STATE STATE PROJECT REFERENCE NO. 10 SF-230084

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY COLUMBUS

PROJECT DESCRIPTION BRIDGE NO. 84 ON SR 1119 (WRIGHT RD.) OVER JUNIPER SWAMP

CONTENTS

SHEET NO.

2, 2A 3 4-9

DESCRIPTION

TITLE SHEET LEGEND (SOIL & ROCK)

SITE PLAN

BORE LOG(S)

PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

INVESTIGATED BY F&R, Inc.

DRAWN BY __T.T. WALKER

CHECKED BY _ C. WANG

SUBMITTED BY P. ALTON

DATE __MAY 2017

CAUTION NOTICE

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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.



Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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9/17

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PROJECT REFERENCE NO.	SHEET NO.
SF-230084	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)

												`		,					
								SCR						GRADATION					
BE PENE ACCORD IS	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										ESS THAN 10 D1586). SOI INCLUDE T	00 BLOWS F IL CLASSIF HE FOLLOW	PER FOOT ICATION ING:	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.					
	AS MIN	ERALO	OGICAL	COMP	OSITIO	ON, AND	ULARI	TY. STR	RUCTUR	E. PLASTI	ITY. ETC. FO	OR EXAMPLE	Ē .	ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:					
	VEHT S										RS.HIGHLY PL			ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED,					
GENERAL			GRANU	LAR MA	TERIALS	5		SIL1	T-CLAY	MATERIALS		RGANIC MATER	RIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, ETC.					
CLASS. GROUP	Α-		(≤ 35% A-3	rassiN)) 1-2		A-4	35% PAS A-5	SING "200) A-6 A-	7 A-1. A-2	A-4, A-5	1	MINERAL NAMES SUCH AS UDARIZ, FELDSPAR, MICA, TALC, RAULIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.					
CLASS.	A-1-a	А-1-ь		A-2-4		A-2-6		000300000		A-7- A-7	A-3	A-6, A-7		COMPRESSIBILITY					
SYMBOL % PASSING	00000	00000					×		17.1					SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50					
*10 *40	50 MX 30 MX										GRANULAR SOILS	SILT- CLAY SOILS	MUCK, PEAT	PERCENTAGE OF MATERIAL GRANULAR SILT - CLAY					
"200 MATERIAL PASSING "40 LL	_		_	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	36 MN 36	N SOIL	.S WITH		ORGANIC MATERIAL GRANULAR SILT - CLAY SOILS OTHER MATERIAL IRACE OF ORGANIC MATTER 2 - 3% 3 - 5% IRACE 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					
PI GROUP INDEX	61	MX	NP a	10 MX	10 MX	+	II MN MX	10 MX 8 MX	10 MX	11 MN 11 M	MOC MOC	DERATE JNTS OF	HIGHLY Organic	GROUND WATER					
USUAL TYPES	STONE		FINE			R CLAY		SIL	_	CLAYEY	☐ OR	IGANIC ATTER	SOILS	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING					
OF MAJOR MATERIALS	GRAVEI SAI		SAND			AND SA		SOI		SOILS				STATIC WATER LEVEL AFTER 24 HOURS					
gen, rating as subgrade				LENT TO					FAIR T		FAIR TO POOR	POOR	UNSUITABLE	<u>▽P₩</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA O-MM- SPRING OR SEEP					
			PI OF							6 SUBGROUP	IS > LL - 30			MISCELLANEOUS SYMBOLS					
			Τ.					RAN	GE OF	STANDARD	RAN	IGE OF UN							
PRIMARY	PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE S (N-VALUE) (TONS/FT						(N-VA	ALUE)	CE COM			ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES							
GENERA GRANUL	GENERALLY VERY LOOSE < 4 LOOSE 4 TO 10						4 T	0 10		SOIL SYMBOL SOIL SYMBOL SOIL SYMBOL SPOT DATE TEST BORING SLOPE INDICATOR INSTALLATION									
MATER	MATERIAL MEDIUM DENSE 10 TO 30 N/ (NON-COHESIVE) DENSE 30 TO 50					N/A		ARTIFICIAL FILL (AF) OTHER											
	VERY SOFT < 2 < 0.25						INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD												
GENERA SILT-C	LAY			MEDI	SOFT UM S	TIFF			2 T 4 T	0 8		0.25 TO 0.5 TO	1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE					
	MATERIAL STIFF (COHESIVE) VERY STIFF						8 TI	0 30		1 TO 2 2 TO		→ → → → → → → → ALLUVIAL SOIL BOUNDARY △ PIEZOMETER INSTALLATION → SPT N-VALUE							
					HARD TEX	<u>KTU</u> F	E O	R GF	· RAIN	30 SIZE		> 4		RECOMMENDATION SYMBOLS					
U.S. STD. S		IZE			4		10	40			00 270			UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE					
OPENING (N BOULDI (BLDR	ER		OBBLE		GRAV	/EL	2.00	COARS	SE D	F1	0.053 NE ND	SILT (SL.)	CLAY (CL.)	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL					
GRAIN M		05 05		75			 2 . 0	CSE. S		(F_ 0.25	SD.) 0.05	0.00		ABBRE VIATIONS AR - AUGER REFUSAL MED, - MEDIUM VST - VANE SHEAR TEST					
SIZE IN		12	2011	3										BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT					
SOTI	MOIS		SOIL SCALI		usti T		- CI				TERMS			CPT - CONE PENETRATION TEST NP - NON PLASTIC 7/4 - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK					
	TERBE						SCRIPT			OUIDE FO	R FIELD MO	usiure DE	SCRIPTION						
LL _		IOUIO	LIMI	т	_		TURATI	ED -			LIOUID; VER OW THE GR			= - VOID RATIO					
PLASTIC RANGE (PI) PLASTI OM OPTIMU SL SHRINK					- WE	T - (W	n			D: REQUIRES PTIMUM MOI		0	FRACI, - FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO						
		PTIMI	им мо	ISTUR	Ε	- MO	IST -	(M)		SOLID; AT	OR NEAR C	PTIMUM M	OISTURE	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:					
				_	- 00	v				ADDITIONAL		0	CME-45C CLAY BITS X AUTOMATIC MANUAL						
- DRY - (D) ATTAIN OF				PTIMUM MOI	STURE		X CME-55 G*CONTINUOUS FLIGHT AUGER CORE SIZE: B*HOLLOW AUGERS -BB												
								ITY IN		PI)		ORY STREN	GTH	CME-550 HARD FACED FINGER BITS					
	N PLAS		STIC					0-5 6-15			_	VERY LO	W	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:					
мо	DERATI	ELY F	PLASTI	IC				16-25	nee			MEDIUM		CASING W/ ADVANCER POST HOLE DIGGER					
HIL	SHLY P	LHDI	10					OR MO				HIGH		PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER					
DESSE:	T101:C	MAY	INC: :	IDE 65	n 00	OD 00				C /TAN	D VEL : 0: :	DDOWN Dr.	IE CDASS	TRICONE TUNGCARB. SOUNDING ROD CORE BIT VANE SHEAR TEST					
											D. YELLOW-			CORE BIT VANE SHEAR TEST					
														L L L					

SF-230084

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

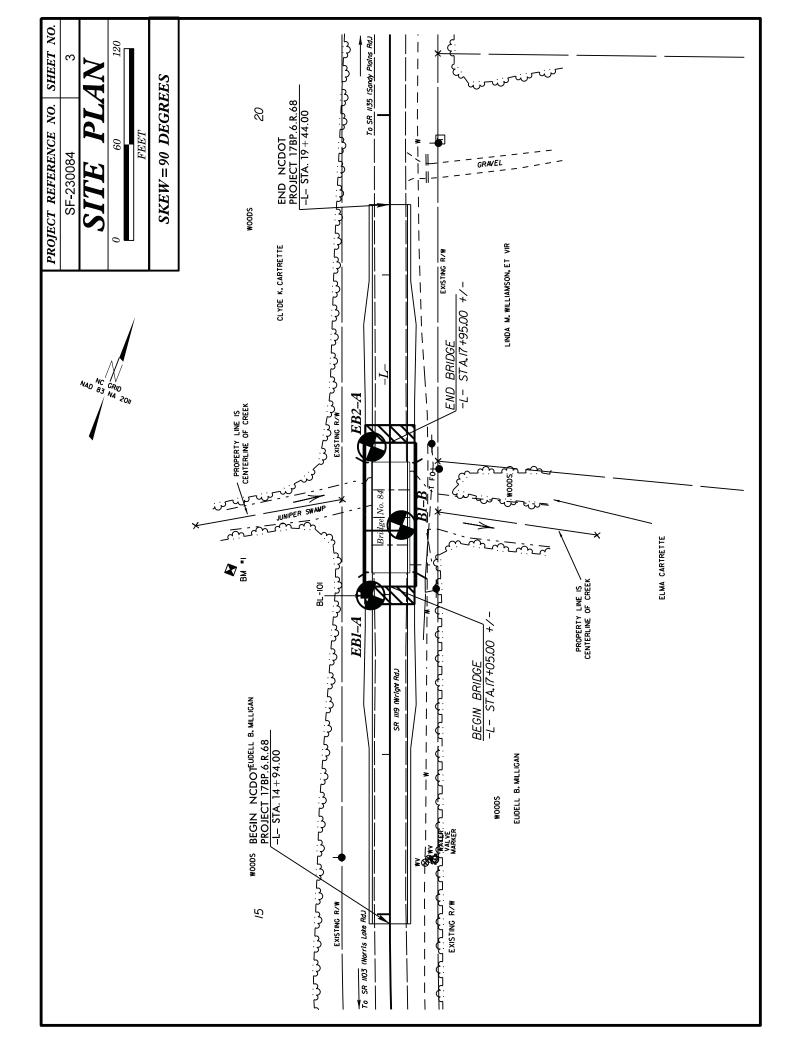
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

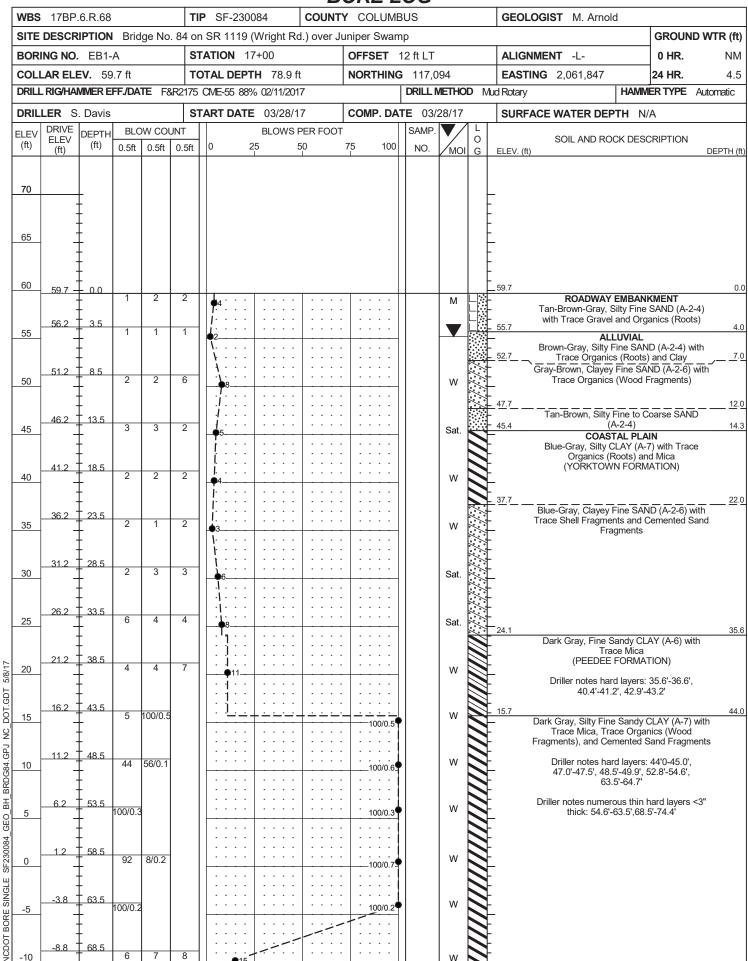
		ROCK DES		TERMS AND DEFINITIONS
			OULD YIELD SPT REFUSAL IF TESTED. AN INFERRED TAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
SPT REFUSAL	. IS PENETRATION BY A	SPLIT SPOON SAM	MPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 SITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
REPRESENTED) BY A ZONE OF WEATH	ERED ROCK.		ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
WEATHERED	IALS ARE TYPICALLY DI		MATERIAL THAT WOULD YIELD SPT N VALUES >	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.
ROCK (WR)	3.3	00 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 ROCK (CR)	۱ ایز: کرز کا		REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE.	SURFACE.
NON-CRYSTAL	I INC	INE TO COARSE GR	RAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
ROCK (NCR)	— — — ·		THAT WOULD YEILD SPT REFUSAL IF TESTED. S PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
COASTAL PLA SEDIMENTARY (CP)	ROCK LLLL S		DIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD 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.
		WEATH	ERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
FRESH	ROCK FRESH, CRYSTALS HAMMER IF CRYSTALLIN		S MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
VERY SLIGHT		N SPECIMEN FACE S	OME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, HINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
SLIGHT (SLI.)	ROCK GENERALLY FRESI I INCH. OPEN JOINTS M	4. JOINTS STAINED A	IND DISCOLORATION EXTENDS INTO ROCK UP TO N GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
MODERATE			STALLINE ROCKS RING UNDER HAMMER BLOWS. COLORATION AND WEATHERING EFFECTS. IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FIDAT - BOCK FRACMENTS ON SUPFACE NEAR THEIR OBJOINAL POSITION AND DISLODED FROM
(MOD.)	GRANITOID ROCKS, MOST	FELDSPARS ARE DI	JULIANION AND WEATHERING EFFECTS. IN JULI AND DISCOLORED, SOME SHOW CLAY, ROCK HAS IOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
	WITH FRESH ROCK.			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
MODERATELY SEVERE			STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
(MOD. SEV.)	AND CAN BE EXCAVATED IF TESTED, WOULD YIEL		"S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
SEVERE			STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
(SEV.)			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.
VERY	IF TESTED. WOULD YIEL	D SPT N VALUES >		MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
SEVERE (V SEV.)	BUT MASS IS EFFECTIV REMAINING. SAPROLITE	ELY REDUCED TO SO IS AN EXAMPLE OF	DIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK ROCK 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,
COMPLETE			IN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
COMILLIE			BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUM AND EXPRESSED AS A PERCENTAGE.
		ROCK HA	RDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
VERY HARD	CANNOT BE SCRATCHED SEVERAL HARD BLOWS		P PICK. BREAKING OF HAND SPECIMENS REQUIRES PICK.	ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
HARD	CAN BE SCRATCHED BY TO DETACH HAND SPEC		Y WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
MODERATELY HARD			JGES OR GROOVES TO 0.25 INCHES DEEP CAN BE T'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
MEDIUM	CAN BE GROOVED OR GO		DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
HARD	CAN BE EXCAVATED IN POINT OF A GEOLOGIST		ICES I 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.
SOFT	CAN BE GROVED OR GOVERNMENT CHIPS TO SEVER	JGED READILY BY KI AL INCHES IN SIZE	NIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
VERY	PIECES CAN BE BROKEN		RE. VATED READILY WITH POINT OF PICK. PIECES I INCH	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
SOFT	OR MORE IN THICKNESS		FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
-	FINGERNAIL.	INC	DEDCING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
F	FRACTURE SPAC	ING PACING	BEDDING TERM THICKNESS	BENCH MARK: BL-IOI: N: II7093.724, E: 2061843.489, -BL- STA. I4+63.83
VERY WIDE	E MORE TI	AN 10 FEET	VERY THICKLY BEDDED 4 FEET	ELEVATION: 59,03 FEET
WIDE MODERATE		10 FEET 3 FEET	THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET	
CLOSE	0.16	TO 1 F00T	VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
VERY CLO	DE LESS IH	AN 0.16 FEET	THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	NM = NOT MEASURED
		INDUR	ATION	FIAD = FILLED IMMEDIATELY AFTER DRILLING
FOR SEDIMEN	ITARY ROCKS, INDURATIO		NG OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
FRIABL	LE		INGER FREES NUMEROUS GRAINS: Y HAMMER DISINTEGRATES SAMPLE.	
MODER	ATELY INDURATED		SEPARATED FROM SAMPLE WITH STEEL PROBE; WHEN HIT WITH HAMMER.	
INDURA	ATED		FICULT TO SEPARATE WITH STEEL PROBE; REAK WITH HAMMER.	

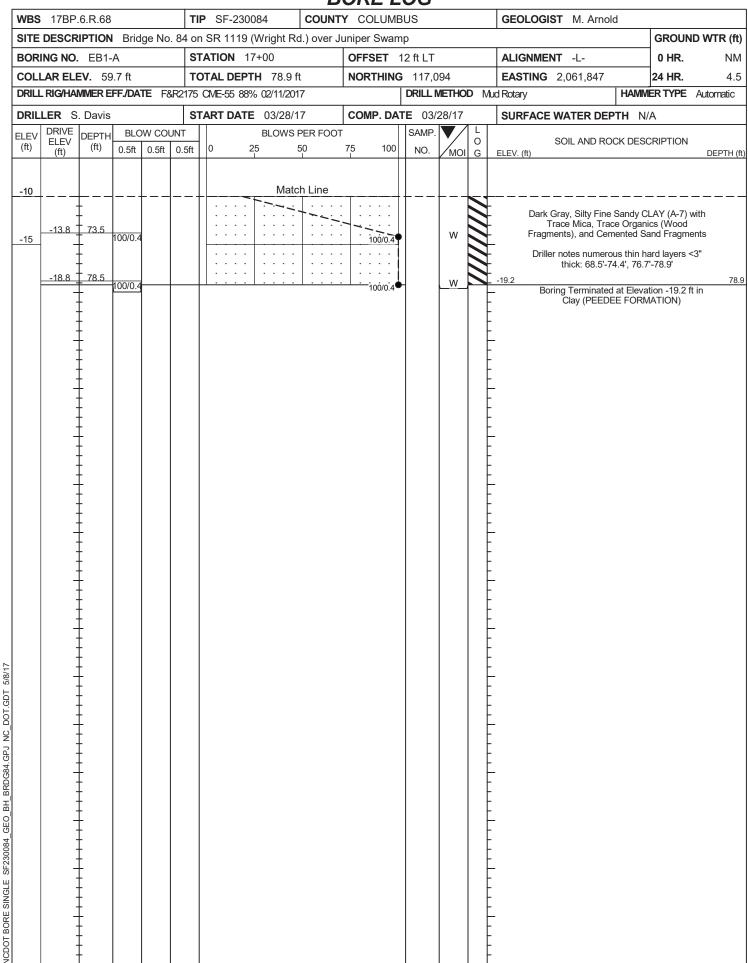
SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

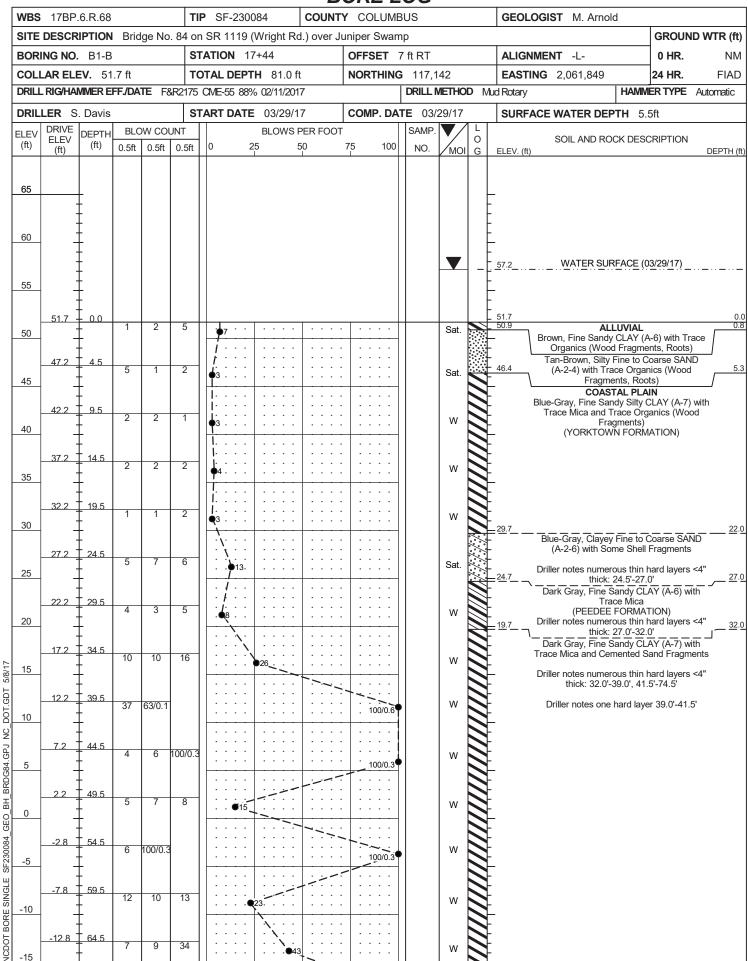
EXTREMELY INDURATED

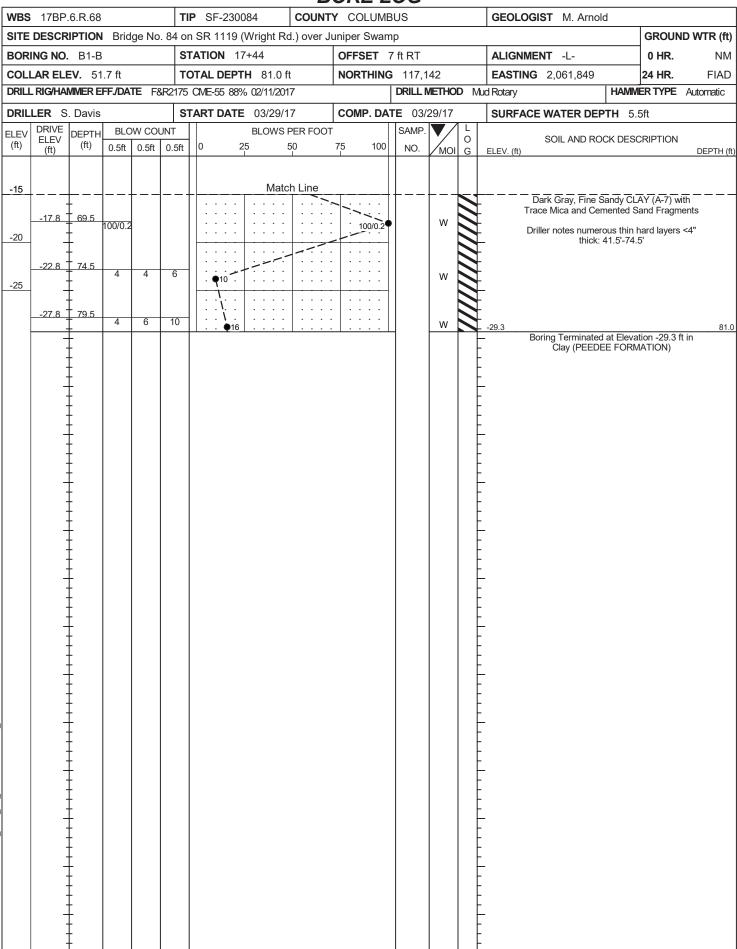
DATE: 8-15-14





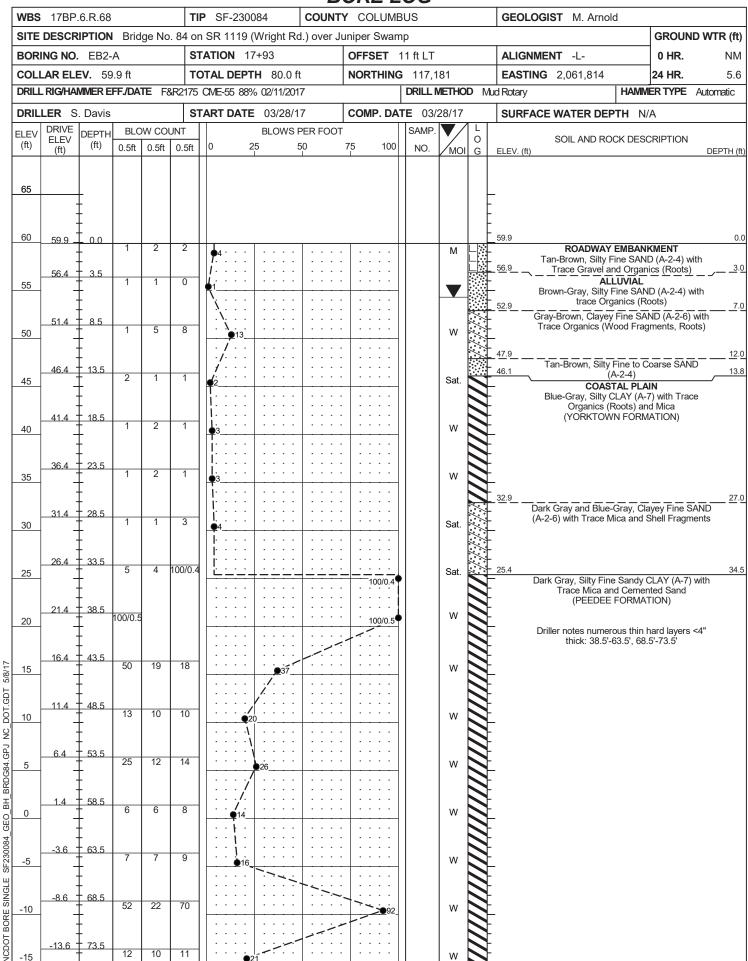






5/8/17

NCDOT BORE SINGLE SF230084 GEO BH BRDG84.GPJ NC DOT.GDT



								ORI	<u> </u>	UG							
WBS 17	7BP.6.R.68			TI	P SF-2300	084	COUNT	Y CO	LUMB	US			GEOLOGIS	ST M. Arno	old		
SITE DES	SCRIPTION	l Brid	ge No.	. 84 or	n SR 1119 (Wright R	Rd.) over J	Juniper	Swam	ρ			(ID WTR (1
BORING	NO. EB2-	·A		S	TATION 17	7+93		OFFS	ET 1	1 ft LT			ALIGNMEN	NT -L-		0 HR.	N
	ELEV. 59				OTAL DEPT			NORT		117,1				2,061,814		24 HR.	5.
DRILL RIG	HAMMER E	FF./DA	TE F&	R2175	CME-55 88%	6 02/11/20	17			DRILL N	/IETHO	D M.	ud Rotary		HAMIN	IER TYPE	Automatic
DRILLER	S. Davis			S	TART DATE	03/28/	17	COME	P. DAT	E 03/2	28/17		SURFACE	WATER DE	PTH N	/A	
-LLV EL	IVE DEPTH	-	0.5ft		0 2	BLOWS	PER FOO	T 75	100	SAMP. NO.	MOI	L O G	ELEV. (ft)	SOIL AND RO	OCK DES	CRIPTION	DEPTH
-1518 -20	3.6 - 78.5	12	12	13		Mat	ch Line 				w		-20.1	Gray, Silty Fir Trace Mica a (PEEDEE iller notes one ring Terminate Clay (PEED	nd Cemer FORMA hard laye	nted Sand ΓΙΟΝ) r: 73.5'-77. ntion -20.1 f	3' 8
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REFERENCE:

TOTAL SHEETS STATE STATE PROJECT REFERENCE NO. SF-230196

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY COLUMBUS

PROJECT DESCRIPTION BRIDGE NO. 196 ON SR 1003 (SILVER SPOON RD.) OVER BIG BRANCH

CONTENTS

SHEET NO.

2, 2A

3 4-10 **DESCRIPTION**

TITLE SHEET LEGEND (SOIL & ROCK)

SITE PLAN BORE LOG(S) **PERSONNEL**

M. ARNOLD

S. DAVIS

T. SHARPE

INVESTIGATED BY _F&R, Inc.

DRAWN BY __T.T. WALKER

CHECKED BY __C. WANG

SUBMITTED BY R. RIVENBARK

DATE _ APRIL 2017

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 1999 707-6805. 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 STITU IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD THE DBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS WAT 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 PLANS AND DOLUMENTS 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 HINSELF 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 CUTTAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

SS:
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.

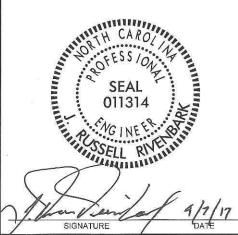


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FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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

PROJECT REPERENCE NO.	SHEET NO.
SF-230196	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)

SOLID CONSIDERATION CONTROLATED AND CONTROLA						
SERVICE PROPERTY WITH A CONTINUADOR FLUCT PROPERTY AREA MACE AND PROPERTY OF THE PROPERTY OF	GRADATION WELL CRADED - INDICATES A COOR PERPERSIATION OF PARTICLE SIZES FROM FINE TO COARSE					
S DREED ON THE AMONITO SYSTEM, BOOK CONTROLLED THE FOLLOWING COUNTY OF C	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.					
SOIL LEGENO AND ASSISTED CLASSIFICATION SOIL LEGENO AND ASSISTED CLASSIFICATION SOIL LEGENO AND ASSISTED CLASSIFICATION SOIL ASSISTED CLASSIFICATION SOIL LEGENO AND ASSISTED CLASSIFICATION MINERAL GOSCIAL COMPOSITION MINERAL GOSCIAL COMPOSITI	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.					
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PRIMARY SOIL TYPE	SYMBOLS					
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MATERIAL (NON-COHESIVE) MEDIUM DENSE	TEST BORING SLOPE INDICATOR INSTALLATION					
VERY SOFT CORE BORING CO						
SILT-CLAY MEDIUM STIFF 4 TO 8	R BORING TEST					
SILT-CLAY MATERIAL STIFF	BORING • SOUNDING ROD					
MATERIAL (COHESIVE) STIFF VERY STIFF HARD TEXTURE OR GRAIN SIZE U.S. STO. SIEVE SIZE U.S. STALLATION U.S. STO. SIEVE SIZE U.S.	TORING WELL TEST BORING					
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- SATURATED - USUALLY LIQUID VERY WET, USUALLY PLASTIC RANCE (PI) PL OM OPTIMUM MOISTURE SL - SHIT, SIT - SHIT, SHIT, SIT - SHIT, SH						
LL LIOUID LIMIT PLASTIC RANGE (PI) PL OM OPTIMUM MOISTURE SL - SHRINKAGE LIMIT OPTIMUM MOISTURE SL - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE OR - CORE SIZE: CME - 45C FOSS FOSSILIFEROUS SLI SLIGHTLY RS - RC FRACC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RE FRACS FRAGMENTS W - MOISTURE CONTENT CBR - CC RT - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE DRILL UNITS: OPTIMUM MOISTURE CME - 45C CLAY BITS COME - 45C CLAY BITS COME - 55	e - VOID RATIO					
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PL PLASTIC LIMIT OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE MI HIGHLY V - VERY F COUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TY CME-45C CLAY BITS X AUTON X CME-55 G*CONTINUOUS FLIGHT AUGER CORE SIZE:						
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT - MOIST - (M) SOLIDI AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE CME-45C CLAY BITS X AUTON - DRY - (D) ATTAIN OPTIMUM MOISTURE X CME-55 CONTINUOUS FLIGHT AUGER CORE SIZE:	RATIO					
SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE CME-45C						
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE X CME-55 G* CONTINUOUS FLIGHT AUGER CORE SIZE:	X AUTOMATIC MANUAL					
	411055					
PLASTICITY S + HOLLOW AUGERS - B -						
PLASTICITY INDEX (PI) DRY STRENGTH CME-550 HARD FACED FINGER BITS -N	=					
NON PLASTIC 0-5 VERY LOW TUNGCARBIDE INSERTS						
MODERATELY PLASTIC 16-25 MEDIUM X CASING X ADVANCER DIST	NANCER HAND TOOLS: POST HOLE DIGGER					
HIGHLY PLASTIC 26 OR MORE HIGH PORTABLE HOIST TRICONE STEEL TEETH HAND	EL TEETH HAND AUGER					
	IGCARB. SOUNDING ROD					
	VANE SHEAR TEST					
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.						

SF-230196

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 DESCRIPTION

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:

WEATHERED

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES NOOK (WR)

ROCK (WR)

CRYSTAL I IME

CRYSTAL I IME

CRYSTAL I IME

CRYSTAL I IME 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, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CNEISS, GABBRO, SCHIST, ETC.
FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.
ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT BEGING ADDRESS OF THE STATE OF CRYSTALLINE ROCK (CR) SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. NON-CRYSTALLINE ROCK (NCR) 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. SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SEDIMENTARY ROCK SHELL BEDS, ETC DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT WEATHERING ROCKS OR CUTS MASSIVE ROCK. FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HAMMER IF CRYSTALLINE. ORIZONTAL. 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 DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE (V SLI.) LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. OF A CRYSTALLINE NATURE. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS ${ ilde {
m FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. (MOD.) SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. WITH FRESH ROCK. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE MODERATELY 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, SEVERE (MOD. SEV.) JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. IF TESTED, WOULD YIELD SPT REFUSAL LEGGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO 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. SEVERE ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTILING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE VERY PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE 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 SEVERE (V SEV.) INTERVENING IMPERVIOUS STRATUM. VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 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 COMPLETE ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. ALSO AN EXAMPLE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. ROCK HARDNESS CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. VERY HARD <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. CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED HARD TO DETACH HAND SPECIMEN. $\underline{\text{SLICKENSIDE}}$ - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. 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 MODERATELY HARD 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 CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. MEDIUM CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. CAN BE GROYED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAYATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN SOFT STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. PIECES CAN BE BROKEN BY FINGER PRESSURE. CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH VERY OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY SOF T TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. FRACTURE SPACING BEDDING BENCH MARK: BL-IOI: N: 247290.6350, E: 2069988.7240, STATION 13+06.48 TERM VERY WIDE SPACING MORE THAN 10 FEET TERM THICKNESS VERY THICKLY BEDDED 4 FEET ELEVATION: 76.98 1.5 - 4 FEET 0.16 - 1.5 FEET 0.03 - 0.16 FEET WINE 3 TO 10 FEET 1 TO 3 FEET THICKLY BEDDED
THINLY BEDDED MODERATELY CLOSE NOTES: 0.16 TO 1 FOOT VERY THINLY BEDDED CLOSE VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED
THINLY LAMINATED 0.008 - 0.03 FEET NM = NOT MEASURED < 0.008 FEET FIAD = FILLED IMMEDIATELY AFTER DRILLING INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS: FRIARI F GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.

GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: DIFFICULT TO BREAK WITH HAMMER.

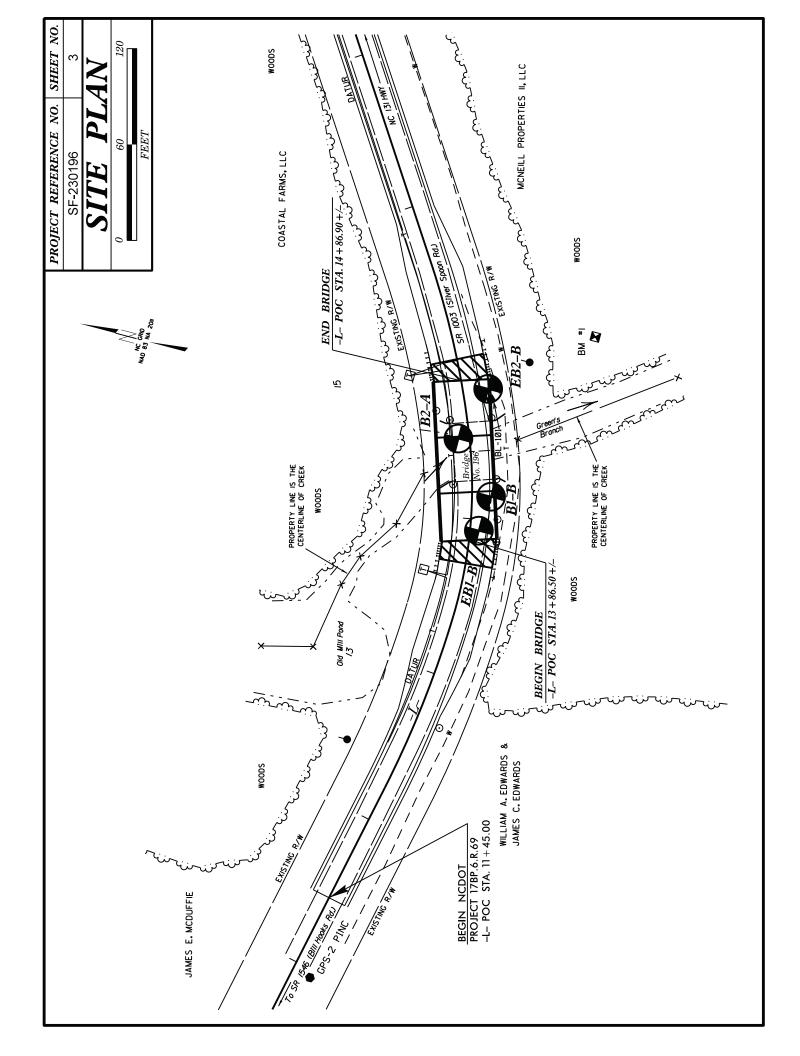
SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

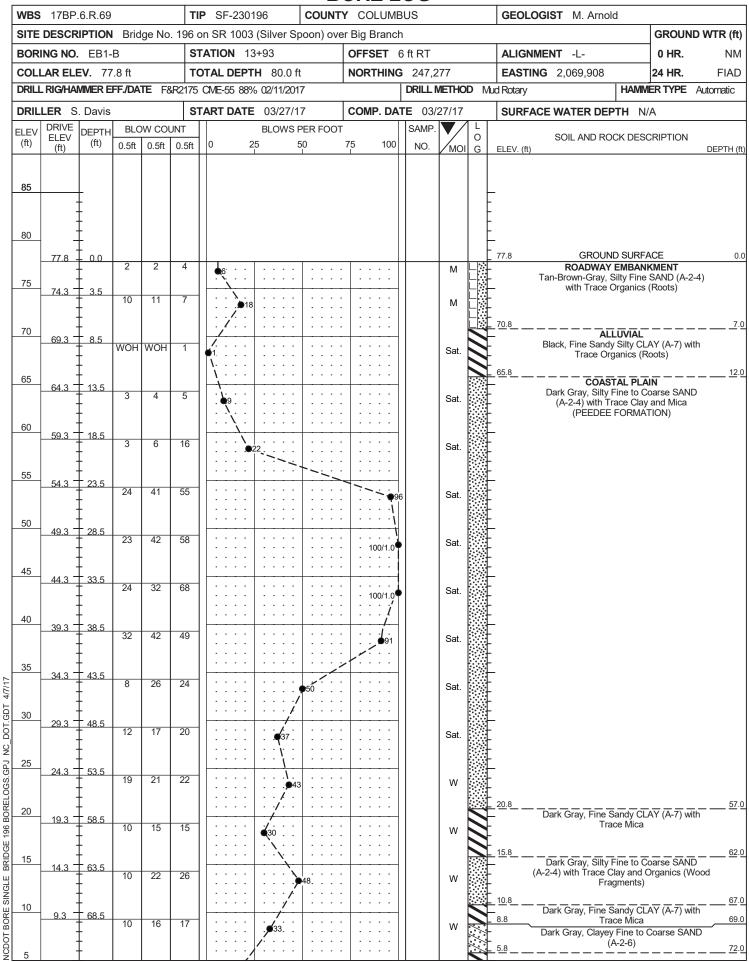
MODERATELY INDURATED

EXTREMELY INDURATED

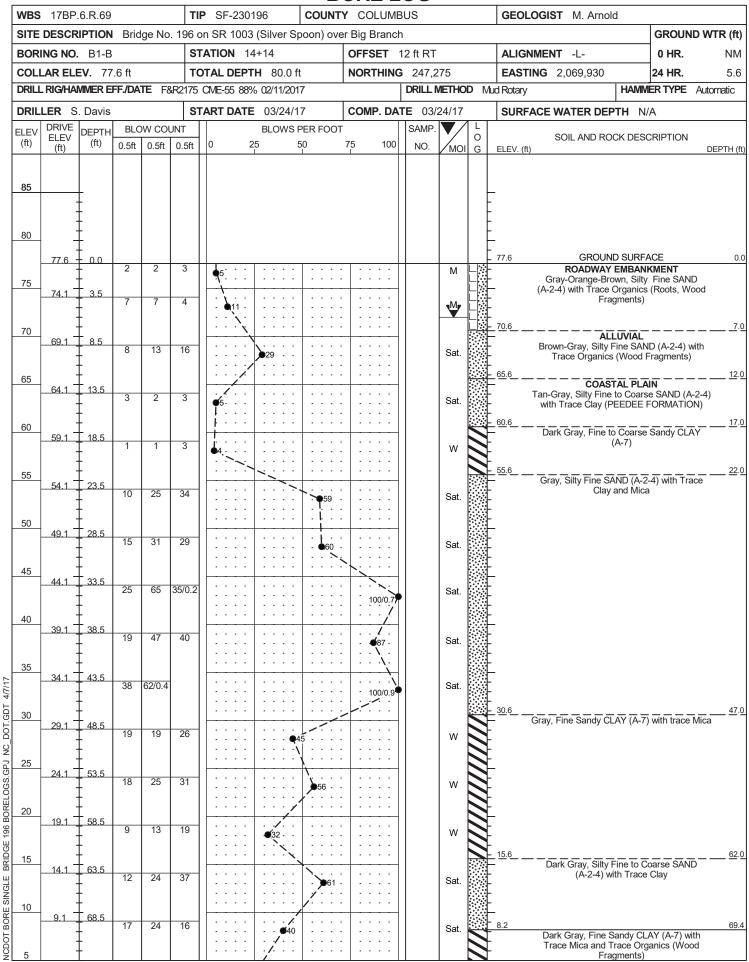
INDURATED

FEET

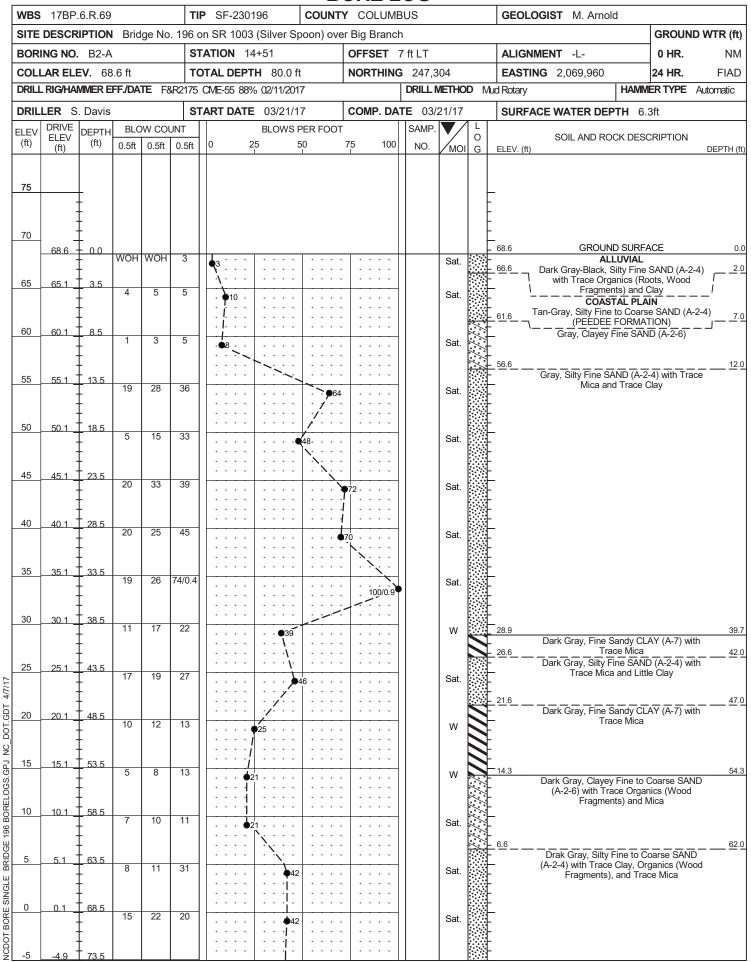




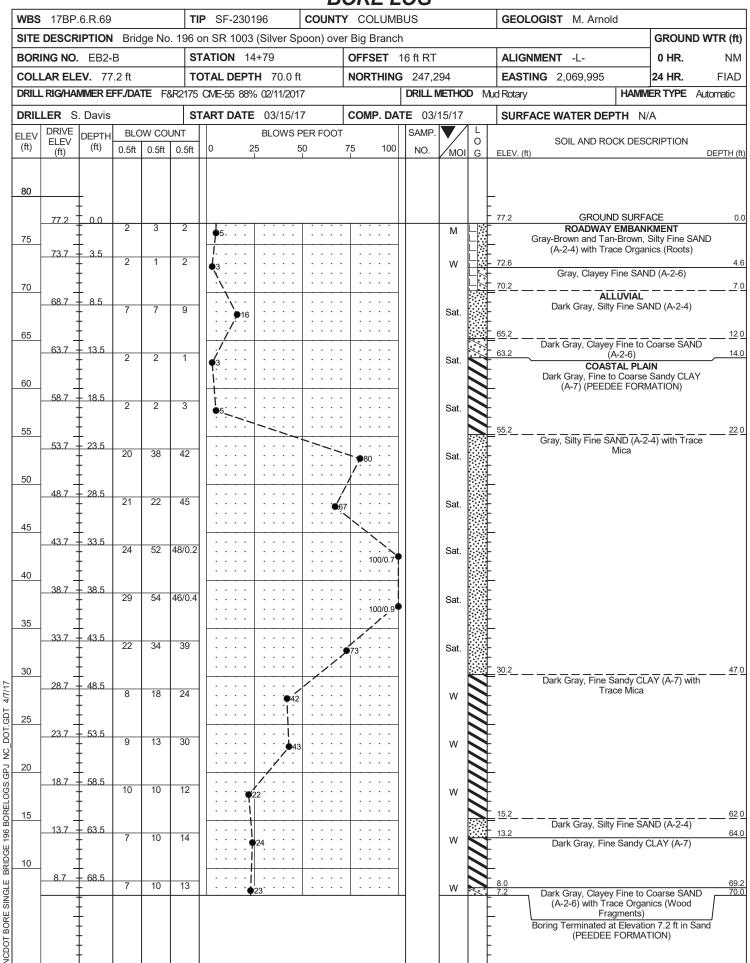
	B	ORE LOG		
WBS 17BP.6.R.69	TIP SF-230196 COUNTY	Y COLUMBUS	GEOLOGIST M. Arnold	
SITE DESCRIPTION Bridge No	o. 196 on SR 1003 (Silver Spoon) ove	r Big Branch		GROUND WTR (fi
BORING NO. EB1-B	STATION 13+93	OFFSET 6 ft RT	ALIGNMENT -L-	0 HR. NI
COLLAR ELEV. 77.8 ft	TOTAL DEPTH 80.0 ft	NORTHING 247,277	EASTING 2,069,908	24 HR. FIAI
DRILL RIG/HAMMER EFF./DATE F	F&R2175 CME-55 88% 02/11/2017	DRILL METHOD N	lud Rotary HAMM	ER TYPE Automatic
DRILLER S. Davis	START DATE 03/27/17	COMP. DATE 03/27/17	SURFACE WATER DEPTH N/	'A
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	 	75 100 NO. MOI G	SOIL AND ROCK DESC	CRIPTION DEPTH
5 4.3 73.5 5 6 	8 Match Line		Dark Gray, Fine Sandy CL/ Trace Mica (contin	nued) 7 oarse SAND
	29 46	Sat.	- (A-2-4) with Trace - (A-2-4) with Trace - Sand (PEEDEE FORM - Sa	Clay 8 ation -2.2 ft in



		ORE LOG		
VBS 17BP.6.R.69	TIP SF-230196 COUNT	COLUMBUS	GEOLOGIST M. Arnold	
SITE DESCRIPTION Bridge No. 19		r Big Branch		GROUND WTR (f
BORING NO. B1-B	STATION 14+14	OFFSET 12 ft RT	ALIGNMENT -L-	0 HR. NI
COLLAR ELEV. 77.6 ft	TOTAL DEPTH 80.0 ft	NORTHING 247,275	I I	24 HR. 5.
DRILL RIG/HAMMER EFF./DATE F&R2	175 CME-55 88% 02/11/2017	DRILL METHOD M	lud Rotary HAMME	ER TYPE Automatic
DRILLER S. Davis	START DATE 03/24/17	COMP. DATE 03/24/17	SURFACE WATER DEPTH N/A	4
LEV DRIVE DEPTH BLOW COUNT (ft) 0.5ft 0.5ft 0.5ft 0.5ft	—	75 100 NO. MOI G	SOIL AND ROCK DESC	RIPTION DEPTH
5 4.1 73.5 5 8 1 0 -0.9 78.5	—			DEPTH AY (A-7) with nics (Wood ued) oarse (A-2-6) Fragments)



BORING NO. B2-A		B	ORE LOG		
BORING NO. B2-A	WBS 17BP.6.R.69	TIP SF-230196 COUNTY	COLUMBUS	GEOLOGIST M. Arnold	
COLLAR ELEV. 68.6 ft	SITE DESCRIPTION Bridge No. 19		r Big Branch		GROUND WTR (f
DRILLER S. Davis START DATE 03/21/17 COMP. DATE 03/21/17 SURFACE WATER DEPTH 6.3ft	BORING NO. B2-A	STATION 14+51		ALIGNMENT -L-	0 HR. NI
DRILLER S. Davis START DATE 03/21/17 COMP. DATE 03/21/17 SURFACE WATER DEPTH 6.5ft					
Section Sect	DRILL RIG/HAMMER EFF./DATE F&R2	2175 CME-55 88% 02/11/2017	DRILL METHOD M.	ud Rotary HAMMI	ER TYPE Automatic
(fi) Control Control		<u> </u>	COMP. DATE 03/21/17	SURFACE WATER DEPTH 6.3	Bft
16 19 22 141	(ft) ELEV (ft)		75 400		RIPTION DEPTH
	-5	Match Line 22	75 100 NO. MOI G	Drak Gray, Silty Fine to Co (A-2-4) with Trace Clay, Org Fragments), and Trace Mica	DEPTH Darse SAND Janics (Wood a (continued)



TOTAL SHEETS STATE PROJECT REFERENCE NO. STATE SF-230198

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY _COLUMBUS

PROJECT DESCRIPTION BRIDGE NO. 198 ON SR 1546 (BILL HOOKS RD.) OVER WEST PRONG CREEK BETWEEN SR 1005 AND SR 1003

CONTENTS

SHEET NO.

2, 2A 3 4-11

DESCRIPTION

TITLE SHEET LEGEND (SOIL & ROCK)

SITE PLAN BORE LOG(S) PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

INVESTIGATED BY F&R, Inc.

DRAWN BY __T.T. WALKER

CHECKED BY __C. WANG

SUBMITTED BY R. RIVENBARK

DATE _APRIL 2017

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 BORNING 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 1919/T07-6550. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CEMERAL 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-PLACEI TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NDICATED 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 CLMANTC 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 GLARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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 SATISY 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 THEORY RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT

NOTES:

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

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



Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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SEAL 0113

SIGNATURE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REPERENCE NO.	SHEET NO.
SF-230198	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)

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STATURE OR GRAIN SIZE	SILT-C						0.5 TO	1.0												
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE 4.7 10 40 68 200 270 4.7 2.88 0.42 0.25 0.875 0.893 BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY (CSE. SD.) (SL.) (CL.) BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY (CSE. SD.) (F SD.) (SL.) (CL.) CRAIN MM 305 75 2.0 0.25 0.895 0.805 SIZE IN. 12 3 2 SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) DESCRIPTION CASTIFICATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION PLASTIC (SAT.) - WET - (W) SEMISOLID, REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OF HIMM MOISTURE - MOISTURE OF MOISTURE DESCRIPTION ATTAIN OPTIMUM MOISTURE OF HIMM MOISTURE SCALE (ATTERBERG LIMITS) DESCRIPTION SEMISOLID, REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE OF HIMM MOISTURE OF MOISTURE OF MOISTURE DESCRIPTION OF TERMS OF HIMM MOISTURE OF MOISTURE OF MOISTURE DESCRIPTION OF TERMS OF HIMM MOISTURE OF M		(COHESIVE) VERY STIFF 15 TO 30 2 TO 4					2 TO -	ALLUMIA CON POUNDARY A PIEZOMETER												
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- SATURATED - USUALLY LIQUID, VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC RANGE (PI) PL OPTIMUM MOISTURE SL SIL, SILT, SILTY SHELDY SL. SILT, SILTY SHELDY RESONANCY ST. SHELDY TUBE FRAGE, FRACTURED, FRACTURES TCR - TRICONE REPUSAL RT - RECOMPACTED TR RATIO OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT OPTIMUM MOISTURE SL SHRINKAGE LIMIT ON PLASTIC TY ON PLASTIC TY NON PLASTIC SLICITY INDEX (PI) SOLID AT OR NEAR OPTIMUM MOISTURE PLASTICITY ON PLASTIC G-15 SLIGHT NON PLASTIC G-15 SLIGHT MODERATELY PLASTIC G-15 SLIGHT MODERATELY PLASTIC I6-25 MEDIUM HIGHLY PLASTIC TO STEEL TEETH HIGHLY VANE SHEAR TEST COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). PLASTIC TY FROM BELOW THE GROUND WATER TABLE POSS FORSILIFEROUS SLI. SILT, SILTY RS SC. SRCID SLI. SILT, SILTY RS SLICHT RS SLI. SILT, SILTY SLI. SILT, SILTY RS SLICHT RS SLI. SILT, SILTY SLI. SILTY SLICHTLY RS SLICHT RY FROM BELOW THE GROUND STILE THE MELDY TO ATTAIN OPTIMUM MOISTURE FRACE. FRACTURED, FRACTURES TCR - TRICONE REPUSAL RT - RECOMPACTED TO RECOMPACTED TO RELEATION STILL SILTY RS SHELDY TUBE SLI. SILT, SILTY RS SLICHT RY SHELDY TO Y WET - (W) ST - SHELDY TUBE SLI. SILT, SILTY SLICHT RY SHELDY TO Y MOISTURE CONTRIBUTION STILL SILTY SLICHTLY PLASTIC SILE FROM THE CONTRIBUTION WATER TO ATTAIN OPTIMUM MOISTURE CORE SIZE TO YERY TO YERY THE FORM. SLI. SILT, SILTY SLICHTY RS SLICHY TO RECOMPACTED THE FRACE. FRACTURED, FRACTURES TCR - TRICONE SIL SLICHT TO A TORION TOUS SLICHTLY PLASTIC SILE SIL SLICHT TO ATTAIN OPTIMUM MOISTURE CORE SIZE TO A TORION TOUS SLICHTLY PLASTIC SILE SILE SILE SILE SILE SILE SILE SILE						\perp					GUIDE FOR	FIELD MO	ISTURE DE	SCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS					
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COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). TRICONE * TUNG,-CARB.										DRE					I ☐ BODTABLE HOLET					
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).								C	DLOR	}					TRICONE TUNC CARR HAND RUCER					
■ MUDIFIERS SOUR AS LIGHT, DAKK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. ■ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □															CORE BIT VANE SHEAR TEST					
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2A

SF-230198

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

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:

WEATHERED

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES NOOK (WR)

ROCK (WR)

CRYSTAL I IME

CRYSTAL I IME

CRYSTAL I IME

CRYSTAL I IME FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CNEISS, GABBRO, SCHIST, ETC.
FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.
ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT BEGING ADDRESS OF THE STATE OF CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SEDIMENTARY ROCK SHELL BEDS, ETC WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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 (V SLI.) OF A CRYSTALLINE NATURE. ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 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 SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS (MOD.) SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY 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, SEVERE (MOD. SEV.) IF TESTED, WOULD YIELD SPT REFUSAL 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. SEVERE IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE VERY 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 SEVERE (V SEV.) VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF 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 COMPLETE ALSO AN EXAMPLE. ROCK HARDNESS CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. VERY HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED HARD TO DETACH HAND SPECIMEN. 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 MODERATELY HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. MEDIUM CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. 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 SOFT PIECES CAN BE BROKEN BY FINGER PRESSURE. CAN BE CARYED 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

			
FRACTUF	RE SPACING	BEDD	ING
TERM	SPACING	<u>TERM</u>	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 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED THINLY LAMINATED	0.008 - 0.03 FEET < 0.008 FEET

VERY SOF T

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS: FRIARI F GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. MODERATELY INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: DIFFICULT TO BREAK WITH HAMMER. INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. EXTREMELY INDURATED

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, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE ORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE

LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

 ${ ilde {
m FLOAT}}$ - 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

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEGGE - 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.

MOTILED (MOI) - 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 INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

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

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

<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.

 $\underline{\text{SLICKENSIDE}}$ - 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 (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

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

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

BENCH MARK: BL-IOI: N: 244550.7430, E: 2070718.2530, STATION 15+45.64

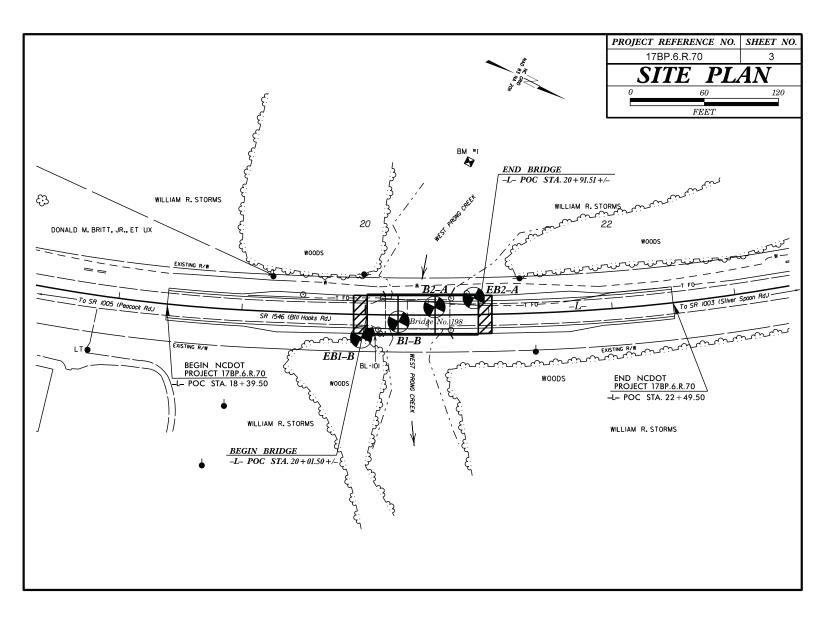
FEET ELEVATION: 75.85

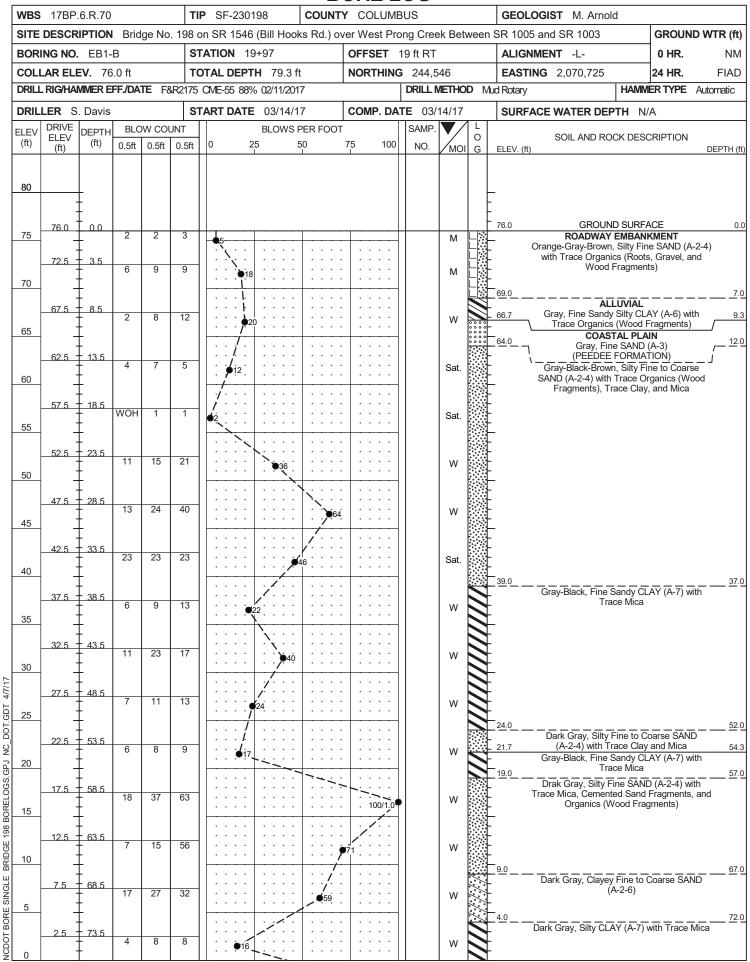
NOTES:

NM = NOT MEASURED

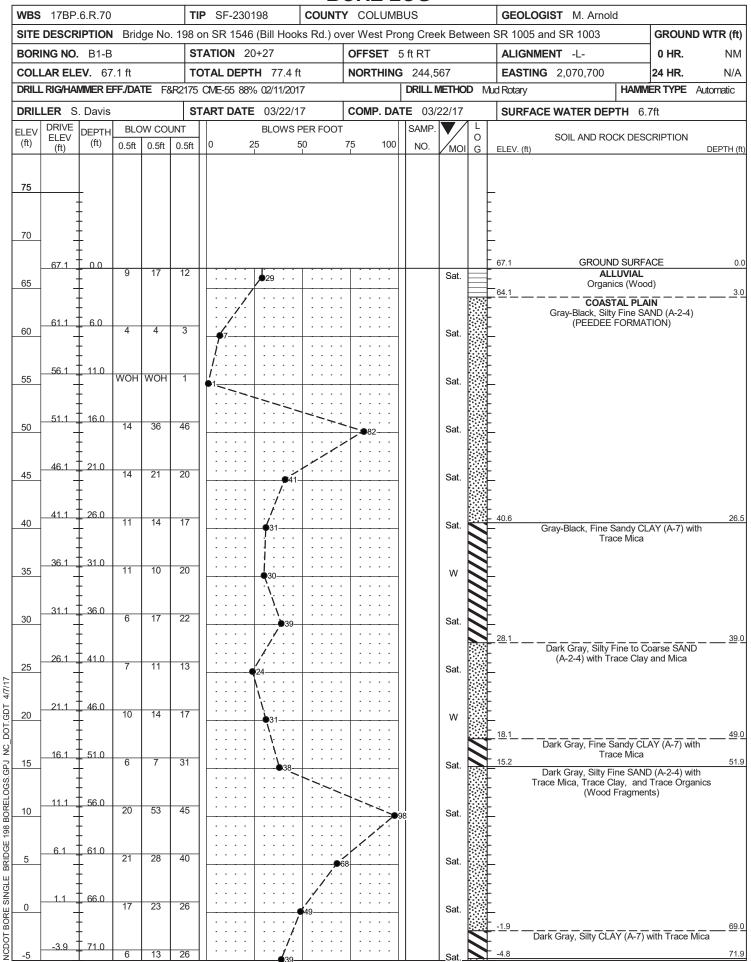
FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

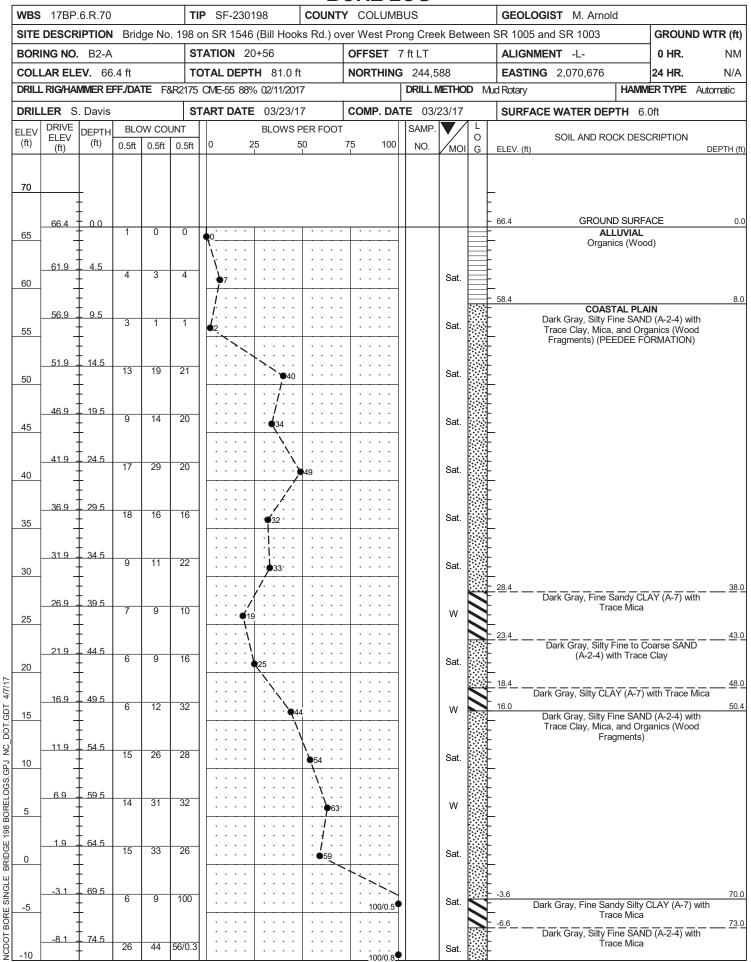




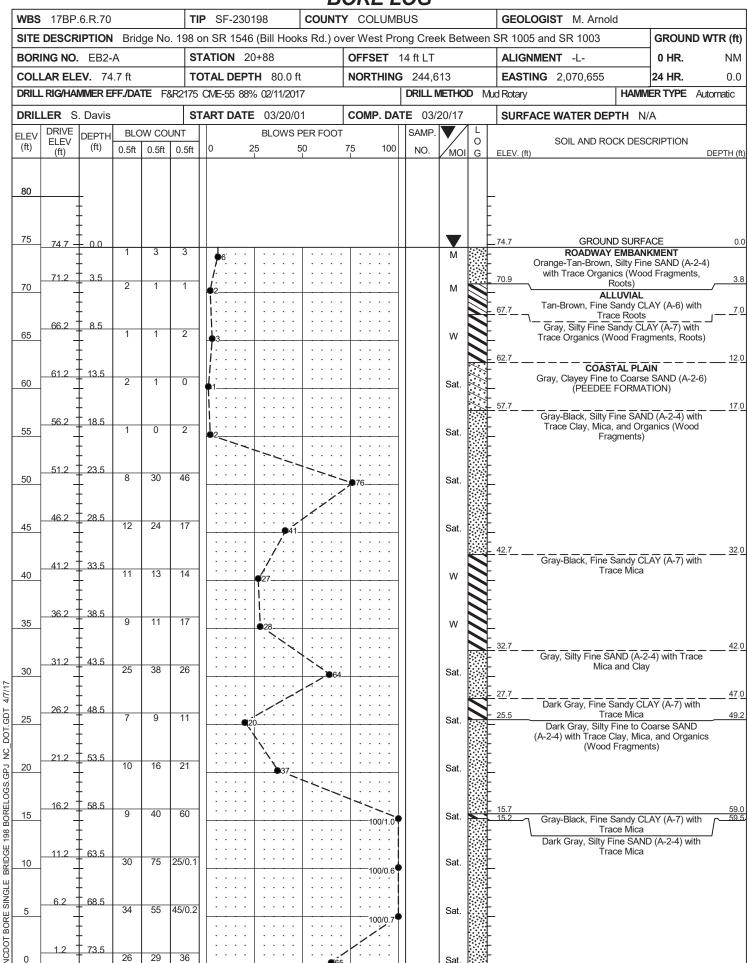
	<u>D</u> \	ORE LOG		
WBS 17BP.6.R.70	TIP SF-230198 COUNTY	COLUMBUS	GEOLOGIST M. Arnold	
SITE DESCRIPTION Bridge No. 19	98 on SR 1546 (Bill Hooks Rd.) ov	er West Prong Creek Between	SR 1005 and SR 1003	GROUND WTR (ff
BORING NO. EB1-B	STATION 19+97	OFFSET 19 ft RT	ALIGNMENT -L-	0 HR. NA
1	TOTAL DEPTH 79.3 ft	NORTHING 244,546	EASTING 2,070,725	24 HR . FIAI
DRILL RIG/HAMMER EFF./DATE F&R21	175 CME-55 88% 02/11/2017	DRILL METHOD Mu	d Rotary HAMME	ERTYPE Automatic
	START DATE 03/14/17	COMP. DATE 03/14/17	SURFACE WATER DEPTH N//	4
ELEV (ft) DRIVE DEPTH BLOW COUNT (ft) (ft) 0.5ft 0.5ft 0.5		75 100 NO. MOI G	SOIL AND ROCK DESC	RIPTION DEPTH
-2.5 - 78.5	Match Line		Dark Gray, Silty CLAY (A-7) w (continued) -3.3 Dark Gray, Silty Fine SAND Trace Mica Boring Terminated at Eleva Sand (PEEDEE FORM	(A-2-4) with 7



			BORE	LOG				
WBS 17BP.6.R.70		TIP SF-230198	MBUS	GEOLOGIST M. Arnold				
SITE DESCRIPTION	Bridge No	198 on SR 1546 (Bill Hoo	oks Rd.) over West F	rong Creek Between	SR 1005 and SR 1003	GROUND WTR (f		
BORING NO. B1-B		STATION 20+27	OFFSET	5 ft RT	ALIGNMENT -L-	0 HR. NI		
COLLAR ELEV. 67		TOTAL DEPTH 77.4		IG 244,567	EASTING 2,070,700	24 HR. N/.		
DRILL RIG/HAMMER E	FF./DATE F8	R2175 CME-55 88% 02/11/20)17	DRILL METHOD M	ud Rotary HAMIN	IER TYPE Automatic		
DRILLER S. Davis		START DATE 03/22/	17 COMP. D	ATE 03/22/17	SURFACE WATER DEPTH 6.	.7ft		
ELEV DRIVE DEPTH (ft)	BLOW COU	0.5ft 0 25	PER FOOT 50 75 10	SAMP. L O NO. MOI G	SOIL AND ROCK DES	CRIPTION DEPTH		
-8.9 76.0			ch Line		Dark Gray, Silty Fine SAN Trace Mica <i>(conti</i>	D (A-2-4) with nued)		
8.9	18 52	48/0.4	100/0.	Sat.	Boring Terminated at Eleva Sand (PEEDEE FORI	ation -10.3 ft in MATION)		



		BORE L	.00	1	
WBS 17BP.6.R.70	TIP SF-230198	COUNTY COLUME		GEOLOGIST M. Arnold	
SITE DESCRIPTION Bridg	No. 198 on SR 1546 (Bill Hoo	oks Rd.) over West Pro	ong Creek Between	SR 1005 and SR 1003	GROUND WTR (f
BORING NO. B2-A	STATION 20+56	OFFSET	7 ft LT	ALIGNMENT -L-	0 HR. NI
COLLAR ELEV. 66.4 ft	TOTAL DEPTH 81.0		244,588	EASTING 2,070,676	24 HR. N/
DRILL RIG/HAMMER EFF./DATI	F&R2175 CME-55 88% 02/11/20	17	DRILL METHOD Mu	id Rotary	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 03/23/	17 COMP. DA	TE 03/23/17	SURFACE WATER DEPT	TH 6.0ft
F F/ · · ·		PER FOOT 50 75 100	SAMP. L O NO. MOI G	SOIL AND ROC	CK DESCRIPTION DEPTH
-10	Mato	ch Line	Sat.	-14.6 Boring Terminated a	at Elevation -14.6 ft in E FORMATION)



							B	<u>ORE L</u>	<u>.OG</u>							
WBS 17BP.6.R.70					IP SF-230	Y COLUMBUS				GEOLOGIST M. Arnold						
SITE DESC	RIPTION	I Brid	ge No.	. 198	on SR 1546	(Bill Hool	ks Rd.) o	ver West Pr	ong Cre	ek Betv	ween	SR 1005 an	d SR 1003		GROUN	D WTR (fi
BORING NO) . EB2-	-A		S	TATION 2	0+88		OFFSET	14 ft LT			ALIGNME	NT -L-		0 HR.	NN
COLLAR ELEV. 74.7 ft TOTAL DEPTH 80.0 ft					NORTHING	G 244,0	613		EASTING	2,070,655		24 HR.	0.0			
DRILL RIG/H	AMMER E	FF./DA	TE F8	R2175	CME-55 889	% 02/11/201	7		DRILL	METHO	D M	lud Rotary		HAMM	ER TYPE	Automatic
DRILLER	S. Davis			S	TART DATE	E 03/20/0	1	COMP. DA	TE 03	/20/17		SURFACE	WATER DE	PTH N	'A	
				JNT 0.5ft	0 2		PER FOOT 50	- 75 100	SAMP NO.	MOI	L O G	ELEV. (ft)	SOIL AND RO	OCK DESC	CRIPTION	DEPTH
DRIVE DEPTH BLOW COUNT			25 5		75 100		17	0	-2.8 Gr -4.3 Gr -5.3 Da	ark Gray, Silty Trace M ay-Black, Fine Tr ark Gray, Silty	Fine SANI ica (contir Sandy CL ace Mica Fine SANI ace Mica ed at Eleva	DEPTI (A-2-4) with ued) AY (A-7) with (A-2-4) with (A-2-4) with (A-2-4) with (A-2-4)				