CLOS	SE	LESS 1	THAN 0.16 FEET	THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	NM= NOT MEASURED
			INDUR		FIAD= FILLED IMMEDIATELY AFTER DRILLING
FOR SEDIMEN		OCKS. INDURAT		ING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
		JUCKS, INDUKAI		FINGER FREES NUMEROUS GRAINS:	
FRIABL	LE			BY HAMMER DISINTEGRATES SAMPLE.	
MODER			GRAINS CAN BE	SEPARATED FROM SAMPLE WITH STEEL PROBE:	
MUDER	HIELY	INDURATED		WHEN HIT WITH HAMMER.	
INDURA	ATED			FICULT TO SEPARATE WITH STEEL PROBE:	
				BREAK WITH HAMMER.	
EXTRE	MELY I	NDURATED		BLOWS REQUIRED TO BREAK SAMPLE:	0ATE: 0.15.14
			SHMPLE BREAKS	HURUDD URHIND.	DATE: 8-15-14

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NORTH CAROLINA DEPAR DIVISION O GEOTECHNICAL E SUBSURFACE	of hi E NGI	GHWAYS NEER	ING	UNI	Г	
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed	ESIGN	SPECIFI	CATION	IS (PAC	I) TABLE GE 1 OF	S 2)
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) 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. STRUCTURE			Di Rough, slightly weathered, iron stained Surfaces MA	D: FAIR D: Smooth, moderately weathered and D: altered surfaces	PDOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	V VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	00 00	- 80			N/A	N/A
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70	60			
			50	-40		
					30	
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces					20	
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes		'A N	I/A			10

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NORTH CAROLINA DEPAR DIVISION O GEOTECHNICAL E SUBSURFACE SUPPLEMENTAL LEGEND, GEOLOGI FROM AASHTO LRFD BRIDGE DE	OF HIG ENGI IN IN CAL S ESIGN	GHWAYS NEER VES TRENGT	S RING TIGA TIGA TINDE TICATION	UNIT A TI (X (GSI) S (PAGE	DN TABLES 2 OF 2	2)
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonic GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos.P and Hoek E., 2000)	cally Defo	rmed Heterog	geneous Rock	Masses (Marıı	nos and Hoek	. 2000)
rom a description of the lithology, structure and urface conditions (particularly of the bedding lanes), 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 ealistic than giving GSI = 35. Note that the lock-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, hese 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, noor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by sing effective stress analysis. COMPOSITION AND STRUCTURE	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
A. Thick bedded, very blocky sandstone 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.		70 60	A			
stone with thin inter- layers of siltstone siltstone amounts siltstone siltstone siltstone	E. Weak siltstone or clayey shale with sandstone layers		50 B 40	СЦ	P E	
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.	siltstone †			30	F 20	
S. Undisturbed silty or clayey shale with or without a few very thin sandstone layers Sandstone are transformed the sandstone layers Sandstone are transformed the sandstone are transformed or clayey shale forming a chaotic structure with pool sandstone are transformed into small rock pieces.	ockets			¢		10
→ → Means deformation after tectonic disturbance					/_	DATE: 8-19



BRDG108.GPJ

GEO BH

15786

NCDOT BORE SINGLE

GEOTECHNICAL BORING REPORT **BORE LOG**

COUNTY JOHNSTON WBS N/A TIP I-5786 GEOLOGIST J. Cranston SITE DESCRIPTION Bridge No. 108 on SR 1001 (Lizzie Mill Road) over I-95 GROUND WTR (ft) OFFSET 8 ft LT BORING NO. EB1-A **STATION** 16+45 ALIGNMENT -Y1-0 HR NM COLLAR ELEV. 195.9 ft TOTAL DEPTH 60.7 ft NORTHING 652,466 EASTING 2,224,854 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 80% 02/11/2017 DRILL METHOD Mud Rotary HAMMER TYPE Automatic DRILLER D. Aiello START DATE 04/10/17 COMP. DATE 04/10/17 SURFACE WATER DEPTH N/A DRIVE **BLOW COUNT BLOWS PER FOOT** SAMP L ELEV DEPTH 0 SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 100 0.5ft 0.5ft 0.5ft 0 25 50 75 NO. мо (ft) G ELEV. (ft) DEPTH (ft 200 GROUND SURFACE 195.9 0.0 195 ASPHALT 194.6 194.6 1.3 1.3 ROADWAY EMBANKMENT 10 Μ Dark Gray, Silty Fine SAND (A-2-4) 192.4 3.5 191.9 4.0 6 . Μ 10 Brown-Gray, Clayey Fine to Coarse SAND . 190 (A-2-6) 188.9 7.0 Dark Gray, Silty Fine SAND (A-2-4) with . 187.4 8.5 Trace Wood Fragments 4 5 М 185 183.9 12.0 Dark to Light Gray, Fine Sandy CLAY (A-6) with Trace Wood Fragments 182.4 13.5 2 5 2 Μ 180 177.4 18.5 4 2 Μ 175 172.4 23.5 2 2 М 170 1<u>68.9</u> 27.0 . COASTAL PLAIN 28.5 167.4 Light Gray, Clayey Fine SAND (A-2-6) 5 3 4 Μ 165 163.9 <u>32.0</u> Orange-Brown-Gray, Fine Sandy Silty CLAY 162.4 33.5 (A-7) 5 8 Δ М 13 160 158.9 <u>37.0</u> Brown-Light Gray, Clayey Fine to Coarse SAND (A-2-6) with Trace Mica 157.4 38.5 3 3 W 155 153.9 42.0 . Light Brown and Gray, Fine to Coarse SAND (A-3) with Trace Gravel 152.4 43.5 6 3 5 Sat. 11 150 NC_DOT.GDT 5/5/17 Sat. 145 143.9 <u>52.0</u> Orange-Brown, Fine Sandy SILT (A-4) 142.4 53.5 10 17 Μ 140 138.9 <u>57.0</u> . • WEATHERED ROCK 137.4 58.5 Blue-Gray (META-ARGILLITE) 00/0. 100/0.5 G. 135.2 135.2 60.7 60.7 60/0 0 Boring Terminated with Standard Penetration Test Refusal at Elevation 135.2 60/0.0 ft on Crystalline Rock (META-ARGILLITE)

SHEET 4

WBS	N/A				Т	P 1-5786		COUNT	Y JOHNST	ON			GEOLOG	GIST J. Crans	ston		
SITE	DESCR		Brid	ge No	108	on SR 1001	(Lizzie Mi	ill Road) o	over I-95							GROUN	D WTR (f
	NG NO.					TATION 10			OFFSET	6 ft RT			ALIGNM	ENT -Y1-		0 HR.	N
COLL	AR ELE	EV. 19	95.6 ft		Т	OTAL DEPT	H 68.5 ft		NORTHING	652,4	156		EASTIN	G 2,224,841		24 HR.	FIA
				TE F		CME-55 80%				· ·		DD M	ud Rotary				Automatic
ORILI	ER D	. Aiello			S		04/14/1	7	COMP. DA					E WATER DEF	TH N/A	\	
LEV	DRIVE	DEPTH		W CO				· PER FOOT		SAMP.	V /	1 L	1				
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.	мо	0 G	ELEV. (ft)	SOIL AND RO	CK DESCH	RIPTION	DEPTH
									·								
200																	
	-	Ŧ										F	-				
	-	Ŧ											. 195.6	GROUN	ID SURFAC)E	
195	- 194.3	1.3											- 194.3	AS	SPHALT		
	- 192.1	3.5	7	7	8	15					M		. <u>192.6</u>	ROADWAY Dark Gray, Silty			<i></i>
90	-	-	3	3	5						м		191.1 E	Brown-Black, Fine Gray, Clayey			-3)
	-	Ŧ				1							- <u>188.6</u>			. ,	<u>.</u>
ŀ	187.1	8.5	1	2	1						W		. G	ray to Dark Gray, with Tra	Fine Sand		A-6)
85	_	ŧ				4 3 · · ·							_				
	- 182.1	13.5															
80	-	-	2	1	2	• 3 • • •					м						
	-	Ŧ											-				
ŀ	177.1	18.5	4	2	3						м		•				
75	-	‡				•5···			· · · ·				—				
	- 172.1	23.5											<u>173.6</u>	Gray, Fine Sar	ndy Silty CL	AY (A-7)	=
70	- 172.1	- 20.0	1	1	2			· · · ·			м						
10	-	ŧ				1							<u> 168.6 </u>				;
ŀ	167.1	28.5	3	4	6	.\	· · · · ·						• E	COAS Brown-Gray, Fine	TAL PLAIN Sandy Silty		-7)
65	-	ŧ				· • 10 ·			· · · ·		M	N	_				
	- 162.1	33.5										N					
60	-102.1	- 33.5	2	4	5	$\left \begin{array}{c} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \bullet \\ 9 \cdot \\ \cdot \\$	· · · · ·				м						
00	-	ŧ				<u>.</u> [-				
ŀ	157.1	38.5	1	2	3								156.1				:
55	-	ŧ		-	Ŭ	• 5			· · · ·		M		L	ight Brown, Claye		oarse SA	ND
	152.1	43.5					· · · ·						- <u>153.6</u> · Lig	ht Brown, Fine to	A-2-6) Coarse SA	AND (A-3)) with
50	-152.1	40.5 -	2	4	6	· · · · · · · · · · · · · · · · · · ·					Sat.			Trace Gra	vel (48.5'-5	6.0')	
30	-	ŧ										0 0 0 0 0 0 0 0 0 0 0 0	_				
-	147.1	48.5	5	6	5	::::	· · · ·	· · · ·	· · · · ·			0 0 0 0 0 0 0 0 0 0 0 0					
45	-	ŧ		0		· • 11 ·					Sat.	0 0 0 0 0 0 0 0 0 0 0 0	—				
	-	+ 					· · · ·					000	- <u>143.6</u> · Lig	ht Brown, GRAVI	EL (A-1-a)	with Little	Fine
40	142.1	53.5	7	4	5						Sat.	0000			arse Sand		
4 0	-	ŧ					· · · · · ·					0000	_ - <u>138.6</u>				
	137.1	58.5	100/0.3											Blue-Gray (N	ERED ROO		
35	-	‡	100/0.3						100/0.3				—			·,	
	-	±						· · · ·				B	<u>133.6</u>	CRYSTA		ск — — —	
20	132.1	63.5	60/0.0						60/0.0			P			-ARGILLITE		
30	-	ŧ							<u> </u>			P	_				
ļ	127.1	68.5							60/0.0			×.	127.1				6
	-	ŧ	60/0.0						6U/U.U					Boring Termin enetration Test Re	efusal at El	evation 12	
	-	ŧ											. f	t in Crystalline Ro	ock (META-	ARGILLI	ſE)
	-	ł															

NBS	N/A				Т	P I-5786			ORE L				GEOLOGIST J. Cranst	ton	
SITE	DESCR		Brid	lge No	108 (on SR 1001	(Lizzie M	ill Road) o	over I-95				•	GROU	ND WTR (ft
BORI	NG NO.	. B1-A	۱		S	TATION 17	7+85		OFFSET	7 ft LT			ALIGNMENT -Y1-	0 HR.	NM
COLL	AR ELI	EV. 17	76.4 ft		Т	OTAL DEPT	H 72.2 ft		NORTHING	652,4	20		EASTING 2,224,986	24 HR.	FIAD
ORILL	RIG/HA	MMER E	FF./DA	TE F	&R5785	CME-55 80%	6 02/11/201	7		DRILL N	/IETHC	DD M	lud Rotary	HAMMER TYPE	Automatic
DRILI	.er D	. Aiello			S	TART DATE	04/12/1	7	COMP. DA	TE 04/	13/17		SURFACE WATER DEP	TH N/A	
LEV	DRIVE	DEPTH	BLC	w co	UNT		BLOWS F	PER FOOT		SAMP.	▼/			CK DESCRIPTION	I
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.	мо		ELEV. (ft)		DEPTH (
180		L											_		
	-	ŧ											-		
		<u> </u>											-	D SURFACE	(
175	174.9	1.5	23	4	3						М		1/4.9	EMBANKMENT	1
F	172.9 .	3.5	1	1	2		· · · ·	· · · ·			м	LN	Dark Gray, Fine San Trace Organics	dy Silty CLAY (A-7 and Trace Grave	
170	-	Ł				1						L	- 		7
	167.9	8.5				$\left \left \begin{array}{c} \dot{\mathbf{A}} \cdot \cdot \cdot \cdot \\ \mathbf{A} \cdot \cdot \cdot \cdot \end{array} \right \right $									
	-	+	2	4	5	· • • 9 · · ·					м	\mathbf{N}	Light Brown-Gray,	Fine Sandy Slity C A-7)	LAY
165	-	F											-		
-	162.9	13.5	2	2	4						м		-		
60	-	Ŧ				● ⁰ · · ·							-		
	157.9	L 18.5											-		
		+ 10.0	2	2	4	6					Sat.		156.9 Light Brown, Fine to	Coarse SAND (A-	1 3) with
55	-	Ŧ										0000		e Gravel	<i>o)</i> m ar
ŀ	152.9	23.5	4	3	4							00000	-		
50	-	ŧ	·	Ű	.						Sat.	0 0 0 0 0 0 0 0 0 0 0 0	-		
	- 147.9 -	- 1 28.5				- <u>\</u>						000	<u>149.4</u> Light Brown, GRAVE	L (A-1-a) with Littl	<u>2</u> e Fine
Ē	- 147.9 -	+ 20.5 +	4	6	9	· · · • 15	· · · ·				Sat.	0000	to Coa	arse Sand	
45	-	‡				· · · · <u>\</u>						000	- 144.4		3
	142.9	33.5	40	16	14	• • • • • • •								SIDUAL ine Sandy SILT (A	-4)
140	-	ŧ			'4						М		-		
	137.9	+ 											<u>- 139.4</u>		<u> </u>
F		- 30.5	60/0.1				· · · ·		· · 60/0.1				Blue-Gray (M	ETA-ARGILLITE)	
35	-	‡											-		
-	132.9	43.5	60/0.1	-									-		
130	-	ŧ	100/0.1				· · · · ·	· · · · ·	· · 60/0.1)			-		
100	-	+											Void Encounter	red from 43.0'-44.5	5'
F	. 127.9	48.5	60/0.1					· · · · ·					-		
125	-	ŧ											-		
	122.9	53.5	60/0.0				· · · ·						-		
20	. 120.7	55.7						· · · ·	60/0.0				- 120.7		5
20	-	ŧ	60/0.0						60/0.0				-		
	-	ŧ						· · · ·					-		
15	- 114.2	+			1								- 		6
F		+ 02.2	60/0.0	1	1				· · 60/0.0	RS-1		R	Blue-Gray (M	ETA-ARGILLITE)	0
10	-	‡											-		
10	-	ŧ			1				+				-		
	-	ŧ			1			 					-		
105	-	ŧ			1					RS-2			-		
ł		t –			1		1	1		+			Boring Terminated		
	-	ł			1								- Crystalline Rock	(META-ARGILLIT	 (

											ELUG	1			
WBS	N/A				TIP	I-5786	6	С	OUNT	Υ J	DHNSTON	GEOLOGIST J. Crans	ton		
SITE	DESCR		Brid	dge No. 1	08 on	SR 10	01 (Lizzi	e Mill F	Road)	over	-95	1		GROUN	D WTR (ft)
BORI	NG NO.	. B1-A	λ		STA	ΓΙΟΝ	17+85			OFI	SET 7 ft LT	ALIGNMENT -Y1-		0 HR.	NM
	AR ELI						PTH 72			NO	RTHING 652,420	EASTING 2,224,986		24 HR.	FIAD
DRILL	. RIG/HA	MMER E	FF./DA	TE F&R5	785 CN	/E-55 8	30% 02/11	/2017			DRILL METHOD Mu	d Rotary	HAMME	ER TYPE	Automatic
DRILI	LER D	. Aiello)		STA	rt da	TE 04/1	2/17		co	IP. DATE 04/13/17	SURFACE WATER DEI	PTH N//	٩	
CORE	E SIZE	NQ			тот	AL RU	N 13.7 f								
ELEV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	STF REC.	RQD	L O	Г	ESCRIPTION AND REMARK	(S		
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (ft)				DEPTH (1
120,7 120	120.7	55.7	3.7	0.20/1.0		(0,0)			(0.0)			Begin Coring @ 55.7 ft to Retrieve Core. A Tricone	waa Than	Line to D	
			3.7	0:32/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%	R	- 120.7 Core Barrel Unable	Through the Core to 62.2	was men	Use to Di	rill 55.
	117.0	59.4		0:25/1.0 0:15/0.7	<u> </u>										
115	114.2	62.2									114.2				62.
Ī		-	5.0	N=60/0.0 0:31/1.0 0:30/1.0 1:14/1.0 1:25/1.0 0:58/1.0	(2.5) 50%	(1.9) 38%	RS-1	(7.4) 74%	(5.7) 57%	R	Gray, Very Slightly W	/eathered to Fresh, Medium F E with Close to Moderately Clo	lard to Mo	derately F	lard,
110	-	ŧ		0:30/1.0	0070	5070		7470	5770	R	RS-1:	62.6'-62.9', qu= 2,422 psi, G 70.5'-70.9', qu= 5,227 psi, G	SI= 35-45		9
110	109.2	67.2	5.0	0:58/1.0	(4.9)	(3.8)				R	- K3-2.	70.5-70.9, qu= 5,227 psi, G	51=30-40		
	-	ł	0.0	0:53/1.0 0:47/1.0	98%	76%				R					
105	104.2	72.2		0:36/1.0			RS-2			P	- 104.2				72.
ľ				0.34/1.0								nated at Elevation 104.2 ft in (META-ARGILLITE)	Crystalline	Rock	12.
	-	÷									-				
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SHEET 8

CORE PHOTOGRAPHS: I-5786, Bridge 108 on Lizzie Mill Road B1-A: -Y1- Station 17+85, 7 ft LT



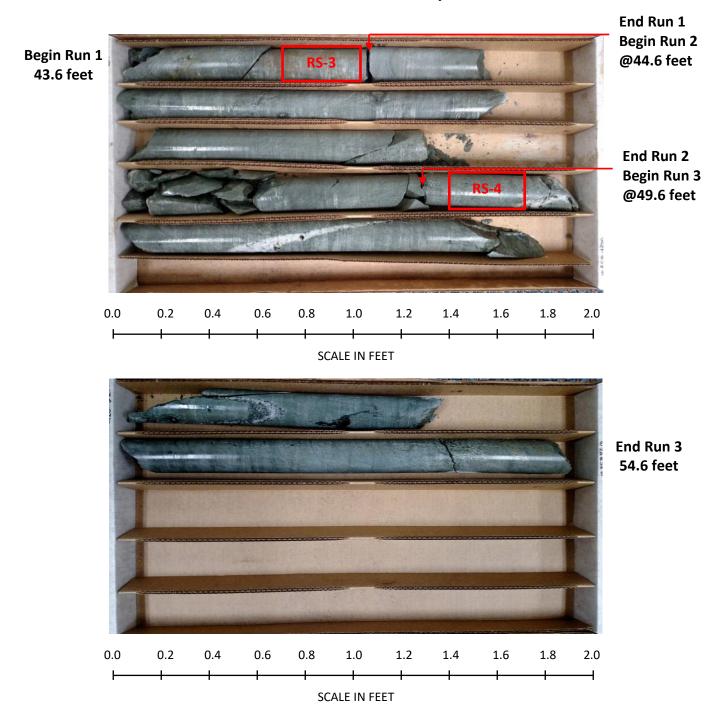
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		ייידם					• I-5786	(Lizzie M4)		JOHNST	UN			GEOLOGIST M. Arnol	u	CROW	יי הייא חו
BORING				uge No			n SR 1001 ATION 17			OFFSET	о fi от			ALIGNMENT -Y1-			ID WTR (f Ni
										NORTHING		08		EASTING 2,224,971		24 HR.	FIA
-							CME-55 85%			NORTHING			יי ס	W Casing w/ Advancer			Automatic
				- r						00MD D.1				-			
			1			51/	ART DATE		7 PER FOOT	COMP. DA	SAMP.	28/17	1 L T	SURFACE WATER DEF	IH N	A	
ELEV ELE	EV	DEPTH (ft)	0.5ft	OW CO	-	-	0 2			75 100	NO.	мо	0	SOIL AND RO	CK DES	CRIPTION	DEDTU
(11	<u> </u>		0.010	0.011	0.010	+	-		Ĩ	1	110.		I G	ELEV. (ft)			DEPTH
180	-	-												-			
	t																
175 174	4.6	- 12				+									D SURF/ PHALT	ACE	
	+		3	3	3		6		 			м		- ROADWAY Black-Dark Gray,	EMBAN		
	2.3	3.5	WOH	WOH	WOF	╡						w		(A-7) with Trace Org	anics (W	ood Fragn	nents)
170	+	-					<u>``</u>										
167	7.3	8.5												Gray-Brown, Claye			with
165	Ŧ		24	4	7		11					W	N		TAL PLA	IN	/
	Ŧ													- Red-Gray-Brown,	Fine San (A-7)	dy Silty CL	AY.
162	2.3 +	13.5	3	6	6							м	N	-			
160	Ŧ	-					· •							- _			
157	7.3 +	18.5						· · · ·						- -			
55	ļ		3	2	3		4 5	· · · · ·				w		- -			
100	+	-					<u>, ,</u>										2
152	2.3 ‡	23.5	3	5	6	-		· · · ·	· · · ·			Sat.		- Orange-Tan, Silty - (A-2-4) wit	Fine to (h Trace (Coarse SA Gravel	ND
150	+	-					. •11 .					Sat.		_			
447	, ‡	00 5					· · · · ·	· · · ·	· · · ·				\sim	<u>148.8</u> Orange-Tan, Claye (A-2-6) wit	y Fine to	Coarse S/	AND - 2
	7.3	28.5	4	7	9		· · · · · ·	· · · ·				w		- (A-2-6) wit	h Trace (Gravel	3
145	+	-					<u></u>	· -						WEATH			
142	2.3	33.5	100/0.:	3					 					Black-Orang (META-	argille-i an ar ARGILLI		
140	ł		100/0.	3						100/0.3							
	ł													-			
137	7.3 +	38.5	100/0.:	3						100/0.3				-			
135	Ŧ	-												 133.8			4
132	2.3	43.5											Ż	CRYSTA			
30	Ŧ		60/0.1							· · 60/0.1	RS-3		R	Blue-Gray (M	ii i A-AR		
	Ŧ	-											N	-			
	Ŧ												R	•			
25	+	-							· · · ·	+	RS-4		R	-			
	‡												R	- -			
	_‡			-		+		• • • •				-		121.2 Boring Terminated	at Eleva	tion 121.2	ft in
	+	-												Crystalline Rock	(META-	ARGILLITE	E)
	‡													Start Co	oring at 4	3.6'	
	+	-												-			
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WBS					I	I-5786					OHNST	NC			GEOLOGIST M. Arno	old	1	
				lge No. 1	-			e Mill F	Road)								-	ID WTR (ft)
	NG NO.						17+75			<u> </u>	FSET 9				ALIGNMENT -Y1-		0 HR.	NM
							PTH 54			NO	RTHING				EASTING 2,224,971	1	24 HR.	FIAD
				TE F&R3											Casing w/ Advancer			Automatic
	ER D	-	r				TE 04/2				MP. DAT	E 04/2	28/17		SURFACE WATER DE	PTH N	/A	
	RUN	1	_	DRILL	REC. (ft)	JN	N 11.0 f	t STF REC. (ft) %	ATA									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft)	RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	Ö G	ELEV. (ft	•)		DE	ESCRIPTION AND REMAR	KS		DEPTH (f
132.2	(19				70	70		70	70		ELEV. (II	.)			Begin Coring @ 43.6 f			DEFTR
130	132.2 - 131.2 -	43.6	1.0	2:30/1.0 2:13/1.0	(1.0)	(0.8) \ 80% /	RS-3	(10.4) 95%	(9.3) 85%	R	132.2	Gray, \ MF	Very Slight	tly We	eathered to Fresh, Medium with Close to Moderately C	Hard to M	oderately H	lard, 43.
100	-	ŧ	5.0	1:50/1.0 2:00/1.0	(4.4) 88%	(3.5) 70%				P	-		F	RS-3:	44.3-44.6, qu=3,347 psi,G 49.7-50.0, qu=4,608 psi, G	SI=35-45		9
	- 126.2	49.6		2:11/1.0							-		·		1011 0010, qui 1,000 poi, o	01 00 10		
125	-	Ŧ	5.0	2:16/1.0 1:56/1.0	(5.0)	(5.0) 100%	RS-4				-							
	-	I		2:02/1.0 2:36/1.0							-							
ŀ	121.2	54.6 _		2:19/1.0							121.2		Boring Te	ermin	ated at Elevation 121.2 ft ir	Crystallin	e Rock	
	-	l									-				(META-ARGILLITE)			
	-	ł									-				Start Coring at 43.6'			
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SHEET 11

CORE PHOTOGRAPHS: I-5786, Bridge 108 on Lizzie Mill Road B1-B: -Y1- Station 17+75, 9 ft RT



5/5/17

BRDG108.GPJ

GEO BH

15786

NCDOT BORE SINGLE

GEOTECHNICAL BORING REPORT BORE LOG

WBS N/A I-5786 COUNTY JOHNSTON TIP GEOLOGIST J. Cranston SITE DESCRIPTION Bridge No. 108 on SR 1001 (Lizzie Mill Road) over I-95 GROUND WTR (ft) OFFSET 6 ft LT BORING NO. EB2-A **STATION** 19+19 ALIGNMENT -Y1-0 HR. NM COLLAR ELEV. 195.8 ft TOTAL DEPTH 58.7 ft NORTHING 652,375 EASTING 2,225,112 24 HR. FIAD DRILL METHOD Mud Rotary DRILL RIG/HAMMER EFF/DATE F&R5785 CME-55 80% 02/11/2017 HAMMER TYPE Automatic DRILLER D. Aiello START DATE 04/11/17 COMP. DATE 04/11/17 SURFACE WATER DEPTH N/A DRIVE **BLOW COUNT BLOWS PER FOOT** SAMP. L ELEV DEPTH 0 SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 100 0.5ft 0.5ft 0.5ft 25 50 75 NO. мо (ft) G ELEV. (ft) DEPTH (ft) 200 195.8 GROUND SURFACE 0.0 195 ASPHALT 193.9 1.9 193.9 1.9 1. 5 8 10 ROADWAY EMBANKMENT Μ 192.4 3.4 3.5 **\$**12 192.3 Dark Gray, Silty Fine SAND (A-2-4) 3 6 . . 6 Μ 12 Red-Brown, Fine Sandy CLAY (A-6) . 190 Gray, Clayey Fine SAND (A-2-6) . . 187.3 8.5 2 3 186.3 9.5 W •5 Gray, Fine Sandy Silty CLAY (A-7) 185 183.8 <u>12.0</u> Dark Gray, Fine Sandy CLAY (A-6) with 182.3 13.5 Trace Organics 2 3 4 w 180 177.3 18.5 4 4 W . 🖗 8 175 172.3 23.5 WOH WOH WOH Μ 170 168.8 <u>27.0</u> COASTAL PLAIN 167.3 28.5 Red-Brown-Gray, Fine Sandy CLAY (A-7) 4 2 3 Μ 165 162.3 33.5 3 5 . 4 Μ 160 157.3 38.5 3 3 39.5 3 156.3 М Brown-Light Gray, Clayey Fine SAND (A-2-6) 155 with Trace Mica 153.8 <u>42.0</u> . Light Brown, Fine to Coarse SAND (A-3) with 152.3 <u>† 43.5</u> Trace Rock Fragments 4 5 Sat. **1**2 150 148.8 47.0 Red-Brown, Fine Sandy CLAY (A-6) with . . 147.3 48.5 Trace Rock Fragments NC_DOT.GDT 8 5 Μ 615 145 143.8 52.0 . WEATHERED ROCK 142.3 53.5 (META-ARGILLITE) 55 45/0 1 100/0.6 140 - -. . - -• . . . • 137.3 58.5 137. 58.7 100/0.: 100/0.2 Boring Terminated at Elevation 137.1 ft in Weathered Rock (META-ARGILLITE)

GEOTECHNICAL BORING REPORT BORE LOG

COUNTY JOHNSTON WBS N/A TIP I-5786 GEOLOGIST D. Racey SITE DESCRIPTION Bridge No. 108 on SR 1001 (Lizzie Mill Road) over I-95 GROUND WTR (ft) OFFSET 6 ft RT BORING NO. EB2-B **STATION** 19+09 ALIGNMENT -Y1-0 HR. NM COLLAR ELEV. 195.9 ft TOTAL DEPTH 63.5 ft NORTHING 652,367 EASTING 2,225,099 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 81% 07/18/2015 DRILL METHOD Mud Rotary HAMMER TYPE Automatic DRILLER S. Sequist START DATE 04/14/17 COMP. DATE 04/14/17 SURFACE WATER DEPTH N/A DRIVE **BLOW COUNT BLOWS PER FOOT** SAMP L ELEV DEPTH 0 SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 0.5ft 100 0.5ft 0.5ft 25 50 75 NO. мо (ft) G ELEV. (ft) DEPTH (ft 200 GROUND SURFACE 195.9 195.6 195 ASPHALT 27 9 W ROADWAY EMBANKMENT Gray-Tan, Clayey Silty Fine SAND (A-2-4) 192.4 3.5 30 191.5 5 . W 16 Red-Tan, Silty CLAY (A-7) 190 188.9 Gray, Clayey Fine SAND (A-2-6) . 187.4 8.5 3 2 1 w 185 183.9 12.0 Gray and Black, Fine Sandy CLAY (A-6) with 182.4 13.5 Trace Organics (Roots) 3 2 4 W 180 177.4 18.5 3 2 W 175 172.4 23.5 WOR WOH 1 Sat. 170 168.9 <u>27.0</u> COASTAL PLAIN 167.4 28.5 Gray-Tan-Red, Silty CLAY (A-7) 6 2 3 Μ 165 162.4 33.5 5 3 М **1**2 160 157.4 38.5 Δ 5 4 Μ 155 153.9 <u>42.0</u> . Gray-Tan, Fine to Coarse SAND (A-3), with 152.4 43.5 Trace Gravel 2 4 4 Sat. 150 BRDG108.GPJ NC_DOT.GDT 5/5/17 148.9 47.0 Tan, Clayey Fine to Coarse SAND (A-2-6) . . 147.4 48.5 2 3 6 w **b**9 145 143.9 <u>52.0</u> RESIDUAL 142.4 53.5 Gray, Silty Fine SAND (A-2-4) 36 26 36 Μ . . 140 138.9 57.0 • . • CRYSTALLINE ROCK . 137.4 58.5 Gray (META-ARGILLITE) 60/0.0 . · 60/0.0 135 ВН GEO 132.4 63.5 132.4 63.5 60/0.0 60/0.0 Boring Terminated with Standard 15786 Penetration Test Refusal at Elevation 132.4 ft in Crystalline Rock (META-ARGILLITE) **NCDOT BORE SINGLE**

SHEET 13

PROJECT NO.:N/ATIP NO.:I-5786COUNTY:JohnstonDESCRIPTION:Bridge No. 108 on SR 1001

Bridge No. 108 on SR 1001 (Lizzie Mill Road) over I-95

Sample #	Boring No.	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diamete r (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	-	GSI
RS-1	B1-A	-Y1-	17+85	7' Lt.	62.6 - 62.9	Meta-Argillite	CZfv	38%	4.10	1.78	163.0	2,422	830	35 - 45
RS-2	B1-A	-Y1-	17+85	7' Lt.	70.5 - 70.9	Meta-Argillite	CZfv	76%	4.14	1.77	158.7	5,227	1,537	35 - 45
RS-3	B1-B	-Y1-	17+75	9' Rt.	44.3 - 44.6	Meta-Argillite	CZfv	70%	4.06	1.77	162.2	3,347	500	35 - 45
RS-4	B1-B	-Y1-	17+75	9' RT.	49.7 - 50.0	Meta-Argillite	CZfv	100%	4.02	1.77	163.9	4,608	724	35 - 45

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I–5786	1	10

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY Johnston

PROJECT DESCRIPTION Bridge No. 111 on SR 2141 (Bizzell Grove Church Rd.) over I-95

CONTENTS

REFERENCE: I-5786

SHEET NO. 2,2A 3 4-9

DESCRIPTION TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN BORE LOG(S)

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 SOLI TEST DATA AVAILABLE MAY BE REVERWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICL ENGINEERING UNIT AT (1991) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CEWERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARRS 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 BORCHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UNPELACED TEST DATA CAN BE RELIED ON ONLY TO THE DEOREE OF RELIABILITY INHERENT IN THE STANDARD TEST WETHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OF 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 DOCS NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPMON 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 SHE DEEDS INCESSARY TO SATISFY IMISSELF AS TO CONDITIONS TO BE ENCOUNTERED AT THE STETENSION OF TIME FOR ANY REASON RESULTING FOM THE ACTUAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FOM THE SUBSURFACE INFORMATION.

NOTES

NA

PROIECT:

- ES: 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 MAVES 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.

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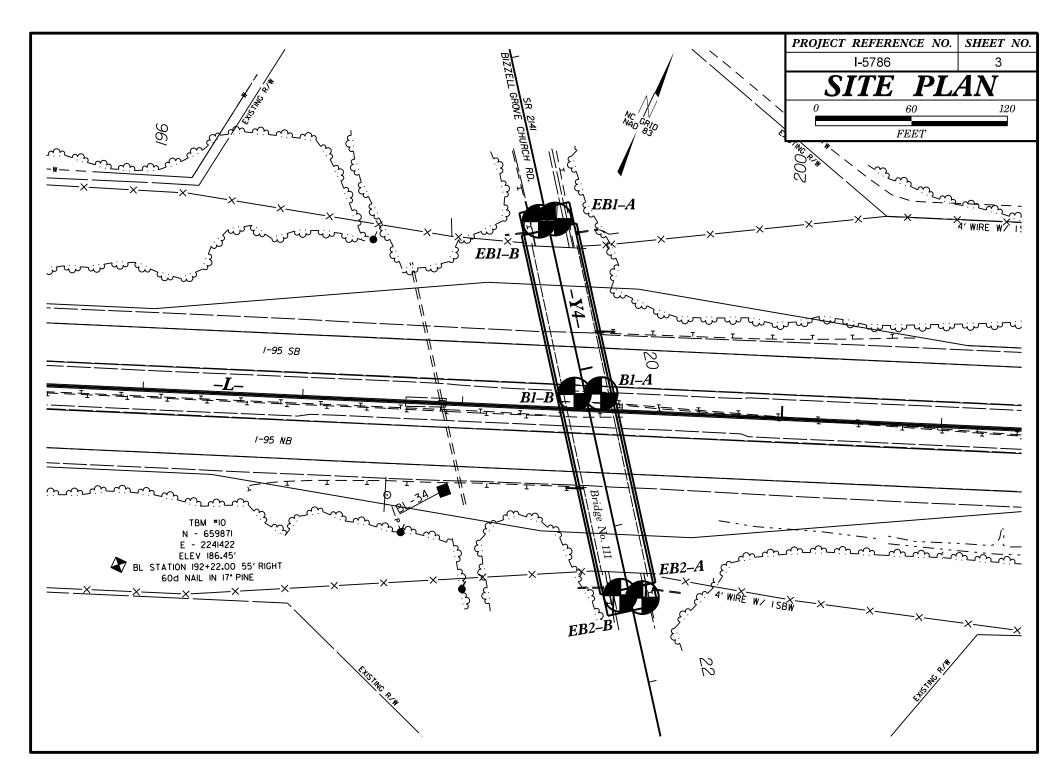
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

ROCK DESCRI		TERMS AND DEFINITIONS
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL) YIELD SPT REFUSAL IF TESTED, AN INFERRED PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLET BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITI	ER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	ADUIFER - A WATER BEARING FORMATION OR STRATA.
REPRESENTED BY A ZONE OF WEATHERED ROCK.	TON DETWEEN SUIL MNU KUUK IS UPTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:		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.
WEATHERED NON-COASTAL PLAIN MAT ROCK (WR) 100 BLOWS PER FOOT IF	NTERIAL THAT WOULD YIELD SPT N VALUES >	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
	IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE,
ROLK (CR) GNEISS, GABBRO, SCHIST,		CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
BOCK (NCR) SEDIMENTARY ROCK THAT	METAMORPHIC AND NON-COASTAL PLAIN AT WOULD YEILD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
RUCK ITPE INCLUDES PR	PHYLLITE, SLATE, SANDSTONE, ETC. NTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
SEDIMENTARY ROCK SPT REFUSAL. ROCK TYP	'PE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
WEATHERI	ING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MA' HAMMER IF CRYSTALLINE.	AY SHOW SLIGHT STAINING. ROCK RINGS UNDER	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME		DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
OF A CRYSTALLINE NATURE.	BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND D (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY, IN GR CRYSTALS OPED DUEL AND DISCOURDED CRYSTAL	RANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
CRYSTALS ARE DULL AND DISCOLORED. CRYSTAL MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLOF		FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL A	AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
DULL SOUND UNDER HAMMER BLOWS AND SHOWS WITH FRESH ROCK.	SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM,
	NINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM,) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLIN (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S P	NIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
IF TESTED, WOULD YIELD SPT REFUSAL		LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAI (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRA	AINED. ROCK FABRIC CLEAR AND EVIDENT BUT RANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
to some extent. Some fragments of strong IF tested, would yield spt n values > 100 (LENS - H BUDT OF SULE OF ROLK THAT THINS OUT IN ONE OF MORE DIRECTIONS.
	AINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL S (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK	STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK IK WEATHERED TO A DEGREE THAT ONLY MINOR	<u>Perched water</u> - water maintained above the normal ground water level by the presence of an intervening impervious stratum,
VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>II</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISC	IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
	PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	<u>ROCK QUALITY DESIGNATION (ROD)</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.
ROCK HARDI	INESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PIC SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICI		ROCK. Sill - An intrusive body of igneous rock of approximately uniform thickness and
	ITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	SILE - AN INTRUSIVE BOUT OF TONEOUS NOLK 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 CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES		SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S P BY MODERATE BLOWS.	PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE. Standard Penetration test (Penetration Resistance) (SPT) - Number of Blows (N or BPF) of
MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES	P BY FIRM PRESSURE OF KNIFE OR PICK POINT. S I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF JOURS WIGHT OF OLD AND A TO DUE A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF JFOOT INTO SOLL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPON SAMPLER, SPT REFUSAL IS PENETRATION EDUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE	OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
	MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
	ED READILY WITH POINT OF PICK. PIECES I INCH NGER PRESSURE, CAN BE SCRATCHED READILY BY	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.
SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FIN FINGERNAIL.	NUER FRESSURE. LAN BE SURATURED READILY BY	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
FRACTURE SPACING	BEDDING	BENCH MARK: BL-34, -BL- STA. 194+23.41, N: 659999, E: 2241586
TERM SPACING VERY WIDE MORE THAN 10 FEET		
WIDE 3 TO 10 FEET	VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 181.87 FEET
	THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
VERY CLOSE LESS THAN 0.16 FEET	THICKLY LAMINATED 0.008 - 0.03 FEET	NM= NOT MEASURED
INDURATII	THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING O		
RUBBING WITH FINGE	ER FREES NUMEROUS GRAINS:	
GENILE BLOW BY HA	AMMER DISINTEGRATES SAMPLE.	
BREAKS EASILY WHEN	PARATED FROM SAMPLE WITH STEEL PROBE; EN HIT WITH HAMMER.	
INDURATED DIFFICULT TO BREAK		
EXTREMELY INDURATED SHARP HAMMER BLOW SAMPLE BREAKS ACR	WS REQUIRED TO BREAK SAMPLE: ROSS GRAINS.	DATE: 8-15-14



WBS	N/A				-	IP I-5786			ORE L				GEOLOGIST D. Racey	,		
			Rrid	lae No		on SR 2141	(Bizzell C						JULUGIOT D. Racey		GROUN	D WTR (ft
	NG NO.			ige inc		TATION 1	-		OFFSET				ALIGNMENT -Y4-		0 HR.	
					_	OTAL DEPT		t t	NORTHING		83		EASTING 2,241,576		24 HR.	FIAD
				TE F		CME-75 819						D M	ud Rotary			Automatic
	ER S								COMP. DA							
	DRIVE	DEPTH	1	W CO				PER FOOT	CONF. DA	SAMP.		1 L	SURFACE WATER DEP		1	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2			75 100	NO.	мо	O G	SOIL AND ROO ELEV. (ft)	CK DESCI	RIPTION	DEPTH (f
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	-	F											-			
	-	E											GROUNE) SURFA	CE	Ą
200	-	E														
	197.3	3.5		1									Tan-Orange-Red, S (A-6) with	Silty Fine	Sandy CL	AY
195	-	Ł	3	1	2	• 3					W		. (A-0) with		avei	
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190	-	ŧ				 <u>;</u>							-			
_	187.3	13.5	WOH	2	2	L L										
185	-	+				•					W	LÈ	_			
	- 182.3	18.5					· · · ·					L	- 100.0			10
180	- 102.5	- 10.5	16	10	6			· · · · ·	· · · ·		м					18
100	-	ł											Gray, Silty Fir			2
-	177.3	23.5	2	3	3						м		Gray, Clayey F	ine SAND) (A-2-6)	
175	-	ŧ.				•										07
	- 172.3	28.5				;::::			· · · · ·					Silty Fine	SAND (A-	<u>-</u> <u>-</u> <u>-</u> <u>27</u> 2-4)
170		-	1	1	1						w	-	with Tra	ace Grave	el	
170	-	÷										-	- ·			
-	167.3	33.5	WOH	WOH	1						Sat.	-				
165	-	ŧ									-	-	_			
	162.3	38.5										-				
160	-	ŧ	3	3	5						Sat.					
	-	F														<u> </u>
-	157.3	<u>43.5</u>	9	14	20		34				м		Gray, Clay	ey SILT (A-5)	
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	152.3	48.5	10	26	54											
150	-	L.	18	26	54				●80		M	N 1 N V	-			
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	147.3	53.5	20	29	51				•80 · ·		м					
145	-	ŧ						<u> </u>	1			1 V	_			
-	142.3	58.5	14	25	58		 	· · · · ·	$ \cdot \cdot \cdot \cdot \cdot $			1 V				
140	-	ŧ									М	1 1	_			
	137.3	63.5					· · · · · · · ·	· · · · ·				л . Г	- - 137.3 - 136.9			63.
F			100/0.4					<u> </u>	100/0.4			<u>rañ</u>	Gray (MET	A-ARGILI	CK LITE)	$\frac{63}{63}$
	-	ŧ											Boring Terminated	at Elevation	on 136.9 f	t in
	-	ŧ											. Weathered Rock	(IVIE I A-A	RGILLITE	.)
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GEOTECHNICAL BORING REPORT BORE LOG

SHEET 5

WRS	N/A				т	I P 1-57	286		1	ORE					GEOLOGIST P. Fahe	,		
			Brid	lae Na				(Bizzell (Grove Ch								GROUN	ID WTR (f
	NG NO			igo ne		TATION		-		OFFSE					ALIGNMENT -Y4-		0 HR.	NI
	AR ELI							- 54.8 f	+	NORTH			77		EASTING 2,241,568		24 HR.	FIA
				TEE				07/18/201							ud Rotary			Automatic
										00110					-			Automatic
	LER S	· ·	1	ow co				04/10/1	/ PER FOOT	COMP.		E 04/		1 L	SURFACE WATER DEF	IH N	/A	
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	1	0.5ft	0	25		50		100	NO.	моі	0	SOIL AND RO	CK DES	CRIPTION	DEDTU
	(ft)		0.010	0.010	0.011				1	Ĩ		110.		G	ELEV. (ft)			DEPTH
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200	200.7	0.0	3	6	3						_		м			D SURF. PHALT	ACE	
		Ł				. 7 .º					:		101		ROADWAY Yellowish Brown, G	EMBAN		/
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180		Ŧ	11	6	3	. • 9							М					:
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-	177.2	23.5	3	4	4								м	N	Gray and felic	w, Silly C	JLAT (A-7)	
175	-	ŧ				·♥° - †					•				. 173.7			,
	172.2	28.5] :		· · · · ·						\mathbf{N}	Light Gray, Clayey	Fine to	Coarse SA	<u>nd</u> <u>2</u>
170		+	1	1	2	• 3 .		· · · · ·			:		Sat.	///	· (/	4-2-6)		
	-	ŧ													_ _ <u>168.7</u>		<u> </u>	3
-	167.2	33.5	WOH	WOH	1		•••	· · · · ·					Sat.		Yellow, Silty F	INE SAN	D (A-2-4)	
165	-	ŧ					• •			· · · ·	·		Out.	-	_			
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	157.2	43.5	8	11	14		ТХ,	· · · · ·			:		М	אין אין	• RE Gray, Cla	SIDUAL yey SILT	(A-5)	
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-	147.2	53.5	26	70	30/0.3		· · ·	· · · · ·			:				145.9			Ę
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			Bric	lae Nr			n SR 2141 (Bizzell								GROUND WTR (ft)		
	NG NO.			<u> </u>			ATION 20+17		OFFSET				ALIGNMENT -Y4-		0 HR.	NM	
	AR ELI						TAL DEPTH 58.6	ft	NORTHING		07		EASTING 2,241,649		24 HR.	FIAD	
				TE E			CME-75 81% 07/18/2					D M	lud Rotary		ER TYPE		
													-				
	.ER S		1				ART DATE 04/12		COMP. DA		12/17	1 L T	SURFACE WATER DEP	'IH N//	4		
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	OW CO	0.5ft		0 25	S PER FOOT 50	75 100	SAMP. NO.		0	SOIL AND RO	CK DESC	RIPTION		
()	(ft)	()	0.51	0.51	0.50	+				NO.	/моі	G	ELEV. (ft)			DEPTH (1	
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	-	Ŧ											- 181.8 GROUN	D SURFA	CE	0	
180	-	<u>+</u>				╈							ROADWAY	EMBANK	MENT		
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	-170.5	- 3.5	3	3	6	11	· · · · · · · · · · · · · · · · · · ·	. .			м	L	-				
175	-	Ł					·/···					L	- 174.8			7.	
	173.3	8.5										$\langle \cdot \rangle$	- COAS Brownish Gray and	TAL PLAI			
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-	168.3	13.5	 WOH	WOH	WOF	T I		· · · · · ·			Sat.	///	-				
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165	400.0	-					<u> </u>					\geq	<u>164.8</u> Brownish Yellow, S	Silty Fine S	SAND (A-2-	<u>4)</u> <u>17</u>	
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160	-	ł					. <u>N.</u> .						159.8			22	
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	-	÷	6	9	13		· · · · Q 22 · · ·	· · · · · ·			Sat.	1	- Gray, Clay	yey SILT (A-5)		
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				lge No		on SR 214		ell Gro	ve Chu			5		1		-	ID WTR (ft
-	NG NO.					TATION 2				OFFSET				ALIGNMENT -Y4-		0 HR.	NM
	AR ELE					OTAL DEP				NORTHIN				EASTING 2,241,634		24 HR.	FIAD
				TE F		7 CME-75 81								/ud Rotary	HAMM	ERTYPE	Automatic
DRIL	LER S.	Sequi	1			TART DAT				COMP. D				SURFACE WATER DEP	TH N/	A	
ELEV (ft)	ELEV	DEPTH (ft)	<u> </u>	0.5ft	-		BLOV 25		R FOOT	75 10	SAMP	17		SOIL AND RO	CK DESC	CRIPTION	
(14)	(ft)	(11)	0.5ft	0.5π	0.5ft		25	50		15 10) NO.	/мо	I G	ELEV. (ft)			DEPTH (
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	+	-		'		$\left \begin{array}{c} \P^3 \\ \vdots \\ $						Sat.	/./.	Light Pink, Clayey	Fine to C		ND
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		8.5	WOH	WOH	WOH							Sat.	/~/~	-			
170		-											/./.				12
	168.3	13.5				$\frac{1}{2}$								Brownish Yellow, S	ilty Fine	SAND (A-2	2-4) — —
	-	-	2	3	7	. •10 .						Sat.		-			
165		-								+			- V				<u>17</u>
	163.3	18.5	7	10	14	:::``						м	∧ И И	Gray, Clay		(A-5)	
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	158.3	23.5									1		ト <i>レ</i> オ レ	-			
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155	4	-					· · ·	•••	· · ·/ · /				トレ	-			
	153.3	28.5	21	26	36							м	х х V	-			
150	+	-								·			r 7 V	-			
150	148.3	- 335												149.8 WEATHE			<u>32</u>
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145	+	-					· · ·	•••			1			-			
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130	128.3	- 53.5									1			 128.3			53
	- 120.0		60/0.0							60/0.0	•			Boring Termina Penetration Test Re	ated with	Standard	
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GEOTECHNICAL BORING REPORT BORE LOG

COUNTY JOHNSTON WBS N/A TIP I-5786 GEOLOGIST M. Arnold SITE DESCRIPTION Bridge No. 111 on SR 2141 (Bizzell Grove Church Road) over I-95 GROUND WTR (ft) OFFSET 8 ft LT BORING NO. EB2-A **STATION** 21+48 ALIGNMENT -Y4-0 HR. NM COLLAR ELEV. 200.9 ft TOTAL DEPTH 64.8 ft NORTHING 659,992 EASTING 2,241,727 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 85% 01/30/2017 DRILL METHOD Mud Rotary HAMMER TYPE Automatic DRILLER D. Tignor START DATE 04/26/17 COMP. DATE 04/26/17 SURFACE WATER DEPTH N/A DRIVE **BLOW COUNT BLOWS PER FOOT** SAMP L ELEV DEPTH 0 SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 100 0.5ft 0.5ft 0.5ft 0 25 50 75 NO. мо (ft) G ELEV. (ft) DEPTH (ft 205 GROUND SURFACE 200.5 200.5 04 200 ASPHALT q 5 5 199 М ROADWAY EMBANKMENT Brown, Fine SAND (A-3) 197.4 3.5 4 Gray-Orange-Brown, Fine Sandy CLAY Μ (A-7) with Trace Organics (Wood Fragments) 195 . [. | . . 192.4 8.5 2 3 4 М 190 187.4 13.5 2 2 3 Μ 185 183.9 17.0 Brown, Silty Fine Sandy CLAY (A-6) 182.4 18.5 WOH 2 W 3 180 178.9 <u>22.0</u> COASTAL PLAIN 177.4 23.5 Gray-Orange-Tan, Fine Sandy CLAY (A-7) 3 3 3 W 175 173.9 <u>27.0</u> Orange-White-Brown, Clayey Fine Sandy 172.4 28.5 SILT (A-5) 2 171.5 29.4 W 63 Orange-Brown, Clayey Fine to Coarse SAND 170 (A-2-6) 168.9 32.0 White-Orange-Brown, Fine Sandy Clayey 167.4 33.5 SILT (A-5) 2 2 w 165 163.9 <u>37.0</u> Orange-Brown, Clayey GRAVEL (A-1-b) with 162.4 38.5 Trace Fine Sand 12 19 W 160 158.9 42.0 RESIDUAL 157.4 43.5 Blue-Gray, Clayey SILT (A-5) 10 20 35 Μ 655 155 5/5/17 152.4 48.5 23 NC_DOT.GDT 6 10 Μ **0**33 150 148.9 52.0 WEATHERED ROCK 53.5 147.4 Brown-Gray (META-ARGILLITE) 34/0.1 66 100/0.6 GPJ. 145 BRDG111. . • 142.4 58.5 23/0.1 77 . 100/0.6 . 140 ВН . 91 GEO . 137.4 + 63.5 100/0.3 39 27 GH. 136.1 64.8 15786 100/0.3 Boring Terminated at Elevation 136.1 ft in Weathered Rock (META-ARGILLITE) **NCDOT BORE SINGLE**

SHEET 8

WBS N/A TIP I-5786 COUNTY JOHNSTON GEOLOGIST P. Fahey SITE DESCRIPTION Bridge No. 111 on SR 2141 (Bizzell Grove Church Road) over I-95 OFFSET 6 ft RT ALIGNMENT -Y4- COLLAR ELEV. 200.9 ft TOTAL DEPTH 54.0 ft NORTHING 659,987 EASTING 2,241,714 DRILL RIGHAMMER EFF./DATE F8R4637 CME-75 81% 07/18/2015 DRILL METHOD Mud Rotary HAMM DRILLER S. Sequist START DATE 04/10/17 COMP. DATE 04/10/17 SURFACE WATER DEPTH N// LEV PRIVE DEPTH BLOW COUNT BLOWS PER FOOT SAMP. NO. MOI G ELEV. (ft) SOIL AND ROCK DESC 200 0.0 7 4 3 7	RIPTION DEPTH (
BORING NO. EB2-B STATION 21+43 OFFSET 6 ft RT ALIGNMENT -Y4- COLLAR ELEV. 200.9 ft TOTAL DEPTH 54.0 ft NORTHING 659,987 EASTING 2,241,714 DRILL RIGHAMMER EFFJDATE F8R4637 CME-75 81% 07/18/2015 DRILL METHOD Mud Rotary HAMM DRILLER S. Sequist START DATE 04/10/17 COMP. DATE 04/10/17 SURFACE WATER DEPTH N/ LEV DRIVE (ft) DEPTH BLOW COUNT (ft) BLOWS PER FOOT (ft) SAMP. MOI C SOIL AND ROCK DESC ELEV. (ft) SOIL AND ROCK DESC (ft) SOI	0 HR. NA 24 HR. FIAE ER TYPE Automatic A RIPTION
COLLAR ELEV. 200.9 ft TOTAL DEPTH 54.0 ft NORTHING 659,987 EASTING 2,241,714 DRILL RIG/HAMMER EFF_/DATE F&R4637 CME-75 81% 07/18/2015 DRILL METHOD Mucl Rotary HAMM DRILLER S. Sequist START DATE 04/10/17 COMP. DATE 04/10/17 SURFACE WATER DEPTH N/ Lev (ft) DRIVE (ft) DEPTH (ft) BLOW COUNT (ft) BLOW COUNT 0.5ft 0.5ft 0.5ft </th <th>24 HR. FIAD ER TYPE Automatic A RIPTION</th>	24 HR. FIAD ER TYPE Automatic A RIPTION
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200.9 0.0 7 4 3 7	
200 7 4 3 7 4 3 7 4 3 7 RoAdWay EmBani Reddish Brown and Light (Coarse Sandy CLAY (A-6) v Odor from 0.0'-1 195 1 3 4 - - - - - - - Coarse Sandy CLAY (A-6) v Odor from 0.0'-1 195 1 3 4 - - - - - - - Odor from 0.0'-1 192.4 8.5 -	
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177.4 + 23.5 + 3 + 4 + 4 Yellow, Brown, and Gray, Si	
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162.4 38.5 6 8 10	AVEL (A-1-b)
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157.4 43.5 Image: Constraint of the second	SILT (A-5)
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- 44 56/0.4 · · · · · · · · · · · · · · · · · · ·	LITE)
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100/0.5 Boring Terminated at Eleval	ion 146.9 ft in
	ion 146.9 ft in ARGILLITE)