

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

STRUCTURE
SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. 33425.1.1 (B-4061) F.A. PROJ. BRZ-1727(1)
 COUNTY CATAWBA
 PROJECT DESCRIPTION BRIDGE OVER HAGAN CREEK ON
SR 1727 (BOGGS RD.) BETWEEN SR 1722 AND NC 10

SITE DESCRIPTION BRIDGE #90 ON SR 1727 (BOGGS RD.) OVER
HAGAN CREEK

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. K. STICKNEY

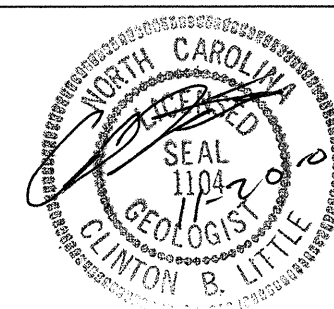
C. L. SMITH

INVESTIGATED BY J. E. BEVERLY

CHECKED BY C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE NOVEMBER, 2009



DRAWN BY: J. E. ROLFSMEYER

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS 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: 33425.1.1 ID: B-4061

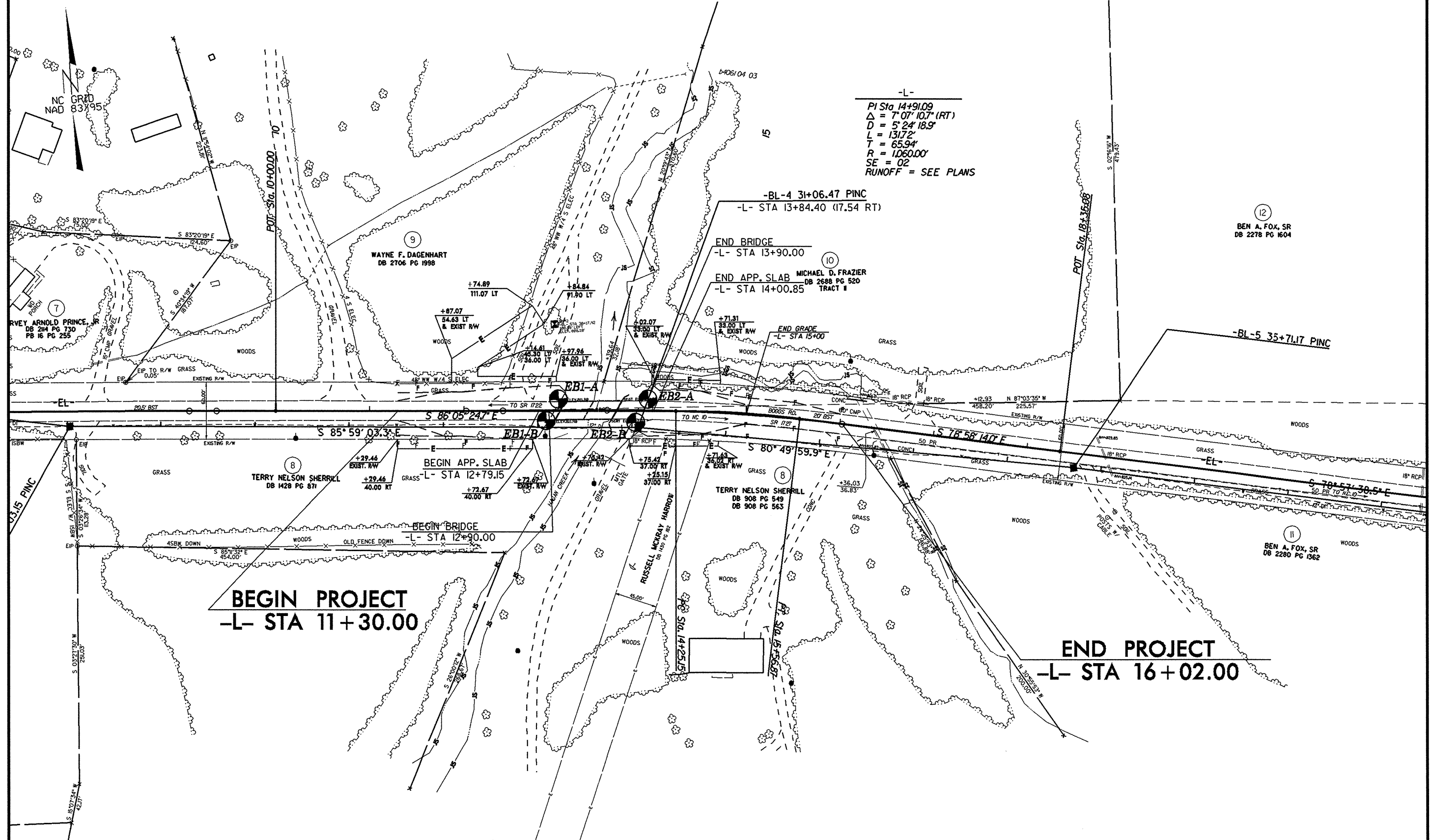
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.
33425.I.I (B-406I) SHEET NO.
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, BRN. 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 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. ADUIFIER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS 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 (SCREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7 SYMBOL [Grid of patterns for soil classification]	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V 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. 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. 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.	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
CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE 4 4 TO 10 LOOSE 10 TO 30 MEDIUM DENSE 30 TO 50 DENSE >50 GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT <2 SOFT 2 TO 4 MEDIUM STIFF 4 TO 8 STIFF 8 TO 15 VERY STIFF 15 TO 30 HARD >30	MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE 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.	ABBEVIATIONS HI. - HIGHLY MED. - MEDIUM MICA. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS # - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT % - DRY UNIT WEIGHT
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053 BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F, SD.) SILT (SL.) CLAY (CL.) GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3	EQUIPMENT USED ON SUBJECT PROJECT 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 *TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	FRACTURE SPACING TERM SPACING 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 BEDDING TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET 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.	SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE 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.
BENCH MARK: BM#2 LOCATED @ BL STA. 30+18, 109' LT N 71080 E 1367982 8" SPIKE IN ROOT OF ALDER TREE ELEVATION: 808.20 FT.			
NOTES:			



-L-
 PI Sta 14+91.09
 $\Delta = 7^{\circ}07'10.7''$ (RT)
 $D = 5^{\circ}24'18.9''$
 $L = 1317.2'$
 $T = 65.94'$
 $R = 1060.00'$
 $SE = 02$
 RUNOFF = SEE PLANS

-BL-4 31+06.47 PINC
 -L- STA 13+84.40 (17.54 RT)

END BRIDGE
 -L- STA 13+90.00
 END APP. SLAB
 -L- STA 14+00.85
 MICHAEL D. FRAZIER
 DB 2688 PG 520
 TRACT #

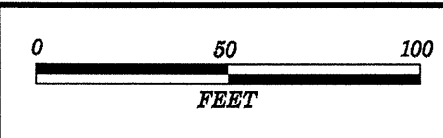
12
 BEN A. FOX, SR
 DB 2278 PG 1604

-BL-5 35+71.17 PINC

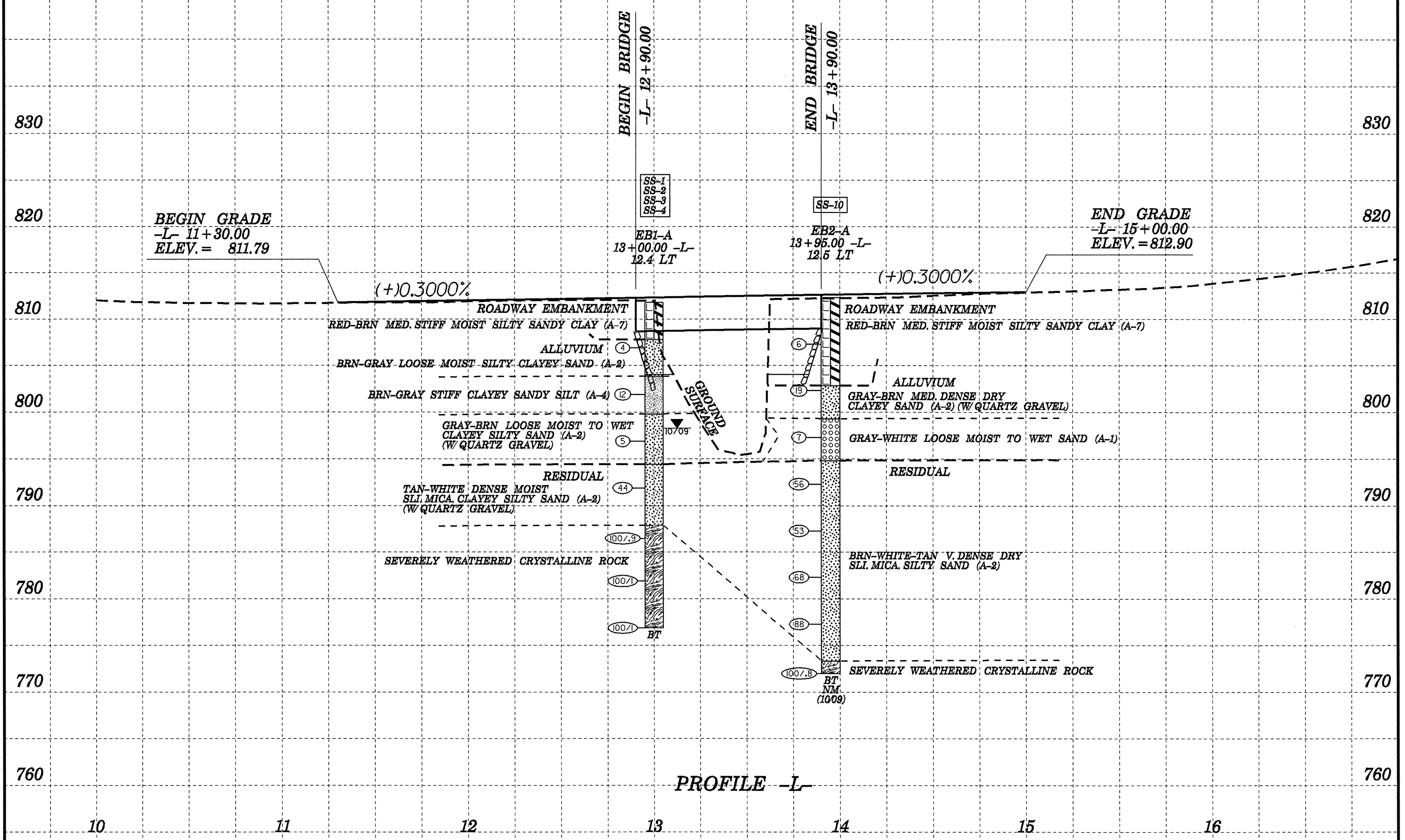
BEGIN PROJECT
 -L- STA 11+30.00

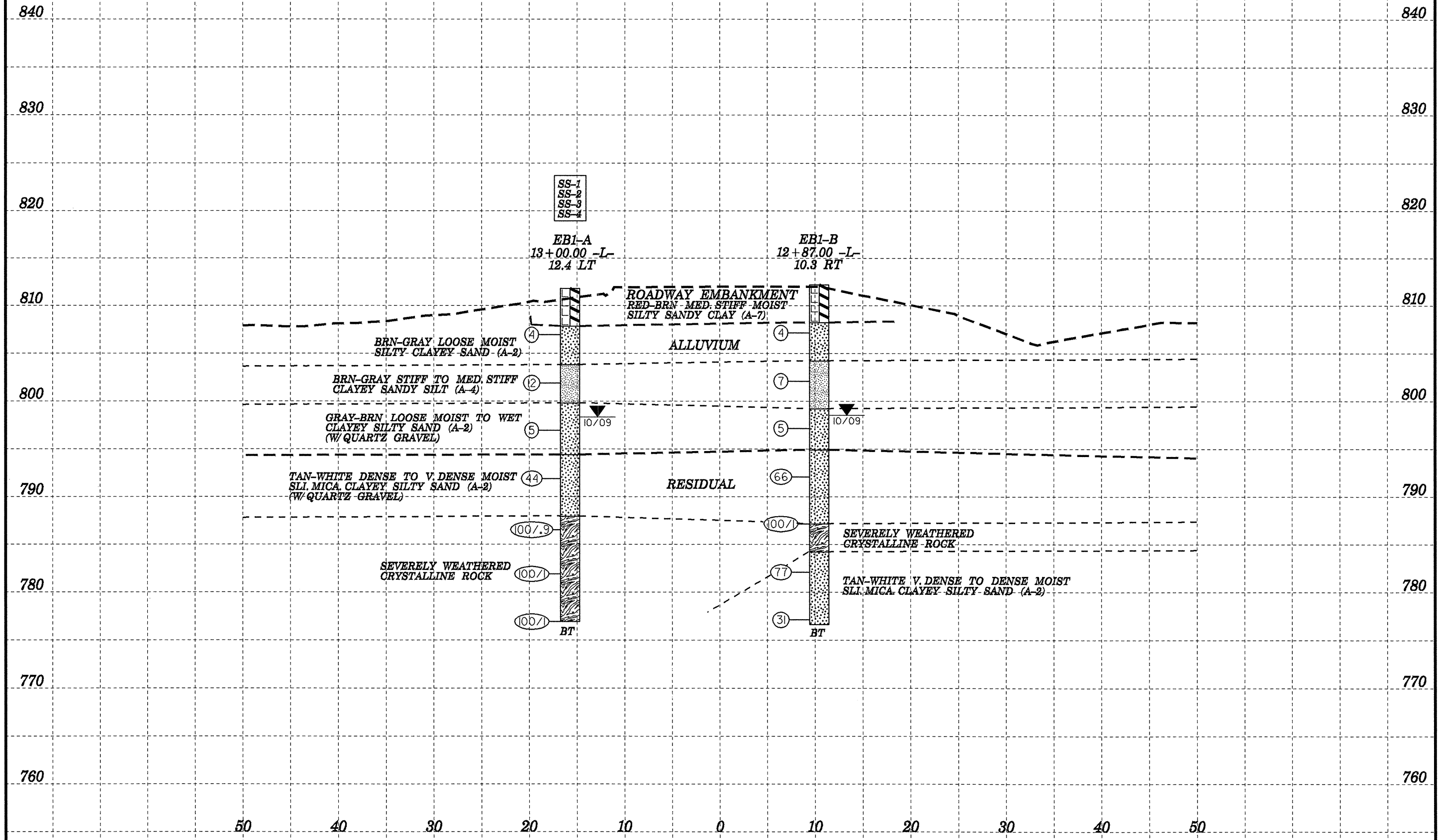
END PROJECT
 -L- STA 16+02.00

11
 BEN A. FOX, SR
 DB 2280 PG 1562



PROJECT REFERENCE NO.	SHEET
33425.1.1 (B-4061)	4
BRIDGE #90 OVER HAGAN CREEK ON SR 1727 (BOGGS RD.) -L- PROFILE	





SS-1
SS-2
SS-3
SS-4

EB1-A
13+00.00 -L-
12.4 LT

EB1-B
12+87.00 -L-
10.3 RT

ROADWAY EMBANKMENT
RED-BRN. MED. STIFF MOIST
SILTY SANDY CLAY (A-7)

ALLUVIUM

RESIDUAL

SEVERELY WEATHERED
CRYSTALLINE ROCK

TAN-WHITE V. DENSE TO DENSE MOIST
SIL. MICA CLAYEY SILTY SAND (A-2)

4

12

5

44

100/9

100/1

100/1

BT

4

7

5

66

100/1

77

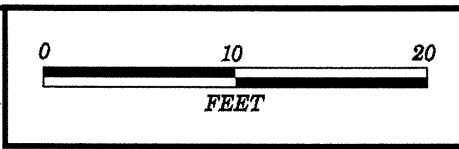
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BT

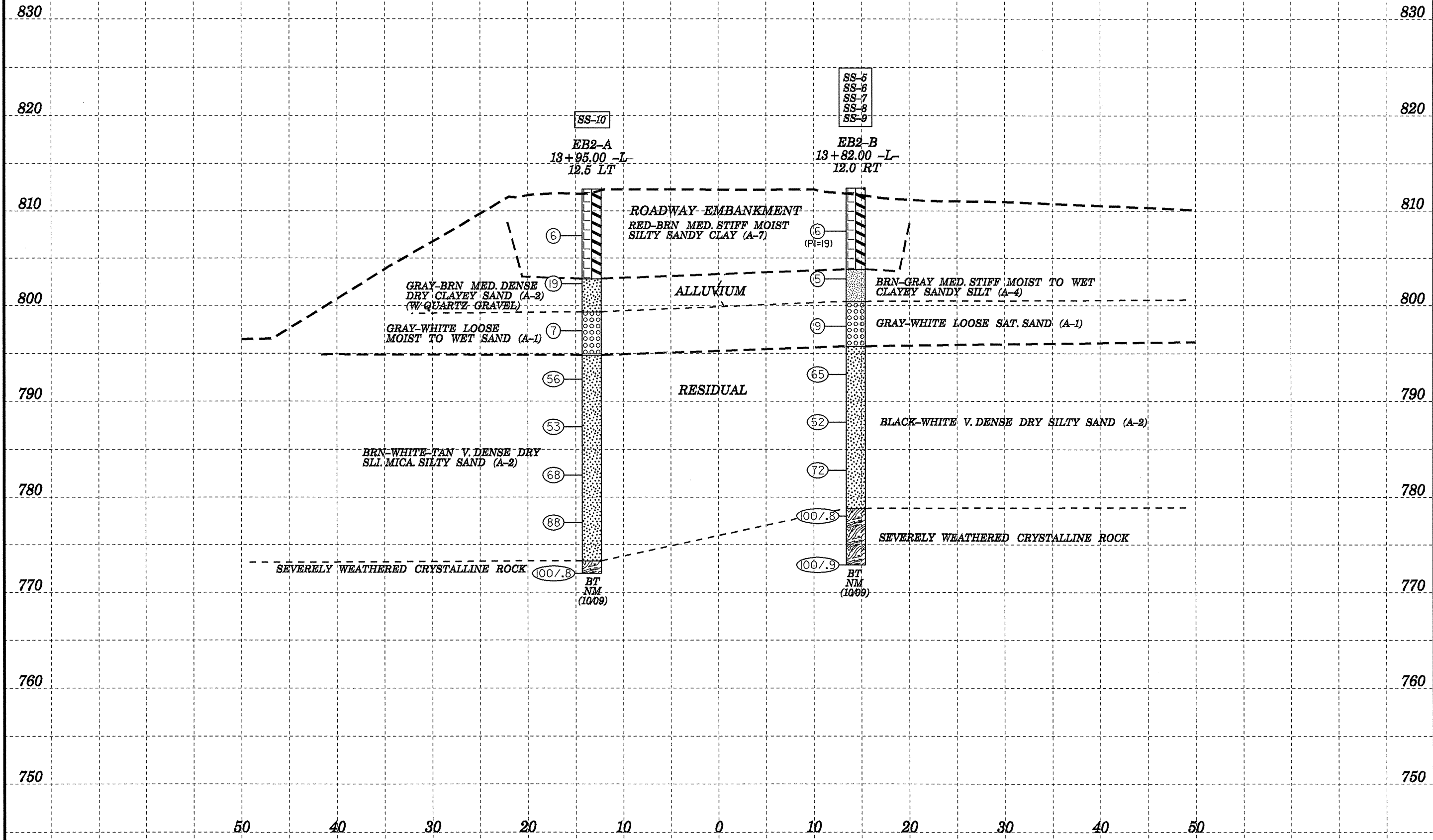
10/09

10/09

50 40 30 20 10 0 10 20 30 40 50



PROJECT REFERENCE NO.	SHEET
33425.1.1 (B-4061)	6
SECTION THRU END BENT TWO	
STA. 13+90.00 -L-	
SKEW=120	



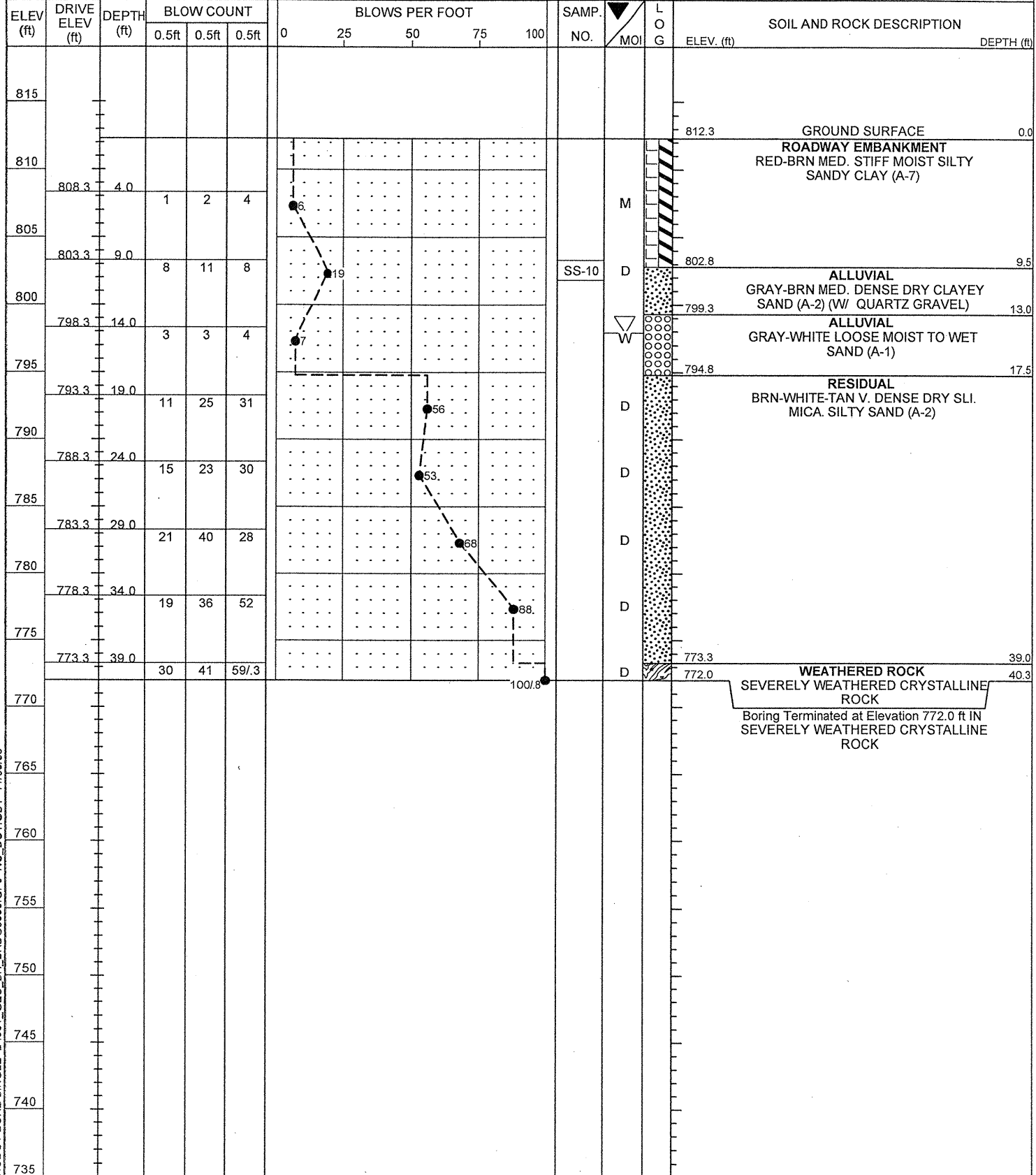
PROJECT NO. 33425.1.1		ID. B-4061		COUNTY CATAWBA		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION BRIDGE #90 OVER HAGAN CREEK ON SR 1727 (BOGGS RD.)							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 13+00		OFFSET 12ft LT		ALIGNMENT -L-										
COLLAR ELEV. 811.8 ft		TOTAL DEPTH 34.9 ft		NORTHING 711,000		EASTING 1,367,981										
DRILL MACHINE CME-550X		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
START DATE 10/07/09		COMP. DATE 10/07/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
815														811.8	GROUND SURFACE	0.0
810														807.8	ROADWAY EMBANKMENT RED-BRN MED. STIFF MOIST SILTY SANDY CLAY (A-7)	4.0
805	807.9	3.9	1	2	2									803.8	ALLUVIAL BRN-GRAY LOOSE MOIST SILTY CLAYEY SAND (A-2)	8.0
800	802.9	8.9	5	6	6									799.8	ALLUVIAL BRN-GRAY STIFF CLAYEY SANDY SILT (A-4)	12.0
795	797.9	13.9	3	2	3									794.4	ALLUVIAL GRAY-BRN LOOSE MOIST TO WET CLAYEY SILTY SAND (A-2) (W/ QUARTZ GRAVEL)	17.4
790	792.9	18.9	11	22	22									787.9	RESIDUAL TAN-WHITE DENSE MOIST SLI. MICA. CLAYEY SILTY SAND (A-2) (W/ QUARTZ GRAVEL)	23.9
785	787.9	23.9	17	37	63/4									100/9	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
780	782.9	28.9	19	44	56/5									100/1		
775	777.9	33.9	30	70/5										100/1		
770															Boring Terminated at Elevation 776.9 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	
765																
760																
755																
750																
745																
740																
735																

NCDOT BORE SINGLE B4061_GEO_BH_BRDG0090.GPJ NC_DOT_GDT 11/09/09

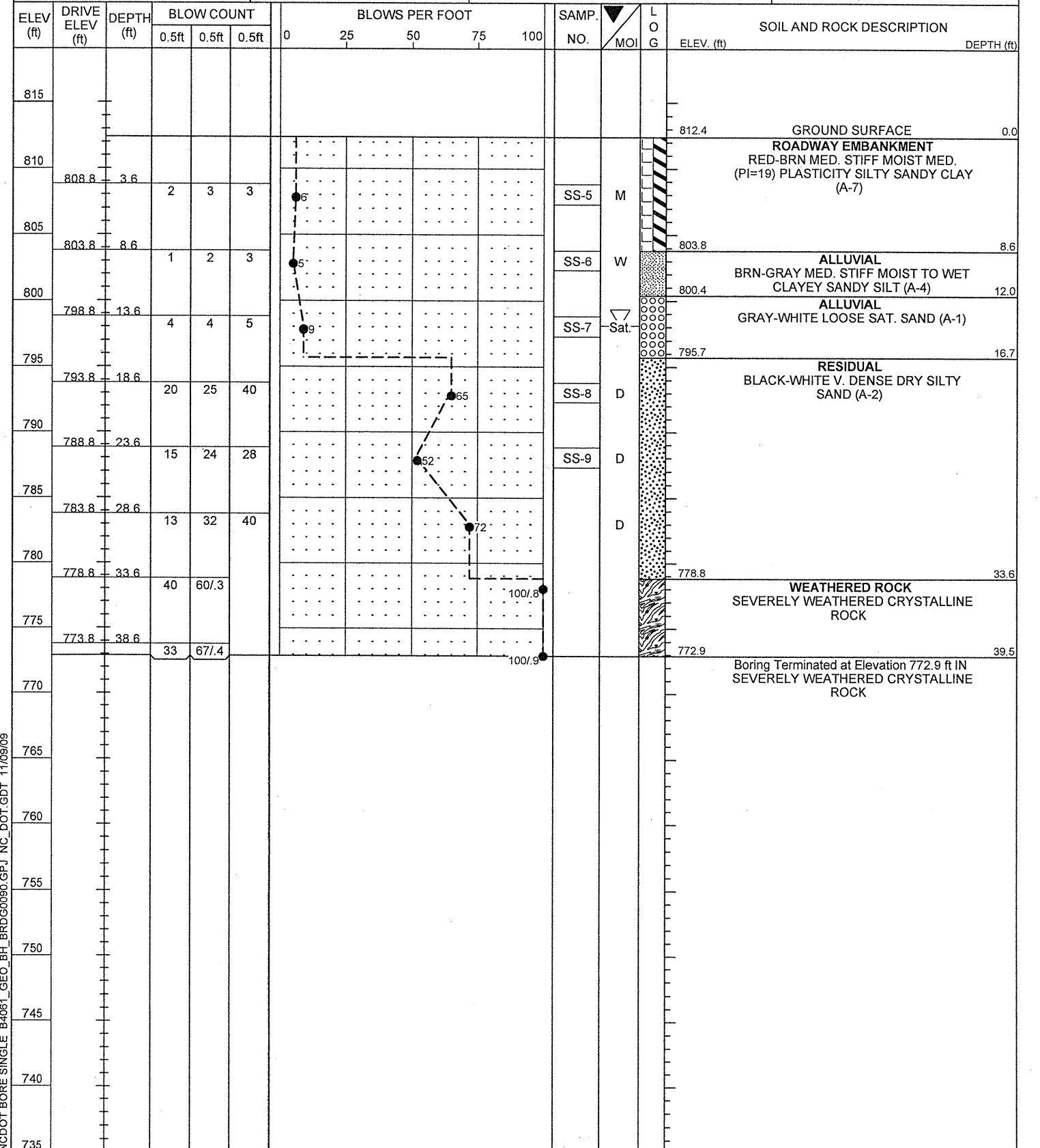
PROJECT NO. 33425.1.1		ID. B-4061		COUNTY CATAWBA		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION BRIDGE #90 OVER HAGAN CREEK ON SR 1727 (BOGGS RD.)							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 12+87		OFFSET 10ft RT		ALIGNMENT -L-										
COLLAR ELEV. 812.2 ft		TOTAL DEPTH 35.6 ft		NORTHING 710,979		EASTING 1,367,966										
DRILL MACHINE CME-550X		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
START DATE 10/07/09		COMP. DATE 10/07/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
815														812.2	GROUND SURFACE	0.0
810														808.2	ROADWAY EMBANKMENT RED-BRN MED. STIFF MOIST SILTY SANDY CLAY (A-7)	4.0
805	808.1	4.1	2	2	2									804.2	ALLUVIAL BRN-GRAY LOOSE MOIST SILTY CLAYEY SAND (A-2)	8.0
800	803.1	9.1	4	3	4									799.2	ALLUVIAL BRN-GRAY MED. STIFF MOIST CLAYEY SANDY SILT (A-4)	13.0
795	798.1	14.1	4	3	2									794.9	ALLUVIAL GRAY-BRN LOOSE MOIST TO WET CLAYEY SILTY SAND (A-2) (W/ QUARTZ GRAVEL)	17.3
790	793.1	19.1	25	34	32									787.1	RESIDUAL TAN-WHITE V. DENSE MOIST SLI. MICA. CLAYEY SILTY SAND (A-2)	25.1
785	788.1	24.1	27	73/5										784.2	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK SEAM	28.0
780	783.1	29.1	23	36	41									776.6	RESIDUAL TAN-WHITE V. DENSE TO DENSE MOIST SLI. MICA. CLAYEY SILTY SAND (A-2)	35.6
775	778.1	34.1	9	11	20										Boring Terminated at Elevation 776.6 ft IN TAN-WHITE DENSE MOIST SLI. MICA. CLAYEY SILTY SAND (A-2)	
770																
765																
760																
755																
750																
745																
740																
735																

NCDOT BORE SINGLE B4061_GEO_BH_BRDG0090.GPJ NC_DOT_GDT 11/09/09

PROJECT NO. 33425.1.1	ID. B-4061	COUNTY CATAWBA	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE #90 OVER HAGAN CREEK ON SR 1727 (BOGGS RD.)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 13+95	OFFSET 13ft LT	ALIGNMENT -L-
COLLAR ELEV. 812.3 ft	TOTAL DEPTH 40.3 ft	NORTHING 710,994	EASTING 1,368,075
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 10/08/09	COMP. DATE 10/08/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



PROJECT NO. 33425.1.1	ID. B-4061	COUNTY CATAWBA	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE #90 OVER HAGAN CREEK ON SR 1727 (BOGGS RD.)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 13+82	OFFSET 12ft RT	ALIGNMENT -L-
COLLAR ELEV. 812.4 ft	TOTAL DEPTH 39.5 ft	NORTHING 710,970	EASTING 1,368,061
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 10/08/09	COMP. DATE 10/08/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE SINGLE B4061_GEO_BH_BRDG0090.GPJ NC_DOT_GDT 11/09/09

NCDOT BORE SINGLE B4061_GEO_BH_BRDG0090.GPJ NC_DOT_GDT 11/09/09

TEST RESULTS

PROJECT: 33425.1.1 (B-4061)

COUNTY: CATAWBA

SITE DESCRIPTION: BRIDGE #90 ON SR 1727 (BOGGS RD.) OVER HAGAN CREEK

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			%	%	UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200				
EB1-A																		
SS-1	12 LT	13+00 -L-	4.4-5.4	A-2-4(0)	4	26	4	35.1	34.1	14.8	16.0	84	68	30				
SS-2	12 LT	13+00 -L-	9.4-10.4	A-4(0)	12	25	4	33.5	29.5	19.0	18.0	88	69	36				
SS-3	12 LT	13+00 -L-	14.4-15.4	A-2-4(0)	5	28	4	31.7	44.5	13.8	10.0	83	66	25				
SS-4	12 LT	13+00 -L-	19.4-20.4	A-2-4(0)	44	24	1	40.5	32.9	18.6	8.0	94	71	31				
EB2-A																		
SS-10	13 LT	13+95 -L-	9.5-10.5	A-2-4(0)	19	21	3	36.3	38.1	9.6	16.0	88	74	26				
EB2-B																		
SS-5	12 RT	13+82 -L-	4.1-5.1	A-7-6(11)	6	43	19	11.2	26.7	18.0	44.1	95	89	64				
SS-6	12 RT	13+82 -L-	9.1-10.1	A-4(1)	5	32	8	22.8	30.5	18.6	28.1	83	71	44				
SS-7	12 RT	13+82 -L-	14.1-15.1	A-1-b(0)	9	22	NP	71.5	18.6	5.8	4.0	84	44	10				
SS-8	12 RT	13+82 -L-	19.1-20.1	A-2-4(0)	65	24	2	41.5	33.6	16.9	8.0	98	74	31				
SS-9	12 RT	13+82 -L-	24.1-25.1	A-2-4(0)	52	26	3	47.7	33.1	13.2	6.0	96	68	23				

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT	Q(MPa) (ksf)	E(MPa) (MPsi)
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**FIELD
 SCOUR REPORT**

WBS: 33425.1.1 TIP: B-4061 COUNTY: Catawba

DESCRIPTION(1): Bridge #90 on SR 1727 (Boggs Rd.) over Hagan Creek

EXISTING BRIDGE

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

Bridge No.: 90 Length: 61' Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 3
 Foundation Type: Timber deck on I-Beams with timber caps and piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Local slope runoff undermining toe of slope at EB2-A

Interior Bents: Noted concrete box repaired to protect timber piles from erosion.

Channel Bed: None observed

Channel Bank: Banks are scoured at toe. Banks are steep and unstable.

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6):

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, or aggrading.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): silt, sand and gravel (Ref. SS-3)

Channel Bank Material(8): silt and sand (Ref. SS-3 and SS-4)

Channel Bank Cover(9): Mature trees and grass

Floodplain Width(10): appx. 400'

Floodplain Cover(11): Mature trees

Stream is(12): Aggrading Degrading _____ Undetermined _____

Channel Migration Tendency(13): Slight to moderate

Observations and Other Comments: Multiple repairs to end bent and interior bents were noted.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

No interior bents

Comparison of DSE to Hydraulics Unit theoretical scour:
 No interior bents, and no abutment scour anticipated.

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 # 9 for
 "Soil Test Results"

Reported by: JKS / JEB Date: 11/16/2009