Ö REFERENCE

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

TITLE SHEET

SITE PLAN

PROFILE BORE LOGS

SHEET NO.

5 - 8

46018

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY _PENDER

PROJECT DESCRIPTION BRIDGE NO. 203 ON SR 1324 OVER SILL'S CREEK

STATE PROJECT REFERENCE NO. 8 B-5304

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 (1991) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 LABDRATORY SAMPLE DATA AND THE IN SITU (IM-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

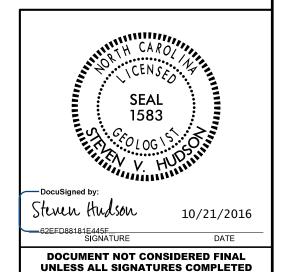
- NOTES:

 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 BY 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.

LYNDSAY PUGH D. T. CHALMERS, CWC INVESTIGATED BY <u>CATLIN</u> DRAWN BY STEVEN HUDSON CHECKED BY J. LEE STONE, LG SUBMITTED BY __STEVEN HUDSON, LG DATE _SEPTEMBER 2016





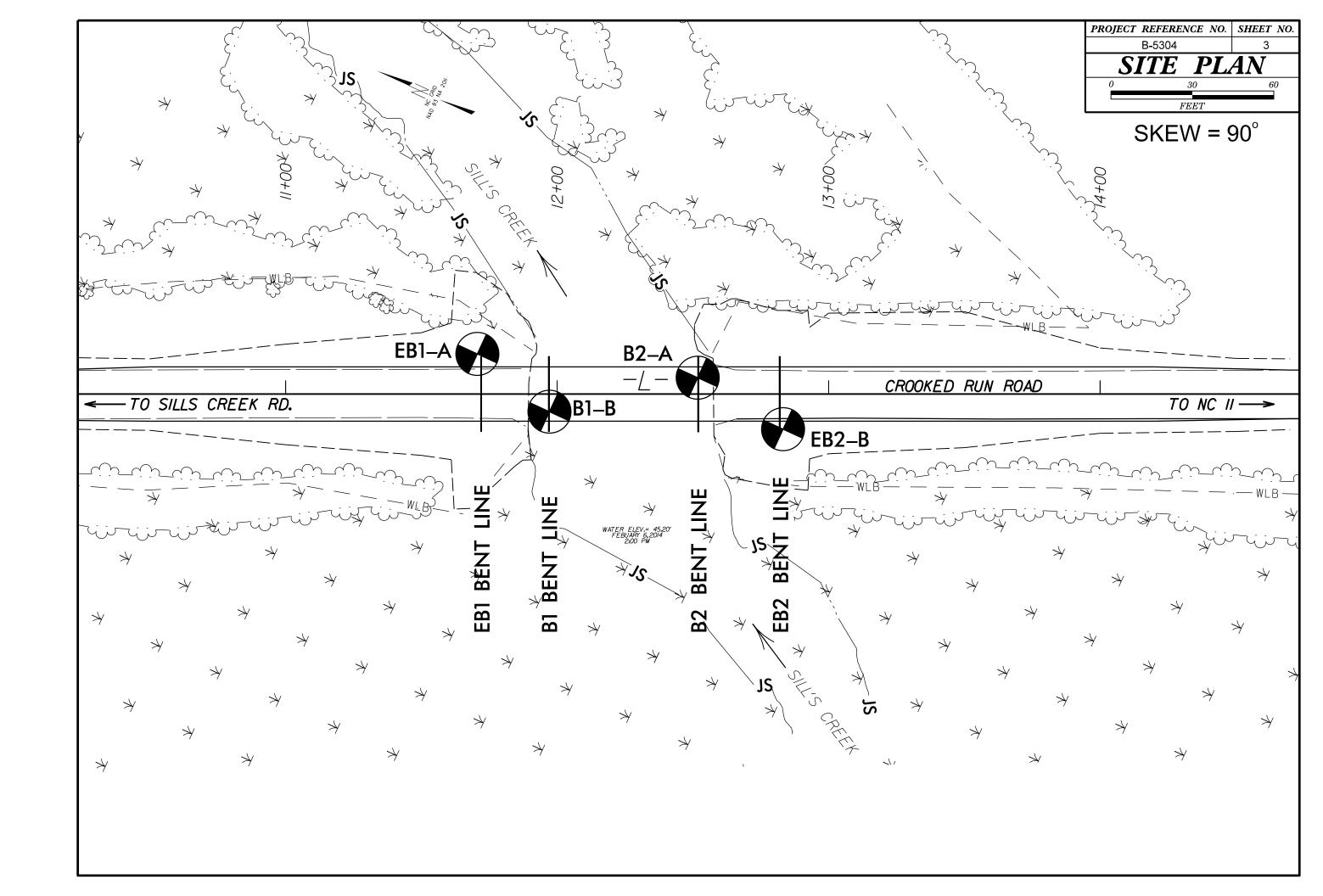
PROJECT REFERENCE NO. SHEET NO. 2

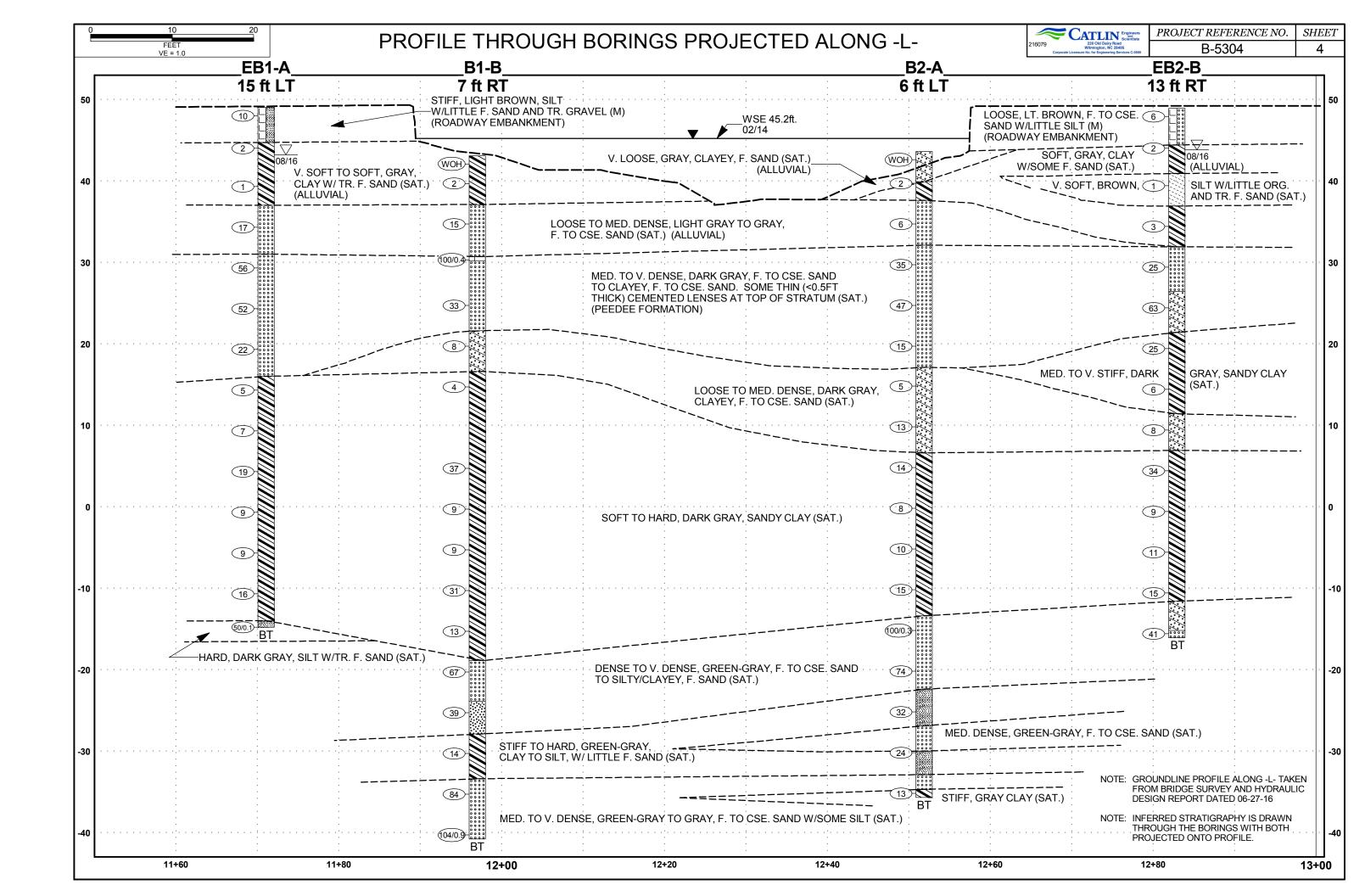
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS		
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	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	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.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.		
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.		
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.		
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING		
VERY STIFF.GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.		
CENERAL CRANIII AR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT	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		
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (CP) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.		
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	UNELSS, DABBRU, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.		
CLASS. A-1-6 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.		
SYMBOL 0000 000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED		
% PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.		
*10 50 MX GRANULAR GLAY PEAT SOILS SOILS CLAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT		
■200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.		
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.		
PASSING *40 40 MX 41 MN	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) 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		
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN 11 MN MODERATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,		
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX ANDUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.		
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(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.		
OF MAJOR GRAVEL, AND MATERIALS SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM		
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABLE		(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.		
AS SUBURAUE POUR	SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.		
PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30	<u> </u>	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.		
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.		
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO		
CUNSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.		
GENERALLY VERY LOOSE < 4 LOOSE 4 TO 10	SOIL SYMBOL SOIL SYMBOL SUPPLINT TEST BORING SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.		
MATERIAL MEDIUM DENSE 10 TO 30 N/A	 内	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.		
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE		
VERY SOFT < 2 < 0.25	— — INFERRED SOIL BOUNDARY — CORE BORING ● SOUNDING ROD	(V SEV.) REMAINING SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.		
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.		
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2	INFERRED ROCK LINE MONITORING WELL WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	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		
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	→ → → → → → → → ALLUVIAL SOIL BOUNDARY \(\triangle \) PIEZOMETER INSTALLATION \(\triangle \) SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.		
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT		
		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	ROCK.		
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNSUITABLE WASTE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO		
COARSE FINE	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.		
BOULDER	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.		
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF		
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS W/ - WITH	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES 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		
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY WEA WEATHERED CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.		
SOIL MOISTURE SCALE FIELD MOISTURE CHIEF OR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC 7d- DRY UNIT WEIGHT	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		
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.		
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY		
(SAT.) FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.		
PLASTIC	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.		
RAINGE - WEI - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: SURVEYED WITH RTK SURVEY GRADE GPS.		
"" PL L _ PLASTIC LIMIT	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	EL EVATION SEET		
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET		
SL SHRINKAGE LIMIT	X CME-45B CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:		
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS ELICHT AUCER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD = FILLED IMMEDIATELY AFTER DRILLING		
	CORE SIZE: 8' HOLLOW AUGERS	INDURATION	1		
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	1		
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW	CME-550 HARD FACED FINGER BITS TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;			
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST X CASING W/ ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINIEGRATES SAMPLE.			
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.			
COLOR	TRICOUS TRICOUS ADD				
	TRICONE 'TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.			
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT VANE SHEAR TEST	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;			
HOSTILIO SOCII AS LIGITI, DANK, STILAKED, ETC. HRE USED TO DESCRIBE HETEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1-		
					





GEOTECHNICAL BORING REPORT BORE LOG

		_				BORE LOG		
WBS: 46018.1.1							GIST: Lindsay Pugh	
				IDGE		ON SR 1324 OVER SILL'S CREEK	GROUND	WTR (ft
BOR	NG NO	.: EB1	I-A		S	ATION: 11+71 OFFSET: 15 ft LT ALIGNN	MENT: -L- 0 HR.	5.
COLLAR ELEV.: 49.0 ft		T	TAL DEPTH: 63.8 ft NORTHING: 337,041 EASTIN	G : 2,288,045 24 HR .	FIA			
DRILL	RIG/HA	MMER E	FF./DA	ATE: (CAT131	ME-45B 81.7% 04/15/2016 DRILL METHOD: Mud Rotary	HAMMER TYPE: A	AUTOMAT
DRIL	LER: [D.T. Ch	almer	s, Jr.	S	ART DATE: 09/01/16 COMP. DATE: 09/01/16 SURFAC	CE WATER DEPTH: N/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	OW CO		BLOWS PER FOOT SAMP. C C C C C C C C C C C C C C C C C C C	SOIL AND ROCK DESCRIPTION	DEPTH
50	49.0	0.0				- 49.0	GROUND SURFACE	(
		<u>†</u>	4	6	4	. / 10 · · · · · · · · · · · · · ·	ROADWAY EMBANKMENT Light brown, SILT w/little f. sand and tr.	
45	45.0	4.0				/··· ··· ···	gravel	4
		+	WOH	1	1	6 2 · · · · · · · · · · · · · · Sat. Sat.	ALLUVIAL Cross LOW TO MODERATE V DI ASTI	-
		Ŧ				¦:::: ::::	Gray, LOW TO MODERATELY PLASTIC CLAY	C
40	40.3	8.7	WOH	I WOH	1	Sat.		
		‡				37.0		1
0.5	25.2	127				· \	Light gray, f. to cse. SAND	1
35	35.3	13.7	5	9	8	Sat. Sat.		
		+						
30	30.3	18.7				31.0	COASTAL PLAIN	1
-	-	‡	80	32	24		Dark gray, f. to cse. SAND w/some silt	
		‡					Peedee Formation	
25	25.3	23.7	10	17	25	· · · · · · · · / · · · · · · · ·		
	-	Ŧ	10	17	35	Sat. Sat.		
		Ŧ						
20	20.3	28.7	3	5	17			
		‡	"		''	Sat. Sa		
		+						3
15	15.3	33.7	1	2	3		Dark gray, Sandy, LOW TO MODERATE PLASTIC CLAY	LY -
		‡					I LASTIC CLAT	
10	10.3	38.7						
10	10.3	30.7	4	3	4	7		
		+				·\·· ···· ···		
5	5.3	T 43.7						
	-	‡	4	11	8	• 19		
		‡						
0	0.3	48.7	3	4	5	· ·/· · · · · · · · · ·	warms found	
		ŧ	"	4	"	. •9	w/some f. sand	
		+						
-5	-4.7	53.7	3	4	5	Sat.	w/little f. sand	
		‡						
-10	-9.7	† 58.7						
-10	-3.1	50.7	6	7	9			
		ŧ						
	-14.7	T 63.7				-14.0 -14.8 -14.8	Dark gray, SILT w/tr. f. sand	$-\frac{69}{69}$
		Ŧ	50/0.1	4		50/0 1 Sai.	BORING TERMINATED AT ELEVATION	N
		Ŧ					-14.8 ft in SILT w/ tr. f. sand. Peedee Formation	
	- -	‡						
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		‡	1					
	_	t	1					
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PROJECT REFERENCE NO. SHEET
B-5304 5

PROJECT REFERENCE NO. SHEET GEOTECHNICAL BORING REPORT CATLIN Engineers and Scientists B-5304 6 **BORE LOG** COUNTY: PENDER COUNTY: PENDER **WBS**: 46018.1.1 **TIP**: B-5304 **GEOLOGIST:** Lindsay Pugh WBS: 46018.1.1 **TIP:** B-5304 **GEOLOGIST:** Lindsay Pugh SITE DESCRIPTION BRIDGE NO. 203 ON SR 1324 OVER SILL'S CREEK **GROUND WTR (ft)** SITE DESCRIPTION BRIDGE NO. 203 ON SR 1324 OVER SILL'S CREEK **GROUND WTR (ft)** OFFSET: 7 ft RT ALIGNMENT: -L-OFFSET: 7 ft RT ALIGNMENT: -L-BORING NO.: B1-B **STATION**: 11+97 0 HR. FIAD **BORING NO.**: B1-B **STATION**: 11+97 0 HR. FIAD COLLAR ELEV.: 43.1 ft TOTAL DEPTH: 83.8 ft **NORTHING:** 337,008 **EASTING**: 2,288,037 COLLAR ELEV.: 43.1 ft TOTAL DEPTH: 83.8 ft **NORTHING**: 337,008 **EASTING:** 2,288,037 24 HR. FIAD 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE: CAT1314 CME-45B 81.7% 04/15/2016 **DRILL METHOD:** Mud Rotary HAMMER TYPE: AUTOMATIC DRILL RIG/HAMMER EFF./DATE: CAT1314 CME-45B 81.7% 04/15/2016 DRILL METHOD: Mud Rotary **HAMMER TYPE:** AUTOMATIC DRILLER: D.T. Chalmers, Jr. **START DATE:** 08/30/16 **COMP. DATE:** 08/30/16 DRILLER: D.T. Chalmers, Jr. **START DATE:** 08/30/16 **COMP. DATE:** 08/30/16 **SURFACE WATER DEPTH: 0.7ft** SURFACE WATER DEPTH: 0.7ft ELEV DRIVE DEPTH ELEV DRIVE DEPTH BLOW COUNT SAMP. SAMP **BLOWS PER FOOT BLOW COUNT BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 0.5ft 0.5ft 0.5ft (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. MOI G 50 75 100 NO. (ft) ELEV. (ft) DEPTH (ft (ft) MOIL G Match Line -35 35 Green-gray, f. SAND w/some silt (continued) MUDLINE 43.1 WOH WOH ALLUVIAL Sat. Gray, LOW TO MODERATELY PLASTIC -39.3 + 82.4 CLAY w/ tr. f. sand 42 62/0.4 Sat Sat. ::::--40.7 BORING TERMINATED AT ELEVATION -40.7 ft in f. SAND w/ some silt. Peedee Gray, f. to cse. SAND Sat. 30.7 + 12.4 100/0.4 COASTAL PLAIN Gray, f. to cse. SAND w/some clay. Thin (<0.5ft) thick cemented lens at top of formation. 25.7 + 17.4 Peedee Formation Sat. Dark gray, clayey, f. to cse. SAND 20.7 3 Sat. Dark gray, sandy, LOW TO MODERATELY <u>15.7 ↓ 27.4</u> WOF Sat. PLASTIC CLAY Sample Interval Missed 10 Sat. Sat w/some f. sand 4 Sat Sat w/little f. sand Sat sandy -19.3 + 62.4 Green-gray, f. to cse. SAND 14 30 Sat. -24.3 + 67.4Green-gray, Silty, f. SAND w/tr. shell frags. 20 Sat. Green-gray, LOW TO MODERATELY -29.3 + 72.4 PLASTIC CLAY, w/ little f, sand Sat Green-gray, f. SAND w/some silt

PROJECT REFERENCE NO. SHEET GEOTECHNICAL BORING REPORT CATLIN Engineers and Scientists B-5304 **BORE LOG** COUNTY: PENDER COUNTY: PENDER **WBS**: 46018.1.1 **TIP**: B-5304 **GEOLOGIST:** Lindsay Pugh WBS: 46018.1.1 **TIP:** B-5304 **GEOLOGIST:** Lindsay Pugh SITE DESCRIPTION BRIDGE NO. 203 ON SR 1324 OVER SILL'S CREEK **GROUND WTR (ft)** SITE DESCRIPTION BRIDGE NO. 203 ON SR 1324 OVER SILL'S CREEK **GROUND WTR (ft)** OFFSET: 6 ft LT ALIGNMENT: -L-OFFSET: 6 ft LT ALIGNMENT: -L-BORING NO.: B2-A **STATION**: 12+52 0 HR. FIAD BORING NO.: B2-A **STATION**: 12+52 0 HR. FIAD **EASTING**: 2,288,071 **EASTING**: 2,288,071 COLLAR ELEV.: 43.6 ft TOTAL DEPTH: 79.3 ft **NORTHING:** 336,964 COLLAR ELEV.: 43.6 ft TOTAL DEPTH: 79.3 ft **NORTHING**: 336,964 24 HR. FIAD 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE: CAT1314 CME-45B 81.7% 04/15/2016 **DRILL METHOD:** Mud Rotary HAMMER TYPE: AUTOMATIC DRILL RIG/HAMMER EFF./DATE: CAT1314 CME-45B 81.7% 04/15/2016 DRILL METHOD: Mud Rotary **HAMMER TYPE:** AUTOMATIC DRILLER: D.T. Chalmers, Jr. **START DATE:** 08/29/16 **COMP. DATE:** 08/29/16 DRILLER: D.T. Chalmers. Jr. **START DATE:** 08/29/16 **COMP. DATE:** 08/29/16 **SURFACE WATER DEPTH: 0.3ft** SURFACE WATER DEPTH: 0.3ft ELEV DRIVE DEPTH DRIVE DEPTH BLOW COUNT SAMP. SAMP **BLOWS PER FOOT BLOW COUNT BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION ELEV (ft) (ft) 0.5ft 0.5ft 0.5ft (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. MOI G 75 100 NO. (ft) ELEV. (ft) DEPTH (ft (ft) MOIL G Match Line -35 Gray, Sandy, MODERATELY PLASTIC MUDLINE 43.6 CLAY (continued) ALLUVIAL Sat. Gray, Clayey, f. SAND BORING TERMINATED AT ELEVATION -35.7 ft in Sandy, MOD. PLASTIC CLAY. Sat. Peedee Formation Gray, sandy, LOW TO MODERATELY PLASTIC CLAY Gray, f. to cse. SAND Sat. COASTAL PLAIN ________11.5 30.7 + 12.9 Dark gray, f. to cse. SAND Sat. 25.7 + 17.9 Sat. 20.7 w/some clay Sat. Dark gray, Clayey, f. to cse. SAND Sat. w/tr. shells Sat. Dark gray, Sandy, LOW TO MODERATELY Sat. PLASTIC CLAY Sat 4 Sat Sat w/some f. sand Green-gray, f. to cse. SAND w/some silt 100/0.: Sat. <u>-19.2 + 62.8</u> 19 38 Sat. Green-gray, SILT w/some f. sand Sat. Green-gray, f. to cse. SAND Sat. Green-gray, SILT w/some f, sand Gray, f. to cse. SAND -34.2 **1** 77 8

GEOTECHNICAL BORING REPORT BORE LOG

								D	UKE L	UG				
WBS	4601	8.1.1			TI	P: B-5304		COUNT	: PENDE	R			GEOLOGIST: Lindsay Pugh	
SITE	DESCR	IPTION	I BRI	IDGE N	NO. 20	03 ON SR 1	324 OVEF	R SILL'S	CREEK					GROUND WTR (ft)
BORI	NG NO.	: EB2	2-B		S	TATION: 1	2+83		OFFSET:	13 ft RT			ALIGNMENT: -L-	0 HR. 5.4
COLL	AR ELE	EV .: 4	8.9 ft		т	OTAL DEPT	H: 65.0 f	ft	NORTHING	336,9	928		EASTING: 2,288,067	24 HR . FIAD
DRILL	RIG/HAI	MMER E	FF./DA	TE: C	AT1314	4 CME-45B 81.	.7% 04/15/20	 016		DRILL N	IETHO	D : M	ud Rotary HAMM	ER TYPE: AUTOMATIC
	LER:					TART DATE			COMP. DA				SURFACE WATER DEPTH: N	
	DRIVE		T	OW COL				PER FOOT	OOM: DA	SAMP.	V /	, 1 L T	SORI ACE WATER DEFIN.	WA
ELEV (ft)	ELEV (ft)	DEPTH (ft)	0.5ft	_	0.5ft	0 2			75 100	NO.	MOI	0	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH (ft
50	48.9	0.0	2	4	2		ı	I					48.9 GROUND SURFA	
	-	ţ	_	-		f 6					М		ROADWAY EMBAN Lt. brown, f. to cse. SAN	
45	45.0	3.9	<u> </u>			/ · · · ·							-44.4	4.5
	-	ŀ	1	1	1	2					Sat.		ALLUVIAL	,
	-	F				i : : : :							Gray, LOW TO MODERAT CLAY, w/some f. :	
40	40.4	8.5	WOH	WOH	1						Sat.		Brown, SILT w/little organics	and tr. f. sand
	-	ţ				[Out.			
	-	<u> </u>											_36.9 Gray, LOW TO MODERAT	<u>12.0</u> ELY PLASTIC
35	35.4	13.5	3	1	2	3			+		Sat.		_ CLAY	
	-	ļ											31.9	17.
20	30.4	- 18.5				: :\ <u>`</u> ;							COASTAL PLA	
30		10.5	11	12	13	1	25	 	 		Sat.		Dark gray, f. to cse. Peedee Format	SAND ion
	-	F					1							
25	25.4	23.5										***		
25			10	23	40	1 		63	 		Sat.			000. 07 11 12
	-	}						/				\\\		
20	20.4	28.5												MODERATELY 27.
20	-	<u> </u>	4	11	14	,	25				Sat.		PLASTIC CLA	Y
	-	t				::::/:								
15	15.4	33.5				. /								
	_	ļ.	2	3	3	6					Sat.		_	
	-	‡				1::::							11.4	37.
10	10.4	38.5	_		-								Dark gray, Clayey, f.	SAND
	-	F	3	3	5	. 8					Sat.		_	
	-	ļ .				:::::::::::::::::::::::::::::::::::::							_6.9	42
5	5.4	43.5	18	19	15	`	<u> </u>						Dark gray, Sandy, LOW TO PLASTIC CLA	MODERATELY Y
	-	-	10	19	13		34				Sat.			
	-	ļ.				:::;/								
0	0.4	48.5	3	4	5	1					Cot		- w/some f. san	d
	-	t				· ¶ ⁹ · ·					Sat.		wisome i. suit	u
	-	F												
-5	-4.6	53.5	3	5	6	1 11		ļ	1		Sat.		-	
	-	ţ				:"":					Out.			
		<u> </u>				: :\: :								
-10	-9.6	58.5	3	7	8	15			1		Sat.		_	
	-	‡				: : 📆 🖔							11.6 Dark gray, Clayey, f.	- <u>SAND</u> — — — <u>60</u> .
	44.0					[] `								. 67 12
-15	-14.6	63.5	4	11	30	i	4 1	.			Sat.	***	15.2 -16.1 Green-gray, f. SAND \	w/little silt 65.0
	-						· · · · · ·						BORING TERMINATED AT	Γ ELEVATION
	- - - - -											-	-16.1 ft in f. SAND w/ little Formation	silt. Peedee
	- - - -	 - -											-	

216079 CATLIN Engineers seems 220 old Dairy Road clerifists Wilmington, NC 28405 Corporate Licensure No. for Engineering Services C-0885

PROJECT REFERENCE NO. SHEET
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