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SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	250008	1	16

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.

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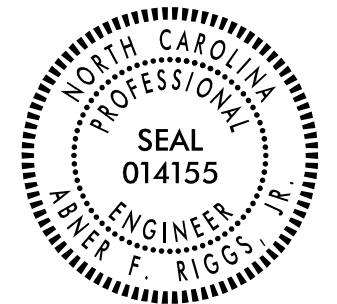
DATE OCTOBER 2017

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11/9/2017

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CONTENTS

LINE	STATION	PLAN
-L-	16+50 TO 25+30	4
-L2-	106+20 TO 110+75	4

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	17+00, 20+00	5
	21+00	6
	22+00	7
	23+50, 24+50	8
-L2-	106+50	9
	108+50	10
	109+00 TO 109+50	11-12
	110+50 TO 111+00	13-14

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY SUMMARY SHEET	16

ROADWAY
SUBSURFACE INVESTIGATION

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

INVENTORY

REFERENCE: 250008

PROJECT: 41665





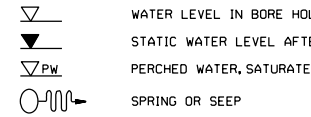
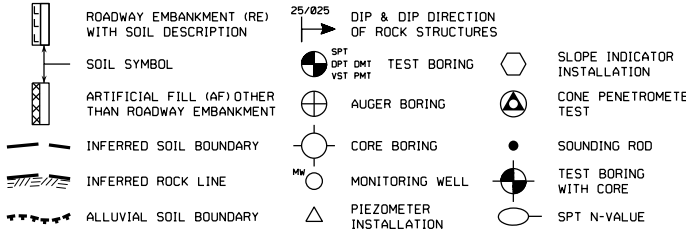
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

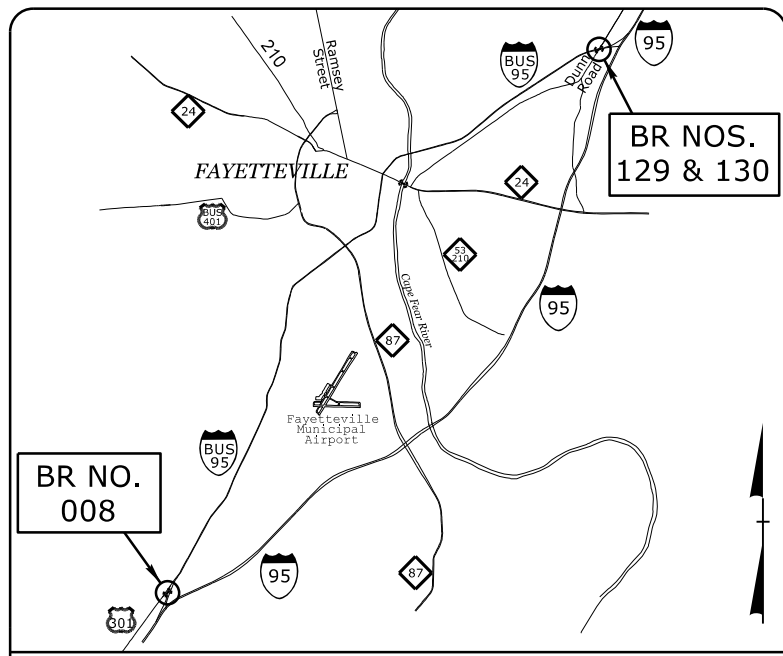
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION						GRADATION						ROCK DESCRIPTION						TERMS AND DEFINITIONS																																																																																							
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 208, 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						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.						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:						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 DISLOADED 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 (ROQ) - 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. SLICKENISE - 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 (SROQ) - 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.																																																																																							
SOIL LEGEND AND AASHTO CLASSIFICATION						ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.						WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.																																																																																													
MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.						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.																																																																																																			
COMPRESSION SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50						NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.																																																																																																			
PERCENTAGE OF MATERIAL						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.																																																																																																			
ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%						WEATHERING FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (IV 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> 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. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> VERY SEVERE (IV 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. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> 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.																																																																																																			
GROUND WATER  WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS 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 DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE																																																																																																			
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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.						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.																																																																																													

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BRIDGE 008
WBS: 41665.7A



VICINITY MAP
NOT TO SCALE

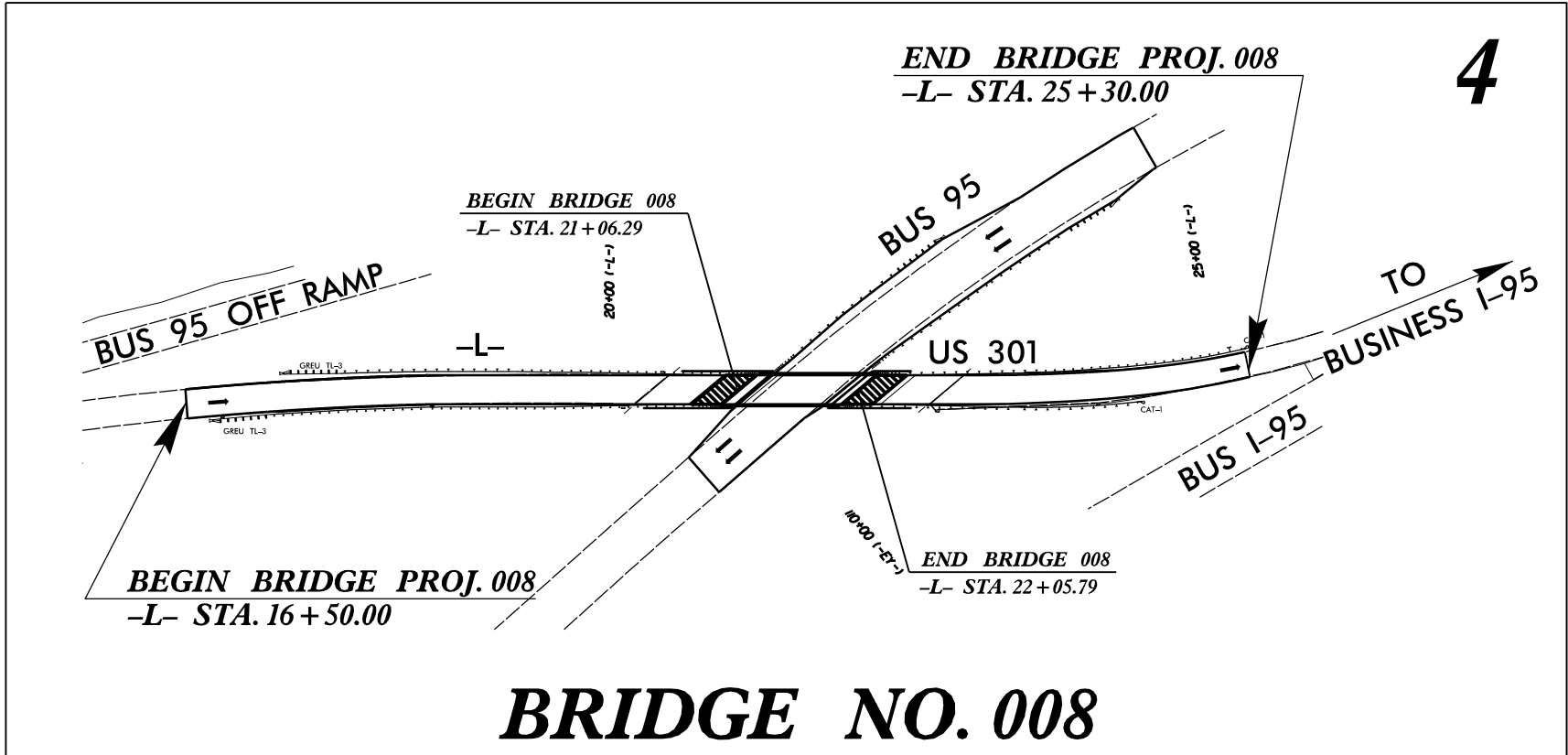
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CUMBERLAND COUNTY

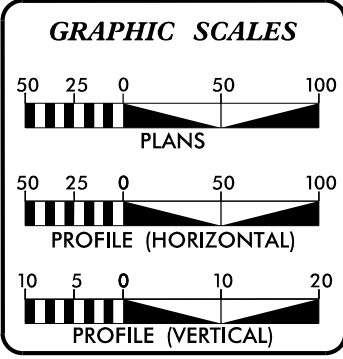
**LOCATION: BRIDGE NOS. 129 & 130 ON I-95 BUSINESS LOOP
OVER US 301 AND BRIDGE NO. 008 ON US 301
OVER I-95 BUSINESS LOOP SBL**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURE,
SIGNING & TRAFFIC CONTROL**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	250008	3	16
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
41665.7A		PE	



BRIDGE NO. 008



DESIGN DATA

BRIDGE 008:
V = 40 MPH

BRIDGES 129 & 130
V = 60 MPH

* TTST = DUAL
FUNC CLASS =

INTERSTATE TIER

PROJECT LENGTH

TIP PROJECT BRIDGE 008:

LENGTH ROADWAY	=	0.148 MI.
LENGTH STRUCTURE	=	0.019 MI.
TOTAL LENGTH OF PROJECT	=	0.167 MI.

TIP PROJECT BRIDGES 129 & 130:

LENGTH ROADWAY (EACH)	=	0.135 MI.
LENGTH STRUCTURE (EACH)	=	0.035 MI.
TOTAL LENGTH OF PROJECT (EACH)	=	0.170 MI.

Prepared In the Office of:

vhb
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705

SUNGATE DESIGN GROUP, P.A.

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: N/A

LETTING DATE: DECEMBER 12, 2017

TIM GOINS, PE
PROJECT ENGINEER

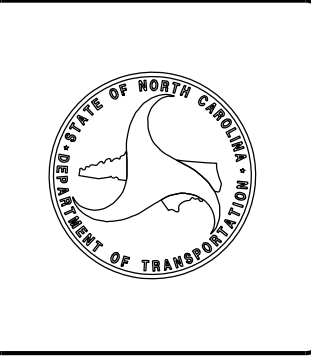
LIZ LAWES, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.





PROJECT REFERENCE NO.	SHEET NO.
250008	3A

Date: October 2017
WBS Number: 41665.7A
TIP Number: 250008
County: Cumberland
Description: Bridge No.008 on US 301 over I-95 Business Loop SBL

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located at the intersection of US 301 and I-95 Business Loop SBL, south of Fayetteville, near Hope Mills in Cumberland County, North Carolina. The project will consist of replacing the existing bridge on US 301 (-L-) over I-95 Business (-L2-) with a new single span bridge with MSE walls constructed at each abutment. The total length of the project is 0.167 miles. The alignments will stay near existing grades and pavements will be widened along the shoulders. Maximum fill heights for construction of the MSE walls at the approaches will be about 23 feet. The project corridor is in a rural setting with some limited development and a cemetery located to the west of the project.

The geotechnical subsurface investigation was performed in September of 2017. Standard penetration test (SPT) borings were advanced using a Diedrich D-50 rotary drill rig equipped with a recently calibrated automatic hammer. Borings were advanced utilizing wash boring and hollow stem auger drilling techniques to the necessary depths. In addition to soil test borings performed along the corridor, three hand auger borings were performed along the roadway shoulders of the -L- and -L2- alignments. Representative soil samples were collected in the field for visual classification and selected samples were submitted for laboratory analysis by Terracon's soil testing laboratory. Laboratory testing was performed in accordance with the AASHTO Soil Classification System.

The following alignments were investigated by soil testing and visual reconnaissance:

<u>Alignment</u>	<u>Stations</u>
-L-	16+50 to 25+30
-L2-	106+20 to 110+75

Physiography and Geology

The site is located within the Inner Coastal Plain Physiographic and Geologic Province of North Carolina in Cumberland County. The Coastal Plain Province is characterized by subdued topographic features. The existing natural grade elevations along the investigated corridor range from approximately 170 feet to 180 feet. In general, the topography at this site is slightly rolling with gentle slopes.

The project is located in the Inner Coastal Plain Physiographic Province with geology consisting of a wedge of unconsolidated sands, silt, marl, and other clays interbedded with occasional limestone strata, which rests atop crystalline basement rocks. Based on previous mapping (N.C. Geologic Map 1985) and our knowledge of the local geology, the site falls within the Cretaceous age Black Creek Formation. However, based on our site

visit and subsurface conditions encountered, the near surface soils appear to be recent Coastal Plain deposits of alluvial origin and are consistent with interbedded sands, clayey sands and clays typical of Undivided Coastal Plain soils. These near surface soils overlie the denser, darker soils belonging to the Black Creek Formation. The Black Creek Formation soils are described as gray to black lignitic clay with thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sand lenses are common in the upper part.

Soil Properties

Soils encountered during this investigation are separated into three categories based on their origin. The soils encountered consist of roadway embankment fill, Undivided Coastal Plain deposited soils and Formational soils.

Roadway Embankment soils were encountered at the following approximate locations:

<u>Alignment</u>	<u>Stations</u>
-L-	16+50 to 25+30
-L2-	106+20 to 110+75

Roadway embankment soils were encountered along the -L- and -L2- alignments at the beginning through the end of the roadway work limits. Approximately 12 to 20 feet of roadway embankment fill soils were encountered along the -L- alignment and at the approaches to the existing bridge. These soils consist of medium dense to dense, dry to moist, relatively clean to silty and clayey fine to coarse sands (A-3, A-2-4 and A-2-6). The roadway embankment soils on the -L2- alignment appear to be reworked in-place Undivided Coastal Plain soils measuring about 1.5 to 3 feet thick beneath the ground surface and existing asphalt pavement sections. The roadway embankment soils along -L2- consist of loose to medium dense, dry to moist, silty fine to coarse sand (A-2-4).

Undivided Coastal Plain deposits are present at the surface and beneath the roadway embankment soils and asphalt pavement sections. The Undivided Coastal Plain soils can be generalized as alternating layers of silty clay and clayey to silty sand extending to the maximum depths of exploration or to the surface of the underlying Black Creek Formation. The near surface natural soils along the -L- and -L2- alignments consist of thickly bedded very loose to dense, moist to saturated, relatively clean to silty and clayey fine to coarse sands (A-3, A-2-4 and A-2-6) and 3 to 10 foot thick layers of very soft to stiff, moist to wet, fine to coarse sandy clays (A-6), moderately to high plasticity silty clays (A-7-6) and fine sandy silts (A-4). These soils were underlain by alternating layers of very loose to dense, saturated, silty to clayey sands (A-2-4 and A-2-6) and very soft to stiff, wet, sandy clays (A-6) and silty clays (A-7-6). The silt and clay soils exhibited plastic indices of 7 to 26 percent and are considered to be slightly to highly plastic soils. These soils also had between 37 and 48 percent fines passing the No. 200 sieve.

Formational soils of the Black Creek Formation were encountered in the deep borings as high as elevation 134.5 feet. These soils are characterized by their black to gray color and consist of layers of very loose to



PROJECT REFERENCE NO.	SHEET NO.
250008	3B

dense, saturated, silty to clayey sands (A-2-4 and A-2-6) and medium stiff to stiff, moist to wet, silty clays (A-7-6) with traces of mica and lignite.

Groundwater

In general, the corridor drains to unnamed jurisdictional streams that run south and east out of the corridor. Groundwater was not encountered within the 13 to 15 feet boring termination depths beneath the ground surface on the -L- alignment. Groundwater was encountered during drilling and sampling along the -L2- alignment at depths of about 8.5 and 9.5 feet below the existing ground surface. The depth of groundwater, beneath the ground surface, will fluctuate with seasonal precipitation and may occur at higher levels at other times of the year and above less permeable near surface clayey soils.

Areas of Special Geotechnical Interest

- 1) Plastic Soils - Moderate to high plasticity soils with plastic indices (PI) of 16 and greater were encountered near the existing ground surface at the following locations:

<u>Alignment</u>	<u>Stations</u>
-L-	106+20 to 108+75
-L-	110+60 to 110+75

A discussion of these plastic soils is located above in the section titled "Soil Properties".

BULK SAMPLES

No bulk samples were collected

UNDISTURBED SAMPLES

No "Shelby" tube samples were taken.

Sincerely,
Terracon Consultants, Inc.

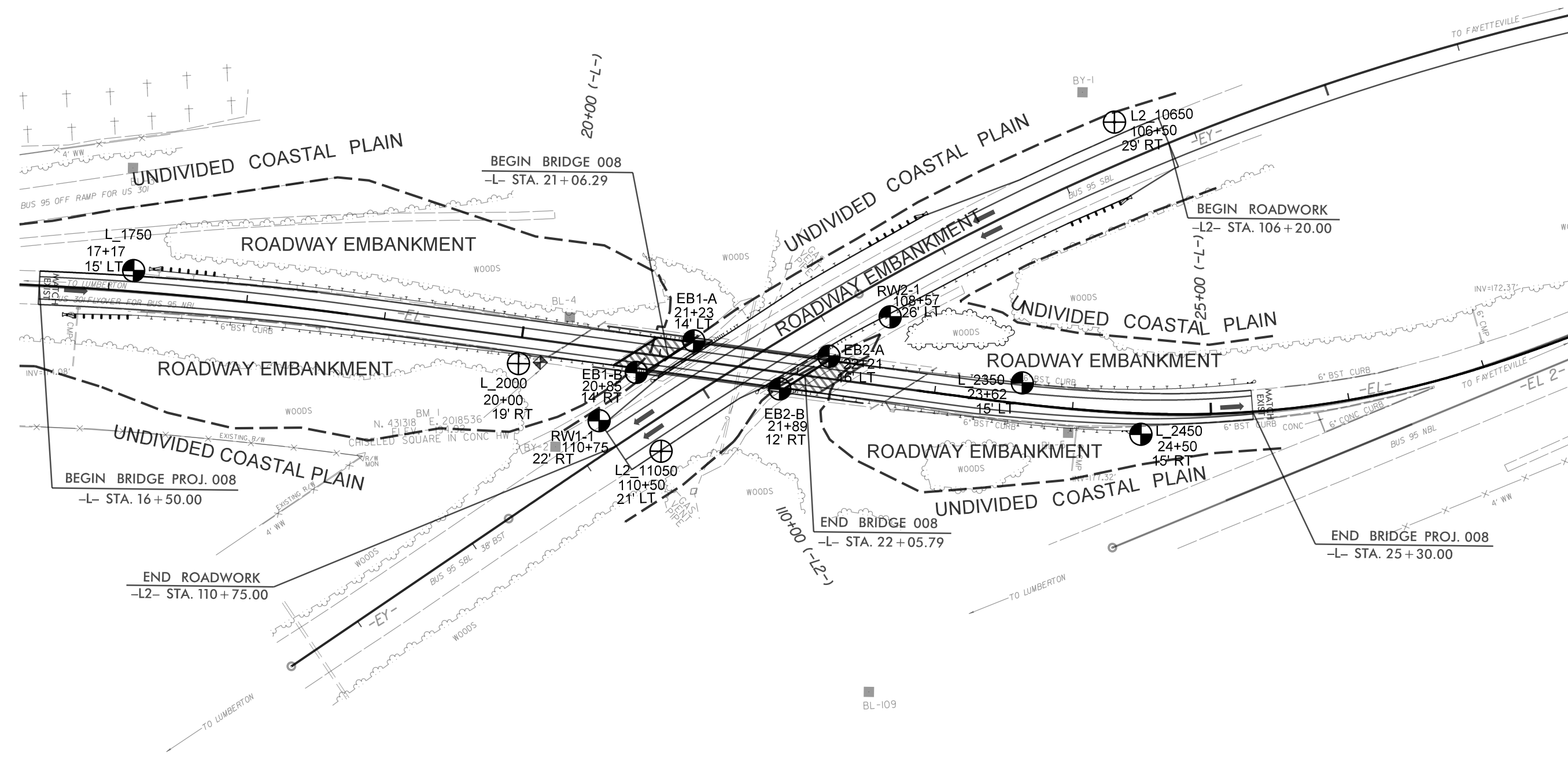
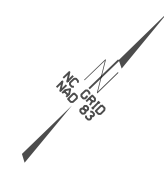


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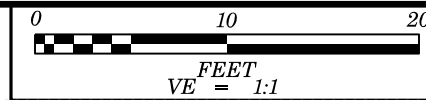
Abner F. Riggs, Jr., PE
Senior Geotechnical Engineer

A handwritten signature in black ink that reads "ANDREW NASH".

Andrew A. Nash, PE
Geotechnical Department Manager

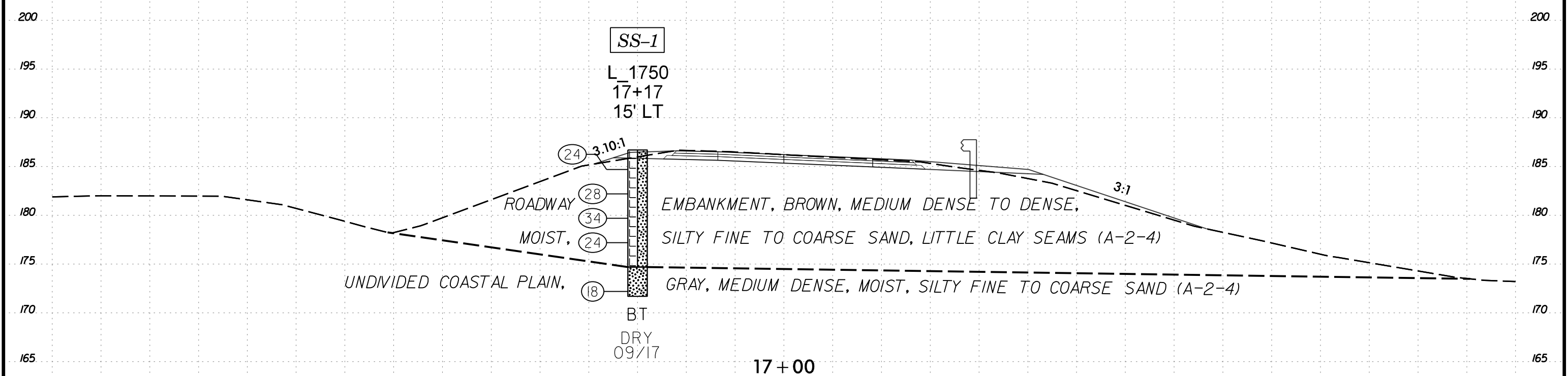
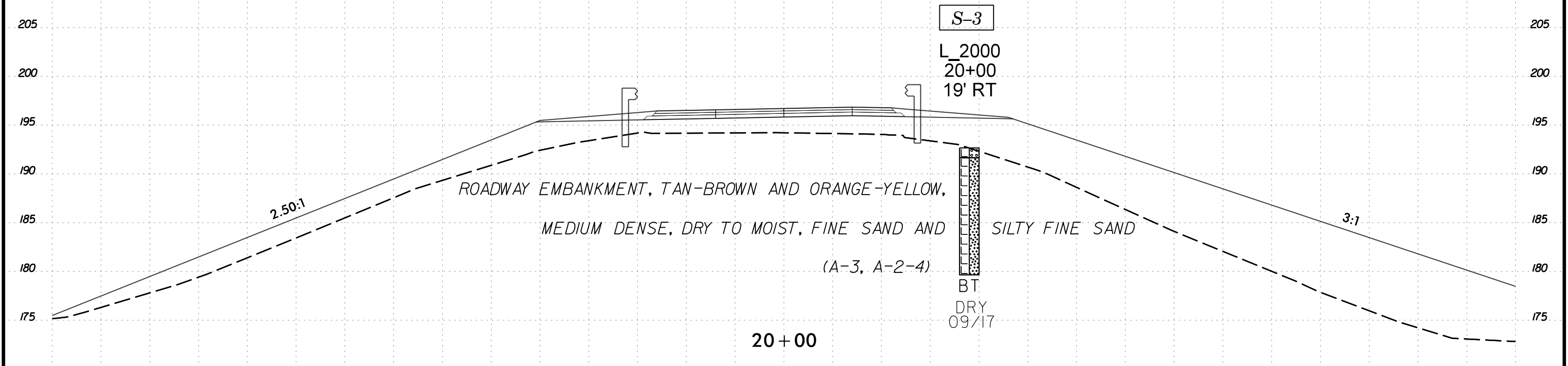


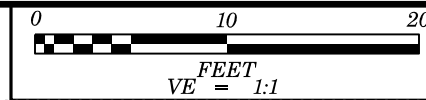
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PROJECT REFERENCE NO.	SHEET NO.
250008	5

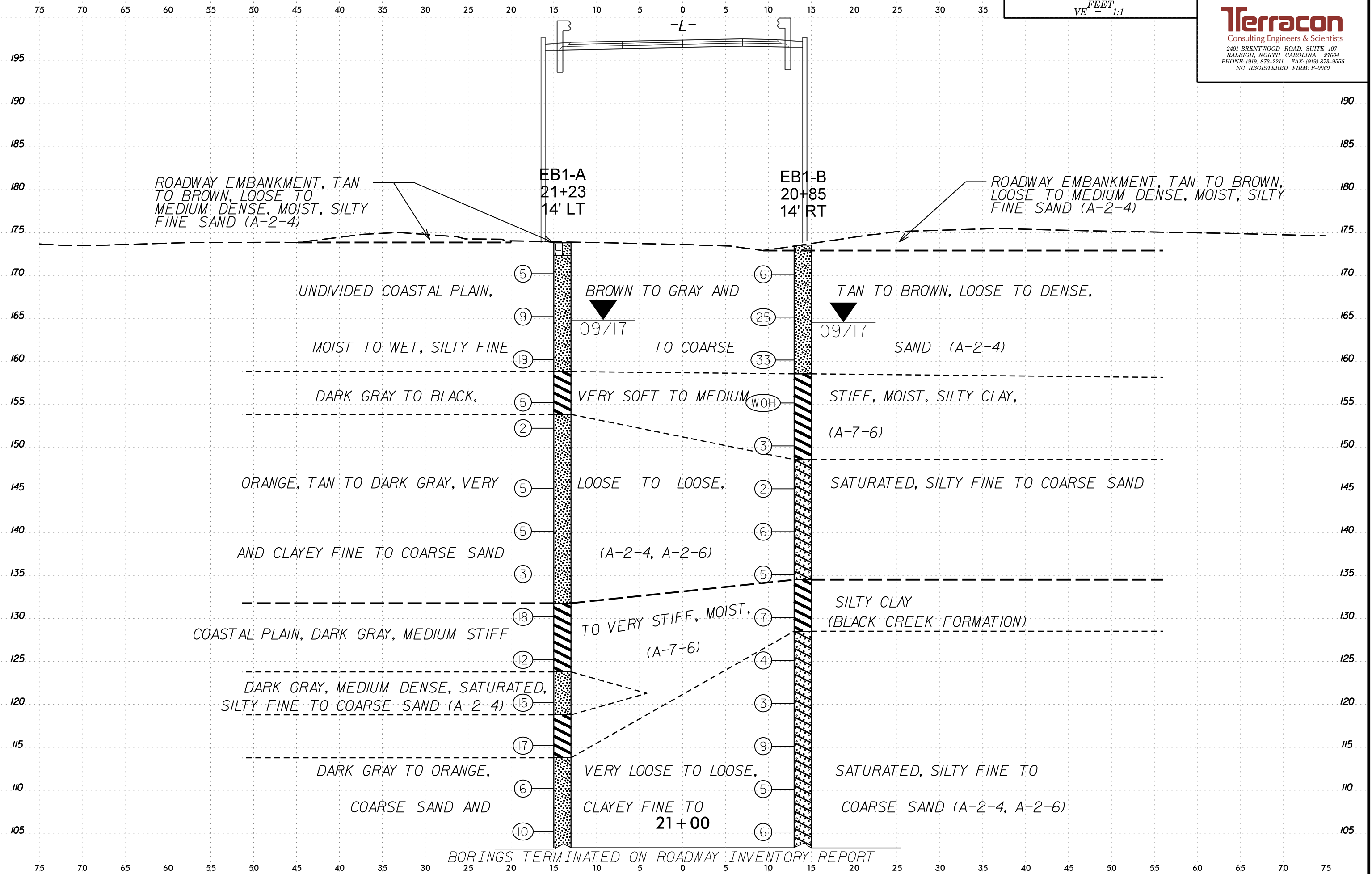
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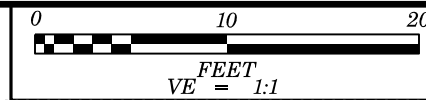




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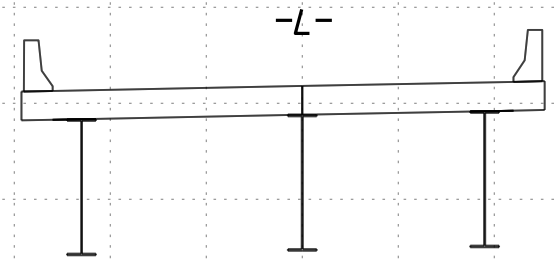
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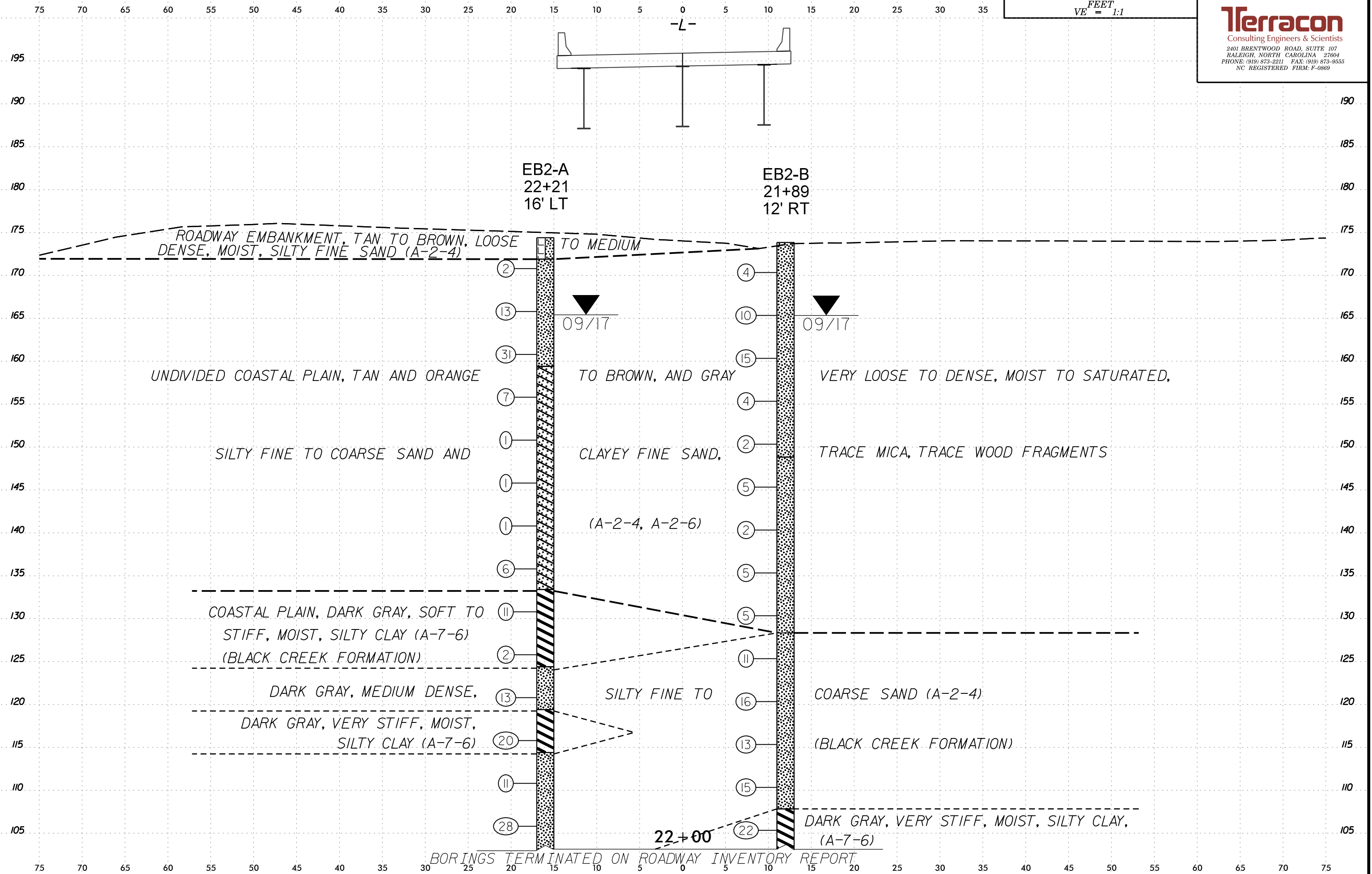
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250008	7

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EB2-A
22+21
16' LT

EB2-B
21+89
12' RT



ROADWAY EMBANKMENT, TAN TO BROWN, LOOSE DENSE, MOIST, SILTY FINE SAND (A-2-4)

TO MEDIUM

UNDIVIDED COASTAL PLAIN, TAN AND ORANGE

TO BROWN, AND GRAY

VERY LOOSE TO DENSE, MOIST TO SATURATED,

SILTY FINE TO COARSE SAND AND

CLAYEY FINE SAND,

TRACE MICA, TRACE WOOD FRAGMENTS

(A-2-4, A-2-6)

COASTAL PLAIN, DARK GRAY, SOFT TO STIFF, MOIST, SILTY CLAY (A-7-6) (BLACK CREEK FORMATION)

DARK GRAY, MEDIUM DENSE, DARK GRAY, VERY STIFF, MOIST, SILTY CLAY (A-7-6)

SILTY FINE TO

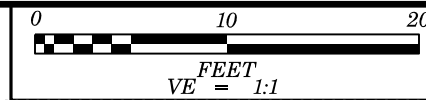
COARSE SAND (A-2-4)

(BLACK CREEK FORMATION)

DARK GRAY, VERY STIFF, MOIST, SILTY CLAY, (A-7-6)

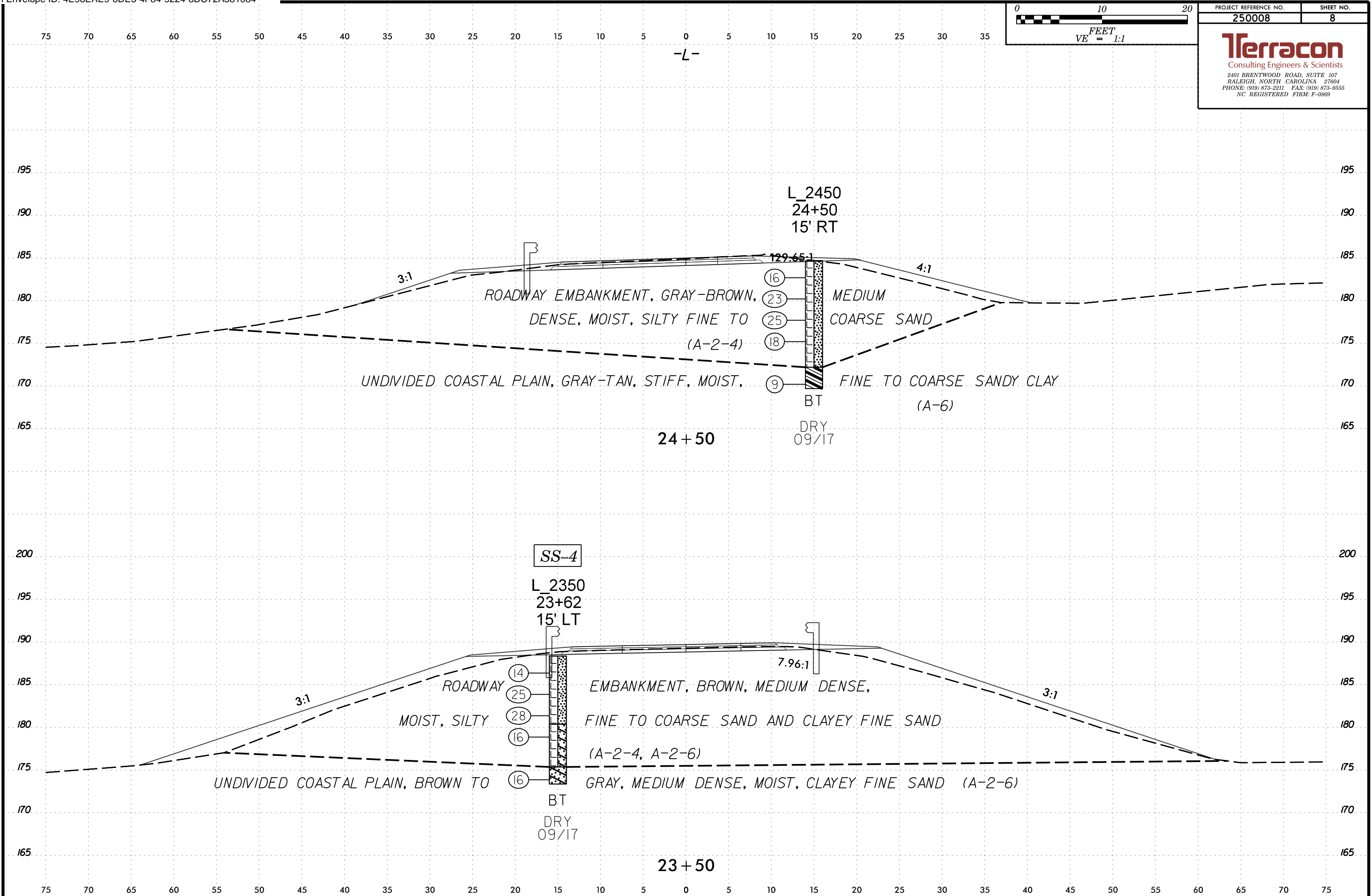
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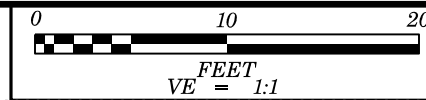
BORINGS TERMINATED ON ROADWAY INVENTORY REPORT



PROJECT REFERENCE NO.	SHEET NO.
250008	8

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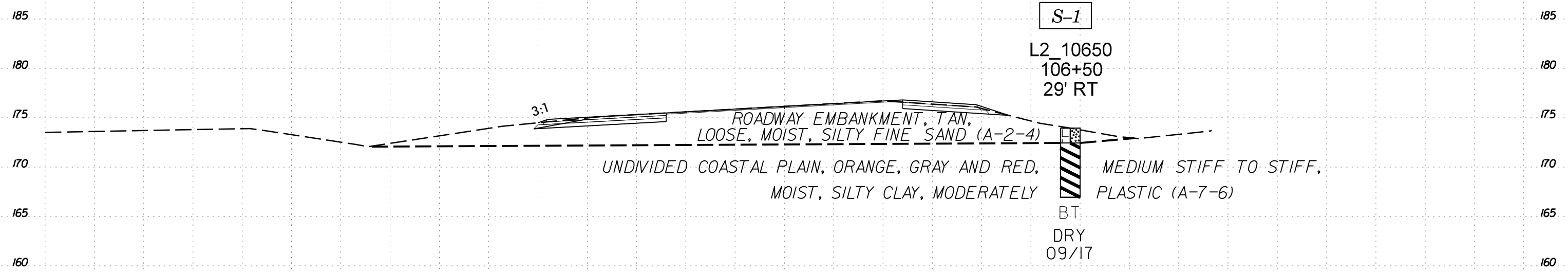


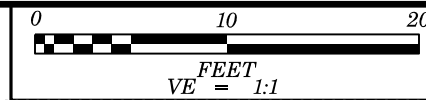


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250008	9

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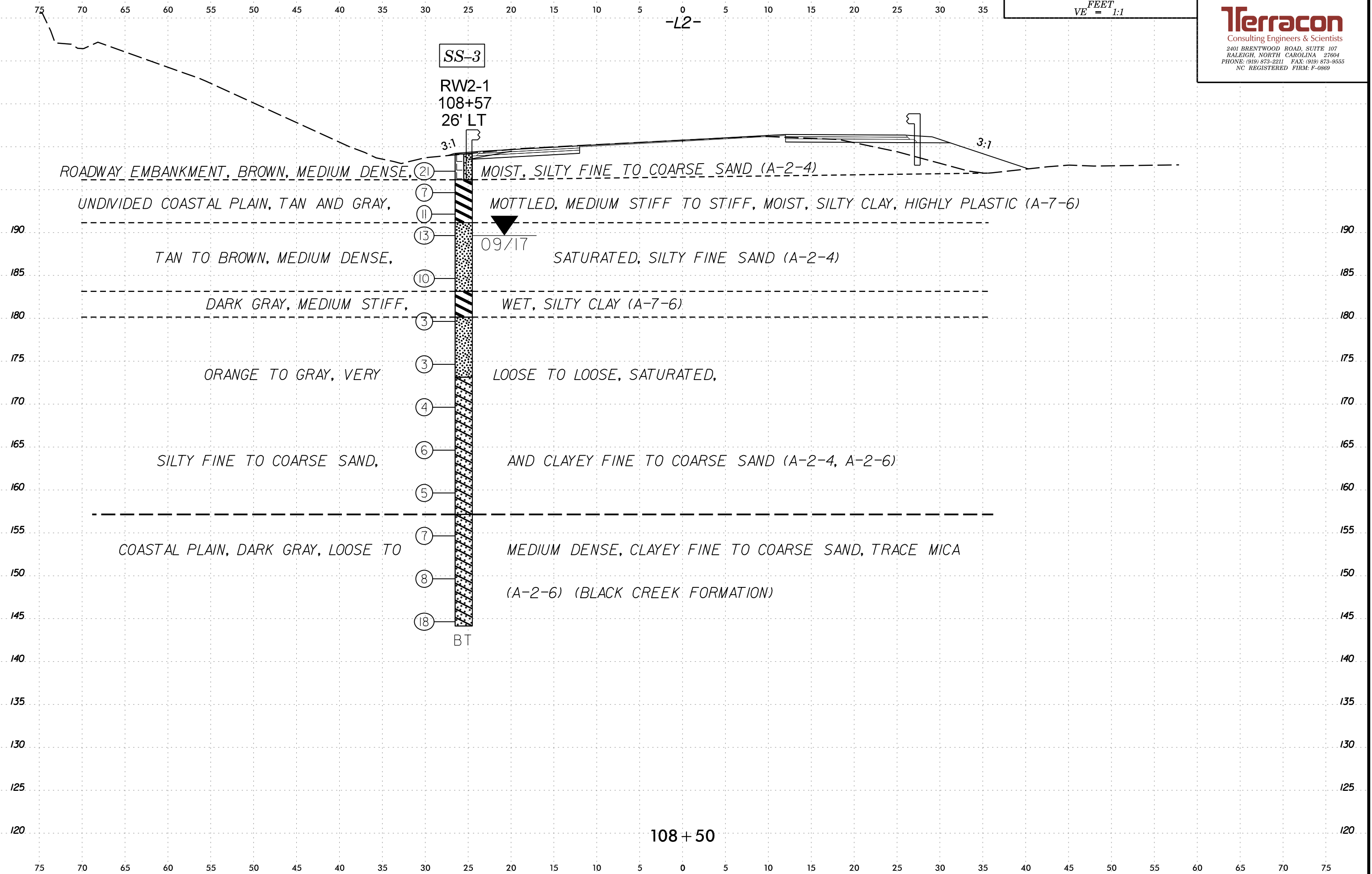
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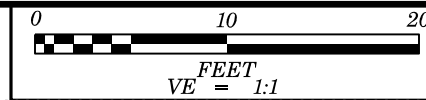




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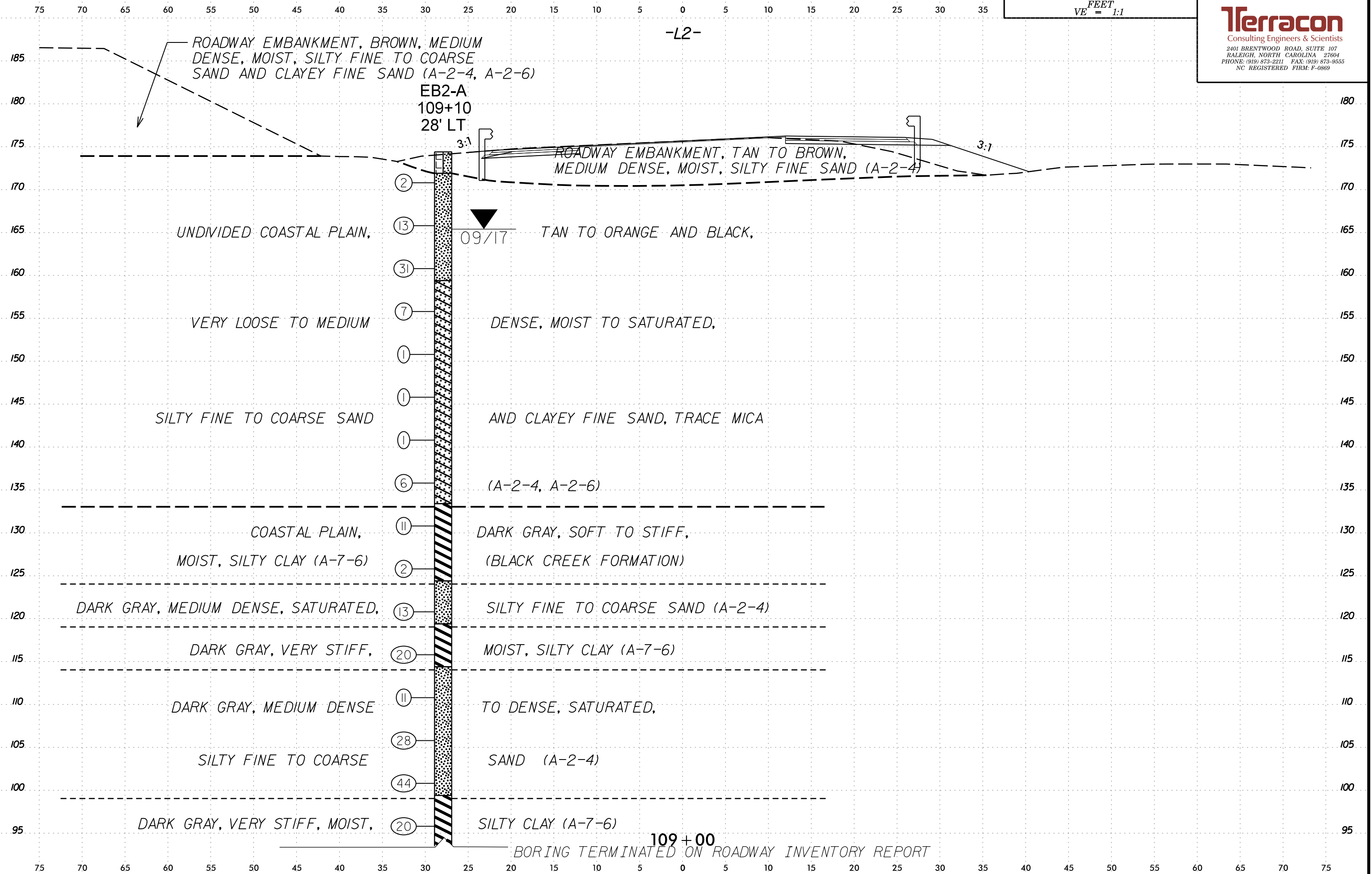




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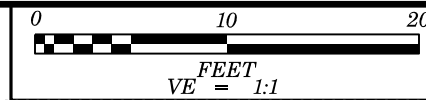


EB2-A
109+10
28' LT

09/17

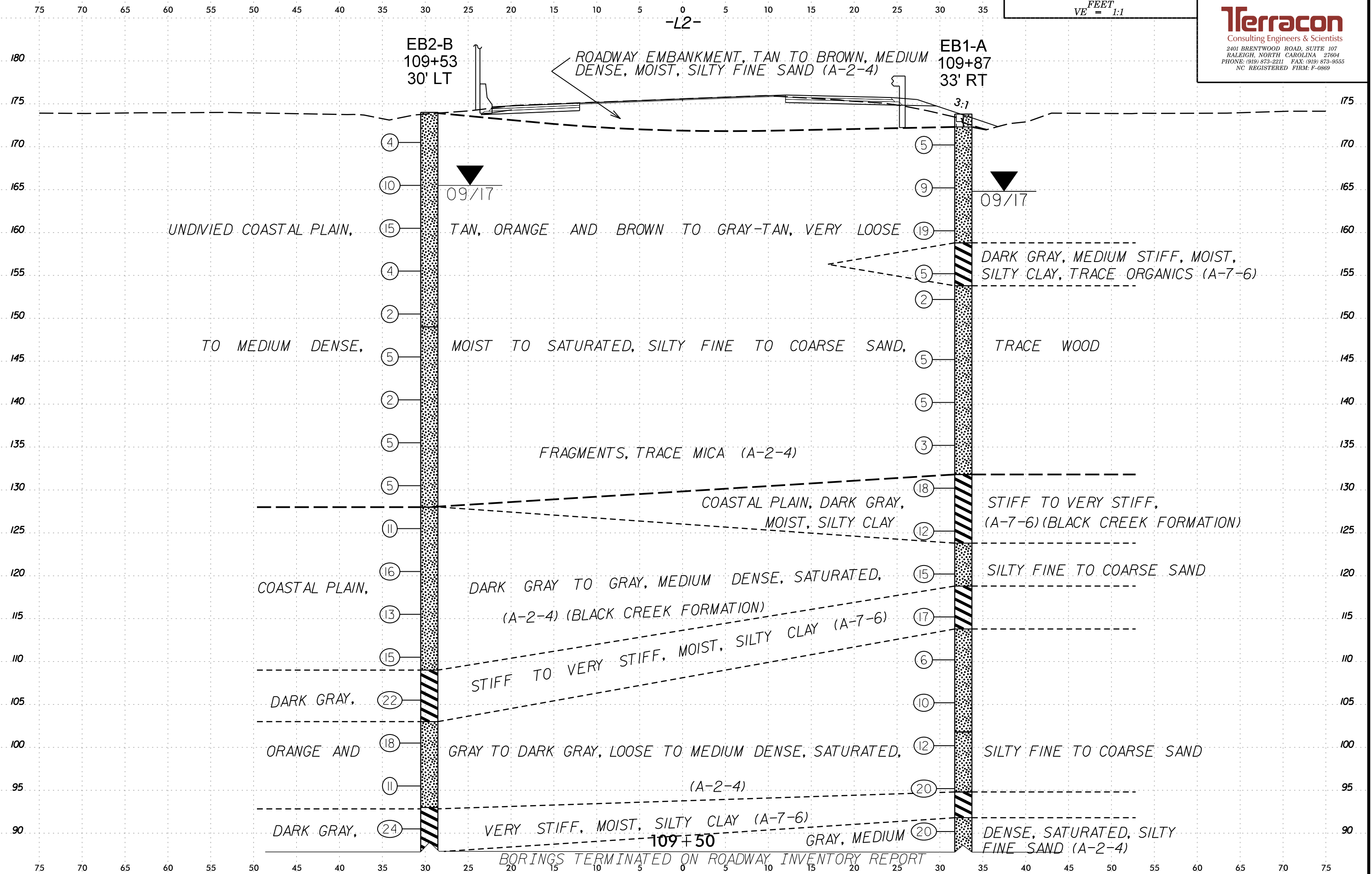
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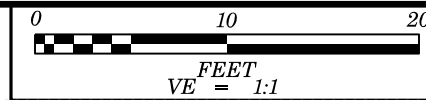
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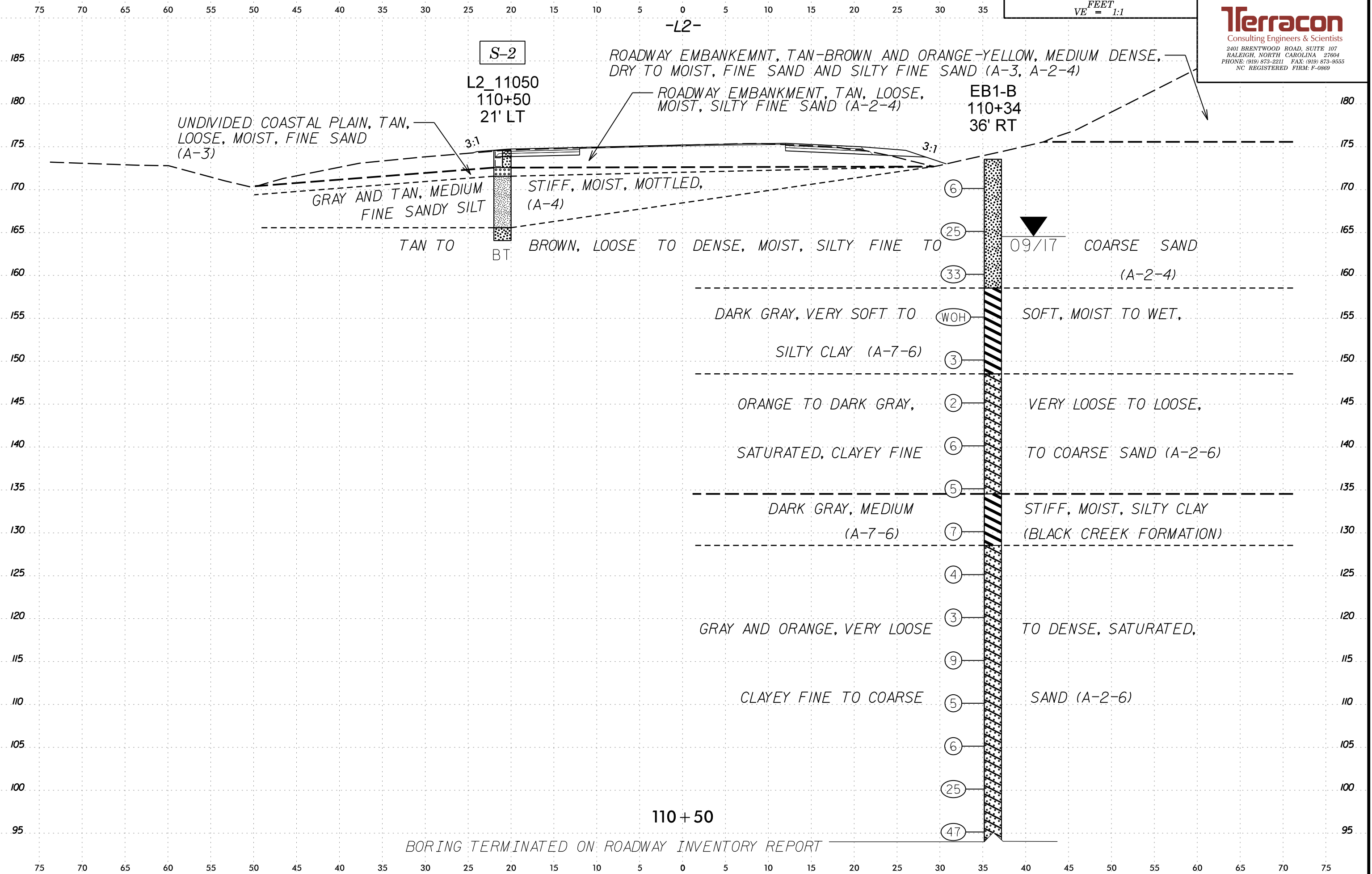
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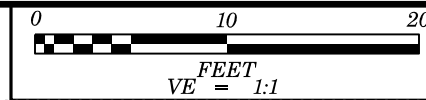
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110 + 50

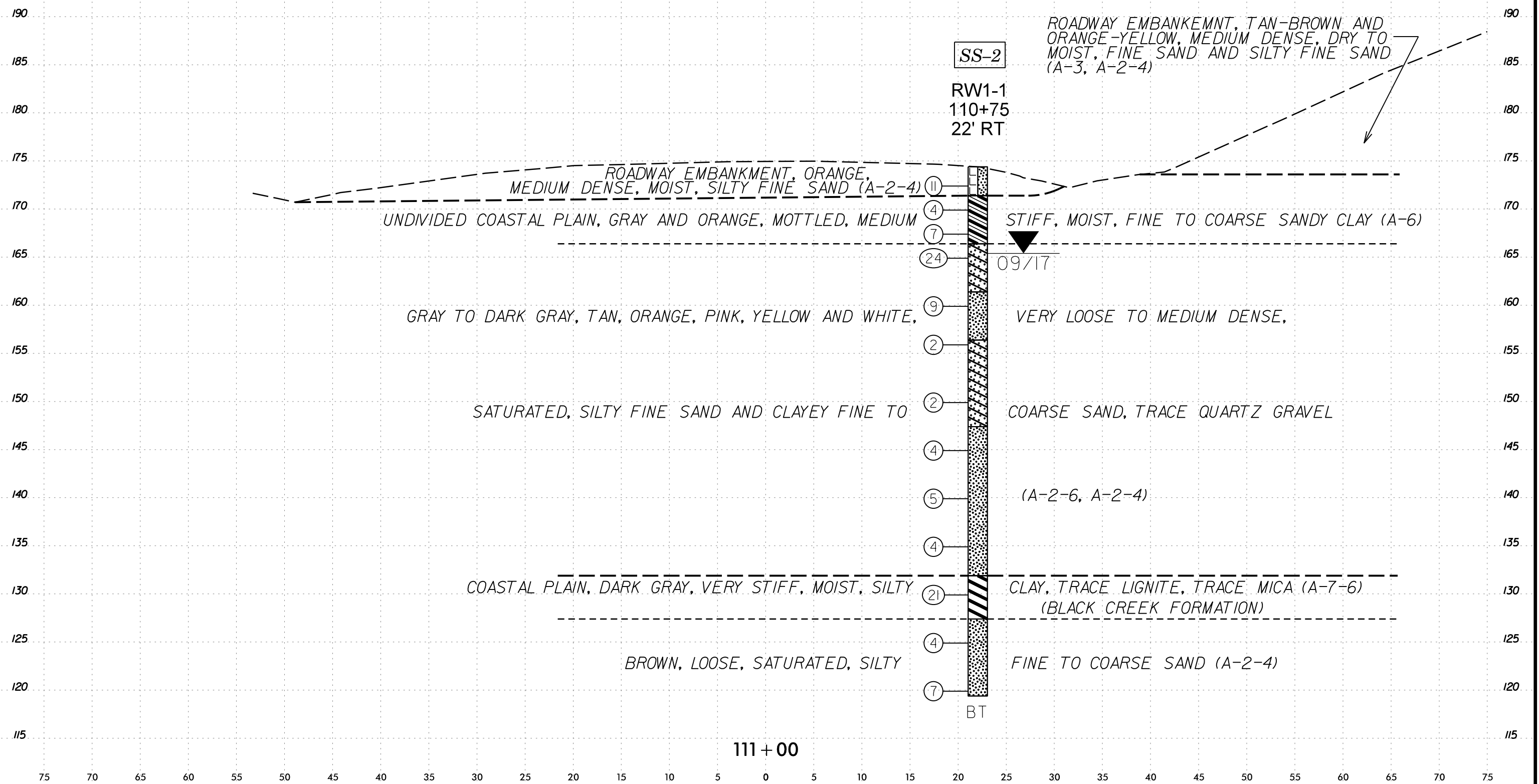
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-L2-



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	250008	15	16

REFERENCE: 250008

PROJECT: 41665.7A

APPENDIX A

PROJECT: 41665 REFERENCE: 250129 & 250130

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

**ROADWAY
SUBSURFACE INVESTIGATION**

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

INVENTORY

CONTENTS

LINE	STATION	PLAN
-L1-	102+50 TO 111+50	4
-L2-	102+50 TO 111+50	4
-Y-	10+85 TO 17+00	4

CROSS SECTIONS

LINE	STATION	SHEETS
-L1-	103+50, 105+50	5
-L1-	106+00	6
-L1-	107+50	7
-L1-	108+50, 110+00	8
-L2-	103+50, 105+50	5
-L2-	106+00	6
-L2-	107+50	7
-L2-	108+50, 110+00	8
-Y-	12+00, 13+00	9
-Y-	13+50	10
-Y-	14+00 TO 14+50	11
-Y-	15+00, 16+00	12

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY SUMMARY SHEET	14

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665	1	14

CAUTION NOTICE

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

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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

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PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: P-0869
NC REGISTERED GEOLOGIC FIRM: C-367



DocuSigned by:

Abner Riggs

11/9/2017

52280738BA4E482

SIGNATURE

DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

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 208, 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

Table with columns for General Class, Group Class, Symbol, % Passing #10, #40, #200, Material Passing #40 LL, PI, Group Index, Usual Types of Major Materials, Gen. Rating as Subgrade, and Soil Legend (Granular Materials, Silty-Clay Materials, Organic Materials).

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

Table showing percentages for Organic Material, Granular Soils, Silty-Clay Soils, and Other Material.

GROUND WATER

Water level in bore hole immediately after drilling
Static water level after 24 hours
Perched water, saturated zone, or water bearing strata
Spring or seep

MISCELLANEOUS SYMBOLS

Symbols for roadway embankment, soil symbol, artificial fill, inferred soil boundary, inferred rock line, alluvial soil boundary, dip and dip direction, test boring, auger boring, core boring, monitoring well, piezometer installation, slope indicator, cone penetrometer test, sounding rod, test boring with core, SPT N-value.

RECOMMENDATION SYMBOLS

Symbols for undercut, shallow undercut, unclassified excavation - unsuitable waste, unclassified excavation - acceptable degradable rock.

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, FRAGMENTS, HI. - HIGHLY, MED. - MEDIUM, MICA. - MICACEOUS, MOD. - MODERATELY, NP - NON PLASTIC, ORG. - ORGANIC, PMT - PRESSUREMETER TEST, SAP. - SAPROLITIC, SD. - SAND, SANDY, SL. - SILTY, SILTY, SLI. - SLIGHTLY, TCR - TRICONE REFUSAL, w - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST, WE. - WEATHERED, U - UNIT WEIGHT, D - DRY UNIT WEIGHT, 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, D-50 (TER373)
ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT, 3/4" HOLLOW STEM AUGER
HAMMER TYPE: 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:

Table with columns for Rock Type (Weathered Rock, Crystalline Rock, Non-Crystalline Rock, Coastal Plain Sedimentary Rock) and Description.

WEATHERING

FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (IV 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 (IV 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 GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT: CAN BE GROUDED 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 FINGER NAIL.

FRACTURE SPACING

Table mapping fracture spacing terms (Very Wide, Wide, Moderately Close, Close, Very Close) to spacing measurements (More than 10 feet, 3 to 10 feet, 1 to 3 feet, 0.16 to 1 foot, Less than 0.16 feet).

BEDDING

Table mapping bedding terms (Very thickly bedded, Thickly bedded, Thinly bedded, Very thinly bedded, Thickly laminated, Thinly laminated) to thickness measurements (4 feet, 1.5 - 4 feet, 0.16 - 1.5 feet, 0.03 - 0.16 feet, 0.008 - 0.03 feet, < 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 DISLOGGED 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 (ROD) - 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 (SROD) - 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.

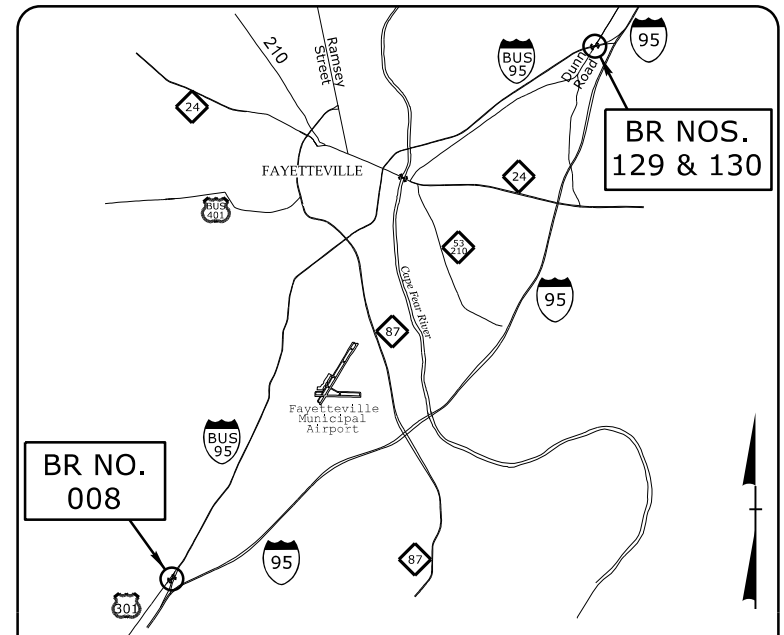
BENCH MARK: BY-2, N=486,477.58, E=2,062,458.96

ELEVATION: 120.92 FEET

NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLING
PROJECT WAS DRAFTED USING PROVIDED TIN FILE
FILE: 250129_Is_tin.tin (DATED: 12/21/2016)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BRIDGES 129 & 130	3	14
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
41665.7A		PE	

BRIDGES 129, & 130

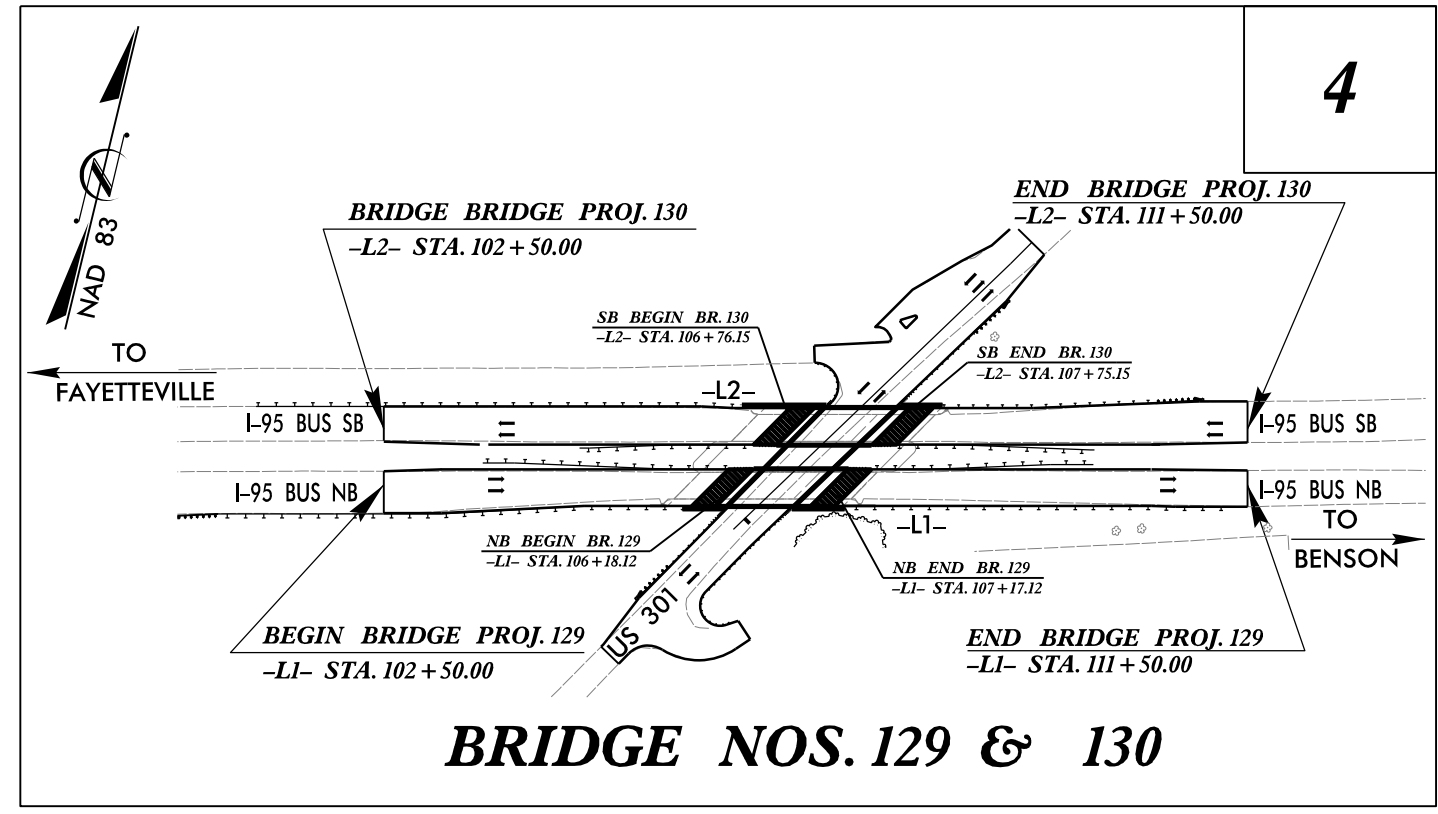


VICINITY MAP
NOT TO SCALE

25% PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
CUMBERLAND COUNTY

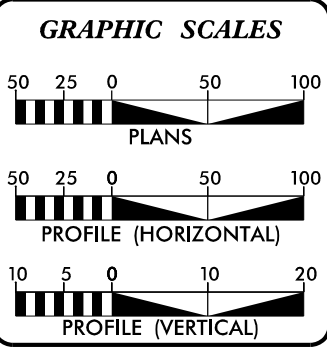
**LOCATION: BRIDGE NOS. 129 & 130 ON I-95 BUSINESS LOOP
OVER US 301 AND BRIDGE NO. 008 ON US 301
OVER I-95 BUSINESS LOOP SBL**
**TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURE,
SIGNING & TRAFFIC CONTROL**



BRIDGE NOS. 129 & 130

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

WBS: 41665.7A



DESIGN DATA

BRIDGE 008:
V = 40 MPH

BRIDGES 129 & 130
V = 60 MPH

* TTST = DUAL
FUNC CLASS =

INTERSTATE TIER

PROJECT LENGTH

TIP PROJECT BRIDGE 008:	
LENGTH ROADWAY	= 0.148 MI.
LENGTH STRUCTURE	= 0.019 MI.
TOTAL LENGTH OF PROJECT	= 0.167 MI.
TIP PROJECT BRIDGES 129 & 130:	
LENGTH ROADWAY (EACH)	= 0.135 MI.
LENGTH STRUCTURE (EACH)	= 0.035 MI.
TOTAL LENGTH OF PROJECT (EACH)	= 0.170 MI.

Prepared in the Office of:

vhb
940 Main Campus Drive, Suite 500
Raleigh, NC 27605
N.C. License No. C-31105

SUNGATE DESIGN GROUP, P.A.
100 SOUTH HARRIS STREET
RALEIGH, NC 27605
N.C. LICENSE NO. C-31105

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
N/A

LETTING DATE:
DECEMBER 12, 2017

TIM GOINS, PE
PROJECT ENGINEER

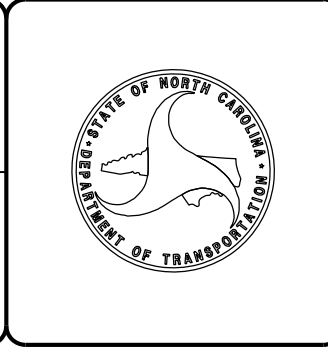
LIZ LAWES, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



09-NOV-2017 16:48 N:\Projects\2017\70175152\Cumberland.GEO_BRDG129_130\CADD_GEO_RDWY129_130_rdy_title01.dgn wdfields AT W8E-70013825



PROJECT REFERENCE NO.	SHEET NO.
250129 & 250130	3A

Date: November 2017
WBS Number: 41665.7A
TIP Number: N/A, (250129 & 250130)
County: Cumberland
Description: Bridge Nos.129 and 130 on I-95 Business Loop over US 301 (Dunn Road)

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located at the intersection of I-95 Business Loop over US 301 (Dunn Road), north of Fayetteville, near Eastover in Cumberland County, North Carolina. The project will consist of replacing the existing NBL (-L1-) and SBL (-L2-) bridges on I-95 Business Loop over US 301 (-Y-) with new single span bridges with MSE walls constructed at each abutment. The total length of the project is 0.17 miles. The alignments will stay near existing grades and pavements will be widened along the shoulders. Maximum fill heights for construction of the MSE walls at the approaches will be about 22 feet. The project corridor is in a rural setting with some limited commercial development.

The geotechnical subsurface investigation was performed in September of 2017. Standard penetration test (SPT) borings were advanced using a Diedrich D-50 rotary drill rig equipped with a recently calibrated automatic hammer. Borings were advanced utilizing wash boring and hollow stem auger drilling techniques to the necessary depths. Representative soil samples were collected in the field for visual classification and selected samples were submitted for laboratory analysis by Terracon's soil testing laboratory. Laboratory testing was performed in accordance with the AASHTO Soil Classification System.

The following alignments were investigated by soil testing and visual reconnaissance:

<u>Alignment</u>	<u>Stations</u>
-L1-	102+50 to 111+50
-L2-	102+50 to 111+50
-Y-	10+85 to 17+00

Physiography and Geology

The site is located within the Inner Coastal Plain Physiographic and Geologic Province of North Carolina in Cumberland County. The Coastal Plain Province is characterized by subdued topographic features. The existing natural grade elevations along the investigated corridor range from approximately 120 feet to 125 feet. In general, the topography at this site is slightly rolling with gentle slopes.

The geology of the Inner Coastal Plain Physiographic Province consists of a wedge of unconsolidated sands, silt, marl, and other clays interbedded with occasional limestone strata, which rests atop crystalline basement rocks. Based on previous mapping (N.C. Geologic Map 1985) and our knowledge of the local geology, the site falls within the Cretaceous Age Cape Fear Formation. However, based on our site visit and subsurface conditions encountered, the near surface soils appear to be recent Coastal Plain deposits of alluvial origin

and are consistent with interbedded sands, clayey sands and clays typical of Undivided Coastal Plain soils. These near surface soils overlie the Cape Fear Formation. The Cape Fear Formation consists of alternating beds of indurated sandstone and mudstone that are generally laterally continuous with some faint cross-bedding. Fine grained to pebble sized quartz are scattered though out the mudstone which grades to a silty clayey soil. Feldspar and mica are also common.

Soil Properties

Soils encountered during this investigation are separated into three categories based on their origin. The soils encountered consist of roadway embankment fill, Undivided Coastal Plain deposited soils and Formational soils.

Roadway Embankment soils were encountered at the following approximate locations:

<u>Alignment</u>	<u>Stations</u>
-L1-	102+50 to 111+50
-L2-	102+50 to 111+50
-Y-	10+85 to 17+00

Roadway embankment soils were encountered along the -L1- , -L2- and -Y- alignments at the beginning through the end of the roadway work limits. Approximately 17 to 18 feet of roadway embankment fill soils were encountered along the -L1- and -L2- alignments and at the approaches to the existing bridges. These soils consist of loose to medium dense, dry to moist, relatively clean to silty fine to coarse sands (A-1-b and A-2-4). The roadway embankment soils on the -Y- alignment appear to be reworked in-place Undivided Coastal Plain soils measuring up to about 6.5 feet thick beneath the ground surface and existing asphalt pavement sections. The roadway embankment soils along -Y- consist of loose to medium dense, dry to moist, relatively clean to silty fine to coarse sand (A-1-b and A-2-4).

Undivided Coastal Plain deposits are present at the surface and beneath the roadway embankment soils and asphalt pavement sections. The Undivided Coastal Plain soils consist of thickly bedded loose to very dense, moist to saturated, relatively clean to silty fine to coarse sands (A-1-b, A-3 and A-2-4) extending to the maximum depths of exploration or to the surface of the underlying Cape Fear Formation. The sandy soils are non-plastic and contain between 6 and 12 percent fines passing the No. 200 sieve.

Formational soils of the Cape Fear Formation were encountered in the deep borings at approximately elevations 103 to 107 feet. The soils in the Cape Fear Formation consist of gray, medium stiff to hard, moist, silty clay (A-7-6) with lenses of mudstone. N-values in the mudstone were as high as 100 blows per 0.4 feet of penetration. The plasticity indices of these soils range from 36 to 41.

Groundwater

In general, the corridor drains to unnamed jurisdictional streams that run south and east out of the corridor. Groundwater was not encountered within the 23 feet beneath the ground surface along the -L1- and -L2- alignments. Groundwater was encountered during drilling and sampling along the -Y- alignment at depths of about 6 to 7 feet below the existing ground surface. The depth of groundwater, beneath the ground surface,



PROJECT REFERENCE NO.	SHEET NO.
250129 & 250130	3B

will fluctuate with seasonal precipitation and may occur a higher levels at other times of the year and above less permeable near surface clayey soils.

BULK SAMPLES

No bulks samples were collected

UNDISTRUBED SAMPLES

No "Shelby" tube samples were taken.

Sincerely,
Terracon Consultants, Inc.



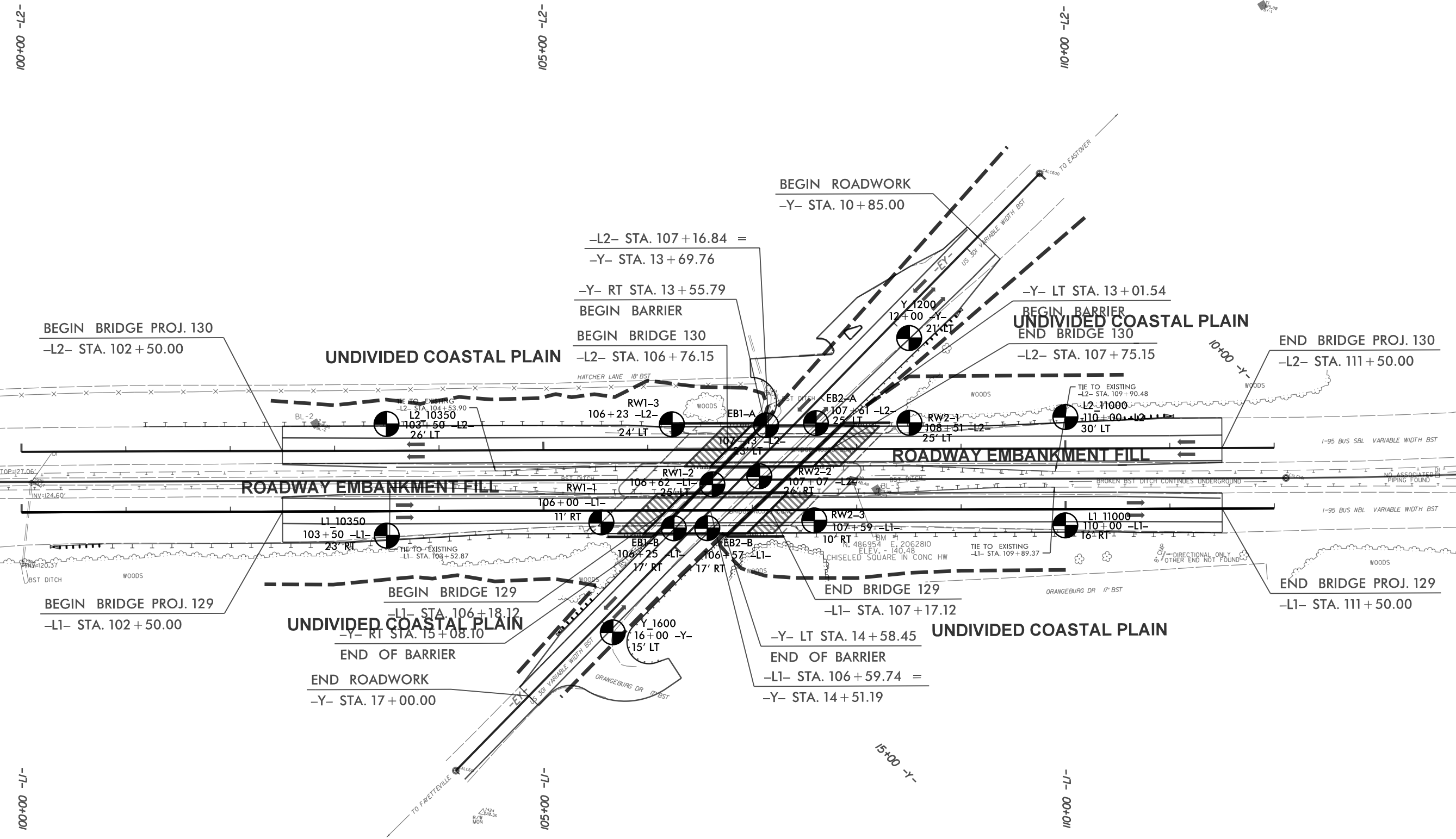
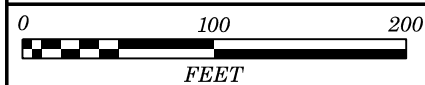
DocuSigned by:
Abner Riggs
5228073BB44F482...
11/9/2017

A handwritten signature in blue ink that reads "Abner F. Riggs, Jr.".

Abner F. Riggs, Jr., PE
Senior Geotechnical Engineer

A handwritten signature in black ink that reads "ANDREW NASH".

Andrew A. Nash, PE
Geotechnical Department Manager



100+00 -L2-

105+00 -L2-

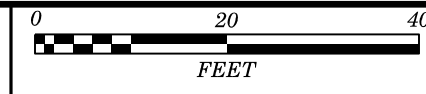
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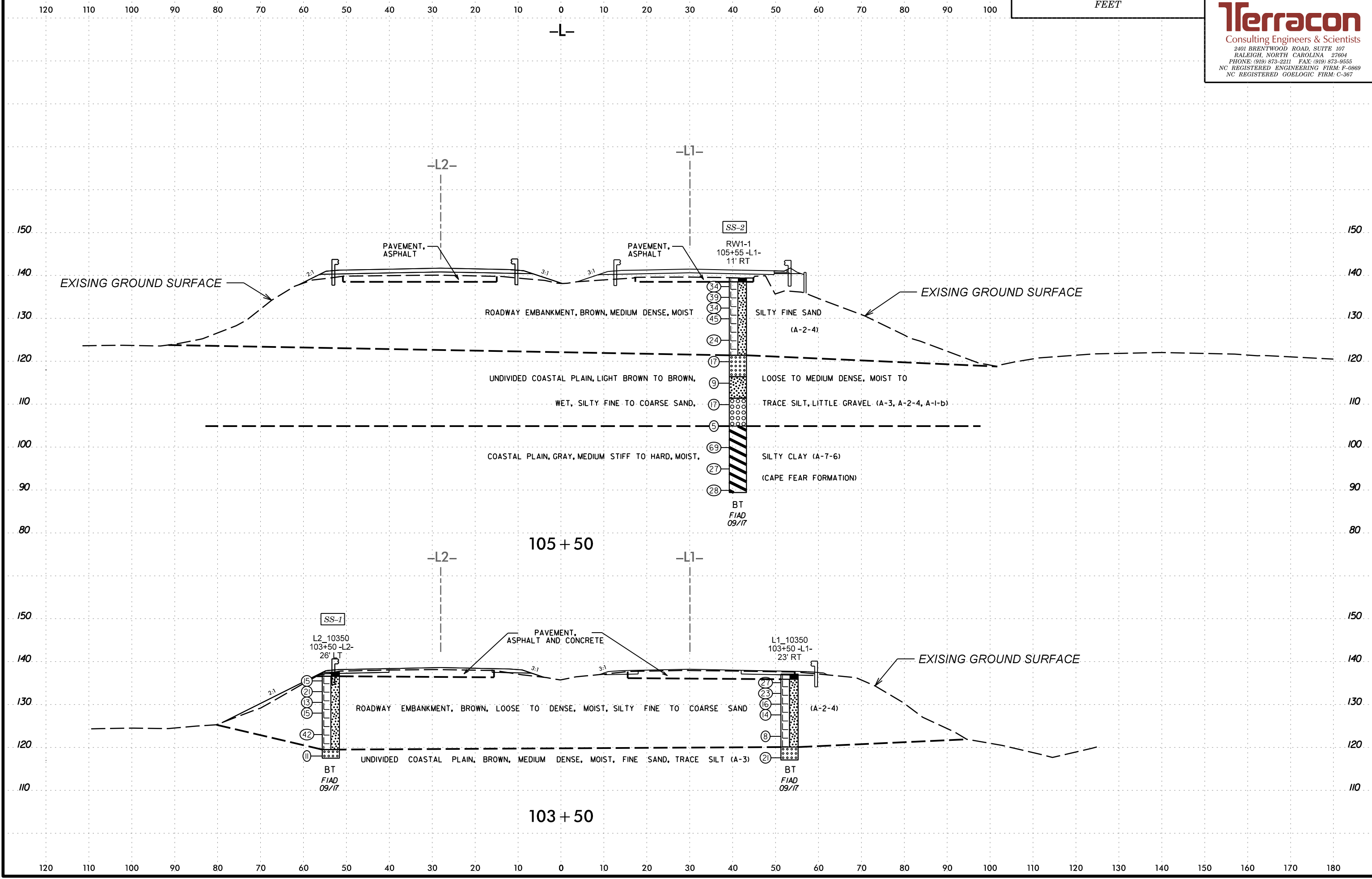
110+00 -L1-

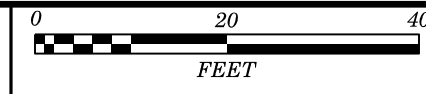
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PROJECT REFERENCE NO. 41665.7A	SHEET NO. 5
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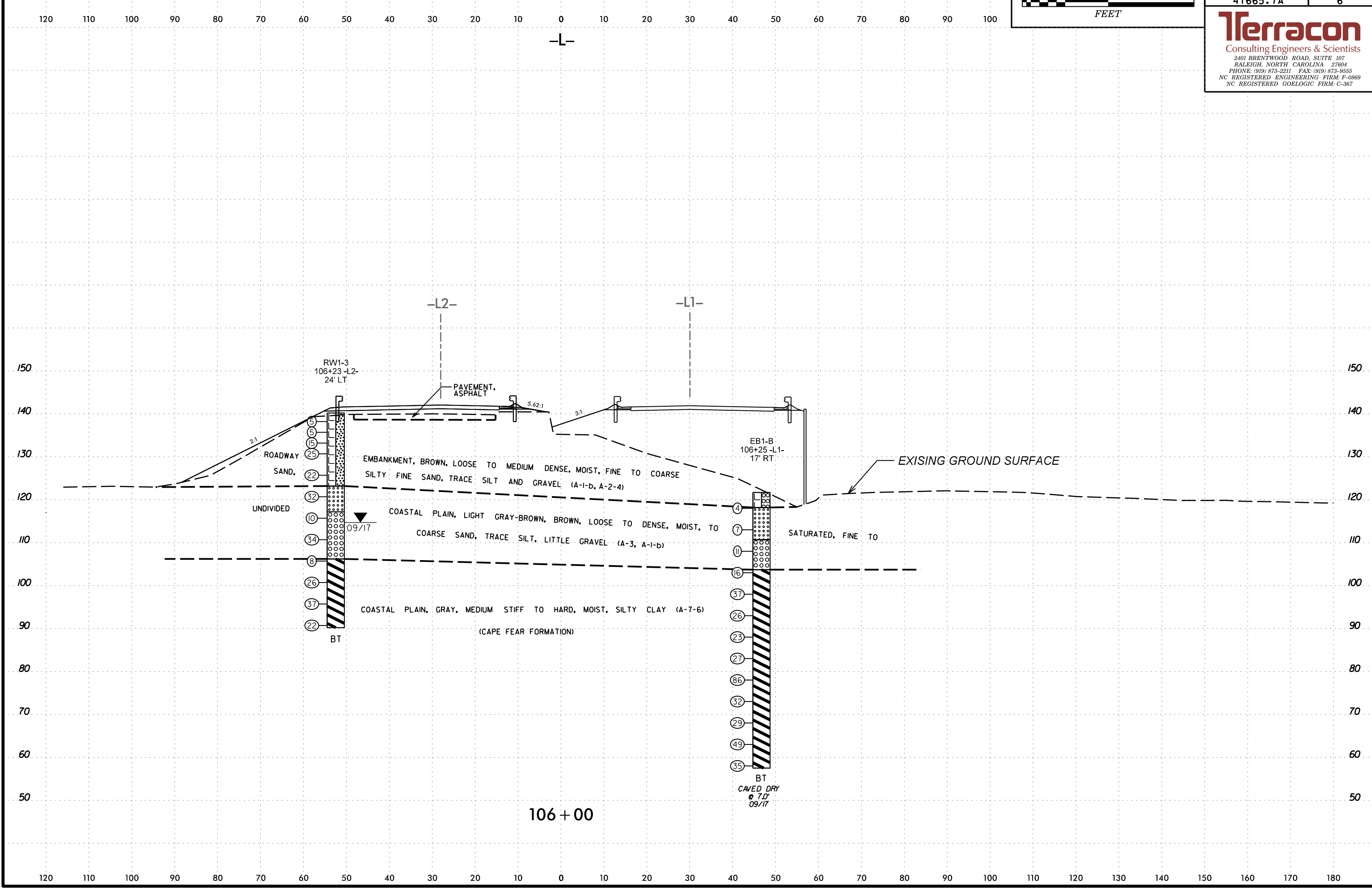
Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

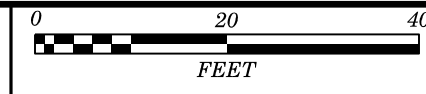




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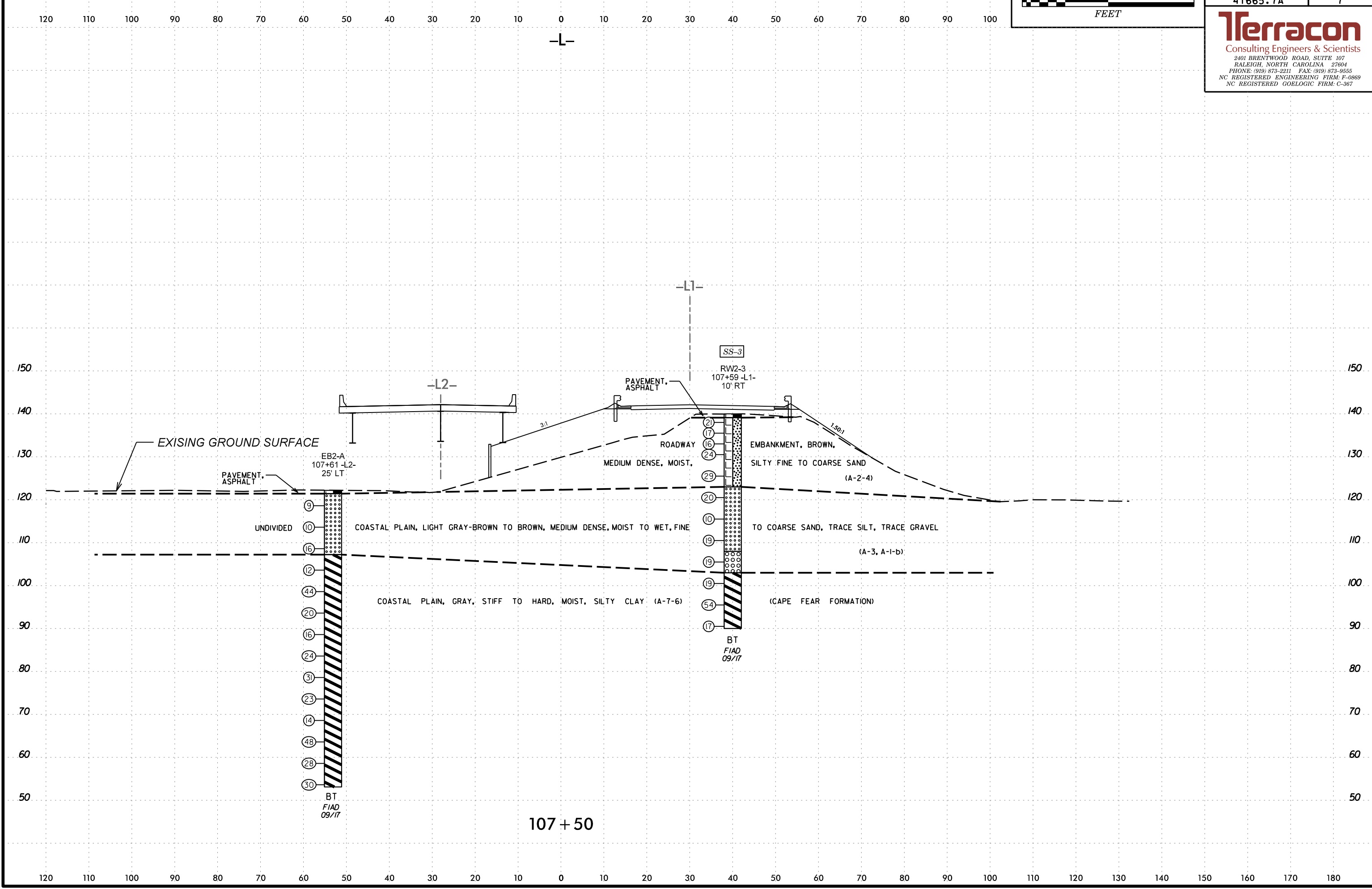
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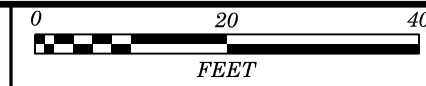


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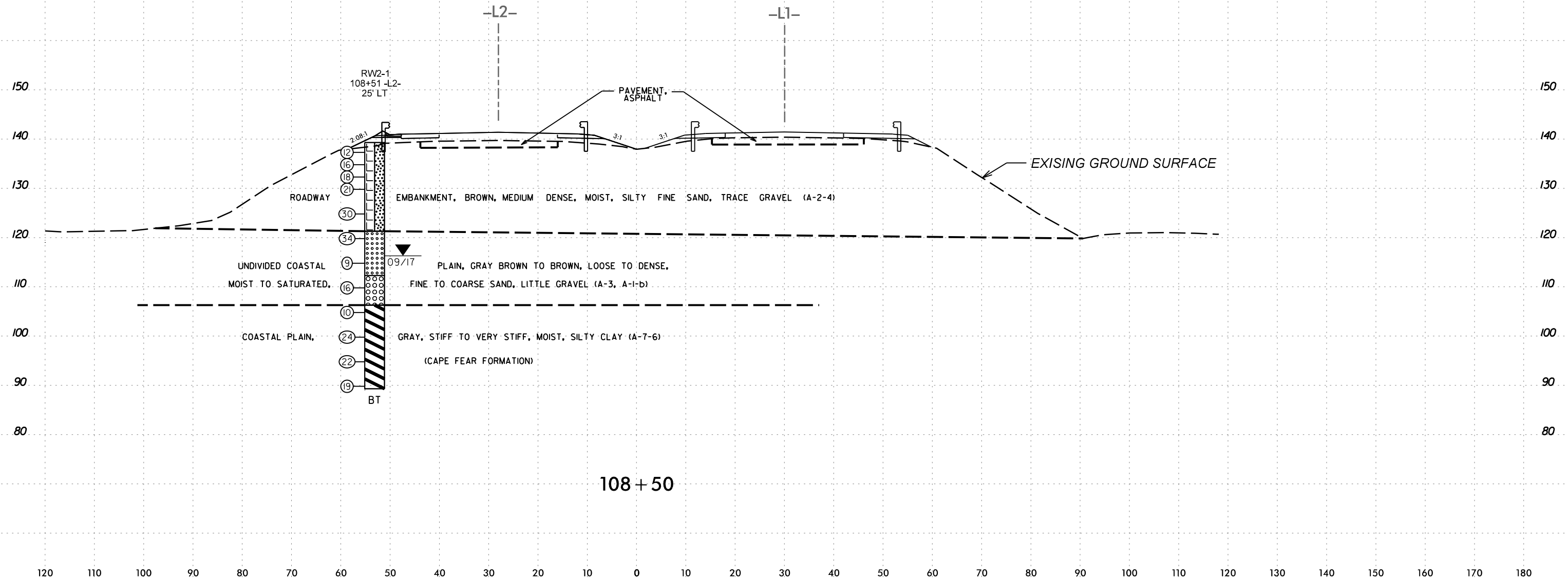
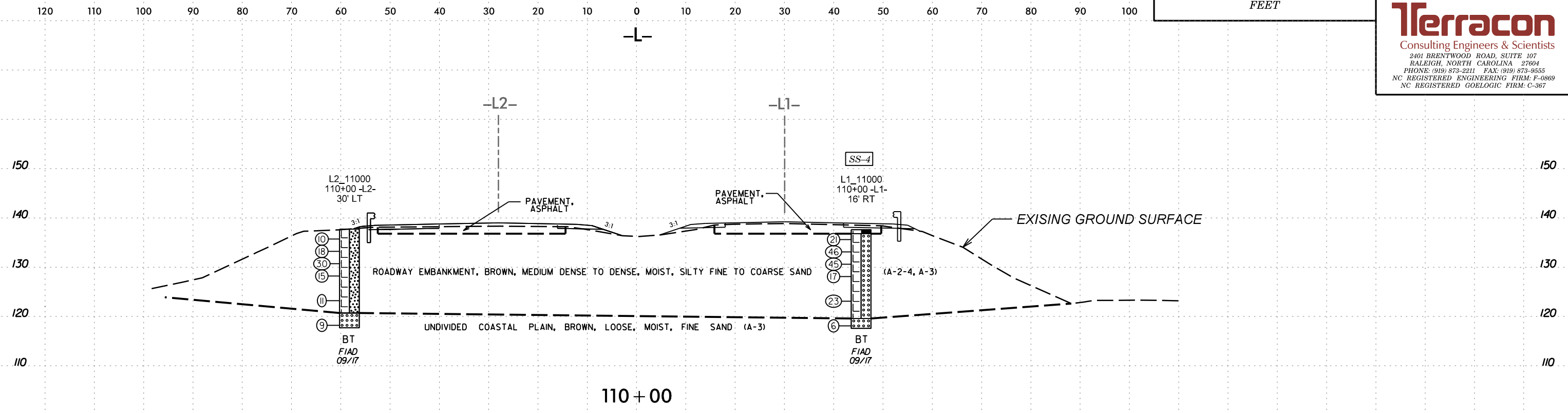


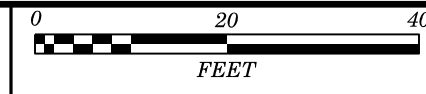
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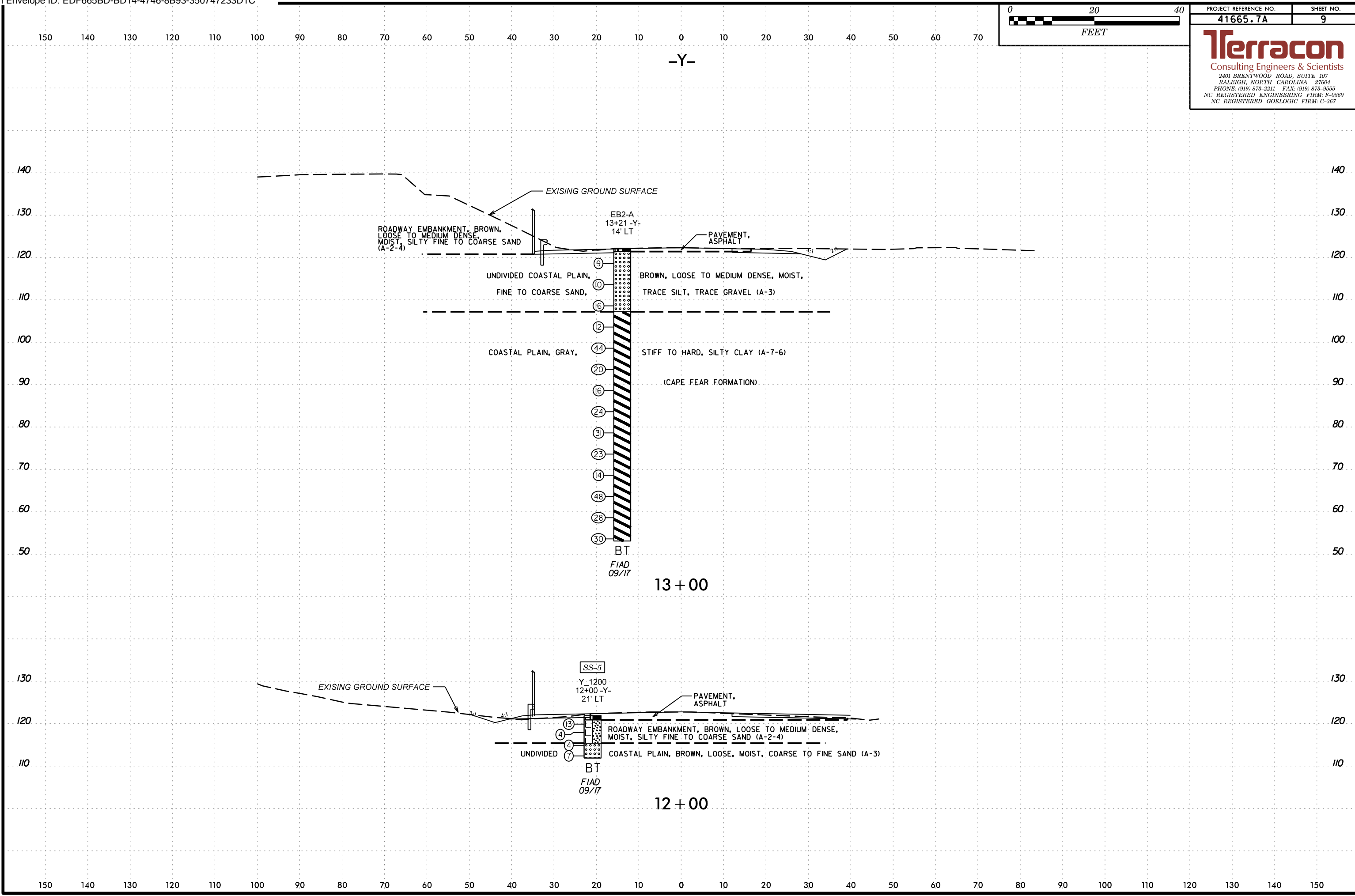
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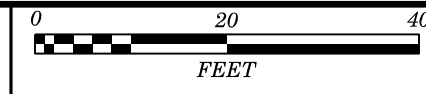




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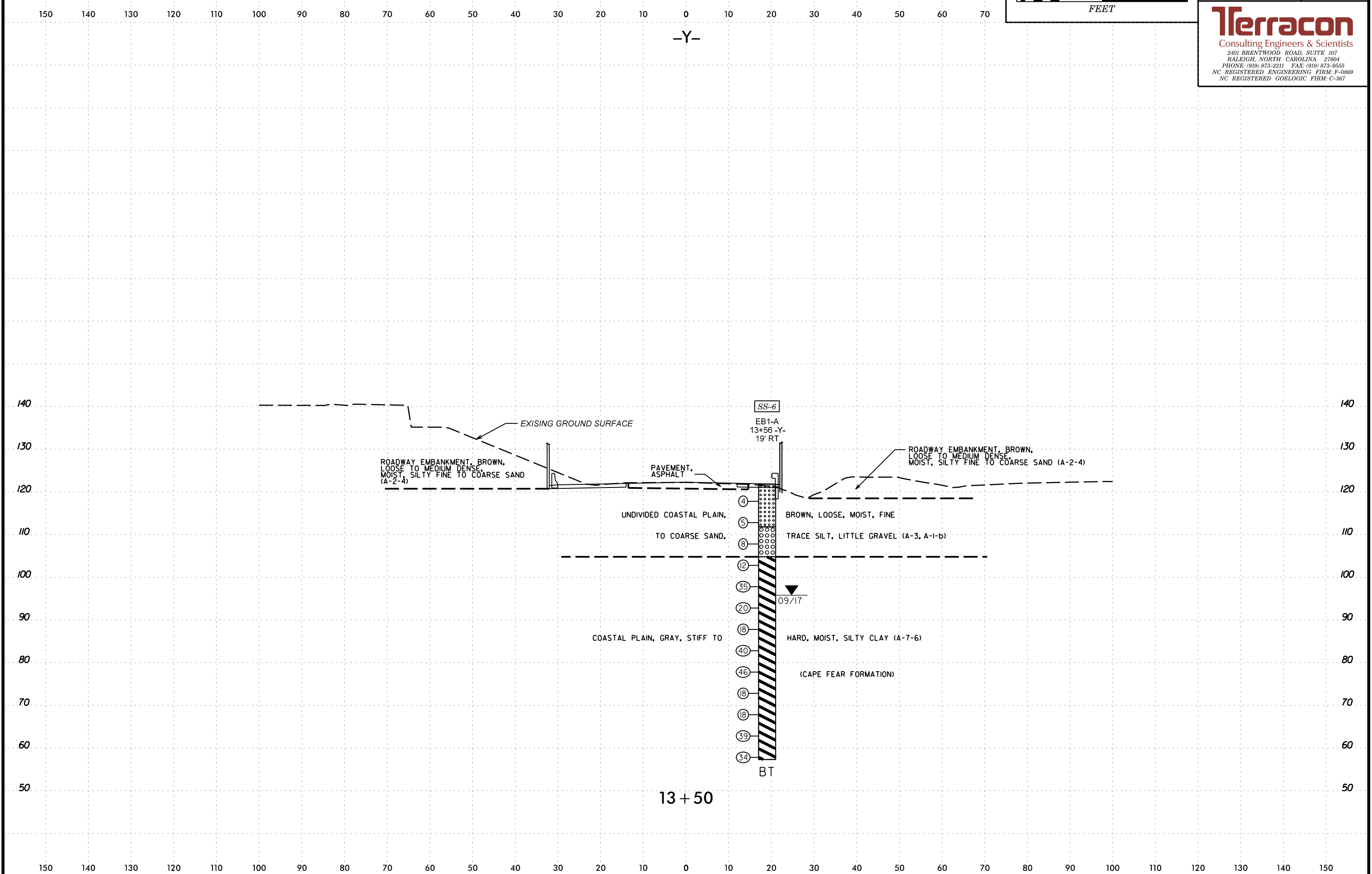
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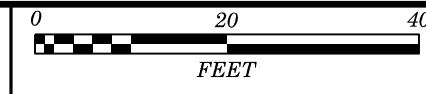




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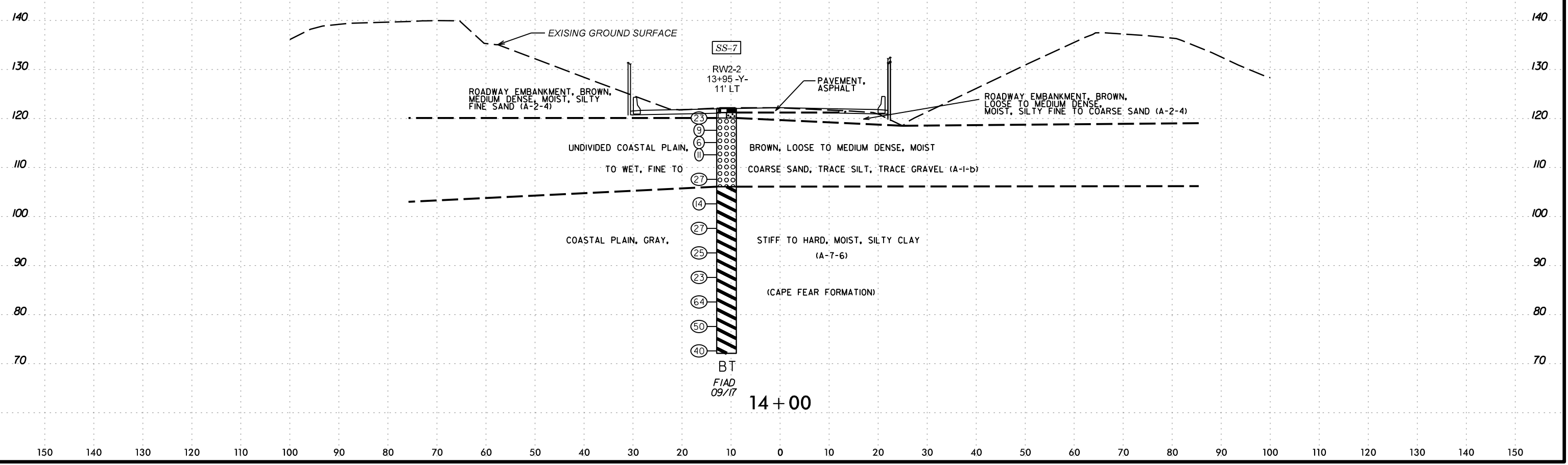
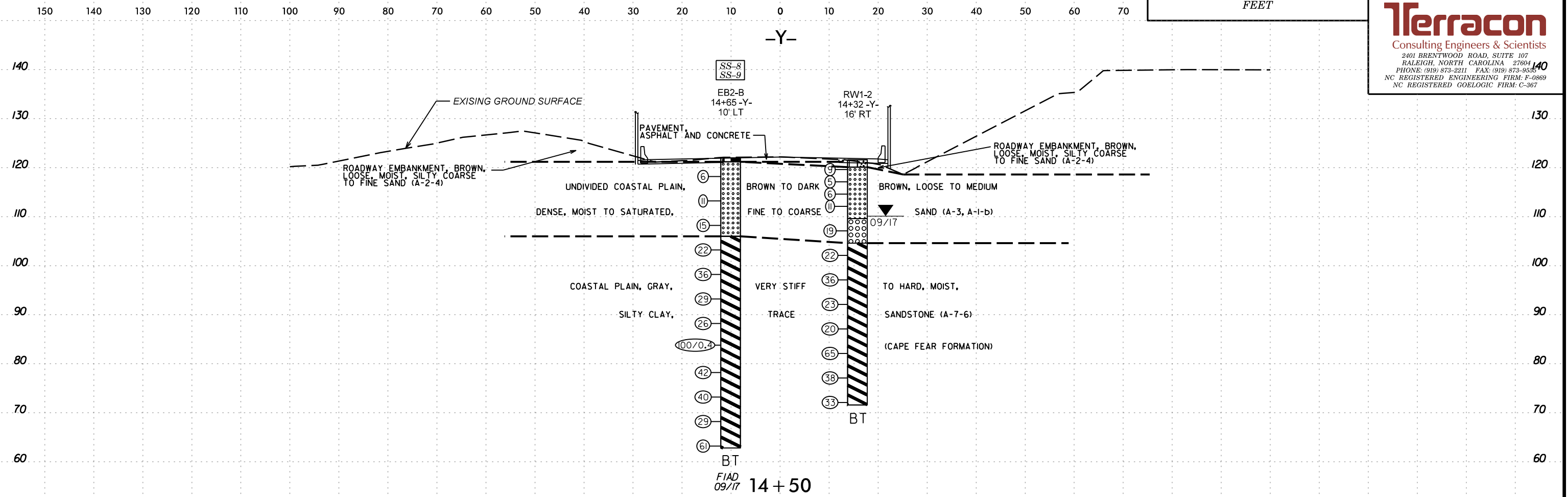
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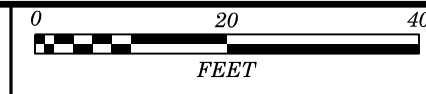




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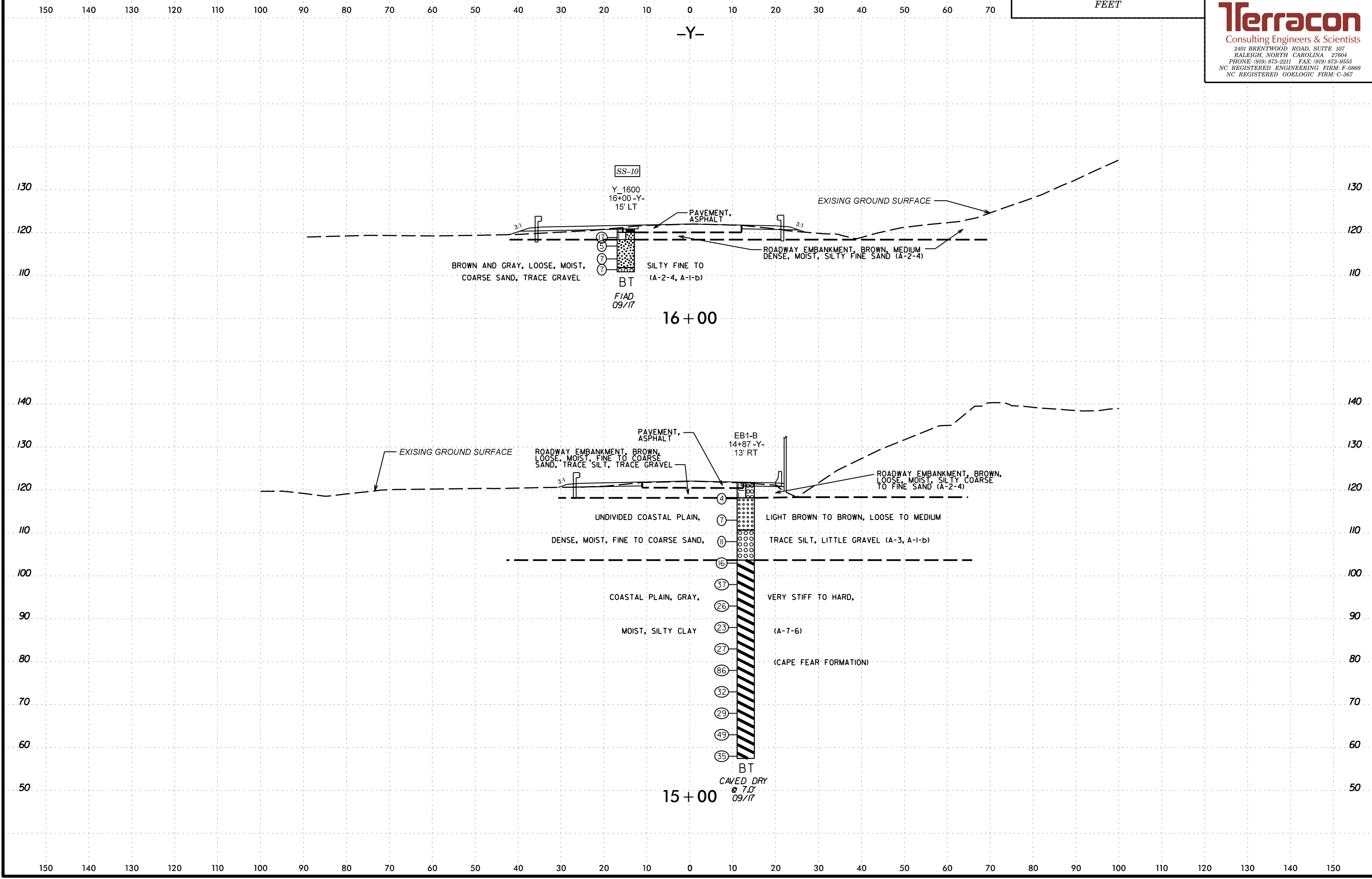
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NC REGISTERED GEOLOGIC FIRM: C-367





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NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



PROJECT: 41665.7A **REFERENCE: 250129 & 250130**

PROJECT REFERENCE NO.	SHEET NO.
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41665.7A	13
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Terracon
Consulting Engineers & Scientists
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APPENDIX A

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 41665.7A

TIP: 250129 & 250130

COUNTY: CUMBERLAND

DESCRIPTION: 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-1	-L2-	103+50	26' LT	3.5-5.0	A-2-4 (0)	15	NP	72.4	16.7	2.7	8.2	0	99	62	12	6.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-2	-L1-	105+61	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-3	-L1-	107+30	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
SS-4	-L1-	110+00	16' RT	3.5-5.0	A-3 (0)	13	NP	83.8	11.1	1.1	4.0	1	97	54	6	18.2	N/D	N/D	N/D	N/D	N/D	N/D
SS-5	-Y-	12+00	21' LT	3.5-5.0	A-2-4 (0)	14	NP	76.7	11.3	3.8	8.2	0	100	60	13	6.1	N/D	N/D	N/D	N/D	N/D	N/D
SS-6	-Y-	13+56	19' RT	18.0-19.5	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	-Y-	13+95	11' 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	-Y-	14+65	10' LT	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	-Y-	14+65	10' LT	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-10	-Y-	16+00	15' LT	3.5-5.0	A-2-4 (0)	14	NP	76.4	13.7	2.1	7.8	0	100	70	11	5.7	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