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REFERENCE: 250008

PROJECT: 41665

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665	1	10

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *DIVISION 6 – I-95 BUSINESS AND US 301 ROADWAY IMPROVEMENTS*

SITE DESCRIPTION *BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE*

CONTENTS

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PERSONNEL

WERITZ, M. A.

FRAWLEY, M. H.

TURNAGE, J. R.

RIGGS, JR., A. F.

RIST, S. A.

HOEVEN, J. H.

INVESTIGATED BY *TERRACON CONSULTANTS*

DRAWN BY *FIELDS, W. D.*

CHECKED BY *RIGGS, JR., A. F.*

SUBMITTED BY *TERRACON CONSULTANTS*

DATE *OCTOBER 2017*

Prepared in the Office of:

Terracon
Consulting Engineers & Scientists

2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

NORTH CAROLINA PROFESSIONAL SEAL 014155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by:
Abner Riggs 11/9/2017
5228073BBA4F482...
SIGNATURE DATE

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PROJECT REFERENCE NO.	SHEET NO.
41665.7A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-50 (TER373)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 7/8" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

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: BY-2, N=431283.72, E=2018587.55

ELEVATION: 173.80 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	3

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 50 100
FEET

SKEW ANGLE 140°

N
NC GRID
NAD 83

106+00 (-L2-)

20+00 (-L-)

25+00 (-L-)

110+00 (-L2-)

BY-1

BY-2

BL-4

BL-5

TO FAYETTEVILLE
-L2-

BUS 95 SBL

BUS 95 SBL

TO LUMBERTON
-L2-

US 301 FLYOVER FOR BUS 95 NBL
TO LUMBERTON

EB1-A

EB2-A

EB1-B

EB2-B

BRIDGE NO.8 CONC.

SEAT
ELEV=
187.21'

CAT-1

CAT-1

MATCH
EXIST

6" CMP
INV=177.32'

BM 1
N. 431318 E. 2018536
ELEV. = 194.92
CHISELED SQUARE IN CONC HW

WOODS

WOODS

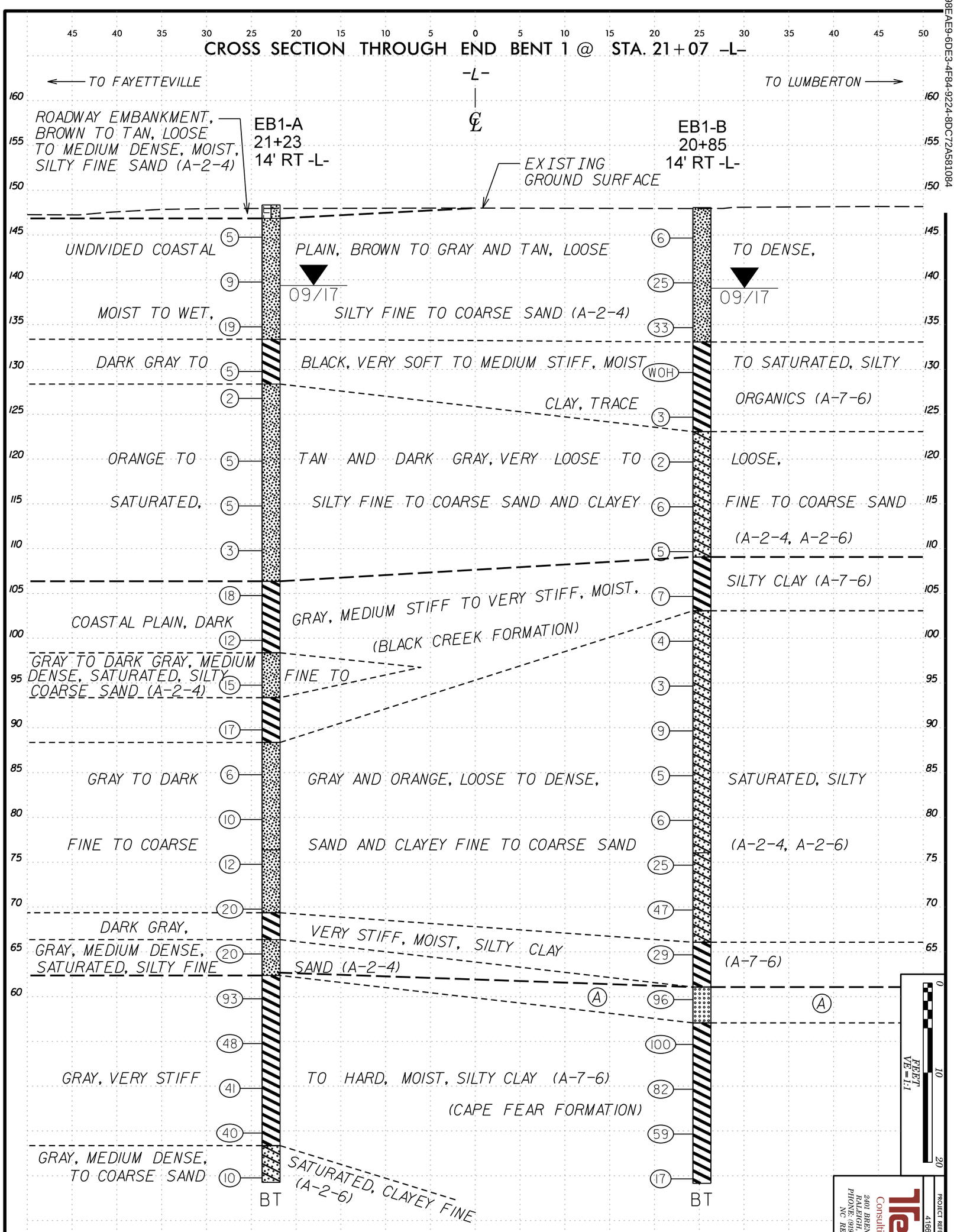
WOODS

WOODS

WOODS

WOODS

CROSS SECTION THROUGH END BENT 1 @ STA. 21+07 –L–



BRIDGE NO. 008
TYPICAL SKEW ANGLE 140°

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TINE FILE 250008_ls_tin.tin (DATED: 08/21/2017)

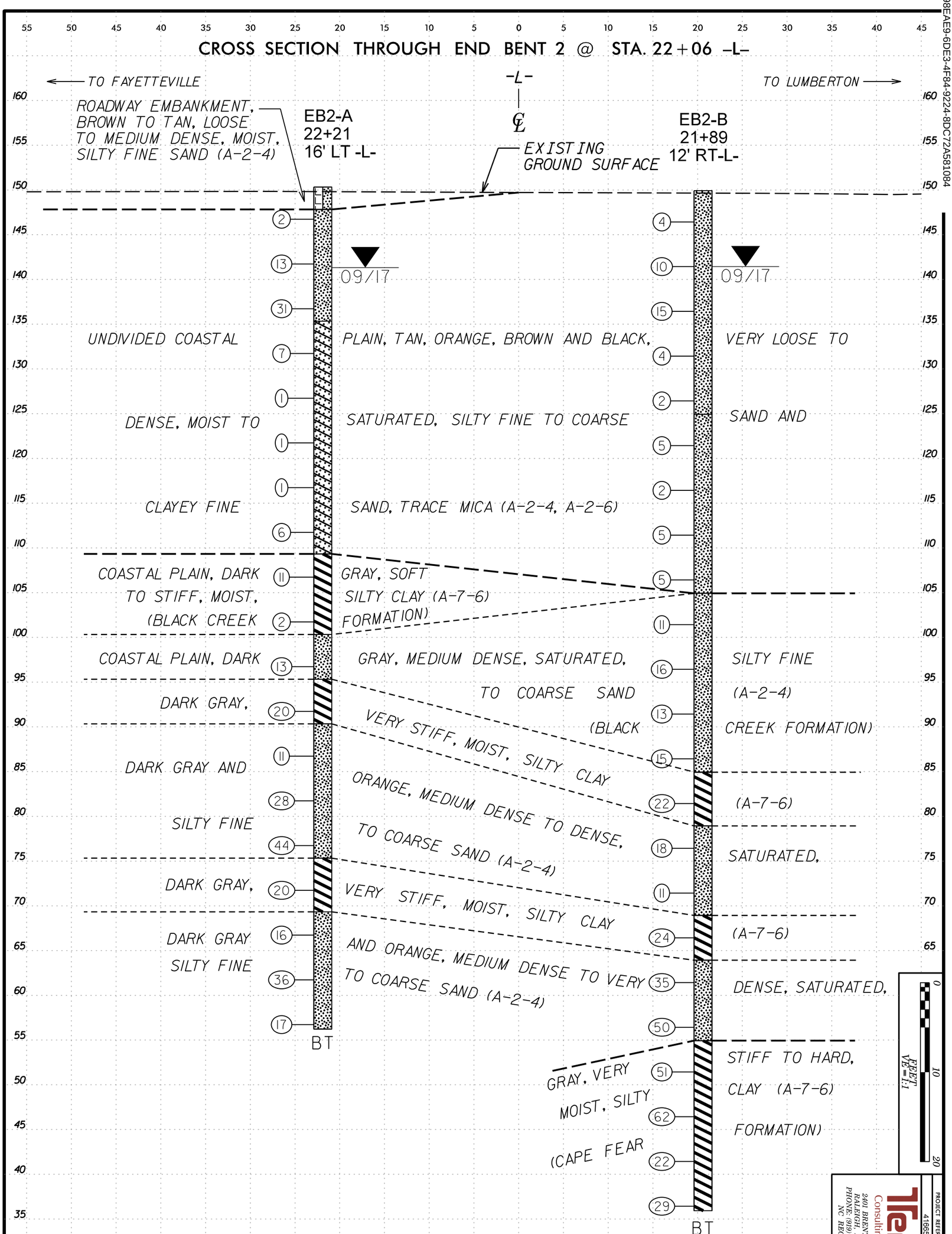
Ⓐ WHITE, VERY DENSE, SATURATED, FINE TO COARSE SAND (A-1-b) (CAPE FEAR FORMATION)

Terracon
Consulting Engineers & Scientists
240 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

PROJECT REFERENCE NO. 41665.7A

SHEET NO. 4

CROSS SECTION THROUGH END BENT 2 @ STA. 22+06 -L-



BRIDGE NO. 008
TYPICAL SKEW ANGLE 140°

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TINE FILE 250008_ls_tin.tin (DATED: 08/21/2017)

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PROJECT REFERENCE NO. 41665.7A

SHEET NO. 5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 21+23	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 173.8 ft	**TOTAL DEPTH** 109.1 ft	**NORTHING** 431,408	**EASTING** 2,018,602	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/15/17	**COMP. DATE** 09/15/17	**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))
175										
										173.8 / 0.0 GROUND SURFACE
										172.3 / 1.5 **ROADWAY EMBANKMENT** BROWN TO TAN, SILTY FINE SAND
170	171.2	2.6	2	2	3	5		M		**UNDIVIDED COASTAL PLAIN** BROWN TO GRAY, SILTY FINE TO COARSE SAND
165	166.2	7.6	3	4	5	9		M		
160	161.2	12.6	7	7	12	19		M		158.8 / 15.0 DARK GRAY TO BLACK, SILTY CLAY, TRACE ORGANICS
155	156.2	17.6	WOH	2	3	5		M		153.8 / 20.0 ORANGE TO TAN, SILTY FINE TO COARSE SAND
150	153.2	20.6	WOH	1	1	2		Sat.		
145	146.2	27.6	1	2	3	5		Sat.		
140	141.2	32.6	WOH	2	3	5		Sat.		
135	136.2	37.6	2	2	1	3		Sat.		
130	131.2	42.6	4	6	12	18		M		131.8 / 42.0 **COASTAL PLAIN** DARK GRAY, SILTY CLAY (BLACK CREEK FORMATION)
125	126.2	47.6	5	6	6	12		M		123.8 / 50.0 DARK GRAY TO GRAY, SILTY FINE TO COARSE SAND
120	121.2	52.6	5	7	8	15		Sat.		118.8 / 55.0 DARK GRAY, SILTY CLAY
115	116.2	57.6	4	8	9	17		M		113.8 / 60.0 DARK GRAY SILTY FINE TO COARSE SAND
110	111.2	62.6	3	3	3	6		Sat.		
105	106.2	67.6	3	5	5	10		Sat.		
100	101.2	72.6	10	7	5	12		Sat.		101.8 / 72.0 ORANGE TO GRAY, SILTY FINE TO COARSE SAND
95	96.2	77.6	8	8	12	20		Sat.		94.8 / 79.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
95						Match Line				
90	91.2	82.6	8	9	11	20		Sat.		91.8 / 82.0 DARK GRAY, SILTY CLAY
85	86.2	87.6	25	47	46	93		M		87.8 / 86.0 GRAY, SILTY FINE SAND
80	81.2	92.6	10	18	30	48		M		GRAY, SILTY CLAY (CAPE FEAR FORMATION)
75	76.2	97.6	13	18	23	41		M		
70	71.2	102.6	13	18	22	40		M		68.8 / 105.0 GRAY, CLAYEY FINE TO COARSE SAND
65	66.2	107.6	4	4	6	10		Sat.		64.7 / 109.1 Boring Terminated at Elevation 64.7 ft IN COASTAL PLAIN (CLAYEY SAND) (CAPE FEAR FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+85	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 173.5 ft	**TOTAL DEPTH** 108.9 ft	**NORTHING** 431,362	**EASTING** 2,018,590	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/16/17	**COMP. DATE** 09/16/17	**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))
175										
										173.5 / 0.0 GROUND SURFACE
										UNDIVIDED COASTAL PLAIN
										TAN TO BROWN, SILTY FINE TO COARSE SAND
170	171.1	2.4	3	3	3	6		M		
165	166.1	7.4	6	11	14	25				
160	161.1	12.4	12	16	17	33		W		
										158.5 / 15.0 DARK GRAY, SILTY CLAY
155	156.1	17.4	WOH	WOH	WOH	0		M		
150	151.1	22.4	WOH	1	2	3		Sat.		
										148.5 / 25.0 ORANGE TO DARK GRAY, CLAYEY FINE TO COARSE SAND
145	146.1	27.4	WOH	1	1	2		Sat.		
140	141.1	32.4	2	3	3	6		Sat.		
135	136.1	37.4	1	2	3	5		Sat.		
										134.5 / 39.0 **COASTAL PLAIN**
										DARK GRAY, SILTY CLAY
										(BLACK CREEK FORMATION)
130	131.1	42.4	2	3	4	7		M		
										128.5 / 45.0 GRAY, CLAYEY FINE TO COARSE SAND
125	126.1	47.4	2	2	2	4		Sat.		
120	121.1	52.4	WOH	1	2	3		Sat.		
115	116.1	57.4	4	5	4	9		Sat.		
110	111.1	62.4	2	2	3	5		Sat.		
105	106.1	67.4	3	3	3	6		Sat.		
										101.5 / 72.0 ORANGE, CLAYEY FINE TO COARSE SAND
100	101.1	72.4	12	12	13	25		Sat.		
95	96.1	77.4	15	25	22	47		Sat.		

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+85	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 173.5 ft	**TOTAL DEPTH** 108.9 ft	**NORTHING** 431,362	**EASTING** 2,018,590	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/16/17	**COMP. DATE** 09/16/17	**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
95						Match Line				
										ORANGE, CLAYEY FINE TO COARSE SAND *(continued)*
90	91.1	82.4	14	14	15	29		M		91.5 / 82.0 DARK GRAY, SILTY CLAY
85	86.1	87.4	21	46	50	96		Sat.		86.5 / 87.0 WHITE, FINE TO COARSE SAND (CAPE FEAR FORMATION)
80	81.1	92.4	22	42	58	100		M		82.5 / 91.0 GRAY, SILTY CLAY
75	76.1	97.4	27	46	36	82		M		
70	71.1	102.4	16	23	36	59		M		
65	66.1	107.4	8	7	10	17		M		64.6 / 108.9 Boring Terminated at Elevation 64.6 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 22+21	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 174.4 ft	**TOTAL DEPTH** 94.1 ft	**NORTHING** 431,470	**EASTING** 2,018,678	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/13/17	**COMP. DATE** 09/13/17	**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)
175										174.4 / 0.0 GROUND SURFACE
	171.8	2.6								**ROADWAY EMBANKMENT**
			1	1	1	2		M		171.9 / 2.5 TAN TO BROWN SILTY FINE SAND
170										**UNDIVIDED COASTAL PLAIN**
	166.8	7.6								TAN TO ORANGE, SILTY FINE TO COARSE SAND
			6	6	7	13				
165										
	161.8	12.6								
			13	12	19	31		Sat.		
160										
	156.8	17.6								159.4 / 15.0 BLACK, CLAYEY FINE SAND, TRACE MICA
			3	4	3	7		Sat.		
155										
	151.8	22.6								
			WOH	1	0	1		Sat.		
150										
	146.8	27.6								
			WOH	WOH	1	1		Sat.		
145										
	141.8	32.6								
			WOH	1	0	1		Sat.		
140										
	136.8	37.6								
			1	1	5	6		Sat.		
135										
	131.8	42.6								133.4 / 41.0 DARK GRAY, SILTY CLAY (BLACK CREEK FORMATION)
			4	4	7	11		M		
130										
	126.8	47.6								
			2	1	1	2		M		124.4 / 50.0 DARK GRAY, SILTY FINE TO COARSE SAND
125										
	121.8	52.6								
			8	7	6	13		Sat.		119.4 / 55.0 DARK GRAY, SILTY CLAY
120										
	116.8	57.6								
			5	9	11	20		M		114.4 / 60.0 DARK GRAY, SILTY FINE TO COARSE SAND
115										
	111.8	62.6								
			3	4	7	11		Sat.		
110										
	106.8	67.6								
			10	12	16	28		Sat.		
105										
	101.8	72.6								
			12	19	25	44		Sat.		
100										
	96.8	77.6								99.4 / 75.0 DARK GRAY, SILTY CLAY
			8	9	11	20		M		
95										

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 22+21	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 174.4 ft	**TOTAL DEPTH** 94.1 ft	**NORTHING** 431,470	**EASTING** 2,018,678	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/13/17	**COMP. DATE** 09/13/17	**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
95						Match Line				DARK GRAY, SILTY CLAY *(continued)*
	91.8	82.6								93.4 / 81.0 DARK GRAY, SILTY FINE TO COARSE SAND
90			6	8	8	16		Sat.		
	86.8	87.6								
			26	20	16	36		Sat.		
85										
	81.8	92.6								
			5	6	11	17		Sat.		80.3 / 94.1 Boring Terminated at Elevation 80.3 ft IN COASTAL PLAIN (SILTY SAND) (CAPE FEAR FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** 250008	**COUNTY** CUMBERLAND	**GEOLOGIST** FRAWLEY, M. H.	
SITE DESCRIPTION BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+89	**OFFSET** 12 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 174.0 ft	**TOTAL DEPTH** 114.0 ft	**NORTHING** 431,428	**EASTING** 2,018,670	**24 HR.** 8.5
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/14/17	**COMP. DATE** 09/14/17	**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))
175										174.0 / 0.0 GROUND SURFACE
	171.5	2.5	1	1	3	4		M		**UNDIVIDED COASTAL PLAIN** TAN AND ORANGE TO BROWN, SILTY FINE SAND, TRACE WOOD FRAGMENTS @ 17.5'
170										
	166.5	7.5	3	4	6	10				
165										
	161.5	12.5	7	8	7	15		Sat.		
160										
	156.5	17.5	4	2	2	4		Sat.		
155										
	151.5	22.5	1	1	1	2		Sat.		
150										149.0 / 25.0 GRAY-TAN, SILTY FINE TO COARSE SAND, TRACE MICA
	146.5	27.5	1	2	3	5		Sat.		
145										
	141.5	32.5	WOH	1	1	2		Sat.		
140										
	136.5	37.5	2	2	3	5		Sat.		
135										
	131.5	42.5	2	2	3	5		Sat.		
130										
	126.5	47.5	4	5	6	11		Sat.		
125										
	121.5	52.5	4	6	10	16		Sat.		
120										
	116.5	57.5	6	7	6	13		Sat.		
115										
	111.5	62.5	4	5	10	15		Sat.		
110										109.0 / 65.0 DARK GRAY, SILTY CLAY
	106.5	67.5	6	10	12	22		M		
105										103.0 / 71.0 ORANGE, SILTY FINE TO COARSE SAND
	101.5	72.5	5	8	10	18		Sat.		
100										
	96.5	77.5	6	5	6	11		Sat.		128.0 / 46.0 **COASTAL PLAIN** DARK GRAY, SILTY FINE TO COARSE SAND (BLACK CREEK FORMATION)
95										

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
95						Match Line				
	91.5	82.5	8	10	14	24		M		93.0 / 81.0 ORANGE, SILTY FINE TO COARSE SAND *(continued)*
90										DARK GRAY, SILTY CLAY
	86.5	87.5	8	14	21	35		Sat.		88.0 / 86.0 ORANGE, SILTY COARSE SAND
85										
	81.5	92.5	14	22	28	50		Sat.		
80										79.0 / 95.0 GRAY, SILTY CLAY (CAPE FEAR FORMATION)
	76.5	97.5	16	22	29	51		M		
75										
	71.5	102.5	25	30	32	62		M		
70										
	66.5	107.5	10	11	11	22		M		
65										
	61.5	112.5	10	15	14	29		M		60.0 / 114.0 Boring Terminated at Elevation 60.0 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)
60										

SITE PHOTOGRAPHS
BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SBL

PHOTOGRAPH NO. 1: WEST APPROACH TO END BENT NO. 1 ON -L- ALIGNMENT, LOOKING EAST

PHOTOGRAPH NO. 3: ON -L2- ALIGNMENT, NORTH OF -L- ALIGNMENT, LOOKING SOUTH

PHOTOGRAPH NO. 2: ON -L2- ALIGNMENT, SOUTH OF -L- ALIGNMENT, LOOKING NORTH

PHOTOGRAPH NO. 4: EAST APPROACH TO END BENT NO.2 ON -L- ALIGNMENT, LOOKING WEST

REFERENCE: 250129 & 250130

PROJECT: 41665

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY CUMBERLAND

PROJECT DESCRIPTION DIVISION 6 – I-95 BUSINESS AND US 301 ROADWAY IMPROVEMENTS

SITE DESCRIPTION DUAL BRIDGES NO. 129 & NO. 130 ON I-95 BUSINESS LOOP OVER US 301

CONTENTS

CAUTION NOTICE

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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.
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PERSONNEL

WERITZ, M. A.

TURNAGE, J. R.

HOEVEN, J. H.

INVESTIGATED BY TERRACON CONSULTANTS

DRAWN BY FIELDS, W. D.

CHECKED BY RIGGS, JR., A. F.

SUBMITTED BY TERRACON CONSULTANTS

DATE NOVEMBER 2017

Prepared in the Office of:

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

NORTH CAROLINA PROFESSIONAL SEAL 014155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by:
Abner Riggs 11/9/2017
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PROJECT REFERENCE NO.	SHEET NO.
41665.7A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-50 (TER373)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 7/8" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

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: BY-2, N=486,477.58, E=2,062,458.96

ELEVATION: 120.92 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	3

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 100 200
FEET

NC GRID NAD 83 NA 2011

BY-I

-L2- 100+00

-L2- 105+00

-L2- 110+00

-L7- 100+00

-L7- 105+00

-L7- 110+00

BEGIN BRIDGE PROJ. 130
–L2– STA. 102 + 50.00

BEGIN BRIDGE 130
–L2– STA. 106 + 76.15

BEGIN BRIDGE 130
–L2– STA. 107 + 75.15

END BRIDGE 130
–L2– STA. 111 + 50.00

POT Sta. 100+00.00

POT Sta. 110+00.00

BEGIN ROADWORK
–Y– STA. 10 + 85.00

POT Sta. 112+00.00

I-95 BUS. SBL

TO FAYETTEVILLE

TOP=127.06'

CONC

INV=124.60'

I-95 BUS. NBL

INV=120.37

WOODS

HATCHER LANE 18' BST

BL-2

CONC

EB1–A

EB2–A

–L2–

BRIDGE NO. 130

RW1–2

RW2–2

–L1–

BRIDGE NO. 129

EB1–B

EB2–B

BL-3

BM #1
N. 486954 E. 2062810
ELEV. = 140.48
CHISELED SQUARE IN CONC HW

8" CMP
CONC
DIRECTIONAL ONLY
OTHER END NOT FOUND

TO BENSON

I-95 BUS. SBL

I-95 BUS. NBL

POT Sta. 112+00.00

BEGIN BRIDGE PROJ. 129
–L1– STA. 102 + 50.00

BEGIN BRIDGE 129
–L1– STA. 106 + 18.12

END BRIDGE 129
–L1– STA. 107 + 17.12

END BRIDGE PROJ. 130
–L1– STA. 111 + 50.00

POT Sta. 100+00.00

TO EASTOVER

DOWN ROAD)

US 301

–Y–

EIP

4" CONC CURB

WOODS

ORANGEBURG DR 17' BST

END ROADWORK
–Y– STA. 17 + 00.00

POT Sta. 18+00.00

VARIABLE WIDTH BST

TO FAYETTEVILLE

R/W MON

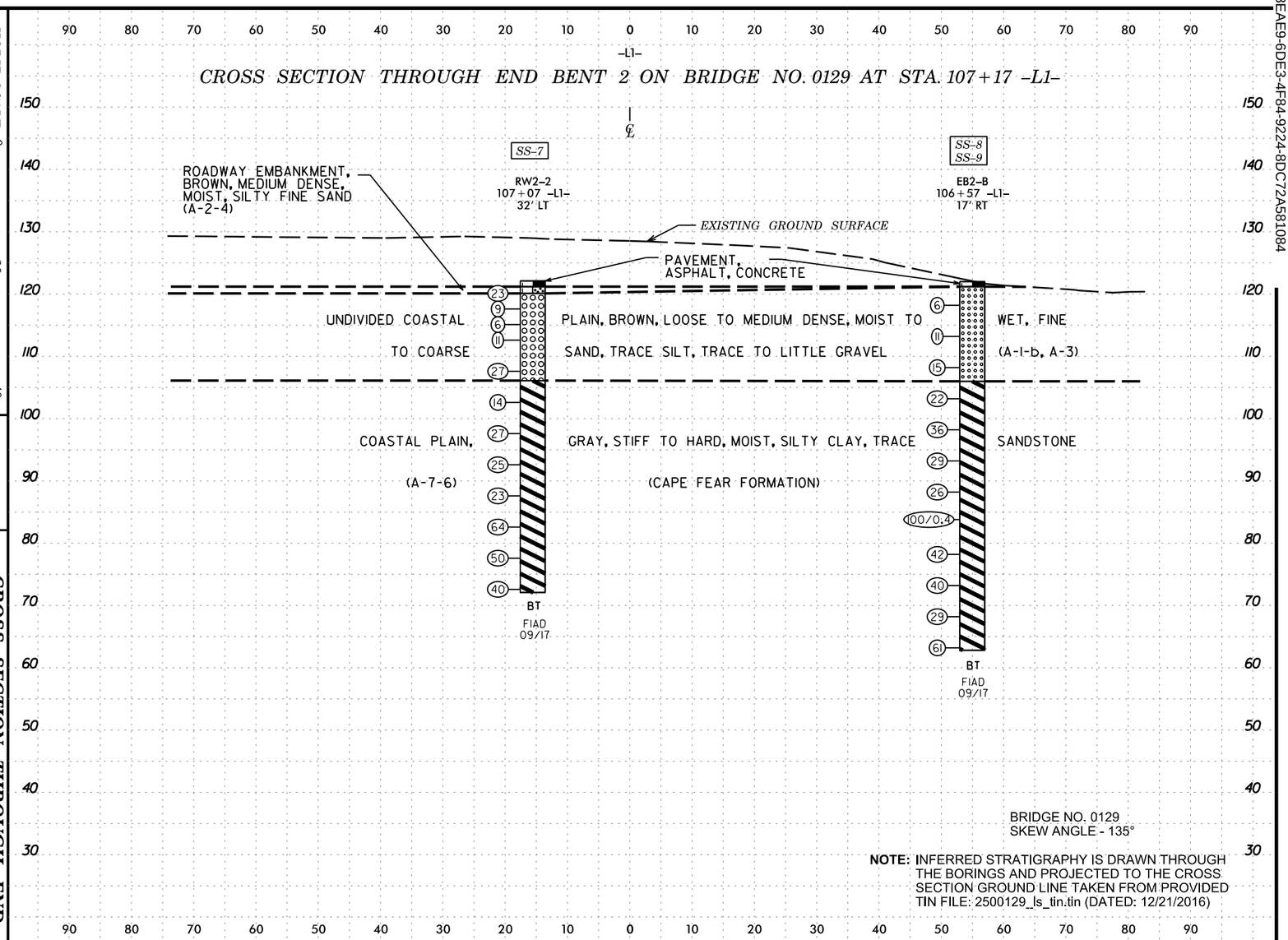
EIP

HORIZ. SCALE (FEET) 0 20 40

VE = 1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 107+17 –L1–

CROSS SECTION THROUGH END BENT 2 ON BRIDGE NO. 0129 AT STA. 107+17 –L1–



BRIDGE NO. 0129
SKEW ANGLE - 135°

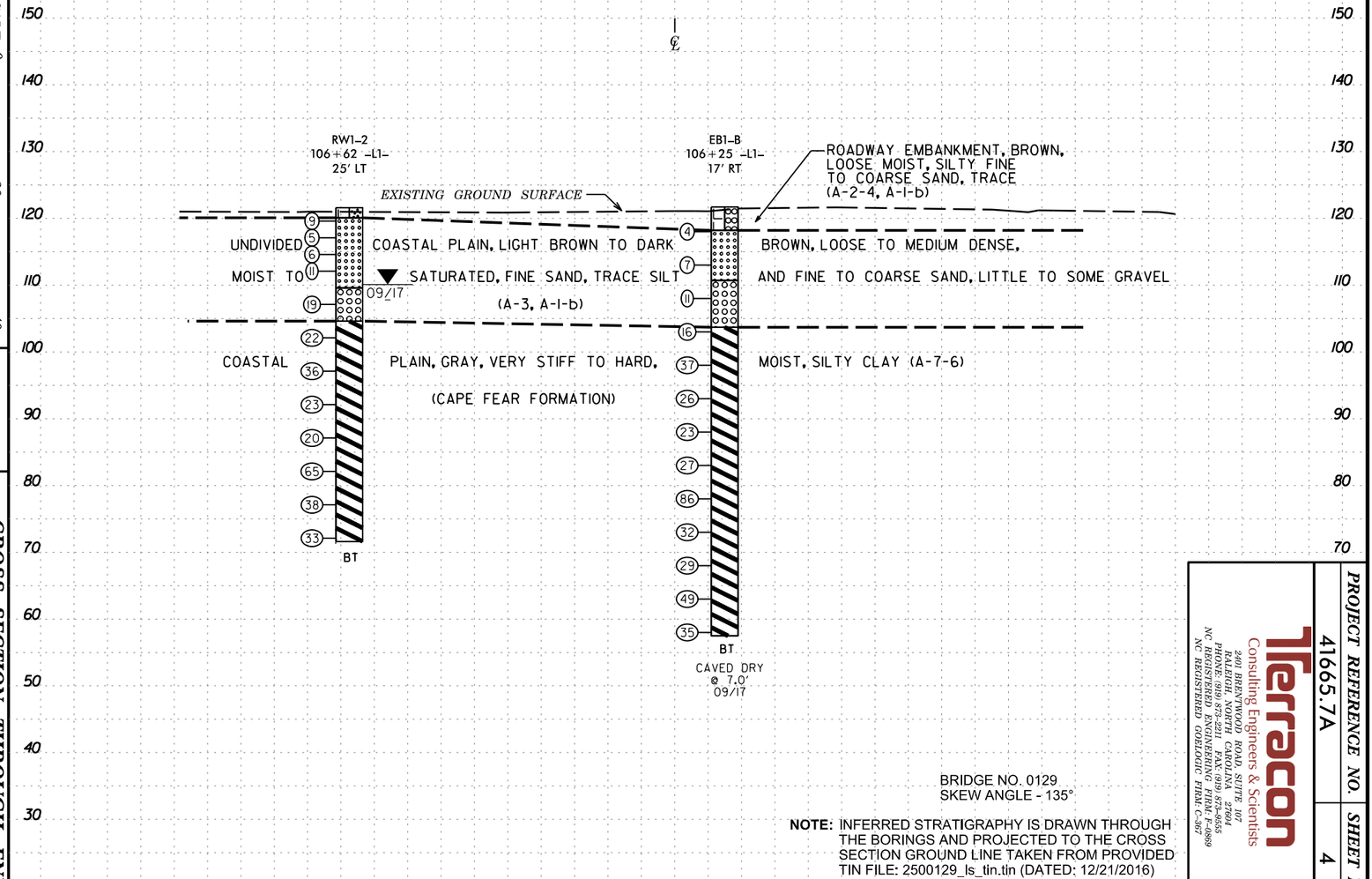
NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: 2500129_ls_tin.tin (DATED: 12/21/2016)

HORIZ. SCALE (FEET) 0 20 40

VE = 1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 106+18 –L1–

CROSS SECTION THROUGH END BENT 1 ON BRIDGE NO. 0129 AT STA. 106+18 –L1–



BRIDGE NO. 0129
SKEW ANGLE - 135°

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: 2500129_ls_tin.tin (DATED: 12/21/2016)

Terracon
Consulting Engineers & Scientists
200 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: P-0869
NC REGISTERED GEOLOGIC FIRM: C-387

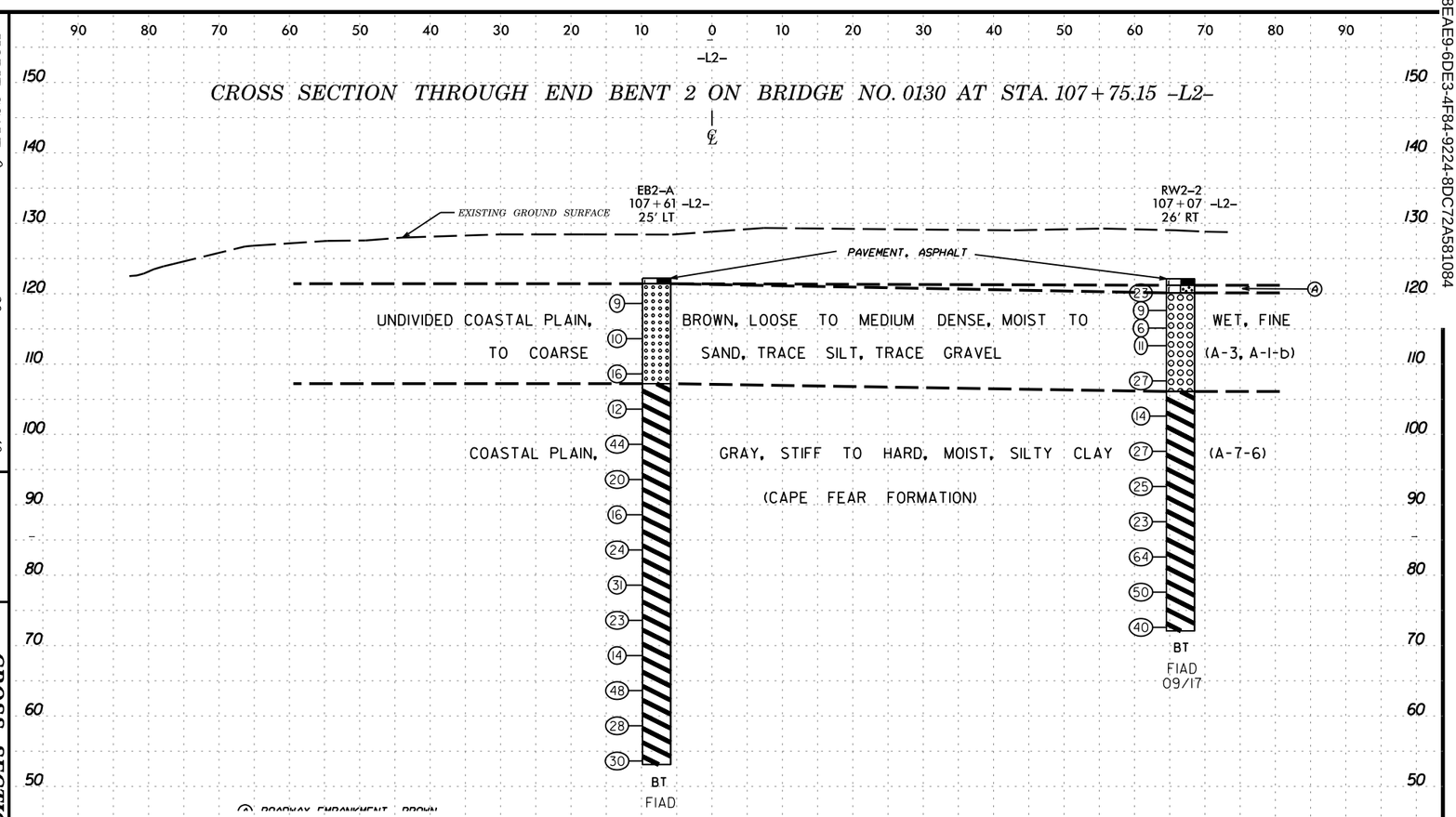
PROJECT REFERENCE NO.	SHEET NO.
41665.7A	4

HORIZ. SCALE (FEET) 0 20 40

VE = 1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 107+75 –L2–

CROSS SECTION THROUGH END BENT 2 ON BRIDGE NO. 0130 AT STA. 107+75.15 –L2–



BRIDGE NO. 0130
SKEW ANGLE - 135°

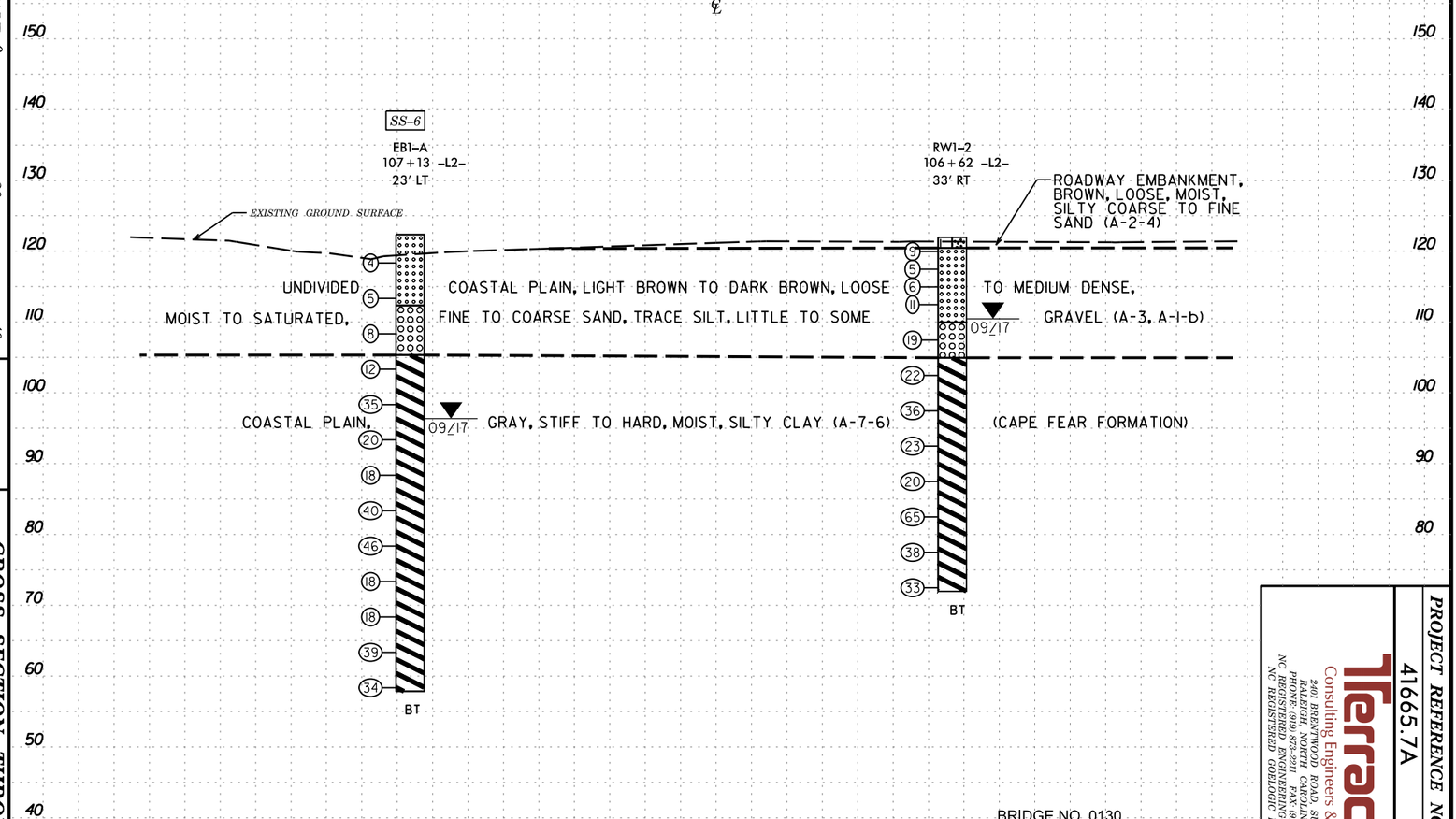
NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: 2500129_ls_tin.tin (DATED: 12/21/2016)

HORIZ. SCALE (FEET) 0 20 40

VE = 1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 106+76 –L2–

CROSS SECTION THROUGH END BENT 1 ON BRIDGE NO. 0130 AT STA. 106+76.15 –L2–



BRIDGE NO. 0130
SKEW ANGLE - 135°

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: 2500129_ls_tin.tin (DATED: 12/21/2016)

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE (919) 873-2211 FAX (919) 873-9555
NC REGISTERED ENGINEERING FIRM F-0869
NC REGISTERED GEOLOGIC FIRM C-187

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	5

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. RW1-2	**STATION** 106+62	**OFFSET** 25 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 121.6 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 486,920	**EASTING** 2,062,680	**24 HR.** 11.5
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/21/17	**COMP. DATE** 09/21/17	**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)
125											
										121.6	0.0
										GROUND SURFACE	
120	120.6	1.0								120.1	1.5
			5	5	4	9		M		**ROADWAY EMBANKMENT** BROWN, SILTY COARSE TO FINE SAND	
	118.1	3.5								**UNDIVIDED COASTAL PLAIN**	
			2	2	3	5		M		DARK BROWN TO BROWN, FINE SAND, TRACE SILT	
115	115.6	6.0									
			2	3	3	6		M			
	113.1	8.5				11					
			3	5	6			M			
110										109.6	12.0
	108.1	13.5								LIGHT BROWN, FINE TO COARSE SAND, SOME GRAVEL	
			4	6	13	19		Sat.			
105										104.6	17.0
	103.1	18.5								**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
			6	8	14	22		M			
100											
	98.1	23.5									
			13	15	21	36		M			
95											
	93.1	28.5									
			10	11	12	23		M			
90											
	88.1	33.5									
			6	9	11	20		M			
85											
	83.1	38.5									
			14	22	43		65	M			
80											
	78.1	43.5									
			11	17	21	38		M			
75											
	73.1	48.5									
			10	14	19	33		M		71.6	50.0
										Boring Terminated at Elevation 71.6 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 106+25	**OFFSET** 17 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 121.7 ft	**TOTAL DEPTH** 64.2 ft	**NORTHING** 486,871	**EASTING** 2,062,654	**24 HR.** CAVED
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/21/17	**COMP. DATE** 09/21/17	**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)
125											
										121.7	0.0
										GROUND SURFACE	
120										**ROADWAY EMBANKMENT** BROWN, FINE TO COARSE SAND, TRACE SILT AND GRAVEL	
	119.0	2.7								118.2	3.5
			1	2	2	4		M		**UNDIVIDED COASTAL PLAIN** BROWN, FINE SAND, TRACE SILT	
115	114.0	7.7									
			3	3	4	7		M			
	109.0	12.7									
			4	5	6	11		M			
110										110.7	11.0
	104.0	17.7								LIGHT BROWN, FINE TO COARSE SAND, LITTLE GRAVEL	
			7	7	9	16		M			
105											
	99.0	22.7									
			8	13	24	37		M			
100											
	94.0	27.7									
			6	10	16	26		M			
95											
	89.0	32.7									
			6	10	13	23		M			
90											
	84.0	37.7									
			8	10	17	27		M			
85											
	79.0	42.7									
			20	32	54		86	M			
80											
	74.0	47.7									
			7	13	19	32		M			
75											
	69.0	52.7									
			11	16	13	29		M			
70											
	64.0	57.7									
			14	20	29		49	M			
65											
	59.0	62.7									
			11	16	19	35		M		57.5	64.2
										Boring Terminated at Elevation 57.5 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	
										24 Hr. Water Level Caved Dry @ 7.0'	

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. RW2-2	**STATION** 107+07	**OFFSET** 32 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 122.1 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 486,938	**EASTING** 2,062,722	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/25/17	**COMP. DATE** 09/25/17	**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)
125											
	121.1	1.0								122.1 PAVEMENT SURFACE	0.0
120			13	13	10	23		M		121.2 **PAVEMENT** 9-INCHES ASPHALT	0.9
	118.6	3.5								120.1 **ROADWAY EMBANKMENT** BROWN, SILTY FINE SAND	2.0
			5	4	5	9	SS-7	M		**UNDIVIDED COASTAL PLAIN** BROWN, FINE TO COARSE SAND,	
115	116.1	6.0								TRACE SILT, TRACE GRAVEL	
			2	3	3	6		M			
	113.6	8.5									
			3	4	7	11		M			
110											
	108.6	13.5									
			9	12	15	27		W		106.1	16.0
105										**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
	103.6	18.5									
			3	6	8	14		M			
100											
	98.6	23.5									
			10	12	15	27		M			
95											
	93.6	28.5									
			8	10	15	25		M			
90											
	88.6	33.5									
			8	11	12	23		M			
85											
	83.6	38.5									
			17	29	35	64		M			
80											
	78.6	43.5									
			14	22	28	50		M			
75											
	73.6	48.5									
			13	20	20	40		M		72.1	50.0
										Boring Terminated at Elevation 72.1 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 106+57	**OFFSET** 17 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 122.0 ft	**TOTAL DEPTH** 59.2 ft	**NORTHING** 486,878	**EASTING** 2,062,685	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/02/17	**COMP. DATE** 09/22/17	**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)
125											
										122.0 PAVEMENT SURFACE	0.0
120	119.2	2.8	3	2	4	6	SS-8	M		121.2 **PAVEMENT** 10-INCHES ASPHALT, 8-INCHES CONCRETE	0.8
	114.2	7.8	3	5	6	11		M		**UNDIVIDED COASTAL PLAIN** BROWN, FINE TO COARSE SAND, LITTLE GRAVEL	
115											
	109.2	12.8	4	7	8	15		M			
110											
	104.2	17.8	5	8	14	22	SS-9	17%			
105											
	99.2	22.8	13	15	21	36		M			
100											
	94.2	27.8	9	13	16	29		M			
95											
	89.2	32.8	12	13	13	26		M			
90											
	84.2	37.8	100/0.4			100/0.4		M			
85											
	79.2	42.8	11	17	25	42		M			
80											
	74.2	47.8	13	16	24	40		M			
75											
	69.2	52.8	13	13	16	29		M			
70											
	64.2	57.8	23	26	35	61		M		62.8	59.2
65										Boring Terminated at Elevation 62.8 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 107+13	**OFFSET** 23 ft LT	**ALIGNMENT** -L2-	**0 HR.** N/A
COLLAR ELEV. 121.8 ft	**TOTAL DEPTH** 64.5 ft	**NORTHING** 486,987	**EASTING** 2,062,717	**24 HR.** 26.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/21/17	**COMP. DATE** 09/21/17	**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)
										121.8	0.0
										GROUND SURFACE	
										UNDIVIDED COASTAL PLAIN	
										BROWN, FINE TO COARSE SAND, TRACE SILT, LITTLE GRAVEL	
120	118.8	3.0	1	1	3	4		M			
115	113.8	8.0	2	2	3	5		M		111.8	10.0
										LIGHT BROWN, FINE TO COARSE SAND, LITTLE GRAVEL	
110	108.8	13.0	2	4	4	8		M			
105	103.8	18.0	2	4	8	12	SS-6	28%		104.8	17.0
										COASTAL PLAIN GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
100	98.8	23.0	8	16	19	35		M			
95	93.8	28.0	7	10	10	20		M			
90	88.8	33.0	5	8	10	18		M			
85	83.8	38.0	5	16	24	40		M			
80	78.8	43.0	12	18	28	46		M			
75	73.8	48.0	7	8	10	18		M			
70	68.8	53.0	8	9	9	18		M			
65	63.8	58.0	13	15	24	39		M			
60	58.8	63.0	12	15	19	34		M		57.3	64.5
										Boring Terminated at Elevation 57.3 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)			**GROUND WTR (ft)**
BORING NO. RW1-2	**STATION** 106+62	**OFFSET** 33 ft RT	**ALIGNMENT** -L2-	**0 HR.** N/A
COLLAR ELEV. 121.6 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 486,920	**EASTING** 2,062,680	**24 HR.** 11.5
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/21/17	**COMP. DATE** 09/21/17	**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)
										121.6	0.0
										GROUND SURFACE	
										120.1 **ROADWAY EMBANKMENT**	1.5
										BROWN, SILTY COARSE TO FINE SAND	
										UNDIVIDED COASTAL PLAIN	
										DARK BROWN TO BROWN, FINE SAND, TRACE SILT	
120	120.6	1.0	5	5	4	9		M			
	118.1	3.5									
115	115.6	6.0	2	2	3	5		M			
	113.1	8.5	2	3	3	6		M			
110			3	5	6	11		M			
	108.1	13.5	4	6	13	19		Sat.			
105	103.1	18.5								109.6	12.0
										LIGHT BROWN, FINE TO COARSE SAND, SOME GRAVEL	
			6	8	14	22		M		104.6	17.0
100	98.1	23.5								**COASTAL PLAIN** GRAY, SILTY CLAY (CAPE FEAR FORMATION)	
			13	15	21	36		M			
95	93.1	28.5									
			10	11	12	23		M			
90	88.1	33.5									
			6	9	11	20		M			
85	83.1	38.5									
			14	22	43	65		M			
80	78.1	43.5									
			11	17	21	38		M			
75	73.1	48.5									
			10	14	19	33		M		71.6	50.0
										Boring Terminated at Elevation 71.6 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)	

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 107+61	**OFFSET** 25 ft LT	**ALIGNMENT** -L2-	**0 HR.** N/A
COLLAR ELEV. 122.2 ft	**TOTAL DEPTH** 69.1 ft	**NORTHING** 487,000	**EASTING** 2,062,763	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/22/17	**COMP. DATE** 09/22/17	**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)
125										
										122.2 PAVEMENT SURFACE 0.0
										121.4 **PAVEMENT** 0.8
										9-INCHES ASPHALT
120	119.6	2.6	4	4	5	9		M		**UNDIVIDED COASTAL PLAIN**
										BROWN, FINE TO COARSE SAND,
115	114.6	7.6	4	4	6	10		M		TRACE SILT AND GRAVEL
110	109.6	12.6	3	6	10	16		M		
										107.2 15.0
105	104.6	17.6	4	5	7	12		M		**COASTAL PLAIN**
										GRAY, SILTY CLAY
100	99.6	22.6	12	17	27	44		M		(CAPE FEAR FORMATION)
95	94.6	27.6	9	9	11	20		M		
90	89.6	32.6	6	7	9	16		M		
85	84.6	37.6	5	8	16	24		M		
80	79.6	42.6	7	14	17	31		M		
75	74.6	47.6	10	11	12	23		M		
70	69.6	52.6	7	7	7	14		M		
65	64.6	57.6	15	20	28	48		M		
60	59.6	62.6	10	12	16	28		M		
55	54.6	67.6	11	15	15	30		M		53.1 69.1
										Boring Terminated at Elevation 53.1 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.7A	**TIP** NA	**COUNTY** CUMBERLAND	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION BRIDGES NO. 129 & 130 ON I-95 BUS LOOP, OVER U.S. 301 (DUNN ROAD)				**GROUND WTR (ft)**
BORING NO. RW2-2	**STATION** 107+07	**OFFSET** 26 ft RT	**ALIGNMENT** -L2-	**0 HR.** N/A
COLLAR ELEV. 122.1 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 486,938	**EASTING** 2,062,722	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 09/25/17	**COMP. DATE** 09/25/17	**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)
125										
										122.1 PAVEMENT SURFACE 0.0
										121.2 **PAVEMENT** 0.9
										120.1 9-INCHES ASPHALT 2.0
										ROADWAY EMBANKMENT
										BROWN, SILTY FINE SAND
										UNDIVIDED COASTAL PLAIN
										BROWN, FINE TO COARSE SAND,
120	121.1	1.0	13	13	10	23		M		TRACE SILT, TRACE GRAVEL
	118.6	3.5	5	4	5	9	SS-7	M		
115	116.1	6.0	2	3	3	6		M		
	113.6	8.5	3	4	7	11		M		
110	108.6	13.5	9	12	15	27		W		
105	103.6	18.5	3	6	8	14		M		
100	98.6	23.5	10	12	15	27		M		
95	93.6	28.5	8	10	15	25		M		
90	88.6	33.5	8	11	12	23		M		
85	83.6	38.5	17	29	35	64		M		
80	78.6	43.5	14	22	28	50		M		
75	73.6	48.5	13	20	20	40		M		72.1 50.0
										Boring Terminated at Elevation 72.1 ft IN COASTAL PLAIN (SILTY CLAY) (CAPE FEAR FORMATION)

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 41665.7A **TIP:** 250129 & 250130 **COUNTY:** CUMBERLAND

DESCRIPTION: US 301 Over I-95 Business Loop SBL

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (Φ)	Effective Cohesion (psf)	Effective Friction (Φ')
SS-7	-L1-	107+07	32 LT	3.5-5.0	A-1-b (0)	16	NP	82.6	11.2	1.7	4.5	5	89	46	6	16.0	N/D	N/D	N/D	N/D	N/D	N/D
SS-8	-L1-	106+57	17 RT	2.8-4.3	A-3 (0)	15	NP	82.5	11.7	0.9	4.9	2	93	52	6	16.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-9	-L1-	106+57	17 RT	17.8-19.3	A-7-6 (12)	48	36	32.3	22.3	12.5	32.9	0	99	78	49	16.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-6	-L2-	107+13	23 LT	10.0-19.5	A-7-6 (26)	57	41	9.6	27.2	16.9	46.3	0	100	94	68	27.7	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

SITE PHOTOGRAPHS
BRIDGES NO. 129 & 130 ON I-95 BUSINESS LOOP OVER US 301 (DUNN ROAD)

PHOTOGRAPH NO. 1: WEST APPROACH TO END BENT NO. 1 BETWEEN -L1- AND -L2- ALIGNMENTS, LOOKING EAST

PHOTOGRAPH NO. 3: ON -Y- ALIGNMENT, SOUTH OF -L1- AND -L2- ALIGNMENTS, LOOKING NORTH

PHOTOGRAPH NO. 2: ON -Y- ALIGNMENT, NORTH OF -L1- AND -L2- ALIGNMENTS, LOOKING SOUTH

PHOTOGRAPH NO. 4: EAST APPROACH TO END BENT NO.2 BETWEEN -L1- AND -L2- ALIGNMENTS, LOOKING WEST

REFERENCE: 250008

PROJECT: 41665

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *DIVISION 6 – I-95 BUSINESS AND US 301 ROADWAY IMPROVEMENTS*

SITE DESCRIPTION *MSE WALLS AT END BENT 1 AND END BENT 2 – BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SOUTHBOUND LANE*

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.

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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

WERITZ, M. A.

FRAWLEY, M. H.

TURNAGE, J. R.

RIGGS, JR., A. F.

RIST, S. A.

HOEVEN, J. H.

INVESTIGATED BY *TERRACON CONSULTANTS*

DRAWN BY *FIELDS, W. D.*

CHECKED BY *RIGGS, JR., A. F.*

SUBMITTED BY *TERRACON CONSULTANTS*

DATE *NOVEMBER 2017*

Prepared in the Office of:

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GOELOGIC FIRM: C-367

NORTH CAROLINA PROFESSIONAL SEAL 014155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by:
Abner Riggs 11/9/2017
5228073BBA4F482...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-50 (TER373)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 7/8" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

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: BY-2, N=431283.72, E=2018587.55

ELEVATION: 173.80 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	3

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 50 100
FEET

SKEW ANGLE 140°

NC GRID NAD 83

20+00 -L-

110+00 -L2-

112+00 -L2-

END WALL NO. 1
-L2- STA. 109+43.24
(59.97' RT)

BEGIN WALL NO. 2
-L2- STA. 108+50
(26.04' LT)

RW1-2
109+47 -L2-
57' RT

RW2-1
108+57 -L2-
26' LT

-L2- STA. 109+71.15
(25.53' RT)

-L2- STA. 109+06.55
(23.50' LT)

EB1-A
109+87 -L2-
33' RT

EB2-A
109+10 -L2-
28' LT

EB1-B
110+34 -L2-
36' RT

EB2-B
109+53 -L2-
30' LT

-L2- STA. 109+66.89
(24.42' LT)

RW1-1
110+75 -L2-
22' RT

RW2-2
109+92 -L2-
56' LT

BEGIN WALL NO. 1
-L2- STA. 110+95.00
(27.36' RT)

END WALL NO. 2
-L2- STA. 109+92.96
(55.04' LT)

23+00 -L-

BM 1
N. 431318 E. 2018536
ELEV. = 194.92
CHISELED SQUARE IN CONC HW

BUS 95 SBL 38' BST

BRIDGE NO.8 CONC

SEAT ELEV= 187.21'

6' CMP
INV=177.32'

CAT-1

MATCH EXIST

BL-1
BL-2
BL-3
BL-4
BL-5

WOODS

0 20 40
FEET

PROJECT REFERENCE NO.	SHEET NO.
41655.7A	4

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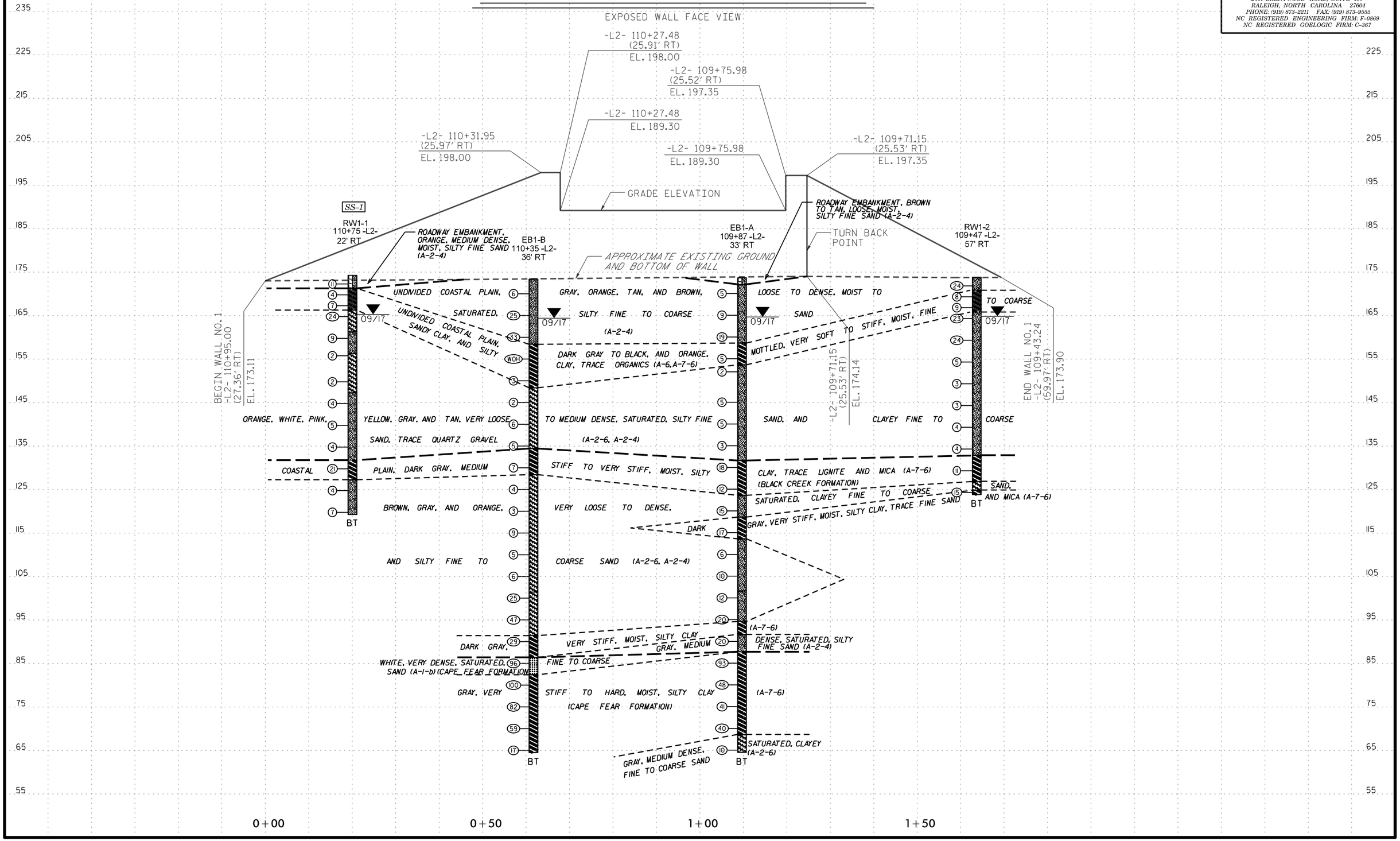
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GOELOGIC FIRM: C-367

WALL ENVELOPE FOR RETAINING WALL NO.1

EXPOSED WALL FACE VIEW



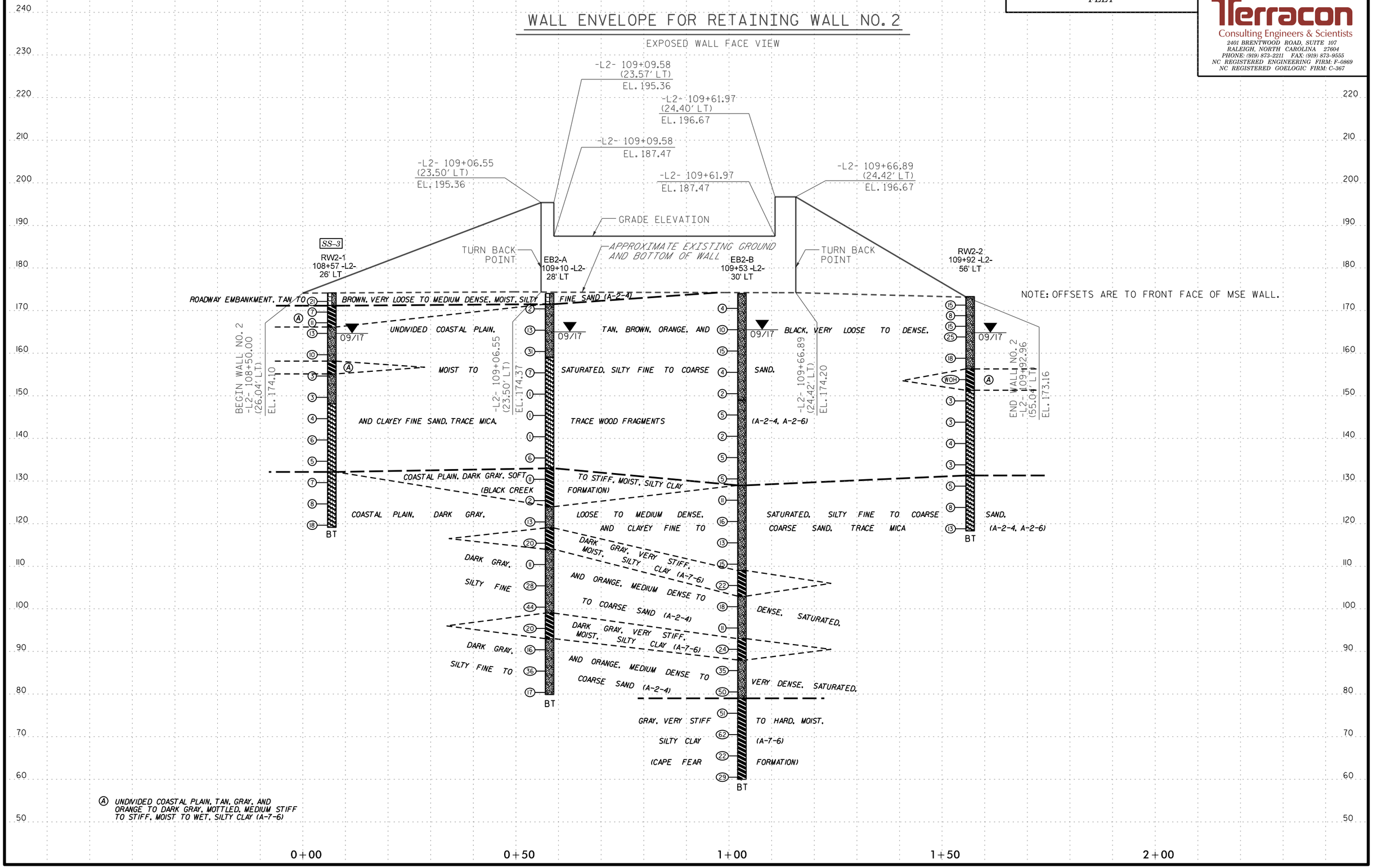
PROJECT REFERENCE NO.	SHEET NO.
41665.7A	5

0 20 40
FEET

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GOELOGIC FIRM: C-367

WALL ENVELOPE FOR RETAINING WALL NO. 2

EXPOSED WALL FACE VIEW



Ⓐ UNDIVIDED COASTAL PLAIN, TAN, GRAY, AND ORANGE TO DARK GRAY, MOTTLED, MEDIUM STIFF TO STIFF, MOIST TO WET, SILTY CLAY (A-7-6)

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 41665.7A **TIP:** 250008 **COUNTY:** CUMBERLAND

DESCRIPTION: US 301 Over I-95 Business Loop SBL

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-1	-L2-	110+75	22 RT	1.0-2.5	A-2-4 (0)	16	NP	58.5	28.1	2.8	10.6	0	100	76	15	N/D	N/D	N/D	N/D	N/D	N/D	N/D
SS-3	-L2-	108+57	26 LT	3.5-5.0	A-7-6 (8)	41	26	27.9	28	12.9	31.2	0	100	87	48	18.6	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

REFERENCE: 250129 & 250130

PROJECT: 41665

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY CUMBERLAND

PROJECT DESCRIPTION DIVISION 6 – I-95 BUSINESS AND US 301 ROADWAY IMPROVEMENTS

SITE DESCRIPTION DUAL BRIDGES NO. 0129 & NO. 0130 ON I-95 BUSINESS LOOP OVER US 301

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

WERITZ, M. A.

TURNAGE, J. R.

HOEVEN, J. H.

INVESTIGATED BY TERRACON CONSULTANTS

DRAWN BY FIELDS, W. D.

CHECKED BY RIGGS, JR., A. F.

SUBMITTED BY TERRACON CONSULTANTS

DATE NOVEMBER 2017

Prepared in the Office of:

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GOELOGIC FIRM: C-367

NORTH CAROLINA PROFESSIONAL SEAL 014155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by:
Abner Riggs 11/9/2017
5228073BBA4F482...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
41665.7A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-50 (TER373)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 7/8" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

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: BY-2, N=486,477.58, E=2,062,245.96

ELEVATION: 120.92 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
TIP	4

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 100 200
FEET

SKEW ANGLE - 134°31'29.142"

NC GRID
NAD 83 NA 2011

-L2- 100+00

-L2- 105+00

-L2- 110+00

BEGIN ROADWORK
-Y- STA. 10+85.00

POT Sta. 10+00.00

TO EASTOVER

US 301 VARIABLE WIDTH BST

-Y-

BEGIN BRIDGE PROJ. 130
-L2- STA. 102+50.00

-Y- RT STA. 13+55.79
BEGIN BARRIER

-Y- LT STA. 13+01.54
BEGIN BARRIER

END BRIDGE 130
-L2- STA. 111+50.00

BEGIN BRIDGE 130
-L2- STA. 106+76.15

BEGIN BRIDGE 130
-L2- STA. 107+75.15

10+00 -Y-

POT Sta. 100+00.00

HATCHER LANE 18' BST

48" RW ISBW

WOODS

BL-2

CONC

RW1-3

EB1-A

EB2-A

RW2-1

I-95 BUS SBL

-L2-

POT Sta. 112+00.00

TO FAYETTEVILLE

TOP=127.06'

CONC

INV=124.60'

RETAINING WALL NO. 3

RW1-2

RW2-2

RETAINING WALL NO. 4

BL-3

NO ASSOCIATE PIPING FOUND

I-95 BUS NBL

-L1-

TO BENSON

RW1-1

RW2-3

EB1-B

EB2-B

BM #1
N. 486954 E. 2062810
ELEV. = 140.48
CHISELED SQUARE IN CONC HW

CONC

8"C.M.P. —DIRECTIONAL ONLY
—OTHER END NOT FOUND

INV=120.37

WOODS

ORANGEBURG DR 17' BST

POT Sta. 100+00.00

BEGIN BRIDGE 129
-L1- STA. 106+18.12

END BRIDGE 129
-L1- STA. 107+17.12

-Y- RT STA. 15+08.10
END OF BARRIER

-Y- LT STA. 14+58.45
END OF BARRIER

END BRIDGE PROJ. 130
-L1- STA. 111+50.00

BEGIN BRIDGE PROJ. 129
-L1- STA. 102+50.00

END ROADWORK
-Y- STA. 17+00.00

-Y-

US 301 VARIABLE WIDTH BST

ORANGEBURG DR 17' BST

POT Sta. 18+00.00

TO FAYETTEVILLE

15+00 -Y-

BY-2

-L1- 100+00

-L1- 105+00

-L1- 110+00

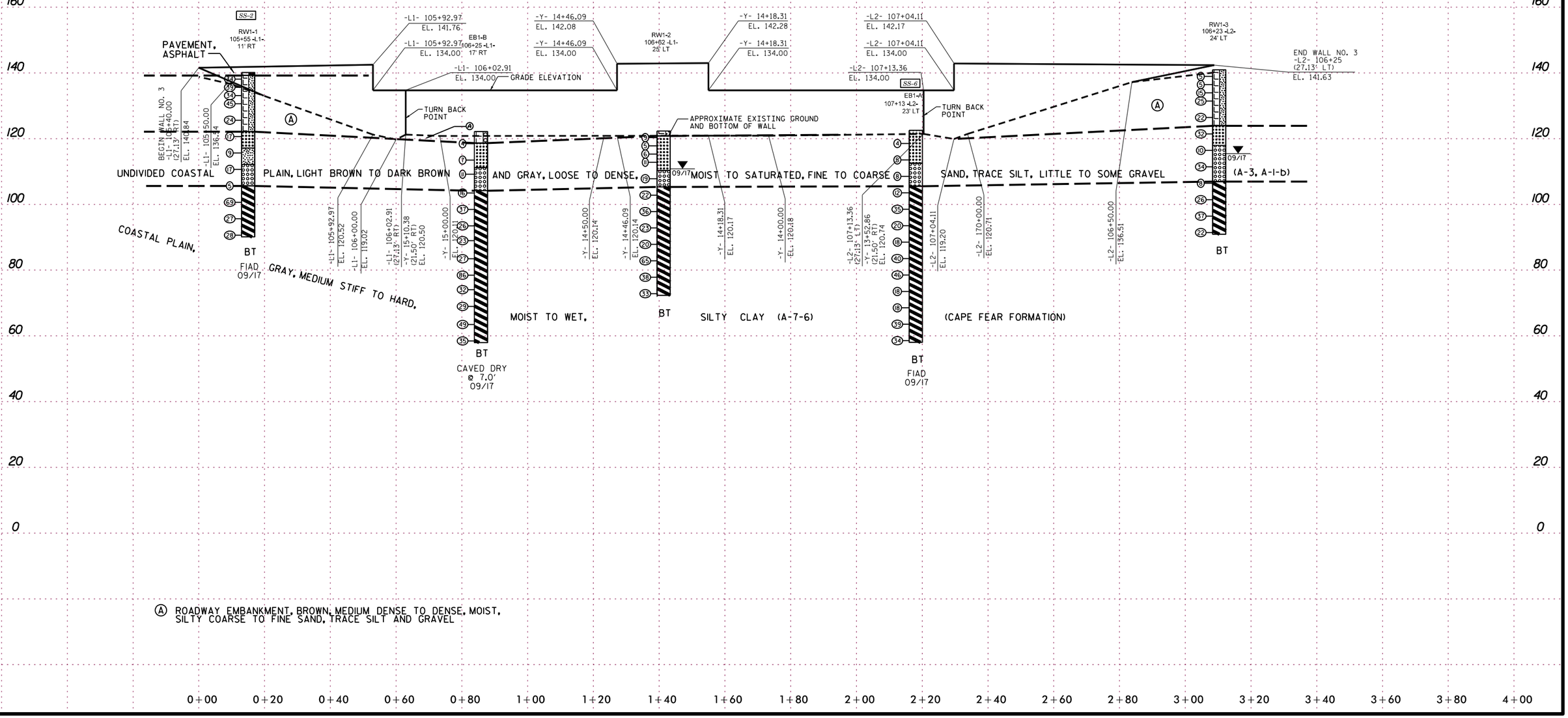
PROJECT REFERENCE NO.	SHEET NO.
41665.7A	4

0 30 60
FEET

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GOELOGIC FIRM: C-367

WALL ENVELOPE FOR RETAINING WALL NO. 3

EXPOSED WALL FACE VIEW



PROJECT REFERENCE NO.	SHEET NO.
41665.7A	5

0 30 60
FEET

Terracon
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2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
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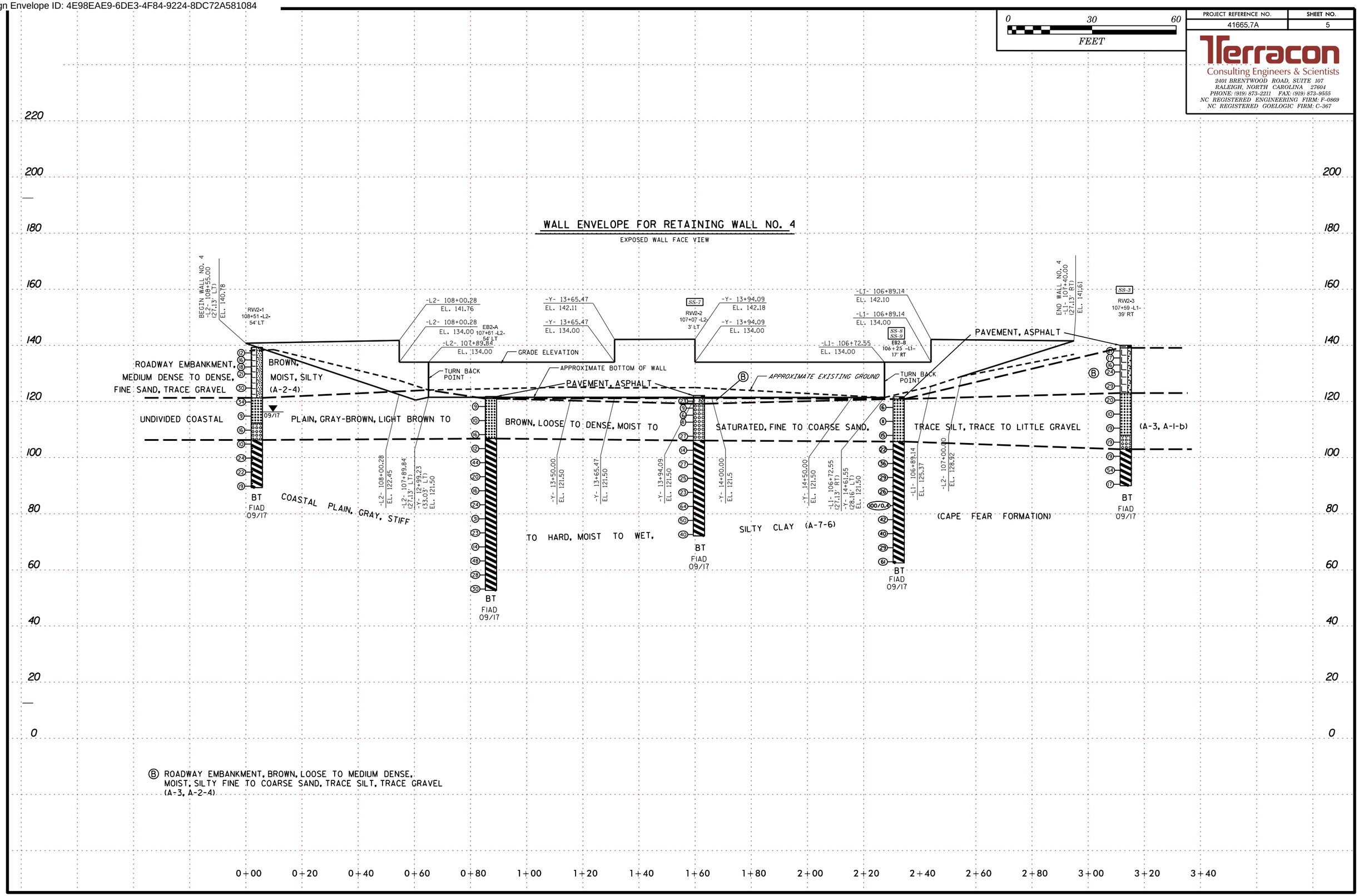
NC REGISTERED GOELOGIC FIRM: C-367

WALL ENVELOPE FOR RETAINING WALL NO. 4

EXPOSED WALL FACE VIEW



Ⓑ ROADWAY EMBANKMENT, BROWN, LOOSE TO MEDIUM DENSE, MOIST, SILTY FINE TO COARSE SAND, TRACE SILT, TRACE GRAVEL (A-3, A-2-4)

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 41665.7A **TIP:** 250129 & 250130 **COUNTY:** CUMBERLAND

DESCRIPTION: DUAL BRIDGES NO. 0129 & NO. 0130 ON I-95 BUSINESS LOOP OVER US 301

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (Φ)	Effective Cohesion (psf)	Effective Friction (Φ')
SS-2	-L1-	105+55	11 RT	3.5-5.0	A-2-4 (0)	15	NP	73.5	15.6	3.1	7.8	0	100	63	12	11.1	N/D	N/D	N/D	N/D	N/D	N/D
SS-6	-L2-	107+13	23 LT	10.0-19.5	A-7-6 (26)	57	41	9.6	27.2	16.9	46.3	0	100	94	68	27.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-7	-L2-	107+07	3 LT	3.5-5.0	A-1-b (0)	16	NP	82.6	11.2	1.7	4.5	5	89	46	6	16.0	N/D	N/D	N/D	N/D	N/D	N/D
SS-8	-L1-	106+25	17 RT	2.8-4.3	A-3 (0)	15	NP	82.5	11.7	0.9	4.9	2	93	52	6	16.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-9	-L1-	106+25	17 RT	17.8-19.3	A-7-6 (12)	48	36	32.3	22.3	12.5	32.9	0	99	78	49	16.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-3	-L1-	107+59	10 RT	3.5-5.0	A-2-4 (0)	12	NP	71.5	19.5	4.1	4.9	0	99	64	11	4.3	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number