STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRU	CTURE
SUBSURFACE	INVESTIGATION

PROJ.REFERENCE NO		F.A. PR	:OJ	
COUNTY CHEROKEE				
PROJECT DESCRIPTION				
				_
	1000			_
SITE DESCRIPTION _CHEROKE	E BRIDGE	NO. 245 ON	SR-1649 OVER	
VALLEY				

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL
N.C.	CHEROKEE COUNTY BRDG. #245	1	11

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVALABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, CEOTECHNICAL ENGINEERING UNIT AT 1919 250-0408N. RETHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 NECESSARLY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNICS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELED ON ONLY TO THE DEGREE OF RELIBBLITY NIMEBERT 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 THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC CONDITIONS INCLUDING

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 DEFARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOT PHE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDIER 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 PRODUCT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS TO BE.

	PERSONNEL
	D.C. ELLIOTT
	D.O. CHEEK
	C.J. COFFEY
INVESTIGATED	BY P.Q. LOCKAMY
CHECKED BY_	
SUBMITTED BY	
DATE	2.6.13



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.

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

TERMS AND DEFINITIONS SOIL DESCRIPTION <u>well graded</u> - indicates a good representation of particle sizes from fine to coarse <u>Uniform</u> - indicates that soil particles are all approximately the same size. (ALSO ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SYT REFUSAL.

SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. AQUIFER - A WATER BEARING FORMATION OR STRATA. GAP-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 <u>ARENACEOUS</u> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. LASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: ANGULARITY OF GRAINS CONSISTENCY, COLOR. TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, AS MINERALOGICAL COMPOSITION ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. WEATHERED ROCK (WR) VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. <u>RTESIAN</u> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO DR ABOVE THE CRYSTALLINE ROCK (CR) GROUND SURFACE. GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS MINERAL NAMES SUCH AS QUARTZ.FELDSPAR.MICA.TALC.KADLIN.ETC.ARE USED IN DESCRIPTIONS would yield spt refusal if tested. ROCK Type includes granite. MOULD YIELD SPT REFUSAL IF TESTED, RUCK TYPE INCLUDES GRANITE,

GNEISS, GABRO, SCHIST, ETC.

FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN

SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE

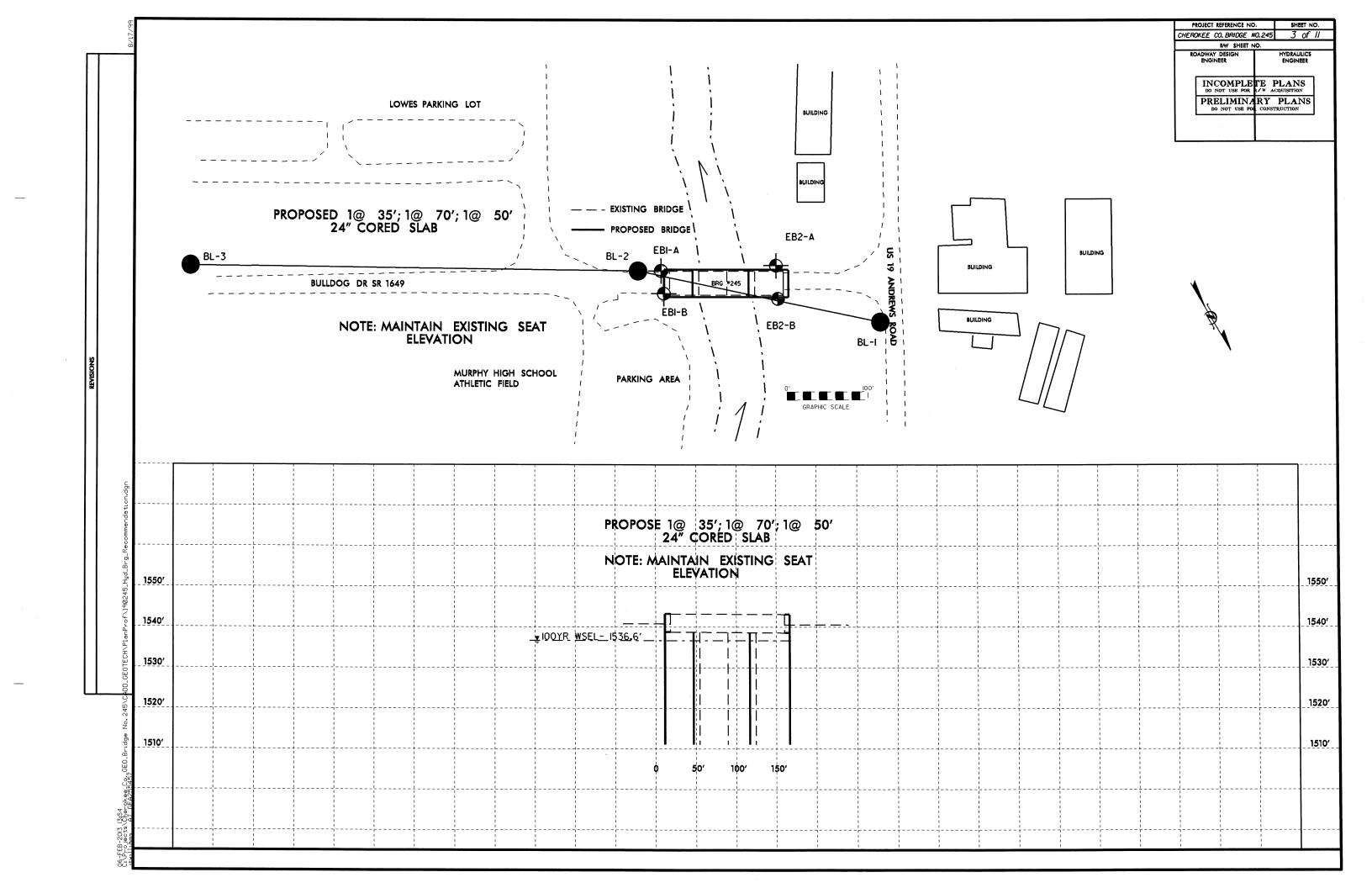
INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

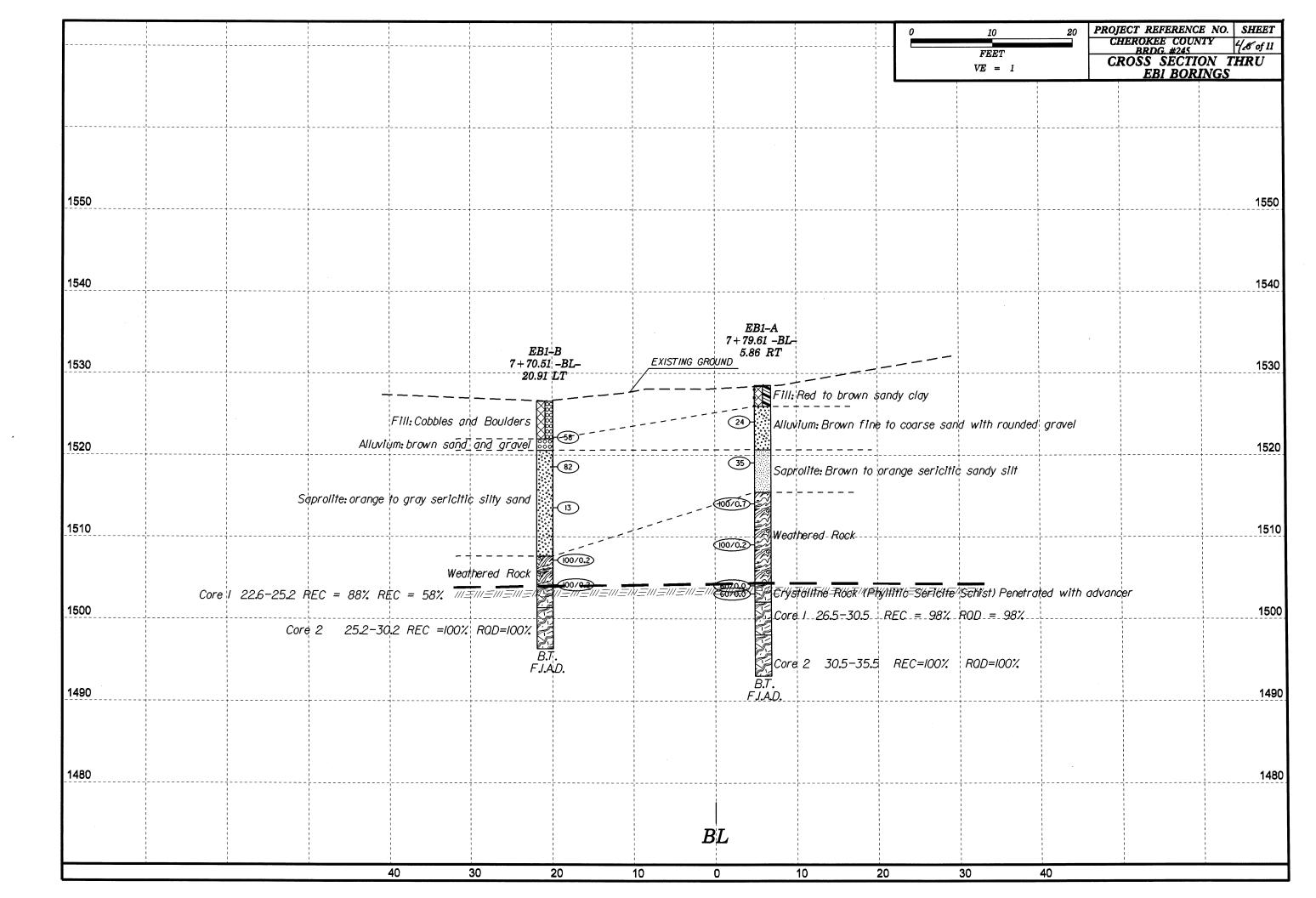
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD ORGANIC MATERIALS (≤ 35% PASSING *200 CLASS. WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6, A-7 A-7, A-7, A-8 A-8 A-6, A-7 A-1 A-3 NON-CRYSTALLINE ROCK (NCR) COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM GROUP CLASS. A-2-4 A-2-5 A-2-6 A-2-7 SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 <u>core recovery (rec.)</u> - total length of all material recovered in the core barrel divided by total Length of core run and expressed as a percentage. COASTAL PLAIN SEDIMENTARY ROCK MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50 SYMBOL SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED PASSING PERCENTAGE OF MATERIAL DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT SILT WEATHERING ROCKS OR CUTS MASSIVE ROCK. ORGANIC MATERIAL OTHER MATERIAL SOILS SOILS SOILS SOILS 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 FRESH RACE OF ORGANIC MATTER 3 - 52 HAMMER IF CRYSTALLINE. LITTLE 10 - 20% LIQUID LIMIT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF MODERATELY ORGANIC SOTI S WITH 5 - 10% 12 - 20% 20 - 35% 35% AND ABOVE PLASTIC INDEX HIGHLY ORGANIC HIGHLY (V SL1.) THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. HIGHL Y OF A CRYSTALLINE NATURE. GROUP INDEX MODERATE 4 MX GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SOTUS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. USUAL TYPES STONE FRAGS.
OF MAJOR
MATERIALS
SAMD
SAND 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STLTY OR CLAYEY STLTY CLAYEY (SLIJ FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. GRAVEL AND SAND SOILS MATTER ▼__ STATIC WATER LEVEL AFTER 24 HOURS SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN ${ t FLOAT}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. MODERATI GEN RATING GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED **∇**P₩ AIR TO PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA (MOD.) EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITARU Flood Plain (FP) – Land Bordering a stream built of sediments deposited by the stream. POOR SURGRADE O-M-SPRING OR SEEP PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH 10DERATEL Y ORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS SEVERE MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. COMPACTNESS OR CONSISTENCY TEST BORING PRIMARY SOIL TYPE ROADWAY EMBANKMENT (RE) DPT DMT TEST BORING OINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED WITH SOIL DESCRIPTION W/ CORE (N-VALUE) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED 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 EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. VERY LOOSE AUGER RORING SPT N-VALUE SOIL SYMBOL ITS LATERAL EXTENT. LOOSE GRANUI AF _ens - A Body of soil or rock that thins out in one or more directions. MEDIUM DENSE N/A 10 TO 30 ARTIFICIAL FILL (AF) OTHER IF TESTED YIELDS SPT N VALUES > 100 BPF (REF)- SPT REFUSAL CORE BORING DENSE 30 TO 50 40TTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT
IV SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (NON-COHESIVE) THAN ROADWAY EMBANKMENT VERY DENSE COILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE **"**O MONITORING WELL (V SEV.) INFERRED SOIL BOUNDARY <u>PERCHED WATER</u> - WATER MAJNTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN VERY SOFT REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR <0.25 2 TO 4 4 TO 8 PIEZOMETER ESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED.YIELDS SPT N VALUES < 100 BPF* NTERVENING IMPERVIOUS STRATUM. 0.25 TO 0.50 INFERRED ROCK LINE Δ MEDIUM STIFF SILT-CLAY INSTALLATION RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE OR DISCERNIBLE ONLY IN SMALL AND MATERIAL STIFF 8 TO 15 SLOPE INDICATOR ALLUVIAL SOIL BOUNDARY ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND VERY STIFF ALSO AN EXAMPLE. >30 ROCK HARDNESS EXPRESSED AS A PERCENTAGE. ROCK STRUCTURES CONE PENETROMETER TEST TEXTURE OR GRAIN SIZE SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES VERY HARD SOUNDING ROD I.S. STD. SIEVE SIZE SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND OPENING (MM) 0.42 0.25 0.075 CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED ABBREVIATIONS RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. COARSE TO DETACH HAND SPECIMEN. FINE (COB.) GRAVEL SILT VANE SHEAR TEST CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED MODERATELY (GR.) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR (SL.) (CL.) BT - BORING TERMINATED MICA. - MICACEOUS WEA. - WEATHERED - UNIT WEIGH GRAIN MM 305 SIZE IN. 12 2.0 0.25 0.05 0.005 BY MODERATE BLOWS. CPT - CONE PENETRATION TEST NP - NON PLASTIC ፟ኂ- DRY UNIT WEIGHT <u>Standard Penetration Test (Penetration Resistance) (SPT)</u> - number of blows (n or BPF) of A 140 LB, Hammer Falling 30 inches required to produce a penetration of 1 foot into soil with CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE SOIL MOISTURE - CORRELATION OF TERMS DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS POINT OF A GEOLOGIST'S PICK. THAN 0.1 FOOT PER 60 BLOWS. SOIL MOISTURE SCALE GUIDE FOR FIELD MOISTURE DESCRIPTION CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS - VOID RATIO SD. - SAND, SANDY SS - SPLIT SPOON SOFT STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. (ATTERBERG LIMITS) DESCRIPTION SILT, SILTY ST - SHELBY TUBE FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN FOSS, - FOSSILIFEROUS PIECES CAN BE BROKEN BY FINGER PRESSURE. SLI. - SLIGHTLY RS - ROCK USUALLY LIQUID: VERY WET, USUALLY <u>Strata rock quality designation (srod) -</u> a measure of rock quality described by total length of rock segments within a stratum equal to or greater than 4 inches divided by the FRAC. - FRACTURED, FRACTURES TCR - TRICONE REFUSA RECOMPACTED TRIAXIAL (SAT.) FROM BELOW THE GROUND WATER TABLE CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH LIQUID LIMIT FRAGS. - FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY OTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. v - VERY LASTIC FINGERNAIL. SEMISOLID: REQUIRES DRYING TO TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING ATTAIN OPTIMUM MOISTURE PLASTIC LIMIT TERM THICKNESS BENCH MARK: -BL I- N 529560 E 499141 ELEV. 1539.94 TERM SPACING DRILL LINITS: ADVANCING TOOLS VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET -BL 2- N 529352 E 499367 ELEV. 1540.07 X AUTOMATIC __ MANUAL THICKLY BEDDED - MDIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE 1.5 - 4 FFFT OPTIMUM MOISTURE CLAY BITS 3 TO 10 FEET ELEVATION: __ MOBILE B- __ THINLY BEDDED L 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: 0.16 TO 1 FEET NOTES: 0.008 - 0.03 FFF1 - DRY - (D) ____ BK-5I VERY CLOS LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE < 0.008 FEET 8' HOLLOW AUGERS THINLY LAMINATED ___-B____ INDURATION PLASTICI HARD FACED FINGER BITS ×-N_XWL ___ CME-45C FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH TUNG.-CARBIDE INSERTS __-H___ VERY LOW RUBBING WITH FINGER FREES NUMEROUS GRAINS; NONPLASTIC X CME-550 LOW PLASTICITY X CASING X W/ ADVANCER GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. 6-15 HAND TOOLS: MED, PLASTICITY MEDIUM X TRICONE 2 15/16 STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; 26 OR MORE POST HOLE DIGGER MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. __ TRICONE ___ • TUNG.-CARB. HAND AUGER INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: SOUNDING ROD X CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). VANE SHEAR TEST MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.

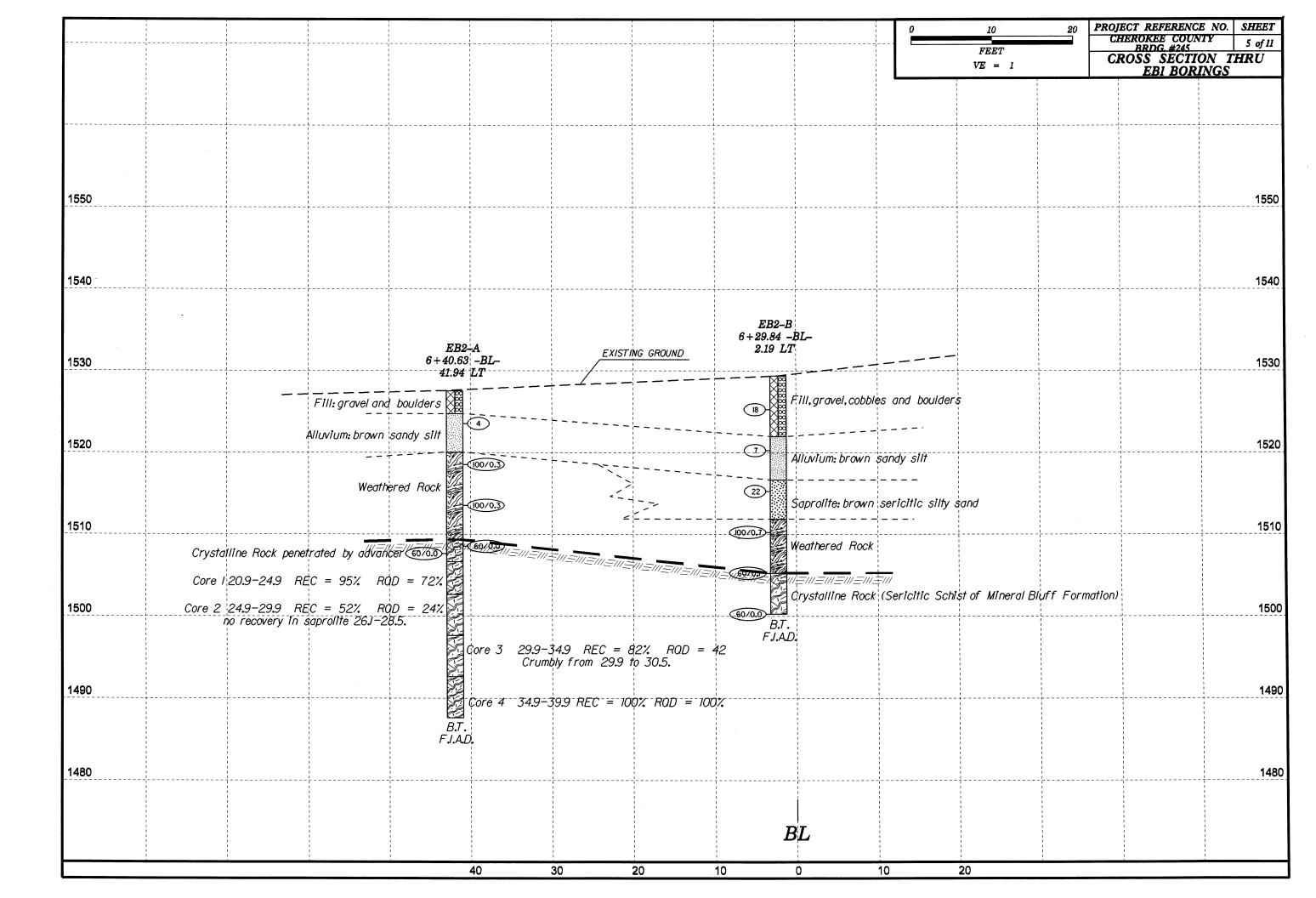
PROJECT REFERENCE NO.

CHEROKEE COUNTY BRDG. #245

SHEET NO.









SHEET

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	LER Cheek, D. O. START DATE 01/31/13					COMP. DA				SURFACE WATER DEPTH				
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No	
BORING NO. EB1-B	0 HR. N/A 24 HR. N/A MER TYPE Automatic N/A SSCRIPTION
COLLAR ELEV. 1,526.6 ft	24 HR. N/A MER TYPE Automatic N/A SSCRIPTION
DRILL RIG/HAMMER EFF/DATE AF00070 CME-550X 81% 09/03/2009 DRILL METHOD NW Casing W/SPT & Core HAN DRILLER Cheek, D. O. START DATE 01/31/13 COMP. DATE 01/31/13 SURFACE WATER DEPTH ELEV (ft) DEPTH (ft) BLOW COUNT (ft) DESTART DATE BLOWS PER FOOT (NO. MO) SAMP. (NO. MO) L O SOIL AND ROCK DESTART	MER TYPE Automatic N/A SSCRIPTION
DRILLER Cheek, D. O. START DATE 01/31/13 COMP. DATE 01/31/13 SURFACE WATER DEPTH ELEV (ft) DEPTH (LEV (ft)) DEPTH (ft) BLOWS PER FOOT (DEPTH (ft)) SAMP. (NO.) NO. MOI G ELEV. (ft)	N/A SCRIPTION
ELEV (ft) DEPTH BLOW COUNT 0.5ft 0.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. MOI G ELEV (ft)	SCRIPTION
ELEV (ft) DEPTH BLOW COUNT BLOW COUNT BLOW SPEKTOOT O SOIL AND ROCK DE	
1545	
1540 — — — — — — — — — — — — — — — — — — —	
1530	RFACE 0.0
1525 Fill: Cobbles and	
1,522.0	4.6
1,521.2 5.4 1,521.6 Alluvium: brown sa	nd and gravel 6.0
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1515	
1510 1.511.2 15.4 4 6 7	
1,507.7 Weathered	18. I Rock
1,506.2 20.4 100/.2	
1,504.2 22.4 1,504.0 Crystalline Rock (S	ericitic Schist)
Core 1 22.6-25.2 REC	thering, Moderately
hard to hard. Rust weathered foliations at:	0 to 70 degrees. 3
natural breaks on 1 1,496.4 Core 2 25.2-30.2 REC	=100% RQD=100% 30
4 breaks on slightly rust degrees, 3 rust stair	/ foliation at 40 t0 70 led breaks not on
foliation. Slight to ver Moderately hard to	slight weathering,
30.1-3 Boring Terminated at E	0.2
crystallin	e rock



SHEET

100	N/A				'''	P N/A	000111	Y CHERON	\			GEOLOGIST DC Elliott					
SITE	DESCRI	PTION	l Che	erokee	Count	ty Bridge Nu	mber 245 on SR-	1649 over Va	lley Rive	er			GROUI	ND WTR (ft			
BORII	NG NO.	EB2	-A		S ⁻	TATION N/	4	OFFSET	V/A			ALIGNMENT N/A	0 HR.	N/A			
COLL	AR ELE	V . 1,	527.5	ft	TO	OTAL DEPTI	d 39.9 ft	NORTHING	529,4	34		EASTING 499,216	24 HR.	N/A			
RILL	RIG/HAN	MER E	FF/DA	TE A	FO0070	CME-550X 81	% 09/03/2009	<u> </u>	DRILL N	ETHO	O NV	V Casing W/SPT & Core HAMMER TYPE Automa					
RILL	ER C	neek, [D. O.		S	TART DATE	01/31/13	COMP. DA	TE 01/	31/13		SURFACE WATER DEPT	JRFACE WATER DEPTH N/A				
LLV	DRIVE ELEV	DEPTH	BLC	ow co	UNT		BLOWS PER FOO	r	SAMP.	lacktriangledown/	L	SOIL AND ROCI	K DESCRIPTION	J			
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	5 50	75 100	NO.	MOI		ELEV. (ft)		DEPTH			
						ŀ											
545		-										_		,			
	‡	-															
	1	-									Ê	g					
540	+	-							l		t	-					
	‡	-															
535												-					
	‡																
	1										ŀ						
530	‡	<u>-</u>										_					
	‡		ļ		-	 		-	 		XIS.		SURFACE and boulders				
525		-				F · · ·						_1,524.7					
l	1.522.5	5.0				[[] []						Alluvium: bro	own sandy silt				
520	1	-	2	2	2	4						1,520.0					
320	1	•											red Rock				
-	1,517.5	10.0	100/.3		1			- 100/.3		٠.		•					
515		• •									7	-					
	1,512.5	- - 15.0										•					
510	1		100/.3		l			- 100/.3			囫						
310	‡	.		ŀ	1					ŀ		-1,509.3 Crystalline Rock pe	netrated by adva	ncer 1			
E	1,507.5 1,506.6	20.0	60/0	1	İ							- 1.506.6		2			
505	†	-	60/0			• • • •		60/0				Core 1 20.9-24.9 RE 5 breaks on foliation v					
	‡									ŀ		rust. Hard and mos					
500	‡											Core 2 24.9-29.9 RE	C = 52% RQD				
300	†	•									M	Numerous breaks on	foliation with son	ne rust.			
	‡					::::						s s	oft.	<i></i>			
495		-										Core 3 29.9-34.9 RI Crumbly from 29	.9 to 30.5. Sligh	itly			
	‡											weathered to fresh 1,492.6 hard.5 breaks on folia	ition at 45 degree	es have3			
490	‡								11				s has rust.	- 1			
100	†	•	ŀ						1			Core 4 34.9-39.9 RE		ch			
-	‡	<u>. </u>	 	 	1	11 1	L	-	4	-		- 1,487.6 Boring Terminated a	t Elevation 1,487				
	#	• •										- crysta 	lline rock				
	‡	•															
	‡											<u>.</u> 5.					
	†	<u>.</u>										<u> </u>					
	‡	•															
	‡	· -										<u>-</u>					
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	‡	•										<u>-</u> -					
- 1	1		I	ŀ	1	1			ı	ī							



30EE1 7/11

WBS N	I/A				T	TIP	N/A		COUNT	Y CHER	OKE	EE			GEOLOGIST	DC Elliot		·	
SITE DE	SCRI	PTION	Che	rokee				mber 245 d	on SR-1				r						D WTR (ft)
BORING							ATION N/			OFFSET					ALIGNMENT			HR.	N/A
COLLAR							TAL DEPT			NORTHI					EASTING 44	19,235		HR.	N/A
				E AF				% 09/03/200		·					Casing w/ SPT	ATED DED	<u> </u>	ITPE	Automatic
DRILLER						STA	ART DATE	01/31/13		COMP. I	TAC	SAMP.	31/13	LT	SURFACE W	ATER DEP	ZIR IN/A		
ELEV DF (ft) El	RIVE LEV (ft)	DEPTH (ft)	0.5ft	W COL		ft	0 2	BLOWS PE 5 50			00	NO.	MOI	0	SC ELEV. (ft)	OIL AND RO	CK DESCR	IPTION	DEPTH (fi
1545 1540 1535															-	GPO! IN	ND SURFAC	re-	0
1530	-	-				1	: : : :								-1,529.4 F	ill, gravel, co			0.
1525 1,5	525.3	4.1	13	4	14	4					•				1,522.0	All :	L	عازه بد	- 7
1520 1,5	520.3	9.1	2	4	3		6 7				-				- - - - - 1,516.7	Alluvium:	brown sand	y silt	12
1515 1.5	515.3	14.1	2	6	16	6		22							- Sa -	aprolite: brov	wn secicitic	silty sand	17
1510 1,	510.3	19.1	79	21/.2						10	- 0/.7				_ 1,511.9	Wea	thered Rock		
1505 1,	505.3	24.1	60/.1							6	D/.1					Crys	stalline Rock	(24
1,	500.3	29.1	60/0		-					: : : :	50/0	\blacksquare	-		1,500.3 Boring	g Terminated	d at Elevation	on 1,500.	29 3 ft in
	-	 							à										

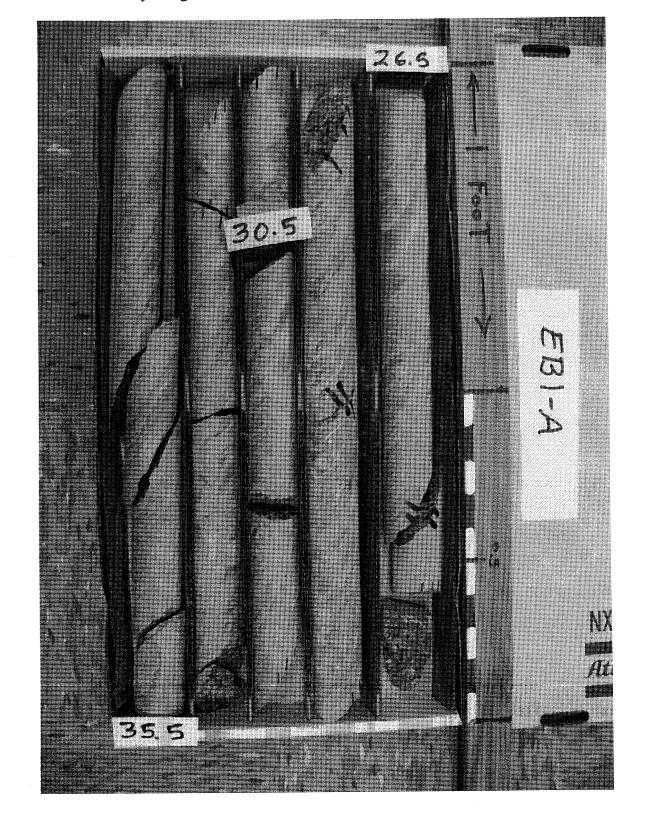


NCDOT GEOTECHNICAL ENGINEERING UNIT

WBS N/A COUNTY CHEROKEE GEOLOGIST DC Elliott SITE DESCRIPTION Cherokee County Bridge Number 245 on SR-1649 over Valley River GROUND WTR (ft) BORING NO. EB1A STATION N/A OFFSET N/A ALIGNMENT N/A 0 HR. N/A COLLAR ELEV. 1,528.5 ft TOTAL DEPTH 35.5 ft **NORTHING** 529,367 **EASTING** 499,343 24 HR. N/A DRILL RIG/HAMMER EFF./DATE AFO0070 CME-550X 81% 09/03/2009 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Cheek, D. O. **START DATE** 01/31/13 **COMP. DATE** 01/31/13 SURFACE WATER DEPTH N/A CORE SIZE NXWL TOTAL RUN 9.0 ft RUN ELEV (ft) DRILL RATE (Min/ft) STRATA REC. RQD (ft) (ft) DEPTH RUN (ft) (ft) REC. RQD SAMP. NO. DESCRIPTION AND REMARKS DEPTH (ft) 1545 Begin Coring @ -16.5 ft 1540 1535 1530 Fill: red to brown sandy clay 1525 Alluvium: brown fine to coarse sand with rounded gravel N=24 1520 Saprolite: brown to orange sericitic sandy silt N=35 1515 Weathered Rock N=100/0.7 1510 N=100/0.2 1505 Crystalline Rock (Phyllitic Sericite Schist N=60/0.0 (3.9) (3.9) (4.0 N=60/0.0 98% 98% 1,502.0 26.5 Penetrated with advancer Slightly metamorphosed fine sandy mud with trace pyrite. Sericite Schist of Mineral Bluff Formation. Hard and Fresh. 5 natural breaks with slight rust 1500 ,498.0 30.5 (5.0) (5.0) 100% 100% Hard and fresh. No natural breaks 1495 1,493.0 35.5 Boring Terminated at Elevation 1,493.0 ft in crystalline rock

SHEET

Cherokee County Bridge Number 245 on SR-1649 over Valley River



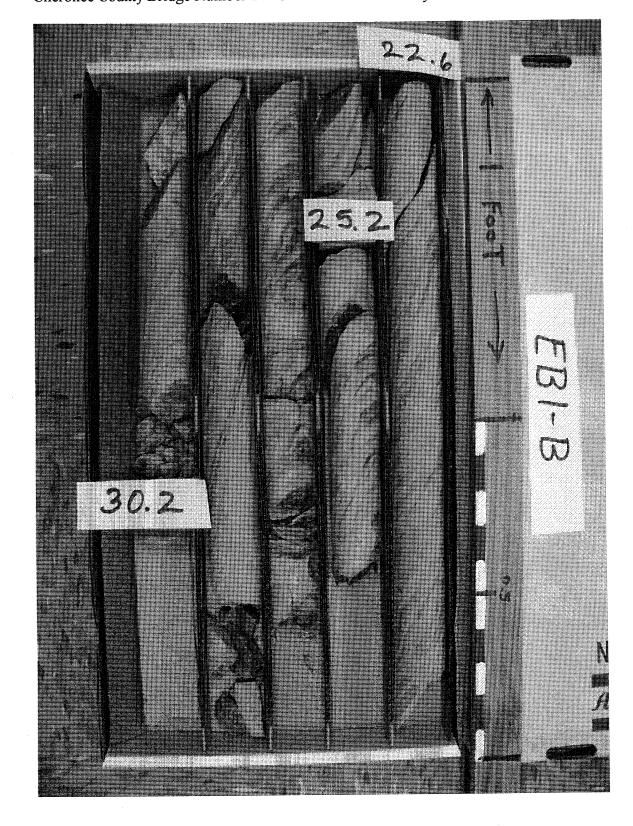
SHEET

TIP N/A COUNTY CHEROKEE GEOLOGIST DC Elliott GROUND WTR (ft) SITE DESCRIPTION Cherokee County Bridge Number 245 on SR-1649 over Valley River BORING NO. EB1-B STATION N/A ALIGNMENT N/A OFFSET N/A 0 HR. COLLAR ELEV. 1,526.6 ft TOTAL DEPTH 30.2 ft **NORTHING** 529,393 **EASTING** 499,354 24 HR. N/A DRILL RIG/HAMMER EFF./DATE AFO0070 CME-550X 81% 09/03/2009 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Cheek, D. O. **START DATE** 01/31/13 **COMP. DATE** 01/31/13 SURFACE WATER DEPTH N/A CORE SIZE NXWL TOTAL RUN 7.6 ft RUN ELEV (ft) DRILL RATE (Min/ft) RUN REC. RQD (ft) (ft) % % STRATA
REC. RQD
(ft) (ft)
% % ELEV DEPTH RUN SAMP. DESCRIPTION AND REMARKS (ft) NO. 1545 Begin Coring @ -18.5 ft 1540 1535 1530 Fill: Cobbles and Boulders 1525 Alluvium: brown sand and gravel N=58 1520 Saprolite: orange to gray sericitic silty sand N=82 1510 N=13 1505 1,504.0 22.6 2.6 W=100/0.2 (2.3) (1.5) 88% 58% Crystalline Rock (Sericitic Schist)
Slight to very slight weathering, Moderately hard to hard. Rust on some slightly weathered foliations at 50 to 70 degrees. 3 natural breaks on rusted 1,501.4 25.2 (5.0) (4.2) 100% 84% 1500 4 breaks on slightly rusty foliation at 40 to 70 degrees, 3 rust stained breaks not on foliation. Slight to very slight weathering. Moderately hard to hard.

Crumbled 30.1-30.2. 1,496.4 + 30.2 Boring Terminated at Elevation 1,496.4 ft in crystalline rock

9/1

Cherokee County Bridge Number 245 on SR-1649 over Valley River



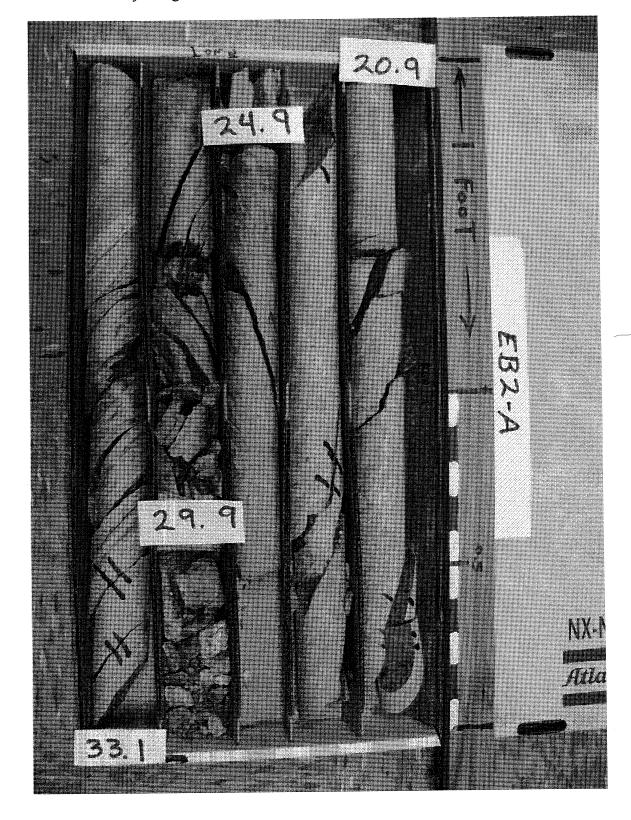
NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET

	N/A				TIP		3 REI			Υ	HEROK	ŒE	GEOLOGIST DC Ellio	tt			
SITE	DESCR	IPTION	l Che	rokee Co	unty E	Bridge	Number 2	245 or	SR-1	649	over Va	lley River			GROUN	D WTR (ft	
BOR	NG NO	. EB2-	-A		STAT	ΓΙΟΝ	N/A			OF	FSET I	N/A	ALIGNMENT N/A		0 HR.	N/A	
COLI	AR EL	EV. 1,	527.5	ft	TOT	AL DE	PTH 39.	9 ft		NO	RTHING	529,434	EASTING 499,216	***************************************	24 HR.	N/A	
DRILL	. RIG/HA	MMER E	FF/DA	TE AFO0	070 CM	E-550X	81% 09/0	3/2009				DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE A					
DRIL	LER C	heek, [D. O.		STAF	RT DA	TE 01/3	1/13		CC	MP. DA	MP. DATE 01/31/13 SURFACE WATER DEPTH N/A					
COR	E SIZE	NXWL	-		TOTA	AL RU	N 19.0 ft	t		T	***************************************	4,08, 11,00, 81,00	<u></u>				
ELEV	RUN	DEPTH	RUN	DRILL	REC.	JN RQD	SAMP.	STR	ATA RQD	L							
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	ELEV. (DESCRIPTION AND REMARK			DEPTH (f	
1545													Begin Coring @ -17.5 ft				
		ŧ															
		ł															
1540	-	ŀ									E						
		ł									E						
1535	_	E									F						
											F						
		F									F						
1530	-	F									F						
		F								١,,,	F						
1525		-									1 504 7		Fill: gravel and boulders			2	
	-	F									1,524.7 		Alluvium: brown sandy sil	t			
		ļ.		N=4							-						
1520	-	ļ.								477	1,520.0		Weathered Rock				
		‡									1		Weathered Nock				
1515		‡		N=100/.3							1						
1010	-	‡									-						
	:	ţ		N=100/.3							1						
1510	-	‡									1,509.3					18	
		ţ									1	Cr	ystalline Rock penetrated by a	dvancer			
1505	1,506.6	20.9	4.0	N=60/0 N=60/0	(3.8)	(2.9)	1				<u> </u>	Sericite Schist of M	Mineral Bluff Formation. 5 bre	aks on fo	liation with	clay	
1303	-	.			95%	73%					+		ust. Hard and mostly unweath weathering.	nered with	n some sligi		
	1,502.6-	24.9	5.0		(2.7)	(1.2)	1				1,502.6	no recovery in sapro	olite 26.1-28.5. Numerous bre	aks on fo	liation with	some 24	
1500	-	F			54%	24%					1	rust. Fre	esh and hard to severely weat	hered and	d soft.		
	1,497.6-	29.9									1,497.6					29	
1495	-	ţ	5.0		(4.1) 82%	(2.1) 42%					1	Crumbly from 29.9 to hard. 5 breaks on f	o 30.5. Slightly weathered to foliation at 45 degrees have sl	fresh. Might rust o	loderately h or clay stair	ard to s. 1	
1490	-	ţ			1	l					1		break at 75 degrees has ru	ist.	-		
	1,492.6-	34.9	5.0		(5.0)	(4.8)	1		 		1,492.6		no natural breaks. hard and	fresh.		3	
1490	-	ţ			100%	96%	1				1						
	1,487.6-	39.9				Ì					1,487.6	5				3	
							1					Boring Terr	minated at Elevation 1,487.6 f	in crysta	lline rock		
	-	-			ŀ			l			F						
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Cherokee County Bridge Number 245 on SR-1649 over Valley River





Cherokee County Bridge Number 245 on SR-1649 over Valley River

