SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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STATION <u>LINE</u> -L -

12+00 TO 19+50

CROSS SECTION <u>PLAN</u> 5-7 4

STATE OF NORTH CAROLINA

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY LEE

PROJECT DESCRIPTION REPLACE BRIDGE NO. 34 ON SR 1146 (ST. ANDREWS CHURCH) OVER UPPER

LITTLE RIVER

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NQ.	TOTAL SHEETS
N.C.	17BP.8.R.134	1	7

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT TEST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 1707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 BORNOS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UNI-FLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLL MOISTIGE 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 TO TETAILS 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 OPNION OF THE DEPARTMENT AS TO THE TYPE OF MATERALS AND CONSTRUCTIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISY 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 CONDENSATION OF FOR ANY EXTENSION OF TIME FOR ANY RESAUCTION FOR MATERAL CONDENSATIONS OF CONTRACTOR THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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PERSONNEL

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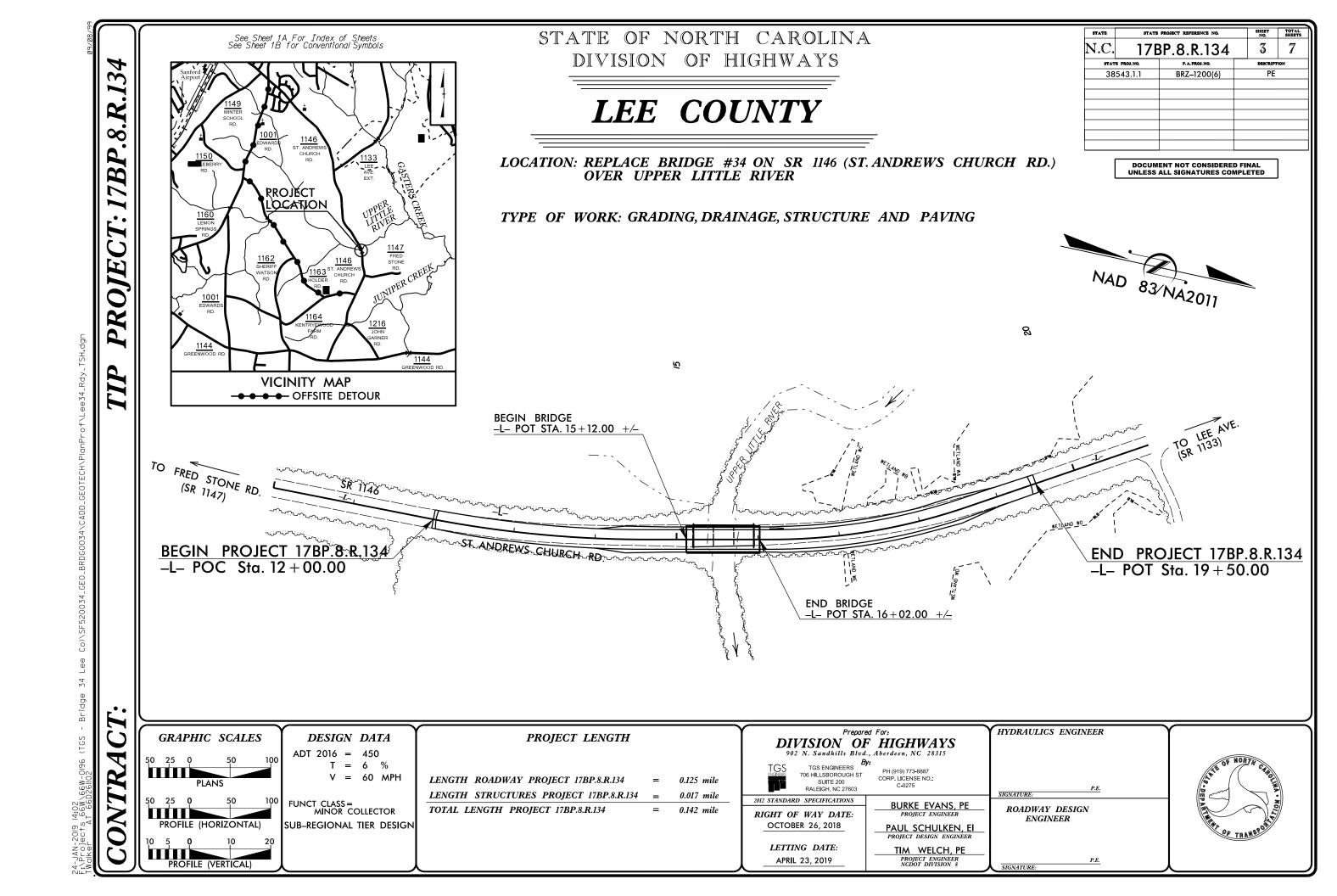
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL C	ESCRIPT	ION					GRADATION			F	OCK DES	SCRIPTION
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 STANDARP PENETRATION TEST (MASHTO I 206, ASTM DISBG). SOIL CLASSIFICATION IS BASED ON THE AASHTD SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUBE THE FOLLOWING CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTD CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH					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.			. ROCK LINE SPT REFUS BLOWS IN	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TEST ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EOUAL TO OR LESS THAN Ø, BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK REPRESENTED BY A ZONE OF WEATHERED ROCK.						
4	S MINERALO	GICAL COMPOSI	TION, ANGULA	RITY, STRUCTL	RE, PLASTICIT	Y, ETC. FOR EXAMP	LE,			ANGULARITY OF GRAIN UNDNESS OF SOIL GRAINS IS DE			RIALS ARE TYPICALLY DIVIDED		S:
						S.HIGHLY PLASTIC.A-7	-6			UBROUNDED, OR ROUNDED.	SIGNATED BY THE LENNS:	WEATHERED ROCK (WR)			N MATERIAL THAT WOULD YIELD SP DOT IF TESTED.
GENERAL		GRANULAR MATERI			CLASSIFI				MIN	ERALOGICAL COMPOSI	TION		EINE T		RAIN IGNEOUS AND METAMORPHIC R
CLASS.		\leq 35% passing *		(> 35% P	ASSING #200)	ORGANIC MAT	ERIALS			H AS QUARTZ, FELDSPAR, MICA, T PTIONS WHEN THEY ARE CONSID		CRYSTALLI ROCK (CR)	VE LING WOULD		REFUSAL IF TESTED. ROCK TYPE II
GROUP CLASS.	A-1 A-1-a A-1-b	A-3	A-2 2-5 A-2-6 A-2-	A-4 A-5	A-6 A-7 A-7-5, A-7 <u>-</u> 6	A-1, A-2 A-4, A- A-3 A-6, A-		HRE USED IN			ERED OF SIGNIFICANCE.	NON-CRYST	ALLINE FINE T	O COARSE C	RAIN METAMORPHIC AND NON-COAST
SYMBOL					A-7:6					1PRESSIBLE	LL < 31	ROCK (NCR)	ROCK Т	TYPE INCLUE	ES PHYLLITE, SLATE, SANDSTONE, ET
% PASSING				*					LY COMPR	COMPRESSIBLE RESSIBLE	LL = 31 - 50 LL > 50	COASTAL P SEDIMENTA	RY ROCK	FUSAL. ROC	DIMENTS CEMENTED INTO ROCK, BUT K TYPE INCLUDES LIMESTONE, SAND
•10	50 MX	E1 141				GRANULAR SILT- SOILS CLAY	MUCK, PEAT		PE	ERCENTAGE OF MATER	IAL	(CP)	HELL	BEDS, ETC.	HERING
•200	30 MX 50 MX 15 MX 25 MX	10 MX 35 MX 35	MX 35 MX 35 M	IX 36 MN 36 M	N 36 MN 36 MN	SOILS	FEHI	ORGANIC MATERIAL	<u>.</u>	GRANULAR SILT - CLAY SOILS SOILS	OTHER MATERIAL	FRESH	ROCK FRESH, CRYSTALS BRIGH		IS MAY SHOW SLIGHT STAINING. ROCK
MATERIAL PASSING #40								TRACE OF ORGANIC MA LITTLE ORGANIC MATT		2 - 3% 3 - 5% 3 - 5% 5 - 12%	TRACE 1 - 10% LITTLE 10 - 20%	NED 1 01 101	HAMMER IF CRYSTALLINE.		
LL	-			N 40 MX 41 MP		SOILS WITH LITTLE OR		MODERATELY ORGANIC HIGHLY ORGANIC		5 - 10% 12 - 20% > 10% > 20%	SOME 20 - 35% HIGHLY 35% AND ABOVE	VERY SLIGH (V SLI.)	CRYSTALS ON A BROKEN SPEC		SOME JOINTS MAY SHOW THIN CLAY SHINE BRIGHTLY. ROCK RINGS UNDER
PI GROUP INDEX	6 MX Ø	NP 10 MX 10	MX 11 MN 11 M 4 MX	N 10 MX 10 M	K 11 MN 11 MN K 16 MX NO MX	MODERATE AMOUNTS OF	HIGHLY ORGANIC	India i onomite		GROUND WATER			OF A CRYSTALLINE NATURE.		
USUAL TYPES	STONE FRAGS.				+	ORGANIC	SOILS	∇	WATEP	LEVEL IN BORE HOLE IMMEDIA	TELY AFTER DRILLING	SLIGHT (SLI.)	1 INCH. OPEN JOINTS MAY COM	NTAIN CLAY.	AND DISCOLORATION EXTENDS INTO R IN GRANITOID ROCKS SOME OCCASION
of Major Materials	GRAVEL, AND SAND		or clayey Il and sand	SILTY SOILS	CLAYEY SOILS	MATTER		T		C WATER LEVEL AFTER 24		MODERATE			YSTALLINE ROCKS RING UNDER HAMME COLORATION AND WEATHERING EFFEC
GEN, RATING						FAIR TO BOOD		P₩_		ED WATER, SATURATED ZONE, OR		(MOD.)	GRANITOID ROCKS, MOST FELD	SPARS ARE D	OULL AND DISCOLORED, SOME SHOW CL
AS SUBGRADE		EXCELLENT TO GO			TO POOR	POOR	UNSUITABLE		SPRIN	G OR SEEP			WITH FRESH ROCK.	BLUWS AND S	HOWS SIGNIFICANT LOSS OF STRENGT
		PI OF A-7-5 SUBG			NSENESS	> LL - 30		0.00	M	ISCELLANEOUS SYMBO		MODERATEL' SEVERE			R STAINED. IN GRANITOID ROCKS, ALL
					STANDARD	RANGE OF L	NCONFINED					(MOD. SEV.)	AND CAN BE EXCAVATED WITH	A GEOLOGIS	KAOLINIZATION. ROCK SHOWS SEVERE ST'S PICK. ROCK GIVES *CLUNK* SOUND
PRIMARY	SOIL TYPE	CONSIS			N RESISTENCE	COMPRESSIVE (TONS)		L ROADWAY EMB			ECTION CTURES	SEVERE	IF TESTED, WOULD YIELD SPT		R STAINED. ROCK FABRIC CLEAR AND
GENERA		VERY L			< 4			SOIL SYMBOL			SLOPE INDICATOR	(SEV.)	REDUCED IN STRENGTH TO ST	RONG SOIL.	IN GRANITOID ROCKS ALL FELDSPARS
GRANUL	AR	LOO MEDIUM			TO 10 TO 30	N/	A					- 0	TO SOME EXTENT. SOME FRAG <u>IF TESTED, WOULD YIELD SPT</u>		
MATERI (NON-CO	HESIVE)	DEN VERY (TO 50 50			THAN ROADWAY	Y EMBAN		CONE PENETROME TEST	VERY			R STAINED. ROCK FABRIC ELEMENTS A SOIL STATUS,WITH ONLY FRAGMENTS (
		VERY			< 2	< 0.	25	- INFERRED SOL	L BOUND	ARY - CORE BORING	SOUNDING ROD	(V SEV.)	REMAINING. SAPROLITE IS AN	EXAMPLE OF	ROCK WEATHERED TO A DEGREE THA
GENERA SILT-CI		SOF MEDIUM			TO 4 TO 8	0.25 T 0.5 T			CK LINE	MW MONITORING WE		COMPLETE			AIN. <u>IF TESTED, WOULD YIELD SPT N</u> T DISCERNIBLE.OR DISCERNIBLE ONLY
MATERI (COHES)	AL	STI VERY	F	8	TO 15 TO 30	1 TC 2 TC	2				WITH CORE				BE PRESENT AS DIKES OR STRINGER
(CONES.	12,	HAF			30	>		ALLUVIAL SOI		INSTALLATION	SPT N-VALUE		HESO HIN EXHIPPEE.	BUCK H	ARDNESS
		T	EXTURE	OR GRAI	N SIZE					COMMENDATION SYMB		VERY HARD	CANNOT BE SCRATCHED BY KI		RP PICK. BREAKING OF HAND SPECIME
U.S. STD. SI OPENING (M			4 10 .76 2.00	40 0.42	60 200 0.25 0.075					LASSIFIED EXCAVATION -	UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE		SEVERAL HARD BLOWS OF THE		
			AVEL	COARSE	FINE	SILT	CLAY	SHALLOW UNDERCUT		LASSIFIED EXCAVATION - EPTABLE DEGRADABLE ROCK	USED IN THE TOP 3 FEET O EMBANKMENT OR BACKFILL	HARD	TO DETACH HAND SPECIMEN.	OR PICK ON	LY WITH DIFFICULTY. HARD HAMMER
BOULDE (BLDR.			GR.)	SAND (CSE. SD.)	SAND (F SD	(SL)	(CL.)			ABBREVIATIONS		MODERATELY HARD			DUGES OR GROOVES TO 0.25 INCHES (ST'S PICK. HAND SPECIMENS CAN BE
GRAIN M	1 305	75	2.0		0.25	0.05 0.0	05	AR - AUGER REFUSAL		MED MEDIUM	VST - VANE SHEAR TEST	THIND	BY MODERATE BLOWS.	H OLOLOOI	ST 3 FICK. THIND SECTIONS CHIN DE
SIZE IN		3						BT - BORING TERMINATED CL CLAY	J	MICA MICACEOUS MOD MODERATELY	WEA WEATHERED γ - UNIT WEIGHT	MEDIUM HARD			DEEP BY FIRM PRESSURE OF KNIFE EICES 1 INCH MAXIMUM SIZE BY HAR
	-	SOIL MOIS			TION OF	TERMS		CPT - CONE PENETRATION	N TEST	NP - NON PLASTIC	$\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT		POINT OF A GEOLOGIST'S PIC	к.	
	MOISTURE TERBERG LI		FIELD MO DESCRI		GUIDE FOR	FIELD MOISTURE (DESCRIPTION	CSE COARSE DMT - DILATOMETER TES		ORG ORGANIC PMT - PRESSUREMETER TE		SOFT			NIFE OR PICK. CAN BE EXCAVATED IN BY MODERATE BLOWS OF A PICK POI
			- SATURA	TED -	USUALLY LI	OUID;VERY WET,U	SUALLY	DPT - DYNAMIC PENETRA e - VOID RATIO	TION TES	ST SAP SAPROLITIC SD SAND, SANDY	S - BULK SS - SPLIT SPOON		PIECES CAN BE BROKEN BY F		
LL _		LIMIT	(SAT.		FROM BELOW	V THE GROUND WA	TER TABLE	F - FINE FOSS FOSSILIFEROUS		SL SILT.SILTY SLI SLIGHTLY	ST - SHELBY TUBE RS - ROCK	VERY SOF T	OR MORE IN THICKNESS CAN I		AVATED READILY WITH POINT OF PICK BY FINGER PRESSURE. CAN BE SCRATC
PLASTIC RANGE <			- WET -	040	SEMISOLID;	REQUIRES DRYING	то	FRAC FRACTURED, FRAC	TURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXI	۱L	FINGERNAIL.		
(PI) PL		C LIMIT	- #21 -	(₩)	ATTAIN OPT	IMUM MOISTURE		FRAGS FRAGMENTS HI HIGHLY		<pre>w - MOISTURE CONTENT V - VERY</pre>	CBR - CALIFORNIA BEARIN RATIO	TERM	FRACTURE SPACING SPACING	;	BEDDING TERM
			- MOIST	- (M)	501 ID• AT 0	R NEAR OPTIMUM	MOISTURE	EOU	UIPMEI	NT USED ON SUBJECT	PROJECT	VERY W		FEET	VERY THICKLY BEDDED THICKLY BEDDED
		M MOISTURE						DRILL UNITS:		CING TOOLS:	HAMMER TYPE:	MODERA	TELY CLOSE 1 TO 3 FE	ET	THINLY BEDDED Ø
			- DRY -	ŝ		DDITIONAL WATER	то	CME-45C		CLAY BITS		CLOSE VERY CL	0.16 TO 1 F .OSE LESS THAN 0.1		VERY THINLY BEDDED 0. THICKLY LAMINATED 0.0
						IMUM MOISTURE		Х СМЕ-55		6°CONTINUOUS FLIGHT AUGER 8°HOLLOW AUGERS	CORE SIZE:				THINLY LAMINATED
				STICITY				CME-550		HARD FACED FINGER BITS	∐-в ∐-н	FOR SEDIM	ENTARY ROCKS, INDURATION IS		ING OF MATERIAL BY CEMENTING, H
NO	PLASTIC		PLAST	0-5	(PI)	DRY STRE VERY L				TUNGCARBIDE INSERTS	N	FRIA	RUE	BBING WITH	FINGER FREES NUMEROUS GRAINS;
SLI	GHTLY PLAS			6-15 16-25		SLIGH MEDIU	т	VANE SHEAR TEST		CASING W/ ADVANCER	HAND TOOLS:		GEN		BY HAMMER DISINTEGRATES SAMPLE
	HLY PLASTI		2	6 OR MORE		HIGH		PORTABLE HOIST		TRICONE STEEL TEETH	X HAND AUGER	MOD			SEPARATED FROM SAMPLE WITH S
			(COLOR					_ ,	TRICONE TUNGCARB.	SOUNDING ROD	INUI			FFICULT TO SEPARATE WITH STEEL
						YELLOW-BROWN, B				CORE BIT	VANE SHEAR TEST		UIF		BREAK WITH HAMMER. BLOWS REQUIRED TO BREAK SAMPL
M	DDIFIERS SL	JCH AS LIGHT.	DARK, STREA	KED, ETC. AR	E USED TO D	ESCRIBE APPEARA	NCE.					EXT			BLOWS REQUIRED TO BREAK SAMPL

project reference no.

TERMS AND DEFINITIONS ED AN INFERRED ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. LD SPT REFUSAL. 0.1 FOOT PER 60 (IS OFTEN 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. T N VALUES > 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 ОСК ТНАТ SURFACE. NCLUDES GRANITE. 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. AL PLAIN IF TESTED. MAY NOT YIELD 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. STONE, CEMENTED DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT BOCKS OR CUTS MASSIVE BOCK. RINGS UNDER $\underline{\text{DIP}}$ - The angle at which a stratum or any planar feature is inclined from the horizontal. COATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. HAMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE OCK UP TO SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. AL FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. $\underline{\mathsf{FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. TS. IN AY. ROCK HAS H AS COMPARED 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. FELDSPARS DULL LOSS OF STRENGTH WHEN STRUCK. 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 EVIDENT BUT ITS LATERAL EXTENT. ARE KAOLINIZED 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. ARE DISCERNIBLE OF STRONG ROCK PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE ONLY MINOR OF AN INTERVENING IMPERVIOUS STRATUM. VALUES < 100 BPF RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. IN SMALL AND 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 RS. SAPROLITE IS RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT POCK NS REQUIRES <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO BLOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT DEEP CAN BE DETACHED 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 OR PICK POINT. WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE 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. FRAGMENTS NT. SMALL, THIN 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. PIECES 1 INCH CHED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BL-102= N: 600641.053, E: 1957331.101 THICKNESS BL STATION 10+38.33 4 FEET 1.5 - 4 FEET ELEVATION: 286.14 FEET 0.16 - 1.5 FEET .03 - 0.16 FEET NOTES: 008 - 0.03 FEET + =HAND AUGER BORING WITH SOUNDING ROD 0.008 FEET FIAD= FILLED IMMEDIATELY AFTER DRILLING EAT. PRESSURE. ETC. BORING ELEVATIONS OBTAINED FROM 520034_Is_tnl_corrected. FILE RECEIVED FROM TGS ENGINEERS ON 10/11/2018 TEEL PROBE: PROBE; .E: DATE: 8-15-14





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November 16, 2018 Revised December 21, 2018

State Project No.: 17BP.8.R.134 (SF-520034) F.A. Number: N/A County: Lee Description: Replace Bridge #34 on SR 1146 (St. Andrews Church Road) Over Upper Little River

SUBJECT: **Geotechnical Report – Inventory**

Project Description

This project involves the replacement of the existing bridge #34 on SR 1146 (St. Andrews Church Road) over the Upper Little River in Lee County, North Carolina. The existing two-lane, single-span bridge will be replaced with a higher, single-span, 33-ft. wide box beam structure, approximately 90 feet in length. The alignment of the proposed bridge will generally coincide with the existing bridge and will be lengthened approximately 12 feet at each end. North of the existing bridge, the existing floodplain is relatively low and flat with areas near the existing roadway embankment shown as wetlands on the plans. An existing 72" corrugated metal pipe located beneath the road at approximately -L- station 17+05 will be removed and the area backfilled.

The geotechnical field investigation was performed on October 8 and 9 of 2018. During this time period, a total of 4 Standard Penetration Test (SPT) borings were advanced with an ATV-mounted CME-55 drill rig with an automatic hammer. In addition, eight hand auger borings (HA-1 to HA-8) were performed using a 3-in diameter bucket auger. Representative soil samples were collected from the split spoon and hand auger cuttings for visual classification in the field and for analysis by F&R's testing laboratory.

The existing roadway alignment in the area of this project generally runs in a north-south direction, with stationing increasing from south to north. The existing grade along the centerline of the road generally slopes downward from an elevation (EL) of 300.89 feet at the beginning of the project (-L- station 12+00.00) to EL 284.55 feet at -L- station 19+50.00 at the end of the project. The low point of the proposed alignment is EL 284.45 at -L- station 19+07.82. The northern portion of the site is composed of flat land containing delineated wetlands, whereas the southern portion of the site slopes upward in elevation towards the Coastal Plain landscape.

Based upon the provided cross sections, the proposed grade will be raised a maximum of approximately 3 feet near the south abutment (End Bent 1), which results in a maximum embankment fill height of approximately 7 feet on the right side of -L- station 17+00, just north of the bridge. The only cut proposed for the project is associated with installing a rip-rap lined, lateral base ditch just beyond the right shoulder of the roadway from -L- station 12+50 to approximately -L- station 15+28, where the ditch dumps into the Upper Little River.

The following alignment was investigated within the approximate limits specified:

<u>Alignment</u>	
-L-	14

Areas of Special Geotechnical Interest

1	.)	Wet or Saturated Soils: The following a
	potent	ial to cause subgrade problems during constru

<u>Alignment</u>	
-L-	14
-L-	16

2) Cohesive Soils: The following areas contain cohesive soils (AASHTO A-5, A-6 & A-7 soils) at, or near, existing subgrade. Due to their fine-grained properties with up to 82% passing the #200 sieve, these soils have the potential to be unstable for construction equipment during construction:

<u>Alignment</u>	
-L-	14
-L-	1!
-L-	10

3) Groundwater: The following areas exhibited groundwater within six feet of the proposed grade, which has the potential to cause subgrade problems during construction:

<u>Alignment</u>	
-L-	

Station (±) 4+00 to 17+50

areas contain wet or saturated soils that have the uction:

Station (±) .4+90 to 15+12, left .6+02 to 18+00

Station (±) 4+00 to 14+50, left 15+00 to 15+25, right 6+00 to 17+25

Station (±) 16+50 to 17+50

Physiography and Geology

The project site is located southeast of Sanford and geologically located near the border of the Piedmont and Coastal Plain physiographic provinces of North Carolina. This zone represents the elevation break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain. The project is located within the Eastern Slate Belt in an area mapped as phyllite (CZph), with the Coastal Plain Middendorf Formation (Km) mapped to the south.

The land surrounding the project site is primarily agricultural and forested land, with some residential areas nearby. According the Lee County Geographic Information Systems website, the soils surrounding the project site are classified as Chewacla Series (silt loam), Pacolet Series (fine sandy loam), and Durham Series (loamy sand). The U.S. Department of Agriculture classifies these soil series as having land use and vegetation concerning cultivation/crop land, pasture land, and forested land.

Soil Properties

Soils within the area of this project have been divided into three categories: roadway embankment fill, alluvial soils, and residual soils:

Roadway Embankment: Roadway embankment (RE) soils were encountered at the surface of 4 SPT borings and 4 hand auger borings. The RE was likely associated with previous construction of St. Andrews Church Road and the bridge embankments. The RE extended to depths ranging from 2 to 7 feet in the SPT borings and 1.6 to 4.6 feet in the hand auger borings. In the SPT borings, the fill was generally described as moist, medium stiff to stiff, sandy, clayey SILT (A-4) and loose to medium dense, silty and clayey SAND (A-2-4 & A-2-6). In the hand auger borings, the fill was generally described as moist, silty SAND (A-2-4), sandy SILT (A-4), and silty CLAY (A-7-5). A majority of the samples contained trace organic matter and/or gravel.

Alluvial Soils: Alluvial soils were encountered under roadway embankment soils in two SPT borings and two hand auger borings, and found at the surface of three hand auger borings. The alluvial soils extended to a depth of approximately 12 feet in the SPT borings and 2 to 5.3 feet in the hand auger borings. In the SPT borings, the alluvial soils typically consisted of moist to wet, soft, sandy, clayey SILT (A-4). In the hand auger borings, the alluvial soils typically consisted of moist to saturated, sandy, clayey SILT (A-4 & A-5). A majority of the samples contained trace organic matter.

Residual Soils: Residual soils were encountered below roadway embankment soils in the two SPT borings at End Bent 1, and below alluvial soils in the two SPT borings at End Bent 2. In the hand auger borings, residual soils were encountered below roadway embankment in two borings, below alluvial soils in two borings, and at the surface of one boring. In the SPT borings, the residual soils were typically described as: wet to saturated, medium dense to dense, silty SAND (A-1-b); moist to wet, stiff to very hard, sandy, clayey SILT (A-4); and moist, medium stiff to stiff, silty CLAY (A-7-5). In the hand auger borings, the residual soils were typically described as wet, silty SAND (A-2-4) and moist, sandy, clayey SILT (A-4). A majority of the samples contained trace mica and rock fragments, and two hand auger borings contained trace organics.

Rock Properties

Weathered Rock (WR) was encountered in all four SPT borings. Of these 4 borings, 2 terminated in WR and 2 terminated in Crystalline Rock (CR). WR was encountered at initial depths ranging from about 27 to 47 feet and elevations ranging from about 239.4 to 259.6 feet. A 5-foot intermediate layer of weathered rock was encountered in boring EB1-A from about 27 to 32 feet and a 10 foot intermediate layer was encountered in boring EB1-B from about 27 to 37 feet. Weathered rock was not encountered within the depths investigated in the hand auger borings.

CR was encountered in borings EB1-B and EB2-B as indicated by auger and/or SPT refusal. The CR was encountered at depths of 47.6 and 57.5 feet, respectively, or elevations of 237.9 and 228.9 feet. The rock consisted of phyllite. Crystalline rock was not encountered in the hand auger borings.

Groundwater Properties

Generally, groundwater measurements were measured in a majority of the SPT and hand auger borings immediately upon their completion. Groundwater measurements were measured in four hand auger borings after a stabilization period of approximately 24 hours. All four (4) SPT borings were backfilled immediately upon their completion due to three of the four being located in the existing roadway of St. Andrews Church Road. Groundwater was observed at the termination of all four SPT borings at depths ranging from 10.2 to 20.9 feet (EL ±265.7 to EL ±276.2) and in two hand auger borings (HA-1 and HA-2) at depths ranging from 1.1 to 1.2 feet (EL ±280.1 to EL ±280.2). Stabilized groundwater was encountered in one hand auger boring (HA-6) at a depth of 3.1 feet (EL ±278.0). Stabilized groundwater was not encountered in the remaining hand auger borings that were left open. The recovered soil samples were generally described as moist above the groundwater level and moist, wet, or saturated below the groundwater level. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

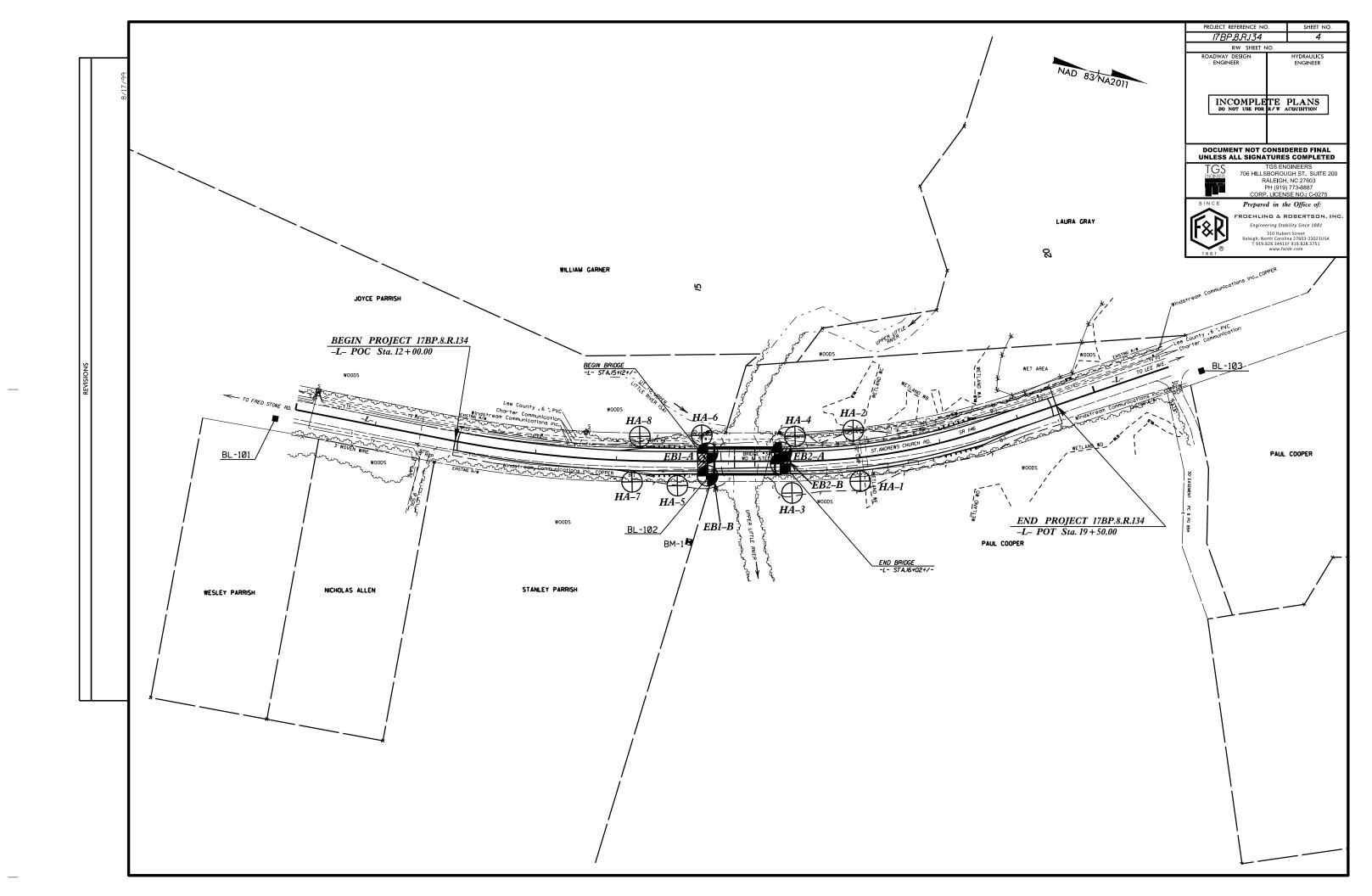
We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

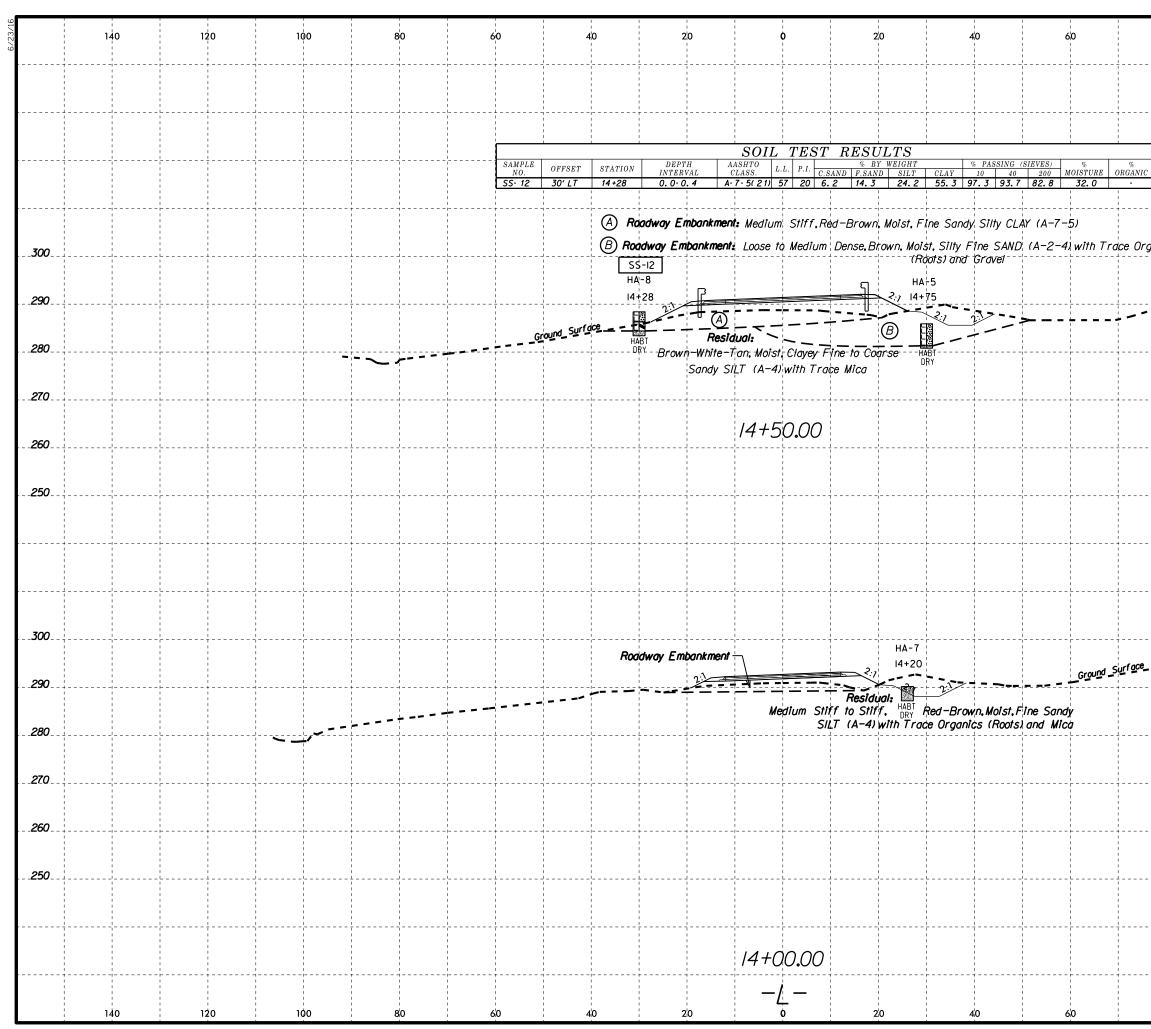
Sincerely, **FROEHLING & ROBERTSON, INC.**

J. Russell Rivenbark, P.E. Geotechnical Project Manager

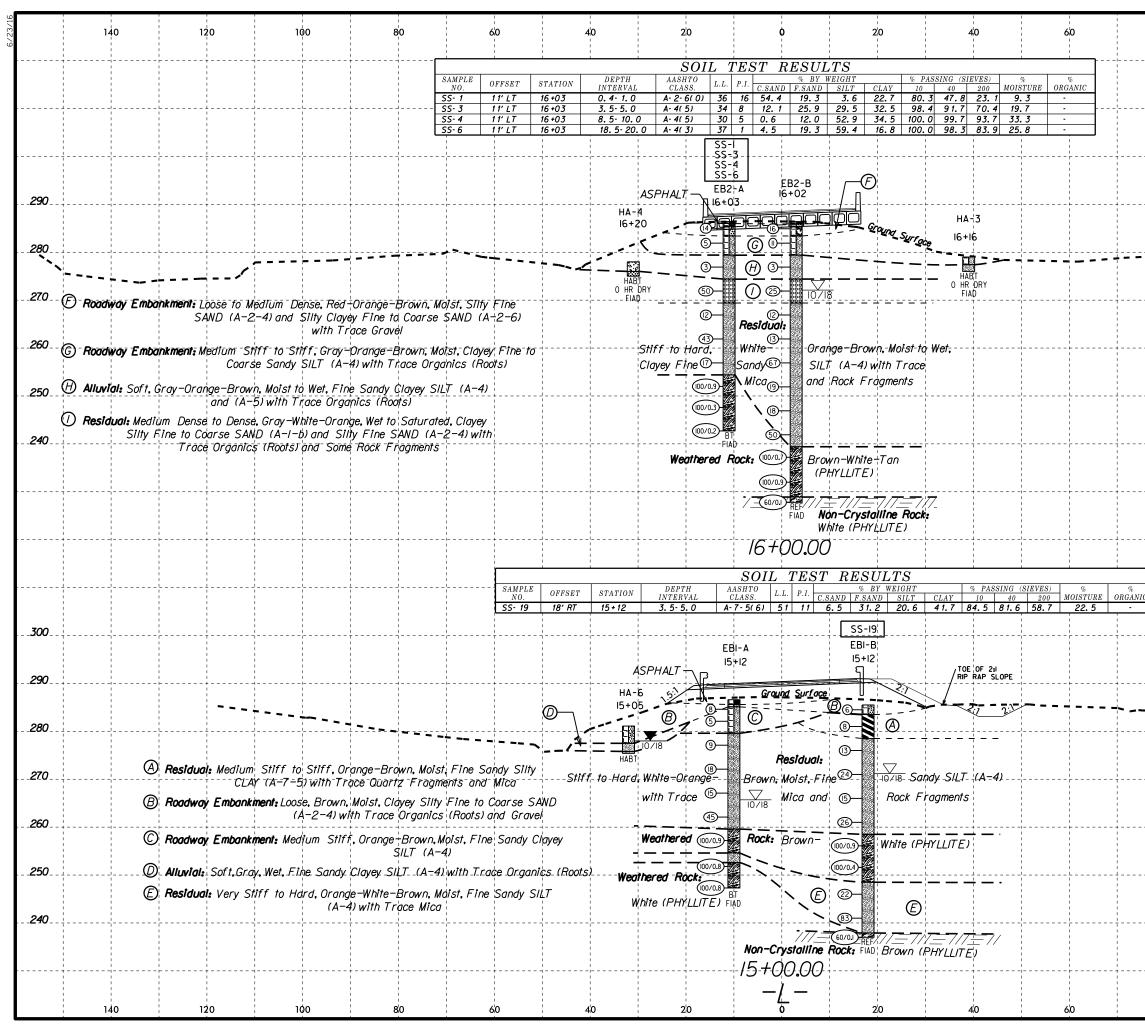
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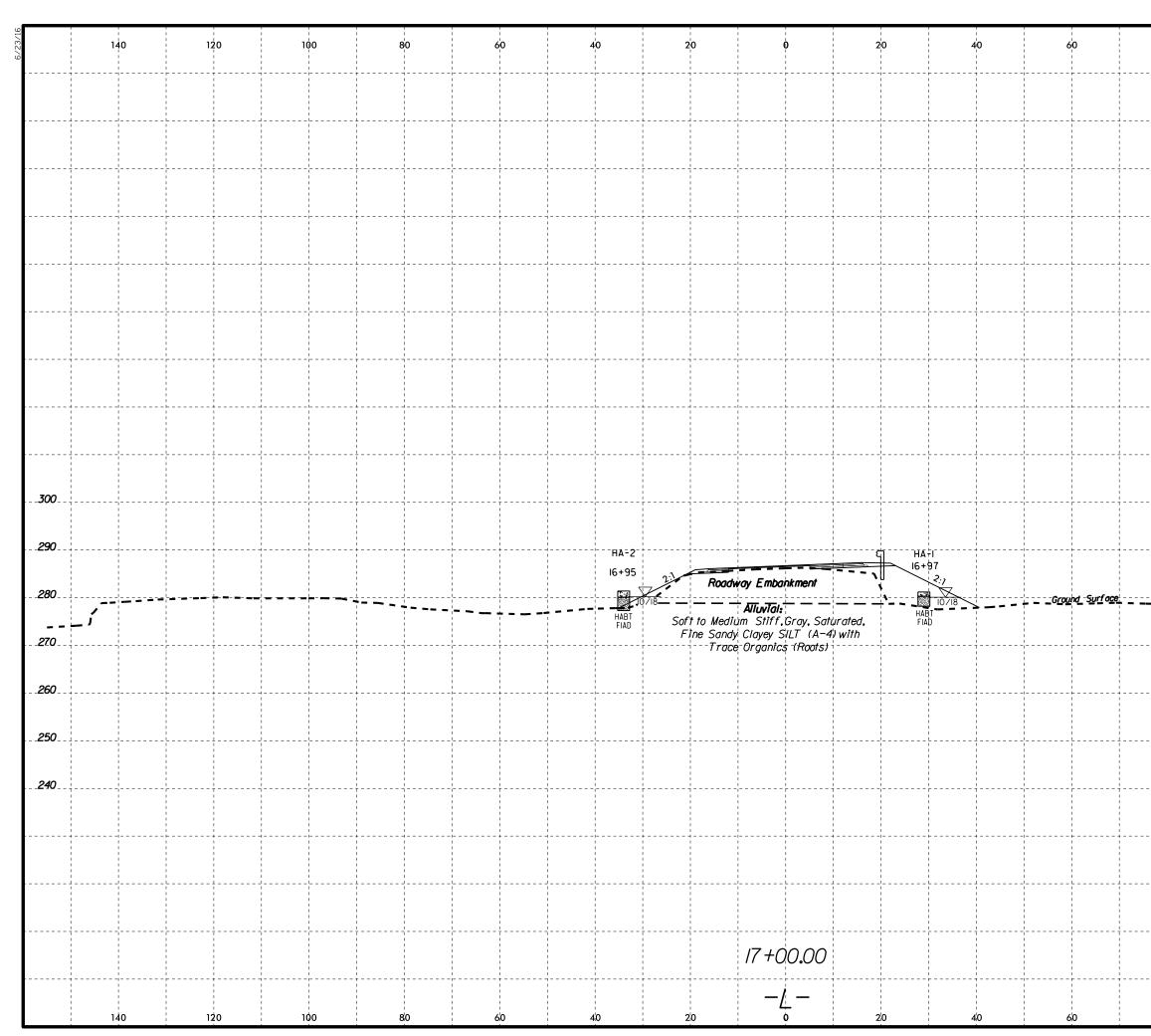




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