## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT <u>34345.1.1</u> I.D. NO. <u>R-0609IB</u>	
F.A. PROJECT	
COUNTY <u>GUILFORD</u> /RANDOLPH	
PROJECT DESCRIPTION US 311 HIGH POINT EAST BEI	$\Sigma T_{}$
FROM I-85 TO SOUTH OF SR 1920 NORTH OF ARCHI	<u>DALE</u>
SITE DESCRIPTION BRIDGE ON -Y9- (SR 1920) OVER	
US 311 (HIGH POINT EAST BELT)	
SITE 2 TUTTLE ROAD	

INVENTORY



STATE	STATE P	ROJECT REFERENCE NO.	SHEET NO.	TOTAL
N.C.		R-0609IB	1	13
STATE	PROJ. NO.	F. A. PROJ. NO.	DESCRIP	TION
8.15	70601	MAF-F-119-(1)	P.E.	
WBS:	34345.1.1		CONS	Т.

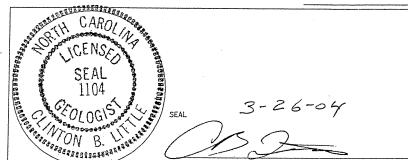
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THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE
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INVESTIGATED BY J.E. BEVERLY PERSONNEL C.C. MURRAY CHECKED BY C.B. LITTLE SUBMITTED BY C.B. LITTLE D.K. BRATTON DATE MARCH 2004 J.W. VANDERBURG



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DRAWN BY: <u>J.K. McCLURE</u>

#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

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### SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND, TER	MS, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH	WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED WOULD SET BEFLISAL AN INFERRED	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.
CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586). SOIL CLASSIFICATION IS	UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED).  GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.	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 THAM 2.5 cm PER 50 BLOWS.	ADUIFER - A WATER BEARING FORMATION OR STRATA.
BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE CONSISTENCY, COLOR. TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL	ANGULARITY OF GRAINS	IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	AREMACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
COMPOSITION, AMGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, SUBANGULAR,	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE
VERY STIFF, GRAV SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS	PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERAL OGICAL COMPOSITION		ARYESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED. BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (35% PASSING *200) (>5% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS DUARTZ, FELDSPAR, MICA, TALC, KAOLIM, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE.	CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-I A-3 A-2 A-4 A-5 A-6 A-7 A-I, A-2 A-4, A-5	COMPRESSIBILITY	OMEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CLASS. A-1-6 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30	ROCK (NCR)  SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	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.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE' LIQUID LIMIT GREATER THAN 50	COASTAL PLAIN   COASTAL PLAIN SEDIMENTS CEMENTED INTO BOCK BUT MAY NOT VIELD	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS
Z PASSING SILT-	PERCENTAGE OF MATERIAL	SEDIMENTARY SPT REFUSAL, ROCK TYPE INCLUDES LINESTONE, SANOSTONE, CEMENTED ROCK (CP) SHELL BEDS, ETC.	MASSIVE ROCK.
# 40 30 MX50 MX51 MN GRANULAR CLAY MUCK.	ORGANIC MATERIAL GRANULAR SILT- CLAY SOILS SOILS OTHER MATERIAL .	WEATHERING	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
■ 200   15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   35 MX   35 MX   36 MM   36 MM	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM MORTH.
LIQUID LIMIT 40 MX41 MN 40 MX41 MN 40 MX 41 MN 40 MX 41 MN SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
PERSTIC MADEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN II MN LITTLE OR HIGHLY	HIGHLY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	(V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
GROUP HOEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC SOILS	GROUND WATER	OF A CRYSTALLINE NATURE.  — SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO BOCK UP TO	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL
DE MATOR GRAVE AND FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.	(SLL) 2.5 cm. OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FEI DSPAR	FLOOD PLAIM (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS MATER	STATIC WATER LEVEL AFTER 24 HOURS.	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
GEN.RATING AS A EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABLE	∇PW PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
SUBGRADE POOR	SPRING OR SEEPAGE	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS
P.I. OF A-7-5 ≤ L.L 30 : P.I. OF A-7-6 > L.L 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRAMITOID ROCKS, ALL FELOSPARS DULL	LATERAL EXTENT.  LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
CONSISTENCY OR DENSENESS  RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUMK' SOUND WHEN STRUCK.	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (RAY/m 2 )	ROADWAY EMBANKMENT SPT CPT OF DIT TEST BORING SAMPLE WITH SOIL DESCRIPTION ST PMT	IF TESTED. WOULD VIELD SPT REFUSAL	INDICATES POOR AERATION AND LACK OF GOOD DRAIMAGE.
VEDY LOSE	DESIGNATIONS	SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GRANULAR LOOSE 4 TO 10	SOIL SYMBOL AUGER BORING S- BULK SAMPLE	(SEV.)  IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL MEDIUM DENSE 10 TO 30 N/A (NON-COHESIVE) DENSE 30 TO 50	ARTIFICIAL FILL OTHER THAN CORE BORING SS- SPLIT SPOON ROADWAY EMBANKMENTS CORE BORING SAMPLE	IF TESTED. YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.	ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF
VERY DENSE >50	SAMPLE	VERY SEVERE ALL ROCK EXCEPT OUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	ROCK SEGMENTS EDUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORF RIN
VERY SOFT         (2         (25           GENERALLY         SOFT         2 TO 4         25 TO 50	MONITORING WELL SAMPLE	(V. SEV.)  THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE	SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 50 TO 100	SINE INFERRED ROCK LINE A PIEZOMETER RS- ROCK SAMPLE	II TESTED. TIECUS SPI W PALUES ( 188 BLUWS PER 38 cm.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN
MATERIAL STIFF 8 TO 15 100 TO 200 (COHESIVE) VERY STIFF 15 TO 30 200 TO 400	TTTTT ALLUVIAL SOIL BOUNDARY INSTALLATION RT- RECOMPACTED	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	COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY
HARD >30 >400	SLOPE INDICATOR TRIAXIAL SAMPLE 25/825 DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE	ALSO AN EXAMPLE.	OF THE INTRUDED ROCKS. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
TEXTURE OR GRAIN SIZE	ROCK STRUCTURES  SPT N-VALUE	ROCK HARDNESS	SLIP PLANE.
U.S. STD. SIEVE STZE 4 10 40 60 200 270	SOUNDING ROD     REF     SPT REFUSAL	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER
OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053		SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.	FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	ABBREVIATIONS	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEM.	WITH 50 BLOWS.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F. SD.) (SL.) (CL.)	AR - AUGER REFUSAL FRAC FRACTURED SL SILT. SILTY	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 6 mm DEEP CAN BE	STRATA CORE RECOVERY ISREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	BT - BORING TERMINATED FRAGS FRAGMENTS SLI SLIGHTLY	HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STRATA ROCK QUALITY DESIGNATION (S.R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:
	CL CLAY HI HIGHLY TCR - TRICONE REFUSAL  CPT - CONE PENETRATION TEST MED MEDIUM W - MOISTURE CONTENT	MEDIUM CAN BE GROOVED OR GOUGED I mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	TOTAL LENGTH OF ROCK SECMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
SOIL MOISTURE - CORRELATION OF TERMS  SOIL MOISTURE SCALE   FIELD MOISTURE   COURSE   COURSE	CSE COARSE MICA MICACEOUS V VERY	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(ATTERBERG LIMITS)  DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST MOD MODERATELY VST - VANE SHEAR TEST  DPT - DYNAMIC PENETRATION TEST NP - NON PLASTIC 7 - UNIT WEIGHT	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	DENCH HARVE THE CO.
- SATURATED - USUALLY LIDUID; VERY WET, USUALLY	e - VOID RATIO PMT - PRESSUREMETER TEST 7 DRY UNIT WEIGHT	FROM CHIPS TO SEVERAL CENTIMETERS IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	BENCH MARK: BY-900 -BY9- PINC 10+84,490 =
(SAT.) FROM BELOW THE GROUND WATER TABLE	F FINE SAP SAPROLITIC FOSS FOSSILIFEROUS SD SANDY	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 25 mm	-Y9- POT STA. 15+24.337 37.31 LT. ELEVATION: 241.159
PLASTIC CENTROL IN OCCUPANT TO	Sol Sandy	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	NOTES: NM = 24 Hr. WATER NOT MEASURED
RANGE - WET - (W) SEMISULIO: REDURES DRING TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING	To the state of th
PLE + PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING TERM THICKNESS	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE	X AUTOMATIC MANUAL	VERY WIDE MORE THAN 3 m VERY THICKLY BEDDED > 1 m	
SL _ SHRINKAGE LIMIT	MUSILE B-	MODERATELY CLOSE 30 TO 100 cm THINLY BEDDED 0.05 - 0.5 m	•
- DRY - (D) REQUIRES ADDITIONAL WATER TO: ATTAIN OPTIMUM MOISTURE	152 mm CONTINUOUS FLIGHT AUGER CORE SIZE:	CLOSE 5 TO 30 cm VERY THINLY BEDDED 10 - 50 mm  VERY CLOSE LESS THAN 5 cm THICKLY LAMINATED 2.5 - 10 mm	
PLASTICITY	A 203 mm HOLLOW AUGERS	THINLY LAMINATED < 2.5 mm	
PLASTICITY (NDEX (PI) DRY STRENGTH	CME-45C HARD FACED FINGER BITS -N	INDURATION  FOR SEDIMENTARY ROCKS, IMDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NONPLASTIC 0-5 VERY LOW	X TUNGCARBIDE INSERTS		
LOW PLASTICITY         6-15         SLIGHT           MED. PLASTICITY         16-25         MEDIUM	CASING W/ ADVANCER HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE Mm STEEL TEETH POST HOLE DIGGER .	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:	
COLOR	OTHER TRICONE	BREAKS EASILY WHEN HIT WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY)	CORE BIT SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:  DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	OTHER OTHER OTHER OTHER	EXTREMELY IMDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE:	
	OTHER	SAMPLE BREAKS ACROSS GRAINS.	
			DELIVED ON WE WAS

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#### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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GOVERNOR

SECRETARY

March 24, 2004

STATE PROJECT: 34345.1.1 (R-0609IB)

COUNTY:

Guilford - Randolph

DESCRIPTION:

Bridge on -Y9- (SR 1920) over US 311 (High Point East Belt)

SUBJECT:

Geotechnical Report - Bridge Foundation Investigation

This is a proposed 2 lane structure on new location south of existing Tuttle Rd. (SR 1920). The new bridge structure will be on a relocated section of Tuttle Rd. over proposed US 311. The bridge is comprised of 2 spans at lengths of 32.009 and 35.963 meters. Skew angle for the structure varies between 67 and 73 degrees due to the curvature of the proposed bridge alignment. Overall structure width is to be 11.6 meters and end bent slopes are proposed at 1 ½:1 with 100mm concrete slope protection.

Foundation test borings were performed with a CME-550 drill machine utilizing hollow stem augers. This rig is equipped with an automatic drop hammer. The field investigation for this project was conducted in February of 2004.

#### Physiography/Geology

The project area is located in Guilford County in the northern-central piedmont region of North Carolina. The site topography ranges from flat to gently sloping.

Geologically this site is part of the Carolina Slate Belt and is underlain by granitic and meta-granitic rock types. Soil types encountered at the bridge site consist primarily of residual medium stiff to stiff sandy silty clay (A-7-5, A-7-6), medium stiff to hard clayey sandy silt (A-4), and medium dense to very dense silty sand (A-2-4). All boring locations encountered weathered rock at depth followed by hard rock, except in one instance.

#### Foundation Materials

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#### End Bent 1:

This bent is located east of proposed US 311. Two borings performed for this bent location encountered 2.0 meters of residual medium stiff sandy silt clay (A-7-6) overlying 5.2 to 6.7 meters of medium stiff to hard clayey sandy silt (A-4). Beneath residual silt

weathered rock is encountered between elevation 226.37 and 225.69 meters. The thickness of the weathered rock layer varies between 0.72 and 2.46 meters before hollow stem refusal was achieved on hard rock at elevation 223.91 meters in boring EB1-A and 224.97 meters in boring EB1-B.

#### Bent 1:

This bent is located along the centerline of proposed US 311. Three borings were performed for this bent location. Soils encountered are residual in nature and vary between medium stiff to hard micaceous clayey sandy silt (A-4) at boring B1-A and medium stiff to stiff, low to high PI, sandy silty clay for boring B1-B and B1-C. As residual soil overlies weathered rock, its thickness varies across the bent from 4.0 to 9.0 meters. The weathered rock horizon varies in elevation from 231.1 meters at boring B1-A to 226.36 meters at boring B1-B. Borings B1-B and B1-C achieved hollow stem refusal on hard rock.

#### End Bent 2:

This bent is located west of proposed US 311. Two borings performed at this location encountered 2.5 to 4.0 meters of residual soft to medium stiff medium plastic to highly plastic silty sandy clay (A-7-5, A-7-6) overlying medium dense to very dense micaceous silty sand (A-2-4). The sand layer extends between 1.8 and 3.2 meters below the clay horizon before encountering weathered rock at approximate elevation 231.5 to 231.8 meters.

#### Groundwater

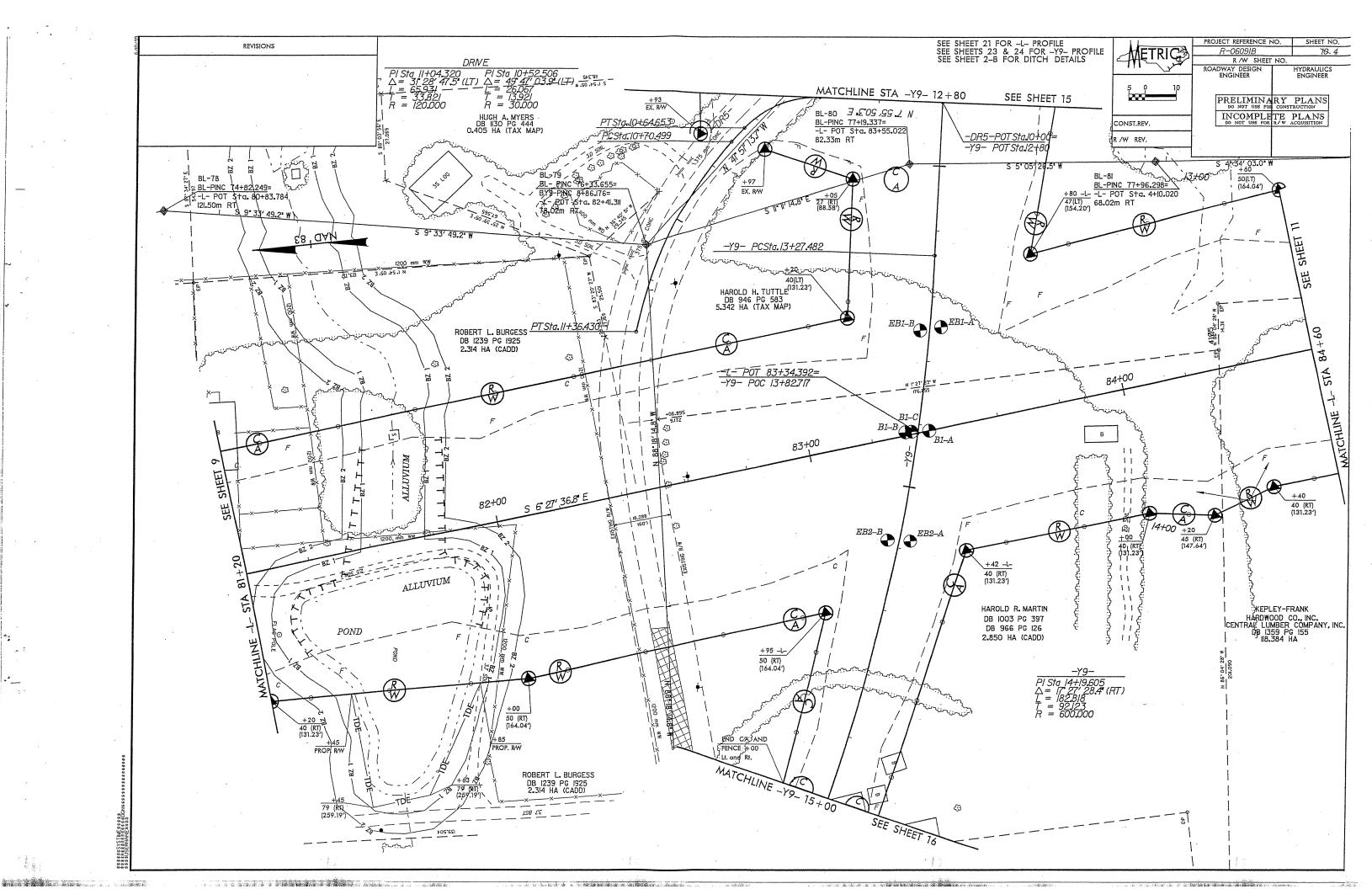
Static groundwater measurements made more than 24 hours after each boring are felt to be inaccurate due to surface water runoff from a recent rain event. Based on initial groundwater readings and correlation with a nearby roadway auger boring we extrapolate the groundwater elevation for the bridge site to be approximately 229 to 230 meters.

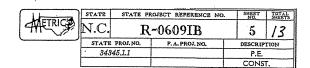
Respectfully submitted,

& E Beverly

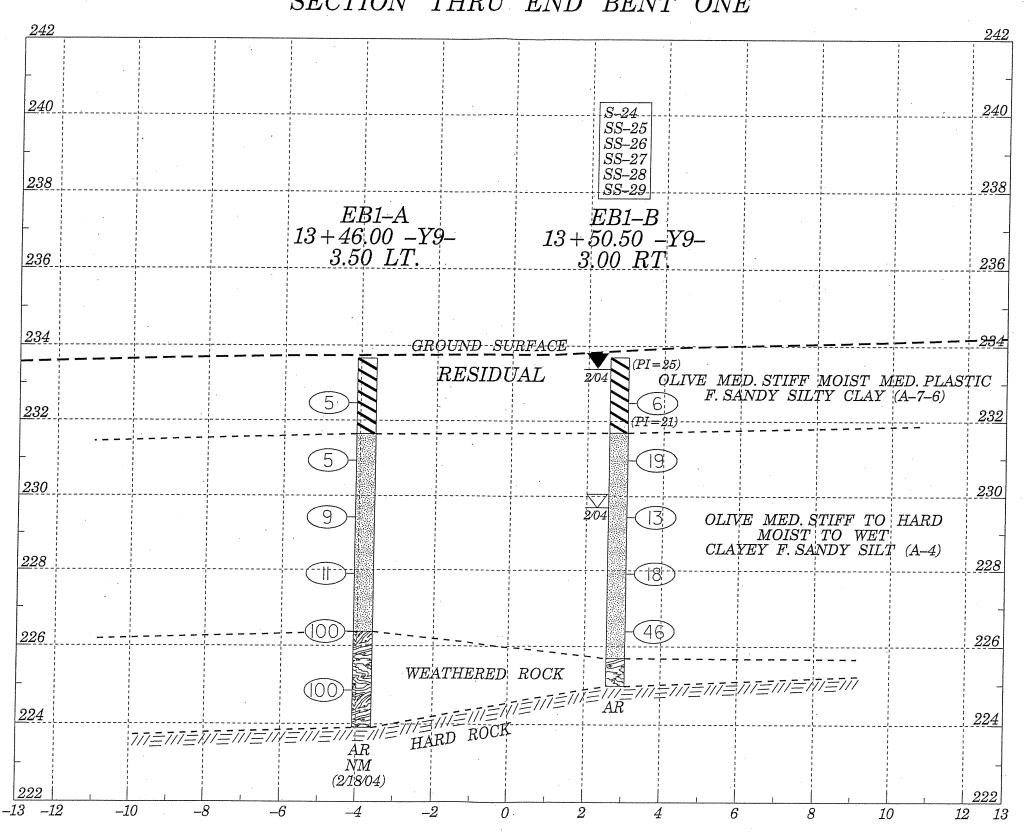
TO SERVER NEW WILLIAM TO THE CONTRACT OF THE SERVER

J.E. Beverly, Project Geologist

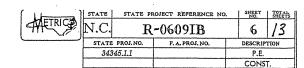




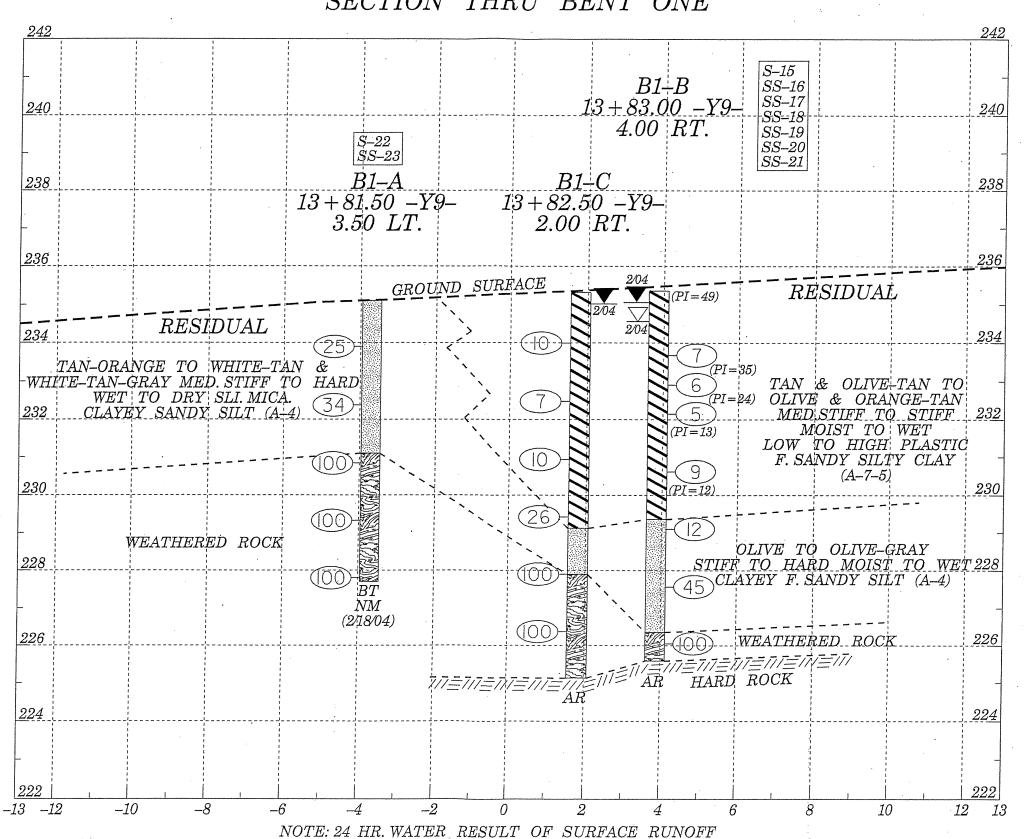
#### SECTION THRU END BENT ONE

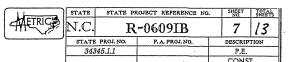


NOTE: 24 HR. WATER RESULT OF SURFACE RUNOFF

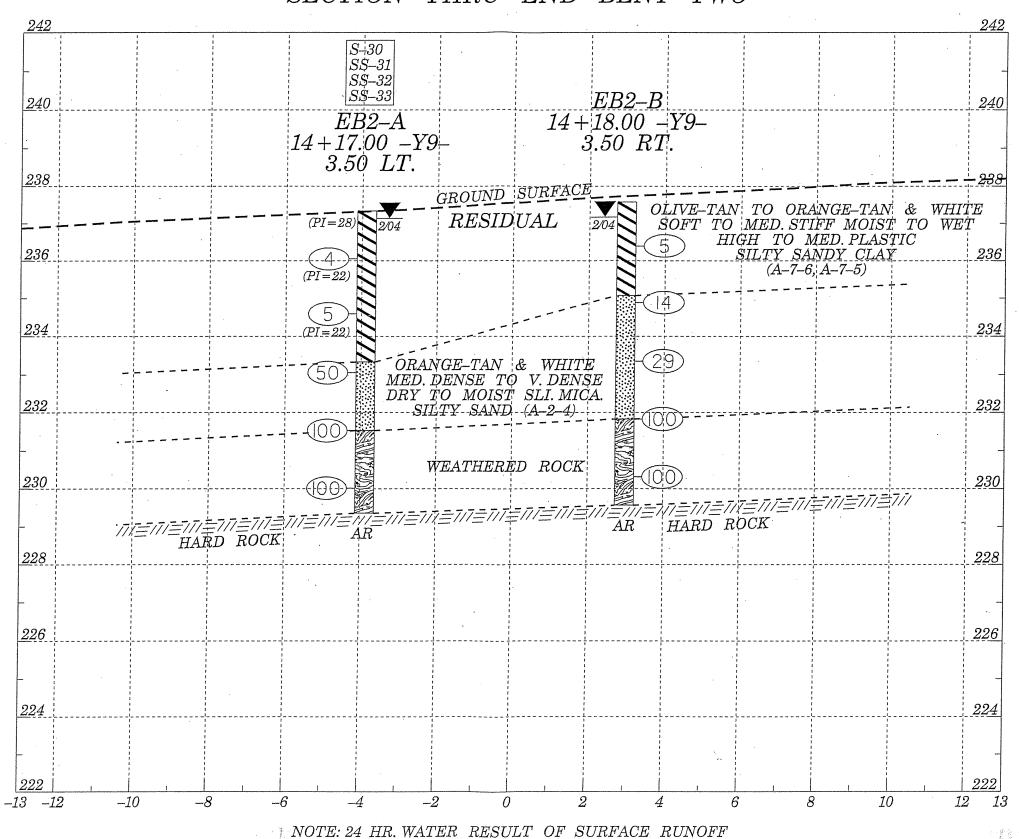


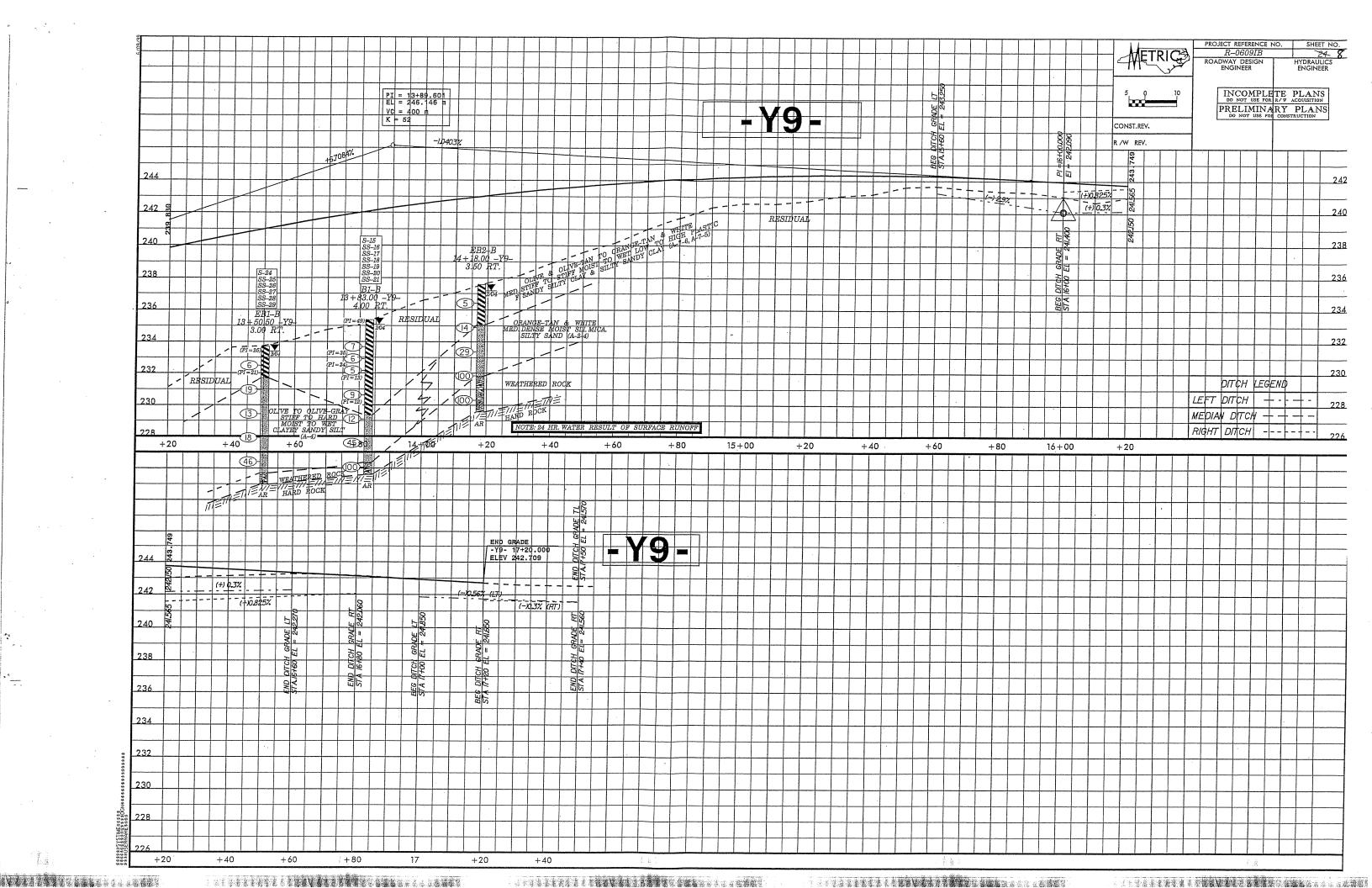
#### SECTION THRU BENT ONE





#### SECTION THRU END BENT TWO





#### Sheet 7

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

						GE01	ECHN	IICAL	UNIT B	ORING	LOC	3					
	CT NO 343				ID R-0609IB COUNTY RANDOLPH GEOLOGIST C.C. MURRAY												
SITE DE	ESCRIPTIO	N SIT	ΓΕ2 (	-Y9-	SR 19:	20 TUTTL	ERD.) O	VER US	311 .	·				GND WATER			
BORING	NO EB1-	A			NORT	HING 0.0	0			EASTIN	G 0.00		·	0 HR N/A			
ALIGNM	MENT Y9				BORI	NG LOCA	TION 13	+49.000		OFFSET	3.50m	LT		24 HR N/A			
COLLAI	RELEV 23	33.65n	n		TOTA	L DEPTH	9.74m		START DA	TE 2/18/	′04		COMPLETION DATE 02/18/04				
DRILL N	IA CHINE	CME-	550X			******	DRILL	METHO	D H.S. AL	IGERS			HAMMER TYPE AUTOMATIC				
SURFAC	E WATER						DEPTH	TO RO	CK 9.74m				Log EB1-A, Page 1 of 1				
ELEV	DEPTH	В	LOW	CT	PEN	1	BLOWS			SAMPLE		15	L SOIL AND ROCK				
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													OLIVE MED. CT	TEE TO OTHER			
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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL LINIT BORING LOG

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COLLAR	ELEV 23	3.69n	1		TOTA	L DEPTH	8.72m		START DA	ATE 2/18/0	4		COMPLETION D.	ATE 02/18/04
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SURFACE	WATER								CK 8.72m			Log EB1-B, Page 1 of 1		
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						R-0609IB COUNTY RANDOLPH GEOLOGIST C.C. MURRAY 920 TUTTLE RD.) OVER US 311 GND WA								
BORING			<u>L Z (</u>										GND WATER	
ALIGNM						G LOCAT		+81 500		OFFSET				0 HR N/A
COLLAR		35 10~	<u> </u>			L DEPTH		<del></del>	START D	<del></del>		LLI	COMMI ETTON D	24 HR N/A
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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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PROJECT N	O 343	45.1.	1		ID R	0609IB COUNTY RANDOLPH GEOLOGIST C.C. MURRA	/V		
				(-Y9-		20 TUTTLE RD.) OVER US 311	GND WATER		
BORING NO				<u> </u>	1	THING 0.00 EASTING 0.00	0 HR N/A		
ALIGNMEN'						NG LOCATION 13+82.500 OFFSET 2.00m RT	24 HIR 0.30m		
COLLAR EL		35.32	m		<del> </del>		DATE 02/17/04		
DRILL MAC					1017				
SURFACE W			*******				HAMMER TYPE AUTOMATIC		
		TE	BLOW	CT	PEN	BLOWS PER 30cm   SAMPLE   Log BI-C, Page 1 of SOIL A	AND ROCK		
ELEV D	EPTH	1	n 15cn		ı		CRIPTION		
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#				1	1	SILIY C	LAY (A-7-5)		
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PROJECT	TNO 343	45 1 1		1	m P	0609IB			ONI D				TST C C MIDDAY	,	
							09IB   COUNTY RANDOLPH   GEOLOGIST C.C. MURRAY TUTTLE RD.) OVER US 311								
			LZ (	,		<del></del>		VER US	1311	12 Y CONTA				GND WATER	
BORING						HING 0.00				EASTIN				0 HR 0.80m	
ALIGNM						NG LOCAT		000.68+c	<del></del>	OFFSET		IKI		24 HR 0.30m	
COLLAR					IUIA	L DEPTH	T	NATION :	START D		U4		COMPLETION DA		
DRILL M									OK 0.70		······································		HAMMER TYPE	AUTOMATIC	
SURFACE	E WATER		LOW	CT	PEN	T	·	PER 300	CK 9.78m	SAMPLE	-   -	711	Log B1-B, Page 1 of 1	ID DOOK	
ELEV	DEPTH	1			1	1		50 50	75 10		- V		SOIL AND ROCK DESCRIPTION		
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	9.31	100			0.14				100				WEATHERE	D ROCK	
225.58 ‡	•								<u> </u>						
						LAUGHE	REFU	SALATI HARD R	LEVIII			$  \   \  $	NOTE: 24 HR WAT SURFACE I		
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#### PROJECT NO 34345.1.1 ID R-06091B COUNTY RANDOLPH GEOLOGIST C.C. MURRAY SITE DESCRIPTION SITE 2 (-Y9- SR 1920 TUTTLE RD.) OVER US 311 GND WATER **BORING NO EB2-A** NORTHING 0.00 EASTING 0.00 0 HR N/A **ALIGNMENT Y9** BORING LOCATION 14+17.000 OFFSET 3.50m LT 24 HR 0.20m COLLAR ELEV 237.33m TOTAL DEPTH 7.98m START DATE 2/18/04 COMPLETION DATE 02/18/04 DRILL MACHINE CME-55OX DRILL METHOD H.S. AUGERS HAMMER TYPE AUTOMATIC SURFACE WATER DEPTH DEPTH TO ROCK 7.98m Log EB2-A, Page 1 of 1 **BLOW CT** PEN BLOWS PER 30cm SAMPLE Y SOIL AND ROCK **ELEV** DEPTH MOI G 15cm | 15cm | 15cm (m) NO DESCRIPTION 237.33 S-30 (RESIDUAL) OLIVE-TAN TO M/W ORANGE-TAN & WHITE SOFT TO MED. STIFF HIGH TO MED. 236.00 + 1.28 2 2 0.30 PLASTIC SILTY SANDY CLAY M/W SS-31 (A-7-6, A-7-5) 2.75 2 3 0.30 SS-32 M/W 234.00\_\_\_\_ 5 23 27 0.30 ORANGE-TAN & WHITE DENSE SS-33 D/M TO V. DENSE SLI. MICA. SILTY SAND (A-2-4) 232.00\_± **‡** 5.80 25 | 63 | 37 0.18 D/M WEATHERED ROCK 230.00 + 7.32 27 73 0.29 229.35 229.35 AUGER REFUSAL AT ELEV. 229:35 NOTE: 24 HR WATER RESULT OF JON:HARD:ROCK | - - - -SURFACE RUNOFF

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL LINIT BORING LOG

							GEOT	ECHNICA	L UNIT	BORING	LOG	) }	, (1101	
.C. MURRAY	PROJECT NO 34345.1.1 ID R-0609IB COUNTY RANDOLPH GEOLOGIST C.C. MURRAY													
GND WATER		SITE DESCRIP		ITE 2	(-Y9-	SR 19	20 TUTTLE	ERD.) OVER	JS 311					GND WATER
0 HR N/A		BORING NO E	B2-B			NORT	THING 0.00	0		EASTIN	G 0.00			0 HR N/A
24 HR 0.20m		ALIGNMENT `	/9			BORI	NG LOCAT	TION 14+18.0	00	3.50m	RT		24 HR 0.40m	
PLETION DATE 02/18/04	1	COLLAR ELEV	237.57	m		TOTA	L DEPTH	8:01m	START	DATE 2/18/			COMPLETION DA	A
MER TYPE AUTOMATIC	1	DRILL MACHI	NE CME	-550)	<			DRILL MET	<del></del>	<del></del>			HAMMER TYPE	
32-A, Page 1 of 1	1	SURFACE WAT	ER DEI	N HT	/A			DEPTH TO R					Log EB2-B, Page 1 of 1	TOTOMATIC
SOIL AND ROCK	1			BLOW		PEN	II E	BLOWS PER 3		SAMPLE		111		ID ROCK
DESCRIPTION	ŀ	ELEV DEF	1H   15c	m   15cn	n 15cr	n (m)	0 2	5 50	75	100 NO	МОІ	8	DESCR	
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ASTIC SILTY SANDY CLAY		上					*===			-	W		SILTY SANDY CL	AY (A-7-6, A-7-5)
(A-7-6, A-7-5)		= .					E = E = E					$\mathcal{N}$		
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		± 4.22	4	7	22	0.30	E====\						( )	•
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/. DENSE SLI. MICA. SILTY		<b> </b>											•	·
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24 HR WATER RESULT OF	1	=======================================					- AUGER	REFUSALA	HEV.			7	NOTE: 24 HR WAT	ER RESULT OF /
SURFACE RUNOFF	.						TTT 229 5	57 ONCHARD	R¢CK:::		.		SURFACE	/1
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#### TEST RESULTS

PROJECT: 34345.1.1 R-0609IB COUNTY: RANDOLPH

SITE DESCRIPTION: SITE 2 (-Y9- SR 1920 TUTTLE RD.) OVER US 311

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH	AASHTO	N	L.L.	P.I.		% BY WEI	GHT		% P.s.	ISSING S	SIEVES	%	%
			INTERVAL	CLASS				C. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
ř										•						
		EB1-B														
S-24	3.0 RT	13+50.5	0.00-0.50	A-7-6(19)		46	25	8.9	21.0	35.7	34.4	100	95	76		
SS-25			1.21-1.66	A-7-6(16)	6	44	21	8.7	20.8	38.1	32.4	98	93	76		
SS-26		•	2.73-3.18	A-4(5)	19	35	7	4.2	34.2	49.4	12.1	100	99	72		
SS-27			4.26-4.71	A-4(2)	13	34	4	6.7	36.2	43.0	14.2	98	95	65	•	
SS-28			5.78-6.23	A-4(4)	18	34	7	6.5	34.0	49.4	10.1	100	97	69		
SS-29			7.30-7.75	A-4(0)	46	27	NP	8.0	46.7	37.2	8.1	100	98	58		
		B1-A									0.1	100	70	50		
S-22	3.5LT	13+81.5	0.00-0.50	A-4(1)		27	8	26.2	31.1	20.4	22.2	100	89	49		
SS-23			1.21-1.66	A-4(0)	25	27	NP	34.3.	34.4	19.2	12.1	100	82	38		
		B1-B											02	5.0		
S-15	4.0 RT	13+83	0.00-0.50	A-7-5(48)		81	49	7.9	9.9	25.6	56.6	100	96	85 .		
SS-16			1.69-2.14	A-7-5(39)	7	68	35	1.6	9.1	36.7	52.6	100	99	93		
SS-17			2.45-2.90	A-7-5(24)	6	54	24	3.4	18.6	45.6	32.4	100	98	87		
SS-18			3.21-3.66	A-7-5(14)	5	47	13	2.6	25.7	47.4	24.3	100	99	84		
SS-19			4.74-5.19	A-7-5(11)	9	47	12	3.2	32.2	48.4	16.2	100	99	77		
SS-20			6.26-6.71	A-4(0)	12	32	NP	9.1	44.7	36.1	10.1	100	96	58		
SS-21			7.79-8.24	A-4(0)	45	25	NP	8.6	46.7	34.6	10.1	100	99	57		
		EB2-A												-,		
S-30	3.5 LT	14+17	0.00-0.50	A-7-6(12)		50	28	29.9	16.4	13.2	40.4	97	81	54		
SS-31			1.28-1.73	A-7-5(15)	4	53	22	18.8	17.0	25.8	38.4	100	89	68		
SS-32			2.75-3.20	A-7-6(14)	.5	49	22	15.0	23.1	33.7	28.3	97	88	67		
SS-33			4.28-4.73	A-2-4(0)	50	26	NP	38.0	33.4	21.5	7.1	92	71	32		

## STATE OF NORTH CAROLINA

#### DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT <u>34345.1.1</u> I.D. NO. <u>R-0609IB</u>
F.A. PROJECT
COUNTYGUILFORD - RANDOLPH
PROJECT DESCRIPTION US 311 HIGH POINT
EAST BELT FROM I-85 TO SOUTH OF
SR 1920 NORTH OF ARCHDALE
SITE DESCRIPTION BRIDGE ON NC 62
OVER US 311 BETWEEN SR 1160 & SR 1161



7	STATE	STATE PR	OJECT REFERENCE NO.	SHEET NO.	TOTAL
	N.C.	R-	-0609IB	1	12
	STATE	PROJ. NO.	F. A. PROJ. NO.	DESCRIP	TION
	8.15	70601	MAF-F-119-(1)	P.E.	
)	WBS #	¥34345.1.1		CONS	т.

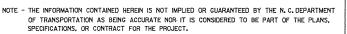
#### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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, CEOTECHNICAL UNIT Q. (919) 250-408B. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

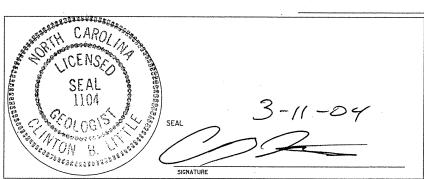
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE, THE LABORATORY SAMPLE DATA AND THE IN SITU IN-PLACE TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STRANDARD TEST METHOD. THE OBSERVED MATER 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 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 THIS PROJECT. THE CONTRACTOR IS ALLL 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 MOIGHTED IN THE SUBSURFACE INFORMATION.

INVESTIGATED BY J.E. BEVERLY PERSONNEL C.C. MURRAY CHECKED BY C.B. LITTLE J.E. ESTEPSUBMITTED BY C.B. LITTLE D.K. BRATTINDATE MARCH 2004



NOTE - 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.



## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT



## SUBSURFACE INVESTIGATION

		SUBSURFACE I	NVESTIONITO	
				TEXNITIONS
		POCK LEGEND TERM	S, SYMBOLS, AND ABBREVIATIONS  ROCK DESCRIPTION	TERMS AND DEFINITIONS
		SOIL AND ROCK LEGETTS, I	T ROCK DESCRIPTION  ROCK DESCRIPTION  INFERRED	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.
		GRADATION	ROCK DESCRIPTION  ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED  HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL,  ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL MOULD YIELD SPT REFUSAL,  ROCK LINE INDICATES THAT IN MY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS.	ACCUSTOR SEASON OR STRATA.  ADUIFER - A WATER BEARING FORMATION OR STRATA.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAINS AND ANOTABLE.
PECCEPIETION	THE INDICATES A GOOD REPRESENT	ATION OF PARTICLE SIZES FROM FINE TO COARSE ATION OF PARTICLE SIZES FROM FINE TO COARSE ARE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED).	HARD ROCK IS NON-COASTAL PLAIN MATERIAL IMM. MATERIAL MOULD YIELU STI REPOSAL. SERVICE AT WHICH NON-COASTAL PLAIN MATERIAL MOULD YIELU STI REPOSAL. SERVICE AT WHICH NON-COASTAL PLAIN MATERIAL, SERVICE AT WHICH NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE	AND TO ALL ROCKS OR SUBSTANCES COM STANCES
	WELL GRADEU- INDICATES THAT SOIL PARTICLES A  UNIFORM- INDICATES THAT SOIL PARTICLES A  GAP-GRADEU- INDICATES A MIXTURE OF UNIFO  AND COMMENTARY O	ATION OF PARTICLE SIZES FROM FINE TO LUBARSE. RRE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED). DRM PARTICLES OF TWO OR MORE SIZES.	IN NON-COASTAL FERRING THREE T	I PROPORTION OF CERT IN THE LEVEL HI WITCH TO
CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED THAN 100 BLOWS FER	GAP-GRADED- INDICATES A MIXTORE OF	ULADITY OF GRAINS	OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS	ASTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT TO OR ABOVE THE GROUND SURFACE.
	HIVO	CALIFICITIES BY THE TERMS; ANGULAR, SUBANGULAR,	PER 30 cm.	ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO G. THE ADMINIST OF CALCIUM CARBONATE.  CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
UN THE HASHTO CLASSIFICATION, AND OTHER PERTURENT				CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE ANDION'S OF SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE  COLLUVIUM - ROCK FRAGMENT
STITION, ANOUGH TO THE SAND LATERS THE SAND LATERS, HOND FOR IT.	MINER	ALOGICAL COMPOSITION  ALOGICAL COMPOSITION  ALOGICAL COMPOSITION  AND USED IN DESCRIPTIONS WHENEVER		
VER SIFF, ON SOUR AND AASHTO CLASSIFICATION	MINERAL NAMES SUCH AS QUARTZ, FELDSPA THEY ARE CONSIDERED OF SIGNIFICANCE.	ALOGICAL CUMPOSITION  R, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER		LENGTH OF CURE ROLL AR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF AUGHCENT ROSKS
TO A STANLE OF MATERIALS	THEY ARE CONSIDERED OF STORM	COMPRESSIBILITY	COOSTAL PLAIN SEDIMENTS CEMENTED CONDSTONE CEMENTED	MASSIVE RUCK.
SS. (95% PASSING *200)	DI IGUTL V. COMPRESSIBLE	LIQUID LIMIT 21-50	SEDIMENTARY SHELL BEDS, ETC.	ATMITTH OF ATMITTH - THE DIRECTION OF BEAUTION OF
P A-1 A-3 F A-3 F A-7-6 A-3 F A-7-6	MODERATELY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 30	ROCK (CP) WEATHERING	OIP DIRECTION OUT FERON NORTH. MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES FAULT - A FRACTURE DAMAILED PARALLEL TO THE FRACTURE.
S. A-1-a A-1-b A-2-4[A-2-5]A-2-6[A-2-7]	PER PER	CENTAGE OF MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	FAULT - A FRACTURE OR FRACTURE ZUNE HEGEN CTURE.
30L 00000000000000000000000000000000000	ORGANIC MATERIAL GRANULAR SOILS	SOU S		RELATIVE TO ONE ANOTHER PARALLEL TO THE PARALLEL PLANES.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
SING GRANULAR CLAY PEAT SOILS SOILS	TRACE OF ORGANIC MATTER 2 - 3%	3 - 5%   THECE 10 - 20%		FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR OFFICE SERVINENTS DEPOSITED BY THE STREAM.
10 30 MX 50 MX 51 MN 25 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	LITTLE ORGANIC MATTER 5 - 107	12 - 20% SUME 25% AND ABOVE		FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR UNLINEAR TOSTMAN TO SEDIMENTS DEPOSITED BY THE STREAM. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM SUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
- I I I I I I I I I I I I I I I I I I I	HIGHLY ORGANIC	GROUND WATER	25 cm. OPEN JUINTS PAT CONTROL THE BOCKS RING UNDER HAPPING DESIGNATION OF THE BOCKS RING UNDER HAPPING DESIGN	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CHINGE MOVEMENT HAS OCCURRED.
S MY NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 M	IC	BORE HOLE IMMEDIATELY AFTER DRILLING.	CONSTALS ARE DULL HAD DISCOURTED THE CEFECTS. IN	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  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
C NOEX 6 FIX 12 TO 10 TO	□ WATER LEVEL IN	BURE NOTED 24 HOURS		LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK MINES OF MORE DIRECTIONS.
TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	STATIC WATER LE	VEL AFTER 24 HOURS.		
AJOR GRAVEL AND GRAVEL AND SHIND	V PW PERCHED WATER.	SATURATED ZONE OR WATER BEARING STRATA	WITH FRESH HULK.	TOPECH ARLY MARKED WITH SPUTS OF BIT CITCH
THE TO BOOK PROPERTY OF POUR UNSUITE	O O O CORING OR SEEPA	GE	MODERATELY MODERATELY SEVERE MOD. SEV.) MODERATELY MODERATELY SEVERE MOD. SEV.) MODERATELY MOD. SEV.) MODERATELY MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. SEV.) MOD. MODERATELY MOD. SEV.) MOD. SEV.) MOD. MODERATELY MOD. SEV.) MOD. MODERATELY MOD. MOD. MOD. MOD. MOD. MOD. MOD. MOD.	INDICATES POUR HENATION MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE FRESCHOOL OF
FXCELLENT TO GOOD	M M	SCELLANEOUS SYMBOLS	(MOD. SEV.) AND CAN BE EXCHANGED WITH BUT REFUSAL	INTERVENING IMPERVIOUS STITUTE OF THE MEATHERING OF ROCK.
P.I. 0F A-7-5 ≤ L.L. 30 DENCENESS	II ROADWAY EMBANKMENT	SPT CPT DEST BORING SAMPLE DESIGNATIONS	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED ROCK TABLE TO SOME	INTERVENING IMPERVIOUS STATISTICS.  RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF CORE.
	ROADWAY EMBANATION WITH SOIL DESCRIPTION		IN STRENGTH TO STRONG ROCK USUALLY REMAIN.	ROCK QUALITY DESIGNATION IN CREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL CENTIL OF
PRIMARY SOIL TYPE COMPACTNESS OR COM	SOIL SYMBOL	AUGER BORING S- BULK SAMPLE	EXTENT. SOME FRAGMENTS OF STRUNK THOSE OF SOME STANDARD ROCK FABRIC ELEMENTS ARE DISCERNIBLE BY TESTED, YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.  IF TESTED, YIELDS SPT N VALUES > 0.00 STANDED, BOCK FABRIC ELEMENTS ARE DISCERNIBLE BY THE STANDARD ROCK FABRIC FLEMENTS LEMENT FLE	T HOUR SECRETARY COSTS AS A PERCENTAGE.  MAINING AND EXPRESSED AS A PERCENTAGE.
WERY LOOSE (4	ARTIFICIAL FILL OTHER	THAN CORE BORING SAMPLE	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLURED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRUNG ROCK R	ROCK SEGMENTS EQUAL TO UN OFFICIAL AND EXPRESSED AS A PERCENTAGE.  MAINING, OF THE  SAPPOLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROC  SAPPOLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROC  SAPPOLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROC  SAPPOLITE - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY INTRUSTVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY INTRUSTVENCE OF THE PARENT ROCK  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH ITS LATERAL EXTENT WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH THE PARALLEL PARALLEL TO THE BEDDING OR SCHIST  COMPARED WITH THE PARALLEL PARAL
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(NON-COHESIVE) VERY DENSE 550 (25	SUEVIS INFERRED ROCK LINE	PIEZOMETER	SCATTERED CONCENTRATIONS STATE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT TOUGHT AND STRIATED SURFACE THAT TOUGHT AND STATE OF A SAS AS HAT
VERT SOFT 2 TO 4 25 TO 100	TTTTT ALLUVIAL SOIL BOUNDAR	TRIAXIAL SAMPLE	ALSO AN EXAMPLE.	SLICKENSIDE - POLISIAE STATE OF THE STATE OF
GENERALLY MEDIUM STIFF 4 TO 8 100 TO 200 SILT-CLAY STIFF 8 TO 15 200 TO 400	•	SLOPE INDICATOR  INSTALLATION CBR - CBR SAMPLE	PROJECTED BY WHIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REDUIRES	FALLING 0.76 METERS REGULATED TO SAMPLER, SPT REFUSAL IS LESS THAN 2.3 CHI PERENTER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 2.3 CHI PERENTER SPLIT SPOON SAMPLER.
MATERIAL VERY STIFF 15 TO 30 >400	25/025 DIP/DIP DIRECTION OF ROCK STRUCTURES	SPT N-VALUE	VERY HARD  CANNOT BE SCRATCHED BY KNIFE ON SMITH OF THE GEOLOGISTS PICK.  SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.	WITH 50 BLOWS.  STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL IS  STRATA CORE AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	SOUNDING ROD	REF SPT REFUSAL	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATH THROUGH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  OF STRATUM AND EXPRESSED AS A PERCENTAGE.  OF STRATUM AND EXPRESSED AS A PERCENTAGE.
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J.S. STD. SIEVE SIZE 4 10 40 60 200 276 4.76 2.0 0.42 0.25 0.075 0.053		PMT - PRESSUREMETER TEST	CVCAVATED BY HARD DLUW OF THE STATE OF THE S	TOTAL LENGTH OF HOLK SECTION AND EXPRESSED AS A PERCENTAGE.
PENING (MM) COARSE FINE SILT CL	AR - AUGER REFUSAL CL.) BT - BORING TERMINATI	SD SAND, SANDT	HARD  BY MODERATE BLOWS.  BY MODERATE BLOWS.  MEDIUM  CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  MEDIUM  CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	TOPSON (T.S.) - SURFACE SOILS USUALLY CONTAINING STATEMENT
BOULDER COBBLE GRAVEL SAND SAND (SL.) (C		CLI - CLIGHTLY	CAN BE EXCAVATED IN STREET COM	BENCH MARK: RR SPIKE IN BASE OF 320mm HICKORY, 90 METERS LT OF
(BLDR.) (COB.) (GR.) (GR.) (CSE. 3637 1	CL CLAT  CPT - CONE PENETRATI  CSE COARSE	ON TEST TCR - TRICONE REFUSAL		
CDATAL MM 305 75 2.0	DMT - DILATOMETER TE DPT - DYNAMIC PENETR	The second rest $\gamma$ - unit weight $\gamma_{d}$ - ory unit weight		
SIZE COPRELATION OF TENIS		W - MOISTURE CONTENT		
SOIL MOISTURE SCALE FIELD SCORE FOR THE SCALE	F FINE FOSS FOSSILIFEROUS	v - VFRY	COST OR MORE IN THICKINGS CITY OF	NOTES:
(ATTERBERG LIMITS)	LY FRAC FRACTURED	A21 - Luin 2000	FINGERNALL. RETURNS	
- SATURATED - USUALLY LIUUDI VERT HE (SAT.) - GROW BELOW THE GROUND WATER		ON CURTICIT PROJECT	FRACTURE SPACING TERM THICKNESS	
LE LIOUID LIMIT SEMISOLID; REQUIRES DRYING TO	EQUIP'	MENT USED ON SUBJECT PROJECT	TERM SPHERICAL VERY HILKET BEDGE 0.5 - 1 m	
PLASTIC   - WET - (W) ATTAIN OPTIMUM MOISTURE		ADVANCING TOOLS:	ANUAL WIDE 1 TO 3 m THINLY BEDDED 10 - 50 mm	
RANGE ( (PI) PLASTIC LIMIT	DRILL UNITS:	CLAY BITS	5 TO 30 cm THICKLY LAMINATED	
SOLID; AT OR NEAR OPTIMUM MO	MOBILE B	152 mm CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 5 CM THINLY LAMINATED	
OM OPTIMUM MUISTURE		203 mm HOLLOW AUGERS	INDURATION  INDURATION  THE MATERIAL BY CEMENTING, HEAT, PRESSURE, I	TC.
SL - SHRINKHOE CHIT.  - DRY - (D)  - DRY - (D)  - TTAIN OPTIMUM MOISTURE	BK-51	HARD FACED FINGER BITS	INDUKATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, I RUBBING WITH FINGER FREES NUMEROUS GRAINS; RUBBING WITH FINGER FREES NUMEROUS GRAINS; RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
	CME-45		ROBBING WITH BY HAMMER DISINTEGRATES SAMPLE.	
PLASTICITY DRY STRENGTH			PERMITTED FROM SAMPLE WITH STEEL PROBE	• .
PLASTICITY INDEX (PI) VERY LOW	X CME-550	CASING W/ ADVANCER HAND TOOLS:  WY STEEL TEETH POST HOLE DIGG	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH DATE OF	
NONPLASTIC . 6-15 SLIGHT MEDIUM	PORTABLE HOIST	TRICONE HAND AUGER	GRAINS ARE DIFFICULT TO SEPARATE WITH STANFALL	
LOW PLASTICITY 16-25 HIGH MED. PLASTICITY 26 OR MORE		TRICONE TUNGCARB. SOUNDING ROD	NUMBER BLOWS REQUIRED TO BREAK SAMPLE;	
HIGH PLASTICITY	OTHER	CORE BIT VANE SHEAR TE	ST EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	
TIONS (TAN BED YEL-BRN, BLUE-GRA	AY) OTHER	OTHEROTHER		
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GR/MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.				
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. AND SOLE				And the second s
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#### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY

P.O. BOX 25201, RALEIGH, N.C. 27611-5201 LYNDO TIPPETT

GOVERNOR

SECRETARY

March 11, 2004

STATE PROJECT: 34345.1.1 (R-0609IB)

COUNTY:

Guilford - Randolph

DESCRIPTION:

Bridge on NC 62 (-Y8-) over US 311 Between SR 1160 &

SR 1161

SUBJECT:

Geotechnical Report – Bridge Foundation Investigation

This is a proposed 2 lane structure on new location north of existing NC 62. The proposed bridge will be on a relocated section of NC 62 over proposed US 311. The structure is comprised of 2 spans at lengths of 37.55 and 35.86 meters. Skew angle for the structure is just over 59 degrees and the bridge design width is stated at 10.54 meters. Slopes for the bridge site are recommended at 1 ½:1 with 100mm concrete slope protection.

Foundation test borings were performed with a CME-550 drill machine utilizing tri-cone roller bit and casing. This rig is equipped with an automatic drop hammer. The field investigation for this project was conducted in February of 2004.

#### Physiography/Geology

The project area is located in Guilford County in the northern-central piedmont region of North Carolina. The site topography ranges from flat to gently sloping.

Geologically this site is part of the Carolina Slate Belt and is underlain by granitic and meta-granitic rock types. Soil types encountered at the bridge site consist primarily of residual clay (A-6, A-7-6), silt (A-4), and sand (A-2-4) overlying weathered rock. At 8.9 meters below ground surface, weathered rock is deepest at End Bent 1. At Bent 1 and End Bent 2 locations weathered rock is much shallower and occurs 1.6 to 2.7 meters below the ground surface.

R-0609IB

#### **Foundation Materials**

#### End Bent 1:

This bent is located east of proposed US 311. Two borings performed for this bent location encountered varying layers of residual soils comprised of stiff to very stiff tan clavey sandy silt (A-4), medium stiff to stiff tan sandy silty clay (A-7-6, A-6), and medium dense to very dense tan-white micaceous silty sand (A-2-4). Weathered rock is encountered below residual soils between elevation 238.53 and 239.13 meters.

#### Bent 1:

This bent is located along the centerline of proposed US 311. Three borings were performed for this bent location. Approximately 1.0 meter of artificial fill material was encountered only at boring B1-C. The fill material is the result of an old abandoned septic leach field. Other than the artificial fill area, soil horizons are very homogeneous with approximately 1.7 meters of residual medium dense to very dense tan-white micaceous silty sand (A-2-4) found overlying weathered rock at elevation 243.75 meters. Borings were advanced until hard rock was encountered at all three boring locations. In this instance, hard rock is defined by SPT refusal.

#### End Bent 2:

This bent is located west of proposed US 311. Two borings performed at this location encountered residual soft to hard tan clayey sandy silt (A-4) overlying weathered rock. The weathered rock line lies between elevation 240.9 meters at boring EB2-A and 242.65 meters at boring EB2-B.

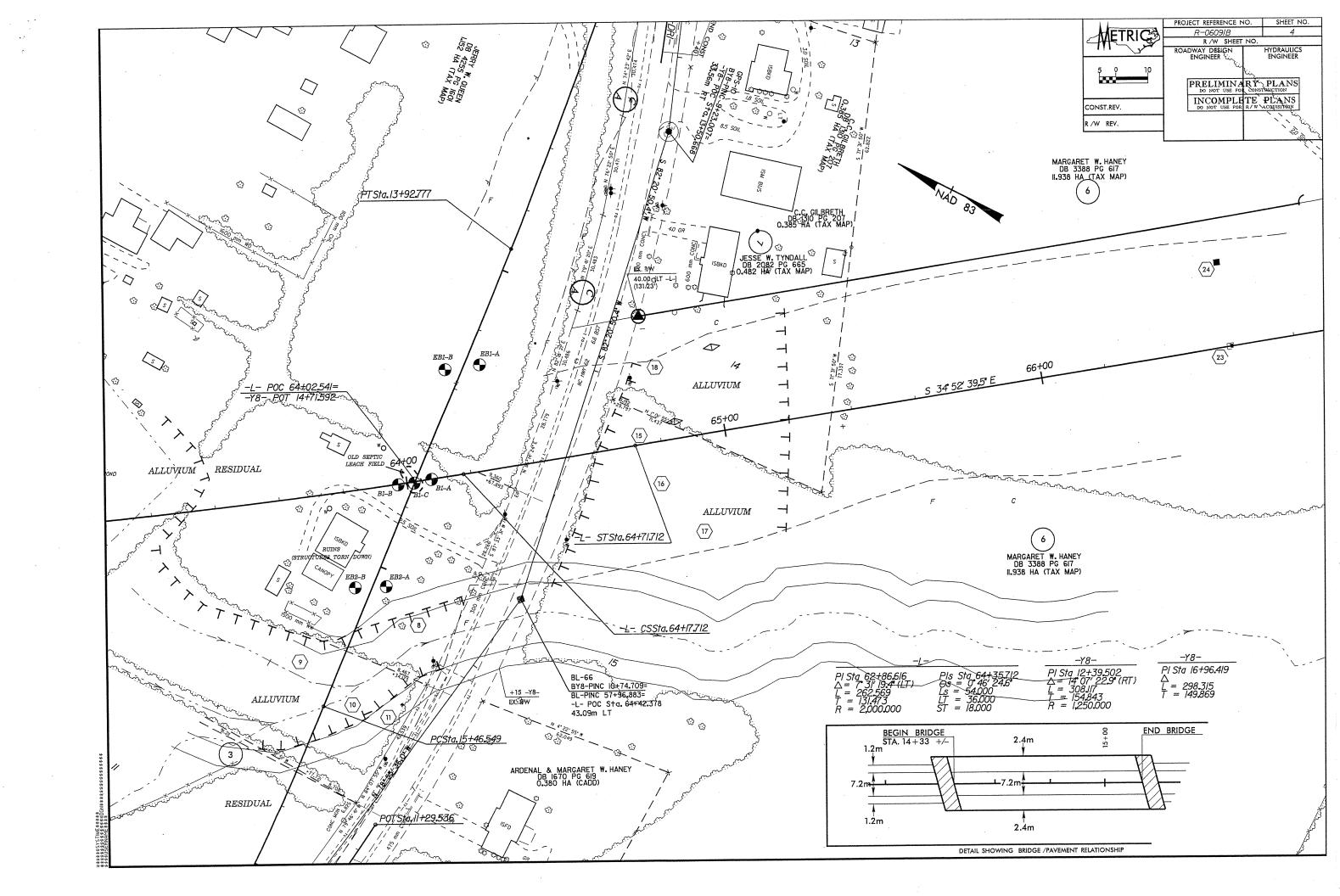
#### Groundwater

Static groundwater measurements made more than 24 hours after each boring indicate a groundwater table between elevation 243 - 247 meters at this site. An abandoned near by well was measured for static water level and produced an elevation of 245.12 meters.

Respectfully submitted,

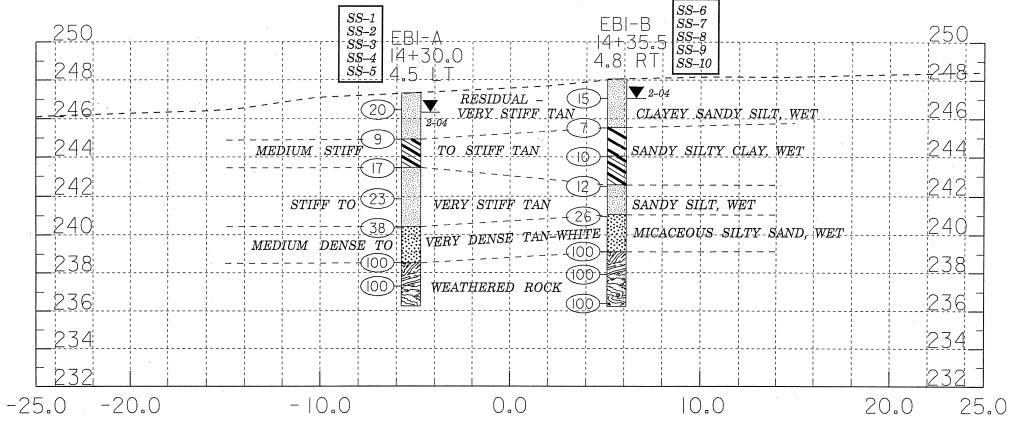
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J.E. Beverly, Project Geologist

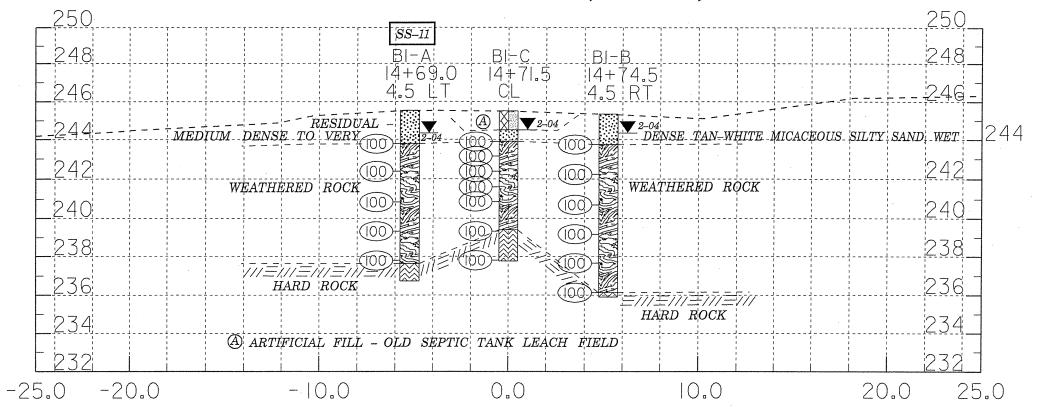


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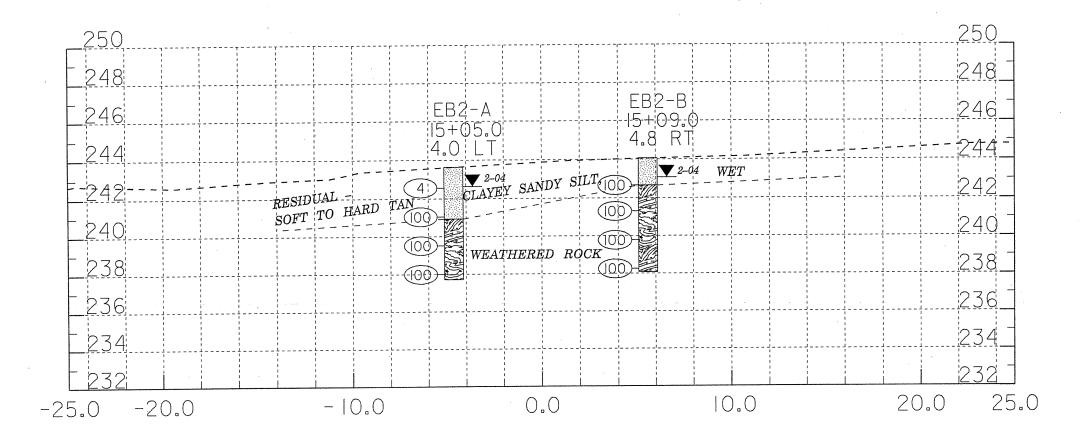


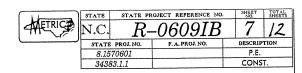
## SECTION THRU B1-A, B1-C, & B1-B



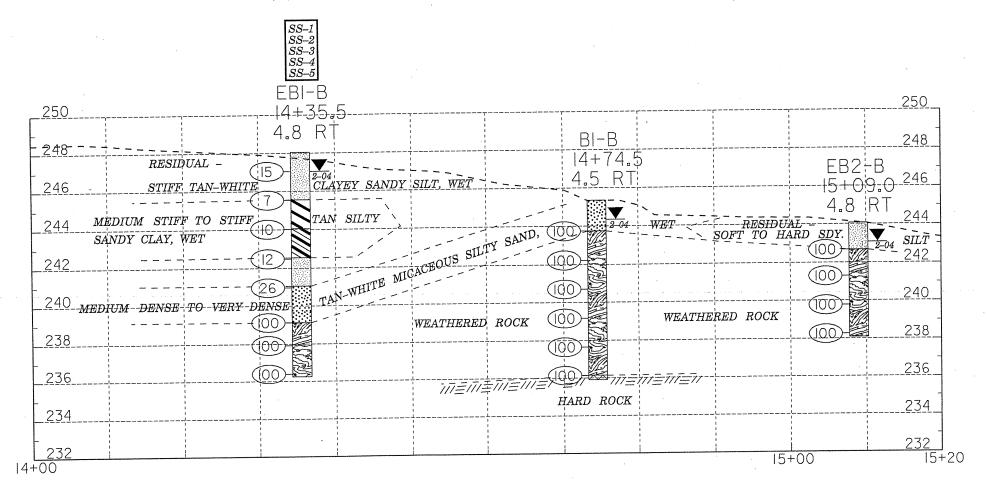


## SECTION THRU EB2-A & EB2-B





## PROFILE 4.5 METERS RIGHT OF -Y8-



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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1   ID R-0509B   COLINTY GUILFORD   GEOLOGIST C.C. MURRAY    NITE BEXCRIPTION BRIDGE ON NO 82 (278-) OVER US 311 BETWEEN SR 1160 & SR 1161   GND WATER BORNEN NO E81-8   NORTHING 0.00   EASTING 0.00   4 UR N/A ALIGNMENT Y8   BORING LOCATION 14-35 500   OFFSET 4.80m RT    LOCALAR FLEV 248.05m   TOTAL DEPTH 1181m   START DATE 2/1004   COMPLETION DATE 02/1004    DRILL MACHINE CME-550   DRILL METHOD ROTARY W/O MUD   LAMMER TYPE AUTOMATIC    BURL METHOD ROTARY W/O MUD   LAMMER TYPE AUTOMATIC    BURL METHOD ROTARY W/O MUD   LAMMER TYPE AUTOMATIC    LOF BHILL PROJECT NO NO    NO NO NO NO NO NO NO NO NO NO							<b>GEOT</b>	<u>ECHN</u>	ICAL	UNIT B	ORI	NG L					
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BORING NO EB1-B	SITE DES	CRIPTION	BRID	GE C	ON NO	C 62 (-	Y8-) OVE	R US 31	1 BETV	VEEN SR	160	& SR 1	161				
ALIGNMENT Y8											EAS	TING	0.00			0 HR N/A	ı
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PROJECT	NO 34345	0.1.1	·	111	V K-06	(0 / O//E	2 115 244	RETME	EN SR 1	160 & SR 1				GND WATER
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BORING N						LOCAT		69 <u>000</u>		OFFSET 4		-		24 HR 1.20m
ALIGNME								09.000		TE 2/10/0			COMPLETION DA	ATE 02/10/04
COLLARI				T	OTAL	DEPTH 8	DDILE A			Y W/O MU			HAMMER TYPE	
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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

			NO	1 \ 1						DRING L		· 1 ( )	17(11011	
PROJECT	NO 3434	5.1.1		'n	D R-06			NTY GUI					IST C.C. MURRAY	
SITE DESC			OGE O					_		160 & SR 1	161			GND WATER
BORING N		-				ING 0.00				EASTING				0 HR 1.00m
ALIGNME				В	ORIN	G LOCAT	ION 14+	71.500		OFFSET C	.00m			24 HR 1.00m
COLLAR		.50m				DEPTH :			TART DA	TE 2/11/0	4 .		COMPLETION DA	ATE 02/11/04
DRILL MA			50					метног	ROTAR	Y W/O MU	D		HAMMER TYPE	AUTOMATIC
SURFACE							DEPTH	TO ROC	<b>K</b> 6.10m				Log B1-C, Page 1 of 1	
\ /	DEPTH	BL	OW C	Т	PEN	E		PER 30cr		SAMPLE	MOI	님		D ROCK
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OJECT NO 34345.1.1   ID R-0609 B   COUNTY GUILFORD   GEOLOGIST C.C. MURRAY
PRING NO B1-B  NORTHING 0.00  BORING LOCATION 14+74.500  OFFSET 4.50m RT  OLLAR ELEV 245.34m  TOTAL DEPTH 9.44m  START DATE 2/11/04  COMPLETION DATE 02/11/04  CILL MACHINE CME-550  DRILL METHOD ROTARY W/O MUD  HAMMER TYPE AUTOMATIC  DEPTH TO ROCK 9.20m  SAMPLE   Log Bi-B, Page 1 of 1  SOIL AND ROCK  SOIL AND ROCK
PRING NO B1-B NORTHING 0.00 EASTING 0.00 0 HR 1.00m  LIGNMENT Y8 BORING LOCATION 14+74.500 OFFSET 4.50m RT 24 HR 1.00m  PLLAR ELEV 245.34m TOTAL DEPTH 9.44m START DATE 2/11/04 COMPLETION DATE 02/11/04  PRILL MACHINE CME-550 DRILL METHOD ROTARY W/O MUD HAMMER TYPE AUTOMATIC  PRICE WATER DEPTH BLOW CT PEN BLOWS PER 30cm SAMPLE  SAMPLE SOIL AND ROCK
AIGNMENT Y8  BORING LOCATION 14+74.500  OFFSET 4.50m RT  OLLAR ELEV 245.34m  TOTAL DEPTH 9.44m  START DATE 2/11/04  COMPLETION DATE 02/11/04  PERILL MACHINE CME-550  ORILL METHOD ROTARY W/O MUD  HAMMER TYPE AUTOMATIC  Log Bi-B, Page 1 of 1  SOIL AND ROCK  SOIL AND ROCK  SOIL AND ROCK
DLLAR ELEV 245.34m  TOTAL DEPTH 9.44m  START DATE 2/11/04  COMPLETION DATE 02/11/04  HAMMER TYPE AUTOMATIC  DEPTH TO ROCK 9.20m  SAMPLE  BLOW CT  PEN  BLOWS PER 30cm  SAMPLE  Log B1-B, Page 1 of 1  SOIL AND ROCK
RILL MACHINE CME-550  DRILL METHOD ROTARY W/O MUD  HAMMER TYPE AUTOMATIC  DEPTH DEPTH BLOW CT PEN BLOWS PER 30cm  SAMPLE   Log B1-B, Page 1 of 1  SOIL AND ROCK  SOIL AND ROCK
RFACE WATER DEPTH  DEPTH TO ROCK 9.20m  Log BI-B, Page 1 of 1  SOIL AND ROCK  SOIL AND ROCK  SOIL AND ROCK  SOIL AND ROCK  SOIL AND ROCK
BLOWS PER 30cm SAMPLE Y L SOIL AND ROCK
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#### Sheet 11

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

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PROJEC?	T NO 3434	5.1.1		Ţ	ID R-0			NTY GUI				_	IST C.C. MURRAY	· .
	SCRIPTION			ON N	IC 62 (	-Y8-) OVE	ER US 31	1 BETW	EEN SR 1	1160 & SR	1161			GND WATER
1	NO EB2-A					HING 0.00				EASTING				0 HR N/A
ALIGNMI	ENT Y8				BORIN	IG LOCAT	TION 15-	+05.000		OFFSET 4	4.00m	LT		24 HR 1.00m
COLLAR	ELEV 243	3.63m	1		TOTAI	L DEPTH	5.92m	5	START DA	ATE 2/16/0	)4		COMPLETION D	ATE 02/16/04
DRILL M	IACHINE (	SME-	550				DRILL	METHO	D ROTAF	RY W/O MU	JD		HAMMER TYPE	AUTOMATIC
SURFACI	E WATER							I TO ROC					Log EB2-A, Page 1 of 1	
ELEV	DEPTH	i	LOW		PEN	L		PER 30cr		SAMPLE	<b>V</b> /			ND ROCK
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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL LINIT BORING LOG

						GEOT				ORING			17(11011	
PROJECT	NO 3434	5.1.1		1	D R-0			NTY GU				-	IST C.C. MURRAY	
SITE DES	CRIPTION	BRI	DGE	ON N	C 62 (	-Y8-) OVE	R US 31	1 BETW	EEN SR 1	160 & SR				GND WATER
BORING I	NO EB2-B			N	ORTI	IING 0.0	0			EASTING	0.00		•	0 HR N/A
ALIGNMI	ENT Y8			H	BORIN	G LOCAT	TION 15+	-09.000		OFFSET	4.80m	RT		24 HR 1.00m
COLLAR	ELEV 244	1.06m		7	ГОТАІ	DEPTH	5.99m		START DA	TE 2/16/0	)4		COMPLETION DA	ATE 02/16/04
DRILL MA	ACHINE (	CME-5	550				DRILL	METHO	D ROTAR	Y W/O ML	JD		HAMMER TYPE	AUTOMATIC
SURFACE	WATER								K 4.20m				Log EB2-B, Page 1 of 1	
ELEV	DEPTH	ı	OW (		PEN		BLOWS F			SAMPLE	MOI			D ROCK
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M & T Form 503

#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

T. I. P. No.	R-609IB		•			
	REPORT ON S	AMPLES OF	SOILS FOR Q	UALIT	Y	
Project	34345.1.1	County	GUILFORD		Owner	
Date: Sampled	2/4/04	Received	2/16/04		Reported	2/19/2004
Sampled from	EB1-B			Ву	C.C. MUR	RAY
Submitted by	N.W. WAINAINA				1995	Standard Specifications

711530 TO 711540 3/8/04

TEST RESULTS

Proj. Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Lab. Sample No.		711530	711531	711532	711533	711534	711535
Retained 4.75 mm Sieve	%	-	-		20	-	-
Passing 2.00 mm Sieve	%	98	97	93	69	88	100
Passing 425 µm Sieve	%	79	72	70	60	56	97
Passing 75 µm Sieve	%	48	40	50	44	26	76

	-	MINUS	2.00 mm FR	ACTION			
SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	%	32.2	37.1	32.4	17.8	50.1	5.9
Fine Sand Ret - 53 µm	%	23.7	28.4	21.1	29.0	26.7	27.8
Silt 0.05 - 0.005 mm	%	25.8	20.4	34.3	39.0	21.2	52.2
Clay < 0.005 mm	%	18.2	14.2	12.2	14.2	2.0	14.2
Passing 425 µm Sieve	%		-	- ·	-	-	-
Passing 75 µm Sieve	%	-	-	-	-	-	-

L. L.	40	41	38	37	29	37
P. I.	8	16	11	9	NP	7
AASHTO Classification	A-4(2)	A-7-6(3)	A-6(3)	A-4(1)	A-2-4(0)	A-4(6)
Station	14+35.5	14+35.5	14+35.5	14+35.5	14+35.5	14+30
	4.8 RT	4.8 RT	4.8 RT	4.8 RT	4.8 RT	4.5 LT
Hole No.	EB1-B	EB1-B	EB1-B	EB1-B	EB1-B	EB1-A
Depth (M)	0.97	2.52	4.05	5.57	7.09	0.87
to	1.42	2.97	4.50	6.02	7.54	1.32

cc: C.C. MURRAY
Soils File

Soils	Engineer

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT

SOILS LABORATORY

T. I. P. No.	R-609IB					
	REPORT ON SA	MPLES OF	SOILS FOR Q	UALIT	Y	
Project	34345.1.1	County	GUILFORD		Owner	
Date: Sampled	2/4/04	Received	2/16/04		Reported	2/19/2004
Sampled from	EB1-B			Ву	C.C. MURI	RAY
Submitted by	N.W. WAINAINA				1995	Standard Specifications

711530 TO 711540 3/8/04

#### TEST RESULTS

Proj. Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	
Lab. Sample No.		711536	711537	711538	711539	711540	
Retained 4.75 mm Sieve	-	-	-	-	-	,	
Passing 2.00 mm Sieve	100	100	100	93	97		
Passing 425 µm Sieve	97	93	95	51	66		
Passing 75 µm Sieve	%	75	54	61	18	23	

#### MINUS 2.00 mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	6.5	18.0	14.0	60.2	49.4		
Fine Sand Ret - 53 μm	%	29.0	36.7	35.1	24.1	32.2	
Silt 0.05 - 0.005 mm	48.3	39.2	42.9	13.7	14.3		
Clay < 0.005 mm	%	16.2	6.1	8.1	2.0	4.1	
Passing 425 µm Sieve	%	-	-	-	-	-	
Passing 75 µm Sieve	%		-	-	-	-	

L. L.	38	39	36	26	22	
P. I.	12	7	8	NP	NP	
AASHTO Classification	A-6(9)	A-4(3)	A-4(4)	A-2-4(0)	A-2-4(0)	
Station	14+30	14+30	14+30	14+30	14+69	
	4.5 LT	4.5 LT	4.5 LT	4.5 LT	4.5 LT	
Hole No.	EB1-A	EB1-A	EB1-A	EB1-A	B1-A	
Depth (M)	2.41	3.93	5.46	6.98	1.67	
to	2.86	4.38	5.91	7.43	2.09	

Soils	Engineer
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NCDOT Classification Sheet

Site Vicinity Map Boring Identification Diagram Subsurface Profile

Subsurface Cross-Sections

D. Hardister

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Geotechnical Report

Final Boring Logs

Site Photographs

# PROJECT:

## STATE OF NORTH CAROLINA

STATE STATE	PROJECT NUMBEROOCH NO	<b>TE</b> *	THE
N.C. R	-2606A	1	17
STATE PROLISO.	F.A.PROLIFO.	MOCKET	1300
34480.1.1	STP-NHF-311-00	P.E	
		COMO	T

**DEPARTMENT OF TRANSPORTATION** 

DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

STATE PE	ROJECT <u>34480.1</u>	I.D. NO. R-2606A							
F.A. PROJECT <u>STP-NHF-311(3)</u>									
COUNTY RANDOLPH									
PROJECT DESCRIPTION Bridge on Poole Road ove									
US 311									
SITE DES	CRIPTION								

For Letting

#### CAUTION NOTICE

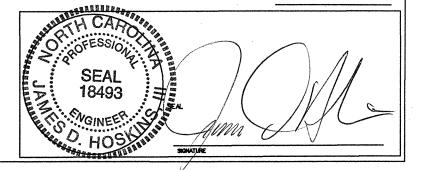
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANINIG AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VAROUS FIELD BORNIG LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY EXPENSED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT 8 (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNIG LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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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 DEELS NECESSARY TO SATISFY HASSLEF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS 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.

- NOTE THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.
- NOTE BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAVES ANY CLAMS
  FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE
  CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

INVESTIGATED BY D. Hardister	PERSONNEL D. Harris
CHECKED BY JD Hoskins III	S. Tierney
SUBMITTED BY JD Hoskins III	R. Benfield
DATESeptember 8, 2004	



#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

#### SUBSURFACE INVESTIGATION

							SOIL AND	ROCK	LEGEND, TERM	S. SYMBO	OLS. A	AND ABBREV	'IATIONS		
	IIOS	DESCRIPTION	- IN				GRADATION			T			DESCRIPTION		TERMS AND DEFINITIONS
Which can be penet 1868 Blows per foot Classification is b	TO BE THE UNCONSOLIDATED RATED WITH A CONTINUOUS ACCORDING TO STANDARD F ASSED ON THE AASHTO SYSTI TEXTURE, MOISTURE, AASHTO	, SEMI-CONSOLIDAT FLIGHT POWER AUG ENETRATION TEST ( EM AND BASIC DESC	TED OR WEATHER ER, AND WHICH Y (AASHTO T286, A CRIPTIONS GENER	(Telds Less Than Istm D-15861, Soil Rally Shall Include	-	UNIFORM- INDICATES THAT SOIL POORLY GRADEDI GAP-GRADED- INDICATES A MIXT	DOO REPRESENTATION OF PARTICLE 1. PARTICLES ARE ALL APPROXIMAT TURE OF UNIFORM PARTICLES OF T ANGULARITY OF GR	ITELY THE SAME SI TWO OR MORE SIZE GRAINS	ize. (ALSO	ROCK LINE I SPT REFUSA IN NON-COAS OF WEATHER	INDICATES N. IS PENE STAL PLAI RED ROCK.	DASTAL PLAIN MATERIAL THE THE LEVEL AT WHICH NOW ETRATION BY A SPLIT SPOO	hat when tested, would yield n-coastal plain material woul on sampler equal to or less fion between soll and rock is	D YIELD SPT REFUSAL. THAN BLI FOOT PER 68 BLOWS.	ALLUVIUM (ALLUV.) - SOILS WHICH 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.
	OMPOSITION, ANGULARITY, STE VERY STIFF, GRAY SILTY CLAY, MOIST WIT	•			l	THE ANGULARITY OR ROUNDNESS SUBANGULAR, SUBROUNDED, OR 1	is of soil grains are designate rounded.	ED BY THE TERMS	ANGULAR,	WEATHERED	9	2525	PLAIN MATERIAL THAT YIELDS S	PT N VALUES > 199 BLOWS	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
	SOIL LEGEND AND						MINERALOGICAL COMP	POSITION		ROCK (WR)		PER FOOT.	RSE GRAIN IGNEOUS AND METAMOR		ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE
GENERAL G	GRANULAR MATERIALS 95% PASSING *2001	SILT-CLAY M	HATERIALS	ORGANIC MATERIA		MINERAL NAMES SUCH AS QUAR WHENEVER THEY ARE CONSIDERE	ITZ, FELDSPAR, MICA, TALC, KAOLIN, E ED OF SIGNIFICANCE.	etc. Are used in	DESCRIPTIONS	CRYSTALLINE ROCK (CR)		WOULD YIELD GNEISS, GABBR	SPT REFUSAL IF TESTED, ROCK RO, SCHIST, ETC.	TYPE INCLUDES GRANITE,	GROUND SURFACE. <u>CALCAREOUS (CALCJ</u> - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 CLASS. A-1-a A-1	A-3 A-2 I-b A-2-4 A-2-5 A-2-6			-1, A-2 A-4, A-5 A-3 A-6, A-7	-	SLIGHTLY COMPRESSI	COMPRESSIBILIT	ITY Lidd Limit Less th	JAN 30	NON-CRYSTALLI ROCK (NCR)	INE E	SEDDMENTARY	ise grain metamorphic and non rock that would yelld spt re lllite, slate, sanostone, etc.		COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL BOOKS						MODERATELY COMPRE HIGHLY COMPRESSIBL	ESSIBLE LIQU LE LIQU	uid limit 31–58 uid limit Greater		COASTAL PLAIN SEDIMENTARY R	ROCK	COASTAL PLAI	n sediments cemented into ro Rock type includes limeston	CK, BUT MAY NOT YIELD E, SANOSTONE, CEMENTED	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.
PASSING SØ MX			GR	ANULAR SILT-	MUCK,	0004470 444777744	PERCENTAGE OF MA GRANULAR SILT- CLAY						EATHERING		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
* 48 38 MX58 * 298 15 MX 25	HXIII HX 35 MX 35 MX 35 MX	35 HX36 MN36 MN	l s	OILS CLAY SOILS	PEAT	TRACE OF ORGANIC MATTER	SOILS SOILS 2 - 3% 3 - 5%	TRACE	MATERIAL 1 - 1872			SH, CRYSTALS BRIGHT, FEW F CRYSTALLINE.	JOINTS MAY SHOW SLIGHT STAIN	IING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
IOUID LIMIT LASTIC INDEX 6 MX		41 MN 48 MX 41 MN L1 MN 18 MX 18 MX		SOILS WITH		LITTLE ORGANIC MATTER MODERATELY ORGANIC HIGHLY ORGANIC	3 - 5% 5 - 12% 5 - 19% 12 - 29% >19% >29%	LITTLE SOME HIGHLY	18 - 28% 28 - 35% 35% and above	(V. SLI)	CRYSTALS	ON A BROKEN SPECIMEN F	ained, some joints may show to face shine brightly, rock ring		DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, NEASURED CLOCKWISE FROM NORTH.
ROUP INDEX B ISUAL TYPES STONE FRA	B B 4  GS. FINE SILTY OR CLAY		16 MX No MX CLAYEY	MODERATE	RGANIC SOILS	V	GROUND WATE  EVEL IN BORE HOLE IMMEDIATEL		₹G.	SLIGHT	ROCK GEN		AINED AND DISCOLORATION EXTEN		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
if najor   Gravel an Vaterials   Sand	SAND GRAVEL AND S		SOILS	MATTER			TATER LEVEL AFTER 24 HOURS			'	CRYSTALS	ARE DULL AND DISCOLORE	ED. CRYSTALLINE ROCKS RING UNI DW DISCOLORATION AND WEATHERI	DER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
enlrating as a e Subgrade	EXCELLENT TO GOOD	FAIR T		AIR TO POOR U	NSLITABLE	→ PW PERCHED  SPRING OR	WATER, SATURATED ZONE OR WAT	TER BEARING STR	MATA	040DJ	GRANITOID	ROCKS, MOST FELDSPARS : NO UNDER HAMMER BLOWS :	ARE DULL AND DISCOLORED, SOME AND SHOWS SIGNIFICANT LOSS OF	SHOW CLAY, ROCK HAS	PARENT MATERIAL.  FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
	P.I. OF A-7-5 ≤ L.L. CONSISTE	- 30 1 P.I. OF A- NCY OR DEN RANGE OF S	ISENESS	RANGE OF UNCONFID	en l	O 00 State of	MISCELLANEOUS SY			SEVERE (	AND DISCO	ILORED AND A MAJORITY S	RED OR STAINED, IN GRANITOID RI HOW KAOLINIZATION, ROCK SHOWS NLOGIST'S PICK, ROCK GIVES "CLU	SEVERE LOSS OF STRENGTH	THE STREAM.  FORNATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TY	PE COMPACTNESS OR CONSISTENCY	PENETRATION R	ESISTENCE	COMPRESSIVE STREE		ROADWAY EMBANKH WITH SOIL DESCRI		EST BORING	SAMPLE DESIGNATIONS		IF TESTEL	). WOULD YIELD SPT REFUS	AL.		JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY GRANULAR	VERY LOOSE LOOSE	4 4 TO				SOIL SYMBOL	→ AUGER	000000	S- BULK SAMPLE	(SEV.)	IN STRENG		ored or stained, rock fabric o Granitoid rocks all feldspars NG rock usually remain.		LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
MATERIAL (NON-COHESIVE	VERY DENSE  VERY SOFT	18 TO 38 TO >58	3Ø 5Ø 3	N/A <8.25		ARTIFICIAL FILL C ROADWAY EMBANKM	MENTS — CORE B OUNDARIES	BURING ST ORING WELL	- SPLIT SPOON SAMPLE - SHELBY TUBE SAMPLE	VERY SEVERE (	IF TESTEL ALL ROCK THE MASS REMAINING	2. <u>YIELDS SPT N VALUES &gt;</u> EXCEPT QUARTZ DISCOLOR IS EFFECTIVELY REDUCED . SAPROLITE IS AN EXAMPI	<u>189 BPF</u> KED OR STAINED, ROCK FABRIC EL I TO SOIL STATUS, WITH ONLY FR LE OF ROCK WEATHERED TO A DE	AGMENTS OF STRONG ROCK EGREE SUCH THAT ONLY MINOR	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOTJ IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED MATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SILT-CLAY MATERIAL	SOFT MEDIUM STIFF STIFF VERY STIFF	2 TO 4 TO 8 TO 15 TO	8 15	0.25 TO 0.5 0.5 TO 1 1 TO 2		ラバラバミ INFERRED ROCK LI イナティイ ALLUVIAL SOIL BO	A PIEZUM	METER	5- ROCK SAMPLE T- RECOMPACTED	COMPLETE F	ROCK REDU	ICED TO SOIL. ROCK FABRI	abric remain. <i>I<u>f Tested yiell</u></i> IC not discernible, or discerni Z may be present as dikes or	BLE ONLY IN SMALL AND	RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE MEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE)	HARD	>36	9	2 TO 4 >4	:	25/825 DIP/DIP DIRECTION ROCK STRUCTURES	N OF () INSTALL	INDICATOR LLATION CE	TRIAXIAL SAMPLE BR - CBR SAMPLE		ALSO AN E		K HARDNESS		ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
		OR GRAIN				- SOUNDING ROD	O- SPT N-			VERY HARD		BE SCRATCHED BY KNIFE O	OR SHARP PICK, BREAKING OF HAN	ID SPECIMENS REQUIRES	SAPPOLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
LS. STD. SIEVE SIZE OPENING 04M0				27Ø Ø.Ø53			ABBREVIATIONS			HARD	CAN BE S	HARD BLOWS OF THE GEOL SCRATCHED BY KNIFE OR P. CH HAND SPECIMEN.	LOGISTS PICK. PICK ONLY WITH DIFFICULTY, HAR	D HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL
(BLDRJ)	COBSLE GRAVEL (COBJ (GRJ)	SAND (CSE, SD.)	SAND (F. SD.)	(SL.)	ILAY ICL.)	AR - AUGER REFUSAL BT - BORING TERMINATED CL CLAY	HSA – HOLLOW STEM MED. – MEDIUM MIC. – MICACEDUS	AUGER	W - MOISTURE CONTENT V VERY VST - VANE SHEAR TEST		CAN BE S	SCRATCHED BY KNIFE OR P	PICK, GOUGES OR GROOVES TO BUR EDLOGISTS PICK, HAND SPECIMEN		TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS  SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 SIZE IN. 12°	3*		8.25	0.05 0.005		CPT - CONE PENETRATION TE CSE COARSE	MOME - NO COMMONATED I	D	WOH - WEIGHT OF HAMMER		CAN BE		INCHES DEEP BY FIRM PRESSURE IS TO PEICES 1 INCH MAXIMUM SI		STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 148 LB, HAMMER FALLING 38 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTURI		MOTOTINE		KMS ELD MOISTURE DESC		CT - CORING TERMINATED  DMT - DILATOMETER TEST  DPT - DYNAMIC PENETRATION	SO SAND, SANDY SL SILT, SILTY SLI SLIGHTLY				POINT OF	A GEOLOGISTS PICK.	Y BY KNIFE OR PICK, CAN BE EX		A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 8.1 FOOT PENETRATION WITH 68 BLOWS.
	- SA	TURATED -		IID; VERY WET, USUAL THE GROUND WATER		• - VOID RATIO F FINE FOSS FOSSILIFEROUS	TCR - TRICONE REFUS	JSAL		VERY	PIECES C	AN BE BROKEN BY FINGER			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 IS.R.Q.D.J A MEASURE OF ROCK QUALITY DESCRIBED BY:
LASTIC	UID LIMIT	***************************************		OUIRES DRYING TO	THOLE	FRAC FRACTURED FRAGS FRAGMENTS	7d - DRY UNIT WEIG	IGHT		SOFT		IN THICKNESS CAN BE BRO	BE EXCAVATED READILY WITH POIL OKEN BY FINGER PRESSURE, CAN		TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUN EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
RANGE <   PLA	STIC LIMIT	ET - (W)	ATTAIN OPTIM		F	EQUI	PMENT USED ON SUBJ	JECT PROJE	СТ		ACTURE	SPACING		DING THICKNESS	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
•					ion pe	DRILL UNITS:	ADVANCING TOOLS	4	ER TYPE	IERM VERY WIDE		SPACING MORE THAN 10 FEET	TERM VERY THICKLY BEDDED	> 4 FEET	BENCH MARK: BL-506 Sta. 29+63.34 -BL- (Sta. 14+60.14, 28.5' LT -L-)
	MUM MOISTURE - M INKAGE LIMIT	DIST - (M)	SULINI AT UK	R NEAR OPTIMUM MO	ISTURE.	MOBILE 8	CLAY BITS	LXI '	AUTOMATIC MANUAL	WIDE MODERATEL		3 TO 10 FEET	THICKLY BEDOED THINLY BEDOED	1.5 - 4 FEET 8.16 - 1.5 FEET	ELEVATION: 760.89 ft
	<b>-</b> D	RY - (D)	REQUIRES ADDI	ITIONAL WATER TO		BK-51	6° CONTINUOUS FLIGHT AUG		SIZE	CLOSE VERY CLOS		8.16 TO 1 FEET LESS THAN 8.16 FEET	VERY THINLY BEDOED THICKLY LAMINATED	9.83 - 8.16 FEET 8.886 - 9.83 FEET	NOTES:
	О	LASTICITY	HITTEN OF ILER	OH HOISTONE			6' HOLLOW AUGERS	1	B				THINLY LAMINATED DURATION	< 8.868 FEET	
		CITY INDEX (PD		DRY STRENGTH		CHE-45	HARD FACED FINGER BITS  TUNGCARBIDE INSERTS	U.		FOR SEDIMENTA	RY ROCKS,		ENING OF THE MATERIAL BY CEM	ENTING, HEAT, PRESSURE, ETC.	1
NONPLASTIC		6-5 6-15		VERY LOW SLIGHT	1	X CME-558	X TUNG,-CARBIDE INSERTS X CASING W/ ADVANCE	PCD	н <u>а</u>	FRIA	ABLE		ig with finger frees numerous e blow by hammer disintegrat		
LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY		16-25		MEDIUM HIGH		PORTABLE HOIST	TRICONE STEEL	HANG	TOOLS: Post hole digger	Mone	ERATELY I		CAN BE SEPARATED FROM SAMP		
MAT FERBILLIT		26 OR MORE  COLOR	·	* 1447 *	——	OTHER CME-55 TM	TRICONE TUNGC		HAND AUGER			BREAKS	S EASILY WHEN HIT WITH HAMME		
DESCRIPTIONS N	MAY INCLUDE COLOR OR O		ONS (TAN, RED, )	YEL-BRN, BLUE-GRAY	,		CORE BIT		SOUNDING ROD	INDU	RATED		s are difficult to separate v Jult to Break With Hammer.	IITH STEEL PROBE:	
	H AS LIGHT, DARK, STREAK					OTHER	OTHER	—	VANE SHEAR TEST OTHER	EXTR	REMELY IN		HAMMER BLOWS REQUIRED TO BE E BREAKS ACROSS GRAINS.	EAK SAMPLE;	
		<del></del>		****						**************************************					REVISED 09/15/00

WBS ELEMENT (TIP):

34480.1.1 (R-2606A)

**FEDERAL PROJECT:** 

STP-NHF-311(3)

**COUNTY:** 

Randolph

**DESCRIPTION:** 

Bridge on Poole Road over US 311

**SUBJECT:** 

Geotechnical Report of Subsurface Exploration

#### **Project Description:**

Geoscience Group, Inc. (Geoscience) has completed the authorized geotechnical investigation for the above referenced project in Randolph County, North Carolina. The bridge will be located in northern Randolph County, near Archdale. More precisely, the bridge will be located on Poole Road at its intersection with US 311. A Site Vicinity Map is included in the following pages. The project will consist of the construction of a two-span plate girder bridge with an overall length of 224.4 feet, a width of 32.1 feet (out to out) and a skew angle of 86° 17' 38". Minimal fill is required at the end bents, with up to 25 feet of cut at the interior bent. The 2H:1V end bent slopes are to be protected with concrete.

The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations. The subsurface exploration was conducted on August 8 and on August 9, 2004. This exploration consisted of the execution of six (6) soil test borings. Using points surveyed by Geoscience personnel, the actual boring locations were measured for location using a tape measure and approximate right angles. Using an NCDOT provided benchmark, the boring locations were surveyed for elevation by the Geoscience personnel. Drilled boring locations are shown on the Boring Identification Diagram included in the following pages.

The soil test borings were advanced using a CME 550x drilling machine utilizing hollow-stem auger and rotary drilling techniques. In each boring, Standard Penetration tests were performed in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil samples were recovered for visual classification in the field. The split-barrel soil samples were returned to our laboratory for testing. Water for drilling purposes was obtained from a residential water supply. Drilling mud slurry was not utilized during the investigation. Core samples of the underlying weathered rock and bedrock were obtained from boring B1-B. The core samples were obtained using an HQ wireline barrel. The core samples were returned to our laboratory for review and classification as well as laboratory testing.

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Laboratory testing was performed on representative split-barrel samples to aid in the assessment of AASHTO soil classification and to refine data for evaluation of engineering properties. The laboratory testing consisted of natural moisture content determinations, Atterberg Limits tests, and grain size analyses with hydrometer. The soil laboratory tests performed were in general accordance with AASHTO and NCDOT specifications. Rock core specimens were selected for laboratory testing of unconfined compressive strength. These tests were performed in general accordance with ASTM Method D 2938. The results of the soil laboratory tests and a rock core test summary are included in the following pages. Complete rock core testing results are provided in Appendix C under separate cover.

#### **Physiography and Geology:**

The project site is located in the Carolina Slate Belt of the Piedmont Physiographic Province of North Carolina. According to the 1985 Geologic Map of North Carolina, the site is located in an area consisting of metamorphosed granite of Cambrian to Late Proterozoic in age. The core samples obtained on-site consist of tan-black-white moderately severely to very slightly weathered, moderately to very hard metamorphosed granite. It should be noted that diabase, in the form of dikes, is present at the site. The overlying soils are the residual product of the physical and chemical weathering of the underlying bedrock. Site topography is relatively flat in the area of the bridge.

#### **Foundation Materials:**

Foundation materials present at the site consist of roadway embankment fill, residual soils, partially weathered rock, and crystalline rock. Subsurface conditions will be described across the site.

Roadway embankment fill is present along end bent-2 to an elevation of approximately 752 feet. The roadway embankment fill is associated with a culvert below the road in this area. The roadway embankment fill consists of moist medium dense silty coarse to fine SAND (A-2-4) and moist stiff clayey fine sandy SILT (A-4). Blow counts of 10 and 12 blows per foot (bpf) were measured in the roadway embankment fill.

Residual soil is present below the fill along end bent-2, is present from the ground surface at end bent-1, and is present interlayered with weathered rock in B1-B. The residual soils consist of soft to very stiff sandy silty CLAY (A-7-5), very stiff to hard fine sandy SILT (A-4), and loose to very dense silty coarse to fine SAND (A-2-4). Blow counts in the residual soils range between 4 and 58 bpf. Moistures range between dry and wet.

Weathered rock is present at the ground surface along bent-1. Additionally, weathered rock begins at elevations ranging between 752 and 734 feet along the end bents. The weathered rock consists of tan-black-white weathered metamorphosed granite. Within B1-B, the cored weathered rock consists of severely weathered medium hard and soft metamorphosed granite and diabase with close and very close fracture spacing. In B1-B, strata recovery values of the weathered rock ranges between 90 and 100 percent. The specimen from B1-B at 35.3 feet had an unconfined compressive strength of 750 pounds per square inch (psi). The end bent borings were terminated in weathered rock.

Crystalline rock is present in borings B1-A and B1-B. The crystalline rock begins at elevations of 748.3 and 747.9 feet, respectively. The crystalline rock generally consists of tan-black-white moderately severely to moderately weathered moderately hard metamorphosed granite with close fracture spacing to a depth of 12 feet below the rock line. From 47.7 feet, the quality of the rock is appreciably better and consists of white-black slightly and very slightly weathered hard and very hard metamorphosed granite with close to moderately close fracture spacing. Strata recovery of the crystalline rock ranges between 88 and 100 percent, with no apparent improvement with depth. Strata RQD being between 46 and 96 percent and improved with depth. The specimen from B1-B at 51.0 feet had an unconfined compressive strength of 4,190 psi. Boring B1-A was terminated in crystalline rock with SPT refusal at an elevation of 734.9 feet. Coring was terminated in B1-B at an elevation of 701.5 feet.

After completion of each boring, temporary piezometers (slotted PVC pipe) were installed in the boreholes. Piezometers were used to measure stabilized groundwater levels at least 24 hours after the completion of drilling. Groundwater elevations range between 746 and 742 feet. Groundwater control may be required. We do not anticipate groundwater to fluctuate more than 2 feet annually.

#### **Notes to the Designer:**

Weathered rock and crystalline rock are present within the anticipated cut area for US 311. Crystalline rock begins around elevation 748 feet. Proposed grade for US 311 is around 734 feet.

#### Closure:

The geotechnical foundation investigation is based on the Preliminary General Drawing dated January 2004. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary. For soil descriptions and general stratification at a particular boring location, the respective Boring Log should be reviewed. Cross-sections and profiles are a generalized interpretation of soil conditions between borings and should not be considered accurate other than at the boring locations. Subsurface conditions between boring locations or elsewhere on the site may vary, and subsurface anomalies may exist which were not detected.

Geoscience Group, Inc. appreciates the opportunity to be of service to the NCDOT on this project. Should you have any questions concerning this report, please feel free to contact the undersigned.

Respectfully,

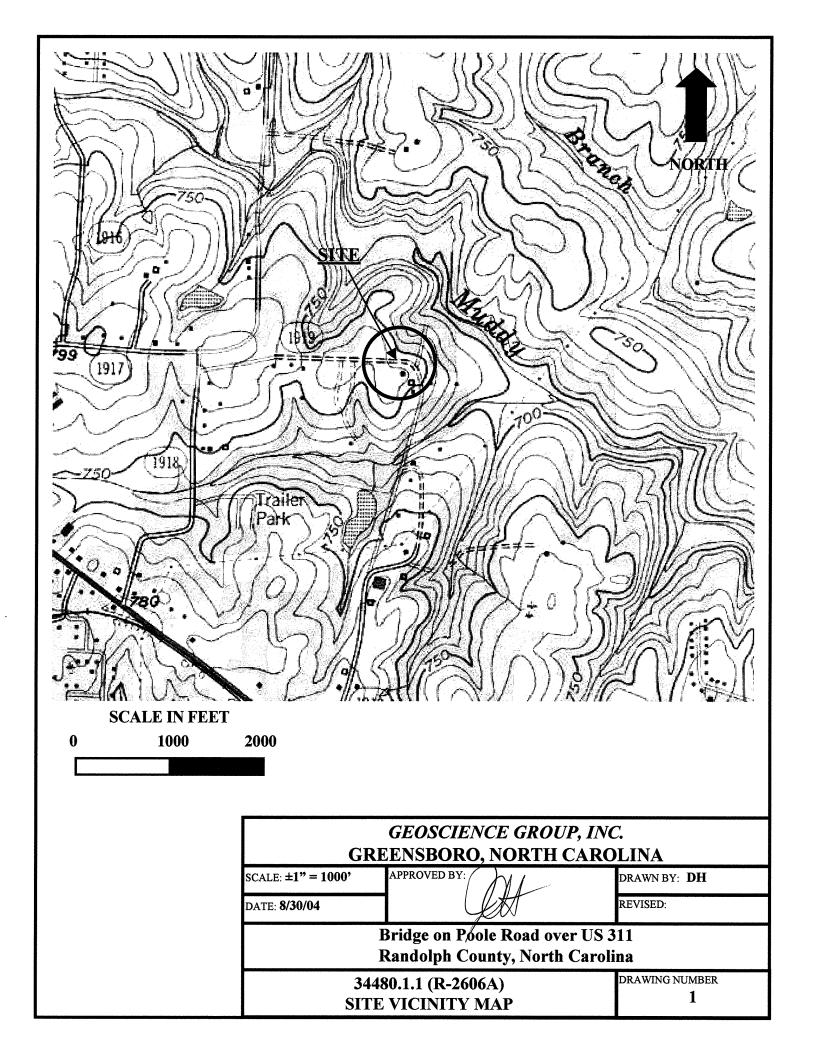
GEOSCIENCE GROUP, INC.

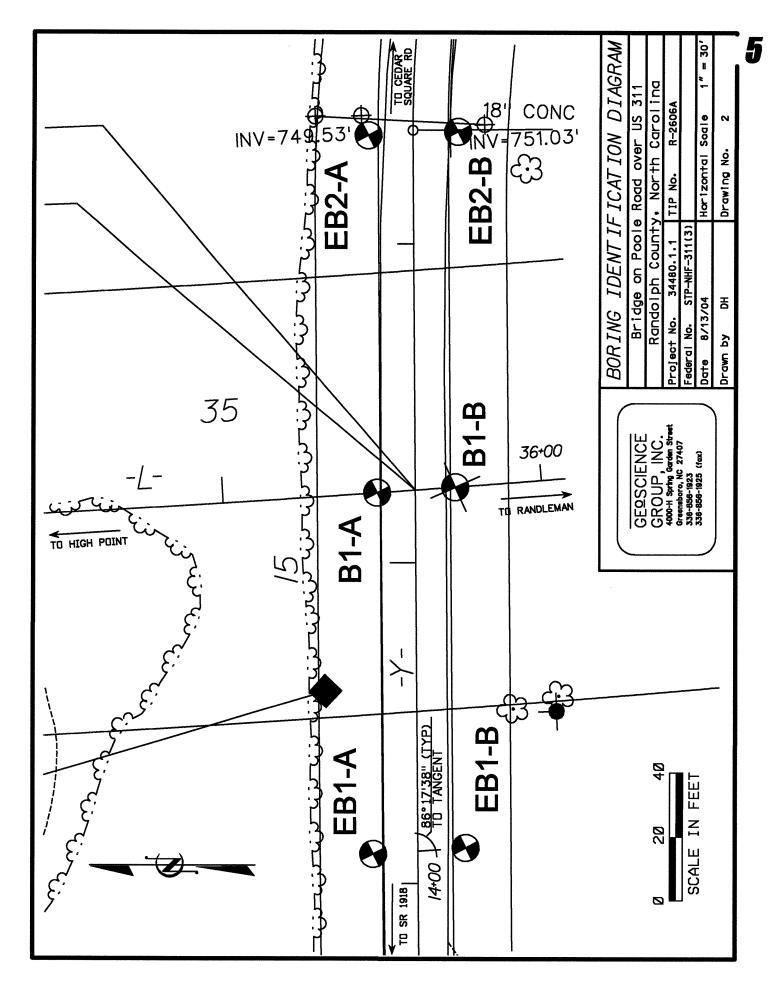
Dean Hardister, PE Project Manager

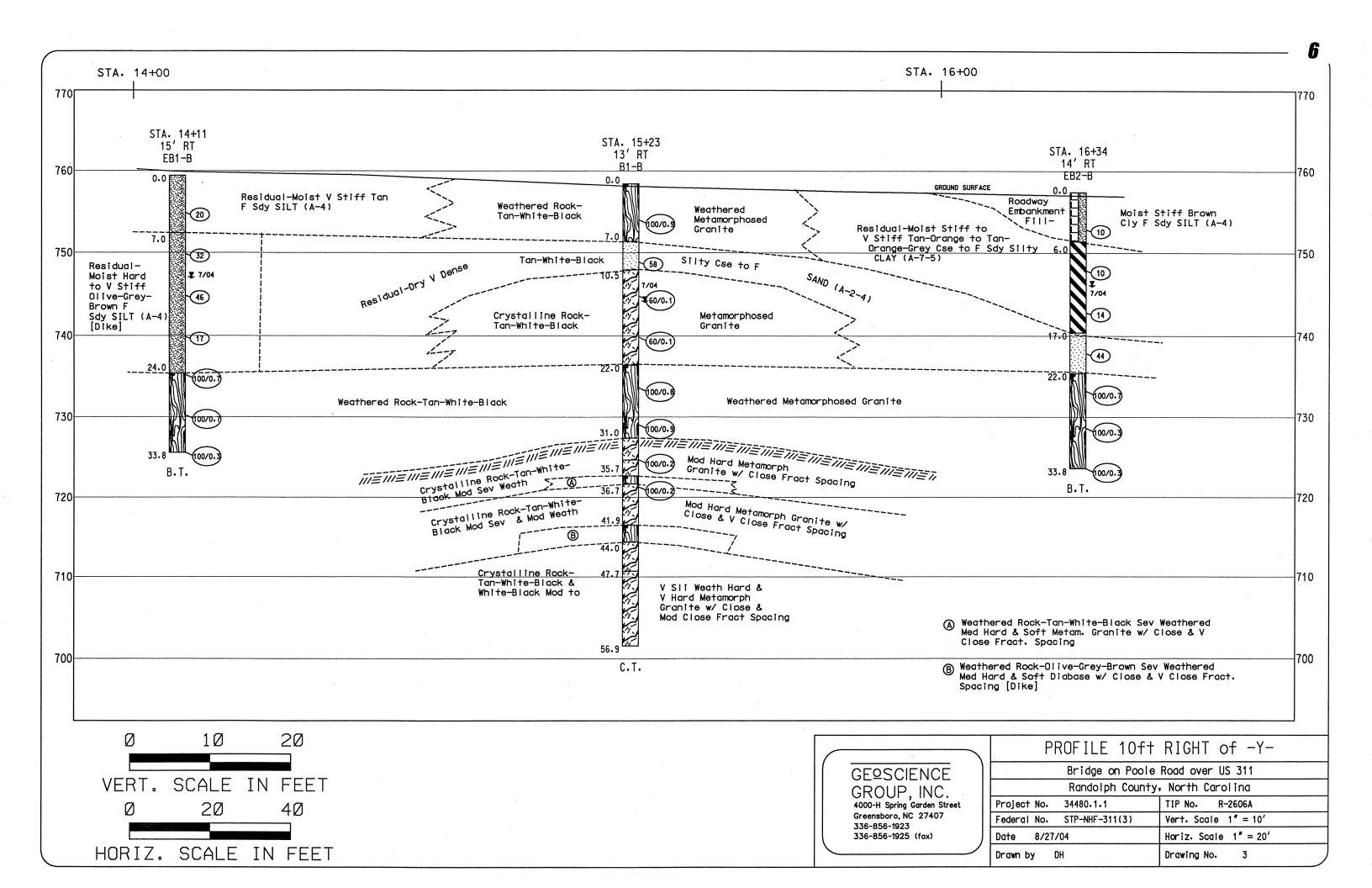
James D. Hoskins, III, PE

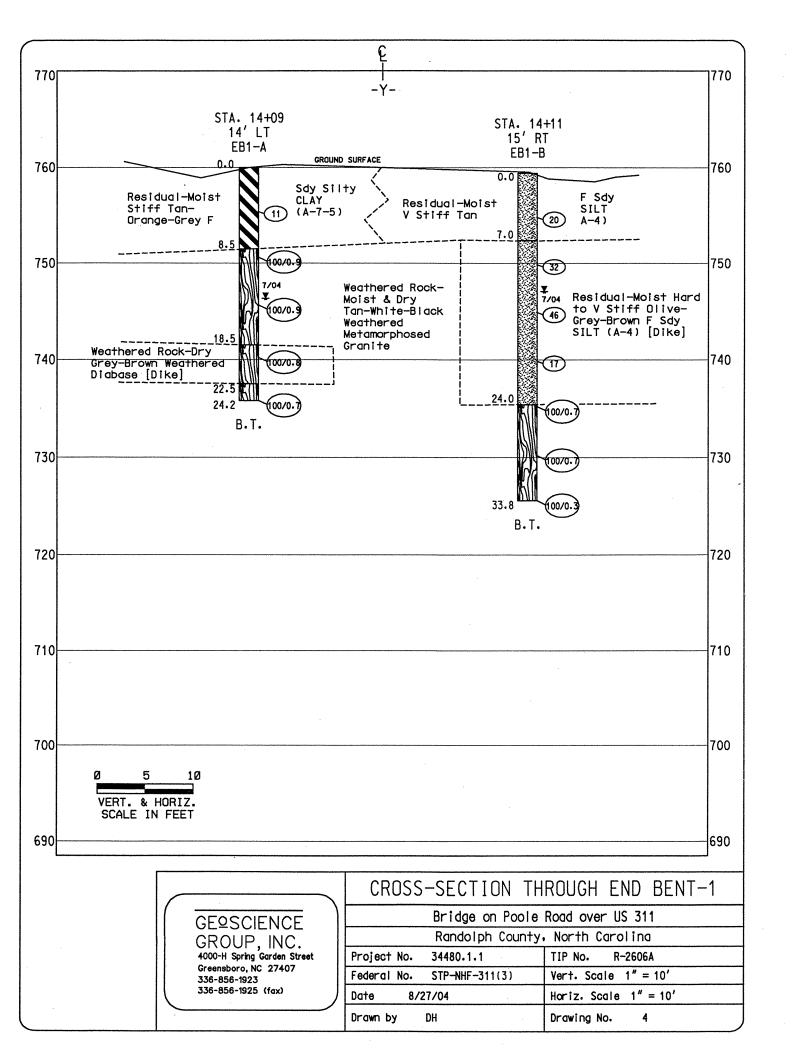
**Enclosures** 

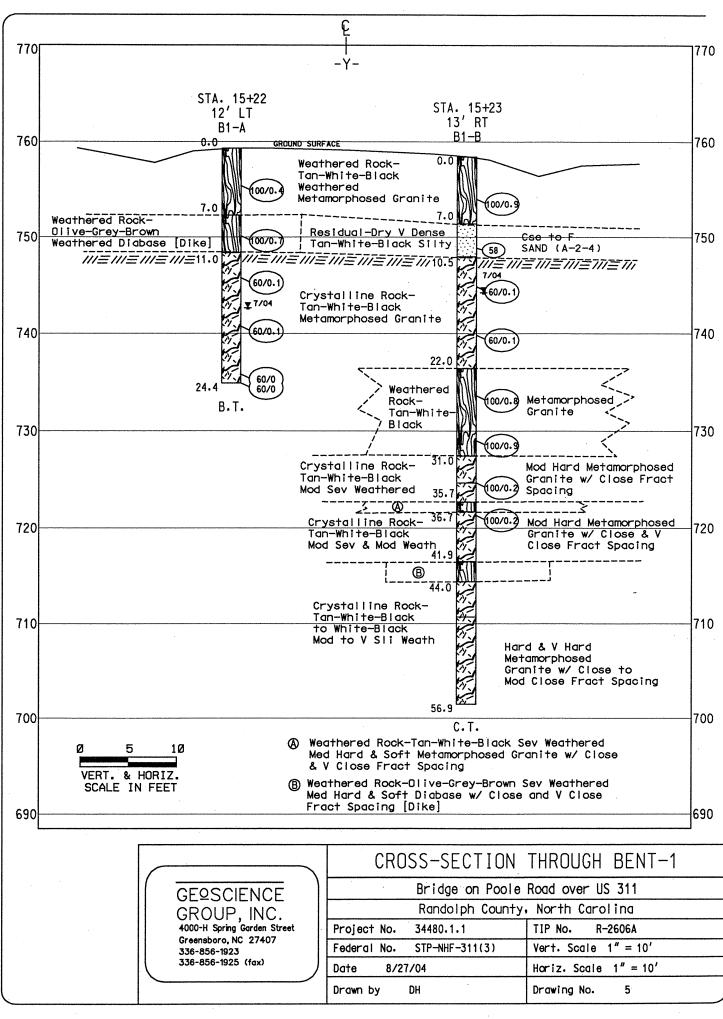
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770	-Y-		777(
760	STA. 16+34 14' LT EB2-A 0.0 GROUND SURFACE  Roadway Filty Cse	STA. 16-1 14' RT EB2-B 0.0 adway Embankment	
750	Embankment to F SAND Brown	<u></u>	750
740	Residual-Dry & M  Tan-White Silty  F SAND (A-2-4)	e & Tan-Orange- ilty CLAY (A-7-5) 	14) 
730	(00/0.8) Weathered Tan-White-	ROCK- II(III)	730
720	34.3 (00/0.8) B.T.	33.8 B.T.	720
710			710
·			
700	Ø 5 1Ø VERT. & HORIZ. SCALE IN FEET		700
690			690
	GEQSCIENCE GROUP, INC. 4000-H Spring Garden Street Greensboro, NC 27407 336-856-1923  Federal N	Bridge on Poole Randolph County o. 34480.1.1	ROUGH END BENT-2  Road over US 311  North Carolina  TIP No. R-2606A  Vert. Scale 1" = 10'  Horiz. Scale 1" = 10'  Drawing No. 6

## GEOSCIENCE GROUP

GEOSCIENCE GROUP, INC. **BORING LOG** 

PROJE	CT NO.	34480	111	ID.	R-2606A	FED	. NO. ST	P-NHE-3	11/3)	1	CO. F	Sando	alph	EIEI	D SUPERV.	D. Hardister	
	SCRIPT				ole Road ov			1 -14111 -0	11(0)			tanuc	o.p.i	1.122	D SOFERV.	GROUND V	
BORING		EB1-B	9-		ORING LOC		14+11	***************************************	OFFS	ET 15'	RT		ALIGNME	NT -\	/-	0 HR.	29.0
COLLA	R ELEV.	759	.4 ft	┰╌┸	L DEPTH	33.8 f	i	NORTHI		0336.69	<del></del>		EASTING			24 HR.	12.4
DRILL N	ACHINE	: CN	1E 550x	<del></del>	DRILL ME	THOD	HSA	<u> </u>			MMER	TYPE	<del></del>			SING DEPTH	N/A
DATE S	TARTED	8/9/	04	СОМЕ	LETED	8/9/04	DRIL	LING FLU	JID DENS		N/A		<del></del>		TER DEPTI		
ELEV.	DEPTH	BL	ow cor	JNT		BLC	WS PER F	OOT		SAMP.	V/	L		·			
(ft)	(ft)	0.5ft	0.5ft	0.5ft	P	20 1	40 6	0 80 1 1	100	NO.	мог	0 G		SOIL	AND ROCK	DESCRIPTION	
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	-					<u></u>						<b>*</b>	Re	sidual-Ha	rd to Very Sti (A-4) [Dike]	ff Olive-Grey-Bro	
+	- 8.5	7	14	18							м	<b>%</b> }	Oai	idy OiLi	(A-4) [Dike]		
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- 1	_	2.5.0							100/0.3	1	-	- 1	Bor	ing Termi	inated @ Elev norphosed Gr	. 725.6ft in Weat	hered

SHEET	1	OF	1

PROJE	CT NO.	34480	0.1.1	ID.	R-2606A FED. NO. STP-NHF-311(3)	co	. Ran	dolph		T 1 OF 1  D. Hardister
SITE DE	ESCRIPT	TION	Bridge	on Poo	ole Road over US 311					GROUND WATER (ft)
BORING	3 NO.	EB1-A		ВС	DRING LOCATION 14+09 OFFSET	Γ 14' LT		Α	LIGNMENT -Y-	OHR. NGWE
COLLA	R ELEV.	760	.0 ft	TOTAL	L DEPTH 24.2 ft NORTHING 7803	365.76		E	ASTING 1728840.13	24 HR. 13.7
DRILL N	ACHINE	E CN	ЛЕ 550x	. 1	DRILL METHOD HSA	НАМ	IER TY			SING DEPTH N/A
DATE S	TARTED	8/9	/04	ــــــــــــــــــــــــــــــــــــــ	PLETED 8/9/04 DRILLING FLUID DENSIT		I/A		SURFACE WATER DEPTH	
ELEV.	DEPTH	·	OW COL	<u> </u>	T		// L	T	TOOK AGE WATER BEI TH	I IVA
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 20 40 60 80 100		O MOI G		SOIL AND ROCK [	DESCRIPTION
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760.0	0.00				Ground Surface Elev. 760.0 ft			76		
									Residual-Stiff Tan-Orange CLAY (A-7-5)	-Grey Fine Sandy Silty
								T		
	3.5	4	5	6		SS-1 3	8.5			
-	-	"	"	"	●11	55-1 3	8.5			
755-	_							1		
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	-									
-	- 8.5							75	1.5	
-	-	14	86/0.4		[			-	Weathered Rock-Tan-Whi	te-Black Weathered
750-	_				100/0.9		N/N	<b>L</b>	Metamorphosed Granite	
							M	IL.		
	13.5	19	81/0.4					W		
		"	0170.4		100/0.9	*		lt		
745-	-							}		
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-	-						W.	╟		
-	18.5				[			74	.5	
		24	43	57/0.3	1			-	Weathered Rock-Grey-Bro	
740-	-						W.	W_	[Dike]	
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1	-							F	Rock (Metamorphosed Gra	anite)
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## GEOSCIENCE GROUP

GEOSCIENCE GROUP, INC. BORING LOG

SHEET 1 OF 1

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PROJE		34480				D. NO. STP-NHF-311	(3)		co.	Rando	olph FIELD SUPERV.	D. Hardister
SITE DE	ESCRIPT	ION	Bridge	on Poo	le Road over US 3	311	·				<b>,</b>	GROUND WATER (ft)
BORING	G NO.	B1-A		ВС	RING LOCATION	15+22	OFFSI	ET 12'	LT		ALIGNMENT -Y-	0 HR. NGWE
COLLA	R ELEV.	759	.3 ft	TOTAL	L DEPTH 24.4	ft NORTHING	78	0360.26	5		EASTING 1728952.66	24 HR. 16.7
ORILL N	/ACHINE	CN.	ЛЕ 550x		DRILL METHOD	HSA		НА	MMEF	TYPE	Automatic FINAL CA	SING DEPTH N/A
DATE S	TARTED	8/9/	04	СОМР	PLETED 8/9/04	DRILLING FLUI	D DENS	ITY	N/A		SURFACE WATER DEPT	
ELEV.	DEPTH	BL	ow cor	<u> </u>	T	OWS PER FOOT		SAMP.	<b>V</b> /	1-1		
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 20	40 60 80	100	1	MO	0     G	SOIL AND ROCK	DESCRIPTION
								<u> </u>	Į mo			
759.3	0.00				Ground S	Surface Elev. 759.3 ft			ļ		759.3	
7						·				MI	Weathered Rock-Tan-Wr Metamorphosed Granite	nite-Black Weathered
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-	<b> </b>									DW		
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	- 8.5									MIL	Diabase [Dike]	
750 -		43	57/0.2				100/0.7	1	D	MIL	<u></u>	
										V		
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											Crystalline Rock-Tan-Wh Metamorphosed Granite	ite-black
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745										阿	-	
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+	- 18.5	60/0.1					60/0.1		D	المنزأ	•	
740	-	50/0.1					5,4,6,1			())	<del>-</del>	
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735	- 24.4	60/0					.60/0		D		_734.9	
135	<u> </u>	60/0					60/0		Ď	<del> " </del>	Boring Terminated with S Refusal at Elev. 734.9ft in	tandard Penetration Test
1											(Metamorphosed Granite)	)
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# GEOSCIENCE GROUP

#### GEOSCIENCE GROUP, INC. **BORING LOG**

SHEET 1 OF 2

PROJE	CT NO.	34480	).1.1	ID. F	R-2606A FED.	NO. STP-NH	IF-311(3)	T (	CO. Rand	olph FI	ELD SUPERV.	D. Hardister	
SITE DE	ESCRIPT	ION	Bridge	on Poo	le Road over US 31		· · · · · · · · · · · · · · · · · · ·			<u></u>	·····	GROUND W	ATER (ft)
BORING	G NO.	B1-B		во	RING LOCATION	15+23	OFFS	ET 13'	RT	ALIGNMENT	-Y-	0 HR.	N/M
COLLA	R ELEV.	758	.4 ft	TOTAL	. DEPTH 56.9 ft	NOR	THING 78	0335.77		EASTING 172	28953.44	24 HR.	14.2
DRILL N	MACHINE	E CN	1E 550x	<u>' T</u>	DRILL METHOD	HSA/HQ		НА	MMER TYP	E Automatic	FINAL CAS	SING DEPTH	33.7 ft
DATE S	TARTED	8/10	0/04	СОМР	LETED 8/10/04	DRILLING	FLUID DENS	SITY	Tap Wate	r SURFACE	WATER DEPTH	N/A	
ELEV.	DEPTH	BL	ow cou	INT	BLO	WS PER FOOT		SAMP.	V/L				
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 20 4	0 60	80 100	NO.	MOI G	S	OIL AND ROCK [	DESCRIPTION	
758.4	0.00				Ground Su	ırface Elev. 75	58.4 ft		ME (1)	758.4 Weather	ed Rock-Tan-Whi	te-Black Weather	0. ed
											phosed Granite		
										-	*		
766	3.5									<u>.</u>			
755-		36	64/0.4						D. (	-			
. 1	T .						100/0.9			-			
-	†									-			
	<b>†</b>									- 751.4			,
	-									- Residual	-Very Dense Tan- o Fine SAND (A-2	-White-Black Silty	
750-	8.5	10	12	46			• • • • •	SS-3	D	·	O . IIIO OMNO (M-2	• 7/	
	-	10	12	70	• • • • • • • •	• · · · • • · · • • • • • • • • • • • •		00-3		-			
	-					· · · · <u>  · · ·</u>				_ 747.9			10
	_										ie Rock-Tan-Whit phosed Granite	e-Black	
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745-	_ 13.5						]				•		
140		60/0.1					60/0.1		V				
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740	_ 18.5	60/0.1					60/0.1						
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1	-					<i>.</i>				-			
1										736.4			22
+	-								KIII		ed Rock-Tan-Whit phosed Granite	te-Black Weather	
735	_ 23.5	20	27	73/0.3					///// w ////				
+	-			. 5. 5. 5						-			
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	_								11/11	•			
730	_ 28.5								10)11	_			
, 30		12	88/0.4				]		M				
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1										727.4			31
t											e Rock-Tan-White phosed Granite	e-Black	
1	-												
725	_ 33.5	100/0.2					100/0.2			<del>-724.7</del>			33
+	-					· · · · · · ·	100/0,2			Severely	Weathered Mode	e-Black Moderate rately Hard	•
+								RS-1	1	Metamor	ohosed Granite w	ith Close Fracture	35
1	36.9								KIII	Weathere	ed Rock-Tan-Whit	e-Black Severely	
<u> </u>	20.3								K-7,1,1	* veaulele			

# GEOSCIENCE GROUP

GEOSCIENCE GROUP, INC. **BORING LOG** 

PROJE	CT NO.	34480	).1.1	ID.	R-2606A	FED.	NO. ST	P-NHF-311	1(3)		co.	Rando	olph FIE	LD SUPERV	ET 2 OF 2  D. Hardiste	er
SITE DI	ESCRIPT	ION	Bridge	on Poo	ole Road ov	er US 31	1								GROUND	WATER (ft
BORING	G NO.	B1-B		В	ORING LOC	NOITA	15+23		OFFS	ET 13	'RT		ALIGNMENT	-Y-	0 HR.	N/M
COLLA	R ELEV.	758	.4 ft	TOTA	L DEPTH	56.9 ft		NORTHIN	G 78	0335.7	7		EASTING 1728	953.44	24 HR.	14.2
RILL N	/ACHINE	CN.	⁄IE 550х	1	DRILL MET	HOD	HSA/HC	)		H	AMME	R TYPI	E Automatic	FINAL CA	ASING DEPTH	33.7 ft
ATE S	TARTED	8/10	0/04	СОМЕ	PLETED 8	/10/04	DRIL	LING FLUI	D DENS	ITY	Тар	Water	SURFACE W	ATER DEPT	'H N/A	
ELEV.	DEPTH	BL	ow cou	JNT		BLOV	VS PER F	оот		SAMP	. 🔻	L		II AND BOOL	C DESCRIPTION	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	0 40	0 60	0 80	100	NO.	МС		. 30	IL AND ROOF	\ DESCRIPTION	
•																
-	-	100/0.2		<del>                                     </del>					100/0.2	-	D		- Metamorpi	nosed Granite	with Close and V	ery /
720 -	_				1								<ul> <li>Crystalline</li> </ul>	ture Spacing Rock-Tan-W	hite-Black Modera	itely
-	_												Severely a	nd Moderatel	y Weathered Mod ranite with Close	erately
_													Very Close	Fracture Spa	acing	
													_			
												rii	716.5 Weathered	Rock-Olive-0	Grey-Brown Sever	elv
7												MI	Weathered	l Medium Har	d and Soft Diabas racture Spacing [	e with
715-	-												714.4			
•	-												Slightly We	eathered Hard	hite-Black Modera I Metamorphosed	itely to Granite
-	-					<b>.</b> .						TO THE	with Close	Fracture Spa	cing	
-	-											TO THE	•			
-	-												710.7	Deal To MA		·
710-	_												Very Slight	ly Weathered	nite-Black Slightly Hard and Very H	ard
-	-											杨	Metamorph Close Frac	nosed Granite ture Spacing	with Close to Moo	derately
-	- 1				1	•.• • •						17.				
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	_												Rock (Meta -	amorphosed (	Granite)	
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#### GEOSCIENCE GROUP

#### GEOSCIENCE GROUP, INC. CORE BORING REPORT

SHEET 1 OF 2

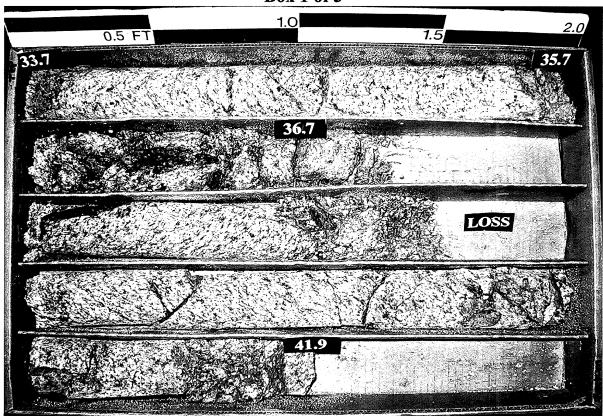
DDO II	COT NO	2.4	400 4 4	1,5	D 000	· · · · · · · · · · · · · · · · · · ·	Teen .		- D NU I = 0444	^`	Tag 5		T			-1 1 OF 2	
<b> </b>	ECT NO.		480.1.1		R-260		- <del>l</del>		P-NHF-311(	3)	CO. Rar	ndolph		FIELD	SUPERV	1	· · · · · · · · · · · · · · · · · · ·
<del> </del>	DESCRIF			<u></u>			US 311								<del></del>	GROUND	WATER (ft)
ļ	NG NO.	B1-		<del></del>		LOCAT		15+23	<del></del>	OFFSET	<del></del>	AL	IGNMENT	-Y	-	0 HR.	N/M
	AR ELE		758.4 ft		AL DEP		56.9 ft		NORTHING	78033	5.77	EA	STING 1	72895	53.44	24 HR.	14.2
<b> </b>	MACHIN		CME 550	<del></del>		L METH		HSA/H	Q		HAMMER TY	PE T	Automatic	С	FINAL CA	ASING DEPTH	33.7 ft
DATE	STARTE	D	8/10/04	COM	IPLETE	D 8/1	0/04	DRII	LLING FLUID	DENSITY	Tap Wat	ter	SURFAC	E WA	TER DEPT	H N/A	······································
CORE	<del>,</del>	HQ		l Di	UN	┰┸	L RUN	23.0 ATA	ft	DRILLER	D. Harris				<del></del>		·
ELEV.	DEPTH	RUN	DRILL RATE	REC.	RQD	SAMP.	REC.	RQD			DES	CRIPTIC	ON AND R	REMAR	KS		
(ft)	(ft)	(ft)	(Min./ft)	(ft) %	(ft) %	NO.	%	%					·····				
724.7	·										Ве	egin Co	oring @ 72	4.70 fl	t		
724.7	33.7	3.2	4:22	(3.2)	(1.4) 44%		2.0	1.4 70%		Crystalli Moderat	ne Rock-Tan- ely Hard Meta	White-E	Black Mod osed Gran	leratel nite wit	y Severely th Close F	y Weathered racture Spacing	a
							10075	,			-	•					
			2:11			RS-1				2 JTS @ 1 JT @ 2 JTS @	10-20° 240-50°						
							1.0	N/A	722.7			-White-	Black Sev	erely \	Weathered	d Medium Hard	35.7 and
			2:25				100%		721.7	Soft Met	amorphosed (	Granite	with Clos	e and	Very Clos	se Fracture Spa	icing 36.7
721.5	36.9		0:39/0.2			N=100/ 0.2	4.6	2.4	121.7	5 JTS @ 2 JTS @ 4 JTS @	0-10° 10-20°						J 30.7
721.3	37.1	4.8	3:05	(4.4) 92%	(2.4)		88%	46%	<b>-</b>	4 JTS @	80-90° S Not Discerni	ible					1
										Crystalli	ne Rock-Tan-	White-E	Black Mod	erately	Severely	and Moderate	ily
			1:41						r	Close F	acture Spacin	y i laiu ig	wetaniorp	0110560	i Granne v	With Close and	very
										4 JTS @	0-10°						
			2:22							1 JT @ 4 JTS @ 2 JTS @ 2 JTS @	20-30°						
			0.40						ļ .	2 JTS @	80-90°						
			, 2:40							Other Jt	s Not Discerni	ble					
716 5	410		2:13/0.8						716 5								44.8
716.5 716.5	41.9 41.9	5.0		(4.7)	(2.1)		1.9	N/A	716.5	Weather	ed Rock-Olive	e-Grey-	Brown Se	verely	Weather	ed Medium Har	41.9 d and
			7:49	94%	42%		90%		<u> </u>		base with Clos	se and	Very Clos	e Frac	ture Spac	ing [Dike]	
			6:38							2 JTS @ 2 JTS @	10-20°						
			0.00						714.4	1 JT @ ? 1 JT @ ?	50-60° 30-90°						44.0
			4:21				3.6 97%	2.9 78%	-	Crystalli	s Not Discerni ne Rock-Tan-\	White-E	Black Mod	erately	to Slighti	y Weathered H	/ lard
							0.70	7070		Metamo	rphosed Grani	ite with	Close Fra	acture	Spacing	•	
			4:21						-	1 JT @ 0 2 JTS @	0-10° ! 10-20°						
			6.47							4 JTS @	20-30°						
711.5	46.9		5:17							2 JTS @ 1 JT @ 8 Clay In J	30-90° Its					•	
711.5	46.9	5.0	2:38	(5.0) 100%	(4.9) 98%				710 7								
							9.1	8.8	710.7							ghtly Weathere	
			4:11				99%	96%	-		d Very Hard M acture Spacin		rphosed G	ranite	with Clos	e to Moderately	1
										1 JT @ 0	)-10°						
			3:45						<b>-</b>	3 JTS @ 4 JTS @	20-30° 40-50°						
			2:18						_								
			2.10			RS-2											
			2:29						-								•
706.5 706.5	51.9 51.9	5.0		(4.9)	(4.7)												
	51.8	0	2:46	98%	94%				-					•			
			2:11						<del>-</del>								•
			0.4**	-													
			3:15														
			3:11														
706.5 706.5																	
							1										

#### GEOSCIENCE GROUP

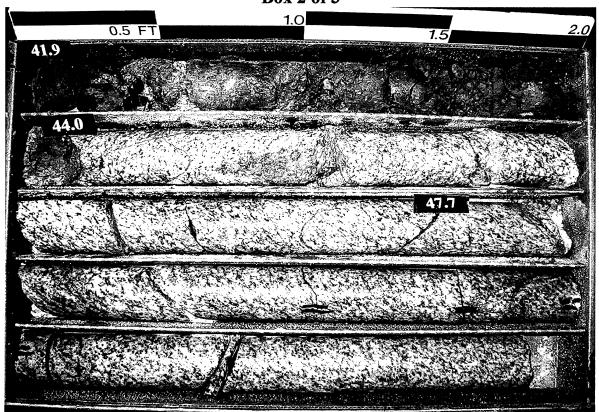
GEOSCIENCE GROUP, INC. CORE BORING REPORT

	ECT NO.		480.1.1		R-260	<del></del>			P-NHF-31	1(3)	CO. Rando	olph	FIELD SUPERV.	D. Hardister	
ITE C	ESCRIF	TION	Bridg	e on Po	oole Ro	ad over	US 311					-		GROUND W	ATER (f
ORIN	IG NO.	B1-	В		BORING	LOCAT	TION	15+23	3	OFFSET	13' RT	ALIGNMEN	T -Y-	0 HR.	N/M
OLL	AR ELEV	<u>'.                                    </u>	758.4 ft		AL DEP	TH	56.9 ft	····	NORTHI	NG 780335	.77	EASTING	1728953.44	24 HR.	14.2
RILL	MACHIN		CME 550	<del></del>		L METH	·····	HSA/H	<del></del>		HAMMER TYPI	E Automa	tic FINAL CA	SING DEPTH	33.7 ft
ATE:	STARTE	D	8/10/04	COM	IPLETE	D 8/1	0/04	DRII	LING FLU	JID DENSITY	Tap Water	SURFA	CE WATER DEPTH	H N/A	
	SIZE	HQ		Di	JN	,	L RUN	23.0	ft	DRILLER	D. Harris				
LEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC.	ATA RQD %			DESCR	RIPTION AND	REMARKS		
											Contin	ued from prev	ious page		
1.5	56.9		3:43						701.5						
		-	·						_	Coring Te Granite)	erminated at Ele	ev. 701.5 ft in	Crystalline Rock (	Metamorphosed	i
									_						
									_						
									-						
									-						
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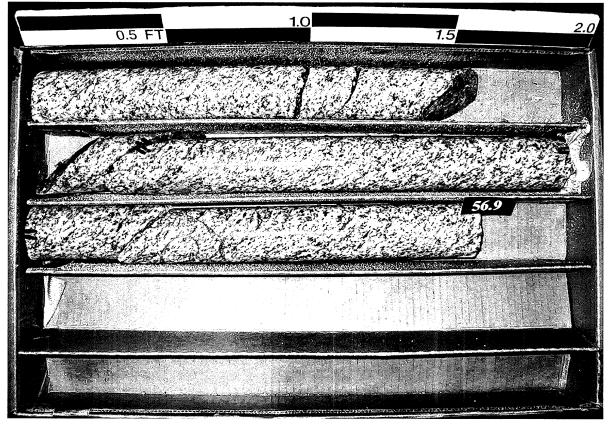
34480.1.1/R-2606A B1-B Box 1 of 3



34480.1.1/R-2606A B1-B Box 2 of 3



34480.1.1/R-2606A B1-B Box 3 of 3



ROJE	CT NO.	34480	).1.1	ID.	R-2606/	A FE	D. NO. ST	P-NHF-31	1(3)		CO. F	Rando	lph F	IELD SUPERV.	D. Hardiste	er
SITE DE	ESCRIPT	ION	Bridge	on Poo	ole Road	over US	311								GROUND	WATER (
BORING	G NO.	EB2-B		В	ORING L	OCATION	16+34		OFFS	ET 14	RT		ALIGNMENT	-Y-	0 HR.	24.8
OLLA	R ELEV.	757	.4 ft	TOTA	L DEPT	H 33.8	ft	NORTHIN	IG - 78	0330.80	)		EASTING 17	29064.16	24 HR.	11.3
RILL M	MACHINE	CN	1E 550x		DRILL	METHOD	HSA			HA	MMER	TYPE	Automatic	FINAL CAS	SING DEPTH	N/A
ATE S	TARTED	8/9/	04	СОМЕ	PLETED	8/9/04	DRIL	LING FLU	ID DENS	ITY	N/A	,	SURFACE	WATER DEPTH	I N/A	
ELEV.	DEPTH		OW COL	·	4.		OWS PER F		400	SAMP.		0	S	OIL AND ROCK	DESCRIPTION	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	19	20 	40 6 1	0 80 1 1	100	) NO.	MOI	G				
757.4	0.00					Ground	Surface Ele	ev. 757.4 f	t			I KA	757.4		II Or# D OI	
1	† l											H		y Embankment F ndy SILT (A-4)	II-Stiff Brown CI	ayey
1																
755	<b>†</b>															
1	3.5	6	6	4	┨					SS-5	10.9		•			
1					•	10						计计				
+	<b>†</b>												751.4			
+	<u> </u>												Residua Tan-Ora	I-Stiff to Very Stiff nge-Grey Coarse	Tan-Orange to to Fine Sandy	Siltv
750	-						,						- CLAY (A	N-7-5)	,	
4	8.5	4	5	5	-						м	1				
.	-	·			•	10						N				
+	-				1						_	N				
- 1	-				• • •							1				
745	-															
-	13.5				<u> </u>	· · · ·						N				
1		3	6	- 8		14					M	N				
1						Ţ										
1						· · · ·						N				
740	_					L	<del></del>						740.4 Residua	I-Dense Tan-Whit	e Silty Coarse to	Fine
1	_ 18.5												SAND (A	\-2-4)	•	
		14	17	27	$\rceil \cdot \cdot \cdot$					SS-6	М					
I										ļ						
Ī																
1							L					<u>.</u>	735.4	ed Rock-Tan-Whi	to Disale Meeth	
735												MI		phosed Granite	te-black vveatri	erea
1	_ 23.5	44	56/0.2		┪				🗼		D					
1	-			·					100/0.7		$\nabla$	M				
t	-				1							17/1				
†					1							$\mathbb{N}$				
730	<u> </u>												•			
+	_ 28.5	100/0.3			┨				.100/0.3		D	W				
+	<u> </u>					• • • •			100/0.3		-	1/1				
+	-					• • • •						$\mathbb{N}$				
1	-		•				• ,• • • • •					KIII-				
725	<u> </u>				1	• • • •						W.	•			
1	_ 33.5				1								723.6			
1	<del></del>	100/0:3			<del> </del>				100/0.3	<del> </del>	<del>  W  </del>	ALLIA		erminated @ Elev	. 723.6ft in Wea	thered

PROJE	CT NO.	34480	.1.1	ID. I	R-2606A FED.	NO. STP-NH	F-311(3)		CO.	Rando	olph FIELD SUPERV. D. Hardister	
SITE DE	ESCRIPT	ION	Bridge	on Poo	le Road over US 311				L		GROUND WATER	(ft)
BORING	G NO.	EB2-A		T	RING LOCATION	16+34	OF	FSET	14' LT		ALIGNMENT -Y- 0 HR. 18	
	R ELEV.	758.	2 ft		DEPTH 34.3 ft		THING	78035			EASTING 1729064.17 24 HR. 11	
	ACHINE		E 550x	<b>!</b> -		HSA		7000	HAMMER	TVDE	L	
	TARTED				LETED 8/9/04	7	FLUID DE	MOITV			SURFACE WATER DEPTH N/A	-
ELEV.	DEPTH		OW COU	L	r ·	S PER FOOT	FLUID DE	<del></del>	AMP. V	111	SURPACE WATER DEPTH IV/A	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 20 40		80		NO. MO	O	SOIL AND ROCK DESCRIPTION	
											•	
758.2	0.00				Ground Sui	face Elev. 7	58.2 ft				758.2	c
•	-									Hil	Roadway Embankment Fill-Medium Dense Brown-Tan Silty Coarse to Fine SAND (A-2-4)	
•	-									Fit		
-	-									Fit		
755-	3.5	3	5	7	,				١,,	FI:H	-	
	-	٦	3	′	●12			٠ .	М			
	-											
-	-				· · ·   · · · · · ·			• •				
•	-				ا · ·رــا · · · · · · · ا					<b>         </b>	751.2  Residual-Loose Brown Silty Coarse to Fine SAND	
750-	8.5	`						• •			(A-2-4)	
-		3	4	3	] · . <u>  ·</u> · · · · ·				W			
-					<mark>T</mark>					iii		
									V	<b> </b>    [		
					1.]						745.2	
745-	13.5	2	2	2				-	SS-4 25.5	N	<ul> <li>Residual-Soft Tan-Orange Coarse to Fine Sandy Silty CLAY (A-7-5)</li> </ul>	
•					4					N	· · · · ·	
-	-										742.2	
-	-										Residual-Very Dense Tan-White-Black Silty Coarse to Fine SAND (A-2-4)	
-	-										Coalse to Fine SAND (A-2-4)	
740-	18.5									<b> </b>    -	-	
	-	14	29	27		- 56			0	1:::}		
-	_				<i></i>			• •				
	_											
	_											
735	- 23.5										_	
755		22	30	70/0.3		<u>L</u>		_	D		734.2	2
							- 100/0-	8	-	MI	Weathered Rock-Tan-White-Black Weathered Metamorphosed Granite	
1	Γ I									MIN		
. 1										DW		
1	<b>-</b>									W		
730 -	28.5	100/0.3		,		- · · · · ·	400:-		D	MI	-	
1							· · ·100/0:	1				
1	-									W		
1	-					• • • • •				W		
-	-									MIL		
725	- 33.5										<del>-</del>	
		61	39/0.3		ı			1 1	М	41.71163		

# SUMMARY OF LABORATORY TEST DATA FOR NCDOT 34480.1.1/R-2606A

### 34480.1.1/R-2606A Bridge on Poole Road over US 311 Randolph County, North Carolina

,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			,			<del>,</del>		 	 	 	 		 	
	Clay (%)	40	6	15	34	18	8							
	Silt (%)	15	51	61	17	27	18							
	Fine Sand (Ret. #270) (%)	33	24	81	20	23	29							
Results.	Coarse Sand (Ret. #60) (%)	12	91	48	29	32	45							
Gradation Results.	Pass #270 Sieve	53	09	31	51	43	26							
	Pass #200 Sieve	63	72	34	55	48	32							-
	Pass #40	93	06	56	81	92	99							
	Pass #10 Sieve	97	100	94	66	86	86							
nits	1-0	24	4	9	81	ď	ŝ							
Atterberg Limits	1 0	36	31	61	23	ďN	ďZ							
At		09	35	25	41	18	28							-
Z	Value	=	46	58	4	10	44							
AASHTO	Class	A-7-5(15)	A-4(0)	A-2-4(0)	A-7-5(7)	A-4(0)	A-2-4(0)							
Natural Moisture Content	(%)	38.5	16.8	N/A	25.5	10.9	N/A							
Sample	Type	SS-1	SS-2	SS-3	SS-4	SS-5	9-SS							
Sample Depth	(fr.)	3.5-5.0	13.5-15.0	8.5-10.0	13.5-15.0	3.5-5.0	18.5-20.0							
Boring	· oZ	EBL-A	EB1-B	B1-B	EB2-A	EB2-B	EB2-B							

GEOSCIENCE GROUP, INC. GREENSBORO, NORTH CAROLINA PROJECT NO: GR04.0266.GE PAGE 1 of 1

#### GEOSCIENCE GROUP, INC. GREENSBORO, NORTH CAROLINA

#### 34480.1.1/R-2606A Bridge on Poole Road over US 311 Randolph County, North Carolina

#### **ROCK TESTING SUMMARY**

BORING NO.	SAMPLE NO.	DEPTH	UNCONFINED COMP.		POISSON'S
			STRENGTH (psi)	MODULUS (psi)	RATIO
D4 D	DO 4	05.0 05.7	750	N. A.	
B1-B	RS-1	35.3 - 35.7	750	NA	NA
B1-B	RS-2	51.0 - 51.4	4,190	NA NA	NA
					·
	·				
				· · · · · · · · · · · · · · · · · · ·	
			·		
					,

#### SITE PHOTOGRAPHS

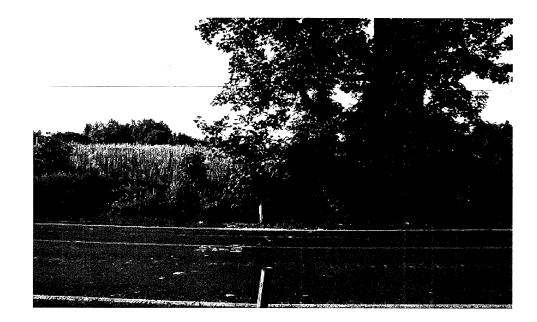


**Looking Left to Right along End Bent-1** 



Looking Left to Right along Bent-1

#### SITE PHOTOGRAPHS



**Looking Left to Right along End Bent-2** 



Looking along Profile – 10' RT of -Y-

#### SITE PHOTOGRAPHS



Looking Increasing Station along -Y-

## $ID.\ R-2606A$

# ROJECT: 34480.1.1

#### STATE OF NORTH CAROLINA

#### DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

#### STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT <u>34480.1.1</u> I.D. NO. <u>R-2606A</u>
F.A. PROJECT
COUNTY <i>RANDOLPH</i>
PROJECT DESCRIPTION <u>US 311 FROM SOUTH</u>
<i>OF SR 1920 TO NORTH OF SR 1929</i>
SITE DESCRIPTION <u>DUAL BRIDGES ON</u>
US 311 OVER MUDDY CREEK
INVENTORY

STATE STATE PROJECT REPERENCE NO. SHEET STATE SHEETS N.C. R=2606A 1 1/2

STATE PROJ.NO. F.A. PROJ.NO. DESCRIPTION
34480.1.1 P.E.

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (1919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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 STRADARD 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 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. THE BIDDER OR 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 MOJICATED IN THE SUBSURFACE INFORMATION.

INVESTIGATED BY J.E. BEVERLY PERSONNEL J.K. STICKNEY

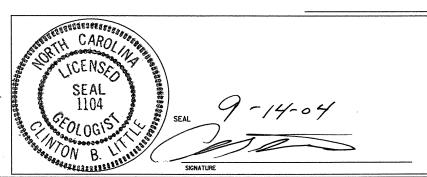
CHECKED BY C.B. LITTLE D.K. BRATTEN

SUBMITTED BY C.B. LITTLE C.L. SMITH

DATE SEPTEMBER 2004

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.



DRAWN BY: J.E. BEVERLY /J.K. McCLURE

#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

#### SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION GRADATION ROCK DESCRIPTION TERMS AND DEFINITIONS WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL, SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM 0-1586). SOIL ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER, POORLY GRADED) SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER FOLIAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS AQUIFER - A WATER BEARING FORMATION OR STRATA. AP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. N NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZON ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUC AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: BOCK MATERIALS ARE TYPICALLY DIVIDED AS EDLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, HE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. WEATHERED SUBANGULAR, SUBROUNDED, OR ROUNDED. VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDOED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT CRYSTALLINE ROCK (CR) GROUND SURFACE. GENERAL MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. ORGANIC MATERIALS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE CLASS. (\$5% PASSING #200) (>85% PASSING #200) CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN COMPRESSIBILITY NON-CRYSTALLINE ROCK (NCR) COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM GROUP FIRE TO COARSE GRAIN WE HAVE MEMORPHIC AND NON-COASTAL PLAIN
SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE
INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD A-1, A-2 A-3 A-6. A-7 CLASS. OF SLOPE. SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 COASTAL PLAIN MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 SYMBOL 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. LIQUID LIMIT GREATER THAN 50 HIGHLY COMPRESSIBLE SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ET PERCENTAGE OF MATERIAL PASSING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT SILT-MLICK. \* 10 \* 40 CLAY SILT- CLA OCKS OR CUTS MASSIVE ROCK. ORGANIC MATERIAL OTHER MATERIAL 30 MX 50 MX 51 MN SOILS PEAT SOILS SOILS SOUS FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE \* 200 RACE OF ORGANIC MATTER 3 - 5% TRACE 1 - 10% HAMMER IF CRYSTALLINE. LITTLE ORGANIC MATTER 3 ~ 57 5 - 12% LITTLE 10 - 20% 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN IOUID LIMI VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. ODERATELY ORGANIC DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF SOME 20 - 35% ASTIC INDEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS I HIGHLY ORGANIC LITTLE OR >10% >20% HIGHLY 35% AND ABOVE THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. HIGHLY OF A CRYSTALLINE NATURE. MODERATE GROUP INDEX a øl ø 4 MX | 8 MX | 12 MX | 16 MX | No MX FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE GROUND WATER ROCK GENERALLY ERESH. JOINTS STAINED AND DISCOLORATION EXTENDS INTO BOCK UP TO AMOUNTS OF SLIGHT USUAL TYPES STONE FRAGS. FINE SOILS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR (SLI.) SILTY OR CLAYEY CLAYE FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. SOILS MATTER CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. STATIC WATER LEVEL AFTER 24 HOURS. MATERIALS SAND MODERAT SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING FEFECTS. IN FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GEN. RATIN V PW GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA (MOD.) PARENT MATERIAL EXCELLENT TO GOOD FAIR TO POOR POOR INSHITARI AS A POOR DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED LOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY SUBGRADE OM-SPRING OR SEEPAGE P.I. OF A-7-5  $\leq$  L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL MISCELLANEOUS SYMBOLS CONSISTENCY OR DENSENESS AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN SEVERE ANGE OF UNCONFINE AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. COMPACTNESS OR ROADWAY EMBANKMENT PRIMARY SOIL TYPE PENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>) DPT DMT TEST BORING IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. CONSISTENCY WITH SOIL DESCRIPTION ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE SEVERE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO  $\oplus$ IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME AUGER BORING (SEV.) GENERALLY S- BULK SAMPLE TS LATERAL EXTENT. LOOSE EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN 4 TO 10 GRANUL AF MEDIUM DENSE N/A LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. 10 TO 30 ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON IF TESTED, YIELDS SPT N VALUES > 100 BPF MATERIAL DENSE 30 TO 50 CORE BORING ROADWAY EMBANKMENTS MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN (NON-COHESIVE) SAMPLE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT VERY DENSE >50 OILS USUALLY INDICATES POOR AFRATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE (V. SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK INFERRED SOIL BOUNDARIES VERY SOFT , th REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN (0.25 MONITORING WELL TERVENING IMPERVIOUS STRATUM. 2 TO 4 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF GENERALLY 0.25 TO 0.5 SINEINS INFERRED ROCK LINE RS- ROCK SAMPLE MEDIUM STIFE PIEZOMETER SILT-CLAY 4 TO 8 0.5 TO 1  $\triangle$ ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. COMPLETE INSTALLATION 8 TO 15 MATERIAL 1 TO 2 ALLUVIAL SOIL BOUNDARY RT- RECOMPACTED SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF VERY STIFF 15 TO 30 TRIAXIAL SAMPLE (COHESIVE) SLOPE INDICATOR COMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND  $\langle \rangle$ DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK HARDNESS BOCK STRUCTURES EXPRESSED AS A PERCENTAGE. TEXTURE OR GRAIN SIZE SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SOUNDING ROD (REF)- SPT REFUSAL U.S. STD. SIEVE SIZE PARENT ROCK. SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED ABBREVIATIONS RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL COARSE TO DETACH HAND SPECIMEN. TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS AR - AUGER REFUSAL SAND PMT - PRESSUREMETER TEST SAND CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (RL DR.) (COB.) (GR) (SL.) ((1) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR BT - BORING TERMINATED SD. - SAND, SANDY HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY CL. - CLAY GRAIN MM 305 2.0 0.25 0.05 0.005 BY MODERATE BLOWS. CPT - CONE PENETRATION TEST SLI. - SLIGHTLY STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF SIZE IN. 12" MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CSE. - COARSE TCR - TRICONE REFUSAL 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE DMT - DILATOMETER TEST SOIL MOISTURE - CORRELATION OF TERMS  $\gamma$  - UNIT WEIGHT A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE FIELD MOISTURE 7d - DRY UNIT WEIGHT GUIDE FOR FIELD MOISTURE DESCRIPTION VOID RATIO SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS (ATTERBERG LIMITS) STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. W - MOISTURE CONTENT FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN F. - FINE FOSS, - FOSSILIFEROUS PIECES CAN BE BROKEN BY FINGER PRESSURE. v. - VERY USUALLY LIQUID: VERY WET. USUALLY SATURATED STRATA ROCK QUALITY DESIGNATION (S.R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:
TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED
BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. FRAC, - FRACTURED VST - VANE SHEAR TEST FROM BELOW THE GROUND WATER TABLE CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH (SAT.) FRAGS. - FRAGMENTS LIQUID LIMIT SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY MED. - MEDIUM LASTIC FINGERNAIL SEMISOLID: REQUIRES DRYING TO TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING BEDDING (PI) PLASTIC · LIMIT TERM THICKNESS TERM SPACING BENCH MARK: BL-502 @ -L- 21+18.18, 19.85' RT - ELEV: 724.84' ADVANCING TOOLS DRILL UNITS: VERY THICKLY BEDDED > 4 FFFT VERY WIDE MORE THAN 10 FEET X AUTOMATIC MANUAL BL-503 @ -L- 23+38.78. 26.52' RT - ELEV: 708.47 OPTIMUM MOISTURE - MOIST - (M SOLID: AT OR NEAR OPTIMUM MOISTURE 1.5 - 4 FEET THICKLY BEDDED CLAY BITS 3 TO 10 FEET MOBILE B-THINLY BEDDED 0.16 - 15 FFFT SHRINKAGE LIMIT MODERATELY CLOSE 1 TO 3 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET 6° CONTINUOUS FLIGHT AUGER REQUIRES ADDITIONAL WATER TO CORE SIZE: CLOSE 0.16 TO 1 FEET THICKLY LAMINATED 0.008 - 0.03 FFFT - DRY - (D) BK-51 VERY CLOSE **ELEVATION:** LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE X 8 HOLLOW AUGERS THINLY LAMINATED < 0.008 FEET NOTES: INDURATION PLASTICITY HARD FACED FINGER BITS CME-45 FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI DRY STRENGTH X TUNG.-CARBIDE INSERTS П-н\_ NONPLASTIC VERY LOW X CME-550 RUBBING WITH FINGER FREES NUMEROUS GRAINS; 0-5 FRIABLE CASING W/ ADVANCER LOW PLASTICITY MED. PLASTICITY SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MEDIUM 16-25 PORTABLE HOIST TRICONE \*STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: POST HOLE DIGGER HIGH PLASTICITY 26 OR MORE HIGH MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER TRICONE HAND AUGER \* TUNG.-CARB. OTHER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED SOUNDING ROD CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) DIFFICULT TO BREAK WITH HAMMER VANE SHEAR TEST OTHER SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. EXTREMELY INDURATED OTHER

STATE PROJECT NO. SHEET NO.

34480.1.1

R-2606A



#### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY P.O. BOX 25201, RALEIGH, N.C. 27611-5201 LYNDO TIPPETT GOVERNOR SECRETARY

September 9, 2004

STATE PROJECT: 34480.1.1 (R-2606A)

COUNTY:

Randolph

DESCRIPTION:

Dual Bridges on US 311 over Muddy Creek

SUBJECT:

Geotechnical Report – Bridge Foundation Investigation

These are proposed dual structure bridges on new location along US 311 over Muddy Creek. Each new structure is a 160' single span design on 90 degree skew. Individual structure widths are approximately 38 feet and end bent slopes are proposed at 1.5:1 (H:V).

Foundation test borings were performed with a CME-550 drill machine utilizing Hollow Stem Augers, and automatic drop hammer. The field investigation for this project was conducted in August of 2004.

#### Physiography/Geology

The project area is located in Randolph County in the northern-central piedmont region of North Carolina. The site topography ranges from flat to gently sloping.

Geologically this site is part of the Carolina Slate Belt and is underlain by granitic and meta-granitic rock types.

Residual soil types encountered at the bridge site consist of medium stiff to stiff sandy silty clay (A-6, A-7-6) and dense to very dense micaceous silty sand (A-2-4). Alluvial soils encountered only at end bent 2 boring locations consist of loose silty sand (A-2-4). Weathered rock and / or hard rock was encountered at all boring locations

sheet 3

2

#### **Foundation Materials**

#### End Bent 1:

This proposed bent location is north of Muddy Creek. A total of four boring were performed across the bent to encompass left and right lane structures. Residual soil types extend below the ground surface some 5.5 to 9.2 feet. These soils consist of medium stiff to stiff tan-brown-black sandy silty clay (A-6, A-7-6) and dense to very dense tan-brownwhite micaceous silty sand (A-2-4). Directly below residual soil weathered and / or hard rock is encountered. The following is a list of elevations for weathered and hard rock contacts at each boring location:

<b>BORING</b>	Weathered Rock	<b>Hard Rock</b>
EB1-A LT LN	704.96	702.56'
EB1-B LT LN	N/A	708.41'
EB1-A RT LN	706.47'	705.67
EB1-B RT LN	707.86'	705.06'

#### End Bent 2:

This proposed bent location is south of Muddy Creek. A total of four boring were performed across the bent to encompass left and right lane structures. Alluvial soil is present at the ground surface across the entire bent and extends 5.6 to 7.2 feet in depth. Alluvium consists of loose tan-brown silty sand (A-2-4). In most instances beneath alluvium at elevation 701 – 702 feet lies 1.5 to 3.0 feet of residual dense to very dense tan-brown micaceous silty sand (A-2-4). Underlying residual soil is weathered and / or hard rock. The following is a list of elevations for weathered and hard rock contacts at each boring location:

<b>BORING</b>	Weathered Rock	<b>Hard Rock</b>
EB2-A LT LN	699.24'	698.74'
EB2-B LT LN	702.30'	701.30'
EB2-A RT LN	N/A	698.73'
EB2-B RT LN	698.69'	696.49'

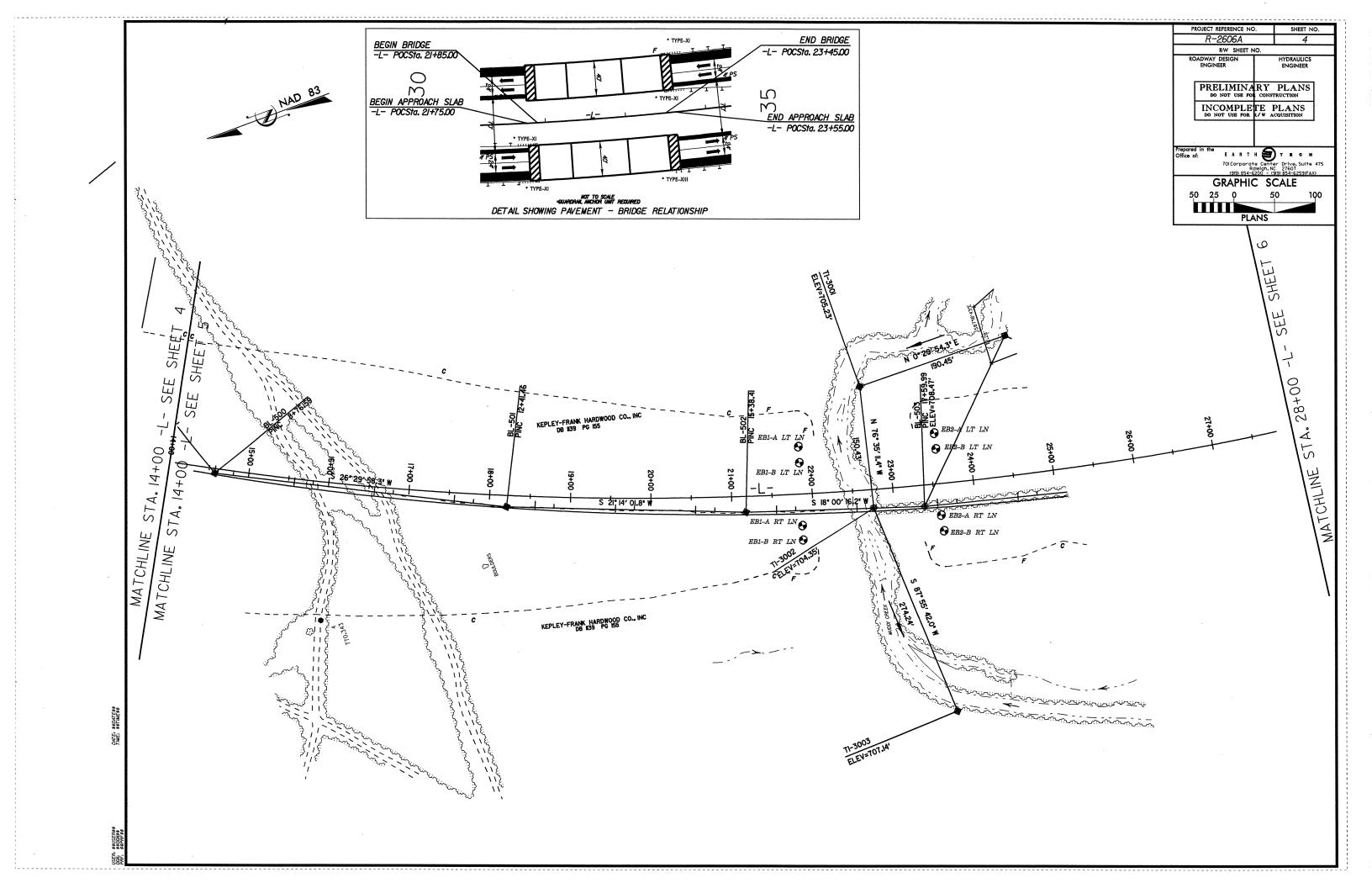
#### Groundwater

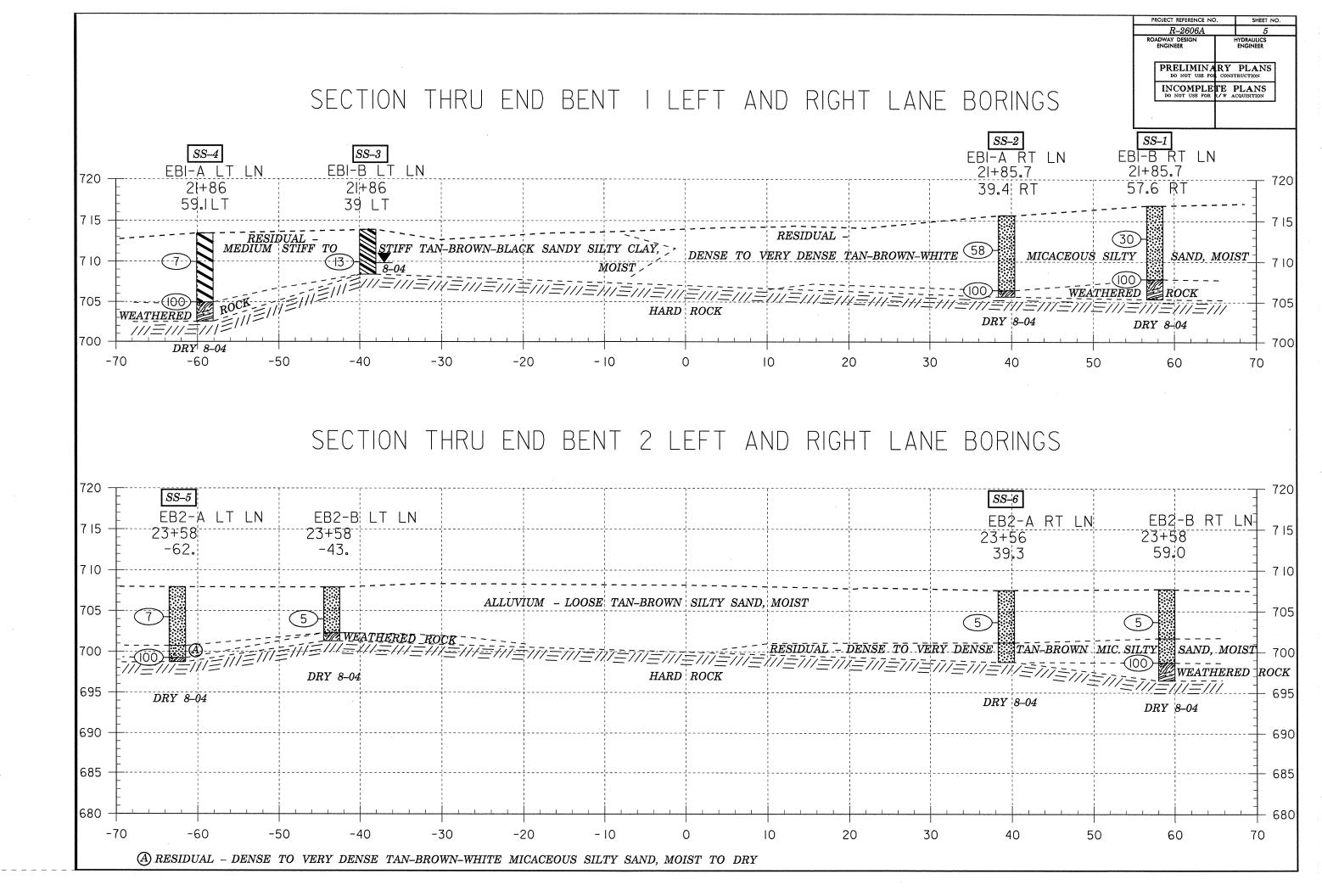
Each boring location was measured for groundwater immediately after drilling and after a period of 24 hours. With the exception of a single boring all holes were dry. Boring EB1-B LT LN produced a 24 hour water reading at elevation 708.41 feet.

Respectfully submitted,

J.E. Beverly, Project Geologist

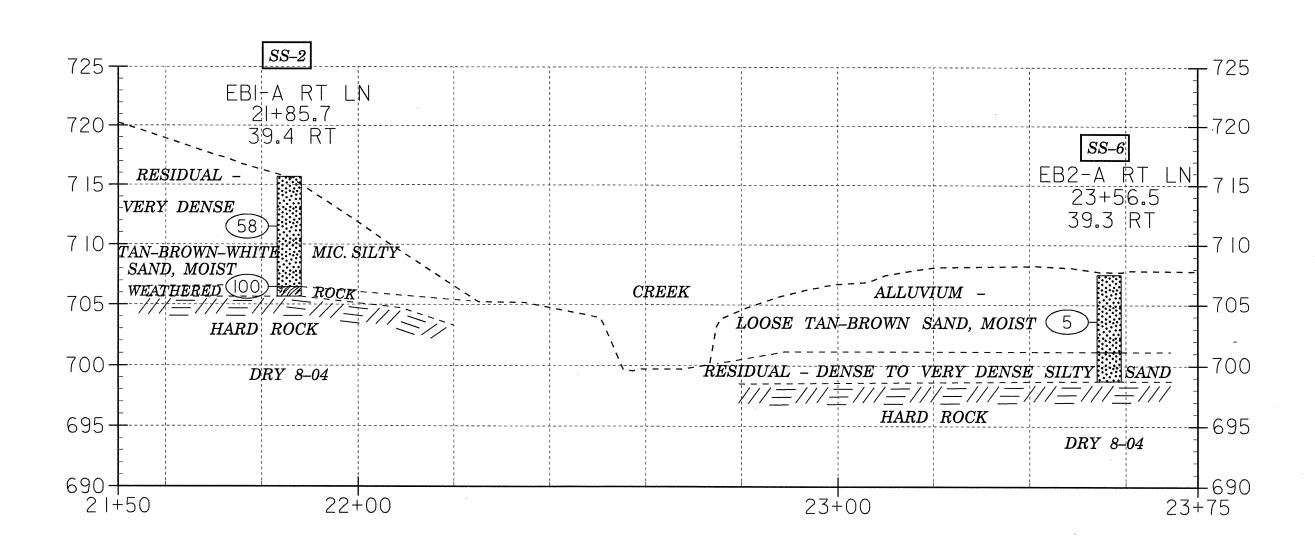
JE Beverly





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	PROJECT NO 34480.1.1 ID R-2606A COUNTY RANDOL SITE DESCRIPTION DUAL BRIDGES ON US 311 OVER MUDDY CREEK														
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### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

T. I. P. No.	R-2606A						
	REPORT ON SAM	IPLES OF	SOILS FO	R QUALI	TY		
Project	34480.1.1	County	RANDOL	PH	Owner		
Date: Sampled		Received	8/17/04		Reported	8/19/2004	
Sampled from				Ву	J E BEVE	RLY	
Submitted by	N WAINAINA		:		1995	Standard S <sub>l</sub>	pecifications
716407 TO 7164 8/23/04	412						
		TE	ST RESU	LTS			
Proj. Sample N	0.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Lab. Sample N	0.	716407	716408	716409	716410	716411	716412
Retained #4 S	ieve %	-	-	-	_	_	-
Passing #10 S	ieve %	100	100	100	100	100	100
Passing #40 S	ieve %	73	79	79	97	85	69
Passing #200 S	Sieve %	29	31	47	85	23	14

#### MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	44.3	38.4	34.5	4.2	36.8	57.4
Fine Sand Ret - #270	%	31.7	36.2	23.8	17.6	46.5	31.4
Silt 0.05 - 0.005 mm	%	13.8	15.4	21.4	39.8	11.7	6.2
Clay < 0.005 mm	%	10.1	10.1	20.2	38.4	5.1	5.1
Passing #40 Sieve	%		-	-	-	-	
Passing #200 Sieve	%	-	-	-	-	_	-

L. L.		26	24	33	49	21	21
P. I.		NP	NP	14	22	NP	NP
AASHTO Classification		A-2-4(0)	A-2-4(0)	A-6(3)	A-7-6(21)	A-2-4(0)	A-2-4(0)
Station		21+85.7	21+85.7	21+86	21+86	23+58	23+56.5
		57.6 LT	39.4RT	39 LT	59.1 LT	62.5 LT	39.3 RT
Hole No.							
Depth (Ft)		4.50	4.70	4.50	4.00	4.20	4.40
	to	5.50	5.70	5.50	5.00	5.20	5.40

cc: JEBEVERLY Soils File

Soils Engineer

#### **GEOTECHNICAL UNIT FIELD SCOUR REPORT**

PROJECT: 34480.1.1 TIP NO.: R-2606A COUNTY: Randolph
DESCRIPTION(1): Dual Bridges on US 311 over Muddy Creek
◆ INFORMATION ON EXISTING BRIDGES Information obtained from ☐ Field Inspection ☐ Microfilm (Reel: Position: ) ☐ Other
COUNTY BRIDGE NO. N/A BRIDGE LENGTH N/A NO. BENTS N/A NO. BENTS IN: CHANNEL N/A FLOODPLAIN N/A
FOUNDATION TYPE: None - new structure
EVIDENCE OF SCOUR(2):
ABUTMENTS OR END BENT SLOPES:
INTERIOR BENTS:
CHANNEL BED: None
CHANNEL BANKS: None
• EXISTING SCOUR PROTECTION:
TYPE(3): None - new structure
EXTENT(4):
EFFECTIVENESS(5):
OBSTRUCTIONS(6) (DAMS, DEBRIS, ETC.): Note: The potential for debris is high. There are many fallen trees, limbs, etc.
♦ DESIGN INFORMATION
CHANNEL BED MATERIAL(7) (Sample Results Attached): Sand, (Reference SS-5)
CHANNEL BANK MATERIAL(8) (Sample Results Attached): Sand (Reference SS-5)
CHANNEL BANK COVER(10): Mature Trees, Grass, Shrubs
FLOOD PLAIN WIDTH(11): approximately 220 feet
FLOOD PLAIN COVER(12): Mature Trees, Grass, Shrubs
STREAM IS: DEGRADING AGGRADING (13)
OTHER OBSERVATIONS AND COMMENTS:

SHEET 12 OF 12

**◆ DESIGN INFORMATION CONT.** 

CHANNEL MIGRATION TENDENCY(14): Slight

GEOTECHNICAL ADJUSTED SCOUR ELEVATIONS (15):

Bridge scour should be a non-issue at this site as both structures are of a single span design utilizing end bent piles. End bents fall well outside of scour zone associated with the creek channel.

The theoretical 500 year scour prediction given on the NCDOT Hydro Report predicts the maximum scour elevation at approximately 690 feet. Based on geotechincal boring data collected at each end bent location we interpret the occurrence of hard rock between approximate elevation 700 (End Bent 2) and 705 feet (End Bent 1). Rock appears to be just beneath the creek channel. Scour should not occur below the hard rock horizon.

REPORTED BY: JKS/JEB DATE: 8-11-04

#### INSTRUCTIONS

- (1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
- (2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS DEGRADATIONS, ETC.)
- (3) NOTE ANY EXISTING SCOUR PROTECTION (RIPRAP, ETC.)
- (4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
- (5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
- (6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
- (7) DESCRIBE THE CHANNEL BED MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (8) DESCRIBE THE CHANNEL BANK MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (9) DESCRIBE THE FOUNDATION BEARING MATERIAL
- (10) DESCRIBE THE BANK COVERING (GRASS, TREES, RIPRAP, NONE, ETC.)
- (11) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
- (12) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.)
- (13) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING.
- (14) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE LATERALLY DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
- (15) GIVE THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION. IF THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION IS DEPENDENT ON SCOUR COUNTER MEASURES, EXPLAIN. (RIPRAP ARMORING ON SLOPES, ETC.) THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENT RQD; DIFFERENTIAL WEATHERING; SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

rev. 9-03

## $D. \ R-2606A$

# JECT: 34480.1.1

#### STATE OF NORTH CAROLINA

#### DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

#### STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT_34480.1.1   I.D. NO. <u>R-2606A</u>
F.A. PROJECT
COUNTY_ <i>RANDOLPH</i>
PROJECT DESCRIPTION <u>US 311 FROM SOUTH</u>
OF SR 1920 TO NORTH OF SR 1929
SITE DESCRIPTION <u>BRIDGE ON -Y1-</u>
(CEDAR SQUARE RD.) OVER US 311

INVENTORY

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORNING LOGS. ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-408B. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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 DIFFERS ARE LEVEL ON INCRESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNES 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.

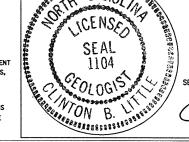
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT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

INVESTIGATED BY J.E. BEVERLY PERSONNEL J.K. STICKNEY

CHECKED BY C.B. LITTLE C.E. BURRIS

SUBMITTED BY C.B. LITTLE C.L. SMITH

DATE APRIL 2004 J.E. ESTEP



4-28-04

NOTE - 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

DRAWN BY: <u>J.E. BEVERLY /J.K. McCLURE</u>

#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAYS

#### GEOTECHNICAL UNIT

#### SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS											
SOIL DESCRIPTION		GRADATION			ROCK DESCRIPTION		TERMS AND DEFINITIONS				
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED O		WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FF UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE	ROM FINE TO COARSE SAME SIZE.(ALSO	ROCK LINE INDICATES THE LEVEL	N MATERIAL THAT WHEN TESTED, WOULD YIE AT WHICH NON-COASTAL PLAIN MATERIAL W	OULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.				
WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, A 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AAS)	HTO T206, ASTM D-1586), SOIL	POORLY GRADED)   CAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MI	ORE SIZES.	SPT REFUSAL IS PENETRATION BY IN NON-COASTAL PLAIN MATERIAL	A SPLIT SPOON SAMPLER EQUAL TO OR LE , THE TRANSITION BETWEEN SOIL AND ROCK	SS THAN 0.1 FOOT PER 60 BLOWS. IS OFTEN REPRESENTED BY A ZONE	AOUIFER - A WATER BEARING FORMATION OR STRATA.				
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPT CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OT	THER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS		OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY			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.				
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ET-		THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE SUBANGULAR, SUBROUNDED, OR ROUNDED.	TERMS; ANGULAR,	WEATHERED 2772	NON-COASTAL PLAIN MATERIAL THAT YIELD	S SPT N VALUES > 100 BLOWS	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.				
SOIL LEGEND AND AASHTO CLAS		MINERALOGICAL COMPOSITIO	DN	a a a a a	PER FOOT.		ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS IS ENCOUNTERED. BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE				
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	RIALS ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE UNHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND META WOULD YIELD SPT REFUSAL IF TESTED. RO		GROUND SURFACE.				
CLASS. (\$5% PASSING *200) (\$5% PASSING *  CROUP A-1 A-3 A-2 A-4 A-5 A-6	(200)	COMPRESSIBILITY		NON-CRYSTALLINE	GNEISS, GABBRO, SCHIST, ETC. FINE TO COARSE GRAIN METAMORPHIC AND		CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM				
GROUP A-1 A-3 A-2 A-4 A-5 A-6 CLASS. A-1-8 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7	A-7-5 A-7-6 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT	LESS THAN 30	ROCK (NCR)	SEDIMENTARY ROCK THAT WOULD YEILD SPT INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC	•	OF SLOPE.				
SYMBOL 000000000000000000000000000000000000		MODERATELY COMPRESSIBLE LIQUID LIMIT HIGHLY COMPRESSIBLE LIQUID LIMIT	31-50 GREATER THAN 50		COASTAL PLAIN SEDIMENTS CEMENTED INTO SPT REFUSAL. ROCK TYPE INCLUDES LIMES		CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDEO BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.				
% PASSING	SILT- MUCK	PERCENTAGE OF MATERIA	L	(CP)	SHELL BEDS, ETC. WEATHERING		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT				
# 10 50 MX # 40 30 MX 50 MX 51 MN	GRANULAR CLAY PEAT	ORGANIC MATERIAL GRANULAR SILT- CLAY SOILS SOILS	OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS	S BRIGHT, FEW JOINTS MAY SHOW SLIGHT ST	TAINING, BOCK BINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.  DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE				
# 200   15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   35 MX   35 MX   36 MN	MN 36 MN  99129	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LIT	ACE 1 - 10% TLE 10 - 20%	HAMMER IF CRYSTALLI	NE.		HORIZONTAL.				
LIDUID LIMIT	N II MN LITTLE OR HIGHLY	MODERATELY ORGANIC 5 - 10% 12 - 20% SOI			SH, JOINTS STAINED, SOME JOINTS MAY SHOW EN SPECIMEN FACE SHINE BRIGHTLY.ROCK R STUBE		DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.				
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 M	AMOUNTS OF SOILS	GROUND WATER		SLIGHT ROCK GENERALLY FRES	SH, JOINTS STAINED AND DISCOLORATION EX		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.				
OF MAJOR CRAVEL AND SAND SOILS S	LAYEY ORGANIC OILS MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER	DRILLING.		MAY CONTAIN CLAY. IN GRANITOID ROCKS SO AND DISCOLORED. CRYSTALLINE ROCKS RING		FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.				
MATERIALS SAND SHIVE THE STATE		STATIC WATER LEVEL AFTER 24 HOURS.		MODERATE SIGNIFICANT PORTIONS	OF ROCK SHOW DISCOLORATION AND WEATH	ERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM				
AS A EXCELLENT TO GOOD FAIR TO P	OOR FAIR TO POOR UNSUITABLE	PERCHED WATER, SATURATED ZONE OR WATER BEAR	NING STRATA	DULL SOUND UNDER HA	T FELDSPARS ARE DULL AND DISCOLORED, S AMMER BLOWS AND SHOWS SIGNIFICANT LOSS		PARENT MATERIAL.  FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY				
P.I. 0F A-7-5 ≤ L.L 30 : P.I. 0F A-7-6	5 > L.L 30	SPRING OR SEEPAGE		WITH FRESH ROCK.  MODERATELY ALL ROCK EXCEPT QUA	ARTZ DISCOLORED OR STAINED. IN GRANITOID	) ROCKS, ALL FELDSPARS DULL	THE STREAM.				
CONSISTENCY OR DENSE		MISCELLANEOUS SYMBOLS		SEVERE AND DISCOLORED AND	A MAJORITY SHOW KAOLINIZATION, ROCK SHED WITH A GEOLOGIST'S PICK, ROCK GIVES	OWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.				
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESIS	STENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT  WITH SOIL DESCRIPTION  ROADWAY EMBANKMENT  SPT CPT  SPT	NG SAMPLE	IF TESTED, WOULD YIE		CCOM SOUND WILL STROCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.				
VERY LOOSE	(10N3/F1= )	1 4	DESIGNATIONS		UARTZ DISCOLORED OR STAINED.ROCK FABRI DNG SOIL, IN GRANITOID ROCKS ALL FELDSP		LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO				
GRANULAR MEDIUM DENSE 4 TO 10	N/A		S- BULK SAMPLE	EXTENT. SOME FRAGME	ENTS OF STRONG ROCK USUALLY REMAIN.  T N VALUES > 100 BPF		LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.				
(NON-COHESIVE) DENSE 30 TO 50		ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS  CORE BORING	SS- SPLIT SPOON SAMPLE	VERY SEVERE ALL ROCK EXCEPT QUA	ARTZ DISCOLORED OR STAINED, ROCK FABRIC		MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN				
VERY DENSE >50  VERY SOFT <2	<0.25	INFERRED SOIL BOUNDARIES MONITORING WE	ST- SHELBY TUBE SAMPLE		VELY REDUCED TO SOIL STATUS, WITH ONLY IS AN EXAMPLE OF ROCK WEATHERED TO A		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				
GENERALLY   SOFT   2 TO 4	0.25 TO 0.5	SIJEINE INFERRED ROCK LINE A PIEZOMETER	RS- ROCK SAMPLE		GINAL ROCK FABRIC REMAIN. <u>IF TESTED, Y</u>		INTERVENING IMPERVIOUS STRATUM.				
MATERIAL STIFF 8 TO 15	0.5 TO 1 1 TO 2	TTTTT ALLUVIAL SOIL BOUNDARY INSTALLATION	RT- RECOMPACTED		L. ROCK FABRIC NOT DISCERNIBLE, OR DISCE ATIONS. QUARTZ MAY BE PRESENT AS DIKES		RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF				
(COHESIVE) VERY STIFF 15 TO 30 HARD >30	2 TO 4 >4	25/025 DIP/DIP DIRECTION OF SLOPE INDICATO	OR TRIAXIAL SAMPLE  CBR - CBR SAMPLE	ALSO AN EXAMPLE.	DOCK HARRIEGO		ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND				
TEXTURE OR GRAIN SI	ZE	ROCK STRUCTURES  — SPT N-VALUE		ANNOT DE CODATOUR	ROCK HARDNESS		EXPRESSED AS A PERCENTAGE.  SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE				
U.S. STD. SIEVE SIZE 4 10 40 60	200 270	SOUNDING ROD     REF— SPT REFUSAL			ED BY KNIFE OR SHARP PICK. BREAKING OF S OF THE GEOLOGISTS PICK.	HAND SPECIMENS REDUIKES	PARENT ROCK.				
DPENING (MM)	FINE SILT CLAY	ABBREVIATIONS  AR - AUGER REFUSAL PMT - PRESSI		HARD CAN BE SCRATCHED E TO DETACH HAND SPE	BY KNIFE OR PICK ONLY WITH DIFFICULTY. I ECIMEN.	HARD HAMMER BLOWS REOUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS				
(BLDR.) (COB.) (GR.) (CSE. SD.)	(F. SD.) (SL.) (CL.)	AR - AUGER REFUSAL PMT - PRESSL  BT - BORING TERMINATED SD SAND, SA  CL CLAY SL SIL - S		HARD EXCAVATED BY HARD	BY KNIFE OR PICK. GOUGES OR GROOVES TO BLOW OF A GEOLOGISTS PICK. HAND SPECIM		SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.				
GRAIN MM 305 75 2.0 0.25 SIZE IN 12" 3"	5 0.05 0.005	CPT - CONE PENETRATION TEST SLI SLIGHTU CSE COARSE TCR - TRICON	_Y	BY MODERATE BLOWS  MEDIUM CAN BE GROOVED OR	GOUGED 0.05 INCHES DEEP BY FIRM PRESS	URE OF KNIFE OR PICK POINT.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF				
SOIL MOISTURE - CORRELATION	OF TERMS	DMT - DILATOMETER TEST  DPT - DYNAMIC PENETRATION TEST  OVER 15 TO 1 TO 1 TO 1 TO 1 TO 1 TO 1 TO 1 T		HARD CAN BE EXCAVATED I POINT OF A GEOLOGI	IN SMALL CHIPS TO PEICES I INCH MAXIMUM STS PICK.	SIZE BY HARD BLOWS OF THE	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 LESS THAN 0.1 FOOT PENETRATION				
SOIL MOISTURE SCALE FIELD MOISTURE GUIL (ATTERBERG LIMITS) DESCRIPTION	DE FOR FIELD MOISTURE DESCRIPTION	e - VOID RATIO			GOUGED READILY BY KNIFE OR PICK, CAN BE		WITH 60 BLOWS.  STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH				
- SATURATED - USL	JALLY LIQUID: VERY WET, USUALLY	F FINE W - MOISTURE FOSS FOSSILIFEROUS V VERY			ERAL INCHES IN SIZE BY MODERATE BLOWS EN BY FINGER PRESSURE.	OF A PICK POINT. SMALL, THIN	OF STRATUM AND EXPRESSED AS A PERCENTAGE.				
LL LIOUID LIMIT(SAT.) FRO	OM BELOW THE GROUND WATER TABLE	FRAC FRACTURED VST - VANE S FRAGS FRAGMENTS MED MEDIUM	HEAR TEST		I KNIFE. CAN BE EXCAVATED READILY WITH SS CAN BE BROKEN BY FINGER PRESSURE. O		STRATA ROCK QUALITY DESIGNATION IS.R.O.D A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.				
RANGE S - WET - (W)	MISOLID; REQUIRES DRYING TO TAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT F	PROJECT	FRACTURE SPACI	NG B	EDDING	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.				
(PI) PL PLASTIC LIMIT		DRILL UNITS: ADVANCING TOOLS:	HAMMER TYPE:		ACING TERM	THICKNESS DED > 4 FEET	BENCH MARK: BL-527				
UM T OF THOSE MOTS TORCE	OLID; AT OR NEAR OPTIMUM MOISTURE		X AUTOMATIC MANUAL	VERY WIDE MORE TH WIDE 3 TO 10	AN 10 FEET VERY THICKLY BEDI FEET THICKLY BEDDED	1.5 - 4 FEET	-BL- PINC 103+58.79=				
SL SHRINKAGE LIMIT	OURSE ARRITONIAL MATER TO	MOBILE B- CLAY BITS  6 CONTINUOUS FLIGHT AUGER	CORE SIZE:	MODERATELY CLOSE 1 TO 3 F CLOSE 0.16 TO	EET THINLY BEDDED VERY THINLY BEDDE		-BY3- PINC I6+98.36 -L- I08+84.55 OFF 4I.69'				
	DUIRES ADDITIONAL WATER TO TAIN OPTIMUM MOISTURE	BK-51 X 8* HOLLOW AUGERS	-B		AN Ø.16 FEET THICKLY LAMINATED		-YI- 26+I4.23 OFF 48.05' ELEVATION: 758.37				
PLASTICITY		CME-45 HARD FACED FINGER BITS	X -N XWL		INDURATION		NOTES:				
PLASTICITY INDEX (PI)	DRY STRENGTH	TUNGCARRIDE INSERTS		FOR SEDIMENTARY ROCKS, INDURATION	IS THE HARDENING OF THE MATERIAL BY						
NONPLASTIC 0-5 LOW PLASTICITY 6-15	VERY LOW SLIGHT	$oxed{X}$ cme-550 $oxed{X}$ casing $oxed{X}$ w/ advancer		FRIABLE	RUBBING WITH FINGER FREES NUMER GENTLE BLOW BY HAMMER DISINTED		,				
MED. PLASTICITY 16-25 HIGH PLASTICITY 26 OR MORE	MEDIUM HIGH	PORTABLE HOIST $X$ TRICONE $2\frac{7}{8}$ STEEL TEETH	HAND TOOLS:  POST HOLE DIGGER	MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM S						
COLOR		TRICONE TUNGCARB.	HAND AUGER		BREAKS EASILY WHEN HIT WITH HAN						
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS	(TAN, RED, YEL-BRN, BLUE-GRAY)	CORE BIT	SOUNDING ROD	INDURATED	GRAINS ARE DIFFICULT TO SEPARA DIFFICULT TO BREAK WITH HAMMER						
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO		OTHEROTHER	VANE SHEAR TEST OTHER	EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO	) BREAK SAMPLE;					
			OTHER		SAMPLE BREAKS ACROSS GRAINS.						

 ID
 STATE PROJECT NO.
 SHEET NO.
 TOTAL SHEETS

 R-2606A
 34480.1.1
 2
 14



#### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201 LYNDO TIPPETT

SECRETARY

April 21, 2004

STATE PROJECT: 34480.1.1 (R-2606A)

COUNTY:

Randolph

DESCRIPTION:

Bridge on -Y1- (Cedar Square Rd.) over US 311

SUBJECT:

Geotechnical Report – Bridge Foundation Investigation

This is a proposed single structure bridge on new location along Cedar Creek Rd. (-Y1-) over proposed US 311. The new structure is a 2 span curved continuous composite plate girder design with span lengths at 114.5' and 117.0' respectively and a total bridge width of 55'-1". The bridge is located in a curve causing the bents to vary in skew angle between 72°-09'-57" and 78°-28'-55". End bent slopes are proposed to be 1.5:1 (H:V) with 4" concrete slope protection.

Foundation test borings were performed with a CME-550 drill machine utilizing Hollow Stem Augers, NW Casing, NXWL, Tri-Cone roller bit and automatic drop hammer. The field investigation for this project was conducted in March of 2004.

#### Physiography/Geology

The project area is located in Randolph County in the northern-central piedmont region of North Carolina. The site topography ranges from flat to gently sloping.

Geologically this site is part of the Carolina Slate Belt and is underlain by granitic and meta-granitic rock types.

Residual soil types encountered at the bridge site consist of medium stiff to stiff sandy silty clay (A-7-5, A-7-6), medium dense to dense silty sand (A-1-b) and stiff to hard clayey sandy silt (A-4). Alluvial soils were present at interior bent and EB2 locations and consist of loose to medium dense silty sand (A-2-4). Weathered rock followed by hard rock was encountered at all boring locations

Sheet 3

#### **Foundation Materials**

#### End Bent 1:

This bent is located south of proposed US 311. Two borings drilled for this bent location encountered 10.5 to 18.3 feet of residual soil overlying a ½ foot layer of weathered rock followed by hard rock. Residual soils are comprised of medium dense to dense brownwhite silty sand (A-1-b), stiff tan-gray-brown sandy silty clay (A-7-6) and hard tan-gray clayey sandy silt (A-4). Weathered rock was encountered at elevation 747.8 feet in boring EB1-A and 754.4 feet in boring EB1-B. Auger refusal on hard rock was achieved 0.5 feet below the weathered rock horizon at each boring location.

#### Bent 1:

Two borings were performed for this interior bent location along the centerline of proposed US 311. Between 1.5 and 6.4 feet of alluvial soil was present across the bent and consists of loose to medium dense gray silty sand (A-2-4) and medium stiff red-graybrown sandy silty clay (A-7-5). Beneath alluvium lies 4.5 to 6 feet of residual medium dense to very dense brown-white silty sand (A-1-b) overlying weathered rock. Weathered rock varies in thickness from 1.0 to 7.0 feet and begins at elevation 753.75 feet in boring B1-A and 746.83 feet in boring B1-B. Hard rock occurs below weathered rock at each boring location and was cored for evaluation. The hard rock horizon varies less than 1 foot in elevation between the two boring locations and occurs at elevation 746.75 feet in boring B1-A and 745.93 feet in boring B1-B.

#### End Bent 2:

Two borings were performed north of proposed US 311 for this bent location and encountered 3.8 to 5.9 feet of alluvium overlying residual soils. Alluvial soils consist of loose to medium dense gray silty sand (A-2-4). Beneath alluvium lies 6.7 to 7.7 feet of residual stiff gray-white sandy silt (A-4) and dense to very dense brown-white to graywhite silty sand (A-2-4). Weathered rock occurs below residual soil and ranges in thickness between 0.5 and 2.2 feet. The weathered rock horizon occurs at elevation 744.37 feet in boring EB2-A and 740.6 feet in boring EB2-B. Auger refusal on hard rock was achieved at each boring location between elevation 743.87 (EB2-A) and 738.4 (EB2-B).

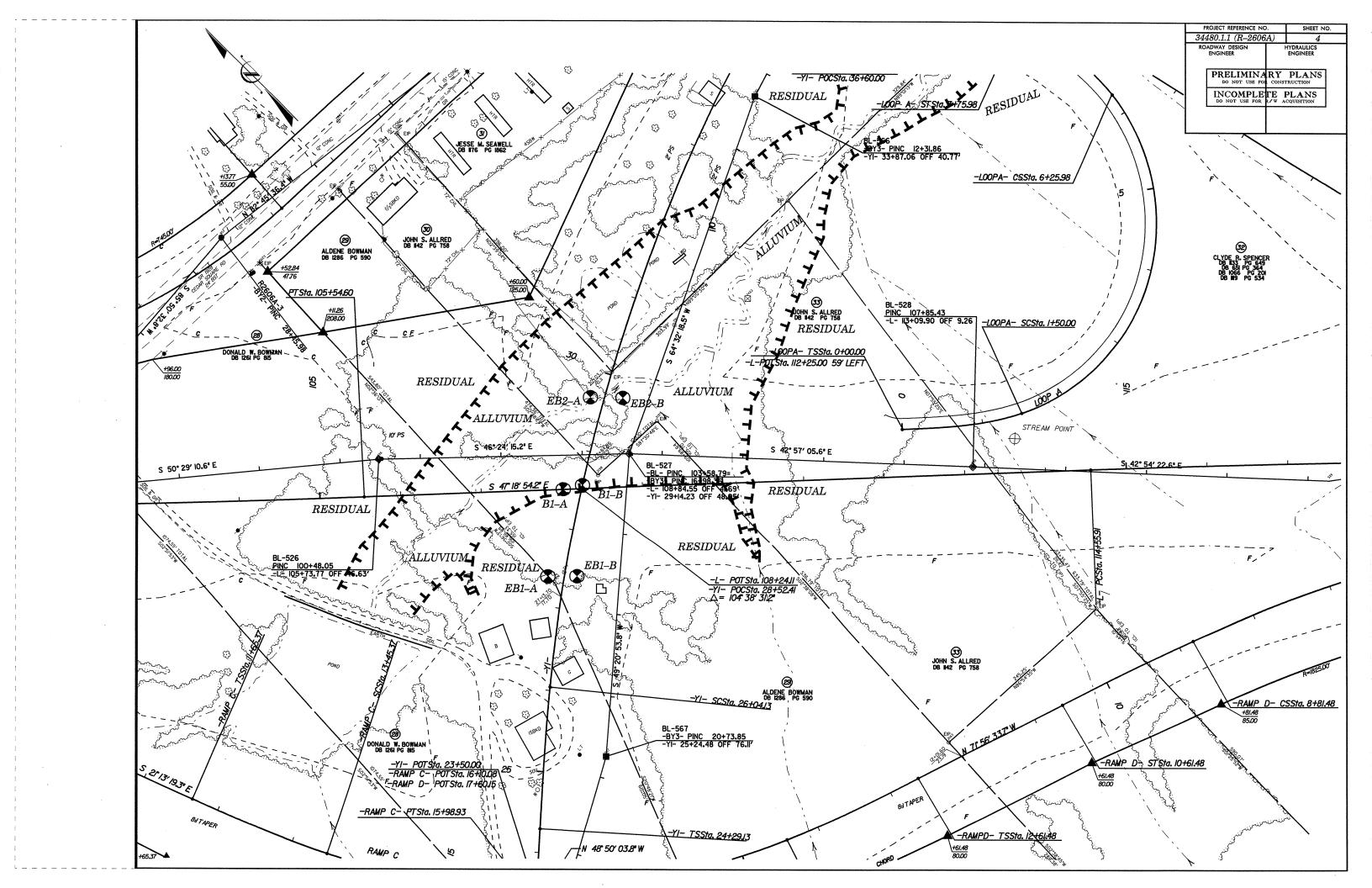
#### Groundwater

Static groundwater measurements made more than 24 hours after each boring indicate a groundwater table between approximate elevation 753.3 and 761.1 feet at this site. Groundwater is within 1 foot of the ground surface at Bent 1 and End Bent 2 locations.

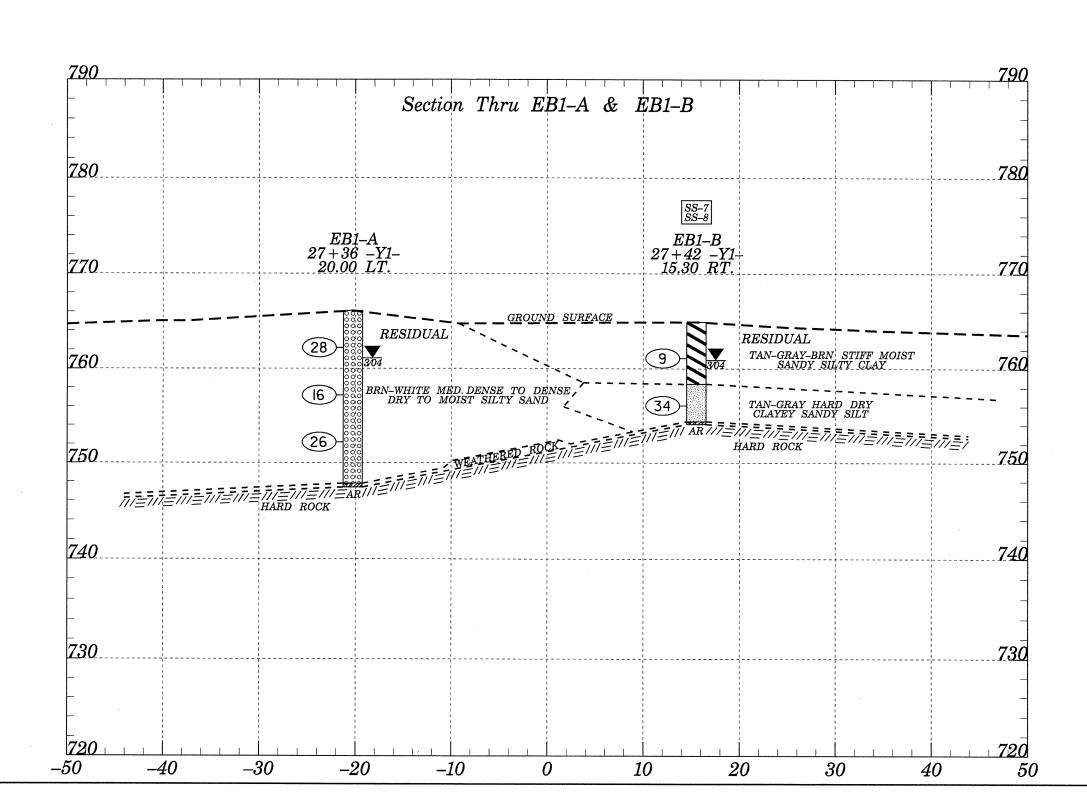
Respectfully submitted,

J.E. Beverly, Project Geologist

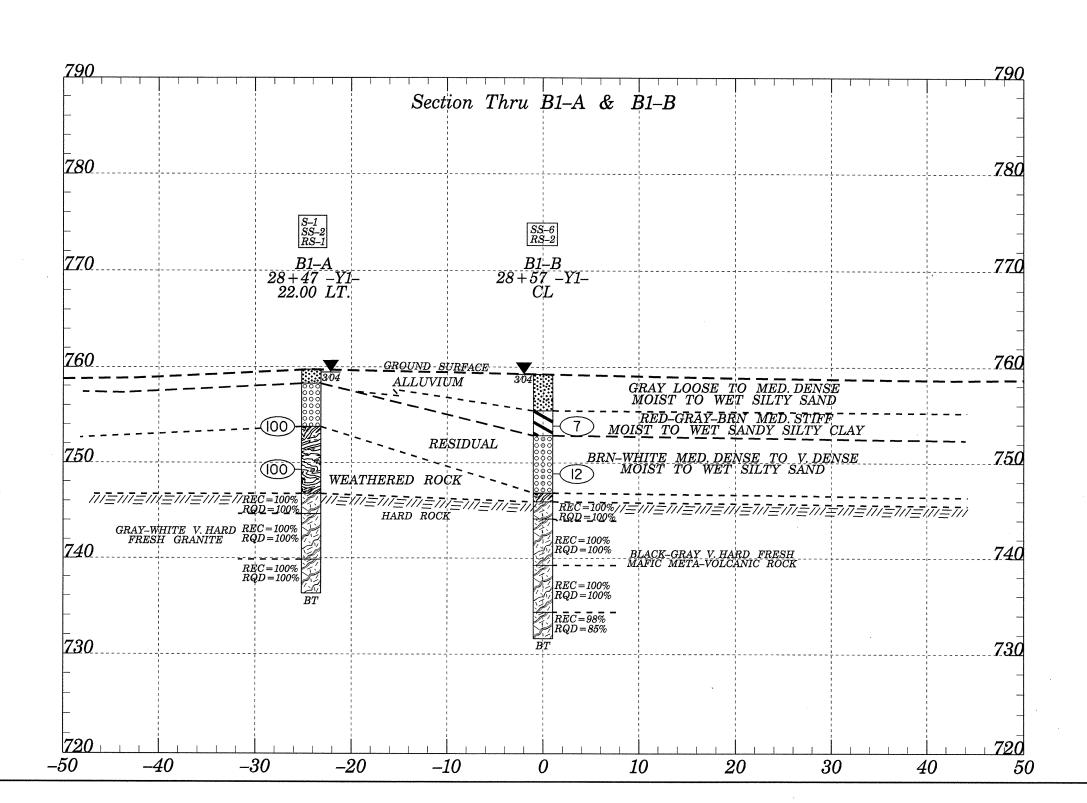
JE Beverly



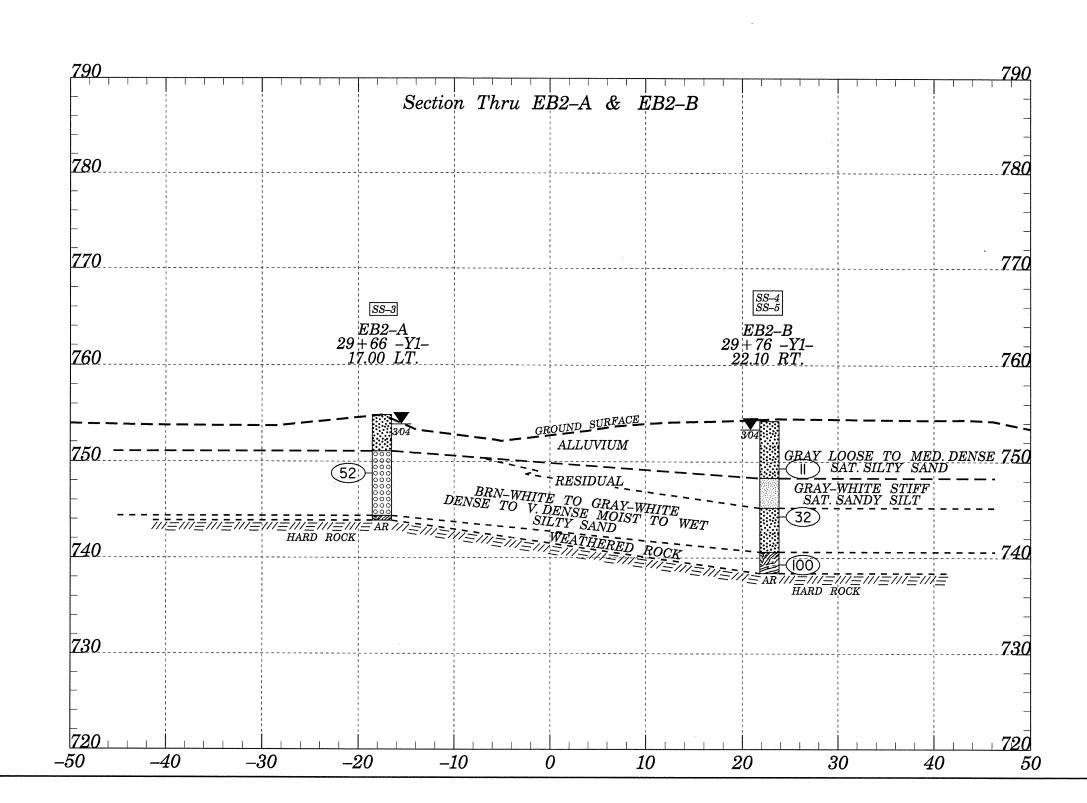
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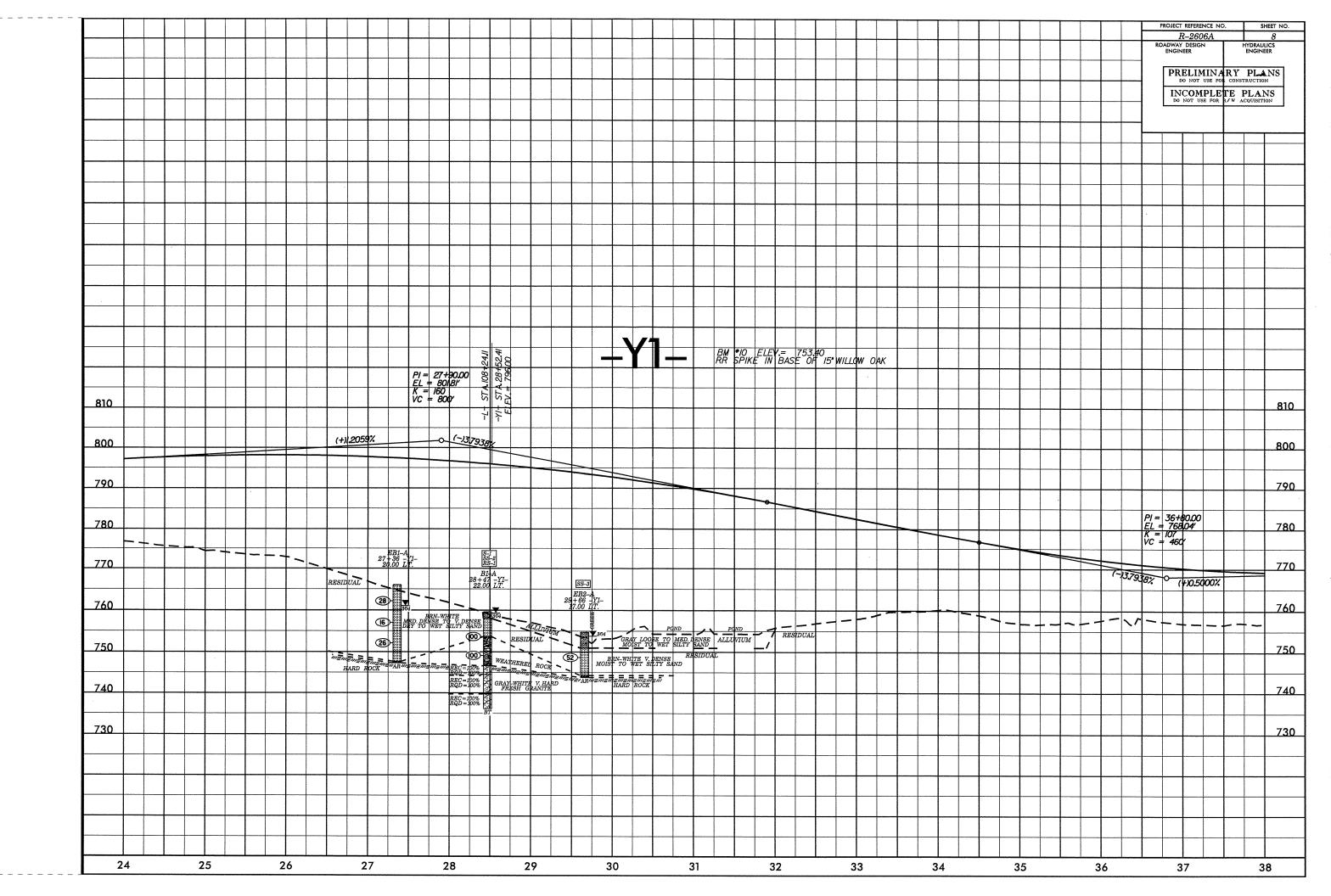


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PROJECT REFERENCE NO	SHEET NO.
R-2606A	7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMIN A DO NOT USE FOR	RY PLANS CONSTRUCTION
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										ORING	LOG			
PROJECT					ID R-2	<del>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</del>			NDOLPH		GEO	LOG	IST J.K. STICKNE	Y
SITE DES			DGE (			·		ER US 3	11					GND WATER
BORING N		<u> </u>				HING 0.00				EASTING				0 HR 14.00ft
ALIGNME		2.40%				G LOCAT				OFFSET :		LT	T	24 HR 5.00ft
COLLAR					101AI	DEPTH	T			TE 3/18/0	4	······································	COMPLETION D.	
DRILL MA						***************************************	<del> </del>		D H.S. AL		······································		HAMMER TYPE	AUTOMATIC
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ELEV	DEPTH	6in			1 1				75 10		MOI	١ġ١		RIPTION
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						GEOT	ECHN	ICAL I	JNIT B	ORING	LOG	<b>O</b> 1 ·	KIAHON				
PROJECT	ΓNO 3448	0.1.1		]	D R-2				NDOLPH		7		GIST J.K. STICKNE	Y			
	CRIPTIO		DGE	ON C	EDAR	SQUARE	RD. OV	ER US 3	11					GND WATER			
BORING	NO EB1-E	}		1	ORT	HING 0.0	0			EASTING	0.00			0 HR N/A			
ALIGNM	ENT Y1			1	BORIN	G LOCAT	TION 27	+42.000		OFFSET		RT		24 HR 4.00ft			
COLLAR	ELEV 76	4.90ft		7	TOTA	L DEPTH	10.80ft		START DA	TE 3/18/0			COMPLETION D.				
DRILL M	ACHINE (	CME-	550				DRILL		D H.S. AL				HAMMER TYPE				
SURFACE	E WATER	DEPT	H N/A	4			1		CK 10.80f				Log EB1-B, Page 1 of 1	, to row, tho			
ELEV	DEPTH	Bl	_OW	CT	PEN	E	BLOWS F			SAMPLE	<b>V</b> /	1	AA IIOS	D ROCK			
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764.90 -	_		<b></b>	l			Giouna	Surface					55015114				
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760.00	3.80	3	4	5	1.0	9-				SS-7	MOIST		CL				
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_	8.80	6	12	22	1.0		34						HARD TAN-GRAY	CLAYEY SANDY			
754.10 <u> </u>	_ 0.00		'~		'		- X			SS-8	DRY		SI				
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PROJECT			DO:		D R-2			·····	NDOLPH		GEO	LUG	GIST J.K. STICKNE	T
	CRIPTION	RKI	DGE (					EK 05 3	11	E A CONTRAC	0.00			GND WATER
BORING						HING 0.0		. 47.000		EASTING				0 HR 0.70ft
ALIGNMI				<del></del>		G LOCAT				OFFSET 2		LT		24 HR 0.30ft
	ELEV 759				TOTAL	_ DEPTH	7			TE 3/17/0	4		COMPLETION D	
DRILL M.	ACHINE (	CME-5	550				<del> </del>		D NW CA				HAMMER TYPE	AUTOMATIC
SURFACE	E WATER								K 13.00ff				Log B1-A, Page 1 of 1	
ELEV	DEPTH	ŀ	OW		PEN			PER FOC		SAMPLE	$ \Psi $	6		D ROCK
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759.75				<del> </del>	<u> </u>		Ground	Surface		1 04	<u> </u>		A1118 (1114 1 0 0	AF TO MEDIUM
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750.00_	10.50	100			0.2				100				WEATHER	RED ROCK
-	10.50	100			0.2				<u> </u>	1				
-	+									RUN #1		33	•	
-	F									1			HARD ROCK -	
	‡									RUN #2			FRESH, GRAY-V (1 SOLID PIEC	
740.00	_												REC=100%	
740.00	_									RUN #3		×	AS ABOVE -	REC=100%
	_									11011110			RQD=	100%
736.25							NG TEE	MINATE		<del> </del>			AS ABOVE -	
-	F								NVERY				RQD=	100%
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SHEET 10 OF 14

### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34480.1.1

PROJECT ID: R-2606A

**COUNTY:** RANDOLPH

SITE DESCRPTION: BRIDGE ON -Y1- (CEDAR SQUARE RD.) OVER US 311

BORING NO: B1-A COLLAR ELEV: 759.75

TOTAL RUN: 10.5

**BORING LOCATION (STA): 28+47** 

COLLAR ELEV: 759.75 PERSONNEL: D.K. BRATTON TOTAL DEPTH: 23.5' DRILL MACHINE: CME-550

DRILL EQUIP: NW CASING

GEOLOGIST: J.K. STICKNEY DRILLER: C.L. SMITH OFFSET: 22 LT CORE SIZE: NXWL

DATE STARTED: 3/17/04 DATE COMPLETED: 3/17/04

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
746.75	13.0		1	100	100		VERY HARD, FRESH, GRAY-WHITE GRANITE (1 SOLID PIECE OF CORE)
744.65	15.1		2	100	100		AS ABOVE (1 SOLID PIECE OF CORE)
739.85	19.9		3	100	100	RS-1	AS ABOVE (1 SOLID PIECE OF CORE)
736.25	23.5	·					
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PDOIECT	Г <b>NO</b> 3448	O 1 1		1	D R-2				NDOLPH	JRING I			GIST J.K. STICKNE	
	CRIPTION		DGE			IST J.N. STICKINE	GND WATER							
BORING		DIXI	DOL			HING 0.00		LIX 00 0	1 1	EASTING	0.00			0 HR 0.00ft
ALIGNM						G LOCAT		-57 000		OFFSET (				24 HR 0.00ft
		7 7 2 4							TADED				COMPLETION D	· · · · · · · · · · · · · · · · · · ·
	ELEV 759				IUIAI	DEPTH	·			ATE 3/17/0	14		COMPLETION D	
	ACHINE (				~~~~~~~~~~		<del> </del>		D NW CA				HAMMER TYPE	AUTOMATIC
SURFACI	E WATER		OW (	СТ	PEN		LDEPTH BLOWS F		K 13.30f	SAMPLE		111	Log B1-B, Page 1 of 1	ID ROCK
ELEV	DEPTH	6in			1 1				75 10		MOI	١٥١		RIPTION
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750.00-	<u> </u>						-Ground	Surface			-			
759.23	<u> </u>	<u> </u>				<del> </del>	Ciduna	Curiacc			<u> </u>		ALLUVIUM - LOC	SE TO MEDILIM
-	<u> </u>							<u> </u>						SILTY SAND
-		3	3	4	1.0							M	MEDIUN	
-	- 3.40	١		7	1.0	-X				SS-6	M/W		RED-GRAY-BF	
750.00_	‡											0000	SILTY	CLAY
750.00	10.40	2	4	8	1.0							0000	RESIDUAL - MI	
-	‡ '					::X::					M/W	0000 0000 0000	BROWN-WHIT	E SILTY SAND
-	±		İ							RUN #1			WEATHER	RED ROCK
-	<u> </u>							<u> </u>		RUN #2			HARD ROCK -	VERY HARD,
_	Ŧ:												FRESH, BLACK	
740.00	<u> </u>									· ·			META-VOLAC	
-	‡.									RUN #3		3	REC=100%	
-	‡												AS ABOVE -	REC=100%
-	t												RQD=	100%
731.63 -	<u> </u>							<u> </u>		RUN #4			AS ABOVE -	
701.00	<b>-</b>					BOR	NG TER	MINATE	DĀŤ				RQD=	
-	F					ELEVATI	DN-731.	3-FEET-	N-VERY				AS ABOVE - EX BROKEN INT	
-	F					HARD	MAEIC M	ETA-VO	TCVVIC -				REC=98%	
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SHEET // OF 14

#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34480.1.1

COLLAR ELEV: 759.23'

BORING NO: B1-B

PROJECT ID: R-2606A

**COUNTY:** RANDOLPH

SITE DESCRPTION: BRIDGE ON -Y1- (CEDAR SQUARE RD.) OVER US 311

**BORING LOCATION (STA): 28+57** 

TOTAL DEPTH: 27.6' **TOTAL RUN:** 14.3'

PERSONNEL: D.K. BRATTON DRILL MACHINE: CME-550

DRILL EQUIP: NW CASING

**GEOLOGIST:** J.K. STICKNEY

DRILLER: C.L. SMITH OFFSET: 22 RT

CORE SIZE: NXWL

DATE STARTED: 3/17/04

DATE COMPLETED: 3/17/04

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
745.93	13.3		1	100	100		VERY HARD, FRESH, BLACK-GRAY MAFIC META- VOLCANIC ROCK (1 SOLID PIECE OF CORE)
744.13	15.1		2	100	100		AS ABOVE (1 SOLID PIECE OF CORE)
739.23	20		3	100	100		AS ABOVE (1 SOLID PIECE OF CORE)
734.33	24.9		4	98	85	RS-2	AS ABOVE EXCEPT CORE IS BROKEN INTO 2 PIECES
731.63	27.6						
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NOTES							

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PROJECT					D R-2			NTY RAI			GEO	LOC	GIST J.K. STICKNE	Y
SITE DES			DGE (					ER US 3	<u>  1</u>	<del></del>				GND WATER
BORING I	NO EB2-A	١		1	NORT	HING 0.00	0			EASTING	0.00			0 HR 0.90ft
ALIGNMI	ENT Y1			I	BORIN	G LOCAT	TION 29-	+66.000		OFFSET	17.00ft	LT		24 HR 1.00ft
COLLAR	ELEV 754	1.87ft			[OTA]	L DEPTH	11.00ft	s	TART DA	TE 3/17/	)4		COMPLETION D.	ATE 03/17/04
DRILL M	ACHINE (	CME-5	550				DRILL	METHOI	H.S. AL	IGERS			HAMMER TYPE	AUTOMATIC
SURFACE	WATER								K 11.00fl				Log EB2-A, Page 1 of 1	
ELEV	DEPTH	Bl	OW (	CT	PEN			PER FOO		SAMPLE	$ \mathbf{Y} $	L	SOIL AN	ID ROCK
LLLV	DEI III	6in	6in	6in	(ft)	0 2 I	25 (	50 7 1	5 10	o NO	моі	Ğ	DESCR	RIPTION
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754.87	_						Ground	Surface						
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743.87	_											0000 0000 2 %	*	*
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PROJECT					ID R-2				NDOLPH		GEO	LOG	IST J.K. STICKNEY	
SITE DES	CRIPTIO	N BRI	DGE	ON C	EDAR	SQUARE	RD. OV	ER US 3	11		4			GND WATER
BORING I	NO EB2-E	3	·····	1	NORT	HING 0.0	0 .			EASTING	0.00			0 HR 0.60ft
ALIGNMI	ENT Y1		· · ·	. ]	BORIN	IG LOCAT	TION 29	+76.000		OFFSET 2	22.10ft	RT		24 HR 0.90ft
COLLAR			··		<b>TOTA</b>	L DEPTH	15.80ft		START DA	TE 3/17/0			COMPLETION DA	
DRILL MA							DRILL	METHO	D H.S. AL	JGERS			HAMMER TYPE	
SURFACE	WATER					r			K 15.80ff				Log EB2-B, Page 1 of 1	
ELEV	DEPTH	1	OW		PEN		BLOWS F			SAMPLE	MOI	닛	SOIL AN	D ROCK
		6in	6in	6in	(ft)	0 2	25 (	50	75 10	O NO	MOI	Ğ	DESCR	IPTION
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754.20	_						Ground	Surface						
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750.00	-	_	_	_									DENSE GRAY	
-	4.90	3	5	6	1.0	11				SS-4	SAT			
7 7	-									33-4	SAI		RESIDUAL - STIF	F GRAY-WHITE
- 1	- - 9.90	17	14	18	1.0								SAND	
· ‡	- 0.00	''	'7	10	1.0		32			SS-5	мм		DENSE GRAY-WH	ITE SILTY SAND
	-				1.									
740.00 738.40	_14.90	27	73		0.8				100-			<u> </u>	WEATHER	ED BOCK
730.40	-				1	ĀŪĢĒR-	RELIGAI	ĀTĒĪĒ	VATION	<del>                                     </del>	DRY		WEATHER	ED ROCK
+	-					738.4	EET-ON	CRYST/	LLINE					
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#### TEST RESULTS

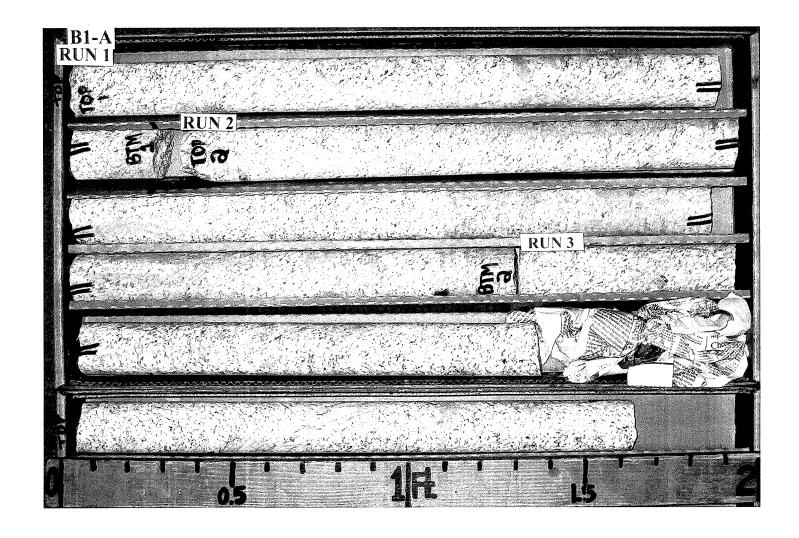
PROJECT: 34480.1.1 R-2606A COUNTY: RANDOLPH

SITE DESCRIPTION: BRIDGE NO. 519 ON -Y1- (CEDAR SQUARE RD.) OVER US 311

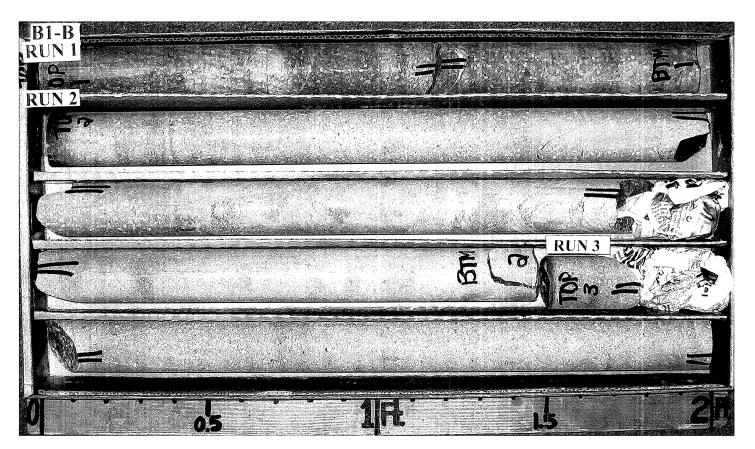
SOILS	SAMPLE RES	SULTS													*				ROCK	SAMPLE RE	SULTS					
SAMPLE NO.	OFFSET	STATION	DEPTH	AASHTO	N	L.L.	P.I.		% BY WEIG	HT		% PAS	SSING S	TEVES	%	%	UNIT	VOID	SAMPLE NO.	OFFSET	STATION	DEPTH	RQD	UNIT WT	Q(MPa)	E(MPa)
			INTERVAL	CLASS				C. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC	WT. (d)	RATIO				INTERVAL			(MPsi)	(MPsi)
		EB1-B																								
SS-7	15.30 RT.	27+42 (-Y1-)	4.30-5.30	A-7-6(12)	9	46	20	17.5	23.3	41	18.1	100	91	64												
SS-8					34	31	8	31	24.7	34.2	10.1	71	56	36												
		B1-A																			<b>B1-A</b>					
S-1	22.00 LT.	28+47 (-Y1-)	0.00-1.50	A-2-4(0)		18	NP	41	33	23.9	2	98	78	30					RS-1	22.00 LT.	28+47 (-Y1-)	19.9-20.5	100%	CURREN	TLY BEING T	<b>FESTED</b>
SS-2			6.00-7.00	A-2-4(0)	100	23	NP	56.5	20.5	18.9	4	93	54	25												
		B1-B																			B1-B				·	
SS-6	CL	28+57 (-Y1-)	5.90-6.90	A-7-5(18)	7	49	18	3.2	19.7	61	16.1	100	99	86					RS-2	CL	28+57 (-Y1-)	24.9-25.4	98%	CURREN	TLY BEING T	ГЕSTED
		EB2-A																								
SS-3	17.00 LT.	29+66 (-Y1-)	6.60-7.60	A-1-b(0)	52	21	NP	62.2	20.5	15.3	2	81	43	16												
		EB2-B																								
SS-4	22.10 RT.	29+76 RT.	5.40-6.40	A-4(0)	11	35	NP	23.3	34	36.6	6	98	84	51												
SS-5			10.40-11.40	A-2-4(0)	32	33	NP	36.6	21.5	37.8	4	54	37	27												

#### 34480.1.1 R-2606A RANDOLPH COUNTY BRIDGE ON CEDAR SQUARE RD. OVER US 311

CORE PHOTOS



B1-A



**B1-B** 

