

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33423.1.1 (B-4059)	1	13

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33423.1.1 (B-4059) F.A. PROJ. BRZ-1156 (2)  
COUNTY CATAWBA  
PROJECT DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER  
HILDEBRAN CREEK

SITE DESCRIPTION \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 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.

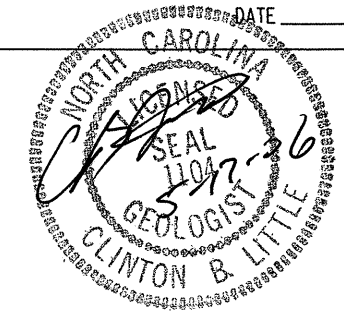
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT 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.

**PROJECT: 33423.1.1 ID: B-4059**

PERSONNEL

- J.K. STICKNEY
- C.L. SMITH
- H.K. WISE
- R.W. TODD
- J.E. ESTEP

INVESTIGATED BY J.E. BEVERLY  
CHECKED BY C.B. LITTLE  
SUBMITTED BY C.B. LITTLE  
DATE MAY 2007



DRAWN BY: J.K. McCLURE

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.

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

PROJECT REFERENCE NO. 33423.11(B-4059)	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 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. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .		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 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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 60 BLOWS PER FOOT. STRATA CORE RECOVERY (SCRC) - 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		ROCK HARDNESS			
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 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 &gt; 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 &lt; 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.		SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50		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 FINGERNAIL.	
PERCENTAGE OF MATERIAL		GROUND WATER		MISCELLANEOUS SYMBOLS		ROCK HARDNESS			
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 PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP		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		S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE			
CONSISTENCY OR DENSENESS		TEXTURE OR GRAIN SIZE		ABBREVIATIONS		EQUIPMENT USED ON SUBJECT PROJECT			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )		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		MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST 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			
PLASTICITY		SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING			
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		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		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> CLAY BITS <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <input type="checkbox"/> BK-51 <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> CORE SIZE: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> -B <input type="checkbox"/> CME-550 <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> -N <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> -H <input type="checkbox"/> <input type="checkbox"/> CASING w/ ADVANCER <input type="checkbox"/> HAND TOOLS: <input type="checkbox"/> <input type="checkbox"/> TRICONE STEEL TEETH <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> <input type="checkbox"/> TRICONE TUNG-CARB. <input type="checkbox"/> HAND AUGER <input type="checkbox"/> <input type="checkbox"/> CORE BIT <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> VANE SHEAR TEST		TERM SPACING THICKNESS VERY WIDE MORE THAN 10 FEET > 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED CLOSE 0.16 TO 1 FEET VERY THINLY BEDDED VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED < 0.008 FEET THINLY LAMINATED			
COLOR		EQUIPMENT USED ON SUBJECT PROJECT		INDURATION		BENCH MARK			
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.		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 #2 RR SPIKE IN BASE OF 24' SYCAMORE TREE BL STATION 17+86.63, 63.65 LT. ELEVATION: 912.79 FT.		NOTES: CAR - CASING ADVANCER REFUSAL			



PROJECT REFERENCE NO.	SHEET
33423.1.1 (B-4059)	4
<b>SITE PLAN</b>	
0 50 100 FEET	

CL STA. 17+87.5 -L-  
1 @ 100.00'  
SKEW=100°

BEGIN TIP PROJECT B-4059  
-EL- STA 14+70.00

END TIP PROJECT B-4059  
-EL- STA 21+00.00

-EL- POC Sta. 16+35.50  
-EYI- POC Sta. 10+00.00  
FT Sta. 16+56.07

BEGIN APPROACH SLAB  
-EL- STA 17+22.50

BEGIN BRIDGE  
-EL- STA 17+37.50

END BRIDGE  
-EL- STA 18+37.50  
END APPROACH SLAB  
-EL- STA 18+52.50

ROADWAY EMBANKMENT (FILL)

ROADWAY EMBANKMENT (FILL)

EB1-A (orig)  
EB1-B (orig)

EB1-B (orig)

EB2-A

EB2-B

4" CONC. SIDEWALK

S 54° 00' 53.8" E

S 49° 09' 43.0" E

S 64° 55' 20.4" E

S 55° 54' 15.6" E

-BL-3 9+47.36 PINC  
7+57.15 POT  
-EL- 14+69.38 (17.5 RT)

7+04.77 POT  
-BYI-6

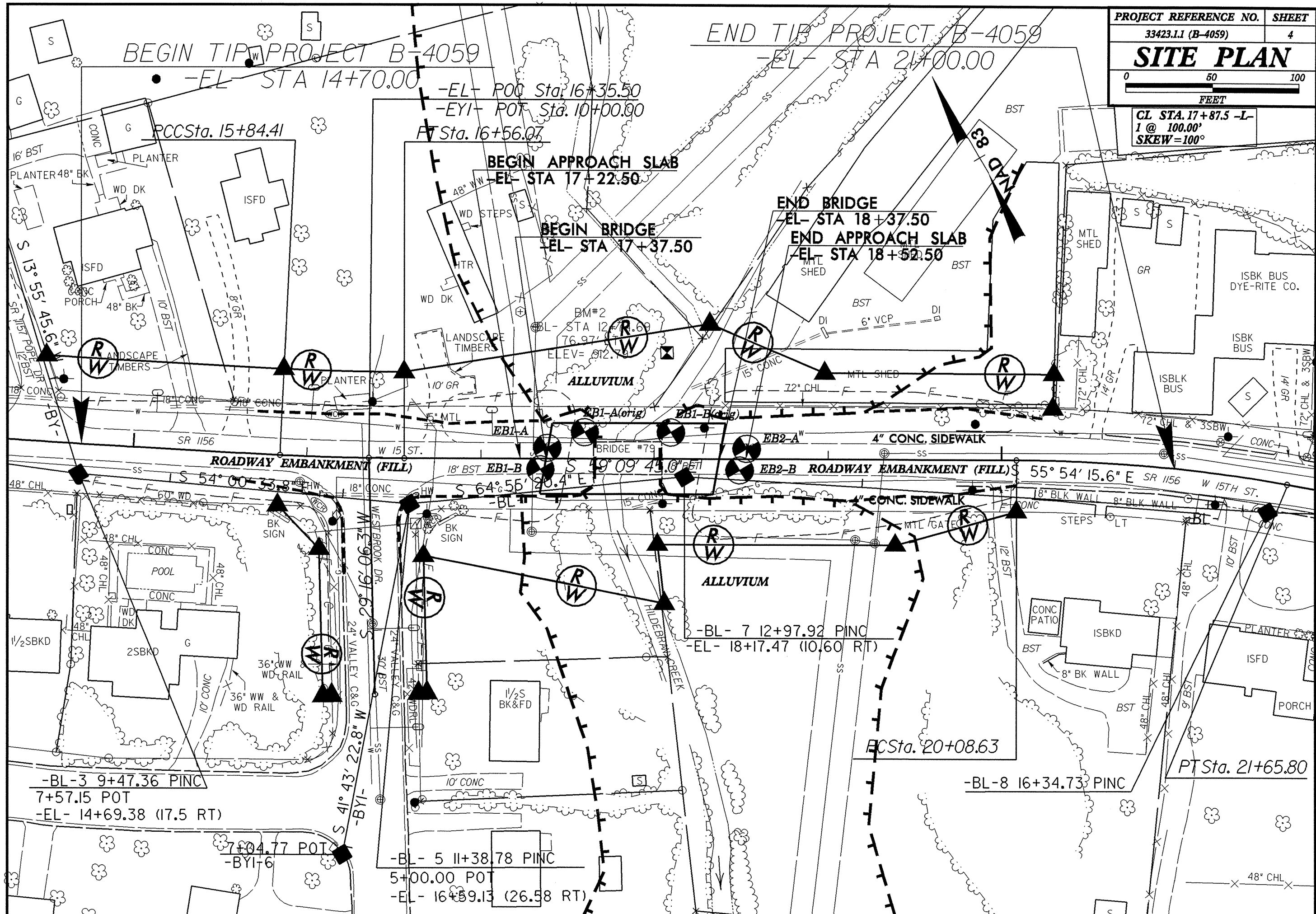
-BL- 5 11+38.78 PINC  
5+00.00 POT  
-EL- 16+59.13 (26.58 RT)

-BL- 7 12+97.92 PINC  
-EL- 18+17.47 (10.60 RT)

ECSta. 20+08.63

-BL-8 16+34.73 PINC

PT Sta. 21+65.80



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PROJECT REFERENCE NO. B-4059	SHEET NO. 5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

**-EL-**

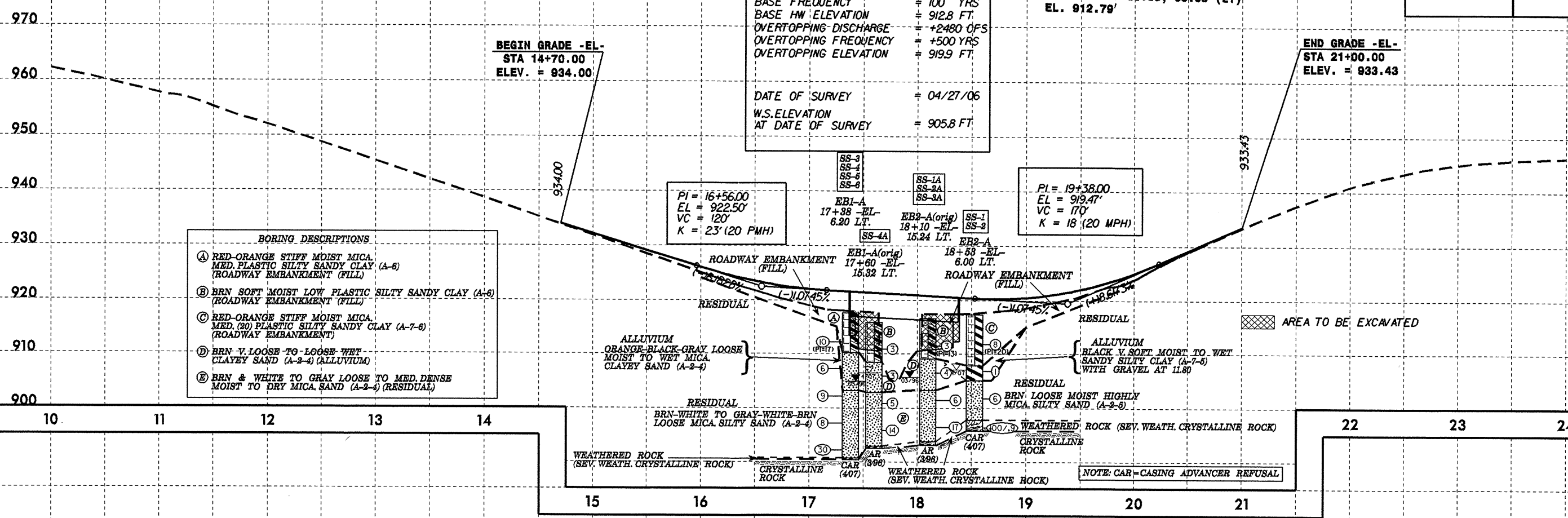
SEE PLAN SHEET 4 FOR PLAN VIEW

**BRIDGE HYDRAULIC DATA**

DESIGN DISCHARGE = 1220 CFS  
 DESIGN FREQUENCY = 25 YRS  
 DESIGN HW ELEVATION = 912.5 FT  
 BASE DISCHARGE = 1520 CFS  
 BASE FREQUENCY = 100 YRS  
 BASE HW ELEVATION = 912.8 FT  
 OVERTOPPING DISCHARGE = +2480 CFS  
 OVERTOPPING FREQUENCY = +500 YRS  
 OVERTOPPING ELEVATION = 919.9 FT

DATE OF SURVEY = 04/27/06  
 W.S. ELEVATION AT DATE OF SURVEY = 905.8 FT

BM#2  
 RR SPIKE IN BASE OF  
 24" SYCAMORE TREE  
 -EL- STA 17+86.63, 63.65 (LT)  
 EL. 912.79'



- BORING DESCRIPTIONS**

  - (A) RED-ORANGE STIFF MOIST MICA, MED. PLASTIC SILTY SANDY CLAY (A-6) (ROADWAY EMBANKMENT (FILL))
  - (B) BRN SOFT MOIST LOW PLASTIC SILTY SANDY CLAY (A-6) (ROADWAY EMBANKMENT (FILL))
  - (C) RED-ORANGE STIFF MOIST MICA, MED. (20) PLASTIC SILTY SANDY CLAY (A-7-6) (ROADWAY EMBANKMENT)
  - (D) BRN V. LOOSE TO LOOSE WET CLAYEY SAND (A-2-4) (ALLUVIUM)
  - (E) BRN & WHITE TO GRAY LOOSE TO MED. DENSE MOIST TO DRY MICA SAND (A-2-4) (RESIDUAL)

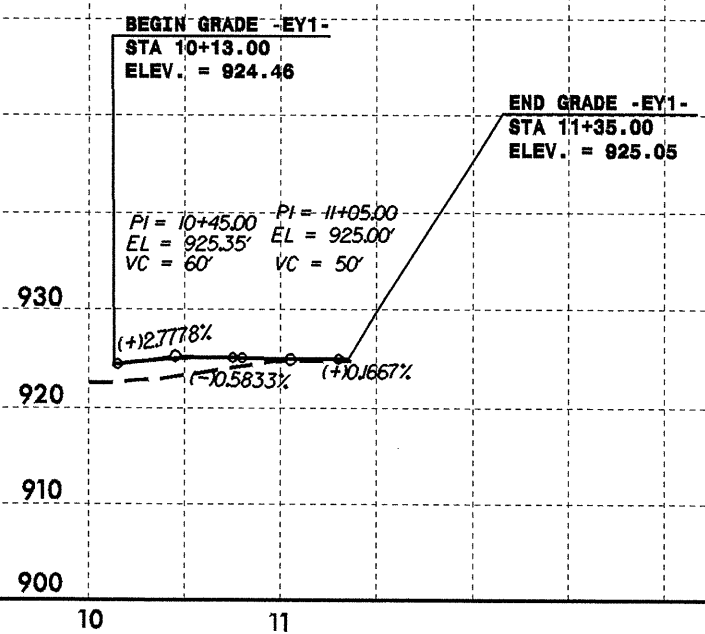
PI = 16+56.00  
 EL = 922.50'  
 VC = 120'  
 K = 23' (20 PMH)

PI = 19+38.00  
 EL = 919.47'  
 VC = 170'  
 K = 18 (20 MPH)

WEATHERED ROCK (SEV. WEATH. CRYSTALLINE ROCK)  
 CRYSTALLINE ROCK  
 WEATHERED ROCK (SEV. WEATH. CRYSTALLINE ROCK)

NOTE: CAR=CASING ADVANCER REFUSAL

**-EY1-**

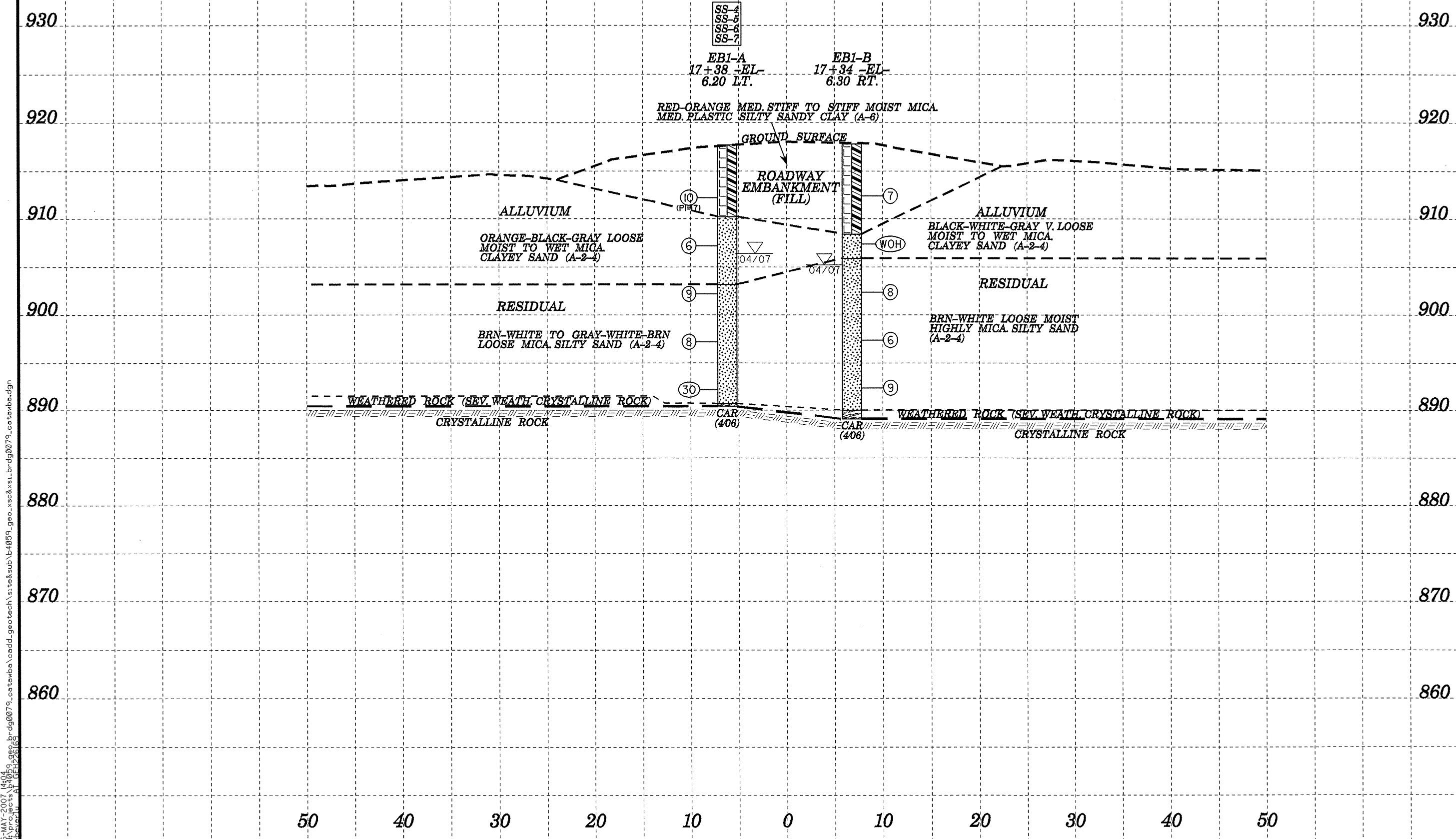




5/28/99

0	5	10
FEET		
PROJECT REFERENCE NO.	SHEET	
33423.1.I (B-4059)	6	
Section thru End Bent One Sta. 17+37.50 -EL- Shew=100'		

NOTE: CAR=CASING ADVANCER REFUSAL



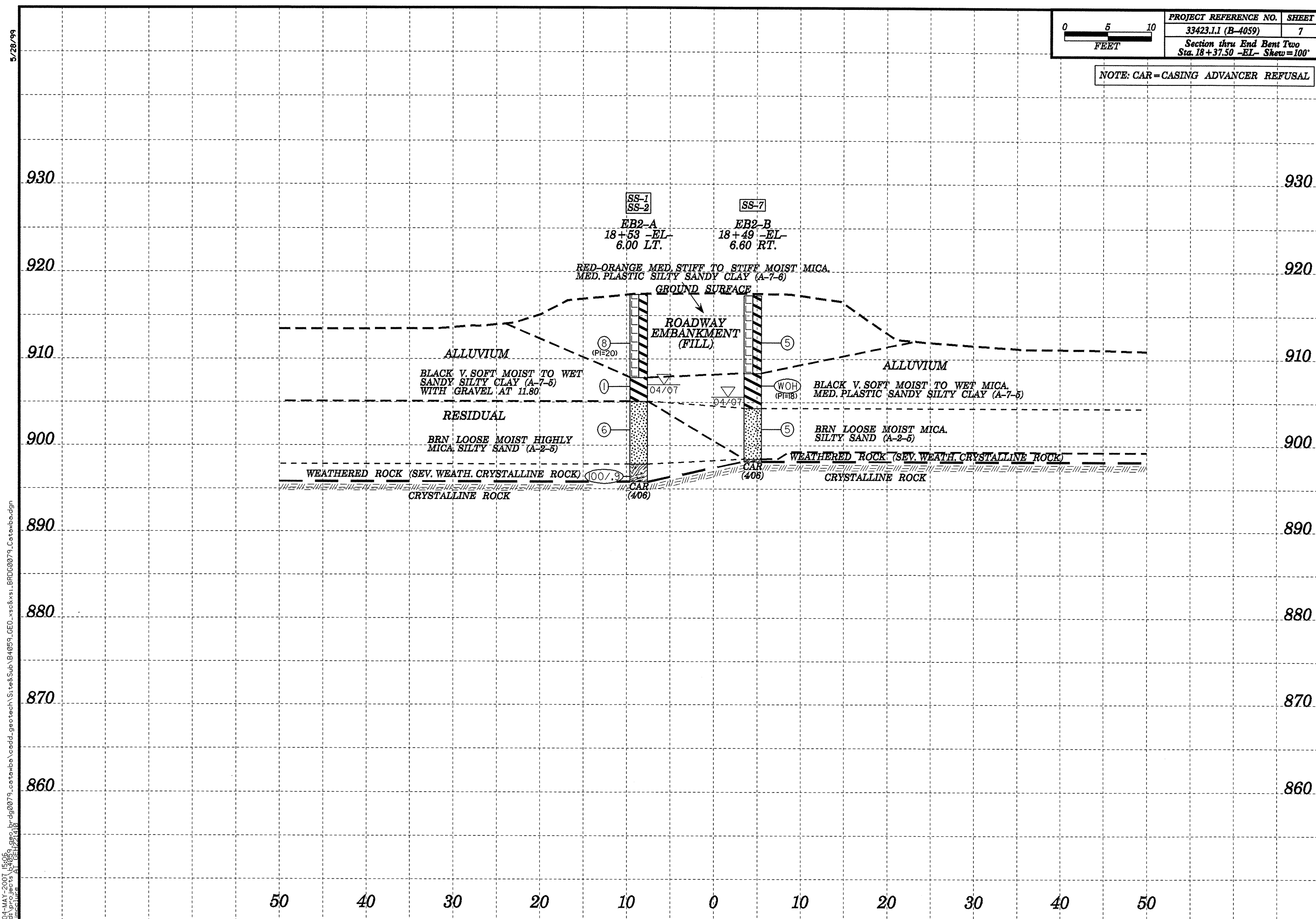
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sheep\lu AT GFH226169

5/28/99



PROJECT REFERENCE NO.	SHEET
33423.1.1 (B-4059)	7
Section thru End Bent Two Sta. 18+37.50 -EL- Skew=100'	

NOTE: CAR = CASING ADVANCER REFUSAL



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imc

PROJECT NO. 33423.1.1		ID. B-4059		COUNTY CATAWBA		GEOLOGIST Todd, R. W.									
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK						GROUND WTR (ft)									
BORING NO. EB1-A		STATION 17+38		OFFSET 6 ft LT		ALIGNMENT -EL-									
COLLAR ELEV. 917.7 ft		TOTAL DEPTH 27.3 ft		NORTHING 709,559		EASTING 1,337,127									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic										
START DATE 04/20/07		COMP. DATE 04/20/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 27.3									
ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
920														917.7	0.0
915	913.1 4.6	4	5	5										910.2	7.5
910	908.2 9.5	4	3	3										903.2	14.5
905	903.2 14.5	3	5	4											
900	898.2 19.5	3	5	3											
895	893.2 24.5	3	10	20											
890														890.7	27.0
														890.4	27.3
885															
880															
875															
870															
865															
860															
855															
850															
845															

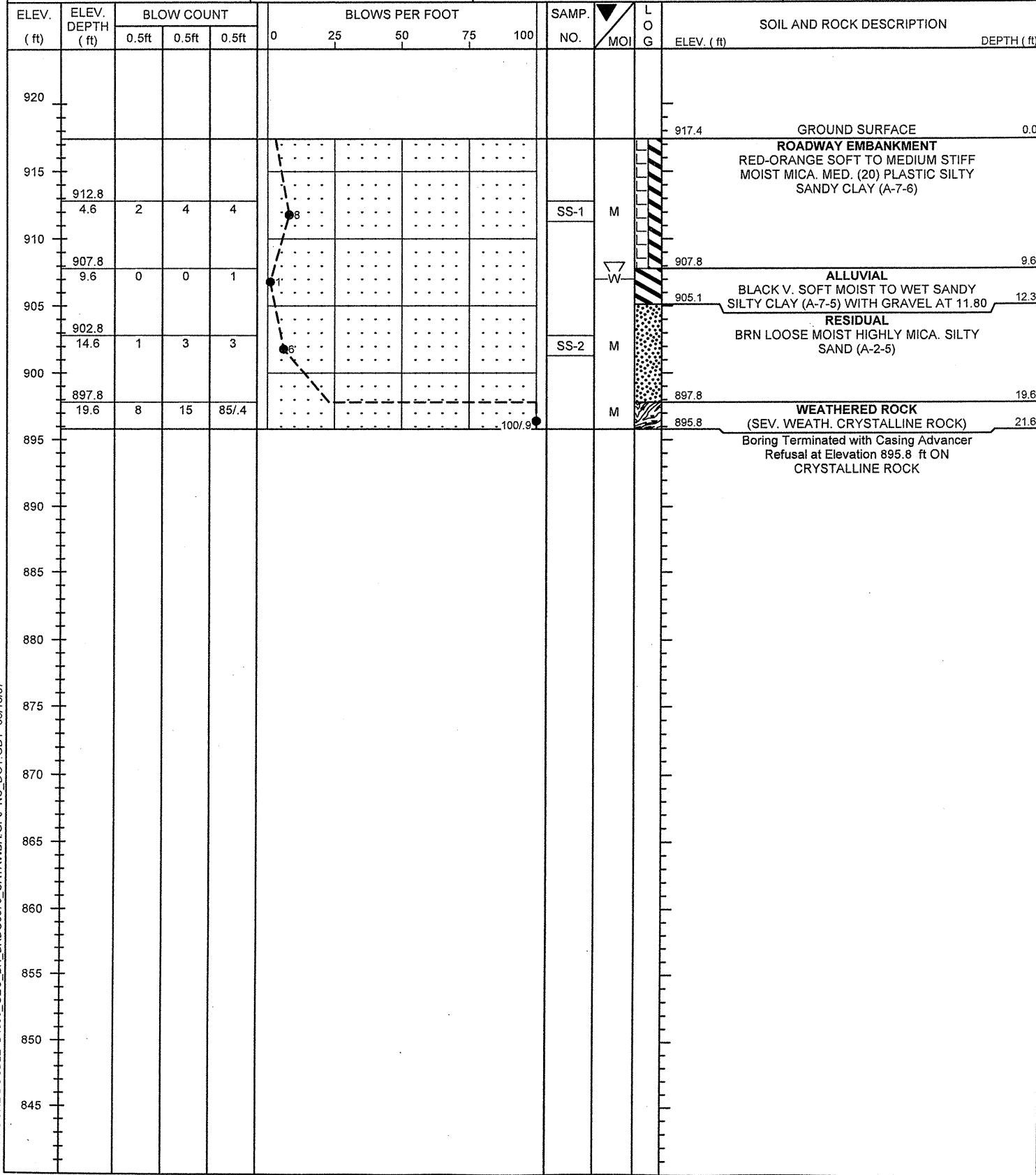
NCDOT BORE DOUBLE B4059\_GEO\_BH\_BRD0079\_CATAWBA.GPJ\_NC\_DOT.GDT\_05/15/07

PROJECT NO. 33423.1.1		ID. B-4059		COUNTY CATAWBA		GEOLOGIST Todd, R. W.									
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK						GROUND WTR (ft)									
BORING NO. EB1-B		STATION 17+34		OFFSET 6 ft RT		ALIGNMENT -EL-									
COLLAR ELEV. 917.8 ft		TOTAL DEPTH 28.7 ft		NORTHING 709,550		EASTING 1,337,117									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic										
START DATE 04/20/07		COMP. DATE 04/20/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 28.7									
ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
920														917.8	0.0
915	913.4 4.4	3	3	4										910.2	7.5
910	908.4 9.4	0	0	0										908.4	9.4
905	903.4 14.4	3	4	4										905.9	11.9
900	898.4 19.4	2	2	4											
895	893.4 24.4	3	4	5											
890														890.0	27.8
														889.1	28.7
885															
880															
875															
870															
865															
860															
855															
850															
845															

NCDOT BORE DOUBLE B4059\_GEO\_BH\_BRD0079\_CATAWBA.GPJ\_NC\_DOT.GDT\_05/15/07

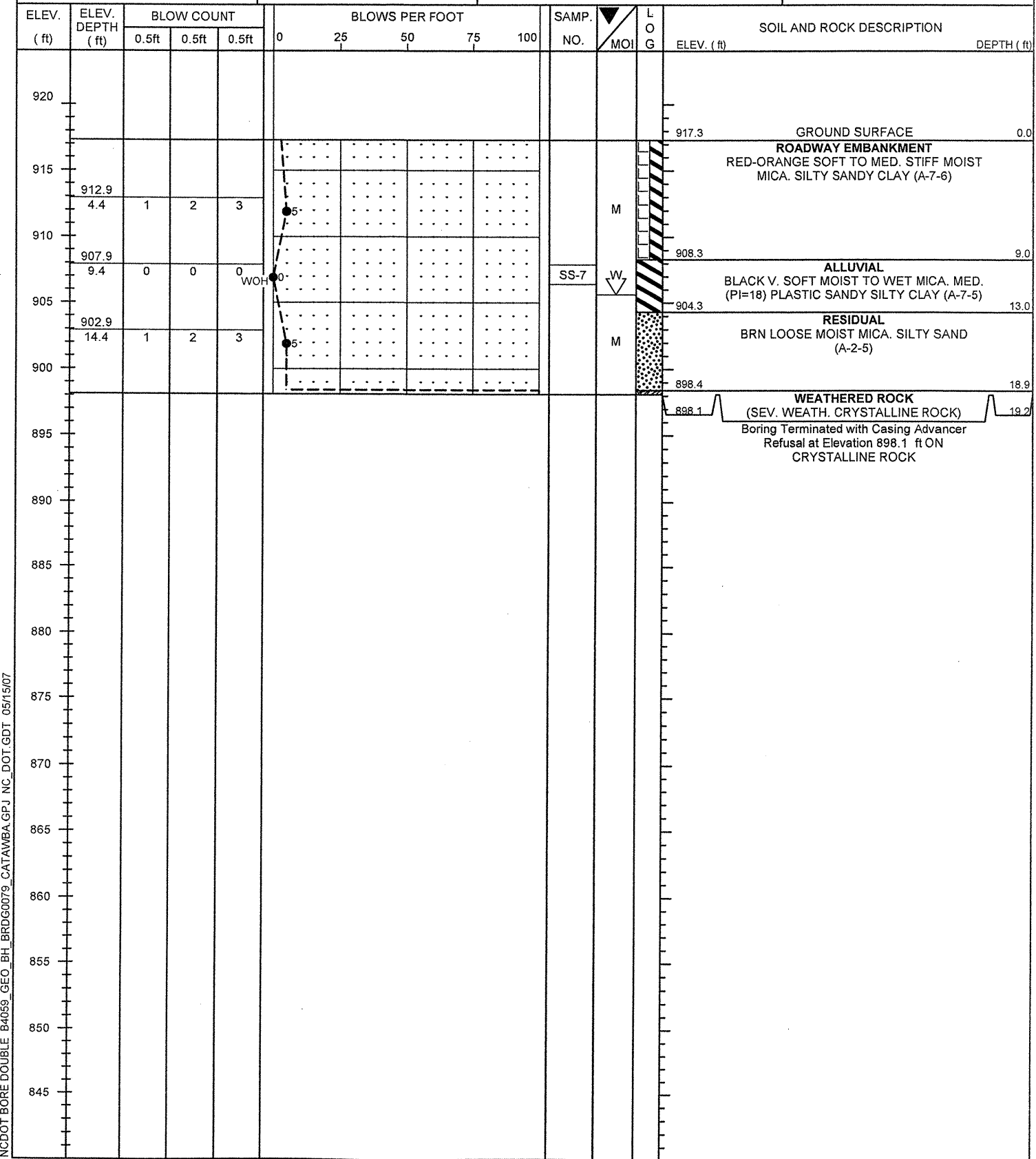


PROJECT NO. 33423.1.1	ID. B-4059	COUNTY CATAWBA	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 18+53	OFFSET 6 ft LT	ALIGNMENT -EL-
COLLAR ELEV. 917.4 ft	TOTAL DEPTH 21.6 ft	NORTHING 709,500	EASTING 1,337,225
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 04/20/07	COMP. DATE 04/20/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 21.6



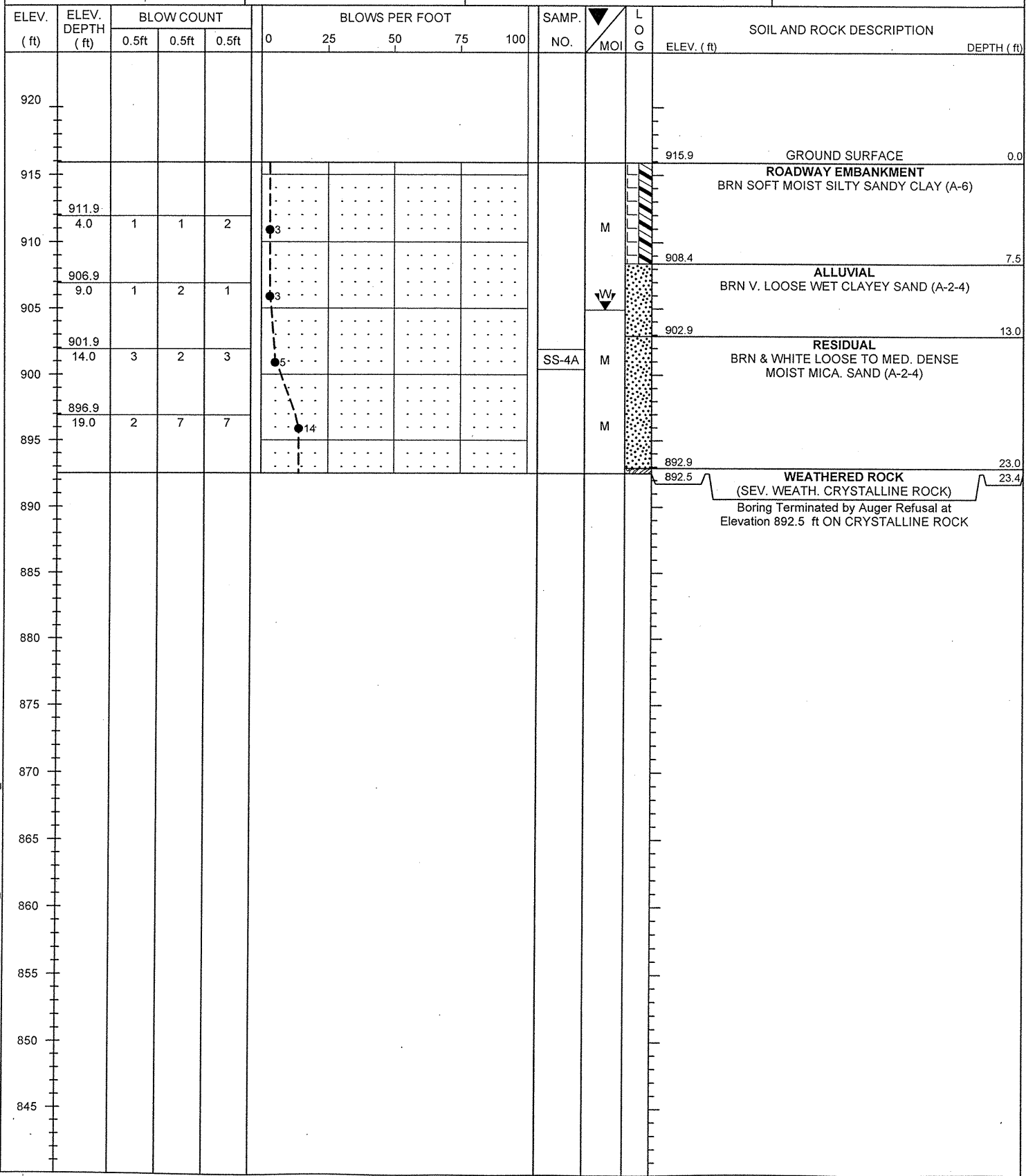
NCDOT BORE DOUBLE B4059\_GEO\_BH\_BRDGG0079\_CATAWBA GPJ\_NC\_DOT\_GDT\_05/15/07

PROJECT NO. 33423.1.1	ID. B-4059	COUNTY CATAWBA	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 18+49	OFFSET 7 ft RT	ALIGNMENT -EL-
COLLAR ELEV. 917.3 ft	TOTAL DEPTH 19.2 ft	NORTHING 709,491	EASTING 1,337,215
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 04/20/07	COMP. DATE 04/20/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 19.2



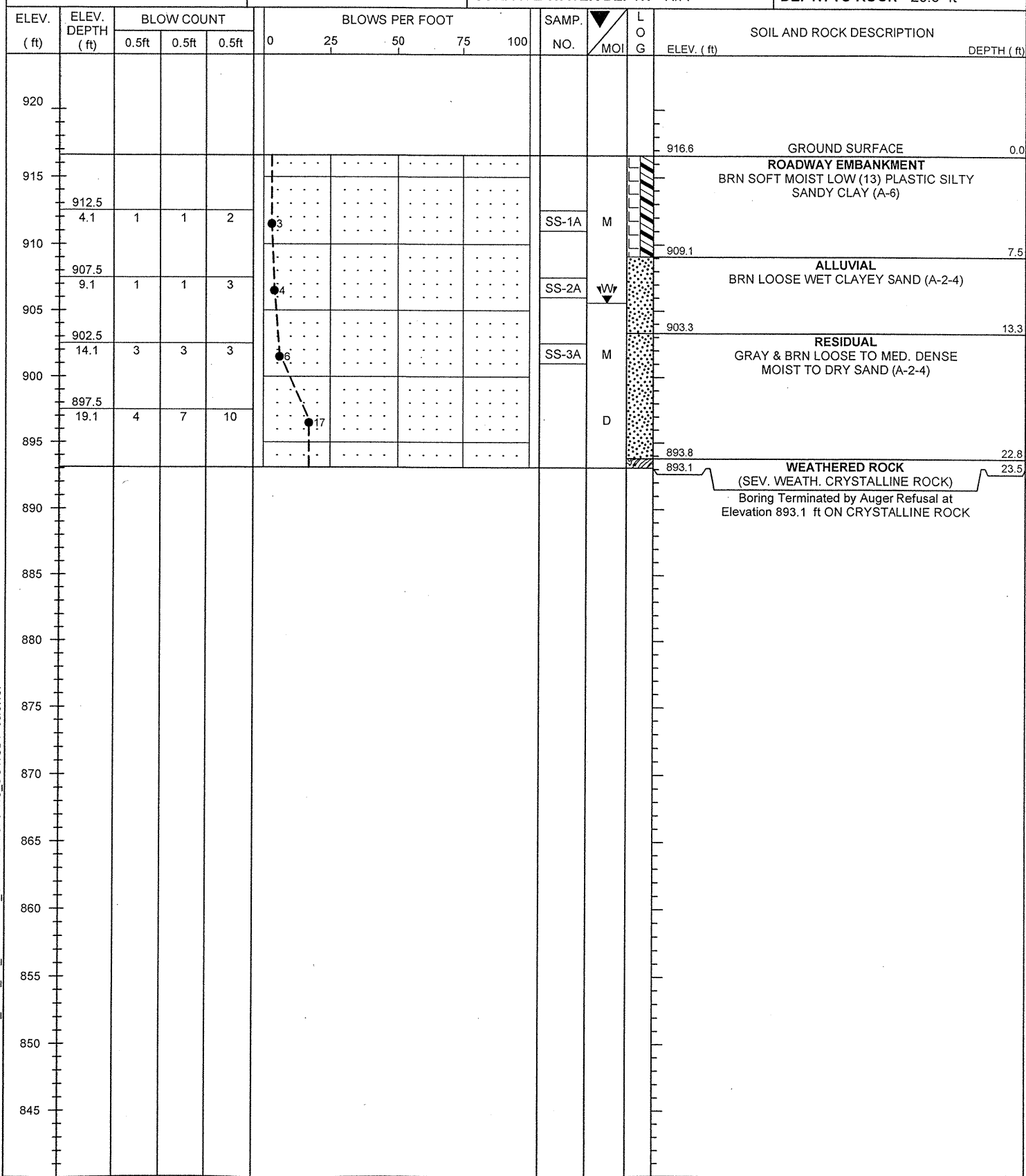
NCDOT BORE DOUBLE B4059\_GEO\_BH\_BRDGG0079\_CATAWBA GPJ\_NC\_DOT\_GDT\_05/15/07

PROJECT NO. 33423.1.1	ID. B-4059	COUNTY CATAWBA	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK			GROUND WTR (ft)
BORING NO. EB1-A(orig)	STATION 17+60	OFFSET 15 ft LT	ALIGNMENT -EL-
COLLAR ELEV. 915.9 ft	TOTAL DEPTH 23.4 ft	NORTHING 709,555	EASTING 1,337,150
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 03/28/96	COMP. DATE 03/28/96	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 23.4 ft



NCDOT BORE SINGLE B4059\_GEO\_BH\_BRDG0079\_CATAWBA.GPJ NC\_DOT.GDT 05/07/07

PROJECT NO. 33423.1.1	ID. B-4059	COUNTY CATAWBA	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK			GROUND WTR (ft)
BORING NO. EB2-A(orig)	STATION 18+10	OFFSET 15 ft LT	ALIGNMENT -EL-
COLLAR ELEV. 916.6 ft	TOTAL DEPTH 23.5 ft	NORTHING 709,530	EASTING 1,337,193
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 03/28/96	COMP. DATE 03/28/96	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 23.5 ft



NCDOT BORE SINGLE B4059\_GEO\_BH\_BRDG0079\_CATAWBA.GPJ NC\_DOT.GDT 05/07/07

TEST RESULTS

PROJECT: 33423.1.1 B-4059  
 COUNTY: CATAWBA  
 SITE DESCRIPTION: BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK

SOIL SAMPLE RESULTS														ROCK SAMPLE RESULTS												
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT	Q(MPa) (MPsi)	E(MPa) (MPsi)
								C. SAND	F. SAND	SILT	CLAY	10	40	200												
				<b>EB1-A</b>																						
SS-3	6.2 LT	17+38	5.00-6.00	A-6(3)	10	37	17	31.0	28.9	14.0	26.1	94	76	41												
SS-4	6.2 LT	17+38	10.00-11.00	A-2-4(0)	6	28	8	43.4	31.0	9.5	16.1	74	52	21												
SS-5	6.2 LT	17+38	15.00-16.00	A-2-4(0)	9	29	NP	40.2	41.2	14.6	4.0	96	71	24												
SS-6	6.2 LT	17+38	20.00-21.00	A-2-4(0)	8	32	NP	50.1	32.8	15.2	2.0	100	65	22												
				<b>EB2-A</b>																						
SS-1	6.0 LT	18+53	5.10-6.10	A-7-6(5)	8	49	20	26.7	32.4	12.8	28.1	96	80	43												
SS-2	6.0 LT	18+53	15.10-16.10	A-2-5(0)	6	44	NP	34.0	49.4	14.6	2.0	100	85	20												
				<b>EB2-B</b>																						
SS-7	6.6 RT	18+49	9.90-10.90	A-7-5(12)	0	49	18	7.8	29.9	30.1	32.2	100	97	67												
				<b>EB1-A(Orig)</b>																						
SS-4A	15.0 LT	17+60	14.00-15.50	A-2-4(0)	5	32	NP	46.3	41.7	5.9	6.0	100	74	16												
				<b>EB2-A(Orig)</b>																						
SS-1A	15.0 LT	18+10	4.10-4.60	A-6(3)	3	36	13	29.8	25.0	13.0	32.2	93	75	45												
SS-2A	15.0 LT	18+10	9.10-10.60	A-2-4(0)	4	24	4	43.3	35.6	4.9	16.1	79	60	19												
SS-3A	15.0 LT	18+10	14.10-15.60	A-2-4(0)	6	30	NP	33.8	53.4	4.7	8.1	100	88	17												
SS-5A		CREEK BOTTOM		A-1-B(0)		24	NP	70.5	22.4	3.1	4.0	67	40	5												



# FIELD SCOUR REPORT

WBS: 33423.1.1 TIP: B-4059 COUNTY: Catawba

DESCRIPTION(1): Bridge No. 79 on SR 1156 over Hildebran Creek

### EXISTING BRIDGE

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

Bridge No.: 79 Length: 40 Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2  
 Foundation Type: Bridge is steel girder, timber deck, with vertical timber abutments and wingwalls

#### EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Scour behind wingwalls at EB1 and EB2

Interior Bents: N/A

Channel Bed: None

Channel Bank: Banks scoured where stream meanders both upstream and downstream. Trees leaning in toward channel.

#### EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): \_\_\_\_\_

Effectiveness(5): \_\_\_\_\_

Obstructions(6): Limbs, trash and construction debris were 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, 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): Sand

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

Channel Bank Cover(9): mature trees and shrubs

Floodplain Width(10): about 275 feet

Floodplain Cover(11): mature trees and grass

Stream is(12): Aggrading \_\_\_\_\_ Degrading  Undetermined \_\_\_\_\_

Channel Migration Tendency(13): slight

Observations and Other Comments: Bridge is in poor condition. Erosion behind wingwalls. Water pipe straddles creek and runs through wingwalls at each end bent.

#### DESIGN SCOUR ELEVATIONS(14)

Feet  Meters \_\_\_\_\_

	Elev.								
EB1 Abutment Scour	904'								
EB2 Abutment Scour	906'								

Comparison of DSE to Hydraulics Unit theoretical scour:  
 Concur with the EB1 abutment scour indicated in the hydro report at elevation 904 feet  
 Concur with the EB2 abutment scour indicated in the hydro report at elevation 906 feet

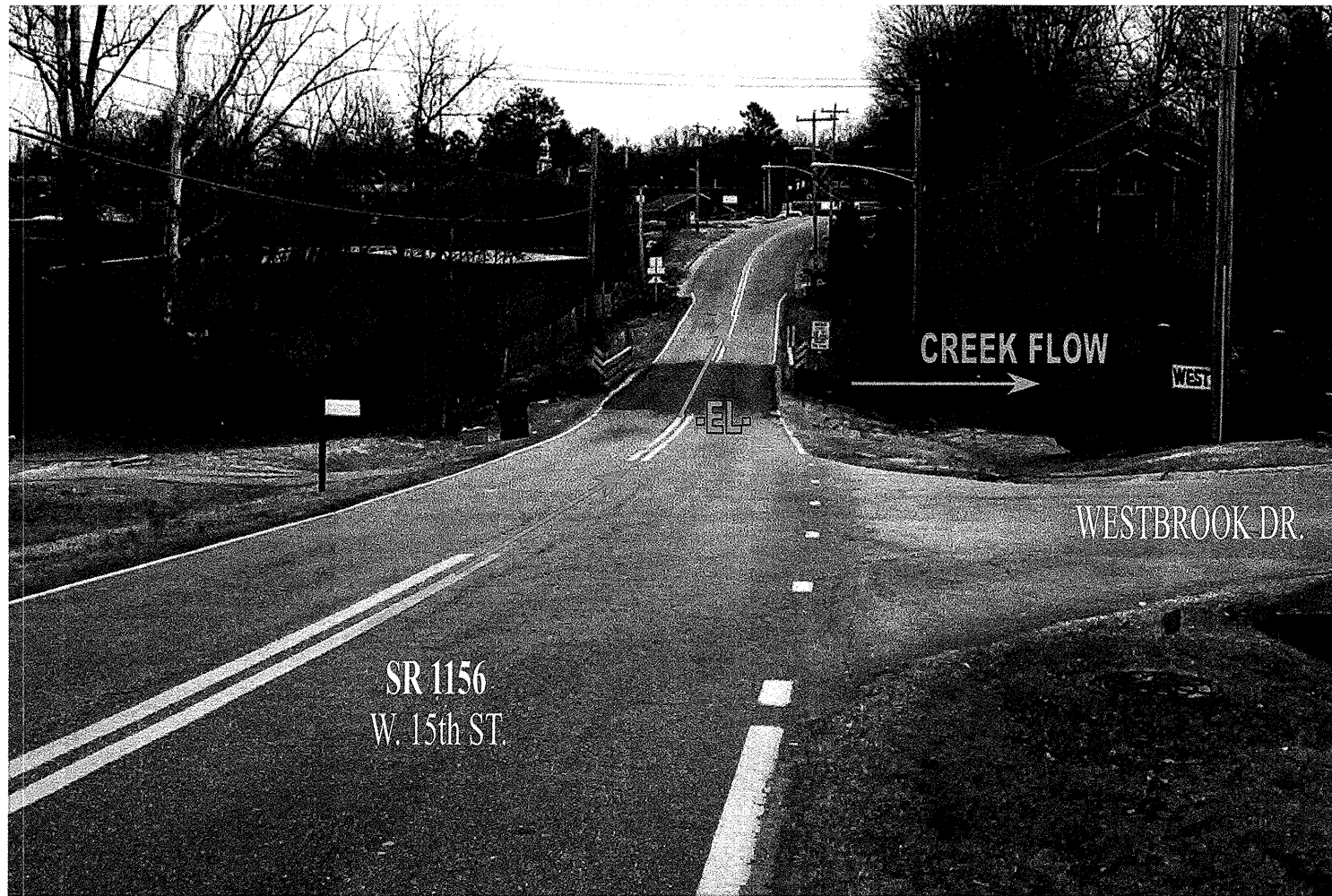
#### SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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: *J.E. Beverly* JKS / JEB Date: 5/14/2007

33423.1.1 B-4059  
CATAWBA COUNTY  
BRIDGE NO. 79 ON SR 1156 OVER HILDEBRAN CREEK

PHOTOS



LOOKING UP LINE



VIEW OF WATER PIPE

(PHOTOGRAPHS COURTESY OF NCDOT ROADWAY UNIT)