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#### STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY GRAHAM

PROJECT DESCRIPTION UPGRADE NC 143 FROM SR 1223 (BEECH CREEK ROAD) TO 0.5 MILES NORTH OF APPALACHIAN TRAIL SITE DESCRIPTION PRECAST CONCRETE ARCH LAND BRIDGE OVER NC 143 BETWEEN SR 1282 AND NC 28 AT -L- STATION 381+40

# -0009CB Ż REFERENCE

	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
l	N.C.	A-0009CB	1	35

#### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 1707-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL SOL 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 UN-PLACED TEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THES WATER LEVELS OR SOLL 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 VIDSUBFACE 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 WARANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPNION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTION STO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FOM THE ACTUAL CONDENSATIONS FOR ANY EXTENSION OF TIME FOR ANY REASON RESULTING FOR THE ACTUAL CONDITIONS TO BE COUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES: I. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR CUARANTEED 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 **CG2 EXPLORATION** 

DDECCIA

DKEUUIA
D. GOODNIGHT
S. BRAUN
INVESTIGATED BYCG2, PLLC
DRAWN BY
CHECKED BY <u>R. KRAL, P.E.</u>
SUBMITTED BY <u>CG2, PLLC</u>
DATE
Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP 2400 CROWNPOINT EXECUTIVE DRIVE SUITE 800 CHARLOTTE, NC 28227 (980) 339-8684
SEAL 041986
D. Mattluw Brewer 04/29/2022
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## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT** SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

		SOTI	DESCRIPT	ION		GRADATION					ROCK DESCRIPTION						
		NCONSOLIDATED, SEMI-CO	NSOLIDATED, OF	WEATHERED			WELL GRADED - INDICA		RTICLE SIZES FROM FINE TO COARSE.			TAL PLAIN MATERIAL THAT	WOULD YIELD SPT REFUSAL				
		A CONTINUOUS FLIGHT PO FANDARD PENETRATION T					UNIFORMLY GRADED - IN	NDICATES THAT SOIL PARTICLES ARE	ALL APPROXIMATELY THE SAME SIZE				ASTAL PLAIN MATERIAL WOUL AMPLER EQUAL TO OR LESS				
IS	BASED ON THE	AASHTO SYSTEM. BASIC	DESCRIPTIONS	GENERALLY	INCLUDE THE FOLLOWIN	NG:	GAP-GRADED - INDICATE	S A MIXTURE OF UNIFORM PARTICLE		BLOWS IN	NON-COASTAL	PLAIN MATERIAL, THE TR	ANSITION BETWEEN SOIL AN				
		EXTURE, MOISTURE, AASHT CAL COMPOSITION, ANGULA				S SUCH		ANGULARITY OF GF				OF WEATHERED ROCK. PICALLY DIVIDED AS FOLLO	wS:				
		Y, SILTY CLAY, MOIST WITH IN						Y OR ROUNDNESS OF SOIL GRAINS I NGULAR, <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .	S DESIGNATED BY THE TERMS:	WEATHERED		NON-COASTAL PLA	IN MATERIAL THAT WOULD Y	IELD SPT N VAL			
	SOI	IL LEGEND AND	AASHTO	CLASSIF	ICATION		<u>HIGOLAN, 300A</u>	MINERALOGICAL COMP	OSITION	ROCK (WR)		100 BLOWS PER F					
GENERAL		ANULAR MATERIALS		MATERIALS	ORGANIC MATERI	ALS				CRYSTALLI	NE		GRAIN IGNEOUS AND METAMO				
CLASS.		35% PASSING #200)		SSING =200)				MES SUCH AS QUARTZ,FELDSPAR,MIC N DESCRIPTIONS WHEN THEY ARE CO		ROCK (CR)		GNEISS, GABBRO, S	REFUSAL IF TESTED. ROCK CHIST, ETC.	TTPE INCLUDES			
GROUP CLASS.	A-1 A- A-1-a A-1-b	-3 A-2 A-2-4 A-2-5 A-2-6 A-2		A-6 A-7 A-7-5	A-1, A-2 A-4, A-5 A-3 A-6, A-7			COMPRESSIBILIT		NON-CRYST			GRAIN METAMORPHIC AND NO K THAT WOULD YEILD SPT R				
	000000000000000000000000000000000000000			A-7-6			SLIG	HTLY COMPRESSIBLE	LL < 31	ROCK (NCR	)		DES PHYLLITE, SLATE, SANDS				
SYMBOL			<b>N</b>					RATELY COMPRESSIBLE	LL = 31 - 50 LL > 50	COASTAL F			EDIMENTS CEMENTED INTO R				
% PASSING =10	50.10				GRANULAR SILT-	миск.	HIGH	PERCENTAGE OF MA		(CP)	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, S (CP) SHELL BEDS, ETC.						
-10 -40	50 MX 30 MX 50 MX 51	MN				PEAT			ERIAL			WEAT	HERING				
*200	15 MX 25 MX 10	MX 35 MX 35 MX 35 MX 35	MX 36 MN 36 M	i 36 mn 36 mn	SOILS		ORGANIC MATERIAL	<u>SOILS</u>	OTHER MATERIAL	FRESH			ITS MAY SHOW SLIGHT STAININ	NG. ROCK RINGS (			
MATERIAL							TRACE OF ORGANIC M LITTLE ORGANIC MAT		TRACE 1 - 10% LITTLE 10 - 20%			CRYSTALLINE.					
PASSING #40 LL		- 40 MX 41 MN 40 MX 41	MN 40 MX 41 MM	40 MX 41 MN	SOILS WITH		MODERATELY ORGANIC		SOME 20 - 35%	VERY SLIGH (V SLI.)			SOME JOINTS MAY SHOW THIN SHINE BRIGHTLY. ROCK RINGS				
PI	6 MX N	4P 10 MX 10 MX 11 MN 11			LITTLE OR MODERATE	HIGHLY	HIGHLY ORGANIC	> 10% > 20%	HIGHLY 35% AND ABOVE	W SEL		ALLINE NATURE.	SHINE BRIDHLET, NOCK MINUS	UNDER THEMPLER			
GROUP INDEX	0 0	0 0 4 MX	8 MX 12 M	16 MX NO MX	AMOUNTS OF	ORGANIC SOILS		GROUND WATEF		SLIGHT	ROCK GENER	RALLY FRESH, JOINTS STAINED	AND DISCOLORATION EXTENDS	INTO ROCK UP			
USUAL TYPES	STONE FRAGS.		CILTY	CLAVEY	ORGANIC	30123	$\nabla$	WATER LEVEL IN BORE HOLE IMM	EDIATELY AFTER DRILLING	(SLI.)			IN GRANITOID ROCKS SOME O				
OF MAJOR	GRAVEL, AND SA	INE SILTY OR CLAYEY IND GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS	MATTER		<b>T</b>	STATIC WATER LEVEL AFTER 2	4 HOURS				RYSTALLINE ROCKS RING UNDE				
MATERIALS	SAND		_				 ₽₩	PERCHED WATER, SATURATED ZONE		MODERATE (MOD.)			SCOLORATION AND WEATHERING				
GEN. RATING AS SUBGRADE	EXC	CELLENT TO GOOD	FAIR	O POOR	FAIR TO POOR	UNSUITABLE		PERCHED WHIER, SHIURHIED ZUNE	, OR WHIER BEARING STRATH		DULL SOUND	UNDER HAMMER BLOWS AND	SHOWS SIGNIFICANT LOSS OF				
H3 SOBOTHEL	PI C	OF A-7-5 SUBGROUP IS ≤ LL	- 30 + PLOF A-7	-6 SURGROUP IS	1001			SPRING OR SEEP			WITH FRESH						
								MISCELLANEOUS SYN	ABOL S	MODERATEL SEVERE			R STAINED. IN GRANITOID ROC KAOLINIZATION. ROCK SHOWS				
				STANDARD	RANGE OF UNC				10023	(MOD. SEV.)	AND CAN BE		ST'S PICK. ROCK GIVES "CLUN				
PRIMARY	SOIL TYPE	COMPACTNESS OR CONSISTENCY	PENETRATIO	N RESISTENCE	COMPRESSIVE S	TRENGTH		ANKMENT (RE) 25/025 DIP & DIP	DIRECTION								
				ALUE)	(TONS/FT	-)		- 597		SEVERE (SEV.)			R STAINED. ROCK FABRIC CLE IN GRANITOID ROCKS ALL FEL				
GENER		VERY LOOSE LOOSE		4 0 10			SOIL SYMBOL		BORING SLOPE INDICATOR INSTALLATION	(324.)			STRONG ROCK USUALLY REMAIN				
GRANUL MATER		MEDIUM DENSE	10	10 30	N/A					R		WOULD YIELD SPT N VALUES					
	OHESIVE)	DENSE VERY DENSE		TO 50 50			X THAN ROADWA		TEST	VERY			R STAINED. ROCK FABRIC ELE				
		VERY SOFT		2	< 0.25		INFERRED SO	IL BOUNDARY CORE BORI		SEVERE (V SEV.)			SOIL STATUS, WITH ONLY FRAC F ROCK WEATHERED TO A DEG				
GENER	ALLY	SOFT		TO 4	Ø.25 TO Ø	0.5		Mar I	1				IAIN. <u>IF TESTED, WOULD YIELD</u>				
SILT-C		MEDIUM STIFF		10 8	0.5 TO 1	.0	INFERRED ROOM	CK LINE TO MONITORIN	G WELL - TEST BORING WITH CORE	COMPLETE			DT DISCERNIBLE, OR DISCERNIB				
MATER (COHES		STIFF VERY STIFF		10 15 10 30/	1 TO 2 2 TO 4		ALLUVIAL SO				SCATTERED ALSO AN EX		Y BE PRESENT AS DIKES OR S	STRINGERS. SAPRO			
		HARD		30	> 4			INSTALLAT	ION OF SECTION				IARDNESS				
		TEXTURE	OR GRAI	N SIZE				RECOMMENDATION SY	MBOLS		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIM						
U.S. STD. S	IEVE SIZE	4 10	40	60 200	270			UNCLASSIFIED EXCAVATION -	TAN UNCLASSIFIED EXCAVATION -	VENT HAND	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPEC SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.						
OPENING (N	1M)	4.76 2.00	0.42	0.25 0.07	5 0.053				ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF	HARD	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMME						
BOULD	ER COBBL	LE GRAVEL	COARSE	FINE		CLAY		UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK	EMBANKMENT OR BACKFILL		TO DETACH	HAND SPECIMEN.					
(BLDR			SAND (CSE. SD.)	SANI (F SE		(CL.)		ABBREVIATIONS		MODERATEL HARD			GOUGES OR GROOVES TO 0.25   IST'S PICK, HAND SPECIMENS (				
GRAIN M	м 305	75 2.0		0.25	0.05 0.005		AR - AUGER REFUSAL	MED MEDIUM	VST - VANE SHEAR TEST	HHND	BY MODERAT		IST S FICK. HHND SPECIFICINE	CHN DE DETHCHEI			
SIZE IN		3		ULU	0.000		BT - BORING TERMINATE		WEA WEATHERED	MEDIUM			S DEEP BY FIRM PRESSURE OF				
	50	IL MOISTURE -		TION OF	TERMS		CL CLAY CPT - CONE PENETRATIO	MOD MODERATELY N TEST NP - NON PLASTIC		HARD		GEOLOGIST'S PICK.	PEICES 1 INCH MAXIMUM SIZE	BY HARD BLOWS			
SOIL	MOISTURE SC						CSE COARSE	ORG ORGANIC	$\gamma_{ m d}$ - DRY UNIT WEIGHT	SOFT			KNIFE OR PICK. CAN BE EXCA	VATED IN ERAGME			
(AT	TERBERG LIMIT	TS) DESCR	IPTION	GUIDE FUR	FIELD MOISTURE DES	CRIPTION	DMT - DILATOMETER TES			3011			BY MODERATE BLOWS OF A F				
		- SATUR	ATED -	USUALLY LI	IQUID: VERY WET, USUA	ALLY	DPT - DYNAMIC PENETRA e - VOID RATIO	TION TEST SAP SAPROLITIC SD SAND, SANDY	S - BULK SS - SPLIT SPOON			BE BROKEN BY FINGER PRES					
		(SAT			W THE GROUND WATER		F - FINE	SL SILT, SILTY	ST - SHELBY TUBE	VERY SOF T			CAVATED READILY WITH POINT BY FINGER PRESSURE. CAN BE				
PLASTIC	- + LIQUID LI	IMIT					FOSS FOSSILIFEROUS	SLI SLIGHTLY	RS - ROCK		FINGERNAIL.	I THICKNESS CAN BE BROKEN	BT TINGEN TRESSORE. CAN BE	SCHATCHED NEH			
RANGE <		- WET -	(W)		REQUIRES DRYING TO IMUM MOISTURE		FRAC FRACTURED, FRAC FRAGS FRAGMENTS	TURES TCR - TRICONE REFUS w - MOISTURE CONTE		L	FRACTUR	E SPACING	BED	DING			
(PI) PL	PLASTIC I	LIMIT			INDIA INDIA DILE		HI HIGHLY	V - VERY	RATIO	TER		SPACING	TERM	THICKN			
	- MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOIST						EQ	UIPMENT USED ON SUBJE	ECT PROJECT	VERY W	IDE	MORE THAN 10 FEET	VERY THICKLY BEDDED				
	OM _ OPTIMUM MOISTURE - MOIST - (M) SULLU; AT OK NEAR OPTIMUM MOIST					ISTURE	DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	WIDE MODERA	ATELY CLOSE	3 TO 10 FEET 1 TO 3 FEET	THICKLY BEDDED THINLY BEDDED	1.5 - 4 0.16 - 1.5			
51	REQUIRES ADDITIONAL WATER TO						CME-45C	CLAY BITS	X AUTOMATIC MANUAL	CLOSE Ø.16 TO 1 FOOT VERY THINLY BEDDED Ø.03 - Ø							
1		- DRY -	(D)		ADDITIONAL WATER TO IMUM MOISTURE	l.		6 CONTINUOUS FLIGHT AUGER	CORE SIZE:	VERY C	LOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED THINLY LAMINATED	0.008 - 0.0 < 0.008			
L		<b></b>	ACTICITY				CME-55	X 8" HOLLOW AUGERS		THINLY LAMINATED < 0.008 INDURATION							
<b>—</b>			ASTICITY				Х СМЕ-550х			FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PF							
	PLASTICITY INDEX (PI)         DRY STRENGTH           NON PLASTIC         0-5         VERY LOW								X -N Q				FINGER FREES NUMEROUS G				
	NON PLASTIC         Ø-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT						VANE SHEAR TEST	TUNGCARBIDE INSERTS	HAND TOOLS:	FRI	ABLE		BY HAMMER DISINTEGRATES				
мо	MODERATELY PLASTIC 16-25 MEDIUM							CASING W/ ADVANCER	POST HOLE DIGGER			GRAINS CAN B	E SEPARATED FROM SAMPLE	WITH STEEL PR			
HIC	HIGHLY PLASTIC 26 OR MORE HIGH						PORTABLE HOIST	TRICONESTEEL TE		MUD	ERATELY INDUF		Y WHEN HIT WITH HAMMER.				
			COLOR					TRICONE TUNGCAR			URATED		IFFICULT TO SEPARATE WITH	H STEEL PROBE:			
DESCRIP	TIONS MAY INC	CLUDE COLOR OR COLOF		IS (TAN. RED	YELLOW-BROWN. BI UF	-GRAY).	X DIEDRICH D50						BREAK WITH HAMMER.				
		AS LIGHT, DARK, STRE								EXT	REMELY INDURA		R BLOWS REQUIRED TO BREAK	K SAMPLE;			
1									_   LJ	- 1		SAMPLE BREAK	S HURUSS URAINS.				

## PROJECT REFERENCE NO.



TERMS AND DEFINITIONS D AN INFERRED ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ED. AN INFERRED SPT REFUSAL. 1 FOOT PER 60 IS OFTEN 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. N VALUES > ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND СК ТНАТ SURFACE. CLUDES GRANITE. 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. AL PLAIN IF TESTED. MAY NOT YIELD STONE, CEMENTED 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. RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. AMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE СК ИР ТО SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. BLOWS.  $\underline{\mathsf{FLOAT}}$  - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. ROCK HAS AS COMPARED 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. FELDSPARS DULL OSS OF STRENGTH WHEN STRUCK. 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 VIDENT BUT ITS LATERAL EXTENT. ARE KAOLINIZED 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. E DISCERNIBLE STRONG ROCK PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE ONLY MINOR OF AN INTERVENING IMPERVIOUS STRATUM. ALUES < 100 BPF RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. IN SMALL AND 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 SAPROLITE IS RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. REQUIRES <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO LOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  $\underline{\text{SLICKENSIDE}}$  - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. EEP CAN BE TACHED 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 B PICK POINT WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE 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. FRAGMENTS T. SMALL, THIN STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. PIECES 1 INCH ED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: THICKNESS 4 FEET 1.5 - 4 FEET FEET ELEVATION: 16 - 1.5 FEET NOTES 3 - 0.16 FEE 98 - Ø.Ø3 FEET ROADWAY DESIGN AND SURVEY INFORMATION PROVIDED BY TGS ENGINEERS 0.008 FEET AT. PRESSURE. ETC. EEL PROBE:

## 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

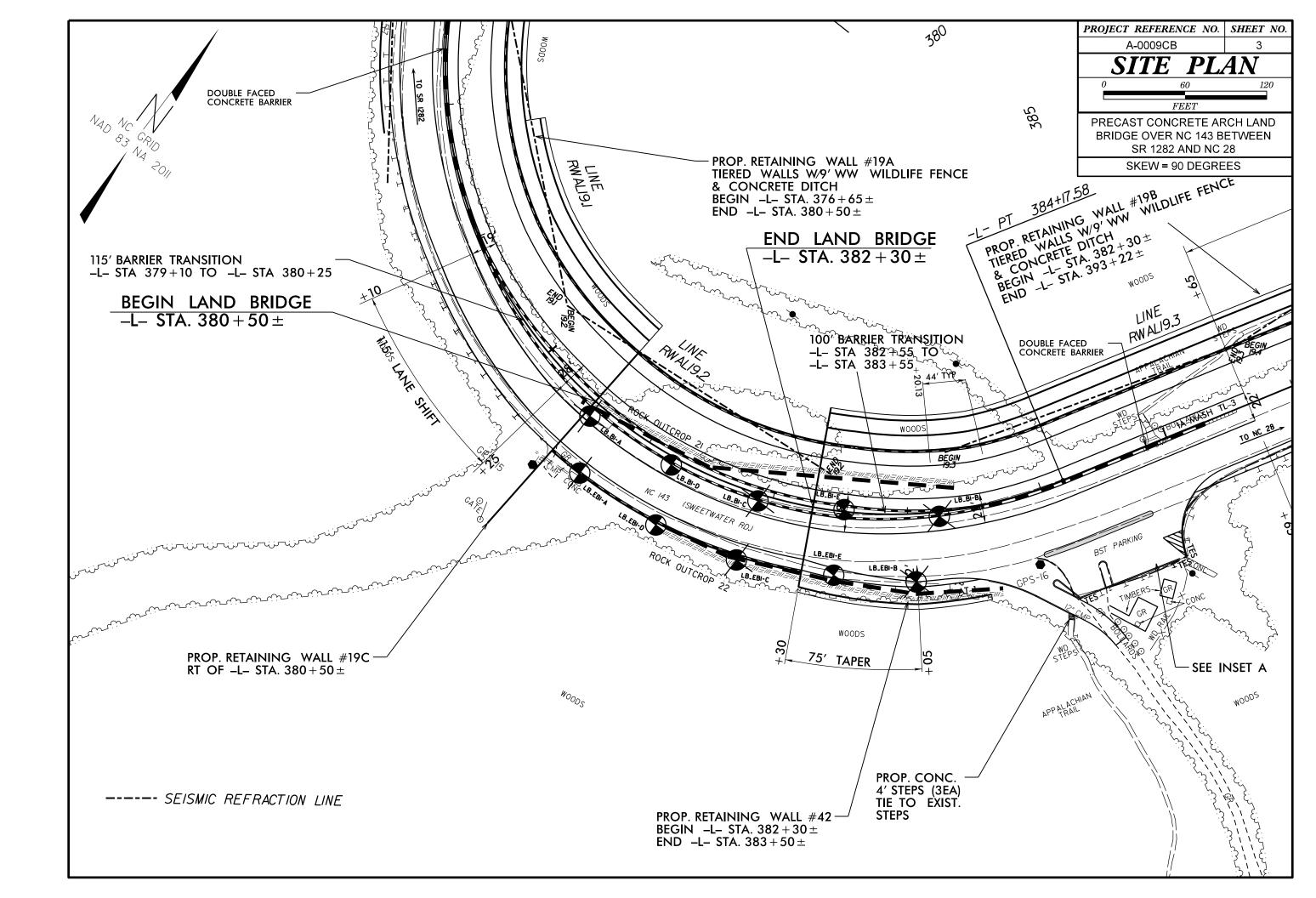
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed F	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to	surfaces	stained	and	l surfaces 1ngs	l surfaces llings	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
be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	VERY GOOD Very rough, fresh unweathered	<b>GOOD</b> Rough, slightly weathered, iron surfaces	<b>FAIR</b> Smooth, moderately weathered altered surfaces	POOR Slickensided, highly weathered sur with compact coatings or fillings or angular fragments	<b>VERY POOR</b> Slickensided, highly weathered with soft clay coatings or fill	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 fai poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING SI	JRFACE QUA		~	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.
BLOCKY - well interlocked un- disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with thin inter-
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			layers of siltstone amounts stone layers
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		$ \begin{array}{c} \textbf{C, D, E, and } \textbf{G} & - \text{ may be more or} \\ \text{less folded than illustrated but} \\ \text{this does not change the strength.} \\ \text{Tectonic deformation, faulting and} \\ \text{loss of continuity moves these} \\ \text{categories to } \textbf{F} \text{ and } \textbf{H}. \end{array} $
discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	

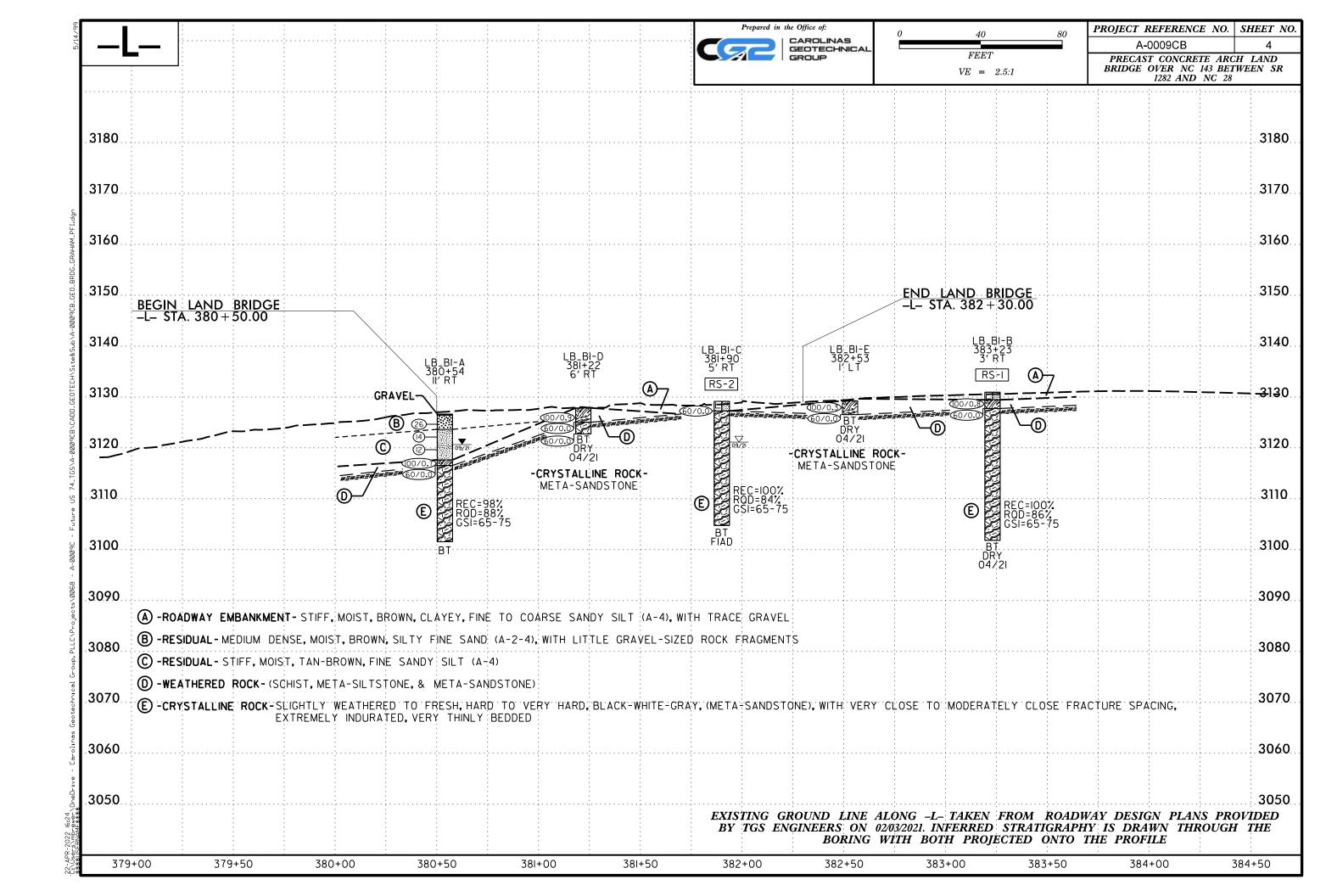
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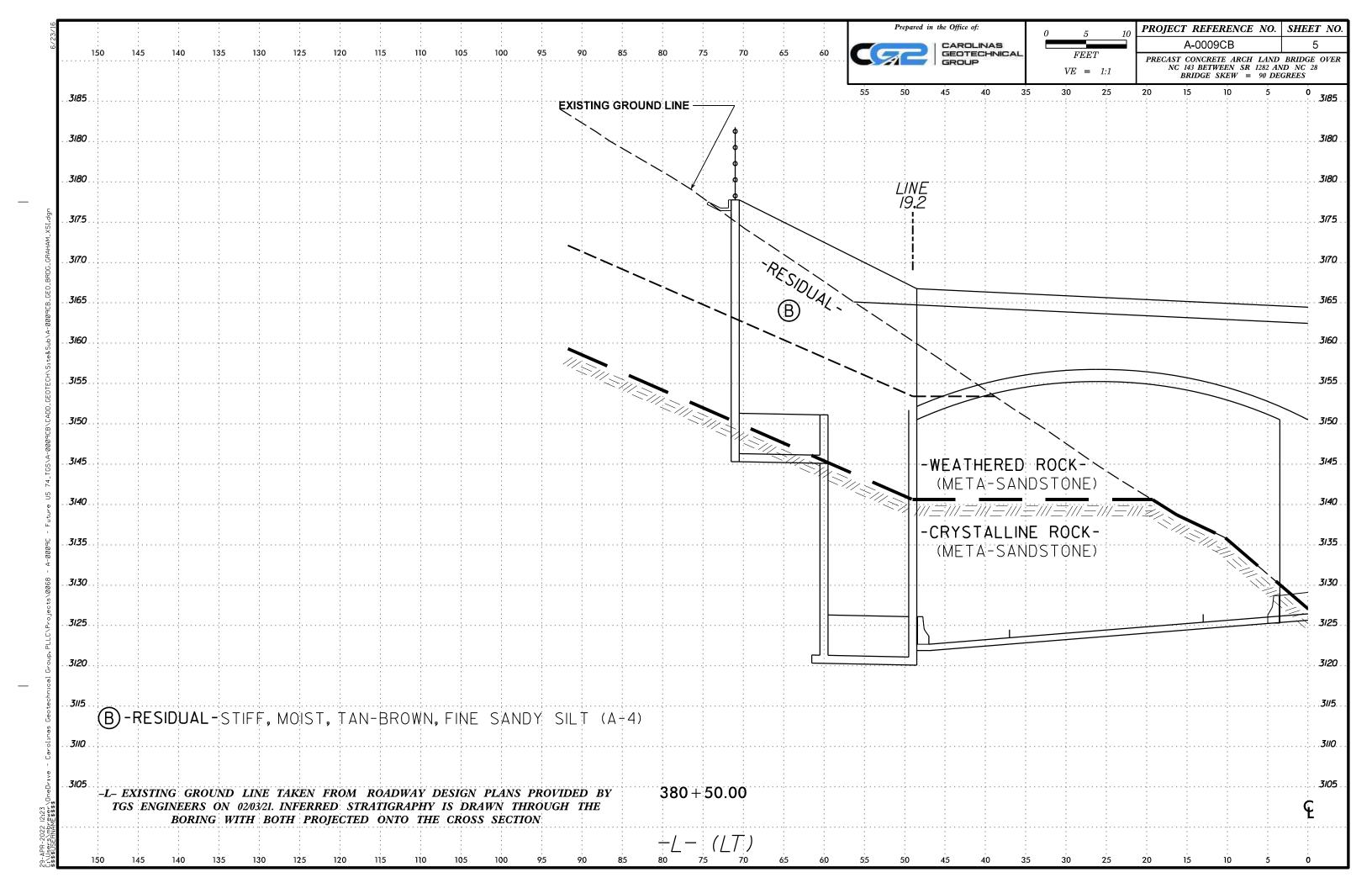
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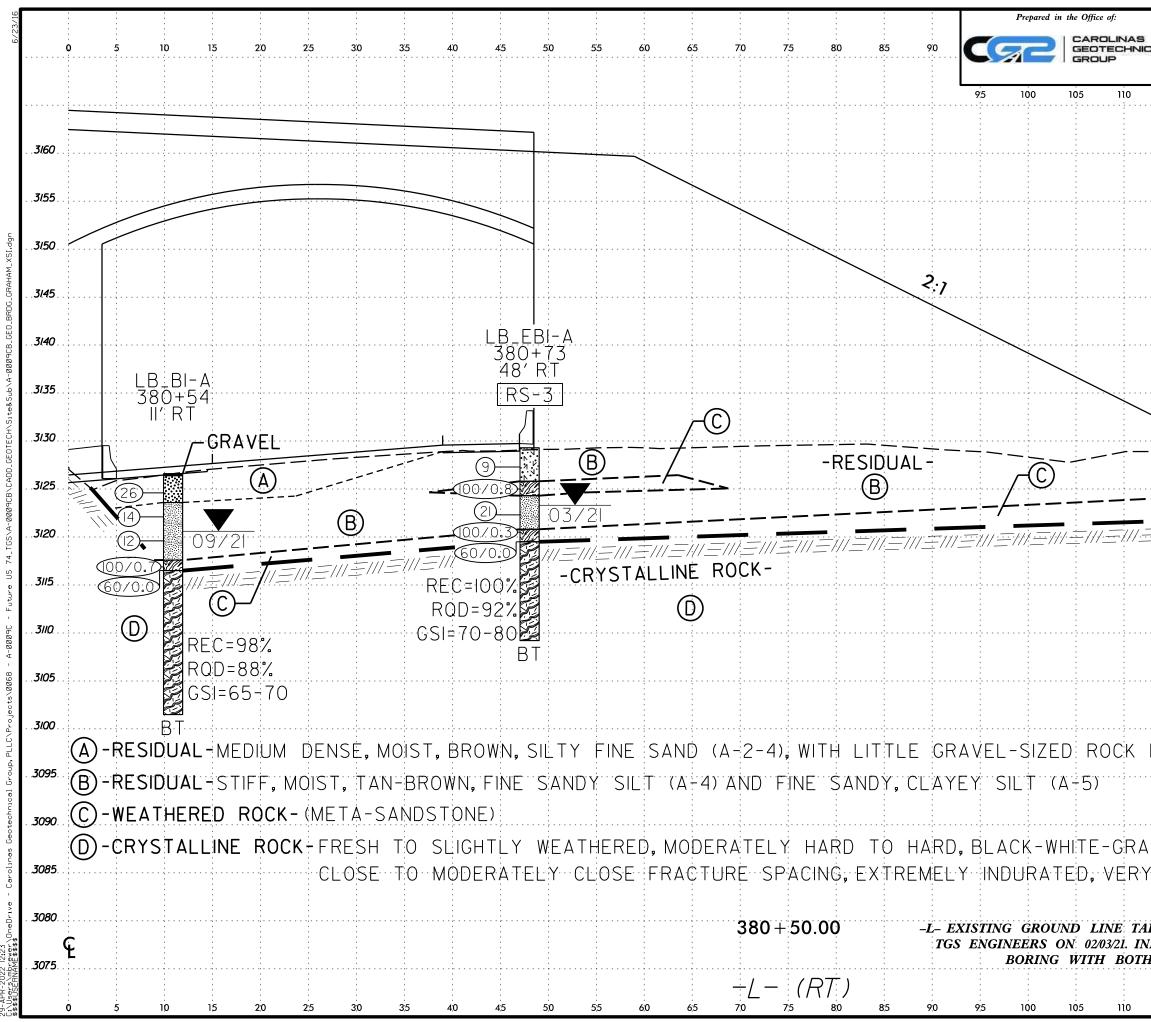
Tectonically Defo	ormed Heterog	geneous Rock	Masses (Marın	nos and Hoek	, 2000)
SURFACE CONDITIONS OF 0 8 9 DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	<b>GOOD -</b> Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	<b>VERY POOR -</b> Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
E. Weak sultstone or clayey shale with sandstone layers leformed, ed/faulted, thale or sultstone deformed s forming an structure	70 60	A 50 B 40	с с 30	р Е F 20	
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DATE: 8-19-16





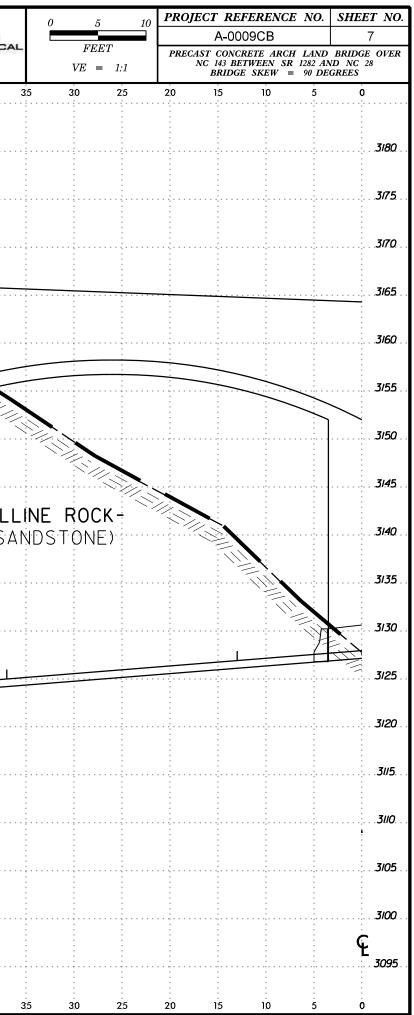


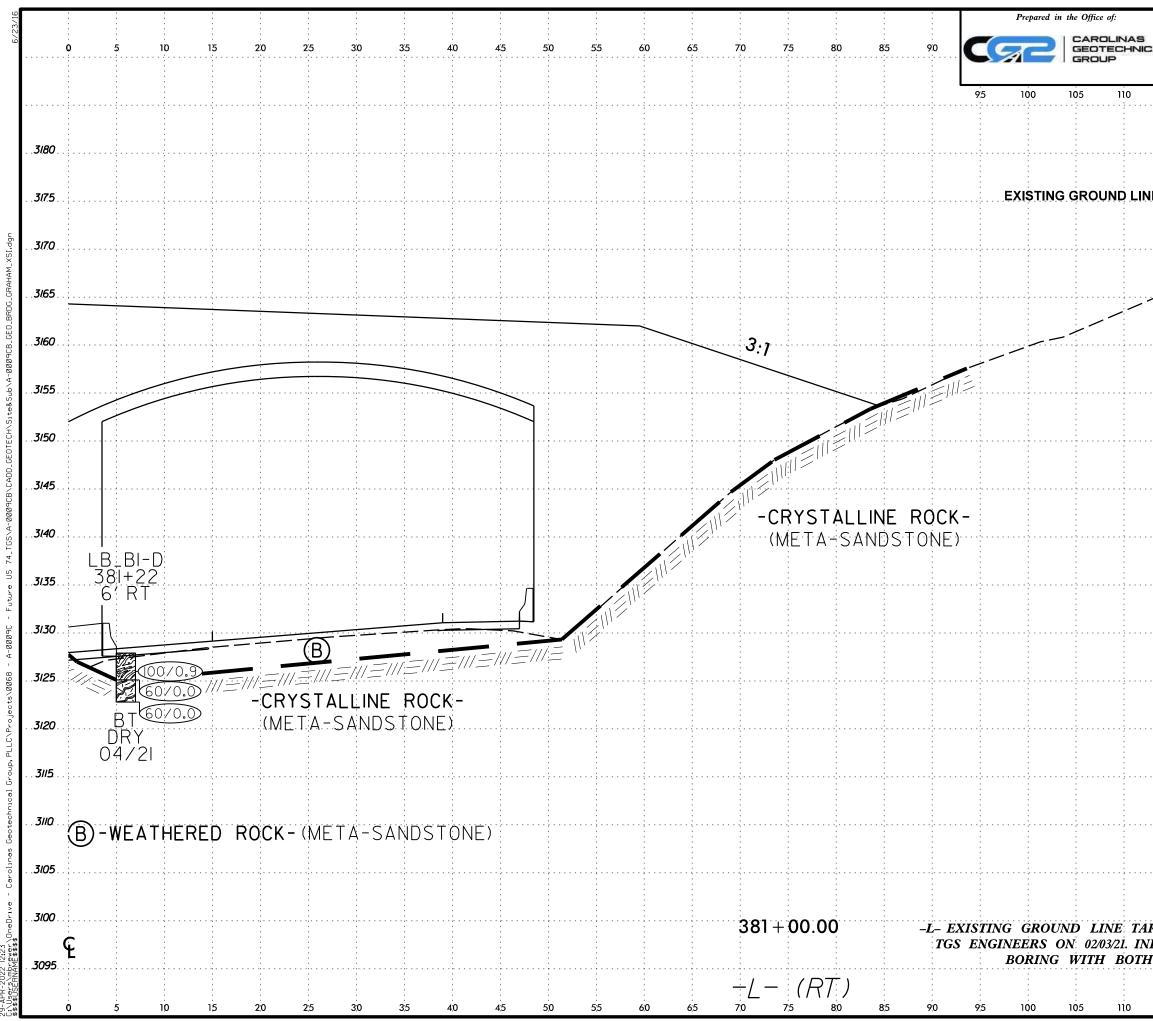


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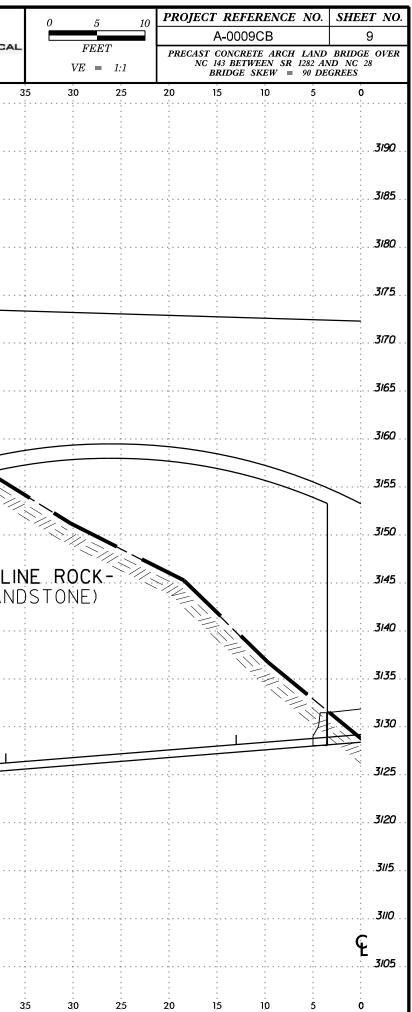
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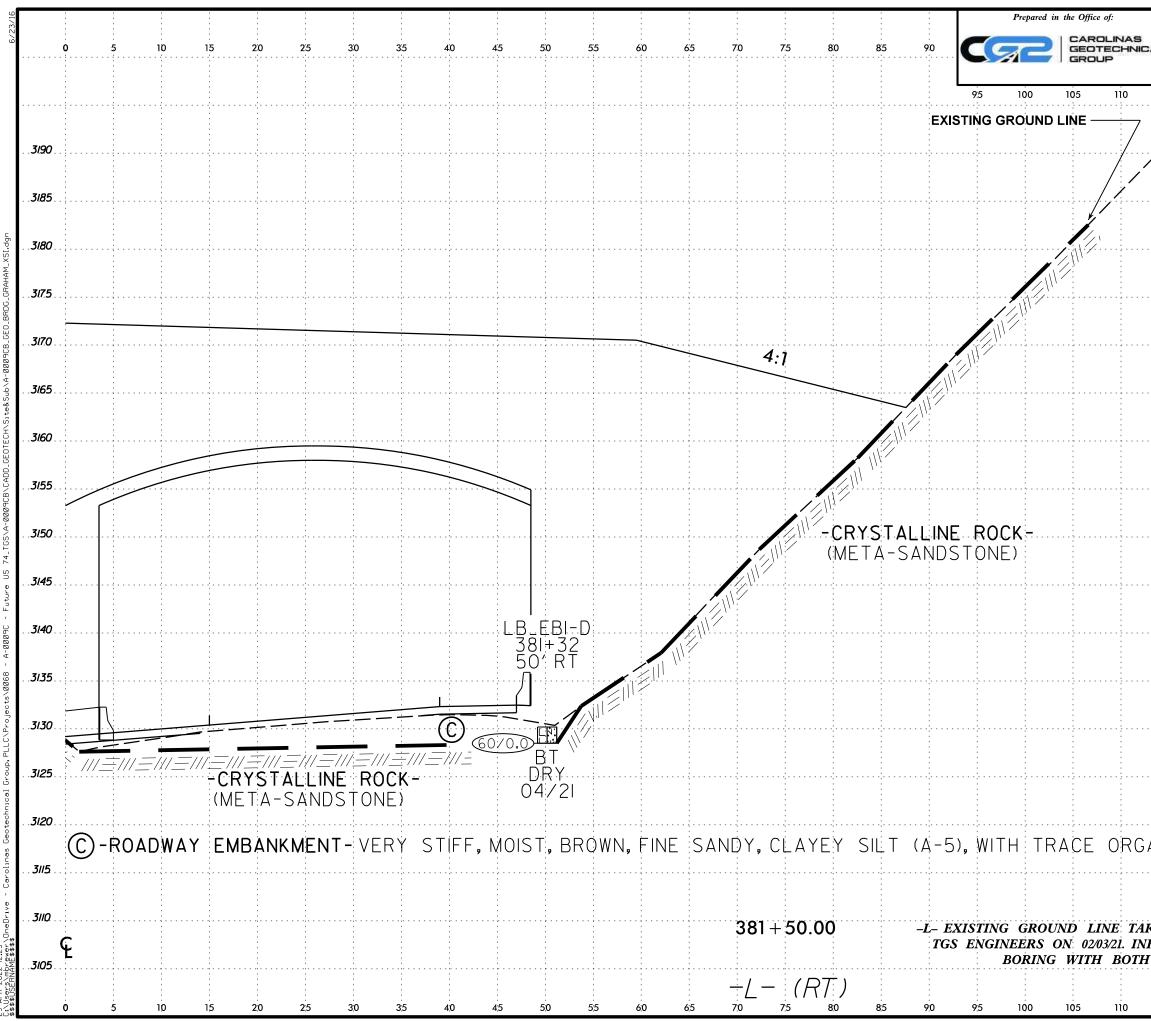




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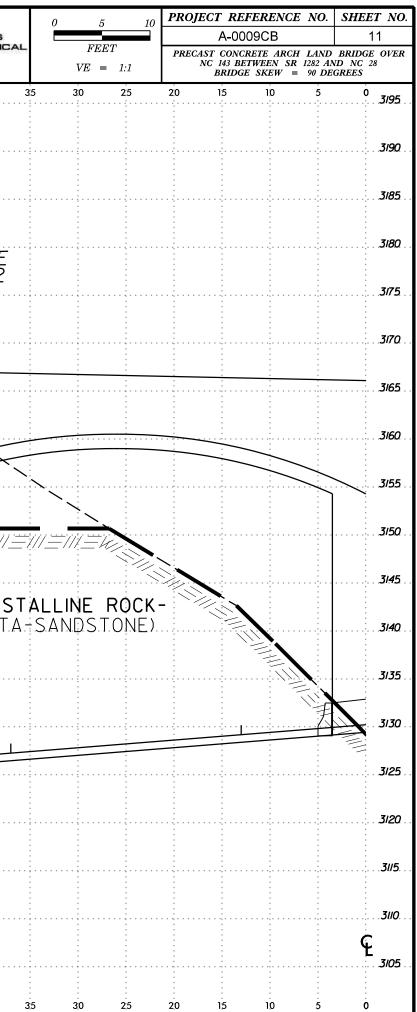
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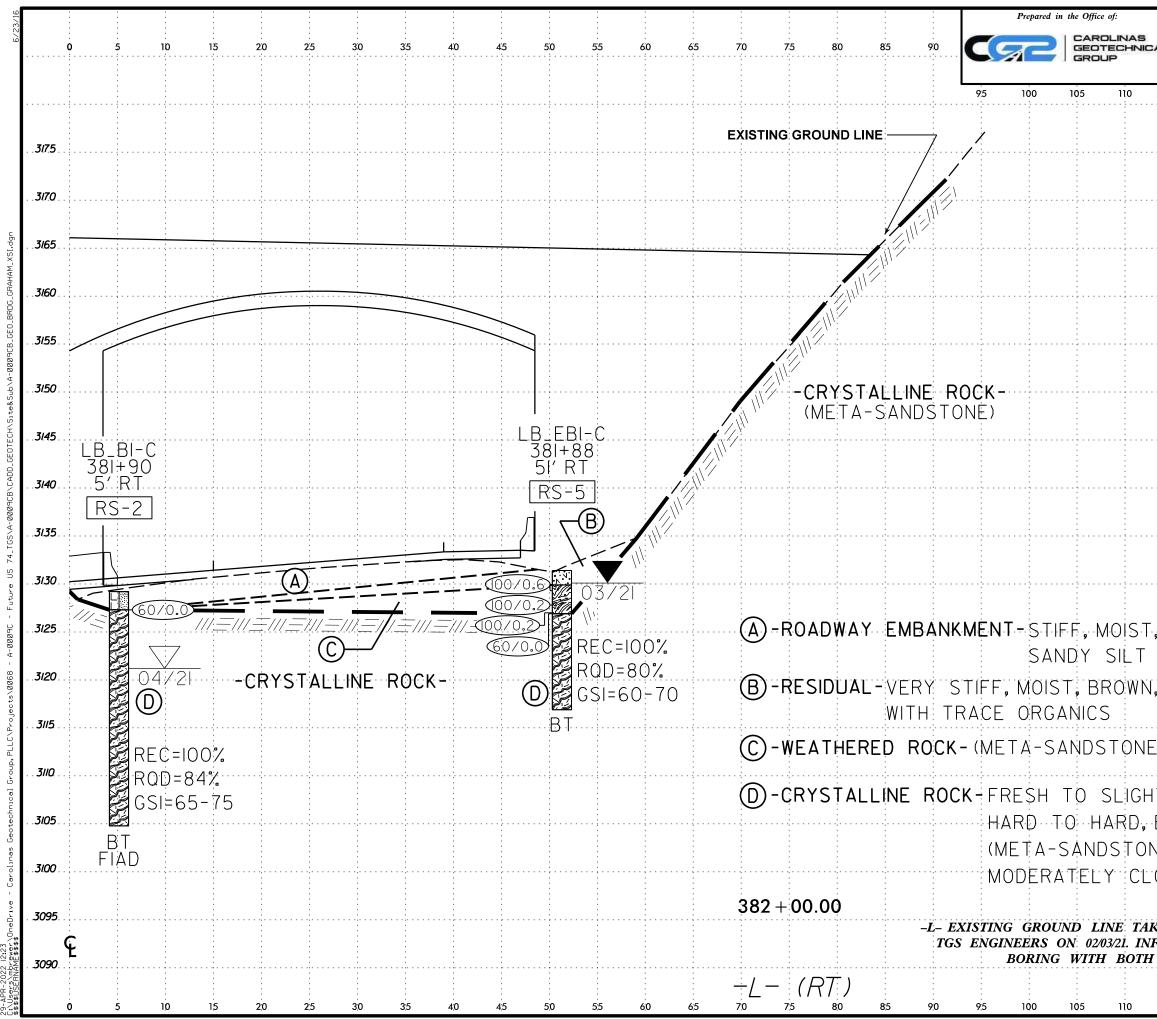




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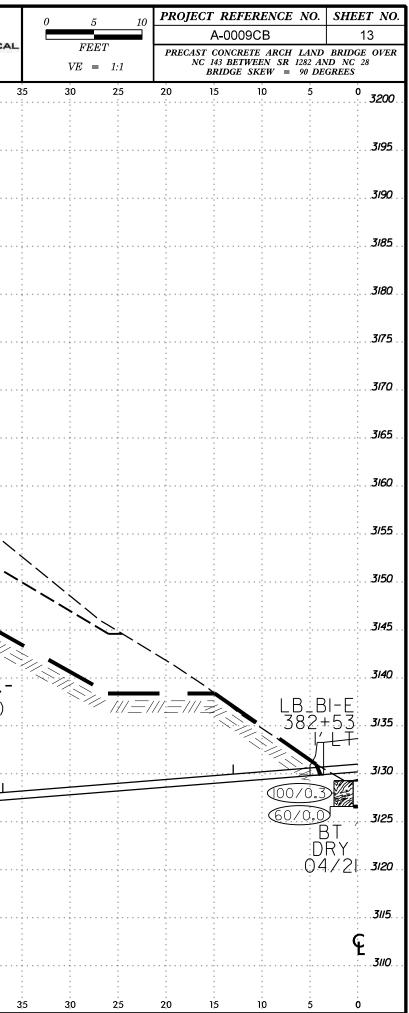
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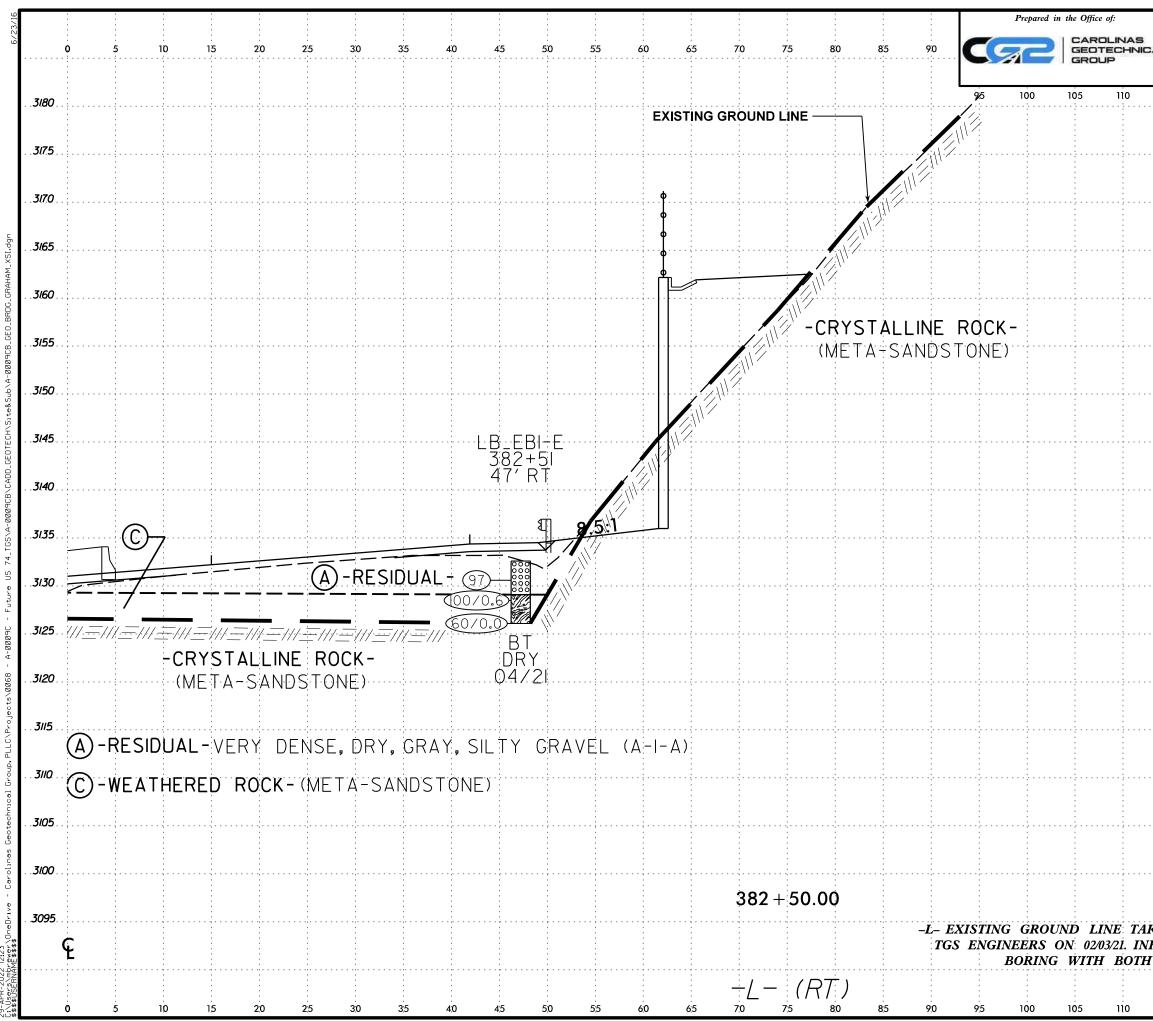




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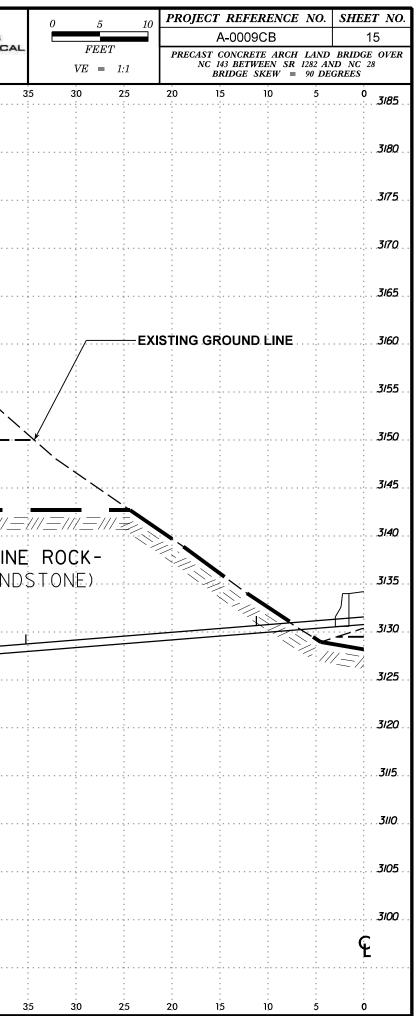
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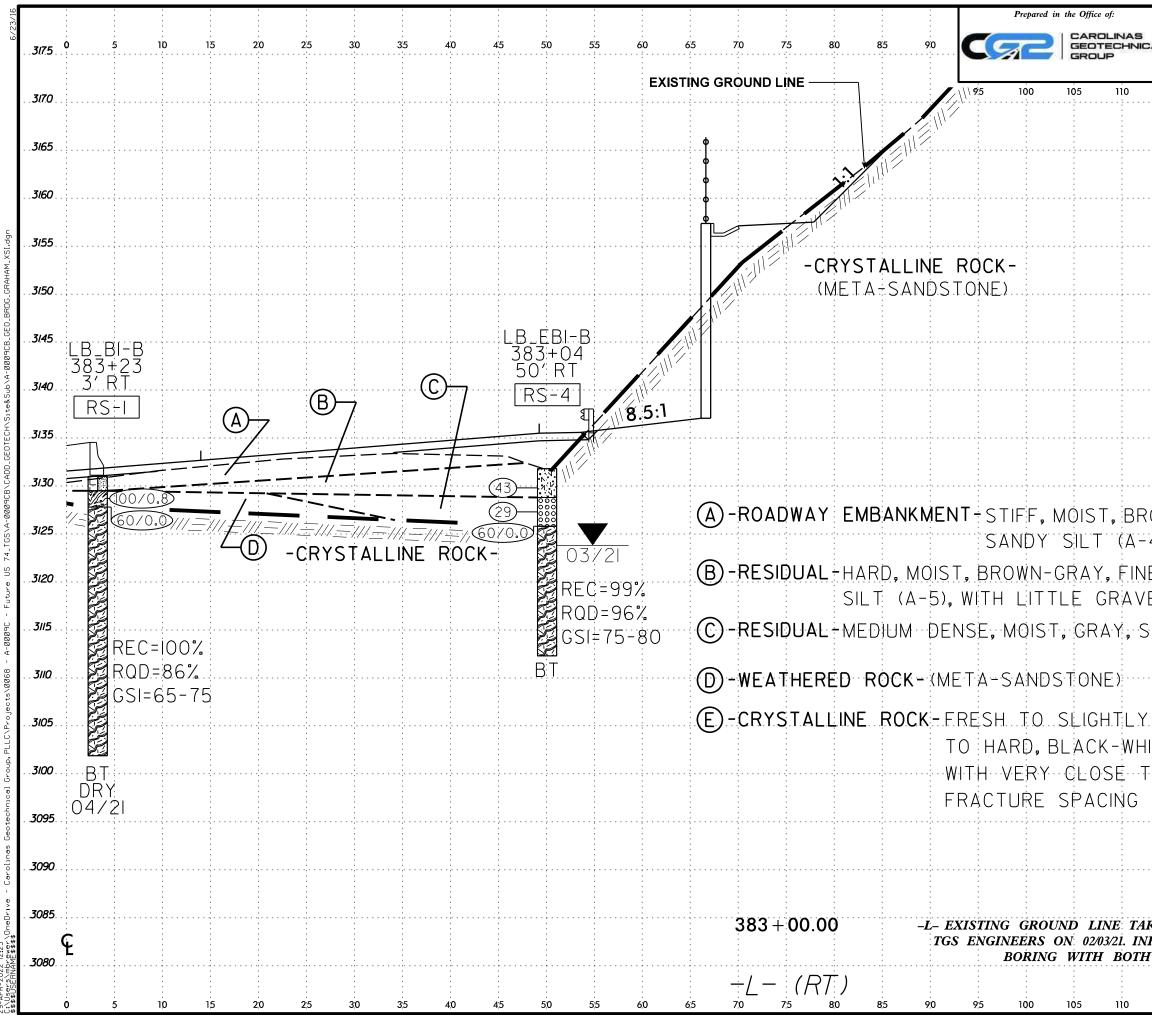




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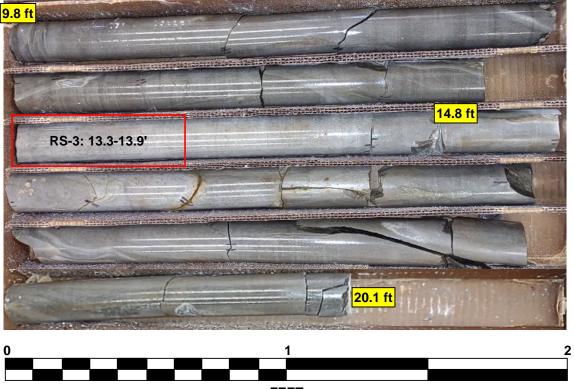
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		SORE LOG	1			JURE LUG		
WBS 32572.1.FS10	TIP A-0009CB COUN	TY GRAHAM	GEOLOGIST S. Braun	WBS 32572.1.FS10		ITY GRAHAM	GEOLOGIST S. Braun	
SITE DESCRIPTION Precast Con	hcrete Arch Land Bridge over NC 143		GROUND WTR (ft)		Concrete Arch Land Bridge over NC 14			GROUND WTR (ft)
BORING NO. LB_EB1-A	<b>STATION</b> 380+73	OFFSET 48 ft RT	ALIGNMENT L 0 HR. 3.9	BORING NO. LB_EB1-A	<b>STATION</b> 380+73	OFFSET 48 ft RT		0 HR. 3.9
COLLAR ELEV. 3,129.3 ft	TOTAL DEPTH 20.1 ft	NORTHING 618,546	<b>EASTING</b> 593,515 <b>24 HR.</b> 6.0	COLLAR ELEV. 3,129.3 ft	TOTAL DEPTH 20.1 ft	NORTHING 618,546	EASTING 593,515	<b>24 HR.</b> 6.0
DRILL RIG/HAMMER EFF./DATE CG20		DRILL METHOD SP			CG20446 Diedrich D50 83%06/16/2020	DRILL METHOD S		MER TYPE Automatic
DRILLER C. Odom	<b>START DATE</b> 03/30/21	COMP. DATE 03/30/21	SURFACE WATER DEPTH N/A	DRILLER C. Odom	<b>START DATE</b> 03/30/21	COMP. DATE 03/30/21	SURFACE WATER DEPTH N	I/A
ELEV DRIVE ELEV (ft) (ft) (ft) 0.5ft 0.5ft			SOIL AND ROCK DESCRIPTION		TOTAL RUN 10.3 ft			
(π) (ft) (π) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft) DEPTH (ft)		RUN         STRATA           RATE         REC.         ROD         SAMP.         REC.         RCM           Min/ft)         (ft)         (ft)         NO.         (ft)         (ft)		DESCRIPTION AND REMARKS	
					Min/ft) % % NO. (#) (#	G ELEV. (ft)		DEPTH (f
3130			-3,129.3 GROUND SURFACE 0.0	3119.5 3,119.5 9.8 5.0 <u>N</u>	<i>60/0.0</i> (5.0) (5.0) (10.3) (9. 58/1.0 100% 100% 100% 100% 92'	5) % 3,119.5 % Fresh to Slightly W	Begin Coring @ 9.8 ft CRYSTALLINE ROCK	9.
3,128.3 1.0 4 4	5		<b>RESIDUAL</b> Stiff, Tan-Brown, Fine Sandy, Clayey SILT		=60/0.0 (5.0) (5.0) (10.3) (9. 58/1.0 100% 100% 100% 100% 92' 09/1.0 34/1.0 RS-3 (	6 Fresh to Slightly W (META-SANDST	/eathered, Moderately Hard to Hard, Bl ONE), with Very Close to Moderately (	ack-White-Gray, Close Fracture
3125 3,125.8 3.5 68 32/0.3	· · · · · · · · · · · · · · · · · · ·		3,125.8 (A-5) 3.5	<u>3115</u> 3,114.5 14.8 3	34/1.0 31/1.0 RS-3		Spacing	
3.123.3 6.0			-3,124.3 WEAT HERED ROCK 5.0 Gray-Brown-Tan (META-SANDSTONE) 5.0 RESIDUAL		:28/1.0   (5.3)   (4.5)		RS-3: 13.3 - 13.9 ft Unit Weight: 171.5 pcf	
	14	M	Very Stiff, Brown-Tan, Fine to Coarse 3,120.8 Sandy SILT (A-4), with trace gravel-sized 8.5	$\begin{vmatrix} -1 \\ -2 \\ -2 \\ -2 \\ -1 \\ -1 \\ -1 \\ -1 \\$	12/1.0 11/1.0	(META-SANDST Unconfine 3,109.2	d Compressive Strength: 20,620 psi (2,	,969 ksf)
3,120.8 8.5 3,119.5 9.8 100/0.3 60/0.0			Sandy SILT (A-4), with trace graver-sized		17/1.3	3,109.2 Boring Term	ninated at Elevation 3,109.2 ft In Crysta	20.2
			WEATHERED ROCK Gray-Brown-Tan, (META-SANDSTONE)				(META-SANDSTONE)	
3115		RS-3	CRYSTALLINE ROCK Black-White-Gray, (META-SANDSTONE)					
			REC=100%					
			-3,119.5 rock fragments 9.8 WEATHERED ROCK Gray-Brown-Tan, (META-SANDSTONE) CRYSTALLINE ROCK Black-White-Gray, (META-SANDSTONE) REC=100% RQD=92% GSI=70-80 -3,109.2 20.1					
3110		-+	-3,109.2 20.1 Pering Terminated at Elevation 2 100 2 ft In					
			Boring Terminated at Elevation 3,109.2 ft In Crystalline Rock (META-SANDSTONE)					
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#### GEOTECHNICAL BORING REPORT CORE LOG



#### Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs Boring: LB\_EB1-A 9.8 to 20.1 Feet



FEET

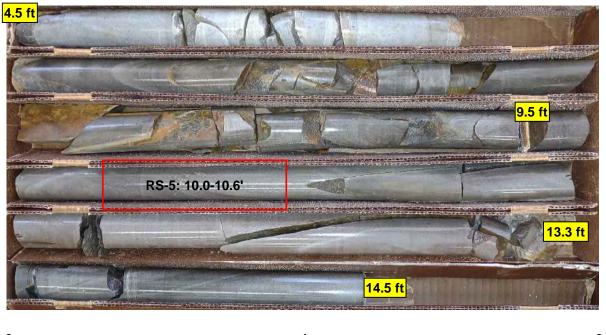
												C L	UG								
WBS	32572	.1.FS10	)	<u>.</u>	Т	P A-0	0009CE	В	co	UNTY	GR	AHAM				GEOLOG	IST S. E	Braun			
SITE	DESCRI	PTION	Preca	ast Cor	ncrete	Arch L	and Br	idge ove	er NC	143 B	etwee	n SR 1	282 and	NC 28	3					GROUN	D WTR (ft
BORI	NG NO.	LB E	B1-D		S	ΓΑΤΙΟ	N 38′	1+32			OFFS	SET 5	0 ft RT			ALIGNME	NT L			0 HR.	Dr
	AR ELE			t				<b>I</b> 1.7 ft	:				618,54	19		EASTING		3		24 HR.	Dr
	. RIG/HAM												DRILL N		) H.S.		,				Automatic
	LER C.							03/29/			COM		E 03/2			SURFACE					
LEV (ft)		DEPTH (ft)		W COL 0.5ft		0	25	BLOWS				100	SAMP. NO.	MOI	L O G	ELEV. (ft)	SOIL AN				DEPTH (
3135 3130	- - - 3,128.5- - - - - -	- - - - - - - - - - -	60/0.0							 		-60/0.0	-	M			ROAL ry Stiff, Bro (A-5 Boring T Penetratio 3,128.5	), with tra erminate n Test R 5 ft On C	<b>WBANKI</b> e Sandy, ace orga ed with S efusal a crystalling	<b>MENT</b> , Clayey S anics Standard t Elevation e Rock	
																	(M	ETA-SAN	NDSTON	NE)	
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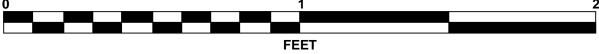
#### GEOTECHNICAL BORING REPORT CORE LOG

		BURE LUG	·			CORE LOG	
WBS 32572.1.FS10		TY GRAHAM	GEOLOGIST S. Braun	WBS 32572.1.FS10		NTY GRAHAM	GEOLOGIST S. Braun
SITE DESCRIPTION Preca	ast Concrete Arch Land Bridge over NC 143		GROUND WTR (ft)	SITE DESCRIPTION Precast Con	-		
BORING NO. LB_EB1-C	<b>STATION</b> 381+88	OFFSET 51 ft RT	ALIGNMENT L 0 HR. 1.4	BORING NO. LB_EB1-C	<b>STATION</b> 381+88	OFFSET 51 ft RT	ALIGNMENT L 0 HR. 1.4
<b>COLLAR ELEV.</b> 3,131.7 ft		NORTHING 618,564	<b>EASTING</b> 593,646 <b>24 HR.</b> 1.3	COLLAR ELEV. 3,131.7 ft	TOTAL DEPTH 14.5 ft	NORTHING 618,564	<b>EASTING</b> 593,646 <b>24 HR.</b> 1.3
DRILL RIG/HAMMER EFF./DATE	OG20446 Diedrich D50 83%06/16/2020	DRILL METHOD SP	T Core Boring HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE CG20		DRILL METHOD	SPT Core Boring HAMMER TYPE Automatic
DRILLER C. Odom	<b>START DATE</b> 03/30/21	COMP. DATE 03/30/21	SURFACE WATER DEPTH N/A	DRILLER C. Odom	START DATE 03/30/21	COMP. DATE 03/30/21	SURFACE WATER DEPTH N/A
	W COUNT BLOWS PER FOO		SOIL AND ROCK DESCRIPTION	CORE SIZE NQ	TOTAL RUN 10.0 ft		
(ft) (ft) (ft) 0.5ft	0.5ft 0.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft) DEPTH (ft)	ELEV RUN (ft) ELEV DEPTH RUN RATE (ft) (ft) (ft) (ft) (Min/ft)	RUN         STRATA           REC.         RQD         SAMP.         REC.         RQ           (ft)         (ft)         NO.         (ft)         (ft)         (ft)         %		DESCRIPTION AND REMARKS
				(II) (II) (III) (Min/ft)	(ft) (ft) (ft) NO. (ft) (ft) (ft)	G ELEV. (ft)	DEPTH (ft)
3135			-	3127.2 3,127.2 4.5 5.0 N=60/0.	0 (5.0) (3.9) (10.0) (8.0	0) 3,127.2	Begin Coring @ 4.5 ft CRYSTALLINE ROCK 4.5
			3,131.7 GROUND SURFACE 0.0	3125 + 6:24/1.0	0 (5.0) (3.9) (10.0) (8.0 0 100% 78% 100% 809	% Fresh to Slightly (META-SAND	Weathered, Moderately Hard to Hard, Black-White-Gray, STONE), with Very Close to Moderately Close Fracture
3,130.7 - 1.0 - 18	77 23/0.1	· · · · · ·	RESIDUAL 1.5	3,127.2 4.5 5.0 N=60/0 6.24/1 5.50/1 2:57/1 3,122.2 9.5 3:20/1.1	0         (5.0)         (3.9)         (10.0)         (8.0)           0         100%         78%         100%         80%           0         0         0         0         0         0		Spacing
			Very Stiff, Brown, Fine Sandy, Clayey SILT (A-5), with trace organics	3120 <b>5.0</b> 3:16/1.0 2:48/1.0	0 (5.0) (4.1) 0 100% 82% RS-5	Unconfii	RS-5: 10.0-10.6 ft Unit Weight: 175.6 pcf
3,128,3 <sup>+</sup> 3,127,5 <sup>+</sup> 3,127,5 <sup>+</sup> 4,2 100/0.2 100/0.2		- 100/0.2 - 100/0.2 	WEATHERED ROCK         4.5           Gray (META-SANDSTONE)	- 2:46/1.0 4:34/1.0		Unconfi	ned Compressive Strength: 22,000 psi (3,168 ksf)
3125 60/0.0			CRYSTALLINE ROCK Black-White-Gray, (META-SANDSTONE)	3,117.2 14.5 5:36/1.0	0		erminated at Elevation 3,117.2 ft In Crystalline Rock
			REC=100%				(META-SANDSTONE)
3120		RS-5	RQD=80% GSI=60-70			I E	
			Gray (META-SANDSTONE)     Gray (META-SANDSTONE)     CRYSTALLINE ROCK     Black-White-Gray, (META-SANDSTONE)     REC=100%     RQD=80%     GSI=60-70     3,117.2     Decise Transiented at Elemetics 2.447.0 ft laboration			I E	
			Boring Terminated at Elevation 3, 117.2 ft in			E	
			Crystalline Rock (META-SANDSTONE)				
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#### Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs Boring: LB\_EB1-C 4.5 to 14.5 Feet





			BURE L	<u> </u>	1	
WBS 32572.1.FS1	10	<b>TIP</b> A-0009CB	COUNTY GRAHAM		GEOLOGIST S. Braun	
SITE DESCRIPTION	Precast Concret	ete Arch Land Bridge over N	NC 143 Between SR 1	282 and NC 28		GROUND WTR (ft)
BORING NO. LB_E	EB1-E	<b>STATION</b> 382+51	OFFSET 4	47 ft RT	ALIGNMENT L	0 HR. Dry
COLLAR ELEV. 3	,132.6 ft	TOTAL DEPTH 6.5 ft	NORTHING	618,598	EASTING 593,710	24 HR. Dry
		6 Diedrich D50 83% 06/16/2020		DRILL METHOD H.S		ER TYPE Automatic
RILLER C. Odom		<b>START DATE</b> 03/29/21	1	re 03/29/21	SURFACE WATER DEPTH N/	Δ
LEV DRIVE ELEV (ft) (ft)		BLOWS PE	ER FOOT	SAMP. L NO. MOI G	SOIL AND ROCK DESC	
	0.511     0.511     0.51       38     44     53       65     35/0.1       60/0.0     -	· · · · · · · · · · · · · · · · · · ·		7 D 0000	ELEV. (ft) <u>3,132.6 GROUND SURFA</u> <u>RESIDUAL</u> Very Dense, Gray, Silty GR <u>3,129.1 WEATHERED RC</u> Gray (META-SANDS <u>3,126.1 ft On Crystalli</u> (META-SANDSTC	ACE 0 AVEL (A-1-a) 3. CK TONE) 6. Standard at Elevation ne Rock

	BORE LOG			<u> </u>	ORE LOG	F	
WBS         32572.1.FS10         TIP         A-000	D9CB COUNTY GRAHAM	GEOLOGIST S. Braun	<b>WBS</b> 32572.1.FS10	TIP A-0009CB COUNT	Y GRAHAM	GEOLOGIST S. Braun	
	d Bridge over NC 143 Between SR 1282 and NC 28	GROUND WTR (ft)	SITE DESCRIPTION Precast Concre	-		1	GROUND WTR (ft
BORING NO. LB_EB1-B STATION	383+04 <b>OFFSET</b> 50 ft RT	ALIGNMENT L 0 HR. 8.2	BORING NO. LB_EB1-B	<b>STATION</b> 383+04	OFFSET 50 ft RT	ALIGNMENT L	0 HR. 8.2
	PTH         19.5 ft         NORTHING         618,630	<b>EASTING</b> 593,761 <b>24 HR.</b> 8.0	· ·	TOTAL DEPTH 19.5 ft	NORTHING 618,630		<b>24 HR.</b> 8.0
DRILL RIG/HAMMER EFF/DATE CG20446 Diedrich D50	0.83%06/16/2020 DRILL METHOD SP	Core Boring HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF/DATE CG2044	6 Diedrich D50 83% 06/16/2020	DRILL METHOD SP	T Core Boring HAMM	ER TYPE Automatic
	TE 03/30/21 COMP. DATE 03/30/21	SURFACE WATER DEPTH N/A	DRILLER C. Odom	<b>START DATE</b> 03/30/21	COMP. DATE 03/30/21	SURFACE WATER DEPTH N//	4
ELEV DRIVE DEPTH BLOW COUNT	BLOWS PER FOOT	SOIL AND ROCK DESCRIPTION	CORE SIZE NQ	TOTAL RUN 13.5 ft			
(ft) (ft) (ft) 0.5ft 0.5ft 0	25 50 75 100 NO. MOI G	ELEV. (ft) DEPTH (ft)	ELEV RUN DEPTH RUN DRILL	RUN         STRATA           REC.         RQD         SAMP.         REC.         RQD           (ft)         (ft)         NO.         (ft)         (ft)         (ft)           %         %         %         %         %         %		DESCRIPTION AND REMARKS	
				(ft) (ft) NO. (ft) (ft) (ft)	G ELEV. (ft)		DEPTH
3135		-	3125.8 3125 3,125.8 6.0 3.5 N=60/0.0	(3 3) (2 0) (13 3) (12 0)	3 125 8	Begin Coring @ 6.0 ft CRYSTALLINE ROCK	
		3,131.8 GROUND SURFACE 0.0	4:21/1.0 	(3.3)         (2.9)           94%         81%           (13.3)         (12.9)           99%         96%	Fresh to Slightly We	eathered, Moderately Hard to Hard, Blac DNE), with Very Close to Moderately Cl	ck-White-Gray,
3130 3,130.8 10 16 16 27		RESIDUAL	3125         3,125.8         6.0         3.5         N=60/0.0           3125         3,122.3         9.5         4:30/1.0         4:39/1.0           3,122.3         9.5         5.0         3:02/1.0           3120         5.0         3:02/1.0           3120         2:06/1.0         2:06/1.0           3,117.3         14.5         3:26/1.0	(5.0) (5.0) 100% 100% RS-4	(IVIETA-SAINDSTC	Spacing	ose Fracture
<u>3130</u> <u>3,128,3</u> <u>3,5</u> <u>16</u> <u>16</u> <u>27</u> <u></u>		- Hard, Brown-Gray, Fine to Coarse Sandy, <u>- 3,128.8</u> Clayey SILT (A-5), with little gravel-sized <u>3.0</u>	3120 + 3:02/1.0 2:06/1.0 2:19/1 0	100% 100% 85-4		RS-4: 10.1 - 10.6 ft	
		Medium Dense, Gray, Silty GRAVEL	- 2:36/1.0 3,117.3 14.5 3:26/1.0		Unconfined	Unit Weight: 174.2 pcf Compressive Strength: 15,620 psi (2,2	49 ksf)
3125 3,125.8 6.0 60/0.0		3,125.8 (A-1-a) CRYSTALLINE ROCK	3115 5.0 2:43/1.0 2;27/1.0	(5.0) (5.0) 100% 100%			
		Black-White-Gray, (META-SANDSTONE)	2:26/1.0 2:13/1.0		-3,125.8 Fresh to Slightly We (META-SANDSTC Unconfined		
3120	· · · · · · · · · · · · · · · · · · ·	REC=99%	3,112.3 19.5 2:06/1.0		Borina Termir	nated at Elevation 3,112.3 ft In Crystalli	ne Rock
		- RQD=96% GSI=75-80				(META-SANDSTONE)	
3115		_					
		3 112 3 10 5					
		Boring Terminated at Elevation 3,112.3 ft In Crystalline Rock (META-SANDSTONE)					
		- Crystailine Rock (META-SANDSTONE)					
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# GEOTECHNICAL BORING REPORT

CORE LOG



#### Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs Boring: LB\_EB1-B 6.0 to 19.5 Feet



WBS       32572.1.FS10       TIP       A-0009CB       COUNTY       GRAHAM       GEOLOGIST       D. Goodnight       WBS       32572.1.FS10       TIP       A-0009CB       COUNTY       GRAHAM         SITE DESCRIPTION       Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28       GROUND WTR (tt)       SITE DESCRIPTION       SITE DESCRIPTION       SITE DESCRIPTION       Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28       GROUND WTR (tt)       SITE DESCRIPTION       SITE DESCRIPTION       Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28       GROUND WTR (tt)       SITE DESCRIPTION       SITE DESCRIPTION       Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28       OFFSET 11 ft RT       ALIGNMENT -L-       0 HR.       2.7       BORING NO. LB_B1-A       STATION 380+54       OFFSET 11       OFFSET 11         COLLAR ELEV.       3,126.7 ft       TOTAL DEPTH 25.1 ft       NORTHING 618,584       EASTING 593,496       24 HR.       6.0       COLLAR ELEV. 3,126.7 ft       TOTAL DEPTH 25.1 ft       NORTHING	1282 and NC 28 GROUND WTR (f
BORING NO. LB_B1-A STATION 380+54 OFFSET 11 ft RT ALIGNMENT -L- 0 HR. 2.7 BORING NO. LB_B1-A STATION 380+54 OFFSET 1	
	1 ft RT   ALIGNMENT -L-   0 HR. 2
COLLAR ELEV.       3,126.7 ft       TOTAL DEPTH       25.1 ft       NORTHING       618,584       EASTING       593,496       24 HR.       6.0       COLLAR ELEV.       3,126.7 ft       TOTAL DEPTH       25.1 ft       NORTHING	
	DRILL METHOD SPT Core Boring HAMMER TYPE Automatic
DRILLER J. Phillips       START DATE 09/09/21       COMP. DATE 09/09/21       SURFACE WATER DEPTH N/A       DRILLER J. Phillips       START DATE 09/09/21       COMP. DATE	E 09/09/21 SURFACE WATER DEPTH N/A
ELEV     DRIVE     DEPTH     BLOW COUNT     BLOWS PER FOOT     SAMP.     L     O     SOIL AND ROCK DESCRIPTION       (ft)     0.5ft	
(4) ELEV (11) DEPTH (11) ELEV (11) DEPTH (11) ELEV (11) RATE REC. RQD (11) (11) NO (11) (11) (11) NO (11) (11) (11) (11) (11) (11) (11) (11	DESCRIPTION AND REMARKS
	•
3130 	Begin Coring @ 10.1 ft CRYSTALLINE ROCK 11
3,198.7         GROUND SURFACE         0         3,116.6         10.1         5.0         N=60/0.0         (4.7)         (4.0)         (14.7)         (13.2)         3,116.6           3,198.7         GROUND SURFACE         0.9         0.6320/1.0         94%         80%         98%         88%         98%         88%         98%         88%         98%         10.5	Fresh to Very Slightly Weathered, Hard to Very Hard, Black-White-Gray, (META-SANDSTONE), with moderately close fracture spacing, extremely
3130	indurated, very thinly bedded
3,123.2     3.5     7     7     7     7     14	
3,120,7 = 6,0 =	
5 5 7 412 5tiff, Tan-Brown, Fine Sandy SILT (A-4)	
3,118.2     8.5	
3,116.6         10.1         05.027.13           3115	2
3.116.6       10.1       13       42       36/0.2         1000.7	Boring Terminated at Elevation 3,101.6 ft In Crystalline Rock (META-SANDSTONE)
3110         REC=98%           3110	
Image: Constraint of the second sec	

#### GEOTECHNICAL BORING REPORT CORE LOG



## Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs Boring: LB\_B1-A 10.1 to 25.1 Feet



1 FEET

NBS	32572	2.1.FS1	0		1	ΓIP	A-0009C	В	COUN	TY 🤆	GRAHAM				GEOLOG	IST S. Brau	n		
SITE	DESCR	IPTION	Prec	ast Co	oncrete	e A	rch Land Bi	ridge over	NC 143	Betwe	een SR 1	282 and	NC 28	3				GROUN	ID WTR (ft
ORI	NG NO.	LB_E	81-D		5	STA	ATION 38	1+22		OF	FSET	6 ft RT			ALIGNME	NT L		0 HR.	Dry
OLI	LAR ELI	<b>EV.</b> 3,	127.9	ft	1	гот	TAL DEPTH	<b>H</b> 5.1 ft		NO	RTHING	618,5	91		EASTING	593,565		24 HR.	Dr
ALL	. RIG/HAN	/IMER EF	f./Dati	E CG	20446	Died	drich D50 83%	606/16/202	20	•		DRILLN	IETHO	D H.S.	Augers		HAMM	ER TYPE	Automatic
RIL	LER C	. Odom	1		5	STA	ART DATE	04/01/2	1	co	MP. DA	TE 04/0	01/21		SURFACE	WATER DE	PTH N/	Ą	
EV ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	OW CO 0.5ft	-		0 2	BLOWS 5	PER FOC		100	SAMP. NO.		L O G	ELEV. (ft)	SOIL AND R	OCK DESC	CRIPTION	DEPTH
<u>30</u>	3,126.9 3,125.1 3,122.8 - - - - - - - - - - - - - - - - - - -	2.8	29 60/0.0							• •	100/0.9 60/0.0 - 60/0.0	•			<u>3,127.9</u> <u>3,125.1</u> <u>3,122.8</u>	WEAT Gray (ME CRYST Gray (ME Boring Term Penetration Te 3,122.8 ft I	ALLINE RO A-SANDS inated with st Refusal	DCK TONE) DCK TONE) Standard at Elevatione Rock	
	-														- - -				

2

WBS 32572	2.1.FS10		TIF	• A-0009CB		TY GRAHAN				GEOLOGIST S. Braun		WBS	<b>S</b> 32572.1.FS10		TIP	A-0009CB	С		GRAHAM	GEOLOGIST S. Braun	
		Precast C		Arch Land Bridge ov	er NC 143	Between SR	1282 and	NC 28			GROUND WTR (ft)			Precast Co					tween SR 1282 and NC 2		GROUND WTR (ft)
BORING NO.				<b>ATION</b> 381+90		OFFSET				ALIGNMENT L	0 HR. 8.0		RING NO. LB_B1-C			<b>ION</b> 381+90			<b>DFFSET</b> 5 ft RT	ALIGNMENT L	<b>0 HR.</b> 8.0
COLLAR EL	<b>EV.</b> 3,129	9.2 ft	тс	DTAL DEPTH 24.4	l ft	NORTHING	618,60	)8		EASTING 593,632	24 HR. FIAD	COL	LLAR ELEV. 3,129	9.2 ft	ΤΟΤΑ	L DEPTH 24	I.4 ft	N	IORTHING 618,608	EASTING 593,632	24 HR. FIAD
DRILL RIG/HAI	MIMER EFF./C	ATE CC	320446 Di	edrich D50 83%06/16/2	020		DRILL	ethod	SPT	Core Boring HAMM	MERTYPE Automatic	DRIL	L RIG/HAMMER EFF./C	DATE CG	20446 Diedri	ich D50 83%06/1	6/2020	I	DRILL METHOD	SPT Core Boring	HAMMER TYPE Automatic
DRILLER (	C. Odom		ST	ART DATE 04/02	/21	COMP. DA	TE 04/0	)2/21		SURFACE WATER DEPTH N/	/Α	DRII	LLER C. Odom		STAF	RT DATE 04/	02/21	С	COMP. DATE 04/02/21	SURFACE WATER DEPT	H N/A
ELEV DRIVE	DEPTH	BLOW CO		BLOW	S PER FOC	T	SAMP.			SOIL AND ROCK DES	CRIPTION	COF	RE SIZE NQ		ΤΟΤΑ	<b>L RUN</b> 22.5					
(ft) (ft)	(ft) 0	.5ft 0.5ft	t 0.5ft	0 25	50	75 100	NO.	MOI		ELEV. (ft)	DEPTH (ft)	ELEV (ft)	V RUN ELEV (ft) (ft) (ft)	UN DRIL ft) RAT (Min/	L RU E REC. /ft) %	IN RQD (ft) % NO.	STR REC. (ft) %	RATA L RQD C (ft) G	ELEV. (ft)	DESCRIPTION AND REMARKS	DEPTH (ft)
3130												3127.3								Begin Coring @ 1.9 ft	
3,127.3	3 <u>1.9</u> 60	/0.0				60/0.0	•	м	<u>к</u> - з	8,129.2 GROUND SURF. ROADWAY EMBANI 8,127.3 Stiff, Brown, Clayey, Fine to SILT (A-4), with trace	KMENT Coarse Sandy <u>1.9</u> e gravel		3,127.3 1.9 2 3,124.8 4.4	2.5 N=60/ 3:41/ 4:49/ 5.0 2:48/ 2:30/ 1:56/ 2:11/ 2:21/ 2:21/	(0.0 (2.5) 1.0 100% 1.0 (5.0) 1.0 (5.0)	88%	(22.4) 100%	(19.0) 84%	3,127.3 Fresh to Slight (META-SANI	CRYSTALLINE ROCK y Weathered, Moderately Hard to Ha DSTONE), with Very Close to Modera Spacing	1.9 rd, Black-White-Gray, ately Close Fracture
3125	$\frac{1}{1}$									CRYSTALLINE R Black-White-Gray, (META-S		3120	2 3,119.8 9.4	2:50/ 1:56/ 2:11/ 2:21/	1.0 100% 1.0 1.0 1.0	RS-2	7			RS-2: 6.5 - 7.0 ft Unit Weight: 169.0 pcf	
3120	Ŧ						RS-2			REC=100% RQD=84% GSI=65-75		0120		2:38/	1.0 (5.0) 1.0 100%	(4.9) 98%			Uncont	ined Compressive Strength: 16,160 p	osi (2,327 ksf)
	Ī					· · · · · ·				GSI=05-75		3115	5 3,114.8 14.4	2:50/ 2:57/ 3:45/	1.0 1.0						
3115	Į													5.0 2:45/ 3:04/ 3:11/	1.0 98% 1.0	(3.3) 66%					
	‡				· · · · ·	· · · · · · · · · · · · · · · · · · ·						3110	3,109.8 19.4	3:23/ 3:16/ 5.0 3:24/	1.0 1.0 (5.0)	(3.6)					
3110	ŧ					· · · · · ·								3:04/ 2:52/ 3:05/	1.0  100%   1.0	72%					
2105	‡											3105	<u>5 3,104.8 24.4</u>	2:48/	1.0				<u>3,104.8</u> Boring T	erminated at Elevation 3,104.8 ft In C (META-SANDSTONE)	24.4 Crystalline Rock
3105	+	_		<u> </u>			4			8,104.8 Boring Terminated at Elevati Crystalline Rock (META-S.	24.4 ion 3,104.8 ft In SANDSTONE)								-	(	
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# CAL BORING REPORT

#### Sheet 28

CORE LOG



## Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs Boring: LB\_B1-C 1.9 to 24.4 Feet

.4 ft RS-2: 6.5-7.0' 14.4 ft 19.4 ft THE REAL 24.4 ft

FEET

											URE				-				
VBS 3	32572.	1.FS10	)			T	IP	A-0009CB	cc	UNT	GRAHA	N			GEOLOG	IST S. Brau	n	_	
ITE DE	ESCRIF	PTION	Pre	ecas	st Cor	ncrete	Ar	rch Land Bridge	e over NC	143 B	etween SR	1282 an	d NC 2	8				GROUN	ID WTR (fi
RING	g no.	LB_B	1-E			S	TA	ATION 382+53	3		OFFSET	1 ft LT			ALIGNME	NT L		0 HR.	Dr
DLLA	RELE	<b>V.</b> 3, <sup>2</sup>	129.3	B ft		Т	ОТ	TAL DEPTH 2	2.7 ft		NORTHIN	<b>G</b> 618,	641		EASTING	593,687		24 HR.	Dr
LL RIC	g/Hami	VIER EFI	F./DA1	TE	0G2	0446 C	Died	drich D50 83%06/	16/2020			DRILL	METHO	DHS	. Augers		HAMM	RTYPE	Automatic
NLLE	R C.	Odom				S	ТΑ	ART DATE 04	/01/21		COMP. D	TE 04	/01/21		SURFACE	WATER DE	PTH N/A	4	
		DEPTH	-	.ow	/ COL				OWS PER	FOOT		SAMF		1	1				
)   E	ttev (ft)	(ft)	0.5f	t C	0.5ft	0.5ft	1	0 25	50		75 10	NO.	мо	0   G	ELEV. (ft)	SOIL AND R	JCK DESC	RIPTION	DEPTH
											·								
0																			
	128.3	1.0					++		.					977	-3,129.3		ND SURFA		
	126.6	. 27	100/0							· · ·	100/0.3				3,126.6	Gray (MET			
			60/0.	0							<u> </u>					Boring Termi Penetration Te 3,126.6 ft C (META-	st Refusal a	at Elevatio ne Rock	n

	E												
WBS 32572.1.FS10	TIP A-0009CB COUN	<b>FY</b> GRAHAM	GEOLOGIST S. Braun	GROUND WTR (ft)		<b>S</b> 32572.1.FS10		<b>TIP</b> A-000			Y GRAHAM	GEOLOGIST S. Braun	
SITE DESCRIPTION Precas	t Concrete Arch Land Bridge over NC 143	SITE	SITE DESCRIPTION Precast Concrete Arch Land Bridge over NC 14					Between SR 1282 and NC 2	GROUND WTR (ft)				
BORING NO. LB_B1-B	STATION 383+23	OFFSET 3 ft RT		0 HR. Dry	BOR	RING NO. LB_B1-B		STATION	383+23		OFFSET 3 ft RT	ALIGNMENT L	0 HR. Dry
<b>COLLAR ELEV.</b> 3,131.0 ft	TOTAL DEPTH 29.1 ft	<b>NORTHING</b> 618,679	EASTING 593,746	24 HR. Dry	COL	LAR ELEV. 3,131.0	ft	TOTAL DE	<b>PTH</b> 29.1 f	t	<b>NORTHING</b> 618,679	<b>EASTING</b> 593,746	24 HR. Dry
	CG20446 Diedrich D50 83%06/16/2020	DRILL METHOD SF		IER TYPE Automatic		L RIG/HAMMER EFF./DA						SPT Core Boring	HAMMER TYPE Automatic
DRILLER C. Odom	<b>START DATE</b> 04/01/21	COMP. DATE 04/01/21	SURFACE WATER DEPTH N/			LLER C. Odom		START DA			COMP. DATE 04/01/21	SURFACE WATER DEF	 PTH N/A
	COUNT BLOWS PER FOC			~	-	RE SIZE NQ		TOTAL RUI					
	0.5ft 0.5ft 0 25 50	75 100 110	SOIL AND ROCK DES	CRIPTION DEPTH (ft)				RUN REC. RQD		STRATA EC.   RQD			
					ELEV (ft)	(ft) (ft) (ft)			NO. (	EC. RQD ft) (ft) % %	G ELEV. (ft)	DESCRIPTION AND REMARK	KS DEPTH (ft)
					3127.8			70 70		/0 /0		Bagin Caring @ 2.2 ft	
3135			_		3127.8	8 3,127.8 3,126.9 4.1 0.9	N=60/0.0	0 (0.8) (0.0) 89% 0%	(2	5.8) (22.3)	) 3,127.8	Begin Coring @ 3.2 ft CRYSTALLINE ROCK	3.2
			-		3125		$\frac{4:13/0.9}{3:15/1.0}$	(50) (41)	10	0% 86%	Slightly Weather (META-SANDS	ered to Fresh, Moderately Hard to I STONE), with Close to Moderately	Hard, Black-White-Gray, Close Fracture Spacing
3130 3,130.0 1.0			3,131.0 GROUND SURF.				4:03/1.0	(5.0) (4.1) 99% 81%			È.	RS-1: 8.0 - 8.6 ft	
	35 65/0.3	· · · · · · · · · · · · · · · · · · ·	Stiff, Brown, Clayey, Fine to	Coarse Sandy		3,121.9 9.1	3:53/1.0	(5.0) (4.5)	RS-1			Unit Weight: 173.8 pcf	
3,127.8 3.2 60/0.0		60/0.0	_ 3,127.8 SILT (A-4), with trac - WEATHERED R	ОСК	3120		2:19/1.0	100% 90%			Uncont	ined Compressive Strength: 21,49	00 psi (3,095 kst)
3125			- Gray (META-SANDS			3,116.9 14.1	2:41/1.0						
			Black-White-Gray, (META-		2145	5.0	2:27/1.0	(5.0) (4.4)		5.8) (22.3) 0% 86%			
		RS-1	REC = 100%		3115	'  ‡	1:40/1.0	100% 88%					
3120			RQD = 86% GSI = 65-75			3,111.9 19.1	3:36/1.0 3:21/1.0						
			-		3110	5.0	2:04/1.0	(5.0) (4.6) 100% 92%					
			-			] <del>]</del>	3:39/1.0				5FF		
		· · · · · · · · · · · · · · · · · · ·	-			3,106.9 24.1	3:26/1.0 2:38/1.0 2:40/1.0	(5.0) (4.7)					
			-		3105		2:49/1.0	100% 94%					
3110		· · · · ·	-				3:27/1.0 2:27/1.0 3:07/1.0						
$\overline{}$			-			3,101.9 29.1	3:07/1.0				3,101.9	erminated at Elevation 3,101.9 ft Ir	n Crystalline Rock
			-									(META-SANDSTONE)	
3105		· · · · · · · · · · · · · · · · · · ·	-								-		
			-			‡							
			Boring Terminated at Elevat			‡							
			Crystalline Rock (META-S	ANDSTONE)									
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#### **GEOTECHNICAL BORING REPORT** CORE LOG



# Precast Concrete Arch Land Bridge over NC 143 Between SR 1282 and NC 28 Rock Core Photographs

Boring: LB\_B1-B 3.2 to 29.1 Feet



	ROCK TEST RESULTS													
SAMPLE NO.	BORING	STATION	OFFSET	DEPTH INTERVAL	ROCK TYPE	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH							
RS-1	LB_B1–B	383+23 -L-	3'RT	8.0 - 8.6'	META-SANDSTONE	173.8	21,490 psi/3,095 ksf							
RS-2	LB_B1-C	381+90 -L-	5' RT	6.5 - 7.0'	META-SANDSTONE	169.0	16,160 psi/2,327 ksf							
RS-3	LB_EB1–A	380+73 -L-	48' RT	13.3 - 13.9'	META-SANDSTONE	171.5	20,620 psi/2,969 ksf							
RS-4	LB_EB1–B	383+04 -L-	50' RT	10.1 - 10.6'	META-SANDSTONE	174.2	15,620 psi/2,249 ksf							
RS-5	LB_EB1-C	381+88 -L-	51' RT	10.0 - 10.6'	META-SANDSTONE	175.6	22,000 psi/3,168 ksf							

LAB TESTING PERFORMED BY NCDOT LAB CERT NO. 117-1104



