

ID: B-3492
 PROJECT: 33108.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33108.1.1 I.D. NO. B-3492
 F.A. PROJECT BRZ-1763(1)
 COUNTY MCDOWELL
 PROJECT DESCRIPTION BRIDGE #56 OVER
NORTH MUDDY CREEK ON SR 1763
(GILBERT BYRD ROAD)
 SITE DESCRIPTION _____

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3492	1	45
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33108.1.1	BRZ-1763(1)	P.E. CONST.	

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.

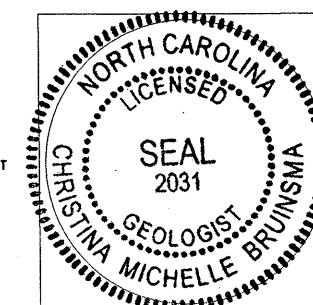
For Letting

INVESTIGATED BY S. HAN PERSONNEL P. ZHANG
 CHECKED BY G. LANG, P.E. C. BRUINSMA
 SUBMITTED BY TIERRA, INC.
 DATE DECEMBER, 2006

DRAWN BY: P. ZHANG

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.



SEAL
 SIGNATURE *[Handwritten Signature]*

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3492	33108.1.1	2	45

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 style="text-align: center;"><i>VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>		<p>WELL GRADED: INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM: INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p>GAP-GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: <u>ANGULAR</u>, <u>SUBANGULAR</u>, <u>SUBROUNDED</u>, OR <u>ROUNDED</u>.</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.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</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>FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED 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>																																																																																															
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December 11, 2006

N.C. Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

Attn: Mr. Njoroge W. Wainaina, P.E.

Ref: Geotechnical Structure Subsurface Investigation Report

State Project No.: 33108.1.1
TIP No.: B-3492
County: McDowell County
Description: Bridge # 56 over North Muddy Creek
on SR 1763 (Gilbert Byrd Road)
Tierra, Inc. Project No.: 6211-06-026

Dear Mr. Wainaina,

As authorized, Tierra, Inc. has completed the geotechnical subsurface investigation for the proposed replacement structure along SR 1763 over North Muddy Creek located in McDowell County, North Carolina. Additionally, a subsurface investigation was performed at a proposed retaining wall structure. The purpose of this report is to present site description and geology to the designer for consideration during design of the planned structures. Field and laboratory test results, site and boring location plans, and profile/cross sections depicting subsurface conditions may be found in the appendix of this report.

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 provide you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,
TIERRA, INC.

Christina M. Bruinsma, L.G.
Project Geologist

Gabriel W. Lang, P.E.
Senior Geotechnical
Engineer/Manager

1.0 PROJECT DESCRIPTION

Based on information obtained from the North Carolina Department of Transportation (NCDOT) Bridge Survey & Hydraulic Design Report dated June 2, 2006, a 3-span, 4-bent structure is proposed to replace the existing 1-span, 2-bent, timber deck bridge on vertical abutments. The proposed structure will be a 150 feet long by 26 feet wide, cored slab bridge. The new structure will be constructed approximately 50 feet downstream on a new alignment. The proposed skew angle for all bents is 42 degrees.

In addition, a proposed retaining wall, approximately 50 feet long, is to be constructed approximately 18' left of -L-. The retaining structure begins at Station 12+00, ends at station 12+50, and is to have a maximum height of 5 feet or less.

2.0 SITE DESCRIPTION AND GEOLOGY

The project site is located along SR 1763 (Gilbert Byrd Road) in a rural area 1.0 miles southeast of Nebo, North Carolina in McDowell County. North Muddy Creek flows generally northeast into the James Lake, approximately 2 miles downstream. The site is located just north of I-40.

Topographically, the site exhibits rolling slopes with a relatively wide floodplain. North Muddy Creek was approximately 45 feet wide and approximately 4 to 6 feet deep during our investigation. The existing floodplain is approximately 400 to 600 feet wide. Floodplain cover consists of brush, grasses, and moderately aged trees.

The project site is located in the Piedmont Physiographic Province of North Carolina. *The Geologic Map of North Carolina* (1985) shows the bridge site to be located within the gneisses of the Inner Piedmont Belt (CZbg). Rocks of this formation are Late Proterozoic to early Paleozoic in age and contain inequigranular biotite gneiss interlayered with schists and amphibolite. The rocks encountered at the site consist of poorly to well foliated gneiss. No outcropping of rock was evident near the bridge site.

3.0 FIELD EVALUATION PROCEDURE

Subsurface conditions were evaluated for the proposed structure by advancing eight soil test borings. Two borings per bent were drilled near proposed bent centerlines in November of 2006. Additionally, one boring was advanced along the centerline of the proposed retaining wall near Station 12+00. Soil test borings were drilled utilizing a trailer-mounted CME 45 drill rig with a manual hammer. Water borings for both interior bents were performed with a trailer mounted CME 45 on a barge. Borings were drilled using a 3-inch tricore with mud rotary methods. Standard penetration tests were performed at regular intervals, in accordance with American Association of State Highway Transportation Officials (AASHTO T-206-03), and North Carolina Department of Transportation (NCDOT) latest Geotechnical Guidelines and Procedures Manual. Rock coring was conducted beneath all interior bent locations and one end bent, and was performed in accordance with (AASHTO T-225-83 (2000)) procedure utilizing a 2.0-inch diameter NQ size core barrel.

In addition to our subsurface investigation, a visual scour evaluation was performed along the channel and banks of North Muddy Creek to determine scour impact for foundation design purposes. The field scour report was electronically submitted on December 1, 2006.

Groundwater was measured within each borehole utilizing a weighted 100-foot 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.

4.0 LABORATORY TESTING

Representative samples collected with a split-barrel sampler were selected from soil test borings to verify visual field classification and determine soil index properties. Twenty-two soil samples and were analyzed in our laboratory for Atterberg limits and grain size with hydrometer analysis. Four alluvial samples were analyzed for grain size determination to assist the NCDOT in theoretical scour elevations. Overall, ten alluvial grain size curves were developed from grain size and hydrometer testing, due to the complex range of alluvial material at the site. Four rock core samples were analyzed in our laboratory for unconfined compression strength and Young's Modulus. 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 (2000) "Laboratory Determination of Moisture Content of Soils"
- ASTM D 1140-97 "Amount of Material in Soils Finer than the #200 Sieve"
- ASTM D 2938-95 "Unconfined Compressive Strength of Intact Rock Core"
- ASTM D 3148-02 "Elastic Moduli of Intact Rock Core in Uniaxial Compression"

5.0 SUBSURFACE AND GROUNDWATER CONDITIONS

5.1 End Bents

Soils beneath End Bent 1 consist of roadway embankment, alluvium deposits and residual soil. Roadway embankment consists of approximately 3 to 5 feet of loose silty sand (A-2-4) and soft to medium stiff sandy silt (A-4). Alluvium deposits consist of approximately 12.5 to 18.0 feet of very loose to loose silty and clayey sand, sand, and gravelly sand (0.5-1.0 inch diameter) (A-2-4, A-2-6, A-3, A-1-a), as well as soft to medium stiff sandy silt (A-4). Alluvium deposits overlie 8 to 8.5 feet of residual loose to very dense silty sand (A-2-4). Residual soils transition to weathered rock at elevations ranging from 1059.9 to 1057.7 feet Mean Sea Level (MSL).

Crystalline rock was encountered at elevations between 1055.4 and 1050.0 feet (MSL), consisting of gneiss.

Strata recovery (REC) for rock cored on EB1A was approximately 80 percent. A majority of the rock is slightly weathered, very hard, and moderately closely fractured. Strata rock quality designation (RQD) at EB1A was 60 percent. Rock encountered at EB1B consisted of weathered rock transitioning to severely weathered moderately hard, very closely fractured gneiss. Only 6 percent of the material cored on EB1B was recovered.

Soils beneath End Bent 2 consist of alluvium deposits and residual soil. Alluvium deposits consist of approximately 14 to 18 feet of very loose to loose silty sand, sand and gravelly sand (up to 1" in diameter) (A-2-4, A-1-b, A-1-a), as well as very soft to soft silty clay and sandy silt (A-7-5, A-4). Alluvium deposits overlie 4 to 10 feet of residual medium dense to very dense silty sand (A-2-4). Residual soils transition to weathered rock at elevations ranging from 1062.6 to 1060.8 feet (MSL).

Borings on EB2 were terminated on crystalline rock (gneiss) between elevations 1056.5 and 1052.8 feet (MSL).

The following table summarizes approximate (MSL) rock elevations across the end bents:

Location	Boring Elevation (ft)	WR Elevation (ft)	CR Elevation (ft)
EB1A	1085.9	1059.9	1055.4
EB1B	1086.7	1057.7	1050.0
EB2A	1084.8	1060.8	1052.8
EB2B	1084.6	1062.6	1056.5

5.2 Interior Bents

Soils beneath both Bent 1 and 2 consist of alluvium deposits and residual material. Alluvium deposits consist of approximately 1.5 to 4.5 feet of very loose to medium dense sand with gravel (typically 0.5 to 1 inch in diameter) (A-3, A-1-a, A-1-b). An approximate 8 to 12-foot residual layer of medium dense to very dense silty sand (A-2-4) underlies alluvium deposits. Residual material directly overlies weathered rock from elevations 1059.5 to 1055.8 feet (MSL).

Crystalline rock exists between elevation 1056.5 to 1050.7 feet (MSL) consisting of poorly to well foliated gneiss with recoveries ranging from 66 to 100 percent. A majority of the rock is moderately severely weathered to fresh, soft to very hard, and very close to moderately closely fractured. Rock quality is between 27 and 90 percent and typically increases with depth. A two foot weathered rock zone was encountered at B1B at 18 feet.

The following table summarizes approximate (MSL) rock elevations across the Interior Bent 1 and 2:

Location	Boring Elevation (ft)	WR Elevation (ft)	CR Elevation (ft)
B1A	1069.8	1055.8	1053.0
B1B	1070.1	1056.1	1054.1
B2A	1072.0	1059.5	1056.5
B2B	1071.7	1058.2	1050.7

5.2 Retaining Wall

Soils beneath the proposed retaining wall at Station 12+00, as seen in RW-1 and EB1A, consist of roadway embankment, alluvium deposits and residual material. Roadway embankment consists of 5 feet of loose silty sand (A-2-4) and soft to medium stiff sandy silt (A-4). Alluvium deposits consist of approximately 12.5 to 16.0 feet of very loose to loose micaceous silty sand, sand, and gravelly sand (0.5-1.0 inch diameter) (A-2-4, A-1-a), as well as soft to medium stiff sandy silt (A-4). Alluvium deposits overlie 8 to 8.5 feet of residual medium dense to very dense silty sand (A-2-4). Residual soils transition to weathered rock at EB1A at an elevation of 1059.9 feet (MSL). Crystalline rock was encountered at EB1A at elevation 1055.4 ft (MSL).

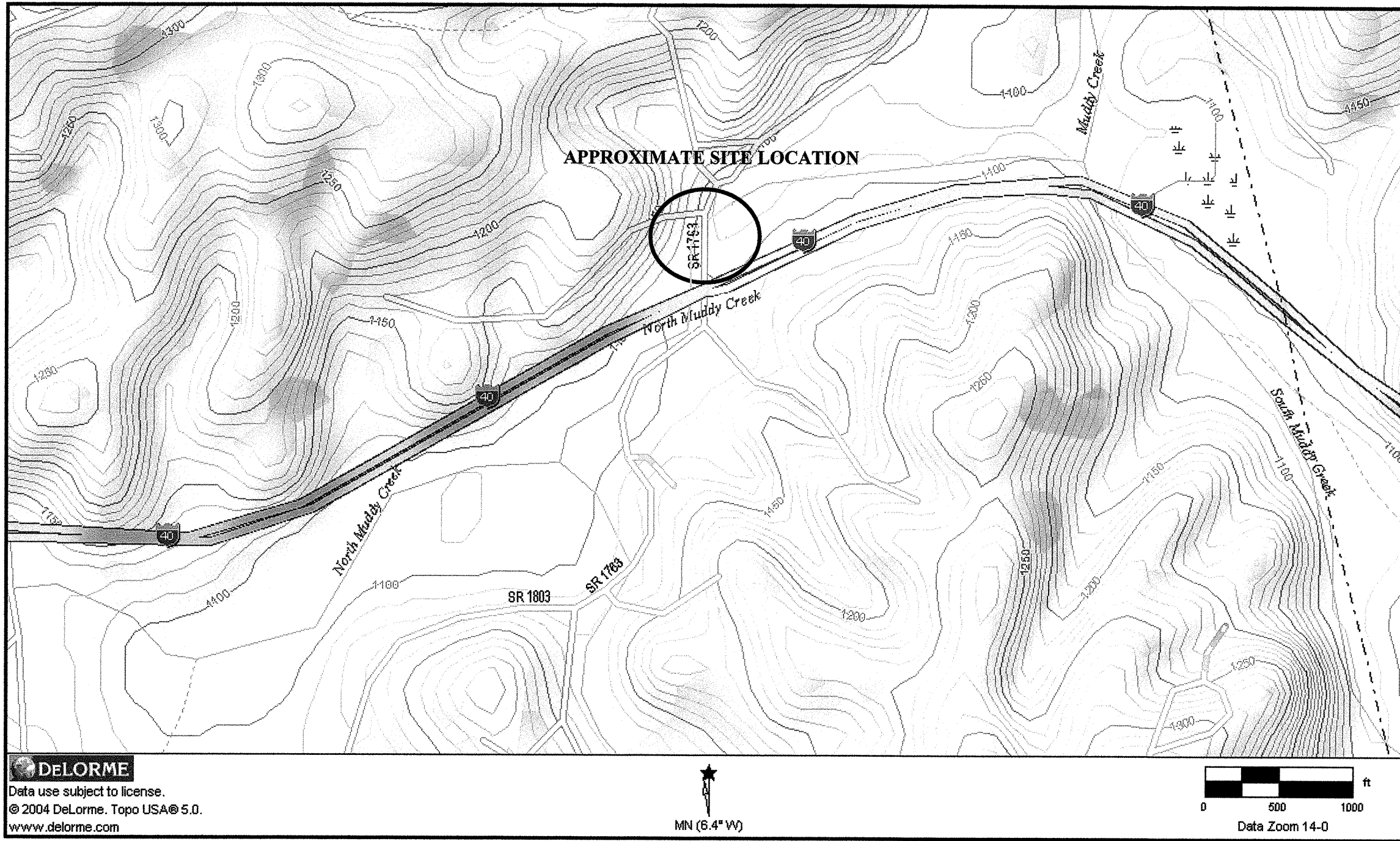
6.0 NOTES TO DESIGNER

Based on our field exploration the following conditions may impact design and construction of the proposed structure. Therefore the designer should be aware of the following subsurface conditions:

- Rip Rap up to 4' in diameter have been placed on the surface of the bank at existing End Bent 1. These boulders may cause difficulty during the construction of the new End Bent 1.
- Weathered rock was encountered across the site at elevations ranging from 1062.6 to 1055.8 feet (MSL).
- Crystalline rock was encountered across the site at elevations ranging from 1056.5 to 1050.0 feet (MSL).
- Static groundwater was measured approximately 7 to 12 feet below existing ground surface across the site, at elevations ranging from approximately 1078.4 to 1074.8 feet (MSL).

7.0 CLOSURE

Notes to the designer and evaluations provided by Tierra, Inc. are based on the Hydraulic Design Report dated June 2, 2006, provided by NCDOT. Modifications to our report may be required if there are changes to the design or location of the proposed structure. Notes to the designer 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

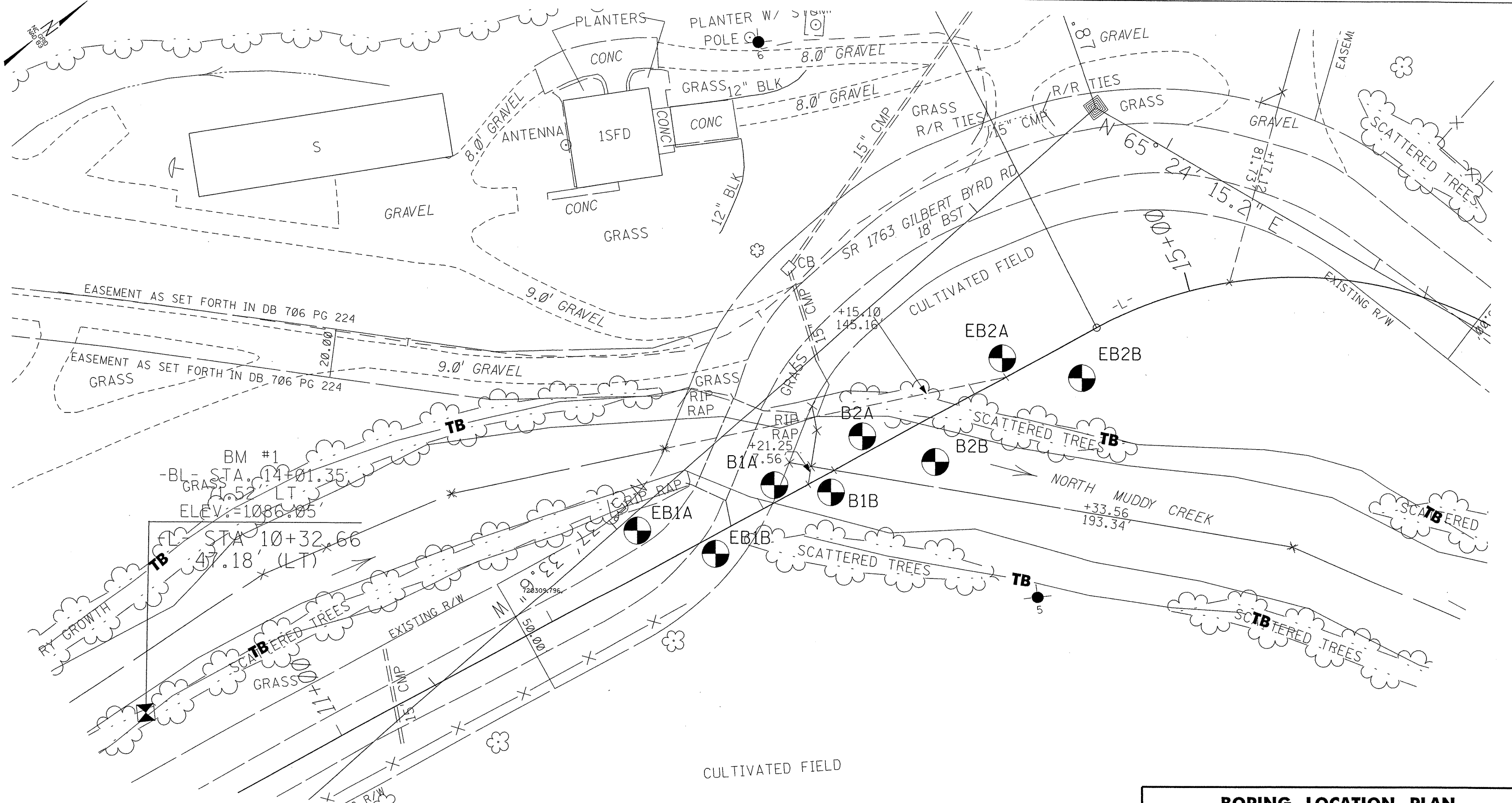


SITE VICINITY MAP

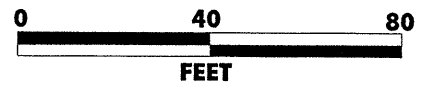
**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



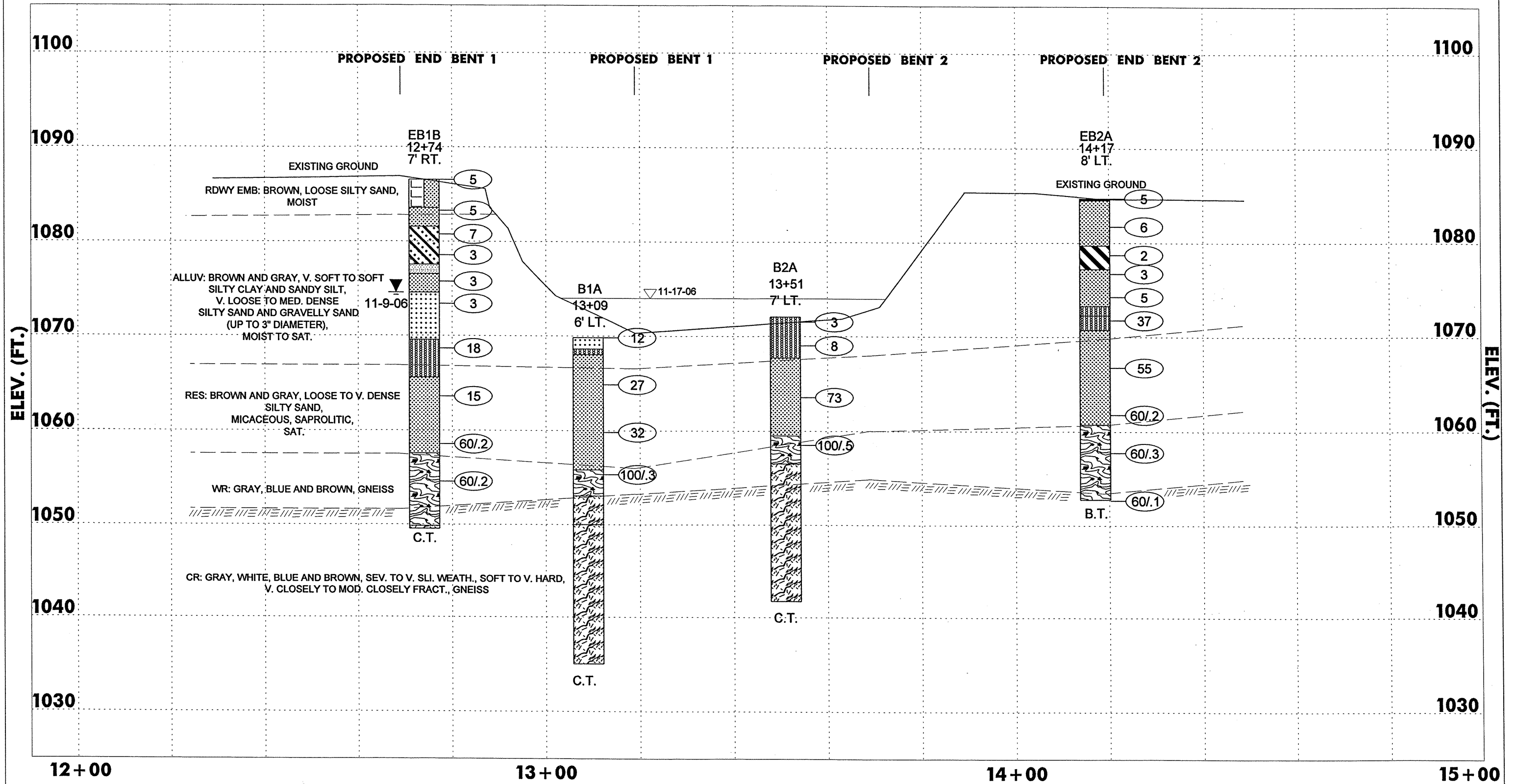
TIERRA, INC.
 2736 ROWLAND RD.
 RALEIGH, NC 27615
 PHONE (919) 871-0800
 FAX (919) 871-0803



NOTES:
BENCH MARK: RR SPIKE BASE OF 22" WHITE OAK, STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED JUNE, 2006
PROPOSED BRIDGE SKEW: 42°

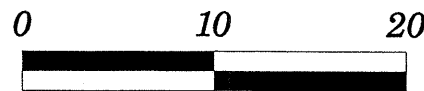


BORING LOCATION PLAN	
BRIDGE #56 OVER NORTH MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD) MCDOWELL COUNTY, NORTH CAROLINA TIP NO: B-3492, STATE PROJECT NO: 33108.1.1	
	TIERRA GEOTECHNICAL • MATERIALS ENGINEERING TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803

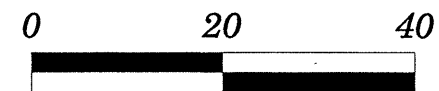


BENCH MARK: R/R SPIKE BASE OF 22" WHITE OAK, STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'

VERTICAL SCALE



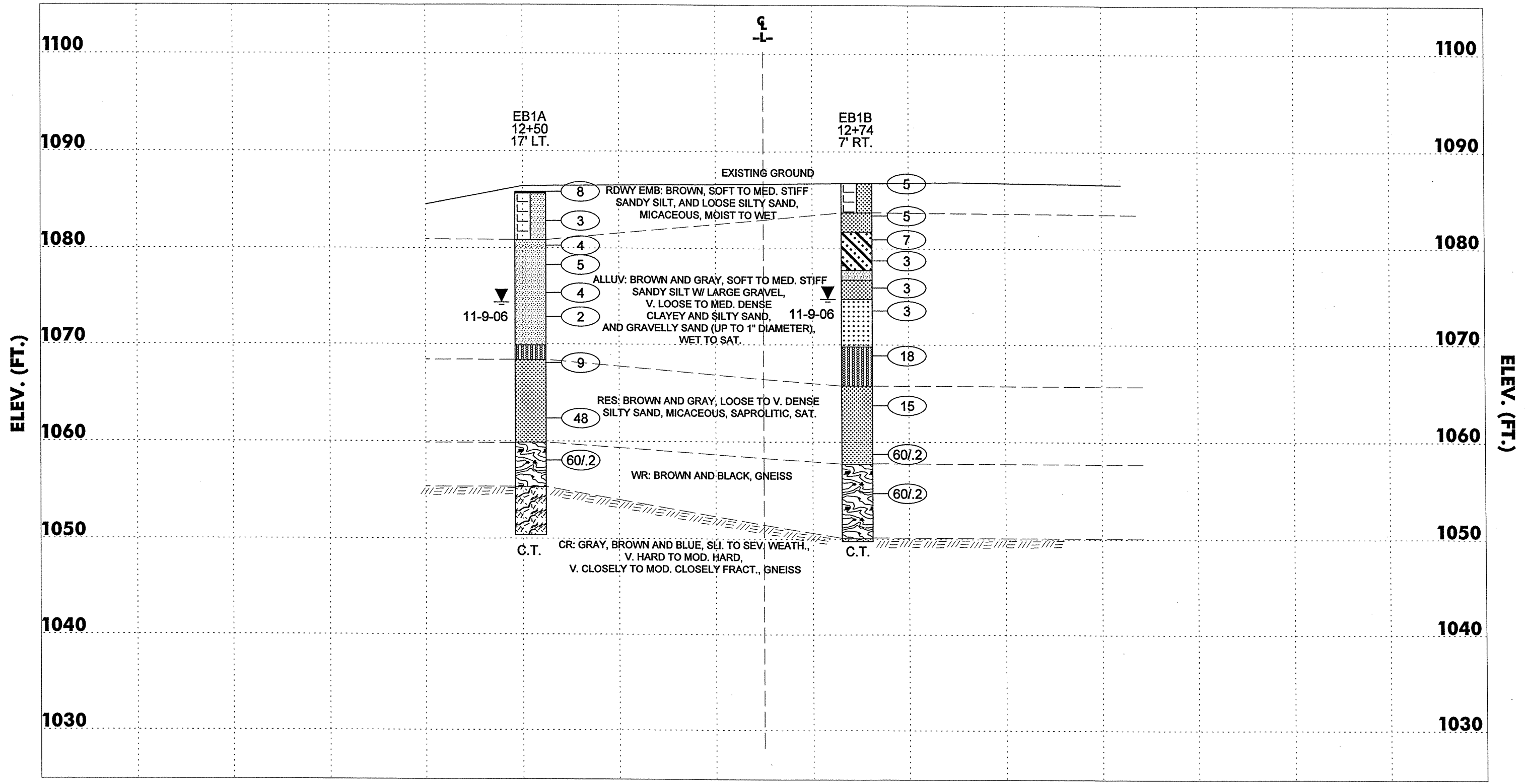
HORIZONTAL SCALE



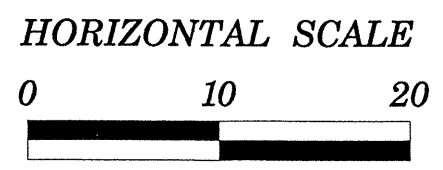
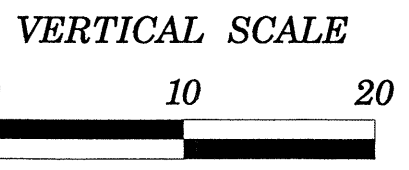
PROFILE ALONG $\frac{1}{2}$ OF -L-

BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33 108.1.1





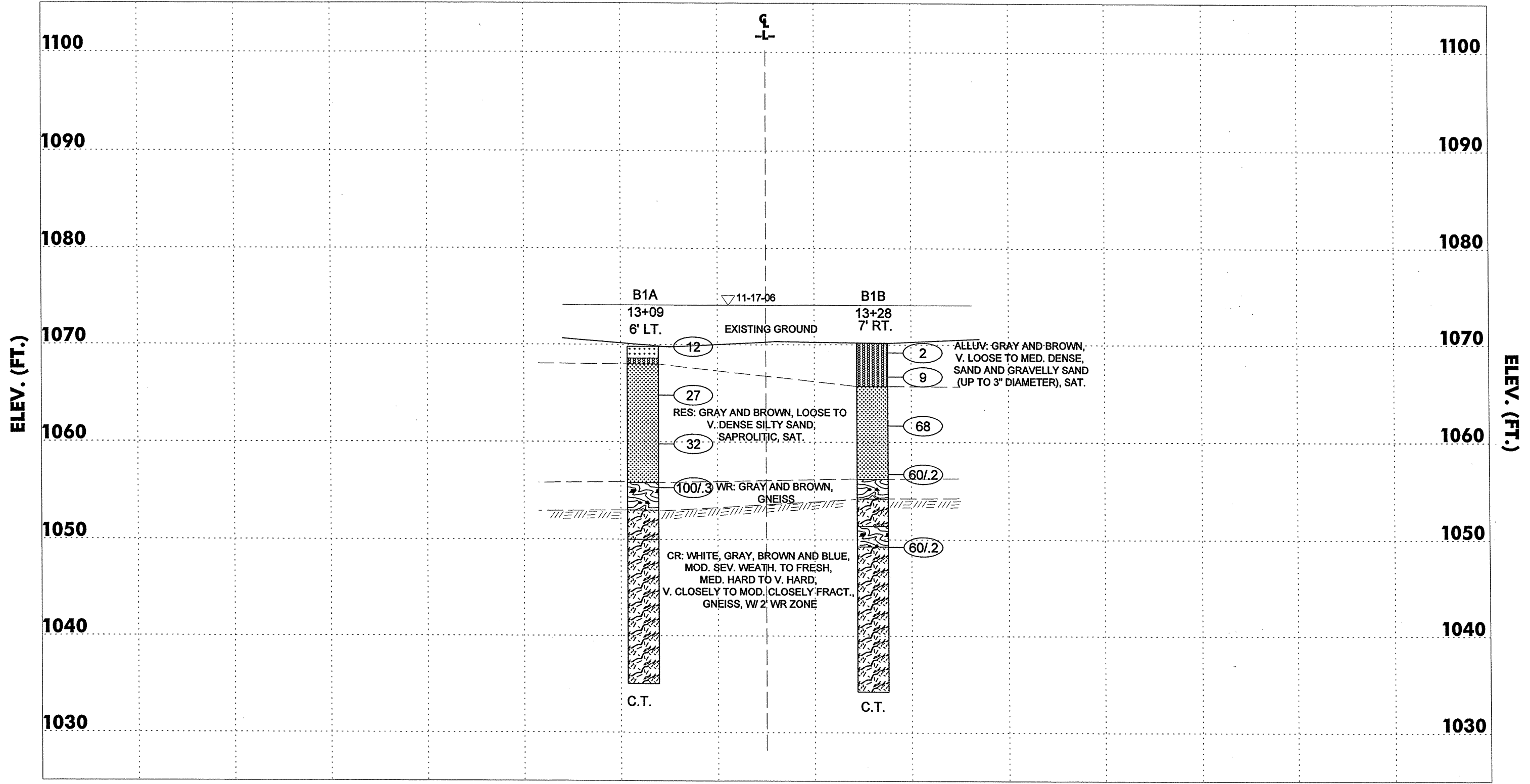
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 STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'



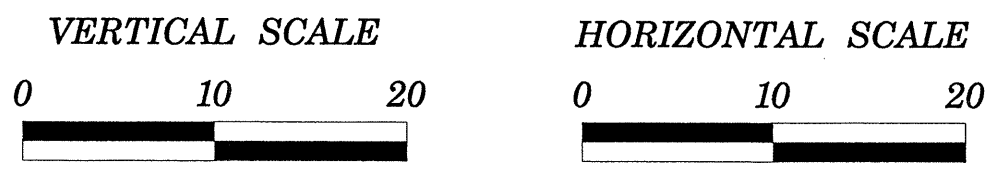
CROSS SECTION END BENT 1

BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33 108, I.1

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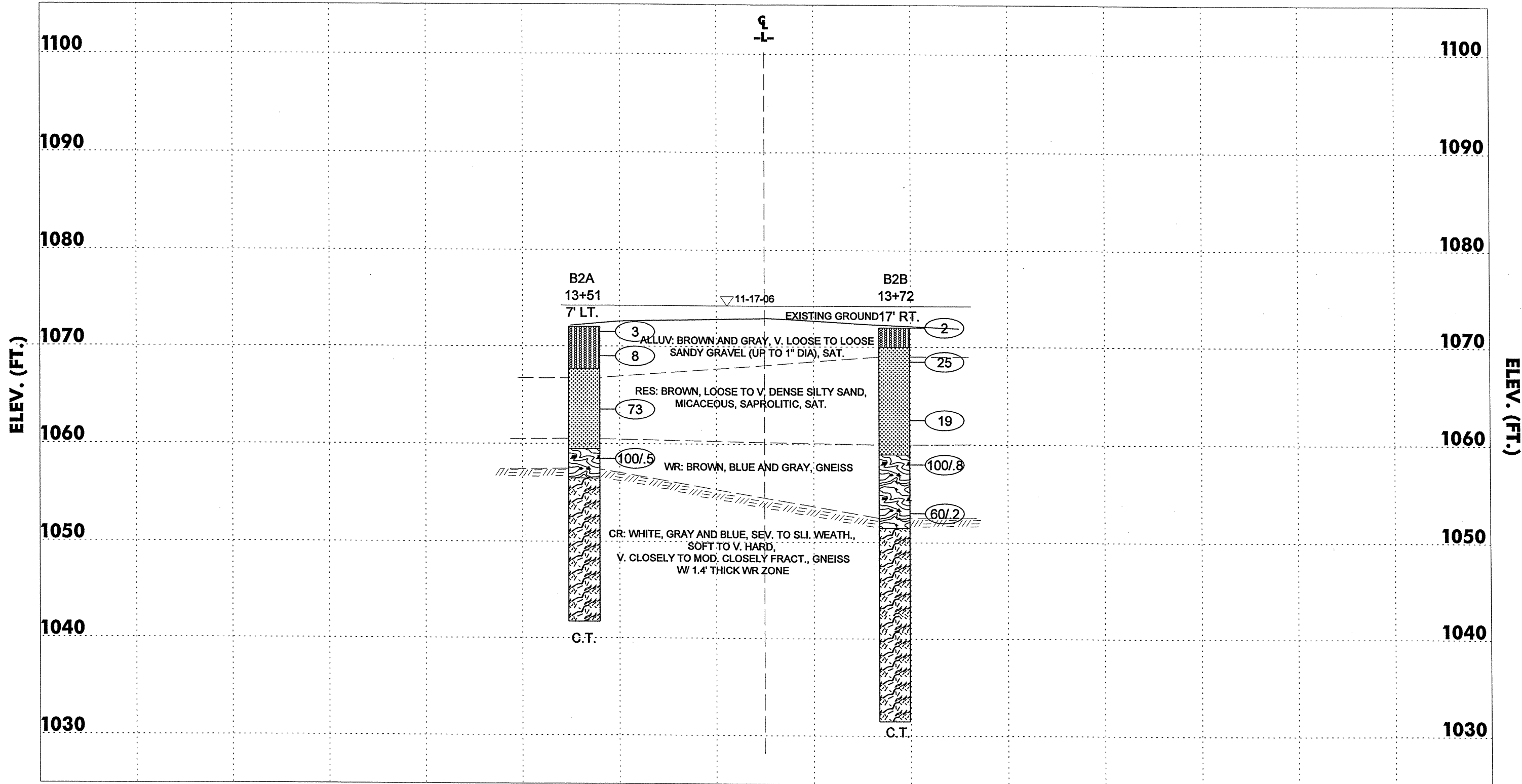
BENCH MARK: R/R SPIKE BASE OF 22" WHITE OAK,
 STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'



CROSS SECTION BENT 1

BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
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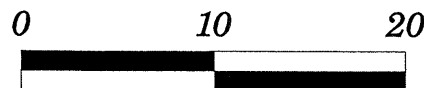


ELEV. (FT.)

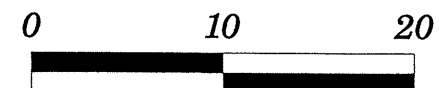
ELEV. (FT.)

BENCH MARK: R/R SPIKE BASE OF 22" WHITE OAK,
STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'

VERTICAL SCALE



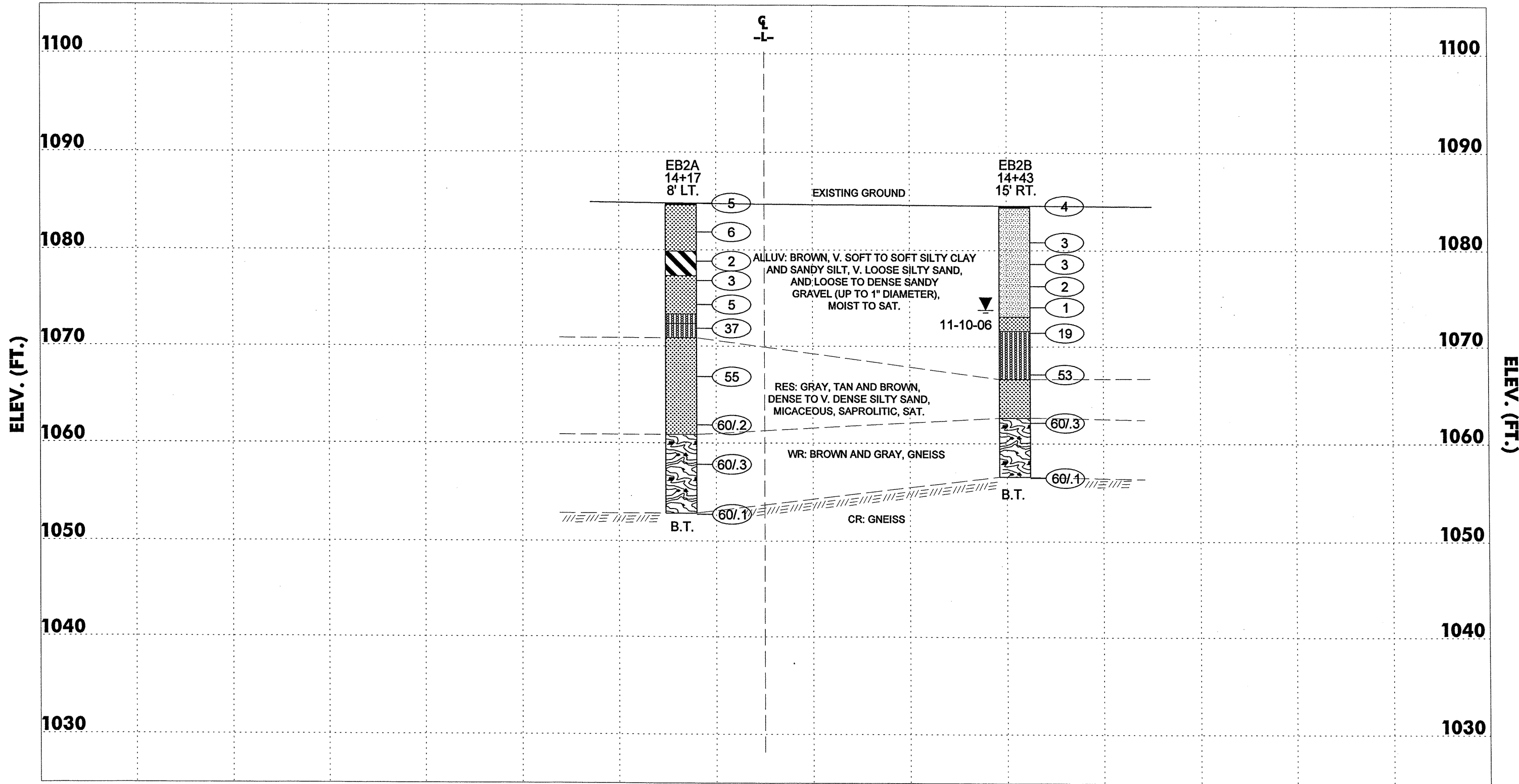
HORIZONTAL SCALE



CROSS SECTION BENT 2

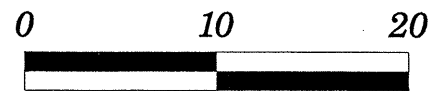
BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33 108.1.1



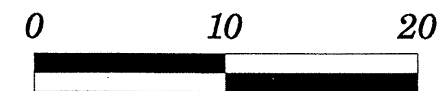


BENCH MARK: R/R SPIKE BASE OF 22" WHITE OAK, STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'

VERTICAL SCALE



HORIZONTAL SCALE



CROSS SECTION END BENT 2

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33 108.1.1



PROJECT NO. 33108.1.1				ID. B-3492	COUNTY MCDOWELL	GEOLOGIST S. HAN							
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK							GROUND WATER (ft)						
BORING NO. EB1A	BORING LOCATION 12+50		OFFSET 17' LT	ALIGNMENT -L-	0 HR.	4.5							
COLLAR ELEV. 1085.9 ft	NORTHING 720,357.1		EASTING 1,146,756.3		24 HR.	11.5							
TOTAL DEPTH 35.5 ft	DRILL MACHINE CME 45	DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL									
DATE STARTED 11-8-06		COMPLETED 11-9-06		SURFACE WATER DEPTH N/A									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100			
1085.9	0.0	2	4	4	EXISTING GROUND								
1085.7	0.2	SS-1 20.0%										ROOTMAT	
1085.5	0.4												RWDY EMB: BROWN, MED. STIFF TO SOFT, SANDY SILT (A-4), MICACEOUS
1080.9	5.0												
1080.9	5.0												
1080.4	5.6												ALLUV: BROWN, SOFT TO MED. STIFF TO SOFT, SANDY SILT (A-4) WITH LARGE GRAVEL (0.5"-1" DIA) AND MICA
1076.5	9.4												SS-2 26.5%
1075.0	10.5												
1075.0	10.5												
1075.0	10.5												
1070.0	13.0												SAT
1070.0	13.0												
1070.0	13.0												
1068.4	17.8												SS-3 SAT
1068.4	17.8												
1068.4	17.8												
1066.9	19.3												
1066.9	19.3												
1066.9	19.3												
1060.0	27.8												SAT
1060.0	27.8												
1060.0	27.8												
1060.0	27.8												
1059.9	28.1												WR: BROWN AND BLACK, GNEISS
1055.4	30.5												CR: GRAY AND BLUE, SLI. WEATHER., V. HARD, V. CLOSELY TO MOD. CLOSE. FRACT., GNEISS
1050.4	35.5												CORING TERMINATED AT ELEV. 1050.4' IN CR: GNEISS
												MUD DENSITY=64.0	
												AUGER REFUSAL AT ELEV. 1055.4'	

CORE BORING REPORT

DATE: 11/9/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: EB1A GEOLOGIST: S. HAN

DESCRIPTION: BRIDGE NO. 56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

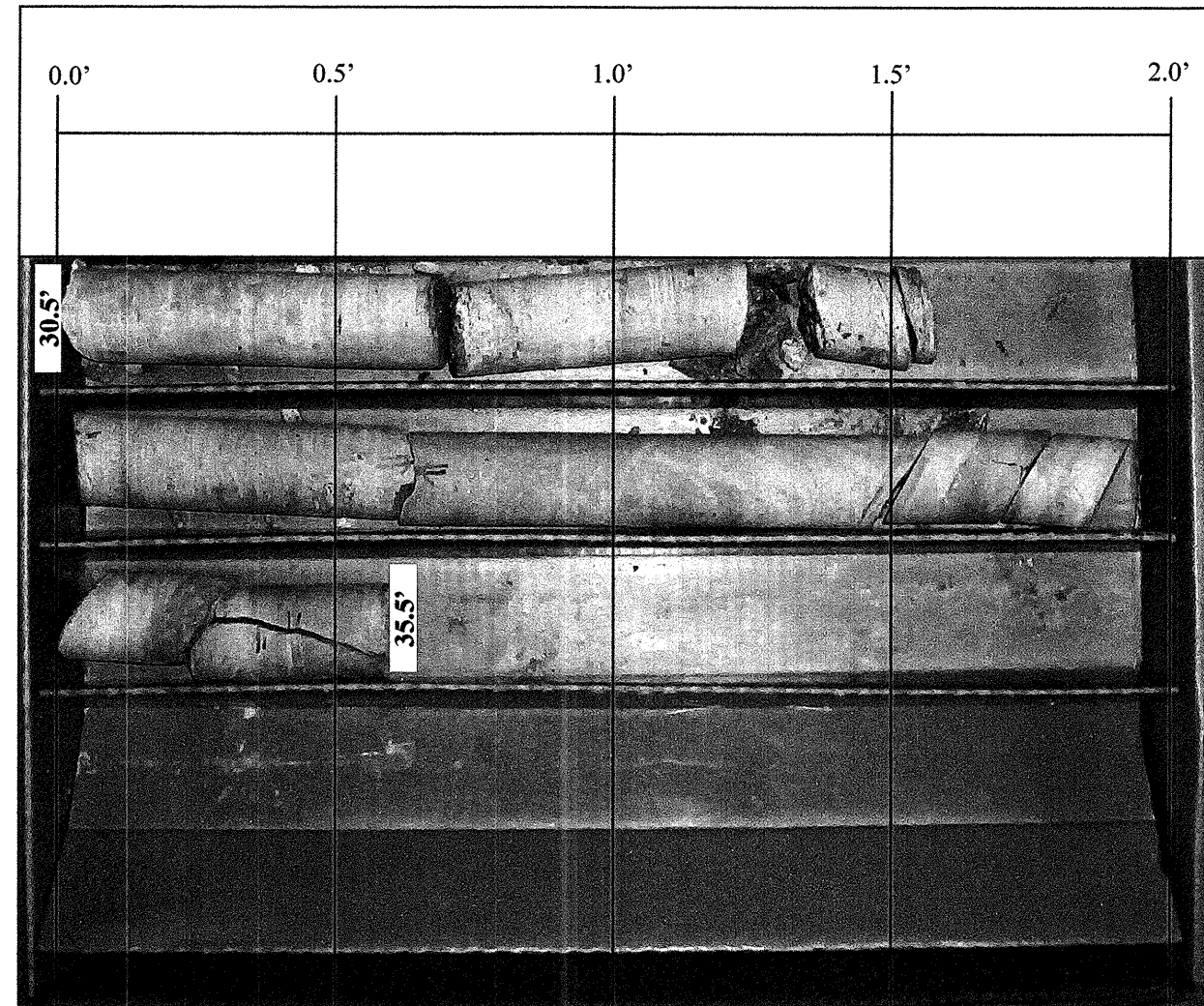
COUNTY: MCDOWELL COLLAR ELEV.: 1085.9 ft TOTAL DEPTH: 35.5 ft

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1055.4	30.5	0:30					30.5-35.5 CR: GRAY AND BLUE, SLI. WEATHER., V. HARD, V. CLOSELY TO MOD. CLOSE. FRACT., GNEISS
		5:30		4.0/5.0	3.0/5.0		
		5:27	5.0				
		4:12		80%	60%		
1050.4	35.5	4:16					STRATA REC=80.0% STRATA RQD=60.0%

CORING TERMINATED AT 35.5 ft
ELEVATION 1050.4 ft

DRILLER: P. BRIDGER CORE SIZE: NQ EQUIPMENT: CME 45

NCDOT_BORE 05-026.GPJ NCDOT.GDT 12/11/06



Boring EB1A, Box 1 of 1, 30.5 feet to 35.5 feet.

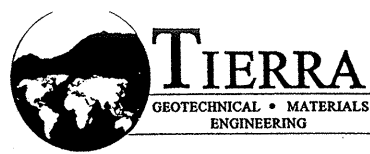
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN						
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)						
BORING NO. EB1B		BORING LOCATION 12+74		OFFSET 7' RT		ALIGNMENT -L-						
COLLAR ELEV. 1086.7 ft		NORTHING 720,378.0		EASTING 1,146,782.8		0 HR. 4.9						
TOTAL DEPTH 37.0 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL						
DATE STARTED 11-8-06		COMPLETED 11-8-06		SURFACE WATER DEPTH N/A								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
1086.7	0.0	3	2	3	EXISTING GROUND						M	RDWY EMB: BROWN, LOOSE, SILTY SAND (A-2-4)
1085	3.3	4	3	2							W	ALLUV: BROWN, LOOSE, SILTY SAND (A-2-4) WITH GRAVEL
1080	5.8	3	3	4							SS-4	ALLUV: BROWN, LOOSE, GRAVELLY CLAYEY SAND (A-2-6), (<0.5" DIA)
1075	8.0	1	1	2							SS-5	29.6%
1070	10.8	2	2	1							SAT	ALLUV: DARK GRAY, SOFT, SANDY SILT (A-4) WITH GRAVEL
1065	13.2	3	2	1							SAT	ALLUV: BROWN AND GRAY, V. LOOSE, SILTY SAND (A-2-4) WITH GRAVEL
1060	17.9	10	9	9							SAT	ALLUV: GRAY AND BROWN, V. LOOSE, GRAVELLY SAND (A-3), (0.5" DIA)
1055	23.0	9	8	7							SAT	ALLUV: BROWN AND GRAY, MED. DENSE, GRAVELLY SAND (A-1-a), (<0.5" DIA)
1050	28.0	11	14	60/2							SAT	RES: BROWN AND GRAY, MED. DENSE TO V. DENSE, SILTY SAND (A-2-4), SAPROLITIC
	32.0	60/2										WR: BROWN, GNEISS
	37.0	60/0.0										CR: GRAY AND BROWN, SEV. WEATHER., MOD. HARD, V. CLOSE. FRACT., GNEISS CORING TERMINATED AT ELEV. 1049.7' IN CR: GNEISS

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06

CORE BORING REPORT

DATE: 11/8/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: EB1B GEOLOGIST: S. HAN

DESCRIPTION: BRIDGE NO.56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

COUNTY: MCDOWELL COLLAR ELEV.: 1086.7 ft TOTAL DEPTH: 37.0 ft

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1054.7	32.0	0:38	5.0	0.3/5.0	0.0/5.0		32.0-36.7 WR: BROWN, GNEISS
		0:44					STRATA REC: 0% STRATA RQD: N/A
		1:22					
		1:26					
1049.7	37.0	2:40					36.7-37.0 CR: GRAY AND BROWN, SEV. WEATHER., MOD. HARD, V. CLOSE. FRACT., GNEISS
							STRATA REC: 100% STRATA RQD: 0%

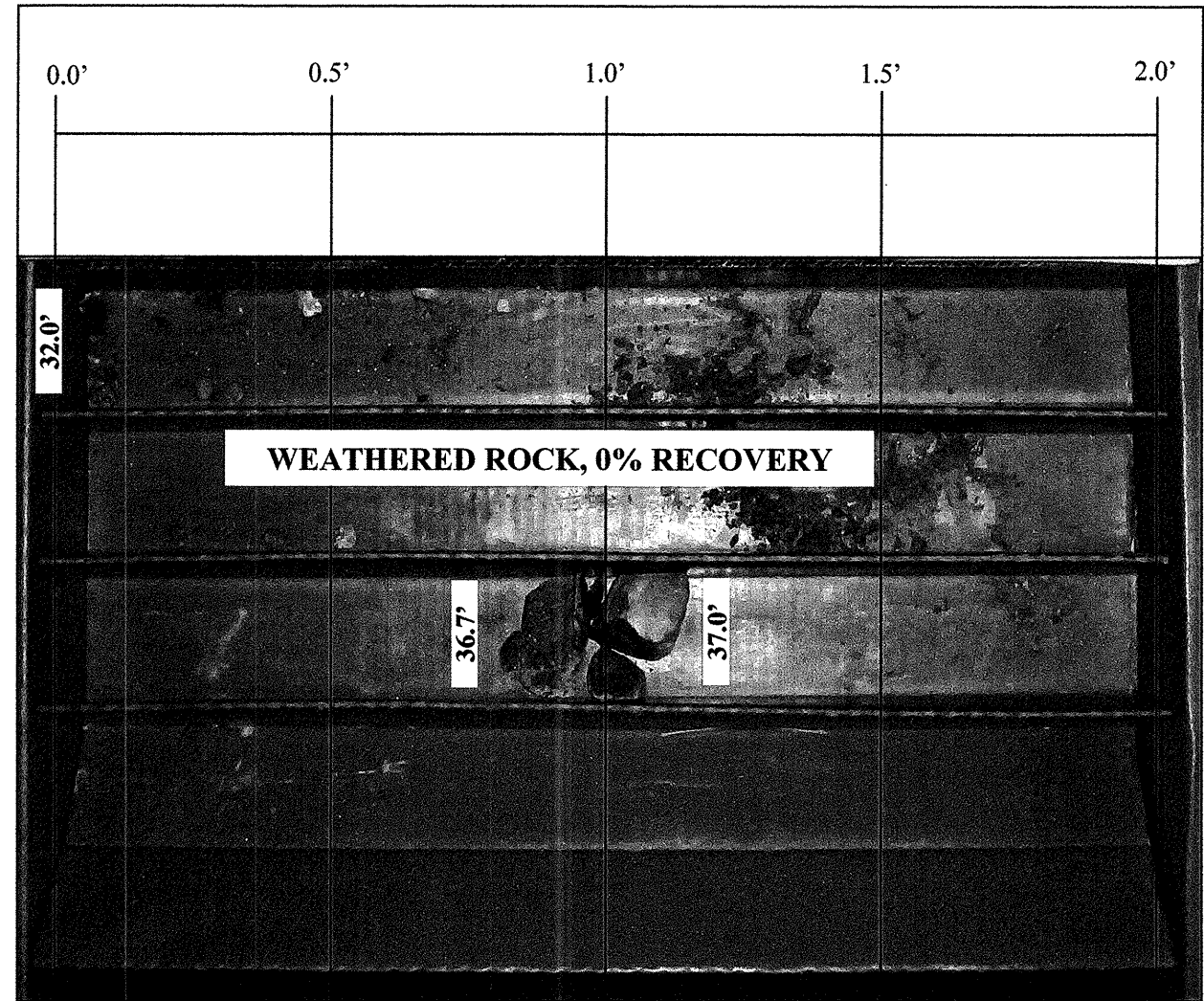
CORING TERMINATED AT 37.0 ft
ELEVATION 1049.7 ft

DRILLER: P. BRIDGER

CORE SIZE: NQ

EQUIPMENT: CME 45

MUD DENSITY=73.7
AUGER REFUSAL AT ELEV. 1054.7'
NOTE: OFFSET 5 FT ALONG BENT LINE DUE TO BIG TREE



Boring EB1B, Box 1 of 1, 32.0 feet to 37.0 feet.

SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN								
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)								
BORING NO. B1A		BORING LOCATION 13+09		OFFSET 6' LT		ALIGNMENT -L-								
COLLAR ELEV. 1069.8 ft		NORTHING 720,414.5		EASTING 1,146,773.9		0 HR. -								
TOTAL DEPTH 34.8 ft		DRILL MACHINE CME 45C		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL								
DATE STARTED 11-16-06		COMPLETED 11-16-06		SURFACE WATER DEPTH 5.0'										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100	
1069.8					EXISTING GROUND									
	0.0	14	5	7								1069.8	0.0	
												1068.6	1.2	ALLUV: GRAY AND BROWN, MED. DENSE, GRAVELLY SAND (A-3), (0.5" DIA)
												1068.0	1.8	ALLUV: GRAVEL LAYER (A-1-a), (1"-3" DIA) RES: GRAY AND BROWN, MED. DENSE, SILTY SAND (A-2-4), SAPROLITIC
1065	5.0	16	13	14										
1060	10.0	10	16	16										
1055	14.5	100/3										1055.8	14.0	WR: GRAY AND BROWN, GNEISS
												1053.0	16.8	CR: BROWN AND GRAY, MOD. TO MOD. SEV. WEATHERED, HARD TO SOFT, CLOSE. TO V. CLOSELY FRACTURED, GNEISS
1050												1050.0	19.8	CR: BLUE AND WHITE, SLI. TO MOD. WEATHERED HARD TO MED. HARD, V. CLOSELY TO MOD. CLOSELY FRACTURED, GNEISS
1045														
1040														
1035												1035.0	34.8	CORING TERMINATED AT ELEV. 1035' IN CR: GNEISS MUD DENSITY=64.1 AUGER REFUSAL AT ELEV. 1053'

CORE BORING REPORT

DATE: 11/16/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: B1A GEOLOGIST: S. HAN

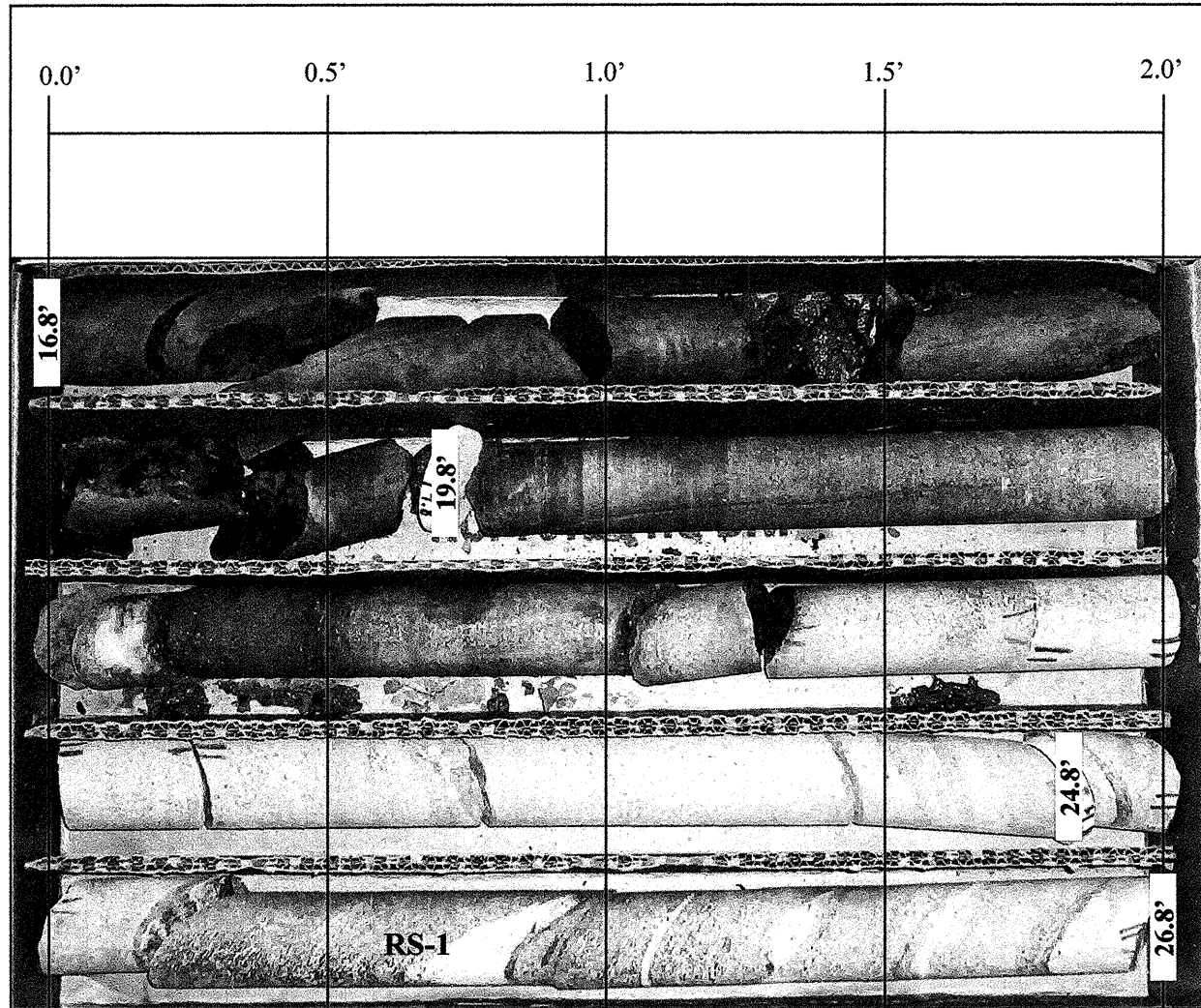
DESCRIPTION: BRIDGE NO.56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

COUNTY: MCDOWELL COLLAR ELEV.: 1069.8 ft TOTAL DEPTH: 34.8 ft

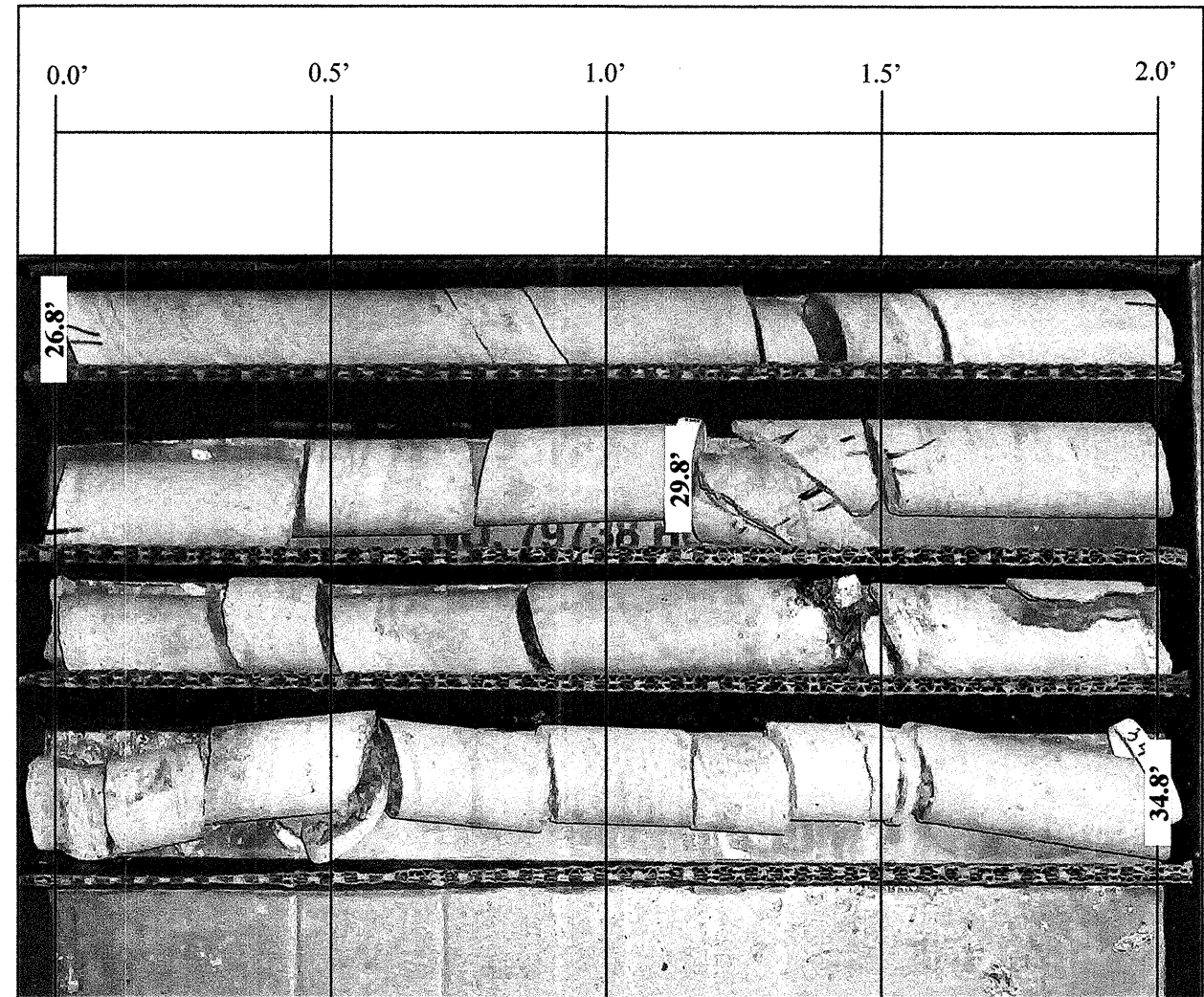
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1053.0	16.8	2:20					16.8-19.8 CR: BROWN AND GRAY, MOD. TO MOD. SEV. WEATHERED, HARD TO SOFT, CLOSE. TO V. CLOSE. FRACT., GNEISS
		3:01		2.8/3.0	0.8/3.0		
		10:07	3.0	93%	27%		
1050.0	19.8						STRATA REC: 93% STRATA RQD: 27%
1050.0	19.8	3:10					19.8-34.8 CR: BLUE AND WHITE, SLI. TO MOD. WEATHER., HARD TO MED. HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
		3:38		4.9/5.0	4.5/5.0		
		4:36	5.0	98%	90%		
		5:20					
1045.0	24.8	3:40					
1045.0	24.8	3:16				RS-1	
		4:38		5.0/5.0	4.2/5.0		
		3:51	5.0	100%	84%		
		3:21					
1040.0	29.8	3:40					
1040.0	29.8	3:42					
		4:00		4.8/5.0	2.5/5.0		
		3:00	5.0	96%	50.1%		
		4:16					
1035.0	34.8	5:10					STRATA REC: 98% STRATA RQD: 75%

CORING TERMINATED AT 34.8 ft
 ELEVATION 1035.0 ft

DRILLER: P. BRIDGER CORE SIZE: NQ EQUIPMENT: CME 45



Boring B1A, Box 1 of 2, 16.8 feet to 26.8 feet.



Boring B1A, Box 2 of 2, 26.8 feet to 34.8 feet.

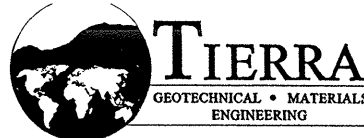
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN							
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)							
BORING NO. B1B		BORING LOCATION 13+28		OFFSET 7' RT		ALIGNMENT -L-							
COLLAR ELEV. 1070.1 ft		NORTHING 720,431.9		EASTING 1,146,790.1		0 HR. -							
TOTAL DEPTH 36.0 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL							
DATE STARTED 11-16-06		COMPLETED 11-17-06		SURFACE WATER DEPTH 3.8									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1070.1													EXISTING GROUND
	1.0	1	1	1							SAT		ALLUV: GRAY AND BROWN, V. LOOSE, SAND (A-1-b)
	3.5	7	5	4							SS-8 SAT		RES: GRAY AND BROWN, LOOSE TO V. DENSE, SILTY SAND (A-2-4), SAPROLITIC
1065	8.5	18	40	28							SAT		
1060	13.5	15	60/2										
1055	21.0	60/2									RS-2		WR: GRAY AND BROWN, GNEISS
													CR: WHITE, GRAY AND BROWN, MOD. TO MOD. SEV. WEATHERED, HARD TO MOD. HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
1050													WR: GRAY AND BROWN, GNEISS
													CR: WHITE AND BLUE, FRESH TO V. SLI. WEATHERED, V. HARD TO HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
1045													
1040													
1035													
													1034.1 CORING TERMINATED AT ELEV. 1034.1' IN CR: GNEISS
													MUD DENSITY=63.7
													AUGER REFUSAL AT 1054.1'
													NOTE: OFFSET

CORE BORING REPORT

DATE: 11/17/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: B1B GEOLOGIST: S. HAN

DESCRIPTION: BRIDGE NO.56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

COUNTY: MCDOWELL COLLAR ELEV.: 1070.1 ft TOTAL DEPTH: 36.0 ft

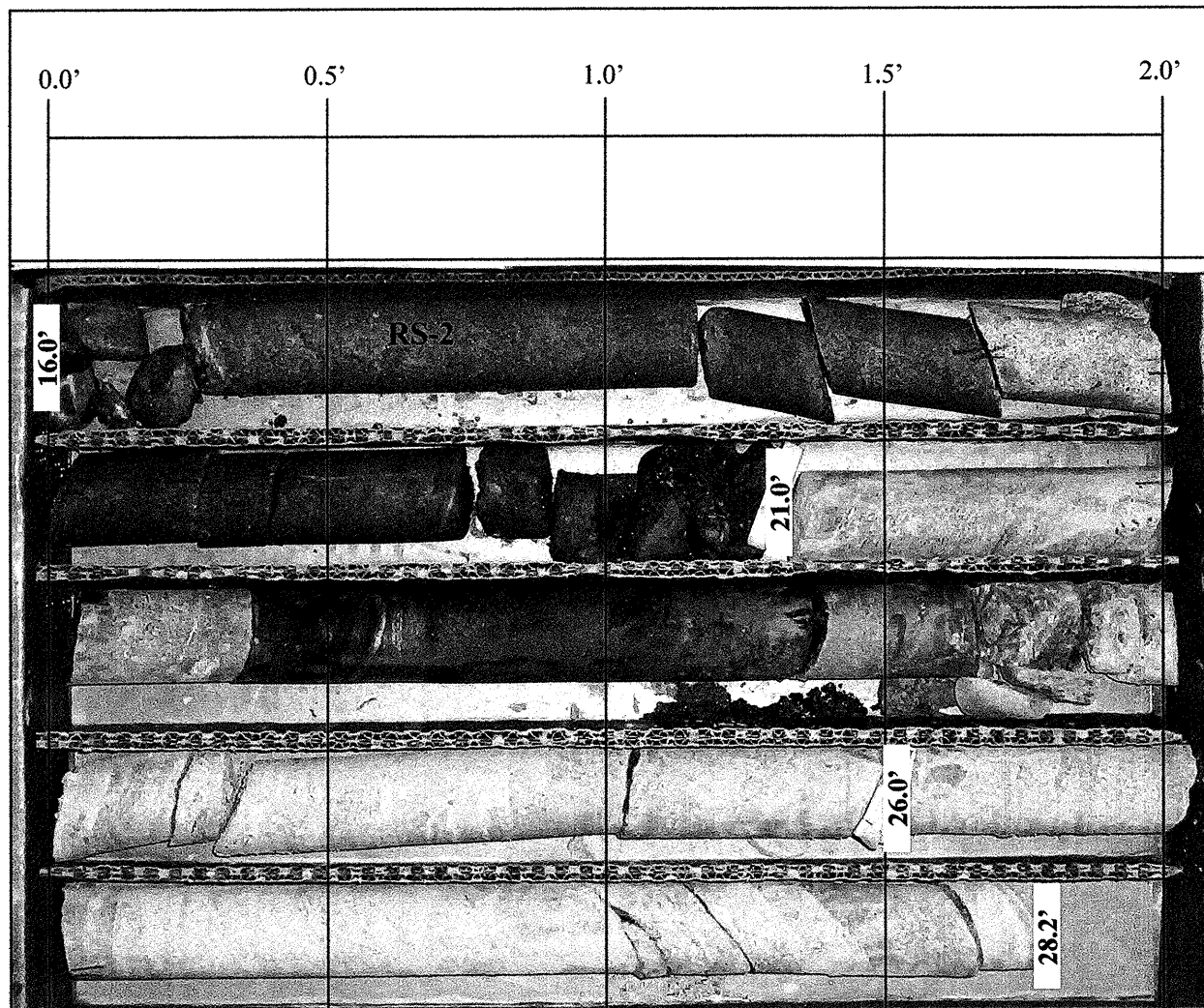
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1054.1	16.0	2:05				RS-2	16-18.8 CR: WHITE, GRAY AND BROWN, MOD. TO MOD. SEV. WEATHER, HARD TO MOD. HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS STRATA REC: 100% STRATA RQD: 79%
		1:50	5.0	3.3/5.0	2.2/5.0		
		1:20		66%	44%		
1049.1	21.0	2:00					18.8-21.2 WR: GRAY AND BROWN, GNEISS STRATA REC: 12.5% STRATA RQD: 0%
1049.1	21.0	21.0 - 21.2 (SPT 60/0.2)					
1048.9	21.2	2:14/0.8					21.2-36 CR: WHITE AND BLUE, FRESH TO V. SLI. WEATHER., V. HARD TO HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
		3:00		4.2/4.8	3.4/4.8		
		2:54	4.8	88%	71%		
		3:00					
1044.1	26.0	3:36					
1044.1	26.0	3:40					
		3:40	5.0	5.0/5.0	4.0/5.0		
		3:23		100%	80%		
		3:24					
1039.1	31.0	3:30					
1039.1	31.0	3:30					
		4:00	5.0	5.0/5.0	4.5/5.0		
		4:00		100%	90%		
		3:55					
1034.1	36.0	4:00					STRATA REC: 96% STRATA RQD: 80%

CORING TERMINATED AT 36.0 ft
ELEVATION 1034.1 ft

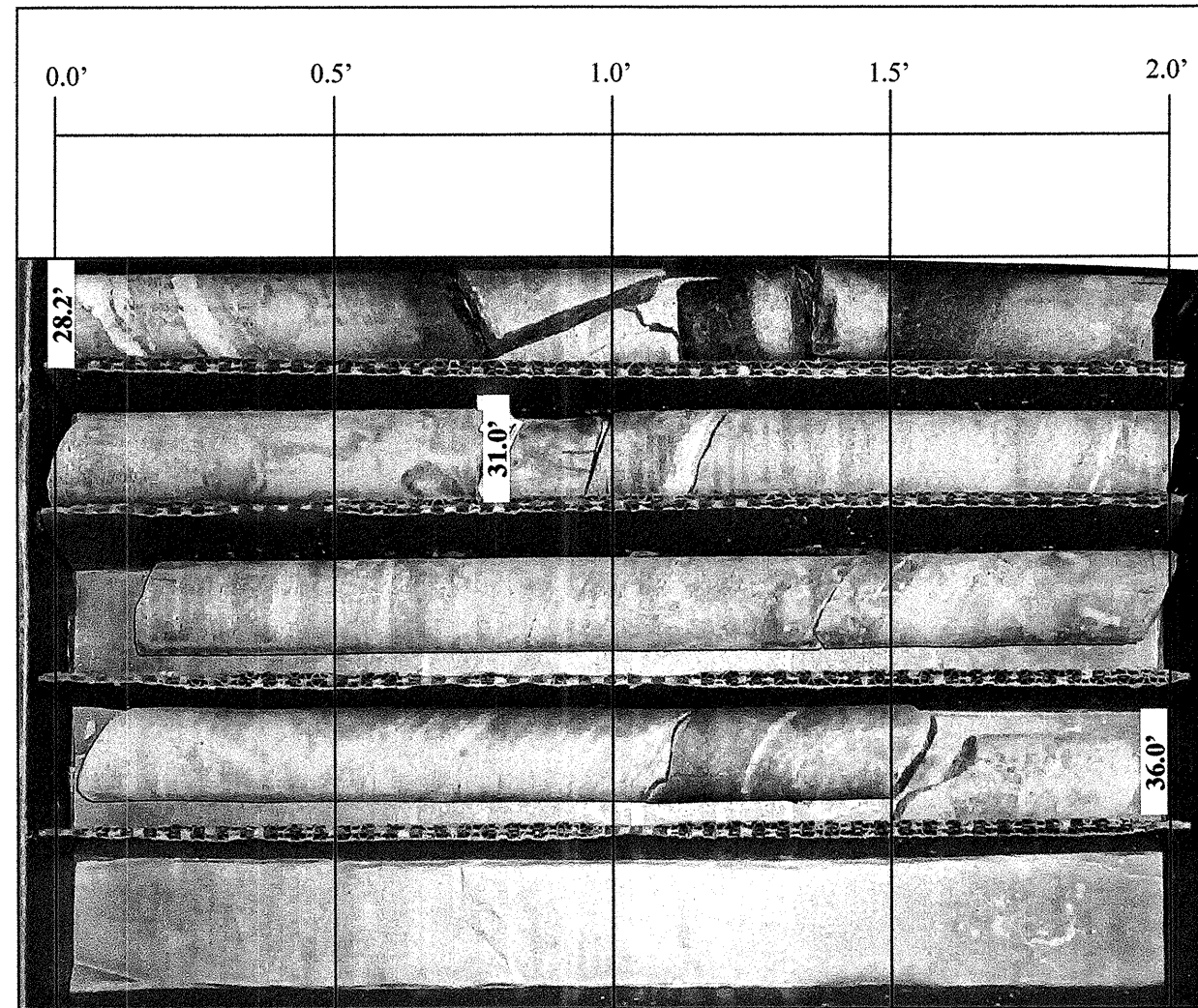
DRILLER: P. BRIDGER

CORE SIZE: NQ

EQUIPMENT: CME 45



Boring B1B, Box 1 of 2, 16.0 feet to 28.2 feet.



Boring B1B, Box 2 of 2, 28.2 feet to 36.0 feet.

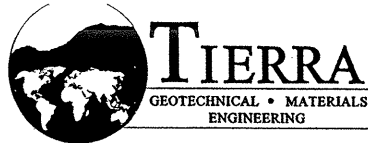
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN							
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)							
BORING NO. B2A		BORING LOCATION 13+51		OFFSET 7' LT		ALIGNMENT -L-							
COLLAR ELEV. 1072.0 ft		NORTHING 720,456.0		EASTING 1,146,779.0		0 HR. -							
TOTAL DEPTH 30.3 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL							
DATE STARTED 11-14-06		COMPLETED 11-14-06		SURFACE WATER DEPTH 3.2									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1072.0													EXISTING GROUND
1070	0.5	1	1	2							SS-9	SAT	1072.0 ALLUV: GRAY AND BROWN, V. LOOSE, TO LOOSE, GRAVELLY SAND (A-1-b), (0.5"DIA)
	3.0	2	4	4								SAT	1067.7 RES: BROWN, LOOSE TO V. DENSE, SILTY SAND (A-2-4), MICACEOUS, SAPROLITIC
1065	8.5	20	29	44								SAT	1059.5 WR: BROWN, GRAY AND BLUE GNEISS
1060	13.5	100/5											1056.5 CR: GRAY, WHITE AND BLUE, MOD. TO V. SLI. WEATHERED, MOD. HARD TO V. HARD, V. CLOSE. TO MOD. CLOSE. FRACTURED, GNEISS
1055													1041.7 CORING TERMINATED AT ELEV. 1041.7' IN CR: GNEISS
1050													MUD DENSITY=73.4
1045													AUGER REFUSAL AT ELE. 1056.5'

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06

CORE BORING REPORT

DATE: 11/14/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: B2A GEOLOGIST: S. HAN

DESCRIPTION: BRIDGE NO.56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

COUNTY: MCDOWELL COLLAR ELEV.: 1072.0 ft TOTAL DEPTH: 30.3 ft

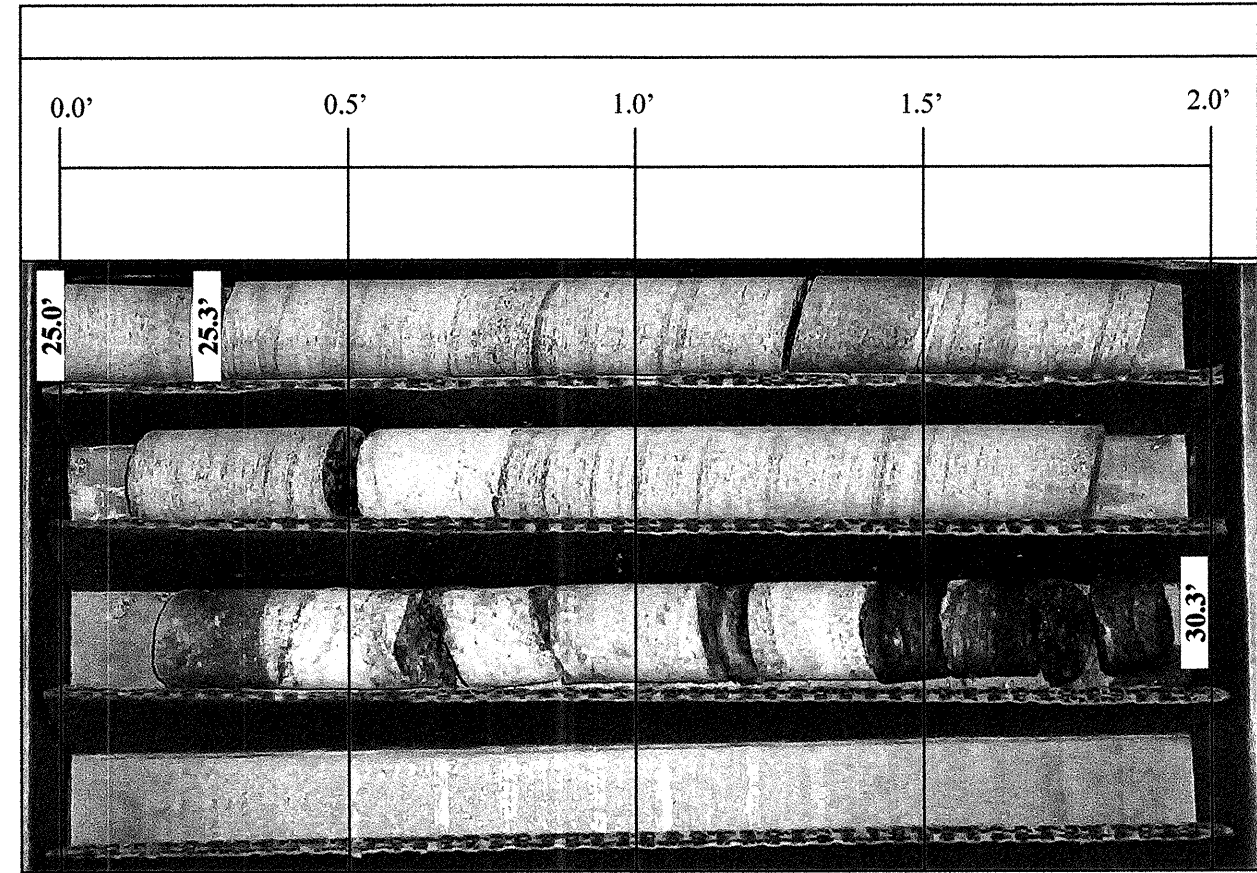
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1056.5	15.5	4:30					15.5-30.3 CR: GRAY, WHITE AND BLUE, MOD. TO V.SLI. WEATHER., MOD. HARD TO V. HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
		3:32		4.8/5.0	1.8/5.0		
		3:12	5.0				
		4:25		96%	36%		
1051.5	20.5	4:10					RS-3
1051.5	20.5	6:40		4.8/4.8	4.2/4.8		
		4:50	4.8				
		6:40		100%	88%		
1046.7	25.3	9:15					STRATA REC: 97.3% STRATA RQD: 66.9%
1046.7	25.3	6:25/0.8					
		8:42		4.8/5.0	3.9/5.0		
		12:05	5.0	96%	78%		
1041.7	30.3	5:20					
		3:40					
		3:06					

CORING TERMINATED AT 30.3 ft
 ELEVATION 1041.7 ft

DRILLER: P. BRIDGER CORE SIZE: NQ EQUIPMENT: CME 45



Boring B2A, Box 1 of 2, 15.5 feet to 25.0 feet.



Boring B2A, Box 2 of 2, 25.0 feet to 30.3 feet.

SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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

SHEET 1 OF 1

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN							
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)							
BORING NO. B2B		BORING LOCATION 13+72		OFFSET 17' RT	ALIGNMENT -L-	0 HR.	-						
COLLAR ELEV. 1071.7 ft		NORTHING 720,474.6		EASTING 1,146,805.1		24 HR.	-						
TOTAL DEPTH 40.5 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL							
DATE STARTED 11-14-06		COMPLETED 11-14-06		SURFACE WATER DEPTH 1.3									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L MOI	O G	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				
1071.7	0.0	1	1	1	EXISTING GROUND					SS-10	SAT		1071.7 ALLUV: BROWN, V. LOOSE, SANDY GRAVEL (A-1-a), (0.5"-1" DIA) 0.0
1070	3.5	11	11	14							SAT		1069.7 RES: BROWN, MED. DENSE, SILTY SAND (A-2-4), SAPROLITIC, MICACEOUS 2.0
1065	9.5	10	10	9							SS-11	SAT	
1060	14.0	43	57	73									1058.7 WR: GRAY, BROWN AND BLUE, GNEISS 13.0
1055	19.0	60	2										1051.2 CR: GRAY, WHITE, BROWN AND BLUE, V. SLI. WEATHERED, V. HARD TO HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS 20.5
1050													
1045													
1040													1042.1 CR: GRAY AND WHITE, SEV. TO MOD. SEV. WEATHERED, SOFT TO MOD. HARD, V. CLOSE. FRACT., GNEISS 29.6
													1040.5 CR: GRAY AND WHITE, SLI. TO MOD. WEATHERED, V. HARD TO MOD. HARD, V. CLOSE TO MOD. CLOSE. FRACT., GNEISS, W/ WR SEAM FROM 37.7' TO 39.1' 31.2
1035													
													1031.2 CORING TERMINATED AT ELEV. 1031.2' IN CR: GNEISS 40.5
													MUD DENSITY=67.4
													AUGER REFUSAL AT ELEV. 1051.2'
													NOTE: OFFSET

CORE BORING REPORT

DATE: 11/14/06

PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: B2B GEOLOGIST: S. HAN

DESCRIPTION: BRIDGE NO.56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

COUNTY: MCDOWELL COLLAR ELEV.: 1071.7 ft TOTAL DEPTH: 40.5 ft

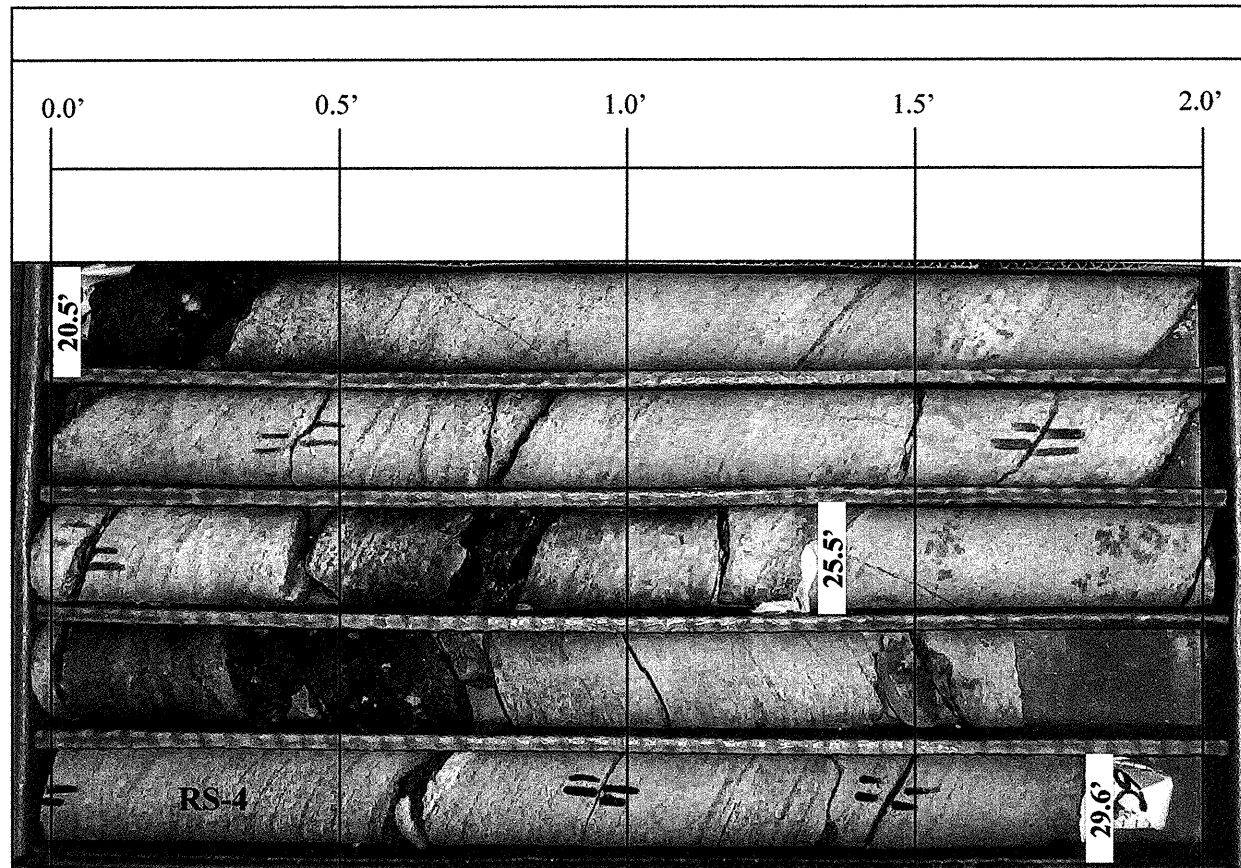
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1051.2	20.5	3:45	5.0	5.0/5.0	3.8/5.0		20.5-29.6 CR: GRAY, WHITE, BROWN AND BLUE V. SLI. WEATHER., V. HARD TO HARD, V. CLOSE. TO MOD. CLOSE. FRACT., GNEISS
		4:48					
		3:42					
		3:41					
1046.2	25.5	4:26	5.0	5.0/5.0	2.9/5.0	RS-4	29.6-31.2 CR: GRAY AND WHITE, SEV. TO MOD. SEV. WEATHER., SOFT TO MOD. HARD, V. CLOSE. FRACT., GNEISS
1046.2	25.5	3:45					
		4:03					
		2:30					
1041.2	30.5	2:42	5.0	4.3/5.0	2.3/5.0		31.2-40.5 CR: GRAY AND WHITE, SLI. WEATHER. TO MOD. WEATHER., V. HARD TO MOD. HARD, V. CLOSE. TO MOD. CLOSE FRACT., GNEISS
1041.2	30.5	4:15					
		3:17					
		3:28					
1036.2	35.5	3:49	5.0	4.3/5.0	3.0/5.0		WR seam from 37.7 to 39.2 ft
1036.2	35.5	4:50					
		4:00					
		8:00					
1031.2	40.5	7:12					STRATA REC: 92% STRATA RQD: 57%

CORING TERMINATED AT 40.5 ft
ELEVATION 1031.2 ft

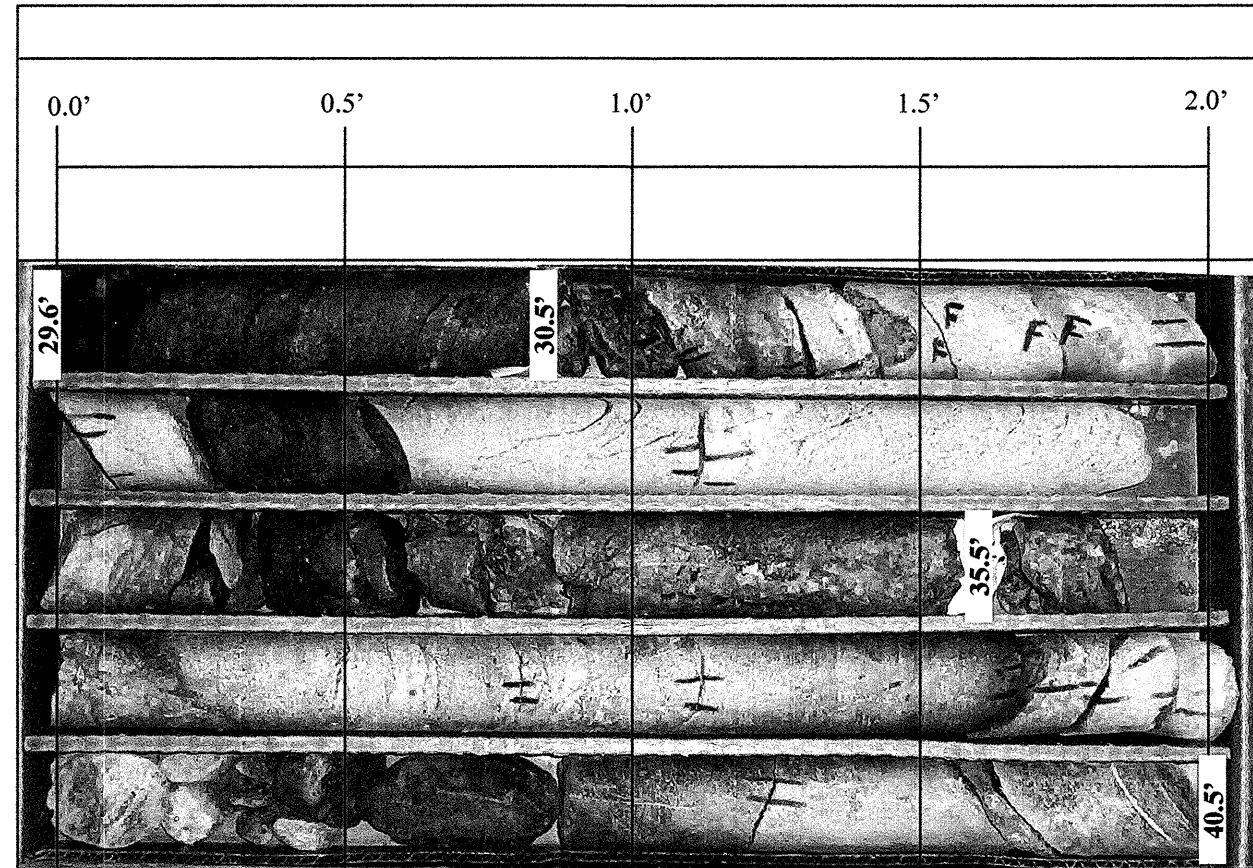
DRILLER: P. BRIDGER CORE SIZE: NQ EQUIPMENT: CME 45

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06

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Boring B2B, Box 1 of 2, 20.5 feet to 29.6 feet.



Boring B2B, Box 2 of 2, 29.6 feet to 40.5 feet.

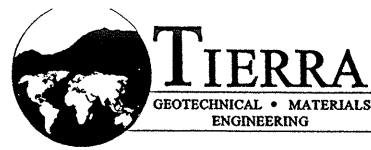
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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

SHEET 1 OF 1

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN						
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)						
BORING NO. EB2A		BORING LOCATION 14+17		OFFSET 8' LT		ALIGNMENT -L-						
COLLAR ELEV. 1084.8 ft		NORTHING 720,522.5		EASTING 1,146,786.2		0 HR. 5.8						
TOTAL DEPTH 32.1 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL						
DATE STARTED 11-9-06		COMPLETED 11-9-06		SURFACE WATER DEPTH N/A								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
1084.8	0.0	2	3	2	EXISTING GROUND							
	3.0	2	3	3								1084.6 ROOTMAT ALLUV: BROWN, LOOSE, SILTY SAND, (A-2-4), MICACEOUS
1080	6.0	1	1	1								1079.8 ALLUV: BROWN, V. SOFT, SILTY CLAY (A-7-5)
	8.0	1	1	2								1077.3 ALLUV: BROWN AND GRAY, V. LOOSE TO LOOSE, SILTY SAND (A-2-4)
1075	10.5	WOH	1	4								1073.3 ALLUV: GRAY AND TAN, LOOSE, GRAVELLY SAND (A-1-b), (<0.5" DIA)
	13.0	6	9	28								1072.3 ALLUV: GRAY, BROWN AND TAN, DENSE, GRAVELLY SAND (A-1-a), (<0.5" DIA)
1070	18.0	21	37	18								1070.8 RES: GRAY AND BROWN, DENSE TO V. DENSE, SILTY SAND (A-2-4), MICACEOUS
1065	23.0	17	41	60/2								1060.8 WR: BROWN AND GRAY, GNEISS
1060	27.0	60/3										
1055	32.0	60/1										1052.7 SPT AND AUGER REFUSAL AT ELEV. 1052.8' IN CR: GNEISS
												MUD DENSITY=64.0

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06



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BORING LOG

25

SHEET 1 OF 1

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN						
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK						GROUND WATER (ft)						
BORING NO. EB2B		BORING LOCATION 14+43		OFFSET 15' RT		ALIGNMENT -L-						
COLLAR ELEV. 1084.6 ft		NORTHING 720,544.7		EASTING 1,146,812.2		0 HR. 6.0						
TOTAL DEPTH 28.1 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		HAMMER TYPE MANUAL						
DATE STARTED 11-9-06		COMPLETED 11-9-06		SURFACE WATER DEPTH N/A								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
1084.6	0.0	2	2	2	EXISTING GROUND							
	2.8	1	2	1								1084.4 ROOTMAT ALLUV: BROWN, SOFT, SANDY SILTY (A-4), MICACEOUS
1080	6.0	2	1	2								1073.1 ALLUV: GRAY AND TAN, V. LOOSE, SILTY SAND (A-2-4)
	8.3	1	1	1								1071.6 ALLUV: BROWN AND TAN, MED. DENSE, SANDY GRAVEL (A-1-a), (UP TO 1" DIA)
1075	10.5	1	WOH	1								1066.6 RES: BROWN AND TAN, V. DENSE, SILTY SAND (A-2-4), MICACEOUS, SAPROLITIC
1070	17.5	8	8	11								1062.6 WR: TAN, GRAY AND BROWN, GNEISS
1065	22.5	60/3										
1060	28.0	60/1										1056.5 SPT AND AUGER REFUSAL AT ELEV. 1056.5' IN CR: GNEISS
												MUD DENSITY=68.0

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492

McDOWELL COUNTY

TIERRA, INC. PROJECT NO: 6211-06-026

BORING #			SAMPLE #			TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED				Limits					
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%			
EB1A			SS-1			92	83	50	17	36	22	25	34	9	20.0
A-4															
12+50	17' LT	0.0-1.5													
EB1A			SS-2			100	99	40	5	66	14	15	27	NP	26.5
A-4															
12+50	17' LT	7.6-9.1													
EB1A			SS-3			99	90	35	25	48	18	9	36	NP	-
A-2-4															
12+50	17' LT	17.8-19.3													
EB1B			SS-4			52	50	23	8	60	17	15	28	13	-
A-2-6															
12+74	7' RT	5.8-7.3													
EB1B			SS-5			78	78	42	3	56	18	23	32	4	29.6
A-4															
12+74	7' RT	8.0-9.5													
EB1B			SS-6			86	68	6	60	35	1	4	24	NP	-
A-3															
12+74	7' RT	13.2-14.7													
B1A			SS-7			89	53	3	69	28	0	3	29	NP	-
A-3															
13+09	6' LT	0.0-1.5													
B1B			SS-8			99	87	24	31	51	13	5	27	NP	-
A-2-4															
13+28	7' RT	3.5-5.0													

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492

McDOWELL COUNTY

TIERRA, INC. PROJECT NO: 6211-06-026

BORING #			SAMPLE #			TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED				Limits					
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%			
B2A			SS-9			88	40	2	71	15	-	-	17	NP	-
A-1-b															
13+51	7' LT	0.5-2.0													
B2B			SS-10			39	20	4	26	9	-	-	16	NP	-
A-1-a															
13+72	17' RT	0.0-1.5													
B2B			SS-11			100	78	21	42	43	10	5	32	NP	-
A-2-4															
13+72	17' RT	9.5-11.0													
EB2A			SS-12			100	99	89	1	20	37	42	49	17	49.1
A-7-5															
14+17	8' LT	6.0-7.5													
EB2A			SS-13			99	87	30	25	51	8	16	36	NP	-
A-2-4															
14+17	8' LT	10.5-11.5													
EB2A			SS-14			88	32	3	-	-	-	-	20	NP	-
A-1-b															
14+17	8' LT	11.5-12.0													
EB2A			SS-15			97	62	25	50	29	11	10	31	4	-
A-2-4															
14+17	8' LT	18.0-19.5													
EB2B			SS-16			100	99	44	-	-	-	-	28	NP	24.8
A-4															
14+43	15' RT	0.0-1.5													

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492

McDOWELL COUNTY

TIERRA, INC. PROJECT NO: 6211-06-026

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			
EB2B		SS-17	100	99	38	2	71	12	15	30	NP	42.6
A-4												
14+43	15' RT	8.3-9.8										
EB2B		SS-18	41	19	4	69	24	3	4	18	NP	-
A-1-a												
14+43	15' RT	13.2-14.7										

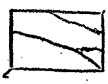



LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 33108.1.1 (B-3492)

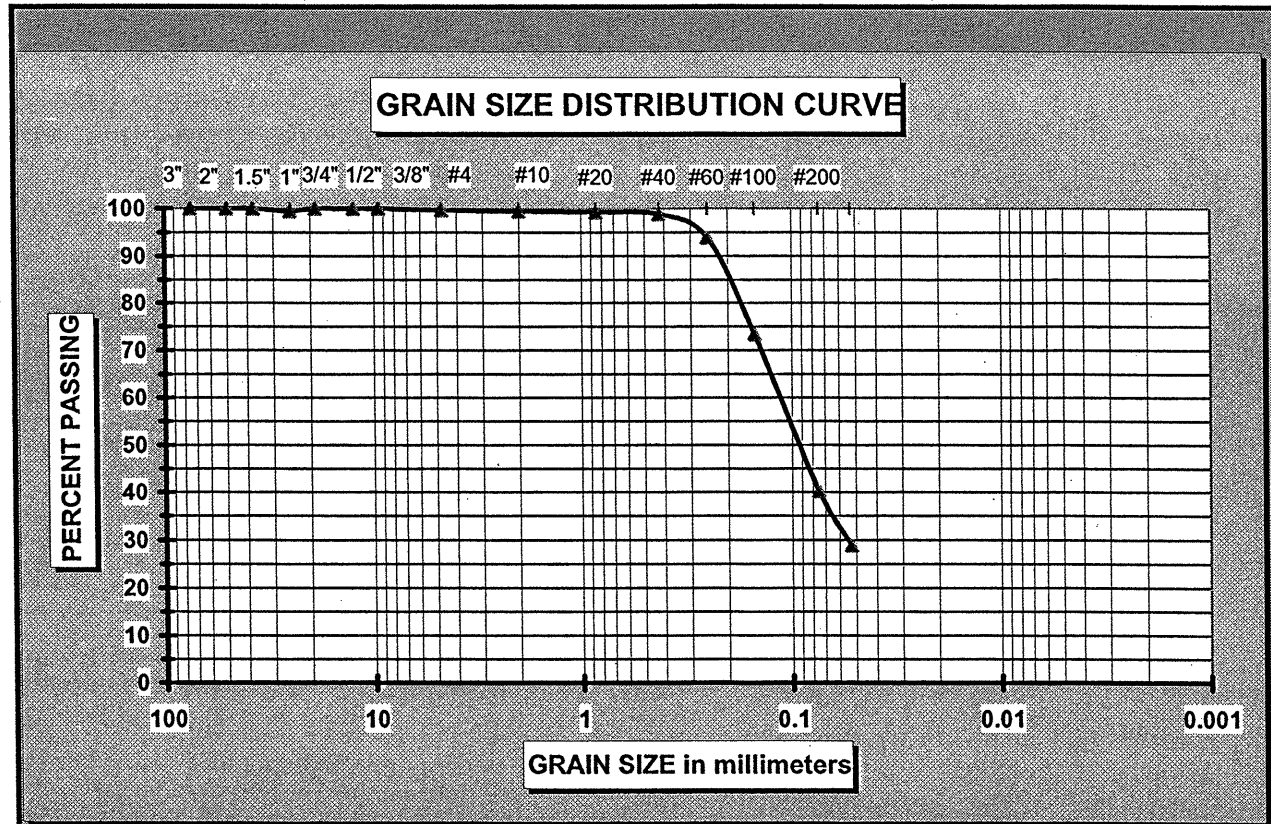
F.A. NO.: BRZ-1763(1)

COUNTY: McDOWELL

BRIDGE NO. 56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

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	24.8-25.4	GNEISS	CZbg	84.0%	0.31	0.17	167.6	11,777.0	516,810		
RS-2	B1B	16.6-17.2	GNEISS	CZbg	44.0%	0.31	0.16	158.9	3,092.0	192,311		
RS-3	B2A	20.8-21.4	GNEISS	CZbg	87.5%	0.28	0.17	172.0	6,537.0	294,185		
RS-4	B2B	27.9-28.5	GNEISS	CZbg	58.0%	0.32	0.17	172.9	12,489.0	871,051		

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



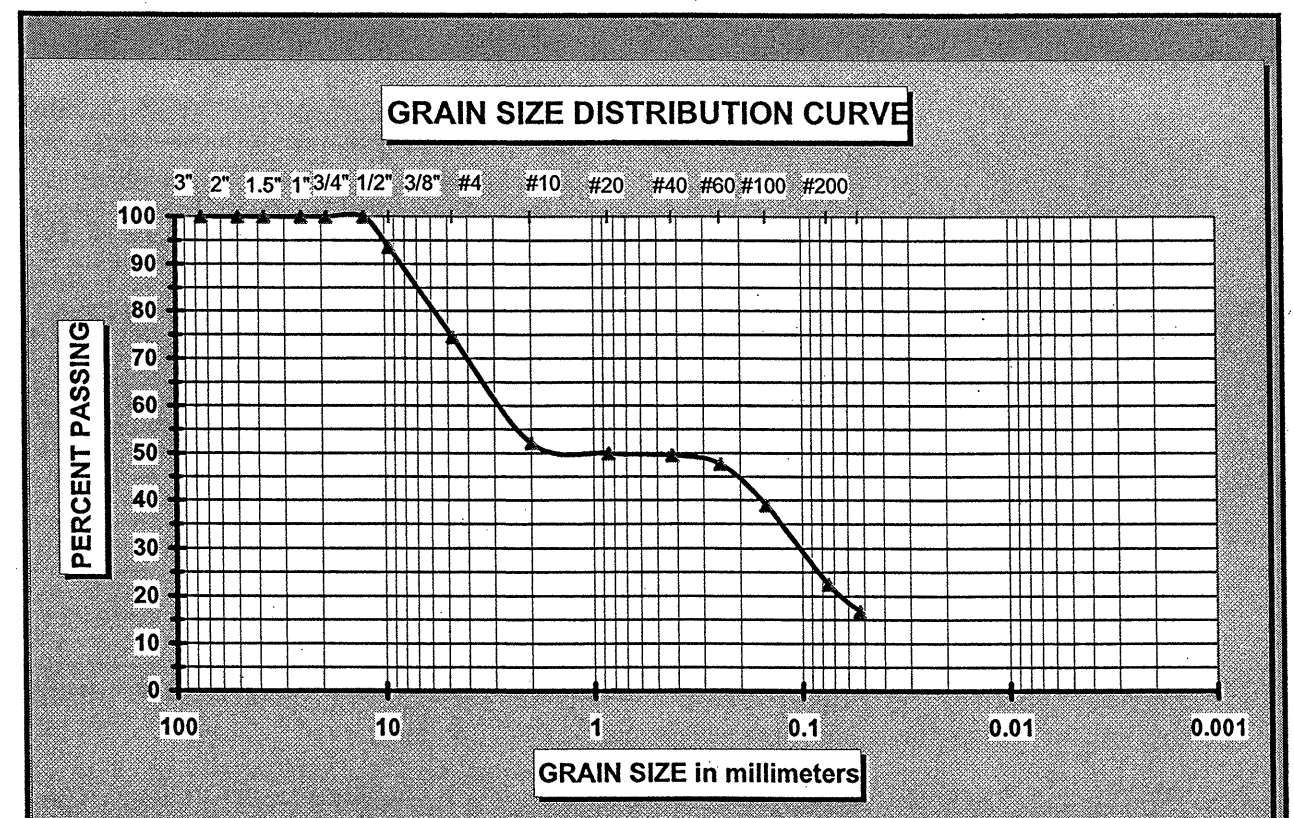
AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	Cu = D60 / D10
		Fine Sand	< #60 and > #200	Cc = (D30) ² / (D10 x D60)

BORING #: EB1A SAMPLE #: SS-2 DEPTH: 7.6-9.1

BROWN SANDY SILT W/ GRAVEL (A-4)
% PASSING #200 SIEVE: 40%
NATURAL MOISTURE CONTENT = 26.5%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	27
PLASTIC LIMIT	-
PLASTIC INDEX	NP

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



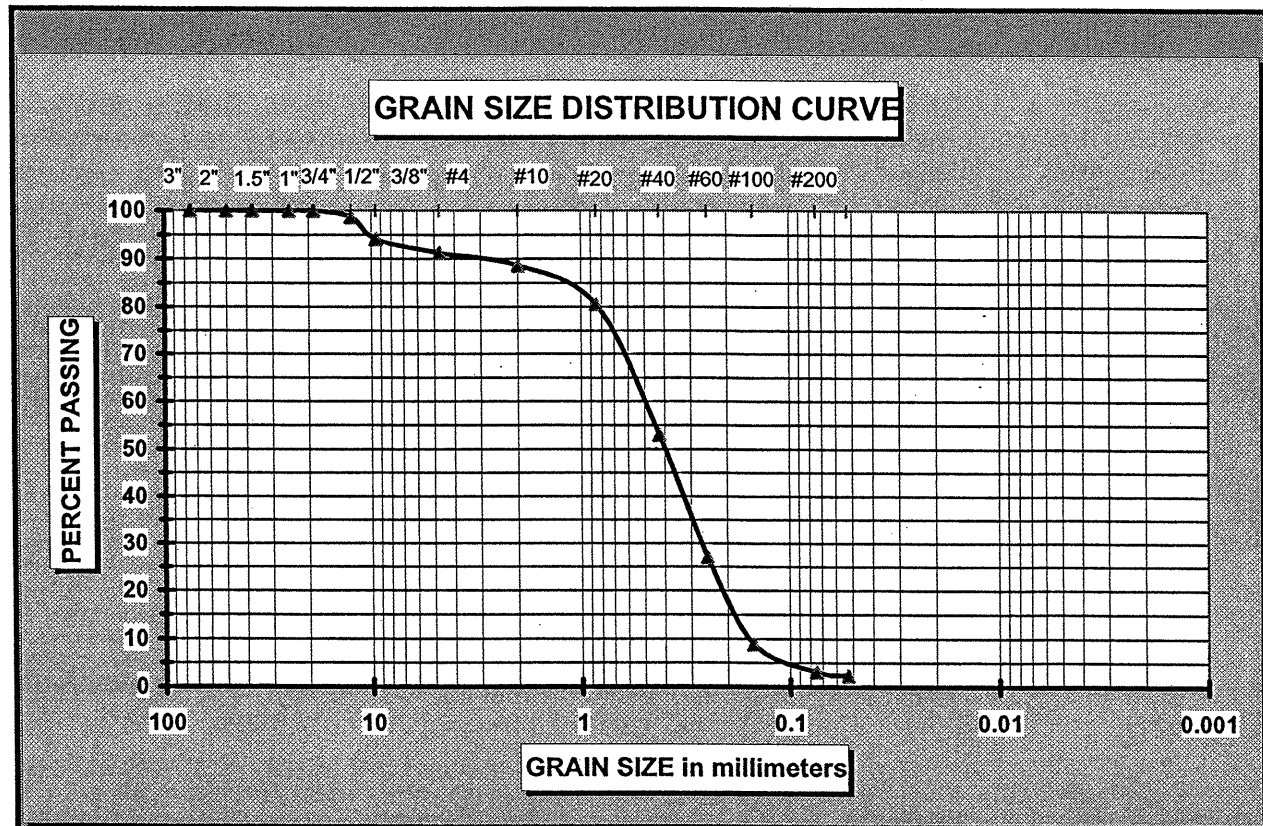
AASHTO M-145 Classification of Soil for Engineering Purposes				
Gravel	< 3" and > #10	Coarse Sand	< #10 and > #60	Cu = D60 / D10
		Fine Sand	< #60 and > #200	Cc = (D30) ² / (D10 x D60)

BORING #: EB1B SAMPLE #: SS-4 DEPTH: 5.8-7.3

BROWN GRAVELLY CLAYEY SAND (A-2-6)
% PASSING #200 SIEVE: 23%
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	28
PLASTIC LIMIT	15
PLASTIC INDEX	13

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: B1A SAMPLE #: SS-7 DEPTH: 0.0-1.5

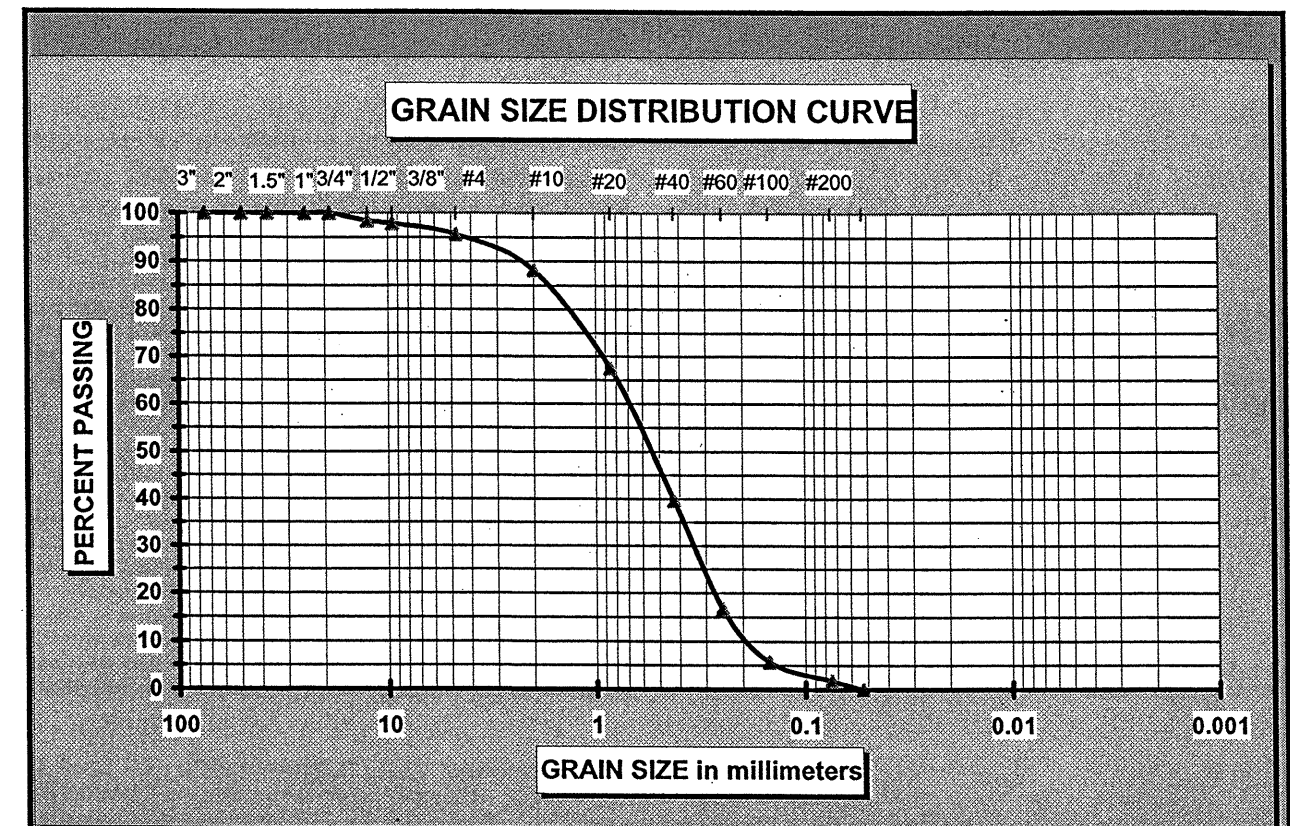
BROWN SAND (A-3)

% PASSING #200 SIEVE: 3%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	29
PLASTIC LIMIT	-
PLASTIC INDEX	NP

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: B2A SAMPLE #: SS-9 DEPTH: 0.5-2.0

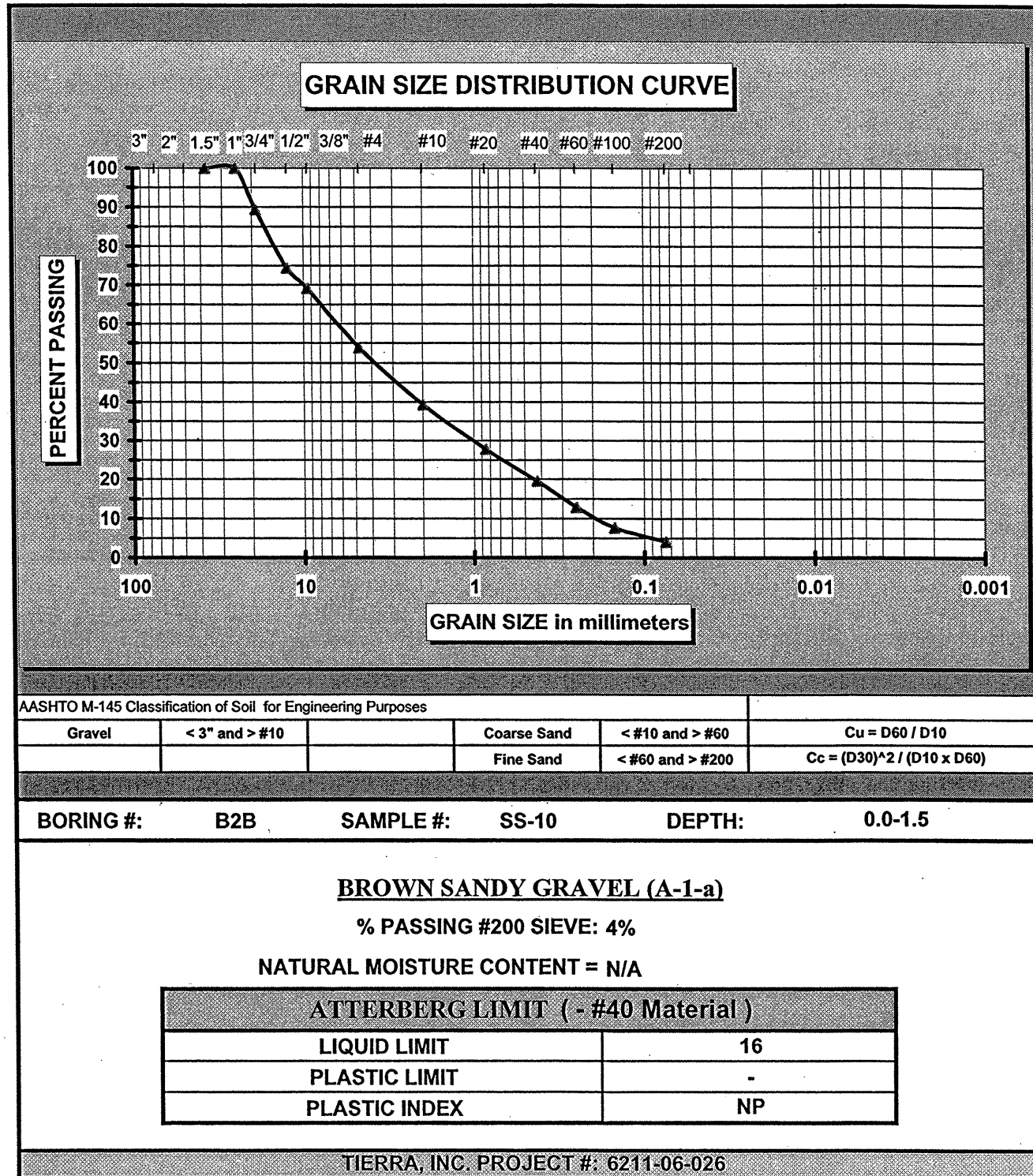
BROWN GRAVELLY SAND (UP TO 0.5") (A-1-b)

% PASSING #200 SIEVE: 2%

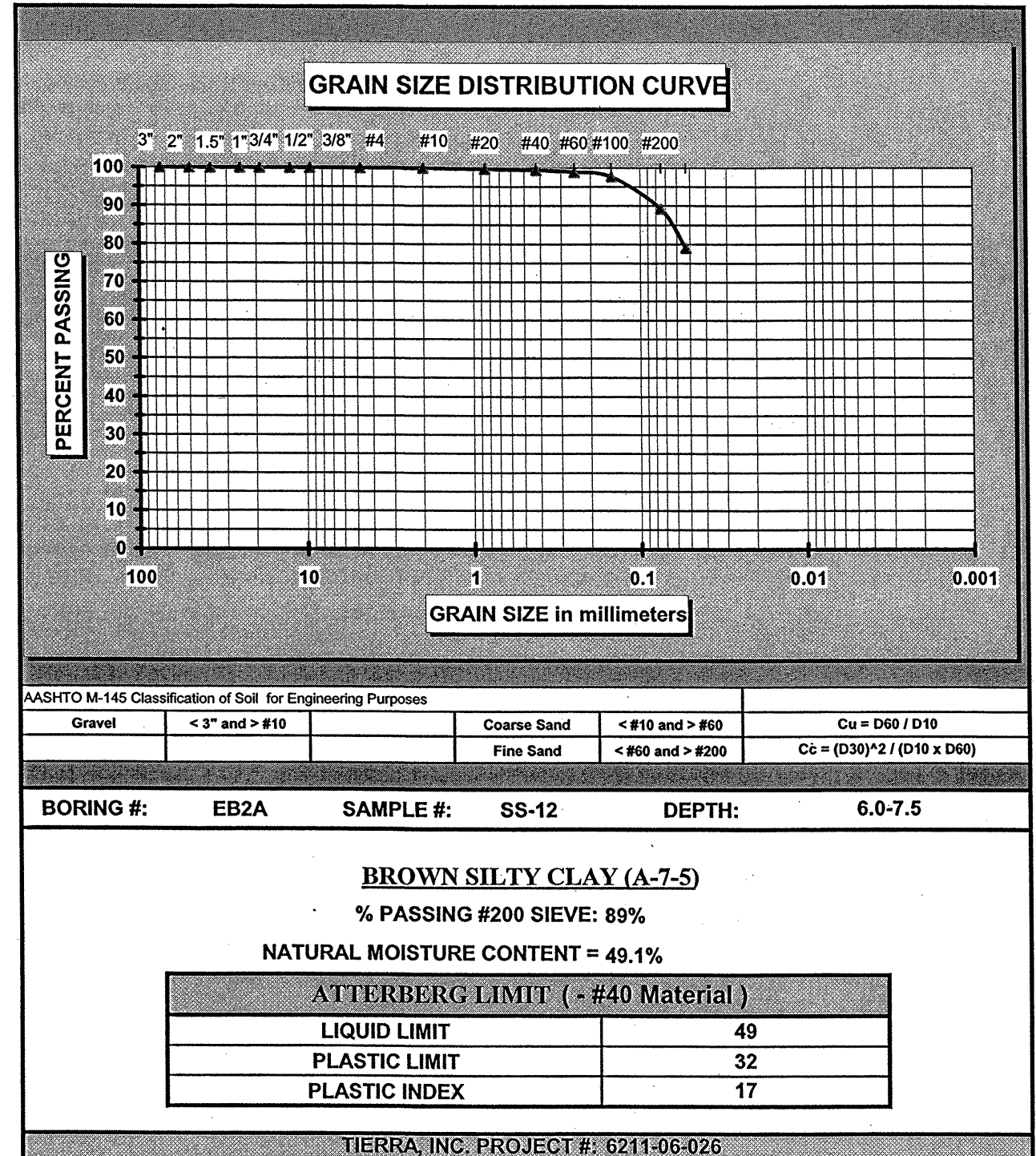
NATURAL MOISTURE CONTENT = N/A

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

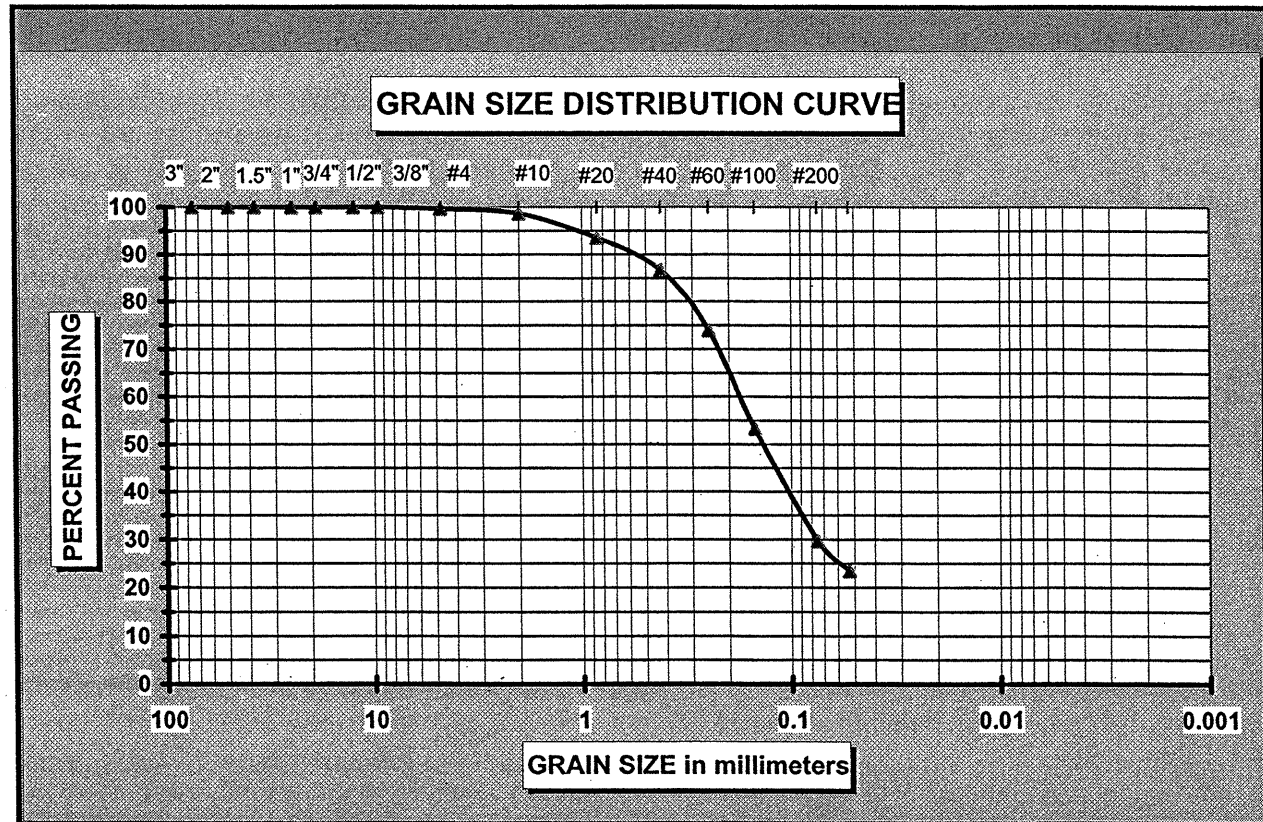
BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: EB2A SAMPLE #: SS-13 DEPTH: 10.5-11.5

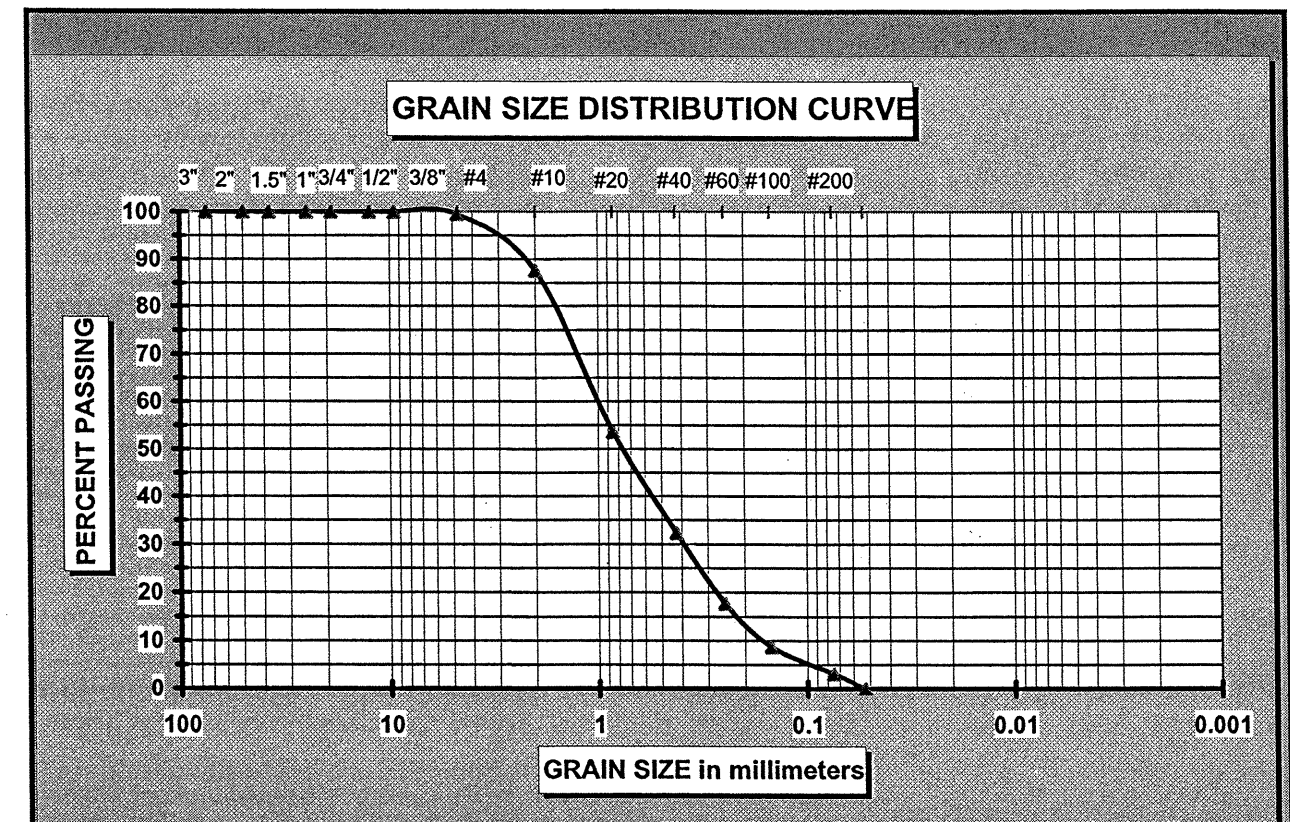
GRAY SILTY SAND (A-2-4)

% PASSING #200 SIEVE: 30%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	36
PLASTIC LIMIT	-
PLASTIC INDEX	NP

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: EB2A SAMPLE #: SS-14 DEPTH: 11.5-12.0

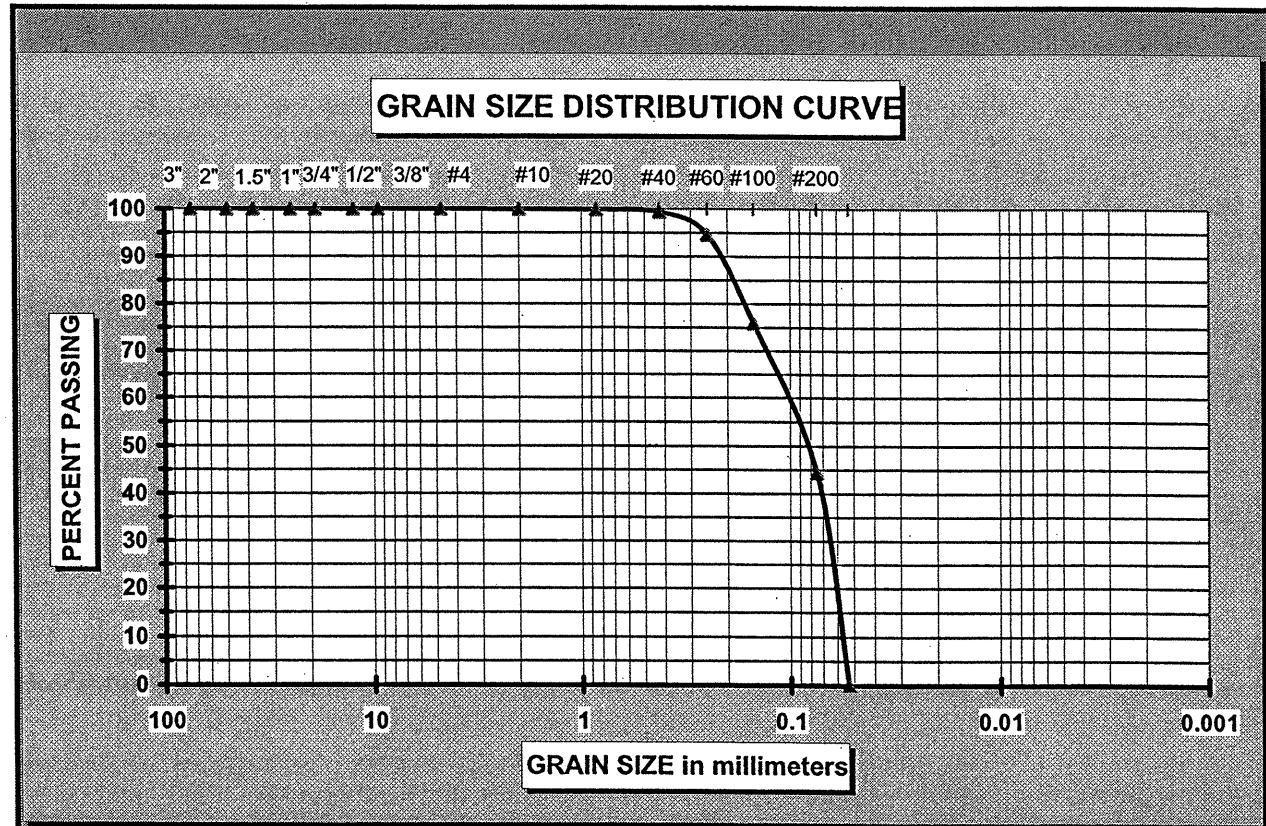
BROWN SAND (A-1-b)

% PASSING #200 SIEVE: 3%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	20
PLASTIC LIMIT	-
PLASTIC INDEX	NP

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: EB2B SAMPLE #: SS-16 DEPTH: 0.0-1.5

BROWN SANDY SILT, MIC. (A-4)

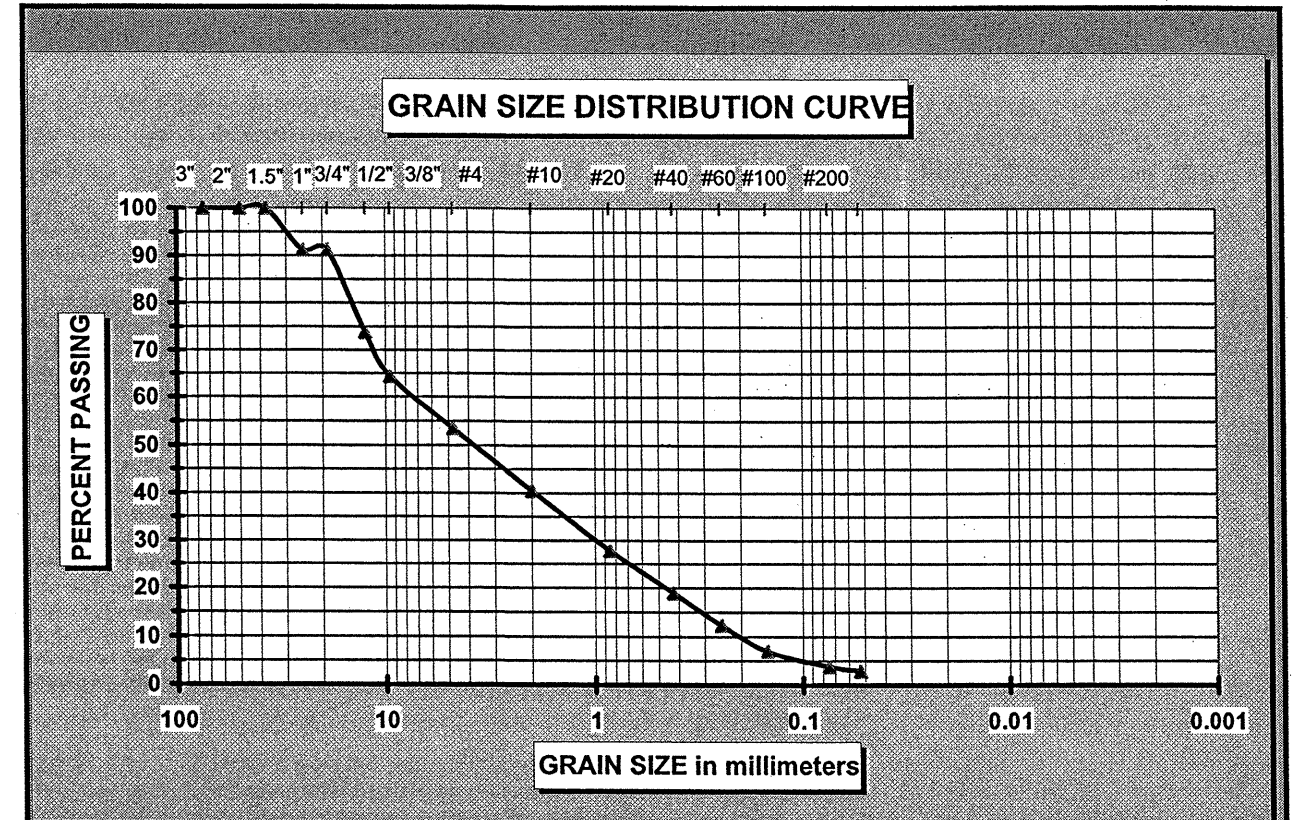
% PASSING #200 SIEVE: 44%

NATURAL MOISTURE CONTENT = 24.8%

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

TIERRA, INC. PROJECT #: 6211-06-026

BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD RD.)
McDOWELL COUNTY
NCDOT Project No: 33108.1.1 - T.I.P. No: B-3492



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

BORING #: EB2B SAMPLE #: SS-18 DEPTH: 13.2-14.7

BROWN SANDY GRAVEL (UP TO 1\" DIA.) (A-1-a)

% PASSING #200 SIEVE: 4%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	18
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-06-026



**FIELD
 SCOUR REPORT**

WBS: 33108.1.1 TIP: B-3492 COUNTY: MCDOWELL

DESCRIPTION(1): BR NO. 56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)

EXISTING BRIDGE

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

Bridge No.: 56 Length: 40 Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2
 Foundation Type: WOODEN PILES, VERTICAL ABUTMENTS

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: EVIDENCE OF SCOUR FROM STREAM AND DRAINAGE FROM ROAD
 AT ALL CORNERS OF EXISTING BRIDGE

Interior Bents: N/A

Channel Bed: CHANNEL BED HAS SCOUR IN VERY CENTER OF CREEK UP TO 4 TO 6 FEET
 SCOUR IS ESPECIALLY EVIDENT IN RELATION TO DRAINAGE NEAR EX. EB1 RT SIDE

Channel Bank: BANKS HAVE BEEN SCOURED AND DOWNCUT EXTENSIVELY ON BOTH EAST AND
 WEST BANKS

EXISTING SCOUR PROTECTION

Type(3): LARGE RIP RAP (UP TO 4 FT DIAMETER) PLACED TO ARMOUR BRIDGE END BENTS

Extent(4): ONLY ALONG EXISTING BRIDGE ENDBENTS, UP AND DOWNSTREAM 15 FEET.

Effectiveness(5): RIP RAP HAS KEPT BANKS AT END BENTS RELATIVELY STABLE.

Obstructions(6): N/A

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): SAND WITH GRAVEL (GRAVEL IS TYPICALLY NO GREATER THAN 1" DIA.
 HOWEVER, OCCASIONAL MATERIAL UP TO 3" DIA. WAS ENCOUNTERED.

Channel Bank Material(8): SILTS AND SANDS WITH OCCASIONAL CLAY, SAND AND GRAVEL LAYER

Channel Bank Cover(9): SOME YOUNG TREES ON EAST, GRASSES AND SHRUBS ON WEST.

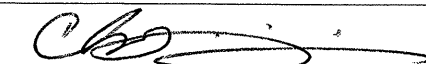
Floodplain Width(10): APPROX. 400 TO 600 FEET (UP TO I-40)

Floodplain Cover(11): GRASSES, SHRUBS, OCCASIONAL YOUNG TO MOD. AGED TREES

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): TO THE EAST/SOUTH EAST

Observations and Other Comments: CHANNEL SUBJECT TO REWORKING/STREAM SUBJECT TO FLASH
 FLOODING. RIFFLE JUST DOWNSTREAM OF PROP. STRUCTURE.


Reported by:  Date: 11/17/2006
 TIERRA, INC.

DESIGN SCOUR ELEVATIONS(14)

Feet x Meters _____

		BENTS											
		B1	B2										
Left	1065.8	1066.3											
Right	1064.3	1067.5											

Comparison of DSE to Hydraulics Unit theoretical scour:
 DSE based on Bridge Survey & Hydraulic Design Report dated 6/02/06

DSE determined by:  Date: 12/6/2006

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	BANK	CHANNEL	CHANNEL	CHANNEL	BANK	BANK
Sample No.	SS-2	SS-4	SS-7	SS-9	SS-10	SS-12	SS-13
Retained #4	0.3	25.4	8.7	4	46	0	0.3
Passed #10	100	52	89	88	39	100	99
Passed #40	99	50	53	40	20	99	87
Passed #200	40	23	3	2	4	89	30
Coarse Sand	5	8	69	71	26	1	25
Fine Sand	66	60	28	15	9	20	51
Silt	14	17	0	-	-	37	8
Clay	15	15	3	-	-	42	16
LL	27	28	29	17	16	49	36
PI	NP	13	NP	NP	NP	17	NP
AASHTO	A-4	A-2-6	A-3	A-1-b	A-1-a	A-7-5	A-2-4
Station	12+50	12+74	13+09	13+51	13+72	14+17	14+17
Offset	17' LT	7' RT	6' LT	7' LT	17' RT	8' LT	8' LT
Depth	7.6-9.1	5.8-7.3	0.0-1.5	0.5-2.0	0.0-1.5	6.0-7.5	10.5-11.5



OVERVIEW OF SITE, LOOKING SOUTHEAST.



PROFILE, LOOKING UPSTATION FROM END BENT 1.

SITE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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



END BENT 1, LOOKING FROM LEFT TO RIGHT.



BENT 1, LOOKING FROM LEFT TO RIGHT.

SITE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



TIERRA, INC.
2786 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



BENT 2, LOOKING FROM LEFT TO RIGHT.



END BENT 2, LOOKING FROM LEFT TO RIGHT.

SITE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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2736 ROWLAND RD.
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PHONE (919) 871-0800
FAX (919) 871-0803



NORTH MUDDY CREEK, LOOKING UPSTREAM FROM CENTERLINE.



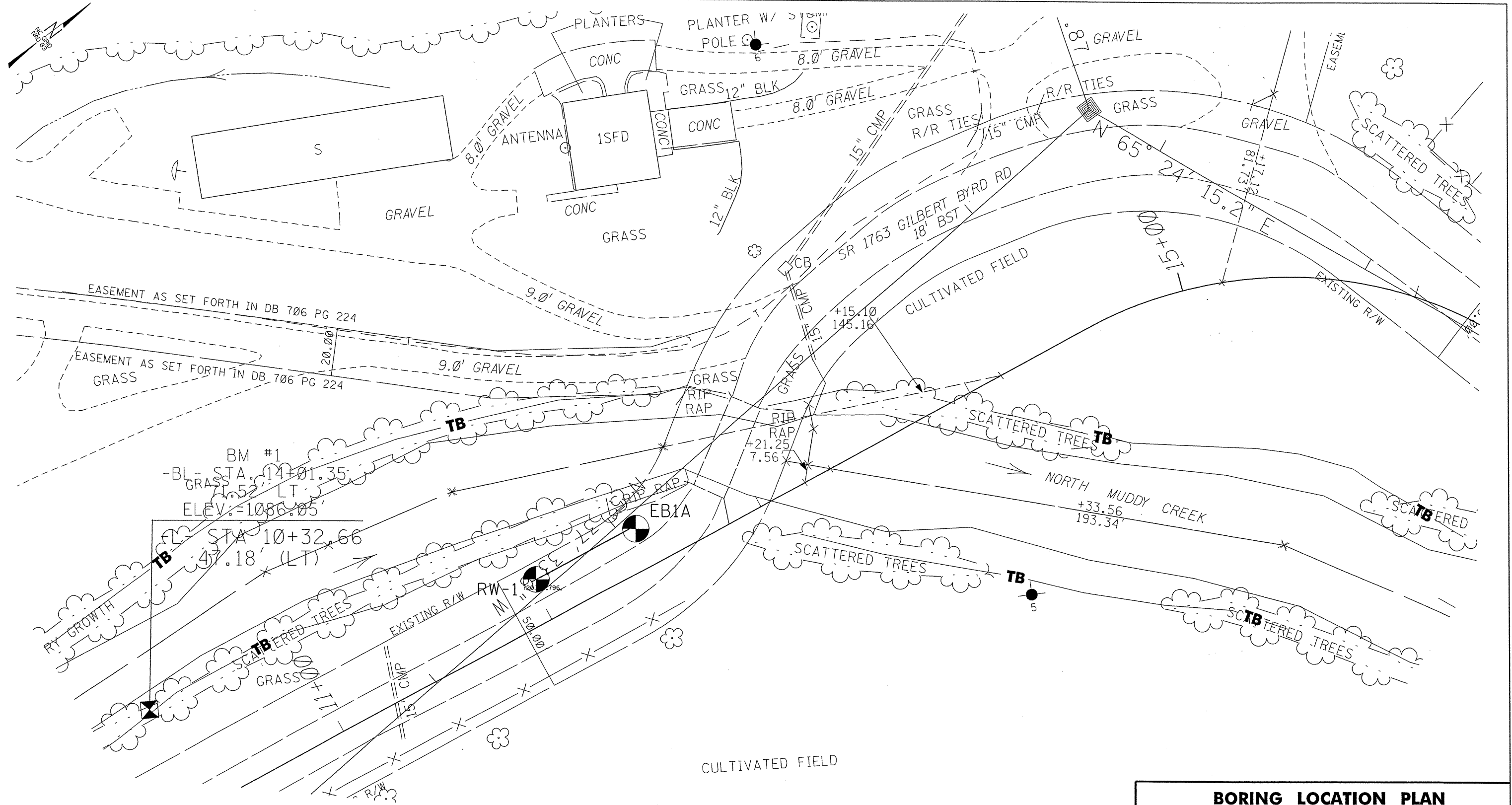
NORTH MUDDY CREEK, LOOKING DOWNSTREAM FROM CENTERLINE.

SITE PHOTOGRAPHS

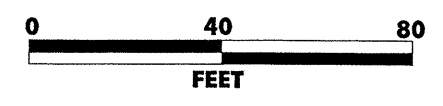
**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



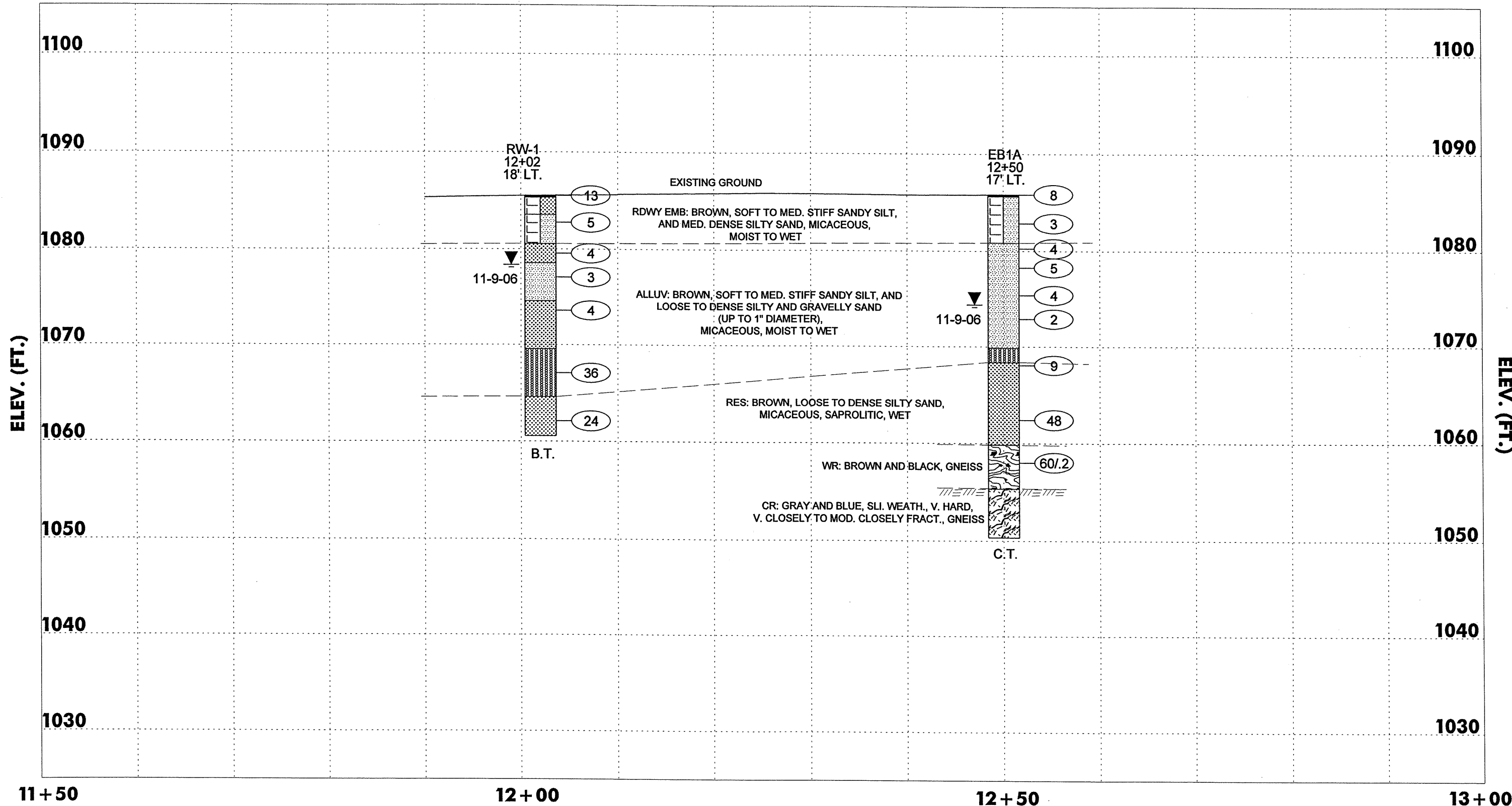
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2736 ROWLAND RD.
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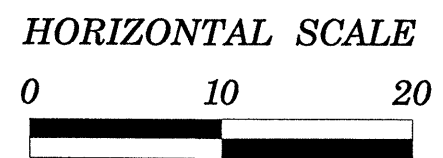
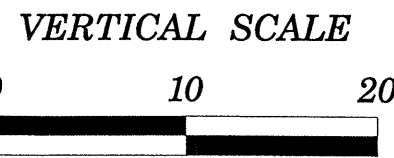
NOTES:
 BENCH MARK: RR SPIKE BASE OF 22" WHITE OAK,
 STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'
 PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED
 FROM NCDOT, DATED JUNE, 2006



BORING LOCATION PLAN	
BRIDGE #56 OVER NORTH MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD) MCDOWELL COUNTY, NORTH CAROLINA TIP NO: B-3492, STATE PROJECT NO: 33 108.1.1	
	TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NC 27615 PHONE (919) 871-0800 FAX (919) 871-0803



BENCH MARK: R/R SPIKE BASE OF 22" WHITE OAK,
 STA. 15+12.44, 271.42' LT. -L-, ELEVATION 1093.87'



PROFILE ALONG RETAINING WALL

BRIDGE #56 OVER NORTH MUDDY CREEK
 ON SR 1763 (GILBERT BYRD ROAD)
 MCDOWELL COUNTY, NORTH CAROLINA
 TIP NO: B-3492, STATE PROJECT NO: 33 108, I.1

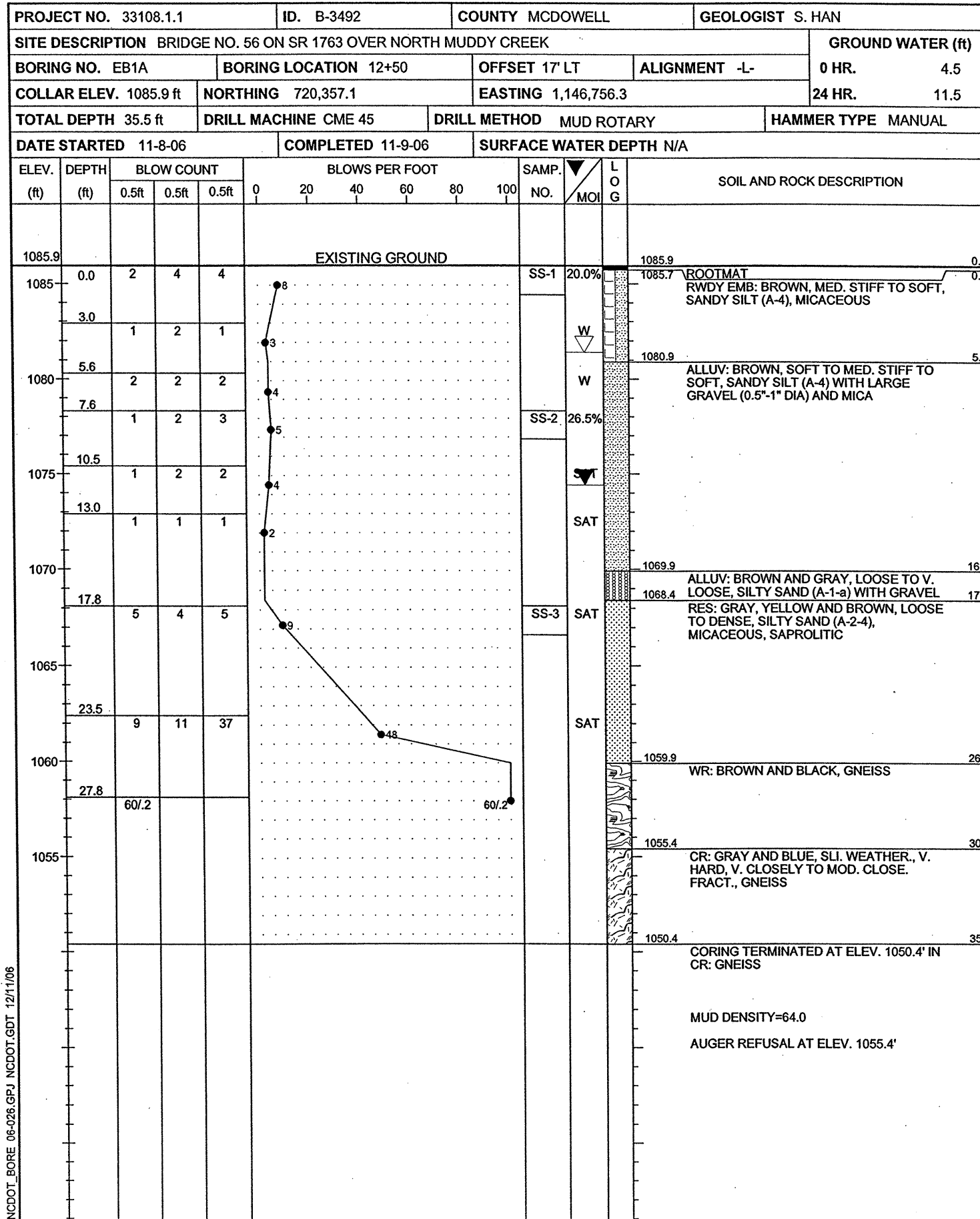
TIERRA, INC.
 2736 RORLAND RD.
 RALEIGH, NC 27615
 PHONE (919) 871-8888
 FAX (919) 871-8883



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

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

SHEET 1 OF 1



CORE BORING REPORT

DATE: 11/9/06

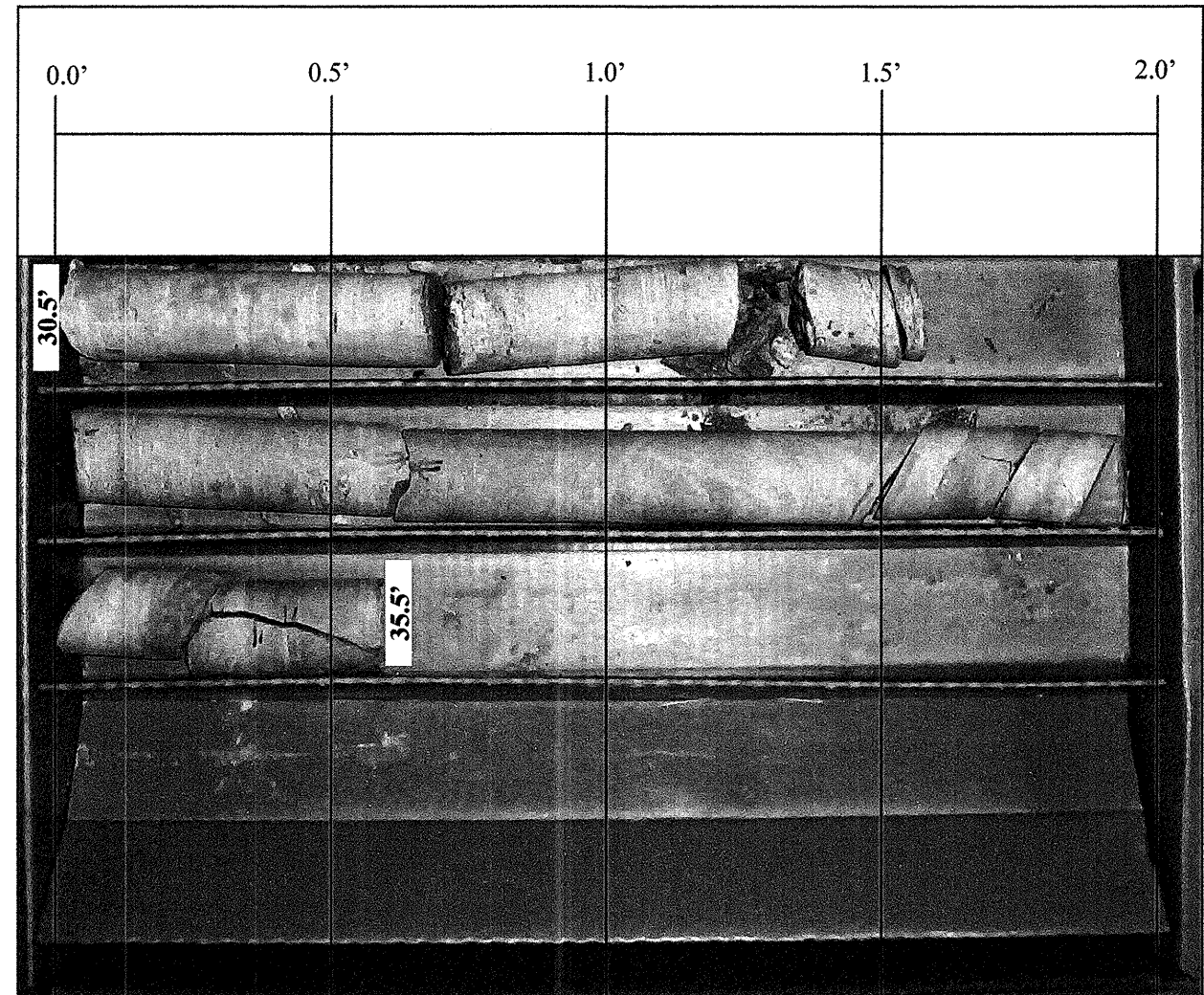
PROJECT: 33108.1.1 I.D. NO.: B-3492 BORING NO: EB1A GEOLOGIST: S. HAN
DESCRIPTION: BRIDGE NO. 56 OVER N. MUDDY CREEK ON SR 1763 (GILBERT BYRD ROAD)
COUNTY: MCDOWELL COLLAR ELEV.: 1085.9 ft TOTAL DEPTH: 35.5 ft

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1055.4	30.5	0:30	5.0	4.0/5.0	3.0/5.0		30.5-35.5 CR: GRAY AND BLUE, SLI. WEATHER., V. HARD, V. CLOSELY TO MOD. CLOSE. FRACT., GNEISS
		5:30					
		5:27					
		4:12					
1050.4	35.5	4:16		80%	60%		STRATA REC=80.0% STRATA RQD=60.0%

CORING TERMINATED AT 35.5 ft
ELEVATION 1050.4 ft

DRILLER: P. BRIDGER CORE SIZE: NQ EQUIPMENT: CME 45

NCDOT_BORE 06-026.GPJ NCDOT.GDT 12/11/06



Boring EB1A, Box 1 of 1, 30.5 feet to 35.5 feet.

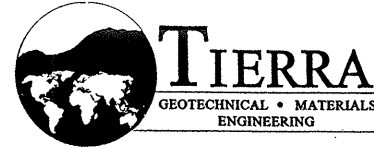
SCALE 1:40 (1"=4")

ROCK CORE PHOTOGRAPHS

**BRIDGE #56 OVER NORTH MUDDY CREEK
ON SR 1763 (GILBERT BYRD ROAD)
MCDOWELL COUNTY, NORTH CAROLINA
TIP NO: B-3492, STATE PROJECT NO: 33108.1.1**



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



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

PROJECT NO. 33108.1.1		ID. B-3492		COUNTY MCDOWELL		GEOLOGIST S. HAN									
SITE DESCRIPTION BRIDGE NO. 56 ON SR 1763 OVER NORTH MUDDY CREEK							GROUND WATER (ft)								
BORING NO. RW-1		BORING LOCATION 12+02		OFFSET 18' LT		ALIGNMENT -L-									
COLLAR ELEV. 1085.6 ft		NORTHING 720,310.4		EASTING 1,146,749.2		0 HR. 4.1									
TOTAL DEPTH 25.0 ft		DRILL MACHINE CME 45		DRILL METHOD MUD ROTARY		24 HR. 7.2									
DATE STARTED 11-8-06		COMPLETED 11-8-06		SURFACE WATER DEPTH N/A											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
1085.6					EXISTING GROUND							1085.6	0.0		
1085	0.0	2	7	6							SS-19	M	1085.4	0.2	ROOTMAT
	2.8												1083.6	2.0	RDWY EMB: BROWN, MED. DENSE, SILTY SAND (A-2-4), MICACEOUS
		3	2	3							SS-20	21-7%	1080.6	5.0	RDWY EMB: BROWN, MED. STIFF, SANDY SILT (A-4), MICACEOUS
1080	6.0												1078.6	7.0	ALLUV: BROWN, LOOSE, SILTY SAND (A-2-4), MICACEOUS WITH GRAVEL
	8.5														ALLUV: BROWN, SOFT, SANDY SILT (A-4), MICACEOUS
		1	2	1								M			
1075	12.0												1074.6	11.0	ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4)
		WOH	WOH	4								SS-21	M		
1070													1069.6	16.0	ALLUV: GRAY, DENSE, GRAVEL (A-1-a), (<0.5" DIA)
	18.5														
		7	14	22									1064.6	21.0	RES: BROWN, MED. DENSE, SILTY SAND (A-2-4), SAPROLITIC
1065															
	23.5												1060.6	25.0	RES: SAND
		11	9	15								SS-22	W		
															BORING TERMINATED AT ELEV. 1060.6' IN RES: SAND
															MUD DENSITY=67.6

NCDOT_BORE_06-026.GPJ NCDOT.GDT 12/11/06



RETAINING WALL PROFILE, LOOKING DOWNSTATION FROM EB1A.

SITE PHOTOGRAPHS

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