

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 38504.1.1 (B-4731) F.A. PROJ. BRZ-2159 (1)
 COUNTY CHATHAM
 PROJECT DESCRIPTION BRIDGE NO. 129 ON SR 2159
OVER HARLAND'S CREEK

SITE DESCRIPTION _____

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

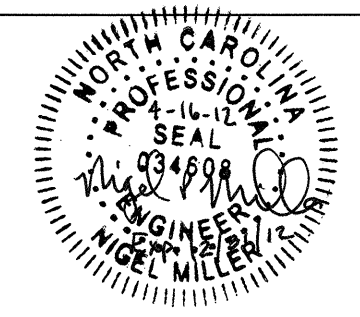
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PROJECT: 38504.1.1
ID: B-4731

PERSONNEL

- S. BUCHANAN
- N. MILLER
- S. KITTS
- TRIGON EXP.
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INVESTIGATED BY S. BUCHANAN
 CHECKED BY N. MILLER
 SUBMITTED BY N. MILLER
 DATE APRIL 2012



DRAWN BY: S. KITTS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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PROJECT REFERENCE NO. 38504.11(B-4731) SHEET NO. 2 OF 17

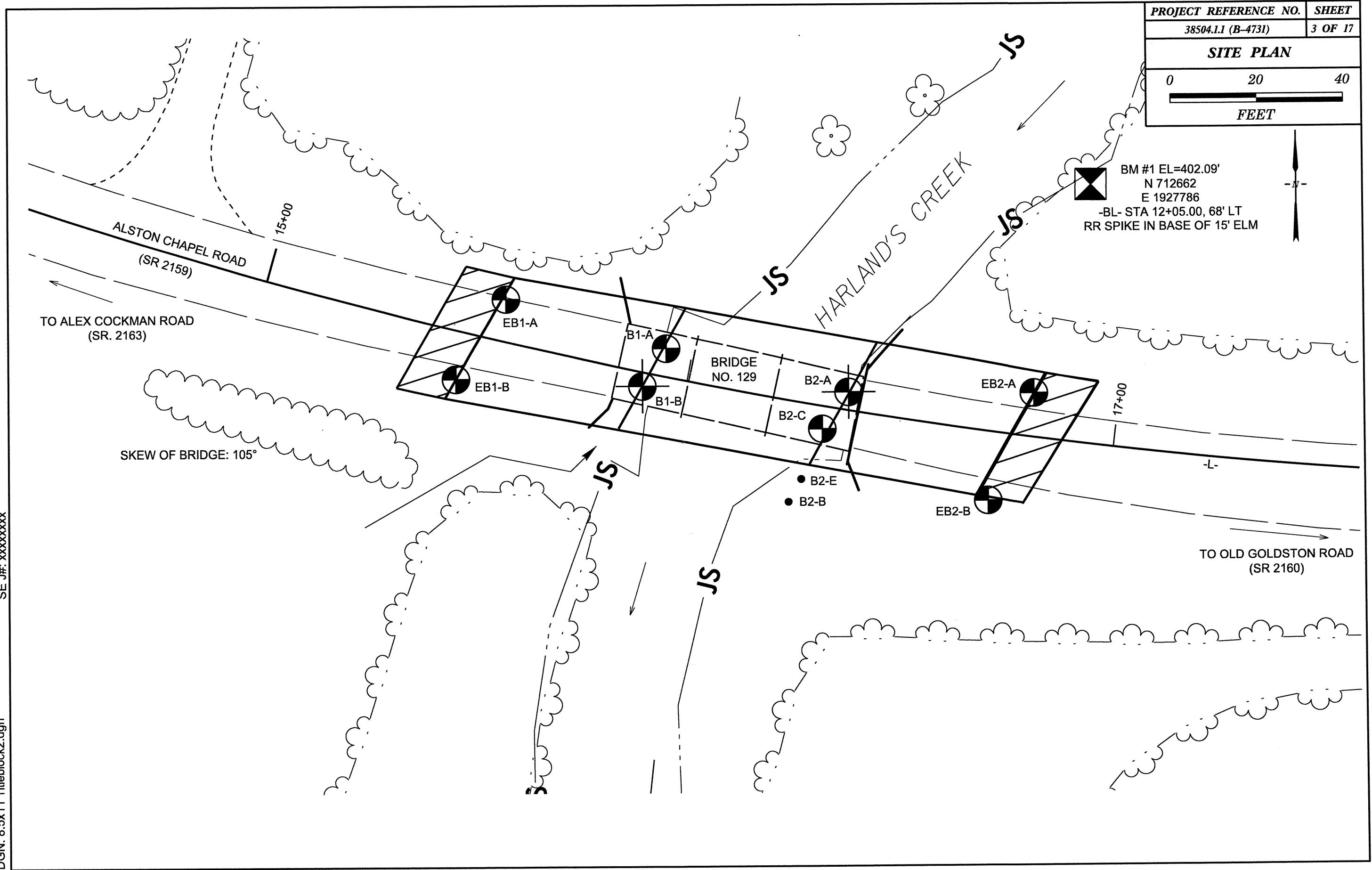
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																																																																							
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>		<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (RQD) - 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.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>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.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																							
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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> </table>		ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V SL.) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SL.) - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>MODERATE (MOD.) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>SEVERE (SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N-VALUES > 100 BPF</i></p> <p>VERY SEVERE (V SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N-VALUES < 100 BPF</i></p> <p>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.</p>		<p style="text-align: center;">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>	
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td>VERY LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> <p style="text-align: center;">COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>		NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	VERY LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH	<p>DRILL UNITS:</p> <p><input type="checkbox"/> MOBILE B-___</p> <p><input type="checkbox"/> BK-51</p> <p><input type="checkbox"/> CME-45C</p> <p><input type="checkbox"/> CME-55B</p> <p><input type="checkbox"/> PORTABLE MOIST</p> <p><input checked="" type="checkbox"/> CME-55</p> <p>ADVANCING TOOLS:</p> <p><input type="checkbox"/> CLAY BITS</p> <p><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</p> <p><input type="checkbox"/> 8" HOLLOW AUGERS</p> <p><input type="checkbox"/> HARD FACED FINGER BITS</p> <p><input type="checkbox"/> TUNG.-CARBIDE INSERTS</p> <p><input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</p> <p><input checked="" type="checkbox"/> TRICONE 3" *STEEL TEETH</p> <p><input type="checkbox"/> TRICONE *TUNG.-CARB.</p> <p><input checked="" type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE:</p> <p><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE:</p> <p><input type="checkbox"/> -B</p> <p><input checked="" type="checkbox"/> -N 02</p> <p><input type="checkbox"/> -H</p> <p>HAND TOOLS:</p> <p><input type="checkbox"/> POST HOLE DIGGER</p> <p><input type="checkbox"/> HAND AUGER</p> <p><input checked="" type="checkbox"/> SOUNDING ROD</p> <p><input type="checkbox"/> VANE SHEAR TEST</p>		<p>VERY WIDE - MORE THAN 18 FEET WIDE - 3 TO</p>																																																																																																										
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																																																											
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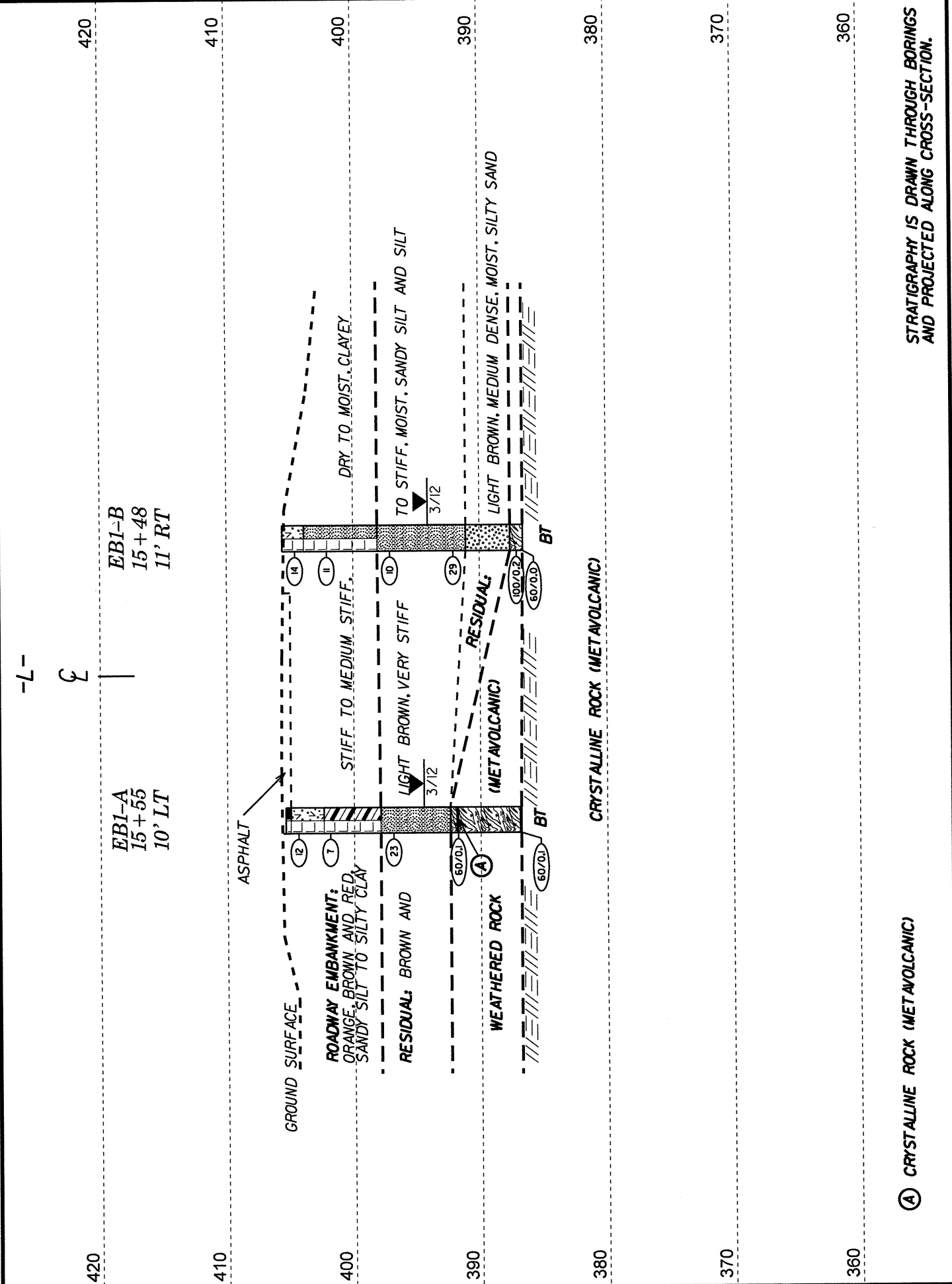
PROJECT REFERENCE NO.	SHEET
38504.1.1 (B-4731)	3 OF 17
SITE PLAN	
0 20 40	
FEET	


 BM #1 EL=402.09'
 N 712662
 E 1927786
 -BL- STA 12+05.00, 68' LT
 RR SPIKE IN BASE OF 15' ELM

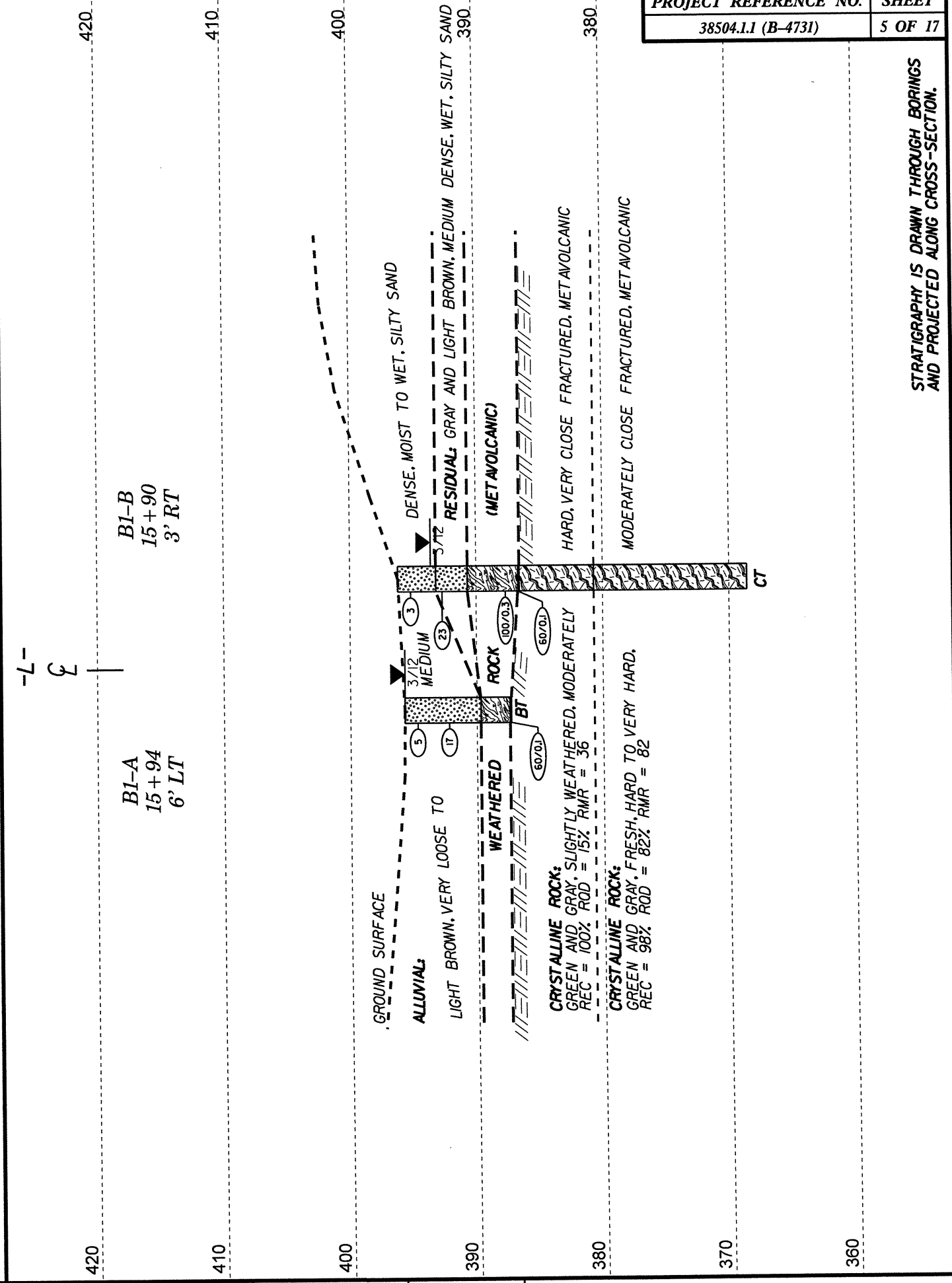


SE J#: xxxxxxxx

DGN: 8.5x11 Titleblock2.dgn



HORIZ. SCALE 0 10 20 (FEET) VE = 1:1 CROSS SECTION THROUGH END BENT 1



HORIZ. SCALE 0 10 20 (FEET) VE = 1:1 CROSS SECTION THROUGH BENT 1

STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ALONG CROSS-SECTION.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 15+55		OFFSET 10 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 405.4 ft		TOTAL DEPTH 18.6 ft		NORTHING 712,636		EASTING 1,927,650										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER R. Toothman		START DATE 03/12/12		COMP. DATE 03/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
410																
405	404.4	1.0	8	7	5											
400	401.9	3.5	4	4	3											
395	396.9	8.5	7	11	12											
390	391.9	13.5	60/0.1													
	386.9	18.5	60/0.1													

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 15+48		OFFSET 11 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 405.6 ft		TOTAL DEPTH 19.0 ft		NORTHING 712,618		EASTING 1,927,638										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER R. Toothman		START DATE 03/12/12		COMP. DATE 03/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
410																
405	404.6	1.0	3	7	7											
400	402.1	3.5	3	5	6											
395	397.1	8.5	3	5	5											
390	392.1	13.5	3	14	15											
	387.1	18.5	100/0.2													
	386.6	19.0	60/0.0													

NCDOT BORE DOUBLE B4731_GEO_BH.GPJ_NC_DOT.GDT 4/17/12

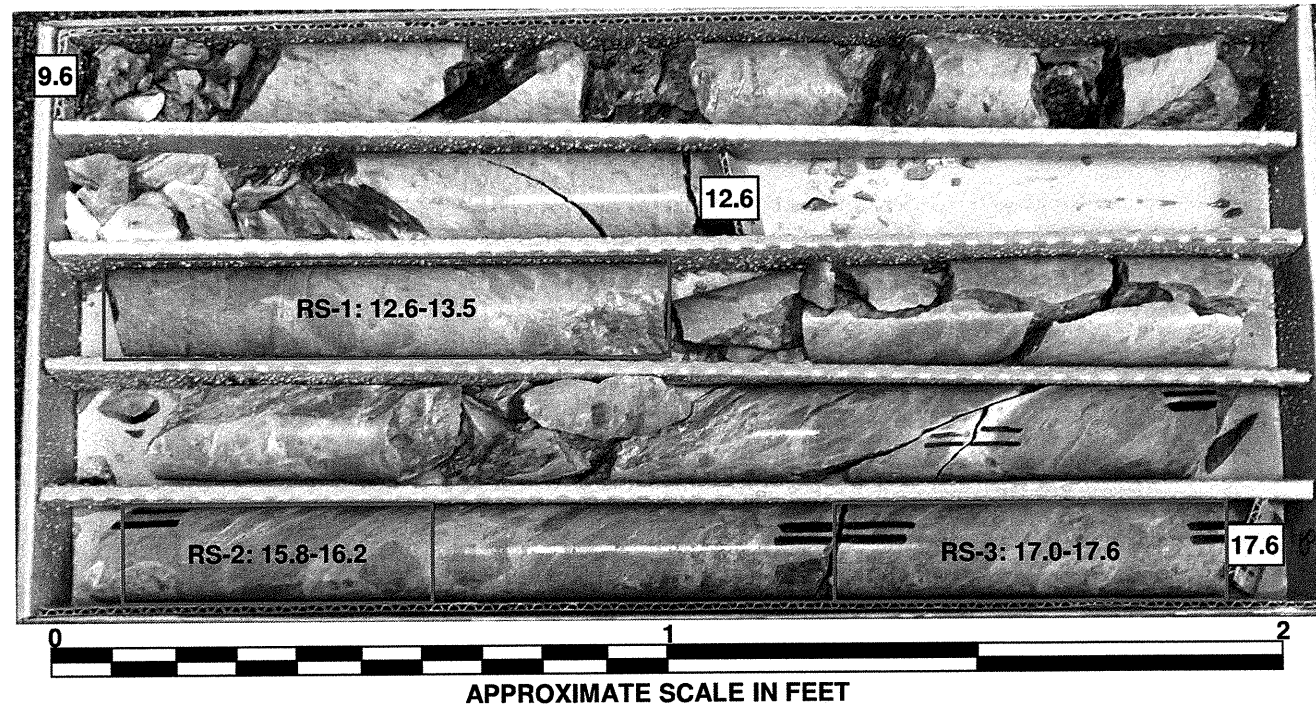
NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. B1-A		STATION 15+94		OFFSET 6 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 395.7 ft		TOTAL DEPTH 8.4 ft		NORTHING 712,625		EASTING 1,927,687										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 03/13/12		COMP. DATE 03/13/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
400																
395	394.7	1.0	3	3	2	5								395.7	GROUND SURFACE	0.0
	392.2	3.5	6	9	8	17									ALLUVIAL LOOSE TO MEDIUM DENSE, LIGHT BROWN, SILTY FINE TO COARSE GRAINED SAND WITH TRACE TO LITTLE ANGULAR GRAVEL	6.0
390	387.4	8.3	60/0.1			60/0.1								389.7	WEATHERED ROCK (METAVOLCANIC)	8.3
														387.4	CRYSTALLINE ROCK (METAVOLCANIC)	8.4
														387.3	Boring Terminated with Standard Penetration Test Refusal at Elevation 387.3 ft in Crystalline Rock (Metavolcanic)	

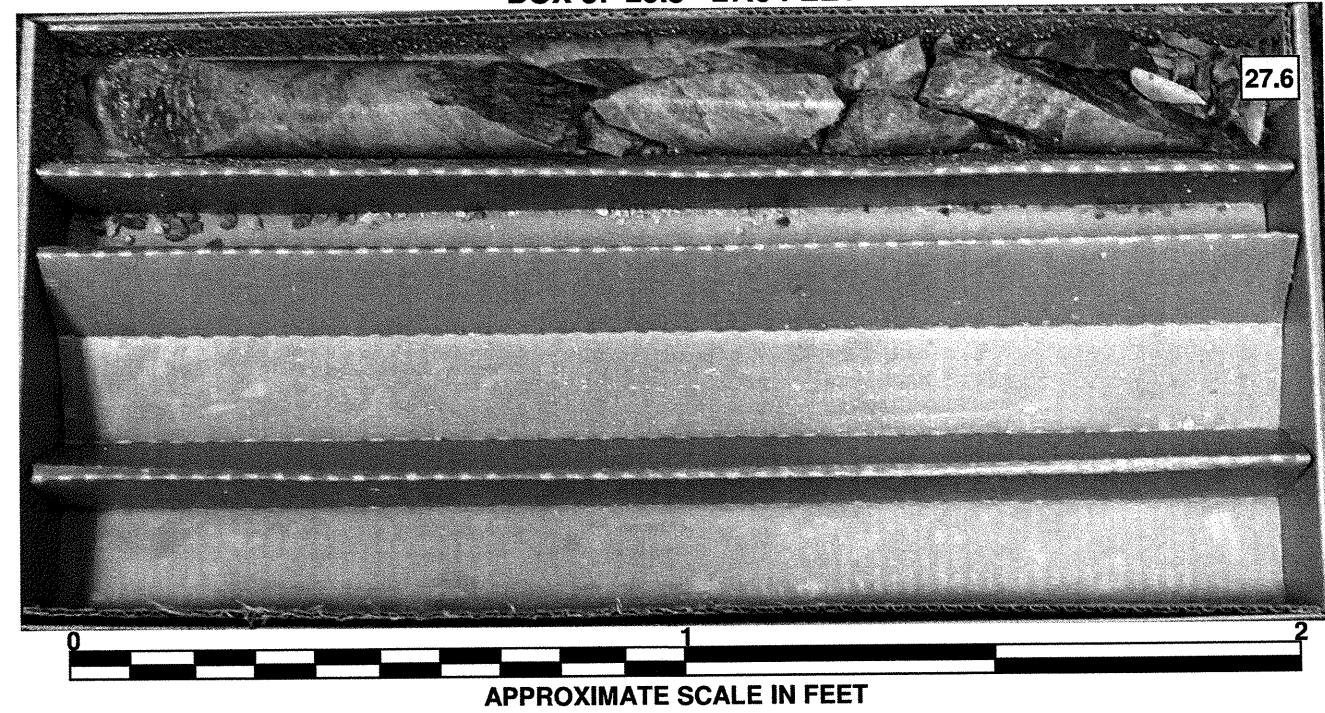
NCDOT BORE DOUBLE B4731_GEO_BH.GPJ_NC_DOT.GDT 4/17/12

**ROCK CORE PHOTOGRAPHS
BRIDGE NO. 129 ON SR 2159 OVER HARLAND'S CREEK**

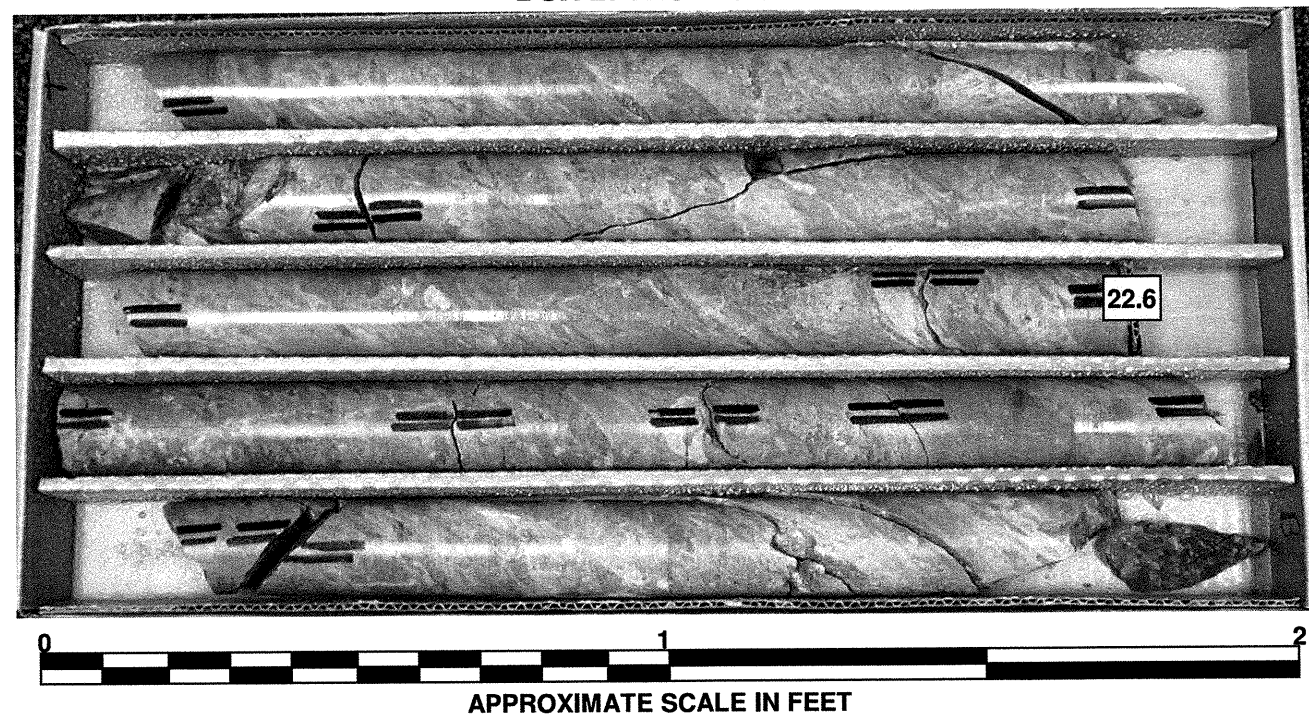
B1-B
BOX 1: 9.6 - 17.6 FEET



B1-B
BOX 3: 25.8 - 27.6 FEET

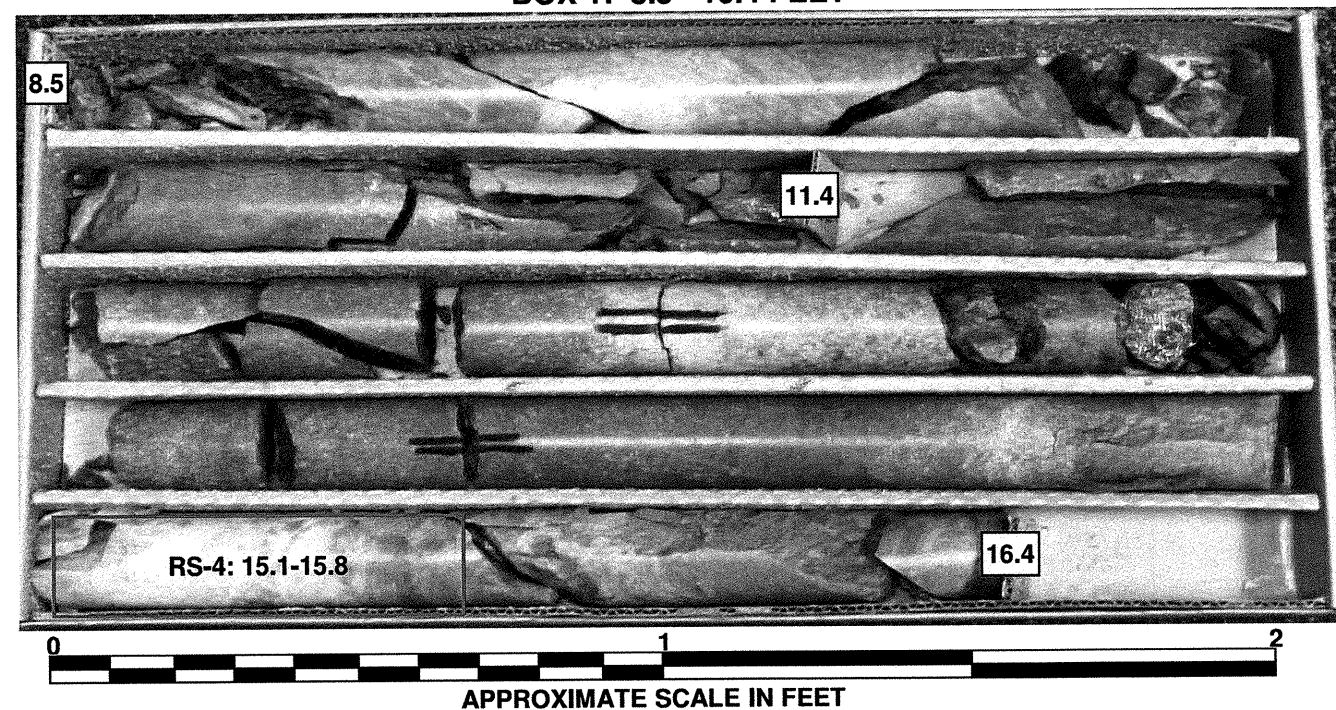


B1-B
BOX 2: 17.6 - 25.8 FEET

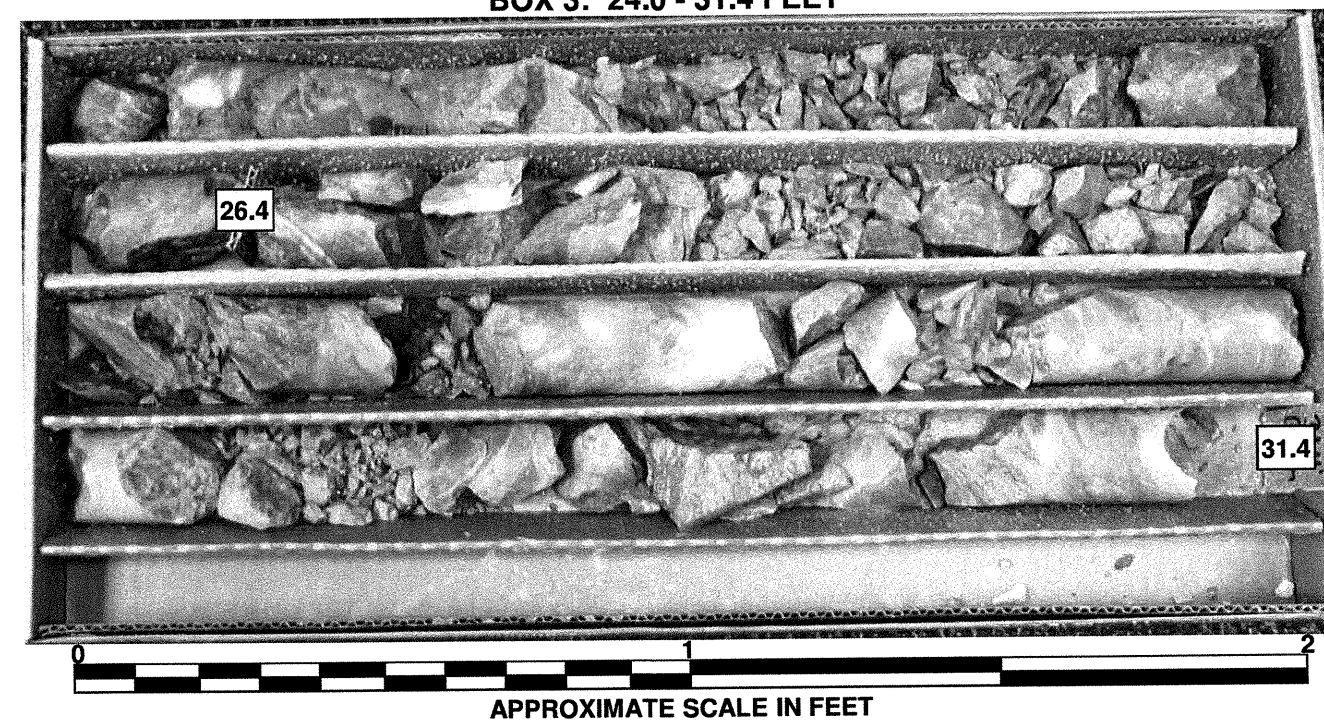


**ROCK CORE PHOTOGRAPHS
BRIDGE NO. 129 ON SR 2159 OVER HARLAND'S CREEK**

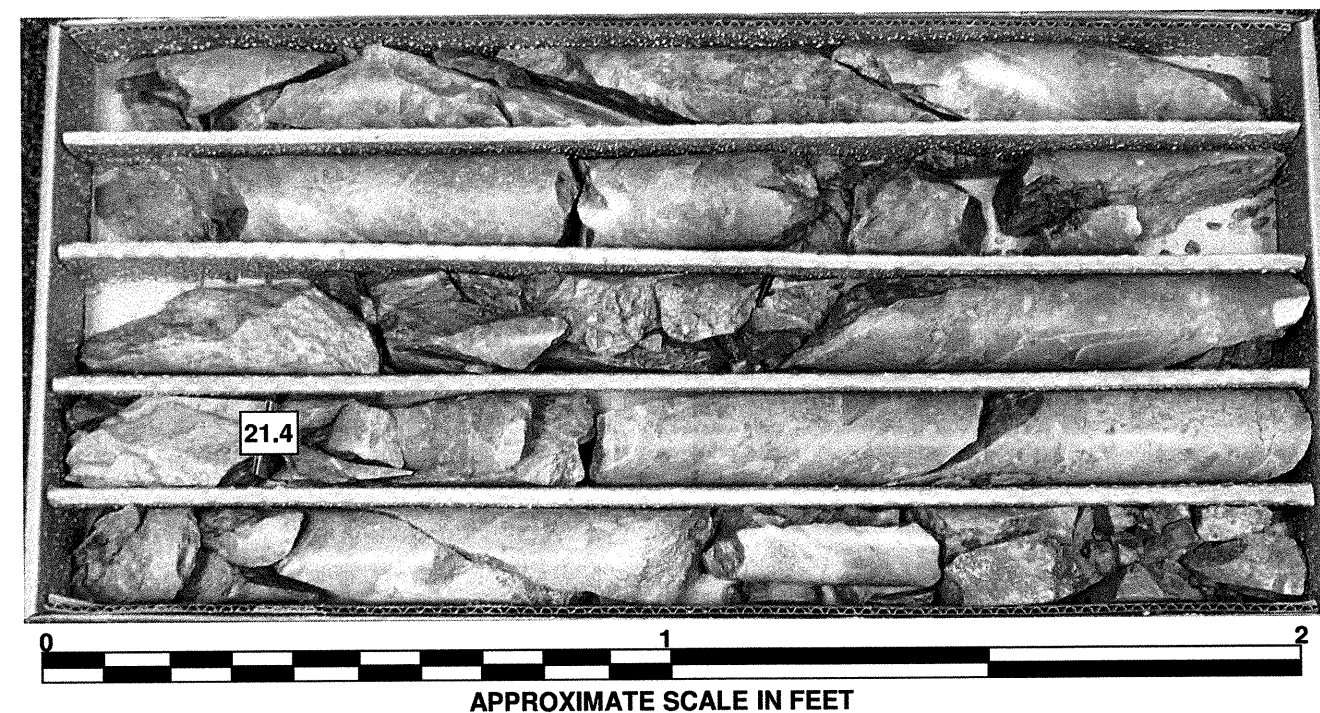
**B2-A
BOX 1: 8.5 - 16.4 FEET**



**B2-A
BOX 3: 24.0 - 31.4 FEET**



**B2-A
BOX 2: 16.4 - 24.0 FEET**



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. B2-C		STATION 16+33		OFFSET 5 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 393.5 ft		TOTAL DEPTH 8.6 ft		NORTHING 712,606		EASTING 1,927,723										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 03/12/12		COMP. DATE 03/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
395														393.5	0.0	GROUND SURFACE
	392.5	1.0	WOH	WOH	4	4						W		389.0	4.5	ALLUVIAL VERY LOOSE, GRAY, SILTY FINE GRAINED SAND WITH SOME WOOD FRAGMENTS
390	390.0	3.5	WOH	12	13	25						W		386.0	7.5	RESIDUAL MEDIUM DENSE, GREEN TO GRAY, SILTY FINE TO COARSE GRAINED SAND WITH LITTLE ROCK FRAGMENTS (QUARTZ)
385	385.0	8.5				60/0.1								385.0	8.5	WEATHERED ROCK (METAVOLCANIC)
														384.9	8.6	CRYSTALLINE ROCK (METAVOLCANIC)
Boring Terminated with Standard Penetration Test Refusal at Elevation 384.9 ft in Crystalline Rock (Metavolcanic)																

NCDOT BORE DOUBLE B4731_GEO_BH.GPJ NC_DOT.GDT 4/17/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38504.1.1	TIP B-4731	COUNTY CHATHAM	GEOLOGIST S. Buchanan
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek			GROUND WTR (ft)
BORING NO. B2-E	STATION 16+30	OFFSET 17 ft RT	ALIGNMENT -L-
COLLAR ELEV. 396.6 ft	TOTAL DEPTH 8.6 ft	NORTHING 712,594	EASTING 1,927,718
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Rod Sounding	HAMMER TYPE N/A
DRILLER R. Toothman	START DATE 03/14/12	COMP. DATE 03/14/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
400															
	396.6	0.0												396.6	0.0
	395.6	1.0	N/A	WOH	1										
395	394.6	2.0	N/A		2									394.1	2.5
	393.6	3.0	N/A		4										
	392.6	4.0	N/A		7										
	391.6	5.0	N/A		7										
	390.6	6.0	N/A		9										
390	389.6	7.0	N/A		15									389.6	7.0
	388.6	8.0	N/A		15									388.0	8.6
			N/A		50										
			N/A		60/0.6										

WBS 38504.1.1	TIP B-4731	COUNTY CHATHAM	GEOLOGIST S. Buchanan
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek			GROUND WTR (ft)
BORING NO. B2-B	STATION 16+28	OFFSET 23 ft RT	ALIGNMENT -L-
COLLAR ELEV. 396.5 ft	TOTAL DEPTH 7.1 ft	NORTHING 712,589	EASTING 1,927,715
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Rod Sounding	HAMMER TYPE N/A
DRILLER R. Toothman	START DATE 03/14/12	COMP. DATE 03/14/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
400															
	396.5	0.0												396.5	0.0
	395.5	1.0	N/A		1										
	394.5	2.0	N/A		3										
	393.5	3.0	N/A		7										
	392.5	4.0	N/A		8										
	391.5	5.0	N/A		8										
	390.5	6.0	N/A		10										
390	389.5	7.0	N/A		13									389.5	7.0
			N/A		19									389.4	7.1
			N/A		60/0.1										

NCDOT BORE DOUBLE B4731_GEO_BH.GPJ NC_DOT.GDT 4/24/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 16+80		OFFSET 10 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 405.3 ft		TOTAL DEPTH 20.1 ft		NORTHING 712,614		EASTING 1,927,772										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER R. Toothman		START DATE 03/12/12		COMP. DATE 03/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
410																
405	404.3	1.0	4	5	4								M	GROUND SURFACE 0.0	0.0	
	401.8	3.5	2	5	5								M	ROADWAY EMBANKMENT STIFF, RED TO BROWN, CLAYEY SILT WITH TRACE WOOD AND ROCK FRAGMENTS 3.0	3.0	
400	396.8	8.5	3	3	6								M	STIFF, BROWN, FINE TO MEDIUM GRAINED SANDY SILT 7.5	7.5	
395	391.8	13.5	3	3	4								M	RESIDUAL STIFF TO MEDIUM STIFF, LIGHT BROWN TO GRAY, FINE TO COARSE GRAINED SANDY SILT 18.5	18.5	
390	386.8	18.5	100/0.4										M	WEATHERED ROCK (METAVOLCANIC) 20.0	20.0	
	385.3	20.0	60/0.1										M	CRYSTALLINE ROCK (METAVOLCANIC) 20.1	20.1	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 385.2 ft in Crystalline Rock (Metavolcanic)	

WBS 38504.1.1		TIP B-4731		COUNTY CHATHAM		GEOLOGIST S. Buchanan										
SITE DESCRIPTION Bridge No. 129 on SR 2159 over Harland's Creek							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 16+73		OFFSET 16 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 405.2 ft		TOTAL DEPTH 23.6 ft		NORTHING 712,589		EASTING 1,927,761										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 82% 11/5/2010		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER R. Toothman		START DATE 03/12/12		COMP. DATE 03/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
410																
405	404.2	1.0	2	4	5								M	GROUND SURFACE 0.0	0.0	
	401.7	3.5	3	3	4								M	ROADWAY EMBANKMENT STIFF, RED TO BROWN, FINE TO MEDIUM GRAINED SANDY CLAYEY SILT WITH TRACE ROOTS 2.0	2.0	
400	396.7	8.5	2	2	2								M	STIFF, LIGHT BROWN, FINE TO MEDIUM GRAINED SANDY SILT 3.0	3.0	
395	391.7	13.5	10	13	35								M	MEDIUM STIFF, RED TO BROWN, FINE TO COARSE GRAINED SANDY CLAY 8.0	8.0	
390	386.7	18.5	42	65	35/0.3								M	ALLUVIAL LOOSE, LIGHT BROWN, FINE GRAINED SAND 13.0	13.0	
	381.7	23.5	60/0.1										M	RESIDUAL DENSE, GRAYISH GREEN TO LIGHT BROWN, SILTY FINE TO COARSE GRAINED SAND WITH LITTLE ROCK FRAGMENTS 16.0	16.0	
															WEATHERED ROCK (METAVOLCANIC) 23.5	23.5
															CRYSTALLINE ROCK (METAVOLCANIC) 23.6	23.6
															Boring Terminated with Standard Penetration Test Refusal at Elevation 381.6 ft in Crystalline Rock (Metavolcanic)	

NCDOT BORE DOUBLE_B4731_GEO_BH.GPJ_NC_DOT.GDT 4/17/12

BRIDGE NO. 129 ON SR 2159 OVER HARLAND'S CREEK

B1-B

ROCK TEST RESULTS											
SAMPLE NO.	STATION	OFFSET	DEPTH INTERVAL (ft)	LENGTH (in.)	DIAMETER (in.)	AREA (sq. in.)	VOLUME		UNIT WEIGHT (pcf)	COMPRESSIVE	TESTING METHOD
							(in. ³)	(cf)		STRENGTH (psi)	
RS-1	15+90	3FT RT	12.6-13.5	4.426	1.981	3.082	13.642	0.008	172.140	4,435	ASTM D-7012-10 METHOD C
RS-2	15+90	3FT RT	15.8-16.2	2.4	1.995	-	-	-	-	20,500	ASTM D-5731
RS-3	15+90	3FT RT	17.0-17.6	3.6	1.995	-	-	-	-	32,000	ASTM D-5731

B2-A

ROCK TEST RESULTS											
SAMPLE NO.	STATION	OFFSET	DEPTH INTERVAL (ft)	LENGTH (in.)	DIAMETER (in.)	AREA (sq. in.)	VOLUME		UNIT WEIGHT (pcf)	COMPRESSIVE	TESTING METHOD
							(in. ³)	(cf)		STRENGTH (psi)	
RS-4	16+37	4FT LT	15.1-15.8	6.0	1.995	-	-	-	-	25,500	ASTM D-5731

SITE PHOTOGRAPHS
BRIDGE NO. 129 ON SR 2159 OVER HARLAND'S CREEK



View of SR 2159 looking West



View of Bridge No. 129 looking Northwest