# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT_MAI2018RI.D. NO
F.A. PROJECTCOUNTY_GASTON
PROJECT DESCRIPTION BRIDGE #28 ON SR
2416 (ROBINSON RD.) OVER MILES CREEK
SITE DESCRIPTION

			CONS	т.					
MAI	2018R		P.E.						
STATE	PROJ. NO.	F. A. PROJ. NO.	DESCRIP	TION					
N.C.	M	1	30						
STATE	STATE PROJECT REFERENCE NO. SHEET TOTAL NO. SHEETS								

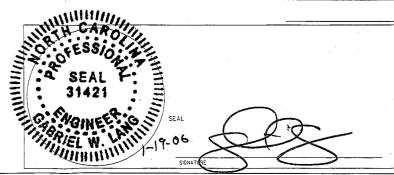
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INVESTIGATED BY J. HOWARD	PERSONNEL P. ZHANG
CHECKED BYG. LANG, P.E.	· · · · · · · · · · · · · · · · · · ·
SUBMITTED BY TIERRA, INC.	
DATE JANUARY, 2006	·



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2018K

DRAWN BY: E. WAGNER

### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

## SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND,	TERMS, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS	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	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIFLD SPT REFLICAL AN INTERPRED	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.
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	POORLY GRADED)  GAP-GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.	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.	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	OF MEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR.	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:	ARGILLACEDUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS,
VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	SUBANGULAR, SUBROUNDED, OR ROUNDED,	MEATHERED NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION		ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (\$5% PASSING #200) (\$5% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE,	AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE,
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5		I GNE ISS. GARRED, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-8 A-3 A-6, A-7	COMPRESSIBILITY  SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50	INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN  COASTAL PLAIN SEDIMENTS CHEMITED INTO ROCK, BUT MAY NOT YIELD  SEDIMENTARY ROCK  SEDIMENTARY ROCK	OF SLOPE,
Z PASSING	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50  PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
# 10 50 MX   GRANULAR SILT- MUCK,   # 40 30 MX50 MX51 MN   GRANULAR CLAY   PFAT   FAT   FA	ORGANIC MATERIAL GRANULAR SILT- CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
# 40 30 MX 50 MX 51 MN   PEAT # 200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MX	TRACE DE OPCANIC MATTER	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
TOUR LIMIT	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PLASTIC INDEX 6 MX N.P. 12 MX 12 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN SOILS WITH	MUDERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,  (V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE RRIGHTLY BOCK BINGS INDER HANNED BY OUR TO	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC	GROUND WATER	(V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
USUAL TYPES STONE FRACS, FINE STATE OR CLAYEY STATE CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING,	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER_24_HOURS.	(SLI,) 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS,	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
GEN, RATING	700	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	
AS A EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABLE	PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SDME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
P.I. OF A-7-5 ≤ L.L 30 : P.I. OF A-7-6 > L.L 30	SPRING OR SEEPAGE	WITH FRESH ROCK,	FLOOD PLAIN (F,P,) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KADI INTZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	THE STREAM,
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED .  PENETRATION RESISTENCE COMPRESSIVE STRENGTH		(MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUMK' SOLIND WHEN STRICK	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY CONSISTENCY (N-VALUE) (TONS/FT <sup>2</sup> )	RCADWAY EMBANKMENT  WITH SOIL DESCRIPTION  ROADWAY EMBANKMENT  OPT DAT TEST BORING  SAMPLE  DESIGNATIONS	IF TESTED, WOULD YIELD SPT REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY VERY LOOSE <4 COMMUNICACIÓN LOOSE 4 TO 18	SOTI SYMBOL ALICED DODING	SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE!  (SEV.) IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAQLINIZED TO SOME	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
MATERIAL MEDIUM DENSE 10 TO 30 N/A	ADTICIONAL STILL OTUFO TILL	EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	ITS LATERAL EXTENT.
(NON-COHESIVE) DENSE 30 TO 50	ROADWAY EMBANKMENTS CORE BORING SS- SPLIT SPOON SAMPLE	IF TESTED, YIELDS SPT N VALUES > 100 BPF	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
VERY SOCT	T ST- SHELBY TUBE	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (V. SEV.) THE MASS IS EFFECTIVELY REDUCED TO SQIL STATUS, WITH QNLY FRAGMENTS OF STRONG ROCK	SOILS USUALLY INDICATES POOR AFRATION AND LACK OF GOOD DRAINAGE.
GENERALLY SOFT 2 TO 4 0 25 TO 45	MONITORING WELL SAMPLE	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 &lt; 100 BPF</i>	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1	PIEZOMETER	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	INTERVENING IMPERVIOUS STRATUM.
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TTTTTT ALLUVIAL SOIL BOUNDARY INSTALLATION RT- RECOMPACTED  SLOPE INDICATOR TRIAXIAL SAM	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF
HARD >30 >4	25/025 DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE  ROCK STRUCTURES	ALSU AN EXAMPLE,	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND
TEXTURE OR GRAIN SIZE	SPT N-VALUE	ROCK HARDNESS	EXPRESSED AS A PERCENTAGE.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 T OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053	● - SOUNDING ROD REF— SPT REFUSAL	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES.  SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.	SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK,
	ABBREVIATIONS	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY (BLDR.) (COB.) (GR.) (COB.) (COB.) (COB.) (COB.)	AR - AUGER REFUSAL MED MEDIUM	TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS
(CSE, SU.) (F, SU.)	BT - BORING TERMINATED PMT - PRESSUREMÊTER TÊST	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN 12" 3"	CL CLAY REF REFUSAL CPT - CONE PENETRATION TEST SD SAND, SANDY	HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	SLIP PLANE.
SOIL MOISTURE - CORRELATION OF TERMS	CSE COARSE SL SILT, SILTY	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTING SCALE FIELD MOISTING	C.T CORING TERMINATED SLI SLIGHTLY DMT - DILATOMETER TEST TCR - TRICONE REFUSAL	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.	A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0,1 FOOT PENETRATION
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DPT - DYNAMIC PENETRATION TEST .	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	WITH 60 BLOWS.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	F FINE 7d - DRY UNIT WEJGHT	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
(SAT.) FROM BELOW THE GROUND WATER TABLE	FOSS, - FOSSILIFEROUS W - MOISTURE CONTENT FRAC, - FRACTURED V, - VERY	VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (S.R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:
PLASTIC SEMISOLID, REQUIRES DRVING TO	FRAGS FRAGMENTS VST - VANE SHEAR TEST	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	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.
ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLL PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING TERM THICKNESS	DENCH MARK TRA TO TRAVEROE DIGITAL
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	N AUTOMATIC C	MANUAL VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED > 4 FEET	BENCH MARK: TBM #3, TRAVERSE DISK AT -L- STA, 20+51,50, 22,4'LT.
SL SHRINKAGE LIMIT	MOBILE B-	WIDE 3 TO 10 FEET THINLY BEDDED 0.16 - 1.5 FEET  WIDE 3 TO 10 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: 636,12'
REQUIRES ADDITIONAL WATER TO - DRY - (D) ATTAIN OPTIMUM MOISTURE	6" CONTINUOUS FLIGHT AUGER CORE SIZE:	CLOSE 0.16 TO 1 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
	8" HOLLOW AUGERS	THINLY LAMINATED ( 0.008 FEET	
PLASTICITY NOT CONCERNATION	CME-45 HARD FACED FINGER BITS -N	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW	TUNG, CARBIDE INSERTS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
LOW PLASTICITY 6-15 SLIGHT	X CASING W/ ADVANCER	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST   TRICONE 3 STEEL TEETH   POST HOLE DIGGE		· · ·
COLOR		H MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	<u>.</u>
	OTHER D-50 TRICONE TUNG, CARB. HAND AUGER  CORE BIT SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:	-
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	OTHER OTHER VANE SHEAR TES	DIFFICULT TO BREAK WITH HAMMER.	
The same of the sa	OTHER	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	

STATE PROJECT NO. SHEET NO. TOTAL SHEETS
MAI2018R 2 30



January 18, 2006

Charles L. Flowe, P.E. TGS Engineers 975 Walnut Street, Suite 141 Cary, NC 27511

Re: Geotechnical Subsurface Exploration Report

Project No.:

MA-12018R

County:

Gaston County

Description:

Bridge No. 28 on SR 2416 (Robinson Road) over Miles Creek

Tierra Inc. Proj. No.: 6211-05-028

Dear Mr. Flowe:

As authorized, Tierra, Inc. has completed the geotechnical subsurface exploration for Bridge No. 28 on SR 2416 (Robinson Road) over Miles Creek. Our investigation was performed in general accordance with our proposal number TR-04-071, dated August 2, 2004. The purpose of this report is to present subsurface conditions at the locations tested and foundation design recommendations for the planned structure. Field and laboratory test results, site and boring location plans, and profile/cross-sections depicting subsurface conditions may be found in this report.

#### PROJECT DESCRIPTION

According to the Bridge Survey and Hydraulic Design Report dated July 2005, the referenced project will replace the existing three span bridge, currently spanning Miles Creek. The proposed replacement structure will be a three span, four bent bridge, located at essentially the same alignment as the existing structure. The proposed bridge will be approximately 122 feet long, located between Station 19+01 and Station 20+23, and have a skew angle of 105°. In addition, the bridge embankments will be reconstructed to match the current pavement elevations and are not anticipated to require new fills. The slopes in front of the abutment will be constructed with 4:1 (horizontal: vertical) slopes and Class II Rip Rap. Design scour elevations and structural loads were provided by TGS Engineers on September 26 and October 20, 2005, respectively, and are presented on the attached Summary of Foundation Recommendations.

#### SITE DESCRIPTION/GEOLOGY

The proposed project site is located along SR 2416 in a rural area of Gaston County, approximately 5 miles south of Gastonia, NC. The area has a generally rolling terrain with a relatively well developed flood plain. It is estimated that the floodplain is approximately 190 feet wide at the bridge site. The site appears to be wooded and undeveloped. The depth of water in the creek at the time of drilling was approximately ½ foot along the upstream side.

According to *The Geologic Map of North Carolina* (1985), the project site is part of the Piedmont Physiographic Providence and is located within the Kings Mountain Belt. The map shows that the site is within the Battleground formation (**Zbt**). Rocks include quartz-sericite schist with metavolcanic rock, quartz-pebble metaconglomerate, kyanite-sillimanite quartzite and garnet-quartz rock.

#### FIELD EVALUATION PROCEDURE

The subsurface exploration consisted of performing six (6) soil test borings near the proposed end bents and interior bents. Some borings were offset due to utility and accessibility issues. Borings were performed with a track-mounted Diedrich D-50 drill rig with an automatic hammer. Standard Penetration Tests (SPT) and soil sampling were performed in general accordance with American Association of State Highway Transportation Officials (AASHTO T-206-87), and North Carolina Department of Transportation (NCDOT) latest Geotechnical Guidelines and Procedures Manual. Rock coring was performed in general conformance with (ASTM) procedure D2113 utilizing HQ size barrels.

Groundwater measurement readings were taken within each borehole with a weighted 100-foot measuring tape from a survey reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period. Surveyed borehole elevations are based on a temporary benchmark TBM #3, located at Station 20+51.50, 22.4 feet left of -L-. The elevation at this benchmark is 636.12 feet.

In addition to our subsurface investigation, a visual scour evaluation was performed along the channel and banks of Miles Creek to determine scour impact for foundation design purposes. The scour report is included in the Appendix of this report.

#### SUBSURFACE AND GROUNDWATER CONDITIONS

Subsurface soils penetrated beneath the site consist of roadway embankment, alluvial deposits and residual materials underlain by weathered rock and crystalline rock.

#### **End Bents**

Soils beneath End Bent 1 consist of roadway embankment, alluvial deposits and residual materials, underlain by weathered rock and crystalline rock. Roadway embankment soils were encountered at or near ground surface and consist of approximately 9 feet of loose silty sand and medium stiff sandy clay (A-2-4, A-7-5). Alluvial deposits were encountered below the roadway embankment soils and consist of approximately 13 to 15 feet of loose to very loose silty sand and soft sandy silt (A-2-4, A-4). Residual soils were encountered below the alluvial deposits and consist of approximately 7 to 12 feet of loose to dense silty sand (A-2-4). Weathered schist was encountered below the residual soils at elevations of approximately 607 and 601 feet. Crystalline rock was encountered below the weathered rock at elevations of approximately 606 and 595 feet.

Soils beneath End Bent 2 consist of roadway embankment, alluvial deposits and residual materials underlain by weathered rock and/or crystalline rock. Roadway embankment soils were encountered at or near ground surface and consist of approximately 4 feet of medium stiff sandy

clay (A-6). Alluvial deposits were encountered either at the ground surface or below the roadway embankment soils and consist of approximately 8 feet of loose to medium dense silty sand and soft to stiff sandy silt (A-2-4, A-4). Residual soils were encountered below the alluvial deposits and consist of approximately 10 to 24 feet of stiff to very stiff sandy silt and loose to dense silty sand (A-4, A-2-4). Weathered rock was encountered below the residual soils at an elevation of approximately 616 feet at EB2B. Crystalline rock was encountered below the weathered rock at EB2B at an elevation of approximately 615 feet, and below the residual soils at EB2A at an elevation of approximately 599 feet.

#### **Interior Bents**

Soils beneath Interior Bent 1 consist of alluvial deposits and residual materials underlain by weathered rock and crystalline rock. Alluvial deposits were encountered at or near ground surface and consist of approximately 19 feet of very loose to loose silty sand (A-2-4). Residual soils were encountered below alluvial deposits and consist of approximately 8 feet of loose to medium dense silty sand (A-2-4). Weathered schist was encountered below the residual soils at an elevation of approximately 600 feet. Crystalline rock was encountered approximately 6 feet below the top of weathered rock at an elevation of approximately 594 feet.

Soils beneath Interior Bent 2 consist of alluvial deposits and residual materials underlain by weathered rock and crystalline rock. Alluvial deposits were encountered at or near ground surface and consist of approximately 8 feet of loose silty sand and stiff sandy clay (A-2-4, A-6). Residual soils were encountered below alluvial deposits and consist of approximately 5 feet of medium stiff sandy clay (A-6). Weathered schist was encountered below the residual soils at an elevation of approximately 614 feet. Crystalline rock was encountered approximately 4 feet below the top of weathered rock at an elevation of approximately 611 feet.

Groundwater across the site ranges in elevation between approximately 627 and 619 feet. Water level within the creek at the time of our investigation was approximately elevation 619 feet.

#### LABORATORY TESTING

Representative split-spoon samples were selected from soil test borings to verify visual field classifications and determine soil index properties. A total of seven split-spoon samples were analyzed in our laboratory for natural moisture determination, Atterberg limits, and grain size analysis. In addition, representative channel and bank samples were analyzed for grain size distribution. Two rock core samples were also tested for compressive strength. All testing was performed in accordance with the following American Society for Testing and Materials (ASTM), (NCDOT) Modified and/or (AASHTO) procedures:

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 "Laboratory Determination of Moisture Content of Soils"
- ASTM 2938-95 "Unconfined Compressive Strength of Intact Rock Core"
- ASTM 3148-02 "Elastic Moduli of Intact Rock Core in Uniaxial Compression"

#### **CONCLUSIONS**

Based on our subsurface investigation, the subsurface conditions consist of loose/medium stiff roadway embankment soils, very loose to medium dense/soft to stiff alluvial soils, and loose to dense/medium stiff to very stiff residual soils, underlain by weathered rock and crystalline rock. The thickness of the alluvial soils ranges from approximately 8 to 19 feet. Weathered rock was encountered at depths ranging from approximately 13 to 35 feet (elevations of 616 to 600 feet). Due to the loose/soft nature of the alluvial soils and deeper depths to weathered rock and crystalline rock, a combination of driven piles and drilled piers bearing on weathered and/or crystalline rock are anticipated for the bridge structure.

#### **FOUNDATION RECOMMENDATIONS**

Based on the depth to competent bearing material, the end bents for the proposed bridge should be supported by driven HP 12x53 piles. The piles may be designed using an allowable capacity of 45 tons and a safety factor of 2. The interior bents of the bridge should be supported by 42-inch concrete drilled piers. The piers may be designed to bear on crystalline rock with an allowable capacity of 330 tons, based on a safety factor of 2.5. For more information, refer to the attached "Summary of Foundation Recommendations".

Based upon the information provided, we understand the existing grades at new end bents will not be changed. Construction for the end bents will only require excavation for the abutments and new slopes. Therefore, additional settlement is not anticipated for the bridge approaches. The end bent slopes are proposed to be 4 Horizontal to 1 Vertical (4H:1V). Provided that the embankments are constructed in accordance with NCDOT specifications and suitable slope protection measures are incorporated, the slopes may be constructed at 4H:1V.

#### **CLOSURE**

Recommendations and evaluations provided by Tierra, Inc. are based on the Bridge Survey & Hydraulic Design Report dated July 2005. Modifications of our recommendations and evaluations may be required if there are changes to the design or location of the structure. Recommendations in this report are based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Tierra, Inc. appreciates this opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely, TIERRA, INC.

Pu (Paul) Zhang, Ph.D., P.E.

Bridge No. 28 on SR 2416 (Robinson Road) over Miles Creek

Geotechnical Engineer

## SUMMARY OF FOUNDATION RECOMMENDATIONS

NCDOT PROJ. NO.:_	MA-12018R	_ PROJEC	CT DESCRIPTION:	Bridge No. 28 on SR 2416
T.I.P. NO.:			· · · · · · · · · · · · · · · · · · ·	over Miles Creek
COUNTY:	Gaston	_		
STATION:	19+62 -L-			SEAL WILL CAP
<del>-</del>		<del>-</del>		SEAL SEAL STATE
PREPARED BY:	PZ DA	<b>TE:</b> 01/1	8/06	C. Names C.
CHECKER:	GL DAT	<b>TE:</b> 01/1	8/06	PIEL W. LANIIII 1-19-0
			: .	8 GNATURS

	STATION	FOUNDATION TYPE	ALLOWABLE LOAD	FOUNDATION DETAILS
END BENT 1	19+01 -L-	Cap on HP 12x53 Steel Pile	45 tons/Pile	Assumed Bottom of Abutment = 631 ft ± Recommended Length of Pile = 35 ft
BENT 1	19+37 -L-	42 inch Drilled Pier	330 tons/Pier	Assumed Bottom of Cap =632 ft ± Assumed Top of Pier = 625 ft ± Recommended Length of Pier = 37 ft Tip Elevation No Higher Than = 588 ft
BENT 2	19+87 -L-	42 inch Drilled Pier	330 tons/Pier	Assumed Bottom of Cap =632 ft ± Assumed Top of Pier = 625 ft ± Recommended Length of Pier = 37 ft LT Recommended Length of Pier = 29 ft RT Tip Elevation No Higher Than = 588 ft LT Tip Elevation No Higher Than = 596 ft RT
END BENT 2	20+23 -L-	Cap on HP 12x53 Steel Pile	45 tons/Pile	Assumed Bottom of Abutment = 632 ft ± Recommended Length of Pile = 35 ft

COMMENTS & NOTES (Attached)

No. MA12018R, Gaston County Bridge # 28 on SR 2416 over Miles Creek 6211-05-028

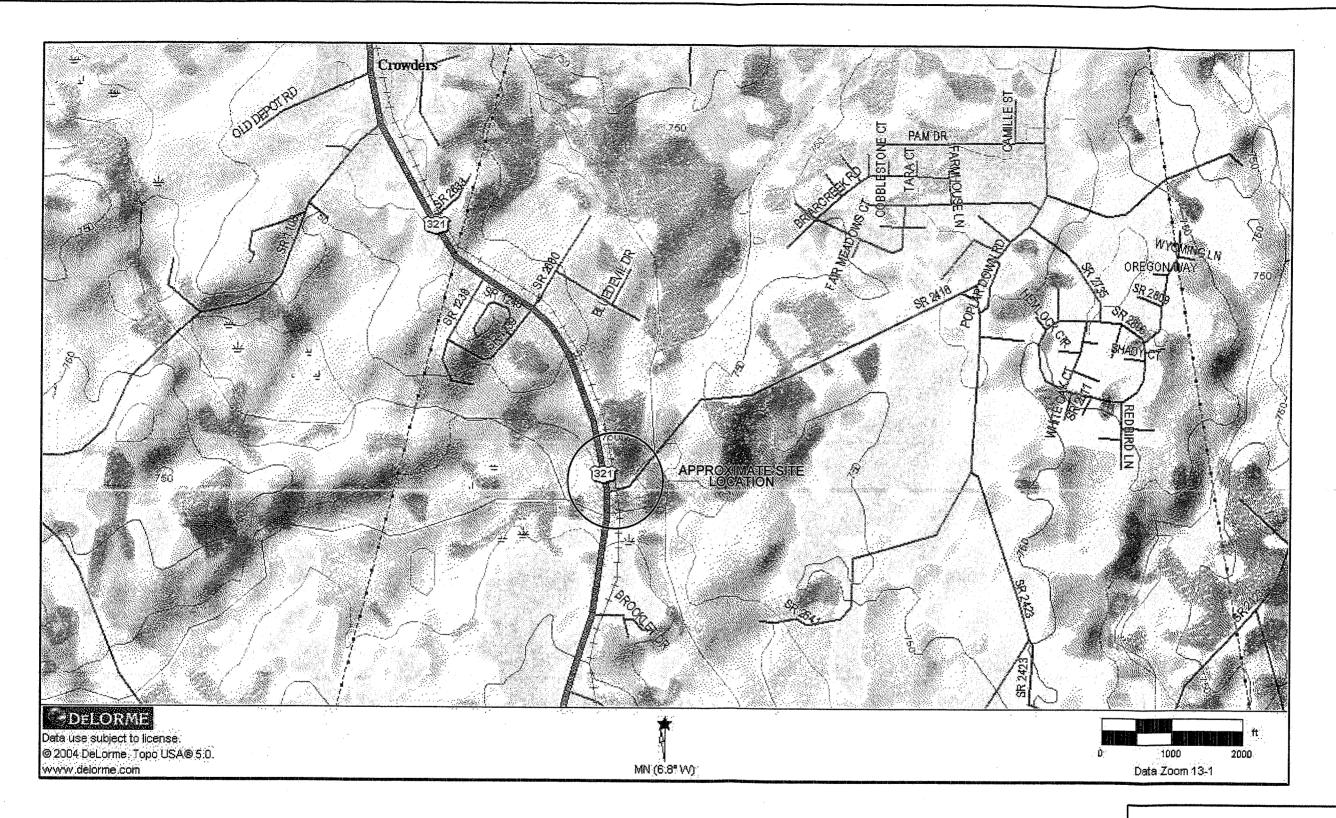
#### Note on Plans:

- 1. Piles for End Bents No. 1 and 2 shall be driven to a minimum bearing capacity of 45 tons each.
- 2. When driving piles, the maximum blow counts shall not be exceeded.
- 3. The drilled piers at Bents No. 1 and 2 have been designed for both skin friction and tip bearing. The required tip bearing capacity is 25 tsf.
- 4. The required tip bearing capacity at Bents No. 1 and 2 shall be verified.
- 5. Drilled piers for Bents No. 1 and 2 have been designed for an applied load of 330 tons each at the top of the column.
- 6. Drilled piers at Bent No. 1 shall extend to an elevation no higher than 588 feet and satisfy the require tip bearing capacity.
- 7. Drilled piers at Bent No. 2 shall extend to an elevation no higher than 588 feet LT and 596 feet RT and satisfy the required tip bearing capacity.
- 8. Permanent steel casing may be required for drilled piers at Bent No. 1. If required, the casing shall no extend below elevation 600 feet without the engineer's permission. The need for permanent steel casin will be determined by the engineer.
- 9. Permanent steel casing may be required for drilled piers at Bent No. 2. If required, the casing shall no extend below elevation 600 feet LT, and 607 feet RT without the engineer's permission. The need for permanent steel casing will be determined by the engineer.
- 10. For permanent steel casing, see special provision for drilled piers.
- 11. SPT testing is not required to determine the tip bearing capacity of the drilled piers at Bents No. 1 and 2.
- 12. Slurry construction shall not be used for this project.
- 13. SID inspections are not required to determine the bottom cleanliness of the drilled piers at Bents No. and 2.
- 14. For drilled piers, see special provisions.
- 15. The scour critical elevations for Bents No. 1 and 2 are 606 feet. The scour critical elevations are for use by maintenance forces to monitor possible scour problems during the life of the structure.

#### **Comments:**

- 1. The elevation of the point of fixity for Bent No. 1 is 592 ft.
- 2. The elevations of the point of fixity for Bent No. 2 are 592 ft LT and 600 ft RT.
- 3. Design scour elevation for Bents No. 1 and 2 is 607 ft.
- 4. The actual boring location for Bent No. 2 was approximately 18 feet offset from the edge of the road du to accessibility issues. Our recommendation for Bent No. 2 is based on assumed rockline elevations a proposed location through interpolation. It is subjected to change if the revealed subsurface condition vary from our assumptions during construction.
- 5. 4:1 (H:V) embankment slope at end bents maybe constructed with suitable slope face protection.
- 6. A longitudinal shear load of 1.1 kips with a free head condition was assumed for Bents No. 1 and 2.
- 7. A transverse shear load of 0.1 kips with a fixed head condition was assumed for Bents No. 1 and 2.

#### **DRILLED PIER PAY ITEM QUANTITIES** PROJECT NO. MA-12018R 1/18/2006 DATE TIP NO. DESIGNED BY COUNTY GASTON GLCHECKED BY STATION 19+62 -L-DESCRIPTION BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREEK NUMBER OF BENTS WITH DRILLED PIERS NUMBER OF PIERS PER BENT DRILLED PIER PAY ITEMS PERMANENT STEEL CASING 42 INCH DIA. **CROSSHOLE** FOR 42 INCH DIA. DRILLED PIERS SPT SID SONIC CSL DRILLED PIER NOT IN SOIL TESTING INSPECTION LOGGING\* TUBES\* BENT# (yes/no/maybe) (feet) (each) (each) (each) (yes/no) Maybe 27 No Maybe 27 0 No 3 5 10 **TOTALS** \* Pay items, "Crosshole Sonic Logging" and "CSL Tubes" are not required unless CSL testing is required with a Note on Plans. Blanks or no represent quantity of zero. If permanent steel casing is required or may be required, Structure Design should calculate the pay item quantity, "Permanent Steel Casing for Dia. Drilled Pier", as the difference between the top of drilled pier elevation or the top of permanent steel casing elevation (whichever is lower) and the elevation the permanent steel casing can not extend below as shown with a Note on Plans. Structure Design should determine the pay item quantity, "\_\_\_ Dia. Drilled Piers in Soil", based upon the total drilled pier length per bent minus the " Dia. Drilled Piers not in Soil" per bent shown in the table above. If CSL tubes are required, Structure design should calculate the pay item quantity, "CSL Tubes", as follows: "CSL Tubes" per bent = (drilled pier length + 2.5 feet) x number of CSL tubes per pier The number of CSL tubes per pier is dependent upon the drilled pier diameter. For drilled piers with a diameter of 5 feet or less, use 4 tubes. For drilled piers with a diameter greater than 5 feet, use 6 tubes.

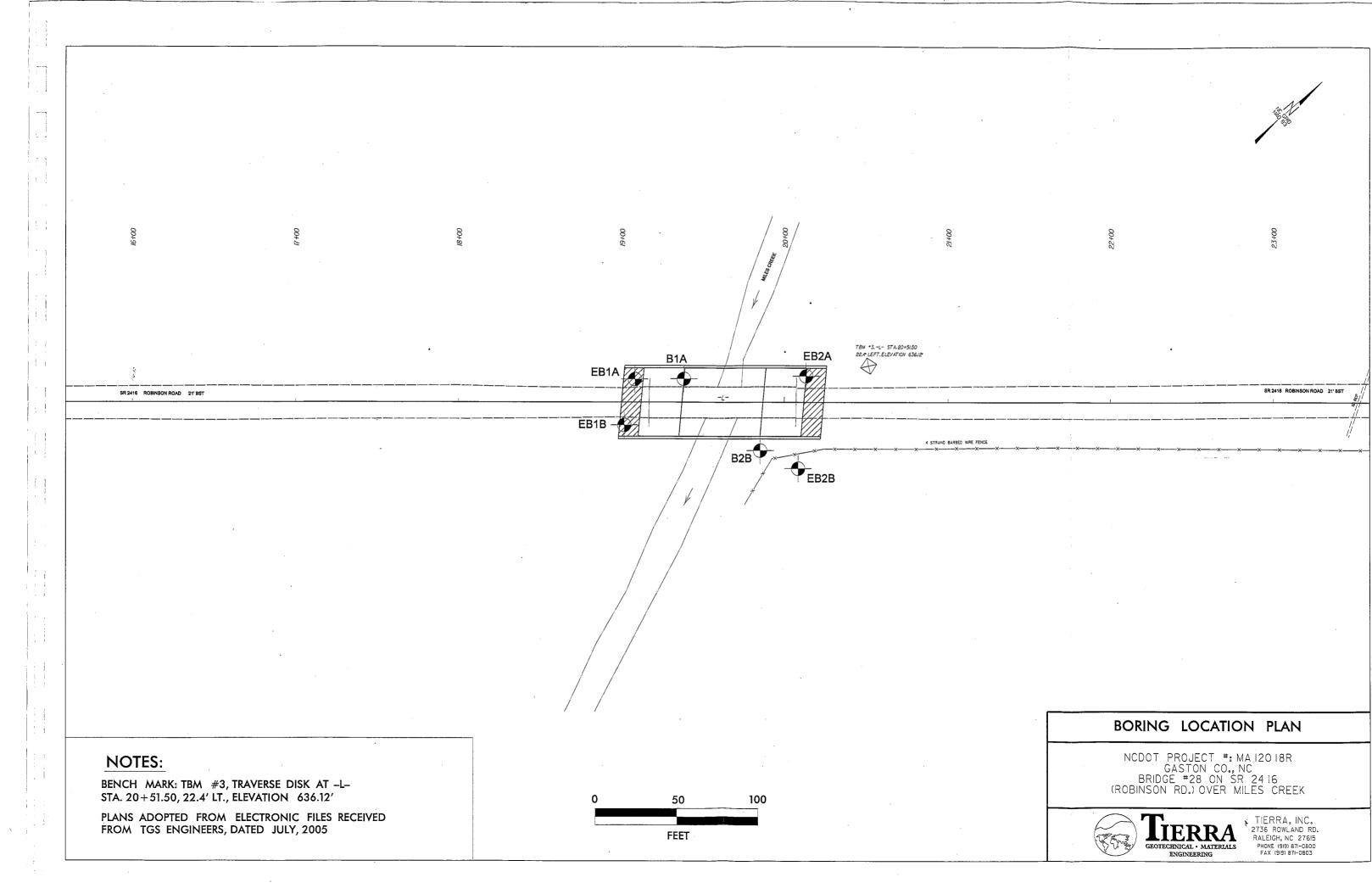


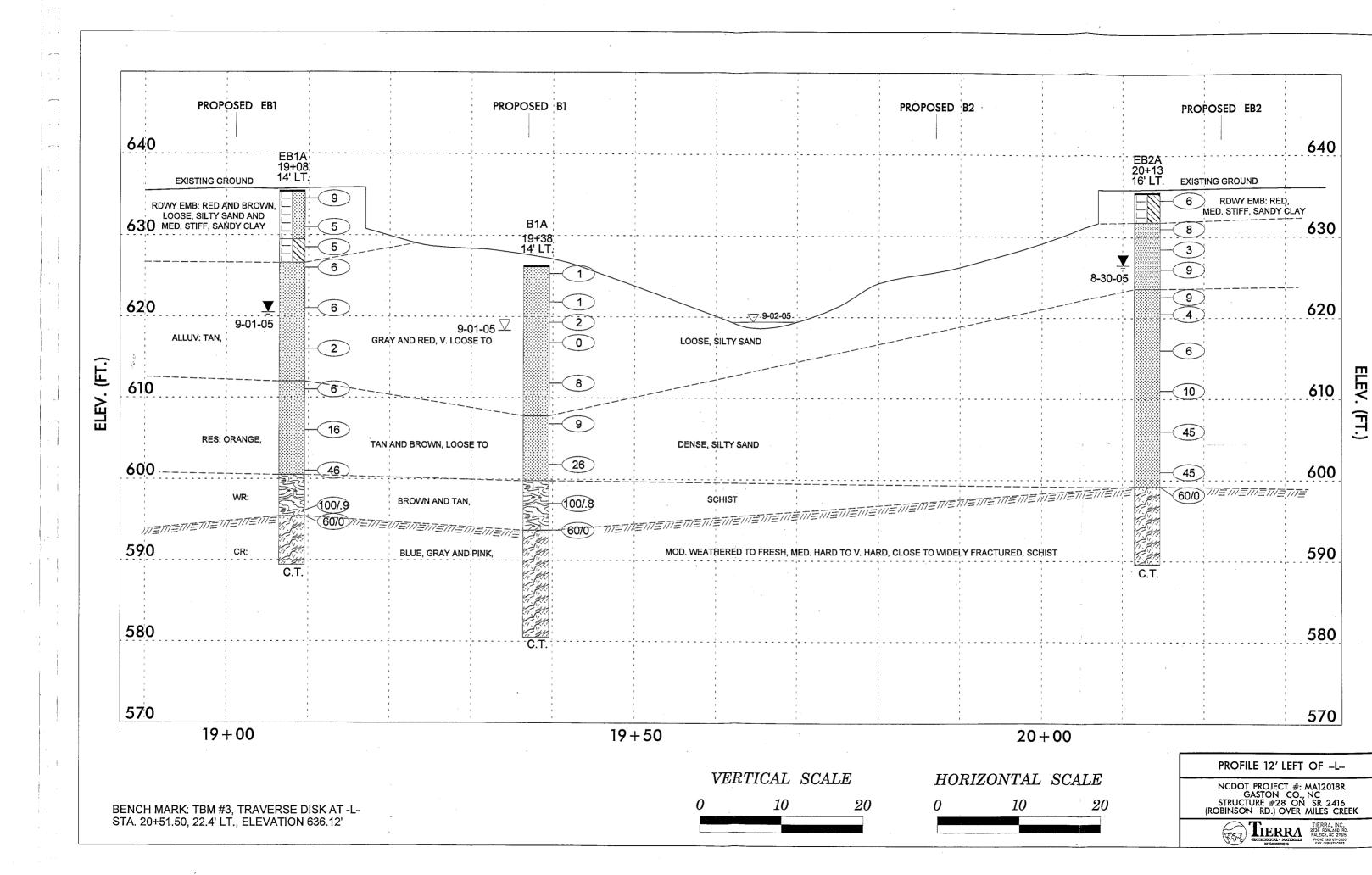
## SITE VICINITY MAP

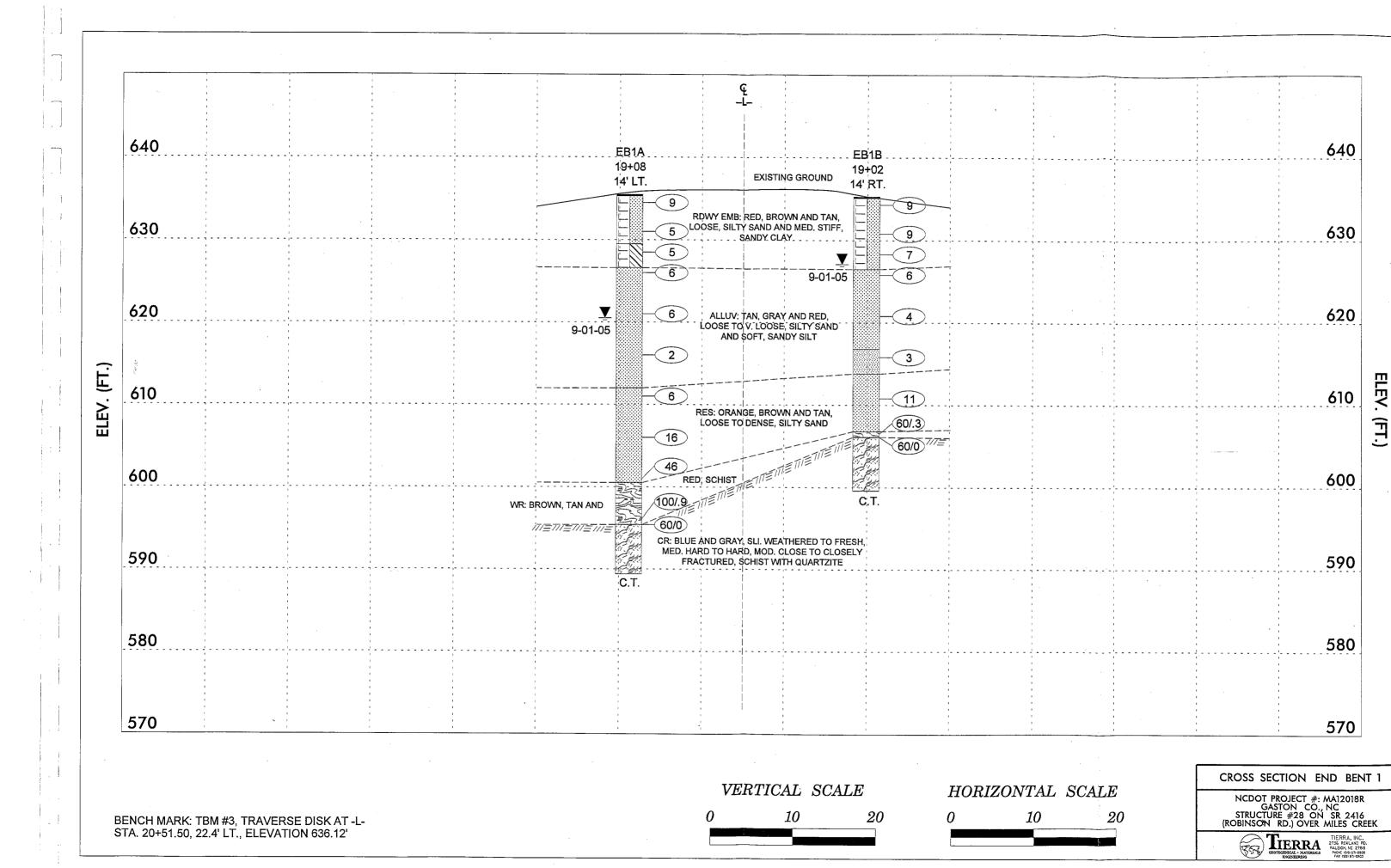
NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

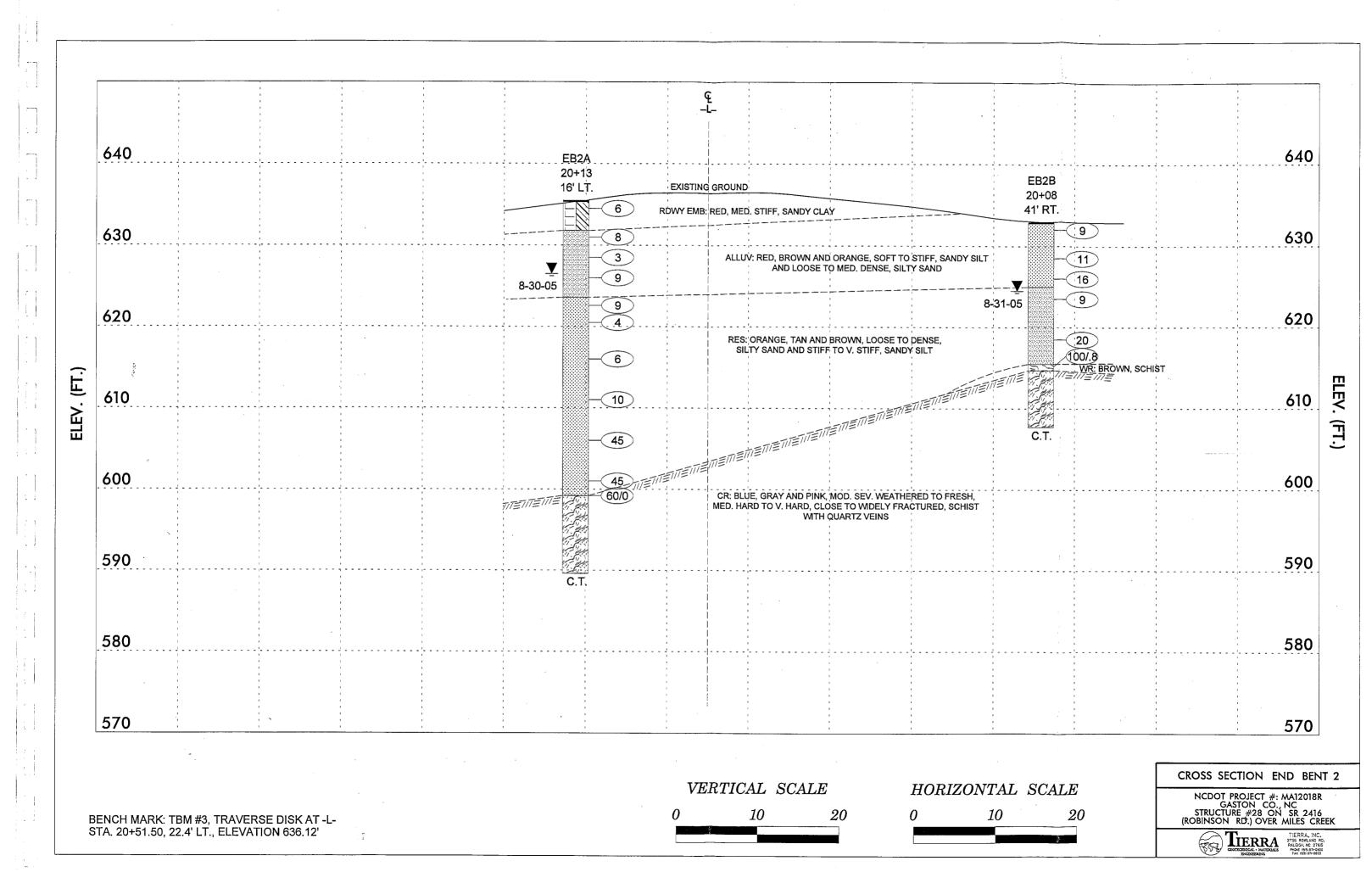


TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (SIE) 871-0803 FAX (SIE) 871-0803









# N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

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GEOTECHNICAL • MATERIALS
ENGINEERING

2736 ROWLAND ROAD RALEIGH, NORTH CAROLINA 27615 Phone (919) 871-0800 Fax (919) 871-0803

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#### **CORE BORING REPORT**

DATE: 9/01/05

PROJECT: MA12018R

I.D. NO.:

BORING NO: EB1A

GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

COUNTY: GASTON

COLLAR ELEV.: 635.5 FT

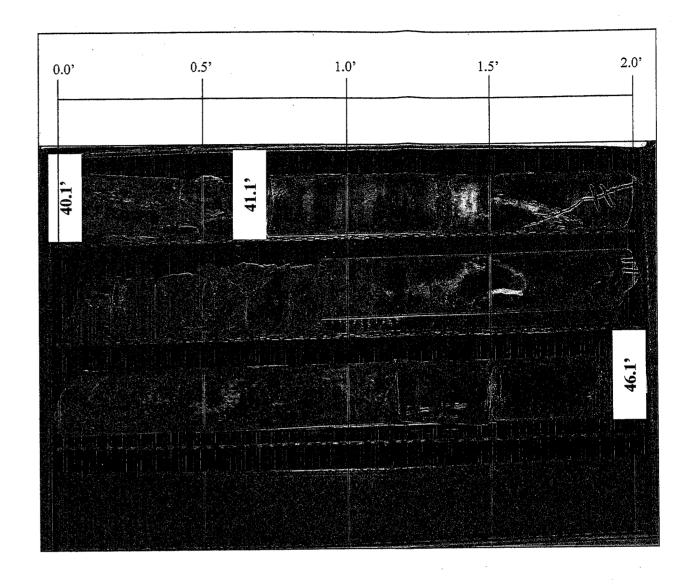
TOTAL DEPTH: 46.1 FT

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CORING TERMINATED AT <u>46.1</u> FT ELEVATION <u>589.4</u> FT

DRILLER: F. COX

CORE SIZE: HQ



Boring EB1A, Box 1 of 1, 40.1 feet to 46.1 feet.

# **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK



TIERRA, INC. 736 ROWLAND RD. ALEIGH, NC 27615 IONE (919) 871+0800 FAX (919) 871-0803

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PROJE	CT NO	. 6211	1-05-02	8		ID. M	A12018F	₹	С	OUNTY	GAS	TON		GEOLOGIST J	. HOWARD	
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## **CORE BORING REPORT**

DATE: <u>8-31-05</u>

PROJECT: MA12018R

I.D. NO.:

BORING NO: EB1B

GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

COUNTY: GASTON

COLLAR ELEV.: 635.3 FT

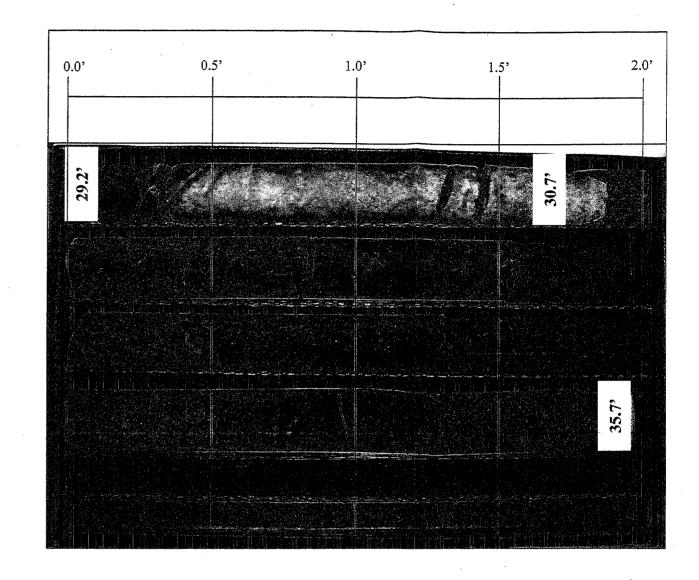
TOTAL DEPTH: 35.7 FT

ELEV.	DEDT	DRILL	<u></u>	REC	RQD		
(FT)	DEPTH (FT)	RATE MIN/FT	RUN	FT %	FT	SAMP	FIELD CLASSIFICATION AND REMARKS
		~	(FT)	%	%	#	
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		2:45	]	1.5/1.5	0.9/1.5		HARD, CLOSELY TO MOD. CLOSELY FRACTURED, SCHIST WITH QUARTZITE
			1.5				SCHIST WITH QUARTZITE
				100%	60%		
604.6	30.7			10070	0070		
-	-						
604.6	30.7	4:30					
		4:15		5.0/5.0	4.5/5.0		
		4:00	5.0				
		4:00		100%	90%		
599.6	35.7	4:00					STRATA REC = 100% STRATA RQD = 83%
1000	50.1	1.00					THE WINES TOOK SHOTA TOOK = 00%
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	H		- 1	.			
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							CODING TEDMINATED AT 65 7 FT

CORING TERMINATED AT <u>35.7</u> FT ELEVATION <u>599.6</u> FT

DRILLER: F. COX

CORE SIZE: HQ



Boring EB1B, Box 1 of 1, 29.2 feet to 35.7 feet.

# **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R
GASTON CO., NC
STRUCTURE #28 ON SR 2416
(ROBINSON RD.) OVER MILES CREEK



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



590

585

N.C.D.O.T. GEOTECHNICAL UNIT **BORING LOG** 2736 ROWLAND ROAD RALEIGH, NORTH CAROLINA 27615 Phone (919) 871-0800 Fax (919) 871-0803 SHEET 1 OF 1 PROJECT NO. 6211-05-028 ID. MA12018R COUNTY GASTON GEOLOGIST J. HOWARD SITE DESCRIPTION BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK GROUND WATER (ft) BORING NO. B1A **BORING LOCATION 19+38** OFFSET 14' LT. ALIGNMENT -L-0 HR. COLLAR ELEV. 626.3 ft **EASTING** NORTHING 24 HR. BACKFILL TOTAL DEPTH 45.8 ft DRILL MACHINE D-50 DRILL METHOD MUD ROTARY HAMMER TYPE AUTO DATE STARTED 9-01-05 COMPLETED 9-02-05 SURFACE WATER DEPTH N/A ELEV. DEPTH **BLOW COUNT BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION 40 60 80 NO. MOI G (ft) 0.5ft 0.5ft 0.5ft 0 626.3 ROOTMAT
ALLUV: TAN TO GRAY, V. LOOSE TO LOOSE,
SILTY SAND (A-2-4) WOH 0.0 625-WOH  $\nabla$ WOH WOH WOH SS-3 615 610+ RES: TAN AND BROWN, LOOSE TO MED. DENSE, SILTY SAND (A-2-4) 5 4 605 8 600+ WR: BROWN AND TAN, SCHIST 31 69/.3 595-CR: BLUE, GRAY AND PINK, SLI. WEATHERED TO FRESH, HARD TO V. HARD, CLOSE TO MOD. CLOSELY FRACTURED, SCHIST WITH QUARTZITE 60/0

#### **CORE BORING REPORT**

DATE: 9-02-05

PROJECT: MA12018R

I.D. NO.:

BORING NO: B1A

GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

**COUNTY: GASTON** 

COLLAR ELEV .: 626.3 FT

TOTAL DEPTH: 45.8 FT

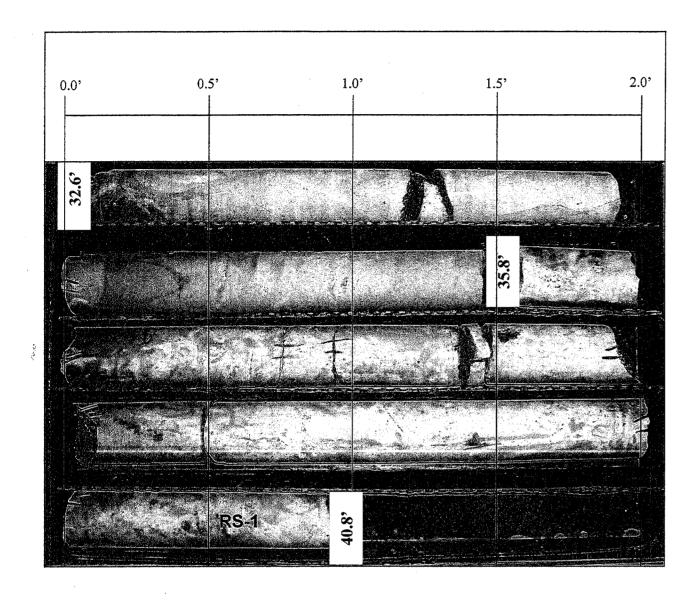
	DEPTH	DRILL	D1 141	REC	RQD		FIELD OF ACCIETOATION AND DEMARKS
(FT)	(FT)	RATE MIN/FT	RUN (FT)	FT %	FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
			1, 1/		- 70	- #	32.6/45.8 CR: BLUE, GRAY AND PINK, SLI. WEATHERED TO
593.7	32.6	6:00		0.010.0			FRESH, HARD TO V. HARD, CLOSE TO MOD.
		6:30		3.2/3.2	3.0/3.2		CLOSELY FRACTURED, SCHIST WITH QUARTZITE
		7:00/1.2	3.20				
				100%	94%		
590.5	35.8						
590.5	35.8	7:00					
		7:30		5.0/5.0	4.9/5.0		
		6:45	5.0				
		7:15	1	100%	98%		
585.5	40.8	8:00	j		-	RS-1	
585.5	40.8	10:30					
		10:15	1	5.0/5.0	4.5/5.0		
		12:15	5.0				***************************************
		13:45	1	100%	90%		· ·
580.5	45.8	12:45		-			STRATA REC = 100% STRATA RQD = 94%
			1				
			1				
			1				
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			1				
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	-				•		CODING TERMINATED AT 45 9 ET

CORING TERMINATED AT 45.8 FT ELEVATION 580.5 FT

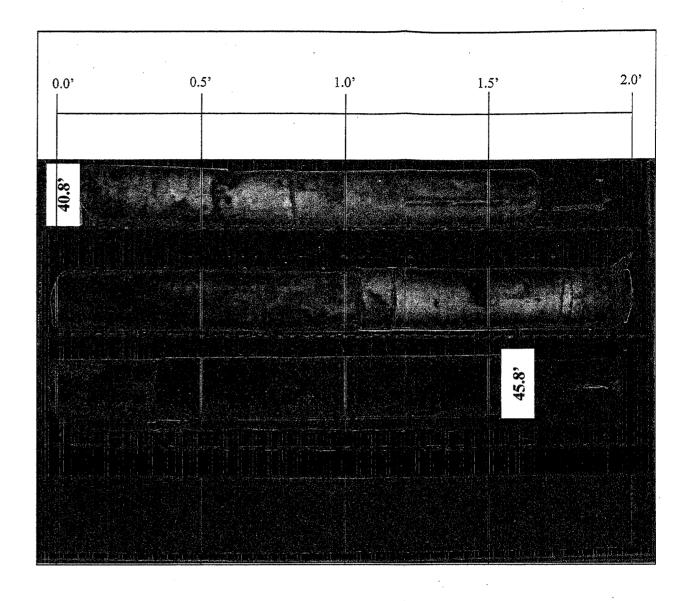
DRILLER: F. COX

CORING TERMINATED AT ELEV. 580.5' IN CR: BLUE, GRAY AND PINK, SCHIST WITH QUARTZITE

CORE SIZE: HQ



Boring B1A, Box 1 of 2, 32.6 feet to 40.8 feet.



Boring B1A, Box 2 of 2, 40.8 feet to 45.8 feet.

# **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R
GASTON CO., NC
STRUCTURE #28 ON SR 2416
(ROBINSON RD.) OVER MILES CREEK



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

# TIERRA GEOTECHNICAL • MATERIALS ENGINEERING

# N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

2736 ROWLAND ROAD RALEIGH, NORTH CAROLINA 27615 Phone (919) 871-0800 Fax (919) 871-0803

			BRIDO	SE #28	ON S	R 2416	ROBINS	SON RD	.) OVE	R MILE	S CRE	EK			GROUND	WATER (ft)
ORIN	G NO.	B2B				LOCAT	TION 19	9+85		OFFS	ET 30'	RT.		ALIGNMENT -L-	0 HR.	8.2
	R ELE			NORT	HING	· ·				EAST	NG				24 HR.	8.2
	DEPTH			DRILL	_ MA	CHINE D				METH	OD	MUDI	ROT	ARY HAMI	MER TYPE A	UTO
	STARTE				ì	1		8-31-05		<u> </u>			RDE	PTH N/A		
- 1	DEPTH		OW COL		_			PER FOO			SAMP.	/ / O   SOIL AND ROCK DESCRIPTION			N	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	Ŷ.	20	40	60	80	100	NO.	MOI	G			
627.4		3	4	5		ΕX	KISTING	GROU	ND					627.4		
Ī	- 0.0	3	4	5	,	<b>•</b> 9 · · ·								ROOTMAT ALLUV: TAN, LOOSE,	SILTY SAND (A	A-2-4)
														-		
625	3.5			:								-		624.4 - ALLUV: RED, STIFF, S	CANDY OF AVAI	
1	. 0.0	4	5	5							•			- ALLUV: RED, STIFF, S	SANDY CLAY (A	A-6)
1	-					<b>♦</b> 10								-		
1	6.0	3	4	5							SS-4	240/		-		
1	-	3	4	5		9					55-4	24%		<b>-</b>		
620	- - 8.5	ğ							<i>.</i>		_			619.4		
1	0.0	2	2	4	1/				. <i>.</i>		SS-5	24%		RES: RED, ORANGE SANDY CLAY (A-6)	AND IAN, MED	. STIFF,
1	-					ξ <u>.</u>								-		
.1	-													<b>-</b>		
İ	-								<u>.</u>					-		
615										·						13
†	13.5	60/.3								60/.3			2	WR: BROWN AND GR	RAY, SCHIST	
†	-													<u>-</u>		
†	-													<b>-</b>		
1	16.9	60/0								60/0				610.5	WILLIE MOD	. 16
610	-	00/0												CR: BLUE, GRAY AND	ESH, HARD TO	V. HARD,
1	-													CLOSE TO MOD. CLO SCHIST WITH QUAR	Z VEINS AND I	PYRITE
. †	-													-		
1	-															
1	-													-		
605	_													<del>-</del>		
1	_									:				-		
1	-													-		
1	-										RS-2			-		
	_								<i>.</i> .		110-2			-		
600	_													_		
1	-													_		
1	_													-		-
1														-		
İ	-												أكريش	595.5	DATELEY	31 5 5' IN
1	_			-										CORING TERMINATE CR: BLUE, GRAY AND	WHITE, SCHI	
Ī	_													_ QUARTZ VEINS AND	PIKIL	
1	-									-				<del>-</del>		
+	-			1 .	1					- 1		1	1	_		

#### **CORE BORING REPORT**

DATE: 8-30-05

PROJECT: MA12018R

I.D. NO.:

BORING NO: B2B

GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

COUNTY: GASTON

COLLAR ELEV.: 627.4 FT

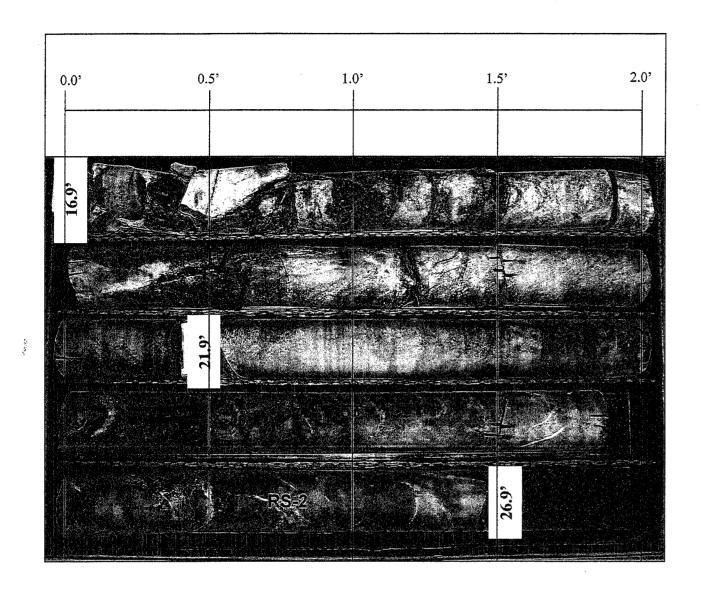
TOTAL DEPTH: 31.9 FT

ELEV/	DEPTH	DRILL RATE	RUN	REC FT	RQD	SAMP	FIELD CLASSIFICATION AND REMARKS
(FT)	. (FT)	MIN/FT	(FT)	%	FT %	#	FIELD CLASSIFICATION AND INCIMARING
610.5	16.9	2:30		-	·-		16.9-31.9 CR: BLUE, GRAY AND WHITE, MOD. WEATHERED
		2:45	1	0.8/1.0	3.0/5.0		TO FRESH, HARD TO V. HARD, CLOSE TO MOD.
i .		3:30	5.0				CLOSELY FRACTURED, SCHIST WITH QUARTZ VEINS AND PYRITE
		3:30	1	80%	60%		
605.5	21.9	2:00					
605.5	21.9	3:00					
		3:00	1	5.0/5.0	4.7/5.0		
		3:00	5.0				
		3:00	1	100%	94%		
600.5	26.9	2:30	1			RS-2	
600.5	26.9	3:45					
		3:00	1	5.0/5.0	4.5/5.0		
		3:45	5.0				
		5:30		100%	90%		
595.5	31.9	5:15	]				STRATA REC = 94% STRATA RQD = 81%
			] j				
			]				
			]				
		_					:
			·				
<b></b>							

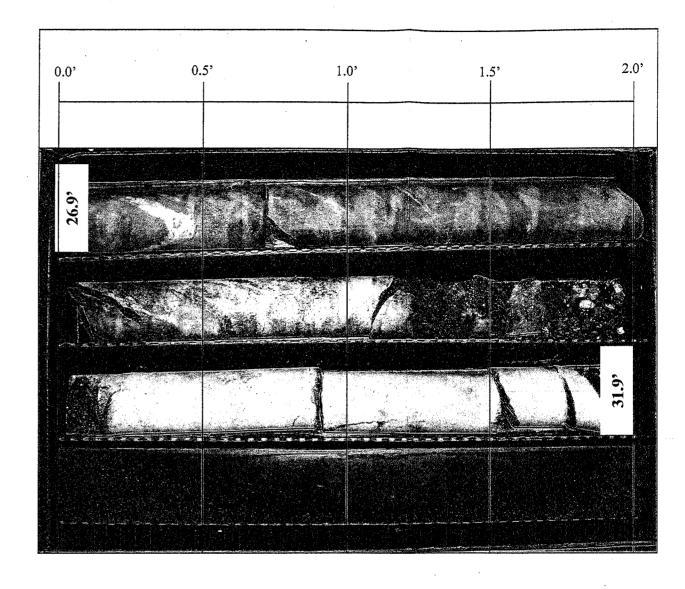
CORING TERMINATED AT 31.9 FT ELEVATION 595.5 FT

DRILLER: F. COX

CORE SIZE: HQ



Boring B2B, Box 1 of 2, 16.9 feet to 26.9 feet.



Boring B2B, Box 2 of 2, 26.9 feet to 31.9 feet.

# **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK



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

# TIERRA GEOTECHNICAL • MATERIALS ENGINEERING

N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

2736 ROWLAND ROAD RALEIGH, NORTH CAROLINA 27615 Phone (919) 871-0800 Fax (919) 871-0803

4			ENGINEER					9) 871-0		`			503	SHEET 1 OF 1
		. 6211					/A1201			OUNTY				GEOLOGIST J. HOWARD
ITE D	ESCRI	PTION	BRID	GE #28	ON SF	R 2416	(ROBIN	ISON RE	).) OVE	RMILE	S CRE	EK		GROUND WATER (ft)
ORIN	G NO.	EB2A		BC	RING	LOCA	TION 2	20+13		OFFS	ET 16'	LT.		ALIGNMENT -L- 0 HR. 12.0
OLLA	R ELE	<b>V.</b> 635.	5 ft	NORT	HING					EAST	ING			24 HR. 9.0
OTAL	DEPT	H 45.9	ft	DRILL	MAC	HINE	D-50		DRILL	METH	IOD	MUD F	ROT	TARY HAMMER TYPE AUTO
ATE S	STARTI	ED 8-2	29-05			COMF	LETED	8-29-05	,					EPTH N/A
	DEPTH	1	OW COI	JNT				PER FOO			SAMP.			
(ft)	(ft)	0.5ft	0.5ft	0.5ft	o o	20	40	60	80	100			0	SOIL AND ROCK DESCRIPTION
				-	<u></u>							/MOI	G	
635.5		3				E	XISTIN	G GROU	ND					635.5
635	- 0.0	3	3	3	. ∳6									RDWY EMB: RED, MED. STIFF, SANDY CLAY
]	_													(A-6)
+	3.5	3	4	4	• •									631.8
+	-	3	4	4		8								ALLUV: BROWN, RED AND ORANGE, MED. STIFF TO SOFT TO STIFF, SANDY SILT (A-4)
630	6.0		<u> </u>		[ . / ]									
1	-	2	1	2	. ∳3 .						SS-6	22%		3 <del>-</del>
]	8.5				. \ .									
1	_	3	4	5	/.	 9								
625-	_ s				· · ]									
+	- 11.9 <sup>°</sup>					 						$\nabla$		623.6
t	_	13	7	2	•	9								L RES: ORANGE, TAN AND BROWN, LOOSE TO DENSE, SILTY SAND (A-2-4)
1	14.0	1	2	2	/.							<u> </u>		0 22102, 01211 0.1115 (1124)
620		'	_	2	• •4									
020	-				•   •									
4	-				'   '			• • • •						8 <u>-</u>
+	18.5	1	2	4										<u>}</u>
+	-		_	"	•6									
615	_													<u> </u>
]														
_	23.5				· ·									
-	-	3	4	6		10								8-
610-	_													<del>_</del>
	-						<u></u>							3
1	28.5					, .	.\							3 <u>-</u> 3
]	_	14	18	27			\.	 45						
605	_						· · · ]	·						
-	-		,											8 8
-	33.5					 <i>.</i> .								-
1	33.5	25	24	21		<i></i>								
600	_							45						3- -
600	36.3	60/0		1						60/0 <b>•</b>				599.2 36
-	-	00/0												CR: BLUE AND PINK, V. SLI. WEATHERED TO FRESH, V. HARD, CLOSE TO WIDELY
-	-													FRACTURED, FELDSPATHIC SCHIST WITH QUARTZ VEINS
-	-					· · · · ·							[المنظم]	4
595-	-													<u></u>
1									, .					
]														4
]	L													
590			<u>L</u>				· · · ·	· · · ·						
-										-			1	CORING TERMINATED AT ELEV. 589.6' IN
-	-													CR: BLUE AND PINK, FELDSPATHIC SCHIST WITH QUARTZ VEINS
1	-													†
	_		1		1.							i	1 -	-

## **CORE BORING REPORT**

DATE: <u>8-30-05</u>

PROJECT: MA12018R

I.D. NO.:

BORING NO: EB2A

GEOLOGIST: <u>J. HOWARD</u>

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

COUNTY: GASTON

COLLAR ELEV.: 635.5 FT

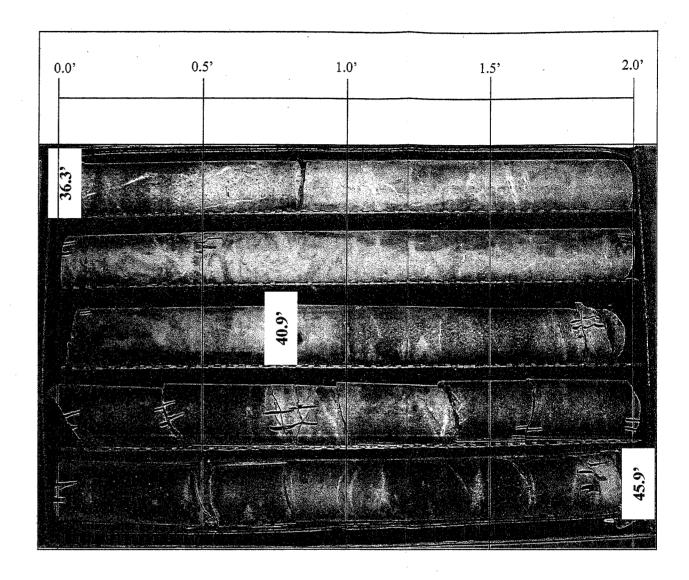
TOTAL DEPTH: 45.9 FT

EI EV	DEPTH	DRILL RATE	RUN	REC FT	RQD		FIFI D CLASSIFICATION AND REMARKS
(FT)	(FT)	MIN/FŢ	(FT)	%	FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
599.2	36.3	8:30	( . ,	,,,,	- 70	. "	36.3-45.9 CR: BLUE AND PINK, V. SLI. WEATHERED TO
000.2	00.0	9:00	1	4.6/4.6	4.6/4.6		FRESH, V. HARD, CLOSE TO WIDELY FRACTURED,
		10:30	4.6	4.0/4.0	4.0/4.0		FELDSPATHIC SCHIST WITH QUARTZ VEINS
			4.6	100%	100%		
504.0	400	9:45	1	100%	100%		
594.6	40.9	7:15/0.6					. ·
594.6	40.9	7:15		<b>50</b> ( <b>50</b>	. ~ . ~		
		6:15		5.0/5.0	4.7/5.0		
		7:00	5.0				
		7:45		100%	94%		
589.6	45.9	5:30					STRATA REC = 100% STRATA RQD = 97%
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CORING TERMINATED AT <u>45.9</u> FT ELEVATION: <u>589.6</u> FT

DRILLER: F. COX

CORE SIZE: HQ



Boring EB2A, Box 1 of 1, 36.3 feet to 45.9 feet.

## **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK



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

# N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

TIERRA

GEOTECHNICAL • MATERIALS
ENGINEERING

2736 ROWLAND ROAD RALEIGH, NORTH CAROLINA 27615 Phone (919) 871-0800 Fax (919) 871-0803

V			ENGINEER	UNG		Pho:	ne (919	9) 871-(	0800	Fax (	919) 8	71-0	803			SHEE	ET 1 OF 1	l .	
PROJE	CT NO.	. 6211	-05-02	8		ID. N	/A12018	3R	CC	типс	' GAS	TON					HOWARD		
SITE D	ESCRI	PTION	BRID	GE #28	ON S	SR 2416	(ROBIN	SON RE	D.) OVE	R MILE	S CRE	EK					GROUND	WATER	(ft)
BORIN	G NO.	EB2B		ВС	ORING	G LOCA	TION 2	80+08		OFFS	ET 41	RT.		ALIG	NMENT -L-		0 HR.	9.	0
OLLA	R ELE	<b>V.</b> 633.	.0 ft	NORT	THING	· ·			:	EAST	ING						24 HR.	8.	5
OTAL	DEPTH	1 25.3	ft	DRILL	L MA	CHINE	D-50		DRILL	. METI	HOD	MUD	ROT	ARY		HAMI	MER TYPE	OTUA	
DATE	STARTE	ED 8-	30-05			COMP	PLETED	8-30-05	5	SURF	ACE V	VATE	R DE	PTH N	/A				
	DEPTH	BL	OW CO					PER FOO		•	SAMP		L		SOIL A	ND ROC	K DESCRIPTIO	N.	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	P	20	40	60	80	100	NO.	МО				15 1100		····	
					-														
633.0						F	XISTING	3 GROU	IND					633.0					(
	0.0	2	5	4		<b></b>								632.8	ROOTMAT	10000	TO MED. DEM	CE CILTY	
-	-					Ĭ		:						-	SAND (A-2-4)	LUUSE	TO MED. DEN	SE, SILIT	
630-	3.5					1								_					
	_	4	5	6		11								_					
	6.0					.\								_					
-	-	3	7	9		16 -													
625-	8.5	4	4	5		./	: • • •				SS-7	46%		625.0	RES: ORANG	E AND	BROWN, STIFF	TO V.	8
. [	_	1	4	3		<b>•</b> 9					33-7	40%		-	STIFF, SAND	Y SILT (	A-4)		
-	-	94				.\								-					
	-					. /							202020 202020 202020	_					
620-	<u>13.5</u>	12	12	8	: :	\								_					
-	-					20	·							-					
-	17.0							· · · · ·						-					
615-		45	55/.3	1						100/.8			5	615.5 614.7	WR: BROWN	SCHIS	<del></del>		17
015-	-											-		- 614.1	CR: BLUE AN	D GRAY	, MOD. SEV.		18
-	-													-	HARD, CLOS	E TO WI	ESH, MED. HAF IDELY FRACTU	RED,	
-	-													-	SCHIST				
610-	-													_					
-	<u>-</u>													-					
-	<u>-</u>		-		<u> </u>					· · · ·	·		11.2	- 607.7	CORING TER	MINATE	D AT ELEV. 60	7 7' IN	2
														_	CR: BLUE AN				
-	-													_					
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#### **CORE BORING REPORT**

DATE: 8-30-05

PROJECT: MA12018R

I.D. NO.:

BORING NO: EB2B

GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK

COUNTY: GASTON

COLLAR ELEV.: 633.0 FT

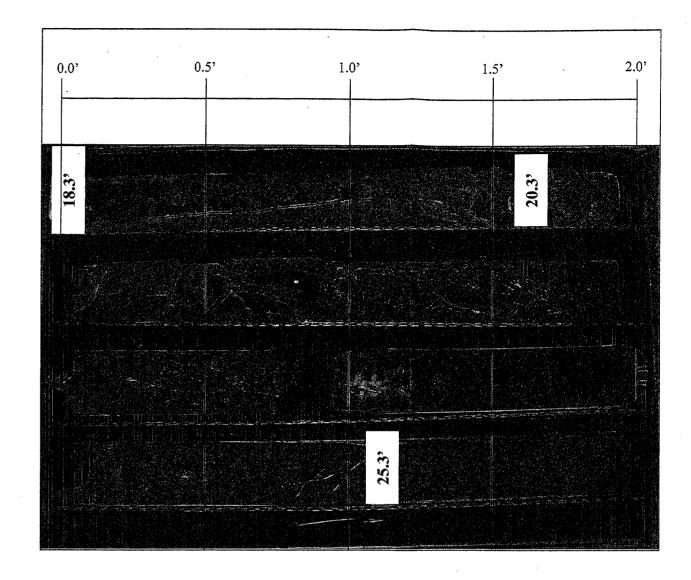
TOTAL DEPTH: 25.3 FT

ELEV/	DEPTH	DRILL	DUM	REC	RQD		FIFE D. OLABOUFICATION AND DEMARKS
(FT)	(FT)	RATE MIN/FŢ	RUN (FT)	FT %	FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
614.7	18.3		(1.1)	/0	70	-#	18.3-25.3 CR: BLUE AND GRAY, MOD. SEV. WEATHERED TO
014.7	10.3	3:15		4.5/0.0	4.460.0	i i	FRESH, MED. HARD TO HARD, CLOSE TO WIDELY
		6:00		1.5/2.0	1.4/2.0		* FRACTURED, SCHIST
			2.0				
		-		75%	70%		·
612.7	20.3						
612.7	20.3	7:00		-			
		5:30	1	4.8/5.0	4.5/5.0		·
		5:00	5.0		,		
		4:30	0.0	96%	90%		•
007.7	05.0		1	3076	3076		STRATA REC = 90% STRATA RQD = 84%
607.7	25.3	3:30					· · · · · · · · · · · · · · · · · · ·
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CORING TERMINATED AT <u>25.3</u> FT ELEVATION <u>607.7</u> FT

DRILLER: F. COX

CORE SIZE: HQ



Boring EB2B, Box 1 of 1, 18.3 feet to 25.3 feet.

# **ROCK CORE PHOTOGRAPHS**

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK



TIERRA, INC. \$2736 ROWLAND RD.
RALEIGH. NC 27615
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# TIERRA, INC.

2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

#### SOIL CLASSIFICATION AND GRADATION SHEET

# BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREEK NCMA PROJECT NO: MA12018R

#### GASTON COUNTY

## TIERRA, INC. PROJECT NO: 6211-05-028

2020732	ING # SHTO Classifi	SAMPLE#	NATURAL	000000000000000000000000000000000000000	OTAL SAME	Brigger (2000)	ATTE	RBERG	LIMIT	
STATION#	OFFSET (FEET)	DEPTH (FEET)	MOISTURE CONTENT	#10	#40	#200	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	
EE	31A	SS-1	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX					ACCUSED COMP		
	A-7-5	•	30.5%	99	95	81	48	33	15	
19+08	14' LT	6.0-7.5								
, EE	31B	\$S-2							T	
	A-4		45.6%	96	84	48	26	21	5	
19+02	14' RT	18.5-20.0								
В	1A	SS-3								
	A-2-4		N/A	100	96	23	NP	NP	NP	
19+38	14' LT	8.5-10.0								
В	2B	SS-4		88	70		38	26	12	
	A-6		23.9%			40				
19+85	30' RT	6.0-7.5								
В	2B	SS-5							1	
	A-6		23.6%	100	94	70	39	28	11	
19+85	30' RT	8.5-10.0								
E	32A	SS-6								
	A-4	T	22.4%	99	95	72	35	25	10	
20+13	16' LT	6.0-7.5				<u> </u>	<u> </u>			
E	EB2B SS-7									
A-4		45.9%	99	95	52	NP	NP	NP		
20+08	41' RT	8.5-10.0	<u> </u>							

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES	Bridge No. 28 on SR 2416 Over Miles Creek	Gaston County, North Carolina	MA 12018 R	TITEDA No. 6244 OF 028
LABORATORY SUMMARY SHEET FO	Bridge No. 28 on SR 2416 O	Gaston County, North	MA 12018 R	

	Remarks	-		di .				
	Max Unconfined Compression (psi)	11093	5895					
	Rate of Stress Increase (Ibs/min)	5000	. 5000					
	Unit Weight (pcf)	167.4	173.3					
	Core Dry Weight (lb)	2.3131	2.3223					
٠	Core Moisture Content (%)		0.33					
	Total Core Weight (lb)	2.3180	2.3300					
	Total Volume (ft)3		0.0134					
	Ω	2.00	1.94					
	Average Length (in)	4.955	4.813					
	Average Diameter (in)	2.478	2.476	٠				
	Depth (ft)	40.0 - 40.8	25.9 - 26.9			·		
	Sample #	RS - 1	RS - 2					
	Boring #	B1A	828			ŧ	·	

#### **ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST**

Job No.:

6211-05-028

Job Name:

Bridge 28 on SR 2416 Over Miles Creek

Gaston County, North Carolina

Project No.

MA 12018 R

Date:

9/9/2005

Sample No.: RS - 1

B1A Boring No.:

Depth (ft): 40.0 - 40.8

Description:

Blue, gray and pink slightly weathered to fresh, hard to very hard, close

to moderately closely fractured schist with quartzite

Length (in.):

4.955

Diameter (in.):

2.478

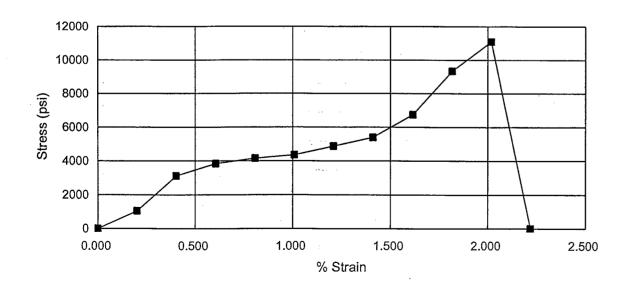
Area (sq. in.):

4.823

Compressive Strength (psi):

11093

Deflection (in.)	Strain (%)	Corrected Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000 0.010 0.020 0.030 0.040 0.050 0.060 0.070 0.080	0.000 0.202 0.404 0.605 0.807 1.009 1.211 1.413 1.615	0 5000 15000 18500 20000 21000 23500 26000 32500	0.0 1036.8 3110.3 3836.0 4147.0 4354.4 4872.8 5391.1 6738.9	513,714 770,571 633,580 513,714 431,520 402,409 381,616 417,392
0.090 0.100 0.110	1.816 2.018 2.220	45000 53500 0	9330.8 11093.3 0.0	513,714 549,674 0



#### **ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST**

Job No.:

6211-05-028

Job Name: Bridge 28 on SR 2416 Over Miles Creek

Gaston County, North Carolina

Project No.

Date:

MA 12018 R 9/9/2005

Sample No.: RS - 2

Boring No.:

B2B

Depth (ft): 25.9 - 26.9

Blue, gray and white moderately weathered to fresh, hard to very hard, close

to moderately closely fractured schist with quartz veins and pyrite

Length (in.):

Description:

4.813

Diameter (in.):

2.476 .

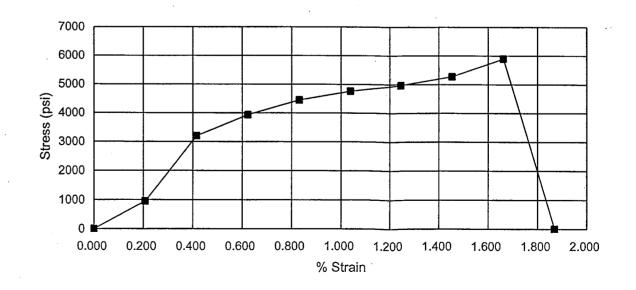
Area (sq. in.):

4.815

Compressive Strength (psi):

5895

Deflection (in.)	Strain (%)	Corrected Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.010	0.208	4580	951.2	457,815
0.020	0.416	15396	3197.5	769,489
0.030	0.623	18924	3930.3	630,545
0.040	0.831	21414	4447.4	535,134
0.050	1.039	22908	4757.7	457,975
0.060	1.247	23904	4964.5	398,239
0.070	1.454	25398	5274.8	362,682
0.080	1.662	28386	5895.4	354,682
0.090	1.870	0	0.0	0



#### GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 6211-05-028 ID: MA12018R COUNTY: GASTON
DESCRIPTION(1): BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREEK
INFORMATION ON EXISTING BRIDGES Information obtained from: field inspection microfilm(Reel: Pos:) x other hydro report
COUNTY BRIDGE NO. 28 BRIDGE LENGTH 90 NO. BENTS IN: CHANNEL 0 FLOOD PLAIN 4
FOUNDATION TYPE:TIMBER DECKING AND TIMBER ABUTMENTS
EVIDENCE OF SCOUR(2):
ABUTMENTS OR END BENT SLOPES: NONE
INTERIOR BENTS: BOTH BENTS SHOW MODERATE SIGNS OF SCOUR
CHANNEL BANKS: DOWNSTREAM HAS LITTLE VEGETATION ON CHANNEL WALLS
EXISTING SCOUR PROTECTION:
TYPE(3): RIPRAP AT UPSTREAM, WING WALLS
EXTENT(4): WING WALLS EXTEND 10 FEET IN ALL DIRECTIONS
EFFECTIVENESS(5): FAIR, MANY PIECES OF RIPRAP ARE NOW IN THE STREAM BEAD
OBSTRUCTIONS(6) (DAMS,DEBRIS,ETC.): NONE
<u>DESIGN INFORMATION</u>
CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): BROWN SAND (A-1-b)
CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): BROWN SILTY SAND (A-2-4)
· · · · · · · · · · · · · · · · · · ·
CHANNEL BANK COVER(9): GRASS
FLOOD PLAIN WIDTH(10): 90 FEET ON EAST SIDE; 100 FEET ON WEST SIDE
FLOOD PLAIN COVER(11): GRASS, SHRUBS AND TREES

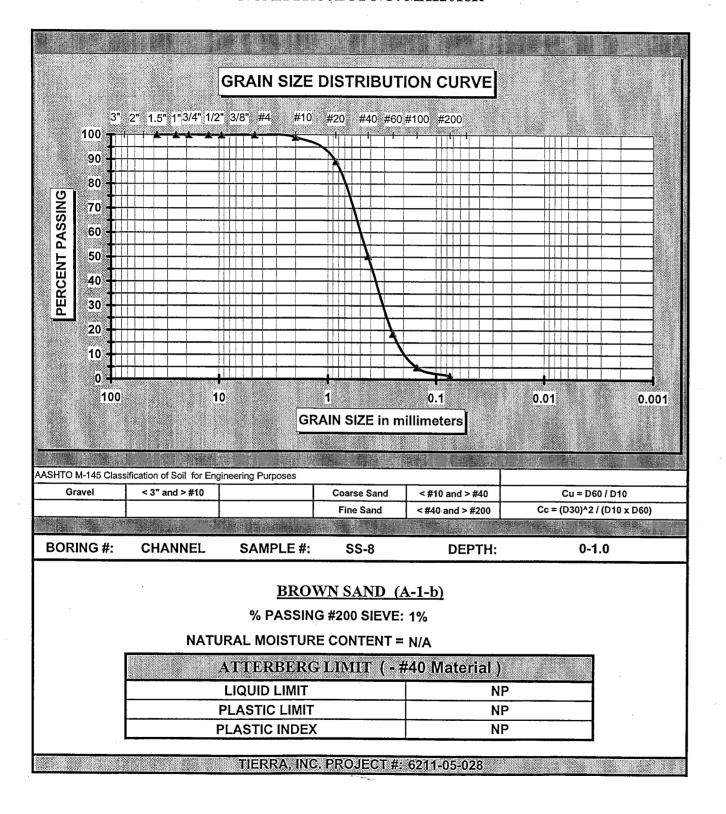
DES	SIGN INFORMATION CONT.		PAGE 2			
STR	EAM ISXDEGRADING AGGRADING (	12)				
)TF	HER OBSERVATIONS AND COMMENTS:	·	· · · · · · · · · · · · · · · · · · ·			
		N. Carlotte				
<b>∩</b> ⊔/	ANNEL MICRATION TENDENCY (12). TOWARD 54.07	_				
	ANNEL MIGRATION TENDENCY (13):	I				
		4				
I	REPORTED BY:	DATE: 9/2/200	<u>5</u>			
	TIERRA, INC					
GE	OTECHNICALLY ADJUSTED SCOUR ELEVATION (14):					
_	w. /					
		- Committee of the comm				
I	REPORTED BY:	DATE:	<u></u>			
	NCDOT GEOTECHNICAL UNIT					
	INSTRUCTIONS					
1)	GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER					
(2)	NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABI	UTMENTS (UNDERMINING,				
·21	SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.)					
(3)	NOTE ANY EXISTING SCOUR PROTECTION (RIP RAP, ETC.)					
(4)	DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.	DE MODIZINO				
(5)	DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO	DE WORKING.	•			
(6) (7)	NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.  DESCRIBE THE CHANNEL BED MATERIAL: A SAMPLE SHOULD BE TAK	CEN EOD ODAIN CIZE DICTDIDITION				
.,	ATTACH LAB RESULTS.	LETT ON GIVAIN SIZE DISTAIDS HON,				
(8)	DESCRIBE THE CHANNEL BANK MATERIAL: A SAMPLE SHOULD BE TA	KEN FOR GRAIN SIZE				
,	DISTRIBUTION, ATTACH LAB RESULTS.	:				
(9)	DESCRIBE THE BANK COVERING (GRASS, TREES, RIP RAP, NONE, ETC	·.				
10)	GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).					
(11)	DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.	C.)				
(12)	CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS D	DEGRADING OR AGGRADING				
(13)	DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE LA	TERALLY DURING THE LIFE OF THE				
	BRIDGE (APPROXIMATELY 100 YEARS).					
(14)	GIVE THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION EXPECTE	ED OVER THE LIFE OF THE BRIDGE				
(APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON						
A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS						
	THEORETICAL SCOUR AND THE GEOTECHNICALLY ADJUSTED SCOUR	ELEVATION. THE GEOTECHNICALLY				
	ADJUSTED SCOUR ELEVEVATION IS BASED ON THE ERODABILITY OF	MATERIALS WITH CONSIDERATION				
	FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY	; CORE RECOVERY PERCENTAGE;				

PERCENTAGE RQD; DIFFERENTIAL WEATHERING, SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

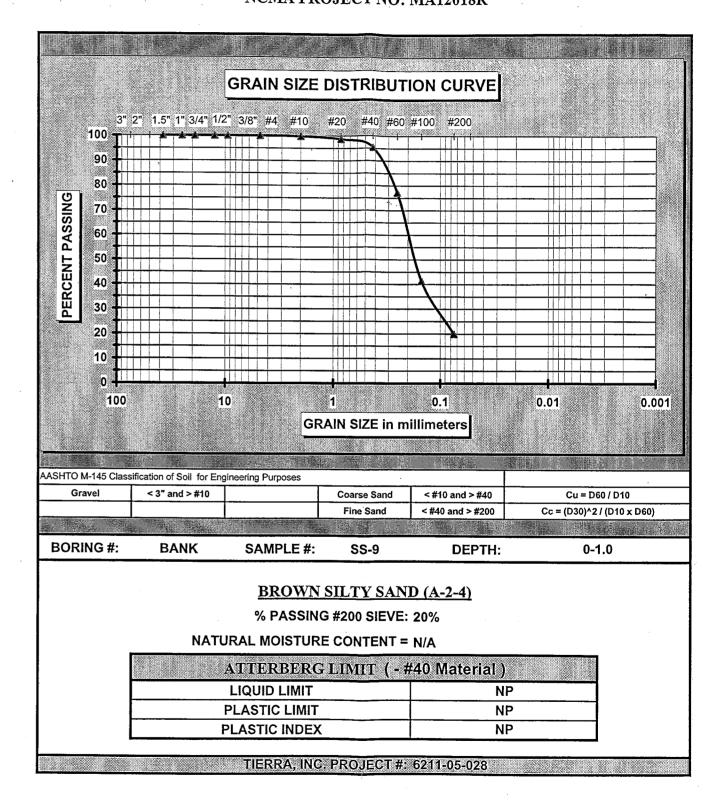
PROJECT #:	6211-05-028	
COUNTY:	GASTON	
DESCRIPTION:	BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREE	K

	CHANNEL BED MATERIAL		CHANNEL BANK MATERIAL			
SAMPLE #	SS-8		:	SS-9		
RETAINED #4	0			. 0		
PASSING #10	99			100		
PASSING #40	50	,	÷	95		
PASSING #200	1			20		
SAND	99			80		
SILT/CLAY	1			20		
LL	NP	_		NP		
PL	NP			NP		
AASHTO	A-1-b			A-2-4		
STATION	19+70		<del></del>	19+68		
OFFSET	CL			CL		
DEPTH	0-1.0			0-1.0		

# BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREEK GASTON COUNTY NCMA PROJECT NO: MA12018R



# BRIDGE #28 ON SR 2416 (ROBINSON ROAD) OVER MILES CREEK GASTON COUNTY NCMA PROJECT NO: MA12018R



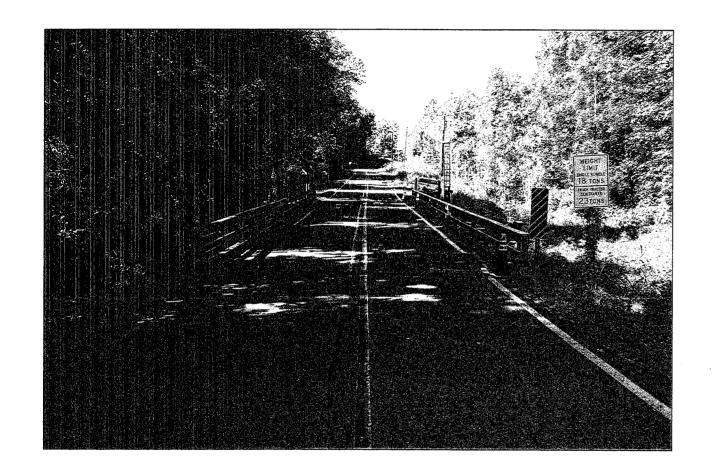


PHOTO 1: CENTERLINE PROFILE (-L-), LOOKING DOWNSTATION

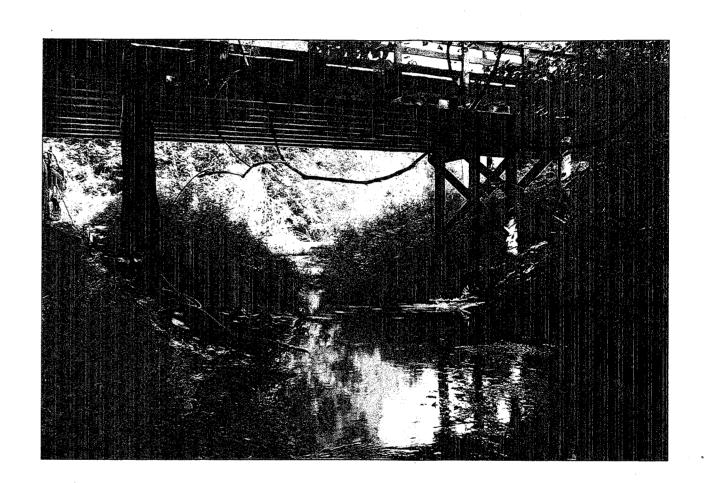


PHOTO 2: MILES CREEK, LOOKING UPSTREAM

## SITE PHOTOS

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK





PHOTO 3: END BENT 1, LOOKING FROM EB1B TO EB1A



PHOTO 4: END BENT 2, LOOKING FROM EB2A TO EB2B

## SITE PHOTOS

NCDOT PROJECT #: MA12018R GASTON CO., NC STRUCTURE #28 ON SR 2416 (ROBINSON RD.) OVER MILES CREEK



TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 FHONE (919) B71-0800 FAX (919) B71-0803