

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33721.1.1 (B-4473)	1	7

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33721.1.1 (B-4473) F.A. PROJ. BRSTP-1006(20)
COUNTY COLUMBUS
PROJECT DESCRIPTION BRIDGE NO. 78 ON SR 1006 OVER GRISSETT SWAMP AT -L- STA. 12+65

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CAUTION NOTICE

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PROJECT: 33721.1.1 ID: B-4473

PERSONNEL

T.C. BOTTOMS

J.M. EDMONDSON

R.E. SMITH

INVESTIGATED BY T.C. BOTTOMS

CHECKED BY D.N. ARGENBRIGHT

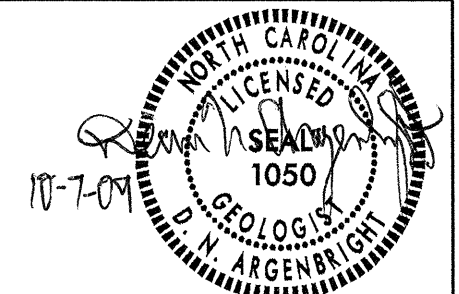
SUBMITTED BY D.N. ARGENBRIGHT

DATE SEPTEMBER 2009

DRAWN BY: C.P. TURNER

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

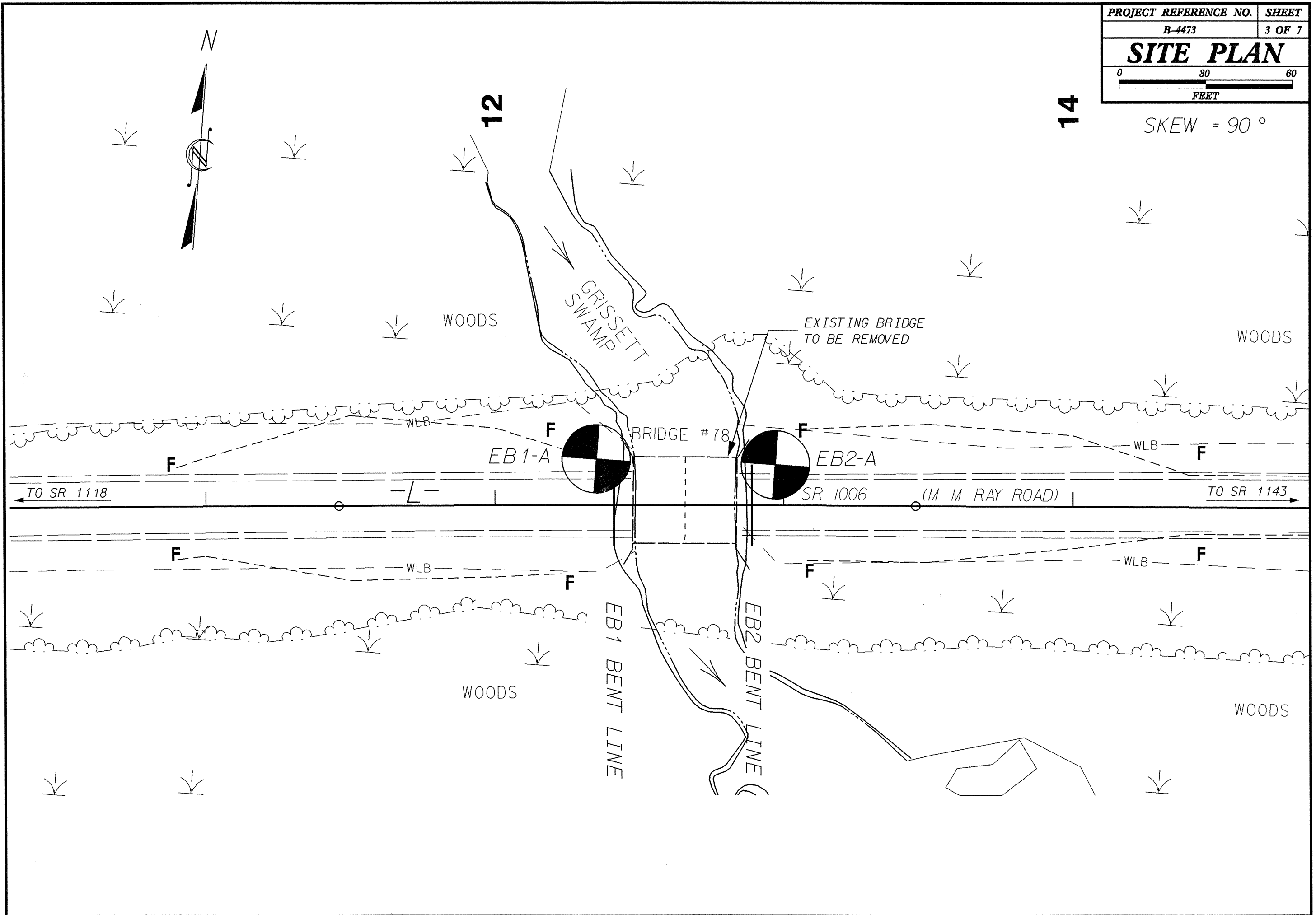
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. B-4473 SHEET NO. 2 OF 7

SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION.

PROJECT REFERENCE NO.	SHEET
B-4473	3 OF 7
SITE PLAN	
FEET	

SKEW = 90°

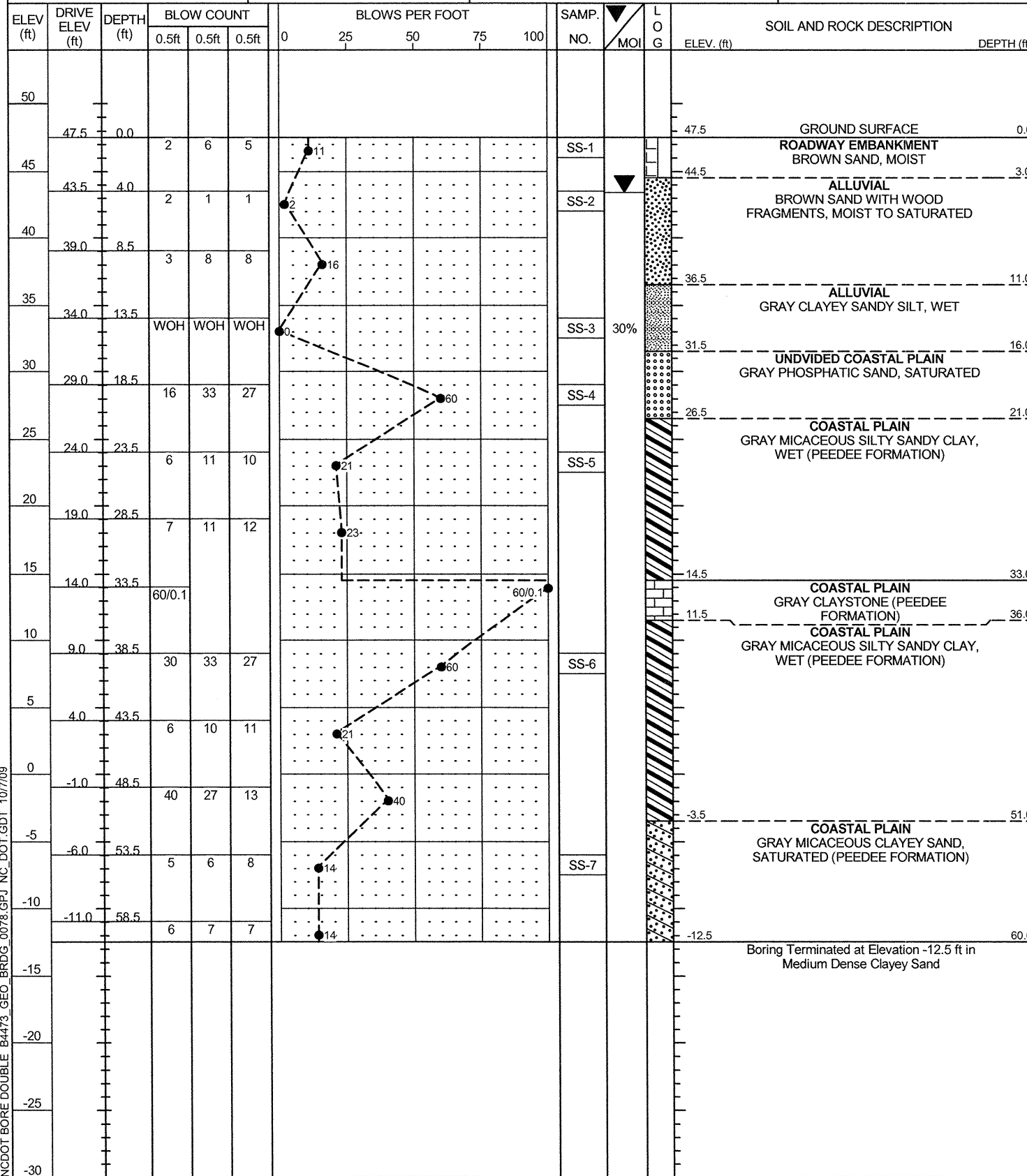




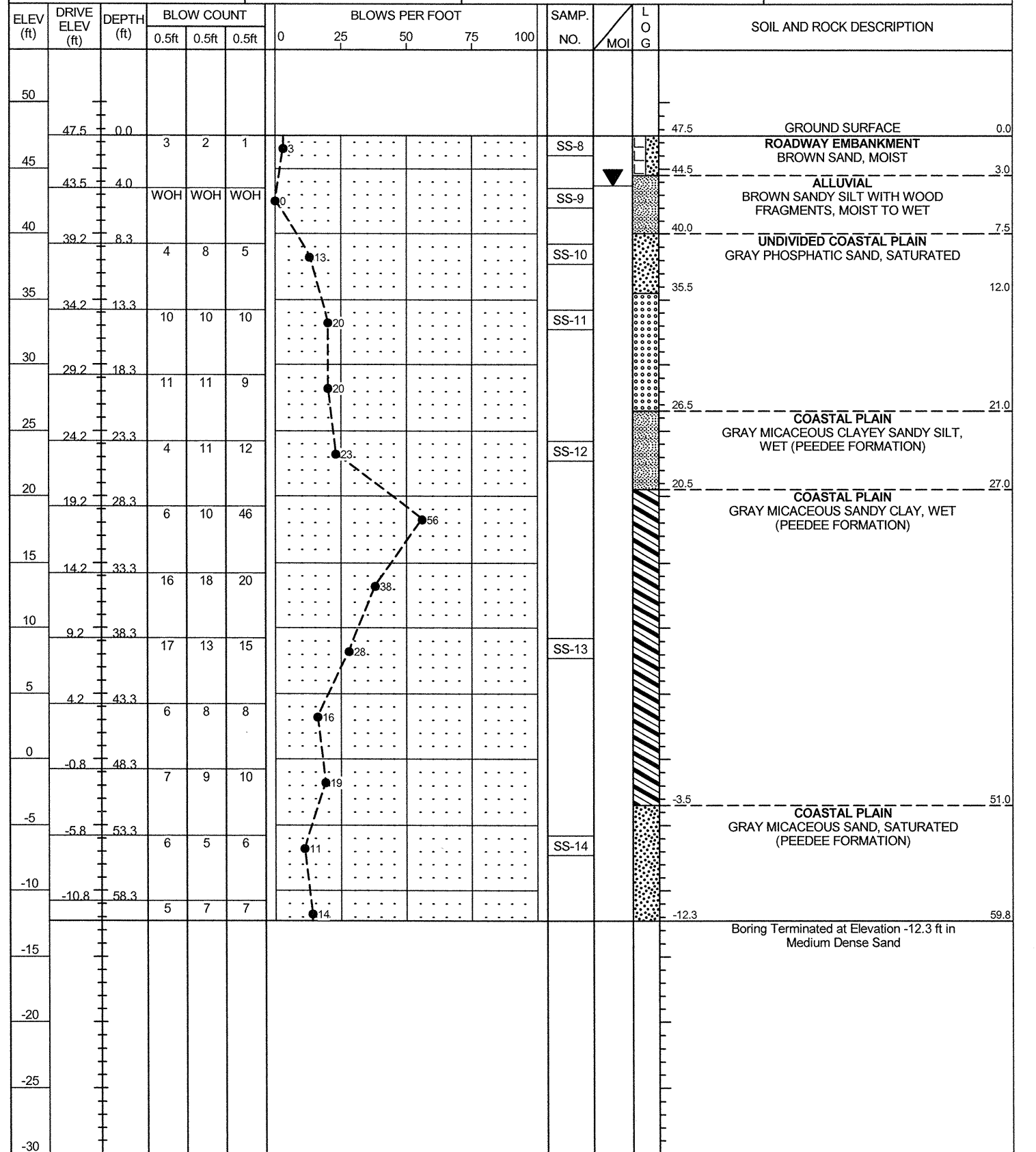
NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33721.1.1	ID. B-4473	COUNTY COLUMBUS	GEOLOGIST Bottoms, T. C.
SITE DESCRIPTION BRIDGE NO. 78 ON -L- (SR 1006) OVER GRISSETT SWAMP			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+35	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 47.5 ft	TOTAL DEPTH 60.0 ft	NORTHING 138,486	EASTING 2,072,041
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/14/09	COMP. DATE 09/15/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 33.0 ft



PROJECT NO. 33721.1.1	ID. B-4473	COUNTY COLUMBUS	GEOLOGIST Bottoms, T. C.
SITE DESCRIPTION BRIDGE NO. 78 ON -L- (SR 1006) OVER GRISSETT SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 12+97	OFFSET 14ft LT	ALIGNMENT -L-
COLLAR ELEV. 47.5 ft	TOTAL DEPTH 59.8 ft	NORTHING 138,489	EASTING 2,072,103
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/15/09	COMP. DATE 09/15/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B4473 GEO_BRDG_0078.GPJ NC_DOT_GDT_10/7/09

33721.1.1

B-4473

BRIDGE NO. 78 ON SR 1006 OVER GRISSETT SWAMP AT -L- STA. 12+65

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	12+35	1.0-1.5	A-2-4(0)	20	NP	26.1	55.3	4.5	14.1	99	86	20	-	-
SS-2	16 LT	12+35	4.0-5.5	A-2-4(0)	21	NP	16.7	72.1	6.2	5.0	100	94	14	-	-
SS-3	16 LT	12+35	13.5-15.0	A-4(0)	24	8	4.8	56.7	10.4	28.1	100	97	43	29.7	-
SS-4	16 LT	12+35	18.5-20.0	A-3(0)	22	NP	22.6	72.9	2.5	2.0	100	94	6	-	-
SS-5	16 LT	12+35	23.5-25.0	A-6(6)	32	11	0.4	47.2	22.2	30.2	100	100	68	-	-
SS-6	16 LT	12+35	38.5-40.0	A-6(6)	29	16	7.6	39.2	21.0	32.2	98	97	57	-	-
SS-7	16 LT	12+35	53.5-55.0	A-2-6(1)	33	15	14.1	52.7	9.1	24.1	100	98	35	-	-

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-8	14 LT	12+97	1.0-1.5	A-2-4(0)	22	NP	10.9	76.6	6.5	6.0	100	96	15	-	-
SS-9	14 LT	12+97	4.0-5.5	A-4(0)	21	2	0.8	63.9	19.2	16.1	100	100	41	-	-
SS-10	14 LT	12+97	8.3-9.8	A-2-4(0)	20	NP	3.9	79.4	7.6	9.0	100	100	21	-	-
SS-11	14 LT	12+97	13.3-14.8	A-3(0)	23	NP	36.5	60.3	1.2	2.0	100	78	4	-	-
SS-12	14 LT	12+97	23.3-24.8	A-4(3)	29	7	1.0	48.2	22.6	28.1	100	100	64	-	-
SS-13	14 LT	12+97	38.3-39.8	A-6(6)	33	19	5.4	47.8	14.6	32.2	99	98	50	-	-
SS-14	14 LT	12+97	53.3-54.8	A-2-4(0)	28	7	11.9	61.7	7.3	19.1	93	91	26	-	-



**FIELD
SCOUR REPORT**

WBS: 33721.1.1 TIP: B-4473 COUNTY: COLUMBUS

DESCRIPTION(1): BRIDGE NO. 78 ON -L- (SR 1006) OVER GRISSETT SWAMP

EXISTING BRIDGE

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

Bridge No.: 78 Length: 37 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 NOTED

Interior Bents: NONE NOTED

Channel Bed: NONE NOTED

Channel Bank: NONE NOTED

EXISTING SCOUR PROTECTION

Type(3): WOODEN WING WALLS

Extent(4): 8' OUTSIDE EDGE OF BRIDGE

Effectiveness(5): EFFECTIVE

Obstructions(6): NONE NOTED

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): SAND AND SANDY SILT

Channel Bank Material(8): SAND AND SANDY SILT

Channel Bank Cover(9): TREES AND SHRUBS

Floodplain Width(10): APPROX. 1000'

Floodplain Cover(11): TREES AND SHRUBS

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): SLIGHT CHANCE TO MIGRATE EAST TOWARD EB1

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

EB1	EB2										
31.5	39.5										

Comparison of DSE to Hydraulics Unit theoretical scour:

The Geotechnical Engineering Unit and the Hydraulics Unit agree the design scour elevations should be raised 9.5' at EB1 and 17' at EB2 from the theoretical scour elevation proposed in the Hydraulics report dated 6-15-09

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 6,
"Soil Test Results",
for samples:
Channel Bed: SS-2, SS-9
Channel Bank: SS-2, SS-9

Reported by:

Tyler Bottoms

Date: 10/7/2009

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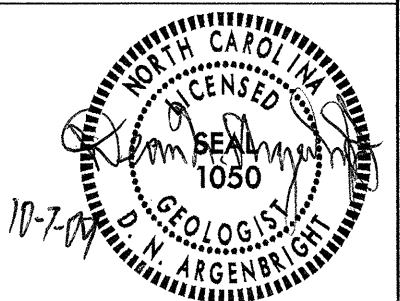
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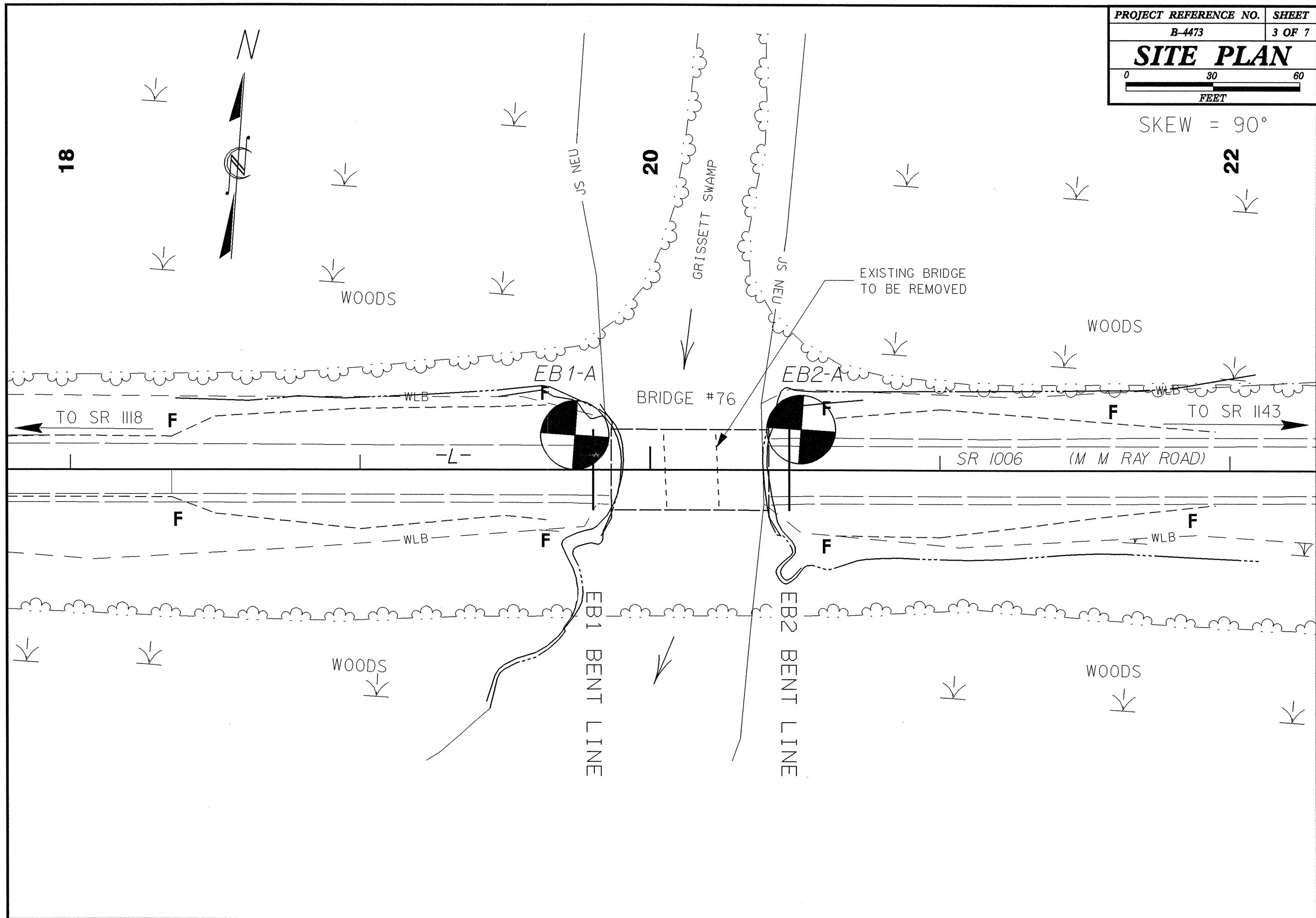
PROJECT REFERENCE NO. B-4473 SHEET NO. 2 OF 7

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

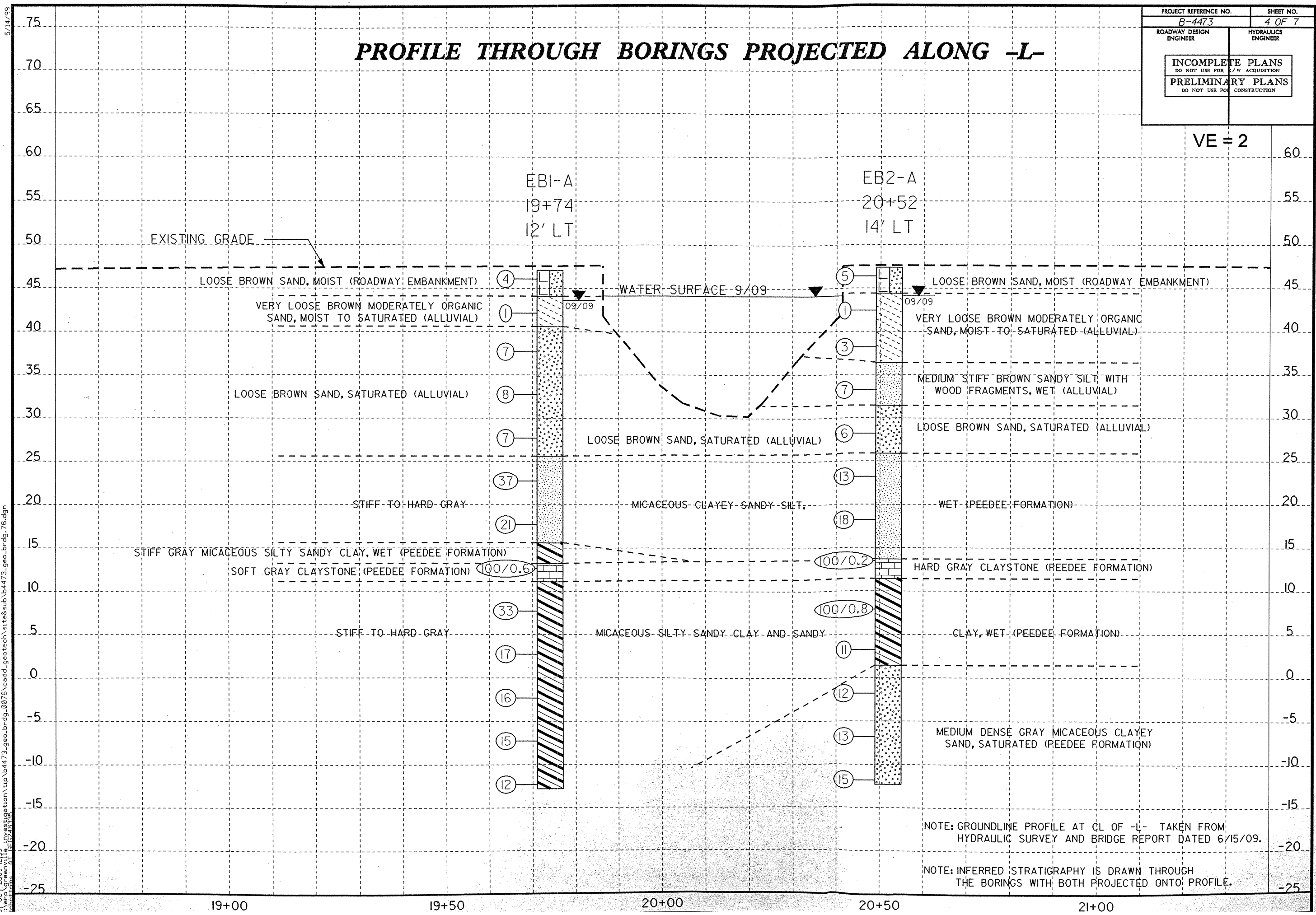
SOIL DESCRIPTION											GRADATION											ROCK DESCRIPTION											TERMS AND DEFINITIONS										
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (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, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD 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) 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.</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)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>											<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC%) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT) - 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 (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. 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 INTRODUCED 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.</p>										
<p>GENERAL CLASS. GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS</p>											<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>											<p>WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>											<p>WEATHERING FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE</p>										
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p>											<p>MINERALOGICAL COMPOSITION</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>GROUP CLASS. A-1, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-3, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7</p>											<p>COMPRESSIBILITY SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>SYMBOL</p>											<p>PERCENTAGE OF MATERIAL ORGANIC MATERIAL TRACE OF ORGANIC MATTER LITTLE ORGANIC MATTER MODERATELY ORGANIC HIGHLY ORGANIC</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>% PASSING # 10 # 40 # 200</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>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>LIQUID LIMIT PLASTIC INDEX</p>											<p>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</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>USUAL TYPES OF MAJOR MATERIALS</p>											<p>ROCK HARDNESS VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>GEN. RATINGS AS A SUBGRADE</p>											<p>ABBREVIATIONS 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</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>											<p>EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM)</p>											<p>FRACTURE SPACING TERM SPACING</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)</p>											<p>BEDDING TERM THICKNESS</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p>											<p>INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</p>											<p>INDURATION</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>PLASTICITY NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY</p>											<p>INDURATION</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										
<p>COLOR DESCRIPTORS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>											<p>INDURATION</p>											<p>WEATHERING</p>											<p>TERMS AND DEFINITIONS</p>										

SKEW = 90°



PROFILE THROUGH BORINGS PROJECTED ALONG -L-

VE = 2



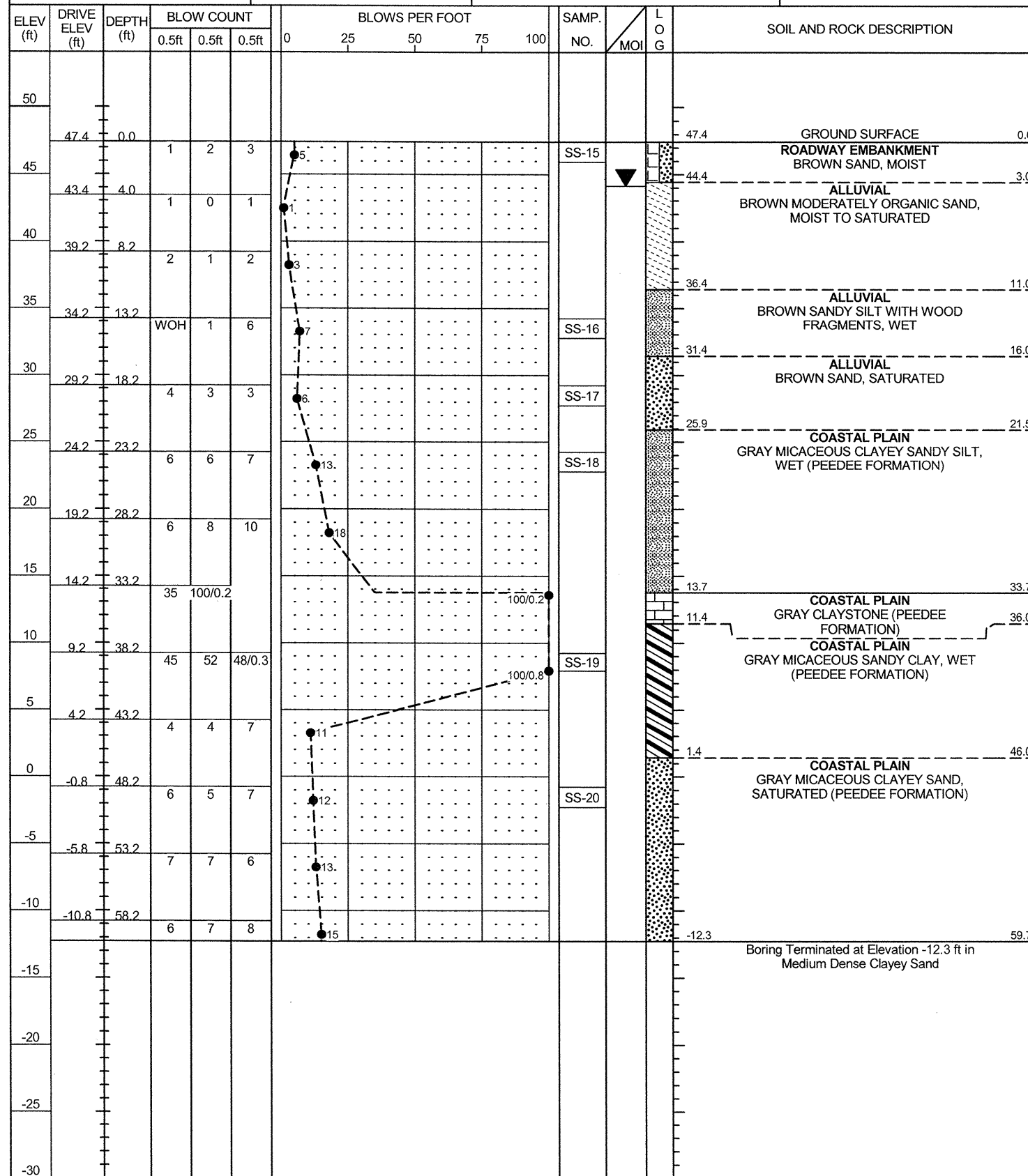
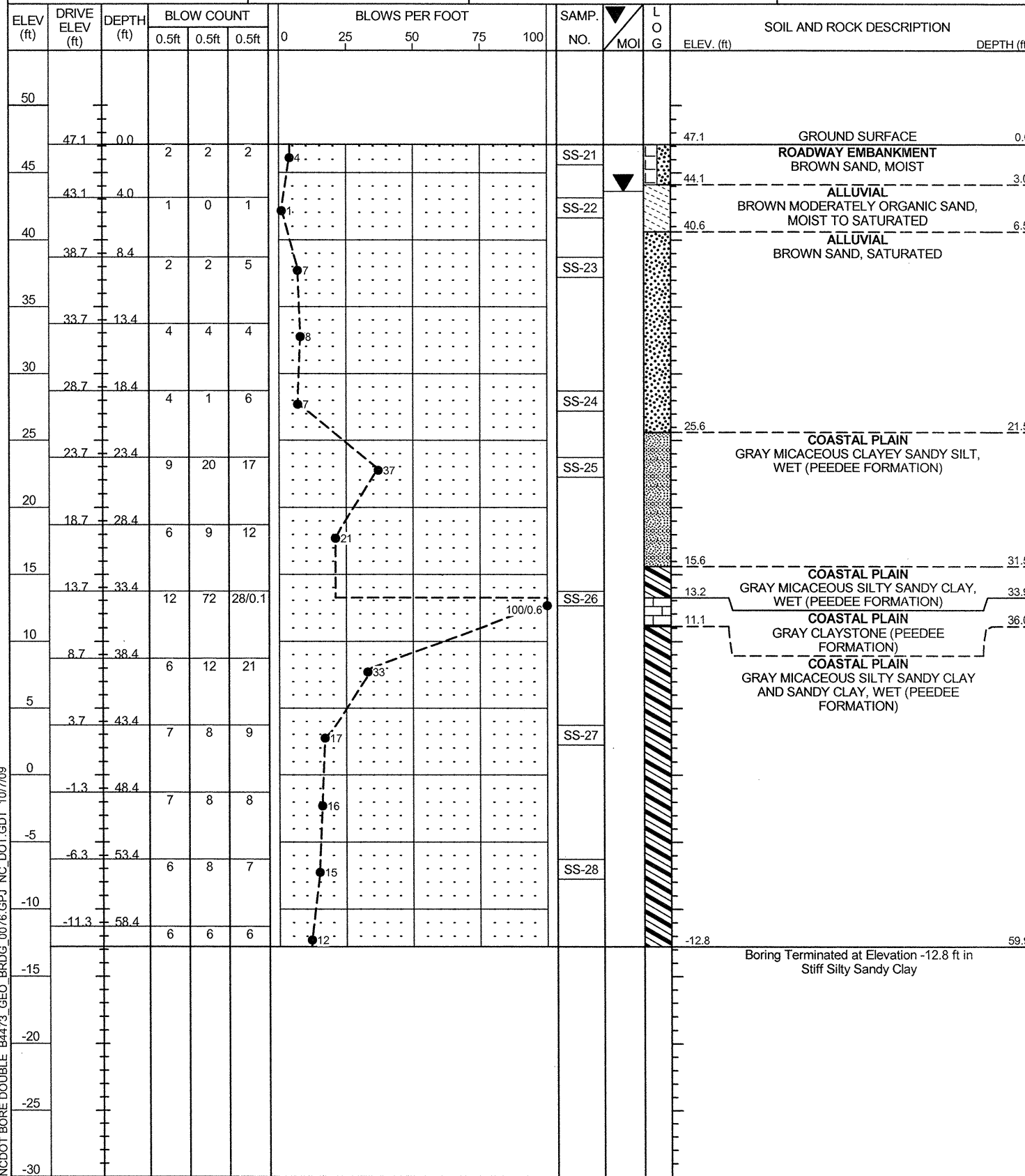
NOTE: GROUNDLINE PROFILE AT CL OF -L- TAKEN FROM HYDRAULIC SURVEY AND BRIDGE REPORT DATED 6/15/09.

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

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PROJECT NO. 33721.1.1	ID. B-4473	COUNTY COLUMBUS	GEOLOGIST Bottoms, T. C.
SITE DESCRIPTION BRIDGE NO. 76 -L- (SR 1006) OVER GRISSETT SWAMP			GROUND WTR (ft)
BORING NO. EB1-A	STATION 19+74	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 47.1 ft	TOTAL DEPTH 59.9 ft	NORTHING 138,535	EASTING 2,072,778
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/15/09	COMP. DATE 09/15/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 33.9 ft

PROJECT NO. 33721.1.1	ID. B-4473	COUNTY COLUMBUS	GEOLOGIST Bottoms, T. C.
SITE DESCRIPTION BRIDGE NO. 76 -L- (SR 1006) OVER GRISSETT SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 20+52	OFFSET 14ft LT	ALIGNMENT -L-
COLLAR ELEV. 47.4 ft	TOTAL DEPTH 59.7 ft	NORTHING 138,543	EASTING 2,072,856
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 09/15/09	COMP. DATE 09/15/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 33.7 ft



NCDOT BORE DOUBLE B4473_GEO_BRDG_0076.GPJ NC_DOT_GDT_10/7/09

33721.1.1

B-4473

BRIDGE NO. 76 ON SR 1006 OVER GRISSETT SWAMP AT -L- STA. 20+14

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-21	12 LT	19+74	1.0-1.5	A-2-4(0)	20	NP	16.9	70.9	5.2	7.0	99	92	14	-	-
SS-22	12 LT	19+74	4.0-5.5	-	-	-	-	-	-	-	-	-	-	-	5.5
SS-23	12 LT	19+74	8.4-9.9	A-2-4(0)	23	NP	2.9	83.5	8.5	5.0	100	99	17	-	-
SS-24	12 LT	19+74	18.4-19.9	A-2-4(0)	21	NP	10.6	75.9	6.5	7.0	97	94	17	-	-
SS-25	12 LT	19+74	23.4-24.9	A-4(4)	30	8	0.8	50.1	23.0	26.1	100	99	68	-	-
SS-26	12 LT	19+74	33.4-33.9	A-6(6)	28	11	2.0	41.8	24.0	32.2	100	99	71	-	-
SS-27	12 LT	19+74	43.4-44.9	A-6(9)	32	18	7.0	39.4	19.4	34.2	100	98	64	-	-
SS-28	12 LT	19+74	53.4-54.9	A-6(9)	32	16	3.4	39.4	23.0	34.2	100	99	71	-	-

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-15	14 LT	20+52	1.0-1.5	A-2-4(0)	19	NP	18.1	65.3	5.5	11.1	98	91	19	-	-
SS-16	14 LT	20+52	13.2-14.7	A-4(0)	20	1	2.0	67.8	18.1	12.1	100	100	36	-	-
SS-17	14 LT	20+52	18.2-19.7	A-2-4(0)	19	NP	11.5	75.8	5.7	7.0	100	98	16	-	-
SS-18	14 LT	20+52	23.2-24.7	A-4(3)	30	6	0.2	51.5	20.2	28.1	100	100	66	-	-
SS-19	14 LT	20+52	38.2-39.5	A-6(9)	33	19	6.4	38.2	19.2	36.2	99	98	64	-	-
SS-20	14 LT	20+52	48.2-49.7	A-2-4(0)	28	7	10.8	61.0	6.1	22.1	100	98	29	-	-



**FIELD
 SCOUR REPORT**

WBS: 33721.1.1 TIP: B-4473 COUNTY: COLUMBUS

DESCRIPTION(1): BRIDGE NO. 76 ON -L- (SR 1006) OVER GRISSETT SWAMP

EXISTING BRIDGE

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

Bridge No.: 76 Length: 55 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
 Foundation Type: TIMBER PILES

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE NOTED

Interior Bents: NONE NOTED

Channel Bed: NONE NOTED

Channel Bank: NONE NOTED

EXISTING SCOUR PROTECTION

Type(3): WOODEN WING WALLS

Extent(4): 8' OUTSIDE EDGE OF BRIDGE

Effectiveness(5): EFFECTIVE

Obstructions(6): NONE NOTED

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): SAND AND SANDY SILT

Channel Bank Material(8): MODERATLEY ORGANIC SAND

Channel Bank Cover(9): TREES AND SHRUBS

Floodplain Width(10): APPROX. 1000'

Floodplain Cover(11): TREES AND SHRUBS

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): SLIGHT CHANCE TO MIGRATE EAST TOWARD EB1

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

CHANNEL BED	25.5																		

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Geotechnical Engineering Unit and the Hydraulics Unit agree that the design scour elevations should be raised 28 feet from the theoretical scour elevation proposed in the Hydraulics report dated 6-15-09

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 6,
 "Soil Test Results",
 for samples:
 Channel Bed: SS-16, SS-23
 Channel Bank: SS-22

Reported by: Tyler Bottoms

Date: 10/7/2009