STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33403.1.1 (B-4037)	1	25

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33403.1.1 F.A. PROJ. B-4037

COUNTY BUNCOMBE

PROJECT DESCRIPTION BRIDGE NO. 262 ON SR-3452 OVER SOUTH HOMINY CREEK

SITE DESCRIPTION

ID: B-4037

PROJECT: 33403.1.1

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PERSONNEL

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CHECKED BY W D FRYE, Jr

SUBMITTED BY W D FRYE, Jr

DATE FEBRUARY 2007

DRAWN BY: C A DUNNAGAN

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C A DUNNAGAN

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST CHARLES ANDREWS DUNNAGAN

PROJECT REFERENCE NO.	SHEET NO.
33403.1.1 (B-4037)	2/25

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING 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 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. 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 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- 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, YELLOW-BROWN, 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 IS 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 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	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 SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — 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 - CALIFORNIA BEARING RATIO SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-__
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

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

CORE SIZE:
- [ ] -B-__
- [X] -N XWL
- [ ] -H-__

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

ROCK DESCRIPTION

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:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
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 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. *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 GEOLOGIST'S 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 GEOLOGIST'S 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 GEOLOGIST'S 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 THAT 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 IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT 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 (FP) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - 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 THAT 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, THAT 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 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.

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 (SRQD) - 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 (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM-2: SPIKE IN 32" POPLAR, 197 FEET RIGHT OF -L- STA 11+23.9
ELEVATION: 2199.23 FT.

NOTES: ALSO USED BM-3: NAIL IN 13 " BLACK WALNUT, 201.5 FEET RIGHT OF -L- STA 16+01.4. ELEVATION 2213.37FT.

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

February 13, 2007

STATE PROJECT: 33403.1.1 (B-4037)
F. A. PROJECT: BRZ-3452(1)
COUNTY: Buncombe

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

SUBJECT: Geotechnical Report – Foundation Investigation

Project Description

The purpose of this investigation is to determine the subsurface conditions at the site of the proposed structure. The proposed structure is a single-span bridge. The span length is 180.0 feet; the skew is 90 degrees. Included in this investigation are borings for two Vertical Abutments. One abutment is proposed at End Bent One; the other for End Bent Two. The project is in southwest Buncombe County, approximately 5.5 miles from Asheville. Two drill machines were used: CME-550 and a CME-45C skid-rig. Borings were advanced with -N- casing and advancer. Standard Penetration Tests were performed at intervals of 5.0 feet. Soil samples were collected and tested for quality. Three rock core samples were submitted for testing for Unit Weight, Compressive Strength (Qu), Young's Modulus (E) and Split Tensile Strength.

Physiography and Geology

The South Hominy Creek is rather deeply incised at the proposed location. The difference between the centerline -L- Station 14+87 (elevation 2230.8) and the creek bottom is approximately 46.5 feet. Rock is exposed over a large portion of the project footprint, particularly around End Bent One. Immediately upline, and to the left of centerline, of end Bent One is a rock cliff.

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FAX: 919-250-4237
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

Around the base of the cliff is a talus field. The boulders in the talus range from a foot in diameter to about ten feet in diameter.

Throughout the project site, the typical stratiographic column is colluvium overlaying weathered rock or crystalline rock. At the End Bent One site, this is represented by 5.0 to 10.0 feet of colluvium, with a minor amount of embankment, on a thin layer of weathered rock. Crystalline rock was encountered at approximate elevation 2204.0 at EB1-A and 2214.5 at EB1-B.

A boring was advanced at 20.0 feet left of -L- Station 13+25 for the Vertical Abutment. Here, approximately 4.0 feet of embankment was emplaced on medium dense silty sand saprolite. Weathered rock is present by 10.2 feet (elevation 2217.9) and grades to crystalline rock by 11.1 feet (elevation 2217.0).

At End Bent Two, colluvium is approximately 3.0 feet thick and rests directly upon crystalline rock. In the borings for EB2-A and EB2-B, crystalline rock was encountered at elevations 2206.8 and 2206.6.

Two additional borings were advanced for the End Bent Two Vertical Abutment. At -L- Station 15+85, 42.0 feet left, weathered rock was encountered at 5.1 feet (elevation 2213.5) and crystalline rock at 5.4 feet (elevation 2213.2). At -L- Station 15+83, 46.0 feet right, weathered rock was encountered at 5.6 feet (elevation 2203.5) and crystalline rock at 7.9 (elevation 2201.2). The overburden at both locations consists of colluvium.

Rock Properties

The rocks that will be involved in this project are members of the Ashe Metamorphic Suite, labeled Zatm on the Geologic Map of North Carolina (1982). This is a very heterogeneous unit, described generally as a muscovite-biotite gneiss. The core recovered at the bridge site is a biotite gneiss with some amphibole minerals and a trace of garnets.

Overall, the core from this site is competent and has high RQD's.

The boring on the End Bent One side of the creek had Recoveries ranging from 58 percent to 100 percent, with an average of 90 percent. The RQD's were from 17 percent to 100 percent with an average of 68 percent. The low RQD's were above 15.0 feet in depth. On the End Bent Two side of the creek, the Recoveries were from 75 percent to 100 percent with an average of 95 percent. The RQD's ranged from 7 percent to 100 percent with an average of 82 percent. The lowest RQD's (7 percent; 58 percent) were from depths less than 12.5 feet.

Rock outcrops are abundant at this site. To more closely define the discontinuities seen in the core photos, rock data was collected. It is presented below in both Strike and Dip format, and Dip/Dip Direction. The Joints are numbered in no particular order of size or frequency.

3A/25

Feature	Strike/Dip	Dip/Dip Direction
Foliation	N63E17SE	17/153
$Joint_1$	N312W70SW	70/222
$Joint_2$	N26E36NW	36/116
$Joint_3$	N282W86NE	86/012
$Joint_4$	N57E65SE	65/147

Groundwater

Static groundwater levels were obtainable from only two borings at the End Bent Two site. The elevations were 2199.4 and 2199.8.

Construction Considerations

The existing ground line across End Bent One may influence construction. The ground line drops 15 to 20 feet over a length of about 10 feet. This begins at approximately 5 feet left of centerline. The cliff created is rock. On, and at the base of the cliff are boulders ranging from 1.0 foot in diameter to a couple that are 10.0 feet in diameter.

Comments

This investigation was based on a Bridge Survey and Hydraulic Design Report received by this office in May of 2006. Also used was the Preliminary General Drawing, dated August 2006. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

Charles A. Dunnagan, LG
Project Geological Engineer

BRIDGE NO. 262 ON SR-3452 OVER SOUTH HOMINY CREEK

PROJECT REFERENCE NO.	SHEET NO.
33403JJ (B-4037)	4 of 25

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- PCSta. 12+40.81

-L- POTSta. 11+70.00
BEGIN STATE PROJECT B-4037
BEGIN CONSTRUCTION

-L- PTSta. 11+45.12

-L- PCSta. 10+00.00

-Y1- POTSta. 10+08.00

-L- POTSta. 16+22.75
-Y1- POTSta. 10+98.00
Δ = 90°27'44"J"

-Y1- POTSta. 13+01.04

VERTICAL ABUTMENT (TYP)

B-1 EB1-B B-2 EB2-B B-3 EB2-A

BM#1
-L- STA 8+43 +/-
25.00' +/- RT
ELEV. = 2235.29'
SPIKE NAIL IN
13" POPLAR

BM#2
-L- STA 11+23.88
OFF 197.13 RT
ELEV. = 2199.23'
SPIKE NAIL IN
32" POPLAR

BM#3
-Y1- STA 12+99.94
OFF 19.34' RT
ELEV. = 2213.37'
SPIKE NAIL IN 13"
BLACK WALNUT

BM#4
-Y1- STA 18+12.93
OFF 20.34' RT
ELEV. = 2192.16'
SPIKE NAIL IN 11"
BLACK WALNUT

WOOD DECK W/ BST
8 I-BEAMS ON CONCRETE BASE
10 I-BEAM PILINGS
4 WOOD PILINGS
WOOD RAILS
WHEEL CLEARANCE 19.1'
HIGH WATER ELEVATION: 2192.19'

15+00

10+00

SR 3452 UPPER GLADY FORK ROAD

TO SOUTH HOMINY

LOWER GLADY FORK ROAD SR 3454

SOUTH HOMINY CREEK

HOMINY VALLEY WILDLIFE CLUB
LAND OF THE SKY BASSMASTERS

PASTURE

WOODS

WOODS/SCRUB

SCRUB

GRASS

ISFD

ISBKDG

ISBLKB

WELL

SEPTIC

HTR

WOOD DECK

WOOD PORCH

LANDSCAPE TIMBER

FLAMING ARROW LANE

60' CHL DOG PEN

SPICKET

18" CMP

15" CMP

15" CMP W/ROCK HDWL

18" BST

12" BST

0 50 100
FEET

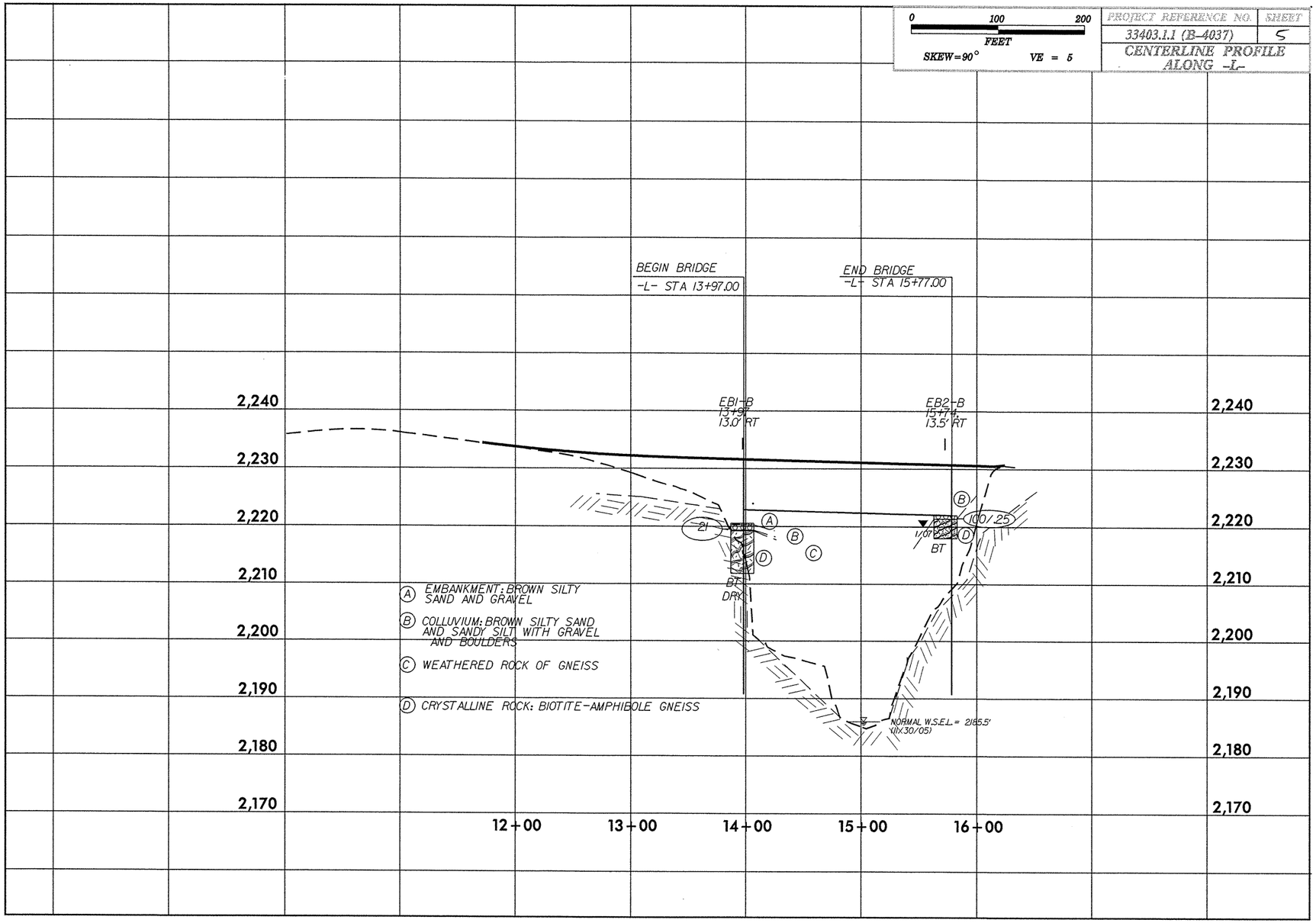
ROCK OUTCROP

5/25

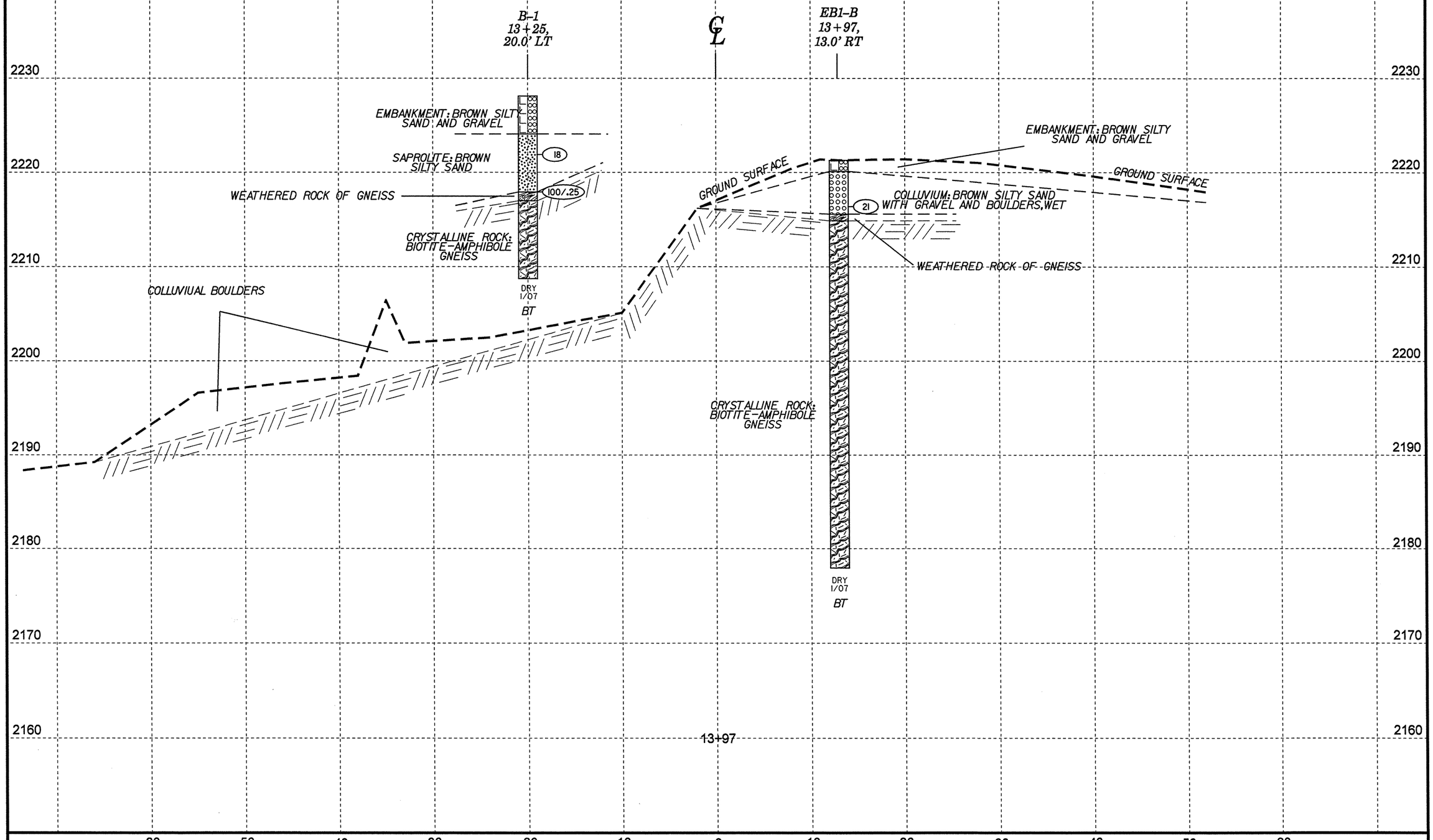
0	100	200
FEET		

SKEW=90° VE = 5

PROJECT REFERENCE NO.	SHEET
33403.1.1 (B-4037)	5
CENTERLINE PROFILE ALONG -L-	



0 10 20 FEET	PROJECT REFERENCE NO.	SHEET
SKEW=90° VE = 1	33403.1.1 (B-4037)	6 OF 25
	CROSS SECTION THROUGH END BENT ONE	

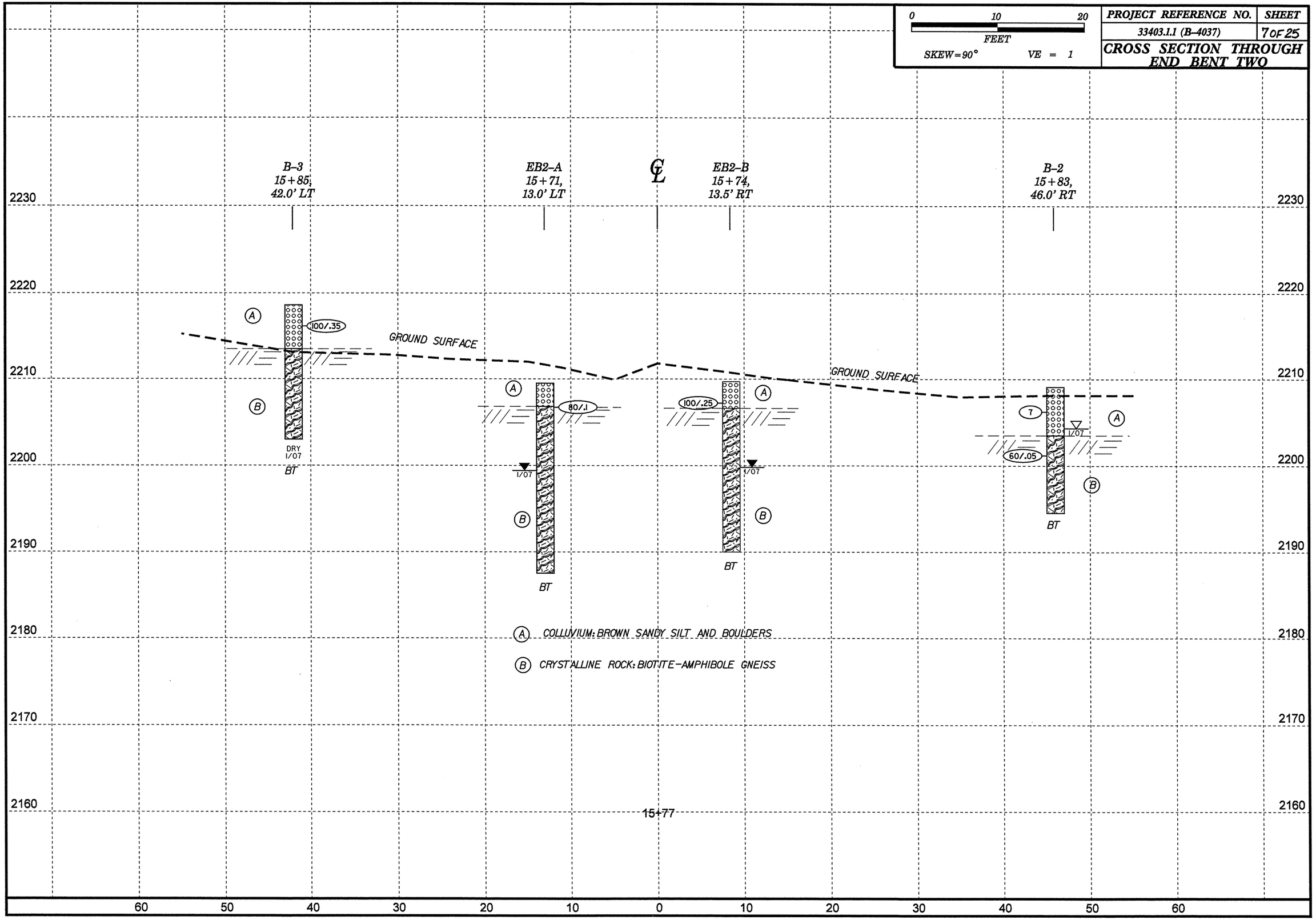


0	10	20
FEET		

SKEW=90° VE = 1

PROJECT REFERENCE NO.	SHEET
33403.1.1 (B-4037)	7 OF 25

CROSS SECTION THROUGH END BENT TWO

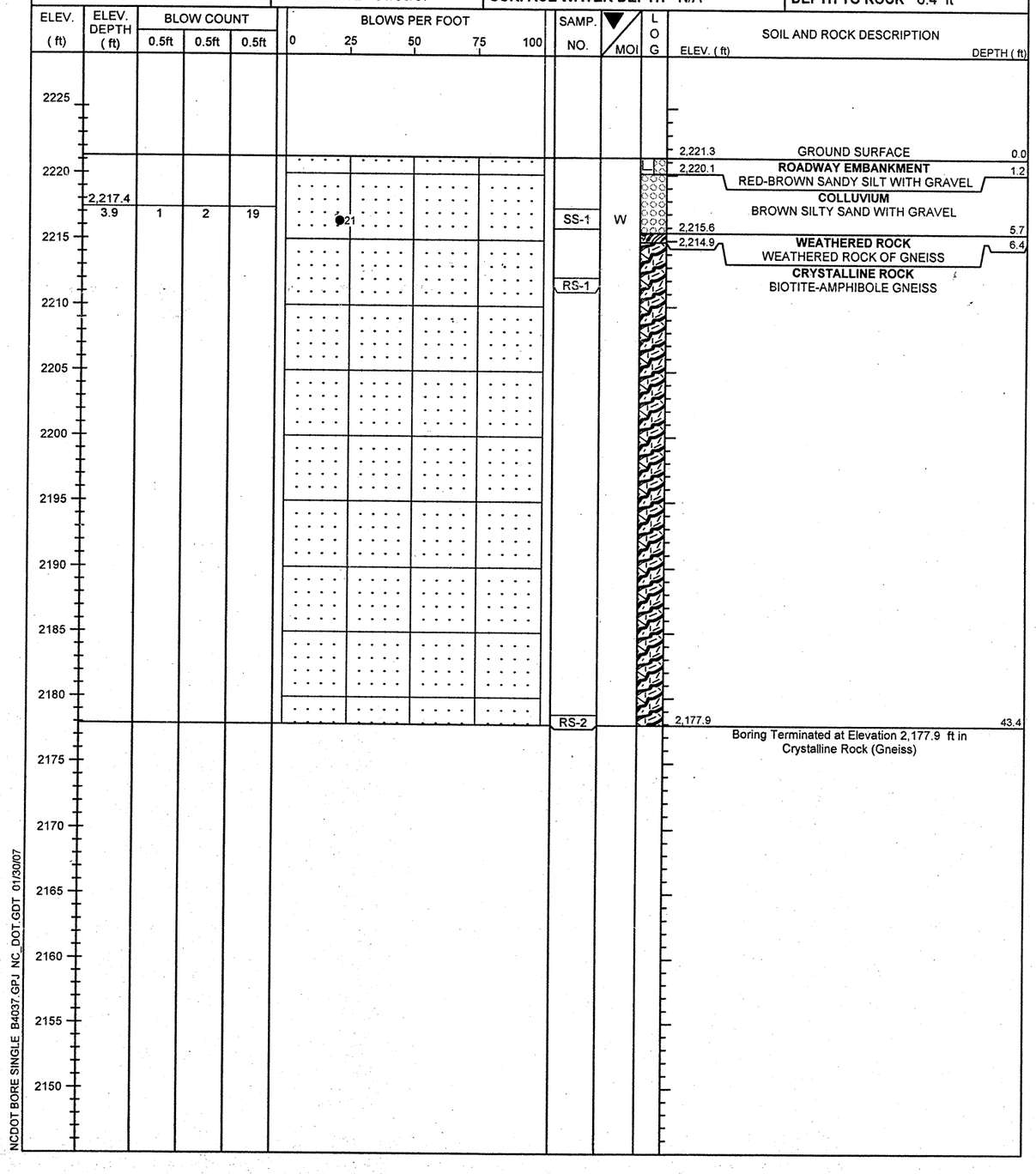


NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

5/25

PROJECT NO. 33403.1.1	**ID.** B-4037	**COUNTY** Buncombe		**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 13+97	**OFFSET** 13 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,221.3 ft	**TOTAL DEPTH** 43.4 ft	**NORTHING** 657,849	**EASTING** 896,760	**24 HR.** N/A
DRILL MACHINE CME-45 SKID	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic	
START DATE 01/02/07	**COMP. DATE** 01/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 6.4 ft	



NCDOT BORE SINGLE B4037.GPJ NC_DOT.GDT 01/30/07

DATE 3-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: EB1-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2221.3 FT. TOTAL DEPTH: 43.4 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2214.9	6.4						
				2.1	0.4		
		6	2.3				
				91	17		
2212.6	8.7						Tan to gray biotite-amphibole gneiss. Predominately hard. Moderately to slightly weathered. Close fracture spacing with joints @ 85°, 60° and 10°. Partings along foliation @ 80° and 30°. Manganese on some joint surfaces.
2212.6	8.7						
				4.9	2.5	RS-1	
		15	4.9				
				100	51		
2207.7	13.6						
2207.7	13.6						14.9
				5.0	3.5		
		9	5.0				
				100	70		
2202.7	18.6						
2202.7	18.6						
				4.7	4.3		
		8	5.0				
				94	86		Gray biotite-amphibole gneiss. Very hard and very slightly weathered. Moderate fracture spacing with joints @ 80°, 45° and 10°.
2197.7	23.6						
2197.7	23.6						
				4.8	4.5		
		7	5.0				
				96	90		
2192.7	28.6						
2192.7	28.6						
				4.3	3.9		
		8	5.0				
				86	78		
2187.7	33.6						

CORING TERMINATED AT ELEVATION 2177.9 FT.

DRILLER: D O Cheek CORE SIZE: NXWL EQUIPMENT: CME-45 CME 45

DATE 1/3/2007

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: EB1-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2221.3 FT. TOTAL DEPTH: 43.4 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2187.7	33.6						
				4.8	4.8		
		9	5.0				Gray biotite-amphibole gneiss. Very hard and very slightly weathered. Moderate fracture spacing with joints @ 80°, 45° and 10°.
				96	96		
2182.7	38.6						
2182.7	38.6						
				4.8	4.8		
		12	4.8				
				100	100	RS-2	
2177.9	43.4						

CORING TERMINATED AT ELEVATION 2177.9 FT.

DRILLER: D O Cheek CORE SIZE: NXWL EQUIPMENT: CME-45

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 33403.1.1	**ID.** B-4037	**COUNTY** Buncombe	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 15+71	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,209.5 ft	**TOTAL DEPTH** 22.0 ft	**NORTHING** 657,960	**EASTING** 896,896	**24 HR.** 10.1
DRILL MACHINE CME-45 SKID	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic	
START DATE 01/22/07	**COMP. DATE** 01/23/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 2.7 ft	

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2210									2,209.5 GROUND SURFACE	0.0
	2,206.7 2.8		80/.1		80/.1				2,206.8 **COLLUVIUM** SANDY SILT WITH BOULDERS	2.7
2205									**CRYSTALLINE ROCK** BIOTITE-AMPHIBOLE GNEISS	
2200										
2195										
2190									2,187.5	22.0
2185									Boring Terminated at Elevation 2,187.5 ft in Crystalline Rock (Gneiss)	
2180										
2175										
2170										
2165										
2160										
2155										
2150										
2145										
2140										
2135										

NCDOT BORE SINGLE B4037.GPJ NC_DOT.GDT 01/30/07

10/25

SHEET 1 OF 1

DATE 24-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: EB2-A GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2209.5 FT. TOTAL DEPTH: 22.0 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2205.1	4.4		2.8	2.7 96	2.7 96		
2202.3	7.2						
2202.3	7.2		4.8	4.6 96	4.3 90		Gray biotite-amphibole gneiss. Very slightly weathered to fresh; hard. Moderately close fracture spacing with joints @ 50° and 80°. Partings along foliation @ 10°.
2197.5	12.0						
2197.5	12.0		4.8	4.8 100	4.8 100		
2192.7	16.8						

CORING TERMINATED AT ELEVATION 2187.5 FT.

DRILLER: D O Cheek CORE SIZE: NXWL EQUIPMENT: CME-45

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33403.1.1	**ID.** B-4037	**COUNTY** Buncombe	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 15+74	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,209.7 ft	**TOTAL DEPTH** 19.7 ft	**NORTHING** 657,938	**EASTING** 896,912	**24 HR.** 9.9
DRILL MACHINE CME-45 SKID	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic	
START DATE 12/04/06	**COMP. DATE** 12/04/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.1 ft	

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2210									2,209.7 GROUND SURFACE	0.0
	2,207.2								**COLLUVIUM** RED-BROWN SILTY SAND WITH GRAVEL AND BOULDERS	
	2.5	100/.3			100/.25	RS-3	M		2,206.6	3.1
2205									**CRYSTALLINE ROCK** BIOTITE-AMPHIBOLE GNEISS	
2200										
2195										
2190									2,190.0	19.7
									Boring Terminated at Elevation 2,190.0 ft in Crystalline Rock (Gneiss)	
2185										
2180										
2175										
2170										
2165										
2160										
2155										
2150										
2145										
2140										
2135										

NCDOT BORE SINGLE B4037.GPJ NC_DOT.GDT 01/30/07

11/25

SHEET 1 OF 1

DATE 5-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: EB2-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2209.7 FT. TOTAL DEPTH: 19.7 FT.

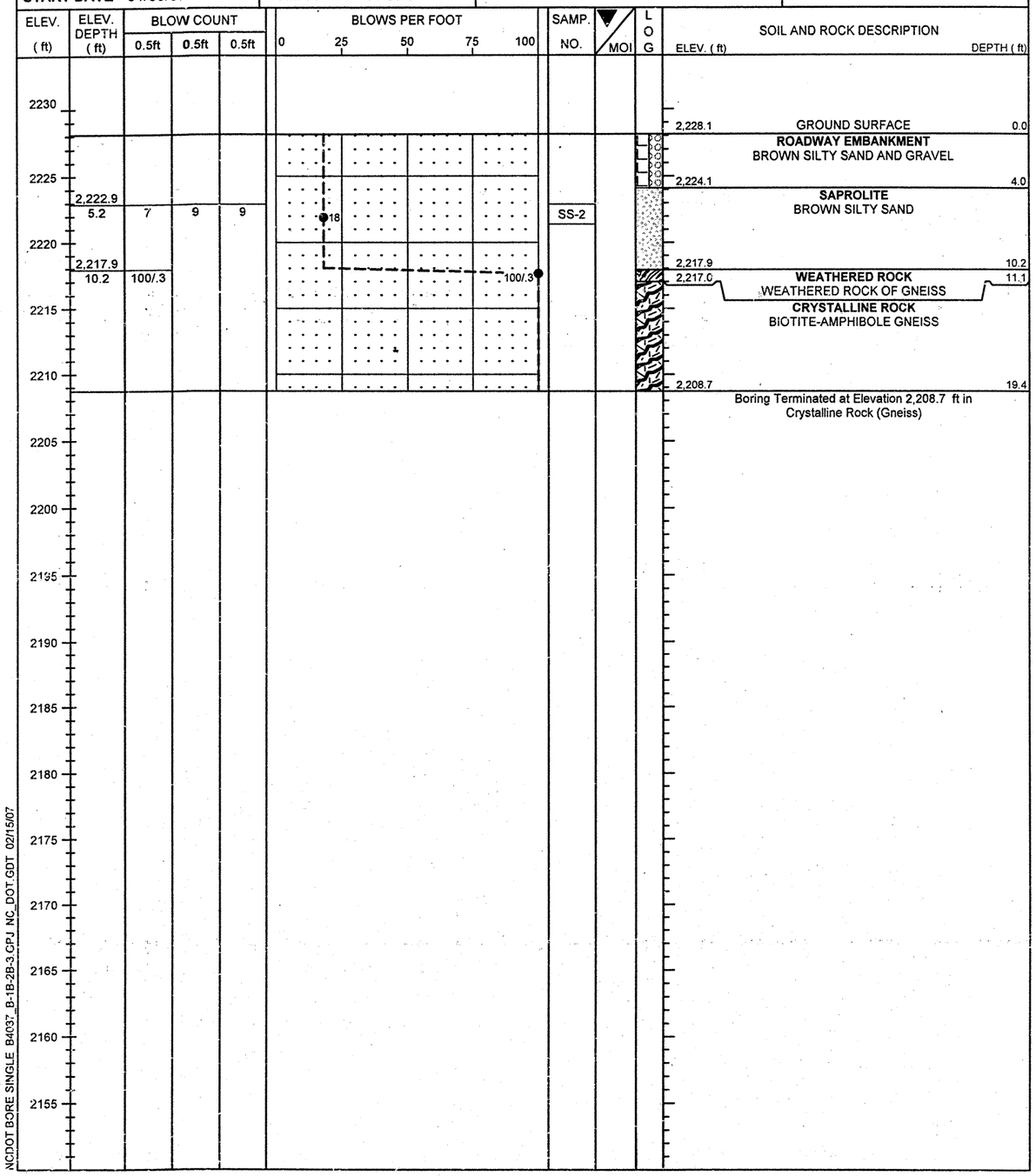
ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2206.6	3.1		2.6	2.4 92	1.5 58	RS-3	
2204.0	5.7						
2204.0	5.7		4.8	4.7 98	4.4 92		Gray biotite-amphibole gneiss. Hard to very hard. Very slightly weathered to fresh. Wide fracture spacing with joints @ 45° and 80°. Partings on foliation @ 20°.
2199.2	10.5						
2199.2	10.5		4.8	4.8 100	4.8 100		
2194.4	15.3						
2194.4	15.3		4.4	4.4 100	4.4 100		
2190.0	19.7						

CORING TERMINATED AT ELEVATION 2190.0 FT.

DRILLER: G K Rose CORE SIZE: NXWL EQUIPMENT: CME-45

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33403.1.1	ID. B-4037	COUNTY Buncombe	GEOLOGIST Daniel, T. B.	
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek				GROUND WTR (ft)
BORING NO. B-1	STATION 13+25	OFFSET 20 ft LT	ALIGNMENT -L-	0 HR. Dry
COLLAR ELEV. 2,228.1 ft	TOTAL DEPTH 19.4 ft	NORTHING 657,811	EASTING 896,688	24 HR. N/A
DRILL MACHINE CME-45 SKID	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic	
START DATE 01/09/07	COMP. DATE 01/09/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 11.1 ft	



NCDOT BORE SINGLE B4037_B-1B-2B-3.GPJ NC_DOT.GDT 02/15/07

SHEET 1 OF 1

DATE 11-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: B-1 GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2228.1 FT. TOTAL DEPTH: 19.4 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2217.0	11.1		3.3	1.9 58	1.5 45		Brown and tan biotite-amphibole gneiss. Moderately hard and moderately weathered. Close fracture spacing with joints @ 45° and 75°; parts along foliation @ 10°.
2213.7	14.4		5.0	4.1 82	2.2 44		
2208.7	19.4						

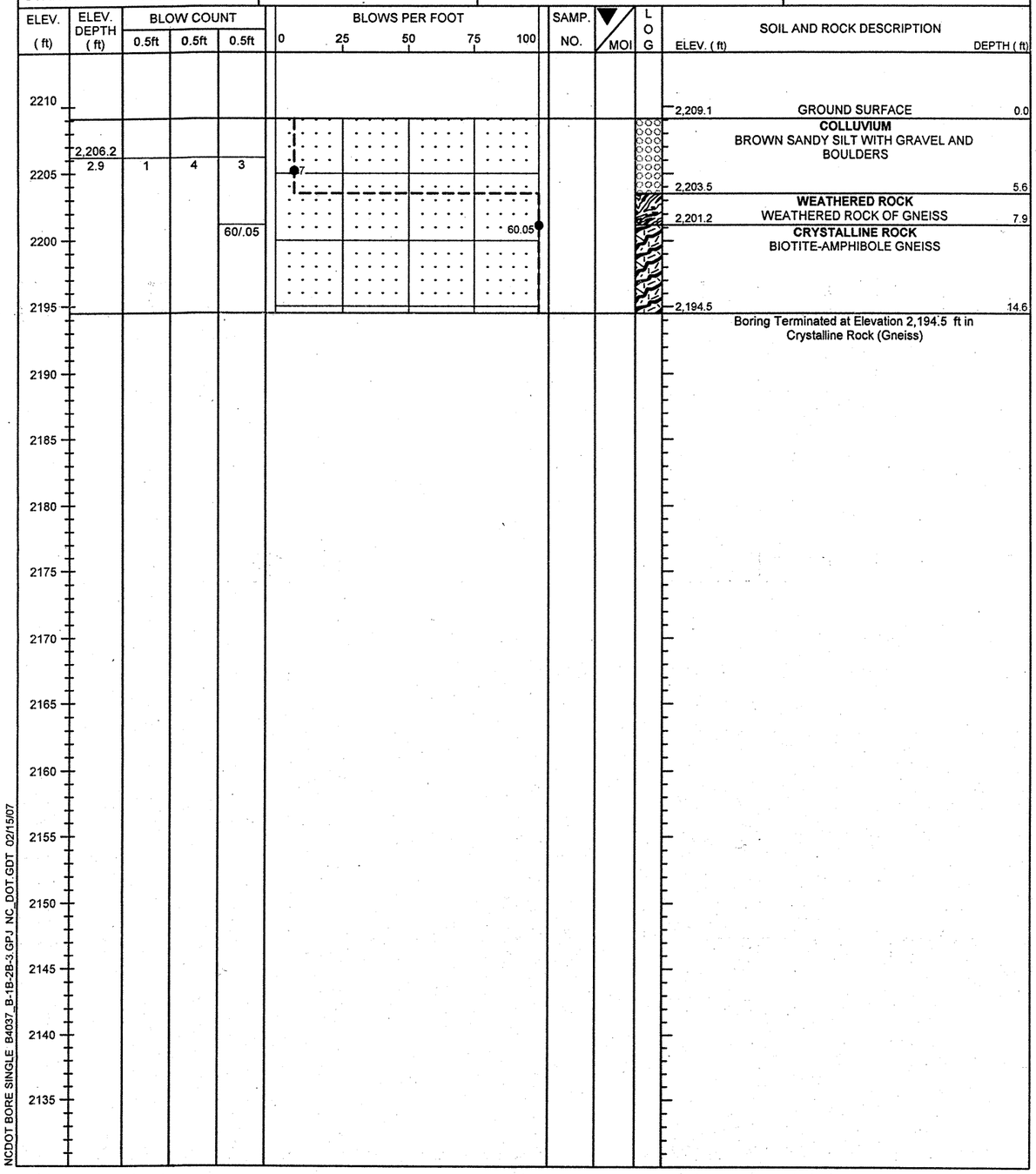
CORING TERMINATED AT ELEVATION 2208.7 FT.

DRILLER: C J Coffey CORE SIZE: NXWL EQUIPMENT: CME-45

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33403.1.1	**ID.** B-4037	**COUNTY** Buncombe	**GEOLOGIST** Daniel, T. B.	
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek				**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 15+83	**OFFSET** 46 ft RT	**ALIGNMENT** -L-	**0 HR.** 4.8
COLLAR ELEV. 2,209.1 ft	**TOTAL DEPTH** 14.6 ft	**NORTHING** 657,915	**EASTING** 896,937	**24 HR.** N/A
DRILL MACHINE CME-45 SKID	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic	
START DATE 01/19/07	**COMP. DATE** 01/19/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 7.9 ft	



NCDOT BORE SINGLE B4037_B-1B-2B-3.GPJ NC_DOT.GDT 02/15/07

SHEET 1 OF 1

DATE 22-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: B-2 GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2208.1 FT. TOTAL DEPTH: 14.6 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2200.2	7.9		2.8	2.7 96	2.7 96		Gray biotite-amphibole gneiss. Fresh, hard. One parting along foliation @ 30°.
2197.4	10.7		3.9	3.7 95	3.7 95		
2193.5	14.6						

CORING TERMINATED AT ELEVATION 2193.5 FT.

DRILLER: D O Cheek CORE SIZE: NXWL EQUIPMENT: CME-45

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33403.1.1	**ID.** B-4037	**COUNTY** Buncombe	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 262 on SR-3452 over South Hominy Creek			**GROUND WTR (ft)**
BORING NO. B-3	**STATION** 15+85	**OFFSET** 42 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,218.6 ft	**TOTAL DEPTH** 15.6 ft	**NORTHING** 657,992	**EASTING** 896,894	**24 HR.** N/A
DRILL MACHINE CME-45 SKID	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic	
START DATE 01/24/07	**COMP. DATE** 01/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.4 ft	

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2220									2,218.6 GROUND SURFACE	0.0
	2,216.1								**COLLUVIUM** SANDY SILT WITH BOULDERS	
2215	2.5	3	100/.35		100.35				2,213.5	5.1
									2,213.2 **WEATHERED ROCK** WEATHERED ROCK OF GNEISS	5.4
2210									**CRYSTALLINE ROCK** BIOTITE-AMPHIBOLE GNEISS	
2205									2,203.0	15.6
									Boring Terminated at Elevation 2,203.0 ft in Crystalline Rock (Gneiss)	
2200										
2195										
2190										
2185										
2180										
2175										
2170										
2165										
2160										
2155										
2150										
2145										

NCDOT BORE SINGLE B4037_B-1B-2B-3.GPJ NC_DOT.GDT 02/15/07

SHEET 1 OF 1

DATE 25-Jan-07

CORE BORING REPORT

PROJECT: 33403.1.1 I. D. NO: B-4037 BORING NO: B-3 GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 262 on SR-3452 over South Hominy Creek

COUNTY: Buncombe COLLAR ELEVATION: 2218.6 FT. TOTAL DEPTH: 15.6 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
2213.5	5.1						5.1ft to 5.4ft: Weathered rock of gneiss.
			5.5	4.1	0.4		Tan and gray biotite-amphibole gneiss. Medium hard to hard. Moderately to slightly weathered. Close fracture spacing with joints @ 80° and 10°. Parts along foliation @ 10° and 70°.
2208.0	10.6			75	7		12.2
2208.0	10.6						
			5.0	4.6	3.4		Gray biotite-amphibole gneiss. Very hard. Fresh.
2203.0	15.6			92	68		

CORING TERMINATED AT ELEVATION 2203.0 FT.

DRILLER: D O Cheek CORE SIZE: NXWL EQUIPMENT: CME-45

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	B-4037

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	33403.1.1	COUNTY:	Buncombe	Owner:	NCDOT
DATE SAMPLED:	1.2.07	DATE RECEIVED:	1.9.07	DATE REPORTED:	1.16.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1							
Lab Sample No. A	154363							
HiCAMS Sample #	--							
Retained #4 Sieve %	32							
Passing #10 Sieve %	43							
Passing #40 Sieve %	35							
Passing #200 Sieve %	18							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	31							
Fine Sand - Ret. #270	33							
Silt 0.05-0.005 mm %	26							
Clay < 0.005 mm %	10							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	34							
Plastic Index	NP							
AASHTO Classification	A-1-b (0)							
Quantity								
Texture								
Station	13+97							
Hole No.								
Depth (ft) From:	4.4							
To:	5.4							

Remarks:

A-154363

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	B-4037

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	33403.1.1	COUNTY:	Buncombe	Owner:	NCDOT
DATE SAMPLED:	1.9.07	DATE RECEIVED:	1.17.07	DATE REPORTED:	1.19.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-2							
Lab Sample No. A	154409							
HiCAMS Sample #	--							
Retained #4 Sieve %	10.1							
Passing #10 Sieve %	69							
Passing #40 Sieve %	57							
Passing #200 Sieve %	20							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	34							
Fine Sand - Ret. #270	45							
Silt 0.05-0.005 mm %	17							
Clay < 0.005 mm %	4							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	37							
Plastic Index	NP							
AASHTO Classification	A-2-4 (0)							
Quantity								
Texture								
Station	13+25							
Hole No.								
Depth (ft) From:	5.7							
To:	6.7							

Remarks:

A-154409

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33403.1.1 TIP: B-4037 COUNTY: Buncombe

DESCRIPTION(1): Bridge No. 262 on SR-3452 over South Hominy Creek

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) ____

Bridge No.: 262 Length: 80 Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 2
Foundation Type: Piles and/or footings.

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Minor to moderate amounts at EB2.

Interior Bents: Minor amount at B1-A.

Channel Bed: None noted

Channel Bank: None noted.

EXISTING SCOUR PROTECTION

Type(3): End-bent walls with wingwalls, except lack of wingwall at EB1-A.

Extent(4): Wingwalls extend 15ft beyond bridge.

Effectiveness(5): Good.

Obstructions(6): Boulders, 2.0ft in largest dimension, in channel upstream of bridge.

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 theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Sand and gravel veneer on rock.

Channel Bank Material(8): Silty sand with occasional boulders.

Channel Bank Cover(9): Brush and trees.

Floodplain Width(10): EB1: 25ft; EB2: 10ft.

Floodplain Cover(11): Trees.

Stream is(12): Aggrading ____ Degrading ____ Static X

Channel Migration Tendency(13): Northeast.

Observations and Other Comments: Existing bridge is approx. 400ft downstream of proposed structure.

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters ____

	BENTS B1	B2	B3	B4							
SB Lanes, Lt											
SB Lanes, Rt											
NB Lanes, Lt											
NB Lanes, Rt											

Comparison of DSE to Hydraulics Unit theoretical scour:
Scour should not be a factor at this site.

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							

Template Revised 02/07/06

Reported by: C A Dunnagan Date: 1/2/2007

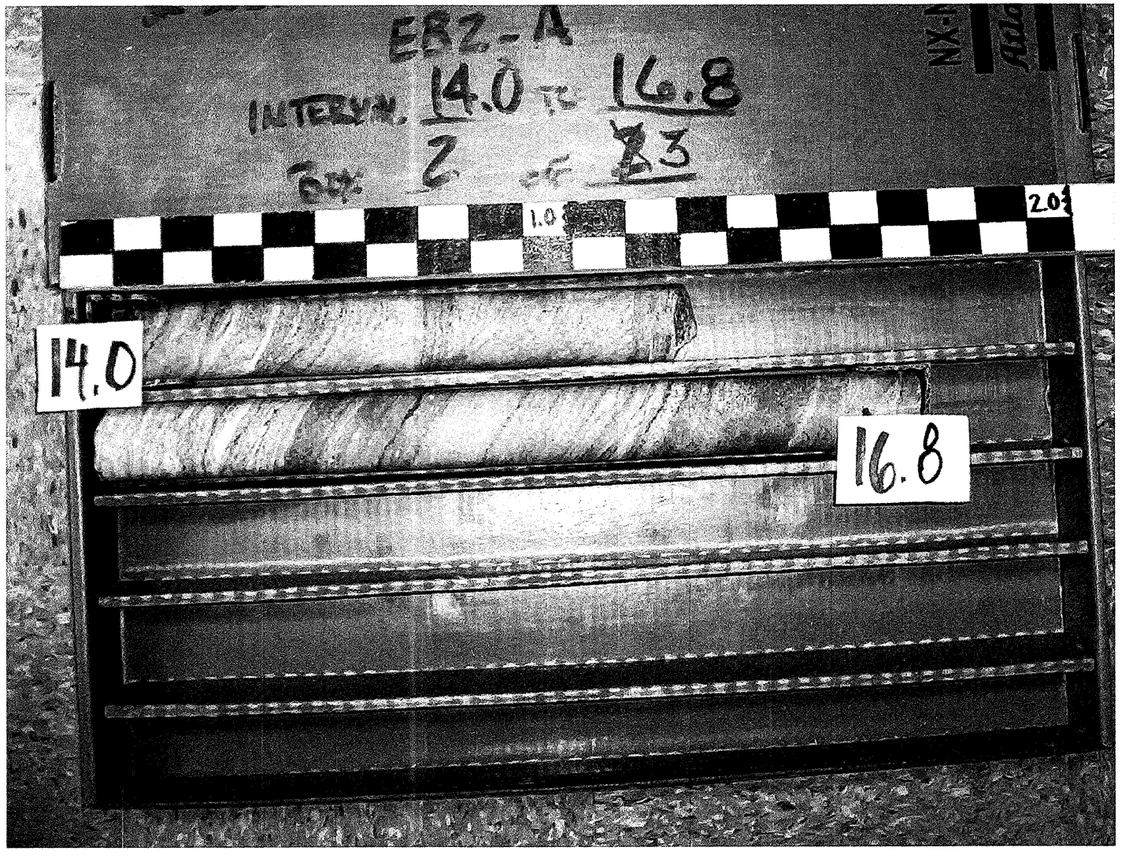
33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB1-B
Box 1 of 4

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek
EB1-B
Box 2 of 4

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB1-B
Box 4 of 4

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek
EB1-B
Box 4 of 4

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB2-A
Box 1 of 3



33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek
EB2-A
Box 2 of 3

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB2-A
Box 3 of 3

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB2-B
Box 1 of 3

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek
EB2-B
Box 2 of 3

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
EB2-B
Box 3 of 3

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
B-1
Box 1 of 1

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
B-2
Box 1 of 1

33403.1.1 B-4037
Bridge No. 262 on SR-3452
Over South Hominy Creek.
B-3
Box 1 of 1