

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33758.1.1 (B-4543) F.A. PROJ. BRSTP-1558(2)
COUNTY HARNETT
PROJECT DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER

INVENTORY

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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 (ON-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.

PROJECT: 33758.1.1
ID: B-4543

PERSONNEL

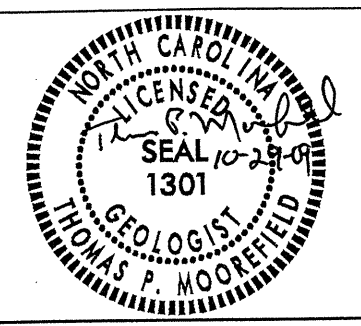
- J.I. MILKOVITS, JR.
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- J.R. MATULA

INVESTIGATED BY J.I. MILKOVITS, JR.

CHECKED BY T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

DATE OCTOBER 2009







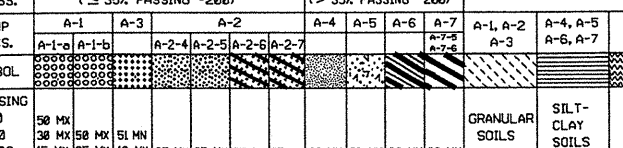
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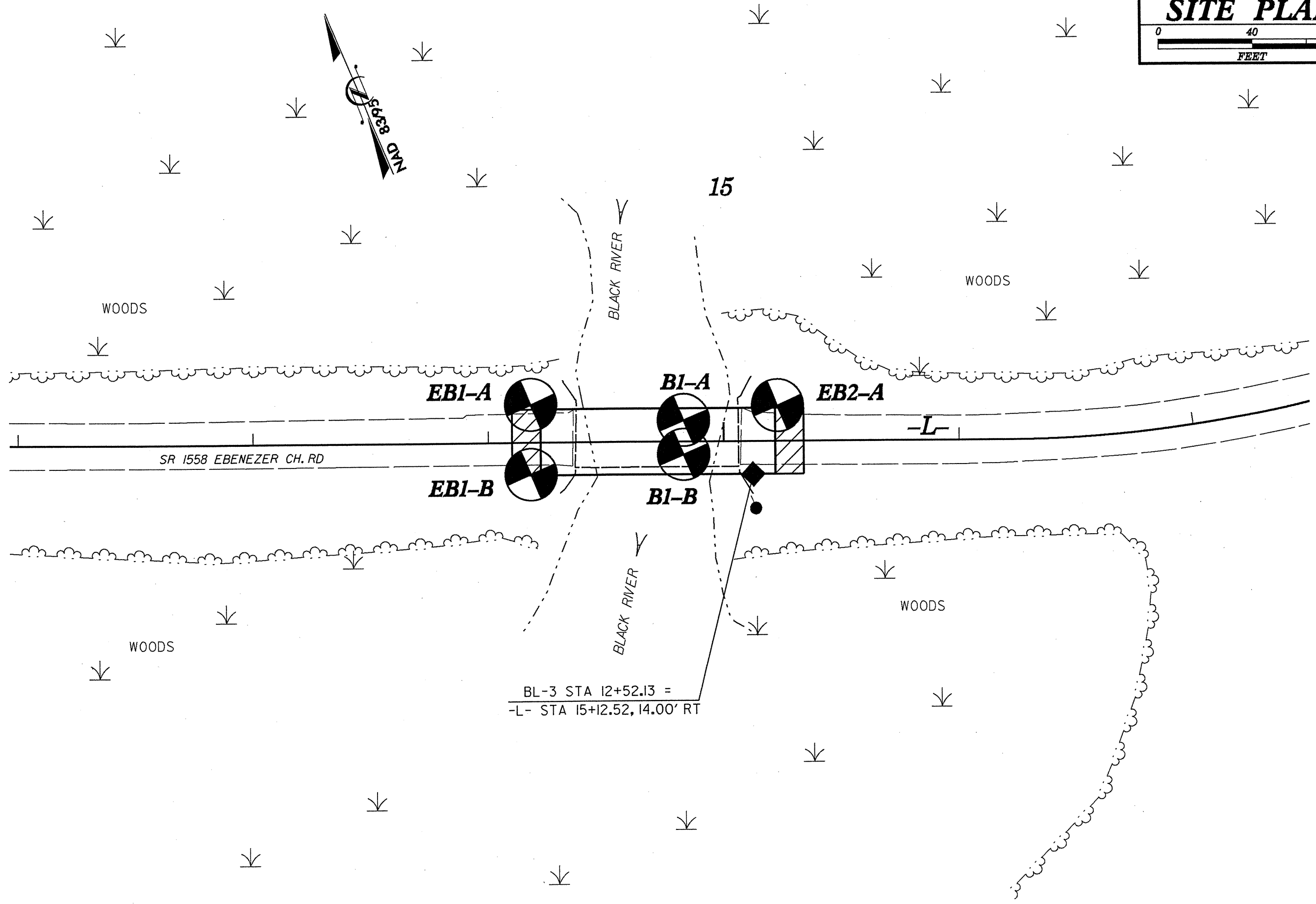
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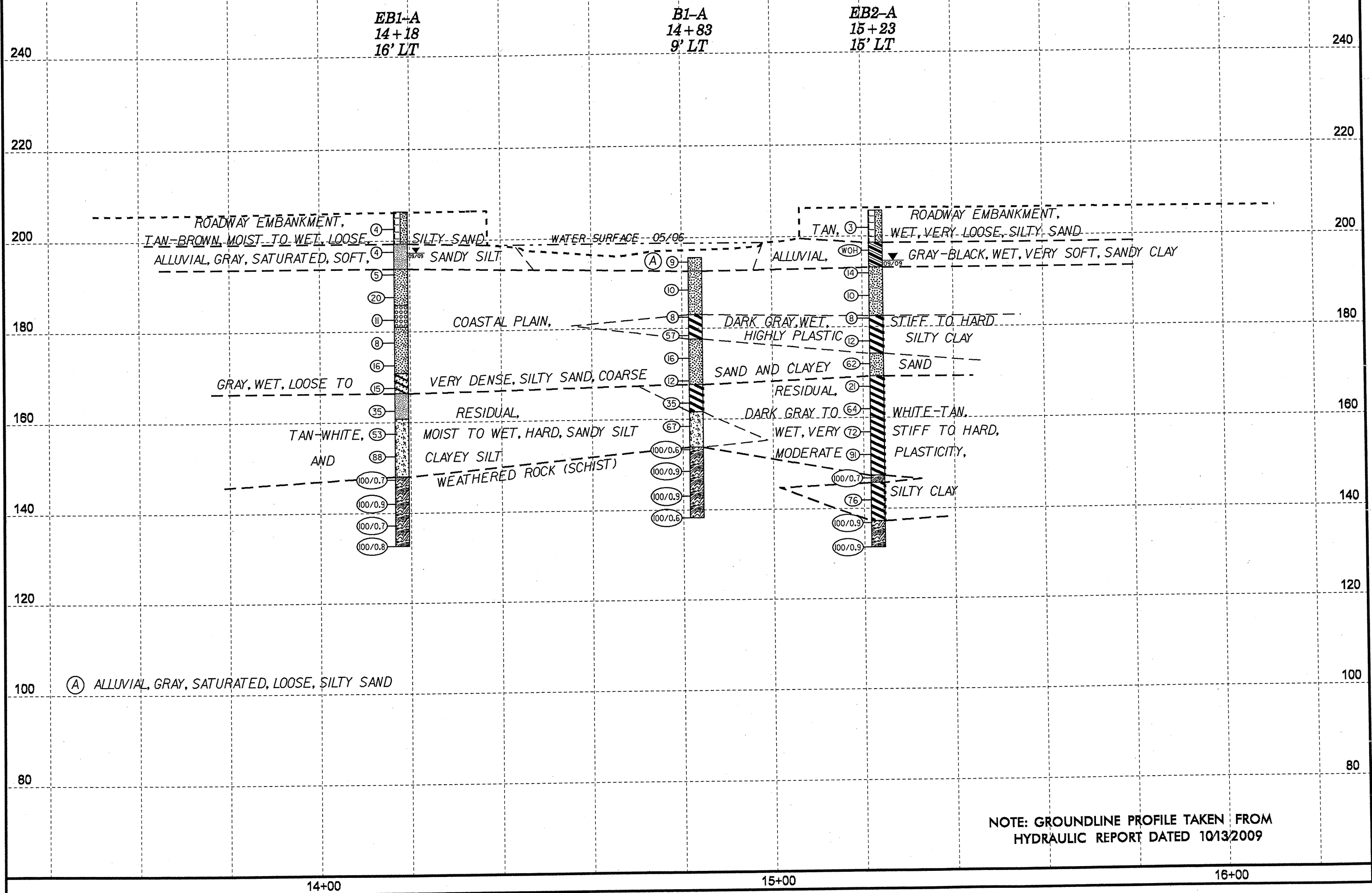
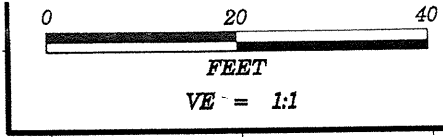
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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 (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, SANDY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, MEDIUM 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. 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 ROCK (WR)  CRYSTALLINE ROCK (CR)  NON-CRYSTALLINE ROCK (NCR)  COASTAL PLAIN SEDIMENTARY ROCK (CPS)	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 DISLODGED 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.) - IRREGULARLY 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 (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 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 (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.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. 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 SYMBOL  % PASSING # 10 # 40 # 200 LIQUID LIMIT PLASTIC INDEX GROUP INDEX USUAL TYPES OF MAJOR MATERIALS GEOLOGIC RATING AS A SUBGRADE	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE PERCENTAGE OF MATERIAL 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	WEATHERING 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 > 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 < 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.	CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE 4 TO 10 MEDIUM DENSE 10 TO 30 DENSE 30 TO 50 VERY DENSE >50 GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT 2 TO 4 SOFT 4 TO 8 MEDIUM STIFF 8 TO 15 STIFF 15 TO 30 VERY STIFF >30 TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053 BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.) GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC RANGE (IP) PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	MISCELLANEOUS SYMBOLS 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 SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	ROCK HARDNESS 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 GROUDED 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 GROUDED 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.	ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS - FRAGMENTS HI - HIGHLY MED. - MEDIUM MICA - MICA MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT % - DRY UNIT WEIGHT
PLASTICITY NONPLASTIC 0-5 LOW PLASTICITY 6-15 MED. PLASTICITY 16-25 HIGH PLASTICITY 26 OR MORE PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST CME-550X 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 DRAG BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -N -H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRITABLE 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.	FRACTURE SPACING TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.6 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET BEDDING 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
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.			BENCH MARK: BL-3, -L- STATION 15+13 14' RT ELEVATION: 205.51 FT. NOTES:

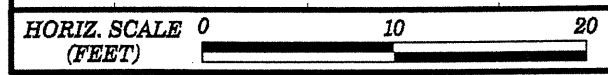
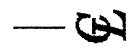




NOTE: GROUNDLINE PROFILE TAKEN FROM HYDRAULIC REPORT DATED 10/13/2009

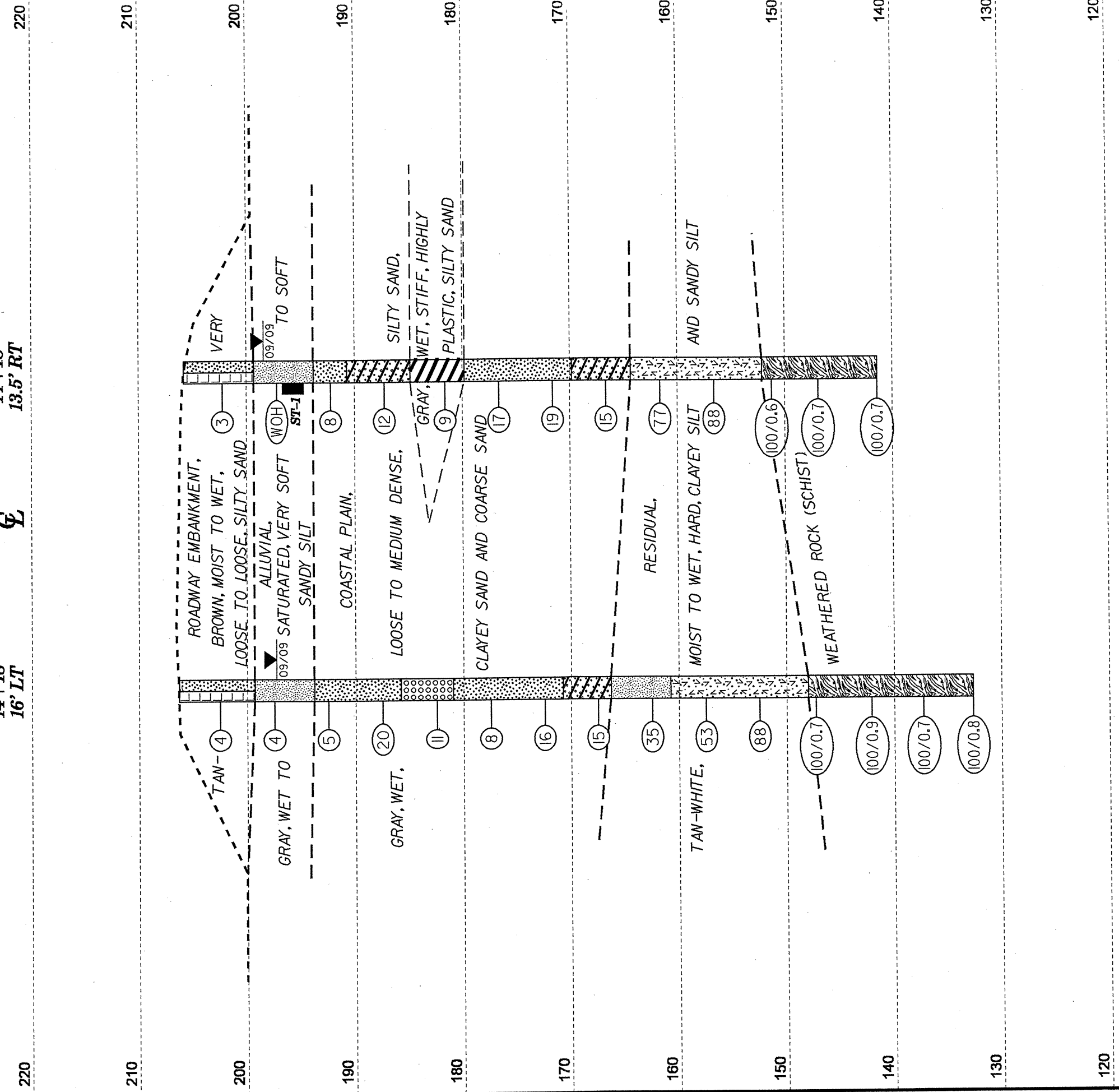
EBI-A
14+18
16' LT

EBI-B
14+18
13.5' RT



VE = 1:1

CROSS SECTION THROUGH END BENT 1



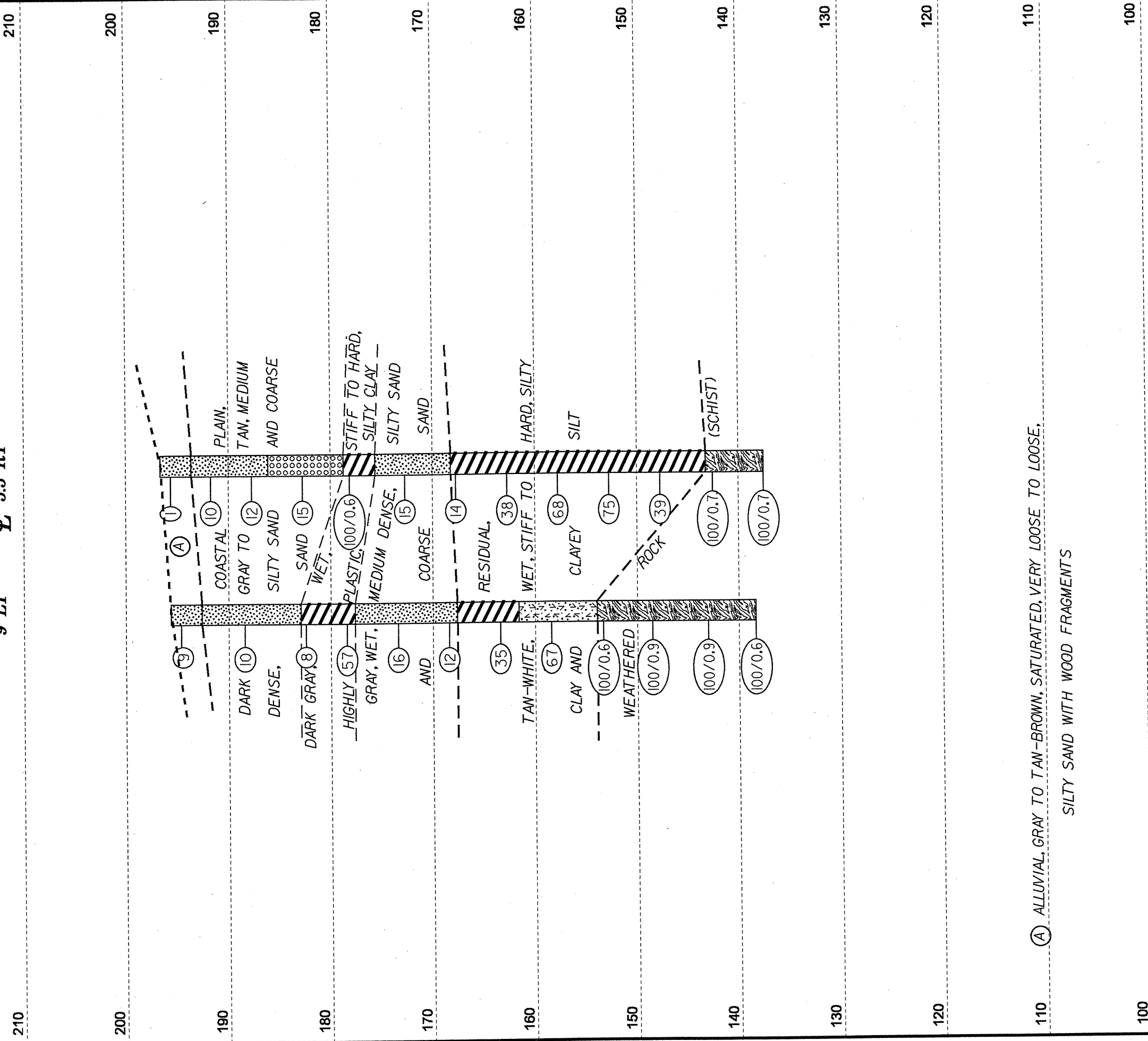
220 210 200 190 180 170 160 150 140 130 120 110 100 90

HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

CROSS SECTION THROUGH BENT 1

BI-A 14+83 9' LT
 BI-B 14+83 5.5' RT



(A) ALLUVIAL, GRAY TO TAN-BROWN, SATURATED, VERY LOOSE TO LOOSE,

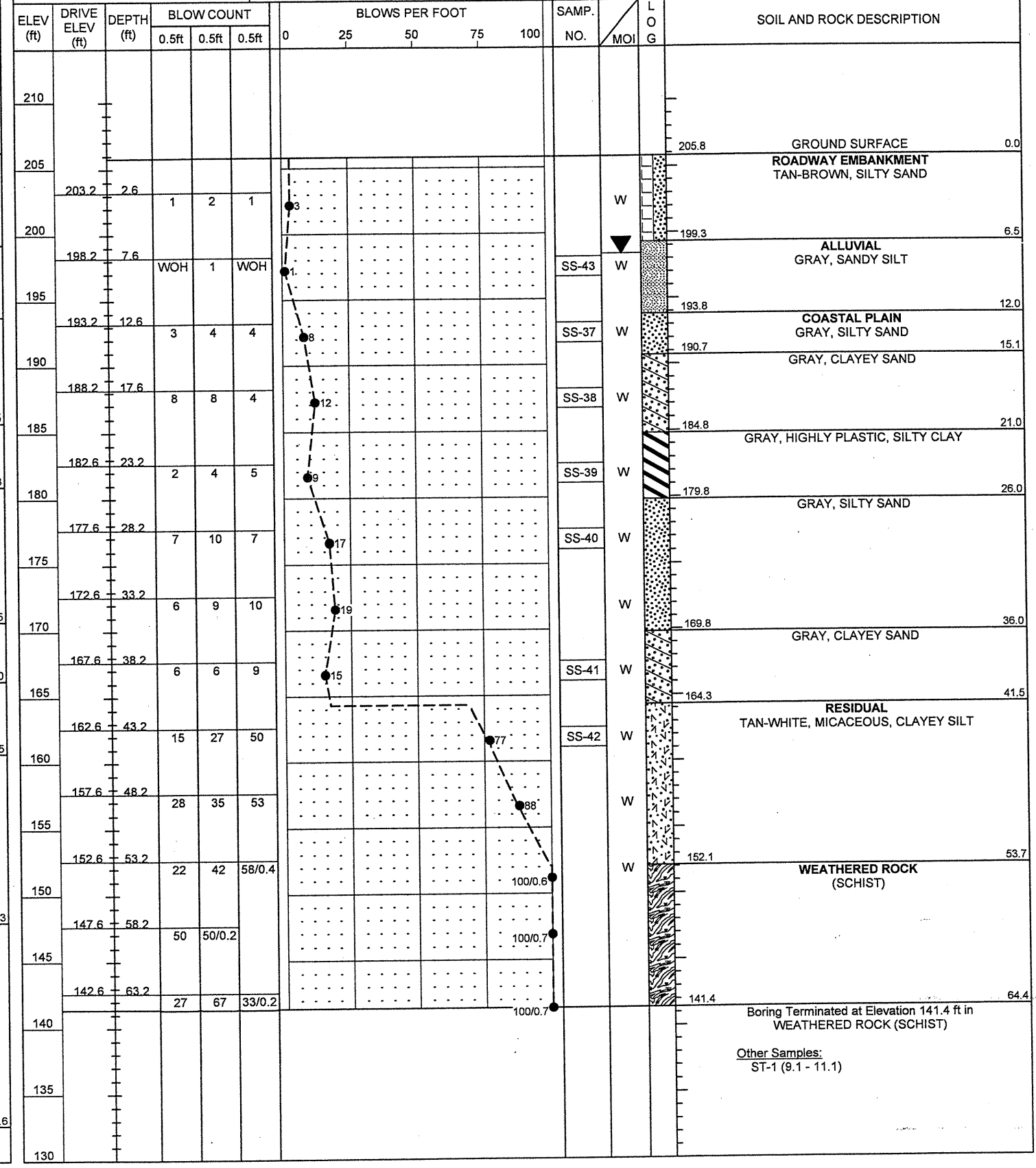
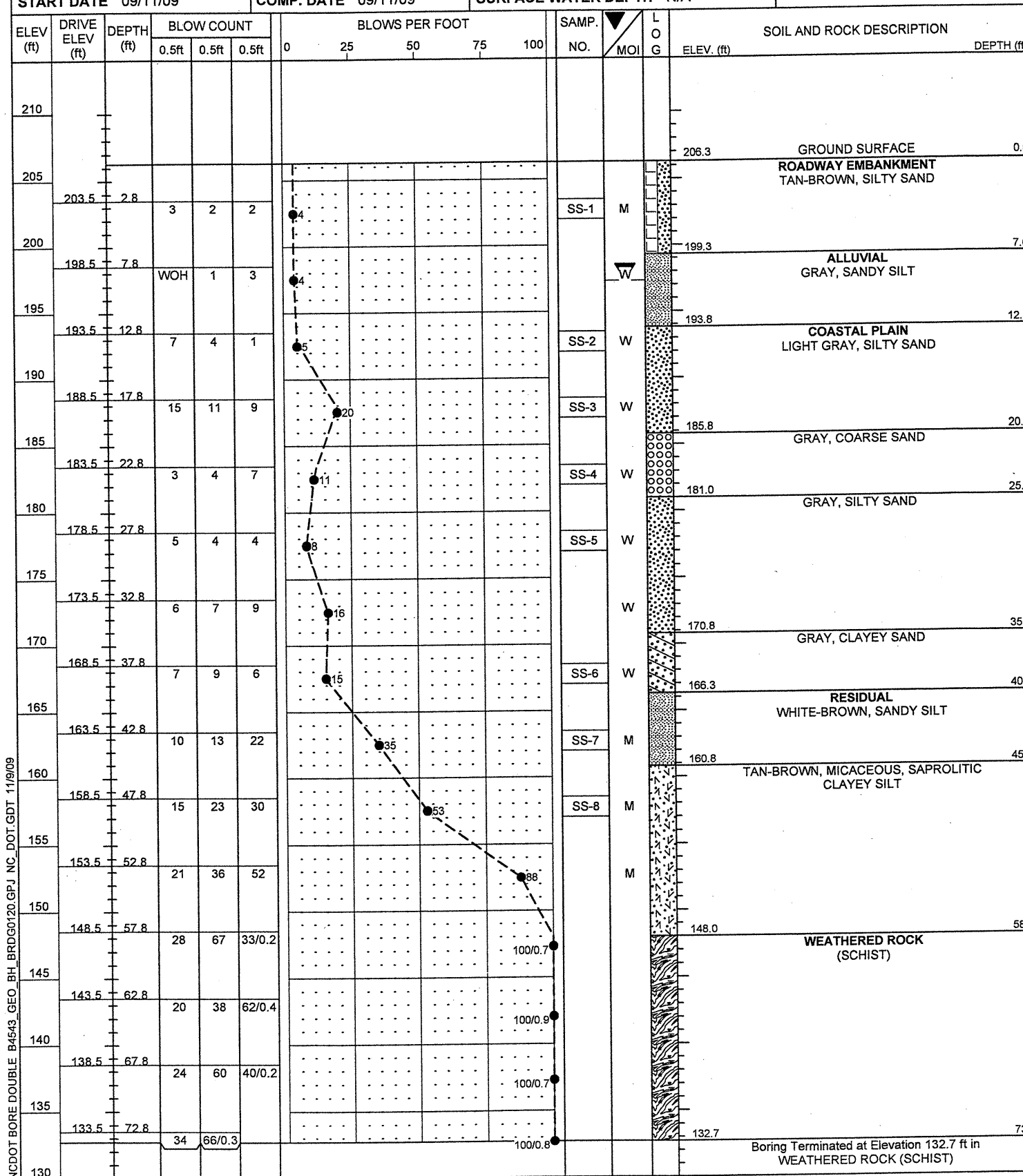
SILTY SAND WITH WOOD FRAGMENTS

210
200
190
180
170
160
150
140
130
120
110
100
90
80

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+18	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 206.3 ft	TOTAL DEPTH 73.6 ft	NORTHING 609,643	EASTING 2,106,576
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/11/09	COMP. DATE 09/11/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. EB1-B	STATION 14+18	OFFSET 14ft RT	ALIGNMENT -L-
COLLAR ELEV. 205.8 ft	TOTAL DEPTH 64.4 ft	NORTHING 609,616	EASTING 2,106,565
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/18/09	COMP. DATE 09/18/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



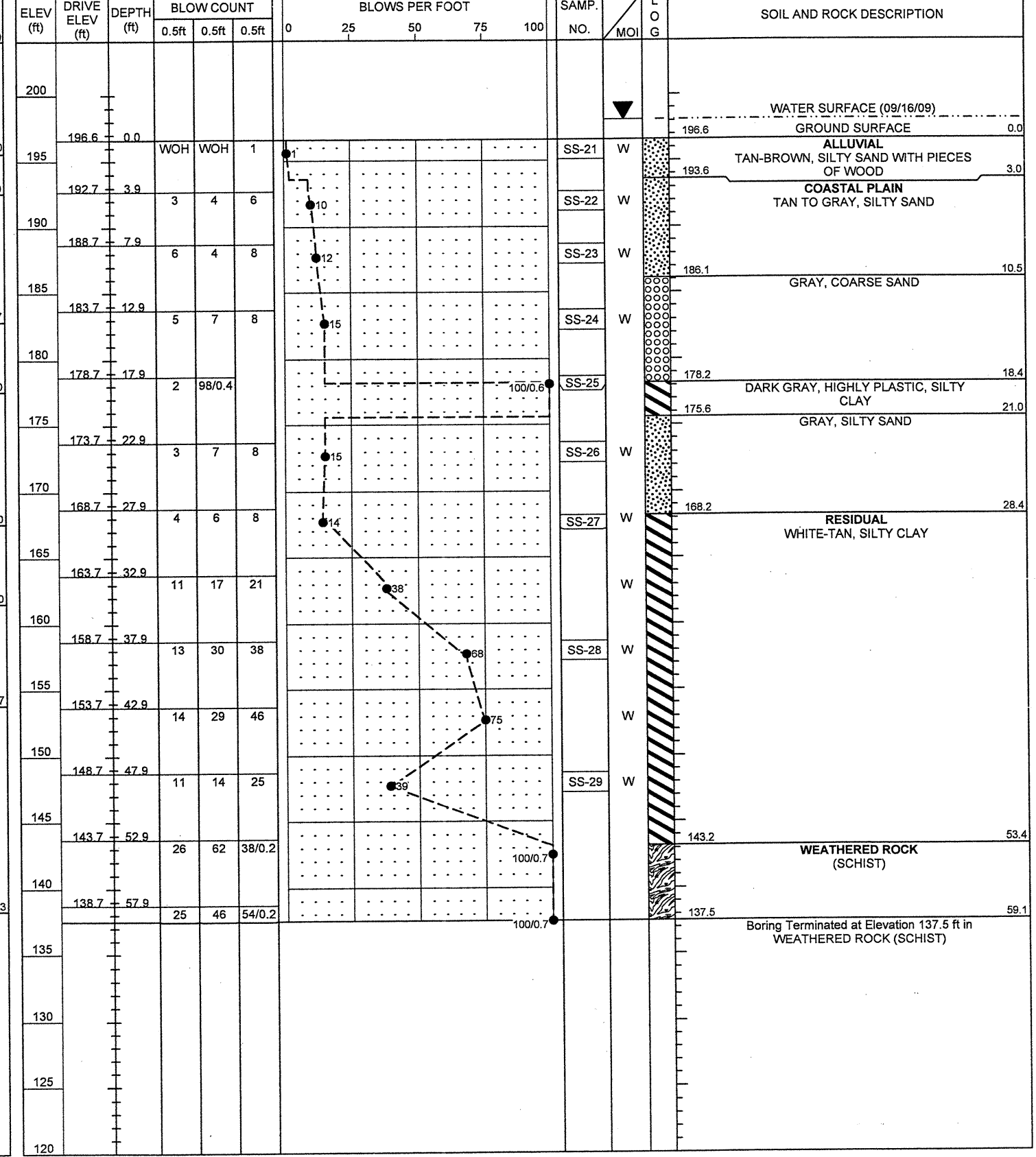
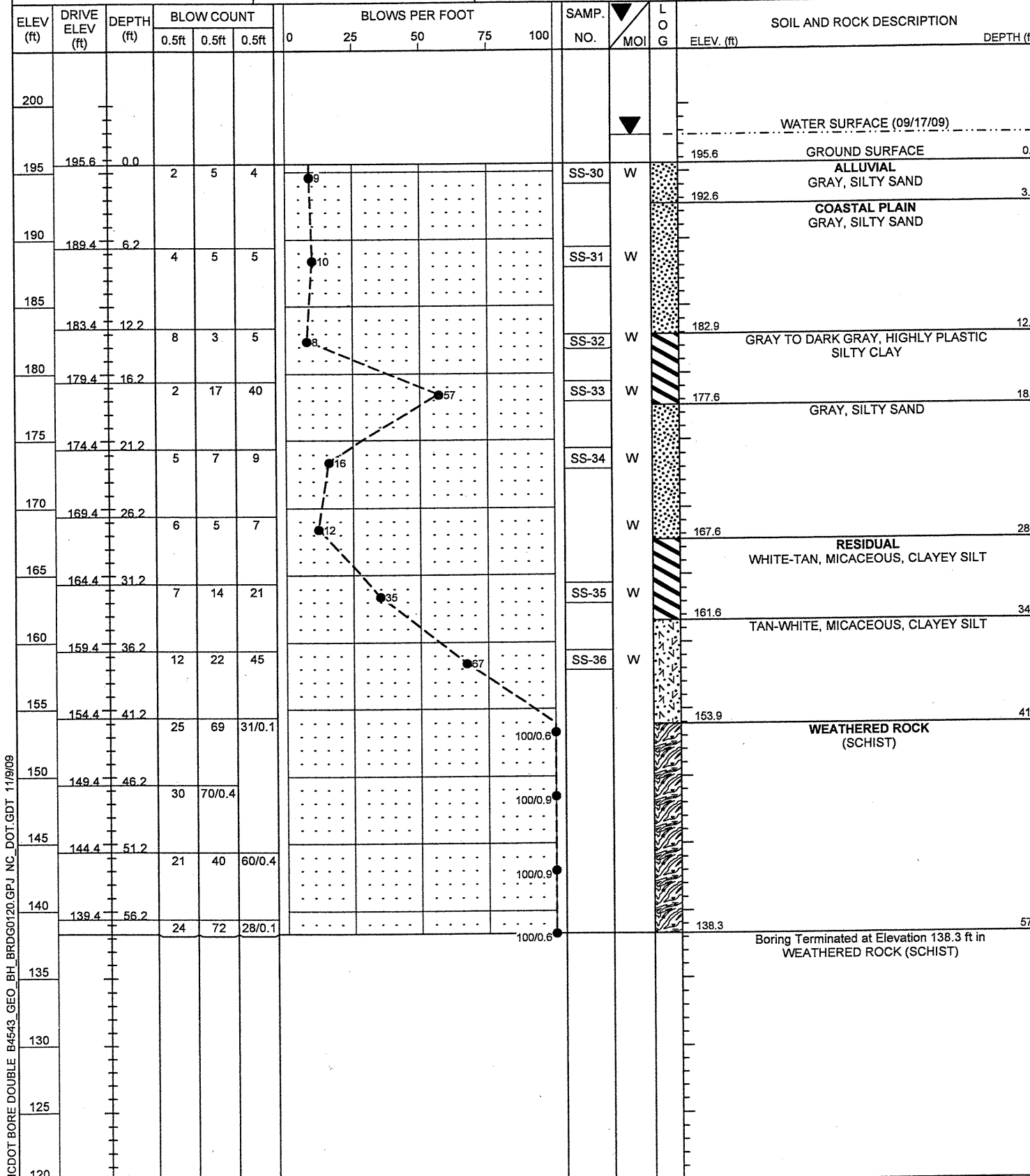
NCDOT BORE DOUBLE B4543_GEO_BH_BRDGG120.GPJ NC_DOT.GDT 11/9/09

Other Samples:
ST-1 (9.1 - 11.1)

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+83	OFFSET 9ft LT	ALIGNMENT -L-
COLLAR ELEV. 195.6 ft	TOTAL DEPTH 57.3 ft	NORTHING 609,611	EASTING 2,106,633
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/17/09	COMP. DATE 09/17/09	SURFACE WATER DEPTH 2.1ft	DEPTH TO ROCK N/A

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. B1-B	STATION 14+83	OFFSET 6ft RT	ALIGNMENT -L-
COLLAR ELEV. 196.6 ft	TOTAL DEPTH 59.1 ft	NORTHING 609,598	EASTING 2,106,627
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/16/09	COMP. DATE 09/16/09	SURFACE WATER DEPTH 1.5ft	DEPTH TO ROCK N/A



NC DOT BORE DOUBLE B4543 GEO_BH_BRD50120.GPJ NC_DOT.GDT 11/9/09

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+23	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 205.7 ft	TOTAL DEPTH 74.2 ft	NORTHING 609,601	EASTING 2,106,627
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/14/09	COMP. DATE 09/14/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33758.1.1	ID. B-4543	COUNTY HARNETT	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 120 ON -L- (SR 1558, EBENEZER CHURCH ROAD) OVER BLACK RIVER			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+23	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 205.7 ft	TOTAL DEPTH 74.2 ft	NORTHING 609,601	EASTING 2,106,627
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/14/09	COMP. DATE 09/14/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
215															
205	202.9	2.8	1	1	2						SS-9	W		ROADWAY EMBANKMENT TAN-BROWN, SILTY SAND	0.0
195	197.9	7.8	WOH	WOH	WOH						SS-10	W		ALLUVIAL GRAY-BLACK, SANDY CLAY	7.0
190	192.9	12.8	5	6	8						SS-11	W		COASTAL PLAIN LIGHT GRAY TO GRAY, SILTY SAND	12.5
185	187.9	17.8	4	4	6						SS-12	W			
180	182.9	22.8	7	4	4						SS-13	W		GRAY TO DARK GRAY, HIGHLY PLASTIC, SILTY CLAY	23.3
175	177.9	27.8	3	5	7						SS-14	W			
170	172.9	32.8	20	30	32						SS-15	W		GRAY, SILTY SAND	31.5
165	167.9	37.8	5	8	13						SS-16	W		RESIDUAL WHITE-BROWN TO TAN-BROWN, SILTY CLAY	36.5
160	162.9	42.8	21	29	35						SS-17	W			
155	157.9	47.8	17	27	45						SS-18	W			
150	152.9	52.8	16	35	56						SS-19	W			
145	147.9	57.8	64	36/0.2										WEATHERED ROCK (SCHIST)	58.3
140	142.9	62.8	22	35	41						SS-20	W		RESIDUAL TAN-BROWN, SAPROLITIC, SILTY CLAY	60.0
135	137.9	67.8	18	34	66/0.4									WEATHERED ROCK (SCHIST)	68.3

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
135															
130	132.9	72.8	24	40	60/0.4									WEATHERED ROCK (SCHIST) (continued)	74.2
125														Boring Terminated at Elevation 131.5 ft in WEATHERED ROCK (SCHIST)	

NC DOT BORE DOUBLE B4543 GEO. BH. BRDGN20.GPJ NC_DOT.GDT 11/9/09

EB1-A

SOIL TEST RESULTS															
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+18	2.8-4.3	A-2-4(0)	16	NP	42.8	38.1	12.1	7.1	79	59	19	-	-
SS-2	16'LT	14+18	12.8-14.3	A-2-4(0)	22	NP	12.4	74.8	7.8	5.1	99	97	20	-	-
SS-3	16'LT	14+18	17.8-19.3	A-2-4(0)	29	9	74.9	11.9	2.1	11.0	99	48	14	-	-
SS-4	16'LT	14+18	22.8-24.3	A-1-b(0)	24	3	79.9	11.0	2.0	7.0	98	40	10	-	-
SS-5	16'LT	14+18	27.8-29.3	A-2-4(0)	24	2	57.8	25.2	1.9	15.1	98	81	17	-	-
SS-6	16'LT	14+18	37.8-39.3	A-2-6(0)	24	12	58.0	17.3	6.6	18.1	95	56	26	-	-
SS-7	16'LT	14+18	42.8-44.3	A-4(5)	39	10	7.0	35.7	35.1	22.1	97	92	63	-	-
SS-8	16'LT	14+18	47.8-49.3	A-5(5)	50	8	6.0	52.0	29.9	12.0	93	90	57	-	-

EB1-B

SOIL TEST RESULTS															
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-43	13.5'RT	14+18	9.1-11.1	A-4(0)	18	1	2.8	57.4	21.5	18.3	100	99	53	-	-
ST-1	13.5'RT	14+18	9.1-11.1	A-4(0)	17	4	3.8	49.2	18.7	28.3	97	96	57	26.1	-
SS-37	13.5'RT	14+18	12.6-14.1	A-2-4(0)	19	NP	21.0	56.0	12.9	10.2	100	95	33	-	-
SS-38	13.5'RT	14+18	17.6-19.1	A-2-7(0)	44	26	81.2	6.8	0.9	11.1	99	34	13	-	-
SS-39	13.5'RT	14+18	23.2-24.7	A-7-6(49)	64	47	2.4	7.9	36.7	52.9	100	98	95	-	-
SS-40	13.5'RT	14+18	28.2-29.7	A-2-4(0)	26	4	70.5	16.0	0.4	13.1	97	62	14	-	-
SS-41	13.5'RT	14+18	38.2-39.7	A-2-7(0)	46	32	88.9	4.3	0.7	6.1	98	19	8	-	-
SS-42	13.5'RT	14+18	43.2-44.7	A-5(6)	48	10	11.2	42.7	29.8	16.3	100	92	61	-	-

B1-A

SOIL TEST RESULTS															
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-30	9'LT	14+83	0.0-1.5	A-2-4(0)	19	NP	10.5	68.5	12.9	8.1	100	97	32	-	-
SS-31	9'LT	14+83	6.2-7.7	A-2-4(0)	25	5	23.2	54.5	5.0	17.3	100	96	25	-	-
SS-32	9'LT	14+83	12.7-13.7	A-7-6(44)	59	43	1.6	7.9	39.6	50.9	100	99	95	-	-
SS-33	9'LT	14+83	16.2-17.7	A-7-6(21)	45	34	20.5	14.6	24.1	40.7	100	91	69	-	-
SS-34	9'LT	14+83	21.2-22.7	A-2-4(0)	26	7	68.5	18.1	0.3	13.1	98	59	14	-	-
SS-35	9'LT	14+83	31.2-32.7	A-7-5(12)	58	18	10.2	32.8	34.7	22.4	90	83	63	-	-
SS-36	9'LT	14+83	36.2-37.7	A-5(7)	51	9	5.1	47.2	33.5	14.2	98	96	65	-	-

B1-B

SOIL TEST RESULTS															
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-21	5.5'RT	14+83	0.0-1.5	A-2-4(0)	25	NP	19.7	61.2	11.0	8.0	100	98	25	-	-
SS-22	5.5'RT	14+83	3.9-5.4	A-2-4(0)	20	NP	12.7	63.9	17.5	6.0	96	92	32	-	-
SS-23	5.5'RT	14+83	7.9-9.4	A-2-4(0)	27	6	33.2	43.1	6.4	17.3	100	88	27	-	-
SS-24	5.5'RT	14+83	12.9-14.4	A-1-b(0)	26	NP	79.3	14.3	0.3	6.1	98	47	9	-	-
SS-25	5.5'RT	14+83	17.9-19.4	A-7-6(26)	49	37	16.5	11.8	27.0	44.8	100	91	75	-	-
SS-26	5.5'RT	14+83	22.9-24.4	A-2-4(0)	21	2	63.8	23.3	0.7	12.2	99	66	14	-	-
SS-27	5.5'RT	14+83	28.4-29.4	A-7-5(9)	48	14	6.9	38.5	28.2	26.4	99	94	66	-	-
SS-28	5.5'RT	14+83	37.9-39.4	A-7-5(10)	52	15	4.5	47.8	31.4	16.3	96	93	65	-	-
SS-29	5.5'RT	14+83	47.9-59.4	A-7-5(16)	53	17	4.9	29.5	41.2	24.4	99	96	78	-	-

EB2-A

SOIL TEST RESULTS															
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	15'LT	15+23	2.8-4.3	A-2-4(0)	22	NP	55.3	29.2	9.4	6.0	83	56	15	-	-
SS-10	15'LT	15+23	7.8-9.3	A-6(4)	29	11	11.0	40.0	20.9	28.1	98	96	58	-	-
SS-11	15'LT	15+23	12.8-14.3	A-2-4(0)	19	NP	35.3	50.6	9.0	5.0	97	87	20	-	-
SS-12	15'LT	15+23	17.8-19.3	A-2-4(0)	27	NP	54.0	30.3	3.6	12.0	100	76	17	-	-
SS-13	15'LT	15+23	23.3-24.3	A-7-6(43)	59	42	2.0	10.4	43.4	44.2	100	99	94	-	-
SS-14	15'LT	15+23	27.8-29.3	A-7-6(44)	61	45	2.2	12.7	39.0	46.2	100	98	92	-	-
SS-15	15'LT	15+23	32.8-34.3	A-2-4(0)	21	NP	71.3	15.4	4.3	9.0	98	64	15	-	-
SS-16	15'LT	15+23	37.8-39.3	A-7-5(15)	63	22	11.6	28.1	28.1	32.1	89	81	63	-	-
SS-17	15'LT	15+23	42.8-44.3	A-7-5(11)	58	15	5.8	44.2	35.9	14.1	100	98	65	-	-
SS-18	15'LT	15+23	47.8-49.3	A-7-5(11)	47	13	2.8	37.3	39.8	20.1	100	99	73	-	-
SS-19	15'LT	15+23	52.8-54.3	A-7-5(11)	49	12	4.4	33.3	44.2	18.1	98	95	74	-	-
SS-20	15'LT	15+23	62.8-64.3	A-7-5(12)	54	16	6.0	36.9	39.0	18.1	95	92	68	-	-



**FIELD
 SCOUR REPORT**

WBS: 33758.1.1 TIP: B-4543 COUNTY: Harnett

DESCRIPTION(1): Bridge No.120 on -L- (SR 1558, Ebenezer Church Rd.) over Black River

EXISTING BRIDGE

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

Bridge No.: 120 Length: 68.8' Total Bents: 5 Bents in Channel: 3 Bents in Floodplain: 2
 Foundation Type: Timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Abutment scour at both end bent abutment walls.

Interior Bents: None observed

Channel Bed: None observed

Channel Bank: None observed

EXISTING SCOUR PROTECTION

Type(3): Timber abutment and wing walls.

Extent(4): At both end bents. Five to six feet in height.

Effectiveness(5): Appears effective. Unable to determine if scoured at base of abutment walls.

Obstructions(6): None observed

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): Alluvial, gray and tan-brown, very loose to loose, silty sand (SS-21)

Channel Bank Material(8): Alluvial, gray, soft, sandy silt (SS-43 and ST-1)
Alluvial, gray-black, very soft, sandy clay (SS-10)

Channel Bank Cover(9): Grass, brush and small to large trees

Floodplain Width(10): 1700 +/- feet

Floodplain Cover(11): Grass, brush and small to large trees

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): Southeast

Observations and Other Comments: Numerous repairs to existing bridge. Some piles encased in concrete. Additional steel piles and cross-bracing have been added.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

**BENT
 B1**

190.5																			

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Geotechnical Engineering Unit agrees with the Hydraulics Unit's theoretical scour at elevation 190.5 feet.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank																				
Sample No.																				
Retained #4																				
Passed #10																				
Passed #40																				
Passed #200																				
Coarse Sand																				
Fine Sand																				
Silt																				
Clay																				
LL																				
PI																				
AASHTO																				
Station																				
Offset																				
Depth																				

Reported by: Joseph J. Wilkins Jr. Date: 9/17/2009

SITE PHOTOGRAPH

Bridge No. 120 on -L- (SR 1558, Ebenezer Church Rd.) over Black River



Looking East towards End Bent 2