(D: B-5149)

ROJECT: 42310.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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STRUCTURE SUBSURFACE INVESTIGATION

ROJ. REFERENCE NO. <u>42310.1.1 (B-5149)</u>	F.A. PROJ. <i>BRZ-1574(3)</i>
OUNTY <u>HENDERSON</u>	
ROJECT DESCRIPTION BRIDGE No. 38 ON	SR-1574
OVER CLEAR CREEK	
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ITE DESCRIPTION	

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	42310.1.1 (B-5149)	1	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE WARROWS FELD BORNE LOSS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GED TECHNICAL ENGINEERING UNIT AT 1919 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNEL LOSS, 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 NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNOS OR BETWEEN SAMPLED STANDARD THE AND THE INSTITUTION FLOREST BATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABLITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSTUME CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTUME CONDITIONS AND VARY CONSIDERABLY WINT TIME ACCORDING TO CLIMATIC COMDITIONS 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 GUARANTE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, FOR 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 SATISTY HUNSELF 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 BEASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

	
	D O CHEEK
	C J COFFEY
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INVESTIGATED BY	C A DUNNAGAN
	W D FRYE, Jr
SUBMITTED BY_	W D FRYE, Jr
DATE	AUGUST 2012
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PERSONNEL P Q LOCKAMY

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.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS GRADATION ROCK DESCRIPTION

MATERIAL THAT IF TESTED WOULD YIELD SPT REFUSAL AN INFERED TERMS AND DEFINITIONS WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COA UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSC 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 1206, ASTM D-1586). SOIL ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.

SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE
OF WEATHERED BOOK. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. AQUIFER - A WATER BEARING FORMATION OR STRATA. LASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLIDE ANGULARITY OF GRAINS OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR. AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. WEATHERED ROCK (WR) OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT CRYSTALLINE ROCK (CR) I WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. GENERAL GRANIII AR MATERIAI S WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. GROUND SURFACE. ORGANIC MATERIALS (≤ 35% PASSING *200) CLASS. > 35% PASSING *200) CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN A-4 A-5 A-6 A-7 NON-CRYSTALLINE ROCK (NCR) COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED, ROCK TYPE A-2-4 A-2-5 A-2-6 A-2-7 A-3 SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD OASTAL PLAIN EDIMENTARY ROCK SYMBOL LIQUID LIMIT EQUAL TO 31-50 SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED <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. LIQUID LIMIT GREATER THAN 50 PASSING PERCENTAGE OF MATERIAL SHELL BEDS, ETC. SILT-= 10 WEATHERING <u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT MUCK PEAT GRANULAR SILT - CLAY ORGANIC MATERIAL ROCKS OR CUTS MASSIVE ROCK. OTHER MATERIAL SOILS SOILS SOILS SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER RACE OF ORGANIC MATTER RESH 200 DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 1 - 10% TRACE HAMMER IF CRYSTALLINE. ITTLE ORGANIC MATTER 3 - 5% 5 - 12% HORIZONTAL. 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN IOUID LIMIT 10 - 20% MODERATELY ORGANIC VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF HIGHLY ORGANIC LITTLE OR >20% V SLIJ CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF 35% AND ABOVE HE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. GROUP INDEX OF A CRYSTALLINE NATURE. а MODERATE 4 MX 8 MX 12 MX 16 MX No M ORGANI GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. AMOUNTS OF USUAL TYPES STONE FRAGS. FINE ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR SOILS ∇ SILTY OR CLAYEY CLAYEY WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING OF MAJOR GRAVEL, AND GRAVEL AND SAND MATTER CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. STATIC WATER LEVEL AFTER 24 HOURS SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GEN. RATING MODERATE FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. ∇_{PW} PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA 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 (LOOM) EXCELLENT TO GOOD POOR FAIR TO POOR UNSUITARI POOR SUBGRADE FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY SPRING OR SEEP WITH FRESH ROCK. 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 MODERATELY CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN BANGE OF UNCONFINED MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. COMPACTNESS OR HE FIELD. SPT CPT

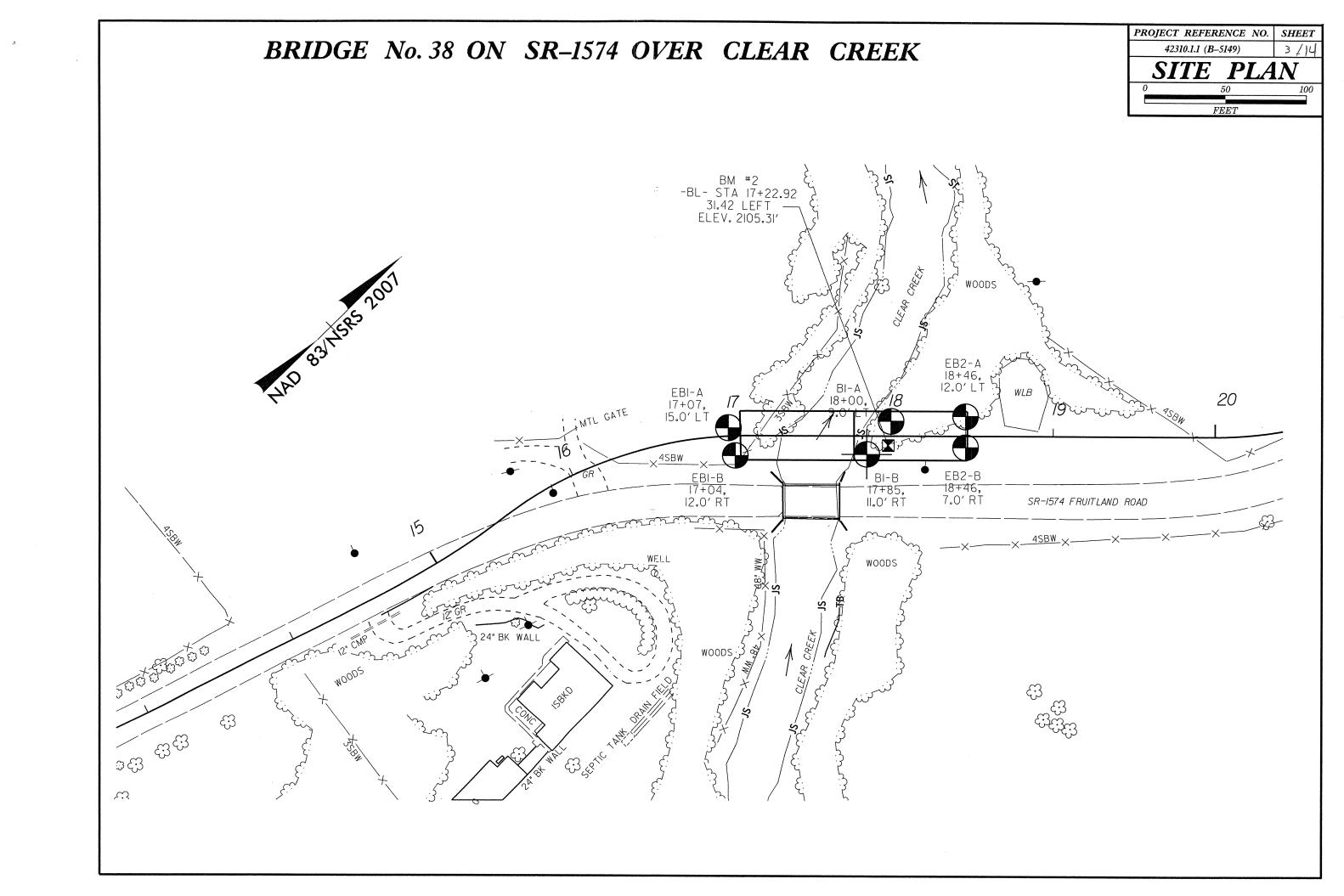
DPT DMT TEST BORING COMPRESSIVE STRENGTH (TONS/FT2) PRIMARY SOIL TYPE PENETRATION RESISTENCE ROADWAY EMBANKMENT (RE) SAMPLE IF TESTED, WOULD YIELD SPT REFUSAL WITH SOIL DESCRIPTION DESIGNATIONS JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. (N-VALUE) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED S - BULK SAMPLE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME GENERALLY SOIL SYMBOL AUGER BORING (SEV.) 4 TO 10 S LATERAL EXTENT. LOOSE GRANULAR SS - SPLIT SPOON EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. MEDIUM DENSE ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT IF TESTED, YIELDS SPT N VALUES > 100 BPF LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. 30 TO 50 CORE BORING (NON-COHESIVE) VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN VERY DENSE ST - SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. INFERRED SOIL BOUNDARY SAMPLE Oww MONITORING WELL <u>PERCHED WATER</u> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR SOFT 2 TO 4 RS - ROCK -SAMPLE 0.25 TO 0.50 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES (100 BPF INFERRED ROCK LINE RVENING IMPERVIOUS STRATUM. SILT-CLAY MEDIUM STIFF PIEZOMETER 0.5 TO 1.0 1 TO 2 Δ RT - RECOMPACTED TRIAXIAL ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND MATERIAL STIFF 8 TO 15 INSTALLATION RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ALLUVIAL SOIL BOUNDARY VERY STIFF 15 TO 30 SAMPLE SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS 2 TO 4 ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND SLOPE INDICATOR \bigcirc DIP & DIP DIRECTION OF ROCK STRUCTURES INSTALLATION CBR - CALIFORNIA BEARING ROCK HARDNESS TEXTURE OR GRAIN SIZ RATIO SAMPLE EXPRESSED AS A PERCENTAGE. - SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SOUNDING ROD U.S. STD. SIEVE SIZE REF- SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. OPENING (MM) 4.76 2,00 0.42 0.25 0.075 0.053 <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL **ABBREVIATIONS** CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED COARSE COBBLE GRAVEL BOULDER SILT AR - ALICER REFLICAL w - MOISTURE CONTENT TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. (COB.) 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 (SL.) (CL.) BT - BORING TERMINATED MED. - MEDIUM V - VFRY SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR CL. - CLAY MICA. - MICACEOUS VST - VANE SHEAR TEST GRAIN MM 305 2.0 0.25 0.05 0.005 - CONE PENETRATION TEST BY MODERATE BLOWS. MOD. - MODERATELY WEA. - WEATHERED SIZE IN. 12 STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH 7 - UNIT WEIGHT CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. ION OF TERMS - DILATOMETER TEST SOIL MOIS URE - CORRELAT ORG. - ORGANIC 7 - DRY UNIT WEIGHT CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST SOIL MOISTURE SCALE FIFLD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION SAP. - SAPROLITIC FIAD- FILLED IMMEDIATELY AFTER DRILLING THAN 0.1 FOOT PER 60 BLOWS. VOID RATIO (ATTERRERG LIMITS) SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. F - FINE SD. - SAND, SAND FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN WOH-WEIGHT OF HAMMER FOSS, - FOSSILIFEROUS SATURATED SL. - SILT, SILTY PIECES CAN BE BROKEN BY FINGER PRESSURE. FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS SLI. - SLIGHTLY TCR - TRICONE REFUSAL STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. (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 OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY ASTIC FINGERNAII SEMISOLID; REQUIRES DRYING TO RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT ATTAIN OPTIMUM MOISTURE FRACTURE SPACING TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. PLASTIC LIMIT TERM THICKNESS TERM HAMMER TYPE SPACING DRILL UNITS: ADVANCING TOOLS: BENCH MARK: BM#2: NCDOT MONUMENT GPS-102 34.5 FEET MORE THAN 10 FEET VERY THICKLY BEDDED THICKLY BEDDED > 4 FEET 1.5 - 4 FEET SOLID; AT OR NEAR OPTIMUM MOISTURE - MOIST - (M) VERY WIDE OPTIMUM MOISTURE X AUTOMATIC __ MANUAL LEFT OF -L- STA 16+33.9 _ CLAY BITS SHRINKAGE LIMIT MOBILE B- _ THINLY REDDER 0.16 - 1.5 FFFT ELEVATION: 2105.31 FT MODERATELY CLOSE 1 TO 3 FEET 6 CONTINUOUS FLIGHT AUGER VERY THINLY BEDDED 0.03 - 0.16 FEE REQUIRES ADDITIONAL WATER TO CORE SIZE: CLOSE 0.16 TO 1 FFFT - DRY - (D) NOTES: THICKLY LAMINATED ATTAIN OPTIMUM MOISTURE VERY CLOSE LESS THAN 0.16 FEET 0.008 - 0.03 FEET 8" HOLLOW AUGERS THINLY LAMINATED < 0.008 FFFT PLASTICIT INDURATION HARD FACED FINGER BITS __ CME-45C X -N XWL 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 NONPLASTIC X CME-550 RUBBING WITH FINGER FREES NUMEROUS GRAD X CASING X W/ ADVANCER FRIABLE OW PLASTICITY 6-15 GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE AND TOOLS: MED. PLASTICITY MEDIUM PORTABLE HOIST __ TRICONE __ HIGH PLASTICITY 26 OR MORE *STEEL TEETH POST HOLE DIGGER GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; MODERATELY INDURATED __ TRICONE __ BREAKS EASILY WHEN HIT WITH HAMMER. HAND AUGER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: SOUNDING ROD __ CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY) DIFFICULT TO BREAK WITH HAMMER. 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.

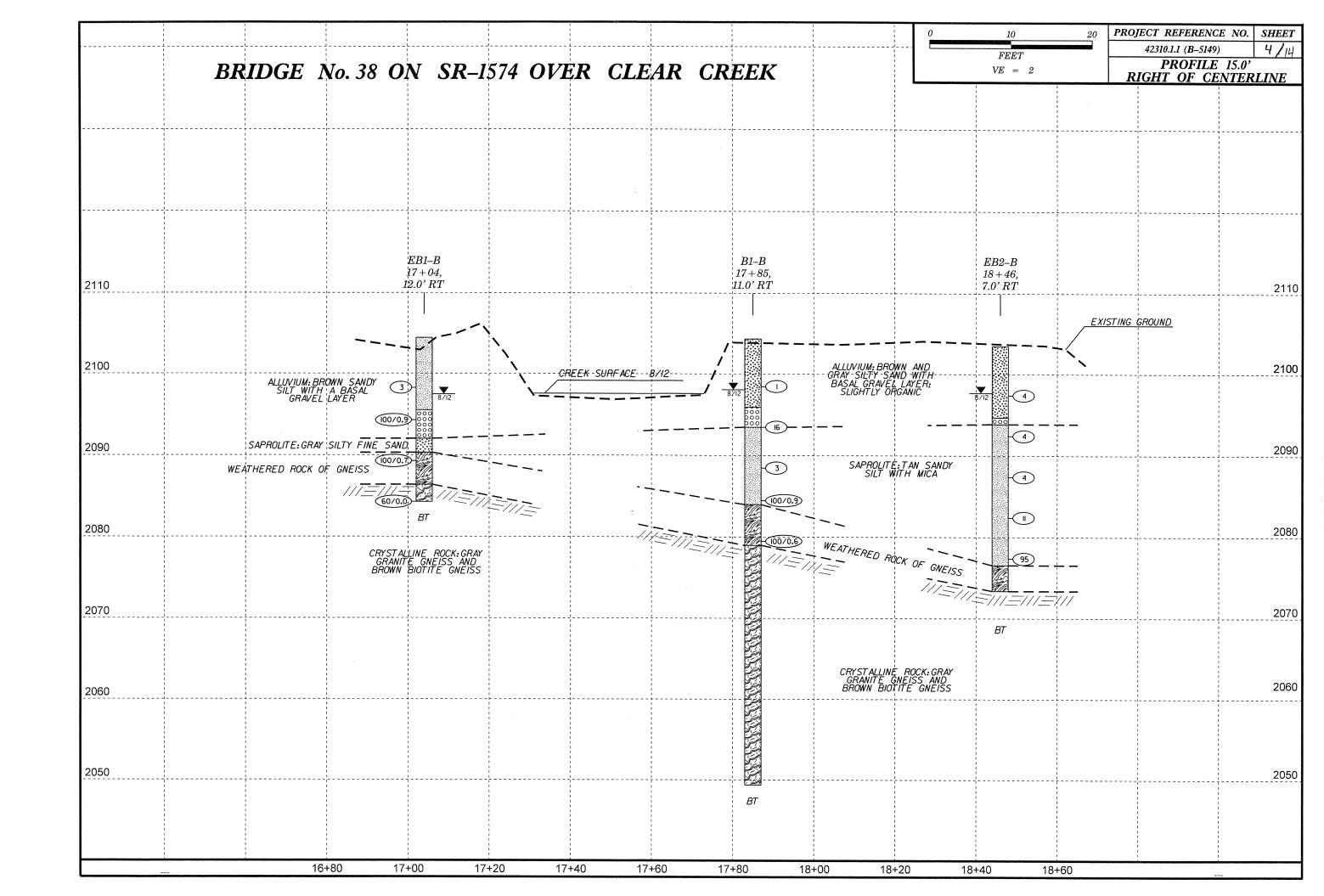
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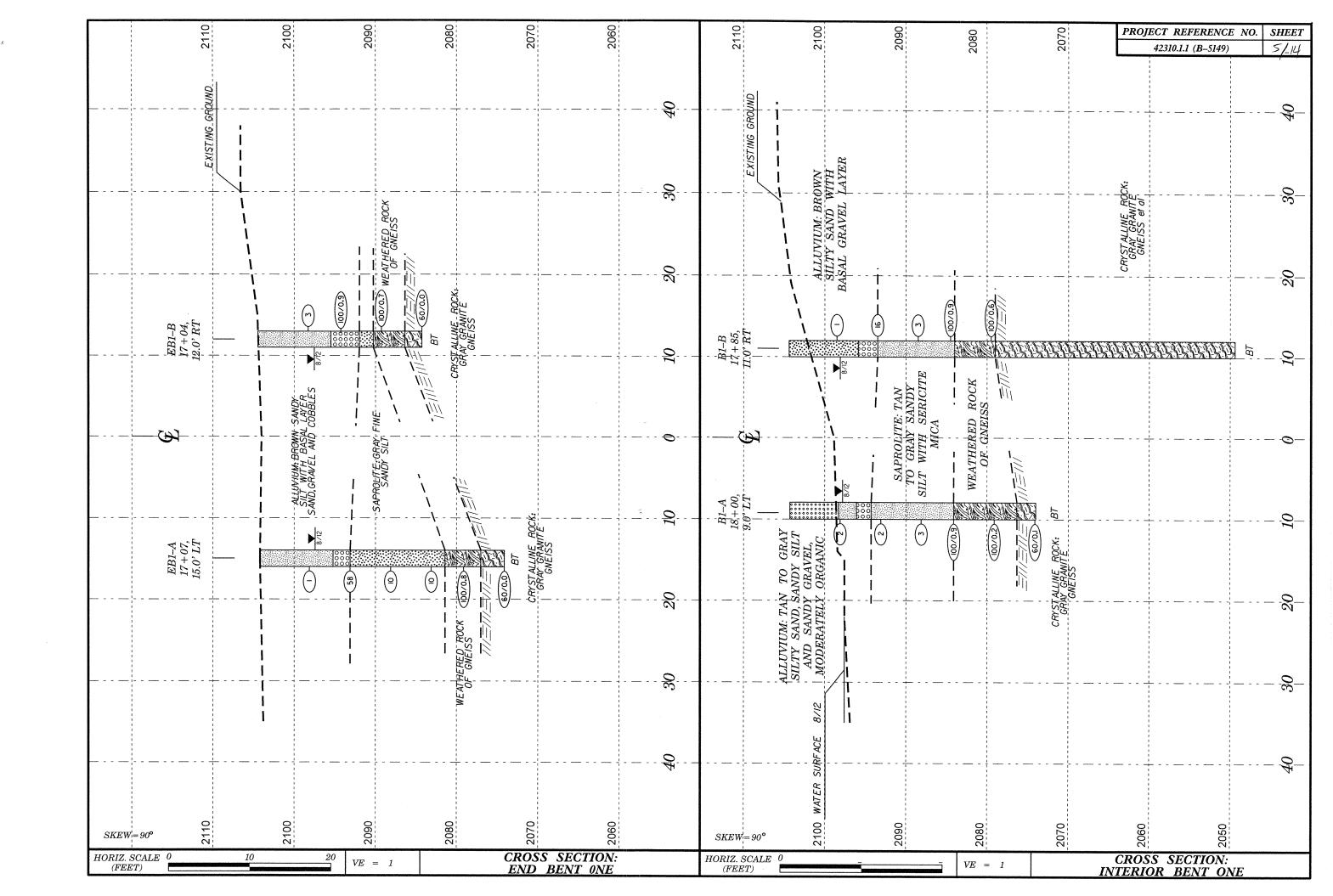
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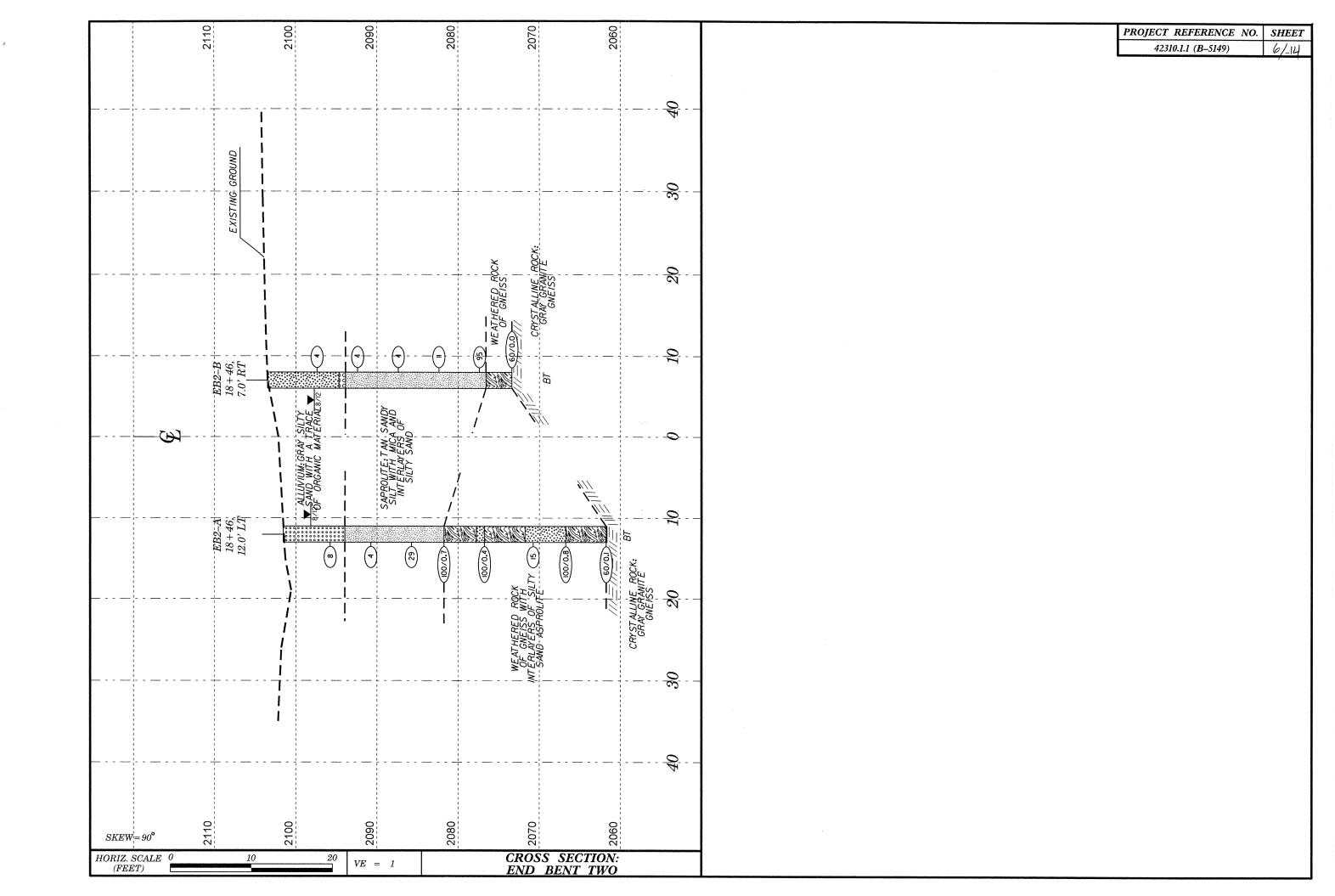
PROJECT REFERENCE NO.

42310.1.1 (B-5149)











SHEET

WBS	42310).1.1			Т	IP B-5149	COUNT	Y Henders	on			GEOLOGIST Lockamy	, P. Q.		
SITE	DESCR	RIPTIO	N Bric	lge No	o. 38 o	on SR-1574 over Clear	Creek.							GROUN	ID WTR (f
BOR	ING NO	. EB1	-A		s	TATION 17+07		OFFSET	15 ft LT			ALIGNMENT -L-		0 HR.	N/A
COLI	AR EL	EV . 2,	104.2	ft	T	OTAL DEPTH 30.1 ft	t	NORTHING	3 609,	13		EASTING 982,620		24 HR.	6.8
DRILL	RIG/HAI	MMER E	FF./DA	TE A	F00070	0 CME-550X 81% 09/03/2	2009		DRILL	METHO	D N	W Casing w/ SPT	HAMME	R TYPE	Automatic
DRIL	LER C	heek, [D. O.		S	TART DATE 08/01/1	2	COMP. DA	<u> </u>			SURFACE WATER DE	L		
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SHEET 7/14

14/000	1001-	4 4				J /\L/						T	
	42310		M D=:-	lao Al-		P B-5149 1 SR-1574			Y Henders	on		GEOLOGIST Lockamy, P. Q.	
	ING NO			ige No				ar Creek.	055055				GROUND WTR (ft)
 	LAR EL			· 		TATION 1		<u></u>	OFFSET			ALIGNMENT -L-	0 HR. N/A
						OME 550Y			NORTHING			EASTING 982,635	24 HR. 7.0
	LER C			IL A		CME-550X			00110 04	L		7	MER TYPE Automatic
ELEV		Γ	T	ow co		TART DAT		PER FOO	COMP. DA	SAMP.	T	SURFACE WATER DEPTH N	/A
(ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft			О	25	50	75 100	NO.	1/2 0	SOIL AND ROCK DES	
										1	MOI G	ELEV. (ft)	DEPTH (ft)
2105				9						l			
2100	-	-				 	T		1	-	888	-2,104.5 GROUND SURF	ACE 0.0
	-	-										Brown sandy s	silt.
2100	2.099.3	5.2				ļ <u>i</u> r · · · ·						-	
	-,000	-	2	1	2	• 3					lacksquare	- -	
2095	-	-				1: : : :		: : : : :				- - 2,095.5	9.0
2000	2,094.3	10.2	11	89/0.4		'	+				000	ALLUVIAL	
	-	-							- 100/0.9		000	Sand, gravel and c	12.5
2090	2,089.3	15.2					1				000	- 2,090.3 SAPROLITE - Gray silty fine s	
	2,000.0		37	63/0.2					. 100/0.7			- WEATHERED R - Weathered rock of	OCK
2005	-	-										2,086.4 CRYSTALLINE F	18.1
2085	2,084 3	20.2	60/0.0						60/0.0	1		2,084.3 Gray granite gne Boring Terminated wit	eiss. 20.2
et.								A.					giloss.

NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 42310.1.1	TIP B-5149 COUN	TY Henderson	GEOLOGIST Lockamy, P. Q.
SITE DESCRIPTION Bridge No.	38 on SR-1574 over Clear Creek.		GROUND WTR
BORING NO. B1-A	STATION 18+00	OFFSET 9ftLT	ALIGNMENT -L- 0 HR. N
COLLAR ELEV. 2,104.3 ft	TOTAL DEPTH 30.3 ft	NORTHING 609,188	EASTING 982,688 24 HR.
DRILL RIG/HAMMER EFF./DATE AFG	00070 CME-550X 81% 09/03/2009	DRILL METHOD NW	Casing w/ SPT HAMMER TYPE Automati
DRILLER Cheek, D. O.	START DATE 08/09/12	COMP. DATE 08/09/12	SURFACE WATER DEPTH N/A
CLEV (ft) DEPTH BLOW COU	0.5ft 0 25 50	75 100 100	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTI
2105	· ·		g 2,104.3 GROUND SURFACE
2100 2,099 1 5 2 1 1	1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ALLUVIAL Alluvium: Tan silty fine sand. • 2,098.3
2,094 1 10.2 2 1	1		ALLUVIAL 2,096.1 Alluvium: Gray fine sandy silt, moderately organic with a log from 7.1' to 8.2'. ALLUVIAL Alluvium: Tan silty sand and gravel.
2,089 1 15 2 1 1	2 3		SAPROLITE Light gray to tan fine sandy silt with trace of sericite mica.
2,084 1 20 2 32 68/0.4		- 100/0.9	WEATHERED ROCK Weathered rock of gneiss.
2080 2,079 1 25.2 100/0.2		. 100/0.2	2,076.3 CRYSTALLINE ROCK
2,074 1 30.2 60/0.1		60/0.1	2,074.0 Gray granite gneiss. Boring Terminated with Standard
			Penetration Test Refusal at Elevation 2,074.0 ft in granite gneiss.



SHEET

	E DESCI	RIPTIC	N Bri	idae N	0 38 (on SD	1574 0405	Cloor	C===1:					GEOLOGIST Lock		7	
			14 1011	iage ivi	0. 50 (UII SIN	-13/4 OVE	Clear	Сгеек.					GROUND			WTR /f
BOF	RING NO						ON 17+85			OFFSET	11 ft R	 Т		ALIGNMENT -L-		0 HR.	N/A
COL	LAR EL	EV . 2	,104.4	1 ft	1	ΓΟΤΑΙ	_ DEPTH :	55.0 ft		NORTHIN				EASTING 982,692		24 HR.	6.3
DRIL	L RIG/HA	MMER E	FF./D	ATE A	F0007	0 CME	-550X 81% (09/03/20	009			METHO	N QC	W Casing W/SPT & Core		ER TYPE A	
	LER C						DATE 08			COMP. D				SURFACE WATER			uwillatic
ELEV	DRIVE ELEV		Τ	OWCC		П			ER FOOT		SAMP		1	SURFACE WATER	DEPTH N	A	
(ft)	(ft)	(ft)	0.5ft	t 0.5ft	0.5ft	0	25	50		75 100	11	МО	0 II G	SOIL AND	ROCK DES	CRIPTION	
							·	·	····			IVIO	1 6	ELEV. (II)		·	DEPTH (f
2105		L															
	-	-		+	 	# -				T	 	+	1::::	-2,104.4 GRC	OUND SURF.	ACE	0.
	-	Ŧ												Br	own silty san	ıd.	
2100	2,099.5	4.9			<u> </u>	Ţ		• • •						-		,	
	-	<u> </u>	1	WOH	1	1						V					
2095	-	-					· · · · ·							_ 2,095.9			8.:
_000	2,094.5	9.9	2	 7	9	1 -							000	- Brown e	ALLUVIAL ilty sand and	laraval	
	-	_				:	16								APROLITE		10.
2090	2.089.5	- 140				./	!						F	Tan sandy	silt with seri	cite mica.	
ĺ	2,009.3	14.9	1	1	2	9 3								-			
	1	-															
085	2,084.5	19.9	15	85/.4		-								20040		•	
	1	-	15	85/.4						100/0.9				2,084.0 WEA	THERED RO	OCK	20.
080	1	•											M	Weathe	red rock of g	neiss.	
	2,079.5	24.9	11	60	40/.1	1							7	2,079.0			25.4
	‡	- -								100/0.6				CRYS White	TALLINE Registre granite gne	OCK ies	
075	1	-												· · ·	granite gne	155.	
	1												F	•			
	1																
070	+	-				l											
	Ŧ					::								2,068.5	TALLINE RO	OCK.	35.9
065	Ŧ					: :								Dark gray-brown	augen gneis	s, biotite aneis	ss
	7													and gra	ay granite gn	eiss.	
	‡										DC 4			2,062.3			42.1
060	#	.				· ·		• •			RS-1			CRYS Gray granite gne	TALLINE RO	OCK brown biotite)
	‡	1				: :									gneiss.		
).E.E	‡	l				: :					RS-2						
055	+	ĺ															
	1	1			1												
050	<u> </u>				ļ												
F	+										-			2,049.4 Boring Terminate	d at Elevation	2040 4 6 :-	55.0
-	Ŧ												F	gra	nite gneiss.	/11 4,048.4 I[II	
	+				ŀ								L				
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NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET

WBS	42310).1.1			TIP	B-514	9	С	ראטס	ΥH	lenderson	GEOLOGIST Lockam	y, P. Q.		
SITE	DESCF	RIPTIO	N Brid	ge No. 3	8 on S	R-157	4 over C	lear Cı	eek.					GROUN	D WTR (
BOR	ING NO	. B1-B			STA	TION	17+85			OF	FSET 11 ft RT	ALIGNMENT -L-		0 HR.	N/A
COL	LAR EL	EV. 2,	104.4	ft	тот	AL DE	PTH 55	.0 ft		NO	RTHING 609,162	EASTING 982,692		24 HR.	6.
DRILI	RIG/HAI	MMER E	FF./DA	TE AFOO	070 CN	1E-550>	(81% 09/	03/200	9		DRILL METHOD NW			ER TYPE	
DRIL	LER C	heek, [D. O.		STA	RT DA	TE 08/0	9/12		СО	MP. DATE 08/09/12	SURFACE WATER DE			
COR	E SIZE	NXWL	•		TOTA	AL RU	N 28.21	t							
ELEV	RUN	DEPTH	RUN	DRILL	REC.	JN RQD	SAMP.	STR REC.	ATA RQD	L					
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	ELEV. (ft)	ESCRIPTION AND REMAR	KS		DEPTH
2077.56				s								Begin Coring @ 26.8 ft			oci m
2075	-2,077.6	26.8	3.2	N/A/28.3	(1.5) 47%	(0.9) 28%				5	- White granite gneiss	CRYSTALLINE ROCK interlayered with dark gray-			
2075	2,074.4	30.0	5.0			. (1.3)					augen gneiss. Mediur	n hard; moderately severely	to moder	ately weath	s and nered.
	•		3.0		(2.2) 44%	26%					-	a) Parts along foliation @ 1 b) Joint @ 65°.			
2070	2.000 4	25.0									- -	c) Joint @ 35°. (continued))		
	2,069.4	35.0	5.0		(2.9)	(0.0)					- 2,068.5				35
					58%	0%					Interlayers of aug	CRYSTALLINE ROCK en gneiss, biotite gneiss and	d granite o	nneiss Dar	
2065	2,064.4	40.0		٠.							gray-brown to gra	y. Severely to moderately w moderately hard.	eathered.	Very soft t	0
	-	_	5.0		(4.3) 86%	(3.2) 64%					a) A	bundant parts along foliation	@ 10°.		
	-				00%	04%	RS-1				2,062.3	CRYSTALLINE ROCK			42
2060	2,059.4	45.0			(5.5)	(1.2)					Light gray granite gn biotite gneiss (severe	eiss (fresh, very hard) inte ely to moderately severely w	rlayered v eathered.	vith dark br soft to me	own dium
	7	-	5.0		(5.0) 100%	(4.9) 98%					- -	hard). a) Parts along foliation @ 1			
2055	-						RS-2				<u>-</u> -	b) Joints @ 70°.	υ.		
	2,054.4	- 50.0 -	5.0		(4.9)	(1.4)					-				
	-	-	5.5		98%	28%					• •				
2050	2,049.4	- - 55 0									-				
	2,040.4	- 00.0								$r_{\mathcal{A}}$	-2,049.4 Boring Termir	nated at Elevation 2,049.4 ft	in granite	gneiss.	55
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NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET

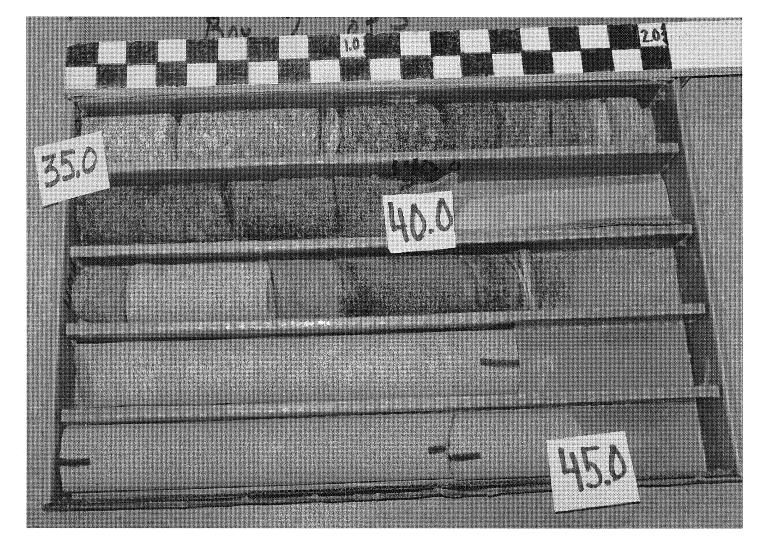
WBS	42310).1.1			Т	ΊP	B-5149		COUNT	Y Hen	derso	on			GEOLOGIST Lockamy, P. Q		
SITE	DESCR	RIPTIO	N Brio	dge No	o. 38 o	on S	SR-1574 d	over Clear	Creek.				***************************************			GROUND W	TR (f
BOR	NG NO	. EB2	-A		s	STA	ATION 18	3+46		OFFS	ET ′	12 ft LT			ALIGNMENT -L-	0 HR.	N/A
COLI	AR EL	EV. 2,	101.6	ft	T	OT	TAL DEPI	ΓH 39.9 ft		NORT	HINC	609,2	222	**********	EASTING 982,718	24 HR.	3.4
DRILL	RIG/HAN	MMER E	FF./DA	TE A	FO0070	0 CI	ME-550X 8	1% 09/03/20	 009			DRILL	METHO	D NV	1	MER TYPE Auton	
	LER C							E 08/02/12		COMP	 P. DA	TE 08/			SURFACE WATER DEPTH N		
LEV	550.45	DEPTH	·	ow co		П		BLOWS P				SAMP	T	11	OCH TO WATER DELT THE		
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft		0 2	5 50)	75	100	NO.	MOI	O G	SOIL AND ROCK DE		PTH (
											-					······································	
105						l										*	
	1	-												E			
	1	-	ļ	ļ	<u> </u>	\parallel				Т		-	ļ		2,101.6 GROUND SUR	FACE	С
100		_				1				-				0000	ALLUVIAL White sand with a trace of	organic material.	
	2 096 8	- 4.8											_				
95		-	1	1	7	1	. •8										
	+	-					.j							****	2,094.0 SAPROLIT		. 7
	2,091.8	- 98	1	1	3	$\ \ $								F	Tan sandy silt wit		
90	Ŧ	-	•	'		1	4			1				F			
		-												F			
85	2,086.8	- 14.8_ -	14	17	12	11		29						 			
	7	-							-								
	2,081.8	- - 19.8									: :				2,081.8		19
080		-	3	50	50/0.2	1				. 100	0/0.7				WEATHERED F Weathered rock of		
	‡	-							 						2,077.8	9,10,001	23
-	2,076.8	- 24.8 -	100/0.4				4	:+		÷ 100				477	2,076.8 SAPROLITI Brown silty sa		24
075	1	-									0/0.4				WEATHERED F	OCK	
	2.071.8	- 29.8						···	·						Weathered rock of 2,071.8	gneiss.	20
070	1	-	12	8	7		•15	-:::						F	SAPROLITI		29
	1					П		7.7.	<u></u>					F	Brown silty sa	na.	
-	2,066.8	34.8	55	45/0.3						·					2,066.8		34
065	1	-		10/0.0		$\ \cdot\ $				100	0/0.8				WEATHERED F Weathered rock of	gneiss.	
	Ī																
-	2,061.8	· 39.8 ·	60/0.1			+		1	· · · ·	60	0/0.1	1		7//	2,061.8 2,061.7 CRYSTALLINE I	ROCK /	39 39
	‡	-													Gray granite gnees Boring Terminated wit		
	‡														Penetration Test Refusa 2,061.7 ft in granite	l at Elevation	
-	#	•													2,001.7 R in grante	grieiss.	
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10/14

	\$ 42310.1.1	TIP B-5149	COUNTY	Henderson	GEOLOGIST Lockamy, P. C).
SITE	DESCRIPTION Bridge No	38 on SR-1574 over Clea	r Creek.	,		GROUND WTR (f
3OR	RING NO. EB2-B	STATION 18+46	OF	FFSET 7 ft RT	ALIGNMENT -L-	0 HR. N/A
COLI	LAR ELEV. 2,103.5 ft	TOTAL DEPTH 30.1	ft NC	ORTHING 609,209	EASTING 982,732	24 HR. 5.8
RILL	L RIG/HAMMER EFF./DATE AF	O0070.CME-550X 81% 09/03/				MER TYPE Automatic
RIL	LLER Coffey, Jr., C.	START DATE 08/02/	12 CC	OMP. DATE 08/02/12	SURFACE WATER DEPTH	
LEV (ft)	DRIVE DEPTH BLOW COUNTY STATE BLOW COUNTY DEPTH DEPTH		PER FOOT 75	SAMP.	SOIL AND ROCK DE	
1 05	-				- 2,103.5 GROUND SUR - ALLUVIAL - Gray silty fine sand with a material.	-
95		3				
90	2,088.4 15.1 4 2	2			SAPROLIT Tan sandy silt with interlay	E
35	2,083.4 20.1 3 4	7			[- - - - -	
5	2,078.4 25.1 18 25	70		95	2,076.6 WEATHERED I Weathered rock o	
*	60/0.0		3	60/0.0	Boring Terminated wi Penetration Test Refus. 2,073.4 ft on granit	th Standard al at Elevation





42310.1.1 (B-5149)
Henderson Co.
Bridge No 38 on SR-1574
Over Clear Creek
B1-B
Box 1 of 3

42310.1.1 (B-5149)
Henderson Co.
Bridge No. 38 on SR-1574
Over Clear Creek
B1-B
Box 2 of 3



42310.1.1 (B-5149)
Henderson Co.
Bridge No 38 on SR-1574
Over Clear Creek
B1-B
Box 3 of 3

13/15

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT PHYSICAL TESTING LABORATORY

T. I. P. No. B-5149

REPORT ON SAMPLES OF ROCK COMPRESSION

Project	42310.1.1	County	Henderson		Owner	C & Dunnagan
Date: Sampled	8/10/2012	Received	8/14/2012		Reported	8/20/12
Sampled from				By		•
Submitted by	C A Dunnagan				2006	Standard Specifications
Tested By	Dan Miller				Date Tested	8/20/2012

TEST RESULTS

Proj. Sample No.		RS-1	RS-2	<i>t.</i>		
Lab. Sample No.		P380570	P380570			
Diameter	in	1.86	1.86			
Specimen Height	in	4.04	3.87			
Area	in ²	2.717	2.717			
H/D Ratio		2.17	2.08			
Weight	lbf	1.08	1.04	23.00.000		
Unit Weight	lbf/ft ³	170.0	170.9			
Ultimate	lbf	27200	20400.0			
Ultimate	ksi	10.010	7.508			
Ultimate Corrected	ksi	10.1	7.54			
Sec Mod @ 40%	Mpsi	5.2	4.24			
Station		17+85	17+85			
Offset		11.0' RT	11.0' RT			
Alignment						
Depth (ft)		42.10	47.40			
	to	42.60	48.10			

cc:

V. O. Colle Physical Testing Engineer

14/14	
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oring Location: B1-B, RS-2 Depth Range: 47.4'-48.1' 47.4'-48.1' ange of Values For this low range - Unit low range - Un			60	Str	B. RATIN		\$º	5 (Join	Infle			4	Co			3 Sp		2 0			Strer		A. CLASSIFI	
Stratigraphic Depth Range	ROCK MASS CLASS	Slopes	Foundations	ike and Dip Orientations	G ADJUSTMENT FOR DIS	Rating	General Conditions	t Water Pressure)/ (Major Principle σ)	ow per 30 ft tunnel length	Rating			ndition of Discontinuities		Rating	acing of Discontinuities	Rating	rill Core Quality - RQD	Rating			Parameter	CATION PARAMETERS A	
Boring Location: B1-B, RS-2	HEICATION	0	0	Very Favorable	CONTINUITY ORIENTAT	. 10	Completely Dry	0	None	25	Hard Joint Wall Rock	No Separation	Not Continuous	Very Rough Surfaces	30	>10 ft	. 20	90 - 100%	15	>30 ksi	>1215psi		ND THEIR VALUES	•
oring Location: B1-B, RS-2 Depth Range: 47.4'-48.1' 47.4'-48.1' ange of Values For this low range - Unit low range - Un	Class III: Fair Rock	-5	-2	Favorable	IONS	7	Moist only	0.0 - 0.2	< 400 gal/hr	20		Hard Joint Wall Rock	Separation <0.5 in	Slightly Rough Surface	25	3 - 10 ft	17	75 - 90%	12	15 - 30 ksi	590 - 1215 psi			
For this low range - Unit -312 psi		-25	-7	Fair			Under Modera	0	400 -	12		Soft Joint Wall Rock	Separation <0.5 in	Slightly Rough Surface	20	1-3ft	13	50 - 75%	7	7.5 - 15 ksi	312 - 590 psi	Range of Valu	Stratigraphic Depth Rang	Boring Locatic
9 Union to provide the provided		-50	-15	Unfavorable		4	ate Water Pressure	2 - 0.5	2000 gal/hr	. 6	Continuous Joints	or Separation 0.05 - 0.2i	or Gouge <0.2 in thick	Slickensided Surfaces	10	2in - 1ft 10	8	25 - 50%	4	3.6 - 7.5 ksi	139-312 psi	es	je: 47.4'-48.1'	n: B1-B, RS-2
	ROCK MASS RATING	-60	-25	Very Unfavorable		0	Severe Water Problems	>0.5	>2000 gal/hr	0		n Continuous Joints	of Separation > 0.2 in	Soft Gouge >0.2 in thick	51	<2in	ယ	<25%		.5 - 3.6 ksi	For this low range - Uniaxial Comp Strength test is preferred			
Strength Value Rating Quality Value Rating	53		-7			4				12			***************************************	aller version de l'	20		Rating 17	Quality Value	Rating 7	7.54	,	,		

B 000	S	6 Four	Strike and L	B. RATING ADJU	73	General	5 (John Water Prin	/ loint Water	Inflow per 30	Inflow per 30	Inflow per 30	Inflow per 30												A. CLASSIFICATION Pau Strength of Intact Rock Material R Drill Core R Spacing of R Inflow per 31	A. CLASSIFICATION Pail Strength of Intact Rock Material R Drill Core 2 Drill Core 2 R Condition or 4 Inflow per 3
BOOK MASS OF ASSIGNATION	Slopes	Foundations	Strike and Dip Orientations	STMENT FOR DISCO	Rating	General Conditions	(Joint Water Pressure)/ (Major Principle o)		Inflow per 30 ft tunnel length	Rating 30 ft tunnel length													PARAMETERS AN ameter Point-load Strength Index Uniaxial Comp. Strength Ating Quality - RQD ating Discontinuities ating T Discontinuities ating T Uniaxial Comp. T Uniaxial	PARAMETERS AN ameter Point-load Strength Index Uniaxial Comp. Strength ating Discontinuities ating This continuities ating This continuities ating This continuities This c	PARAMETERS ANI ameter Point-load Strength Index Uniaxial Comp. Strength ating Quality - RQD ating Discontinuities ating Discontinuities ating I tunnel length
IC ATION	0	0	Very Favorable	RATING ADJUSTMENT FOR DISCONTINUITY ORIENTATIONS	10	Completely Dry	0		None	None	Hard Joint Wall Rock 25 None	No Separation Hard Joint Wall Rock 25 None	Not Continuous No Separation Hard Joint Wall Rock 25 None	Very Rough Surfaces Not Continuous No Separation Hard Joint Wall Rock 25 None	30 Very Rough Surfaces Not Continuous No Separation Hard Joint Wall Rock 25 None	>10 ft 30 Very Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	>10 ft 30 Very Rough Surfaces Not Continuous Vo Separation Hard Joint Wall Rock 25 None	20 20 >10 ft 30 Very Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	90 - 100% 20 20 >10 ft 30 /ery Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	>30 ksi 15 90 - 100% 20 >10 ft 30 /ery Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	>1215psi >30 ksi 15 90 - 100% 20 >10 ft 30 /ery Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	>1215psi >30 ksi 15 90 - 100% 20 >10 ft 30 /ery Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	>1215psi >30 ksi 15 90 - 100% 20 >10 ft 30 /ery Rough Surfaces Vot Continuous Vo Separation lard Joint Wall Rock 25 None	D THEIR VALUES >1215psi >30 ksi 15 90 - 100% 20 >10 ft 30 Very Rough Surfaces Vot Continuous Vo Separation Hard Joint Wall Rock 25 None	Rock Mass Rating (AASHTO) METERS AND THEIR VALUES aad h Index >1215psi h Index >1215psi I Comp. >30 ksi - RQD 90 - 100% 20 20 Inuities >10 ft Not Continuous Sig No Separation Hall Hard Joint Wall Rock Hard Joint Wall Rock 25 Lel length None
	-5	-2	Favorable	ONS	7	Moist only	0.0 - 0.2		< 400 gal/hr	20 < 400 gal/hr	20 < 400 gal/hr	Hard Joint Wall Rock 20 < 400 gal/hr	Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	75 - 90% 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr	75 - 90% 17 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 < 400 gal/hr	15 - 30 ksi 12 75 - 90% 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr	590 - 1215 psi 15 - 30 ksi 12 75 - 90% 17 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 20 400 gal/hr	590 - 1215 psi 15 - 30 ksi 12 75 - 90% 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr	590 - 1215 psi 15 - 30 ksi 12 75 - 90% 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr	590 - 1215 psi 15 - 30 ksi 12 75 - 90% 17 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr < 400 gal/hr	75 - 90% 15 - 30 ksi 12 75 - 90% 17 3 - 10 ft 25 Slightly Rough Surface Separation <0.5 in Hard Joint Wall Rock 400 gal/hr
Class III. Esir Bask	-25	-7	Fair			Under Mode			400	12	1 1	공	Separation <0.5 in Soft Joint Wall Rock 12	Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12	Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12	1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12	1-3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12	50 - 75% 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400	50 - 75% 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400	7.5 - 15 ksi 7 7 13 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400	312 - 590 psi 7.5 - 15 ksi 7 7 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400	Range of Values 312 - 590 psi 7.5 - 15 ksi 7 50 - 75% 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400 - 20	Stratigraphic Depth Range: 42.1'-42.6' Range of Values Range of Values 138 312 - 590 psi 35 7.5 - 15 ksi 36 7 13 50 - 75% 25 13 20 Slightly Rough Surface Slickenside Separation <0.5 in	Boring Locat Stratigraphic Depth Ran Range of Va 312 - 590 psi 312 - 590 psi 7.5 - 15 ksi 7 13 1-3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400	Boring Locat Boring Locat Stratigraphic Depth Rar Range of Va 312 - 590 psi 7.5 - 15 ksi 7 7 13 1 - 3 ft 20 Slightly Rough Surface Separation <0.5 in Soft Joint Wall Rock 12 400
	-50	-15	Unfavorable		4	Under Moderate Water Pressure	0.2 - 0.5	X	400 - 2000 gal/hr	6 2000 gal/hr	suc	continuous Joints Continuous Joints 6	e <0.2 in thi ation 0.05 - ous Joints 6	e <0.2 in thi ation 0.05 - bus Joints	ided Surface e <0.2 in thi ation 0.05 - us Joints 6	2in - 1ft 10 10 ided Surface e <0.2 in thi ration 0.05 - ous Joints 6	8 2in - 1ft 10 10 ided Surface < 0.2 in thi ation 0.05 - ous Joints 6	25 - 50% 8 2in - 1ft 10 ided Surface e <0.2 in thi ation 0.05 - bus Joints 6	4 25 - 50% 8 2in - 1ft 10 ided Surfac e <0.2 in thi ation 0.05 - ous Joints 6	4 4 25 - 50% 8 2in - 1ft 10 ided Surfac e <0.2 in thi ation 0.05 - ous Joints	39-312 psi 4 4 25 - 50% 8 2in - 1ft 10 10 10 e < 0.2 in thi ation 0.05 - ous Joints 6	139-312 psi 3.6 - 7.5 ksi 4 25 - 50% 8 2in - 1ft 10 Slickensided Surfac or Gouge <0.2 in thi or Separation 0.05 Contlinuous Joints 6	3-312 psi - 7.5 ksi 4 4 3 - 50% 8 8 8 8 10 10 20 2 in thi ion 0.05 - 5 Joints	1 3-312 psi -7.5 ksi 4 4 3-50% 8 8 8 8 8 8 6 6	3-312 psi -7.5 ksi -7.5 ksi -7.5 ksi -7.5 ksi -7.5 nti -7.5 nti -7
	-60.	-25	Very Unfavorable		0	Severe Water Problems	>0.5		>2000 gal/hr	0 >2000 gal/hr	0 >2000 gal/hr	Continuous	of Separation Continuous	Soft Gouge of Separation Continuous	Soft Gouge of Separation Continuous	Soft Gouge of Separation Continuous	Soft Gouge of Separatit Continuous	Soft Gouge of Separatit	2 Soft Gouge of Separatic	1.5 - 3.6 ks 2 2 Soft Gouge of Separatit Continuous	For this lov Stren 1.5 - 3.6 ks 2 2 Soft Gouge of Separatit Continuous				
ROCK MASS RATING	Rating	Adjust to	ble		R	blems	Groundwate		,										0	0.1-0.5 ksi 0	axial Comp. Str. O.1 - 0.5 Ksi O O O O O O O O O O O O O	axial Comp. Str. O.1 - 0.5 Ksi O	axial Comp. sferred 0.1 - 0.5 Ksi 0	axial Comp. Sterred 0.1 - 0.5 ksi 0 0 0 Co	axial Comp. Str. 0.1 - 0.5 Ksi 0
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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

CONTENTS

COLLE	110
<u>SHEET</u>	DESCRIPTION
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4	CROSS SECTIONS
5-7	BORE LOG REPORTS
	(DETOUR LOGS INCLUDED)

STRUCTURE SUBSURFACE INVESTIGATION

	FERENCE NO HENDER		2 B	-4765	F.	_ F.A. PROJ			
	DESCRIPTION		NO. 113	ON SR	1574	OVER	KYLES	CREEK	
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ITE DESCRIPTION									

STATE	STATE PROJECT	REFERENCE NO.	SHEET NO.	TOTAL
N.C.	38537.1.2	B-4765	1	7

CAUTION NOTICE

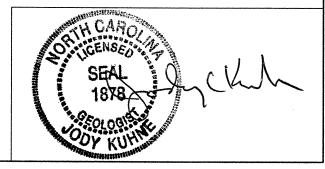
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARROUS FIELD BORNING LOSS, ROCK CORES, AND SOUL TEST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL PROMERENME UNIT AT 1999 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNING LOSS, ROCK CORES, OR SOUL 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 NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORRIOS OR BETWEEN SAMPLED STRATA WITHIN THE BORCHOLE. THE LABORATORY SAMPLE DATA AND THE IN STILL IN-PLACEITEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE TIME OF THE INVESTICATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS AND 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 CUARANTE 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 MEMBEL 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 TO BE.

INVESTIGATED BY_	JC KUHNE	
CHECKED BY	WD FRYE	
SUBMITTED BY	JC KUHNE	
DATE 4/13	12012	

PERSONNEL
MM HAGER
DO CHEEK
C COFFEY



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

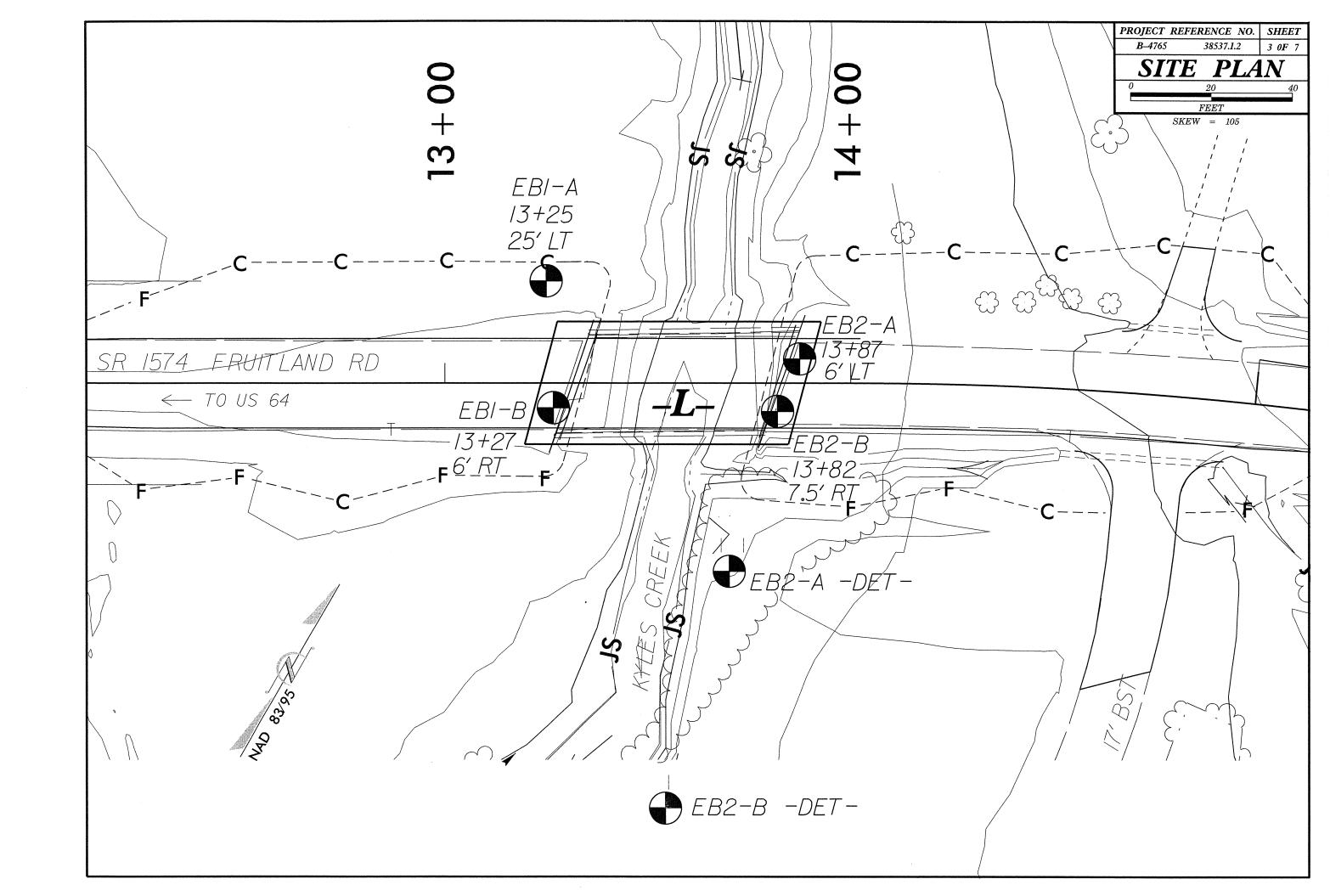
SUBSURFACE INVESTIGATION

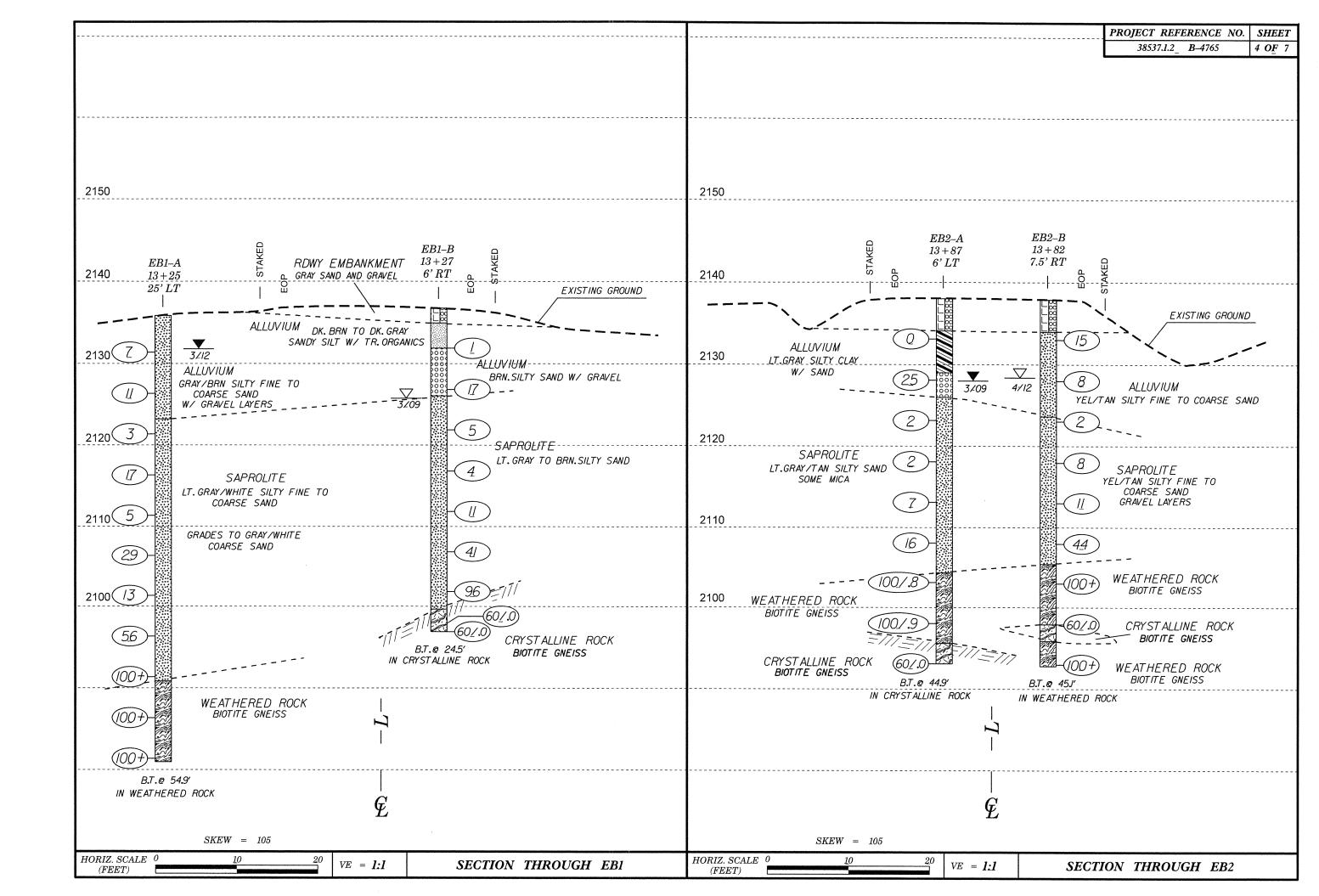
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS										
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS							
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1566). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTITENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAP, SUTY CLAY, MOST WITH INTERBEDGED FINE SMOL INTERSTRUCTUR PLAST, A7-6	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 POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED WEATHERED WEATHERED WEATHERED BLOWS PER FOOT IF TESTED.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AGUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL							
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL GRANULAR MATERIALS (≤ 35% PASSING *200) ORGANIC MATERIALS GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6, A-7 A-1, A-2 A-6, A-7	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT MOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE. CMEISS, GABBRO, SCHIST, ETC. NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK (CP) SHELL BEDS, ETC. WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLIJ) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORATION AND WEATHERING EFFECTS. IN	AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE CROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAYITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO DNE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM							
AS A SUBGRADE EXCELLENT TO GOOD FAIR TO POOR PAIR TO POOR POOR UNSUITABLE	SPRING OR SEEP MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED SOIL BOUNDARY INFERRED ROCK LINE INFERRED ROCK LINE PIEZOMETER ALLUVIAL SOIL BOUNDARY ST. SHELBY TUBE SAMPLE MONITORING WELL RS - ROCK SAMPLE PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CBR - CALIFORNIA BEARING RATIO SAMPLE SPT N-VALUE	GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) SEVERE (MOD. SEV.) SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL, AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK, IF TESTED, WOLLD YIELD SPT REFUSAL SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN, IF TESTED, YIELDS SPT N VALUES > 100 BPF VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REQUICED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING, SAPPOLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DECREASE OLD THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES \ 100 BPF COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE. ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AFRATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (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 EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE							
U.S. STO. SIEVE SIZE	ABBRE VIATIONS AR - AUGER REFUSAL HI HIGHLY BT - BORING TERMINATED MED MEDIUM V - VERY CL CLAY MICA MICACEOUS VST - VANE SHEAR TEST CPT - CONE PENETRATION TEST MOD MODERATELY CSE COARSE NP - NON PLASTIC DHT - DILATOMETER TEST ORG ORGANIC DPT - OYNAMIC PENETRATION TEST PHT - PRESSUREMETER TEST O- VOID RATIO SAP SAPROLITIC F - FINE SD SAND, SANDY FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES FRAGS FRAGMENTS AMOUNT OF THE CONTROL	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BC CARVEO WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES I INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) — MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.							
RANGE (PI) PL PLASTIC LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE PLASTICITY	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: L ADVANCING TOOLS: CLAY BITS G* CONTINUOUS FLIGHT AUGER B* HOLLOW AUGERS L B* HOLLOW AUGERS L B* HOLLOW AUGERS	FRACTURE SPACING BEDDING	DOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BM #1: L&S MONUMENT, 24.57' RT OF -L- STA. 10+00							
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.								

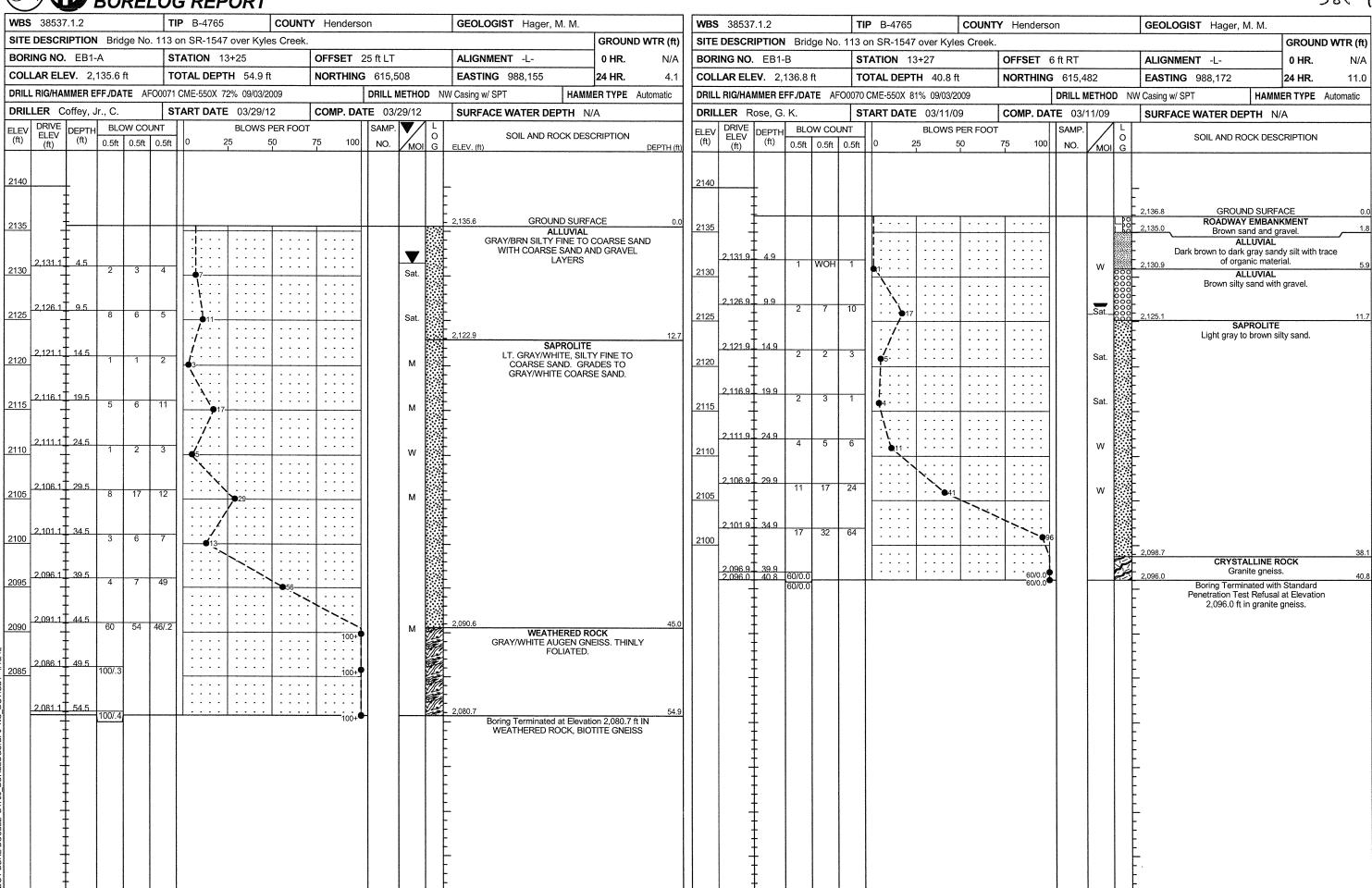
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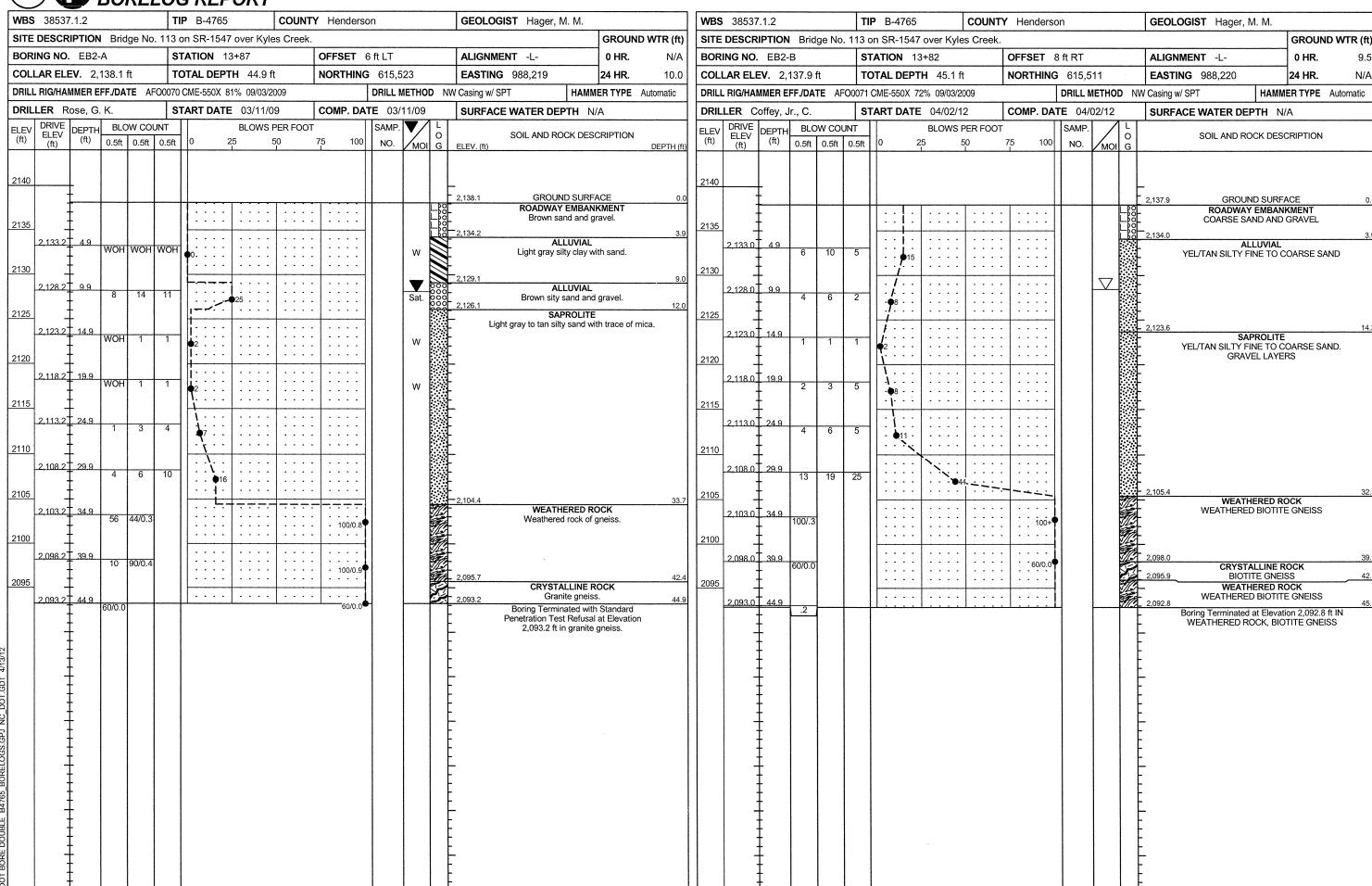
PROJECT REFERENCE NO. 38537.1.2 B-4765

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