

REFERENCE: U-2579AB

PROJECT: 34839

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY FORSYTH

PROJECT DESCRIPTION WINSTON-SALEM BELTWAY
FROM US 421/I-40 BUS TO I-40

SITE DESCRIPTION BRIDGE NO. 723 ON SR 4315
(KERNERSVILLE RD) OVER WINSTON-SALEM
NORTHERN BELTWAY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AB	1	20

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:
1. 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.
 2. 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

P. CARY

GET PERSONNEL

INVESTIGATED BY RK&K, LLP

DRAWN BY P. CARY

CHECKED BY G. GOINS

SUBMITTED BY RK&K, LLP

DATE MAY 2019

Prepared in the Office of:

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Signed by:

Gregory K. Goins

4725B2704A9E4D7
6/4/2019

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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6				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:				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. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FMU) - 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 (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															
GENERAL CLASS.		GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)						ORGANIC MATERIALS	
GROUP CLASS.	A-1	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7
SYMBOL															
% PASSING	50 MX	30 MX	50 MX	51 MN											
*10															
*40															
*200															
MATERIAL PASSING #40			40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	
LL															
PI															
GROUP INDEX															
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND			FINE SAND			SILTY OR CLAYEY GRAVEL AND SAND			SILTY SOILS			CLAYEY SOILS		
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR			FAIR TO POOR			POOR		
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30															
CONSISTENCY OR DENSENESS															
PRIMARY SOIL TYPE		COMPACTNESS OR CONSISTENCY				RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)				RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)					
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)		VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE				< 4 4 TO 10 10 TO 30 30 TO 50 > 50				N/A					
GENERALLY SILT-CLAY MATERIAL (COHESIVE)		VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD				< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30				< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4					
TEXTURE OR GRAIN SIZE															
U.S. STD. SIEVE SIZE OPENING (MM)		4		10		2.00		40		60		200		270	
BOULDER (BLDR.)		COBBLE (COB.)		GRAVEL (GR.)		COARSE SAND (CSE, SD.)		FINE SAND (F SD.)		SILT (SL.)		CLAY (CL.)			
GRAIN SIZE		MM		305		75		2.0		0.25		0.05		0.005	
IN.		12		3											
SOIL MOISTURE - CORRELATION OF TERMS															
SOIL MOISTURE SCALE (ATTERBERG LIMITS)				FIELD MOISTURE DESCRIPTION				GUIDE FOR FIELD MOISTURE DESCRIPTION							
LL				- SATURATED - (SAT.)				USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE							
PLASTIC RANGE (PI)				- WET - (W)				SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE							
PL				- MOIST - (M)				SOLID; AT OR NEAR OPTIMUM MOISTURE							
OM				- DRY - (D)				REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE							
SL															
PLASTICITY															
NON PLASTIC		PLASTICITY INDEX (PI)						DRY STRENGTH							
SLIGHTLY PLASTIC		0-5						VERY LOW							
MODERATELY PLASTIC		6-15						SLIGHT							
HIGHLY PLASTIC		16-25						MEDIUM							
		26 OR MORE						HIGH							
COLOR															
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.															
DRILL UNITS:				ADVANCING TOOLS:				HAMMER TYPE:							
<input checked="" type="checkbox"/> CME-45C				<input type="checkbox"/> CLAY BITS				<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL							
<input type="checkbox"/> CME-55				<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER				CORE SIZE:							
<input type="checkbox"/> CME-550				<input type="checkbox"/> 8" HOLLOW AUGERS				<input type="checkbox"/> -B <input type="checkbox"/> -H							
<input type="checkbox"/> VANE SHEAR TEST				<input type="checkbox"/> HARD FACED FINGER BITS				<input checked="" type="checkbox"/> -N <input type="checkbox"/> -Q							
<input type="checkbox"/> PORTABLE HOIST				<input type="checkbox"/> TUNG.-CARBIDE INSERTS				HAND TOOLS:							
				<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER				<input type="checkbox"/> POST HOLE DIGGER							
				<input type="checkbox"/> TRICONE _____ * STEEL TEETH				<input type="checkbox"/> HAND AUGER							
				<input type="checkbox"/> TRICONE _____ * TUNG.-CARB.				<input type="checkbox"/> SOUNDING ROD							
				<input checked="" type="checkbox"/> CORE BIT				<input type="checkbox"/> VANE SHEAR TEST							
EQUIPMENT USED ON SUBJECT PROJECT															
FRACTURE SPACING				BEDDING											
TERM				SPACING				TERM				THICKNESS			
VERY WIDE				MORE THAN 10 FEET				VERY THICKLY BEDDED				4 FEET			
WIDE				3 TO 10 FEET				THICKLY BEDDED				1.5 - 4 FEET			
MODERATELY CLOSE				1 TO 3 FEET				THINLY BEDDED				0.16 - 1.5 FEET			
CLOSE				0.16 TO 1 FOOT				VERY THINLY BEDDED				0.03 - 0.16 FEET			
VERY CLOSE				LESS THAN 0.16 FEET				THICKLY LAMINATED				0.008 - 0.03 FEET			
								THINLY LAMINATED				< 0.008 FEET			
INDURATION															
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.															
FRIABLE				RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.											
MODERATELY INDURATED				GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.											
INDURATED				GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.											
EXTREMELY INDURATED				SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.											
BENCH MARK: N/A				ELEVATION: N/A FEET											
NOTES:															
FIAD = FILLED IMMEDIATELY AFTER DRILLING															
BORING COLLAR ELEVATIONS DETERMINED USING SURVEY-GRADE GPS															

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

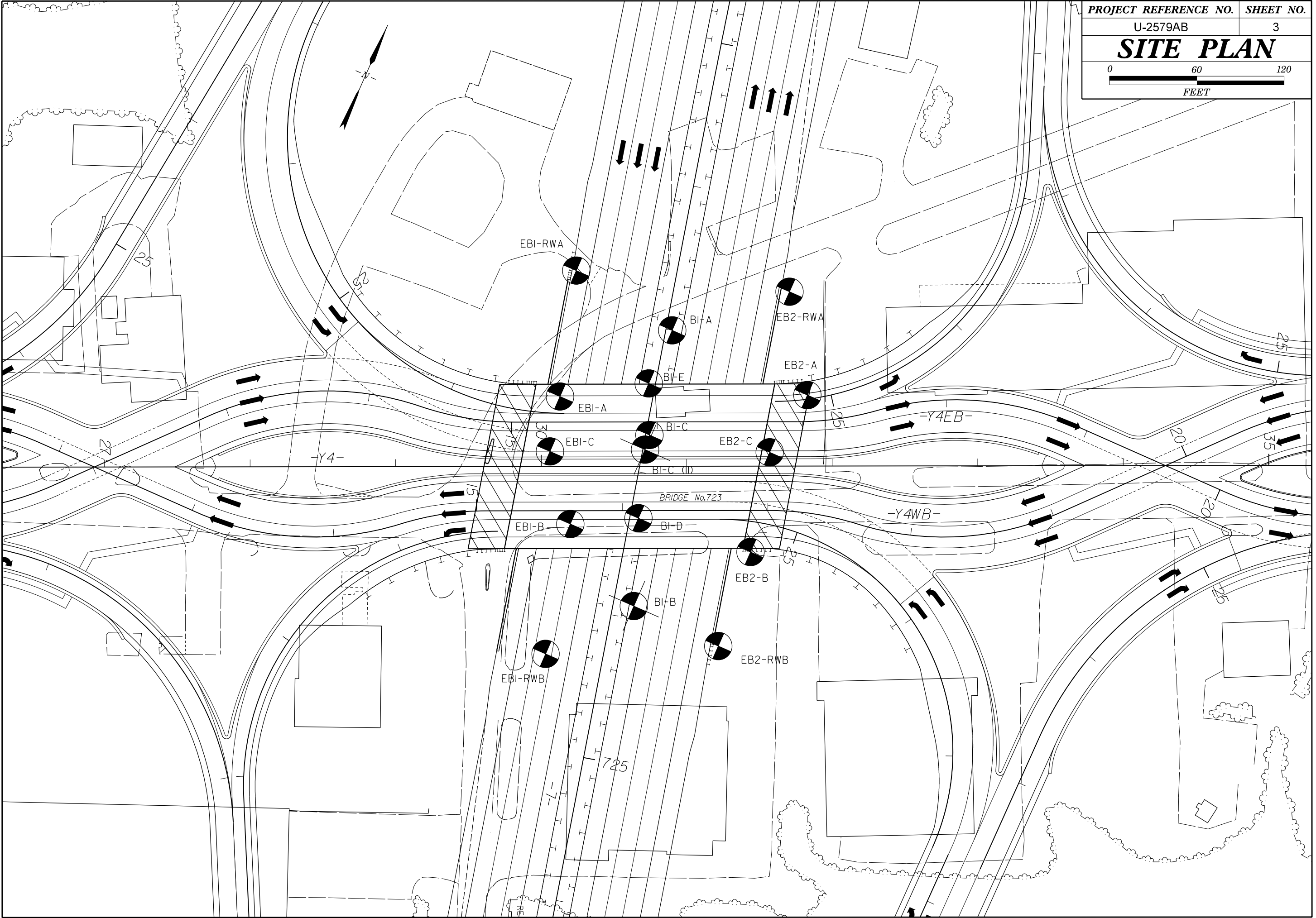
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

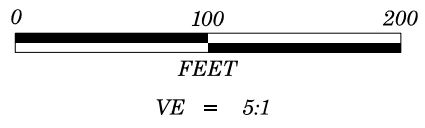
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
<p>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.</p>		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	<p>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.</p>	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		
		Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings		Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	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				N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70				
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70						B. Sandstone with thin inter-layers of siltstone	60	50			
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60	50					C. Sandstone and siltstone in similar amounts		40			
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40					D. Siltstone or silty shale with sandstone layers			30		
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				30				E. Weak siltstone or clayey shale with sandstone layers				20	
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes					20			F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					10
		N/A	N/A			10			G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers					
									H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.					

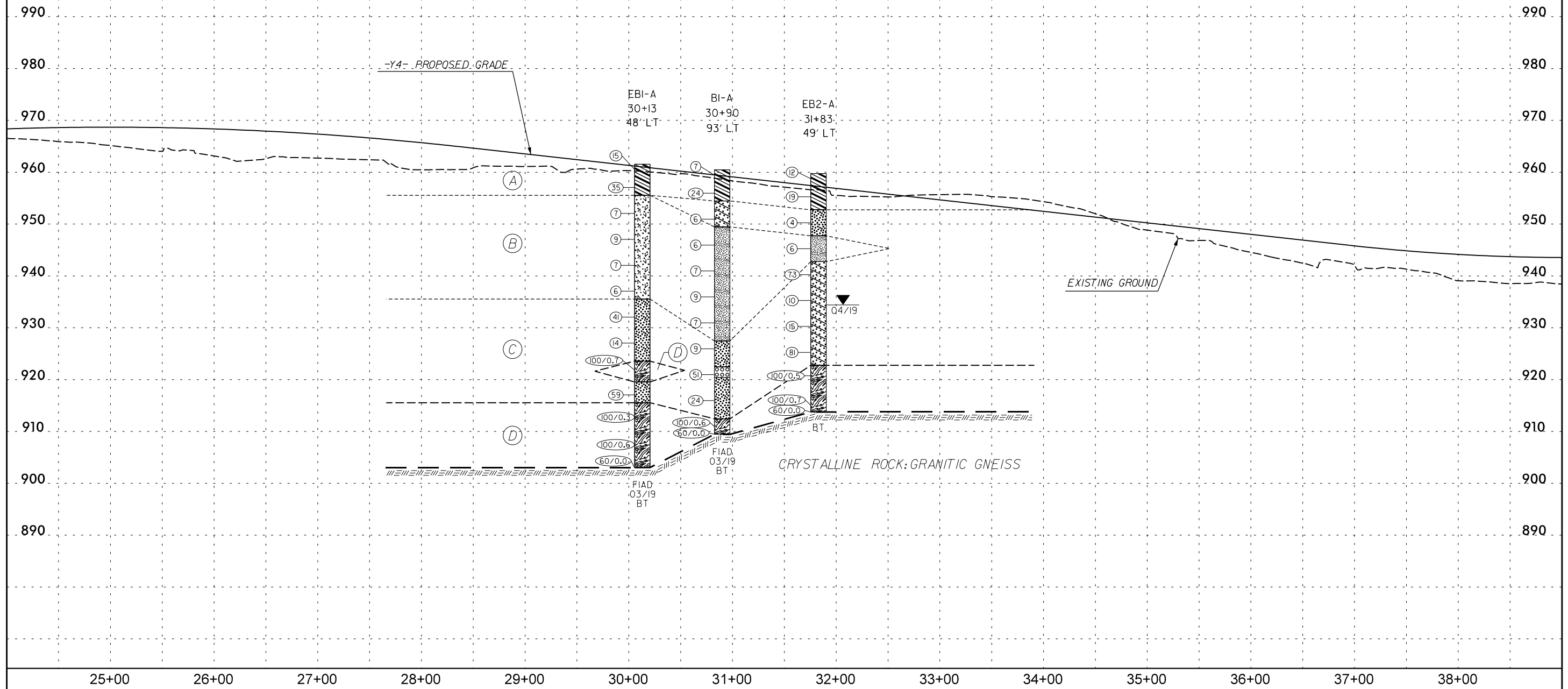
→ Means deformation after tectonic disturbance

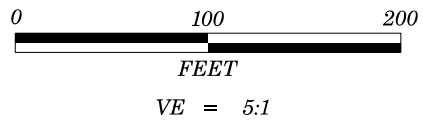




PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	4
PROFILE ALONG -Y4EB-	

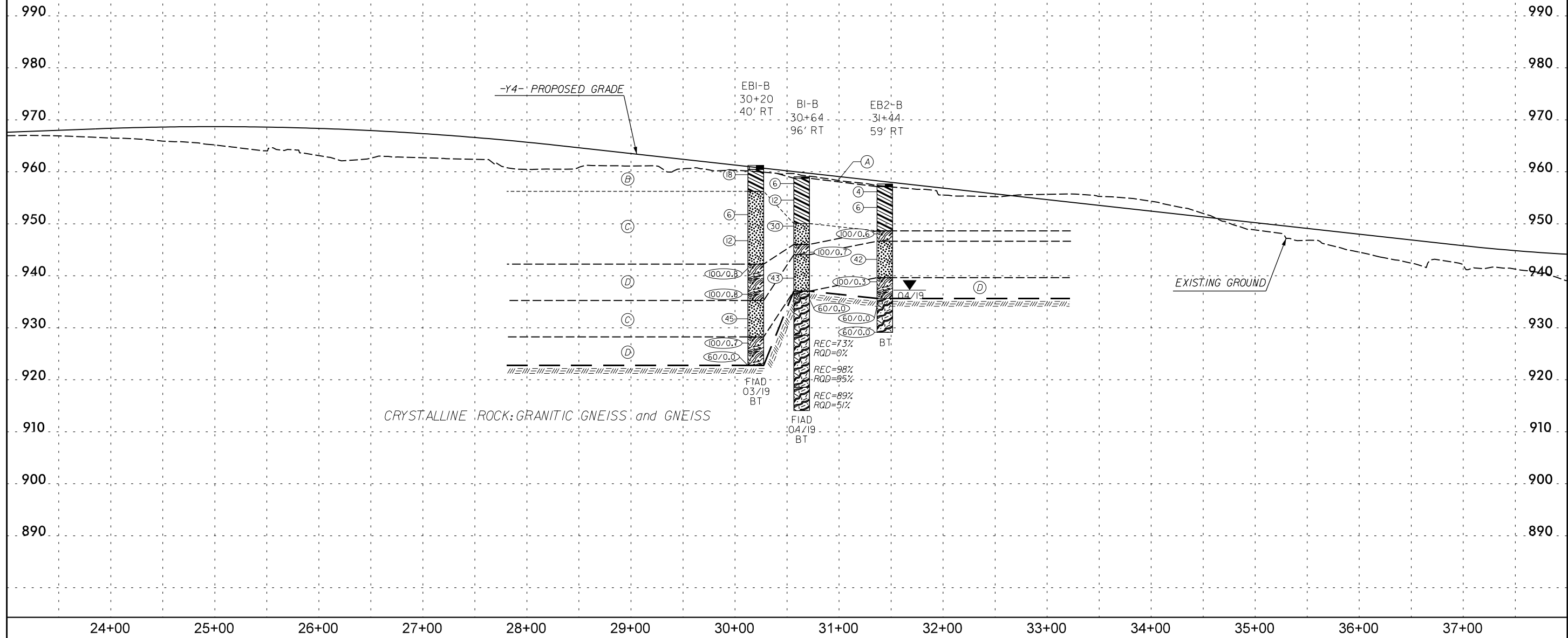
- (A) RESIDUAL: Red, medium stiff to hard, silty CLAY and sandy CLAY (A-6), trace mica
- (B) RESIDUAL: Orange to brown-red to brown-gray, medium stiff to stiff, sandy SILT and sandy clayey SILT (A-4, A-5), trace mica; to moderately micaceous, saprolitic
- (C) RESIDUAL: Brown-red to brown to gray-white, loose to very dense, silty fine to coarse SAND (A-2-4, A-2-6) and sandy GRAVEL (A-1-b), trace to some rock fragments, trace mica
- (D) WEATHERED ROCK: GRANITIC GNEISS

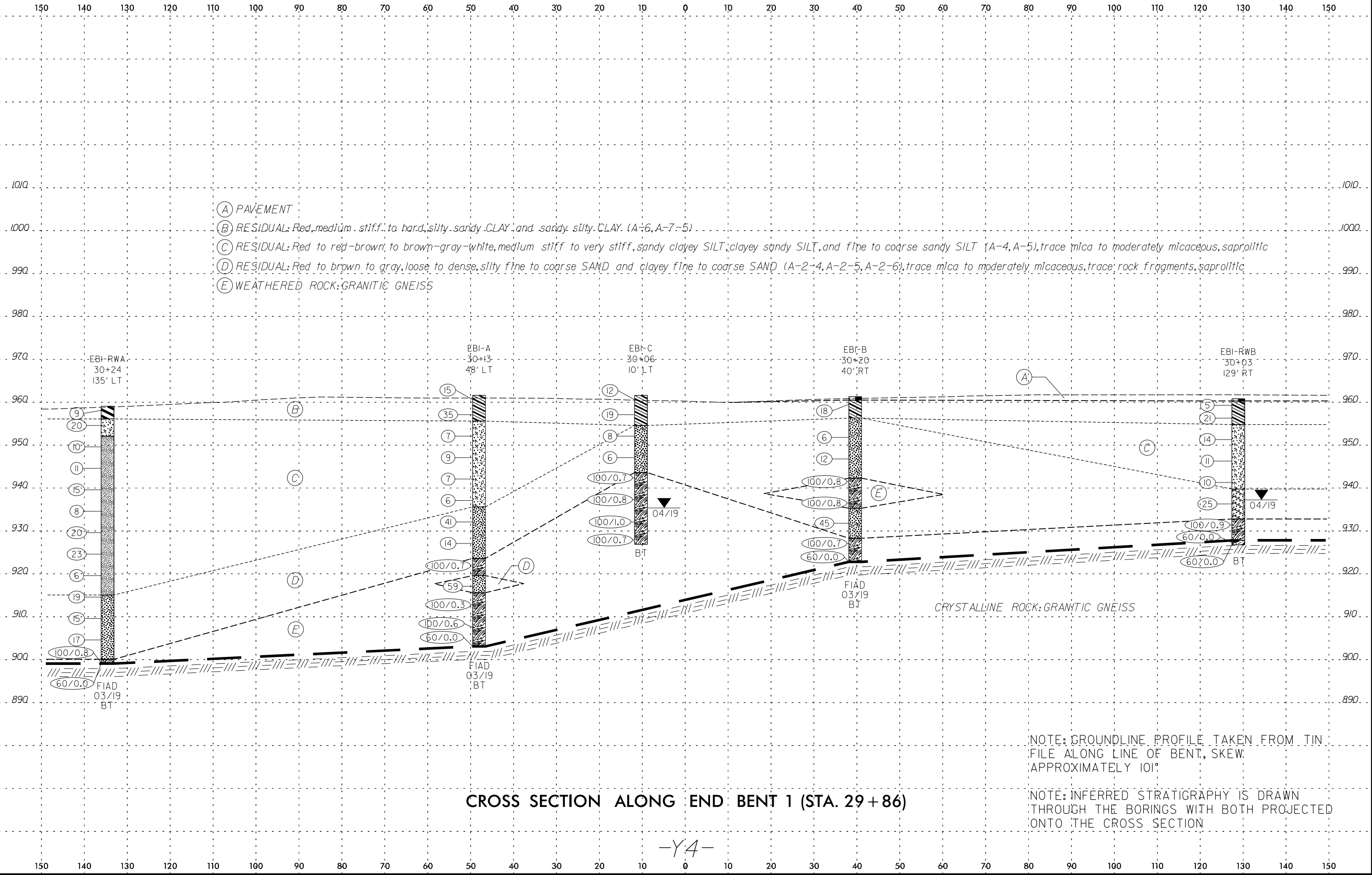




PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	5
PROFILE ALONG -Y4WB-	

- (A) PAVEMENT
- (B) RESIDUAL: Red-brown to red, medium stiff to very stiff, silty CLAY and sandy CLAY (A-6)
- (C) RESIDUAL: White-red to red-brown to gray, loose to dense, silty-fine to coarse SAND (A-2-4), trace mica
- (D) WEATHERED ROCK: GRANITIC GNEISS





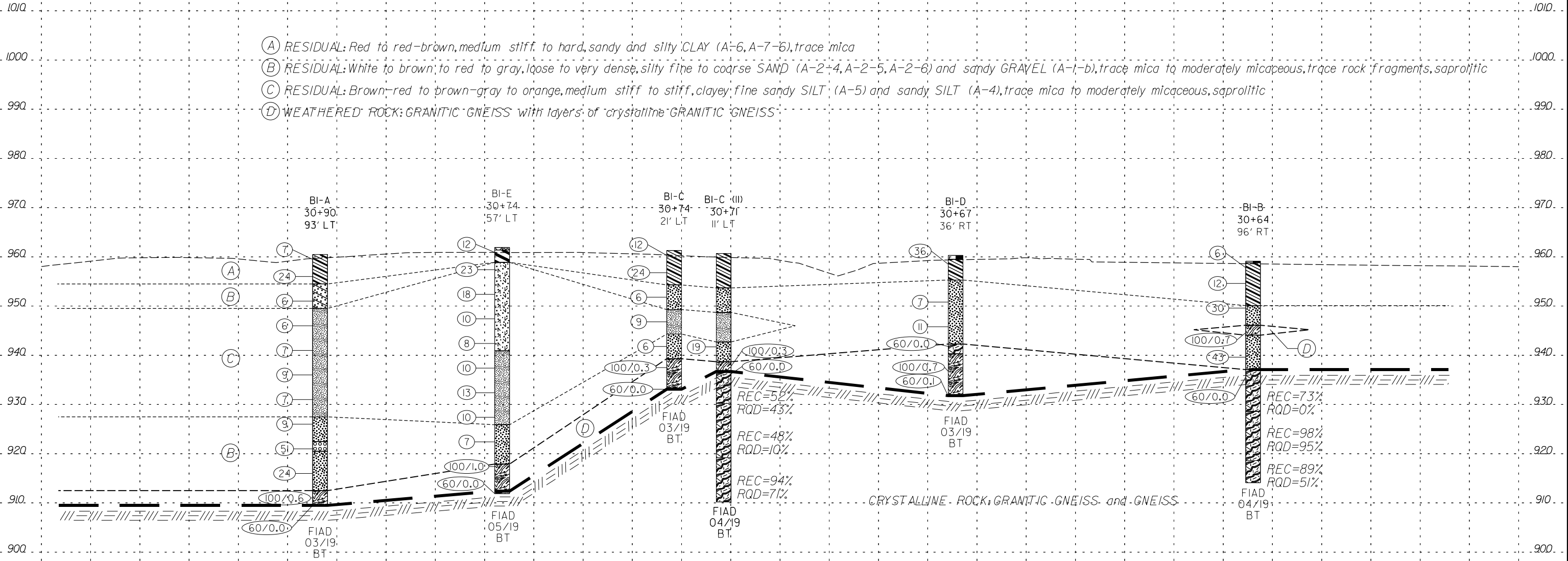
- (A) PAVEMENT
- (B) RESIDUAL: Red, medium stiff, to hard, silty sandy CLAY and sandy silty CLAY. (A-6, A-7-5)
- (C) RESIDUAL: Red to red-brown, to brown-gray-white, medium stiff to very stiff, sandy clayey SILT; clayey sandy SILT, and fine to coarse sandy SILT (A-4, A-5), trace mica to moderately micaceous, saprolitic
- (D) RESIDUAL: Red to brown to gray, loose to dense, silty fine to coarse SAND and clayey fine to coarse SAND (A-2-4, A-2-5, A-2-6), trace mica to moderately micaceous, trace rock fragments, saprolitic
- (E) WEATHERED ROCK: GRANITIC GNEISS

CROSS SECTION ALONG END BENT 1 (STA. 29 + 86)

NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



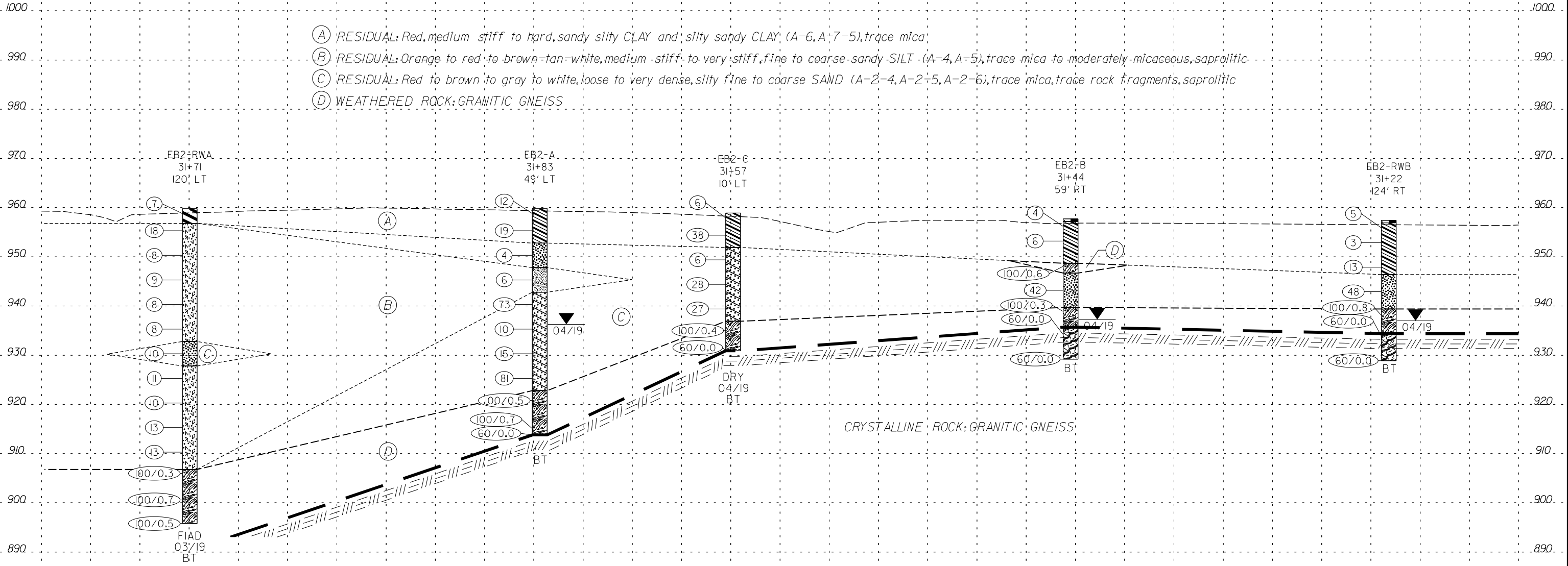
- (A) RESIDUAL: Red to red-brown, medium stiff to hard, sandy and silty CLAY (A-6, A-7-6), trace mica
- (B) RESIDUAL: White to brown, to red to gray, loose to very dense, silty fine to coarse SAND (A-2-4, A-2-5, A-2-6) and sandy GRAVEL (A-1-b), trace mica to moderately micaceous, trace rock fragments, saprolitic
- (C) RESIDUAL: Brown-red to brown-gray to orange, medium stiff to stiff, clayey fine sandy SILT (A-5) and sandy SILT (A-4), trace mica to moderately micaceous, saprolitic
- (D) WEATHERED ROCK: GRANITIC GNEISS with layers of crystalline GRANITIC GNEISS

CROSS SECTION ALONG BENT 1 (STA. 30+68)

NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



CROSS SECTION ALONG END BENT 2 (STA. 31+50)

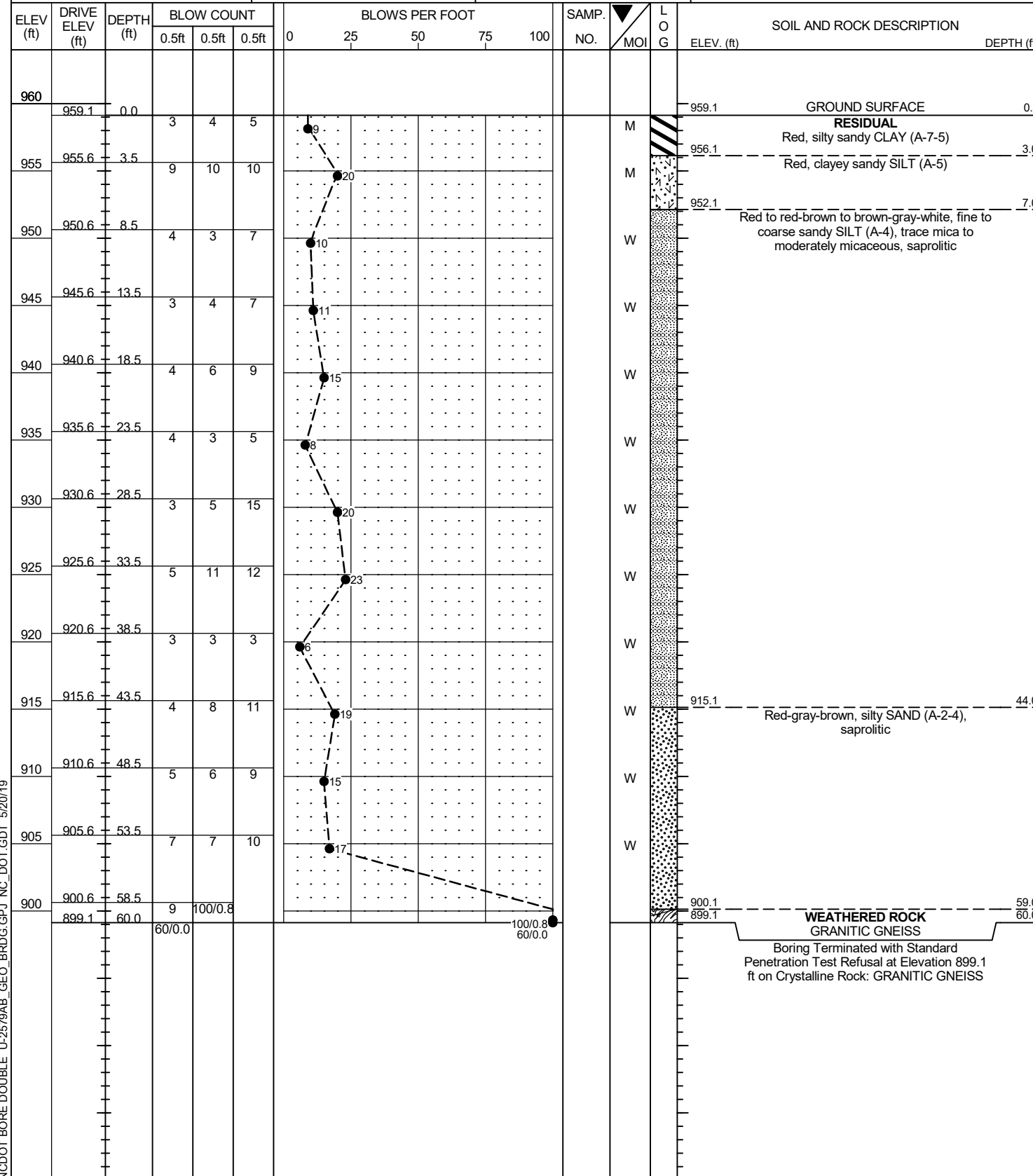
NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

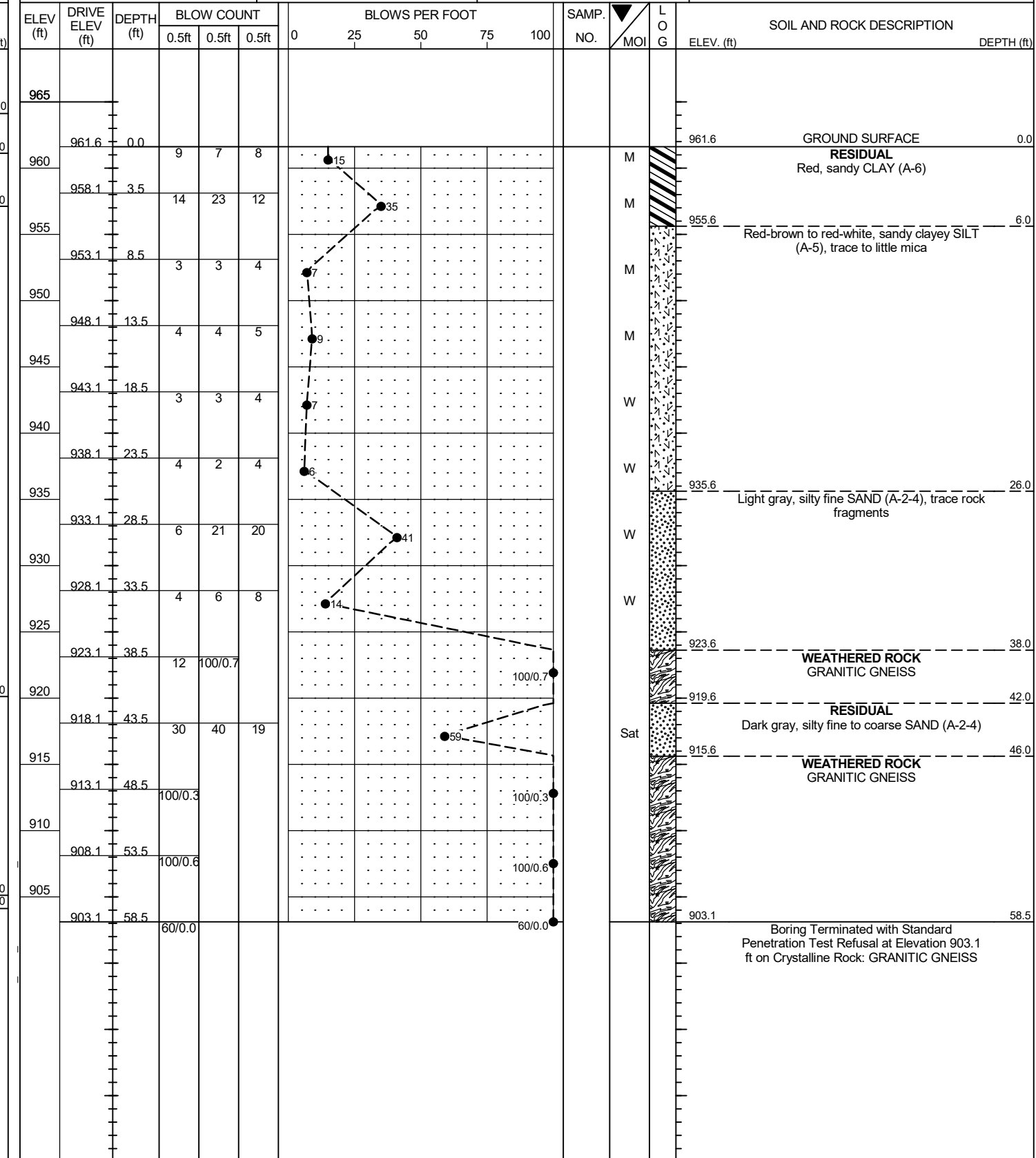
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8	TIP U-2579AB	COUNTY FORSYTH	GEOLOGIST P. Cary
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway			GROUND WTR (ft)
BORING NO. EB1-RWA	STATION 30+24	OFFSET 135 ft LT	ALIGNMENT Y4
COLLAR ELEV. 959.1 ft	TOTAL DEPTH 60.0 ft	NORTHING 854,574	EASTING 1,663,695
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER T. Donahue	START DATE 03/26/19	COMP. DATE 03/26/19	SURFACE WATER DEPTH N/A



WBS 34839.1.8	TIP U-2579AB	COUNTY FORSYTH	GEOLOGIST P. Cary
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway			GROUND WTR (ft)
BORING NO. EB1-A	STATION 30+13	OFFSET 48 ft LT	ALIGNMENT Y4
COLLAR ELEV. 961.6 ft	TOTAL DEPTH 58.5 ft	NORTHING 854,491	EASTING 1,663,719
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER T. Donahue	START DATE 03/29/19	COMP. DATE 03/29/19	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE U-2579AB_GEO_BRDG.GPJ_NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary										
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)									
BORING NO. EB1-C		STATION 30+06		OFFSET 10 ft LT		ALIGNMENT Y4										
COLLAR ELEV. 961.6 ft		TOTAL DEPTH 34.7 ft		NORTHING 854,453		EASTING 1,663,728										
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
DRILLER T. Donahue		START DATE 03/28/19		COMP. DATE 03/28/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
965																
960	961.6	0.0	3	6	6	12							M	GROUND SURFACE	0.0	
	958.1	3.5	9	9	10	19							M	RESIDUAL Red, sandy CLAY (A-6)		
955	953.1	8.5	3	4	4	8							W	Brown-red to gray, silty SAND (A-2-5), moderately micaceous, saprolitic	7.0	
950	948.1	13.5	3	3	3	6							W			
945	943.1	18.5	100/0.7											WEATHERED ROCK GRANITIC GNEISS	18.0	
940	938.1	23.5	100/0.8													
935	933.1	28.5	11	100/1.0												
930	929.1	32.5	14	100/0.7												
															Boring Terminated at Elevation 926.9 ft in Weathered Rock: GRANITIC GNEISS	34.7

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary									
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 30+20		OFFSET 40 ft RT		ALIGNMENT Y4									
COLLAR ELEV. 961.3 ft		TOTAL DEPTH 38.5 ft		NORTHING 854,413		EASTING 1,663,761									
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic									
DRILLER T. Donahue		START DATE 03/27/19		COMP. DATE 03/27/19		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
965															
960	960.5	0.8	7	8	10	18							W	GROUND SURFACE	0.0
	956.3	5.0											W	ROADWAY EMBANKMENT Pavement	0.8
955	952.8	8.5	3	2	4	6							W	RESIDUAL Red, silty sandy CLAY (A-6)	5.0
950	947.8	13.5	5	4	8	12							W	Red-brown to gray-brown-white, silty SAND (A-2-4), trace mica	
945	942.8	18.5	34	100/0.8										WEATHERED ROCK GRANITIC GNEISS	19.0
940	937.8	23.5	14	100/0.8											
935	932.8	28.5	39	30	15	45								RESIDUAL Gray, silty SAND (A-2-4)	26.0
930	927.8	33.5	100/0.7										Sat	WEATHERED ROCK GRANITIC GNEISS	33.0
925	922.8	38.5	60/0.0											WEATHERED ROCK GRANITIC GNEISS	38.5
															Boring Terminated with Standard Penetration Test Refusal at Elevation 922.8 ft on Crystalline Rock: GRANITIC GNEISS

NCDOT BORE DOUBLE U-2579AB_GEO_BRDG.GPJ_NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary											
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)										
BORING NO. EB1-RWB		STATION 30+03		OFFSET 129 ft RT		ALIGNMENT Y4											
COLLAR ELEV. 960.8 ft		TOTAL DEPTH 34.0 ft		NORTHING 854,325		EASTING 1,663,782											
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER T. Donahue		START DATE 03/29/19		COMP. DATE 03/29/19		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
965																	
960	960.3	0.5	2	2	3										960.8	0.0	GROUND SURFACE
															960.3	0.5	ROADWAY EMBANKMENT Pavement
	957.3	3.5	6	9	12												RESIDUAL Red, sandy silty CLAY (A-6)
955															954.8	6.0	Red to pink to brown-red, sandy clayey SILT (A-5), some mica to moderately micaceous, saprolitic
	952.3	8.5	4	6	8												
950																	
	947.3	13.5	3	4	7												
945																	
	942.3	18.5	4	4	6												
940															939.8	21.0	Brown-red-gray, silty clayey fine to coarse SAND (A-2-6)
	937.3	23.5	6	14	11												
935																	
	932.3	28.5	100/0.9												932.8	28.0	WEATHERED ROCK GRANITIC GNEISS
930																	
	927.3	33.5													927.8	33.0	CRYSTALLINE ROCK GRANITIC GNEISS
	926.8	34.0	60/0.0												926.8	34.0	Boring Terminated with Standard Penetration Test Refusal at Elevation 926.8 ft in Crystalline Rock: GRANITIC GNEISS

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary											
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)										
BORING NO. B1-A		STATION 30+90		OFFSET 93 ft LT		ALIGNMENT Y4											
COLLAR ELEV. 960.5 ft		TOTAL DEPTH 51.0 ft		NORTHING 854,563		EASTING 1,663,772											
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER T. Donahue		START DATE 03/26/19		COMP. DATE 03/26/19		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
965																	
960	960.5	0.0	3	3	4										960.5	0.0	GROUND SURFACE
																	RESIDUAL Red, silty CLAY (A-6), trace mica
	957.0	3.5	9	12	12												
955															954.5	6.0	Brown, silty fine to coarse SAND (A-2-6)
	952.0	8.5	2	3	3												
950																	
	947.0	13.5	4	2	4												
945																	
	942.0	18.5	3	2	5												
940																	
	937.0	23.5	4	4	5												
935																	
	932.0	28.5	2	3	4												
930																	
	927.0	33.5	3	3	6												
925																	
	922.0	38.5	20	26	25												
920																	
	917.0	43.5	22	11	13												
915																	
	912.0	48.5	100/0.6														
910																	
	909.5	51.0	60/0.0												909.5	51.0	WEATHERED ROCK GRANITIC GNEISS
																	Boring Terminated with Standard Penetration Test Refusal at Elevation 909.5 ft on Crystalline Rock: GRANITIC GNEISS

NCDOT BORE DOUBLE U-2579AB_GEO_BRDG.GPJ_NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary								
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)							
BORING NO. B1-E		STATION 30+74		OFFSET 57 ft LT		ALIGNMENT Y4								
COLLAR ELEV. 961.9 ft		TOTAL DEPTH 50.0 ft		NORTHING 854,523		EASTING 1,663,772								
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/24/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER J. Turney		START DATE 05/16/19		COMP. DATE 05/16/19		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				
965														
	961.9	0.0	6	5	7									961.9 GROUND SURFACE 0.0
960	958.4	3.5	8	9	14									958.9 ARTIFICIAL FILL GRAVEL 3.0
														RESIDUAL Red, silty CLAY (A-7-6) Red to brown-red to orange, clayey fine sandy SILT (A-5), trace mica, saprolitic
955	953.4	8.5	5	8	10									
950	948.4	13.5	3	4	6									
945	943.4	18.5	2	3	5									
940	938.4	23.5	4	4	6									940.9 Brown, fine sandy SILT (A-4), little mica, saprolitic 21.0
935	933.4	28.5	4	6	7									
930	928.4	33.5	3	4	6									
925	923.4	38.5	2	3	4									925.9 Tan, silty fine SAND (A-2-5) 36.0
920	918.4	43.5	12	88/0.5										917.9 WEATHERED ROCK GRANITIC GNEISS 44.0
915	911.9	50.0	60/0.0											912.4 CRYSTALLINE ROCK GRANITIC GNEISS 49.5 911.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 911.9 ft in Crystalline Rock: GRANITIC GNEISS 50.0

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary								
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)							
BORING NO. B1-C		STATION 30+74		OFFSET 21 ft LT		ALIGNMENT Y4								
COLLAR ELEV. 961.3 ft		TOTAL DEPTH 28.2 ft		NORTHING 854,491		EASTING 1,663,786								
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER T. Donahue		START DATE 03/28/19		COMP. DATE 03/28/19		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				
965														
	961.3	0.0	9	5	7									961.3 GROUND SURFACE 0.0
960	957.8	3.5	9	12	12									RESIDUAL Red, sandy CLAY (A-6)
955	952.8	8.5	4	3	3									954.3 Brown-red-gray, silty SAND (A-2-5) 7.0
950	947.8	13.5	4	4	5									949.3 Brown-red, sandy SILT (A-4), some mica, saprolitic 12.0
945	942.8	18.5	2	3	3									944.3 Gray-brown, silty SAND (A-2-5), moderately micaceous, saprolitic 17.0
940	937.8	23.5	100/0.3											939.3 WEATHERED ROCK GRANITIC GNEISS 22.0
935	933.1	28.2	60/0.0											933.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 933.1 ft on Crystalline Rock: GRANITIC GNEISS 28.2

NCDOT BORE DOUBLE U-2579AB_GEO_BRDG.GPJ_NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

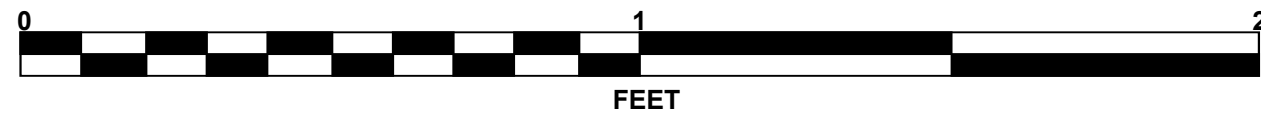
WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary										
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)									
BORING NO. B1-C (II)		STATION 30+71		OFFSET 11 ft LT		ALIGNMENT Y4										
COLLAR ELEV. 960.7 ft		TOTAL DEPTH 50.5 ft		NORTHING 854,481		EASTING 1,663,788										
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER T. Donahue		START DATE 04/02/19		COMP. DATE 04/02/19		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			ELEV. (ft)	DEPTH (ft)		
965																
960														960.7	0.0	GROUND SURFACE RESIDUAL Red, sandy CLAY (A-6)
955														953.7	7.0	Brown-red-gray, silty SAND (A-2-5)
950														948.7	12.0	Brown-red, sandy SILT (A-4)
945														942.7	18.0	RESIDUAL Dark gray, silty SAND (A-2-4), trace mica, saprolitic
940	942.7	18.0	4	3	16									938.7	22.0	WEATHERED ROCK GRANITIC GNEISS
935	937.7	23.0	100/0.3											936.7	24.0	CRYSTALLINE ROCK GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close to very close fracture spacing REC=63% RQD=38%
930	936.2	24.5	60/0.0											930.2	30.5	GRANITIC GNEISS, slightly to moderately weathered, hard to medium hard, close to very close fracture spacing REC=48% RQD=10%
925														919.2	41.5	GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing REC=94% RQD=71%
920														910.2	50.5	Boring Terminated at Elevation 910.2 ft in Crystalline Rock: GRANITIC GNEISS

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary						
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)					
BORING NO. B1-C (II)		STATION 30+71		OFFSET 11 ft LT		ALIGNMENT Y4						
COLLAR ELEV. 960.7 ft		TOTAL DEPTH 50.5 ft		NORTHING 854,481		EASTING 1,663,788						
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic							
DRILLER T. Donahue		START DATE 04/02/19		COMP. DATE 04/02/19		SURFACE WATER DEPTH N/A						
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)
936.19												Begin Coring @ 24.5 ft
935	936.2	24.5	1.0	N=60/0.0 2:15/1.0	(0.8)	(0.8)						CRYSTALLINE ROCK GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close to very close fracture spacing (continued)
930	930.2	30.5	5.0	2:15/1.0 2:18/1.0 0:47/1.0 0:07/1.0 0:12/1.0	83%	75%						GRANITIC GNEISS, slightly to moderately weathered, hard to medium hard, close to very close fracture spacing
925	925.2	35.5	5.0	0:47/1.0 0:45/1.0 0:18/1.0 0:24/1.0 0:24/1.0	(0.8)	(0.0)		(5.3) 48%	(1.1) 10%			GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing
920	920.2	40.5	5.0	0:43/1.0 1:13/1.0 1:00/1.0 1:54/1.0 2:08/1.0	(3.3)	(0.4)						GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing
915	915.2	45.5	5.0	2:25/1.0 2:18/1.0 2:49/1.0 2:16/1.0 2:26/1.0	(4.7)	(2.8)		(8.5) 94%	(6.4) 71%			GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing
	910.2	50.5		2:45/1.0 2:16/1.0 2:24/1.0 2:37/1.0 2:23/1.0	(5.0)	(3.3)						Boring Terminated at Elevation 910.2 ft in Crystalline Rock: GRANITIC GNEISS

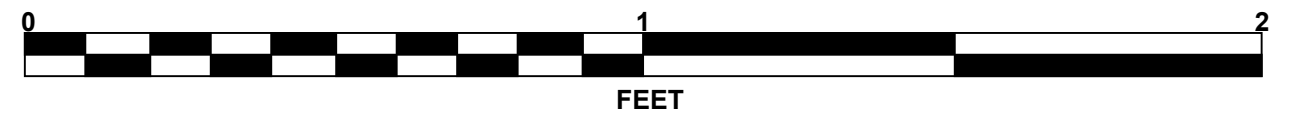
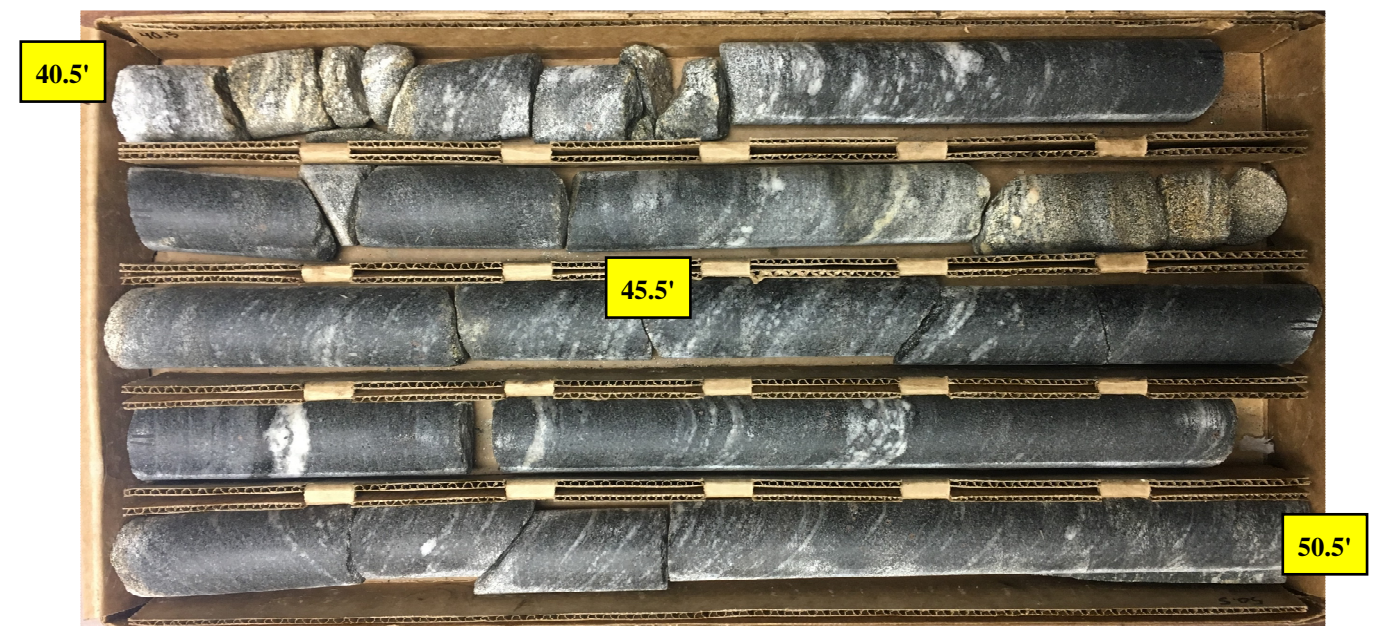
NCDOT BORE DOUBLE U-2579AB_GEO_BRDG.GPJ_NC_DOT.GDT 5/20/19

CORE PHOTOGRAPHS

B1-C (II)
BOX 1 OF 2: 24.5 - 40.5 FEET



B1-C (II)
BOX 2 OF 2: 40.5 - 50.5 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary									
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)								
BORING NO. B1-D		STATION 30+67		OFFSET 36 ft RT		ALIGNMENT Y4									
COLLAR ELEV. 960.3 ft		TOTAL DEPTH 28.6 ft		NORTHING 854,436		EASTING 1,663,802									
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic									
DRILLER T. Donahue		START DATE 03/27/19		COMP. DATE 03/27/19		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
965															
960	959.5	0.8	11	16	20								M	960.3 GROUND SURFACE 959.5 ROADWAY EMBANKMENT Pavement	0.0 0.8
955													W	955.3 RESIDUAL Red, sandy silty CLAY (A-6) Red to gray, silty SAND (A-2-5)	5.0
950	951.8	8.5	3	3	4								W		
945	946.8	13.5	5	4	7								W		
940	941.8	18.5												942.3 CRYSTALLINE ROCK GRANITIC GNEISS	18.0
935	936.8	23.5												940.3 WEATHERED ROCK GRANITIC GNEISS	20.0
	931.8	28.5												931.8 CRYSTALLINE ROCK GRANITIC GNEISS	28.5
														Boring Terminated with Standard Penetration Test Refusal at Elevation 931.7 ft in Crystalline Rock: GRANITIC GNEISS	

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary									
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)								
BORING NO. B1-B		STATION 30+64		OFFSET 96 ft RT		ALIGNMENT Y4									
COLLAR ELEV. 959.1 ft		TOTAL DEPTH 45.0 ft		NORTHING 854,379		EASTING 1,663,824									
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic									
DRILLER T. Donahue		START DATE 04/02/19		COMP. DATE 04/02/19		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
960	958.8	0.3	3	2	4										
955	955.6	3.5	3	5	7								M	959.1 GROUND SURFACE ROADWAY EMBANKMENT Pavement	0.0 0.8
950	950.6	8.5	5	17	13								W	950.1 RESIDUAL Red-brown, sandy CLAY (A-6)	9.0
945	945.6	13.5											W	950.1 White-red, silty fine to coarse SAND (A-2-4)	9.0
940	940.6	18.5	11	22	21								W	946.1 WEATHERED ROCK GRANITIC GNEISS 944.1 RESIDUAL White-tan, silty coarse SAND (A-2-4)	13.0 15.0
935	935.6	23.5												937.1 CRYSTALLINE ROCK GRANITIC GNEISS, moderately weathered, moderately hard to hard, close to very close fracture spacing REC=73% RQD=0%	22.0
930														928.6 GNEISS, fresh to very slightly weathered, hard, wide to close fracture spacing REC=98% RQD=95%	30.5
925														918.6 GNEISS, fresh to very slightly weathered, hard, close fracture spacing REC=89% RQD=51%	40.5
920															
915														Boring Terminated at Elevation 914.1 ft in Crystalline Rock: GNEISS	

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GEOTECHNICAL BORING REPORT

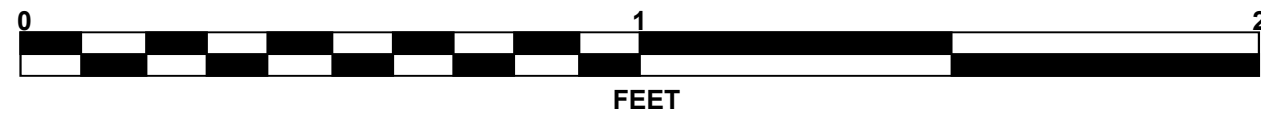
CORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary					
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)				
BORING NO. B1-B		STATION 30+64		OFFSET 96 ft RT		ALIGNMENT Y4					
COLLAR ELEV. 959.1 ft		TOTAL DEPTH 45.0 ft		NORTHING 854,379		EASTING 1,663,824					
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic					
DRILLER T. Donahue		START DATE 04/02/19		COMP. DATE 04/02/19		SURFACE WATER DEPTH N/A					
CORE SIZE NQ		TOTAL RUN 21.5 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
935.58										Begin Coring @ 23.5 ft	
935	935.6	23.5	2.0	N=60/0.0	(1.5)	(0.0)				CRYSTALLINE ROCK	
	933.6	25.5		5:38/1.0	75%	0%				GRANITIC GNEISS, moderately weathered, moderately hard to hard, close to very close fracture spacing (continued)	
			5.0	1:52/1.0							
				1:54/1.0	(3.6)	(0.0)					
930				1:36/1.0	72%	0%					
				0:54/1.0							
				1:34/1.0							
	928.6	30.5		2:39/1.0							30.5
			5.0	0:52/1.0	(4.8)	(4.5)	(9.8)	(9.5)		GNEISS, fresh to very slighty weathered, hard, wide to close fracture spacing	
				1:00/1.0	96%	90%	98%	95%			
925				1:19/1.0							
				4:01/1.0							
	923.6	35.5		2:21/1.0							
			5.0	1:22/1.0	(5.0)	(5.0)					
				1:56/1.0	100%	100%					
920				2:09/1.0							
				2:46/1.0							
	918.6	40.5		3:00/1.0							40.5
			4.5	3:49/1.0	(4.0)	(2.3)	(4.0)	(2.3)		GNEISS, fresh to very slighty weathered, hard, close fracture spacing	
				3:32/1.0	89%	51%	89%	51%			
915				2:06/1.0							
	914.1	45.0		2:31/1.0							45.0
				1:30/0.5						Boring Terminated at Elevation 914.1 ft in Crystalline Rock: GNEISS	

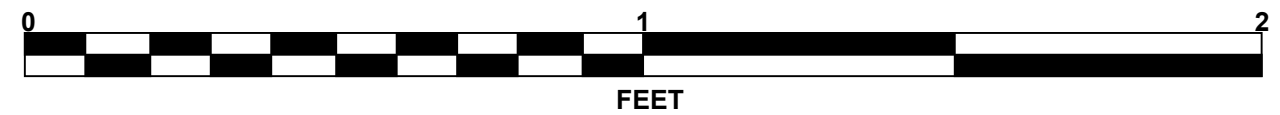
NCDOT CORE DOUBLE U-2579AB_GEO_BRDG.GPJ NC_DOT.GDT 5/20/19

CORE PHOTOGRAPHS

B1-B
BOX 1 OF 2: 23.5 - 33.5 FEET



B1-B
BOX 2 OF 2: 33.5 - 45.0 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)
BORING NO. EB2-RWA		STATION 31+71		OFFSET 120 ft LT		ALIGNMENT Y4	
COLLAR ELEV. 959.8 ft		TOTAL DEPTH 64.0 ft		NORTHING 854,620		EASTING 1,663,835	
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER T. Donahue		START DATE 03/26/19		COMP. DATE 03/26/19		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
960	959.8	0.0	2	3	4							M	GROUND SURFACE	0.0
	956.3	3.5	10	9	9							M	RESIDUAL Red, silty CLAY (A-7-5), trace mica	3.0
955	951.3	8.5	3	3	5							M	Red to brown-orange-white, fine sandy SILT (A-5), some mica to moderately micaceous	
950	946.3	13.5	4	4	5							M		
945	941.3	18.5	3	4	4							M		
940	936.3	23.5	4	3	5							M		
935	931.3	28.5	7	5	5							W	Brown-red-white, silty coarse SAND (A-2-4)	27.0
930	926.3	33.5	3	5	6							W	Brown to brown-tan-white, fine to coarse sandy SILT (A-5), trace mica to moderately micaceous, saprolitic	32.0
925	921.3	38.5	4	4	6							W		
920	916.3	43.5	15	6	7							W		
915	911.3	48.5	4	4	9							W		
910	906.3	53.5	100/0.3									W	WEATHERED ROCK GRANITIC GNEISS	53.0
905	901.3	58.5	100/0.7									W		
900	896.3	63.5	100/0.5									W		
													Boring Terminated at Elevation 895.8 ft in Weathered Rock: GRANITIC GNEISS	64.0

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)
BORING NO. EB2-A		STATION 31+83		OFFSET 49 ft LT		ALIGNMENT Y4	
COLLAR ELEV. 959.8 ft		TOTAL DEPTH 46.0 ft		NORTHING 854,560		EASTING 1,663,875	
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER T. Donahue		START DATE 03/28/19		COMP. DATE 03/28/19		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
960	959.8	0.0	4	4	8							M	GROUND SURFACE	0.0
	956.3	3.5	9	10	9							W	RESIDUAL Red, silty sandy CLAY (A-6)	
955	951.3	8.5	3	1	3							W	Brown-red, silty SAND (A-2-4)	7.0
950	946.3	13.5	2	3	3							W	Orange, sandy SILT (A-4)	12.0
945	941.3	18.5	10	8	65							W	Gray to brown-red to dark gray, silty fine to coarse SAND (A-2-6), trace mica	17.0
940	936.3	23.5	9	5	5							W		
935	931.3	28.5	6	5	10							W		
930	926.3	33.5	35	33	48							W		
925	921.3	38.5	100/0.5									W	WEATHERED ROCK GRANITIC GNEISS	37.0
920	916.3	43.5	26	100/0.7								W		
915	913.8	46.0	60/0.0									W		
													Boring Terminated with Standard Penetration Test Refusal at Elevation 913.8 ft on Crystalline Rock: GRANITIC GNEISS	46.0

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GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary										
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)									
BORING NO. EB2-C		STATION 31+57		OFFSET 10 ft LT		ALIGNMENT Y4										
COLLAR ELEV. 958.9 ft		TOTAL DEPTH 28.0 ft		NORTHING 854,514		EASTING 1,663,867										
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
DRILLER T. Donahue		START DATE 03/28/19		COMP. DATE 03/28/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
960	958.9	0.0	5	3	3									958.9	0.0	GROUND SURFACE
955	955.4	3.5	21	18	20									951.9	7.0	RESIDUAL Red, sandy silty CLAY (A-6)
950	950.4	8.5	3	2	4									936.9	22.9	Red-black to brown-gray, silty SAND (A-2-6), trace mica, trace rock fragments, saprolitic
945	945.4	13.5	9	9	19									930.9	28.0	WEATHERED ROCK GRANITIC GNEISS
940	940.4	18.5	5	5	22											
935	935.4	23.5	100/0.4													
	930.9	28.0	60/0.0													Boring Terminated with Standard Penetration Test Refusal at Elevation 930.9 ft on Crystalline Rock: GRANITIC GNEISS

WBS 34839.1.8		TIP U-2579AB		COUNTY FORSYTH		GEOLOGIST P. Cary										
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 31+44		OFFSET 59 ft RT		ALIGNMENT Y4										
COLLAR ELEV. 957.7 ft		TOTAL DEPTH 28.5 ft		NORTHING 854,446		EASTING 1,663,882										
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
DRILLER T. Donahue		START DATE 04/01/19		COMP. DATE 04/01/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
960														957.7	0.0	GROUND SURFACE
955	957.2	0.5	3	2	2									937.2	6.5	ROADWAY EMBANKMENT Pavement
950	954.2	3.5	3	3	3									948.7	9.0	RESIDUAL Red, sandy CLAY (A-6)
945	949.2	8.5	6	100/0.6										946.7	11.0	WEATHERED ROCK GRANITIC GNEISS
940	944.2	13.5	18	26	16									939.7	18.0	RESIDUAL Dark gray, silty SAND (A-2-4)
935	939.2	18.5	100/0.3											935.7	22.0	WEATHERED ROCK GRANITIC GNEISS
930	934.2	23.5	60/0.0											930.9	28.0	CRYSTALLINE ROCK GRANITIC GNEISS
	929.2	28.5	60/0.0													Boring Terminated with Standard Penetration Test Refusal at Elevation 929.2 ft in Crystalline Rock: GRANITIC GNEISS

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GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34839.1.8	TIP U-2579AB	COUNTY FORSYTH	GEOLOGIST P. Cary
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway			GROUND WTR (ft)
BORING NO. EB2-RWB	STATION 31+22	OFFSET 124 ft RT	ALIGNMENT Y4
COLLAR ELEV. 957.4 ft	TOTAL DEPTH 28.5 ft	NORTHING 854,377	EASTING 1,663,888
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER T. Donahue	START DATE 04/01/19	COMP. DATE 04/01/19	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			ELEV. (ft)	DEPTH (ft)		
960																
	956.9	0.5	3	3	2	5						M		957.4	0.0	GROUND SURFACE
955	953.9	3.5	1	2	1	3						W		956.9	0.5	ROADWAY EMBANKMENT Pavement
	948.9	8.5	5	6	7	13						W				RESIDUAL Red, sandy CLAY (A-6), trace mica
950	943.9	13.5	14	16	32							W		946.4	11.0	Red-white, silty coarse SAND (A-2-4), trace rock fragments, saprolitic
945	938.9	18.5	100/0.8									W		939.4	18.0	WEATHERED ROCK GRANITIC GNEISS
940	933.9	23.5	60/0.0											934.4	23.0	CRYSTALLINE ROCK GRANITIC GNEISS
935	928.9	28.5	60/0.0											928.9	28.5	Boring Terminated with Standard Penetration Test Refusal at Elevation 928.9 ft in Crystalline Rock: GRANITIC GNEISS
930																

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