STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4484	1	21

REFERENCE: B-4484

PROJECT: 33723

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *BRIDGE NOS. 138 AND 139 ON SR 1470 (MAPLE CYPRESS RD.) OVER NEUSE RIVER AND NEUSE RIVER OVERFLOW*

SITE DESCRIPTION *BRIDGE NO. 138 ON SR 1470 (MAPLE CYPRESS RD.) OVER NEUSE RIVER*

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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PERSONNEL

J.R. SWARTLEY
MID-ATLANTIC DRILLING, INC.

E. BLONSHINE

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *J. DAILY*

DATE *MARCH 2019*

3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
Jarett Swartley
919459487BA347...
SIGNATURE

5/28/2019
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-4484	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-25
- [X] D-50

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

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 HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

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

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

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

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

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

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

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

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

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

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

BENCH MARK: B4484-1 N: 572680 E: 2506001

ELEVATION: 24.22 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-4484	3

SITE PLAN

0 50 100
FEET

EB1 SKEW = 90°
B1 SKEW = 89°
B2 SKEW = 86°
B3 SKEW = 85°
B4 SKEW = 82°
B5 SKEW = 81°
EB2 SKEW = 81°

NAD 83

NEUSE RIVER

PROPERTY LINE RUNS ALONG HIGH WATER LINE OF NEUSE RIVER

WOODS

BEGIN RETAINING WALL

TH 3
6.58
10 3/4" MTL.
WATER LINE

EB1 BENT LINE
B1 BENT LINE
B2 BENT LINE
B3 BENT LINE
B4 BENT LINE
B5 BENT LINE
EB2 BENT LINE

10" DI (NW CRAVEN WSD)

25+00
27+00

EB1-A
B1-A
B2-B
B3-A
B4-A
B5-A
EB2-A
B5-B
B1-B

-L1-

FALLOW

END RETAINING WALL

TH 4
6.04
10 3/4" DI
WATER LINE

BRIDGE #138

SR 1470 (MAPLE CYPRESS RD.)

TO BIDDLE RD.

TO RIVER RD.

-BL- 2

-BL- 3

-LI- PT Sta. 27+30.84

TOP OF RAIL AT EB1
ELEV.= 32.82'

TOP OF RAIL AT EB2
ELEV.= 32.23'

BEGIN RETAINING WALL

END RETAINING WALL

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-4484	4

0 100 200
FEET
VE = 5

PROFILE PROJECTED ALONG –L1–

Ⓐ VERY LOOSE TO LOOSE, TAN, SAND, MOIST TO SAT., (ALLUVIAL)
Ⓑ MED. STIFF, ORANGE AND GRAY, SANDY CLAY, MOIST TO WET (ALLUVIAL)
Ⓒ GRAY, DARK GRAY, GREEN AND BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)
Ⓓ DENSE, GRAY, SAND WITH MODERATELY INDURATED SEAMS (0.1'–0.2'), SAT. (CASTLE HAYNE FORMATION)

BEGIN BRIDGE
–L1– STA.22+06 +/–
ELEV.= 32.61'

END BRIDGE
–L1– STA.28+06 +/–
ELEV.= 33.69'

EB1-A 22+00 25' LT –L1– SS-30 SS-31
B1-B 23+09 41' RT –L1–
B2-B 24+09 5' RT –L1–
B3-A 25+20 2' LT –L1–
B4-A 26+40 5' LT –L1– SS-28 SS-29
B5-A 27+04 13' LT –L1– SS-23 SS-24
EB2-A 28+01 25' LT –L1– SS-19 SS-20

BRIDGE NO. 138

PROPOSED GRADE
EXISTING GROUND

NWS EL = 1.5' +/–
DATE OF SURVEY: 7/15/2018

LOOSE TO MED. DENSE, TAN AND GRAY, SILTY SAND, MOIST (ROADWAY EMBANKMENT)
MED. STIFF, ORANGE AND GRAY, SANDY CLAY, WET (ALLUVIAL)
VERY LOOSE TO MED. DENSE, GRAY, SILTY SAND, SAT. (DUPLIN FM.)
MED. DENSE, LIGHT GRAY, CALC., SILTY SAND, SAT. (DUPLIN FM.)
SOFT, TO VERY STIFF, SANDY SILT, WET
MED. DENSE, GRAY, SILTY SAND, SATURATED
VERY DENSE, GRAY, SAND WITH SEAMS (0.1'–0.2'), SAT. (CASTLE HAYNE FM.)
MOD. INDURATED
MED. DENSE TO VERY DENSE, GRAY, LIGHT GRAY, DARK GRAY, GREEN AND BLACK, SAND, SILTY SAND AND CLAYEY SAND, SAT. (CASTLE HAYNE FM.)
DARK GRAY AND BLACK, MOD. WEATHERED, HARD, SANDY LIMESTONE
MED. DARK BLACK, CLAYEY SAND WITH MOD. TO INDURATED SEAMS, SATURATED
DENSE TO DENSE, GRAY, DARK GREEN, SILTY SAND AND INDURATED SEAMS, SATURATED
MED. STIFF TO HARD, DARK GRAY AND BLACK, SANDY CLAY, SILTY CLAY AND SANDY SILT, WET
MED. DENSE, BLACK, SILTY SAND WITH TRACE SHELL FRAGMENTS, SATURATED
VERY STIFF, BLACK AND GRAY, SANDY SILT, WET
DARK GRAY AND BLACK, MOD. WEATHERED, HARD, SANDY LIMESTONE
VERY LOOSE TO MED. DENSE, GRAY, LIGHT GRAY AND TAN, CLAYEY SAND, SAT. (DUPLIN FORMATION)
LOOSE, GRAY AND GREEN, SILTY SAND AND CLAYEY SAND, SATURATED
GRAY, LIGHT GRAY AND GREEN, CALC., SILTY SAND AND TRACE ORGANIC MATTER, MOIST TO SAT. (ALLUVIAL)

BT

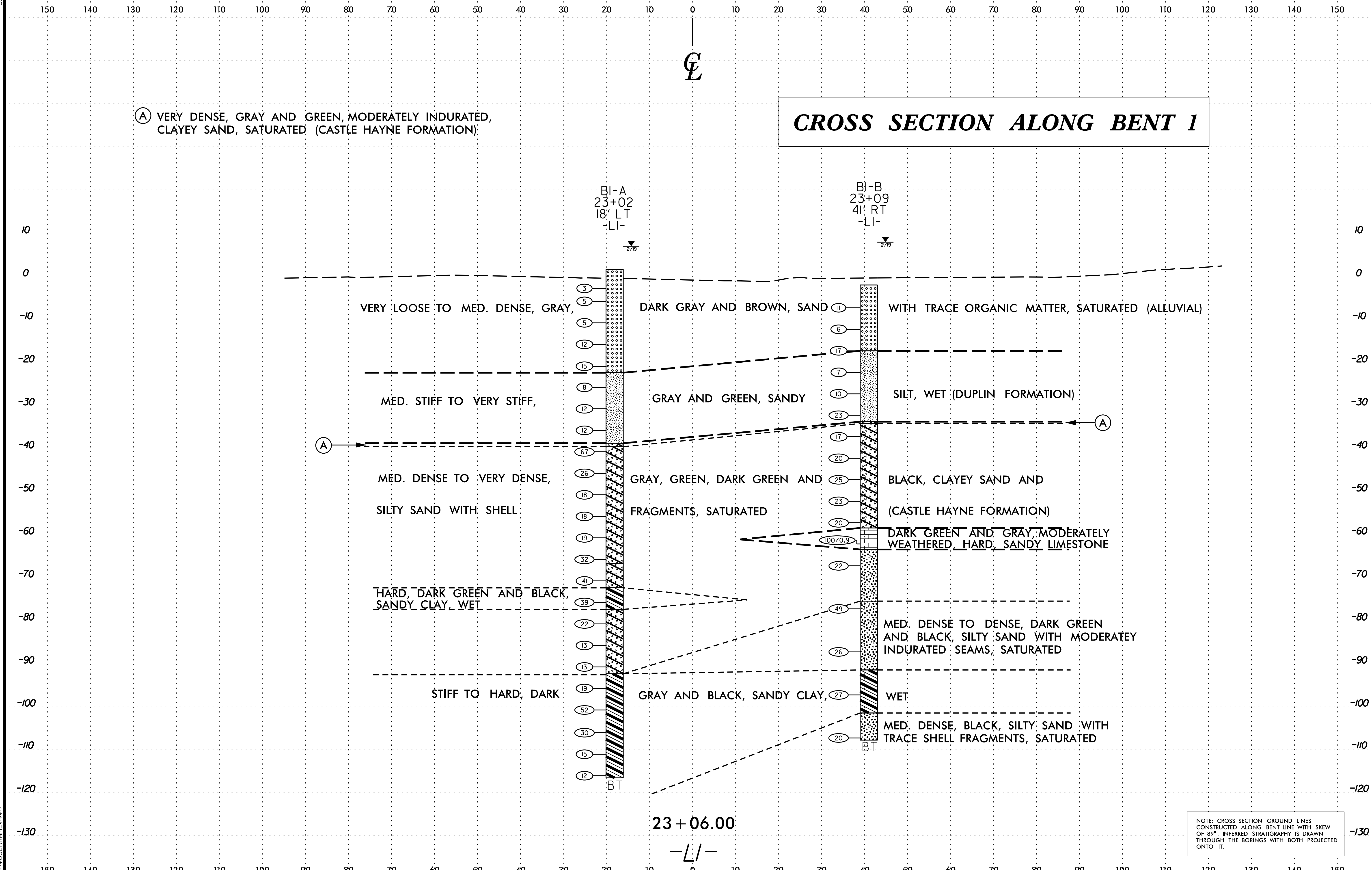
NOTE: EXISTING GROUND SURFACE PROFILE OF –L1– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'B4484_ls_tin.tin' DATED 1/26/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70 –80 –90 –100 –110 –120 –130

19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00

PROJ. REFERENCE NO.	SHEET NO.
B-4484	5

CROSS SECTION ALONG BENT 1

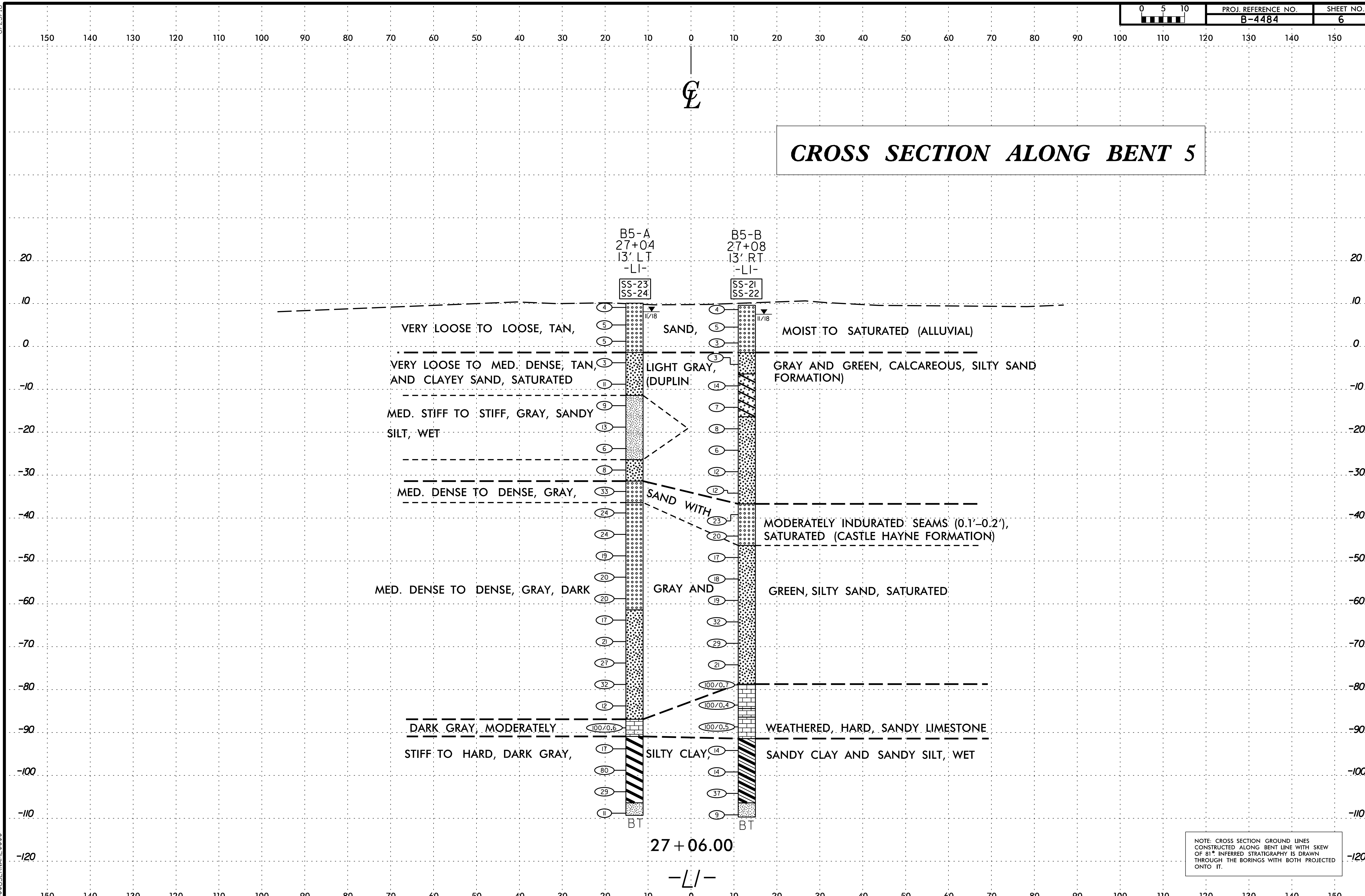


6/23/16

$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$$

PROJ. REFERENCE NO.	SHEET NO.
B-4484	6

CROSS SECTION ALONG BENT 5



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 81°. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 22+00	**OFFSET** 25 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 10.1 ft	**TOTAL DEPTH** 94.3 ft	**NORTHING** 572,875	**EASTING** 2,506,150	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/07/18	**COMP. DATE** 11/07/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
15										
10	10.1	0.0	WOH	2	3	5				10.1 / 0.0 GROUND SURFACE **ALLUVIAL** TAN SAND
	6.2	3.9						W		5.2 / 4.9
5			1	2	1	3				ORANGE AND GRAY, SANDY CLAY
	2.3	7.8	WOH	2	4	6	SS-30	28%		
0										-0.9 / 11.0
	-2.7	12.8	3	6	7	13		Sat.		GRAY SAND
-5										
	-7.7	17.8	4	5	6	11		Sat.		
-10										
	-12.7	22.8	6	8	13	21		Sat.		
-15										
	-17.7	27.8	6	6	6	12		Sat.		-15.9 / 26.0
-20										**COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
	-22.7	32.8	3	3	4	7		W		-20.9 / 31.0
-25										LIGHT GRAY, CALCAREOUS, SANDY SILT
	-27.7	37.8	3	5	5	10		Sat.		-25.9 / 36.0
-30										GRAY, SILTY SAND
	-32.7	42.8	4	4	9	13		Sat.		
-35										-35.2 / 45.3
	-37.7	47.8	60	21	38	59		Sat.		**COASTAL PLAIN** GRAY SAND WITH MODERATELY INDURATED TO INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION)
-40										-40.9 / 51.0
	-42.7	52.8	8	8	9	17		Sat.		GRAY, DARK GRAY, GREEN AND BLACK, SAND AND SILTY SAND
-45										
	-47.7	57.8	8	9	10	19		Sat.		
-50										
	-52.7	62.8	8	7	9	16		Sat.		
-55										
	-57.7	67.8	6	8	9	17		Sat.		
-60										-60.9 / 71.0
	-62.7	72.8	7	8	14	22		Sat.		
-65										

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 22+00	**OFFSET** 25 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 10.1 ft	**TOTAL DEPTH** 94.3 ft	**NORTHING** 572,875	**EASTING** 2,506,150	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/07/18	**COMP. DATE** 11/07/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-67.7	77.8	5	6	11	17	SS-31	35%		
-70										
	-72.7	82.8	19	12	18	30		Sat.		
-75										-75.9 / 86.0
	-77.7	87.8	7	53	47/0.3	100/0.8				**COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-80										-80.9 / 91.0
	-82.7	92.8	4	26	14	40		W		DARK GRAY AND BLACK, SANDY SILT
										-84.2 / 94.3
										Boring Terminated at Elevation -84.2 ft IN HARD SANDY SILT (COASTAL PLAIN) 1) ST-1 taken at 21+95, 25 LT, -L1- <u>Other Samples:</u> ST-1 (7.8 - 9.8)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 23+02	**OFFSET** 18 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 1.5 ft	**TOTAL DEPTH** 118.2 ft	**NORTHING** 572,932	**EASTING** 2,506,235	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/07/19	**COMP. DATE** 02/08/19	**SURFACE WATER DEPTH** 5.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
5										WATER SURFACE (02/07/19)
										1.5 GROUND SURFACE 0.0
0										**ALLUVIAL** DARK GRAY AND BROWN, SAND WITH TRACE ORGANIC MATTER
	-1.9	3.4	1	1	2	3		Sat.		
-5	-4.9	6.4	2	2	3	5		Sat.		
-10	-9.9	11.4	2	2	3	5		Sat.		
-15	-14.9	16.4	4	4	8	12		Sat.		
-20	-19.9	21.4	8	6	9	15		Sat.		
-22.5		24.0								**COASTAL PLAIN** GRAY AND GREEN, SANDY SILT (DUPLIN FORMATION)
-25	-24.9	26.4	4	3	5	8		W		
-30	-29.9	31.4	4	4	8	12		W		
-35	-34.9	36.4	8	5	7	12		W		
-38.9		40.4								
-39.7		41.2								**COASTAL PLAIN** GRAY AND GREEN, CLAYEY SAND WITH MODERATELY INDURATED SEAMS (CASTLE HAYNE FORMATION)
-40	-39.9	41.4	11	26	41	67		Sat.		
-45	-44.9	46.4	14	14	12	26		Sat.		GRAY, GREEN, DARK GREEN AND BLACK, CLAYEY SAND
-50	-49.9	51.4	9	10	8	18		Sat.		
-55	-54.9	56.4	8	8	10	18		Sat.		
-60	-59.9	61.4	8	9	10	19		Sat.		
-65	-64.9	66.4	10	10	22	32		Sat.		
-70	-69.9	71.4	5	13	28	41		Sat.		
-72.5		74.0								DARK GREEN AND BLACK, SANDY CLAY
-75	-74.9	76.4								

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 23+02	**OFFSET** 18 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 1.5 ft	**TOTAL DEPTH** 118.2 ft	**NORTHING** 572,932	**EASTING** 2,506,235	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/07/19	**COMP. DATE** 02/08/19	**SURFACE WATER DEPTH** 5.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75			27	21	18	Match Line		W		DARK GREEN AND BLACK, SANDY CLAY *(continued)*
-77.5		79.0								DARK GRAY, CLAYEY SAND WITH TRACE SHELL FRAGMENTS
-80	-79.9	81.4	4	9	13	22		Sat.		
-85	-84.9	86.4	4	5	8	13		Sat.		
-90	-89.9	91.4	7	5	8	13		Sat.		
-92.5		94.0								DARK BLACK, SANDY CLAY
-95	-94.9	96.4	6	8	11	19		W		
-100	-99.9	101.4	37	30	22	52		W		
-105	-105.2	106.7	14	15	15	30		W		
-110	-110.2	111.7	7	8	7	15		W		
-115	-115.2	116.7	4	6	6	12		W		
-116.7		118.2								Boring Terminated at Elevation -116.7 ft STIFF SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 23+09	**OFFSET** 41 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -2.1 ft	**TOTAL DEPTH** 105.8 ft	**NORTHING** 572,889	**EASTING** 2,506,276	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SME0382 DIEDRICH D-50 98% 02/15/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Millwood, J.	**START DATE** 02/06/19	**COMP. DATE** 02/06/19	**SURFACE WATER DEPTH** 9.9ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
5										
0										WATER SURFACE (02/06/19)
-5										-2.1 / 0.0 GROUND SURFACE **ALLUVIAL** BROWN AND GRAY, SAND WITH TRACE ORGANIC MATTER
-10	-6.4	4.3	4	5	6	11		Sat.		
-15	-11.4	9.3	5	3	3	6		Sat.		
-20	-16.4	14.3	5	8	9	17		Sat.		-17.4 / 15.3 **COASTAL PLAIN** GRAY AND GREEN, SANDY SILT (DUPLIN FORMATION)
-25	-21.4	19.3	3	3	4	7		W		
-30	-26.4	24.3	5	4	6	10		W		
-35	-31.4	29.3	5	6	17	23 IMPLIED 50 BPF		W		-33.9 / 31.8 -34.3 / 32.2 **COASTAL PLAIN** GRAY AND GREEN, MODERATEY INDURATED, CLAYEY SAND (CASTLE HAYNE FORMATION) GRAY AND GREEN. CLAYEY SAND
-40	-36.4	34.3	8	8	9	17		Sat.		
-45	-41.4	39.3	10	10	10	20		Sat.		
-50	-46.4	44.3	10	12	13	25		Sat.		
-55	-51.4	49.3	10	11	12	23		Sat.		
-60	-56.4	54.3	9	10	10	20		Sat.		-58.6 / 56.5 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GREEN AND GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-65	-61.4	59.3	73	27/0.4		100/0.9				-63.6 / 61.5 DARK GREEN AND BLACK, SILTY SAND
-70	-66.4	64.3	13	12	10	22		Sat.		

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 23+09	**OFFSET** 41 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -2.1 ft	**TOTAL DEPTH** 105.8 ft	**NORTHING** 572,889	**EASTING** 2,506,276	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SME0382 DIEDRICH D-50 98% 02/15/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Millwood, J.	**START DATE** 02/06/19	**COMP. DATE** 02/06/19	**SURFACE WATER DEPTH** 9.9ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				DARK GREEN AND BLACK, SILTY SAND *(continued)*
-75	-76.4	74.3	29	18	31	49		Sat.		-75.6 / 73.5 DARK GREEN AND BLACK, SILTY SAND WITH MODERATELY INDURATED SEAMS
-80										
-85	-86.4	84.3	18	9	17	26		Sat.		
-90										-91.6 / 89.5 DARK GRAY, SANDY CLAY
-95	-96.4	94.3	5	4	23	27		W		
-100										-101.6 / 99.5 BLACK, SILTY SAND WITH TRACE SHELL FRAGMENTS
-105	-106.4	104.3	8	8	12	20		Sat.		-107.9 / 105.8 Boring Terminated at Elevation -107.9 ft IN MEDIUM DENSE SILTY SAND (COASTAL PLAIN) 1) Hard drilling from depths 31.8' - 32.2'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 24+09	**OFFSET** 5 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -8.4 ft	**TOTAL DEPTH** 118.4 ft	**NORTHING** 572,976	**EASTING** 2,506,336	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/13/19	**COMP. DATE** 02/14/19	**SURFACE WATER DEPTH** 15.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
5										
0										WATER SURFACE (02/13/19)
-5										
-10										-8.4 / 0.0 GROUND SURFACE **ALLUVIAL** GRAY, SAND WITH TRACE ORGANIC MATTER
	-12.3	3.9	3	4	8	12		Sat.		-13.4 / 5.0
-15	-15.9	7.5	3	4	5	9		W		**COASTAL PLAIN** LIGHT GRAY, SANDY SILT (DUPLIN FORMATION)
-20	-20.9	12.5	2	3	5	8		W		
-25	-25.9	17.5	4	3	4	7		W		
-30	-30.9	22.5	5	3	4	7		W		
-35	-35.9	27.5	100/0.4			100/0.4		W		-34.4 / 26.0 **COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)
-40	-40.9	32.5	13	14	14	28		Sat.		-39.9 / 31.5 LIGHT GRAY, CLAYEY SAND
-45	-45.9	37.5	8	9	11	20		Sat.		
-50	-50.9	42.5	8	9	9	18		Sat.		
-55	-55.9	47.5	9	8	10	18		Sat.		
-60	-60.9	52.5	32	68/.5		100/1.0				-59.4 / 51.0 **COASTAL PLAIN SEDIMENTARY ROCK** GREEN AND GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-65	-65.9	57.5	14	16	16	32		Sat.		-63.4 / 55.0 GREEN AND DARK GRAY, SILTY SAND
-70										

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 24+09	**OFFSET** 5 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -8.4 ft	**TOTAL DEPTH** 118.4 ft	**NORTHING** 572,976	**EASTING** 2,506,336	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/13/19	**COMP. DATE** 02/14/19	**SURFACE WATER DEPTH** 15.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-70.9	62.5	4	8	13	21		Sat.		GREEN AND DARK GRAY, SILTY SAND *(continued)*
-75	-75.9	67.5	27	6	11	17		Sat.		
-80	-80.9	72.5	4	9	20	29		Sat.		-79.4 / 71.0 DARK GRAY, CLAYEY SAND WITH INDURATED SEAMS
-85	-85.9	77.5	7	19	11	30		Sat.		
-90	-90.9	82.5	5	8	9	17		W		-89.4 / 81.0 DARK GRAY, SANDY CLAY WITH TRACE MICA
-95	-95.9	87.5	4	5	5	10		W		
-100	-100.9	92.5	3	5	12	17		W		
-105	-105.9	97.5	4	6	5	11		W		
-110	-110.9	102.5	5	4	5	9		W		
-115	-115.9	107.5	4	3	3	6		W		
-120	-120.9	112.5	4	6	9	15		W		
-125	-125.9	117.5	15	85/0.4		100/0.9				-124.4 / 116.0 **COASTAL PLAIN SEDIMENTARY ROCK** -126.8 / 118.4 DARK GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE Boring Terminated at Elevation -126.8 ft IN HARD SANDY LIMESTONE (COASTAL PLAIN SEDIMENTARY ROCK)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 25+20	**OFFSET** 2 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -5.5 ft	**TOTAL DEPTH** 121.4 ft	**NORTHING** 573,043	**EASTING** 2,506,424	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/12/19	**COMP. DATE** 02/13/19	**SURFACE WATER DEPTH** 11.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
5										WATER SURFACE (02/12/19)
0										
-5	-5.8	0.3	8	2	3	5		Sat.		-5.5 / 0.0 GROUND SURFACE **ALLUVIAL** GRAY AND DARK GRAY, SAND WITH GRAVEL AND SILTY SAND
-10	-10.8	5.3	2	2	2	4		Sat.		-8.5 / 3.0
-15	-15.5	10.0	3	3	6	9		W		-13.5 / 8.0 **COASTAL PLAIN** GREEN AND GRAY, SANDY SILT (DUPLIN FORMATION)
-20	-20.6	15.1	2	2	2	4		W		
-25	-25.6	20.1	2	3	7	10		W		
-30	-30.6	25.1	5	5	3	8		W		-33.5 / 28.0 **COASTAL PLAIN SEDIMENTARY ROCK** GREEN AND GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)
-35	-35.6	30.1	100/0.2			100/0.2				-38.5 / 33.0 GRAY, GREEN AND BLACK, SILTY SAND
-40	-40.6	35.1	9	9	8	17		Sat.		
-45	-45.6	40.1	7	7	6	13		Sat.		
-50	-50.6	45.1	8	8	8	16		Sat.		
-55	-55.6	50.1	7	8	9	17		Sat.		
-60	-60.6	55.1	10	7	11	18		Sat.		-63.5 / 58.0 BLACK AND GRAY, SANDY SILT
-65	-65.6	60.1	8	15	8	23		W		
-70										

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Blonshine, E.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 25+20	**OFFSET** 2 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. -5.5 ft	**TOTAL DEPTH** 121.4 ft	**NORTHING** 573,043	**EASTING** 2,506,424	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 02/12/19	**COMP. DATE** 02/13/19	**SURFACE WATER DEPTH** 11.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70	-70.6	65.1	16	7	23	Match Line 30		W		BLACK AND GRAY, SANDY SILT *(continued)*
-75	-75.6	70.1	10	7	10	17		W		-78.5 / 73.0 **COASTAL PLAIN SEDIMENTARY ROCK** BLACK AND GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-80	-80.6	75.1	5	28	72/0.1	100/0.6				
-85	-86.0	80.5	17	28	72/0.3	100/0.8				-88.5 / 83.0 DARK GRAY, SANDY SILT
-90	-91.0	85.5	7	7	10	17		Sat.		
-95	-96.0	90.5	19	11	12	23		Sat.		
-100	-101.0	95.5	4	3	5	8		W		-98.5 / 93.0 DARK GRAY, SANDY CLAY WITH TRACE MICA
-105	-106.0	100.5	4	5	6	11		W		
-110	-111.0	105.5	4	4	5	9		W		
-115	-116.0	110.5	3	2	4	6		W		
-120	-121.0	115.5	5	8	9	17		W		-124.5 / 119.0 **COASTAL PLAIN SEDIMENTARY ROCK** BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE -126.9 / 121.4
-125	-126.0	120.5	13	87/0.4		100/0.9				Boring Terminated at Elevation -126.9 ft IN HARD SANDY LIMESTONE (COASTAL PLAIN SEDIMENTARY ROCK)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 26+40	**OFFSET** 5 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 9.0 ft	**TOTAL DEPTH** 124.0 ft	**NORTHING** 573,109	**EASTING** 2,506,525	**24 HR.** 1.4
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/06/18	**COMP. DATE** 11/06/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
15										
10	9.0	0.0	WOH	2	3	5				9.0 0.0 GROUND SURFACE
5	5.1	3.9	1	0	2	2		Sat.		**ALLUVIAL**
0	1.5	7.5	1	1	1	2		Sat.		7.0 2.0 ORANGE AND TAN, SANDY CLAY GRAY AND TAN, SAND
-5	-3.5	12.5	1	2	2	4		Sat.		-2.0 11.0 **COASTAL PLAIN** LIGHT GRAY AND TAN, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
-10	-8.5	17.5	5	7	14	21		Sat.		
-15	-13.5	22.5	3	3	4	7		Sat.		-12.0 21.0 LIGHT GRAY, CALCAREOUS, CLAYEY SAND
-20	-18.5	27.5	3	3	3	6		W		-17.0 26.0 GRAY AND GREEN, SANDY SILT
-25	-23.5	32.5	3	3	4	7	SS-28	32%		
-30	-28.5	37.5	3	3	4	7		W		
-35	-33.5	42.5	60/0.1			60/0.1		W		-33.0 42.0 -33.8 42.8 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION) GRAY, GREEN, DARK GRAY AND BLACK, SAND AND SILTY SAND
-40	-38.5	47.5	7	8	9	17		Sat.		
-45	-43.5	52.5	7	7	8	15		Sat.		
-50	-48.5	57.5	7	9	8	17		Sat.		
-55	-53.5	62.5	8	9	10	19		Sat.		
-60	-58.5	67.5	8	10	25	35		Sat.		
-65	-63.5	72.5	7	19	53	72		Sat.		-61.0 70.0

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 26+40	**OFFSET** 5 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 9.0 ft	**TOTAL DEPTH** 124.0 ft	**NORTHING** 573,109	**EASTING** 2,506,525	**24 HR.** 1.4
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/06/18	**COMP. DATE** 11/06/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
-70	-68.5	77.5	4	96/0.4		100/0.6		Sat.		-69.0 78.0 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-75	-73.5	82.5	5	6	11	17	SS-29	36%		-72.0 81.0 DARK GRAY AND BLACK, SILTY SAND
-80	-78.5	87.5	100/0.4			100/0.4				-77.0 86.0 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-85	-83.5	92.5	4	9	15	24		W		-82.0 91.0 DARK GRAY, SANDY SILT
-90	-88.5	97.5	60/0.1			60/0.1				-88.0 97.0 -89.0 98.0 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-95	-93.5	102.5	10	7	10	17		W		DARK GRAY, SANDY CLAY
-100	-98.5	107.5	4	5	16	21		W		
-105	-103.5	112.5	5	8	10	18		W		-102.0 111.0 DARK GRAY, SANDY SILT
-110	-108.5	117.5	4	4	5	9		W		
-115	-113.5	122.5	7	9	12	21		W		-115.0 124.0 Boring Terminated at Elevation -115.0 ft IN VERY STIFF SANDY SILT (COASTAL PLAIN)

NCDOT BORE DOUBLE B4484_GEO_BRDG_0138.GPJ NC_DOT.GDT 3/13/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B5-A	**STATION** 27+04	**OFFSET** 13 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 10.1 ft	**TOTAL DEPTH** 119.4 ft	**NORTHING** 573,148	**EASTING** 2,506,576	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/02/18	**COMP. DATE** 11/05/18	**SURFACE WATER DEPTH** N/A	

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B5-A	**STATION** 27+04	**OFFSET** 13 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 10.1 ft	**TOTAL DEPTH** 119.4 ft	**NORTHING** 573,148	**EASTING** 2,506,576	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/02/18	**COMP. DATE** 11/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
15										
10	10.1	0.0	WOH	2	2	4				10.1 — 0.0 GROUND SURFACE **ALLUVIAL** TAN SAND
	6.0	4.1	1	3	2	5		Sat.		
5	2.2	7.9	2	2	3	5		Sat.		
0	-2.8	12.9	WOH	1	2	3				-1.4 — 11.5 **COASTAL PLAIN** LIGHT GRAY AND TAN, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
-5	-7.8	17.9	5	4	7	11		Sat.		
-10	-12.8	22.9	3	4	5	9		W		-11.4 — 21.5 GRAY, SANDY SILT
-15	-17.8	27.9	6	7	6	13		W		
-20	-22.8	32.9	3	3	3	6		W		
-25	-27.8	37.9	3	4	4	8		Sat.		-26.4 — 36.5 GRAY, SILTY SAND
-30	-32.8	42.9	8	11	22	33		Sat.		-31.4 — 41.5 **COASTAL PLAIN** GRAY SAND WITH MODERATLEY INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION)
-35	-37.8	47.9	10	12	12	24		Sat.		-36.4 — 46.5 GRAY, DARK GRAY, GREEN AND BLACK, SAND AND SILTY SAND
-40	-42.8	52.9	10	12	12	24		Sat.		
-45	-47.8	57.9	7	9	10	19		Sat.		
-50	-52.8	62.9	9	9	11	20		Sat.		
-55	-57.8	67.9	8	9	11	20		Sat.		
-60	-62.8	72.9	5	6	11	17		Sat.		-61.4 — 71.5
-65										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
-70	-67.8	77.9	5	8	13	21		Sat.		
-75	-72.8	82.9	17	9	18	27		Sat.		
-80	-77.8	87.9	3	16	16	32	SS-23	37%		
-85	-82.8	92.9	4	4	8	12		Sat.		
-90	-87.8	97.9	11	60	40/0.1	100/0.6				-86.9 — 97.0 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-95	-92.8	102.9	5	7	10	17	SS-24	28%		-90.9 — 101.0 DARK GRAY, SILTY CLAY
-100	-97.8	107.9	4	52	28	80		W		
-105	-102.8	112.9	15	16	13	29		W		-106.4 — 116.5 DARK GRAY, SANDY SILT
	-107.8	117.9	5	6	5	11		W		-109.3 — 119.4 Boring Terminated at Elevation -109.3 ft IN STIFF SANDY SILT (COASTAL PLAIN)

NCDOT BORE DOUBLE B4484_GEO_BRDG_0138.GPJ NC_DOT.GDT 3/13/19

GEOTECHNICAL BORING REPORT
BORE LOG

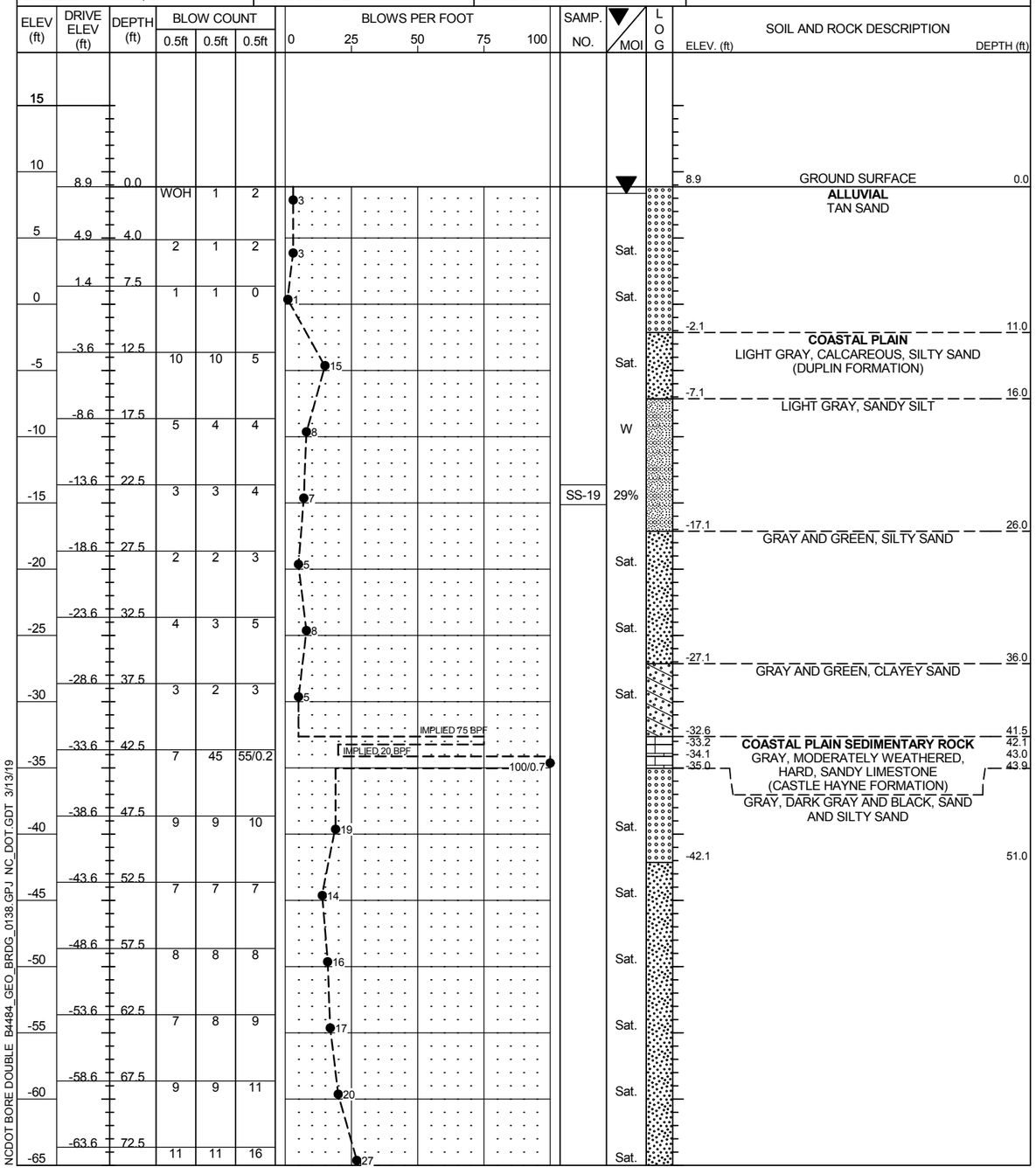
WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 27+08	**OFFSET** 13 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 9.6 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 573,128	**EASTING** 2,506,593	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/01/18	**COMP. DATE** 11/02/18	**SURFACE WATER DEPTH** N/A	

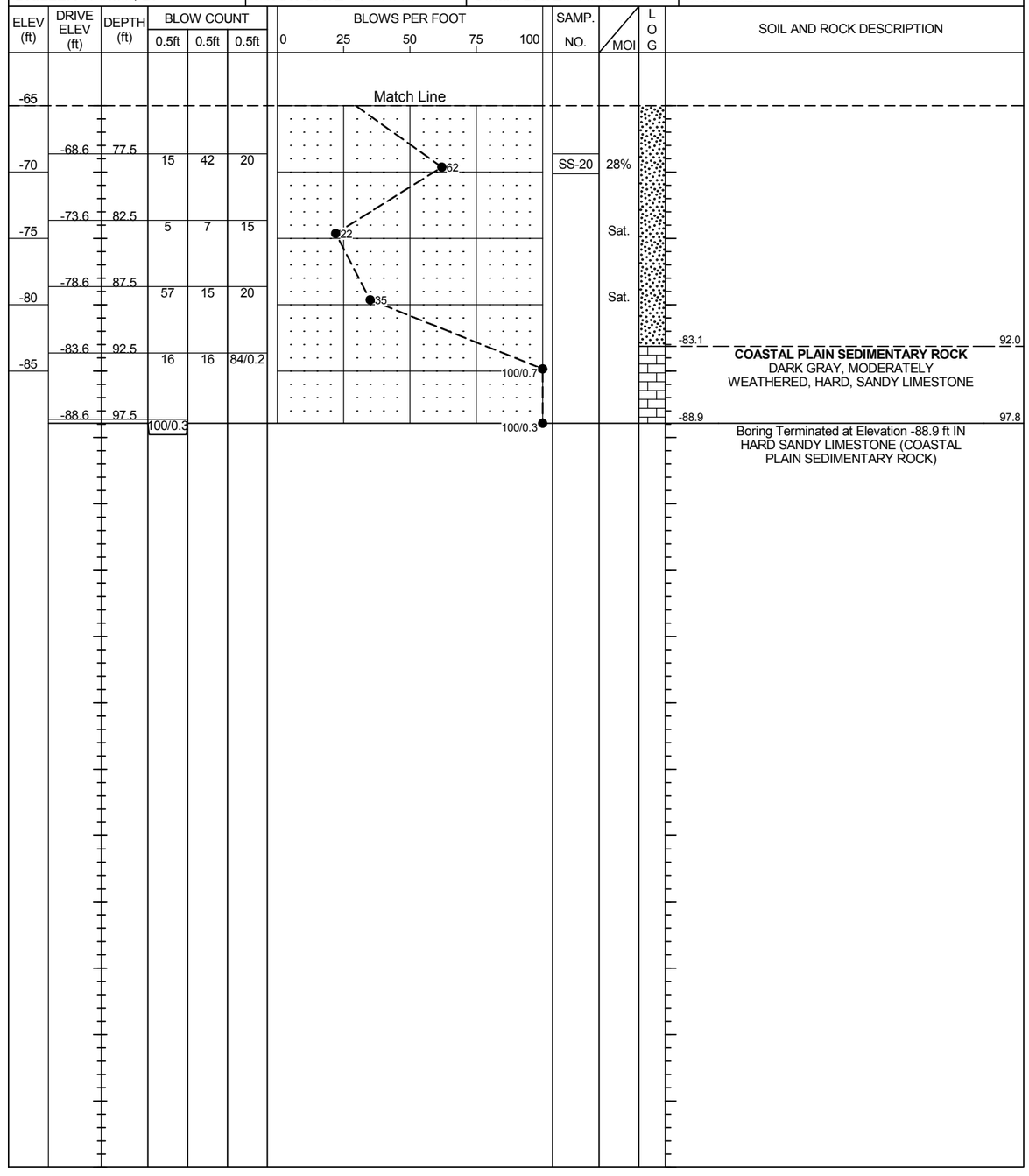
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
	9.6	0.0	WOH	2	2	4				9.6 / 0.0 GROUND SURFACE **ALLUVIAL** TAN SAND
5	5.5	4.1	2	2	3	5		Sat.		
0	1.8	7.8	2	2	1	3		Sat.		
	-3.2	12.8	2	1	2	3		Sat.		-1.4 / 11.0 **COASTAL PLAIN** LIGHT GRAY AND TAN, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
-5	-8.2	17.8	4	6	8	14		Sat.		-6.4 / 16.0 GRAY AND GREEN, SANDY SILT
-10	-13.2	22.8	3	3	4	7		Sat.		-16.4 / 26.0 GRAY AND GREEN, SILTY SAND
-15	-18.2	27.8	3	4	4	8		Sat.		
-20	-23.2	32.8	2	3	3	6		Sat.		
-25	-28.2	37.8	3	2	10	12		Sat.		
-30	-33.2	42.8	3	6	6	12		Sat.		
-35	-38.2	47.8	8	12	11	23		Sat.		-36.7 / 46.3 **COASTAL PLAIN** GRAY SAND WITH MODERATELY INDURATED SEAMS (0.1') (CASTLE HAYNE FORMATION)
-40	-43.2	52.8	10	9	11	20		Sat.		
-45	-48.2	57.8	9	8	9	17		Sat.		-46.4 / 56.0 GRAY, DARK GRAY AND GREEN, SILTY SAND
-50	-53.2	62.8	9	7	11	18		Sat.		
-55	-58.2	67.8	9	9	10	19	SS-21	32%		
-60	-63.2	72.8	7	9	23	32		Sat.		
-65	-68.2	77.8	5	8	21	29		Sat.		
-70										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-73.2	82.8	6	8	13	21		Sat.		GRAY, DARK GRAY AND GREEN, SILTY SAND *(continued)*
-75	-78.2	87.8	3	97/0.2		100/0.7		Sat.		-78.7 / 88.3 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE
-80	-83.2	92.8	100/0.4			100/0.4				-84.4 / 94.0
-85	-88.2	97.8	100/0.5			IMPLIED 30 BPF 100/0.5	SS-22	26%		-86.4 / 96.0
-90	-93.2	102.8	5	6	8	14		W		-91.4 / 101.0 DARK GRAY, SANDY CLAY
-95	-98.2	107.8	9	6	8	14		W		
-100	-103.2	112.8	34	15	22	37		W		-106.4 / 116.0 DARK GRAY, SANDY SILT
-105	-108.2	117.8	4	4	5	9		W		-109.7 / 119.3 Boring Terminated at Elevation -109.7 ft IN STIFF SANDY SILT (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+01	**OFFSET** 25 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 8.9 ft	**TOTAL DEPTH** 97.8 ft	**NORTHING** 573,206	**EASTING** 2,506,655	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/01/18	**COMP. DATE** 11/01/18	**SURFACE WATER DEPTH** N/A	





SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #: 6235-18-035 — Date Report: 11/26/2018

State Project No.: 33723.1.2 — County: Craven — Date Tested: 11/16-11/26/18

Federal ID No.: N/A — TIP No.: B-4484

Project Name: Bridge No. 138 on SR 1470 (-L1-) over Neuse River

Client Name: NCDOT GEU — Client Address: Raleigh, NC

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
							10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay				
SS-19	28+01	25 LT	-L1-	22.5-24.0	A-4	(0)	98	89	83	51	47	15	36	25	24	23	19	4	29.1
SS-20	28+01	25 LT	-L1-	77.5-79.0	A-2-4	(0)	96	84	61	18	15	36	49	7	8	NP	NP	NP	28.3
SS-21	27+08	13 RT	-L1-	67.8-69.3	A-2-4	(0)	94	71	46	13	12	51	37	7	5	NP	NP	NP	32.1
SS-22	27+08	13 RT	-L1-	97.8-98.3	A-2-4	(0)	75	62	51	21	18	31	45	14	10	23	21	2	25.6
SS-23	27+04	13 LT	-L1-	87.9-89.4	A-2-4	(0)	94	90	83	27	25	12	62	15	11	27	25	2	36.7
SS-24	27+04	13 LT	-L1-	102.9-104.4	A-7-6	(7)	99	97	91	46	42	8	50	12	30	45	20	25	27.8
SS-28	26+40	5 LT	-L1-	32.5-34.0	A-4	(0)	96	82	72	47	45	25	28	25	22	24	22	2	32.1
SS-29	26+40	5 LT	-L1-	82.5-84.0	A-2-4	(0)	99	96	86	18	16	14	70	6	10	NP	NP	NP	36.1
SS-30	22+00	25 LT	-L1-	7.8-9.3	A-6	(11)	100	100	98	70	63	2	35	18	45	37	18	19	27.9
SS-31	22+00	25 LT	-L1-	77.8-79.3	A-2-4	(0)	100	97	85	20	18	15	67	7	11	NP	NP	NP	34.9
ST-1	21+95	25 LT	-L1-	7.8-9.8	A-7-6	(17)	100	100	97	74	68	3	30	22	45	45	21	24	27.4-28.3

References / Comments / Deviations: ND=Not Detemined. NP=Non-Plastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT — AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils — AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET		104-01-0703	Thomas J. Daily, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth	7.8 - 9.8 ft.
Description:	Gray Coarse to Fine Sandy Silty CLAY (A-7-6) (17)

	Specimen 1	Specimen 2
Type	Undisturbed	Undisturbed
Height H_0 (in)	6.029	5.919
Diameter D_0 (in)	2.868	2.865
Weight W_0 (gr)	1225.4	1216.2
Bulk Density ρ (PCF)	119.86	121.42
Particle Density ρ_s	2.668 (measured)	2.668 (measured)

Initial Conditions

	Specimen 1	Specimen 2
Cell Pressure σ_3 (lbf/in2)	2.5	10.0
Pore Pressure u (lbf/in2)	5.0	5.0
Machine Speed d_r(in/min)	0.015	0.023
No. of Membranes	1	1
Total Thickness (in)	0.012	0.012
Strain Channel	1798	1798
Load Channel	1776	1776
Pore P. Channel	1779	1779
Volume Channel	Volume Chang	Volume Chang
Moisture Content w_0%	28.4	29.4
Dry Density ρ_{d0} (PCF)	93.33	93.82
Voids Ratio e_0	0.78	0.77
Deg of Saturation S_0%	96.75	100.00
Final B Value	0.98	0.97

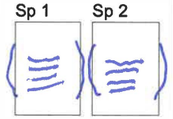
Final Conditions

	Specimen 1	Specimen 2
Moisture Content w_f%	28.3	27.4
Dry Density ρ_d (PCF)	94.23	95.26
Voids Ratio e_f	0.77	0.75
Deg of Saturation S_f%	98.62	97.76
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	2.0	5.0
Corr Dev Stress $(\sigma_1 - \sigma_3)f$ (lbf/in2)	6.6	14.3
Minor Stress σ_{3f} (lbf/in2)	0.5	5.4
Major Stress σ_{1f} (lbf/in2)	7.1	19.7
Stress Ratio $(\sigma_1/\sigma_3)_f$	14.2	3.6

Notes:

Failure Sketch

Sp 1 Sp 2

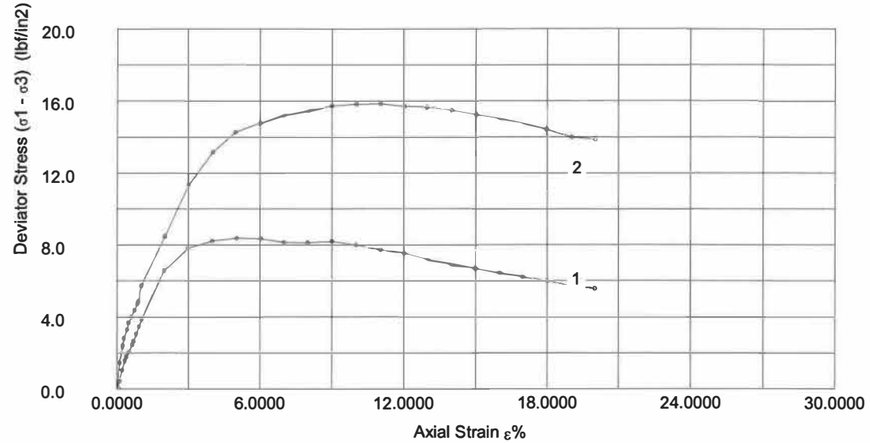


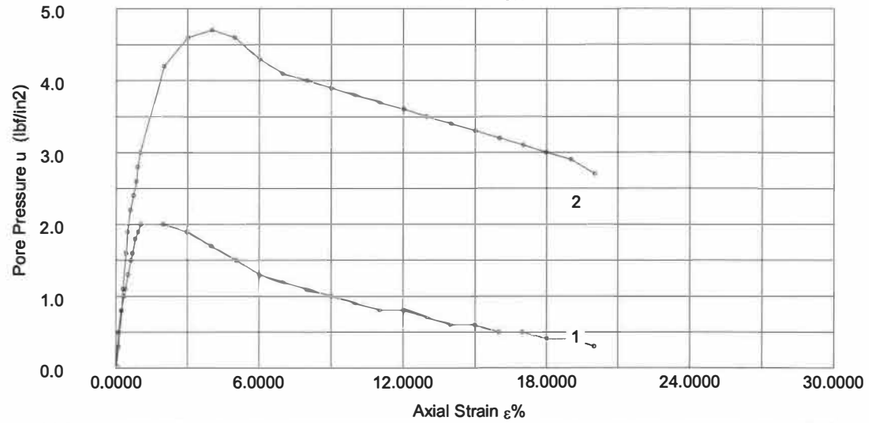
Surface Inclination

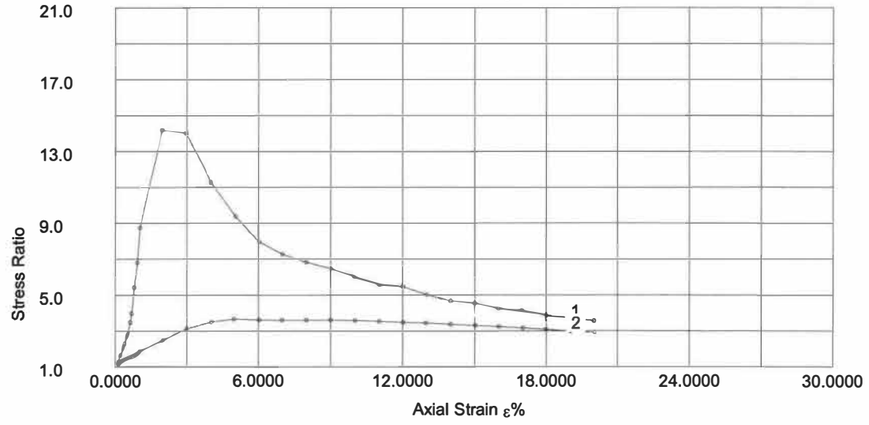
Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained



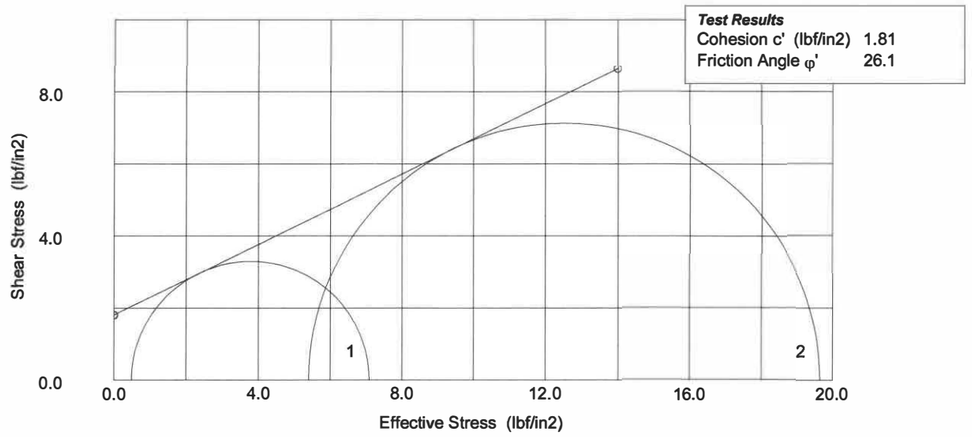


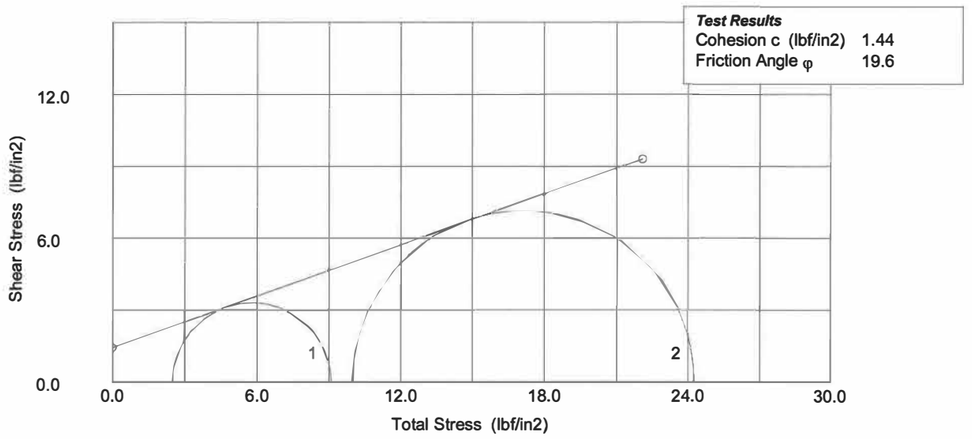


Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained

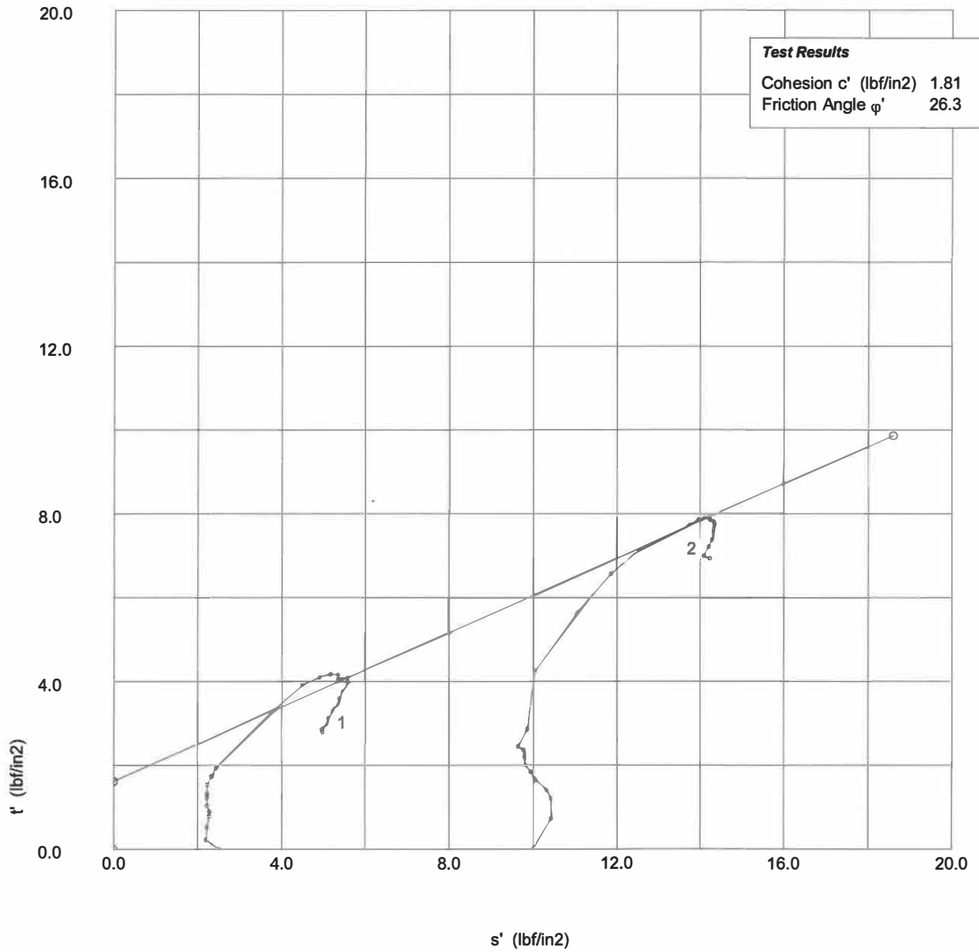




Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator: MLC	*Checked:* MLC	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained



Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator: MLC	*Checked:* MLC	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	92	0.00	563	0.0	0	0.0	0.0	0.0	2.50	2.50	1.00
2	157	0.11	590	2.7	5	0.5	0.4	0.4	2.00	2.42	1.21
3	226	0.22	630	6.7	8	0.8	1.0	1.0	1.70	2.74	1.61
4	295	0.34	663	10.0	10	1.0	1.6	1.6	1.50	3.05	2.04
5	334	0.40	678	11.5	11	1.1	1.8	1.8	1.40	3.18	2.27
6	399	0.51	706	14.3	13	1.3	2.2	2.1	1.20	3.26	2.71
7	470	0.63	732	16.9	15	1.5	2.6	2.5	1.00	3.46	3.46
8	505	0.69	745	18.2	16	1.6	2.8	2.7	0.90	3.56	3.95
9	575	0.80	772	20.9	18	1.8	3.2	3.1	0.70	3.77	5.39
10	643	0.92	798	23.5	19	1.9	3.6	3.5	0.60	4.07	6.78
11	715	1.04	824	26.1	20	2.0	4.0	3.9	0.50	4.37	8.73
12	1278	1.97	1012	44.9	20	2.0	6.9	6.6	0.50	7.08	14.16
13	1880	2.98	1103	54.0	19	1.9	8.2	7.8	0.60	8.41	14.01
14	2496	4.00	1144	58.1	17	1.7	8.7	8.2	0.80	9.01	11.27
15	3120	5.04	1166	60.3	15	1.5	8.9	8.4	1.00	9.36	9.36
16	3719	6.04	1176	61.3	13	1.3	9.0	8.3	1.20	9.54	7.95
17	4308	7.02	1174	61.1	12	1.2	8.9	8.1	1.30	9.44	7.26
18	4901	8.00	1185	62.2	11	1.1	8.9	8.1	1.40	9.52	6.80
19	5505	9.01	1202	63.9	10	1.0	9.1	8.2	1.50	9.68	6.46
20	6102	10.00	1201	63.8	9	0.9	8.9	8.0	1.60	9.59	6.00
21	6721	11.03	1196	63.3	8	0.8	8.8	7.7	1.70	9.44	5.55
22	7319	12.03	1194	63.1	8	0.8	8.6	7.5	1.70	9.24	5.43
23	7918	13.02	1180	61.7	7	0.7	8.4	7.2	1.80	8.98	4.99
24	8505	14.00	1172	60.9	6	0.6	8.2	6.9	1.90	8.80	4.63
25	9100	14.99	1167	60.4	6	0.6	8.0	6.7	1.90	8.59	4.52
26	9704	15.99	1162	59.9	5	0.5	7.8	6.5	2.00	8.46	4.23
27	10293	16.97	1158	59.5	5	0.5	7.7	6.2	2.00	8.25	4.12
28	10915	18.01	1150	58.7	4	0.4	7.5	6.0	2.10	8.09	3.85
29	11521	19.02	1140	57.7	4	0.4	7.3	5.7	2.10	7.83	3.73
30	12115	20.01	1138	57.5	3	0.3	7.2	5.6	2.20	7.78	3.53

Test Method: ASTM D4767-95

Test name CU Triaxial (SS, MS) Shear (Specimen 1)

Date of Test: 12-26-18

Site Reference: Br. Nos. 138 & 139

Jobfile: E:\18-036.JOB

Sample: ST-1

Borehole: 21+95, 25 LT, -L1-

Operator: MLL

Checked: MLL

Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	0	0.00	620	0.0	0	0.0	0.0	0.0	10.00	10.00	1.00
2	71	0.12	713	9.3	3	0.3	1.5	1.5	9.70	11.16	1.15
3	140	0.24	776	15.6	8	0.8	2.4	2.4	9.20	11.64	1.27
4	176	0.30	801	18.1	11	1.1	2.8	2.8	8.90	11.73	1.32
5	248	0.42	832	21.2	16	1.6	3.3	3.3	8.40	11.71	1.39
6	283	0.48	856	23.6	19	1.9	3.7	3.7	8.10	11.78	1.45
7	355	0.60	888	26.8	22	2.2	4.2	4.0	7.80	11.81	1.51
8	427	0.73	912	29.2	24	2.4	4.5	4.4	7.60	11.98	1.58
9	495	0.84	935	31.5	26	2.6	4.9	4.7	7.40	12.14	1.64
10	530	0.90	945	32.5	28	2.8	5.0	4.9	7.20	12.09	1.68
11	599	1.02	999	37.9	30	3.0	5.9	5.7	7.00	12.72	1.82
12	1182	2.01	1190	57.0	42	4.2	8.8	8.5	5.80	14.27	2.46
13	1772	3.01	1389	76.9	46	4.6	11.7	11.3	5.40	16.73	3.10
14	2371	4.03	1525	90.5	47	4.7	13.6	13.1	5.30	18.43	3.48
15	2928	4.97	1615	99.5	46	4.6	14.8	14.3	5.40	19.66	3.64
16	3551	6.03	1667	104.7	43	4.3	15.4	14.8	5.70	20.48	3.59
17	4114	6.99	1712	109.2	41	4.1	15.9	15.2	5.90	21.10	3.58
18	4714	8.00	1748	112.8	40	4.0	16.3	15.5	6.00	21.46	3.58
19	5300	9.00	1783	116.3	39	3.9	16.6	15.7	6.10	21.81	3.57
20	5895	10.01	1809	118.9	38	3.8	16.8	15.8	6.20	22.01	3.55
21	6495	11.03	1829	120.9	37	3.7	16.9	15.8	6.30	22.12	3.51
22	7086	12.03	1839	121.9	36	3.6	16.8	15.7	6.40	22.09	3.45
23	7646	12.98	1854	123.4	35	3.5	16.8	15.6	6.50	22.15	3.41
24	8244	14.00	1862	124.2	34	3.4	16.7	15.5	6.60	22.08	3.35
25	8843	15.02	1864	124.4	33	3.3	16.6	15.3	6.70	21.95	3.28
26	9432	16.02	1868	124.8	32	3.2	16.4	15.0	6.80	21.85	3.21
27	10024	17.02	1867	124.7	31	3.1	16.2	14.8	6.90	21.66	3.14
28	10595	17.99	1860	124.0	30	3.0	15.9	14.4	7.00	21.42	3.06
29	11214	19.04	1844	122.4	29	2.9	15.5	14.0	7.10	21.07	2.97
30	11806	20.05	1854	123.4	27	2.7	15.5	13.9	7.30	21.17	2.90

Test Method: ASTM D4767-95

Test name CU Triaxial (SS, MS) Shear (Specimen 2)

Date of Test: 12-26-18

Site Reference: Br. Nos. 138 & 139

Jobfile: E:\18-036.JOB

Sample: ST-1

Borehole: 21+95, 25 LT, -L1-

Operator: MLL

Checked: MLL

Approved:

SITE PHOTOGRAPH (S)

Bridge No. 138 on SR 1470 (-L1-) over Neuse River

Looking South

SITE PHOTOGRAPH (S)

Bridge No. 138 on SR 1470 (-L1-) over Neuse River

Looking Southwest towards End Bent 1