STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5883	1	15

REFERENCE: I-5883

PROJECT: 53083

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HARNETT*

PROJECT DESCRIPTION *IMPROVE I-95 INTERCHANGES AT SR 1808 (JONESBORO RD.) AND SR 1709 (HODGES CHAPEL RD.)*

SITE DESCRIPTION *BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)*

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.

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.

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

NOTES:
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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.

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INVESTIGATED BY *J.R. SWARTLEY*

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DATE *FEBRUARY 2018*

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NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
Jarett R. Swartley
919459487BA3471
SIGNATURE

7/23/2018
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5883	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] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [ ] 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
- [X] BWJ RODS

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.

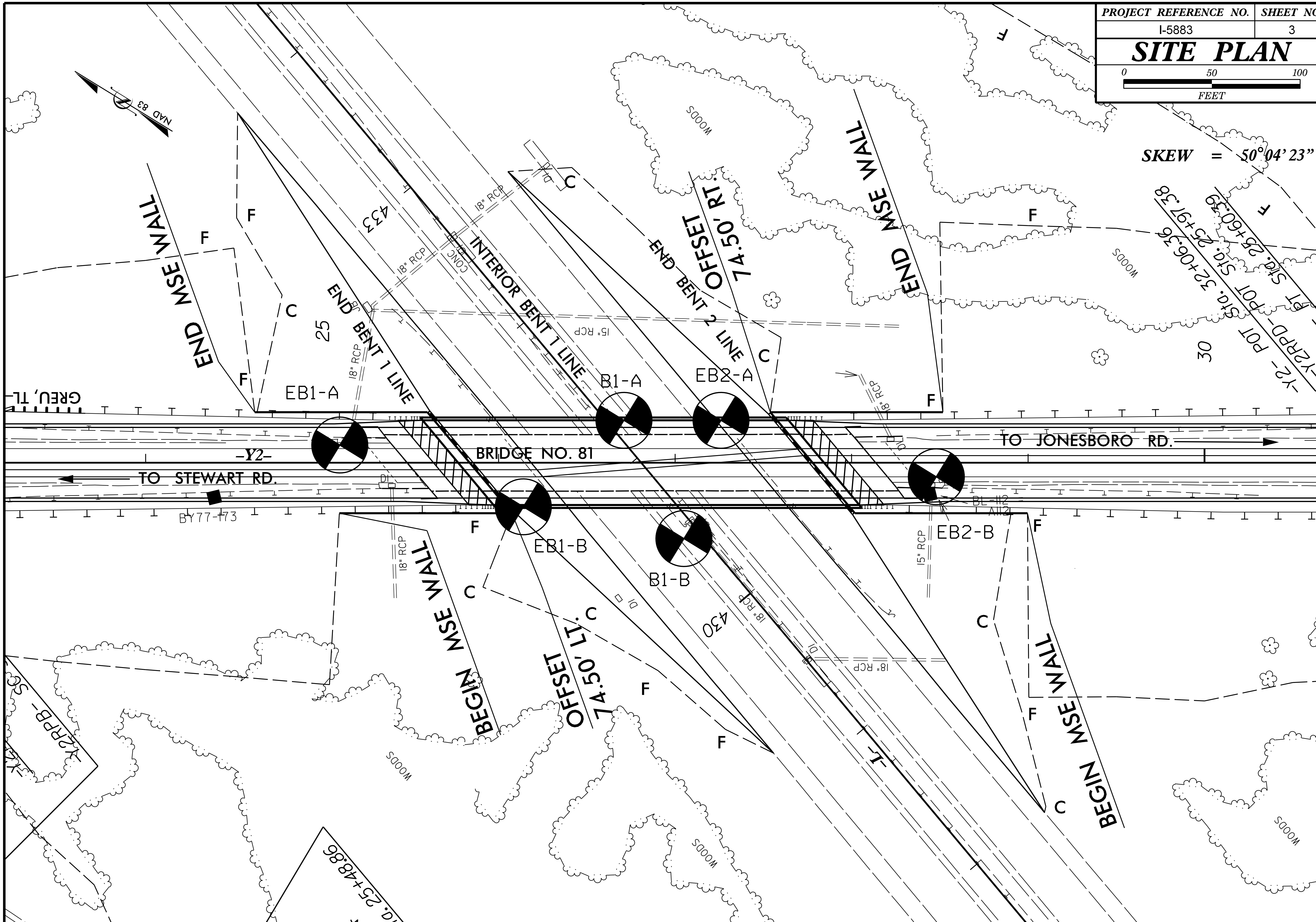
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY77-173
NORTHING: 580156 EASTING: 2131628
ELEVATION: 259.26 FEET

NOTES:

DATE: 8-15-14



PROJECT REFERENCE NO.
SHEET NO.
I-5883
3
SITE PLAN
0
50
100
FEET
SKEW = 50°04' 23"
NAD 83
END MSE WALL
END BENT 1 LINE
INTERIOR BENT 1 LINE
END BENT 2 LINE
OFFSET 74.50' RT.
END MSE WALL
EB1-A
B1-A
EB2-A
-Y2-
BRIDGE NO. 81
TO STEWART RD.
TO JONESBORO RD.
BY77-173
EB1-B
B1-B
EB2-B
BEGIN MSE WALL
OFFSET 74.50' LT.
BEGIN MSE WALL
WOODS
18" RCP
15" RCP
CONC

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5883	4

PROFILE ALONG –Y2–

0 40 80
FEET
VE = 2:1

Ⓐ ROADWAY EMBANKMENT, TAN AND BROWN, MOIST, MED. STIFF, SANDY CLAY
Ⓑ COASTAL PLAIN, BROWN AND BLACK, WET, MED. STIFF TO STIFF, SANDY CLAY AND SILTY CLAY, (CAPE FEAR FORMATION)
Ⓒ COASTAL PLAIN, GRAY, WET, VERY STIFF, SILTY CLAY, (CAPE FEAR FORMATION)

PROPOSED GRADE

EXISTING GROUND

BRIDGE NO. 81

EB1–A
25+10
10' LT
SS-146

EB1–B
26+14
25' RT
SS-167

B1–B
27+05
43' RT

EB2–B
28+48
8' RT
SS-121

PAVEMENT
ROADWAY EMBANKMENT, BROWN, MOIST, VERY LOOSE COARSE SAND WITH
BROWN, MOIST, SOFT,
BROWN, MOIST, LOOSE,
COASTAL PLAIN,
GRAY, BROWN, RED,
COASTAL PLAIN,
COASTAL PLAIN,
20 6 3 2 4 6 8 4 18 15 10 22 10 15 16 38 20 35 62 35 49 21
FIAD
BT

GRAY, RED AND TO MED. DENSE, GRAVEL AND CLAYEY SAND
SANDY CLAY
SILTY SAND AND CLAYEY SAND
GRAY, TAN AND BLACK,
YELLOW, WHITE, TAN, ORANGE
GRAY AND BLACK, SATURATED, MED.
GRAY, TAN AND BLACK,
GRAY AND
8 7 6 8 11 18 11 9 7 6 77 25 53 36 47 25 39 17 40 32 19
10/17
Ⓒ
BT

MOIST TO WET,
AND PURPLE, LOOSE TO DENSE,
DENSE TO VERY DENSE, SAND,
WET, MED. STIFF
GREEN, SATURATED,
8 5 9 8 9 15 19 12 6 16 51 68 33 37 36 36 30 32 25 37 21
10/17
Ⓐ
Ⓑ
Ⓒ
BT

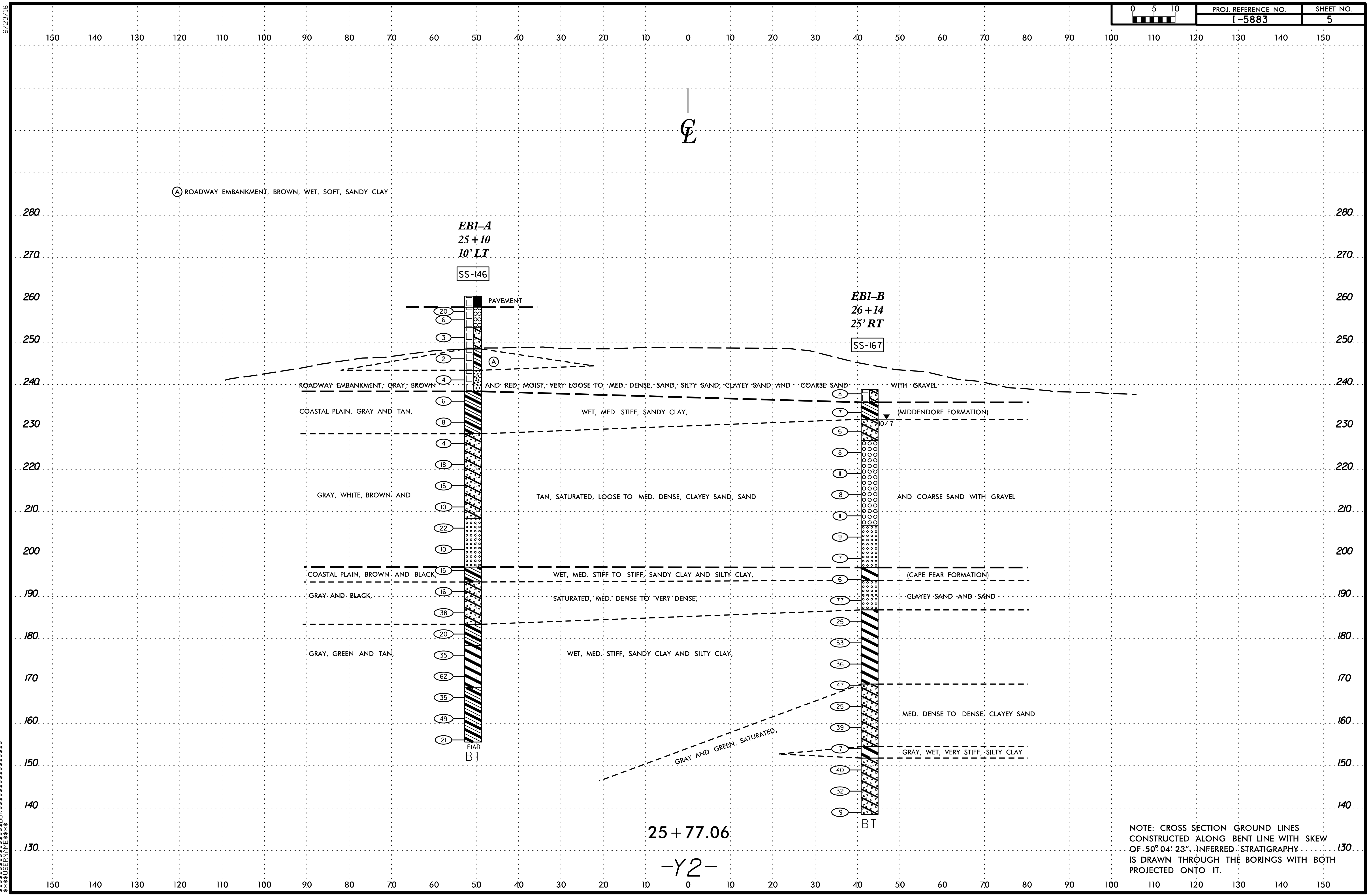
MED. STIFF TO VERY STIFF, SANDY CLAY,
COARSE SAND WITH GRAVEL, SAND, SILTY SAND AND
SILTY SAND AND CLAYEY SAND, (CAPE FEAR FORMATION)
TO VERY STIFF, SANDY CLAY,
MED. DENSE TO DENSE,

PAVEMENT
ROADWAY EMBANKMENT, LOOSE TO MED. DENSE, CLAYEY SAND
RED AND BROWN, MOIST, MED. STIFF, SANDY CLAY
GRAY AND BROWN, MOIST, LOOSE, SILTY SAND
(MIDDENDORF FORMATION)
CLAYEY SAND
(CAPE FEAR FORMATION)
CLAYEY SAND
29 5 5 5 4 8 16 6 30 19 15 11 21 6 12 16 28 25 64 38 23
FIAD
BT

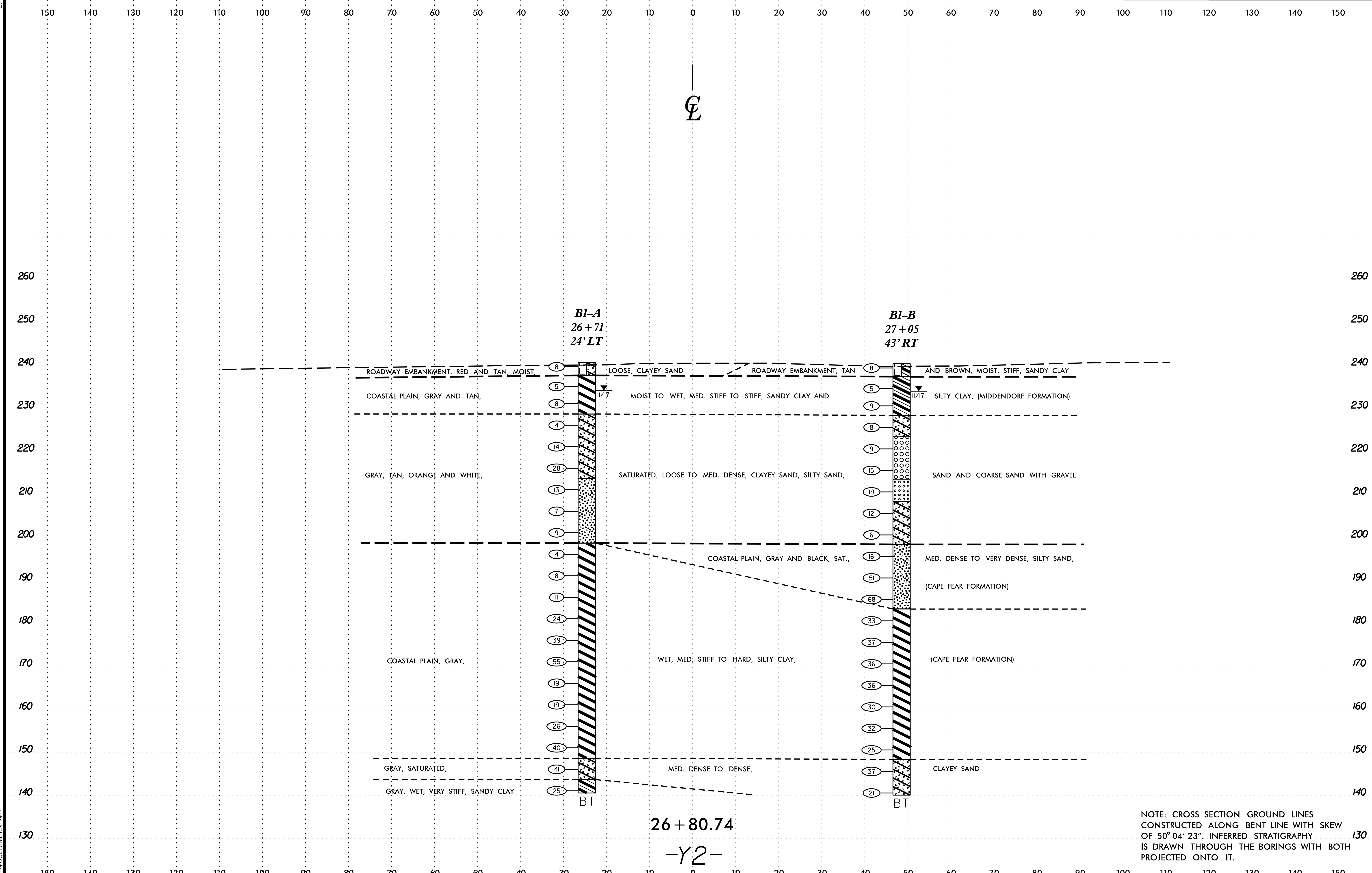
NOTE: EXISTING GROUND SURFACE PROFILE OF –Y2– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15883_ls_dtm.tin' DATED 5/8/17. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110

24+00 25+00 26+00 27+00 28+00 29+00


6/23/16
0 5 10
PROJ. REFERENCE NO.
I-5883
SHEET NO.
5
(A) ROADWAY EMBANKMENT, BROWN, WET, SOFT, SANDY CLAY
EB1–A
25+10
10' LT
SS-146
PAVEMENT
EB1–B
26+14
25' RT
SS-167
ROADWAY EMBANKMENT, GRAY, BROWN AND RED, MOIST, VERY LOOSE TO MED. DENSE, SAND, SILTY SAND, CLAYEY SAND AND COARSE SAND WITH GRAVEL
COASTAL PLAIN, GRAY AND TAN, WET, MED. STIFF, SANDY CLAY, (MIDDENDORF FORMATION)
10/17
GRAY, WHITE, BROWN AND TAN, SATURATED, LOOSE TO MED. DENSE, CLAYEY SAND, SAND AND COARSE SAND WITH GRAVEL
COASTAL PLAIN, BROWN AND BLACK, WET, MED. STIFF TO STIFF, SANDY CLAY AND SILTY CLAY, (CAPE FEAR FORMATION)
GRAY AND BLACK, SATURATED, MED. DENSE TO VERY DENSE, CLAYEY SAND AND SAND
GRAY, GREEN AND TAN, WET, MED. STIFF, SANDY CLAY AND SILTY CLAY,
GRAY AND GREEN, SATURATED, MED. DENSE TO DENSE, CLAYEY SAND
GRAY, WET, VERY STIFF, SILTY CLAY
FIAD
BT
BT
25+77.06
-Y2-
NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04' 23". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.
$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
I-5883	6



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04′ 23″. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

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

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5883	7

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

℄

280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130

EB2–A
27+26
24' LT
SS-96

EB2–B
28+48
8' RT
SS-121

PAVEMENT

ROADWAY EMBANKMENT, GRAY, BROWN, RED, TAN AND BLACK, MOIST, LOOSE TO MED. DENSE,

RED AND BROWN, MOIST, MED. STIFF, SANDY CLAY

SILTY SAND AND CLAYEY SAND

COASTAL PLAIN, GRAY AND TAN, MOIST TO WET, STIFF, SANDY CLAY,

(MIDDENDORF FORMATION)

GRAY, BROWN, TAN, WHITE, YELLOW AND PURPLE, MOIST TO SATURATED, LOOSE TO DENSE, SILTY SAND, CLAYEY SAND, SAND AND COARSE SAND WITH GRAVEL

COASTAL PLAIN, BLACK, GRAY, GREEN AND PURPLE, WET, MED. STIFF TO HARD, SILTY CLAY AND SANDY CLAY, (CAPE FEAR FORMATION)

GRAY AND BLACK, SAT., DENSE, SILTY SAND

GRAY AND GREEN, SATURATED, MED. DENSE TO DENSE, CLAYEY SAND

BT

FIAD

27+84.40

–Y2–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04' 23". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 25+10	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 105.3 ft	**NORTHING** 580,110	**EASTING** 2,131,691	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/20/17	**COMP. DATE** 10/20/17	**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)
265											
260										260.9 GROUND SURFACE	0.0
	258.3	2.6								**ROADWAY EMBANKMENT** (PAVEMENT)	
	256.3	4.6	15	11	9	20		M		258.3 RED AND BROWN, COARSE SAND WITH GRAVEL	2.6
255			3	3	3	6		M			
	252.1	8.8								253.4 GRAY AND RED, CLAYEY SAND	7.5
250			2	2	1	3		Sat.			
	247.1	13.8								248.4 BROWN, SANDY CLAY	12.5
245			1	1	1	2		W			
	242.1	18.8								243.4 BROWN, SILTY SAND	17.5
240			3	2	2	4		Sat.			
	237.1	23.8								238.4 **COASTAL PLAIN** GRAY, SANDY CLAY (MIDDENDORF FORMATION)	22.5
235			4	3	3	6		W			
	232.1	28.8									
230			4	4	4	8		W			
	227.1	33.8								228.4 GRAY AND WHITE, CLAYEY SAND	32.5
225			2	2	2	4		Sat.			
	222.1	38.8									
220			7	10	8	18		Sat.			
	217.1	43.8									
215			10	9	6	15		Sat.			
	212.1	48.8									
210			3	6	4	10		Sat.			
	207.1	53.8								208.4 BROWN AND GRAY, SAND	52.5
205			11	11	11	22	SS-146	23%			
	202.1	58.8									
200			4	5	5	10		Sat.			
	197.1	63.8								196.9 **COASTAL PLAIN** BROWN, SANDY CLAY (CAPE FEAR FORMATION)	64.0
195			7	6	9	15		W			
	192.1	68.8								193.4 GRAY, CLAYEY SAND	67.5
190			5	6	10	16		Sat.			
	187.1	73.8									
185			6	17	21	38		Sat.			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 25+10	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 105.3 ft	**NORTHING** 580,110	**EASTING** 2,131,691	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/20/17	**COMP. DATE** 10/20/17	**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
185						Match Line				
	182.1	78.8	4	8	12	20		W		GRAY, CLAYEY SAND *(continued)* 183.4 77.5
180										GRAY AND GREEN, SANDY CLAY AND SILTY CLAY
	177.1	83.8	13	16	19	35		W		178.4 82.5
175										
	172.1	88.8	18	26	36	62		W		
170										168.4 92.5
	167.1	93.8	9	14	21	35		W		
165										
	162.1	98.8	14	21	28	49		W		
160										
	157.1	103.8	9	10	11	21		W		155.6 105.3
										Boring Terminated at Elevation 155.6 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+14	**OFFSET** 25 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 238.8 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 580,003	**EASTING** 2,131,715	**24 HR.** 7.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/23/17	**COMP. DATE** 10/24/17	**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)
240											
	238.8	0.0	2	5	3	8		M		238.8 GROUND SURFACE	0.0
235	234.4	4.4	2	3	4	7				**ROADWAY EMBANKMENT** BROWN, CLAYEY SAND	
										235.8 **COASTAL PLAIN** GRAY AND TAN, SANDY CLAY (MIDDENDORF FORMATION)	3.0
230	230.0	8.8	3	3	3	6		Sat.		231.8 GRAY, CLAYEY SAND	7.0
225	225.0	13.8	2	3	5	8		Sat.		226.8 WHITE AND TAN, COARSE SAND WITH GRAVEL	12.0
220	220.0	18.8	5	4	7	11		Sat.			
215	215.0	23.8	8	10	8	18		Sat.			
210	210.0	28.8	7	6	5	11		Sat.		206.8 GRAY AND TAN, SAND	32.0
205	205.0	33.8	3	4	5	9		Sat.			
200	200.0	38.8	3	3	4	7		Sat.		196.8 **COASTAL PLAIN** BLACK, SILTY CLAY (CAPE FEAR FORMATION)	42.0
195	195.0	43.8	1	1	5	6		W		193.8 BLACK, SAND	45.0
190	190.0	48.8	10	35	42	77	SS-167	23%		186.8 GRAY, SILTY CLAY	52.0
185	185.0	53.8	5	10	15	25		W			
180	180.0	58.8	12	23	30	53		W			
175	175.0	63.8	11	17	19	36		W			
170	170.0	68.8	17	22	25	47		W		169.3 GRAY AND GREEN, CLAYEY SAND	69.5
165	165.0	73.8	10	12	13	25		Sat.			
160	160.0	78.8									

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+14	**OFFSET** 25 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 238.8 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 580,003	**EASTING** 2,131,715	**24 HR.** 7.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/23/17	**COMP. DATE** 10/24/17	**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
160						Match Line				
	155.0	83.8	13	18	21	39		Sat.		GRAY AND GREEN, CLAYEY SAND *(continued)*
155	150.0	88.8	10	7	10	17		W		154.5 GRAY, SILTY CLAY 84.3
150	145.0	93.8	12	19	21	40		Sat.		151.8 GRAY AND GREEN, CLAYEY SAND 87.0
145	140.0	98.8	8	16	16	32		Sat.		
140			7	8	11	19		Sat.		138.5 Boring Terminated at Elevation 138.5 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN) 100.3

NCDOT BORE DOUBLE I5833_BRDG0081_SPT_BORINGS.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+71	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.6 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,981	**EASTING** 2,131,787	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/07/17	**COMP. DATE** 11/08/17	**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)
245											
240	240.6	0.0	3	4	4	8		M		240.6 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED AND TAN, CLAYEY SAND	
	236.0	4.6								237.6	3.0
235			1	2	3	5				**COASTAL PLAIN** GRAY AND TAN, SILTY CLAY (MIDDENDORF FORMATION)	
	232.0	8.6									
230			2	3	5	8		W			
	227.0	13.6								228.6	12.0
225			1	2	2	4		Sat.		GRAY, CLAYEY SAND	
	222.0	18.6									
220			6	8	6	14		Sat.			
	217.0	23.6									
215			6	13	15	28		Sat.			
	212.0	28.6								213.6	27.0
210			4	7	6	13		Sat.		TAN, GRAY AND ORANGE, SILTY SAND	
	207.0	33.6									
205			3	4	3	7		Sat.			
	202.0	38.6									
200			5	4	5	9		Sat.			
	197.0	43.6								198.6	42.0
195			11	2	2	4		W		**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
	192.0	48.6									
190			3	3	5	8		W			
	187.0	53.6									
185			3	6	5	11		W			
	182.0	58.6									
180			6	9	15	24		W			
	177.0	63.6									
175			14	17	22	39		W			
	172.0	68.6									
170			14	23	32	55		W			
	167.0	73.6									
165			6	8	11	19		W			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+71	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.6 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,981	**EASTING** 2,131,787	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/07/17	**COMP. DATE** 11/08/17	**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
165						Match Line				
	162.0	78.6	6	8	11	19		W		**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION) *(continued)*
160										
	157.0	83.6	11	12	14	26		W		
155										
	152.0	88.6	14	19	21	40		W		
150										
	147.0	93.6	16	18	23	41		Sat.		148.6 GRAY, CLAYEY SAND 92.0
145										
	142.0	98.6	9	12	13	25		W		143.6 GRAY, SANDY CLAY 97.0 140.5 100.1 Boring Terminated at Elevation 140.5 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5833_BRDG0081_SPT_BORINGS.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+05	**OFFSET** 43 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,916	**EASTING** 2,131,748	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/06/17	**COMP. DATE** 11/07/17	**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)
245												
240	240.3	0.0	3	4	4	8		M		GROUND SURFACE **ROADWAY EMBANKMENT** TAN AND BROWN, SANDY CLAY	240.3	0.0
235	235.5	4.8	1	2	3	5		W		**COASTAL PLAIN** GRAY AND TAN, SANDY CLAY (MIDDENDORF FORMATION)	237.3	3.0
230	231.5	8.8	3	4	5	9		W				
225	226.5	13.8	1	4	4	8		Sat.		TAN AND WHITE, CLAYEY SAND	228.3	12.0
220	221.5	18.8	8	5	4	9		Sat.		TAN, WHITE AND ORANGE, COARSE SAND WITH GRAVEL AND SAND	223.3	17.0
215	216.5	23.8	10	9	6	15		Sat.				
210	211.5	28.8	4	8	11	19		Sat.			213.3	27.0
205	206.5	33.8	3	5	7	12		Sat.		ORANGE, CLAYEY SAND	208.3	32.0
200	201.5	38.8	4	2	4	6		Sat.				
195	196.5	43.8	7	9	7	16		Sat.		**COASTAL PLAIN** GRAY AND BLACK, SILTY SAND (CAPE FEAR FORMATION)	198.3	42.0
190	191.5	48.8	8	20	31	51		Sat.				
185	186.5	53.8	30	31	37	68		Sat.				
180	181.5	58.8	8	13	20	33		W		GRAY, SILTY CLAY	183.3	57.0
175	176.5	63.8	12	17	20	37		W				
170	171.5	68.8	12	17	19	36		W				
165	166.5	73.8	13	16	20	36		W				

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+05	**OFFSET** 43 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,916	**EASTING** 2,131,748	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/06/17	**COMP. DATE** 11/07/17	**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
165						Match Line				
160	161.5	78.8	11	13	17	30		W		GRAY, SILTY CLAY *(continued)*
155	156.5	83.8	7	13	19	32		W		
150	151.5	88.8	6	9	16	25		W		
145	146.5	93.8	13	16	21	37		Sat.		GRAY, CLAYEY SAND
140	141.5	98.8	6	9	12	21		Sat.		Boring Terminated at Elevation 140.0 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

ELEV. (ft)	DEPTH (ft)
148.3	92.0
140.0	100.3

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 27+26	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 239.7 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,934	**EASTING** 2,131,816	**24 HR.** 8.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/18/17	**COMP. DATE** 10/18/17	**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)
240											
	239.7	0.0	2	2	3	5		M		239.7 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT TAN AND BLACK, CLAYEY SAND	
										236.7	3.0
235	235.0	4.7	2	3	5	8		M		**COASTAL PLAIN** TAN AND GRAY, SANDY CLAY (MIDDENDORF FORMATION)	
										232.7	7.0
	231.1	8.6								GRAY, CLAYEY SAND	
230			3	3	3	6		Sat.			
	226.1	13.6								227.7	12.0
225			2	3	4	7	SS-96	25%		GRAY, WHITE, TAN AND PURPLE, COARSE SAND WITH GRAVEL	
	221.1	18.6									
220			7	7	3	10		Sat.			
	216.1	23.6									
215			17	14	13	27		Sat.			
	211.1	28.6								212.7	27.0
210			12	7	3	10		Sat.		TAN AND BROWN, CLAYEY SAND	
	206.1	33.6									
205			5	5	5	10		Sat.			
	201.1	38.6								202.7	37.0
200			3	6	6	12		Sat.		TAN, SILTY SAND	
	196.1	43.6								197.7	42.0
195			1	2	6	8		W		**COASTAL PLAIN** BLACK, SILTY CLAY (CAPE FEAR FORMATION)	
	191.1	48.6									
190			3	3	4	7		W			
	186.1	53.6								187.7	52.0
185			12	17	18	35		Sat.		GRAY AND BLACK, SILTY SAND	
	181.1	58.6								182.7	57.0
180			11	19	24	43		W		GRAY, SILTY CLAY AND SANDY CLAY	
	176.1	63.6									
175			15	17	27	44		W			
	171.1	68.6								172.7	67.0
170			14	23	31	54		W			
	166.1	73.6								167.7	72.0
165			9	21	28	49		Sat.		GRAY AND GREEN, CLAYEY SAND	
	161.1	78.6									
160			13	18	19	37		Sat.			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 27+26	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 239.7 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,934	**EASTING** 2,131,816	**24 HR.** 8.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/18/17	**COMP. DATE** 10/18/17	**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
160						Match Line				
	156.1	83.6	11	11	13	24		Sat.		GRAY AND GREEN, CLAYEY SAND *(continued)*
155										
	151.1	88.6	6	8	8	16		Sat.		
150										
	146.1	93.6	5	6	6	12		Sat.		
145										
	141.1	98.6	7	7	10	17		Sat.		139.6 100.1
140										Boring Terminated at Elevation 139.6 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+48	**OFFSET** 8 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,813	**EASTING** 2,131,852	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/19/17	**COMP. DATE** 10/19/17	**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)
265												
260										GROUND SURFACE	260.9	0.0
	258.1	2.8								**ROADWAY EMBANKMENT** (PAVEMENT)	258.1	2.8
	256.3	4.6	21	18	11	29		M		RED AND BROWN, CLAYEY SAND		
255			3	3	2	5		M				
	252.1	8.8	2	3	2	5		Sat.				
250											248.9	12.0
	247.1	13.8	1	1	4	5		W		RED AND BROWN, SANDY CLAY		
245											243.9	17.0
	242.1	18.8	2	2	2	4		Sat.		GRAY AND BROWN, SILTY SAND		
240											238.9	22.0
	237.1	23.8	4	4	4	8		W		**COASTAL PLAIN** GRAY, SANDY CLAY (MIDDENDORF FORMATION)		
235												
	232.1	28.8	4	7	9	16		W				
230											228.9	32.0
	227.1	33.8	4	3	3	6	SS-121	23%		GRAY, BROWN, RED AND YELLOW, SILTY SAND		
225												
	222.1	38.8	6	12	18	30		Sat.				
220												
	217.1	43.8	8	9	10	19		Sat.				
215												
	212.1	48.8	3	5	10	15		Sat.				
210												
	207.1	53.8	6	5	6	11		Sat.				
205											203.9	57.0
	202.1	58.8	3	9	12	21		Sat.		RED AND BROWN, CLAYEY SAND		
200											198.9	62.0
	197.1	63.8	3	2	4	6		W		**COASTAL PLAIN** GRAY, GREEN AND PURPLE, SILTY CLAY AND SANDY CLAY (CAPE FEAR FORMATION)		
195												
	192.1	68.8	3	5	7	12		W				
190												
	187.1	73.8	4	7	9	16		W				
185												

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+48	**OFFSET** 8 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,813	**EASTING** 2,131,852	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/19/17	**COMP. DATE** 10/19/17	**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)
185						Match Line						
	182.1	78.8	10	12	16	28		W		**COASTAL PLAIN** GRAY, GREEN AND PURPLE, SILTY CLAY AND SANDY CLAY (CAPE FEAR FORMATION) *(continued)*		
180											178.9	82.0
	177.1	83.8	9	11	14	25		W				
175											173.9	87.0
	172.1	88.8	14	27	37	64		W				
170											168.9	92.0
	167.1	93.8	14	17	21	38		Sat.		GRAY AND GREEN, CLAYEY SAND		
165											160.6	100.3
	162.1	98.8	10	11	12	23		Sat.		Boring Terminated at Elevation 160.6 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)		

SUMMARY OF LABORATOTY TEST DATA

Soil Classification and Gradation

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

S&ME Project #:	6235-16-015			Date Report	12/1/2017
State Project No.:	53083.1.1	County:	Harnett	Date Tested	11/1/17-11/30/17
Federal ID No.:	N/A	TIP No.:	I-5883		
Project Name:	Bridge No. 81 on -Y2- (SR 1709) over -L- (I-95)				
Client Name:	Michael Baker International				

Sample No.	Station #:	Offset	Boring #:	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve # 10	40	60	200	270	Total Mortar Fraction (%) Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Moist. %
SS-96	27+26	24 LT	EB2-A	Y2	13.6-15.1	A-1-b	(0)	57	26	18	8.5	7.7	39	10	1	6	28	0	N.P.	25.3
SS-121	28+48	8 RT	EB2-B	Y2	33.8-35.3	A-2-4	(0)	65	30	21	10.6	9.2	44	12	3	7	28	20	8	23.2
SS-146	25+10	10 LT	EB1-A	Y2	53.8-55.3	A-3	(0)	100	56	20	7.0	5.5	80	15	1	4	18	0	N.P.	23.1
SS-167	26+14	25 RT	EB1-B	Y2	48.8-50.3	A-3	(0)	99	61	17	6.1	4.8	82	12	3	2	17	0	N.P.	23.3

References / Comments / Deviations: ND=Not Detemined.

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	Stewart Laney, P.E.	Project Manager
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

SITE PHOTOGRAPH

Bridge No. 81 on -Y2- (SR 1709) over -L- (I-95)

Looking Southeast towards End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5883	1	15

REFERENCE: I-5883

PROJECT: 53083

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HARNETT*

PROJECT DESCRIPTION *IMPROVE I-95 INTERCHANGES AT SR 1808 (JONESBORO RD.) AND SR 1709 (HODGES CHAPEL RD.)*

SITE DESCRIPTION *BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)*

CONTENTS

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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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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

E.G. BLONSHINE

M.S. HAYES

G.H. GOSLIN

T.J. WHITE

K.S. HARDEE

INVESTIGATED BY *J.R. SWARTLEY*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *S.S. LANEY*

DATE *FEBRUARY 2018*

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

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
Jarett R. Swartley
919459487BA3471...
SIGNATURE

7/23/2018
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5883	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] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [ ] 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
- [X] BWJ RODS

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: BY75-153
NORTHING: 570733 EASTING: 2127213
ELEVATION: 230.26 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5833	3

SITE PLAN

0 50 100

FEET

SKEW = 120° 34' 30"

END MSE WALL

END BENT 1 LINE

INTERIOR BENT 1 LINE

END BENT 2 LINE

END MSE

CONCRETE BRIDGE

BRIDGE NO. 80

EB1-A

B1-A

EB2-A

EB1-B

B1-B

EB2-B

BEGIN MSE WALL

OFFSET 74.50' LT.

OFFSET 74.50' RT.

BEGIN MSE WALL

-YIRPC- PT Sta. 31+66.03

-YI- POT

TO LANE RD.

TO SADDLEBRED RD.

JONESBORO RD

NAD 83

CONC

GRAVEL

18" RCP

24" RCP

36" MTL

60" WW

60" CONC

BY75-53

328

325

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5883	4

PROFILE ALONG –Y1–

0 40 80
FEET
VE = 2:1

Ⓐ ROADWAY EMBANKMENT, TAN AND GRAY, MOIST, STIFF, SANDY CLAY
Ⓑ ROADWAY EMBANKMENT, BLACK, MOIST, LOOSE, SILTY SAND
Ⓒ COASTAL PLAIN, TAN AND GRAY, WET, SOFT, SANDY CLAY, (MIDDENDORF FORMATION)

PROPOSED GRADE

EXISTING GROUND

EB1–B
26+00
29' RT
SS-II

B1–B
27+00
25' RT
SS-328

BRIDGE NO. 80

EB2–B
28+00
25' RT

–L–

ROADWAY EMBANKMENT, BROWN, MOIST, TO LOOSE, SILTY SAND AND CLAYEY

VERY LOOSE TO LOOSE SAND

COASTAL PLAIN, GRAY, RED, BROWN, YELLOW, TAN AND RED, MOIST TO SAT., VERY LOOSE TO LOOSE, CLAYEY SAND AND SILTY SAND, (MIDDENDORF FORMATION)

GRAY, BROWN, RED, YELLOW, TAN AND PINK, WET, SOFT TO MED. STIFF, HIGHLY PLASTIC, SILTY CLAY

TAN, RED AND PINK, VERY LOOSE TO MED. DENSE, SAND, SILTY SAND AND CLAYEY SAND

COASTAL PLAIN, GRAY AND BROWN, PLASTIC, SILTY CLAY, (CAPE FEAR FORMATION) WET, VERY STIFF, HIGHLY

COASTAL PLAIN, GRAY AND TAN, SAT., MED. DENSE TO DENSE, CLAYEY SAND, (CAPE FEAR FORMATION)

COASTAL PLAIN, GRAY, GREEN AND TAN, WET, STIFF TO HARD, SILTY CLAY AND SANDY CLAY, (CAPE FEAR FORMATION)

GRAY AND GREEN, SAT., DENSE, CLAYEY SAND

GRAY, SATURATED, MEDIUM DENSE TO DENSE, CLAYEY SAND

GRAY, GREEN, RED, TAN AND PURPLE, WET, STIFF TO HARD, SANDY CLAY AND SILTY CLAY

B.T

B.T

B.T

NOTE: EXISTING GROUND SURFACE PROFILE OF –Y1– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15883_ls_dtm.tin' DATED 5/8/17. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80

24+00 25+00 26+00 27+00 28+00 29+00

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5833	5

℄

Ⓐ COASTAL PLAIN, GRAY AND GREEN, SATURATED, DENSE, CLAYEY SAND, (CAPE FEAR FORMATION)

EB1–A
26+31
30' LT

EB1–B
26+00
29' RT

SS-II

ROADWAY EMBANKMENT,

BROWN, MOIST, VERY LOOSE TO LOOSE, SILTY SAND AND CLAYEY SAND

COASTAL PLAIN, GRAY, BROWN, RED, YELLOW AND PINK, MOIST TO SATURATED, CLAYEY SAND, (MIDDENDORF FORMATION)

GRAY, RED, BROWN AND YELLOW, SOFT TO MED. STIFF,

ST-2 HIGHLY PLASTIC, SILTY CLAY

GRAY, TAN, BROWN, YELLOW AND PINK, SATURATED, LOOSE TO MED. DENSE, SILTY SAND AND SAND

YELLOW AND BROWN, WET, MED. STIFF TO VERY STIFF, SANDY CLAY

VERY STIFF TO HARD,

COASTAL PLAIN, YELLOW, BROWN, GRAY, GREEN AND BLUE, WET,

SANDY CLAY AND HIGHLY PLASTIC, SILTY CLAY, (CAPE FEAR FORMATION)

GRAY AND BROWN, SATURATED, MED. DENSE TO DENSE, SILTY SAND AND CLAYEY SAND

GRAY, BROWN AND GREEN, WET, VERY STIFF TO HARD, SILTY CLAY

GRAY AND BLUE, SAT., MED. DENSE, CLAYEY SAND

BT

BT

26+16.44

–Y/–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120° 34' 30". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

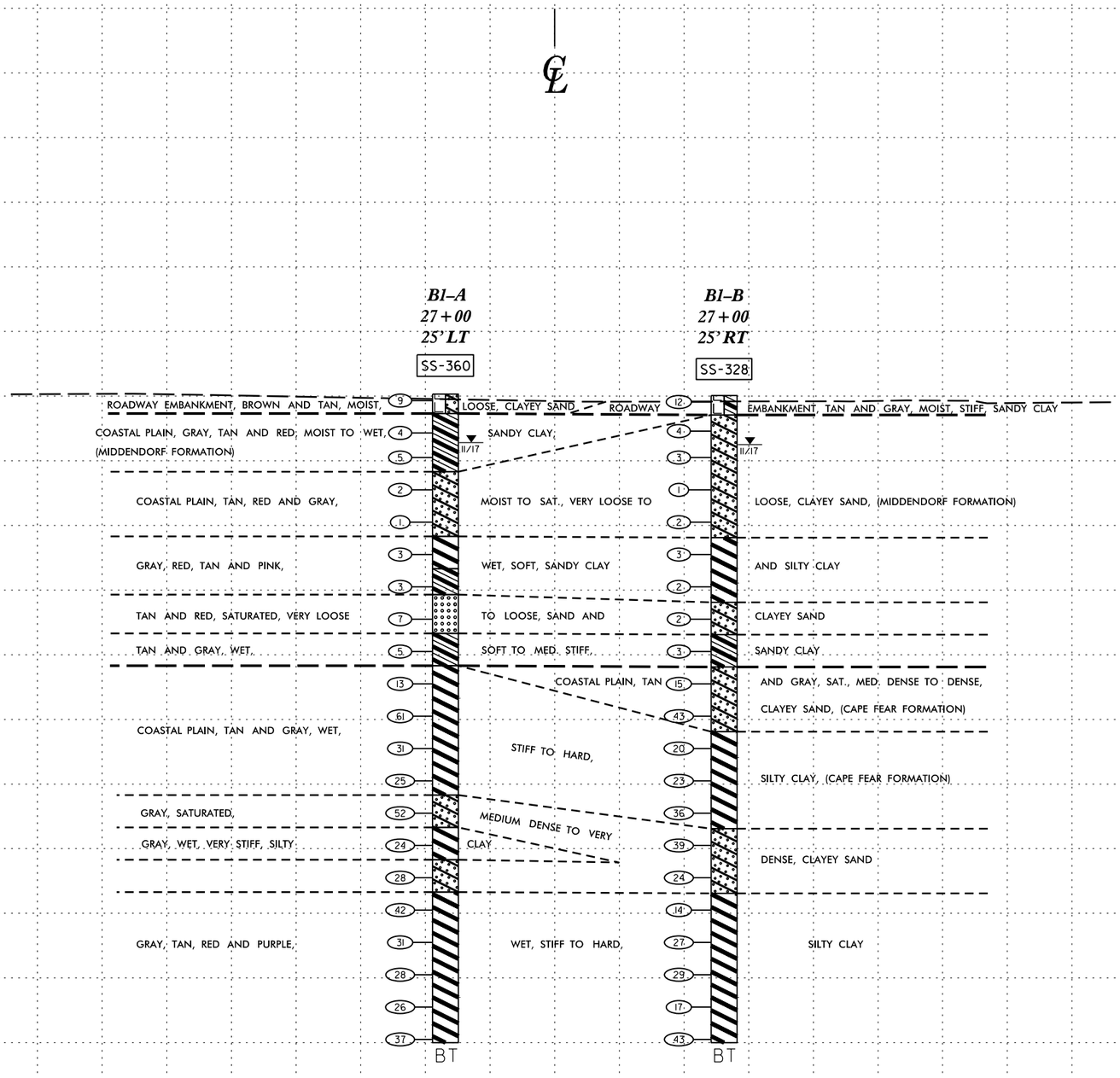
$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5833	6

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90



27 + 09.21

–Y/–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120° 34' 30". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5833	7

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90

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Ⓐ COASTAL PLAIN, GRAY AND TAN, MOIST TO WET, SOFT, SANDY CLAY, (MIDDENDORF FORMATION)
Ⓑ COASTAL PLAIN, GRAY, WET, STIFF, SILTY CLAY, (CAPE FEAR FORMATION)

EB2–A
28 + 00
25' LT
SS-64

EB2–B
28 + 00
25' RT

ROADWAY EMBANKMENT,
MOIST, LOOSE, SILTY SAND
10/17
10/17
COASTAL PLAIN, GRAY, TAN, AND RED, MOIST TO SAT., VERY LOOSE TO LOOSE, CLAYEY SAND AND SILTY SAND, (MIDDENDORF FORMATION)
GRAY, PURPLE AND RED, WET, VERY SOFT TO SOFT, HIGHLY PLASTIC, SILTY CLAY
ST-1
TAN AND GRAY, SAT., LOOSE, CLAYEY SAND AND SILTY SAND
COASTAL PLAIN, GRAY AND TAN, WET, STIFF, SILTY CLAY, (CAPE FEAR FORMATION)
GRAY AND GREEN, SAT., MED. DENSE TO DENSE, CLAYEY SAND
GRAY, WET, VERY STIFF, SANDY SILT
GRAY AND GREEN, SAT., MED. DENSE TO DENSE, CLAYEY SAND
GRAY, RED AND GREEN, WET, VERY STIFF TO HARD, SANDY CLAY

BT
BT

28 + 01.47
–Y/–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120° 34' 30". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 26+31	**OFFSET** 30 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.7 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 570,707	**EASTING** 2,126,942	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/12/17	**COMP. DATE** 10/13/17	**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)
210											
	209.7	0.0	2	2	2	4		M		209.7 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT BROWN, SILTY SAND	
205	205.3	4.4	3	2	3	5		M		206.7	3.0
										COASTAL PLAIN GRAY, BROWN, RED, YELLOW AND PINK, CLAYEY SAND (MIDDENDORF FORMATION)	
200	201.0	8.7	2	2	2	4		Sat.			
195	196.0	13.7	1	0	1	1		Sat.			
190	191.0	18.7	WOH	WOH	1	1		Sat.			
185	186.0	23.7	WOH	1	2	3		W		187.7 GRAY, RED AND BROWN, SILTY CLAY	22.0
180	181.0	28.7	WOH	5	6	11		Sat.		182.7 GRAY, TAN, BROWN AND YELLOW, SAND AND SILTY SAND	27.0
175	176.0	33.7	3	3	4	7		Sat.		177.7	32.0
170	171.0	38.7	3	3	4	7		W		172.7 YELLOW AND BROWN, SANDY CLAY	37.0
165	166.0	43.7	9	9	16	25		W			
160	161.0	48.7	6	14	28	42		W		162.7 **COASTAL PLAIN** YELLOW, BROWN, GRAY, GREEN AND BLUE, SANDY CLAY AND SILTY CLAY (CAPE FEAR FORMATION)	47.0
155	156.0	53.7	6	7	8	15		W		157.7	52.0
150	151.0	58.7	9	12	15	27		W			
145	146.0	63.7	9	13	17	30		W			
140	141.0	68.7	15	17	27	44		W			
135	136.0	73.7	14	19	23	42		Sat.		137.7 GRAY AND BROWN, SILTY SAND	72.0
130	131.0	78.7	9	14	12						

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 26+31	**OFFSET** 30 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.7 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 570,707	**EASTING** 2,126,942	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/12/17	**COMP. DATE** 10/13/17	**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
130						Match Line				
125	126.0	83.7	11	17	28	45		Sat.		GRAY AND BROWN, SILTY SAND *(continued)*
										127.7 GRAY AND BROWN, SILTY CLAY 82.0
120	121.0	88.7	5	10	13	23		W		
										122.7 GRAY AND BLUE, CLAYEY SAND 87.0
115	116.0	93.7	8	9	12	21		Sat.		
										117.7 GRAY AND GREEN, SILTY CLAY 92.0
110	111.0	98.7	12	20	27	47		W		
										109.5 Boring Terminated at Elevation 109.5 ft IN HARD SILTY CLAY (COASTAL PLAIN) 100.2

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+00	**OFFSET** 29 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.8 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 570,654	**EASTING** 2,126,901	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/11/17	**COMP. DATE** 10/12/17	**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)
210												
	209.8	0.0	1	2	4	6		M		GROUND SURFACE **ROADWAY EMBANKMENT** BROWN, SILTY SAND	209.8	0.0
	206.2	3.6									207.3	2.5
205			2	2	1	3		M		BROWN, CLAYEY SAND		
	201.2	8.6									203.1	6.7
200			2	3	2	5		Sat.		**COASTAL PLAIN** RED, BROWN, YELLOW AND GRAY, CLAYEY SAND (MIDDENDORF FORMATION)		
	196.2	13.6										
195			1	1	2	3		Sat.				
	191.2	18.6										
190			1	2	2	4		Sat.				
	186.2	23.6									187.8	22.0
185			1	1	1	2		W		BROWN, RED AND YELLOW, HIGHLY PLASTIC, SILTY CLAY		
	181.2	28.6										
180			7	3	4	7		W				
	176.2	33.6									178.1	31.7
175			3	3	4	7		Sat.		PINK SAND		
	171.2	38.6										
170			4	5	8	13		Sat.				
	166.2	43.6									168.1	41.7
165			10	13	12	25		W		**COASTAL PLAIN** GRAY AND BROWN, HIGHLY PLASTIC, SILTY CLAY (CAPE FEAR FORMATION)		
	161.2	48.6										
160			7	9	11	20	SS-11	23%				
	156.2	53.6									158.1	51.7
155			10	14	27	41		Sat.		GRAY, CLAYEY SAND		
	151.2	58.6									153.1	56.7
150			11	14	18	32		W		GRAY, SILTY CLAY		
	146.2	63.6									148.1	61.7
145			6	15	32	47		Sat.		GRAY AND GREEN, CLAYEY SAND		
	141.2	68.6									143.1	66.7
140			6	9	13	22		W		GRAY AND GREEN, SANDY CLAY		
	136.2	73.6									138.1	71.7
135			15	17	20	37		Sat.		GRAY, CLAYEY SAND		
	131.2	78.6									133.1	76.7
130			6	12	13	25		W		GRAY AND GREEN, SILTY CLAY		

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+00	**OFFSET** 29 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.8 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 570,654	**EASTING** 2,126,901	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/11/17	**COMP. DATE** 10/12/17	**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
130						Match Line				GRAY AND GREEN, SILTY CLAY *(continued)*
	126.2	83.6	11	15	21	36		W		
125										
	121.2	88.6	10	16	19	35		W		
120										
	116.2	93.6	9	13	18	31		W		
115										
	111.2	98.6	12	21	31	52		W		109.7 100.1
110										Boring Terminated at Elevation 109.7 ft IN HARD SILTY CLAY (COASTAL PLAIN) ST-2 Pushed at Sta. 26+00, 31 RT, -Y1- <u>Other Samples:</u> ST-2 (23.5 - 25.5)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 27+00	**OFFSET** 25 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 210.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 570,690	**EASTING** 2,127,009	**24 HR.** 7.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 11/01/17	**COMP. DATE** 11/02/17	**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)
215												
210	210.3	0.0	3	4	5	9		M		GROUND SURFACE **ROADWAY EMBANKMENT** BROWN AND TAN, CLAYEY SAND	210.3	0.0
205	205.3	5.0	2	2	2	4				**COASTAL PLAIN** GRAY, TAN AND RED, SANDY CLAY (MIDDENDORF FORMATION)	207.3	3.0
200	201.5	8.8	1	2	3	5		W				
195	196.5	13.8	WOH	1	1	2		Sat.		TAN AND RED, CLAYEY SAND	198.3	12.0
190	191.5	18.8	1	0	1	1		Sat.				
185	186.5	23.8	WOH	1	2	3		W		GRAY, RED AND TAN, SILTY CLAY AND SANDY CLAY	188.3	22.0
180	181.5	28.8	2	1	2	3		W			183.3	27.0
175	176.5	33.8	3	3	4	7		Sat.		TAN AND RED, SAND	179.3	31.0
170	171.5	38.8	3	2	3	5		W		TAN AND GRAY, SANDY CLAY	173.3	37.0
165	166.5	43.8	3	6	7	13		W		**COASTAL PLAIN** TAN AND GRAY, SILTY CLAY (CAPE FEAR FORMATION)	168.3	42.0
160	161.5	48.8	12	23	38	61		W				
155	156.5	53.8	9	12	19	31		W				
150	151.5	58.8	9	11	14	25		W				
145	146.5	63.8	16	21	31	52	SS-360	18%		GRAY, CLAYEY SAND	148.3	62.0
140	141.5	68.8	11	11	13	24		W		GRAY, SILTY CLAY	143.3	67.0
135	136.5	73.8	16	16	12	28		Sat.		GRAY, CLAYEY SAND	138.3	72.0

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 27+00	**OFFSET** 25 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 210.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 570,690	**EASTING** 2,127,009	**24 HR.** 7.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 11/01/17	**COMP. DATE** 11/02/17	**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)
135						Match Line						
130	131.5	78.8	11	18	24	42		W		GRAY, CLAYEY SAND *(continued)*	133.3	77.0
125	126.5	83.8	12	14	17	31		W		GRAY, SILTY CLAY		
120	121.5	88.8	9	12	16	28		W				
115	116.5	93.8	8	12	14	26		W				
110	111.5	98.8	12	14	23	37		W		Boring Terminated at Elevation 110.0 ft IN HARD SILTY CLAY (COASTAL PLAIN)	110.0	100.3

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+00	**OFFSET** 25 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 210.1 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 570,641	**EASTING** 2,127,000	**24 HR.** 7.6
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/02/17	**COMP. DATE** 11/03/17	**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)
215												
210	210.1	0.0	2	5	7	12		M		GROUND SURFACE	210.1	0.0
										ROADWAY EMBANKMENT TAN AND GRAY, SANDY CLAY	207.1	3.0
205	205.6	4.5	1	2	2	4		M		**COASTAL PLAIN** GRAY, TAN AND RED, CLAYEY SAND (MIDDENDORF FORMATION)		
	201.5	8.6										
200			1	1	2	3	SS-328	20%				
	196.5	13.6										
195			1	0	1	1		Sat.				
	191.5	18.6										
190			1	1	1	2		Sat.				
	186.5	23.6									188.1	22.0
185			WOH	1	2	3		W		GRAY, TAN AND PINK, SILTY CLAY		
	181.5	28.6										
180			WOH	1	1	2		W				
	176.5	33.6									178.1	32.0
175			1	1	1	2		Sat.		TAN AND RED, CLAYEY SAND		
	171.5	38.6									173.1	37.0
170			4	1	2	3		W		TAN AND GRAY, SANDY CLAY		
	166.5	43.6									168.1	42.0
165			4	6	9	15		Sat.		**COASTAL PLAIN** TAN AND GRAY, CLAYEY SAND (CAPE FEAR FORMATION)		
	161.5	48.6										
160			5	16	27	43		Sat.				
	156.5	53.6									158.1	52.0
155			4	7	13	20		W		GRAY AND TAN, SILTY CLAY		
	151.5	58.6										
150			4	7	16	23		W				
	146.5	63.6										
145			2	16	20	36		W				
	141.5	68.6									143.1	67.0
140			10	16	23	39		Sat.		GRAY, CLAYEY SAND		
	136.5	73.6										
135			7	8	16	24		Sat.				

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+00	**OFFSET** 25 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 210.1 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 570,641	**EASTING** 2,127,000	**24 HR.** 7.6
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/02/17	**COMP. DATE** 11/03/17	**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)
135						Match Line						
	131.5	78.6	4	5	9	14		W		GRAY, CLAYEY SAND *(continued)*	133.1	77.0
130										GRAY, TAN, RED AND PURPLE, SILTY CLAY		
	126.5	83.6	10	11	16	27		W				
125												
	121.5	88.6	10	12	17	29		W				
120												
	116.5	93.6	6	7	10	17		W				
115												
	111.5	98.6	12	18	25	43		W			110.0	100.1
110										Boring Terminated at Elevation 110.0 ft IN HARD SILTY CLAY (COASTAL PLAIN)		

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+00	**OFFSET** 25 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.2 ft	**TOTAL DEPTH** 105.4 ft	**NORTHING** 570,672	**EASTING** 2,127,108	**24 HR.** 6.2
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/16/17	**COMP. DATE** 10/17/17	**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)
210											
	209.2	0.0	4	4	3	7		M		209.2 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT BROWN, SILTY SAND	
205	204.9	4.3	WOH	2	2	4				206.2 **COASTAL PLAIN** GRAY AND TAN, SANDY CLAY (MIDDENDORF FORMATION	3.0
200	200.3	8.9	1	2	2	4		Sat.		201.7 TAN AND RED, CLAYEY SAND	7.5
195	195.3	13.9	2	1	2	3		Sat.			
190	190.3	18.9	1	0	1	1		Sat.		189.3 GRAY, PURPLE AND RED, SILTY CLAY	19.9
185	185.3	23.9	1	1	0	1		W			
180	180.3	28.9	3	2	2	4		Sat.		181.7 TAN, SILTY SAND	27.5
175	175.3	33.9	4	4	3	7		Sat.			
170	170.3	38.9	3	3	4	7		Sat.		172.2 TAN, CLAYEY SAND	37.0
165	165.3	43.9	3	4	4	8		Sat.		164.3 **COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	44.9
160	160.3	48.9	3	5	7	12		W			
155	155.3	53.9	4	7	9	16		Sat.		157.2 GRAY, CLAYEY SAND	52.0
150	150.3	58.9	4	6	9	15		Sat.		149.1 GRAY, SILTY CLAY	60.1
145	145.3	63.9	14	13	16	29		Sat.		147.2 GRAY, CLAYEY SAND	62.0
140	140.3	68.9	9	7	11	18	SS-64	20%		142.2 GRAY, SANDY SILT	67.0
135	135.3	73.9	8	10	12	22		Sat.		137.2 GRAY AND GREEN, CLAYEY SAND	72.0
130	130.3	78.9									

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+00	**OFFSET** 25 ft LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 209.2 ft	**TOTAL DEPTH** 105.4 ft	**NORTHING** 570,672	**EASTING** 2,127,108	**24 HR.** 6.2
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/16/17	**COMP. DATE** 10/17/17	**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
130						Match Line				
	125.3	83.9	6	10	12	22		Sat.		GRAY AND GREEN, CLAYEY SAND *(continued)*
125			7	11	21	32		Sat.		
120	120.3	88.9	8	9	10	19		Sat.		117.2 GRAY AND RED, SANDY CLAY 92.0
115	115.3	93.9	10	12	15	27		W		
110	110.3	98.9	19	24	30	54		W		
105	105.3	103.9	13	16	22	38		W		103.8 Boring Terminated at Elevation 103.8 ft IN HARD SANDY CLAY (COASTAL PLAIN) 105.4

NCDOT BORE DOUBLE I5833_GEO_BRDG0080_SPT_BORINGS.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+00	**OFFSET** 25 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 207.5 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 570,623	**EASTING** 2,127,099	**24 HR.** 4.3
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/17/17	**COMP. DATE** 10/17/17	**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)
210											
	207.5	0.0						M		207.5 GROUND SURFACE	0.0
			1	3	3	6				**ROADWAY EMBANKMENT** BLACK, SILTY SAND	
205										204.5	3.0
	203.0	4.5	2	3	3	6		Sat.		**COASTAL PLAIN** GRAY, TAN AND RED, CLAYEY SAND (MIDDENDORF FORMATION)	
200											
	199.0	8.5	2	2	3	5		Sat.			
195										195.5	12.0
	194.0	13.5	2	2	1	3		Sat.		TAN AND RED, SILTY SAND	
190										190.5	17.0
	189.0	18.5	1	1	2	3		W		GRAY AND RED, HIGHLY PLASTIC, SILTY CLAY	
185											
	184.0	23.5	WOH	1	1	2		W			
180										180.5	27.0
	179.0	28.5	4	2	3	5		Sat.		TAN, SILTY SAND	
175											
	174.0	33.5	3	2	2	4		Sat.			
170										170.5	37.0
	169.0	38.5	3	2	3	5		Sat.		GRAY AND TAN, CLAYEY SAND	
165										165.5	42.0
	164.0	43.5	3	6	6	12		W		**COASTAL PLAIN** GRAY AND TAN, SILTY CLAY (CAPE FEAR FORMATION)	
160										160.5	47.0
	159.0	48.5	6	10	15	25		Sat.		GRAY, CLAYEY SAND	
155											
	154.0	53.5	4	7	8	15		Sat.			
150											
	149.0	58.5	7	7	15	22		Sat.			
145											
	144.0	63.5	11	15	14	29		Sat.			
140											
	139.0	68.5	16	20	18	38		Sat.			
135											
	134.0	73.5	8	9	10	19		Sat.			
130											

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
130						Match Line				
	129.0	78.5	8	12	19	31		Sat.		GRAY, CLAYEY SAND *(continued)*
125										125.5 82.0
	124.0	83.5	9	13	16	29		W		GRAY, RED AND GREEN, SANDY CLAY
120										
	119.0	88.5	7	9	12	21		W		
115										
	114.0	93.5	12	13	19	32		W		
110										
	109.0	98.5	11	22	18	40		W		107.5 100.0
										Boring Terminated at Elevation 107.5 ft IN HARD SANDY CLAY (COASTAL PLAIN)
										ST-1 Pushed at Sta. 28+05, 25 RT, -Y1-
										Other Samples: ST-1 (18.8 - 20.7)

WBS 53083.1.1	**TIP** I-5883	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.
SITE DESCRIPTION BRIDGE NO. 80 ON -Y1- (SR 1808) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+00	**OFFSET** 25 ft RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 207.5 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 570,623	**EASTING** 2,127,099	**24 HR.** 4.3
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 8/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/17/17	**COMP. DATE** 10/17/17	**SURFACE WATER DEPTH** N/A

SUMMARY OF LABORATOTY TEST DATA

Soil Classification and Gradation

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

S&ME Project #:	6235-16-015			Date Report	12/1/2017
State Project No.:	53083.1.1	County:	Harnett	Date Tested	11/1/17-11/30/17
Federal ID No.:	N/A	TIP No.:	I-5883		
Project Name:	Bridge No. 80 on -Y1- (SR 1808) over -L- (I-95)				
Client Name:	Michael Baker International				

Sample No.	Station #:	Offset	Boring #:	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve # 10	40	60	200	270	Total Mortar Fraction (%) Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Moist. %
SS-11	26+00	29 RT	EB1-B	Y1	48.6-50.1	A-7-6	(8)	100	97	95	48.1	42.4	5	53	8	34	43	17	26	23.3
SS-64	28+00	25 LT	EB2-A	Y1	68.9-70.4	A-4	(1)	100	97	95	55.8	36.1	5	59	30	6	30	26	4	19.8
SS-328	27+00	25 RT	B1-B	Y1	8.6-10.1	A-2-6	(0)	100	61	43	26.7	25.4	57	18	7	18	37	22	15	20.2
SS-360	27+00	25 LT	B1-A	Y1	63.8-65.3	A-2-7	(0)	100	48	30	18.6	15.2	70	15	10	5	41	22	19	18.4
ST-1	28+05	25 RT	EB2-B	Y1	18.8-20.7	A-7-6	(45)	100	100	99	98.7	96.5	1	3	36	60	64	25	39	41.0
ST-2	26+00	31 RT	EB1-B	Y1	23.5-25.5	A-7-6	(46)	100	99	98	97.0	94.3	2	4	34	60	65	23	42	37.8

References / Comments / Deviations: ND=Not Detemined.

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	Stewart Laney, P.E.	Project Manager
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

SITE PHOTOGRAPH

Bridge No. 80 on -Y1- (SR 1808) over -L- (I-95)

Looking West towards End Bent 1

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5883	1	15

REFERENCE: I-5883

PROJECT: 53083

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HARNETT*

PROJECT DESCRIPTION *IMPROVE I-95 INTERCHANGES AT SR 1808 (JONESBORO RD.) AND SR 1709 (HODGES CHAPEL RD.)*

SITE DESCRIPTION *BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)*

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.

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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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

E.G. BLONSHINE

M.S. HAYES

G.H. GOSLIN

T.J. WHITE

K.S. HARDEE

INVESTIGATED BY *J.R. SWARTLEY*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *S.S. LANEY*

DATE *FEBRUARY 2018*

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

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
Jarett R. Swartley
919459487BA3471
SIGNATURE

7/23/2018
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5883	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] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [ ] 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
- [X] BWJ RODS

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.

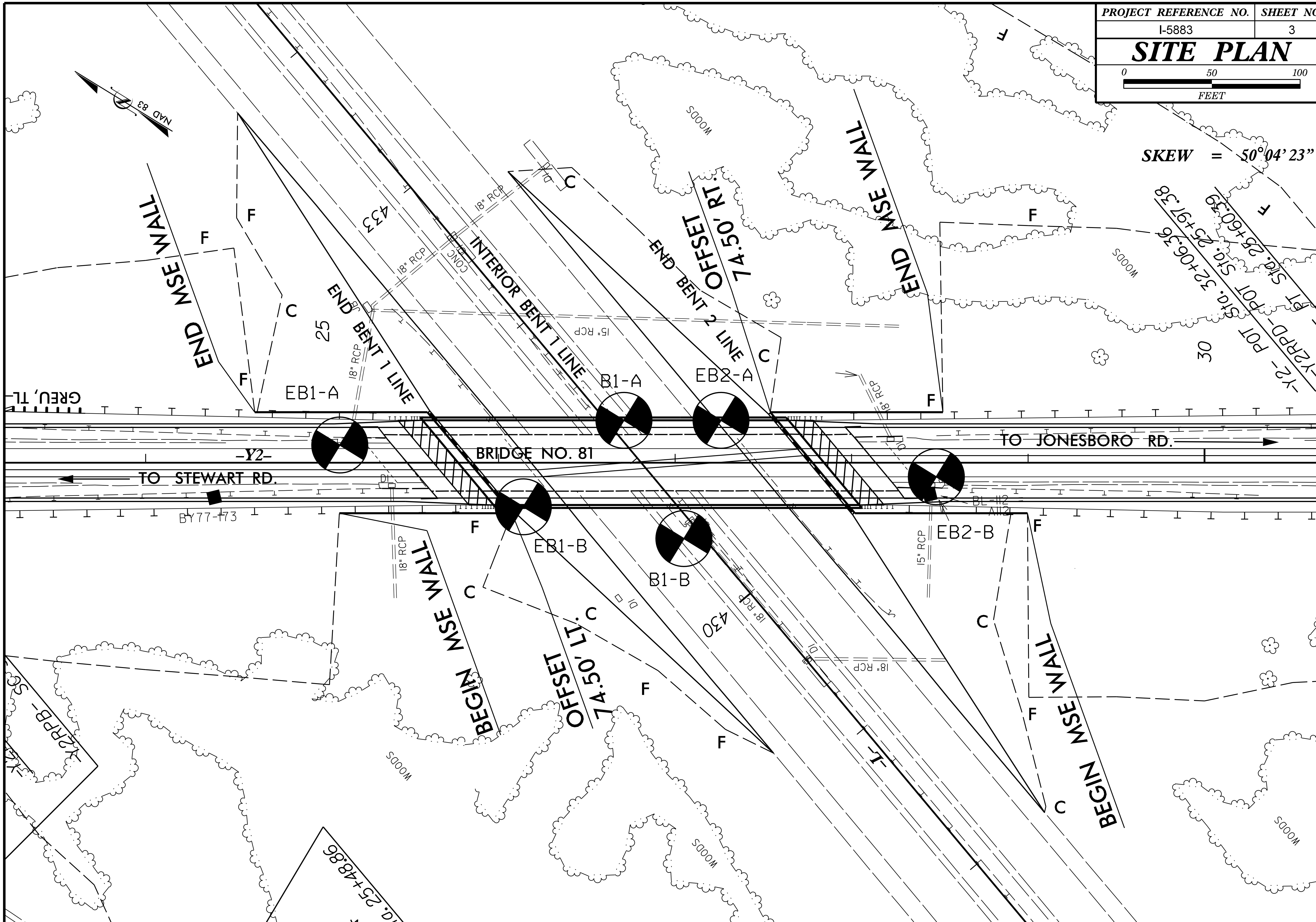
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY77-173
NORTHING: 580156 EASTING: 2131628
ELEVATION: 259.26 FEET

NOTES:

DATE: 8-15-14


PROJECT REFERENCE NO.
I-5883
SHEET NO.
3
SITE PLAN
0
50
100
FEET
SKEW = 50°04' 23"
NAD 83
END MSE WALL
BEGIN MSE WALL
END BENT 1 LINE
INTERIOR BENT 1 LINE
END BENT 2 LINE
OFFSET 74.50' RT.
OFFSET 74.50' LT.
EB1-A
EB1-B
B1-A
B1-B
EB2-A
EB2-B
BRIDGE NO. 81
-Y2-
TO STEWART RD.
TO JONESBORO RD.
BY77-173
WOODS
18" RCP
15" RCP
CONC
-Y2- POT Sta. 32+06.36
-Y2RPD- POT Sta. 25+97.38
-Y2RPD- PT Sta. 25+60.39
-Y2RPB-
Sta. 25+48.86
GREU, TL
BL-112
All2

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5883	4

PROFILE ALONG –Y2–

0 40 80
FEET
VE = 2:1

Ⓐ ROADWAY EMBANKMENT, TAN AND BROWN, MOIST, MED. STIFF, SANDY CLAY
Ⓑ COASTAL PLAIN, BROWN AND BLACK, WET, MED. STIFF TO STIFF, SANDY CLAY AND SILTY CLAY, (CAPE FEAR FORMATION)
Ⓒ COASTAL PLAIN, GRAY, WET, VERY STIFF, SILTY CLAY, (CAPE FEAR FORMATION)

PROPOSED GRADE

EXISTING GROUND

BRIDGE NO. 81

EB1–A
25+10
10' LT
SS-146

EB1–B
26+14
25' RT
SS-167

B1–B
27+05
43' RT

EB2–B
28+48
8' RT
SS-121

PAVEMENT
ROADWAY EMBANKMENT, BROWN, MOIST, VERY LOOSE COARSE SAND WITH
BROWN, MOIST, SOFT,
BROWN, MOIST, LOOSE,
COASTAL PLAIN,
GRAY, BROWN, RED,
COASTAL PLAIN,
COASTAL PLAIN,
20 6 3 2 4 6 8 4 18 15 10 22 10 15 16 38 20 35 62 35 49 21
FIAD
BT

GRAY, RED AND TO MED. DENSE, GRAVEL AND CLAYEY SAND
SANDY CLAY
SILTY SAND AND CLAYEY SAND
GRAY, TAN AND BLACK,
YELLOW, WHITE, TAN, ORANGE
GRAY AND BLACK, SATURATED, MED.
GRAY, TAN AND BLACK,
GRAY AND
8 7 6 8 11 18 11 9 7 6 77 25 53 36 47 25 39 17 40 32 19
10/17
Ⓒ
BT

MOIST TO WET,
AND PURPLE, LOOSE TO DENSE,
DENSE TO VERY DENSE, SAND,
WET, MED. STIFF
GREEN, SATURATED,
8 5 9 8 9 15 19 12 6 16 51 68 33 37 36 36 30 32 25 37 21
10/17
Ⓐ
Ⓑ
Ⓒ
BT

MED. STIFF TO VERY STIFF, SANDY CLAY,
COARSE SAND WITH GRAVEL, SAND, SILTY SAND AND
SILTY SAND AND CLAYEY SAND, (CAPE FEAR FORMATION)
TO VERY STIFF, SANDY CLAY,
MED. DENSE TO DENSE,

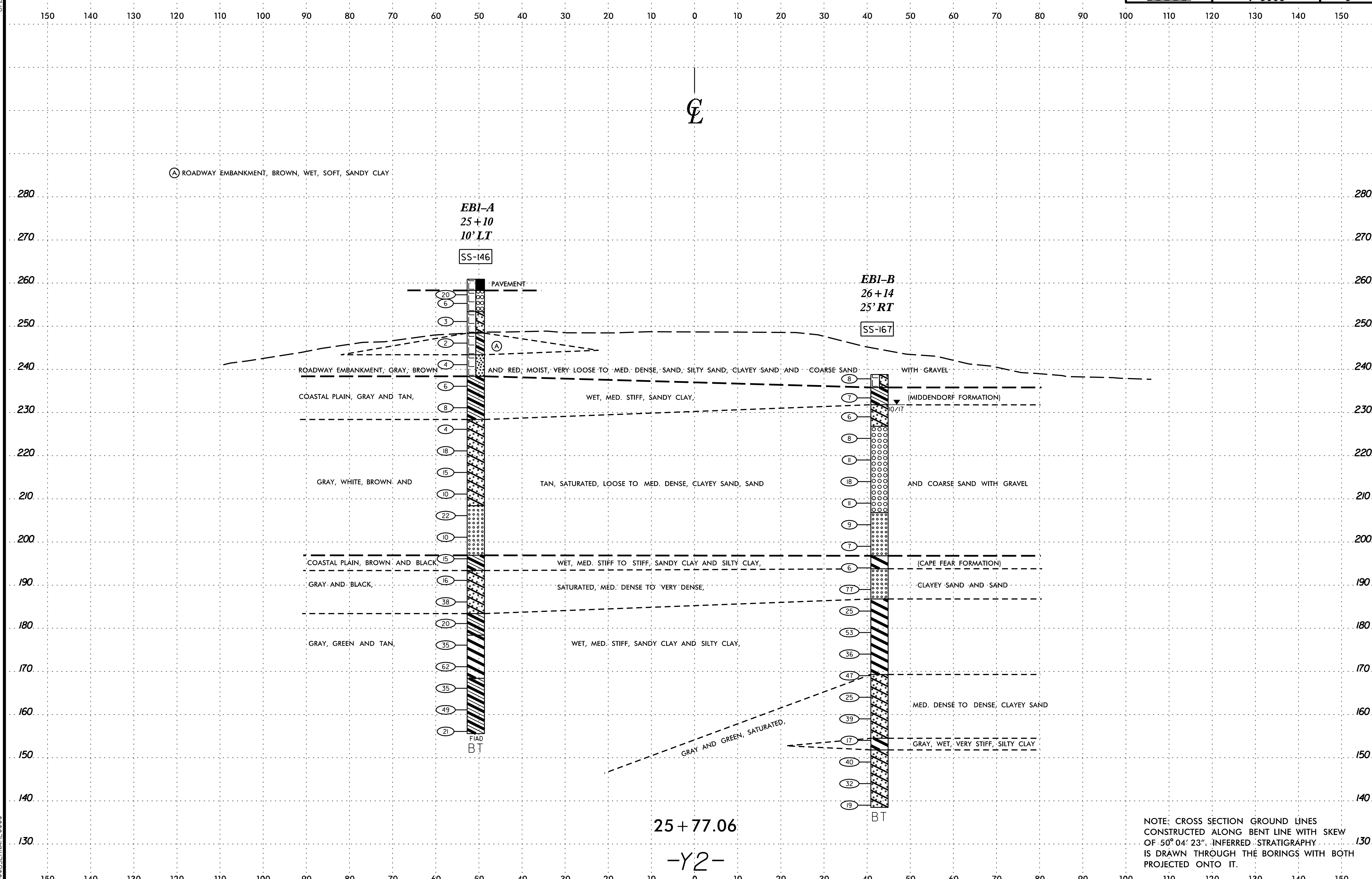
PAVEMENT
ROADWAY EMBANKMENT, LOOSE TO MED. DENSE, CLAYEY SAND
RED AND BROWN, MOIST, MED. STIFF, SANDY CLAY
GRAY AND BROWN, MOIST, LOOSE, SILTY SAND
(MIDDENDORF FORMATION)
CLAYEY SAND
(CAPE FEAR FORMATION)
CLAYEY SAND
29 5 5 5 4 8 16 6 30 19 15 11 21 6 12 16 28 25 64 38 23
FIAD
BT

NOTE: EXISTING GROUND SURFACE PROFILE OF –Y2– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15883_ls_dtm.tin' DATED 5/8/17. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110

24+00 25+00 26+00 27+00 28+00 29+00

PROJ. REFERENCE NO.	SHEET NO.
I-5883	5



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04′ 23″. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5883	6

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

℄

260 250 240 230 220 210 200 190 180 170 160 150 140 130

B1–A
26+71
24' LT

B1–B
27+05
43' RT

B1–A		B1–B	
8	ROADWAY EMBANKMENT, RED AND TAN, MOIST,	8	ROADWAY EMBANKMENT, TAN AND BROWN, MOIST, STIFF, SANDY CLAY
5	LOOSE, CLAYEY SAND	5	
8	▼ 11/17	9	▼ 11/17
4	COASTAL PLAIN, GRAY AND TAN, MOIST TO WET, MED. STIFF TO STIFF, SANDY CLAY AND	8	SILTY CLAY, (MIDDENDORF FORMATION)
14		9	
28	GRAY, TAN, ORANGE AND WHITE, SATURATED, LOOSE TO MED. DENSE, CLAYEY SAND, SILTY SAND,	15	SAND AND COARSE SAND WITH GRAVEL
13		19	
7		12	
9		6	
4	COASTAL PLAIN, GRAY AND BLACK, SAT.,	16	MED. DENSE TO VERY DENSE, SILTY SAND,
8		51	
11		68	(CAPE FEAR FORMATION)
24		33	
39		37	
55	COASTAL PLAIN, GRAY, WET, MED. STIFF TO HARD, SILTY CLAY,	36	(CAPE FEAR FORMATION)
19		36	
19		30	
26		32	
40		25	
41	GRAY, SATURATED, MED. DENSE TO DENSE,	37	CLAYEY SAND
25	GRAY, WET, VERY STIFF, SANDY CLAY	21	
BT		BT	

26+80.74

–Y2–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04' 23". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5883	7

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

℄

280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130

EB2–A
27+26
24' LT
SS-96

EB2–B
28+48
8' RT
SS-121

PAVEMENT

ROADWAY EMBANKMENT, GRAY, BROWN, RED, TAN AND BLACK, MOIST, LOOSE TO MED. DENSE,

RED AND BROWN, MOIST, MED. STIFF, SANDY CLAY

SILTY SAND AND CLAYEY SAND

COASTAL PLAIN, GRAY AND TAN, MOIST TO WET, STIFF, SANDY CLAY,

(MIDDENDORF FORMATION)

GRAY, BROWN, TAN, WHITE, YELLOW AND PURPLE, MOIST TO SATURATED, LOOSE TO DENSE, SILTY SAND, CLAYEY SAND, SAND AND COARSE SAND WITH GRAVEL

COASTAL PLAIN, BLACK, GRAY, GREEN AND PURPLE, WET, MED. STIFF TO HARD, SILTY CLAY AND SANDY CLAY, (CAPE FEAR FORMATION)

GRAY AND BLACK, SAT., DENSE, SILTY SAND

GRAY AND GREEN, SATURATED, MED. DENSE TO DENSE, CLAYEY SAND

BT

FIAD

27+84.40

–Y2–

NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 50° 04' 23". INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 25+10	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 105.3 ft	**NORTHING** 580,110	**EASTING** 2,131,691	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/20/17	**COMP. DATE** 10/20/17	**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)
265											
260										260.9 GROUND SURFACE	0.0
	258.3	2.6								**ROADWAY EMBANKMENT** (PAVEMENT)	
	256.3	4.6	15	11	9	20		M		258.3 RED AND BROWN, COARSE SAND WITH GRAVEL	2.6
255			3	3	3	6		M			
	252.1	8.8								253.4 GRAY AND RED, CLAYEY SAND	7.5
250			2	2	1	3		Sat.			
	247.1	13.8								248.4 BROWN, SANDY CLAY	12.5
245			1	1	1	2		W			
	242.1	18.8								243.4 BROWN, SILTY SAND	17.5
240			3	2	2	4		Sat.			
	237.1	23.8								238.4 **COASTAL PLAIN** GRAY, SANDY CLAY (MIDDENDORF FORMATION)	22.5
235			4	3	3	6		W			
	232.1	28.8									
230			4	4	4	8		W			
	227.1	33.8								228.4 GRAY AND WHITE, CLAYEY SAND	32.5
225			2	2	2	4		Sat.			
	222.1	38.8									
220			7	10	8	18		Sat.			
	217.1	43.8									
215			10	9	6	15		Sat.			
	212.1	48.8									
210			3	6	4	10		Sat.			
	207.1	53.8								208.4 BROWN AND GRAY, SAND	52.5
205			11	11	11	22	SS-146	23%			
	202.1	58.8									
200			4	5	5	10		Sat.			
	197.1	63.8								196.9 **COASTAL PLAIN** BROWN, SANDY CLAY (CAPE FEAR FORMATION)	64.0
195			7	6	9	15		W			
	192.1	68.8								193.4 GRAY, CLAYEY SAND	67.5
190			5	6	10	16		Sat.			
	187.1	73.8									
185			6	17	21	38		Sat.			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 25+10	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 105.3 ft	**NORTHING** 580,110	**EASTING** 2,131,691	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER White, T.J.	**START DATE** 10/20/17	**COMP. DATE** 10/20/17	**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
185						Match Line				
	182.1	78.8	4	8	12	20		W		GRAY, CLAYEY SAND *(continued)* 183.4 77.5
180										GRAY AND GREEN, SANDY CLAY AND SILTY CLAY
	177.1	83.8	13	16	19	35		W		178.4 82.5
175										
	172.1	88.8	18	26	36	62		W		
170										168.4 92.5
	167.1	93.8	9	14	21	35		W		
165										
	162.1	98.8	14	21	28	49		W		
160										
	157.1	103.8	9	10	11	21		W		155.6 105.3
										Boring Terminated at Elevation 155.6 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+14	**OFFSET** 25 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 238.8 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 580,003	**EASTING** 2,131,715	**24 HR.** 7.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/23/17	**COMP. DATE** 10/24/17	**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)
240											
	238.8	0.0	2	5	3	8		M		238.8 GROUND SURFACE	0.0
235	234.4	4.4	2	3	4	7				**ROADWAY EMBANKMENT** BROWN, CLAYEY SAND	
										235.8 **COASTAL PLAIN** GRAY AND TAN, SANDY CLAY (MIDDENDORF FORMATION)	3.0
230	230.0	8.8	3	3	3	6		Sat.		231.8 GRAY, CLAYEY SAND	7.0
225	225.0	13.8	2	3	5	8		Sat.		226.8 WHITE AND TAN, COARSE SAND WITH GRAVEL	12.0
220	220.0	18.8	5	4	7	11		Sat.			
215	215.0	23.8	8	10	8	18		Sat.			
210	210.0	28.8	7	6	5	11		Sat.		206.8 GRAY AND TAN, SAND	32.0
205	205.0	33.8	3	4	5	9		Sat.			
200	200.0	38.8	3	3	4	7		Sat.		196.8 **COASTAL PLAIN** BLACK, SILTY CLAY (CAPE FEAR FORMATION)	42.0
195	195.0	43.8	1	1	5	6		W		193.8 BLACK, SAND	45.0
190	190.0	48.8	10	35	42	77	SS-167	23%		186.8 GRAY, SILTY CLAY	52.0
185	185.0	53.8	5	10	15	25		W			
180	180.0	58.8	12	23	30	53		W			
175	175.0	63.8	11	17	19	36		W			
170	170.0	68.8	17	22	25	47		W		169.3 GRAY AND GREEN, CLAYEY SAND	69.5
165	165.0	73.8	10	12	13	25		Sat.			
160	160.0	78.8									

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 26+14	**OFFSET** 25 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 238.8 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 580,003	**EASTING** 2,131,715	**24 HR.** 7.0
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/23/17	**COMP. DATE** 10/24/17	**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
160						Match Line				
	155.0	83.8	13	18	21	39		Sat.		GRAY AND GREEN, CLAYEY SAND *(continued)*
155	150.0	88.8	10	7	10	17		W		154.5 GRAY, SILTY CLAY 84.3
150	145.0	93.8	12	19	21	40		Sat.		151.8 GRAY AND GREEN, CLAYEY SAND 87.0
145	140.0	98.8	8	16	16	32		Sat.		
140			7	8	11	19		Sat.		138.5 Boring Terminated at Elevation 138.5 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN) 100.3

NCDOT BORE DOUBLE I5833_BRDG0081_SPT_BORINGS.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+71	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.6 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,981	**EASTING** 2,131,787	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/07/17	**COMP. DATE** 11/08/17	**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)
245											
240	240.6	0.0	3	4	4	8		M		240.6 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED AND TAN, CLAYEY SAND	
	236.0	4.6								237.6	3.0
235			1	2	3	5				**COASTAL PLAIN** GRAY AND TAN, SILTY CLAY (MIDDENDORF FORMATION)	
	232.0	8.6									
230			2	3	5	8		W			
	227.0	13.6								228.6	12.0
225			1	2	2	4		Sat.		GRAY, CLAYEY SAND	
	222.0	18.6									
220			6	8	6	14		Sat.			
	217.0	23.6									
215			6	13	15	28		Sat.			
	212.0	28.6								213.6	27.0
210			4	7	6	13		Sat.		TAN, GRAY AND ORANGE, SILTY SAND	
	207.0	33.6									
205			3	4	3	7		Sat.			
	202.0	38.6									
200			5	4	5	9		Sat.			
	197.0	43.6								198.6	42.0
195			11	2	2	4		W		**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
	192.0	48.6									
190			3	3	5	8		W			
	187.0	53.6									
185			3	6	5	11		W			
	182.0	58.6									
180			6	9	15	24		W			
	177.0	63.6									
175			14	17	22	39		W			
	172.0	68.6									
170			14	23	32	55		W			
	167.0	73.6									
165			6	8	11	19		W			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+71	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.6 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,981	**EASTING** 2,131,787	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/07/17	**COMP. DATE** 11/08/17	**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
165						Match Line				
	162.0	78.6	6	8	11	19		W		**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION) *(continued)*
160										
	157.0	83.6	11	12	14	26		W		
155										
	152.0	88.6	14	19	21	40		W		
150										
	147.0	93.6	16	18	23	41		Sat.		148.6 GRAY, CLAYEY SAND 92.0
145										
	142.0	98.6	9	12	13	25		W		143.6 GRAY, SANDY CLAY 97.0 140.5 100.1 Boring Terminated at Elevation 140.5 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5833_BRDG0081_SPT_BORINGS.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+05	**OFFSET** 43 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,916	**EASTING** 2,131,748	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/06/17	**COMP. DATE** 11/07/17	**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)
245												
240	240.3	0.0	3	4	4	8		M		GROUND SURFACE **ROADWAY EMBANKMENT** TAN AND BROWN, SANDY CLAY	240.3	0.0
235	235.5	4.8	1	2	3	5		W		**COASTAL PLAIN** GRAY AND TAN, SANDY CLAY (MIDDENDORF FORMATION)	237.3	3.0
230	231.5	8.8	3	4	5	9		W				
225	226.5	13.8	1	4	4	8		Sat.		TAN AND WHITE, CLAYEY SAND	228.3	12.0
220	221.5	18.8	8	5	4	9		Sat.		TAN, WHITE AND ORANGE, COARSE SAND WITH GRAVEL AND SAND	223.3	17.0
215	216.5	23.8	10	9	6	15		Sat.				
210	211.5	28.8	4	8	11	19		Sat.			213.3	27.0
205	206.5	33.8	3	5	7	12		Sat.		ORANGE, CLAYEY SAND	208.3	32.0
200	201.5	38.8	4	2	4	6		Sat.				
195	196.5	43.8	7	9	7	16		Sat.		**COASTAL PLAIN** GRAY AND BLACK, SILTY SAND (CAPE FEAR FORMATION)	198.3	42.0
190	191.5	48.8	8	20	31	51		Sat.				
185	186.5	53.8	30	31	37	68		Sat.				
180	181.5	58.8	8	13	20	33		W		GRAY, SILTY CLAY	183.3	57.0
175	176.5	63.8	12	17	20	37		W				
170	171.5	68.8	12	17	19	36		W				
165	166.5	73.8	13	16	20	36		W				

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Hayes, M.S.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+05	**OFFSET** 43 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 240.3 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,916	**EASTING** 2,131,748	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 11/06/17	**COMP. DATE** 11/07/17	**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
165						Match Line				
160	161.5	78.8	11	13	17	30		W		GRAY, SILTY CLAY *(continued)*
155	156.5	83.8	7	13	19	32		W		
150	151.5	88.8	6	9	16	25		W		
145	146.5	93.8	13	16	21	37		Sat.		GRAY, CLAYEY SAND
140	141.5	98.8	6	9	12	21		Sat.		Boring Terminated at Elevation 140.0 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

ELEV. (ft)	DEPTH (ft)
148.3	92.0
140.0	100.3

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 27+26	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 239.7 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,934	**EASTING** 2,131,816	**24 HR.** 8.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/18/17	**COMP. DATE** 10/18/17	**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)
240											
	239.7	0.0	2	2	3	5		M		239.7 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT TAN AND BLACK, CLAYEY SAND	
										236.7	3.0
235	235.0	4.7	2	3	5	8		M		**COASTAL PLAIN** TAN AND GRAY, SANDY CLAY (MIDDENDORF FORMATION)	
										232.7	7.0
	231.1	8.6								GRAY, CLAYEY SAND	
230			3	3	3	6		Sat.			
	226.1	13.6								227.7	12.0
225			2	3	4	7	SS-96	25%		GRAY, WHITE, TAN AND PURPLE, COARSE SAND WITH GRAVEL	
	221.1	18.6									
220			7	7	3	10		Sat.			
	216.1	23.6									
215			17	14	13	27		Sat.			
	211.1	28.6								212.7	27.0
210			12	7	3	10		Sat.		TAN AND BROWN, CLAYEY SAND	
	206.1	33.6									
205			5	5	5	10		Sat.			
	201.1	38.6								202.7	37.0
200			3	6	6	12		Sat.		TAN, SILTY SAND	
	196.1	43.6								197.7	42.0
195			1	2	6	8		W		**COASTAL PLAIN** BLACK, SILTY CLAY (CAPE FEAR FORMATION)	
	191.1	48.6									
190			3	3	4	7		W			
	186.1	53.6								187.7	52.0
185			12	17	18	35		Sat.		GRAY AND BLACK, SILTY SAND	
	181.1	58.6								182.7	57.0
180			11	19	24	43		W		GRAY, SILTY CLAY AND SANDY CLAY	
	176.1	63.6									
175			15	17	27	44		W			
	171.1	68.6								172.7	67.0
170			14	23	31	54		W			
	166.1	73.6								167.7	72.0
165			9	21	28	49		Sat.		GRAY AND GREEN, CLAYEY SAND	
	161.1	78.6									
160			13	18	19	37		Sat.			

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 27+26	**OFFSET** 24 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 239.7 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 579,934	**EASTING** 2,131,816	**24 HR.** 8.5
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/18/17	**COMP. DATE** 10/18/17	**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
160						Match Line				
	156.1	83.6	11	11	13	24		Sat.		GRAY AND GREEN, CLAYEY SAND *(continued)*
155										
	151.1	88.6	6	8	8	16		Sat.		
150										
	146.1	93.6	5	6	6	12		Sat.		
145										
	141.1	98.6	7	7	10	17		Sat.		139.6 100.1
140										Boring Terminated at Elevation 139.6 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+48	**OFFSET** 8 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,813	**EASTING** 2,131,852	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/19/17	**COMP. DATE** 10/19/17	**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)
265												
260										GROUND SURFACE	260.9	0.0
	258.1	2.8								**ROADWAY EMBANKMENT** (PAVEMENT)	258.1	2.8
	256.3	4.6	21	18	11	29		M		RED AND BROWN, CLAYEY SAND		
255			3	3	2	5		M				
	252.1	8.8	2	3	2	5		Sat.				
250											248.9	12.0
	247.1	13.8	1	1	4	5		W		RED AND BROWN, SANDY CLAY		
245											243.9	17.0
	242.1	18.8	2	2	2	4		Sat.		GRAY AND BROWN, SILTY SAND		
240											238.9	22.0
	237.1	23.8	4	4	4	8		W		**COASTAL PLAIN** GRAY, SANDY CLAY (MIDDENDORF FORMATION)		
235												
	232.1	28.8	4	7	9	16		W				
230											228.9	32.0
	227.1	33.8	4	3	3	6	SS-121	23%		GRAY, BROWN, RED AND YELLOW, SILTY SAND		
225												
	222.1	38.8	6	12	18	30		Sat.				
220												
	217.1	43.8	8	9	10	19		Sat.				
215												
	212.1	48.8	3	5	10	15		Sat.				
210												
	207.1	53.8	6	5	6	11		Sat.				
205											203.9	57.0
	202.1	58.8	3	9	12	21		Sat.		RED AND BROWN, CLAYEY SAND		
200											198.9	62.0
	197.1	63.8	3	2	4	6		W		**COASTAL PLAIN** GRAY, GREEN AND PURPLE, SILTY CLAY AND SANDY CLAY (CAPE FEAR FORMATION)		
195												
	192.1	68.8	3	5	7	12		W				
190												
	187.1	73.8	4	7	9	16		W				
185												

WBS 53083.1.1	**TIP** I-5833	**COUNTY** HARNETT	**GEOLOGIST** Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 81 ON -Y2- (SR 1709) OVER -L- (I-95)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+48	**OFFSET** 8 ft RT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 260.9 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 579,813	**EASTING** 2,131,852	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9563 CME-550X 88% 08/10/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, T.J.	**START DATE** 10/19/17	**COMP. DATE** 10/19/17	**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)
185						Match Line						
	182.1	78.8	10	12	16	28		W		**COASTAL PLAIN** GRAY, GREEN AND PURPLE, SILTY CLAY AND SANDY CLAY (CAPE FEAR FORMATION) *(continued)*		
180											178.9	82.0
	177.1	83.8	9	11	14	25		W				
175											173.9	87.0
	172.1	88.8	14	27	37	64		W				
170											168.9	92.0
	167.1	93.8	14	17	21	38		Sat.		GRAY AND GREEN, CLAYEY SAND		
165											160.6	100.3
	162.1	98.8	10	11	12	23		Sat.		Boring Terminated at Elevation 160.6 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)		

SUMMARY OF LABORATOTY TEST DATA

Soil Classification and Gradation

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

S&ME Project #:	6235-16-015			Date Report	12/1/2017
State Project No.:	53083.1.1	County:	Harnett	Date Tested	11/1/17-11/30/17
Federal ID No.:	N/A	TIP No.:	I-5883		
Project Name:	Bridge No. 81 on -Y2- (SR 1709) over -L- (I-95)				
Client Name:	Michael Baker International				

Sample No.	Station #:	Offset	Boring #:	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve # 10	40	60	200	270	Total Mortar Fraction (%) Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Moist. %
SS-96	27+26	24 LT	EB2-A	Y2	13.6-15.1	A-1-b	(0)	57	26	18	8.5	7.7	39	10	1	6	28	0	N.P.	25.3
SS-121	28+48	8 RT	EB2-B	Y2	33.8-35.3	A-2-4	(0)	65	30	21	10.6	9.2	44	12	3	7	28	20	8	23.2
SS-146	25+10	10 LT	EB1-A	Y2	53.8-55.3	A-3	(0)	100	56	20	7.0	5.5	80	15	1	4	18	0	N.P.	23.1
SS-167	26+14	25 RT	EB1-B	Y2	48.8-50.3	A-3	(0)	99	61	17	6.1	4.8	82	12	3	2	17	0	N.P.	23.3

References / Comments / Deviations: ND=Not Detemined.

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	Stewart Laney, P.E.	Project Manager
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

SITE PHOTOGRAPH

Bridge No. 81 on -Y2- (SR 1709) over -L- (I-95)

Looking Southeast towards End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	12

REFERENCE: I-5986B

PROJECT: 47532

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 FROM NORTH OF SR 1002 (LONG BRANCH ROAD) (EXIT 71) TO I-40 (EXIT 81).*

SITE DESCRIPTION *BRIDGE 653 ON -Y29- (S. MARKET ST.) OVER -L- (I-95)*

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

E. BLONESHINE

J. PREVATTE

A. BLYTHE

J. SWARTLEY

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *JANUARY 2020*

9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726

NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by:
Stacie Mitchell 1/9/2020
BBC611B64E18458...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-750
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" 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: BY6-202 N: 588609 E: 2134438

ELEVATION: 241.76 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

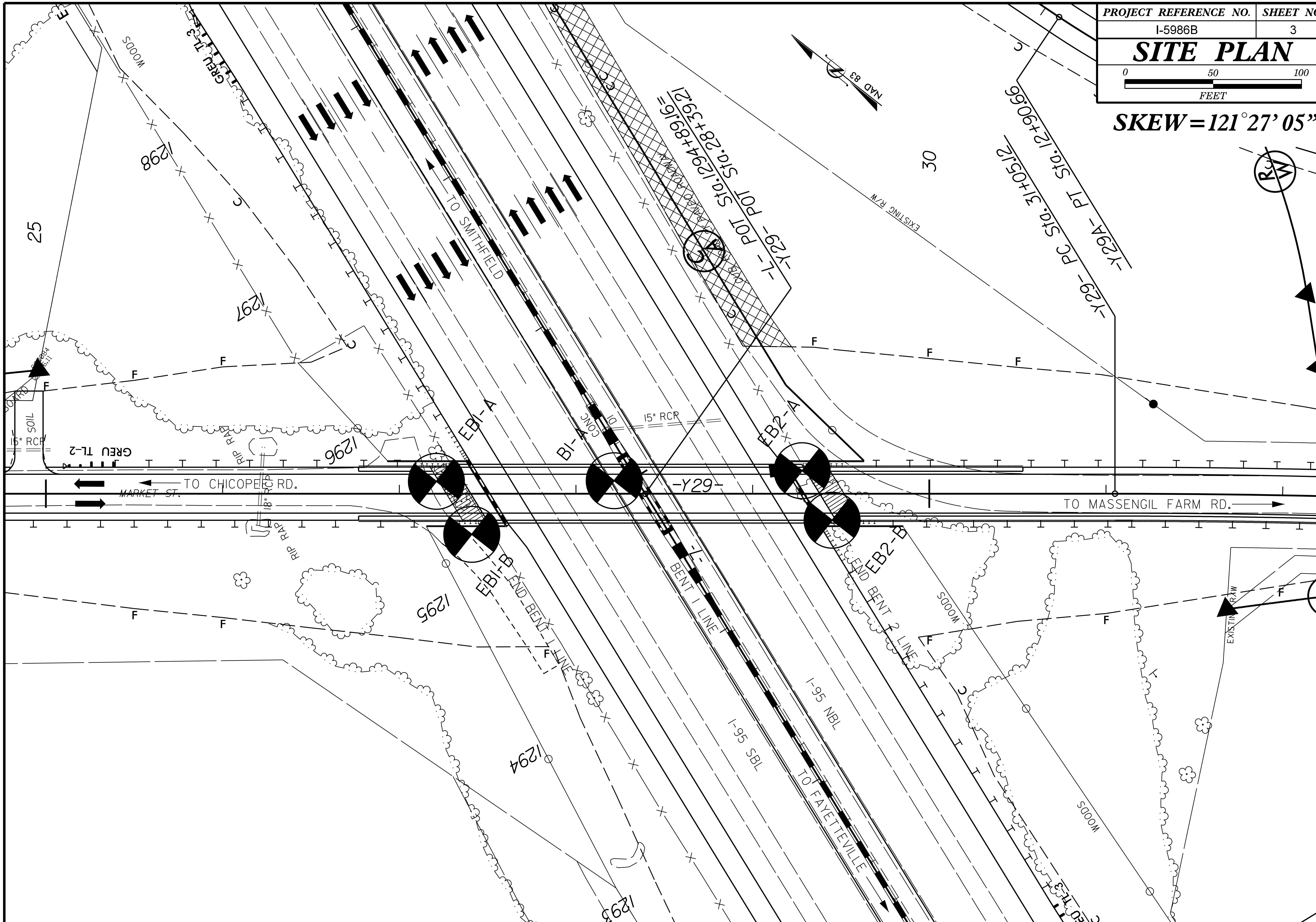
DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	3

SITE PLAN

0 50 100 FEET

SKEW = 121° 27' 05"



5/14/99

0	40	80

FEET

VE = 2:1

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE PROJECTED ALONG –Y29–

290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130

Ⓐ **ROADWAY EMBANKMENT.** LOOSE TO MEDIUM DENSE GRAY,BROWN,YELLOW,SILTY SAND (A-2-4),AND CLAYEY SAND (A-2-6) TRACE GRAVEL,MOIST

Ⓑ **ROADWAY EMBANKMENT.** MED. STIFF, ORANGE, SANDY CLAY (A-6), MOIST

Ⓒ **COASTAL PLAIN.** MEDIUM STIFF PINK,GRAY SANDY CLAY (A-6),WET [MIDDENDORF FORMATION]

EB1–A
27+21
7' LT
–Y29–

B–1
28+22
7' LT
–Y29–

EB2–A
29+28
13' LT
–Y29–

COASTAL PLAIN. VERY LOOSE TO MED. DENSE. RED, GRAY, TAN AND ORANGE, CLAYEY SAND (A-2-6) AND SILTY SAND (A-2-4),TRACE GRAVEL MOIST TO SAT. [MIDDENDORF FORMATION]

COASTAL PLAIN. MED. STIFF, BLACK AND DARK GRAY. SILTY CLAY (A-7-6),WITH SAND SEAMS,TRACE MICA AND TRACE GRAVEL,WET [CAPE FEAR FORMATION]

LOOSE TO MED. DENSE, DARK GRAY, BROWN. SILTY SAND (A-2-4),TRACE MICA,MOIST TO SAT.

STIFF TO HARD, BLACK, GRAY AND DARK GRAY, SANDY CLAY (A-6) AND CLAY WITH SAND SEAMS (A-7-6),TRACE MICA,MOIST

DENSE, GRAY, SILTY SAND (A-2-4), SAT.

VERY STIFF, GREEN, GRAY, SILTY CLAY (A-7-6), AND SANDY CLAY (A-6),TRACE MICA WET

MED. DENSE TO DENSE, TAN, GRAY AND GREEN, CLAYEY FINE SAND (A-2-6),WITH SAND SEAMS,TRACE MICA, MOIST TO SAT.

VERY STIFF TO HARD, TAN, BROWN AND GRAY, SILTY CLAY (A-7-6) AND SANDY CLAY (A-6),TRACE MICA, MOIST TO WET

MEDIUM DENSE GRAY CLAYEY SAND (A-2-6) TRACE MICA,WET

VERY STIFF GRAY SANDY CLAY (A-6),TRACE MICA,WET

BT FIAD 06/2019

BT FIAD 12/2019

BT FIAD 06/2019

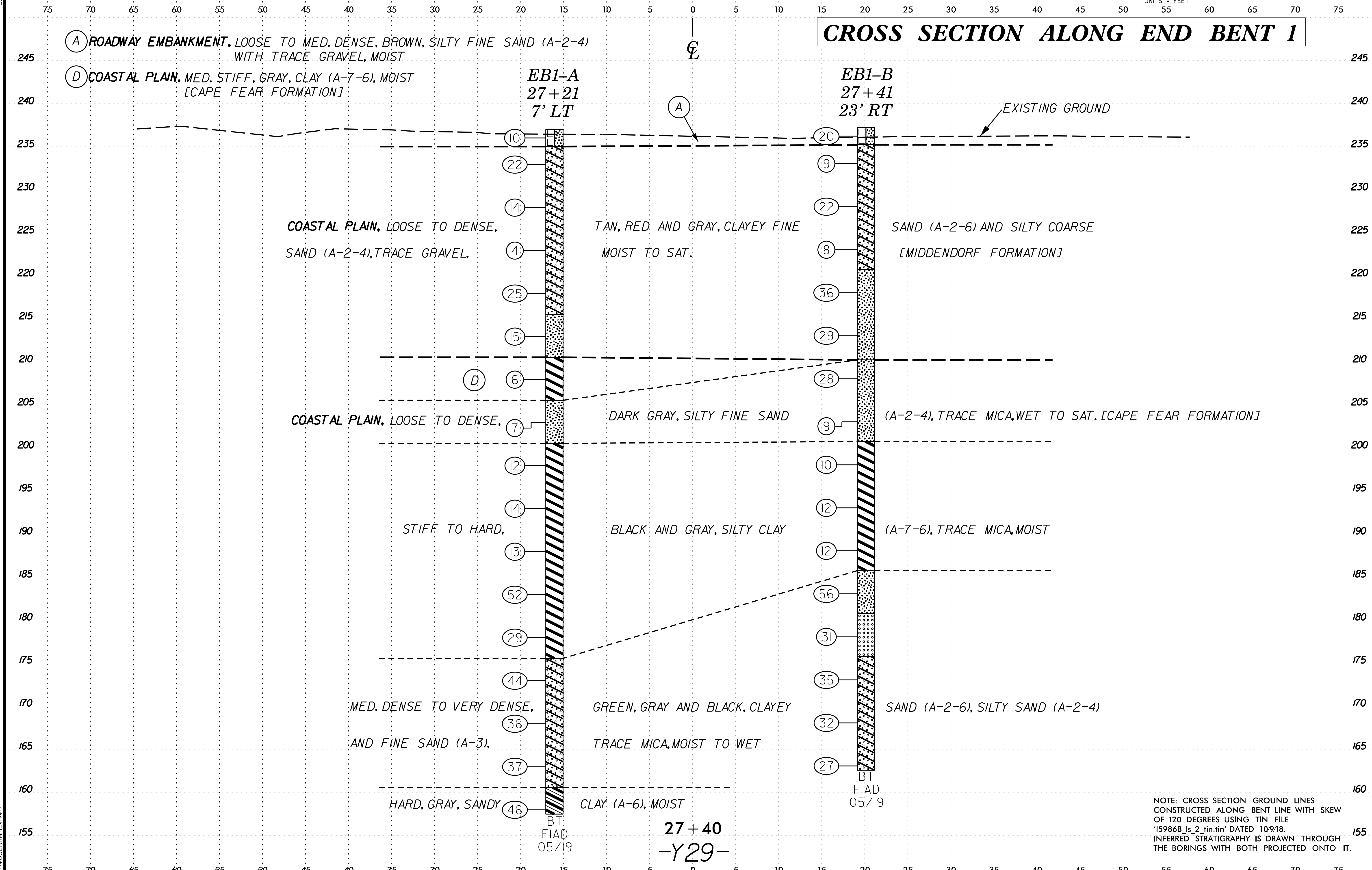
NOTE: EXISTING GROUND SURFACE PROFILE OF –Y29– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

–Y29–

26+00 27+00 28+00 29+00 30+00 31+00

PROJ. REFERENCE NO.	SHEET NO.
I-5986B	5

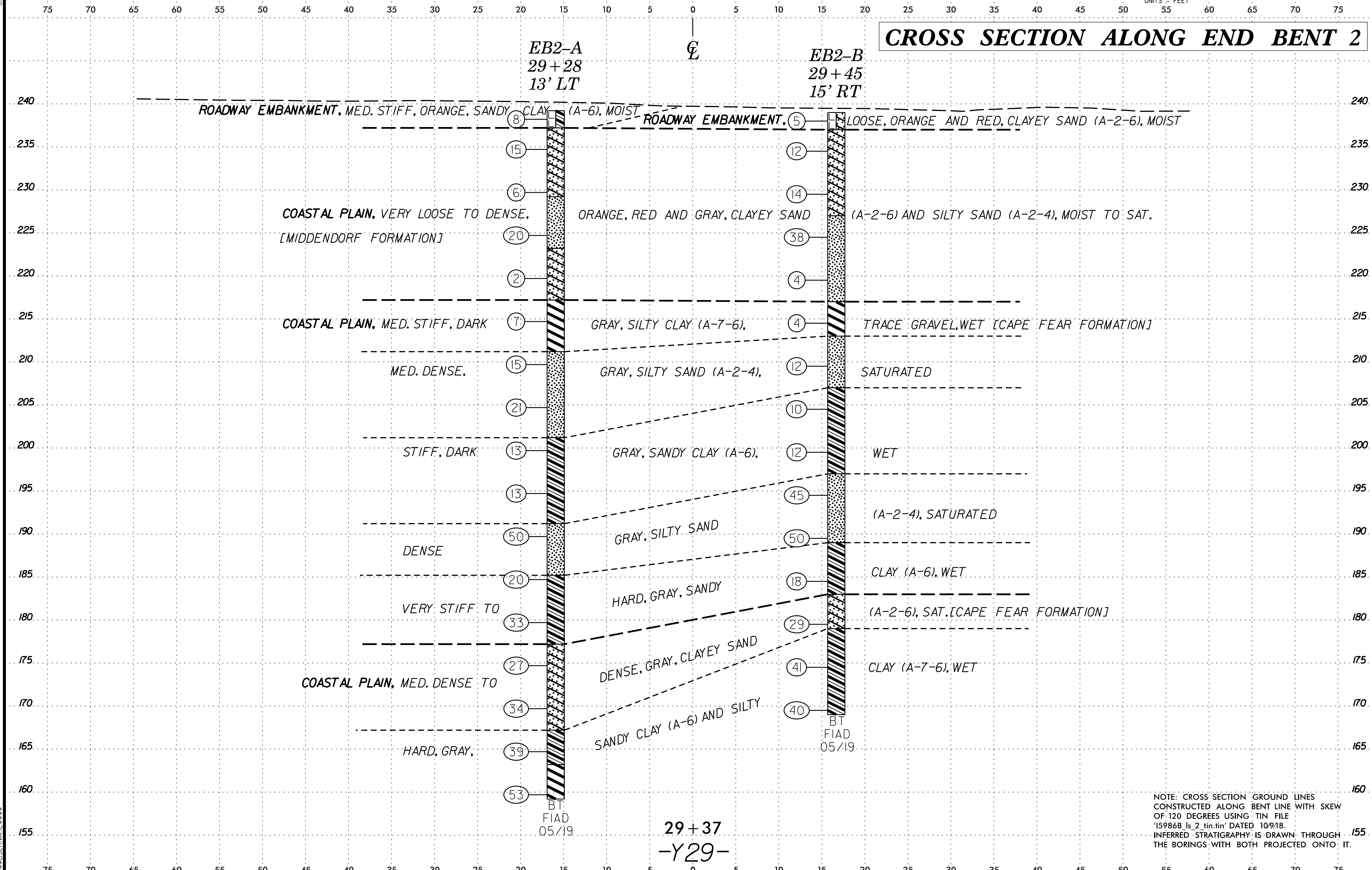
CROSS SECTION ALONG END BENT 1



6/23/16
$$$$$SYSTIME$$$$$
$$$$$$$DGN$$$$$$$$$$$$$$$$$$$
$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
I-5986B	6

CROSS SECTION ALONG END BENT 2



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120 DEGREES USING TIN FILE 'I5986B_ls_2_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+21	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 240.9 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 588,367	**EASTING** 2,134,686	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/03/19	**COMP. DATE** 05/03/19	**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))
245										
240	240.9	0.0	4	4	6	10		M		240.9 / 0.0 GROUND SURFACE
	237.8	3.1								**ROADWAY EMBANKMENT**
			4	9	13	22		M		238.9 / 2.0 LOOSE, BROWN, SILTY FINE SAND (A-2-4) W/ TRACE GRAVEL
235										**COASTAL PLAIN**
	232.8	8.1								LOOSE TO MED. DENSE, RED, GRAY AND TAN, CLAYEY FINE SAND (A-2-6) W/ TRACE GRAVEL
			6	8	6	14		M		[MIDDENDORF FORMATION]
230										
	227.8	13.1								
			2	2	2	4		Sat.		
225										
	222.8	18.1								
			12	12	13	25		Sat.		
220										219.4 / 21.5 MED. DENSE, TAN, SILTY COARSE SAND (A-2-4) WITH TRACE GRAVEL
	217.8	23.1								
			13	7	8	15		Sat.		
215										214.4 / 26.5 **COASTAL PLAIN**
	212.8	28.1								MED. STIFF, BLACK, CLAY (A-7-6) W/ SAND SEAMS
			3	3	3	6		M		[CAPE FEAR FORMATION]
210										
	207.8	33.1								209.4 / 31.5 LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4) W/ TRACE MICA
			5	3	4	7		Sat.		
205										
	202.8	38.1								204.4 / 36.5 STIFF TO HARD, BLACK AND GRAY, CLAY (A-7-6) W/ SAND SEAMS AND MICA
			5	6	6	12		M		
200										
	197.8	43.1								
			5	6	8	14		M		
195										
	192.8	48.1								
			5	6	7	13		M		
190										
	187.8	53.1								
			9	20	32	52		M		
185										
	182.8	58.1								
			10	12	17	29		M		
180										179.4 / 61.5 DENSE, GREEN AND GRAY, CLAYEY FINE SAND (A-2-6) W/ TRACE MICA
	177.8	63.1								
			11	14	30	44		M		
175										
	172.8	68.1								
			15	16	20	36		M		
170										
	167.8	73.1								
			12	15	22	37		M		
165										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+21	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 240.9 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 588,367	**EASTING** 2,134,686	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/03/19	**COMP. DATE** 05/03/19	**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
165						Match Line				
	162.8	78.1	9	16	30	46		M		164.4 / 76.5 HARD, GRAY, SANDY CLAY (A-6)
										161.3 / 79.6 Boring Terminated at Elevation 161.3 ft IN HARD SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+41	**OFFSET** 23 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 241.1 ft	**TOTAL DEPTH** 74.7 ft	**NORTHING** 588,333	**EASTING** 2,134,674	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/06/19	**COMP. DATE** 05/06/19	**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)
245											
240	241.1	0.0	6	11	9	20		M		241.1 GROUND SURFACE	0.0
										239.1 **ROADWAY EMBANKMENT** MED. DENSE, BROWN, SILTY FINE SAND (A-2-4)	2.0
235	237.9	3.2	3	3	6	9		M		**COASTAL PLAIN** LOOSE TO MED. DENSE, RED AND TAN, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION]	
230	232.9	8.2	9	11	11	22		W			
225	227.9	13.2	4	4	4	8		W			
220	222.9	18.2	9	19	17	36		W		224.6 MED. DENSE TO DENSE, TAN, SILTY COARSE SAND (A-2-4), TRACE GRAVEL	16.5
215	217.9	23.2	8	18	11	29		W			
210	212.9	28.2	8	14	14	28		W		214.1 **COASTAL PLAIN** LOOSE TO MED. DENSE, DARK GRAY, SILTY FINE SAND (A-2-4), TRACE MICA [CAPE FEAR FORMATION]	27.0
205	207.9	33.2	5	4	5	9		W			
200	202.9	38.2	2	5	5	10		M		204.6 STIFF, BLACK, SILTY CLAY (A-7-6), TRACE MICA	36.5
195	197.9	43.2	5	5	7	12		M			
190	192.9	48.2	4	5	7	12		M			
185	187.9	53.2	19	29	27	56		W		189.6 DENSE TO VERY DENSE, BLACK, SILTY COARSE SAND (A-2-4) AND FINE SAND (A-3)	51.5
180	182.9	58.2	9	14	17	31		W		184.6	56.5
175	177.9	63.2	12	15	20	35		M		179.6 MED. DENSE TO DENSE, GREEN AND GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA	61.5
170	172.9	68.2	10	14	18	32		M			
	167.9	73.2	10	12	15	27		M		166.4 Boring Terminated at Elevation 166.4 ft IN	74.7

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+41	**OFFSET** 23 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 241.1 ft	**TOTAL DEPTH** 74.7 ft	**NORTHING** 588,333	**EASTING** 2,134,674	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/06/19	**COMP. DATE** 05/06/19	**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
165						Match Line				MED. DENSE CLAYEY SAND (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG_Y29.GPJ NC_DOT.GDT 1/9/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+22	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** 3.5
COLLAR ELEV. 239.3 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 588,288	**EASTING** 2,134,748	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9978 CME-750 74% 12/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Norwood	**START DATE** 12/09/19	**COMP. DATE** 12/10/19	**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)
240											
	239.3	0.0	3	4	6	10		M		239.3 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
235	235.8	3.5	4	6	6	12		W		236.8 LOOSE, YELLOW BROWN, CLAYEY FINE to COARSE SAND (A-2-6) W/ TRACE GRAVEL	2.5
										COASTAL PLAIN	
230	230.8	8.5	2	3	3	6		W		MEDIUM DENSE, RED, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) [MIDDENDORF FORMATION]	
										231.8 MEDIUM STIFF, PINK GRAY, COARSE SANDY CLAY (A-6)	7.5
225	225.8	13.5	3	7	8	15		W		227.3 MEDIUM DENSE, TAN, YELLOW, CLAYEY FINE TO COARSE SAND (A-2-6)	12.0
220	220.8	18.5	3	1	14	15		W			
215	215.8	23.5	5	4	2	6		W		215.3 **COASTAL PLAIN**	24.0
210	210.8	28.5	1	5	9	14		W		212.3 MED. STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ SAND SEAMS, TRACE MICA [CAPE FEAR FORMATION]	27.0
205	205.8	33.5	4	3	7	10		W		MEDIUM DENSE TO LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4) W/ TRACE MICA	
200	200.8	38.5	2	4	6	10		W		202.3 STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ SAND SEAMS, TRACE MICA	37.0
195	195.8	43.5	3	6	7	13		W		197.3 STIFF TO VERY STIFF GRAY, SANDY CLAY (A-6), TRACE MICA	42.0
190	190.8	48.5	4	4	7	11		W			
185	185.8	53.5	28	8	9	17		W			
180	180.8	58.5	7	10	15	25		W		182.3 VERY STIFF, GREEN GRAY, SILTY CLAY (A-7-5) W/ SAND SEAMS, TRACE MICA	57.0
175	175.8	63.5	13	9	19	28		W		177.3 VERY STIFF GRAY, SANDY CLAY (A-6), TRACE MICA	62.0
170	170.8	68.5	8	12	14	26		W			
165	165.8	73.5	11	14	22	36		W		167.3 DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA	72.0
160	160.8	78.5	12	14	15					162.3 VERY STIFF TAN, GRAY, SANDY CLAY (A-6), TRACE MICA	77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+22	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** 3.5
COLLAR ELEV. 239.3 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 588,288	**EASTING** 2,134,748	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9978 CME-750 74% 12/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Norwood	**START DATE** 12/09/19	**COMP. DATE** 12/10/19	**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
160						Match Line				
	155.8	83.5	6	12	13	25		W		VERY STIFF TAN, GRAY, SANDY CLAY (A-6), TRACE MICA *(continued)*
155										157.3 MEDIUM DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA 82.0
	150.8	88.5	10	9	12	21		W		152.3 VERY STIFF, GRAY, SANDY CLAY (A-6), TRACE MICA 87.0
150										149.3 Boring Terminated at Elevation 149.3 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN) 90.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 29+28	**OFFSET** 13 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 588,208	**EASTING** 2,134,818	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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))
240										
	239.2	0.0	4	4	4	8		M		239.2 / 0.0 GROUND SURFACE
										ROADWAY EMBANKMENT
										MED. STIFF, ORANGE, SANDY CLAY (A-6)
	237.2	2.0								237.2 / 2.0
235	235.7	3.5	4	6	9	15		M		**COASTAL PLAIN**
										LOOSE TO MED. DENSE, ORANGE, RED AND GRAY, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]
230	230.7	8.5	3	3	3	6		M		
										229.2 / 10.0
										MED. DENSE, ORANGE AND GRAY, SILTY SAND (A-2-4)
225	225.7	13.5	17	14	6	20		Sat.		
										223.2 / 16.0
										VERY LOOSE, ORANGE AND RED, CLAYEY SAND (A-2-6), TRACE GRAVEL
220	220.7	18.5	2	1	1	2		Sat.		
										217.2 / 22.0
										COASTAL PLAIN
										MED. STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ TRACE GRAVEL [CAPE FEAR FORMATION]
215	215.7	23.5	8	5	2	7		W		
										211.2 / 28.0
										MED. DENSE, DARK GRAY, SILTY SAND (A-2-4)
210	210.7	28.5	6	8	7	15		Sat.		
205	205.7	33.5	8	10	11	21		Sat.		
200	200.7	38.5	4	6	7	13		W		201.2 / 38.0 STIFF, DARK GRAY, SANDY CLAY (A-6)
195	195.7	43.5	5	6	7	13		W		
190	190.7	48.5	22	25	25	50		Sat.		191.2 / 48.0 DENSE, GRAY, SILTY SAND (A-2-4)
185	185.7	53.5	6	9	11	20		Sat.		185.2 / 54.0 VERY STIFF TO HARD, DARK GRAY AND GRAY, SANDY CLAY (A-6)
180	180.7	58.5	12	16	17	33		W		
175	175.7	63.5	10	12	15	27		W		177.2 / 62.0 MED. DENSE TO DENSE, GRAY, CLAYEY SAND (A-2-6)
170	170.7	68.5	11	17	17	34		Sat.		
165	165.7	73.5	14	19	20	39		W		167.2 / 72.0 HARD, BROWN AND GRAY, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6)
160	160.7	78.5								163.2 / 76.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 29+28	**OFFSET** 13 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 588,208	**EASTING** 2,134,818	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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
160						Match Line				
			15	24	29	53		W		159.2 / 80.0 Boring Terminated at Elevation 159.2 ft IN HARD SILTY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 29+45	**OFFSET** 15 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.0 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 588,177	**EASTING** 2,134,807	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER T. Whitehead	**START DATE** 05/08/19	**COMP. DATE** 05/08/19	**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)
240											
	239.0	0.0	5	3	2	5		M		239.0 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
										237.0 LOOSE, ORANGE AND RED, CLAYEY SAND (A-2-6)	2.0
235	235.5	3.5	5	6	6	12		M		**COASTAL PLAIN**	
										MED. DENSE, ORANGE AND RED, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]	
230	230.5	8.5	7	6	8	14		M			
										227.0	12.0
225	225.5	13.5	14	17	21	38		Sat.		LOOSE TO DENSE, ORANGE AND RED, SILTY SAND (A-2-4)	
220	220.5	18.5	5	1	3	4		Sat.			
										217.0	22.0
215	215.5	23.5	1	2	2	4		W		**COASTAL PLAIN** SOFT, DARK GRAY, SILTY CLAY (A-7-6) [CAPE FEAR FORMATION]	
										213.0	26.0
210	210.5	28.5	4	5	7	12		Sat.		MED. DENSE, GRAY, SILTY SAND (A-2-4)	
										207.0	32.0
205	205.5	33.5	4	5	5	10		W		STIFF, DARK GRAY, SANDY CLAY (A-6)	
200	200.5	38.5	4	6	6	12		W			
										197.0	42.0
195	195.5	43.5	17	23	22	45		Sat.		DENSE, DARK GRAY, SILTY SAND (A-2-4)	
190	190.5	48.5	9	28	22	50		Sat.		189.0	50.0
										VERY STIFF, GRAY, SANDY CLAY (A-6)	
185	185.5	53.5	7	8	10	18		W			
										183.0	56.0
180	180.5	58.5	8	11	18	29		Sat.		MED. DENSE, GRAY, CLAYEY SAND (A-2-6)	
										179.0	60.0
175	175.5	63.5	10	12	29	41		W		HARD, GRAY, SANDY CLAY (A-6)	
170	170.5	68.5	13	18	22	40		W		169.0	70.0
										Boring Terminated at Elevation 169.0 ft IN HARD SANDY CLAY (COASTAL PLAIN)	

NCDOT BORE DOUBLE I5986B_GEO_BRDG_Y29.GPJ NC_DOT.GDT 1/9/20

SITE PHOTOGRAPH

Bridge 653 on -Y29- over -L- (I-95)

Looking North

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	20

REFERENCE: I-5986B

PROJECT: 47532

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 WIDENING FROM SR 1811 (BUD HAWKINS RD.) (EXIT 70) TO I-40 (EXIT 81) – WIDEN TO EIGHT LANES*

SITE DESCRIPTION *BRIDGE NO. 654 ON I-95 OVER MINGO SWAMP*

CONTENTS

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

NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES 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

E. BLONESHINE

M. HARTMAN

T. WHITEHEAD

A. BLYTHE

J. SWARTLEY

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *FEBRUARY 2020*

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NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by: Stacie Mitchell BBC611B64F19458... 2/6/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" 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: BM #1 N: 585603 E: 2133854

ELEVATION: 199.73 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	3

SITE PLAN

0 50 100
FEET

SKEW = 90°

NAD 83

N 79°42'25" W 85.69'

HARNETT CO
JOHNSTON CO

291

THOMAS HODGES
DB 772 PG 378

END BENT 1 LINE
BENT 1 LINE
1260+00
MINGO SWAMP
BENT 2 LINE
END BENT 2 LINE
1264+00

F
JS

TYPE B-77
BRIDGE NO. 654
TYPE B-77

13' CONC WW
51' CONC HW
13' CONC WW

EB1-A
B1-A
B2-A
EB2-A

MTL

TO DUNN

I-95 SBL

-L-

-102

4 9'x12' BOX CULVERTS

EB1-C
B1-C
B2-C
EB2-C

I-95 NBL

TO BENSON

B1-B
B2-B

EB1-B
EB2-B

18" CMP

MTL

13' CONC WW
13' CONC WW

TYPE B-77
TYPE B-77

CAT 1

F

MINGO SWAMP

JS

WOODS

BEG. WW FENCE
+50.00 -L-
130.00' RT

BILLY & SANDRA PARKER
DB 1159 PG 362

NDRA PARKER
PG 362

68°25'44" W
209.77'

249

30° E

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE ALONG CENTERLINE OF –L–

0 40 80
FEET
VE = 2:1

Ⓐ **ROADWAY EMBANKMENT.** MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6), MOIST
Ⓑ **ALLUVIAL.** VERY SOFT TO SOFT, BROWN AND GRAY, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6) WITH TRACE OF ORGANIC MATTER, MOIST TO WET
Ⓒ **ALLUVIAL.** VERY LOOSE, BROWN AND GRAY, SILTY FINE SAND (A-2-4) AND CLAYEY SAND (A-2-6), MOIST TO SAT.

EB1–C
1259+21
7' LT
–L–
SS-4759
SS-4762
SS-4766

B1–C
1259+89
7' LT
–L–
SS-4746
SS-4752

B2–C
1260+79
8' LT
–L–
SS-4726

EB2–C
1261+39
6' LT
–L–
SS-4707
SS-4713

BRIDGE NO. 654

PROPOSED GRADE
EXISTING GROUND

ROADWAY EMBANKMENT. VERY LOOSE TO MED. WITH TRACE OF GRAVEL, MOIST TO SAT.

DENSE, ORANGE, BROWN AND RED, CLAYEY FINE SAND (A-2-6)

COASTAL PLAIN. LOOSE TO DENSE, GRAY AND WHITE, CLAYEY SAND (A-2-6), SILTY SAND (A-2-4), FINE TO COARSE SAND (A-3) AND GRAVELLY COARSE SAND (A-1-b); WET TO SAT. [MIDDENDORF FORMATION]

COASTAL PLAIN. MED. STIFF TO HARD, GRAY, MOIST TO WET [CAPE FEAR FORMATION]

DARK GRAY AND TAN, SILTY CLAY (A-7-6), SANDY CLAY (A-6), AND SANDY SILT (A-4),

DENSE TO VERY DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), MOIST TO WET

VERY DENSE, GRAY, SILTY SAND (A-2-4), SAT.

MED. DENSE TO DENSE, GRAY, RED AND BROWN, SILTY SAND (A-2-4) AND CLAYEY FINE SAND (A-2-6), MOIST TO SAT.

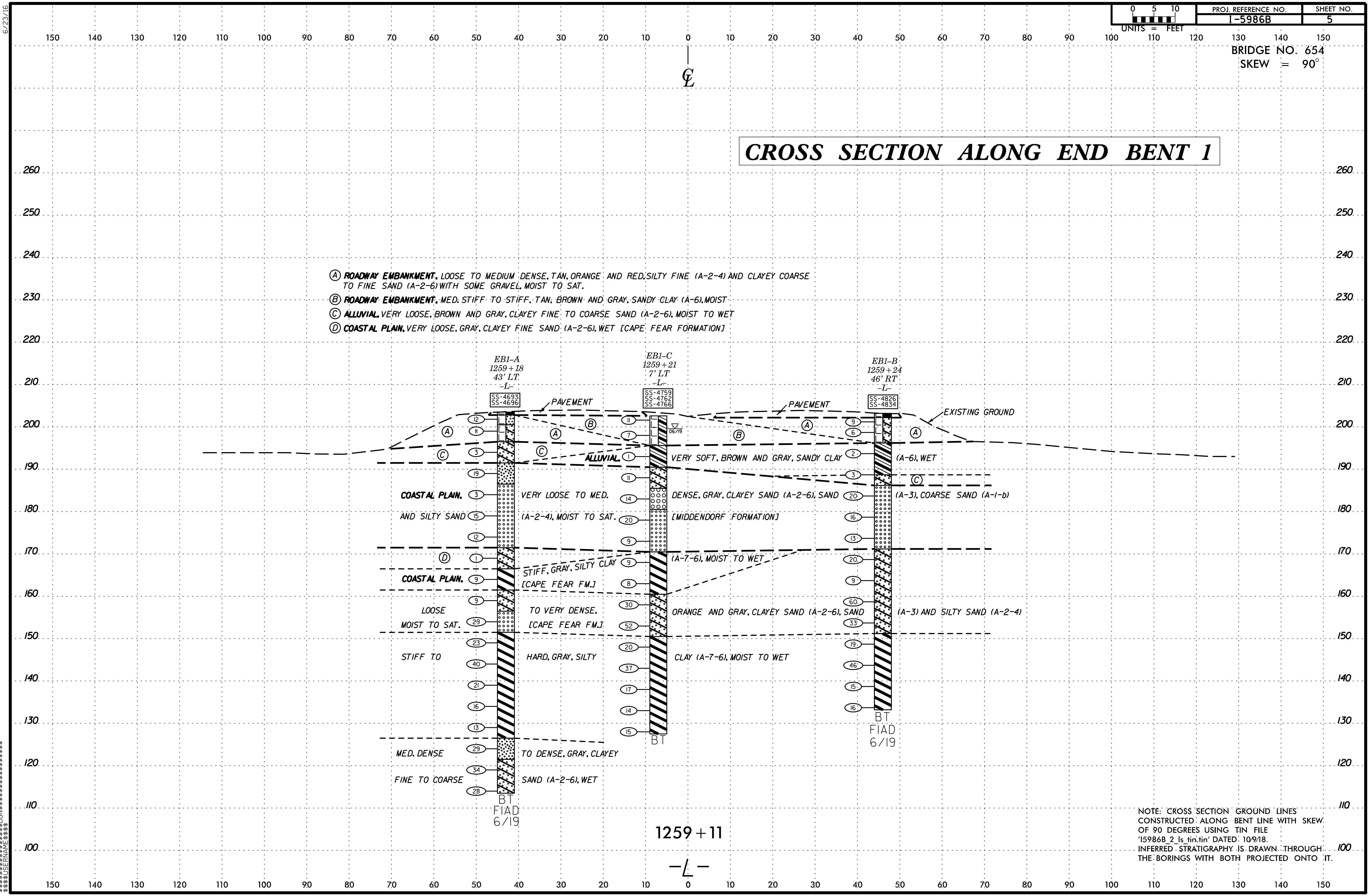
VERY STIFF TO HARD, GRAY, CLAY (A-7-6), MOIST

FIAD
06/2019

NOTE: EXISTING GROUND SURFACE PROFILE OF –L– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

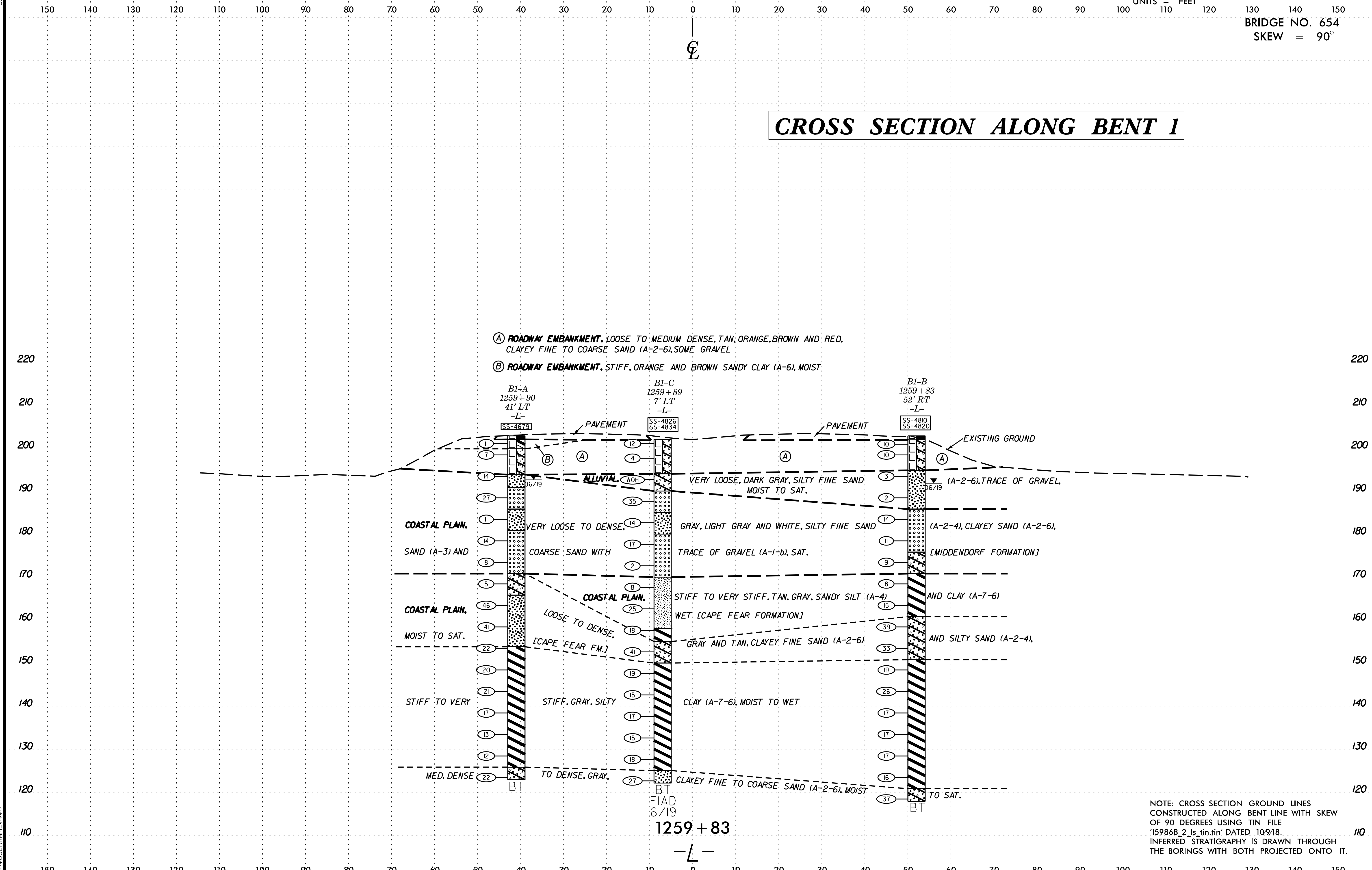
260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90

1258+00 1259+00 1260+00 1261+00 1262+00 1263+00


PROJ. REFERENCE NO.
I-5986B
SHEET NO.
5
0 5 10
UNITS = FEET
BRIDGE NO. 654
SKEW = 90°
CROSS SECTION ALONG END BENT 1
℄
(A) ROADWAY EMBANKMENT. LOOSE TO MEDIUM DENSE, TAN, ORANGE AND RED, SILTY FINE (A-2-4) AND CLAYEY COARSE TO FINE SAND (A-2-6) WITH SOME GRAVEL, MOIST TO SAT.
(B) ROADWAY EMBANKMENT. MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6), MOIST
(C) ALLUVIAL. VERY LOOSE, BROWN AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), MOIST TO WET
(D) COASTAL PLAIN. VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6), WET [CAPE FEAR FORMATION]
EB1-A
1259+18
43' LT
-L-
SS-4693
SS-4696
EB1-C
1259+21
7' LT
-L-
SS-4759
SS-4762
SS-4766
EB1-B
1259+24
46' RT
-L-
SS-4826
SS-4834
PAVEMENT
PAVEMENT
EXISTING GROUND
06/19
ALLUVIAL. VERY SOFT, BROWN AND GRAY, SANDY CLAY (A-6), WET
COASTAL PLAIN. VERY LOOSE TO MED. DENSE, GRAY, CLAYEY SAND (A-2-6), SAND (A-3), COARSE SAND (A-1-b)
AND SILTY SAND (A-2-4), MOIST TO SAT. [MIDDENDORF FORMATION]
STIFF, GRAY, SILTY CLAY (A-7-6), MOIST TO WET
COASTAL PLAIN. [CAPE FEAR FM.]
LOOSE TO VERY DENSE, ORANGE AND GRAY, CLAYEY SAND (A-2-6), SAND (A-3) AND SILTY SAND (A-2-4)
MOIST TO SAT. [CAPE FEAR FM.]
STIFF TO HARD, GRAY, SILTY CLAY (A-7-6), MOIST TO WET
MED. DENSE TO DENSE, GRAY, CLAYEY
FINE TO COARSE SAND (A-2-6), WET
BT
FIAD
6/19
BT
BT
FIAD
6/19
1259+11
-L-
NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.
6/23/16
$$$$$SYSTIME$$$$$
$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG BENT 1

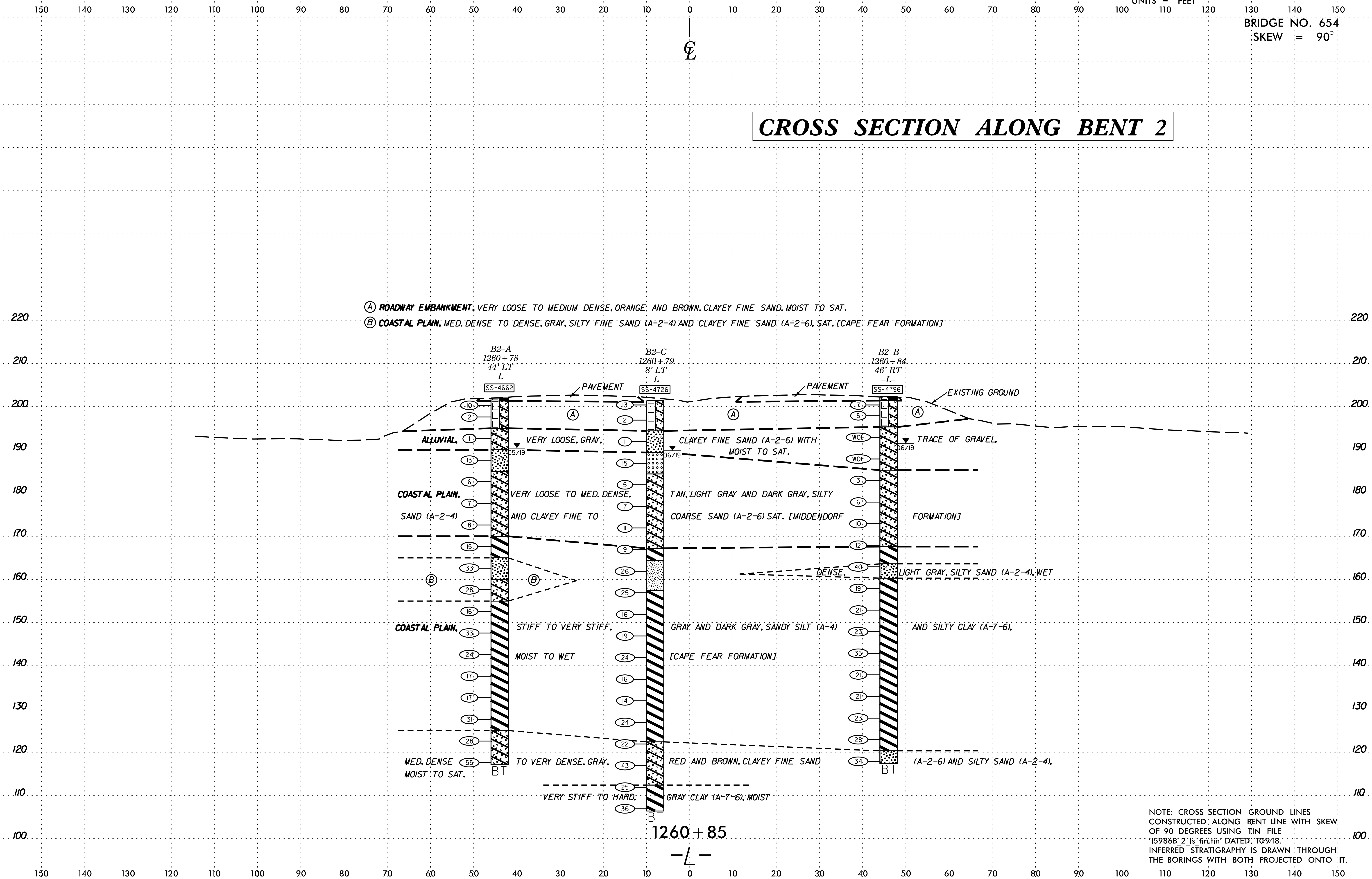


NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

0 5 10 UNITS = FEET	PROJ. REFERENCE NO.	SHEET NO.
	I-5986B	7

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG BENT 2



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

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

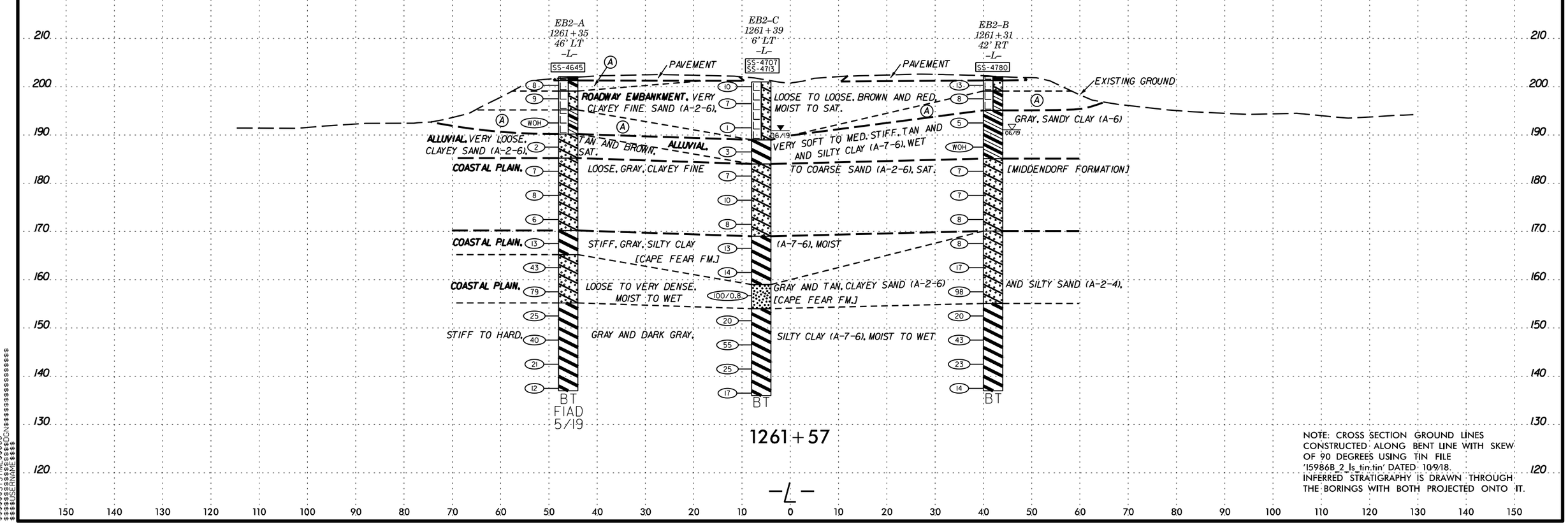
6/23/16

0 5 10 UNITS = FEET	PROJ. REFERENCE NO.	SHEET NO.
	I-5986B	8

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG END BENT 2

Ⓐ **ROADWAY EMBANKMENT.** VERY SOFT TO STIFF, BROWN, PINK AND TAN, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6), MOIST TO WET



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1259+18	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.5 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 584,937	**EASTING** 2,133,470	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/03/19	**COMP. DATE** 06/04/19	**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)
205										
	202.8	0.7								203.5 — 0.0 GROUND SURFACE 202.8 — 0.7 **ROADWAY EMBANKMENT** PAVEMENT (0.7 FEET)
200	200.0	3.5	9	7	5	12		W		200.5 — 3.0 MED. DENSE, TAN AND RED, SILTY FINE SAND (A-2-4)
195	195.0	8.5	3	5	6	11		M		MED. DENSE, BROWN, CLAYEY COARSE TO FINE SAND (A-2-6), TRACE OF GRAVEL 196.5 — 7.0
190	190.0	13.5	1	1	2	3		M		**ALLUVIAL** VERY LOOSE, BROWN, CLAYEY SAND (A-2-6) 191.5 — 12.0
185	185.0	18.5	3	9	10	19		M		**COASTAL PLAIN** VERY LOOSE TO MED. DENSE, LIGHT GRAY, GRAY AND WHITE, SILTY FINE SAND (A-2-4) AND FINE SAND (A-3) WITH GRAVEL [MIDDENDORF FORMATION] 186.5 — 17.0
180	180.0	23.5	3	1	2	3		W		
175	175.0	28.5	5	7	8	15		W		
170	170.0	33.5	4	6	6	12		W		
165	165.0	38.5	3	1	0	1		W		171.5 — 32.0 **COASTAL PLAIN** VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6) [CAPE FEAR FORMATION]
160	160.0	43.5	2	4	5	9	SS-4693	22%		166.5 — 37.0 STIFF, GRAY, SILTY CLAY (A-7-6)
155	155.0	48.5	3	4	5	9		W		161.5 — 42.0 LOOSE, LIGHT GRAY, CLAYEY FINE SAND (A-2-6)
150	150.0	53.5	15	18	11	29		W		156.5 — 47.0 MED. DENSE, DARK GRAY, FINE SAND (A-3)
145	145.0	58.5	7	11	12	23	SS-4696	23%		151.5 — 52.0 STIFF TO HARD, GRAY, SILTY CLAY (A-7-6)
140	140.0	63.5	10	19	21	40		M		
135	135.0	68.5	6	10	11	21		M		
130	130.0	73.5	5	7	9	16		M		
125			5	6	7	13		M		126.5 — 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1259+18	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.5 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 584,937	**EASTING** 2,133,470	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/03/19	**COMP. DATE** 06/04/19	**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
125						Match Line				
	125.0	78.5	5	15	14	29		W		MED. DENSE, GRAY, SILTY FINE SAND (A-2-4) *(continued)*
120	120.0	83.5	12	16	18	34		W		121.5 — 82.0 MED. DENSE TO DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)
115	115.0	88.5	13	12	16	28		W		113.5 — 90.0 Boring Terminated at Elevation 113.5 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 1259+24	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.2 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 584,911	**EASTING** 2,133,556	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/19/19	**COMP. DATE** 06/20/19	**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)
205										203.2 GROUND SURFACE	0.0
	202.2	1.0	5	5	4	9		M		202.2 **ROADWAY EMBANKMENT** PAVEMENT (1.0 FEET) LOOSE, TAN AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6), SOME GRAVEL	1.0
200	199.7	3.5	4	3	3	6		M		196.2 **ALLUVIAL** SOFT, ORANGE, SANDY CLAY (A-6)	7.0
195	194.7	8.5	2	1	1	2		W		188.7 VERY LOOSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)	14.5
190	189.7	13.5	WOH	WOH	3	3		W		186.2 **COASTAL PLAIN** MED. DENSE, WHITE AND TAN, FINE TO COARSE SAND (A-3) [MIDDENDORF FORMATION]	17.0
185	184.7	18.5	5	10	10	20		W			
180	179.7	23.5	4	8	8	16	SS-4826	24%			
175	174.7	28.5	4	7	6	13		W		171.2 **COASTAL PLAIN** LOOSE TO VERY DENSE, ORANGE AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE OF MICA [CAPE FEAR FORMATION]	32.0
170	169.7	33.5	6	11	9	20		W			
165	164.7	38.5	3	4	5	9		W			
160	159.7	43.5	9	21	39	60		W			
155	154.7	48.5	11	16	17	33		W			
150	149.7	53.5	5	8	11	19		M		151.2 STIFF TO HARD, GRAY, HIGHLY PLASTIC, CLAY (A-7-6), TRACE OF MICA	52.0
145	144.7	58.5	10	19	27	46		M			
140	139.7	63.5	5	7	8	15	SS-4834	25%			
135	134.7	68.5	5	7	9	16		M		133.2 Boring Terminated at Elevation 133.2 ft IN VERY STIFF CLAY (COASTAL PLAIN)	70.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 1259+21	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.0
COLLAR ELEV. 202.6 ft	**TOTAL DEPTH** 75.1 ft	**NORTHING** 584,927	**EASTING** 2,133,505	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/11/19	**COMP. DATE** 06/12/19	**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
205										
	202.6	0.0	3	6	5	11		M		202.6 GROUND SURFACE 0.0
200	199.0	3.6	4	3	4	7		M		**ROADWAY EMBANKMENT** MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6)
195	194.0	8.6	1	0	1	1		W		195.6 **ALLUVIAL** VERY SOFT, BROWN AND GRAY, SANDY CLAY (A-6) 7.0
190	189.0	13.6	3	3	8	11		W		190.5 **COASTAL PLAIN** MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION] 12.1
185	184.0	18.6	2	6	8	14	SS-4759	14%		185.5 LOOSE TO MED. DENSE, GRAY, GRAVELLY COARSE SAND (A-1-b) AND FINE SAND (A-3) 17.1
180	179.0	23.6	8	9	11	20		W		180.5 22.1
175	174.0	28.6	3	5	4	9		W		
170	169.0	33.6	12	5	4	9	SS-4762	35%		170.5 **COASTAL PLAIN** STIFF, GRAY, HIGHLY PLASTIC, SILTY CLAY (A-7-5), TRACE OF MICA [CAPE FEAR FORMATION] 32.1
165	164.0	38.6	2	4	4	8		W		
160	159.0	43.6	4	14	16	30		W		160.5 MED. DENSE TO VERY DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE OF MICA 42.1
155	154.0	48.6	10	17	35	52		W		
150	149.0	53.6	5	9	11	20	SS-4766	26%		150.5 STIFF TO HARD, GRAY, SILTY CLAY (A-7-6), TRACE OF MICA 52.1
145	144.0	58.6	10	15	22	37		W		
140	139.0	63.6	5	7	10	17		W		
135	134.0	68.6	4	6	8	14		W		
130	129.0	73.6	4	7	8	15		W		127.5 Boring Terminated at Elevation 127.5 ft IN STIFF SILTY CLAY (COASTAL PLAIN) 75.1

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 1259+90	**OFFSET** 41 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 585,003	**EASTING** 2,133,497	**24 HR.** 10.2
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/02/19	**COMP. DATE** 06/03/19	**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)
205										
	202.0	0.8	8	5	6	11		M		202.8 GROUND SURFACE 0.0 202.0 **ROADWAY EMBANKMENT** 0.8 PAVEMENT (0.8 FEET)
200	199.4	3.4	4	4	3	7		M		199.8 STIFF, ORANGE AND BROWN, SANDY CLAY (A-6) 3.0 LOOSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
195	194.4	8.4	2	9	5	14				193.8 9.0 **COASTAL PLAIN**
190	189.4	13.4	5	12	15	27		M		LOOSE TO MED. DENSE, GRAY, LIGHT GRAY AND WHITE, SILTY FINE SAND (A-2-4) AND FINE TO COARSE SAND (A-3), TRACE OF GRAVEL [MIDDENDORF FORMATION]
185	184.4	18.4	4	6	5	11		W		190.8 12.0
180	179.4	23.4	4	6	8	14		W		185.8 17.0 180.8 22.0
175	174.4	28.4	2	4	4	8		W		
170	169.4	33.4	2	2	3	5		W		170.8 32.0 **COASTAL PLAIN**
165	164.4	38.4	13	20	26	46		W		LOOSE, GRAY AND TAN, CLAYEY FINE SAND (A-2-6) [CAPE FEAR FORMATION]
160	159.4	43.4	8	20	21	41		W		165.8 37.0 DENSE, LIGHT GRAY AND GRAY, SILTY FINE SAND (A-2-4)
155	154.4	48.4	11	11	11	22		M		153.8 49.0 STIFF TO VERY STIFF, GRAY, SILTY CLAY (A-7-5)
150	149.4	53.4	4	9	11	20	SS-4679	24%		
145	144.4	58.4	4	9	12	21		M		
140	139.4	63.4	5	9	8	17		M		
135	134.4	68.4	5	6	7	13		M		
130	129.4	73.4	4	7	5	12		M		
125										125.8 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 1259+90	**OFFSET** 41 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 585,003	**EASTING** 2,133,497	**24 HR.** 10.2
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/02/19	**COMP. DATE** 06/03/19	**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
125	124.4	78.4	5	10	12	Match Line 22		W		122.9 MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) *(continued)* 79.9 Boring Terminated at Elevation 122.9 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN) *NO RECOVERY FROM DEPTH 28.4' TO 29.9'*

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 1259+83	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 584,965	**EASTING** 2,133,582	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/18/19	**COMP. DATE** 06/19/19	**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)
205										
	201.9	0.9	6	5	5	10		M		202.8 0.0 GROUND SURFACE 201.9 0.9 **ROADWAY EMBANKMENT** PAVEMENT (0.9 FEET) LOOSE, TAN AND RED, CLAYEY FINE TO COARSE SAND (A-2-6), SOME GRAVEL
200	199.4	3.4	4	6	4	10		W		
195	194.4	8.4	2	1	2	3				194.8 8.0 **ALLUVIAL** VERY LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4), TRACE OF GRAVEL
190	189.4	13.4	2	2	0	2		W		
185	184.4	18.4	2	6	8	14		W		185.8 17.0 **COASTAL PLAIN** MED. DENSE, LIGHT GRAY AND TAN, FINE TO COARSE SAND (A-3), SOME GRAVEL [MIDDENDORF FORMATION]
180	179.4	23.4	4	6	5	11		W		
175	174.4	28.4	2	4	5	9		W		175.8 27.0 LOOSE, TAN AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6)
170	169.4	33.4	3	3	5	8	SS-4810	21%		170.8 32.0 **COASTAL PLAIN** MED. STIFF TO STIFF, GRAY, HIGHLY PLASTIC, CLAY (A-7-6) [CAPE FEAR FORMATION]
165	164.4	38.4	3	6	9	15		M		
160	159.4	43.4	11	16	23	39		W		160.8 42.0 DENSE, GRAY, CLAYEY FINE SAND (A-2-6)
155	154.4	48.4	9	15	18	33		W		
150	149.4	53.4	5	9	10	19		M		150.8 52.0 VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA
145	144.4	58.4	8	12	14	26		M		
140	139.4	63.4	5	7	10	17		M		
135	134.4	68.4	5	7	10	17		M		
130	129.4	73.4	5	8	9	17		M		
125										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 1259+83	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 584,965	**EASTING** 2,133,582	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/18/19	**COMP. DATE** 06/19/19	**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
125						Match Line				
	124.4	78.4	5	6	10	16		M		VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA *(continued)*
120	119.4	83.4	9	18	19	37	SS-4820	18%		120.8 82.0 DENSE, BROWN AND GRAY, CLAYEY FINE SAND (A-2-6) 117.9 84.9 Boring Terminated at Elevation 117.9 ft IN DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 1259+89	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 584,991	**EASTING** 2,133,529	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/06/19	**COMP. DATE** 06/07/19	**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)
205											
	202.0	0.0								202.0 GROUND SURFACE	0.0
200	198.6	3.4	4	7	5	12		M		**ROADWAY EMBANKMENT** LOOSE TO MED. DENSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL	
			3	2	2	4		Sat.			
195	193.6	8.4								194.0	8.0
			WOH	WOH	WOH	0		Sat.		**ALLUVIAL** VERY LOOSE, BROWN, CLAYEY SAND (A-2-6)	
190	188.6	13.4								190.0	12.0
			4	16	19	35		Sat.		**COASTAL PLAIN** VERY LOOSE TO DENSE, GRAY AND WHITE, COARSE SAND (A-3) WITH GRAVEL, SILTY FINE SAND (A-2-4) AND SAND (A-3) WITH CLAY SEAMS (22.0'-32.0') [MIDDENDORF FORMATION]	
185	183.6	18.4								185.0	17.0
			3	6	8	14		Sat.			
180	178.6	23.4								180.0	22.0
			5	8	9	17		Sat.			
175	173.6	28.4									
			1	1	1	2		Sat.			
170	168.6	33.4								170.0	32.0
			3	4	4	8		Sat.		**COASTAL PLAIN** STIFF TO VERY STIFF, TAN, SANDY SILT (A-4) [CAPE FEAR FORMATION]	
165	163.6	38.4									
			6	10	15	25	SS-4746	20%			
160	158.6	43.4								158.0	44.0
			4	9	9	18		Sat.		VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA	
155	153.6	48.4								155.0	47.0
			10	20	21	41		M		DENSE, GRAY, CLAYEY COARSE TO FINE SAND (A-2-6)	
150	148.6	53.4								150.0	52.0
			5	8	11	19		M		VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-5), TRACE OF MICA	
145	143.6	58.4									
			4	7	8	15		M			
140	138.6	63.4									
			4	7	10	17		M			
135	133.6	68.4									
			4	7	8	15	SS-4752	30%			
130	128.6	73.4									
			6	9	9	18		M			
125										125.0	77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 1259+89	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 584,991	**EASTING** 2,133,529	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/06/19	**COMP. DATE** 06/07/19	**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
125						Match Line				
	123.6	78.4	9	13	14	27		M		MED. DENSE, GRAY, SILTY FINE SAND (A-2-4)
										122.1 79.9
										Boring Terminated at Elevation 122.1 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 1260+78	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,087	**EASTING** 2,133,525	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/28/19	**COMP. DATE** 05/30/19	**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)
205										
	201.3	0.7								202.0 GROUND SURFACE 0.0 201.3 **ROADWAY EMBANKMENT** 0.7 PAVEMENT (0.7 FEET)
200			7	5	5	10		M		VERY LOOSE TO LOOSE, BROWN, CLAYEY FINE SAND (A-2-6)
	198.6	3.4	1	1	1	2		Sat.		
195										195.0 7.0 **ALLUVIAL**
	193.6	8.4	1	0	1	1		Sat.		VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
190										190.0 12.0
	188.6	13.4	1	3	10	13		Sat.		**COASTAL PLAIN** MED. DENSE, TAN, SILTY FINE SAND (A-2-4) [MIDDENDORF FORMATION]
185										185.0 17.0
	183.6	18.4	2	3	3	6		Sat.		LOOSE, GRAY AND TAN, CLAYEY FINE SAND (A-2-6), TRACE OF MICA
180										
	178.6	23.4	4	3	4	7		Sat.		
175										
	173.6	28.4	5	4	4	8		Sat.		
170										170.0 32.0 **COASTAL PLAIN**
	168.6	33.4	4	6	9	15		M		STIFF, GRAY, CLAY (A-7-6) [CAPE FEAR FORMATION]
165										165.0 37.0
	163.6	38.4	10	16	17	33		Sat.		DENSE, GRAY, SILTY FINE SAND (A-2-4)
160										160.0 42.0
	158.6	43.4	8	12	16	28		Sat.		MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6)
155										155.0 47.0
	153.6	48.4	5	6	10	16		M		VERY STIFF TO HARD, GRAY, CLAY (A-7-5)
150										
	148.6	53.4	9	15	18	33		M		
145										
	143.6	58.4	9	11	13	24	SS-4662	23%		
140										
	138.6	63.4	8	8	9	17		M		
135										
	133.6	68.4	5	8	9	17		M		
130										
	128.6	73.4	9	14	17	31		M		
125										125.0 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 1260+78	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,087	**EASTING** 2,133,525	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/28/19	**COMP. DATE** 05/30/19	**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
125						Match Line				
	123.6	78.4	7	12	16	28		Sat.		MED. DENSE TO VERY DENSE, GRAY, CLAYEY FINE SAND (A-2-6) *(continued)*
120										
	118.6	83.4	19	28	27	55		Sat.		117.1 84.9 Boring Terminated at Elevation 117.1 ft IN VERY DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 1260+84	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.3 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,061	**EASTING** 2,133,611	**24 HR.** 10.8
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/17/19	**COMP. DATE** 06/18/19	**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)
205										
	201.4	0.9	7	4	3	7		M		202.3 — GROUND SURFACE — 0.0 201.4 — **ROADWAY EMBANKMENT** PAVEMENT (0.9 FEET) — 0.9 LOOSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
200	198.9	3.4	6	3	2	5		M		
195	193.9	8.4	WOH	WOH	WOH	0				195.3 — **ALLUVIAL** — 7.0 VERY LOOSE, BROWN, CLAYEY FINE SAND (A-2-6)
190	188.9	13.4	WOH	WOH	WOH	0				
185	183.9	18.4	2	2	1	3		W		185.3 — **COASTAL PLAIN** — 17.0 VERY LOOSE TO MED. DENSE, LIGHT GRAY AND DARK GRAY, CLAYEY COARSE SAND (A-2-6) [MIDDENDORF FORMATION]
180	178.9	23.4	3	3	3	6		W		
175	173.9	28.4	4	4	6	10		W		
170	168.9	33.4	3	5	7	12		W		167.6 — **COASTAL PLAIN** — 34.7 STIFF, DARK GRAY, CLAY (A-7-5) [CAPE FEAR FORMATION]
165	163.9	38.4	11	19	21	40		W		163.6 — 38.7 DENSE, LIGHT GRAY, SILTY FINE SAND (A-2-4)
160	158.9	43.4	6	7	12	19		M		160.3 — 42.0 VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE MICA
155	153.9	48.4	6	9	12	21		M		
150	148.9	53.4	5	11	12	23		M		
145	143.9	58.4	9	17	18	35		M		
140	138.9	63.4	7	11	10	21	SS-4798	20%		
135	133.9	68.4	6	9	12	21		M		
130	128.9	73.4	7	11	12	23		M		
125										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 1260+84	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.3 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,061	**EASTING** 2,133,611	**24 HR.** 10.8
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/17/19	**COMP. DATE** 06/18/19	**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
125						Match Line				
	123.9	78.4	6	10	18	28		M		VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE MICA *(continued)*
120	118.9	83.4	12	17	17	34		M		120.3 — 82.0 DENSE, GRAY, SILTY FINE SAND (A-2-4)
										117.4 — 84.9 Boring Terminated at Elevation 117.4 ft IN DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 1260+79	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 201.4 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 585,075	**EASTING** 2,133,559	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/05/19	**COMP. DATE** 06/06/19	**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)
205										
	201.4	0.0	8	8	5	13		M		201.4 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** VERY LOOSE TO MED. DENSE, BROWN AND ORANGE, CLAYEY FINE SAND (A-2-6)
200	197.9	3.5	3	1	1	2		Sat.		
195	192.9	8.5	1	0	1	1		Sat.		194.4 7.0 **ALLUVIAL** VERY LOOSE, GRAY, SILTY FINE SAND (A-2-4)
190	187.9	13.5	5	7	8	15		Sat.		189.4 12.0 **COASTAL PLAIN** MED. DENSE, GRAY, COARSE TO FINE SAND (A-3) WITH GRAVEL [MIDDENDORF FORMATION]
185	182.9	18.5	2	3	2	5		Sat.		184.4 17.0 LOOSE TO MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6) WITH CLAY SEAMS
180	177.9	23.5	2	3	4	7		Sat.		
175	172.9	28.5	5	5	6	11		Sat.		
170	167.9	33.5	3	4	5	9		M		167.2 34.2 **COASTAL PLAIN** STIFF, GRAY, CLAY (A-7-6)
165	162.9	38.5	8	11	15	26	SS-4726	17%		164.4 37.0 [CAPE FEAR FORMATION] VERY STIFF, GRAY, SANDY SILT (A-4)
160	157.9	43.5	8	13	12	25		M		157.4 44.0 STIFF TO VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-6), TRACE OF MICA
155	152.9	48.5	6	7	9	16		M		
150	147.9	53.5	5	9	10	19		M		
145	142.9	58.5	8	11	13	24		M		
140	137.9	63.5	5	7	9	16		M		
135	132.9	68.5	4	7	7	14		M		
130	127.9	73.5	7	12	12	24		M		
125										

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
125						Match Line				
	122.9	78.5	6	8	14	22		Sat.		122.4 79.0 STIFF TO VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-6), TRACE OF MICA *(continued)*
120	117.9	83.5	13	20	23	43		Sat.		DENSE, GRAY, RED AND BROWN, CLAYEY FINE SAND (A-2-6)
115	112.9	88.5	11	11	14	25		M		112.4 89.0 VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE OF MICA
110	107.9	93.5	12	16	20	36		M		106.4 95.0 Boring Terminated at Elevation 106.4 ft IN HARD CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG0654.GPJ NC_DOT.GDT 2/6/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Hartman, M.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 1261+35	**OFFSET** 46 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.1 ft	**TOTAL DEPTH** 65.1 ft	**NORTHING** 585,141	**EASTING** 2,133,543	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/23/19	**COMP. DATE** 05/24/19	**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)
205											
	201.3	0.8						M		202.1 GROUND SURFACE 201.3 **ROADWAY EMBANKMENT** PAVEMENT (0.8 FEET)	0.0 0.8
200			6	4	4	8					
	198.5	3.6						M		199.1 MED. STIFF, BROWN, SILTY CLAY (A-7-6), TRACE OF GRAVEL	3.0
			4	4	5	9				LOOSE, BROWN, CLAYEY SAND (A-2-6), TRACE OF GRAVEL	
195	193.5	8.6								195.2 VERY SOFT, BROWN, SANDY CLAY (A-6), TRACE OF GRAVEL	6.9
			WOH	WOH	WOH	0		W			
190										190.2 **ALLUVIAL**	11.9
	188.5	13.6								VERY LOOSE, TAN AND BROWN, CLAYEY SAND (A-2-6)	
			WOH	1	1	2		Sat.			
185	183.5	18.6								185.2 **COASTAL PLAIN**	16.9
			2	4	3	7				LOOSE, GRAY, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]	
180	178.5	23.6						Sat.			
			3	3	5	8					
175	173.5	28.6						Sat.			
			3	3	3	6					
170	168.5	33.6								170.2 **COASTAL PLAIN**	31.9
			4	6	7	13		M		STIFF, GRAY, SILTY CLAY (A-7-6) [CAPE FEAR FORMATION]	
165	163.5	38.6								165.2 DENSE TO VERY DENSE, TAN, CLAYEY SAND (A-2-6)	36.9
			13	22	21	43		M			
160	158.5	43.6									
			27	36	43	79	SS-4645	23%			
155	153.5	48.6								155.2 STIFF TO HARD, GRAY, SILTY CLAY (A-7)	46.9
			8	10	15	25		W			
150	148.5	53.6									
			13	19	21	40		M			
145	143.5	58.6									
			8	9	12	21		W			
140	138.5	63.6									
			3	6	6	12		W		137.0	65.1
										Boring Terminated at Elevation 137.0 ft IN STIFF SILTY CLAY (COASTAL PLAIN)	

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 1261+31	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 202.1 ft	**TOTAL DEPTH** 65.1 ft	**NORTHING** 585,107	**EASTING** 2,133,624	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/13/19	**COMP. DATE** 06/14/19	**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
205										
	201.3	0.8						M		202.1 GROUND SURFACE 201.3 **ROADWAY EMBANKMENT** PAVEMENT (0.8 FEET)
200			5	5	8	13				
	198.5	3.6						W		199.1 MED. DENSE, YELLOW AND BROWN, CLAYEY COARSE SAND (A-2-6)
			3	4	4	8				MED. STIFF, PINK AND TAN, SANDY CLAY (A-6)
195	193.5	8.6								195.1 **ALLUVIAL**
			2	3	2	5				VERY SOFT TO MED. STIFF, TAN, SANDY CLAY (A-6)
190										
	188.5	13.6								
			WOH	WOH	WOH	0		W		
185	183.5	18.6								185.1 **COASTAL PLAIN**
			2	4	3	7				LOOSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) [MIDDENDORF FORMATION]
180	178.5	23.6								
			3	4	3	7		W		
175	173.5	28.6								
			2	4	4	8		W		
170	168.5	33.6								170.1 **COASTAL PLAIN**
			2	4	4	8		W		LOOSE TO VERY DENSE, GRAY, CLAYEY SAND (A-2-6), TRACE OF MICA [CAPE FEAR FORMATION]
165	163.5	38.6								
			5	8	9	17		W		
160	158.5	43.6								
			18	42	56	98	SS-4780	18%		
155	153.5	48.6								155.1 STIFF TO HARD, GRAY, SILTY CLAY (A-7-5), TRACE MICA
			6	8	12	20		W		
150	148.5	53.6								
			12	20	23	43		W		
145	143.5	58.6								
			9	11	12	23		W		
140	138.5	63.6								
			4	7	7	14		W		137.0 65.1
										Boring Terminated at Elevation 137.0 ft IN STIFF SILTY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 1261+39	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 201.0 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 585,131	**EASTING** 2,133,582	**24 HR.** 10.1
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/04/19	**COMP. DATE** 06/04/19	**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)
205										
	201.0	0.0	7	5	5	10		M		201.0 GROUND SURFACE 0.0
200										**ROADWAY EMBANKMENT**
	197.5	3.5	3	4	3	7		Sat.		VERY LOOSE TO LOOSE, BROWN AND RED, CLAYEY FINE SAND (A-2-6)
195										
	192.5	8.5	2	1	0	1				
190										189.0 12.0
	187.5	13.5	2	1	2	3				**ALLUVIAL**
185							SS-4707	34%		SOFT, GRAY, SILTY CLAY (A-7-6), TRACE OF ORGANIC MATTER
	182.5	18.5	3	3	4	7				184.0 17.0
180										**COASTAL PLAIN**
	177.5	23.5	3	5	5	10		Sat.		LOOSE, GRAY, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION]
175										
	172.5	28.5	5	4	4	8		Sat.		
170										169.0 32.0
	167.5	33.5	3	6	7	13				**COASTAL PLAIN**
165								M		STIFF, GRAY, CLAY (A-7-6) [CAPE FEAR FORMATION]
	162.5	38.5	4	6	8	14		M		
160										159.0 42.0
	157.5	43.5	40	60/0.3		100/0.8	SS-4713	21%		VERY DENSE, GRAY, SILTY SAND (A-2-4)
155										154.0 47.0
	152.5	48.5	6	8	12	20		M		VERY STIFF TO HARD, GRAY AND DARK GRAY, CLAY (A-7-6)
150										
	147.5	53.5	15	27	28	55		M		
145										
	142.5	58.5	7	11	14	25		M		
140										
	137.5	63.5	5	8	9	17		M		136.0 65.0
										Boring Terminated at Elevation 136.0 ft IN VERY STIFF CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG0654.GPJ NC_DOT.GDT 2/6/20

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

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

S&ME Project #:	6235-17-048		Date Report: 8/1/2019
State Project No.:	47532.1.3	County: Johnston	Date Tested: 7/1/2019
Federal ID No.:	N/A	TIP No.: I-5986B	
Project Name:	Br. No. 654 on I-95 (-L-) over Mingo Swamp		
Client Name:	Michael Baker International	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	Coarse Sand	Fine Sand	Silt	Clay				
SS-4645	1261+35	46' LT	-L-	43.6-45.1	A-2-6	(0)	100	89	-	24.1	32	48	10	10	36	19	17	22.5
SS-4662	1260+78	44' LT	-L-	58.4-59.9	A-7-5	(10)	100	93	-	65.5	16	28	42	14	46	31	15	22.7
SS-4679	1259+90	41' LT	-L-	53.4-54.9	A-7-6	(20)	100	99	-	81.1	2	33	44	21	51	29	22	23.8
SS-4693	1259+18	43' LT	-L-	38.5-40.0	A-7-6	(3)	99	68	-	36.7	46	19	4	31	41	17	24	22.0
SS-4696	1259+18	43' LT	-L-	53.5-55.0	A-7-6	(15)	100	95	-	68.3	10	33	40	17	50	28	22	22.6
SS-4707	1261+39	6' LT	-L-	13.5-15.0	A-7-6	(3)	87	82	-	35.8	15	47	3	35	44	19	25	33.5
SS-4713	1261+39	6' LT	-L-	43.5-45.0	A-2-4	(0)	100	87	-	33.5	28	43	16	13	23	14	9	20.5
SS-4726	1260+79	8' LT	-L-	38.5-40.0	A-4	(2)	100	99	-	17.3	2	56	24	18	31	22	9	17.3
SS-4746	1259+89	7' LT	-L-	38.4-39.9	A-4	(1)	100	100	-	47.2	3	60	17	20	25	16	9	20.0
SS-4752	1259+89	7' LT	-L-	68.4-69.9	A-7-5	(22)	100	96	-	84.5	7	17	58	18	54	32	22	30.1
SS-4759	1259+21	7' LT	-L-	18.6-20.1	A-1-b	(1)	50	43	-	4.6	64	28	3	5	N.P.	N.P.	N.P.	13.5
SS-4762	1259+21	7' LT	-L-	33.6-35.1	A-7-6	(30)	100	97	-	87.9	4	12	25	59	53	21	32	34.6
SS-4766	1259+21	7' LT	-L-	53.5-55.1	A-7-6	(16)	100	96	-	73.6	9	29	50	12	50	29	21	25.5
SS-4780	1261+31	42' RT	-L-	43.6-45.1	A-2-6	(0)	99	79	-	28.7	37	40	19	4	31	20	11	17.5
SS-4798	1260+84	46' RT	-L-	63.4-64.9	A-7-6	(16)	100	97	-	76.7	6	21	53	20	49	29	20	19.6
SS-4810	1259+83	52' RT	-L-	33.4-34.9	A-7-6	(32)	100	95	-	77.2	9	20	23	48	58	17	41	21.2
SS-4820	1259+83	52' RT	-L-	83.4-84.9	A-2-6	(0)	100	71	-	30.7	46	27	14	13	32	19	13	18.1
SS-4826	1259+24	46' RT	-L-	23.5-25.0	A-3	(1)	99	53	-	4.9	86	10	1	3	N.P.	N.P.	N.P.	23.9
SS-4834	1259+24	46' RT	-L-	63.5-65.0	A-7-6	(25)	100	99	-	85.9	2	28	49	21	52	25	27	24.7

References / Comments / Deviations: References / Comments / De References / Comments / Deviation References / Com References / Comments / I References / Comments / I

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	Stacie E. Mitchell, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

SITE PHOTOGRAPH

Bridge No. 654 on –L– (I-95) over Mingo Swamp

Looking South

REFERENCE: I-5986B

PROJECT: 47532

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 WIDENING FROM SR 1811 (BUD HAWKINS RD.) (EXIT 70) TO I-40 (EXIT 81) – WIDEN TO EIGHT LANES*

SITE DESCRIPTION *BRIDGE NO. 655 ON I-95 OVER DRIVING BRANCH*

CONTENTS

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PERSONNEL

H. CAMP

S. HARDEE

T. WHITEHEAD

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *FEBRUARY 2020*

9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726

NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by:
Stacie Mitchell
BBC611B64F19458...
SIGNATURE

2/7/2020
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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
- [X] 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
- [ ] TRICONE _____" 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-119 N: 595164 E: 2141124

ELEVATION: 176.43 FEET

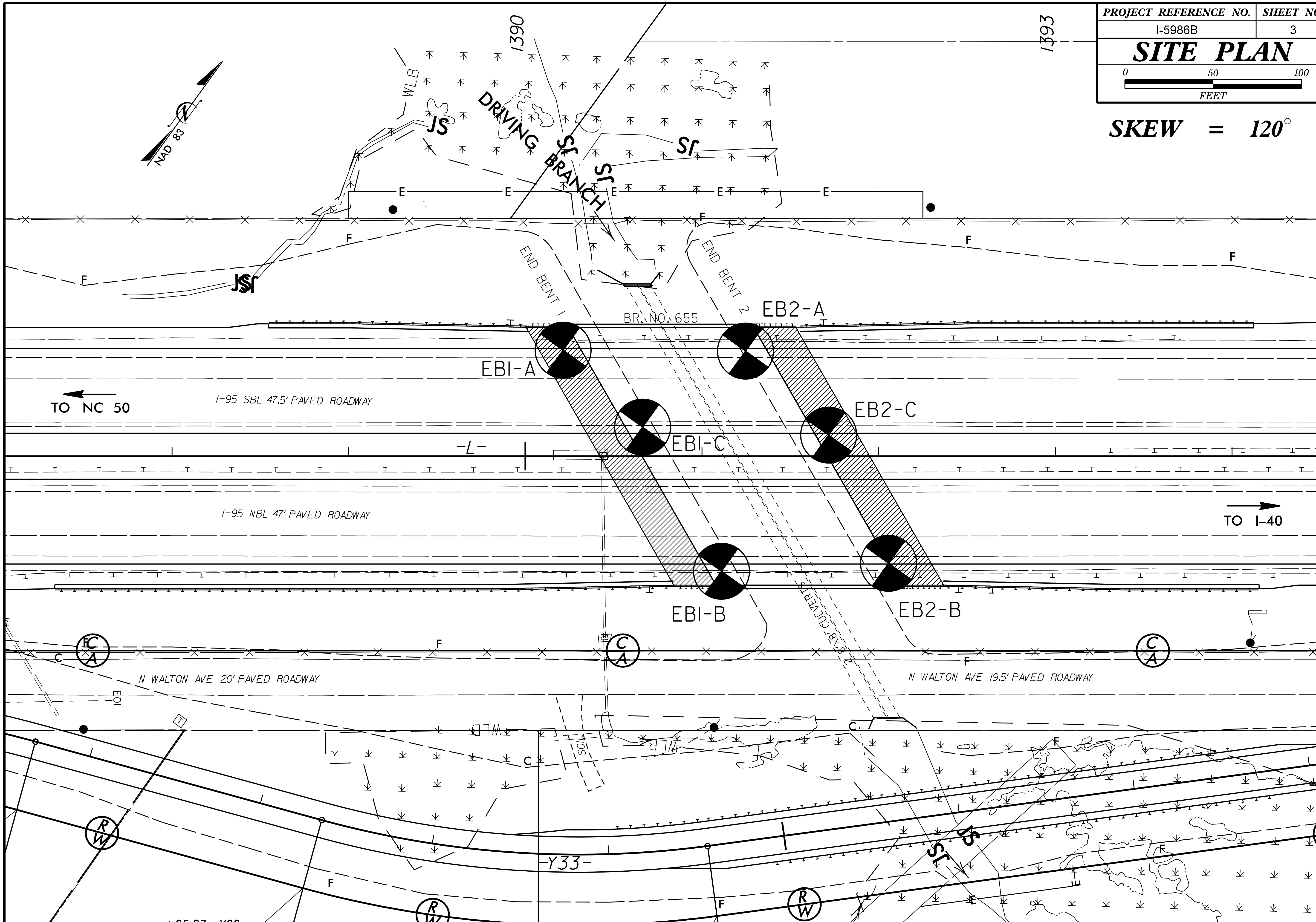
NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	3

SITE PLAN



5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE ALONG CENTERLINE OF –L–

0 40 80
FEET
VE = 2:1

BEGIN BRIDGE
–L– Sta. 1390+66 ±

END BRIDGE
–L– Sta. 1391+72 ±

EXISTING GROUND

EB1–C
1390+66
16' LT
–L–

EB2–C
1391+72
12' LT
–L–

BRIDGE NO. 655

PROPOSED GRADE

ROADWAY EMBANKMENT. LOOSE TO FINE TO MED. DENSE, RED, ORANGE AND BROWN, COARSE SAND (A-2-4), MOIST

CLAYEY FINE TO COARSE SAND (A-2-6) AND SILTY

ALLUVIAL. SOFT TO MED. STIFF, VERY LOOSE TO LOOSE, GRAVEL (A-1-B) AND CLAYEY GRAY, BROWN, RED AND DARK GRAY, GRAY AND DARK GRAY, CLAYEY F.TO GRAVEL (A-1-B), MOIST

SANDY CLAY (A-6) WITH TRACE WOOD PIECES, MOIST TO WET

COASTAL PLAIN. STIFF TO VERY STIFF, MED. DENSE, CLAYEY F.TO CSE. SAND (A-2-6) WITH TRACE MICA, MOIST

GRAY, SANDY CLAY (A-6) AND CLAY

CSE. SAND (A-2-6) WITH TRACE WOOD AND ORGANIC ODOR.

(A-7-6) WITH TRACE MICA, MOIST [MIDDDENDORF FORMATION]

MED. DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) WITH TRACE MICA, MOIST

VERY STIFF, GREEN, BROWN, RED AND GRAY, SANDY CLAY (A-6) AND CLAY (A-7-6) WITH TRACE MICA, MOIST

MED. DENSE, GRAY AND BROWN, SILTY F.TO CSE. SAND (A-2-4) AND CLAYEY F. TO CSE. SAND (A-2-6), MOIST

VERY STIFF TO HARD, GRAY, RED AND BROWN, CLAY (A-7-6) AND SANDY CLAY (A-6), MOIST

MED. DENSE, GRAY, SILTY F.TO CSE. SAND (A-2-4) AND CLAYEY F.TO CSE. SAND (A-2-6) WITH TRACE MICA, MOIST

HARD, GRAY, SANDY CLAY (A-6) WITH TRACE MICA, MOIST

VERY DENSE, GRAY AND BROWN, SILTY FINE SAND (A-2-4), MOIST

BT
FIAD
01/20

BT
FIAD
01/20

NOTE: EXISTING GROUND SURFACE PROFILE OF –L– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60

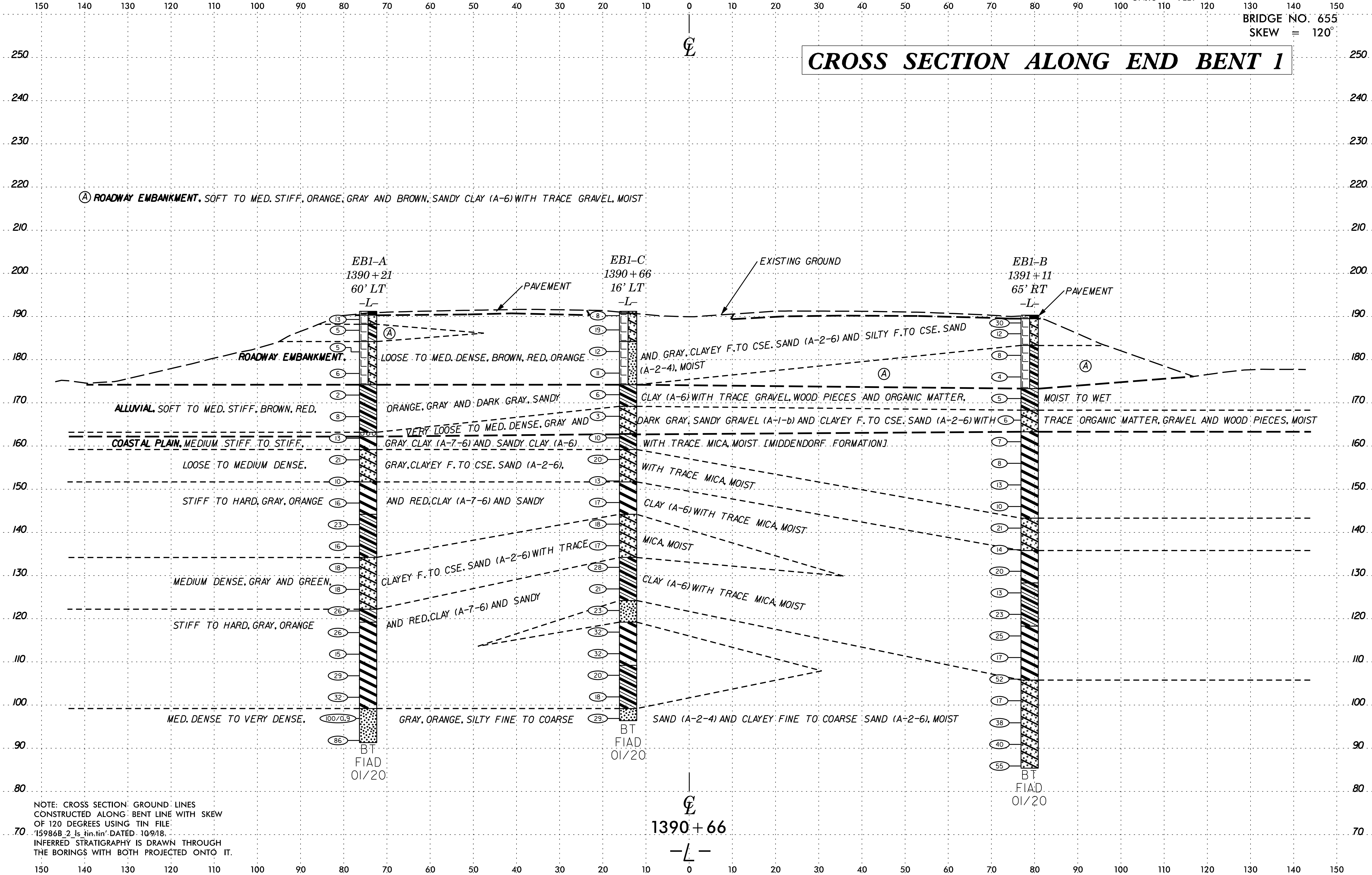
1389+00 1390+00 1391+00 1392+00 1393+00

PROJ. REFERENCE NO.	SHEET NO.
I-5986B	5

0 5 10 UNITS = FEET

BRIDGE NO. 655
SKEW = 120°

CROSS SECTION ALONG END BENT 1



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120 DEGREES USING TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

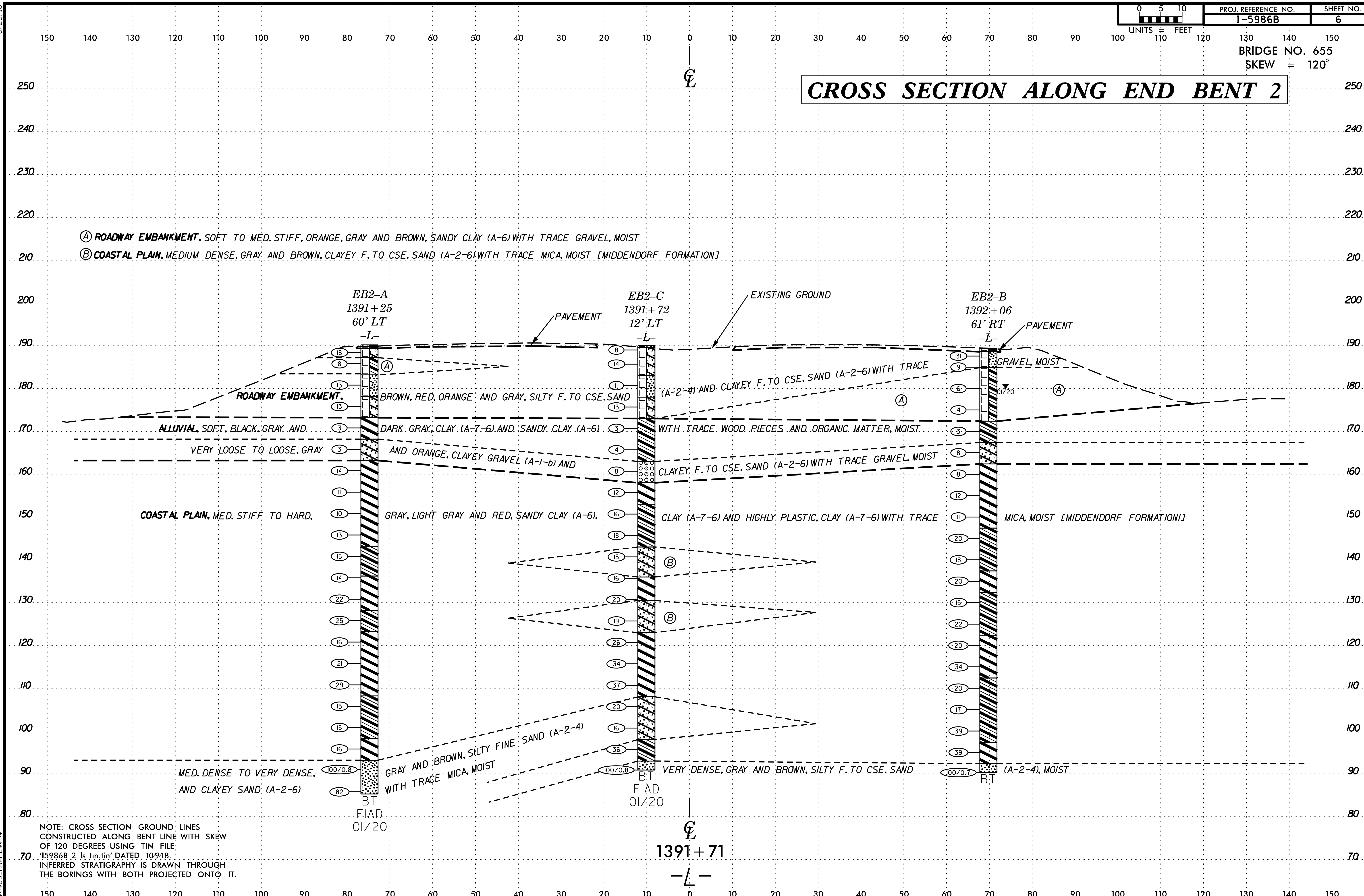
6/23/16

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

PROJ. REFERENCE NO. I-5986B | SHEET NO. 6

BRIDGE NO. 655
SKEW = 120°

CROSS SECTION ALONG END BENT 2



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1390+21	**OFFSET** 60 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 191.2 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 595,223	**EASTING** 2,140,864	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/22/20	**COMP. DATE** 01/23/20	**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)
195										
190	190.3	0.9	10	6	7	13		M		191.2 — GROUND SURFACE — 0.0 190.3 — **ROADWAY EMBANKMENT** (PAVEMENT) — 0.9
	187.8	3.4	2	2	3	5		M		188.2 — MEDIUM DENSE, ORANGE, GRAY AND BROWN, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL — 3.0
185										
	182.8	8.4	4	2	3	5		M		184.2 — MEDIUM STIFF, ORANGE, GRAY, AND BROWN, SANDY CLAY (A-6), TRACE GRAVEL — 7.0 LOOSE, BROWN, RED, AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL
180										
	177.8	13.4	2	3	3	6		M		
175										
	172.8	18.4	1	1	1	2		W		174.2 — **ALLUVIAL** — 17.0 VERY SOFT TO MEDIUM STIFF, BROWN, RED AND DARK GRAY, SANDY CLAY (A-6), TRACE GRAVEL AND WOOD PIECES
170										
	167.8	23.4	1	3	5	8		W		
165										
	162.8	28.4	3	5	8	13		M		163.2 — 28.0 162.2 — MEDIUM DENSE, GRAY, SANDY GRAVEL (A-1-b) — 29.0
160										
	157.8	33.4	6	10	11	21		M		159.2 — **COASTAL PLAIN** — 32.0 STIFF, GRAY, CLAY (A-7-6) [MIDDENDORF FORMATION] MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
155										
	152.8	38.4	6	6	4	10		M		151.7 — 39.5 STIFF TO VERY STIFF, GRAY, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA
150										
	147.8	43.4	6	7	9	16		M		
145										144.2 — 47.0
	142.8	48.4	6	10	13	23		M		
140										
	137.8	53.4	5	7	9	16		M		
135										134.2 — 57.0 MEDIUM DENSE, GRAY AND GREEN, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
	132.8	58.4	6	7	11	18		M		
130										
	127.8	63.4	5	8	10	18		M		
125										
	122.8	68.4	8	10	16	26		M		122.2 — 69.0 VERY STIFF TO HARD, GRAY AND RED, SANDY CLAY (A-6) AND CLAY (A-7-6), TRACE MICA
120										
	117.8	73.4	7	10	16	26		M		119.2 — 72.0
115										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1390+21	**OFFSET** 60 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 191.2 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 595,223	**EASTING** 2,140,864	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/22/20	**COMP. DATE** 01/23/20	**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
115						Match Line				
110	112.8	78.4	5	7	8	15		M		
	107.8	83.4	6	9	20	29		M		
105										
100	102.8	88.4	6	11	21	32		M		
	97.8	93.4	30	70/0.4		100/0.9		M		99.2 — 92.0 VERY DENSE, GRAY, SILTY FINE TO COARSE SAND (A-2-4)
95										
	92.8	98.4	25	50	36	86		M		91.3 — 99.9 Boring Terminated at Elevation 91.3 ft IN VERY DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 1391+11	**OFFSET** 65 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 190.3 ft	**TOTAL DEPTH** 104.9 ft	**NORTHING** 595,174	**EASTING** 2,141,010	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/19/20	**COMP. DATE** 01/20/20	**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)
195										
190	189.5	0.8	6	14	16	30		M		190.3 — GROUND SURFACE — 0.0 189.5 — **ROADWAY EMBANKMENT** (PAVEMENT) — 0.8
	187.0	3.3	7	8	4	12		M		MEDIUM DENSE, BROWN AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL
185										183.3 — 7.0
	182.0	8.3	3	3	5	8		M		SOFT TO MEDIUM STIFF, GRAY, ORANGE, AND BROWN, SANDY CLAY (A-6), TRACE GRAVEL
180										
	177.0	13.3	2	2	2	4		M		
175										
	172.0	18.3	2	3	2	5		M		173.3 — 17.0 **ALLUVIAL** MEDIUM STIFF, DARK GRAY, SANDY CLAY (A-6), TRACE ORGANICS AND WOOD
170										168.3 — 22.0
	167.0	23.3	2	2	4	6		M		LOOSE, DARK GRAY, CLAYEY FINE SAND (A-2-6), TRACE ORGANICS AND WOOD
165										
	162.0	28.3	2	4	3	7		M		163.3 — 27.0 **COASTAL PLAIN** MEDIUM STIFF TO STIFF, GRAY, CLAY (A-7-6) [MIDDENDORF FORMATION]
160										
	157.0	33.3	3	3	5	8		M		
155										
	152.0	38.3	5	6	7	13		M		
150										
	147.0	43.3	3	5	5	10		M		
145										143.3 — 47.0 MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)
	142.0	48.3	6	10	11	21		M		
140										
	137.0	53.3	7	7	7	14		M		135.8 — 54.5 STIFF TO VERY STIFF, DARK GRAY, GRAY, ORANGE AND RED, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA
135										
	132.0	58.3	6	8	12	20		M		
130										128.3 — 62.0
	127.0	63.3	5	6	7	13		M		
125										
	122.0	68.3	8	10	13	23		M		
120										118.3 — 72.0
	117.0	73.3	7	10	15	25		M		
115										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 1391+11	**OFFSET** 65 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 190.3 ft	**TOTAL DEPTH** 104.9 ft	**NORTHING** 595,174	**EASTING** 2,141,010	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/19/20	**COMP. DATE** 01/20/20	**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
115						Match Line				
	112.0	78.3	6	7	10	17		M		
110										
	107.0	83.3	7	10	42	52		M		105.8 — 84.5 MED. DENSE TO VERY DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)
105										
	102.0	88.3	7	7	10	17		M		
100										
	96.9	93.4	14	18	20	38		M		
95										
	91.9	98.4	7	18	22	40		M		
90										
	86.9	103.4	17	25	30	55		M		85.4 — 104.9 Boring Terminated at Elevation 85.4 ft IN VERY DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 1390+66	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 191.2 ft	**TOTAL DEPTH** 94.8 ft	**NORTHING** 595,214	**EASTING** 2,140,926	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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)
195										
	191.2	0.0	3	3	5	8		M		191.2 0.0 GROUND SURFACE
190										190.7 0.5 **ROADWAY EMBANKMENT** LOOSE, BROWN, SILTY SAND (A-2-4)
	187.9	3.3	8	8	11	19		M		LOOSE TO MEDIUM DENSE, ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6)
185										
	182.9	8.3	6	6	6	12		M		184.2 7.0 MEDIUM DENSE, RED AND BROWN, SILTY FINE TO COARSE SAND (A-2-4)
180										
	177.9	13.3	5	6	5	11		M		
175										174.2 17.0 **ALLUVIAL**
	172.9	18.3	2	3	3	6		M		MEDIUM STIFF, GRAY AND BROWN, SANDY CLAY (A-6), TRACE WOOD PIECES
170										169.2 22.0
	167.9	23.3	3	2	1	3		W		VERY LOOSE, DARK GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL, TRACE WOOD PIECES, ORGANIC ODOR
165										
	162.9	28.3	2	4	6	10		M		162.9 28.3
160										162.7 28.5 LOOSE, DARK GRAY, GRAVEL (A-1-B)
	157.9	33.3	6	9	11	20		M		**COASTAL PLAIN**
155										159.2 32.0 STIFF, GRAY, SANDY CLAY (A-6), TRACE MICA [MIDDENDORF FORMATION]
	152.9	38.3	6	7	6	13		M		MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
150										
	147.9	43.3	5	8	9	17		M		151.7 39.5 STIFF TO VERY STIFF, GRAY, CLAY (A-7-6), TRACE MICA
145										
	142.9	48.3	5	9	9	18		M		144.2 47.0 MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
140										
	137.9	53.3	7	9	8	17		M		
135										134.2 57.0 VERY STIFF, GRAY, GREEN, AND BROWN, SANDY CLAY (A-6), TRACE MICA
	132.9	58.3	7	13	15	28		M		
130										
	127.9	63.3	6	10	11	21		M		
125										124.2 67.0 MEDIUM DENSE, GRAY, SILTY FINE TO COARSE SAND (A-2-4)
	122.9	68.3	11	10	13	23		M		
120										119.2 72.0 VERY STIFF TO HARD, GRAY, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA
	117.9	73.3	9	15	17	32		M		
115										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 1390+66	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 191.2 ft	**TOTAL DEPTH** 94.8 ft	**NORTHING** 595,214	**EASTING** 2,140,926	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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
115						Match Line				
	112.9	78.3	7	14	18	32		M		VERY STIFF TO HARD, GRAY, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA *(continued)*
110										109.2 82.0
	107.9	83.3	5	9	11	20		M		
105										
	102.9	88.3	5	8	10	18		M		
100										99.2 92.0
	97.9	93.3	17	16	13	29		M		MEDIUM DENSE, GRAY, SILTY FINE TO COARSE SAND (A-2-4)
										96.4 94.8 Boring Terminated at Elevation 96.4 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)
										No recovery from depths 82.0'-87.0', assume A-6

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 1391+25	**OFFSET** 60 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 190.2 ft	**TOTAL DEPTH** 104.9 ft	**NORTHING** 595,283	**EASTING** 2,140,948	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/22/20	**COMP. DATE** 01/23/20	**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)
195											
190	189.4	0.8	5	8	10	18		M		190.2 GROUND SURFACE	0.0
										189.4 **ROADWAY EMBANKMENT** (PAVEMENT)	0.8
	186.8	3.4	2	3	5	8		M		187.2 MEDIUM DENSE, BROWN AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL	3.0
185										183.2 MEDIUM STIFF, GRAY, ORANGE AND BROWN, SANDY CLAY (A-6), TRACE GRAVEL	7.0
	181.8	8.4	5	6	7	13		M		MEDIUM DENSE, ORANGE, SILTY FINE TO COARSE SAND (A-2-4)	
180										178.2	12.0
	176.8	13.4	7	7	6	13		M		MEDIUM DENSE, BROWN AND RED, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL	
175										173.2	17.0
	171.8	18.4	2	1	2	3		M		**ALLUVIAL** SOFT, BLACK, CLAY (A-7-6), TRACE WOOD PIECES	
170										168.2	22.0
	166.8	23.4	3	1	2	3		M		VERY LOOSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)	
165										163.2	27.0
	161.8	28.4	3	6	8	14		M		**COASTAL PLAIN** STIFF TO VERY STIFF, GRAY, BROWN AND RED, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA [MIDDENDORF FORMATION]	
160											
	156.8	33.4	3	5	6	11		M			
155											
	151.8	38.4	4	4	6	10		M			
150											
	146.8	43.4	4	5	8	13		M			
145										143.2	47.0
	141.8	48.4	5	7	8	15		M			
140											
	136.8	53.4	5	6	8	14		M		136.2	54.0
135											
	131.8	58.4	6	10	12	22		M			
130										128.2	62.0
	126.8	63.4	8	11	14	25		M			
125										123.2	67.0
	121.8	68.4	5	7	9	16		M			
120											
	116.8	73.4	6	9	12	21		M			
115											

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
115						Match Line				
110	111.8	78.4	7	12	17	29		M		108.2 82.0
	106.8	83.4	8	6	9	15		M		
105										
	101.8	88.4	6	5	10	15		M		98.2 92.0
100										
	96.8	93.4	7	6	10	16		M		93.2 97.0
95										VERY DENSE, GRAY, SILTY FINE SAND (A-2-4)
	91.8	98.4	55	45/0.3		100/0.8		M		
90										85.3 104.9
	86.8	103.4	36	51	31	82		M		Boring Terminated at Elevation 85.3 ft IN VERY DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 1392+06	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 189.4 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 595,233	**EASTING** 2,141,084	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/20/20	**COMP. DATE** 01/21/20	**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)
190										189.4 — 0.0 GROUND SURFACE
	188.6	0.8						M		188.6 — 0.8 (PAVEMENT)
			3	15	16	31				**ROADWAY EMBANKMENT** MEDIUM DENSE TO DENSE, GRAY, ORANGE AND BROWN, SILTY FINE TO COARSE SAND (A-2-4), TRACE GRAVEL
	186.0	3.4						M		184.9 — 4.5
185			6	5	4	9				SOFT TO STIFF, GRAY, RED AND BROWN, SANDY CLAY (A-6)
	181.0	8.4								
180			2	4	2	6				
	176.0	13.4						M		
175			2	2	2	4				
	171.0	18.4						M		172.4 — 17.0 **ALLUVIAL** SOFT, GRAY, SANDY CLAY (A-6), TRACE WOOD AND ORGANICS
170			1	1	2	3				
	166.0	23.4						M		167.4 — 22.0 LOOSE, GRAY AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL
165			2	3	5	8				
	161.0	28.4						M		162.4 — 27.0 **COASTAL PLAIN** MEDIUM STIFF TO STIFF, LIGHT GRAY, CLAY (A-7-6), HIGHLY PLASTIC [MIDDENDORF FORMATION]
160			5	4	4	8				
	156.0	33.4						M		
155			4	4	8	12				
	151.0	38.4						M		
150			3	5	6	11				
	146.0	43.4						M		147.4 — 42.0 STIFF TO VERY STIFF, GRAY, DARK GRAY AND RED, SANDY CLAY (A-6) AND CLAY (A-7-6), TRACE MICA
145			4	7	13	20				
	141.0	48.4						M		
140			6	9	9	18				
	136.0	53.4						M		137.4 — 52.0
135			5	9	11	20				
	131.0	58.4						M		132.4 — 57.0
130			6	7	8	15				
	126.0	63.4						M		
125			7	9	13	22				
	121.0	68.4						M		122.4 — 67.0 VERY STIFF TO HARD, GRAY AND RED, CLAY (A-7), HIGHLY PLASTIC
120			6	8	12	20				
	116.0	73.4						M		
115			9	13	21	34				
	111.0	78.4						M		112.4 — 77.0
110			7	9	11	20				

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 1392+06	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 189.4 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 595,233	**EASTING** 2,141,084	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/20/20	**COMP. DATE** 01/21/20	**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
110						Match Line		M		VERY STIFF TO HARD, GRAY AND BROWN, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6), TRACE MICA *(continued)*
	106.0	83.4	7	8	9	17				
105								M		
	101.0	88.4	7	16	23	39				
100								M		97.4 — 92.0
	96.0	93.4	12	18	21	39				
95								M		92.4 — 97.0 VERY DENSE, GRAY, SILTY FINE TO COARSE SAND (A-2-4), TRACE MICA
	91.0	98.4	50	50/0.2		100/0.7		M		90.3 — 99.1 Boring Terminated at Elevation 90.3 ft IN VERY DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 1391+72	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 190.0 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 595,272	**EASTING** 2,141,014	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/28/20	**COMP. DATE** 01/29/20	**SURFACE WATER DEPTH** N/A	

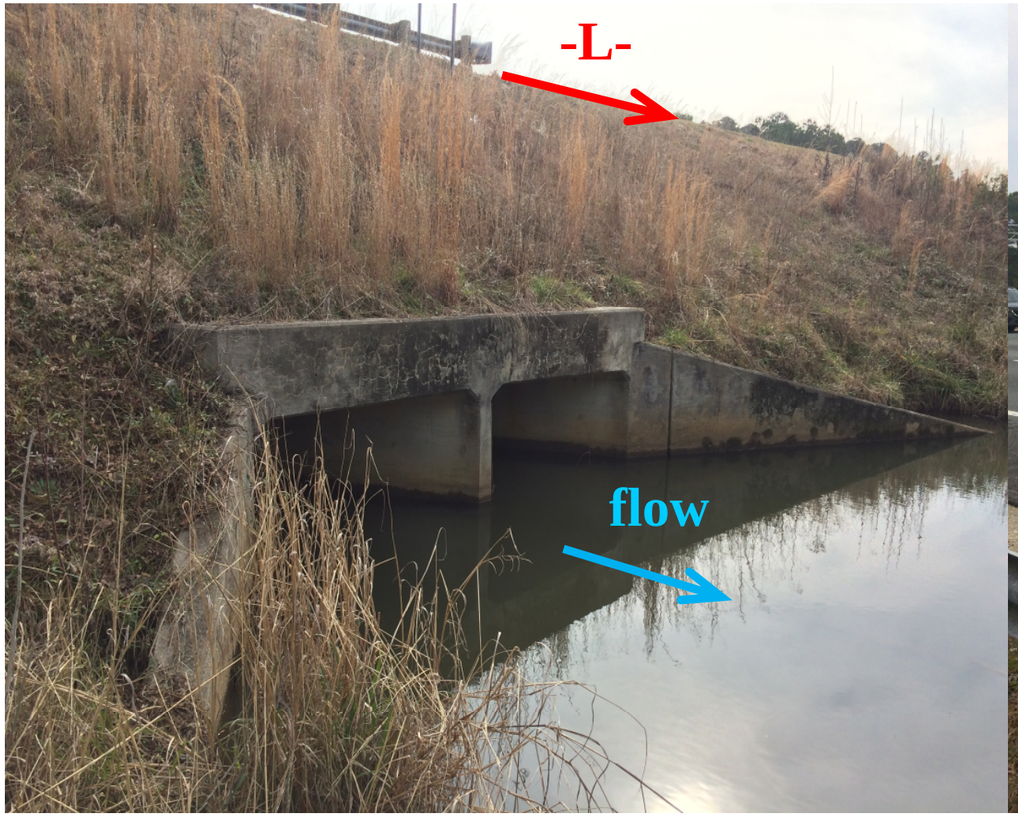
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
195										
190	190.0	0.0	3	4	4	8		M		190.0 — 0.0 GROUND SURFACE 189.6 — 0.4 **ROADWAY EMBANKMENT** LOOSE, BROWN, SILTY SAND (A-2-4)
	186.7	3.3	4	7	7	14		M		LOOSE TO MEDIUM DENSE, ORANGE AND BROWN, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE GRAVEL
185										183.0 — 7.0
	181.7	8.3	5	6	5	11		M		MEDIUM DENSE, BROWN AND RED, SILTY FINE TO COARSE SAND (A-2-4)
180										178.0 — 12.0
	176.7	13.3	4	5	8	13		M		MEDIUM DENSE, BROWN AND RED, CLAYEY FINE TO COARSE SAND (A-2-6)
175										173.0 — 17.0
	171.7	18.3	1	1	2	3		M		**ALLUVIAL** SOFT, BROWN, RED AND DARK GRAY, SANDY CLAY (A-6), TRACE WOOD PIECES
170										
	166.7	23.3	2	2	2	4		M		
165										163.0 — 27.0
	161.7	28.3	10	5	3	8		M		LOOSE, GRAY, CLAYEY GRAVEL (A-1-B)
160										158.0 — 32.0
	156.7	33.3	4	6	6	12		M		**COASTAL PLAIN** STIFF TO VERY STIFF, GRAY, CLAY (A-7-6) AND SANDY CLAY (A-6), TRACE MICA
155										153.0 — 37.0 [MIDDENDORF FORMATION]
	151.7	38.3	4	7	9	16		M		
150										
	146.7	43.3	4	7	11	18		M		
145										
	141.7	48.3	6	8	7	15		M		143.0 — 47.0 MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
140										
	136.7	53.3	6	8	8	16		M		136.0 — 54.0 VERY STIFF, RED AND GRAY, CLAY (A-7-6), TRACE MICA
135										
	131.7	58.3	6	9	11	20		M		130.5 — 59.5 MEDIUM DENSE, GRAY AND BROWN, CLAYEY FINE SAND (A-2-6)
130										
	126.7	63.3	7	8	11	19		M		123.0 — 67.0 VERY STIFF TO HARD, GRAY, RED AND BROWN, CLAY (A-7-6)
125										
	121.7	68.3	8	12	14	26		M		
120										
	116.7	73.3	6	14	20	34		M		
115										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Camp. H.	
SITE DESCRIPTION BRIDGE NO. 655 ON I-95 (-L-) OVER DRIVING BRANCH				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 1391+72	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 190.0 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 595,272	**EASTING** 2,141,014	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME8245 CME-55 90% 09/06/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Miller	**START DATE** 01/28/20	**COMP. DATE** 01/29/20	**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
115						Match Line				
	111.7	78.3	10	17	20	37		M		VERY STIFF TO HARD, GRAY, RED AND BROWN, CLAY (A-7-6) *(continued)*
110										108.0 — 82.0
	106.7	83.3	6	10	10	20		M		MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE MICA
105										
	101.7	88.3	6	8	8	16		M		
100										98.0 — 92.0
	96.7	93.3	13	16	20	36		M		HARD, GRAY, SANDY CLAY (A-6), TRACE MICA
95										93.0 — 97.0
	91.7	98.3	37	63/0.3		100/0.8		M		90.9 — 99.1 VERY DENSE, GRAY AND BROWN, SILTY FINE SAND (A-2-4)
										Boring Terminated at Elevation 90.9 ft IN VERY DENSE SILTY SAND (COASTAL PLAIN)

SITE PHOTOGRAPH

Bridge No. 655 on –L– (I-95) over Driving Branch



Looking Northeast

Looking West

Culvert Foundation Recommendation Letter
Box Culvert @ -Y33- Sta. 35+91 over Driving Branch
Johnston County, North Carolina
TIP No. I-5986B
S&ME Project No. 6235-17-048

PREPARED FOR:

Michael Baker International
8000 Regency Parkway, Suite 600
Cary, North Carolina 27518

PREPARED BY:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

March 10, 2020

March 10, 2020

Michael Baker International
8000 Regency Parkway, Suite 600
Cary, North Carolina 27518

Attention: Mr. Dwain Hathaway, P.E.

Reference: **Culvert Foundation Recommendation Letter**
Box Culvert @ -Y33- Sta. 35+91 over Driving Branch
Johnston County, North Carolina
NCDOT TIP No. I-5986B
S&ME Project No. 6235-17-048
NC PE Firm License No. F-0176

Dear Mr. Hathaway:

S&ME, Inc. (S&ME) has completed the authorized foundation recommendation report for the above-referenced project as part of the I-95 Widening project. Our services were performed in general accordance with the *Exhibit A - Task Order#6* of the Master Subcontract Agreement between Michael Baker International (MBI) and S&ME executed on March 24, 2017. Culvert design information was provided via the Culvert Survey & Hydraulic Design Report prepared by Sungate Design Group, P.A., dated January 13, 2020.

Project and Recommendations

We understand that the proposed culvert will consist of an approximately 62.5 feet long, 21 @ 6-foot x 9-foot RCBC with centerline bed elevation of 163.5 feet and slope of 0.3% at Station 35+91 -Y33- alignment. Based on our subsurface exploration, the box culvert is planned to bear in alluvial soils. The RCBC should be installed to bear on a minimum of 12 inches of foundation conditioning material in accordance with NCDOT Standard Specifications Section 414 due to the variability of alluvial soils. A total of 79 tons of foundation conditioning material is anticipated.

Total settlement along the proposed culvert alignment is anticipated to be less than 1 inch with differential settlement of approximately ½ inches, if constructed on suitable soils.

S&ME appreciates the opportunity to provide our services on this project. Please contact us if you have any questions regarding this report or if we may be of further assistance.

Sincerely,

S&ME, Inc.

DocuSigned by:
Stacie Mitchell
BBC611B64F19458...
Stacie E. Mitchell, P.E.
Project Manager

DocuSigned by:
Alyson Aarons
840D60E56C0C46C...
Alyson K. Aarons, P.E.
(née Yetman)
Project Engineer
NC Registration No. 046061

Senior Review By: Kristen H. Hill, P.E., P.G.

Attachments

Structure Subsurface Inventory Report
Culvert Survey & Hydraulic Design Report
FCM Quantity Calculations
Settlement Calculations

Attachments

REFERENCE: I-5986B

PROJECT: 47532

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 WIDENING FROM SR 1811 (BUD HAWKINS RD.) (EXIT 70) TO I-40 (EXIT 81) – WIDEN TO EIGHT LANES*

SITE DESCRIPTION *CULVERT ON -Y33- OVER DRIVING BRANCH*

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.

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.

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

NOTES:

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

H. CAMP

T. MILLER

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *MARCH 2020*

9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726

NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by: Stacie Mitchell BBC611B64F19458... 3/10/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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 / CPT / 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-50
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" 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.

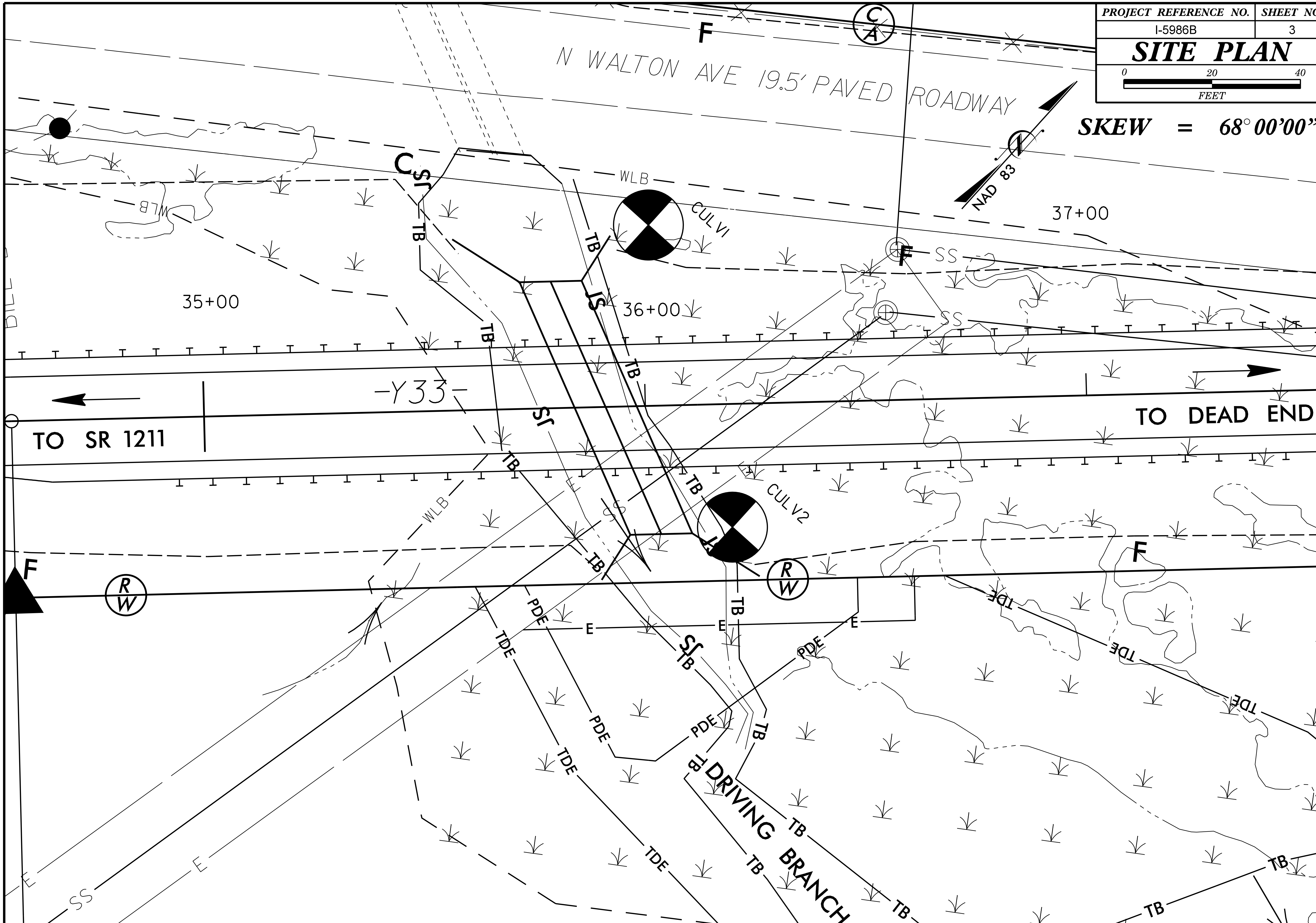
BENCH MARK: •SEE NOTE

ELEVATION: FEET

NOTES:

•ELEVATIONS DERIVED FROM GEOPAK AND .TIN FILE '15986b_2_ls_tin.tin' DATED 10/9/18

DATE: 8-15-14


PROJECT REFERENCE NO.
I-5986B
SHEET NO.
3
SITE PLAN
0
20
40
FEET
SKEW = 68° 00'00"
NAD 83
N WALTON AVE 19.5' PAVED ROADWAY
37+00
36+00
35+00
CULV1
CULV2
-Y33-
TO SR 1211
TO DEAD END
DRIVING BRANCH
WLB
TB
PDE
TDE
SS
E
F
R/W
C/A

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE PROJECTED ALONG C.L. OF CULVERT

0 20 40
FEET
VE = 2

(A) ALLUVIAL ,VERY LOOSE, BROWN, CLAYEY FINE SAND (A–2–6) WITH TRACE ORGANIC MATTER, MOIST
(B) ALLUVIAL ,VERY SOFT, GRAY, BLACK AND BROWN, SANDY CLAY (A–6), MOIST TO WET
(C) ALLUVIAL ,LOOSE, BROWN AND GRAY, CLAYEY GRAVEL (A–1–b), WET

-Y33- STA 35+91
SKEW = 68°
PROPOSED 2@6'X9' RCBC
GRADE POINT ELEV. = 177.97

3:1 NORMAL
PROP. GRADE
PROP. CULVERT
3:1 NORMAL
EX TB LT
EX TB RT
NWS AND WS ON 6–3–19 = 172.4
CULV1 36+02 41' LT –Y33–
CULV2 36+19 28' RT –Y33–
EX BEAVER DAM TOP
WS BEYOND BEAVER DAM ON 6–25–19 = 171.3
EXISTING GROUND ALONG C.L. OF CULVERT
EXISTING 2@6'X8' CULVERT TO BE REMOVED
ALLUVIAL ,VERY SOFT, GRAY, BLACK AND BROWN, SANDY CLAY AND SILTY CLAY (A–6, A–7–5), MOIST TO WET
CL II RIPRAP
CL INV. = 163.5
SLOPE = 0.30%
EX BED
TOE WALL
PROPOSED CHANNEL SLOPE = 0.30%
ALLUVIAL, VERY LOOSE TO LOOSE, GRAY AND BROWN, CLAYEY GRAVEL (A–1–a), MOIST TO WET
COASTAL PLAIN, SOFT TO STIFF, GRAY, SANDY CLAY AND SILTY CLAY (A–6,A–7–5), MOIST [MIDDENDORF FORMATION]
FIAD BT
FIAD BT

NOTE: EXISTING GROUND SURFACE PROFILE OF CULVERT CENTERLINE TAKEN FROM PRELIMINARY CULVERT SURVEY AND HYDRAULIC DESIGN REPORT DATED 12/24/19. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

210 200 190 180 170 160 150 140 130 120

–100 –50 00 +50 +100

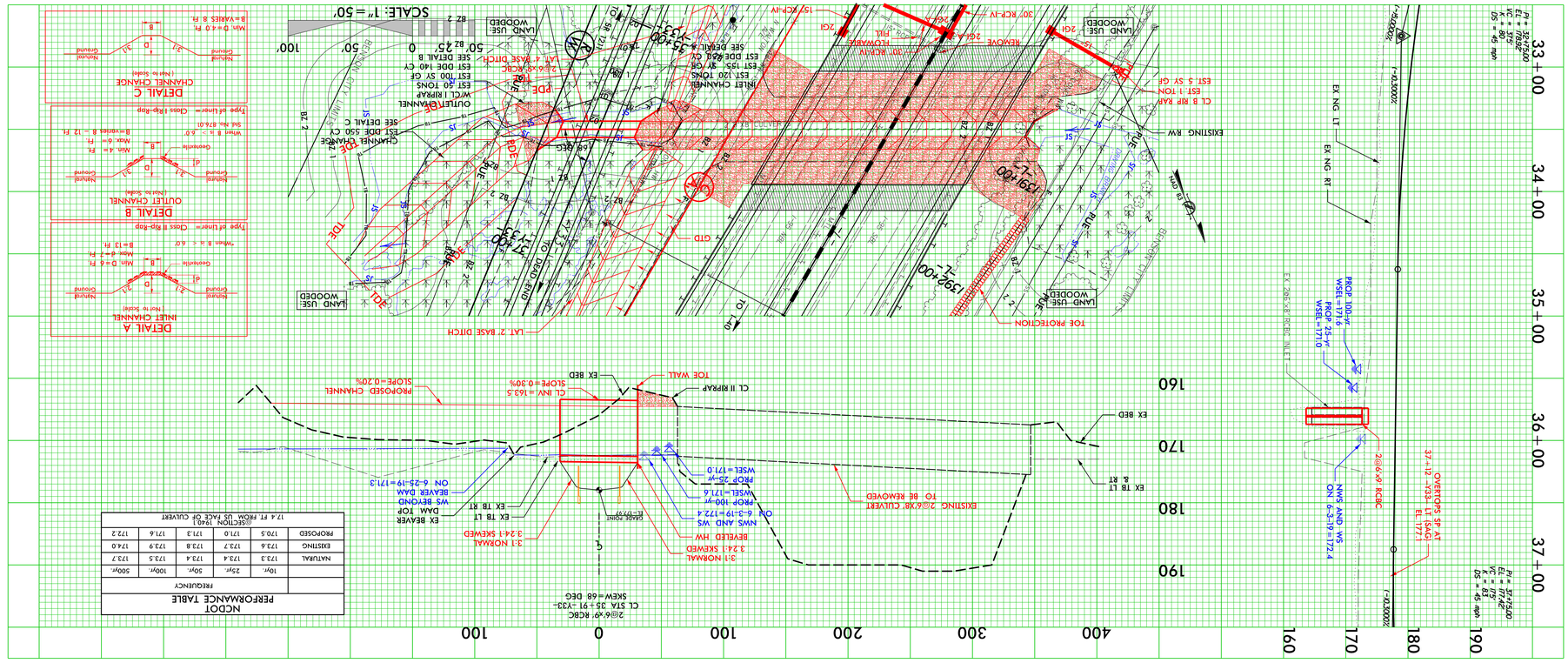
GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** H. Camp	
SITE DESCRIPTION I-95 from SR 1811 Bud Hawkins Road to I-40 Widen to Eight Lanes				**GROUND WTR (ft)**
BORING NO. CULV1	**STATION** 36+02	**OFFSET** 41 ft LT	**ALIGNMENT** -Y33-	**0 HR.** surface
COLLAR ELEV. 173.1 ft	**TOTAL DEPTH** 29.5 ft	**NORTHING** 595,173	**EASTING** 2,141,172	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME275 DIEDRICH D-50 90% 11/08/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Williams	**START DATE** 03/04/20	**COMP. DATE** 03/04/20	**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)
175											
	173.1	0.0	1	0	0	0		M		173.1 GROUND SURFACE	0.0
170	170.1	3.0	1	0	0	0		M		**ALLUVIAL** VERY LOOSE, BROWN, CLAYEY FINE SAND (A-2-6), TRACE ORGANICS, TRACE GRAVEL 170.1	3.0
										VERY SOFT, GRAY BROWN, SANDY CLAY (A-6), TRACE ORGANICS 166.1	7.0
165	165.1	8.0	2	4	6	10		W		LOOSE, GRAY BROWN, CLAYEY GRAVEL (A-1-B)	
160	160.1	13.0	4	3	3	6		M		161.1 **COASTAL PLAIN** MEDIUM STIFF, GRAY, CLAY (A-7-5) [MIDDENDORF FORMATION]	12.0
155	155.1	18.0	4	5	7	12		M		156.1 NO RECOVERY (ASSUME A-7-5)	17.0
150	150.1	23.0	3	6	8	14		M		151.1 STIFF, GRAY, CLAY (A-7-5)	22.0
145	145.1	28.0	7	8	10	18		M		146.1 VERY STIFF, GRAY, SANDY CLAY (A-6), TRACE MICA	27.0
										143.6 Boring Terminated at Elevation 143.6 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)	29.5

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** H. Camp	
SITE DESCRIPTION I-95 from SR 1811 Bud Hawkins Road to I-40 Widen to Eight Lanes				**GROUND WTR (ft)**
BORING NO. CULV2	**STATION** 36+19	**OFFSET** 28 ft RT	**ALIGNMENT** -Y33-	**0 HR.** surface
COLLAR ELEV. 173.2 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 595,135	**EASTING** 2,141,232	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME275 DIEDRICH D-50 90% 11/08/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Williams	**START DATE** 03/04/20	**COMP. DATE** 03/04/20	**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)
175											
	173.2	0.0	WOH	WOH	WOH	0		W		173.2 GROUND SURFACE	0.0
170	169.7	3.5	WOH	WOH	1	1		M		**ALLUVIAL** VERY SOFT, GRAY, SANDY CLAY (A-6), TRACE ORGANICS 170.2	3.0
										VERY SOFT, BLACK, CLAY (A-7-5) 166.2	7.0
165	164.7	8.5	2	1	1	2		M		VERY LOOSE, WHITE, GRAVEL (A-1-a) 165.2 NO RECOVERY (ASSUME A-1-a)	8.0
160	159.7	13.5	2	2	3	5		M		161.2 **COASTAL PLAIN** SOFT TO STIFF, GRAY, CLAY (A-7-5) [MIDDENDORF FORMATION]	12.0
155	154.7	18.5	4	4	6	10		M			
150	149.7	23.5	3	5	9	14		M		146.2 VERY STIFF, GRAY, SANDY CLAY (A-6), TRACE MICA	27.0
145	144.7	28.5	7	8	11	19		M		143.2 Boring Terminated at Elevation 143.2 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN)	30.0



NCDOT PERFORMANCE TABLE						
	FREQUENCY					
	10yr.	25yr.	50yr.	100yr.	500yr.	
NATURAL	173.3	173.4	173.4	173.5	173.7	
EXISTING	173.6	173.7	173.8	173.9	174.0	
PROPOSED	170.5	171.0	171.3	171.6	172.2	

@SECTION 1940.1 12.4 FT. FROM US FACE OF CULVERT

ADDITIONAL INFORMATION AND COMPUTATIONS

DRAINAGE AREA = 811 ACRES (1.27 SQ. MI.)

IMPERVIOUS AREA % = 34.8% (FROM FUTURE LAND USE MAPS)

24-HR. 50-YR. MAX. PRECIPITATION = 7.64 IN

USGS SIR 2014-5030

REGION 4, 0.10 SQ. MI < DA < 53.5 SQ. MI.

			SAY
Q_{10} = $51.8(1.27)^{0.6004}10^{0.0101*34.8}10^{0.0666*7.64}$		=434 CFS	430 CFS
Q_{25} = $67.1(1.27)^{0.6047}10^{0.0075*34.8}10^{0.0708*7.64}$		=492 CFS	490 CFS
Q_{50} = $78.4(1.27)^{0.6111}10^{0.0058*34.8}10^{0.0738*7.64}$		=529 CFS	530 CFS
Q_{100} = $90.5(1.27)^{0.6154}10^{0.0043*34.8}10^{0.0762*7.64}$		=565 CFS	570 CFS
Q_{500} = $119(1.27)^{0.6261}$	$10^{0.0012*34.8}10^{0.0813*7.64}$	=638 CFS	650 CFS

-BED MATERIALS: SAND, SILT, GRAVEL
-NO UPSTREAM OR DOWNSTREAM STRUCTURES THAT WERE IN PLACE AT THE TIME THIS PROJECT WAS DESIGNED WILL BE ADVERSELY IMPACTED BY THIS CULVERT PROJECT

SITE DATA

Drainage Area 1.27 SQ. MI. Source QL2 LiDAR

River Basin NEUSE Character RESIDENTIAL; AGRICULTURAL

Stream Classification (Such as Trout, High Quality Water, etc.) C; NSW

Data on Existing Structure 2@6'X8' RCBC

Total Waterway Opening 96 s.f. Waterway Opening Below 100yr. WS EL. 77 s.f.

Debris Potential: Low ☐ Moderate ☐ High ☒

Data on Structures Up and Down Stream US: BRIDGE #449 ON SR 1173; 1@60' CORED SLAB; 10.2' BED TO CROWN

DS: 2@8'X8' RCBC ON I-40

Gage Station No. N/A Period of Records N/A yrs.

Max. Discharge N/A c.f.s Date N/A Frequency N/A

Historical Flood Information:

DID NOT OT IN HURRICANE MATTHEW(10/2016)/FLORENCE(09/2018) RAYMOND HONBARRIER Period of Knowledge 28 yrs.
Date Elev. ft. Est. Freq. yr. Source DIV. 4 MAINT. ENGINEER

DID NOT OT IN HURRICANE MATTHEW(10/2016)/FLORENCE(09/2018) NEIL GODWIN – DIV. 4 Period of Knowledge 23 yrs.
Date Elev. ft. Est. Freq. yr. Source BRIDGE MAINT. SUPERVISOR

Allowable HW Elev. 175.6 (1.5' BELOW SP*) ft. Normal Water Surface Elev. 172.4 ft.
*SP @ 37+12 –Y33– LT (SAG)

Manning's n : Left O.B. 0.12 Channel .045 Right O.B. 0.12 Obtained From FIELD RECON

Flood Study /Status N/A Floodway Established? N/A

Flood Study 100 yr. Discharge N/A c.f.s.; WS Elev.: With Floodway N/A ft. Without Floodway N/A ft.

DESIGN DATA

Hydrological Method USGS SIR 2014-5030 (REGION 4, 34.8% IMPERVIOUS AREA)

Hydraulic Design Method HEC-RAS 5.0.6 (I-5986B DRIVIING BRANCH I-95)

Design Tailwater : Q_{10} 5.0 ft.; Q_{25} 5.4 ft.; Q_{50} N/A ft.; Q_{100} 5.8 ft.; Q_{500} 6.1 ft.

INV. IN EL.=163.6, INV. OUT EL.=163.4, BURIED 1-FOOT
SIZE & TYPE: 2@6' X 9' RCBC @STATION 1940.1, APPROX. 17.4' UPSTREAM OF CULVERT.

FREQUENCY	Q (cfs)	Inlet Control HWD	Inlet Control H.W.	Inlet Control WSEL	Outlet Control H.W.	Outlet Control WSEL	Remarks
10 YR	430	0.64	5.1	169.7	5.9	170.5	OUTLET CONTROL
25 YR	490	0.70	5.6	170.2	6.4	171.0	OUTLET CONTROL
100 YR	570	0.78	6.2	170.8	7.0	171.6	OUTLET CONTROL
500 YR	650	0.85	6.8	171.4	7.6	172.2	OUTLET CONTROL

Is a Floodway Revision Required? N/A Total Proposed Waterway Opening 96 s.f.

Outlet Velocity (V_{10}) 7.1 f.p.s. Natural Channel Velocity (V_{10}) 5.0 f.p.s.

Required Outlet Protection CLASS I RIPRAP (BANKS ONLY)

INFORMATION TO BE SHOWN ON PLANS

WS EL. Taken @ River Station 1940.1

Design: Discharge 490 c.f.s. Frequency 25 yr. Elev. 171.0 ft.

Base Flood: Discharge 530 c.f.s. Frequency 100 yr. Elev. 171.6 ft.

Overtopping: Discharge 1350 c.f.s. Frequency 500+ yr. Elev. 177.1* ft.

*SP @ 37+12 –Y33– LT (SAG)

NEUSE RIVER BASIN
NON FEMA STUDY AREA

CULVERT SURVEY & HYDRAULIC DESIGN REPORT

N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N. C.

I.D. No. I-5986B Project No. 47532.1.3 Proj. Station 35+91 –Y33–

County JOHNSTON Stream DRIVING BRANCH Stru. No. C01

On Highway SR1219 (N. WALTON AVE.) Between SR1211 and DEAD END

Recommended Structure 2@6'X9' RCBC W/6" BEVELED HW (BURIED 1' BELOW STREAM BED)

Recommended Width of Roadway 30' SP-SP (NORMAL) Skew 68 DEGREES

Recommended Location is (Up, At, Down) Stream from Existing Crossing. DOWN

Latitude 35.38440 Longitude -078.52650

Statewide Tier ☒ Regional Tier ☐ Sub-Regional Tier ☐

Bench Mark is BM#7: BENCH TIE IN 17" POPULAR TREE, STA 1391+89 –L–, 187' RT

N 595120 E 2141144 Elev. 175.42 ft. Datum: NAVD 88

Temporary Crossing N/A (PROPOSED BOX CULVERT IS DOWNSTREAM OF EXISTING CROSSING)

Designed by: WILL HINES, P.E.

Assisted by: D. TALBERT, J. HARVEY, M. EDWARDS, F. REESE

Project Engineer : JOSHUA G. DALTON, P.E.

Reviewed by: Matthew J. York, PE

Date 1/23/2020

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
NC COA No. C-0890

SEAL 26971 ENGINEER JOSHUA G. DALTON

Stream DRIVING BRANCH Struc. Inv. No. C01 I.D. No. I-5986B Project No. 47532.1.3 PDF File. 5000000_2019_I-5986B_DRIVING_BRANCH_SR1219.PDF

Culvert Undercut Quantities
Box Culvert over Driving Branch Creek

Portland Concrete Box Culvert (2 @ 6 ft x 9 ft)

Foundation Conditioning Material Beneath Culvert Footprint	
Single Culvert Inside Width	6
Number of Culverts	2
Number of Culvert Outside Walls	2
Number of Culvert Internal Divisions	*1*
Thickness of Walls & Divisions	*2.00*
Total Culvert(s) Outside Width	*14.00*
Culvert(s) Length (ft)	62.5
Per Structure Memo, UC to Outer + 4 feet	
UC Outside Width (ft)	*18.00*
UC depth (ft)	1
volume beneath culvert (ft^3)	*1125*
volume beneath culvert (cy)	*41.67*
Reqd. Foundation Conditioning Material for Culvert(s) (tons)	***79.3***
Reqd. Foundation Conditioning Material for Culvert(s) (tons)	***79***
Per Structure Memo, 1.904 tons/cy	1.904

Per Structure Memo, do not include FCM quantity for standard turned-back wings

Project: I-95 Widening (I-5986B)
Proj. #: 6235-17-048
Date: 3/6/2020

Embankment & Culvert Calculations for Settle3D

Embankment Inputs

Slope:	3.0	(H):1(V)	Skew:	68	deg
Angle:	17.15	deg.	Skewed Slope:	3.24	(H):1(V)
Height:	5	ft			
Top Length:	36.8	ft			
Base Length:	69.2	ft			

(If culvert is not skewed, leave S8 blank & sheet will calculate as if it is perpendicular (90 deg skew))

Equivalent Culvert & Embankment Load Inputs

Culvert

Unit Weight:	150	pcf	Full Outside Width:	14.0	ft
Number:	2				
Inside Width:	6	ft	Equivalent Volume:	2291.7	ft^3
Inside Height:	9	ft	Equivalent Weight:	343.8	kips
Length:	62.5	ft			
Assumed Wall Thickness:	0.67	ft	*Equiv. Pressure:*	*0.393*	*ksf*

Embankment

Unit Weight:	120	pcf	Equivalent Volume:	2780.4	ft^3
Top Length:	36.8	ft	Equivalent Weight:	333.6	kips
Bottom Length:	62.5	ft			
Avg. Height:	4	ft	*Equiv. Pressure:*	*0.381*	*ksf*

Total Equivalent Pressure: 0.774 ksf

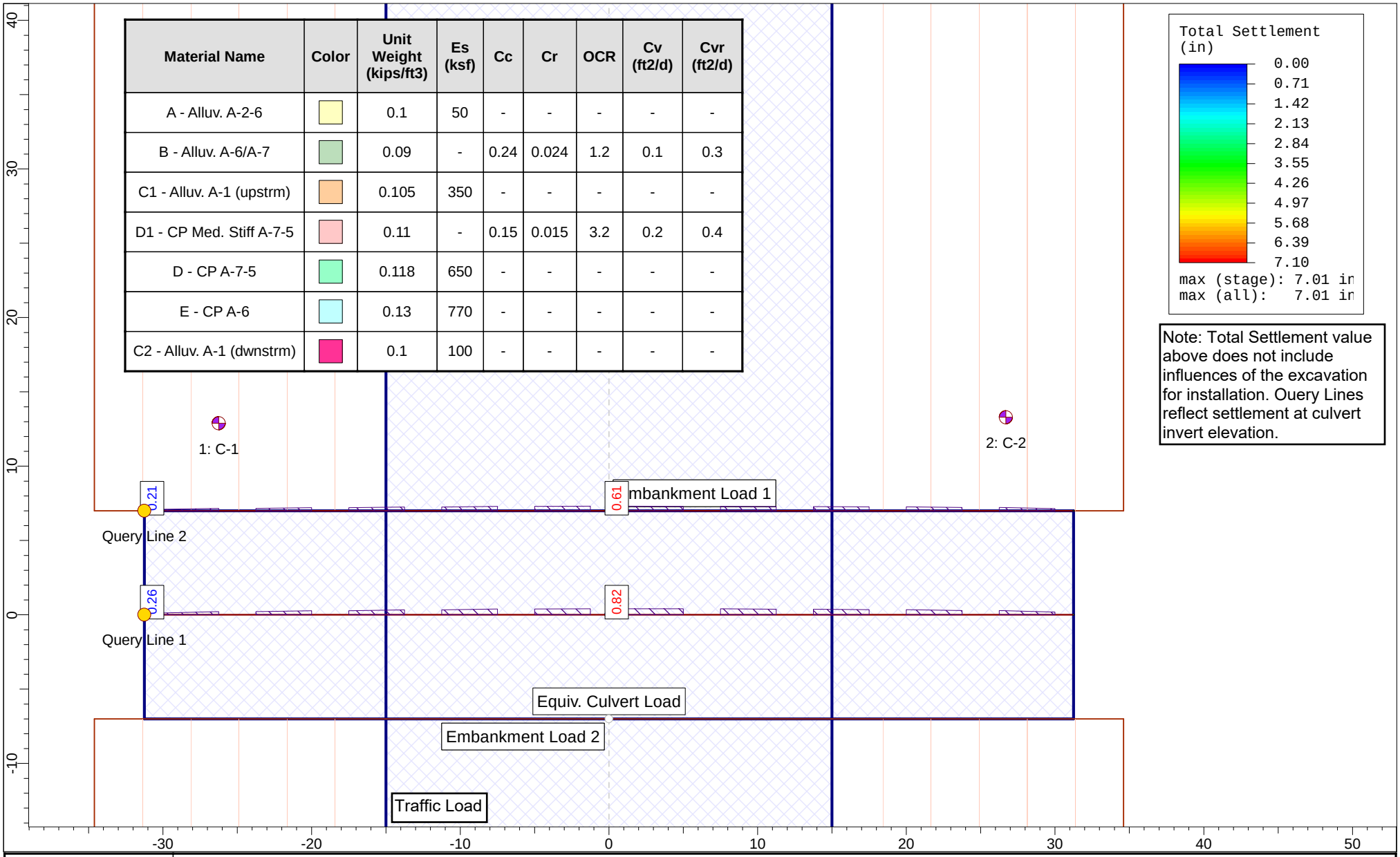
Traffic Loading:	240	psf
	0.240	ksf
Width:	30	ft

Parameters:

Parameters are based upon soil type, N-value, and lab testing correlations, where applicable. Where lab testings is not applicable, parameters are based on similar soils tested in the project and/or previous knowledge from the geology.
Cc/Cr - Terzaghi & Peck (1967); Cv/Cvr - NAVFAC DM 7.01 Ch. 3 Fig. 4
Es - AASHTO LRFD Table C10.4.6.3-1

Blue Values are inputs
Black Values are calculations/references

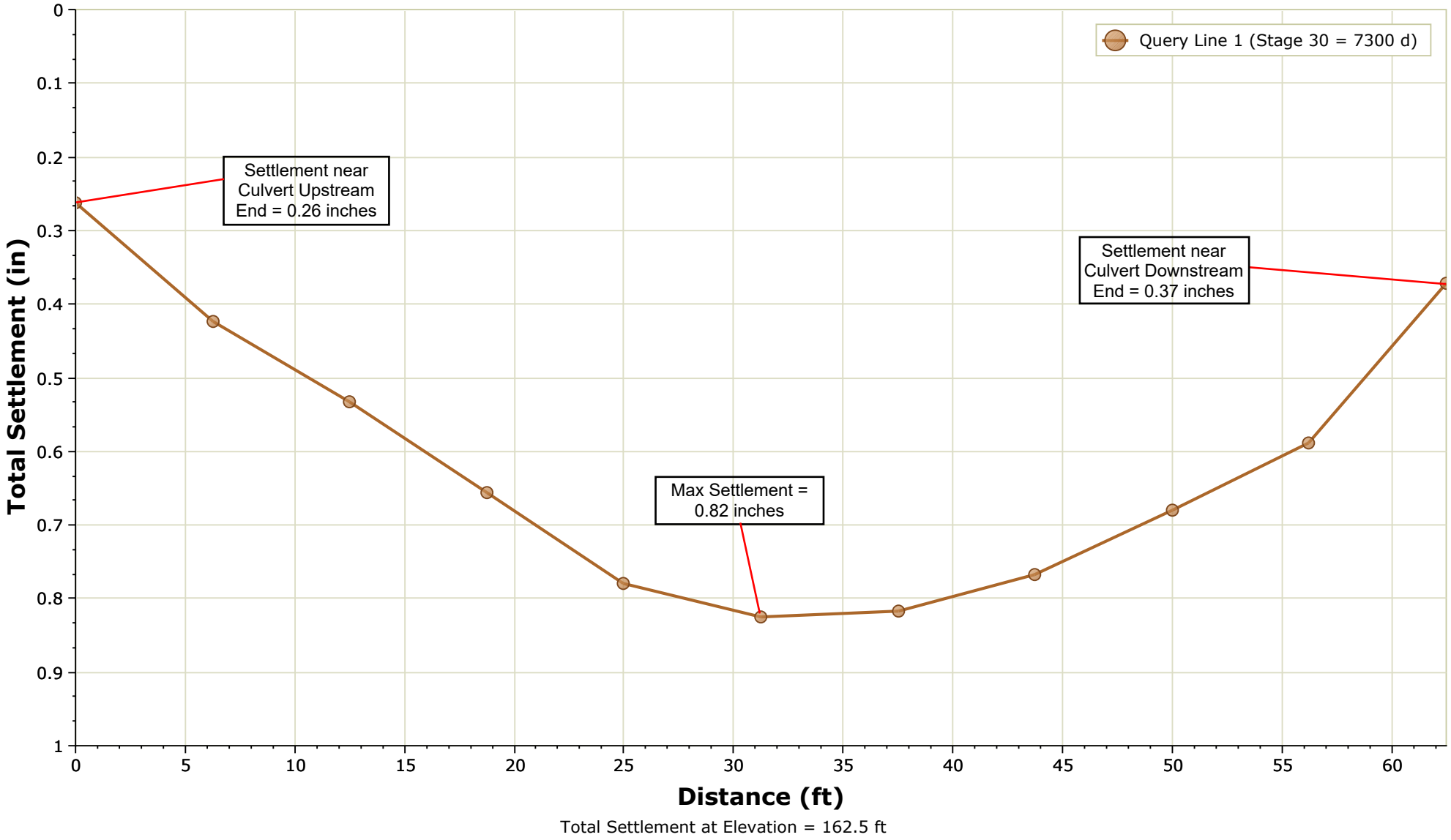
Material Name	Color	Unit Weight (kips/ft3)	Es (ksf)	Cc	Cr	OCR	Cv (ft2/d)	Cvr (ft2/d)
A - Alluv. A-2-6		0.1	50	-	-	-	-	-
B - Alluv. A-6/A-7		0.09	-	0.24	0.024	1.2	0.1	0.3
C1 - Alluv. A-1 (upstrm)		0.105	350	-	-	-	-	-
D1 - CP Med. Stiff A-7-5		0.11	-	0.15	0.015	3.2	0.2	0.4
D - CP A-7-5		0.118	650	-	-	-	-	-
E - CP A-6		0.13	770	-	-	-	-	-
C2 - Alluv. A-1 (dwnstrm)		0.1	100	-	-	-	-	-



Project: I-95			
Analysis: Settlement			
Drawn By: AKA	Project Number: 6235-17-048	Company: S&ME	Figure: ?
Location: -Y33- Sta 35+91	File Name: Y33_3591_Culv.s3z	Date: 3/5/2020	

SETTLE3 5.001

Distance vs. Total Settlement along Culvert Center Line



Total Settlement at Elevation = 162.5 ft

Project	I-95			
Analysis	Settlement			
Drawn By: AKA		Project Number: 6235-17-048	Company: S&ME	Figure: ?
Location: -Y33- Sta 35+91		File Name: Y33_3591_Culv.s3z	Date: 3/5/2020	

SETTLE3 5.001

Settle3 Analysis Information

I-95

Project Settings

Document Name	Y33_3591_Culv.s3z
Project Title	I-95
Analysis	Settlement
Author	AKA
Company	S&ME
Date Created	3/6/2019, 3:30:56 PM

Comments

?
6235-17-048
-Y33- Sta 35+91
New Culvert

Stress Computation Method	Boussinesq
Time-dependent Consolidation Analysis	
Time Units	days
Permeability Units	feet/day
Minimum settlement ratio for subgrade modulus	0.9

Include buoyancy effect when material settles below water table

Use average properties to calculate layered stresses

Improve consolidation accuracy

Ignore negative effective stresses in settlement calculations

Stage Settings

Stage #	Name	Time [days]
1	Stage 1	0
2	Stage 2	1
3	Stage 3	2
4	Stage 4	3
5	Stage 5	4
6	Stage 6	5
7	Stage 7	6
8	Stage 8	7
9	Stage 9	14
10	Stage 10	21
11	Stage 11	30
12	Stage 12	60
13	Stage 13	90
14	Stage 14	120
15	Stage 15	150
16	Stage 16	180
17	Stage 17	210
18	Stage 18	240
19	Stage 19	270
20	Stage 20	300
21	Stage 21	330
22	Stage 22	365
23	Stage 23	730
24	Stage 24	1095
25	Stage 25	1460
26	Stage 26	1825
27	Stage 27	2920
28	Stage 28	3650
29	Stage 29	5475
30	Stage 30	7300

Results

Time taken to compute: 0 seconds

Stage: Stage 1 = 0 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0
Total Consolidation Settlement [in]	0	0
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	0
Immediate Settlement [in]	0	0
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	0
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	1.43788
Effective Stress XX [ksf]	0	1.43788
Effective Stress YY [ksf]	0	1.43788
Total Stress ZZ [ksf]	0	3.30364
Total Stress XX [ksf]	0	3.30364
Total Stress YY [ksf]	0	3.30364
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0	0
Pore Water Pressure [ksf]	0	1.86576
Excess Pore Water Pressure [ksf]	0	0
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.00054	2.21208
Over-consolidation Ratio	1	3.8
Void Ratio	0	0.841
Permeability [ft/d]	0	0.235789
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0

Stage: Stage 2 = 1 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.375895
Total Consolidation Settlement [in]	-0.0133037	0
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	-0.0133037	0
Immediate Settlement [in]	0	0.376109
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	0.774
Loading Stress XX [ksf]	-0.00381059	0.45236
Loading Stress YY [ksf]	0	0.708851
Effective Stress ZZ [ksf]	0	1.43788
Effective Stress XX [ksf]	0	1.45381
Effective Stress YY [ksf]	0	1.45452
Total Stress ZZ [ksf]	0	3.57494
Total Stress XX [ksf]	0	3.57268
Total Stress YY [ksf]	0	3.59666
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	59.8087
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	57.0329
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	-0.000911934	0.00774
Pore Water Pressure [ksf]	0	2.15895
Excess Pore Water Pressure [ksf]	0	0.774
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.00054	2.21208
Over-consolidation Ratio	1	3.83599
Void Ratio	0	0.842714
Permeability [ft/d]	0	0.235789
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0

Stage: Stage 3 = 2 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.451371
Total Consolidation Settlement [in]	-0.00142163	0.199712
Virgin Consolidation Settlement [in]	0	0.190957
Recompression Consolidation Settlement [in]	-0.00142163	0.0439599
Immediate Settlement [in]	0	0.407825
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	0.809594
Loading Stress XX [ksf]	-0.052422	0.532211
Loading Stress YY [ksf]	0.0225721	0.824725
Effective Stress ZZ [ksf]	0	1.37804
Effective Stress XX [ksf]	-0.052422	1.61969
Effective Stress YY [ksf]	0.0225721	1.89891
Total Stress ZZ [ksf]	0	3.64433
Total Stress XX [ksf]	-0.052422	3.75445
Total Stress YY [ksf]	0.0225721	3.81494
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	44.1258
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	52.1269
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	330.087
Total Strain	-0.00111148	0.276194
Pore Water Pressure [ksf]	0	2.55654
Excess Pore Water Pressure [ksf]	0	0.7263
Degree of Consolidation [%]	0	23.102
Pre-consolidation Stress [ksf]	0.00054	2.21208
Over-consolidation Ratio	1	3.84331
Void Ratio	0	0.843089
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-1.30104e-018	0.0387355

Stage: Stage 4 = 3 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.886579
Total Consolidation Settlement [in]	-0.00197142	0.708272
Virgin Consolidation Settlement [in]	0	0.666041
Recompression Consolidation Settlement [in]	-0.00197142	0.0698696
Immediate Settlement [in]	0	0.440664
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	5.58541e-005	0.852317
Loading Stress XX [ksf]	-0.0824862	0.609377
Loading Stress YY [ksf]	0.0469876	0.944868
Effective Stress ZZ [ksf]	5.58541e-005	1.38156
Effective Stress XX [ksf]	-0.0824862	1.72346
Effective Stress YY [ksf]	0.0469876	2.05043
Total Stress ZZ [ksf]	5.58541e-005	3.71055
Total Stress XX [ksf]	-0.0824862	3.93831
Total Stress YY [ksf]	0.0469876	4.02979
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	38.8815
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	48.3304
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	184.762
Total Strain	-0.0012438	0.281503
Pore Water Pressure [ksf]	0	2.62029
Excess Pore Water Pressure [ksf]	0	0.761446
Degree of Consolidation [%]	0	30.4928
Pre-consolidation Stress [ksf]	0.00054	2.21208
Over-consolidation Ratio	1	3.60659
Void Ratio	0	0.843338
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0400098

Stage: Stage 5 = 4 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	1.24064
Total Consolidation Settlement [in]	-0.0014357	0.918477
Virgin Consolidation Settlement [in]	0	0.837593
Recompression Consolidation Settlement [in]	-0.0014357	0.0986428
Immediate Settlement [in]	0	0.473941
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.000273412	0.898506
Loading Stress XX [ksf]	-0.0906459	0.661412
Loading Stress YY [ksf]	0.058274	1.06792
Effective Stress ZZ [ksf]	0.000273412	1.38847
Effective Stress XX [ksf]	-0.0906459	1.80651
Effective Stress YY [ksf]	0.0608746	2.20964
Total Stress ZZ [ksf]	0.000273412	3.7727
Total Stress XX [ksf]	-0.0906459	4.12341
Total Stress YY [ksf]	0.0610746	4.23464
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	34.4088
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	45.4215
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	148.854
Total Strain	-0.00126446	0.282196
Pore Water Pressure [ksf]	0	2.67802
Excess Pore Water Pressure [ksf]	0	0.812898
Degree of Consolidation [%]	0	38.6631
Pre-consolidation Stress [ksf]	0.000725822	2.21208
Over-consolidation Ratio	1	3.4458
Void Ratio	0	0.843376
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0412628

Stage: Stage 6 = 5 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	1.62874
Total Consolidation Settlement [in]	-0.00125618	1.28114
Virgin Consolidation Settlement [in]	0	1.17441
Recompression Consolidation Settlement [in]	-0.00125618	0.114063
Immediate Settlement [in]	0	0.50677
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.000626371	0.948061
Loading Stress XX [ksf]	-0.0796754	0.739658
Loading Stress YY [ksf]	0.0521195	1.19173
Effective Stress ZZ [ksf]	0.000626371	1.39861
Effective Stress XX [ksf]	-0.0790157	1.93747
Effective Stress YY [ksf]	0.0547692	2.37334
Total Stress ZZ [ksf]	0.000626371	3.83102
Total Stress XX [ksf]	-0.0790157	4.30925
Total Stress YY [ksf]	0.0549692	4.42558
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	18.0238
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	43.2099
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	114.448
Total Strain	-0.000948924	0.282339
Pore Water Pressure [ksf]	0	2.72777
Excess Pore Water Pressure [ksf]	0	0.863634
Degree of Consolidation [%]	0	47.7373
Pre-consolidation Stress [ksf]	0.00108046	2.21208
Over-consolidation Ratio	1	3.42145
Void Ratio	0	0.842782
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0565032

Stage: Stage 7 = 6 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	1.928
Total Consolidation Settlement [in]	-0.000925932	1.56141
Virgin Consolidation Settlement [in]	0	1.43732
Recompression Consolidation Settlement [in]	-0.000925932	0.128303
Immediate Settlement [in]	0	0.540567
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00106005	0.997669
Loading Stress XX [ksf]	-0.0933493	0.81937
Loading Stress YY [ksf]	0.0469083	1.31291
Effective Stress ZZ [ksf]	0.00106005	1.41123
Effective Stress XX [ksf]	-0.0926679	2.0905
Effective Stress YY [ksf]	0.0495852	2.53719
Total Stress ZZ [ksf]	0.00106005	3.88379
Total Stress XX [ksf]	-0.0926679	4.49553
Total Stress YY [ksf]	0.0497852	4.59807
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	14.3725
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	40.0077
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	-0.000691943	0.282335
Pore Water Pressure [ksf]	0	2.76858
Excess Pore Water Pressure [ksf]	0	0.905872
Degree of Consolidation [%]	0	53.9604
Pre-consolidation Stress [ksf]	0.00151567	2.21208
Over-consolidation Ratio	1	3.37271
Void Ratio	0	0.842274
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.058917

Stage: Stage 8 = 7 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	2.19735
Total Consolidation Settlement [in]	-0.000400691	1.78684
Virgin Consolidation Settlement [in]	0	1.64746
Recompression Consolidation Settlement [in]	-0.000400691	0.149148
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	1.42543
Effective Stress XX [ksf]	-0.0762268	2.18101
Effective Stress YY [ksf]	0.0663101	2.61928
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.63068
Total Stress YY [ksf]	0.0665101	4.72433
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	3.23238
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	10.6433
Total Strain	-0.000494192	0.282765
Pore Water Pressure [ksf]	0	2.87109
Excess Pore Water Pressure [ksf]	0	1.05099
Degree of Consolidation [%]	0	55.5245
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.29467
Void Ratio	0	0.84191
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0622389

Stage: Stage 9 = 14 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	4.07088
Total Consolidation Settlement [in]	0	3.39003
Virgin Consolidation Settlement [in]	0	3.18481
Recompression Consolidation Settlement [in]	0	0.242987
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	1.60463
Effective Stress XX [ksf]	-0.0762268	2.35523
Effective Stress YY [ksf]	0.0663101	2.82075
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.62194
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	1.11568
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	1.44988
Total Strain	4.67194e-005	0.282606
Pore Water Pressure [ksf]	-2.31299e-005	2.68822
Excess Pore Water Pressure [ksf]	-0.000200629	0.831203
Degree of Consolidation [%]	0	78.3383
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.0556
Void Ratio	0	0.840873
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-5.44848e-005	0.0691228

Stage: Stage 10 = 21 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	4.85416
Total Consolidation Settlement [in]	0	4.17332
Virgin Consolidation Settlement [in]	0	3.94092
Recompression Consolidation Settlement [in]	0	0.272425
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	1.60766
Effective Stress XX [ksf]	-0.0762268	2.35523
Effective Stress YY [ksf]	0.0663101	2.82075
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.6187
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.909318
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	1.16595
Total Strain	-3.62789e-005	0.282514
Pore Water Pressure [ksf]	-2.84238e-005	2.43337
Excess Pore Water Pressure [ksf]	-0.00118287	0.579586
Degree of Consolidation [%]	0	85.4925
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05644
Void Ratio	0	0.841067
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691228

Stage: Stage 11 = 30 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	5.45219
Total Consolidation Settlement [in]	0	4.81728
Virgin Consolidation Settlement [in]	0	4.56568
Recompression Consolidation Settlement [in]	0	0.294969
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	1.82825
Effective Stress XX [ksf]	-0.0762268	2.44357
Effective Stress YY [ksf]	0.0663101	2.82075
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61616
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.822339
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.982844
Total Strain	-0.000134145	0.282428
Pore Water Pressure [ksf]	-3.13943e-005	2.20373
Excess Pore Water Pressure [ksf]	0	0.337968
Degree of Consolidation [%]	0	90.8851
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05713
Void Ratio	0	0.841247
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691228

Stage: Stage 12 = 60 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	6.38239
Total Consolidation Settlement [in]	0	5.77051
Virgin Consolidation Settlement [in]	0	5.49374
Recompression Consolidation Settlement [in]	0	0.314742
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.12202
Effective Stress XX [ksf]	-0.0762268	2.73382
Effective Stress YY [ksf]	0.0663101	2.82747
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61263
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.699234
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.816282
Total Strain	-0.000263605	0.282272
Pore Water Pressure [ksf]	-3.43938e-005	1.94977
Excess Pore Water Pressure [ksf]	-0.00106	0.12163
Degree of Consolidation [%]	0	98.8333
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05805
Void Ratio	0	0.841485
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691228

Stage: Stage 13 = 90 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	6.75415
Total Consolidation Settlement [in]	0	6.14226
Virgin Consolidation Settlement [in]	0	5.85955
Recompression Consolidation Settlement [in]	0	0.316787
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15017
Effective Stress XX [ksf]	-0.0762268	2.7609
Effective Stress YY [ksf]	0.0663101	2.85455
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61157
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.672658
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.786948
Total Strain	-0.000290392	0.282199
Pore Water Pressure [ksf]	-3.52083e-005	1.88664
Excess Pore Water Pressure [ksf]	-0.00251507	0.054006
Degree of Consolidation [%]	0	99.8677
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05827
Void Ratio	0	0.841535
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691228

Stage: Stage 14 = 120 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	6.90273
Total Consolidation Settlement [in]	0	6.29084
Virgin Consolidation Settlement [in]	0	6.00675
Recompression Consolidation Settlement [in]	0	0.317028
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15398
Effective Stress XX [ksf]	-0.0762268	2.76436
Effective Stress YY [ksf]	0.0663101	2.858
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61121
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.665111
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.779868
Total Strain	-0.000299798	0.282165
Pore Water Pressure [ksf]	-3.55e-005	1.87095
Excess Pore Water Pressure [ksf]	-0.00562164	0.0231892
Degree of Consolidation [%]	0	99.9845
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05833
Void Ratio	0	0.841552
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691626

Stage: Stage 15 = 150 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	6.96467
Total Consolidation Settlement [in]	0	6.35278
Virgin Consolidation Settlement [in]	0	6.06834
Recompression Consolidation Settlement [in]	0	0.317066
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15459
Effective Stress XX [ksf]	-0.0762268	2.76484
Effective Stress YY [ksf]	0.0663101	2.85849
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61109
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.662816
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.778034
Total Strain	-0.00030356	0.282149
Pore Water Pressure [ksf]	-3.56276e-005	1.86705
Excess Pore Water Pressure [ksf]	-0.00258401	0.00994969
Degree of Consolidation [%]	0	99.9982
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841559
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691735

Stage: Stage 16 = 180 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	6.99108
Total Consolidation Settlement [in]	0	6.37919
Virgin Consolidation Settlement [in]	0	6.09466
Recompression Consolidation Settlement [in]	0	0.317076
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.1547
Effective Stress XX [ksf]	-0.0762268	2.76491
Effective Stress YY [ksf]	0.0663101	2.85856
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61104
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.662105
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.77755
Total Strain	-0.00030519	0.28214
Pore Water Pressure [ksf]	-3.80176e-005	1.86608
Excess Pore Water Pressure [ksf]	-0.00561128	0.00421342
Degree of Consolidation [%]	0	99.9999
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841562
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.069175

Stage: Stage 17 = 210 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00199
Total Consolidation Settlement [in]	0	6.3901
Virgin Consolidation Settlement [in]	0	6.10554
Recompression Consolidation Settlement [in]	0	0.317079
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15473
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61103
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661883
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777422
Total Strain	-0.000306001	0.282136
Pore Water Pressure [ksf]	-3.91476e-005	1.86584
Excess Pore Water Pressure [ksf]	-0.00269724	0.00556153
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841563
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 18 = 240 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00653
Total Consolidation Settlement [in]	0	6.39464
Virgin Consolidation Settlement [in]	0	6.11009
Recompression Consolidation Settlement [in]	0	0.31708
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661814
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777388
Total Strain	-0.000306697	0.282134
Pore Water Pressure [ksf]	-3.96047e-005	1.86578
Excess Pore Water Pressure [ksf]	-0.00538007	0.00270954
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841565
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 19 = 270 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.0085
Total Consolidation Settlement [in]	0	6.39661
Virgin Consolidation Settlement [in]	0	6.11205
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661792
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777379
Total Strain	-0.000307032	0.282133
Pore Water Pressure [ksf]	-3.97897e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00267732	0.00525408
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841565
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 20 = 300 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00934
Total Consolidation Settlement [in]	0	6.39745
Virgin Consolidation Settlement [in]	0	6.11289
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661786
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777376
Total Strain	-0.000307194	0.282133
Pore Water Pressure [ksf]	-3.98646e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00510218	0.00236932
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 21 = 330 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.0097
Total Consolidation Settlement [in]	0	6.39782
Virgin Consolidation Settlement [in]	0	6.11325
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661783
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777376
Total Strain	-0.000307272	0.282133
Pore Water Pressure [ksf]	-3.98949e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00264463	0.00496218
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 22 = 365 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00988
Total Consolidation Settlement [in]	0	6.39799
Virgin Consolidation Settlement [in]	0	6.11342
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661783
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307314	0.282133
Pore Water Pressure [ksf]	-3.99081e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.0048043	0.00227044
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 23 = 730 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00998
Total Consolidation Settlement [in]	0	6.39809
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00436792	0.00212855
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 24 = 1095 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00998
Total Consolidation Settlement [in]	0	6.39809
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00257931	0.00428378
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 25 = 1460 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00998
Total Consolidation Settlement [in]	0	6.39809
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00424207	0.00211264
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 26 = 1825 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00997
Total Consolidation Settlement [in]	0	6.39808
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00210818	0.00422129
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 27 = 2920 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00997
Total Consolidation Settlement [in]	0	6.39808
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.0041866	0.0025737
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 28 = 3650 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00998
Total Consolidation Settlement [in]	0	6.39809
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00418063	0.00209615
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 29 = 5475 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00997
Total Consolidation Settlement [in]	0	6.39808
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
Effective Stress YY [ksf]	0.0663101	2.85857
Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00209073	0.00417003
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Stage: Stage 30 = 7300 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.00998
Total Consolidation Settlement [in]	0	6.39809
Virgin Consolidation Settlement [in]	0	6.11352
Recompression Consolidation Settlement [in]	0	0.317081
Immediate Settlement [in]	0	0.714042
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.00232683	1.18714
Loading Stress XX [ksf]	-0.0768665	0.877028
Loading Stress YY [ksf]	0.0636749	1.35085
Effective Stress ZZ [ksf]	0.00232683	2.15474
Effective Stress XX [ksf]	-0.0762268	2.76492
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Total Stress ZZ [ksf]	0.00232683	4.00084
Total Stress XX [ksf]	-0.0762268	4.61102
Total Stress YY [ksf]	0.0665101	4.71811
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0.661782
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	38.7603
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0.777375
Total Strain	-0.000307346	0.282133
Pore Water Pressure [ksf]	-3.99155e-005	1.86576
Excess Pore Water Pressure [ksf]	-0.00257012	0.00416455
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.00278597	2.21208
Over-consolidation Ratio	1	3.05834
Void Ratio	0	0.841566
Permeability [ft/d]	0	0.785962
Coefficient of Consolidation [ft^2/d]	0	0.4
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.0691753

Loads

1. Rectangular Load: "Traffic Load"

Length	30 ft
Width	300 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	9000 ft^2
Load	0.24 ksf
Depth	-177.5 ft
Installation Stage	Stage 8 = 7 d

Coordinates

X [ft]	Y [ft]
-15	-150
15	-150
15	150
-15	150

2. Rectangular Load: "Equiv. Culvert Load"

Length	62.5 ft
Width	14 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	875 ft^2
Load	0.774 ksf
Depth	-163.5 ft
Installation Stage	Stage 2 = 1 d

Coordinates

X [ft]	Y [ft]
-31.25	-7
31.25	-7
31.25	7
-31.25	7

Embankments

1. Embankment: "Embankment Load 1"

Label	Embankment Load 1
Center Line	(0, 7) to (0, 149)
Near End Angle	90 degrees
Far End Angle	90 degrees
Number of Layers	5
Base Width	69.2

Layer	Stage	Left Bench Width (ft)	Left Angle (deg)	Height (ft)	Unit Weight ($kips/ft^3$)	Right Angle (deg)	Right Bench Width (ft)
1	Stage 3 = 2 d	0	17.17	1	0.12	17.17	0
2	Stage 4 = 3 d	0	17.17	1	0.12	17.17	0
3	Stage 5 = 4 d	0	17.17	1	0.12	17.17	0
4	Stage 6 = 5 d	0	17.17	1	0.12	17.17	0
5	Stage 7 = 6 d	0	17.17	1	0.12	17.17	0

2. Embankment: "Embankment Load 2"

Label	Embankment Load 2
Center Line	(0, -7) to (0, -149)
Near End Angle	90 degrees
Far End Angle	90 degrees
Number of Layers	5
Base Width	69.2

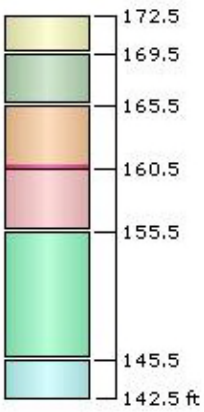
Layer	Stage	Left Bench Width (ft)	Left Angle (deg)	Height (ft)	Unit Weight (kips/ft^3)	Right Angle (deg)	Right Bench Width (ft)
1	Stage 3 = 2 d	0	17.17	1	0.12	17.17	0
2	Stage 4 = 3 d	0	17.17	1	0.12	17.17	0
3	Stage 5 = 4 d	0	17.17	1	0.12	17.17	0
4	Stage 6 = 5 d	0	17.17	1	0.12	17.17	0
5	Stage 7 = 6 d	0	17.17	1	0.12	17.17	0

Soil Layers

Ground Surface Drained: Yes

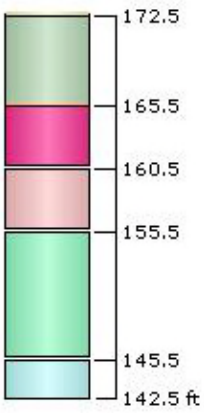
C-1: (-26.235, 12.88)

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	A - Alluv. A-2-6	3	-172.5	No
2	B - Alluv. A-6/A-7	4	-169.5	Yes
3	C1 - Alluv. A-1 (upstrm)	5	-165.5	No
4	C2 - Alluv. A-1 (dwnstrm)	0	-160.5	No
5	D1 - CP Med. Stiff A-7-5	5	-160.5	No
6	D - CP A-7-5	10	-155.5	No
7	E - CP A-6	3	-145.5	No



C-2: (26.711, 13.27)

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	A - Alluv. A-2-6	0	-172.5	No
2	B - Alluv. A-6/A-7	7	-172.5	Yes
3	C1 - Alluv. A-1 (upstrm)	0	-165.5	No
4	C2 - Alluv. A-1 (dwnstrm)	5	-165.5	No
5	D1 - CP Med. Stiff A-7-5	5	-160.5	No
6	D - CP A-7-5	10	-155.5	No
7	E - CP A-6	3	-145.5	No



Soil Properties

Property	A - Alluv. A-2-6	B - Alluv. A-6/A-7	C1 - Alluv. A-1 (upstrm)	D1 - CP Med. Stiff A-7-5
Color				
Unit Weight [kips/ft^3]	0.1	0.09	0.105	0.11
Saturated Unit Weight [kips/ft^3]	0.1	0.09	0.105	0.11
K0	1	1	1	1
Immediate Settlement	Enabled	Disabled	Enabled	Disabled
Es [ksf]	50	-	350	-
Esur [ksf]	50	-	350	-
Primary Consolidation	Disabled	Enabled	Disabled	Enabled
Material Type		Non-Linear		Non-Linear
Cc	-	0.24	-	0.15
Cr	-	0.024	-	0.015
e0	-	0.841	-	0.7805
OCR	-	1.2	-	3.2
Cv [ft^2/d]	-	0.1	-	0.2
Cvr [ft^2/d]	-	0.3	-	0.4
B-bar	-	1	-	1
Undrained Su A [kips/ft2]	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8
Piezo Line ID	1	1	1	1

Property	D - CP A-7-5	E - CP A-6	C2 - Alluv. A-1 (dwnstrm)
Color			
Unit Weight [kips/ft^3]	0.118	0.13	0.1
Saturated Unit Weight [kips/ft^3]	0.118	0.13	0.1
K0	1	1	1
Immediate Settlement	Enabled	Enabled	Enabled
Es [ksf]	650	770	100
Esur [ksf]	650	770	100
B-bar	-	-	-
Undrained Su A [kips/ft2]	0	0	0
Undrained Su S	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8
Piezo Line ID	1	1	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft^3

Piezometric Line Entities

ID	Depth (ft)
1	-172.4 ft

Query Lines

Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	-31.25, 0	31.25, 0	10	Auto: 77
2	Query Line 2	-31.25, 7	31.25, 7	10	Auto: 77

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	12

REFERENCE: I-5986B

PROJECT: 47532

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 FROM NORTH OF SR 1002 (LONG BRANCH ROAD) (EXIT 71) TO I-40 (EXIT 81).*

SITE DESCRIPTION *BRIDGE 653 ON -Y29- (S. MARKET ST.) OVER -L- (I-95)*

CONTENTS

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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

E. BLONESHINE

J. PREVATTE

A. BLYTHE

J. SWARTLEY

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *JANUARY 2020*

9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726

NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by:
Stacie Mitchell 1/9/2020
BBC611B64E18458...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-750
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" 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: BY6-202 N: 588609 E: 2134438

ELEVATION: 241.76 FEET

NOTES:

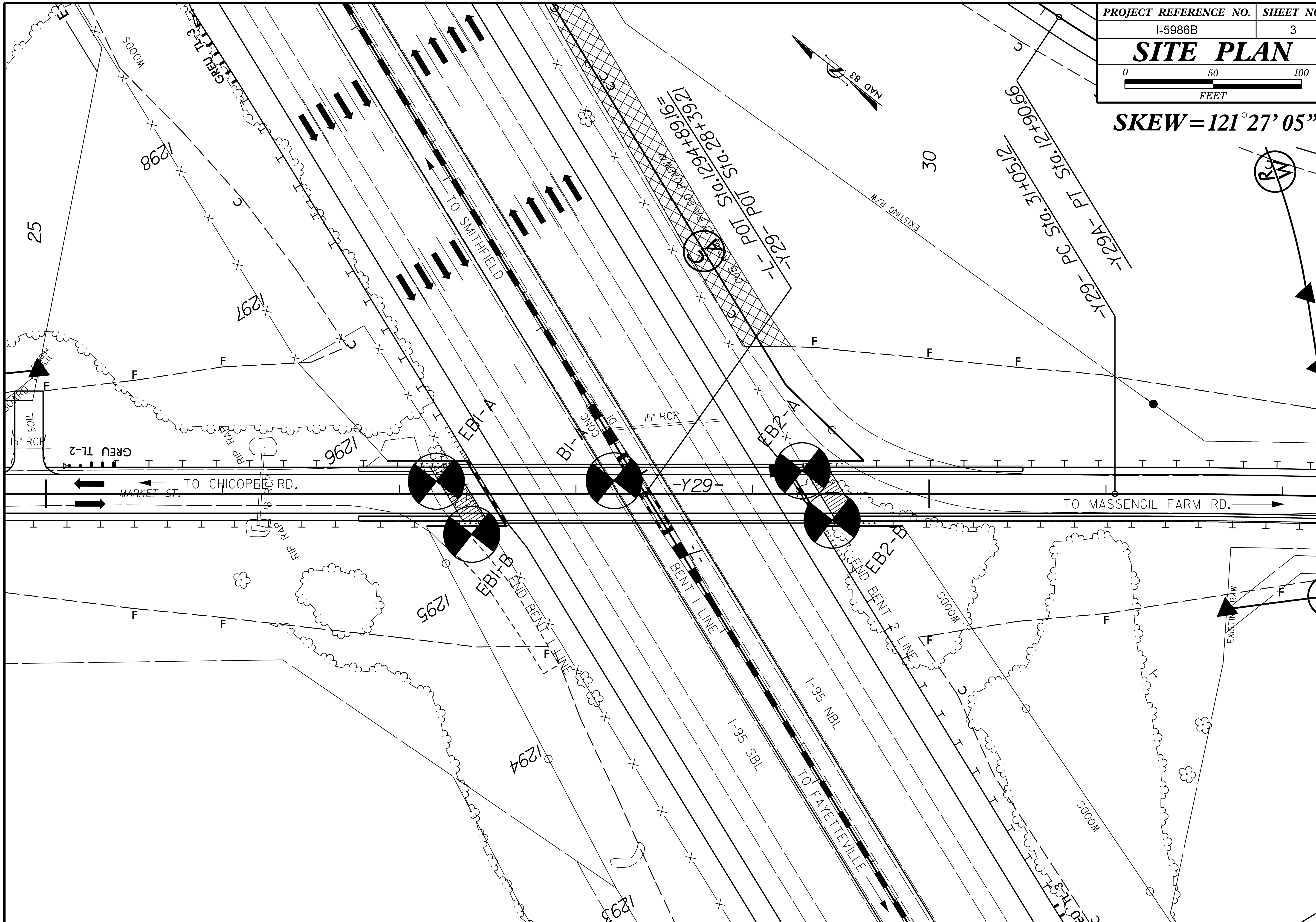
FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	3

SITE PLAN

SKEW = 121°27' 05"



5/14/99

0	40	80

FEET

VE = 2:1

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE PROJECTED ALONG –Y29–

290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130

Ⓐ **ROADWAY EMBANKMENT.** LOOSE TO MEDIUM DENSE GRAY,BROWN,YELLOW,SILTY SAND (A-2-4),AND CLAYEY SAND (A-2-6) TRACE GRAVEL,MOIST

Ⓑ **ROADWAY EMBANKMENT.** MED. STIFF, ORANGE, SANDY CLAY (A-6), MOIST

Ⓒ **COASTAL PLAIN.** MEDIUM STIFF PINK,GRAY SANDY CLAY (A-6),WET [MIDDENDORF FORMATION]

EB1–A
27+21
7' LT
–Y29–

B–1
28+22
7' LT
–Y29–

EB2–A
29+28
13' LT
–Y29–

COASTAL PLAIN. VERY LOOSE TO MED. DENSE. RED, GRAY, TAN AND ORANGE, CLAYEY SAND (A-2-6) AND SILTY SAND (A-2-4),TRACE GRAVEL MOIST TO SAT. [MIDDENDORF FORMATION]

COASTAL PLAIN. MED. STIFF, BLACK AND DARK GRAY. SILTY CLAY (A-7-6),WITH SAND SEAMS,TRACE MICA AND TRACE GRAVEL,WET [CAPE FEAR FORMATION]

LOOSE TO MED. DENSE, DARK GRAY, BROWN. SILTY SAND (A-2-4),TRACE MICA,MOIST TO SAT.

STIFF TO HARD, BLACK, GRAY AND DARK GRAY, SANDY CLAY (A-6) AND CLAY WITH SAND SEAMS (A-7-6),TRACE MICA,MOIST

DENSE, GRAY, SILTY SAND (A-2-4), SAT.

VERY STIFF, GREEN, GRAY, SILTY CLAY (A-7-6), AND SANDY CLAY (A-6),TRACE MICA WET

MED. DENSE TO DENSE, TAN, GRAY AND GREEN, CLAYEY FINE SAND (A-2-6),WITH SAND SEAMS,TRACE MICA, MOIST TO SAT.

VERY STIFF TO HARD, TAN, BROWN AND GRAY, SILTY CLAY (A-7-6) AND SANDY CLAY (A-6),TRACE MICA, MOIST TO WET

MEDIUM DENSE GRAY CLAYEY SAND (A-2-6) TRACE MICA,WET

VERY STIFF GRAY SANDY CLAY (A-6),TRACE MICA,WET

BT FIAD 06/2019

BT FIAD 12/2019

BT FIAD 06/2019

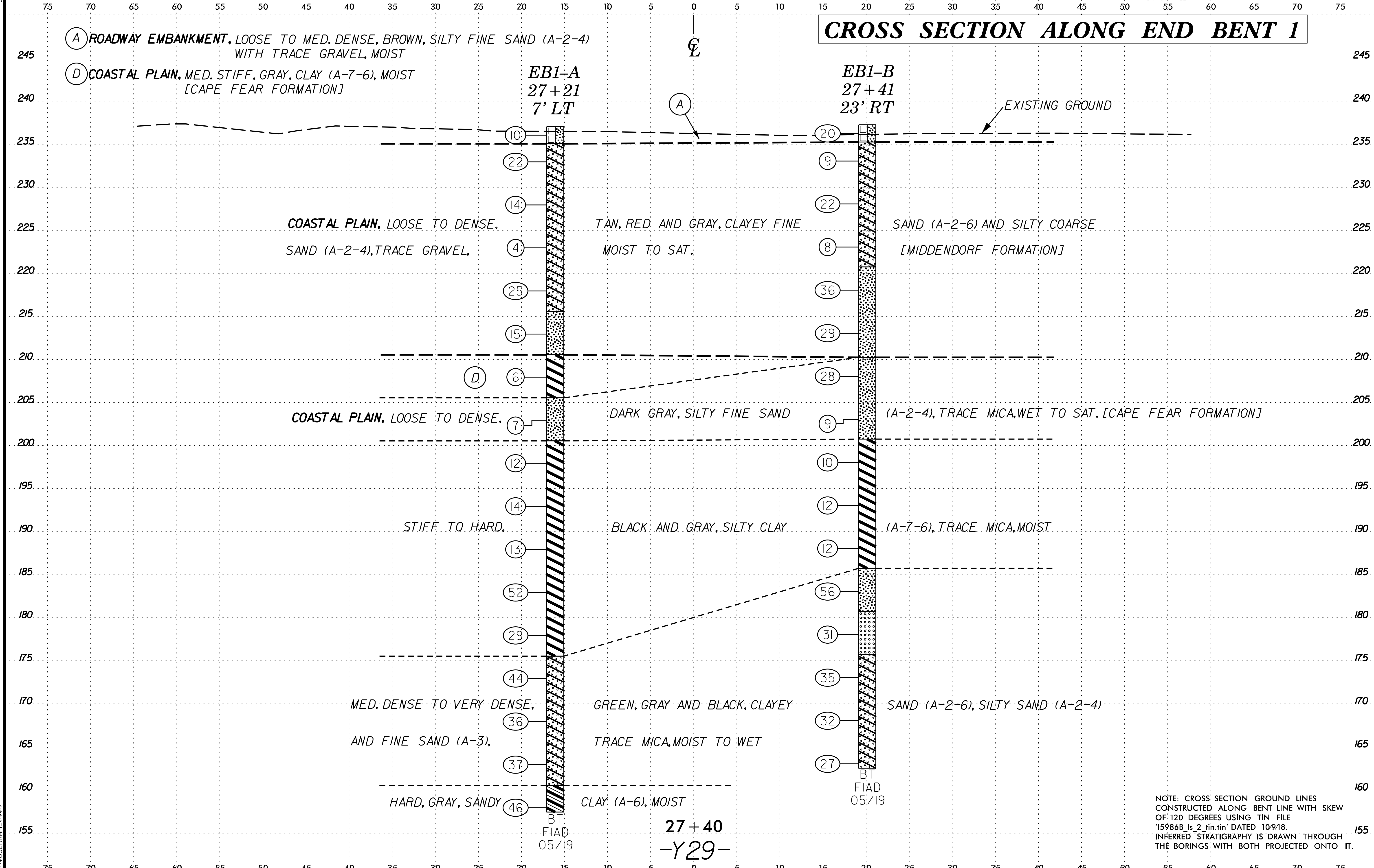
NOTE: EXISTING GROUND SURFACE PROFILE OF –Y29– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

–Y29–

26+00 27+00 28+00 29+00 30+00 31+00

PROJ. REFERENCE NO.	SHEET NO.
I-5986B	5

CROSS SECTION ALONG END BENT 1



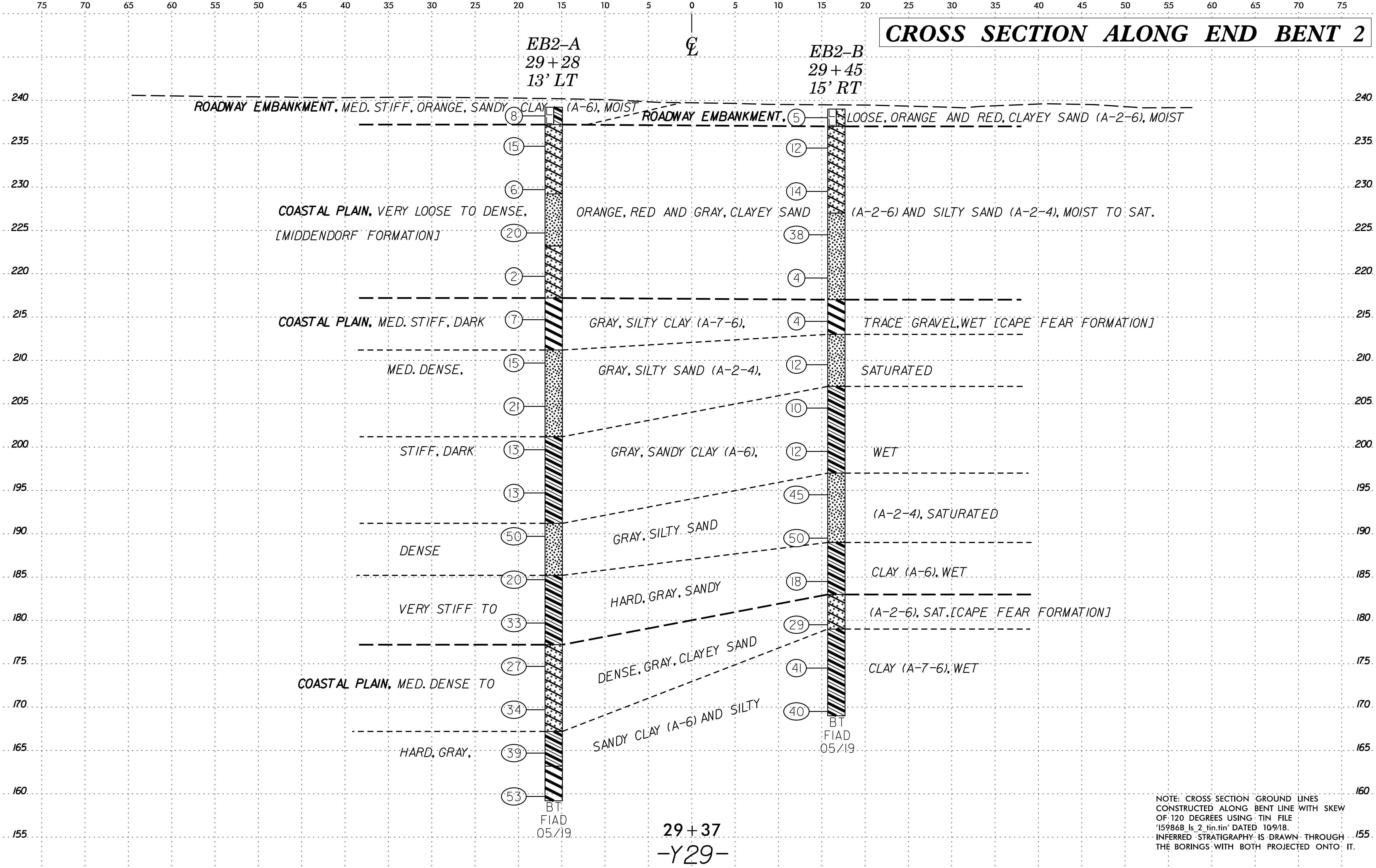
NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120 DEGREES USING TIN FILE 'I5986B_ls_2_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

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

0 2.5 5 UNITS = FEET	PROJ. REFERENCE NO.	SHEET NO.
	I-5986B	6

CROSS SECTION ALONG END BENT 2



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 120 DEGREES USING TIN FILE 'I5986B_ls_2_tin.tin' DATED 10/9/18.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+21	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 240.9 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 588,367	**EASTING** 2,134,686	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/03/19	**COMP. DATE** 05/03/19	**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))
245										
240	240.9	0.0	4	4	6	10		M		240.9 / 0.0 GROUND SURFACE
	237.8	3.1								**ROADWAY EMBANKMENT**
			4	9	13	22		M		238.9 / 2.0 LOOSE, BROWN, SILTY FINE SAND (A-2-4) W/ TRACE GRAVEL
235										**COASTAL PLAIN**
	232.8	8.1								LOOSE TO MED. DENSE, RED, GRAY AND TAN, CLAYEY FINE SAND (A-2-6) W/ TRACE GRAVEL
			6	8	6	14		M		[MIDDENDORF FORMATION]
230										
	227.8	13.1								
			2	2	2	4		Sat.		
225										
	222.8	18.1								
			12	12	13	25		Sat.		
220										219.4 / 21.5 MED. DENSE, TAN, SILTY COARSE SAND (A-2-4) WITH TRACE GRAVEL
	217.8	23.1								
			13	7	8	15		Sat.		
215										214.4 / 26.5 **COASTAL PLAIN**
	212.8	28.1								MED. STIFF, BLACK, CLAY (A-7-6) W/ SAND SEAMS
			3	3	3	6		M		[CAPE FEAR FORMATION]
210										
	207.8	33.1								209.4 / 31.5 LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4) W/ TRACE MICA
			5	3	4	7		Sat.		
205										
	202.8	38.1								204.4 / 36.5 STIFF TO HARD, BLACK AND GRAY, CLAY (A-7-6) W/ SAND SEAMS AND MICA
			5	6	6	12		M		
200										
	197.8	43.1								
			5	6	8	14		M		
195										
	192.8	48.1								
			5	6	7	13		M		
190										
	187.8	53.1								
			9	20	32	52		M		
185										
	182.8	58.1								
			10	12	17	29		M		
180										179.4 / 61.5 DENSE, GREEN AND GRAY, CLAYEY FINE SAND (A-2-6) W/ TRACE MICA
	177.8	63.1								
			11	14	30	44		M		
175										
	172.8	68.1								
			15	16	20	36		M		
170										
	167.8	73.1								
			12	15	22	37		M		
165										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+21	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 240.9 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 588,367	**EASTING** 2,134,686	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/03/19	**COMP. DATE** 05/03/19	**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
165						Match Line				
	162.8	78.1	9	16	30	46		M		164.4 / 76.5 HARD, GRAY, SANDY CLAY (A-6)
										161.3 / 79.6 Boring Terminated at Elevation 161.3 ft IN HARD SANDY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+41	**OFFSET** 23 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 241.1 ft	**TOTAL DEPTH** 74.7 ft	**NORTHING** 588,333	**EASTING** 2,134,674	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/06/19	**COMP. DATE** 05/06/19	**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)
245											
240	241.1	0.0	6	11	9	20		M		241.1 GROUND SURFACE	0.0
										239.1 **ROADWAY EMBANKMENT** MED. DENSE, BROWN, SILTY FINE SAND (A-2-4)	2.0
235	237.9	3.2	3	3	6	9		M		**COASTAL PLAIN** LOOSE TO MED. DENSE, RED AND TAN, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION]	
230	232.9	8.2	9	11	11	22		W			
225	227.9	13.2	4	4	4	8		W			
220	222.9	18.2	9	19	17	36		W		224.6 MED. DENSE TO DENSE, TAN, SILTY COARSE SAND (A-2-4), TRACE GRAVEL	16.5
215	217.9	23.2	8	18	11	29		W			
210	212.9	28.2	8	14	14	28		W		214.1 **COASTAL PLAIN** LOOSE TO MED. DENSE, DARK GRAY, SILTY FINE SAND (A-2-4), TRACE MICA [CAPE FEAR FORMATION]	27.0
205	207.9	33.2	5	4	5	9		W			
200	202.9	38.2	2	5	5	10		M		204.6 STIFF, BLACK, SILTY CLAY (A-7-6), TRACE MICA	36.5
195	197.9	43.2	5	5	7	12		M			
190	192.9	48.2	4	5	7	12		M			
185	187.9	53.2	19	29	27	56		W		189.6 DENSE TO VERY DENSE, BLACK, SILTY COARSE SAND (A-2-4) AND FINE SAND (A-3)	51.5
180	182.9	58.2	9	14	17	31		W		184.6	56.5
175	177.9	63.2	12	15	20	35		M		179.6 MED. DENSE TO DENSE, GREEN AND GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA	61.5
170	172.9	68.2	10	14	18	32		M			
	167.9	73.2	10	12	15	27		M		166.4 Boring Terminated at Elevation 166.4 ft IN	74.7

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+41	**OFFSET** 23 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 241.1 ft	**TOTAL DEPTH** 74.7 ft	**NORTHING** 588,333	**EASTING** 2,134,674	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/06/19	**COMP. DATE** 05/06/19	**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
165						Match Line				MED. DENSE CLAYEY SAND (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG_Y29.GPJ NC_DOT.GDT 1/9/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+22	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** 3.5
COLLAR ELEV. 239.3 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 588,288	**EASTING** 2,134,748	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9978 CME-750 74% 12/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Norwood	**START DATE** 12/09/19	**COMP. DATE** 12/10/19	**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)
240											
	239.3	0.0	3	4	6	10		M		239.3 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
235	235.8	3.5	4	6	6	12		W		236.8 LOOSE, YELLOW BROWN, CLAYEY FINE to COARSE SAND (A-2-6) W/ TRACE GRAVEL	2.5
										COASTAL PLAIN	
230	230.8	8.5	2	3	3	6		W		MEDIUM DENSE, RED, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) [MIDDENDORF FORMATION]	
										231.8 MEDIUM STIFF, PINK GRAY, COARSE SANDY CLAY (A-6)	7.5
225	225.8	13.5	3	7	8	15		W		227.3 MEDIUM DENSE, TAN, YELLOW, CLAYEY FINE TO COARSE SAND (A-2-6)	12.0
220	220.8	18.5	3	1	14	15		W			
215	215.8	23.5	5	4	2	6		W		215.3 **COASTAL PLAIN**	24.0
210	210.8	28.5	1	5	9	14		W		212.3 MED. STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ SAND SEAMS, TRACE MICA [CAPE FEAR FORMATION]	27.0
205	205.8	33.5	4	3	7	10		W		MEDIUM DENSE TO LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4) W/ TRACE MICA	
200	200.8	38.5	2	4	6	10		W		202.3 STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ SAND SEAMS, TRACE MICA	37.0
195	195.8	43.5	3	6	7	13		W		197.3 STIFF TO VERY STIFF GRAY, SANDY CLAY (A-6), TRACE MICA	42.0
190	190.8	48.5	4	4	7	11		W			
185	185.8	53.5	28	8	9	17		W			
180	180.8	58.5	7	10	15	25		W		182.3 VERY STIFF, GREEN GRAY, SILTY CLAY (A-7-5) W/ SAND SEAMS, TRACE MICA	57.0
175	175.8	63.5	13	9	19	28		W		177.3 VERY STIFF GRAY, SANDY CLAY (A-6), TRACE MICA	62.0
170	170.8	68.5	8	12	14	26		W			
165	165.8	73.5	11	14	22	36		W		167.3 DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA	72.0
160	160.8	78.5	12	14	15					162.3 VERY STIFF TAN, GRAY, SANDY CLAY (A-6), TRACE MICA	77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+22	**OFFSET** 7 ft LT	**ALIGNMENT** -Y29-	**0 HR.** 3.5
COLLAR ELEV. 239.3 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 588,288	**EASTING** 2,134,748	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME9978 CME-750 74% 12/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Norwood	**START DATE** 12/09/19	**COMP. DATE** 12/10/19	**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
160						Match Line				
	155.8	83.5	6	12	13	25		W		VERY STIFF TAN, GRAY, SANDY CLAY (A-6), TRACE MICA *(continued)*
155										157.3 MEDIUM DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE MICA 82.0
	150.8	88.5	10	9	12	21		W		152.3 VERY STIFF, GRAY, SANDY CLAY (A-6), TRACE MICA 87.0
150										149.3 Boring Terminated at Elevation 149.3 ft IN VERY STIFF SANDY CLAY (COASTAL PLAIN) 90.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 29+28	**OFFSET** 13 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 588,208	**EASTING** 2,134,818	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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))
240										
	239.2	0.0	4	4	4	8		M		239.2 / 0.0 GROUND SURFACE
										ROADWAY EMBANKMENT
										MED. STIFF, ORANGE, SANDY CLAY (A-6)
	237.2	2.0								237.2 / 2.0
235	235.7	3.5	4	6	9	15		M		**COASTAL PLAIN**
										LOOSE TO MED. DENSE, ORANGE, RED AND GRAY, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]
230	230.7	8.5	3	3	3	6		M		
										229.2 / 10.0
										MED. DENSE, ORANGE AND GRAY, SILTY SAND (A-2-4)
225	225.7	13.5	17	14	6	20		Sat.		
										223.2 / 16.0
										VERY LOOSE, ORANGE AND RED, CLAYEY SAND (A-2-6), TRACE GRAVEL
220	220.7	18.5	2	1	1	2		Sat.		
										217.2 / 22.0
										COASTAL PLAIN
										MED. STIFF, DARK GRAY, SILTY CLAY (A-7-6) W/ TRACE GRAVEL [CAPE FEAR FORMATION]
215	215.7	23.5	8	5	2	7		W		
										211.2 / 28.0
										MED. DENSE, DARK GRAY, SILTY SAND (A-2-4)
210	210.7	28.5	6	8	7	15		Sat.		
205	205.7	33.5	8	10	11	21		Sat.		
200	200.7	38.5	4	6	7	13		W		201.2 / 38.0 STIFF, DARK GRAY, SANDY CLAY (A-6)
195	195.7	43.5	5	6	7	13		W		
190	190.7	48.5	22	25	25	50		Sat.		191.2 / 48.0 DENSE, GRAY, SILTY SAND (A-2-4)
185	185.7	53.5	6	9	11	20		Sat.		185.2 / 54.0 VERY STIFF TO HARD, DARK GRAY AND GRAY, SANDY CLAY (A-6)
180	180.7	58.5	12	16	17	33		W		
175	175.7	63.5	10	12	15	27		W		177.2 / 62.0 MED. DENSE TO DENSE, GRAY, CLAYEY SAND (A-2-6)
170	170.7	68.5	11	17	17	34		Sat.		
165	165.7	73.5	14	19	20	39		W		167.2 / 72.0 HARD, BROWN AND GRAY, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6)
160	160.7	78.5								163.2 / 76.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 29+28	**OFFSET** 13 ft LT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 588,208	**EASTING** 2,134,818	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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
160						Match Line				
			15	24	29	53		W		159.2 / 80.0 Boring Terminated at Elevation 159.2 ft IN HARD SILTY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Prevatte, J.	
SITE DESCRIPTION BRIDGE 653 ON -Y29- OVER (-L-) I-95				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 29+45	**OFFSET** 15 ft RT	**ALIGNMENT** -Y29-	**0 HR.** N/A
COLLAR ELEV. 239.0 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 588,177	**EASTING** 2,134,807	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER T. Whitehead	**START DATE** 05/08/19	**COMP. DATE** 05/08/19	**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)
240											
	239.0	0.0	5	3	2	5		M		239.0 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
										237.0 LOOSE, ORANGE AND RED, CLAYEY SAND (A-2-6)	2.0
235	235.5	3.5	5	6	6	12		M		**COASTAL PLAIN**	
										MED. DENSE, ORANGE AND RED, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]	
230	230.5	8.5	7	6	8	14		M			
										227.0	12.0
225	225.5	13.5	14	17	21	38		Sat.		LOOSE TO DENSE, ORANGE AND RED, SILTY SAND (A-2-4)	
220	220.5	18.5	5	1	3	4		Sat.			
										217.0	22.0
215	215.5	23.5	1	2	2	4		W		**COASTAL PLAIN** SOFT, DARK GRAY, SILTY CLAY (A-7-6) [CAPE FEAR FORMATION]	
										213.0	26.0
210	210.5	28.5	4	5	7	12		Sat.		MED. DENSE, GRAY, SILTY SAND (A-2-4)	
										207.0	32.0
205	205.5	33.5	4	5	5	10		W		STIFF, DARK GRAY, SANDY CLAY (A-6)	
200	200.5	38.5	4	6	6	12		W			
										197.0	42.0
195	195.5	43.5	17	23	22	45		Sat.		DENSE, DARK GRAY, SILTY SAND (A-2-4)	
190	190.5	48.5	9	28	22	50		Sat.		189.0	50.0
										VERY STIFF, GRAY, SANDY CLAY (A-6)	
185	185.5	53.5	7	8	10	18		W			
										183.0	56.0
180	180.5	58.5	8	11	18	29		Sat.		MED. DENSE, GRAY, CLAYEY SAND (A-2-6)	
										179.0	60.0
175	175.5	63.5	10	12	29	41		W		HARD, GRAY, SANDY CLAY (A-6)	
170	170.5	68.5	13	18	22	40		W		169.0	70.0
										Boring Terminated at Elevation 169.0 ft IN HARD SANDY CLAY (COASTAL PLAIN)	

NCDOT BORE DOUBLE I5986B_GEO_BRDG_Y29.GPJ NC_DOT.GDT 1/9/20

SITE PHOTOGRAPH

Bridge 653 on -Y29- over -L- (I-95)

Looking North

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	20

REFERENCE: I-5986B

PROJECT: 47532

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *I-95 WIDENING FROM SR 1811 (BUD HAWKINS RD.) (EXIT 70) TO I-40 (EXIT 81) – WIDEN TO EIGHT LANES*

SITE DESCRIPTION *BRIDGE NO. 654 ON I-95 OVER MINGO SWAMP*

CONTENTS

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PERSONNEL

E. BLONESHINE

M. HARTMAN

T. WHITEHEAD

A. BLYTHE

J. SWARTLEY

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J. SWARTLEY*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S. MITCHELL*

DATE *FEBRUARY 2020*

9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726

NORTH CAROLINA PROFESSIONAL SEAL 032125 ENGINEER STACIE E. MITCHELL

DocuSigned by: Stacie Mitchell BBC611B64F19458... 2/6/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	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] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" 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: BM #1 N: 585603 E: 2133854

ELEVATION: 199.73 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	3

SITE PLAN

0 50 100
FEET

SKEW = 90°

NAD 83

N 79°42'25" W 85.69'

HARNETT CO
JOHNSTON CO

291

THOMAS HODGES
DB 772 PG 378

END BENT 1 LINE
BENT 1 LINE
1260+00
MINGO SWAMP
BENT 2 LINE
END BENT 2 LINE
1264+00

F
JS

TYPE B-77
BRIDGE NO. 654
TYPE B-77

13' CONC WW
51' CONC HW
13' CONC WW

EB1-A
B1-A
B2-A
EB2-A

MTL

TO DUNN

I-95 SBL

-L-

-102

4 9'x12' BOX CULVERTS

EB1-C
B1-C
B2-C
EB2-C

I-95 NBL

TO BENSON

B1-B
B2-B

EB1-B
EB2-B

18" CMP

MTL

13' CONC WW
13' CONC WW

TYPE B-77
TYPE B-77

CAT 1

F

MINGO SWAMP

JS

WOODS

BEG. WW FENCE
+50.00 -L-
130.00' RT

BILLY & SANDRA PARKER
DB 1159 PG 362

NDRA PARKER
PG 362

68°25'44" W
209.77'

249

30° E

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	4

PROFILE ALONG CENTERLINE OF –L–

0 40 80
FEET
VE = 2:1

Ⓐ **ROADWAY EMBANKMENT.** MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6), MOIST
Ⓑ **ALLUVIAL.** VERY SOFT TO SOFT, BROWN AND GRAY, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6) WITH TRACE OF ORGANIC MATTER, MOIST TO WET
Ⓒ **ALLUVIAL.** VERY LOOSE, BROWN AND GRAY, SILTY FINE SAND (A-2-4) AND CLAYEY SAND (A-2-6), MOIST TO SAT.

EB1–C
1259+21
7' LT
–L–
SS-4759
SS-4762
SS-4766

B1–C
1259+89
7' LT
–L–
SS-4746
SS-4752

B2–C
1260+79
8' LT
–L–
SS-4726

EB2–C
1261+39
6' LT
–L–
SS-4707
SS-4713

BRIDGE NO. 654

PROPOSED GRADE
EXISTING GROUND

ROADWAY EMBANKMENT. VERY LOOSE TO MED. WITH TRACE OF GRAVEL, MOIST TO SAT.

DENSE, ORANGE, BROWN AND RED, CLAYEY FINE SAND (A-2-6)

COASTAL PLAIN. LOOSE TO DENSE, GRAY AND WHITE, CLAYEY SAND (A-2-6), SILTY SAND (A-2-4), FINE TO COARSE SAND (A-3) AND GRAVELLY COARSE SAND (A-1-b); WET TO SAT. [MIDDENDORF FORMATION]

COASTAL PLAIN. MED. STIFF TO HARD, GRAY, MOIST TO WET [CAPE FEAR FORMATION]

DARK GRAY AND TAN, SILTY CLAY (A-7-6), SANDY CLAY (A-6), AND SANDY SILT (A-4),

DENSE TO VERY DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), MOIST TO WET

VERY DENSE, GRAY, SILTY SAND (A-2-4), SAT.

MED. DENSE TO DENSE, GRAY, RED AND BROWN, SILTY SAND (A-2-4) AND CLAYEY FINE SAND (A-2-6), MOIST TO SAT.

VERY STIFF TO HARD, GRAY, CLAY (A-7-6), MOIST

FIAD
06/2019

NOTE: EXISTING GROUND SURFACE PROFILE OF –L– CENTERLINE TAKEN FROM ELECTRONIC TIN FILE '15986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRPAHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90

1258+00 1259+00 1260+00 1261+00 1262+00 1263+00

0 5 10 UNITS = FEET	PROJ. REFERENCE NO.	SHEET NO.
	I-5986B	5

BRIDGE NO. 654
SKEW = 90°

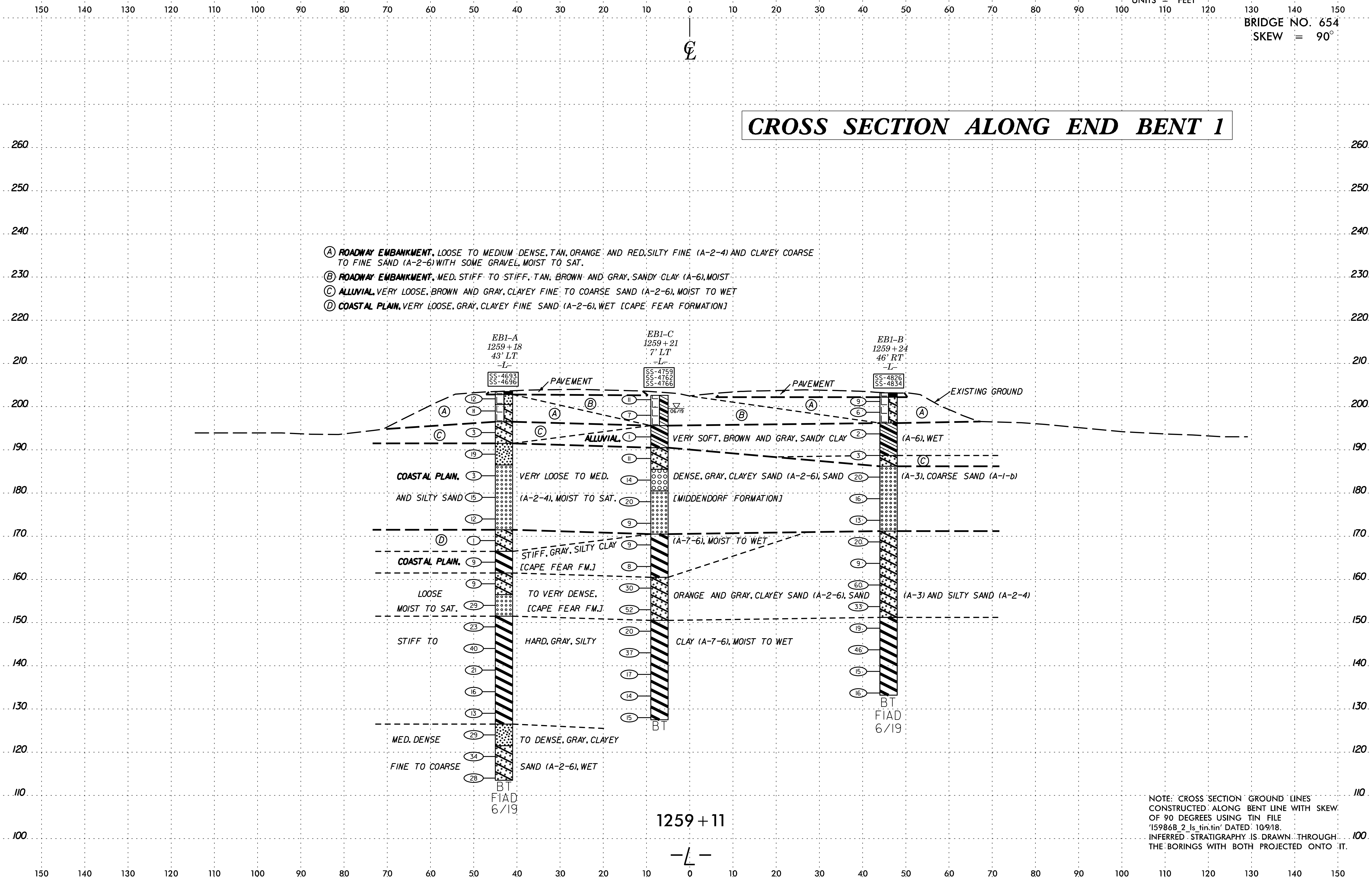
CROSS SECTION ALONG END BENT 1

Ⓐ **ROADWAY EMBANKMENT.** LOOSE TO MEDIUM DENSE, TAN, ORANGE AND RED, SILTY FINE (A-2-4) AND CLAYEY COARSE TO FINE SAND (A-2-6) WITH SOME GRAVEL, MOIST TO SAT.

Ⓑ **ROADWAY EMBANKMENT.** MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6), MOIST

Ⓒ **ALLUVIAL.** VERY LOOSE, BROWN AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), MOIST TO WET

Ⓓ **COASTAL PLAIN.** VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6), WET [CAPE FEAR FORMATION]



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

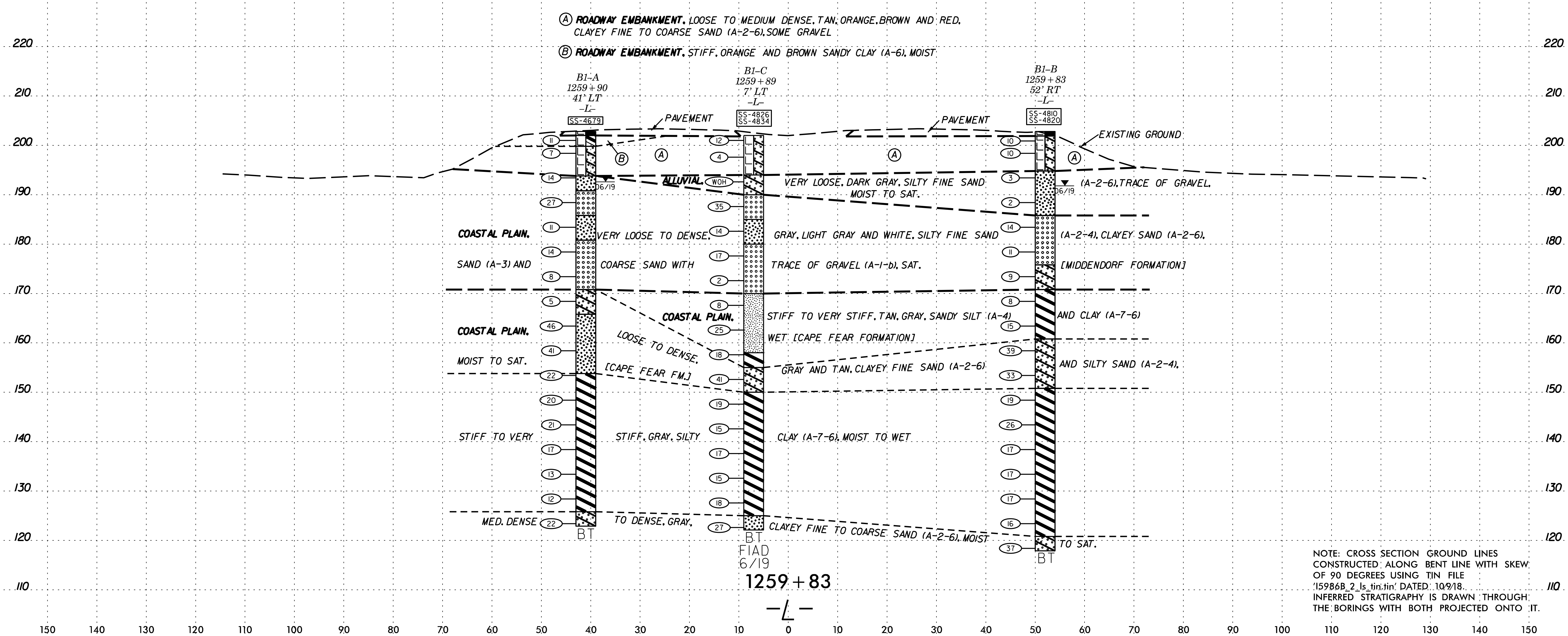
6/23/16

PROJ. REFERENCE NO.	SHEET NO.
I-5986B	6

0 5 10 UNITS = FEET

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG BENT 1



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

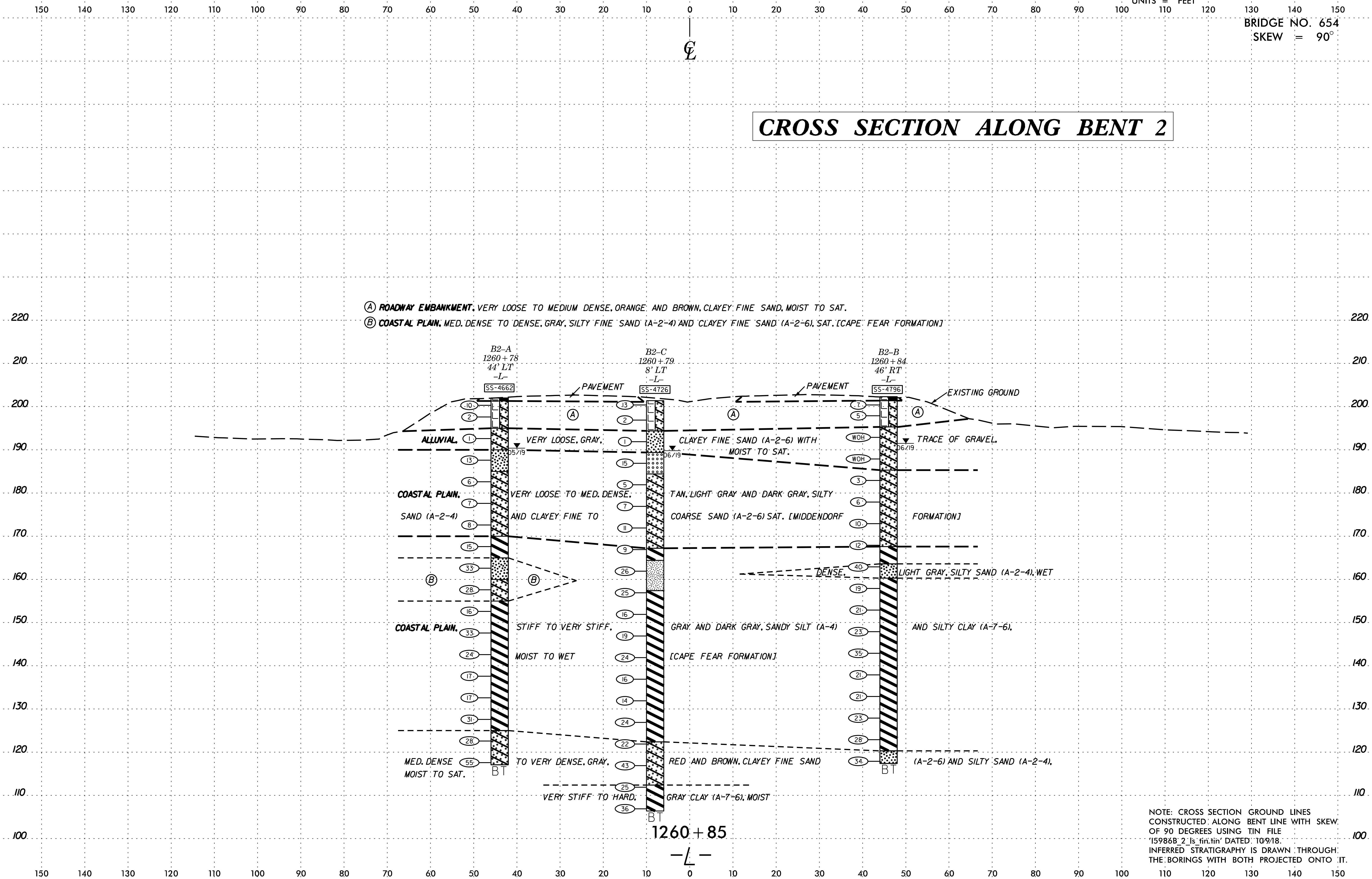
$$$$SYSTIME$$$$ $$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

PROJ. REFERENCE NO. I-5986B | SHEET NO. 7

0 5 10 UNITS = FEET

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG BENT 2



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

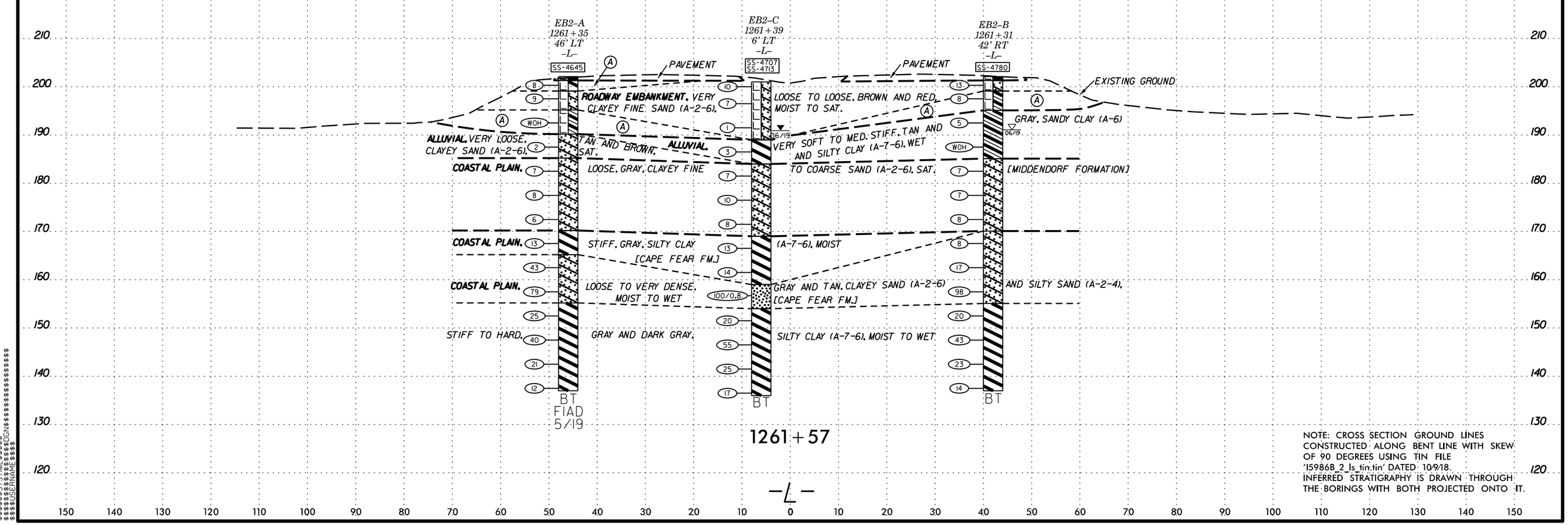
6/23/16

0 5 10 UNITS = FEET	PROJ. REFERENCE NO.	SHEET NO.
	I-5986B	8

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG END BENT 2

Ⓐ **ROADWAY EMBANKMENT.** VERY SOFT TO STIFF, BROWN, PINK AND TAN, SANDY CLAY (A-6) AND SILTY CLAY (A-7-6), MOIST TO WET



NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

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

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1259+18	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.5 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 584,937	**EASTING** 2,133,470	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/03/19	**COMP. DATE** 06/04/19	**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)
205										
	202.8	0.7								203.5 — 0.0 GROUND SURFACE 202.8 — 0.7 **ROADWAY EMBANKMENT** PAVEMENT (0.7 FEET)
200	200.0	3.5	9	7	5	12		W		200.5 — 3.0 MED. DENSE, TAN AND RED, SILTY FINE SAND (A-2-4)
195	195.0	8.5	3	5	6	11		M		MED. DENSE, BROWN, CLAYEY COARSE TO FINE SAND (A-2-6), TRACE OF GRAVEL 196.5 — 7.0
190	190.0	13.5	1	1	2	3		M		**ALLUVIAL** VERY LOOSE, BROWN, CLAYEY SAND (A-2-6) 191.5 — 12.0
185	185.0	18.5	3	9	10	19		M		**COASTAL PLAIN** VERY LOOSE TO MED. DENSE, LIGHT GRAY, GRAY AND WHITE, SILTY FINE SAND (A-2-4) AND FINE SAND (A-3) WITH GRAVEL [MIDDENDORF FORMATION] 186.5 — 17.0
180	180.0	23.5	3	1	2	3		W		
175	175.0	28.5	5	7	8	15		W		
170	170.0	33.5	4	6	6	12		W		
165	165.0	38.5	3	1	0	1		W		171.5 — 32.0 **COASTAL PLAIN** VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6) [CAPE FEAR FORMATION]
160	160.0	43.5	2	4	5	9	SS-4693	22%		166.5 — 37.0 STIFF, GRAY, SILTY CLAY (A-7-6)
155	155.0	48.5	3	4	5	9		W		161.5 — 42.0 LOOSE, LIGHT GRAY, CLAYEY FINE SAND (A-2-6)
150	150.0	53.5	15	18	11	29		W		156.5 — 47.0 MED. DENSE, DARK GRAY, FINE SAND (A-3)
145	145.0	58.5	7	11	12	23	SS-4696	23%		151.5 — 52.0 STIFF TO HARD, GRAY, SILTY CLAY (A-7-6)
140	140.0	63.5	10	19	21	40		M		
135	135.0	68.5	6	10	11	21		M		
130	130.0	73.5	5	7	9	16		M		
125			5	6	7	13		M		126.5 — 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 1259+18	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.5 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 584,937	**EASTING** 2,133,470	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/03/19	**COMP. DATE** 06/04/19	**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
125						Match Line				
	125.0	78.5	5	15	14	29		W		MED. DENSE, GRAY, SILTY FINE SAND (A-2-4) *(continued)*
120	120.0	83.5	12	16	18	34		W		121.5 — 82.0 MED. DENSE TO DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)
115	115.0	88.5	13	12	16	28		W		113.5 — 90.0 Boring Terminated at Elevation 113.5 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 1259+24	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 203.2 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 584,911	**EASTING** 2,133,556	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/19/19	**COMP. DATE** 06/20/19	**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)
205										203.2 GROUND SURFACE	0.0
	202.2	1.0	5	5	4	9		M		202.2 **ROADWAY EMBANKMENT** PAVEMENT (1.0 FEET) LOOSE, TAN AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6), SOME GRAVEL	1.0
200	199.7	3.5	4	3	3	6		M		196.2 **ALLUVIAL** SOFT, ORANGE, SANDY CLAY (A-6)	7.0
195	194.7	8.5	2	1	1	2		W		188.7 VERY LOOSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6)	14.5
190	189.7	13.5	WOH	WOH	3	3		W		186.2 **COASTAL PLAIN** MED. DENSE, WHITE AND TAN, FINE TO COARSE SAND (A-3) [MIDDENDORF FORMATION]	17.0
185	184.7	18.5	5	10	10	20		W			
180	179.7	23.5	4	8	8	16	SS-4826	24%			
175	174.7	28.5	4	7	6	13		W		171.2 **COASTAL PLAIN** LOOSE TO VERY DENSE, ORANGE AND GRAY, CLAYEY FINE TO COARSE SAND (A-2-6), TRACE OF MICA [CAPE FEAR FORMATION]	32.0
170	169.7	33.5	6	11	9	20		W			
165	164.7	38.5	3	4	5	9		W			
160	159.7	43.5	9	21	39	60		W			
155	154.7	48.5	11	16	17	33		W			
150	149.7	53.5	5	8	11	19		M		151.2 STIFF TO HARD, GRAY, HIGHLY PLASTIC, CLAY (A-7-6), TRACE OF MICA	52.0
145	144.7	58.5	10	19	27	46		M			
140	139.7	63.5	5	7	8	15	SS-4834	25%			
135	134.7	68.5	5	7	9	16		M		133.2 Boring Terminated at Elevation 133.2 ft IN VERY STIFF CLAY (COASTAL PLAIN)	70.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 1259+21	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.0
COLLAR ELEV. 202.6 ft	**TOTAL DEPTH** 75.1 ft	**NORTHING** 584,927	**EASTING** 2,133,505	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/11/19	**COMP. DATE** 06/12/19	**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
205										
	202.6	0.0	3	6	5	11		M		202.6 GROUND SURFACE 0.0
200	199.0	3.6	4	3	4	7		M		**ROADWAY EMBANKMENT** MED. STIFF TO STIFF, TAN, BROWN AND GRAY, SANDY CLAY (A-6)
195	194.0	8.6	1	0	1	1		W		195.6 **ALLUVIAL** VERY SOFT, BROWN AND GRAY, SANDY CLAY (A-6) 7.0
190	189.0	13.6	3	3	8	11		W		190.5 **COASTAL PLAIN** MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION] 12.1
185	184.0	18.6	2	6	8	14	SS-4759	14%		185.5 LOOSE TO MED. DENSE, GRAY, GRAVELLY COARSE SAND (A-1-b) AND FINE SAND (A-3) 17.1
180	179.0	23.6	8	9	11	20		W		180.5 22.1
175	174.0	28.6	3	5	4	9		W		
170	169.0	33.6	12	5	4	9	SS-4762	35%		170.5 **COASTAL PLAIN** STIFF, GRAY, HIGHLY PLASTIC, SILTY CLAY (A-7-5), TRACE OF MICA [CAPE FEAR FORMATION] 32.1
165	164.0	38.6	2	4	4	8		W		
160	159.0	43.6	4	14	16	30		W		160.5 MED. DENSE TO VERY DENSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE OF MICA 42.1
155	154.0	48.6	10	17	35	52		W		
150	149.0	53.6	5	9	11	20	SS-4766	26%		150.5 STIFF TO HARD, GRAY, SILTY CLAY (A-7-6), TRACE OF MICA 52.1
145	144.0	58.6	10	15	22	37		W		
140	139.0	63.6	5	7	10	17		W		
135	134.0	68.6	4	6	8	14		W		
130	129.0	73.6	4	7	8	15		W		127.5 Boring Terminated at Elevation 127.5 ft IN STIFF SILTY CLAY (COASTAL PLAIN) 75.1

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 1259+90	**OFFSET** 41 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 585,003	**EASTING** 2,133,497	**24 HR.** 10.2
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/02/19	**COMP. DATE** 06/03/19	**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)
205										
	202.0	0.8	8	5	6	11		M		202.8 GROUND SURFACE 0.0 202.0 **ROADWAY EMBANKMENT** 0.8 PAVEMENT (0.8 FEET)
200	199.4	3.4	4	4	3	7		M		199.8 STIFF, ORANGE AND BROWN, SANDY CLAY (A-6) 3.0 LOOSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
195	194.4	8.4	2	9	5	14				193.8 9.0 **COASTAL PLAIN**
190	189.4	13.4	5	12	15	27		M		LOOSE TO MED. DENSE, GRAY, LIGHT GRAY AND WHITE, SILTY FINE SAND (A-2-4) AND FINE TO COARSE SAND (A-3), TRACE OF GRAVEL [MIDDENDORF FORMATION]
185	184.4	18.4	4	6	5	11		W		190.8 12.0
180	179.4	23.4	4	6	8	14		W		185.8 17.0 180.8 22.0
175	174.4	28.4	2	4	4	8		W		
170	169.4	33.4	2	2	3	5		W		170.8 32.0 **COASTAL PLAIN**
165	164.4	38.4	13	20	26	46		W		LOOSE, GRAY AND TAN, CLAYEY FINE SAND (A-2-6) [CAPE FEAR FORMATION]
160	159.4	43.4	8	20	21	41		W		165.8 37.0 DENSE, LIGHT GRAY AND GRAY, SILTY FINE SAND (A-2-4)
155	154.4	48.4	11	11	11	22		M		153.8 49.0 STIFF TO VERY STIFF, GRAY, SILTY CLAY (A-7-5)
150	149.4	53.4	4	9	11	20	SS-4679	24%		
145	144.4	58.4	4	9	12	21		M		
140	139.4	63.4	5	9	8	17		M		
135	134.4	68.4	5	6	7	13		M		
130	129.4	73.4	4	7	5	12		M		
125										125.8 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 1259+90	**OFFSET** 41 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 585,003	**EASTING** 2,133,497	**24 HR.** 10.2
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/02/19	**COMP. DATE** 06/03/19	**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
125	124.4	78.4	5	10	12	Match Line 22		W		122.9 MEDIUM DENSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) *(continued)* 79.9 Boring Terminated at Elevation 122.9 ft IN MED. DENSE CLAYEY SAND (COASTAL PLAIN) *NO RECOVERY FROM DEPTH 28.4' TO 29.9'*

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 1259+83	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 584,965	**EASTING** 2,133,582	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/18/19	**COMP. DATE** 06/19/19	**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)
205										
	201.9	0.9	6	5	5	10		M		202.8 0.0 GROUND SURFACE 201.9 0.9 **ROADWAY EMBANKMENT** PAVEMENT (0.9 FEET) LOOSE, TAN AND RED, CLAYEY FINE TO COARSE SAND (A-2-6), SOME GRAVEL
200	199.4	3.4	4	6	4	10		W		
195	194.4	8.4	2	1	2	3				194.8 8.0 **ALLUVIAL** VERY LOOSE, DARK GRAY, SILTY FINE SAND (A-2-4), TRACE OF GRAVEL
190	189.4	13.4	2	2	0	2		W		
185	184.4	18.4	2	6	8	14		W		185.8 17.0 **COASTAL PLAIN** MED. DENSE, LIGHT GRAY AND TAN, FINE TO COARSE SAND (A-3), SOME GRAVEL [MIDDENDORF FORMATION]
180	179.4	23.4	4	6	5	11		W		
175	174.4	28.4	2	4	5	9		W		175.8 27.0 LOOSE, TAN AND ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6)
170	169.4	33.4	3	3	5	8	SS-4810	21%		170.8 32.0 **COASTAL PLAIN** MED. STIFF TO STIFF, GRAY, HIGHLY PLASTIC, CLAY (A-7-6) [CAPE FEAR FORMATION]
165	164.4	38.4	3	6	9	15		M		
160	159.4	43.4	11	16	23	39		W		160.8 42.0 DENSE, GRAY, CLAYEY FINE SAND (A-2-6)
155	154.4	48.4	9	15	18	33		W		
150	149.4	53.4	5	9	10	19		M		150.8 52.0 VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA
145	144.4	58.4	8	12	14	26		M		
140	139.4	63.4	5	7	10	17		M		
135	134.4	68.4	5	7	10	17		M		
130	129.4	73.4	5	8	9	17		M		
125										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 1259+83	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.8 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 584,965	**EASTING** 2,133,582	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/18/19	**COMP. DATE** 06/19/19	**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
125						Match Line				
	124.4	78.4	5	6	10	16		M		VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA *(continued)*
120	119.4	83.4	9	18	19	37	SS-4820	18%		120.8 82.0 DENSE, BROWN AND GRAY, CLAYEY FINE SAND (A-2-6) 117.9 84.9 Boring Terminated at Elevation 117.9 ft IN DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 1259+89	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 584,991	**EASTING** 2,133,529	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/06/19	**COMP. DATE** 06/07/19	**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)
205											
	202.0	0.0								202.0 GROUND SURFACE	0.0
200	198.6	3.4	4	7	5	12		M		**ROADWAY EMBANKMENT** LOOSE TO MED. DENSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL	
			3	2	2	4		Sat.			
195	193.6	8.4								194.0	8.0
			WOH	WOH	WOH	0		Sat.		**ALLUVIAL** VERY LOOSE, BROWN, CLAYEY SAND (A-2-6)	
190	188.6	13.4								190.0	12.0
			4	16	19	35		Sat.		**COASTAL PLAIN** VERY LOOSE TO DENSE, GRAY AND WHITE, COARSE SAND (A-3) WITH GRAVEL, SILTY FINE SAND (A-2-4) AND SAND (A-3) WITH CLAY SEAMS (22.0'-32.0') [MIDDENDORF FORMATION]	
185	183.6	18.4								185.0	17.0
			3	6	8	14		Sat.			
180	178.6	23.4								180.0	22.0
			5	8	9	17		Sat.			
175	173.6	28.4									
			1	1	1	2		Sat.			
170	168.6	33.4								170.0	32.0
			3	4	4	8		Sat.		**COASTAL PLAIN** STIFF TO VERY STIFF, TAN, SANDY SILT (A-4) [CAPE FEAR FORMATION]	
165	163.6	38.4									
			6	10	15	25	SS-4746	20%			
160	158.6	43.4								158.0	44.0
			4	9	9	18		Sat.		VERY STIFF, GRAY, CLAY (A-7-6), TRACE OF MICA	
155	153.6	48.4								155.0	47.0
			10	20	21	41		M		DENSE, GRAY, CLAYEY COARSE TO FINE SAND (A-2-6)	
150	148.6	53.4								150.0	52.0
			5	8	11	19		M		VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-5), TRACE OF MICA	
145	143.6	58.4									
			4	7	8	15		M			
140	138.6	63.4									
			4	7	10	17		M			
135	133.6	68.4									
			4	7	8	15	SS-4752	30%			
130	128.6	73.4									
			6	9	9	18		M			
125										125.0	77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Boneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 1259+89	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 584,991	**EASTING** 2,133,529	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/06/19	**COMP. DATE** 06/07/19	**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
125						Match Line				
	123.6	78.4	9	13	14	27		M		MED. DENSE, GRAY, SILTY FINE SAND (A-2-4)
										122.1 79.9
										Boring Terminated at Elevation 122.1 ft IN MED. DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 1260+78	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,087	**EASTING** 2,133,525	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/28/19	**COMP. DATE** 05/30/19	**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)
205										
	201.3	0.7								202.0 GROUND SURFACE 0.0 201.3 **ROADWAY EMBANKMENT** 0.7 PAVEMENT (0.7 FEET)
200			7	5	5	10		M		VERY LOOSE TO LOOSE, BROWN, CLAYEY FINE SAND (A-2-6)
	198.6	3.4	1	1	1	2		Sat.		
195										195.0 7.0 **ALLUVIAL**
	193.6	8.4	1	0	1	1		Sat.		VERY LOOSE, GRAY, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
190										190.0 12.0
	188.6	13.4	1	3	10	13		Sat.		**COASTAL PLAIN** MED. DENSE, TAN, SILTY FINE SAND (A-2-4) [MIDDENDORF FORMATION]
185										185.0 17.0
	183.6	18.4	2	3	3	6		Sat.		LOOSE, GRAY AND TAN, CLAYEY FINE SAND (A-2-6), TRACE OF MICA
180										
	178.6	23.4	4	3	4	7		Sat.		
175										
	173.6	28.4	5	4	4	8		Sat.		
170										170.0 32.0 **COASTAL PLAIN**
	168.6	33.4	4	6	9	15		M		STIFF, GRAY, CLAY (A-7-6) [CAPE FEAR FORMATION]
165										165.0 37.0
	163.6	38.4	10	16	17	33		Sat.		DENSE, GRAY, SILTY FINE SAND (A-2-4)
160										160.0 42.0
	158.6	43.4	8	12	16	28		Sat.		MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6)
155										155.0 47.0
	153.6	48.4	5	6	10	16		M		VERY STIFF TO HARD, GRAY, CLAY (A-7-5)
150										
	148.6	53.4	9	15	18	33		M		
145										
	143.6	58.4	9	11	13	24	SS-4662	23%		
140										
	138.6	63.4	8	8	9	17		M		
135										
	133.6	68.4	5	8	9	17		M		
130										
	128.6	73.4	9	14	17	31		M		
125										125.0 77.0

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 1260+78	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.0 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,087	**EASTING** 2,133,525	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/28/19	**COMP. DATE** 05/30/19	**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
125						Match Line				
	123.6	78.4	7	12	16	28		Sat.		MED. DENSE TO VERY DENSE, GRAY, CLAYEY FINE SAND (A-2-6) *(continued)*
120										
	118.6	83.4	19	28	27	55		Sat.		117.1 84.9 Boring Terminated at Elevation 117.1 ft IN VERY DENSE CLAYEY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 1260+84	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.3 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,061	**EASTING** 2,133,611	**24 HR.** 10.8
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/17/19	**COMP. DATE** 06/18/19	**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)
205										
	201.4	0.9	7	4	3	7		M		202.3 — GROUND SURFACE — 0.0 201.4 — **ROADWAY EMBANKMENT** PAVEMENT (0.9 FEET) — 0.9 LOOSE, ORANGE AND BROWN, CLAYEY FINE SAND (A-2-6), TRACE OF GRAVEL
200	198.9	3.4	6	3	2	5		M		
195	193.9	8.4	WOH	WOH	WOH	0				195.3 — **ALLUVIAL** — 7.0 VERY LOOSE, BROWN, CLAYEY FINE SAND (A-2-6)
190	188.9	13.4	WOH	WOH	WOH	0				
185	183.9	18.4	2	2	1	3		W		185.3 — **COASTAL PLAIN** — 17.0 VERY LOOSE TO MED. DENSE, LIGHT GRAY AND DARK GRAY, CLAYEY COARSE SAND (A-2-6) [MIDDENDORF FORMATION]
180	178.9	23.4	3	3	3	6		W		
175	173.9	28.4	4	4	6	10		W		
170	168.9	33.4	3	5	7	12		W		167.6 — **COASTAL PLAIN** — 34.7 STIFF, DARK GRAY, CLAY (A-7-5) [CAPE FEAR FORMATION]
165	163.9	38.4	11	19	21	40		W		163.6 — 38.7 DENSE, LIGHT GRAY, SILTY FINE SAND (A-2-4)
160	158.9	43.4	6	7	12	19		M		160.3 — 42.0 VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE MICA
155	153.9	48.4	6	9	12	21		M		
150	148.9	53.4	5	11	12	23		M		
145	143.9	58.4	9	17	18	35		M		
140	138.9	63.4	7	11	10	21	SS-4798	20%		
135	133.9	68.4	6	9	12	21		M		
130	128.9	73.4	7	11	12	23		M		
125										

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 1260+84	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.3 ft	**TOTAL DEPTH** 84.9 ft	**NORTHING** 585,061	**EASTING** 2,133,611	**24 HR.** 10.8
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/17/19	**COMP. DATE** 06/18/19	**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
125						Match Line				
	123.9	78.4	6	10	18	28		M		VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE MICA *(continued)*
120	118.9	83.4	12	17	17	34		M		120.3 — 82.0 DENSE, GRAY, SILTY FINE SAND (A-2-4)
										117.4 — 84.9 Boring Terminated at Elevation 117.4 ft IN DENSE SILTY SAND (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 1260+79	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 201.4 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 585,075	**EASTING** 2,133,559	**24 HR.** 11.6
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/05/19	**COMP. DATE** 06/06/19	**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)
205										
	201.4	0.0	8	8	5	13		M		201.4 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** VERY LOOSE TO MED. DENSE, BROWN AND ORANGE, CLAYEY FINE SAND (A-2-6)
200	197.9	3.5	3	1	1	2		Sat.		
195	192.9	8.5	1	0	1	1		Sat.		194.4 7.0 **ALLUVIAL** VERY LOOSE, GRAY, SILTY FINE SAND (A-2-4)
190	187.9	13.5	5	7	8	15		Sat.		189.4 12.0 **COASTAL PLAIN** MED. DENSE, GRAY, COARSE TO FINE SAND (A-3) WITH GRAVEL [MIDDENDORF FORMATION]
185	182.9	18.5	2	3	2	5		Sat.		184.4 17.0 LOOSE TO MED. DENSE, GRAY, CLAYEY FINE SAND (A-2-6) WITH CLAY SEAMS
180	177.9	23.5	2	3	4	7		Sat.		
175	172.9	28.5	5	5	6	11		Sat.		
170	167.9	33.5	3	4	5	9		M		167.2 34.2 **COASTAL PLAIN** STIFF, GRAY, CLAY (A-7-6)
165	162.9	38.5	8	11	15	26	SS-4726	17%		164.4 37.0 [CAPE FEAR FORMATION] VERY STIFF, GRAY, SANDY SILT (A-4)
160	157.9	43.5	8	13	12	25		M		157.4 44.0 STIFF TO VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-6), TRACE OF MICA
155	152.9	48.5	6	7	9	16		M		
150	147.9	53.5	5	9	10	19		M		
145	142.9	58.5	8	11	13	24		M		
140	137.9	63.5	5	7	9	16		M		
135	132.9	68.5	4	7	7	14		M		
130	127.9	73.5	7	12	12	24		M		
125										

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
125						Match Line				
	122.9	78.5	6	8	14	22		Sat.		122.4 79.0 STIFF TO VERY STIFF, GRAY AND DARK GRAY, CLAY (A-7-6), TRACE OF MICA *(continued)*
120	117.9	83.5	13	20	23	43		Sat.		DENSE, GRAY, RED AND BROWN, CLAYEY FINE SAND (A-2-6)
115	112.9	88.5	11	11	14	25		M		112.4 89.0 VERY STIFF TO HARD, GRAY, CLAY (A-7-6), TRACE OF MICA
110	107.9	93.5	12	16	20	36		M		106.4 95.0 Boring Terminated at Elevation 106.4 ft IN HARD CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG0654.GPJ NC_DOT.GDT 2/6/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Hartman, M.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 1261+35	**OFFSET** 46 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 202.1 ft	**TOTAL DEPTH** 65.1 ft	**NORTHING** 585,141	**EASTING** 2,133,543	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 05/23/19	**COMP. DATE** 05/24/19	**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)
205											
	201.3	0.8						M		202.1 GROUND SURFACE 201.3 **ROADWAY EMBANKMENT** PAVEMENT (0.8 FEET)	0.0 0.8
200			6	4	4	8					
	198.5	3.6						M		199.1 MED. STIFF, BROWN, SILTY CLAY (A-7-6), TRACE OF GRAVEL	3.0
			4	4	5	9				LOOSE, BROWN, CLAYEY SAND (A-2-6), TRACE OF GRAVEL	
195	193.5	8.6								195.2 VERY SOFT, BROWN, SANDY CLAY (A-6), TRACE OF GRAVEL	6.9
			WOH	WOH	WOH	0		W			
190										190.2 **ALLUVIAL**	11.9
	188.5	13.6								VERY LOOSE, TAN AND BROWN, CLAYEY SAND (A-2-6)	
			WOH	1	1	2		Sat.			
185	183.5	18.6								185.2 **COASTAL PLAIN**	16.9
			2	4	3	7				LOOSE, GRAY, CLAYEY SAND (A-2-6) [MIDDENDORF FORMATION]	
180	178.5	23.6						Sat.			
			3	3	5	8					
175	173.5	28.6						Sat.			
			3	3	3	6					
170	168.5	33.6								170.2 **COASTAL PLAIN**	31.9
			4	6	7	13		M		STIFF, GRAY, SILTY CLAY (A-7-6) [CAPE FEAR FORMATION]	
165	163.5	38.6								165.2 DENSE TO VERY DENSE, TAN, CLAYEY SAND (A-2-6)	36.9
			13	22	21	43		M			
160	158.5	43.6									
			27	36	43	79	SS-4645	23%			
155	153.5	48.6								155.2 STIFF TO HARD, GRAY, SILTY CLAY (A-7)	46.9
			8	10	15	25		W			
150	148.5	53.6									
			13	19	21	40		M			
145	143.5	58.6									
			8	9	12	21		W			
140	138.5	63.6									
			3	6	6	12		W		137.0	65.1
										Boring Terminated at Elevation 137.0 ft IN STIFF SILTY CLAY (COASTAL PLAIN)	

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Goslin, G.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 1261+31	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 202.1 ft	**TOTAL DEPTH** 65.1 ft	**NORTHING** 585,107	**EASTING** 2,133,624	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/13/19	**COMP. DATE** 06/14/19	**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
205										
	201.3	0.8						M		202.1 GROUND SURFACE 201.3 **ROADWAY EMBANKMENT** PAVEMENT (0.8 FEET)
200			5	5	8	13				
	198.5	3.6						W		199.1 MED. DENSE, YELLOW AND BROWN, CLAYEY COARSE SAND (A-2-6)
			3	4	4	8				MED. STIFF, PINK AND TAN, SANDY CLAY (A-6)
195	193.5	8.6								195.1 **ALLUVIAL**
			2	3	2	5				VERY SOFT TO MED. STIFF, TAN, SANDY CLAY (A-6)
190										
	188.5	13.6								
			WOH	WOH	WOH	0		W		
185	183.5	18.6								185.1 **COASTAL PLAIN**
			2	4	3	7				LOOSE, GRAY, CLAYEY FINE TO COARSE SAND (A-2-6) [MIDDENDORF FORMATION]
180	178.5	23.6								
			3	4	3	7		W		
175	173.5	28.6								
			2	4	4	8		W		
170	168.5	33.6								170.1 **COASTAL PLAIN**
			2	4	4	8		W		LOOSE TO VERY DENSE, GRAY, CLAYEY SAND (A-2-6), TRACE OF MICA [CAPE FEAR FORMATION]
165	163.5	38.6								
			5	8	9	17		W		
160	158.5	43.6								
			18	42	56	98	SS-4780	18%		
155	153.5	48.6								155.1 STIFF TO HARD, GRAY, SILTY CLAY (A-7-5), TRACE MICA
			6	8	12	20		W		
150	148.5	53.6								
			12	20	23	43		W		
145	143.5	58.6								
			9	11	12	23		W		
140	138.5	63.6								
			4	7	7	14		W		137.0 65.1
										Boring Terminated at Elevation 137.0 ft IN STIFF SILTY CLAY (COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 47532.1.3	**TIP** I-5986B	**COUNTY** JOHNSTON	**GEOLOGIST** Bloneshine, E.	
SITE DESCRIPTION BRIDGE NO. 654 ON I-95 (-L-) OVER MINGO SWAMP				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 1261+39	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 201.0 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 585,131	**EASTING** 2,133,582	**24 HR.** 10.1
DRILL RIG/HAMMER EFF./DATE SME3193 CME-550X 85% 11/14/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Whitehead	**START DATE** 06/04/19	**COMP. DATE** 06/04/19	**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)
205										
	201.0	0.0	7	5	5	10		M		201.0 GROUND SURFACE 0.0
200										**ROADWAY EMBANKMENT**
	197.5	3.5	3	4	3	7		Sat.		VERY LOOSE TO LOOSE, BROWN AND RED, CLAYEY FINE SAND (A-2-6)
195										
	192.5	8.5	2	1	0	1				
190										189.0 12.0
	187.5	13.5	2	1	2	3				**ALLUVIAL**
185							SS-4707	34%		SOFT, GRAY, SILTY CLAY (A-7-6), TRACE OF ORGANIC MATTER
	182.5	18.5	3	3	4	7				184.0 17.0
180										**COASTAL PLAIN**
	177.5	23.5	3	5	5	10		Sat.		LOOSE, GRAY, CLAYEY FINE SAND (A-2-6) [MIDDENDORF FORMATION]
175										
	172.5	28.5	5	4	4	8		Sat.		
170										169.0 32.0
	167.5	33.5	3	6	7	13				**COASTAL PLAIN**
165								M		STIFF, GRAY, CLAY (A-7-6) [CAPE FEAR FORMATION]
	162.5	38.5	4	6	8	14		M		
160										159.0 42.0
	157.5	43.5	40	60/0.3		100/0.8	SS-4713	21%		VERY DENSE, GRAY, SILTY SAND (A-2-4)
155										154.0 47.0
	152.5	48.5	6	8	12	20		M		VERY STIFF TO HARD, GRAY AND DARK GRAY, CLAY (A-7-6)
150										
	147.5	53.5	15	27	28	55		M		
145										
	142.5	58.5	7	11	14	25		M		
140										
	137.5	63.5	5	8	9	17		M		136.0 65.0
										Boring Terminated at Elevation 136.0 ft IN VERY STIFF CLAY (COASTAL PLAIN)

NCDOT BORE DOUBLE I5986B_GEO_BRDG0654.GPJ NC_DOT.GDT 2/6/20

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

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

S&ME Project #:	6235-17-048		Date Report: 8/1/2019
State Project No.:	47532.1.3	County: Johnston	Date Tested: 7/1/2019
Federal ID No.:	N/A	TIP No.: I-5986B	
Project Name:	Br. No. 654 on I-95 (-L-) over Mingo Swamp		
Client Name:	Michael Baker International	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	Coarse Sand	Fine Sand	Silt	Clay				
SS-4645	1261+35	46' LT	-L-	43.6-45.1	A-2-6	(0)	100	89	-	24.1	32	48	10	10	36	19	17	22.5
SS-4662	1260+78	44' LT	-L-	58.4-59.9	A-7-5	(10)	100	93	-	65.5	16	28	42	14	46	31	15	22.7
SS-4679	1259+90	41' LT	-L-	53.4-54.9	A-7-6	(20)	100	99	-	81.1	2	33	44	21	51	29	22	23.8
SS-4693	1259+18	43' LT	-L-	38.5-40.0	A-7-6	(3)	99	68	-	36.7	46	19	4	31	41	17	24	22.0
SS-4696	1259+18	43' LT	-L-	53.5-55.0	A-7-6	(15)	100	95	-	68.3	10	33	40	17	50	28	22	22.6
SS-4707	1261+39	6' LT	-L-	13.5-15.0	A-7-6	(3)	87	82	-	35.8	15	47	3	35	44	19	25	33.5
SS-4713	1261+39	6' LT	-L-	43.5-45.0	A-2-4	(0)	100	87	-	33.5	28	43	16	13	23	14	9	20.5
SS-4726	1260+79	8' LT	-L-	38.5-40.0	A-4	(2)	100	99	-	17.3	2	56	24	18	31	22	9	17.3
SS-4746	1259+89	7' LT	-L-	38.4-39.9	A-4	(1)	100	100	-	47.2	3	60	17	20	25	16	9	20.0
SS-4752	1259+89	7' LT	-L-	68.4-69.9	A-7-5	(22)	100	96	-	84.5	7	17	58	18	54	32	22	30.1
SS-4759	1259+21	7' LT	-L-	18.6-20.1	A-1-b	(1)	50	43	-	4.6	64	28	3	5	N.P.	N.P.	N.P.	13.5
SS-4762	1259+21	7' LT	-L-	33.6-35.1	A-7-6	(30)	100	97	-	87.9	4	12	25	59	53	21	32	34.6
SS-4766	1259+21	7' LT	-L-	53.5-55.1	A-7-6	(16)	100	96	-	73.6	9	29	50	12	50	29	21	25.5
SS-4780	1261+31	42' RT	-L-	43.6-45.1	A-2-6	(0)	99	79	-	28.7	37	40	19	4	31	20	11	17.5
SS-4798	1260+84	46' RT	-L-	63.4-64.9	A-7-6	(16)	100	97	-	76.7	6	21	53	20	49	29	20	19.6
SS-4810	1259+83	52' RT	-L-	33.4-34.9	A-7-6	(32)	100	95	-	77.2	9	20	23	48	58	17	41	21.2
SS-4820	1259+83	52' RT	-L-	83.4-84.9	A-2-6	(0)	100	71	-	30.7	46	27	14	13	32	19	13	18.1
SS-4826	1259+24	46' RT	-L-	23.5-25.0	A-3	(1)	99	53	-	4.9	86	10	1	3	N.P.	N.P.	N.P.	23.9
SS-4834	1259+24	46' RT	-L-	63.5-65.0	A-7-6	(25)	100	99	-	85.9	2	28	49	21	52	25	27	24.7

References / Comments / Deviations: References / Comments / De References / Comments / Deviation References / Com References / Comments / I References / Comments / I

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	Stacie E. Mitchell, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

SITE PHOTOGRAPH

Bridge No. 654 on –L– (I-95) over Mingo Swamp

Looking South