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REFERENCE: I-4700A

PROJECT: 36030

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	14700A 100069 & 100070	1	8

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	CROSS SECTIONS
6-8	BORELOGS

STRUCTURE  
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE  
PROJECT DESCRIPTION I-4700A TWIN BRIDGES ON I-26  
OVER GLENN BRIDGE RD.

SITE DESCRIPTION \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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 1919 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
- M. ARNOLD
  - S. WOODS
  - W. HAMRICK
  - N. CONSIGLI
  - S. DAVIS
  - J. HOYLE

INVESTIGATED BY DMM  
DRAWN BY DMM DS  
CHECKED BY JCK Jz  
SUBMITTED BY JCK  
DATE 9/20/2018



DocuSigned by:  
Matt Mullen 9/21/2018  
SIGNATURE DATE  
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DOCUMENT NOT CONSIDERED FINAL  
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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

Table with columns for GENERAL CLASS., GRANULAR MATERIALS (≤ 35% PASSING #200), SILT-CLAY MATERIALS (> 35% PASSING #200), ORGANIC MATERIALS, GROUP CLASS., SYMBOL, % PASSING #10 #40 #200, MATERIAL PASSING #40 LL PI, GROUP INDEX, USUAL TYPES OF MAJOR MATERIALS, GEN. RATING AS SUBGRADE, and SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER.

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

CONSISTENCY OR DENSENESS

Table with columns for PRIMARY SOIL TYPE, COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE), and RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²).

TEXTURE OR GRAIN SIZE

Table with columns for U.S. STD. SIEVE SIZE OPENING (MM), BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CS, SD.), FINE SAND (F SD.), SILT (SL.), and CLAY (CL.).

SOIL MOISTURE - CORRELATION OF TERMS

Table with columns for SOIL MOISTURE SCALE (ATTERBERG LIMITS), FIELD MOISTURE DESCRIPTION, and GUIDE FOR FIELD MOISTURE DESCRIPTION. Includes plasticity limits (LL, PL, OM, SL) and moisture conditions (SAT., WET - (W), MOIST - (M), DRY - (D)).

PLASTICITY

Table with columns for PLASTICITY INDEX (PI) and DRY STRENGTH, ranging from NON PLASTIC to HIGHLY PLASTIC.

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

Table with columns for ORGANIC MATERIAL, GRANULAR SOILS, SILT - CLAY SOILS, and OTHER MATERIAL. Includes percentages for TRACE OF ORGANIC MATTER, LITTLE ORGANIC MATTER, MODERATELY ORGANIC, and HIGHLY ORGANIC.

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

Diagrammatic symbols for 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.

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. - SILTY, SILTY, SLI. - SLIGHTLY, TCR - TRICONE REFUSAL, w - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST, WEA. - WEATHERED, UNIT WEIGHT, 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. 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. 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 WEATHERED ROCK (WR), CRYSTALLINE ROCK (CR), NON-CRYSTALLINE ROCK (NCR), COASTAL PLAIN SEDIMENTARY ROCK (CP).

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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT: CAN BE GROOVED 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 with columns for TERM, SPACING, and THICKNESS. Includes categories like VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE.

INDURATION

- 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

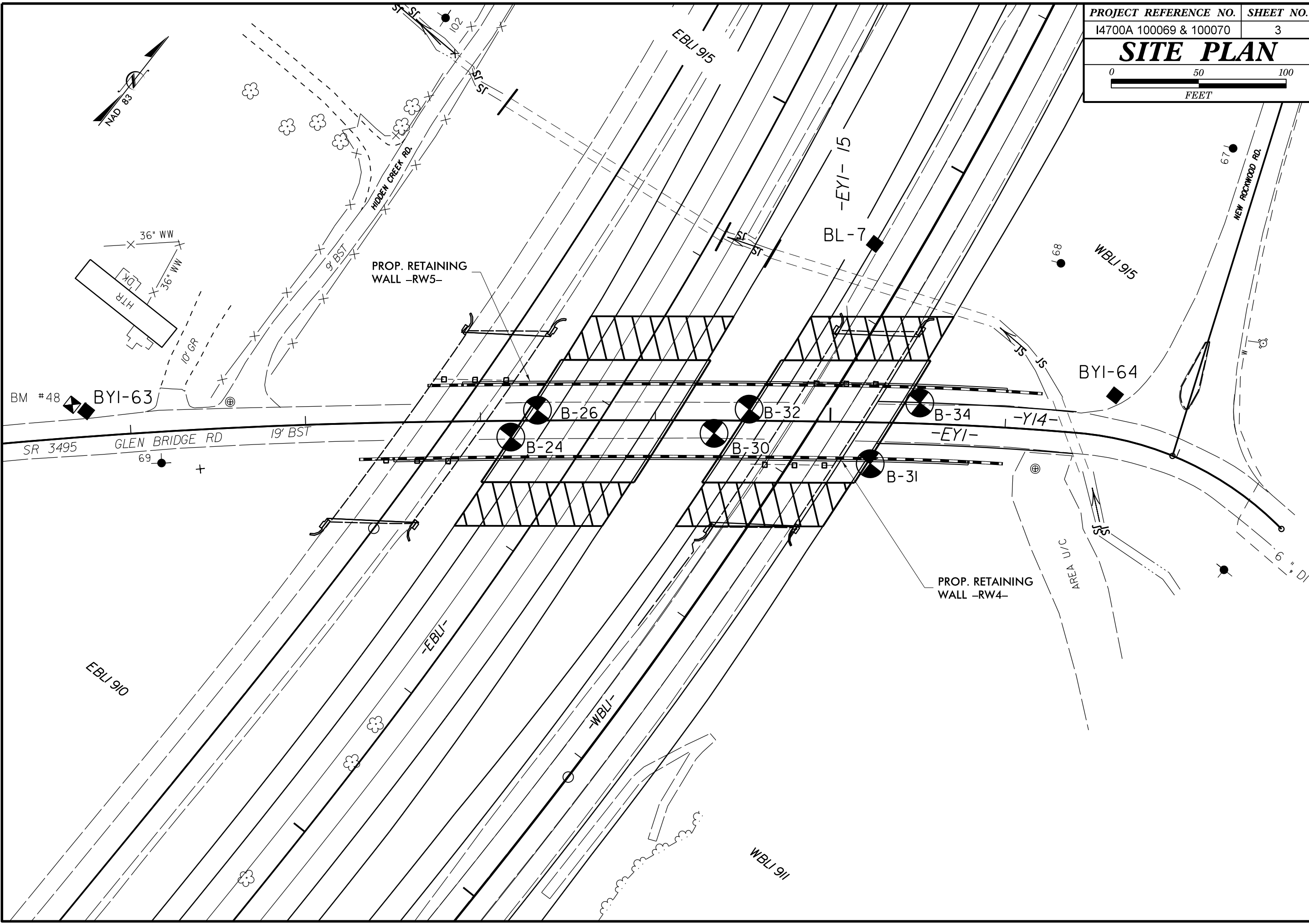
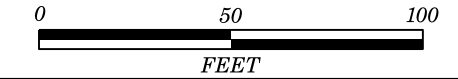
- ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION 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 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 (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: BL-8 N 640855.4117 E 945125.7609

ELEVATION: 2058.70 FEET

NOTES:

# SITE PLAN





6/23/16

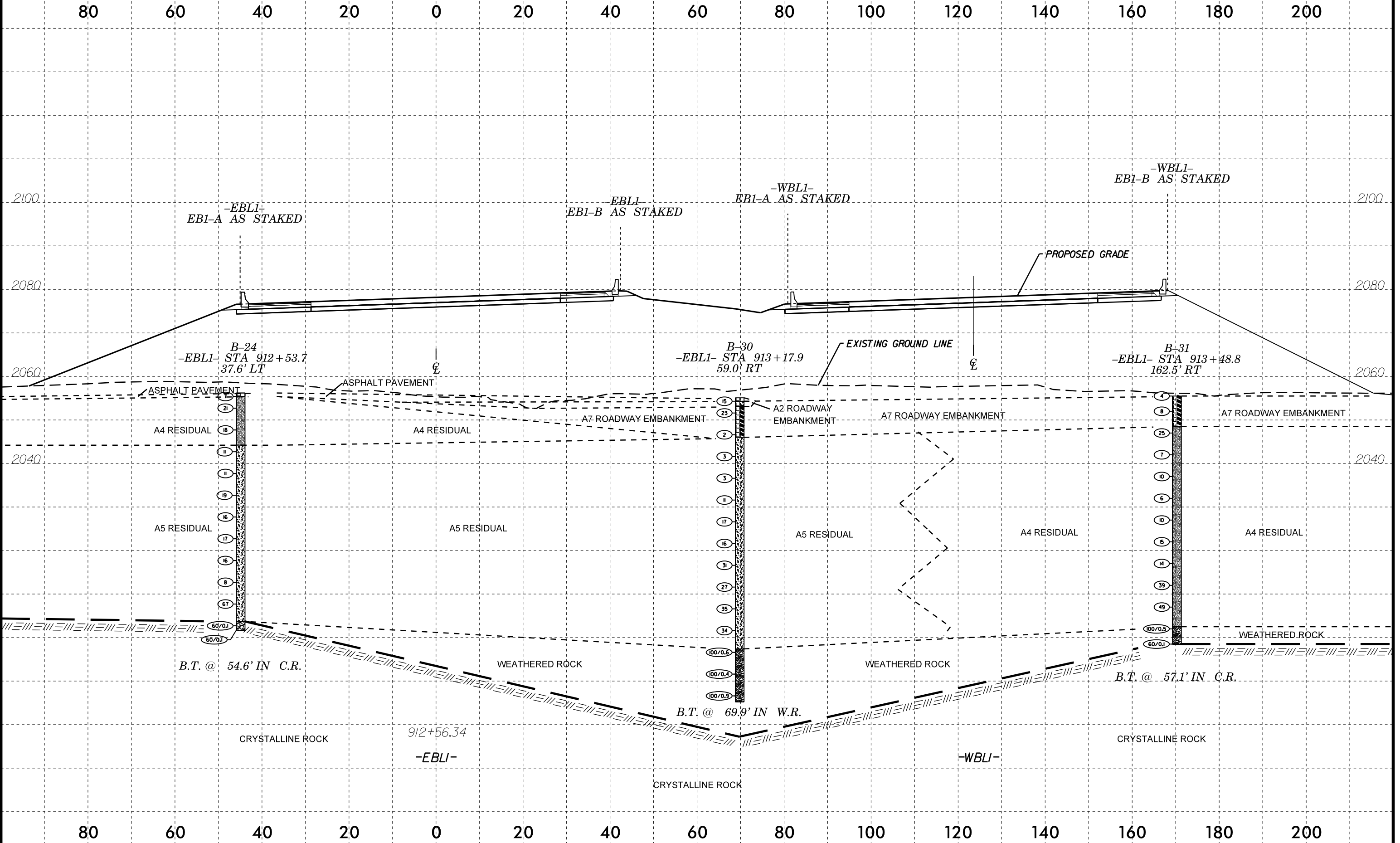
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PROJ. REFERENCE NO.  
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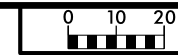
TWIN BRIDGES ON I-26 OVER GLENN BRIDGE RD.  
CROSS SECTION ALONG END BENT I



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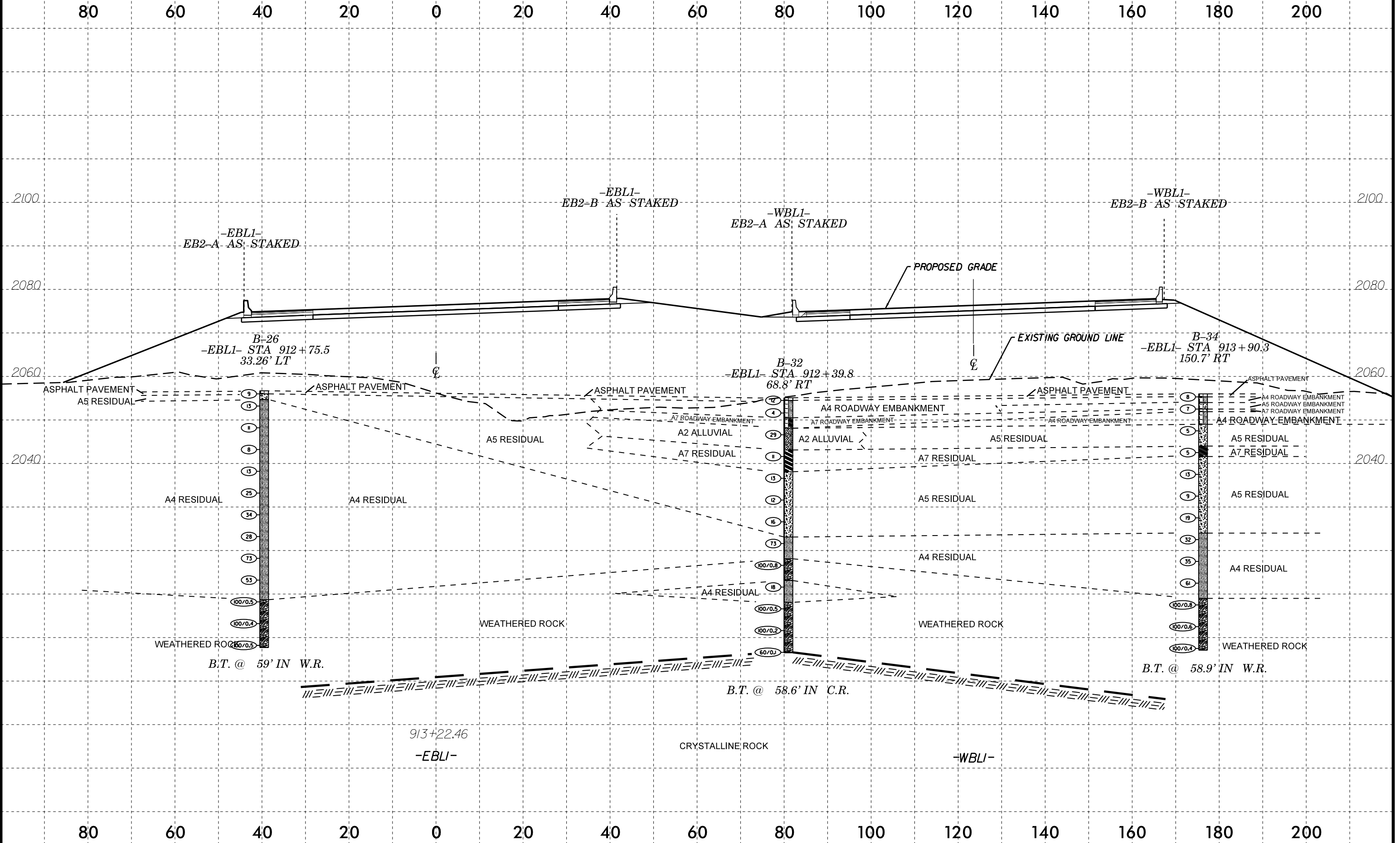
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PROJ. REFERENCE NO.  
14700A 100069

SHEET NO.  
5

TWIN BRIDGES ON I-26 OVER GLENN BRIDGE RD.  
CROSS SECTION ALONG END BENT 2



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# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS		TIP		COUNTY		GEOLOGIST										
36030.1.FS4		I-4700A		BUNCOMBE		M. Arnold										
<b>SITE DESCRIPTION</b> Twin bridges on I-26 over Glenn Bridge Rd.							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B-24		<b>STATION</b> 912+54		<b>OFFSET</b> 38 ft LT		<b>ALIGNMENT</b> -EBL1-										
2,056.2 ft		54.6 ft		639,983		945,213										
<b>COLLAR ELEV.</b>		<b>TOTAL DEPTH</b>		<b>NORTHING</b>		<b>EASTING</b>										
2,056.2 ft		54.6 ft		639,983		945,213										
<b>DRILL RIG/HAMMER EFF./DATE</b> F&R2175 CME-55 88% 02/11/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> S. Davis		<b>START DATE</b> 08/14/17		<b>COMP. DATE</b> 08/14/17		<b>SURFACE WATER DEPTH</b> N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,055.4	0.8	3	2	5											2,056.2 2,055.4
	2,052.7	3.5	6	11	10											
2050	2,047.7	8.5	6	9	9											
2045	2,042.7	13.5	5	6	5											2,044.2
2040	2,037.7	18.5	4	5	6											
2035	2,032.7	23.5	5	7	12											
2030	2,027.7	28.5	6	5	11											
2025	2,022.7	33.5	8	8	9											
2020	2,017.7	38.5	6	7	9											
2015	2,012.7	43.5	2	3	5											
2010	2,007.7	48.5	5	21	46											
2005	2,002.7	53.5														2,003.7
	2,001.7	54.5	60/0.1													2,001.6
			60/0.1													

WBS		TIP		COUNTY		GEOLOGIST										
36030.1.FS4		I-4700A		BUNCOMBE		W. Hamrick										
<b>SITE DESCRIPTION</b> Twin bridges on I-26 over Glenn Bridge Rd.							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B-26		<b>STATION</b> 912+75		<b>OFFSET</b> 33 ft LT		<b>ALIGNMENT</b> -EBL1-										
2,056.7 ft		59.0 ft		640,004		945,216										
<b>COLLAR ELEV.</b>		<b>TOTAL DEPTH</b>		<b>NORTHING</b>		<b>EASTING</b>										
2,056.7 ft		59.0 ft		640,004		945,216										
<b>DRILL RIG/HAMMER EFF./DATE</b> F&R3763 CME-550X 86% 1/30/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> J. Hoyle		<b>START DATE</b> 08/15/17		<b>COMP. DATE</b> 08/15/17		<b>SURFACE WATER DEPTH</b> N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,056.0	0.7	7	5	4											2,056.7 2,056.0 2,054.7
	2,053.2	3.5	6	7	6											
2050	2,048.2	8.5	3	5	6											
2045	2,043.2	13.5	4	3	5											
2040	2,038.2	18.5	3	6	7											
2035	2,033.2	23.5	6	8	17											
2030	2,028.2	28.5	7	13	21											
2025	2,023.2	33.5	7	11	17											
2020	2,018.2	38.5	12	27	46											
2015	2,013.2	43.5	21	27	26											
2010	2,008.2	48.5														2,008.7
2005	2,003.2	53.5														48.0
2000	1,998.2	58.5														59.0

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_BRDG\_100069.GPJ\_NC\_DOT\_GDT\_9/21/18

Notes:  
1. Auger refusal at 54.5'  
2. Boring FIAD due to location in roadway

Note:  
1. Boring FIAD due to location in roadway

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 36030.1.FS4		<b>TIP</b> I-4700A		<b>COUNTY</b> BUNCOMBE		<b>GEOLOGIST</b> M. Arnold										
<b>SITE DESCRIPTION</b> Twin bridges on I-26 over Glenn Bridge Rd.							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B-30		<b>STATION</b> 913+18		<b>OFFSET</b> 59 ft RT		<b>ALIGNMENT</b> -EBL1-	0 HR. 17.3									
<b>COLLAR ELEV.</b> 2,055.1 ft		<b>TOTAL DEPTH</b> 69.9 ft		<b>NORTHING</b> 640,056		<b>EASTING</b> 945,304	24 HR. FIAD									
<b>DRILL RIG/HAMMER EFF./DATE</b> F&R2175 CME-55 88% 02/11/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> S. Davis		<b>START DATE</b> 08/14/17		<b>COMP. DATE</b> 08/14/17		<b>SURFACE WATER DEPTH</b> N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2060																2,055.1 GROUND SURFACE 0.0
2055	2,054.3	0.8														2,054.3 ASPHALT 0.8
	2,051.6	3.5	7	9	6											2,053.1 ROADWAY EMBANKMENT 2.0
2050			4	9	14											Brown, Silty Fine to Coarse SAND (A-2-4)
	2,046.6	8.5	2	1	1											2,046.0 RED-BROWN, Silty CLAY (A-7) with Little Quartz Fragments 9.1
2045																<b>RESIDUAL</b>
	2,041.6	13.5	1	2	1											Gray-White-Brown, Clayey SILT (A-5) with Some Mica and Trace Rock Fragments
2040																
	2,036.6	18.5	2	1	2											
2035																
	2,031.6	23.5	3	4	7											
2030																
	2,026.6	28.5	5	9	8											
2025																
	2,021.6	33.5	6	8	8											
2020																
	2,016.6	38.5	8	18	13											
2015																
	2,011.6	43.5	9	8	19											
2010																
	2,006.6	48.5	8	14	21											
2005																
	2,001.6	53.5	7	12	22											
2000																
	1,996.6	58.5	55	45/0.1												100/0.6
1995																
	1,991.6	63.5	100/0.4													100/0.4
1990																
	1,986.6	68.5	14	25	75/0.4											100/0.9

<b>WBS</b> 36030.1.FS4		<b>TIP</b> I-4700A		<b>COUNTY</b> BUNCOMBE		<b>GEOLOGIST</b> W. Hamrick										
<b>SITE DESCRIPTION</b> Twin bridges on I-26 over Glenn Bridge Rd.							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B-31		<b>STATION</b> 913+49		<b>OFFSET</b> 163 ft RT		<b>ALIGNMENT</b> -EBL1-	0 HR. Dry									
<b>COLLAR ELEV.</b> 2,055.5 ft		<b>TOTAL DEPTH</b> 57.1 ft		<b>NORTHING</b> 640,098		<b>EASTING</b> 945,384	24 HR. Dry									
<b>DRILL RIG/HAMMER EFF./DATE</b> F&R3763 CME-550X 86% 1/30/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> J. Hoyle		<b>START DATE</b> 08/14/17		<b>COMP. DATE</b> 08/14/17		<b>SURFACE WATER DEPTH</b> N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2060																2,055.5 GROUND SURFACE 0.0
2055	2,055.5	0.0	2	2	2											2,055.5 ROADWAY EMBANKMENT 0.0
	2,052.0	3.5	3	5	3											Red-Brown, Silty CLAY (A-7) with Trace Mica
2050																
	2,047.0	8.5	5	13	18											2,048.5 RESIDUAL 7.0
2045																
	2,042.0	13.5	4	3	4											
2040																
	2,037.0	18.5	3	5	5											
2035																
	2,032.0	23.5	2	2	4											
2030																
	2,027.0	28.5	3	4	6											
2025																
	2,022.0	33.5	3	7	8											
2020																
	2,017.0	38.5	3	5	9											
2015																
	2,012.0	43.5	12	24	15											
2010																
	2,007.0	48.5	24	24	25											
2005																
	2,002.0	53.5	100/0.5													100/0.5
2000																
	1,998.5	57.0	60/0.1													60/0.1

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_BRDG\_100068.GPJ\_NC\_DOT\_GDT\_9/21/18

Note:  
 1. Boring FIAD due to location in roadway

Note:  
 1. Boring FIAD due to location in roadway

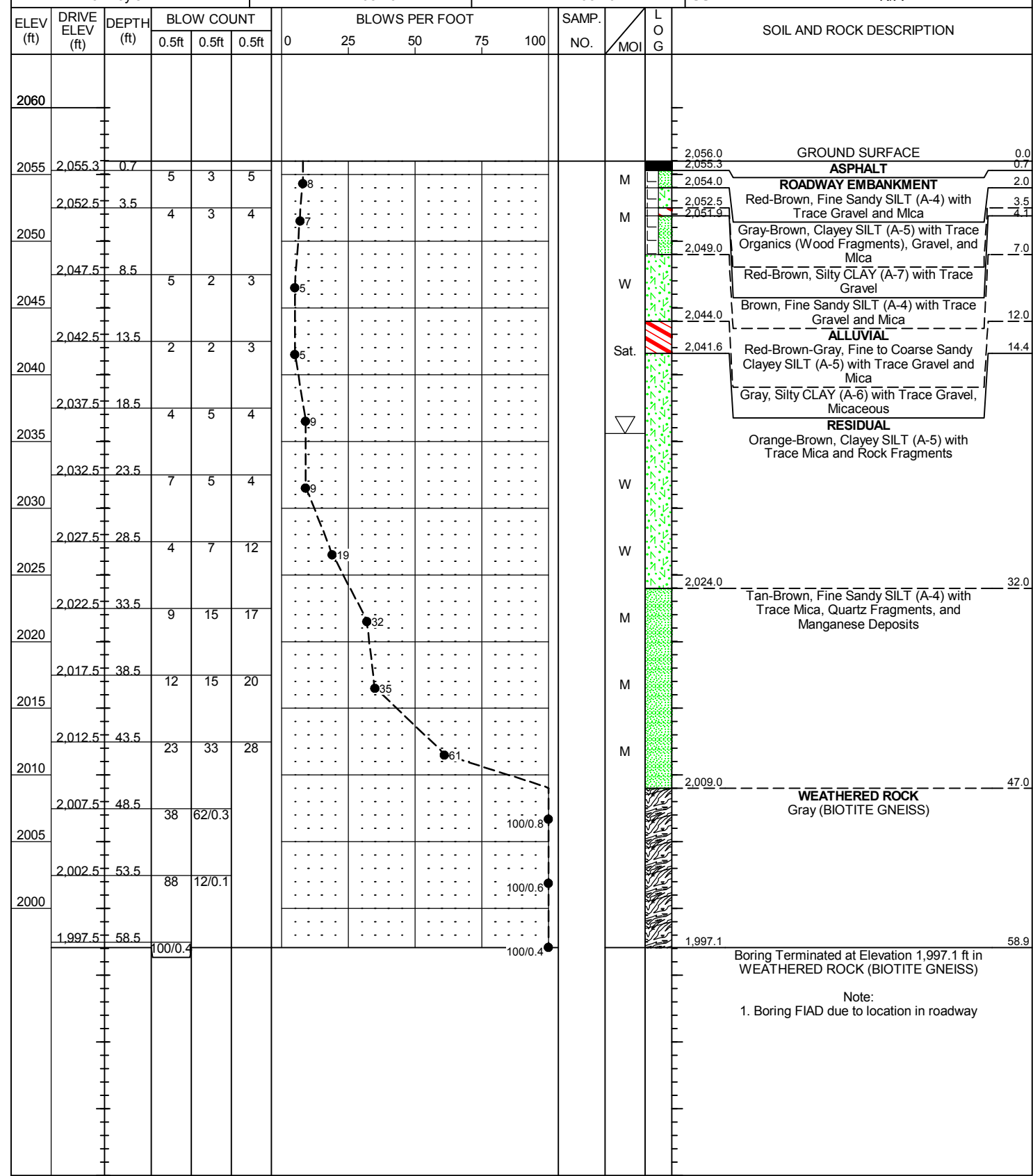
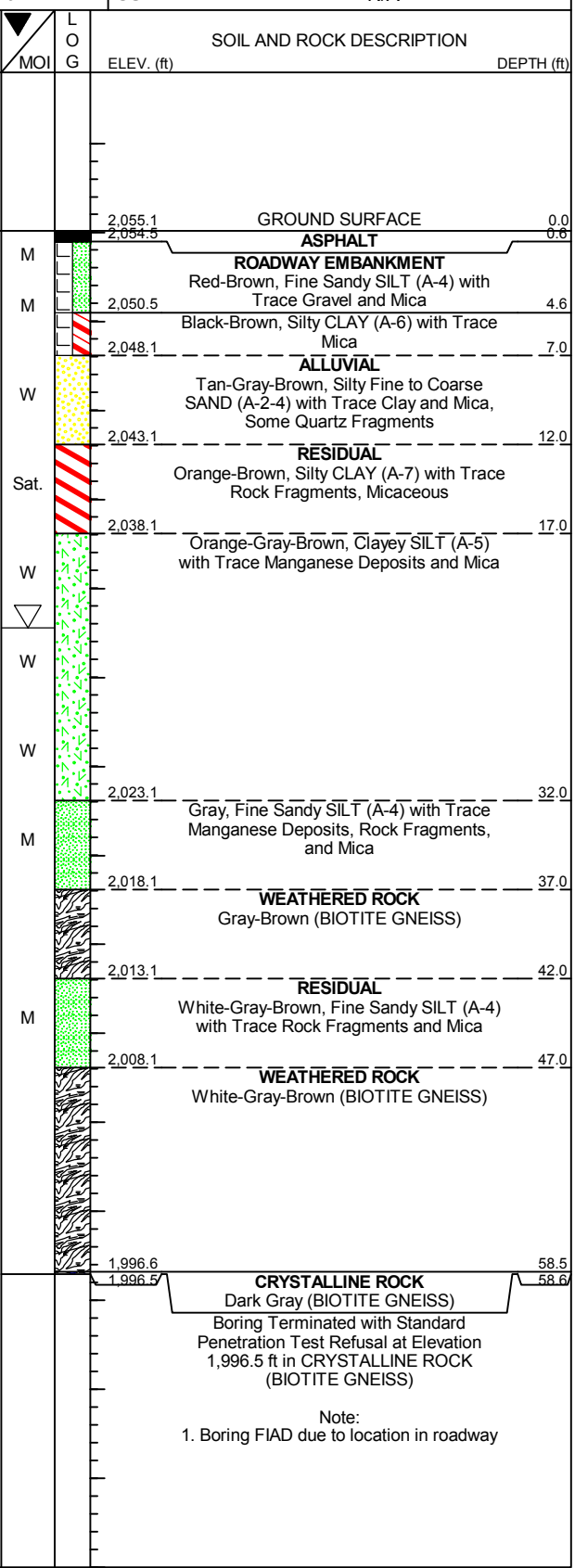
# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION Twin bridges on I-26 over Glenn Bridge Rd.							GROUND WTR (ft)									
BORING NO. B-32		STATION 912+40		OFFSET 69 ft RT		ALIGNMENT -EBL1-										
COLLAR ELEV. 2,055.1 ft		TOTAL DEPTH 58.6 ft		NORTHING 640,080		EASTING 945,311										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER J. Hoyle		START DATE 08/10/17		COMP. DATE 08/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,054.5	0.6	11	6	6											
2050	2,051.6	3.5	2	2	2											
2045	2,046.6	8.5	10	13	16											
2040	2,041.6	13.5	5	5	6											
2035	2,036.6	18.5	4	5	8											
2030	2,031.6	23.5	3	6	6											
2025	2,026.6	28.5	6	6	10											
2020	2,021.6	33.5	14	35	38											
2015	2,016.6	38.5	37	63/0.3												
2010	2,011.6	43.5	10	8	10											
2005	2,006.6	48.5	100/0.5													
2000	2,001.6	53.5	100/0.2													
	1,996.6	58.5	60/0.1													

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION Twin bridges on I-26 over Glenn Bridge Rd.							GROUND WTR (ft)									
BORING NO. B-34		STATION 913+90		OFFSET 151 ft RT		ALIGNMENT -EBL1-										
COLLAR ELEV. 2,056.0 ft		TOTAL DEPTH 58.9 ft		NORTHING 640,143		EASTING 945,385										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER J. Hoyle		START DATE 08/10/17		COMP. DATE 08/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,055.3	0.7	5	3	5											
2050	2,052.5	3.5	4	3	4											
2045	2,047.5	8.5	5	2	3											
2040	2,042.5	13.5	2	2	3											
2035	2,037.5	18.5	4	5	4											
2030	2,032.5	23.5	7	5	4											
2025	2,027.5	28.5	4	7	12											
2020	2,022.5	33.5	9	15	17											
2015	2,017.5	38.5	12	15	20											
2010	2,012.5	43.5	23	33	28											
2005	2,007.5	48.5	38	62/0.3												
2000	2,002.5	53.5	88	12/0.1												
	1,997.5	58.5	100/0.4													

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_BRDG\_100069.GPJ\_NC\_DOT\_GDT 9/21/18



Note:  
1. Boring FIAD due to location in roadway

REFERENCE: I-4700A

PROJECT: 36030

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION I-4700A I-26  
 \_\_\_\_\_  
 \_\_\_\_\_  
 SITE DESCRIPTION BRIDGE NO. 157 ON I-26 OVER BILTMORE  
FARMS ROAD

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-6	CROSS SECTIONS
7, 8	BORE LOGS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A 36030	1	8

**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**

F&R CONSULTANTS

D. RACEY

M. ARNOLD

S. DAVIS

NCDOT GEU

J. KUHNE

INVESTIGATED BY J. KUHNE

DRAWN BY \_\_\_\_\_

CHECKED BY DM MULLEN

SUBMITTED BY J. KUHNE

DATE \_\_\_\_\_



DocuSigned by:  
Jody C. Kuhne  
 4F9C0668A1BC400...

10/29/2018

SIGNATURE

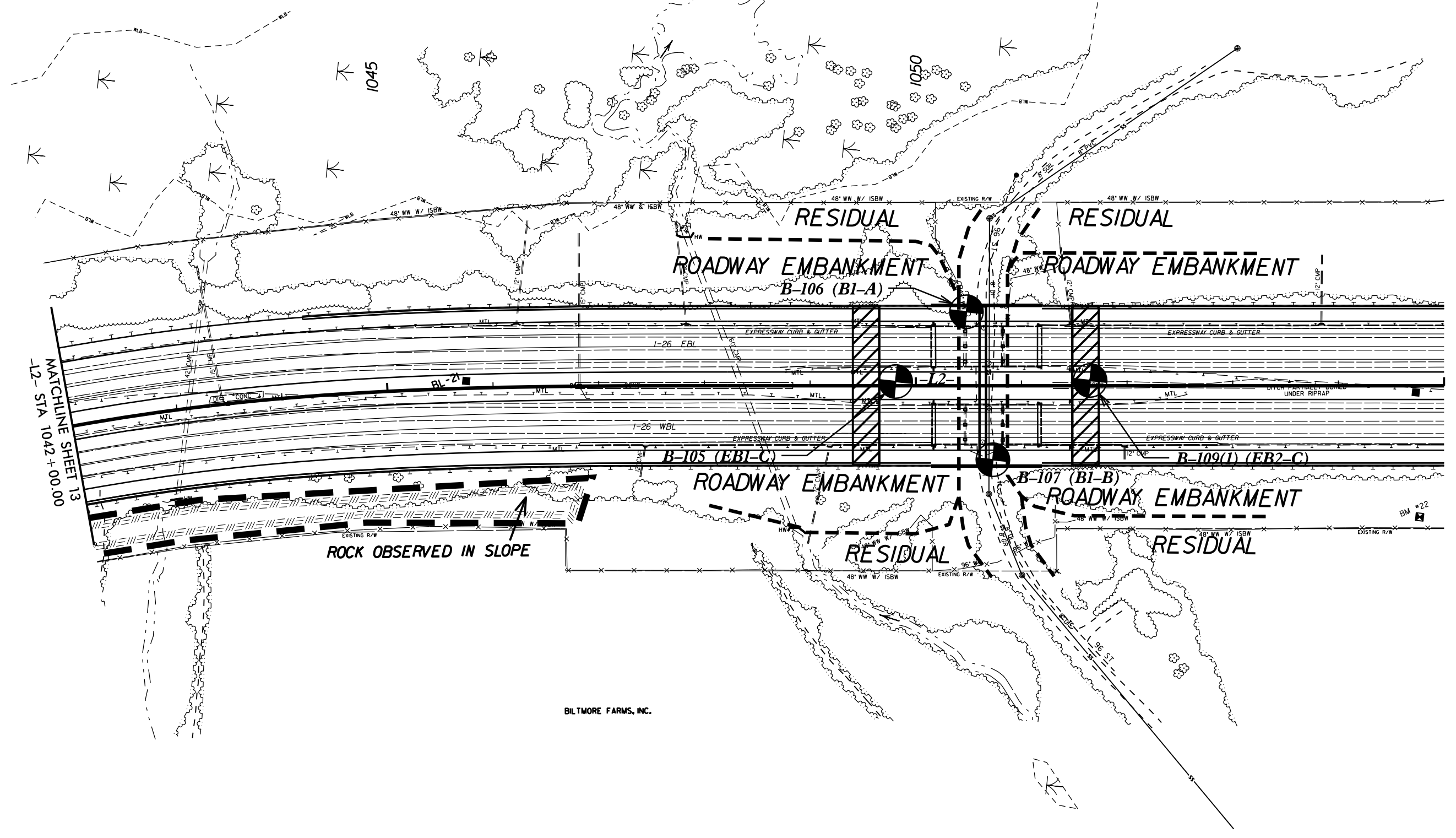
DATE

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



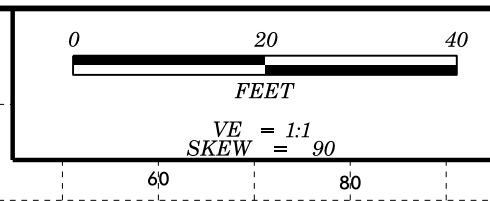
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table containing sections: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSION, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, and COLOR.

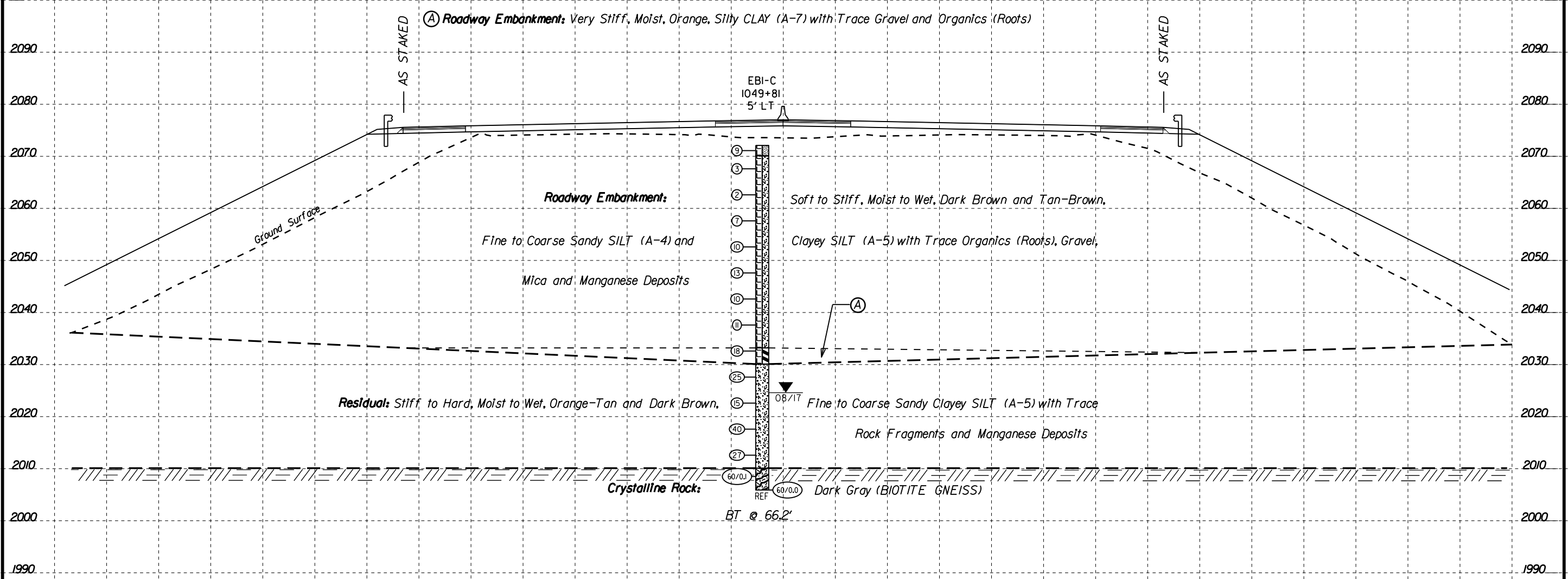


BILTMORE FARMS, INC.

140 120 100 80 60 40 20 0 20 40



<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700A BRDG 100157	4
<b>SECTION ALONG EB-1</b>	



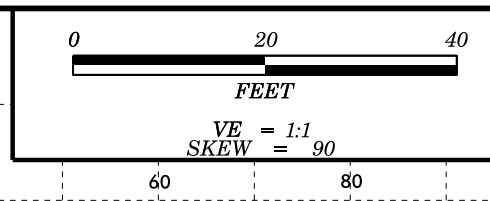
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1050+00.00  
-12-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140

140 120 100 80 60 40 20 0 20 40

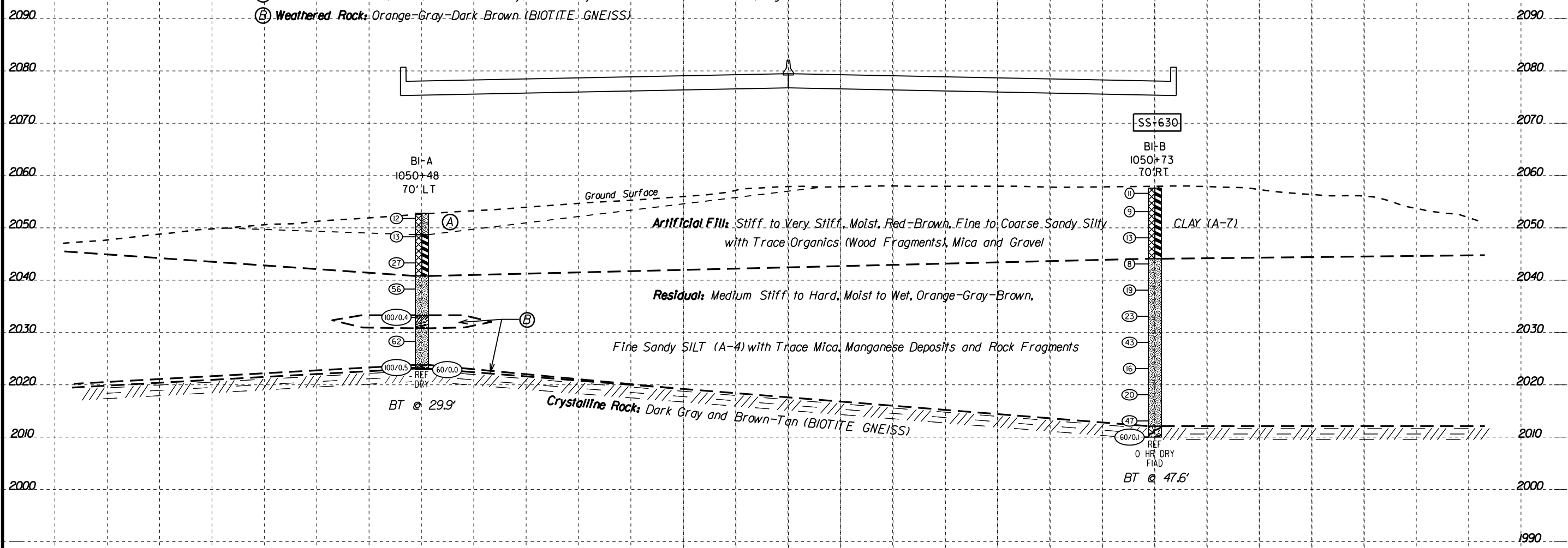


PROJECT REFERENCE NO. SHEET NO.  
I-4700A BRDG 100157 5

SECTION ALONG B-1

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-630	70' RT	1050+73	0' 1'- 1.5	A-7-6(10)	49	24	14.6	32.2	5.4	47.8	90.9	86.3	52.6	21.2	-

- (A) Artificial Fill: Stiff, Moist, Brown and Gray, Fine Sandy SILT (A-4) with Trace Mica, Organics (Roots) and Gravel
- (B) Weathered Rock: Orange-Gray-Dark Brown (BIOTITE GNEISS)



###

1050+50.00

-12-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140

140 120 100 80 60 40 20 0 20 40

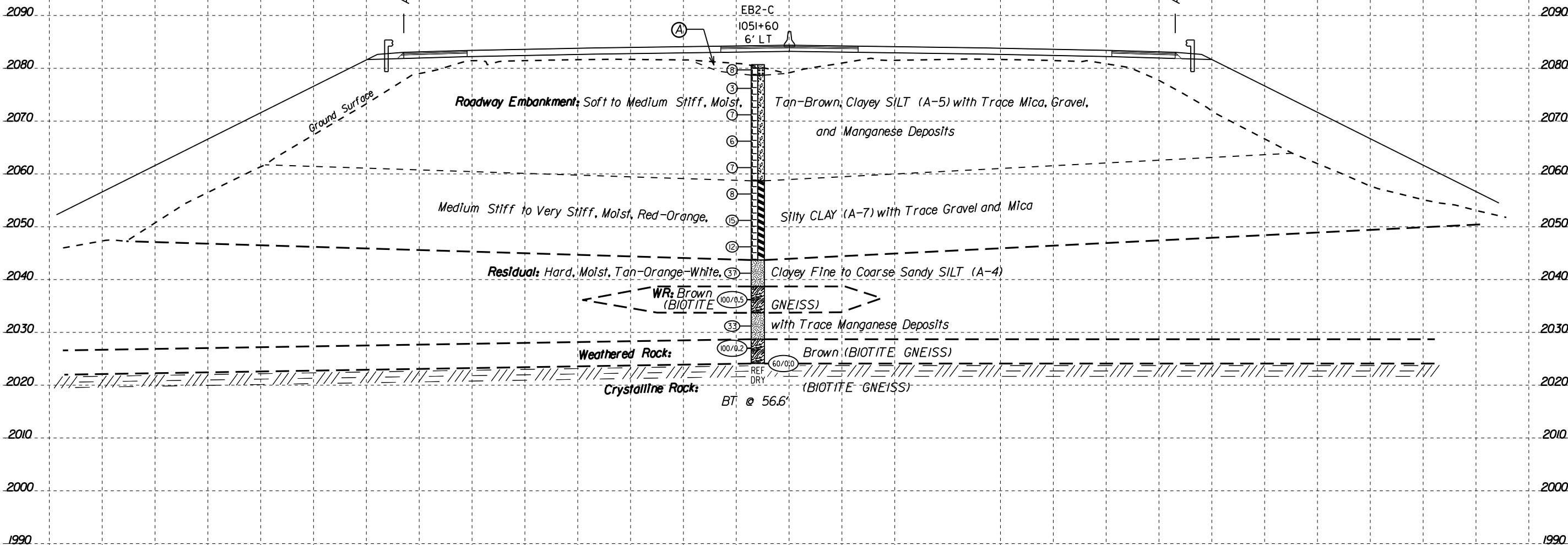
0 60 20 80 40

PROJECT REFERENCE NO. SHEET NO.

I-4700A BRDG 100157 6

VE = 1:1  
SKEW = 90

SECTION ALONG EB-2



###

1051+50.00

-12-

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140

# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37)							GROUND WTR (ft)									
BORING NO. EB1-C		STATION 1049+81		OFFSET 4 ft LT		ALIGNMENT -L2-										
COLLAR ELEV. 2,072.1 ft		TOTAL DEPTH 66.2 ft		NORTHING 652,272		EASTING 939,692										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER S. Davis		START DATE 08/29/17		COMP. DATE 08/29/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2075																
	2,072.1	0.0	2	4	5										2,072.1	0.0
2070															2,070.1	2.0
	2,068.6	3.5	3	2	1											
2065																
	2,063.6	8.5	WOH	1	1											
2060																
	2,058.6	13.5		3	4	3										
2055																
	2,053.6	18.5		4	5	5										
2050																
	2,048.6	23.5		5	6	7										
2045																
	2,043.6	28.5		5	4	6										
2040																
	2,038.6	33.5		3	4	7										
2035																
	2,033.6	38.5		14	7	11										
2030																
	2,028.6	43.5		12	14	11										
2025																
	2,023.6	48.5		5	5	10										
2020																
	2,018.6	53.5		10	16	24										
2015																
	2,013.6	58.5		27	13	14										
2010																
	2,008.6	63.5														
	2,006.1	66.0														

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37)							GROUND WTR (ft)									
BORING NO. B1-A		STATION 1050+48		OFFSET 70 ft LT		ALIGNMENT -L2-										
COLLAR ELEV. 2,052.8 ft		TOTAL DEPTH 29.9 ft		NORTHING 652,332		EASTING 939,619										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER S. Davis		START DATE 08/26/17		COMP. DATE 08/26/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2055																
	2,052.8	0.0	3	7	5										2,052.8	0.0
2050																
	2,049.3	3.5	6	6	7											
2045																
	2,044.3	8.5	7	12	15											
2040																
	2,039.3	13.5	10	28	28											
2035																
	2,034.3	18.5	7	19	100/0.4											
2030																
	2,029.3	23.5	11	17	45											
2025																
	2,024.3	28.5														
	2,022.9	29.9	8	100/0.5												

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_BRDG\_BF.GPJ NC\_DOT.GDT 10/28/18

NCDOT BORE SINGLE I4700A\_GEO\_BH\_BRDG\_BF.GPJ NC\_DOT.GDT 10/28/18

Note:  
1. Auger refusal at 29.9'

Note:  
1. Auger refusal at 66.2'



# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37)							GROUND WTR (ft)									
BORING NO. B1-B		STATION 1050+73		OFFSET 70 ft RT		ALIGNMENT -L2-										
COLLAR ELEV. 2,057.6 ft		TOTAL DEPTH 47.6 ft		NORTHING 652,372		EASTING 939,756										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER J. Hoyle		START DATE 08/24/17		COMP. DATE 08/24/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060	2,057.6	0.0	3	5	6									2,057.6	GROUND SURFACE	0.0
2055	2,054.1	3.5	4	5	4									2,044.1	<b>ARTIFICIAL FILL</b> Red, Fine to Coarse Sandy SILT (A-7-6) with Trace Mica	
2050	2,049.1	8.5	4	6	7									2,044.1		
2045	2,044.1	13.5	3	4	4									2,044.1	<b>RESIDUAL</b> Orange-Brown, Fine Sandy SILT (A-4) with Trace Mica, Manganese Deposits, and Rock Fragments	13.5
2040	2,039.1	18.5	7	9	10											
2035	2,034.1	23.5	17	15	8											
2030	2,029.1	28.5	10	28	15											
2025	2,024.1	33.5	5	7	9											
2020	2,019.1	38.5	8	9	11											
2015	2,014.1	43.5	23	17	30											
2010	2,010.1	47.5	60/0.1											2,010.0	<b>CRYSTALLINE ROCK</b> Brown-Tan (BIOTITE GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 2,010.0 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)  Note: 1. Auger refusal at 47.5'	47.6

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37)							GROUND WTR (ft)									
BORING NO. EB2-C		STATION 1051+60		OFFSET 6 ft LT		ALIGNMENT -L2-										
COLLAR ELEV. 2,080.7 ft		TOTAL DEPTH 56.6 ft		NORTHING 652,450		EASTING 939,671										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/28/17		COMP. DATE 08/28/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2085																
2080	2,080.7	0.0	2	4	4									2,080.7	GROUND SURFACE	0.0
2075	2,077.2	3.5	3	1	2									2,078.7	<b>ROADWAY EMBANKMENT</b> Dark Brown, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots), Mica, and Gravel Tan, Fine SAND (A-3) with Trace Gravel Tan-Brown, Clayey SILT (A-5) with Trace Gravel, Mica and Manganese Deposits	2.0
2070	2,072.2	8.5	4	3	4											
2065	2,067.2	13.5	4	3	3											
2060	2,062.2	18.5	2	3	4											
2055	2,057.2	23.5	3	4	4									2,058.7	Red-Orange, Silty CLAY (A-7) with Trace Gravel and Mica	22.0
2050	2,052.2	28.5	6	7	8											
2045	2,047.2	33.5	5	5	7											
2040	2,042.2	38.5	12	22	15									2,043.7	<b>RESIDUAL</b> Tan-Orange-White, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Manganese Deposits	37.0
2035	2,037.2	43.5	14	100/0.5										2,038.7	<b>WEATHERED ROCK</b> Brown (BIOTITE GNEISS)	42.0
2030	2,032.2	48.5	16	18	15									2,033.7	Tan-Orange-White, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Manganese Deposits	47.0
2025	2,027.2	53.5	100/0.2											2,028.7	<b>WEATHERED ROCK</b> Brown (BIOTITE GNEISS)	52.0
	2,024.1	56.6	60/0.0											2,024.1	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,024.1 ft on CRYSTALLINE ROCK (BIOTITE GNEISS)  Note: 1. Auger refusal at 56.6'	56.6

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_BRDG\_BF.GPJ NC\_DOT.GDT 10/28/18

NCDOT BORE SINGLE I4700A\_GEO\_BH\_BRDG\_BF.GPJ NC\_DOT.GDT 10/28/18

REFERENCE: I-4700B

PROJECT: 36030

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION WIDENING OF I-26 FROM .3 MI SOUTH OF NC 280 TO .5 M SOUTH OF NC 191  
 SITE DESCRIPTION BRIDGE 100211  
BRIDGE NO. 211 OVER THE FRENCH BROAD RIVER

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4 - 7	CROSS SECTIONS
8 - 11	PROFILES
12 - 22	BORE LOGS & CORE REPORTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700 36030	1	22

**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:
- 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.
  - 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

CD JOHNSON

CJ COFFEY

DO CHEEK

INVESTIGATED BY JC KUHNE

DRAWN BY JC KUHNE

CHECKED BY \_\_\_\_\_

SUBMITTED BY JC KUHNE

DATE \_\_\_\_\_



DocuSigned by: Jody C. Kuhne 1/8/2019

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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 (ASTM 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>																
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-1-a	A-1-b	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7
SYMBOL	[Patterned boxes for soil classification symbols]															
% PASSING #10 #40 #200	[Soil classification data table]															
MATERIAL PASSING #40 LL PI	[Soil classification data table]															
GROUP INDEX	[Soil classification data table]															
USUAL TYPES OF MAJOR MATERIALS	[Soil classification data table]															
GEN. RATING AS SUBGRADE	[Soil classification data table]															
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																

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 TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%
GRANULAR SOILS SILT - CLAY SOILS
OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE
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
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 % - UNIT WEIGHT %g - 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: <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____

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) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)
NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. 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. COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.
WEATHERING
FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE
ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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> 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 &gt; 100 BPF</i> 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 &lt; 100 BPF</i> 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 HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT
CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. 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. CAN BE GROOVED 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. CAN BE GROOVED 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. 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
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 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: FROM XSC AND EXISTING BRIDGE DECK ELEVATIONS
ELEVATION: FEET
NOTES:

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

# **SUBSURFACE INVESTIGATION**

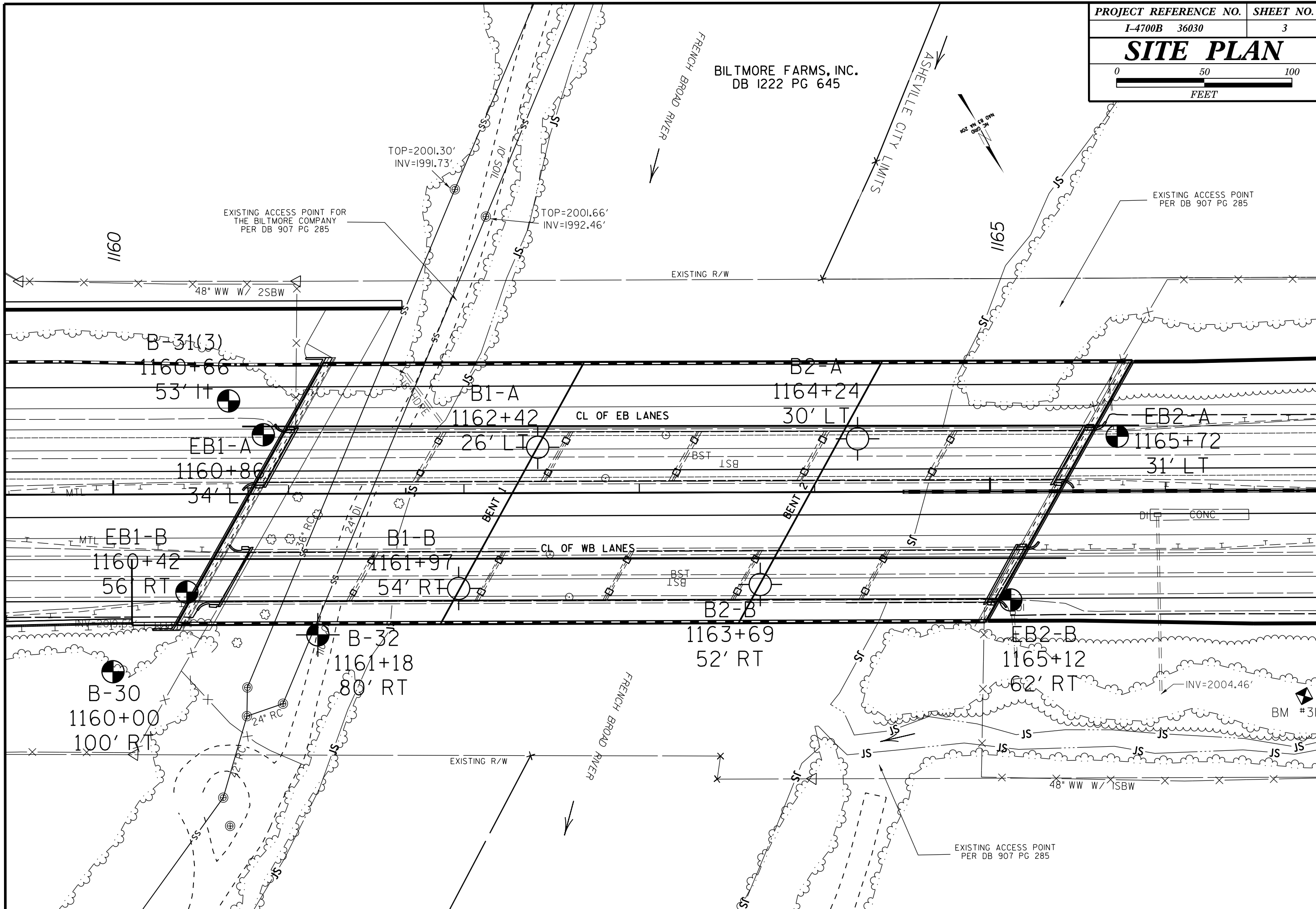
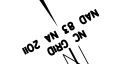
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES  
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

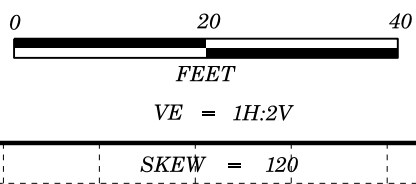
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

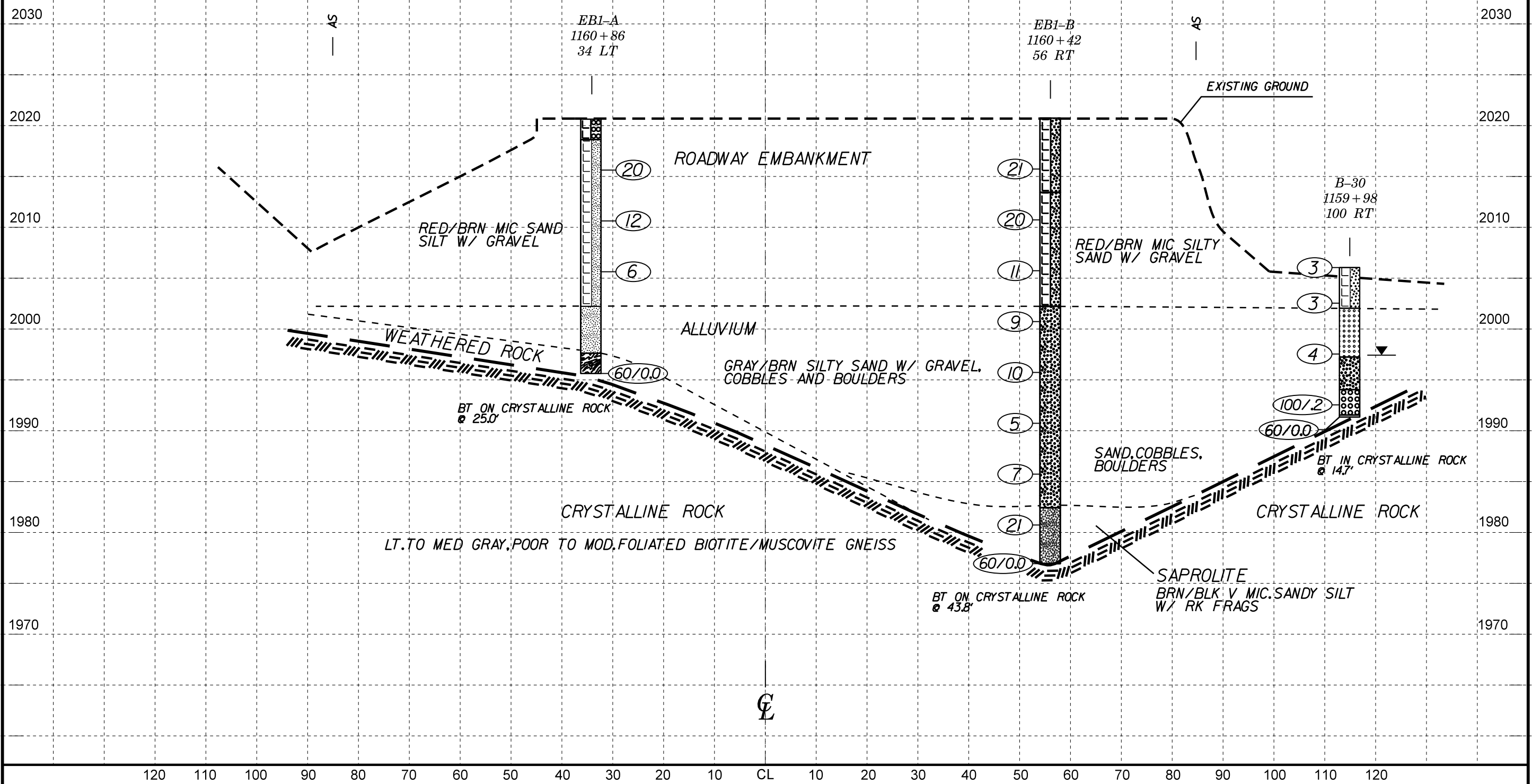
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90				N/A	N/A		A					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80							B					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70						C					
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60						D					
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces		50						E					
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes		40						F					
			30						G					
			20						H					
			10											
		N/A	N/A											

BILTMORE FARMS, INC.  
DB I222 PG 645

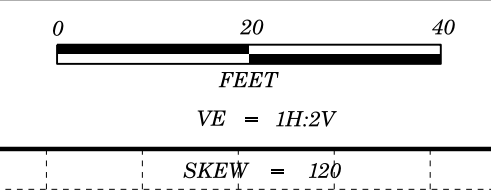




<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700B 36030	4
<b>SECTION THROUGH EB-1 BRDG 100221 I-26 OVER THE FRENCH BROAD RIVER</b>	







PROJECT REFERENCE NO.	SHEET NO.
I-4700B 36030	5
SECTION THROUGH B-1 BRDG 100221 I-26 OVER THE FRENCH BROAD RIVER	

2030 2030

2020 2020

2010 2010

2000 2000

1990 1990

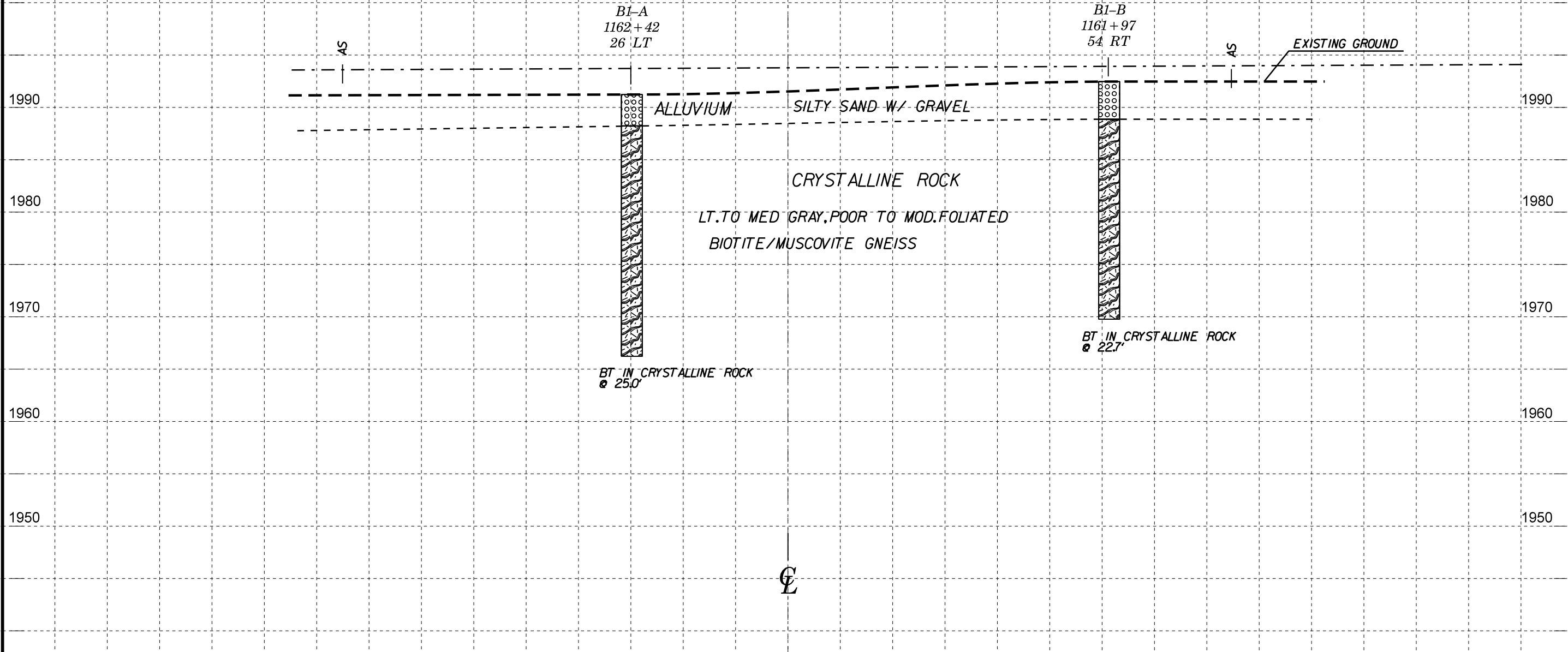
1980 1980

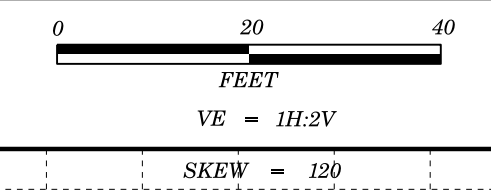
1970 1970

1960 1960

1950 1950

120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120





<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700B 36030	6
<b>SECTION THROUGH B-2</b>	
<b>BRDG 100221</b>	
<b>I-26 OVER THE FRENCH BROAD RIVER</b>	

2030 2030

2020 2020

2010 2010

2000 2000

1990 1990

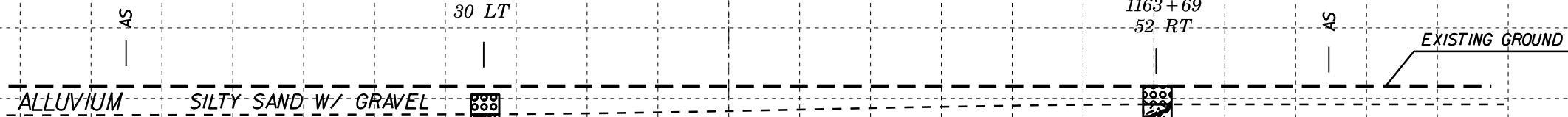
1980 1980

1970 1970

1960 1960

1950 1950

120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120



B2-A  
1164+24  
30 LT

B2-B  
1163+69  
52 RT

EXISTING GROUND

ALLUVIUM

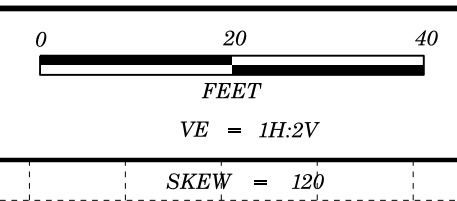
SILTY SAND W/ GRAVEL

CRYSTALLINE ROCK

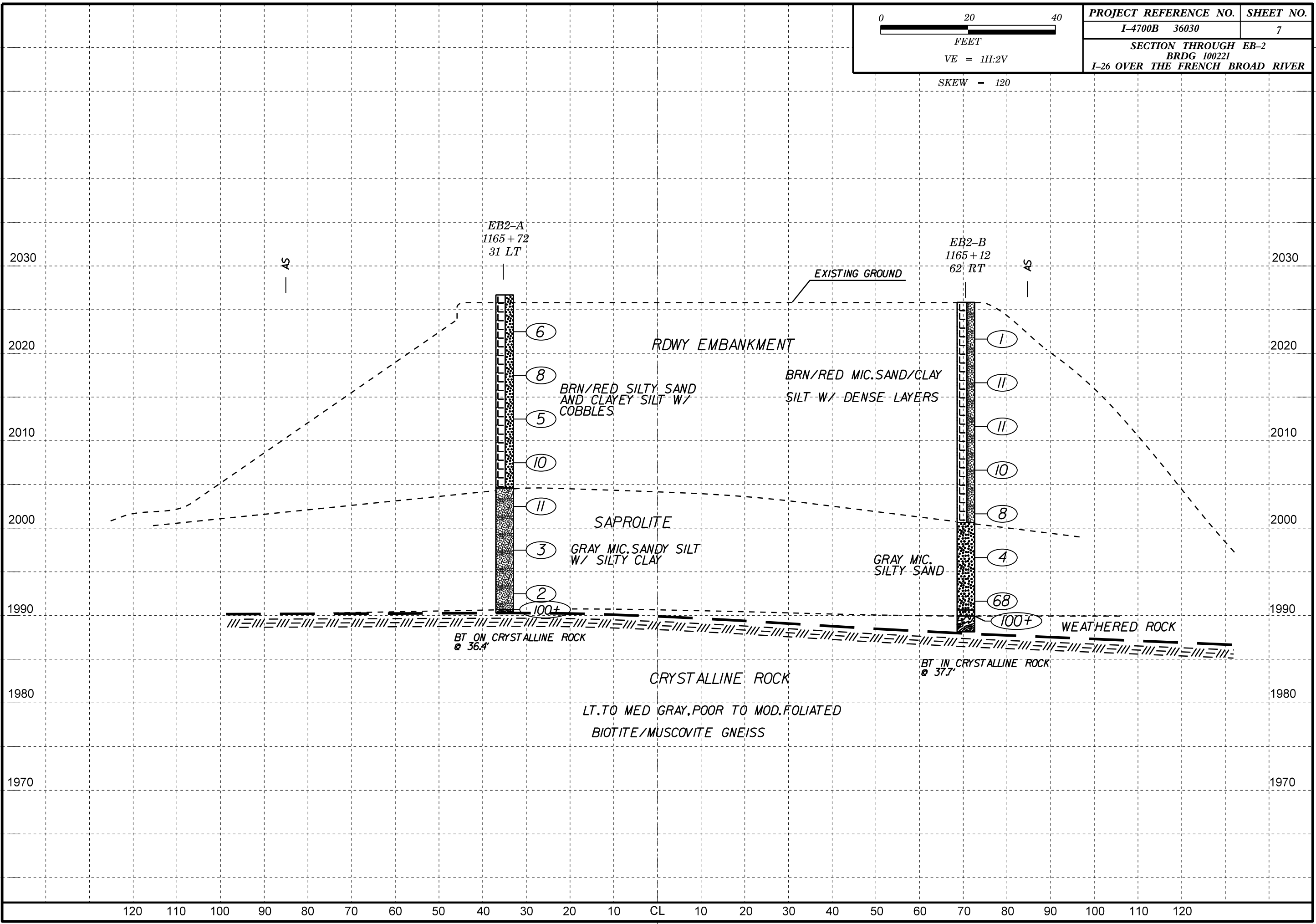
LT. TO MED GRAY, POOR TO MOD. FOLIATED  
BIOTITE/MUSCOVITE GNEISS

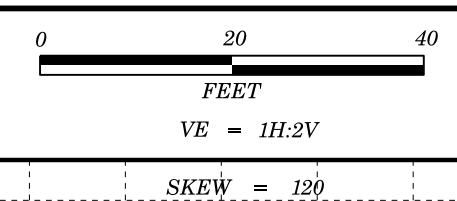
BT IN CRYSTALLINE ROCK  
@ 20.9'

BT IN CRYSTALLINE ROCK  
@ 20.7'

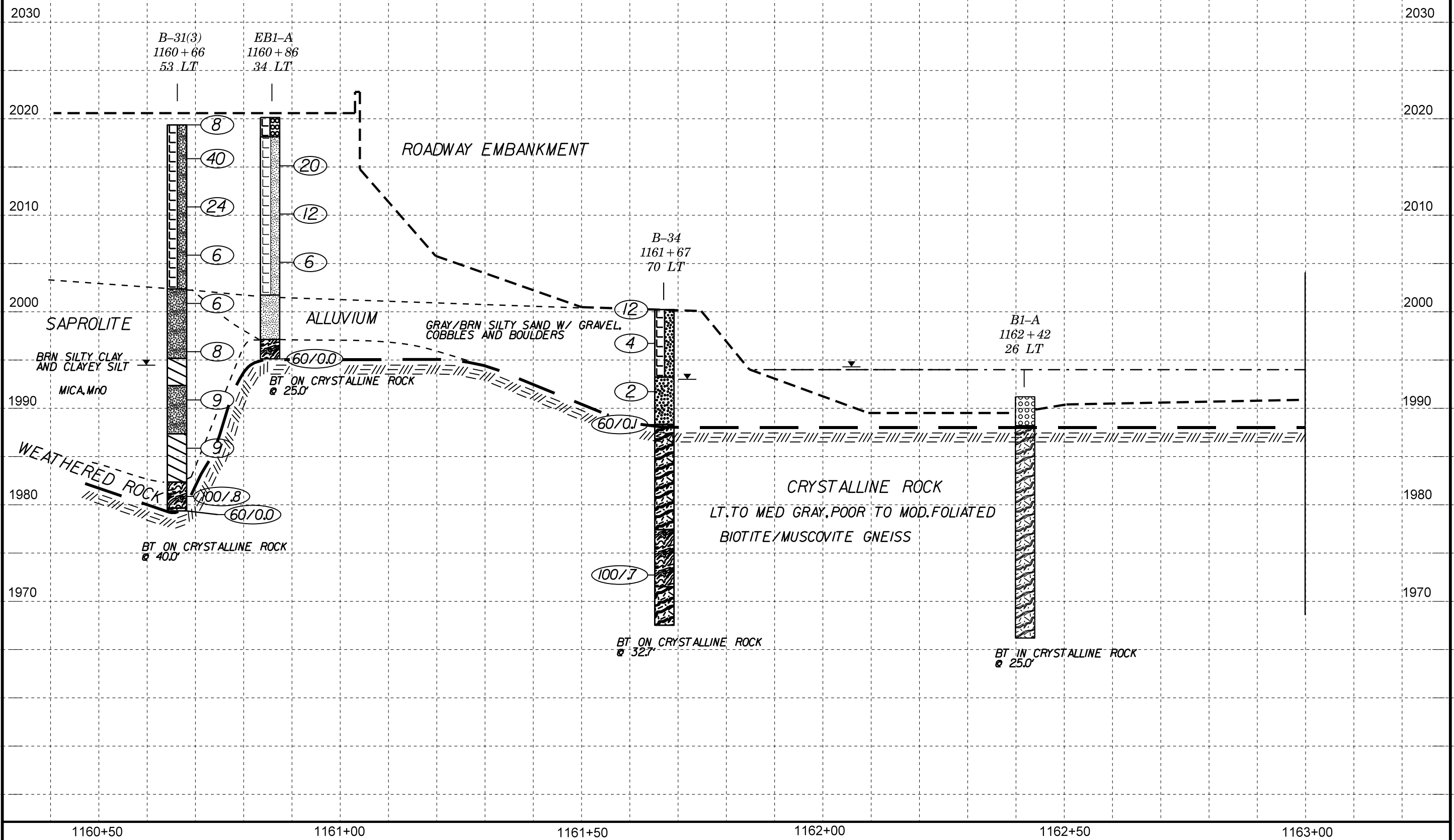


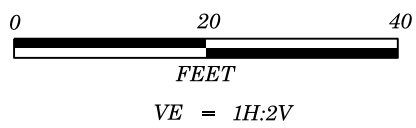
<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700B 36030	7
<b>SECTION THROUGH EB-2</b>	
<b>BRDG 100221</b>	
<b>I-26 OVER THE FRENCH BROAD RIVER</b>	





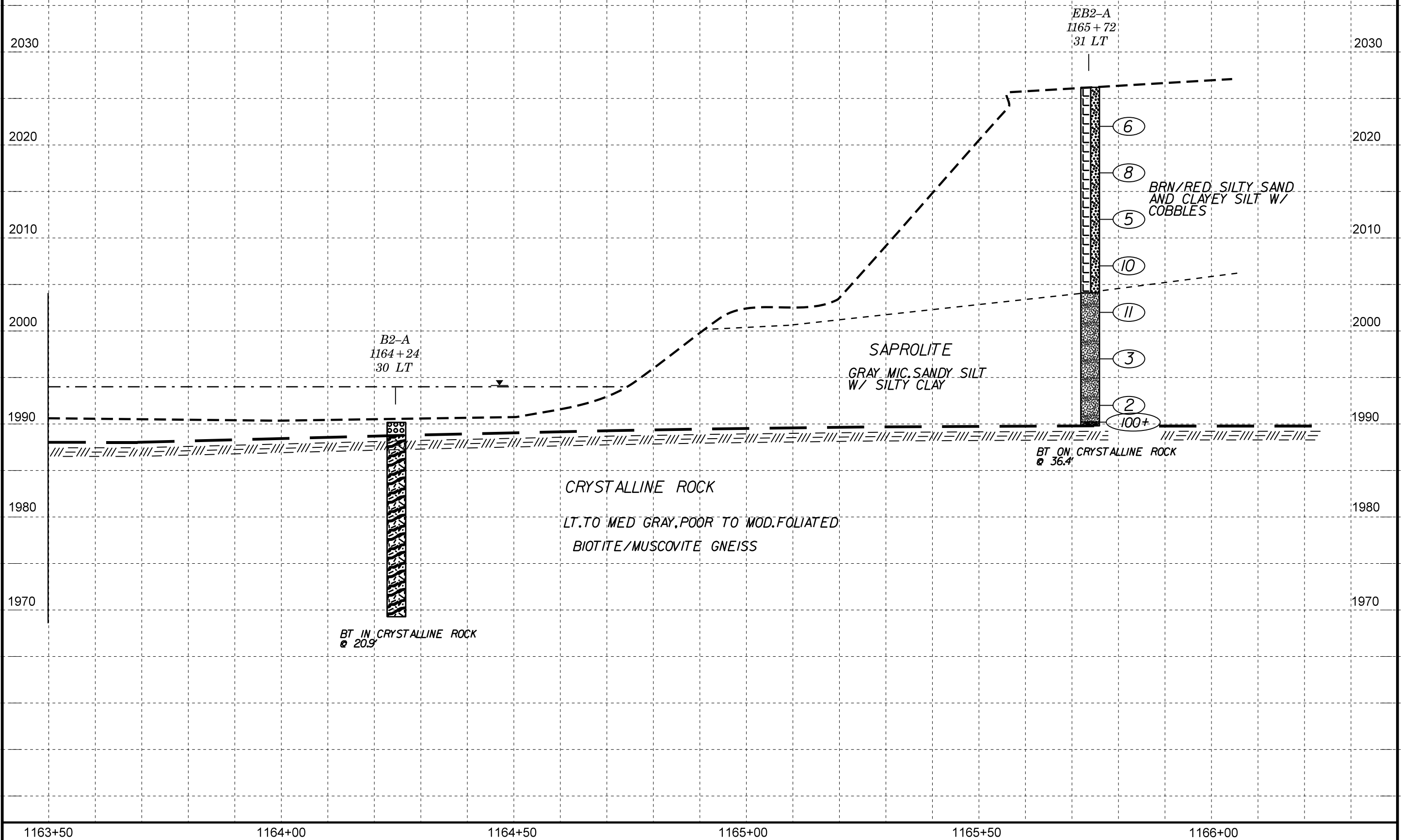
<b>PROJECT REFERENCE NO.</b> I-4700B 36030	<b>SHEET NO.</b> 8
<b>PROFILE ALONG CL OF EB LANES BRDG 100221 I-26 OVER THE FRENCH BROAD RIVER</b>	

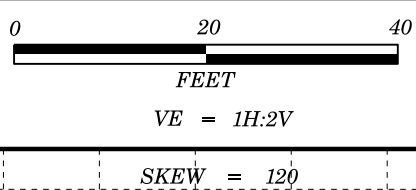




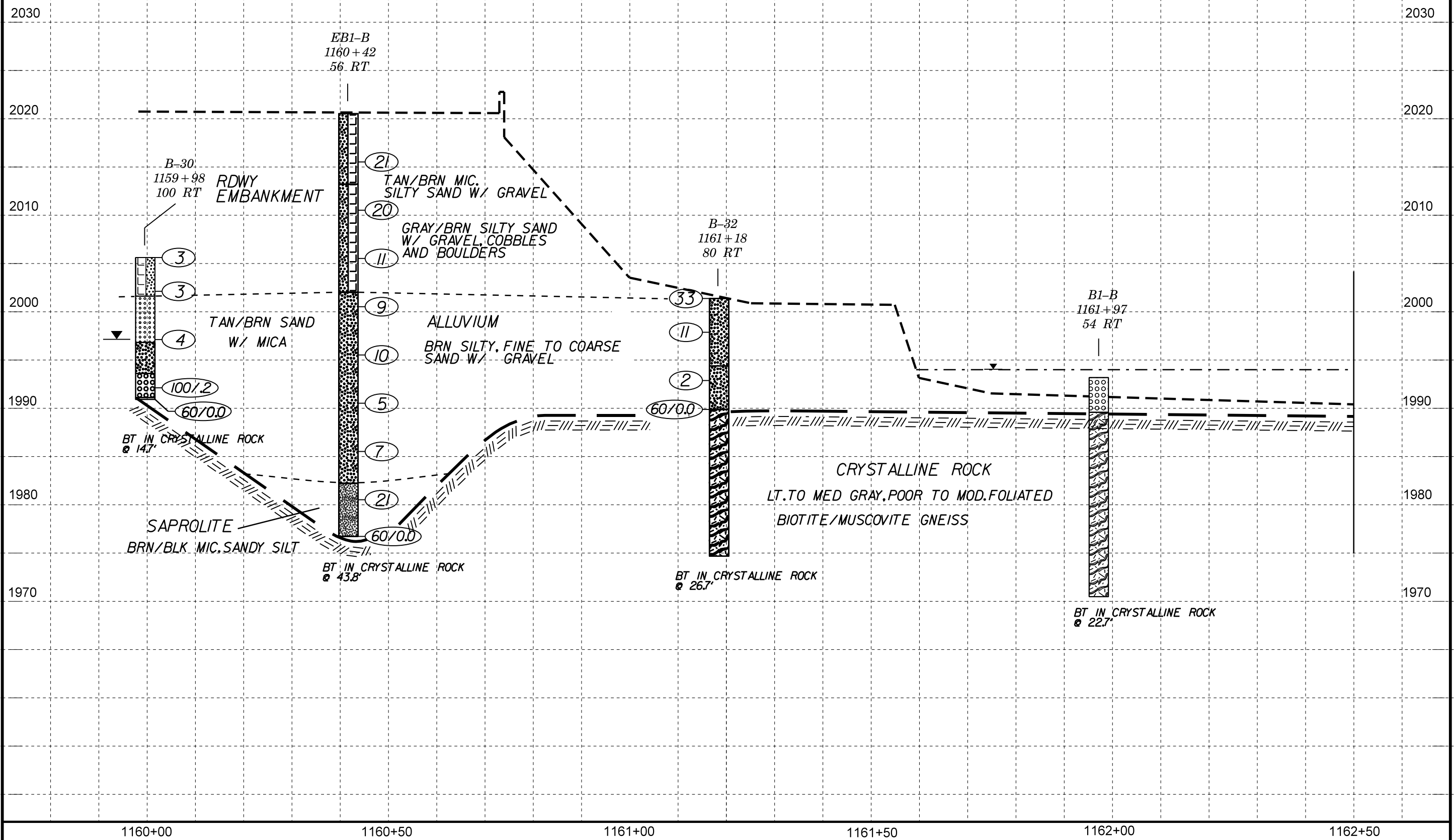
<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700B 36030	9
<b>PROFILE ALONG CL OF EB LANES BRDG 100221 I-26 OVER THE FRENCH BROAD RIVER</b>	

SKEW = 120

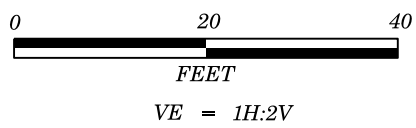




<b>PROJECT REFERENCE NO.</b> I-4700B 36030	<b>SHEET NO.</b> 10
<b>PROFILE ALONG CL OF WB LANES</b> BRDG 100221	
<b>I-26 OVER THE FRENCH BROAD RIVER</b>	

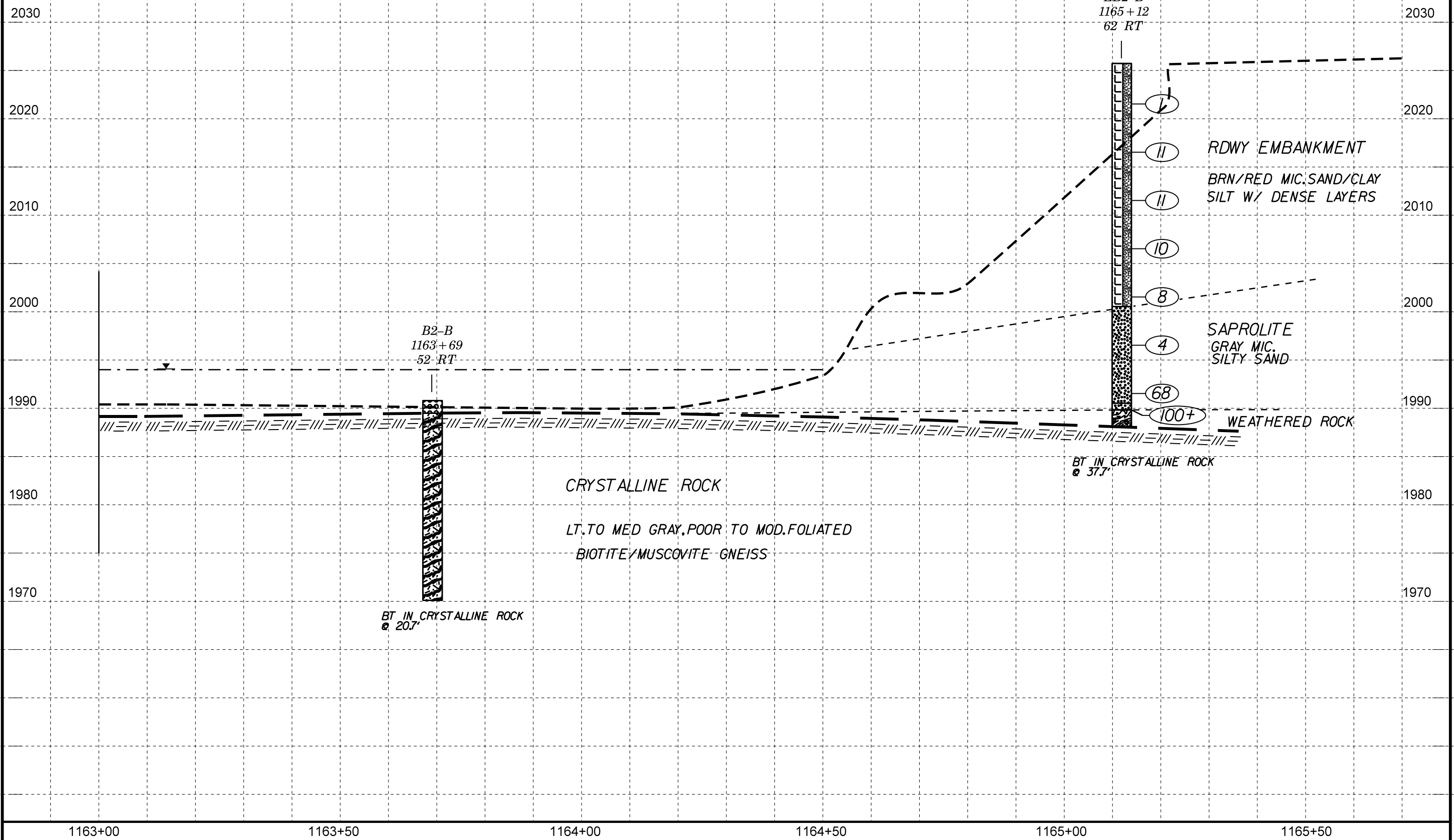






<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
I-4700B 36030	II
<b>PROFILE ALONG CL OF WB LANES</b>	
BRDG 100221	
I-26 OVER THE FRENCH BROAD RIVER	

SKEW = 120



1162+50      1163+00      1163+50      1164+00      1164+50      1165+00      1165+50

# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS3		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST M. Arnold											
SITE DESCRIPTION I-26 from near NC 146 (Exit 37) to near NC 191 (Exit 33)							GROUND WTR (ft)										
BORING NO. B-31 (3) (EB1-A (3))		STATION 1160+66		OFFSET 53 ft LT		ALIGNMENT -L3-											
COLLAR ELEV. 2,019.6 ft		TOTAL DEPTH 40.0 ft		NORTHING 660,681		EASTING 933,683											
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER S. Davis		START DATE 08/24/17		COMP. DATE 08/24/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2020	2,019.6	0.0	5	3	5										2,019.6	0.0	GROUND SURFACE
															2,018.6	1.0	ABC STONE
																	ROADWAY EMBANKMENT
																	Red-Brown, Clayey SILT (A-5) with Trace Mica and Gravel
2015	2,016.1	3.5	6	30	10												Brown, Fine to Coarse SAND (A-1-b) with Some Gravel
																	Red-Brown, Clayey SILT (A-5) with Trace Mica and Gravel
2010	2,011.1	8.5	37	17	7												Tan, Fine to Coarse SAND (A-1-b) with Some Gravel
																	Red-Brown, Fine Sandy SILT (A-4) with Trace Mica and Little Gravel
2005	2,006.1	13.5	4	3	3												
2000	2,001.1	18.5	3	2	4												RESIDUAL
																	Brown, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits
1995	1,996.1	23.5	4	1	7												
1990	1,991.1	28.5	4	3	6												
1985	1,986.1	33.5	3	4	5												
1980	1,981.1	38.5	44	56/0.3													
	1,979.6	40.0															

WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Johnson, C. D.											
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)										
BORING NO. EB1-A		STATION 1160+86		OFFSET 34 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,020.9 ft		TOTAL DEPTH 25.0 ft		NORTHING 660,707		EASTING 933,675											
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Cheek, D. O.		START DATE 10/06/18		COMP. DATE 10/06/18		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2025																	GROUND SURFACE
																	ROADWAY EMBANKMENT
																	ASPHALT/CONCRETE W/GRAVELS
2020																	ROADWAY EMBANKMENT
																	RED-BROWN, SL MICACEOUS CLAY-SAND-SILT W/GRAVELS; SOME ORGANIC MATERIAL
2015	2,015.9	5.0	4	8	12												
2010	2,010.9	10.0	6	6	6												
2005	2,005.9	15.0	2	3	3												
2000	2,000.9	20.0															
	1,995.9	25.0															

NCDOT BORE DOUBLE I4700B\_GEO\_BH\_RDWY\_DRAFT.GPJ NC\_DOT.GDT 12/27/18

NCDOT BORE SINGLE I4700\_GEO\_BRDG0211-0214\_BOREHOLES.GPJ NC\_DOT.GDT 12/27/18

Note:  
1. Auger refusal at 40.0'

Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,995.9 ft ON CRYSTALLINE ROCK

# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 1160+42		OFFSET 56 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,021.0 ft		TOTAL DEPTH 43.8 ft		NORTHING 660,766		EASTING 933,755										
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017			DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 10/07/18		COMP. DATE 10/07/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2025																
2020																
2015	2,016.0	5.0	16	12	9											
2010	2,011.0	10.0	12	10	10											
2005	2,006.0	15.0	4	4	7											
2000	2,001.0	20.0	5	4	5											
1995	1,996.0	25.0	5	5	5											
1990	1,991.0	30.0	2	2	3											
1985	1,986.0	35.0	5	4	3											
1980	1,981.0	40.0	13	12	9											
	1,977.2	43.8														60/0.0

WBS 36030.1.FS3		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION I-26 from near NC 146 (Exit 37) to near NC 191 (Exit 33)							GROUND WTR (ft)									
BORING NO. B-30 (EB1-B)		STATION 1060+00		OFFSET 100 ft RT		ALIGNMENT -L3-										
COLLAR ELEV. 2,005.6 ft		TOTAL DEPTH 14.7 ft		NORTHING 660,785		EASTING 933,810										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/22/17		COMP. DATE 08/22/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2010																
2005	2,005.6	0.0	WOH	2	1											
2000	2,002.1	3.5	1	1	2											
1995	1,997.1	8.5	3	2	2											
	1,992.1	13.5	15	22	100/0.2											100/0.2
	1,990.9	14.7	60/0.0													60/0.0

NCDOT BORE DOUBLE I4700\_GEO\_BRDG0211-0214\_BOREHOLES.GPJ NC\_DOT.GDT 12/27/18

NCDOT BORE SINGLE I4700B\_GEO\_BH\_RDWY\_DRAFT.GPJ NC\_DOT.GDT 12/27/18

Note:  
1. Auger refusal at 14.7'

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Johnson, C. D.						
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)					
BORING NO. B1-A		STATION 1162+42		OFFSET 26 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 1,991.2 ft		TOTAL DEPTH 25.0 ft		NORTHING 660,787		EASTING 933,540						
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Cheek, D. O.		START DATE 10/06/18		COMP. DATE 10/06/18		SURFACE WATER DEPTH N/A						
CORE SIZE NXWL		TOTAL RUN 23.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
1988.2	1,988.2	3.0	3.0		(2.2) 73%	(1.3) 43%					1,988.2	3.0
1985	1,985.2	6.0	5.0		(4.8) 96%	(4.2) 84%			Begin Coring @ 3.0 ft CRYSTALLINE ROCK		1,966.2	25.0
1980	1,980.2	11.0	5.0		(4.4) 88%	(3.1) 62%						
1975	1,976.2 1,975.2	15.0 16.0	5.0		(4.4) 88%	(3.1) 62%						
1970	1,971.2	20.0	5.0		(4.4) 88%	(4.4) 88%						
	1,966.2	25.0										Boring Terminated at Elevation 1,966.2 ft IN CRYSTALLINE ROCK

WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Johnson, C. D.						
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)					
BORING NO. B1-B		STATION 1161+97		OFFSET 54 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 1,992.4 ft		TOTAL DEPTH 22.7 ft		NORTHING 660,837		EASTING 933,618						
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Cheek, D. O.		START DATE 10/07/18		COMP. DATE 10/07/18		SURFACE WATER DEPTH N/A						
CORE SIZE NXWL		TOTAL RUN 22.7 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
1988.8	1,988.8	3.6	2.7		(2.5) 93%	(1.9) 70%					1,988.8	3.6
1985	1,986.1	6.3	5.0		(5.0) 100%	(5.0) 100%			Begin Coring @ 3.6 ft CRYSTALLINE ROCK		1,969.7	22.7
1980	1,981.1	11.3	5.0		(5.0) 100%	(4.5) 90%						
1975	1,976.1	16.3	5.0		(5.0) 100%	(5.0) 100%						
1970	1,971.1	21.3	5.0		(4.6) 92%	(4.2) 84%						
	1,966.1	26.3										Boring Terminated at Elevation 1,969.7 ft IN CRYSTALLINE ROCK

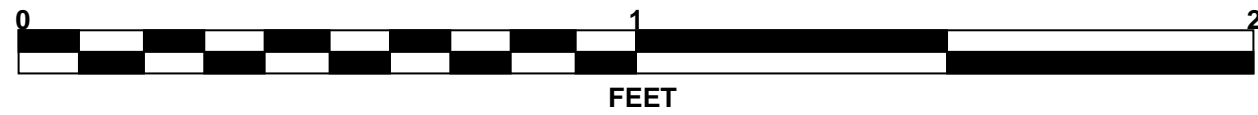
NCDOT CORE DOUBLE I4700\_GEO\_BRDG0211-0214\_BOREHOLES.GPJ NC\_DOT.GDT 12/27/18



# CORE PHOTOGRAPHS

**B1-A**  
BOX 1 OF 3: 3.0 - 12.5 FEET

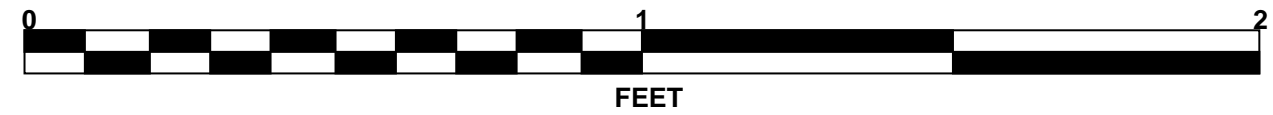
GSI = 65 TO 75



**B1-A**  
BOXES 2 OF 3: 12.5.5 - 23.5  
FEET

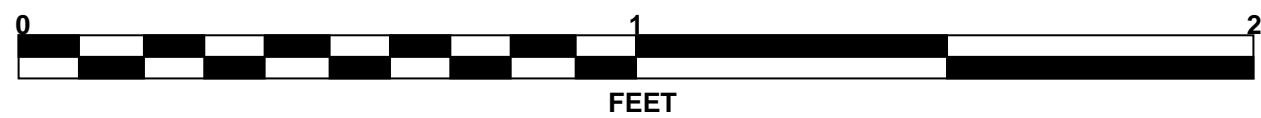
GSI = 70 TO 80

NOTE: Bit wear from 1,969' to 1963.5'. Bit changed at 1963.5



# CORE PHOTOGRAPHS

**B1-A**  
BOX 3 OF 3: 23.5 - 25.0 FEET



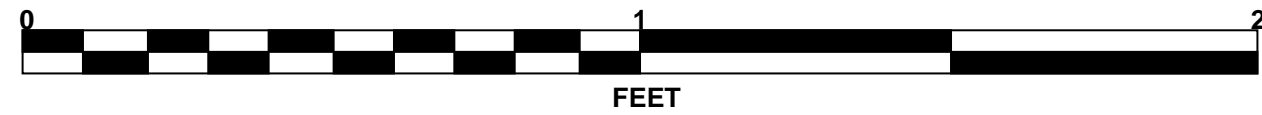


# CORE PHOTOGRAPHS

## B1-B

BOX 1 OF 3: 3.6 - 12.6 FEET

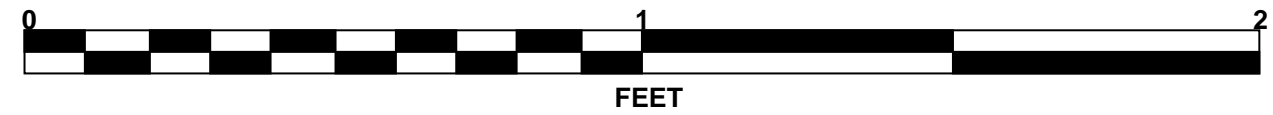
GSI = 45 TO 55 TO DEPTH 1973.8'  
GSI = 70 TO 80 TO DEPTH 1968.8'



## B1-B

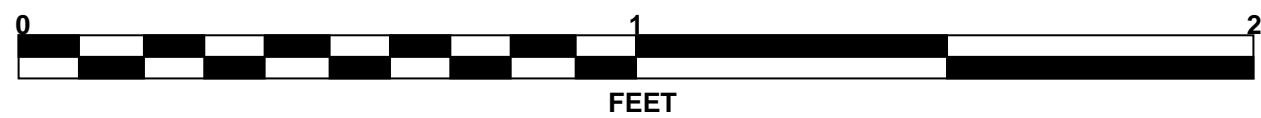
BOX 2 OF 3: 12.6 - 21.3 FEET

GSI = 80 TO 90  
DEPTHS 1968.8 TO  
1958.8



# CORE PHOTOGRAPHS

**B1-B**  
BOX 3 OF 3: 21.3 - 26.3 FEET





# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Stickney, J. K.						
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)					
BORING NO. B2-A		STATION 1164+24		OFFSET 30 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 1,990.0 ft		TOTAL DEPTH 20.9 ft		NORTHING 660,869		EASTING 933,377						
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Smith, C. L.		START DATE 10/06/18		COMP. DATE 10/06/18		SURFACE WATER DEPTH N/A						
CORE SIZE NXWL		TOTAL RUN 19.5 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
1988.6	1,988.6	1.4	4.5	1:00/0.5 2:19/1.0 3:05/1.0 2:20/1.0 2:40/1.0	(4.4) 98%	(3.5) 78%					1,988.6	1.4
Begin Coring @ 1.4 ft												
CRYSTALLINE ROCK												
1985	1,984.1	5.9	5.0	1:31/1.0 1:43/1.0 1:56/1.0 1:51/1.0 2:01/1.0	(4.8) 96%	(4.7) 94%						
1980	1,979.1	10.9	5.0	1:22/1.0 1:20/1.0 1:18/1.0 1:20/1.0 1:22/1.0	(5.0) 100%	(4.6) 92%						
1975	1,974.1	15.9	5.0	1:11/1.0 1:12/1.0 1:24/1.0 1:17/1.0 1:23/1.0	(4.9) 98%	(4.8) 96%						
1970	1,969.1	20.9									1,969.1	20.9
Boring Terminated at Elevation 1,969.1 ft IN CRYSTALLINE ROCK												

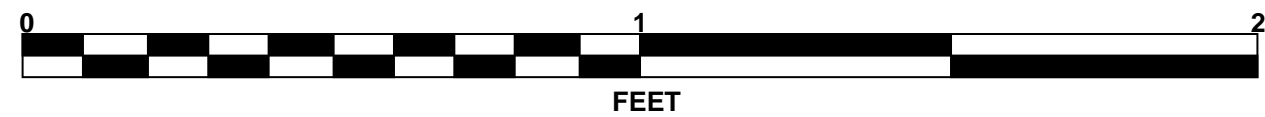
WBS 36030.1.1		TIP I-4700B		COUNTY BUNCOMBE		GEOLOGIST Stickney, J. K.						
SITE DESCRIPTION REPLACE BRIDGES 0211/0214 ON I-26 OVER FRENCH BROAD RIVER							GROUND WTR (ft)					
BORING NO. B2-B		STATION 1163+69		OFFSET 52 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 1,990.9 ft		TOTAL DEPTH 20.7 ft		NORTHING 660,916		EASTING 933,465						
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Smith, C. L.		START DATE 10/07/18		COMP. DATE 10/07/18		SURFACE WATER DEPTH N/A						
CORE SIZE NXWL		TOTAL RUN 19.4 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
1989.6	1,989.6	1.3	4.4	00:30/0.4 1:41/1.0 1:08/1.0 1:06/1.0	(4.3) 98%	(3.2) 73%					1,989.6	1.3
Begin Coring @ 1.3 ft												
CRYSTALLINE ROCK												
1985	1,985.2	5.7	5.0	1:53/1.0 1:42/1.0 2:18/1.0 2:02/1.0 1:55/1.0	(5.0) 100%	(5.0) 100%						
1980	1,980.2	10.7		1:28/1.0 1:22/1.0 1:29/1.0 1:18/1.0 1:46/1.0								
1975	1,975.2	15.7	5.0	1:14/1.0 1:20/1.0 1:16/1.0 1:22/1.0 1:11/1.0	(5.0) 100%	(5.0) 100%						
	1,970.2	20.7	5.0		(4.8) 96%	(4.1) 82%					1,970.2	20.7
Boring Terminated at Elevation 1,970.2 ft IN CRYSTALLINE ROCK												

NCDOT CORE DOUBLE I4700\_GEO\_BRDG0211-0214\_BOREHOLES.GPJ NC\_DOT.GDT 12/27/18

# CORE PHOTOGRAPHS

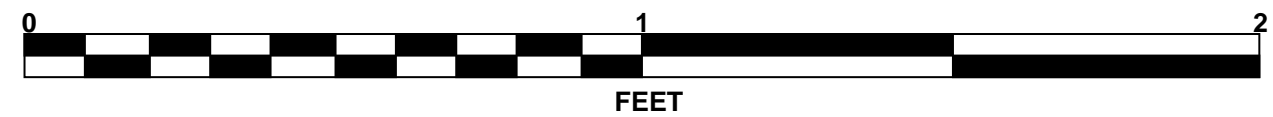
**B2-A**  
BOX 1 OF 2: 1.4 - 10.9 FEET

GSI = 65 TO 75



**B2-A**  
BOX 2 OF 2: 10.9 - 20.9 FEET

GSI = 65 TO 75

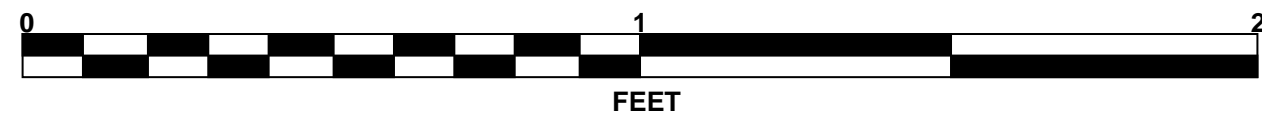




# CORE PHOTOGRAPHS

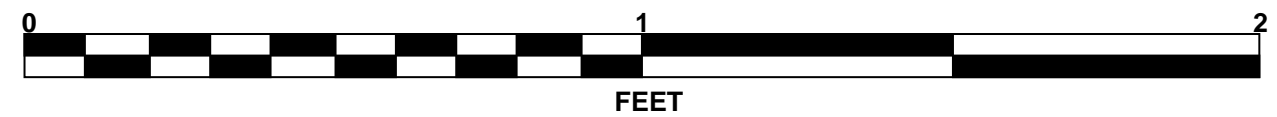
**B2-B**  
BOX 1 OF 2: 1.3 - 10.7 FEET

GSI = 65 TO 75



**B2-B**  
BOX 2 OF 2: 10.7 - 20.7 FEET

GSI = 65 TO 75







REFERENCE: I-4700

PROJECT: 36030

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	36030	1	5

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	BORE LOGS

STRUCTURE  
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION EXTEND CULVERT 100000  
-SBL- STA 888+31.84 -NBL- STA 887+89.2  
I-26 OVER TRIBUTARY OF FRENCH BROAD  
 SITE DESCRIPTION \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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 1919 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:
- 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.
  - 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

S. WOODS  
N. CONSIGLI  
S. DAVIS  
C. BOYCE

INVESTIGATED BY D. MULLEN  
 DRAWN BY D. MULLEN DS  
 CHECKED BY J. KUHNE JK  
 SUBMITTED BY D. MULLEN  
 DATE 2.22.2019



DocuSigned by:  
D Matt Mullen 2/22/2019  
 18909BD3C316N4QURE DATE

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED



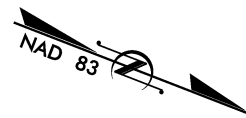
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with multiple columns and rows containing technical specifications, legends, and definitions. Columns include SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, FRACTURE SPACING, BEDDING, and INDURATION.

8/17/99

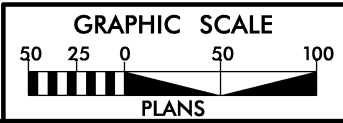
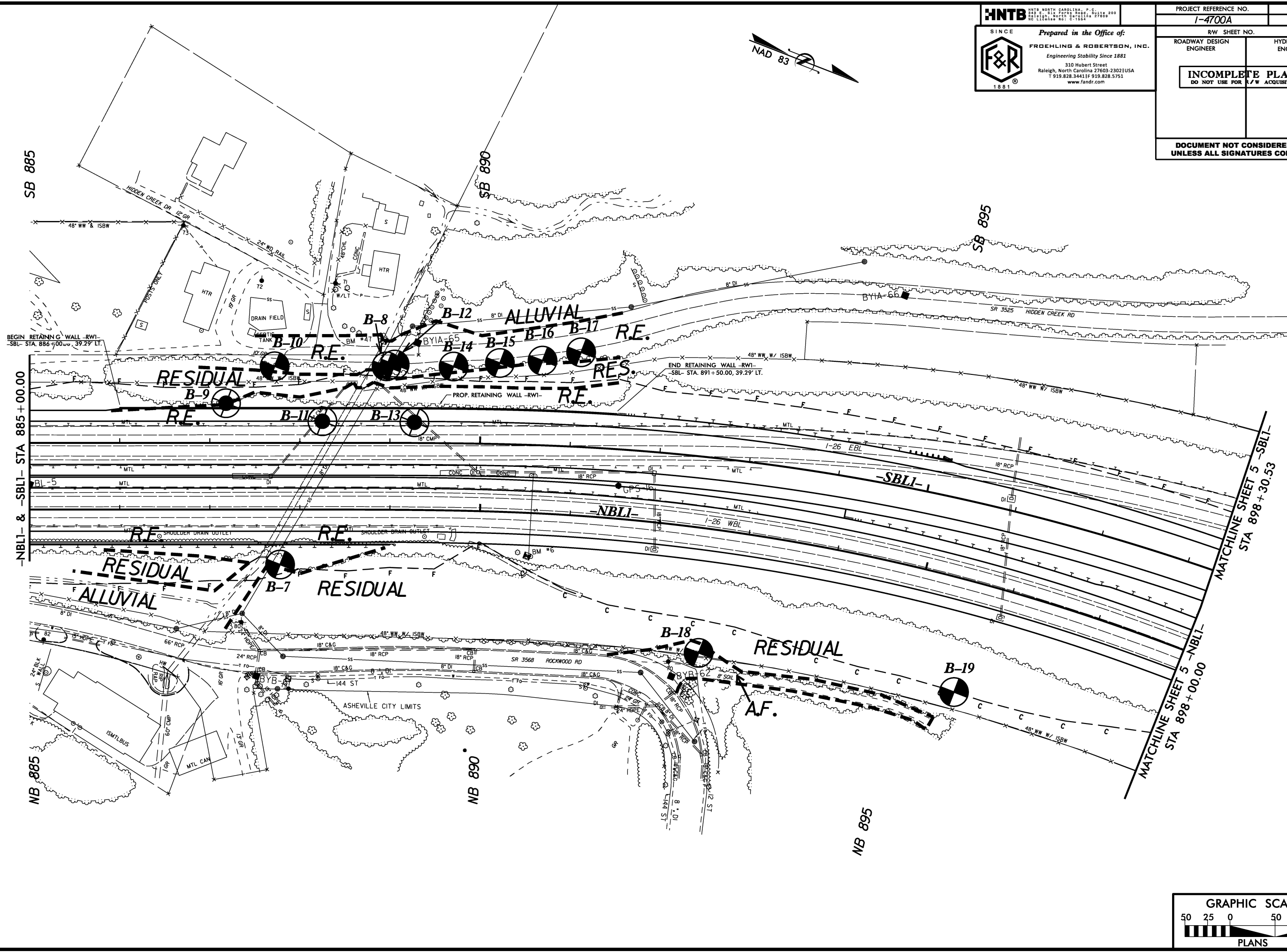
**HNTB** SINCE 1881  
**F&R**  
 Prepared in the Office of:  
**FROEHLING & ROBERTSON, INC.**  
 Engineering Stability Since 1881  
 310 Hubert Street  
 Raleigh, North Carolina 27603-2302 USA  
 T 919.828.3441 F 919.828.5751  
 www.fandr.com

PROJECT REFERENCE NO. <b>1-4700A</b>	SHEET NO. <b>X 3</b>
RW SHEET NO. ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	



REVISIONS

05-SEP-2018 14:16:55 A:\SSV\3046 INC001-1-4700A Buncombe Co\14700A.GEO\RDY\CADD GEOTECH\Plan\Pr\14700A\_RDY\_PSH-19\_004.dgn  
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# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700		COUNTY BUNCOMBE		GEOLOGIST N. Consigli								
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT-TRIBUTARY OF FR. BROAD							GROUND WTR (ft)							
BORING NO. B-7		STATION 887+78		OFFSET 61 ft RT		ALIGNMENT -NBL1-								
COLLAR ELEV. 2,084.7 ft		TOTAL DEPTH 15.0 ft		NORTHING 637,595		EASTING 945,610								
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/27/17		COMP. DATE 07/27/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2085	2,084.7	0.0	2	2	3									2,084.7 GROUND SURFACE 0.0
														2,082.7 ROADWAY EMBANKMENT 2.0
														2,081.2 Brown, Fine Sandy SILT (A-4) with Trace Organics (Roots) and Gravel
2080	2,081.2	3.5	4	4	4									2,077.7 RESIDUAL 7.0
														Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Mica, Highly Plastic
2075	2,076.2	8.5	3	3	1									2,077.7 Gray-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica, Rock Fragments, and Manganese Deposits
2070	2,071.2	13.5	4	5	7									2,069.7 Boring Terminated at Elevation 2,069.7 ft in SILT (RESIDUAL) 15.0
														Note: 0.0-0.2' = SURFICIAL ORGANIC SOILS
PROPOSED CULVERT EXTENSION INVERT ELEVATION OF INLET: 2075.92'														

WBS 36030		TIP I-4700		COUNTY BUNCOMBE		GEOLOGIST N. Consigli								
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT-TRIBUTARY OF FR. BROAD							GROUND WTR (ft)							
BORING NO. B-8		STATION 888+96		OFFSET 85 ft LT		ALIGNMENT -SBL1-								
COLLAR ELEV. 2,076.2 ft		TOTAL DEPTH 15.0 ft		NORTHING 637,625		EASTING 945,362								
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/27/17		COMP. DATE 07/27/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2080														2,076.2 GROUND SURFACE 0.0
														2,074.2 ROADWAY EMBANKMENT 2.0
														2,072.7 Brown, Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots) and Gravel
2075	2,076.2	0.0	4	3	2									2,072.7 Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Gravel, Highly Plastic
														2,072.7 Gray, Fine to Coarse Sandy SILT (A-4) with Trace Mica, Rock Fragments, and Manganese Deposits
2070	2,072.7	3.5	1	1	2									2,069.2 ALLUVIAL 7.0
														Gray, Fine to Coarse Sandy Clayey SILT (A-5)
2065	2,067.7	8.5	2	1	2									2,064.2 RESIDUAL 12.0
														Brown-Gray, Fine Sandy Clayey SILT (A-5) with Trace Mica and Manganese Deposits
														2,062.7 Boring Terminated at Elevation 2,061.2 ft in SILT (RESIDUAL) 15.0
														Note: 0.0-0.2' = SURFICIAL ORGANIC SOILS
PROPOSED CULVERT EXTENSION INVERT ELEVATION OF OUTLET: 2068.26'														

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT-TRIBUTARY OF FR. BROAD							GROUND WTR (ft)									
BORING NO. B-12		STATION 889+05		OFFSET 87 ft LT		ALIGNMENT -SBL1-										
COLLAR ELEV. 2,075.8 ft		TOTAL DEPTH 20.0 ft		NORTHING 637,633		EASTING 945,357										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 09/06/17		COMP. DATE 09/06/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2080																
2075	2,075.8	0.0	1	7	8										2,075.8	0.0
2070	2,072.3	3.5	3	2	2										2,073.8	2.0
2065	2,067.3	8.5	1	1	2										2,068.8	7.0
2060	2,062.3	13.5	2	3	3										2,063.8	12.0
	2,057.3	18.5	1	4	3										2,055.8	20.0
<p>PROPOSED CULVERT EXTENSION INVERT ELEVATION OF OUTLET: 2068.26'</p>																
<p>Boring Terminated at Elevation 2,055.8 ft in SILT (RESIDUAL)</p>																

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY.GPJ NC\_DOT.GDT 2/22/19

REFERENCE: I-4700

PROJECT: 36030

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	36030	1	8

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-8	BORE LOGS

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION I-4700A I-26 FROM 0.3 MI. EAST OF NC 280 (AIRPORT RD.) TO 0.5 MI EAST OF NC 191 (BREVARD RD.)  
 SITE DESCRIPTION EXTEND CULVERT 100101 -SBL- STA 984+42.13 -NBL- STA 984+16.39 I-26 OVER POWELL CREEK AND DUKE ENERGY CAR TUNNEL UNDER I-26 AT -NBL- STA 983

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 1919 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

W. HAMRICK  
D. AIELLO  
J. HOYLE

INVESTIGATED BY D. MULLEN  
 DRAWN BY D. MULLEN  
 CHECKED BY J. KUHNE  
 SUBMITTED BY D. MULLEN  
 DATE 2.25.2019



DocuSigned by:  
D Matt Mullen 2/26/2019

18909BD3CD5644A 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

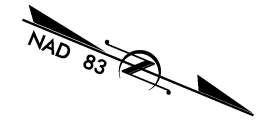
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																			
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>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:</p>										<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (IN 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																			
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b>										<b>WEATHERED ROCK (WR)</b>										<b>CRYSTALLINE ROCK (CR)</b>																			
<p>GENERAL CLASS. GRANULAR MATERIALS (&lt;= 35% PASSING #200) SILT-CLAY MATERIALS (&gt; 35% PASSING #200) ORGANIC MATERIALS</p>										<p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</b></p>										<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p>										<p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>																			
<b>MINERALOGICAL COMPOSITION</b>										<b>COMPRESSION</b>										<b>NON-CRYSTALLINE ROCK (NCR)</b>										<b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>																			
<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL &lt; 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL &gt; 50</p>										<p>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.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																			
<b>PERCENTAGE OF MATERIAL</b>										<b>GROUND WATER</b>										<b>WEATHERING</b>										<b>FRESH</b>																			
<p>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 &gt; 10% &gt; 20% HIGHLY 35% AND ABOVE</p>										<p>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</p>										<p>ROCK GENERALLY FRESH, JOINTS STAINED, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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> 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 &gt; 100 BPF</i> 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 &lt; 100 BPF</i> 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.</p>										<p>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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> 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 &gt; 100 BPF</i> 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 &lt; 100 BPF</i> 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.</p>																			
<b>CONSISTENCY OR DENSENESS</b>										<b>MISCELLANEOUS SYMBOLS</b>										<b>MODERATE (MOD.)</b>										<b>MODERATELY SEVERE (MOD. SEV.)</b>																			
<p>PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</p>										<p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY</p>										<p>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES SPT DMT VST PMT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION</p>										<p>SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE</p>																			
<b>TEXTURE OR GRAIN SIZE</b>										<b>RECOMMENDATION SYMBOLS</b>										<b>SEVERE (SEV.)</b>										<b>VERY SEVERE (IV SEV.)</b>																			
<p>U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053</p>										<p>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</p>										<p>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> 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 &gt; 100 BPF</i> 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 &lt; 100 BPF</i> 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.</p>										<p>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. 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. CAN BE GROOVED 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. CAN BE GROOVED 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. 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.</p>																			
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>ABBREVIATIONS</b>										<b>VERY HARD</b>										<b>HARD</b>																			
<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p>										<p>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. - SILTY, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT %g - DRY UNIT WEIGHT</p>										<p>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>										<p>VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT</p>																			
<b>PLASTICITY</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>MODERATELY SEVERE (MOD. SEV.)</b>										<b>SEVERE (SEV.)</b>																			
<p>NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH</p>										<p>DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST</p>										<p>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</p>										<p>HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -H -N HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST</p>										<p>VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT</p>									
<b>COLOR</b>										<b>FRACATURE SPACING</b>										<b>MODERATELY SEVERE (MOD. SEV.)</b>										<b>SEVERE (SEV.)</b>																			
<p>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.</p>										<p>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</p>										<p>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 &lt; 0.008 FEET</p>										<p>VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT</p>																			
<b>INDURATION</b>										<b>FRACATURE SPACING</b>										<b>MODERATELY SEVERE (MOD. SEV.)</b>										<b>SEVERE (SEV.)</b>																			
<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>										<p>FRIBLE MODERATELY INDURATED INDURATED EXTREMELY INDURATED</p>										<p>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p>VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT</p>																			
<b>NOTES:</b>										<b>BENCH MARK:</b> N/A ELEVATIONS DERIVED FROM PROJECT DTM										<b>ELEVATION:</b> FEET										<b>DATE:</b> 8-15-14																			



8/17/99

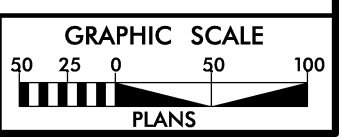
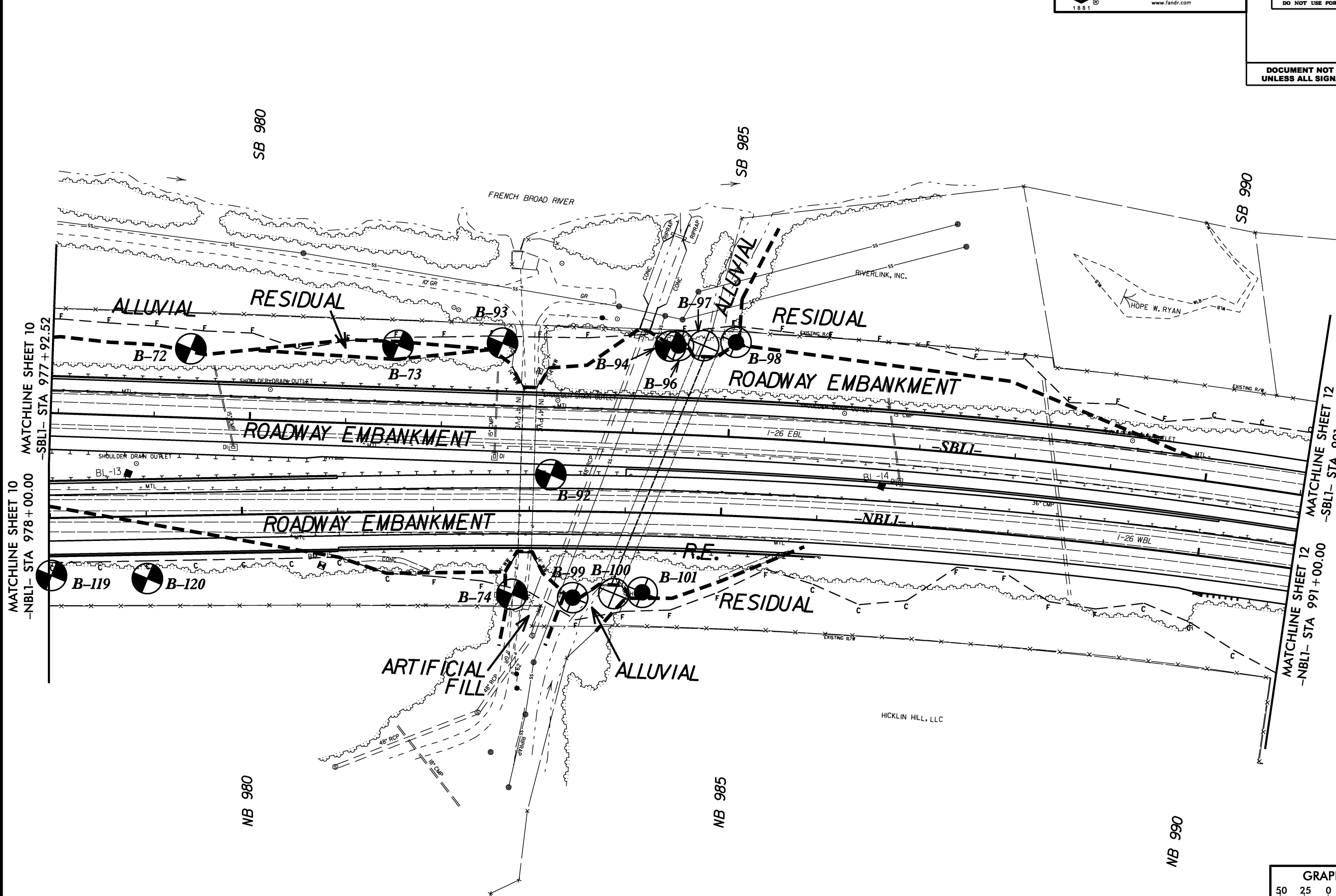
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REVISIONS



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PROJECT REFERENCE NO. <b>I-4700A</b>	SHEET NO. <b>3</b>
Roadway Design Engineer	Hydraulics Engineer
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	





# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-74		STATION 982+82		OFFSET 87 ft RT		ALIGNMENT -NBL1-										
COLLAR ELEV. 2,040.5 ft		TOTAL DEPTH 11.0 ft		NORTHING 646,370		EASTING 942,449										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 85% 01/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Aiello		START DATE 08/01/17		COMP. DATE 08/01/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2045																
2040	2,040.5	0.0	3	4	3										2,040.5	0.0
	2,037.0	3.5	3	3	4											
2035																
	2,032.0	8.5	23	20	44											
2030	2,029.5	11.0	60/0.0												2,029.5	11.0
ARTIFICIAL FILL Brown, Fine Sandy SILT (A-4) with Trace Mica and Gravel																
RESIDUAL Brown, Fine Sandy SILT (A-4) with Trace Mica and Little Rock Fragments																
CRYSTALLINE ROCK Gray (BIOTITE GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 2,029.5 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)																
Notes: 1) 0.0-0.1' = SURFICIAL ORGANIC SOILS 2) Auger Refusal at 11.0'																
INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34' INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27' INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040' INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'																

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-93		STATION 982+61		OFFSET 90 ft RT		ALIGNMENT -NBL1-										
COLLAR ELEV. 2,030.4 ft		TOTAL DEPTH 4.0 ft		NORTHING 646,431		EASTING 942,427										
DRILL RIG/HAMMER EFF./DATE N/A			DRILL METHOD Hand Auger		HAMMER TYPE N/A											
DRILLER J. Hoyle		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2035																
2030															2,030.4	0.0
INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34' INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27' INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040' INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'																

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-94		STATION 984+36		OFFSET 92 ft LT		ALIGNMENT -SBL1-										
COLLAR ELEV. 2,032.1 ft		TOTAL DEPTH 17.5 ft		NORTHING 646,424		EASTING 942,146										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 85% 01/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Aiello		START DATE 08/01/17		COMP. DATE 08/01/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2035																
	2,032.1	0.0	1	1	2	3									2,032.1	0.0
2030																
	2,028.6	3.5	10	7	8	15										
2025																
	2,023.6	8.5	1	2	3	5										
2020																
	2,018.6	13.5	5	4	6	10										
2015																
	2,014.7	17.4	60/0.1			60/0.1									2,014.7	17.4
															2,014.6	17.5

INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34'

INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27'

INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'

INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-96		STATION 984+44		OFFSET 93 ft LT		ALIGNMENT -SBL1-										
COLLAR ELEV. 2,031.4 ft		TOTAL DEPTH 4.0 ft		NORTHING 646,431		EASTING 942,143										
DRILL RIG/HAMMER EFF./DATE N/A			DRILL METHOD Hand Auger		HAMMER TYPE N/A											
DRILLER J. Hoyle		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2035																
															2,031.4	0.0
2030																
															2,027.4	4.0

INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34'

INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27'

INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'

INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-97		STATION 984+70		OFFSET 94 ft LT		ALIGNMENT -SBL1-										
COLLAR ELEV. 2,029.2 ft		TOTAL DEPTH 3.5 ft		NORTHING 646,455		EASTING 942,133										
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand Auger		HAMMER TYPE N/A												
DRILLER J. Hoyle		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2030														2,029.2	GROUND SURFACE	0.0
														2,025.7	ALLUVIAL Tan-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica	3.5
Boring Terminated at Elevation 2,025.7 ft in SILT (ALLUVIAL)																
INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34'  INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27'  INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'  INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'																

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick										
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)									
BORING NO. B-98		STATION 985+03		OFFSET 99 ft LT		ALIGNMENT -SBL1-										
COLLAR ELEV. 2,029.5 ft		TOTAL DEPTH 4.0 ft		NORTHING 646,485		EASTING 942,117										
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand Auger		HAMMER TYPE N/A												
DRILLER J. Hoyle		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2030														2,029.5	GROUND SURFACE	0.0
														2,025.5	ALLUVIAL Soft, Tan-Brown, Fine Sandy SILT (A-4)	4.0
Boring Terminated at Elevation 2,025.5 ft in SILT (RESIDUAL)																
INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34'  INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27'  INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'  INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'																



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick								
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTEND CULVERT AND TUNNEL STA 983-984							GROUND WTR (ft)							
BORING NO. B-101		STATION 984+20		OFFSET 83 ft RT		ALIGNMENT -NBL1-								
COLLAR ELEV. 2,032.3 ft		TOTAL DEPTH 4.0 ft		NORTHING 646,494		EASTING 942,395								
DRILL RIG/HAMMER EFF./DATE N/A				DRILL METHOD Hand Auger/Sounding Rod		HAMMER TYPE N/A								
DRILLER J. Hoyle		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2035														
														2,032.3 GROUND SURFACE 0.0
2030														ROADWAY EMBANKMENT Soft, Brown-Tan, Fine Sandy SILT (A-4) with Trace Mica
														2,028.3 4.0
														Boring Terminated at Elevation 2,028.3 ft in SILT (ROADWAY EMBANKMENT)
														Note: Sounding rod pushed to 5.0', then hammered to refusal at 6.0'. 11bpf recorded from 5.0'-6.0'.
														INVERT ELEVATION OF PROPOSED CULVERT EXTENSION INLET: 2025.34'
														INVERT ELEVATION OF PROPOSED CULVERT EXTENSION OUTLET: 2023.27'
														INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'
														INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION OUTLET: ~2030.4'

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY.GPJ NC\_DOT.GDT 2/25/19

REFERENCE: I-4400C

PROJECT: 34232

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN & PROFILE
4-6	CROSS SECTION(S)
7-9	BORE LOG(S)
10	SOIL TEST RESULTS

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM US 25 BUSINESS  
(EXIT 44) TO NEAR NC 280 (EXIT 40)

SITE DESCRIPTION RETAINING WALL 0 ON -Y13RPC-  
FROM 11+25 TO 16+25, 27.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4400C	1	10

**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 (ON-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:
- 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.
  - 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

S. WOODS

S. DAVIS

T. BEARD

INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE JANUARY 2019

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DocuSigned by:  
Patrice Alton 1/29/2019  
A270EF78680424 SIGNATURE DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
**GEOTECHNICAL ENGINEERING UNIT**  
**SUBSURFACE INVESTIGATION**  
 SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

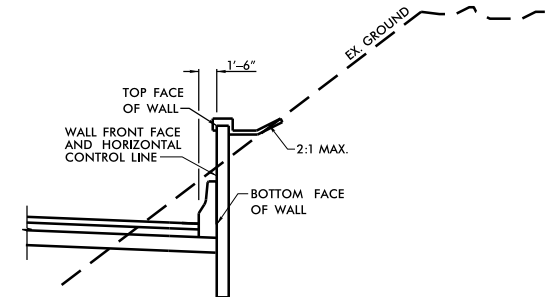
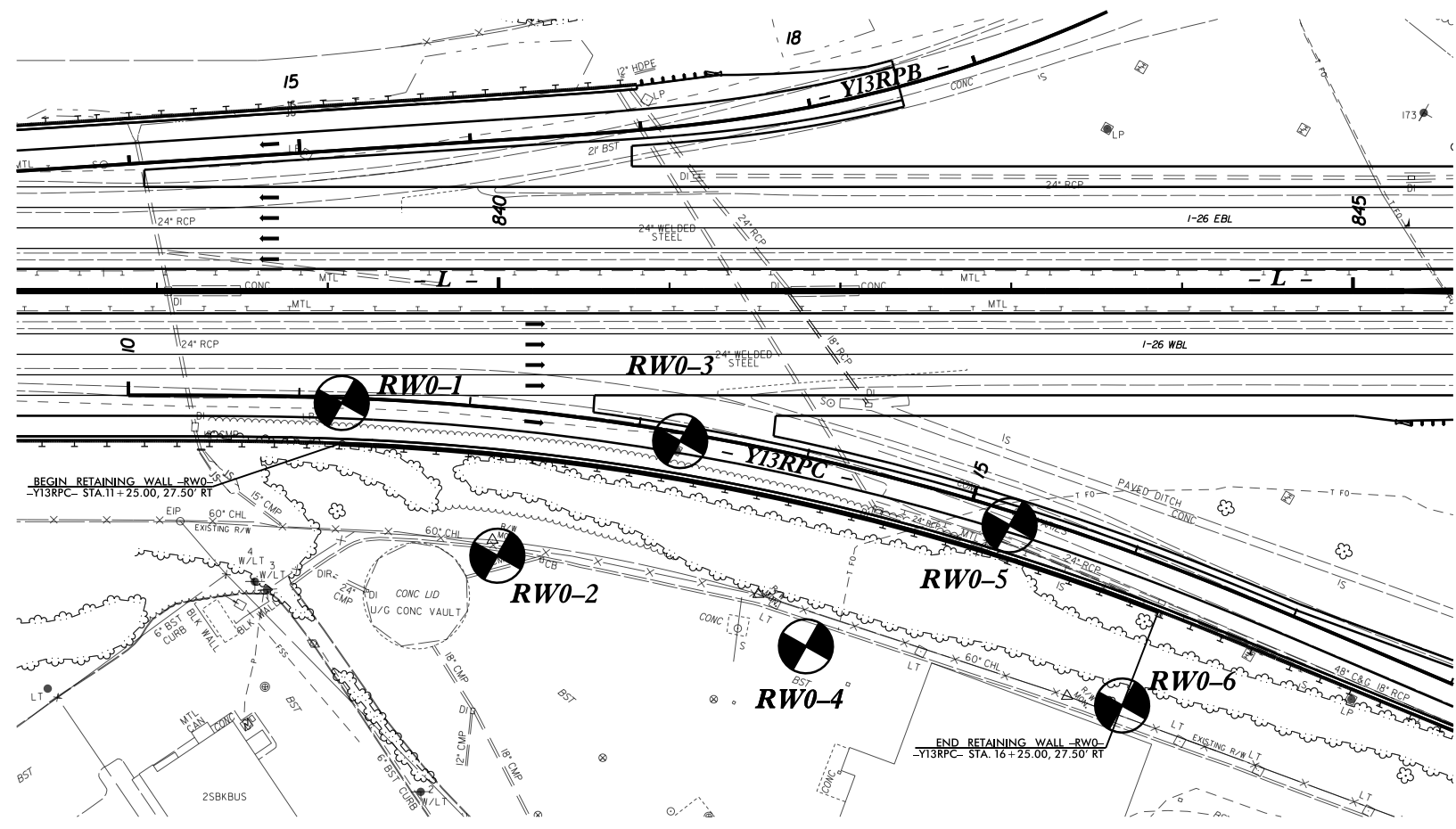
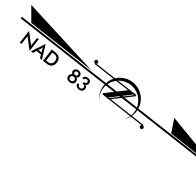
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 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	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: WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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 INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	<b>WEATHERING</b> FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE	
<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	<b>PERCENTAGE OF MATERIAL</b>	
<b>GRADATION</b>	<b>GROUND WATER</b>	<b>MISCELLANEOUS SYMBOLS</b>	
<b>CONSISTENCY OR DENSENESS</b>	<b>RECOMMENDATION SYMBOLS</b>	<b>ABBREVIATIONS</b>	
<b>TEXTURE OR GRAIN SIZE</b>	<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	
<b>PLASTICITY</b>	<b>PLASTICITY</b>	<b>FRACTURE SPACING</b>	<b>BEDDING</b>
<b>COLOR</b>	<b>COLOR</b>	<b>INDURATION</b>	<b>INDURATION</b>



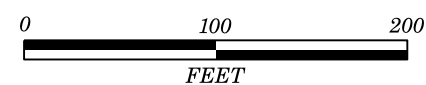
8/17/99

RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

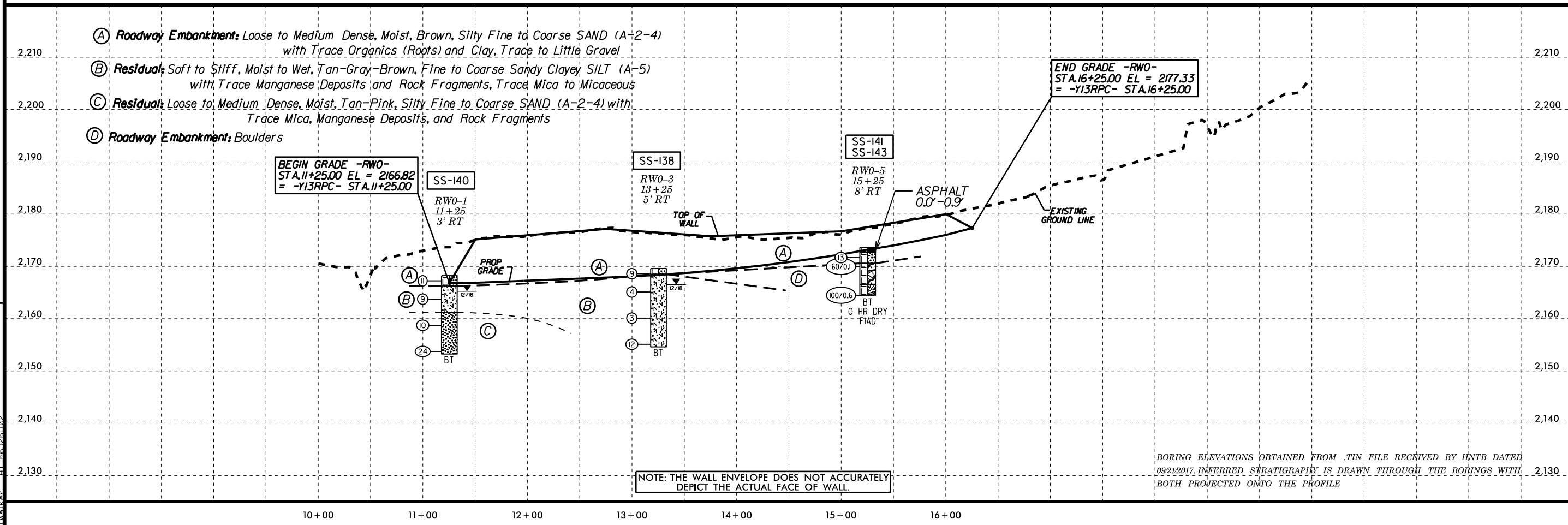
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



### RETAINING WALL -RW0-



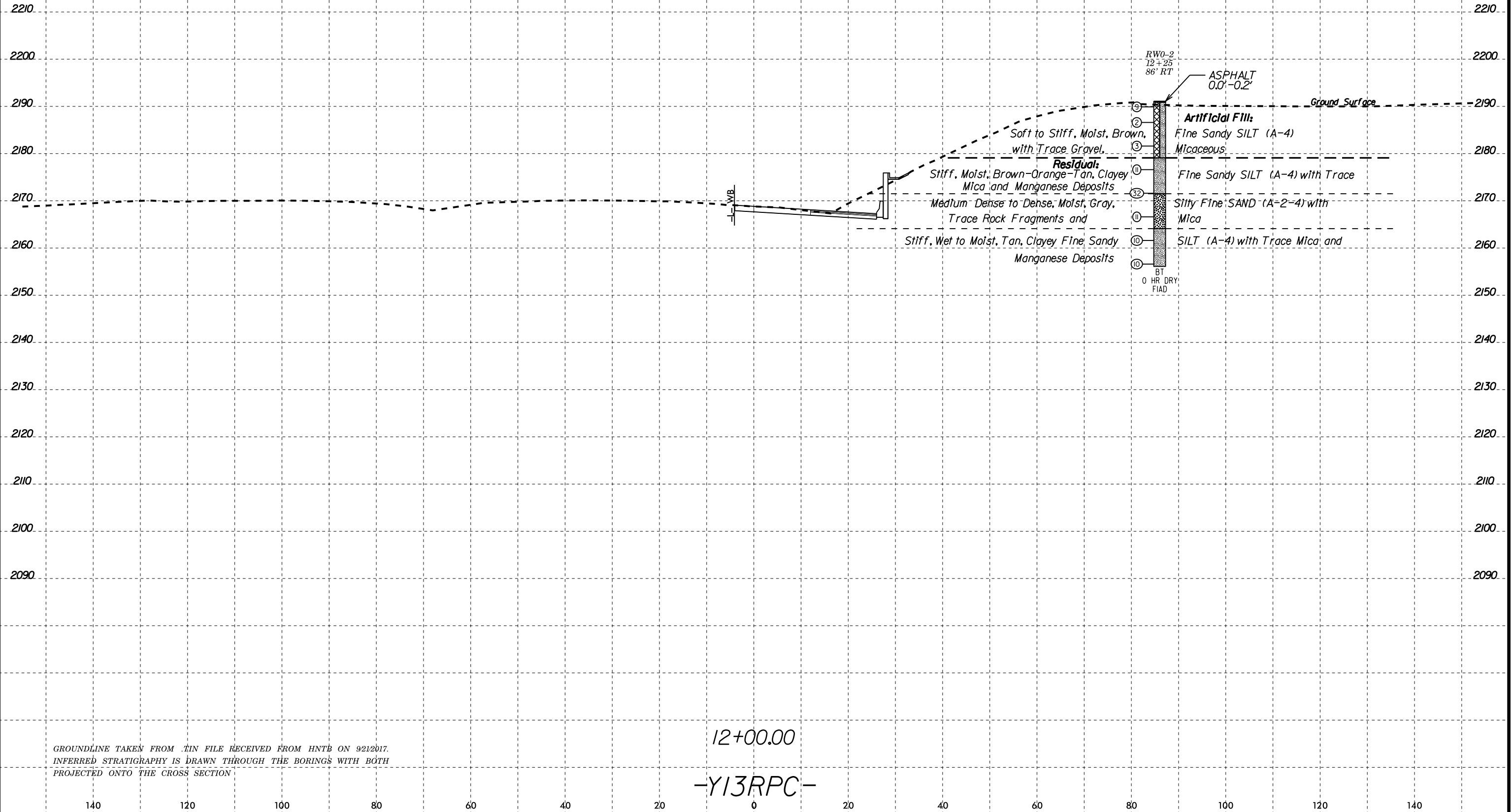
- (A) **Roadway Embankment:** Loose to Medium Dense, Moist, Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots) and Clay, Trace to Little Gravel
- (B) **Residual:** Soft to Stiff, Moist to Wet, Tan-Gray-Brown, Fine to Coarse Sandy Clayey, SILT (A-5) with Trace Manganese Deposits and Rock Fragments, Trace Mica to Micaceous
- (C) **Residual:** Loose to Medium Dense, Moist, Tan-Pink, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Manganese Deposits, and Rock Fragments
- (D) **Roadway Embankment:** Boulders



BORING ELEVATIONS OBTAINED FROM .TIN. FILE RECEIVED BY HNTB DATED 09/21/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

REVISIONS  
25-MAY-2019 11:24  
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Walker AT 66261102

6/23/16  
25 JAN 2019 11:23  
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25 JAN 2019 11:23  
I:\Projects\14700A\14700A-Geo\14700A-Geo-SSI-RW0.dgn

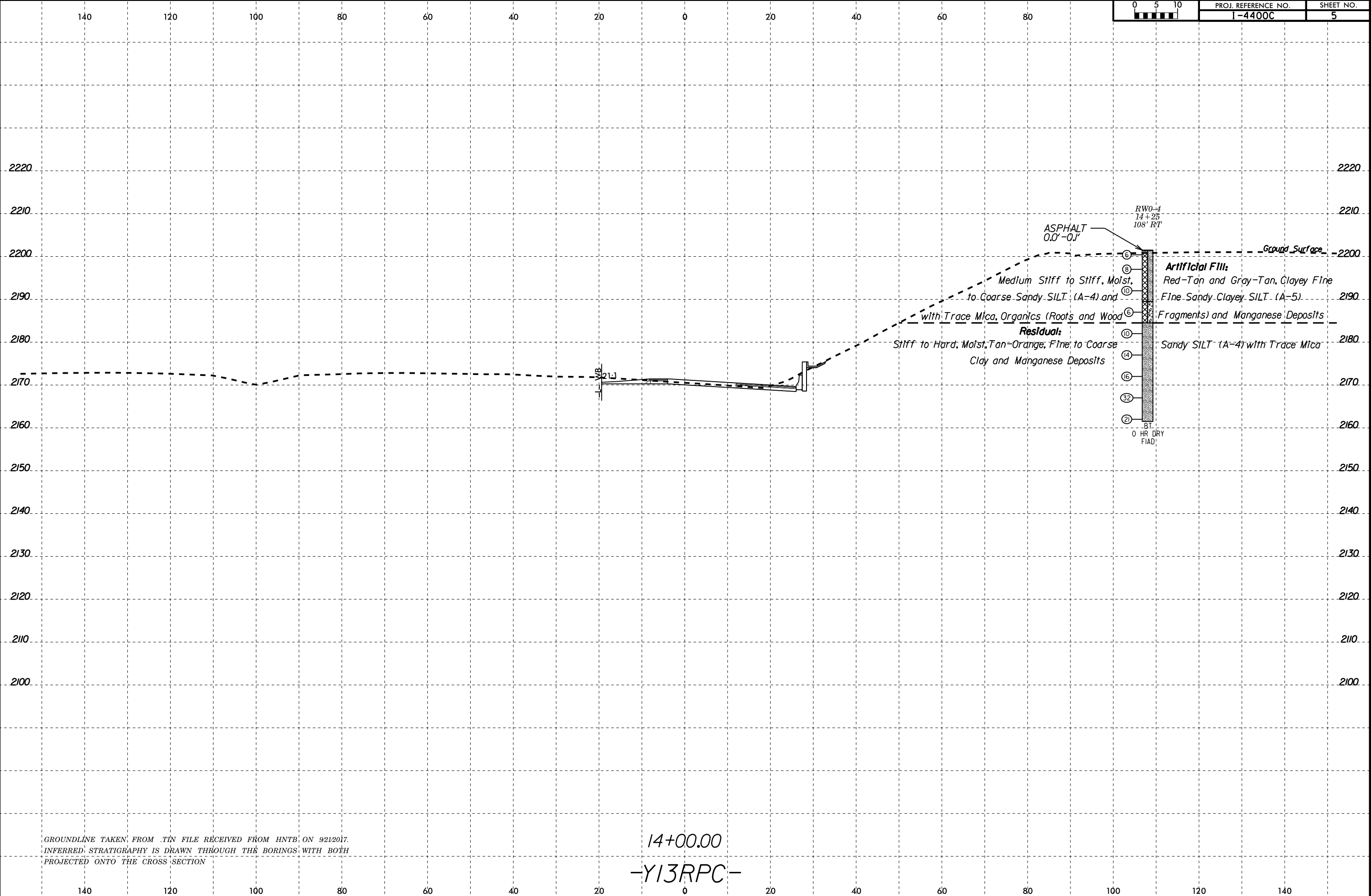


GROUNDLINE TAKEN FROM .TIN FILE RECEIVED FROM HNTB ON 9/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.	SHEET NO.
I-4400C	5



25-JAN-2019 16:27  
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GROUNDLINE TAKEN FROM TIN FILE RECEIVED FROM HNTB ON 9/21/2017.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

14+00.00  
 -Y13RPC-



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)									
BORING NO. RW0-1		STATION 11+25		OFFSET 3 ft RT		ALIGNMENT -Y13RPC-										
COLLAR ELEV. 2,168.2 ft		TOTAL DEPTH 15.0 ft		NORTHING 633,180		EASTING 947,613										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 12/01/18		COMP. DATE 12/01/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2170	2,168.2	0.0	8	5	6										2,168.2	0.0
2165	2,164.7	3.5	7	5	4										2,166.2	2.9
2160	2,159.7	8.5	3	4	6										2,161.2	7.0
2155	2,154.7	13.5	2	9	15										2,153.2	15.0
Boring Terminated at Elevation 2,153.2 ft in SAND (RESIDUAL)																

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)									
BORING NO. RW0-2		STATION 12+25		OFFSET 86 ft RT		ALIGNMENT -Y13RPC-										
COLLAR ELEV. 2,191.1 ft		TOTAL DEPTH 35.0 ft		NORTHING 633,303		EASTING 947,646										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 12/02/18		COMP. DATE 12/02/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2195	2,190.9	0.2													2,191.1	0.0
2190	2,187.6	3.5	9	5	4										2,187.6	3.5
2185	2,182.6	8.5	2	1	1										2,182.6	8.5
2180	2,177.6	13.5	1	1	2										2,177.6	13.5
2175	2,172.6	18.5	3	5	6										2,172.6	18.5
2170	2,167.6	23.5	3	5	27										2,167.6	23.5
2165	2,162.6	28.5	9	5	6										2,162.6	28.5
2160	2,157.6	33.5	3	5	5										2,157.6	33.5
Boring Terminated at Elevation 2,156.1 ft in SILT (RESIDUAL)																
Note: FIAD due to boring location in parking lot																

NCDOT BORE DOUBLE I4400C\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/25/19



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)									
BORING NO. RW0-3		STATION 13+25		OFFSET 5 ft RT		ALIGNMENT -Y13RPC-										
COLLAR ELEV. 2,169.6 ft		TOTAL DEPTH 15.0 ft		NORTHING 633,363		EASTING 947,535										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 11/30/18		COMP. DATE 11/30/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2170	2,169.6	0.0	4	6	3											2,169.6
																2,168.5
2165	2,166.1	3.5	2	1	3								M			
2160	2,161.1	8.5	1	1	2								W			
2155	2,156.1	13.5	3	5	7								M			2,154.6
Boring Terminated at Elevation 2,154.6 ft in SILT (RESIDUAL)																

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)									
BORING NO. RW0-4		STATION 14+25		OFFSET 108 ft RT		ALIGNMENT -Y13RPC-										
COLLAR ELEV. 2,201.5 ft		TOTAL DEPTH 40.0 ft		NORTHING 633,487		EASTING 947,603										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 12/02/18		COMP. DATE 12/02/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2205																
2200	2,201.4	0.1	7	3	3								M			2,201.5
2195	2,198.0	3.5	2	2	6								M			
2190	2,193.0	8.5	5	5	5								M			
2185	2,188.0	13.5	1	2	4								M			2,189.5
2180	2,183.0	18.5	2	4	6								M			2,184.5
2175	2,178.0	23.5	4	6	8								M			
2170	2,173.0	28.5	5	8	8								M			
2165	2,168.0	33.5	9	16	16								M			
	2,163.0	38.5	11	8	13								M			2,161.5
Boring Terminated at Elevation 2,161.5 ft in SILT (RESIDUAL)																
Note: FIAD due to boring location in parking lot																

NCDOT BORE DOUBLE I4400C\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/25/19

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)								
BORING NO. RW0-5		STATION 15+25		OFFSET 8 ft RT		ALIGNMENT -Y13RPC-									
COLLAR ELEV. 2,173.6 ft		TOTAL DEPTH 9.1 ft		NORTHING 633,556		EASTING 947,483									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 12/01/18		COMP. DATE 12/01/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2175															
	2,172.7	0.9	6	6	7									2,173.6	0.0
														2,172.7	0.9
2170	2,170.1	3.5	60/0.1											2,170.6	3.0
														2,166.6	7.0
2165	2,165.1	8.5	76	24/0.1										2,164.5	9.1

Boring Terminated at Elevation 2,164.5 ft in BOULDER (ROADWAY EMBANKMENT)

Note:  
FIAD due to boring location in roadway

WBS 34232.1.FS4		TIP I-4400C		COUNTY HENDERSON		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right							GROUND WTR (ft)								
BORING NO. RW0-6		STATION 16+25		OFFSET 86 ft RT		ALIGNMENT -Y13RPC-									
COLLAR ELEV. 2,202.9 ft		TOTAL DEPTH 35.0 ft		NORTHING 633,665		EASTING 947,542									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 12/02/18		COMP. DATE 12/02/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2205															
	2,202.9	0.0												2,202.9	0.0
2200	2,199.4	3.5	2	2	2									2,199.4	3.5
			5	5	5										
2195	2,194.4	8.5	2	1	2									2,195.9	7.0
			1	2	2									2,190.9	12.0
2190	2,189.4	13.5	3	5	8									2,185.9	17.0
			6	7	10									2,180.9	22.0
2185	2,184.4	18.5	6	8	8									2,175.9	27.0
			3	4	6									2,170.9	32.0
2180	2,179.4	23.5												2,167.9	35.0
2175	2,174.4	28.5													
2170	2,169.4	33.5													

Boring Terminated at Elevation 2,167.9 ft in SILT (RESIDUAL)

NCDOT BORE DOUBLE I4400C\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/25/19

**North Carolina Department of Transportation  
Division of Highways  
Materials and Test Unit  
Soils Laboratory**

T.I.P. ID NO.: I-4400C  
DESCRIPTION: Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right

REPORT ON SAMPLES OF: SOIL FOR QUALITY

WBS No.: 34232.1.FS4  
DATE SAMPLED: 12/18  
SAMPLED FROM: -Y13RPC-  
SUBMITTED BY: D. Racey

COUNTY: Henderson  
RECEIVED: 12/18  
REPORTED: 12/18  
BY: D. Council  
Cert No. 101-02-0603

**TEST RESULTS**

PROJ. SAMPLE NO.	SS-140	SS-138	SS-141	SS-143						
BORING NO.	RW0-1	RW0-3	RW0-6	RW0-6						
Retained #4 Sieve %	2.1	0.0	0.0	3.7						
Passing #10 Sieve %	85.1	100.0	98.3	96.2						
Passing #40 Sieve %	62.4	97.6	87.9	92.3						
Passing #200 Sieve %	34.7	51.7	46.8	62.0						

SOIL MORTAR - 100%										
Coarse Sand Ret - #60 %	38.9	16.0	24.1	12.9						
Fine Sand Ret - #270 %	26.9	40.3	36.0	25.7						
Silt 0.053 - 0.010 mm %	18.9	30.5	21.2	14.2						
Clay < 0.010 mm %	15.3	13.2	18.7	47.2						
L.L.	39	41	39	38						
P.L.	36	40	34	24						
P.I.	3	1	5	14						
AASHTO Classification	A-2-4 (0)	A-5 (0)	A-4 (1)	A-6 (7)						
Station	11+25	13+25	16+25	16+25						
Offset	3' RT	5' RT	86' RT	86' RT						
Depth (ft)	8.5	1.1	0.0	13.5						
to	10.0	1.5	1.5	15.0						
Alignment	-Y13RPC-	-Y13RPC-	-Y13RPC-	-Y13RPC-						
Moisture Content (%)	21.4	29.4	20.4	24.7						
Organic Content (%)	NT	NT	NT	NT						

NP = Not plastic  
NT = Not tested  
ND = Not Determined  
CL = Centerline

W.P. Alton, P.E.  
Soils Engineer

REFERENCE: I-4700A

PROJECT: 36030

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN & PROFILE
4-5	CROSS SECTION(S)
6-10	BORE LOG(S)
11	SOIL TEST RESULTS

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE

PROJECT DESCRIPTION I-26 FROM NEAR NC 280  
(EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 3 ON -EBL-  
FROM 886+00 TO 891+50, 39.29' LEFT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	11

**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 (ON-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:
- 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.
  - 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**

<u>C. BOYCE</u>	<u>T. SHARPE</u>
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INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE NOVEMBER 2018

SINCE **Prepared in the Office of:**  
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DocuSigned by:  
*Patrick Alton* 11/26/2018  
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SIGNATURE DATE

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

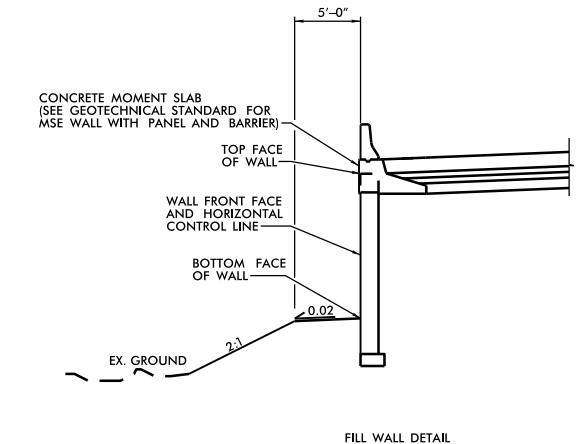
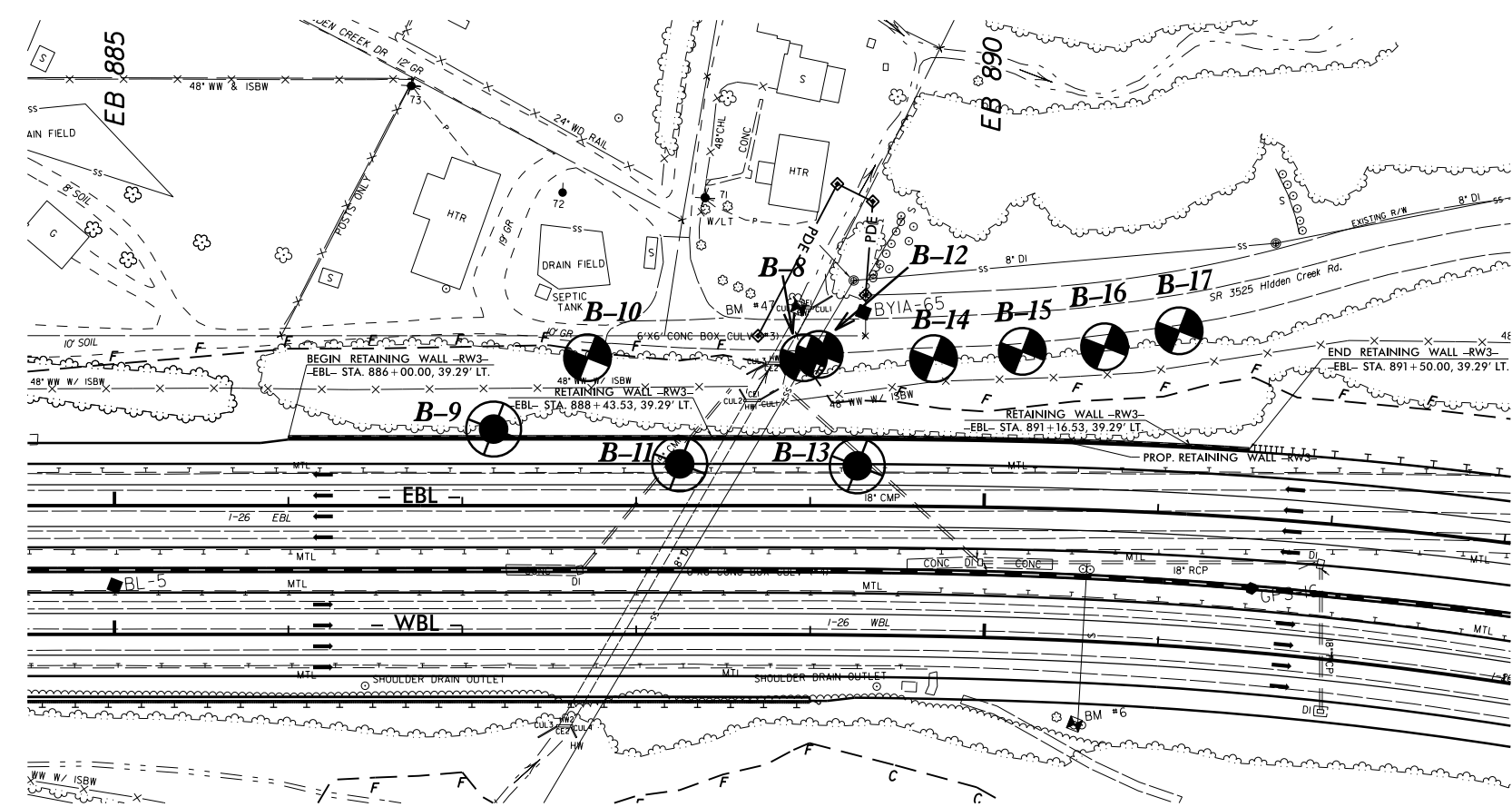
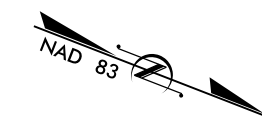
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**  
**SUBSURFACE INVESTIGATION**  
**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION		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		<b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.		<b>HARD ROCK</b> 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: <b>WEATHERED ROCK (WR)</b> - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. <b>CRYSTALLINE ROCK (CR)</b> - FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. <b>NON-CRYSTALLINE ROCK (INCR)</b> - FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLITE, SLATE, SANDSTONE, ETC. <b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b> - COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.		<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																																																																																																																																								
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="6">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1-a</th> <th>A-1-b</th> <th>A-3</th> <th>A-2-4</th> <th>A-2-5</th> <th>A-2-6</th> <th>A-2-7</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</th> <th>A-6, A-7</th> </tr> <tr> <th>GROUP CLASS.</th> <td colspan="2">A-1</td> <td>A-3</td> <td colspan="2">A-2</td> <td colspan="2">A-2</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-4, A-5</td> <td>A-6, A-7</td> </tr> <tr> <th>SYMBOL</th> <td colspan="2">[Pattern]</td> <td>[Pattern]</td> <td colspan="2">[Pattern]</td> <td colspan="2">[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> <td>[Pattern]</td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 MX 30 MX 15 MX</td> <td>50 MX 30 MX 15 MX</td> <td>51 MN 10 MX</td> <td>35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>GRANULAR SOILS</td> <td>SILT-CLAY SOILS</td> <td>MUCK, PEAT</td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="2">-</td> <td>-</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td>HIGHLY ORGANIC SOILS</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="2">0</td> <td>0</td> <td>4 MX</td> <td>8 MX</td> <td>12 MX</td> <td>16 MX</td> <td>NO MX</td> <td colspan="2"></td> <td colspan="2"></td> <td></td> <td></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. 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A-1		A-3	A-2		A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7	SYMBOL	[Pattern]		[Pattern]	[Pattern]		[Pattern]		[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 30 MX 15 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	-		-	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS	GROUP INDEX	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	UNSATURABLE				<b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</b>		<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.		<b>WEATHERING</b> <b>FRESH</b> - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. <b>VERY SLIGHT (V SLI.)</b> - 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. <b>SLIGHT (SLI.)</b> - 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. <b>MODERATE (MOD.)</b> - 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. <b>MODERATELY SEVERE (MOD. SEV.)</b> - 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> <b>SEVERE (SEV.)</b> - 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 &gt; 100 BPF</i> <b>VERY SEVERE (V SEV.)</b> - 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 &lt; 100 BPF</i> <b>COMPLETE</b> - 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.		<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	
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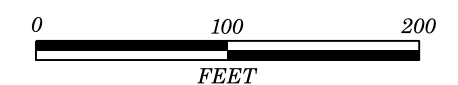


8/17/99

PROJECT REFERENCE NO.	SHEET NO.
1-4700A	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

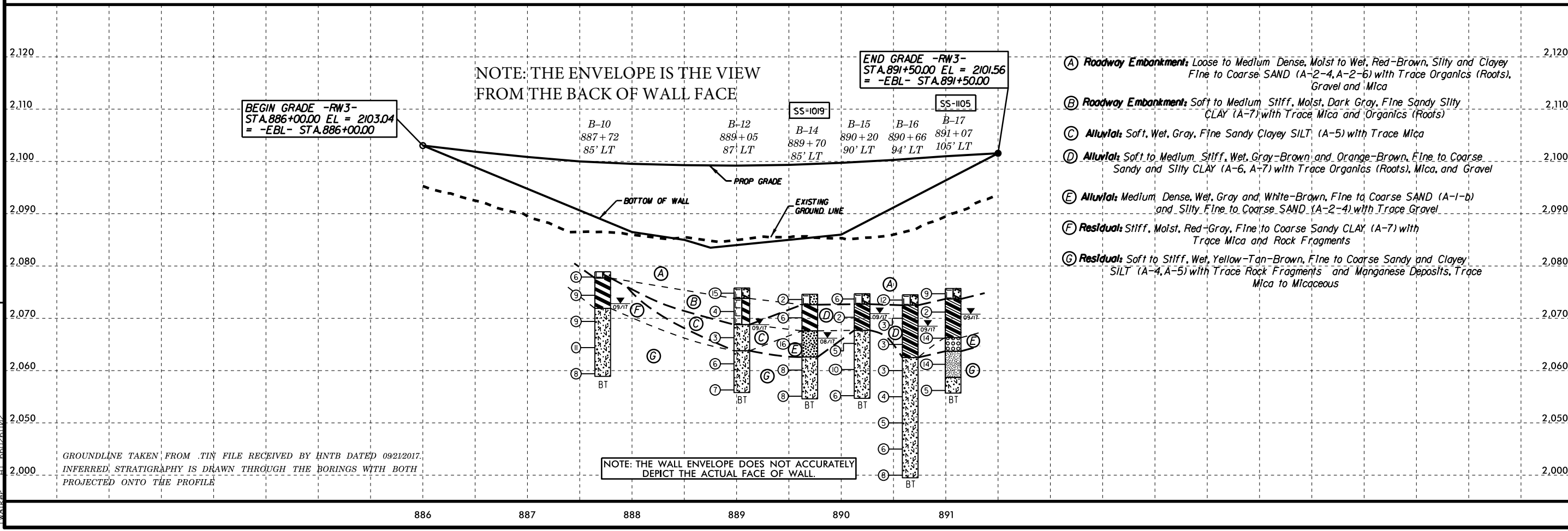


### RETAINING WALL -RW3-



REVISIONS

20-NOV-2018 13:39 E:\Projects\66166\66166-0046 (NCDDOT-1-4700A) Buncembe Co\14700A.GEO\RDWY\CADD\_GEO\RDWY\Site&Sub\14700A.RDY\_RW\_03.dgn







# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST N. Consigli									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-8		STATION 888+96		OFFSET 85 ft LT		ALIGNMENT -EBL1-									
COLLAR ELEV. 2,076.2 ft		TOTAL DEPTH 15.0 ft		NORTHING 637,625		EASTING 945,362									
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER C. Boyce		START DATE 07/27/17		COMP. DATE 07/27/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2080															
	2,076.2	0.0	4	3	2									2,076.2	0.0
2075														2,074.2	2.0
	2,072.7	3.5	1	1	2									2,072.2	2.0
2070														2,069.2	7.0
	2,067.7	8.5	2	1	2									2,069.2	7.0
2065														2,064.2	12.0
	2,062.7	13.5	2	3	5									2,064.2	12.0
														2,061.2	15.0

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-9		STATION 887+18		OFFSET 44 ft LT		ALIGNMENT -EBL-									
COLLAR ELEV. 2,088.2 ft		TOTAL DEPTH 2.4 ft		NORTHING 637,474		EASTING 945,465									
DRILL RIG/HAMMER EFF./DATE N/A				DRILL METHOD Hand Auger		HAMMER TYPE N/A									
DRILLER D. Aiello		START DATE 08/14/17		COMP. DATE 08/14/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2090															
														2,088.2	0.0
														2,085.8	2.4

GROUND SURFACE 0.0

**RESIDUAL**  
Soft, Brown, Fine to Coarse Sandy SILT (A-4) with Trace Rock Fragments and Organics (Roots)

Boring Terminated at Elevation 2,085.8 ft in SILT (RESIDUAL)

Note:  
Hand Auger Refusal at 2.4'. Sounding rod pushed to 1.2', then hammered to refusal at 7.1'

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-10		STATION 887+72		OFFSET 85 ft LT		ALIGNMENT -EBL-									
COLLAR ELEV. 2,078.9 ft		TOTAL DEPTH 20.0 ft		NORTHING 637,509		EASTING 945,407									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 09/06/17		COMP. DATE 09/06/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2080	2,078.9	0.0												2,078.9	0.0
			1	3	3									2,077.7	1.2
2075	2,075.4	3.5	4	4	5										
2070	2,070.4	8.5	2	4	5									2,071.9	7.9
2065	2,065.4	13.5	3	5	6										
2060	2,060.4	18.5	3	5	3									2,058.9	20.0
Boring Terminated at Elevation 2,058.9 ft in SILT (RESIDUAL)															
Note: 0.0'-0.2' = SURFICIAL ORGANIC SOILS															

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-11		STATION 888+25		OFFSET 24 ft LT		ALIGNMENT -EBL-									
COLLAR ELEV. 2,096.6 ft		TOTAL DEPTH 1.7 ft		NORTHING 637,581		EASTING 945,445									
DRILL RIG/HAMMER EFF./DATE N/A				DRILL METHOD Hand Auger		HAMMER TYPE N/A									
DRILLER D. Aiello		START DATE 08/14/17		COMP. DATE 08/14/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2100															
2095														2,096.6	0.0
														2,095.6	1.0
														2,094.9	1.7
ROADWAY EMBANKMENT Soft, Dark Brown, Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots) and Gravel															
Loose, Brown, Fine to Coarse SAND (A-1-b) with Trace Gravel															
Boring Terminated at Elevation 2,094.9 ft in SAND (ROADWAY EMBANKMENT)															
Note: Hand Auger Refusal at 1.7'. Sounding rod pushed to 0.8', then hammered to termination at 10.0'															

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-12		STATION 889+05		OFFSET 87 ft LT		ALIGNMENT -EBL-									
COLLAR ELEV. 2,075.8 ft		TOTAL DEPTH 20.0 ft		NORTHING 637,633		EASTING 945,357									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 09/06/17		COMP. DATE 09/06/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2080															
2075	2,075.8	0.0	1	7	8									2,075.8	GROUND SURFACE
														2,073.8	ROADWAY EMBANKMENT Red-Brown, Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots) and Mica, Some Gravel
2070	2,072.3	3.5	3	2	2									2,068.8	Dark Gray, Fine Sandy Silty CLAY (A-7) with Trace Mica and Organics (Roots)
														2,063.8	ALLUVIAL Gray, Fine Sandy Clayey SILT (A-5) with Trace Mica
2065	2,067.3	8.5	1	1	2									2,063.8	RESIDUAL Yellow-Tan-Brown, Clayey SILT (A-5) with Trace Manganese Deposits, Trace Mica to Micaceous
2060	2,062.3	13.5	2	3	3										
	2,057.3	18.5	1	4	3									2,055.8	Boring Terminated at Elevation 2,055.8 ft in SILT (RESIDUAL)

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)								
BORING NO. B-13		STATION 889+27		OFFSET 23 ft LT		ALIGNMENT -EBL-									
COLLAR ELEV. 2,095.5 ft		TOTAL DEPTH 2.8 ft		NORTHING 637,676		EASTING 945,409									
DRILL RIG/HAMMER EFF./DATE N/A				DRILL METHOD Hand Auger		HAMMER TYPE N/A									
DRILLER D. Aiello		START DATE 08/14/17		COMP. DATE 08/14/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2100															
														2,095.5	GROUND SURFACE
2095														2,092.7	ROADWAY EMBANKMENT Soft, Orange-Brown, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots) and Mica, Trace to Little Gravel Boring Terminated at Elevation 2,092.7 ft in SILT (ROADWAY EMBANKMENT)

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods											
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)										
BORING NO. B-14		STATION 889+70		OFFSET 85 ft LT		ALIGNMENT -EBL-											
COLLAR ELEV. 2,074.6 ft		TOTAL DEPTH 20.0 ft		NORTHING 637,695		EASTING 945,335											
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 80% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Aiello		START DATE 08/27/17		COMP. DATE 08/27/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2075	2,074.6	0.0	1	1	1										2,074.6	0.0	GROUND SURFACE
															2,072.6	2.0	ROADWAY EMBANKMENT Dark Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots), Mica, and Gravel
2070	2,071.1	3.5	2	3	3												ALLUVIAL Orange-Brown, Fine to Coarse Sandy Silty CLAY (A-7) with Trace Mica, Gravel, and Organics (Roots)
															2,067.6	7.0	ALLUVIAL Gray, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel
2065	2,066.1	8.5	6	11	5												RESIDUAL Tan-Brown, Clayey SILT (A-5) with Trace Mica and Manganese Deposits
															2,062.6	12.0	
2060	2,061.1	13.5	4	3	5												
2055	2,056.1	18.5	2	3	5												
Boring Terminated at Elevation 2,054.6 ft in SILT (RESIDUAL)																	
Note: 0.0-0.1' = SURFICIAL ORGANIC SOILS																	

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods											
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left							GROUND WTR (ft)										
BORING NO. B-15		STATION 890+20		OFFSET 90 ft LT		ALIGNMENT -EBL-											
COLLAR ELEV. 2,074.7 ft		TOTAL DEPTH 20.0 ft		NORTHING 637,741		EASTING 945,313											
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER S. Davis		START DATE 09/06/17		COMP. DATE 09/06/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2075	2,074.7	0.0	1	2	4										2,074.7	0.0	GROUND SURFACE
															2,072.7	2.0	ROADWAY EMBANKMENT Brown, Silty Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots), Gravel, and Mica
2070	2,071.2	3.5	1	1	1												ALLUVIAL Gray, Fine to Coarse Sandy Silty CLAY (A-6) with Trace Organics (Roots) and Mica
															2,067.7	7.0	RESIDUAL Yellow-Brown to Tan-Brown, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Manganese Deposits, Trace Mica to Micaceous
2065	2,066.2	8.5	2	3	2												
2060	2,061.2	13.5	3	5	5												
2055	2,056.2	18.5	2	2	4												
Boring Terminated at Elevation 2,054.7 ft in SILT (RESIDUAL)																	
Note: 0.0-0.2' = SURFICIAL ORGANIC SOILS																	



**North Carolina Department of Transportation  
Division of Highways  
Materials and Test Unit  
Soils Laboratory**

T.I.P. ID NO.: I-4700A  
DESCRIPTION: Retaining Wall 3 on -EBL- from 886+00 to 891+50, 39.29' Left

REPORT ON SAMPLES OF: SOIL FOR QUALITY

WBS No.: 36030.1.FS4  
DATE SAMPLED: 8/17 & 9/17  
SAMPLED FROM: -EBL-  
SUBMITTED BY: D. Racey

COUNTY: Buncombe  
RECEIVED: 8/17  
REPORTED: 9/17  
BY: D. Jenks  
Cert No. 101-02-0603

**TEST RESULTS**

PROJ. SAMPLE NO.	SS-1019	SS-1105											
BORING NO.	B-14	B-17											
Retained #4 Sieve %	8.9	1.4											
Passing #10 Sieve %	87.6	98.1											
Passing #40 Sieve %	72.6	91.9											
Passing #200 Sieve %	34.6	66.5											

SOIL MORTAR - 100%													
Coarse Sand Ret - #60 %	30.5	12.9											
Fine Sand Ret - #270 %	36.4	24.1											
Silt 0.053 - 0.010 mm %	17.0	20.8											
Clay < 0.010 mm %	16.1	42.2											
L.L.	34	36											
P.L.	NP	22											
P.I.	NP	14											
AASHTO Classification	A-2-4(0)	A-6(8)											
Station	889+70	891+07											
Offset	85' LT.	105' LT.											
Depth (ft)	0.1	3.5											
to	1.5	5.0											
Alignment	-EBL-	-EBL-											
Moisture Content (%)	24.9	27.0											
Organic Content (%)	NT	NT											

NP = Not plastic  
NT = Not tested  
ND = Not Determined  
CL = Centerline

W.P. Alton, P.E.  
Soils Engineer

REFERENCE: I-4700A

PROJECT: 36030

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN & PROFILE
4-7	BORE LOG(S)
8	SOIL TEST RESULTS

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION I-26 FROM NEAR NC 280  
(EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 4 ON -Y14-  
FROM 12 + 50 TO 15 + 80, 21.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	8

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 (ON-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:
- 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.
  - 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

<u>J. HOYLE</u>	<u>S. WOODS</u>
<u>T. LUCAS</u>	<u>M. ARNOLD</u>
	<u>W. HAMRICK</u>
	<u>S. DAVIS</u>
	<u>T. SHARPE</u>
	<u>T. BEARD</u>

INVESTIGATED BY F&R, Inc.  
 DRAWN BY T.T. WALKER  
 CHECKED BY D. RACEY  
 SUBMITTED BY P. ALTON, P.E.  
 DATE JANUARY 2019

SINCE **Prepared in the Office of:**  
**F&R** FROEHLING & ROBERTSON, INC.  
 Engineering Stability Since 1881  
 310 Hubert Street  
 Raleigh, North Carolina 27603-2302 | USA  
 T 919.828.3441 | F 919.828.5751  
 www.fandr.com



DocuSigned by:  
Patrick Alton 1/23/2019  
 AZ70EF78ASDF442 SIGNATURE DATE

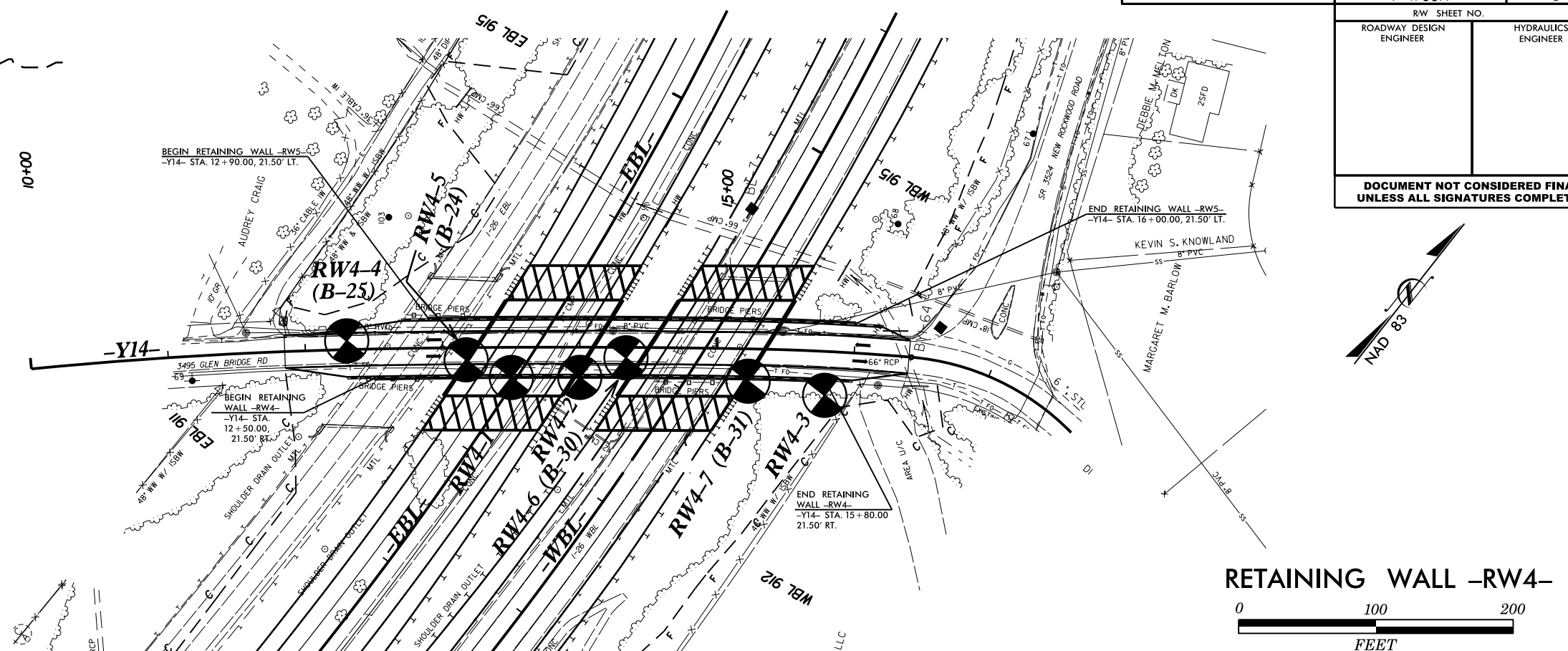
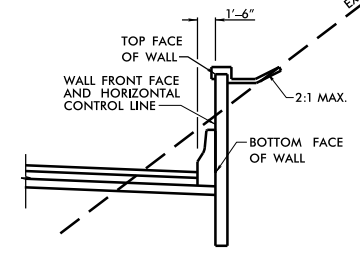
**DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED**



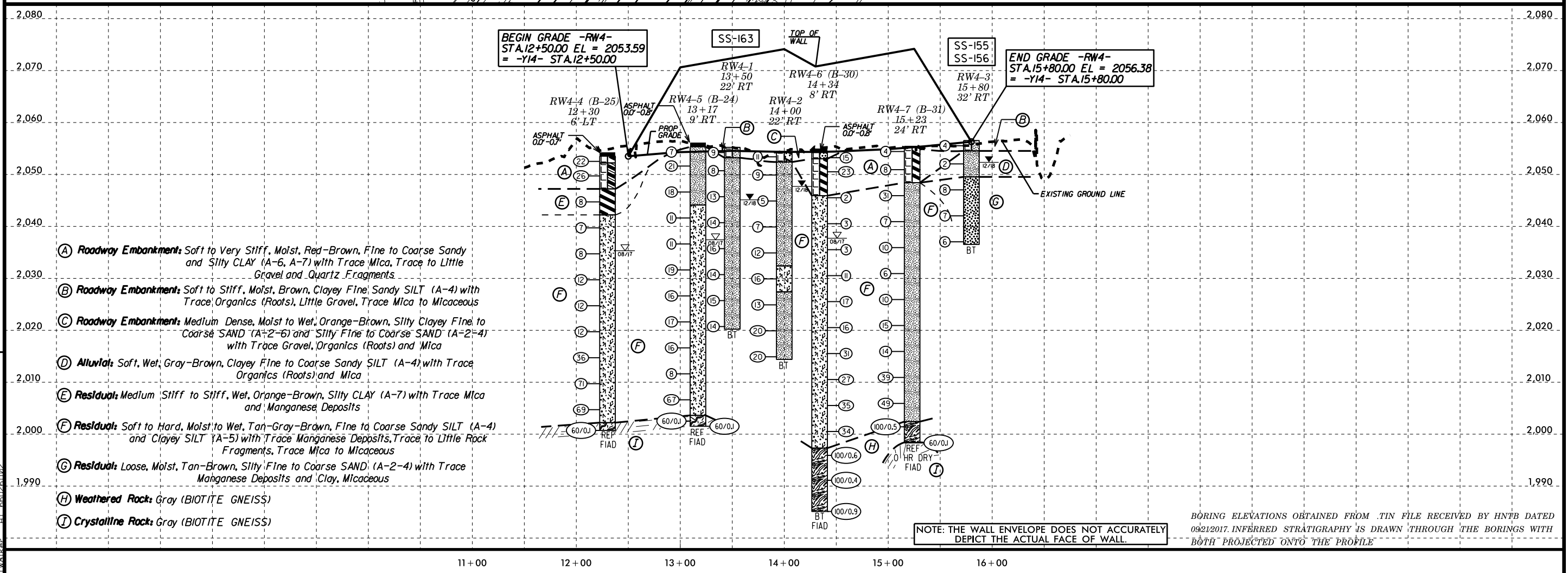
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
**GEOTECHNICAL ENGINEERING UNIT**  
**SUBSURFACE INVESTIGATION**  
 SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	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 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i> .	<b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - 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: 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 (INCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLITE, 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.	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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 INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																																																																																																																																													
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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																																																																																																																																													
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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.	BENCH MARK: N/A ELEVATION: N/A FEET <b>NOTES:</b> FIAD= FILLED IMMEDIATELY AFTER DRILLING BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED FROM HNTB ON 9/21/2017																												
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PROJECT REFERENCE NO.	SHEET NO.
1-4700A	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



RETAINING WALL -RW4-  
0 100 200  
FEET



- (A) Roadway Embankment: Soft to Very Stiff, Moist, Red-Brown, Fine to Coarse Sandy and Silty CLAY (A-6, A-7) with Trace Mica, Trace to Little Gravel and Quartz Fragments
- (B) Roadway Embankment: Soft to Stiff, Moist, Brown, Clayey Fine Sandy SILT (A-4) with Trace Organics (Roots), Little Gravel, Trace Mica to Micaceous
- (C) Roadway Embankment: Medium Dense, Moist to Wet, Orange-Brown, Silty Clayey Fine to Coarse SAND (A-2-6) and Silty Fine to Coarse SAND (A-2-4) with Trace Gravel, Organics (Roots) and Mica
- (D) Alluvial: Soft, Wet, Gray-Brown, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots) and Mica
- (E) Residual: Medium Stiff to Stiff, Wet, Orange-Brown, Silty CLAY (A-7) with Trace Mica and Manganese Deposits
- (F) Residual: Soft to Hard, Moist to Wet, Tan-Gray-Brown, Fine to Coarse Sandy SILT (A-4) and Clayey SILT (A-5) with Trace Manganese Deposits, Trace to Little Rock Fragments, Trace Mica to Micaceous
- (G) Residual: Loose, Moist, Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Manganese Deposits and Clay, Micaceous
- (H) Weathered Rock: Gray (BIOTITE GNEISS)
- (I) Crystalline Rock: Gray (BIOTITE GNEISS)

NOTE: THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF WALL.

BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED BY HNTB DATED 09/21/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH 'PROJECTED' ONTO THE PROFILE

REVISIONS  
 23-144-2019 1516  
 E:\Projects\66W\66W-0209 (NCDOT-I-4400 & I-4700 Retaining Walls)\4400-14700-Geo.Walls\CADD\GEOTECH\Sub\14700A-RDY-RW\_04.dgn  
 8/17/99

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right							GROUND WTR (ft)								
BORING NO. RW4-1		STATION 13+50		OFFSET 22 ft RT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,055.3 ft		TOTAL DEPTH 35.0 ft		NORTHING 639,993		EASTING 945,247									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 12/04/18		COMP. DATE 12/04/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2060															
2055	2,055.3	0.0	1	5	4									2,055.3	0.0
2050	2,051.8	3.5	3	3	5									2,053.3	2.0
2045	2,046.8	8.5	5	5	8										
2040	2,041.8	13.5	4	5	9										
2035	2,036.8	18.5	2	6	10										
2030	2,031.8	23.5	4	6	8										
2025	2,026.8	28.5	4	4	11										
	2,021.8	33.5	3	6	8										
														2,020.3	35.0
Boring Terminated at Elevation 2,020.3 ft in SILT (RESIDUAL)															
Note: Surficial Organic Soils = 0.0'-0.2'															

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right							GROUND WTR (ft)								
BORING NO. RW4-2		STATION 14+00		OFFSET 22 ft RT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,054.5 ft		TOTAL DEPTH 40.0 ft		NORTHING 640,024		EASTING 945,286									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 12/04/18		COMP. DATE 12/04/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2055	2,054.5	0.0	1	4	7									2,054.5	0.0
2050	2,051.0	3.5	3	4	5									2,052.5	2.0
2045	2,046.0	8.5	2	2	3										
2040	2,041.0	13.5	1	3	4										
2035	2,036.0	18.5	2	5	7										
2030	2,031.0	23.5	5	5	11									2,032.5	22.0
2025	2,026.0	28.5	3	5	8									2,027.5	27.0
2020	2,021.0	33.5	7	9	11										
2015	2,016.0	38.5	5	7	13									2,014.5	40.0
Boring Terminated at Elevation 2,014.5 ft in SILT (RESIDUAL)															
Note: 1) 0 hr groundwater elevation likely inaccurate due to boring location in ditch															

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold									
SITE DESCRIPTION Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right							GROUND WTR (ft)								
BORING NO. RW4-5 (B-24)		STATION 13+17		OFFSET 9 ft RT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,056.2 ft		TOTAL DEPTH 54.6 ft		NORTHING 639,983		EASTING 945,213									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/14/17		COMP. DATE 08/14/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2060															
2055	2,055.4	0.8	3	2	5								M	2,056.2 GROUND SURFACE 0.0 2,055.4 ASPHALT 0.8	
2050	2,052.7	3.5	6	11	10								M	RESIDUAL Orange-Brown, Fine Sandy SILT (A-4) with Trace Manganese Deposits and Mica	
2045	2,047.7	8.5	6	9	9								M		
2040	2,042.7	13.5	5	6	5								W	2,044.2 RESIDUAL 12.0 Brown, Clayey SILT (A-5) with Trace Manganese Deposits, Trace Quartz Fragments, and Little Mica	
2035	2,037.7	18.5	4	5	6								W		
2030	2,032.7	23.5	5	7	12								W		
2025	2,027.7	28.5	6	5	11								W		
2020	2,022.7	33.5	8	8	9								W		
2015	2,017.7	38.5	6	7	9								W		
2010	2,012.7	43.5	2	3	5								W		
2005	2,007.7	48.5	5	21	46								W		
	2,002.7	53.5												2,003.7 CRYSTALLINE ROCK 52.5	
	2,001.7	54.5	60/0.1											2,001.6 Dark Gray (BIOTITE GNEISS) 54.6	
			60/0.1											Boring Terminated with Standard Penetration Test Refusal at Elevation 2,001.6 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)	
														Notes: 1. Auger refusal at 54.5' 2. Boring FIAD due to location in roadway	

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold									
SITE DESCRIPTION Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right							GROUND WTR (ft)								
BORING NO. RW4-6 (B-30)		STATION 14+34		OFFSET 8 ft RT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,055.1 ft		TOTAL DEPTH 69.9 ft		NORTHING 640,056		EASTING 945,304									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/14/17		COMP. DATE 08/14/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2060															
2055	2,055.1	0.8	7	9	6								M	2,055.1 GROUND SURFACE 0.0 2,054.3 ASPHALT 0.8	
2050	2,051.6	3.5	4	9	14								M	2,053.1 ROADWAY EMBANKMENT 2.0 Brown, Silty Fine to Coarse SAND (A-2-4) Red-Brown, Silty CLAY (A-7) with Little Quartz Fragments	
2045	2,046.6	8.5	2	1	1								M	2,046.0 RESIDUAL 9.1 Gray-White-Brown, Clayey SILT (A-5) with Some Mica and Trace Rock Fragments	
2040	2,041.6	13.5	1	2	1								W		
2035	2,036.6	18.5	2	1	2								W		
2030	2,031.6	23.5	3	4	7								W		
2025	2,026.6	28.5	5	9	8								W		
2020	2,021.6	33.5	6	8	8								W		
2015	2,016.6	38.5	8	18	13								W		
2010	2,011.6	43.5	9	8	19								W		
2005	2,006.6	48.5	8	14	21								W		
2000	2,001.6	53.5	7	12	22								W		
1995	1,996.6	58.5	55	45/0.1									W	1,997.4 WEATHERED ROCK 57.7 Gray (BIOTITE GNEISS)	
1990	1,991.6	63.5	100/0.4										W	1,985.2 WEATHERED ROCK 69.9 Boring Terminated at Elevation 1,985.2 ft in WEATHERED ROCK (BIOTITE GNEISS)	
	1,986.6	68.5	14	25	75/0.4								W	Note: 1. Boring FIAD due to location in roadway	

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19



# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.FS4	TIP I-4700A	COUNTY BUNCOMBE	GEOLOGIST W. Hamrick
SITE DESCRIPTION Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right			GROUND WTR (ft)
BORING NO. RW4-7 (B-31)	STATION 15+23	OFFSET 24 ft RT	ALIGNMENT -Y14-
COLLAR ELEV. 2,055.5 ft	TOTAL DEPTH 57.1 ft	NORTHING 640,098	EASTING 945,384
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER J. Hoyle	START DATE 08/14/17	COMP. DATE 08/14/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,055.5	0.0													2,055.5	GROUND SURFACE
2050	2,052.0	3.5	2	2	2	4										
2045	2,047.0	8.5	3	5	3	11										
2040	2,042.0	13.5	4	3	4	11										
2035	2,037.0	18.5	3	5	5	13										
2030	2,032.0	23.5	2	2	4	11										
2025	2,027.0	28.5	3	4	6	13										
2020	2,022.0	33.5	3	7	8	18										
2015	2,017.0	38.5	3	5	9	17										
2010	2,012.0	43.5	12	24	15	30										
2005	2,007.0	48.5	24	24	25	49										
2000	2,002.0	53.5	100	0.5											2,002.5	WEATHERED ROCK Gray (BIOTITE GNEISS)
	1,998.5	57.0	60	0.1											1,998.5	CRYSTALLINE ROCK Gray (BIOTITE GNEISS)
															1,998.4	CRYSTALLINE ROCK Gray (BIOTITE GNEISS)

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19

Boring Terminated with Standard Penetration Test Refusal at Elevation 1,998.4 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)

Note:  
1. Boring FIAD due to location in roadway

**North Carolina Department of Transportation  
Division of Highways  
Materials and Test Unit  
Soils Laboratory**

T.I.P. ID NO.: I-4700A  
DESCRIPTION: Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right

REPORT ON SAMPLES OF: SOIL FOR QUALITY

WBS No.: 36030.1.FS4  
DATE SAMPLED: 12/18  
SAMPLED FROM: -Y14-  
SUBMITTED BY: D. Racey

COUNTY: Buncombe  
RECEIVED: 12/18  
REPORTED: 12/18  
BY: D. Council  
Cert No. 101-02-0603

**TEST RESULTS**

PROJ. SAMPLE NO.	SS-163	SS-155	SS-156								
BORING NO.	RW4-1	RW4-3	RW4-3								
Retained #4 Sieve %	0.0	0.0	0.0								
Passing #10 Sieve %	100.0	100.0	100.0								
Passing #40 Sieve %	90.8	98.4	92.8								
Passing #200 Sieve %	36.1	56.0	34.5								

SOIL MORTAR - 100%											
Coarse Sand Ret - #60 %	23.0	5.8	18.8								
Fine Sand Ret - #270 %	56.0	48.2	59.3								
Silt 0.053 - 0.010 mm %	11.6	25.0	14.8								
Clay < 0.010 mm %	9.4	21.0	7.1								
L.L.	NP	35	NP								
P.L.	NP	32	NP								
P.I.	NP	3	NP								
AASHTO Classification	A-4 (0)	A-4 (1)	A-2-4 (0)								
Station	13+50	15+80	15+80								
Offset	22' RT	32' RT	32' RT								
Depth (ft)	3.5	3.5	8.5								
to	5.0	5.0	10.0								
Alignment	-Y14-	-Y14-	-Y14-								
Moisture Content (%)	26.9	41.2	25.5								
Organic Content (%)	NT	NT	NT								

NP = Not plastic  
NT = Not tested  
ND = Not Determined  
CL = Centerline

W.P. Alton, P.E.  
Soils Engineer

REFERENCE: I-4700A

PROJECT: 36030

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
 PROJECT DESCRIPTION I-26 FROM NEAR NC 280  
(EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 5 ON -Y14-  
FROM 12+90 TO 16+00, 21.5' LEFT

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN & PROFILE
4-5	CROSS SECTION
6-9	BORE LOG(S)
10	SOIL TEST RESULTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	10

**CAUTION NOTICE**

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

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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- NOTES:
- 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.
  - 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

<u>J. HOYLE</u>	<u>S. WOODS</u>
<u>T. LUCAS</u>	<u>M. ARNOLD</u>
	<u>W. HAMRICK</u>
	<u>S. DAVIS</u>
	<u>T. SHARPE</u>
	<u>T. BEARD</u>

INVESTIGATED BY F&R, Inc.  
 DRAWN BY T.T. WALKER  
 CHECKED BY D. RACEY  
 SUBMITTED BY P. ALTON, P.E.  
 DATE JANUARY 2019

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**FROEHLING & ROBERTSON, INC.**  
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 Raleigh, North Carolina 27603-2302 | USA  
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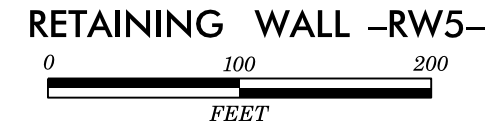
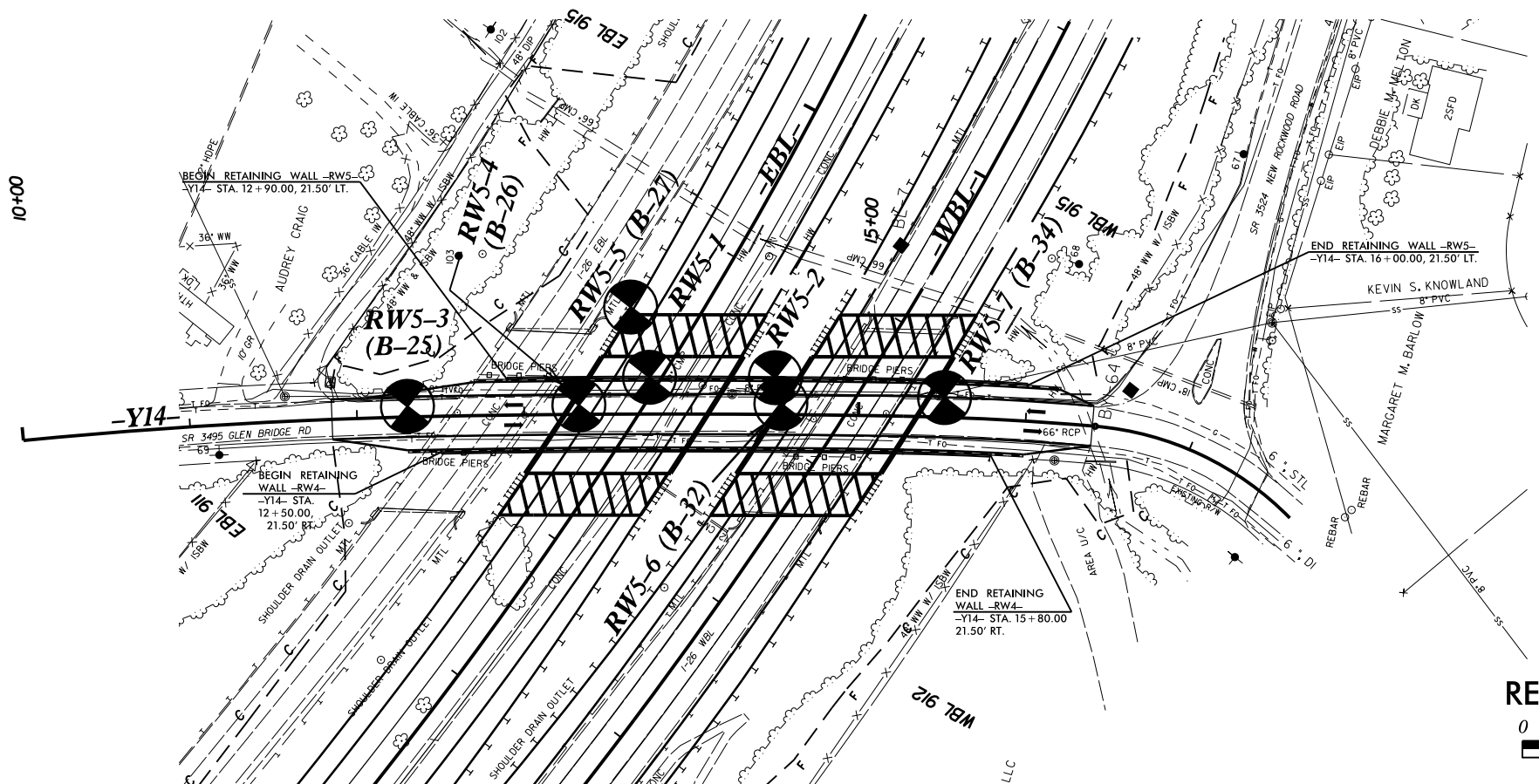
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

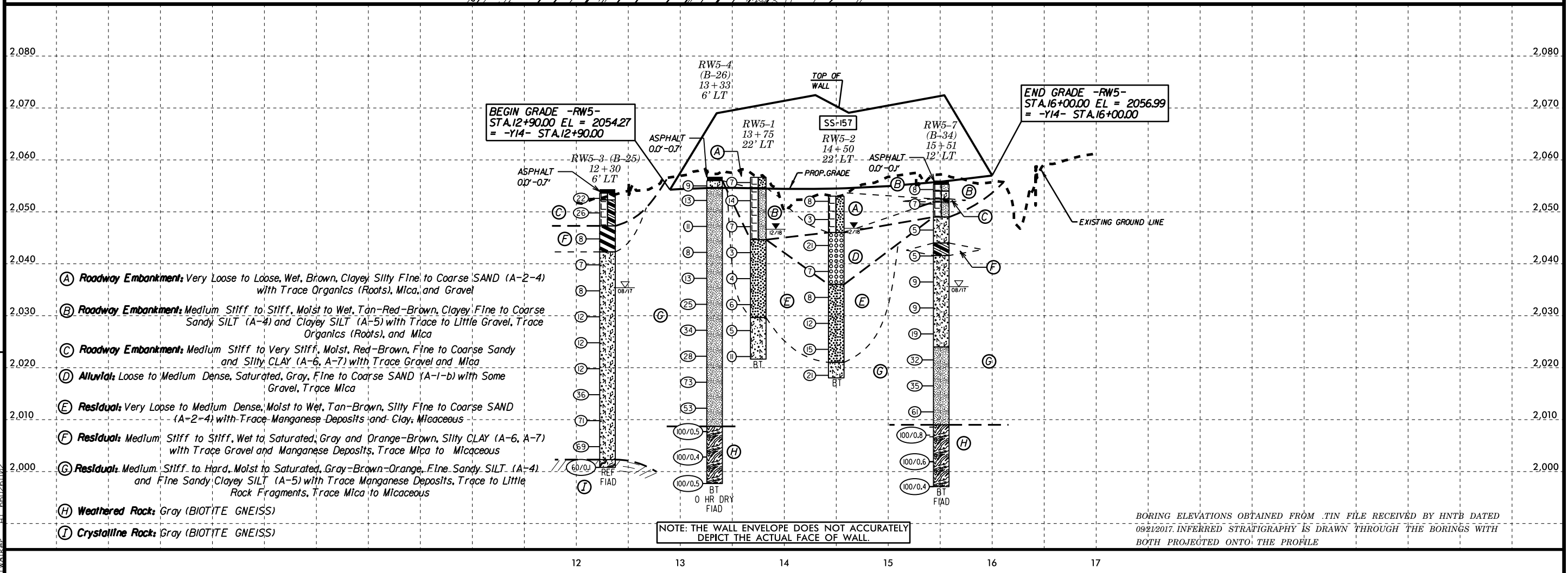
Table with multiple columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, CONSISTENCY OR DENSENESS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, ROCK HARDNESS, FRACTURE SPACING, BEDDING, INDURATION. Includes various symbols, abbreviations, and technical specifications.

8/17/99

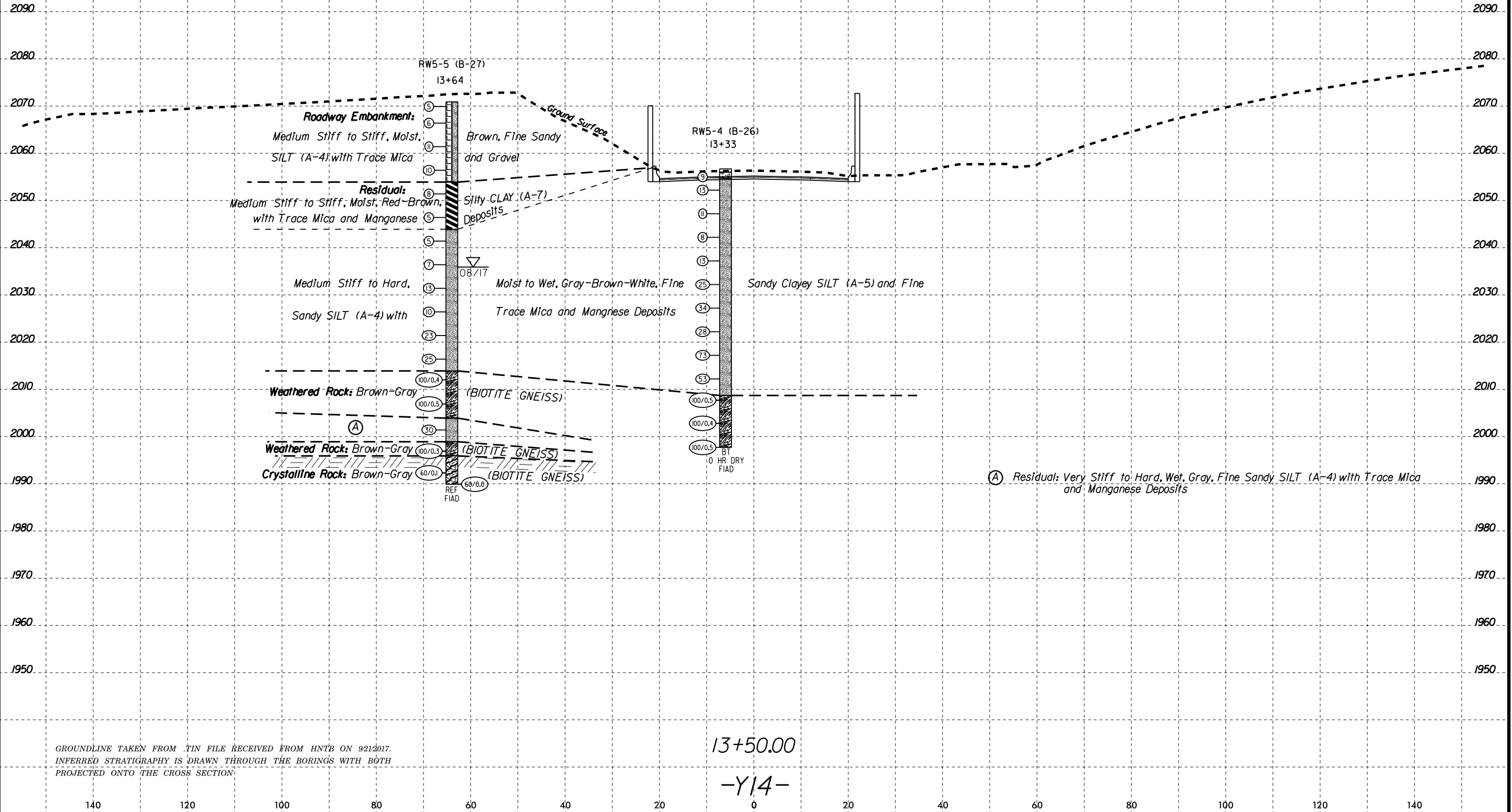
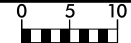
PROJECT REFERENCE NO.	SHEET NO.
1-4700A	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	



REVISIONS  
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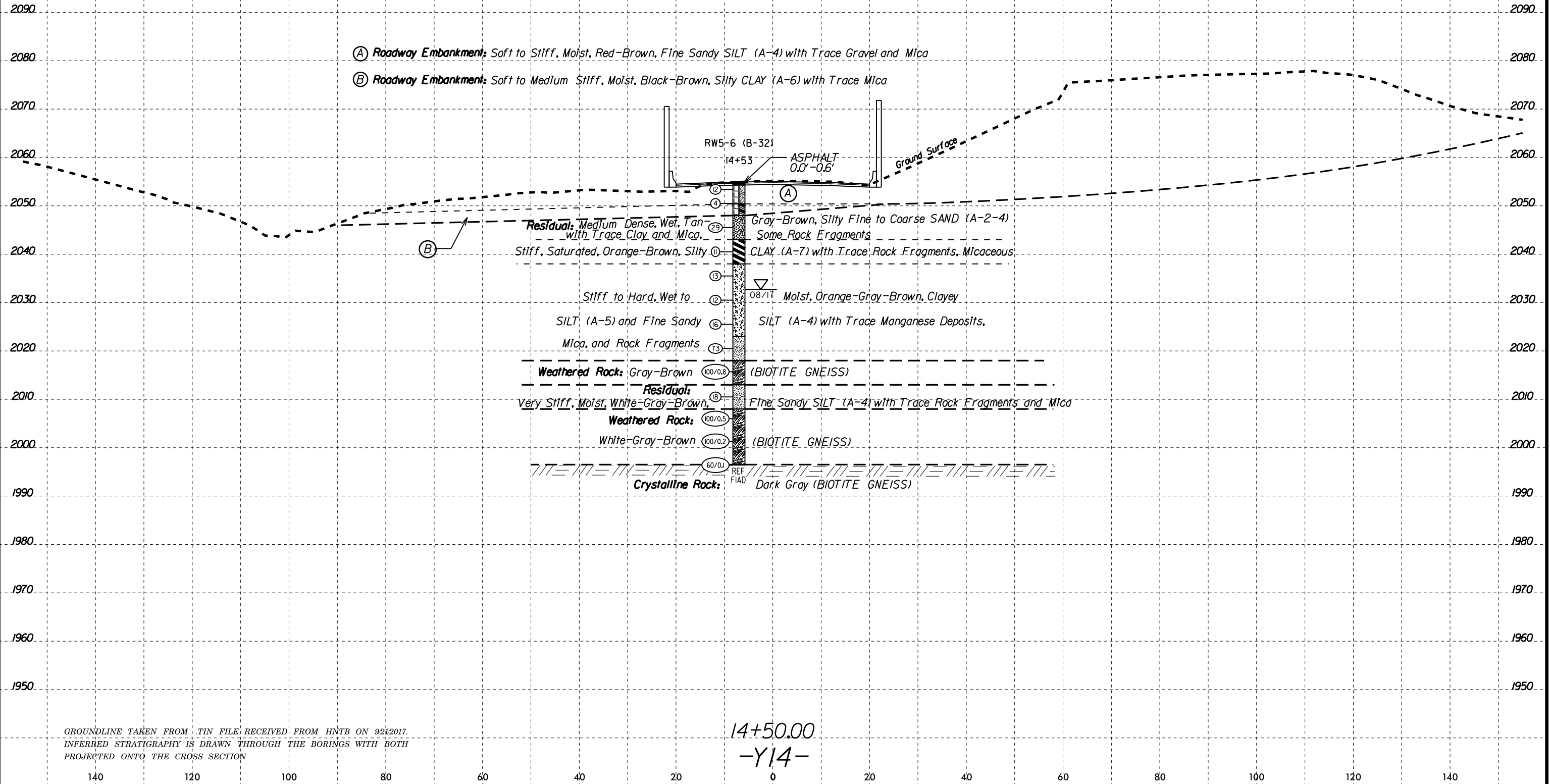


GROUNDLINE TAKEN FROM TIN FILE RECEIVED FROM HNTB ON 9/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION.

13+50.00  
-Y14-



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GROUNDLINE TAKEN FROM TIN FILE RECEIVED FROM HNTB ON 9/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods											
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)										
BORING NO. RW5-1		STATION 13+75		OFFSET 22 ft LT		ALIGNMENT -Y14-											
COLLAR ELEV. 2,056.6 ft		TOTAL DEPTH 35.0 ft		NORTHING 640,043		EASTING 945,239											
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER S. Davis		START DATE 12/04/18		COMP. DATE 12/04/18		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2060																	
	2,056.6	0.0	1	4	3									2,056.6	GROUND SURFACE	0.0	
2055	2,053.1	3.5	5	10	4									2,054.6	<b>ROADWAY EMBANKMENT</b> Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots), Mica, and Gravel	2.0	
2050	2,048.1	8.5	6	4	3										Tan-Orange, Clayey Fine to Coarse Sandy SILT (A-4) with Little Gravel		
2045	2,043.1	13.5	1	1	2									2,044.6	<b>RESIDUAL</b> Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Manganese Deposits and Clay, Micaceous	12.0	
2040	2,038.1	18.5	1	2	2												
2035	2,033.1	23.5	2	2	4												
2030	2,028.1	28.5	3	2	3									2,029.6	Gray-Orange, Fine Sandy Clayey SILT (A-5) with Trace Manganese Deposits, Micaceous	27.0	
2025	2,023.1	33.5	3	5	6									2,021.6	Boring Terminated at Elevation 2,021.6 ft in SILT (RESIDUAL)	35.0	

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods											
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)										
BORING NO. RW5-2		STATION 14+50		OFFSET 22 ft LT		ALIGNMENT -Y14-											
COLLAR ELEV. 2,053.0 ft		TOTAL DEPTH 35.0 ft		NORTHING 640,090		EASTING 945,298											
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER S. Davis		START DATE 12/03/18		COMP. DATE 12/03/18		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2055																	
	2,053.0	0.0	1	4	4									2,053.0	GROUND SURFACE	0.0	
2050	2,049.5	3.5	WOH	2	1										<b>ROADWAY EMBANKMENT</b> Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots) and Mica		
2045	2,044.5	8.5	5	13	8									2,046.0	<b>ALLUVIAL</b> Gray, Fine to Coarse SAND (A-1-b) with Some Gravel and Trace Mica	7.0	
2040	2,039.5	13.5	5	2	5												
2035	2,034.5	18.5	2	3	5									2,036.0	<b>RESIDUAL</b> Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Manganese Deposits and Clay, Micaceous	17.0	
2030	2,029.5	23.5	3	3	9												
2025	2,024.5	28.5	10	9	6												
2020	2,019.5	33.5	2	9	12									2,021.0	Gray-Dark Brown, Fine Sandy Clayey SILT (A-5) with Little Rock Fragments, Micaceous	32.0	
														2,018.0	Boring Terminated at Elevation 2,018.0 ft in SILT (RESIDUAL)	35.0	

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19

Note:  
Surficial Organic Soils = 0.0-0.1'

Note:  
Surficial Organic Soils = 0.0-0.2'

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold								
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)							
BORING NO. RW5-3 (B-25)		STATION 12+30		OFFSET 6 ft LT		ALIGNMENT -Y14-								
COLLAR ELEV. 2,054.3 ft		TOTAL DEPTH 53.5 ft		NORTHING 639,940		EASTING 945,136								
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic								
DRILLER S. Davis		START DATE 08/15/17		COMP. DATE 08/15/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2055	2,053.6	0.7	13	13	9							M	GROUND SURFACE 2,054.3	0.0
	2,053.6											M	ASPHALT 2,053.6	0.7
	2,052.3											M	ROADWAY EMBANKMENT 2,052.3	2.0
2050	2,050.8	3.5	5	11	15							M	Red-Brown, Fine to Coarse Sandy CLAY (A-7) with Trace Gravel	
	2,047.3											M	Red-Brown, Fine to Coarse Sandy CLAY (A-6) with Trace Mica and Quartz Fragments	7.0
2045	2,045.8	8.5	5	4	4							W	RESIDUAL Orange-Brown, Silty CLAY (A-7) with Trace Mica and Manganese Deposits	
	2,042.3											W	Tan-White-Brown, Clayey SILT (A-5) with Trace Manganese Deposits and Quartz Fragments, Little Mica	12.0
2040	2,040.8	13.5	2	3	4							W		
2035	2,035.8	18.5	3	4	4							W		
2030	2,030.8	23.5	4	4	8							W		
2025	2,025.8	28.5	4	6	6							W		
2020	2,020.8	33.5	3	5	7							W		
2015	2,015.8	38.5	11	19	17							W		
2010	2,010.8	43.5	12	23	48							W		
2005	2,005.8	48.5	25	32	37							W		
	2,000.9	53.4	60/0.1									W		60/0.1
	2,002.3												CRYSTALLINE ROCK 2,002.3	52.0
	2,000.8												Gray (BIOTITE GNEISS) 2,000.8	53.5
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,000.8 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)														
Notes: 1. Auger refusal at 53.4' 2. Boring FIAD due to location in roadway														

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick									
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)								
BORING NO. RW5-4 (B-26)		STATION 13+33		OFFSET 6 ft LT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,056.7 ft		TOTAL DEPTH 59.0 ft		NORTHING 640,004		EASTING 945,216									
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER J. Hoyle		START DATE 08/15/17		COMP. DATE 08/15/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2060														GROUND SURFACE 2,056.7	0.0
	2,056.0												M	ASPHALT 2,056.0	0.7
	2,054.7												M	RESIDUAL 2,054.7	2.0
2055	2,056.0	0.7	7	5	4							M	Red, Clayey Fine Sandy SILT (A-5) with Trace Mica		
	2,053.2	3.5	6	7	6							M	Brown-Tan, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits		
2050	2,048.2	8.5	3	5	6							M			
2045	2,043.2	13.5	4	3	5							W			
2040	2,038.2	18.5	3	6	7							W			
2035	2,033.2	23.5	6	8	17							W			
2030	2,028.2	28.5	7	13	21							W			
2025	2,023.2	33.5	7	11	17							W			
2020	2,018.2	38.5	12	27	46							W			
2015	2,013.2	43.5	21	27	26							W			
2010	2,008.2	48.5	100/0.5									W			
2005	2,003.2	53.5	100/0.4									W			
2000	1,998.2	58.5	100/0.5									W			
	2,008.7												WEATHERED ROCK 2,008.7	48.0	
	1,997.7												Gray (BIOTITE GNEISS) 1,997.7	59.0	
Boring Terminated at Elevation 1,997.7 ft in WEATHERED ROCK (BIOTITE GNEISS)															
Note: 1. Boring FIAD due to location in roadway															

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick									
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)								
BORING NO. RW5-5 (B-27)		STATION 13+64		OFFSET 64 ft LT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,070.9 ft		TOTAL DEPTH 81.0 ft		NORTHING 640,070		EASTING 945,204									
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. Hoyle		START DATE 08/17/17		COMP. DATE 08/18/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
2075															
2070	2,070.9	0.0	2	2	3									2,070.9	0.0
2065	2,067.4	3.5	3	3	3										
2060	2,062.4	8.5	5	5	6										
2055	2,057.4	13.5	6	5	5										
2050	2,052.4	18.5	3	4	4										
2045	2,047.4	23.5	2	2	3										
2040	2,042.4	28.5	6	2	3										
2035	2,037.4	33.5	3	3	4										
2030	2,032.4	38.5	5	5	8										
2025	2,027.4	43.5	4	4	6										
2020	2,022.4	48.5	8	10	13										
2015	2,017.4	53.5	11	10	15										
2010	2,012.4	58.5	100/0.4												
2005	2,007.4	63.5	100/0.5												
2000	2,002.4	68.5	11	13	17										
1995	1,997.4	73.5	100/0.5												

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST W. Hamrick									
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)								
BORING NO. RW5-5 (B-27)		STATION 13+64		OFFSET 64 ft LT		ALIGNMENT -Y14-									
COLLAR ELEV. 2,070.9 ft		TOTAL DEPTH 81.0 ft		NORTHING 640,070		EASTING 945,204									
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. Hoyle		START DATE 08/17/17		COMP. DATE 08/18/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
1995															
	1,992.4	78.5													
1990	1,989.9	81.0													

Match Line

**CRYSTALLINE ROCK**  
Gray-Brown (BIOTITE GNEISS) (continued)

Boring Terminated with Standard Penetration Test Refusal at Elevation 1,989.9 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)

Note:  
1. Auger refusal at 81.0'

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)									
BORING NO. RW5-6 (B-32)		STATION 14+53		OFFSET 7 ft LT		ALIGNMENT -Y14-										
COLLAR ELEV. 2,055.1 ft		TOTAL DEPTH 58.6 ft		NORTHING 640,080		EASTING 945,311										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. Hoyle		START DATE 08/10/17		COMP. DATE 08/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,054.5	0.6	11	6	6									2,055.1	GROUND SURFACE	0.0
														2,054.5	ASPHALT	0.6
															ROADWAY EMBANKMENT	
															Red-Brown, Fine Sandy SILT (A-4) with Trace Gravel and Mica	
2050	2,051.6	3.5	2	2	2									2,050.5	Black-Brown, Silty CLAY (A-6) with Trace Mica	4.6
														2,048.1	RESIDUAL	7.0
															Tan-Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Clay and Mica, Some Rock Fragments	
2045	2,046.6	8.5	10	13	16									2,043.1	Orange-Brown, Silty CLAY (A-7) with Trace Rock Fragments, Micaceous	12.9
														2,038.1	Orange-Gray-Brown, Clayey SILT (A-5) with Trace Manganese Deposits and Mica	17.0
2040	2,041.6	13.5	5	5	6											
2035	2,036.6	18.5	4	5	8											
2030	2,031.6	23.5	3	6	6											
2025	2,026.6	28.5	6	6	10											
2020	2,021.6	33.5	14	35	38											
2015	2,016.6	38.5	37	63/0.3												
2010	2,011.6	43.5	10	8	10											
2005	2,006.6	48.5	100/0.5													
2000	2,001.6	53.5	100/0.2													
	1,996.6	58.5	60/0.1													

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST M. Arnold										
SITE DESCRIPTION Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left							GROUND WTR (ft)									
BORING NO. RW5-7 (B-34)		STATION 15+51		OFFSET 12 ft LT		ALIGNMENT -Y14-										
COLLAR ELEV. 2,056.0 ft		TOTAL DEPTH 58.9 ft		NORTHING 640,143		EASTING 945,385										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. Hoyle		START DATE 08/10/17		COMP. DATE 08/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2060																
2055	2,055.3	0.7	5	3	5									2,056.0	GROUND SURFACE	0.0
														2,055.3	ASPHALT	0.7
															ROADWAY EMBANKMENT	
															Red-Brown, Fine Sandy SILT (A-4) with Trace Gravel and Mica	
2050	2,052.5	3.5	4	3	4									2,052.5	Gray-Brown, Clayey SILT (A-5) with Trace Organics (Wood Fragments), Gravel, and Mica	3.5
														2,051.9	Red-Brown, Silty CLAY (A-7) with Trace Gravel	4.1
														2,049.0	Brown, Fine Sandy SILT (A-4) with Trace Gravel and Mica	7.0
2045	2,047.5	8.5	5	2	3									2,044.0	Red-Brown, Silty CLAY (A-7) with Trace Gravel	12.0
														2,041.6	RESIDUAL	14.4
															Red-Brown-Gray, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Gravel and Mica	
2040	2,042.5	13.5	2	2	3										Gray, Silty CLAY (A-6) with Trace Gravel, Micaceous	
															Orange-Brown, Clayey SILT (A-5) with Trace Mica and Rock Fragments	
2035	2,037.5	18.5	4	5	4											
2030	2,032.5	23.5	7	5	4											
2025	2,027.5	28.5	4	7	12											
2020	2,022.5	33.5	9	15	17											
2015	2,017.5	38.5	12	15	20											
2010	2,012.5	43.5	23	33	28											
2005	2,007.5	48.5	38	62/0.3												
2000	2,002.5	53.5	88	12/0.1												
	1,997.5	58.5	100/0.4													

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_WALLS.GPJ NC\_DOT.GDT 1/23/19

Boring Terminated at Elevation 1,997.1 ft in WEATHERED ROCK (BIOTITE GNEISS)

Note:  
1. Boring FIAD due to location in roadway

**North Carolina Department of Transportation  
Division of Highways  
Materials and Test Unit  
Soils Laboratory**

T.I.P. ID NO.: I-4700A  
DESCRIPTION: Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left

REPORT ON SAMPLES OF: SOIL FOR QUALITY

WBS No.: 36030.1.FS4  
DATE SAMPLED: 12/18  
SAMPLED FROM: -Y14-  
SUBMITTED BY: D. Racey

COUNTY: Buncombe  
RECEIVED: 12/18  
REPORTED: 12/18  
BY: D. Council  
Cert No. 101-02-0603

**TEST RESULTS**

PROJ. SAMPLE NO.	SS-157										
BORING NO.	RW5-2										
Retained #4 Sieve %	14.4										
Passing #10 Sieve %	81.0										
Passing #40 Sieve %	75.6										
Passing #200 Sieve %	32.6										

SOIL MORTAR - 100%											
Coarse Sand Ret - #60 %	11.4										
Fine Sand Ret - #270 %	56.3										
Silt 0.053 - 0.010 mm %	11.4										
Clay < 0.010 mm %	20.9										
L.L.	29										
P.L.	26										
P.I.	3										
AASHTO Classification	A-2-4 (0)										
Station	14+50										
Offset	22' LT										
Depth (ft)	0.2										
to	1.5										
Alignment	-Y14-										
Moisture Content (%)	19.2										
Organic Content (%)	NT										

NP = Not plastic  
NT = Not tested  
ND = Not Determined  
CL = Centerline

W.P. Alton, P.E.  
Soils Engineer



REFERENCE: I-4700A

PROJECT: 36030

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN & PROFILE
4-6	BORE LOG(S)

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE  
PROJECT DESCRIPTION I-26 FROM NEAR NC 280  
(EXIT 40) TO NEAR NC 146 (EXIT 37)  
  
SITE DESCRIPTION RETAINING WALL 6 ON -WBL-  
FROM 918 + 25 TO 923 + 75, 39.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	6

**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 (ON-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:
- 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.
  - 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

D. RACEY

C. BOYCE

J. HOYLE

N. CONSIGLI

INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE NOVEMBER 2018

SINCE **Prepared in the Office of:**  
**F&R**  
**FROEHLING & ROBERTSON, INC.**  
*Engineering Stability Since 1881*  
310 Hubert Street  
Raleigh, North Carolina 27603-2302 | USA  
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www.fandr.com



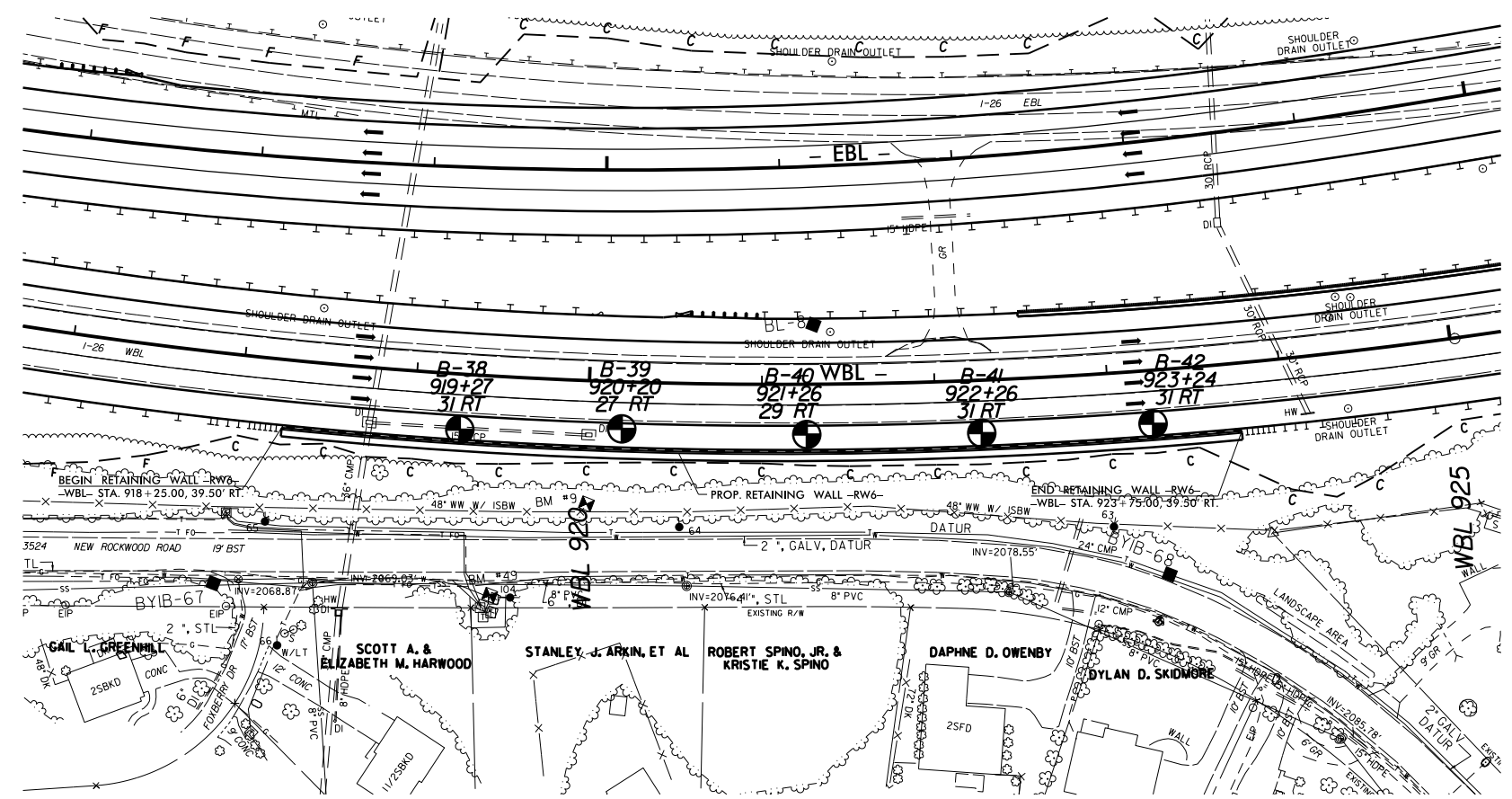
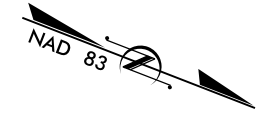
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Patrick Alton 11/26/2018  
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**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. Includes sub-sections like SOIL LEGEND AND AASHTO CLASSIFICATION, CONSISTENCY OR DENSENESS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, and COLOR.

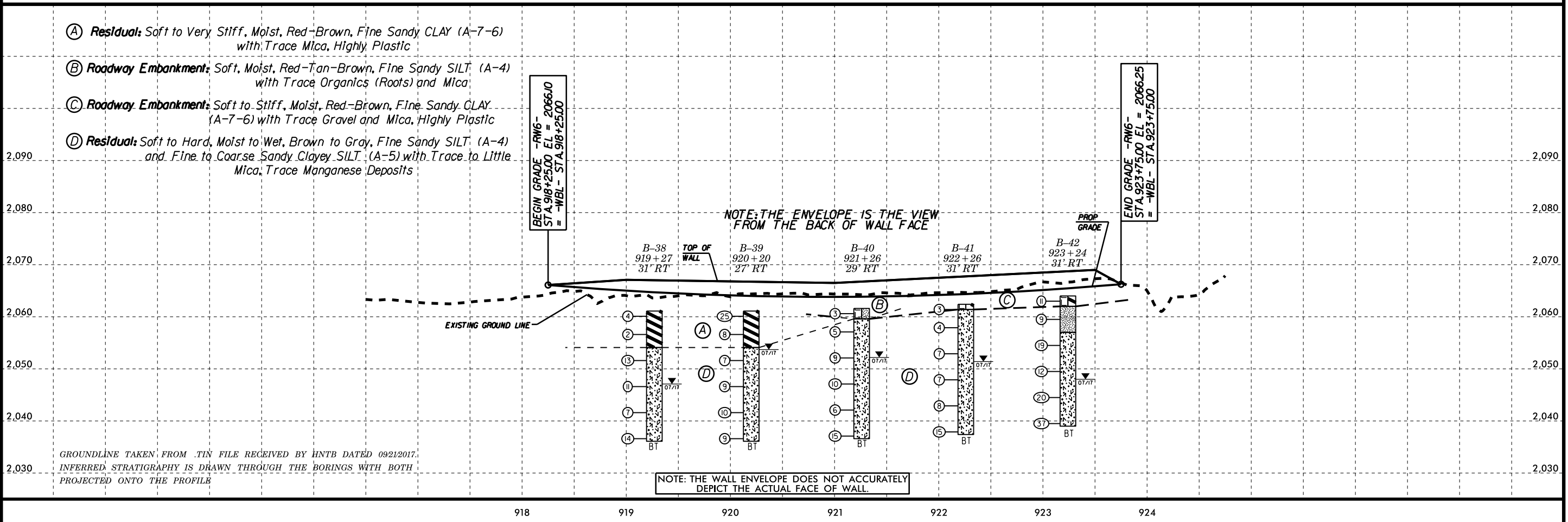
PROJECT REFERENCE NO. <b>1-4700A</b>	SHEET NO. <b>3</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	



**RETAINING WALL -RW6-**

0 100 200  
FEET

- (A) **Residual:** Soft to Very Stiff, Moist, Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Mica, Highly Plastic
- (B) **Roadway Embankment:** Soft, Moist, Red-Tan-Brown, Fine Sandy SILT (A-4) with Trace Organics (Roots) and Mica
- (C) **Roadway Embankment:** Soft to Stiff, Moist, Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Gravel and Mica, Highly Plastic
- (D) **Residual:** Soft to Hard, Moist to Wet, Brown to Gray, Fine Sandy SILT (A-4) and Fine to Coarse Sandy Clayey SILT (A-5) with Trace to Little Mica, Trace Manganese Deposits



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE PROFILE

NOTE: THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF WALL.

NOTE: THE ENVELOPE IS THE VIEW FROM THE BACK OF WALL FACE

REVISIONS  
 21-NOV-2018 (2:51) C:\Projects\14700A\_GEO\_WALLS\14700A\_GEO\_WALLS\14700A\_GEO\_WALLS\14700A\_GEO\_WALLS\14700A\_FDY\_RW\_06.dgn  
 8/17/99

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST N. Consigli										
SITE DESCRIPTION Retaining Wall 6 on WBL from 918+25 to 923+75, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-38		STATION 919+27		OFFSET 31 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,061.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 640,686		EASTING 945,256										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/26/17		COMP. DATE 07/26/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2065																
2060	2,061.1	0.0	2	2	2								M	GROUND SURFACE	0.0	
2055	2,057.6	3.5	WOH	1	1								M	<b>RESIDUAL</b> Red-Brown, Fine to Coarse Sandy CLAY (A-7-6) with Trace Mica, Highly Plastic		
2050	2,052.6	8.5	5	5	8								M	Brown to Gray, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Manganese Deposits and Little Mica	7.0	
2045	2,047.6	13.5	2	5	6								W			
2040	2,042.6	18.5	1	2	5								W			
	2,037.6	23.5	5	7	7								W			
Boring Terminated at Elevation 2,036.1 ft in SILT (RESIDUAL)																
Note: 0.0-0.3' = SURFICIAL ORGANIC SOILS																

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST N. Consigli										
SITE DESCRIPTION Retaining Wall 6 on WBL from 918+25 to 923+75, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-39		STATION 920+20		OFFSET 27 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,061.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 640,774		EASTING 945,222										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/26/17		COMP. DATE 07/26/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2065																
2060	2,061.1	0.0	2	12	13								M	GROUND SURFACE	0.0	
2055	2,057.6	3.5	4	4	4								M	<b>RESIDUAL</b> Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Mica and Rock Fragments, Highly Plastic		
2050	2,052.6	8.5	3	3	4								M	Brown to Gray, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Manganese Deposits and Little Mica	7.0	
2045	2,047.6	13.5	3	4	5								M			
2040	2,042.6	18.5	1	5	5								M			
	2,037.6	23.5	2	5	4								M			
Boring Terminated at Elevation 2,036.1 ft in SILT (RESIDUAL)																

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST N. Consigli										
SITE DESCRIPTION Retaining Wall 6 on WBL from 918+25 to 923+75, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-40		STATION 921+26		OFFSET 29 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,061.6 ft		TOTAL DEPTH 25.0 ft		NORTHING 640,875		EASTING 945,186										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/26/17		COMP. DATE 07/26/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2065																
	2,061.6	0.0												2,061.6	GROUND SURFACE	0.0
2060			1	1	2								M	2,059.6	ROADWAY EMBANKMENT Red-Brown to Tan Brown, Fine Sandy SILT (A-4) with Trace Organics (Roots) and Mica	2.0
	2,058.1	3.5	2	2	3								M			
2055			4	4	5								M			
	2,053.1	8.5											M			
2050			4	4	6								M			
	2,048.1	13.5											M			
2045			1	2	4								M			
	2,043.1	18.5											M			
2040			4	7	8								M			
	2,038.1	23.5											M			
														2,036.6	Boring Terminated at Elevation 2,036.6 ft in SILT (RESIDUAL)	25.0
Note: 0.0-0.2' = SURFICIAL ORGANIC SOILS																

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST N. Consigli										
SITE DESCRIPTION Retaining Wall 6 on WBL from 918+25 to 923+75, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-41		STATION 922+26		OFFSET 31 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,062.4 ft		TOTAL DEPTH 25.0 ft		NORTHING 640,969		EASTING 945,150										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 07/26/17		COMP. DATE 07/26/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2065																
	2,062.4	0.0	1	1	2								M	2,062.4	GROUND SURFACE	0.0
2060			1	2	2								M	2,061.4	ROADWAY EMBANKMENT Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Mica, Highly Plastic	1.0
	2,058.9	3.5											M			
2055			3	3	4								M			
	2,053.9	8.5											M			
2050			2	4	3								M			
	2,048.9	13.5											M			
2045			3	3	5								M			
	2,043.9	18.5											M			
2040			4	7	8								M			
	2,038.9	23.5											M			
														2,037.4	Boring Terminated at Elevation 2,037.4 ft in SILT (RESIDUAL)	25.0
Note: 0.0-0.2' = SURFICIAL ORGANIC SOILS																

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36030.1.FS4	TIP I-4700A	COUNTY BUNCOMBE	GEOLOGIST N. Consigli
SITE DESCRIPTION Retaining Wall 6 on WBL from 918+25 to 923+75, 39.5' Right			GROUND WTR (ft)
BORING NO. B-42	STATION 923+24	OFFSET 31 ft RT	ALIGNMENT -WBL-
COLLAR ELEV. 2,064.0 ft	TOTAL DEPTH 25.0 ft	NORTHING 641,059	EASTING 945,108
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 07/26/17	COMP. DATE 07/26/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2065	2,064.0	0.0											2,064.0	GROUND SURFACE	0.0
			3	4	7	11						M	2,062.0	ROADWAY EMBANKMENT Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Gravel, Highly Plastic	2.0
2060	2,060.5	3.5	4	4	5	9						M	2,057.0	RESIDUAL Red-Brown, Fine Sandy SILT (A-4) with Trace Mica	7.0
2055	2,055.5	8.5	5	7	12	19						M		Brown to Gray, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Manganese Deposits, Little Mica	
2050	2,050.5	13.5	5	6	6	12						M			
2045	2,045.5	18.5	4	7	13	20						M			
2040	2,040.5	23.5	11	15	22	37						M	2,039.0	Boring Terminated at Elevation 2,039.0 ft in SILT (RESIDUAL)	25.0

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18



REFERENCE: I-4700A

PROJECT: 36030

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	6

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL)
3	SITE PLAN & PROFILE
4-6	CROSS SECTIONS

STRUCTURE  
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE  
PROJECT DESCRIPTION I-26 FROM NEAR NC-280  
(EXIT 40) to NC-146/LONG SHOALS RD (EXIT 37)  
SITE DESCRIPTION RETAINING WALL 07 ALONG -WBL-  
@ -WBL- STA'S 948+75 to 950+00

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 1919 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.

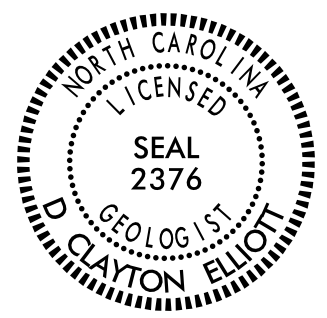
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT 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:
- 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.
  - 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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

INVESTIGATED BY DC ELLIOTT  
DRAWN BY DC ELLIOTT  
CHECKED BY JC KUHNE  
SUBMITTED BY JC KUHNE  
DATE \_\_\_\_\_



DocuSigned by:  
D. Clayton Elliott 12/7/2018  
FD421F60CB8E3E3A SIGNATURE DATE

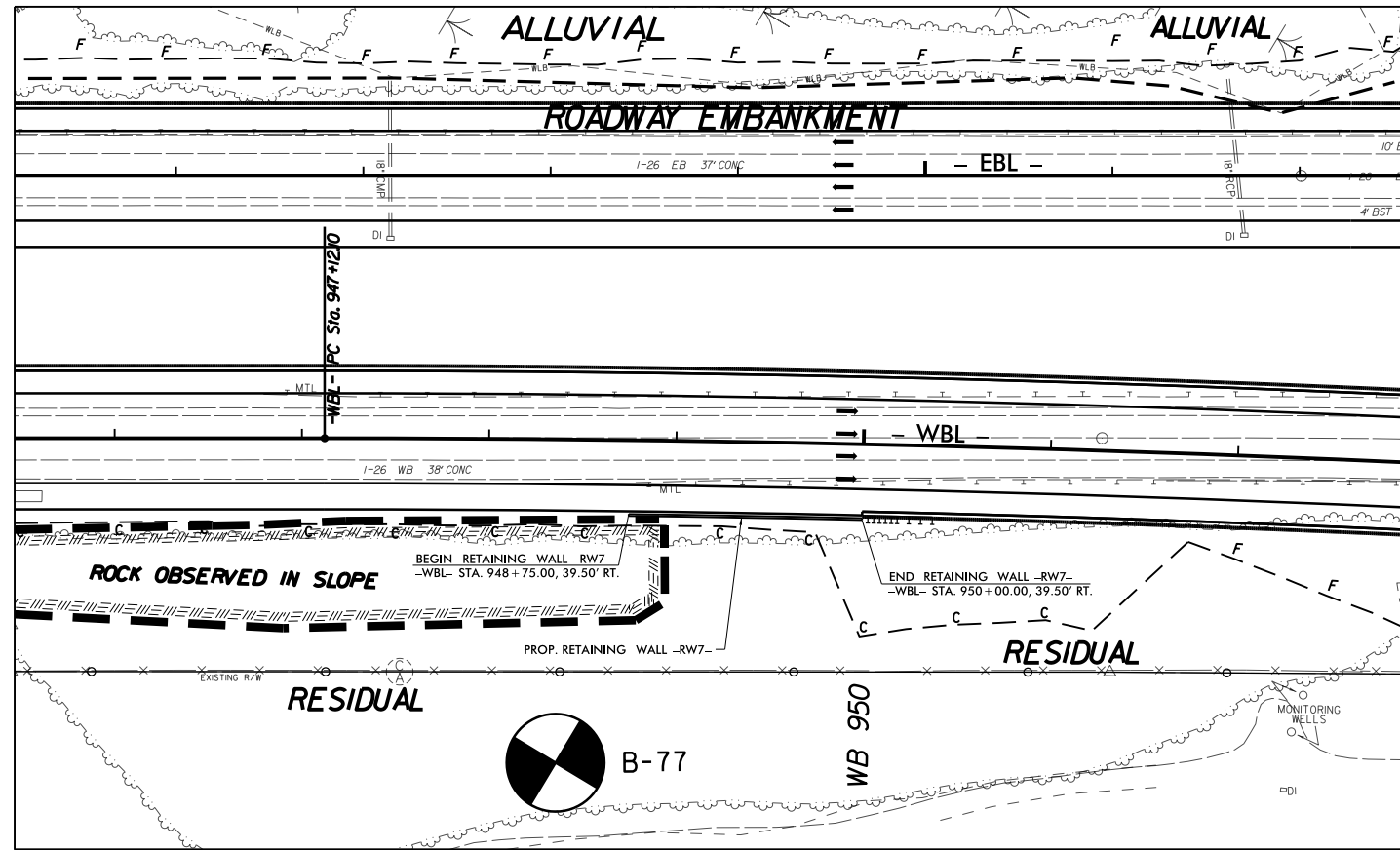
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

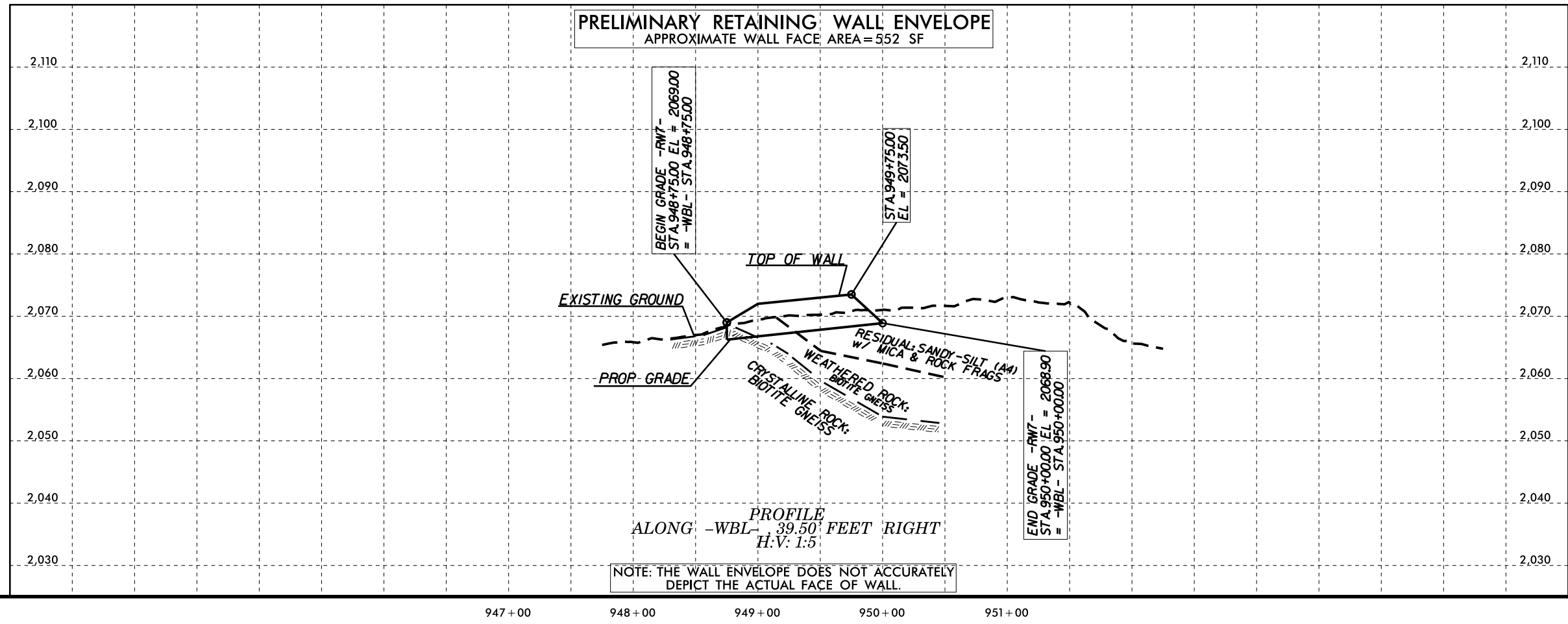
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table containing SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, FRACTURE SPACING, BEDDING, INDURATION, and BENCH MARK.



RETAINING WALL -RW7-



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 8/17/99

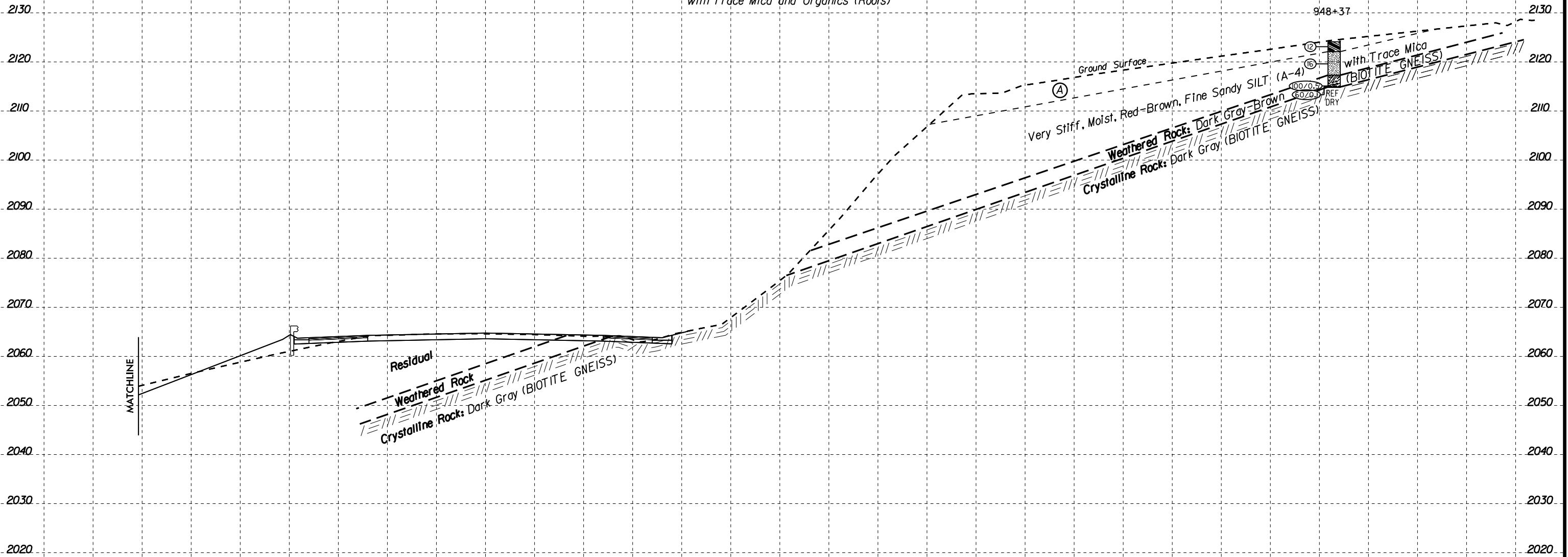
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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-69	17.3' RT	948+37	0.0-1.5	A-6(6)	34	14	18.9	26.7	12.3	42.1	100.0	91.9	58.3	15.4	-

(A) Residual: Stiff, Moist, Red-Brown, Silty Fine to Coarse Sandy CLAY (A-6) with Trace Mica and Organics (Roots)

SS-69

B-77  
948+37



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948+50.00  
-WBL-

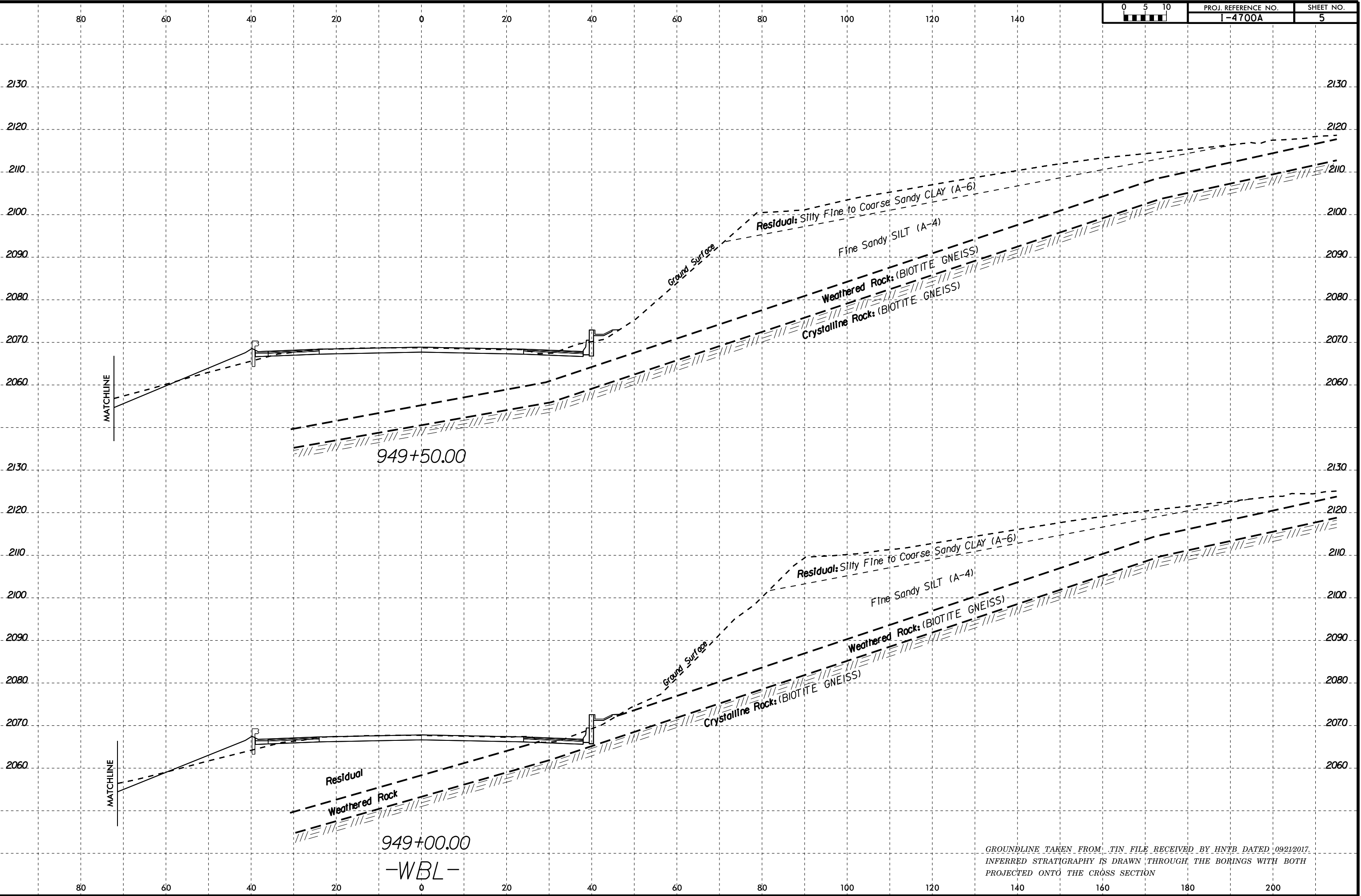
GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

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6/23/16

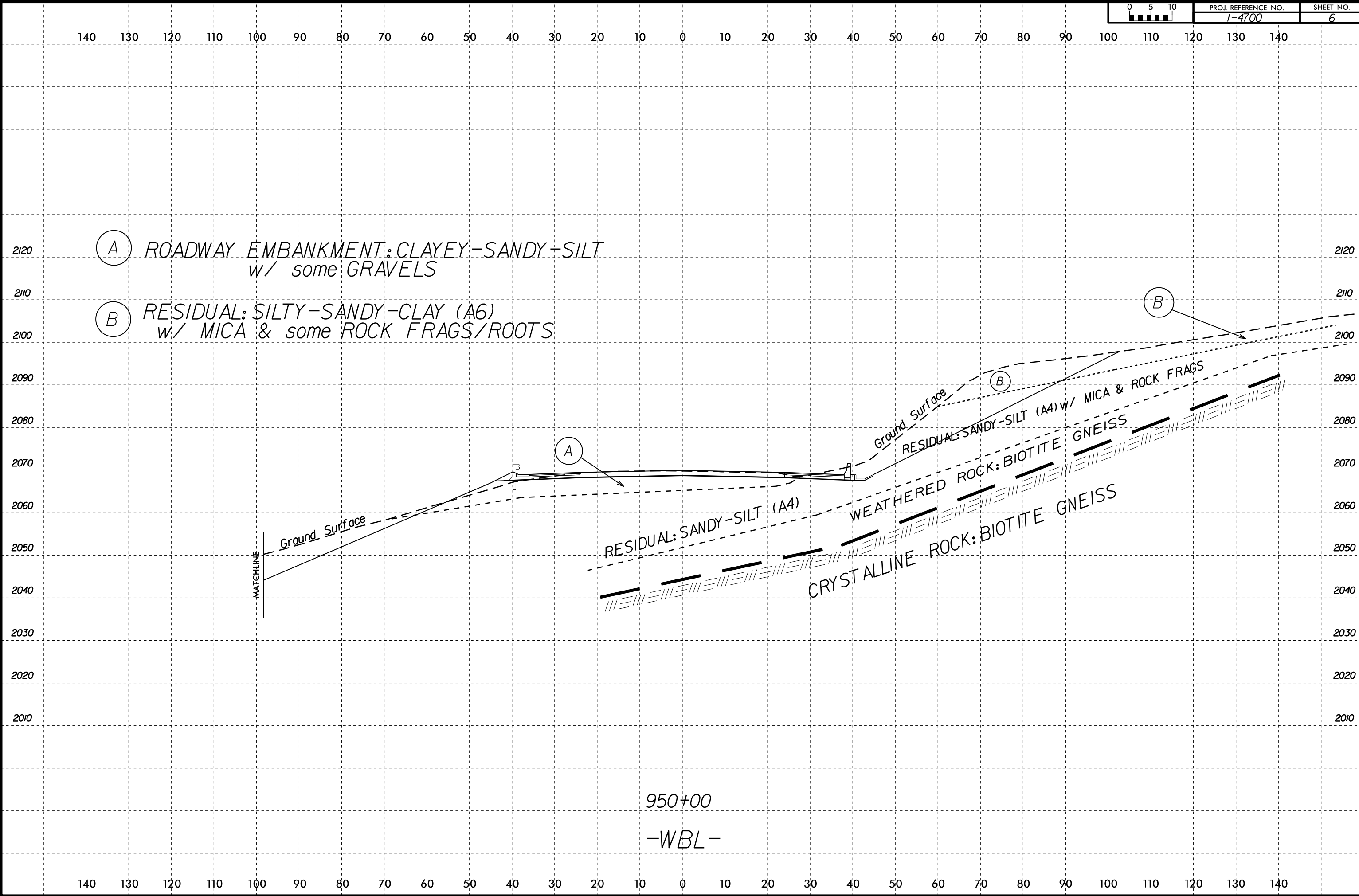


PROJ. REFERENCE NO.	SHEET NO.
I-4700A	5



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GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION





REFERENCE: I-4700A

PROJECT: 36030

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3-4	SITE PLAN & PROFILE
5-9	BORE LOG(S)

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY BUNCOMBE

PROJECT DESCRIPTION I-26 FROM NEAR NC 280  
(EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 8 ON -WBL-  
FROM 960+00 TO 975+00, 39.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	9

**CAUTION NOTICE**

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PERSONNEL

D. RACEY

S. WOODS

S. DAVIS

T. SHARPE

INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE NOVEMBER 2018

SINCE **Prepared in the Office of:**  
**F&R** FROEHLING & ROBERTSON, INC.  
 Engineering Stability Since 1881  
 310 Hubert Street  
 Raleigh, North Carolina 27603-2302 | USA  
 T 919.828.3441 | F 919.828.5751  
 www.fandr.com



DocuSigned by:  
*Patrick Alton* 11/26/2018  
 A270EF78A0DE442 SIGNATURE DATE

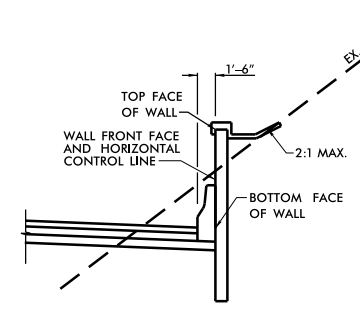
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

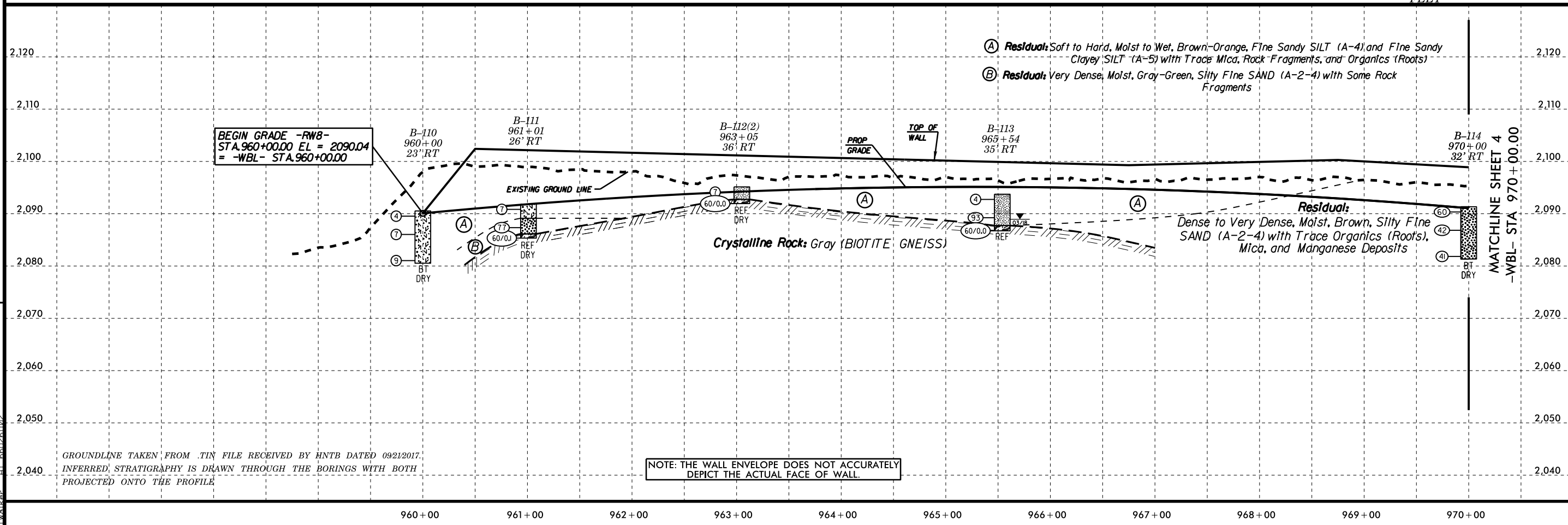
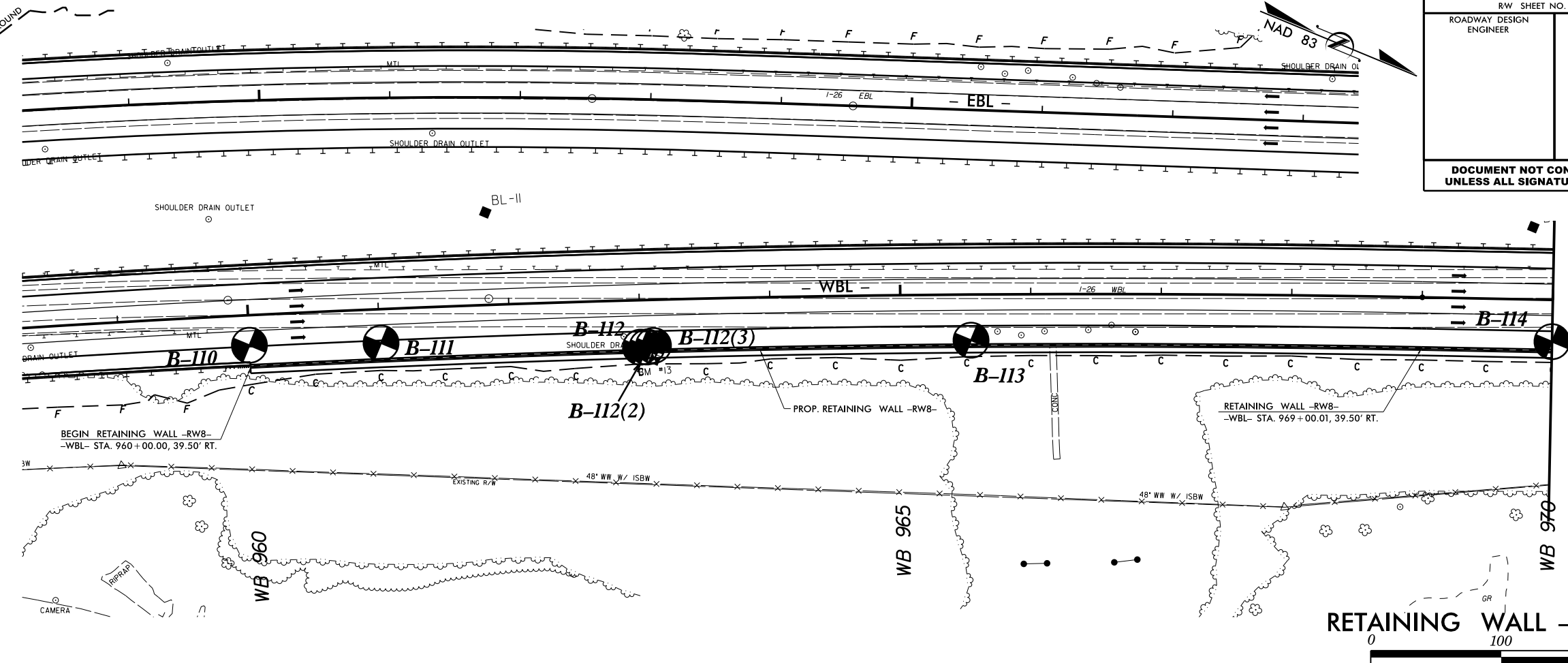
Table with multiple columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION.

8/17/99

PROJECT REFERENCE NO. 1-4700A	SHEET NO. 3
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



CUT WALL DETAIL



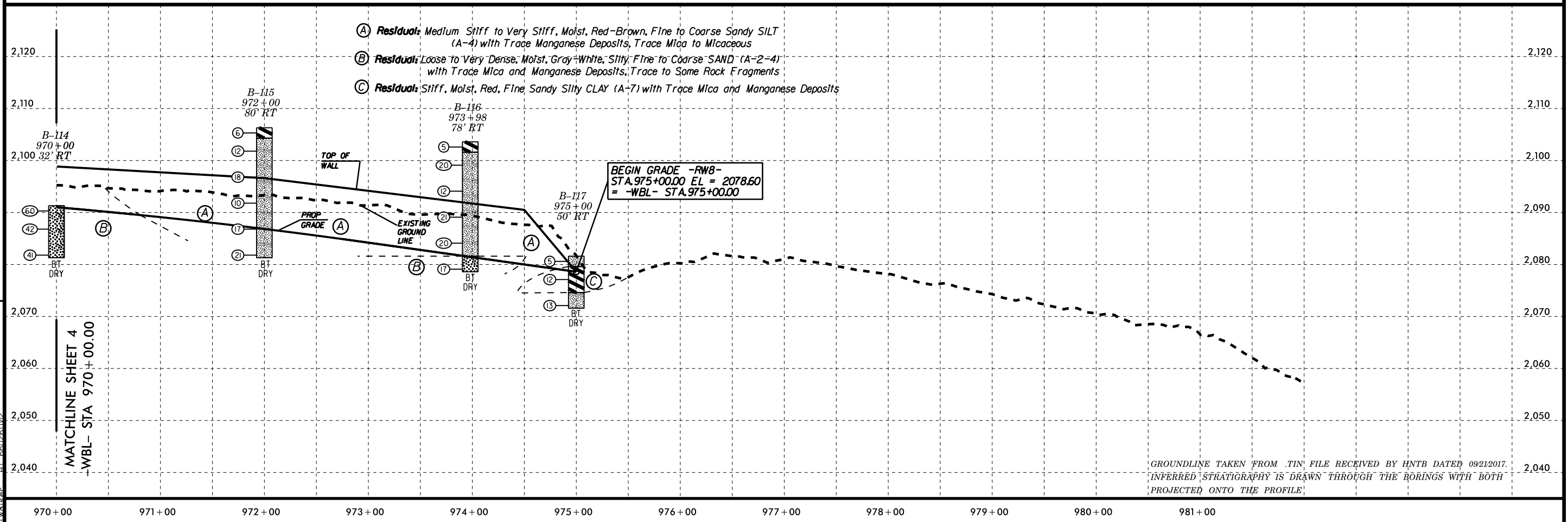
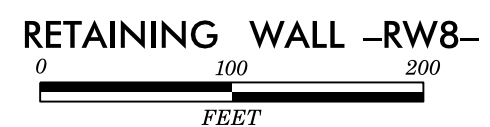
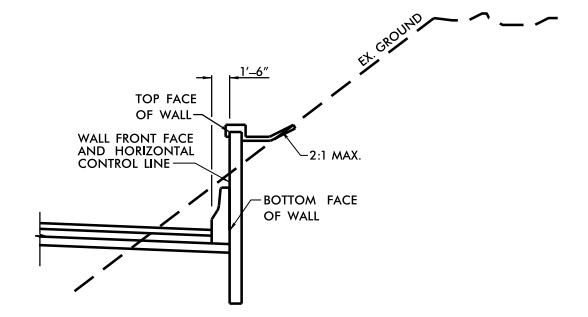
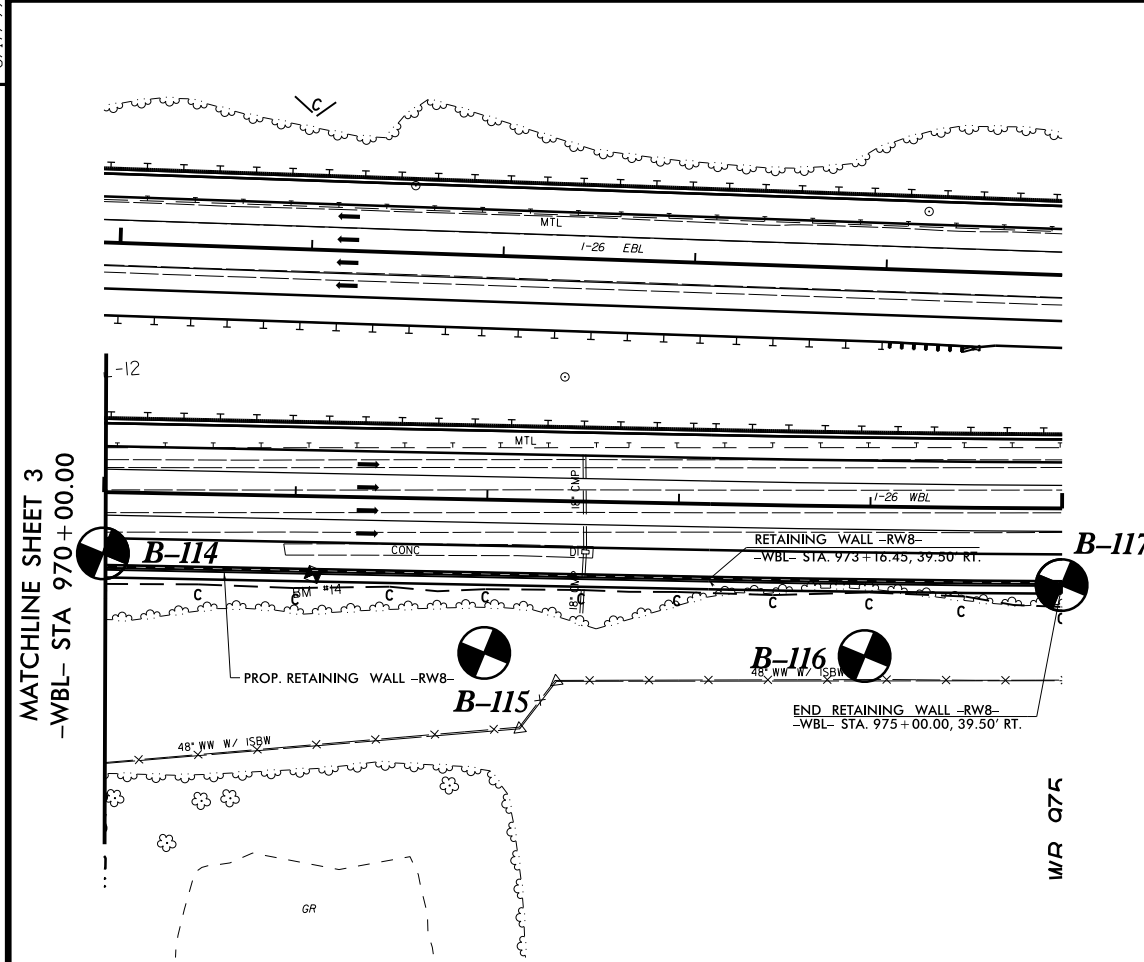
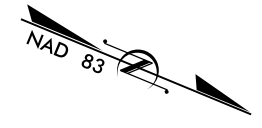
GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY HNTB DATED 09/21/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

NOTE: THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF WALL.

REVISIONS

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PROJECT REFERENCE NO. <b>1-4700A</b>	SHEET NO. <b>4</b>
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	



REVISIONS

20-NOV-2018 14:04  
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 MATCHLINE SHEET 3  
 -WBL- STA 970+00.00  
 MATCHLINE SHEET 4  
 -WBL- STA 970+00.00  
 W/R 075

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-110		STATION 960+00		OFFSET 23 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,090.5 ft		TOTAL DEPTH 10.0 ft		NORTHING 644,243		EASTING 943,273										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 03/27/18		COMP. DATE 03/27/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2095																
2090	2,090.5	0.0	1	1	3										2,090.5	0.0
	2,087.0	3.5	4	3	4											
2085	2,082.0	8.5	3	4	5										2,080.5	10.0
Boring Terminated at Elevation 2,080.5 ft in SILT (RESIDUAL)																
Note: 0.0'-0.1' = SURFICIAL ORGANIC SOILS																

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-111		STATION 961+01		OFFSET 26 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,091.8 ft		TOTAL DEPTH 6.5 ft		NORTHING 644,335		EASTING 943,233										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 03/27/18		COMP. DATE 03/27/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2095																
	2,091.8	0.0	1	2	5										2,091.8	0.0
2090	2,088.3	3.5	25	45	32										2,089.1	2.7
	2,085.4	6.4	60/0.1												2,086.1	5.7
															2,085.3	6.5
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,085.3 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)																
Note: 1. 0.0'-0.3' = SURFICIAL ORGANIC SOILS 2. Auger Refusal at 6.4'																

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)								
BORING NO. B-112(1)		STATION 963+00		OFFSET 36 ft RT		ALIGNMENT -WBL-									
COLLAR ELEV. 2,095.2 ft		TOTAL DEPTH 4.3 ft		NORTHING 644,520		EASTING 943,160									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 03/27/18		COMP. DATE 03/27/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2100															
2095	2,095.2	0.0	2	4	5								W	2,095.2 GROUND SURFACE 0.0	
														2,092.7 RESIDUAL 2.5	
														2,090.9 Boring Terminated at Elevation 2,090.9 ft in CRYSTALLINE ROCK (BIOTITE GNEISS) 4.3	
Note: 1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS 2. Auger Refusal at 4.3' 3. Offset to B-112(2) due to Auger Becoming Crooked															

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)								
BORING NO. B-112(2)		STATION 963+05		OFFSET 36 ft RT		ALIGNMENT -WBL-									
COLLAR ELEV. 2,095.1 ft		TOTAL DEPTH 3.2 ft		NORTHING 644,525		EASTING 943,158									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 03/27/18		COMP. DATE 03/27/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2100															
2095	2,095.1	0.0	2	3	4								W	2,095.1 GROUND SURFACE 0.0	
														2,092.7 RESIDUAL 2.4	
														2,091.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,091.9 ft in CRYSTALLINE ROCK (BIOTITE GNEISS) 3.2	
Notes: 1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS 2. Auger Refusal at 3.2' 3. Offset to B-112(3) due to Shallow Refusal															

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4	TIP I-4700A	COUNTY BUNCOMBE	GEOLOGIST S. Woods
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right			GROUND WTR (ft)
BORING NO. B-112(3)	STATION 963+10	OFFSET 35 ft RT	ALIGNMENT -WBL-
COLLAR ELEV. 2,094.5 ft	TOTAL DEPTH 2.8 ft	NORTHING 644,529	EASTING 943,155
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 03/27/18	COMP. DATE 03/27/18	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2095	2,094.5	0.0											GROUND SURFACE	0.0
	2,092.4												RESIDUAL	
	2,091.7	2.8	1	2	4								Brown, Fine Sandy SILT (A-4) with Trace Mica, Rock Fragments, and Organics (Roots)	2.8
	2,091.7	2.8											CRYSTALLINE ROCK	
													Gray (BIOTITE GNEISS)	
													Boring Terminated with Standard Penetration Test Refusal at Elevation 2,091.7 ft on CRYSTALLINE ROCK (BIOTITE GNEISS)	
													Note:	
													1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS	
													2. Auger Refusal at 2.8'	

WBS 36030.1.FS4	TIP I-4700A	COUNTY BUNCOMBE	GEOLOGIST S. Woods
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right			GROUND WTR (ft)
BORING NO. B-113	STATION 965+54	OFFSET 35 ft RT	ALIGNMENT -WBL-
COLLAR ELEV. 2,093.7 ft	TOTAL DEPTH 7.0 ft	NORTHING 644,752	EASTING 943,058
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 03/27/18	COMP. DATE 03/27/18	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2095	2,093.7	0.0											GROUND SURFACE	0.0
	2,093.7	0.0	1	1	3								RESIDUAL	
	2,090.2	3.5											White-Brown, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organic (Roots) from 0.0'-2.3', Trace Mica, and Trace to Some Rock Fragments	
2090	2,090.2	3.5	31	46	47								CRYSTALLINE ROCK	
	2,086.7	7.0											Gray (BIOTITE GNEISS)	
	2,086.7	7.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 2,086.7 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)	
													Note:	
													1. Auger Refusal at 7.0'	



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)								
BORING NO. B-114		STATION 970+00		OFFSET 32 ft RT		ALIGNMENT -WBL-									
COLLAR ELEV. 2,091.3 ft		TOTAL DEPTH 10.0 ft		NORTHING 645,164		EASTING 942,889									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 03/27/18		COMP. DATE 03/27/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2095															
2090	2,091.3	0.0	3	19	41									2,091.3	0.0
	2,087.8	3.5	20	21	21										
2085	2,082.8	8.5	15	20	21									2,081.3	10.0
Boring Terminated at Elevation 2,081.3 ft in SAND (RESIDUAL) Note: 1. 0.0'-0.3' = SURFICIAL ORGANIC SOILS															

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods									
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)								
BORING NO. B-115		STATION 972+00		OFFSET 80 ft RT		ALIGNMENT -WBL-									
COLLAR ELEV. 2,106.3 ft		TOTAL DEPTH 25.0 ft		NORTHING 645,368		EASTING 942,861									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 03/28/17		COMP. DATE 03/28/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2110															
2105	2,106.3	0.0	1	2	4									2,106.3	0.0
	2,102.8	3.5	3	5	7									2,104.3	2.0
2100	2,097.8	8.5	6	8	10										
2095	2,092.8	13.5	4	5	5										
2090	2,087.8	18.5	7	7	10										
2085	2,082.8	23.5	10	9	12									2,081.3	25.0
Boring Terminated at Elevation 2,081.3 ft in SILT (RESIDUAL)															

NCDOT BORE DOUBLE I4700A\_GEO\_BH\_RDWY WALL.GPJ NC\_DOT.GDT 11/20/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-116		STATION 973+98		OFFSET 78 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,103.6 ft		TOTAL DEPTH 25.0 ft		NORTHING 645,552		EASTING 942,786										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 03/28/18		COMP. DATE 03/28/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2105	2,103.6	0.0	1	2	3									2,103.6	GROUND SURFACE	0.0
2100	2,100.1	3.5	7	8	12								M	2,101.6	RESIDUAL Red, Fine Sandy Silty CLAY (A-7) with Trace Mica, Manganese Deposits, and Organics (Roots)	2.0
2095	2,095.1	8.5	3	4	8								M		Red, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits	
2090	2,090.1	13.5	6	9	12								M			
2085	2,085.1	18.5	3	9	11								M			
2080	2,080.1	23.5	7	7	10								M	2,081.6	White-Brown, Silty Fine SAND (A-2-4)	22.0
														2,078.6	Boring Terminated at Elevation 2,078.6 ft in SAND (RESIDUAL)	25.0
Note: 1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS																

WBS 36030.1.FS4		TIP I-4700A		COUNTY BUNCOMBE		GEOLOGIST S. Woods										
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right							GROUND WTR (ft)									
BORING NO. B-117		STATION 975+00		OFFSET 50 ft RT		ALIGNMENT -WBL-										
COLLAR ELEV. 2,081.6 ft		TOTAL DEPTH 10.0 ft		NORTHING 645,633		EASTING 942,713										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 03/28/18		COMP. DATE 03/28/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2085	2,081.6	0.0												2,081.6	GROUND SURFACE	0.0
2080	2,078.1	3.5	6	5	7								M	2,079.6	RESIDUAL Brown, Clayey Fine Sandy SILT (A-4) with Trace Organics (Roots)	2.0
2075	2,073.1	8.5	4	6	7								M		Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits	
													M	2,074.6	Brown, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits	7.0
													M	2,071.6	Boring Terminated at Elevation 2,071.6 ft in SILT (RESIDUAL)	10.0

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