

REFERENCE: I-2513AC

PROJECT: 34165

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE
PROJECT DESCRIPTION I-26I-40I-240 INTERCHANGE TO
SR 3548 (HAYWOOD RD)

SITE DESCRIPTION BRIDGE NO. 905 ON -Y2RPB- OVER
HOMINY CREEK AND SR 3620 (HOMINY CREEK
RD) BETWEEN I-40 WB AND NC 191

STATE	TOWN OF HOLLY SPRINGS PROJECT NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-2513AC	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.

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 THE 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.

- 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

CG2

GOODNIGHT, D.J.

INVESTIGATED BY FALCON ENG.

DRAWN BY CROCKETT, S.C.

CHECKED BY HUNSBERGER, W.S.

SUBMITTED BY FALCON ENG.

DATE SEPTEMBER 2024



DocuSigned by:

Stephen Crockett

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SIGNATURE

9/24/2024

DATE

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 (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, MOST 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: WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. CRYSTALLINE ROCK (CR) - FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL, IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. NON-CRYSTALLINE ROCK (NCR) - FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL, IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK (CP) - COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.										ALLUVIUM (ALLOY) - 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 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. MOTTILING 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 (SCREC) - 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. GROUP CLASS. SYMBOL % PASSING MATERIAL PASSING #10 LL PI GROUP INDEX USUAL TYPES OF MAJOR MATERIALS DESCRIBING AS SUBGRADE										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. 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. IF TESTED, WOULD YIELD SPT REFUSAL. 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. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF. 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. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF. 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.										MUCK, PEAT																			
PERCENTAGE OF MATERIAL										GROUND WATER																																							
ORGANIC MATERIAL: TRACE OF ORGANIC MATTER, LITTLE ORGANIC MATTER, MODERATELY ORGANIC, HIGHLY ORGANIC										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																																							
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, TEST BORING, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR (INSTALLATION), CONE PENETROMETER TEST, SOUNDING ROD, TEST BORING WITH CORE, SPT N-VALUE																																							
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS																																							
U.S. STD. SIEVE SIZE OPENING (MM), BOULDER (BLDR), COBBLE (COB), GRAVEL (GR), COARSE SAND (CSE, SD), FINE SAND (F SD), SILT (SL), CLAY (CL)										UNDERCUT EXCAVATION, SHALLOW UNDERCUT, UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE, UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK, UNCLASSIFIED EXCAVATION - UNSUITABLE BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL																																							
SOIL MOISTURE - CORRELATION OF TERMS										ABBREVIATIONS																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS), FIELD MOISTURE DESCRIPTION, GUIDE FOR FIELD MOISTURE DESCRIPTION										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, H - HIGHLY, MED - MEDIUM, MICA - MICACEOUS, MOD - MODERATELY, NP - NON PLASTIC, ORG - ORGANIC, PMT - PRESSUREMETER TEST, SAP - SAPROLITIC, SD - SAND, SANDY, SIL - SILT, SILTY, SLI - SLIGHTLY, TCR - TRICONE REFUSAL, W - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST, WEA - WEATHERED, UNIT WEIGHT, DRY UNIT WEIGHT, SAMPLE ABBREVIATIONS, S - BULK, SS - SPLIT SPOON, ST - SHELBY TUBE, RS - ROCK, RT - RECOMPACTED TRIAXIAL, CBR - CALIFORNIA BEARING RATIO																																							
PLASTICITY										EQUIPMENT USED ON SUBJECT PROJECT																																							
NON PLASTIC, SLIGHTLY PLASTIC, MODERATELY PLASTIC, HIGHLY PLASTIC, PLASTICITY INDEX (PI), DRY STRENGTH										DRILL UNITS, ADVANCING TOOLS, HAMMER TYPE, CORE SIZE, HAND TOOLS																																							
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.																																																	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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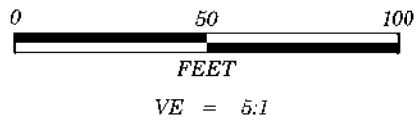
SUBSURFACE INVESTIGATION

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

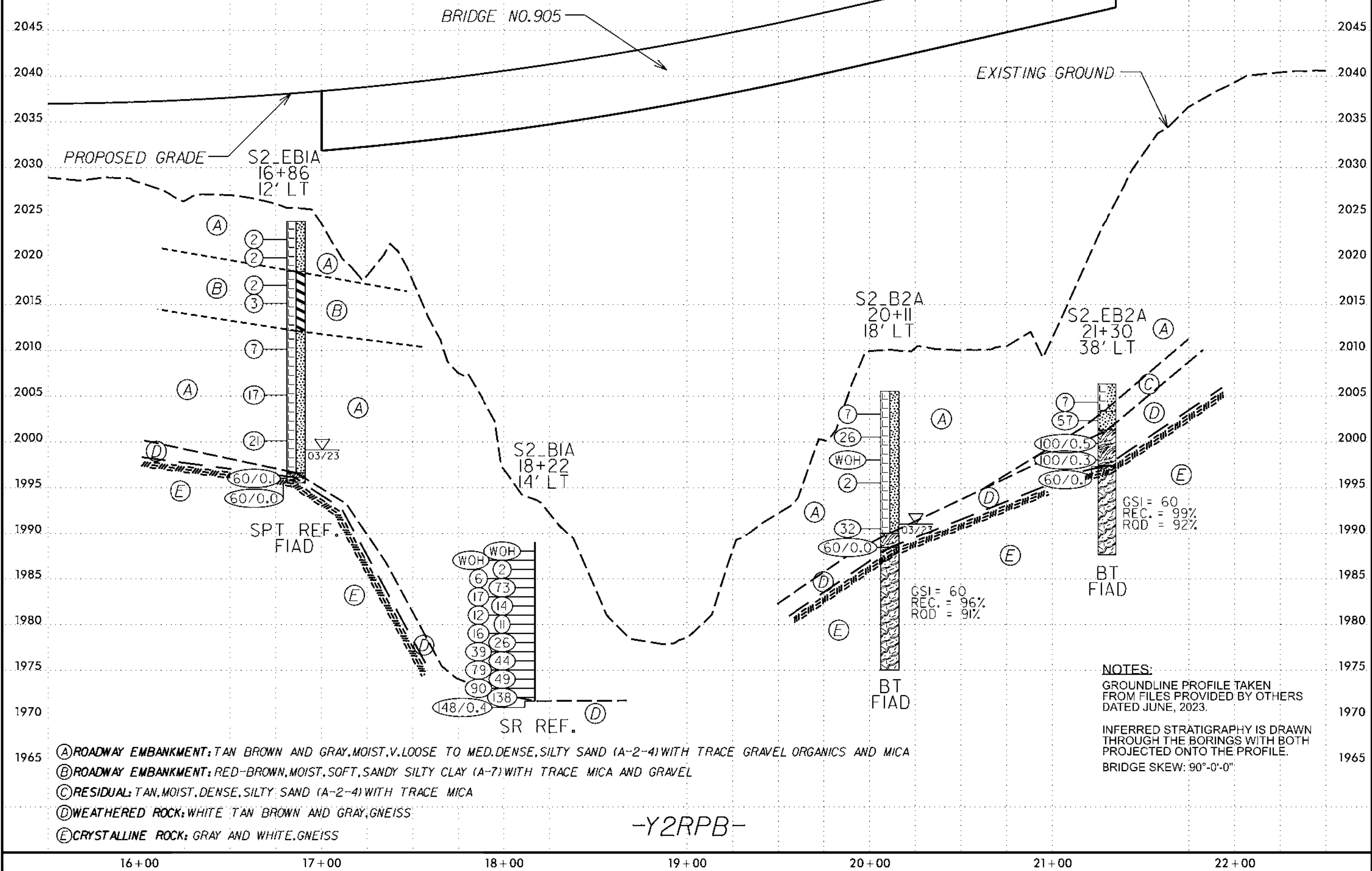
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

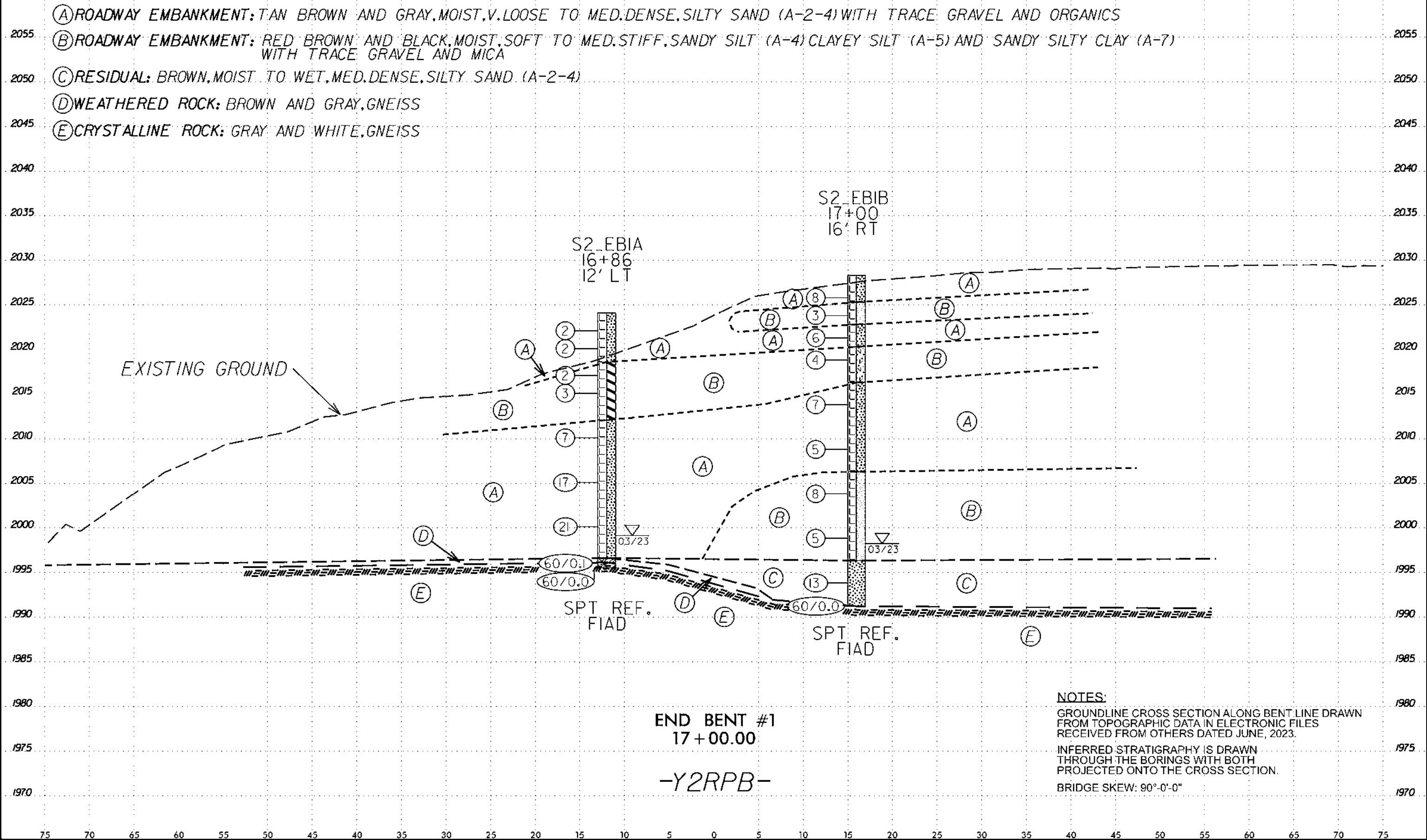
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

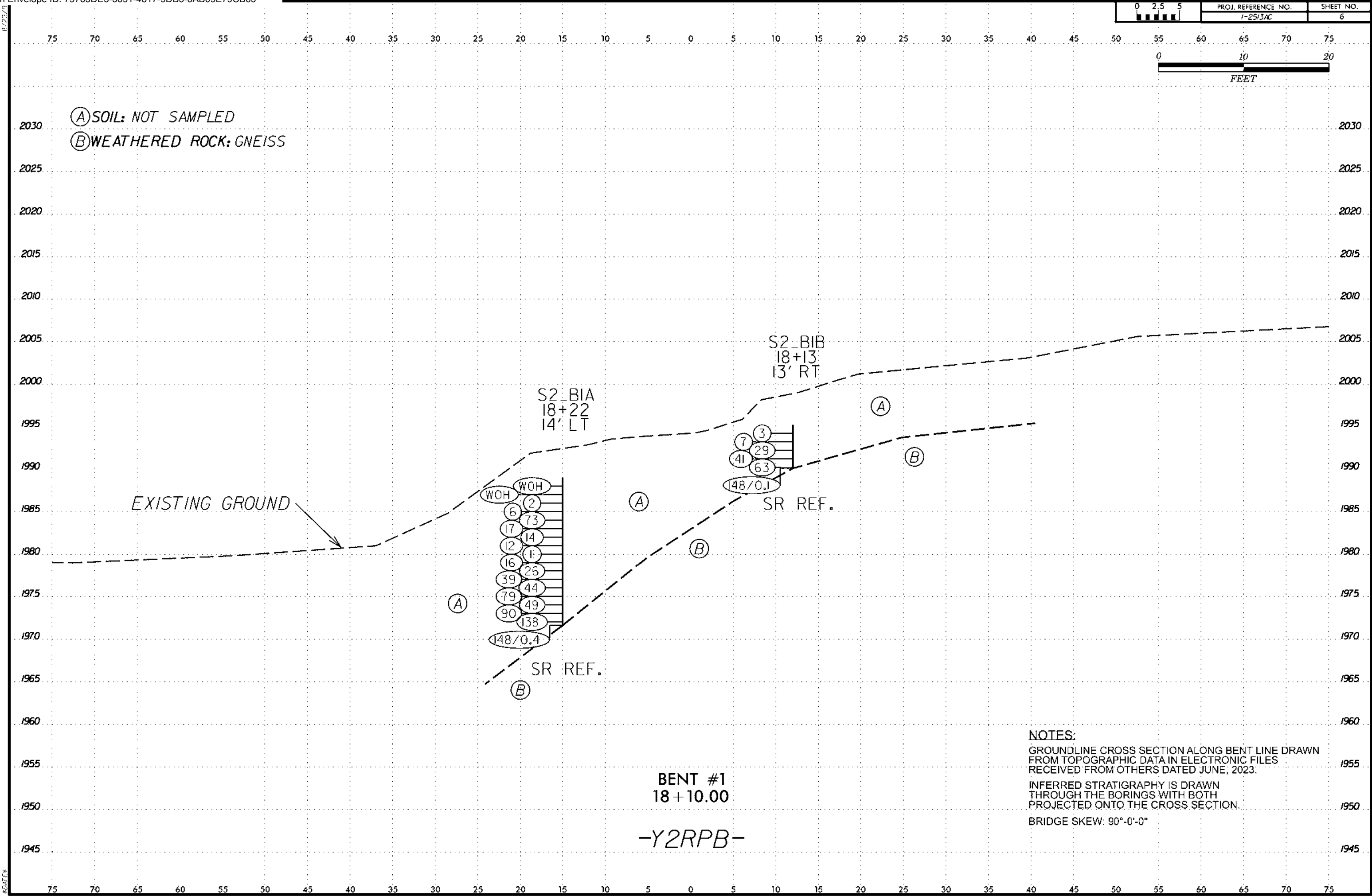
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that 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	STRUCTURE INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities 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	DECREASING SURFACE QUALITY ➡ DECREASING INTERLOCKING OF ROCK PIECES ➡	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	COMPOSITION AND STRUCTURE 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. B. Sandstone with thin inter-layers of siltstone C. Sandstone and siltstone in similar amounts D. Siltstone or silty shale with sandstone layers E. Weak siltstone or clayey shale with sandstone layers F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure 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
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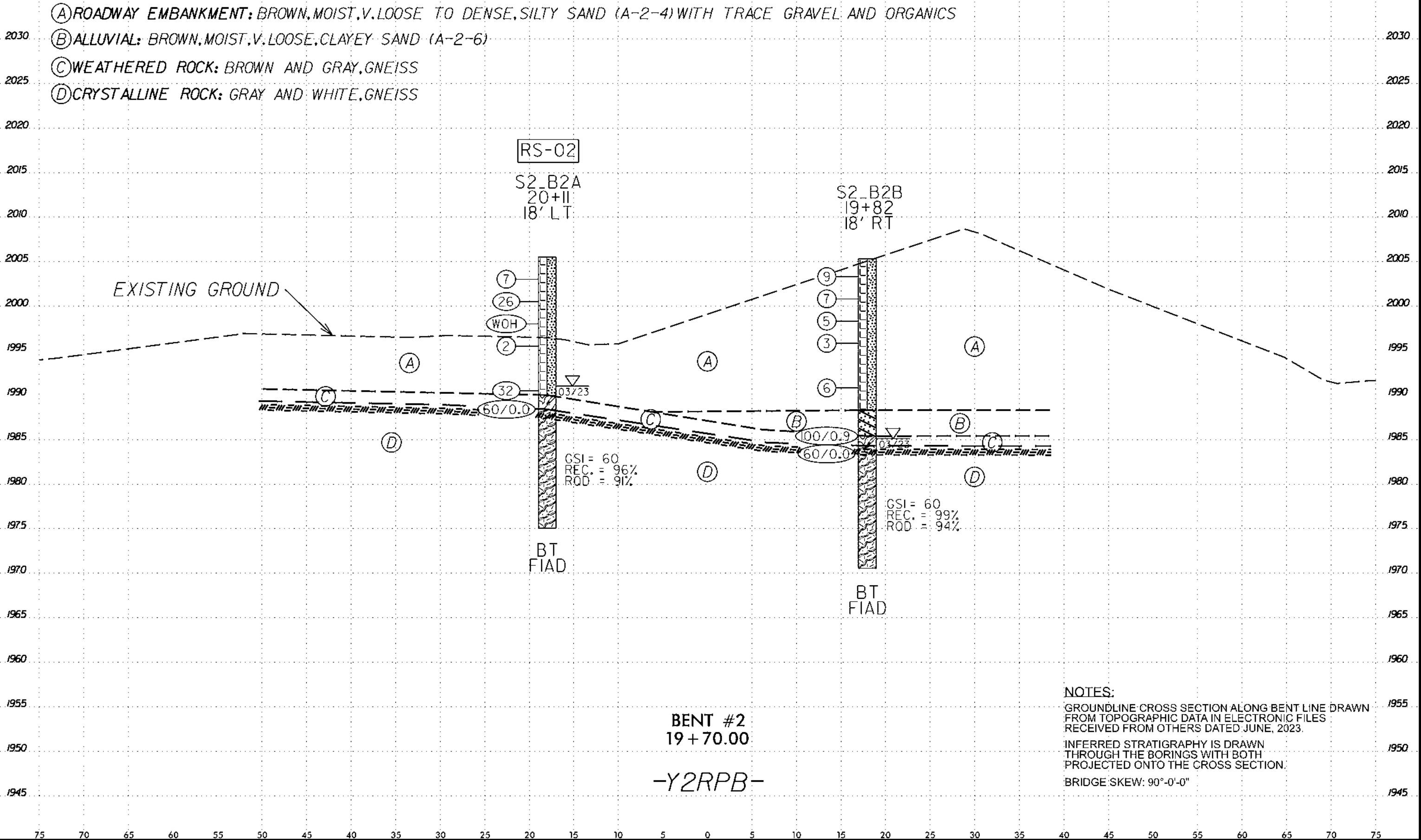
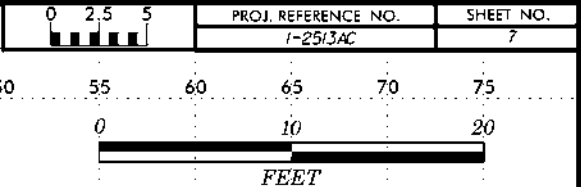
PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	4
BRIDGE ON -Y2RPB- OVER HOMINY CREEK AND HOMINY CREEK RD.	



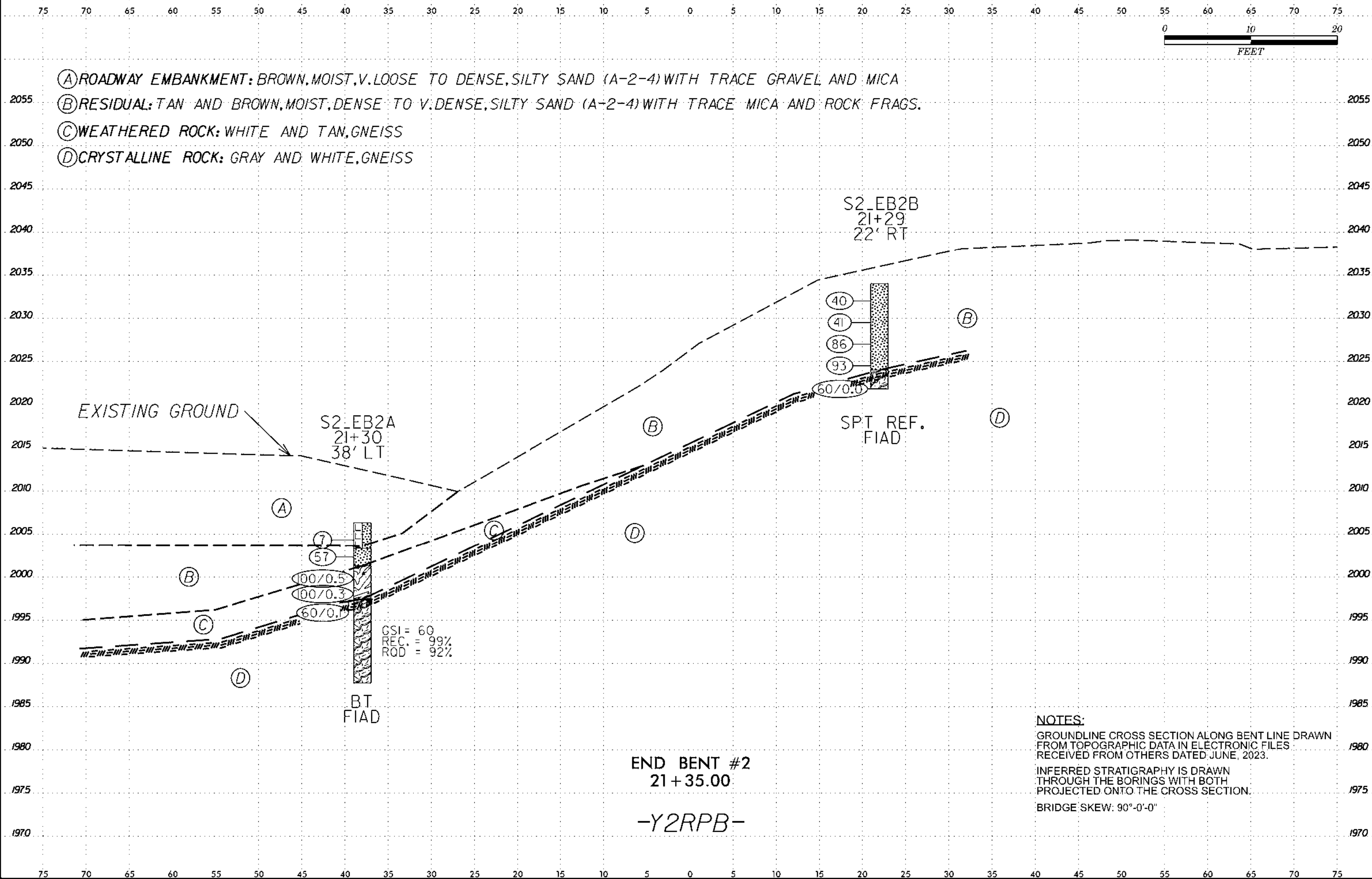
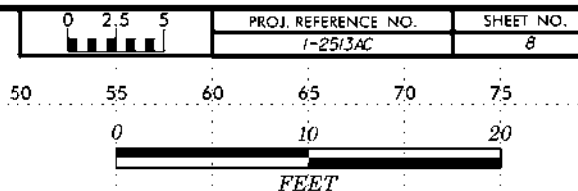




B/23/3



B/23/3



GEOTECHNICAL BORING REPORT

BORE LOG

[illegible]

NCDOT BORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24

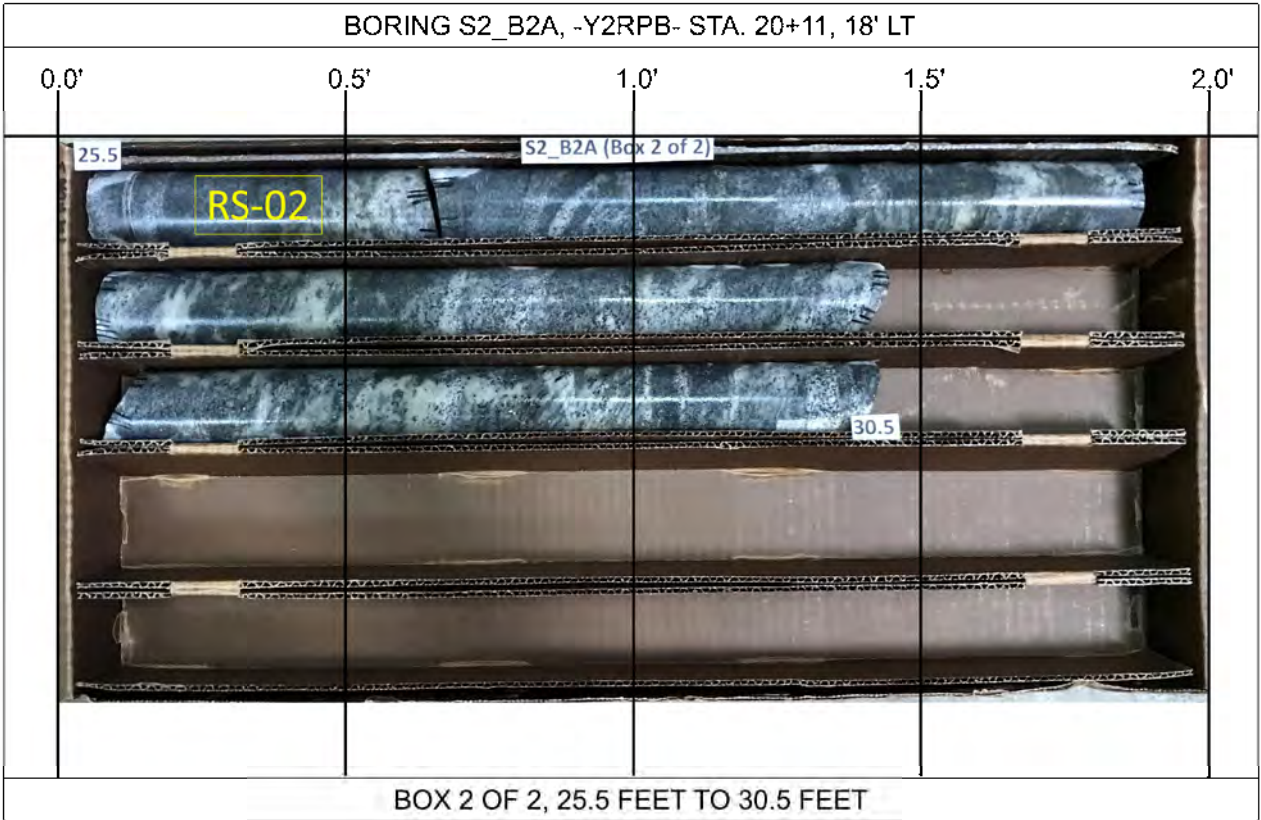
NCDOT BORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24

NCDOT BORE SINGLE I-1213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/20/24

NCDOT CORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24



GSI = 60



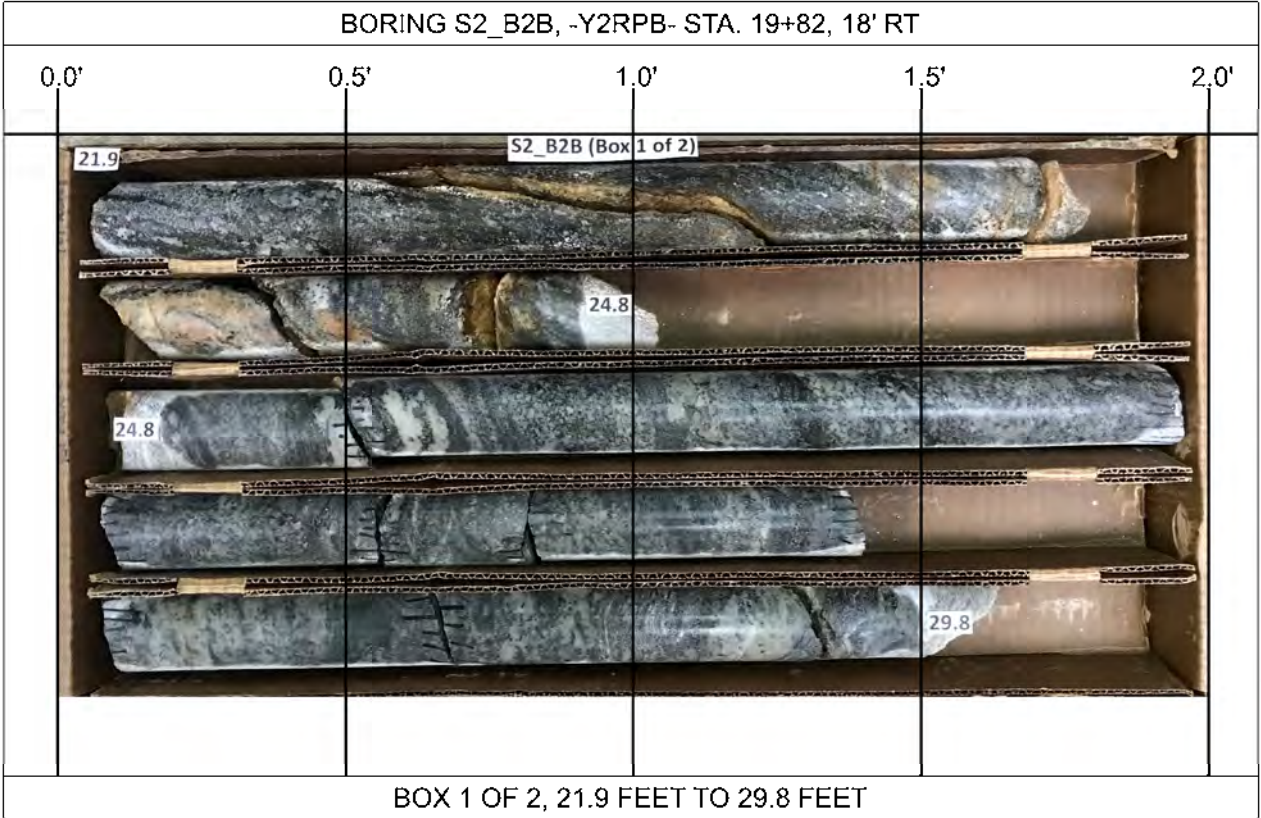
GSI = 60



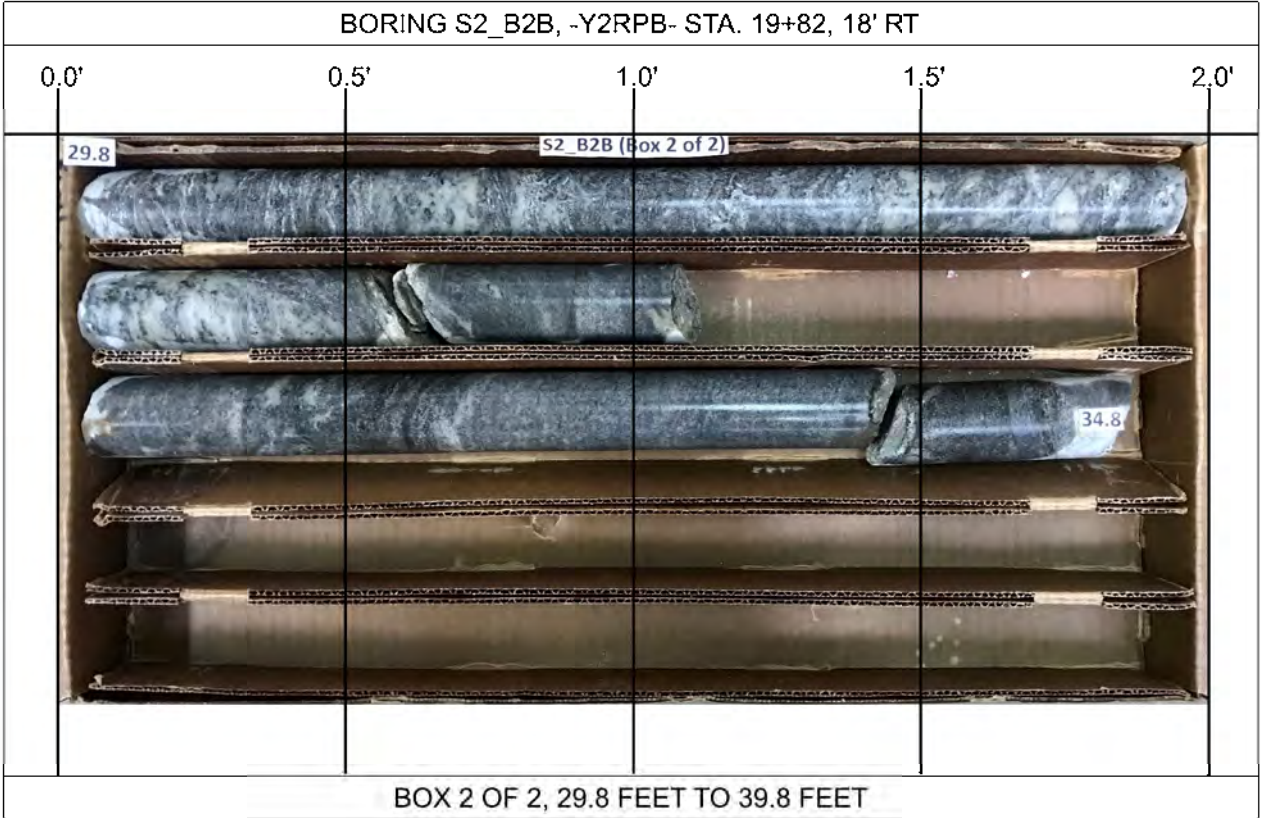
 FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 CARY, NC 27513 PHONE: 919.871.0800 www.falconengineering.com	ROCK CORE PHOTOGRAPHS
	BRIDGE ON -Y2RPB- OVER HOMINY CREEK AND SR 3620 BETWEEN I-40 WB AND NC 191 BUNCOMBE COUNTY, NC WBS: 34165 TIP: I-2513AC FALCON PROJECT NO. G22009.01

NCDOT BORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24

NCDOT CORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24



GSI = 60



GSI = 60



 FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 CARY, NC 27513 PHONE: 919.871.0800 www.falconengineering.com	ROCK CORE PHOTOGRAPHS
	BRIDGE ON -Y2RPB- OVER HOMINY CREEK AND SR 3620 BETWEEN I-40 WB AND NC 191 BUNCOMBE COUNTY, NC WBS: 34165 TIP: I-2513AC FALCON PROJECT NO. G22009.01

NCDOT BORE SINGLE I-1213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/20/24

NCDOT CORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/20/24



GSI = 60



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ROCK CORE PHOTOGRAPHS

BRIDGE ON -Y2RPB- OVER HOMINY CREEK AND
SR 3620 BETWEEN I-40 WB AND NC 191
BUNCOMBE COUNTY, NC
WBS: 34165 | TIP: I-2513AC
FALCON PROJECT NO. G22009.01

WBS		34165.1.2		TIP		1-2513AC		COUNTY		BUNCOMBE		GEOLOGIST		Goodnight, D.J.																					
SITE DESCRIPTION												Bridge No. 905 on -Y2RPB- Over Hominy Creek and SR 3620 Between I-40 WB and NC 191				GROUND WTR (ft)																			
BORING NO.				S2_EB2B				STATION				21+29		OFFSET		22 ft RT		ALIGNMENT		-Y2RPB-		0 HR.		Dry											
COLLAR ELEV.				2,034.0 ft				TOTAL DEPTH				12.2 ft		NORTHING		679,298		EASTING		930,532		24 HR.		N/A											
DRILL RIG/HAMMER EFF./DATE								CG20446 Diedrich D50 87% 05/10/2022								DRILL METHOD				H.S. Augers				HAMMER TYPE				Automat							
DRILLER						Odom, C.						START DATE				03/14/23				COMP. DATE				03/14/23				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)															
2035																																			
		2,033.0		1.0		8 14 26														2,034.0 GROUND SURFACE 0.0															
2030		2,030.5		3.5		15 23 18														RESIDUAL TAN-BROWN, DENSE TO VERY DENSE, SILTY SAND (A-2-4) WITH SOME ROCK FRAGMENTS															
		2,028.0		6.0		31 38 48																													
2025		2,025.5		8.5		36 51 42														2,024.0 10.0															
		2,021.8		12.2		60/0.0														CRYSTALLINE ROCK GRAY AND WHITE, GNEISS 12.2															
																				Boring Terminated at Elevation 2,021.8 ft on CR: GNEISS															

NC DOT BORE DOUBLE I-1213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/20/24

REFERENCE: I-25I3AC

PROJECT: 34I65

PROJECT REFERENCE NO.	SHEET NO.
I-25I3AC	18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
LABORATORY RESULTS

Project No.:	G22009.01	Tested By:	C. Sullivan	Test Date:	2023-19-12
Project Name:	I-2513AA-AC				
Boring ID:	S2-B2-A	Sample ID:	RS-02	Sample Depth:	25.6-26.0 ft
Sample Description:	Black and White Granitic Rock				

Initial Specimen Measurements	
Diameter:	1.860 in L/D: 2.44
Area:	2.717 in²
Length:	4.54 in
Weight:	545.9 g
Unit Weight:	168.6 pcf

LOAD TEST DATA

Deflection Reading (in)	Load Reading (lb)	Strain (%)	Stress (psi)
0.000	0	0.000	0
0.005	1700	0.110	630
0.010	9800	0.220	3610
0.015	21800	0.330	8020
0.020	35200	0.441	12950
0.025	46300	0.551	17040
0.030	55750	0.661	20520
0.034	60250	0.749	22170

Strain Rate: %/min

Failure Mode:

Remarks:

Note: Uniaxial compressive strength was determined in general accordance with ASTM D7012-14 Method C. Deflection, Strain, and Young's modulus (E) data is provided for reference only and is not intended to be in accordance with ASTM D7012-14 Method D as deflection and strain is not measured in accordance with that procedure. Young's Modulus is calculated using this data to determine the secant modulus at each data interval per Figure 2 (C) in ASTM D 7012-14.



REFERENCE: I-2513AC

PROJECT: 34165

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-7	CROSS SECTIONS
8-14	BORE LOGS, CORE LOGS, AND CORE PHOTOS

APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>	<u>SHEETS</u>
A	LABORATORY RESULTS	15-16

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE
PROJECT DESCRIPTION I-26I-40I-240 INTERCHANGE TO
SR 3548 (HAYWOOD RD)

SITE DESCRIPTION BRIDGE NO. 906 ON -Y2RPC- OVER
HOMINY CREEK AND SR 3620 (HOMINY CREEK
RD) BETWEEN I-26I-240 AND NC 191

STATE	TOWN OF HOLLY SPRINGS PROJECT NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-2513AC	1	17

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.

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 THE 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.

- 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

CG2

GOODNIGHT, D.J.

NCDOT

INVESTIGATED BY FALCON ENG.

DRAWN BY CROCKETT, S.C.

CHECKED BY HUNSBERGER, W.S.

SUBMITTED BY FALCON ENG.

DATE SEPTEMBER 2024



DocuSigned by:
Stephen Crockett 9/24/2024
C5CA5FED48E0435...
SIGNATURE DATE

SOIL DESCRIPTION							
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							
SOIL LEGEND AND AASHTO CLASSIFICATION							
GENERAL CLASS.	GRANULAR MATERIALS (< 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)		
GROUP CLASS.	A-1	A-1-a	A-1-b	A-2	A-2-a	A-2-b	A-2-c
SUBCLASS.	A-1-a	A-1-b	A-2	A-2-a	A-2-b	A-2-c	A-2-d
% PASSING #10 #40 #60 #100	50 MX 30 MX 15 MX	50 MX 30 MX 15 MX	50 MX 30 MX 15 MX	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN
MATERIAL PASSING #40 LL PI	- 6 MX	- NP	40 MX 10 MX	40 MN 10 MN	40 MN 10 MN	40 MN 10 MN	40 MN 10 MN
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 MX
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS	HIGHLY ORGANIC 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-INCHES)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F.T 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 4.75	10 2.00	40 0.42	60 0.25	200 0.075	270 0.053	
BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GRV.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)	
GRAIN SIZE MM IN.	305 12	75 3	2.0	0.25	0.05	0.005	
SOIL MOISTURE - CORRELATION OF TERMS							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION					
LL - LIQUID LIMIT PL - PLASTIC LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE					
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE					
OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE					
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE					
PLASTICITY							
PLASTICITY INDEX (PI)				DRY STRENGTH			
NON PLASTIC	0-5	VERY LOW					
SLIGHTLY PLASTIC	6-15	SLIGHT					
MODERATELY PLASTIC	16-25	MEDIUM					
HIGHLY PLASTIC	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.							

GRADATION		
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.		
ANGULARITY OF GRAINS		
THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		
MINERALOGICAL COMPOSITION		
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.		
COMPRESSIBILITY		
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE		LL < 31 LL = 31 - 50 LL > 50
PERCENTAGE OF MATERIAL		
ORGANIC MATERIAL	GRANULAR SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	> 10%	> 20%
HIGHLY 35% AND ABOVE		
GROUND WATER		
▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING		
▼ STATIC WATER LEVEL AFTER 24 HOURS		
▽PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA		
○ SPRING OR SEEP		
MISCELLANEOUS SYMBOLS		
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	DIP & DIP DIRECTION OF ROCK STRUCTURES	SLOPE INDICATOR INSTALLATION
SOIL SYMBOL	TEST BORING	CONE PENETROMETER TEST
ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	AUGER BORING	SOUNDING ROD
INFERRED SOIL BOUNDARY	CORE BORING	TEST BORING WITH CORE
INFERRED ROCK LINE	MONITORING WELL	SPT N-VALUE
ALLUVIAL SOIL BOUNDARY	PIEZOMETER INSTALLATION	
RECOMMENDATION SYMBOLS		
UNDERCUT EXCAVATION	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL
SHALLOW UNDERCUT	UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK	
ABBREVIATIONS		
AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS 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
EQUIPMENT USED ON SUBJECT PROJECT		
DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
☐ CME-45C	☐ CLAY BITS	☒ AUTOMATIC ☐ MANUAL
☐ CME-55	☐ 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
☒ CME-550X	☒ 8" HOLLOW AUGERS	☐ -B ☐ -H
☐ CME-550X	☐ HARD FACED FINGER BITS	☒ -N Q
☐ VANE SHEAR TEST	☐ TUNG.-CARBIDE INSERTS	HAND TOOLS:
☐ PORTABLE HOIST	☒ CASING ☐ W/ ADVANCER	☐ POST HOLE DIGGER
☒ DIEDRICH D-50	☐ TRICONE * STEEL TEETH	☐ HAND AUGER
☐	☐ TRICONE * TUNG.-CARB.	☐ SOUNDING ROD
☐	☒ CORE BIT	☐ VANE SHEAR TEST
☐	☐	☐

ROCK DESCRIPTION		
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		

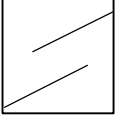
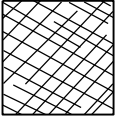
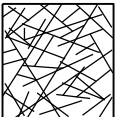
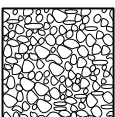
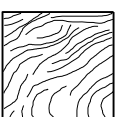
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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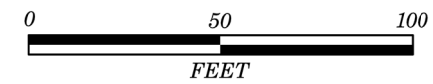
SUBSURFACE INVESTIGATION

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

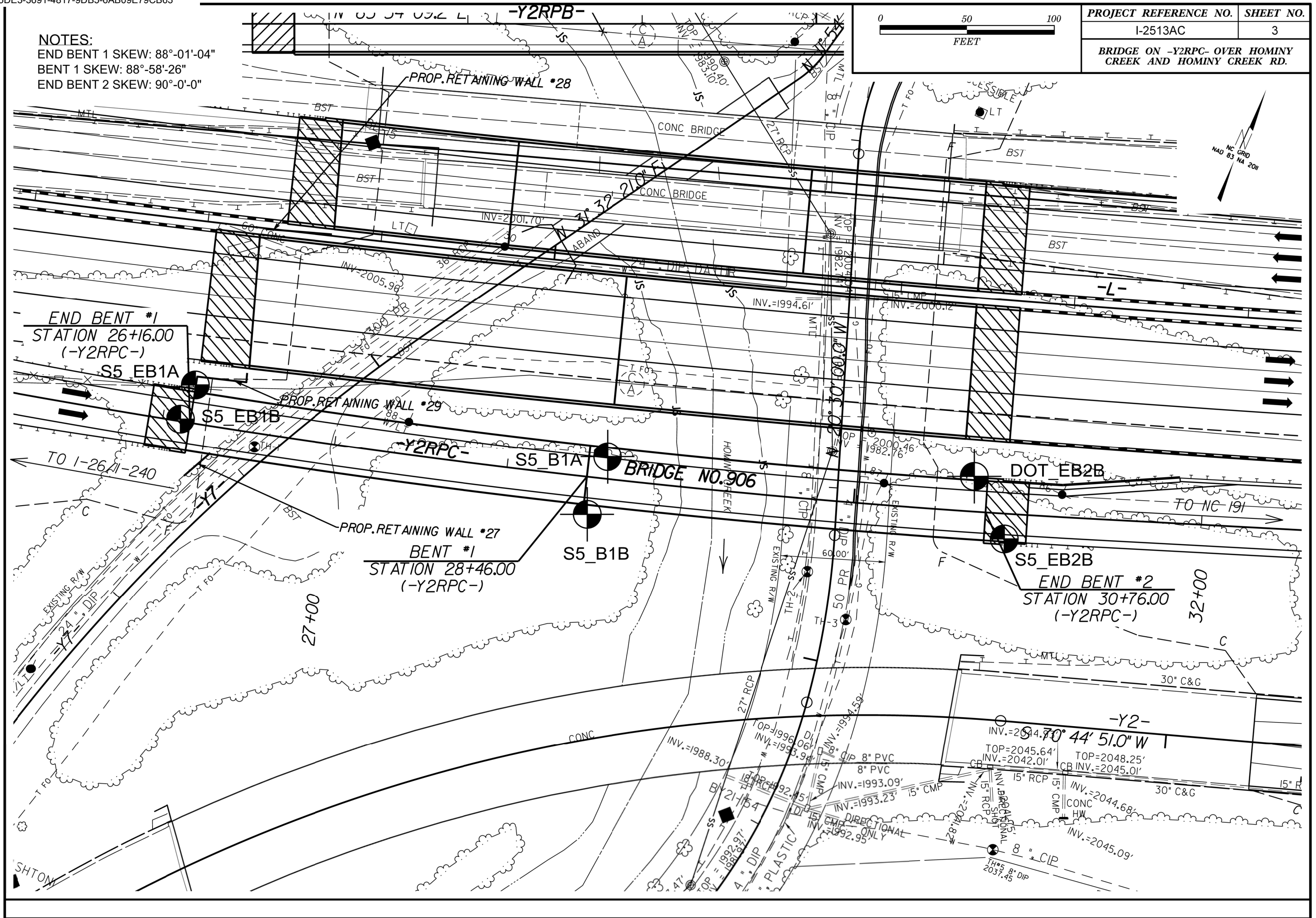
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

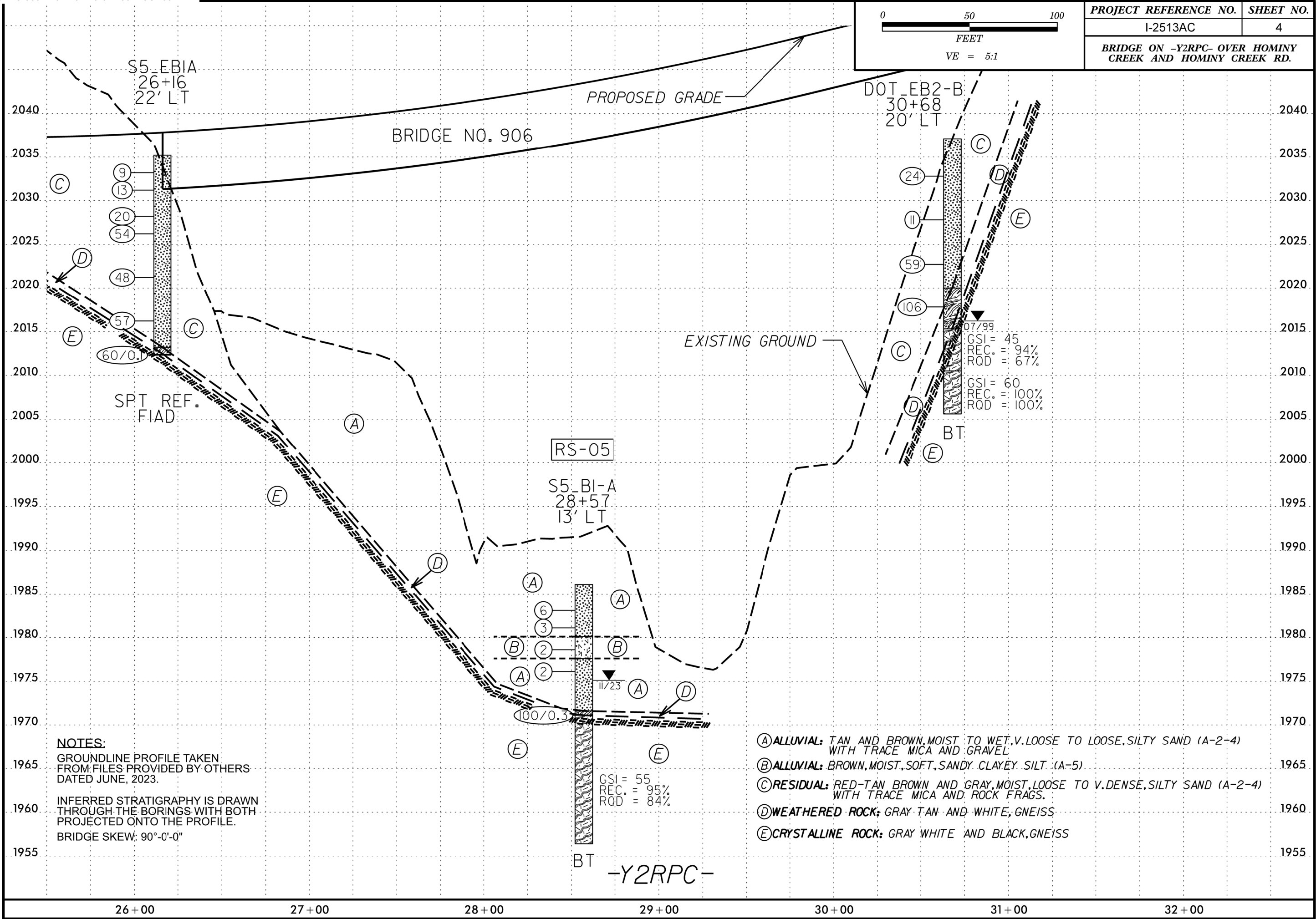
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)				
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.		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	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.		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			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							60				
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70					B. Sandstone with thin inter-layers of siltstone		50			
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60					C. Sandstone and siltstone in similar amounts					
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			50				D. Siltstone or silty shale with sandstone layers		40			
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes			40				E. Weak siltstone or clayey shale with sandstone layers					
				30			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.			30			
				20									
				10				G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers					
		N/A	N/A					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						



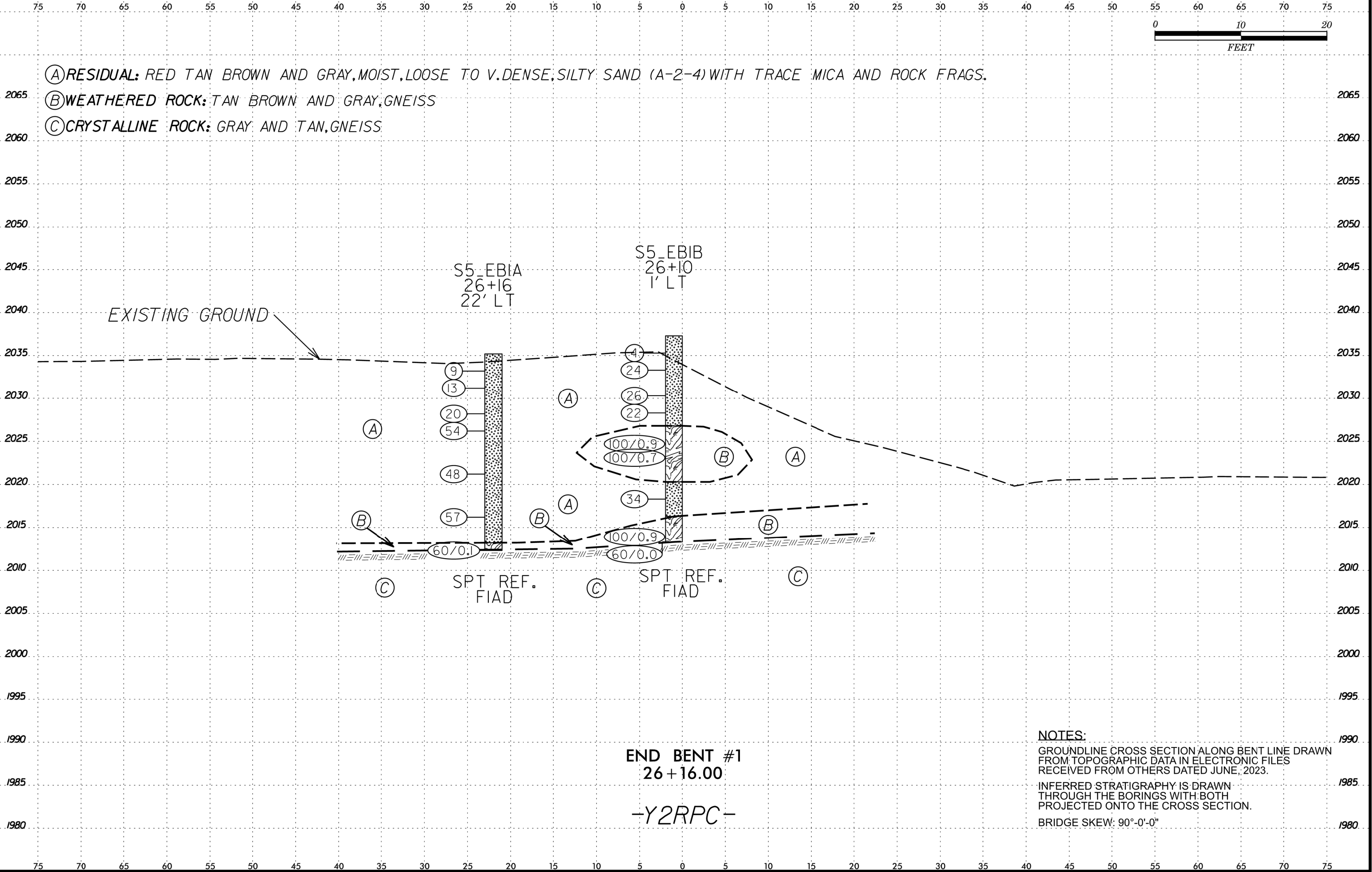
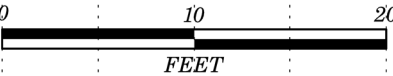
PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	3
BRIDGE ON -Y2RPC- OVER HOMINY CREEK AND HOMINY CREEK RD.	





8/23/9

02.55	PROJ. REFERENCE NO.	SHEET NO.
	I-25/3AC	5



8/23/23

02.55

PROJ. REFERENCE NO.

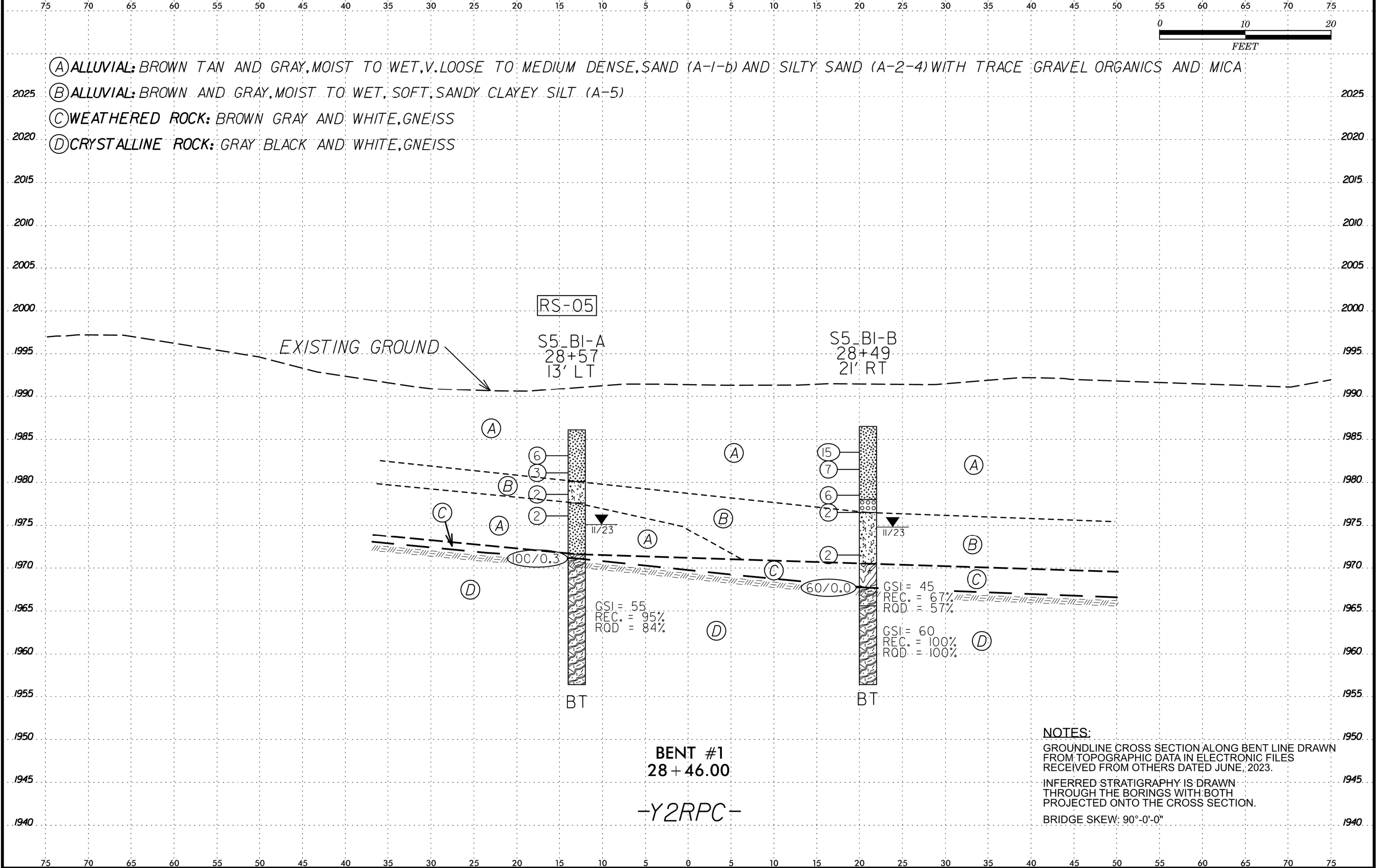
1-2513AC

SHEET NO.

6

01020

FEET



\$DATE\$

8/23/9

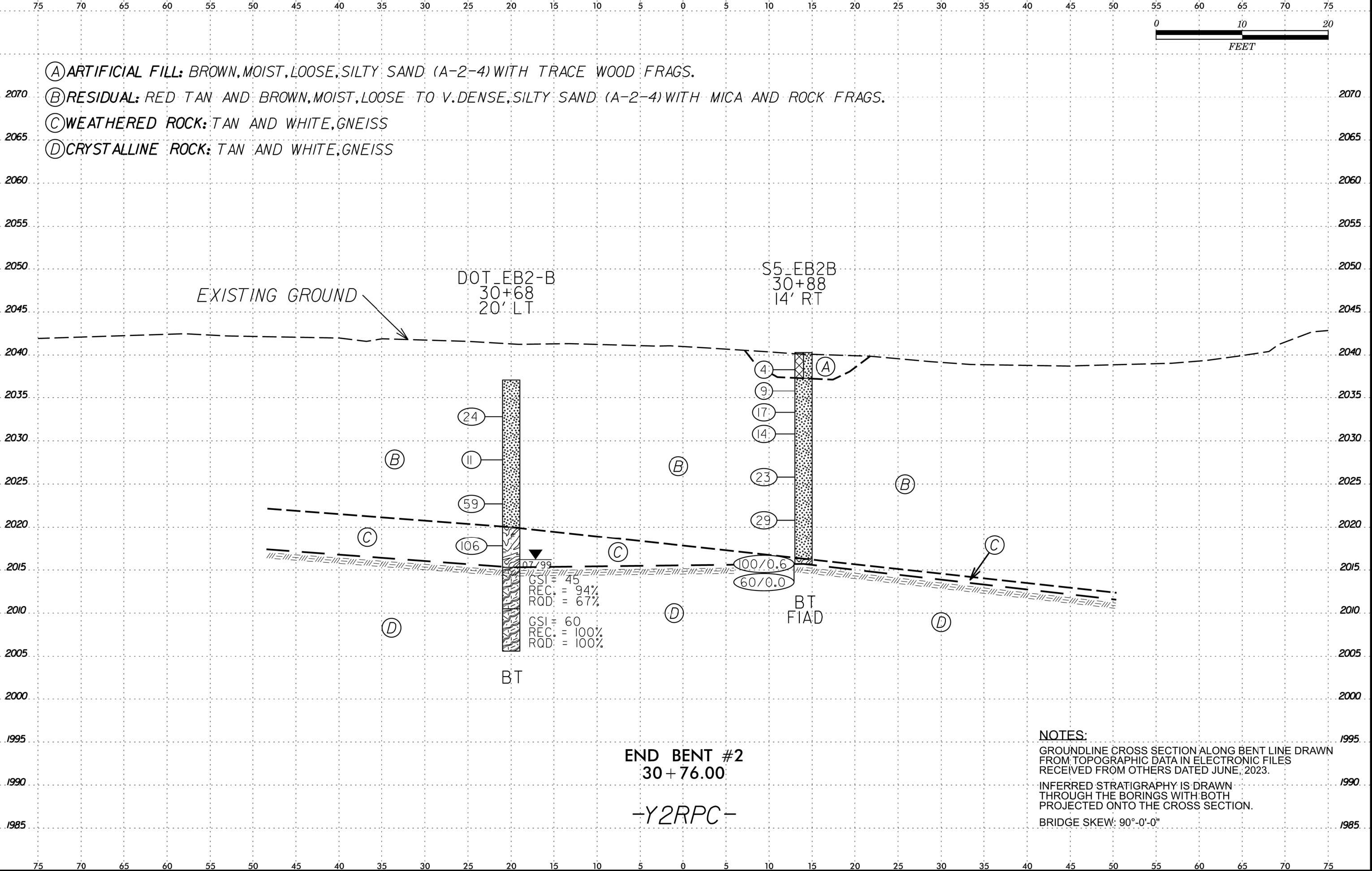
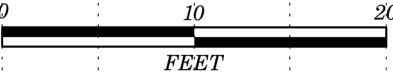
02.55

PROJ. REFERENCE NO.

1-2513AC

SHEET NO.

7



- Ⓐ ARTIFICIAL FILL: BROWN, MOIST, LOOSE, SILTY SAND (A-2-4) WITH TRACE WOOD FRAGS.
- Ⓑ RESIDUAL: RED TAN AND BROWN, MOIST, LOOSE TO V. DENSE, SILTY SAND (A-2-4) WITH MICA AND ROCK FRAGS.
- Ⓒ WEATHERED ROCK: TAN AND WHITE, GNEISS
- Ⓓ CRYSTALLINE ROCK: TAN AND WHITE, GNEISS

EXISTING GROUND

DOT_EB2-B
30+68
20' LT

S5_EB2B
30+88
14' RT

24

11

59

106

0.7/99
GSI = 45
REC. = 94%
ROD = 67%
GSI = 60
REC. = 100%
ROD = 100%

BT

4

9

17

14

23

29

100/0.6

60/0.0

BT
FIAD

END BENT #2
30+76.00

-Y2RPC-

NOTES:
GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM OTHERS DATED JUNE, 2023.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.
BRIDGE SKEW: 90°-0'-0"

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34165.1.2			TIP 1-2513AC			COUNTY BUNCOMBE			GEOLOGIST Goodnight, D.J.						
SITE DESCRIPTION Bridge No. 906 on -L- over Hominy Creek and SR 3620 Between I-26/I-240 and NC 191												GROUND WTR (ft)			
BORING NO. S5_EB1A			STATION 26+16			OFFSET 22 ft LT			ALIGNMENT -Y2RPC-			0 HR.	Dry		
COLLAR ELEV. 2,035.2 ft			TOTAL DEPTH 22.9 ft			NORTHING 678,930			EASTING 930,164			24 HR.	N/A		
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 87% 05/10/2022						DRILL METHOD H.S. Augers						HAMMER TYPE Automatic			
DRILLER Odom, C.			START DATE 03/14/23			COMP. DATE 03/14/23			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)
2040															
2035														2,035.2	GROUND SURFACE 0.0
2030	2,034.2	1.0	2	2	7									RESIDUAL RED-TAN BROWN AND GRAY, LOOSE TO VERY DENSE, SILTY SAND (A-2-4), WITH TRACE MICA	
	2,032.2	3.0	6	6	7										
	2,029.2	6.0	8	9	11										
2025	2,027.2	8.0	12	21	33										
	2,022.2	13.0	28	26	22										
2020															
2015	2,017.2	18.0	27	32	25										
	2,012.4	22.8	60/0.1											2,013.2 22.0 2,012.4 22.8 2,012.3 22.9	WEATHERED ROCK TAN AND GRAY, GNEISS CRYSTALLINE ROCK TAN AND GRAY, GNEISS Boring Terminated at Elevation 2,012.3 ft in CR: GNEISS

NC DOT BORE SINGLE I-213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34165.1.2			TIP 1-2513AC			COUNTY BUNCOMBE			GEOLOGIST Goodnight, D.J.						
SITE DESCRIPTION Bridge No. 906 on -L- over Hominy Creek and SR 3620 Between I-26/I-240 and NC 191											GROUND WTR (ft)				
BORING NO. S5_EB1B			STATION 26+10			OFFSET 1 ft LT			ALIGNMENT -Y2RPC-			0 HR. Dry			
COLLAR ELEV. 2,037.3 ft			TOTAL DEPTH 24.0 ft			NORTHING 678,909			EASTING 930,165			24 HR. N/A			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 87% 05/10/2022						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER Odom, C.			START DATE 03/14/23			COMP. DATE 03/14/23			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)
2040															
2035	2,036.3	1.0	2	1	3									2,037.3	GROUND SURFACE 0.0
	2,034.3	3.0	4	11	13										
2030	2,031.3	6.0	8	12	14										
	2,029.3	8.0	11	12	10										
2025	2,025.6	11.7	42	58/0.4										2,026.8	10.5
	2,024.3	13.0	27	50	50/0.2										
2020	2,019.3	18.0	9	17	17									2,020.3	17.0
2015	2,014.8	22.5	67	33/0.4										2,016.3	21.0
	2,013.3	24.0	60/0.0											2,013.3	24.0
														Boring Terminated at Elevation 2,013.3 ft on CR: GNEISS	

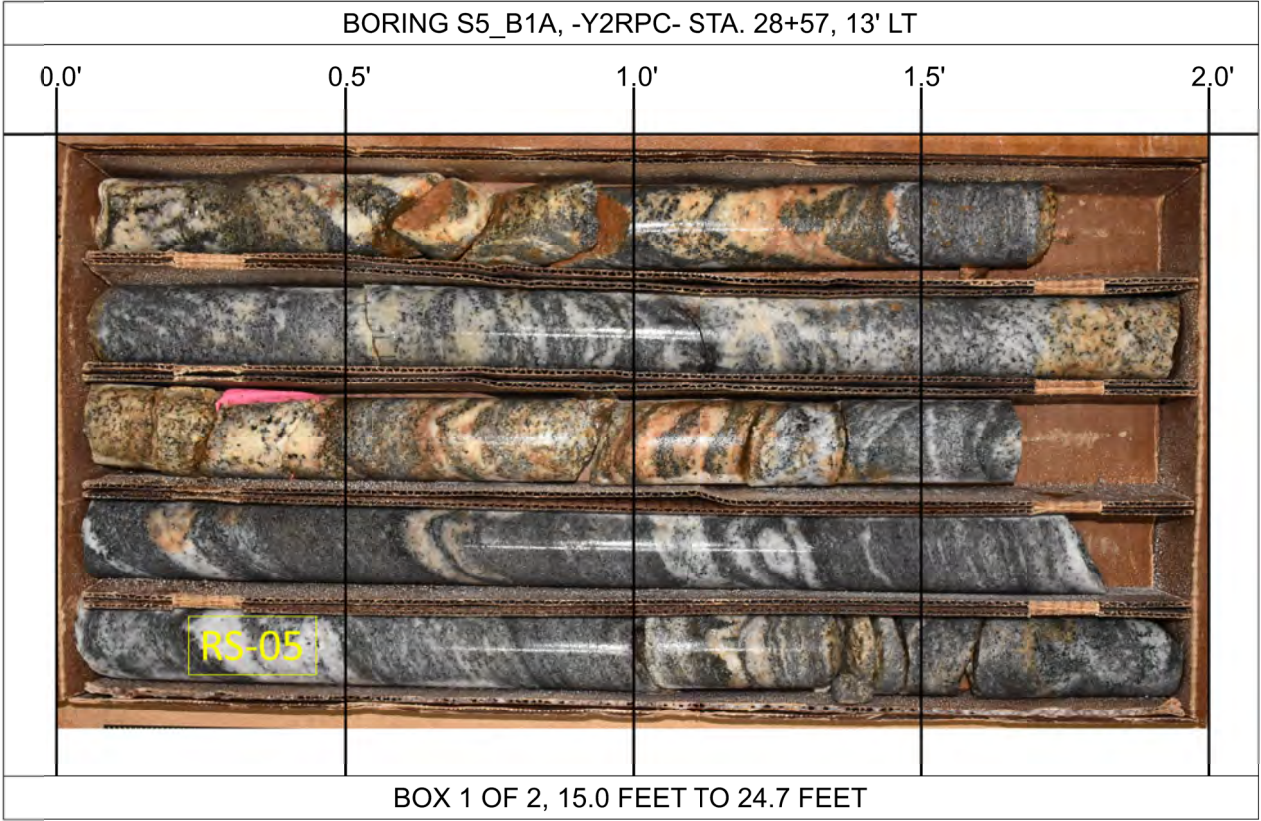
NC DOT BORE SINGLE I-213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24

GEOTECHNICAL BORING REPORT

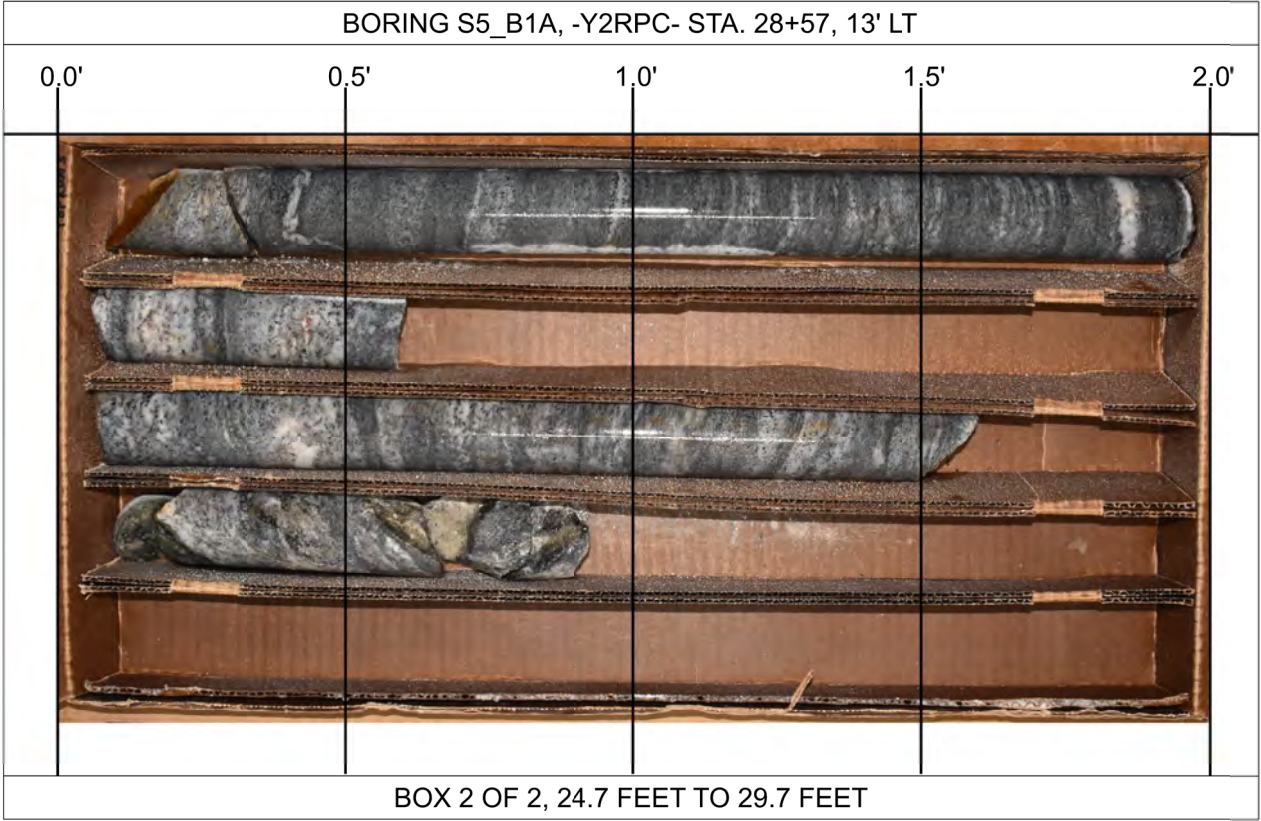
CORE LOG

NCDOT BORE SINGLE I-1213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24

NCDOT CORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/24/24



GSI = 60



GSI = 60



 FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 CARY, NC 27513 PHONE: 919.871.0800 www.falconengineering.com	ROCK CORE PHOTOGRAPHS
	BRIDGE ON -Y2RPC- OVER HOMINY CREEK AND SR 3620 BETWEEN I-26/I-240 AND NC 191 BUNCOMBE COUNTY, NC WBS: 34165 TIP: I-2513AC FALCON PROJECT NO. G22009.01

GEOTECHNICAL BORING REPORT
BORE LOG

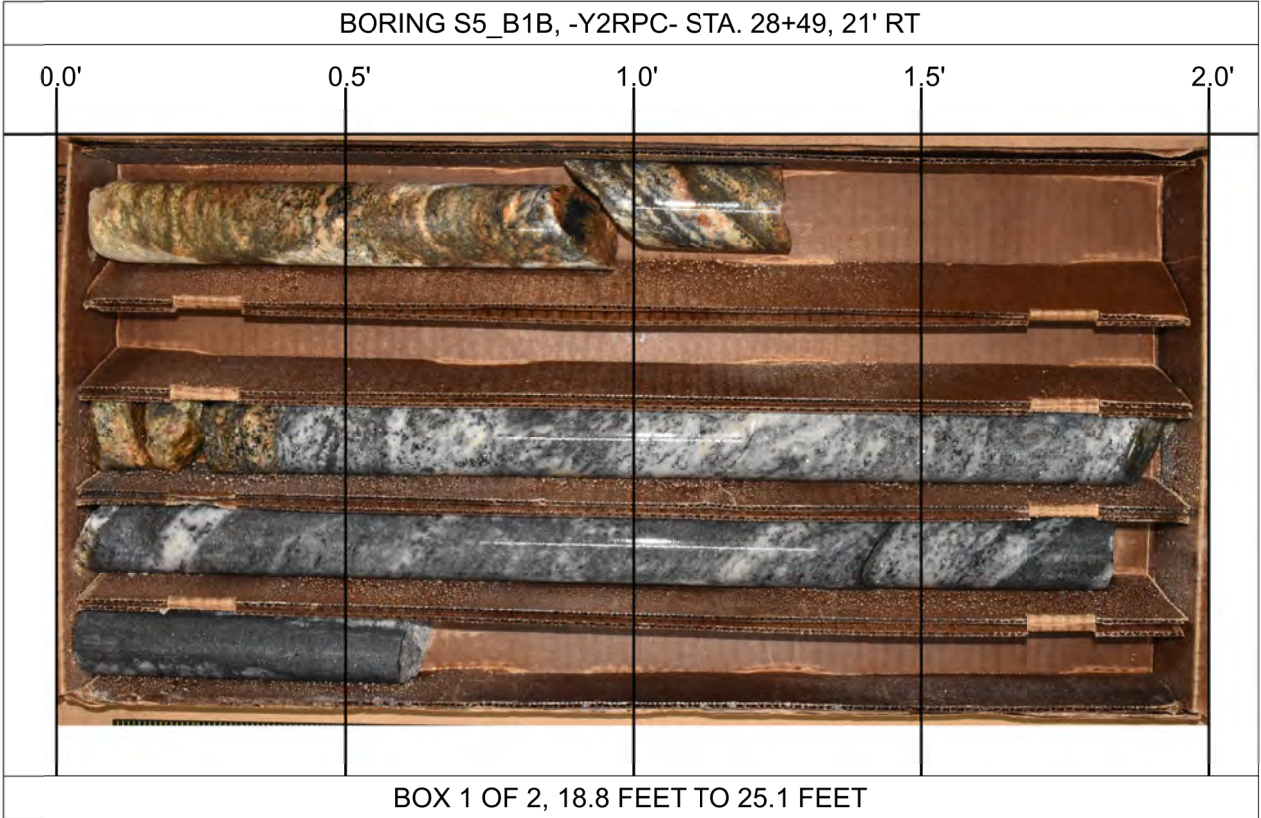
WBS 34165.1.2			TIP 1-2513AC			COUNTY BUNCOMBE			GEOLOGIST Goodnight, D.J.						
SITE DESCRIPTION Bridge No. 906 on -L- over Hominy Creek and SR 3620 Between I-26/I-240 and NC 191									GROUND WTR (ft)						
BORING NO. S5_B1-B			STATION 28+49			OFFSET 21 ft RT			ALIGNMENT -Y2RPC-			0 HR. 15.3			
COLLAR ELEV. 1,986.5 ft			TOTAL DEPTH 30.1 ft			NORTHING 678,955			EASTING 930,400			24 HR. 11.7			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 87% 05/10/2022						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic						
DRILLER Brewer, M.			START DATE 10/27/23			COMP. DATE 11/01/23			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)
1990															
1985														1,986.5	GROUND SURFACE 0.0
1980	1,984.5	2.0												M M M	ALLUVIAL BROWN TAN AND GRAY, MEDIUM DENSE TO LOOSE, SILTY SAND (A-2-4) WITH TRACE GRAVEL AND LITTLE ORGANICS (WOOD FRAGMENTS)
	1,982.5	4.0													
	1,979.5	7.0													
1975	1,977.5	9.0												W W W	GRAY-BROWN, VERY LOOSE, SLIGHTLY SILTY FINE TO COARSE SAND (A-1-b) WITH TRACE GRAVEL GRAY, SOFT, CLAYEY SANDY SILT (A-5)
1970	1,972.5	14.0	WOH	1	1									1,970.5	16.0
1965	1,967.7	18.8												W	WEATHERED ROCK GRAY AND BROWN, GNEISS
1960														1,967.7	18.8
														1,965.6	20.9

NCDOT BORE SINGLE I-213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24

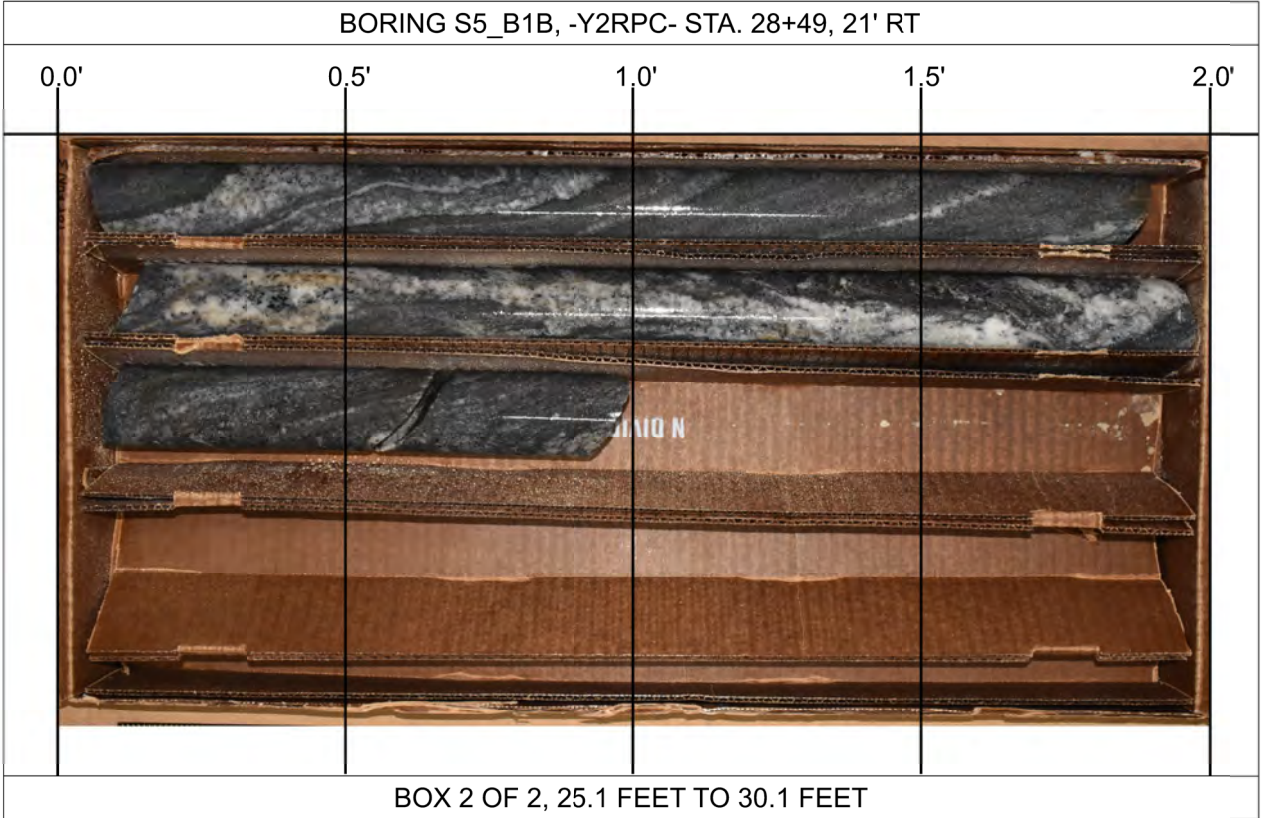
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34165.1.2					TIP 1-2513AC			COUNTY BUNCOMBE			GEOLOGIST Goodnight, D.J.		
SITE DESCRIPTION Bridge No. 906 on -L- over Hominy Creek and SR 3620 Between I-26/I-240 and NC 191											GROUND WTR (ft)		
BORING NO. S5_B1-B				STATION 28+49				OFFSET 21 ft RT			ALIGNMENT -Y2RPC-		0 HR. 15.3
COLLAR ELEV. 1,986.5 ft				TOTAL DEPTH 30.1 ft				NORTHING 678,955			EASTING 930,400		24 HR. 11.7
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 87% 05/10/2022							DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic			
DRILLER Brewer, M.				START DATE 10/27/23				COMP. DATE 11/01/23			SURFACE WATER DEPTH N/A		
CORE SIZE NQ				TOTAL RUN 11.3 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %ROD (ft) %		SAMP. NO.	STRATA REC. (ft) %ROD (ft) %		L O G	DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (ft)		
1967.72	1,967.7	18.8	1.3	6:15/1.0	(1.2)	(1.2)		(1.4)	(1.2)		Begin Coring @ 18.8 ft		
1965	1,966.4	20.1	5.0	2:35/0.3	92%	92%		67%	57%		CRYSTALLINE ROCK 18.8		
				6:35/1.0	(4.4)	(4.2)		(9.2)	(9.2)		WHITE AND GRAY, MOD. TO SLIGHT WEATHERING, MOD. HARD TO 20.9		
				6:02/1.0									
				4:15/1.0	88%	84%		100%	100%		HARD, GNEISS, WITH V. CLOSE TO CLOSE FRACTURE SPACING		
	1,961.4	25.1		5:48/1.0							GSI = 45		
			5.0	4:55/1.0							GRAY WHITE AND BLACK, V. SLIGHT TO FRESH WEATHERING, HARD		
1960				9:10/1.0	(5.0)	(5.0)					TO V. HARD, GNEISS, WITH WIDE TO MOD. CLOSE FRACTURE		
				9:14/1.0	100%	100%					SPACING		
				10:01/1.0									
	1,956.4	30.1		13:52/1.0							GSI = 60		
				21:39/1.0							30.1		
Boring Terminated at Elevation 1,956.4 ft in CR: GNEISS													

NCDOT CORE SINGLE I-213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24



GSI = 60



GSI = 60



 FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 CARY, NC 27513 PHONE: 919.871.0800 www.falconengineering.com	ROCK CORE PHOTOGRAPHS
	BRIDGE ON -Y2RPC- OVER HOMINY CREEK AND SR 3620 BETWEEN I-26/I-240 AND NC 191 BUNCOMBE COUNTY, NC WBS: 34165 TIP: I-2513AC FALCON PROJECT NO. G22009.01

NCDOT BORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/24/24

NCDOT CORE SINGLE I-1213AC GEO COMBINED.GPJ NC DOT.GDT 9/24/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34165.1.2			TIP 1-2513AC			COUNTY BUNCOMBE			GEOLOGIST Goodnight, D.J.							
SITE DESCRIPTION Bridge No. 906 on -L- over Hominy Creek and SR 3620 Between I-26/I-240 and NC 191											GROUND WTR (ft)					
BORING NO. S5_EB2B			STATION 30+88			OFFSET 14 ft RT			ALIGNMENT -Y2RPC-			0 HR.	Dry			
COLLAR ELEV. 2,040.3 ft			TOTAL DEPTH 24.6 ft			NORTHING 679,040			EASTING 930,625			24 HR.	N/A			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 87% 05/10/2022						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic						
DRILLER Odom, C.			START DATE 03/14/23			COMP. DATE 03/14/23			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2045																
2040																
2035	2,039.3	1.0	1	2	2											
	2,036.8	3.5	2	3	6						M				ARTIFICIAL FILL BROWN, LOOSE, SILTY SAND (A-2-4) WITH LITTLE WOOD FRAGMENTS	
	2,034.3	6.0	4	8	9						M				RESIDUAL RED TAN AND BROWN, LOOSE TO MEDIUM DENSE, SILTY SAND (A-2-4) WITH TRACE MICA AND ROCK FRAGMENTS	
2030	2,031.8	8.5	6	6	8						M					
	2,026.8	13.5	3	10	13						M					
2025	2,021.8	18.5	13	14	15						M					
2020	2,016.8	23.5	5	67	33/0.1											
	2,015.7	24.6														
											</					

NCDOT BORE DOUBLE I-1213AC_GEO_COMBINED.GPJ NC_DOT.GDT 9/24/24

REFERENCE: I-25I3AC

PROJECT: 34I65

PROJECT REFERENCE NO.	SHEET NO.
I-25I3AC	15

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
LABORATORY RESULTS

Project No.:	G22009.01	Tested By:	C. Sullivan	Test Date:	2023-19-12
Project Name:	I-2513AA-AC				
Boring ID:	S5-B1-A	Sample ID:	RS-05	Sample Depth:	22.8-23.2 ft
Sample Description:	Gray and Black and White Granitic Rock				

Initial Specimen Measurements	
Diameter:	1.860 in
Area:	2.717 in ²
Length:	4.57 in
Weight:	547.3 g
Unit Weight:	167.9 pcf

LOAD TEST DATA

Deflection Reading (in)	Load Reading (lb)	Strain (%)	Stress (psi)
0.000	0	0.000	0
0.005	1440	0.109	530
0.010	5200	0.219	1910
0.015	14200	0.328	5230
0.020	27300	0.438	10050
0.025	42500	0.547	15640
0.030	50400	0.656	18550
0.032	53290	0.700	19610

Strain Rate: %/min

Failure Mode:

Remarks:

Note: Uniaxial compressive strength was determined in general accordance with ASTM D7012-14 Method C. Deflection, Strain, and Young's modulus (E) data is provided for reference only and is not intended to be in accordance with ASTM D7012-14 Method D as deflection and strain is not measured in accordance with that procedure. Young's Modulus is calculated using this data to determine the secant modulus at each data interval per Figure 2 (C) in ASTM D 7012-14.

