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

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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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.

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...
SIGNATURE

2/6/2020
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
- [ ] 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.

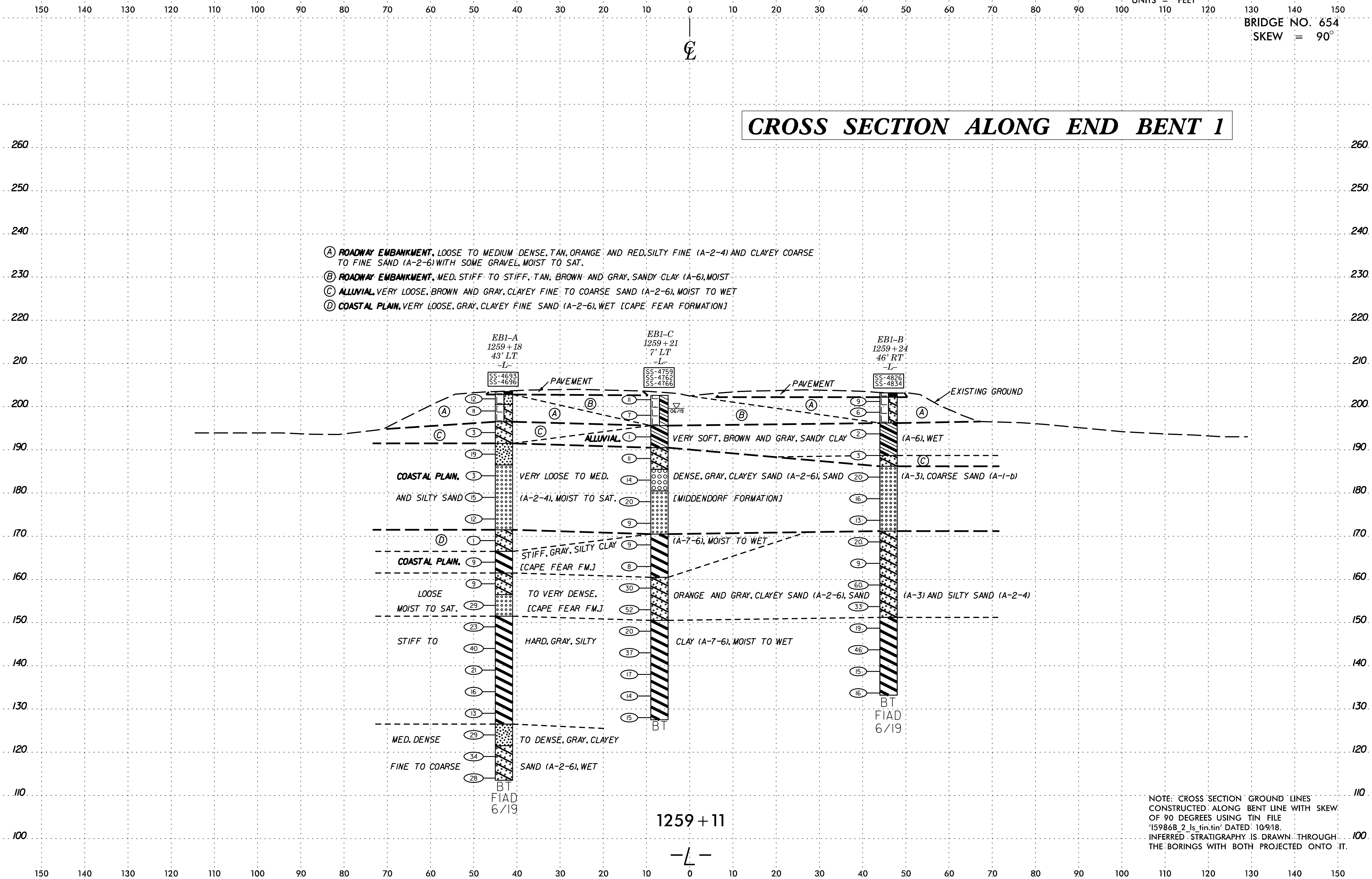
260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90

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

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

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG END BENT 1



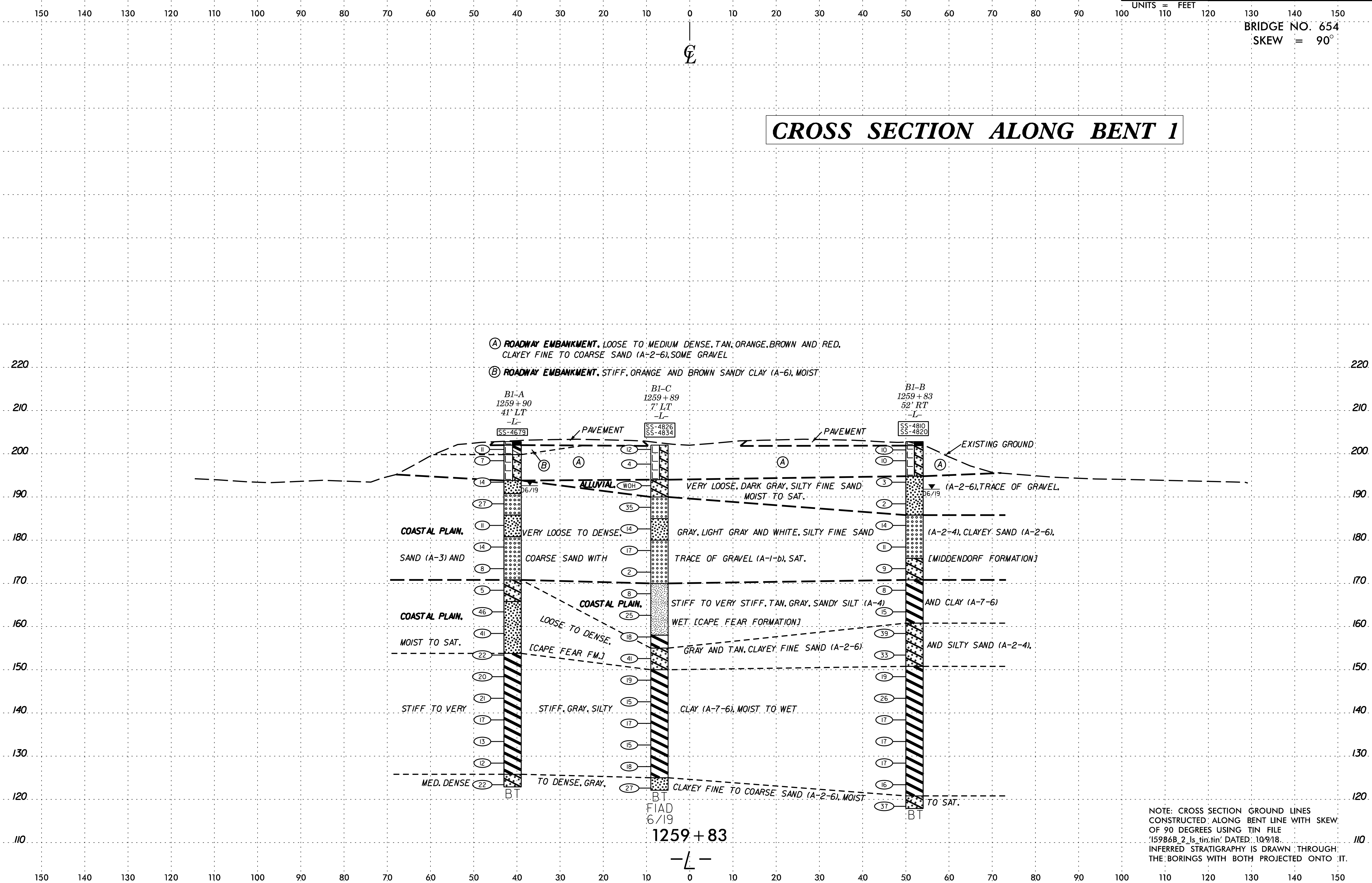
NOTE: CROSS SECTION GROUND LINES CONSTRUCTED ALONG BENT LINE WITH SKEW OF 90 DEGREES USING TIN FILE 'I5986B_2_ls_tin.tin' DATED 10/9/18. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO IT.

6/23/16

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

BRIDGE NO. 654
SKEW = 90°

CROSS SECTION ALONG BENT 1



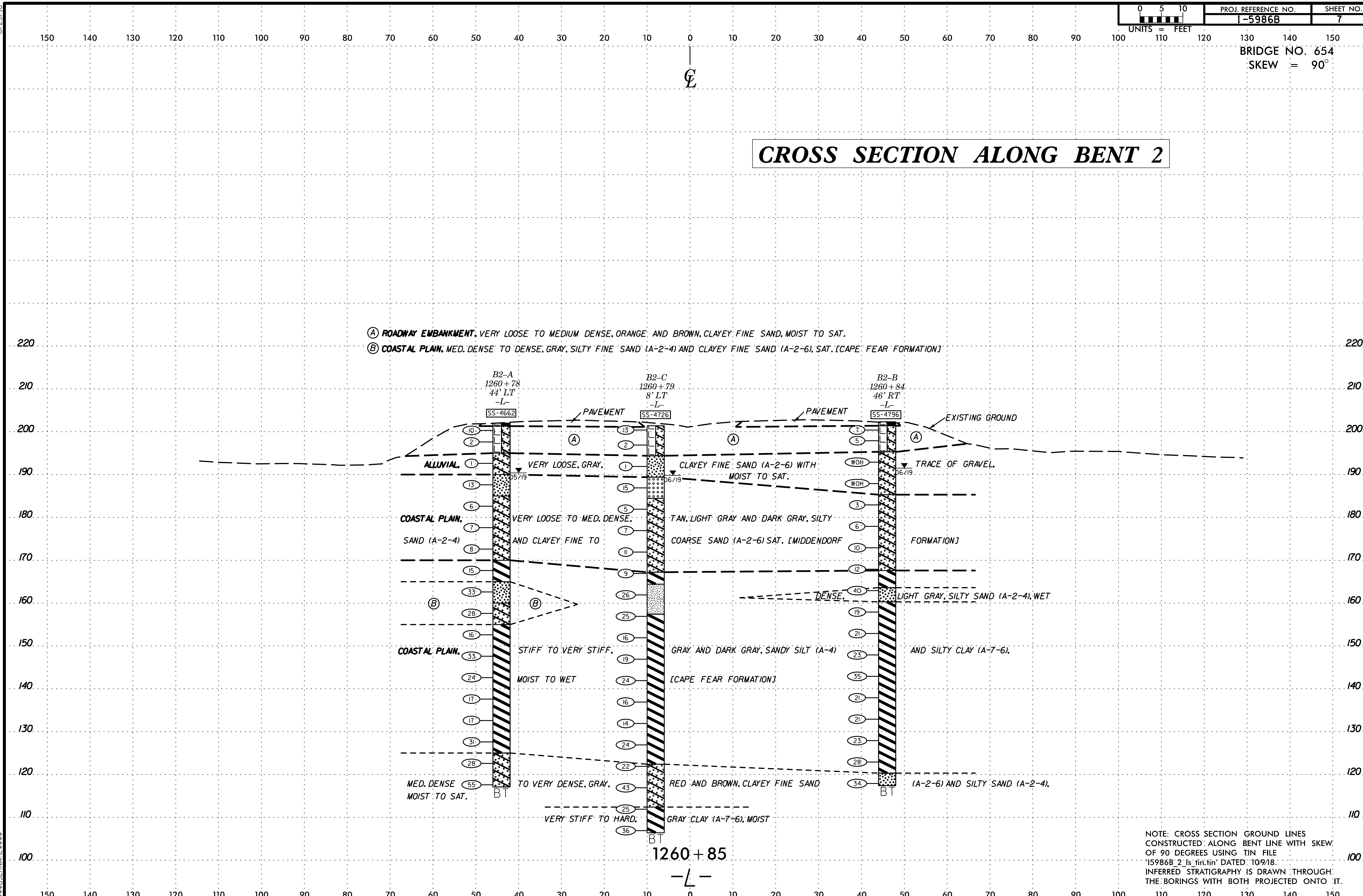
1259+83
-L-

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.

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.

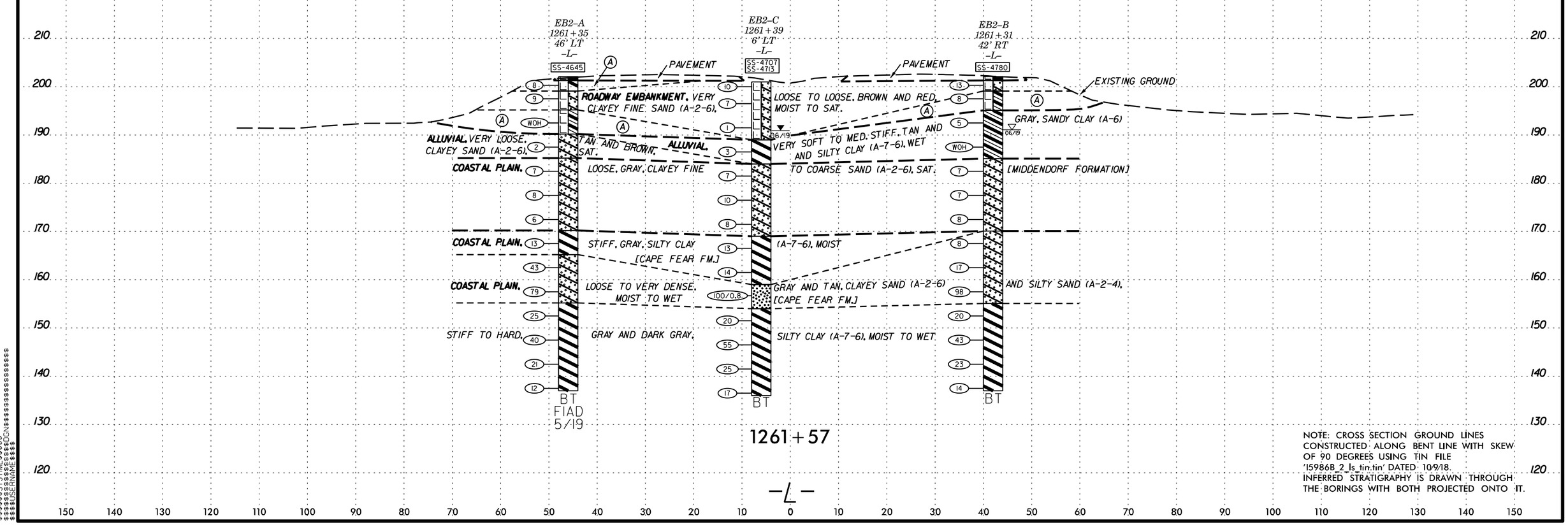
6/23/16

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