

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: BRIDGE 67
6	CROSS SECTION(S): BRIDGE 67
7-8	BORE LOG(S): BRIDGE 67
9	PROFILE: BRIDGE 95
10	CROSS SECTION(S): BRIDGE 95
11-12	BORE LOG(S): BRIDGE 95
13	SOIL TEST RESULTS
14	SCOUR REPORT: BRIDGE 67
15	SCOUR REPORT: BRIDGE 95
16	SITE PHOTOGRAPHS

PROJ. REFERENCE NO. 33594.1.1 (B-4252) F.A. PROJ. BRSTP-311(14)
COUNTY ROCKINGHAM
PROJECT DESCRIPTION SITE 1: BRIDGE NO. 67 ON -L- (US 311) OVER
LITTLE BEAVER ISLAND CREEK
SITE 2: BRIDGE NO. 95 ON -L- (US 311) OVER BIG BEAVER
ISLAND CREEK

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.

PERSONNEL

TRIGON:

D. GOODNIGHT

W. WHICHARD

B. HENDRICKS

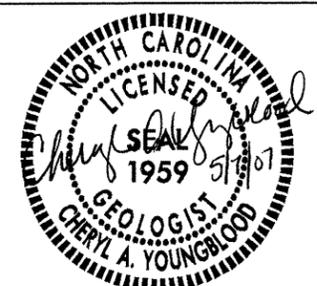
P. WEAVER

INVESTIGATED BY C.A. YOUNGBLOOD

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE MARCH 2007



PROJECT: 33594.1.1
ID: B-4252

DRAWN BY: J.R. MATULA

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT 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					
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, DARK 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. 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 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 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.					
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.		WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)							
GROUP CLASS. A-1, A-2, A-3, A-4, A-5, A-6, A-7		COMPRESSIBILITY		FRESH VERY SLIGHT (V SL.) SLIGHT (SL.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
SYMBOL		SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE		ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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. 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. 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. 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.		LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL. IF TESTED, ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.			
% PASSING # 10 # 40 # 200		PERCENTAGE OF MATERIAL		MODERATE MODERATELY SEVERE SEVERE VERY SEVERE COMPLETE							
LIQUID LIMIT PLASTIC INDEX		ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL		FRESH VERY SLIGHT (V SL.) SLIGHT (SL.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
GROUP INDEX		TRACE OF ORGANIC MATTER LITTLE ORGANIC MATTER MODERATELY ORGANIC HIGHLY ORGANIC		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
USUAL TYPES OF MAJOR MATERIALS		GROUND WATER		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
GEN. RATING AS A SUBGRADE		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		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MISCELLANEOUS SYMBOLS		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
CONSISTENCY OR DENSENESS		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		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)		SOUNDING ROD 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		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
GENERALY GRANULAR MATERIAL (NON-COHESSIVE)		SOUNDING ROD 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		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
GENERALY SILT-CLAY MATERIAL (COHESSIVE)		SOUNDING ROD 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		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
TEXTURE OR GRAIN SIZE		ABBREVIATIONS		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
U.S. STD. SIEVE SIZE OPENING (MM)		HI. - HIGHLY MED. - MEDIUM MICA - MICA MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)		HI. - HIGHLY MED. - MEDIUM MICA - MICA MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
GRAIN SIZE MM 305 75 2.0 0.25 0.075 0.005 IN. 12 3		HI. - HIGHLY MED. - MEDIUM MICA - MICA MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
- SATURATED - (SAT.) - WET - (W) - MOIST - (M) - DRY - (D)		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
SOLID; AT OR NEAR OPTIMUM MOISTURE		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
PLASTICITY		FRACTURE SPACING		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
PLASTICITY INDEX (PI) DRY STRENGTH		TERM SPACING TERM THICKNESS		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
NONPLASTIC 0-5 LOW PLASTICITY 6-15 MED. PLASTICITY 16-25 HIGH PLASTICITY 26 OR MORE		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		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							
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.		INDURATION		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							
		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.		MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE							



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

LYNDO TIPPETT
SECRETARY

March 7, 2007

STATE PROJECT: 33594.1.1 (B-4252)
FEDERAL PROJECT: BRSTP-311(14)
COUNTY: Rockingham
DESCRIPTION: Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek and
Bridge No. 95 on -L- (US 311) over Big Beaver Island Creek
SUBJECT: Geotechnical Report – Structure Inventory

Project Description

This report consists of the subsurface inventories for the replacement of bridge no. 67 and bridge no. 95 on US 311. Proposed span length for both bridges is 100 feet. Bridge no. 67 and 95 will be built on a 75° skew and a 105° skew, respectively. The project is located in Rockingham County about two miles southwest of Madison.

The subsurface investigation was conducted during November of 2006 using an ATV-mounted CME-55 drill machine. Standard Penetration Test borings were performed at each of the four proposed bent locations. All borings were advanced until non-crystalline rock was encountered. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Tests Unit for laboratory analysis.

Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Triassic Basin, Dan River Group, Cow Branch Formation. The area consists of wooded land and commercial properties.

Soil Properties for Bridge No. 67

Soils encountered at bridge no. 67 include roadway embankment, alluvial and residual soils.

Roadway embankment soils are present in EB1-B and EB2-B borings and range in thickness from 11.0 to 12.0 feet. These soils consist of tan, moist, medium stiff to hard, silty and sandy clay (A-6), (A-7-6).

Roadway embankment soils are underlain by alluvial soils.

Alluvial soils are present at all the bent locations and range in thickness from 7.5 to 9.9 feet. These soils consist primarily of tan-brown, moist to wet, soft to medium stiff, sandy silt (A-4); brown to gray, moist to wet, loose to medium dense, silty and coarse sand (A-2-4, A-1-b). Minor amounts of brown, moist to wet, medium stiff, sandy and silty clay (A-6, A-7-6) are present. Alluvial soils were deposited on residual soils and weathered rock.

Residual soils are present at the EB1-B and are 0.5 feet thick. These soils consist of black, moist, very dense, coarse sand (A-1-b). Residual soils are derived from weathering of the underlying weathered and non-crystalline Triassic rock.

Soil Properties for Bridge No. 95

Soils encountered at bridge no. 95 include roadway embankment, alluvial and residual soils.

Roadway embankment soils are present in EB1-B and EB2-B borings and are 12.0 feet in thickness. These soils consist of a tan, moist, loose to medium dense, silty sand (A-2-4). Roadway embankment soils are underlain by alluvial soils.

Alluvial soils are present at all the bent locations and range in thickness from 7.5 to 9.9 feet. These soils consist primarily of tan-brown to gray, moist to wet, soft to very stiff, sandy silt (A-4) with minor amounts of brown, moist, dense to very dense, coarse sand. Alluvial soils were deposited on residual soils and weathered rock.

Residual soils are present at the EB2-B and are 0.5 feet thick. These soils consist of black, moist, very dense, clayey sand (A-2-6). Residual soils are derived from weathering of the underlying weathered and non-crystalline Triassic rock.

Rock Properties for Bridge No. 67

Weathered rock is present at each boring location. Weathered rock is derived from the underlying non-crystalline Triassic rock and ranges in thickness from 0.7 to 3.5 feet. The top of weathered rock was encountered at elevations ranging from 546.8 to 549.1 feet.

Non-crystalline rock was encountered at each boring location by Standard Penetration Test refusal. The top of non-crystalline rock ranges in elevation from 544.1 to 547.2 feet. The non-crystalline rock type is a Triassic black shale.

Rock Properties for Bridge No. 95

Weathered rock is present at each boring location. Weathered rock is derived from the underlying non-crystalline Triassic rock and ranges in thickness from 0.7 to 2.8 feet. The top of weathered rock was encountered at elevations ranging from 546.8 to 549.0 feet.

Non-crystalline rock was encountered at each boring location by Standard Penetration Test refusal. The top of non-crystalline rock ranges in elevation from 544.3 to 547.8 feet. The non-crystalline rock type is a Triassic black shale.

Groundwater for Bridge No. 67

Groundwater was encountered at all boring locations except for EB2-B. At the time of the investigation, groundwater elevations ranged from 553.0 to 555.7 feet. The surface water elevation was 550.5 feet for Little Beaver Island Creek.

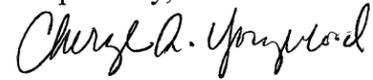
Groundwater for Bridge No. 95

Groundwater was encountered at all boring locations. At the time of the investigation, groundwater elevations ranged from 550.7 to 551.9. The surface water elevation was 550.5 feet for Big Beaver Island Creek.

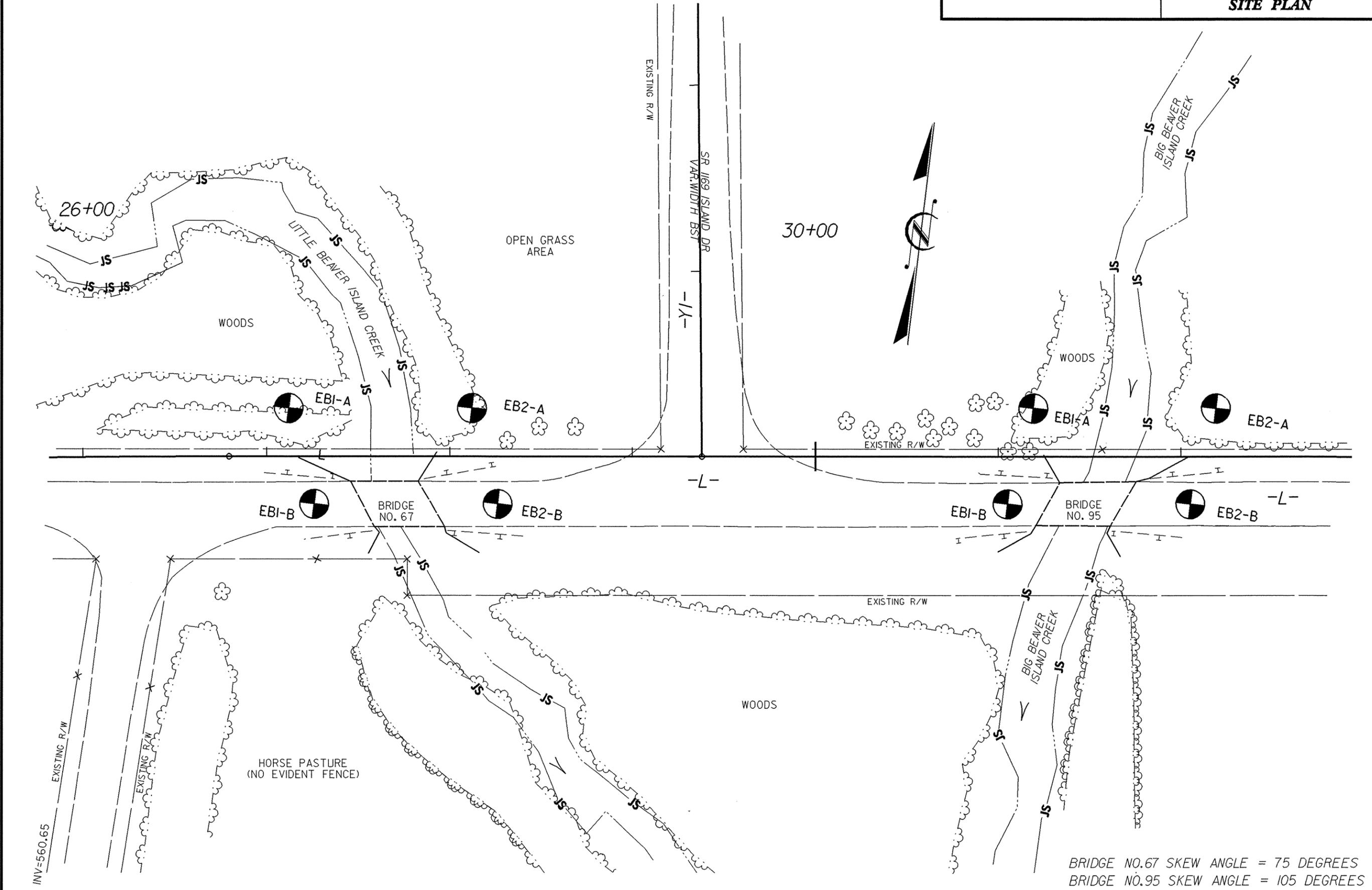
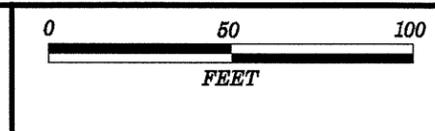
Notice

This Geotechnical foundation report is based on the Preliminary General Drawing dated October 2006 and the Bridge Survey & Hydraulic Design Report dated August 30, 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared by,



Cheryl A. Youngblood, LG
Project Geological Engineer



BRIDGE NO. 67 SKEW ANGLE = 75 DEGREES
 BRIDGE NO. 95 SKEW ANGLE = 105 DEGREES

INV=560.65

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 27+12	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 558.6 ft	TOTAL DEPTH 13.2 ft	NORTHING 959,680	EASTING 1,710,906
DRILL MACHINE CME-55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/09/06	COMP. DATE 11/09/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 13.2 ft

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						
560															
557.6	1.0													558.6	GROUND SURFACE
555.1	3.5	4	3	4									SS-1	555.6	ALLUVIAL BROWN, SANDY CLAY
552.6	6.0	2	2	2									SS-2		BROWN, SANDY SILT
550.1	8.5	1	2	1									SS-3		
		2	1	4									SS-4		BROWN, COARSE SAND
545.4	13.2													548.7	WEATHERED ROCK (TRIASSIC BLACK SHALE)
														545.4	Boring Terminated with Standard Penetration Test Refusal at Elevation 545.4 ft On Non-cystalline Rock (Triassic Black Shale)

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 27+26	OFFSET 26ft RT	ALIGNMENT -L-
COLLAR ELEV. 567.6 ft	TOTAL DEPTH 23.5 ft	NORTHING 959,630	EASTING 1,710,926
DRILL MACHINE CME-55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/14/06	COMP. DATE 11/14/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 23.5 ft

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						
570															
566.1	1.5	3	5	4										567.6	GROUND SURFACE
564.1	3.5													566.1	ASPHALT (0.0-0.7') AND CONCRETE (0.7-1.5')
561.6	6.0														ROADWAY EMBANKMENT TAN, SANDY CLAY
559.1	8.5	9	19	6											
554.1	13.5	3	5	5										556.6	ALLUVIAL GRAY, SILTY SAND
549.1	18.5	1	3	70										548.1	RESIDUAL BLACK COARSE SAND (TRIASSIC)
544.1	23.5													547.6	WEATHERED ROCK (TRIASSIC BLACK SHALE)
														544.1	Boring Terminated with Standard Penetration Test Refusal at Elevation 544.1 ft On Non-cystalline Rock (Triassic Black Shale)

NCDOT BORE DOUBLE B4252_GEO_BH_067.GPJ NC_DOT.GDT 05/07/07



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 28+12	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 557.1 ft	TOTAL DEPTH 11.0 ft	NORTHING 959,692	EASTING 1,711,005
DRILL MACHINE CME-55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/09/06	COMP. DATE 11/09/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 11.0 ft

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				
560													
556.1	1.0	2	3	2							M	GROUND SURFACE	0.0
553.6	3.5	2	2	3							SS-8	ALLUVIAL BROWN, SANDY SILT	3.0
551.1	6.0	2	3	4							W	BROWN, SILTY CLAY	8.0
548.6	8.5	60/0.2										WEATHERED ROCK (TRIASSIC BLACK SHALE)	8.0
546.1	11.0	60/0.0										WEATHERED ROCK (TRIASSIC BLACK SHALE)	11.0
												Boring Terminated with Standard Penetration Test Refusal at Elevation 546.1 ft On Non-cystalline Rock (Triassic Black Shale)	

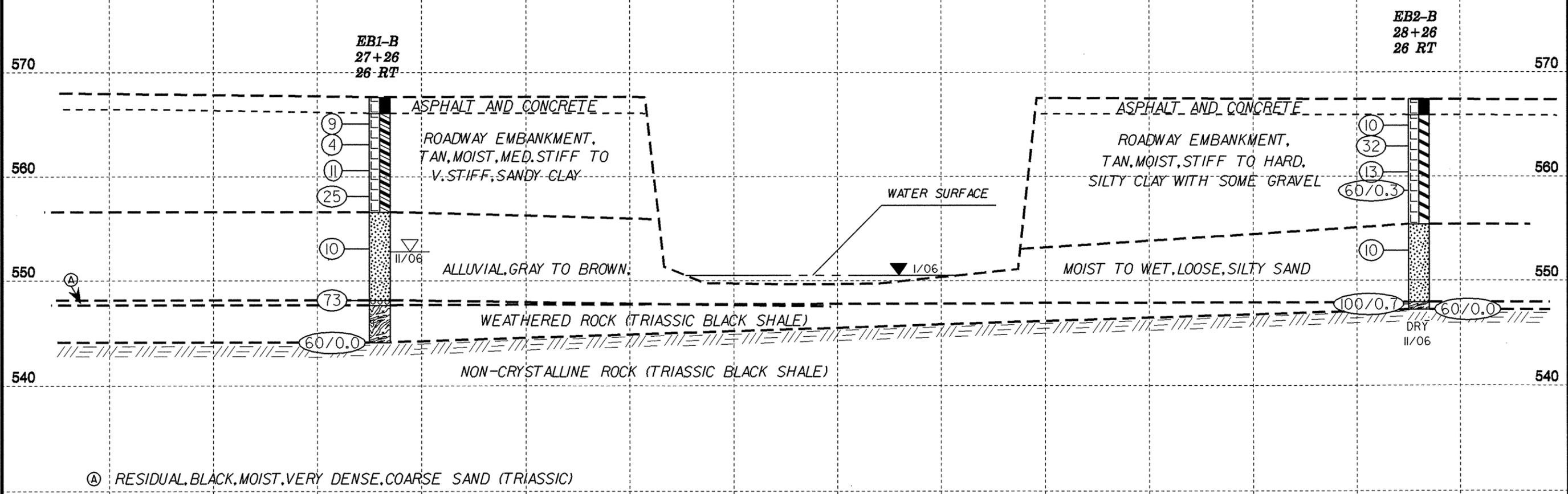
PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 28+26	OFFSET 26ft RT	ALIGNMENT -L-
COLLAR ELEV. 567.4 ft	TOTAL DEPTH 20.2 ft	NORTHING 959,642	EASTING 1,711,025
DRILL MACHINE CME-55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/13/06	COMP. DATE 11/13/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 20.2 ft

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				
570													
565.9	1.5											GROUND SURFACE	0.0
563.9	3.5	6	4	6							SS-9	ASPHALT (0.0-0.7') AND CONCRETE (0.7-1.5')	1.5
561.4	6.0	5	21	11							M	ROADWAY EMBANKMENT TAN, SILTY CLAY WITH LARGE GRAVEL	6.0
558.9	8.5	3	7	6							M	*Blow counts influenced by large gravel	8.0
		60/0.3											
553.9	13.5	4	5	5							SS-10	ALLUVIAL BROWN, SILTY SAND	12.0
548.9	18.5	2	13	87/0.2									
547.2	20.2	60/0.0										WEATHERED ROCK (TRIASSIC BLACK SHALE)	19.5
												Boring Terminated with Standard Penetration Test Refusal at Elevation 547.2 ft On Non-cystalline Rock (Triassic Black Shale)	

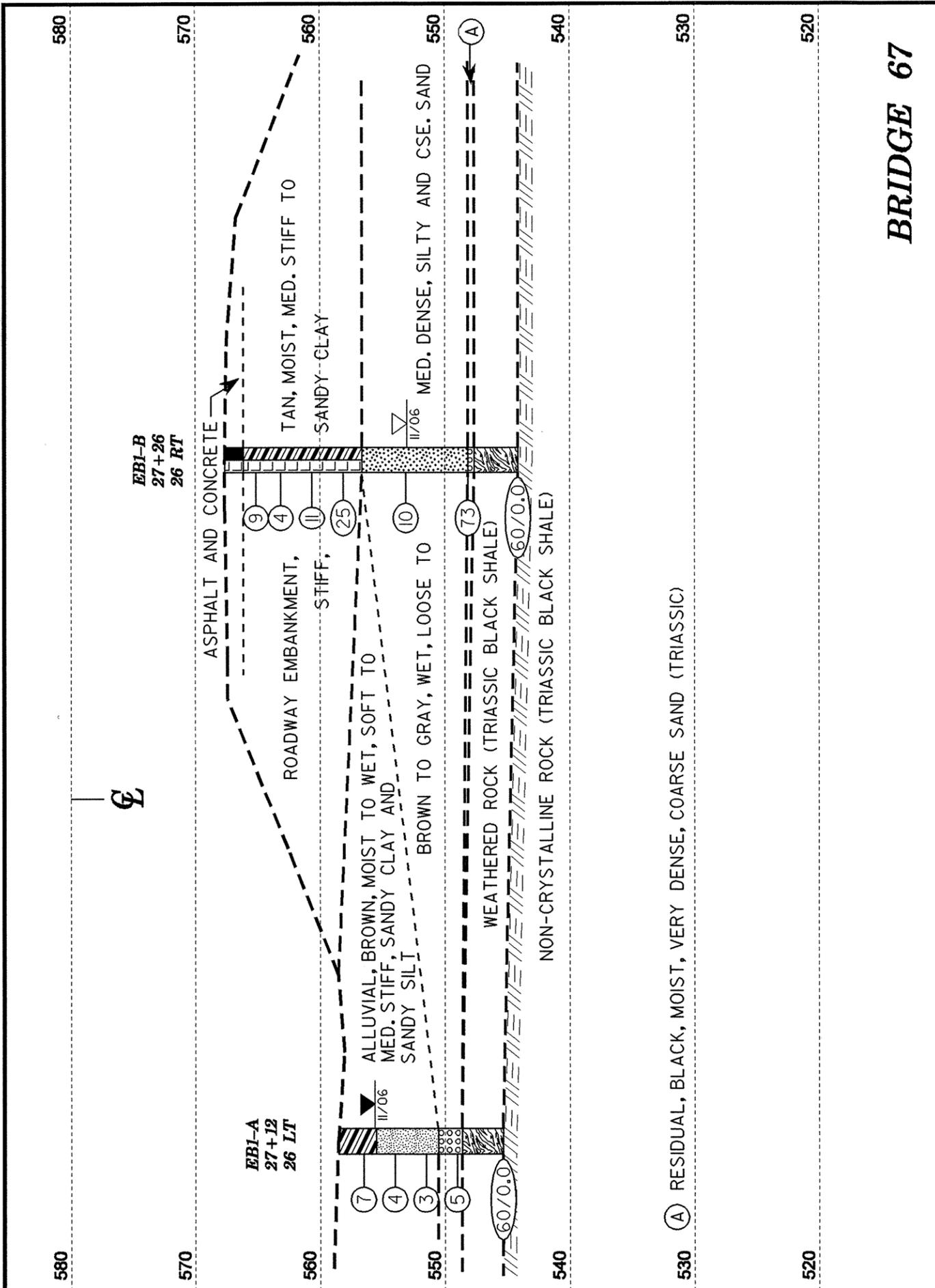
NCDOT BORE DOUBLE B4252_GEO_BH_067.GPJ NC_DOT_GDT_05/07/07

BRIDGE 67

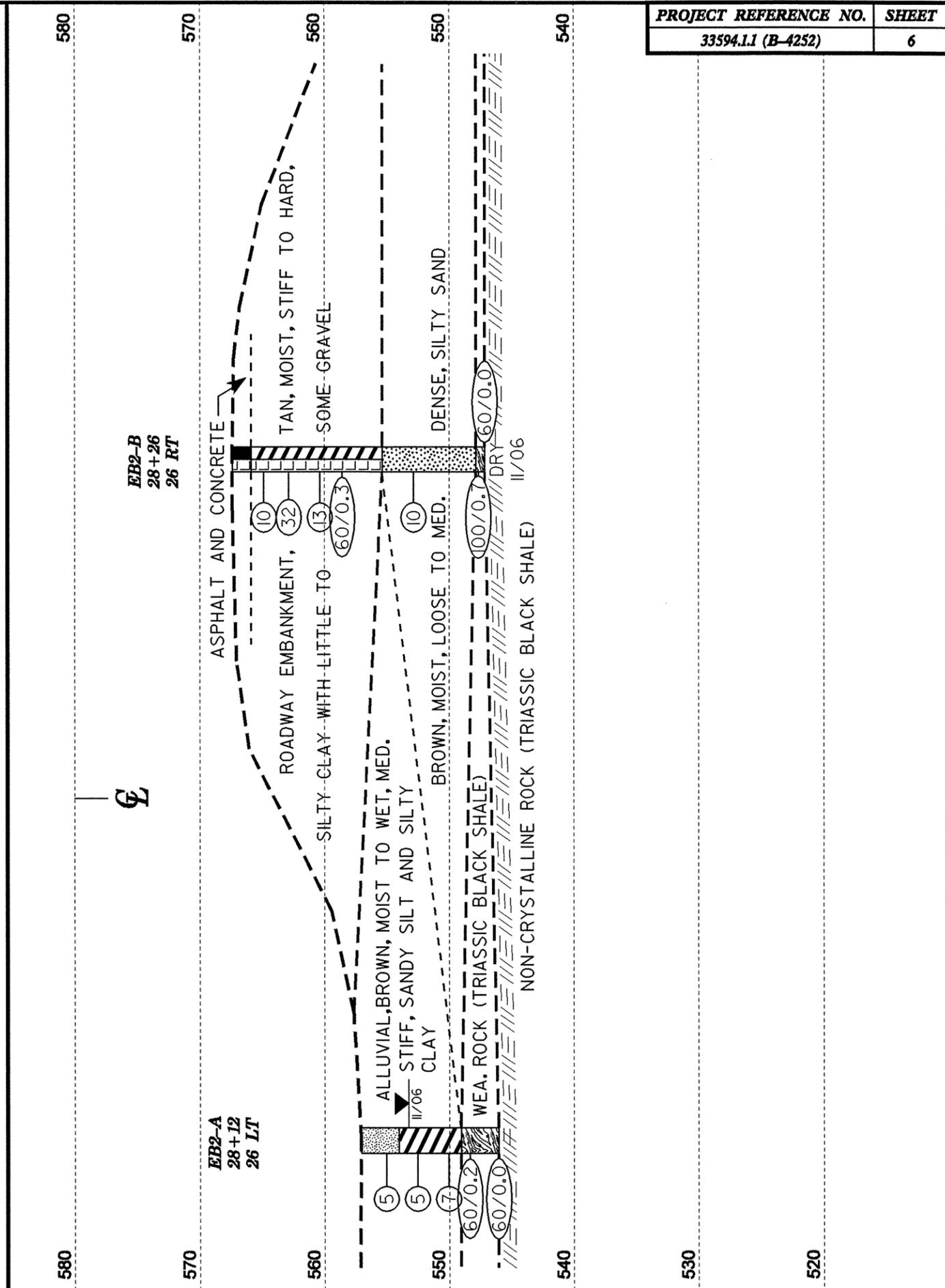
PROFILE 26' RIGHT OF -L-



NOTE: GROUND SURFACE PROFILE CREATED FROM THE TIN FILE: b4252_ls_tin_060123.tin DATED 1/23/2006



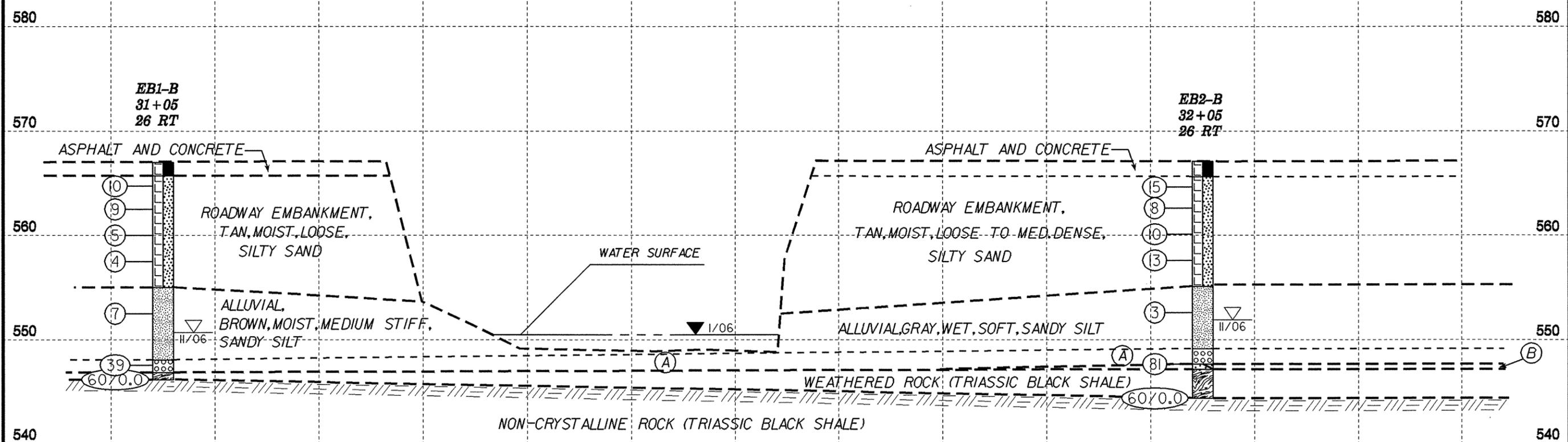
HORIZ. SCALE 0 10 20 (FEET) VE = 1:1 **BORINGS THROUGH BENT 1**



HORIZ. SCALE 0 10 20 (FEET) VE = 1:1 **BORINGS THROUGH BENT 2**

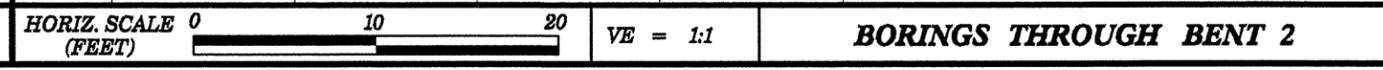
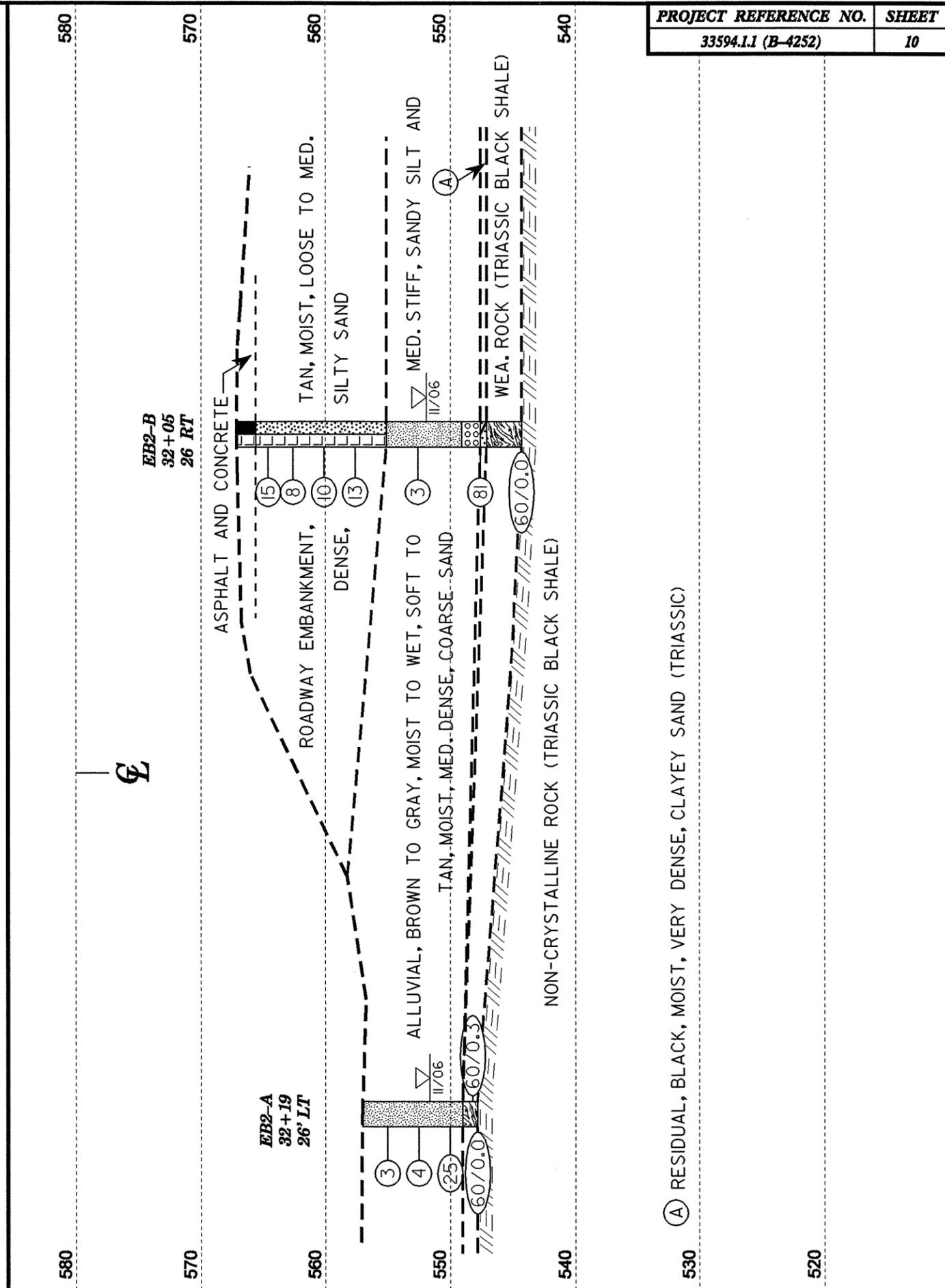
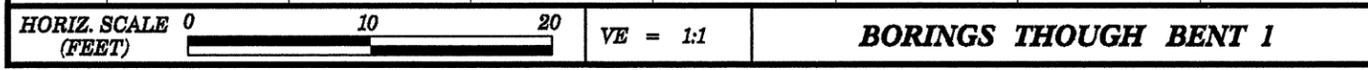
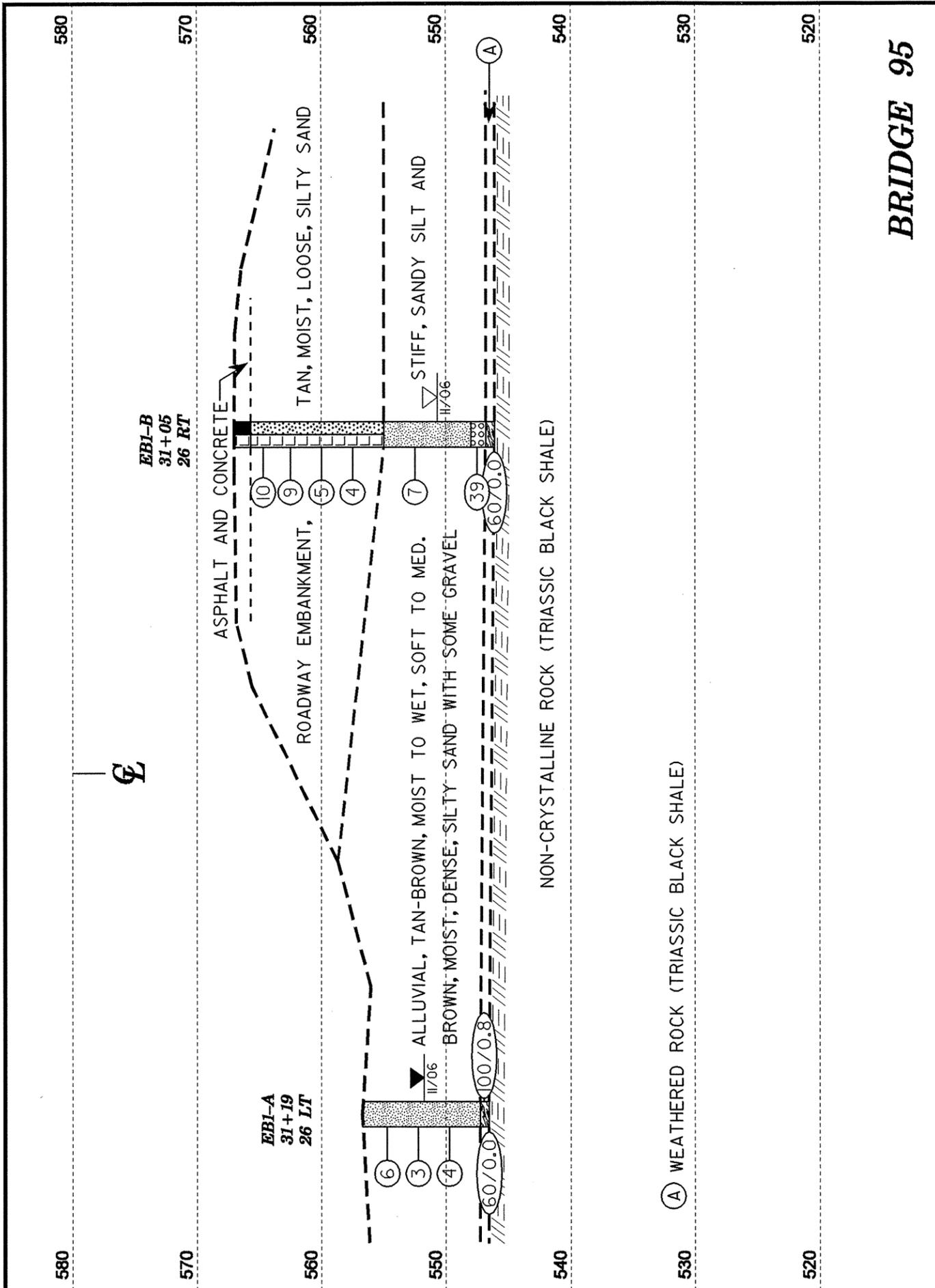
BRIDGE 95

PROFILE 26' RIGHT OF -L-



- (A) ALLUVIAL, TAN-BROWN, MOIST, MEDIUM DENSE TO DENSE, COARSE SAND
- (B) RESIDUAL, BLACK, MOIST, HARD, CLAYEY SAND (TRIASSIC)

NOTE: GROUND SURFACE PROFILE CREATED FROM THE TIN FILE: b4252_ls_tin_060123.tin DATED 1/23/2006



BRIDGE 95



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 095 on -L- (US 311) Over Big Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 31+19	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 556.7 ft	TOTAL DEPTH 10.2 ft	NORTHING 959,730	EASTING 1,711,310
DRILL MACHINE CME -55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/09/06	COMP. DATE 11/09/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 10.2 ft

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					
560														
556.7	1.0	3	2	4									GROUND SURFACE	0.0
553.2	3.5	2	1	2						SS-11	M		ALLUVIAL TAN-BROWN, SANDY SILT	
550.7	6.0	2	2	2										
548.2	8.5	2	2	2						SS-12	W			
546.5	10.2	18	26	74/0.3									WEATHERED ROCK (TRIASSIC BLACK SHALE)	9.5
		60/0.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 546.5 ft On Non-crystalline Rock (Triassic Black Shale)	10.2

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 095 on -L- (US 311) Over Big Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 31+05	OFFSET 26ft RT	ALIGNMENT -L-
COLLAR ELEV. 567.0 ft	TOTAL DEPTH 20.9 ft	NORTHING 959,676	EASTING 1,711,302
DRILL MACHINE CME -55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/13/06	COMP. DATE 11/13/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 20.9 ft

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					
570														
567.0													GROUND SURFACE	0.0
565.7	1.3	4	4	6									ASPHALT (0.0-0.7') AND CONCRETE (0.7-1.3')	1.3
563.5	3.5	4	5	4									ROADWAY EMBANKMENT TAN, SILTY SAND	
561.0	6.0	3	3	2										
558.5	8.5	3	2	2										
555.0													ALLUVIAL BROWN, SANDY SILT	12.0
553.5	13.5	3	4	3						SS-17	M			
548.5	18.5	8	13	26									BROWN, COARSE SAND	19.0
546.1	20.9									SS-18			WEATHERED ROCK (TRIASSIC BLACK SHALE)	20.2
		60/0.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 546.1 ft On Non-crystalline Rock (Triassic Black Shale)	20.9

NCDOT BORE DOUBLE B4252_GEO_BH_095.GPJ NC_DOT.GDT 05/07/07



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 095 on -L- (US 311) Over Big Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 32+19	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 557.0 ft	TOTAL DEPTH 9.2 ft	NORTHING 959,742	EASTING 1,711,409
DRILL MACHINE CME -55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/10/06	COMP. DATE 11/10/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 9.2 ft

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					
560													
556.0	1.0	2	1	2								GROUND SURFACE	0.0
553.5	3.5	3	2	2								ALLUVIAL BROWN, SANDY SILT	
551.0	6.0	2	1	24									
548.5	8.5												
547.8	9.2	60/0.3										WEATHERED ROCK (TRIASSIC BLACK SHALE)	9.2
		60/0.0										Boring Terminated with Standard Penetration Test Refusal at Elevation 547.8 ft On Non-crystalline Rock (Triassic Black Shale)	

PROJECT NO. 33594.1.1	ID. B-4252	COUNTY Rockingham	GEOLOGIST D. Goodnight
SITE DESCRIPTION Bridge No. 095 on -L- (US 311) Over Big Beaver Island Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 32+05	OFFSET 26ft RT	ALIGNMENT -L-
COLLAR ELEV. 567.1 ft	TOTAL DEPTH 22.8 ft	NORTHING 959,688	EASTING 1,711,402
DRILL MACHINE CME -55	DRILL METHOD H.S. Augers	HAMMER TYPE Manual	
START DATE 11/13/06	COMP. DATE 11/13/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 22.8 ft

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					
570													
565.6	1.5	8	7	8								GROUND SURFACE	0.0
563.6	3.5	5	4	4								ASPHALT (0.0-0.8') AND CONCRETE (0.8-1.5')	1.5
561.1	6.0	5	5	5								ROADWAY EMBANKMENT TAN, SILTY SAND	
558.6	8.5	4	8	5									
553.6	13.5	2	2	1								ALLUVIAL GRAY, SANDY SILT	12.0
548.6	18.5	5	16	65								TAN, COARSE SAND	19.0
544.3	22.8	60/0.0										RESIDUAL BLACK, CLAYEY SAND (TRIASSIC)	19.5
												WEATHERED ROCK (TRIASSIC BLACK SHALE)	20.0
												Boring Terminated with Standard Penetration Test Refusal at Elevation 544.3 ft On Non-crystalline Rock (Triassic Black Shale)	

NCDOT BORE DOUBLE B4252_GEO_BH_095.GPJ NC_DOT_GDT 05/07/07

Bridge No. 67: EB1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	26 LT	27+12	1.0-2.5	A-6(0)	34	11	26.9	28.3	24.6	20.2	70	56	36	-	-
SS-2	26 LT	27+12	3.5-5.0	A-4(2)	30	7	8.5	42.7	30.6	18.2	98	95	58	-	-
SS-3	26 LT	27+12	6.0-7.5	A-4(0)	26	7	21.8	39.2	18.7	20.2	92	88	41	-	-
SS-4	26 LT	27+12	8.5-10.0	A-1-b(0)	23	NP	79.9	12.7	4.3	3.0	75	27	6	-	-

Bridge No. 67: EB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	26 RT	27+26	1.5-3.0	A-6(4)	38	16	38.0	19.8	17.9	24.3	100	71	46	-	-
SS-6	26 RT	27+26	13.5-15.0	A-2-4(0)	24	NP	28.1	53.6	8.2	10.1	100	94	22	-	-
SS-7	26 RT	27+26	19.5-20.0	A-1-b(0)	24	5	61.3	16.8	11.8	10.1	51	25	12	-	-

Bridge No. 67: EB2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-8	26 LT	28+12	3.5-5.0	A-7-6(14)	43	18	4.4	25.7	33.5	36.4	100	98	77	-	-

Bridge No. 67: EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	26 RT	28+26	1.5-3.0	A-7-6(4)	44	22	34.0	17.8	17.9	30.3	79	58	41	-	-
SS-10	26 RT	28+26	13.5-15.0	A-2-4(0)	23	NP	41.5	45.4	7.1	6.1	97	86	15	-	-

Bridge No. 95: EB1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-11	26 LT	31+19	1.0-2.5	A-4(4)	33	7	2.2	40.3	33.2	24.3	100	100	70	-	-
SS-12	26 LT	31+19	6.0-7.5	A-4(6)	37	9	3.6	34.6	35.4	26.3	100	99	72	-	-

Bridge No. 95: EB2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-13	26 LT	32+19	6.0-7.5	A-4(0)	26	3	11.9	56.3	15.6	16.2	94	93	36	-	-

Bridge No. 95: EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-14	26 RT	32+05	1.5-3.0	A-2-4(0)	37	10	37.9	21.3	22.7	18.2	50	36	23	-	-
SS-15	26 RT	32+05	13.5-15.0	A-4(3)	33	5	0.8	44.7	32.2	22.3	100	100	70	-	-
SS-16	26 RT	32+05	19.5-20.0	A-2-6(0)	35	12	50.6	19.0	14.2	16.2	60	36	20	-	-

Bridge No. 95: EB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-17	26 RT	31+05	13.5-15.0	A-4(0)	26	4	11.5	49.0	23.3	16.2	100	98	47	-	-
SS-18	26 RT	31+05	19.0-20.0	A-1-a(0)	21	NP	55.1	26.1	10.7	8.1	45	27	10	-	-



**FIELD
SCOUR REPORT**

WBS: 33594.1.1 TIP: B-4252 COUNTY: Rockingham

DESCRIPTION(1): Site 1: Bridge No. 67 on -L- (US 311) over Little Beaver Island Creek

EXISTING BRIDGE

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

Bridge No.: 67 Length: 36' Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: 0
Foundation Type: Spread footing

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Footing in existing EB1 visible.

Interior Bents: N/A

Channel Bed: channel scoured down to rock in some locations, especially upstream

Channel Bank: Trees have fallen or are leaning toward the channel and roots are exposed in the channel bank.

EXISTING SCOUR PROTECTION

Type(3): Concrete wingwalls at each end bent and riprap along sewer line near EB2 abutment.

Extent(4): From top of bridge structure to the top of the spread footing, terminating at the ground surface 10' away approximately 45 degree angle from the creek bank. Riprap downstream on both sides.

Effectiveness(5): wingwalls are effectively preventing scour at end bents, riprap minimizing channel bank erosion

Obstructions(6): Trees are partially obstructing channel upstream, old concrete abutments 200' upstream

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): Bedrock, coarse sand with gravel and cobbles

Channel Bank Material(8): alluvial sandy silts, silty clays, silty and coarse sands

Channel Bank Cover(9): hardwood trees, briars, forest ground cover

Floodplain Width(10): 400'

Floodplain Cover(11): hardwood forest and grass covered fields

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): Southwest

Observations and Other Comments: Several exposures to black shale upstream. No outcrops observed down stream of bridge

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

The Geotechnical Engineering Unit agrees with the Hydraulics Unit 100 year theoretical scour elevation 547 feet based site conditions. The theoretical scour elevation does not intersect with either end bent.

Comparison of DSE to Hydraulics Unit theoretical scour:
See above.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bank	Bank				
Sample No.	SS-2	SS-6	SS-8				
Retained #4	-	-	-				
Passed #10	98	100	100				
Passed #40	95	94	98				
Passed #200	58	22	77				
Coarse Sand	8.5	28.1	4.4				
Fine Sand	42.7	53.6	25.7				
Silt	30.6	8.2	33.5				
Clay	18.2	10.1	36.4				
LL	30	24	43				
PI	7	NP	18				
AASHTO	A-4(2)	A-2-4(0)	A-7-6(14)				
Station	27+12	27+26	28+12				
Offset	26' Lt.	26' Rt.	26' Lt.				
Depth	3.5'-5.0'	13.5'-15.0'	3.5'-5.0'				



**FIELD
 SCOUR REPORT**

WBS: 33594.1.1 TIP: B-4252 COUNTY: Rockingham

DESCRIPTION(1): Site 2: Bridge No. 95 on -L- (US 311) over Big Beaver Island Creek

EXISTING BRIDGE

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

Bridge No.: 95 Length: 41' Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: 0
 Foundation Type: Spread Footings

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Footing under existing EB2 is visible under water

Interior Bents: N/A

Channel Bed: scoured out depression under roadway

Channel Bank: leaning trees, exposed roots visible in channel bank

EXISTING SCOUR PROTECTION

Type(3): concrete wingwalls at each existing end bent

Extent(4): From top of bridge structure to the top of the spread footing, terminating at the ground surface 15' to 20' away approximately 45 degree angle from the creek bank.

Effectiveness(5): wingwalls are effectively preventing scour at end bents

Obstructions(6): Approximately 200' upstream there are several large trees in channel

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): organic silts

Channel Bank Material(8): alluvial sandy silts and coarse sands

Channel Bank Cover(9): hardwood trees, brush and grass

Floodplain Width(10): 750'

Floodplain Cover(11): hardwood trees and grassy fields

Stream is(12): Aggrading Degrading Static

Channel Migration Tendency(13): West

Observations and Other Comments: No rock outcrop observed in the channel near the bridge. Big Beaver Island Creek is a meandering creek.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters

The Geotechnical Engineering Unit raised the scour elevation from Hydraulics Unit 100 year theoretical scour elevation from 545.0 feet to 546.0 feet based on site conditions. The Geotechnical Adjusted Scour Elevation (GASE) does not intersect with either end bent.

Comparison of DSE to Hydraulics Unit theoretical scour:

The Geotechnical Engineering Unit raised the scour from Hydraulics Unit theoretical scour from 545.0 feet to 546.0 feet based on site conditions.

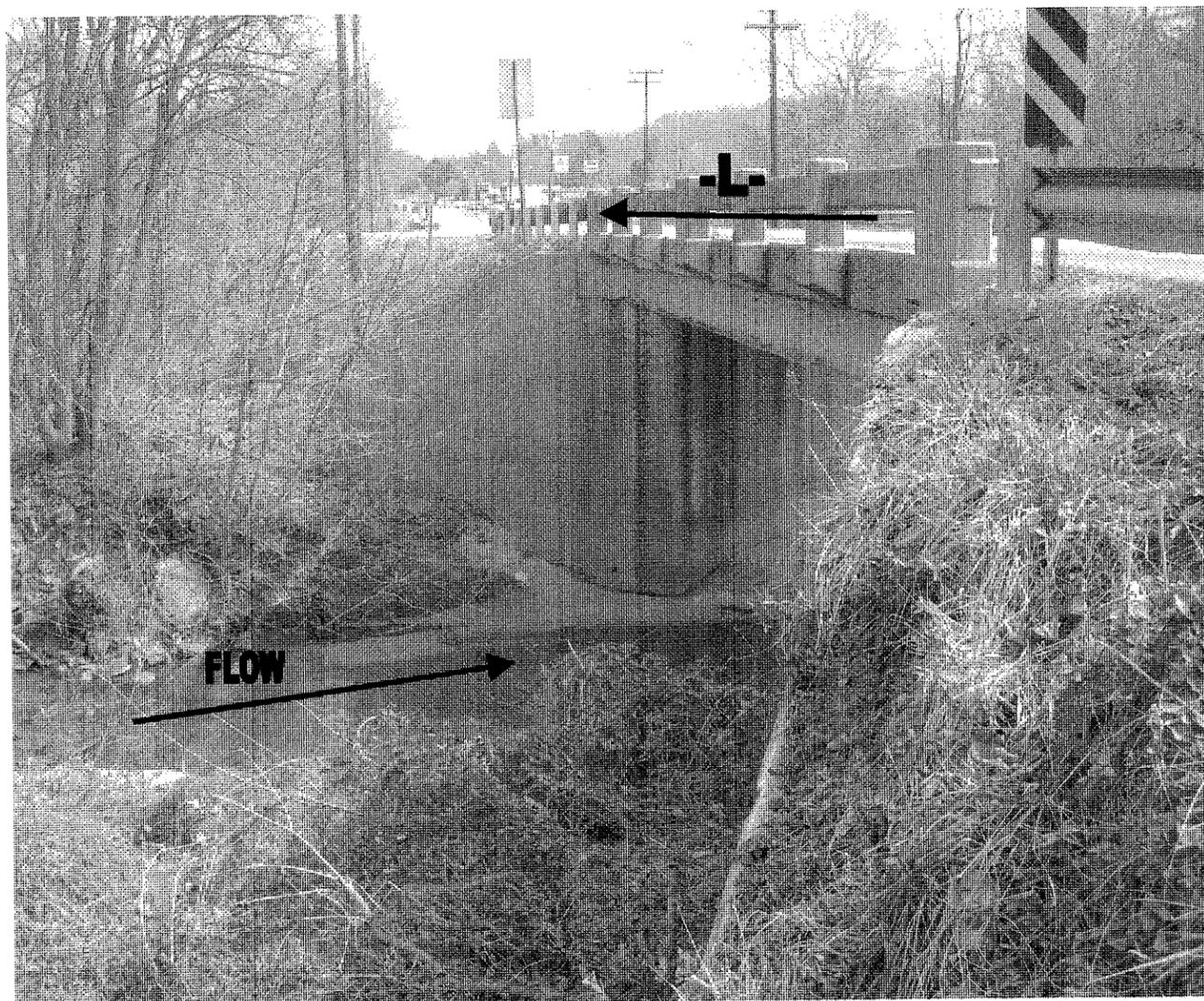
SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank						
Sample No.	SS-11						
Retained #4	-						
Passed #10	100						
Passed #40	100						
Passed #200	70						
Coarse Sand	2.2						
Fine Sand	40.3						
Silt	33.2						
Clay	24.3						
LL	33						
PI	7						
AASHTO	A-4(4)						
Station	31+19						
Offset	26' Lt.						
Depth	1.0'-2.5'						

Reported by: _____ Date: 11/14/2006

SITE PHOTOGRAPH

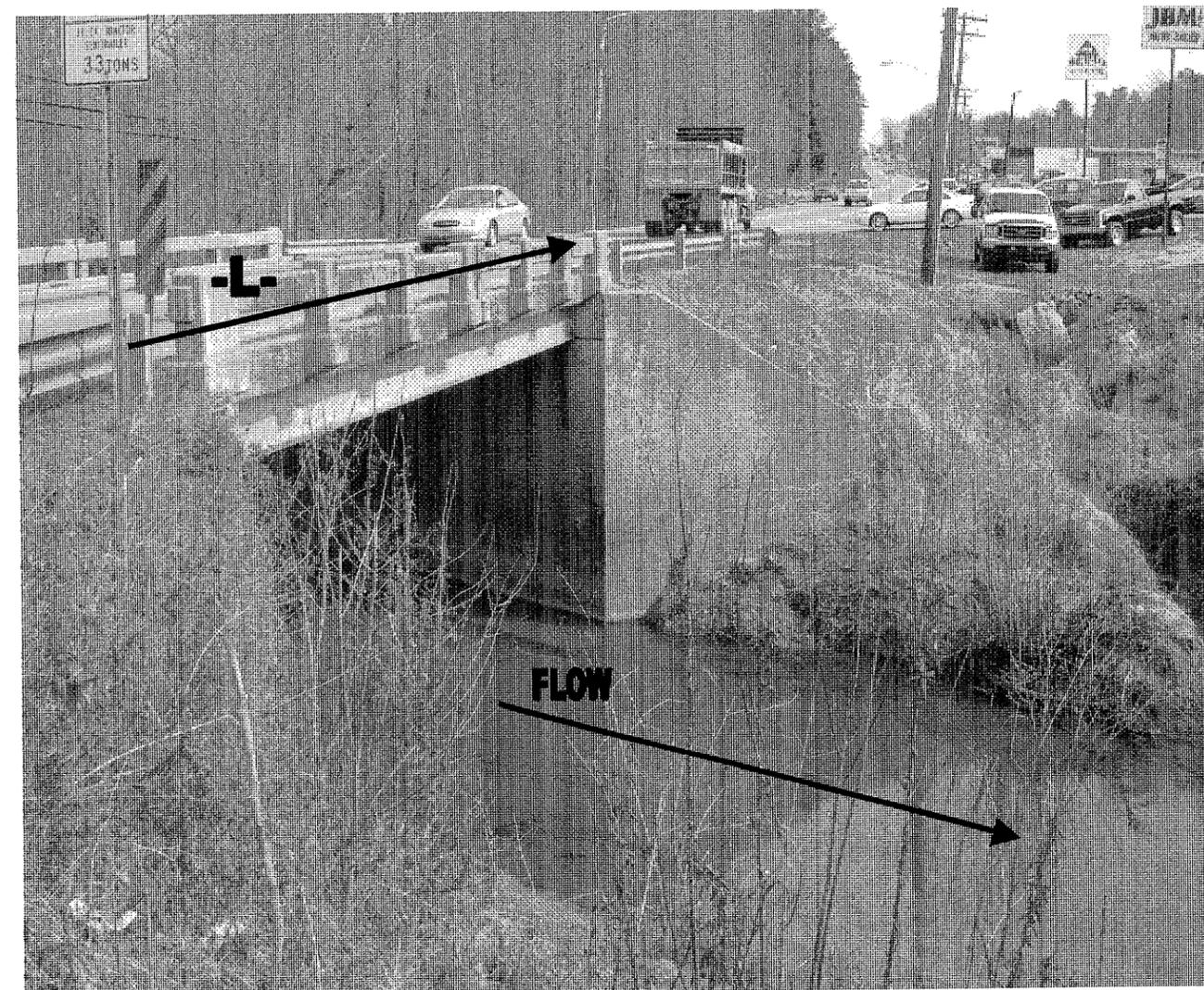
BRIDGE NO. 67 ON -L- (US 311) OVER LITTLE BEAVER ISLAND CREEK



LOOKING EAST FROM EB1 TO EB2

SITE PHOTOGRAPH

BRIDGE NO. 95 ON -L- (US 311) OVER BIG BEAVER ISLAND CREEK



LOOKING EAST FROM EB1 TO EB2