

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	40278.1.1 (U-4909)	1	13

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 40278.1.1 (U-4909) F.A. PROJ. STP-2643(2)

COUNTY FORSYTH

PROJECT DESCRIPTION SR 2643 (UNION CROSS RD.) FROM SR 2691
(WALLBURG RD.) TO SR 2632 (SEdge GARDEN RD.)

SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.)
OVER -Y15- (I-40) & MSE RETAINING WALLS

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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 (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 (ON-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
C.C. MURRAY

J.E. ESTEP

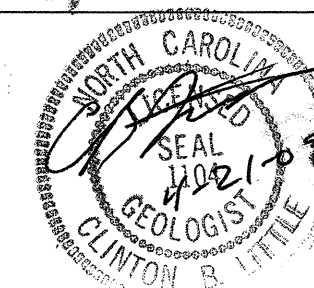
M.R. MOORE

INVESTIGATED BY R.Q. CALLAWAY

CHECKED BY LITTLE

SUBMITTED BY LITTLE

DATE APRIL 2009



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.

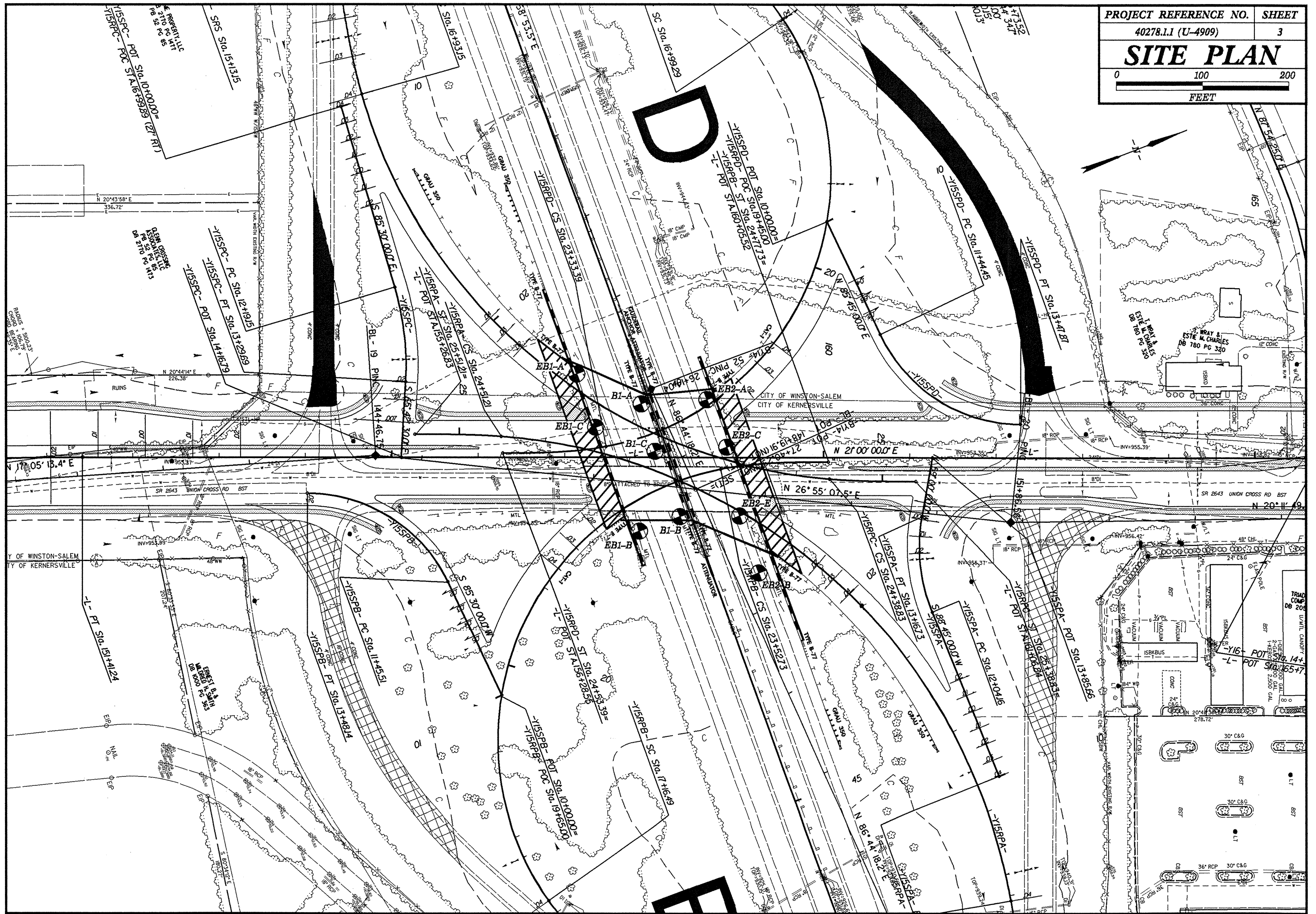
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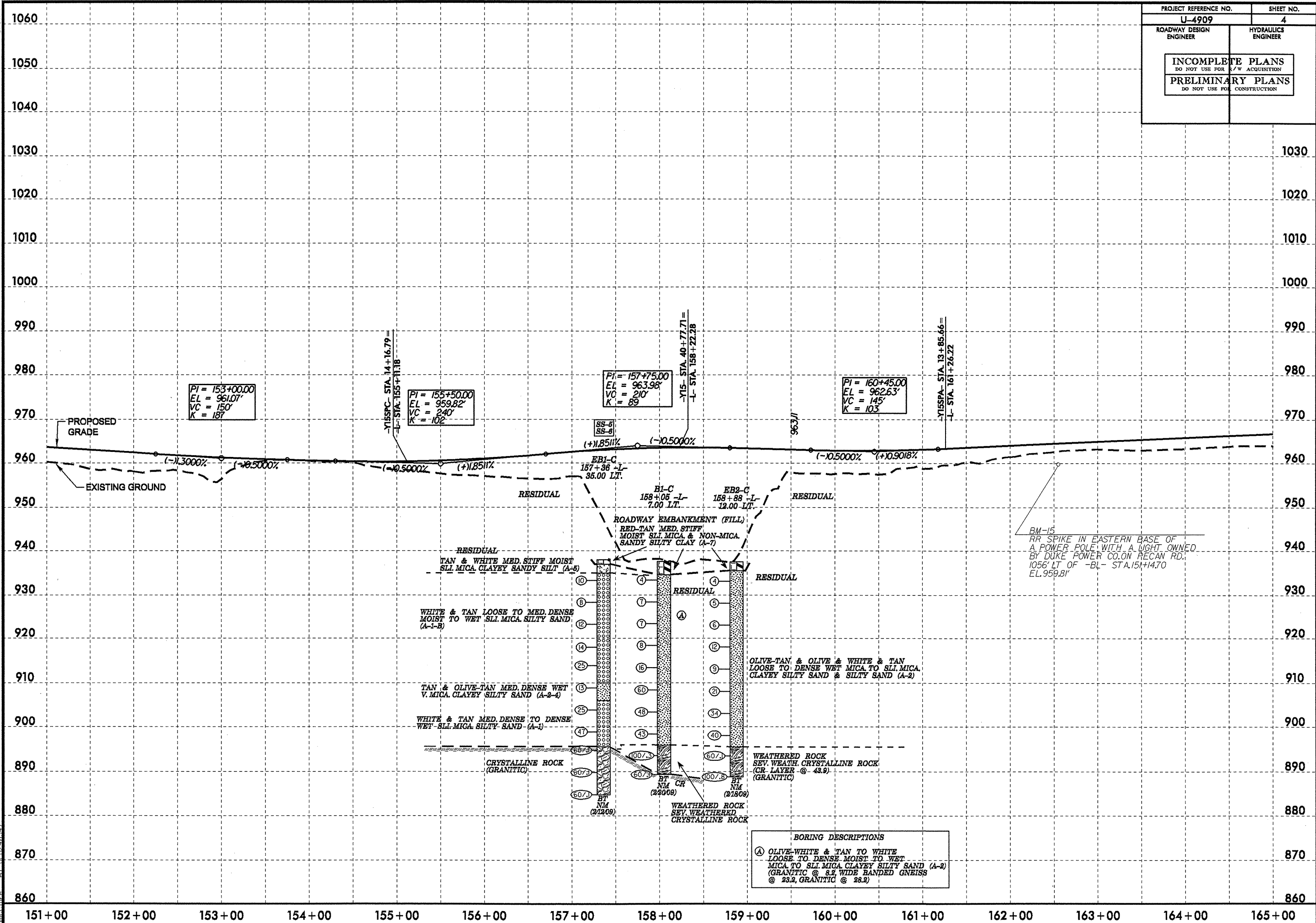
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

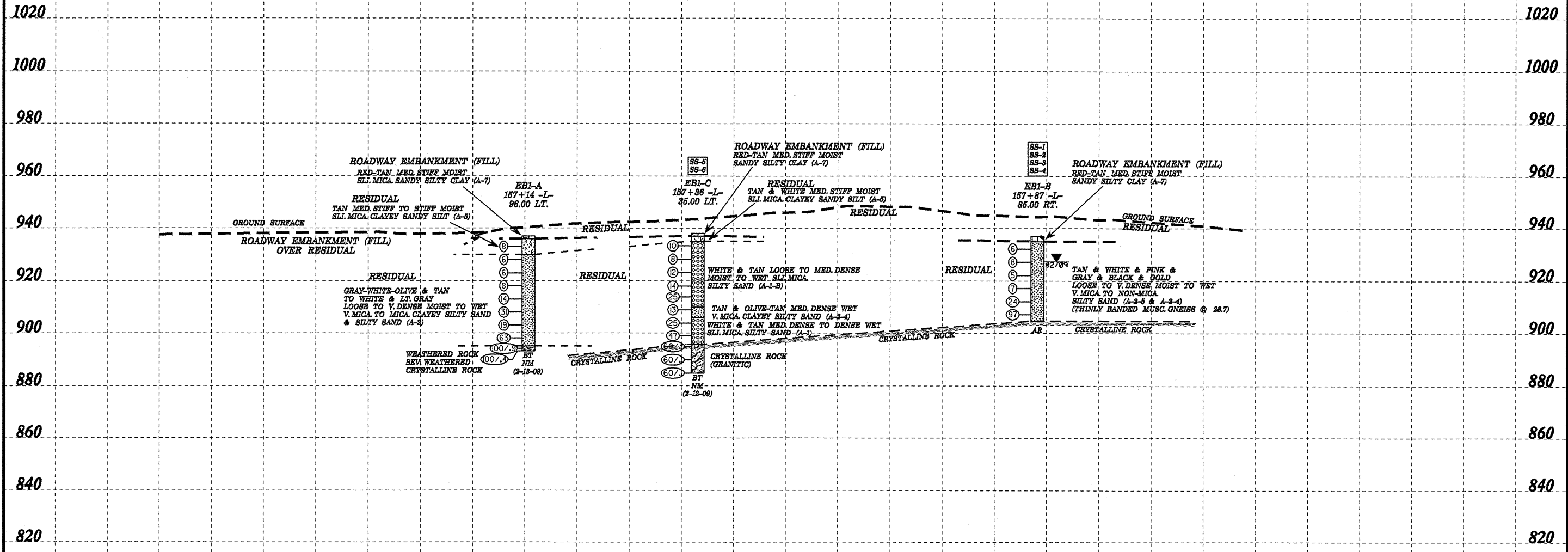
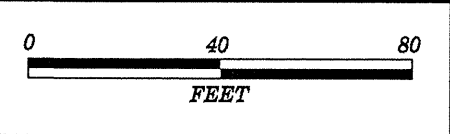
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

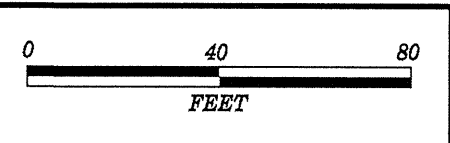
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, DRN. SAT. CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. 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. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN 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 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 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 SILT-CLAY 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 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.	
CONSISTENCY OR DENSITY PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	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.	
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4, 10, 40, 60, 200, 270 BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F. SD.) SILT (SL.) CLAY (CL.)	ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT % _d - DRY UNIT WEIGHT	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.	
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B-51, 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, 6 1/4" HOLLOW AUGERS 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.	
PLASTICITY NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY			FRAC. SPACING 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.
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.			NOTES: BENCH MARK: BY14-52 STA. BY14 PINC 26+14.04= -Y15- STA. 39+96.02 (6.69 LT.) ELEVATION: 937.05 FT.



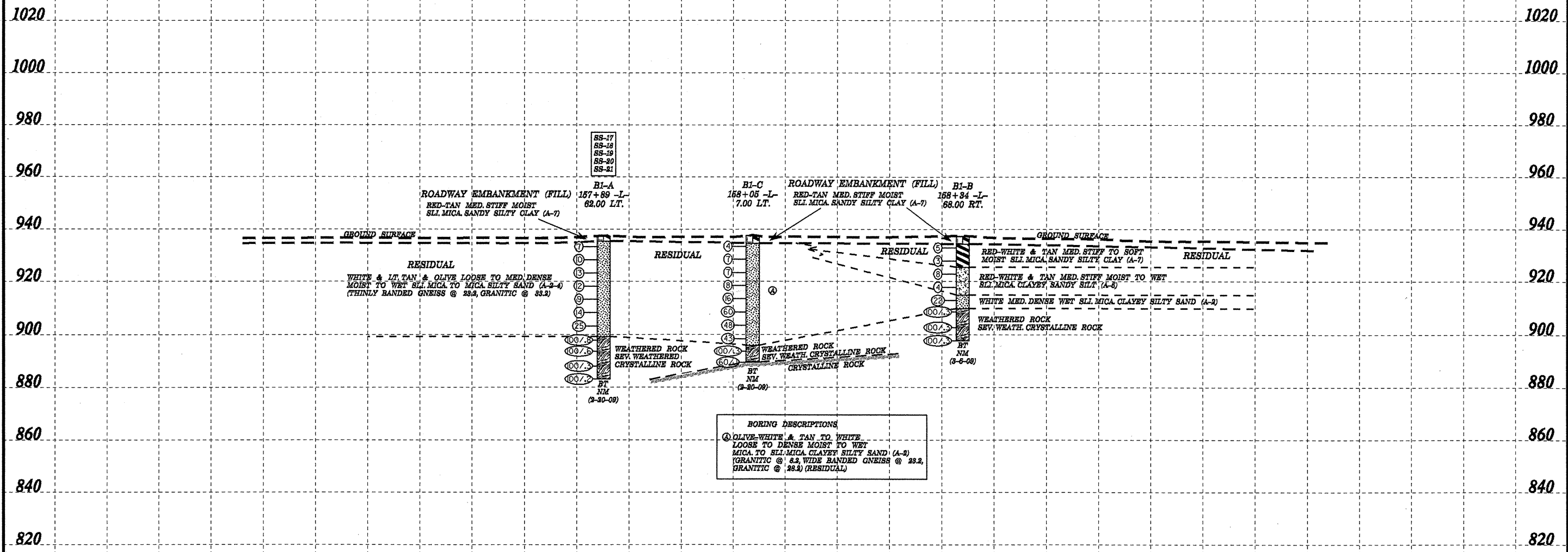


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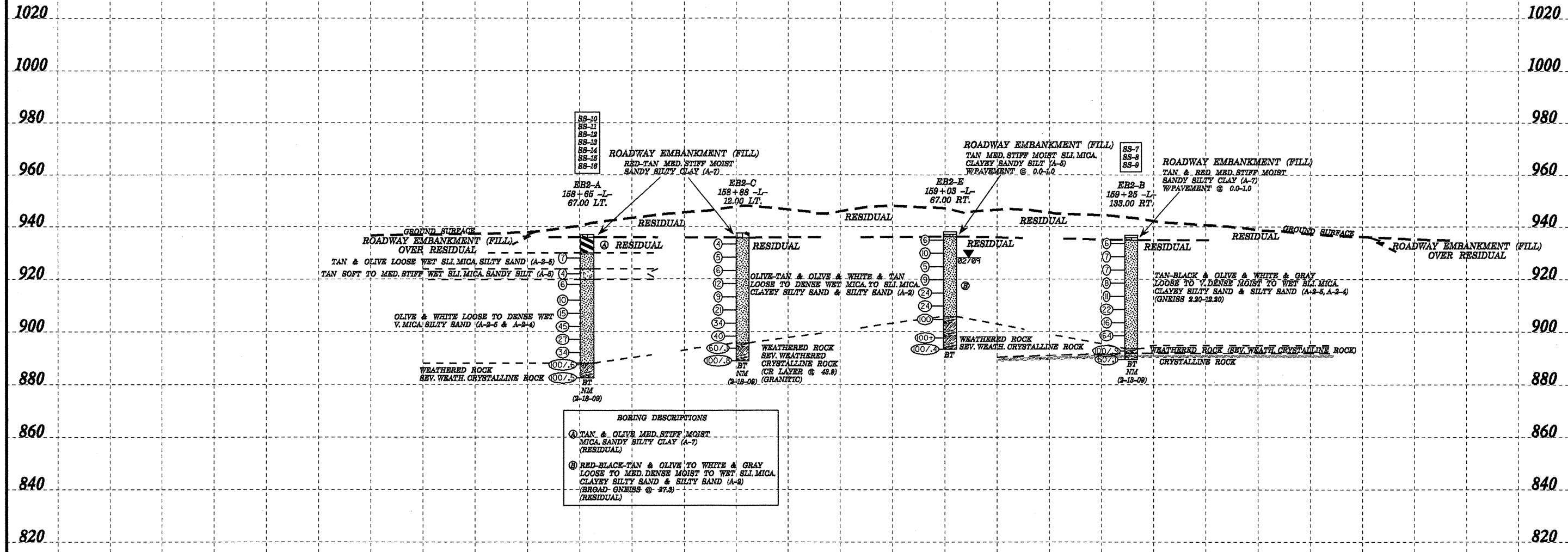
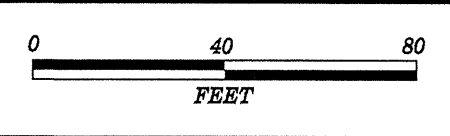


PROJECT REFERENCE NO.	SHEET
40278.1.1 (U-4909)	6
Section Thru Bent One Sta. 158+22.28 -L- (WP #2) Skew = 69°58'05"	

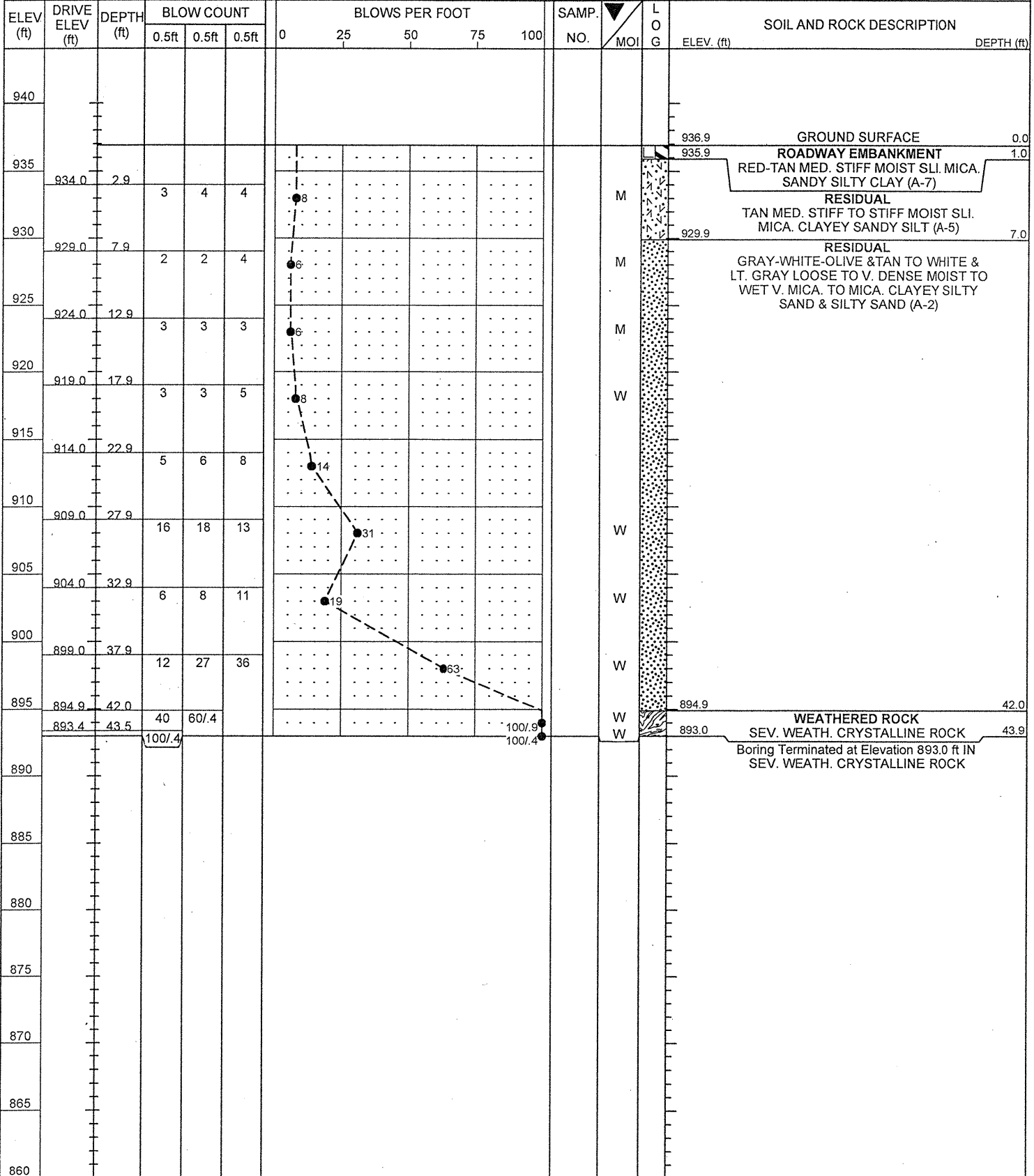


BORING DESCRIPTIONS
 (A) OLIVE-WHITE & TAN TO WHITE
 LOOSE TO DENSE MOIST TO WET
 MICA TO SLI. MICA CLAYEY SILTY SAND (A-2)
 (GRANITIC @ 23.2, WIDE BANDED GNEISS @ 23.2,
 GRANITIC @ 23.2) (RESIDUAL)

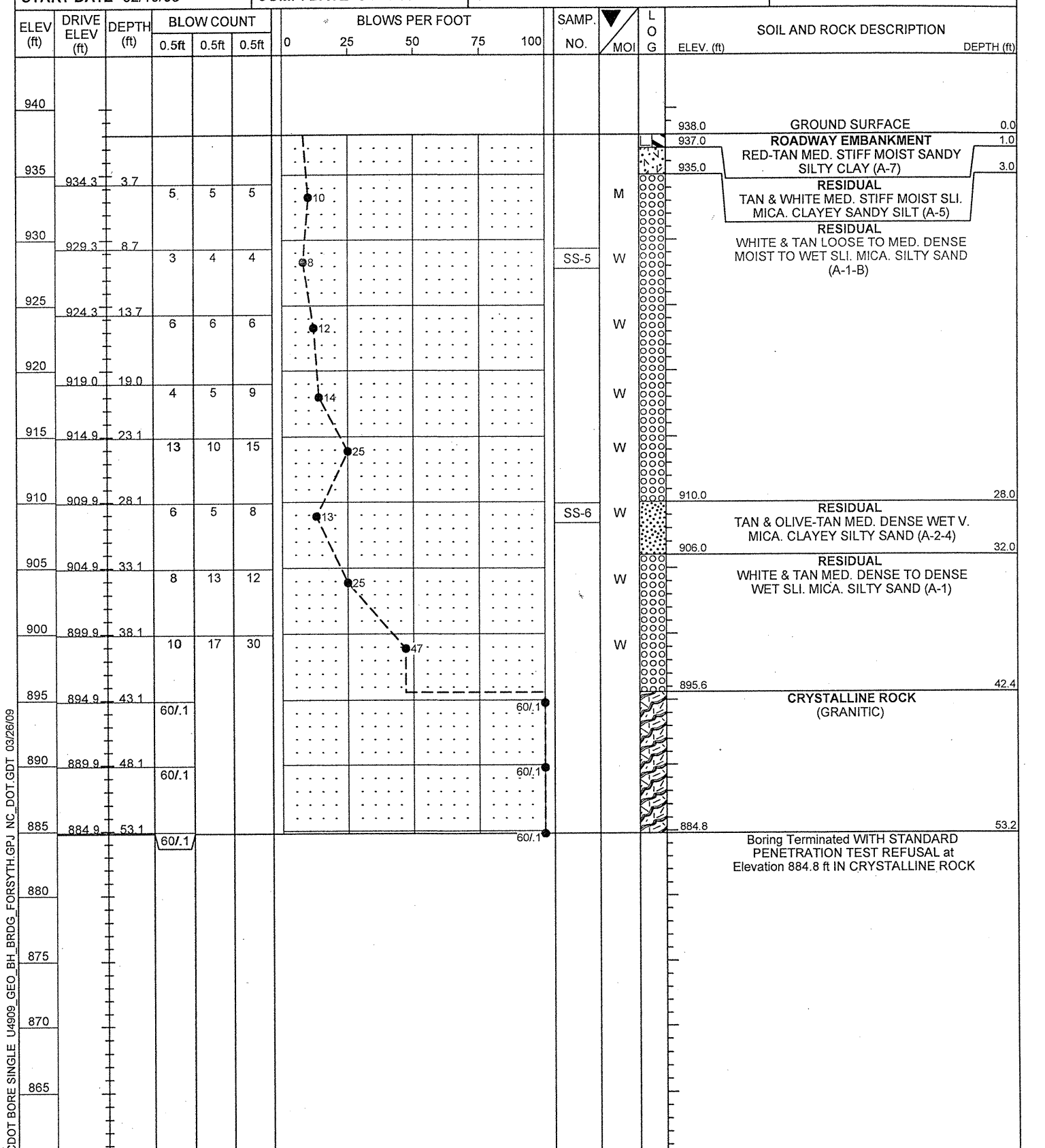
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PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 157+14	OFFSET 96ft LT	ALIGNMENT -L-
COLLAR ELEV. 936.9 ft	TOTAL DEPTH 43.9 ft	NORTHING 848,003	EASTING 1,671,955
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/11/09	COMP. DATE 02/12/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



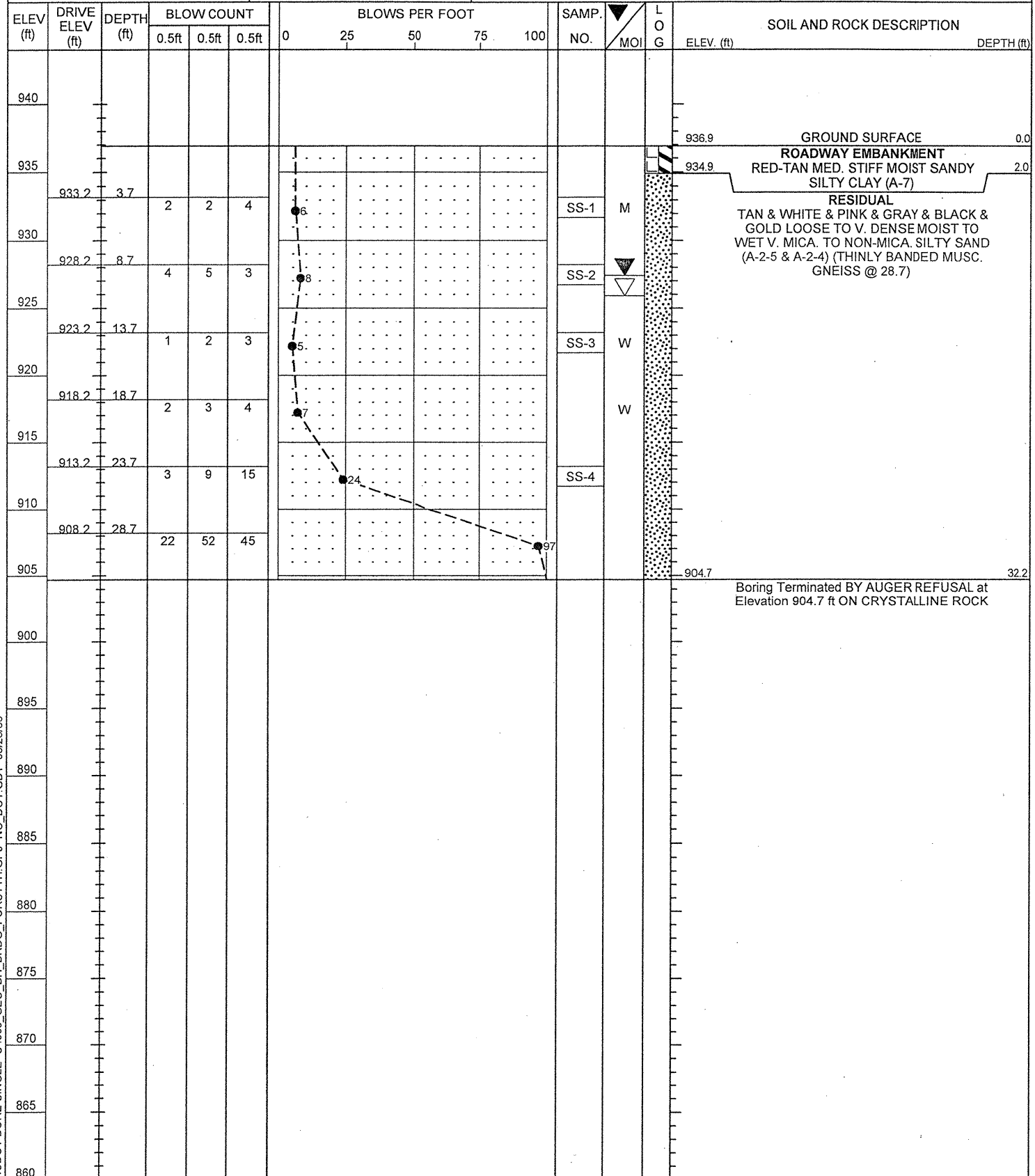
PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB1-C	STATION 157+36	OFFSET 35ft LT	ALIGNMENT -L-
COLLAR ELEV. 938.0 ft	TOTAL DEPTH 53.2 ft	NORTHING 848,002	EASTING 1,672,020
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/10/09	COMP. DATE 02/11/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 42.4 ft



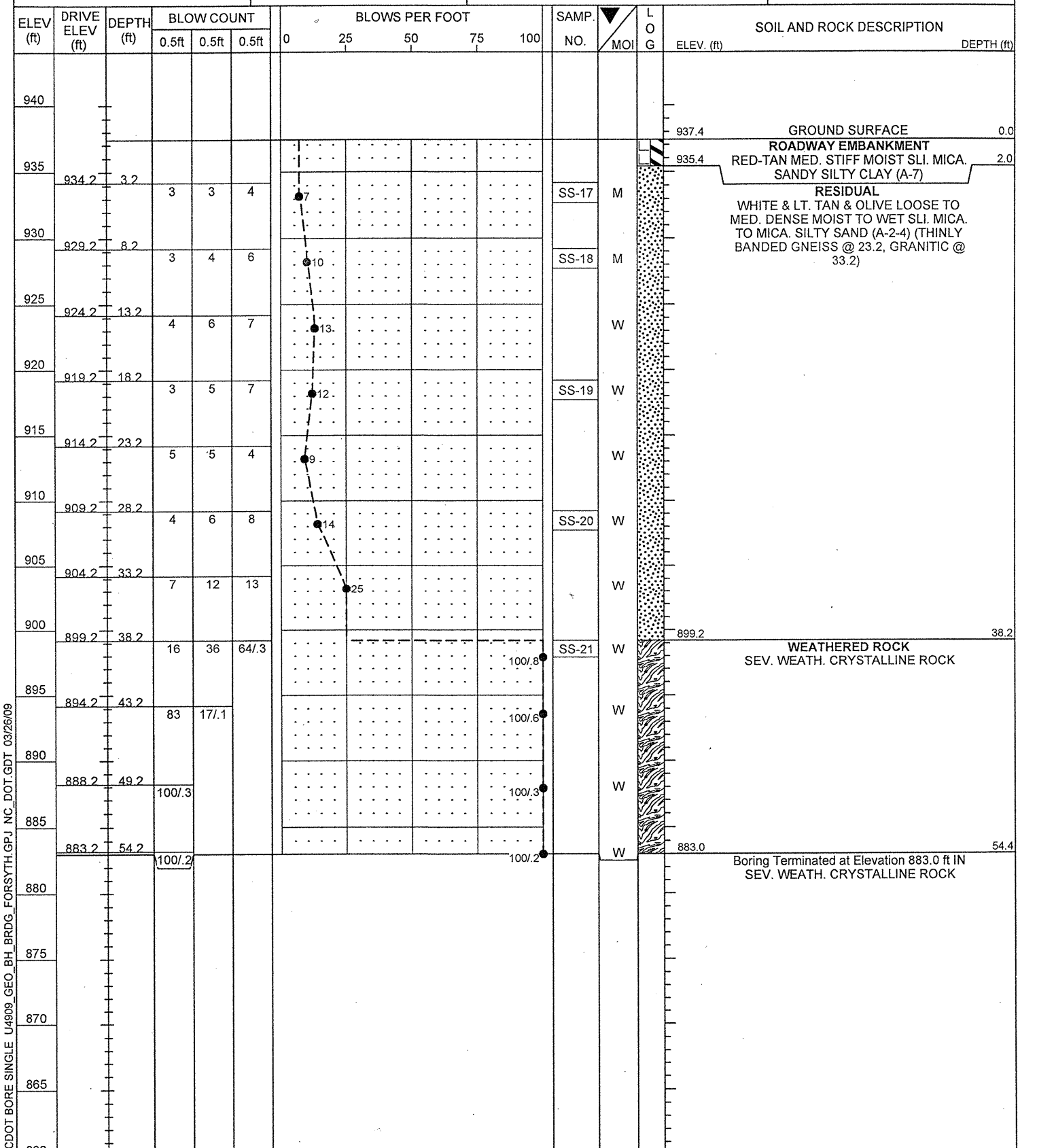
NCDOT BORE SINGLE U4909 GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT 03/26/09

NCDOT BORE SINGLE U4909 GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT 03/26/09

PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB1-B	STATION 157+87	OFFSET 85ft RT	ALIGNMENT -L-
COLLAR ELEV. 936.9 ft	TOTAL DEPTH 32.2 ft	NORTHING 848,006	EASTING 1,672,150
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/10/09	COMP. DATE 02/10/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 32.2 ft



PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. B1-A	STATION 157+89	OFFSET 62ft LT	ALIGNMENT -L-
COLLAR ELEV. 937.4 ft	TOTAL DEPTH 54.4 ft	NORTHING 848,061	EASTING 1,672,014
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/19/09	COMP. DATE 02/19/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/26/09

NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/26/09

PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. B1-C	STATION 158+05	OFFSET 7ft LT	ALIGNMENT -L-
COLLAR ELEV. 937.6 ft	TOTAL DEPTH 48.3 ft	NORTHING 848,056	EASTING 1,672,071
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/19/09	COMP. DATE 02/19/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 48.2 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
940													GROUND SURFACE	0.0
935	934.4	3.2	2	2	2							M	ROADWAY EMBANKMENT RED-TAN MED. STIFF MOIST SLI. MICA. SANDY SILTY CLAY (A-7)	3.0
930	929.4	8.2	2	3	4							M	RESIDUAL OLIVE-WHITE & TAN TO WHITE LOOSE TO DENSE MOIST TO WET MICA. TO SLI. MICA. CLAYEY SILTY SAND (A-2) (GRANITIC @ 8.2, WIDE BANDED GNEISS @ 23.2, GRANITIC @ 28.2)	
925	924.4	13.2	2	3	4							W		
920	919.4	18.2	3	3	5							W		
915	914.4	23.2	3	6	10							W		
910	909.4	28.2	10	13	47							W		
905	904.4	33.2	8	15	33							W		
900	899.4	38.2	7	23	20							W		
895	894.4	43.2	14	100/3										
890	889.4	48.2												
885														
880														
875														
870														
865														
860														

PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. B1-B	STATION 158+34	OFFSET 68ft RT	ALIGNMENT -L-
COLLAR ELEV. 937.3 ft	TOTAL DEPTH 39.6 ft	NORTHING 848,056	EASTING 1,672,151
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic	
START DATE 03/05/09	COMP. DATE 03/05/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
940													GROUND SURFACE	0.0
935	933.8	3.5	2	2	3							M	ROADWAY EMBANKMENT RED-TAN MED. STIFF MOIST SLI. MICA. SANDY SILTY CLAY (A-7)	3.0
930	928.8	8.5	2	1	2							M	RESIDUAL RED-WHITE & TAN MED. STIFF TO SOFT MOIST SLI. MICA. SANDY SILTY CLAY (A-7)	
925	923.8	13.5	2	3	5							W	RESIDUAL RED-WHITE & TAN MED. STIFF MOIST TO WET SLI. MICA. CLAYEY SANDY SILT (A-5)	12.0
920	918.8	18.5	1	2	2							W		
915	913.8	23.5	5	9	13							W	RESIDUAL WHITE MED. DENSE WET SLI. MICA. CLAYEY SILTY SAND (A-2)	22.5
910	908.8	28.5	100/3										WEATHERED ROCK SEV. WEATH. CRYSTALLINE ROCK	27.5
905	903.0	34.3	100/3											
900	898.0	39.3	100/3											
895														
890														
885														
880														
875														
870														
865														
860														

NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/26/09

NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/26/09

PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 158+65	OFFSET 67ft LT	ALIGNMENT -L-
COLLAR ELEV. 936.8 ft	TOTAL DEPTH 54.4 ft	NORTHING 848,134	EASTING 1,672,036
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/17/09	COMP. DATE 02/17/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
940													GROUND SURFACE 0.0	
935													ROADWAY EMBANKMENT 1.0 RED-TAN MED. STIFF MOIST SANDY SILTY CLAY (A-7)	
930													RESIDUAL 7.0 TAN & OLIVE MED. STIFF MOIST MICA. SANDY SILTY CLAY (A-7)	
925	928.9	7.9	3	3	4						SS-10	W	RESIDUAL 13.0 TAN & OLIVE LOOSE WET SLI. MICA. SILTY SAND (A-2-5)	
920	922.9	13.9	3	2	2						SS-11	W	RESIDUAL 17.0 TAN SOFT TO MED. STIFF WET SLI. MICA. SANDY SILT (A-5)	
915	918.9	17.9	2	2	4						SS-12	W	RESIDUAL 48.9 OLIVE & WHITE LOOSE TO DENSE WET V. MICA. SILTY SAND (A-2-5 & A-2-4)	
910	912.9	23.9	3	3	7						SS-13	W		
905	907.9	28.9	4	5	10						SS-14	W		
900	902.9	33.9	8	14	31						SS-15	W		
895	897.9	38.9	10	12	15						W			
890	892.9	43.9	15	18	16						SS-16	W		
885	887.9	48.9	70	30/1							W		WEATHERED ROCK 48.9 SEV. WEATH. CRYSTALLINE ROCK	
880	882.9	53.9	100/5								W		WEATHERED ROCK 54.4 SEV. WEATH. CRYSTALLINE ROCK	

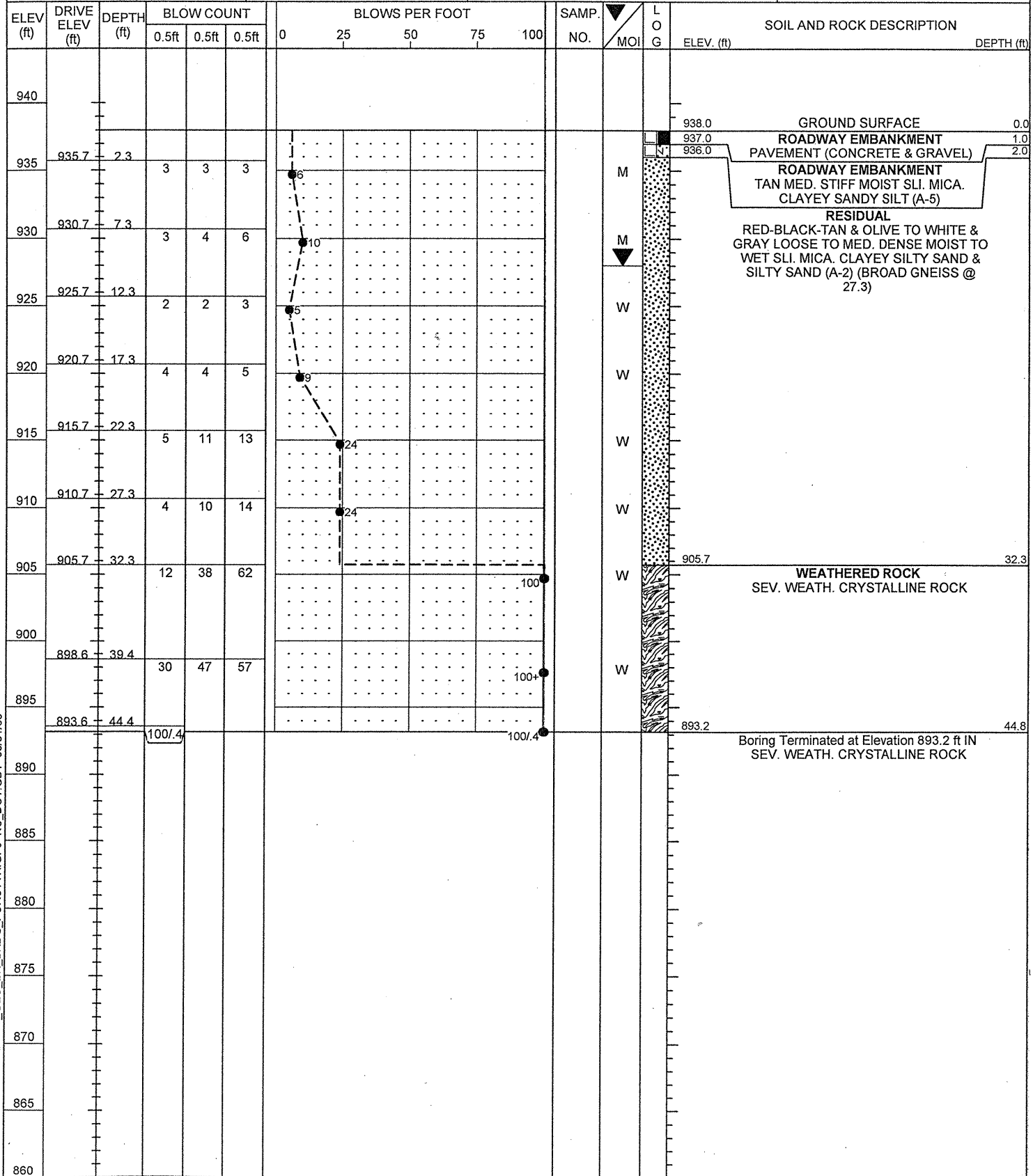
PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB2-C	STATION 158+88	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 937.5 ft	TOTAL DEPTH 48.7 ft	NORTHING 848,135	EASTING 1,672,096
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/17/09	COMP. DATE 02/17/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
940													GROUND SURFACE 0.0	
935													ROADWAY EMBANKMENT 2.0 RED-TAN MED. STIFF MOIST SANDY SILTY CLAY (A-7)	
930	934.1	3.4	3	1	3								RESIDUAL 7.0 OLIVE-TAN & OLIVE & WHITE & TAN LOOSE TO DENSE WET MICA. TO SLI. MICA. CLAYEY SILTY SAND & SILTY SAND (A-2)	
925	929.1	8.4	2	2	3									
920	924.1	13.4	2	3	3									
915	919.1	18.4	3	6	6									
910	914.1	23.4	2	4	5									
905	909.1	28.4	7	9	12									
900	904.1	33.4	14	15	19									
895	899.1	38.4	13	18	22									
890	894.1	43.4	48	60/1									WEATHERED ROCK 42.0 SEV. WEATH. CRYSTALLINE ROCK (CR LAYER @ 43.9) (GRANITIC)	
885	890.1	47.4	15	53	47/3								WEATHERED ROCK 48.7 SEV. WEATH. CRYSTALLINE ROCK	
880													Boring Terminated at Elevation 888.8 ft IN SEV. WEATH. CRYSTALLINE ROCK	

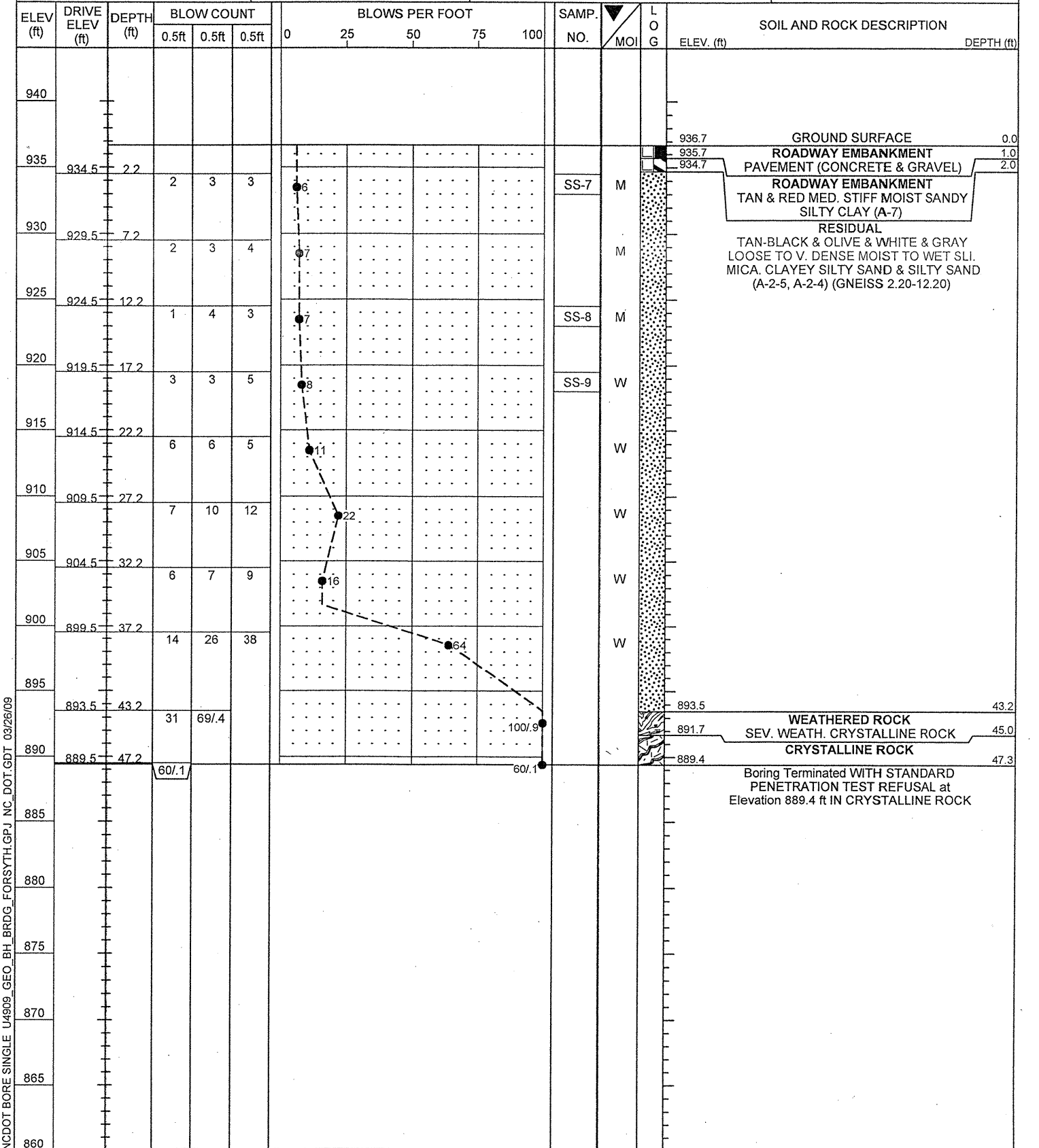
NCDOT BORE SINGLE U4909 GEO_BH_BRDG_FORSYTH.GPJ NC_DOT.GDT 03/26/09

NCDOT BORE SINGLE U4909 GEO_BH_BRDG_FORSYTH.GPJ NC_DOT.GDT 03/26/09

PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB2-E	STATION 159+03	OFFSET 67ft RT	ALIGNMENT -L-
COLLAR ELEV. 938.0 ft	TOTAL DEPTH 44.8 ft	NORTHING 848,121	EASTING 1,672,175
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/12/09	COMP. DATE 02/12/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



PROJECT NO. 40278.1.1	ID. U-4909	COUNTY FORSYTH	GEOLOGIST Murray, C. C.
SITE DESCRIPTION BRIDGE ON -L- (SR 2643 UNION CROSS RD.) OVER -Y15- (I-40)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 159+25	OFFSET 133ft RT	ALIGNMENT -L-
COLLAR ELEV. 936.7 ft	TOTAL DEPTH 47.3 ft	NORTHING 848,118	EASTING 1,672,245
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT / TRI-CONE	HAMMER TYPE Automatic	
START DATE 02/12/09	COMP. DATE 02/12/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 45.0 ft



NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/31/09

NCDOT BORE SINGLE U4909_GEO_BH_BRDG_FORSYTH.GPJ NC_DOT_GDT_03/26/09

