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

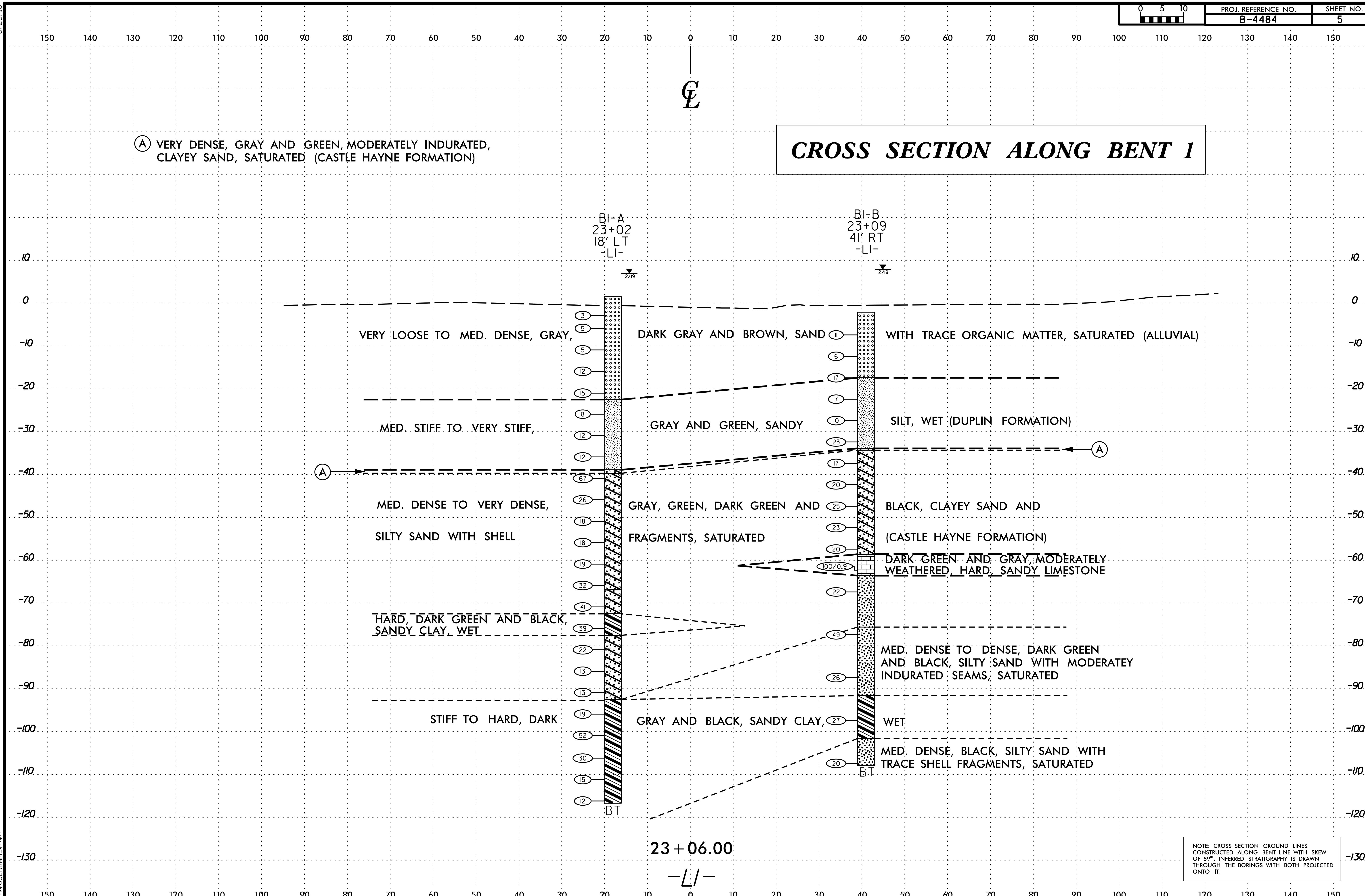
NOTE: EXISTING GROUND SURFACE PROFILE OF –L1– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'B4484_ls_tin.tin' DATED 1/26/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

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

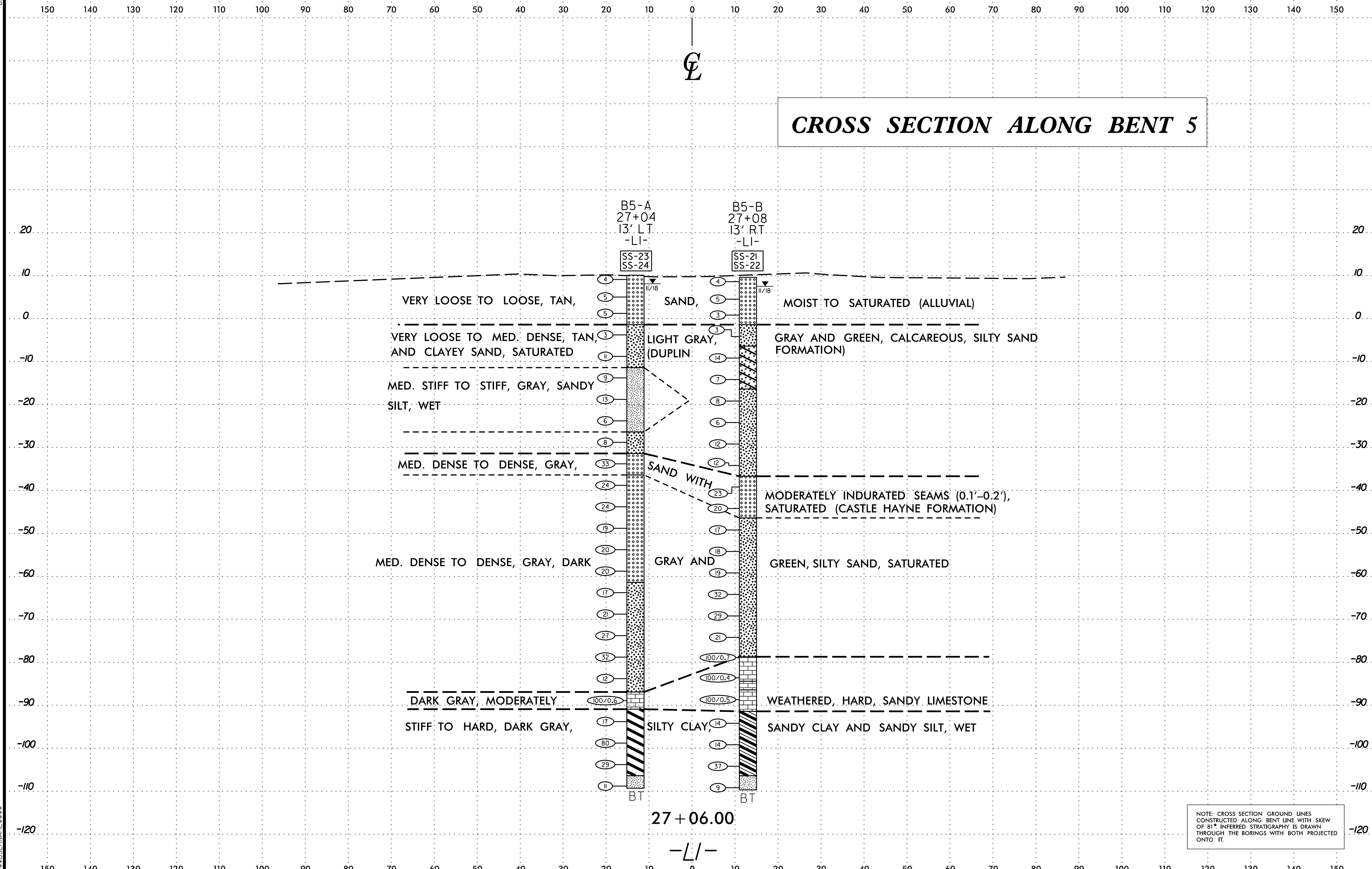
PROJ. REFERENCE NO.	SHEET NO.
B-4484	5

CROSS SECTION ALONG BENT 1



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.

6/23/16

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

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

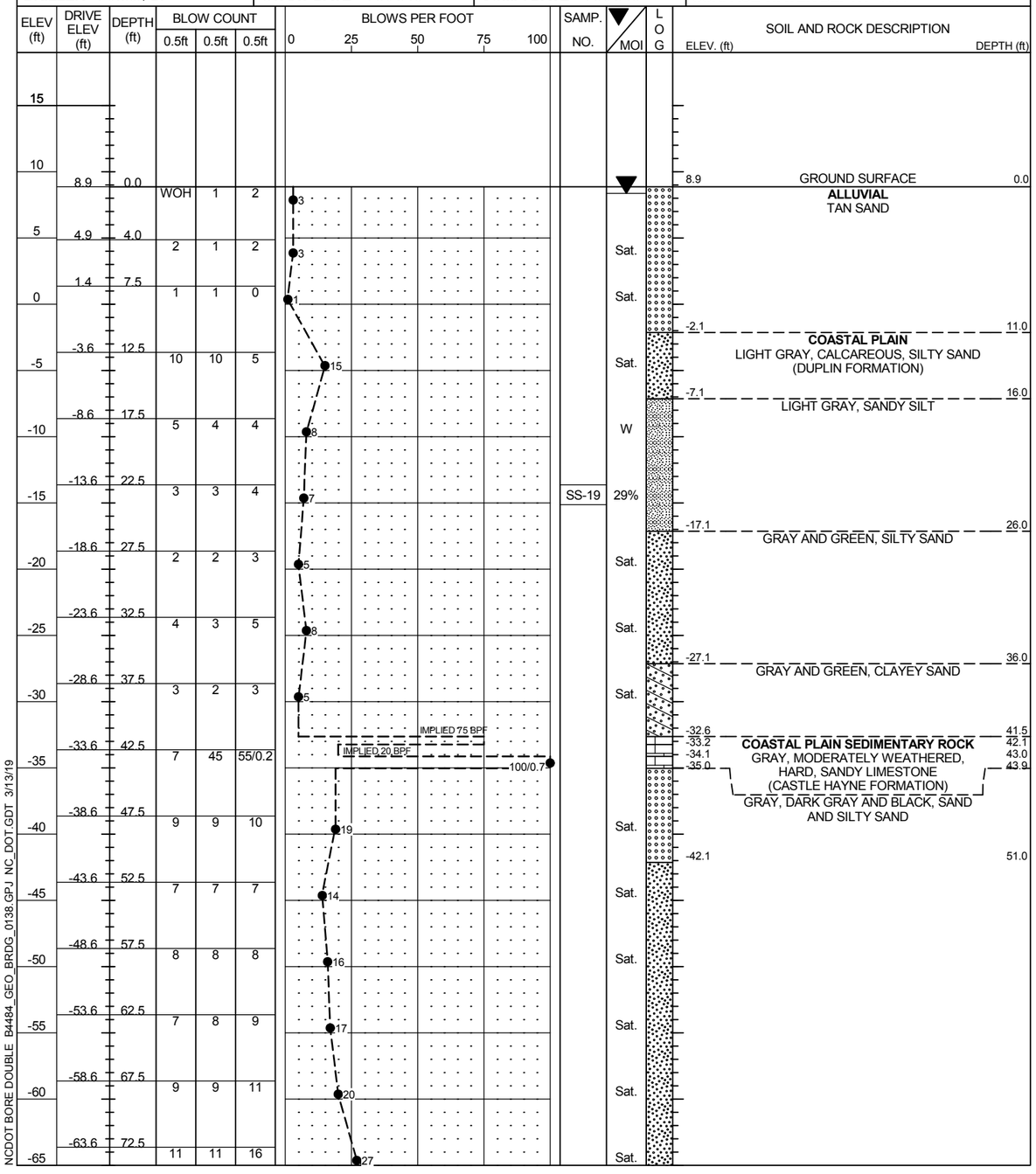
WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J.R.	
SITE DESCRIPTION BRIDGE NO. 138 ON SR 1470 (-L1-) OVER NEUSE RIVER				**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 27+08	**OFFSET** 13 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 9.6 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 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	

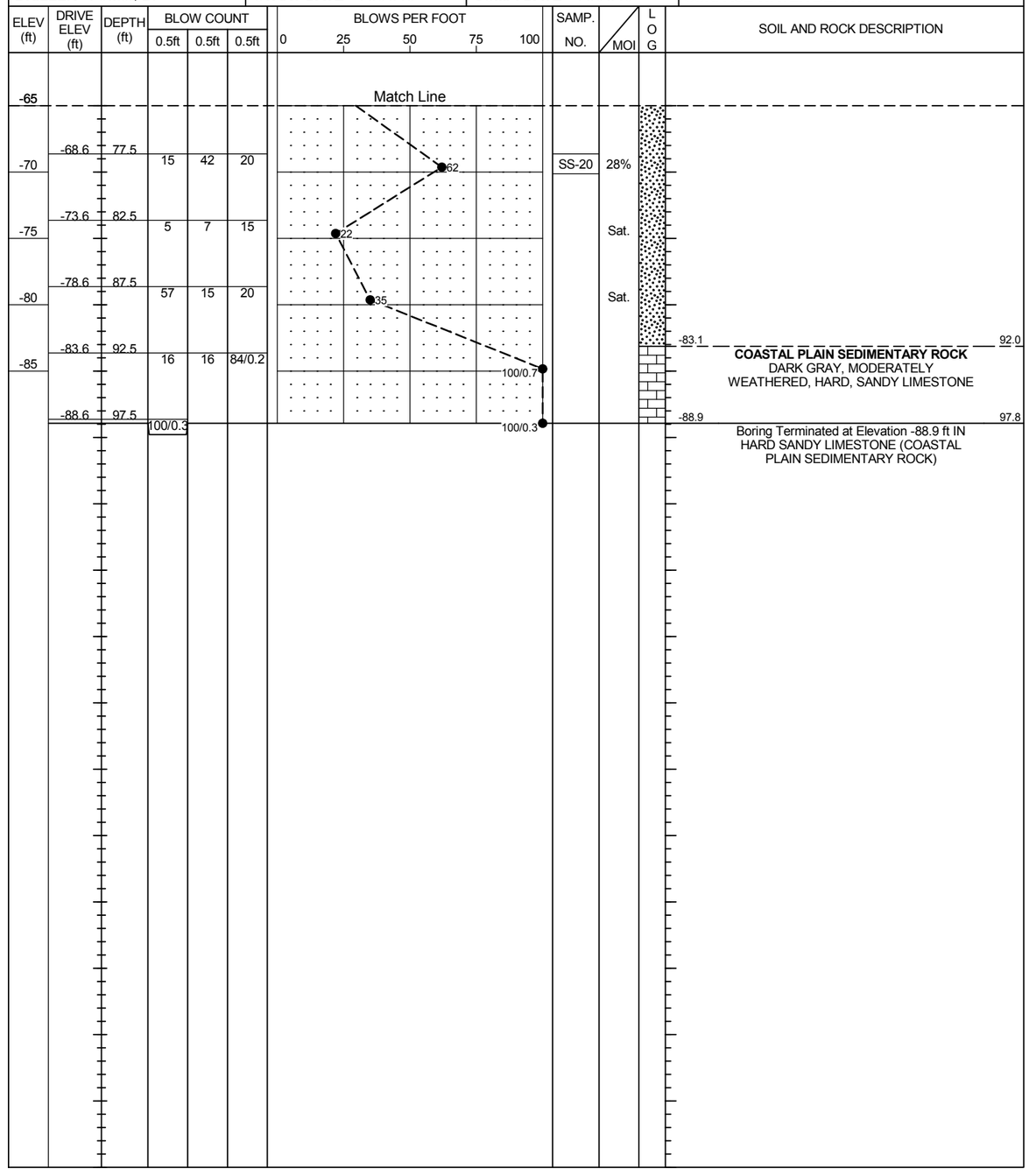
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
	9.6	0.0	WOH	2	2	4				9.6 / 0.0 GROUND SURFACE **ALLUVIAL** TAN SAND
5	5.5	4.1	2	2	3	5		Sat.		
0	1.8	7.8	2	2	1	3		Sat.		
	-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

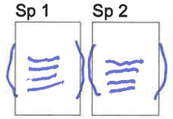
Final Conditions

	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

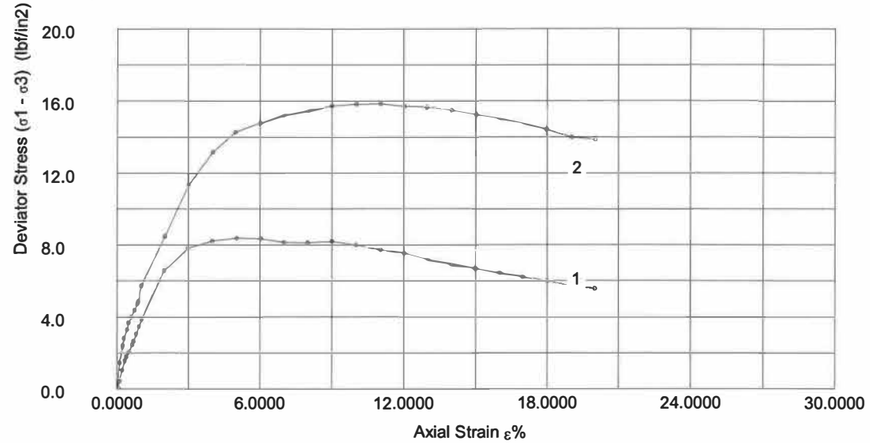


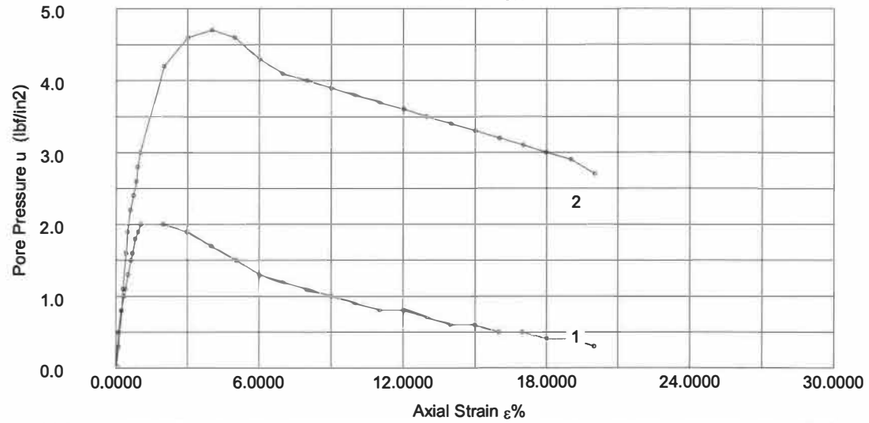
Surface Inclination

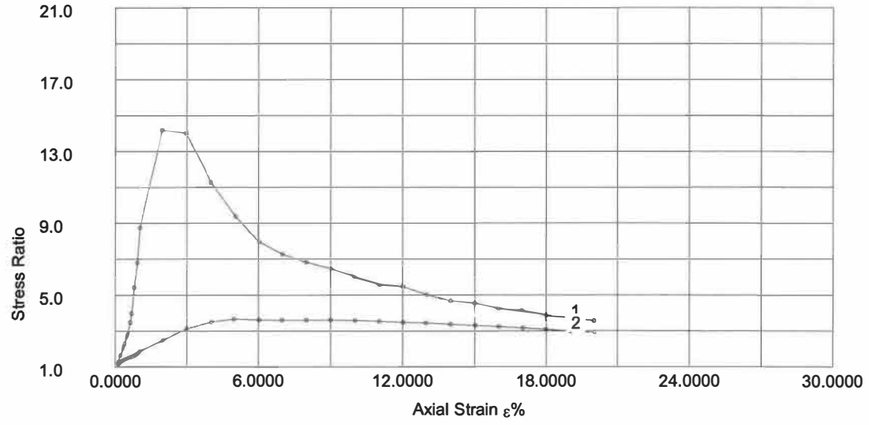
Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained



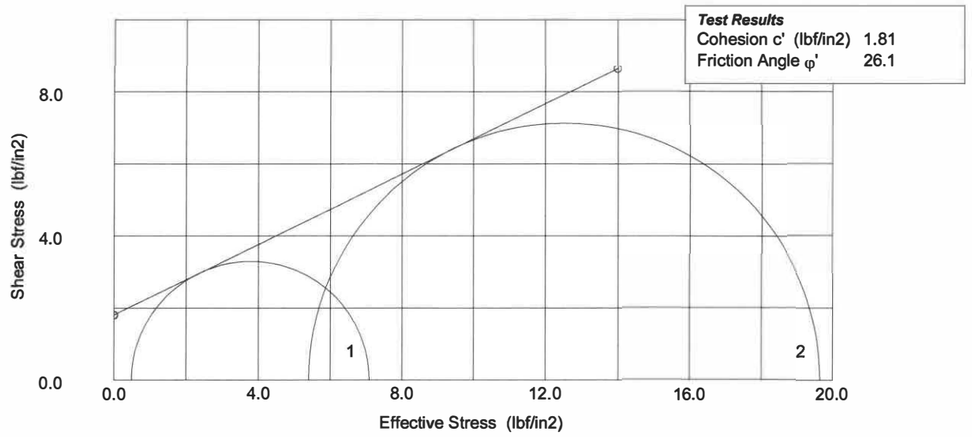


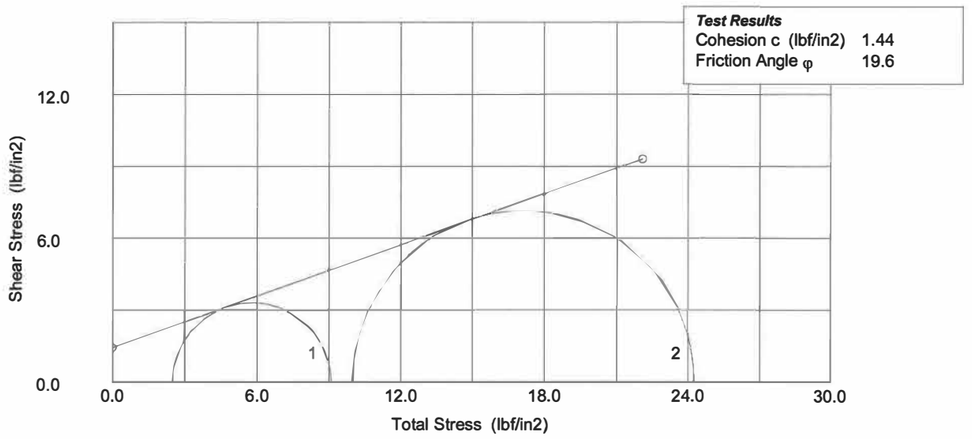


Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained

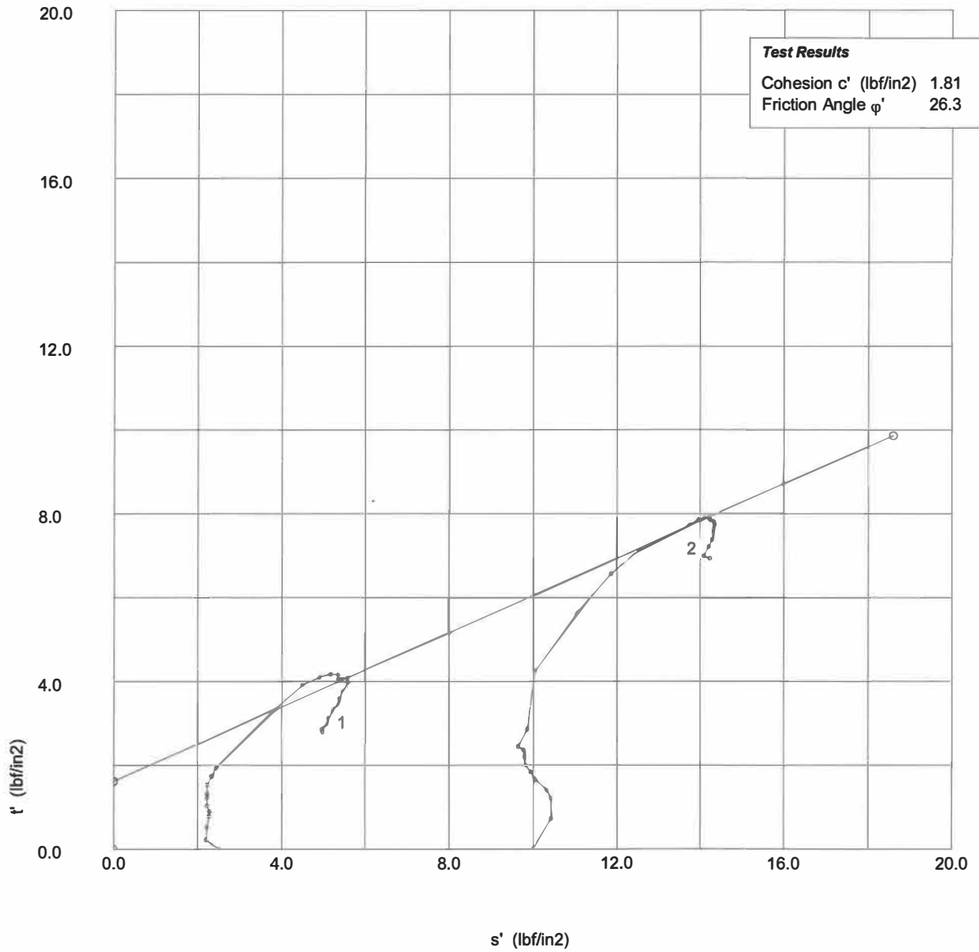




Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	21+95, 25 LT, -L1-
Operator: MLC	*Checked:* MLC	*Approved:*	

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4484	1	11

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. 139 ON SR 1470 (MAPLE CYPRESS RD.) OVER NEUSE RIVER OVERFLOW*

CONTENTS

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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.

PERSONNEL

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

INVESTIGATED BY *S&ME, Inc.*
DRAWN BY *J.R. SWARTLEY*
CHECKED BY *S.S. LANEY*
SUBMITTED BY *J. DAILY*
DATE *JANUARY 2019*

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

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
919459487B4347...
SIGNATURE

4/19/2019
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:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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: BL-5 N: 574269 E: 2507876

ELEVATION: 14.02 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-4484	3

SITE PLAN

0 50 100
FEET

SKEW = 90°

ELISHA U. HEATH
DB 2849 PG 235
PC H PG 152-F

WOODS

NEUSE RIVER OVERFLOW

END RETAINING WALL

BEGIN RETAINING WALL

NAD 83

24.22

104

WOODS

20' INGRESS EGRESS EASEMENT AND REGRESS EASEMENT

EB1 BENT LINE

40+00

B1 BENT LINE

B2 BENT LINE

B3 BENT LINE

CYPRESS SWAMP

EB2 BENT LINE

45+00

+33.62

EXISTING R/W

10" A/C WATER LINE

EB1-C

15" CMP

-LI-

TH 7
10.15
10" DIP
8" PLAS
WATER LINE

8:1

10"

W

41+00

W WSD)

SR 1470 (MAPLE CYPRESS RD)

-EL-

NEUSE RIVER OVERFLOW BRIDGE #139

TO RIVER RD.

EXISTING R/W

TO BIDDLE RD.

B1-B

B2-B

B3-B

EB2-B

105

106

TOP OF RAIL AT EB1
ELEV.= 18.13'

TOP OF RAIL AT EB2
ELEV.= 18.14'

-BL- 5

9' SOIL

NEUSE RIVER OVERFLOW

CYPRESS SWAMP

-LI- PC St

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-4484	4

PROFILE PROJECTED ALONG –L1–

0 40 80
FEET
VE = 2

(A) VERY LOOSE TO MED. DENSE, TAN AND BROWN, SILTY SAND AND SAND, MOIST TO SAT. (ROADWAY EMBANKMENT)
(B) SOFT, BROWN, SANDY CLAY, MOIST TO WET (ROADWAY EMBANKMENT)
(C) LOOSE, GRAY, SAND, SATURATED (ALLUVIAL)
(D) LOOSE, GRAY AND GREEN, CLAYEY SAND, SATURATED (DUPLIN FORMATION)
(E) GRAY, MODERATELY WEATHERED, SANDY LIMESTONE (CASTLE HAYNE FORMATION)
(F) DENSE, GRAY, SAND WITH FRIABLE TO MOD. INDURATED SEAMS (0.1'–0.2'), SATURATED (CASTLE HAYNE FORMATION)
(G) MED. DENSE, GRAY, SAND, SATURATED (CASTLE HAYNE FORMATION)

BEGIN BRIDGE
-L1- STA. 39+45 +/-
ELEV. = 18.75'

END BRIDGE
-L1- STA. 43+45 +/-
ELEV. = 20.68'

BRIDGE NO. 139

EXISTING GROUND ALONG CENTERLINE
PROPOSED GRADE
EB1–C 39+14 CL
SS-46 SS-47
EXISTING GROUND ALONG –EL–
B1–B 40+37 59' RT
SS-60 SS-61
PAVEMENT
EXISTING GROUND ALONG CENTERLINE
B2–B 41+45 54' RT
SS-58 SS-59
PROPOSED GRADE
B3–B 42+45 49' RT
SS-56 SS-57
EXISTING GROUND ALONG –EL–
PAVEMENT
EB2–B 43+45 44' RT
SS-55

NWS EL. = 3.8' +/-
DATE OF SURVEY: 7/15/2018

SOFT, GRAY, VERY SOFT, SANDY CLAY, WOH
SANDY CLAY, MOIST TO WET (ALLUVIAL)
GRAY, WET
VERY SOFT TO SOFT, BROWN, MUCK, WET TO SAT. (ALLUVIAL)
VERY LOOSE TO MED. DENSE, BROWN AND GRAY, SILTY SAND AND SAND, SAT. (ALLUVIAL)
LOOSE TO MEDIUM DENSE, MEDIUM STIFF TO STIFF, LOOSE TO MEDIUM DENSE, GRAY, SILTY SAND
LIGHT GRAY AND GRAY, GRAY AND GREEN, AND CLAYEY SAND, SATURATED
CALCAREOUS, SILTY SAND AND CLAYEY SAND, SATURATED
SANDY SILT, WET
(DUPLIN FORMATION)
MED. DENSE TO DENSE, GRAY, DARK GRAY
AND BLACK, SILTY SAND
AND SAND, SATURATED
(CASTLE HAYNE FORMATION)
LIMESTONE
GRAY, DARK GRAY AND BLACK, MED. DENSE TO DENSE, DARK GRAY STIFF, GRAY AND BLACK,
MODERATELY WEATHERED, AND BLACK, SILTY SAND AND CLAYEY SANDY CLAY, WET
SAND, SATURATED
GRAY, DARK GRAY AND BLACK, MED. DENSE TO DENSE, GRAY, SANDY LIMESTONE
MODERATELY WEATHERED, SANDY
DARK GRAY AND BLACK, SILTY SAND, SATURATED
VERY STIFF, GRAY AND BLACK, SANDY SILT, WET

NOTE: EXISTING GROUND SURFACE PROFILE OF –L1– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'B4484_ls_tin.tin' DATED 1/2618. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

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

39+00 40+00 41+00 42+00 43+00 44+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 39+14	**OFFSET** CL	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 13.2 ft	**TOTAL DEPTH** 103.6 ft	**NORTHING** 573,864	**EASTING** 2,507,532	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/13/18	**COMP. DATE** 11/14/18	**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											
	13.2	0.0	4	8	11	19		M		13.2 GROUND SURFACE	0.0
10	10.4	2.8	6	7	3	10		M		11.2 **ROADWAY EMBANKMENT** TAN, SILTY SAND AND SAND	2.0
								▼		8.7 **ALLUVIAL** GRAY, SANDY CLAY	4.5
5	5.4	7.8	WOH	2	2	4		Sat.		4.9 GRAY SAND	8.3
										2.2 GRAY, CALCAREOUS, SANDY CLAY	11.0
0	0.4	12.8	WOH	WOH	WOH	WOH		W		-2.8 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	16.0
-5	-4.6	17.8	5	5	7	12		Sat.			
-10	-9.6	22.8	6	5	7	12		Sat.			
-15	-14.6	27.8	3	2	2	4	SS-46	30%		-12.8 GRAY, SANDY SILT	26.0
-20	-19.6	32.8	2	2	3	5		W			
-25	-24.6	37.8	4	3	4	7		W			
-30	-29.6	42.8	2	3	5	8		Sat.		-27.8 GRAY, SILTY SAND	41.0
-35	-34.6	47.8	3	4	11	15		Sat.		-36.8 **COASTAL PLAIN** GRAY SAND (CASTLE HAYNE FORMATION)	50.0
-40	-39.6	52.8	60/0.1			60/0.1		Sat.		-39.6	52.8
										-40.1 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, SANDY LIMESTONE GRAY, DARK GRAY AND BLACK, SILTY SAND AND SAND	53.3
-45	-44.6	57.8	7	9	9	18		Sat.			
-50	-49.6	62.8	7	7	9	16		Sat.			
-55	-54.6	67.8	8	7	8	15		Sat.		-52.8	66.0
-60	-59.6	72.8	7	8	9	17		Sat.			
-65	-64.6	77.8									

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 39+14	**OFFSET** CL	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 13.2 ft	**TOTAL DEPTH** 103.6 ft	**NORTHING** 573,864	**EASTING** 2,507,532	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/13/18	**COMP. DATE** 11/14/18	**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				
	-69.6	82.8	10	9	17	26		Sat.		
-70			5	6	15	21		Sat.		
-75	-74.6	87.8	6	6	10	16	SS-47	35%		
-80	-79.6	92.8	5	7	9	16		Sat.		
-85	-84.6	97.8	3	4	14	18		Sat.		
-90	-89.6	102.8	25	75/0.3		100/0.8		Sat.		-88.8 **COASTAL PLAIN SEDIMENTARY ROCK** 102.0 -90.4 DARK GRAY, MODERATELY WEATHERED, SANDY LIMESTONE 103.6 Boring Terminated at Elevation -90.4 ft IN SANDY LIMESTONE (COASTAL PLAIN SEDIMENTARY ROCK)

NCDOT BORE DOUBLE B4484_GEO_BRDG00139.GPJ NC_DOT.GDT 1/14/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 40+37	**OFFSET** 59 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 15.9 ft	**TOTAL DEPTH** 109.3 ft	**NORTHING** 573,926	**EASTING** 2,507,653	**24 HR.** 7.4
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/28/18	**COMP. DATE** 11/29/18	**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)
20										
15	14.7	1.2								15.9 GROUND SURFACE 0.0
			7	5	5	10		M		14.7 **ROADWAY EMBANKMENT** (PAVEMENT) 1.2
10	12.0	3.9	1	1	1	2		M		12.9 TAN, SILTY SAND AND SAND 3.0
	8.1	7.8	1	0	1	1		Sat.		9.9 6.0
5										4.9 **ALLUVIAL** BROWN MUCK 11.0
	3.1	12.8	WOH	1	1	2		W		
0	-1.9	17.8	WOH	1	1	2		W		-3.2 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION) 19.1
-5										
	-6.9	22.8	4	5	5	10		Sat.		
-10										-10.1 GRAY, SANDY SILT 26.0
	-11.9	27.8	3	2	3	5		W		
-15										
	-16.9	32.8	2	3	2	5	SS-60	30%		
-20										
	-21.9	37.8	7	3	3	6		W		
-25										-25.1 GRAY, SILTY SAND 41.0
	-26.9	42.8	2	2	3	5		Sat.		
-30										
	-31.9	47.8	9	3	3	6		Sat.		
-35										-35.1 GRAY, CLAYEY SAND 51.0
	-36.9	52.8	5	5	5	10		Sat.		
-40										-40.6 **COASTAL PLAIN** GRAY SAND WITH FRIABLE TO MODERATELY INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION) 56.5
	-41.9	57.8	56	18	20	38		Sat.		
-45										-45.1 GRAY, DARK GRAY AND BLACK, SILTY SAND 61.0
	-46.9	62.8	13	9	9	18		Sat.		
-50										
	-51.9	67.8	9	8	10	18		Sat.		
-55										
	-56.9	72.8	8	9	9	18		Sat.		
-60										

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 40+37	**OFFSET** 59 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 15.9 ft	**TOTAL DEPTH** 109.3 ft	**NORTHING** 573,926	**EASTING** 2,507,653	**24 HR.** 7.4
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/28/18	**COMP. DATE** 11/29/18	**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
-60						Match Line				
	-61.9	77.8	50	29	11	40		Sat.		GRAY, DARK GRAY AND BLACK, SILTY SAND *(continued)*
-65										
	-66.9	82.8	5	7	9	16		Sat.		
-70										
	-71.9	87.8	6	6	12	18		Sat.		
-75										
	-76.9	92.8	10	5	7	12	SS-61	33%		
-80										
	-81.9	97.8	100/0.2			100/0.2		Sat.		-81.7 97.6 -82.2 **COASTAL PLAIN SEDIMENTARY ROCK** 98.1 DARK GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE
-85										
	-86.9	102.8	11	89/0.3		100/0.8		Sat.		-87.4 103.3 -88.1 104.0 DARK GRAY AND BLACK, SILTY SAND
-90										
	-91.9	107.8	9	6	8	14		W		-91.1 107.0 GRAY AND BLACK, SANDY CLAY -93.4 109.3 Boring Terminated at Elevation -93.4 ft IN STIFF SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 41+45	**OFFSET** 54 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 2.2 ft	**TOTAL DEPTH** 110.7 ft	**NORTHING** 574,015	**EASTING** 2,507,715	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/27/18	**COMP. DATE** 11/28/18	**SURFACE WATER DEPTH** 7.0ft	

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										WATER SURFACE (11/27/18)
5										
	2.2	0.0								2.2 / 0.0 GROUND SURFACE
0			WOH	WOH	1	1		Sat.		0.2 / 2.0 **ALLUVIAL** BROWN MUCK GRAY SAND
	-3.1	5.3								
-5			4	3	3	6		Sat.		-5.3 / 7.5 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
	-7.0	9.2								
-10			6	7	7	14		Sat.		-10.3 / 12.5 GRAY, CLAYEY SAND
	-12.0	14.2								
-15			3	2	3	5		Sat.		
	-17.0	19.2								
-20			3	2	3	5		Sat.		-20.3 / 22.5 GRAY AND GREEN, SANDY SILT
	-22.0	24.2								
-25			3	3	4	7		W		
	-27.0	29.2								
-30			5	3	3	6		W		
	-32.0	34.2								
-35			4	5	8	13		W		
	-37.0	39.2								
-40			5	4	6	10		W		-40.3 / 42.5
	-42.0	44.2				IMPLIED 50 BPF				-41.0 / 43.2 **COASTAL PLAIN** GRAY, GREEN, DARK GRAY AND BLACK, SAND AND SILTY SAND; MODERATELY INDURATED FROM DEPTHS 43.2'-44.0' (CASTLE HAYNE FORMATION)
-45			8	6	4	10		Sat.		-41.8 / 44.0
	-47.0	49.2								-45.3 / 47.5
-50			7	8	10	18		Sat.		
	-52.0	54.2								
-55			8	7	8	15		Sat.		
	-57.0	59.2								
-60			9	9	10	19		Sat.		
	-62.0	64.2								
-65			8	5	14	19		Sat.		
	-67.0	69.2								
-70			5	6	9	15	SS-58	33%		

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 41+45	**OFFSET** 54 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 2.2 ft	**TOTAL DEPTH** 110.7 ft	**NORTHING** 574,015	**EASTING** 2,507,715	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/27/18	**COMP. DATE** 11/28/18	**SURFACE WATER DEPTH** 7.0ft	

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				
	-72.0	74.2	5	6	11	17		Sat.		-76.6 / 78.8 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE
-75										
	-77.0	79.2	11	10	56	66		Sat.		-79.3 / 81.5 DARK GRAY AND BLACK, SILTY SAND
-80										
	-82.0	84.2	5	5	38	43		Sat.		-85.3 / 87.5 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE
-85										
	-87.0	89.2	85	15/0.1		100/0.6		Sat.		
-90										-90.3 / 92.5 DARK GRAY AND BLACK, CLAYEY SAND
	-92.0	94.2	7	5	7	12	SS-59	31%		
-95										
	-97.0	99.2	19	23	16	39		Sat.		
-100										
	-102.0	104.2	4	6	18	24		Sat.		
-105										
	-107.0	109.2	5	6	7	13		Sat.		-108.0 / 110.2 -108.5 / 110.7 DARK GRAY AND BLACK, SILTY SAND

Boring Terminated at Elevation -108.5 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)

1) Harder drilling from depths 43.2'-44.0'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 42+45	**OFFSET** 49 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 15.8 ft	**TOTAL DEPTH** 109.3 ft	**NORTHING** 574,098	**EASTING** 2,507,772	**24 HR.** 7.9
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/27/18	**COMP. DATE** 11/27/18	**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)
20											
15	15.1	0.7	12	9	8	17		M		15.8 GROUND SURFACE	0.0
	11.9	3.9								15.1 **ROADWAY EMBANKMENT** (PAVEMENT)	0.7
10			2	5	7	12		M		13.3 TAN AND BROWN, SILTY SAND AND SAND	2.5
	8.0	7.8								9.8	6.0
5			3	4	3	7		Sat.		4.8 **ALLUVIAL** BROWN AND GRAY, SILTY SAND AND SAND	11.0
	3.0	12.8									
0			1	1	2	3		Sat.		-0.2	16.0
	-2.0	17.8									
-5			7	7	11	18		Sat.		-5.2 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	21.0
	-7.0	22.8									
-10			6	5	6	11		Sat.		-10.2 GRAY AND GREEN, SANDY SILT	26.0
	-12.0	27.8									
-15			2	2	4	6	SS-56	32%			
	-17.0	32.8									
-20			3	2	5	7	SS-57	32%			
	-22.0	37.8									
-25			3	1	3	4		W			
	-27.0	42.8									
-30			3	3	7	10		W		-30.2 GRAY AND GREEN, CLAYEY SAND	46.0
	-32.0	47.8									
-35			9	5	4	9		Sat.		-35.2 GRAY AND GREEN, SANDY SILT	51.0
	-37.0	52.8									
-40			3	5	7	12		W			
	-42.0	57.8								-41.7 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	57.5
-45			86	14/0.1		100/0.6		Sat.		-44.2 GRAY, GREEN, DARK GRAY AND BLACK, SAND AND SILTY SAND	60.0
	-47.0	62.8									
-50			15	10	8	18		Sat.			
	-52.0	67.8									
-55			9	8	13	21		Sat.			
	-57.0	72.8									
-60			7	8	11	19		Sat.		-60.2	76.0

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
-60						Match Line				GRAY, GREEN, DARK GRAY AND BLACK, SAND AND SILTY SAND *(continued)*
	-62.0	77.8	15	12	8	20		Sat.		
-65										
	-67.0	82.8	5	6	12	18		Sat.		
-70										
	-72.0	87.8	5	7	11	18		Sat.		
-75										-75.2 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE
	-77.0	92.8	21	25	75/0.2	100/0.7		Sat.		
-80										-80.2 GRAY AND BLACK, SILTY SAND
	-82.0	97.8	21	7	20	27		Sat.		
-85										-85.2 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE
	-87.0	102.8	100/0.3			100/0.3		Sat.		
-90										-90.2 GRAY AND BLACK, SANDY SILT
	-92.0	107.8	30	8	10	18		W		-93.5 Boring Terminated at Elevation -93.5 ft IN VERY 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. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 43+45	**OFFSET** 44 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 15.4 ft	**TOTAL DEPTH** 104.3 ft	**NORTHING** 574,180	**EASTING** 2,507,828	**24 HR.** 8.4
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/17/18	**COMP. DATE** 11/26/18	**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)
20											
15	14.5	0.9	8	8	8	16		M		15.4 GROUND SURFACE	0.0
										14.5 **ROADWAY EMBANKMENT** (PAVEMENT) TAN, SILTY SAND	0.9
10	11.5	3.9	1	2	1	3		M		9.4 BROWN, SANDY CLAY	6.0
5	7.6	7.8	3	1	2	3				4.4 **ALLUVIAL** GRAY, SILTY SAND AND SAND	11.0
0	2.6	12.8	4	2	5	7		Sat.		-0.6	16.0
-5	-2.4	17.8	5	6	8	14		Sat.		-5.6 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	21.0
-10	-7.4	22.8	3	4	7	11		Sat.		-10.6 GRAY AND GREEN, SANDY SILT	26.0
-15	-12.4	27.8	2	3	3	6		W			
-20	-17.4	32.8	3	3	5	8		W			
-25	-22.4	37.8	2	2	2	4	SS-55	32%			
-30	-27.4	42.8	2	4	5	9		W			
-35	-32.4	47.8	3	2	3	5		W			
-40	-37.4	52.8	7	4	6	10		W			
-45	-42.4	57.8	6	33	17	50		Sat.		-41.4 **COASTAL PLAIN** GRAY SAND WITH MODERATELY INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION)	56.8
-50	-47.4	62.8	10	9	11	20		Sat.		-45.6 GRAY SAND	61.0
-55	-52.4	67.8	7	8	11	19		Sat.			
-60	-57.4	72.8	8	7	8	15		Sat.			

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 139 ON SR 1470 (-L1-) OVER NEUSE RIVER OVERFLOW				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 43+45	**OFFSET** 44 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 15.4 ft	**TOTAL DEPTH** 104.3 ft	**NORTHING** 574,180	**EASTING** 2,507,828	**24 HR.** 8.4
DRILL RIG/HAMMER EFF./DATE MID5464 CME-45C 87% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/17/18	**COMP. DATE** 11/26/18	**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
-60						Match Line				
-65	-62.4	77.8	36	22	58	80		Sat.		GRAY SAND *(continued)* 77.5
-70	-67.4	82.8	4	6	29	35		Sat.		-62.1 **COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY AND BLACK, MODERATELY WEATHERED, SANDY LIMESTONE 81.0
-75	-72.4	87.8	5	7	11	18		Sat.		-65.6 DARK GRAY AND BLACK, SILTY SAND
-80	-77.4	92.8	3	11	12	23		Sat.		
-85	-82.4	97.8	5	29	8	37		Sat.		
	-87.4	102.8	8	9	17	26		Sat.		-88.9 104.3 Boring Terminated at Elevation -88.9 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)

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. 139 on SR 1470 (-L1-) over Neuse River Overflow

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-46	39+14	CL	-L1-	27.8-29.3	A-4	(1)	99	91	86	56	51	13	35	22	30	26	20	6	30.4
SS-47	39+14	CL	-L1-	87.8-89.3	A-2-4	(0)	95	90	81	24	22	15	62	12	11	NP	NP	NP	34.5
SS-55	43+45	44 RT	-L1-	37.8-39.3	A-4	(0)	99	94	89	44	40	10	50	19	21	22	21	1	31.7
SS-56	42+45	49 RT	-L1-	27.8-29.3	A-4	(3)	100	95	90	64	59	10	30	28	32	28	21	7	32.3
SS-57	42+45	49 RT	-L1-	32.8-34.3	A-4	(0)	99	91	83	46	42	16	42	24	18	22	21	1	32.0
SS-58	41+45	54 RT	-L1-	69.2-70.7	A-2-4	(0)	100	96	83	18	16	17	66	8	9	NP	NP	NP	33.3
SS-59	41+45	54 RT	-L1-	94.2-95.7	A-2-6	(0)	100	98	83	31	28	17	55	9	19	36	22	14	30.9
SS-60	40+37	59 RT	-L1-	32.8-34.3	A-4	(0)	100	92	84	50	46	16	38	23	23	23	20	3	30.3
SS-61	40+37	59 RT	-L1-	92.8-94.3	A-2-4	(0)	97	92	83	29	26	15	58	17	10	NP	NP	NP	33.0

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

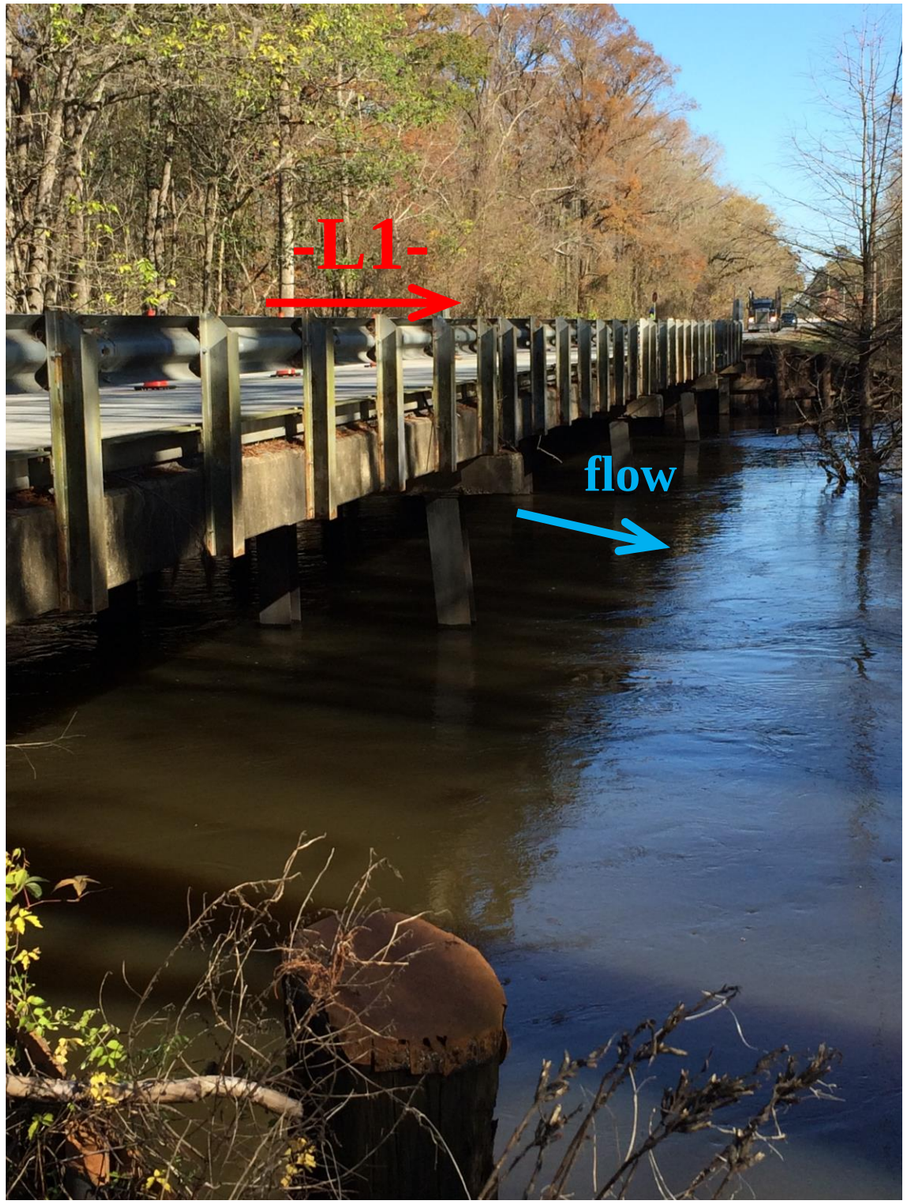
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils — AASHTO T265: Laboratory Determination of Moisture Content of Soils

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

SITE PHOTOGRAPH

Bridge No. 139 on SR 1470 (-L1-) over Neuse River Overflow



Looking North towards End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4484	1	36

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 *RETAINING WALLS 1-2*

CONTENTS

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.

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PERSONNEL

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

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *J. DAILY*

DATE *JUNE 2019*

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

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
919459487BA247...
SIGNATURE

1/31/2020
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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-25
- [ ] _____

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: BL-3 N: 573123 E: 2506704

ELEVATION: 28.95 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-4484	3

SITE PLAN

0 60 120
FEET

–RETWLI– DETAIL

DB 1457 PG 210
MB 1PG 2

20

–LI– PRC Sta. 20+27.10

–LI– PCC Sta. 17+72.05

WOODS

TIE TO EXIST. GUARDRAIL
REMOVE APPROX. 50 LF OF EXIST. GUARDRAIL FROM –L1– STA. 17+00.00 TO 17+52 +/–

END PROP. RET. WALL #1
–L1– STA. 19+50.00

BEGIN PROP. RET. WALL #1
–L1– STA. 22+00.00

WOODS

END CONSTRUCTION
–RETWLI– PT Sta.12+51.74 =
–LI– Sta.19+50.00, 43.00' LT

BEGIN CONSTRUCTION
–RETWLI– PC Sta.10+00.00 =
–LI– Sta.22+00.00, 43.00' LT

–RETWLI– PRC Sta.11+75.06 =
–LI– Sta.20+27.10, 43.00' LT

20 (–LI–)

10 (–RETWLI–)

EXISTING R/W VARIES

9' GR

RETWLI-B1

RETWLI-B2

RETWLI-B3

RETWLI-B4

RETWLI-B5

EB1-A

–RETWLI–

GREU TL-3

GREU TL-3

WOODS

EXISTING R/W MON

–L–

TO BIDDLE RD.

SR 1470 MAPLE CYPRESS RD

TO RIVER RD.

F

C

SF

PROPERTY LINE RUNS ALONG HIGH WATER LINE OF NEUSE RIVER

NEUSE RIVER

12" CMP

EXISTING R/W MON

EXISTING R/W VARIES

NCDOT GPS
(B4484-1)

NOTE: 2 SEPARATE MONITORING INSTRUMENTS
INSTRUMENTS MEASURE FLOW RATE AND WATER LEVEL
AND THE OTHER IS UNKNOWN, POSSIBLY

BRIDGE #138

NOTE: BRIDGE HAS CONC DECK, RAILS AN
STEEL I–BEAM STRINGERS SUPPORTED ON

PROPOSED GRADING
(SEE EC PLANS)

–BL– 2

NAD 83

SANDRA N. WHITE
DB 2834 PG 537
MB 2 PG 103

NOTE: CONCRETE DITCH BEHIND WALL NOT SHOWN IN PLAN VIEW FOR CLARITY.

PROJECT REFERENCE NO.	SHEET NO.
B-4484	4

SITE PLAN

0 60 120

FEET

30

NAD 83

-RETWL2- DETAIL

-RETWL2- CURVE DATA

PI Sta 10+90.09	PI Sta 10+17.07
Δ = 4° 22' 50.1" (RT)	Δ = 1° 20' 12.8" (RT)
D = 3° 54' 58.8"	D = 3° 54' 58.8"
L = 111.85'	L = 34.14'
T = 55.95'	T = 17.07'
R = 1,463.00'	R = 1,463.00'

FALLOW

END CONSTRUCTION
-RETWL2- Sta.15+21.60 =
-LI- Sta.28+10.00, 49.00' LT

TURNING POINT
-RETWL2- Sta.14+81.60
-LI- Sta.28+50.00, 49.00' LT

TURNING POINT
-RETWL2- Sta.12+31.31
-LI- Sta.31+00.00, 37.00' LT

-RETWL2- PT Sta.11+45.99
-LI- Sta.31+85.32, 37.00' LT

BEGIN CONSTRUCTION
-RETWL2- PC Sta.10+00.00 =
-LI- Sta.33+35.00, 37.00' LT

-RETWL2- PCC Sta.10+34.14
-LI- Sta.33+00.00, 37.00' LT

15 (-RETWL2-)

30 (-LI-)

10 (-RETWL2-)

RETWL2-BI RETWL2-B2 RETWL2-B4 RETWL2-B6 RETWL2-B8 RETWL2-BI0 RETWL2-BI2

-RETWL2-

-LI-

RETWL2-BI3

N 52°21'16" W 260.98'

SHOP CURVED G/R

AT-1

SOIL

F F

C

EXISTING R/W

GREU 350 TL-3

TO BIDDLE RD.

TO RIVER RD.

SR 1470 MAPLE CYPRESS RD 22' BST

BRIDGE NO. 138

-BL- 3

F F

N 35°05'59.80" W 72.50'

GATE

SOIL

N 41°47'38" W 125.55'

WOODS

FALLOW

HEATH FAMILY FARMS, LLC
DB 1800 PG 832
DB 1016 PG 952

SF

NEUSE RIVER

NOTE: CONCRETE DITCH BEHIND WALL NOT SHOWN IN PLAN VIEW FOR CLARITY. SEE DETAIL ON SHEET 2B-1.

WOODS

COASTAL LUMBER COMPANY

5/14/99

RETAINING WALL 1

PROJECT REFERENCE NO.	SHEET NO.
B-4484	5

PROFILE PROJECTED ALONG –RETWL1–

0 50 100
FEET
VE = 5

BEGIN CONSTRUCTION
–RETWL1– STA.10+00.00
TOP OF WALL ELEV.= 22.92'
BOTTOM OF WALL
ELEV. = 10.08'

END CONSTRUCTION
–RETWL1– STA.12+51.74
TOP OF WALL ELEV.= 16.10'
BOTTOM OF WALL
ELEV. = 12.98'

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

EB1–A 10+01 18' LT –RETWL1– SS-30 SS-31
RETWL1–B5 10+51 8' LT –RETWL1– SS-32 SS-33
RETWL1–B4 11+01 5' LT –RETWL1– SS-34 SS-35
RETWL1–B3 11+52 CL –RETWL1– SS-36 SS-37
RETWL1–B2 12+12 3' LT –RETWL1– SS-38 SS-39
RETWL1–B1 12+57 22' RT –RETWL1–

PROPOSED TOP OF WALL
BOTTOM OF WALL
EXISTING GROUND
PROP. GRADE ELEVATION

MATCH LINE

VERY SOFT TO MED. STIFF, GRAY AND BROWN, ORANGE, SANDY CLAY, HIGHLY PLASTIC, MOIST TO WET (ALLUVIAL)
VERY LOOSE TO MED. DENSE, GRAY, BROWN AND TAN, SILTY SAND AND SILT, SILTY CLAY AND SILTY SAND, CLAYEY SAND
LOOSE TO MED. DENSE, GRAY AND LIGHT GRAY, SILTY SAND AND CLAYEY SAND, AND SAT. CALCAREOUS, SILTY SAND AND CLAYEY SAND, (DUPLIN FORMATION)

ST-1 ST-2 ST-3

GROUNDLINE PROFILE IS CONSTRUCTED ALONG FACE OF THE WALL. GROUNDLINE PROFILE IS FROM WALL ENVELOPE FILE 'B4484_SMU_RW_1.dgn' DATED 5/24/19 RECIEVED FROM NCDOT GEU. OFFSETS ARE FROM THE FACE OF THE WALL.

40 30 20 10 0 –10 –20 –30 –40 –50
10+00 11+00 12+00 13+00
–RETWL1–

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-4484	6

PROFILE PROJECTED ALONG –RETWL2–

0 50 100
FEET
VE = 5

(A) VERY SOFT TO SOFT, BROWN, TAN AND ORANGE, SANDY CLAY AND SANDY SILT WITH TRACE ORGANIC MATTER, MOIST TO WET (ALLUVIAL)
(B) VERY LOOSE, BROWN, SILTY SAND WITH LITTLE ORGANIC MATTER, SATURATED (ALLUVIAL)
(C) MED. DENSE TO DENSE, GRAY,, SAND WITH FRIABLE TO INDURATED SEAMS (0.1'–0.2'),, SATURATED (CASTLE HAYNE FORMATION)
(D) GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)

BEGIN CONSTRUCTION –RETWL2– STA.10+00.00 TOP OF WALL ELEV.= 11.59' BOTTOM OF WALL ELEV.= 10.59'

END CONSTRUCTION –RETWL2– STA.15+21.60 TOP OF WALL ELEV.= 21.63' BOTTOM OF WALL ELEV.= 7.89'

PROP. TOP OF WALL

PROP. GRADE ELEVATION

BOTTOM OF WALL

EXISTING GROUND

RETWL2–B12 9+36 4' LT –RETWL2– SS-1 SS-2

RETWL2–B10 10+35 14' LT –RETWL2– SS-3 SS-4

RETWL2–B8 11+32 14' LT –RETWL2– SS-5 SS-6

RETWL2–B6 12+31 6' LT –RETWL2– SS-8 SS-9

RETWL2–B4 13+31 10' LT –RETWL2– SS-10 SS-11

RETWL2–B2 14+31 14' LT –RETWL2– SS-12 SS-13

RETWL2–B1 15+22 18' LT –RETWL2– SS-16 SS-17

VERY LOOSE TO LOOSE, TAN, BROWN, ORANGE, LOOSE TO MED. DENSE, LIGHT MED. STIFF TO STIFF, LOOSE TO MED. DENSE, LIGHT GRAY AND LIGHT GRAY, GRAY, GRAY, CALCAREOUS, TAN, CALCAREOUS, TAN AND GREEN, SILTY SAND, CLAYEY SAND AND GRAY AND GREEN, SILTY SAND, CLAYEY SAND, MOIST TO SAT. (ALLUVIAL)
SAND AND SILTY SAND, SATURATED
SANDY CLAYEY SAND, SATURATED
SILT, WET
MED. STIFF, GRAY, SANDY SILT, WET
GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FM.)
MED. DENSE, GRAY, SILTY SAND, SATURATED
MED. DENSE, GRAY, SAND, SATURATED
(DUPLIN FM.)

BT

GROUNDLINE PROFILE IS CONSTRUCTED ALONG FACE OF THE WALL. GROUNDLINE PROFILE IS FROM WALL ENVELOPE FILE 'B4484_SMU_RW_2.dgn' DATED 5/24/19 RECIEVED FROM NCDOT GEU. OFFSETS ARE FROM THE FACE OF THE WALL.

RETAINING WALL 2

–RETWL2–

10+00 11+00 12+00 13+00 14+00 15+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. RETWL1-B1	**STATION** 12+57	**OFFSET** 22 ft RT	**ALIGNMENT** -RETWL1-	**0 HR.** N/A
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 29.4 ft	**NORTHING** 572,741	**EASTING** 2,505,928	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/09/18	**COMP. DATE** 11/09/18	**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											
	7.8	0.0	WOH	WOH	WOH	WOH				7.8 GROUND SURFACE	0.0
5										5.8 **ALLUVIAL** BROWN, SANDY CLAY	2.0
	3.6	4.2	WOH	2	1	3		Sat.		BROWN AND ORANGE, SILTY SAND	
0	-0.1	7.9	WOH	WOH	4	4		W		2.8 GRAY, HIGHLY PLASTIC, SILTY CLAY	5.0
-5	-5.1	12.9	WOH	WOH	WOH	WOH		W			
-10	-10.1	17.9	3	1	2	3		W		-13.2 **COASTAL PLAIN** GRAY, CLAYEY SAND (DUPLIN FORMATION)	21.0
-15	-15.1	22.9	4	5	4	9		Sat.			
-20	-20.1	27.9	3	7	3	10		Sat.		-21.6 Boring Terminated at Elevation -21.6 ft IN LOOSE CLAYEY SAND (COASTAL PLAIN)	29.4

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. RETWL1-B2	**STATION** 12+12	**OFFSET** 3 ft LT	**ALIGNMENT** -RETWL1-	**0 HR.** N/A
COLLAR ELEV. 7.9 ft	**TOTAL DEPTH** 49.4 ft	**NORTHING** 572,752	**EASTING** 2,505,978	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/09/18	**COMP. DATE** 11/09/18	**SURFACE WATER DEPTH** 0.3ft	

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
10										
	7.9	0.0	WOH	WOH	WOH	WOH				7.9 WATER SURFACE (11/09/18) 0.0
5								Sat.		**ALLUVIAL** ORANGE AND GRAY, SANDY CLAY AND HIGHLY PLASTIC, SILTY CLAY
	3.7	4.2	1	1	2	3	SS-38	27%		1.9 6.0
0	0.0	7.9	WOH	3	3	6	SS-39	37%		
-5	-5.0	12.9	WOH	2	3	5		W		-8.1 16.0 TAN SAND
-10	-10.0	17.9	1	3	6	9		Sat.		
-15	-15.0	22.9	3	3	5	8		Sat.		-13.1 21.0 **COASTAL PLAIN** GRAY, CLAYEY SAND (DUPLIN FORMATION)
-20	-20.0	27.9	3	3	4	7		Sat.		
-25	-25.0	32.9	5	4	4	8		Sat.		-23.1 31.0 GRAY, SILTY SAND
-30	-30.0	37.9	5	7	6	13		Sat.		-33.1 41.0
-35	-35.0	42.9	16	66	34/0.1	IMPLIED 100 BPF / IMPLIED 30 BPF / 100/0.6		Sat.		-34.1 **COASTAL PLAIN SEDIMENTARY ROCK** 42.0 GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION) -35.5 43.4 GRAY SAND
-40	-40.0	47.9	17	16	20	36		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE -41.5 49.4 Boring Terminated at Elevation -41.5 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 MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. RETWL1-B3	**STATION** 11+52	**OFFSET** CL	**ALIGNMENT** -RETWL1-	**0 HR.** N/A
COLLAR ELEV. 8.4 ft	**TOTAL DEPTH** 49.6 ft	**NORTHING** 572,793	**EASTING** 2,506,021	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/08/18	**COMP. DATE** 11/08/18	**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											
	8.4	0.0								8.4 GROUND SURFACE	0.0
			WOH	1	1	2				**ALLUVIAL**	
										6.4 TAN SAND	2.0
5										ORANGE AND GRAY, SANDY CLAY	
	4.2	4.2	WOH	WOH	WOH	WOH	SS-36	27%			
0	0.3	8.1	WOH	WOH	WOH	WOH		W		-3.1 GRAY, SANDY SILT	11.5
-5	-4.7	13.1	WOH	WOH	WOH	WOH	SS-37	29%			
										-8.1 GRAY SAND	16.5
-10	-9.7	18.1	5	12	12	24		Sat.			
-15	-14.7	23.1	5	8	8	16		Sat.		-15.2 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	23.6
-20	-19.7	28.1	3	7	6	13		Sat.		-18.1 GRAY, CLAYEY SAND	26.5
-25	-24.7	33.1	4	5	11	16		Sat.		-23.1 GRAY, SILTY SAND	31.5
-30	-29.7	38.1	3	5	5	10		Sat.			
-35	-34.7	43.1	76	24/0.1		100/0.6		Sat.		-33.7 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	42.1
-40	-39.7	48.1	7	7	11	18		Sat.		-36.6 GRAY SAND	45.0
										-41.2 Boring Terminated at Elevation -41.2 ft IN MED. DENSE SAND	49.6

1) ST-3 taken at 11+57, CL, -RETWL1-

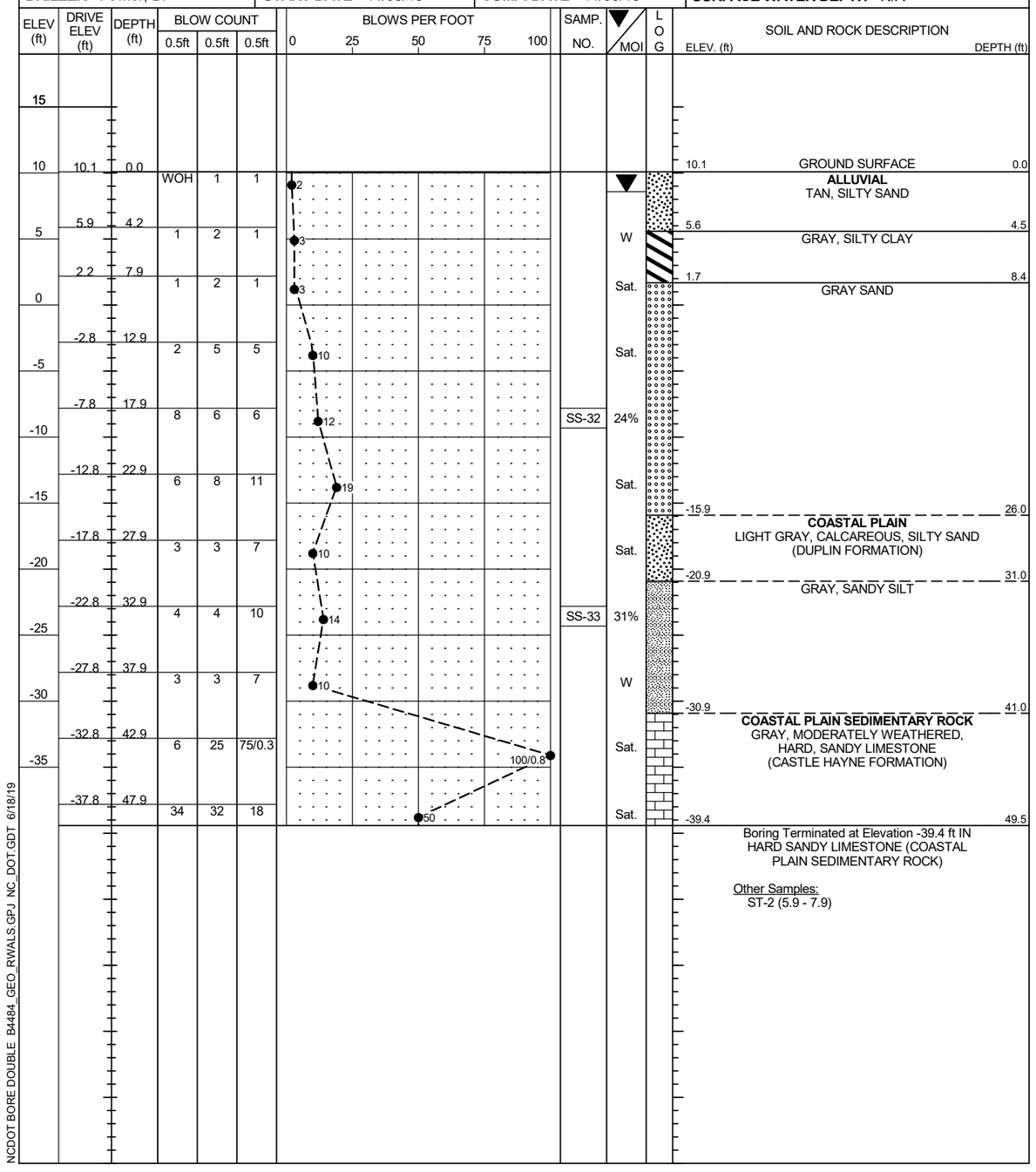
Other Samples:
ST-3 (7.1 - 9.1)

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. RETWL1-B4	**STATION** 11+01	**OFFSET** 5 ft LT	**ALIGNMENT** -RETWL1-	**0 HR.** N/A
COLLAR ELEV. 9.1 ft	**TOTAL DEPTH** 49.4 ft	**NORTHING** 572,822	**EASTING** 2,506,063	**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** 11/08/18	**COMP. DATE** 11/08/18	**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
10										
	9.1	0.0								9.1 GROUND SURFACE 0.0
			WOH	1	1	2				**ALLUVIAL**
										7.1 ORANGE, SANDY CLAY 2.0
5	5.0	4.1								ORANGE AND GRAY, SANDY SILT
			WOH	2	2	4	SS-34	23%		
0	1.2	7.9	WOH	WOH	WOH	WOH		W		-1.9 ORANGE AND GRAY, SILTY SAND 11.0
-5	-3.8	12.9	1	1	2	3		Sat.		
										-6.9 GRAY, SILTY CLAY 16.0
-10	-8.8	17.9	WOH	8	11	19		W		-9.3 GRAY AND BROWN, SAND 18.4
-15	-13.8	22.9	4	5	10	15		Sat.		-16.9 **COASTAL PLAIN** GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION) 26.0
-20	-18.8	27.9	3	3	3	6		Sat.		-21.9 GRAY, SANDY SILT 31.0
-25	-23.8	32.9	4	6	5	11	SS-35	31%		
-30	-28.8	37.9	6	6	17	23		W		-31.9 **COASTAL PLAIN** GRAY SAND WITH MOD. INDURATED TO INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION) 41.0
-35	-33.8	42.9	5	63	37/0.2	100/0.7		Sat.		-34.3 43.4 -35.4 44.5
-40	-38.8	47.9	65	23	15	38		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE -40.3 GRAY SAND WITH MOD. INDURATED TO INDURATED SEAMS (0.1'-0.2') 49.4
										Boring Terminated at Elevation -40.3 ft IN DENSE SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. RETWL1-B5	**STATION** 10+51	**OFFSET** 8 ft LT	**ALIGNMENT** -RETWL1-	**0 HR.** N/A
COLLAR ELEV. 10.1 ft	**TOTAL DEPTH** 49.5 ft	**NORTHING** 572,852	**EASTING** 2,506,104	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 11/08/18	**COMP. DATE** 11/08/18	**SURFACE WATER DEPTH** N/A	



NCDOT BORE DOUBLE B4484_GEO_RWALS.GPJ NC_DOT.GDT 6/18/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 10+01	**OFFSET** 18 ft LT	**ALIGNMENT** -RETWL1-	**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 GROUND SURFACE	0.0
										ALLUVIAL TAN SAND	
5	6.2	3.9	1	2	1	3		W		5.2	4.9
										ORANGE AND GRAY, SANDY CLAY	
0	2.3	7.8	WOH	2	4	6	SS-30	28%		-0.9	11.0
	-2.7	12.8								GRAY SAND	
-5			3	6	7	13		Sat.			
	-7.7	17.8									
-10			4	5	6	11		Sat.			
	-12.7	22.8									
-15			6	8	13	21		Sat.			
	-17.7	27.8								-15.9	26.0
-20			6	6	6	12		Sat.		**COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	
	-22.7	32.8								-20.9	31.0
-25			3	3	4	7		Sat.		LIGHT GRAY, CALCAREOUS, CLAYEY SAND	
	-27.7	37.8								-25.9	36.0
-30			3	5	5	10		Sat.		GRAY, SILTY SAND	
	-32.7	42.8									
-35			4	4	9	13		Sat.			
	-37.7	47.8								-35.2	45.3
-40			60	21	38	59		Sat.		**COASTAL PLAIN** GRAY SAND WITH MODERATELY INDURATED TO INDURATED SEAMS (0.1'-0.2') (CASTLE HAYNE FORMATION)	
	-42.7	52.8								-40.9	51.0
-45			8	8	9	17		Sat.		GRAY SAND	
	-47.7	57.8									
-50			8	9	10	19		Sat.			
	-52.7	62.8									
-55			8	7	9	16		Sat.			
	-57.7	67.8									
-60			6	8	9	17		Sat.			
	-62.7	72.8								-60.9	71.0
-65			7	8	14	22		Sat.		DARK GRAY, GREEN AND BLACK, SILTY SAND	

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 1				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 10+01	**OFFSET** 18 ft LT	**ALIGNMENT** -RETWL1-	**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%		DARK GRAY, GREEN AND BLACK, SILTY SAND *(continued)*
-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		Sat.		**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 10+06, 18 LT, -RETWL1-
										Other Samples: ST-1 (7.8 - 9.8)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B1	**STATION** 15+22	**OFFSET** 18 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 8.9 ft	**TOTAL DEPTH** 54.5 ft	**NORTHING** 573,215	**EASTING** 2,506,661	**24 HR.** 0.2
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/31/18	**COMP. DATE** 10/31/18	**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											
	8.9	0.0	WOH	1	2	3		W		8.9 GROUND SURFACE	0.0
5										**ALLUVIAL**	
	4.6	4.3	1	3	2	5		Sat.		6.9 TAN, SANDY CLAY	2.0
0	0.9	8.0	2	1	2	3		Sat.		TAN SAND	
	-4.1	13.0	2	4	7	11		Sat.		-2.6 **COASTAL PLAIN**	11.5
-5										LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	
	-9.1	18.0	3	3	3	6		W		-7.6 LIGHT GRAY, CALCAREOUS, SANDY SILT	16.5
-10											
	-14.1	23.0	3	3	4	7		W			
-15											
	-19.1	28.0	3	3	3	6		Sat.		-17.6 GRAY, SILTY SAND	26.5
-20											
	-24.1	33.0	3	3	3	6	SS-16	25%		-22.6 GRAY, SANDY SILT	31.5
-25											
	-29.1	38.0	8	5	5	10		Sat.		-27.6 GRAY, CLAYEY SAND	36.5
-30						IMPLIED 100 BPF				-31.4 **COASTAL PLAIN SEDIMENTARY ROCK**	40.3
	-34.1	43.0	13	22	42	64	SS-17	20%		-33.8 GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	42.7
-35										-37.6 GRAY SAND WITH MODERATELY INDURATED SEAMS (0.1'-0.2') GRAY SAND	46.5
	-39.1	48.0	11	13	12	25		Sat.			
-40											
	-44.1	53.0	8	7	8	15		Sat.		-45.6	54.5
-45										Boring Terminated at Elevation -45.6 ft IN MED. DENSE SAND (COASTAL PLAIN)	

1) Hard drilling from depth 40.3'-42.7'

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B2	**STATION** 14+31	**OFFSET** 14 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 8.2 ft	**TOTAL DEPTH** 54.6 ft	**NORTHING** 573,261	**EASTING** 2,506,738	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/31/18	**COMP. DATE** 10/31/18	**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	
10											
	8.2	0.0	WOH	WOH	WOH	WOH		M		8.2 GROUND SURFACE	0.0
5										**ALLUVIAL**	
	3.8	4.4	1	2	2	4		Sat.		6.2 BROWN, TAN AND ORANGE, SANDY CLAY	2.0
0	0.1	8.1	WOH	WOH	WOH	WOH		Sat.		TAN SAND	
	-4.9	13.1	13	7	8	15	SS-12	27%		-3.3 **COASTAL PLAIN**	11.5
-5										LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	
	-9.9	18.1	3	3	4	7	SS-13	31%		-8.3 LIGHT GRAY, CALCAREOUS, SANDY SILT	16.5
-10											
	-14.9	23.1	3	4	3	7		W			
-15											
	-19.9	28.1	10	5	6	11		Sat.		-18.3 LIGHT GRAY, SILTY SAND	26.5
-20											
	-24.9	33.1	3	3	3	6		Sat.			
-25											
	-29.9	38.1	4	4	4	8		Sat.		-33.3 **COASTAL PLAIN**	41.5
-30										GRAY SAND WITH FRIABLE TO INDURATED SEAMS (0.1') (CASTLE HAYNE FORMATION)	
	-34.9	43.1	6	12	16	28		Sat.		-39.8 **COASTAL PLAIN SEDIMENTARY ROCK**	48.0
-35										-41.3 GRAY, MODERATLEY WEATHERED, HARD, SANDY LIMESTONE GRAY SAND WITH FRIABLE TO INDURATED SEAMS (0.1')	49.5
	-39.9	48.1	40	60/0.2		100/0.7		Sat.			
-40											
	-44.9	53.1	23	24	18	42		Sat.		-46.4	54.6
-45										Boring Terminated at Elevation -46.4 ft IN DENSE SAND (COASTAL PLAIN)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B4	**STATION** 13+31	**OFFSET** 10 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 8.9 ft	**TOTAL DEPTH** 54.3 ft	**NORTHING** 573,309	**EASTING** 2,506,826	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/30/18	**COMP. DATE** 10/30/18	**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											
	8.9	0.0	WOH	1	2	3				8.9 GROUND SURFACE	0.0
5	4.7	4.2	1	2	2	4		Sat.		**ALLUVIAL** 6.9 ORANGE, SANDY CLAY TAN AND BROWN, SAND	2.0
0	1.1	7.8	2	2	1	3		Sat.		-2.1 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	11.0
-5	-3.9	12.8	2	3	4	7		Sat.		-7.1 LIGHT GRAY, CALCAREOUS, SANDY SILT	16.0
-10	-8.9	17.8	3	3	3	6		W			
-15	-13.9	22.8	2	3	2	5		W		-17.1 GRAY, LIGHT GRAY AND GREEN, SILTY SAND	26.0
-20	-18.9	27.8	4	8	6	14		Sat.			
-25	-23.9	32.8	4	4	12	16		Sat.			
-30	-28.9	37.8	5	10	4	14		Sat.			
-35	-33.9	42.8	8	92/0.2		100/0.7		Sat.		-34.4 -35.4 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	43.3 44.3
-40	-38.9	47.8	31	25	27	52	SS-10	20%		-40.6 GRAY, SILTY SAND	49.5
-45	-43.9	52.8	7	7	9	16	SS-11	32%		-45.4 Boring Terminated at Elevation -45.4 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)	54.3

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B6	**STATION** 12+31	**OFFSET** 6 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 8.8 ft	**TOTAL DEPTH** 44.3 ft	**NORTHING** 573,358	**EASTING** 2,506,913	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/30/18	**COMP. DATE** 10/30/18	**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	
10											
	8.8	0.0	WOH	WOH	1	1				8.8 GROUND SURFACE	0.0
5	4.6	4.2	3	3	3	6	SS-8	20%		**ALLUVIAL** 6.8 BROWN AND TAN, SANDY SILT WITH TRACE ORGANIC MATTER BROWN AND TAN, SILTY SAND AND SAND	2.0
0	1.0	7.8	3	2	2	4		Sat.		1.8	7.0
-5	-4.0	12.8	2	2	4	6		Sat.		-2.2 **COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	11.0
-10	-9.0	17.8	2	4	3	7		W		-7.2 LIGHT GRAY, CALCAREOUS, SANDY SILT	16.0
-15	-14.0	22.8	3	3	4	7	SS-9	27%			
-20	-19.0	27.8	5	4	4	8		Sat.		-17.2 GRAY, LIGHT GRAY AND GREEN, SILTY SAND	26.0
-25	-24.0	32.8	3	2	4	6		Sat.			
-30	-29.0	37.8	4	7	7	14		Sat.			
-35	-34.0	42.8	15	9	12	21		Sat.		-33.2 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, MODERATELY WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	42.0
										-35.5 Boring Terminated at Elevation -35.5 ft IN HARD SANDY LIMESTONE (COASTAL PLAIN SEDIMENTARY ROCK)	44.3

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B8	**STATION** 11+32	**OFFSET** 14 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 8.0 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 573,400	**EASTING** 2,507,004	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/30/18	**COMP. DATE** 10/30/18	**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)
										8.0	0.0
	8.0	0.0	WOH	WOH	1	1	SS-5	80%		GROUND SURFACE	
										ALLUVIAL	
5										BROWN, SILTY SAND WITH LITTLE ORGANIC MATTER	
	3.8	4.2	WOH	2	2	4		Sat.		5.5	2.5
										TAN AND ORANGE, SILTY SAND	
0	0.2	7.8	WOH	WOH	WOH	WOH	SS-6	39%		2.0	6.0
										GREEN AND GRAY, CLAYEY SAND	
-5	-4.8	12.8	7	8	5	13		Sat.		-3.0	11.0
										COASTAL PLAIN	
										LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	
-10	-9.8	17.8	5	6	4	10		W		-8.0	16.0
										LIGHT GRAY AND TAN, CALCAREOUS, SANDY SILT	
-15	-14.8	22.8	3	3	4	7		W		-18.0	26.0
										TAN AND GRAY, SILTY SAND	
-20	-19.8	27.8	2	3	3	6		Sat.			
-25	-24.8	32.8	5	8	3	11		Sat.			
-30	-29.8	37.8	4	3	3	6		Sat.		-31.3	39.3
										Boring Terminated at Elevation -31.3 ft IN LOOSE SILTY SAND (COASTAL PLAIN)	

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B10	**STATION** 10+35	**OFFSET** 14 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 9.6 ft	**TOTAL DEPTH** 29.7 ft	**NORTHING** 573,452	**EASTING** 2,507,087	**24 HR.** 2.3
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/29/18	**COMP. DATE** 10/29/18	**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
										9.6 0.0
	9.6	0.0	WOH	WOH	WOH	WOH				GROUND SURFACE
										ALLUVIAL
5										BROWN, SANDY CLAY 7.1 2.5
	5.4	4.2	1	2	1	3		Sat.		ORANGE, SILTY SAND 4.4 5.2
										ORANGE, SANDY CLAY 2.6 7.0
0	1.4	8.2	WOH	2	1	3	SS-3	19%		ORANGE, SILTY SAND
										-2.0 11.5
-5	-3.7	13.2	7	6	5	11		Sat.		**COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
-10	-8.7	18.2	4	8	9	17		Sat.		
										-12.0 21.5
-15	-13.7	23.2	3	2	3	5		W		LIGHT GRAY, CALCAREOUS, SANDY SILT
										-17.0 26.5
-20	-18.7	28.2	5	3	3	6	SS-4	28%		LIGHT GRAY, SILTY SAND
										-20.2 29.7
										Boring Terminated at Elevation -20.2 ft IN LOOSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B12	**STATION** 9+36	**OFFSET** 4 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 12.1 ft	**TOTAL DEPTH** 24.7 ft	**NORTHING** 573,516	**EASTING** 2,507,163	**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** 10/29/18	**COMP. DATE** 10/29/18	**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											
	12.1	0.0	2	4	4	8				12.1 GROUND SURFACE	0.0
10										**ALLUVIAL**	
	7.9	4.2	2	2	2	4		Sat.		10.1 TAN, SILTY SAND	2.0
5										TAN SAND	
	3.9	8.2	2	0	2	2		Sat.			
0										0.6 **COASTAL PLAIN**	11.5
	-1.1	13.2	5	6	7	13	SS-1	28%		LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)	
-5											
	-6.1	18.2	3	4	11	15		Sat.			
-10										-9.4	21.5
	-11.1	23.2	4	3	3	6	SS-2	34%		LIGHT GRAY, CALCAREOUS, SANDY SILT	
										-12.6	24.7
										Boring Terminated at Elevation -12.6 ft IN MED. STIFF SANDY SILT (COASTAL PLAIN)	

WBS 33723.1.2	**TIP** B-4484	**COUNTY** CRAVEN	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION MAPLE CYPRESS RD. BRIDGE REPLACEMENT - RETAINING WALL NO. 2				**GROUND WTR (ft)**
BORING NO. RETWL2-B13	**STATION** 14+41	**OFFSET** 52 ft LT	**ALIGNMENT** -RETWL2-	**0 HR.** N/A
COLLAR ELEV. 11.9 ft	**TOTAL DEPTH** 39.6 ft	**NORTHING** 573,223	**EASTING** 250,676	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 10/31/18	**COMP. DATE** 10/31/18	**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
15										
	11.9	0.0	WOH	WOH	3	3		W		11.9 GROUND SURFACE 0.0
10										**ALLUVIAL**
	7.5	4.4	WOH	WOH	WOH	WOH		Sat.		BROWN AND TAN, SANDY CLAY
5										6.5 5.4
	3.8	8.1	2	1	1	2		Sat.		TAN SAND
0										0.4 11.5
	-1.2	13.1	2	3	5	8		Sat.		**COASTAL PLAIN** LIGHT GRAY, CALCAREOUS, SILTY SAND (DUPLIN FORMATION)
-5										-4.6 16.5
	-6.2	18.1	4	2	3	5		W		LIGHT GRAY, CALCAREOUS, SANDY SILT
-10										
	-11.2	23.1	3	3	4	7	SS-14	30%		-14.6 26.5
-15										LIGHT GRAY, SILTY SAND
	-16.2	28.1	2	3	2	5		Sat.		-19.6 31.5
-20										GRAY, SANDY SILT
	-21.2	33.1	6	7	6	13	SS-15	32%		
-25										
	-26.2	38.1	8	13	6	19		Sat.		-27.7 39.6
										Boring Terminated at Elevation -27.7 ft IN VERY STIFF SANDY SILT (COASTAL PLAIN)

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

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

S&ME Project #: 6235-18-036 — 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: Maple Cypress Rd. Bridge Replacement, Retaining Walls 1-2

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-1	9+36	4 LT	-RETWL2-	13.2-14.7	A-2-4	(0)	91	52	41	24	22	50	19	13	9	NP	NP	NP	28.2
SS-2	9+36	4 LT	-RETWL2-	23.2-24.7	A-4	(0)	100	97	93	47	40	7	54	19	21	25	22	3	34.0
SS-3	10+35	14 LT	-RETWL2-	8.2-9.7	A-2-4	(0)	98	78	61	22	17	37	44	8	9	NP	NP	NP	19.0
SS-4	10+35	14 LT	-RETWL2-	28.2-29.7	A-2-4	(0)	91	84	75	35	31	16	15	44	16	NP	NP	NP	28.3
SS-5	11+32	14 LT	-RETWL2-	0.0-1.5	A-2-4	(0)	100	95	87	35	30	13	57	14	6	28	26	2	80.1
SS-6	11+32	14 LT	-RETWL2-	7.8-9.3	A-2-6	(0)	91	80	66	33	30	27	40	15	18	30	18	12	38.6
SS-8	12+31	6 LT	-RETWL2-	4.2-5.7	A-2-4	(0)	100	86	57	17	13	43	44	5	8	NP	NP	NP	19.6
SS-9	12+31	6 LT	-RETWL2-	22.8-24.3	A-4	(0)	94	83	70	37	34	26	38	18	18	NP	NP	NP	26.8
SS-10	13+31	10 LT	-RETWL2-	47.8-49.3	A-2-4	(0)	86	60	40	17	14	54	29	10	7	NP	NP	NP	19.9
SS-11	13+31	10 LT	-RETWL2-	52.8-54.3	A-2-4	(0)	98	76	49	17	15	50	35	7	8	NP	NP	NP	31.9
SS-12	14+31	14 LT	-RETWL2-	13.1-14.6	A-2-4	(0)	90	65	52	29	27	43	28	15	14	NP	NP	NP	26.9
SS-13	14+31	14 LT	-RETWL2-	18.1-19.6	A-4	(1)	98	84	76	46	42	23	35	20	22	24	16	8	31.0
SS-14	14+41	52 LT	-RETWL2-	23.1-24.6	A-4	(0)	95	80	72	45	41	24	32	21	23	23	20	3	29.5
SS-15	14+41	52 LT	-RETWL2-	33.1-34.6	A-4	(0)	97	94	89	42	37	9	53	20	18	25	22	3	31.9
SS-16	15+22	18 LT	-RETWL2-	33.0-34.5	A-4	(0)	95	79	68	41	39	28	31	20	21	27	25	2	25.2
SS-17	15+22	18 LT	-RETWL2-	43.0-44.5	A-1-b	(0)	63	33	23	12	11	63	20	8	9	NP	NP	NP	20.0
SS-30	10+01	18 LT	-RETWL1-	7.8-9.3	A-6	(11)	10	100	98	70	63	2	35	18	45	37	18	19	27.9
SS-31	10+01	18 LT	-RETWL1-	77.8-79.3	A-2-4	(0)	100	97	85	21	18	15	67	7	11	NP	NP	NP	34.9
SS-32	10+51	8 LT	-RETWL1-	17.9-19.4	A-3	(1)	100	80	33	4	3	67	30	1	2	NP	NP	NP	23.5
SS-33	10+51	8 LT	-RETWL1-	32.9-34.4	A-4	(0)	95	91	86	40	36	10	53	15	22	23	20	3	30.8
SS-34	11+01	5 LT	-RETWL1-	4.1-5.6	A-4	(0)	100	100	97	39	30	3	67	10	20	25	18	7	23.2
SS-35	11+01	5 LT	-RETWL1-	32.9-34.4	A-4	(0)	99	96	92	45	40	7	52	18	23	24	21	3	30.9
SS-36	11+52	CL	-RETWL1-	4.2-5.7	A-6	(12)	100	100	99	73	66	1	33	23	43	37	19	18	27.2
SS-37	11+52	CL	-RETWL1-	13.1-14.6	A-4	(0)	100	100	99	43	34	1	65	13	21	23	21	2	28.5
SS-38	12+12	3 LT	-RETWL1-	4.2-5.7	A-6	(6)	100	99	95	62	54	5	41	20	34	31	18	13	27.0
SS-39	12+12	3 LT	-RETWL1-	7.9-9.4	A-7-6	(31)	100	99	98	91	87	2	11	28	59	56	26	30	37.3
ST-1	10+06	18 LT	-RETWL1-	7.8-9.8	A-7-6	(17)	100	100	97	74	68	3	30	22	45	45	21	24	ND
ST-2	10+51	8 LT	-RETWL1-	5.9-7.9	A-7-6	(13)	100	96	89	67	61	12	27	22	39	42	20	22	ND
ST-3	11+57	CL	-RETWL1-	7.1-9.1	A-6	(4)	100	94	83	49	44	17	39	14	30	32	16	16	ND

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

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

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

S&ME Project #: 6235-18-036 — 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: Maple Cypress Rd. Bridge Replacement, Retaining Walls 1-2

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				

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

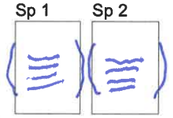
Final Conditions

	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

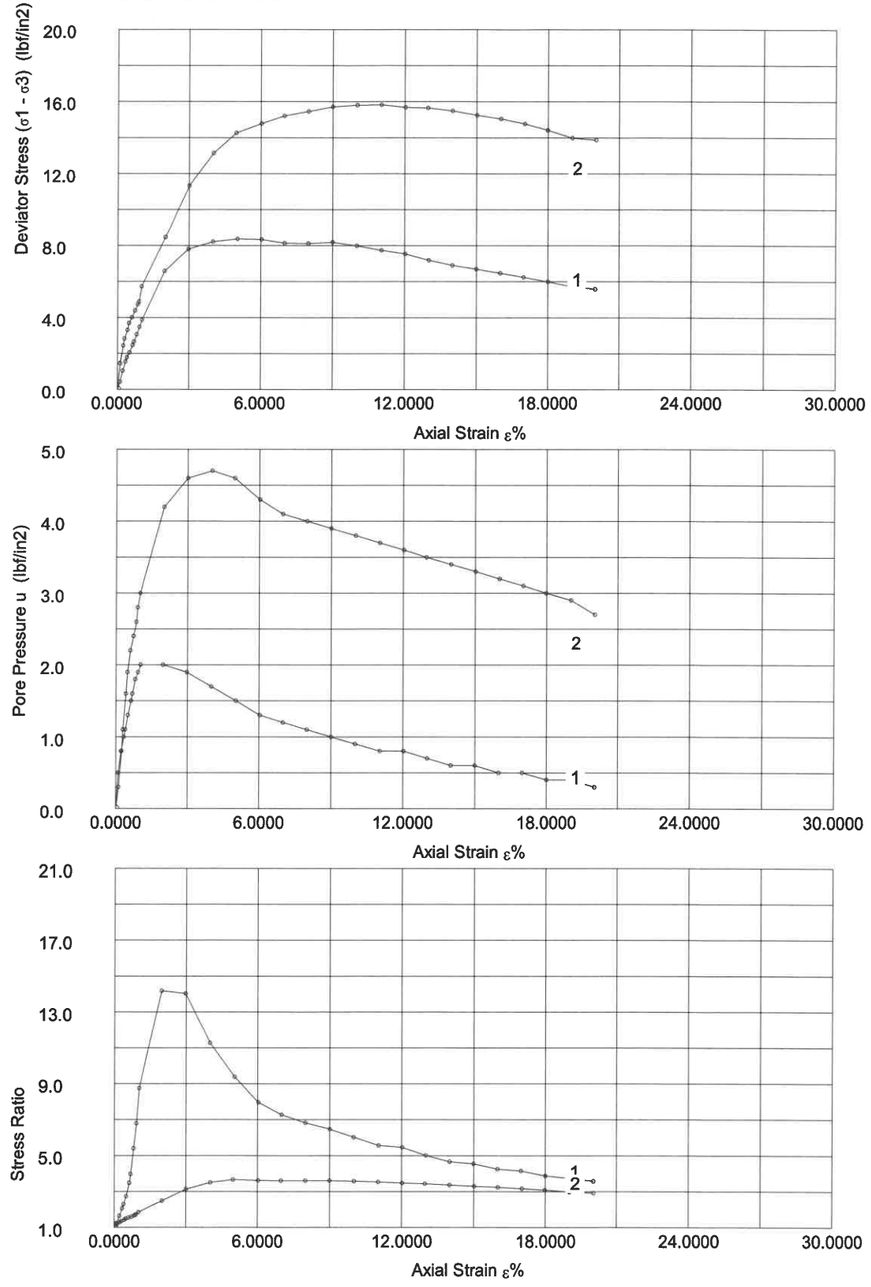


Surface Inclination

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:	ST-1
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

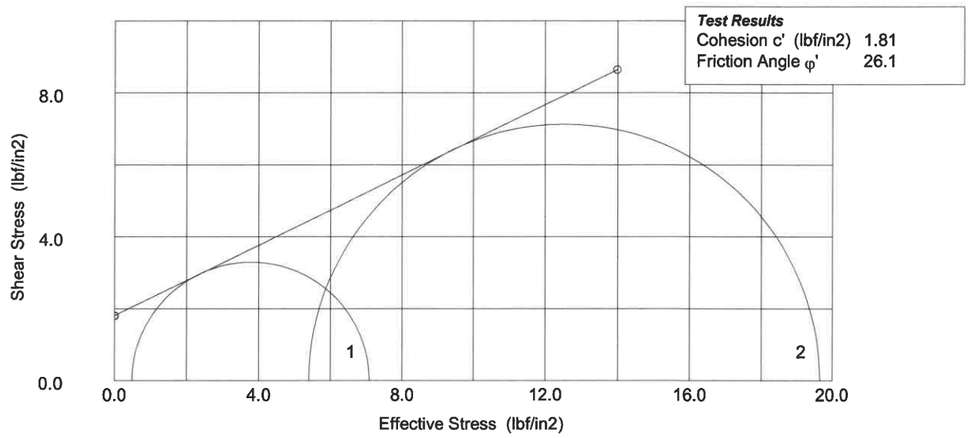
Consolidated Undrained

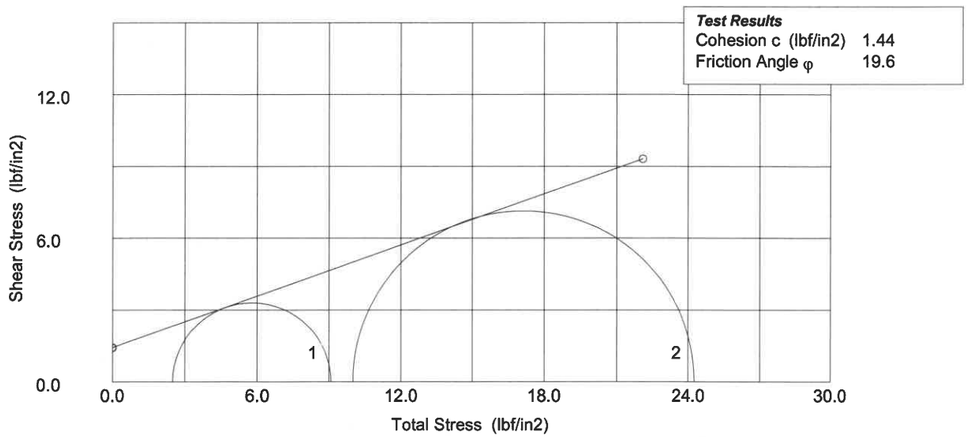


Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	ST-1
Operator:	*Checked:*	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained

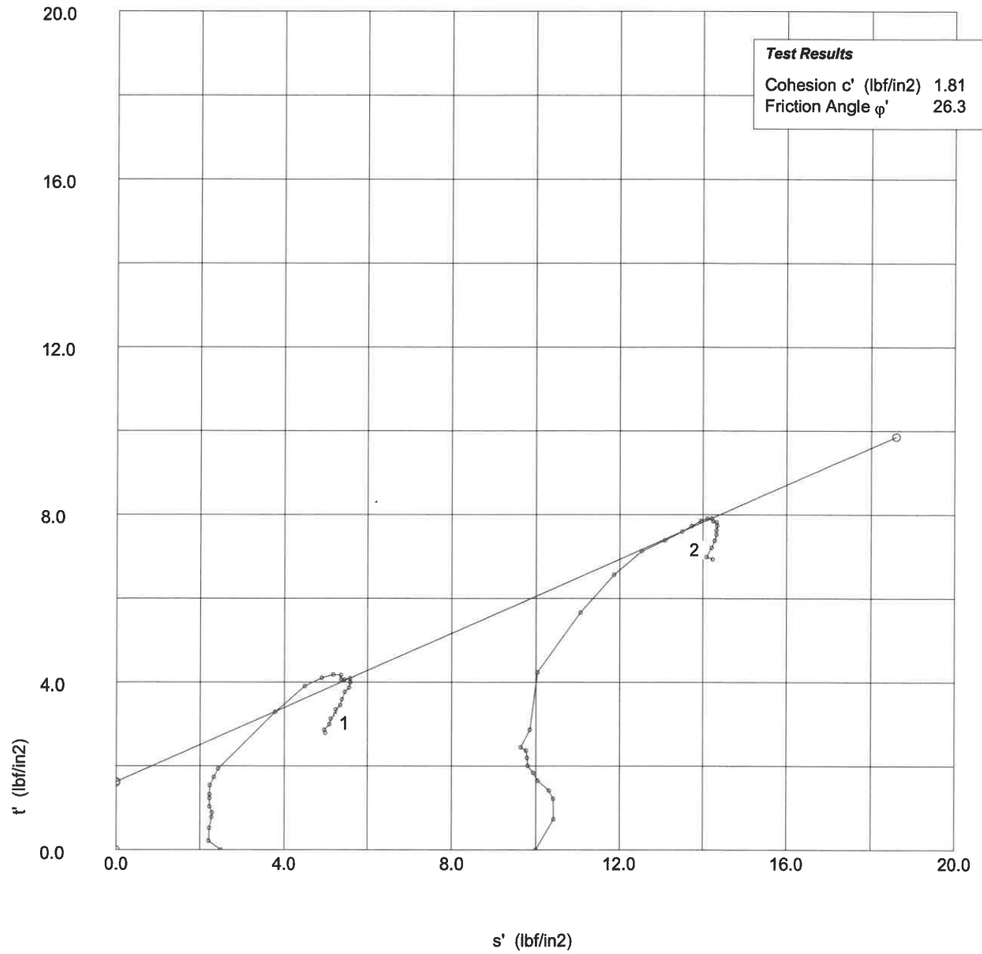




Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	ST-1
Operator:	*Checked:*	*Approved:*	

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:	ST-1
Operator:	*Checked:*	*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	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	ST-1
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	Sample:	ST-1
Jobfile:	E:\18-036.JOB	Borehole:	ST-1
Operator: MLL	*Checked:* MLL	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth	5.9 - 7.9 ft.
Description:	Gray Coarse to Fine Sandy Silty CLAY (A-7-6) (13)

	Specimen 1	Specimen 2
Type	Undisturbed	Undisturbed
Height H_0 (in)	5.769	5.756
Diameter D_0 (in)	2.859	2.857
Weight W_0 (gr)	1165.6	1160.1
Bulk Density ρ (PCF)	119.90	119.77
Particle Density ρ_s	2.677 (measured)	2.677 (measured)

Initial Conditions

	Specimen 1	Specimen 2
Cell Pressure σ_3 (lbf/in2)	1.5	6.0
Pore Pressure u (lbf/in2)	0.0	0.0
Machine Speed d_r(in/min)	0.011	0.013
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	27.5
Dry Density ρ_{d0} (PCF)	93.37	93.95
Voids Ratio e_0	0.79	0.78
Deg of Saturation S_0%	96.39	94.55
Final B Value	0.96	0.96

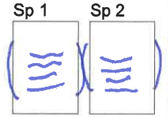
Final Conditions

	Specimen 1	Specimen 2
Moisture Content w_f%	28.2	26.9
Dry Density ρ_d (PCF)	94.41	95.28
Voids Ratio e_f	0.77	0.75
Deg of Saturation S_f%	98.02	95.65
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	6.0	5.0
Corr Dev Stress $(\sigma_1 - \sigma_3)f$ (lbf/in2)	4.0	6.1
Minor Stress σ_{3f} (lbf/in2)	0.7	2.8
Major Stress σ_{1f} (lbf/in2)	4.7	8.9
Stress Ratio $(\sigma_1/\sigma_3)_f$	6.7	3.2

Notes:

Failure Sketch

Sp 1 Sp 2

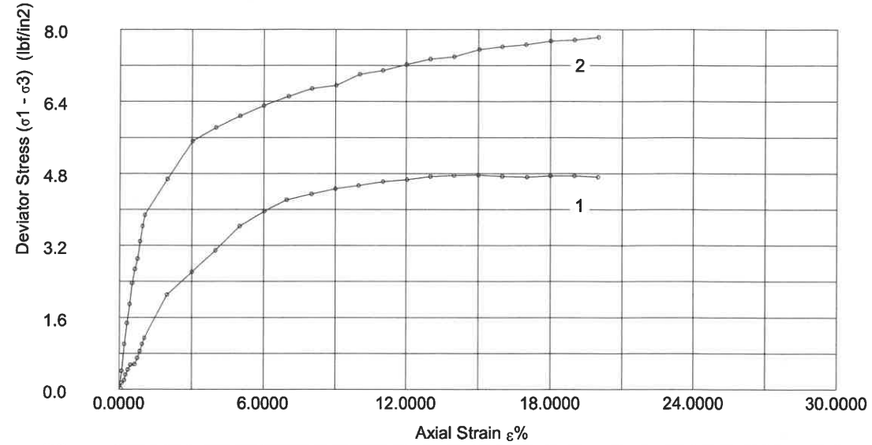


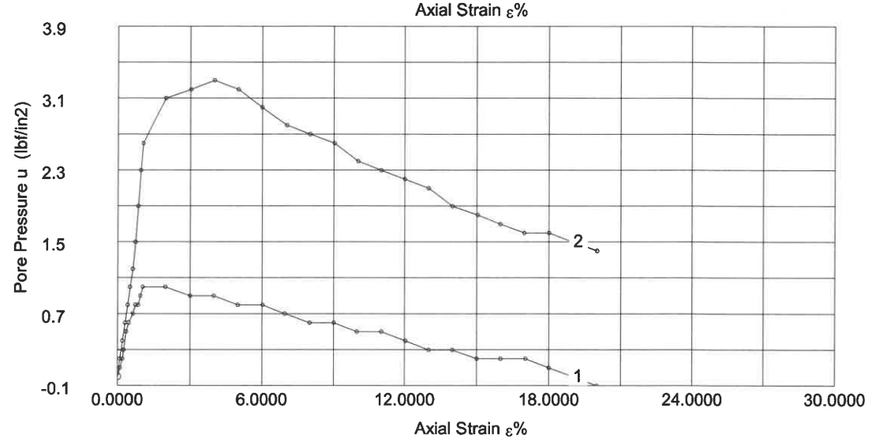
Surface Inclination

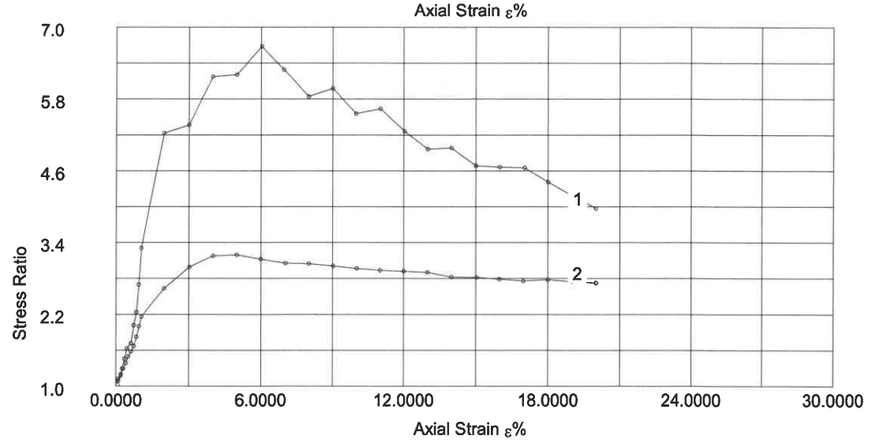
Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: MLL	*Checked:* MLL		*Approved:*

Effective Stress Triaxial Compression

Consolidated Undrained



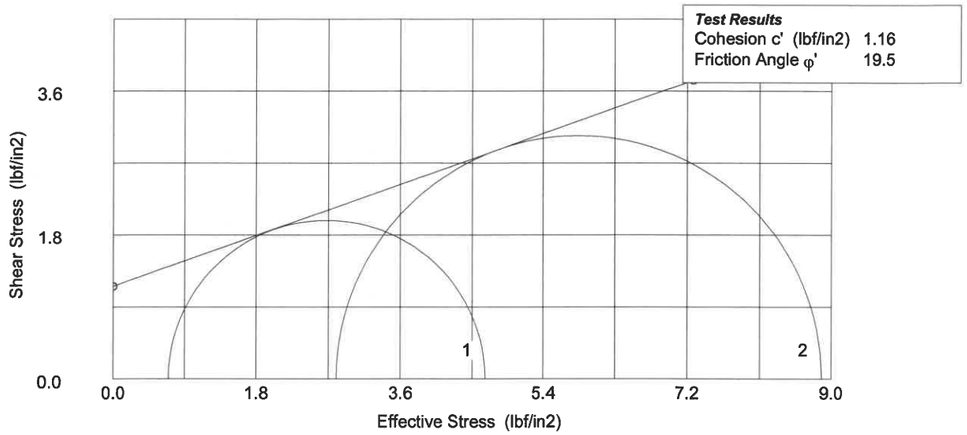


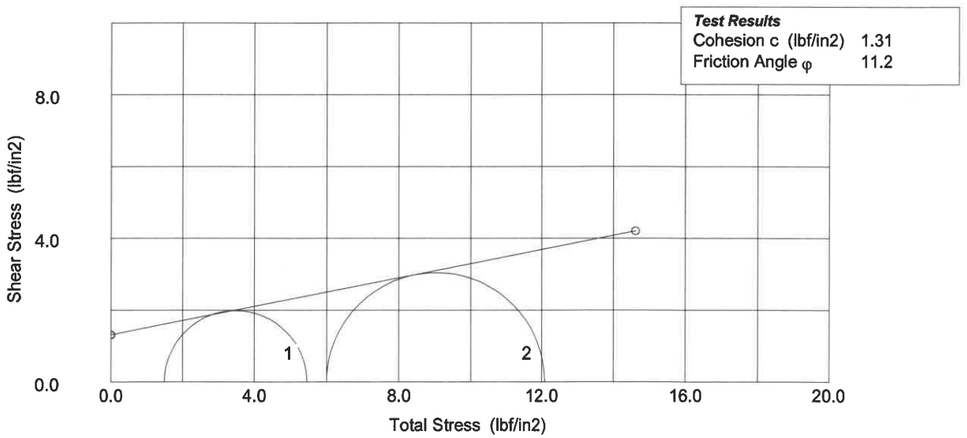


Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: MLL	*Checked:* MLL		*Approved:*

Effective Stress Triaxial Compression

Consolidated Undrained

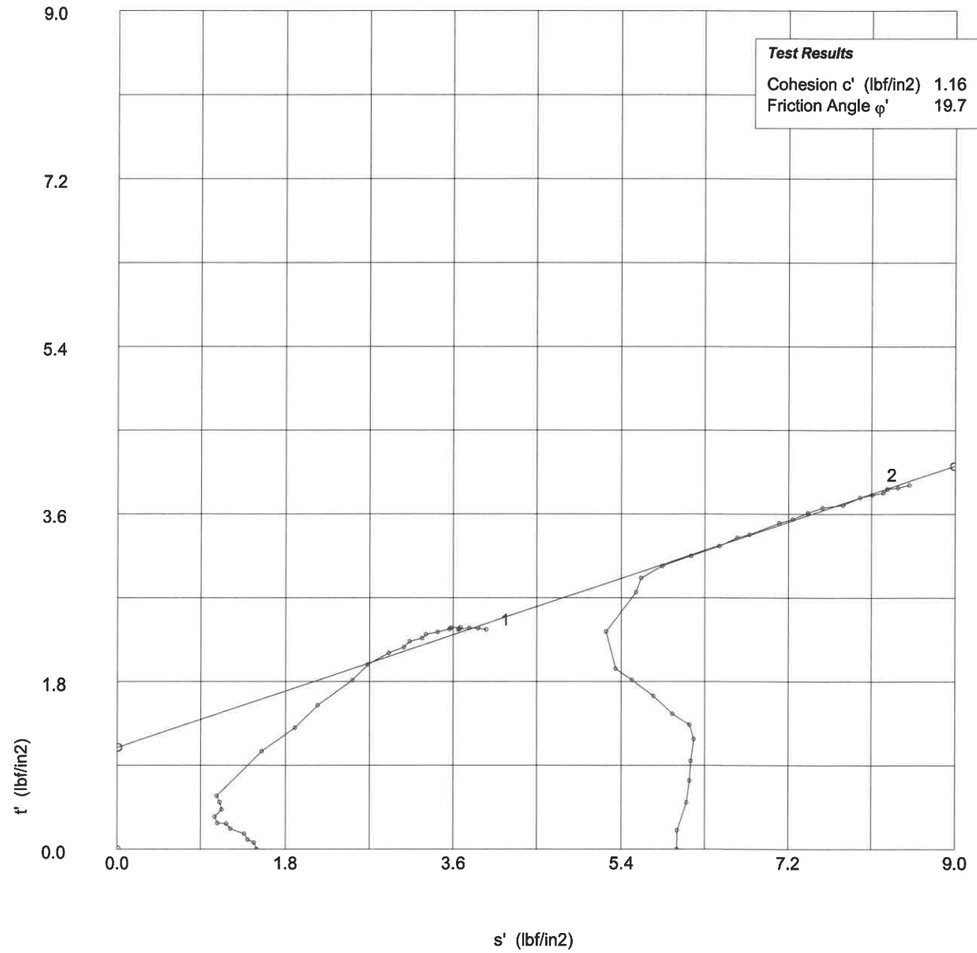




Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: mk	*Checked:* mk	*Approved:*	

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-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: mk	*Checked:* mk	*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	0	0.00	510	0.0	0	0.0	0.0	0.0	1.50	1.50	1.00
2	60	0.10	519	0.9	1	0.1	0.1	0.1	1.40	1.54	1.10
3	120	0.21	523	1.3	2	0.2	0.2	0.2	1.30	1.50	1.16
4	151	0.26	531	2.1	3	0.3	0.3	0.3	1.20	1.53	1.27
5	209	0.36	538	2.8	5	0.5	0.4	0.4	1.00	1.44	1.44
6	270	0.47	545	3.5	6	0.6	0.5	0.5	0.90	1.45	1.61
7	358	0.62	556	4.6	7	0.7	0.7	0.6	0.80	1.36	1.70
8	417	0.73	565	5.5	8	0.8	0.9	0.7	0.70	1.40	2.00
9	477	0.83	575	6.5	8	0.8	1.0	0.9	0.70	1.55	2.22
10	537	0.93	585	7.5	9	0.9	1.2	1.0	0.60	1.61	2.68
11	596	1.04	594	8.4	10	1.0	1.3	1.1	0.50	1.64	3.29
12	1136	1.98	665	15.5	10	1.0	2.4	2.1	0.50	2.60	5.21
13	1731	3.01	705	19.5	9	0.9	3.0	2.6	0.60	3.21	5.35
14	2295	3.99	747	23.7	9	0.9	3.6	3.1	0.60	3.69	6.15
15	2869	4.99	791	28.1	8	0.8	4.2	3.6	0.70	4.33	6.19
16	3465	6.03	822	31.2	8	0.8	4.6	4.0	0.70	4.66	6.66
17	4003	6.96	848	33.8	7	0.7	4.9	4.2	0.80	5.02	6.27
18	4604	8.01	866	35.6	6	0.6	5.1	4.3	0.90	5.24	5.82
19	5176	9.00	884	37.4	6	0.6	5.3	4.5	0.90	5.36	5.96
20	5740	9.99	899	38.9	5	0.5	5.5	4.5	1.00	5.54	5.54
21	6337	11.02	915	40.5	5	0.5	5.7	4.6	1.00	5.62	5.62
22	6917	12.03	929	41.9	4	0.4	5.8	4.7	1.10	5.77	5.24
23	7484	13.02	943	43.3	3	0.3	5.9	4.7	1.20	5.93	4.94
24	8052	14.01	956	44.6	3	0.3	6.0	4.8	1.20	5.96	4.96
25	8623	15.00	966	45.6	2	0.2	6.1	4.8	1.30	6.07	4.67
26	9198	16.00	974	46.4	2	0.2	6.1	4.7	1.30	6.04	4.64
27	9790	17.03	984	47.4	2	0.2	6.2	4.7	1.30	6.02	4.63
28	10358	18.02	997	48.7	1	0.1	6.3	4.7	1.40	6.15	4.39
29	10933	19.02	1006	49.6	0	0.0	6.3	4.7	1.50	6.25	4.16
30	11500	20.01	1013	50.3	-1	-0.1	6.3	4.7	1.60	6.32	3.95

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	Sample:	ST-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: MK	*Checked:* MK		*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	137	0.00	619	0.0	0	0.0	0.0	0.0	6.00	6.00	1.00
2	197	0.10	645	2.6	2	0.2	0.4	0.4	5.80	6.21	1.07
3	256	0.21	683	6.4	4	0.4	1.0	1.0	5.60	6.61	1.18
4	317	0.31	713	9.4	6	0.6	1.5	1.5	5.40	6.88	1.27
5	376	0.42	740	12.1	8	0.8	1.9	1.9	5.20	7.10	1.36
6	435	0.52	780	16.1	10	1.0	2.5	2.4	5.00	7.36	1.47
7	496	0.63	800	18.1	12	1.2	2.8	2.7	4.80	7.47	1.56
8	554	0.73	815	19.6	15	1.5	3.1	2.9	4.50	7.40	1.65
9	613	0.83	840	22.1	19	1.9	3.5	3.3	4.10	7.39	1.80
10	674	0.94	862	24.3	23	2.3	3.8	3.6	3.70	7.33	1.98
11	734	1.04	878	25.9	26	2.6	4.0	3.9	3.40	7.28	2.14
12	1277	1.99	940	32.1	31	3.1	5.0	4.7	2.90	7.58	2.61
13	1874	3.03	1004	38.5	32	3.2	5.9	5.5	2.80	8.32	2.97
14	2438	4.02	1036	41.7	33	3.3	6.3	5.8	2.70	8.52	3.16
15	3003	5.00	1063	44.4	32	3.2	6.6	6.1	2.80	8.88	3.17
16	3573	6.00	1088	46.9	30	3.0	6.9	6.3	3.00	9.30	3.10
17	4166	7.03	1113	49.4	28	2.8	7.2	6.5	3.20	9.71	3.04
18	4731	8.02	1136	51.7	27	2.7	7.5	6.7	3.30	9.99	3.03
19	5311	9.03	1152	53.3	26	2.6	7.6	6.8	3.40	10.16	2.99
20	5881	10.03	1181	56.2	24	2.4	8.0	7.0	3.60	10.61	2.95
21	6446	11.01	1199	58.0	23	2.3	8.1	7.1	3.70	10.79	2.92
22	7017	12.01	1221	60.2	22	2.2	8.3	7.2	3.80	11.02	2.90
23	7592	13.01	1241	62.2	21	2.1	8.5	7.3	3.90	11.24	2.88
24	8159	14.00	1258	63.9	19	1.9	8.7	7.4	4.10	11.49	2.80
25	8750	15.03	1282	66.3	18	1.8	8.9	7.6	4.20	11.75	2.80
26	9297	15.99	1299	68.0	17	1.7	9.0	7.6	4.30	11.92	2.77
27	9866	16.98	1316	69.7	16	1.6	9.1	7.7	4.40	12.06	2.74
28	10458	18.02	1336	71.7	16	1.6	9.3	7.7	4.40	12.14	2.76
29	11031	19.02	1350	73.1	15	1.5	9.3	7.8	4.50	12.27	2.73
30	11608	20.02	1367	74.8	14	1.4	9.4	7.8	4.60	12.42	2.70

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	Sample:	ST-2
Jobfile:	E:\18-036.JOB	Borehole:	ST-2
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	7.1 - 9.1 ft.
Description:	Gray Coarse to Fine Sandy Silty CLAY (A-6) (4)
Type	Undisturbed
Height H_0 (in)	0.999
Diameter D_0 (in)	2.501
Weight W_0 (gr)	158.56
Bulk Density ρ (PCF)	123.08
Particle Density ρ_s	2.688 (measured)

Initial Conditions

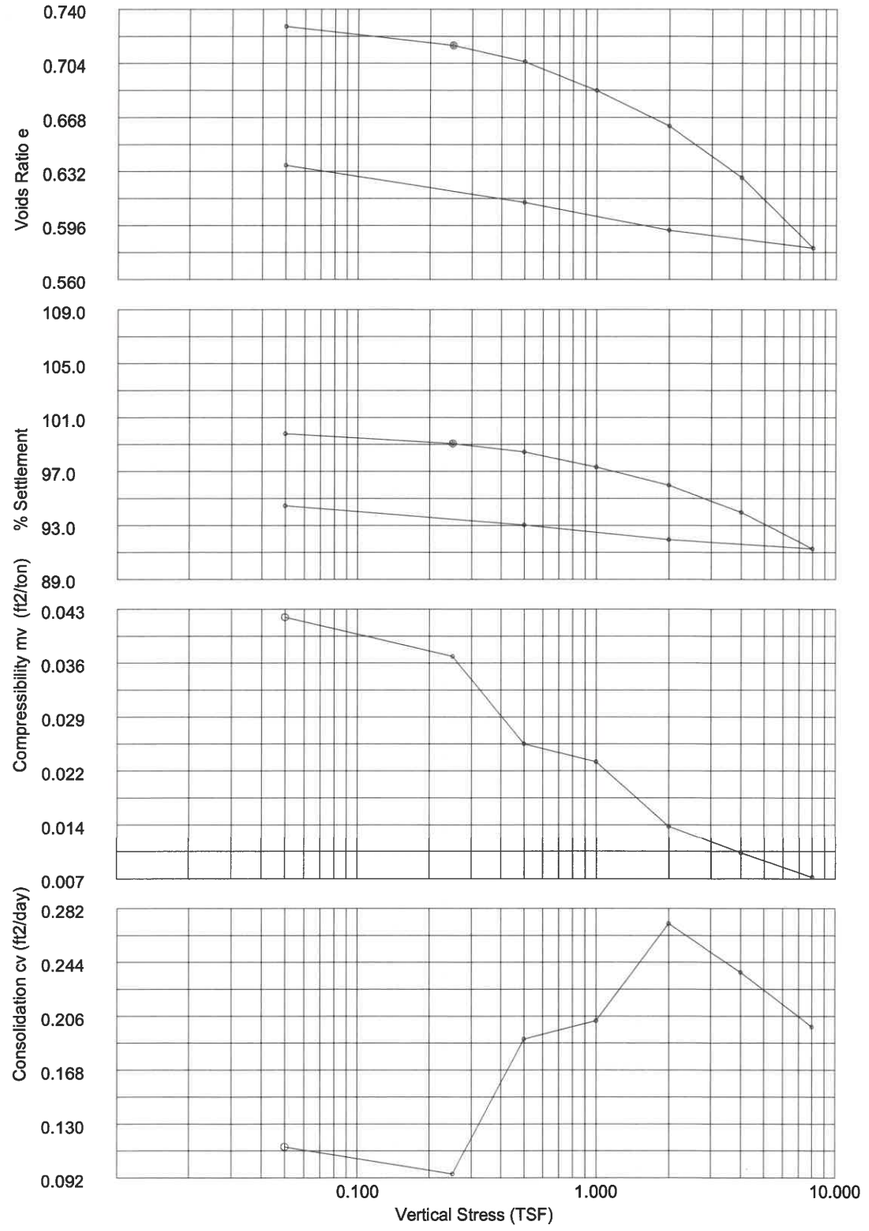
Settlement Channel	1001
Moisture Content w_0%	27.1
Dry Density ρ_d (PCF)	96.83
Voids Ratio e_0	0.7321
Deg of Saturation S_0%	99.5
Swelling Pressure Ss (TSF)	0.000

Final Conditions

Moisture Content w_f%	24.5
Dry Density ρ_d (PCF)	102.52
Voids Ratio e_f	0.6361
Deg of Saturation S_f%	100.00
Settlement: (in)	0.055
Compression Index C_c	0.158
Notes:	Test specimen taken from the middle portion of UD tube.

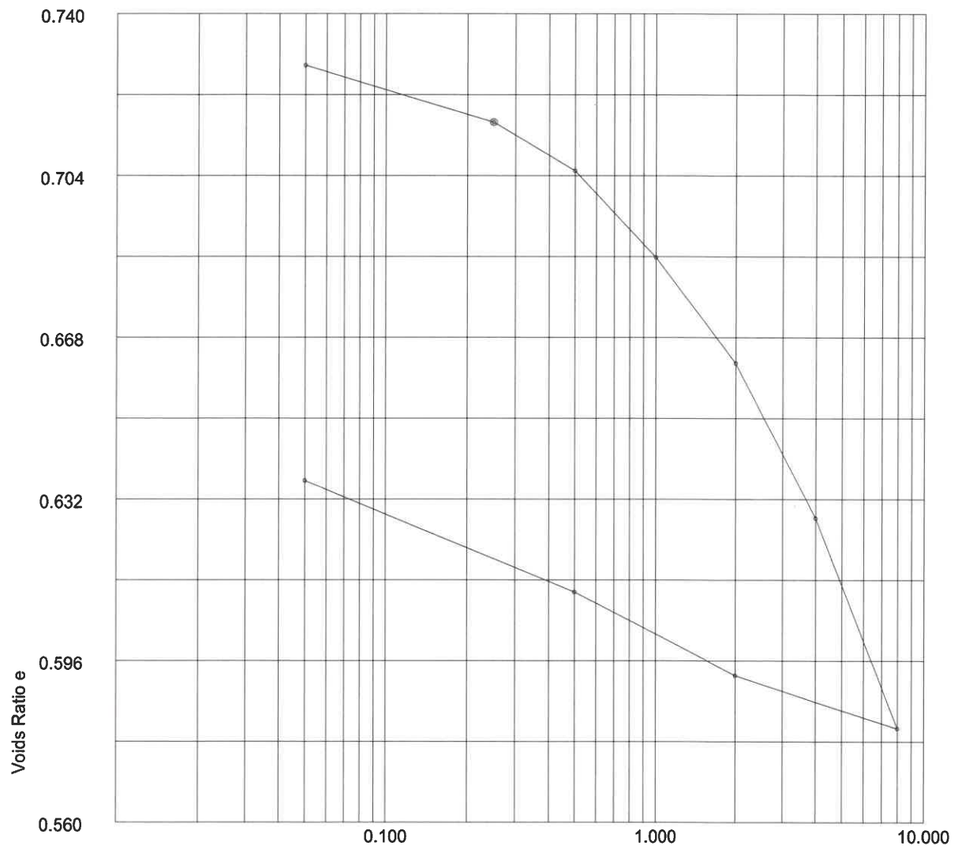
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests



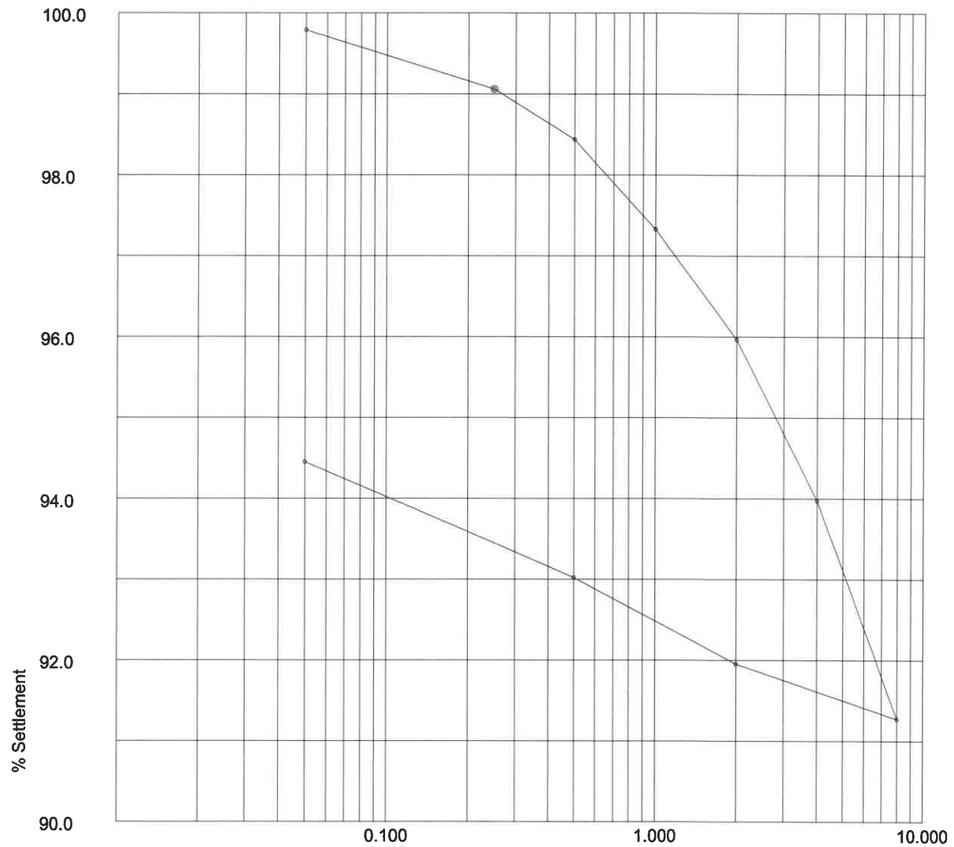
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests



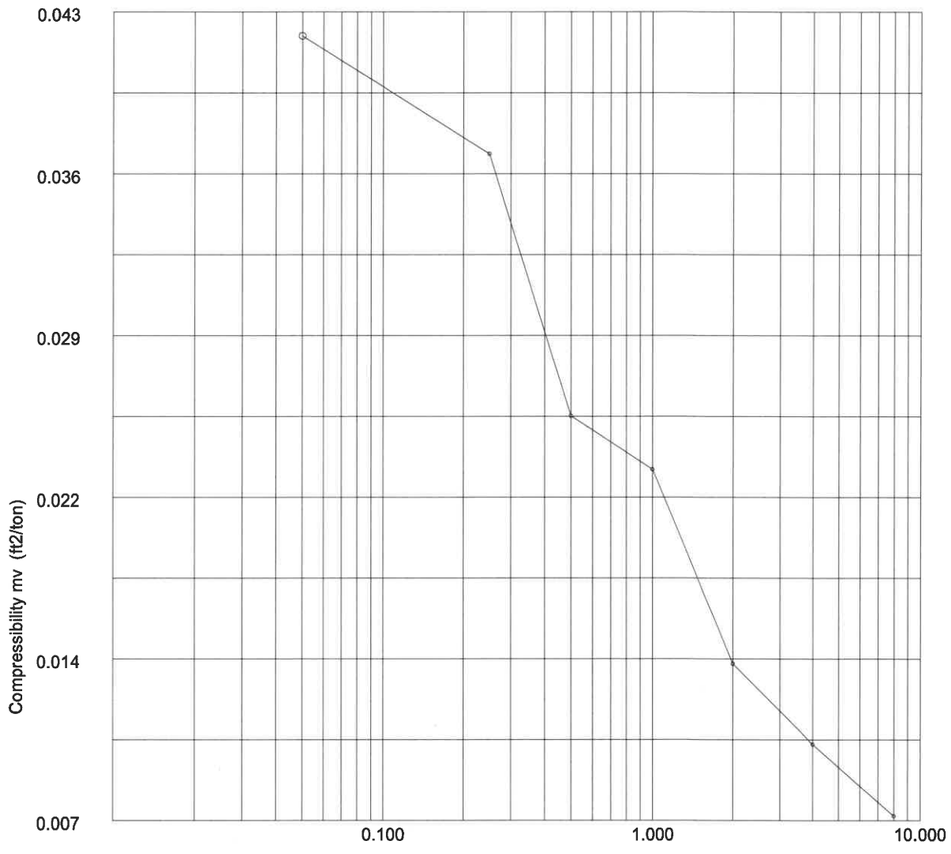
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests



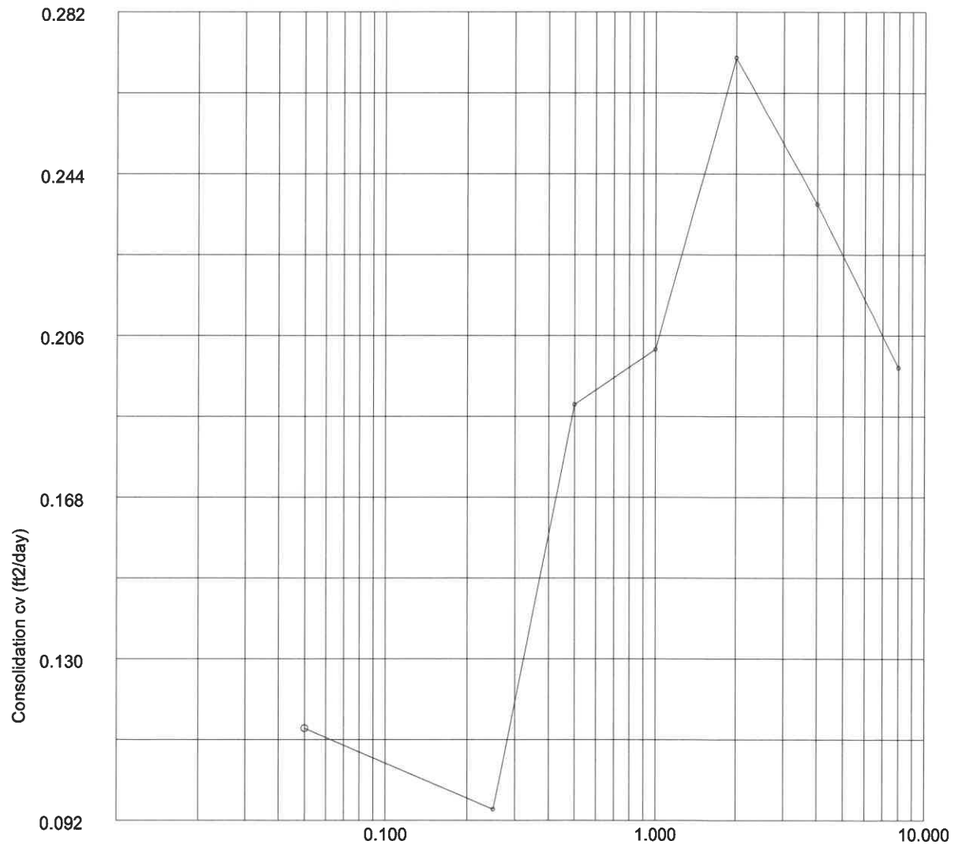
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	20.0	0.0021	0.0	21.7	0.7285	4.315	0.0003	0.115	0.042
0.250	20.0	0.0094	0.0	21.7	0.7158	5.213	0.0005	0.095	0.037
0.500	20.0	0.0156	0.0	21.7	0.7051	2.564	0.001	0.190	0.025
1.000	20.0	0.0267	0.0	21.7	0.6858	2.358	0.0006	0.203	0.023
2.000	20.0	0.0403	0.0	21.7	0.6623	1.718	0.0009	0.271	0.014
4.000	20.0	0.0602	0.0	21.7	0.6278	1.900	0.0012	0.237	0.011
8.000	20.0	0.0872	0.0	21.7	0.5809	2.157	0.0126	0.198	0.007
2.000	20.0	0.0804	0.0	21.7	0.5927				0.001
0.500	20.0	0.0697	0.0	21.7	0.6113				0.008
0.050	20.0	0.0554	0.0	21.7	0.6361				0.034

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

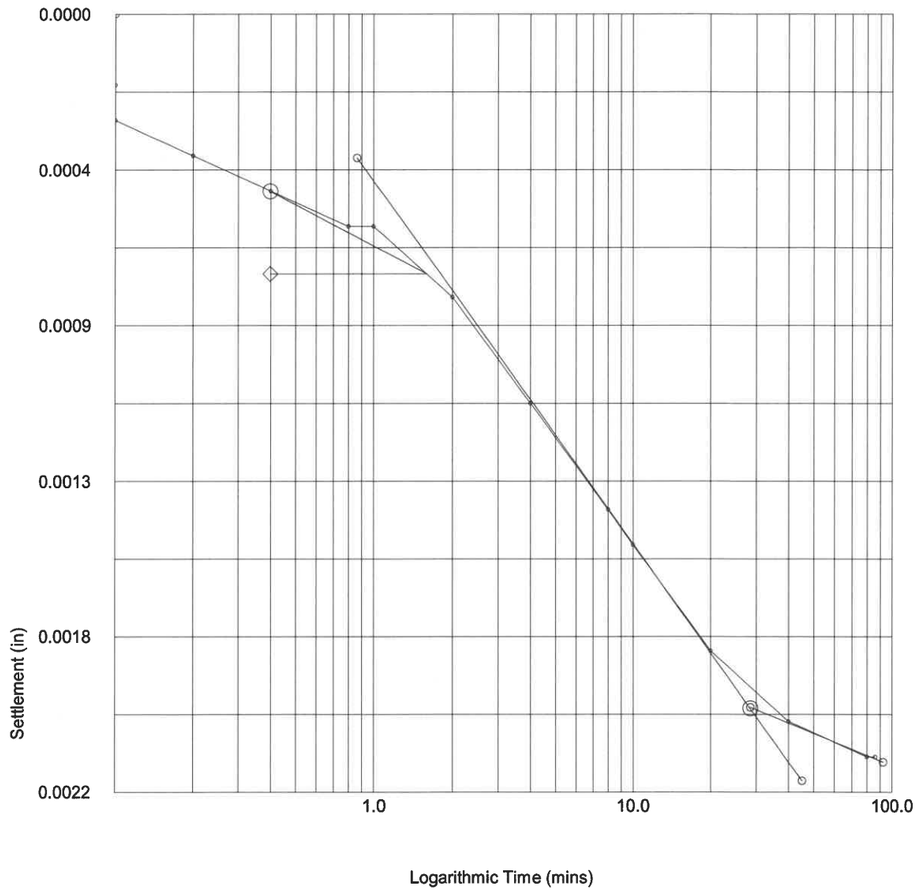
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	2	0.0002	0.0002
3	0.033	2	0.0002	0.0002
4	0.050	3	0.0003	0.0003
5	0.067	3	0.0003	0.0003
6	0.083	3	0.0003	0.0003
7	0.100	3	0.0003	0.0003
8	0.200	4	0.0004	0.0004
9	0.400	5	0.0005	0.0005
10	0.800	6	0.0006	0.0006
11	1.000	6	0.0006	0.0006
12	2.000	8	0.0008	0.0008
13	4.000	11	0.0011	0.0011
14	8.000	14	0.0014	0.0014
15	10.000	15	0.0015	0.0015
16	20.000	18	0.0018	0.0018
17	40.000	20	0.0020	0.0020
18	80.000	21	0.0021	0.0021
19	86.183	21	0.0021	0.0021

ASTM D2435-96		Test name	Consolidation Load: 0.050 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0021
Voids Ratio e	0.7285
Final Temp oC	0.0
t_{50} (mins)	4.32
c_v (ft2/day)	0.115
m_v (ft2/ton)	0.042
Sec Compression C_{sec}	0.0003



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

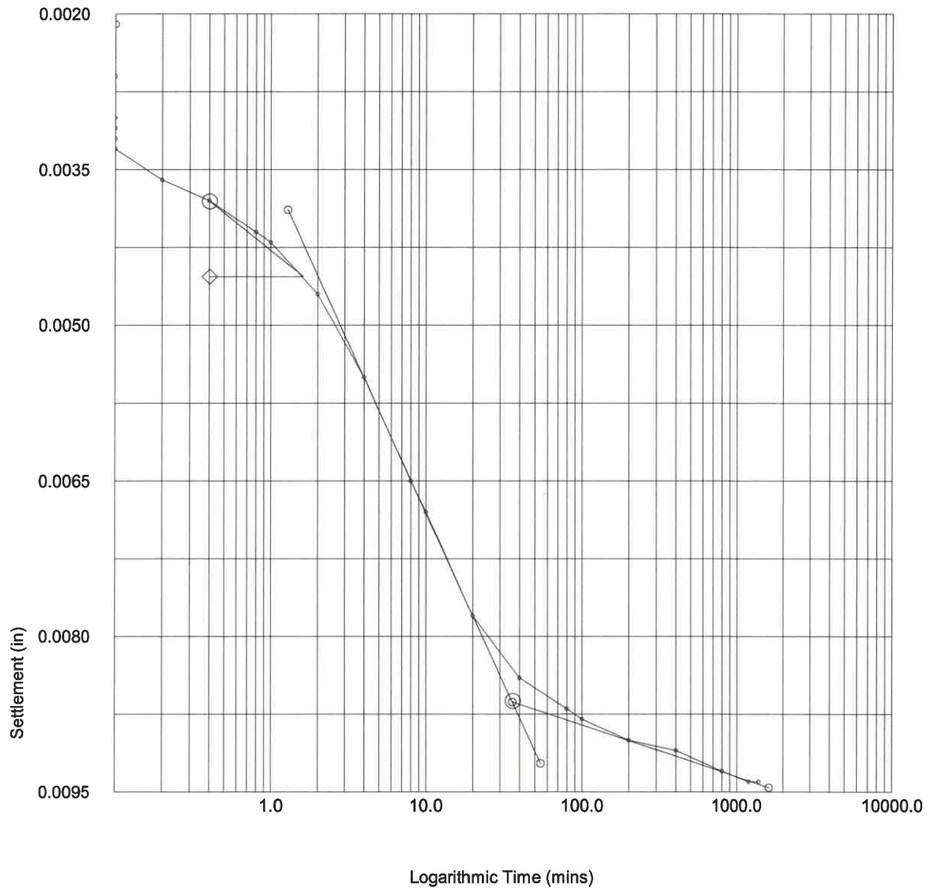
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	21	0.0021	0.0021
2	0.017	26	0.0026	0.0026
3	0.033	30	0.0030	0.0030
4	0.050	31	0.0031	0.0031
5	0.067	32	0.0032	0.0032
6	0.083	33	0.0033	0.0033
7	0.100	33	0.0033	0.0033
8	0.200	36	0.0036	0.0036
9	0.400	38	0.0038	0.0038
10	0.800	41	0.0041	0.0041
11	1.000	42	0.0042	0.0042
12	2.000	47	0.0047	0.0047
13	4.000	55	0.0055	0.0055
14	8.000	65	0.0065	0.0065
15	10.000	68	0.0068	0.0068
16	20.000	78	0.0078	0.0078
17	40.000	84	0.0084	0.0084
18	80.000	87	0.0087	0.0087
19	100.000	88	0.0088	0.0088
20	200.000	90	0.0090	0.0090
21	400.000	91	0.0091	0.0091
22	800.000	93	0.0093	0.0093
23	1200.000	94	0.0094	0.0094
24	1393.500	94	0.0094	0.0094

ASTM D2435-96		Test name	Consolidation Load: 0.250 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0073
Voids Ratio e	0.7158
Final Temp oC	0.0
t_{50} (mins)	5.21
c_v (ft2/day)	0.095
m_v (ft2/ton)	0.037
Sec Compression C_{sec}	0.0005



ASTM D2435-96		Test name	Consolidation	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MLC	*Checked:* MLC		*Approved:*	

Oedometer Settlement Tests

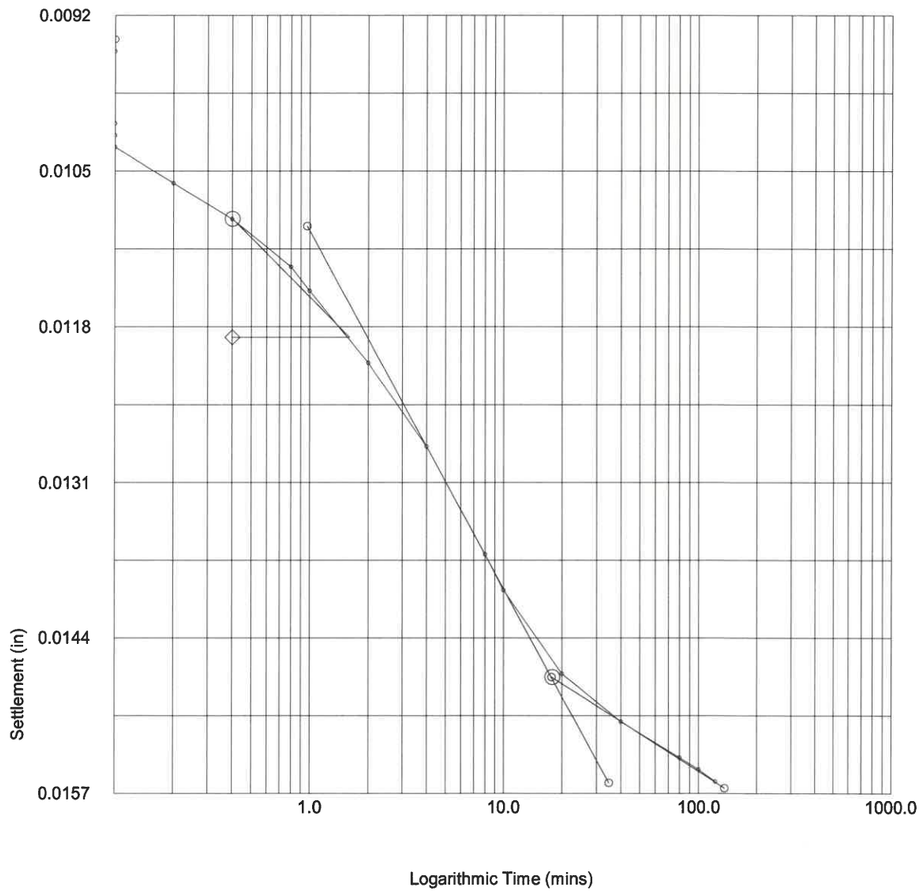
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	94	0.0094	0.0094
2	0.017	95	0.0095	0.0095
3	0.033	101	0.0101	0.0101
4	0.050	102	0.0102	0.0102
5	0.067	102	0.0102	0.0102
6	0.083	103	0.0103	0.0103
7	0.100	103	0.0103	0.0103
8	0.200	106	0.0106	0.0106
9	0.400	109	0.0109	0.0109
10	0.800	113	0.0113	0.0113
11	1.000	115	0.0115	0.0115
12	2.000	121	0.0121	0.0121
13	4.000	128	0.0128	0.0128
14	8.000	137	0.0137	0.0137
15	10.000	140	0.0140	0.0140
16	20.000	147	0.0147	0.0147
17	40.000	151	0.0151	0.0151
18	80.000	154	0.0154	0.0154
19	100.000	155	0.0155	0.0155
20	122.450	156	0.0156	0.0156

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MLC	*Checked:* MLC		*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0062
Voids Ratio e	0.7051
Final Temp oC	0.0
t_{50} (mins)	2.56
c_v (ft2/day)	0.19
m_v (ft2/ton)	0.025
Sec Compression C_{sec}	0.001



ASTM D2435-96		Test name	Consolidation	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MK	*Checked:* MK		*Approved:*	

Oedometer Settlement Tests

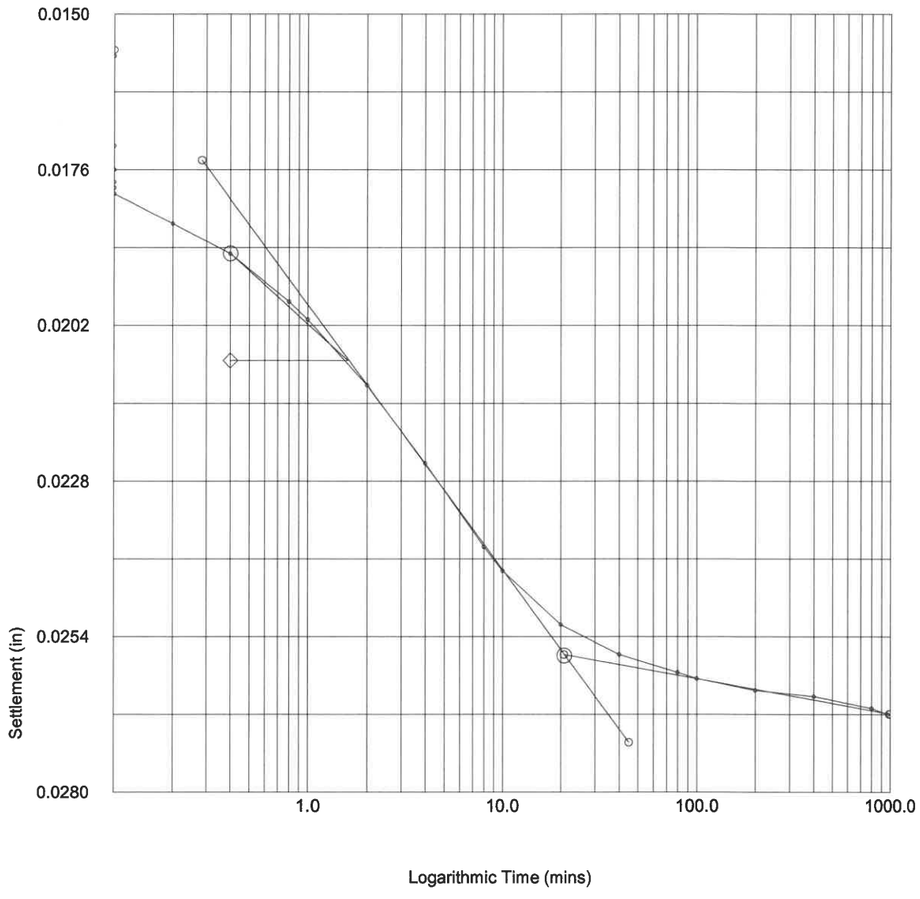
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	156	0.0156	0.0156
2	0.017	157	0.0157	0.0157
3	0.033	172	0.0172	0.0172
4	0.050	176	0.0176	0.0176
5	0.067	178	0.0178	0.0178
6	0.083	179	0.0179	0.0179
7	0.100	180	0.0180	0.0180
8	0.200	185	0.0185	0.0185
9	0.400	190	0.0190	0.0190
10	0.800	198	0.0198	0.0198
11	1.000	201	0.0201	0.0201
12	2.000	212	0.0212	0.0212
13	4.000	225	0.0225	0.0225
14	8.000	239	0.0239	0.0239
15	10.000	243	0.0243	0.0243
16	20.000	252	0.0252	0.0252
17	40.000	257	0.0257	0.0257
18	80.000	260	0.0260	0.0260
19	100.000	261	0.0261	0.0261
20	200.000	263	0.0263	0.0263
21	400.000	264	0.0264	0.0264
22	800.000	266	0.0266	0.0266
23	970.000	267	0.0267	0.0267

ASTM D2435-96		Test name	Consolidation Load: 1.000 (TSF)	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MK	*Checked:* MK		*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0111
Voids Ratio e	0.6858
Final Temp oC	0.0
t_{50} (mins)	2.36
c_v (ft2/day)	0.203
m_v (ft2/ton)	0.023
Sec Compression C_{sec}	0.0006



ASTM D2435-96		Test name	Consolidation	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MK	*Checked:* MK	*Approved:*		

Oedometer Settlement Tests

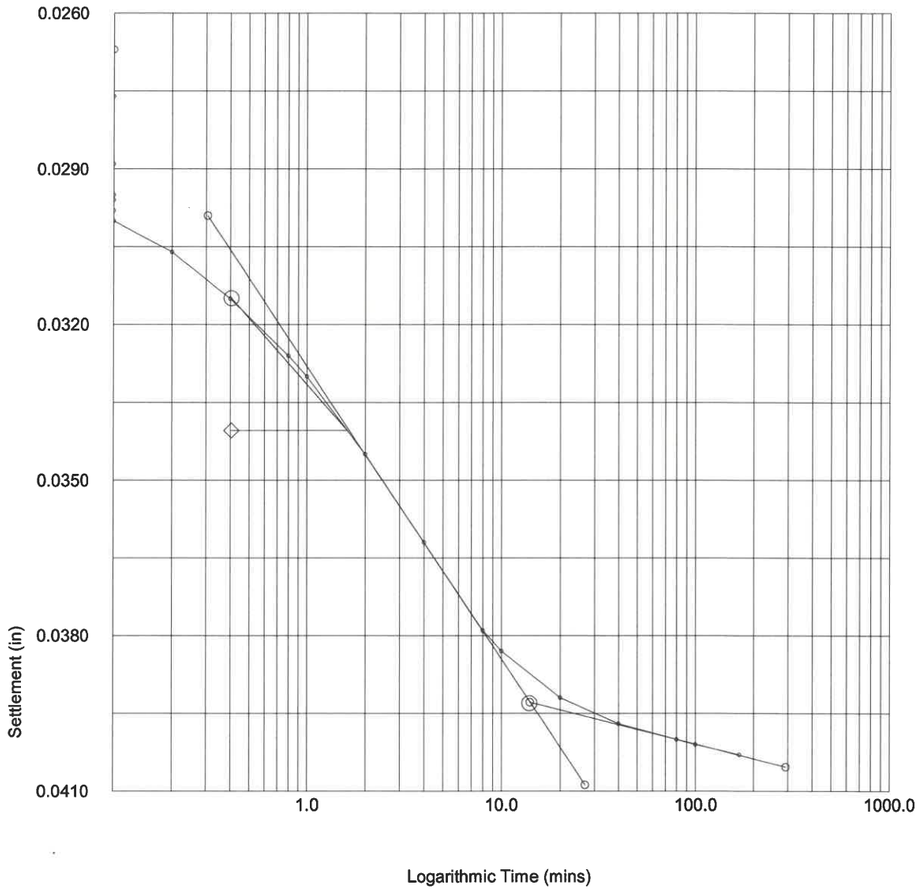
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	267	0.0267	0.0267
2	0.017	276	0.0276	0.0276
3	0.033	289	0.0289	0.0289
4	0.050	295	0.0295	0.0295
5	0.067	296	0.0296	0.0296
6	0.083	298	0.0298	0.0298
7	0.100	300	0.0300	0.0300
8	0.200	306	0.0306	0.0306
9	0.400	315	0.0315	0.0315
10	0.800	326	0.0326	0.0326
11	1.000	330	0.0330	0.0330
12	2.000	345	0.0345	0.0345
13	4.000	362	0.0362	0.0362
14	8.000	379	0.0379	0.0379
15	10.000	383	0.0383	0.0383
16	20.000	392	0.0392	0.0392
17	40.000	397	0.0397	0.0397
18	80.000	400	0.0400	0.0400
19	100.000	401	0.0401	0.0401
20	168.817	403	0.0403	0.0403

ASTM D2435-96		Test name	Consolidation Load: 2.000 (TSF)	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MK	*Checked:* MK	*Approved:*		

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0136
Voids Ratio e	0.6623
Final Temp oC	0.0
t_{50} (mins)	1.72
c_v (ft2/day)	0.271
m_v (ft2/ton)	0.014
Sec Compression C_{sec}	0.0009



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

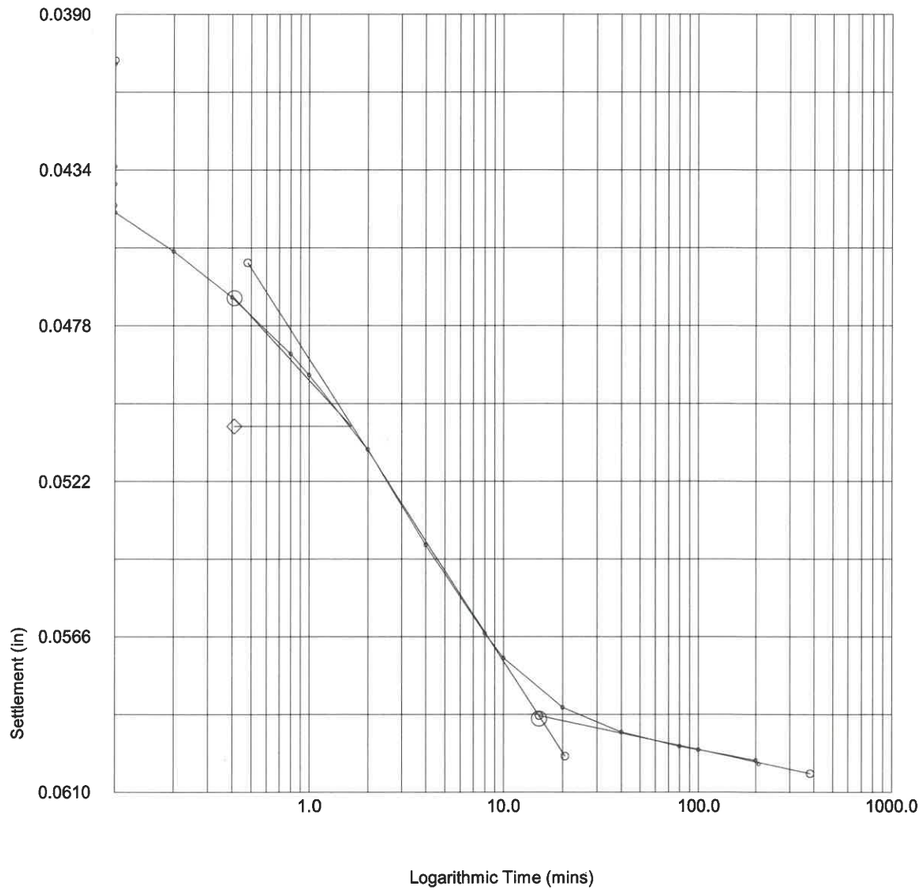
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	403	0.0403	0.0403
2	0.017	404	0.0404	0.0404
3	0.033	404	0.0404	0.0404
4	0.050	433	0.0433	0.0433
5	0.067	438	0.0438	0.0438
6	0.083	444	0.0444	0.0444
7	0.100	446	0.0446	0.0446
8	0.200	457	0.0457	0.0457
9	0.400	470	0.0470	0.0470
10	0.800	486	0.0486	0.0486
11	1.000	492	0.0492	0.0492
12	2.000	513	0.0513	0.0513
13	4.000	540	0.0540	0.0540
14	8.000	565	0.0565	0.0565
15	10.000	572	0.0572	0.0572
16	20.000	586	0.0586	0.0586
17	40.000	593	0.0593	0.0593
18	80.000	597	0.0597	0.0597
19	100.000	598	0.0598	0.0598
20	200.000	601	0.0601	0.0601
21	207.150	602	0.0602	0.0602

ASTM D2435-96		Test name	Consolidation Load: 4.000 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0199
Voids Ratio e	0.6278
Final Temp oC	0.0
t_{50} (mins)	1.90
c_v (ft2/day)	0.237
m_v (ft2/ton)	0.011
Sec Compression C_{sec}	0.0012



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

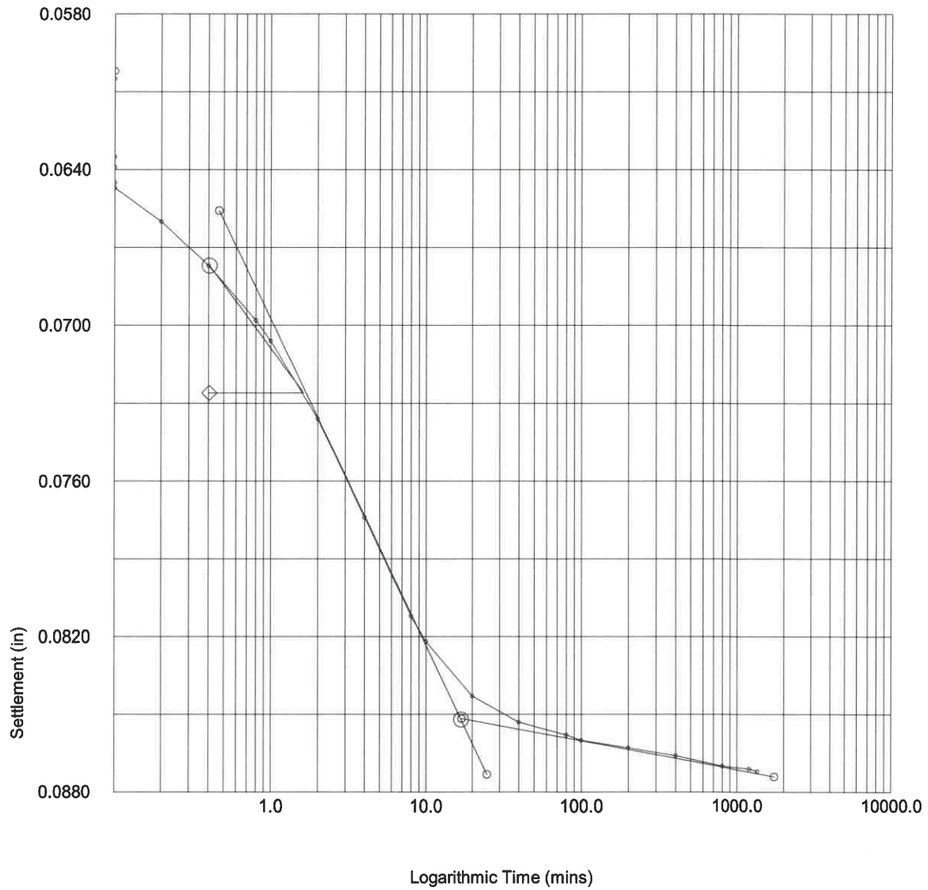
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	602	0.0602	0.0602
2	0.017	605	0.0605	0.0605
3	0.033	605	0.0605	0.0605
4	0.050	635	0.0635	0.0635
5	0.067	639	0.0639	0.0639
6	0.083	645	0.0645	0.0645
7	0.100	647	0.0647	0.0647
8	0.200	660	0.0660	0.0660
9	0.400	677	0.0677	0.0677
10	0.800	698	0.0698	0.0698
11	1.000	706	0.0706	0.0706
12	2.000	736	0.0736	0.0736
13	4.000	774	0.0774	0.0774
14	8.000	812	0.0812	0.0812
15	10.000	822	0.0822	0.0822
16	20.000	843	0.0843	0.0843
17	40.000	853	0.0853	0.0853
18	80.000	858	0.0858	0.0858
19	100.000	860	0.0860	0.0860
20	200.000	863	0.0863	0.0863
21	400.000	866	0.0866	0.0866
22	800.000	870	0.0870	0.0870
23	1200.000	871	0.0871	0.0871
24	1348.933	872	0.0872	0.0872

ASTM D2435-96		Test name	Consolidation Load: 8.000 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	8.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.027
Voids Ratio e	0.5809
Final Temp oC	0.0
t_{50} (mins)	2.16
c_v (ft2/day)	0.198
m_v (ft2/ton)	0.007
Sec Compression C_{sec}	0.0126



ASTM D2435-96		Test name	Consolidation	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MLC	*Checked:* MLC	*Approved:*		

Oedometer Settlement Tests

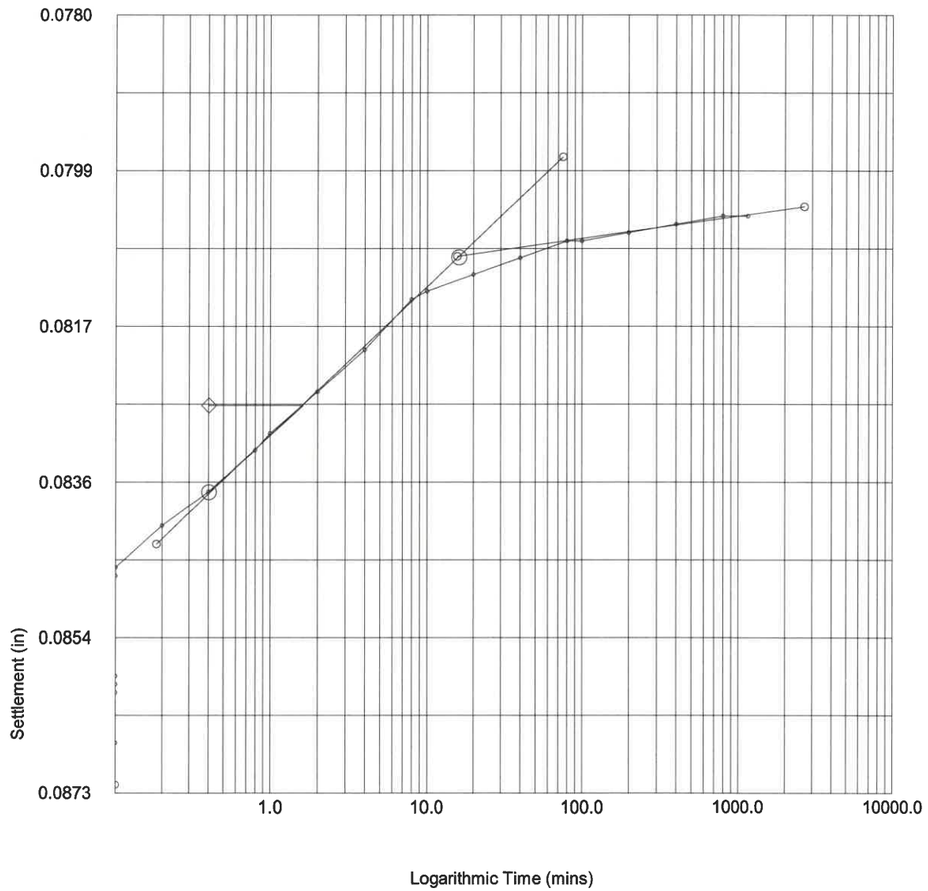
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	872	0.0872	0.0872
2	0.017	867	0.0867	0.0867
3	0.033	861	0.0861	0.0861
4	0.050	860	0.0860	0.0860
5	0.067	859	0.0859	0.0859
6	0.083	847	0.0847	0.0847
7	0.100	846	0.0846	0.0846
8	0.200	841	0.0841	0.0841
9	0.400	837	0.0837	0.0837
10	0.800	832	0.0832	0.0832
11	1.000	830	0.0830	0.0830
12	2.000	825	0.0825	0.0825
13	4.000	820	0.0820	0.0820
14	8.000	814	0.0814	0.0814
15	10.000	813	0.0813	0.0813
16	20.000	811	0.0811	0.0811
17	40.000	809	0.0809	0.0809
18	80.000	807	0.0807	0.0807
19	100.000	807	0.0807	0.0807
20	200.000	806	0.0806	0.0806
21	400.000	805	0.0805	0.0805
22	800.000	804	0.0804	0.0804
23	1153.783	804	0.0804	0.0804

ASTM D2435-96		Test name	Consolidation Load: 2.000 (TSF)	
		Date of Test:	12-26-18	
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3	
Jobfile:	E:\18-036.JOB	Borehole:	ST-3	
Operator: MLC	*Checked:* MLC	*Approved:*		

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0068
Voids Ratio e	0.5927
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

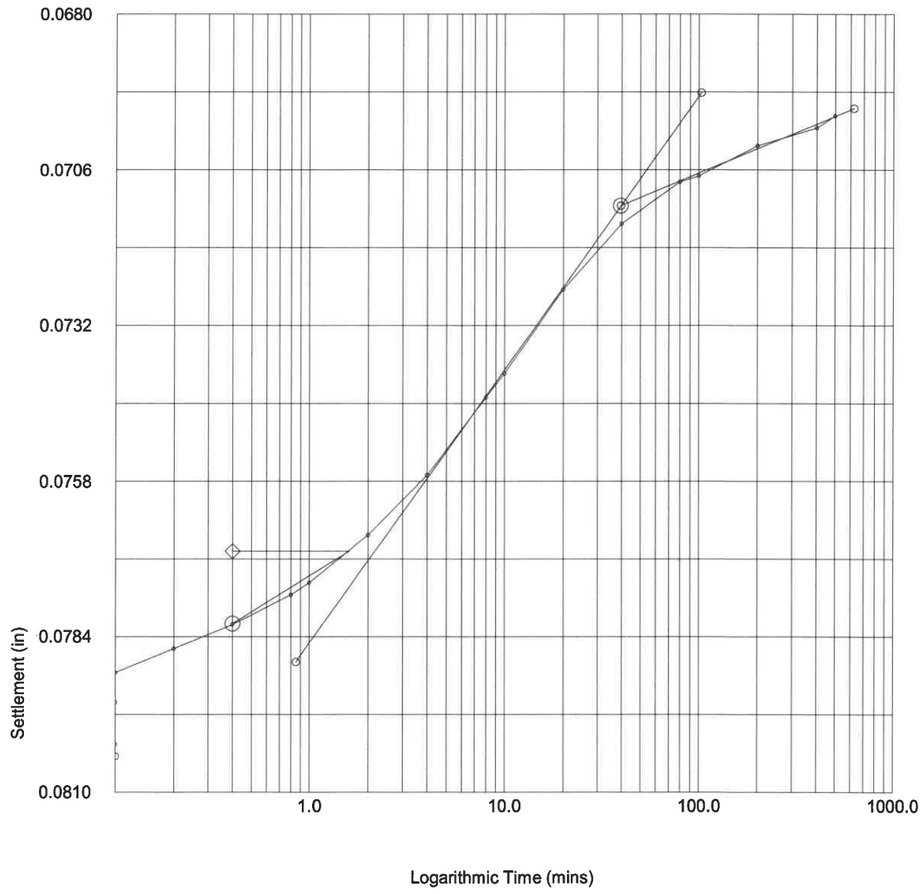
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	804	0.0804	0.0804
2	0.017	802	0.0802	0.0802
3	0.033	802	0.0802	0.0802
4	0.050	802	0.0802	0.0802
5	0.067	795	0.0795	0.0795
6	0.083	790	0.0790	0.0790
7	0.100	790	0.0790	0.0790
8	0.200	786	0.0786	0.0786
9	0.400	782	0.0782	0.0782
10	0.800	777	0.0777	0.0777
11	1.000	775	0.0775	0.0775
12	2.000	767	0.0767	0.0767
13	4.000	757	0.0757	0.0757
14	8.000	744	0.0744	0.0744
15	10.000	740	0.0740	0.0740
16	20.000	726	0.0726	0.0726
17	40.000	715	0.0715	0.0715
18	80.000	708	0.0708	0.0708
19	100.000	707	0.0707	0.0707
20	200.000	702	0.0702	0.0702
21	400.000	699	0.0699	0.0699
22	498.117	697	0.0697	0.0697

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0107
Voids Ratio e	0.6113
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

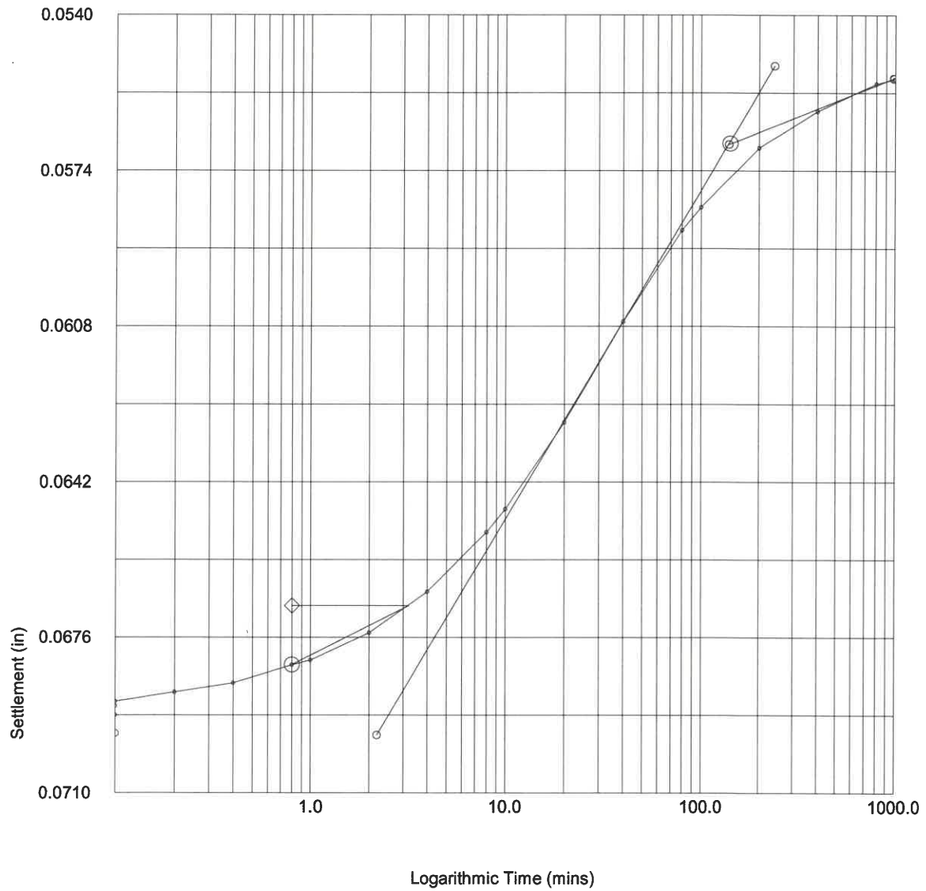
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	697	0.0697	0.0697
2	0.017	693	0.0693	0.0693
3	0.033	693	0.0693	0.0693
4	0.050	691	0.0691	0.0691
5	0.067	691	0.0691	0.0691
6	0.083	690	0.0690	0.0690
7	0.100	690	0.0690	0.0690
8	0.200	688	0.0688	0.0688
9	0.400	686	0.0686	0.0686
10	0.800	682	0.0682	0.0682
11	1.000	681	0.0681	0.0681
12	2.000	675	0.0675	0.0675
13	4.000	666	0.0666	0.0666
14	8.000	653	0.0653	0.0653
15	10.000	648	0.0648	0.0648
16	20.000	629	0.0629	0.0629
17	40.000	607	0.0607	0.0607
18	80.000	587	0.0587	0.0587
19	100.000	582	0.0582	0.0582
20	200.000	569	0.0569	0.0569
21	400.000	561	0.0561	0.0561
22	800.000	555	0.0555	0.0555
23	990.533	554	0.0554	0.0554

ASTM D2435-96		Test name	Consolidation Load: 0.050 (TSF)
		Date of Test:	12-26-18
Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator: MLC	*Checked:* MLC	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0143
Voids Ratio e	0.6361
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



ASTM D2435-96			Test name Date of Test:	Consolidation 12-26-18
Site Reference: Jobfile:	Br. Nos. 138 & 139 E:\18-036.JOB		Sample: Borehole:	ST-3 ST-3
Operator: MLL		*Checked:* MLL		*Approved:*