

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 41141.1.1 (U-5008) F.A. PROJ. NA
 COUNTY MECKLENBURG
 PROJECT DESCRIPTION SUGAR CREEK ROAD AND NCRRNSRR
CROSSING No. 715352H GRADE SEPARATION
 SIET DESCRIPTION BRIDGE ON SUGAR CREEK ROAD OVER
BEARWOOD AVE., NCRRNSRR, AND RALEIGH ST., BETWEEN
US74/NC27 AND US29/NC49
INVENTORY

CONTENTS

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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) 707-6650. 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.

ID: U-5008

PROJECT: 41141.1.1

PERSONNEL

S. Protopappas

S. Gower

C. Baldwin

M. Lear

INVESTIGATED BY AMEC E&I, Inc.

CHECKED BY S. Johnson

SUBMITTED BY M. Lear

DATE October, 2014

Professional seal of Michael B. Lear, North Carolina License No. 10101, dated 10/27/14. The seal includes the text 'NORTH CAROLINA LICENSED PROFESSIONAL SEAL 1927' and 'MICHAEL B. LEAR'. To the right is the AMEC E&I, Inc. logo and contact information: AMEC E&I, Inc., 4021 STIRRUP CREEK DRIVE, SUITE 100, DURHAM, NORTH CAROLINA 27703, (919) 381-9900. A signature of Michael B. Lear is present over the seal.

DRAWN BY: R. Rahie

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.

NC Engineering F-1253 NC Geology C-247

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

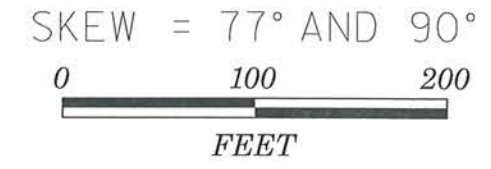
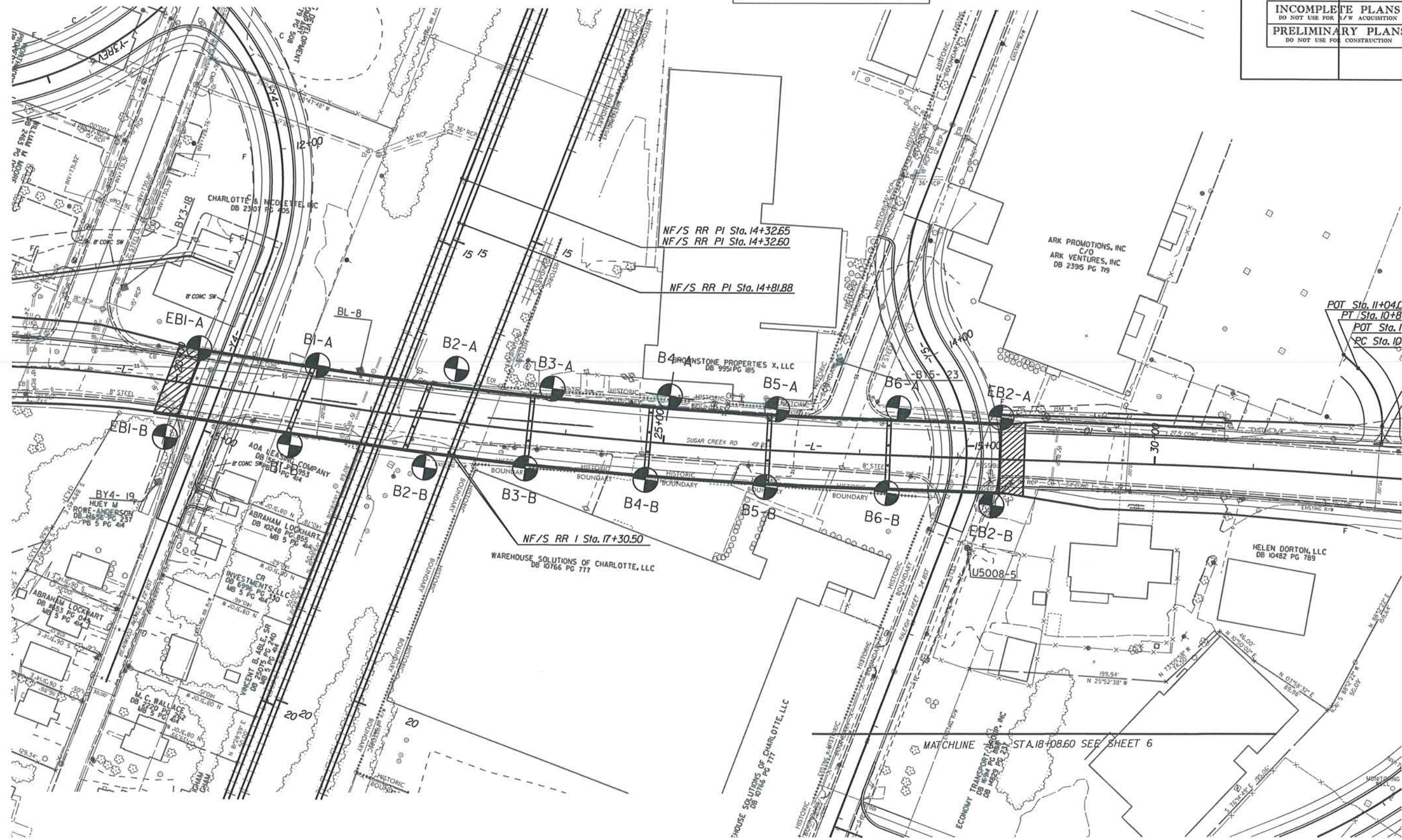
PROJECT REFERENCE NO. U-5008	SHEET NO. 2
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SUBSURFACE INVESTIGATION

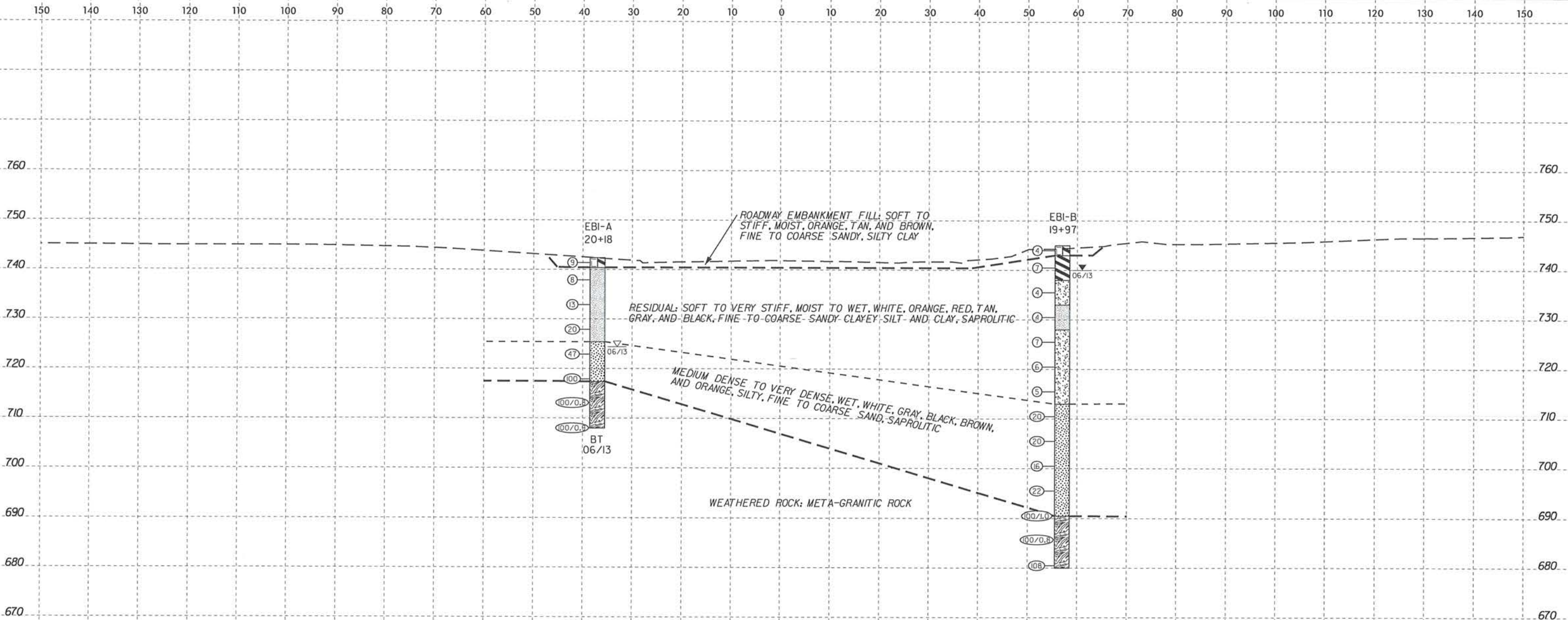
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, 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: <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 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 (CPS) - 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 IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	WEATHERING	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V 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 DIXES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	
COMPRESSIBILITY	PERCENTAGE OF MATERIAL	GROUND WATER	
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50	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	MISCELLANEOUS SYMBOLS	ROCK HARDNESS	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES	VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT - CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.	
TEXTURE OR GRAIN SIZE	ABBREVIATIONS	FRACTURE SPACING	BEDDING
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053	AR - AUGER REFUSAL 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 HL - 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 %g - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO	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	VERY THICKLY BEDDED - > 4 FEET THICKLY BEDDED - 1.5 - 4 FEET THINLY BEDDED - 0.16 - 1.5 FEET VERY THINLY BEDDED - 0.03 - 0.16 FEET THICKLY LAMINATED - 0.008 - 0.03 FEET THINLY LAMINATED - < 0.008 FEET
SOIL MOISTURE - CORRELATION OF TERMS	EQUIPMENT USED ON SUBJECT PROJECT	INDURATION	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DRILL UNITS: <input checked="" type="checkbox"/> MOBILE B-57 <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST	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.	FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY
PLASTICITY	ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ *STEEL TEETH <input type="checkbox"/> TRICONE _____ *TUNG-CARB. <input checked="" type="checkbox"/> CORE BIT <input type="checkbox"/> _____	HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> B _____ <input checked="" type="checkbox"/> N Q _____ <input type="checkbox"/> H _____ HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST	INDURATION
COLOR			NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLING CT - CORING TERMINATED
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: N/A ELEVATIONS FROM PROVIDED ELECTRONIC FILES. ELEVATION: N/A FT.

PROJECT REFERENCE NO. U-5008	SHEET NO. 3
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

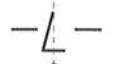


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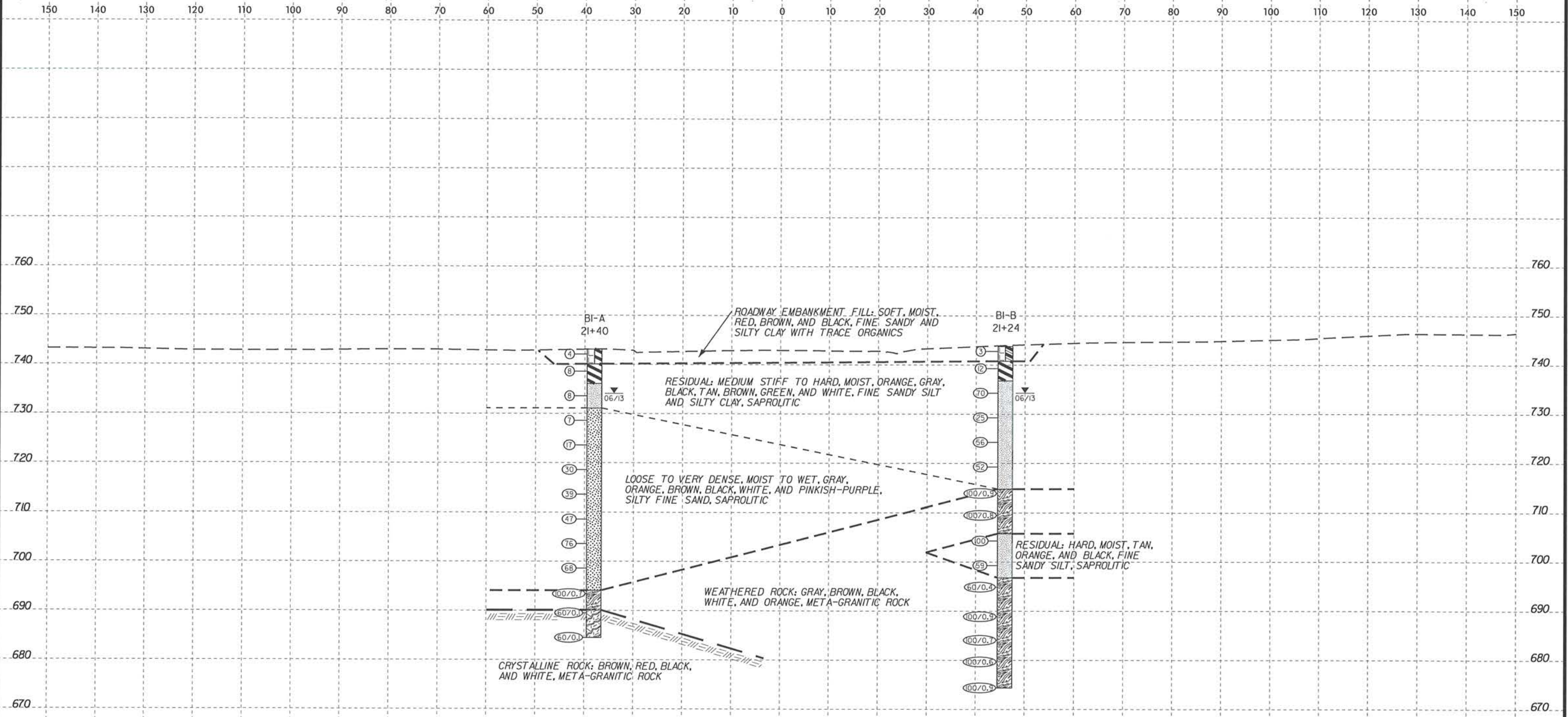


CROSS SECTION ALONG END BENT 1 (STA. 20+13.78)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW APPROXIMATELY 77°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

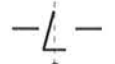


8/22/09



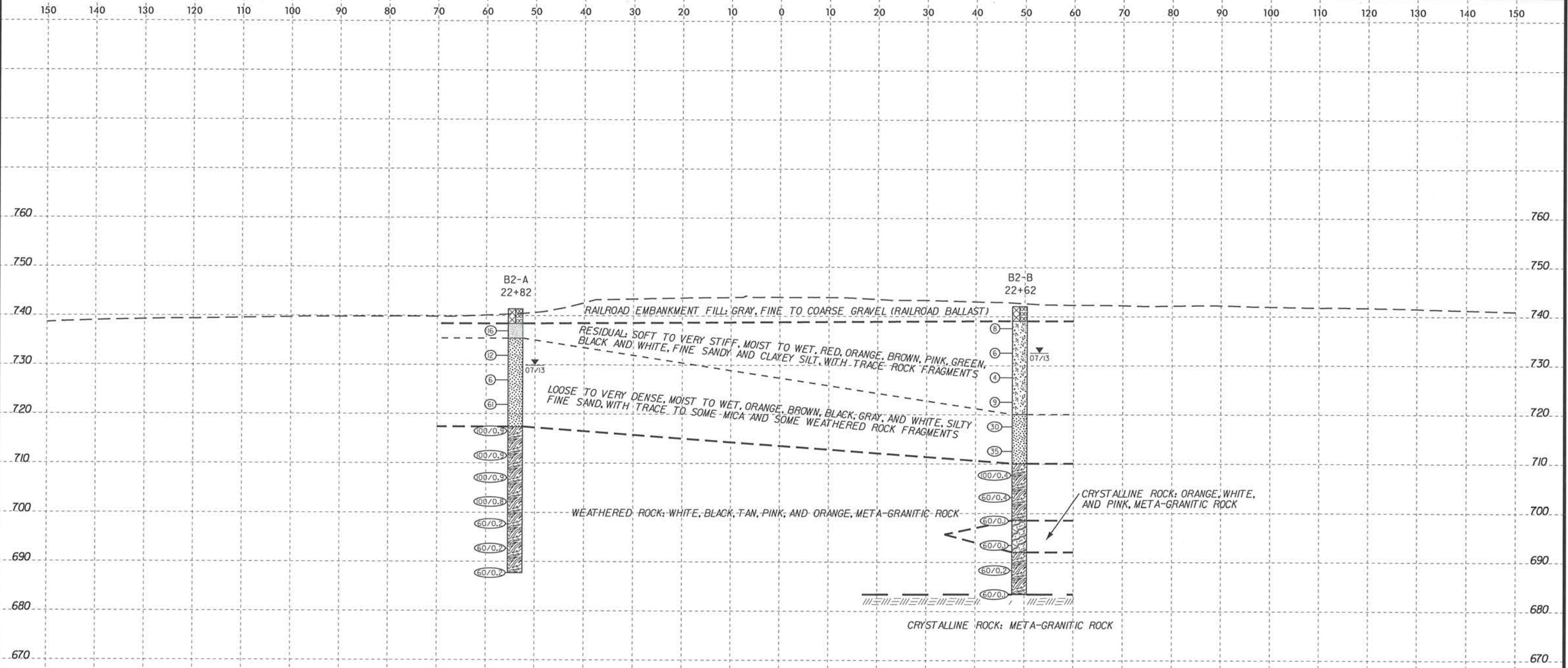
CROSS SECTION ALONG BENT 1 (STA. 21+28.13)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW APPROXIMATELY 77°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.



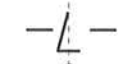
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8/23/09



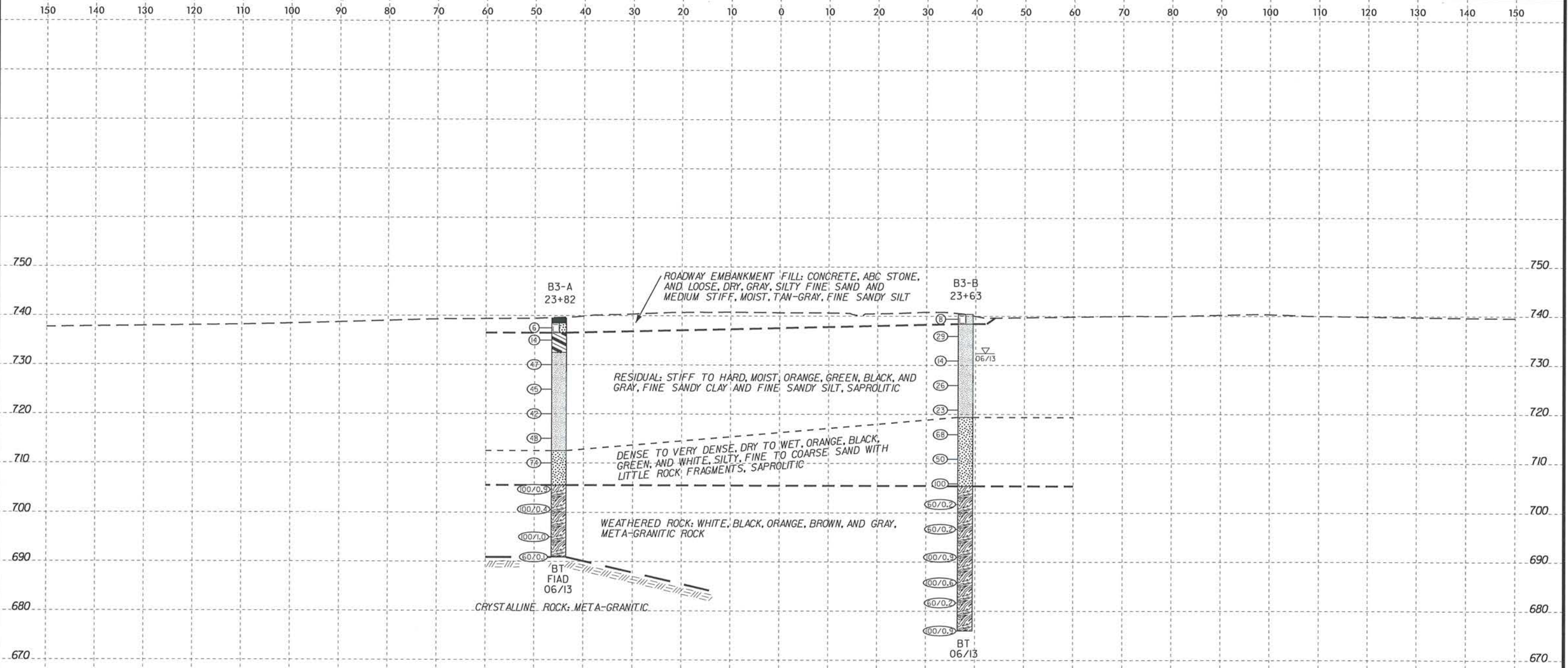
CROSS SECTION ALONG BENT 2 (STA. 22 + 48.04)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW APPROXIMATELY 77°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.



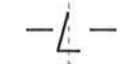
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B/23/99



CROSS SECTION ALONG BENT 3 (STA. 23 + 63.02)

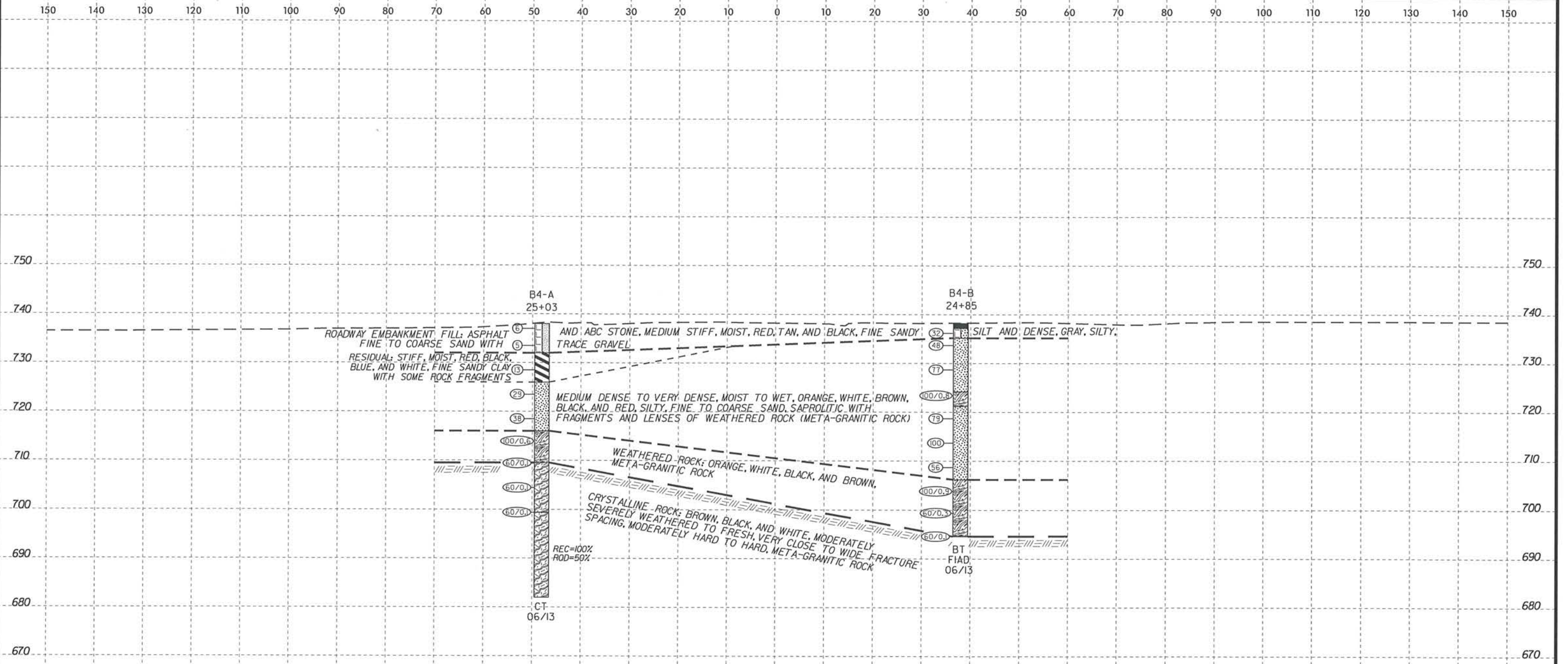
- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.



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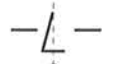
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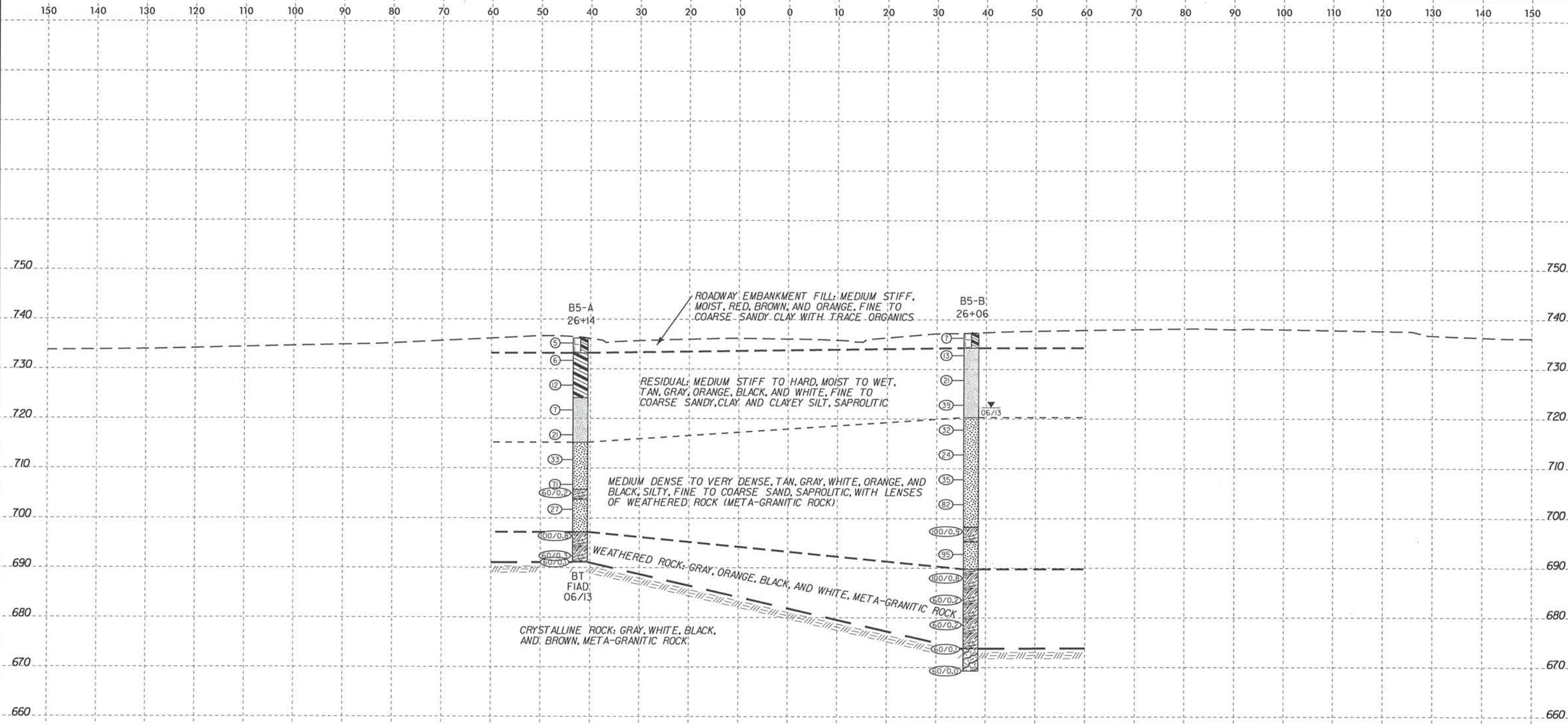
CROSS SECTION ALONG BENT 4 (STA. 24+85.11)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
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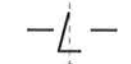
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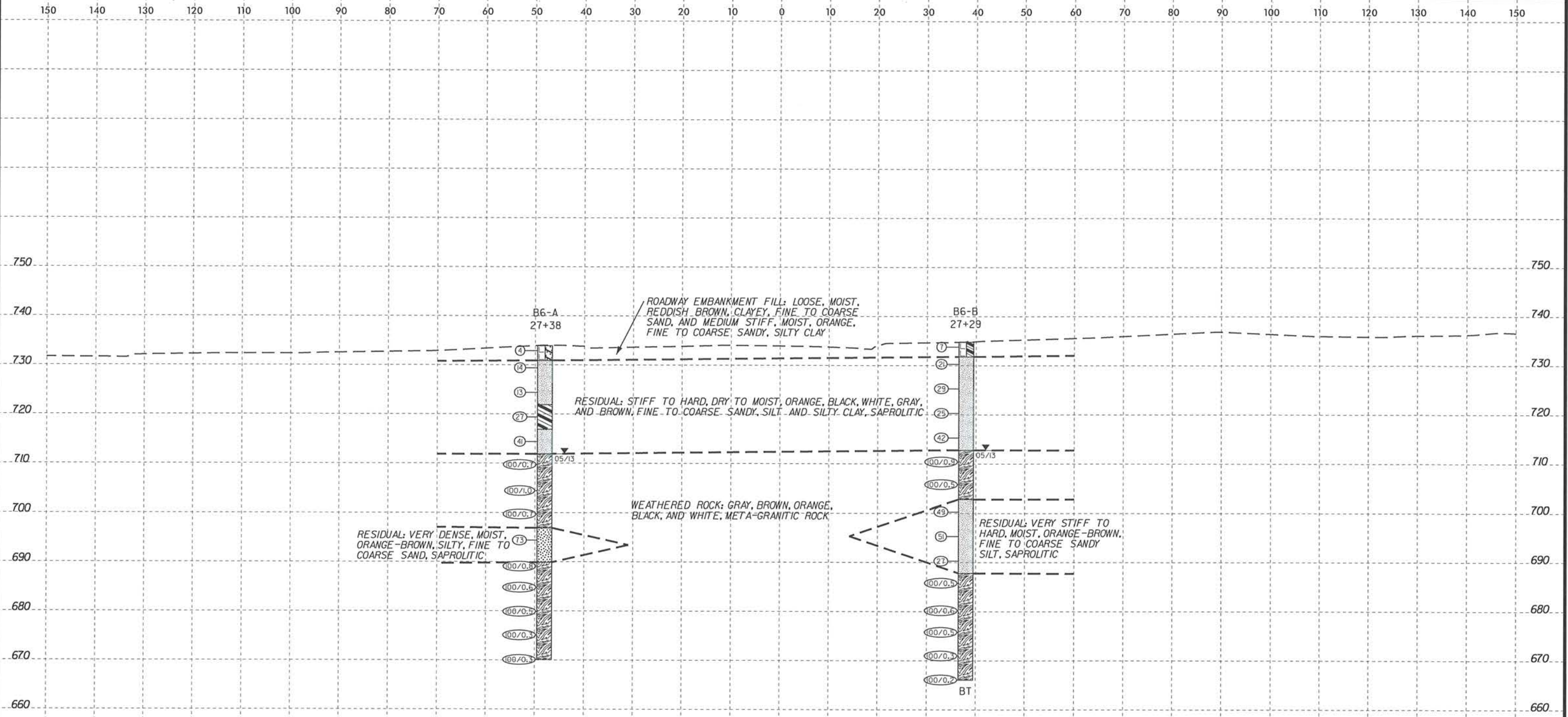
CROSS SECTION ALONG BENT 5 (STA. 26+07.02)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.



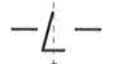
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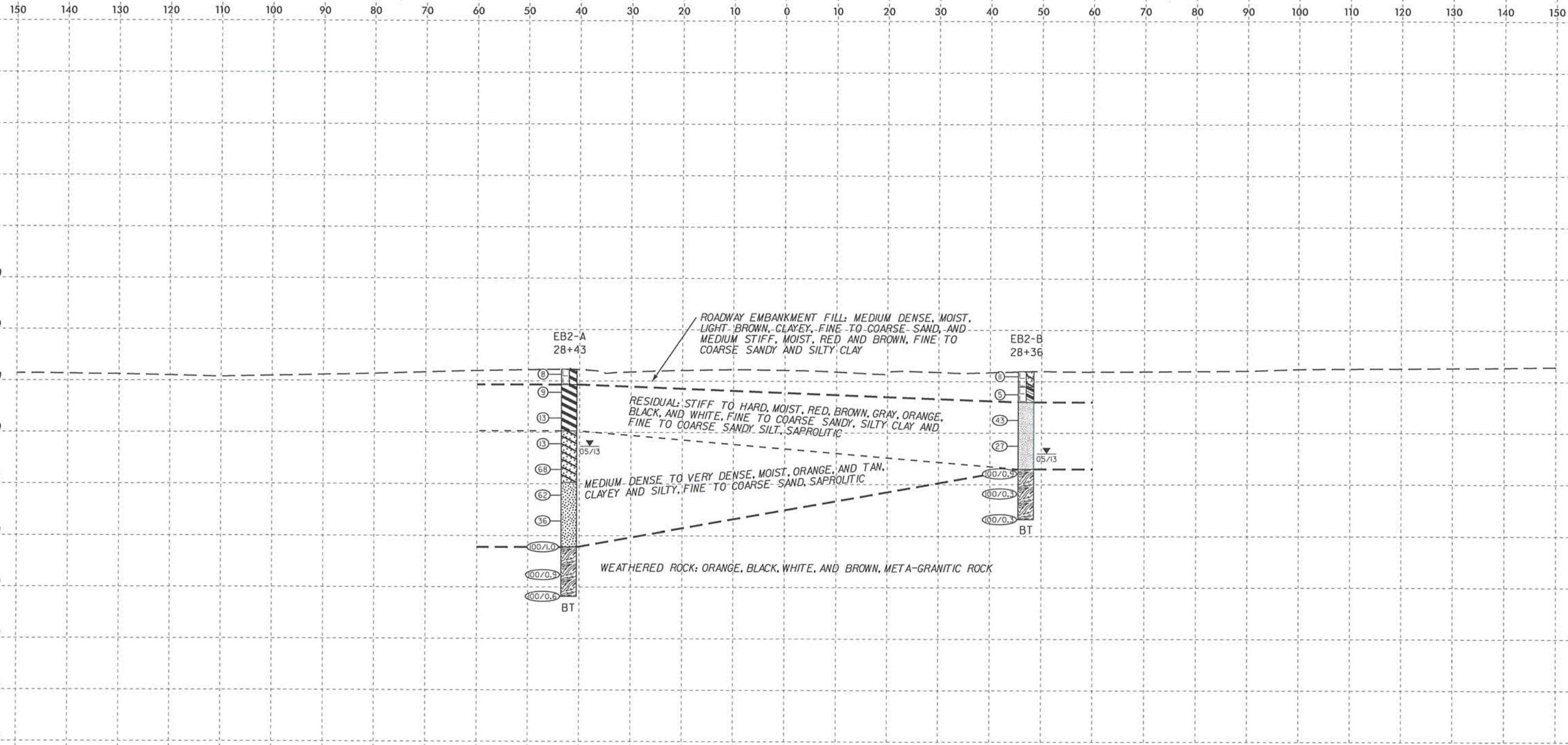


CROSS SECTION ALONG BENT 6 (STA. 27+29.06)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

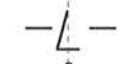


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CROSS SECTION ALONG END BENT 2 (STA. 28+42.55)

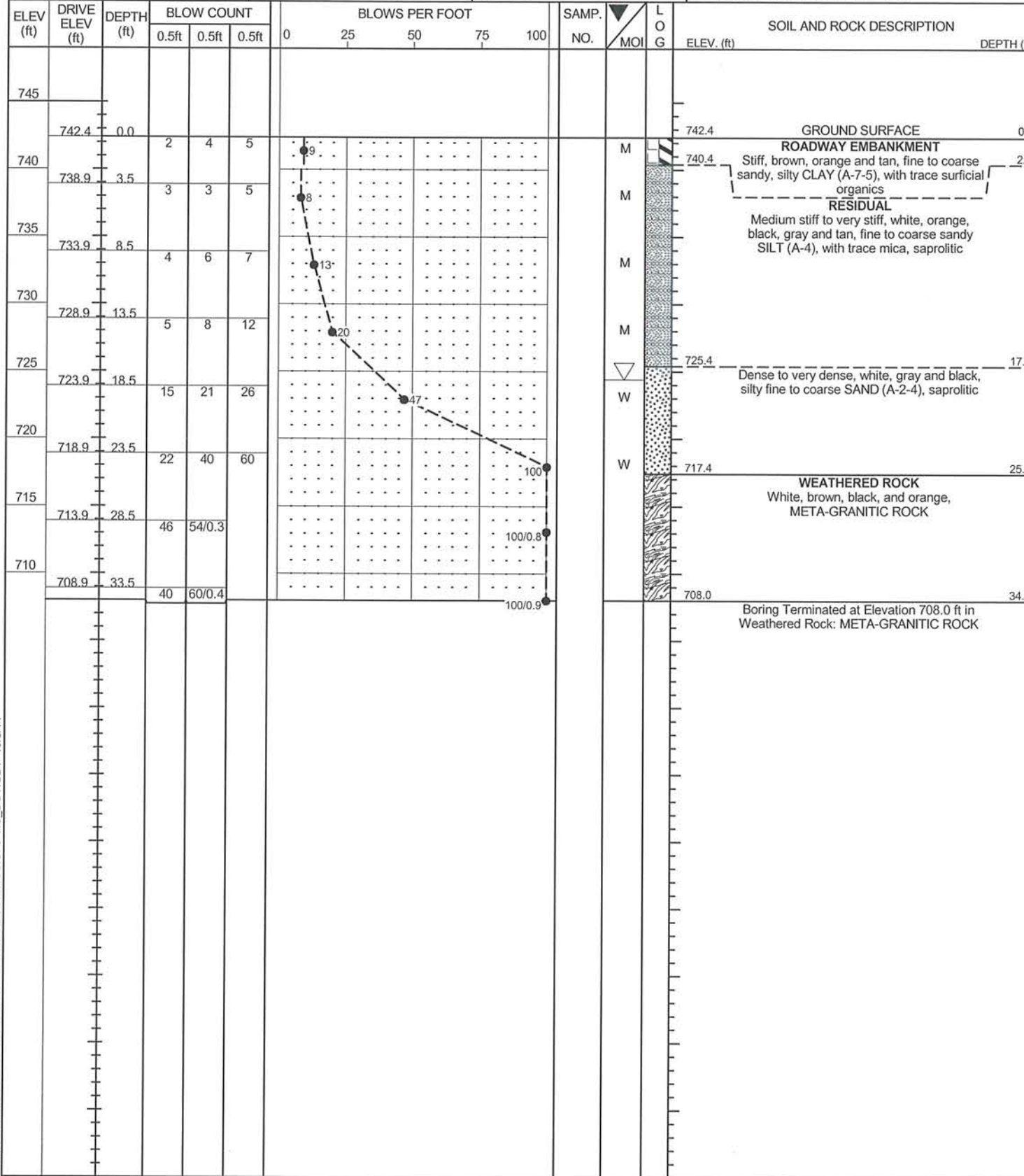
- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.



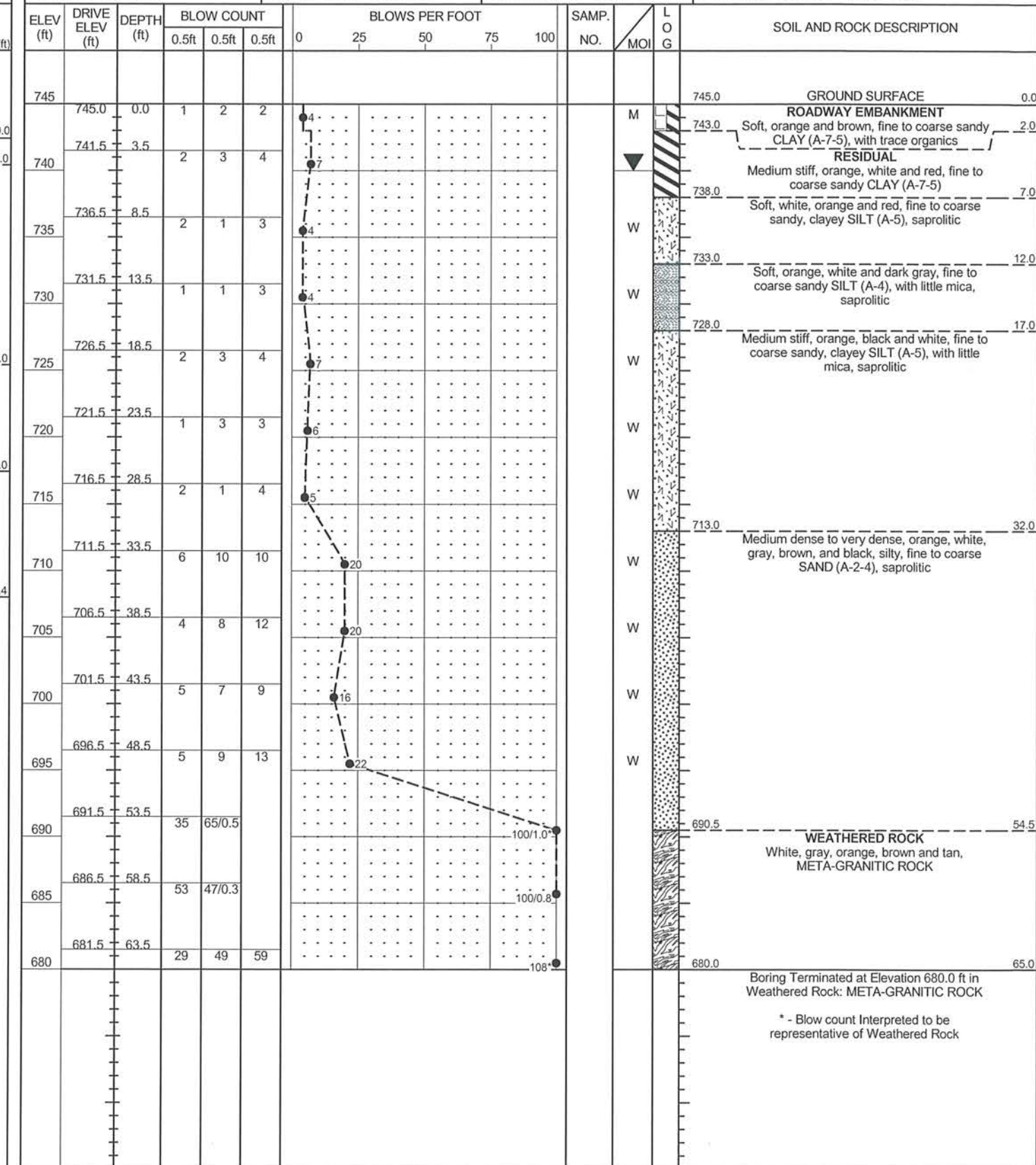
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WBS 41141.1.1	TIP U-5008	COUNTY MECKLENBURG	GEOLOGIST S.Protopappas	
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCR/NSRR, Raleigh St., between US74/NC27-US29/NC49				GROUND WTR (ft)
BORING NO. EB1-A	STATION 20+18	OFFSET 37 ft LT	ALIGNMENT -L-	0 HR. 18.0
COLLAR ELEV. 742.4 ft	TOTAL DEPTH 34.4 ft	NORTHING 551,073	EASTING 1,465,337	24 HR. N/A
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER S. Gower	START DATE 06/05/13	COMP. DATE 06/05/13	SURFACE WATER DEPTH N/A	



WBS 41141.1.1	TIP U-5008	COUNTY MECKLENBURG	GEOLOGIST S.Protopappas	
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCR/NSRR, Raleigh St., between US74/NC27-US29/NC49				GROUND WTR (ft)
BORING NO. EB1-B	STATION 19+97	OFFSET 57 ft RT	ALIGNMENT -L-	0 HR. 17.0
COLLAR ELEV. 745.0 ft	TOTAL DEPTH 65.0 ft	NORTHING 551,088	EASTING 1,465,432	24 HR. 5.0
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER S. Gower	START DATE 06/04/13	COMP. DATE 06/04/13	SURFACE WATER DEPTH N/A	



NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT_GDT_10/08/14

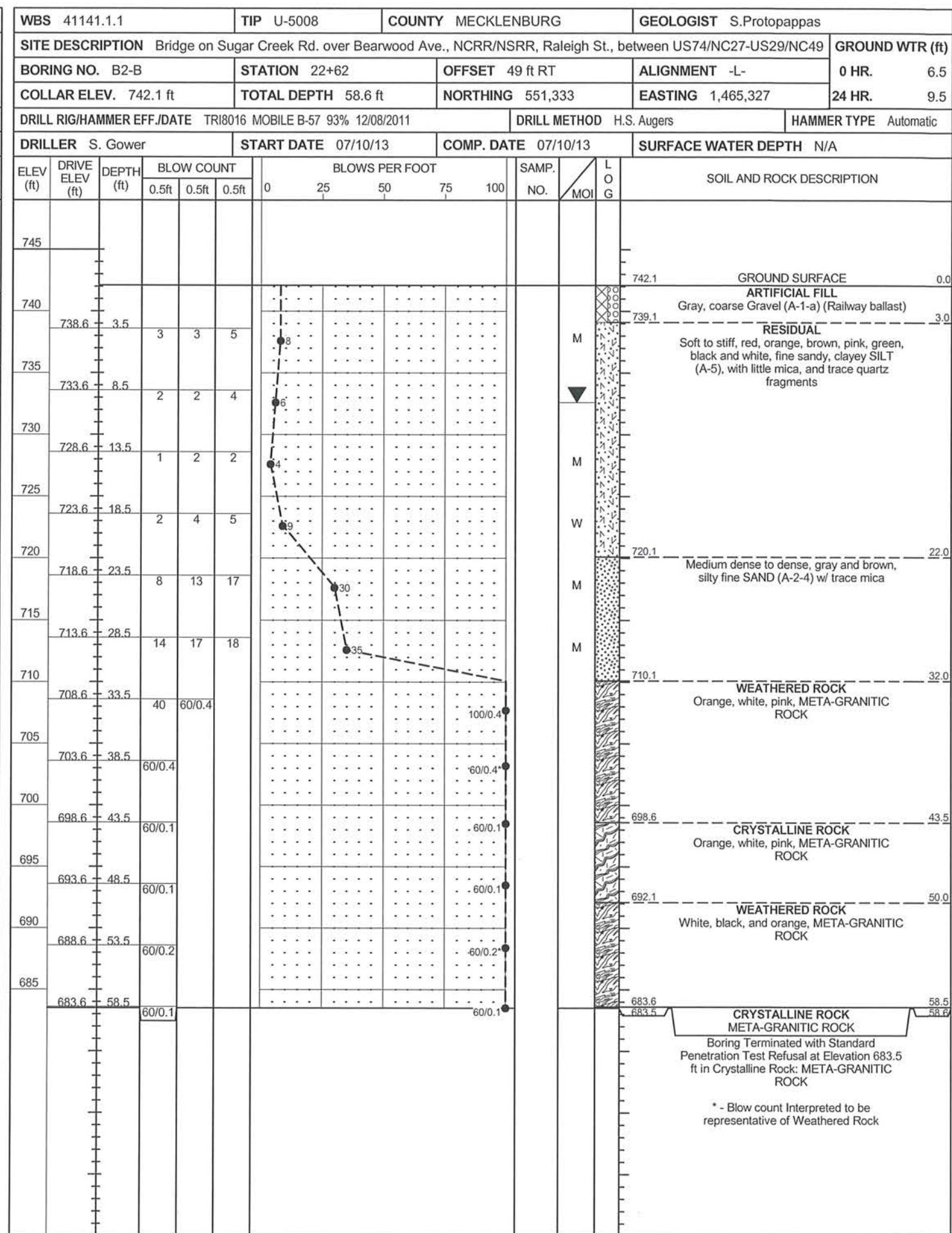
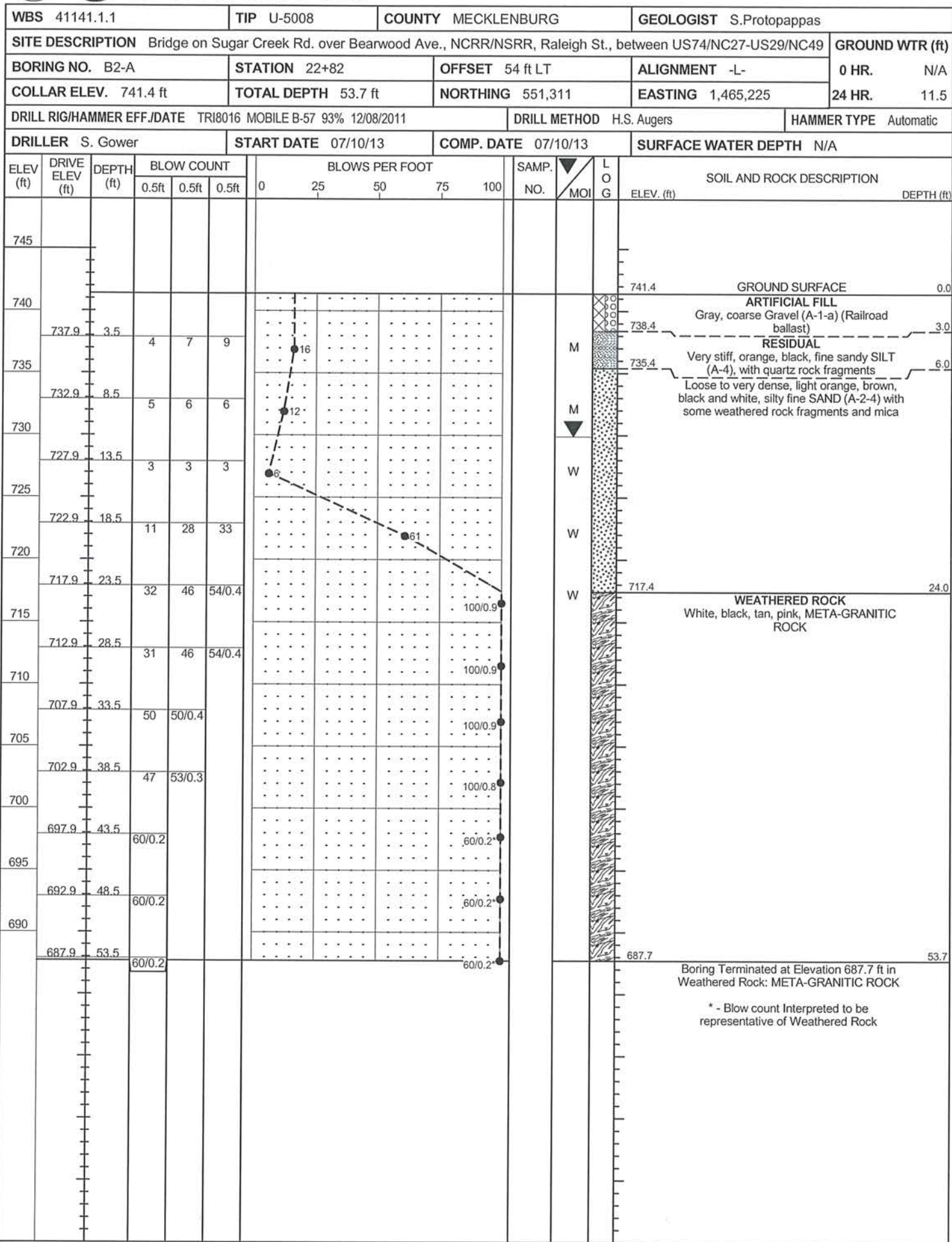
* - Blow count Interpreted to be representative of Weathered Rock

WBS 41141.1.1		TIP U-5008		COUNTY MECKLENBURG		GEOLOGIST S.Protopappas								
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCR/NSRR, Raleigh St., between US74/NC27-US29/NC49								GROUND WTR (ft)						
BORING NO. B1-A		STATION 21+40		OFFSET 38 ft LT		ALIGNMENT -L-		0 HR. 23.0						
COLLAR ELEV. 743.1 ft		TOTAL DEPTH 58.6 ft		NORTHING 551,186		EASTING 1,465,292		24 HR. 9.0						
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic								
DRILLER S. Gower		START DATE 06/05/13		COMP. DATE 06/05/13		SURFACE WATER DEPTH 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				
745	743.1	0.0	3	2	2							M	GROUND SURFACE	0.0
740	739.6	3.5	3	3	5							M	ROADWAY EMBANKMENT Soft, red and black, silty CLAY (A-7-5), trace fine sand and surficial organics	3.0
735	734.6	8.5	4	3	5							M	RESIDUAL Medium stiff, orange and gray, silty CLAY (A-7-5)	7.0
730	729.6	13.5	3	4	3							M	Medium stiff, gray, fine sandy SILT (A-4), saprolitic	12.0
725	724.6	18.5	5	8	9							M	Loose to very dense, gray, orange, black, brown, white, pinkish-purple, silty fine SAND (A-2-4), saprolitic	
720	719.6	23.5	9	15	15							W		
715	714.6	28.5	10	17	22							M		
710	709.6	33.5	13	21	26							M		
705	704.6	38.5	24	32	44							M		
700	699.6	43.5	19	27	41							M		
695	694.6	48.5	21	34	66/0.2							M		
690	689.6	53.5	60/0.1									M	WEATHERED ROCK Gray, META-GRANITIC ROCK	49.0
685	684.6	58.5	60/0.1									M	CRYSTALLINE ROCK Brown, red, white and black, META-GRANITIC ROCK	53.0
													Boring Terminated with Standard Penetration Test Refusal at Elevation 684.5 ft in Crystalline Rock: META-GRANITIC ROCK	58.6

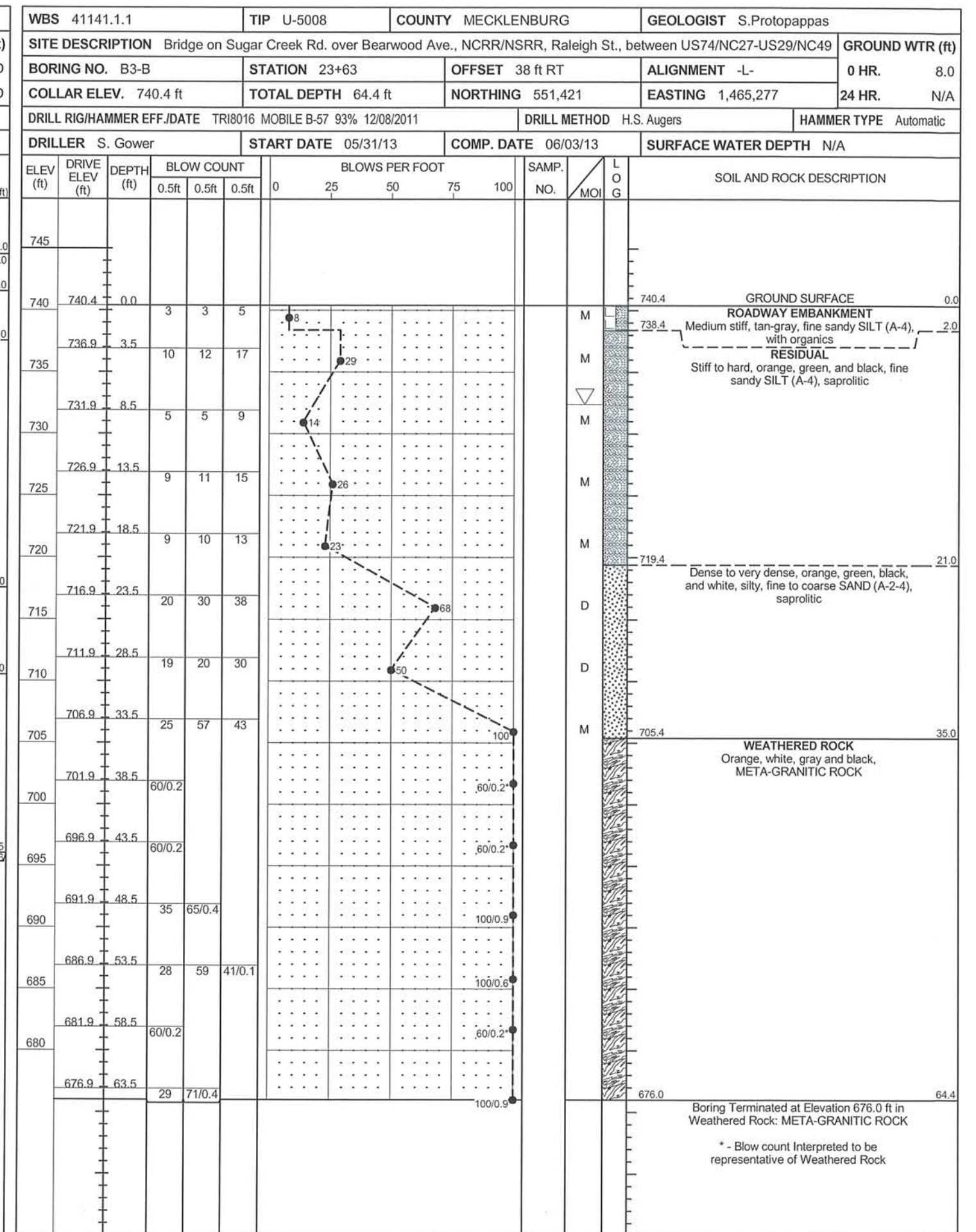
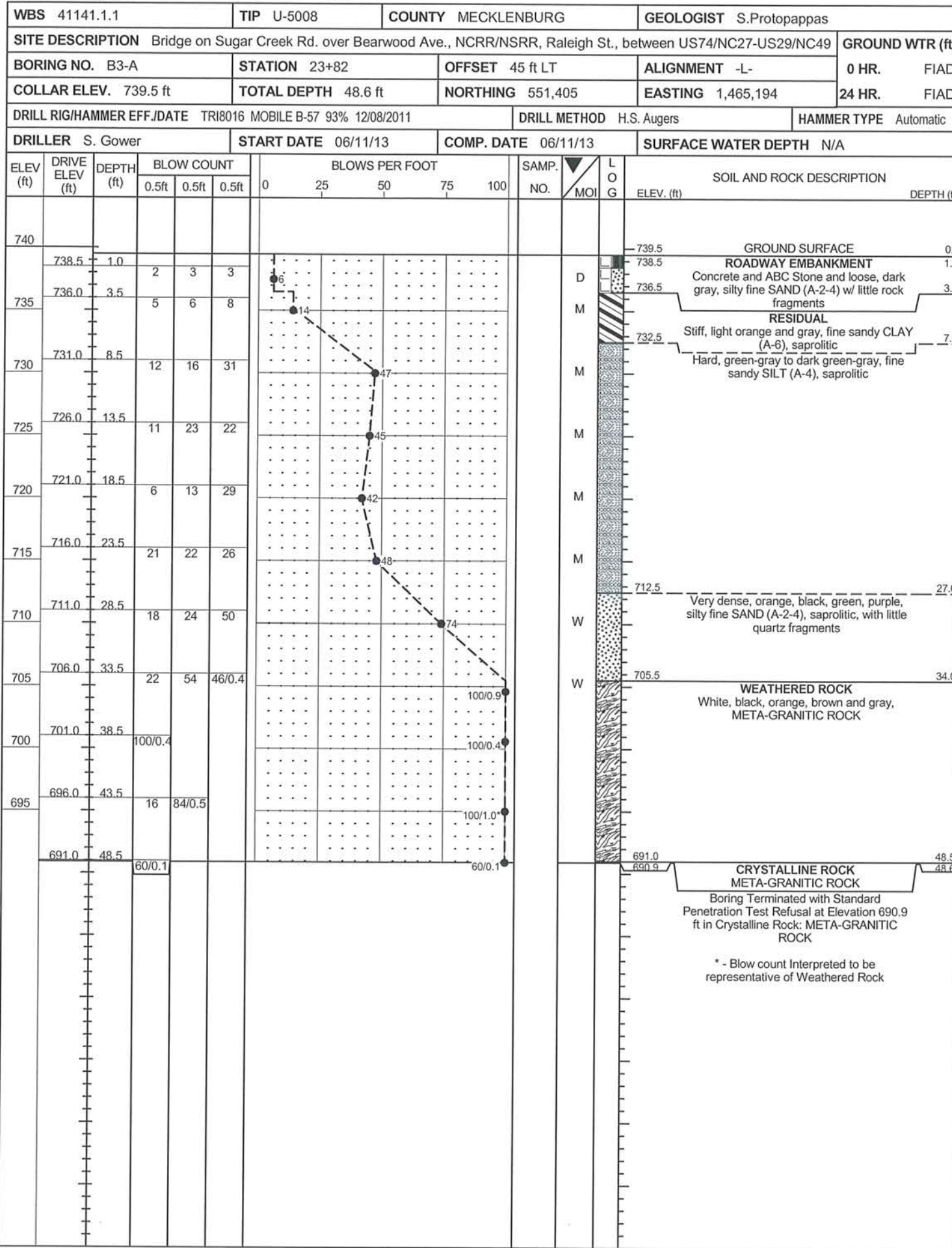
WBS 41141.1.1		TIP U-5008		COUNTY MECKLENBURG		GEOLOGIST S.Protopappas								
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCR/NSRR, Raleigh St., between US74/NC27-US29/NC49								GROUND WTR (ft)						
BORING NO. B1-B		STATION 21+24		OFFSET 46 ft RT		ALIGNMENT -L-		0 HR. 8.0						
COLLAR ELEV. 743.8 ft		TOTAL DEPTH 69.4 ft		NORTHING 551,202		EASTING 1,465,376		24 HR. 9.5						
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic								
DRILLER S. Gower		START DATE 06/03/13		COMP. DATE 06/04/13		SURFACE WATER DEPTH 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				
745	743.8	0.0	2	2	1							M	GROUND SURFACE	0.0
740	740.3	3.5	3	5	7							M	ROADWAY EMBANKMENT Soft, brown, fine sandy CLAY (A-6) with trace organics	3.0
735	735.3	8.5	11	24	46							M	RESIDUAL Stiff, orange and black, silty CLAY (A-7-5) with trace fine sand and organics	7.0
730	730.3	13.5	11	14	11							W	Very stiff to hard, tan-brown, orange, green, reddish-orange, black, and white, fine sandy SILT (A-4), saprolitic	
725	725.3	18.5	20	29	27							M		
720	720.3	23.5	18	29	23							M		
715	715.3	28.5	18	51	49/0.4							M		
710	710.3	33.5	41	59/0.3								M	WEATHERED ROCK Brown, white and black, META-GRANITIC ROCK	29.0
705	705.3	38.5	48	42	58							M		
700	700.3	43.5	19	25	34							M	RESIDUAL Hard, light tan, orange, black, fine sandy SILT (A-4), saprolitic	38.0
695	695.3	48.5	60/0.4									M		
690	690.3	53.5	17	58	42/0.4							M	WEATHERED ROCK Orange, black and white, META-GRANITIC ROCK	47.0
685	685.3	58.5	6	14	86/0.2							M		
680	680.3	63.5	59	41/0.1								M		
675	675.3	68.5	42	58/0.4								M		
													Boring Terminated at Elevation 674.4 ft in Weathered Rock: META-GRANITIC ROCK	69.4

NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT_GDT 10/8/14

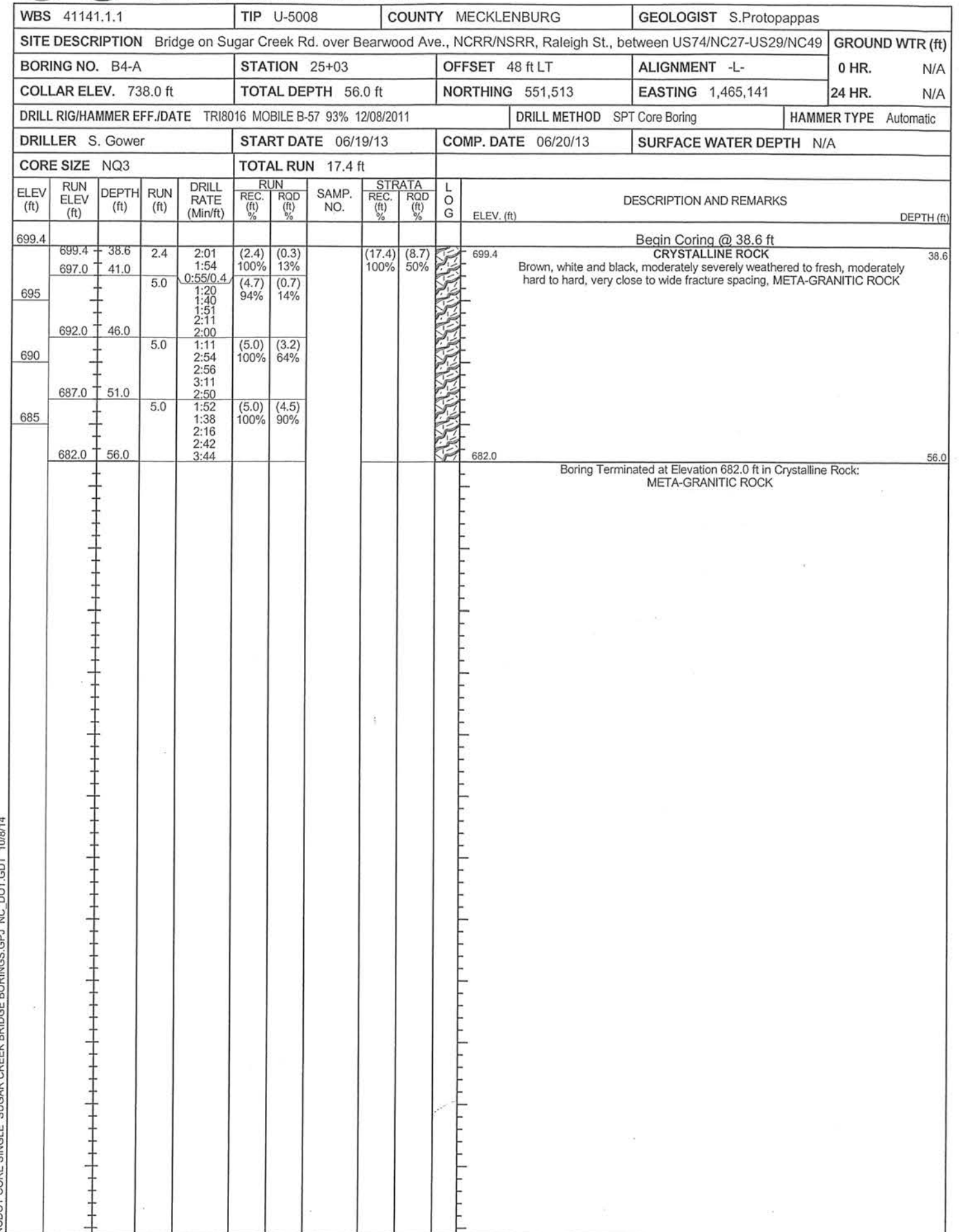
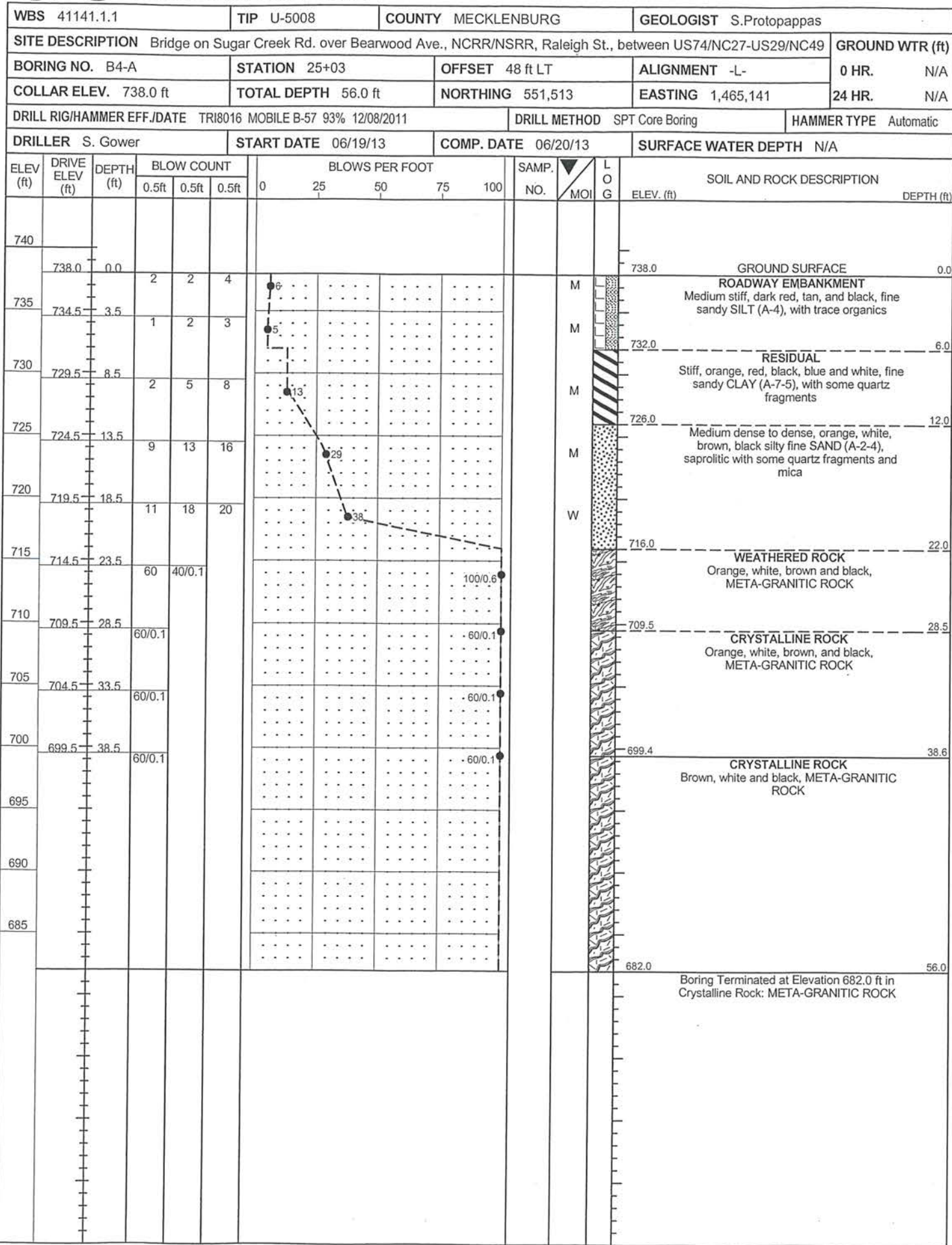
* - Blow count Interpreted to be representative of Weathered Rock



NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT_GDT 10/8/14



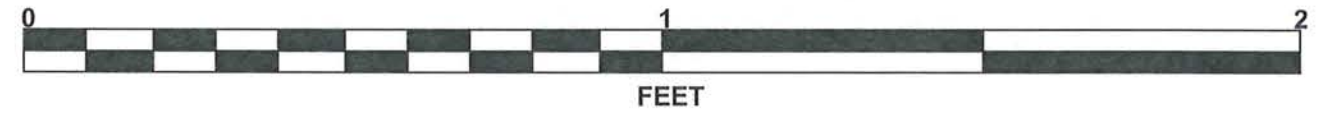
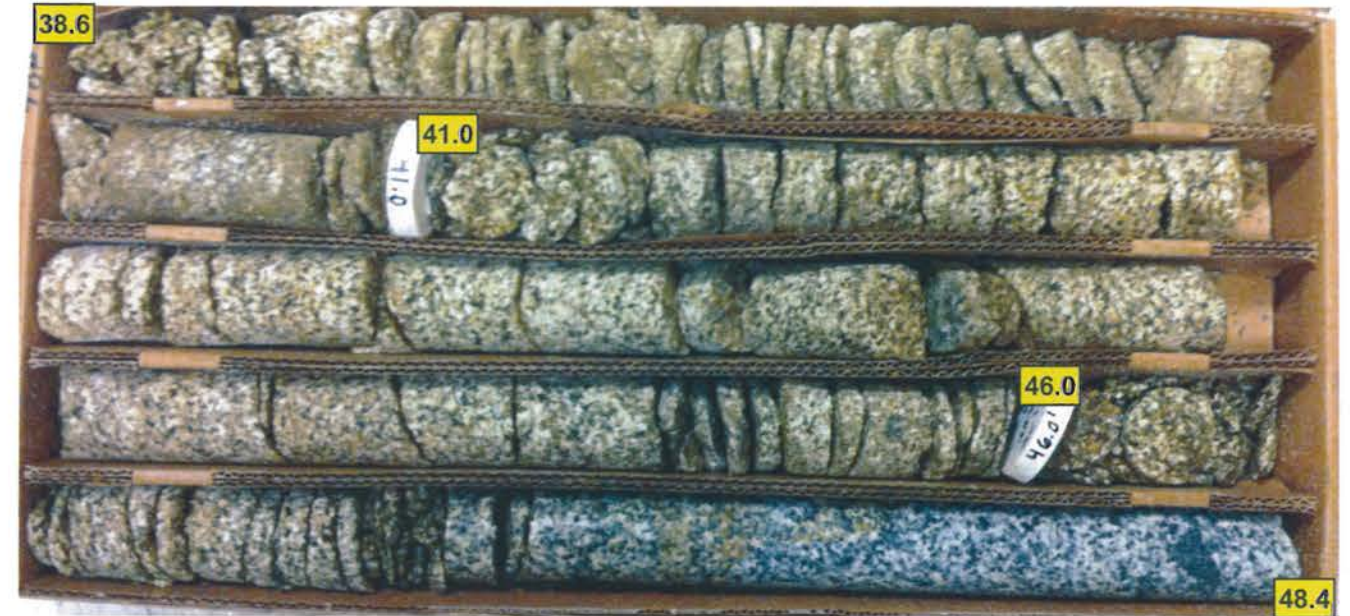
NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC DOT.GDT 10/8/14



CORE PHOTOGRAPHS

B4-A

BOX 1 of 2: 38.6 - 48.4 FEET



BOX 2 of 2: 48.4 - 56.0 FEET

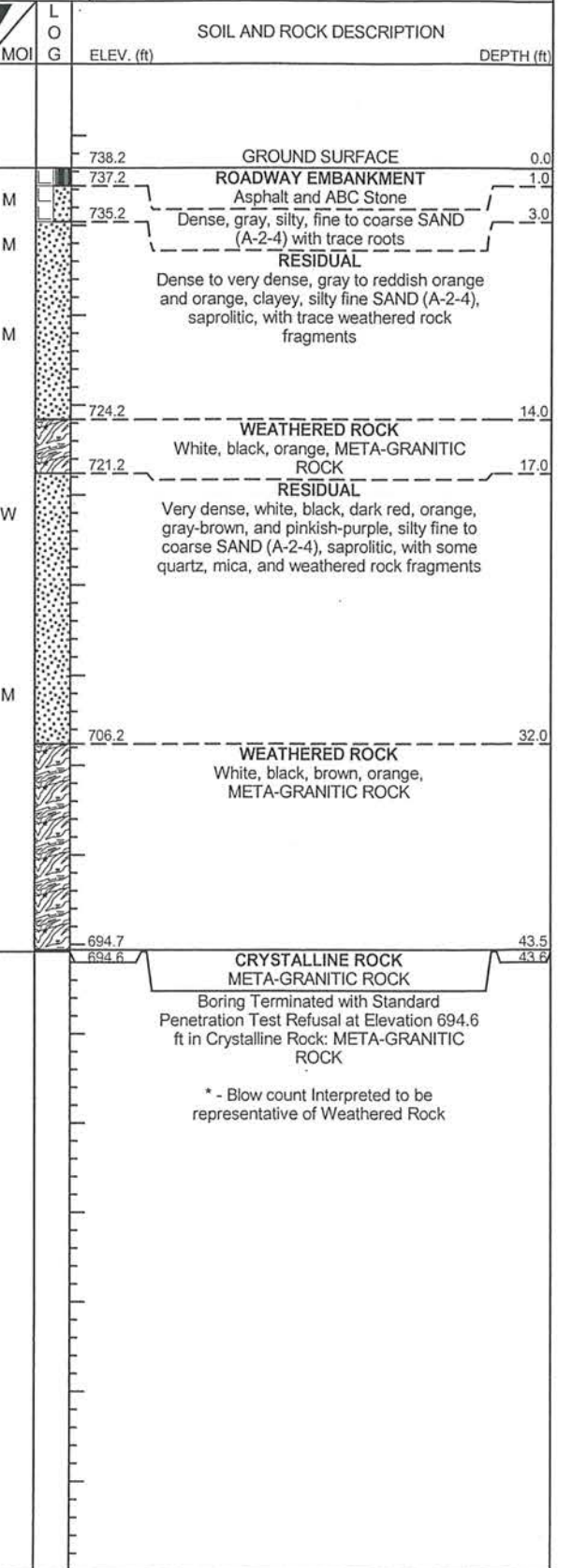


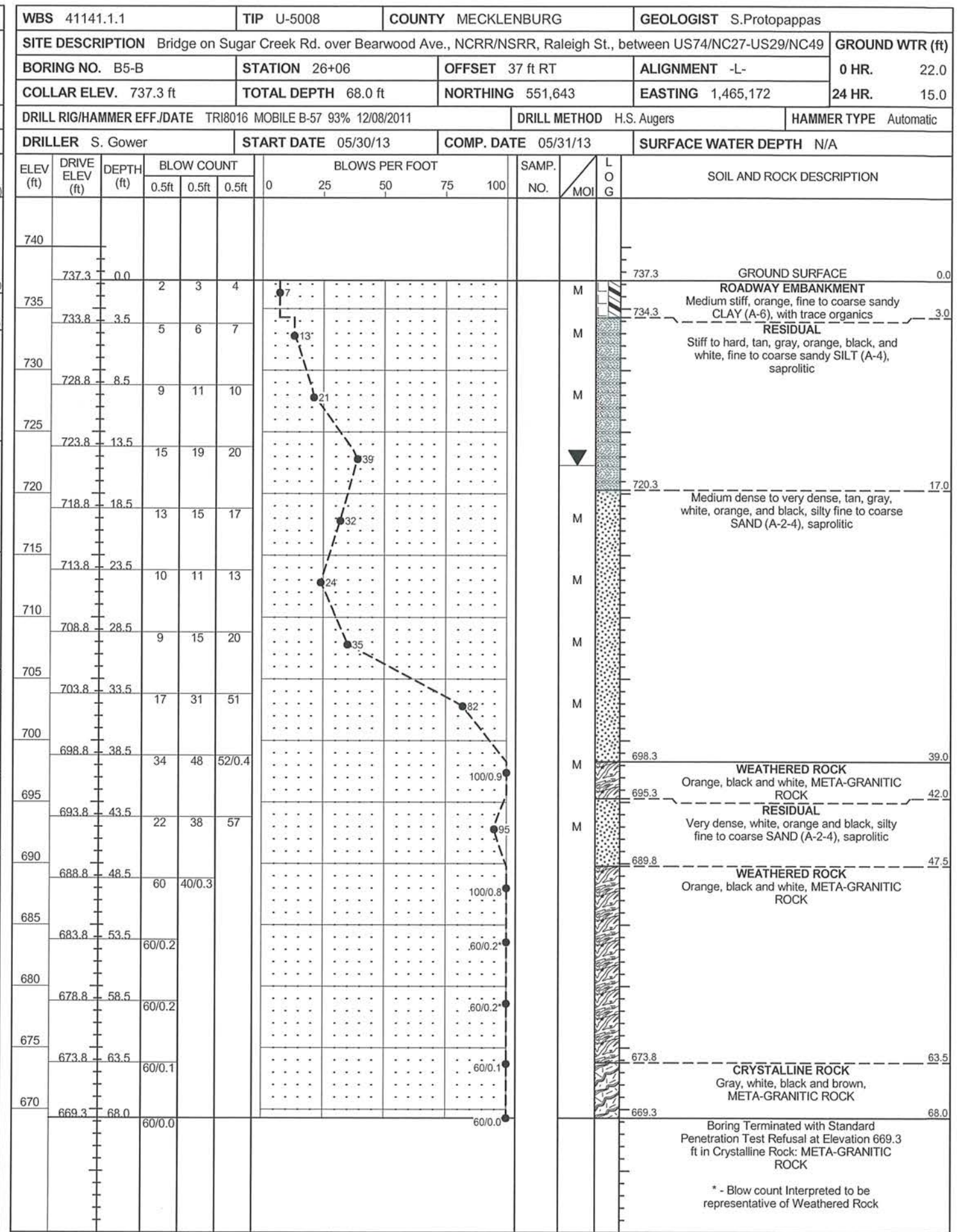
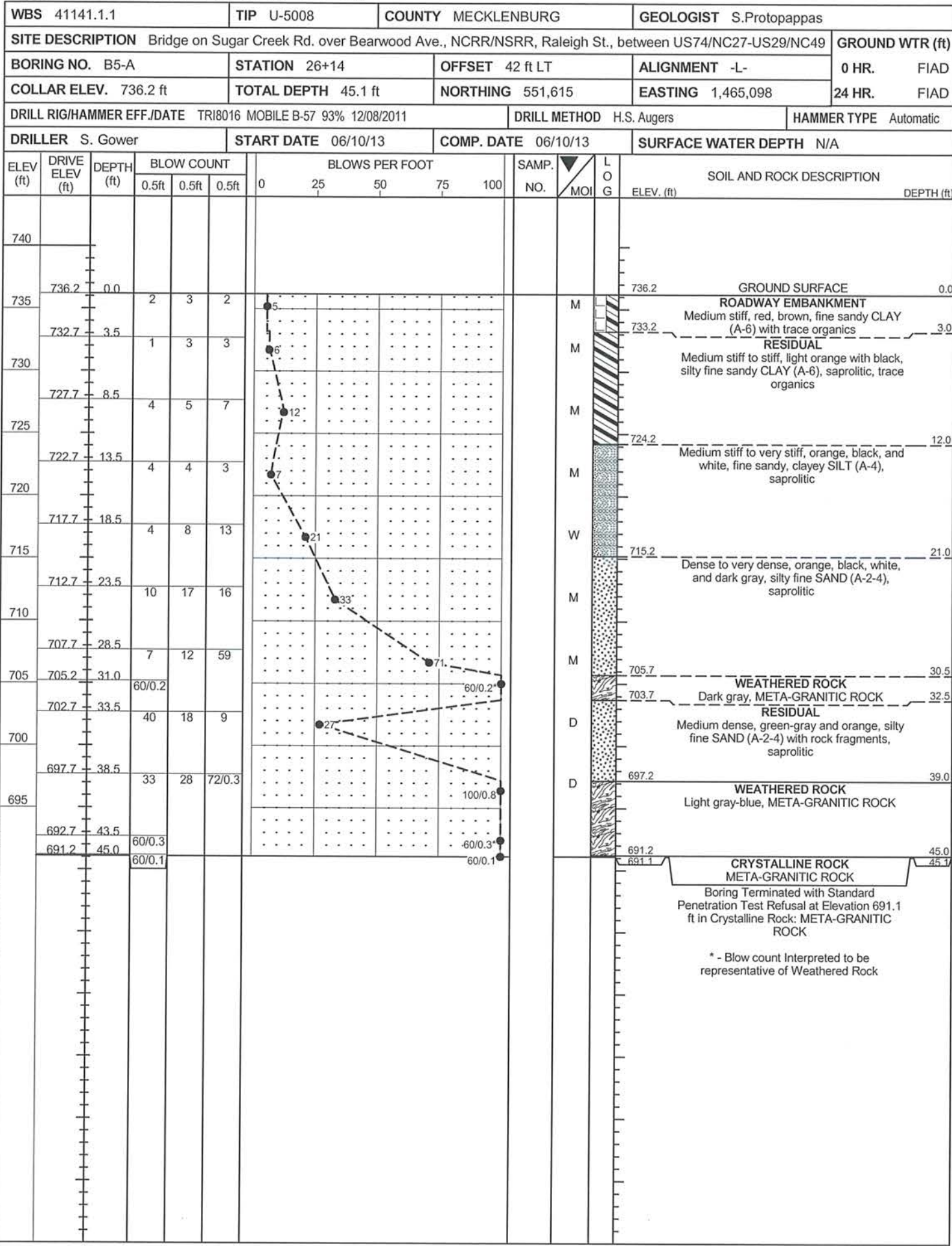


WBS 41141.1.1	TIP U-5008	COUNTY MECKLENBURG	GEOLOGIST S.Protopappas
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, Raleigh St., between US74/NC27-US29/NC49			GROUND WTR (ft)
BORING NO. B4-B	STATION 24+85	OFFSET 38 ft RT	ALIGNMENT -L-
COLLAR ELEV. 738.2 ft	TOTAL DEPTH 43.6 ft	NORTHING 551,533	EASTING 1,465,226
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Gower	START DATE 06/19/13	COMP. DATE 06/19/13	SURFACE WATER DEPTH 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					
740															
	737.2	1.0													
	735.2	3.5	3	10	22										
735	734.7	3.5	13	21	27										
	729.7	8.5													
730	729.7	8.5	12	27	50										
	724.7	13.5													
725	724.7	13.5	28	67	33/0.3										
	719.7	18.5													
720	719.7	18.5	27	40	39										
	714.7	23.5													
715	714.7	23.5	26	42	58										
	709.7	28.5													
710	709.7	28.5	20	30	26										
	704.7	33.5													
705	704.7	33.5	43	57/0.4											
	699.7	38.5													
700	699.7	38.5	60/0.3												
	694.7	43.5													
695	694.7	43.5	60/0.1												

NCDOT BORE SINGLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT.GDT 10/8/14

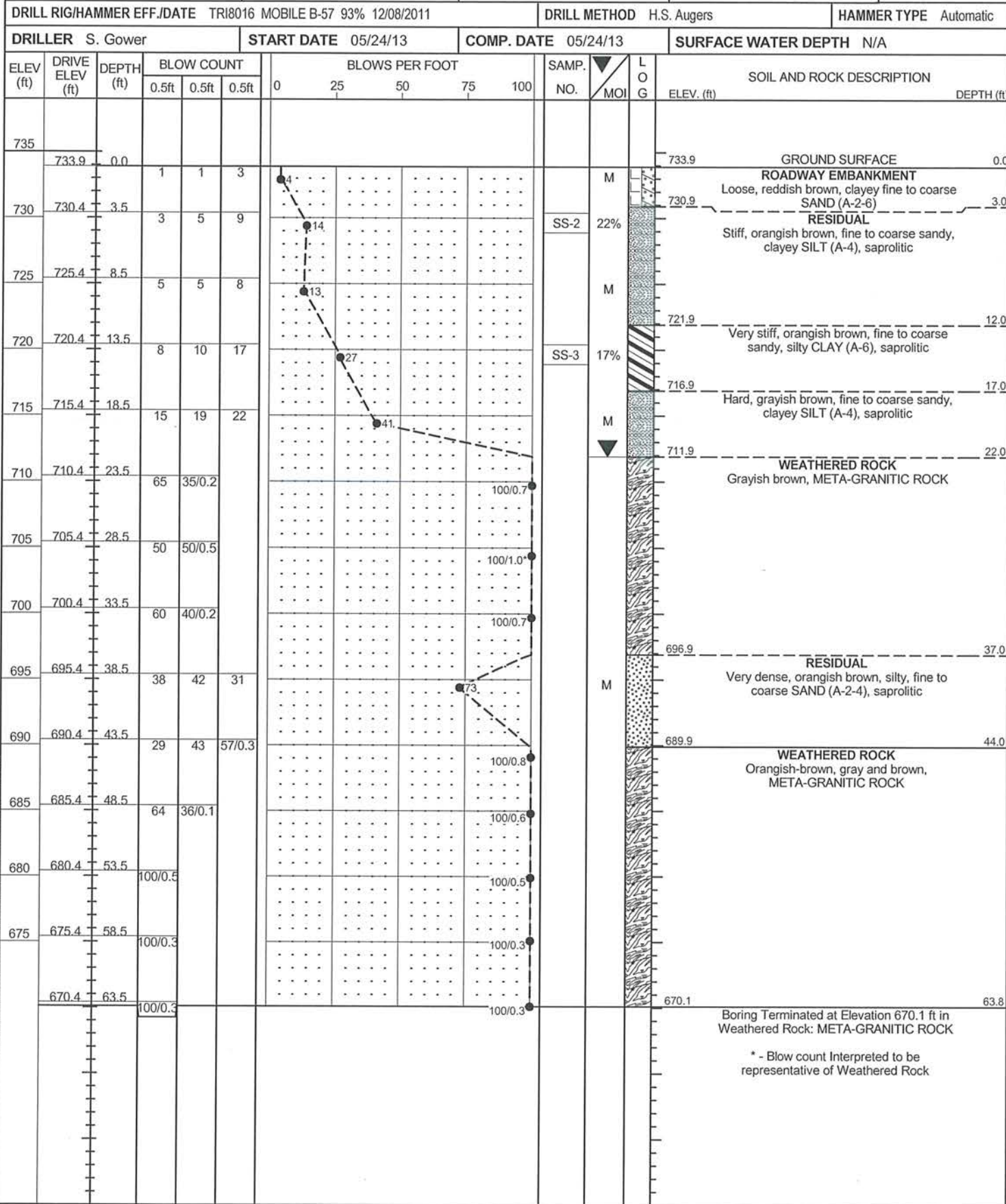




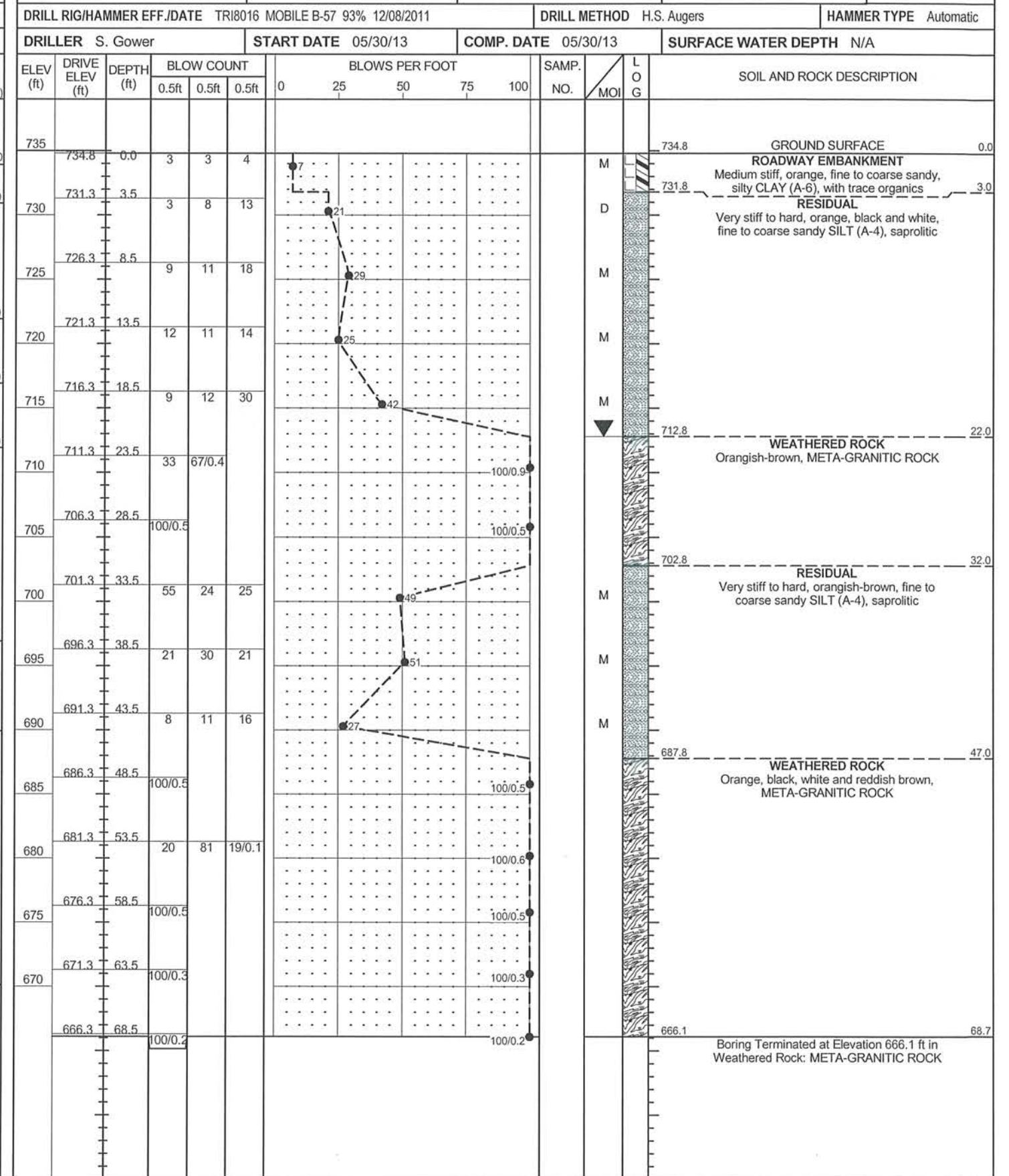
NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT_GDT_10/8/14



WBS 41141.1.1	TIP U-5008	COUNTY MECKLENBURG	GEOLOGIST C. Baldwin
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, Raleigh St., between US74/NC27-US29/NC49			GROUND WTR (ft)
BORING NO. B6-A	STATION 27+38	OFFSET 48 ft LT	ALIGNMENT -L-
COLLAR ELEV. 733.9 ft	TOTAL DEPTH 63.8 ft	NORTHING 551,721	EASTING 1,465,036
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Gower	START DATE 05/24/13	COMP. DATE 05/24/13	SURFACE WATER DEPTH N/A



WBS 41141.1.1	TIP U-5008	COUNTY MECKLENBURG	GEOLOGIST S. Protopoulos
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, Raleigh St., between US74/NC27-US29/NC49			GROUND WTR (ft)
BORING NO. B6-B	STATION 27+29	OFFSET 38 ft RT	ALIGNMENT -L-
COLLAR ELEV. 734.8 ft	TOTAL DEPTH 68.7 ft	NORTHING 551,753	EASTING 1,465,116
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Gower	START DATE 05/30/13	COMP. DATE 05/30/13	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT_GDT 10/8/14

* - Blow count interpreted to be representative of Weathered Rock



WBS 41141.1.1		TIP U-5008		COUNTY MECKLENBURG		GEOLOGIST S.Protopappas										
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, Raleigh St., between US74/NC27-US29/NC49						GROUND WTR (ft)										
BORING NO. EB2-A		STATION 28+43		OFFSET 42 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 732.3 ft		TOTAL DEPTH 44.1 ft		NORTHING 551,816		EASTING 1,464,992										
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER S. Gower		START DATE 05/28/13		COMP. DATE 05/28/13		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
735																
	732.3	0.0	2	4	4										732.3	0.0
730	728.8	3.5	3	4	5										729.3	3.0
725	723.8	8.5	3	5	8											
720	718.8	13.5	8	7	6										720.3	12.0
715	713.8	18.5	16	38	30											
710	708.8	23.5	6	29	33										710.3	22.0
705	703.8	28.5	15	19	17											
700	698.8	33.5	40	60/0.5											697.8	34.5
695	693.8	38.5	26	49	51/0.4											
690	688.8	43.5	83	17/0.1											688.2	44.1

WBS 41141.1.1		TIP U-5008		COUNTY MECKLENBURG		GEOLOGIST S.Protopappas										
SITE DESCRIPTION Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, Raleigh St., between US74/NC27-US29/NC49						GROUND WTR (ft)										
BORING NO. EB2-B		STATION 28+36		OFFSET 47 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 732.0 ft		TOTAL DEPTH 28.8 ft		NORTHING 551,852		EASTING 1,465,074										
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER S. Gower		START DATE 05/29/13		COMP. DATE 05/29/13		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
735																
	732.0	0.0	3	5	6										732.0	0.0
730	728.5	3.5	2	3	2										729.0	3.0
725	723.5	8.5	10	19	24										726.0	6.0
720	718.5	13.5	8	11	16											
715	713.5	18.5	22	55	45/0.4										713.0	19.0
710	708.5	23.5	100/0.3													
705	703.5	28.5	100/0.3												703.2	28.8

NCDOT BORE DOUBLE SUGAR CREEK BRIDGE BORINGS.GPJ NC_DOT.GDT 10/8/14

* - Blow count interpreted to be representative of Weathered Rock

Bridge on Sugar Creek Rd. over Bearwood Ave., NCRR/NSRR, and Raleigh St., between US74/NC27 & US29/NC49

<i>SOIL TEST RESULTS</i>																	
Boring I.D.	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%	Alignment
								C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC	
B6-A	SS 2	48 LT	27+38	3.5-5.0	A-4(6)	38	10	16.8	26.7	45.9	10.6	100	90.9	64.9	22.3	-	L
B6-A	SS 3	48 LT	27+38	13.5-15.0	A-6(6)	39	11	15.4	29.3	44.0	11.3	99.6	91.7	63.5	16.7	-	L