

PROJECT: 33617.1.1 ID: B-4276

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4276	1	37
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33617.1.1	BRSTP-73 (5)	P.E. CONST.	

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

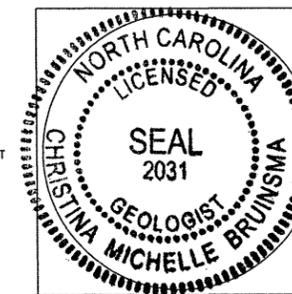
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT 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.

STATE PROJECT 33617.1.1 I.D. NO. B-4276
 F.A. PROJECT BRSTP-73 (5)
 COUNTY STANLY
 PROJECT DESCRIPTION BRIDGE #33 OVER
LONG CREEK ON NC 73

 SITE DESCRIPTION _____

FOR LETTING

INVESTIGATED BY C. BRUINSMA PERSONNEL P. ZHANG
 CHECKED BY G. LANG, P.E. C. BRUINSMA
 SUBMITTED BY TIERRA, INC. B. SAWASKA
 DATE SEPTEMBER 7, 2007



SEAL

SIGNATURE

9-7-07

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.

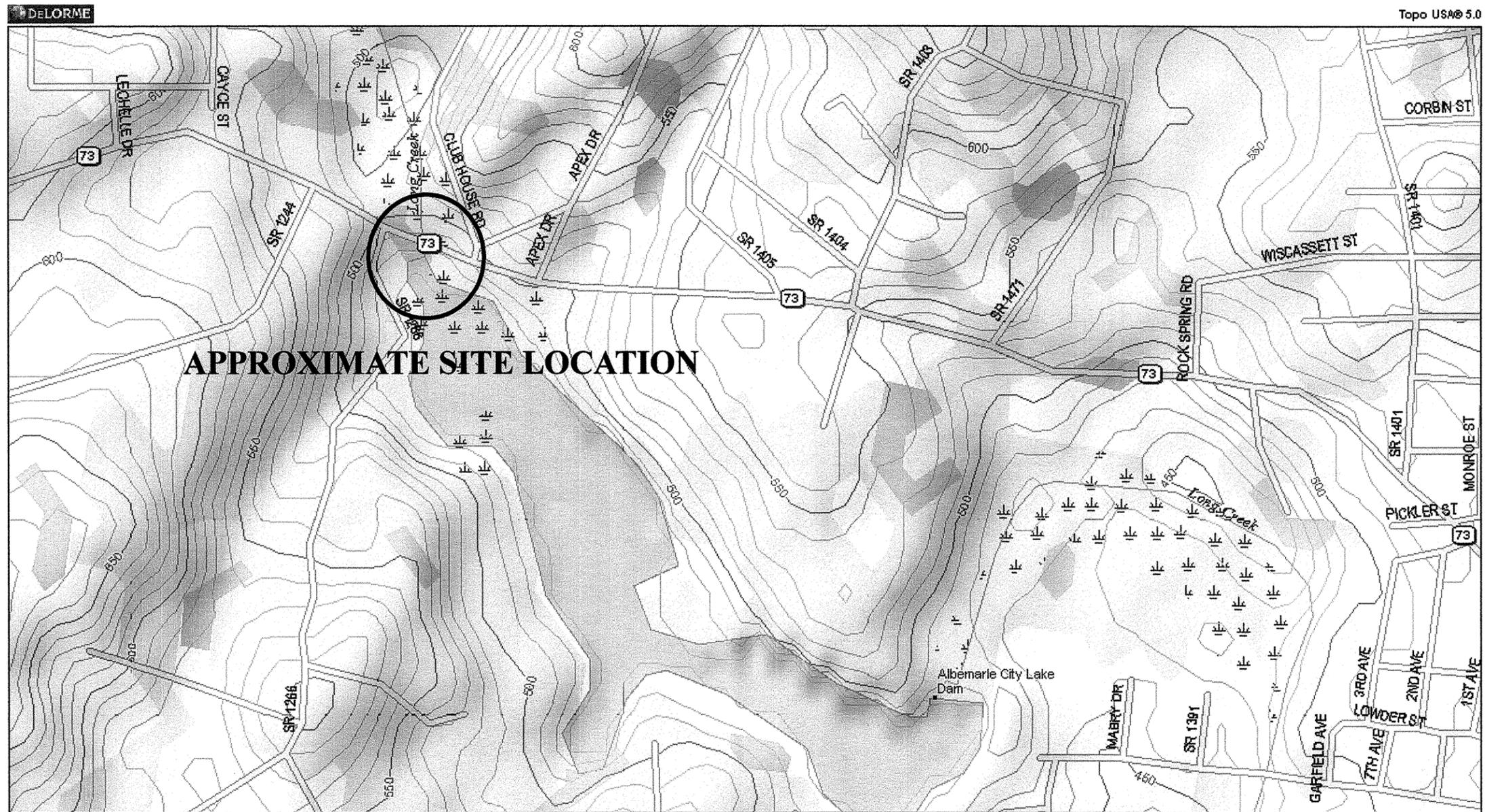
DRAWN BY: P. ZHANG, B. SAWASKA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

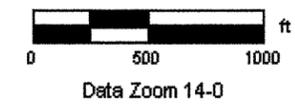
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																										
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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 align="center"><i>VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGH 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 align="center">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p>WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.</p> <p>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.</p> <p>NON-CRYSTALLINE ROCK (ICR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CPS)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>										<p>ALLUVIUM (ALLUV.) - SOILS WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS WHICH 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 DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F. 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																										
<p align="center">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (> 35% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (> 85% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-2.5</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td></td> <td>A-7-5</td> <td>A-7-6</td> <td>A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50 MX</td> <td>30 MX</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6 MX</td> <td>N.P.</td> <td>40 MX</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td> <td>FINE SAND</td> <td>SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS</td> <td>CLAYEY SOILS</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>GENERAL RATING AS A SUBGRADE</td> <td colspan="3">EXCELLENT TO GOOD</td> <td colspan="3">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td>UNSUITABLE</td> <td></td> </tr> </table> <p align="center">P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30</p>										GENERAL CLASS.	GRANULAR MATERIALS (> 35% PASSING #200)				SILT-CLAY MATERIALS (> 85% PASSING #200)				ORGANIC MATERIALS		A-1	A-3	A-2	A-2.5	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7		A-7-5	A-7-6	A-6, A-7	SYMBOL											% PASSING	50 MX	30 MX	30 MX	30 MX	30 MX	30 MX	30 MX	30 MX	30 MX	30 MX	LIQUID LIMIT	6 MX	N.P.	40 MX	PLASTIC INDEX	0	0	0	0	0	0	0	0	0	0	GROUP INDEX	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS						GENERAL RATING AS A SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			FAIR TO POOR	POOR	UNSUITABLE		<p align="center">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p align="center">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p>										<p align="center">PERCENTAGE OF MATERIAL</p> <table border="1"> <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							
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<p 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 SEEPAGE</p>										<p align="center">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. SLI.) 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 (SLI.) 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 ROCKS 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, YIELDS 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, YIELDS 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>																																																																																																																																																														
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APPROXIMATE SITE LOCATION

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 www.delorme.com



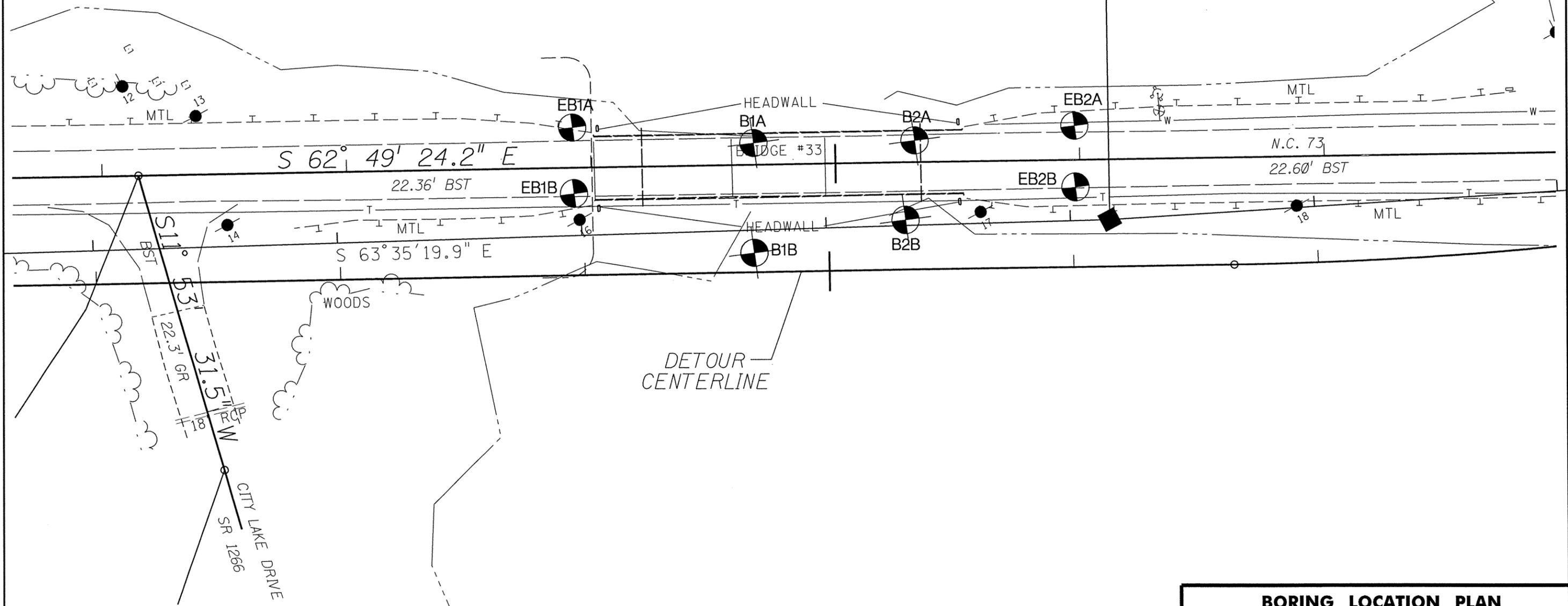
SITE VICINITY MAP
BRIDGE #33 OVER LONG CREEK ON NC 73 STANLY COUNTY, NORTH CAROLINA TIP NO: B-4276, STATE PROJECT NO: 33617.1.1
 <div style="display: inline-block; vertical-align: middle; font-size: 8px;"> TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803 </div>

NC GRID NAD 83

POT Sta. 10+21.68-Y3-
BEGIN CONSTRUCTION

-BL-2 22+16.07 PINC
POT 21+11.76 -L- 24.35 RT.
ELEV = 468.07

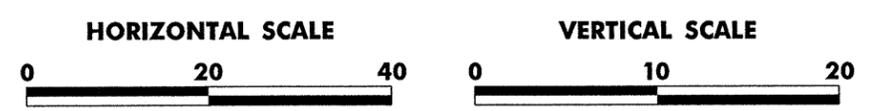
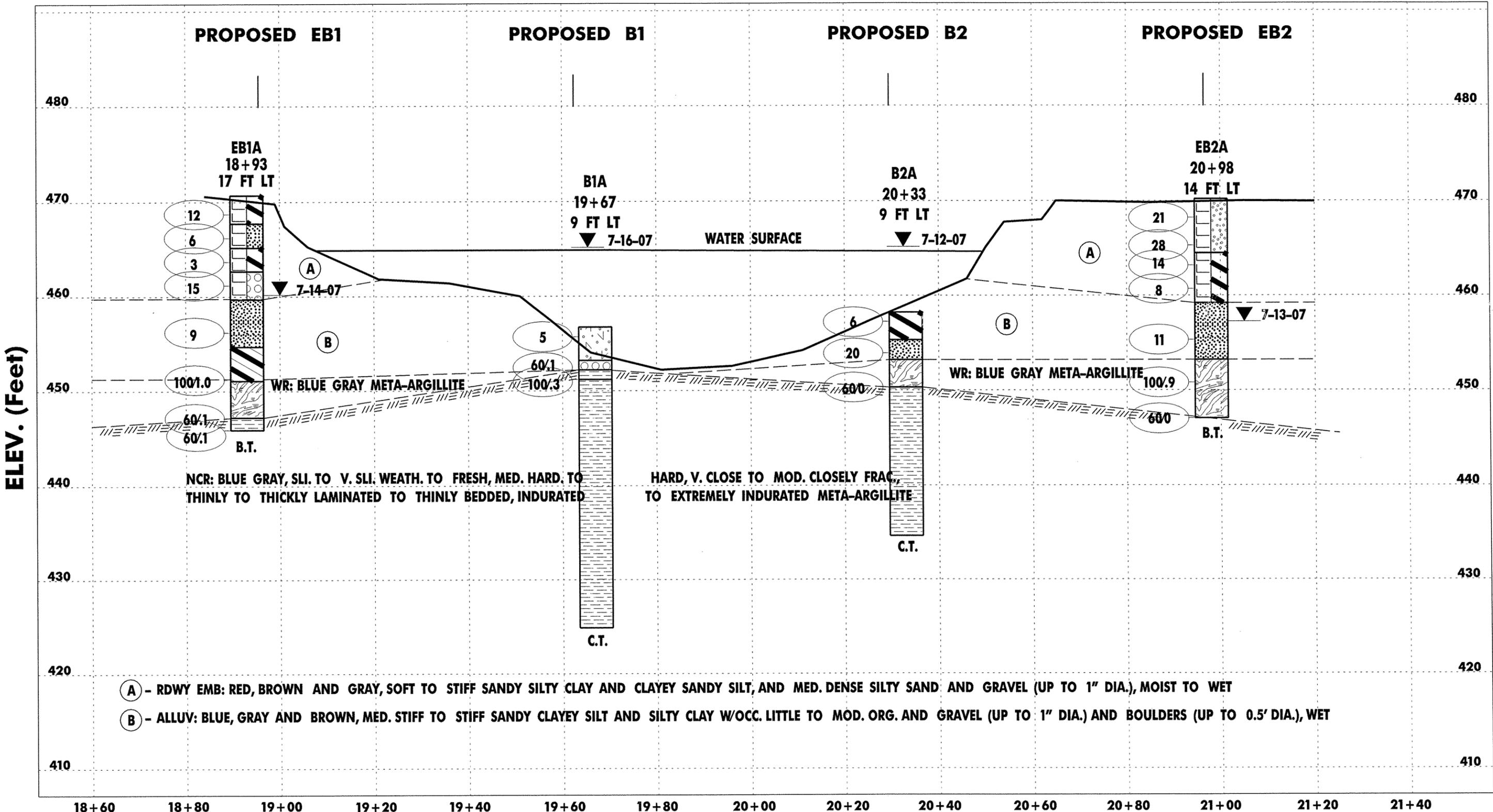
SR 1406
CLUB HOUSE RD



NOTES:
 BENCH MARK: TMB #2, STA. 20+7.86 -BL-, 10.69' LT,
 CHISELED SQUARE ON HEADWALL OF BRIDGE # 33.
 PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED
 FROM NCDOT, DATED JUNE, 2007
 PROPOSED BRIDGE SKEW: 90°



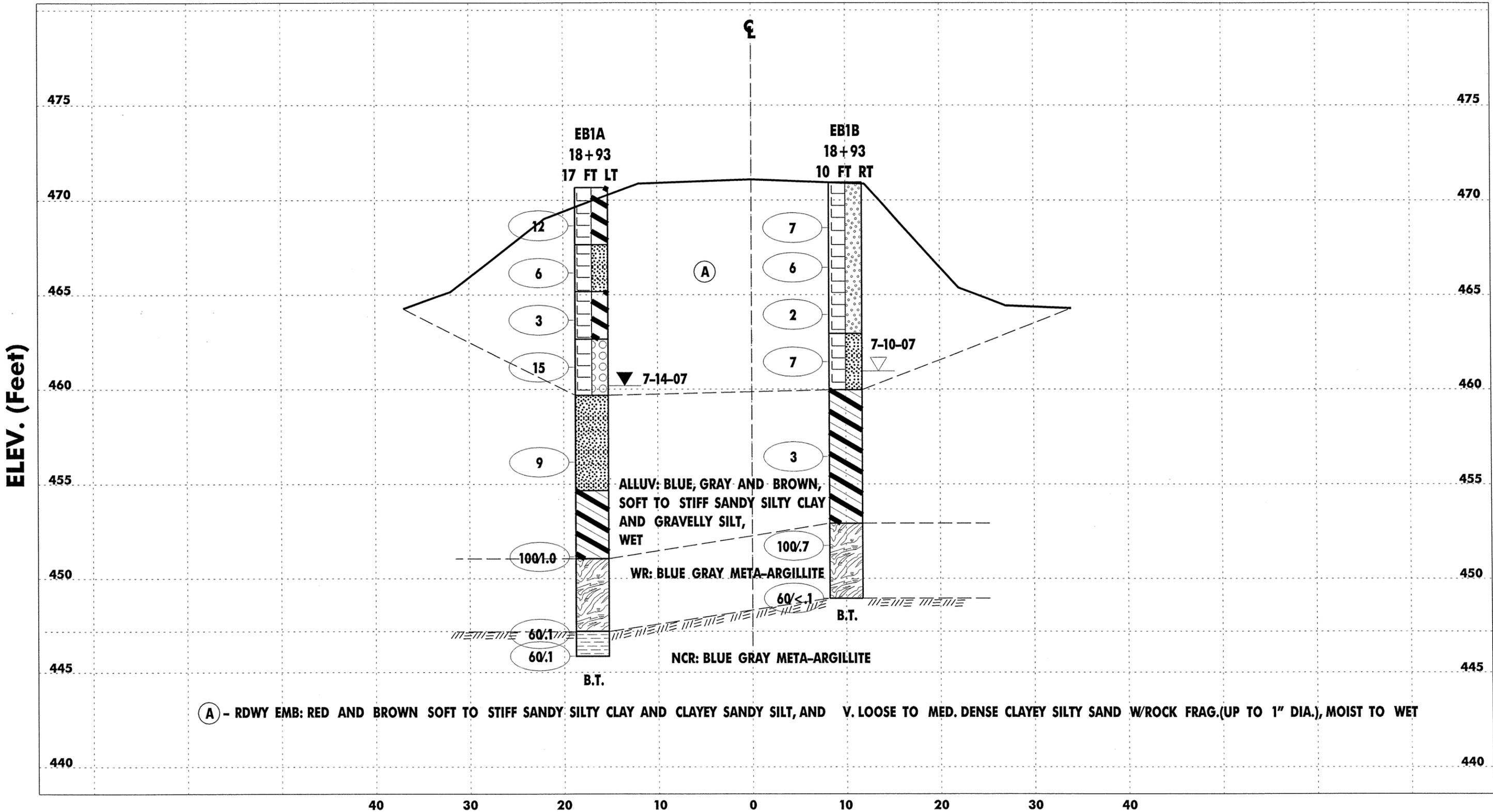
BORING LOCATION PLAN	
BRIDGE #33 OVER LONG CREEK ON NC 73 STANLY COUNTY, NORTH CAROLINA TIP NO: B-4276, STATE PROJECT NO: 33617.1.1	
 TIERRA GEOTECHNICAL • MATERIALS ENGINEERING	TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803



STRUCTURE PROFILE
14ft LT OF CENTERLINE

Bridge No. 33 over Long Creek on NC 73
Stanly County, North Carolina
TIP: B-4276
Project No: 33617.1.1

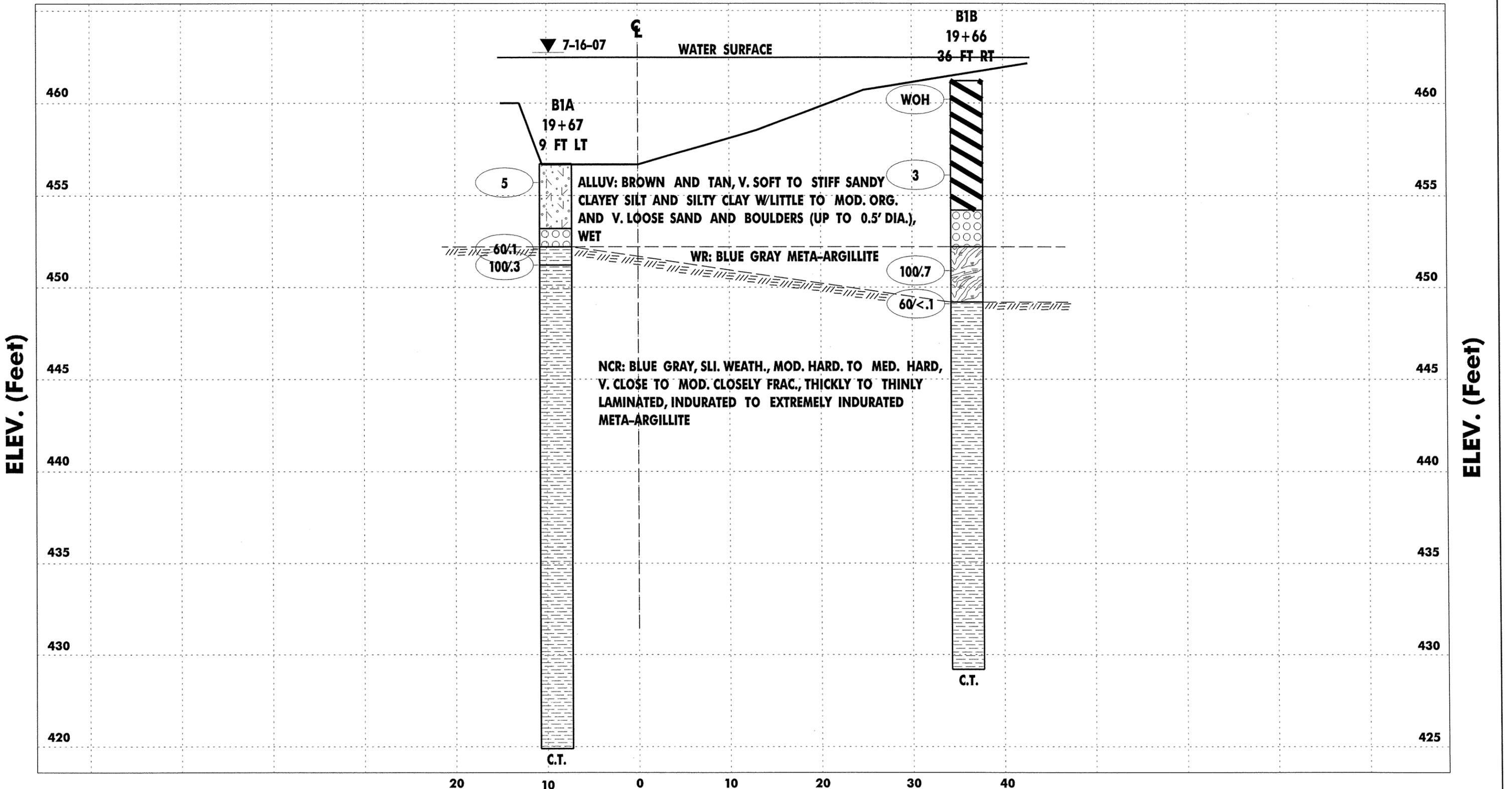
TIERRA
TIERRA, INC.
2736 ROWLAND RD.
BALLS BLVD, NC 27415
PHONE 773-875-8888
FAX 773-875-8889



CROSS SECTION END BENT 1

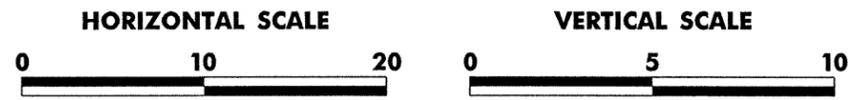
Bridge No. 33 over Long Creek on NC 73
 Stanly County, North Carolina
 TIP: B-4276
 Project No: 33617.1.1





ELEV. (Feet)

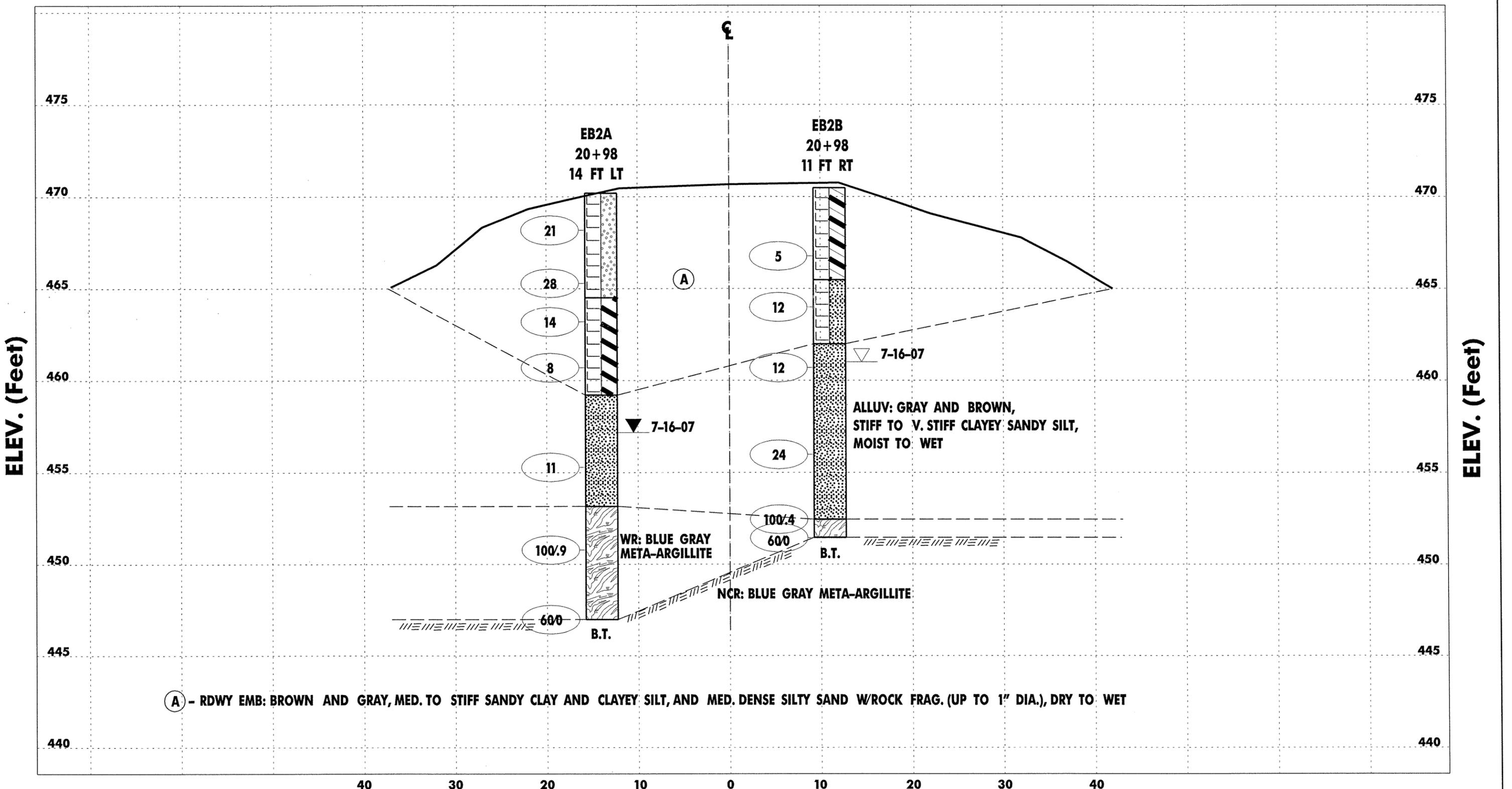
ELEV. (Feet)



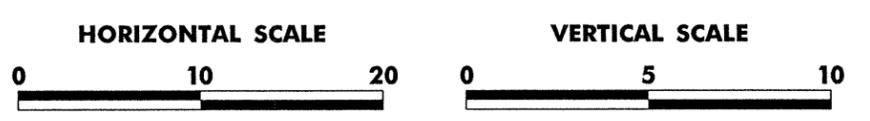
CROSS SECTION BENT 1
 Bridge No. 33 over Long Creek on NC 73
 Stanly County, North Carolina
 TIP: B-4276
 Project No: 33617.1.1

TIERRA
 GEOTECHNICAL - MATERIALS
 ENGINEERING

TIERRA, INC.
 3726 HOWLAND DR.
 RALEIGH, NC 27615
 PHONE (919) 875-8888
 FAX (919) 875-8888



(A) - RDWY EMB: BROWN AND GRAY, MED. TO STIFF SANDY CLAY AND CLAYEY SILT, AND MED. DENSE SILTY SAND W/ROCK FRAG. (UP TO 1" DIA.), DRY TO WET



CROSS SECTION END BENT 2

Bridge No. 33 over Long Creek on NC 73
Stanly County, North Carolina
TIP: B-4276
Project No: 33617.1.1

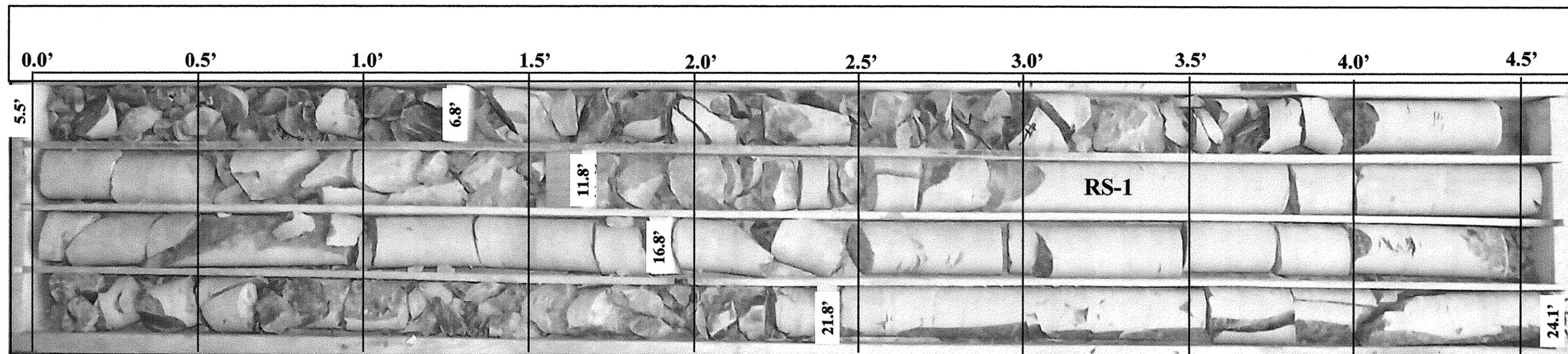
TIERRA
TIERRA, INC.
2728 HOWLAND RD.
RALEIGH, NC 27615
PHONE 919 875-8888
FAX 919 875-8889

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.									
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)								
BORING NO. EB1A		STATION 18+93		OFFSET 17ft LT		ALIGNMENT -L-									
COLLAR ELEV. 470.7 ft		TOTAL DEPTH 24.8 ft		NORTHING 588,134		EASTING 1,630,988									
DRILL MACHINE CME-75		DRILL METHOD H.S. Augers		HAMMER TYPE Manual											
START DATE 07/13/07		COMP. DATE 07/13/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 23.5 ft									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
475															
469.7	1.0	8	5	7									470.7	GROUND SURFACE	0.0
467.2	3.5	7	3	3									467.7	ROADWAY EMBANKMENT RED AND BROWN, STIFF, SANDY SILT CLAY (A-7-5) WITH ROCK FRAG. (UP TO 1" DIA.)	3.0
464.7	6.0	2	1	2									465.2	ROADWAY EMBANKMENT BROWN, MED. STIFF, CLAYEY SANDY SILT (A-4) WITH ROCK FRAG. (UP TO 1" DIA.)	5.5
462.2	8.5	2	5	10									462.7	ROADWAY EMBANKMENT RED AND BROWN, SOFT, SANDY SILTY CLAY (A-7-6) WITH ROCK FRAG. (UP TO 1" DIA.)	8.0
457.2	13.5	11	6	3									459.7	ROADWAY EMBANKMENT BROWN, MED. DENSE, SANDY SILTY GRAVEL (A-1-a)	11.0
452.2	18.5	5	9	91/1.5									454.7	ALLUVIAL BLUE AND GRAY, STIFF, SANDY GRAVELLY SILT (A-4) (GRAVEL UP TO 2" DIA.)	16.0
447.2	23.5												451.1	ALLUVIAL GRAY, MED. STIFF, SANDY SILTY CLAY (A-6)	19.6
446.0	24.7	60/1											447.2	WEATHERED ROCK BLUE-GRAY, META-ARGILLITE	23.5
		60/1											445.9	NON-CRYSTALLINE ROCK BLUE-GRAY, META-ARGILLITE	24.8
														Boring Terminated at Elevation 445.9 ft ON NCR: BLUE GRAY, META-ARGILLITE	
														SPT REFUSAL AT ELEV. 447.2 FT. AUGER REFUSAL AT ELEV. 445.9 FT.	

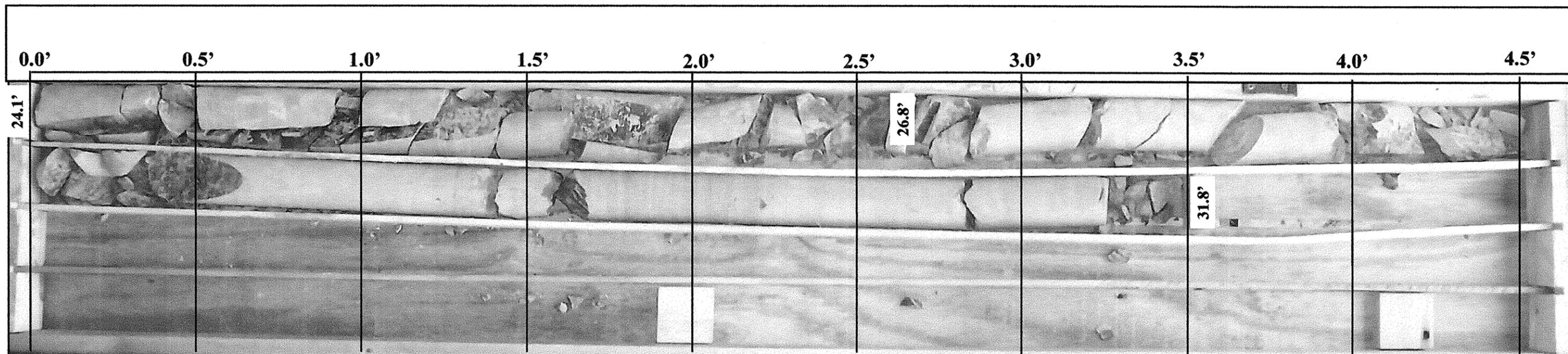
NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.									
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)								
BORING NO. EB1B		STATION 18+93		OFFSET 10ft RT		ALIGNMENT -L-									
COLLAR ELEV. 471.0 ft		TOTAL DEPTH 22.0 ft		NORTHING 588,110		EASTING 1,630,976									
DRILL MACHINE CME-75		DRILL METHOD Wash Boring		HAMMER TYPE Manual											
START DATE 07/10/07		COMP. DATE 07/10/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
475															
469.6	1.4	2	4	3									471.0	GROUND SURFACE	0.0
467.5	3.5	2	1	5									467.5	ROADWAY EMBANKMENT RED AND BROWN, LOOSE TO V. LOOSE, CLAYEY SILTY SAND (A-2-4) WITH ROCK FRAG. (UP TO 1" DIA.)	3.0
465.0	6.0	3	1	1									463.0	ROADWAY EMBANKMENT BLUE, GRAY AND BROWN, MED. STIFF, CLAYEY SANDY SILT (A-4) WITH ROCK FRAG. (UP TO 1" DIA.)	8.0
462.5	8.5	2	3	4									460.0	ALLUVIAL BROWN, SOFT, SANDY SILTY CLAY (A-6)	11.0
457.5	13.5	2	1	2									453.0	WEATHERED ROCK BLUE AND GRAY, META-ARGILLITE	18.0
452.5	18.5												449.0	Boring Terminated at Elevation 449.0 ft ON NCR: BLUE GRAY, META-ARGILLITE	
449.0	22.0	60/<.1												TRICONE AND CASING REFUSAL AT ELEV. 449.0 FT	

NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07



Boring B1A, Box 1 of 2, 5.5 feet to 24.1 feet.



Boring B1A, Box 2 of 2, 24.1 feet to 31.8 feet.

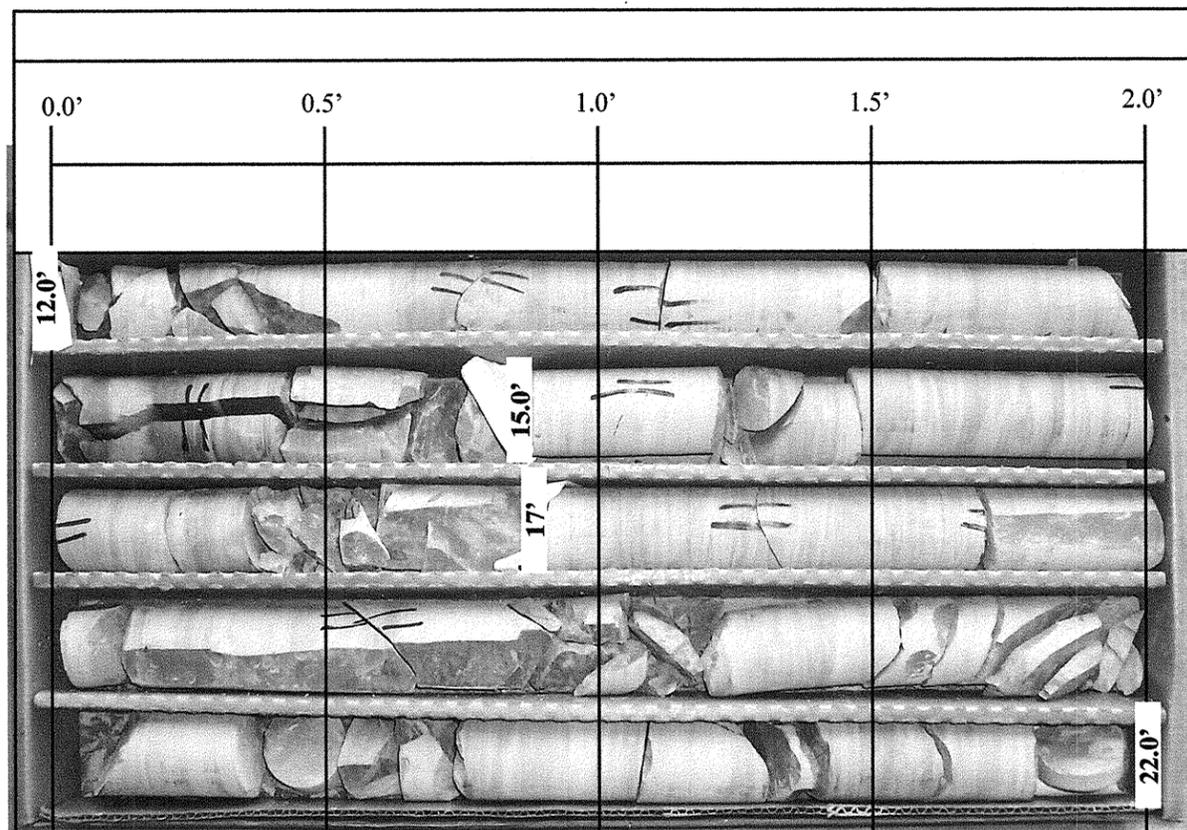
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

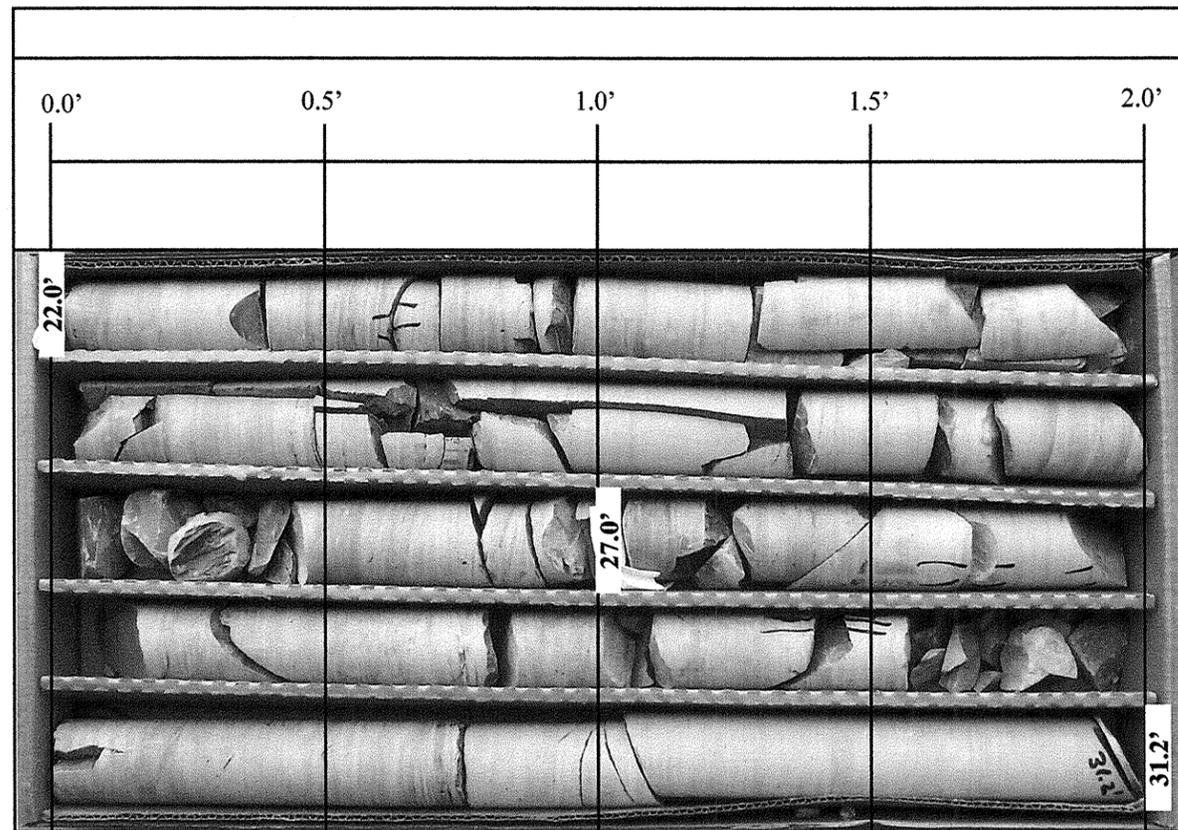
BRIDGE # 33 OVER LONG CREEK ON NC 73
STANLY CO., NC
NCDOT PROJECT #: 33617.1.1
TIP #: B-4276



TIERRA, INC.
 2736 ROWLAND RD.
 RALEIGH, NC 27615
 PHONE (919) 871-0800
 FAX (919) 871-0803



Boring B1B, Box 1 of 3, 12.0 feet to 22.0 feet.



Boring B1B, Box 2 of 3, 22.0 feet to 31.2 feet.

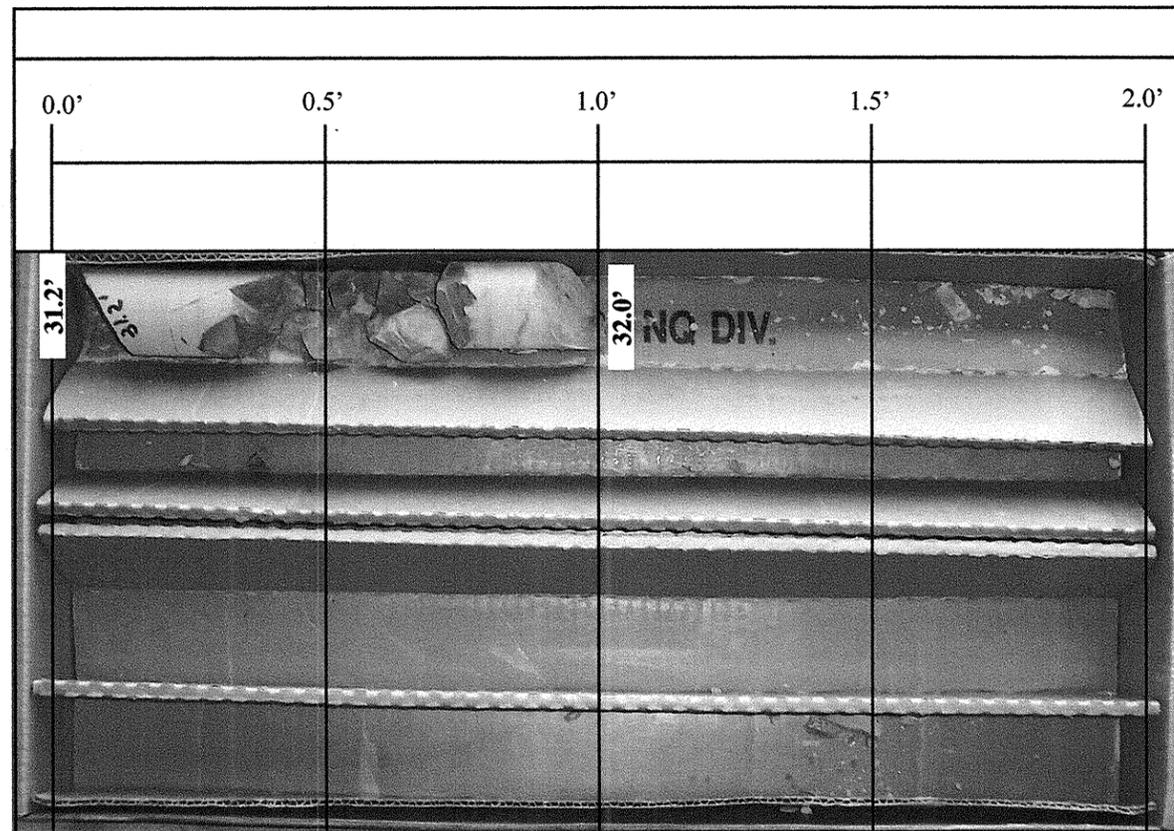
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE # 33 OVER LONG CREEK ON NC 73
 STANLY CO., NC
 NCDOT PROJECT #: 33617.1.1
 TIP #:B-4276**



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 2736 ROWLAND RD.
 RALEIGH, NC 27615
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 FAX (919) 871-0803



Boring B1B, Box 3 of 3, 31.2 feet to 32.0 feet.

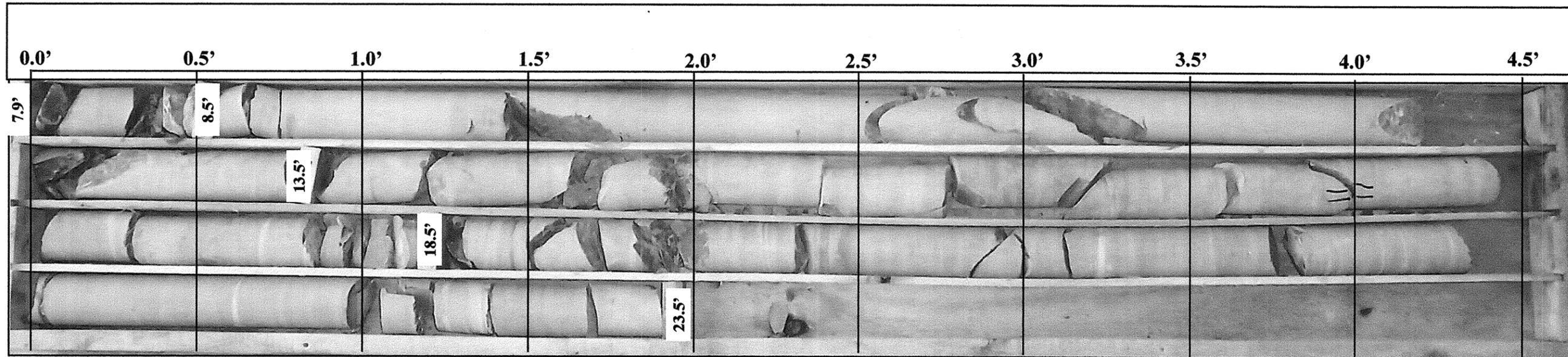
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE # 33 OVER LONG CREEK ON NC 73
STANLY CO., NC
NCDOT PROJECT #: 33617.1.1
TIP #: B-4276**



TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



Boring B2A, Box 1 of 1, 7.9 feet to 23.5 feet.

SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE # 33 OVER LONG CREEK ON NC 73
STANLY CO., NC
NCDOT PROJECT #: 33617.1.1
TIP #: B-4276**



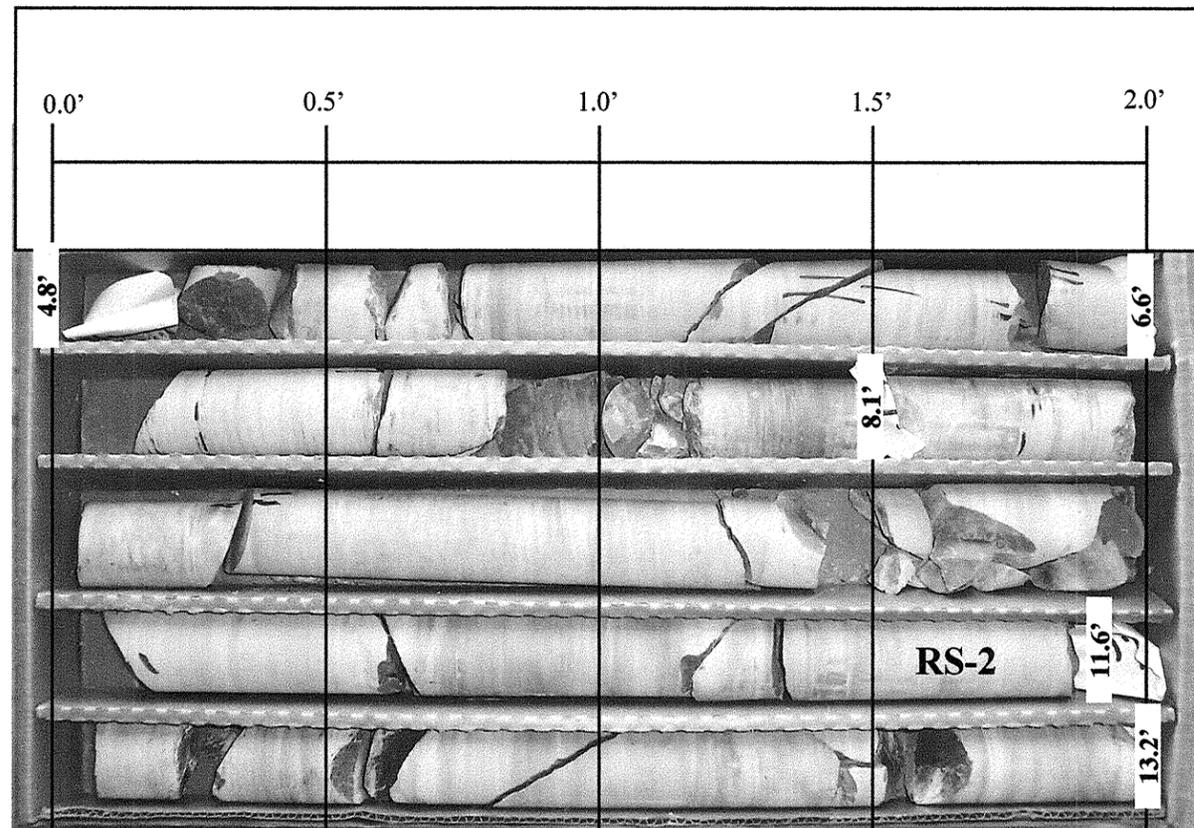
TIERRA, INC.
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RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.							
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)						
BORING NO. B2B		STATION 20+28		OFFSET 23ft RT		ALIGNMENT -L-							
COLLAR ELEV. 455.9 ft		TOTAL DEPTH 21.6 ft		NORTHING 588,036		EASTING 1,631,090							
DRILL MACHINE CME-45B		DRILL METHOD Wash Boring		HAMMER TYPE Manual									
START DATE 06/28/07		COMP. DATE 06/28/07		SURFACE WATER DEPTH 8.6ft		DEPTH TO ROCK 3.8 ft							
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)
460													WATER SURFACE (06/28/07)
455.9	0.0												GROUND SURFACE 455.9 0.0
452.0	3.9	WOH	WOH	WOH									ALLUVIAL BROWN, V. SOFT, SILTY CLAY (A-7-6) WITH LITTLE ORGANIC MATTER (WOOD FROM 3.2 TO 3.8 FT.)
451.1	4.8												NON-CRYSTALLINE ROCK BLUE GRAY, META ARGILLITE
													NON-CRYSTALLINE ROCK BLUE GRAY, SLI. WEATH. MOD. HARD, V. CLOSE. TO MOD. CLOSE FRACT., THINLY TO THICKLY LAMINATED EXTREMELY INDURATED META-ARGILLITE
													Boring Terminated at Elevation 434.3 ft IN NCR: BLUE GRAY, META-ARGILLITE
													SPT REFUSAL AT ELEV. 452.0 FT. TRICONE REFUSAL AT ELEV. 451.1 FT.

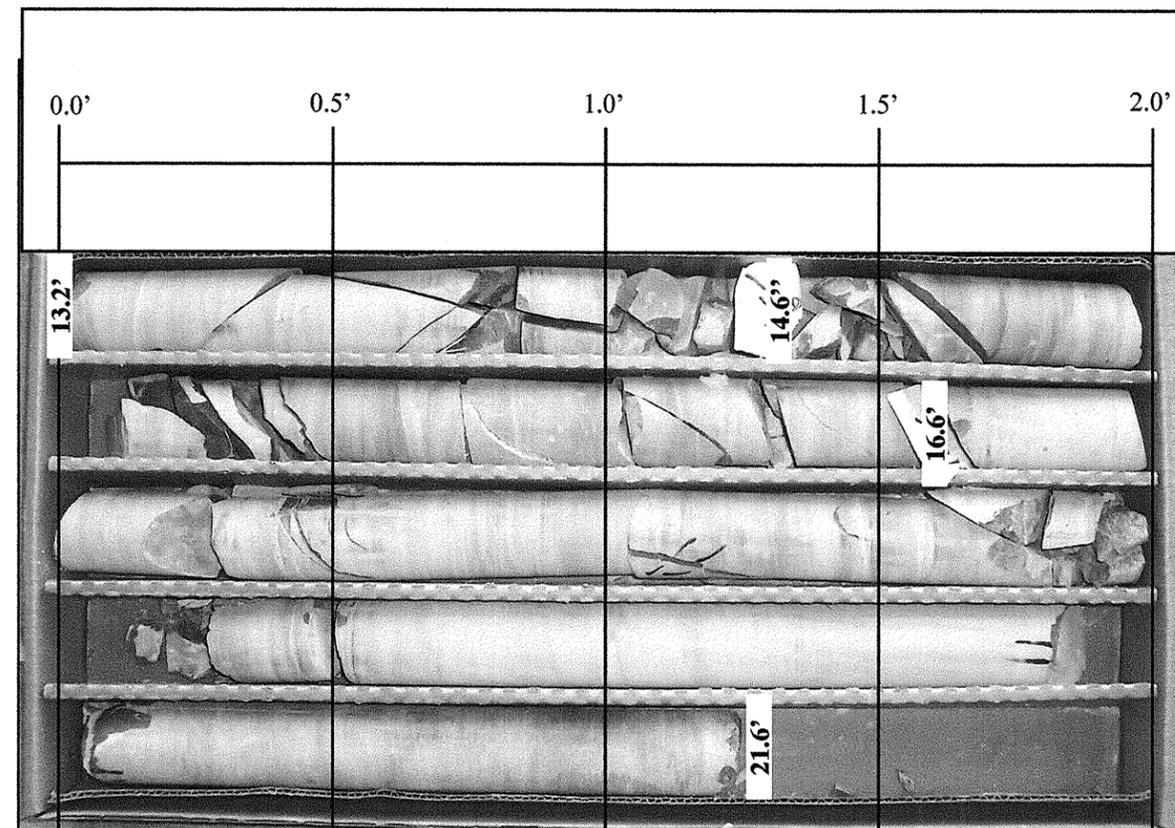
NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.				
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)			
BORING NO. B2B		STATION 20+28		OFFSET 23ft RT		ALIGNMENT -L-				
COLLAR ELEV. 455.9 ft		TOTAL DEPTH 21.6 ft		NORTHING 588,036		EASTING 1,631,090				
DRILL MACHINE CME-45B		DRILL METHOD Wash Boring		HAMMER TYPE Manual						
START DATE 06/28/07		COMP. DATE 06/28/07		SURFACE WATER DEPTH 8.6ft		DEPTH TO ROCK 3.8 ft				
ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
451.1	4.8	1.8	2:00/0.8	(1.8)	(1.2)		(16.6)	(10.2)		Begin Coring @ 4.8 ft
449.3	6.6		2:00/0.8	100%	67%					NON-CRYSTALLINE ROCK
447.8	8.1	1.5	N=60/<.1	(1.4)	(0.6)					BLUE GRAY, SLI. WEATH. MOD. HARD, V. CLOSE. TO MOD. CLOSE FRACT., THINLY TO THICKLY LAMINATED EXTREMELY INDURATED META-ARGILLITE
		3.5	5:45	93%	40%					
444.3	11.6		3:00/0.5	(3.5)	(2.6)					
442.7	13.2	1.6	2:00/0.5	100%	74%	RS-2				
441.3	14.6	1.4	3:30	(1.6)	(0.7)					
439.3	16.6	2.0	4:27	100%	44%					
		5.0	3:55/0.6	(1.3)	(0.7)					
			1:30/0.4	93%	50%					
			5:30	(2.0)	(0.3)					
			3:00/0.6	100%	15%					
			5:30	(5.0)	(4.1)					
434.3	21.6		4:27	100%	82%					
			3:30							
			4:30							
										Boring Terminated at Elevation 434.3 ft IN NCR: BLUE GRAY, META-ARGILLITE
										SPT REFUSAL AT ELEV. 452.0 FT. TRICONE REFUSAL AT ELEV. 451.1 FT.

NCDOT CORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07



Boring B2B, Box 1 of 2, 4.8 feet to 13.2 feet.



Boring B2B, Box 2 of 2, 13.2 feet to 21.6 feet.

SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE # 33 OVER LONG CREEK ON NC 73
 STANLY CO., NC
 NCDOT PROJECT #: 33617.1.1
 TIP #: B-4276**



TIERRA, INC.
 2736 ROWLAND RD.
 RALEIGH, NC 27615
 PHONE (919) 871-0800
 FAX (919) 871-0803

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.									
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)								
BORING NO. EB2A		STATION 20+98		OFFSET 14ft LT		ALIGNMENT -L-									
COLLAR ELEV. 470.2 ft		TOTAL DEPTH 23.2 ft		NORTHING 588,038		EASTING 1,631,170									
DRILL MACHINE CME-75		DRILL METHOD H.S. Augers		HAMMER TYPE Manual											
START DATE 07/10/07		COMP. DATE 07/12/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
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						
475															
469.2	1.0													470.2	0.0
466.3	3.9	7	11	10											
464.2	6.0	9	14	14										464.5	5.7
461.7	8.5	2	9	5										459.2	11.0
456.3	13.9	4	5	3										453.2	17.0
451.7	18.5	4	5	6										447.0	23.2
447.0	23.2														
		60/0													

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.									
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)								
BORING NO. EB2B		STATION 20+98		OFFSET 11ft RT		ALIGNMENT -L-									
COLLAR ELEV. 470.5 ft		TOTAL DEPTH 19.0 ft		NORTHING 588,015		EASTING 1,631,158									
DRILL MACHINE CME-75		DRILL METHOD Wash Boring		HAMMER TYPE Manual											
START DATE 07/13/07		COMP. DATE 07/13/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
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						
475															
467.8	2.7													470.5	0.0
465.0	5.5	4	2	3										465.5	5.0
461.7	8.8	4	6	6										462.0	8.5
457.0	13.5	6	9	3										452.5	18.0
452.0	18.5	7	11	13										451.5	19.0
451.5	19.0														

NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

TIERRA, INC.

2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE #33 OVER LONG CREEK ON NC 73
 NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276

STANLY COUNTY

TIERRA, INC. PROJECT NO: 6211-07-049

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
EB1A		SS-1										
A-7-6			93	88	80	7	9	32	52	48	21	30.7
18+93	17' LT	6.0-7.5										
EB1B		SS-2										
A-2-4			46	33	26	32	13	22	33	31	10	-
18+93	10' RT	1.4 - 2.9										
EB1B		SS-3										
A-6			93	89	86	5	3	39	53	38	15	33.6
18+93	10' RT	13.5 - 15.0										
B1B		SS-4										
A-7-6			100	98	94	3	5	47	45	44	17	80.2
19+66	36' RT	0.0 - 1.5										
B2A		SS-5										
A-4			68	62	55	10	12	35	43	31	10	19.3
20+33	9' LT	3.3 - 4.8										
EB2A		SS-6										
A-2-4			52	30	25	39	15	20	26	31	8	-
20+98	14' LT	1.0 - 2.5										
EB2B		SS-7										
A-6			66	48	43	30	6	36	28	34	23	17.6
20+98	11' RT	2.7 - 4.2										
EB2B		SS-8										
A-4			72	63	58	14	7	29	50	31	9	23.8
20+98	11' RT	5.5 - 7.0										

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 33617.1.1 (B-4276)
 F.A. NO.: BRSTP-73(5)
 COUNTY: STANLY

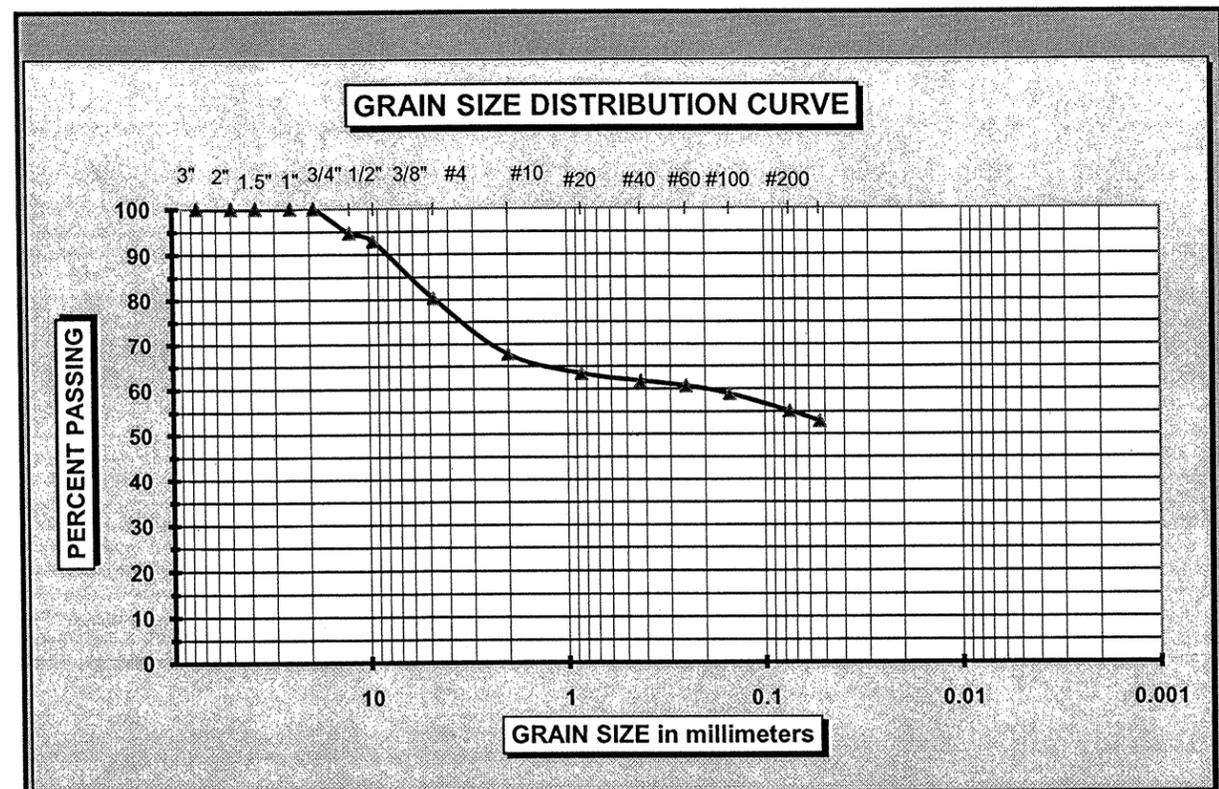
BRIDGE NO. 33 OVER LONG CREEK ON NC 73

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Splitting Tensile Strength (PSI)	Remarks
RS-1	B1A	13.2 - 13.8	META ARGILLITE	CZmd	42.0%	0.33	0.17	171.8	8,716	574,382	-	
RS-2	B2B	11.1 - 11.6	META ARGILLITE	CZmd	74.0%	0.31	0.15	173.2	10,066	574,399	-	

BRIDGE #33 OVER LONG CREEK ON NC 73

STANLY COUNTY

NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276



AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	Cu = D60 / D10
		Fine Sand	< #60 and > #200	Cc = (D30) ² / (D10 x D60)

BORING #: B2A SAMPLE #: SS-5 DEPTH: 3.3 - 4.8

BLUE-GRAY AND BROWN SANDY CLAYEY SILT (A-4) W/ GRAVEL

% PASSING #200 SIEVE: 55%

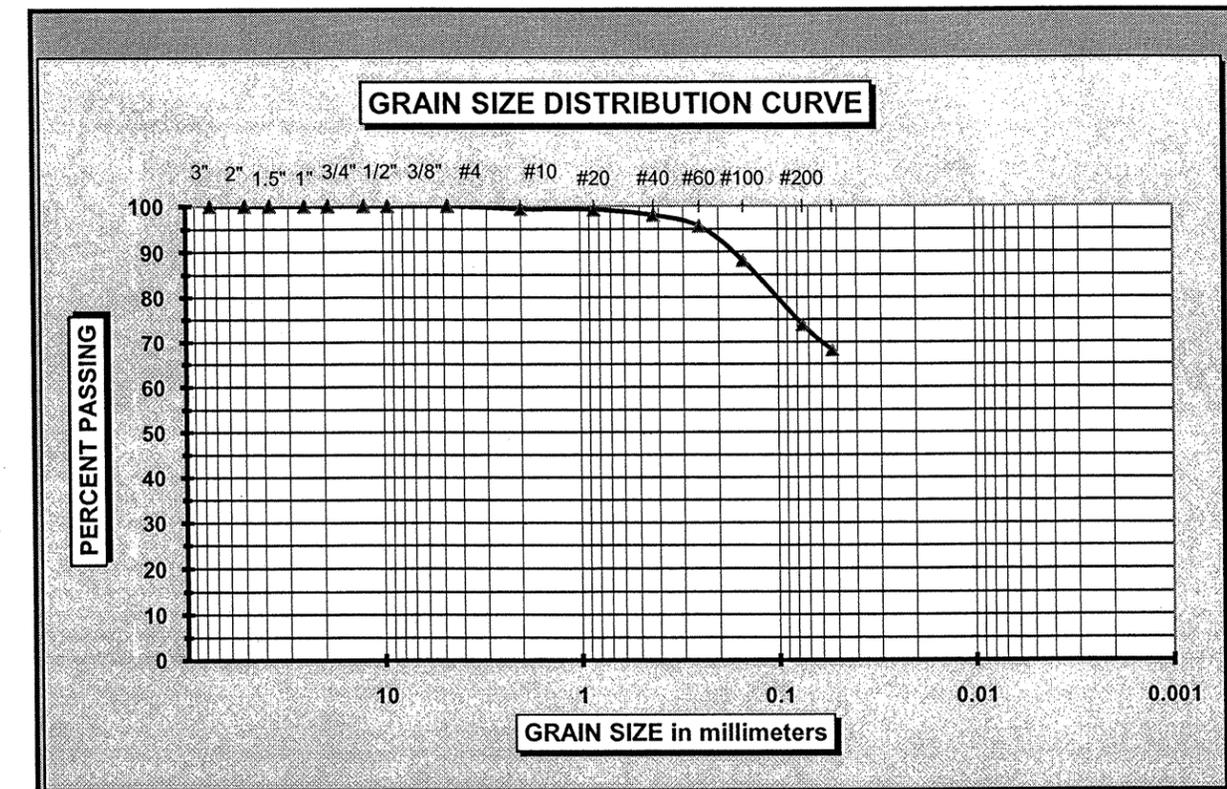
NATURAL MOISTURE CONTENT = 19.3%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	31
PLASTIC LIMIT	21
PLASTIC INDEX	10

BRIDGE #33 OVER LONG CREEK ON NC 73

STANLY COUNTY

NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276



AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	Cu = D60 / D10
		Fine Sand	< #60 and > #200	Cc = (D30) ² / (D10 x D60)

BORING #: DET-1 SAMPLE #: SS-9 DEPTH: 6.5 - 8.0

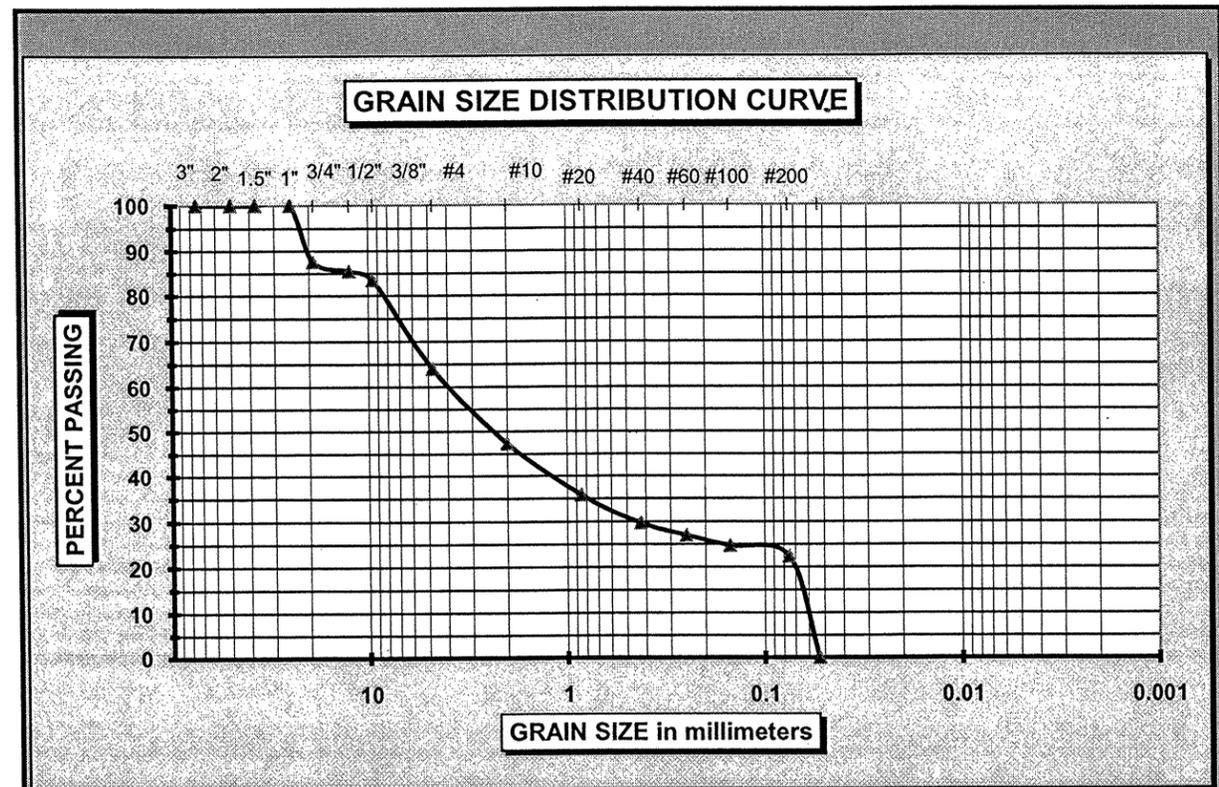
GRAY AND TAN SANDY CLAYEY SILT (A-4)

% PASSING #200 SIEVE: 74%

NATURAL MOISTURE CONTENT = 23.0%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	28
PLASTIC LIMIT	24
PLASTIC INDEX	4

BRIDGE #33 OVER LONG CREEK ON NC 73
 STANLY COUNTY
 NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276



AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	$Cu = D60 / D10$
		Fine Sand	< #60 and > #200	$Cc = (D30)^2 / (D10 \times D60)$

BORING #: DET-2 SAMPLE #: SS-10 DEPTH: 0.5 - 1.6

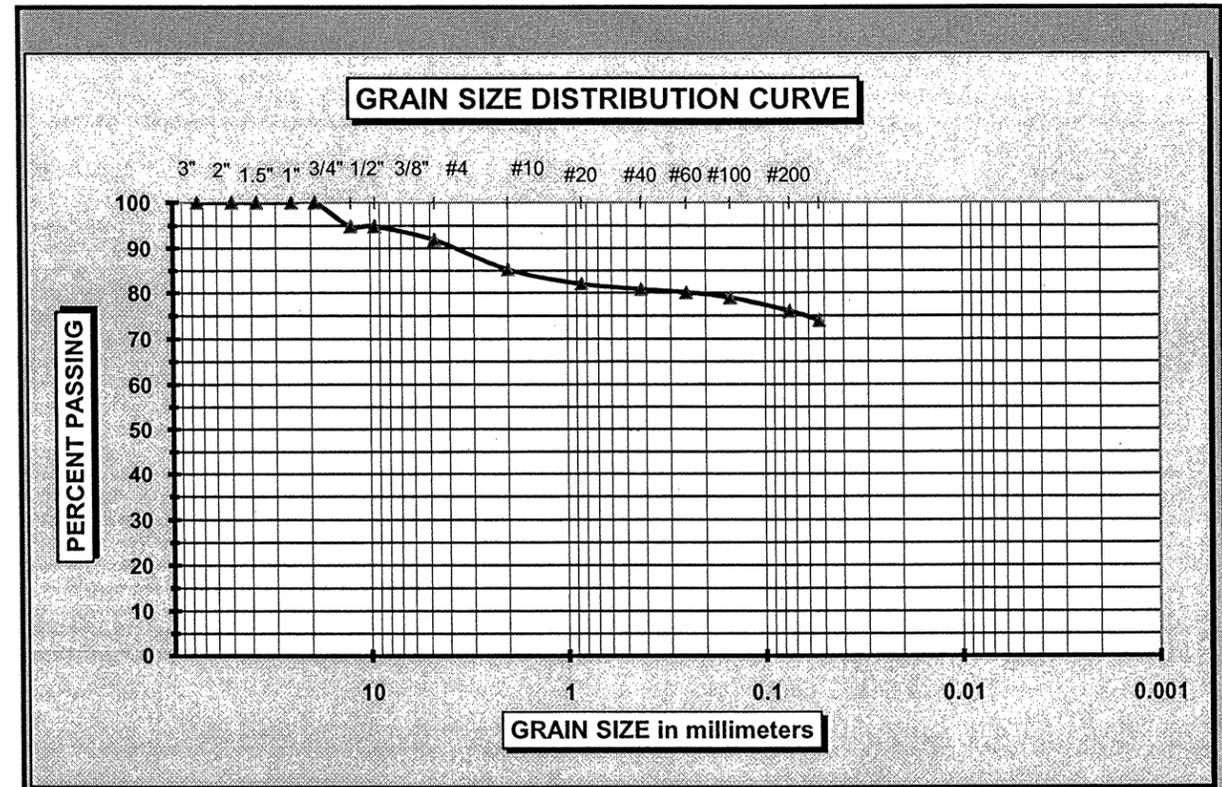
BROWN SILTY SAND (A-1-b) W/ GRAVEL

% PASSING #200 SIEVE: 22%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	17
PLASTIC LIMIT	-
PLASTIC INDEX	NP

BRIDGE #33 OVER LONG CREEK ON NC 73
 STANLY COUNTY
 NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276



AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	$Cu = D60 / D10$
		Fine Sand	< #60 and > #200	$Cc = (D30)^2 / (D10 \times D60)$

BORING #: DET-3 SAMPLE #: SS-11 DEPTH: 0.0 - 1.5

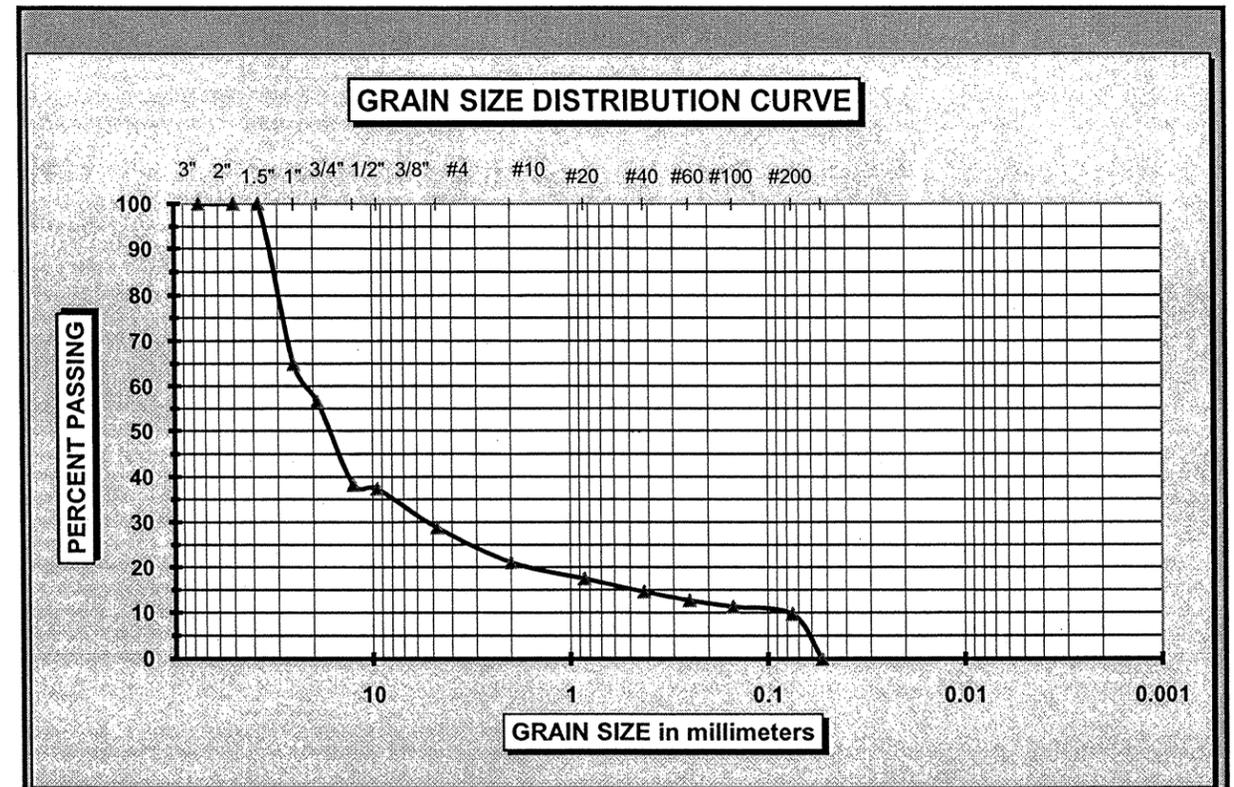
BROWN CLAYEY SILT (A-4)

% PASSING #200 SIEVE: 76%

NATURAL MOISTURE CONTENT = 35.0%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	24
PLASTIC LIMIT	19
PLASTIC INDEX	5

BRIDGE #33 OVER LONG CREEK ON NC 73
 STANLY COUNTY
 NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276



AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	$C_u = D_{60} / D_{10}$
		Fine Sand	< #60 and > #200	$C_c = (D_{30})^2 / (D_{10} \times D_{60})$

BORING #: DET-3 SAMPLE #: SS-12 DEPTH: 7.1 - 7.7

BLUE-GRAY SAND W/ GRAVEL (A-1-a)

% PASSING #200 SIEVE: 10%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	19
PLASTIC LIMIT	-
PLASTIC INDEX	NP



**FIELD
 SCOUR REPORT**

WBS: 33617.1.1 TIP: B-4276 COUNTY: STANLY

DESCRIPTION(1): BR. NO. 33 OVER LONG CREEK ON NC 73

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
 Other (explain) HYDRO REPORT

Bridge No.: 33 Length: 130 Total Bents: 6 Bents in Channel: 4 Bents in Floodplain: 2
 Foundation Type: CAP ON PILES WITH H-PILE REINFORCEMENT. CONCRETE ABUTMENTS

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE EVIDENT

Interior Bents: ASSUMED SCOUR FOR INTERIOR BENTS THAT HAVE BEEN REINFORCED WITH H-PILES. SCOUR NOT VISIBLE

Channel Bed: NO RECENT SCOUR FOR CHANNEL BED IS ASSUMED. ALL BORINGS HAD COHESIVE SOILS ON SURFACE.

Channel Bank: NONE EVIDENT

EXISTING SCOUR PROTECTION

Type(3): H-PILES ADJACENT TO 2 INTERIOR BENTS IN CENTER CHANNEL

Extent(4): ON DOWNSTATION AND UPSTATION SIDE OF EACH BENT

Effectiveness(5): ASSUMED TO REINFORCE EXISTING BENT LINE

Obstructions(6): NONE

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): SILT AND CLAY OVERLYING SAND WITH GRAVEL UP TO 1" DIAMETER ASSUMED THAT OCCASIONAL 1' BOULDERS MAY BE PRESENT

Channel Bank Material(8): SILT AND CLAY W/ ORGANICS

Channel Bank Cover(9): WETLAND VEGETATION WITH OCCASIONAL SHRUBS

Floodplain Width(10): APPROX. 500 FEET (LAKE AND OR WETLAND)

Floodplain Cover(11): WETLAND VEGETATION, W/ OCCASIONAL SHRUBS AND SMALL TREES

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): TO EAST

Observations and Other Comments: DOWNSTREAM RUNS INTO CITY LAKE, UPSTREAM HAS BACKED UP FROM BRIDGE INTO A WELL DEVELOPED WETLAND/PONDED AREA

Reported by: [Signature] Date: 7/13/2007
 TIERRA, INC.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

	BENTS							
	B1	B2						
500 Year Event	451.8	451.6						

Comparison of DSE to Hydraulics Unit theoretical scour:
 The DSE elevations are higher than theoretical scour due to the presence of weathered rock and rock.
 The DSE is based on the Bridge Survey and Hydraulic Design Report dated 4/23/07.

DSE determined by: _____ Date: 8/28/2007
 Charles M. Whalen, Jr.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	CHANNEL	CHANNEL	CHANNEL	CHANNEL	BANK	BANK
Sample No.	SS-3	SS-4	SS-5	SS-9	SS-10	SS-11	SS-12
Retained #4	4	0	20	0	36	8	71
Passed #10	93	100	68	99	47	85	21
Passed #40	89	98	62	98	30	81	15
Passed #200	86	94	55	74	22	76	10
Coarse Sand	5	3	10	4	20	6	8
Fine Sand	3	5	12	27	38	7	3
Silt	39	47	35	33	-	43	-
Clay	53	45	43	36	-	44	-
LL	38	44	31	28	17	24	19
PI	15	17	10	4	NP	5	NP
AASHTO	A-6	A-7-6	A-4	A-4	A-1-b	A-4	A-1-a
Station	18+93	19+66	20+33	19+55	20+22	20+61	20+62
Offset	10' RT -L-	36' RT -L-	9' LT -L-	CL -DET-	1' RT -DET-	5' RT -DET-	5' RT -DET-
Depth	13.5 - 15.0	0.0 - 1.5	3.3 - 4.7	6.5 - 8.0	0.5 - 1.6	0.0 - 1.5	7.1 - 7.7



OVERVIEW OF SITE, LOOKING EAST.



PROFILE, LOOKING DOWNSTATION FROM END BENT 2 AREA.

SITE PHOTOGRAPHS

**BRIDGE #33 OVER LONG CREEK
ON NC 73
STANLY COUNTY, NORTH CAROLINA
TIP NO: B-4276, STATE PROJECT NO: 33617.1.1**



TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



END BENT 1, LOOKING LEFT TO RIGHT.



BENT 1, LOOKING LEFT TO RIGHT.

SITE PHOTOGRAPHS

**BRIDGE #33 OVER LONG CREEK
ON NC 73
STANLY COUNTY, NORTH CAROLINA
TIP NO: B-4276, STATE PROJECT NO: 33617.1.1**



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BENT 2, LOOKING LEFT TO RIGHT.



END BENT 2, LOOKING LEFT TO RIGHT.

SITE PHOTOGRAPHS	
BRIDGE #33 OVER LONG CREEK ON NC 73 STANLY COUNTY, NORTH CAROLINA TIP NO: B-4276, STATE PROJECT NO: 33617.1.1	
	<small>TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803</small>



LONG CREEK, LOOKING DOWNSTREAM.



LONG CREEK, LOOKING UPSTREAM.

SITE PHOTOGRAPHS-DETOUR STRUCTURE

**BRIDGE #33 OVER LONG CREEK
ON NC 73
STANLY COUNTY, NORTH CAROLINA
TIP NO: B-4276, STATE PROJECT NO: 33617.1.1**

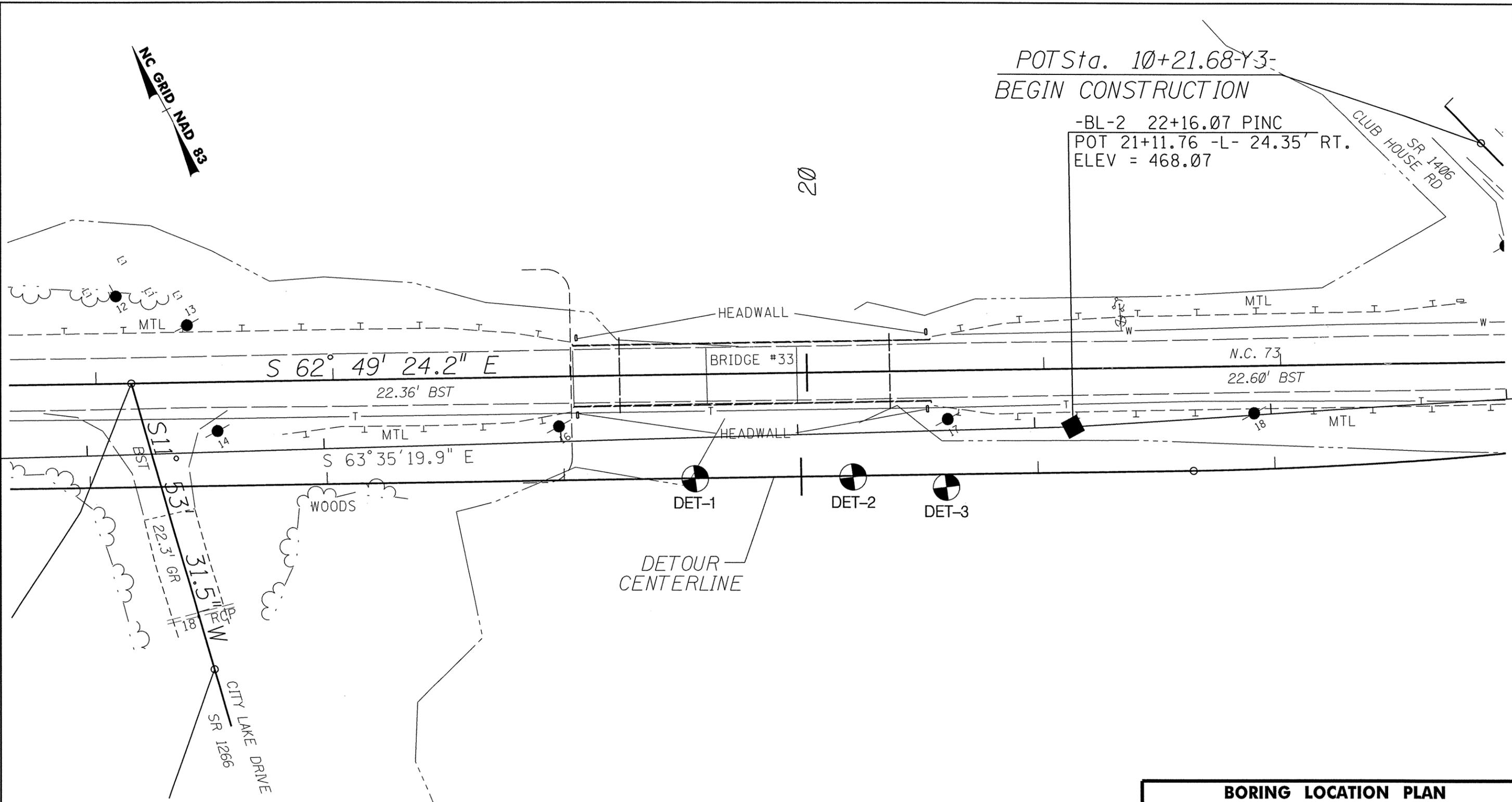


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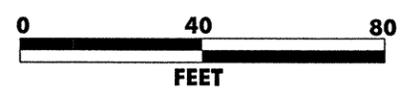
NC GRID NAD 83

POT Sta. 10+21.68-Y3-
 BEGIN CONSTRUCTION

-BL-2 22+16.07 PINC
 POT 21+11.76 -L- 24.35' RT.
 ELEV = 468.07



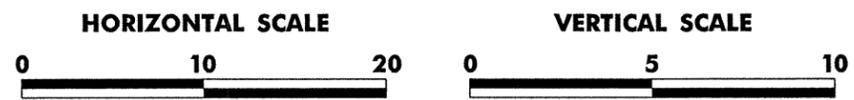
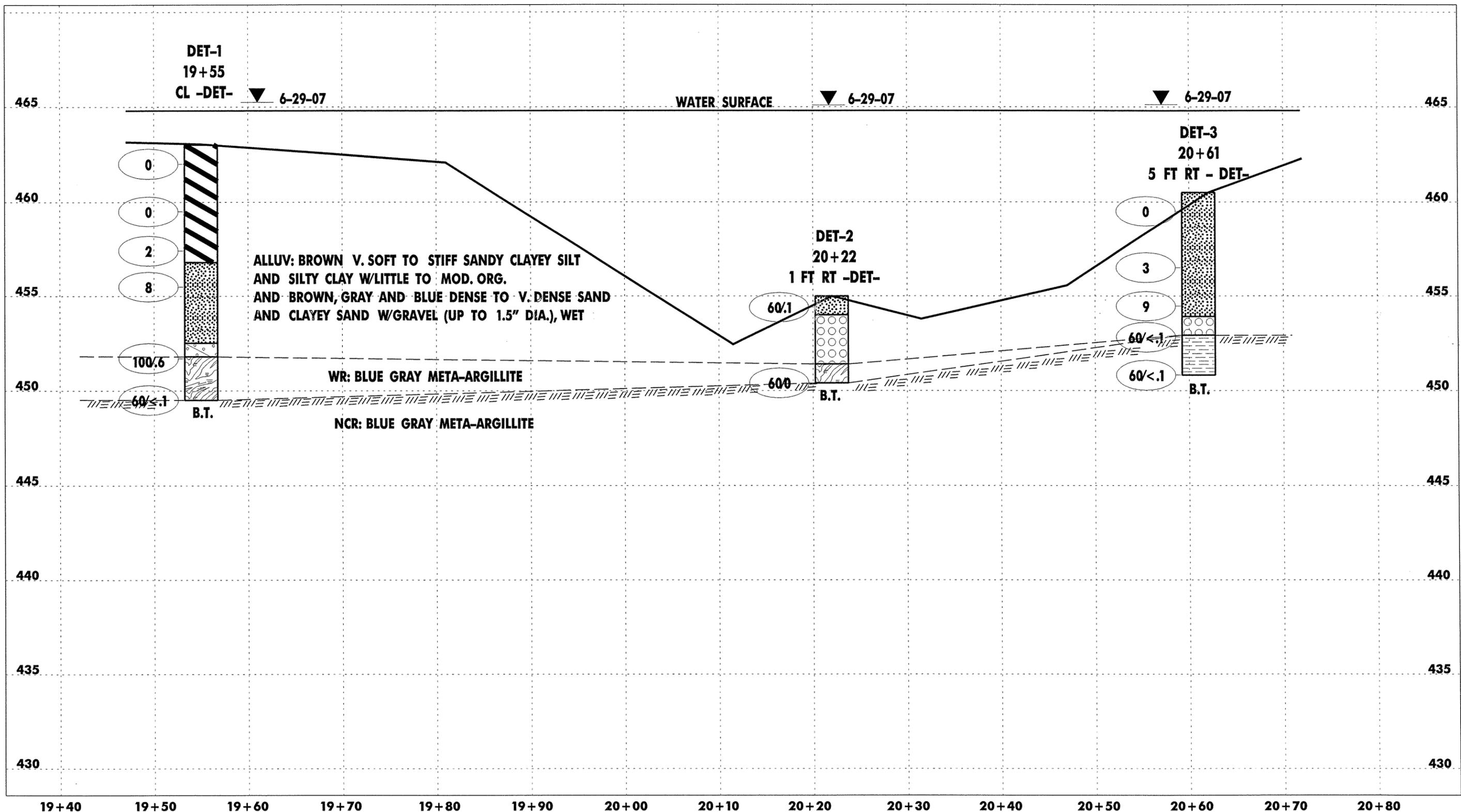
NOTES:
 BENCH MARK: TMB #2, STA. 20+7.86 -BL-, 10.69' LT,
 CHISELED SQUARE ON HEADWALL OF BRIDGE # 33.
 PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED
 FROM NCDOT, DATED JUNE, 2007
 PROPOSED BRIDGE SKEW: 68°



BORING LOCATION PLAN DETOUR STRUCTURE	
BRIDGE #33 OVER LONG CREEK ON NC 73 STANLY COUNTY, NORTH CAROLINA TIP NO: B-4276, STATE PROJECT NO: 33617.1.1	
 TIERRA GEOTECHNICAL • MATERIALS ENGINEERING	TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803

ELEV. (Feet)

ELEV. (Feet)



**DETOUR STRUCTURE PROFILE
ALONG CENTERLINE OF -DET-**
 Bridge No. 33 over Long Creek on NC 73
 Stanly County, North Carolina
 TIP: B-4276
 Project No: 33617.1.1



PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.								
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)							
BORING NO. DET-1		STATION 19+55		OFFSET 0ft CL		ALIGNMENT -DET-								
COLLAR ELEV. 463.0 ft		TOTAL DEPTH 13.5 ft		NORTHING 588,053		EASTING 1,631,013								
DRILL MACHINE CME-55		DRILL METHOD Wash Boring		HAMMER TYPE Manual										
START DATE 06/29/07		COMP. DATE 06/29/07		SURFACE WATER DEPTH 1.8ft		DEPTH TO ROCK N/A								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
465														
463.0	0.0												463.0	0.0
460.5	2.5	WOH	WOH	WOH								W		
458.4	4.6	WOH	WOH	WOH								W		
456.5	6.5	1	1	1								W		
452.3	10.7	1	3	5								SS-9	23%	
449.5	13.5	43	57/1									W		
		60/<.1												60/<.1

PROJECT NO. 33617.1.1		ID. B-4276		COUNTY STANLY		GEOLOGIST BRUINSMA, C.								
SITE DESCRIPTION BRIDGE #33 OVER LONG CREEK ON NC 73							GROUND WTR (ft)							
BORING NO. DET-2		STATION 20+22		OFFSET 1ft RT		ALIGNMENT -DET-								
COLLAR ELEV. 455.0 ft		TOTAL DEPTH 4.6 ft		NORTHING 588,022		EASTING 1,631,072								
DRILL MACHINE CME-55		DRILL METHOD Wash Boring		HAMMER TYPE Manual										
START DATE 06/29/07		COMP. DATE 06/29/07		SURFACE WATER DEPTH 10.3ft		DEPTH TO ROCK N/A								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
455														
454.5	0.5	WOH	5	60/1									458.0	0.0
450.4	4.6												451.4	3.6
		60/0											450.4	4.6

NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

NCDOT BORE SINGLE 07-049.GPJ NC_DOT.GDT 9/6/07

TIERRA, INC.

2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE #33 OVER LONG CREEK ON NC 73

NCDOT Project No: 33617.1.1 - T.I.P. No: B-4276

STANLY COUNTY

TIERRA, INC. PROJECT NO: 6211-07-049

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED				LL	PI	%
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY			
DET-1		SS-9	99	98	74	4	27	33	36	28	4	23.0
A-4												
19+55	CL -DET-	6.5 - 8.0										
DET-2		SS-10	47	30	22	20	38	-	-	17	NP	-
A-1-b												
20+22	1' RT -DET-	0.5 - 1.6										
DET-3		SS-11	85	81	76	6	7	43	44	24	5	35.0
A-4												
20+61	5' RT -DET-	0.0-1.5										
DET-3		SS-12	21	15	10	8	3	-	-	19	NP	-
A-1-a												
20+61	5' RT -DET-	7.1 - 7.7										



OVERVIEW OF SITE, LOOKING EAST.



PROFILE, LOOKING UPSTATION FROM -DET- STATION 19+00.

SITE PHOTOGRAPHS-DETOUR STRUCTURE

**BRIDGE #33 OVER LONG CREEK
ON NC 73**

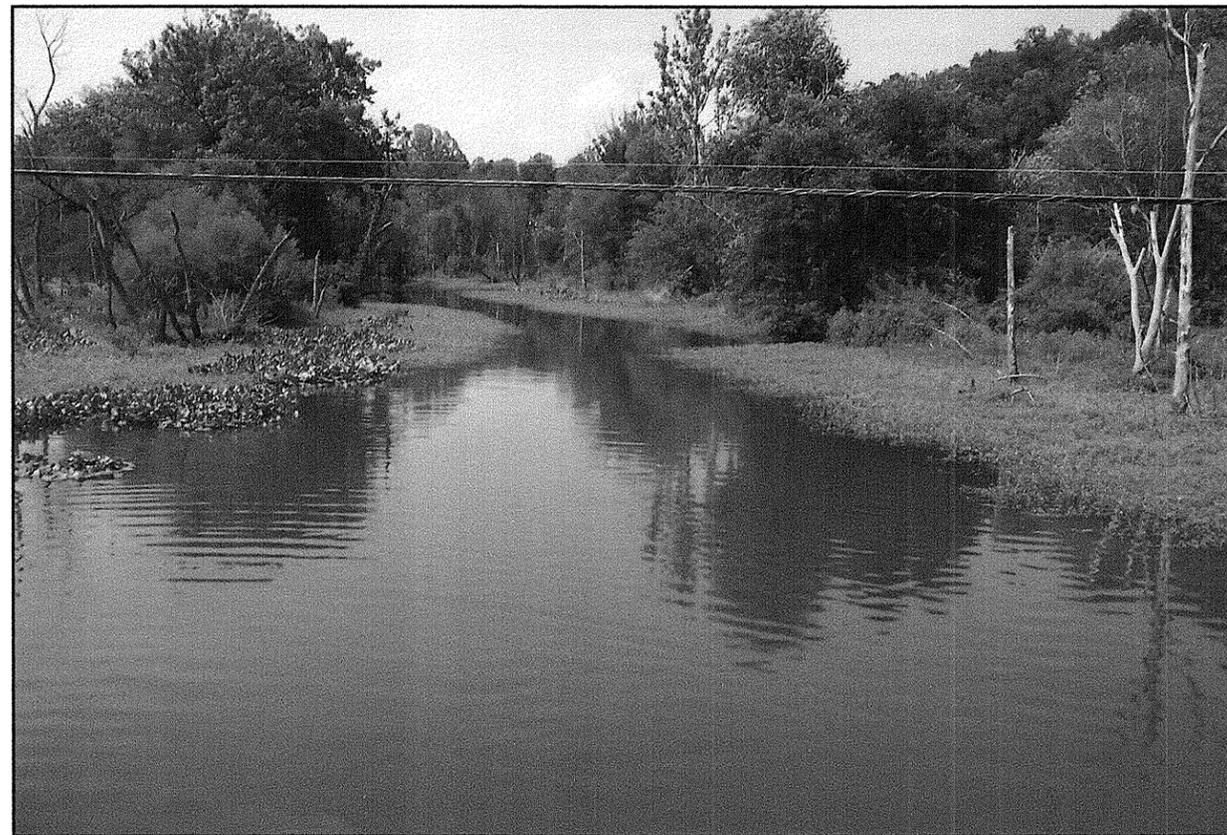
**STANLY COUNTY, NORTH CAROLINA
TIP NO: B-4276, STATE PROJECT NO: 33617.1.1**



TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
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LONG CREEK, LOOKING DOWNSTREAM.



LONG CREEK, LOOKING UPSTREAM.

SITE PHOTOGRAPHS

**BRIDGE #33 OVER LONG CREEK
ON NC 73
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