

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

STRUCTURE SUBSURFACE INVESTIGATION

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE
6	CROSS SECTIONS
7-10	BORE LOG & CORE REPORTS
11	CORE PHOTOGRAPHS
12	SOIL SAMPLE RESULTS
13	SCOUR REPORT
14	SITE PHOTOGRAPHS

PROJ. REFERENCE NO. 33402.1.1 (B-4036) F.A. PROJ. BRZ-2098(1)
 COUNTY BUNCOMBE
 PROJECT DESCRIPTION BRIDGE NO. 220 ON SR-2098 OVER
REEMS CREEK

SITE DESCRIPTION _____

CAUTION NOTICE

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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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PROJECT: 33402.1.1 ID: B-4036

PERSONNEL

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INVESTIGATED BY M.M. HAGER

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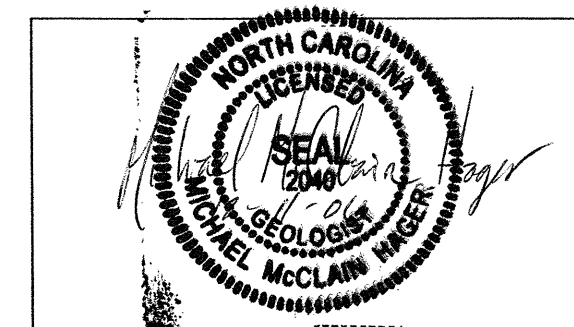
SUBMITTED BY W.D. FRYE, JR

DATE 12-11-2006

DRAWN BY: M.M. HAGER

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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			
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 (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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>				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.				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 60 BLOWS PER FOOT 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:				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 DISLOGGED 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 - A 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 (ROD) - 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. SHALL - 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 60 BLOWS PER FOOT. 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 (SROD) - 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.			
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING							
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS				MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL.) 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 (SL.) 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.							
CONSISTENCY OR DENSENESS				GROUND WATER				WEATHERING							
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)				WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP				FRESH VERY SLIGHT (V SL.) SLIGHT (SL.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
TEXTURE OR GRAIN SIZE				MISCELLANEOUS SYMBOLS				ROCK HARDNESS							
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 200 270 4.76 2.00 0.42 0.25 0.075 0.053				ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD				SPT DMT VST TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL							
SOIL MOISTURE - CORRELATION OF TERMS				ABBREVIATIONS				ROCK HARDNESS							
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 WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				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 HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL				HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. 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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED 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.							
PLASTICITY				EQUIPMENT USED ON SUBJECT PROJECT				EQUIPMENT USED ON SUBJECT PROJECT							
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG-CARB. CORE BIT				HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -N XLW -H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST							
COLOR				EQUIPMENT USED ON SUBJECT PROJECT				EQUIPMENT USED ON SUBJECT PROJECT							
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.				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							



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

December 11, 2006

STATE PROJECT: 33402.1.1 (B-4036)

FA PROJECT: BRZ-2098 (1)

COUNTY: BUNCOMBE

DESCRIPTION: Replace Bridge No. 220 over Reems Creek on SR 2098
at -L- Station 14+22.5

SUBJECT: Geotechnical Report- Inventory

Project Description

The purpose of this project is to investigate and categorize the subsurface conditions present at the said job site. This project is located in north central Buncombe County, approximately 1 mile south of the town of Weaverville, NC and 0.2 miles east of the intersection of SR-2098 (Herron Cove Rd.) and SR 1003 (Reems Creek Rd.).

Bridge 220 is a dual lane, dual span steel bridge built on timber piles on concrete footings. The proposed replacement structure will be built along the existing alignment and will traverse Reems Creek with one span of length of 105' and width of 33' built on a 62° skew.

The Geotechnical Engineering Unit conducted a foundation investigation for this project in November of 2006. Two borings were made at each proposed bent utilizing a CME 550 X drill with N-sized casing advancement equipment and NXWL wire line rock coring equipment. Standard Penetration Tests (SPT's) were performed in each boring on five foot intervals until crystalline rock was encountered, whereupon rock core was taken to prove bedrock. Six soil samples were submitted to the Materials and Tests Unit soils lab for quality analysis. One moisture sample was also submitted.

Physiography and Geology

Geologically, the project area falls near the faulted contact between the Ashe metamorphic suite and locally migmatized basement rocks consisting of layered metamorphic granites and gneisses. The specific project area itself can be located within the basement window in layered, migmatized (partially melted metamorphic texture) meta-granites and biotite-gneiss crystalline rocks roughly 1.2 billion years in age.

The topography around the study area is marked by the 4000'+ ridge line of the Bull Mountains to the east and northeast and the Elk Mountains to the south and southeast. Reems Creek drains this area and contributes to the French Broad River at their confluence, roughly 3.5 miles downstream of the project area.

No areas of specific, adverse geologic concern affecting possible bridge foundation design (i.e. Landfills, UST's, etc...) were discovered during the investigation of this project.

At the site, Reems Creek is 25' wide on average as it flows over a channel bed load of cobbles, gravels and sand. Stream banks at the site are 2-12' in height and are gently sloping to precipitous. The Reems Creek floodplain at the site is narrow, but may reach up to 200' from the channel, mainly to the south.

The materials encountered during the drilling of this project were classified as embankment, alluvium, saprolite, and weathered rock (gneiss). Crystalline rock (gneiss) was encountered in each of the four borings.

Embankment materials encountered consisted of up to 3.7' of mixed very loose to medium dense silty sand and very soft to stiff sandy silt. Small amounts of gravel, sized 0.007' - 0.25', were found within the embankment. No embankment was encountered in boring EB1-B, this boring was advanced through the bridge deck and directly into underlying alluvial soils.

A marked fining upward sequence of alluvial sediments due to the natural fluctuations in flow rate and channel orientation of Reems Creek was encountered in each of the four foundation investigation borings. A uniform layer of 3.3' to 4.4' of very soft to stiff sandy silt was found to cap the alluvial suite across the site, forming the stream banks and the natural ground surface. At EB2, 5.5' to 5.9' of soft to medium stiff, clayey fine sandy silt interlayered with roots and lenses (+/- 0.01' thickness) of fine sand and some to highly micaceous fine sand was found to exist below the surficial silt. An inconsistent layer of medium dense, fine to coarse sand was found to occur below the previous layer as lenses (up to 4.4' thickness) in two of the borings, EB1-A and EB2-B, directly overlying a basal sand and gravel unit. The basal sand and gravel encountered at the lower margin of the alluvial suite was found to be medium dense in consistency and existed consistently across the site in thickness from 1.8' to 4.2'.

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ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC

Saprolite was found in only one boring and consisted of up to 1' of silty fine to coarse sand. No SPT tests were performed directly within the saprolite unit.


Weathered rock derivative of layered, migmatitic meta-granites and gneisses was found to occur as a thin cap up to 1' thick above crystalline rock in three of the borings. The material was found to crumble easily into silty fine to coarse sand with fragments of competent, crystalline rock and clay filled seams.

Crystalline (gneiss) rock was found at elevations 2019.3', 2017.3', 2012.3', and 2011.3' in borings EB1-A, EB1-B, EB2-A, and EB2-B respectively. NXWL sized core was removed from each boring in order to advance the boring far enough to determine the competency of the rock. No rock core was submitted for strength analysis. RQD values measured in the field for each boring were; EB1-A=20%; EB1-B= 70%; EB2-A= 0% and 54% in runs 1 and 2 respectively; EB2-B= 58%. Two joint sets were measured in each of the core runs, one nearly horizontal and the other trending 20° from the horizontal. Crystalline rock encountered on this site was migmatized gneiss consisting of dark gray to black biotite-hornblende gneiss and a light gray to white biotite-granite gneiss.

Groundwater elevations across the site ranged from 2020.2' to 2023.0'.

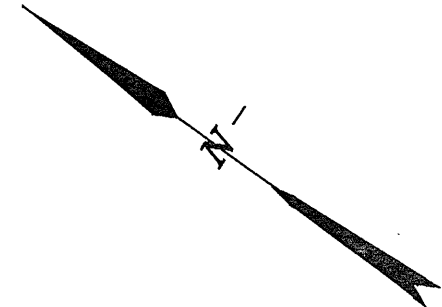
This geotechnical foundation investigation was based on Bridge Survey and Hydraulic Design Report dated 03-27-2006. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

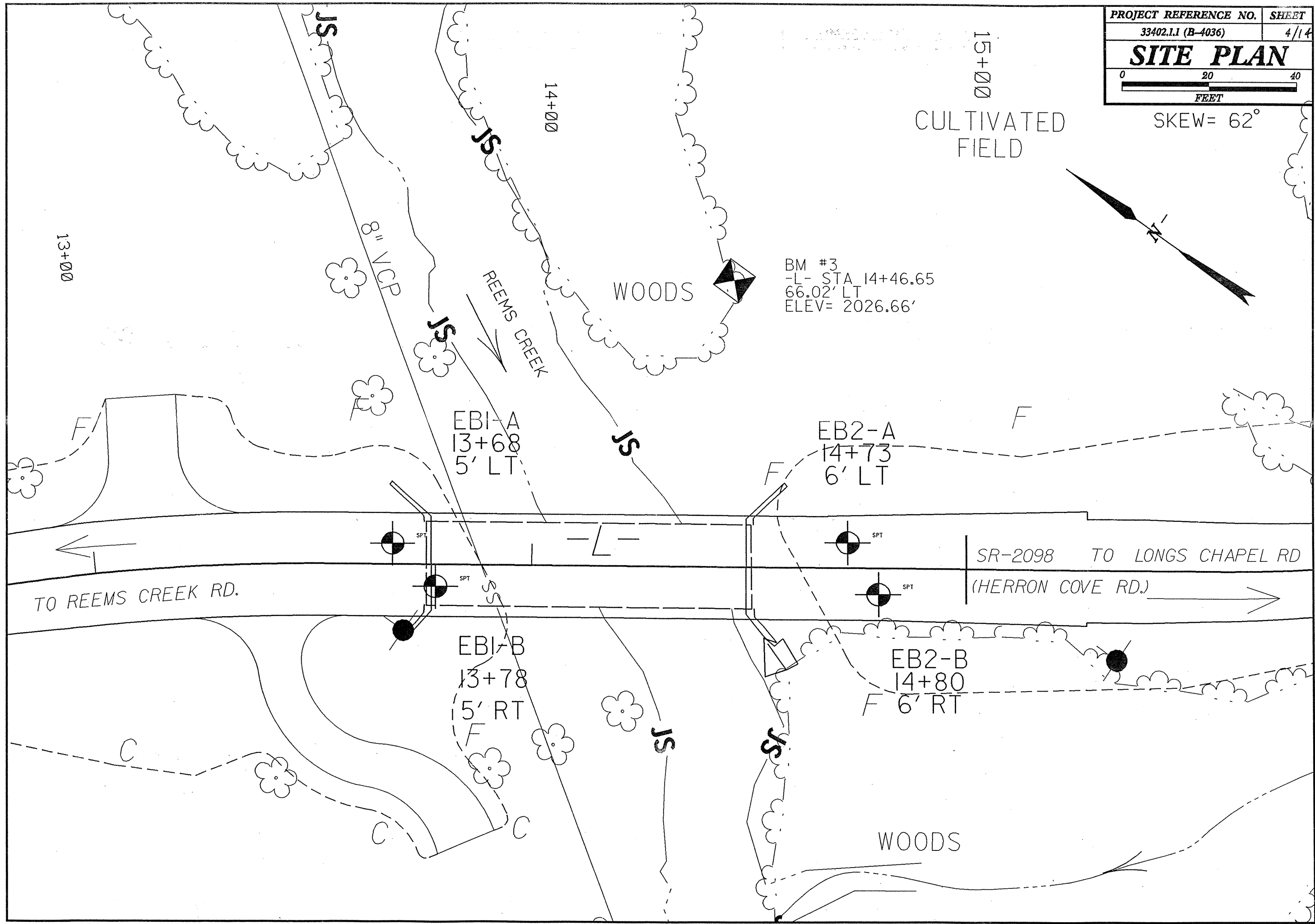

Michael McClain Hager, LG

SKEW = 62°

15+00
CULTIVATED FIELD



BM #3
-L- STA 14+46.65
66.02' LT
ELEV = 2026.66'



13+00

14+00

15+00

JS

JS

JS

JS

JS

JS

8" VCP

REEMS CREEK

WOODS

TO REEMS CREEK RD.

SR-2098 TO LONGS CHAPEL RD

(HERRON COVE RD.)

EBI-A
13+68
5' LT

EB2-A
14+73
6' LT

EBI-B
13+78
5' RT

EB2-B
14+80
6' RT

WOODS

SPT

SPT

SPT

SPT

SPT

C

C

C

C

F

F

SS

F

-L-

-R-

2060

2050

2040

2030

2020

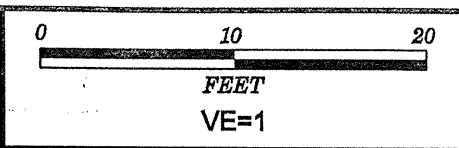
2010

2000

1990

1980

1970



PROJECT REFERENCE NO.	SHEET
33402.1.1 (B-4036)	5/14
PROFILE 16.5' RT OF -L-	

2050

2040

2030

2020

2010

2000

1990

1980

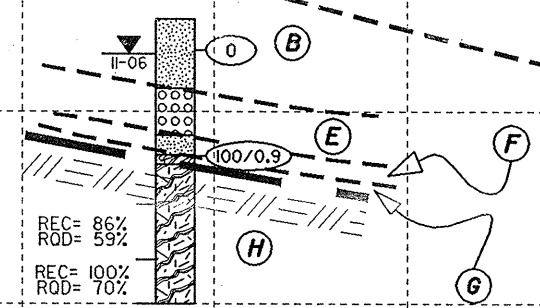
1970

SS-6

EB1-B
13+78
5' RT

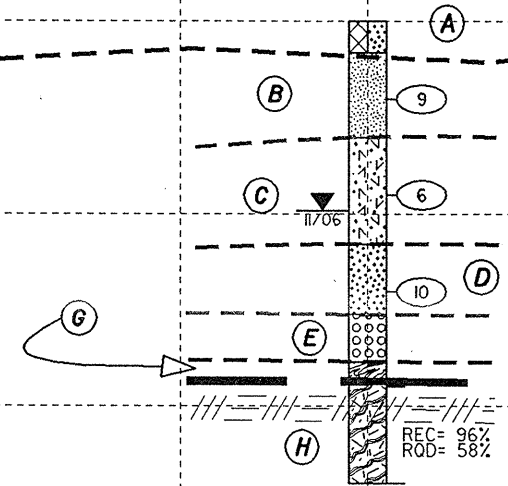
SS-5

EB2-B
14+80
6' RT



WATER SURFACE 11/06

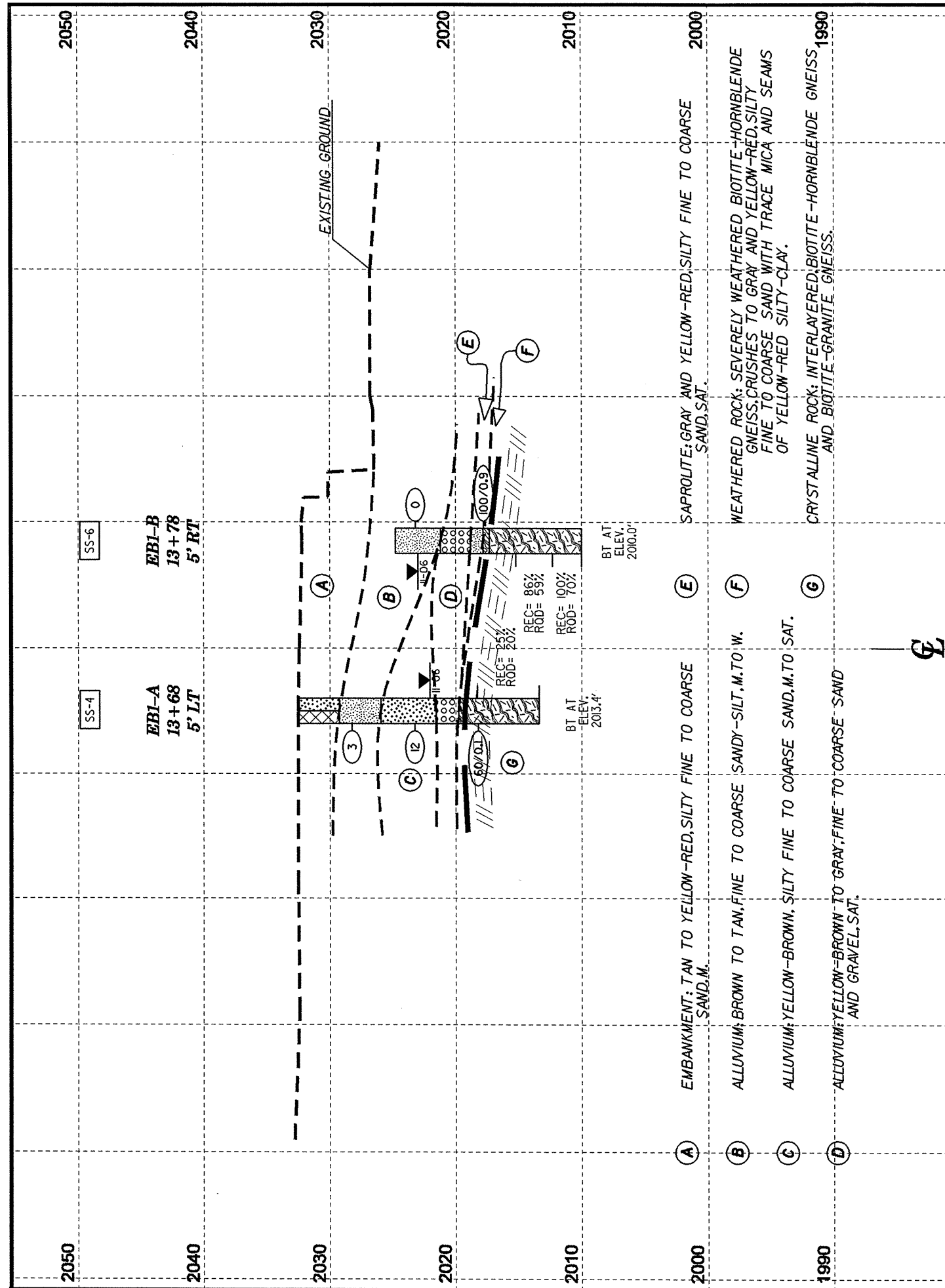
EXISTING GROUND



- (A) EMBANKMENT; TAN TO YELLOW-RED, SILTY FINE TO COARSE SAND, M.
- (B) ALLUVIUM; BROWN, COARSE SANDY-SILT, M.
- (C) ALLUVIUM; GRAY TO BROWN, CLAYEY-FINE SANDY SILT WITH ROOTS AND THINLY LAMINATED LENSES OF LITTLE TO SOME MICACEOUS-FINE, SAND, M TO W.
- (D) ALLUVIUM; GRAY, COARSE SAND, SAT.
- (E) ALLUVIUM; GRAY, COARSE SAND AND GRAVEL, SAT.

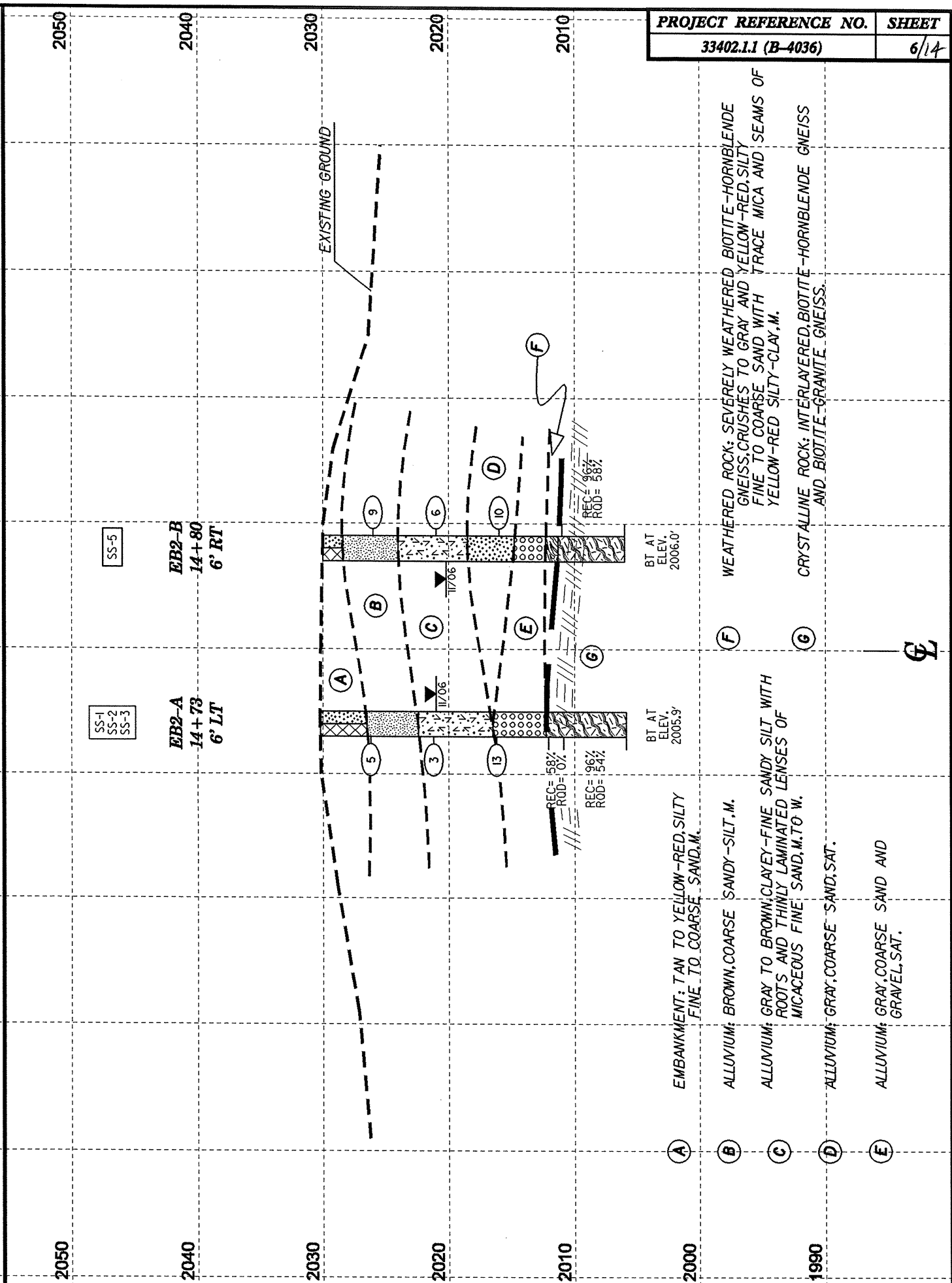
- (F) SAPROLITE; GRAY AND YELLOW-RED, SILTY FINE TO COARSE SAND, SAT.
- (G) WEATHERED ROCK; SEVERELY WEATHERED BIOTITE-HORNBLende GNEISS, CRUSHES TO GRAY AND YELLOW-RED, SILTY FINE TO COARSE SAND WITH TRACE MICA AND SEAMS OF YELLOW-RED SILTY-CLAY.
- (H) CRYSTALLINE ROCK; INTERLAYERED, BIOTITE-HORNBLende GNEISS AND BIOTITE-GRANITE GNEISS.

13+60 13+70 13+80 13+90 14+00 14+10 14+20 14+30 14+40 14+50 14+60 14+70 14+80 14+90



HORIZ. SCALE 0 10 20 (FEET) VE=1

CROSS SECTION THROUGH EB1 ON 62° SKEW

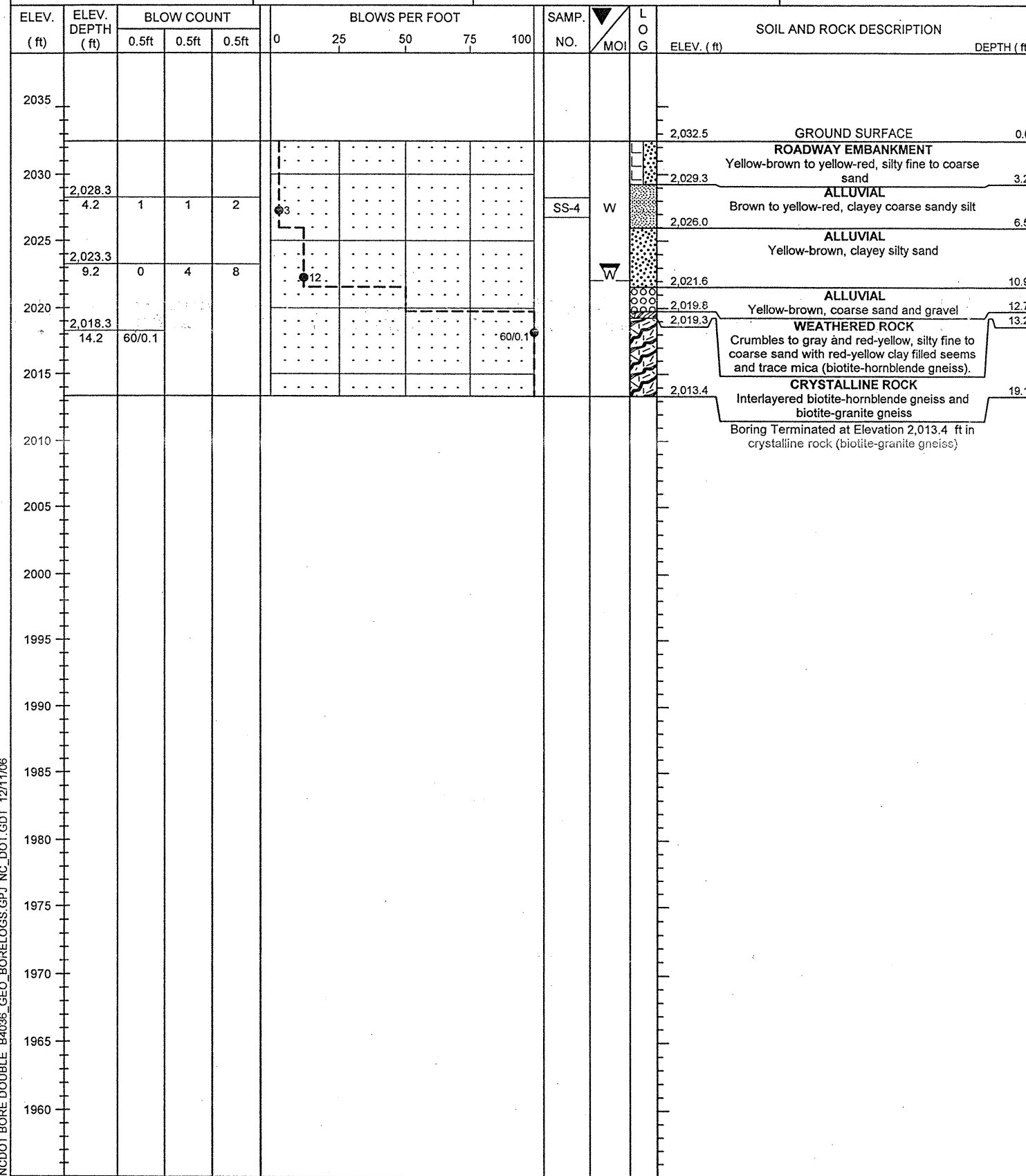


HORIZ. SCALE 0 10 20 (FEET) VE=1

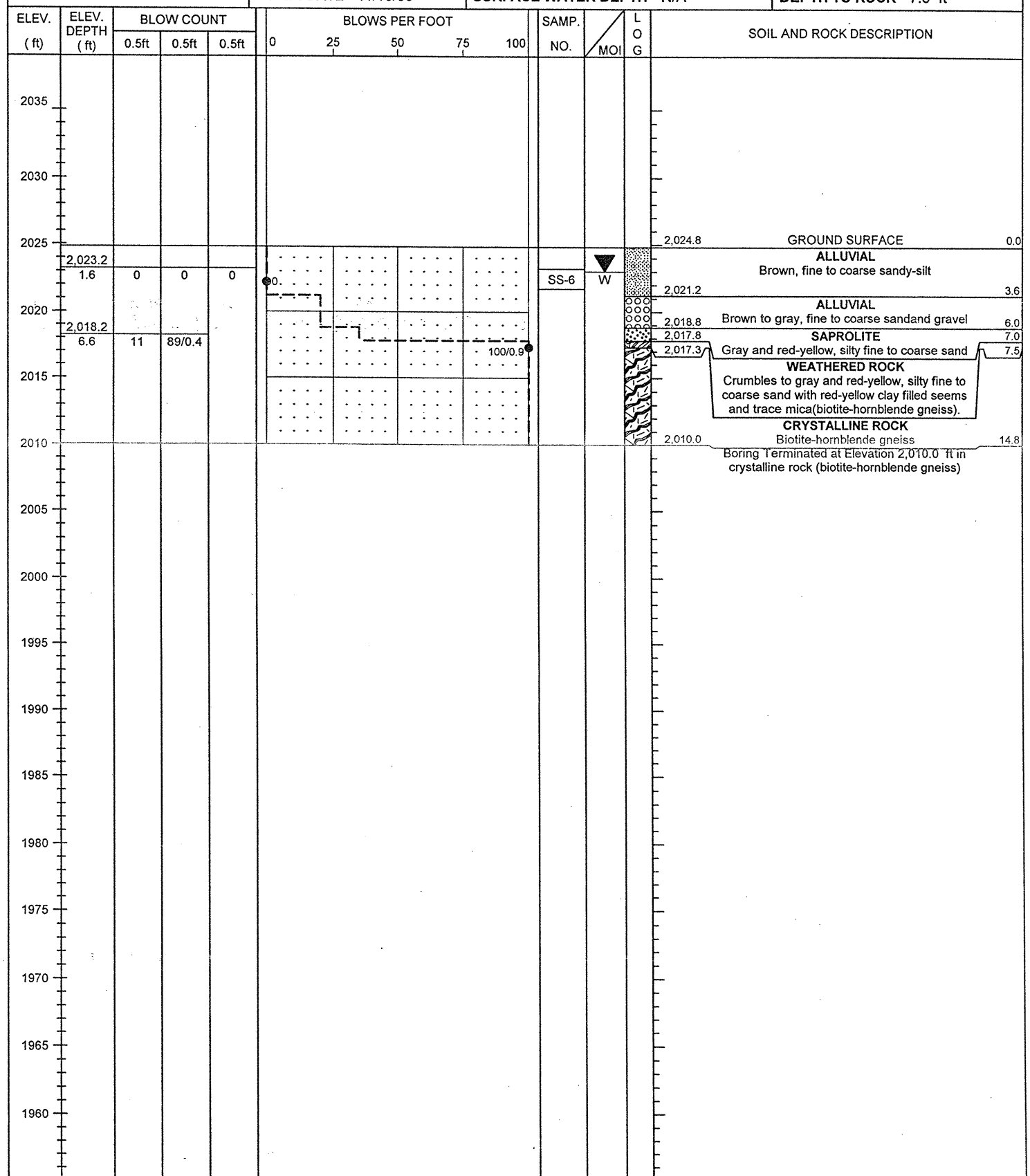
CROSS SECTION THROUGH EB2 ON 62° SKEW



PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 13+68	OFFSET 5 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,032.5 ft	TOTAL DEPTH 19.1 ft	NORTHING 723,006	EASTING 942,710
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/14/06	COMP. DATE 11/14/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 13.2 ft



PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+78	OFFSET 5 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,024.8 ft	TOTAL DEPTH 14.8 ft	NORTHING 722,992	EASTING 942,708
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/16/06	COMP. DATE 11/16/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.5 ft



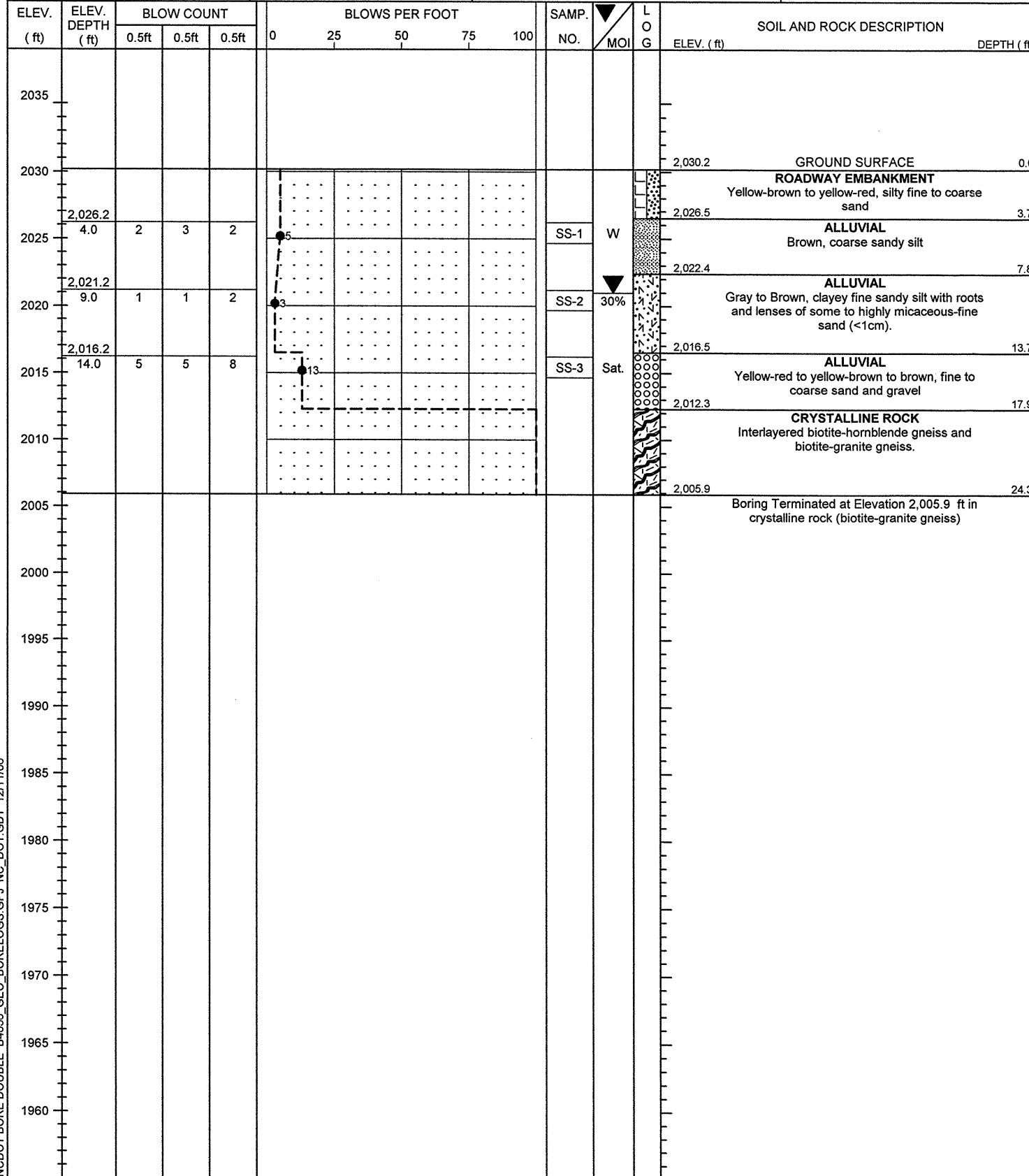
NCDOT BORE DOUBLE B4036_GEO_BORELOGS.GPJ NC_DOT_GDT 12/11/06



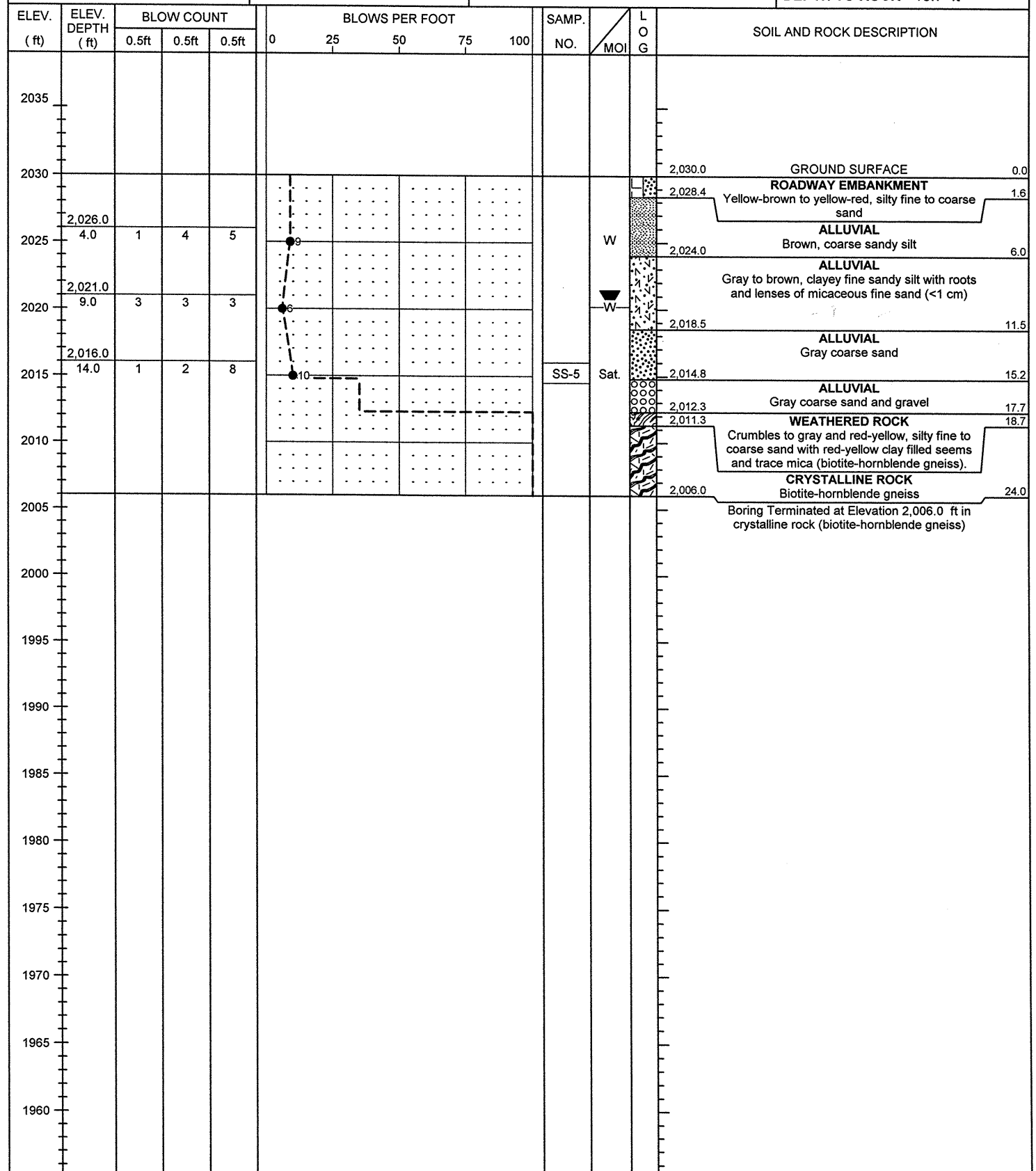
NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+73	OFFSET 6 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,030.2 ft	TOTAL DEPTH 24.3 ft	NORTHING 722,920	EASTING 942,771
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/13/06	COMP. DATE 11/13/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 17.9 ft



PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 14+80	OFFSET 6 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,030.0 ft	TOTAL DEPTH 24.0 ft	NORTHING 722,908	EASTING 942,765
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/14/06	COMP. DATE 11/14/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 18.7 ft



NCDOT BORE DOUBLE B4036_GEO_BORELOGS.GPJ NC_DOT_GDT 12/11/06

PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 13+68	OFFSET 5 ft LT	ALIGNMENT -L- 0 HR. N/A
COLLAR ELEV. 2,032.5 ft	TOTAL DEPTH 19.1 ft	NORTHING 723,006	EASTING 942,710 24 HR. 10.4
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/14/06	COMP. DATE 11/14/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 13.2 ft
CORE SIZE NXWL	TOTAL RUN 0.0 ft	DRILLER Cheek, D. O.	

ELEV. (ft)	ELEV. DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
				REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2032.47										Ground Surface	
										ROADWAY EMBANKMENT	
										Yellow-brown to yellow-red, silty fine to coarse sand	3.2
2028.3	4.2	1.5	N=3			SS-4				ALLUVIAL	
										Brown to yellow-red, clayey coarse sandy silt	6.5
2023.3	9.2	1.5	N=12							ALLUVIAL	
										Yellow-brown, clayey silty sand	10.9
2018.3	14.2	0.1	N=60/0.1	(4.7)	(3.8)					ALLUVIAL	12.7
										Yellow-brown, coarse sand and gravel	13.2
2018.2	14.3	19.1		25%	20%					WEATHERED ROCK	
										Crumbles to gray and red-yellow, silty fine to coarse sand with red-yellow clay filled seams and trace mica (biotite-hornblende gneiss).	
										CRYSTALLINE ROCK	
										Interlayered biotite-hornblende gneiss and biotite-granite gneiss	19.1
										Interlayered, fresh to moderate severely weathered biotite-hornblende gneiss and fresh to severely weathered biotite-granite gneiss.	
										Boring Terminated at Elevation 2,013.4 ft in crystalline rock (biotite-granite gneiss)	

PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+78	OFFSET 5 ft RT	ALIGNMENT -L- 0 HR. N/A
COLLAR ELEV. 2,024.8 ft	TOTAL DEPTH 14.8 ft	NORTHING 722,992	EASTING 942,708 24 HR. 1.8
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/16/06	COMP. DATE 11/16/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.5 ft
CORE SIZE NXWL	TOTAL RUN 0.0 ft	DRILLER Coffey, Jr., C.	

ELEV. (ft)	ELEV. DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
				REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2024.81										Ground Surface	
										ALLUVIAL	
										Brown, fine to coarse sandy-silt	3.6
2020	1.6	1.5	N=0			SS-6				ALLUVIAL	
										Brown to gray, fine to coarse sand and gravel	6.0
2018.2	6.6	0.9	N=100/0.9							SAPROLITE	7.0
										Gray and red-yellow, silty fine to coarse sand	7.5
2015.2	9.6	2.9		(2.5)	(1.7)					WEATHERED ROCK	
				86%	59%					Crumbles to gray and red-yellow, silty fine to coarse sand with red-yellow clay filled seams and trace mica (biotite-hornblende gneiss).	
2012.3	12.5	2.3		(2.3)	(1.6)					CRYSTALLINE ROCK	
				100%	70%					Biotite-hornblende gneiss	14.8
2010										Fresh to slightly weathered biotite-hornblende gneiss.	
										Fresh to slightly weathered biotite-hornblende gneiss.	
										Boring Terminated at Elevation 2,010.0 ft in crystalline rock (biotite-hornblende gneiss)	

NCDOT CORE DOUBLE B4036_GEO_BORELOGS.GPJ NC_DOT.GDT 12/11/06

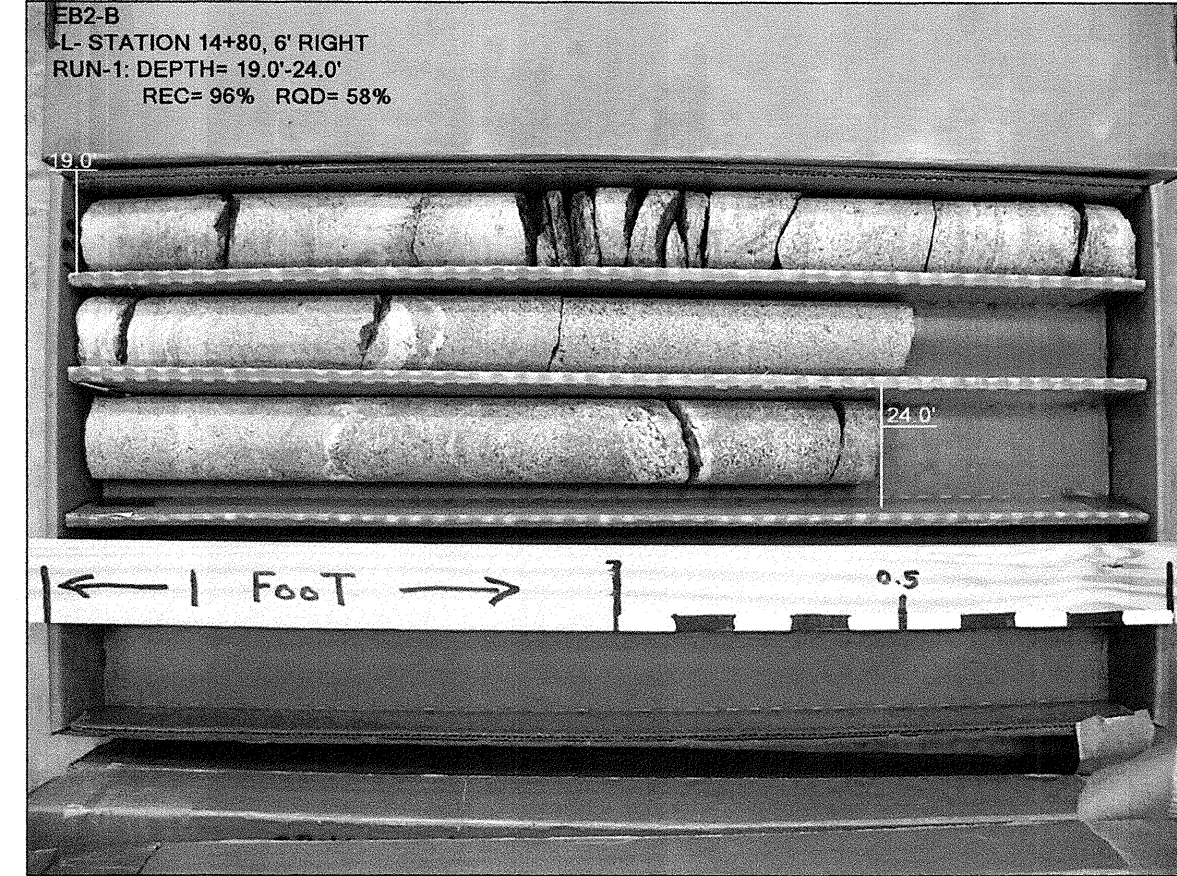
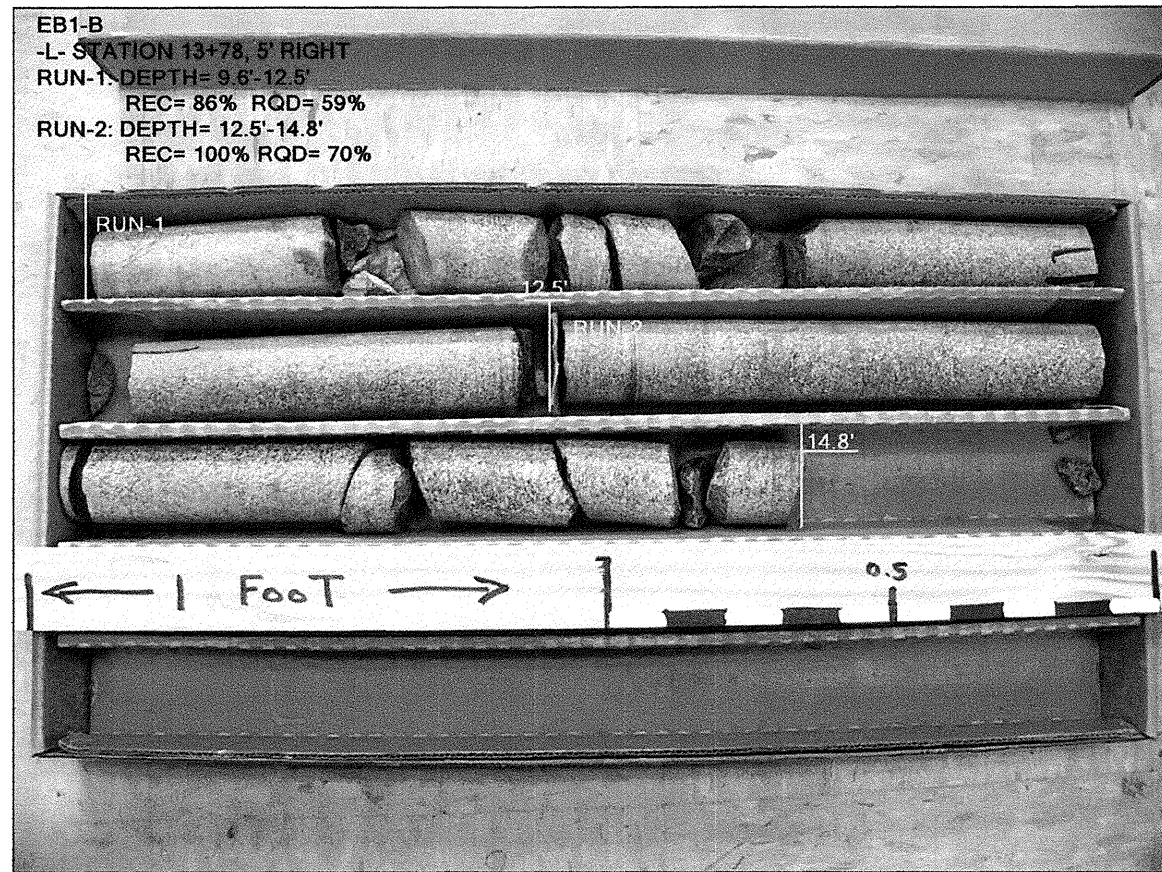
PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+73	OFFSET 6 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,030.2 ft	TOTAL DEPTH 24.3 ft	NORTHING 722,920	EASTING 942,771
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/13/06	COMP. DATE 11/13/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 17.9 ft
CORE SIZE NXWL	TOTAL RUN 0.0 ft	DRILLER Rose, G. K.	

ELEV. (ft)	ELEV. DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
				REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2030.18										Continued from previous page	
										ROADWAY EMBANKMENT	
	2,026.2									Yellow-brown to yellow-red, silty fine to coarse sand	3.7
2025	4.0	1.5	N=5			SS-1				ALLUVIAL	
										Brown, coarse sandy silt	
	2,021.2									ALLUVIAL	7.8
2020	9.0	1.5	N=3			SS-2				Gray to Brown, clayey fine sandy silt with roots and lenses of some to highly micaceous-fine sand (<1cm).	
	2,016.2									ALLUVIAL	13.7
2015	14.0	1.5	N=13			SS-3				Yellow-red to yellow-brown to brown, fine to coarse sand and gravel	
	2,012.1									ALLUVIAL	17.9
	18.1	1.5	N=100	(0.7)	(0.0)					CRYSTALLINE ROCK	
2010	2,010.9	1.2		58%	0%					Interlayered biotite-hornblende gneiss and biotite-granite gneiss.	
	19.3	5.0		(4.8)	(2.7)					Fresh to very severely weathered biotite-hornblende gneiss.	
				96%	54%					Interlayered, fresh to moderate severely weathered biotite-hornblende gneiss and fresh to very severely weathered biotite-granite gneiss.	
2005										Boring Terminated at Elevation 2,005.9 ft in crystalline rock (biotite-granite gneiss)	24.3

PROJECT NO. 33402.1.1	ID. B-4036	COUNTY Buncombe	GEOLOGIST Hager, M. M.
SITE DESCRIPTION Bridge No. 220 on -L- (SR 2098 Herron Cove Rd.) over Reems Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 14+80	OFFSET 6 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,030.0 ft	TOTAL DEPTH 24.0 ft	NORTHING 722,908	EASTING 942,765
DRILL MACHINE CME-550X	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 11/14/06	COMP. DATE 11/14/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 18.7 ft
CORE SIZE NXWL	TOTAL RUN 0.0 ft	DRILLER Coffey, Jr., C.	

ELEV. (ft)	ELEV. DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
				REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2030										Continued from previous page	
										ROADWAY EMBANKMENT	
	2,028.4									Yellow-brown to yellow-red, silty fine to coarse sand	1.6
2025	4.0	1.5	N=9							ALLUVIAL	
										Brown, coarse sandy silt	
	2,024.0									ALLUVIAL	6.0
2020	9.0	1.5	N=6							Gray to brown, clayey fine sandy silt with roots and lenses of micaceous fine sand (<1 cm)	
	2,018.5									ALLUVIAL	11.5
2015	14.0	1.5	N=10			SS-5				Gray coarse sand	
	2,014.8									ALLUVIAL	15.2
	2,012.3									Gray coarse sand and gravel	17.7
2010	19.0	5.0	N=100	(4.8)	(2.9)					WEATHERED ROCK	18.7
				96%	58%					Crumbles to gray and red-yellow, silty fine to coarse sand with red-yellow clay filled seams and trace mica (biotite-hornblende gneiss).	
										CRYSTALLINE ROCK	
										Biotite-hornblende gneiss	
2005										Fresh to moderately weathered biotite-hornblende gneiss.	24.0
										Boring Terminated at Elevation 2,006.0 ft in crystalline rock (biotite-hornblende gneiss)	

NC DOT CORE DOUBLE B4036_GEO_BORELOGS.GPJ NC_DOT_GDT 12/11/06



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

T.I.P. ID #: B-4036

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33402.1.1	COUNTY:	Buncombe	Owner:	NCDOT
DATE SAMPLED:	11.6.06	DATE RECEIVED:	11.15.06	DATE REPORTED:	11.21.06
SAMPLED FROM:	Bridge	SAMPLED BY:	M. M. Hager		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-5	SS-4	SS-6		
Lab Sample No. A	154119	154120	154122	154123	154131	154132		
HiCAMS Sample #	--	--	--	--	--	--		
Retained #4 Sieve %	0.0	0.0	22.2	0.0	0.0	0.0		
Passing #10 Sieve %	90	88	50	96	90	92		
Passing #40 Sieve %	66	86	25	76	73	86		
Passing #200 Sieve %	41	73	8	11	42	43		

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	46	6	75	78	41	24		
Fine Sand - Ret. #270	12	19	14	13	16	43		
Silt 0.05-0.005 mm %	30	57	11	9	25	25		
Clay < 0.005 mm %	12	18	0.0	0.0	18	8		
Passing # 40 Sieve %	--	--	--	--	--	--		
Passing # 200 Sieve %	--	--	--	--	--	--		

Liquid Limit	31	41	24	23	28	29		
Plastic Index	9	10	NP	NP	9	NP		
AASHTO Classification	A-4 (1)	A-5 (7)	A-1-a (0)	A-2-4 (0)	A-4 (1)	A-4 (1)		
Quantity								
Texture								
Station	14+73	14+73	14+73	14+80	13+68	13+78		
Hole No.								
Depth (ft) From:	4.5	9.5	14.5	14.5	4.7	2.1		
To:	5.5	10.5	15.5	15.5	5.7	3.1		

Remarks:

A-154119 - 154132; Moisture sample M-2 = 30.4% moisture.

CC:

M. M. Hager	
File	

SOILS ENGINEER:



**FIELD
 SCOUR REPORT**

WBS: 33402.1.1 TIP: B-4036 COUNTY: BUNCOMBE

DESCRIPTION(1): BRIDGE NO. 220 ON SR-2098 (HERRON COVE RD.) OVER REEMS CREEK

EXISTING BRIDGE

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

Bridge No.: 220 Length: 75' Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 2
 Foundation Type: TIMBER PILES ON CONCRETE FOOTING

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: EB1 IS OK; EB2 WING WALL HAS HAD BEEN REPAIRED WITH A GABION BASKET WALL,

Interior Bents: MINOR SCOURING OF CHANNEL BED AROUND EXISTING INTERIOR BENT ON UPSTREAM SIDE.

Channel Bed: NONE NOTED

Channel Bank: EVIDENCE OF MINOR SCOURING ALONG NORTH BANK OF CREEK, 20' DOWNSTREAM OF EXISTING STRUCTURE.

EXISTING SCOUR PROTECTION

Type(3): WING WALLS, CONCRETE ABUTMENT WALLS, GABION BASKETS

Extent(4): EB1 WALLS 10'L X 5' H; EB2- WALLS 20' L X 15' H

Effectiveness(5): EB1 APPEARS OK; EB2 BASKETS SEEM EFFECTIVE, WALLS OBVIOUSLY DAMAGED FROM

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): COARSE SAND AND GRAVEL (SS-3)

Channel Bank Material(8): SANDY SILT (SS-1)

Channel Bank Cover(9): GRASS LAWN, DECIDUOS WOODS, SHRUBS

Floodplain Width(10): 0-150'

Floodplain Cover(11): DECIDUOUS WOODS, AGRICULTURAL FIELDS

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): TENDING TO MIGRATE SOUTH AGAINST EB2 WING WALL

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

	BENTS											
	EB1	EB2	B3	B4								
A-SIDE (LEFT)	2032.1	2030.2										
B-SIDE (RIGHT)	2024.8	2030										

Comparison of DSE to Hydraulics Unit theoretical scour: _____

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bed				
Sample No.	SS-1	SS-3				
Retained #4	0	22.2				
Passed #10	90	50				
Passed #40	66	25				
Passed #200	41	8				
Coarse Sand	46	75				
Fine Sand	12	14				
Silt	30	11				
Clay	12	0				
LL	31	24				
PI	9	NP				
AASHTO	A-4 (1)	A-1a (0)				
Station	14+73	14+73				
Offset	6' LT	6' LT				
Depth	4.5-5.5	14.5-15.5				

Reported by: M.M. Hager
 M.M. HAGER

Date: 11/27/2006



Photo 1: Looking upstream (East) at existing bridge. Line -L- is running from left to right. Note sewer manhole in foreground



Photos 4-6: Looking at damaged wing wall repaired with Gabion baskets.

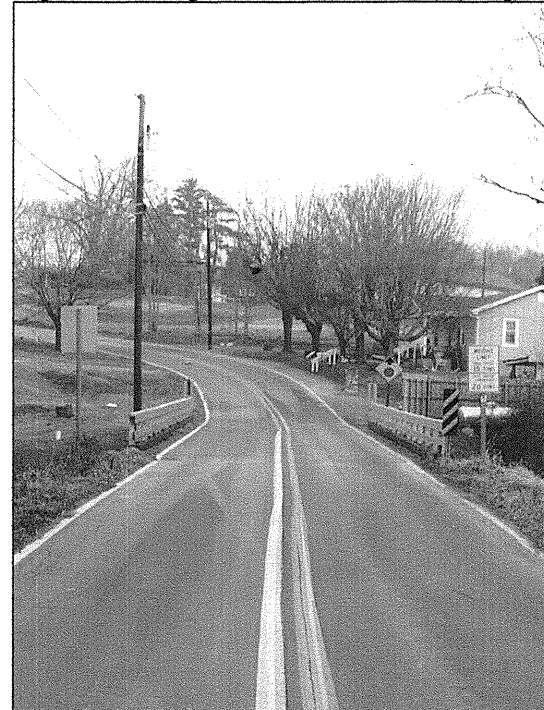
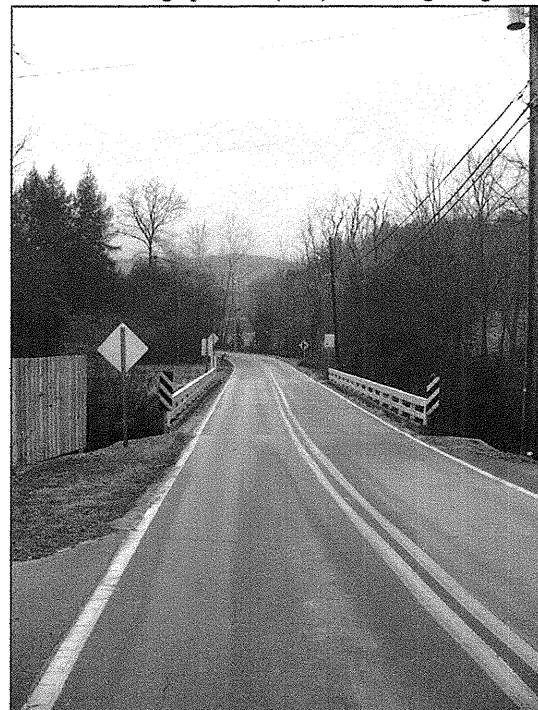


Photo 2: Looking Upstation (South) at -L- from Station 13+00. Photo 3: Looking Downstation (North) at -L- from Station 15+00.

