PROJECT: 33379.1.1 ID: B-4011

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4011	1	28
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
33379.1.1	BRZ-1106(4)	P.E.	
		CONST.	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

For Letting

STATE PROJECT 33379.1.1 I.D. NO. B-4011

F.A. PROJECT BRZ-1106(4)

COUNTY ASHE

PROJECT DESCRIPTION BRIDGE NO. 85 OVER MILL CREEK ON SR 1106 (RAILROAD GRADE ROAD)

SITE DESCRIPTION

CONTENTS:

DRAWN BY: DRK

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.

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INVESTIGATED BY G LICAYAN — PERSONNEL D KITCHEN

CHECKED BY J VINSON — S WILLARD

SUBMITTED BY P WEAVER — R TOOTHMAN

DATE 10/6/05 — B FOSTER

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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER SEAL

10/25/05

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-4011	33379.1.1	2	28

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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:

VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤35% PASSING #200)							SILT-CLAY MATERIALS (>35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2, A-3	A-4, A-5, A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		N.P.	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F. SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12"	3"				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

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.

GRADATION

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)
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.
- STATIC WATER LEVEL AFTER 24 HOURS.
- PW — PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA
- SPRING OR SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/825 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- BOULDER
- SPT, CPT, DMT, PMT, VST — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S- BULK SAMPLE
SS- SPLIT SPOON SAMPLE
ST- SHELBY TUBE SAMPLE
RS- ROCK SAMPLE
RT- RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
C.T. - CORING TERMINATED
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
NM - NOT MEASURED
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B- 57
- [ ] BK-51
- [ ] CME-45
- [ ] CME-55
- [ ] PORTABLE HOIST
- [ ] OTHER CME 850
- [x] OTHER ACKER MARK II

ADVANCING TOOLS:
- [ ] CLAY BITS
- [x] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [x] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [x] TRICONE 3⅞" - TUNG.-CARB.
- [x] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC
- [x] MANUAL

CORE SIZE:
- [ ] -B____
- [x] -N__Q
- [x] -H__Q

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V. SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

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.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

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

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

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 A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

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.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #2 R/R Spike in Power Pole, STA. 23+22.14 -BL-, 9.78' RT.

ELEVATION: 2986.47'

NOTES:

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SUBMITTED TO: North Carolina Department of Transportation
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ATTENTION: Mr. Njoroge W. Wainaina, P.E.
State Geotechnical Engineer

SUBMITTED BY: Trigon Engineering Consultants, Inc.
Post Office Box 18846
Greensboro, North Carolina 27419-8846
Trigon Project No. 071-05-024

DATE: October 5, 2005

STATE PROJECT: 33379.1.1

TIP : B-4011

FEDERAL PROJECT: BRZ-1106(4)

COUNTY: Ashe

DESCRIPTION: Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

SUBJECT: Geotechnical Report of Structure Subsurface Investigation

Thank you for our success.

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STATE PROJECT: 33379.1.1

TIP : B-4011

FEDERAL PROJECT: BRZ-1106(4)

COUNTY: Ashe

DESCRIPTION: Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

SUBJECT: Geotechnical Report of Structure Subsurface Investigation

Trigon Engineering Consultants, Inc. has completed the authorized geotechnical investigation for the above referenced project in Ashe County, North Carolina. The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations and to provide general construction considerations based on the subsurface conditions.

1.0 SITE DESCRIPTION

The project site is located in the south central portion of Ashe County between the rural communities of Fleetwood and Brownwood, approximately 2 miles north of the Watauga County/Ashe County line, and approximately 1.8 miles north of the intersection of SR 1102 (Brownwood Road) and SR 1106 (Railroad Grade Road) at the approximate location shown on the Site Vicinity Map (Drawing No. 1) located behind this report. The site and project description of the proposed project is "Bridge No. 85 over Mill Creek on SR 1106 (Railroad Grade Road)". The existing and proposed bridges cross Mill Creek approximately 50 feet upstream

from where Mill Creek empties into the South Fork of New River. Topographically, the site slopes relatively steeply down towards Mill Creek from both ends of the existing bridge, and relatively steeply down from west to east across the site (towards the South Fork of the New River). The floodplain at the location of the existing bridge appears to be approximately 220 feet wide. The topography of the general site vicinity is mountainous.

At the time of this investigation, a three-span bridge (existing Bridge No. 85) was present at the location of the proposed bridge. The centerline of the proposed bridge will be located approximately 1 foot right of the centerline of the existing bridge at the location of the proposed End Bent-1, and approximately 3 feet right of the centerline of the existing bridge at the proposed End Bent-2. The existing bridge consists of an asphalt covered timber deck supported by timber beams between the end bents and interior bents, and steel I-beams between the interior bents. Wood and concrete piles and concrete footings support the superstructure. The existing bridge is approximately 85 feet in length and approximately 19 feet (out-to-out) in width.

The creek water surface elevation surveyed by Trigon on September 7, 2005 was ±2893 feet. According to the Bridge Survey and Hydraulic Report, the normal creek water surface elevation is 2891.6 feet, the 10-year floodwater surface elevation is 2896.9 feet, the 50-year floodwater surface elevation is 2898.3 feet, the 100-year flood elevation is 2899.0 feet, and the 500-year flood elevation is 2900.5 feet. A moderate amount of debris, including trees and limbs, was present during this exploration against the upstream (left) side of Bent-2 of the existing bridge.

2.0 PROJECT DESCRIPTION

Proposed for construction is a new, single-span structure to replace the existing Bridge No. 85 on SR 1106 (Railroad Grade Road over Mill Creek). Information for the proposed bridge structure was obtained from the Bridge Survey & Hydraulic Design Report dated February 25, 2005, and the Preliminary General Drawing dated April 2005. Both the Bridge Survey & Hydraulic Design Report and the Preliminary General Drawing were provided to Trigon by the NCDOT. The proposed bridge will be 100 feet in length and approximately 27.3 feet in width (out to out). A skew angle of 93°52'17" is proposed for End Bent-1, while a skew angle of 85°07'43" is proposed for End Bent-2. The proposed grade along the -L- centerline of the new bridge will remain essentially unchanged from the existing grade. Excavation of the End Bent-1 and End Bent-2 embankment slopes is proposed between the old and new abutments. This excavation will involve both horizontal and vertical excavation, with vertical excavation extending to approximately 2 feet below the existing top-of-soil at the -L- centerline. Total excavation quantities of approximately 45 cubic yards at End

Bent-1 and approximately 30 cubic yards at End Bent-2 are anticipated. Slopes on the order of 1.5(H):1(V) are proposed for the new embankment slopes.

The Bridge Survey & Hydraulic Design Report and the Preliminary General Drawing are in English units with feet as the primary unit of length.

3.0 SCOPE OF INVESTIGATION

3.1 FIELD TESTING

The NCDOT Asheville Geotechnical Field Office, in January 2005, performed a subsurface investigation for widening the existing road to 36 feet and constructing a retaining wall 200 feet in length along the right side of the roadway. A total of five soil test borings were performed as part of the NCDOT's subsurface investigation. One of these five borings (Boring 3 as originally drilled, Boring DOT EB2-B as included in this report) was drilled in the vicinity of the proposed End Bent-2 of the proposed bridge replacement. The boring and coring data from Boring DOT EB2-B of the NCDOT's exploration is included in this report, and the location of that NCDOT soil test boring is shown on the Boring Identification Diagram (Drawing No. 2) which follows this report.

The as-drilled locations for the soil test borings performed by Trigon for the investigation were located by personnel from Trigon using the existing bridge for reference. All of the drilled borings were offset in towards the -L- centerline from the proposed end-of-bent locations due to trees and/or thick brush and/or relatively steep slopes. Elevations at the as-drilled boring locations, along the existing ground surface at the bent locations, and along the structure profile were surveyed by personnel from Trigon using the BM #2 benchmark elevation (Elevation 2906.47 feet) established by an NCDOT survey crew as a reference point.

Trigon's subsurface investigation for the proposed bridge was conducted between September 1 and September 9, 2005. This exploration consisted of three soil test borings: two (TEB1-A and TEB1-B) at the proposed End Bent-1 location, and one (TEB2-A) at the proposed End Bent-2 location. As-drilled soil test boring locations are shown on the Boring Identification Diagram (Drawing No. 2) following this report.

The NCDOT's soil test boring included in this report (DOT EB2-B) was drilled using a CME 550 drilling machine equipped with a 140-pound automatic hammer. Trigon's borings for this project were drilled with a truck-mounted Acker AD II drilling machine equipped with a 140-pound manual hammer. All of Trigon's soil

test borings were advanced through soil utilizing 0.33-foot tricone/wash-drilling techniques with creek water alone as the drilling fluid. Boring Logs and coring logs are located following this report.

Standard Penetration Tests were performed in the soil and weathered rock materials in the soil test borings in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil and weathered rock samples were recovered for visual classification and potential laboratory testing.

Rock coring was performed at all four bridge borings in order to evaluate the nature of the weathered rock/crystalline rock. The cored weathered rock/crystalline rock from Trigon's borings was returned to our laboratory for further classification and possible testing. The rock coring performed by the NCDOT utilized NX size coring equipment, while the rock coring performed by Trigon was performed with an HQ or NQ size hollow double-tube core barrel. Creek water alone was used as the drilling fluid during the rock coring performed by Trigon.

3.2 LABORATORY TESTING

Laboratory soil testing was performed by the NCDOT on two representative split-barrel samples from Boring DOT EB2-B (Boring 3) as part of their previous investigation at the site. Laboratory soil testing was performed by Trigon on three representative split-barrel samples and four grab samples (two from the streambed and two from the stream bank) to aid in the assessment of AASHTO soil classification and to provide data for evaluation of engineering properties. The laboratory testing on the samples tested by Trigon consisted of Natural Moisture Content, Atterberg Limit, and grain size analysis with hydrometer. In addition, two Unconfined Compressive Strength (Qu only) tests were performed by Trigon on selected samples of the recovered rock core from our borings. Laboratory tests were performed in general accordance with AASHTO and NCDOT specifications. The results of the soil and rock laboratory tests are included on Sheet 21. Laboratory results of the rock testing are also included under separate cover in Appendix A.

3.3 SITE GEOLOGY

The site of the proposed project is located in the Blue Ridge Belt of the Blue Ridge Physiographic Province of North Carolina. According to The Geology of the Carolinas published by the Carolina Geological Society in l991, the Blue Ridge "consists of a series of crystalline thrust sheets, each with different tectonic histories". Also according to The Geology of the Carolinas, the stratigraphy of the Blue Ridge in North Carolina consists of "continental basement rocks and a series of clastic sequences reflecting events of late Precambrian continental rifting and subsequent development of early Paleozoic continental platform".

According to the 1985 Geologic Map of North Carolina, the site is located in an area generally consisting of muscovite-biotite gneiss interlayered and gradational with mica schist, minor amphibolite, and hornblende gneiss. Six rock outcrops are present within close proximity to the existing/proposed bridge. In addition, Railroad Grade Road cuts through rock both north and south of the existing/proposed bridge. Foliation within these existing rock cuts dips down in a westerly to easterly direction at an angle of 55° to 65°.

The crystalline rock encountered in our test borings generally consisted of moderately weathered to fresh, moderately hard to very hard mica schist. The crystalline rock cored ranged in quality from very poor to very good with the majority of the crystalline rock encountered being fair to good. The overlying residual soils at the site are the product from the physical and chemical weathering of the underlying crystalline rock.

3.4 FOUNDATION MATERIALS

The generalized subsurface conditions indicated by the borings are described below. For soil descriptions and general stratification at a particular boring location, the respective Boring Log should be reviewed. For rock descriptions and stratification at a particular boring location, the respective Coring Log should be reviewed. The Boring Identification Diagram, Boring Logs, Coring Logs, and Core Photographs are located behind this report. Representative subsurface cross-sections at each bent location and a subsurface profile along the structure are also included behind this report. The subsurface properties for the project site are described below.

Foundation materials encountered at the site included roadway embankment fill, alluvial soils, residual soils, weathered rock, and crystalline rock.

Roadway embankment fill was encountered beginning at the existing ground surface at all four borings drilled for the bridge structure. The fill extends to depths of between ±7 and ±10 feet (Elevations ±2904 feet to ±2901 feet) at End Bent-1, and to depths of between ±5 and ±6 feet (Elevations ±2906 feet to ±2905 feet) at End Bent-2. The roadway embankment fill encountered generally consists of loose to medium dense, silty, coarse to fine sand (A-2-4); and stiff, clayey, coarse to fine sandy silt (A-4). Trace amounts of mica and gravel are common within the fill material, and a trace of organic material in the form of root fragments was present within the fill material at Boring TEB1-B. Standard Penetration Resistance values of 5 to 15 blows per foot (bpf) were encountered within the roadway embankment fill.

Alluvial soil was encountered underlying the roadway embankment fill at Boring DOT EB2-B. The alluvial soil extends to a depth of ±11 feet (Elevation ±2899 feet), and consists of very soft to medium stiff, clayey, coarse to fine sandy silt (A-4). Standard Penetration Resistance values within the alluvial soil ranged from 0 to 6 blows per foot (bpf).

Residual soils were encountered underlying the alluvium at Boring DOT EB1-B. The residual soil extends to a depth of ±14 feet (Elevation ±2896 feet), and consists of dense, saprolitic, silty, coarse to fine sand (A-2-4) with a little rock fragments and a trace of clay. A Standard Penetration Resistance value of 33 bpf was encountered within the residual soil.

Weathered rock was encountered underlying the roadway embankment fill at Borings TEB1-A, TEB1-B, and TEB2-A. Weathered rock was not encountered at Boring DOT EB2-B. The weathered rock generally consists of mica schist. The weathered rock was encountered between the following depths and elevations: 9.5 feet to 13.3 feet (Elevations 2900.9 feet to 2897.1 feet) at Boring TEB1-A; 6.5 feet to 8.5 feet (Elevations 2903.9 feet to 2901.9 feet) at Boring TEB1-B; and 5.0 feet to 5.6 feet (Elevations 2905.6 feet to 2905.0 feet) at Boring TEB2-A.

Crystalline rock was encountered underlying the weathered rock at Borings TEB1-A, TEB1-B, and TEB2-A, and directly underlying the residual soil at Boring DOT EB2-B. The crystalline rock generally consists of mica schist. The crystalline rock was encountered at the following depths and elevations: 13.3 feet (Elevation 2897.1 feet) at TEB1-A, 8.5 feet (Elevation 2901.9 feet) at TEB1-B, 5.6 feet (Elevation 2905.0 feet) at TEB2-A, and 14.0 feet (Elevation 2896.2 feet) at DOT EB2-B.

Between ±13 and ±19 feet of weathered rock/crystalline rock was cored at each of the structure borings drilled for this project. In general, the cored weathered rock is severely weathered, soft to medium hard mica schist. Strata recovery (REC) values within the weathered rock ranged from 0 to 29 percent. In general, the cored crystalline rock is moderately weathered to fresh, moderately hard to very hard mica schist with very close to wide fracture spacing. Strata (REC) values within the crystalline rock ranged from 54 to 100 percent and strata Rock Quality Designation (RQD) values ranged from 0 to 96 percent.

3.5 GROUNDWATER

Groundwater was encountered in all three of the borings drilled by Trigon for this project. Groundwater was not measured in the NCDOT boring (DOT EB2-B) drilled for this project. The groundwater elevation ranged from ±2898 feet to ±2892 feet. The creek water surface elevation of Mill Creek surveyed by Trigon on September 7, 2005 was ±2893 feet. According to the Bridge Survey and Hydraulic Report, the normal creek water surface elevation is 2891.6 feet, the 10-year floodwater surface elevation is 2896.9 feet, the 50-year floodwater surface elevation is 2898.3 feet, the 100-year flood elevation is 2899.0 feet, and the 500-year flood elevation is 2900.5 feet.

4.0 NOTES TO THE DESIGNER

Boulders, while not encountered within the borings performed for this project, were visible within the abutment slope on the right side of the existing End Bent-2. These boulders appear to be up to three-foot in diameter, and were close enough to the drilled location of Boring DOT EB2-B to allow boring backfill material to escape from between the boulders thus preventing the backfilling of Boring DOT EB2-B.

5.0 CLOSURE

The geotechnical investigation, analysis, and general construction considerations included in this report are based on the Bridge Survey & Hydraulic Design Report, the Preliminary General Drawing, and the data obtained from our field and laboratory-testing program. If the proposed location and geometry, or finished grades are changed or are different from those outlined above, or if subsurface conditions are encountered during construction which differ from those indicated by our borings, we will require the opportunity to review these changed conditions and make any necessary modifications to the general conditions presented in this report.

Cross-sections and profiles are a generalized interpretation of soil conditions between borings and should not be considered accurate other than at the boring locations. Subsurface conditions between boring locations or elsewhere on the site may vary, and subsurface anomalies may exist which were not detected.

Trigon Engineering Consultants, Inc. appreciates the opportunity to be of service to the NCDOT on this project. Should you have any questions concerning this report, please feel free to contact the undersigned.

Respectfully submitted,

TRIGON ENGINEERING CONSULTANTS, INC.

Paul M. Weaver, P.G.
Registered North Carolina No. 1500

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

10/25/05

Jeffrey R. Vinson, P.G.
Senior Project Manager

PMW/JRV:pmw

Attachments

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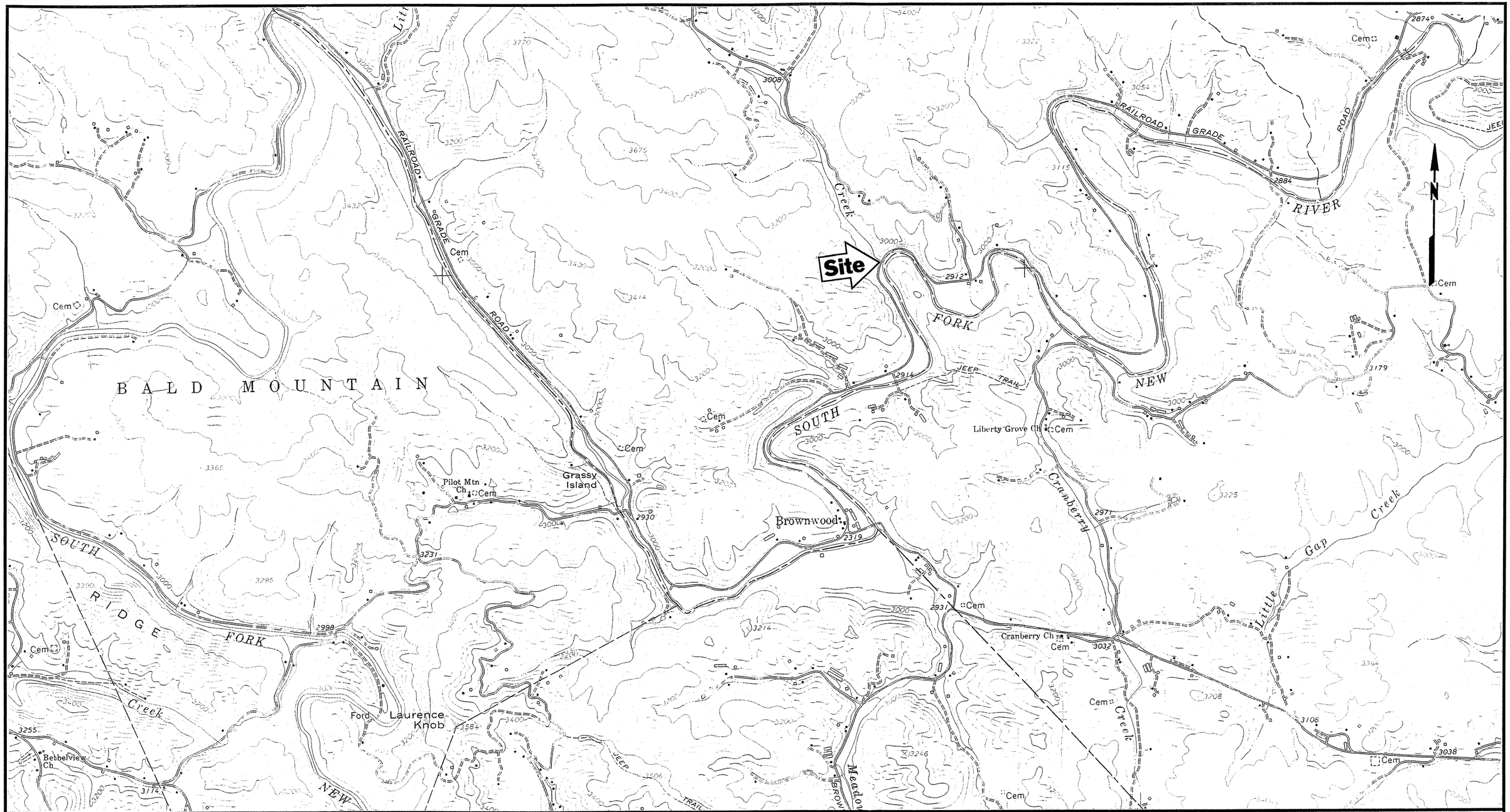


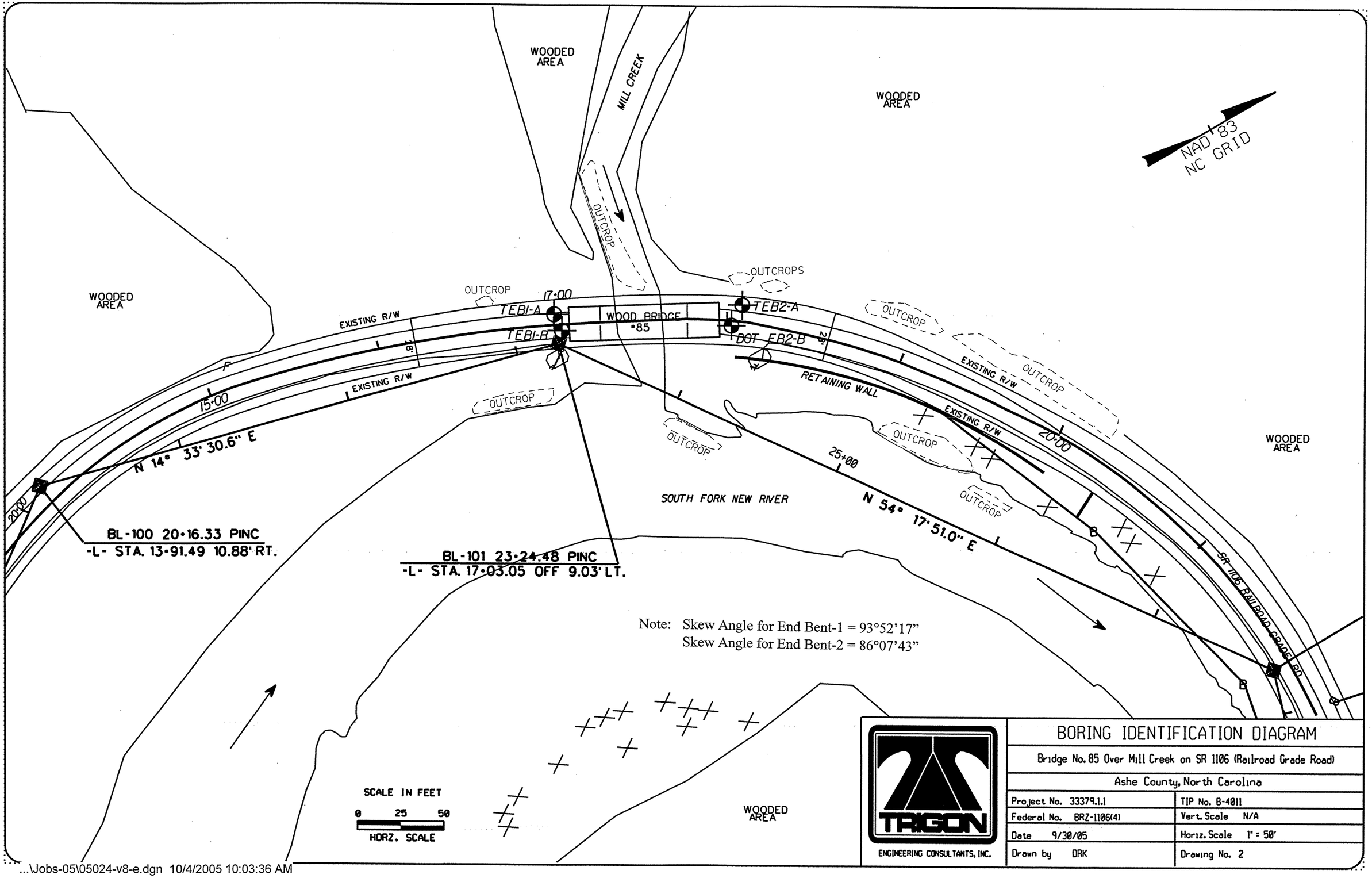
SCALE: 1 = 24,000	**DATE:** 9/21/05	**STATE PROJECT NO.** 33379.1.1	**TIP NO.:** B-4011

SITE VICINITY MAP
Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

USGS Todd Quadrangle

DRAWING NUMBER: 1

TRIGON
Trigon Engineering Consultants, Inc.
Greensboro North Carolina



TRIGON
ENGINEERING CONSULTANTS, INC.

BORING IDENTIFICATION DIAGRAM

Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

Ashe County, North Carolina

Project No. 33379.1.1	TIP No. B-4011
Federal No. BRZ-1106(4)	Vert. Scale N/A
Date 9/30/05	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 2

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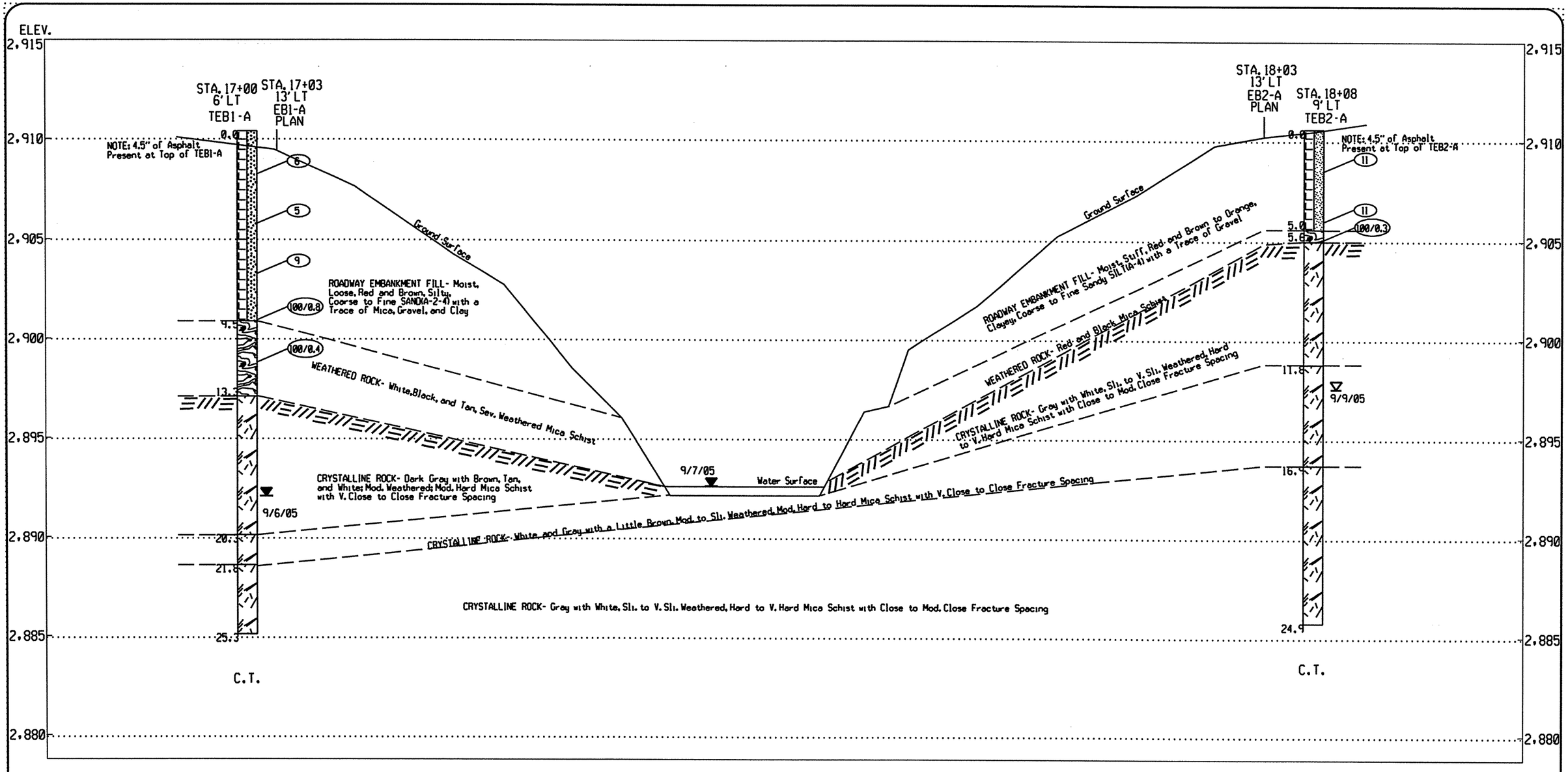

SCALE IN FEET

0 2.5 5

VERT. SCALE

0 5 10

HORZ. SCALE

TRIGON

ENGINEERING CONSULTANTS, INC.

PROFILE 13' LEFT OF -L-

Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

Ashe County, North Carolina

Project No. 33379.1.1	TIP No. B-4011
Federal No. BRZ-1106(4)	Vert. Scale 1" = 5'
Date 9/30/05	Horiz. Scale 1" = 10'
Drawn by DRK	Drawing No. 3

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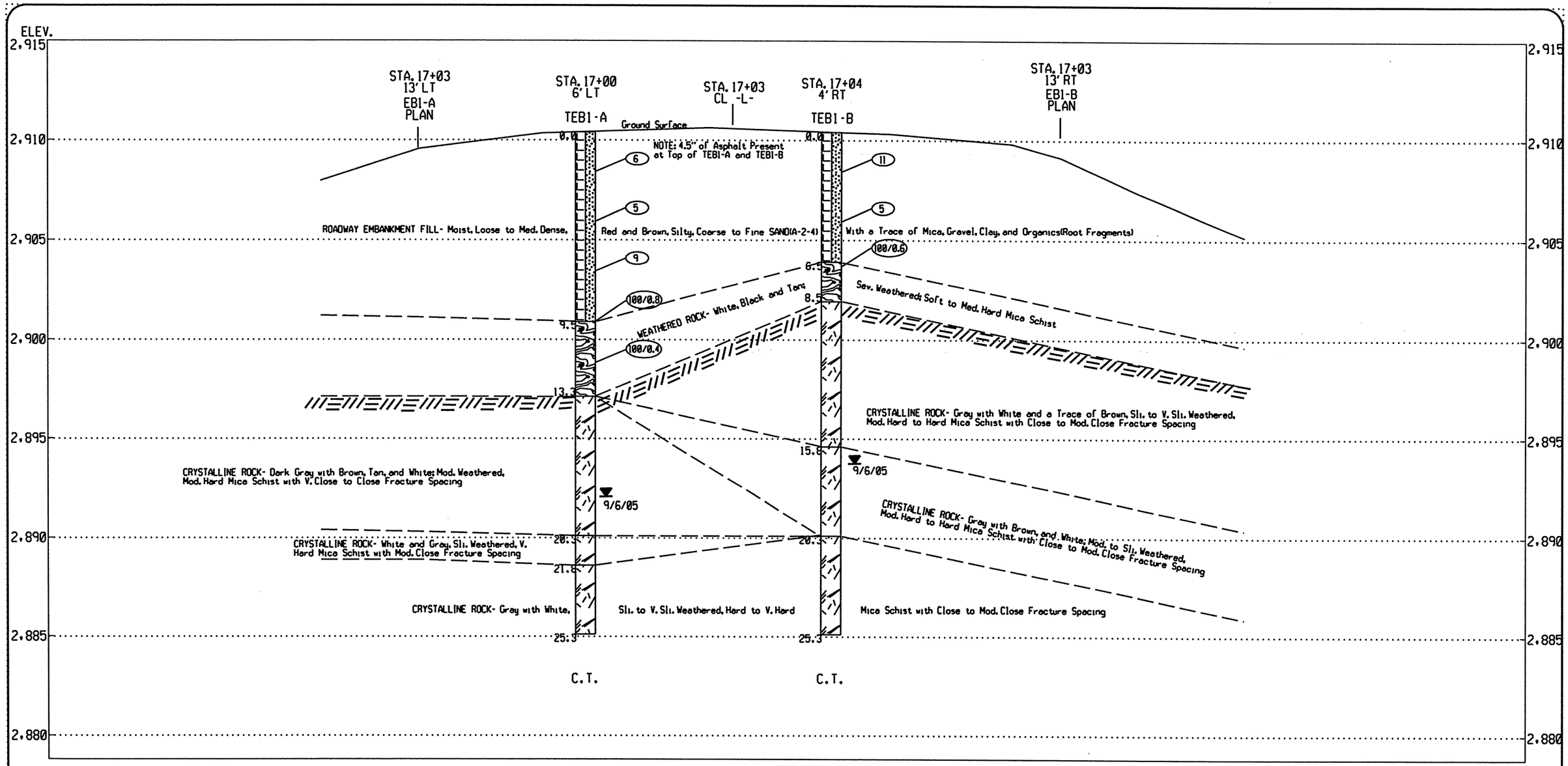

SCALE IN FEET

0 2.5 5

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON

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CROSS-SECTION ALONG END BENT-1

Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

Ashe County, North Carolina

Project No. 33379.1.1	TIP No. B-4011
Federal No. BRZ-1106(4)	Vert. Scale 1" = 5'
Date 9/30/05	Horiz. Scale 1" = 4'
Drawn by DRK	Drawing No. 4

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ELEV.

STA. 18+03
13' LT
EB2-A
PLAN

STA. 18+08
9' LT
TEB2-A

STA. 18+03
CL -L-

STA. 18+02
3' RT
DOT EB2-B

STA. 18+03
13' RT
EB2-B
PLAN

Ground Surface

NOTE: Approximately 4.5" of Asphalt Present at Top of TEB2-A and DOT EB2-B

ROADWAY EMBANKMENT FILL- Moist, Stiff, Red and Brown to Orange, Clayey, Coarse to Fine Sandy SILT(A-4) with a Trace of Gravel

ROADWAY EMBANKMENT FILL- Med. Dense, Orange to Brown, Silty, Coarse to Fine SAND(A-2-4) with Gravel

ALLUVIAL- Moist, V. Soft to Med. Stiff, Brown to Orange-Brown, Clayey, Coarse to Fine Sandy SILT(A-4)

Coarse to Fine SAND(A-2-4) with a Little Rock Fragments and a Trace of Clay

WEATHERED ROCK- Red and Brown Mica Schist

RESIDUAL- Dense, Orange to Gray, Saprolitic

CRYSTALLINE ROCK- Gray with White, Sli. to V. Sli. Weathered, Hard to V. Hard Mica Schist with Close to Mod. Close Fracture Spacing

CRYSTALLINE ROCK- Gray with White and a Little Brown, Mod. to Sli. Weathered, Mod. Hard to Hard Mica Schist with Close Fracture Spacing

CRYSTALLINE ROCK- No Description Given

CRYSTALLINE ROCK- White and Gray, Sli. to V. Sli. Weathered, Hard to V. Hard Mica Schist with Close to Mod. Close Fracture Spacing

CRYSTALLINE ROCK- Gray, Fresh, Hard Mica Schist with Mod. Close to Wide Fracture Spacing

11
11
(100/0.3)
15
0
6
33
60/0.1

5.0
5.6
5.5
11.5
14.0
16.
16.2
24.
28.

9/9/05

C.T.
C.T.

GROUNDWATER
NOT MEASURED

2.915
2.910
2.905
2.900
2.895
2.890
2.885
2.880

SCALE IN FEET

0 2.5 5
VERT. SCALE

0 2 4
HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

CROSS-SECTION ALONG END BENT-2

Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)

Ashe County, North Carolina

Project No. 33379.1.1	TIP No. B-4011
Federal No. BRZ-1106(4)	Vert. Scale 1" = 5'
Date 9/30/05	Horiz. Scale 1" = 4'
Drawn by DRK	Drawing No. 5

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

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. TEB1-A	**BORING LOCATION** 17+00	**OFFSET** 6ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 2910.4 ft	**NORTHING** 934925	**EASTING** 1248017		**24 HR.** 18.5
TOTAL DEPTH 25.3 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/NQ Core	**HAMMER TYPE** 140lb Manual
DATE STARTED 9/1/05	**COMPLETED** 9/2/05	**SURFACE WATER DEPTH** NA	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2,910.4									2,910.4 0.00
2,909.4	1.0	4	3	3	6		M		ROADWAY EMBANKMENT FILL: Loose, Red and Brown, Silty, Coarse to Fine SAND with a Trace of Mica, Gravel and Clay
2,906.9	3.5	3	2	3	5	SS-T1	M		Note: 4.5" of Asphalt Present at top of Boring
2,904.4	6.0	3	2	7	9		M		
2,901.9	8.5	7	9	91/.3	100/.8				2,900.9 9.5
2,899.1	11.3	100/.4			100/.4				WEATHERED ROCK: White, Black and Tan; Severely Weathered MICA SCHIST
									2,897.1 13.3
									CRYSTALLINE ROCK: Dark Grey with Brown, Tan and White; Moderately Weathered; Moderately Hard MICA SCHIST with Very Close to Close Fracture Spacing
									2,890.1 20.3
									CRYSTALLINE ROCK: White and Grey, Slightly Weathered, Hard MICA SCHIST with Very Close to Close Fracture Spacing 2,888.6 21.8
									CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Very Hard MICA SCHIST with Moderately Close Fracture Spacing 2,885.1 25.3
									Coring Terminated at Elevation 2885.1ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT BORE SINGLE 07105024.GPJ NC_DOT.GDT 10/21/05

CORE BORING REPORT
SHEET 13 OF 28

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. TEB1-A	**BORING LOCATION** 17+00	**OFFSET** 6ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 2910.4 ft	**NORTHING** 934925	**EASTING** 1248017		**24 HR.** 18.5
TOTAL DEPTH 25.3 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/NQ Core	**HAMMER TYPE** 140lb Manual
DATE STARTED 9/1/05	**COMPLETED** 9/2/05	**SURFACE WATER DEPTH** NA	
CORE SIZE NQ	**TOTAL RUN** 15.1 ft	**DRILLER** Toothman	

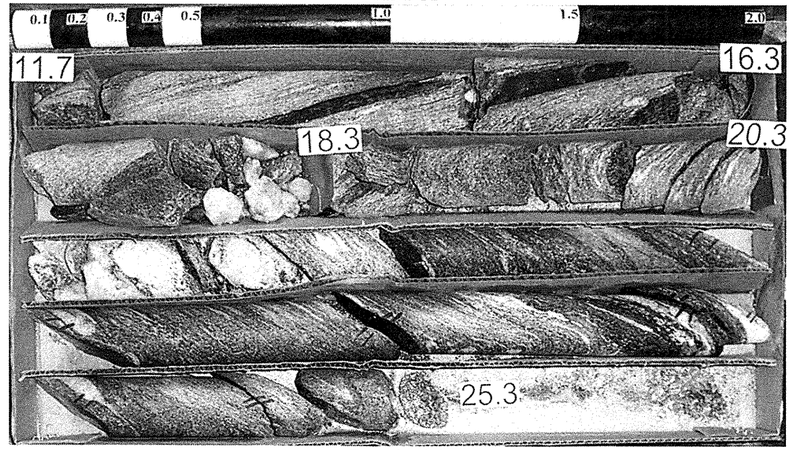
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Begin Coring @ 9.8 ft
2,900.6	9.8	1.5	:15	(0.0)	(NA)		(0.0)	(NA)		2,900.6 Core Loss in WEATHERED ROCK: White, Black and Tan; Severely Weathered MICA SCHIST 9.8
2,899.1	11.3		:10/0.5	0%			0%			
2,898.7	11.7	4.6	N=100/.4	(1.9)	(0.6)					2,897.1 13.3
			:50/0.6	41%	13%		(3.8)	(0.6)		CRYSTALLINE ROCK: Dark Grey with Brown, Tan and White; Moderately Weathered; Moderately Hard MICA SCHIST with Very Close to Close Fracture Spacing
2,894.1	16.3		3:12				54%	9%		
			5:21							Isolated Quartz Rich Zones
2,892.1	18.3	2.0	3:10	(0.7)	(0.0)					Majority of Fractures at 20° - 30° (Parallel to Foliation) with Light Iron Staining
			3:13	35%	0%					High Angle (70° - 80°) Fractures from 13.3ft-15.0ft with Heavy Iron Staining
2,890.1	20.3	2.0	3:15	(1.2)	(0.0)					2,890.1 20.3
			2:33	60%	0%					2,888.6 21.8
		5.0	2:54	(4.4)	(3.2)		(0.9)	(0.0)		Note: Core Block at 18.3ft and 20.3ft
			2:28	88%	64%		60%	0%		CRYSTALLINE ROCK: White and Grey, Slightly Weathered, Hard MICA SCHIST with Very Close to Close Fracture Spacing
			4:44				(3.5)	(3.2)		
			3:51				100%	91%		2,885.1 25.3
			4:53							Majority Is Very Quartz Rich
2,885.1	25.3		4:32							
			5:06							2 Joints at 0°
										3 Joints at 20° - 30°
										CRYSTALLINE ROCK: Grey with White, Very Slightly Weathered to Fresh, Very Hard MICA SCHIST with Moderately Close Fracture Spacing
										All But Last 0.3ft Has Only Mechanical Breaks
										Well Foliated with Foliation Angles from 40° to 70°
										Coring Terminated at Elevation 2885.1ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT CORE SINGLE 07105024C.GPJ NC_DOT.GDT 10/4/05

CORE PHOTOGRAPHS

Bridge No. 85 over Mill Creek on SR 1106 (Rairoad Grade Road)
Ashe County, North Carolina
NCDOT Project No. 33379.1.1 (B-4011)

TEB1-A



Box 1 of 1
Scale = 1:4

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

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. TEB1-B	**BORING LOCATION** 17+04	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 2910.4 ft	**NORTHING** 934925	**EASTING** 1248026		**24 HR.** 16.8
TOTAL DEPTH 25.3 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/NQ & HQ Core	**HAMMER TYPE** 140lb Manual
DATE STARTED 9/2/05	**COMPLETED** 9/8/05	**SURFACE WATER DEPTH** NA	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2,910.4									2,910.4 0.00
2,909.4	1.0	4	6	5	11	SS-T2	M		ROADWAY EMBANKMENT FILL: Medium Dense to Loose, Red and Brown, Silty, Coarse to Fine SAND with a Trace of Mica, Gravel and Organics (Root Fragments)
2,906.9	3.5	2	2	3	5		M		
2,904.4	6.0	13	75	25/.1	100/.6				2,903.9 Note: 4.5" of Asphalt Present at Top of Boring 6.5
									WEATHERED ROCK: White, Black and Tan; Severely Weathered; Soft to Medium Hard MICA SCHIST 8.5
						RS-1			CRYSTALLINE ROCK: Grey with White and a Trace of Brown, Slightly to Very Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
									2,894.6 15.8
									CRYSTALLINE ROCK: Grey with Brown and White, Moderately to Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close to Moderately Close Fracture Spacing 20.3
									2,890.1
									CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
									2,885.1 25.3
									Coring Terminated at Elevation 2885.1ft in CRYSTALLINE ROCK: MICA SCHIST

CORE BORING REPORT

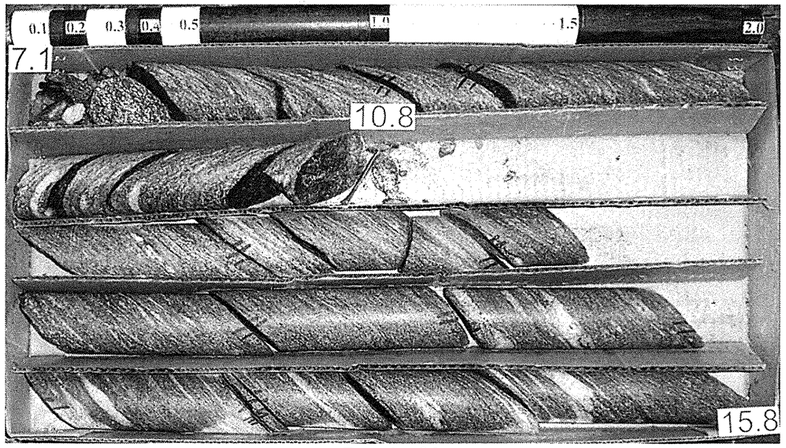
PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe		**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)				**GROUND WATER (ft)**
BORING NO. TEB1-B	**BORING LOCATION** 17+04	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 2910.4 ft	**NORTHING** 934925	**EASTING** 1248026		**24 HR.** 16.8
TOTAL DEPTH 25.3 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/NQ & HQ Core		**HAMMER TYPE** 140lb Manual
DATE STARTED 9/2/05	**COMPLETED** 9/8/05	**SURFACE WATER DEPTH** NA		
CORE SIZE NQ	**TOTAL RUN** 18.2 ft	**DRILLER** Toothman		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	LOG	DESCRIPTION AND REMARKS
										Begin Coring @ 7.1 ft
2,903.3	7.1	3.7	:17	(2.6)	(1.2)		(0.4)	(NA)		2,903.3 WEATHERED ROCK: White, Black and Tan MICA SCHIST 7.1
			2:58	70%	32%		29%			2,901.9 CRYSTALLINE ROCK: Grey with White and a Trace of Brown, Slightly to Very Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close to Moderately Close Fracture Spacing 8.5
2,899.6	10.8		5:27			RS-1	(7.1)	(5.8)		
			4:02/0.7				97%	79%		Well Foliated
		5.0	3:36	(4.9)	(4.6)					Majority of Fractures at 35° - 40° Parallel to Foliation with Some Iron Staining
			4:34	98%	92%					Isolated Light Iron Staining of Rock Fabric 15.8
2,894.6	15.8		5:28							2,894.6 CRYSTALLINE ROCK: Grey with Brown and White, Moderately to Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
			5:03							
		5.0	3:20	(4.6)	(3.6)		(4.1)	(3.1)		
			1:08	92%	72%		91%	69%		2,890.1 20.3
2,889.6	20.8		2:18							Well Foliated
			2:30							Very Quartz Rich 16.8ft-17.8ft
			2:22							4 Joints at 20°-30° with Moderate Iron Staining
		4.5	2:00	(4.5)	(4.0)		(5.0)	(4.5)		3 Joints at 0°-10° with Heavy Iron Staining
			2:10	100%	89%		100%	90%		3 joints at 35°-45° Parallel to Foliation with Heavy Iron Staining 25.3
2,885.1	25.3		3:02							2,885.1 CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
			3:05							
			2:28							Well Foliated
			1:08/0.5							Majority of Fractures at 30°-40° Parallel to Foliation
										Very Close Fracture Spacing at 24.6ft-24.9ft
										Note: Run Cut Short Due to Rock Not Recovered from Previous Run
										Coring Terminated at Elevation 2885.1ft in CRYSTALLINE ROCK: MICA SCHIST

CORE PHOTOGRAPHS

Bridge No. 85 over Mill Creek on SR 1106 (Rairoad Grade Road)
Ashe County, North Carolina
NCDOT Project No. 33379.1.1 (B-4011)

TEB1-B



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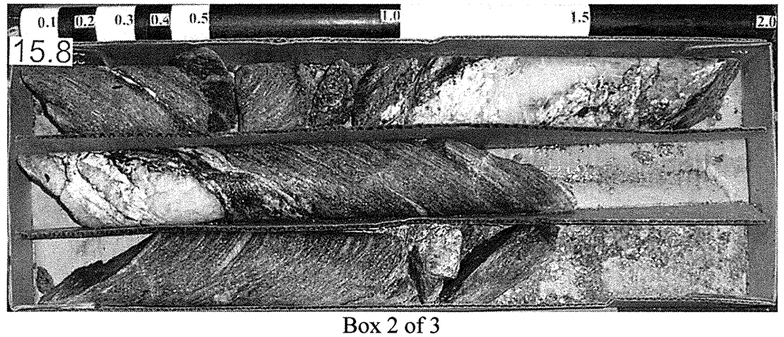
Scale = 1:4

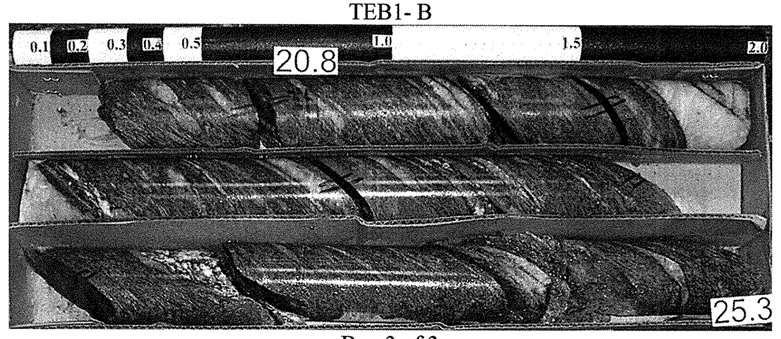


Box 2 of 3
Scale = 1:4

CORE PHOTOGRAPHS

Bridge No. 85 over Mill Creek on SR 1106 (Rairoad Grade Road)
Ashe County, North Carolina
NCDOT Project No. 33379.1.1 (B-4011)

TEB1- B



Box 3 of 3
Scale = 1:4

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

PAGE 1 OF 1

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. TEB2-A	**BORING LOCATION** 18+08	**OFFSET** 9ft LT	**ALIGNMENT** -L-	**0 HR.** 13.0
COLLAR ELEV. 2910.6 ft	**NORTHING** 935022	**EASTING** 1248065		**24 HR.** NM
TOTAL DEPTH 24.9 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/HQ Core	**HAMMER TYPE** 140lb Manual	
DATE STARTED 9/9/05	**COMPLETED** 9/9/05	**SURFACE WATER DEPTH** NA		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2,910.6									2,910.6 0.00
2,909.6	1.0						M		ROADWAY EMBANKMENT FILL: Stiff, Red and Brown to Orange, Clayey, Coarse to Fine Sandy SILT with a Trace of Gravel
2,907.1	3.5	5	5	6	11 11	SS-T3	24.1%		Note: 4.5" of Asphalt Present at Top of Boring 5.0
2,905.3	5.3	3	3	8	100/.3				2,905.0 5.6 WEATHERED ROCK: Red and Black MICA SCHIST
		100/.3				RS-2			CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
									2,898.8 11.8 CRYSTALLINE ROCK: Grey with White and a Little Brown, Moderately to Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close Fracture Spacing
									2,893.7 16.9 CRYSTALLINE ROCK: White with Grey, Slightly to Very Slightly Weathered, Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture Spacing
									2,885.7 24.9 Coring Terminated at Elevation 2885.7ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT BORE SINGLE 07105024.GPJ NC_DOT.GDT 10/21/05

CORE BORING REPORT
SHEET 17 OF 28

PAGE 1 OF 1

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** Licayan/Weaver
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. TEB2-A	**BORING LOCATION** 18+08	**OFFSET** 9ft LT	**ALIGNMENT** -L-	**0 HR.** 13.0
COLLAR ELEV. 2910.6 ft	**NORTHING** 935022	**EASTING** 1248065		**24 HR.** 13.0
TOTAL DEPTH 24.9 ft	**DRILL MACHINE** Acker AD-II	**DRILL METHOD** Wash Rotary/HQ Core	**HAMMER TYPE** 140lb Manual	
DATE STARTED 9/9/05	**COMPLETED** 9/9/05	**SURFACE WATER DEPTH** NA		
CORE SIZE HQ	**TOTAL RUN** 19.3 ft	**DRILLER** Toothman		

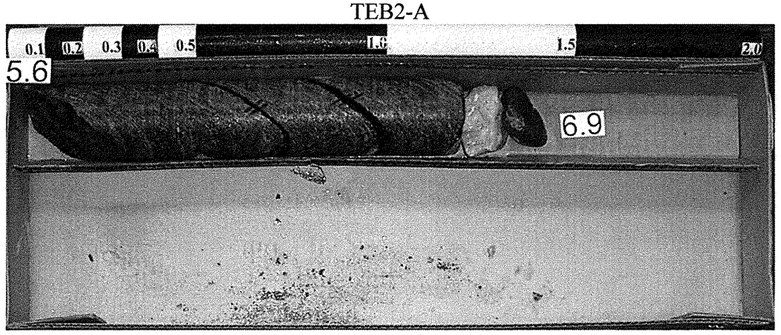
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Begin Coring @ 5.6 ft
2,905.0	5.6	1.3	3:17	(1.2) 92%	(1.0) 77%		(6.1) 98%	(5.3) 85%		2,905.0 CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture Spacing 5.6
2,903.7	6.9	5.0	:44/0.3			RS-2				
			2:27	(5.0) 100%	(4.3) 86%					Majority of Fractures at 30°-40° Parallel to Foliation
			2:58							
2,898.7	11.9		2:44							2,898.8 Very Broken from 11.3ft-11.6ft Due to Extraction from Core Barrel 11.8
			2:45							
		5.0	2:35	(4.7) 94%	(3.5) 70%		(4.8) 94%	(3.5) 69%		CRYSTALLINE ROCK: Grey with White and a Little Brown, Moderately to Slightly Weathered, Moderately Hard to Hard MICA SCHIST with Close Fracture Spacing
			2:00							
			2:22							
2,893.7	16.9		2:08							2,893.7 16.9
			1:36							Some Iron Staining of Rock Fabric
		5.0	1:59	(4.9) 98%	(3.9) 78%		(7.8) 98%	(6.5) 81%		Majority of Fractures at 30° - 40° Parallel to Foliation with Iron Staining
			1:54							5 Joints at 10° - 20° with Iron Staining
			1:48							Very Close Fracture Spacing and Some Core Loss from 15.1ft-15.3ft and
2,888.7	21.9		2:02							16.3ft-16.6ft
			2:27							CRYSTALLINE ROCK: White with Grey, Slightly to Very slightly Weathered,
		3.0	2:31	(2.9) 97%	(2.6) 87%					Hard to Very Hard MICA SCHIST with Close to Moderately Close Fracture
2,885.7	24.9		2:16							2,885.7 Spacing 24.9
			2:32							
			3:35							Majority of Fractures at 20° - 30° Parallel to Foliation
										Very Close Fracture Spacing 17.9ft-18.0ft; 18.3ft-18.5ft; and 24.5ft-24.6ft
										Coring Terminated at Elevation 2885.7ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT CORE SINGLE 07105024C.GPJ NC_DOT.GDT 10/4/05

CORE PHOTOGRAPHS

Bridge No. 85 over Mill Creek on SR 1106 (Rairoad Grade Road)
Ashe County, North Carolina
NCDOT Project No. 33379.1.1 (B-4011)

TEB2-A



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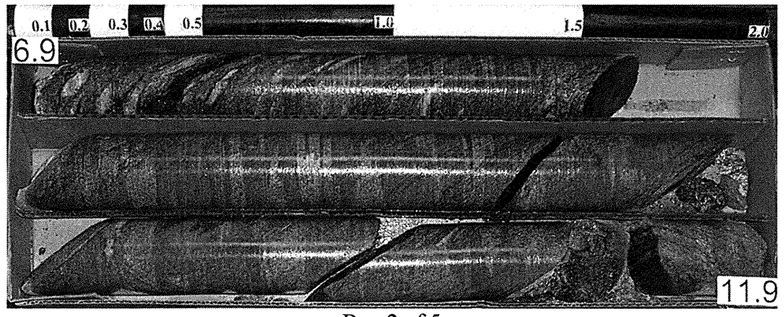
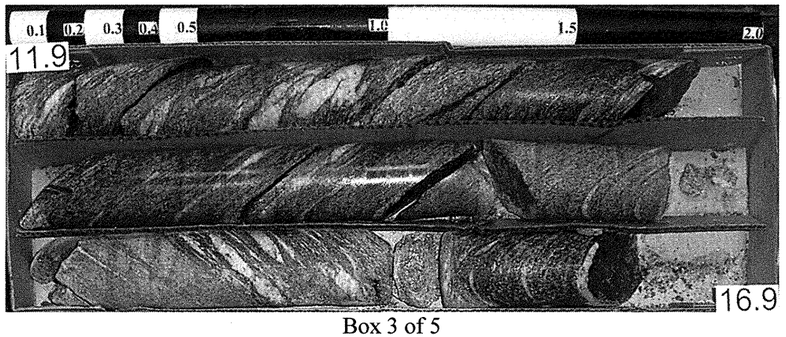
Scale = 1:4



Box 2 of 5
Scale = 1:4

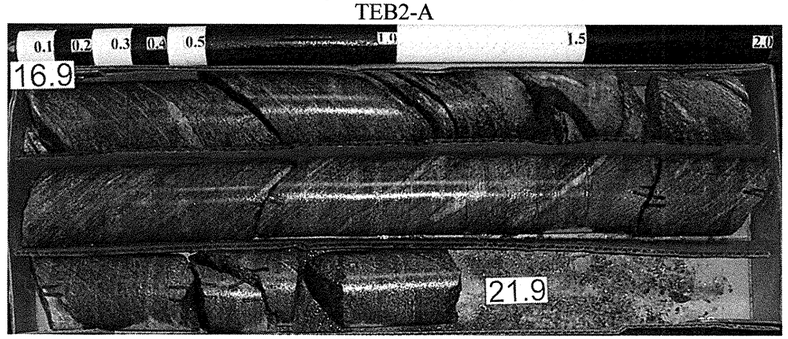


Box 3 of 5
Scale = 1:4

CORE PHOTOGRAPHS

Bridge No. 85 over Mill Creek on SR 1106 (Rairoad Grade Road)
Ashe County, North Carolina
NCDOT Project No. 33379.1.1 (B-4011)

TEB2-A



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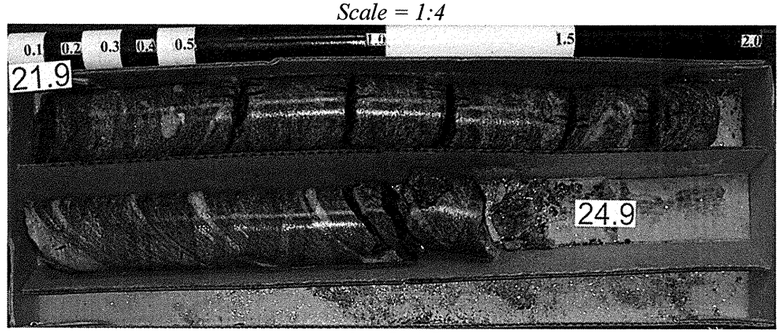


Box 5 of 5
Scale = 1:4

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

PAGE 1 OF 1

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** L.L. Acker
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)			**GROUND WATER (ft)**
BORING NO. DOT EB2-B	**BORING LOCATION** 18+02	**OFFSET** 3ft RT	**ALIGNMENT** -L-	**0 HR.** NA
COLLAR ELEV. 2910.2 ft	**NORTHING** 935011	**EASTING** 1248072		**24 HR.** NA
TOTAL DEPTH 28.9 ft	**DRILL MACHINE** CME550	**DRILL METHOD** Wash Rotary	**HAMMER TYPE** 140lb Manual	
DATE STARTED 1/12/05	**COMPLETED** 1/12/05	**SURFACE WATER DEPTH** NA		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2,910.2									2,910.2 0.00
2,905.7	4.5	2	11	4	15				ROADWAY EMBANKMENT FILL: Medium Dense, Orange to Brown, Silty, Coarse to Fine SAND with Gravel
2,903.2	7.0	0	0	0	0				2,904.7 5.5
2,900.7	9.5	1	3	3	6	SS-DS4			ALLUVIAL: Very Soft to Medium Stiff, Brown to Orange Brown, Clayey, Coarse to Fine Sandy SILT
2,898.2	12.0	6	12	21	33	SS-DS5			2,898.9 11.3
2,895.7	14.5	60/.1			60/.1				RESIDUAL: Dense, Orange to Grey, Saprolitic, Silty, Coarse to Fine SAND with a Little Rock Fragments and a Trace of Clay 2,896.2 14.0
									CRYSTALLINE ROCK: No Description Provided 2,894.0 16.2
									CRYSTALLINE ROCK: Grey, Fresh, Hard, MICA SCHIST with Moderately Close to Wide Fracture Spacing
									2,881.3 28.9
									Coring Terminated at Elevation 2881.3ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT BORE SINGLE 07105024.GPJ NC_DOT.GDT 10/4/05

CORE BORING REPORT

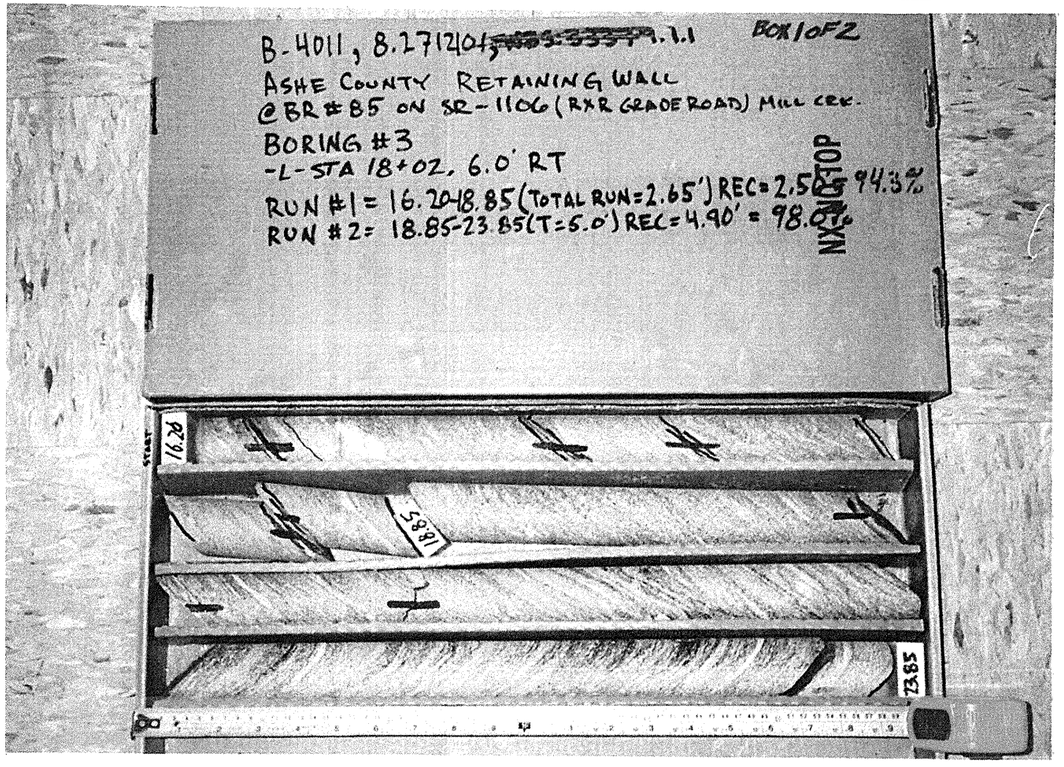
SHEET 19 OF 28

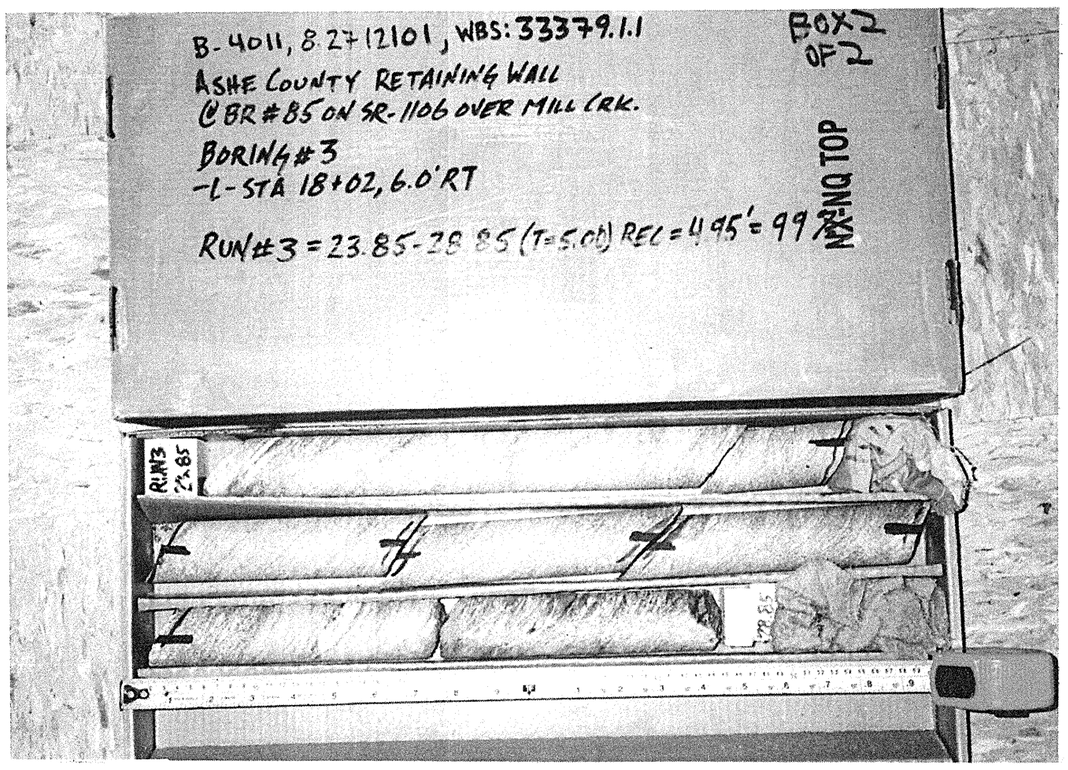
PAGE 1 OF 1

PROJECT NO. 33379.1.1	**ID No.** B-4011	**COUNTY** Ashe	**GEOLOGIST** L.L.Acker	
SITE DESCRIPTION Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)				**GROUND WATER (ft)**
BORING NO. DOT EB2-B	**BORING LOCATION** 18+02	**OFFSET** 3ft RT	**ALIGNMENT** -L-	**0 HR.** NA
COLLAR ELEV. 2910.2 ft	**NORTHING** 935011	**EASTING** 1248072		**24 HR.** NA
TOTAL DEPTH 28.9 ft	**DRILL MACHINE** CME550	**DRILL METHOD** Wash Rotary	**HAMMER TYPE** 140lb Manual	
DATE STARTED 1/12/05	**COMPLETED** 1/12/05	**SURFACE WATER DEPTH** NA		
CORE SIZE NX	**TOTAL RUN** 12.7 ft	**DRILLER**		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Begin Coring @ 16.2 ft
2,894.0	16.2	2.7		(2.5) 91%	(2.5) 91%		(11.8) 93%	(11.7) 92%		2,894.0 CRYSTALLINE ROCK: Grey, Fresh, Hard MICA SCHIST with Moderately Close to Wide Fracture Spacing 16.2
2,891.3	18.9	5.0		(4.6) 92%	(4.4) 88%					4 Pieces with Longest Piece being 7ft 4 Joints Parallel to Foliation at 60° with a Little Iron Staining
2,886.3	23.9	5.0		(4.8) 96%	(4.8) 96%					
2,881.3	28.9									2,881.3 28.9
										Coring Terminated at Elevation 2881.3ft in CRYSTALLINE ROCK: MICA SCHIST

NCDOT CORE SINGLE 07105024C.GPJ NC_DOT.GDT 10/4/05


B-4011, 8.2712101, WBS: 33379.1.1
BOX 1 OF 2
ASHE COUNTY RETAINING WALL
@ BR #85 ON SR-1106 (RXR GRADE ROAD) MILL CRK.
BORING #3
-L- STA 18+02, 6.0' RT
RUN #1 = 16.20-18.85 (TOTAL RUN=2.65') REC=2.50' = 94.3%
RUN #2 = 18.85-23.85 (T=5.0') REC=4.90' = 98.0%
NW END TOP
START
16.20
18.85
23.85


B-4011, 8.2712101, WBS: 33379.1.1
BOX 2 OF 2
ASHE COUNTY RETAINING WALL
@ BR #85 ON SR-1106 OVER MILL CRK.
BORING #3
-L- STA 18+02, 6.0' RT
RUN #3 = 23.85-28.85 (T=5.0') REC = 4.95' = 99%
NW END TOP
RUN 3
23.85
28.85

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 33379.1.1
TIP NO.: B-4011
F.A. NO.: BRZ-1106(4)
COUNTY: Ashe
DESCRIPTION: Bridge No. 85 over Mill Creek on SR 1106 (Railroad Grade Road)

Sample #	Boring #	Depth (ft.)	Rock Type	Geologic Map Unit	Run RQD	Length (ft.)	Diameter (ft.)	Dry Density (lbs/cu. ft.)	Unconfined Compressive Strength (psi)	Maximum Load (lbs.)	Loading Rate (in./min.)
RS-1	TEB1-B	9.5-9.8	Mica Schist	Zatm	79%	0.3276	0.1666	172.2	1,490	4,680	0.009
RS-2	TEB2-A	7.5-7.9	Mica Schist	Zatm	86%	0.4158	0.2083	165.9	3,453	16,940	0.009

State Project No. 33379.1.1
TIP No. B-4011 F.A. No. BRZ-1106(4)
Bridge No. 85 over Mill Creek SR 1106 (Railroad Grade Road
Ashe County, North Carolina
SUMMARY OF LABORATORY TEST DATA

						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
TEB1-A	3.5-5.0	SS-T1	-	A-2 4 (0)	5	31	NP	NP	93	76	35	69	30	36	25	9
TEB1-B	1.0-2.5	SS-T2	-	A-2-4 (0)	11	20	NP	NP	94	77	30	74	32	40	22	6
TEB2-A	3.5-5.0	SS-T3	24.1	A-4 (2)	11	34	28	6	97	86	53	50	18	30	21	31
DOT EB2-B	9.5-11.0	SS-DS4		A-4 (2)	33	32	NP	NP	100	98	45	64	9	55	14	22
DOT EB2-B	12.0-13.5	SS-DS5		A-2-4 (0)	60	34	NP	NP	81	68	17	13	33	54	9	4
SBK-1	0.0-0.5	G-1	-	A-2-4 (0)	NA	25	NP	NP	95	86	23	81	24	56	20	0
SBK-2	0.0-0.5	G-2	-	A-2-4 (0)	NA	21	NP	NP	100	87	12	91	35	56	6	3
SBD-1	0.0-0.5	G-3	-	A-3 (0)	NA	25	NP	NP	99	73	8	94	51	43	3	3
SBD-2	0.0-0.5	G-4	-	A-1-a (0)	NA	NA	NA	NA	26	2	0	100	98	2	0	0

* SS = Split-Spoon Sample (ASTM-D-1586)
** G = Grab Sample
***ST=Shelby Tube (Undisturbed) Sample
NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-05-024
Page: 1 of 1

Note: "SS-T_" are samples collected by Trigon during their subsurface investigation at the site
"SS-DS_" are samples collected by the NCDOT Asheville Field Office during their subsurface investigation at the site
"SBK" indicates stream bank samples
"SBD" indicates stream bed samples
Note: Sample G-4 did not consist of enough material passing the #40 sieve to allow for Atterberg Limits testing

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 33379.1.1 ID: B-4011 COUNTY: Ashe

F.A. Number: BRZ-1106(4)

DESCRIPTION(1): Bridge No. 85 over Mill Creek on SR 1106 (Railroad Grade Road)

INFORMATION ON EXISTING BRIDGES Information obtained from: X field inspection
___ microfilm(Reel: ___ Pos: ___)
X other Bridge Survey and Hydraulic Design Report

COUNTY BRIDGE NO. 85 BRIDGE LENGTH 85 NO. BENTS IN: CHANNEL 0 FLOOD PLAIN 4

FOUNDATION TYPE: Timber deck with asphalt surface supported by wood and concrete vertical supports with timber abutments

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: None observed

INTERIOR BENTS: None observed

CHANNEL BED: Sand bar adjacent to Bent-1, some scour pockets present where exposed rock redirects flow

CHANNEL BANKS: None observed on west bank; east bank has minor undercutting causing slope failure

EXISTING SCOUR PROTECTION:

TYPE(3): Vegetation on embankment slopes

EXTENT(4): Covers majority of slopes

EFFECTIVENESS(5): Appears to be effective

OBSTRUCTIONS(6) (DAMS,DEBRIS,ETC.): Debris in the form of small limbs present against upstream side of Bent-2

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): Fine to coarse SAND (A-3); and GRAVEL and coarse SAND (A-1-a)

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): Variably silty, coarse to fine SAND (A-2-4); and clayey, coarse to fine sandy SILT (A-4)

CHANNEL BANK COVER(9): Hardwood, brush, and grass/weeds with some exposed rock

FLOOD PLAIN WIDTH(10): Approximately 220 feet

FLOOD PLAIN COVER(11): Hardwood, brush, and grass/weeds

DESIGN INFORMATION CONT. PAGE 2

STREAM IS X DEGRADING ___ AGGRADING (12)

OTHER OBSERVATIONS AND COMMENTS: ___

CHANNEL MIGRATION TENDENCY (13): Migration potential appears to be towards End Bent-2

REPORTED BY: Paul M Wen DATE: 9/21/2005
Trigon Engineering Consultants, Inc.

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (14): ___

The Geotechnical Unit agrees with theoretical scour shown on the Bridge Survey and Hydraulic Design Report dated 2/25/05.

REPORTED BY: Paul M Wen DATE: 10/12/2005
NCDOT GEOTECHNICAL UNIT

INSTRUCTIONS

(1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
(2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.)
(3) NOTE ANY EXISTING SCOUR PROTECTION (RIP RAP, ETC.)
(4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
(5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
(6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
(7) DESCRIBE THE CHANNEL BED MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(8) DESCRIBE THE CHANNEL BANK MATERIAL: A SAMPLE SHOULD BE TAKEN 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.)
(12) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING
(13) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE LATERALLY DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
(14) GIVE THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION EXPECTED 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 ELEVATION 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.

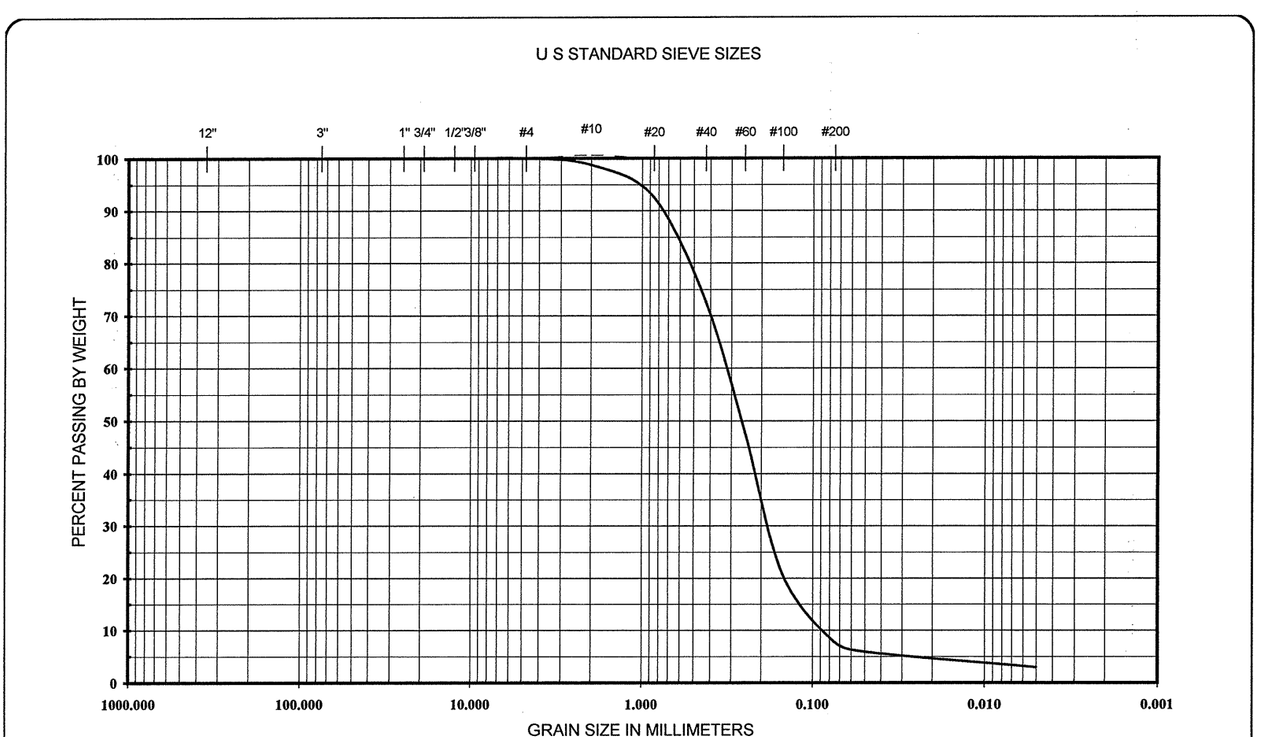
WBS ELEMENT #: 33379.1.1

TIP #: B-4011

COUNTY: Ashe

DESCRIPTION: Bridge No. 85 over Mill Creek on SR 1106 (Railroad Grade Road)

	CHANNEL BED MATERIAL		CHANNEL BANK MATERIAL			
SAMPLE #	G-3	G-4	SS-T2	SS-T3	G-1	G-2
RETAINED #4	0%	42%	4%	1%	4%	0%
PASSING #10	99%	26%	94%	97%	95%	100%
PASSING #40	73%	2%	77%	86%	86%	87%
PASSING #200	8%	0%	30%	53%	23%	12%
COARSE SAND	51%	98%	32%	18%	24%	35%
FINE SAND	43%	2%	40%	30%	56%	56%
SILT	3%	0%	22%	21%	20%	6%
CLAY	3%	0%	6%	31%	0%	3%
LL	25	NA	20	34	25	21
PI	NP	NA	NP	6	NP	NP
AASHTO CLASSIFICATION	A-3 (0)	A-1-a (0)	A-2-4 (0)	A-4 (2)	A-2-4 (0)	A-2-4 (0)
STATION	17+45	17+60	17+04	18+08	17+31	17+70
OFFSET	8' LT	6' RT	4' RT	9' LT	12' LT	7' RT
DEPTH (Feet)	0.0-0.5	0.0-0.5	1.0-2.5	3.5-5.0	0.0-0.5	0.0-0.5



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBD-1	G-3	0.0-0.5	NA	25	NP	NP	ALLUVIAL: Fine to Coarse SAND (A-3)

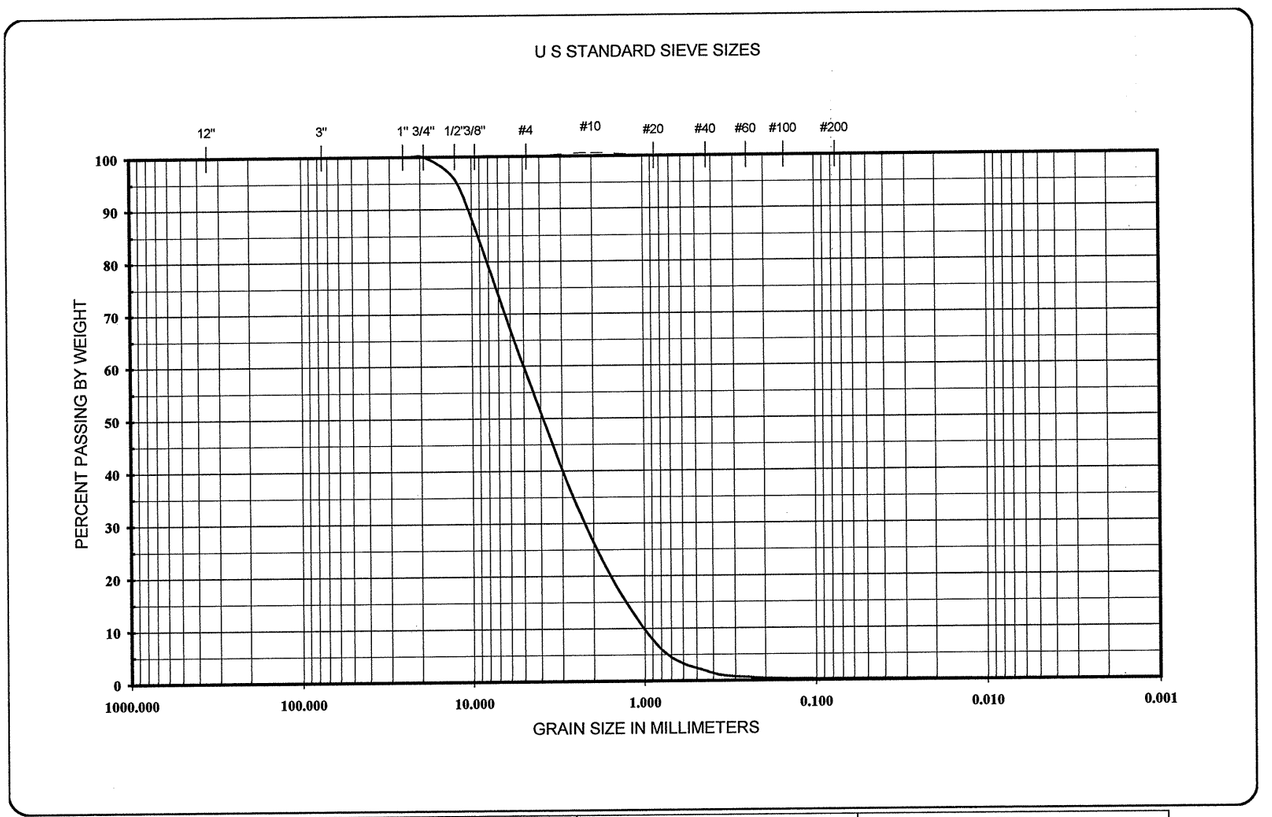
GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

071-05-024

9/23/2005

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

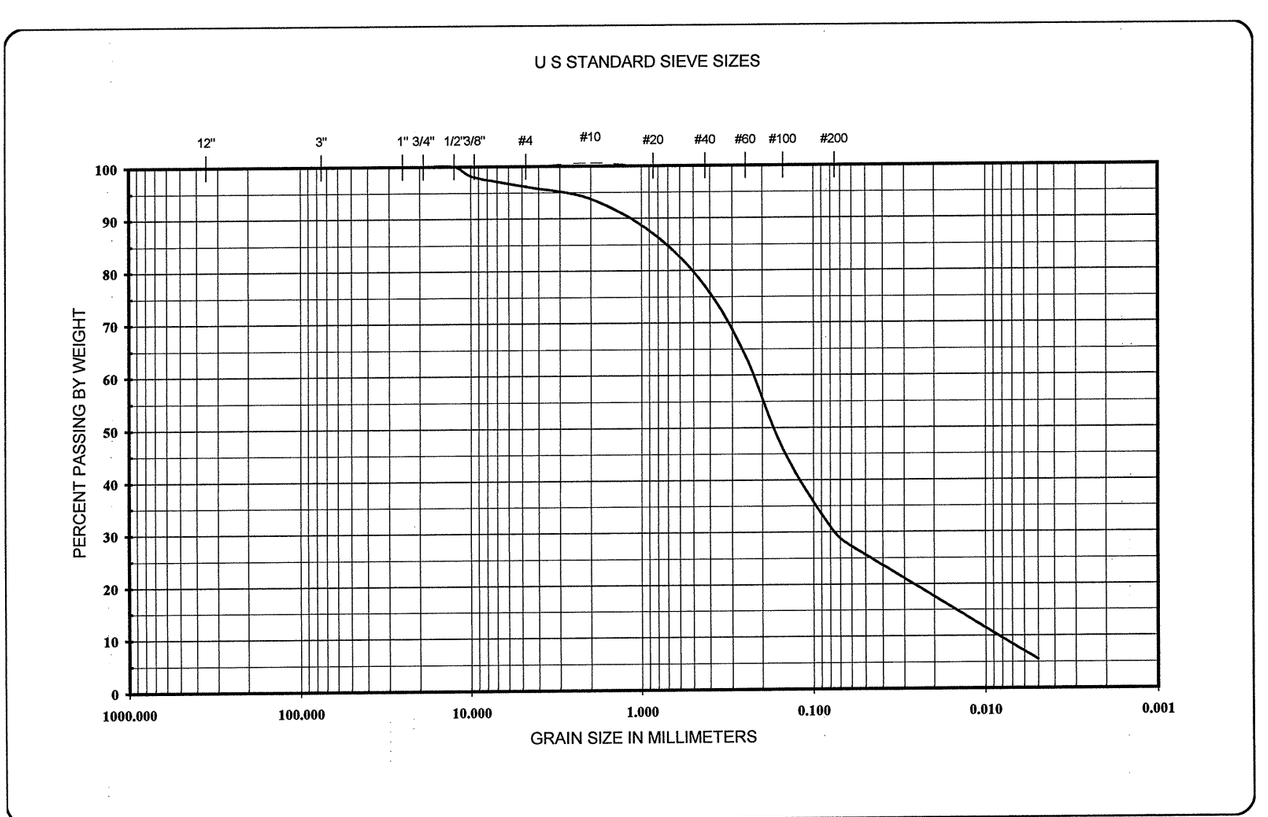
BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBD-2	G-4	0.0-0.5	NA	NA	NA	NA	ALLUVIAL: GRAVEL and Coarse SAND (A-1-a)

GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

071-05-024

9/23/2005



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

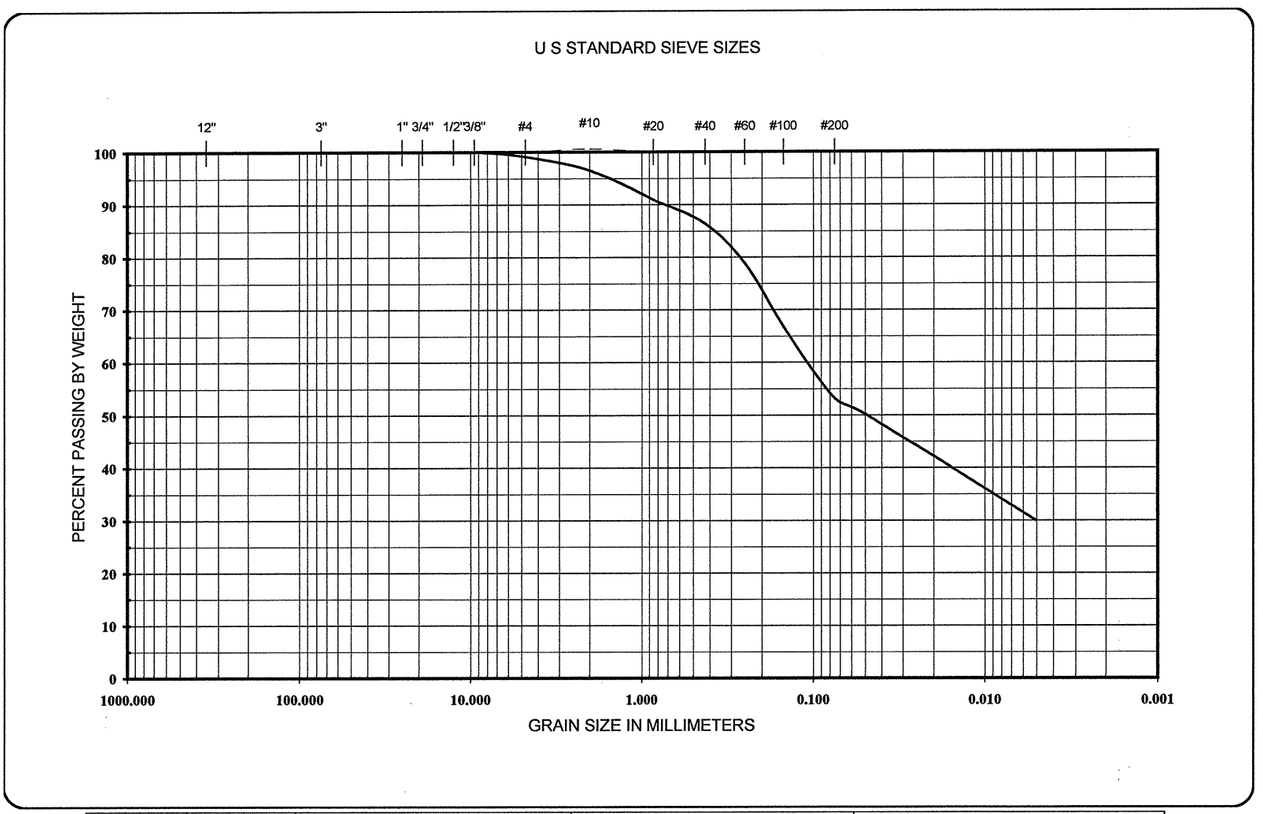
BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
TEB1-B	SS-T2	1.0-2.5	NA	20	NP	NP	ROADWAY EMBANKMENT FILL: Silty, Coarse to Fine SAND (A-2-4)

GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

071-05-024

10/3/2005



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

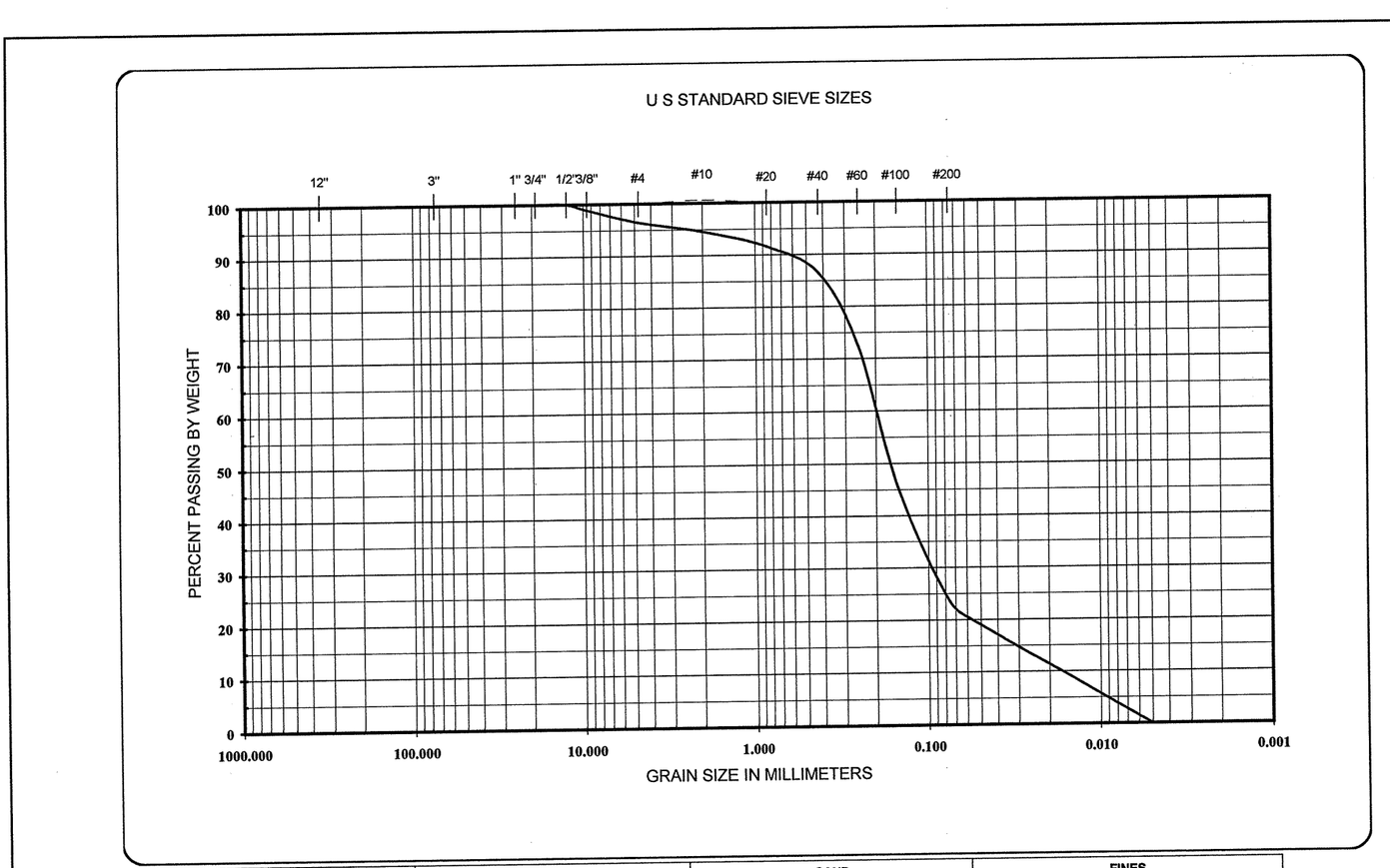
BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
TEB2-A	SS-T3	3.5-5.0	24.1	34	28	6	ROADWAY EMBANKMENT FILL: Clayey, Coarse to Fine Sandy SILT (A-4)

GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

071-05-024

10/3/2005



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

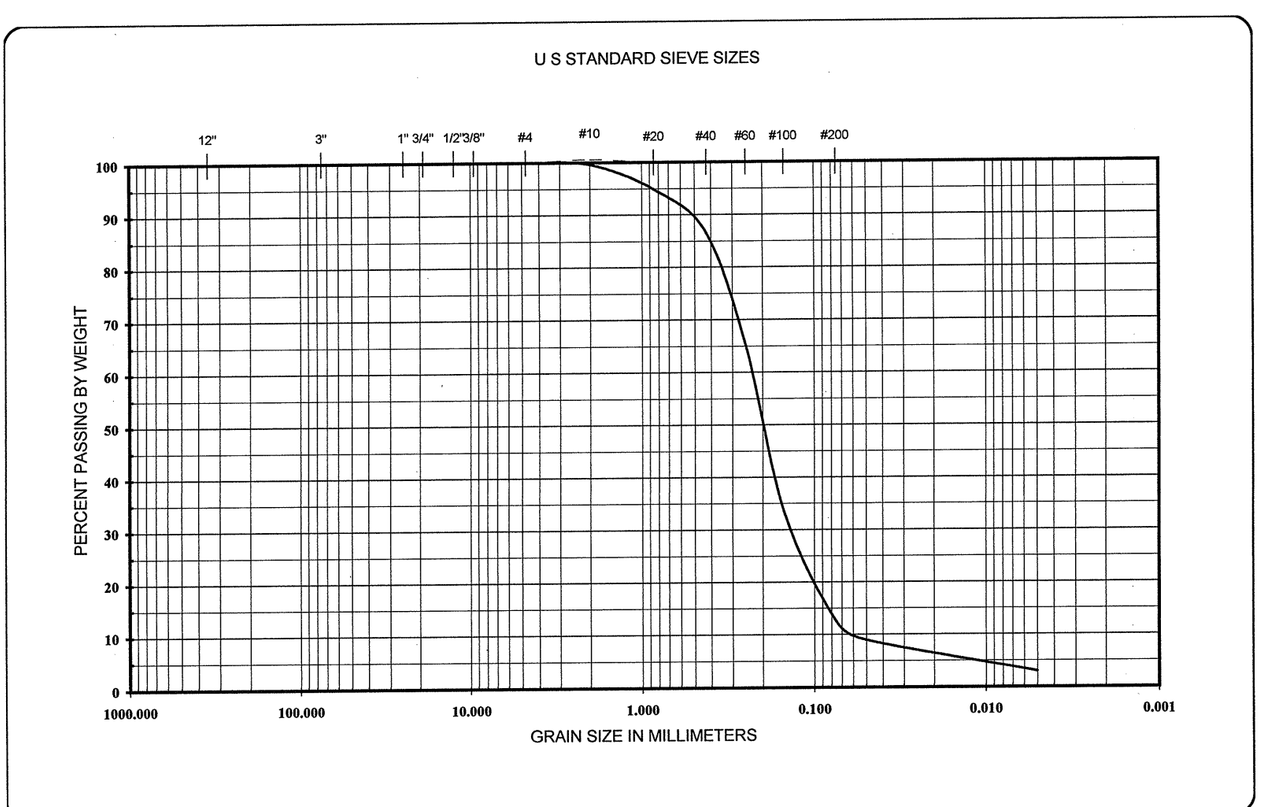
BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBK-1	G-1	0.0-0.5	NA	25	NP	NP	ALLUVIAL: Silty, Coarse to Fine SAND (A-2-4)

GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

071-05-024

9/23/2005



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBK-2	G-2	0.0-0.5	NA	21	NP	NP	ALLUVIAL: Coarse to Fine SAND (A-2-4)

GRAIN SIZE DISTRIBUTION

Bridge 85 (B-4011)

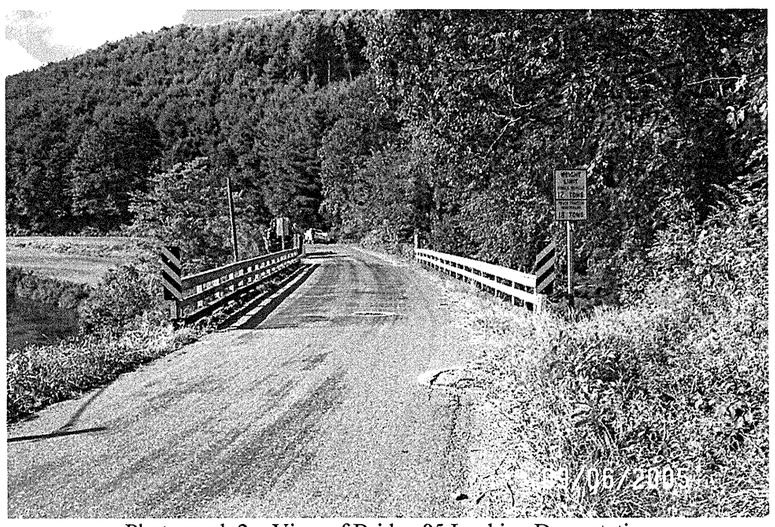
071-05-024

9/23/2005

TRIGON

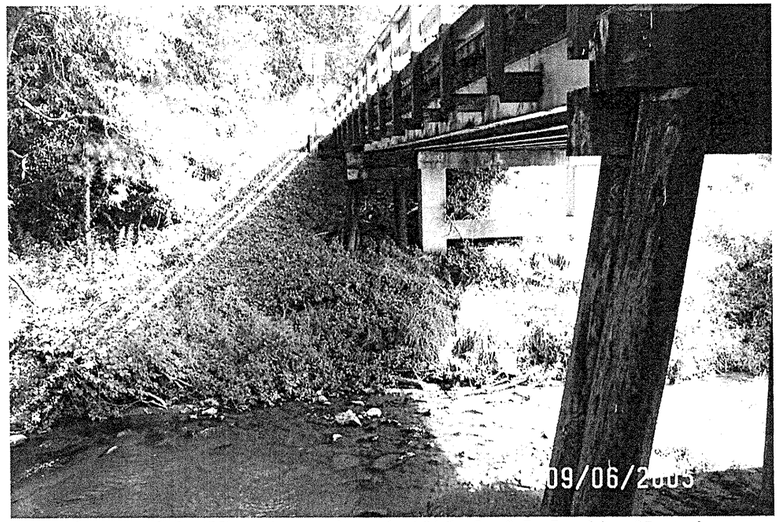
SITE PHOTOGRAPHS
State Project No. 33379.1.1 TIP No. B-4011
Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)
Ashe County, North Carolina
Page 1 of 4

Photograph 1 – View of Bridge 85 Looking Upstation



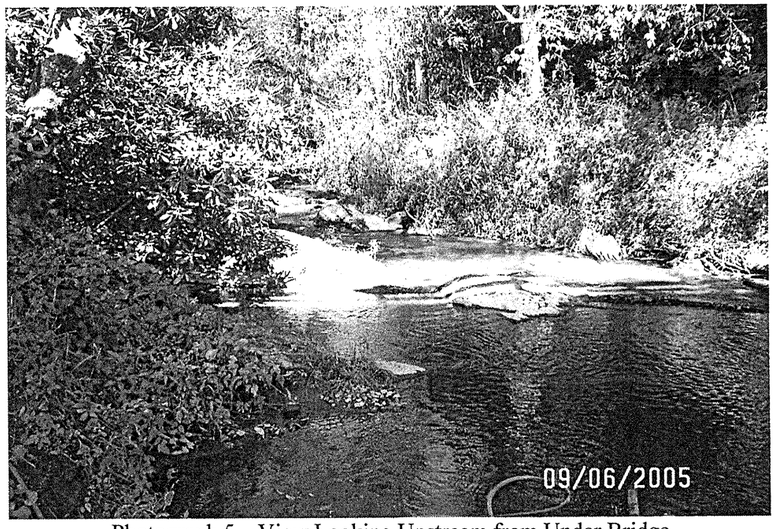
Photograph 2 – View of Bridge 85 Looking Downstation

SITE PHOTOGRAPHS
State Project No. 33379.1.1 TIP No. B-4011
Bridge No. 85 Over Mill Creek on SR 1106 (Railroad Grade Road)
Ashe County, North Carolina
Page 2 of 4



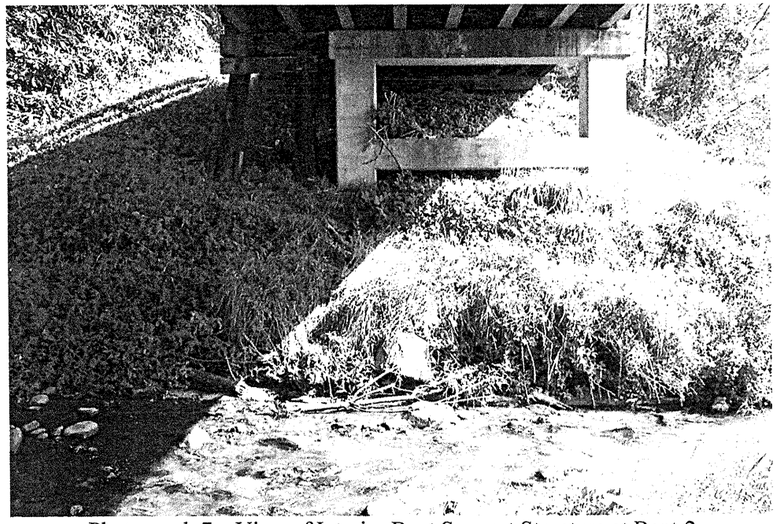
Photograph 3 – View Approximately 13' Left of -L- Looking Upstation

Photograph 4 – View Looking Downstream from Under Bridge



Photograph 5 – View Looking Upstream from Under Bridge

Photograph 6 – View of Interior Bent Support Structure at Bent-1



Photograph 7 – View of Interior Bent Support Structure at Bent-2

Photograph 8 – View of Boulders with Prominent Voids Near EB2-B