

PROJECT: 33792.1.1 ID: B-4600

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33792.1.1 (B-4600)	1	15

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STRUCTURE  
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33792.1.1 (B-4600) F.A. PROJ. BRZ-1112(7)  
COUNTY PERSON  
PROJECT DESCRIPTION BRIDGE NO. 43 ON -L- (SR 1112, CHARLIE  
LONG RD.) OVER SOUTH FLAT RIVER AT STATION 15+13

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER 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 NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON 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.

PERSONNEL  
C.D. CZAJKA

J.R. TURNAGE

H.R. CONLEY

J.R. MATULA

N.D. MOHS

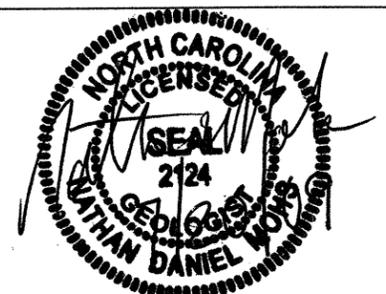
D.W. DIXON

INVESTIGATED BY N.D. MOHS

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE JULY 2009



DRAWN BY: N.D. MOHS

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

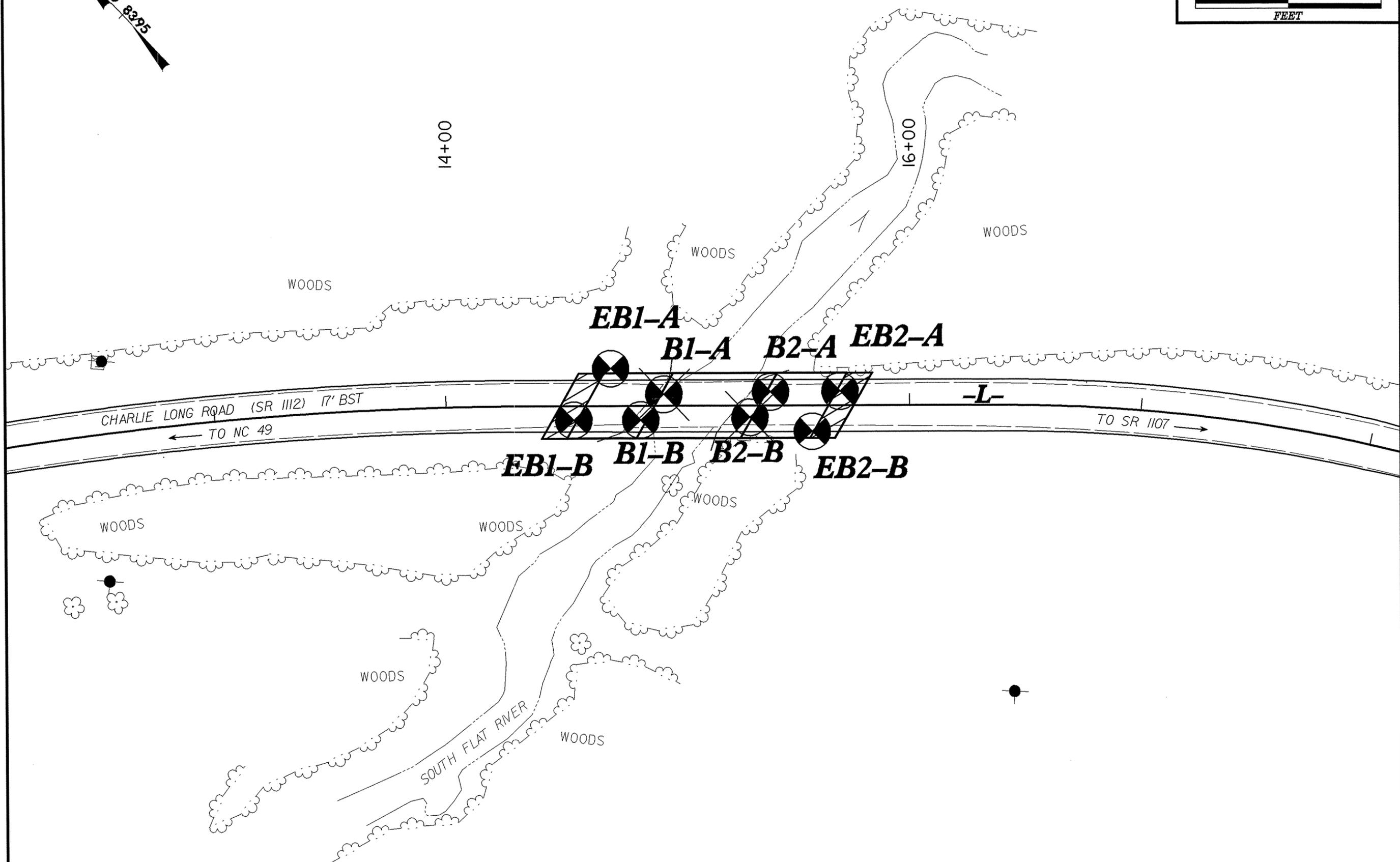
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

## SUBSURFACE INVESTIGATION

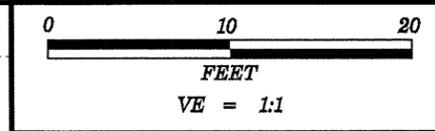
### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>	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.  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 ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. 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 ONE 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 DISLOGGED FROM 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.) - IRRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN 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 INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 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 EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE 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 (SCREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - 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. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>MINERALOGICAL COMPOSITION</b>	<b>WEATHERING</b>	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.  VERY SLIGHT (V SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.  SLIGHT (SLI.) 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 DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.  MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN 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.) 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>  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. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i>  VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT 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 ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i>  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.	
<b>COMPRESSION</b>	<b>PERCENTAGE OF MATERIAL</b>	<b>GROUND WATER</b>	
SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP	
<b>CONSISTENCY OR DENSENESS</b>	<b>MISCELLANEOUS SYMBOLS</b>	<b>ROCK HARDNESS</b>	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.  MODERATELY HARD 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 HARD CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.  SOFT CAN BE GROUVED 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 SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.	
<b>TEXTURE OR GRAIN SIZE</b>	<b>ABBREVIATIONS</b>	<b>FRACATURE SPACING</b>	<b>BEDDING</b>
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 0.075 0.25 0.85 2.0 6.0 17.5 47.5	HI - HIGHLY MED. - MEDIUM MICA - MICAEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL	VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET	TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>INDURATION</b>	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DRILL UNITS: MOBILE B-51, BK-51, CME-45C, CME-550, PORTABLE HOIST ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING, W/ ADVANCER, TRICONE, STEEL TEETH, TRICONE, TUNG-CARB. CORE BIT	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.  MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.  INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.  EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
<b>PLASTICITY</b>			
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY			
<b>COLOR</b>			
DESCRIPTORS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.			

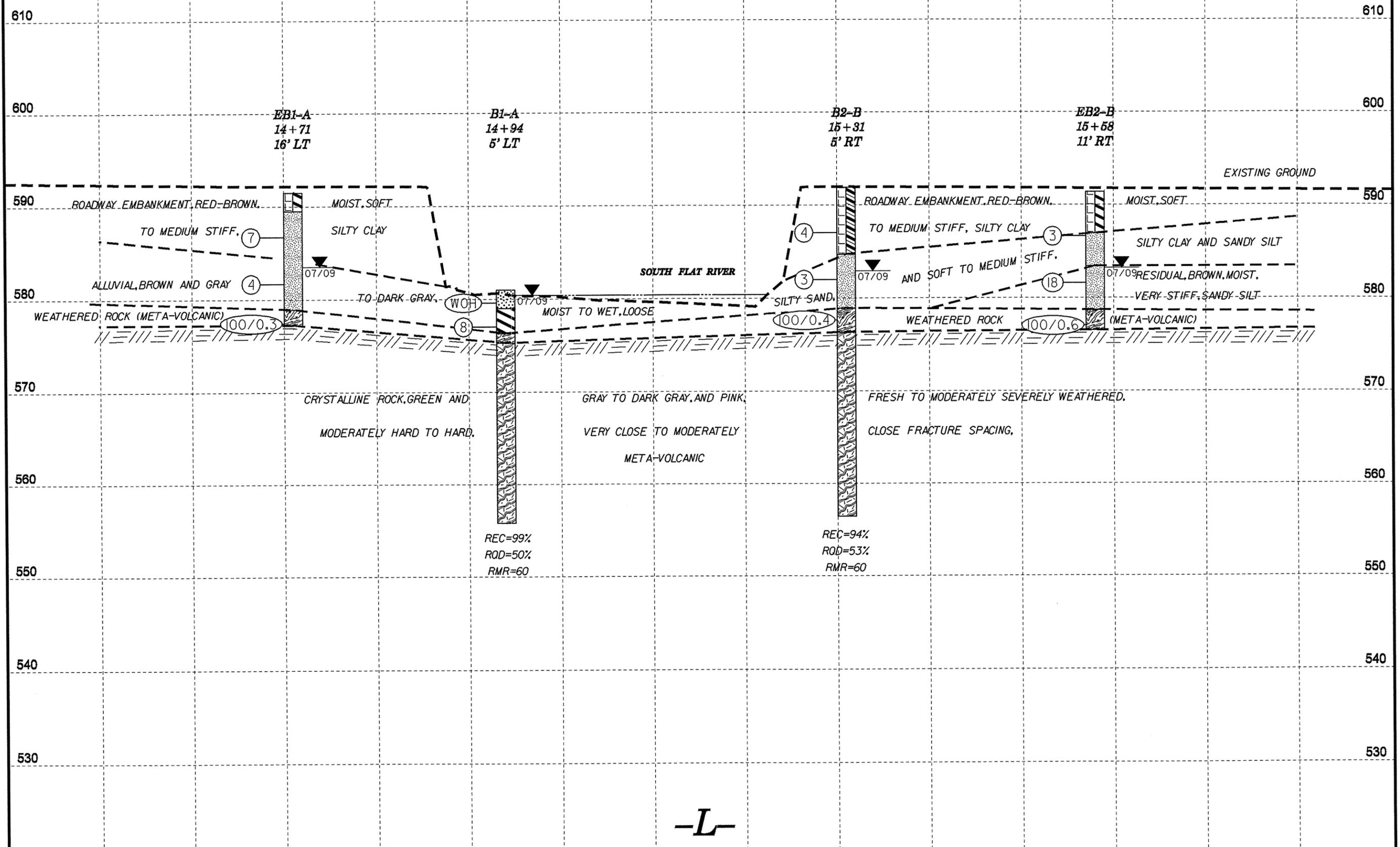


SKEW = 120°

GROUNDLINE PROFILE AT CENTERLINE OF -L- TAKEN FROM ROADWAY DESIGN PLANS AS OF 12/30/2008.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.



PROJECT REFERENCE NO.	SHEET
33792.1.1 (B-4600)	4
<b>PROFILE ALONG -L-</b>	

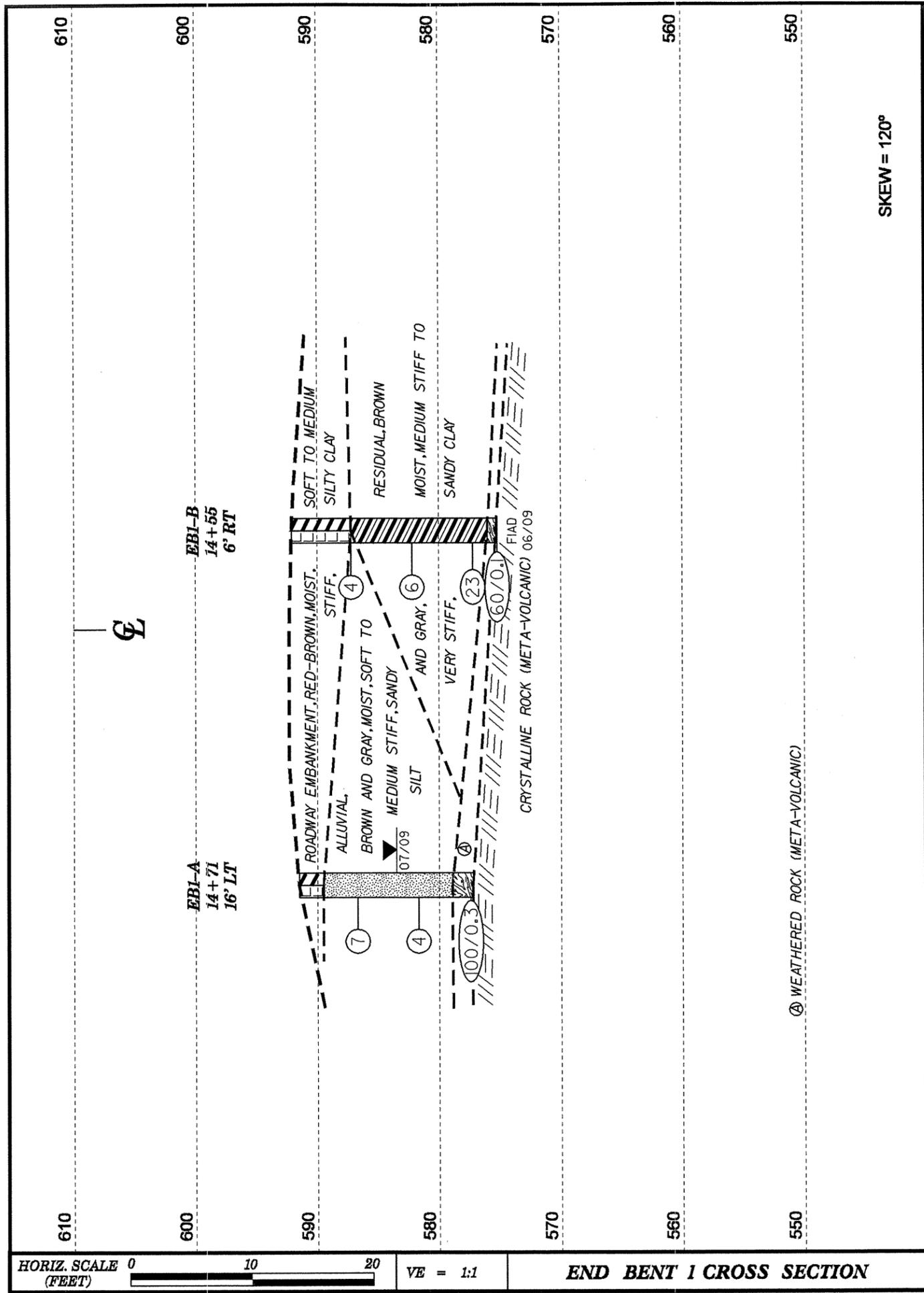


**-L-**

14+50

15+00

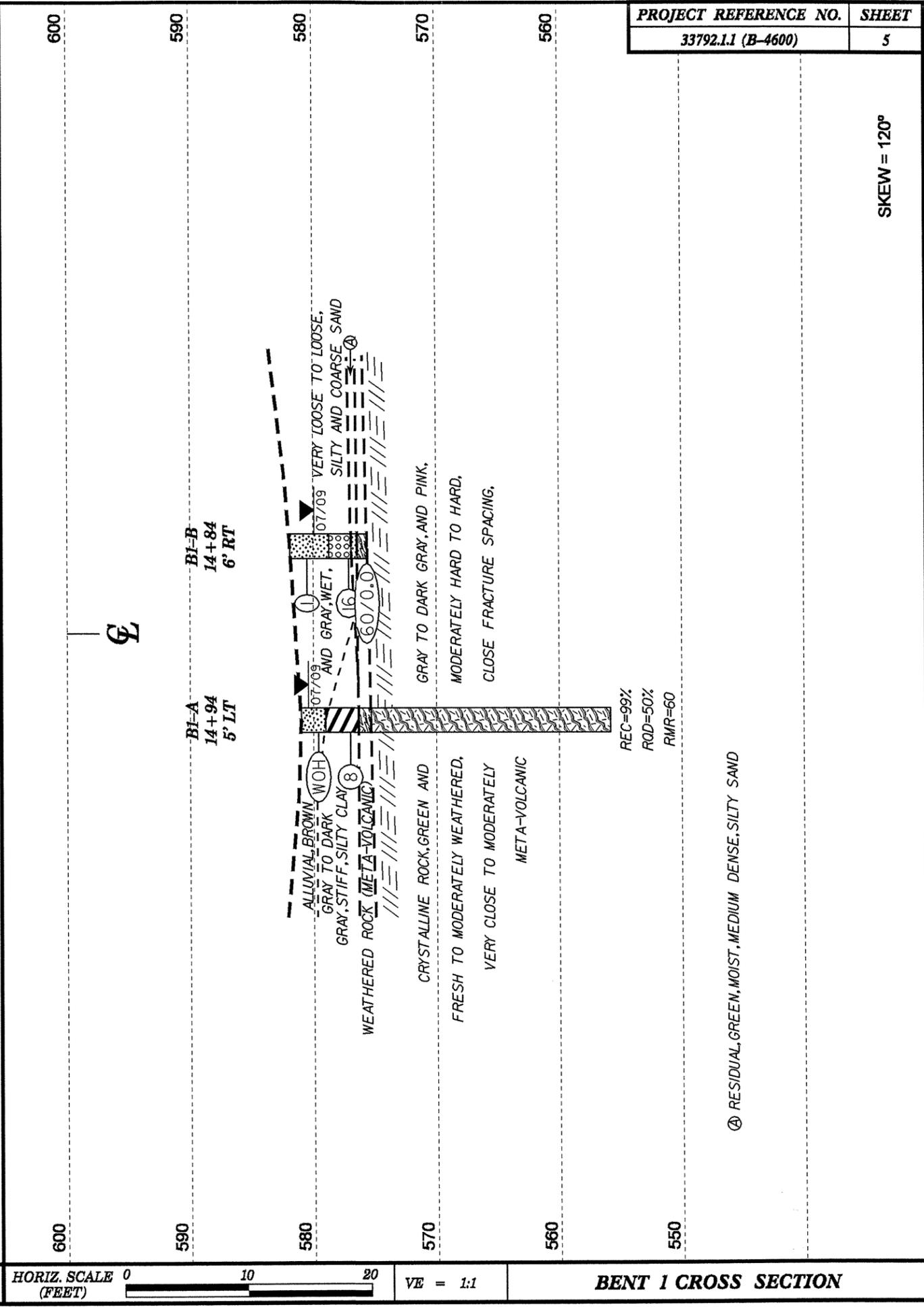
15+50



HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

END BENT 1 CROSS SECTION

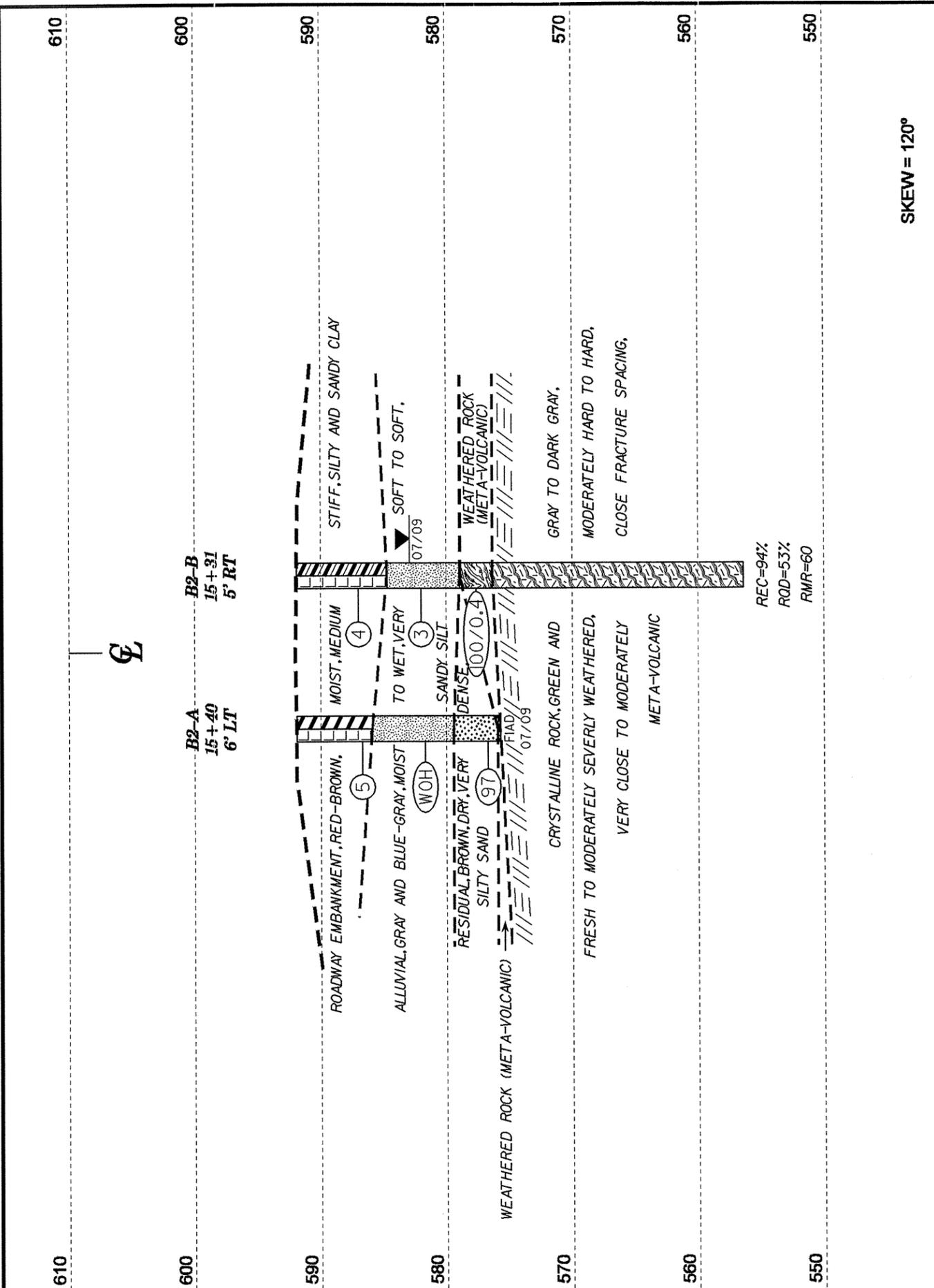


HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

BENT 1 CROSS SECTION

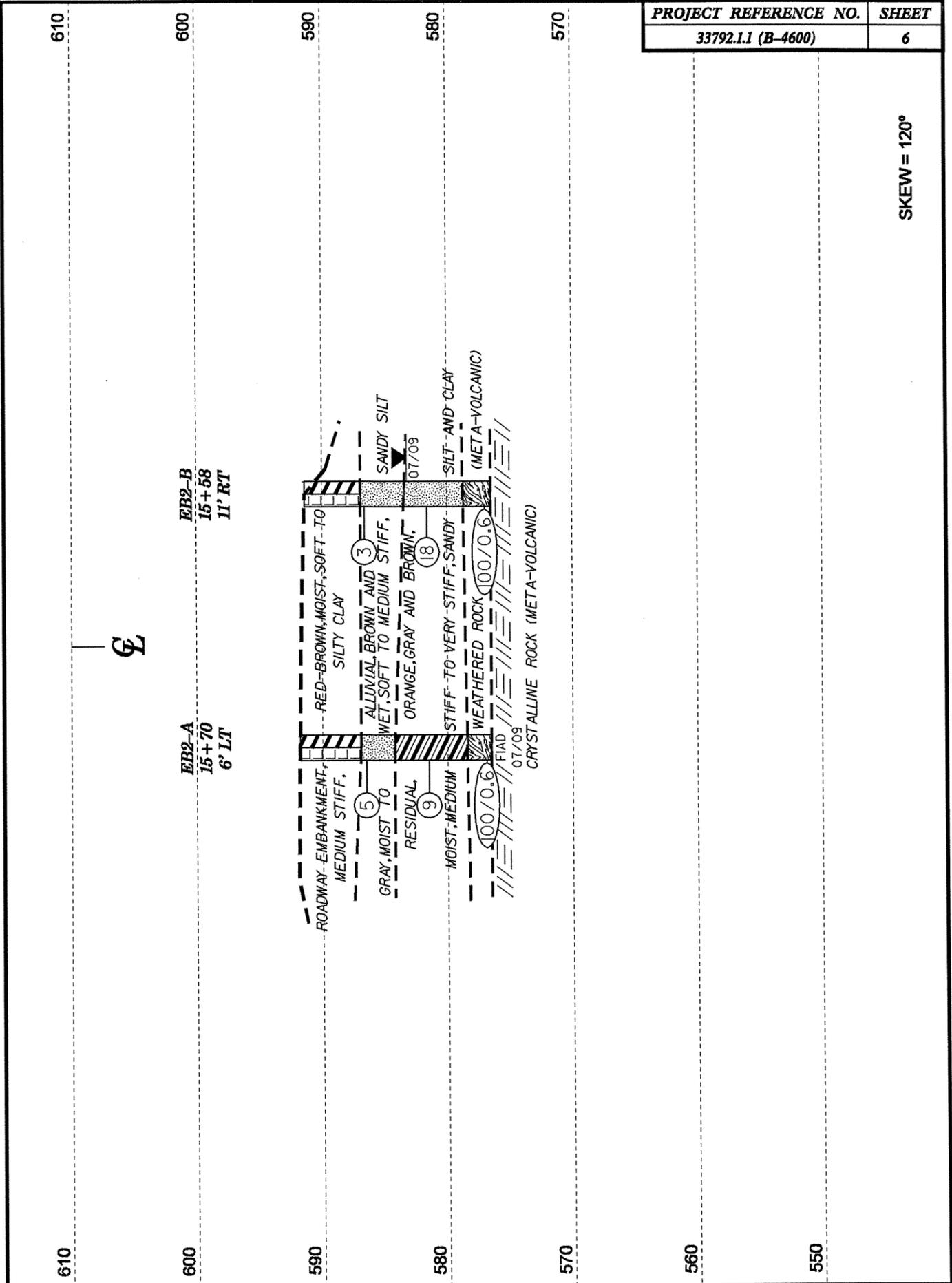
REC=99%  
ROD=50%  
RMR=60



HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

**BENT 2 CROSS SECTION**



HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

**END BENT 2 CROSS SECTION**

SKREW = 120°

SKREW = 120°

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

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+71	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 591.5 ft	TOTAL DEPTH 14.3 ft	NORTHING 926,241	EASTING 1,980,917
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 06/30/09	COMP. DATE 06/30/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 14.3 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
595														591.5	GROUND SURFACE	0.0
590														589.5	ROADWAY EMBANKMENT Red-Brown, Silty Clay	2.0
585	587.7	3.8	3	3	4						SS-1	M			ALLUVIAL Brown and Gray, Sandy Silt	
580	582.7	8.8	3	2	2						SS-2	W				
575	577.7	13.8	100/0.3			100/0.3								578.9	WEATHERED ROCK (Meta-Volcanic)	12.6
														577.2	WEATHERED ROCK (Meta-Volcanic)	14.3
Boring Terminated by Auger Refusal at Elevation 577.2 ft On Crystalline Rock (Meta-Volcanic)																

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. EB1-B	STATION 14+55	OFFSET 6ft RT	ALIGNMENT -L-
COLLAR ELEV. 592.1 ft	TOTAL DEPTH 16.9 ft	NORTHING 926,237	EASTING 1,980,890
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 06/30/09	COMP. DATE 06/30/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 16.8 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
595														592.1	GROUND SURFACE	0.0
590															ROADWAY EMBANKMENT Red-Brown, Silty Clay	
585	588.2	3.9	1	1	3						S-3 SS-4	M		587.2	RESIDUAL Brown and Gray, Sandy Clay	4.9
580	583.2	8.9	2	2	4							M				
575	578.2	13.9	8	8	15						SS-5	M		576.0	WEATHERED ROCK (Meta-Volcanic)	16.1
	575.3	16.8	60/0.1			60/0.1								575.3	WEATHERED ROCK (Meta-Volcanic)	16.8
														575.2	CRYSTALLINE ROCK (Meta-Volcanic)	16.9
Boring Terminated with Standard Penetration Test Refusal at Elevation 575.2 ft In Crystalline Rock (Meta-Volcanic)																

NCDOT BORE DOUBLE B4600\_GEO\_BH.GPJ NC\_DOT.GDT 7/20/09

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+94	OFFSET 5ft LT	ALIGNMENT -L-
COLLAR ELEV. 581.0 ft	TOTAL DEPTH 25.2 ft	NORTHING 926,218	EASTING 1,980,926
DRILL MACHINE CME-550X		DRILL METHOD NW Casing W/SPT & Core	
START DATE 07/08/09		COMP. DATE 07/09/09	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 5.7 ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
585														
580	580.6	6.4											581.0 GROUND SURFACE	0.0
			WOH	WOH	WOH								579.0 ALLUVIAL Brown, Silty Sand	2.0
	578.0	3.0	1	1	7								576.3 Gray to Dark Gray, Silty Clay	4.7
575													575.3 WEATHERED ROCK (Meta-Volcanic)	5.7
570													CRYSTALLINE ROCK Green, Gray to Dark Gray, and Pink, Fresh to Moderately Weathered, Moderately Hard to Hard, Very Close to Moderately Close Fracture Spacing, Meta-Volcanic REC=99%, RQD=50%, RMR=60	
565														
560														
555													555.8 Boring Terminated at Elevation 555.8 ft In Crystalline Rock (Meta-Volcanic)	25.2
550														
545														
540														
535														
530														
525														
520														
515														
510														
505														
500														

NCDOT BORE DOUBLE B4600\_GEO\_BH.GPJ NC\_DOT.GDT 7/20/09

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+94	OFFSET 5ft LT	ALIGNMENT -L-
COLLAR ELEV. 581.0 ft	TOTAL DEPTH 25.2 ft	NORTHING 926,218	EASTING 1,980,926
DRILL MACHINE CME-550X		DRILL METHOD NW Casing W/SPT & Core	
START DATE 07/08/09		COMP. DATE 07/09/09	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 5.7 ft	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
575.3											Begin Coring @ 5.7 ft	
	575.3	5.7	4.7	1:00/0.7 1:25/1.0 1:20/1.0 1:37/1.0 1:25/1.0	(4.6) 98%	(2.0) 43%		(19.4) 99%	(9.7) 50%		575.3 CRYSTALLINE ROCK Green, Gray to Dark Gray, and Pink, Fresh to Moderately Weathered, Moderately Hard to Hard, Very Close to Moderately Close Fracture Spacing, Meta-Volcanic REC=99%, RQD=50%, RMR=60	5.7
570	570.6	10.4	4.8	1:00/0.8 :57/1.0 1:07/1.0 1:01/1.0 :58/1.0	(4.8) 100%	(4.0) 83%						
565	565.8	15.2	5.0	1:05/1.0 1:05/1.0 :58/1.0 :44/1.0 :55/1.0	(5.0) 100%	(2.1) 42%						
560	560.8	20.2	5.0	1:09/1.0 1:07/1.0 :55/1.0 1:11/1.0 1:29/1.0	(5.0) 100%	(1.6) 32%						
555	555.8	25.2									555.8 Boring Terminated at Elevation 555.8 ft In Crystalline Rock (Meta-Volcanic)	25.2
550												
545												
540												
535												
530												
525												
520												
515												
510												
505												
500												

NCDOT CORE SINGLE B4600\_GEO\_BH.GPJ NC\_DOT.GDT 07/20/09





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

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+70	OFFSET 6ft LT	ALIGNMENT -L-
COLLAR ELEV. 591.8 ft	TOTAL DEPTH 15.3 ft	NORTHING 926,166	EASTING 1,980,982
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 07/06/09	COMP. DATE 07/06/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 15.3 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75					100
595												591.8	GROUND SURFACE	0.0
590												586.9	ROADWAY EMBANKMENT Red-Brown, Silty Clay	4.9
585	587.5	4.3	5	3	2							584.2	ALLUVIAL Brown, Sandy Silt	7.6
580	582.5	9.3	3	4	5							578.4	RESIDUAL Orange and Gray, Sandy Clay	13.4
575	577.5	14.3	55	45/0.1								576.5	WEATHERED ROCK (Meta-Volcanic)	15.3
575													Boring Terminated by Auger Refusal at Elevation 576.5 ft On Crystalline Rock (Meta-Volcanic)	

PROJECT NO. 33792.1.1	ID. B-4600	COUNTY Person	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River at Station 15+13			GROUND WTR (ft)
BORING NO. EB2-B	STATION 15+58	OFFSET 11ft RT	ALIGNMENT -L-
COLLAR ELEV. 591.4 ft	TOTAL DEPTH 14.9 ft	NORTHING 926,162	EASTING 1,980,961
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 06/30/09	COMP. DATE 06/30/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 14.9 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75					100
595												591.4	GROUND SURFACE	0.0
590												586.9	ROADWAY EMBANKMENT Red-Brown, Silty Clay	4.5
585	587.6	3.8	1	1	2							583.4	ALLUVIAL Gray, Sandy Silt	8.0
580	582.6	8.8	6	6	12							578.7	RESIDUAL Brown, Sandy Silt	12.7
575	577.6	13.8	51	49/0.1								576.5	WEATHERED ROCK (Meta-volcanic)	14.9
575													Boring Terminated by Auger Refusal at Elevation 576.5 ft On Crystalline Rock (Meta-Volcanic)	

NCDOT BORE DOUBLE B4600\_GEO\_BH.GPJ NC\_DOT.GDT 07/17/09

**E1-A**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	16 LT	14+71	3.8-5.3	A-4(0)	22	4	17.5	17.5	44.8	20.2	95	85	66	-	-
SS-2	16 LT	14+71	8.8-10.3	A-4(0)	17	NP	8.3	31.3	42.3	18.1	100	97	68	-	-

**E1-B**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-3	6 RT	14+55	3.9-4.9	A-7-6(14)	47	25	24.6	10.9	20.2	44.4	95	78	63	-	-
SS-4	6 RT	14+55	4.9-5.4	A-6(11)	34	17	9.7	23.0	35.1	32.3	99	93	73	-	-
SS-5	6 RT	14+55	13.9-15.4	A-4(4)	36	7	15.9	19.8	42.1	22.2	97	87	67	-	-

**B1-A**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-12	5 LT	14+94	0.4-1.9	A-2-4(0)	30	NP	22.6	48.4	21.0	8.1	98	93	33	-	-
SS-13	5 LT	14+94	3.0-4.5	A-7-5(7)	45	15	18.5	27.6	33.7	20.2	99	89	58	-	-

**B1-B**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-14	6 RT	14+84	3.8-5.0	A-1-b(0)	19	NP	60.7	21.7	10.6	7.1	84	45	17	-	-

**B2-A**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-7	6 LT	15+40	9.2-10.7	A-4(0)	20	3	19.2	24.4	38.3	18.1	98	89	60	-	-
SS-8	6 LT	15+40	14.2-15.7	A-2-4(0)	23	1	47.8	25.0	19.2	8.1	85	53	28	-	-

**B2-B**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	5 RT	15+31	3.9-5.4	A-6(3)	28	11	24.8	17.5	29.4	28.2	89	74	54	-	-
SS-11	5 RT	15+31	8.9-10.4	A-4(0)	21	4	14.9	24.2	38.7	22.2	88	81	58	-	-

**EB2-A**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	6 LT	15+70	9.3-10.8	A-6(9)	33	14	10.5	22.0	45.4	22.2	99	93	75	-	-

**EB2-B**

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	11 RT	15+58	4.5-5.3	A-4(0)	20	3	25.8	24.2	29.8	20.2	95	81	51	-	-



# FIELD SCOUR REPORT

WBS: 33792.1.1 TIP: B-4600 COUNTY: Person

DESCRIPTION(1): Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) over South Flat River

### EXISTING BRIDGE

Information from: Field Inspection  Microfilm \_\_\_\_\_ (reel \_\_\_\_\_ pos: \_\_\_\_\_)  
 Other (explain) \_\_\_\_\_

Bridge No.: 43 Length: 41.0' Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2  
 Foundation Type: Timber pile end bents.

#### EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: N/A

Channel Bed: None

Channel Bank: None

#### EXISTING SCOUR PROTECTION

Type(3): Wooden wingwalls at end bents

Extent(4): 6' up and downstream

Effectiveness(5): Effective

Obstructions(6): None

#### INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

### DESIGN INFORMATION

Channel Bed Material(7): Silt, sand and gravel

Channel Bank Material(8): Silt and sand

Channel Bank Cover(9): Grass and trees

Floodplain Width(10): 100'

Floodplain Cover(11): Trees

Stream is(12): Aggrading \_\_\_\_\_ Degrading  Static \_\_\_\_\_

Channel Migration Tendency(13): East toward EB2

Observations and Other Comments: Shallow, slow moving water.

#### DESIGN SCOUR ELEVATIONS(14)

Feet  Meters \_\_\_\_\_

Bent 1	Bent 2									
578.0	582.0									

Comparison of DSE to Hydraulics Unit theoretical scour:  
 The Geotechnical Engineering Unit and the Hydraulics Unit agree that the DSE should be 578.0' for bent 1 and 582.0' for bent 2.

#### SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank					
Sample No.					
Retained #4	See Sheet 12, "Soil Test Results", for samples:				
Passed #10					
Passed #40					
Passed #200					
Coarse Sand					
Fine Sand					
Silt					
Clay					
LL					
PI					
AASHTO					
Station					
Offset					
Depth					

Form GEU-017e Revised 7/26/2007

Reported by: N.D. Mohs Date: 6/23/09

# CORE PHOTOGRAPHS

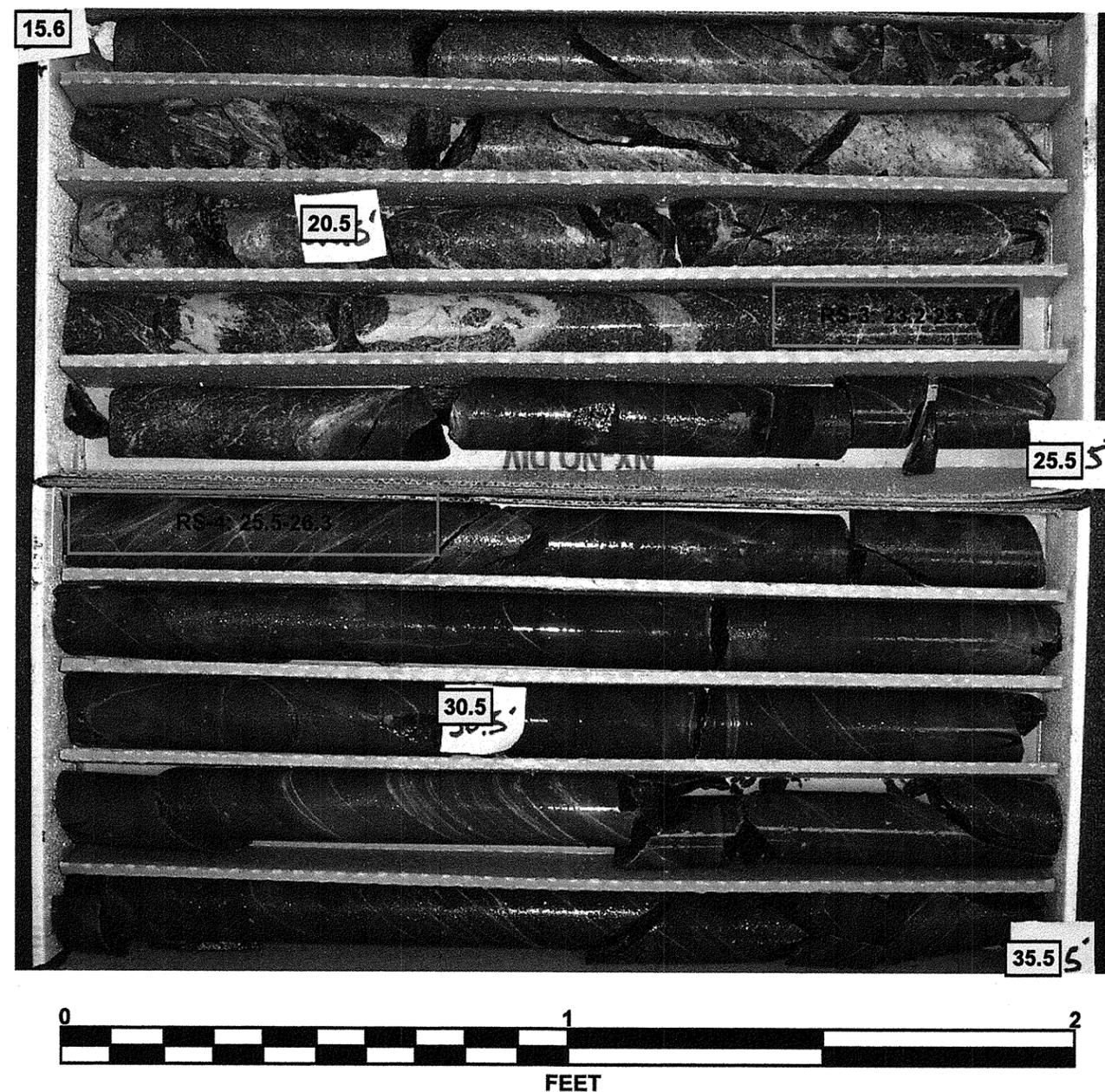
## B1-A

BOXES 1 - 3: 5.7 - 25.2 FEET



## B2-B

BOXES 1 & 2: 15.6 - 35.5 FEET



Site Photograph

Bridge No. 43 on -L- (SR 1112, Charlie Long Rd.) Over South Flat River



Looking North