

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BP14.R004	1	18

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY HAYWOOD
PROJECT DESCRIPTION REPLACE BRIDGE NO. 430382
ON SR 1835 (ISRAEL ROAD) OVER
DUTCH COVE CREEK

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>	<u>PERSONNEL</u>
1	TITLE SHEET	<u>DEGON, A. N.</u>
2, 2A	LEGEND (SOIL & ROCK)	<u>DUGGINS, W. T.</u>
2B, 2C	SUPPLEMENTAL LEGEND (GSI)	<u>MARPLES, Z.</u>
3	SITE PLAN	<u>JOHNSON, C. D. (NCDOT)</u>
4	PROFILE	<u>CHEEK, D. O. (NCDOT)</u>
5 - 6	CROSS SECTIONS	
7 - 16	BORE LOGS, CORE LOGS & CORE PHOTOGRAPHS	
17	LABORATORY TESTING SUMMARY	
18	SITE PHOTOGRAPHS	

INVESTIGATED BY RIGGS, Jr., A. F.
DRAWN BY FIELDS, W. D.
CHECKED BY RIGGS, Jr., A. F.
SUBMITTED BY ALEXANDER, M. J.
DATE DECEMBER 2021

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.

Prepared in the Office of:

Terracon
Consulting Engineers and Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



DocuSigned by:

Matthew J. Alexander 5/17/2022

18774C886B9544A...

SIGNATURE

DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

REFERENCE: BP14.R004

PROJECT: DF17614.2044019

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

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION																																																																																																																																																														
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										WELL-GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.																																																																																																																																																														
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**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)**

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 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.

TERMS AND DEFINITIONS
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 DISLODGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (ROQ) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

WEATHERING	
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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>
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. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>
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. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS	
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.

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: SEE NOTES BELOW	
ELEVATION:	FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

(BL-4) ALUMINUM DISK IN GROUND NEXT TO GRAVEL ROAD, STA. -L- 11+70.12, 11.6639' LT, ELEV. 2,590.38' N-666,621; E-865,028

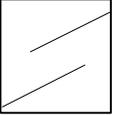
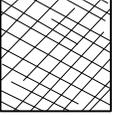
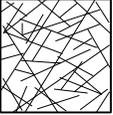
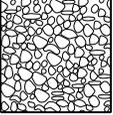
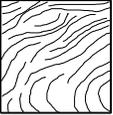
(BL-5) STA. -L-14+47.30, 5.9957' LT, ELEV. 2,582.18' N-666,699; E-865,290

**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 (PAGE 1 OF 2)**

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

<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <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> <p>STRUCTURE</p>	<p>SURFACE CONDITIONS</p> <p>VERY GOOD Very rough, fresh unweathered surfaces</p> <p>GOOD Rough, slightly weathered, iron stained surfaces</p> <p>FAIR Smooth, moderately weathered and altered surfaces</p> <p>POOR Slackensided, highly weathered surfaces with compact coatings or fillings or angular fragments</p> <p>VERY POOR Slackensided, highly weathered surfaces with soft clay coatings or fillings</p>	<p align="center">DECREASING SURFACE QUALITY →</p>			
<p>DECREASING INTERLOCKING OF ROCK PIECES ↓</p>					
 <p>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p>	90	80	70	N/A	N/A
 <p>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p>	80	70	60	50	40
 <p>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p>	70	60	50	40	30
 <p>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p>	60	50	40	30	20
 <p>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p>	50	40	30	20	10
 <p>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	N/A	N/A	10	10	10

**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 (PAGE 2 OF 2)**

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

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 peltic 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

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**.



F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure

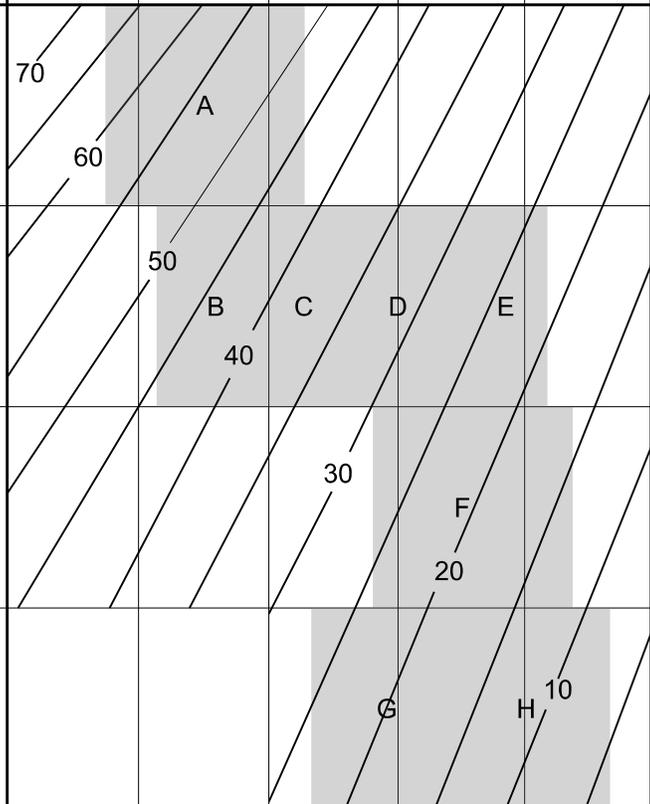


G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



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

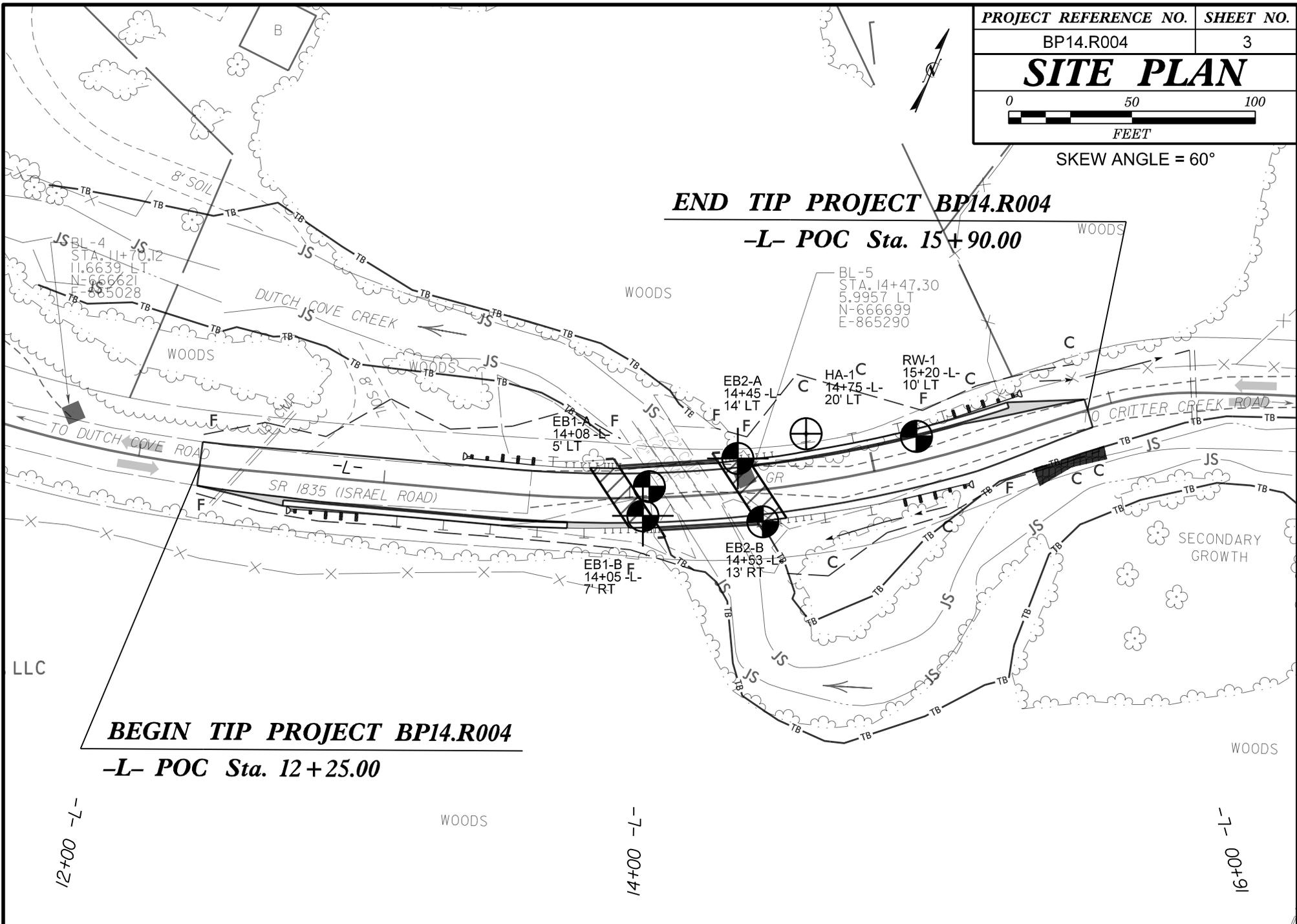


PROJECT REFERENCE NO.	SHEET NO.
BP14.R004	3
SITE PLAN	
 0 50 100 FEET	

SKREW ANGLE = 60°

END TIP PROJECT BP14.R004

-L- POC Sta. 15+90.00



BEGIN TIP PROJECT BP14.R004

-L- POC Sta. 12+25.00

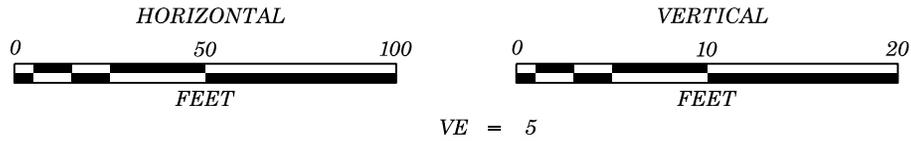
12+00 -L-

WOODS

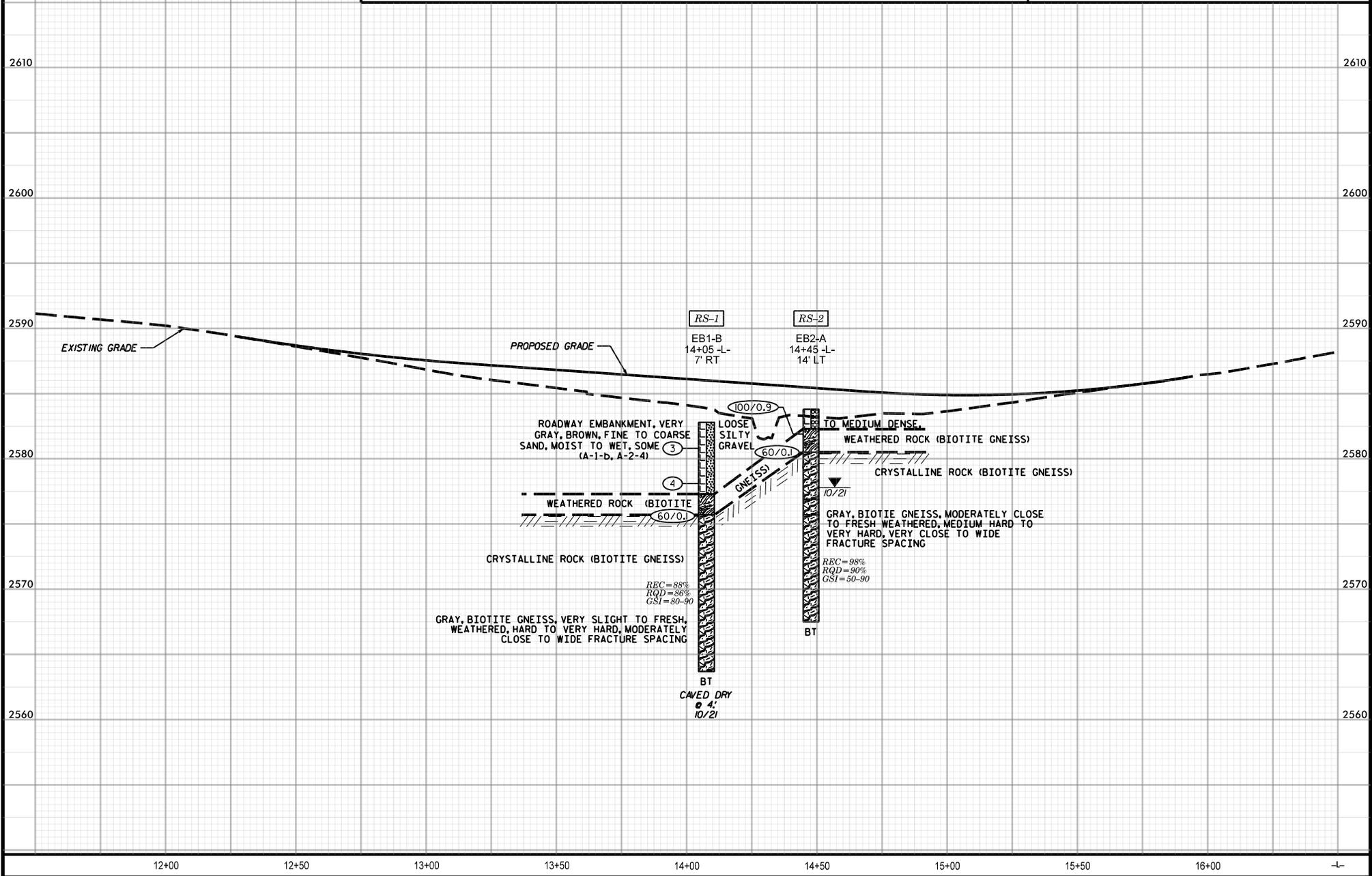
14+00 -L-

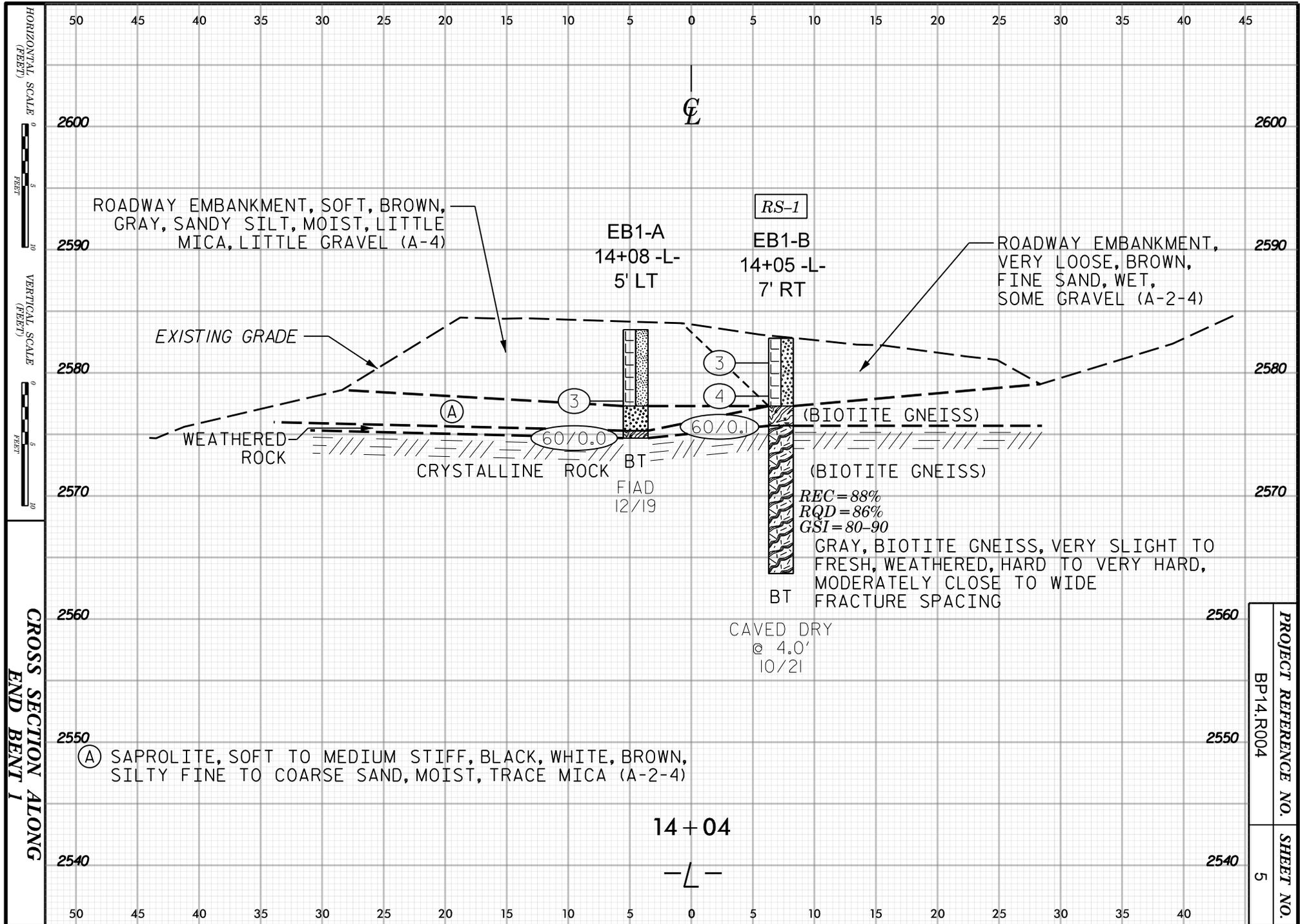
16+00 -L-

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE EXISTING GROUND PROFILE ALONG THE CENTERLINE OF -L- TAKEN FROM THE PROVIDED PROJECT TIN FILE (b5900_Is_tin.tin) DATED 11/12/2021.

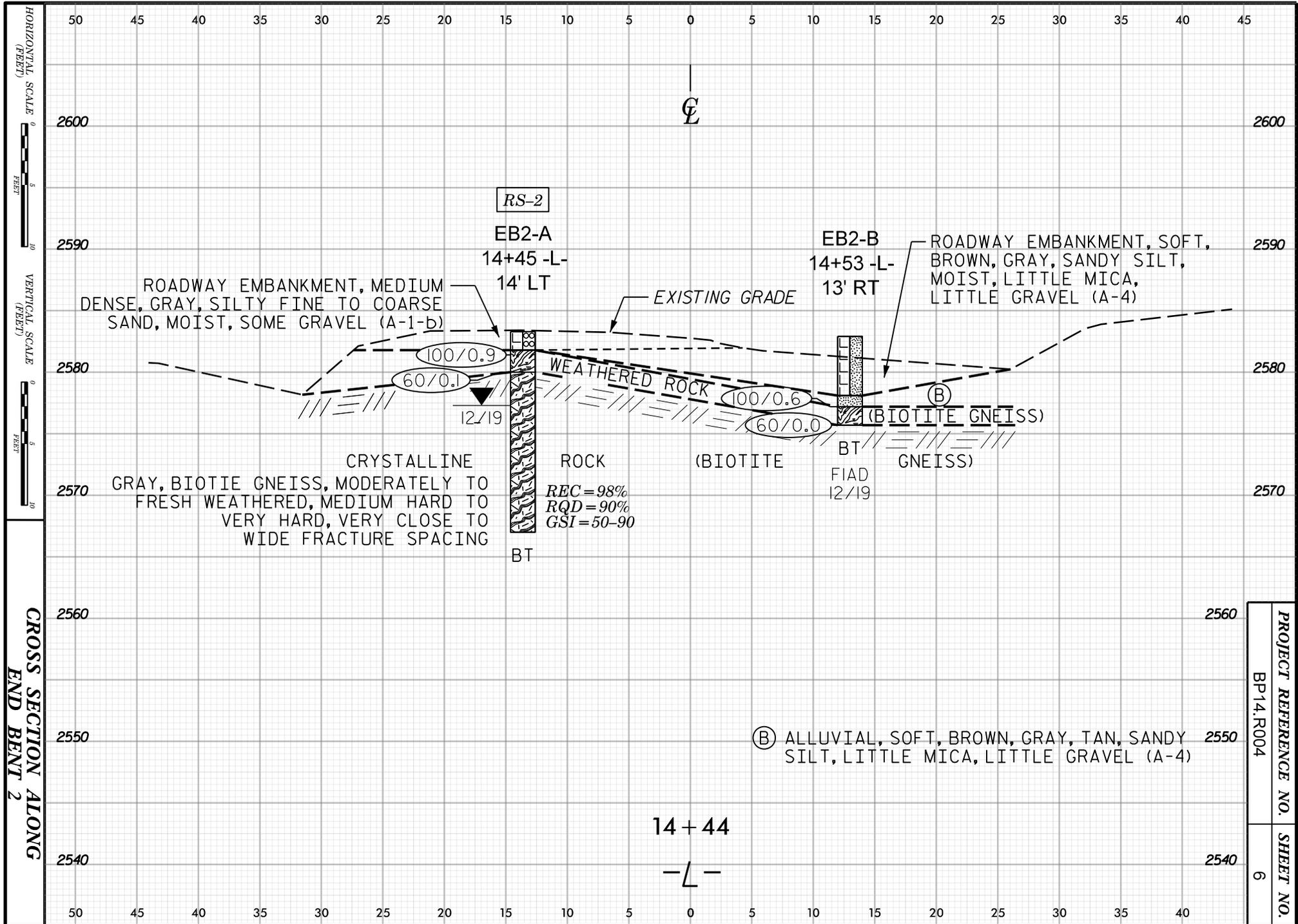


PROJECT REFERENCE NO.	SHEET NO.
BP14.R004	4
CENTERLINE PROFILE ALONG -L-	





PROJECT REFERENCE NO.	BP14.R004
SHEET NO.	5



GEOTECHNICAL BORING REPORT BORE LOG

WBS DF17614.2044019		TIP BP14.R004		COUNTY HAYWOOD		GEOLOGIST Johnson, C. D.											
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK							GROUND WTR (ft)										
BORING NO. EB1-A		STATION 14+08		OFFSET 5 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,583.5 ft		TOTAL DEPTH 8.8 ft		NORTHING 666,681		EASTING 865,256											
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Cheek, D. O.		START DATE 12/04/19		COMP. DATE 12/04/19		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2585															2,583.5	GROUND SURFACE	0.0
2580	2,578.7	4.8	2	2	1									ROADWAY EMBANKMENT SOFT, BROWN, GRAY, SANDY SILT, MOIST, LITTLE MICA, LITTLE GRAVEL (A-4)			
2575	2,574.7	8.8	60/0.0														
														2,575.3	SOFT TO MEDIUM STIFF, BLACK, WHITE, BROWN, SILTY FINE TO COARSE SAND, MOIST, TRACE MICA (A-2-4)	8.2	

NCDOT BORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/7/21

Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,574.7 ft ON CRYSTALLINE ROCK (BIOTITE GNEISS)

GEOTECHNICAL BORING REPORT CORE LOG

WBS DF17614.2044019				TIP BP14.R004			COUNTY HAYWOOD			GEOLOGIST RIGGS, Jr., A. F.			
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK										GROUND WTR (ft)			
BORING NO. EB1-B				STATION 14+05			OFFSET 7 ft RT			ALIGNMENT -L-			
COLLAR ELEV. 2,582.8 ft				TOTAL DEPTH 19.1 ft			NORTHING 666,669			EASTING 865,258			
DRILL RIG/HAMMER EFF./DATE TER0012 Geoprobe 3230DT 93% 09/09/2021							DRILL METHOD Core Boring			HAMMER TYPE Automatic			
DRILLER DUGGINS, W. T.				START DATE 10/12/21			COMP. DATE 10/12/21			SURFACE WATER DEPTH N/A			
CORE SIZE NQ2				TOTAL RUN 12.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %				
2575.7													
2575	2,575.7	7.1	5.0	0:52/1.0 2:29/1.0 2:45/1.0 2:21/1.0 2:35/1.0	(3.5) 70%	(3.3) 66%		(10.5) 88%	(10.3) 86%		Begin Coring @ 7.1 ft CRYSTALLINE ROCK GRAY, BIOTITE GNEISS, VERY SLIGHT TO FRESH WEATHERED, HARD TO VERY HARD, MODERATELY CLOSE TO WIDE FRACTURE SPACING 1 JOINT @ 30° 1 JOINT @ 50° 1 JOINT @ 90° GSI=80-90	7.1	
2570	2,570.7	12.1	5.0	2:15/1.0 2:36/1.0 2:24/1.0 2:22/1.0 2:25/1.0	(5.0) 100%	(5.0) 100%	RS-1						
2565	2,565.7	17.1	2.0	2:37/1.0 2:53/1.0	(2.0) 100%	(2.0) 100%							
	2,563.7	19.1									Boring Terminated at Elevation 2,563.7 ft IN CRYSTALLINE ROCK BIOTITE GNEISS CAVED DRY @ 4.0'	19.1	

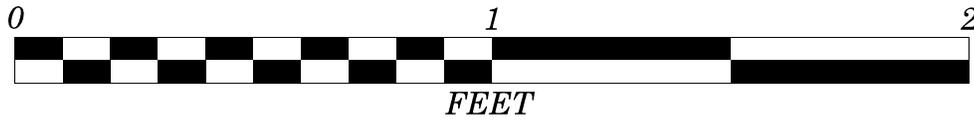
NCDOT CORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/8/21

PROJECT REFERENCE NO.	SHEET NO.
BP14.R004	10

CORE PHOTOGRAPHS

REPLACE BRIDGE NO. 430382 ON
SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK
EB1-B

BOX 1 OF 2
7.1' TO 16.8'



EB1-B
BOX 2 OF 2
16.8' TO 19.1'





GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF17614.2044019	TIP BP14.R004	COUNTY HAYWOOD	GEOLOGIST RIGGS, Jr., A. F.
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+45	OFFSET 14 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,583.8 ft	TOTAL DEPTH 16.3 ft	NORTHING 666,705	EASTING 865,285
DRILL RIG/HAMMER EFF./DATE TER0012 Geoprobe 3230DT 93% 09/09/2021			DRILL METHOD Core Boring
DRILLER DUGGINS, W. T.			HAMMER TYPE Automatic
START DATE 10/12/21		COMP. DATE 10/12/21	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)
2585															
	2,582.8	1.0	6	94/0.4											2,583.8 GROUND SURFACE 0.0
2580	2,580.6	3.2	60/0.1							100/0.9				2,582.3 ROADWAY EMBANKMENT 1.5	
										60/0.1				2,580.5 MEDIUM DENSE, GRAY, SILTY FINE TO COARSE SAND, MOIST, SOME GRAVEL (A-1-b) 3.3	
2575															WEATHERED ROCK (BIOTITE GNEISS)
															CRYSTALLINE ROCK BIOTITE GNEISS
2570															
															2,567.5 Boring Terminated at Elevation 2,567.5 ft IN CRYSTALLINE ROCK BIOTITE GNEISS 16.3

NCDOT BORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/8/21

GEOTECHNICAL BORING REPORT CORE LOG

WBS DF17614.2044019			TIP BP14.R004			COUNTY HAYWOOD			GEOLOGIST RIGGS, Jr., A. F.		
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK										GROUND WTR (ft)	
BORING NO. EB2-A			STATION 14+45			OFFSET 14 ft LT			ALIGNMENT -L-		0 HR. 1.3
COLLAR ELEV. 2,583.8 ft			TOTAL DEPTH 16.3 ft			NORTHING 666,705			EASTING 865,285		24 HR. 6.0
DRILL RIG/HAMMER EFF./DATE TER0012 Geoprobe 3230DT 93% 09/09/2021						DRILL METHOD Core Boring			HAMMER TYPE Automatic		
DRILLER DUGGINS, W. T.			START DATE 10/12/21			COMP. DATE 10/12/21			SURFACE WATER DEPTH N/A		
CORE SIZE NQ2			TOTAL RUN 13.0 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
					REC. (ft)	RQD (%)		REC. (%)	RQD (ft)		
2580.5											Begin Coring @ 3.3 ft
2580	2,580.5	3.3	3.0	1:35/1.0 1:35/1.0 1:40/1.0	(2.8) 93%	(2.8) 93%		(12.8) 98%	(11.7) 90%	2580.5	3.3
	2,577.5	6.3									
			5.0	1:35/1.0 1:28/1.0 2:01/1.0 2:05/1.0 1:37/1.0	(5.0) 100%	(3.9) 78%					
2575							RS-2				
	2,572.5	11.3									
			5.0	1:33/1.0 1:24/1.0 2:53/1.0 2:43/1.0 2:40/1.0	(5.0) 100%	(5.0) 100%					
2570											
	2,567.5	16.3								2,567.5	16.3
Boring Terminated at Elevation 2,567.5 ft IN CRYSTALLINE ROCK BIOTITE GNEISS											

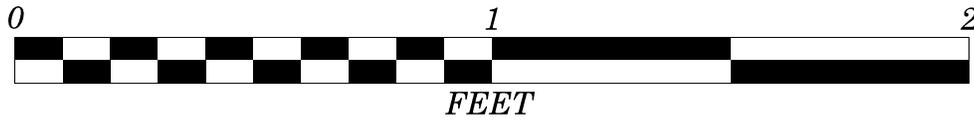
NCDOT CORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/8/21

PROJECT REFERENCE NO.	SHEET NO.
BP14.R004	13

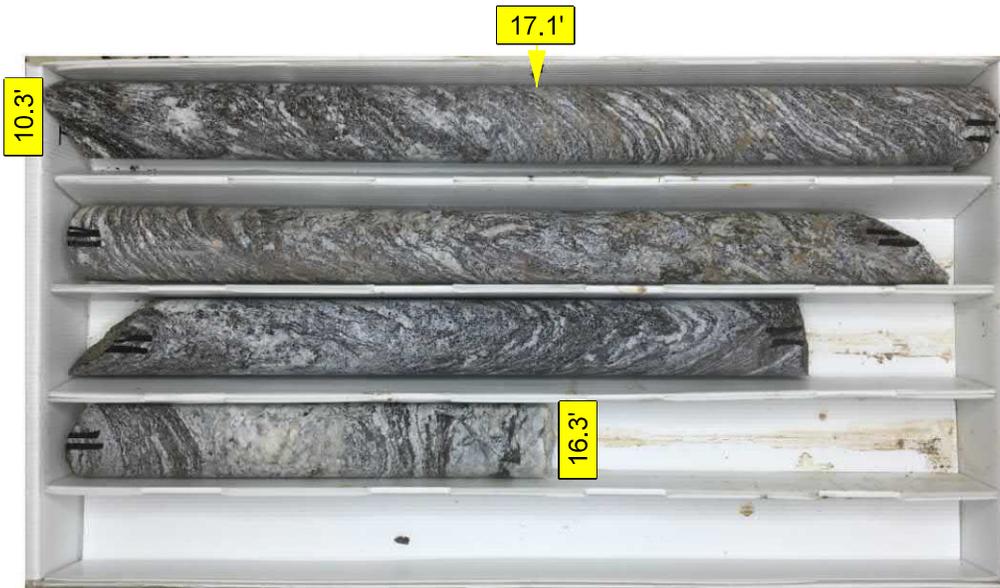
CORE PHOTOGRAPHS

REPLACE BRIDGE NO. 430382 ON
SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK
EB2-A

BOX 1 OF 2
3.3' TO 10.3'



EB2-A
BOX 2 OF 2
10.3' TO 16.3'



GEOTECHNICAL BORING REPORT BORE LOG

WBS DF17614.2044019		TIP BP14.R004		COUNTY HAYWOOD		GEOLOGIST Johnson, C. D.											
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK							GROUND WTR (ft)										
BORING NO. EB2-B		STATION 14+53		OFFSET 13 ft RT		ALIGNMENT -L-	0 HR. FIAD										
COLLAR ELEV. 2,583.4 ft		TOTAL DEPTH 7.2 ft		NORTHING 666,685		EASTING 865,304	24 HR. FIAD										
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Cheek, D. O.		START DATE 12/04/19		COMP. DATE 12/04/19		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2585																	
2580																	
	2,578.3	5.1	5	95/0.1													
	2,576.2	7.2	60/0.0							100/0.6							
										60/0.0							

2,583.4 GROUND SURFACE 0.0

ROADWAY EMBANKMENT
SOFT, BROWN, GRAY, SANDY SILT,
MOIST, LITTLE MICA, LITTLE GRAVEL
(A-4) 4.8

2,578.6
2,577.7 ALLUVIAL 5.7

2,576.2 SOFT, BROWN, GRAY, TAN, SANDY
SILT, LITTLE MICA, LITTLE GRAVEL (A-4) 7.2

WEATHERED ROCK
(BIOTITE GNEISS)

Boring Terminated WITH STANDARD
PENETRATION TEST REFUSAL at
Elevation 2,576.2 ft ON CRYSTALLINE
ROCK (BIOTITE GNEISS)

NCDOT BORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/7/21



GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF17614.2044019		TIP BP14.R004		COUNTY HAYWOOD		GEOLOGIST DEGEON, A. N.											
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK									GROUND WTR (ft)								
BORING NO. HA-1		STATION 14+75		OFFSET 20 ft LT		ALIGNMENT -L-		0 HR. Dry									
COLLAR ELEV. 2,591.7 ft		TOTAL DEPTH 5.0 ft		NORTHING 666,725		EASTING 865,307		24 HR. FIAD									
DRILL RIG/HAMMER EFF./DATE N/A					DRILL METHOD Hand Auger			HAMMER TYPE N/A									
DRILLER N/A		START DATE 10/13/21		COMP. DATE 10/13/21		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)		
2595															2,591.7	GROUND SURFACE	0.0
2590											2,586.7	RESIDUAL LOOSE, RED- BROWN, SILTY FINE SAND, MOIST, TRACE ORGANICS AND ROCK FRAGMENTS (A-2-4)	5.0
																Boring Terminated BY AUGER REFUSAL at Elevation 2,586.7 ft ON CRYSTALLINE ROCK (BIOTITE GNEISS)	

NCDOT BORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/7/21



GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF17614.2044019		TIP BP14.R004		COUNTY HAYWOOD		GEOLOGIST DEGEON, A. N.										
SITE DESCRIPTION REPLACE BRIDGE NO. 430382 ON SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK							GROUND WTR (ft)									
BORING NO. RW-1		STATION 15+20		OFFSET 10 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,584.9 ft		TOTAL DEPTH 6.1 ft		NORTHING 666,740		EASTING 865,349										
DRILL RIG/HAMMER EFF./DATE TER0012 Geoprobe 3230DT 93% 09/09/2021				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 10/13/21		COMP. DATE 10/13/21		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						
2585														2,584.9	GROUND SURFACE	0.0
	2,583.9	1.0	2	3	4	●										
2580	2,581.2	3.7	5	20	17	●							2,580.7	ROADWAY EMBANKMENT LOOSE, RED-BROWN, SILTY FINE SAND, TRACE MICA, GRAVEL, COBBLES, MOIST (A-2-4)	4.2	
	2,578.9	6.0	60/0.1			●							2,578.9	RESIDUAL DENSE, RED-BROWN, SILTY FINE SAND, TRACE MICA, MOIST (A-2-4)	6.0	
						●							2,578.8	CRYSTALLINE ROCK (GRAY, BIOTITE GNEISS) Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,578.8 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	6.1	

NCDOT BORE SINGLE BP14.R004_GEO_BRDG.GPJ NC_DOT.GDT 12/7/21

**UNCONFINED COMPRESSION
(ASTM D7012 Method C)**

Project: (BP14.R004) DF17614.2044019
 Description: Bridges No. 430382 over Dutch Cove Creek on SR 1835 (Israel Road)
 County: Haywood, North Carolina
 F. A. ID No.: N/A

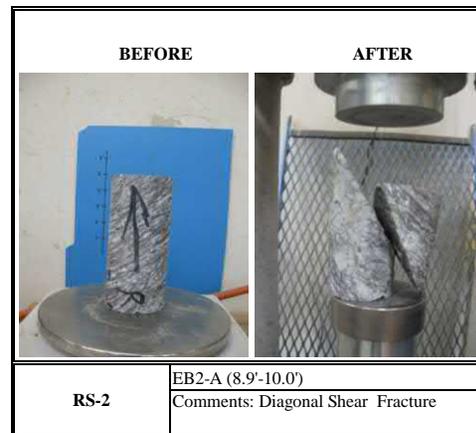
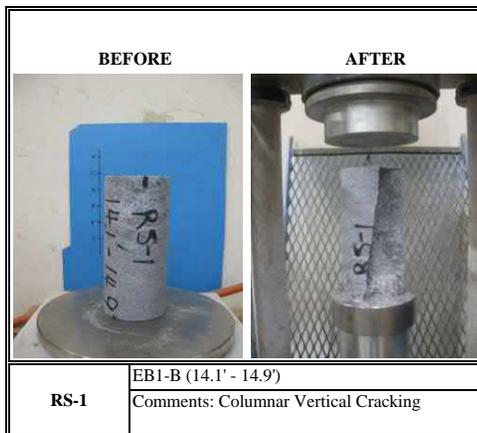
TERRACON Project No.: 70215210
 Tested By: MY (Geotechnics)
 Reviewed By: MPS (Geotechnics)
 Report Date: October 26 2021



Boring No.	Sample ID.	Depth (ft)	Dimensions, in.		Specific Gravity	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (lb/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)	Rock Type (GSI*)
			Length	Diameter								
EB1-B	RS-1	14.1 - 14.9	4.60	2.00	2.695	3.14	168.2	211	37,860	12,080	0.05	Biotite Gneiss (80-90)
EB2-A	RS-2	8.9 - 10.0	4.58	1.99	2.822	3.12	176.1	211	17,020	5,450	0.18	Biotite Gneiss (80-90)

NOTES: *GEOLOGIC STRENGTH INDEX
 Effective (as received) unit weight
 Loading rates were selected to target reaching failure between 2 and 15 minutes.

ASTM D4543-08 *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."



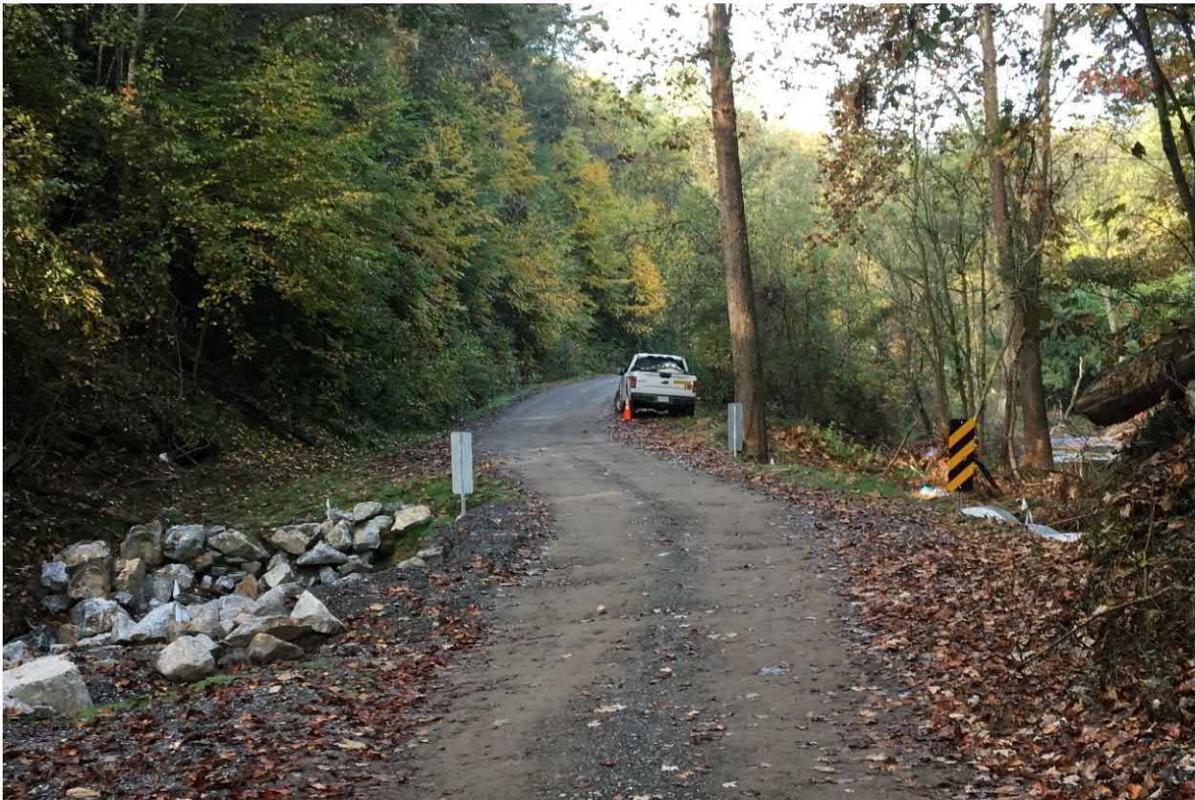
PROJECT REFERENCE NO.	SHEET NO.
BP14.R004	18

SITE PHOTOGRAPHS

REPLACE BRIDGE NO. 430382 ON
SR 1835 (ISRAEL ROAD) OVER DUTCH COVE CREEK



FROM END BENT 1 LOOKING NORTHEAST TOWARD END BENT 2



FROM END BENT 2 LOOKING SOUTHWEST TOWARD END BENT 1