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REFERENCE: B-5125

PROJECT: 42271

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY MACON  
 PROJECT DESCRIPTION BRIDGE NO. 22 OVER LITTLE  
TENNESSEE RIVER ON US441 BUSINESS

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	42271	1	26

**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.

PERSONNEL

- N. PAGE
- J. WELLS
- M. KEATTS
- R. NORWOOD
- S. HARDEE
- M.G. MOSELEY
- M.B. MOSELEY

INVESTIGATED BY S&ME, INC.  
 DRAWN BY B. RATTI  
 CHECKED BY A.F. RIGGS JR, P.E.  
 SUBMITTED BY S&ME, INC.  
 DATE DECEMBER 2015



DocuSign by: Abner F. Riggs, Jr.  
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2/8/2016

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 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

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.

ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

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.

SOIL LEGEND AND AASHTO CLASSIFICATION table with columns for GENERAL CLASS., GRANULAR MATERIALS (A-1 to A-7), SILT-CLAY MATERIALS (A-1 to A-7), ORGANIC MATERIALS (A-1, A-2, A-3, A-4, A-5, A-6, A-7), and SYMBOLS. Includes a detailed chart for MATERIAL PASSING #10, #40, #200, and GROUP INDEX.

MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50

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

WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V.SL.) 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.

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/FT<sup>2</sup>).

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. INFERRER SOIL BOUNDARY. INFERRER ROCK LINE. ALLUVIAL SOIL BOUNDARY.

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.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - 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.

TEXTURE OR GRAIN SIZE table with columns for U.S. STD. SIEVE SIZE, BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F SD.), SILT (SL.), and CLAY (CL.).

RECOMMENDATION SYMBOLS UNDERCUT EXCAVATION. UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE. UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK. ABBREVIATIONS AR - AUGER REFUSAL, BT - BORING TERMINATED, CL - CLAY, CPT - CONE PENETRATION TEST, CSE - COARSE, DMT - DILATOMETER TEST, DPT - DYNAMIC PENETRATION TEST, e - VOID RATIO, F - FINE, FOSS. - FOSSILIFEROUS, FRAC. - FRACTURED, FRACTURES, FRAGS. - FRAGMENTS, HI. - HIGHLY.

ROCK HARDNESS (CONT.) MEDIUM HARD CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.

SOFT CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.

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 ranges (LL, PL, OM, SL) and moisture levels (SAT, WET, MOIST, DRY).

EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST, CME-550X, CME-45C BARCEL. ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE 2 1/16" STEEL TEETH, TRICONE TUNG-CARB., CORE BIT, 3/4" HSA. HAMMER TYPE: AUTOMATIC, MANUAL. CORE SIZE: -B, -H, -N Q2.

FRACTURE SPACING and BEDDING tables. FRACTURE SPACING: TERM, SPACING. BEDDING: TERM, THICKNESS.

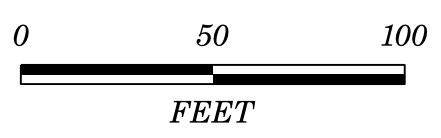
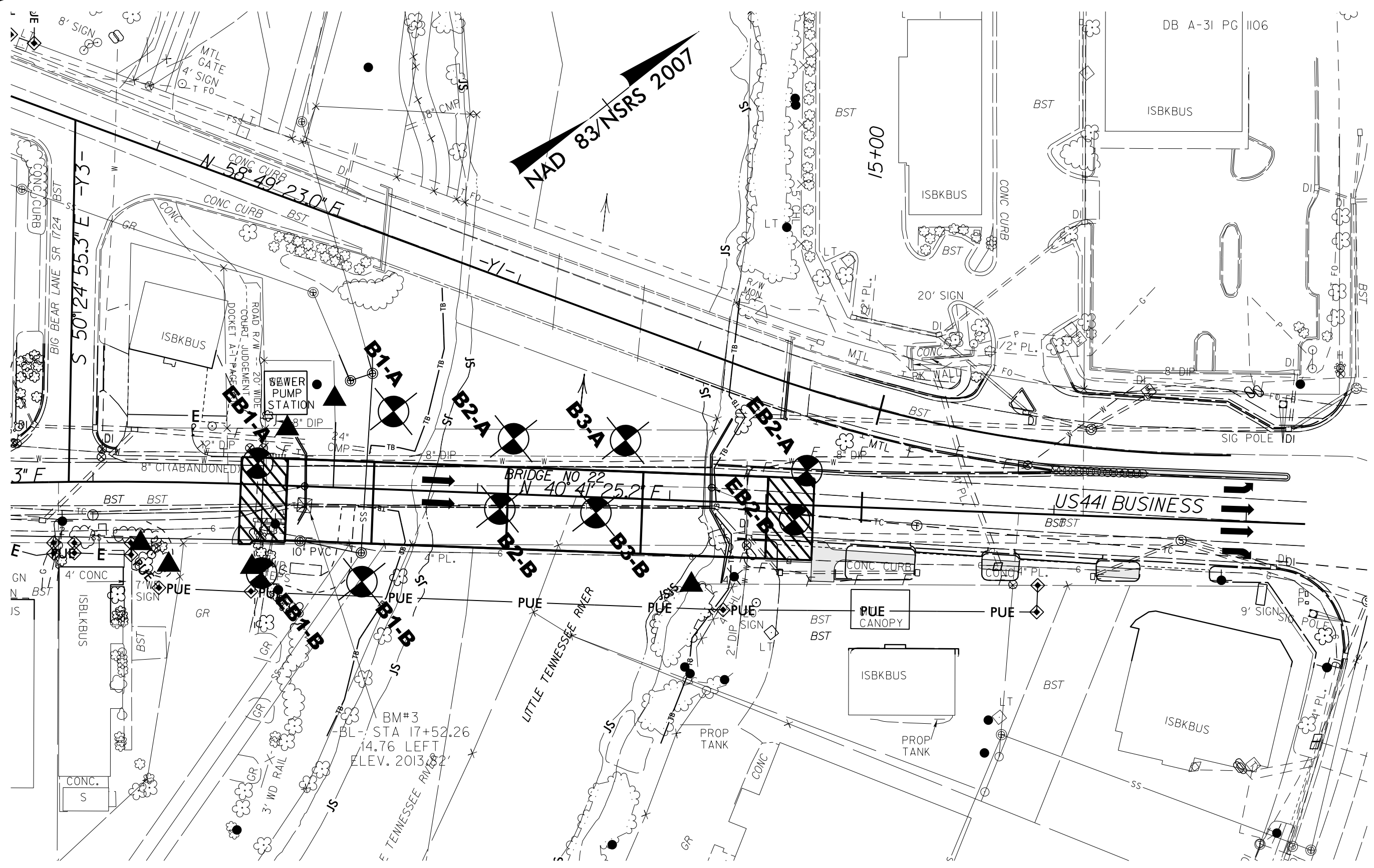
INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT 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.

PLASTICITY table with columns for PLASTICITY INDEX (PI), DRY STRENGTH, and COLOR. Includes descriptions of color combinations (tan, red, yellow-brown, blue-gray) and modifiers (light, dark, streaked).

NOTES: FIAD - FILLED IN AFTER DRILLING

ELEVATION: 2013.92 FEET

DATE: 8-15-14



SKREW ANGLE FOR BENTS 90° TYPICAL

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APPROVED BY: ARF	SCALE: 1" = 50'	DRAWN BY: BTR	DATE: DEC 2015
			JOB NO:
			SHEET: 3

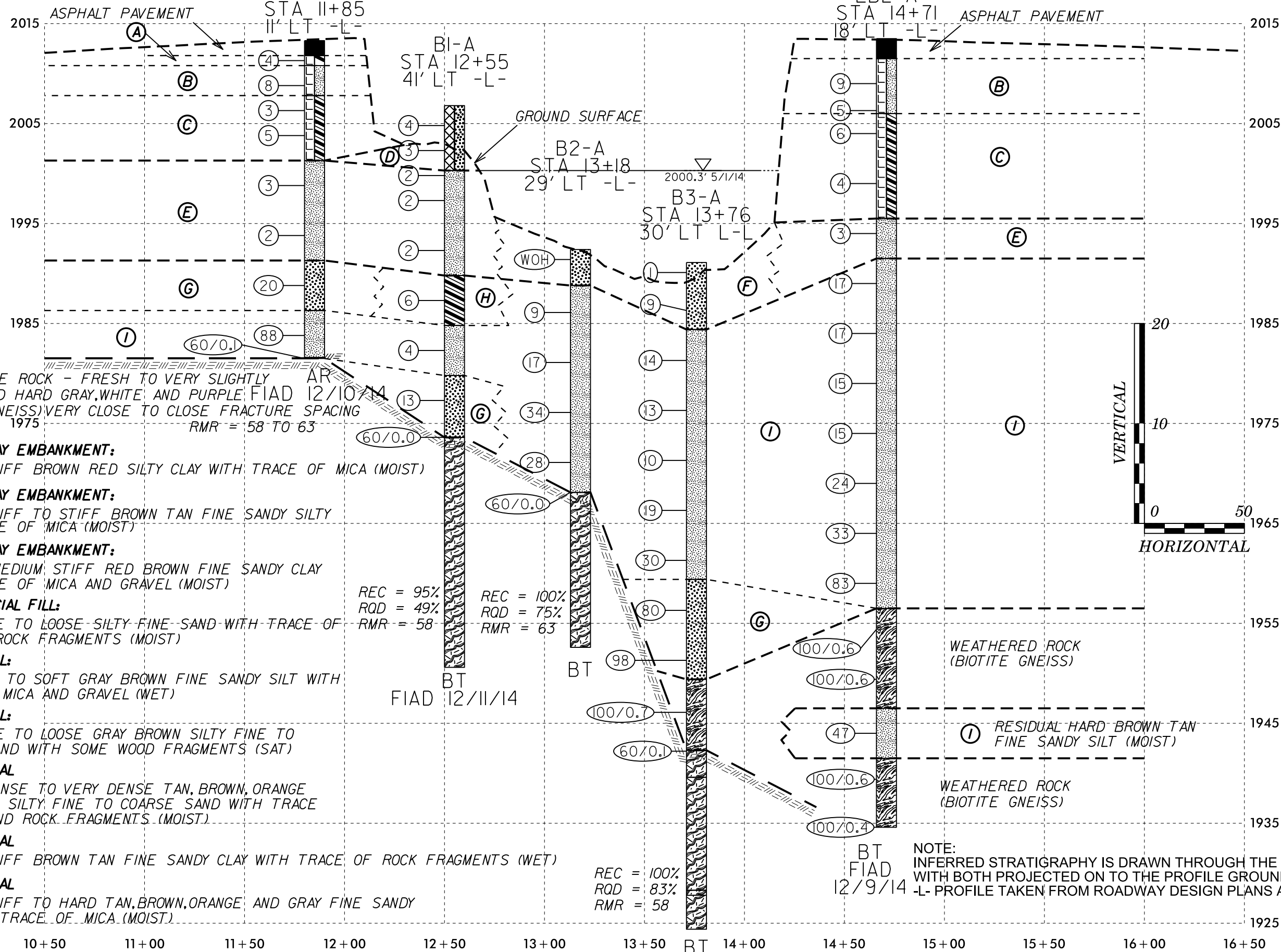
**BORING LOCATION PLAN**

BRIDGE NO. 22  
OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
STATE PROJ NO. 42271 TIP NO. B-5125  
MACON COUNTY, NORTH CAROLINA

TO BIG BEAR LN (SR1724)

# GENERALIZED SUBSURFACE PROFILE ALONG -L-

TO LAKESIDE DR (SR1324)



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## GENERALIZED SUBSURFACE PROFILE ALONG -L-

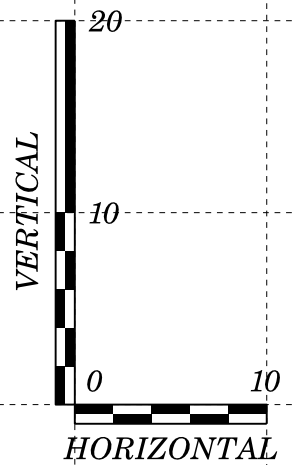
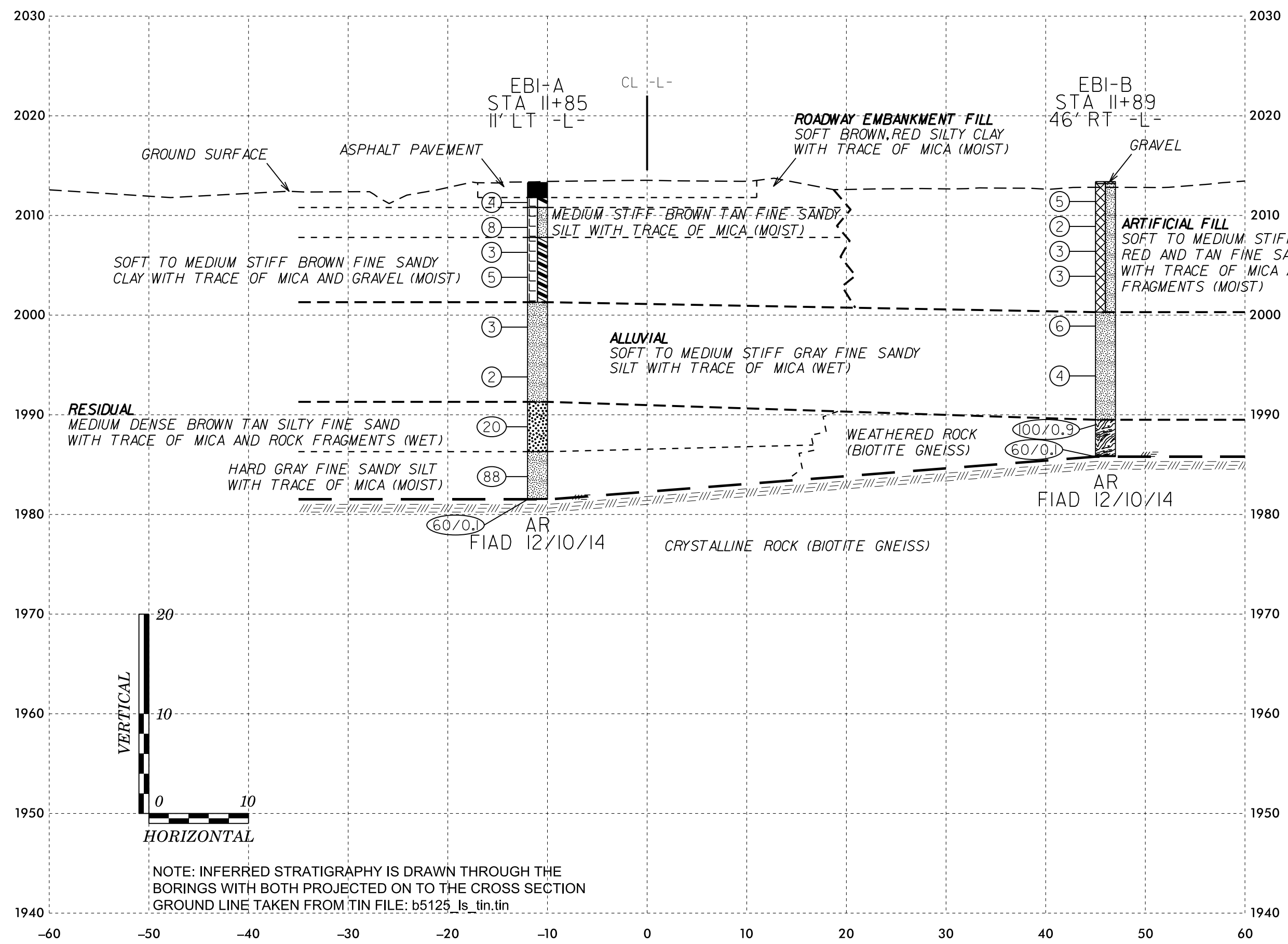
BRIDGE NO. 22  
 OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
 STATE PROJ NO. 42271 TIP NO. B-5125  
 MACON COUNTY, NORTH CAROLINA

**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE PROFILE GROUND LINE AND -L- PROFILE TAKEN FROM ROADWAY DESIGN PLANS AS OF JAN 2015

← TO NORTHWEST

# CROSS SECTION THROUGH (STA 12+00.89)

→ TO SOUTHEAST



NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION  
GROUND LINE TAKEN FROM TIN FILE: b5125\_ls\_tin.tin

APPROVED BY: AFR		DRAWN BY: BTR	
SCALE: VERT. 1" = 10' HOR. 1" = 10'		DATE: DEC 2015	
JOB NO:		SHEET: 5	

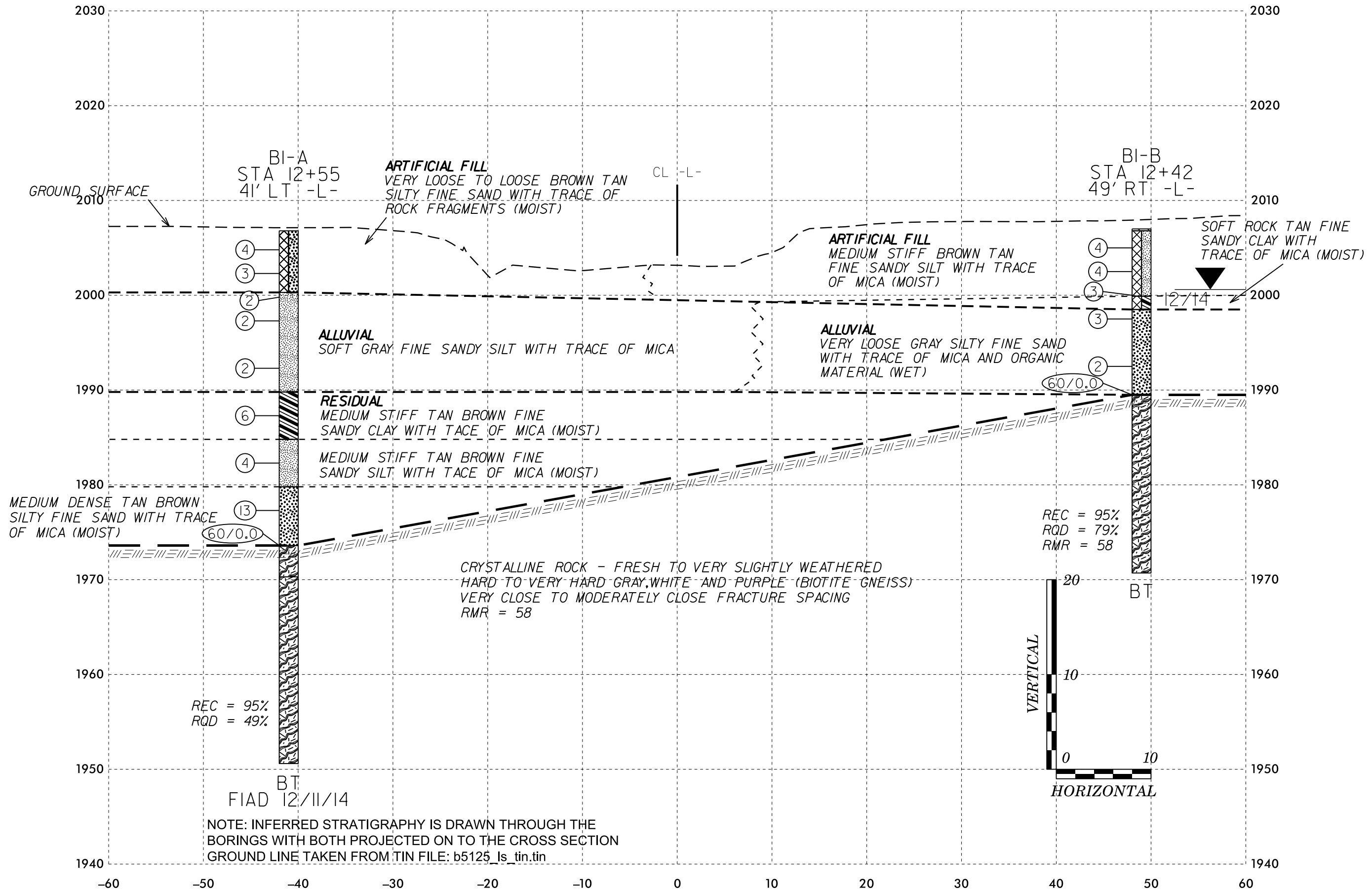
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**CROSS SECTION THROUGH (STA 12+00.89)**  
BRIDGE NO. 22  
OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
STATE PROJ NO. 42271 TIP NO. B-5125  
MACON COUNTY, NORTH CAROLINA

TO NORTHWEST

# CROSS SECTION THROUGH (STA 12+45.89)

TO SOUTHEAST



APPROVED BY: AFR

SCALE: VERT. 1" = 10'  
HOR. 1" = 10'

DRAWN BY: BTR

DATE: DEC 2015

SHEET: 6



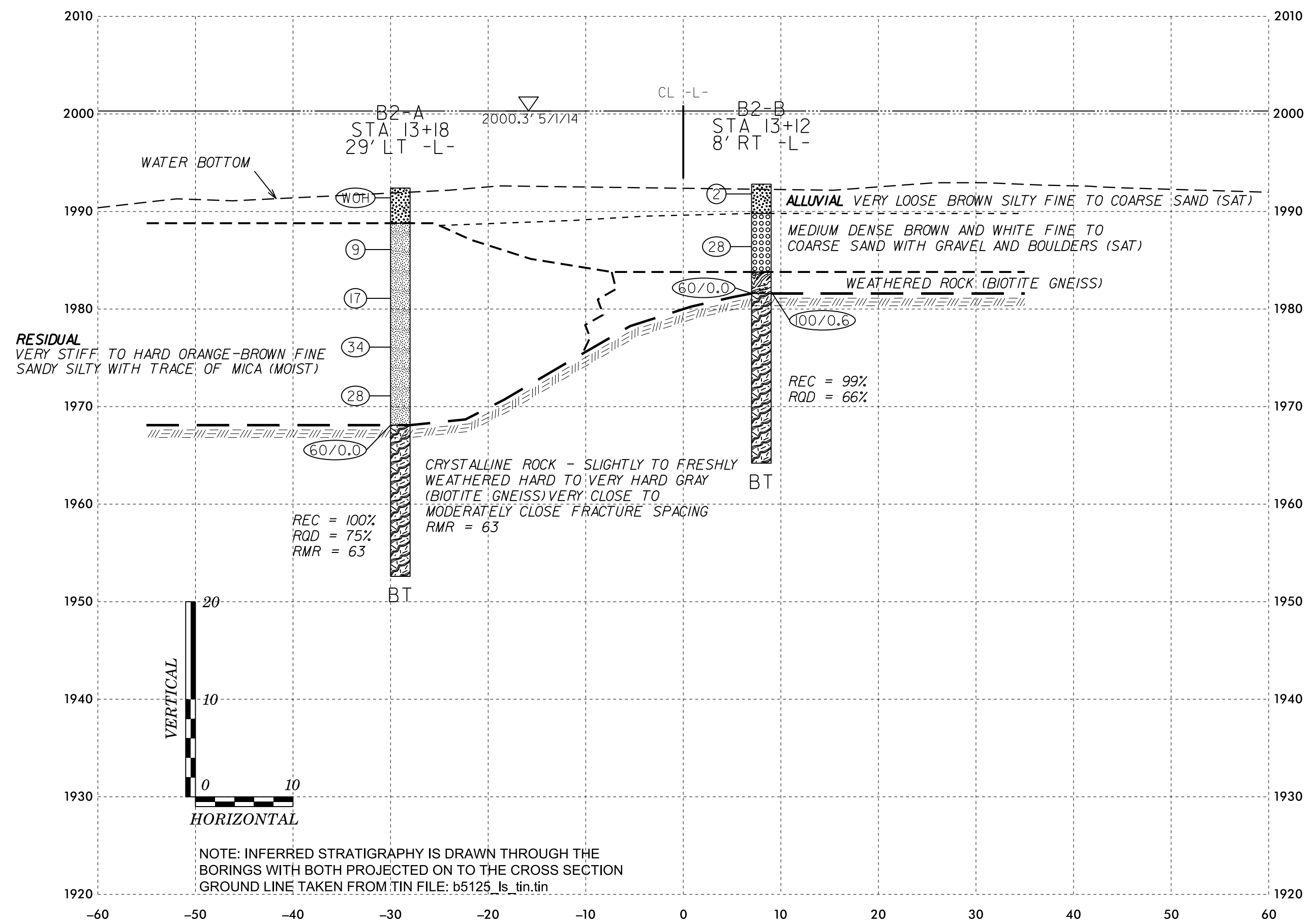
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## CROSS SECTION THROUGH (STA 12+45.89)

BRIDGE NO. 22  
OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
STATE PROJ NO. 42271 TIP NO. B-5125  
MACON COUNTY, NORTH CAROLINA

← TO NORTHWEST **CROSS SECTION THROUGH (STA 13+15.89)** TO SOUTHEAST →



NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION  
 GROUND LINE TAKEN FROM TIN FILE: b5125\_ls\_tin.tin

**CROSS SECTION THROUGH (STA 13+15.89)**

BRIDGE NO. 22  
 OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
 STATE PROJ NO. 42271 TIP NO. B-5125  
 MACON COUNTY, NORTH CAROLINA

APPROVED BY: AFR

SCALE: VERT. 1" = 10'  
HOR. 1" = 10'

DATE: DEC 2015

JOB NO:

DRAWN BY: BTR

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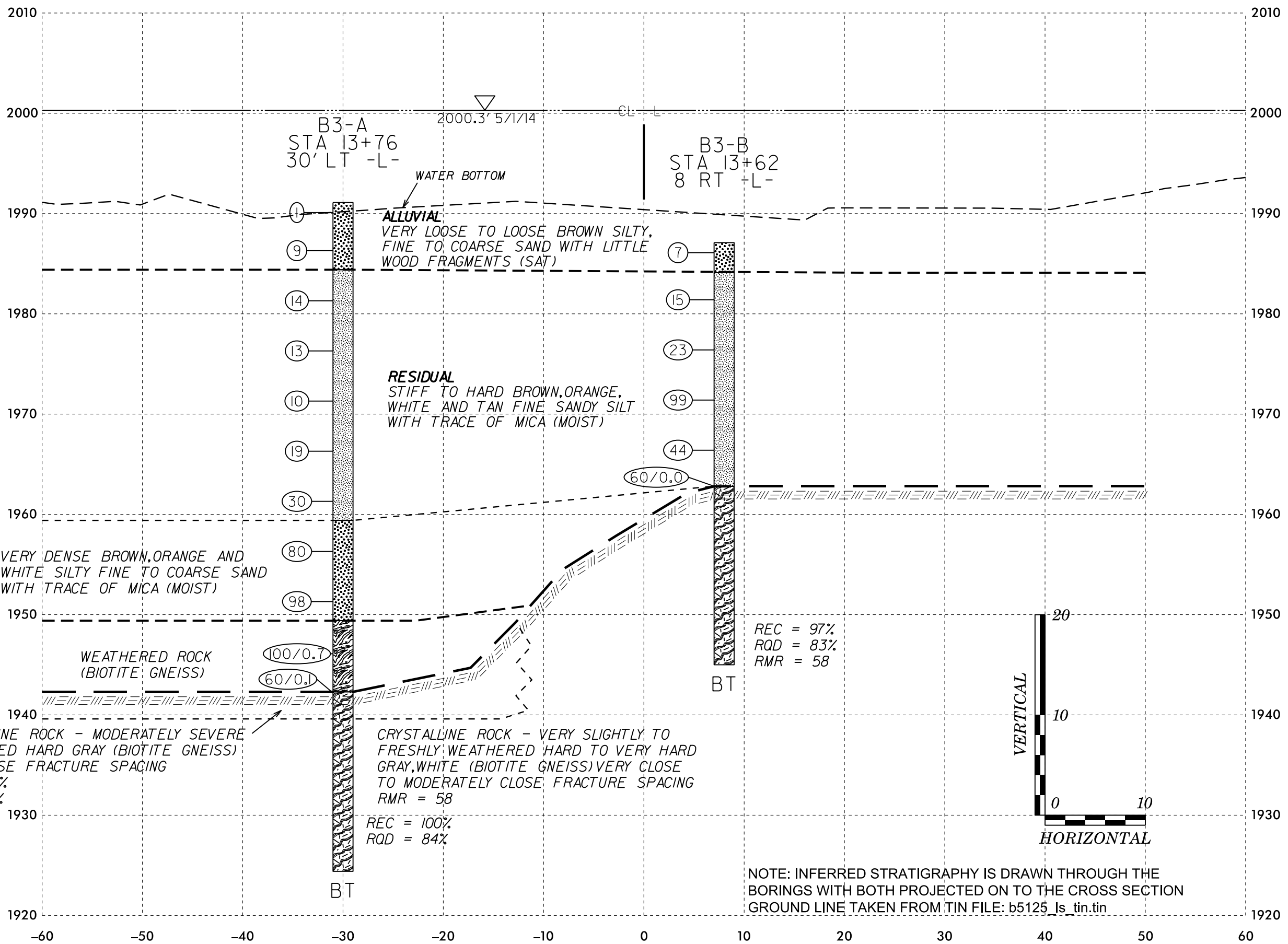
SHEET: 7



← TO NORTHWEST

### CROSS SECTION THROUGH (STA 13+85.89)

→ TO SOUTHEAST



APPROVED BY: AFR	DRAWN BY: BTR
SCALE: VERT. 1" = 10' HOR. 1" = 10'	JOB NO:
DATE: DEC 2015	SHEET: 8

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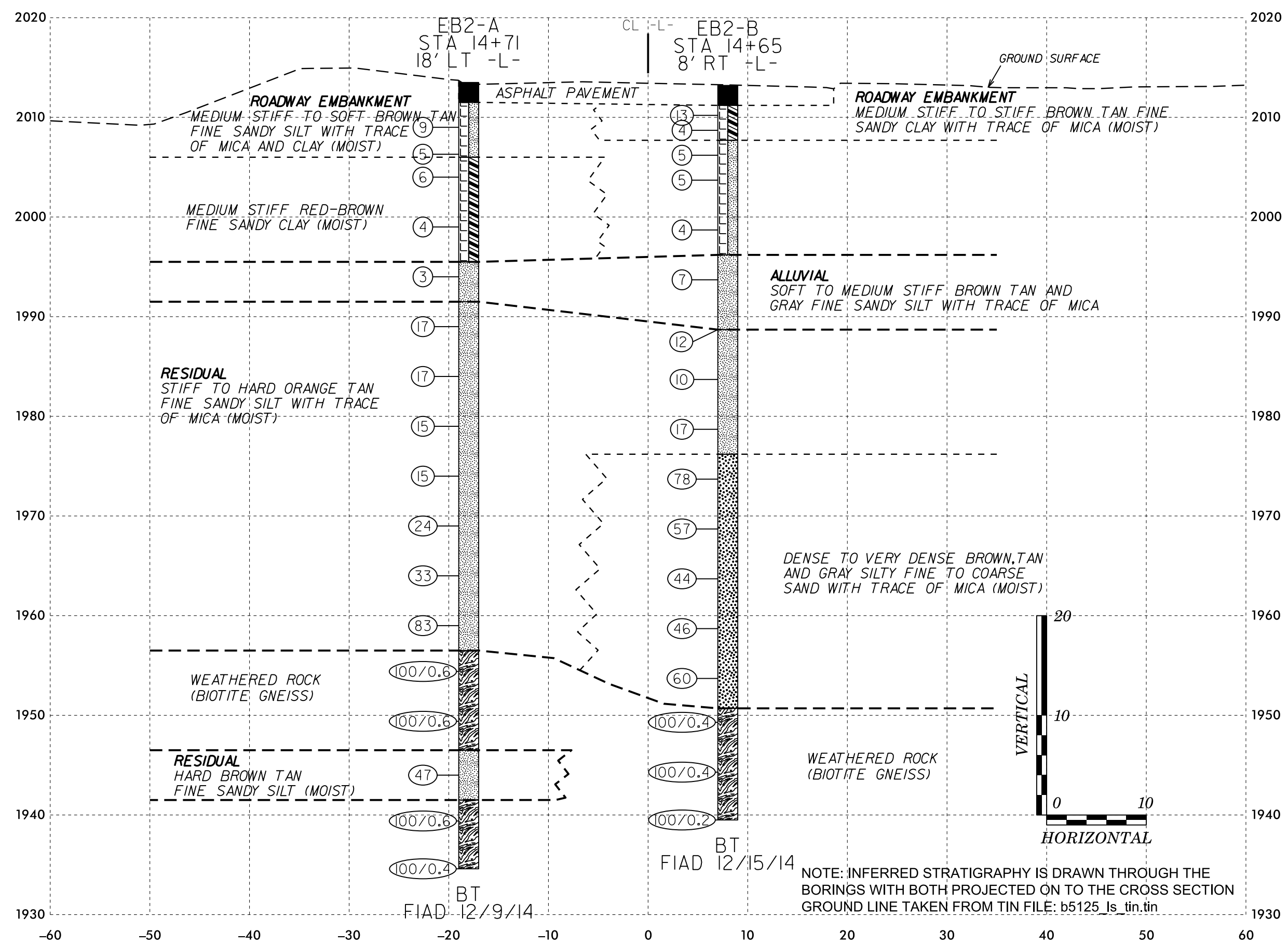
CROSS SECTION THROUGH (STA 13+85.89)

BRIDGE NO. 22  
OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
STATE PROJ NO. 42271 TIP NO. B-5125  
MACON COUNTY, NORTH CAROLINA

← TO NORTHWEST

### CROSS SECTION THROUGH (STA 14+50.89)

→ TO SOUTHEAST



NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION  
 GROUND LINE TAKEN FROM TIN FILE: b5125\_ls\_tin.tin

APPROVED BY: AFR	DRAWN BY: BTR
SCALE: VERT. 1" = 10' HOR. 1" = 10'	DATE: DEC 2015
JOB NO:	SHEET: 9

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CROSS SECTION THROUGH (STA 14+50.89)  
 BRIDGE NO. 22  
 OVER LITTLE TENNESSEE RIVER ON -L- (US441 BUSINESS)  
 STATE PROJ NO. 42271 TIP NO. B-5125  
 MACON COUNTY, NORTH CAROLINA

**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.											
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)										
BORING NO. EB1-A		STATION 11+85		OFFSET 11 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,013.3 ft		TOTAL DEPTH 31.8 ft		NORTHING 551,342		EASTING 694,045											
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014			DRILL METHOD Wash Boring		HAMMER TYPE Automatic												
DRILLER R. Norwood		START DATE 12/10/14		COMP. DATE 12/10/14		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							
2015																	
	2,012.3	1.0	3	1	3										2,013.3	PAVEMENT SURFACE	0.0
	2,011.8														2,011.8	Asphalt (10 inches) ABC Stone (8 inches)	1.5
	2,010.8														2,010.8	<b>ROADWAY EMBANKMENT</b>	2.5
2010	2,009.8	3.5	4	4	4										2,007.8	Brown Red Silty CLAY with Trace of Mica	
	2,007.3	6.0													2,007.8	Brown Tan Fine Sandy SILT with Trace of Mica	5.5
2005	2,004.8	8.5	2	1	2											Brown Fine Sandy CLAY with Trace of Mica and Gravel	
	2,004.8		3	2	3												
2000	1,999.8	13.5	3	2	1										2,001.3	<b>ALLUVIAL</b>	12.0
	1,999.8															Gray Fine Sandy SILT with Trace of Mica	
1995	1,994.8	18.5	2	1	1												
	1,994.8																
1990	1,989.8	23.5	18	11	9										1,991.3	<b>RESIDUAL</b>	22.0
	1,989.8															Brown Tan Silty Fine SAND with Trace of Mica and Rock Fragments	
1985	1,984.8	28.5	26	39	49										1,986.3	Gray Fine Sandy SILT with Trace of Mica	27.0
	1,984.8																
	1,981.6	31.7													1,981.6	<b>CRYSTALLINE ROCK</b>	31.7
		60/0.1													1,981.5	(Biotite Gneiss)	31.8
																Boring Terminated with Standard Penetration Test Refusal at Elevation 1,981.5 ft in Crystalline Rock (Biotite Gneiss)	
																1) Advanced 2-15/16" Tricone roller bit to 31.7 feet. 2) NW casing advanced to 28 feet (30 feet). 3) Bentonite mud used as drilling fluid.	

WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.											
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)										
BORING NO. EB1-B		STATION 11+89		OFFSET 46 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 2,013.4 ft		TOTAL DEPTH 27.6 ft		NORTHING 551,308		EASTING 694,091											
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER R. Norwood		START DATE 12/10/14		COMP. DATE 12/10/14		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							
2015																	
	2,012.4	1.0	3	2	3										2,013.4	GROUND SURFACE	0.0
2010	2,009.9	3.5	2	1	1											<b>ARTIFICIAL FILL</b>	
	2,007.4	6.0														Gravel (2 inches)	
	2,007.4		2	1	2											Brown Red Tan Fine Sandy SILT with Trace of Mica and Rock Fragments	
2005	2,004.9	8.5	2	1	2												
	2,004.9																
2000	1,999.9	13.5	2	4	2										2,000.3	<b>ALLUVIAL</b>	13.1
	1,999.9															Gray Fine Sandy SILT with Trace of Mica	
1995	1,994.9	18.5	2	2	2												
	1,994.9																
1990	1,989.9	23.5	26	74/0.4											1,989.5	<b>WEATHERED ROCK</b>	23.9
	1,989.9															(Biotite Gneiss)	
	1,985.9	27.5	60/0.1												1,985.9	<b>CRYSTALLINE ROCK</b>	27.5
															1,985.8	(Biotite Gneiss)	27.6
																Boring Terminated with Standard Penetration Test Refusal at Elevation 1,985.8 ft in Crystalline Rock (Biotite Gneiss)	
																1) Advanced 3-1/4" HSA to 27.5 feet.	

NCDOT BORE DOUBLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Wells, J.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. B1-A	STATION 12+55	OFFSET 41 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,006.8 ft	TOTAL DEPTH 56.2 ft	NORTHING 551,414	EASTING 694,068
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER R. Norwood	START DATE 12/11/14	COMP. DATE 12/12/14	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					
2015															
2010															
2005	2,005.8	1.0	3	2	2								M	2,006.8 GROUND SURFACE	0.0
	2,003.3	3.5	3	2	1								M	ARTIFICIAL FILL Brown Tan Silty Fine SAND with Trace of Mica and Rock Fragments	
2000	2,000.8	6.0	2	1	1								W	2,000.3	6.5
	1,998.3	8.5	1	1	1								W	ALLUVIAL Gray Fine Sandy SILT with Trace of Mica	
1995	1,993.3	13.5	1	1	1								W		
1990	1,988.3	18.5	3	2	4								W	1,989.8	17.0
	1,984.8	22.0	3	2	2								W	1,984.8	22.0
1985	1,983.3	23.5	3	2	2								M	1,979.8	27.0
1980	1,978.3	28.5	10	6	7								M	1,979.8	27.0
1975	1,973.6	33.2	60/0.0											1,973.6	33.2
1970															
1965															
1960															
1955															
														1,950.6	56.2
Boring Terminated at Elevation 1,950.6 ft in Crystalline Rock (Biotite Gneiss)															
1) Advanced 2-15/16" Tricone roller bit to 33.2 feet. 2) NW casing advanced to 33.2 feet (35 feet). 3) SPT refusal encountered at 33.2 feet. 4) Water used as drilling fluid. 5) Advanced NQ2 core barrel from 33.2 feet to 56.2 feet.															

NCDOT BORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Wells, J.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. B1-A	STATION 12+55	OFFSET 41 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,006.8 ft	TOTAL DEPTH 56.2 ft	NORTHING 551,414	EASTING 694,068
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER R. Norwood	START DATE 12/11/14	COMP. DATE 12/12/14	SURFACE WATER DEPTH N/A

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)			
1973.6	1,973.6	33.2	3.3	2:30/0.3 5:00/1.0 7:00/1.0 4:30/1.0	(2.9)	(1.2)						
1970	1,970.3	36.5	5.0	4:15/1.0 4:00/1.0 3:30/1.0 3:00/1.0 3:15/1.0	(4.9)	(1.3)						
1965	1,965.3	41.5	5.0	3:45/1.0 3:15/1.0 3:00/1.0 3:15/1.0	(4.8)	(4.1)						
1960	1,960.3	46.5	5.0	4:30/1.0 3:30/1.0 4:15/1.0 4:00/1.0 3:15/1.0	(4.8)	(2.9)						
1955	1,955.3	51.5	4.7	4:00/1.0 3:00/1.0 4:00/1.0 4:15/1.0 3:00/0.7	(4.5)	(1.8)						
	1,950.6	56.2										
Boring Terminated at Elevation 1,950.6 ft in Crystalline Rock (Biotite Gneiss)												
1) Advanced 2-15/16" Tricone roller bit to 33.2 feet. 2) NW casing advanced to 33.2 feet (35 feet). 3) SPT refusal encountered at 33.2 feet. 4) Water used as drilling fluid. 5) Advanced NQ2 core barrel from 33.2 feet to 56.2 feet.												

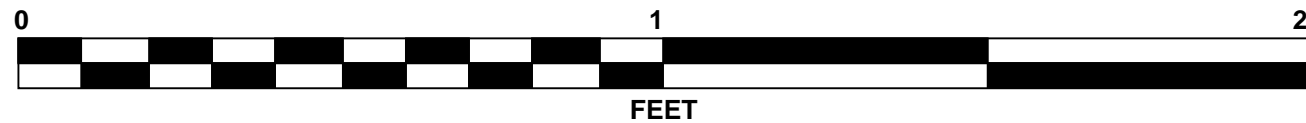
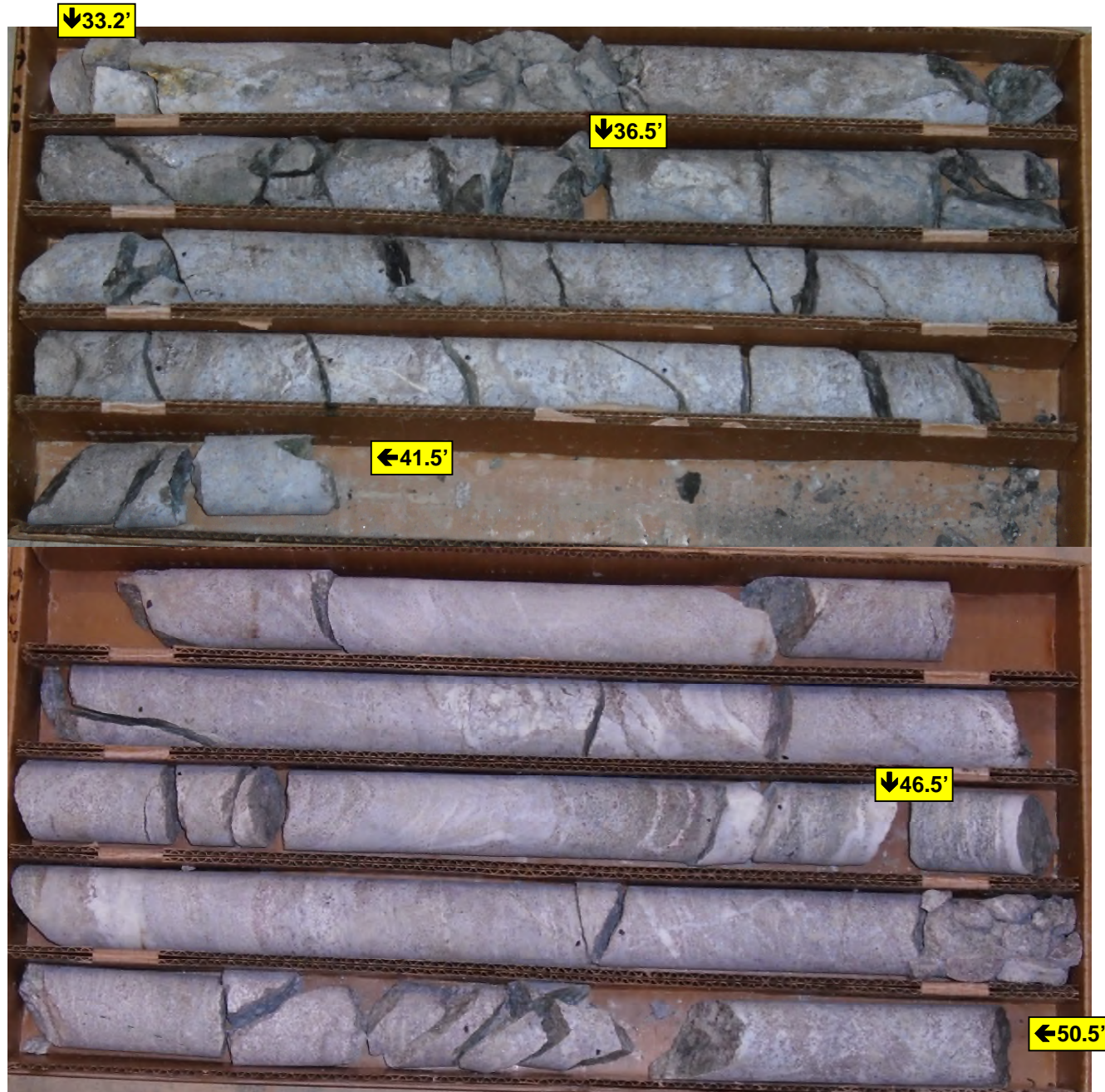
NCDOT CORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

Project No. 42271  
Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B1-A

BOX 1: 33.2 to 41.5 FEET and BOX 2: 41.5 to 50.5 FEET

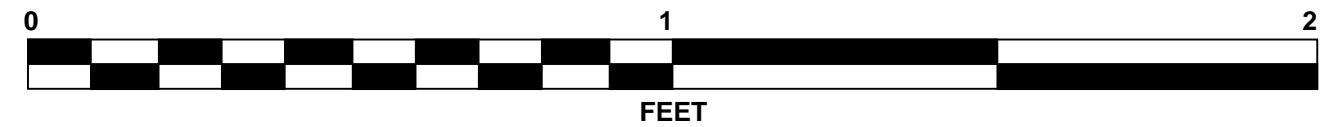
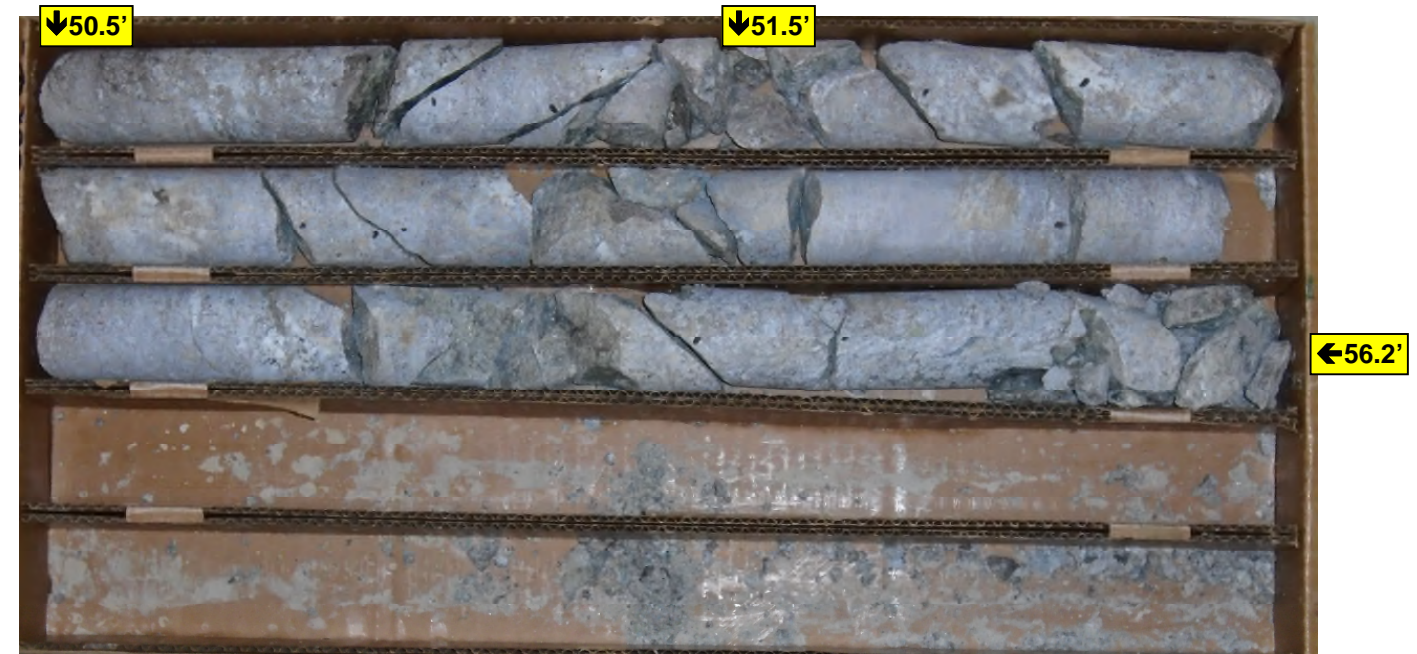


Project No. 42271  
Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B1-A

BOX 3: 50.5 to 56.2 FEET



WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.									
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)								
BORING NO. B1-B		STATION 12+42		OFFSET 49 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,007.0 ft		TOTAL DEPTH 36.3 ft		NORTHING 551,346		EASTING 694,127									
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER R. Norwood		START DATE 12/10/14		COMP. DATE 12/11/14		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					
2015															
2010															
2005	2,006.0	1.0	3	2	2						M		2,007.0	0.0	
	2,003.5	3.5	2	2	2						M				
	2,001.0	6.0	1	2	1						M				
2000	1,998.5	8.5	2	2	1						Sat.		1,999.9	7.1	
	1,998.5	8.5	2	2	1						Sat.		1,998.5	8.5	
1995	1,993.5	13.5	1	1	1						Sat.				
1990	1,989.5	17.5	60/0.0										1,989.5	17.5	
1985															
1980											RS-1				
1975															
													1,970.7	36.3	
Boring Terminated at Elevation 1,970.7 ft in Crystalline Rock (Biotite Gneiss)															
<ol style="list-style-type: none"> <li>Advanced 2-15/16" Tricone roller bit to 17.5 feet.</li> <li>NW casing advanced to 17.5 feet (20 feet).</li> <li>SPT refusal encountered at 17.5 feet.</li> <li>Bentonite mud used as drilling fluid.</li> <li>Advanced NQ2 core barrel from 17.5 feet to 36.3 feet.</li> </ol>															

NCDOT BORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.						
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)					
BORING NO. B1-B		STATION 12+42		OFFSET 49 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,007.0 ft		TOTAL DEPTH 36.3 ft		NORTHING 551,346		EASTING 694,127						
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic								
DRILLER R. Norwood		START DATE 12/10/14		COMP. DATE 12/11/14		SURFACE WATER DEPTH N/A						
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 (%)	RQD (%)			
1989.5	1,989.5	17.5	3.8	1:30/0.8 3:15/1.0 3:00/1.0	(3.3)	(2.7)						
1985	1,985.7	21.3	5.0	2:45/1.0 2:30/1.0 3:00/1.0 3:00/1.0	(4.8)	(4.6)						
1980	1,980.7	26.3	5.0	3:30/1.0 3:00/1.0 3:45/1.0 3:45/1.0	(4.9)	(3.3)	RS-1					
1975	1,975.7	31.3	5.0	5:30/1.0 3:30/1.0 4:00/1.0 4:15/1.0	(4.9)	(4.3)						
	1,970.7	36.3		5:30/1.0								36.3
Boring Terminated at Elevation 1,970.7 ft in Crystalline Rock (Biotite Gneiss)												
<ol style="list-style-type: none"> <li>Advanced 2-15/16" Tricone roller bit to 17.5 feet.</li> <li>NW casing advanced to 17.5 feet (20 feet).</li> <li>SPT refusal encountered at 17.5 feet.</li> <li>Bentonite mud used as drilling fluid.</li> <li>Advanced NQ2 core barrel from 17.5 feet to 36.3 feet.</li> </ol>												

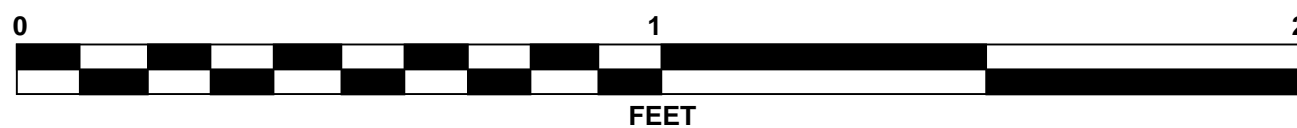
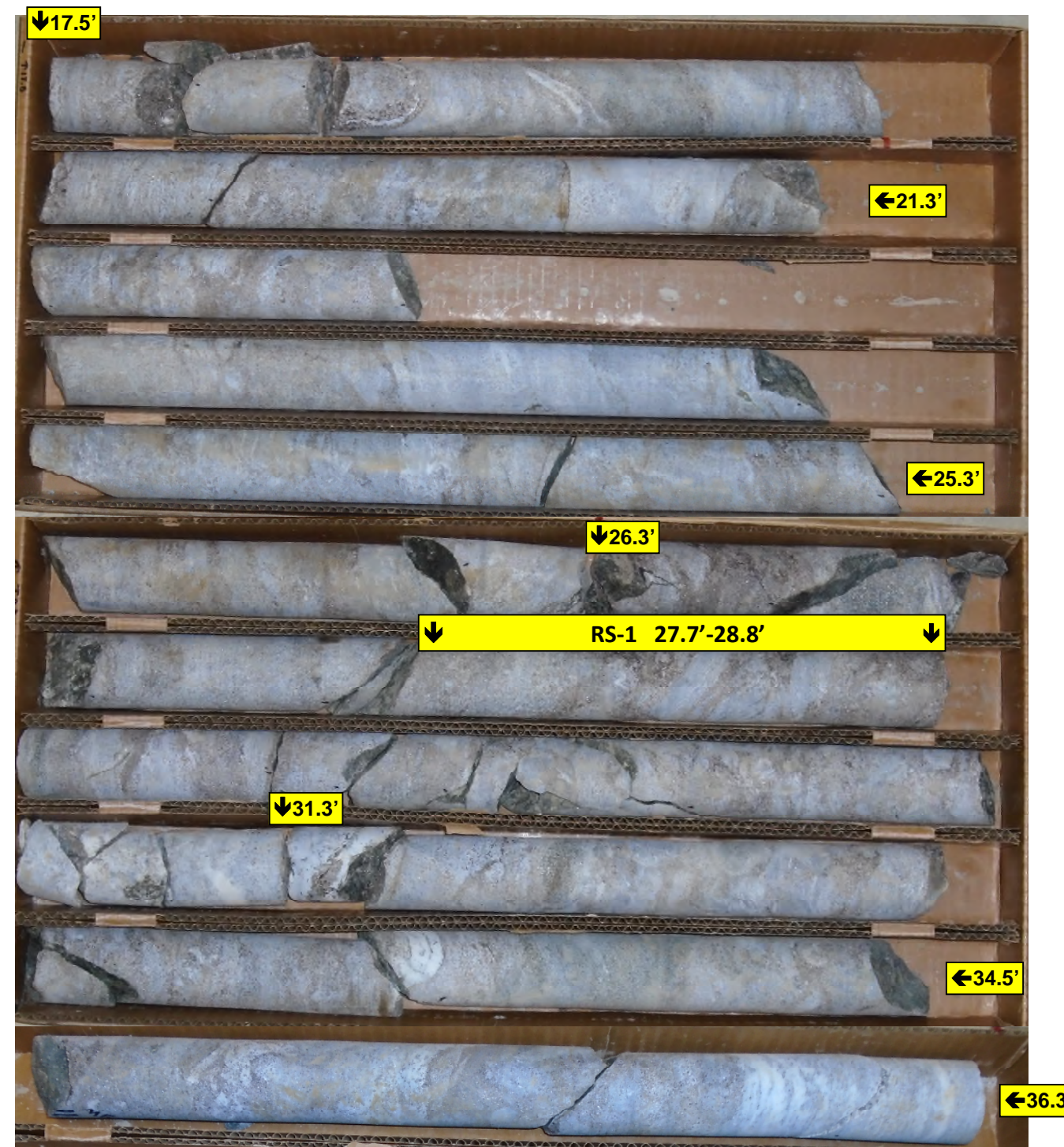
NCDOT CORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

Project No. 42271  
Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B1-B

BOX 1: 17.5 to 25.3 FEET, BOX 2: 25.3 TO 34.5 FEET and BOX 3: 34.5 to 36.3 FEET





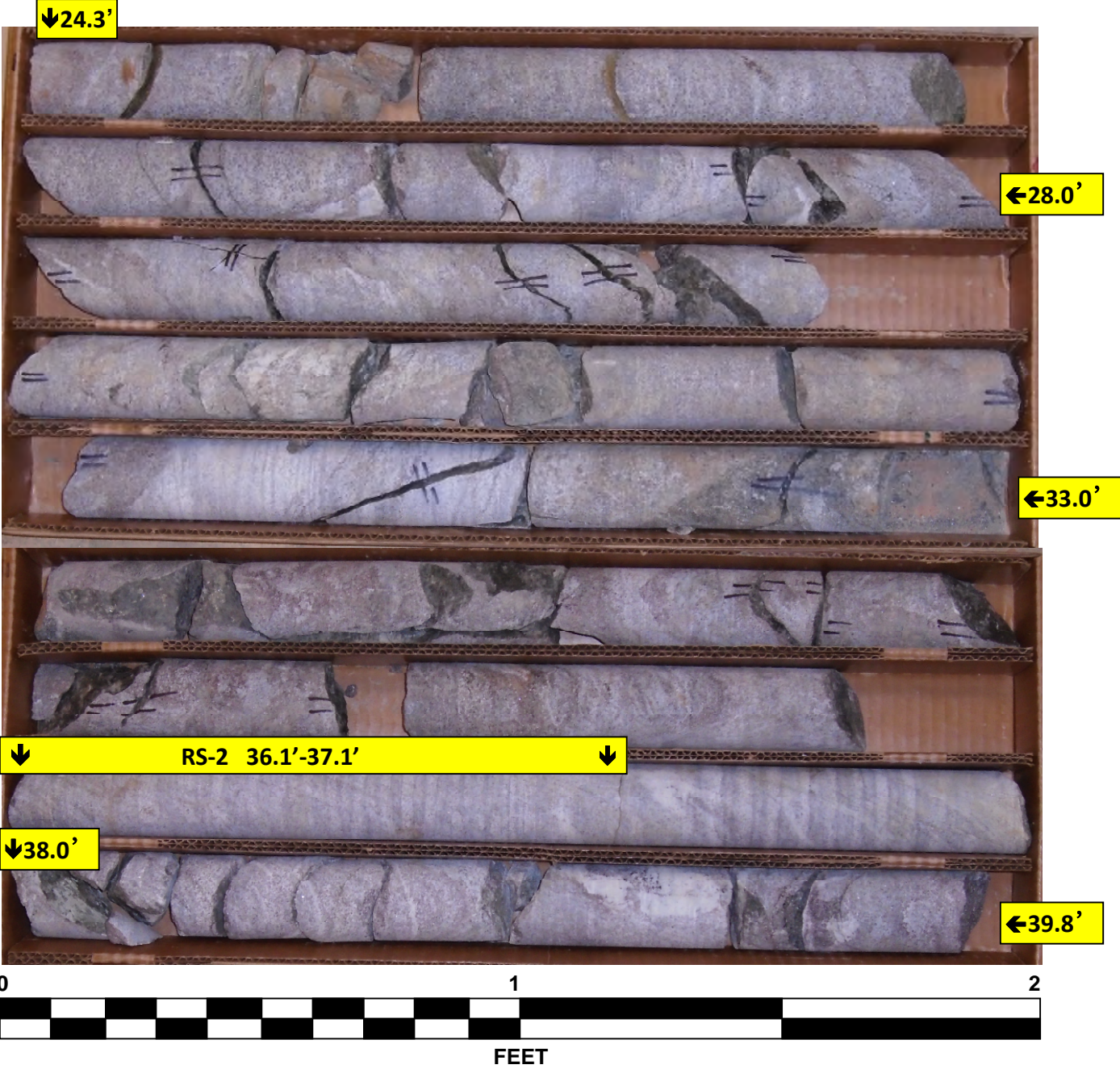


Project No. 42271  
Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B2-A

BOX 1: 24.3 to 33.0 FEET and BOX 2: 33.0 to 39.8 FEET



WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Keatts, M.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. B2-B	STATION 13+12	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 1,992.8 ft	TOTAL DEPTH 28.6 ft	NORTHING 551,426	EASTING 694,142
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 89% 12/19/2014		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER M. Moseley	START DATE 12/12/14	COMP. DATE 12/12/14	SURFACE WATER DEPTH 7.1ft

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					
2000														WATER SURFACE (12/12/14)	
1995															
1990	1,992.8	0.0	2	1	1								Sat.	1,992.8	0.0
1985	1,987.4	5.4	24	15	13								Sat.	1,989.8	3.0
1980	1,982.4	10.4	80	20	0.1									1,983.8	9.0
1980	1,981.6	11.2	60	0	0									1,981.6	11.2
1975															
1970															
1965														1,964.2	28.6
Boring Terminated at Elevation 1,964.2 ft in Crystalline Rock (Biotite Gneiss)															
1) Advanced 2-15/16" Tricone roller bit to 11.2 feet. 2) NW casing advanced to 11.2 feet. 3) SPT refusal encountered at 11.2 feet. 4) Water used as drilling fluid. 5) Advanced NQ core barrel from 11.2 feet to 28.6 feet.															

NCDOT BORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Keatts, M.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. B2-B	STATION 13+12	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 1,992.8 ft	TOTAL DEPTH 28.6 ft	NORTHING 551,426	EASTING 694,142
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 89% 12/19/2014		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER M. Moseley	START DATE 12/12/14	COMP. DATE 12/12/14	SURFACE WATER DEPTH 7.1ft

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) %			
CORE SIZE NQ2												TOTAL RUN 17.4 ft
1981.6	1,981.6	11.2	2.4	1:00/0.4	(2.2)	(1.5)		(17.2)	(11.4)		Begin Coring @ 11.2 ft	
1980	1,979.2	13.6	5.0	2:30/1.0	92%	63%					CRYSTALLINE ROCK	11.2
				3:00/1.0	100%	40%					Very Slight to Slightly Weathered Hard to Very Hard Gray (Biotite Gneiss)	
1975	1,974.2	18.6	5.0	2:30/1.0		(2.0)					Moderately Close to Close Fracture Spacing with 6 Joints at 10°-20°, 5 Joints at 30°, 3 Joints at 45°, 2 Joints at 60°-75°, and 1 Joint at 90°	
				2:15/1.0								
1970	1,969.2	23.6	5.0	2:45/1.0	(5.0)	(3.9)						
				3:00/1.0	100%	78%						
				4:00/1.0								
				4:15/1.0								
1965	1,964.2	28.6		2:15/1.0	(5.0)	(4.0)						
				2:30/1.0	100%	80%						
				2:15/1.0								
Boring Terminated at Elevation 1,964.2 ft in Crystalline Rock (Biotite Gneiss)												
1) Advanced 2-15/16" Tricone roller bit to 11.2 feet. 2) NW casing advanced to 11.2 feet. 3) SPT refusal encountered at 11.2 feet. 4) Water used as drilling fluid. 5) Advanced NQ core barrel from 11.2 feet to 28.6 feet.												

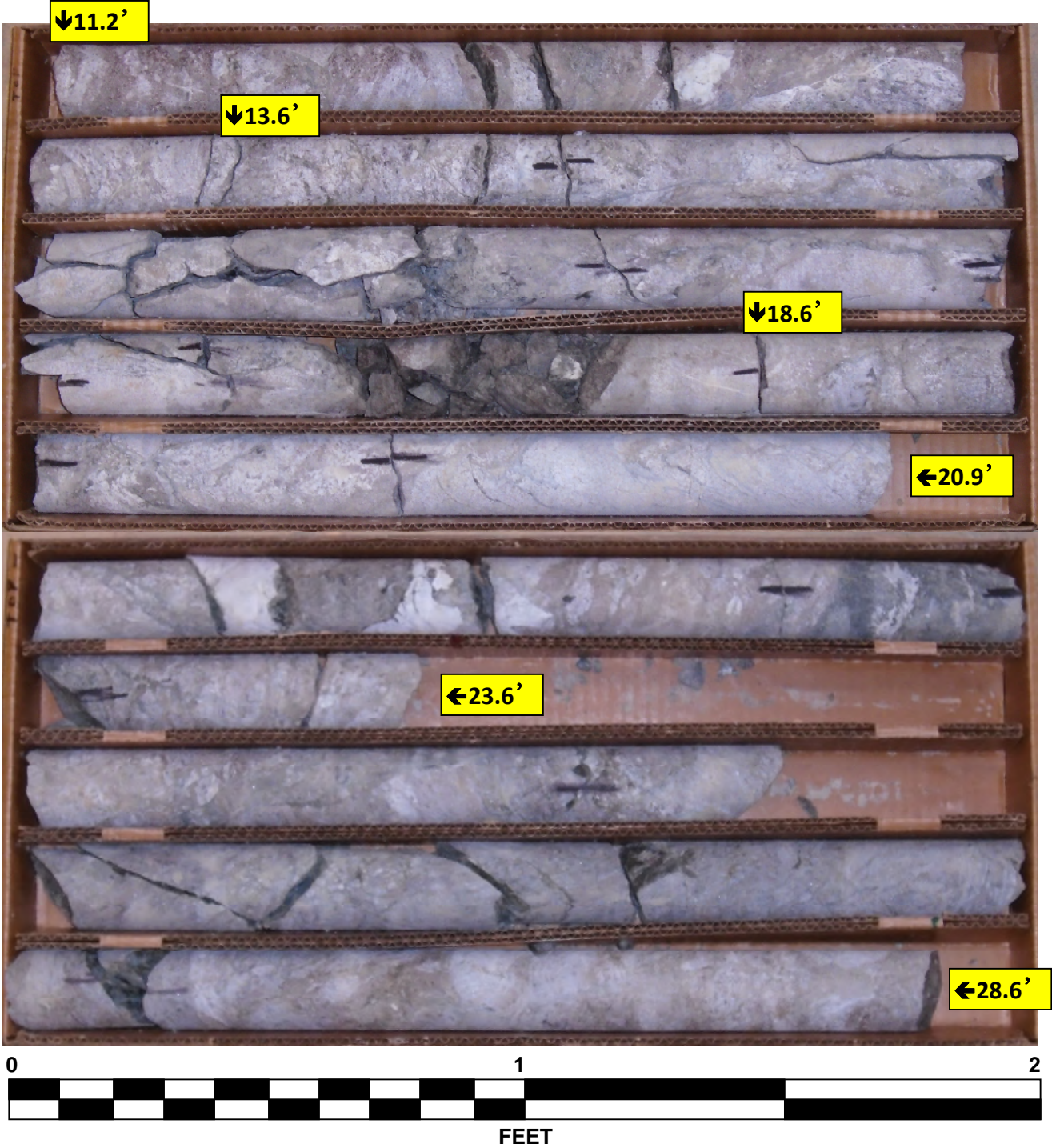
NCDOT CORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

Project No. 42271  
Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B2-B

BOX 1: 11.2 to 20.9 FEET and BOX 2: 20.9 to 28.6 FEET





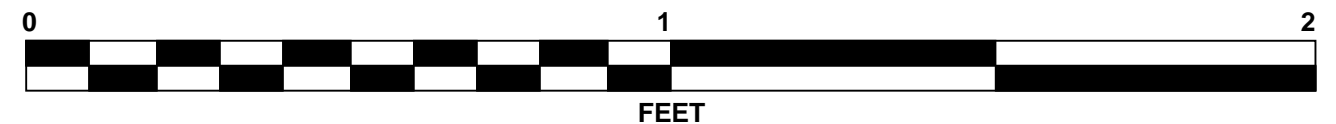
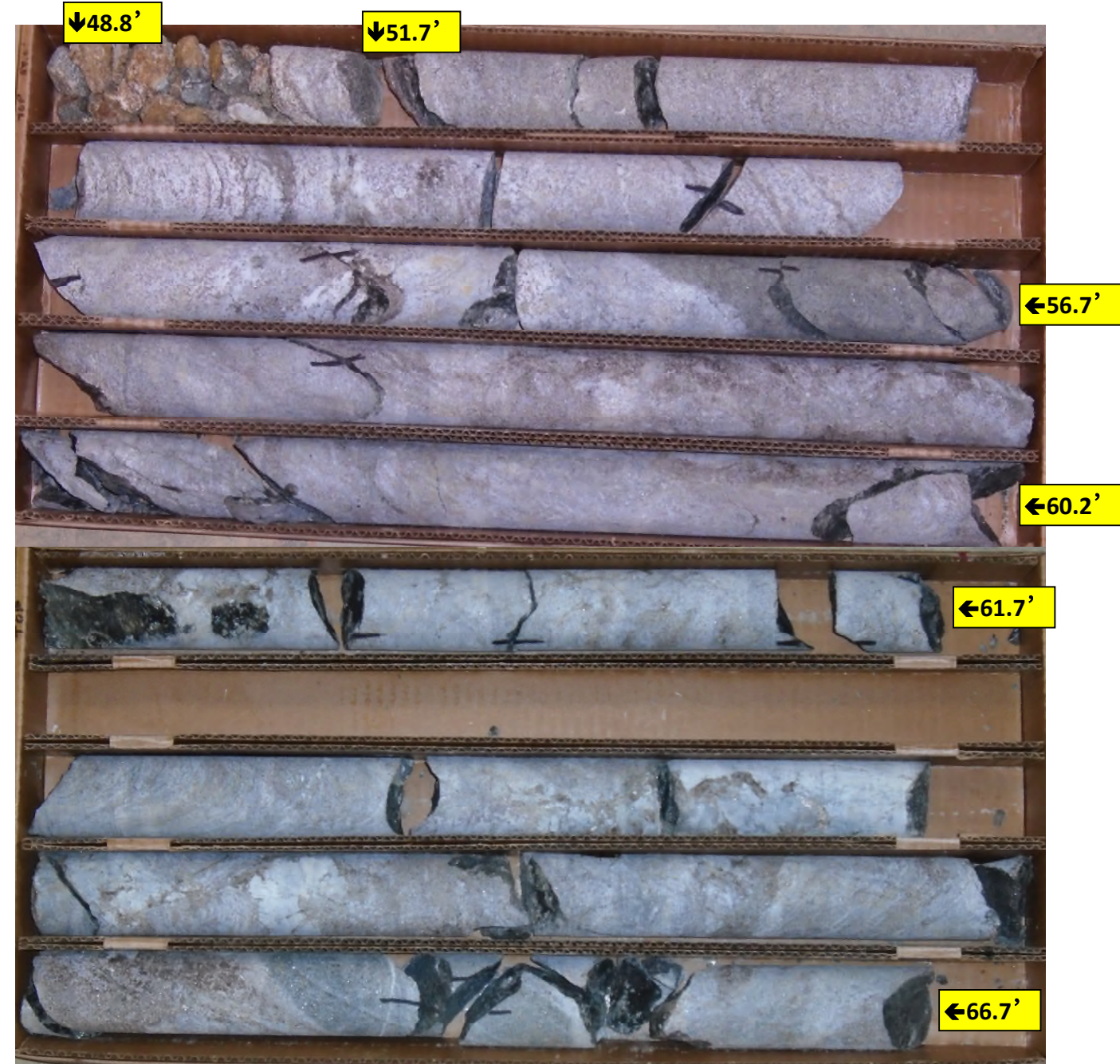
WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Page, N.						
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)					
BORING NO. B3-A		STATION 13+76		OFFSET 30 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 1,991.1 ft		TOTAL DEPTH 66.7 ft		NORTHING 551,499		EASTING 694,155						
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 89% 12/19/2014				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER M. Moseley		START DATE 12/10/14		COMP. DATE 12/11/14		SURFACE WATER DEPTH 8.8ft						
CORE SIZE NQ2		TOTAL RUN 17.9 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) %			
1942.3	1,942.3	48.8	2.9	1:00/0.9 1:15/1.0 1:15/1.0	(0.6) 21%	(0.0) 0%		(0.4) 15%	(0.0) 0%		Begin Coring @ 48.8 ft <b>CRYSTALLINE ROCK</b> Moderately Severe Weathering Hard Gray (Biotite Gneiss)	48.8
1940	1,939.4	51.7	5.0	2:30/1.0 2:45/1.0 3:00/1.0 4:00/1.0 4:00/1.0	(4.7) 94%	(3.8) 76%		(15.2) 100%	(12.7) 84%		Fresh to Very Slightly Weathered Very Hard Very Close Fracture Spacing (Undistinguishable Angles)	51.5
1935	1,934.4	56.7	5.0	2:45/1.0 4:00/1.0 3:15/1.0 4:30/1.0 3:00/1.0	(5.0) 100%	(4.4) 88%					Gray (Biotite Gneiss) Quartz Vein Between 62.8 and 63.3 feet Very Close to Moderately Close Fracture Spacing with 10 Joints at 10°-20°, 4 Joints at 30°-45°	
1930	1,929.4	61.7	5.0	3:00/1.0 5:00/1.0 2:30/1.0 3:15/1.0 3:00/1.0	(5.0) 100%	(4.5) 90%						
1925	1,924.4	66.7									Boring Terminated at Elevation 1,924.4 ft in Crystalline Rock (Biotite Gneiss)	66.7

Project No. 42271  
 Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B3-A

BOX 1: 48.8 to 60.2 FEET and BOX 2: 60.2 to 66.7 FEET



WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Page, N.					
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)				
BORING NO. B3-B		STATION 13+62		OFFSET 8 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 1,987.1 ft		TOTAL DEPTH 42.1 ft		NORTHING 551,464		EASTING 694,174					
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 89% 12/19/2014		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic							
DRILLER M. Moseley		START DATE 12/15/14		COMP. DATE 12/16/14		SURFACE WATER DEPTH 12.7ft					
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	
2000											WATER SURFACE (12/15/14)
1995											
1990											
1985	1,987.1	0.0	5	4	3						1,987.1 WATER BOTTOM 0.0
											ALLUVIAL
											Brown Silty Fine to Coarse SAND
1980	1,982.4	4.7	4	5	10						1,984.1 3.0
											RESIDUAL
											Brown- White and Tan Fine Sandy SILT with Trace of Mica
1975	1,977.4	9.7	10	10	13						
1970	1,972.4	14.7	19	41	58						
1965	1,967.4	19.7	12	15	29						
1960	1,962.8	24.3	60/0.0								1,962.8 24.3
											CRYSTALLINE ROCK
											(Biotite Gneiss)
1950											RS-3
1945											1,945.0 42.1
											Boring Terminated at Elevation 1,945.0 ft in Crystalline Rock (Biotite Gneiss)
											1) Advanced 2-15/16" Tricone roller bit to 24.3 feet.
											2) NW casing advanced to 22.3 feet.
											3) SPT refusal encountered at 24.3 feet.
											4) Water used as drilling fluid.
											5) Advanced NQ core barrel from 24.3 feet to 42.1 feet.

NCDOT BORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

WBS B-5125		TIP 42271		COUNTY MACON		GEOLOGIST Page, N.						
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)							GROUND WTR (ft)					
BORING NO. B3-B		STATION 13+62		OFFSET 8 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 1,987.1 ft		TOTAL DEPTH 42.1 ft		NORTHING 551,464		EASTING 694,174						
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 89% 12/19/2014		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic								
DRILLER M. Moseley		START DATE 12/15/14		COMP. DATE 12/16/14		SURFACE WATER DEPTH 12.7ft						
CORE SIZE NQ2		TOTAL RUN 17.8 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC (ft) %	RQD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
1962.8	1,962.8	24.3	3.5	1:45/0.5 4:30/1.0 4:00/1.0 1:30/1.0	(3.0) 86%	(3.0) 86%					Begin Coring @ 24.3 ft	
1960	1,959.3	27.8	5.0	1:45/1.0 2:00/1.0 2:00/1.0 2:30/1.0 2:00/1.0	(5.0) 100%	(4.1) 82%					CRYSTALLINE ROCK	
											Freshly Weathered Hard	
											Gray White (Biotite Gneiss)	
											Very Close to Moderately Close Fracture Spacing with	
											16 Joints at 10°-20°, 5 Joints at 30° and 5 Joints at 45°	
											RS-3 36.5'-37.2'	
											qu=1964 Ksf Axial	
											R1=7, R2=17, R3=10, R4=20, R5=4	
											RMR=58	
											Rock Type E (continued)	
1950	1,949.3	37.8	4.3	2:30/1.0 2:30/1.0 4:00/1.0 5:45/1.0 1:45/0.3	(4.3) 100%	(3.7) 86%		RS-3				
1945	1,945.0	42.1									1,945.0	42.1
											Boring Terminated at Elevation 1,945.0 ft in Crystalline Rock (Biotite Gneiss)	
											1) Advanced 2-15/16" Tricone roller bit to 24.3 feet.	
											2) NW casing advanced to 22.3 feet.	
											3) SPT refusal encountered at 24.3 feet.	
											4) Water used as drilling fluid.	
											5) Advanced NQ core barrel from 24.3 feet to 42.1 feet.	

NCDOT CORE SINGLE B5125\_GEO\_BRDG0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

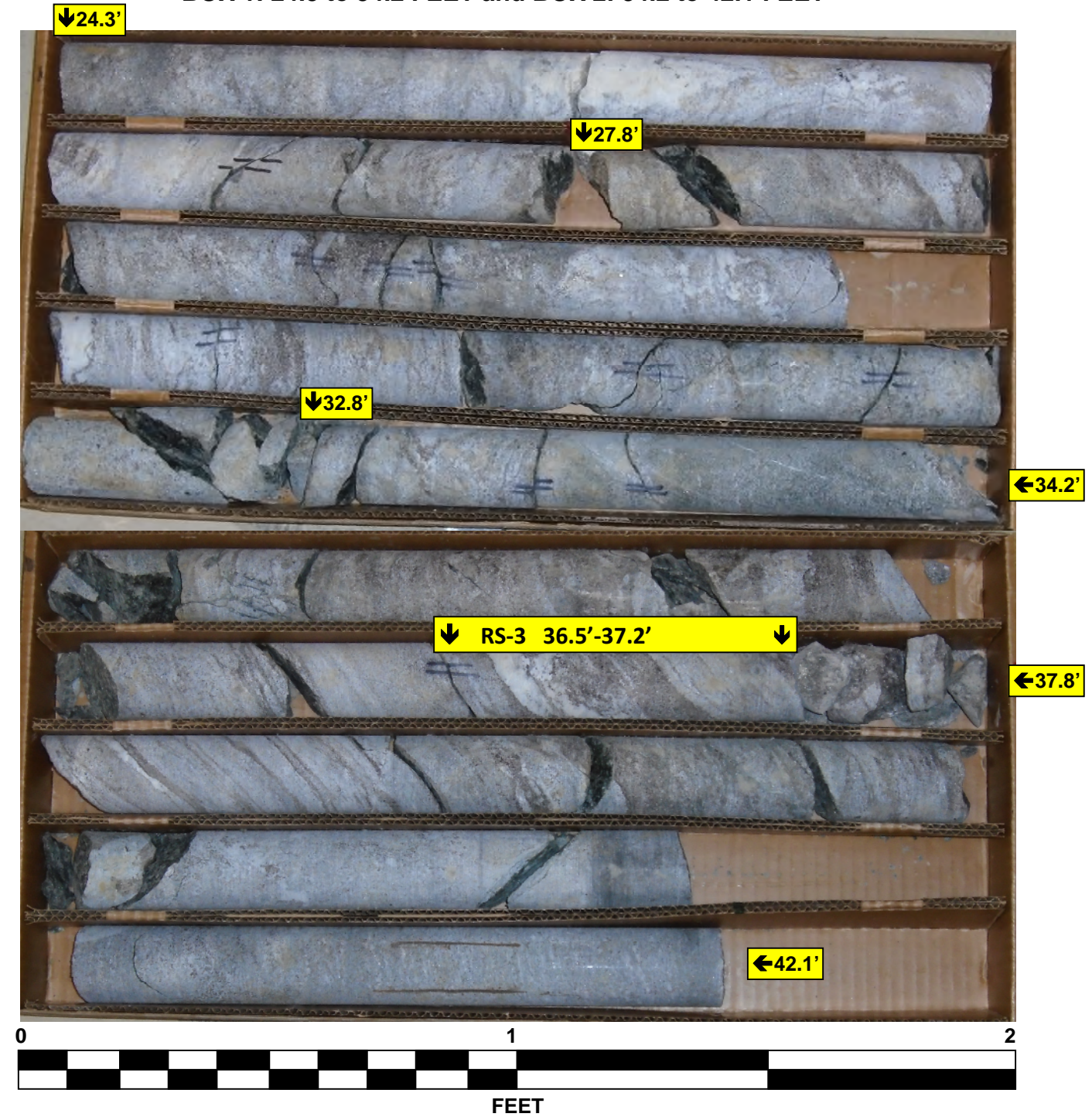
Project No. 42271

Bridge No. 22 over Little Tennessee River on US 441 Business (B-5125)

# CORE PHOTOGRAPHS

## B3-B

BOX 1: 24.3 to 34.2 FEET and BOX 2: 34.2 to 42.1 FEET



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS B-5125	TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.												
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)						GROUND WTR (ft)											
BORING NO. EB2-A		STATION 14+71		OFFSET 18 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,013.5 ft		TOTAL DEPTH 78.9 ft		NORTHING 551,563		EASTING 694,226											
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014			DRILL METHOD Wash Boring		HAMMER TYPE Automatic												
DRILLER R. Norwood		START DATE 12/09/14		COMP. DATE 12/09/14		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)		
2015															2.013.5	PAVEMENT SURFACE	0.0
															2.011.5	Asphalt (11 inches) ABC Stone (13 inches)	2.0
															2.006.0	<b>ROADWAY EMBANKMENT</b> Brown Tan Fine Sandy SILT with Trace of Mica and Clay Pockets	7.5
2010	2,010.0	3.5	3	2	7												
	2,007.3	6.2	3	3	2												
2005	2,005.0	8.5	3	2	4												
	2,000.0	13.5	2	1	3												
2000	2,000.0	13.5	2	1	3												
	1,995.0	18.5	2	1	2												
1995	1,995.0	18.5	2	1	2												
	1,991.5	23.5	13	9	8												
1990	1,990.0	23.5	13	9	8												
	1,985.0	28.5	7	8	9												
1985	1,985.0	28.5	7	8	9												
	1,980.0	33.5	7	7	8												
1980	1,980.0	33.5	7	7	8												
	1,975.0	38.5	5	6	9												
1975	1,975.0	38.5	5	6	9												
	1,970.0	43.5	8	12	12												
1970	1,970.0	43.5	8	12	12												
	1,965.0	48.5	13	15	18												
1965	1,965.0	48.5	13	15	18												
	1,960.0	53.5	15	31	52												
1960	1,960.0	53.5	15	31	52												
	1,955.0	58.5	96	4/0.1													
1955	1,955.0	58.5	96	4/0.1													
	1,950.0	63.5	64	36/0.1													
1950	1,950.0	63.5	64	36/0.1													
	1,945.0	68.5	14	15	32												
1945	1,945.0	68.5	14	15	32												
	1,940.0	73.5	72	28/0.1													
1940	1,940.0	73.5	72	28/0.1													
	1,935.0	78.5															
1935	1,935.0	78.5															

WBS B-5125	TIP 42271		COUNTY MACON		GEOLOGIST Wells, J.												
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)						GROUND WTR (ft)											
BORING NO. EB2-A		STATION 14+71		OFFSET 18 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,013.5 ft		TOTAL DEPTH 78.9 ft		NORTHING 551,563		EASTING 694,226											
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014			DRILL METHOD Wash Boring		HAMMER TYPE Automatic												
DRILLER R. Norwood		START DATE 12/09/14		COMP. DATE 12/09/14		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)		
1935															1,934.6	Boring Terminated at Elevation 1,934.6 ft in Weathered Rock (Biotite Gneiss)	78.9

NCDOT BORE DOUBLE B5125\_GEO\_BRD0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

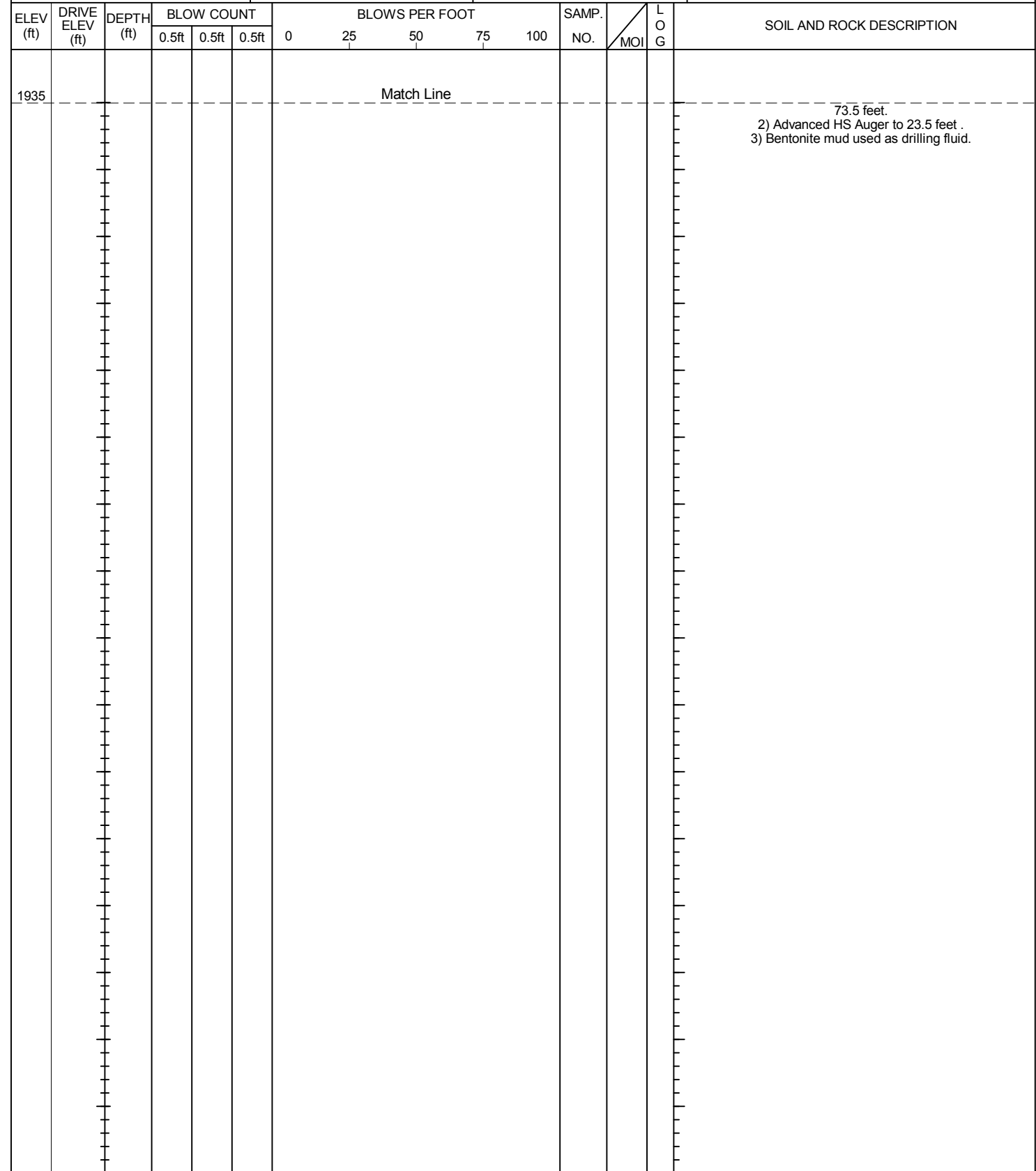
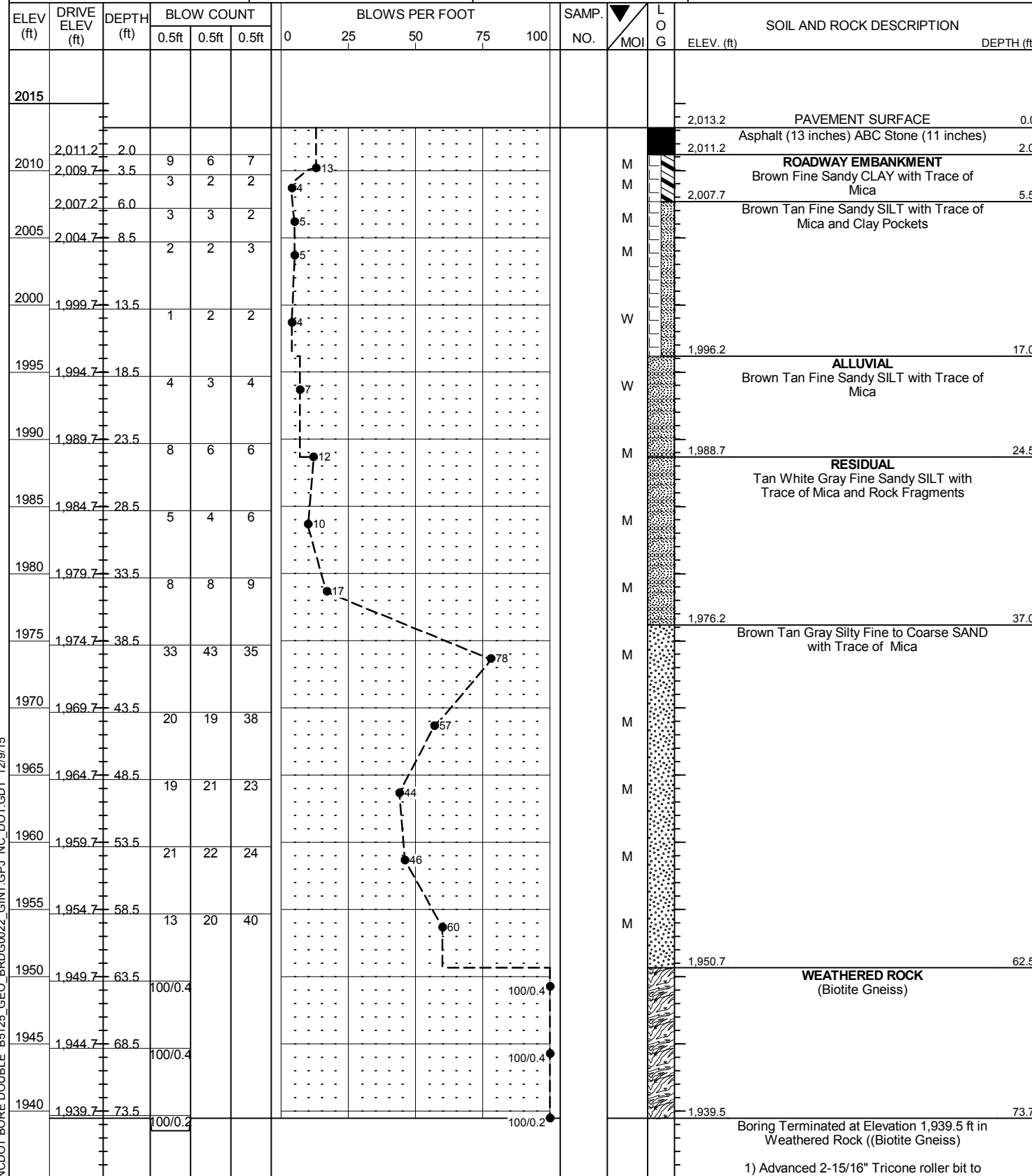
- 1) Advanced 2-15/16" Tricone roller bit to 78.5 feet.
- 2) NW casing advanced to 23.1 feet.
- 3) Bentonite mud used as drilling fluid.



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Wells, J.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 14+65	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,013.2 ft	TOTAL DEPTH 73.7 ft	NORTHING 551,542	EASTING 694,242
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER R. Norwood	START DATE 12/15/14	COMP. DATE 12/15/14	SURFACE WATER DEPTH N/A

WBS B-5125	TIP 42271	COUNTY MACON	GEOLOGIST Wells, J.
SITE DESCRIPTION Bridge No. 22 over Little Tennessee River on US 441 (Business)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 14+65	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,013.2 ft	TOTAL DEPTH 73.7 ft	NORTHING 551,542	EASTING 694,242
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 88% 12/19/2014		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER R. Norwood	START DATE 12/15/14	COMP. DATE 12/15/14	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE B5125\_GEO\_BRD0022\_GINT.GPJ NC\_DOT.GDT 12/9/15

## UNCONFINED COMPRESSION (ASTM D7012 Method C)



S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project: WBS No.: 42271, Tip No.: B-5125  
 Description: Bridge No. 22 over Little Tennessee River on US 441 Business  
 County: Macon, North Carolina  
 F. A. ID No.: BRNHS-0441 (8)

S&ME Project No.: 1305-14-126  
 Tested By: Tommy J. Webb  
 Reviewed By: Jason B. Burgess  
 Report Date: January 16, 2015

Sample No.	Sample Id	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in <sup>2</sup> )	Unit Weight (lbs/ft <sup>3</sup> )	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)	Rock Type
			Length	Diameter								
RS-1	B1-B	27.7 - 28.8	3.95	1.85	D	2.69	199.0	87	21,300	7,918	0.1	Rock Type E (Biotite Gneiss)
RS-2	B2-A	36.1 - 37.1	4.33	1.98	A	3.08	183.6	83	90,090	29,250	0.0	
RS-3	B3-B	36.5 - 37.2	4.44	1.98	A	3.08	187.7	84	42,000	13,636	0.1	

NOTES: Effective (as received) unit weight as determined by RTH 109-93.  
 Loading rates were selected to target reaching failure between 2 and 15 minutes.

SHAPE KEY

ASTM D4543-08 *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-08 (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-08 for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-08 for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-08 for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-08 for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

<b>1</b>	B1-B, RS-1 (27.7' - 28.8')
	Comments:

<b>2</b>	B2-A, RS-2 (36.1' - 37.1')
	Comments:

<b>3</b>	B3-B, RS-3 (36.5'-37.2')
	Comments:



Photograph No. 1: This photograph was taken from proposed End Bent No. 1 right of the US 441 -L- alignment, looking North along proposed bridge alignment



Photograph No. 2: This photograph was taken from proposed End Bent No. 2 right of the US 441 -L- alignment, looking South along the proposed bridge alignment



Photograph No. 3: This photograph was taken from the South side of the Little Tennessee River East of the US 441 -L- alignment, looking North



Photograph No. 4: This photograph was taken from the South side of the Little Tennessee River West of the US 441 -L- alignment, looking East