

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33703.1.1 B-4446	1	8

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33703.1.1 B-4446 F.A. PROJ. BRZ-2105(1)  
COUNTY BUNCOMBE  
PROJECT DESCRIPTION BRIDGE NO. 227 ON SR 2105 (PLEASANT GROVE RD.) OVER REEMS CREEK

SITE DESCRIPTION \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CONTENTS**

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**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

**PROJECT: 33703.1.1**  
**ID: B-4446**

PERSONNEL  
M.M. HAGER

D.O. CHEEK

G.K. ROSE

INVESTIGATED BY J.W. MANN

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 03/13/09



DRAWN BY: J.W. MANN

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

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

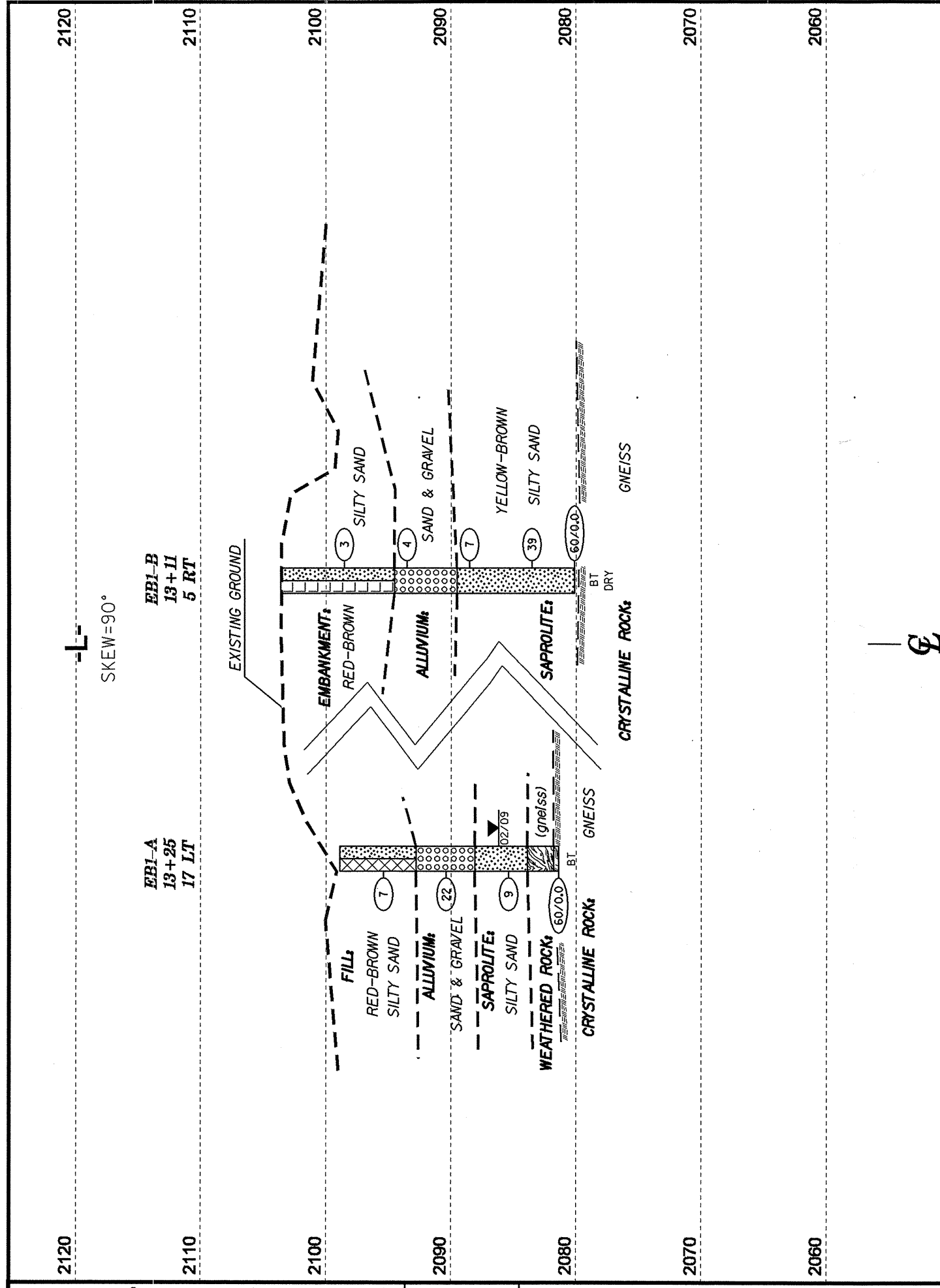
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**

**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																																																																																																																																																																																																										
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES:</p> <p><i>VERY STIFF, GRN, SKY CLR, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>		<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORM</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p><b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b>, <b>SUBANGULAR</b>, <b>SUBROUNDED</b>, OR <b>ROUNDED</b>.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p><b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.</p> <p><b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p><b>ARGILLACEOUS</b> - 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><b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p><b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p><b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p><b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p><b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p><b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p><b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p><b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p><b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p><b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p><b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p><b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p><b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p><b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p><b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p><b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p><b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p><b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (RQD)</b> - 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><b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p><b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p><b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p><b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p><b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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><b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																										
<p><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1"> <tr> <th>GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (&lt;= 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th><th>A-1-b</th><th>A-3</th><th>A-2-4</th><th>A-2-5</th><th>A-2-6</th><th>A-2-7</th> <th>A-4</th><th>A-5</th><th>A-6</th><th>A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> <th colspan="3"></th> </tr> <tr> <th>SYMBOL</th> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td colspan="3"></td> </tr> <tr> <th>% PASSING</th> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <td># 10</td> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <td># 40</td> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <td># 200</td> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <th>LIQUID LIMIT</th> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <th>PLASTIC INDEX</th> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="7"></td> <td colspan="7"></td> <td colspan="3"></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="3">FINE SAND</td> <td colspan="4">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="3">SILTY SOILS</td> <td colspan="4">CLAYEY SOILS</td> <td colspan="3">ORGANIC MATTER</td> </tr> <tr> <th>GEN. 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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>		<p><b>COMPRESSIONIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p> <p>LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50</p>		<p><b>PERCENTAGE OF MATERIAL</b></p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35% AND ABOVE</td> </tr> </table>		ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY				35% AND ABOVE	<p><b>WEATHERING</b></p> <p>FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE</p>		<p><b>WEATHERING</b></p> <p>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i></p> <p>ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i></p> <p>ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>	
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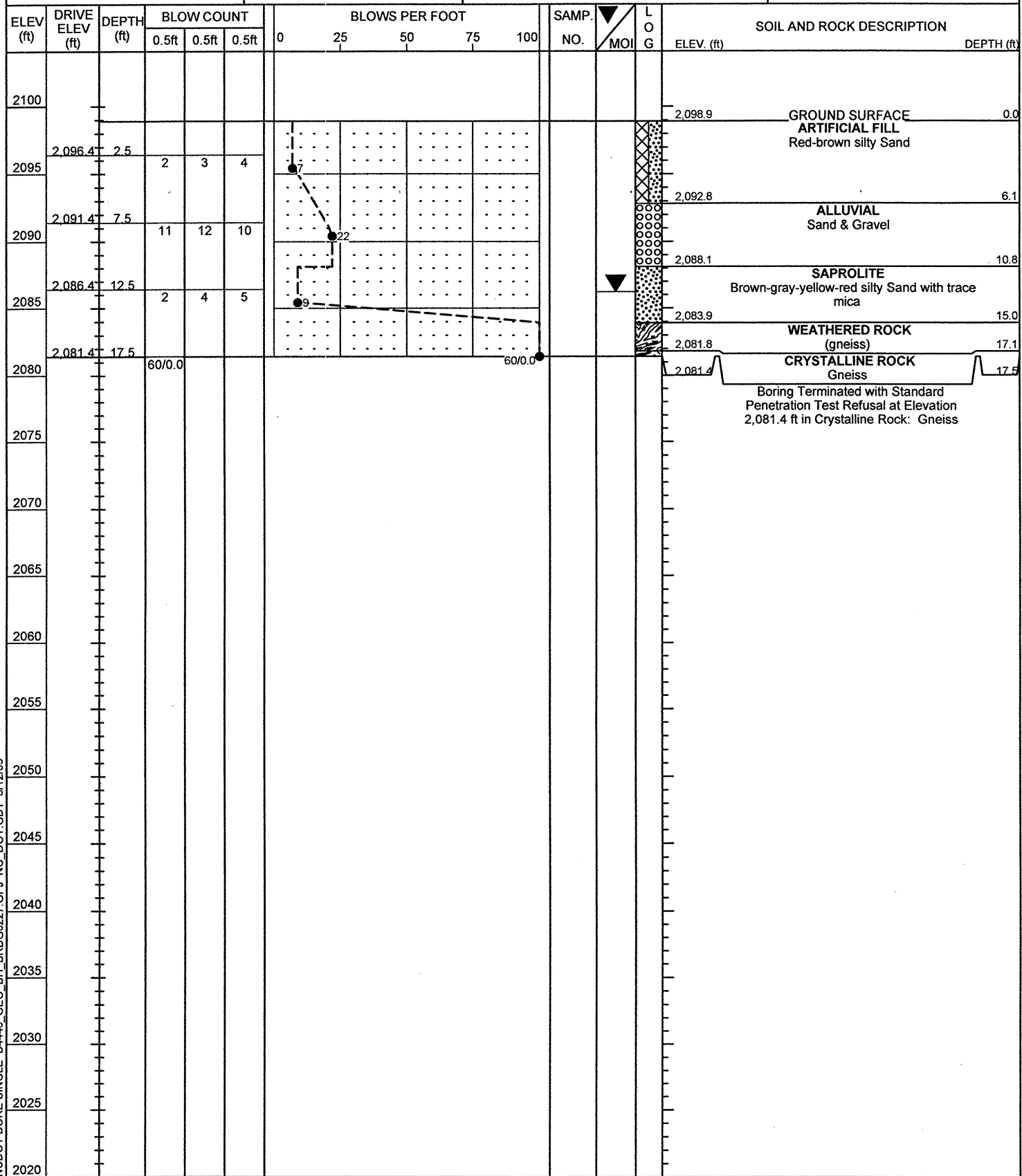


HORIZ. SCALE 0 10 20 (FEET) VE = 1 SECTION THRU END BENT ONE



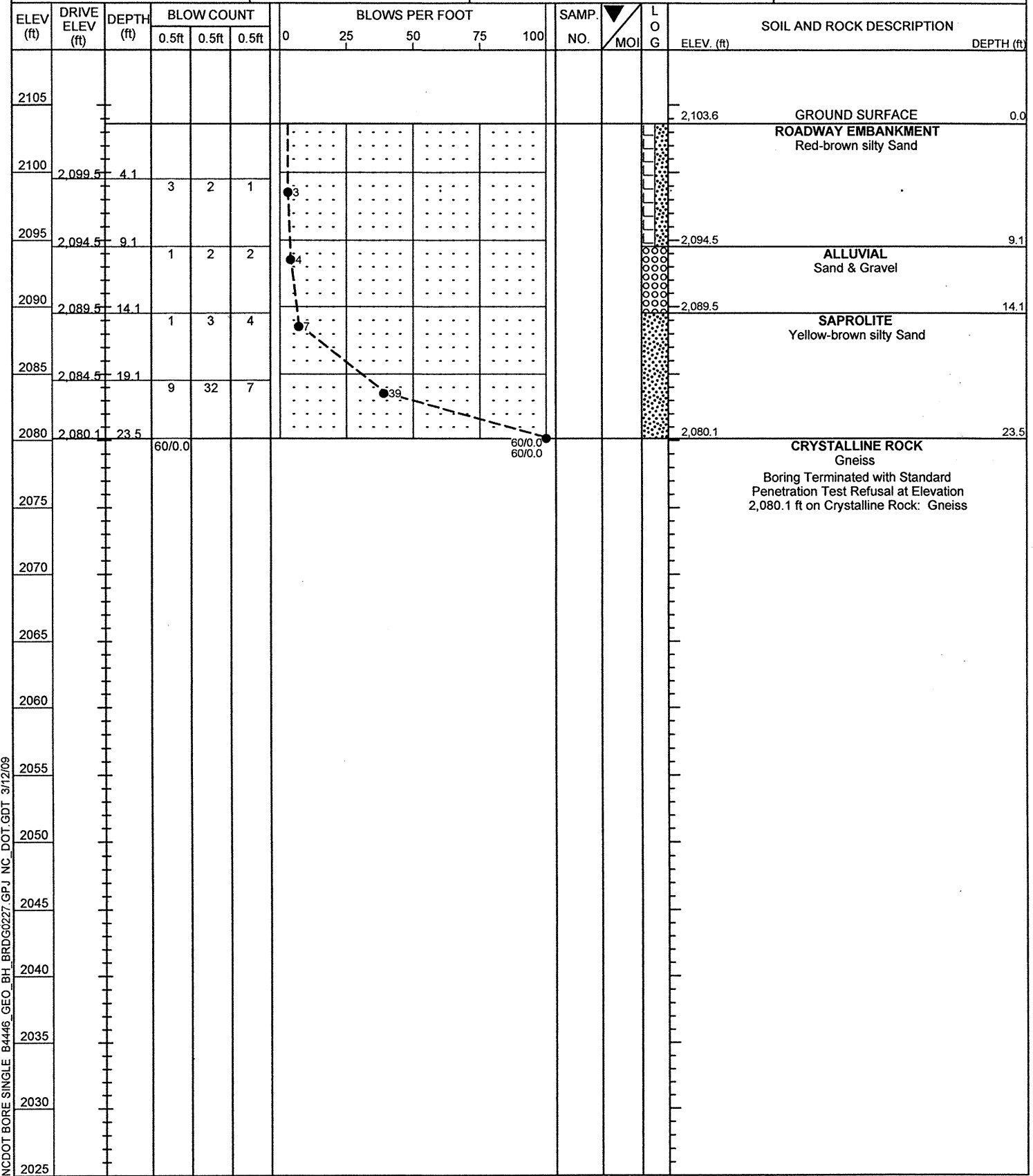
HORIZ. SCALE 0 10 20 (FEET) VE = 1 SECTION THRU END BENT TWO

PROJECT NO. 33703.1.1	ID. B-4446	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 227 on SR-2105 over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 13+25	OFFSET 17ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,098.9 ft	TOTAL DEPTH 17.5 ft	NORTHING 724,473	EASTING 952,475
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT	
START DATE 02/19/09		COMP. DATE 02/19/09	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 17.1 ft	



NCDOT BORE SINGLE B4446\_GEO\_BH\_BRDG0227.GPJ NC\_DOT.GDT 3/12/09

PROJECT NO. 33703.1.1	ID. B-4446	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 227 on SR-2105 over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+11	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,103.6 ft	TOTAL DEPTH 23.5 ft	NORTHING 724,456	EASTING 952,495
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT	
START DATE 02/23/09		COMP. DATE 02/23/09	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 23.5 ft	



NCDOT BORE SINGLE B4446\_GEO\_BH\_BRDG0227.GPJ NC\_DOT.GDT 3/12/09



PROJECT NO. 33703.1.1		ID. B-4446		COUNTY Buncombe		GEOLOGIST Hager, M. M.										
SITE DESCRIPTION Bridge No. 227 on SR-2105 over Reems Creek							GROUND WTR (ft)									
BORING NO. EB1-C		STATION 13+33		OFFSET 5ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,103.5 ft		TOTAL DEPTH 24.5 ft		NORTHING 724,478		EASTING 952,498										
DRILL MACHINE CME-550X		DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic											
START DATE 06/18/04		COMP. DATE 06/18/04		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 21.3 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2105														2,103.5	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT Red-brown silty Sand
2100		2,098.5	5.0	0	0	0										
2095		2,093.5	10.0	0	1	11										
2090		2,088.5	15.0	7	5	6										ALLUVIAL Brown fine-coarse Sand & Gravel
2085		2,083.5	20.0	6	6	100/0.3										SAPROLITE Brown silty Sand with some mica
2080														2,082.2	21.3	CRYSTALLINE ROCK Gneiss
														2,079.0	24.5	Boring Terminated at Elevation 2,079.0 ft in Crystalline Rock: Gneiss
2075																
2070																
2065																
2060																
2055																
2050																
2045																
2040																
2035																
2030																
2025																

NCDOT BORE SINGLE B4446 GEO\_BH\_BRD0227.GPJ NC\_DOT.GDT 3/12/09



PROJECT NO. 33703.1.1		ID. B-4446		COUNTY Buncombe		GEOLOGIST Hager, M. M.					
SITE DESCRIPTION Bridge No. 227 on SR-2105 over Reems Creek							GROUND WTR (ft)				
BORING NO. EB1-C		STATION 13+33		OFFSET 5ft RT		ALIGNMENT -L-					
COLLAR ELEV. 2,103.5 ft		TOTAL DEPTH 24.5 ft		NORTHING 724,478		EASTING 952,498					
DRILL MACHINE CME-550X		DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic						
START DATE 06/18/04		COMP. DATE 06/18/04		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 21.3 ft					
CORE SIZE NXWL		TOTAL RUN 3.1 ft		DRILLER Rose, G. K.							
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	ROD (%)			
2082.14	2,082.1	21.4	3.1		(3.1)	(3.1)					
2080	2,079.0	24.5			100%	100%					
2075											
2070											
2065											
2060											
2055											
2050											
2045											
2040											
2035											
2030											
2025											

NCDOT CORE SINGLE B4446 GEO\_BH\_BRD0227.GPJ NC\_DOT.GDT 3/13/09

PROJECT NO. 33703.1.1	ID. B-4446	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 227 on SR-2105 over Reems Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 13+80	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,103.9 ft	TOTAL DEPTH 24.2 ft	NORTHING 724,525	EASTING 952,505
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic	
START DATE 02/23/09	COMP. DATE 02/23/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 19.2 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)
2105														2,103.9	GROUND SURFACE	0.0
															ROADWAY EMBANKMENT	
															Brown silty Sand	
2100	2,099.7	4.2	1	1	2											
2095	2,094.7	9.2	8	2	2									2,094.7	ALLUVIAL	9.2
															Sand & Gravel	
2090	2,089.7	14.2	6	12	7									2,091.5	SAPROLITE	12.4
															Yellow-brown silty Sand	
2085	2,084.7	19.2												2,084.7	CRYSTALLINE ROCK	19.2
															Gneiss	
	2,082.7	21.2	76	24/0.1										2,082.7	WEATHERED ROCK	21.2
														2,081.2	(gneiss)	22.7
2080	2,079.7	24.2												2,079.7	CRYSTALLINE ROCK	24.2
															Gneiss	
															Boring Terminated at Elevation 2,079.7 ft in Crystalline Rock: Gneiss	
2075																
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NCDOT BORE SINGLE B4446 GEO\_BH\_BRDGO27.GPJ NC\_DOT.GDT 3/12/09



**FIELD  
 SCOUR REPORT**

WBS: 33703.1.1 TIP: B-4446 COUNTY: BUNCOMBE

DESCRIPTION(1): Bridge No. 227 on SR 2105 over Reems Creek

**EXISTING BRIDGE**

Information from: Field Inspection  Microfilm (reel pos: )  
 Other (explain) BSR dated 02/05/09

Bridge No.: 227 Length: 41 Total Bents: 2 Bents in Channel: Bents in Floodplain: 2  
 Foundation Type:

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: Minor scour at EB2-A

Interior Bents: n/a

Channel Bed: None Noted

Channel Bank: None Noted

**EXISTING SCOUR PROTECTION**

Type(3): Timber headwalls with rip rap slope protection

Extent(4): Around perimeter of headwalls

Effectiveness(5): Effective

Obstructions(6): None Noted

**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): Silty sand with boulders, cobbles, & gravel

Channel Bank Material(8): Sand and gravel

Channel Bank Cover(9): Trees, shrubs, and grass

Floodplain Width(10): ~200'

Floodplain Cover(11): Pastoral grass

Stream is(12): Aggrading  Degrading  Static

Channel Migration Tendency(13): Toward End Bent Two

Observations and Other Comments:

**DESIGN SCOUR ELEVATIONS(14)**

Feet  Meters

**BENTS**

EB1	EB2											
n/a	2091											

Comparison of DSE to Hydraulics Unit theoretical scour:  
 Agree with Hydraulics Unit theoretical scour.

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

Bed or Bank												
Sample No.												
Retained #4												
Passed #10												
Passed #40												
Passed #200												
Coarse Sand												
Fine Sand												
Silt												
Clay												
LL												
PI												
AASHTO												
Station												
Offset												
Depth												

Reported by: M.M. Hager, J.W. Mann

Date: 2/18/2009