

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33233.1.1(B-3693) F.A. PROJ. BRZ-1527(2)
COUNTY ROBESON
PROJECT DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER
RAFT SWAMP

INVENTORY

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-9	BORE LOG(S)
10	SOIL TEST RESULTS
11	SCOUR REPORT
12	SITE PHOTOGRAPH(S)

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
J.I. MILKOVITS, JR.

H.R. CONLEY

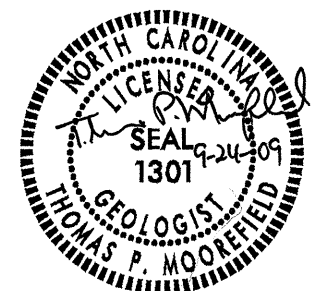
J.R. TURNAGE

INVESTIGATED BY J.I. MILKOVITS, JR.

CHECKED BY T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

DATE SEPTEMBER 2009



PROJECT: 33233.1.1 ID: B-3693

DRAWN BY: T.T. WALKER

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.

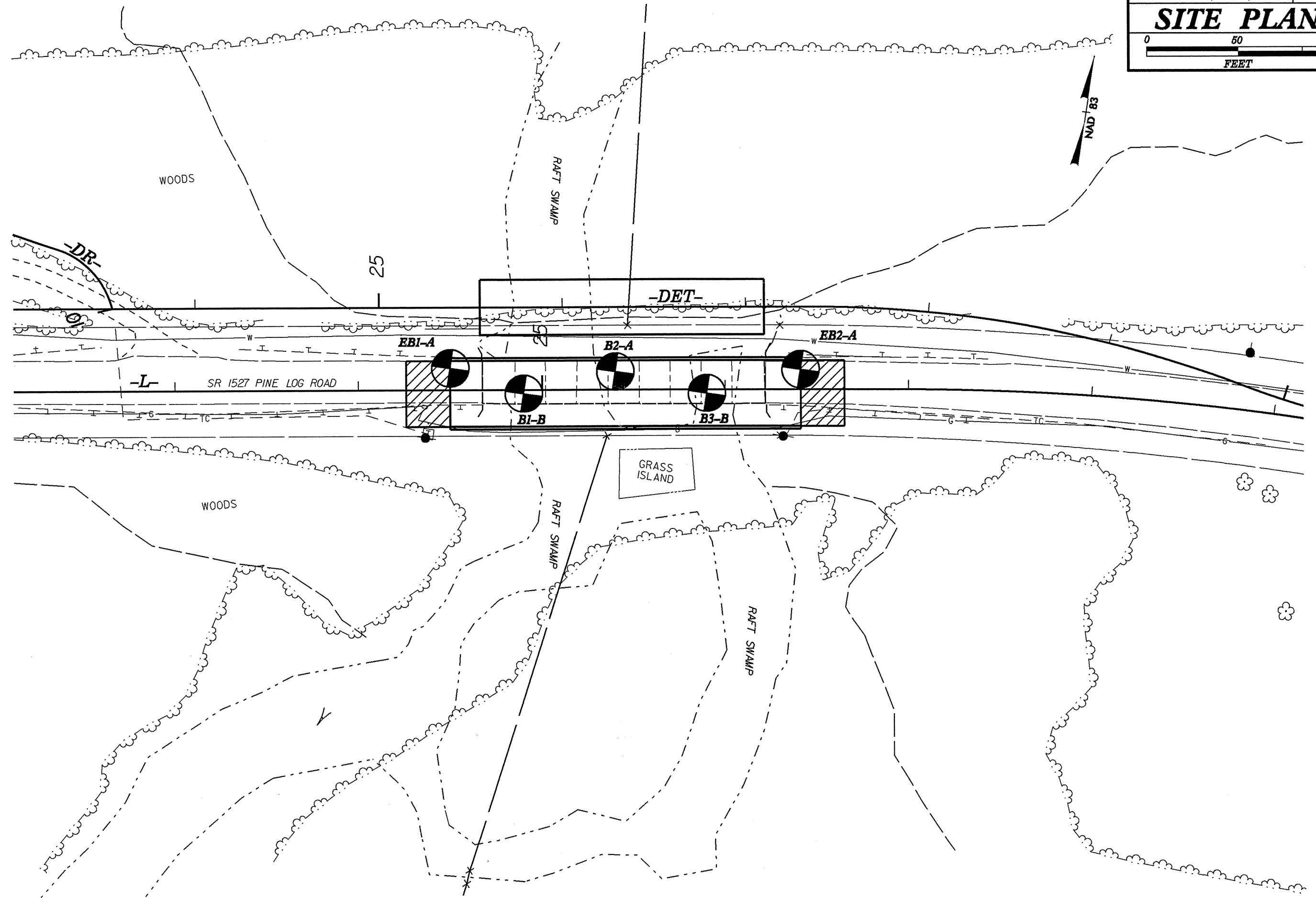
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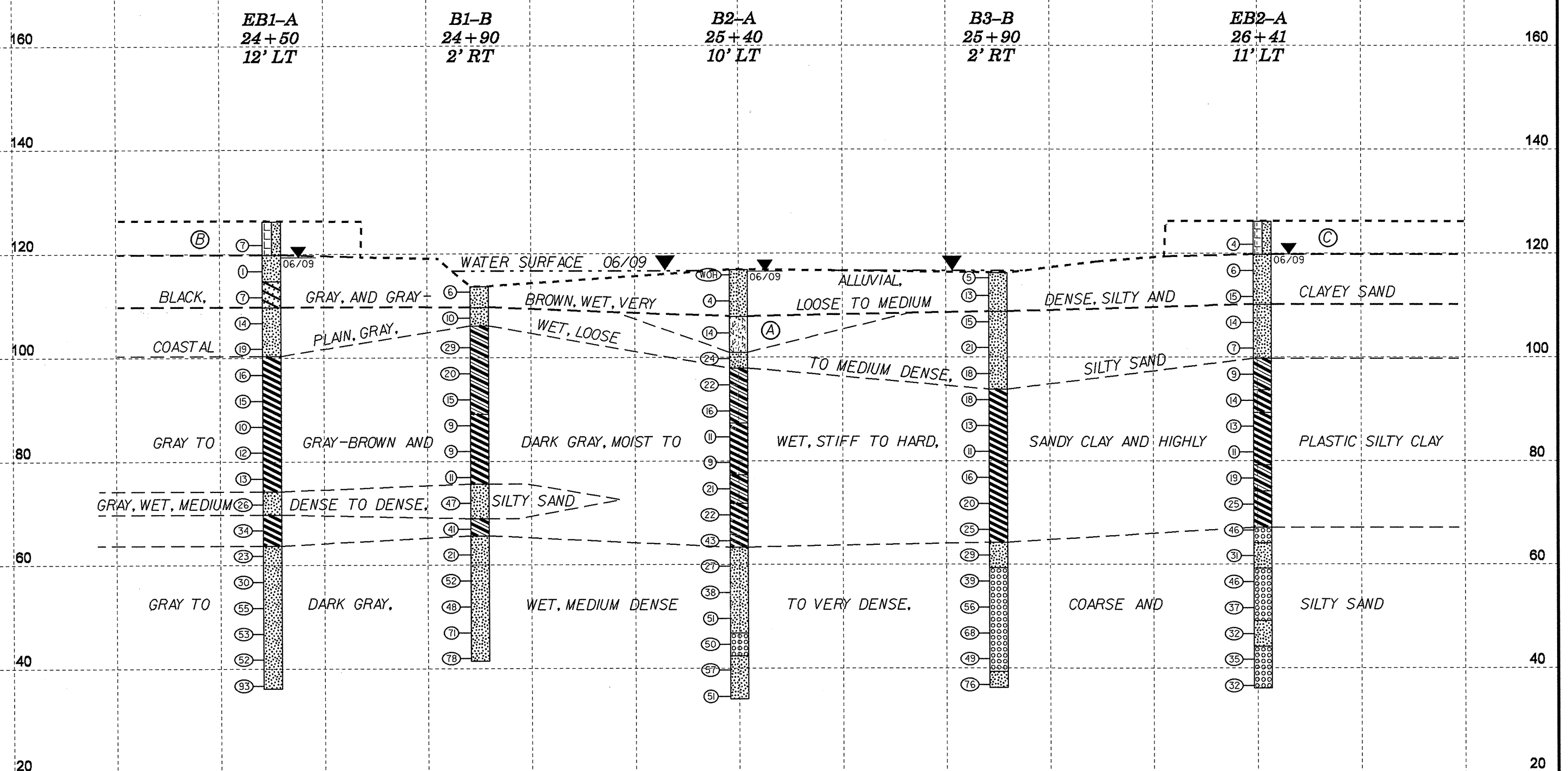
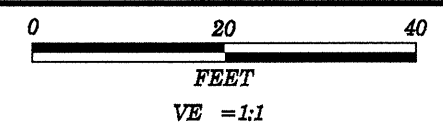
PROJECT REFERENCE NO. 33233.1.(B-3693)	SHEET NO. 2
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SUBSURFACE INVESTIGATION

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 SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, BRN. SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH 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 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 ENLACED 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	MINERALOGICAL COMPOSITION	WEATHERING	
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 > 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.	
PERCENTAGE OF MATERIAL	GROUND WATER	ROCK HARDNESS	
ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC >10%	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	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 GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 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 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.	
CONSISTENCY OR DENSITY	MISCELLANEOUS SYMBOLS	ABBREVIATIONS	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	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	AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST F - FINE FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS - FRAGMENTS HL - HIGHLY MED - MEDIUM MICA - MICACEOUS 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 W - UNIT WEIGHT W - DRY UNIT WEIGHT	
TEXTURE OR GRAIN SIZE		EQUIPMENT USED ON SUBJECT PROJECT	
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		DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST	
SOIL MOISTURE - CORRELATION OF TERMS		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	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		HAMMER TYPE: AUTOMATIC MANUAL	
LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM OPTIMUM MOISTURE SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		CORE SIZE: -B -N -H	
PLASTICITY		HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	
NONPLASTIC 0-5 DRY STRENGTH 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.			
		FRACURE SPACING	BEDDING
		TERM SPACING VERY WIDE MORE THAN 18 FEET WIDE 3 TO 18 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
		INDURATION	
		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
		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.	
			BENCH MARK: BL-3 AT -L- STA. 24+34.90, 21.46' LT ELEVATION: 125.89 FT.
			NOTES:





- (A) COASTAL PLAIN, GRAY-BROWN, WET, STIFF, CLAYEY SILT
- (B) ROADWAY EMBANKMENT, TAN-BROWN, MOIST, LOOSE, SILTY SAND
- (C) ROADWAY EMBANKMENT, TAN-BLACK, MOIST, LOOSE, SILTY SAND

NOTE: GROUNDLINE PROFILE TAKEN FROM
HYDRAULIC REPORT DATED 12/09/2009 AND
GEU SURVEY NOTES DATED 6/24/2009

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BORING NO. EB1-A	STATION 24+50	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.3 ft	TOTAL DEPTH 90.0 ft	NORTHING 331,808	EASTING 1,980,057
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/16/09	COMP. DATE 06/17/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
130																
															126.3	GROUND SURFACE
																ROADWAY EMBANKMENT TAN-BROWN, SILTY SAND
125	122.8	3.5	4	4	3											
120	117.8	8.5	WOH	WOH	1											
115	112.8	13.5	3	3	4											
110	107.8	18.5	4	6	8											
105	102.8	23.5	6	7	12											
100	97.8	28.5	4	5	11											
95	92.8	33.5	4	6	9											
90	87.8	38.5	3	4	6											
85	82.8	43.5	4	4	8											
80	77.8	48.5	4	5	8											
75	72.8	53.5	6	11	15											
70	67.8	58.5	7	14	20											
65	62.8	63.5	10	11	12											
60	57.8	68.5	12	17	13											
55	52.8	73.5	18	26	29											
50																

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COLLAR ELEV. 126.3 ft	TOTAL DEPTH 90.0 ft	NORTHING 331,808	EASTING 1,980,057
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/16/09	COMP. DATE 06/17/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
50																
	47.8	78.5	24	27	26											
45	42.8	83.5	23	24	28											
40	37.8	88.5	36	44	49											
35																
30																
25																
20																
15																
10																
5																
0																
-5																
-10																
-15																
-20																
-25																
-30																

NC DOT BORE DOUBLE B3693_GEO_BH_BRD0211.GPJ NC DOT_GDT_9/23/09

Match Line

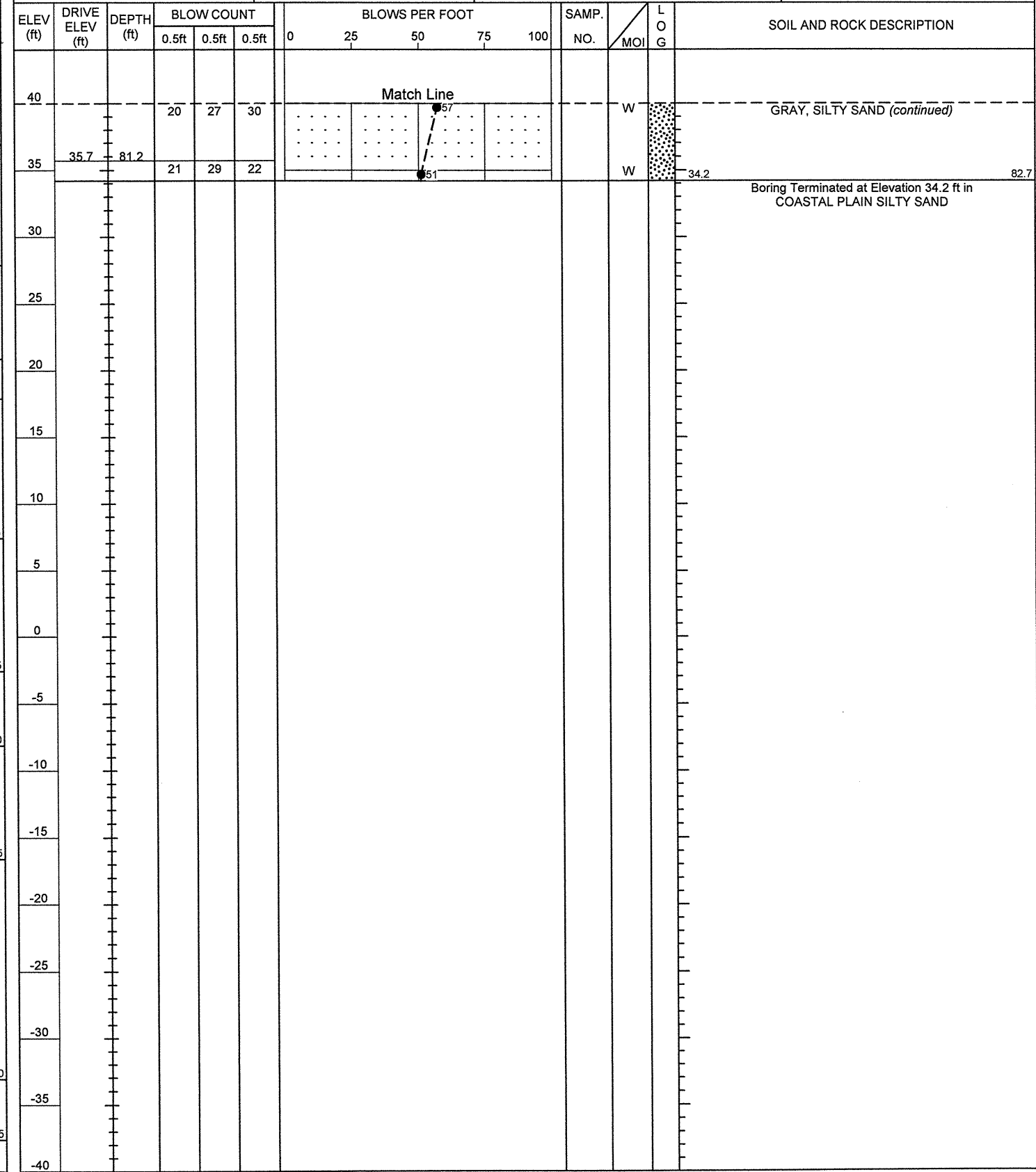
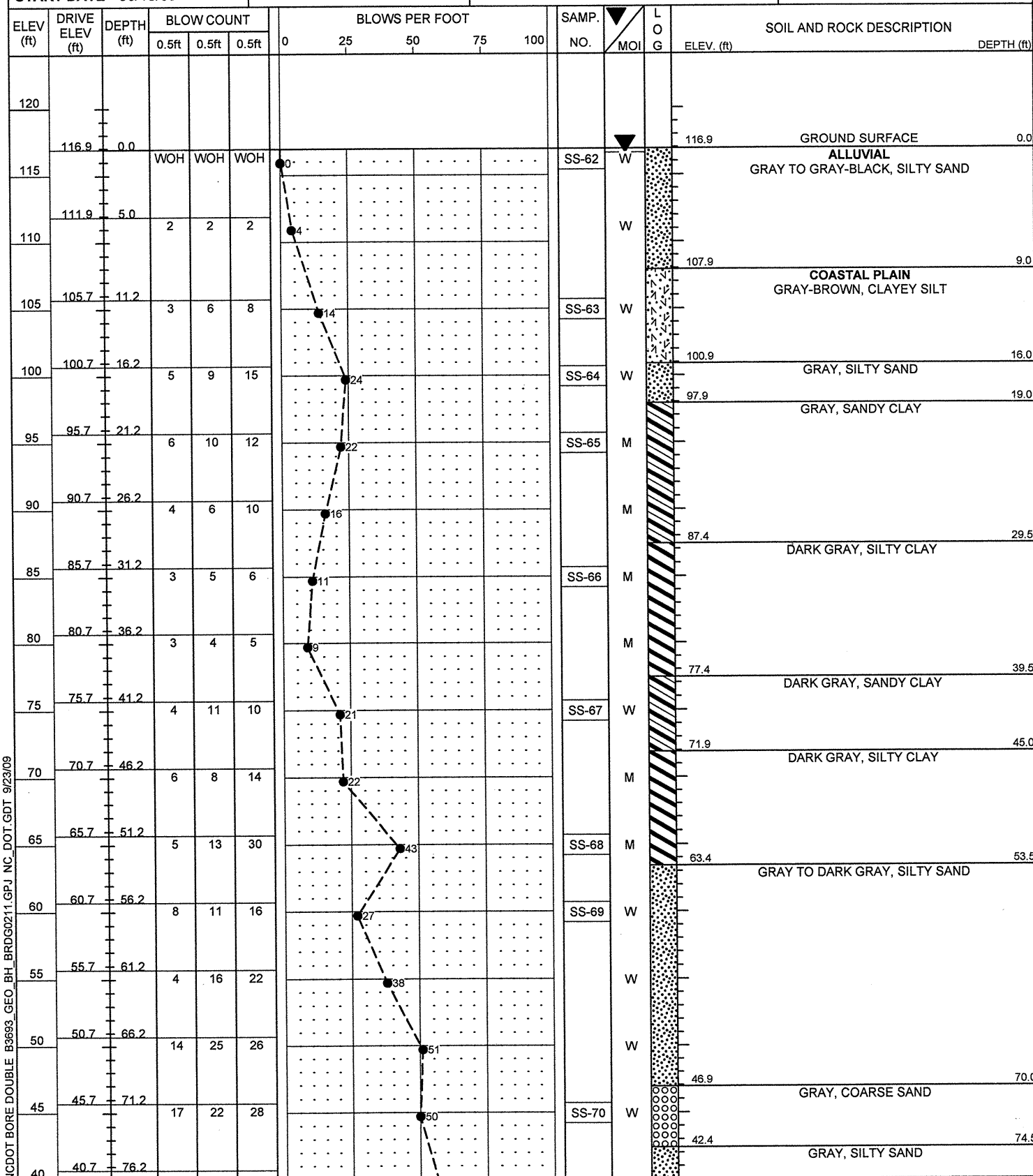
GRAY TO DARK GRAY, SILTY SAND
(continued)

Boring Terminated at Elevation 36.3 ft in
COASTAL PLAIN SILTY SAND

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BOHRING NO. B2-A	STATION 25+40	OFFSET 10ft LT	ALIGNMENT -L-
COLLAR ELEV. 116.9 ft	TOTAL DEPTH 82.7 ft	NORTHING 331,820	EASTING 1,980,146
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/18/09	COMP. DATE 06/18/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BOHRING NO. B2-A	STATION 25+40	OFFSET 10ft LT	ALIGNMENT -L-
COLLAR ELEV. 116.9 ft	TOTAL DEPTH 82.7 ft	NORTHING 331,820	EASTING 1,980,146
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/18/09	COMP. DATE 06/18/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

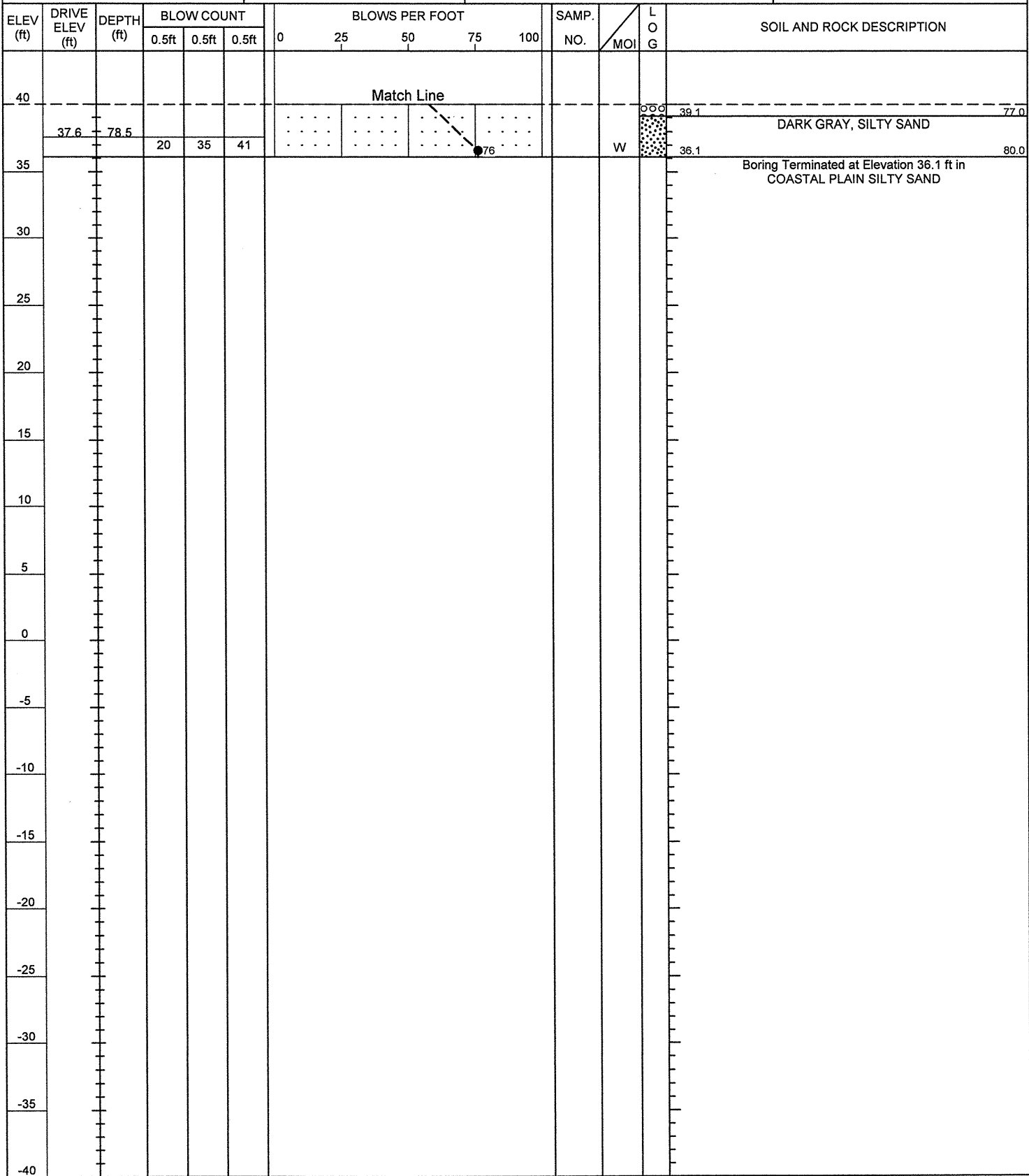
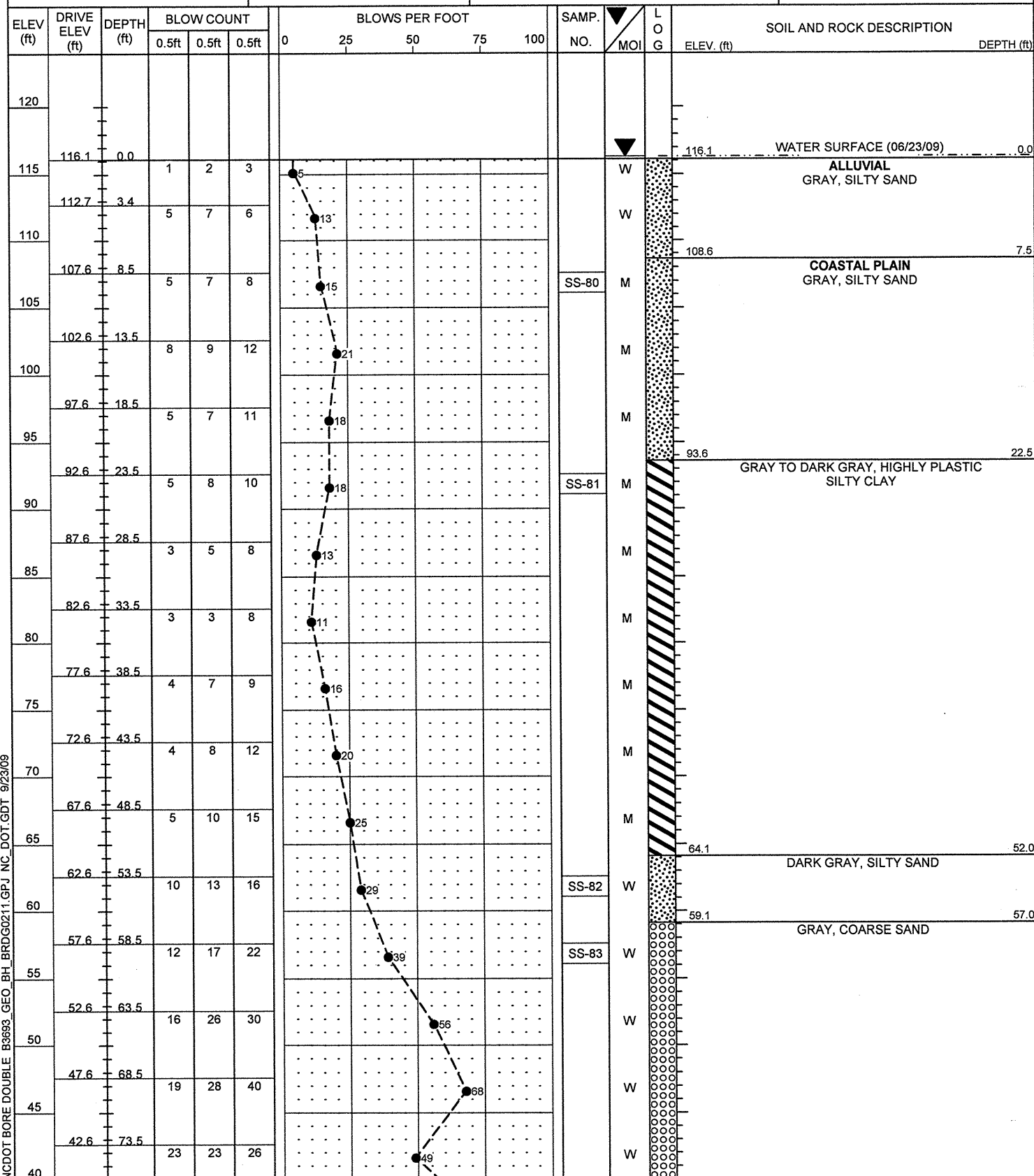


NCDOT BORE DOUBLE B3693_GEO_BH_BRD0211.GPJ NC_DOT_GDT_9/23/09

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BORING NO. B3-B	STATION 25+90	OFFSET 2ft RT	ALIGNMENT -L-
COLLAR ELEV. 116.1 ft	TOTAL DEPTH 80.0 ft	NORTHING 331,815	EASTING 1,980,198
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/23/09	COMP. DATE 06/23/09	SURFACE WATER DEPTH 0.2ft	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BORING NO. B3-B	STATION 25+90	OFFSET 2ft RT	ALIGNMENT -L-
COLLAR ELEV. 116.1 ft	TOTAL DEPTH 80.0 ft	NORTHING 331,815	EASTING 1,980,198
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/23/09	COMP. DATE 06/23/09	SURFACE WATER DEPTH 0.2ft	DEPTH TO ROCK N/A

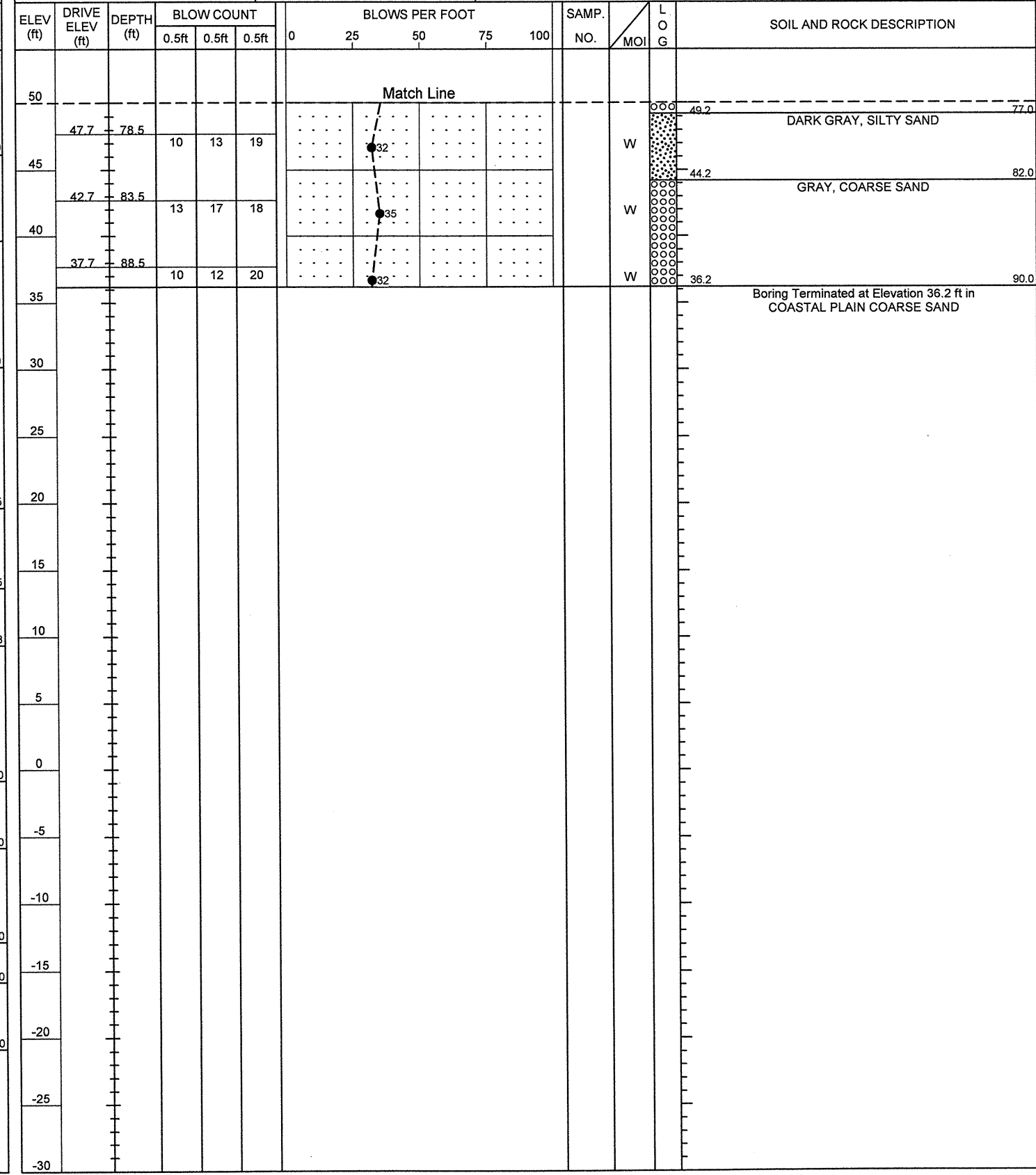
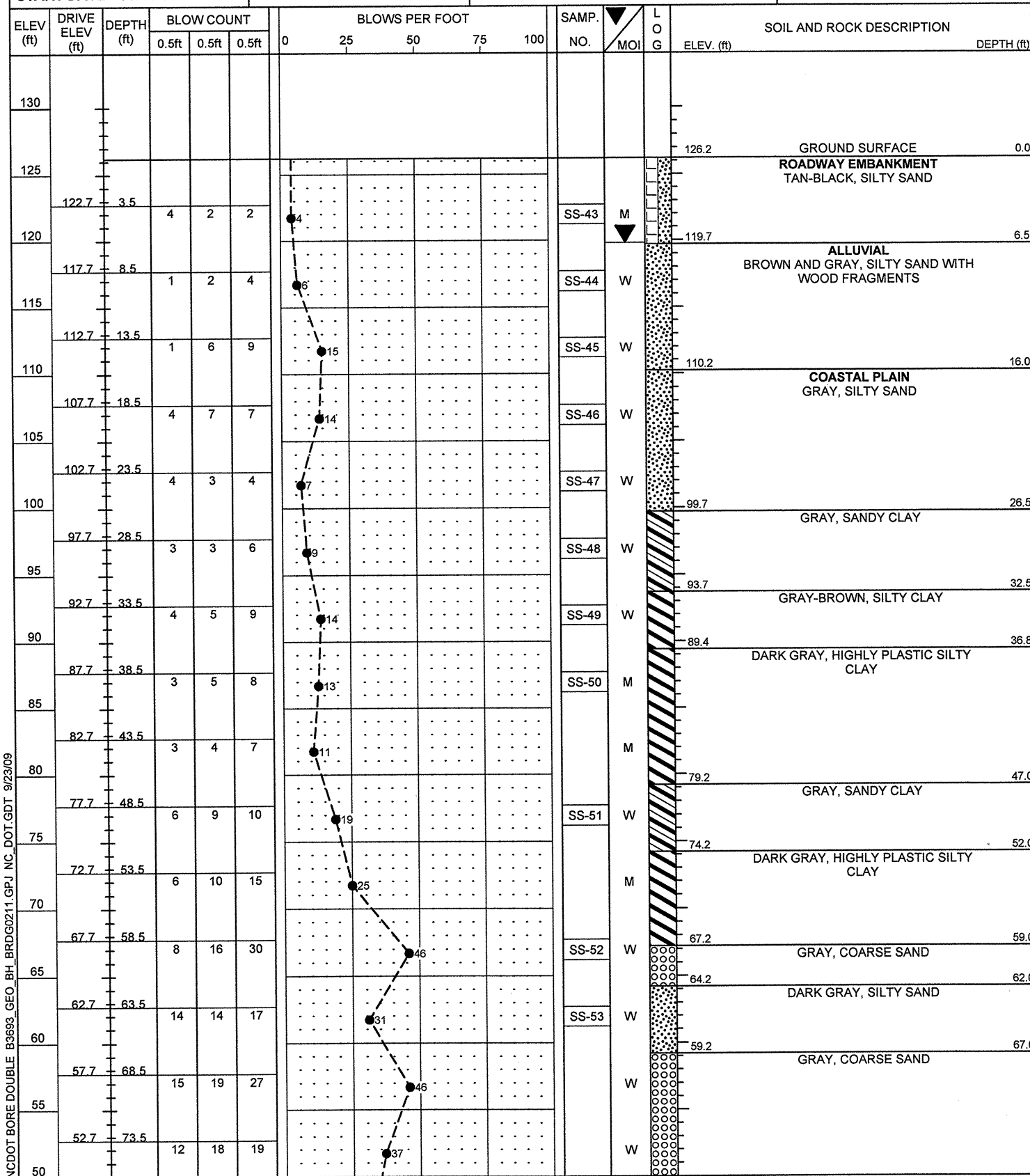


NC DOT BORE DOUBLE B3693_GEO_BH_BRD0211.GPJ NC DOT.GDT 9/23/09

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 26+41	OFFSET 11ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.2 ft	TOTAL DEPTH 90.0 ft	NORTHING 331,836	EASTING 1,980,246
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/11/09	COMP. DATE 06/11/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER RAFT SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 26+41	OFFSET 11ft LT	ALIGNMENT -L-
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DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/11/09	COMP. DATE 06/11/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NC DOT BORE DOUBLE B3693_GEO_BH_BRD0211.GPJ_NC_DOT_GDT_9/23/09

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-54	12'LT	24+50	3.5-5.0	A-2-4(0)	16	NP	60.5	28.6	3.8	7.1	98	60	12	-	-	
SS-55	12'LT	24+50	8.5-10.0	A-2-4(0)	25	NP	25.2	52.9	9.6	12.3	100	86	26	-	-	
SS-56	12'LT	24+50	13.5-15.0	A-2-6(0)	36	13	59.5	12.9	13.4	14.1	94	47	29	-	-	
SS-57	12'LT	24+50	18.5-20.0	A-2-4(0)	32	6	25.2	49.4	17.3	8.1	98	86	33	-	-	
SS-58	12'LT	24+50	28.5-30.0	A-7-5(9)	46	14	16.8	27.4	35.6	20.2	100	91	64	-	-	
SS-59	12'LT	24+50	38.5-40.0	A-7-6(47)	68	41	0.6	4.6	34.2	60.5	100	100	97	-	-	
SS-60	12'LT	24+50	53.5-55.0	A-2-4(0)	25	NP	14.0	76.0	2.9	7.1	100	99	11	-	-	
SS-61	12'LT	24+50	63.5-65.0	A-2-4(0)	21	NP	70.2	18.6	2.1	9.1	100	58	12	-	-	

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-71	2'RT	24+90	0.0-1.5	A-2-4(0)	31	NP	47.2	28.7	16.0	8.1	97	67	26	-	-	
SS-72	2'RT	24+90	5.0-6.5	A-2-4(0)	30	4	33.8	34.8	17.3	14.1	99	82	35	-	-	
SS-73	2'RT	24+90	10.7-12.2	A-6(3)	35	12	25.0	38.5	26.3	10.1	100	84	47	-	-	
SS-74	2'RT	24+90	20.7-22.2	A-6(7)	37	13	7.1	44.6	34.2	14.1	100	97	66	-	-	
SS-75	2'RT	24+90	25.7-27.2	A-7-5(26)	58	26	1.4	21.8	38.4	38.3	100	100	85	-	-	
SS-76	2'RT	24+90	40.7-42.2	A-2-4(0)	23	NP	7.9	79.7	3.3	9.1	100	99	14	-	-	
SS-77	2'RT	24+90	45.7-47.2	A-6(12)	39	22	24.2	11.9	13.4	50.5	100	84	67	-	-	
SS-78	2'RT	24+90	50.7-52.2	A-2-4(0)	19	2	63.1	21.6	1.2	14.1	99	63	16	-	-	
SS-79	2'RT	24+90	55.7-57.2	A-2-4(0)	17	NP	64.2	23.9	3.8	8.1	100	73	14	-	-	

B2-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-62	10'LT	25+40	0.0-1.5	A-2-4(0)	38	NP	22.8	51.9	17.3	8.1	100	87	30	-	-	
SS-63	10'LT	25+40	11.2-12.7	A-5(8)	46	10	4.6	45.0	40.3	10.1	100	98	69	-	-	
SS-64	10'LT	25+40	16.2-17.7	A-2-4(0)	33	NP	55.3	33.0	9.7	2.0	99	72	15	-	-	
SS-65	10'LT	25+40	21.2-22.7	A-6(8)	38	13	9.5	34.3	44.1	12.1	100	95	69	-	-	
SS-66	10'LT	25+40	31.2-32.7	A-7-6(24)	54	25	2.2	22.6	46.9	28.3	100	99	84	-	-	
SS-67	10'LT	25+40	41.2-42.7	A-6(4)	35	19	34.3	23.0	8.4	34.3	100	83	45	-	-	
SS-68	10'LT	25+40	51.2-52.7	A-7-6(14)	44	25	25.0	9.9	12.6	52.5	98	80	66	-	-	
SS-69	10'LT	25+40	56.2-57.7	A-2-4(0)	18	NP	51.1	32.8	3.0	13.1	100	78	17	-	-	
SS-70	10'LT	25+40	71.2-72.7	A-1-b(0)	19	NP	79.3	12.0	4.6	4.0	99	34	10	-	-	

B3-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-80	2'RT	25+90	8.5-10.0	A-2-4(0)	40	NP	69.7	20.9	4.3	5.0	96	52	12	-	-	
SS-81	2'RT	25+90	23.5-25.0	A-7-6(13)	41	19	8.3	27.4	36.0	28.3	100	96	73	-	-	
SS-82	2'RT	25+90	53.5-55.0	A-2-4(0)	20	NP	61.4	23.2	3.3	12.1	100	60	17	-	-	
SS-83	2'RT	25+90	58.5-60.0	A-1-b(0)	19	NP	76.3	14.4	2.2	7.1	99	50	11	-	-	

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-43	11'LT	26+41	3.5-5.0	A-2-4(0)	19	NP	22.7	63.2	8.9	5.1	100	90	19	-	-	
SS-44	11'LT	26+41	8.5-10.0	A-2-4(0)	32	NP	15.4	67.4	14.1	3.0	100	92	24	-	-	
SS-45	11'LT	26+41	13.5-15.0	A-2-4(0)	33	NP	47.7	28.9	16.2	7.1	98	70	27	-	-	
SS-46	11'LT	26+41	18.5-20.0	A-2-4(0)	33	NP	83.6	5.5	6.9	4.1	97	66	13	-	-	
SS-47	11'LT	26+41	23.5-25.0	A-2-4(0)	24	NP	55.6	32.3	5.0	7.1	93	62	12	-	-	
SS-48	11'LT	26+41	28.5-30.0	A-6(14)	38	20	1.6	33.5	46.6	18.3	100	99	78	-	-	
SS-49	11'LT	26+41	33.5-35.0	A-7-6(24)	47	25	1.6	17.1	48.8	32.5	100	99	89	-	-	
SS-50	11'LT	26+41	38.5-40.0	A-7-6(39)	61	36	1.2	9.5	50.7	38.6	100	99	94	-	-	
SS-51	11'LT	26+41	48.5-50.0	A-6(2)	28	14	23.4	36.2	7.9	32.5	100	91	44	-	-	
SS-52	11'LT	26+41	58.5-60.0	A-1-b(0)	18	NP	80.3	10.9	3.8	5.1	100	39	10	-	-	
SS-53	11'LT	26+41	63.5-65.0	A-2-4(0)	17	NP	56.4	30.7	3.8	9.1	100	76	15	-	-	



**FIELD
 SCOUR REPORT**

WBS: 33233.1.1 TIP: B-3693 COUNTY: Robeson

DESCRIPTION(1): Bridge No. 211 on -L- (SR 1527, Pine Log Road) over Raft Swamp

EXISTING BRIDGE

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

Bridge No.: 211 Length: 155.1 Total Bents: 10 Bents in Channel: 4 Bents in Floodplain: 6
 Foundation Type: Timber piles reinforced by steel H beams

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None observed

Channel Bed: None observed

Channel Bank: Some erosion of banks from high water

EXISTING SCOUR PROTECTION

Type(3): Abutment wall

Extent(4): At both end bents

Effectiveness(5): Effective

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 sand (SS-71)

Channel Bank Material(8): Alluvial sand (SS-71)

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

Floodplain Width(10): +/-1400 feet

Floodplain Cover(11): Wetland forest

Stream is(12): Aggrading Degrading _____ Static _____

Channel Migration Tendency(13): Toward the south

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

B1	B2	B3								
111.9	115.5	115.5								

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Geotechnical Engineering Unit agrees with the Hydraulics Unit's theoretical scour elevations at B1(111.9) and B2/B3(115.5).

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. Phillips

Date: 6/18/2009

SITE PHOTOGRAPH

Bridge No. 211 on -L- (SR 1527) Over Raft Swamp



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33233.1.1(B-3693)	1	

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33233.1.1(B-3693) F.A. PROJ. BRZ-1527(2)
COUNTY ROBESON
PROJECT DESCRIPTION BRIDGE NO 207 ON SR 1527 OVER
HOLLY SWAMP

INVENTORY

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-7	BORE LOG(S)
8	SOIL TEST RESULTS
9	SCOUR REPORT
10	SITE PHOTOGRAPH(S)

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

J.I. MILKOVITS, JR.

H.R. CONLEY

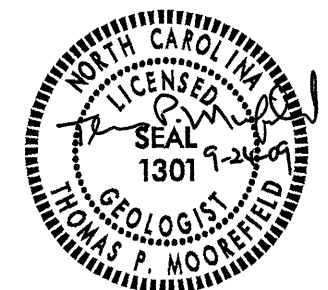
J.R. TURNAGE

INVESTIGATED BY J.I. MILKOVITS, JR.

CHECKED BY T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

DATE SEPTEMBER 2009



PROJECT: 33233.1.1 ID: B-3693

DRAWN BY: T.T. WALKER

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.

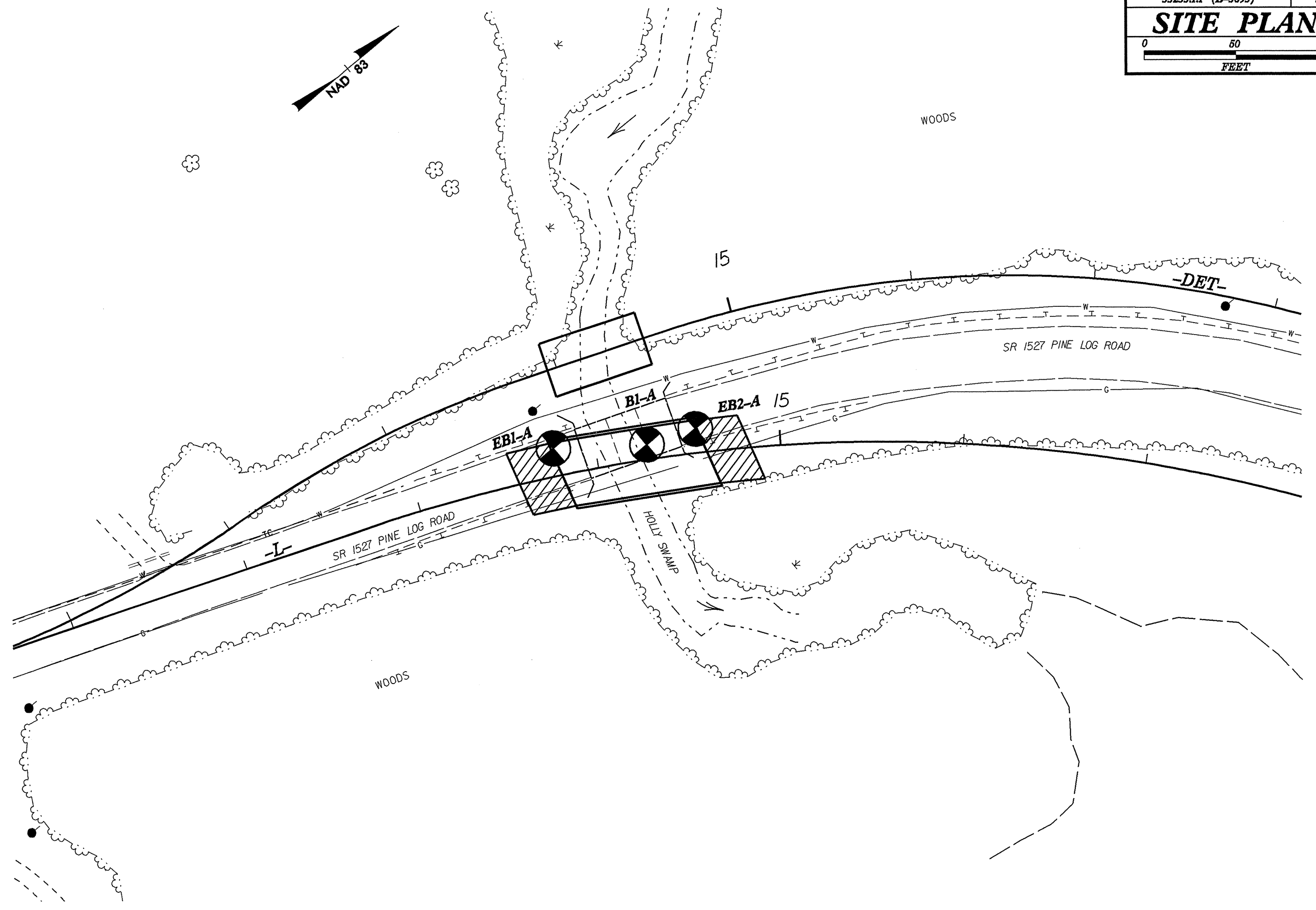
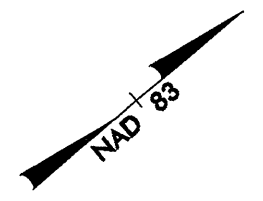
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

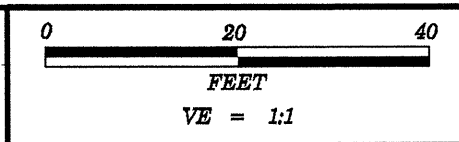
PROJECT REFERENCE NO.
33233.I.(B-3693) SHEET NO.
2

SUBSURFACE INVESTIGATION

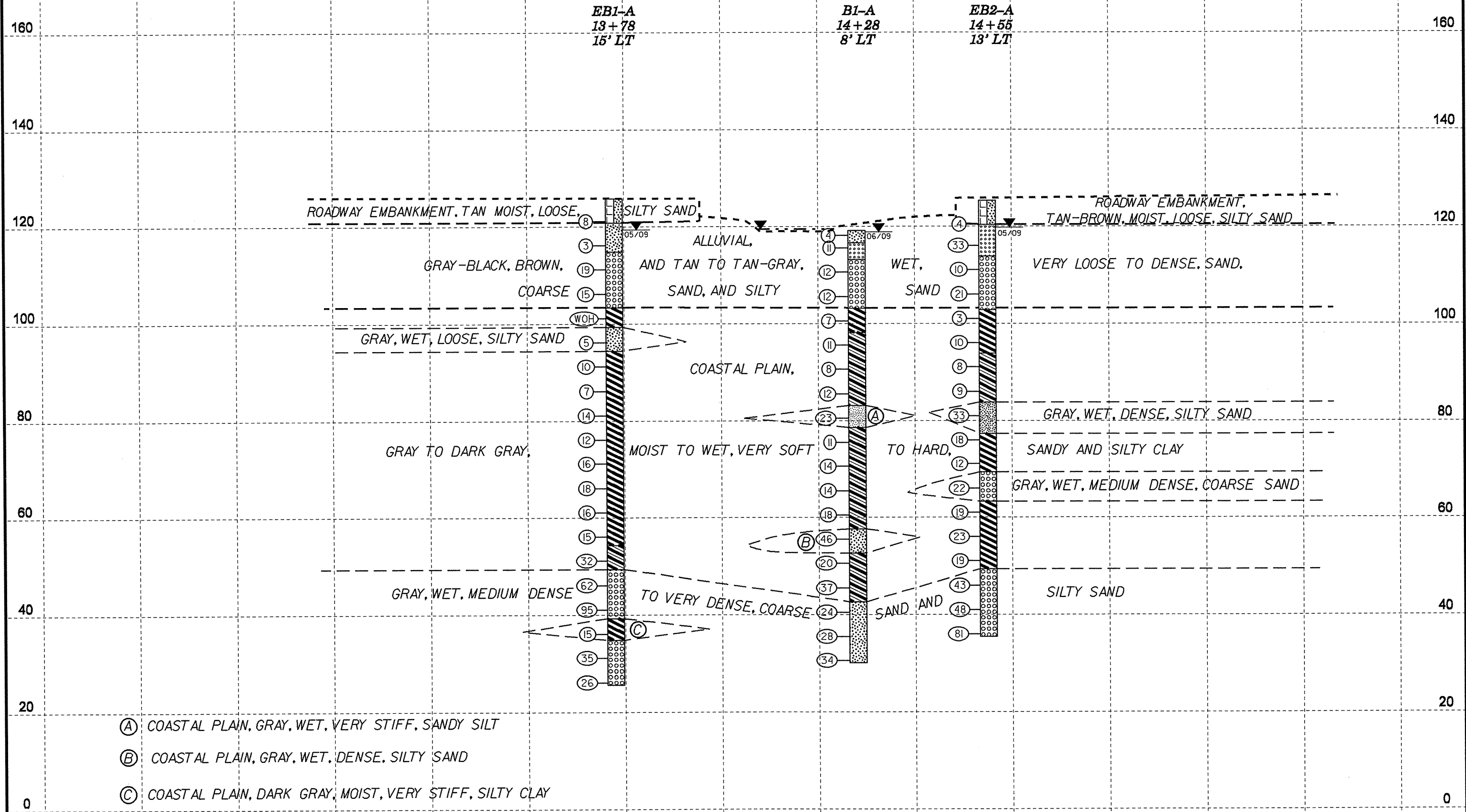
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
<p>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 SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, DARK SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC A-7-6</i></p>										<p>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)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>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:</p> <p>WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>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.</p> <p>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.</p> <p>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.</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>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.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (ROQ) - 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.</p> <p>SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>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.</p> <p>STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>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.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
<p>GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS</p> <p>GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7</p> <p>SYMBOL</p> <p>% PASSING: 10, 40, 200</p> <p>LIQUID LIMIT, PLASTIC INDEX, GROUP INDEX</p> <p>USUAL TYPES OF MAJOR MATERIALS: STONE FRAGS, GRAVEL, SAND, SILTY OR CLAYEY GRAVEL AND SAND, SILTY SOILS, CLAYEY SOILS</p> <p>GENERAL RATINGS AS A SUBGRADE: EXCELLENT TO GOOD, FAIR TO POOR, POOR, UNSUITABLE</p>										<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p>COMPRESSIBILITY: SLIGHTLY COMPRESSIBLE, MODERATELY COMPRESSIBLE, HIGHLY COMPRESSIBLE</p> <p>PERCENTAGE OF MATERIAL: ORGANIC MATERIAL, GRANULAR SOILS, SILT-CLAY SOILS, OTHER MATERIAL</p> <p>GROUND WATER: 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</p>										<p>FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V SL.): 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.</p> <p>SLIGHT (SL.): 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.</p> <p>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.</p> <p>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. IF TESTED, WOULD YIELD SPT REFUSAL.</p> <p>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.</p> <p>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. IF TESTED, YIELDS SPT N VALUES < 100 BPF.</p> <p>COMPLETE: ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIXES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>																			
CONSISTENCY OR DENSITY										MISCELLANEOUS SYMBOLS										ROCK HARDNESS																			
<p>PRIMARY SOIL TYPE, COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE), RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</p>										<p>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</p> <p>SPT DPT DMT TEST BORING, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR INSTALLATION, CALIFORNIA BEARING RATIO SAMPLE</p>										<p>VERY HARD: CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD: CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD: 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 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT: CAN BE GROOVED 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.</p> <p>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 FINGERNAIL.</p>																			
TEXTURE OR GRAIN SIZE										ABBREVIATIONS										FRACTURE SPACING										BEDDING									
<p>U.S. STD. SIEVE SIZE OPENING (MM): 4, 10, 40, 60, 200, 270</p> <p>BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.)</p>										<p>AR - AUGER REFUSAL, BT - BORING TERMINATED, CL - CLAY, CPT - CONE PENETRATION TEST, CSE - COARSE, DMT - DILATOMETER TEST, DPT - DYNAMIC PENETRATION TEST, F - VOID RATIO, F - FINE, FOSS - FOSSILIFEROUS, FRAC - FRACTURED, FRACTURES, FRAGS - FRAGMENTS</p> <p>HI - HIGHLY, MED - MEDIUM, MICA - MICACEOUS, MOD - MODERATELY, NP - NON PLASTIC, ORG - ORGANIC, PMT - PRESSUREMETER TEST, SAP - SAPROLITIC, SD - SAND, SANDY, SL - SILTY, SLI - SLIGHTLY, TCR - TRICONE REFUSAL</p>										<p>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</p>										<p>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</p>									
SOIL MOISTURE - CORRELATION OF TERMS										EQUIPMENT USED ON SUBJECT PROJECT										INDURATION																			
<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS), FIELD MOISTURE DESCRIPTION, GUIDE FOR FIELD MOISTURE DESCRIPTION</p> <p>LL - LIQUID LIMIT, PL - PLASTIC LIMIT, DM - OPTIMUM MOISTURE, SL - SHRINKAGE LIMIT</p> <p>- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</p> <p>- WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</p> <p>- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE</p> <p>- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p>										<p>DRILL UNITS: MOBILE B-, BK-51, CME-45C, CME-550, PORTABLE HOIST</p> <p>ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 6" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT, DRAG BIT</p> <p>HAMMER TYPE: AUTOMATIC, MANUAL</p> <p>CORE SIZE: B, N, H</p> <p>HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																			
PLASTICITY																																							
<p>NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY</p> <p>PLASTICITY INDEX (PI), DRY STRENGTH, VERY LOW, SLIGHT, MEDIUM, HIGH</p>																																							
COLOR																																							
<p>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.</p>																																							
																														<p>BENCH MARK: BL-1 AT -L- STA. 13+00.99, 20.12' LT</p> <p>ELEVATION: 125.30 FT.</p> <p>NOTES:</p>									





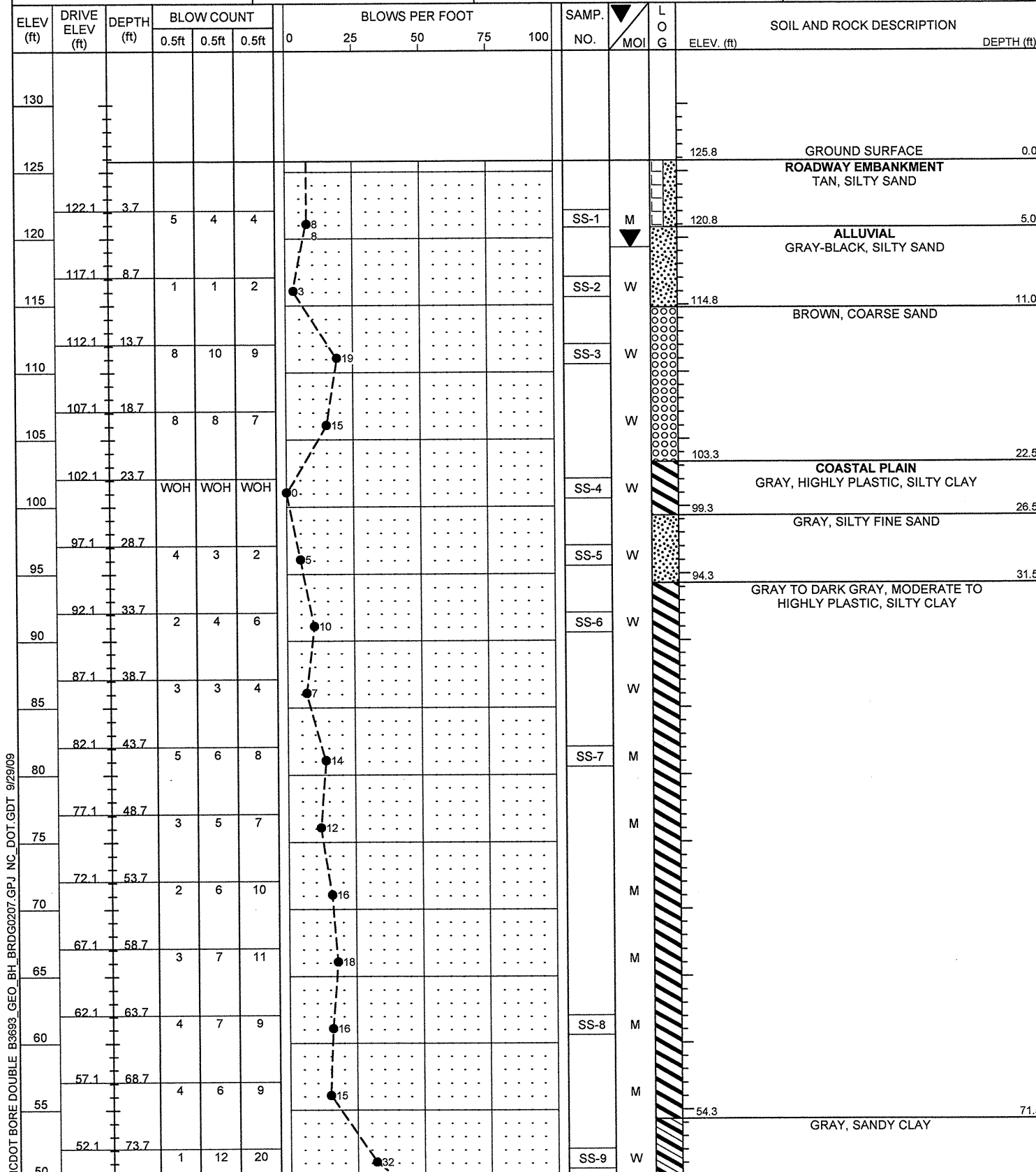
PROJECT REFERENCE NO.	SHEET
(33233.1.1)(B-3693)	4
PROFILE BORINGS PROJECTED ALONG -L-	



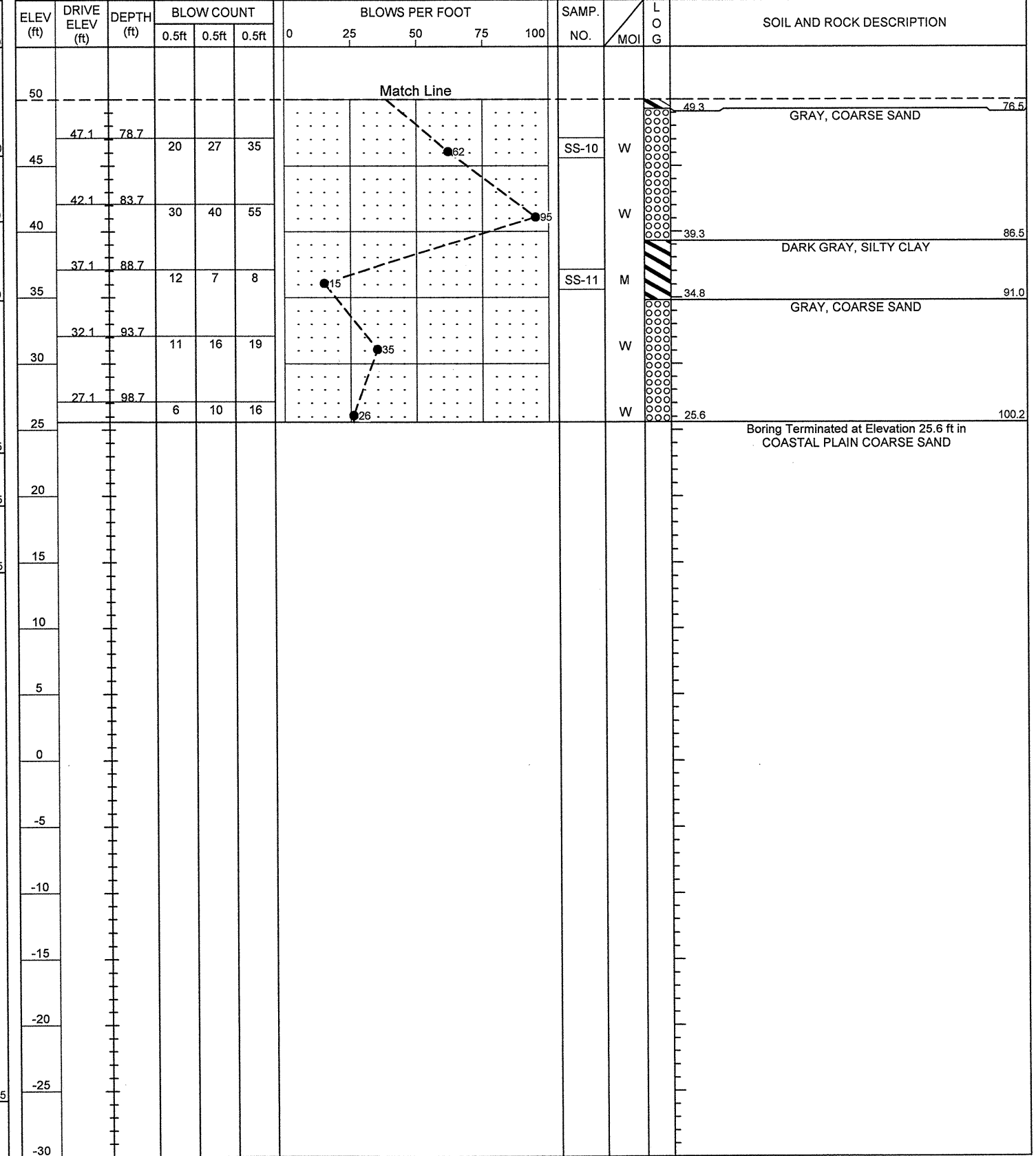
NOTE: GROUNDLINE PROFILE TAKEN FROM HYDRAULIC REPORT DATED 07/28/2009

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. EB1-A	STATION 13+78	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 125.8 ft	TOTAL DEPTH 100.2 ft	NORTHING 331,314	EASTING 1,979,148
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/27/09	COMP. DATE 05/27/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. EB1-A	STATION 13+78	OFFSET 15ft LT	ALIGNMENT -L-
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DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/27/09	COMP. DATE 05/27/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

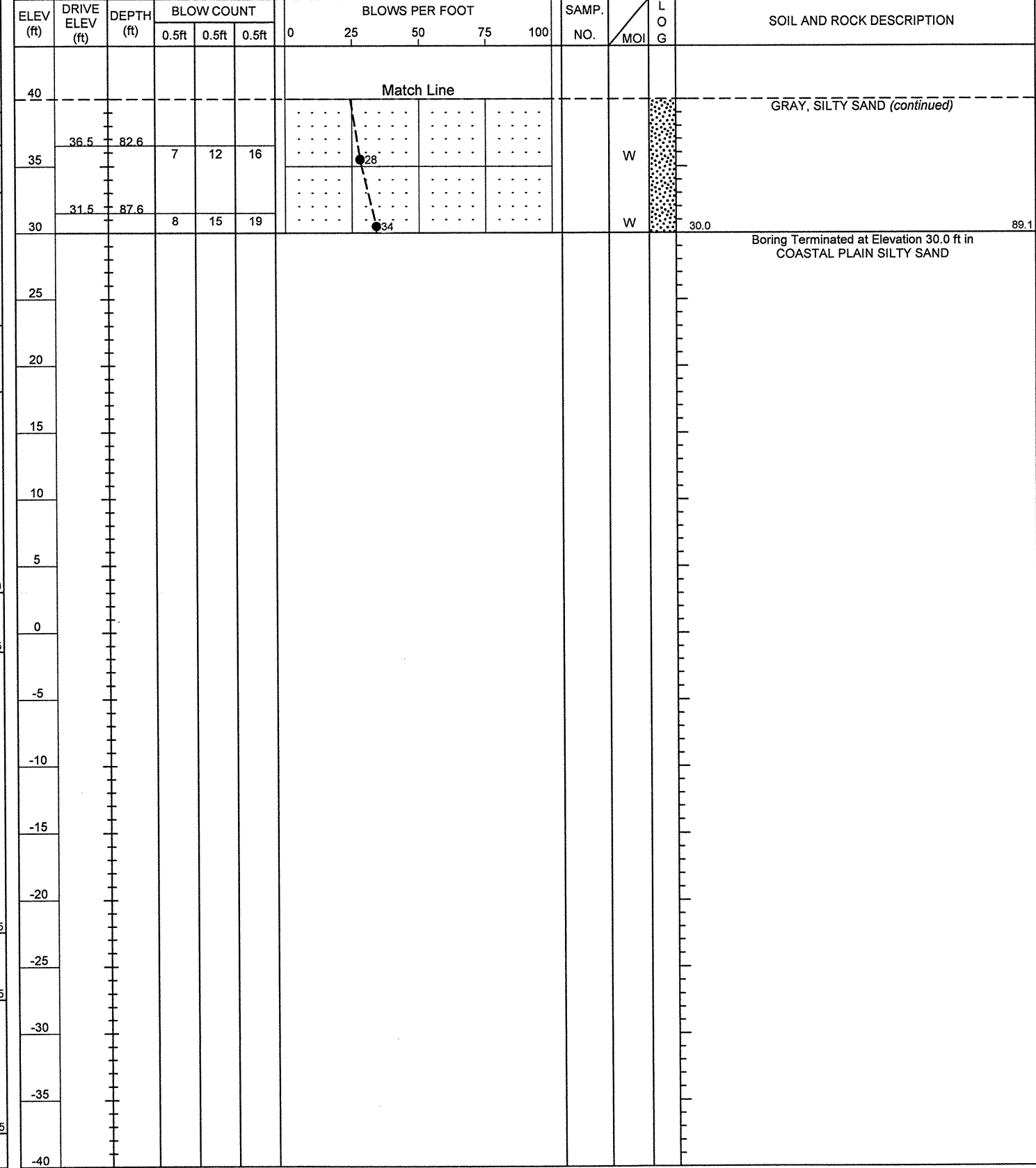
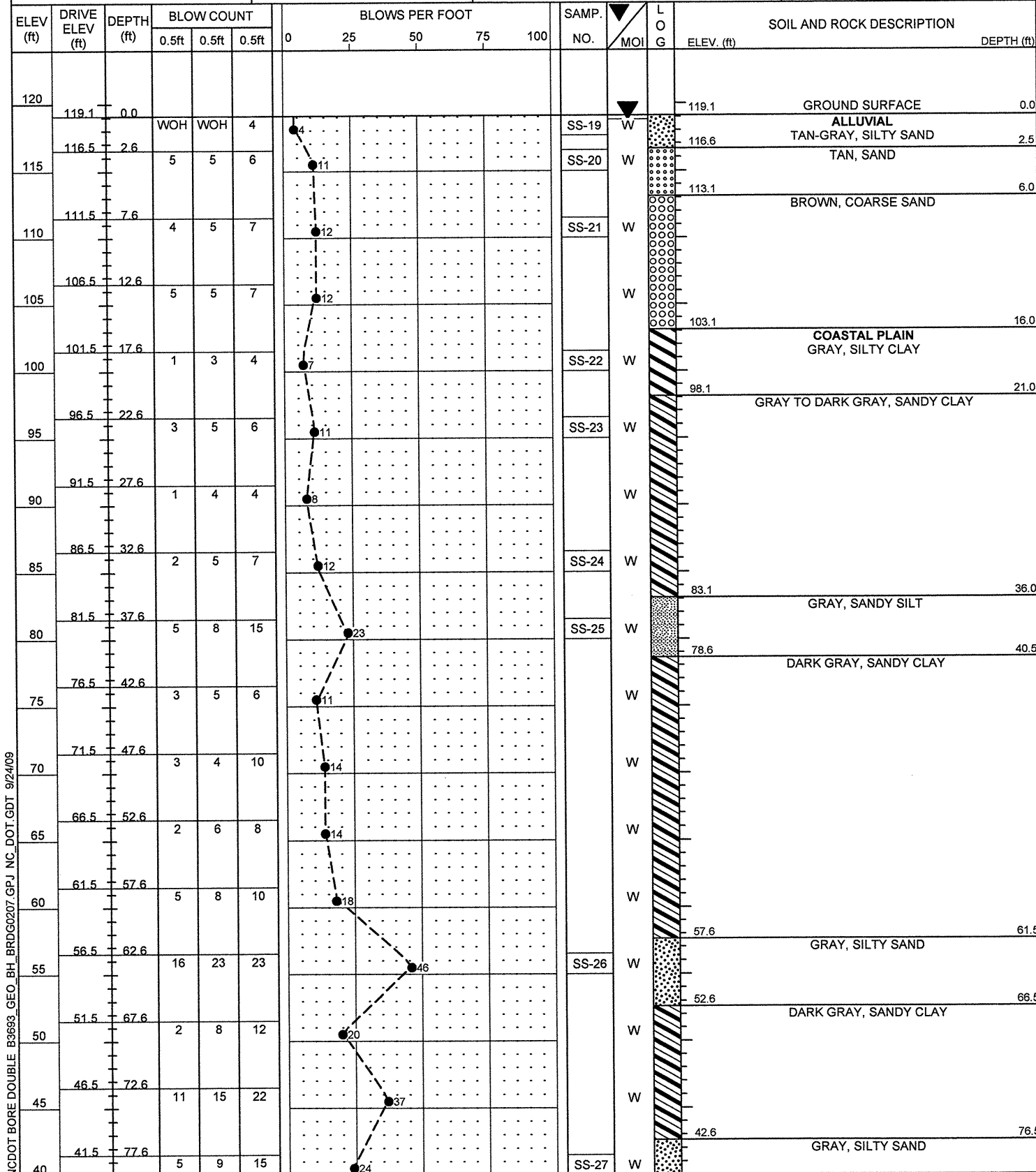


NCDOT BORE DOUBLE B3693_GEO_BH_BRD0207.GPJ NC_DOT_GDT 9/29/09

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+28	OFFSET 8ft LT	ALIGNMENT -L-
COLLAR ELEV. 119.1 ft	TOTAL DEPTH 89.1 ft	NORTHING 331,355	EASTING 1,979,179
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/02/09	COMP. DATE 06/03/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+28	OFFSET 8ft LT	ALIGNMENT -L-
COLLAR ELEV. 119.1 ft	TOTAL DEPTH 89.1 ft	NORTHING 331,355	EASTING 1,979,179
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/02/09	COMP. DATE 06/03/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

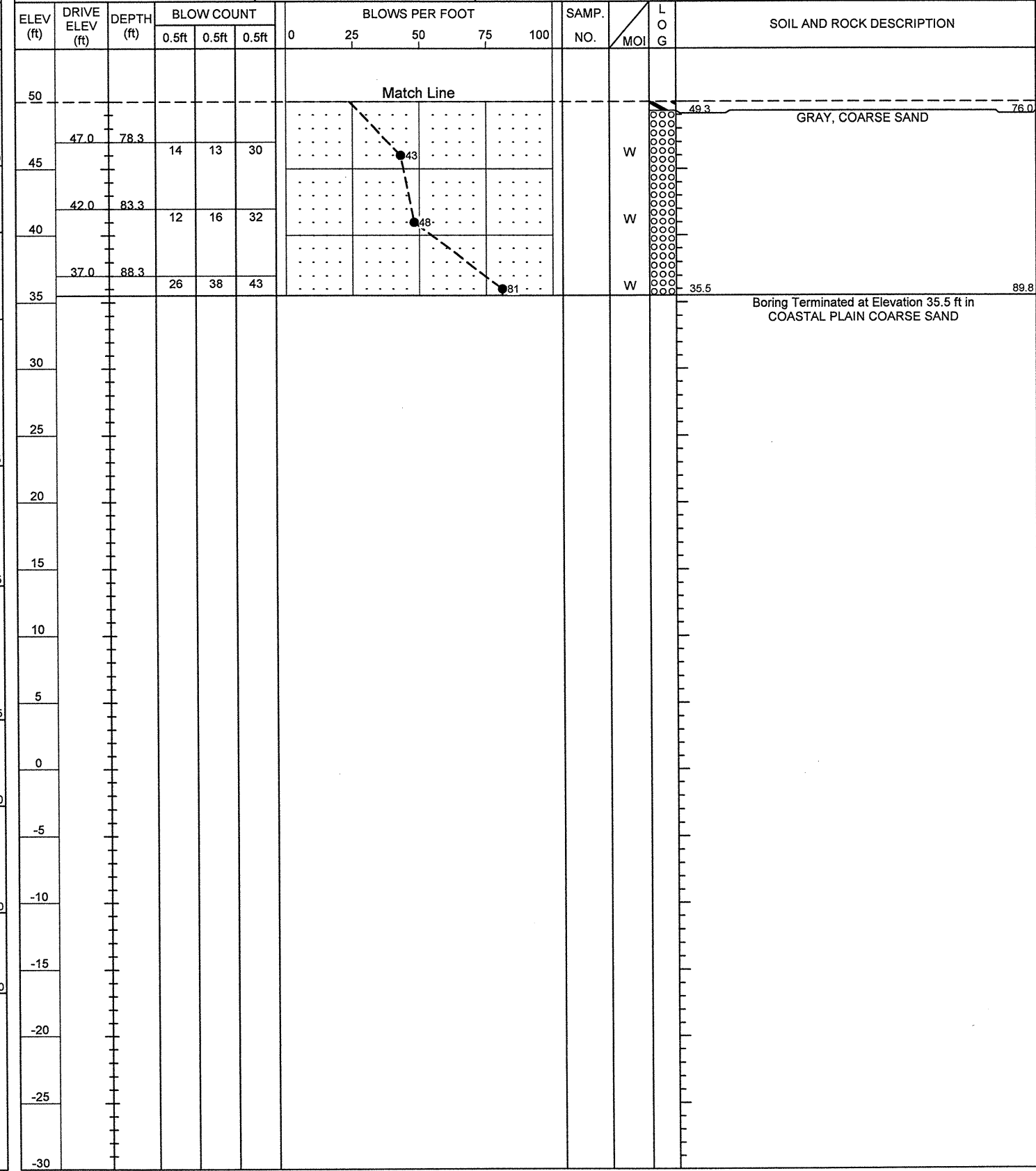
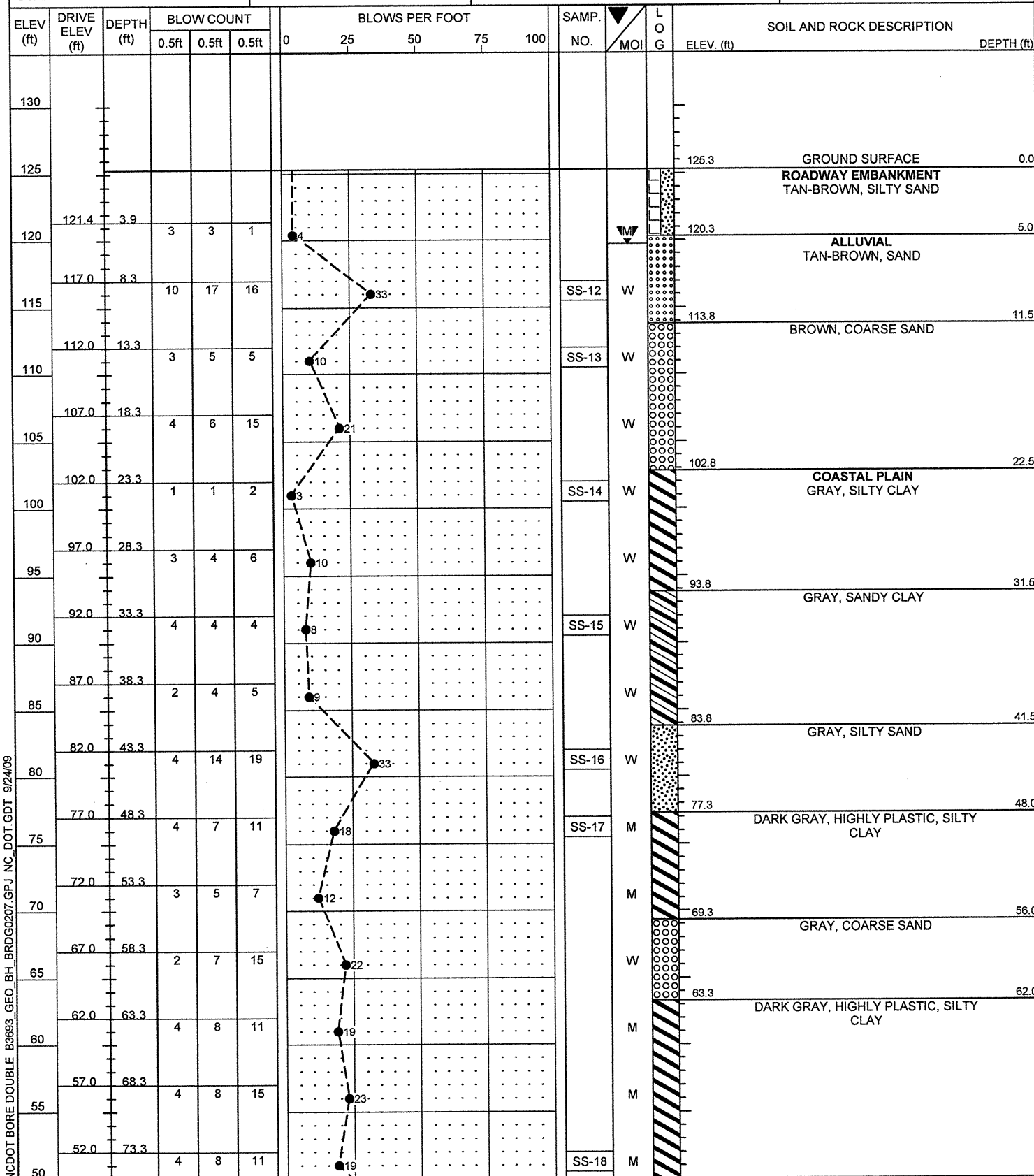


NC DOT BORE DOUBLE B3693_GEO_BH_BRD0207.GPJ NC_DOT_GDT_9/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+55	OFFSET 13ft LT	ALIGNMENT -L-
COLLAR ELEV. 125.3 ft	TOTAL DEPTH 89.8 ft	NORTHING 331,381	EASTING 1,979,190
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/28/09	COMP. DATE 05/28/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 207 ON SR 1527 OVER HOLLY SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+55	OFFSET 13ft LT	ALIGNMENT -L-
COLLAR ELEV. 125.3 ft	TOTAL DEPTH 89.8 ft	NORTHING 331,381	EASTING 1,979,190
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/28/09	COMP. DATE 05/28/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B3693_GEO_BH_BRD0207.GPJ NC_DOT_GDT_9/24/09

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	15'LT	13+78	3.7-5.0	A-2-4(0)	19	3	40.4	38.6	7.8	13.1	100	77	23	-	-
SS-2	15'LT	13+78	8.7-10.2	A-2-4(0)	23	NP	28.7	57.2	10.0	4.0	100	87	17	-	-
SS-3	15'LT	13+78	13.7-15.2	A-1-b(0)	19	NP	85.7	11.6	2.6	0.0	91	27	3	-	-
SS-4	15'LT	13+78	23.7-25.2	A-7-6(37)	62	36	4.0	9.5	33.9	52.6	100	97	90	-	-
SS-5	15'LT	13+78	28.7-30.2	A-2-4(0)	23	NP	12.9	66.0	7.9	13.1	100	92	26	-	-
SS-6	15'LT	13+78	33.7-35.2	A-7-6(20)	41	24	1.2	24.3	34.1	40.4	100	100	85	-	-
SS-7	15'LT	13+78	43.7-45.2	A-7-6(29)	50	29	2.0	7.9	21.3	68.8	100	99	93	-	-
SS-8	15'LT	13+78	63.7-65.2	A-7-6(25)	47	26	2.8	11.5	27.0	58.6	100	99	89	-	-
SS-9	15'LT	13+78	73.7-75.2	A-6(7)	30	15	13.8	26.1	23.8	36.4	100	95	63	-	-
SS-10	15'LT	13+78	78.7-80.2	A-1-b(0)	19	2	73.7	15.2	7.1	4.0	96	38	13	-	-
SS-11	15'LT	13+78	88.7-90.1	A-7-6(24)	48	24	6.5	3.2	41.8	48.5	100	94	92	-	-

BI-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-19	8'LT	14+28	0.0-1.5	A-2-4(0)	29	NP	54.3	35.6	7.1	3.0	100	74	11	-	-
SS-20	8'LT	14+28	2.6-4.1	A-3(0)	20	NP	72.3	23.4	3.2	1.0	100	63	6	-	-
SS-21	8'LT	14+28	7.6-9.1	A-1-b(0)	20	NP	94.0	4.9	1.0	0.0	100	35	1	-	-
SS-22	8'LT	14+28	17.6-19.1	A-7-5(4)	46	16	42.4	19.6	25.9	12.1	100	65	44	-	-
SS-23	8'LT	14+28	22.6-24.1	A-6(5)	30	13	5.7	49.3	34.9	10.1	100	98	58	-	-
SS-24	8'LT	14+28	32.6-34.1	A-6(15)	38	18	1.0	23.6	30.9	44.4	100	99	85	-	-
SS-25	8'LT	14+28	37.6-39.1	A-4(1)	28	5	11.7	51.9	18.2	18.2	100	94	52	-	-
SS-26	8'LT	14+28	62.6-64.1	A-2-4(0)	18	NP	64.8	23.1	4.9	7.1	99	74	14	-	-
SS-27	8'LT	14+28	77.6-79.1	A-2-4(0)	26	4	7.7	64.3	9.8	18.2	79	78	24	-	-

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-12	13'LT	14+55	8.3-9.8	A-3(0)	19	NP	64.6	29.5	4.9	1.0	100	57	9	-	-
SS-13	13'LT	14+55	13.3-14.8	A-1-b(0)	15	NP	94.1	4.6	1.3	0.0	81	16	1	-	-
SS-14	13'LT	14+55	0.0-0.0	A-7-5(4)	52	15	40.4	18.2	27.2	14.2	100	67	46	-	-
SS-15	13'LT	14+55	33.3-34.8	A-6(3)	28	11	16.8	40.8	32.3	10.1	99	88	52	-	-
SS-16	13'LT	14+55	43.3-44.8	A-2-4(0)	21	NP	7.4	69.3	1.1	22.2	100	98	31	-	-
SS-17	13'LT	14+55	48.3-49.8	A-7-6(44)	68	40	3.6	3.2	8.2	84.9	100	97	94	-	-
SS-18	13'LT	14+55	73.3-74.8	A-7-6(38)	60	34	1.4	2.0	27.8	68.8	100	99	97	-	-



**FIELD
 SCOUR REPORT**

WBS: 33233.1.1 TIP: B-3693 COUNTY: Robeson

DESCRIPTION(1): Bridge No.207 on -L- (SR 1527, Pine Log Road) over Holly Swamp

EXISTING BRIDGE

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

Bridge No.: 207 Length: 54 Total Bents: 4 Bents in Channel: 1 Bents in Floodplain: 3
 Foundation Type: Timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None observed

Channel Bed: None observed

Channel Bank: Some erosion of bank during high water

EXISTING SCOUR PROTECTION

Type(3): Abutment wall

Extent(4): At both end bents

Effectiveness(5): Effective

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 sand (SS-20, SS-21) and silty sand (SS-19)

Channel Bank Material(8): Alluvial sand (SS-12) and silty sand (SS-2)

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

Floodplain Width(10): +/- 1400 feet

Floodplain Cover(11): Wetland forest

Stream is(12): Aggrading Degrading _____ Static _____

Channel Migration Tendency(13): Toward the southeast

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

**BENT
 B1**

114.0																			

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Geotechnical Engineering Unit agrees with the Hydraulics Unit's theoretical scour at elevation 114.0 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. Wilharts Jr.* Date: 6/24/2009

SITE PHOTOGRAPH

Bridge No. 207 on -L- (SR 1527) Over Holly Swamp



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

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33233.1.1(B-3693) F.A. PROJ. BRZ-1527(2)
 COUNTY ROBESON
 PROJECT DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER
 RAFT SWAMP (OVERFLOW)

INVENTORY

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-6	BORE LOG(S)
7	SOIL TEST RESULTS
8	SCOUR REPORT
9	SITE PHOTOGRAPH(S)

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 1919 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

J.I. MILKOVITS JR.

H.R. CONLEY

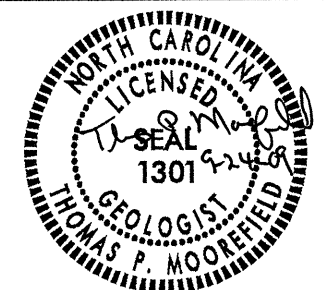
J.R. TURNAGE

INVESTIGATED BY J.I. MILKOVITS, JR.

CHECKED BY T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

DATE SEPTEMBER 2009

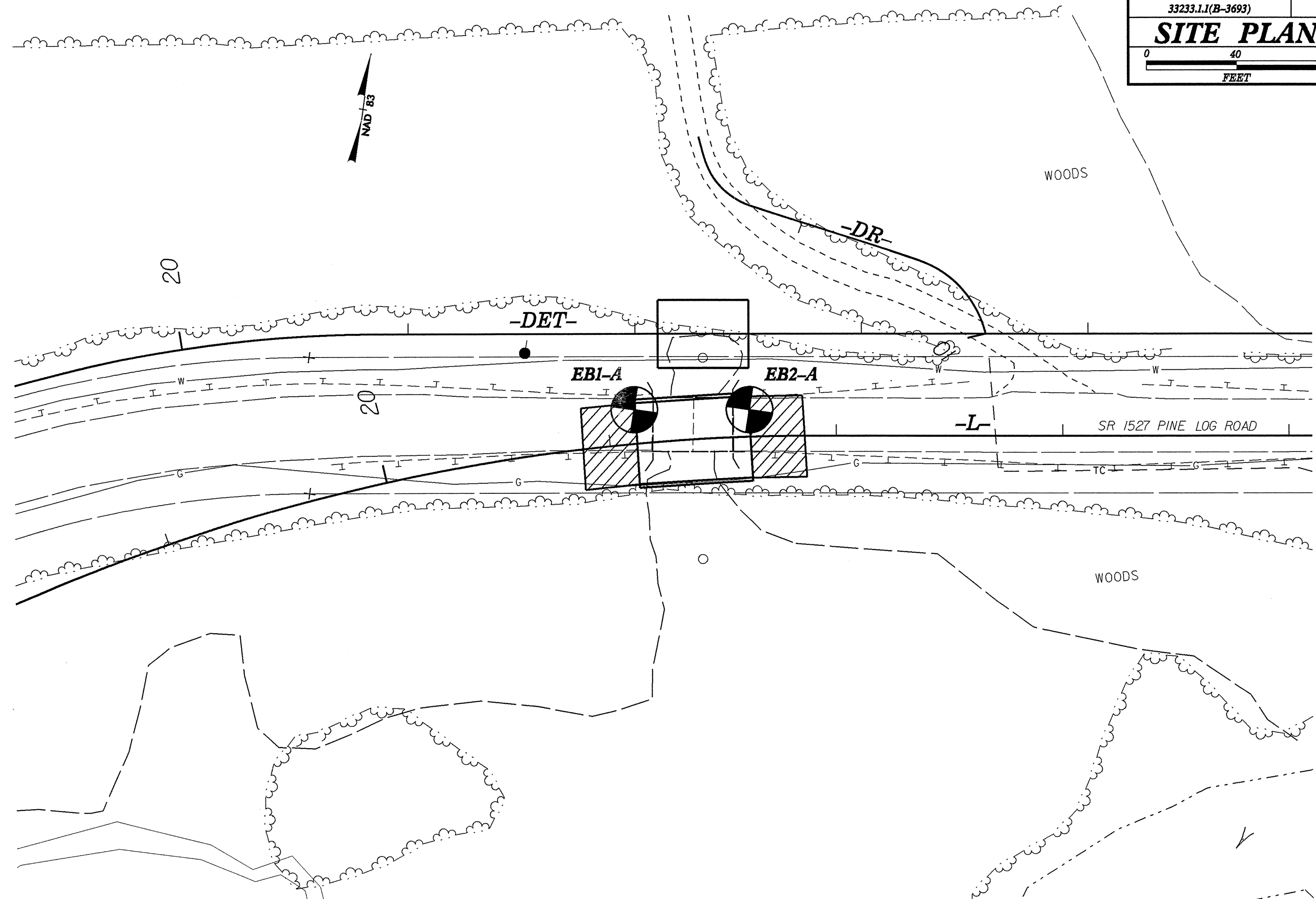


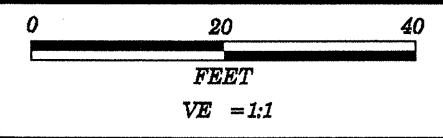
PROJECT: 33233.1.1 ID: B-3693

DRAWN BY: T.T. WALKER

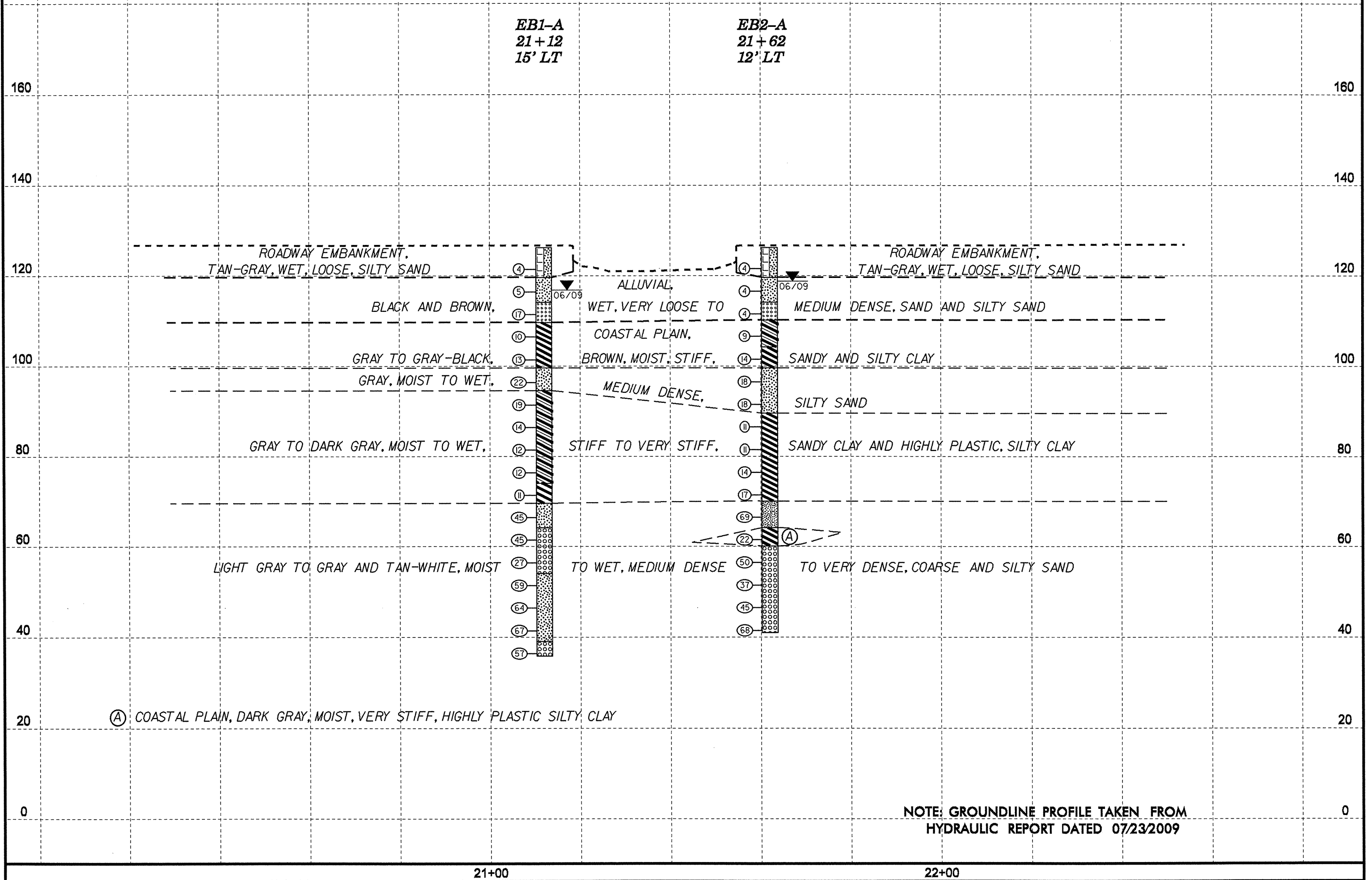
NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.





PROJECT REFERENCE NO.	SHEET
33233.1.1(B-3693)	4
PROFILE BORINGS PROJECTED ALONG -L-	

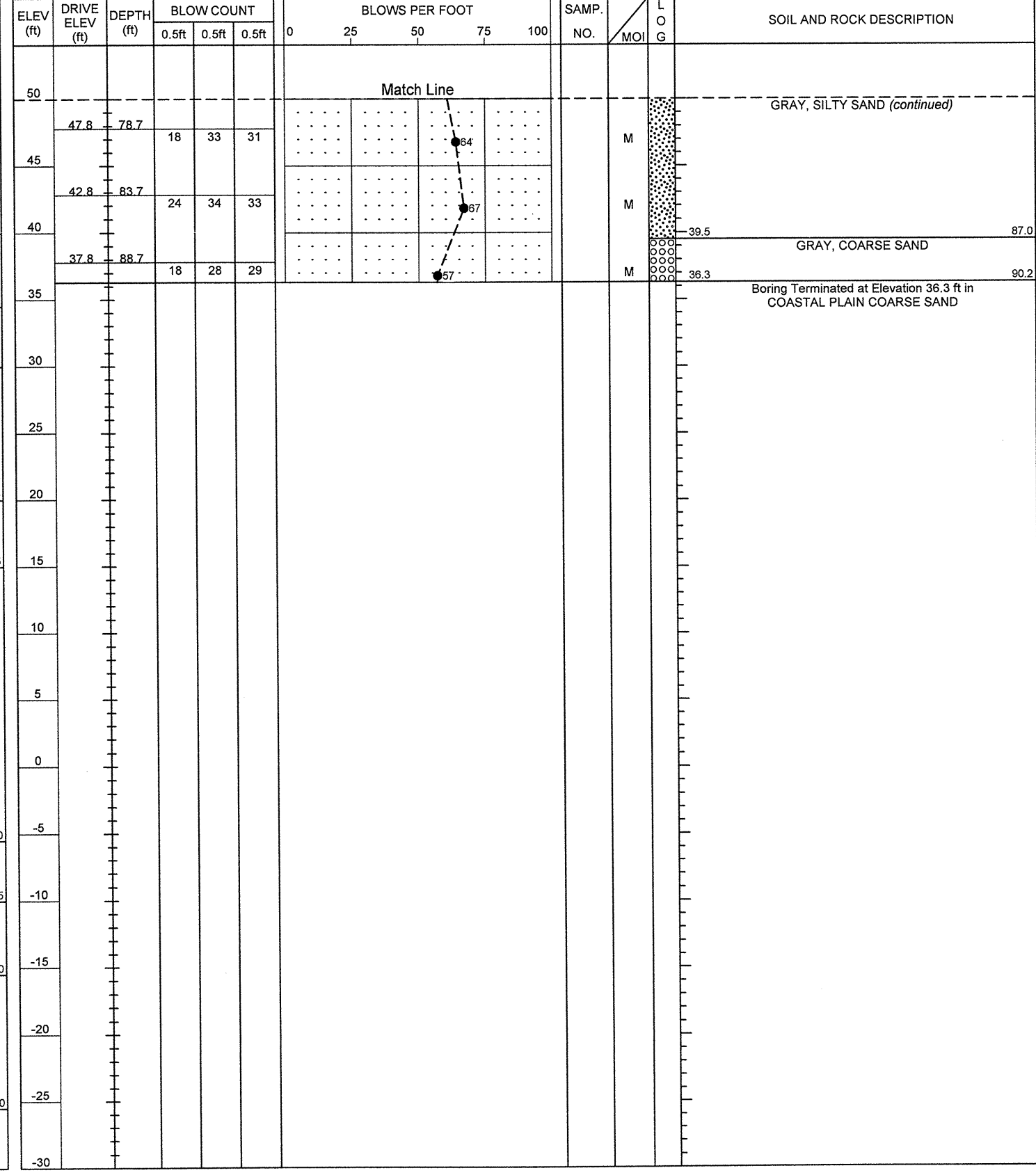
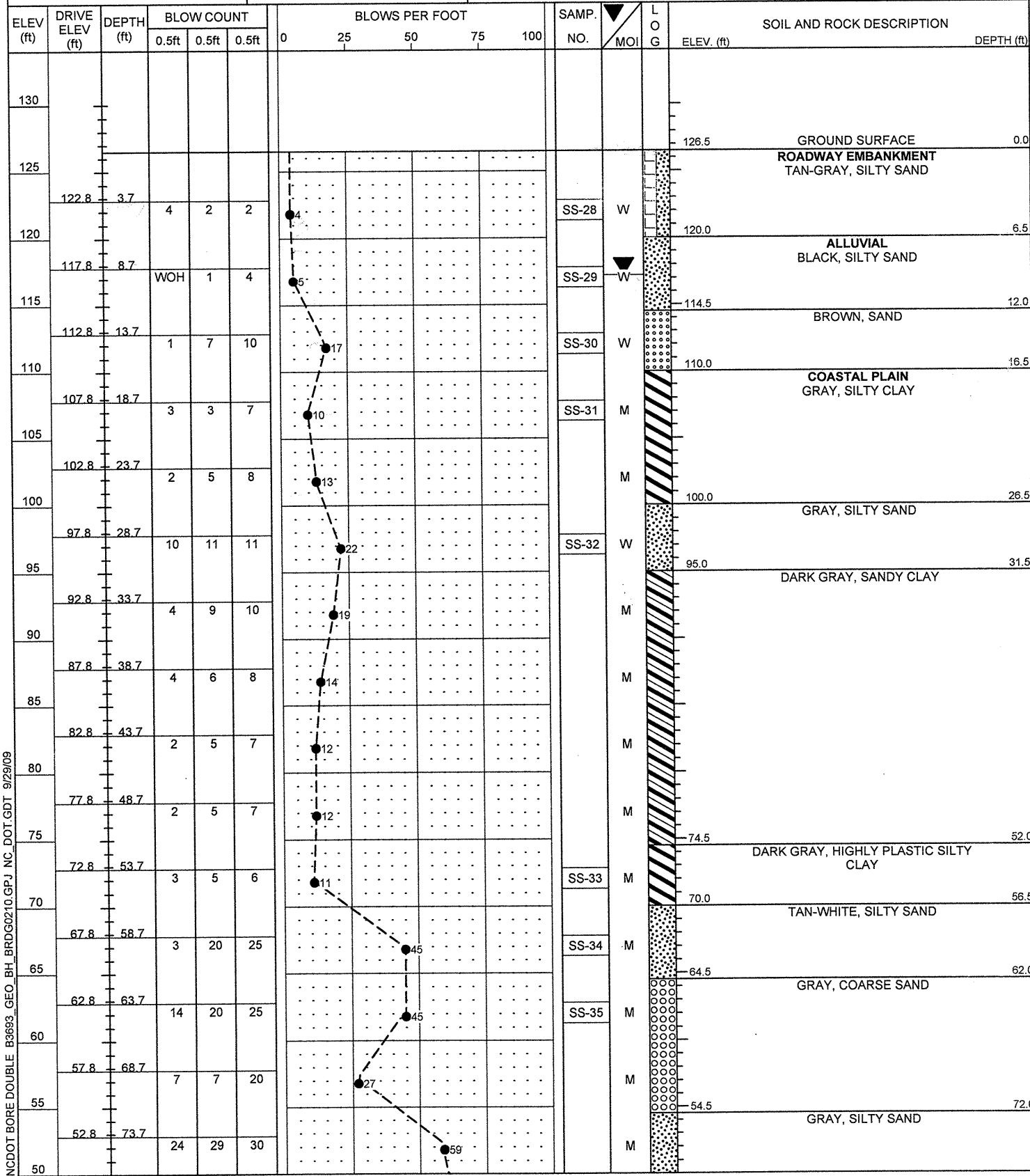


NOTE: GROUNDLINE PROFILE TAKEN FROM HYDRAULIC REPORT DATED 07/23/2009

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER RAFT SWAMP (OVERFLOW)			GROUND WTR (ft)
BOHRING NO. EB1-A	STATION 21+12	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.5 ft	TOTAL DEPTH 90.2 ft	NORTHING 331,757	EASTING 1,979,722
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/04/09	COMP. DATE 06/09/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER RAFT SWAMP (OVERFLOW)			GROUND WTR (ft)
BOHRING NO. EB1-A	STATION 21+12	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.5 ft	TOTAL DEPTH 90.2 ft	NORTHING 331,757	EASTING 1,979,722
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/04/09	COMP. DATE 06/09/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

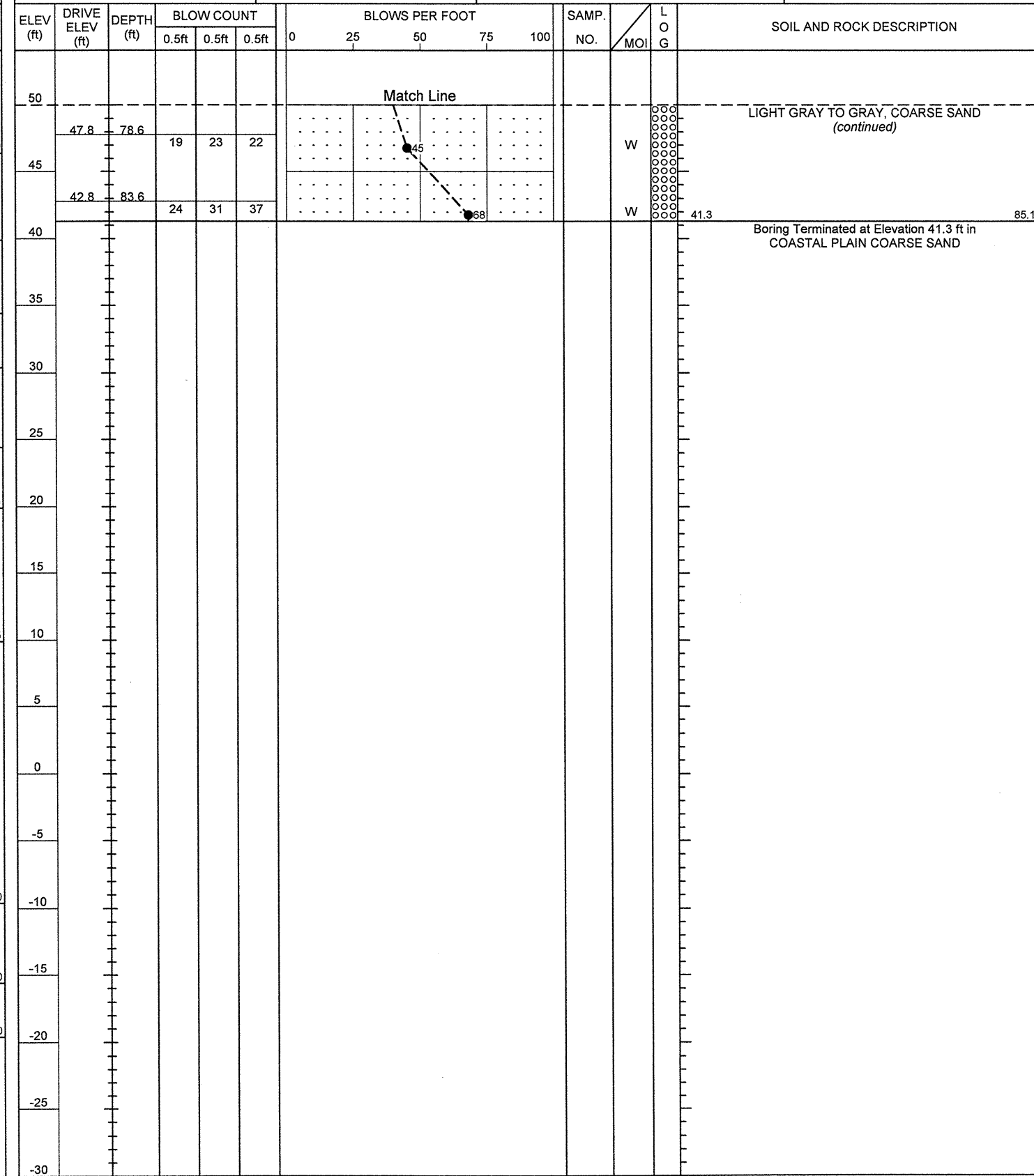
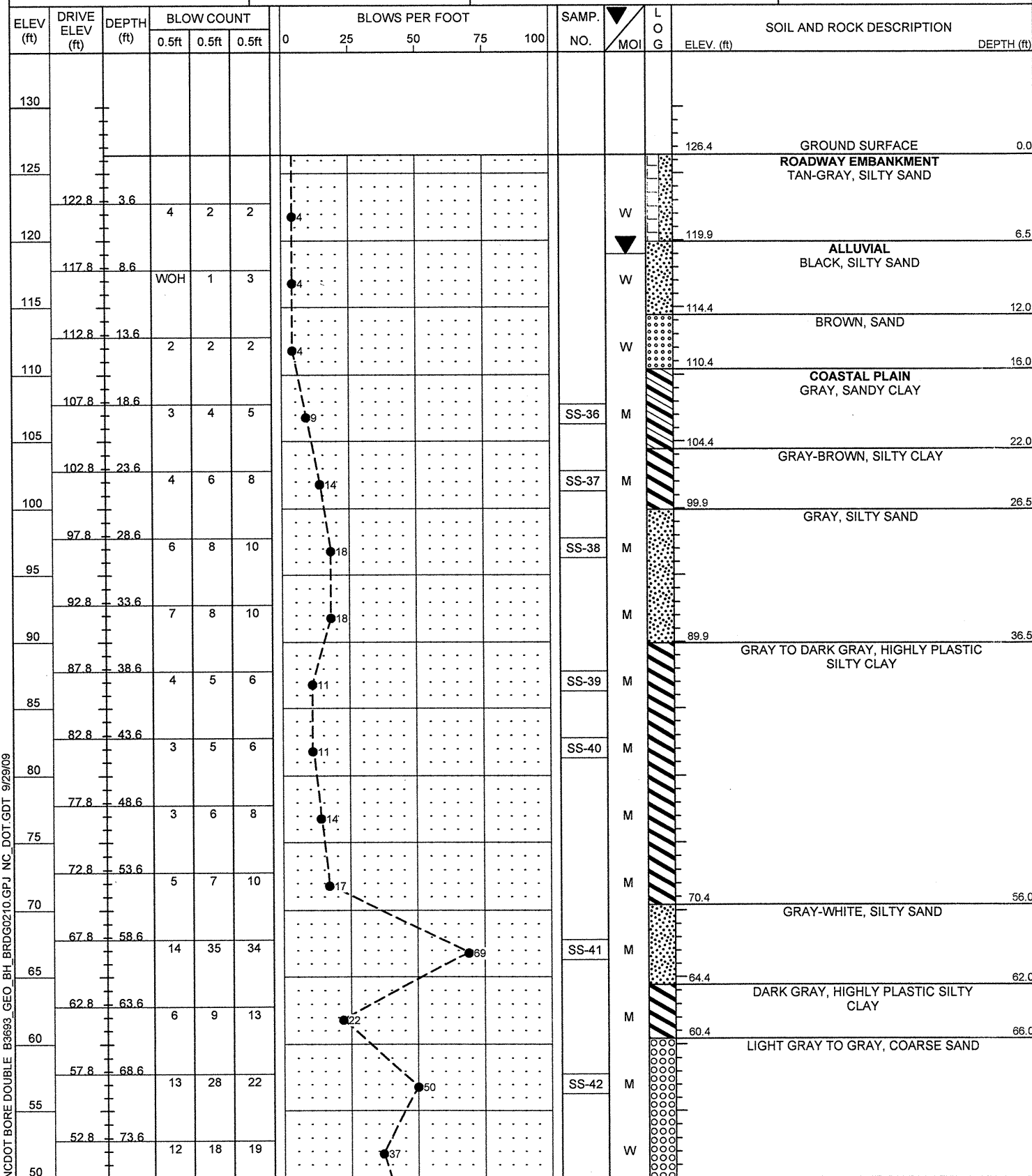


NCDOT BORE DOUBLE B3693_GEO_BH_BRD0210.GPJ NC_DOT_GDT 9/29/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER RAFT SWAMP (OVERFLOW)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 21+62	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.4 ft	TOTAL DEPTH 85.1 ft	NORTHING 331,765	EASTING 1,979,772
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/10/09	COMP. DATE 06/10/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER RAFT SWAMP (OVERFLOW)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 21+62	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 126.4 ft	TOTAL DEPTH 85.1 ft	NORTHING 331,765	EASTING 1,979,772
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/10/09	COMP. DATE 06/10/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B3693_GEO_BH_BRD0210.GPJ_NC_DOT.GDT_9/29/09

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-28	15'LT	21+12	3.7-5.2	A-2-4(0)	17	NP	39.8	43.3	8.8	8.1	99	73	21	-	-
SS-29	15'LT	21+12	8.7-10.2	A-2-4(0)	19	NP	68.3	20.7	3.9	7.1	98	52	12	-	-
SS-30	15'LT	21+12	13.7-15.2	A-3(0)	25	NP	71.5	24.8	3.6	0.0	96	56	5	-	-
SS-31	15'LT	21+12	18.7-20.2	A-7-6(13)	46	20	15.8	26.7	33.3	24.2	100	88	68	-	-
SS-32	15'LT	21+12	28.7-30.2	A-2-4(0)	32	NP	60.6	28.6	9.8	1.0	99	66	14	-	-
SS-33	15'LT	21+12	53.7-55.2	A-7-6(44)	64	39	0.6	2.0	16.1	81.2	100	100	98	-	-
SS-34	15'LT	21+12	58.7-60.2	A-2-4(0)	18	NP	53.8	37.4	4.8	4.1	100	79	11	-	-
SS-35	15'LT	21+12	63.7-65.2	A-1-b(0)	22	NP	80.7	13.3	2.9	3.0	99	28	7	-	-

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-36	12'LT	21+62	18.6-20.1	A-6(6)	40	16	22.3	31.7	29.7	16.2	99	84	55	-	-
SS-37	12'LT	21+62	23.6-25.1	A-7-6(13)	47	20	12.4	29.4	37.9	20.3	100	94	67	-	-
SS-38	12'LT	21+62	28.6-30.1	A-2-4(0)	35	NP	49.8	37.2	11.0	2.0	97	66	16	-	-
SS-39	12'LT	21+62	38.6-40.1	A-7-6(17)	41	20	1.0	32.1	46.6	20.3	100	100	84	-	-
SS-40	12'LT	21+62	43.6-45.1	A-7-6(62)	81	55	1.0	4.5	25.5	69.0	100	100	97	-	-
SS-41	12'LT	21+62	58.6-60.1	A-2-4(0)	17	NP	68.2	22.1	5.6	4.1	100	54	12	-	-
SS-42	12'LT	21+62	68.6-70.1	A-1-b(0)	17	NP	68.5	18.9	4.5	8.1	96	50	14	-	-



FIELD SCOUR REPORT

WBS: 33233.1.1 TIP: B-3693 COUNTY: Robeson

DESCRIPTION(1): Bridge No. 210 on -L- (SR 1527, Pine Log Road) over Raft Swamp (Overflow)

EXISTING BRIDGE

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

Bridge No.: 210 Length: 35.5' Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 2
 Foundation Type: Timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None Observed

Channel Bed: None observed

Channel Bank: None observed

EXISTING SCOUR PROTECTION

Type(3): Abutment wall

Extent(4): At both end bents

Effectiveness(5): Effective

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 sand (SS-30) and silty sand (SS-29)

Channel Bank Material(8): Alluvial sand (SS-30) and silty sand (SS-29)

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

Floodplain Width(10): +/- 1400 feet

Floodplain Cover(11): Wetland forest

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): None

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

NO INTERIOR BENTS

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Geotechnical Engineering Unit agrees with the Hydraulics Unit's theoretical scour at elevation 120.3 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																				

See Sheet 7,
 "Soil Test Results",
 for samples:
 SS-29
 SS-30

Reported by: Date: 6/24/2009

SITE PHOTOGRAPH

Bridge No. 210 on -L- (SR 1527) Over Raft Swamp (Overflow)

