~~~~	4. L = 4
SHEET	<b>DESCRIPTION</b>
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE(S)
6-7	CROSS SECTION(S)
8-13	BORE LOG & CORE REPORT(S)
14	SOIL TEST RESULTS
15	SCOUR REPORT
16	CORE PHOTOGRAPH(S)
17	SITE PHOTOGRAPH(S)

### STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33355.1.1(B-3921) F.A. PROJ. BRZ-1600(7)
COUNTY WARREN
PROJECT DESCRIPTION BRIDGE NO. 45 ON -L- (SR 1600) OVER
FISHING CREEK AT -L- STATION 12+95

### *INVENTORY*

 STATE
 STATE PROJECT REPERENCE NO.
 SIGN SOCIETY
 SOCIETY

 N.C.
 33355.1.1(B-3921)
 1
 17

#### **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 VARBOUS FIELD BORNG 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 (9)91 250-408B. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FELD 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 BORNIOS OR BETWEEN SAMPLED STRATA WITHIN THE BORRHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU IN-PLACE! TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INRERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS AND VARY CONSIDERALLY WITH THAT 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 COMDITIONS 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 OF 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.

TIERRA PERSONNEL

C. BRUINSMA

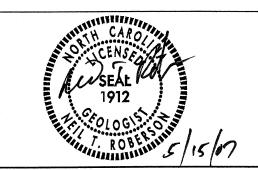
S. GOWER

INVESTIGATED BY J.I. MILKOVITS

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

MAY 2007



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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS
FOR INGREASED 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, TERM	S, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS	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	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.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586). SOIL	POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.	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	ADUJFER - A WATER BEARING FORMATION OR STRATA.
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	THE ANGULARITY OR ROUNDNESS OF GOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR,	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	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.
VERY STUFF, GRAY, SETY CLAY, MOIST WITH INTERBEDDED FINE SAND LAVERS, HIGHLY PLASTIC, A-7-6	SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR)  WENTIERED  WON-LOASTAL PLAIN MATERIAL THAT WOULD FIELD SPT N VALUES > 100	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL
SOIL LEGEND AND AASHTO CLASSIFICATION  GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS OFFICIALS ASSESSMENT MATERIALS	MINERAL OGICAL COMPOSITION  MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS	CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT NOULD YIELD ST REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE,	AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS  CLASS. (≤35% PASSING *200) (>35% PASSING *200) ORGANIC MATERIALS	WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	GNEISS, GABBRU, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-2-6 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	4
SYMBOL 000000000000000000000000000000000000	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	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.
% PASSING SILT- MUCK, GRANULAR SILT-	PERCENTAGE OF MATERIAL  GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
* 40 30 MX 56 MX 51 MN S01LS S01LS S01LS S01LS S01LS S01LS	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL  TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
Tough that	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LT00/10 LTMT	MODERATELY ORGANIC	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	<u>DIP DIRECTION (DIP AZIMUTH) -</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.  SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USUAL TYPES STONE FRACS. FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLL) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.  MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN_RATING AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	$ abla_{E} $ Perched water, saturated zone, or water bearing strata	(MOD.) 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	PARENT MATERIAL.
SUBGRADE	OAMA SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30  CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN
RANGE OF STANDARD RANGE OF UNCONFINED		(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK,  IF TESTED, WOULD YIELD SPT REFUSAL	THE FIELD.
PRIMARY SOIL TYPE CUMPACTINESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/FT2)	WITH SOIL DESCRIPTION VST PHT DESIGNATIONS	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY VERY LOOSE (4	S - BULK SAMPLE  AUGER BORING SS - SPLIT SPOON	(SEV.)  IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GRANULAR LOOSE 4 TO 10  GRANULAR MEDIUM DENSE 10 TO 30  MATERIAL MEDIUM DENSE 10 TO 30	ARTIFICIAL FILL (AF) OTHER ARTIFICIAL FILL (AF) OTHER ARTIFICIAL FILL (AF) OTHER	IF TESTED, YIELDS SPT N VALUES > 100 BPF	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE >50	THAN ROADWAY EMBANKMENT - CORE BORING ST - SHELBY YUBE	VERY SEVERE ALL ROCK EXCEPT OWARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (Y SEV.)  THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY SOFT <2 <0.25	INFERRED SOIL BOUNDARY  MONITORING WELL  DC - BOCK CANDLE	REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY   SOFT   2 TO 4   0.25 TO 0.50     SILT-CLAY   MEDIUM STIFF   4 TO 8   0.5 TO 1.0	INFERRED ROCK LINE PIFTOMFTER	VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF COMPLETE	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	ALLUVIAL SOIL BOUNDARY  AND INSTALLATION  RT - RECOMPACTED TRIAXIAL SAMPLE	COPPLETE	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 >4	25/825 DIP & DIP DIRECTION OF SLOPE INDICATOR INSTALLATION CBR - CALIFORNIA BEARING	ROCK HARDNESS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AN EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RATIO SAMPLE SPT N-VALUE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SOUNDING ROD     REF SPT REFUSAL	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	PARENT ROCK.
OPENING (MM) 4,76 2,00 0.42 0.25 0.075 0.053	ABBREVIATIONS	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY (BLDR.) (COB.) (GR.) (CF. CD.) (SL.) (CL.)	AR - AUGER REFUSAL HI HIGHLY # - MOISTURE CONTENT BT - BORING TERMINATED MED MEDIUM V - VERY	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
(USE, SUL) (F SUL)	CL CLAY MICA MICACEOUS VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN 12 3	CPT - CONE PENETRATION TEST MOD MODERATELY WEA WEATHERED CSE COARSE NP - NON PLASTIC Y - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
SOIL MOISTURE - CORRELATION OF TERMS	DMT - DILATOMETER TEST ORG ORGANIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  (ATTERBERG LIMITS) DESCRIPTION	DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST  • - VOID RATIO SAP SAPROLITIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	THAN 0.1 FOOT PER 60 BLOWS.  STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH
	F - FINE SD SAND, SANDY FOSS, - FOSSILIFEROUS SL SILT, SILTY	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	FRAC FRACTURED, FRACTURES SLI SLIGHTLY	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	STRATA ROCK DUALITY 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
PLASTIC   LIQUID LIMIT   PLASTIC   PRIVATE PRI	FRAGS FRAGMENTS TCR - TRICONE REFUSAL	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
RANGE - WET - (W) SEMISULING REQUIRES DITTING TO	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PLL PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING TERM THICKNESS  VERY THICKLY BEDDED > 4 FEET	BENCH MARK: BM 200 -L- STATION 14+23.95, 38.78' RT.
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	automatic Manual	VERY WIDE MUSE HAN 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 231.99 FT.
SL SHRINKAGE LIMIT	MOBILE B-	MDERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FEET THINLY BEDDED 0.03 - 0.16 FEET CLOSE 0.16 TO 1 FEET THINLY BEDDED 0.03 - 0.16 FEET CLOSE 0.16 TO 1 FEET THINLY BEDDED 0.03 - 0.16 FEET CLOSE 0.16 TO 1 FEET CLOSE	
REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	DV-51	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	NOTES:
PLASTICITY	J -B	INDURATION	1
PLASTICITY INDEX (P) DRY STRENGTH	- Chic-450	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NONPLASTIC 0-5 VERY LOW	TUNG,-CARBIDE INSERTS -H	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS: GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
LOW PLASTICITY         6-15         SLIGHT           MED. PLASTICITY         16-25         MEDIUM	HAND TOULS:	CONTROL ON DE CEDADATED FOOT CAMPLE LATE CONTROL	
HIGH PLASTICITY 26 OR MORE HIGH		MODERATELY INDURATED  GRAINS LAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;  BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNGCARB. HAND AUGER CORE BIT SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.  EYTDEMELY INDUBATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	

PROJECT REFERENCE NO. 33355.I.I(B-392I)



# STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT SECRETARY

May 14, 2007

STATE PROJECT:

33355.1.1 (B-3921)

F.A. PROJECT:

BRZ-1600 (7)

COUNTY:

Warren

DESCRIPTION:

Bridge No. 45 on -L- (SR 1600) over Fishing Creek at Station 12+95

SUBJECT:

Geotechnical Report – Structure Inventory

#### **Project Description**

A three-span bridge, 185-feet in length with a 105° skew, is proposed on -L- (SR 1600, Baltimore Road) over Fishing Creek. The project is located in central Warren County about 3 miles south of Warrenton.

The subsurface investigation was conducted during February and March of 2007 using an ATV-mounted CME-550 drill machine with a manual hammer. Standard Penetration Test borings were performed at each of the proposed bent locations. In addition, one location at each interior bent was cored using NQ core equipment. All borings were advanced to crystalline rock using hollow stem augers or N-casing with advancer. 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. Two rock core samples were submitted to the Materials and Tests Unit to determine Unit Weight and Compressive Strength.

#### Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic province. Geologically, the site is underlain by metamorphic rock from the Raleigh Belt. The area consists of a mixture of woods and pastures with scattered homes.

#### Soil Properties

Soils encountered at the project site include roadway embankment, alluvial and residual soils.

Roadway embankment soils were encountered at all end bent locations except EB2-B. The embankment soils range in thickness from 8.0 to 10.5 feet. These soils consist of red-brown, moist, soft to stiff, sandy and clayey silt (A-4, A-5) and sandy clay (A-6). Alluvial soils underlie roadway embankment soils.

SHEET 3 OF 17 33355.1.1 (B-3921)

Alluvial soils range from 11.8 to 21.0 feet in thickness. These soils predominantly consist of red-brown and gray, moist to wet, very loose to very dense, sand and silty sand (A-3, A-2-4) and red-brown and brown, soft to very stiff, moist to wet, sandy and clayey silt (A-4, A-5) and sandy clay (A-6). Lessor amounts of brown, tan and gray, medium dense to very dense, coarse sand (A-1-b) with some quartz gravel is also present. The alluvial soils were deposited on residual soils and weathered rock.

Residual soils were present at all bent locations except for EB2 and range in thickness from 5.5 to 12.2 feet. These soils consist of tan, brown and white, moist to wet, medium dense to very dense, coarse and silty sand (A-1-b, A-2-4) and tan and brown, moist, very stiff to hard, saprolitic, sandy silt (A-4). Residual soils are underlain by weathered rock.

#### **Rock Properties**

Weathered rock was derived from the underlying metamorphic rock, and ranges in thickness from 1.3 feet at EB2-A, to 10.4 feet at EB2-B. Weathered rock was encountered in all of the borings. The top of weathered rock ranges in elevation from 198.2 feet at B2-B to 211.8 feet at EB2-B.

Crystalline rock was encountered at all bent locations. Rock present at the site consists of gray, white and brown, moderately severely weathered to fresh, hard to very hard, moderately closely to very closely fractured, metamorphic mica gneiss. Core Recovery (REC) values range per run from 86% to 100%, and Rock Quality Designation (RQD) values range per run from 22% to 100%. Laboratory tests show compressive strengths ranging from 5.47 ksi to 6.85 ksi and unit weights ranging from 185.0 lb/ft<sup>3</sup> to 186.7 lb/ft<sup>3</sup>. More detailed rock descriptions can be found in the Core Boring Reports. The top of crystalline rock ranges in elevation from 189.9 feet at B2-B to 204.5 feet at EB2-A.

#### **Groundwater**

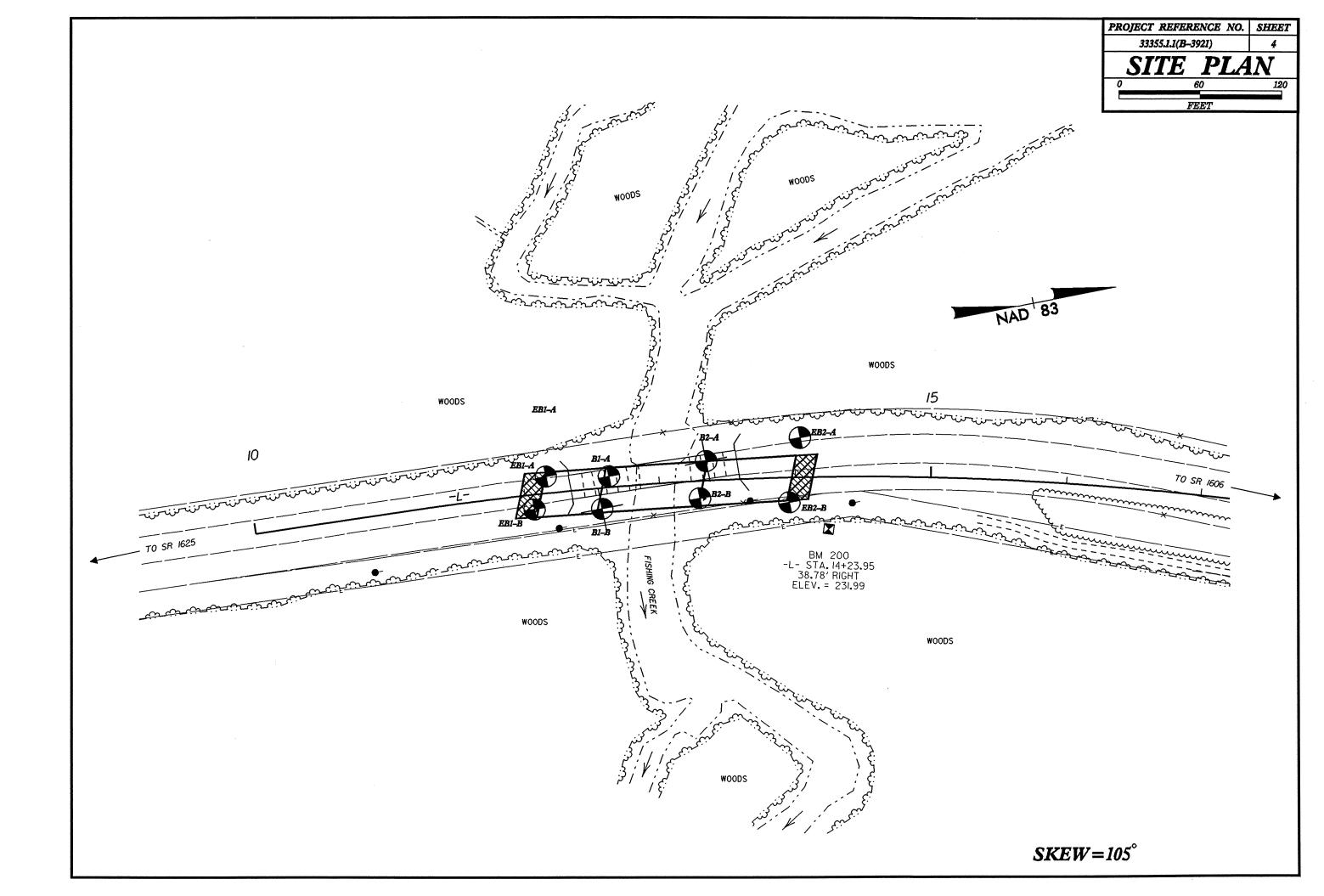
Groundwater was encountered at all bent locations. The groundwater elevations range from 220.8 feet at EB2-B to 225.2 feet at EB1-B. The water in Fishing Creek was at an elevation of 222.1 feet (4-17-06).

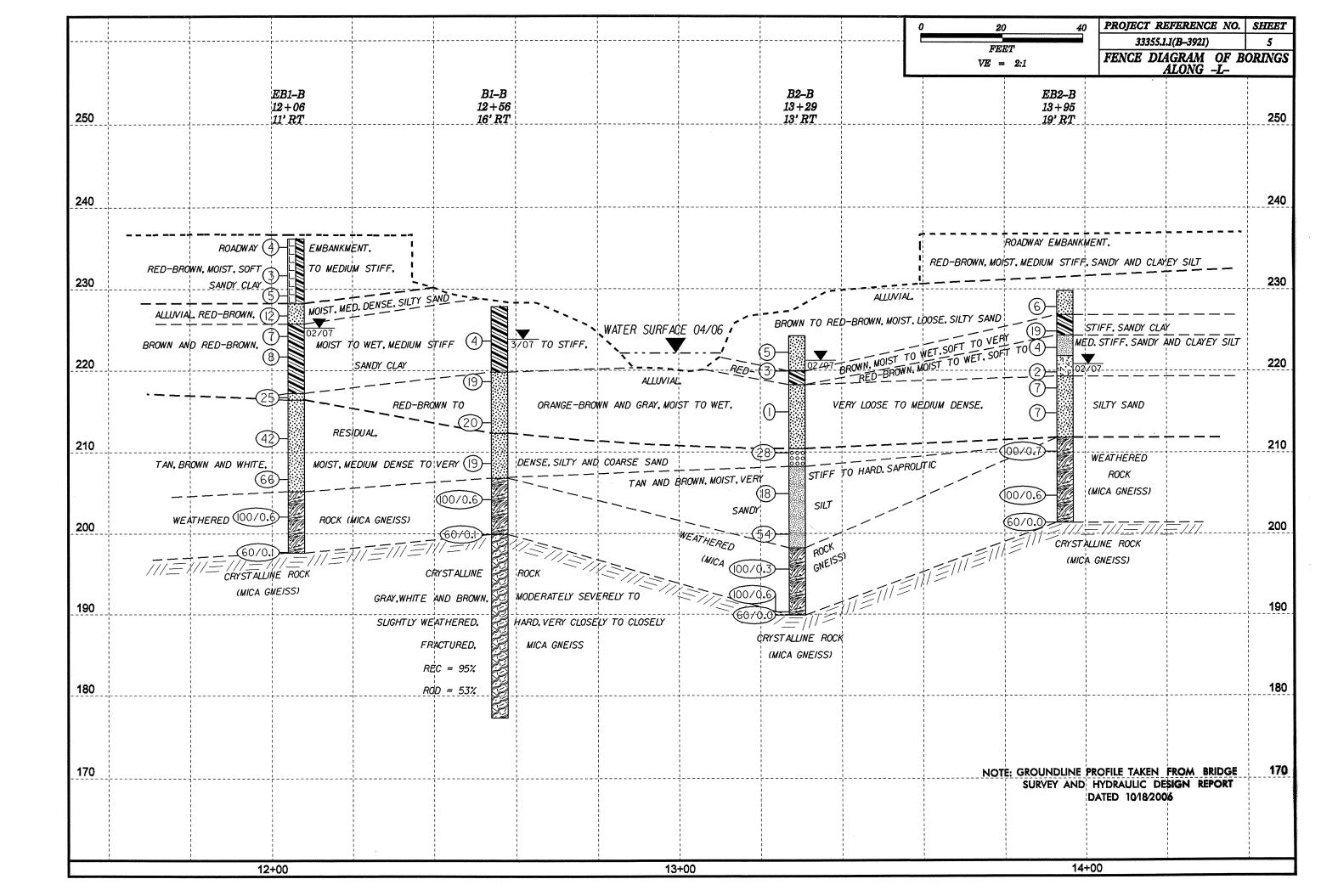
#### Notice

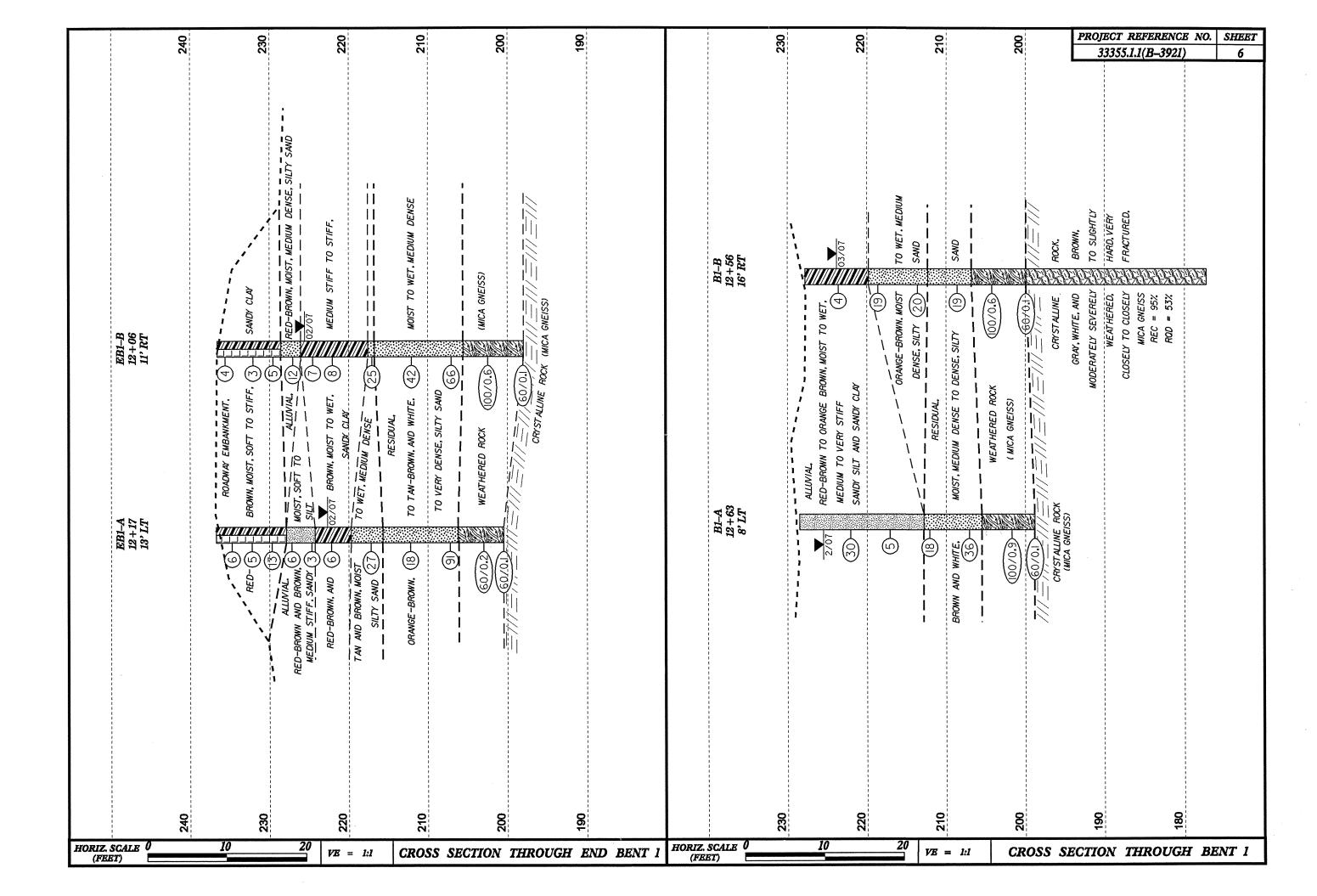
This Geotechnical foundation report is based on the Preliminary General Drawing dated October 2006 and the Hydraulics Bridge Report dated June 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

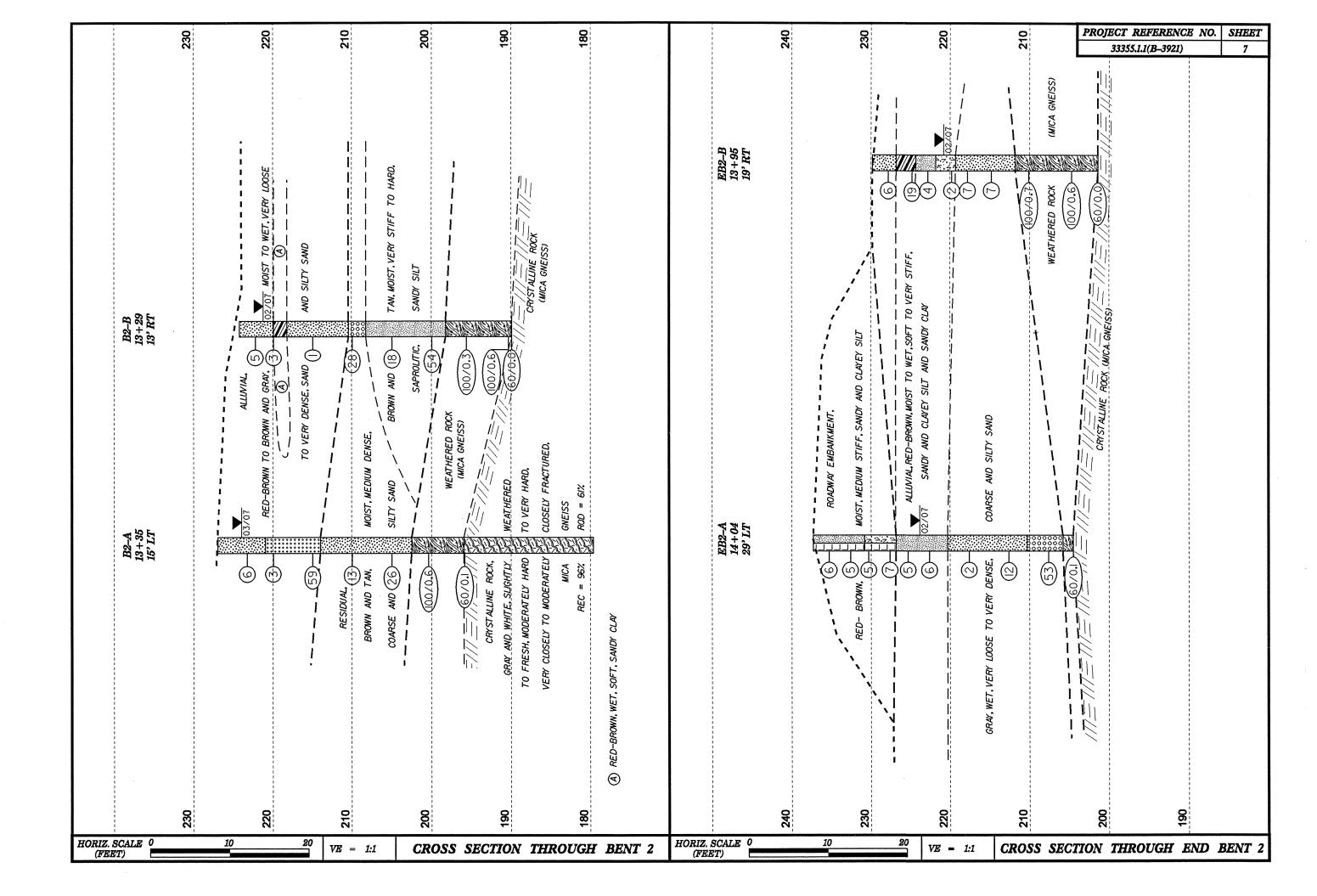
Prepared by.

Joseph I. Milkovits, Jr.Project Geological Engineer









<b>W</b> BOREL	OG REPORT						
		COUNTY WARREN	GEOLOGIST C.BRUINSMA	PROJECT NO. 33355.1.1	ID. B-3921	COUNTY WARREN	GEOLOGIST C.BRUINSMA
SITE DESCRIPTION BRIDGE NO	O. 45 ON -L- (SR 1600) BALTIMORE	RD. OVER FISHING CREEK	GROUND WTR (ft)	SITE DESCRIPTION BRIDGE NO	O. 45 ON -L- (SR 1600) BALTIMO	RE RD. OVER FISHING CREEK	GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+17 O	OFFSET 13ft LT ALIGNMENT	T -L- <b>0 HR.</b> 8.0	BORING NO. EB1-B	STATION 12+06	OFFSET 11ft RT ALIC	GNMENT -L- 0 HR. 7.4
COLLAR ELEV. 236.6 ft	TOTAL DEPTH 36.2 ft N	NORTHING 950,041 EASTING 2,	2,251,781 <b>24 HR.</b> 14.0	COLLAR ELEV. 236.2 ft	TOTAL DEPTH 38.6 ft	NORTHING 950,028 EAS	STING 2,251,803 24 HR. 11.0
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers		HAMMER TYPE Manual	DRILL MACHINE CME-550	DRILL METHOD H.S. Augers		HAMMER TYPE Manual
START DATE 02/26/07	COMP. DATE 02/26/07 S	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 36.2 ft	START DATE 02/26/07	COMP. DATE 02/26/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 38.6 ft
ELEV DEPTH BLOW COUNT	BLOWS PER FOOT		DIL AND ROCK DESCRIPTION	ELEV DEPTH BLOW COUNT	BLOWS PER FOOT	11 1 / 101	SOIL AND ROCK DESCRIPTION
(ft) (ft) 0.5ft 0.5ft 0.5ft	ft 0 25 50 75	100 NO. MOI G ELEV. (ft)	DEPTH (ft)	(ft) (ft) 0.5ft 0.5ft 0.5	ift 0 25 50	75 100 NO. MOI G	
240	13	SS-1 M R M M 227.8  SS-4 M RED-BR SS-5 M 2224.2	GROUND SURFACE 0.0  ROADWAY EMBANKMENT RED-BROWN, SANDY CLAY  8.8  ALLUVIAL ROWN AND BROWN, SANDY SILT  BROWN, SANDY CLAY	240	\$ 12	SS-20 M L 236.2  M L 228.2  SS-23 M 2225.7  SS-24 M M	GROUND SURFACE 0.0  ROADWAY EMBANKMENT RED-BROWN, SANDY CLAY  8.0  ALLUVIAL RED-BROWN, SILTY SAND 10.5  RED-BROWN, SANDY CLAY
218.1 18.5 5 7 20	1	219.6 ————————————————————————————————————	BROWN, SILTY SAND  21.0  RESIDUAL E-BROWN AND WHITE, SILTY SAND	217.7 - 18.5 6 9 16	25	SS-26A M 216.4	TAN, SILTY SAND  RESIDUAL  TAN AND BROWN, SILTY SAND
208.1 28.5 33 38 53		SS-8 M	30.5 WEATHERED ROCK	212.7		SS-27 M	31.0
203.1 33.5 60/0.2 200.5 36.1 60/0.1		60/0.1 Boring Te	(MICA GNEISS)  36.2  Ferminated with Standard Penetration	202.7 - 33.5 90 10/0.1			WEATHERED ROCK (MICA GNEISS)
NCDOT BORE DOUBLE B3921_GEO_BH_BRDG0045,GPJ NC_DOT.GDT 05/14/07		Test CRYS - CRYS	t Refusal at Elevation 200.4 ft on STALLINE ROCK (MICA GNEISS)	197.7 38.5			Boring Terminated with Standard Penetration Test Refusal at Elevation 197.6 ft on CRYSTALLINE ROCK (MICA GNEISS)

			Г
			3
: :			
			L

### SHEET 9

PROJECT NO. 33355.1.1 ID. B-3921							COUNTY	WARI	REN			GEOLOGIST C.BRUINSMA					
			BRIDG	E NO.	45	5 ON -L- (	SR 1600)	BALTIMO	RE RD. OV	ER FISI	HING (	CREE	K		GROUND W	TR (ft)	
BORIN	G NO.	B1-A				TATION			OFFSET				ALIGNMEN	Γ -L-	0 HR.	3.0	
<b></b>	R ELEV					OTAL DEI			NORTHIN	NORTHING 950,086 EASTING 2,251,790 24 F							
<u> </u>	MACHIN							S. Augers	Т					HAMMER TYPE			
<b></b>	DATE				CC	OMP. DAT			SURFAC		R DEF	PTH	N/A	DEPTH TO ROCK	K 29.7 ft		
ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	0.5ft	11,	0 2		PER FOOT 50 7	75 100	SAMP.	моі	0	sc	OIL AND ROCK DESCR	RIPTION	ŧ	
					Ħ		I	<del>-1</del>			VIVICI						
230																	
	-				$\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$			т		-			228.5	GROUND SURFAC	CE	0.0	
	-						i : : :	: : : :	: : : :			× t	RED-BR	OWN TO ORANGE-BF SILT	ROWN, SANDY		
223.1	- - 5.4				lt		İ	<del> </del>				-		O.E.			
	-	1	25	5	$\ $		30	::::		SS-30	w	*					
	-				H	/		<del>                                     </del>				-					
218.1	10.4	2	2	3	H						w	Œ					
					Ш	70		1				Æ					
213.1	15.4			- 10		\		: : : :	: : : :			<u></u>	212.8			15.7	
	-	6	8	10				: : : :		SS-32	М		BR	<b>RESIDUAL</b> OWN AND WHITE, SIL	TY SAND		
208.1	- 20.4				$\  \cdot \ $		<u>\</u>	<b>†</b>									
	-	14	15	21	11		. 36 -				М						
-	-					• • • •			7				205.5	WEATHERED ROO		23.0	
203.1	25.4	28	46	54/0.4	$\ $									(MICA GNEISS)			
	-								100/0.9								
198.9	29.6 -	60/0.1		<u> </u>	Н		<u> </u>	<u> </u>	60/0.1	<del> </del>				Terminated with Standa		29.7	
-	-													t Refusal at Elevation 1 STALLINE ROCK (MIC			
-	-											-					
-	-											F					
-		2										F					
-	-																
_	-											L					
-	-																
-	-											F			•		
												E					
_	-																
_	-											-					
-	-													·			
_	-																
-	-																
-												F					
_										1		E	•				
												E					
-	-											-					
	<u> </u>																
-	<u>-</u>									1		<u> </u>					
-	<u>-</u>	,										-					
-	-																
	L	<b></b>		<b></b>	-						•	·					

PROJECT NO. 33355.1.1 ID. B-3921 COUNTY WARREN GEOLOGIST C.BRUINSMA SITE DESCRIPTION BRIDGE NO. 45 ON -L- (SR 1600) BALTIMORE RD. OVER FISHING CREEK GROUND WTR (ft) BORING NO. B1-B STATION 12+56 OFFSET 16ft RT ALIGNMENT -L-0 HR. 3.0 COLLAR ELEV. 227.8 ft TOTAL DEPTH 50.5 ft **NORTHING** 950,076 **EASTING** 2,251,812 24 HR. 4.0 DRILL MACHINE CME-550 DRILL METHOD H.S. Augers HAMMER TYPE Manual **START DATE** 03/01/07 COMP. DATE 03/01/07 SURFACE WATER DEPTH N/A DEPTH TO ROCK 27.9 ft **BLOW COUNT** SAMP. V **BLOWS PER FOOT** ELEV DEPTH MOI G SOIL AND ROCK DESCRIPTION (ft) (ft) 100 0.5ft 0.5ft 0.5ft 50 75 NO. DEPTH (ft) 230 227.8 GROUND SURFACE ALLUVIAL BROWN, SANDY CLAY 224.6 SS-57 —M— . . . . . . . . 219.6 - 8.2 ORANGE-BROWN, SILTY SAND W/ 3 16 SS-58 BOULDER AND COBBLE LAYER FROM 9.7' TO 10.2' AND 11.2' TO 11.6' 214.6 - 13.2 W RESIDUAL BROWN AND WHITE, SILTY SAND 209.6 6 13 M WEATHERED ROCK 204.8 23.0 (MICA GNEISS) 84 16/0.1 . . . 100/0.6 200.0 7 27.8 CRYSTALLINE ROCK GRAY, WHITE AND BROWN, MODERATE 60/0.1 60/0.1 SEVERE TO SLIGHTLY WEATHERED, HARD. VERY CLOSELY TO CLOSELY FRACTURED, MICA GNEISS REC=95% RQD=53% . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Boring Terminated at Elevation 177.3 ft in CRYSTALLINE ROCK (MICA GNEISS)

SHEET 10 OF 17

	CORE BORING REPORT  PROJECT: 33355.1.1 ID: B-3921 COUNTY: Warren BORING NO: B1-B																		
PRC	JECT:	33355.	1.1	ID	: B-3	921	COUNTY: BORING NO: B1-B												
DES	CRIPTI	ON: Brid	dge No	. 45 on	-L- (SR	: 1600) ov	er Fishing Creek												
LOC	ATION	OF BORIN	۷G:	-L- Sta	a. 12+5	6, Offset -	16' RT COMPLETION DATE: 3/1/07												
COL	LAR or	GROUND	ELEV	'ATION	: 227	.8 ft	CORE SIZE: NQ GEOLOGIST: C. Bruinsma												
COR	E EQUI	PMENT:	·	· · · · · · · · · · · · · · · · · · ·	C	ME-550, I	N-Casing, NQ DRILLER: S. Gower												
ELEV	DEPTH	DRILL RATE	RUN	REC (ft)	RQD (ft)	SAMPLE	FIELD CLASSIFICATION and REMARKS												
(ft)	(ft)	(min/ft)	(ft)	(%)	(%)	NUMBER													
199.9	27.9	4:15 4:30		2.3	0.8		Gray, white and brown, slightly to moderately severely weathered, hard, very closely to closely fractured, mica gneiss												
		2:00/0.6	2.6	(88%)	(31%)														
197.3 197.3	30.5	- 2.45		<u> </u>	<u> </u>														
197.3	30.5	2:45 2:45		4.8	1.1		Gray, white and brown, slightly to moderately severely weathered, hard, very closely to closely fractured, mica gneiss												
		3:15 3:45	5.0	(96%)	(22%)														
192.3	35.5	4:00		(0070)	(2270)														
192.3	35.5	3:00 2:45		4.3	1.7	Gray, white and brown, slightly to moderately severely weathered, hard, very closely to closely fractured, mica gneiss													
		3:20 3:00	5.0	(86%)	(34%)		nactured, mica grieiss												
187.3	40.5	3:45		(60%)	(3470)														
187.3	40.5	1:45 1:45		5.0	3.8		Gray and white, very slightly to freshly weathered, hard to very hard, very closely to moderately closely fractured, mica gneiss												
		1:45	5.0			RS-1													
182.3	45.5	1:45 2:00		(100%)	(76%)	42.7'-43.3'													
182.3	45.5	1:45 1:45		5,0	4.5		Gray and white, very slightly to freshly weathered, hard to very hard, very closely to moderately closely fractured, mica gneiss												
		1:45	5.0				navureu, mica grieiss												
177.3	50.5	1:45 2:15		(100%)	(90%)														
	ļ																		
	ŀ																		
					•														
T							`												
							BOREHOLE TERMINATED AT ELEVATION OF 177.3 FEET, IN MICA GNEISS.												

# NCDOT GEOTECHNICAL ENGINEERING UNIT

PROJECT NO. 33355.1.1 ID. B-3921 COUNTY WARREN GEOLOGIST C.BRUINSMA GROUND WTR (ft) SITE DESCRIPTION BRIDGE NO. 45 ON -L- (SR 1600) BALTIMORE RD. OVER FISHING CREEK OFFSET 15ft LT BORING NO. B2-A STATION 13+35 ALIGNMENT -L-0 HR. 2.0 COLLAR ELEV. 226.8 ft TOTAL DEPTH 47.3 ft **NORTHING** 950,159 **EASTING** 2,251,792 24 HR. 3.0 **DRILL MACHINE** CME-550 HAMMER TYPE Manual DRILL METHOD Wash Boring **START DATE 02/28/07** COMP. DATE 02/28/07 SURFACE WATER DEPTH N/A DEPTH TO ROCK 31.0 ft SAMP. **BLOW COUNT BLOWS PER FOOT** ELEV DEPTH SOIL AND ROCK DESCRIPTION (ft) (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. MOI G ELEV. (ft) DEPTH (ft) 230 \_ **GROUND SURFACE** ALLUVIAL RED-BROWN, SILTY SAND 224.1 . . . . 220.8 6.0 GRAY, SAND SS-52 M 215.8 13 21 38 SS-53A W 213.8 RESIDUAL BROWN AND TAN, SILTY SAND 210.8 16.0 11 SS-54 M 205.8 1 21.0 13 14 М WEATHERED ROCK 200.8 26.0 (MICA GNEISS) 74 26/0,1 -100/0.6 195.8 📘 31.0 60/0.1 CRYSTALLINE ROCK 60/0.1 GRAY AND WHITE, SLIGHTLY WEATHERED . . . TO FRESH, MODERATELY HARD TO VERY HARD, VERY CLOSELY TO MODERATELY CLOSELY FRACTURED, MICA GNEISS REC=96% RQD=61% . . . . . . . . . . . . . . . . . . . . Boring Terminated at Elevation 179.5 ft in CRYSTALLINE ROCK (MICA GNEISS)

SHEET 11 OF 17

	CORE BORING REPORT PROJECT: 33355.1.1 ID: B-3921 COUNTY: Warren BORING NO: B2-A																		
PRO	JECT:	33355.1	1.1	ID:	B-39	921	COUNTY: Warren BORING NO: B2-A												
DES	CRIPTIC	ON: Brid	lge No.	45 on -	L- (SR	1600) ove	rer Fishing Creek												
		***************************************																	
LOC	ATION (	OF BORIN	IG:	-L- Sta	. 13+35	5, Offset -	- 15' LT COMPLETION DATE:												
COL	LAR or	GROUND	ELEV	ATION:	226	.8 ft	CORE SIZE: NQ GEOLOGIST: C. Bruinsma												
COR	E EQUI	PMENT:			С	ME-550, N	N-Casing, NQ DRILLER: S. Gower												
		DRILL		REC	RQD		<del></del>												
ELEV (ft)	DEPTH (ft)	RATE (min/ft)	RUN (ft)	(ft) (%)	(ft) (%)	SAMPLE NUMBER													
195.8	31.0	3:45	(11)				Gray and white, slightly to freshly weathered, moderately hard to very hard, very closely to moderately												
		3:30 1:30/0.3	2.3	2.0	0.8		closely fractured,mica gneiss												
193.5	33.3			(87%)	(35%)														
193.5	33.3	3:30 3:45		4.8	1.2		Gray and white, slightly to freshly weathered, moderately hard to very hard, very closely to moderately closely fractured, mica gneiss												
		3:00	5.0				closely fractured, filica gnelss												
188.5	38.3 <sup>-</sup>	3:20 4:00		(96%)	(24%)														
188.5	88.5 38.3 3:00 Gray and white, slightly to freshly weathered, moderately hard to very hard, very closely to moderately closely fractured, mica gneiss																		
		3:30 3:45	5.0	(96%)	(78%)	RS-2 38.6'-39.2'													
183.5	43.3	4:30		(3070)	(1070)														
183.5	43.3	4:00 3:45		4.0	4.0		Gray and white, slightly to freshly weathered, moderately hard to very hard, very closely to moderately closely fractured, mica gneiss												
		3:00 3:00	4.0	(100%)	(100%)														
179.5	47.3						·												
							·												
							·												
		<del></del>																	
							•												
							BOREHOLE TERMINATED AT ELEVATION OF 179.5 FEET, IN MICA GNEISS.												

			PF
			PF SI BC CC DF S1
			co
			DF S1
			EL
			22
			22
			21
			21
			20
			_20
			19
			15 18
•			

SHEET 12

PROJE	CT NO.	3335	5.1.1	T I I		B-39	921					C	OUNT	γ	WAR	REN			1	G	EOLOGIST (	C BE	RIJINSMA	
	ESCRIP							SR 10	600)	BAL	TIMO						CRE	=Fk					GROUND W	/TR (ff)
	G NO.							13+2							13ft R		1	1	ALIGNMEN	IT	<b>-</b> L-	$\dashv$	0 HR.	4.0
	R ELEV		2 ft						34.3	ft					950				EASTING				24 HR.	3.0
DRILL	MACHIN	IE CM	E-550		DF	RILL	MET	HOD	H.S	3. Au	ugers										HAMMER TY	PE	Manual	
START	DATE	02/27/	07						2/27				URFA	CE	WATE	R DE	PTH	N	1/A	†	DEPTH TO R	ОСК	34.3 ft	
ELEV	DEPTH	BLC	ow cor	INT	Π			BLC	OWS F	PER F	OOT	SAMP.								DTION				
(ft)	(ft)	0.5ft	0.5ft	0.5ft		0	2	5	5	50		75 	100	Ш	NO.	MOI		L	٠٠.		AND ROCK DE		PTION	
					$\  \ $																			
225 _					$\ $													L						
223.2	1.0	2	3	2	#	1:			::		<del></del>	Τ:		$\dagger \dagger$	22.42			+-2	224.2		-GROUND SUF			0.0
220.9	3.3				$\prod$	5.		::	: :			:			SS-43	M		Ì.			BROWN, SILTY	T SAI	ND	
-	-	3	1	2		<b>∮</b> 3		<b>-</b>		<b> </b>		╁:		1	SS-44B/	W		1	219.9 218.2	RE	D-BROWN, SAI	NDY	CLAY	4.3 6.0
-	<b>†</b>					ļ: :				:		:	: : :					‡	10.2		GRAY, SILTY	SAN	D	0.0
215.9	8.3	1	WOH	1	الا	1	• •		• •	<u> </u>	• • •	<u> </u> :	• • •	<u></u> ∦∤	SS-45	w		L						
:	<u> </u>					1		::	::	:		:	: : :					‡						
210.9	13.3		15		$\ $	: :	```	::	: :	:		:						‡ 2	210.4					13.8
-	-	7	15	13	lt		• •	28	• •	<b> </b> -		†-		1	SS-46A	M	000		208.2 BR	OV	<b>RESIDUA</b> VN AND TAN, C		SE SAND	16.0
205.9	18.3					: :	: : <i>/</i>	: :	: :	:		:	: : :					F			AND TAN, SAP			
200.5	- 10.0	8	7	11	1		- <b>d</b> 18		· ·	<u>├</u>		+		+	SS-47	М		F			0121			
:	F					: :	`	1	::	:		:	: : :					F						
200.9	23.3	24	22	32	$\  \ $	: :		: :		Ŀ	· · ·	:				м		F						
-	F								• •	54	~~.	$\int$				191		$E_1$	198.2					26.0
195.9	28.3				$\ $	: :	: :	: :		:		]						Ŧ			WEATHERED (MICA GNE		:K	
-		100/0.3			$\ \cdot\ $					-		+	_100/0.3	1				1						
:	<u> </u>				П			: :		:		:						1						
190.9 189.9	33.3 34.3	56	44/0.1		Ш			٠.		٠.		<u> </u>	-100/0.6					}	189.9					34.3
	L	60/0.0											60/0.0					E			minated with Sta Refusal at Elevat			
:	‡																	F	CRY	YST	ALLINE ROCK	(MICA	A GNEISS)	
-	‡																	-						
	‡																ļ	þ						
:	‡																	L						
	‡																	F						
	‡																	F						
-	<u> </u>																	F						
	<u> </u>																	F						
1 :	ŧ																	L						
	ł																	E						
	ł																	E						
-	Ŧ																	F						
	Ŧ																	E						
	Ŧ																	F						
-	Ŧ																	F						
	Ŧ																	F						
-	‡																	F						
	‡																	F						
	‡																	F						
-	‡																	F						
	‡																	F						
L	<u> </u>	<u> </u>		<u> </u>	L										<u> </u>	L		上						

BORELOG RE	PORT											
PROJECT NO. 33355.1.1 ID. B-3921	COUNTY WARREN	GEOLOGIST C.BRUINSMA		PROJEC	Γ <b>ΝΟ.</b> 33	3355.1.1	IC	D. B-3921	COUNTY WAR	RREN	GEOLOGIST	C.BRUINSMA
SITE DESCRIPTION BRIDGE NO. 45 ON -L- (	(SR 1600) BALTIMORE RD. OVER FISHING CREE	GROUND V	WTR (ft)	SITE DES	CRIPTIO	N BRIDG	SE NO.	45 ON -L- (SR 1600) BALTIM	ORE RD. OVER FI	SHING CREE	K	GROUND WT
BORING NO. EB2-A STATION	14+04 <b>OFFSET</b> 29ft LT	ALIGNMENT -L- 0 HR.	14.0	BORING	NO. EB	2-B		STATION 13+95	OFFSET 19ft I	RT	ALIGNMENT -L-	0 HR.
COLLAR ELEV. 237.3 ft TOTAL DE	PTH 32.8 ft NORTHING 950,230	EASTING 2,251,788 24 HR.	13.5	COLLAR				TOTAL DEPTH 28.4 ft	NORTHING 95	0,213	<b>EASTING</b> 2,251,833	24 HR.
DRILL MACHINE CME-550 DRILL MET	THOD H.S. Augers	HAMMER TYPE Manual		DRILL MA				DRILL METHOD H.S. Auger	<del></del>		HAMMER TY	
	TE 02/26/07 SURFACE WATER DEPTH	N/A DEPTH TO ROCK 32.8 ft		START D			1	COMP. DATE 02/27/07	SURFACE WAT		N/A DEPTH TO R	OCK 28.4 ft
ELEV	BLOWS PER FOOT SAMP. C C C C C C C C C C C C C C C C C C C	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		-:	BLOW COU	UNT 0.5ft	BLOWS PER FOO 25 50	T SAMF 75 100 NO.	1/101	SOIL AND ROCK DE	ESCRIPTION
5.5% 5.5%	, , , , , , , , , , , , , , , , , , ,	ELEV. (II)	DEP IT (II)							V WIOT G		
240				230								
				228.8		4 3	3	1			229.8 GROUND SU RED-BROWN, SI	
236.3 1.0 1		237.3 GROUND SURFACE  ROADWAY EMBANKMENT	0.0	225.8	4.0	`   `		¶6"	SS-35	4 M	226.8 RED-BROWN, SA	
233.6 + 3.7	SS-11 M	RED-BROWN, SANDY SILT				2 4	15	19	SS-36	M 📡	224.3	
3 2 3					- 1	4 3	1	1 •4 · · ·   · · · ·   · · · ·	SS-3	7 <u>w</u>   t	RED-BROWN, SA 221.8	ANDY SILT
3 2 3		230.8 RED-BROWN, CLAYEY SILT	6.5	220.8		2 1	1				RED-BROWN, CL 219.3	AYEY SILT
228.6 + 8.7 7 4 3				218.8	11.0	2 5	2	7	SS-39		GRAY, SILTY	SAND
226.3 + 11.0		226.8 ALLUVIAL	10.5	215.8								
223.6 + 13.7	SS-15 M	RED-BROWN, SANDY SILT				3 3	4	7	SS-40	의 w 🔃	•	
3 3 3 6				210.8	19.0				-		211.8 WEATHERED	POCK
107	<u> </u>	220.3 GRAY, SILTY SAND	17.0	+		7 63/0.2			100/0.7		. (MICA GNE	
218.6 18.7	SS-17 W			I								
<u> </u>		215.3	22.0	205.8 ]		3 47	53/0.1	-				
213.6 + 23.7	· · · ·   · · · ·   · · · ·			1 ‡					100/0.6			
2 5 7 1 12.		210.3	27.0	201.4		0.0	<del> </del>		60/0.0		201.4 Boring Terminated with S	tandard Penetration
208.6 + 28.7		GRAY, COARSE SAND		1 ‡							Test Refusal at Eleva CRYSTALLINE ROCK	tion 201.4 ft on
25   24   29		205.8	31.5	1 ‡					,	F		
204.6 32.7	60/0.1	204.5 WEATHERED ROCK (MICA GNEISS)	32.8	1 <del>I</del>						1   E	•	
60/0.1/		Boring Terminated with Standard Penetration Test Refusal at Elevation 204.5 ft on	on	1 ‡						1   ‡		
		CRYSTALLINE ROCK (MICA GNEISS)									•	
				‡								
				‡				,				
										1   F	•	
6 1 1 1 1				1 7								
198				1 <del>I</del>						1   E	-	
				1 I			}			I I E	•	
				1 I							· •	
				1 ‡								
8				1 ‡								
86 +				1 ‡							-	
				‡		1						
				‡							-	
1,21												
				‡							-	
				‡								
				‡							-	
				1 =						E		
ğ  <del> </del>				<del> </del>								

PROJ. NO. - 33355.1.1 ID NO. - B-3921 COUNTY - WARREN

EB1-B

	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	SIEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-20	11' RT	12+06	1.0-2.5	A-6(3)	37	13	22.6	32.9	16.3	28.2	94	83	47	•	
SS-23	11' RT	12+06	8.5-10.0	A-2-4(0)	20	NP	31.9	45.8	10.3	12.1	93	77	26	•	-
SS-24	11' RT	12+06	11.0-12.5	A-6(7)	37	16	5.6	42.5	13.5	38.3	100	98	58	•	-
SS-26A	11' RT	12+06	19.0-19.8	A-2-4(0)	25	NP	29.2	55.0	9.7	6.0	98	87	19	-	-
SS-27	11' RT	12+06	23.5-25.0	A-2-4(0)	36	NP	33.7	41.9	16.3	8.1	97	83	30		-

EB1-A

EDI-A															
	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY V	VEIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-1	13' LT	12+17	1.0-2.5	A-6(2)	31	12	24.0	31.7	14.0	30.3	91	80	45	•	-
SS-4	13' LT	12+17	8.8-10.0	A-4(1)	29	8	23.2	34.5	16.0	26.2	96	84	46	•	-
SS-5	13' LT	12+17	11.0-12.4	A-4(1)	26	7	11.3	47.0	13.5	28.2	100	96	48	•	-
SS-6	13' LT	12+17	13.5-15.0	A-6(5)	37	15	13.1	38.9	11.7	36.3	100	93	53	•	-
SS-7	13' LT	12+17	18.5-20.0	A-2-4(0)	25	NP	35.7	45.0	5.2	14.1	100	87	23	•	-
SS-8	13' LT	12+17	23.5-25.0	A-2-4(0)	36	NP	20.4	53.6	20.0	6.0	100	94	34		-

*B1-B* 

SOIL TEST RESULTS															
SAMPLE			DEPTH	AASHTO				% BY W	VEIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-57	16' RT	12+56	3.2-4.7	A-6(2)	33	12	8.7	53.2	11.9	26.2	100	99	46	-	
SS-58	16' RT	12+56	8.2-9.7	A-2-4(0)	32	7	14.1	57.3	12.5	16.1	91	86	32	•	•

	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-30	8' LT	12+63	5.4-6.9	A-4(0)	26	7	8.3	58.5	9.1	24.2	100	98	41	•	•
SS-32	8' LT	12+63	15.7-16.9	A-2-4(0)	30	NP	38.1	44.6	13.3	4.0	94	75	21	•	•

*B2-B* 

	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-43	13' RT	13+29	1.0-2.5	A-2-4(0)	25	3	37.7	37.1	9.1	16.1	94	79	27	•	
SS-44B	13' RT	13+29	4.3-4.8	A-6(4)	36	11	21.6	29.0	17.1	32.3	100	89	53	-	
SS-45	13' RT	13+29	8.3-9.8	A-2-4(0)	24	NP	26.8	58.9	6.3	8.1	76	73	13		-
SS-46A	13' RT	13+29	13.8-14.8	A-1-b(0)	25	NP	67.7	26.0	4.2	2.0	69	33	6		-
SS-47	13' RT	13+29	18.3-19.8	A-4(0)	35	NP	28.4	41.7	19.8	10.1	97	84	36	-	-

*B2-A* 

SOIL TEST RESULTS															
SAMPLE			DEPTH	AASHTO				% BY W	EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-52	15' LT	13+35	6.0-7.5	A-2-4(0)	24	NP	10.5	73.4	12.1	4.0	100	99	24	-	•
SS-53A	15' LT	13+35	11.0-12.5	A-3(0)	29	NP	25.6	70.2	2.2	2.0	100	97	6	-	
SS-54	15' LT	13+35	16.0-17.5	A-2-4(0)	36	NP	33.5	49.0	13.5	4.0	94	74	23	-	•

EB2-B

	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-35	19' RT	13+95	1.0-2.5	A-2-4(0)	24	NP	43.5	34.9	9.5	12.1	91	68	23	-	•
SS-36	19' RT	13+95	4.0-5.5	A-6(4)	35	12	19.2	28.4	22.2	30.2	94	84	54	•	-
SS-37	19' RT	13+95	6.0-7.5	A-4(0)	32	10	26.6	38.3	12.9	22.2	95	81	38	-	•
SS-39	19' RT	13+95	11.0-12.5	A-5(1)	41	7	11.1	47.4	15.3	26.2	95	92	43	-	-
SS-40	19' RT	13+95	14.0-15.5	A-2-4(0)	24	NP	12.9	67.1	9.9	10.1	100	98	25		

EB2-A

	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-11	29' LT	14+04	1.0-2.5	A-4(1)	30	10	29.8	32.1	11.9	26.2	91	75	39	•	•
SS-13	29' LT	14+04	6.5-7.5	A-5(1)	41	9	31.7	29.4	16.7	22.2	95	75	41		•
SS-15	29' LT	14+04	11.0-12.5	A-4(2)	32	10	27.2	32.7	13.9	26.2	96	81	45	-	-
SS-17	29' LT	14+04	18.7-20.2	A-2-4(0)	23	NP	7.5	76.0	10.5	6.0	100	100	24	-	•
SS-18	29' LT	14+04	23.7-25.2	A-2-4(0)	26	NP	39.3	49.6	5.0	6.0	91	72	13	-	-
SS-19	29' LT	14+04	28.7-30.2	A-1-b(0)	24	NP	77.8	17.1	4.0	1.0	92	37	6		-



# FIELD SCOUR REPORT

WBS:	33355.1.1 TIP: B-3921 COUNTY: Warren	
DESCRIPTION(1):	Bridge No. 45 on -L- (SR 1600) over Fishing Creek	
	EXISTING BRIDGE	
Information from:	Field Inspection X Microfilm (reel pos: ) Other (explain) Hydro Report	
Bridge No.: Foundation Type:	45 Length: 124' Total Bents: 12 Bents in Channel: 1 Bents in Floodplain: 11  N/A	
EVIDENCE OF S Abutments or B	SCOUR(2) End Bent Slopes: None	
Interior Bents:	None	
Channel Bed:	Some scour in middle of stream, appears minor	
Channel Bank:	Evident on upstream side of bridge, predominately on EB2 side	
1	UR PROTECTION  Rip rap up to 2-3' diameter, placed under bridge on both banks	
Extent(4):	Timber wing walls extend 8' out from bridge	
Effectiveness(5):	Effective	
Obstructions(6):	None	

#### **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).
- 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.

			<b>DESIGN IN</b>	<b>IFORMATIC</b>	<u> </u>			,
Channel	Bed Material(7):	Alluvial. gra	av and orange	-brown very lo	ose to med	dium dense s	ilty sand	
		(SS-45, SS		Diown, vory		aidin dende, e	mry ourid	-
								_
Channel E	Bank Material(8):					, sandy clay (	SS-44, SS-57)	
		Alluvial, bro	own, loose, silt	y sand (SS-43	3)			
Channe	el Bank Cover(9):	Shrube ar	race large and	emall trace		*		
Onamic	a Barik Gover(o).	Siliubs, gi	ass, large and	Siliali liees				-
Flood	dplain Width(10):	Approxima	tely 500 feet					_
Flood	lplain Cover(11):	trees, shrul	bs, grass					_
	Stream is(12):	Aggra	ading	Degrading	X	Static_		
Channel Migratio	n Tendency(13):	Slight tende	ency to the so	uth				
		ong/it tollar	J. 1.0 1.1.0 00.					-
Observations	and Other Comn				dge site. Fu	ther downstre	eam and upstream	
		becomes n	nulti-channeled	<u> </u>				_
DESIGN SCO	UR ELEVATION	IS(14)		Fe	eet X	Meters		
								_
Interior Bent C	One - Elevation 2	10.0						
1	wo - Elevation 2							
		37.0						
Comparison	f DSE to Hydrau	ice I Init the	oretical scour					-
	0 feet higher at E				the theoret	ical scour for	the overtonning	
	rted in the Bridge						are overtopping	
		<b>,</b>						
L		****	<del></del>	<del></del>				L
								_
	SIS RESULTS F	ROM CHAN	NEL BED AN	ID BANK MAT	ERIAL			
Bed or Bank								
Sample No.								
Retained #4					_			
Passed #10 Passed #40					_			
Passed #40 Passed #200			See Sheet 1		-			
Coarse Sand			"Soil Test Re	•	-			
Fine Sand			for samples:		-			
Silt			SS-45, SS-5		-			
Clay			SS-43, SS-4	4, 55-57	-			
LL								
PI								
AASHTO			<u> </u>					
Station				:				
Offset								
Depth								

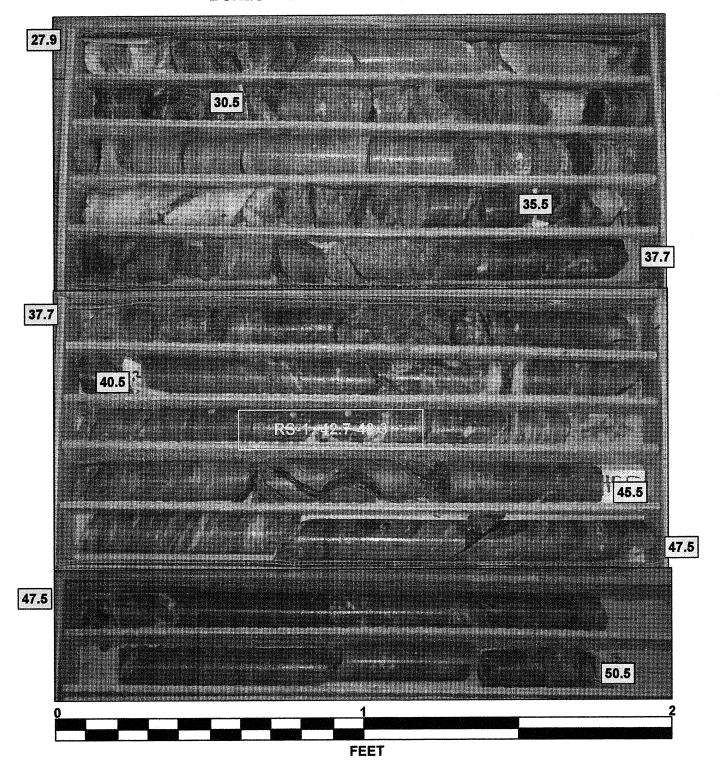
Template Revised 02/07/06

Reported by:

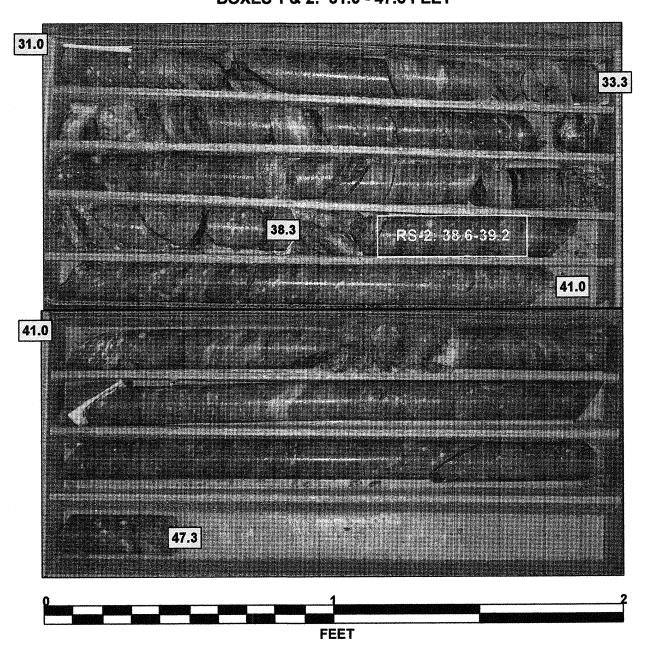
Date: 4/2/2007

## **CORE PHOTOGRAPHS**

**B1-B**BOXES 1 & 2 & 3: 27.9 - 50.5 FEET



**B2-A**BOXES 1 & 2: 31.0 - 47.3 FEET



## SITE PHOTOGRAPH

Bridge No. 45 on -L- (SR 1600) over Fishing Creek

