



Mr. Robbie Kirk, PE
Roadway Department Manager
SEPI Engineering & Construction
11020 David Taylor Drive, Suite 115
Charlotte, NC 28262

October 1, 2018

RE: TIP U-5738, WBS 50163.1.1
Rowan County, North Carolina
Structure Subsurface Investigation for Bridge over Town Creek on SR 2528 between SR 2540 and US 601

Dear Mr. Kirk,

HDR Engineering, Inc. has completed the structure subsurface investigation for the proposed Structure on -L- of SR 2528 (Julian Rd.) between SR 2540 and US 601. Borings were taken by HDR in accordance with Geotechnical Engineering Unit requirements and are shown within the attached report for the following bent locations: End Bent 1, Bent 1, and End Bent 2.

The following information is included within this structure subsurface investigation report:

1. Title sheet
2. Soil and rock legends
3. Site plan with boring locations
4. Subsurface profile
5. Subsurface cross sections at each bent location
6. Soil boring and rock coring logs
7. Rock core photos
8. Soil and rock laboratory test results
9. Site photos



Please contact me if you have any questions.

Sincerely,
HDR ENGINEERING, INC.



Michael G. Batten, PE
Senior Geotechnical Engineer
Professional Associate

Attachments

Bridge over Town Creek Structure Subsurface Investigation

REFERENCE: U-5738

PROJECT: 50163

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5738	1	23

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE
5-6	CROSS SECTIONS
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15-20	CORE PHOTOGRAPHS
21	SOIL TEST RESULTS
22	ROCK CORE TEST RESULTS
23	SITE PHOTOGRAPHS

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ROWAN
PROJECT DESCRIPTION BRIDGE NO. 201 ON SR 2528
(JULIAN ROAD) OVER TOWN CREEK

SITE DESCRIPTION SR 2528 (JULIAN ROAD) FROM
SR 2667 (SUMMIT PARK DRIVE) TO US 601 (JAKE
ALEXANDER BLVD.) IN SALISBURY

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:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

J.K. CRENSHAW

C. TAYLOR

O.F. WOODARD

INVESTIGATED BY J.K. CRENSHAW

DRAWN BY W. SHUECRAFT

CHECKED BY M.G. BATTEN

SUBMITTED BY M.G. BATTEN

DATE OCTOBER 2018



SIGNATURE

DATE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

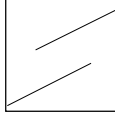
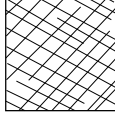
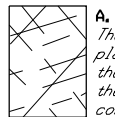
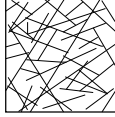
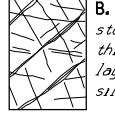

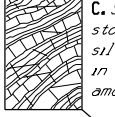
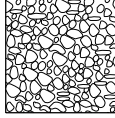
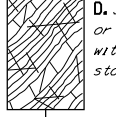
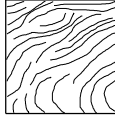
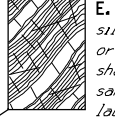

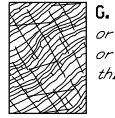


Table containing sections: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION.

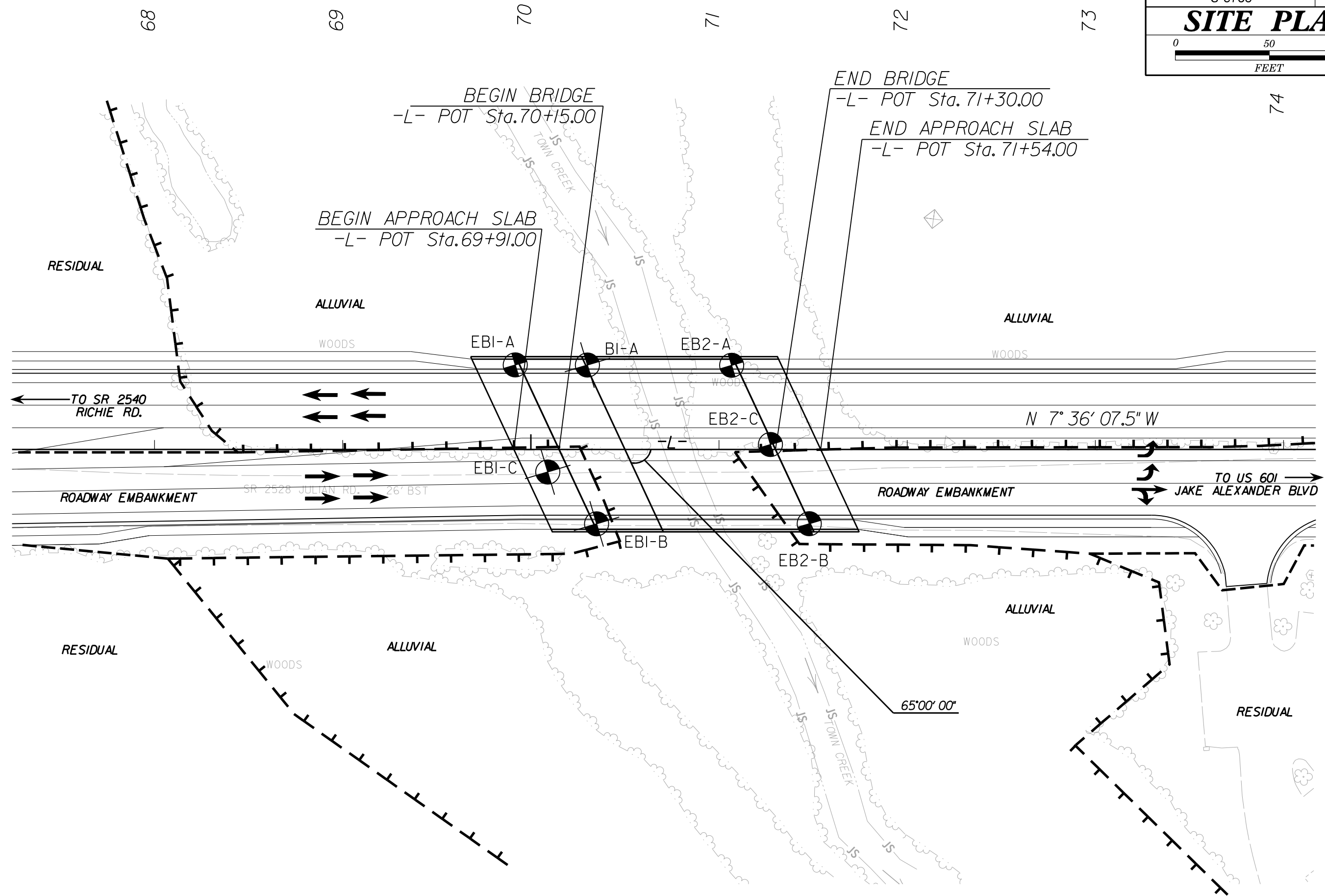
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION**

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

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

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

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)				
<p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p>		VERY GOOD 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	<p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>		VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings
		STRUCTURE							COMPOSITION AND STRUCTURE				
 <p>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p>	90			N/A	N/A	 <p>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p>	 <p>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.</p>	70					
 <p>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p>	80	70				 <p>B. Sandstone with thin inter-layers of siltstone</p>	60						
 <p>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p>		60	50			 <p>C. Sandstone and siltstone in similar amounts</p>	50						
 <p>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p>			40			 <p>D. Siltstone or silty shale with sandstone layers</p>	40						
 <p>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>			30			 <p>E. Weak siltstone or clayey shale with sandstone layers</p>	30						
			20			 <p>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p>	20						
			10			 <p>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p>	10						
	N/A	N/A				 <p>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.</p>							
						 <p>Means deformation after tectonic disturbance</p>							



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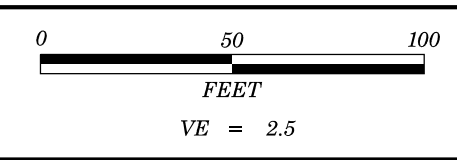
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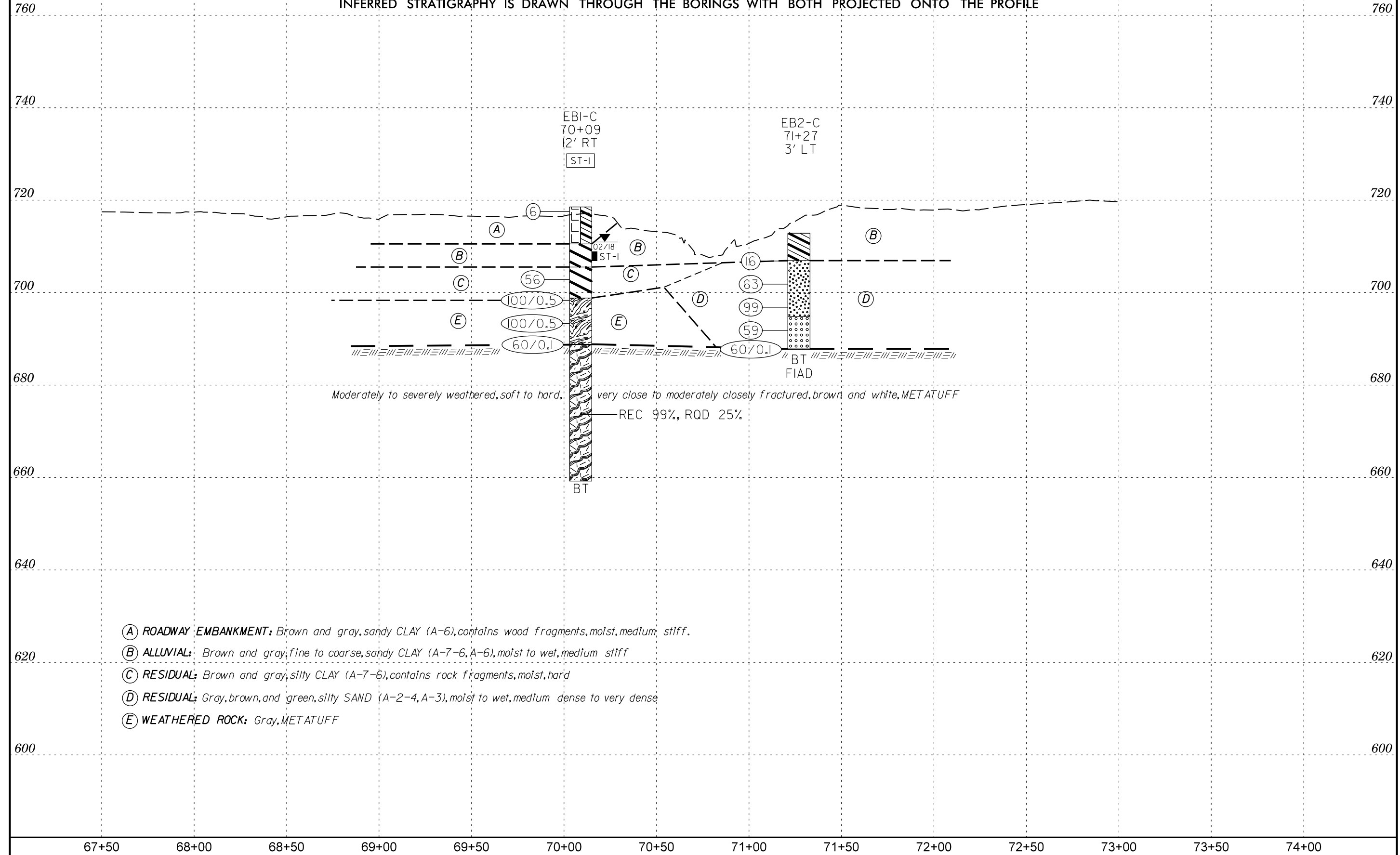
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7/12/99



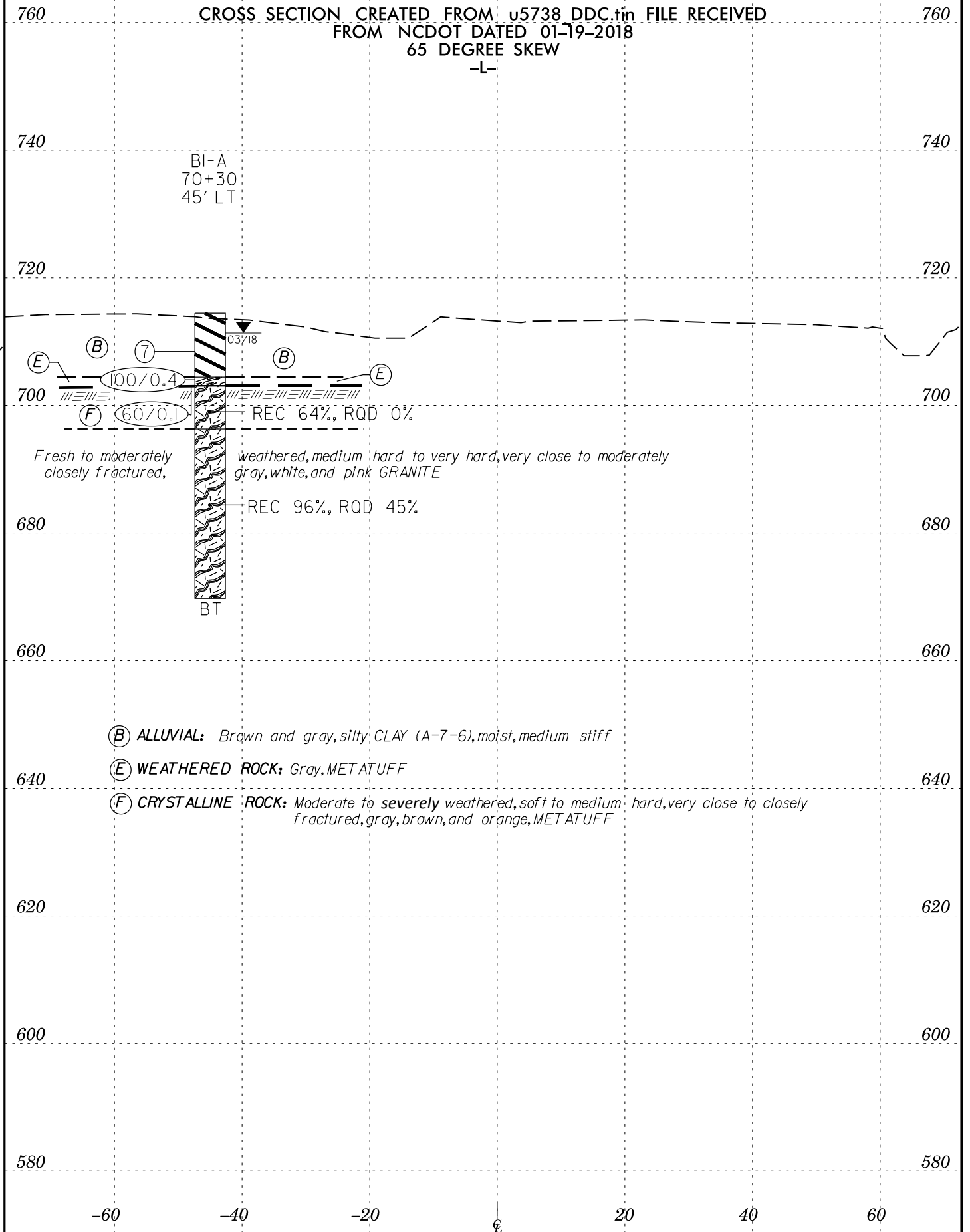
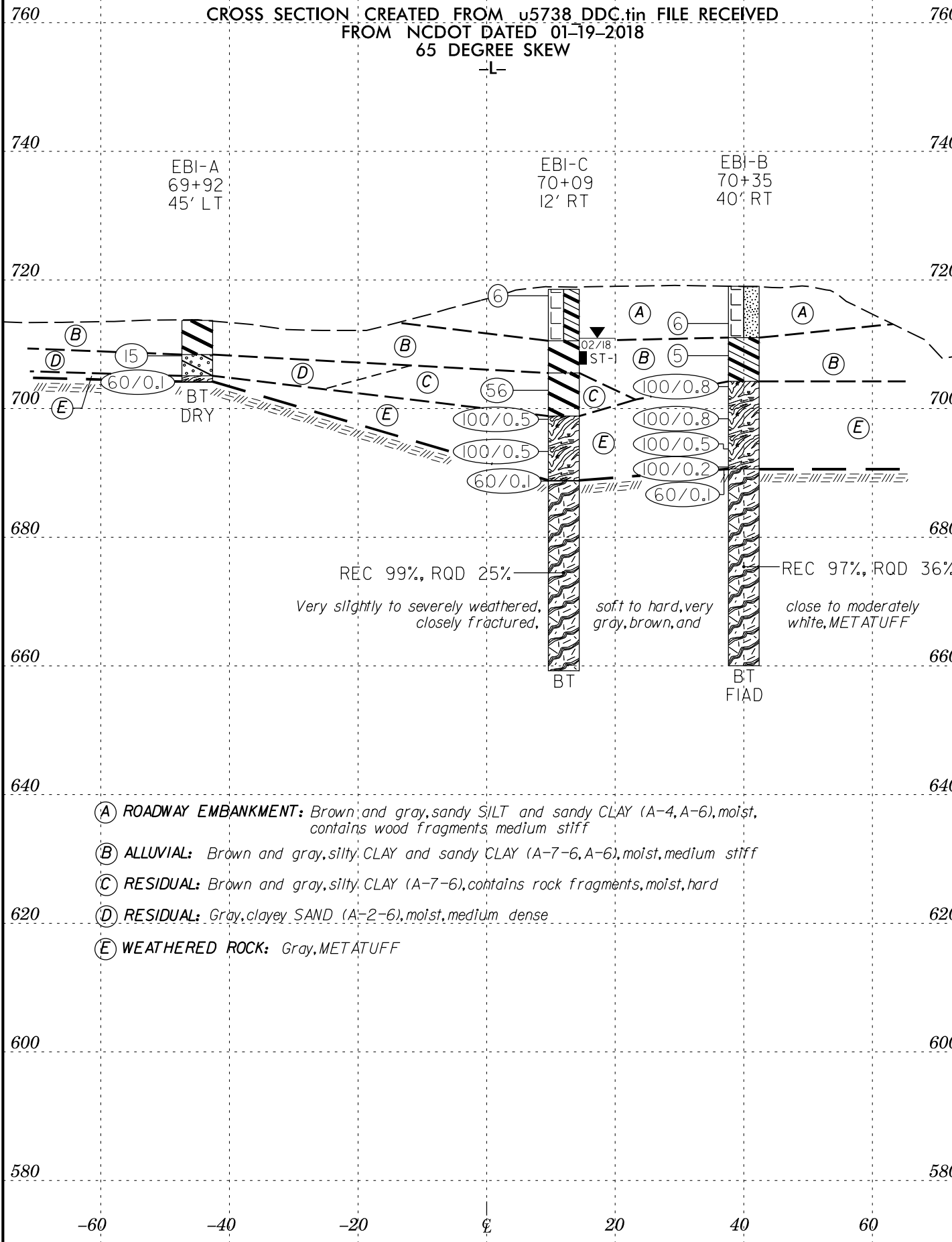
PROJECT REFERENCE NO.	SHEET NO.
U-5738	4
BRIDGE NO. 201	
PROFILE CL OF -L-	

GROUNDLINE PROFILE CREATED FROM u5738_DDC.tin FILE RECEIVED FROM NCDOT DATED 01-19-2018
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE



- (A) **ROADWAY EMBANKMENT:** Brown and gray, sandy CLAY (A-6), contains wood fragments, moist, medium stiff.
- (B) **ALLUVIAL:** Brown and gray, fine to coarse, sandy CLAY (A-7-6, A-6), moist to wet, medium stiff
- (C) **RESIDUAL:** Brown and gray, silty CLAY (A-7-6), contains rock fragments, moist, hard
- (D) **RESIDUAL:** Gray, brown, and green, silty SAND (A-2-4, A-3), moist to wet, medium dense to very dense
- (E) **WEATHERED ROCK:** Gray, METATUFF

7/12/99



VE = N/A

**BRIDGE NO. 201 - END BENT 1
CROSS SECTION - STA. 70+15.00**

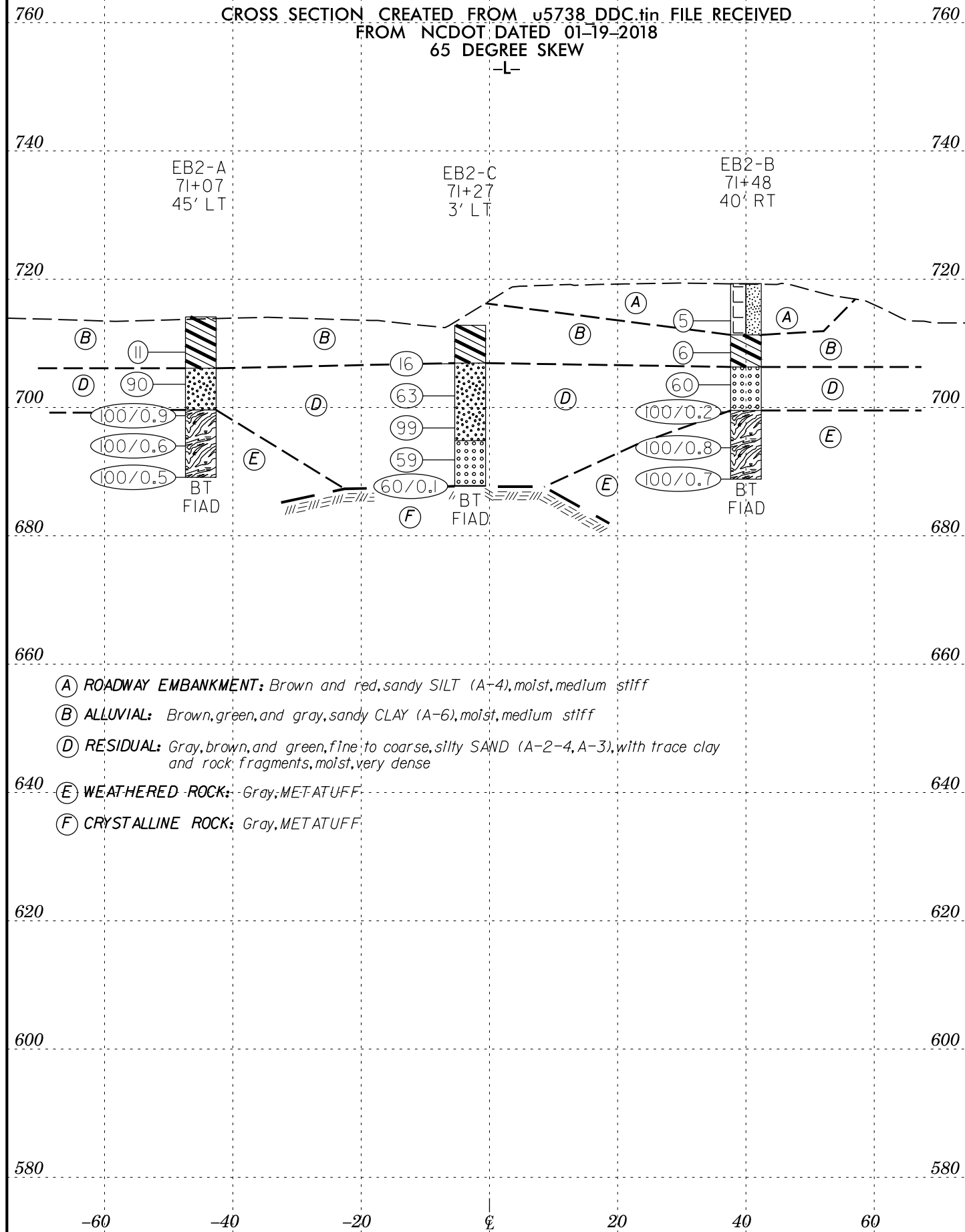


VE = N/A

**BRIDGE NO. 201 - BENT 1
CROSS SECTION - STA. 70+50.00**

7/12/99

CROSS SECTION CREATED FROM u5738_DDC.tin FILE RECEIVED
FROM NCDOT DATED 01-19-2018
65 DEGREE SKEW
-L-



- (A) ROADWAY EMBANKMENT: Brown and red, sandy SILT (A-4), moist, medium stiff
- (B) ALLUVIAL: Brown, green, and gray, sandy CLAY (A-6), moist, medium stiff
- (D) RESIDUAL: Gray, brown, and green, fine to coarse, silty SAND (A-2-4, A-3), with trace clay and rock fragments, moist, very dense
- (E) WEATHERED ROCK: Gray, METATUFF
- (F) CRYSTALLINE ROCK: Gray, METATUFF

HORIZ. SCALE 0 20 40
(FEET)

VE = N/A

BRIDGE NO. 201 - END BENT 2
CROSS SECTION - STA. 71+30.00



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 69+92		OFFSET 45 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 713.7 ft		TOTAL DEPTH 9.6 ft		NORTHING 693,141		EASTING 1,556,024										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Woodard, O.F.		START DATE 03/03/18		COMP. DATE 03/03/18		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						
715														713.7	GROUND SURFACE	0.0
															ALLUVIAL	
															Brown and gray, silty CLAY (A-7-6), medium stiff	
710	709.2	4.5	3	4	11									708.4	RESIDUAL	5.3
															Gray, clayey SAND (A-2-6), medium dense	
705	704.2	9.5	60/0.1											705.1	WEATHERED ROCK	8.6
														704.2	Gray, METATUFF	9.5
														704.1	CRYSTALLINE ROCK	9.6
															Gray, METATUFF	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 704.1 ft in CRYSTALLINE ROCK (METATUFF)	
															Strata Break in Split Spoon at 5.3 feet.	

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 70+35		OFFSET 40 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 719.0 ft		TOTAL DEPTH 59.0 ft		NORTHING 693,195		EASTING 1,556,102										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic												
DRILLER Woodard, O.F.		START DATE 02/27/18		COMP. DATE 02/27/18		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						
720														719.0	GROUND SURFACE	0.0
															ROADWAY EMBANKMENT	
															Brown and gray, clayey SILT (A-4), medium stiff	
715	714.2	4.8	1	3	3									711.0	RESIDUAL	8.0
															Gray and brown, sandy CLAY (A-6), medium stiff	
710	709.2	9.8	2	2	3									704.2	WEATHERED ROCK	14.8
															Gray, METATUFF	
705	704.2	14.8	31	69/0.3											WEATHERED ROCK	
															Gray, METATUFF	
700	699.2	19.8	30	70/0.3											WEATHERED ROCK	
															Gray, METATUFF	
695	694.2	24.8	100/0.5												WEATHERED ROCK	
															Gray, METATUFF	
690	691.1	27.9	100/0.2											690.7	CRYSTALLINE ROCK	28.3
	690.7	28.3	60/0.1											690.6	Gray, METATUFF	28.4
															METATUFF	
685																
680																
675																
670																
665																
660														660.0	CRYSTALLINE ROCK	59.0
															Boring Terminated at Elevation 660.0 ft in CRYSTALLINE ROCK (METATUFF)	
															Auger refusal at 28.3 feet.	

NCDOT BORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.					
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)				
BORING NO. EB1-B		STATION 70+35		OFFSET 40 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 719.0 ft		TOTAL DEPTH 59.0 ft		NORTHING 693,195		EASTING 1,556,102					
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic					
DRILLER Woodard, O.F.		START DATE 02/27/18		COMP. DATE 02/27/18		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 30.6 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
690.6	690.6	28.4	0.6	1:35/0.6	(0.6)	(0.0)	(29.2)	(10.7)		Begin Coring @ 28.4 ft	28.4
	690.0	29.0	5.0	1:58 2:38 3:01 3:56 2:07	100% (4.7) 94%	0% (0.0) 0%	95%	35%		CRYSTALLINE ROCK	
	685.0	34.0	5.0	1:59 2:18 2:33 2:12 2:29	(4.6) 92%	(3.3) 66%				Very slight to moderately severely weathered, moderately hard to hard, very close to closely fractured, gray and brown, METATUFF	
	680.0	39.0	5.0	2:19 2:46 2:55 2:25 2:35	(5.0) 100%	(0.9) 18%					
	675.0	44.0	5.0	1:42 4:19 1:37 2:18 2:22	(4.9) 98%	(0.9) 18%					
	670.0	49.0	5.0	1:37 1:42 1:48 1:43 1:50	(4.4) 88%	(3.4) 68%					
	665.0	54.0	5.0	2:03 2:44 2:09 1:57 2:18	(5.0) 100%	(2.2) 44%					
	660.0	59.0									
Boring Terminated at Elevation 660.0 ft in CRYSTALLINE ROCK (METATUFF)											
Auger refusal at 28.3 feet.											

NCDOT CORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT_GDT 10/1/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50163.1.1	TIP U-5738	COUNTY ROWAN	GEOLOGIST Taylor, C.
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK			GROUND WTR (ft)
BORING NO. EB1-C	STATION 70+09	OFFSET 12 ft RT	ALIGNMENT -L-
COLLAR ELEV. 718.5 ft	TOTAL DEPTH 59.3 ft	NORTHING 693,166	EASTING 1,556,078
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER Woodard, O.F.	START DATE 02/28/18	COMP. DATE 02/28/18	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							
720														718.5	GROUND SURFACE	0.0	
715	713.8	4.7	3	3	3									710.5	ROADWAY EMBANKMENT Brown and gray, sandy CLAY (A-6), contains wood fragments, medium stiff		
710														705.5	ALLUVIAL Brown and gray, fine to coarse, sandy CLAY (A-7-6(13)), medium stiff	8.0	
705	703.8	14.7	12	19	37									705.5	RESIDUAL Brown and gray, silty CLAY (A-7-6), contains rock fragments, hard	13.0	
700	698.8	19.7	100/0.5											698.8	WEATHERED ROCK Gray, brown, and orange, METATUFF	19.7	
695	693.8	24.7	100/0.5														
690	688.8	29.7	60/0.1											688.8	CRYSTALLINE ROCK Gray, brown, and orange, METATUFF	29.7	
685														688.7		29.8	
680																	
675																	
670																	
665																	
660																	
														659.2	Boring Terminated at Elevation 659.2 ft in CRYSTALLINE ROCK (METATUFF)	59.3	
															Other Samples: ST-1 (9.7 - 11.7)		

NCDOT BORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT_GDT 10/1/18

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.						
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)					
BORING NO. EB1-C		STATION 70+09		OFFSET 12 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 718.5 ft		TOTAL DEPTH 59.3 ft		NORTHING 693,166		EASTING 1,556,078						
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER Woodard, O.F.		START DATE 02/28/18		COMP. DATE 02/28/18		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 29.5 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %				RQD (ft) %
688.7	688.7	29.8	4.5	2:54/0.5	(4.4)	(0.0)				Begin Coring @ 29.8 ft		
				1:58	98%	0%	(29.2)	(7.3)		688.7	CRYSTALLINE ROCK	29.8
685	684.2	34.3		3:29							Moderately to severely weathered, soft to hard, very close to moderately closely fractured, brown and white, METATUFF	
			5.0	2:05								
				2:23								
680	679.2	39.3		1:52	(5.0)	(0.6)						
			5.0	1:54	100%	12%						
				1:56								
				2:19								
				2:56								
675	674.2	44.3		2:16	(5.0)	(2.6)						
			5.0	2:20	100%	52%						
				1:56								
				1:58								
				2:05								
670	669.2	49.3		1:55	(4.8)	(1.1)						
			5.0	2:06	96%	22%						
				2:01								
				2:10								
				2:19								
665	664.2	54.3		1:58	(5.0)	(1.2)						
			5.0	2:07	100%	24%						
				2:20								
				2:18								
				2:24								
660	659.2	59.3		2:03	(5.0)	(1.8)						
			5.0	2:19	100%	36%						
				2:07								
				2:04								
				2:21								
							RS-3					
										Boring Terminated at Elevation 659.2 ft in CRYSTALLINE ROCK (METATUFF)		
										Other Samples: ST-1 (9.7 - 11.7)		

NCDOT CORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. B1-A		STATION 70+30		OFFSET 45 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 714.4 ft		TOTAL DEPTH 44.7 ft		NORTHING 693,179		EASTING 1,556,019										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic										
DRILLER Woodard, O.F.		START DATE 03/03/18		COMP. DATE 03/03/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
715														714.4	0.0	GROUND SURFACE
710	709.4	5.0	2	3	4											ALLUVIAL Gray and brown, silty CLAY (A-7-6), moist, medium stiff
705	704.4	10.0												704.4	10.0	WEATHERED ROCK Gray and brown, METATUFF
700	703.1	11.3	100/0.4											703.1	11.3	CRYSTALLINE ROCK Gray, brown, and orange, METATUFF
			60/0.1											703.0	11.4	METATUFF
695														696.3	18.1	GRANITE
690																
685																
680																
675																
670														669.7	44.7	Boring Terminated at Elevation 669.7 ft in CRYSTALLINE ROCK (METATUFF) Auger refusal at 11.3 feet.

NCDOT BORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.						
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)					
BORING NO. B1-A		STATION 70+30		OFFSET 45 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 714.4 ft		TOTAL DEPTH 44.7 ft		NORTHING 693,179		EASTING 1,556,019						
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER Woodard, O.F.		START DATE 03/03/18		COMP. DATE 03/03/18		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 33.3 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %				
703	703.0	11.4	3.3	0:35/0.3	(3.3)	(0.0)	(4.3)	(0.0)		Begin Coring @ 11.4 ft		
700	699.7	14.7	5.0	1:45 2:30 2:17	(2.6)	(1.1)	(4.3)	(0.0)		703.0	11.4	
695	694.7	19.7	5.0	1:15 1:22 2:08 2:27 2:01	(2.6)	(1.1)	(25.6)	(11.9)		696.3	18.1	
690	689.7	24.7	5.0	1:31 1:43 1:53 2:05 2:16	(4.9)	(1.8)	(25.6)	(11.9)				
685	684.7	29.7	5.0	2:00 2:41 2:29 2:18 2:07	(4.7)	(1.3)						
680	679.7	34.7	5.0	2:26 2:11 3:50 2:42 2:40	(5.0)	(2.2)						
675	674.7	39.7	5.0	1:59 2:10 2:21 2:36 3:22	(4.9)	(1.3)						
670	669.7	44.7	5.0	2:27 3:01 2:52 2:56 3:18	(5.0)	(4.2)				669.7	44.7	
											Boring Terminated at Elevation 669.7 ft in CRYSTALLINE ROCK (METATUFF)	
											Auger refusal at 11.3 feet.	

NCDOT CORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 71+07		OFFSET 45 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 714.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 693,255		EASTING 1,556,009										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Woodard, O.F.		START DATE 03/04/18		COMP. DATE 03/04/18		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						
715														714.1	0.0	GROUND SURFACE
710	709.6	4.5	4	4	7								M	706.1	8.0	ALLUVIAL Gray, brown, and green, silty and sandy CLAY (A-6), stiff
705	704.6	9.5	28	45	45								M	699.6	14.5	RESIDUAL Brown, gray, and green, fine to coarse SAND (A-2-4), contains rock fragments, very dense
700	699.6	14.5	36	64/0.4										699.6	14.5	WEATHERED ROCK Brown, green, and gray, METATUFF
695	694.6	19.5	75	25/0.1										699.6	14.5	
690	689.6	24.5	100/0.5											689.1	25.0	Boring Terminated at Elevation 689.1 ft in WEATHERED ROCK (METATUFF)

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 71+48		OFFSET 40 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 719.3 ft		TOTAL DEPTH 30.5 ft		NORTHING 693,307		EASTING 1,556,087										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Woodard, O.F.		START DATE 02/27/18		COMP. DATE 02/27/18		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						
720														719.3	0.0	GROUND SURFACE
715	714.5	4.8	2	2	3								M	711.3	8.0	ROADWAY EMBANKMENT Brown and red, sandy SILT (A-4), medium stiff
710	709.5	9.8	2	3	3								M	706.3	13.0	ALLUVIAL Gray and brown, sandy CLAY (A-6), medium stiff
705	704.5	14.8	16	34	26								M	699.5	19.8	RESIDUAL Brown, gray, and red, SAND (A-3), with trace clay and rock fragments, very dense
700	699.5	19.8	100/0.2											699.5	19.8	WEATHERED ROCK Gray and brown, METATUFF
695	694.5	24.8	41	59/0.3										699.5	19.8	
690	689.5	29.8	46	54/0.2										688.8	30.5	Boring Terminated at Elevation 688.8 ft in WEATHERED ROCK (METATUFF)

NCDOT BORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50163.1.1		TIP U-5738		COUNTY ROWAN		GEOLOGIST Taylor, C.										
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK							GROUND WTR (ft)									
BORING NO. EB2-C		STATION 71+27		OFFSET 3 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 712.8 ft		TOTAL DEPTH 25.1 ft		NORTHING 693,281		EASTING 1,556,048										
DRILL RIG/HAMMER EFF./DATE HDR9935 CME-55 85% 03/20/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Woodard, O.F.		START DATE 03/04/18		COMP. DATE 03/04/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
715														712.8	0.0	GROUND SURFACE
710														706.9	5.9	ALLUVIAL Gray and brown, sandy CLAY (A-6), medium stiff
705	707.8	5.0	2	4	12											RESIDUAL Gray, brown, and green, silty SAND (A-2-4), medium dense to very dense
700	702.8	10.0	23	30	33											
695	697.8	15.0	23	48	51											
690	692.8	20.0	12	29	30									694.8	18.0	Gray, brown, and green, silty SAND (A-3), very dense
	687.8	25.0	60/0.1											687.8	25.0	CRYSTALLINE ROCK Gray, METATUFF
														687.7	25.1	Boring Terminated with Standard Penetration Test Refusal at Elevation 687.7 ft in CRYSTALLINE ROCK (METATUFF)
																Strata Break in Split Spoon at 5.9 feet.

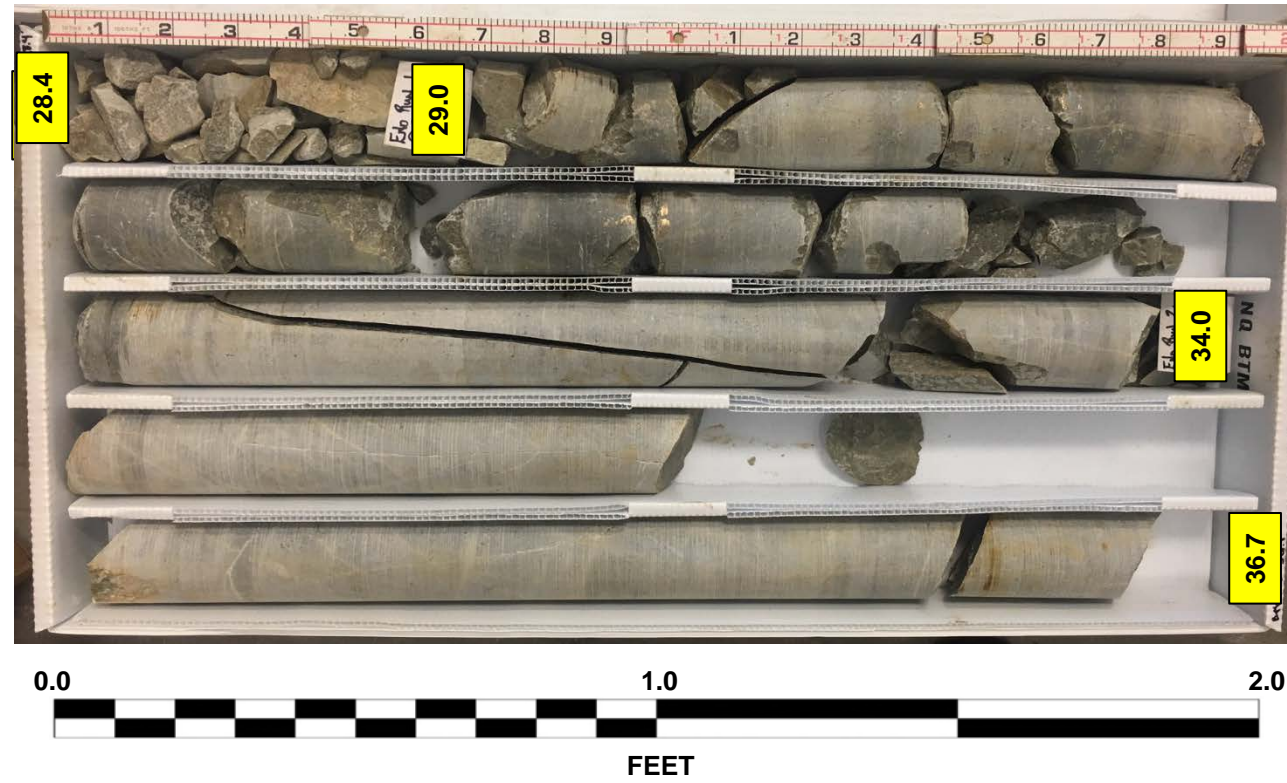
NCDOT BORE DOUBLE BRIDGE BORINGS-THIS IS THE MOST UPDATED FILE.GPJ NC_DOT.GDT 10/1/18

CORE PHOTOGRAPHIC RECORD

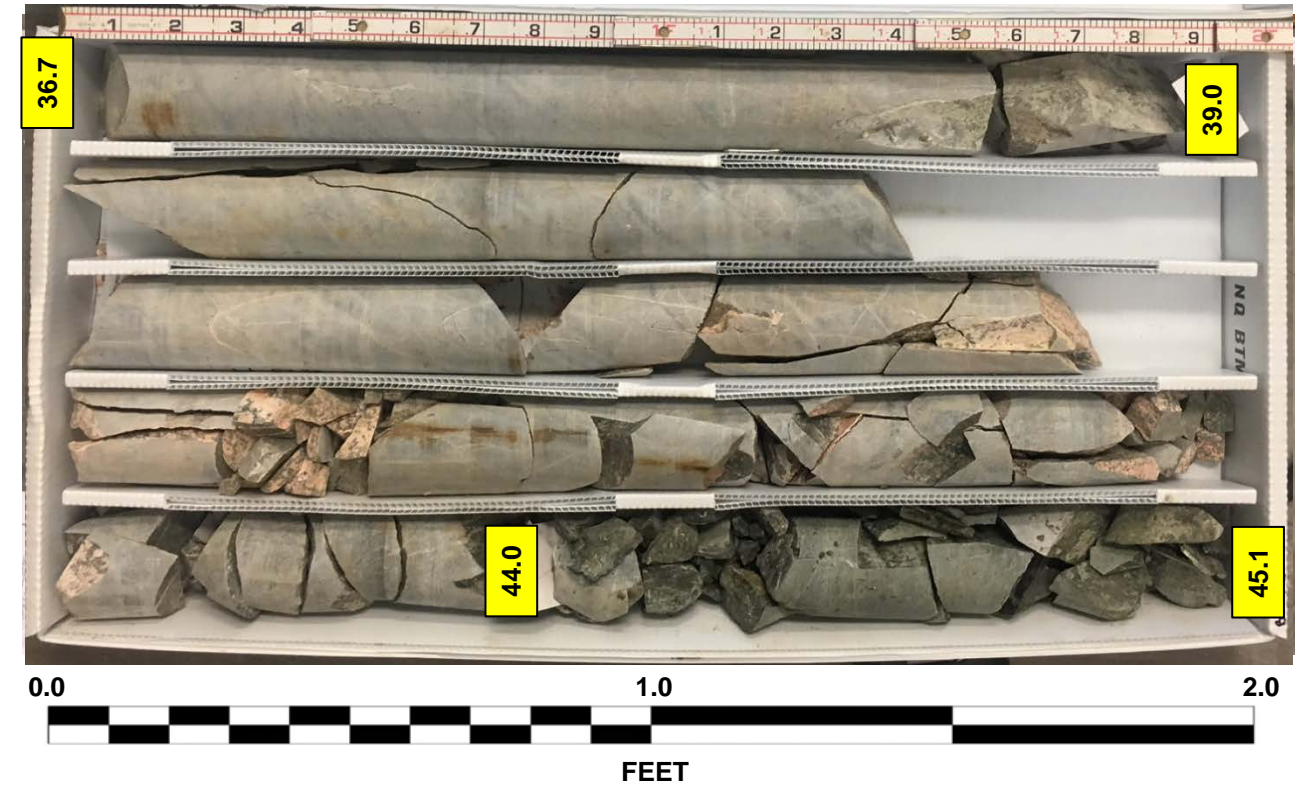
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

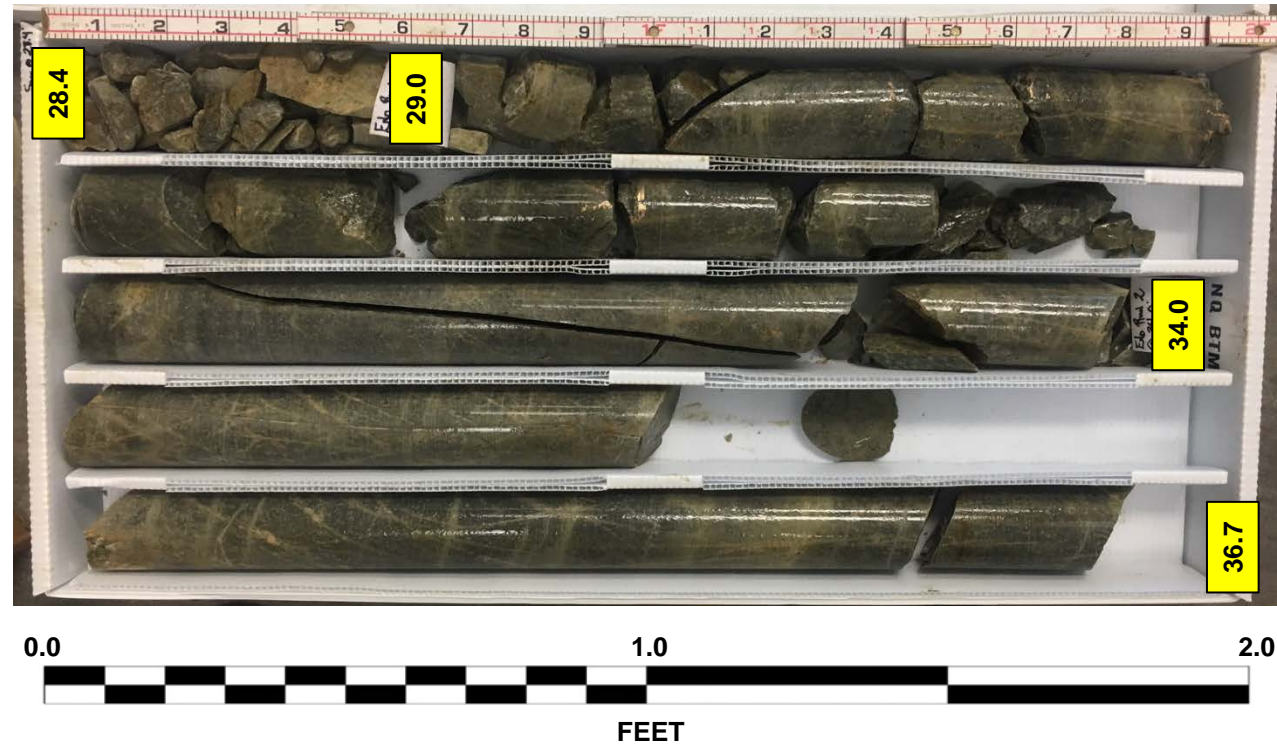
U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 1 of 4: 8.3 FEET
DRY



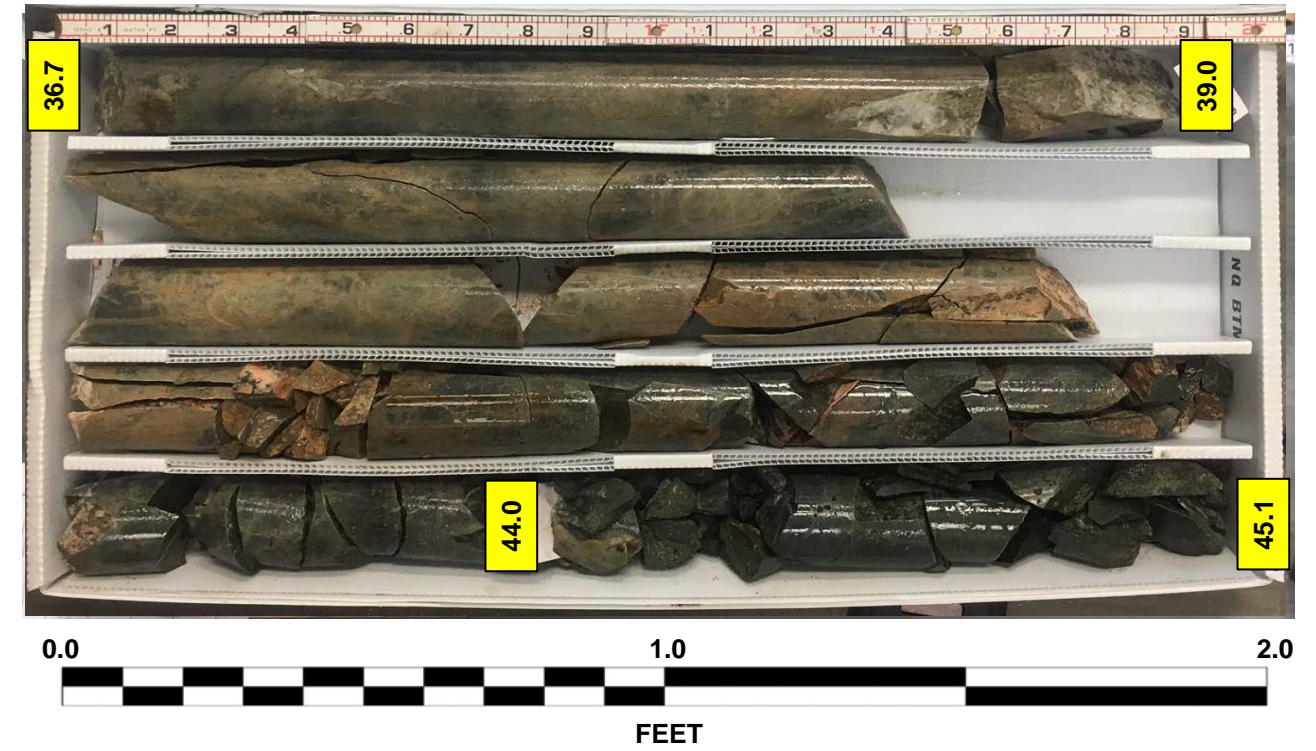
U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET
DRY



U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 1 of 4: 8.3 FEET
WET



U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET
WET

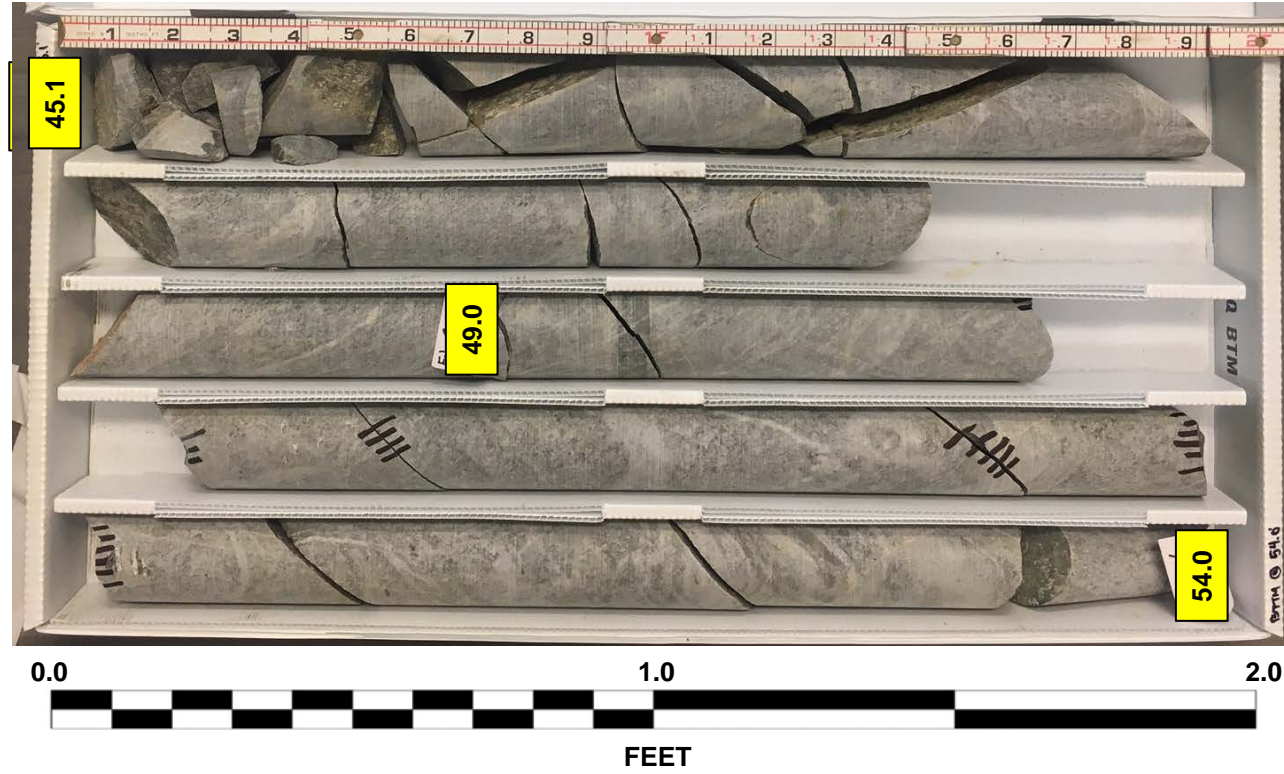


CORE PHOTOGRAPHIC RECORD

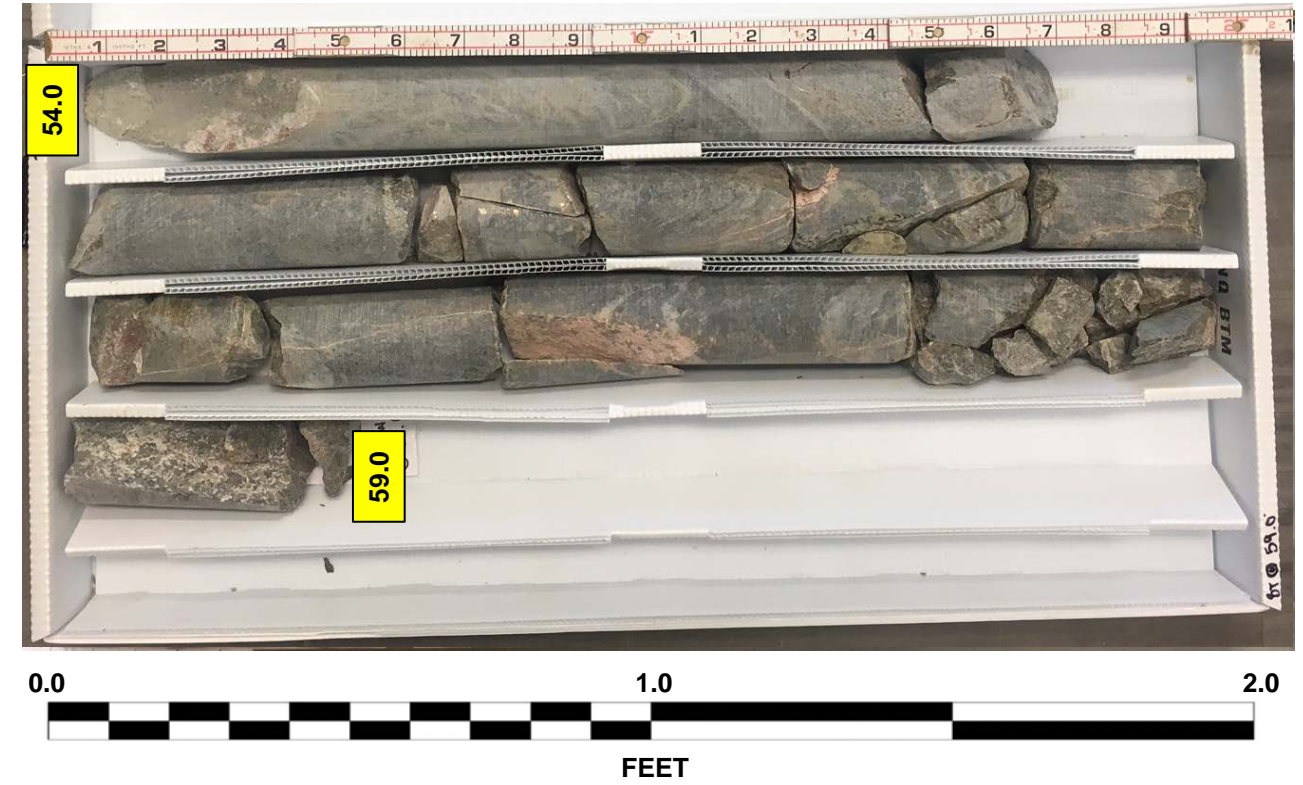
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

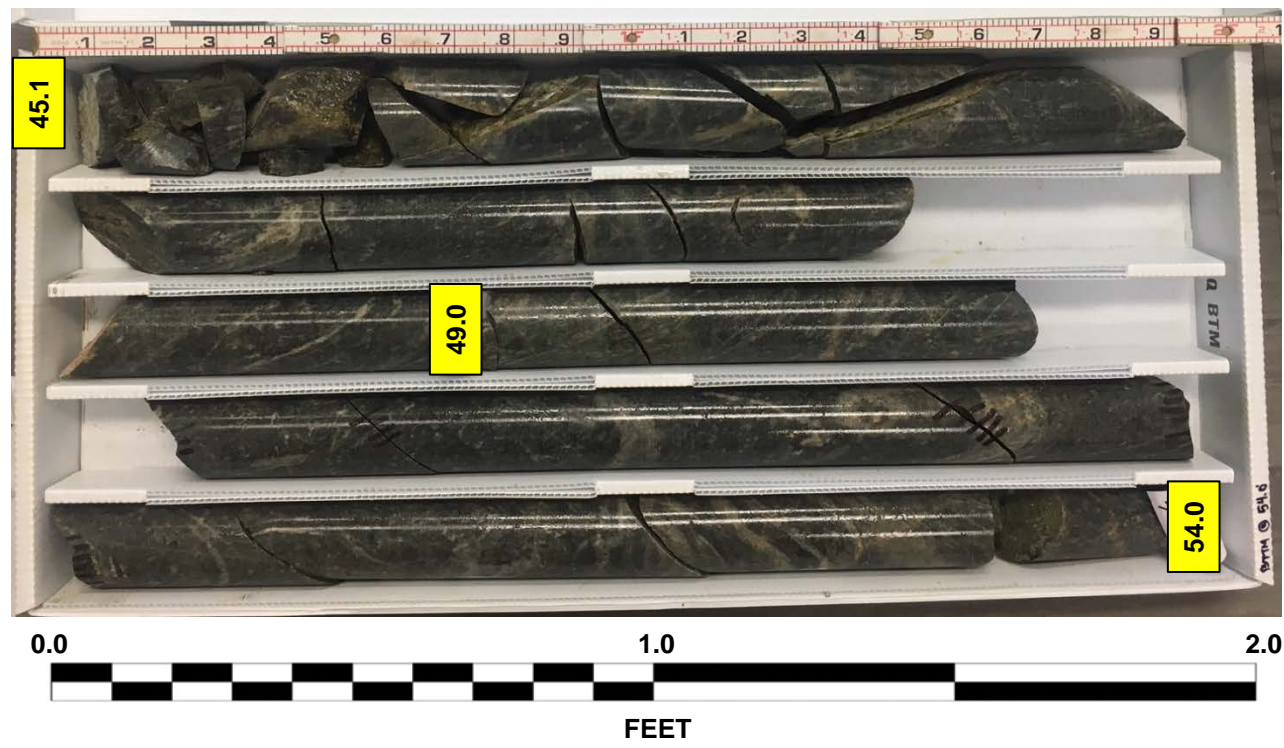
U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 3 of 4: 8.9 FEET
DRY



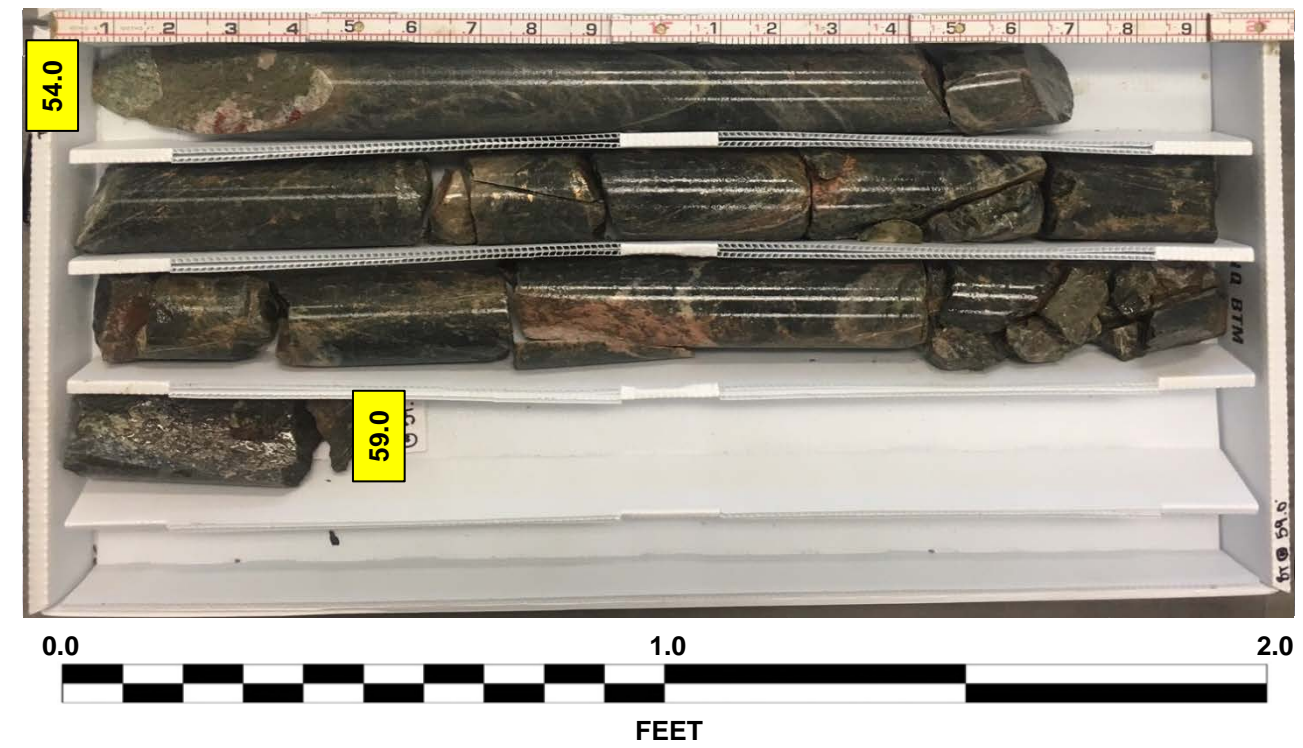
U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 4 of 4: 5.0 FEET
DRY



U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 3 of 4: 8.9 FEET
WET



U-5738 – EB1-B
STA. 27+53 @ 27' Rt. Box 4 of 4: 5.0 FEET
WET

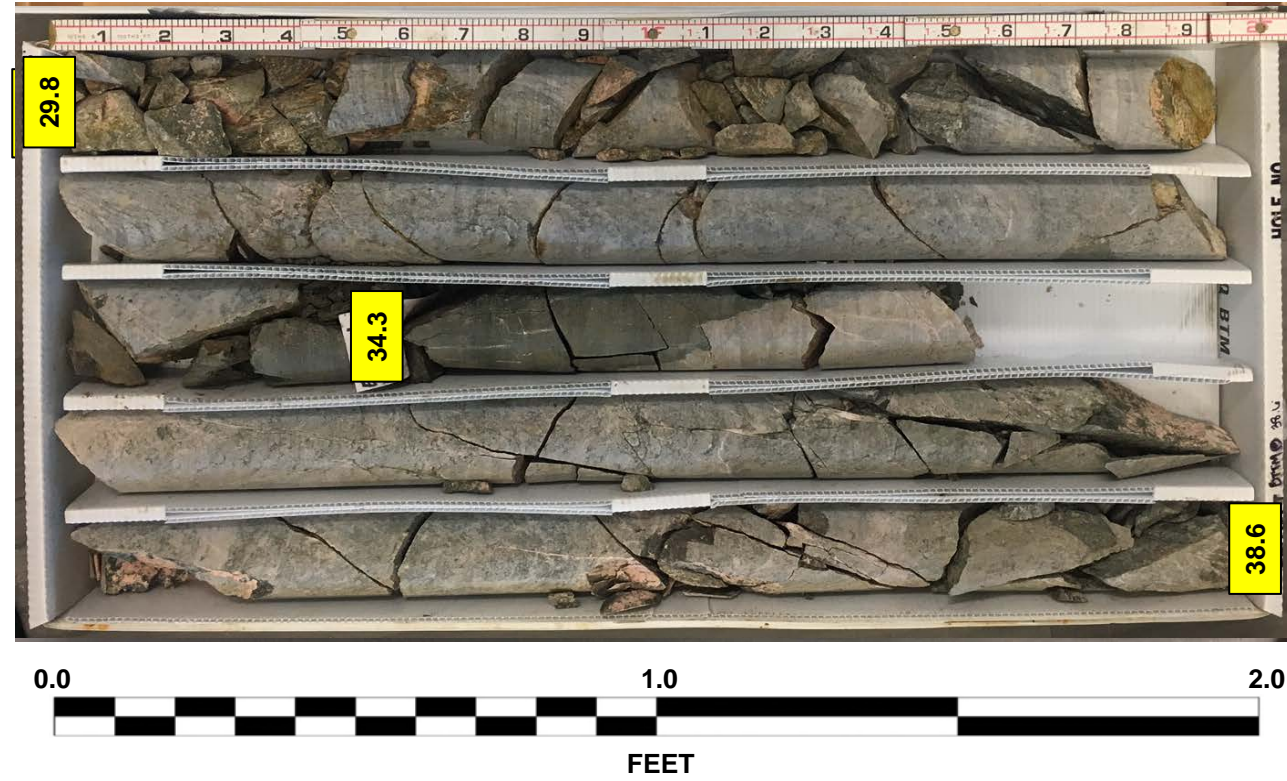


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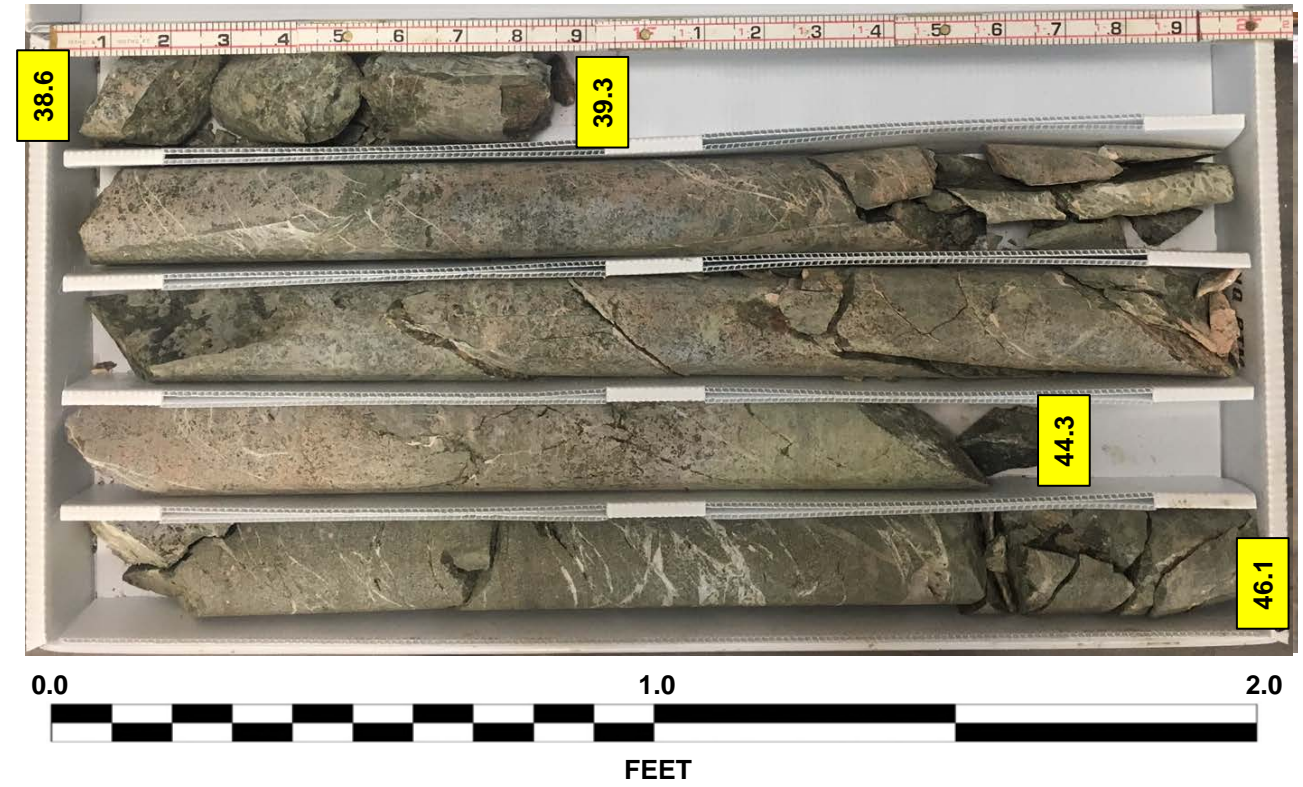
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 1 of 4: 8.8 FEET
DRY



U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 2 of 4: 7.5 FEET
DRY



U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 1 of 4: 8.8 FEET
WET



U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 2 of 4: 7.5 FEET
WET

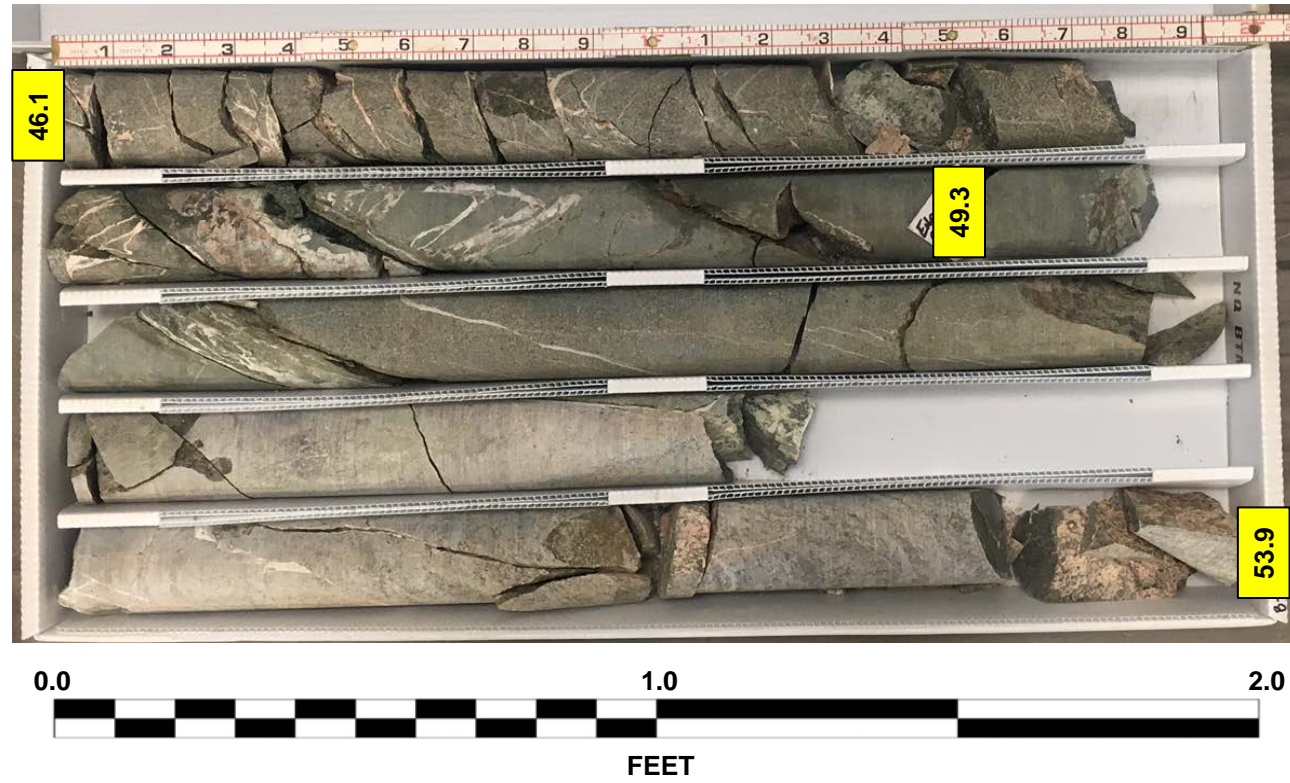


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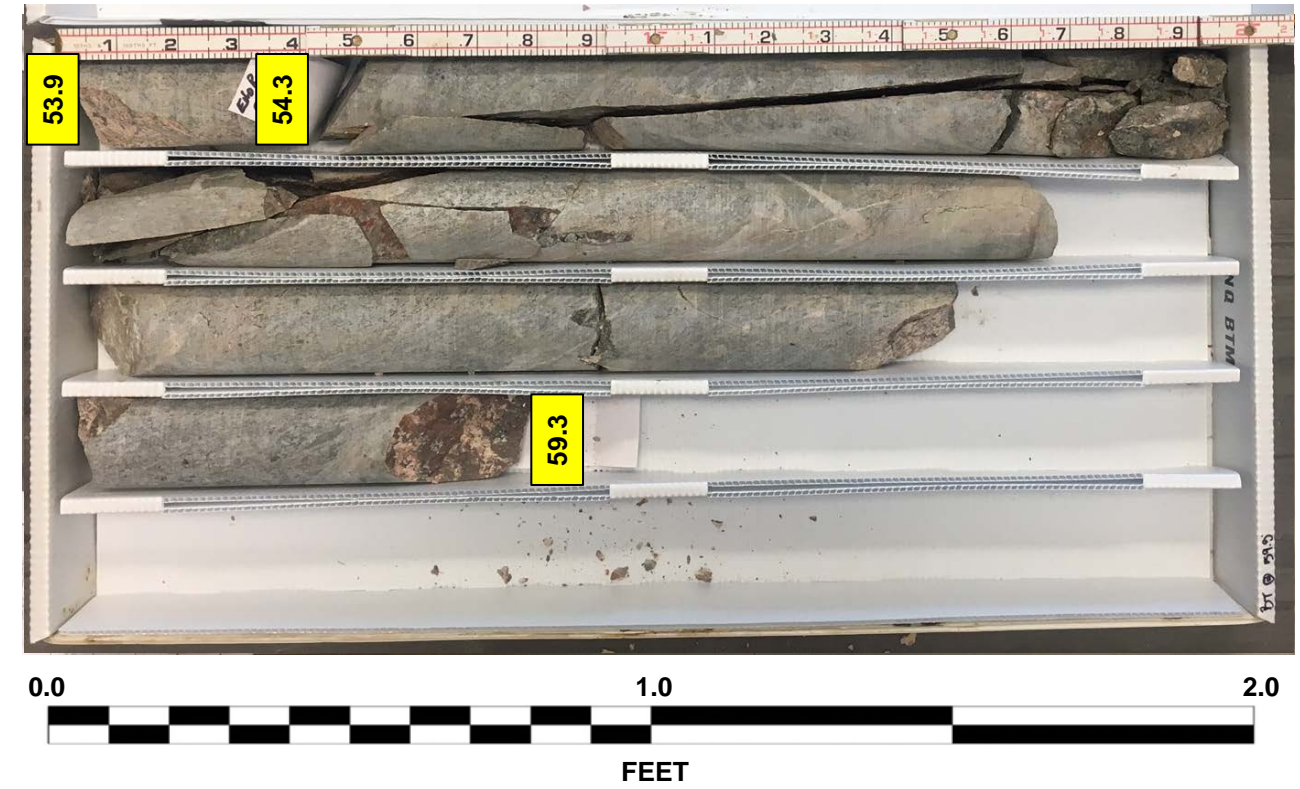
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

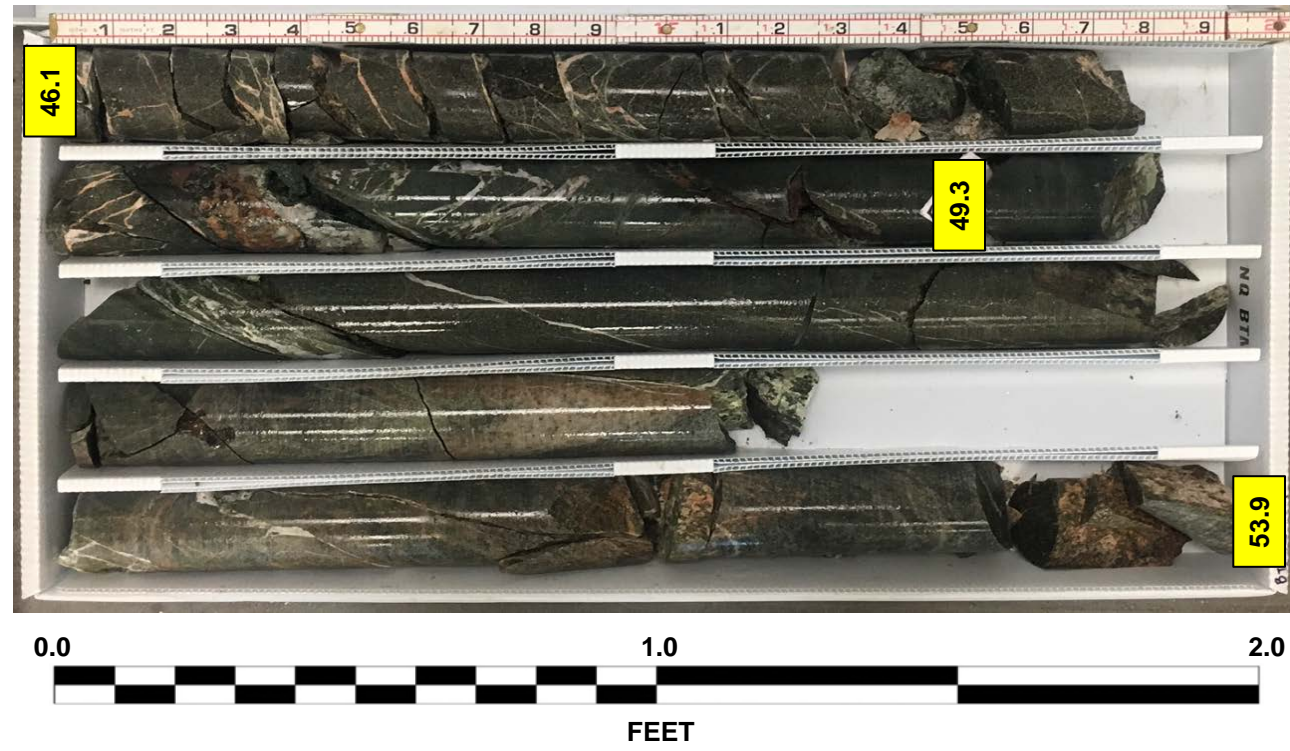
U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 3 of 4: 7.8 FEET
DRY



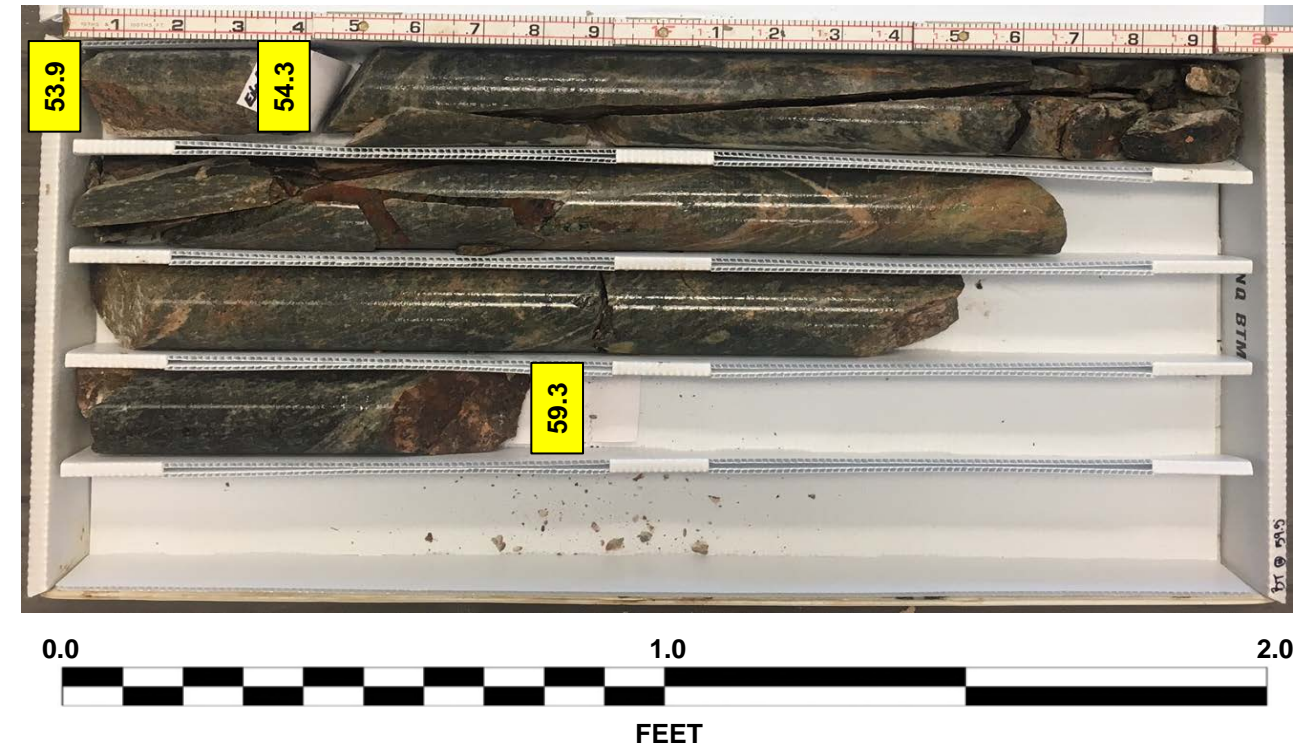
U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 4 of 4: 5.4 FEET
DRY



U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 3 of 4: 7.8 FEET
WET



U-5738 – EB1-C
STA. 27+53 @ 27' Rt. Box 4 of 4: 5.4 FEET
WET

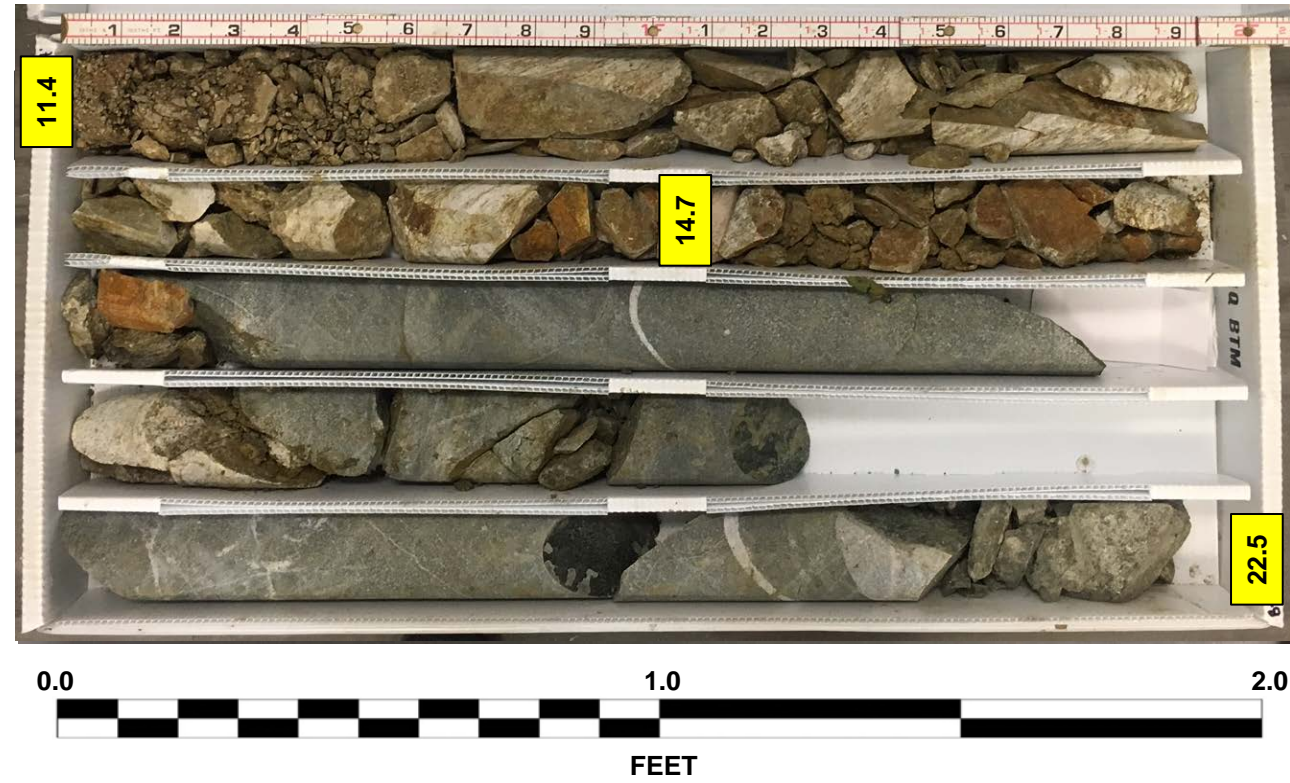


CORE PHOTOGRAPHIC RECORD

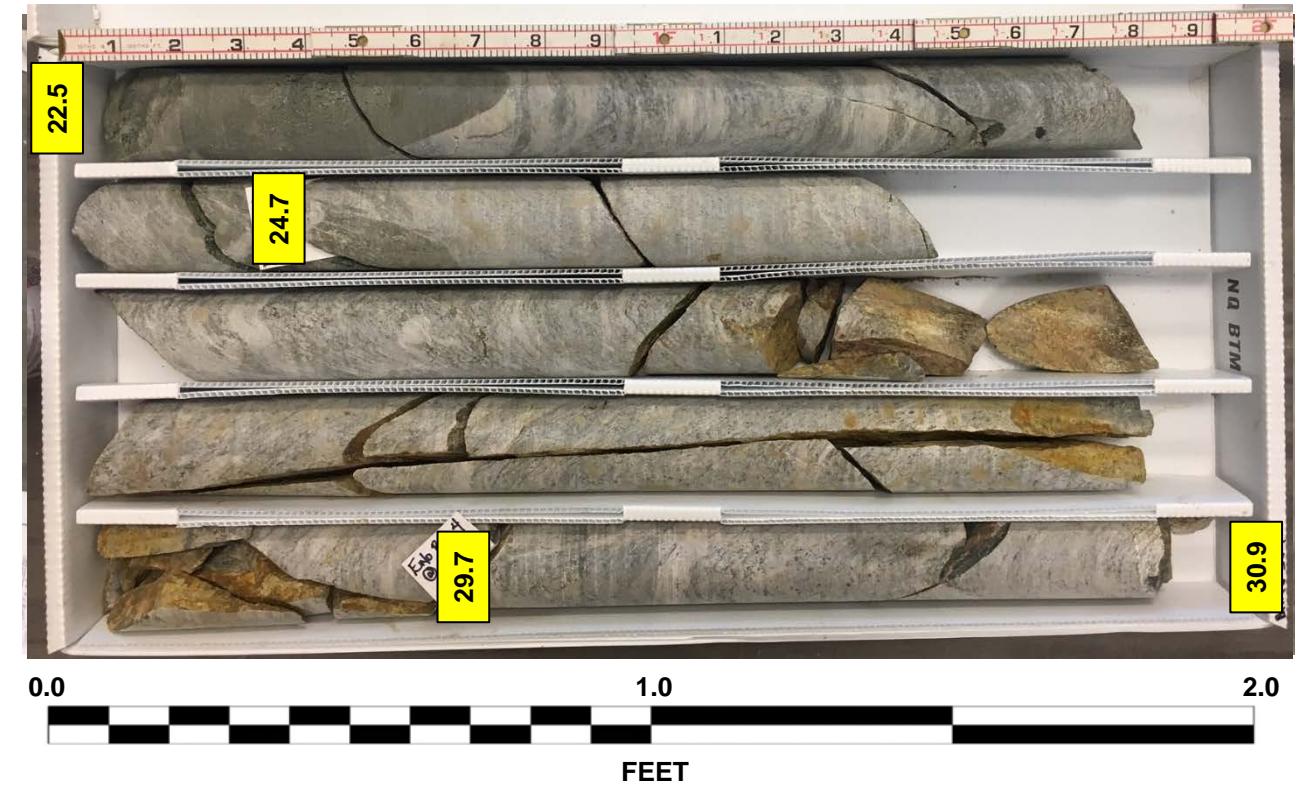
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

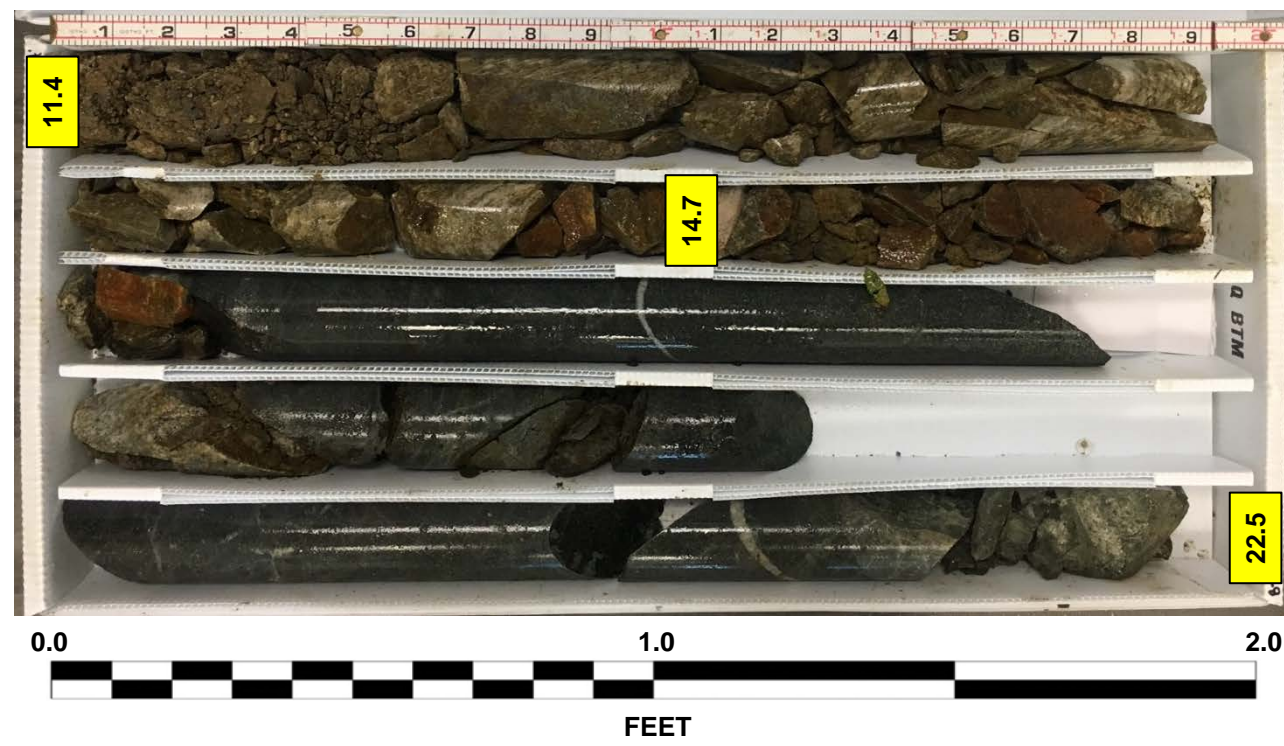
U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 1 of 4: 11.1 FEET
DRY



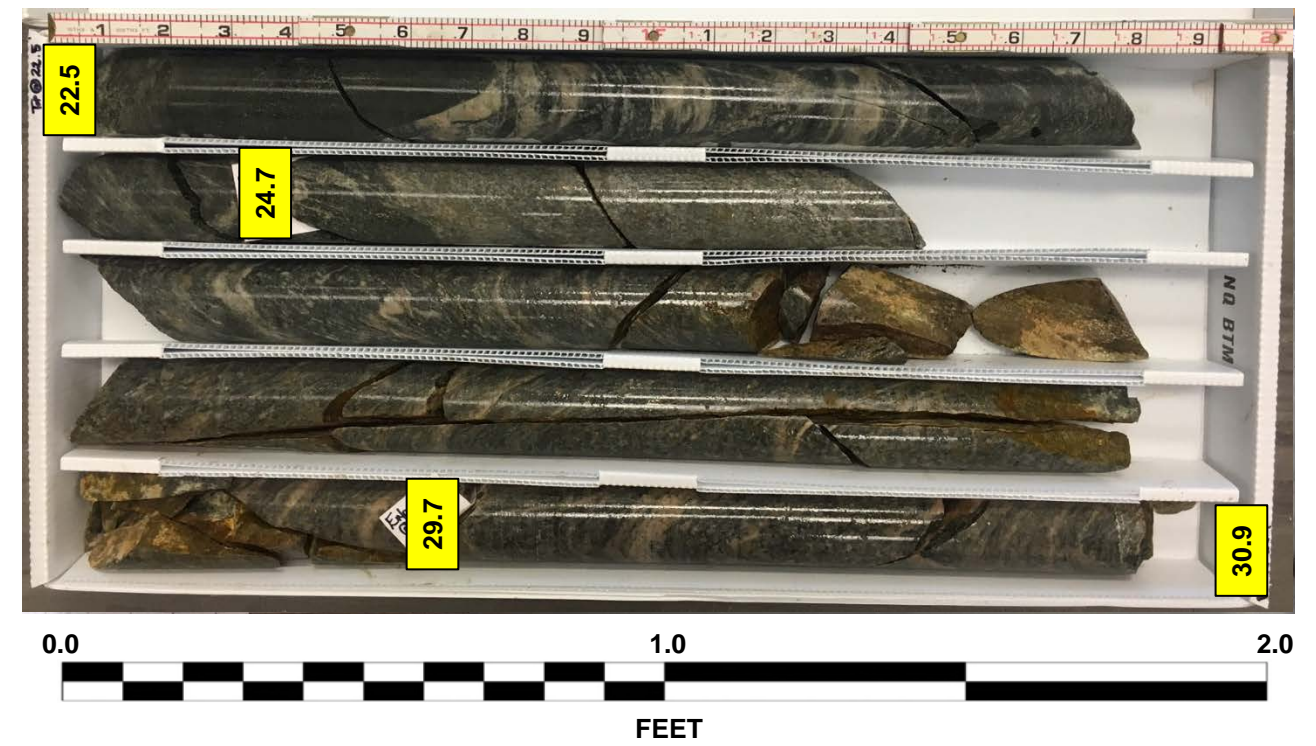
U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET
DRY



U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 1 of 4: 11.1 FEET
WET



U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET
WET

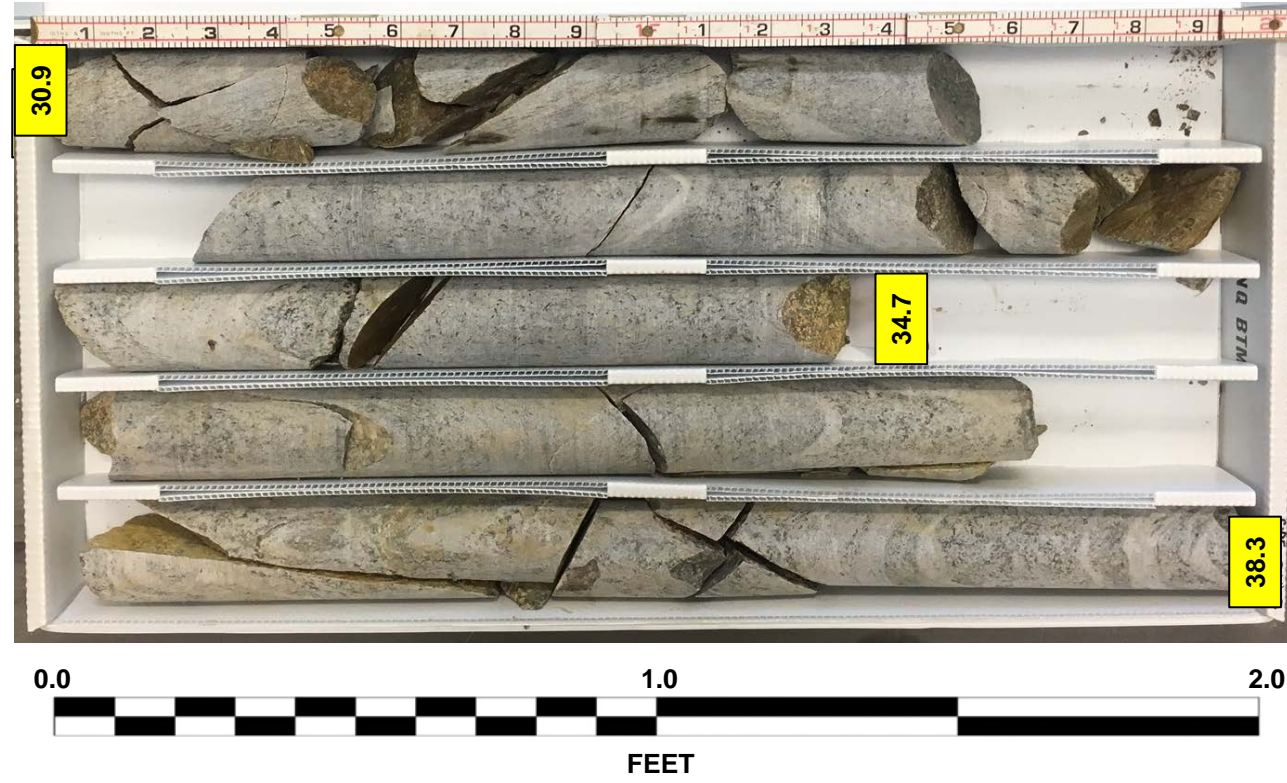


CORE PHOTOGRAPHIC RECORD

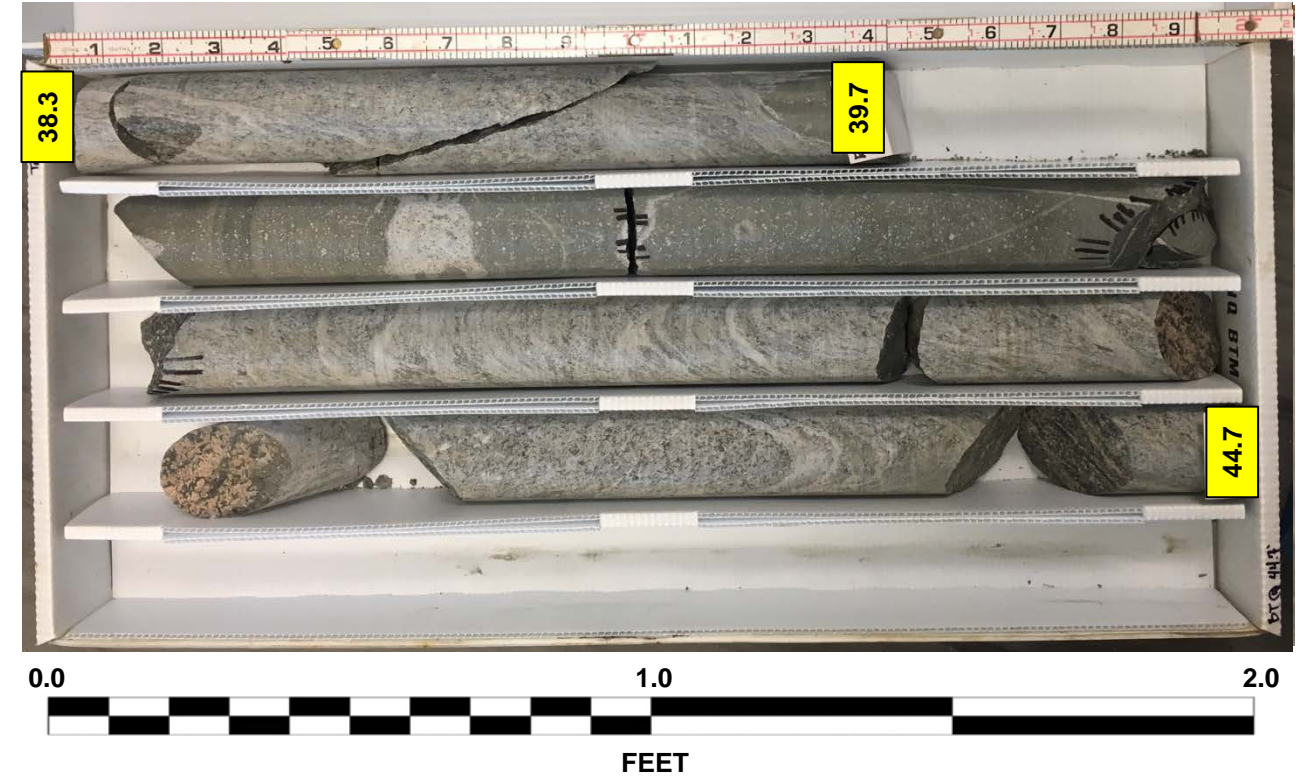
U-5738

SR2526 (Julian Road) widening- Bridge over Town Creek

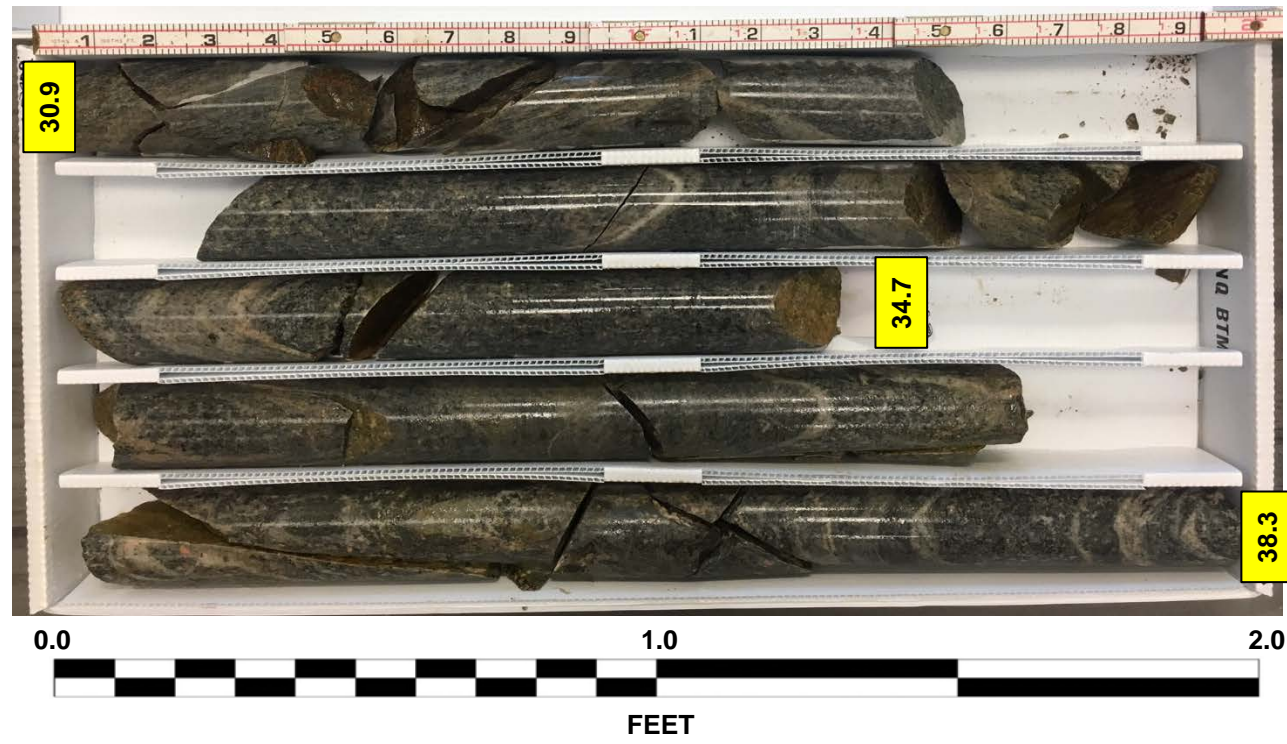
U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 3 of 4: 7.4 FEET
DRY



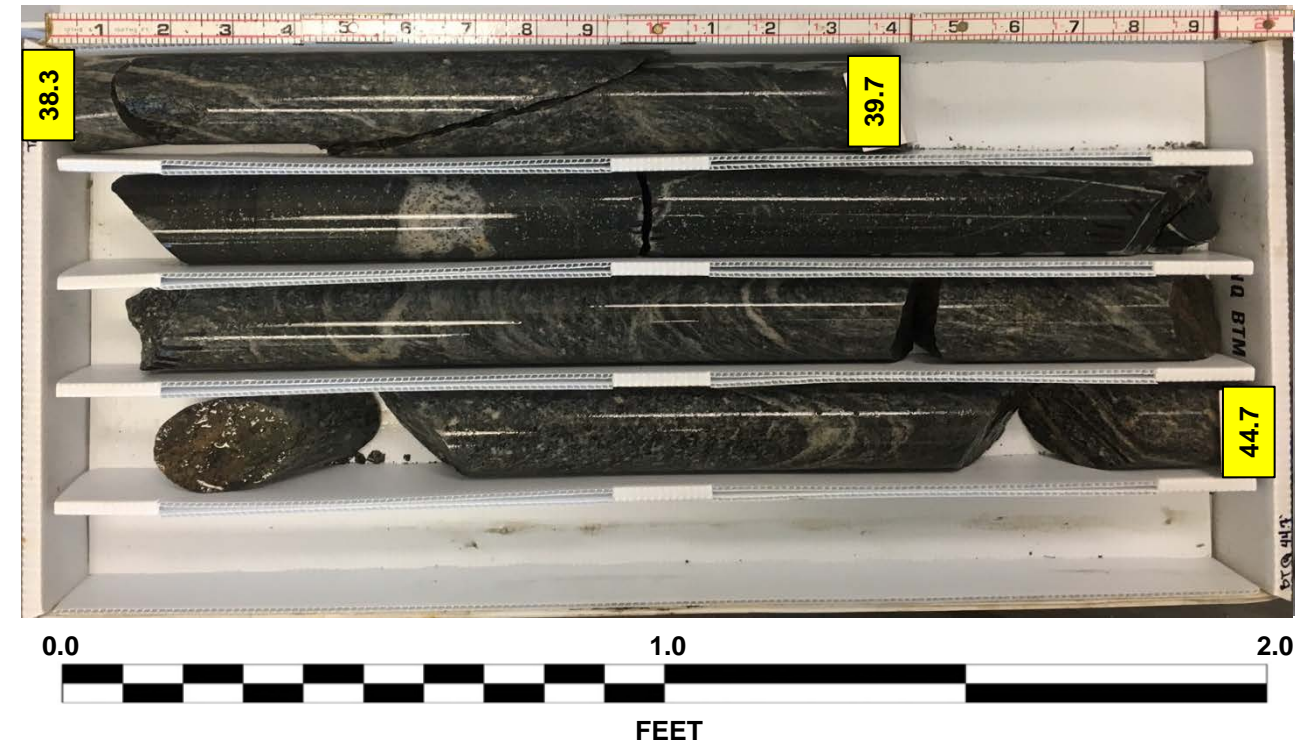
U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 4 of 4: 8.4 FEET
DRY



U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 3 of 4: 7.4 FEET
WET



U-5738 – B1-A
STA. 27+53 @ 27' Rt. Box 4 of 4: 8.4 FEET
WET



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
ST- 1	12 RT	70+09	9.7- 11.7	A-7-6(13)	49	22	16	19	41.3	23.7	93.4	85.2	63.2	37.0	-

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

<i>SAMPLE NO.</i>	<i>BORING NO.</i>	<i>DEPTH (FT.)</i>	<i>ROCK TYPE</i>	<i>GEOLOGIC MAP UNIT</i>	<i>RUN RQD</i>	<i>LENGTH (FT)</i>	<i>DIAMETER (FT)</i>	<i>UNIT WEIGHT (PCF)</i>	<i>UNCONFINED COMPRESSIVE STRENGTH (PSI)</i>	<i>YOUNG'S MODULUS (PSI)</i>	<i>SPLITTING TENSILE STRENGTH (PSI)</i>	<i>REMARKS</i>
RS- 1	B1- A	32. 3- 32. 95	GRANITE	DSg	44%	0. 358	0. 166	168	18390	-	-	-
RS- 2	L- EB1- B	40. 2- 40. 85	METATUFF	CVZ	18%	0. 355	0. 166	170	3492	-	-	-
RS- 3	L- EB1- C	57. 3- 58. 1	METATUFF	CVZ	36%	0. 378	0. 166	171	10336	-	-	-



Photo 1: Looking upstream Town Creek

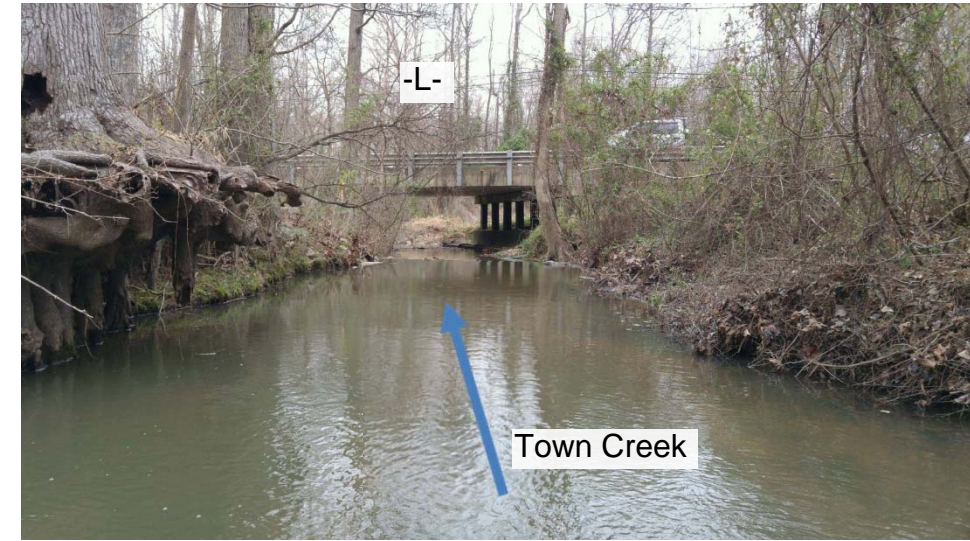


Photo 2: Looking downstream Town Creek



Photo 3: Looking South (Down-Station) along SR 2526 (Julian Road)