

REFERENCE: U-5760

PROJECT: 46381

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY FORSYTH
PROJECT DESCRIPTION BRIDGE ON BIG MILL FARM
ROAD OVER US 421 /I-40 BUS /NC 150 BETWEEN
SR 4315 AND SR 2649

SITE DESCRIPTION BRIDGE NO. 751 AT STA. 27+37.26 -L-
ON BIG MILL FARM ROAD OVER US 421 /I-40
BUS /NC 150

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5760	1	11

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) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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.

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- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - 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.

PERSONNEL

J. K. STICKNEY

C. L. SMITH

B. E. FOSTER

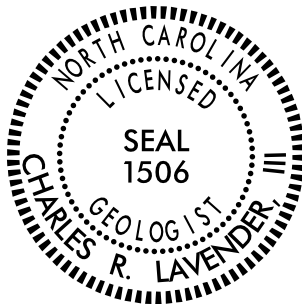
INVESTIGATED BY C. R. LAVENDER, III

DRAWN BY C. E. BURRIS

CHECKED BY J. E. BEVERLY

SUBMITTED BY K. B. MILLER

DATE APRIL 2021



DocuSigned by:

4/13/2021

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SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

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 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 (ICR) 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, SUCH 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. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOED 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 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 (SROD) - 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.										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																			
GROUP CLASS.										COMPRESSIBILITY										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.																			
SYMBOL										PERCENTAGE OF MATERIAL										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.																			
Z PASSING #10 #200										GROUND WATER										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.																			
MATERIAL PASSING #40 LL PI										MISCELLANEOUS SYMBOLS										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>																			
GROUP INDEX										RECOMMENDATION SYMBOLS										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, WOULD YIELD SPT N VALUES > 100 BPF</i>																			
USUAL TYPES OF MAJOR MATERIALS										ABBREVIATIONS										VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>																			
GEN. RATING AS SUBGRADE										EQUIPMENT USED ON SUBJECT PROJECT										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.																			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30																				ROCK HARDNESS																			
CONSISTENCY OR DENSENESS																				VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.																			
PRIMARY SOIL TYPE																				HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.																			
COMPACTNESS OR CONSISTENCY																				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.																			
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)																				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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.																			
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																				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.																			
GENERAL																				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.																			
GENERAL																																							
TEXTURE OR GRAIN SIZE																				FRACTURE SPACING																			
U.S. STD. SIEVE SIZE OPENING (MM)																				BEDDING																			
BOULDER (BLDR.)																				TERM THICKNESS																			
COBBLE (COB.)																				VERY THICKLY BEDDED 4 FEET																			
GRAVEL (GR.)																				THICKLY BEDDED 1.5 - 4 FEET																			
COARSE SAND (CSE. SD.)																				THINLY BEDDED 0.16 - 1.5 FEET																			
FINE SAND (F SD.)																				VERY THINLY BEDDED 0.03 - 0.16 FEET																			
SILT (SL.)																				THICKLY LAMINATED 0.008 - 0.03 FEET																			
CLAY (CL.)																				THINLY LAMINATED < 0.008 FEET																			
GRAIN SIZE																				INDURATION																			
SOIL MOISTURE - CORRELATION OF TERMS																				FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.																			
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																				FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.																			
FIELD MOISTURE DESCRIPTION																				MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.																			
GUIDE FOR FIELD MOISTURE DESCRIPTION																				INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.																			
LL - LIQUID LIMIT																				EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																			
PL - PLASTIC LIMIT																																							
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
SL - SHRINKAGE LIMIT																																							
PLASTICITY																																							
NON PLASTIC																																							
SLIGHTLY PLASTIC																																							
MODERATELY PLASTIC																																							
HIGHLY PLASTIC																																							
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.																																							

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SUBSURFACE INVESTIGATION

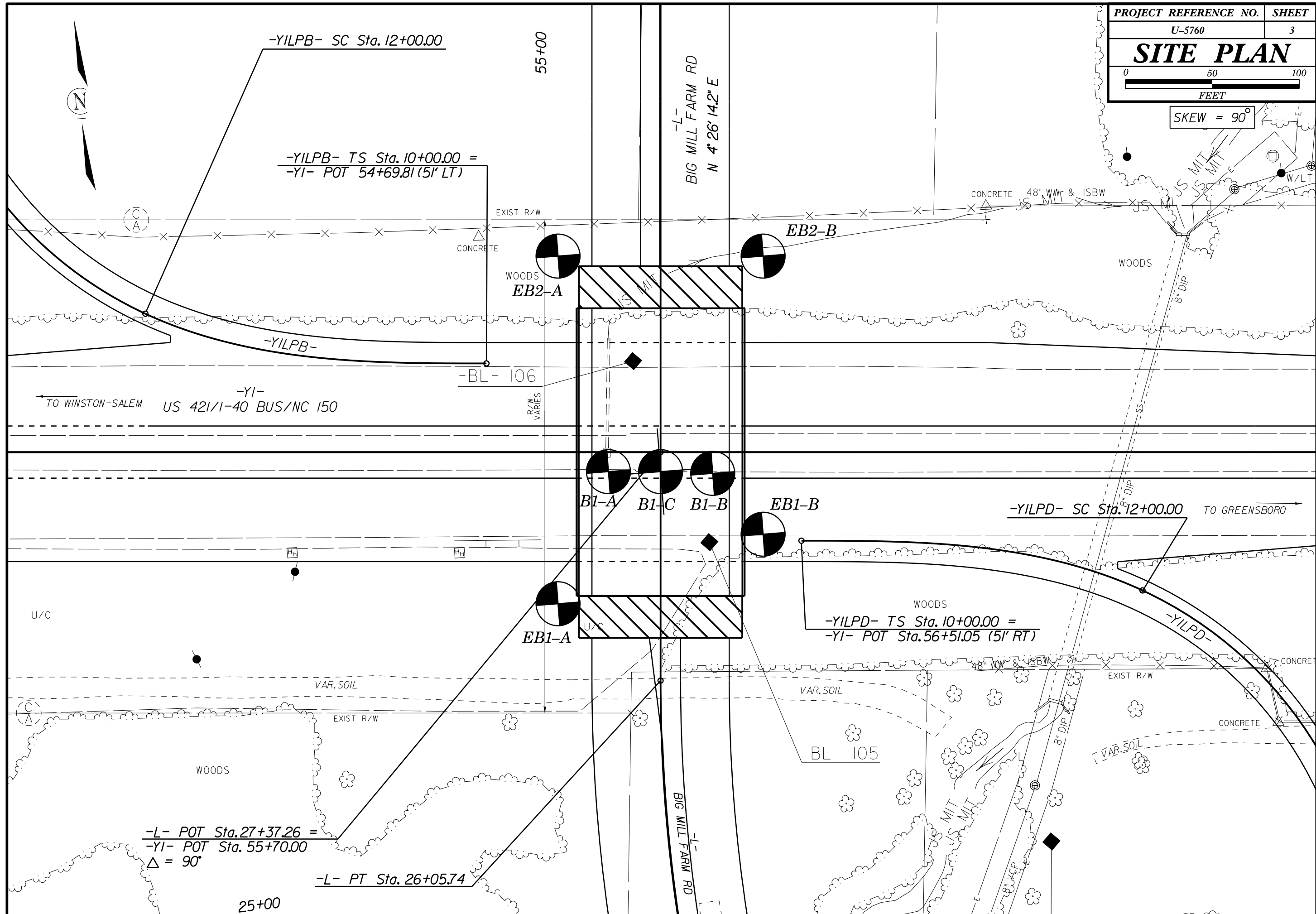
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

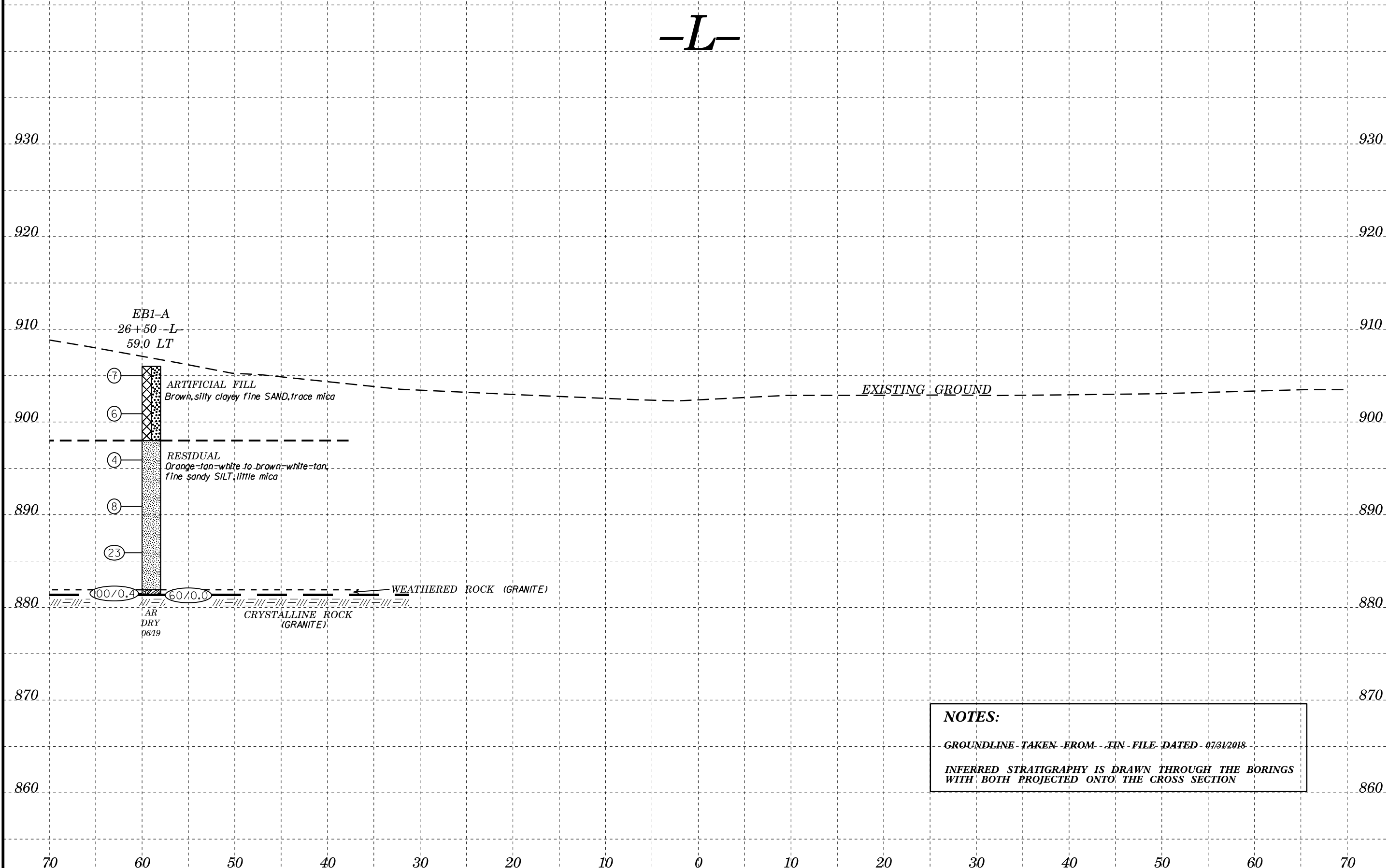
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

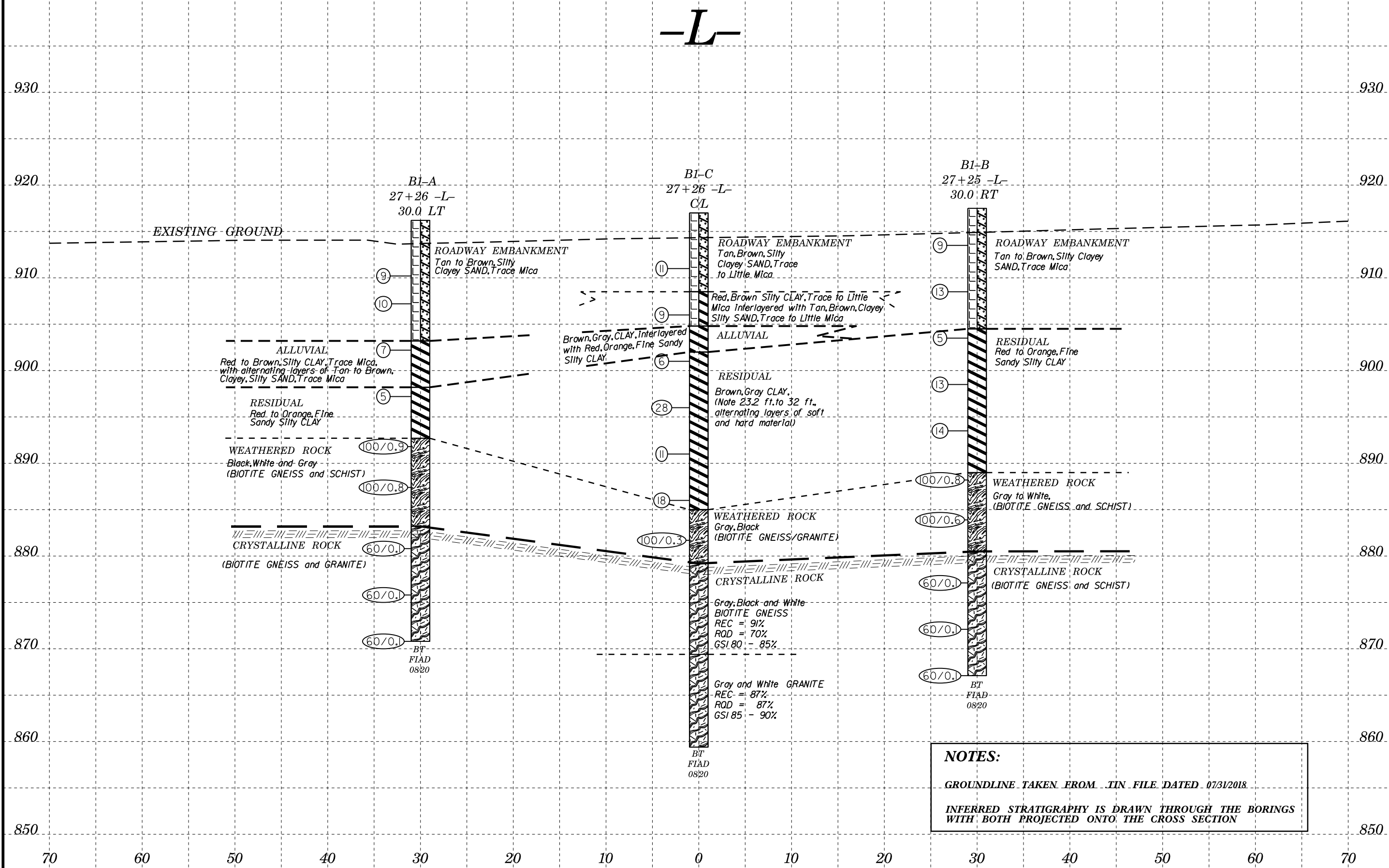
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

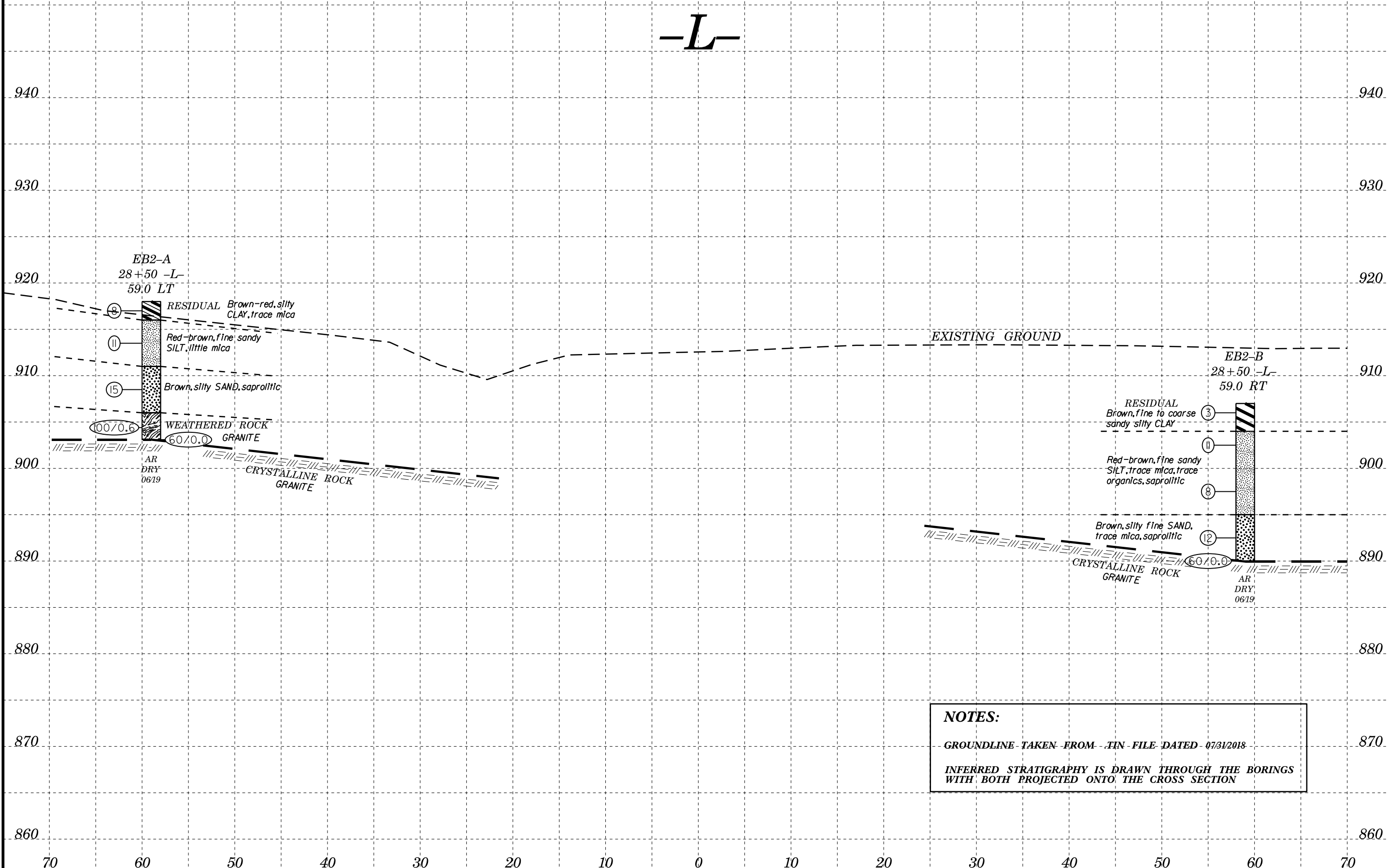
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	SURFACE CONDITIONS VERY GOOD Very rough, fresh unweathered surfaces GOOD Rough, slightly weathered, iron stained surfaces FAIR Smooth, moderately weathered and altered surfaces POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes) VERY GOOD - Very Rough, fresh unweathered surfaces GOOD - Rough, slightly weathered surfaces FAIR - Smooth, moderately weathered and altered surfaces POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings
STRUCTURE	DECREASING SURFACE QUALITY ➡	COMPOSITION AND STRUCTURE	
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90 80 70 60 50 40 30 20 10	C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.	70 60 50 40 30 20 10
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets			
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets			
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	➡		

SKEW = 90°







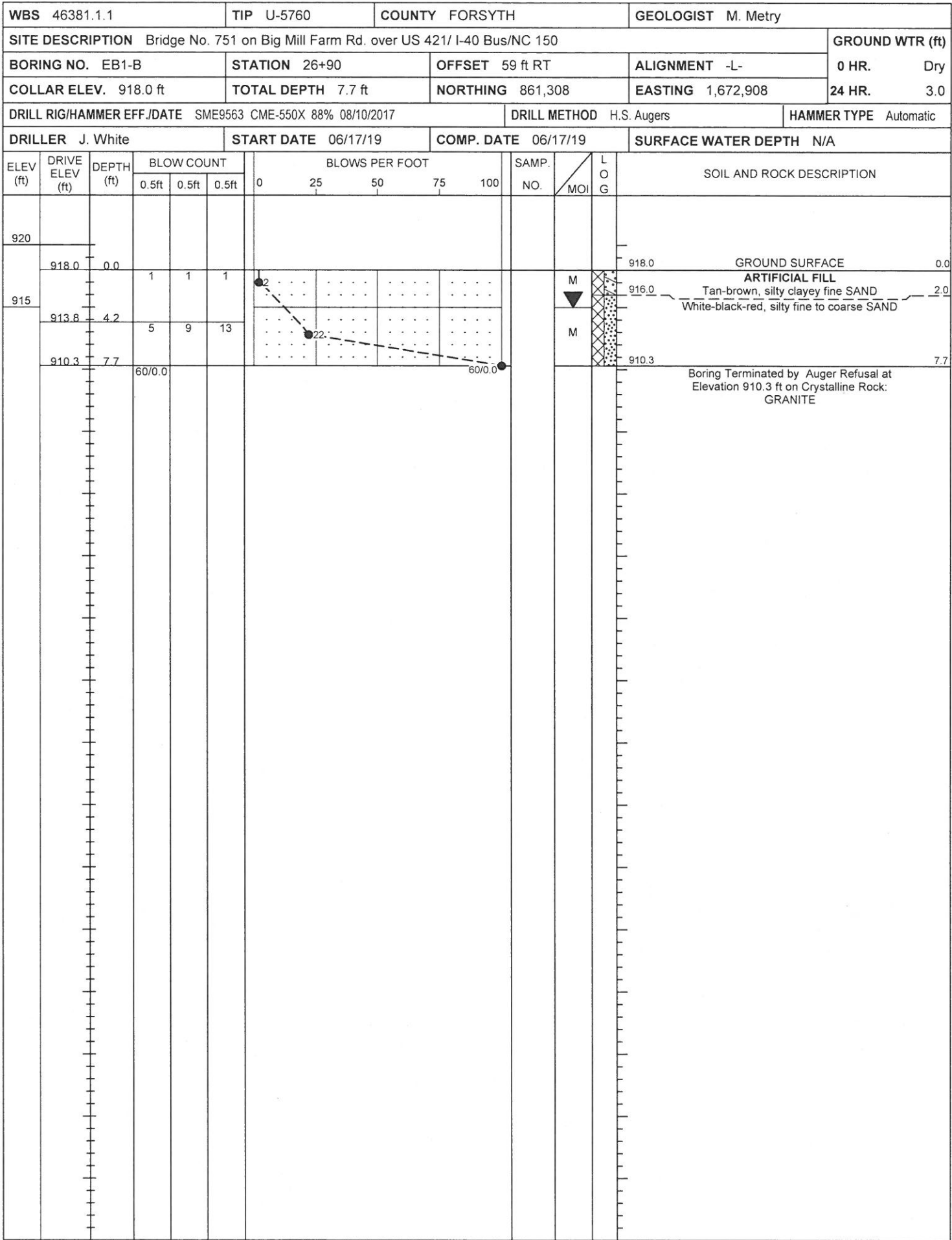
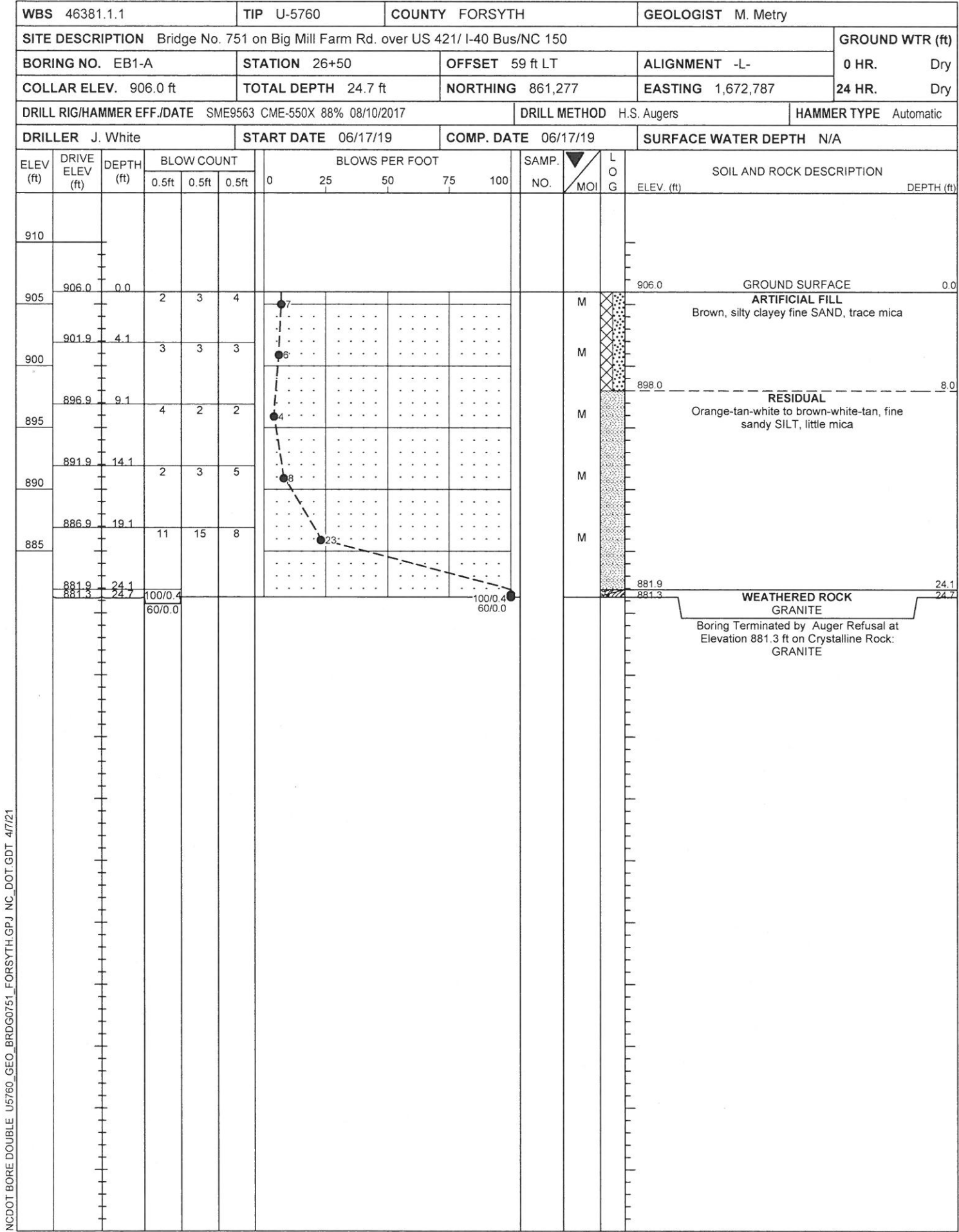


NOTES:

GROUNDLINE TAKEN FROM TIN FILE DATED 07/31/2018

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG



WBS 46381.1.1			TIP U-5760			COUNTY FORSYTH			GEOLOGIST Stickney, J. K.					
SITE DESCRIPTION Bridge No. 751 on Big Mill Farm Rd. over US 421/ I-40 Bus/NC 150									GROUND WTR (ft)					
BORING NO. B1-B			STATION 27+25			OFFSET 30 ft RT			ALIGNMENT -L-					
COLLAR ELEV. 917.5 ft			TOTAL DEPTH 50.4 ft			NORTHING 861,345			EASTING 1,672,882					
0 HR. N/A			24 HR. FIAD											
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019						DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic					
DRILLER Smith, C. L.			START DATE 08/26/20			COMP. DATE 08/26/20			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
920														
915	914.5	3.0	4	4	5									917.5 GROUND SURFACE 0.0
910	909.5	8.0	3	4	9									ROADWAY EMBANKMENT Tan to Brown, Silty Clayey SAND, Trace Mica
905	904.5	13.0	2	2	3									904.5 13.0
900	899.5	18.0	5	5	8									RESIDUAL Red to Orange, Fine Sandy Silty CLAY
895	894.5	23.0	5	6	8									
890	889.5	28.0	5	37	63/0.3									889.0 28.5
885	884.5	33.0	69	31/1.1										WEATHERED ROCK Gray to White, (BIOTITE GNEISS and SCHIST)
880	877.2	40.3												880.5 37.0
875	872.2	45.3												CRYSTALLINE ROCK (BIOTITE GNEISS and SCHIST)
870	867.2	50.3												867.1 50.4
														Boring Terminated at Elevation 867.1 ft in CRYSTALLINE ROCK (BIOTITE GNEISS/GRANITE)

WBS 46381.1.1			TIP U-5760			COUNTY FORSYTH			GEOLOGIST Stickney, J. K.						
SITE DESCRIPTION Bridge No. 751 on Big Mill Farm Rd. over US 421/I-40 Bus/NC 150									GROUND WTR (ft)						
BORING NO. B1-C			STATION 27+26			OFFSET CL			ALIGNMENT -L-						
COLLAR ELEV. 917.0 ft			TOTAL DEPTH 57.6 ft			NORTHING 861,348			EASTING 1,672,852						
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019							DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic					
DRILLER Smith, C. L.			START DATE 08/25/20			COMP. DATE 08/25/20			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
920															
														917.0	GROUND SURFACE 0.0
915															
910	912.0	5.0											M		
905	907.0	10.0											M		
														908.5	ROADWAY EMBANKMENT 8.5
900	902.0	15.0											W		
														904.8	Red, Brown Silty CLAY, Trace to Little Mica interlayered with Tan, Brown, Clayey Silty SAND, Trace to Little Mica 12.2
895	897.0	20.0											W		
														902.0	ALLUVIAL 15.0
890	892.0	25.0											W		
885	887.0	30.0											W		
880	882.0	35.0											W		
														885.0	WEATHERED ROCK 32.0
875															
														879.2	CRYSTALLINE ROCK 37.8
870															
865														869.4	Gray and White GRANITE 47.6
860															
														859.4	Boring Terminated at Elevation 859.4 ft in CRYSTALLINE ROCK (BIOTITE GNEISS/GNANITE) 57.6

WBS 46381.1.1				TIP U-5760				COUNTY FORSYTH				GEOLOGIST Stickney, J. K.			
SITE DESCRIPTION Bridge No. 751 on Big Mill Farm Rd. over US 421/ I-40 Bus/NC 150												GROUND WTR (ft)			
BORING NO. B1-C				STATION 27+26				OFFSET CL				ALIGNMENT -L-			
COLLAR ELEV. 917.0 ft				TOTAL DEPTH 57.6 ft				NORTHING 861,348				EASTING 1,672,852			
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019								DRILL METHOD NW Casing W/SPT & Core				HAMMER TYPE Automatic			
DRILLER Smith, C. L.				START DATE 08/25/20				COMP. DATE 08/25/20				SURFACE WATER DEPTH N/A			
CORE SIZE NQ				TOTAL RUN 19.8 ft											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS				
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		ELEV. (ft)	DEPTH (ft)			
879.2	879.2	37.8	4.8		(4.1) 85%	(2.6) 54%		(8.9) 91%	(6.9) 70%		879.2	Begin Coring @ 37.8 ft CRYSTALLINE ROCK Gray, Black and White, Very Slight to Fresh, Medium Hard to Moderately Hard, BIOTITE GNEISS, vertical contact with Sillimanite-Mica Schist, with close to moderately close fracture spacing.	37.8		
875	874.4	42.6	5.0		(4.8) 96%	(4.3) 86%					869.4		47.6		
870	869.4	47.6						(8.7) 87%	(8.7) 87%						
865	864.4	52.6	5.0		(4.4) 88%	(4.4) 88%									
860	859.4	57.6			(4.3) 86%	(4.3) 86%									
												Boring Terminated at Elevation 859.4 ft in CRYSTALLINE ROCK (BIOTITE GNEISS/GRANITE)			

WCDOT CORE SINGLE U5760_GEO_BRD0751_FORSYTH.GPJ NC_DOT_GDT_4/7/21

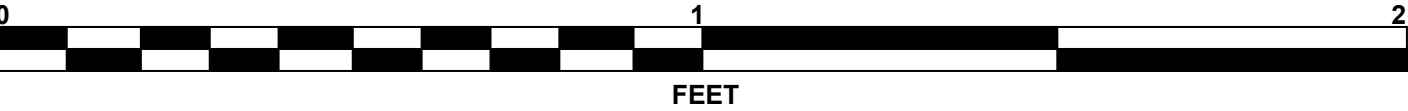
GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46381.1.1			TIP U-5760			COUNTY FORSYTH			GEOLOGIST J. Mize					
SITE DESCRIPTION Bridge No. 751 on Big Mill Farm Rd. over US 421/ I-40 Bus/NC 150									GROUND WTR (ft)					
BORING NO. EB2-A			STATION 28+50			OFFSET 59 ft LT			ALIGNMENT -L-					
COLLAR ELEV. 918.0 ft			TOTAL DEPTH 14.9 ft			NORTHING 861,477			EASTING 1,672,803					
DRILL RIG/HAMMER EFF./DATE SME275 DIEDRICH D-50 87% 10/21/2017						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER T. Williams			START DATE 06/17/19			COMP. DATE 06/17/19			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
920														
	918.0	0.0	2	4	4	8						M	918.0	0.0
915														
	914.5	3.5	3	4	7	11						M	916.0	2.0
910													911.0	7.0
	909.5	8.5	4	5	10	15						M		
905													906.0	12.0
	905.0	13.0	57	43/0.1										
	903.1	14.9								100/0.6			903.1	14.9
			60/0.0							60/0.0				

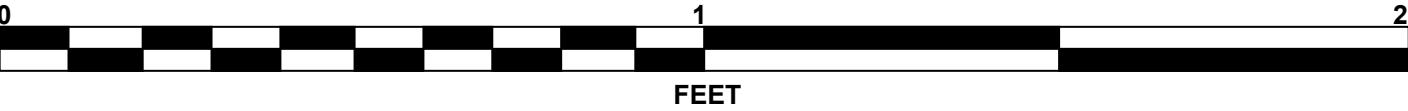
WBS 46381.1.1			TIP U-5760			COUNTY FORSYTH			GEOLOGIST J. Mize				
SITE DESCRIPTION Bridge No. 751 on Big Mill Farm Rd. over US 421/ I-40 Bus/NC 150									GROUND WTR (ft)				
BORING NO. EB2-B			STATION 28+50			OFFSET 59 ft RT			ALIGNMENT -L-				
COLLAR ELEV. 907.0 ft			TOTAL DEPTH 17.0 ft			NORTHING 861,468			EASTING 1,672,920				
DRILL RIG/HAMMER EFF./DATE SME275 DIEDRICH D-50 87% 10/21/2017						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic				
DRILLER T. Williams			START DATE 06/18/19			COMP. DATE 06/18/19			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			
910													
	907.0	0.0											907.0 GROUND SURFACE 0.0
905			1	1	2						W		RESIDUAL
	903.5	3.5											904.0 Brown, fine to coarse sandy silty CLAY 3.0
	903.5	3.5	3	5	6						M		Red-brown, fine sandy SILT, trace mica, trace organics, saprolitic
900													
	898.5	8.5	4	4	4						M		
	898.5	8.5											
895													895.0 Brown, silty fine SAND, trace mica, saprolitic 12.0
	893.5	13.5	7	5	7						W		
	893.5	13.5											
890	890.0	17.0	60/0.0										890.0 Boring Terminated by Auger Refusal at Elevation 890.0 ft on Crystalline Rock: GRANITE 17.0

46381.1.1 (U-5760)
FORSYTH COUNTY
BRIDGE ON BIG MILL FARM ROAD OVER US 421 / I-40 BUSINESS / NC 150
BETWEEN SR 4315 AND SR 2649

CORE PHOTOS



B1-C
37.8' TO 47.6'



B1-C
47.6' TO 57.6'