

REFERENCE: U-5108

PROJECT: 42370

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG
 PROJECT DESCRIPTION NORTHCROSS DRIVE EXTENSION
FROM EXISTING END OF NORTHCROSS DRIVE
TO WESTMORELAND DRIVE
 SITE DESCRIPTION BRIDGE NO. 591403 ON NORTHCROSS
DRIVE EXTENSION OVER MCDOWELL CREEK
-L- STA. 74 + 01

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5108	1	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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

P.M. WEAVER

C.R. PASTRANA

D.M. NANCE

B.R. LONG

HPC

HDR

INVESTIGATED BY ESP Associates, Inc.

DRAWN BY C.R. PASTRANA

CHECKED BY P.M. WEAVER

SUBMITTED BY ESP Associates, Inc.

DATE November 2023

ESP ASSOCIATES, INC.
 7011 ALBERT PICK RD
 SUITE E
 GREENSBORO, NC 27409
 FIRM # C-0587
 WWW.ESPASSOCIATES.COM



SIGNATURE _____ DATE _____

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																				
<p>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</p>										<p>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.</p>										<p>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 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:</p>										<p>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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (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 (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																				
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U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270																																																																																																																																																																																																												
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BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)																																																																																																																																																																																																												
GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005																																																																																																																																																																																																											
	IN.	12	3																																																																																																																																																																																																															
SOIL MOISTURE - CORRELATION OF TERMS										ABBREVIATIONS										FRACTURE SPACING										BEDDING																																																																																																																																																																																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT PL - PLASTIC LIMIT</td> <td>- SATURATED - (SAT.) - WET - (W)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE SHRINKAGE LIMIT</td> <td>- MOIST - (M) - DRY - (D)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>										SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT PL - PLASTIC LIMIT	- SATURATED - (SAT.) - WET - (W)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M) - DRY - (D)	SOLID; AT OR NEAR OPTIMUM MOISTURE REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	<p>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 HI. - 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 W - UNIT WEIGHT W_d - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p>										<p>TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET</p>										<p>TERM THICKNESS VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET</p>																																																																																																																																																																											
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PLASTICITY										EQUIPMENT USED ON SUBJECT PROJECT										INDURATION										NOTES:																																																																																																																																																																																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td>6-15</td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>16-25</td> <td>26 OR MORE</td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td></td> <td></td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td></td> <td></td> <td>HIGH</td> </tr> </table>										NON PLASTIC	PLASTICITY INDEX (PI)		DRY STRENGTH		0-5	6-15	VERY LOW	SLIGHTLY PLASTIC	16-25	26 OR MORE	SLIGHT	MODERATELY PLASTIC			MEDIUM	HIGHLY PLASTIC			HIGH	<p>DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> D-50</p> <p>ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG-CARB. <input checked="" type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE: <input type="checkbox"/> -B <input type="checkbox"/> -H <input checked="" type="checkbox"/> -N Q</p> <p>HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST</p>										<p>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.</p>										<p>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.</p>																																																																																																																																																																
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HIGHLY PLASTIC			HIGH																																																																																																																																																																																																															
COLOR										BENCH MARK: FILE 'U5108_Is_tin.tin' WAS USED TO DETERMINE GROUND ELEVATION AT BORINGS										ELEVATION: FEET										DATE: 8-15-14																																																																																																																																																																																				
<p>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.</p>										<p>NOTES: F.J.A.D. = FILLED IMMEDIATELY AFTER DRILLING</p>																																																																																																																																																																																																								

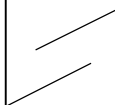
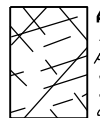
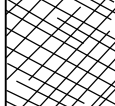
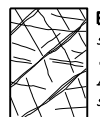





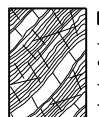


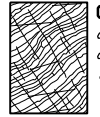

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

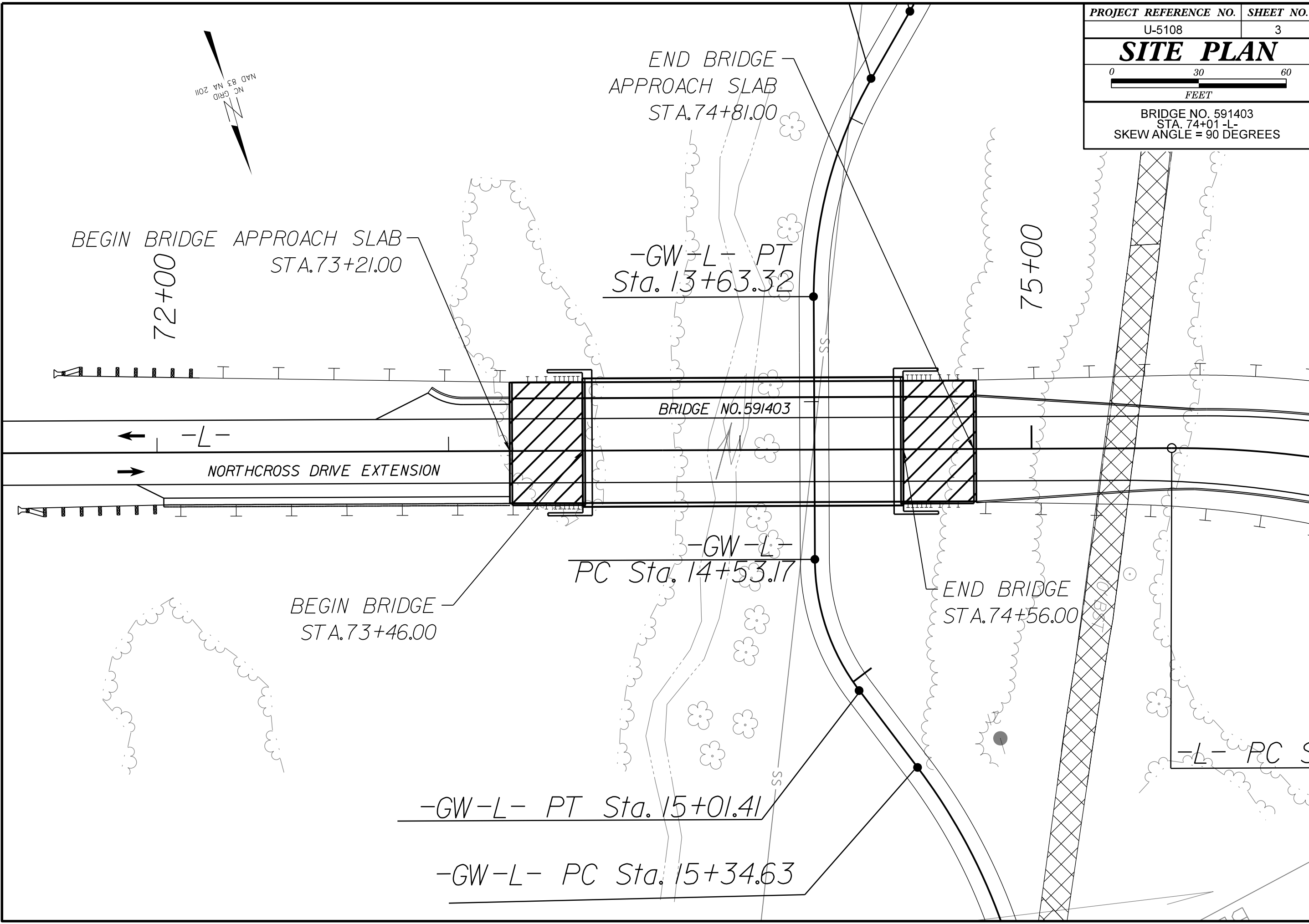
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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)					
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	GOOD	FAIR	POOR	VERY POOR	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	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60	50				C. Sandstone and siltstone in similar amounts		50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40				D. Siltstone or silty shale with sandstone layers		40				
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				30			E. Weak siltstone or clayey shale with sandstone layers			30			
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A		20			F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure				20		
					10			G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers					10	
								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.						10

→ Means deformation after tectonic disturbance

PROJECT REFERENCE NO.	SHEET NO.
U-5108	3
SITE PLAN	
BRIDGE NO. 591403 STA. 74+01 -L- SKEW ANGLE = 90 DEGREES	



BEGIN BRIDGE APPROACH SLAB
STA. 73+21.00

72+00

END BRIDGE
APPROACH SLAB
STA. 74+81.00

-GW-L-PT
Sta. 13+63.32

75+00

BRIDGE NO. 591403

NORTHCROSS DRIVE EXTENSION

BEGIN BRIDGE
STA. 73+46.00

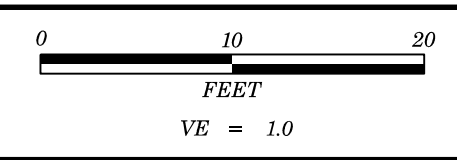
-GW-L-PC
Sta. 14+53.17

END BRIDGE
STA. 74+56.00

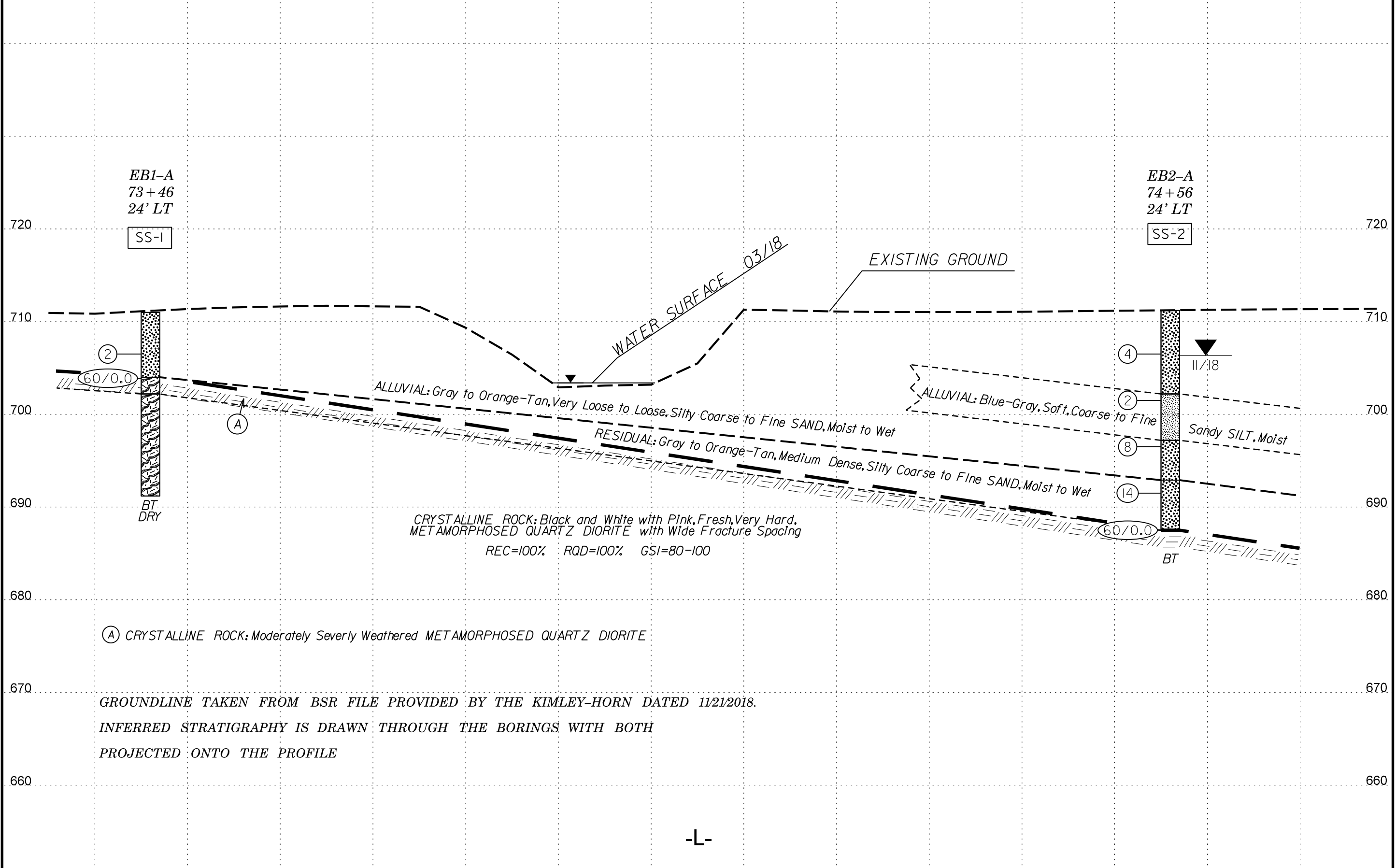
-GW-L-PT Sta. 15+01.41

-GW-L-PC Sta. 15+34.63

-L-PC S



PROJECT REFERENCE NO.	SHEET NO.
U-5108	4
PROFILE BORINGS PROJECTED ALONG -L-	



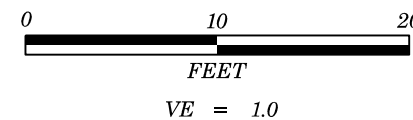
73+50

74+00

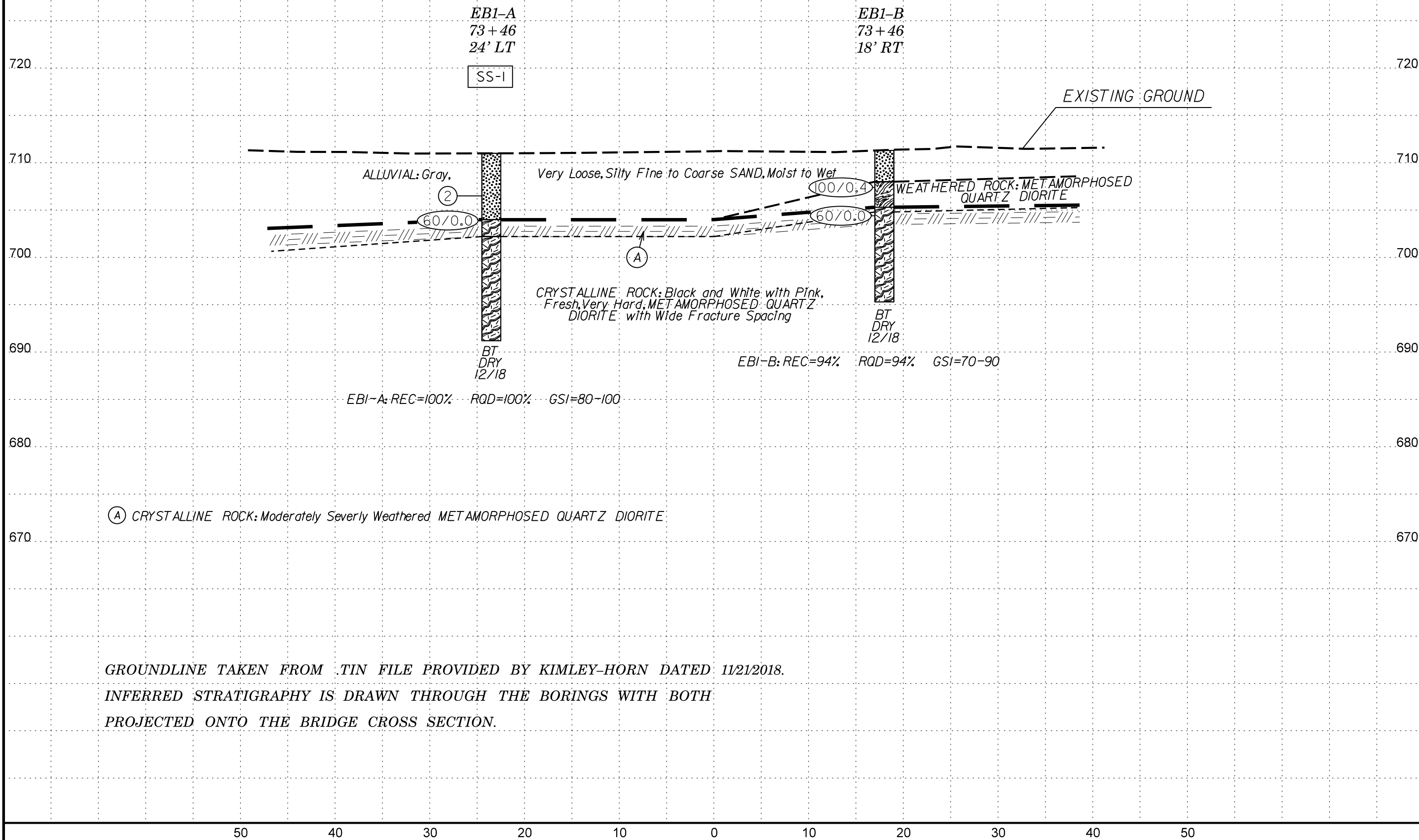
74+50

-L-

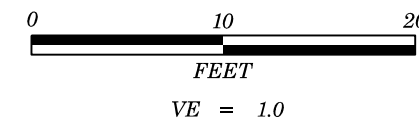
-L- 73+46



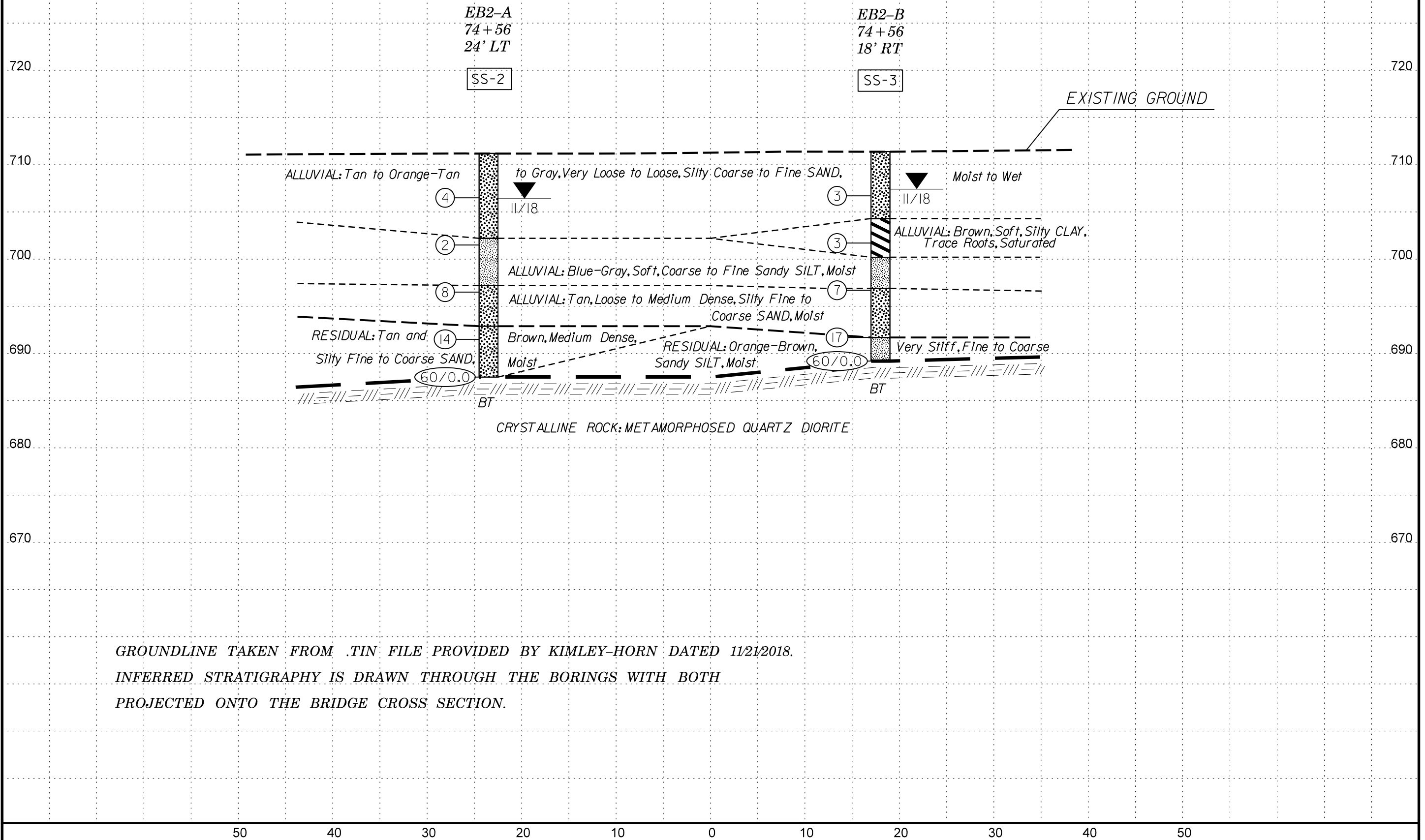
PROJECT REFERENCE NO.	SHEET NO.
U-5108	5
SECTION THROUGH END BENT 1 SKEW = 90 DEGREES	



-L- 74+56



PROJECT REFERENCE NO.	SHEET NO.
U-5108	6
SECTION THROUGH END BENT 2	
SKEW = 90 DEGREES	



GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY KIMLEY-HORN DATED 11/21/2018.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE BRIDGE CROSS SECTION.

50 40 30 20 10 0 10 20 30 40 50

CORE PHOTOGRAPHS

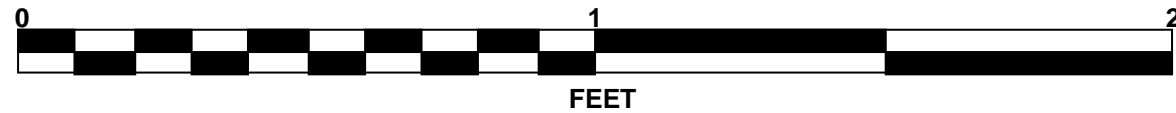
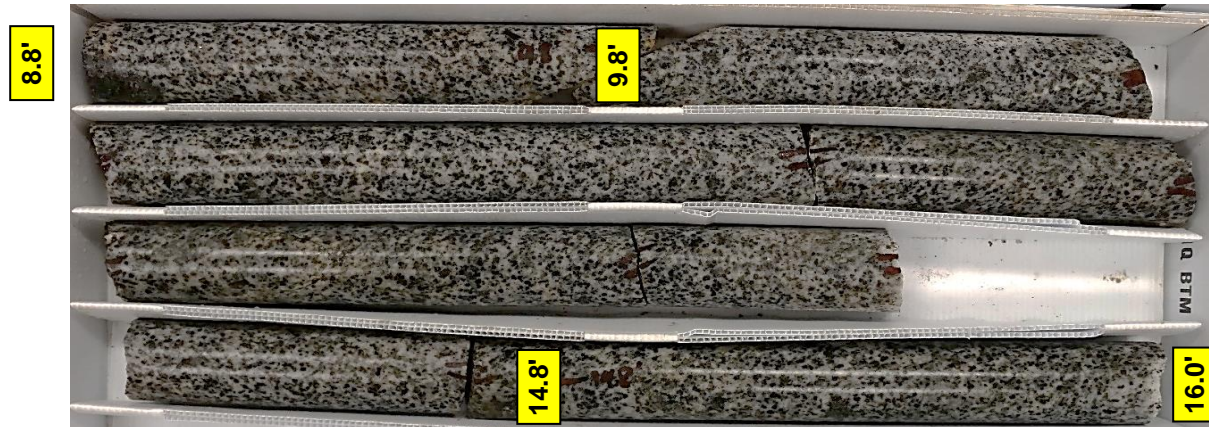
WBS No. 42370.1.1

TIP No. U-5108

Project Description: Bridge No. 591403 on Northcross Drive Extension
Over McDowell Creek
Mecklenburg County, North Carolina

EB1-A

Box 1: 8.8 Feet to 16.0 Feet



CORE PHOTOGRAPHS

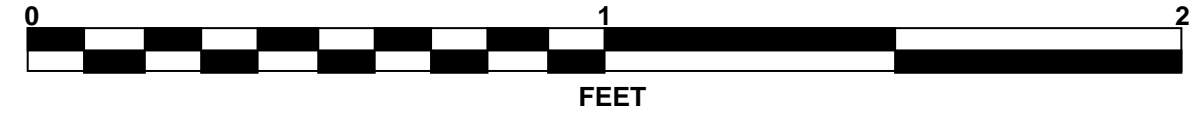
WBS No. 42370.1.1

TIP No. U-5108

Project Description: Bridge No. 591403 on Northcross Drive Extension
Over McDowell Creek
Mecklenburg County, North Carolina

EB1-A

Box 2: 16.0 Feet to 19.8 Feet



CORE PHOTOGRAPHS

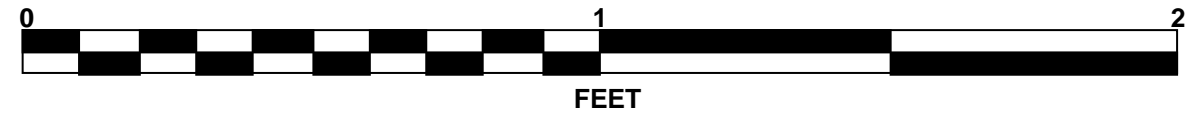
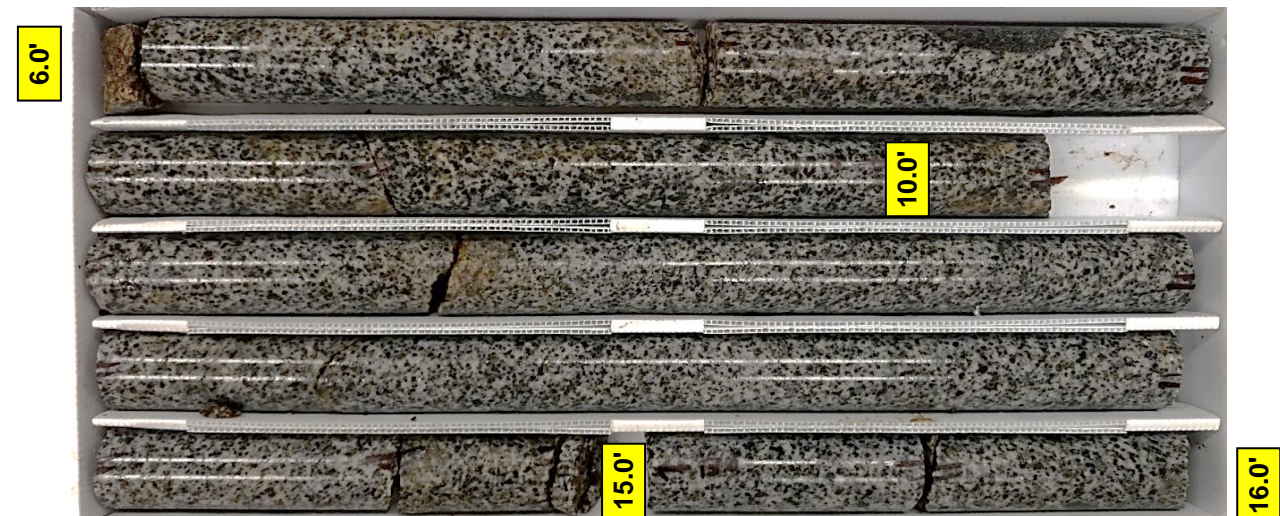
WBS No. 42370.1.1

TIP No. U-5108

Project Description: Bridge No. 591403 on Northcross Drive Extension
Over McDowell Creek
Mecklenburg County, North Carolina

EB1-B

Box 1: 6.0 Feet to 16.0 Feet



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 42370.1.1		TIP U-5108		COUNTY MECKLENBURG		GEOLOGIST Long, B.									
SITE DESCRIPTION Bridge No. 591403 on Northcross Drive Extension Over McDowell Creek							GROUND WTR (ft)								
BORING NO. EB2-A		STATION 74+56		OFFSET 24 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 711.2 ft		TOTAL DEPTH 23.7 ft		NORTHING 626,358		EASTING 1,440,795									
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 84% 01/10/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Kiker, Z.		START DATE 11/06/18		COMP. DATE 11/06/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
715															
710														711.2	GROUND SURFACE
															ALLUVIAL
															Tan, Silty Coarse to Fine SAND
	707.5	3.7		2	2	2									
	705														
	702.5	8.7		2	1	1								702.2	Blue-Gray, Coarse to Fine Sandy SILT
	700														
	697.5	13.7		1	3	5								697.2	Tan, Silty Fine to Coarse SAND
	695														
	692.5	18.7		8	7	7								692.9	RESIDUAL
	690														Tan and Brown, Silty Fine to Coarse SAND
	687.5	23.7												687.5	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 687.5 ft on Crystalline Rock: METAMORPHOSED QUARTZ DIORITE

WBS 42370.1.1		TIP U-5108		COUNTY MECKLENBURG		GEOLOGIST Long, B.									
SITE DESCRIPTION Bridge No. 591403 on Northcross Drive Extension Over McDowell Creek							GROUND WTR (ft)								
BORING NO. EB2-B		STATION 74+56		OFFSET 18 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 711.4 ft		TOTAL DEPTH 22.2 ft		NORTHING 626,397		EASTING 1,440,807									
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 84% 01/10/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Kiker, Z.		START DATE 11/06/18		COMP. DATE 11/06/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
715															
710														711.4	GROUND SURFACE
															ALLUVIAL
															Orange-Tan to Gray, Silty Coarse to Fine SAND
	707.7	3.7		2	1	2									
	705														
	702.7	8.7		1	1	2								704.3	Brown, Silty CLAY, Trace Roots
	700														
	697.7	13.7		2	2	5								700.2	Blue-Gray, Coarse to Fine Sandy SILT
	695														
	692.7	18.7		4	6	11								696.9	Tan, Silty Coarse to Fine SAND
	690														
	689.2	22.2												691.7	RESIDUAL
															Orange-Brown, Fine to Coarse Sandy SILT
															Boring Terminated with Standard Penetration Test Refusal at Elevation 689.2 ft on Crystalline Rock: METAMORPHOSED QUARTZ DIORITE

NCDOT BORE DOUBLE U5108_GINTLOGS.GPJ NC_DOT.GDT 2/11/19

SOILS LABORATORY TESTS RESULTS

WBS NO.: 42370.1.1

TIP NO.: U-5108

COUNTY: Mecklenburg

SITE DESCRIPTION: Bridge No. 591403 on Northcross Drive Extension Over McDowell Creek

BORING NO.	SAMPLE NO.	BORING LOCATION	DEPTH INTERVAL (FT)	AASHTO CLASS	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-A	SS-1	-L- STA. 73+46, 24' LT	3.5-5.0	A-2-4 (0)	2	NP	NP	61	26	5	8	99	57	16	22.3	-
EB2-A	SS-2	-L- STA. 74+56, 24' LT	8.7-10.2	A-4 (1)	2	31	7	19	41	21	19	100	93	49	36.6	-
EB2-B	SS-3	-L- STA. 74+56, 18' RT	8.7-10.2	A-7-6 (6)	3	41	20	28	28	17	27	95	80	47	26.2	-

Signed: 

NCDOT Certification No. 129-04-0411