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810 Š Ä REFERENCE **CONTENTS** 

**DESCRIPTION** 

LEGEND (SOIL & ROCK)

SUPPLEMENTAL LEGEND (GSI)

BORE LOG(S), CORE REPORT(S), CORE PHOTOGRAPH(S)

TITLE SHEET

SITE PLAN

CROSS SECTION(S)

ROCK TEST RESULTS

SITE PHOTOGRAPH(S)

SHEET NO.

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4-10

11-31

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#### STATE OF NORTH CAROLINA

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

#### **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY \_CABARRUS SITE DESCRIPTION BRIDGE NO. 22 ON NC 24/27 EBL OVER ROCKY RIVER

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5810	1	33

#### **CAUTION NOTICE**

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CENERAL 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 (INP-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 NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE TOTAL WITH THE 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 OF FOR ANY TEASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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  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.

J.K. STICKNEY C.L. SMITH INVESTIGATED BY J.K. STICKNEY DRAWN BY \_T.T. WALKER CHECKED BY J.E. BEVERLY SUBMITTED BY \_\_K.B. MILLER



DATE JULY 2019

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

PROJECT REPERENCE NO.	SHEET NO.
B-5810	2

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

### SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

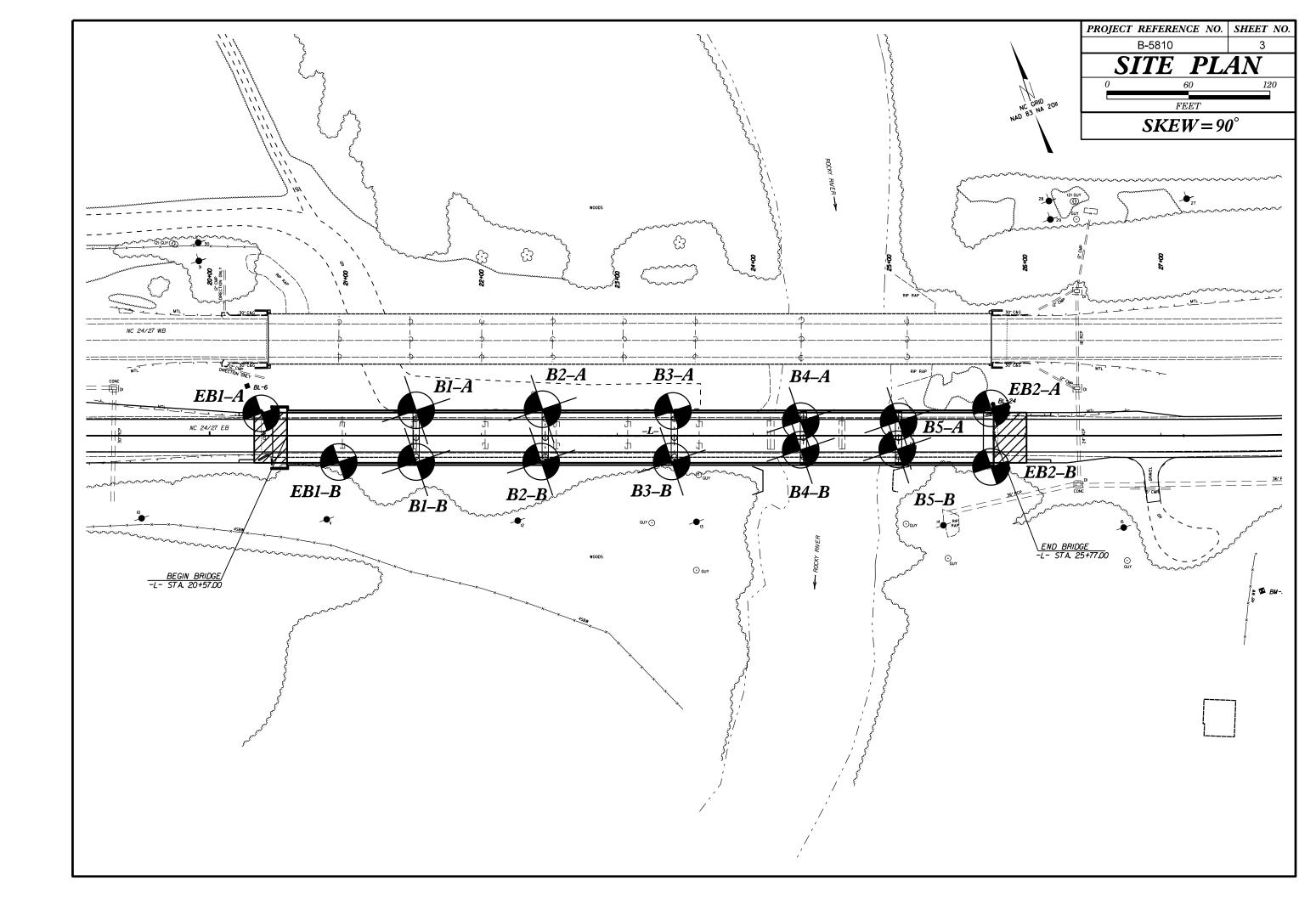
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FILLIGHT POWER AUGER AND YIELD LESS THAN 100 BLUWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DISBÓ). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLIONING; CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO LCASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS	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 Ø.I FOOT PER 6Ø BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	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.
AS MINERALOGICAL COMPOSITION, ANOULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SLLY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6  SOIL LEGEND AND AASHTO CLASSIFICATION  GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	THE ANGULARITY OR ROUNDIESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:  ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.  MINERALOGICAL COMPOSITION	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.	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
CLASS.   CLASS.   CLASS   C	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.  COMPRESSIBILITY	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 SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED.	SURFACE.  CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31  MODERATELY COMPRESSIBLE LL = 31 - 50  HIGHLY COMPRESSIBLE LL > 50	ROCK (NCR)  ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD  SEDIMENTARY ROCK  SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED  SHELL BEOS, ETC.	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.
**10		FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	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
PASSING *40  LL	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%  MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%  HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	VERY SLIGHT (V SLI.)  ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.)  CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	HORIZONTAL. <u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF ORGANIC USUAL TYPES STONE FRACS. OF MAJOR GRAVEL AND SAND SOILS SOILS SOILS		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO  (SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	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.
GEN. RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITAB	─────────────────────────────────────	MODERATE 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.	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.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 :PI OF A-7-6 SUBGROUP IS > LL - 30  CONSISTENCY OR DENSENESS  COMPACTNESS OR RANGE OF STANDARD PENETRATION RESISTENCE COMPRESSIVE TENGTH CONSISTENCY  CONSISTENCY  PRIMARY SOIL TYPE  CONSISTENCY  CONSISTEN	MISCELLANEOUS SYMBOLS  ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	MODERATELY SEVERE MOD. SEV.) MOD.	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
GENERALLY VERY LOOSE	with soil description of rock structures  soil symbol of rock structures  spot out test boring Slope indicator installation  artificial fill (AF) Other Only of the structure of	SEVERE ALL ROCK EXCEPT QUARITZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEY.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	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.
DENSE   30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING SOUNDING ROD	VERY  ALL ROCK EXCEPT QUARIZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.)  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 &lt; 100 BPF</u>	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.
SILT-CLAY   MEDIUM STIFF   4 TO 8   0.5 TO 1.0	TIETTE INFERRED ROCK LINE  MONITORING WELL  TEST BORING WITH CORE  TEST BORING WITH CORE  TEST BORING WITH CORE INSTALLATION  SPT N-VALUE	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 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.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE	UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  SHALLOW UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	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.	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.
GRAIN MM 305 75   2.0   0.25   0.005   0.0005	ABBREVIATIONS  AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA, - MICACEOUS WEA, - WEATHERED	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.  MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS  SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 <sub>d</sub> - DRY UNIT WEIGHT CSE - COARSE	HARD  CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.  SOFT  CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	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.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	DPT - DYNAMIC PENETRATION TEST   SAP SAPROLITIC   S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.  VERY  CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT  OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	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.
PLASTIC - WET - (W) SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS 20 - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	FINGERNAIL.           FRACTURE SPACING         BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.    BENCH MARK: BL-6: -BL- 19+41.82; N: 551070.2340, E: 1559978.6410   B-5810-3: -BL- 24+90.80; N:550880.752, E: 1560493.888
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT  - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE  - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE  - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	DRILL UNITS:  ORILL UNITS:  CME-45C  CME-55  DRILL UNITS:  ADVANCING TOOLS:  CLAY BITS  CME-55  CME-55  CME-55  CME-55  CME-6*  CONTINUOUS FLIGHT AUGER  CORE SIZE:	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         THINKLY BEDDED         0.16 - 1.5 FEET           CLOSE         0.16 TO 1 FOOT         VERY THINKLY BEDDED         0.03 - 0.16 FEET           VERY CLOSE         LESS THAN 0.16 FEET         THICKLY LAMINATED         0.008 FEET           THINKLY LAMINATED         < 0.008 FEET	BL-6 ELEVATION: 504.22 FEET B-5810-3 ELEVATION: 505.48 FEET  NOTES: NM= NOT MEASURED
PLASTICITY  PLASTICITY INDEX (PI) DRY STRENGTH	X 8* HOLLOW AUGERS	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC         0-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT           MODERATELY PLASTIC         16-25         MEDIUM           HIGHLY PLASTIC         26 OR MORE         HIGH	VANE SHEAR TEST   TUNGCARBIDE INSERTS   HAND TOOLS:   X CASING   W / ADVANCER   POST HOLE DIGGER     PORTABLE HOIST   TRICONE   'STEEL TEETH   HAND AUGER	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.	
COLOR  DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY), MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	X CME-550X TRICONE TRICONE SOUNDING ROD VANE SHEAR TEST	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.	DATE: 8-15-14

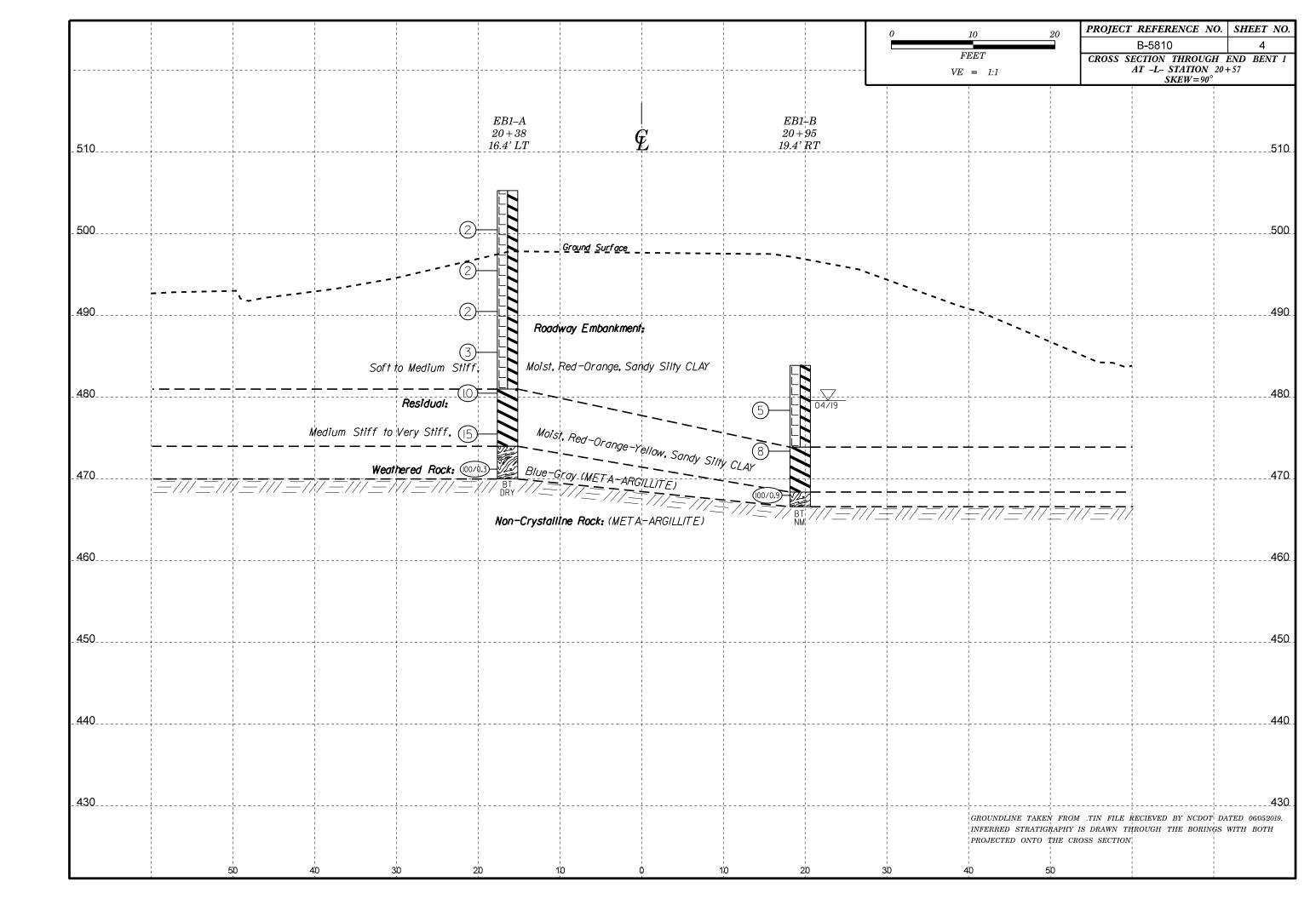
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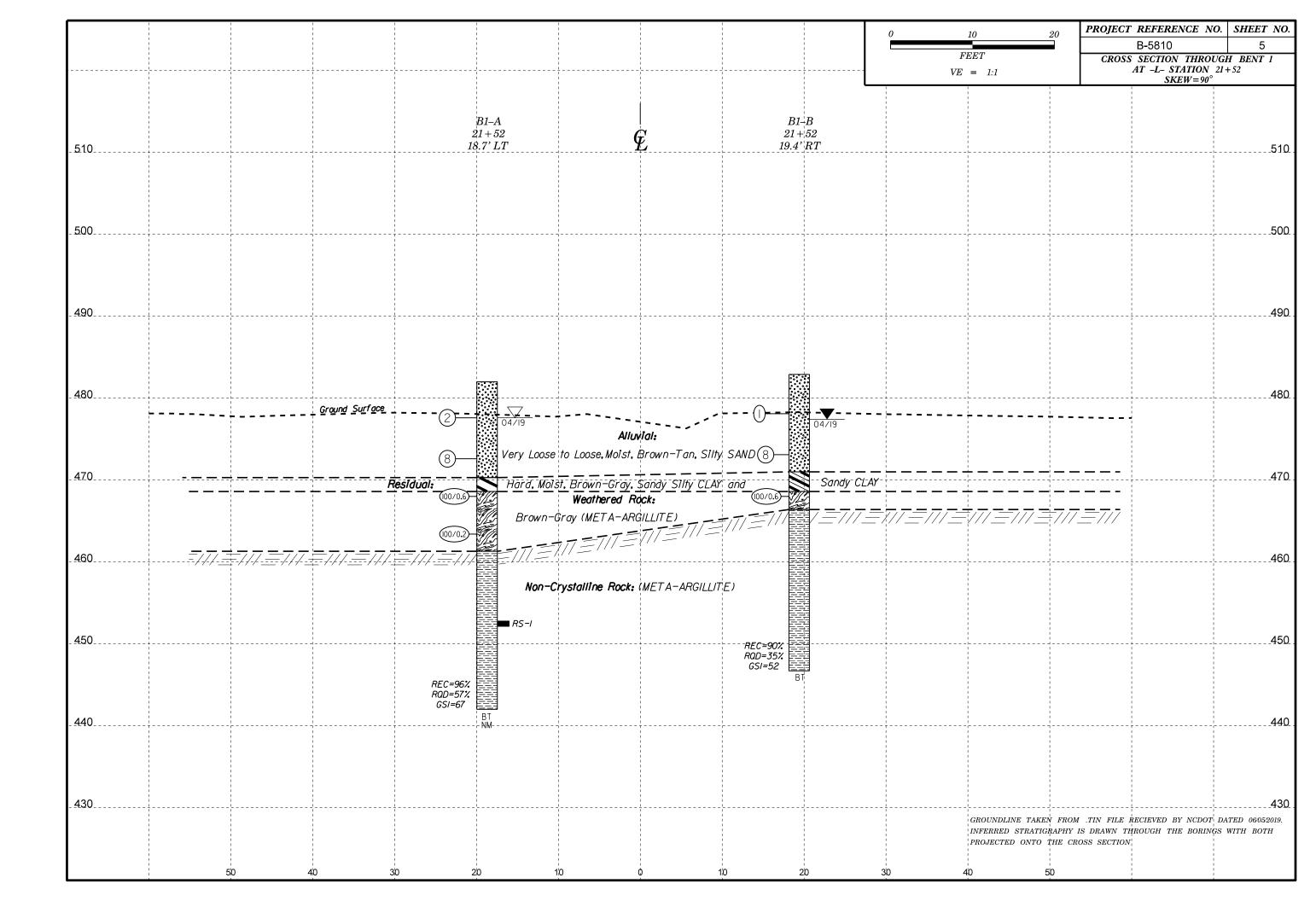
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

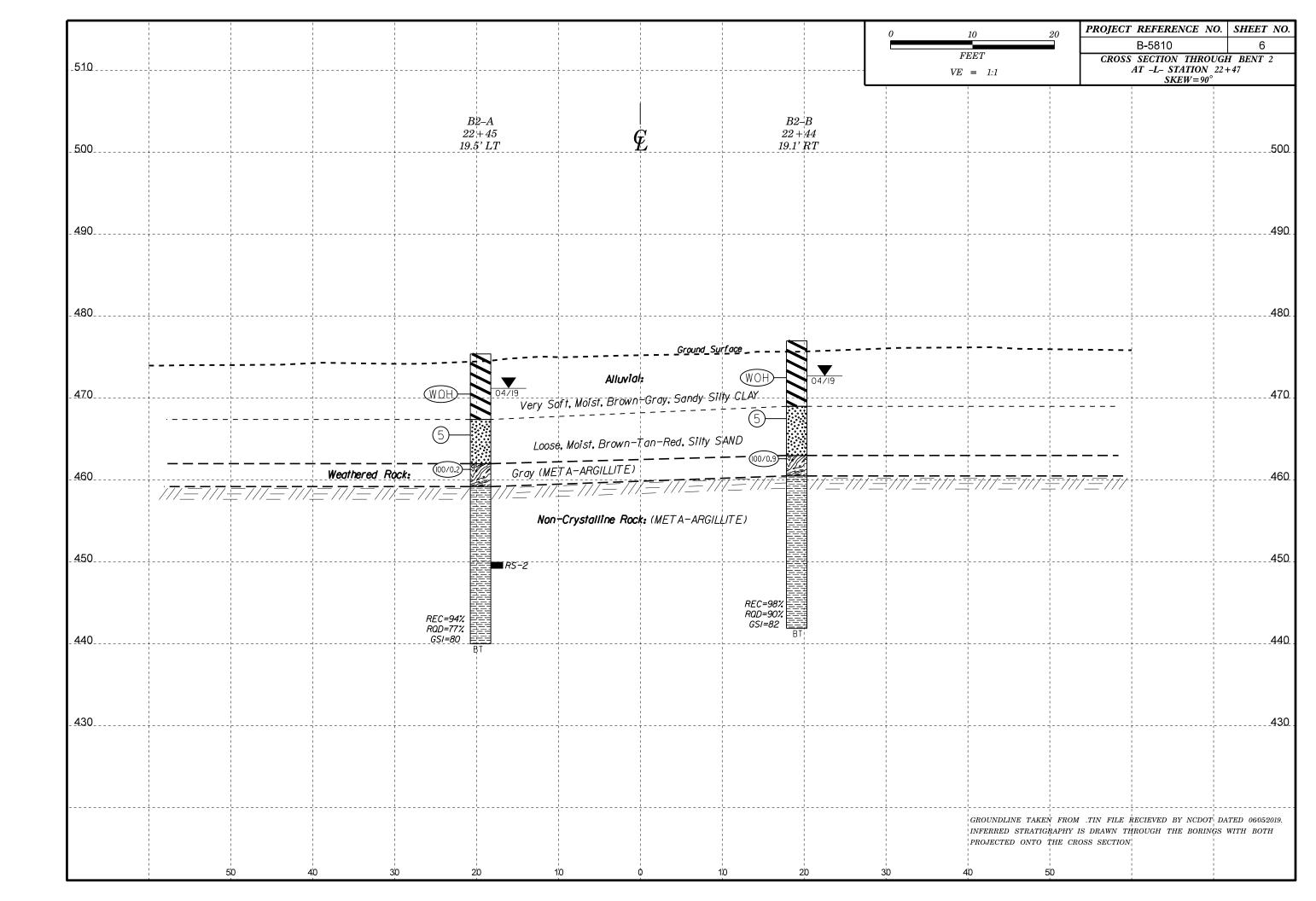
## SUBSURFACE INVESTIGATION

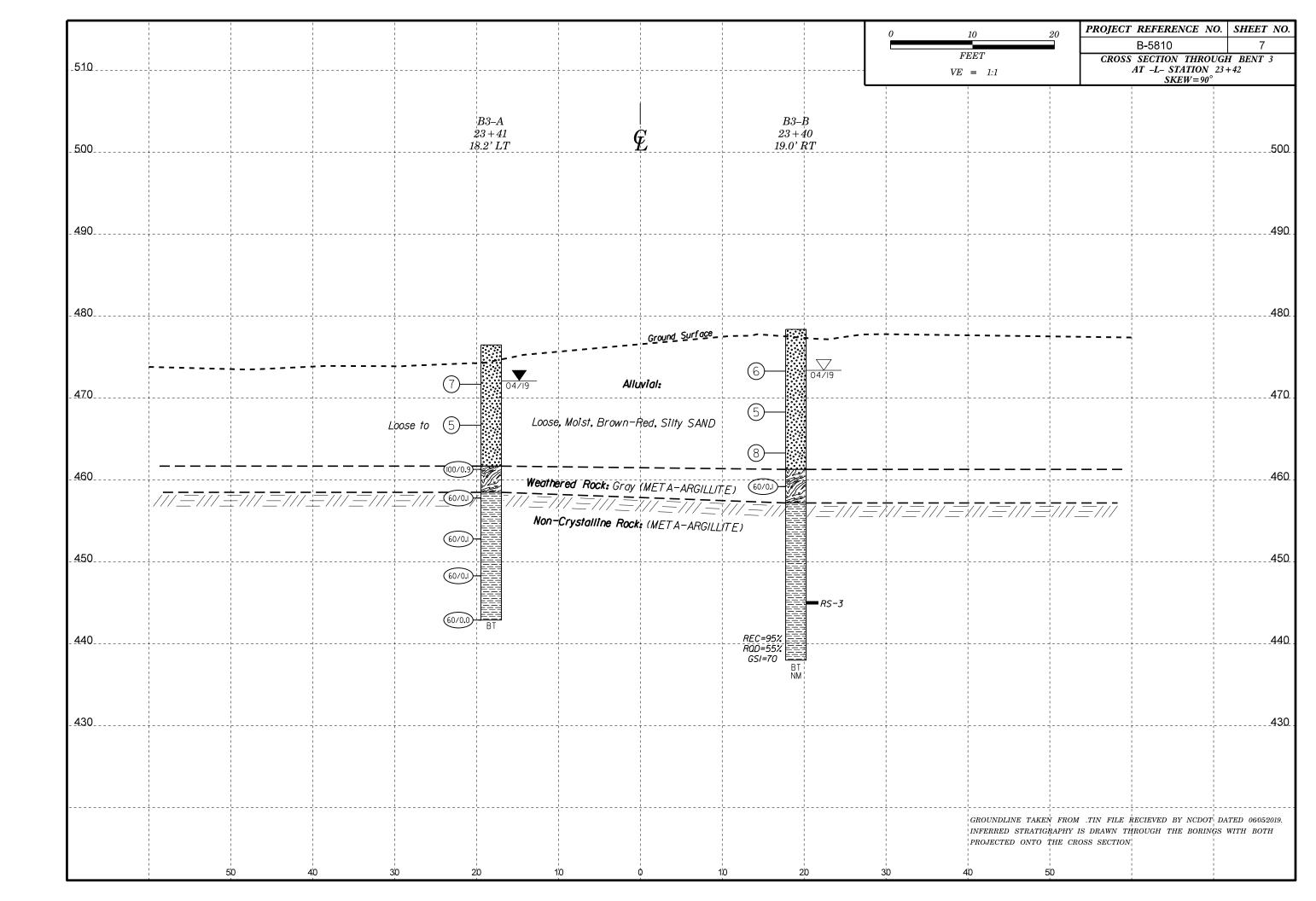
	SUPPLE.	MENTAL LEGEND, GEO FROM AASHTO LRFD	OLOGIC D BRID	AL STRENGTH INDEX (GSI) TABLES GE DESIGN SPECIFICATIONS		
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Joi	ted Rock Mass (Marinos and Ho	ek, 2000)		AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Def	ormed Heterogeneous Rock I	Masses (Marinos and Hoek, 2000)
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)  From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.  STRUCTURE	VERY GOOD Very rough, fresh unweathered surfaces Rough, slightly weathered, iron stained	Edition of the control of the contro	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	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.  COMPOSITION AND STRUCTURE	B   3	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 highlu weathered surfaces
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90 SECKE ASING	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 A	
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets  VERY BLOCKY - interlocked, partially disturbed mass with	CKING OF 80CK 90 90 90 90 90 90 90 90 90 90 90 90 90	50		B. Sand- stone with stone and sultstone layers of siltstone amounts  D. Siltstone or silty shale with sand- stone layers stone layers layers layers sandstone layers		C D E
multi-faceted angular blocks formed by 4 or more joint sets  BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	ASING INTERLOCK	40 30		C.D.E. and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.		30 F 20
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces  LAMINATED/SHEARED - Lack of	DECREA	20	10	G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers  H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.		G H <sub>1</sub> 10
blockiness due to close spacing of weak schistosity or shear planes	N/A N/A			─────────────────────────────────────	<u> </u>	DATE: 8

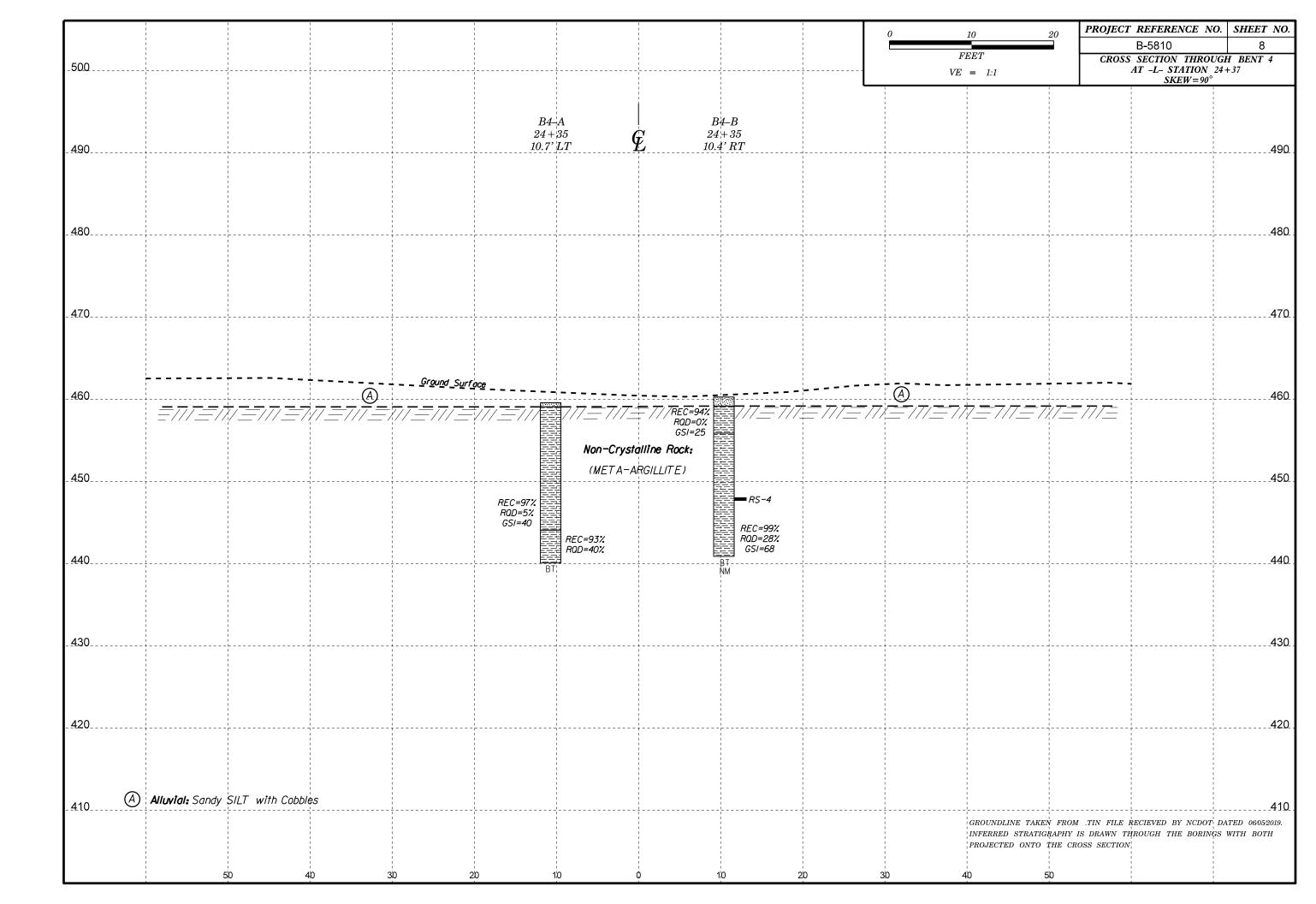


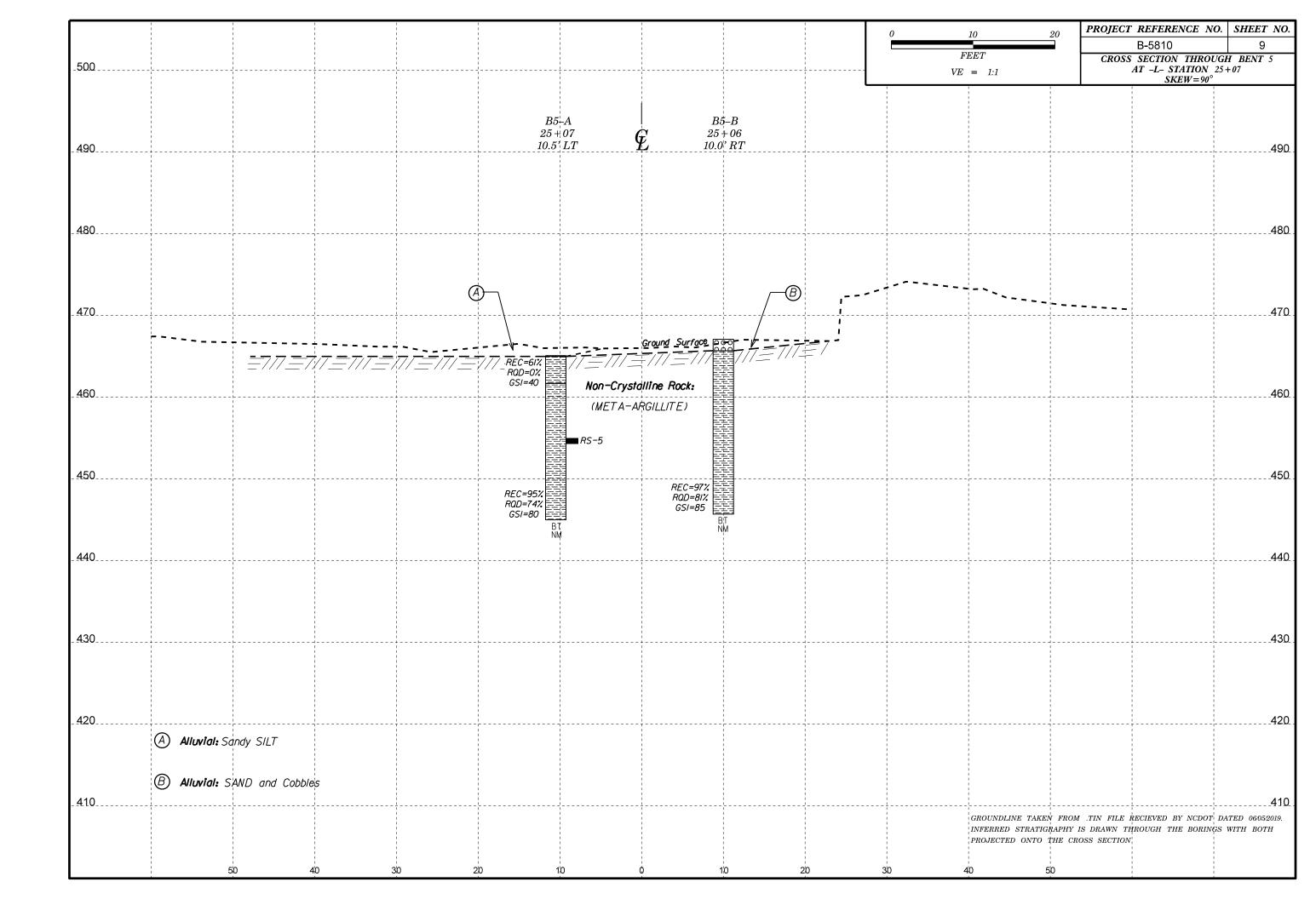


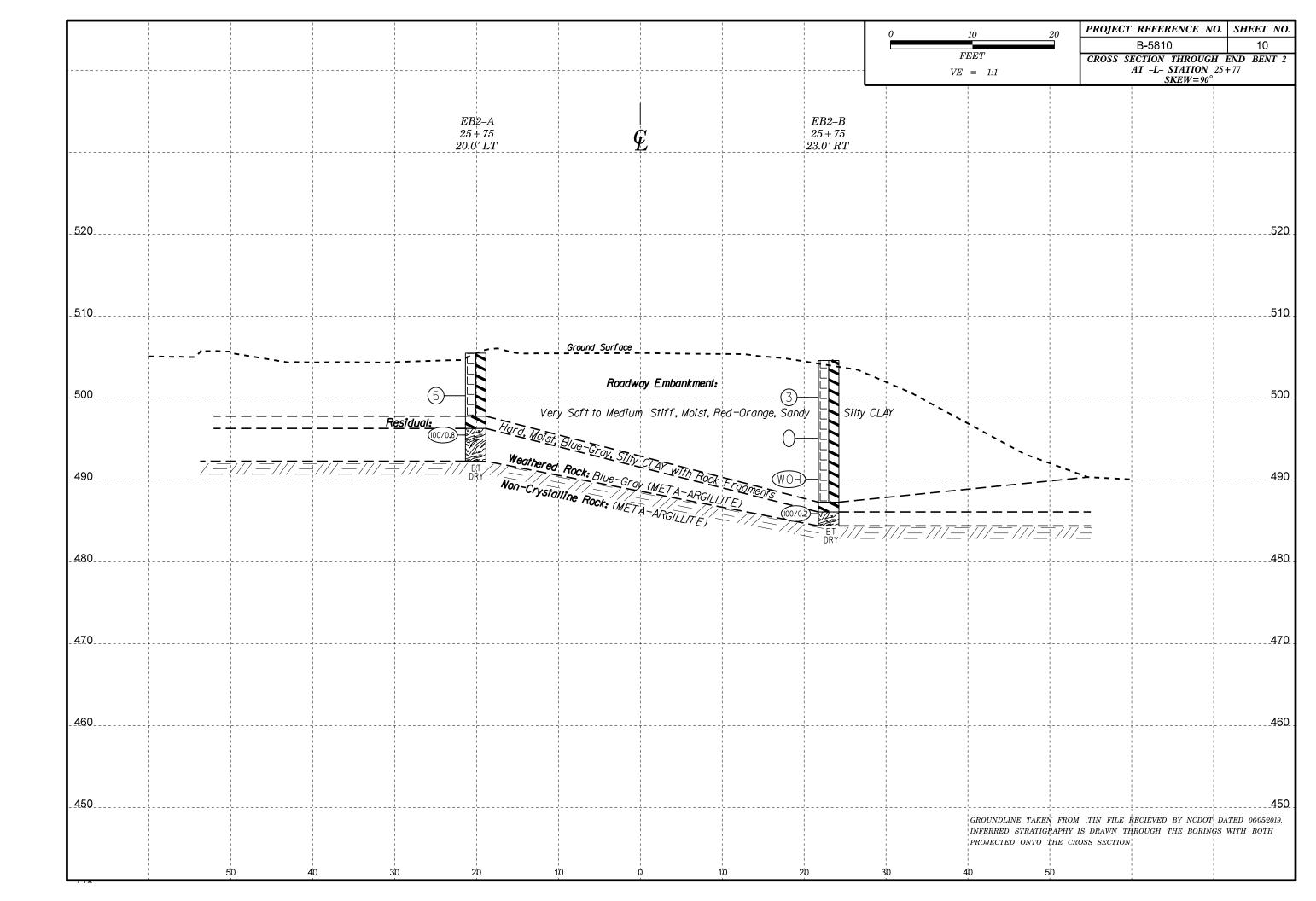


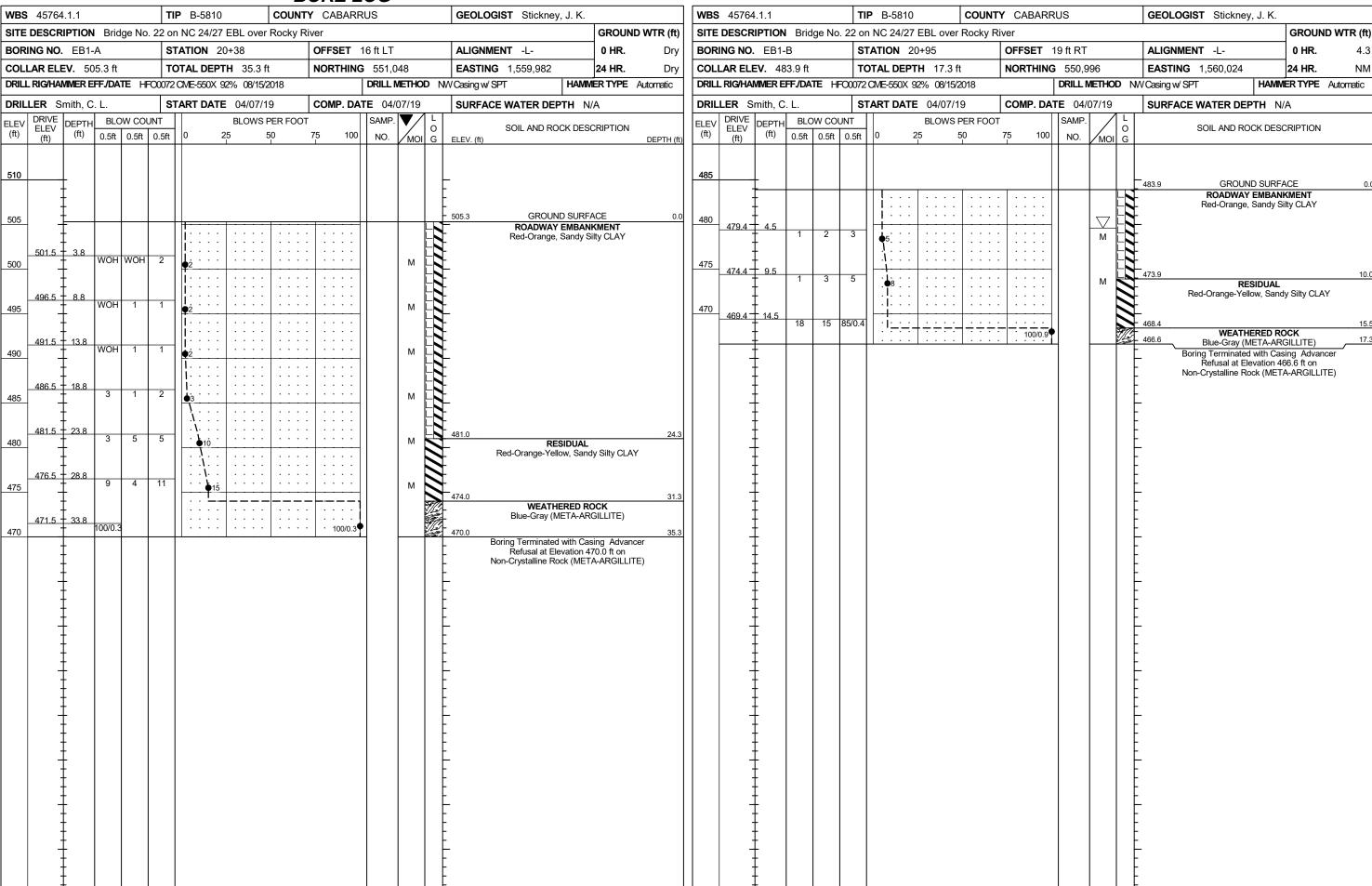










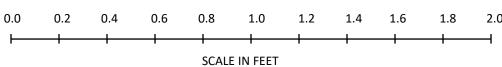


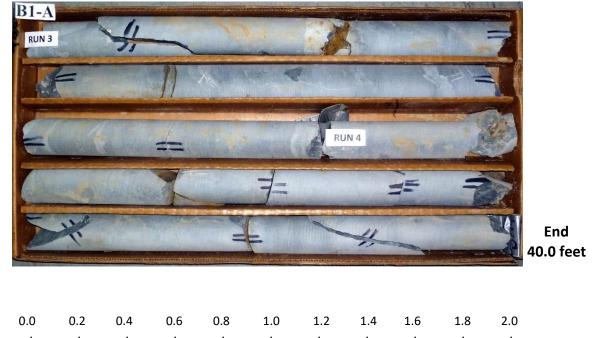
													JKE	<u></u>	<u>UG</u>			
NBS	457	64.1.	.1				TII	<b>P</b> B-5810			COU	NTY	CABA	RR	US			GEOLOGIST Stickney, J. K.
SITE	DESC	RIP	TION	Brid	dge N	o. 2	_	n NC 24/27			Rocky	y Riv	er					GROUND WTR (f
3ORI	ING N	O. [	B1-A				ST	TATION 2	1+52				OFFSE	Γ 1	9 ft LT			ALIGNMENT -L- 0 HR. 4.
COLI	LAR E	LEV.	. 48	2.0 ft			TC	OTAL DEP	TH 4	40.0 ft	t	- I	NORTH	ING	551,0	13		<b>EASTING</b> 1,560,091 <b>24 HR.</b> NI
ORILL	_ RIG/H	AMM	ER E	FF./D/	TE H	-IFO	0072	CME-550X	92% (	08/15/2	2018				DRILL N	/IETHO	D N	W Casing W/SPT & Core HAMMER TYPE Automatic
RIL	LER	Smit	th, C	. L.			ST	TART DAT	E 04	1/05/1	9		COMP.	DAT	<b>E</b> 04/0	05/19		SURFACE WATER DEPTH N/A
LEV (ft)	DRIVE ELEV (ft)	E DE	EPTH (ft)		0.5ft	_	T .5ft	0	BL0 25 1		PER FC		5 1	00	SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH
85		<u> </u>  -						1										- - - - - - - - - - - - - - - - - - -
80_	478.6	+	3.4	1	1		1							:			_	Brown-Tan, Silty SAND
75_	473.6		8.4	3	4		4	<b>9</b> 8								М		- - - -
70	468.6	+	13.4	60	40/0.	1			7.7	·		· · · ```.	100/0					- 470.3 1: - 468.6 Brown-Gray, Sandy Silty CLAY 1:
65_	463.6	† + 1 1 1	18.4	100/0	7													WEATHERED ROCK Brown-Gray (META-ARGILLITE)
60_		+		100/0.						· · · · · · · · · · · · · · · · · · ·			. 100/0					- 461.3 20 - NON-CRYSTALLINE ROCK (META-ARGILLITE)
55_		 																- - <del>-</del>
50		‡ ‡								· · · · · · · · · · · · · · · · · · ·					RS-1			· · - -
15		† †								· · · · · ·								• • • –
		+							<u> </u>			• •		$\perp$				442.0 40
		+++++++++++++++++++++++++++++++++++++++																Boring Terminated at Elevation 442.0 ft in Non-Crystalline Rock (META-ARGILLITE)

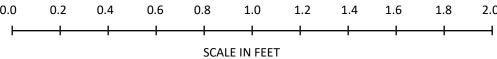
								C	<u>Ol</u>	<u>RE L</u>	OG						
WBS	45764.1.1			TIP	B-581	0	C	OUNT	Υ (	CABARRI	JS		GEOLOGI	<b>ST</b> Stickn	ey, J. K.		
SITE	DESCRIPTION	Bric	lge No. 2	2 on N	IC 24/2	27 EBL o	ver Ro	cky R	iver							GROUN	ID WTR (ft)
BORI	<b>ING NO</b> . B1-A	į.		STA	TION	21+52			OF	FSET 1	9 ft LT		ALIGNMEN	NT -L-		0 HR.	4.4
	AR ELEV. 48					<b>PTH</b> 40			NO		551,013		EASTING			24 HR.	NM
DRILL	. RIG/HAMMER E	FF./DA	TE HFOO	072 CN	/E-550X	92% 08/	15/2018	3			DRILL METHOD	NW	Casing W/SP	T & Core	HAMIN	IER TYPE	Automatic
	LER Smith, C	. L.		STAI	RT DA	<b>TE</b> 04/0	5/19		co	MP. DAT	<b>E</b> 04/05/19		SURFACE	WATER D	EPTH N	/A	
CORI	E SIZE NX		l			<b>N</b> 19.3 f		NATA									
ELEV (ft)	RUN ELEV (ft) DEPTH	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	L O G	ELEV. (ft)	ı	D	ESCRIPTION	AND REMA	RKS		DEPTH (ft)
461.3	461.3 + 20.7	4.2	1.02/1.0	(4.2)	(0.E)		(10.6)	(11.0)		- 404.0			Begin Cori				00.7
455	457.0 25.0 452.0 30.0	5.0	1:03/1.0 1:01/1.0 0:52/1.0 0:56/1.0 0:00/0.3 0:47/1.0 0:49/1.0 0:52/1.0 0:39/1.0	(4.3) 100% (4.8) 96%	(2.0) 40%	RS-1	(18.6) 96%	(11.0) 57%		461.3  _ _ _ _ _ _	Gray, Moderate META-ARGILL	ely Se ITE w	ith Very Close	ed to Fresh,	Moderately	r Hard to Ha acture Spac	20.7 ard, sing
450	447.0 35.0	5.0	0:34/1.0 0:39/1.0 0:44/1.0 0:47/1.0 0:49/1.0	(4.8) 96%	(4.6) 92%	( K5-1 )				- - - -							
445	442.0 40.0	5.0	0:43/1.0 0:39/1.0 0:42/1.0 0:46/1.0	94%	(3.9) 78%					-							40.0
-	442.0 7 40.0		0:40/1.0							442.0	Boring Ter	rminat	ted at Elevatio	n 442.0 ft in ARGILLITE)	Non-Crysta	lline Rock	40.0
	**************************************																

#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B1-A 21+52, 18.7' LT





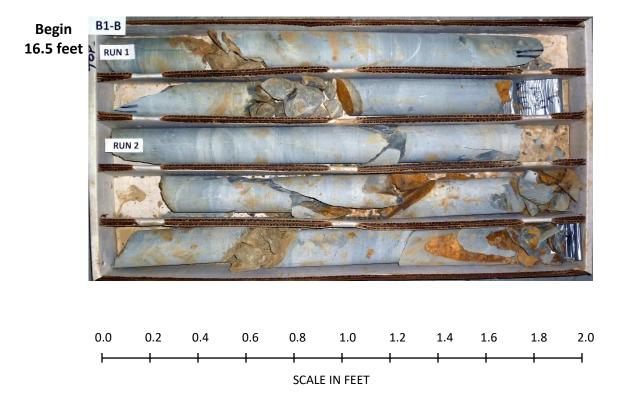


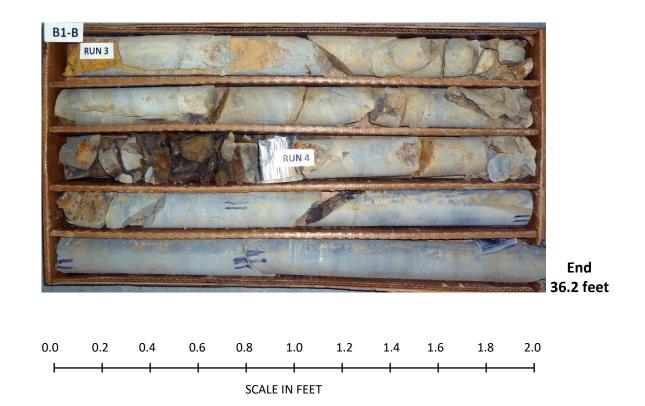


										UKE I		<u> </u>					
VBS	45764	1.1.1				TIP	B-5810		COUNT	Y CABAR	RI	US			GEOLOGIST Stickney, J. K.	_	
SITE	DESCR	RIPTION	<b>l</b> Brid	dge N	lo. 22	on	NC 24/27	EBL over	Rocky Ri	ver						GROUN	D WTR (ft)
BORI	NG NO.	. B1-E	3			ST	ATION 21	+52		OFFSET	1	9 ft RT			ALIGNMENT -L-	0 HR.	5.8
COLL	AR ELI	<b>EV</b> . 48	32.9 ft			TO	TAL DEPT	<b>H</b> 36.2 ft		NORTHIN	IG	550,9	77		<b>EASTING</b> 1,560,078	24 HR.	5.5
PRILL	.RIG/HA	MMER E	FF/D/	ATE	HFO00	72 C	OME-550X 92	2% 08/15/2	018			DRILL N	ETHO	D N	W Casing W/SPT & Core HAMM	ER TYPE	Automatic
DRIL	LER S	mith, C	). L.			ST	ART DATE	04/05/1	9	COMP. D	ΑT	<b>E</b> 04/0	5/19		SURFACE WATER DEPTH N/	A	
LEV	DRIVE ELEV	DEPTH	BLO	OW C	OUNT			BLOWS F	ER FOOT			SAMP.	<b>V</b> /	LO	SOIL AND ROCK DESC	PDIDTION	
(ft)	(ft)	(ft)	0.5ft	0.5f	t 0.5f	ft	0 2	5 5	0 I	75 100	ו	NO.	<u>/MOI</u>		ELEV. (ft)	JAII HOIV	DEPTH (fi
485															_		
	-	Ŧ													482.9 GROUND SURFA	ACE	0.
	-														ALLUVIAL Brown-Tan, Silty S	AND	
80	479.1	3.8								+	+				-	71110	
			1	0	1	Π,	1						¶M <b>r</b>				
75		‡					\(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\)								•		
7.5	474.1	8.8	2	4	4	4	1			1	1				<del>-</del> ,		
		‡	-	"	-		·•8~; ÷.	· · · · · · · · · · · · · · · · · · ·					М				44
70		‡													471.0 RESIDUAL		11.
	469.1	13.8	12	41	59/0	.1				100/0.6					. 468.6 Brown-Gray, Sandy WEATHERED RO		14.
		‡								100/0.6	ľ				Hon-Crystalline	GILLITE)	16.
35	_	<u> </u>								+	+				MON-CRYSTALLINE (META-ARGILLI		
	-	ł															
80		+													•		
	-	Ŧ													<del>-</del> ·		
		Ŧ													•		
55	-	‡								ļ · · · ·	+				<del>-</del>		
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50		‡													•		
30	-	‡								1	1				<del>-</del> ,		
		‡													. 446.7		36.
	-	‡													Boring Terminated at Elevat Non-Crystalline Rock (META		
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WBS	45764	.1.1			TIP	B-581	0	C	OUNT	Y	ABARRU	JS		GEOLOG	IST Stickr	ey, J. K.		
SITE	DESCR	IPTION	l Brid	lge No. 2	2 on N	IC 24/2	27 EBL o	ver Ro	cky R	iver							GROUN	O WTR (ft)
BOR	NG NO.	B1-B			STA	TION	21+52			OF	FSET 19	ft RT		ALIGNME	NT -L-		0 HR.	5.8
COLI	AR ELE	<b>V</b> . 48	32.9 ft		TOT	AL DE	<b>PTH</b> 36	.2 ft		NO	RTHING	550,977		EASTING	1,560,07	3	24 HR.	5.5
DRILL	RIG/HAI	VIMER E	FF./DA	TE HFO	0072 CN	/IE-550>	(92% 08/	15/2018	3		I	DRILL MET	HOD N/\	V Casing W/SI	PT & Core	HAMIN	IER TYPE	Automatic
DRIL	LER S	mith, C	. L.		STAI	RT DA	<b>TE</b> 04/0	5/19		СО	MP. DATI	E 04/05/	19	SURFACI	WATER D	EPTH N	/A	
COR	E SIZE	NX					<b>N</b> 19.7 f											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	UN RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	L O G	ELEV. (ft)		D	DESCRIPTION	N AND REMA	RKS		DEPTH (ft)
466.4															ing @ 16.5			
465	466.4 - - - 461.7 -	- 16.5 - - - - 21.2	5.0	0:44/1.0 0:41/1.0 0;52/1.0 0:47/1.0 0:00/0.7	(3.1) 66% (5.0)	(2.1) 45% (1.6)		(17.8) 90%	(6.8) 35%		466.4 - -	Gray to Bro Hard, ME	wn, Moder ETA-ARGIL	rately Severly LLITE with Ve	STALLINE RO Weathered to ery Close to M Spacing SSI=52	Fresh, Mo	derately Har lose Fractur	16.5 d to e
460	- 456.7 -	26.2	3.0	0:46/1.0 0:39/1.0 0:44/1.0 0:50/1.0 0:37/1.0	100%					墓	-  -							
455		-	5.0	0:39/1.0 0:41/1.0 0:47/1.0 0:40/1.0	(4.7) 94%	(0.0) 0%				蓋蓋	- - 							
450	451.7 - - -	31.2	5.0	0:42/1.0 0:48/1.0 0:41/1.0 0:53/1.0	(5.0) 100%	(3.1) 62%					- - - -							
	446.7	36.2		0:44/1.0 0:49/1.0							446.7		T		on 446.7 ft in	N C	III D :	36.2
														(WE-17	-ARGILLITE)			

#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B1-B 21+52, 19.4' RT





									В	<u>ORE I</u>	_(	JG					
WBS	45764	1.1.1			Т	I <b>P</b> B-	5810		COUNT	Y CABAR	RUS	S			GEOLOGIST Stickney, J. K.		
SITE	DESCR	IPTION	<b>N</b> Brid	dge N	o. 22 o	n NC 2	24/27	EBL over	Rocky Ri	iver						GROUN	D WTR (ft
BORI	NG NO.	. B2- <i>A</i>	4		s	TATIO	N 22	2+45		OFFSET	20	ft LT			ALIGNMENT -L-	0 HR.	4.4
OLL	AR ELI	<b>EV</b> . 4	75.4 ft		Т	OTAL	DEPT	<b>H</b> 35.41	t	NORTHIN	G	550,98	34		<b>EASTING</b> 1,560,179	24 HR.	4.2
RILL	RIG/HA	MMER E	FF/D/	ATE I	-IFO0072	2 CME-5	50X 9	2% 08/15/	2018		D	RILL IV	ETHO	D NV	V Casing W/SPT & Core HAMM	ER TYPE	Automatic
RILL	<b>ER</b> S	mith, C	D. L.		S	TART	DATE	04/30/	9	COMP. DA	١TE	04/3	0/19		SURFACE WATER DEPTH N/	A	
LEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	1	OW C0		0	2		PER FOOT 50	75 100		SAMP. NO.	MOI	L O G	SOIL AND ROCK DESC		DEPTH (I
80		  -  -													-		
75	- - -	<u> </u>				<u> </u>		<del> </del>	<del> </del>	<b></b>					475.4 GROUND SURFA - ALLUVIAL	CE	0
		‡				::									Brown-Gray, Sandy Sil	ty CLAY	
0	471.5	3.9	WOH	I WOH	H WOH	]::						-	_M_				
0	-	‡				\ <u>\\\</u>			1	1	11				-		
	466.5	8.9				'. :									467.4 Brown-Tan-Red, Silty	SAND	8
5		-	1	2	3	<b>6</b> 5.	· ·			1	11		М		-	0,2	
		‡				:::		7 7 7							400.0		4.0
_	461.5	13.9	100/0.	2		::				100/0.2					WEATHERED RC		13
0	-	ţ	1			<del>   </del>			1					III.	Gray (META-ARGIL		16
		‡												計	NON-CRYSTALLINE (META-ARGILLIT		
5	-	ţ					• •								_		
	-	ŧ				: :								量			
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0	-	+							<b> </b>		+	RS-2			-		
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		‡															
10	•	-				Ш.:	• •							掌	440.0	ion 440 0 f	35
	-	‡												ţ	Boring Terminated at Elevat Non-Crystalline Rock (META	ION 440.0 T N-ARGILLIT	τ in ΓΕ)
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	CORE LOG  /BS 45764.1.1 TIP B-5810 COUNTY CABARRUS GEOLOGIST Stickney, J. K.															
<b>WBS</b> 45	764.1.1			TIP	B-581	0	C	TNUC	Υ	ABARRUS		GEOLOGIST	Stickney,	J. K.		
SITE DES	CRIPTION	l Brid	ge No. 22	2 on N	C 24/2	7 EBL o	ver Ro	cky R	iver						GROUN	D WTR (ft)
BORING N	<b>NO</b> . B2-A	ı		STAT	TION	22+45			OF	SET 20 ft LT	•	ALIGNMENT	-L-		0 HR.	4.4
COLLAR	<b>ELEV</b> . 47	5.4 ft		TOTA	AL DEI	<b>PTH</b> 35.	.4 ft		NC	RTHING 550,	984	EASTING 1,	560,179		24 HR.	4.2
DRILL RIG/	HAMMER E	FF./DA	TE HFOO	072 CIV	<b>E</b> -550X	92% 08/	15/2018	3		DRILL	METHOD NW	/Casing W/SPT &	Core	HAMM	ER TYPE	Automatic
DRILLER	Smith, C	. L.		STAF	RT DA	<b>TE</b> 04/3	0/19		CC	IP. DATE 04	/30/19	SURFACE WA	ATER DEPT	TH N/	A	
CORE SIZ	ZE NX					<b>N</b> 19.2 f										
ELEV RUI (ft) ELE (ft)		RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	ATA RQD (ft) %	L O G	ELEV. (ft)	D	ESCRIPTION AN	D REMARKS	3		DEPTH (ft)
459.2												Begin Coring				
459 455 455	‡	5.0	0:59/1.0 1:07/1.0 1:15/1.0 1:20/1.0 \1:18/0.2	(3.5) 83% (4.5)	(3.0) 71% (4.0)		(18.0) 94%	(14.8) 77%		459.2 Gray, <sup>°</sup>	Very Slightly We	NON-CRYSTAL eathered to Fresh, to Wide Fractu GSI=	Hard, META Ire Spacing		LITE with C	lose
450 450	0.0 25.4		1:21/1.0 1:23/1.0 1:20/1.0 1:24/1.0 1:25/1.0	90%	80%					_						
445 445	5.0 30.4	5.0	1:31/1.0 1:21/1.0 1:24/1.0 1:27/1.0 1:30/1.0	(5.0) 100%		RS-2				_						
440 440	0.0 + 35.4	5.0	1:27/1.0 1:19/1.0 1:22/1.0 1:27/1.0 1:30/1.0	(5.0) 100%	(4.7) 94%					440.0						35.4
	+++++++++++++++++++++++++++++++++++++++									-	Boring Terminat	ted at Elevation 44 (META-ARC	GILLITE)	Crystall	ine Kock	

#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B2-A 22+45, 19.5' LT

Begin
16.2 feet

RUN 1

RUN 2

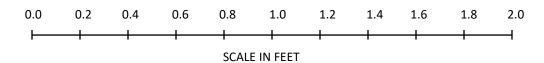
RUN 3

RUN 3

RUN 3

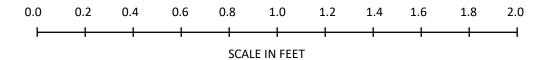
RUN 3

RUN 3





End 35.4 feet

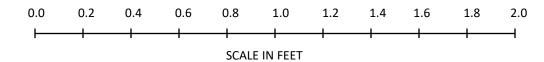


#### COUNTY CABARRUS **WBS** 45764.1.1 GEOLOGIST Stickney, J. K. **TIP** B-5810 GROUND WTR (ft) SITE DESCRIPTION Bridge No. 22 on NC 24/27 EBL over Rocky River STATION 22+44 OFFSET 19 ft RT ALIGNMENT -L-BORING NO. B2-B 0 HR. 4.6 COLLAR ELEV. 477.0 ft TOTAL DEPTH 35.1 ft **NORTHING** 550,948 **EASTING** 1,560,165 24 HR. 4.3 **DRILL RIG/HAMMER EFF./DATE** HF00072 CME-550X 92% 08/15/2018 HAMMER TYPE Automatic **DRILL METHOD** NW Casing W/SPT & Core DRILLER Smith. C. L. **START DATE** 04/01/19 **COMP. DATE** 04/01/19 SURFACE WATER DEPTH N/A ELEV CHI DEPTH BLOW COUNT (ft) (ft) 0.5ft 0.5ft 0.5ft SAMP. **BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft MOI G 75 100 NO. ELEV. (ft) DEPTH (ft 480 **GROUND SURFACE** ALLUVIAL 475 Brown-Gray, Sandy Silty CLAY 473.5 WOH WOH WOH 470 468.5 + 8.5 Brown-Red, Silty SAND М 465 463.5 + 13.5 15 85/0.4 100/0.9 WEATHERED ROCK Gray (META-ARGILLITE) 460 NON-CRYSTALLINE ROCK 455 450 445 Boring Terminated at Elevation 441.9 ft in Non-Crystalline Rock (META-ARGILLITE)

SITE DESCRIPTION   Bridge No. 22 on NC 24/27 EBL over Rocky River			_	ND WTR (ft)
BORING NO. B2-B   STATION 22+44   OFFSET 19 ft RT	EASTING 1,560,16 Casing W/SPT & Core		_	ID WTR (ff)
BORING NO. B2-B   STATION 22+44   OFFSET 19 ft RT	EASTING 1,560,16 Casing W/SPT & Core		_	( ( ( ( ( ( ( ( ( ( ( ( ( ( (
DRILL RIG/HAMMER EFF/DATE         HFC0072 CME-550X 92% 08/15/2018         DRILL METHOD         NW (           DRILLER Smith, C. L.         START DATE 04/01/19         COMP. DATE 04/01/19           CORE SIZE NX         TOTAL RUN 18.6 ft           ELEV (ft)         DEPTH RUN (ft) (ft)         DRILL RCL RQD (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)	Casing W/SPT & Core		0 HR.	4.6
DRILLER         Smith, C. L.         START DATE         04/01/19         COMP. DATE         04/01/19           CORE SIZE         NX         TOTAL RUN         18.6 ft           ELEV (ft)         RUN (ft)         DEPTH (ft)         RUN (ft)         REC. (ROD (ft) (ft)         SAMP. (ft)         STRATA (REC. RQD (ft))         O (ft)         O (ft) <th< th=""><th></th><th>5</th><th>24 HR.</th><th>4.3</th></th<>		5	24 HR.	4.3
CORE SIZE   NX   TOTAL RUN   18.6 ft	OUDEACE WATER E	HAMI	MER TYPE	Automatic
RUN   RLEV   (ft)   (	SURFACE WATER D	DEPTH N	I/A	
(ft) (ft) (ft) (Min/ft) (ft) (Min/ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft) (				
460.5 + 16.5   3.6   0:51/1.0   (3.6)   (3.2)   (18.3)   (16.8)   460.5	ESCRIPTION AND REMA	ARKS		DEPTH (ft)
	Begin Coring @ 16.5	ft		
456.9 20.1 0:43/1.0 0:00/0.6 0:00/0.0 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.0 0:00/0.6 0:00/0.0 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.6 0:00/0.0 0:00/0.6 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0:00/0.0 0	NON-CRYSTALLINE RO TA-ARGILLITE with Clos GSI=82	e to Wide F	racture Spa	16.5 acing
451.9 25.1 0:42/1.0 25.1 0:46/1.0				
450 - 5.0 0:39/1.0 (4.9) (4.1) 0:44/1.0 98% 82% 0:42/1.0 0:46/1.0				
446.9 <u>1</u> 30.1 <u>0:40/1.0</u> <u>1 5.0 0:48/1.0 (4.8) (4.6)                                    </u>				
441.9 35.1 0:53/1.0 E 441.9 Boring Terminate	ed at Elevation 441.9 ft in	Non-Crysta	alline Rock	35.1
	(META-ARGILLITE)			

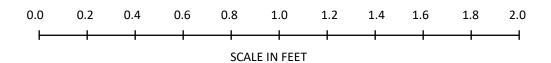
#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B2-B 22+44, 19.1' RT







End 35.1 feet





## GEOTECHNICAL BORING REPORT

SHEET 20

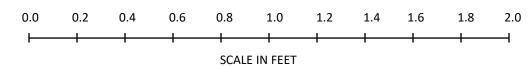
									ORE L							
	45764					IP B-5810			CABARR	RUS			GEOLOGIST Stickney,			
				lge No		n NC 24/27 E		<del></del>					1			ID WTR (ft)
BORI	NG NO.	B3- <i>A</i>	١		S.	TATION 23+	-41		OFFSET	18 ft LT			ALIGNMENT -L-		0 HR.	5.0
	AR ELE					OTAL DEPTH			NORTHING	, -			<b>EASTING</b> 1,560,269		24 HR.	4.4
DRILL	. RIG/HAI	MMER E	FF./DA	TE H		2 CME-550X 929				DRILL N	METHO	D N	W Casing w/ SPT	HAMME	ER TYPE	Automatic
DRIL	LER S	mith, C	1			TART DATE			COMP. DA	_	29/19	1. 1	SURFACE WATER DEP	TH N/	A	
ELEV (ft)	DRIVE ELEV	DEPTH (ft)	0.5ft	OW CO		4	BLOWS PER		75 100	SAMP.	<b>V</b> /	0	SOIL AND ROO	CK DESC	RIPTION	
(11)	(ft)	(11)	0.5π	0.5ft	0.5ft	0 25	50	•	100	NO.	/MOI	G	ELEV. (ft)			DEPTH (ft
480		-											_			
		E											- - 476.5 GROUNI	SURFA	CF	0.0
475	_					1 .1							- ALL	UVIAL		0.0
	472.7 -	3.8									_		Brown-Red	a, Slity S/	AND	
	412.1	3.0	5	4	3	1 7					-м-		•			
470	_	-											<u>-</u>			
	467.7	8.8	1	2	3		.						•			
465	-	F	'	-		<b>●</b> 5					М		•			
	400 7	F							: : : :				<del>-</del> ·			
	462.7 -	13.8	3	22	78/0.4	[]		· · · ·	100/2				- - 461.7 - <b>WEATHE</b>	DED DO	CK	14.8
460	_	F							- 100/0.9				<ul><li>Gray (MET.</li></ul>			
	457.9	18.6	60/0.1	-					60/0.1	,			- 458.5 - NON-CRYST			18.0
455	-	ţ	00/0.1										· (META-A	ARGILLIT	E)	
100	450.0	†											-			
	452.9	23.6	60/0.1	1				: : :	60/0.1	•			•			
450	_	ţ											<del>-</del>			
	448.4	28.1	60/0.1	-					60/0.1	,			• •			
445	-	‡	00,0													
445	-	<u> </u>											<del>-</del>			
	442.9	33.6	60/0.0			<del>                                     </del>	<u>l.</u>		60/0.0	+			. Boring Terminated	at Elevati	ion 442.9	33.6 ft in
	-	L											. Non-Črystalline Rod	ck (META	A-ARGILLI	TE)
	-	<u> </u>											• •			
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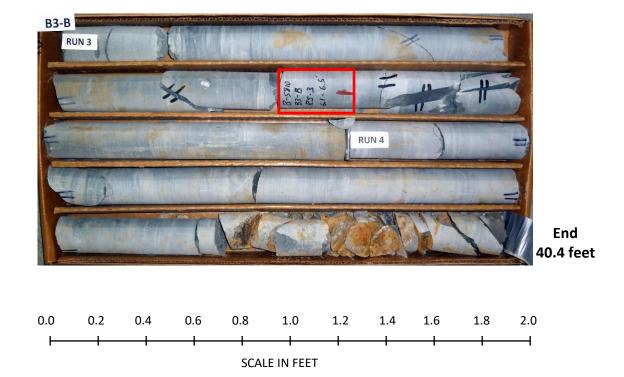
COLLAR ELEV.         478.4 ft         TOTAL DEPTH         40.4 ft         NORTHING         550,917         EASTING         1,560,256         24 HR.           DRILL RIG/HAMMER EFF/DATE         HF00072 CME-550X 92% 08/15/2018         DRILL METHOD         NW Casing W/SPT & Core         HAMMER TYPE         Automa           DRILLER         Smith, C. L.         START DATE         04/30/19         COMP. DATE         04/30/19         SURFACE WATER DEPTH         N/A           ELEV (ft)         DEPTH BLOW COUNT (ft)         BLOW SPER FOOT (ft)         SAMP.         L O         SOIL AND ROCK DESCRIPTION									D	UKE	<u>_</u>						
BORING NO. B3-B											RRU	JS			GEOLOGIST Stickney, J. K.	1	
COLLAR ELEV. 478.4 ft					dge No				Rocky Ri						1	-	
DRILLER   Smith, C. L.   START DATE   04/30/19   COMP. DATE   04/30/19   SURFACE WATER DEPTH   N/A	BOR	ING NO.	В3-Е	3		S <sup>-</sup>	TATION 23	+40		OFFSET	19	9 ft RT			ALIGNMENT -L-	0 HR.	4.0
START DATE										NORTHIN							NM
EL	RILL	_RIG/HAI	VIMER E	FF./D/	ATE H	FO0072	: CME-550X 92	2% 08/15/2	2018			DRILL M	ETHO	D M	W Casing W/SPT & Core HAMM	ER TYPE	Automatic
The first of the f	RIL	LER S	mith, C	). L.		S.	TART DATE	04/30/19	9	COMP. D	ΑT	<b>E</b> 04/3	0/19		SURFACE WATER DEPTH N/	A	
478.4 GROUND SURFACE ALLUVIAL Red-Brown, Silty SAND  469.3 9.1 2 2 3		ELEV		`—			0 25			75 10	0		MOI	0		CRIPTION	DEPTH (f
75	30		_				<u> </u>			1				*****		ACE	0.
70	75	474.3	4.1	1	3	3							М	-		AND	
35 464.3 14.1 3 4 4 4 3 3 4 4 4 3 3 4 4 4 3 4 4 4 4	70	469.3	9.1				<b>♥</b> 6 <b>1</b>							-	-		
3 4 4 4	35	- 1643 —	14.1	2	2	3	<b>♦</b> 5						М		-		
459.3 T 19.1 Go/0.1 Gray (META-ARGILLITE)  60/0.1 F 60/0.1 Gray (META-ARGILLITE)  15	80	-		3	4	4		· · · · · · · · · · · · · · · · · · ·					М	<i>M</i>	WEATHERED RO		17.
RS-3  RS-3  Boring Terminated at Elevation 438 0 ft in		459.3 - - -	19.1	60/0.1	Ī					60/0.	•				457.2 NON-CRYSTALLINE	ROCK	21.
RS-3  RS-3  Agring Terminated at Elevation 438 0 ft in	15	- - -	-												_ (META-ARGILLI - -	IE)	
40 RS-3 RS-3 A38.0 Boring Terminated at Flevation 438.0 ft in	<u>50</u>	- - -													· _		
438.0 Boring Terminated at Flevation 438.0 ft in	45	- - -	<u>-</u>								_	RS-3 /			<del>-</del>		
Boring Terminated at Elevation 438.0 ft in Non-Crystalline Rock (META-ARGILLITE)	40										_						40.
			- - - - - -												Boring Terminated at Elevat Non-Crystalline Rock (MET/	ion 438.0 ft A-ARGILLITE	in Ξ)
		- - - -	-												<del>-</del>		
		- - - -	<u> </u>												: - - :		
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											KE LUG				
WBS	45764	1.1.1			TIP	B-581	0	С	OUNT	Υ	ABARRUS	GEOLOGIST Stickney	, J. K.		
SITE	DESCR	RIPTION	<b>I</b> Brid	lge No. 2	2 on N	IC 24/2	27 EBL o	ver Ro	cky R	liver				GROUN	D WTR (ft)
BOR	ING NO	. B3-B	3		STA	TION	23+40			OF	FSET 19 ft RT	ALIGNMENT -L-		0 HR.	4.0
COLI	LAR ELI	<b>EV</b> . 47	78.4 ft		тот	AL DE	<b>PTH</b> 40	.4 ft		NO	<b>RTHING</b> 550,917	<b>EASTING</b> 1,560,256		24 HR.	NM
DRILL	RIG/HA	MMER E	FF./DA	TE HFO	0072 CN	/IE-550>	(92% 08	/15/2018	3		DRILL METHOD N	V Casing W/SPT & Core	HAMM	ER TYPE	Automatic
DRIL	LER S	mith, C	C. L.		STA	RT DA	<b>TE</b> 04/3	80/19		СО	MP. DATE 04/30/19	SURFACE WATER DEP	TH N/	Α	
	E SIZE				<del>                                     </del>		<b>N</b> 19.21					<u> </u>			
ELEV	RUN	DEPTH	RUN	DRILL	REC.		SAMP.	STR REC.	RATA	L					
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft)	(ft)	NO.	(ft)	RQD (ft) %	O G	ELEV. (ft)	DESCRIPTION AND REMARK	S		DEPTH (ft)
157.2					,,,	70		,,,	,,,			Begin Coring @ 21.2 ft			
455	457.2	21.2	4.2	0:54/1.0 0:48/1.0	(3.5) 83%	(1.3) 31%		(18.2) 95%	(10.6) 55%	臺	457.2	NON-CRYSTALLINE ROCK eathered to Fresh, Hard, META		ITE with C	21.2
.55	452.0	1 25 4		1 0.59/1 0	1	3170		9570	3376	蓋	_ Gray, very Slightly vi	Moderately Close Fracture Sp.	acing	LITE WILLI	lose
	453.0	25.4	5.0	0:58/1.0	(5.0)	(2.4)				壒	•	GSI=70			
150	-	‡		1:15/1.0 1:18/1.0 1:20/1.0	100%	48%				鼜	- <del>-</del>				
	448.0	30.4		1:14/1.0 1:16/1.0						鼜	•				
		ŧ	5.0	1:21/1.0 1:27/1.0	(5.0) 100%	(4.6) 92%				鼜					
145	-	t		1:15/1.0			RS-3	1			<del>-</del>				
	443.0	35.4	5.0	1:24/1.0 1:23/1.0	(4.7)	(2.3)					•				
40		Ŧ	0.0	1:27/1.0 1:25/1.0	94%	46%					•				
	438.0	40.4		1:11/1.0							<del>-</del> - 438.0				40.4
				1.0771.0							Boring Termin	ated at Elevation 438.0 ft in No (META-ARGILLITE)	n-Crystall	ine Rock	
	-	‡									· <del>-</del>	(META-ARGILLITE)			
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#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B3-B 23+40, 19.0' RT







#### SHEET 23

#### GEOTECHNICAL BORING REPORT BORE LOG

A/DO 45704.4.4				
<b>WBS</b> 45764.1.1	TIP B-5810 COUNT	Y CABARRUS	GEOLOGIST Stickney, J. K.	
SITE DESCRIPTION Bridge No. 22	2 on NC 24/27 EBL over Rocky F	iver		GROUND WTR (ft)
ORING NO. B4-A	STATION 24+35	OFFSET 11 ft LT	ALIGNMENT -L-	<b>0 HR</b> . N/A
OLLAR ELEV. 459.6 ft	TOTAL DEPTH 19.5 ft	<b>NORTHING</b> 550,915	<b>EASTING</b> 1,560,356	<b>24 HR</b> . N/A
RILL RIG/HAMMER EFF/DATE HFOO	072 CME-550X 92% 08/15/2018	DRILL METHOD NV	/ Casing W/SPT & Core HAMM	ER TYPE Automatic
PRILLER Smith, C. L.	<b>START DATE</b> 04/10/19	<b>COMP. DATE</b> 04/10/19	SURFACE WATER DEPTH 4.6	6ft
DRIVE   DEPTH   BLOW COUNT   (ft)   0.5ft   0.5ft   0.5ft   0.5ft	<del> </del>	75 100   100   /   0	SOIL AND ROCK DESC	CRIPTION DEPTH (ft
155   1   1   1   1   1   1   1   1   1			459.6 GROUND SURFA  ALLUVIAL Sandy SILT with Co NON-CRYSTALLINE (META-ARGILLIT  440.1  Boring Terminated at Elevat Non-Crystalline Rock (META	0.5 ROCK (FE)  15.5  19.5  ion 440.1 ft in

									C	U	RE LUG							
WBS	45764	l.1.1			TIP	B-58	10	С	OUNT	Υ	ABARRUS		GEOLO	GIST	Stickne	y, J. K.		
SITE	DESCR	IPTION	<b>I</b> Brid	dge No. 2	2 on N	IC 24/	27 EBL o	ver Ro	cky R	liver			•				GROUN	ID WTR (ft)
BOR	ING NO.	. B4-A	\		STA	TION	24+35			OF	FSET 11 ft LT	•	ALIGNN	IENT	· -L-		0 HR.	N/A
COLI	LAR ELI	<b>EV</b> . 45	59.6 ft		тот	AL DE	<b>PTH</b> 19	.5 ft		NO	RTHING 550,	915	EASTIN	<b>G</b> 1	,560,356		24 HR.	N/A
DRILL	RIG/HA	MMER E	FF./D/	TE HFO	0072 CN	/IE-550)	K 92% 08	/15/2018	3		DRILL	METHOD N	W Casing W	SPT 8	& Core	HAMIN	IER TYPE	Automatic
DRIL	LER S	mith, C	. L.		STA	RT DA	TE 04/1	0/19		СО	MP. DATE 04	/10/19	SURFA	CE W	ATER DE	PTH 4.	.6ft	
	E SIZE				<u> </u>		<b>N</b> 19.01											
ELEV	RUN	DEPTH	RUN	DRILL	REC.	UN RQD	SAMP.	STR REC.	ATA	Ţ								
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	RQD (ft) %	O G	ELEV. (ft)		DESCRIPTION	ON AI	ND REMAR	KS		DEPTH (ft
459.1													Begin C	Coring	g @ 0.5 ft			
	459.1	0.5	3.0	0:00/1.0	(3.0)	(0.0)		(14.6) 97%	(0.8) 5%		_ 459.1 Brown	and Gray, Se			LLINE ROC Slightly W		Medium Ha	0.9 ard to
455	456.1	3.5	5.0	0:00/1.0 0:00/1.0 1:24/1.0	(5.0)	(0.4)	1				_ Mo	derately Hard	META-ARGI	LLITE Spac	with Very (	Close to C	lose Fractu	re
	-	[		1:33/1.0	100%									ĠSI:				
	451.1	8.5		1:51/1.0 1:34/1.0							- -							
450	_	-	5.0	1:41/1.0	(4.6)	(0.4) 8%				薑	_							
	-	<u> </u>		1:32/1.0 1:35/1.0							- -							
445	446.1	13.5	5.0	1:40/1.0 1:43/1.0	(4.6)	(1.6)	_			薑	- -							
	-	[		1:51/1.0	92%	32%		(3.7)	(1.6)		444.1 -							15.
	441.1	18.5		1:41/1.0 1:44/1.0				93%	40%		-							
	440.1	19.5	1.0	0:00/1.0	(1.0) \100%	(0.0) 0%	l			===	440.1	Boring Termir	nated at Eleva	ation 4	140.1 ft in N	on-Crysta	lline Rock	19.
	-	<u> </u>									<b>-</b>		(ME	IA-AR	RGILLITE)			
	_	_									<u>-</u>							
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#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B4-A 23+35, 10.7' LT

Begin 0.5 feet

RUN 1

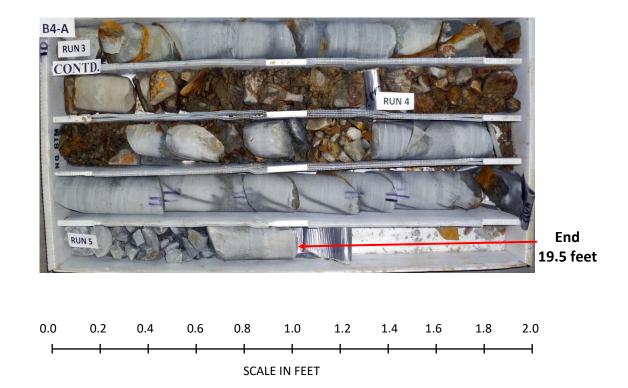
RUN 2

RUN 2

RUN 3

D.O 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET



#### SHEET 25

#### GEOTECHNICAL BORING REPORT BORE LOG

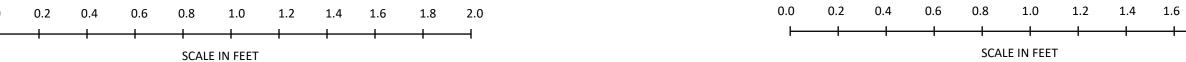
												<u> </u>		-00	_							
VBS	45764	.1.1			T	<b>IP</b> B	-5810	)		CC	DUNT	<b>Y</b> C	ABAR	RUS				GEOLO	GIST Stickne	y, J. K.		
SITE	DESCR	IPTION	<b>N</b> Bri	dge No	. 22 o	n NC	24/27	7 EE	BL ove	r Ro	cky R	iver									GROUN	ND WTR (ft)
BORI	NG NO.	B4-E	3		S	TATIO	ON 2	24+3	35			OF	FSET	10 ft I	RT			ALIGNN	MENT -L-		0 HR.	N/A
	AR ELE								19.4			NO	RTHIN	<b>G</b> 55	0,8	95		EASTIN	<b>IG</b> 1,560,349		24 HR.	N/A
PRILL	. RIG/HAI	VIMER E	FF./D/	ATE H	FO0072	2 CME	-550X	92%	08/15/	/2018				DRIL	L N	METHO	D N	V Casing W	SPT & Core	HAMIN	IER TYPE	Automatic
RIL	LER S	mith, C	). L.		S	TART	DAT	E (	04/15/	19		СО	MP. DA	TE (	)4/	15/19		SURFA	CE WATER DE	<b>PTH</b> 5.	.5ft	
LEV	DRIVE ELEV	DEPTH	`—	ow co					BLOWS		FOOT			SAN	ΛP.	lacktriangledown/	L		SOIL AND RO	OCK DES	CRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0		25		50		75 	100	NO	Э.	/MOI		ELEV. (ft)				DEPTH (t
65		Ļ																-				
	-	Ē																				
60	-																_	460.3		ID SURF	ACE	0
	-	E						T:		T			: : :					459.2	Sandy SI			
	-							:		:		.   :						455.9	NON-CRYS (META	<b>STALLINI</b> -ARGILLI		4
55	_	-				<del>  -</del>		+:		+-		.   .						-	(META	-ARGILLI	TE)	
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	-	<u> </u>						:	· · · ·	:		:   :						440.0				40
	_	<u> </u>				μ.		ш.	· · · · ·		• • •		• • •					440.9	Boring Terminate	d at Eleva	tion 440.9	ft in
	-	<u> </u>																	Non-Črystalline R	OCK (IVIE I	A-ARGILL	IIE)
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										<u> </u>	VL LUG				
WBS	45764	.1.1			TIP	B-58′	10	C	OUNT	Υ (	CABARRUS	GEOLOGIST Stickney, J	. K.		
SITE	DESCR	IPTION	l Brid	lge No. 2	2 on N	IC 24/2	27 EBL o	ver Ro	cky R	iver				GROUN	D WTR (ft)
BOR	NG NO.	B4-B	3		STA	TION	24+35			OF	FSET 10 ft RT	ALIGNMENT -L-		0 HR.	N/A
COLI	AR ELE	<b>EV</b> . 46	30.3 ft		тот	AL DE	<b>PTH</b> 19	.4 ft		NO	<b>PRTHING</b> 550,895	<b>EASTING</b> 1,560,349		24 HR.	N/A
RILL	. RIG/HAI	MMER E	FF./DA	TE HFO	0072 CN	/IE-550>	( 92% 08	/15/2018	3		DRILL METHOD NV	/Casing W/SPT & Core   F	IAMME	R TYPE	Automatic
RIL	LER S	mith, C	. L.		STA	RT DA	<b>TE</b> 04/1	5/19		СО	MP. DATE 04/15/19	SURFACE WATER DEPTH	<b>1</b> 5.5	ift	
OR	E SIZE	NX			тот	AL RU	<b>N</b> 18.31	ŧ							
LEV	RUN	DEPTH	RUN	DRILL	REC.	UN RQD	SAMP.	STR REC.	ATA RQD	Ļ		ECODIDITION AND DEMARKS			
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	ELEV. (ft)	ESCRIPTION AND REMARKS			DEPTH (ft)
59.2												Begin Coring @ 1.1 ft			
	459.2	1.1	3.3	0:00/1.0 0:00/1.0	(3.1) 94%	(0.0) 0%		(3.1) 94%	(0.0) 0%	藍	459.2 Brown Very Sev	NON-CRYSTALLINE ROCK erly Weathered to Moderately We	eathere	ed Soft to	1.1
155	455.9	4.4		0:00/1.0							455.9 Moderately Hard M	ETA-ARGILLITE with Very Close Spacing	to Clo	se Fractur	e <u>4.4</u>
.55	-	-	5.0	1:52/1.0	(5.0) 100%	(1.1) 22%		(14.8) 99%	(4.2) 28%	鼜	-	GSI=25			
	450.0	- , ,		1:52/1.0 1:59/1.0 1:47/1.0 1:55/1.0							–	ed to Fresh, Hard, META-ARGII to Close Fracture Spacing	LLITE	with Very C	Close
150	450.9	9.4	5.0	1:47/1.0	(4.9)	(2.6)				藍	<u>-</u>	GSI=68			
	-	_		1:53/1.0 1:59/1.0	98%	52%				蠹	<b>-</b> -				
	445.9	14.4		1:58/1.0 1:51/1.0			RS-4	1			-				
145	-	-	5.0	1:54/1.0	(4.9) 98%	(0.5) 10%					_				
	-			1:49/1.0 2:02/1.0 2:00/1.0							_				
	440.9	19.4		1:51/1.0							440.9 Boring Termina	ted at Elevation 440.9 ft in Non-C	`rvetalli	ne Rock	19.4
	-	-									- Bonning romana	(META-ARGILLITE)	oi yotaiii	no recor	
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#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B4-B 24+35, 10.4' RT



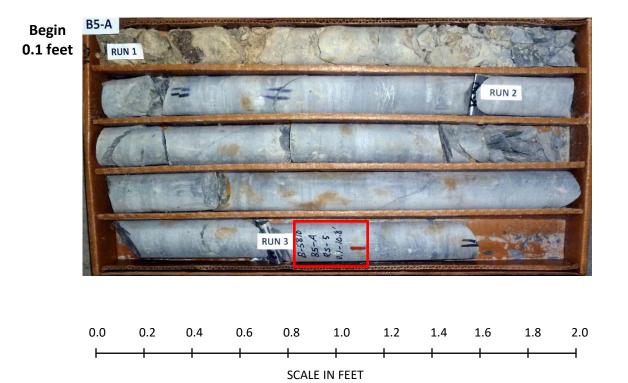




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WBS	4576	4.1.1			Т	IP E	3-5810	)		COI	JNTY	CA	BARF	RUS			GEOLOGIST Stickney, J.	K.	
	DESCF			dge N						Rock	ky Riv	ver						GROU	ND WTR (ft)
BORI	NG NO	. B5-	A		s	TATI	ON 2	25+0	7			OFFS	SET ·	11 ft LT			ALIGNMENT -L-	0 HR.	NM
COLL	AR EL	<b>EV</b> . 4	65.1 ft	t	Т	OTAI	_ DEP	ТН	20.1 f	t		NOR'	THING	550,8	391		<b>EASTING</b> 1,560,424	24 HR.	NM
DRILL	. RIG/HA	MMER	EFF./D/	ATE	FO0072	2 CME	-550X	92%	08/15/	2018				DRILL	METHO	DΝ	W Casing W/SPT & Core H	AMMER TYPE	Automatic
DRIL	LER S	Smith, (	C. L.		s	TAR	Γ DAT	<b>E</b> 0	4/09/1	19		СОМ	P. DA	TE 04/	09/19		SURFACE WATER DEPTH	N/A	
LEV	DRIVE ELEV	DEPTH	H BL	ow co	DUNT			ВІ	LOWS	PER F	ООТ			SAMP.	lacksquare	LO	SOIL AND ROCK	DESCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0		25 		50 	,	75 	100	NO.	моі		ELEV. (ft)	SECONII TION	DEPTH (ft
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65	-	┼				╫╴		_				_					465.6 GROUND S		0:
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60		Ŧ				:		:		: :		: :					- (META-AR	SILLITE)	
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55	-	‡				Iŀ		+:		+		ļ · ·		RS-5	-		<u>-</u>		
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5	_	‡				Ľ		•		<u></u>	• •	<u> </u>	• •				445.0	1	20.
		‡															Boring Terminated at I Non-Crystalline Rock (	META-ARGILL	π in ITE)
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WBS	45764	4.1.1			TIP	B-581	10	C	OUNT	<b>Y</b> C	ABARRUS	GEOLOGIST Stickney, J. K.		
SITE	DESCF	RIPTION	Bric	lge No. 2	2 on N	IC 24/2	27 EBL o	ver Ro	cky R	iver			GROUN	D WTR (ft)
BOR	ING NO	. B5-A	١		STA	TION	25+07			OF	SET 11 ft LT	ALIGNMENT -L-	0 HR.	NM
COL	LAR EL	<b>EV</b> . 46	55.1 ft		тот	AL DE	<b>PTH</b> 20	.1 ft		NO	<b>RTHING</b> 550,891	<b>EASTING</b> 1,560,424	24 HR.	NM
DRILL	RIG/HA	MMER E	FF./DA	TE HFO	0072 CN	/IE-550>	( 92% 08	/15/2018	3		DRILL METHOD N	W Casing W/SPT & Core HAMIN	ER TYPE	Automatic
DRIL	LER S	mith, C	. L.		STA	RT DA	TE 04/0	9/19		СО	MP. DATE 04/09/19	SURFACE WATER DEPTH N	/A	
COR	E SIZE	NX			тот	AL RU	<b>N</b> 20.01	t						
ELEV	RUN	DEPTH	RUN	DRILL	REC.	UN RQD	SAMP.	STR REC.	ATA RQD	L		DECODIDE ON AND DELIABIO		
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	ELEV. (ft)	DESCRIPTION AND REMARKS		DEPTH (ft)
465												Begin Coring @ 0.1 ft		
	465.0	0.1	5.0	0:00/1.0 0:00/1.0	(3.5) 70%	(1.2) 24%		(2.0) 61%	(0.0) 0%	蠹	_ 465.0 Tan-Brown-Gra	NON-CRYSTALLINE ROCK ay, Moderately Severely Weathered, Me	dium Hard,	0.1
		ł		0:00/1.0 0:00/1.0				(15.9)	(12.4)	蓋	META-ARGIL	LLITE with Very Close to Close Fracture GSI=40	Spacing	3.4
460	460.0	5.1	5.0	0:00/1.0	(4.5)	(2.5)		95%	74%	鼜	- Gray, Fresh, Hard	, META-ARGILLITE with Very Close to \	Vide Fractu	re
		Ŧ		1:43/1.0	90%	50%				囊	• •	Spacing GSI=80		
455	455.0	10.1		1:36/1.0 1:51/1.0							•			
		Ŧ	5.0	1:53/1.0 1:42/1.0	(4.8)	(4.4) 88%	RS-5	1			<del>-</del>			
		Ŧ		1:48/1.0 1:57/1.0	0070	0070				薑	•			
450	450.0	15.1	5.0	1:51/1.0 1:54/1.0	(5.0)	(4.3)					<del>-</del>			
		Ŧ	0.0	1:42/1.0	100%					鼜	•			
445	445.0	20.1		1:39/1.0 1:38/1.0						薑	- - 445.0			20.1
		+		1.00/1.0								nated at Elevation 445.0 ft in Non-Crysta (META-ARGILLITE)	lline Rock	
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#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B5-A 25+07, 11.3' LT



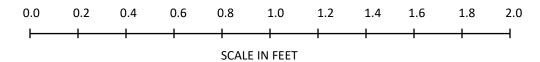


										D	UK	C L	OG								
VBS	45764	4.1.1			Т	IP B	-5810		С	OUNT	Y CA	BARF	RUS			GEOL	OGIST :	Stickney	/, J. Κ.		
ITE	DESCF	RIPTIO	N Bri	dge N	o. 22 o	n NC	24/27	EBL ov	er Ro	ocky R	iver									GROUN	ID WTR (ft)
ORI	NG NO	. B5-E	3		s	TATIO	ON 25	5+06			OFF	SET	10 ft RT	-		ALIGN	IMENT -	·L-		0 HR.	NM
OLI	AR EL	<b>EV</b> . 4	67.1 ft	t	Т	OTAL	DEPT	<b>H</b> 21.4	l ft		NOR	THING	550,8	372		EAST	NG 1,56	50,416		24 HR.	NM
RILL	RIG/HA	MMER E	EFF./D/	ATE	FO0072	2 CME-	550X 9	2% 08/1	5/201	8			DRILL	METHO	DΝ	W Casing \	N/SPT&C	ore	HAMIN	MER TYPE	Automatic
RIL	LER S	Smith, C	C. L.		s	TART	DATE	04/14	/19		СОМ	P. DA	TE 04	/14/19		SURF	ACE WAT	TER DEI	TH N	/A	
.EV	DRIVE ELEV			ow co						R FOOT			SAMP		LO					CRIPTION	
ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50		75 	100	NO.	МОІ		ELEV. (ft)		. AND RC	OK DES	CRIPTION	DEPTH (ft)
70		1														_					
		‡														- 467.1		CPOLIN	ID SURF	ACE	0.0
`-		<del>                                     </del>				#:				<del></del>	T::				000	465.7		AL	LUVIAL		1.4
35_	-	‡				-			+		<del>  .</del> .					_ `\	NO	ON-CRYS	and Cobl TALLIN	E ROCK	
		‡				:					: :					-		(META	-ARGILL	ITE)	
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	-	Ŧ														_	Boring Te	erminated	at Eleva	ation 445.7 A-ARGILLI	ft in
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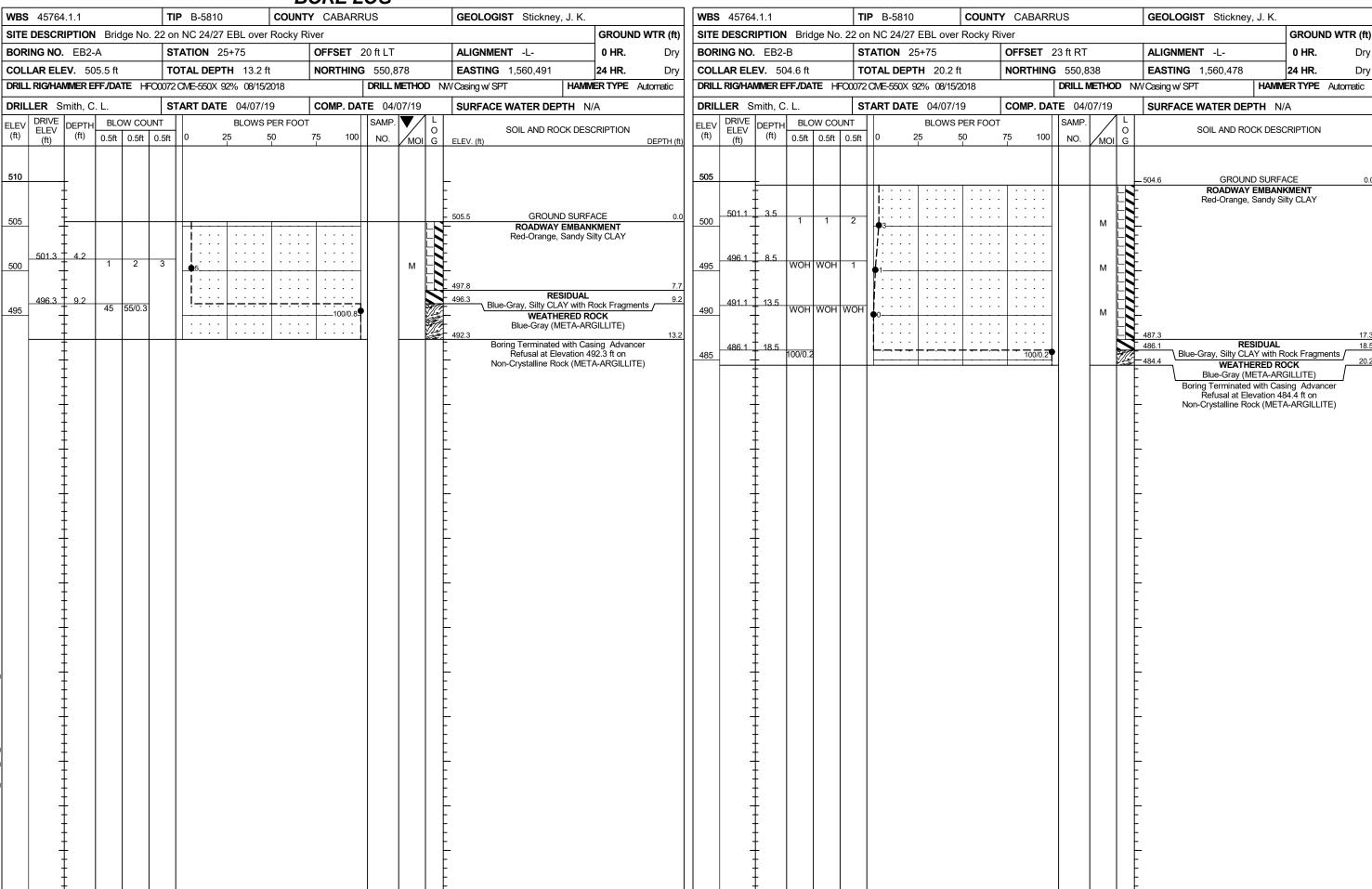
WBS	45764	<del>1</del> .1.1			TIP	B-581	0	С			RE L CABARR			GEOLOGIST	Sticknev	, J. K.		
			l Brid	lge No. 2											2)		GROUN	ID WTR (ft)
	ING NO			<u> </u>			25+06				FSET 1	0 ft RT		ALIGNMENT	-L-		0 HR.	NM
COL	LAR EL	<b>EV</b> . 46	7.1 ft		тот	AL DE	<b>PTH</b> 21	.4 ft		NO	RTHING	550,872		EASTING 1,	,560,416		24 HR.	NM
DRILI	L RIG/HA	MMER E	FF./DA	TE HFOO	072 CN	/IE-550X	(92% 08/	/15/2018	3			DRILL METHOD	) NW	Casing W/SPT &	Core	HAMIV	ER TYPE	Automatic
DRIL	LER S	mith, C	. L.		STAI	RT DA	<b>TE</b> 04/1	4/19		CO	MP. DAT	Γ <b>E</b> 04/14/19		SURFACE WA	ATER DEF	TH N	/A	
COR	E SIZE	NX					<b>N</b> 20.0 f											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	RQD (ft) %	SAMP. NO.	REC. (ft)	RATA RQD (ft) %	LOG	ELEV. (fi	t)	D	ESCRIPTION AN	ID REMARK	S		DEPTH (ft
465.7 465	405.7													Begin Coring				
460	460.7	6.4	5.0	0:00/1.0 0:00/1.0 1:41/1.0 1:39/1.0 1:47/1.0 1:52/1.0 1:43/1.0	(4.6) 92% (5.0)	(2.7) 54% (3.8)		(19.4) 97%	(16.1) 81%		— 465.7 - - - -	Gray, Slightly V	Weathe (	NON-CRYSTAL ered to 2.4' then F Close to Wide Fra GSI=	Fresh, Hard, acture Spaci	META-A	RGILLITE	1.4 with
455	455.7	11.4	5.0	1:43/1.0 1:49/1.0 1:53/1.0 1:46/1.0 1:50/1.0		76%					- - -							
450	450.7	16.4	5.0	1:47/1.0 1:52/1.0 1:51/1.0 1:45/1.0	100%						- - -							
	445.7	21.4	0.0	1:48/1.0 1:59/1.0 1:42/1.0 1:51/1.0 1:40	96%	96%					- - - 445.7	Poring To	rminat	ed at Elevation 4	45.7 ft in No	n Crieta	lling Pook	21.

#### CORE PHOTOGRAPHS: Bridge No. 22 on NC 24/27 EBL over Rocky River, B5-B 25+06, 10.0' RT









#### LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NC 45764.1.1

TIP: B-5810

**COUNTY: CABARRUS** 

Bridge No. 22 on NC 24/27 EBL over Rocky River

								Unit	Unconfined	
				Geologic	Run			Weight	Compressive	
Sample #	Boring #	Depth (ft)	Rock Type	Map Unit	RQD (%)	Length (in)	Diameter (in)	(PCF)	Strength (PSI)	Remarks
RS-1	B1-A	29.2-29.9	Meta-Argillite	CZmd	57	0.7	1.86	166.7	8,030	Bridge No. 22
RS-2	B2-A	25.4-26.2	Meta-Argillite	CZmd	77	0.8	1.87	169.9	16,970	Bridge No. 22
RS-3	В3-В	33.2-33.6	Meta-Argillite	CZmd	55	0.4	1.87	165.9	16,410	Bridge No. 22
RS-4	B4-A	12.2-12.6	Meta-Argillite	CZmd	5	0.4	1.86	166.5	11,260	Bridge No. 22
RS-5	B5-A	10.1-10.8	Meta-Argillite	CZmd	74	0.7	1.86	172.8	12,980	Bridge No. 22

# Bridge No. 22 on NC 24/27 EBL over Rocky River SITE PHOTOGRAPH



View Looking Downstream