

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B- 4285	1	14

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

STRUCTURE
SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. 33624.1.1 F.A. PROJ. BRZ-1625 (2)
COUNTY SURRY
PROJECT DESCRIPTION BRIDGE 221 OVER PAUL'S CREEK ON
SR 1625

SITE DESCRIPTION _____

CAUTION NOTICE

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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. K. STICKNEY

C. L. SMITH

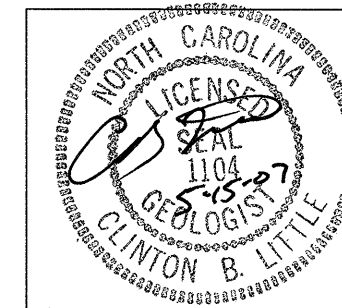
H. K. WISE

INVESTIGATED BY J. E. BEVERLY

CHECKED BY C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE MAY 2007



PROJECT: ID: B-4285

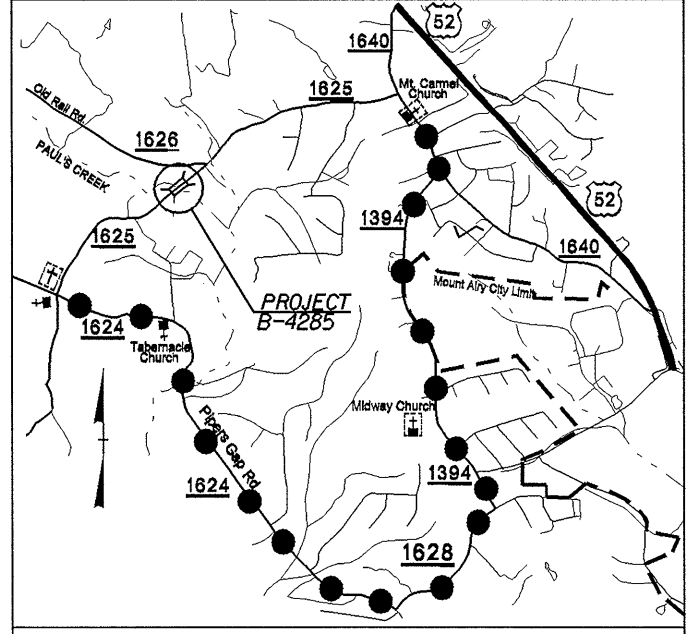
DRAWN BY: C. E. BURRIS

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

05/08/09

See Sheet 1-A For Index of Sheets



VICINITY MAP

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.



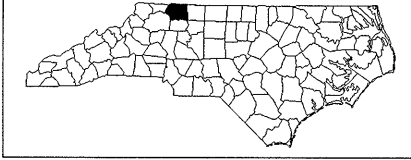
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

SURRY COUNTY

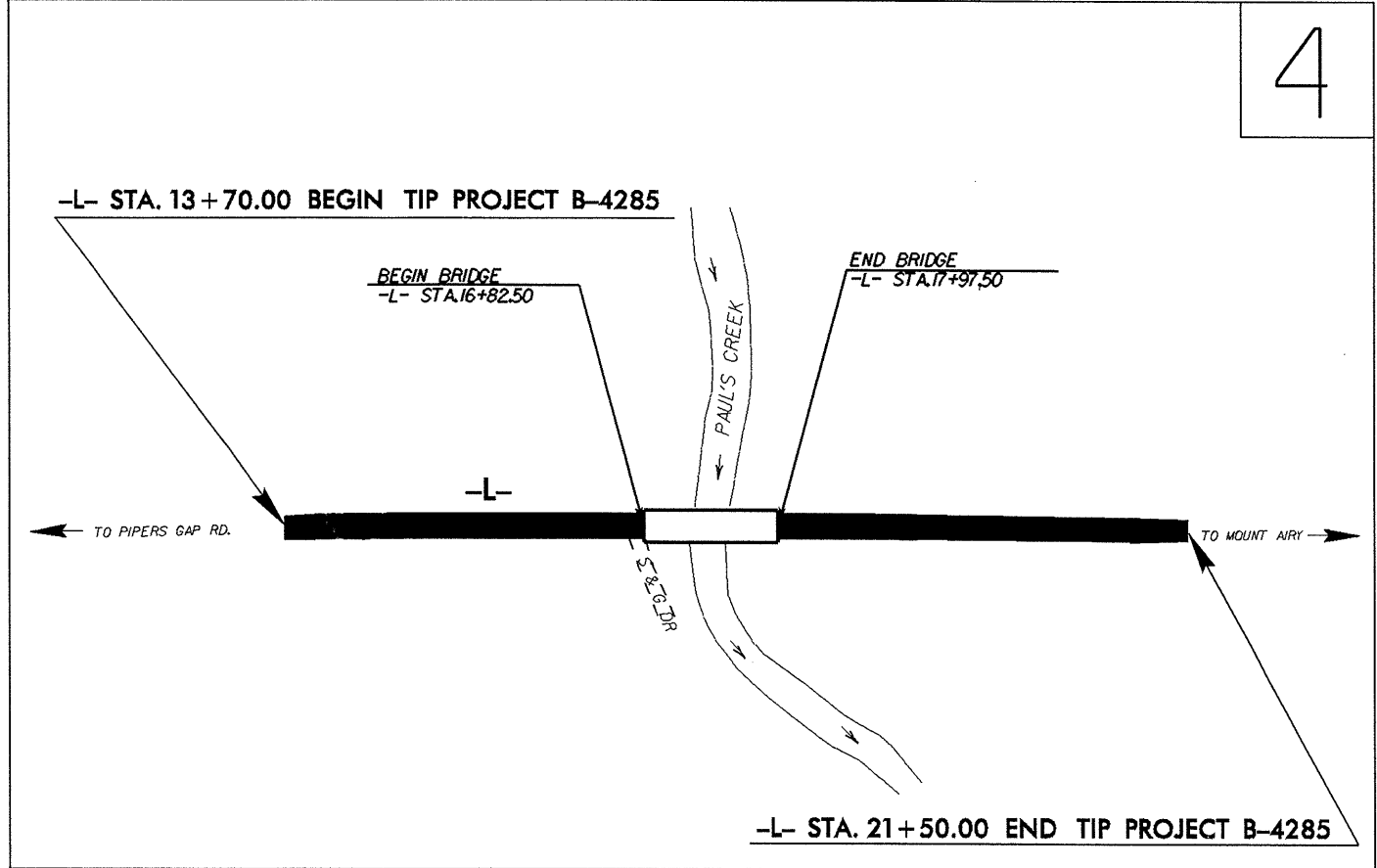
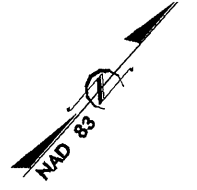
LOCATION: BRIDGE NO. 221 OVER PAUL'S CREEK ON SR 1625

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND STRUCTURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4285	1A	12
STATE PROJ. NO.	P.A. PROJ. NO.	DESCRIPTION	
33624.1.1	BRZ-1625(2)	P.E.	



4



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

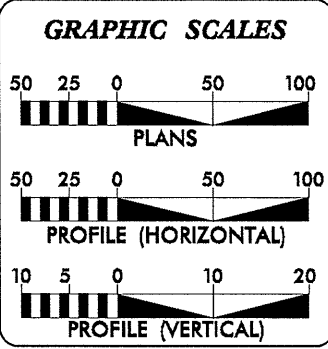
** DESIGN EXCEPTION REQUIRED FOR SAG VERTICAL CURVE.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

22-MAY-2007 08:59
d:\projects\050809\geo_br_dg221.surry\cadd_geotech\site&sub\b4285.geo_rdy_tsh.dgn
cburris AT GEN226157

TIP PROJECT: B-4285

CONTRACT: 0.0000000



DESIGN DATA

ADT 2006 =	1,004
ADT 2025 =	1,400
DHV =	12 %
D =	60 %
T =	4 %*
V =	60 MPH**
* TTST 1%	DUAL 3%
FUNCTIONAL CLASS = RURAL LOCAL	

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT B-4285	=	0.126 MILES
LENGTH OF STRUCTURE TIP PROJECT B-4285	=	0.022 MILES
TOTAL LENGTH OF TIP PROJECT B-4285	=	0.148 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2002 STANDARD SPECIFICATIONS	
RIGHT OF WAY DATE: APRIL 25, 2007	G.E. BREW, PE PROJECT ENGINEER
LETTING DATE: APRIL 20, 2008	D. WILLIAMS PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER _____ P.E.

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED _____ P.E.
DIVISION ADMINISTRATOR DATE _____

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.	SHEET NO.
B-4285	2

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY 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, HIGHLY PLASTIC, A-7-6</i>	WELL-GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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: NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. 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 SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - 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 REPLACED 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 IN 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.	
COMPRESSIONIBILITY	PERCENTAGE OF MATERIAL	GROUND WATER	
SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▽ STATIC WATER LEVEL AFTER 24 HOURS ▽ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA ○ SPRING OR SEEP	
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	ROCK HARDNESS	
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	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.	
TEXTURE OR GRAIN SIZE	ABBREVIATIONS	FRACTURE SPACING	BEDDING
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	AR - AUGER REFUSAL HI. - HIGHLY BT - BORING TERMINATED MED. - MEDIUM CL - CLAY MICA - MICACEOUS CPT - CONE PENETRATION TEST MOD. - MODERATELY CSE - COARSE NP - NON PLASTIC DMT - DILATOMETER TEST ORG. - ORGANIC DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST e - VOID RATIO SAP. - SAPROLITIC F - FINE SD. - SAND, SANDY FOSS. - FOSSILIFEROUS SL. - SILT, SILTY FRAC. - FRACTURED, FRACTURES SLI. - SLIGHTLY FRAGS. - FRAGMENTS TCR - TRICONE REFUSAL	VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET	TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
SOIL MOISTURE - CORRELATION OF TERMS	EQUIPMENT USED ON SUBJECT PROJECT	INDURATION	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE 2 1/8" TUNG-CARB. CORE BIT HAMMER TYPE: [X] AUTOMATIC [] MANUAL CORE SIZE: [] -B [] -N [] -H HAND TOOLS: [] POST HOLE DIGGER [] HAND AUGER [] SOUNDING ROD [] VANE SHEAR TEST	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: BM NO. 2 RR SPIKE IN BASE OF DUKE POWER POLE (3D14) LEFT OF C/L OF MILLER ROAD -BL- STA. 20+82.67 IT.II' LEFT ELEVATION: 1127.13 FT. NOTES:
PLASTICITY			
NONPLASTIC PLASTICITY INDEX (PI) DRY STRENGTH LOW PLASTICITY 0-5 VERY LOW MED. PLASTICITY 6-15 SLIGHT HIGH PLASTICITY 16-25 MEDIUM 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.			



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY P.O. BOX 25201, RALEIGH, N.C. 27611-5201 LYNDON TIPPETT
GOVERNOR SECRETARY

May 30, 2007

STATE PROJECT: 33624.1.1 (B-4285)
COUNTY: Surry
DESCRIPTION: Bridge No. 221 on SR 1625 over Paul's Creek
(-L- Sta. 17+40)

SUBJECT: Geotechnical Report – Bridge Foundation Investigation

This is a proposed bridge replacement for existing bridge number 221 on SR 1625 over Paul's Creek. The new structure will occupy the same location as the existing structure except on a larger scale. The proposed structure is set at a 90 degree skew angle and is comprised of two spans at 80 and 35 feet respectively. Total bridge width is 33' (out to out).

A total of 5 holes were drilled for this bridge investigation. The 4 end bent holes were originally done back in August of 2006 based on the assumption that the bridge was to be a 110' single span structure. The additional boring at B1-B was performed on 4-25-07 to accommodate the current design with interior bent. Equipment used for this investigation was a CME 550X drill machine, hollow stem augers, NW casing, NXWL and an automatic drop hammer.

Physiography/Geology

The bridge project is located in northern Surry County less than 3 miles from the Virginia State Line. Geologically this site lies in the Alligator Back Formation of the Blue Ridge Belt. This area is underlain by Late Proterozoic age gneiss rock. Weathered versions of this rock were encountered at all boring locations.

Foundation Materials

End Bent 1:

Two borings performed for this bent location encountered up to 13 feet of soft to medium stiff clayey sandy silty (A-4) roadway embankment fill underlain by 2.5 – 2.8 feet of medium dense to dense clayey coarse sandy alluvium (A-1-a) with quartz gravel. Residual soils are encountered below alluvium around elevation 1109.8 feet and consist

of 3.8 to 7.8 feet of very stiff sandy silt (A-4). Weathered rock is encountered at both boring locations. Auger refusal on rock was achieved at the EB1-A boring location. Following is a listing of weathered and crystalline rock elevations at each boring location:

<u>Boring Location</u>	<u>Weathered Rock Elev. (feet)</u>	<u>Crystalline Rock Elev. (ft.)</u>
EB1-A	1,106.2	1,102.4
EB1-B	1,101.8	

Bent 1:

A single boring was performed for the interior bent location. Five separate attempts to obtain the B1-A boring failed due to buried concrete and rocks in this general area. Boring B1-B encountered 9.2 feet of loose coarse sandy alluvium (A-1-a) with gravel overlying 10 feet of hard residual sandy silt (A-4). A thin weathered rock layer was noted at the beginning of the residual layer between elevation 1,106.4 and 1,105.4 feet. Weathered rock of a consistent nature is encountered beginning at elevation 1,096.4 feet and continues for another 20 + feet. Crystalline rock was not encountered at this location.

End Bent 2:

A pair of borings performed at this bent location encountered 9.3 – 9.9 feet of soft to medium stiff silty sandy clayey (A-6) roadway embankment fill underlain by 7 – 7.6 feet of medium dense silty fine to coarse sandy alluvium (A-2-4, A-1-a) with quartz gravel. Residual soil occurs beneath alluvium around elevation 1,106.7 feet and consists of very stiff to hard sandy silt (A-4). A weathered rock seam 3 to 7 feet in thickness is encountered within 2 feet of the residual soil boundary at elevation 1,106.6 feet. Beneath this layer of weathered rock, several more feet of hard residual material is again encountered. Boring EB2-A is terminated in hard residual soil while EB2-B encounters another 3 feet of weathered rock prior to auger refusal on crystalline rock at elevation 1,094.2 feet.

Groundwater

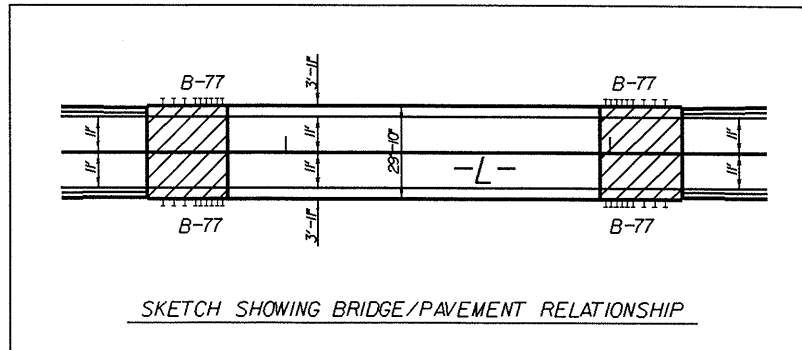
Based on groundwater measurements taken at boring locations and the normal creek surface elevation the static groundwater elevation across the bridge site was determined to be around elevation 1,112 feet.

Respectfully submitted,

J.E. Beverly, Project Geologic Engineer

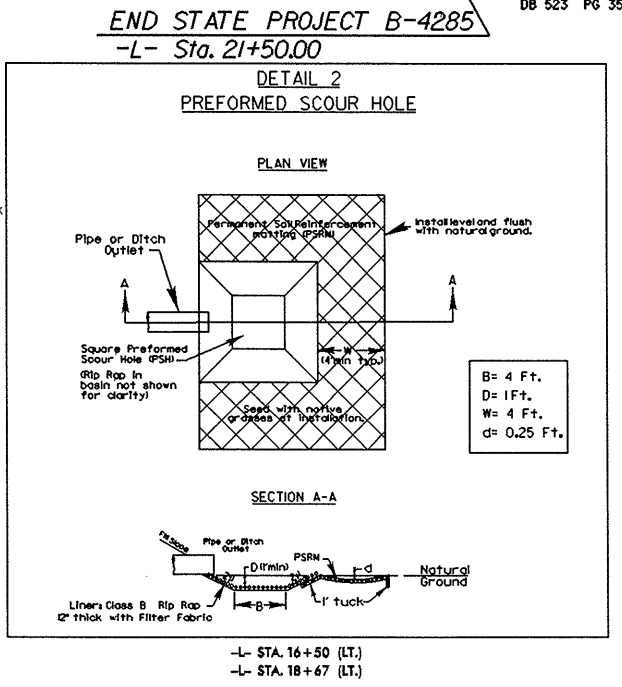
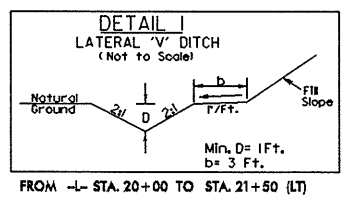
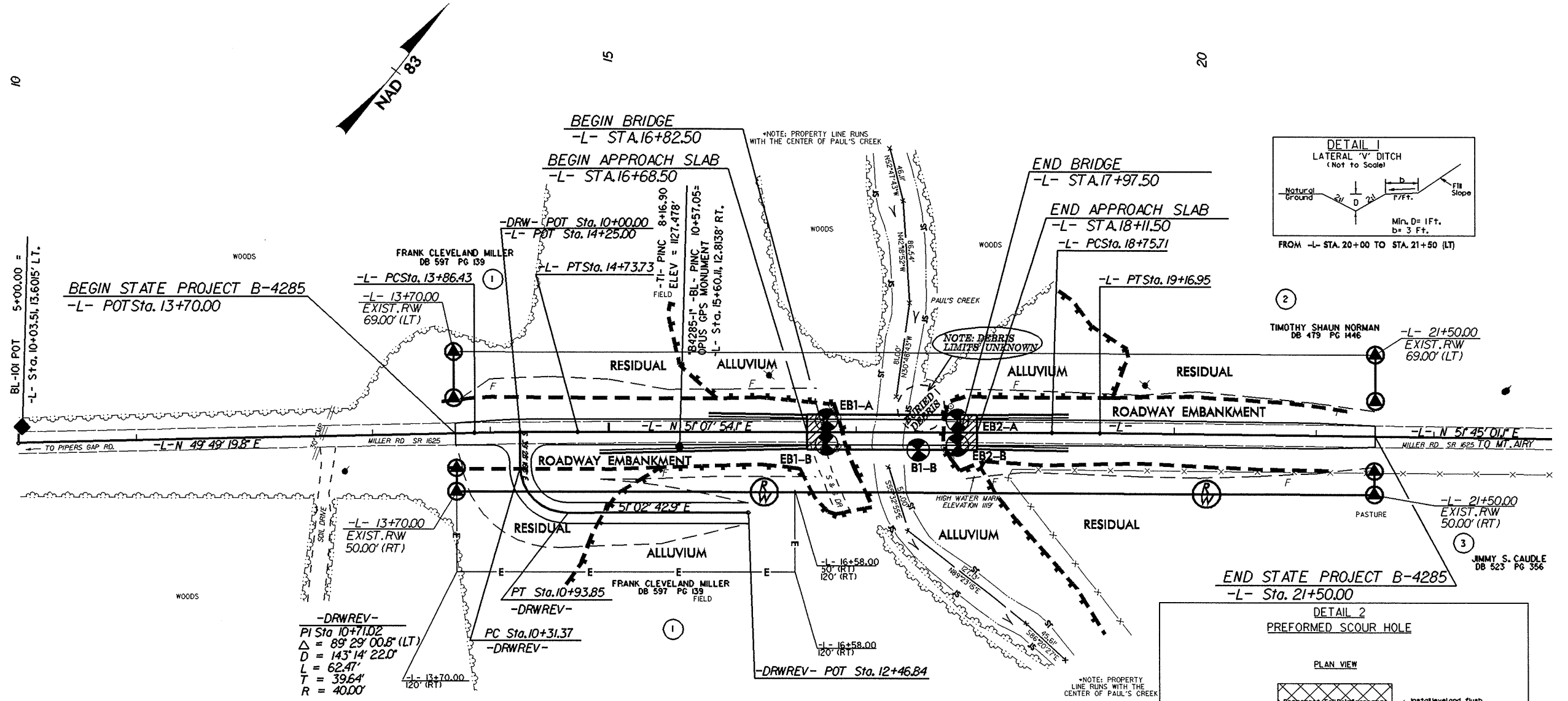
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PROJECT REFERENCE NO. B-4285	SHEET NO. 4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



SEE SHEET NO.5 FOR PROFILE

REVISIONS



-L-	-L-
PI Sta 14+30.08	PI Sta 18+96.33
$\Delta = 1' 18' 34.3'' (RT)$	$\Delta = 0' 37' 07.0'' (RT)$
$D = 1' 30' 00.0''$	$D = 1' 30' 00.0''$
$L = 87.30'$	$L = 41.24'$
$T = 43.65'$	$T = 20.62'$
$R = 3,819.72'$	$R = 3,819.72'$

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PROJECT REFERENCE NO. B-4285	SHEET NO. 5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

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-4	10.5 RT	16+85	19.10 - 20.10	A-4(0)	37	NP	11.9	63.2	20.8	4.0	100	97	41		
SS-5	11.0 RT	17+85	4.30 - 5.30	A-8(6)	39	15	14.9	34.2	14.6	36.3	99	91	57		
SS-6	11.0 RT	17+95	9.30 - 10.30	A-2-4(0)	26	NP	15.1	61.8	13.0	10.1	91	85	30		
SS-7	11.0 RT	17+95	14.30 - 15.30	A-1-a(0)	24	NP	58.6	29.4	8.0	4.0	39	20	5		
SS-8	11.0 RT	17+95	24.30 - 25.30	A-4(0)	36	NP	11.1	64.9	20.0	4.0	100	97	39		
SS-1A	15.2 RT	17+62	4.70 - 5.70	A-1-a(0)	22	NP	73.4	21.3	3.2	2.0	27	11	2		
SS-2A	15.2 RT	17+62	9.20 - 10.05	A-4(0)	30	NP	11.4	63.3	23.3	2.0	100	97	39		
SS-3A	15.2 RT	17+62	14.30 - 15.30	A-4(0)	33	NP	7.90	67.5	22.6	2.0	100	98	42		

BM NO.1 RR SPIKE IN BASE OF POWER
 POLE RIGHT OF EXISTING CL OF MILLER
 ROAD. -BL- STA. 3+41.75 41.06' RIGHT
 ELEV. 1210.34'

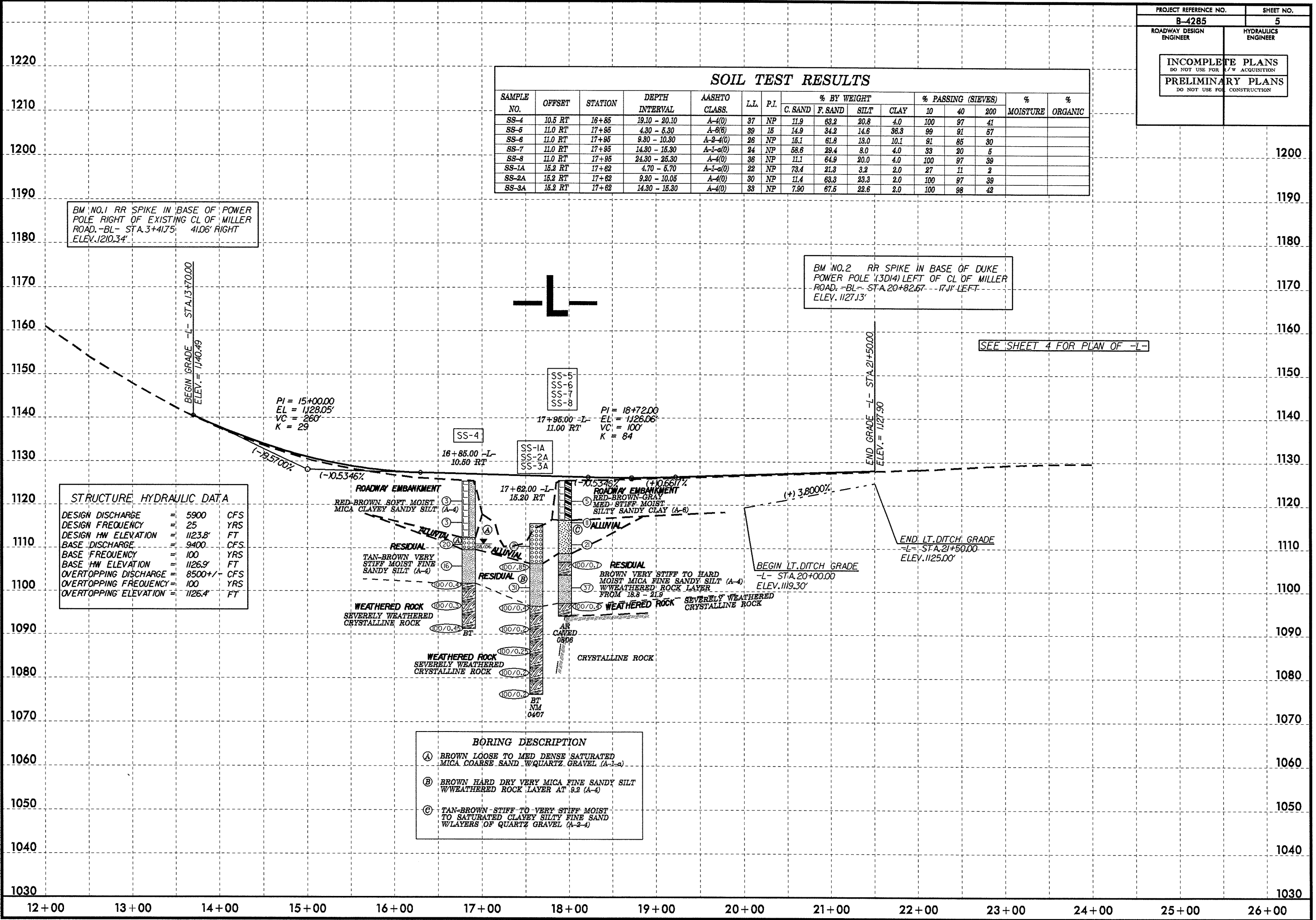
BM NO.2 RR SPIKE IN BASE OF DUKE
 POWER POLE (3DI4) LEFT OF CL OF MILLER
 ROAD. -BL- STA. 20+82.67 -17.11' LEFT
 ELEV. 1127.13'

STRUCTURE HYDRAULIC DATA

DESIGN DISCHARGE	=	5900	CFS
DESIGN FREQUENCY	=	25	YRS
DESIGN HW ELEVATION	=	1123.8'	FT
BASE DISCHARGE	=	9400	CFS
BASE FREQUENCY	=	100	YRS
BASE HW ELEVATION	=	1126.9'	FT
OVERTOPPING DISCHARGE	=	8500+/-	CFS
OVERTOPPING FREQUENCY	=	100	YRS
OVERTOPPING ELEVATION	=	1126.4'	FT

BORING DESCRIPTION

- (A) BROWN LOOSE TO MED DENSE SATURATED MICA COARSE SAND W/QUARTZ GRAVEL (A-1-a)
- (B) BROWN HARD DRY VERY MICA FINE SANDY SILT W/WEATHERED ROCK LAYER AT 9.2 (A-4)
- (C) TAN-BROWN STIFF TO VERY STIFF MOIST TO SATURATED CLAYEY SILTY FINE SAND W/LAYERS OF QUARTZ GRAVEL (A-2-4)



SEE SHEET 4 FOR PLAN OF -L-

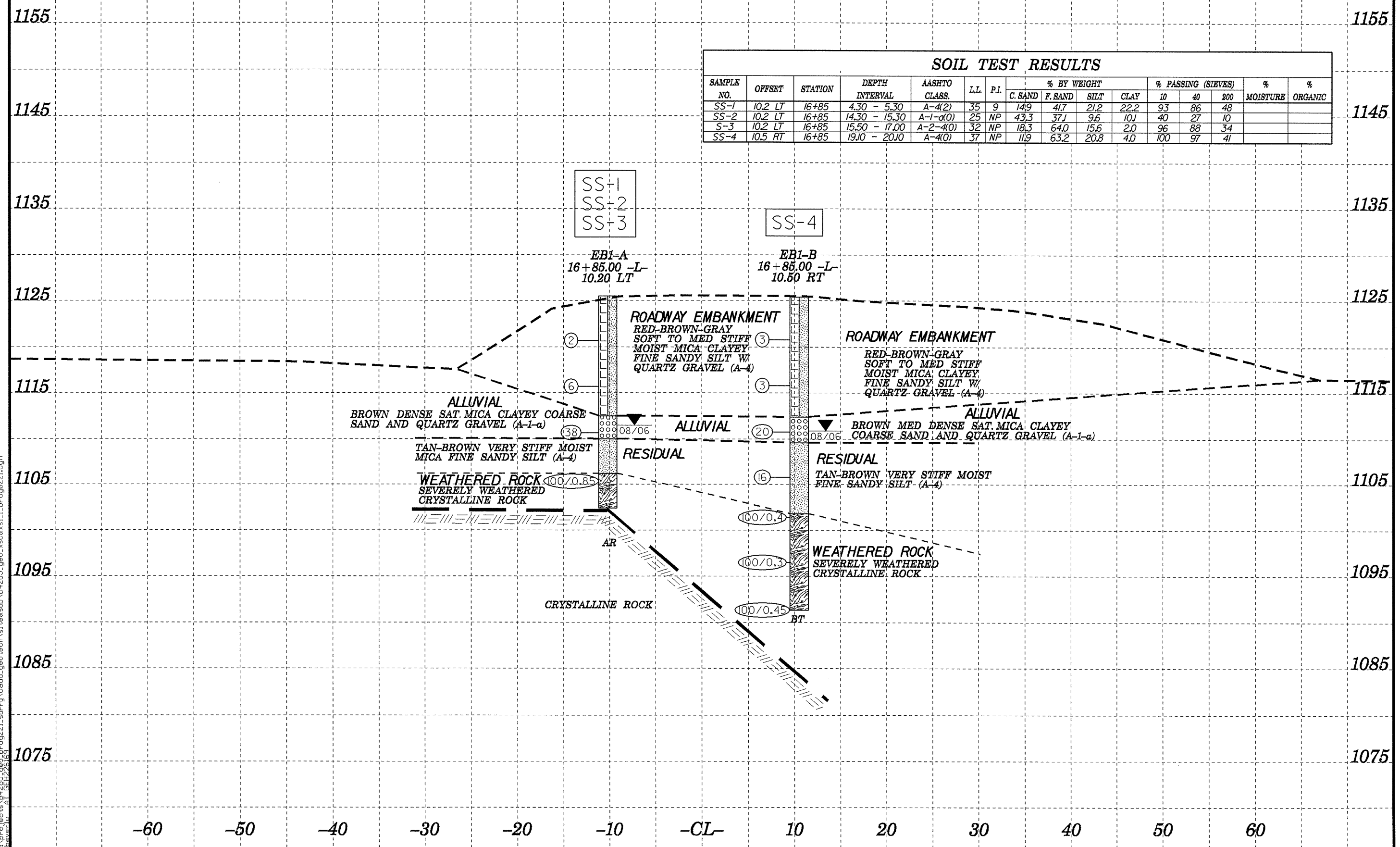
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1190
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1030

12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00

5/28/99



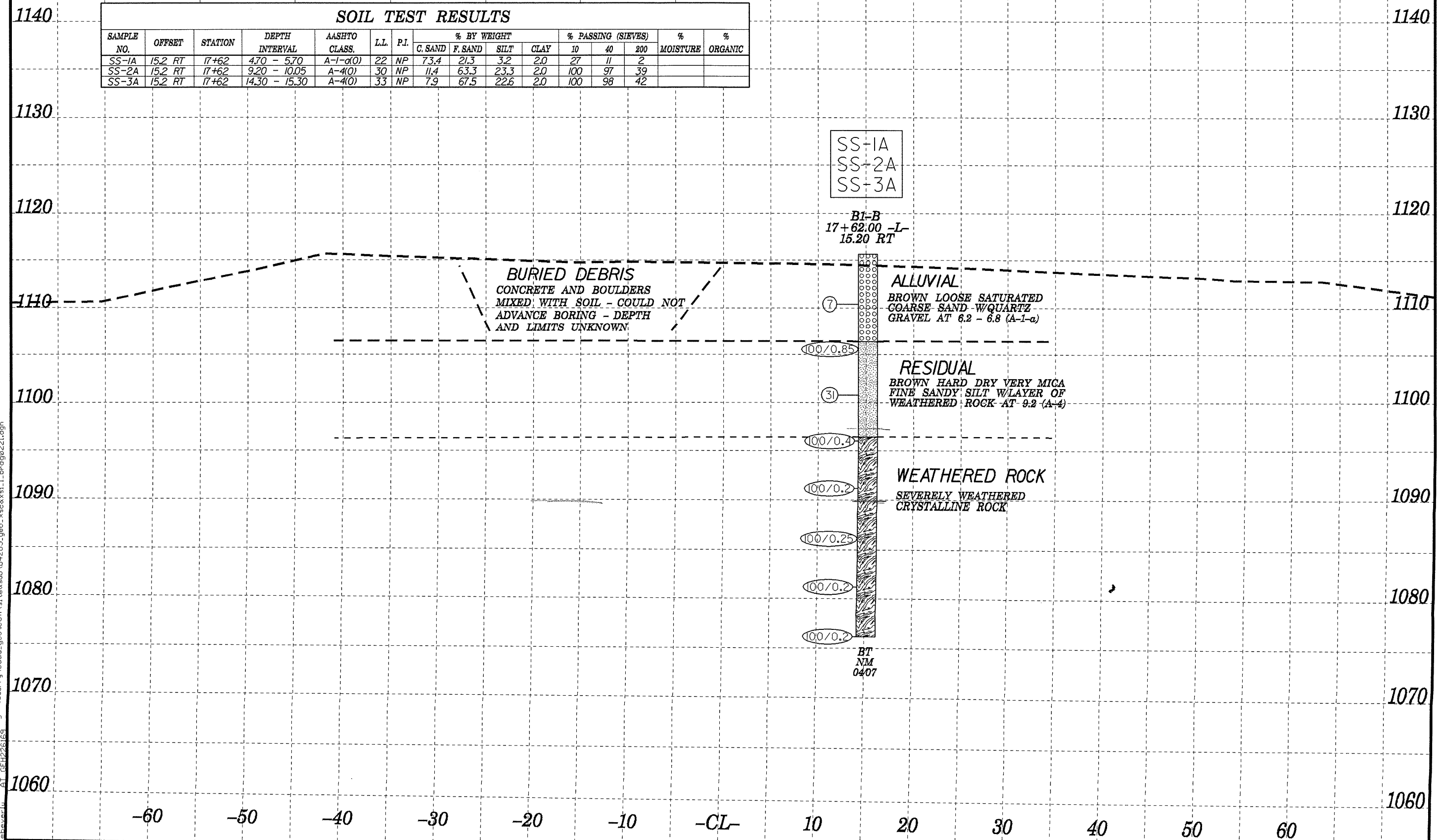
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	10.2 LT	16+85	4.30 - 5.30	A-4(2)	35	9	14.9	41.7	21.2	22.2	93	86	48		
SS-2	10.2 LT	16+85	14.30 - 15.30	A-1-α(0)	25	NP	43.3	37.1	9.6	10.1	40	27	10		
S-3	10.2 LT	16+85	15.50 - 17.00	A-2-4(0)	32	NP	18.3	64.0	15.6	2.0	96	88	34		
SS-4	10.5 RT	16+85	19.10 - 20.10	A-4(0)	37	NP	11.9	63.2	20.8	4.0	100	97	41		



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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1A	15.2 RT	17+62	4.70 - 5.70	A-1-a(0)	22	NP	73.4	21.3	3.2	2.0	27	11	2		
SS-2A	15.2 RT	17+62	9.20 - 10.05	A-4(0)	30	NP	11.4	63.3	23.3	2.0	100	97	39		
SS-3A	15.2 RT	17+62	14.30 - 15.30	A-4(0)	33	NP	7.9	67.5	22.6	2.0	100	98	42		

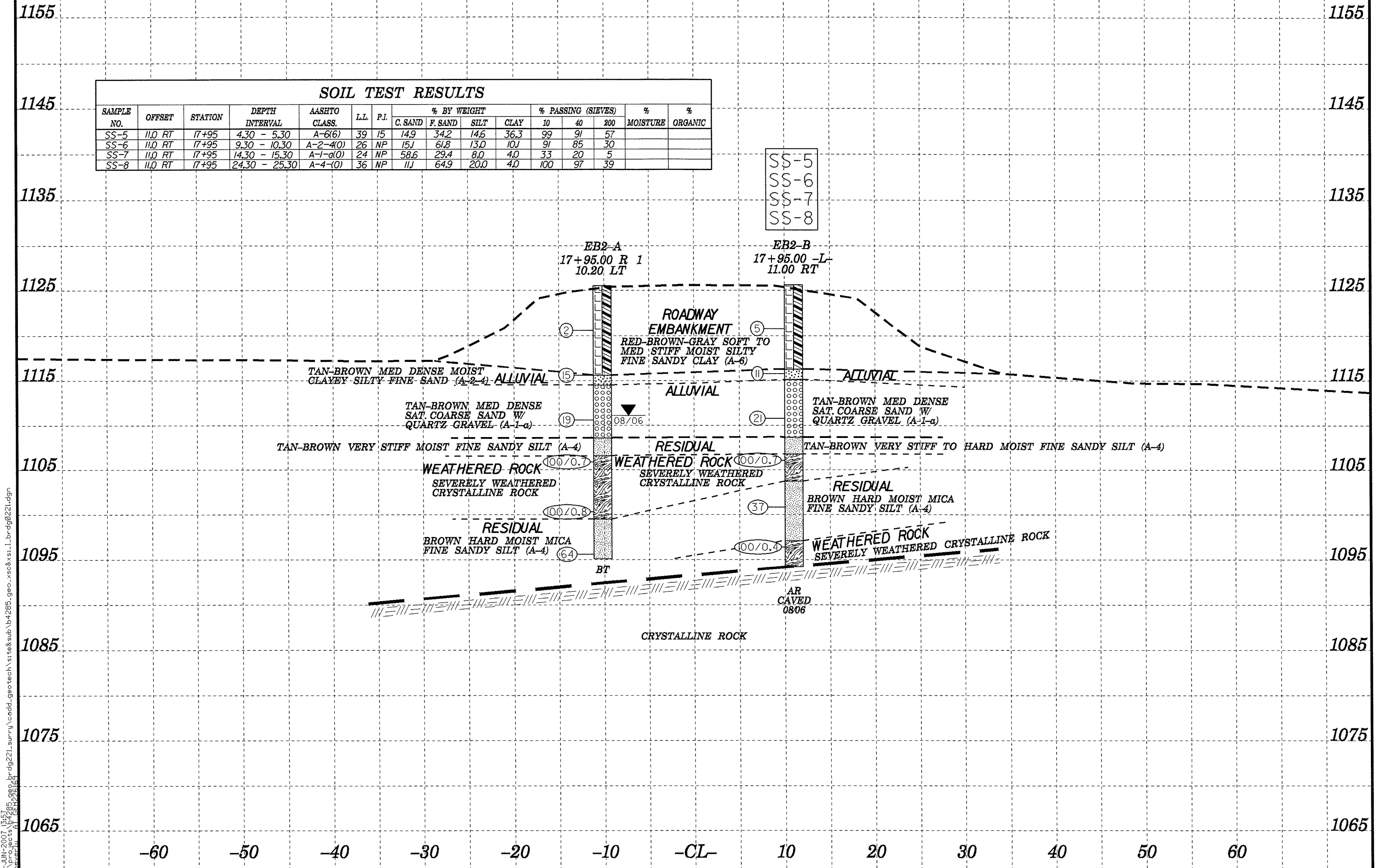


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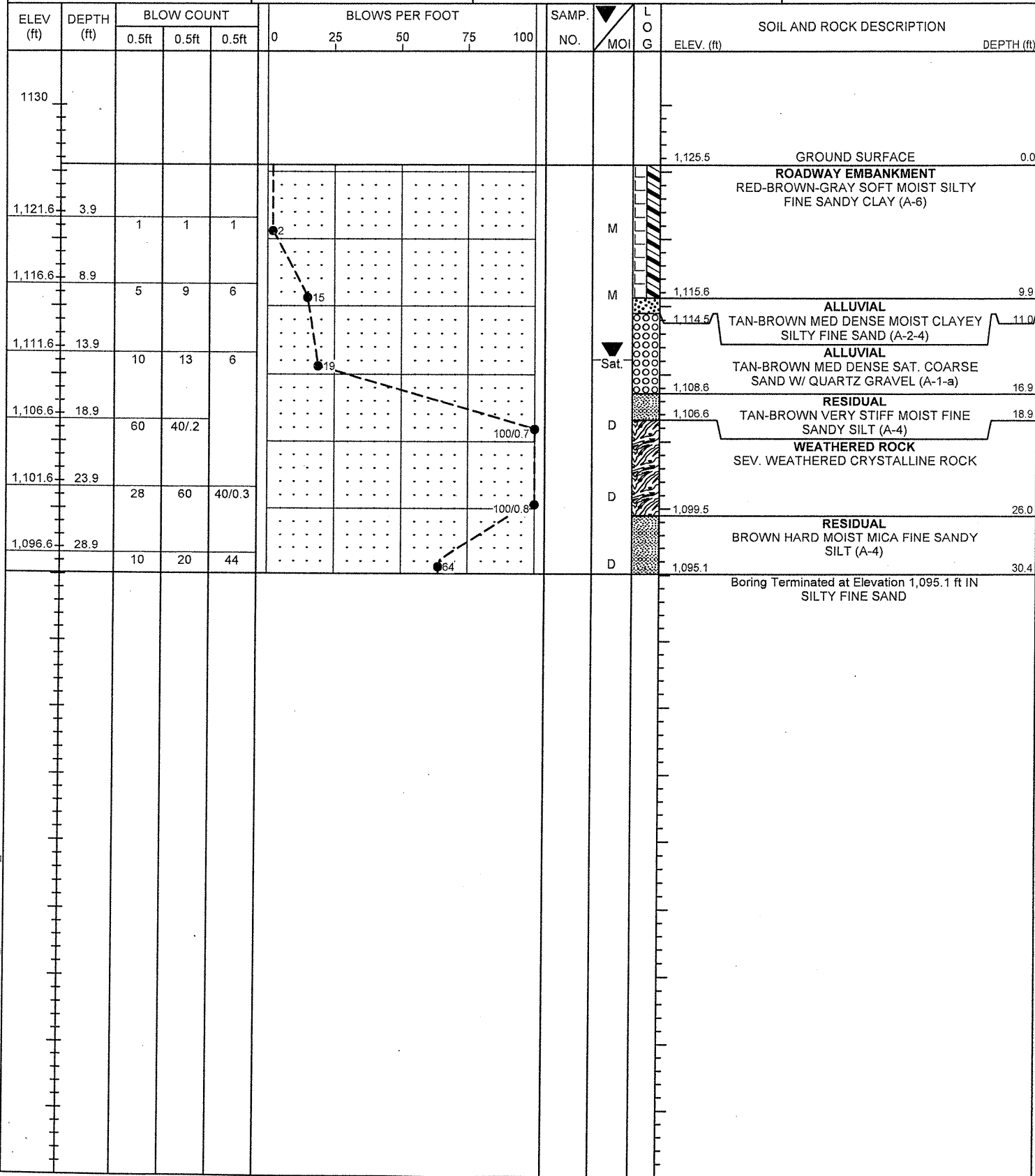
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-5	11.0 RT	17+95	4.30 - 5.30	A-6(6)	39	15	14.9	34.2	14.6	36.3	99	91	57		
SS-6	11.0 RT	17+95	9.30 - 10.30	A-2-4(0)	26	NP	15.1	61.8	13.0	10.1	91	85	30		
SS-7	11.0 RT	17+95	14.30 - 15.30	A-1-a(0)	24	NP	58.6	29.4	8.0	4.0	33	20	5		
SS-8	11.0 RT	17+95	24.30 - 25.30	A-4-(0)	36	NP	11.1	64.9	20.0	4.0	100	97	39		

SS-5
SS-6
SS-7
SS-8

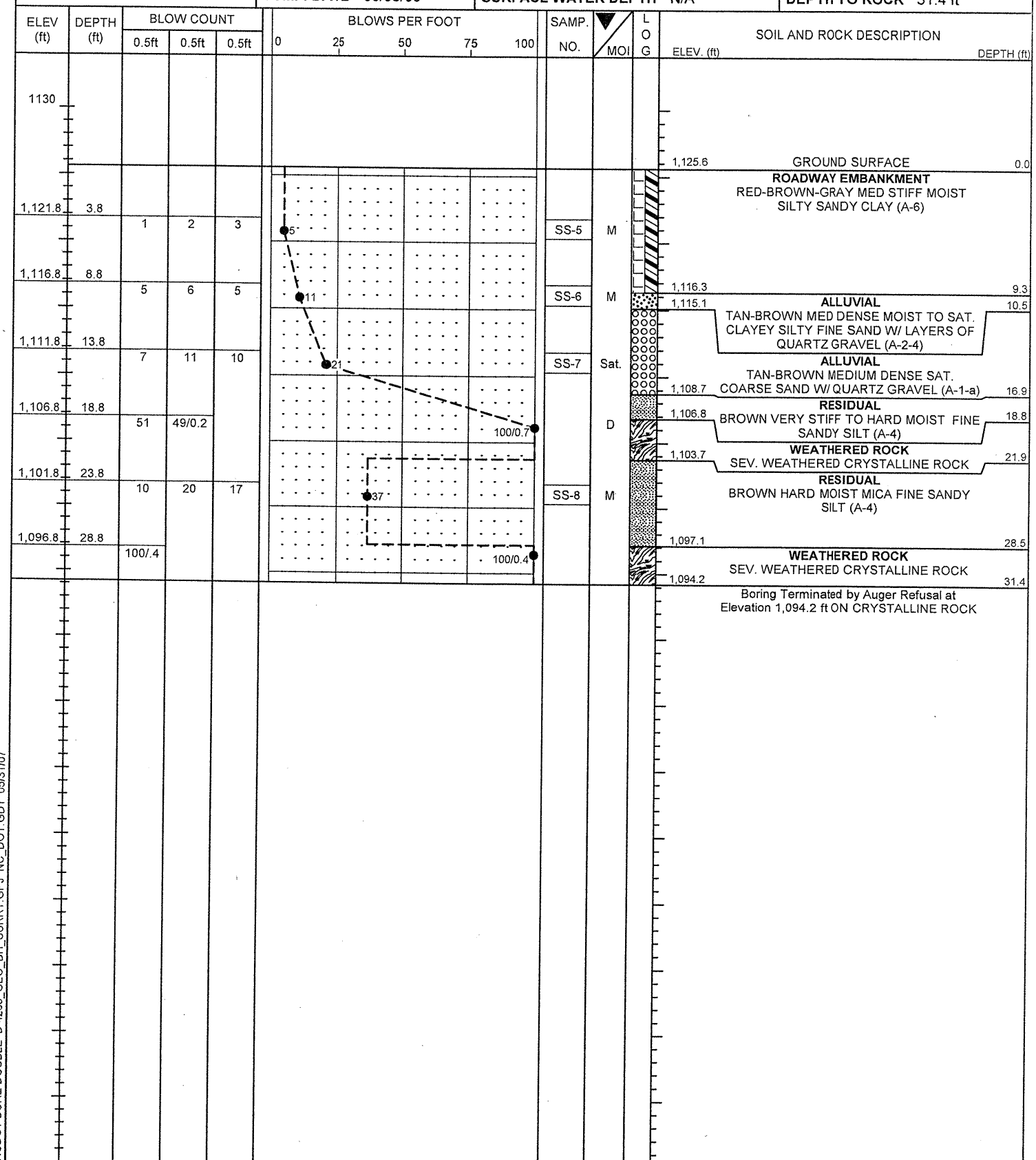


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PROJECT NO. 33624.1.1	ID. B-4285	COUNTY SURRY	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE 221 OVER PAUL'S CREEK ON SR 1625			GROUND WTR (ft)
BORING NO. EB2-A	STATION 17+95	OFFSET 10ft LT	ALIGNMENT -L-
COLLAR ELEV. 1,125.5 ft	TOTAL DEPTH 30.4 ft	NORTHING 1,018,997	EASTING 1,511,174
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 08/03/06	COMP. DATE 08/03/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



PROJECT NO. 33624.1.1	ID. B-4285	COUNTY SURRY	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE 221 OVER PAUL'S CREEK ON SR 1625			GROUND WTR (ft)
BORING NO. EB2-B	STATION 17+95	OFFSET 11ft RT	ALIGNMENT -L-
COLLAR ELEV. 1,125.6 ft	TOTAL DEPTH 31.4 ft	NORTHING 1,018,980	EASTING 1,511,187
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 08/03/06	COMP. DATE 08/03/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 31.4 ft



NCDOT BORE DOUBLE B-4285_GEO_BH_SURRY.GPJ_NC_DOT_GDT_05/31/07

NCDOT BORE DOUBLE B-4285_GEO_BH_SURRY.GPJ_NC_DOT_GDT_05/31/07

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

T. I. P. No. B-4285

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 33624.1.1 County SURRY Owner _____
 Date: Sampled 8/3/06 Received 8/8/06 Reported 8/10/06
 Sampled from BRIDGE By J E BEVERLY
 Submitted by N WAINAINA 1995 Standard Specifications

LOCATION
 732091 TO 732098
 8/11/06

TEST RESULTS

Proj. Sample No.	SS-1	SS-2	S-3	SS-4	SS-5	SS-6
Lab. Sample No.	732091	732092	732093	732094	732095	732096
Retained #4 Sieve %	3	48	-	-	-	5
Passing #10 Sieve %	93	40	96	100	99	91
Passing #40 Sieve %	86	27	88	97	91	85
Passing #200 Sieve %	48	10	34	41	57	30

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	14.9	43.3	18.3	11.9	14.9	15.1
Fine Sand Ret - #270 %	41.7	37.1	64.0	63.2	34.2	61.8
Silt 0.05 - 0.005 mm %	21.2	9.6	15.6	20.8	14.6	13.0
Clay < 0.005 mm %	22.2	10.1	2.0	4.0	36.3	10.1
Passing #40 Sieve %	-	-	-	-	-	-
LOCATION	FB1-A	FB1-A	FB1-A	FB1-B	FB2-B	FB2-B

L. L.	35	25	32	37	39	26
P. I.	9	NP	NP	NP	15	NP
AASHTO Classification	A-4(2)	A-1-a(0)	A-2-4(0)	A-4(0)	A-6(6)	A-2-4(0)
Station	16+85	16+85	16+85	16+85	17+95	17+95
OFFSET	10.2 LT	10.2 LT	10.2 LT	10.5 RT	11.0 RT	11.0 RT
Hole No.	L	L	L	L	L	L
Depth (Ft)	4.30	14.30	15.50	19.10	4.30	9.30
to	5.30	15.30	17.00	20.10	5.30	10.30

cc: J E BEVERLY
 Soils File

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

T. I. P. No. B-4285

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 33624.1.1 County SURRY Owner _____
 Date: Sampled 8/3/06 Received 8/8/06 Reported 8/10/06
 Sampled from BRIDGE By J E BEVERLY
 Submitted by N WAINAINA 1995 Standard Specifications

732091 TO 732098
 8/11/06

TEST RESULTS

Proj. Sample No.	SS-7	SS-8			
Lab. Sample No.	732097	732098			
Retained #4 Sieve %	59	-			
Passing #10 Sieve %	33	100			
Passing #40 Sieve %	20	97			
Passing #200 Sieve %	5	39			

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%					
Coarse Sand Ret - #60 %	58.6	11.1			
Fine Sand Ret - #270 %	29.4	64.9			
Silt 0.05 - 0.005 mm %	8.0	20.0			
Clay < 0.005 mm %	4.0	4.0			
Passing #40 Sieve %	-	-			
LOCATION	FB2-B	FB2-B			

L. L.	24	36			
P. I.	NP	NP			
AASHTO Classification	A-1-a(0)	A-4(0)			
Station	17+95	17+95			
OFFSET	11.0 RT	11.0 RT			
Hole No.	L	L			
Depth (Ft)	14.30	24.30			
to	15.30	25.30			



FIELD SCOUR REPORT

WBS: 33624.1.1 TIP: B-4285 COUNTY: Surry

DESCRIPTION(1): Bridge No. 221 on SR 1625 over Paul's Creek

EXISTING BRIDGE

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

Bridge No.: 221 Length: 90'8" Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 4
 Foundation Type: Timber pile with timber cap, abutment and wingwalls.

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None

Channel Bed: None

Channel Bank: Steep and stable

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): Tress, limbs, branches on upstream side

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): Sandy clay (A-6) Ref. SS-5

Channel Bank Material(8): Sandy clay (A-6) Ref. SS-5

Channel Bank Cover(9): Grass, shrubs, and small trees

Floodplain Width(10): appx. 400' (15+50 - 19+50)

Floodplain Cover(11): Grass, pasture, small trees, crops

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): Slight

Observations and Other Comments: Recent repairs done at B-2 include concrete around timber piles and new wood on wingwalls.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

B1	B2	B3	B4						
1,105									

Comparison of DSE to Hydraulics Unit theoretical scour:
 Raised DSE from Hydraulics Theoretical Scour of 1093.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

Reported by: Stickney

Date: 8/3/2007

B-4285
SURRY COUNTY
BRIDGE 221 OVER PAUL'S CREEK ON SR 1625

PHOTOS

