

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33201.1.1 (B-3655)	1	11

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

STRUCTURE
SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. 33201.1.1 F.A. PROJ. BRZ-1117(3)
COUNTY HARNETT
PROJECT DESCRIPTION BRIDGE NO. 59 ON -L- (SR 1117, NURSERY RD.) OVER JUMPING RUN CREEK AT STATION 17+50.5

CAUTION NOTICE

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

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

PROJECT: 33201.1.1
ID: B-3655

PERSONNEL

C.D. CZAJKA

H.R. CONLEY

D.W. DIXON

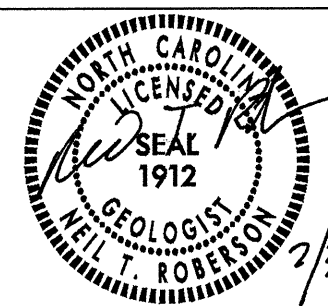
M.L. REEDER

INVESTIGATED BY C.D. CZAJKA

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE JULY 2007



DRAWN BY: C.D. CZAJKA

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 33201.II (B-3655)	SHEET NO. 2
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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH 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. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR , SUBANGULAR , SUBROUNDED , OR ROUNDED .	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. CRYSTALLINE ROCK (CR) - FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL, IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. NON-CRYSTALLINE ROCK (NCR) - FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK (CP) - COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7 SYMBOL [Diagrams showing soil patterns for A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7] % PASSING #10, #40, #200 LIQUID LIMIT, PLASTIC INDEX GROUP INDEX USUAL TYPES OF MAJOR MATERIALS: STONE FRAGS, GRAVEL, AND SAND; FINE SAND; SILTY OR CLAYEY GRAVEL AND SAND; SILTY SOILS; CLAYEY SOILS GEN. RATING AS A SUBGRADE: EXCELLENT TO GOOD, FAIR TO POOR, FAIR TO POOR, POOR, UNSUITABLE PI OF A-7-5 SUBGROUP IS <= LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE, MODERATELY COMPRESSIBLE, HIGHLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31, LIQUID LIMIT EQUAL TO 31-50, LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL ORGANIC MATERIAL, GRANULAR SOILS, SILT-CLAY SOILS, OTHER MATERIAL TRACE OF ORGANIC MATTER, LITTLE ORGANIC MATTER, MODERATELY ORGANIC, HIGHLY ORGANIC GROUND WATER: 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	WEATHERING FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI): ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI): ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH, OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.): SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> VERY SEVERE (V SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE: ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	
CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE, COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE), RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION, SOIL SYMBOL, ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT, INFERRED SOIL BOUNDARY, INFERRED ROCK LINE, ALLUVIAL SOIL BOUNDARY, DIP & DIP DIRECTION OF ROCK STRUCTURES, SOUNDING ROD, SPT DPT DMT VST TEST BORING, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR INSTALLATION, SPT N-VALUE, SPT REFUSAL		
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM), GRAIN SIZE	ABBREVIATIONS AR - AUGER REFUSAL, BT - BORING TERMINATED, CL - CLAY, CPT - CONE PENETRATION TEST, CSE - COARSE, DMT - DILATOMETER TEST, DPT - DYNAMIC PENETRATION TEST, F - FINE, FOSS. - FOSSILIFEROUS, FRAC. - FRACTURED, FRACTURES, FRAGS. - FRAGMENTS, HI. - HIGHLY, MED. - MEDIUM, MICA - MICACEOUS, MOD. - MODERATELY, NP - NON PLASTIC, ORG. - ORGANIC, PMT - PRESSUREMETER TEST, SAP. - SAPROLITIC, SD. - SAND, SANDY, SL. - SILT, SILTY, SLL. - SLIGHTLY, TCR - TRICONE REFUSAL, # - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST, WEA. - WEATHERED, % - UNIT WEIGHT, %d - DRY UNIT WEIGHT	ROCK HARDNESS VERY HARD: CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD: CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD: CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD: CAN BE GROVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT, CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT: CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT: CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGER NAIL.	
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS), FIELD MOISTURE DESCRIPTION, GUIDE FOR FIELD MOISTURE DESCRIPTION	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B-..., BK-51, CME-45C, CME-550, PORTABLE HOIST ADVANCING TOOLS: [X] CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 6" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT HAMMER TYPE: [X] AUTOMATIC, [] MANUAL CORE SIZE: [] B, [] N, [] H HAND TOOLS: [] POST HOLE DIGGER, [] HAND AUGER, [] SOUNDING ROD, [] VANE SHEAR TEST	FRACTURE SPACING TERM, SPACING VERY WIDE: MORE THAN 10 FEET WIDE: 3 TO 10 FEET MODERATELY CLOSE: 1 TO 3 FEET CLOSE: 0.16 TO 1 FEET VERY CLOSE: LESS THAN 0.16 FEET BEDDING THICKNESS TERM, THICKNESS VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
PLASTICITY NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY, PLASTICITY INDEX (PI), DRY STRENGTH			ROCK QUALITY DESIGNATION (RQD) - 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 CORE RUN AND EXPRESSED AS A PERCENTAGE. DIPOSOIL (DIP) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.			BENCH MARK: BL-2, -L- STATION 17+65.08, 16.53' LT N: 547859.392 E: 2001015.346 ELEVATION: 189.65 FT. NOTES:



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

July 2, 2007

STATE PROJECT: 33201.1.1 (B-3655)
F.A. PROJECT: BRZ-1117(3)
COUNTY: Harnett
DESCRIPTION: Bridge No. 59 on -L- (SR 1171, Nursery Rd.) over Jumping Run Creek at Station 17+50.5
SUBJECT: Geotechnical Report – Structure Inventory

Project Description

A three-span bridge, 105-feet in length with a 60° skew, is proposed on -L- (SR 1170, Nursery Rd.) over Jumping Run Creek. The project is located in southern Harnett County near the town of Spring Lake.

The subsurface investigation was conducted during June of 2007 using a CME-550 ATV-mounted drill machine. One standard penetration test boring was performed at each of the proposed bent locations. All borings were advanced with a clay bit and bentonite drilling fluid. 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 relatively flat terrain of the Coastal Plain Physiographic province. Geologically, the site is underlain by coastal plain soils of the Middendorf Formation. The coastal plain soils are underlain by residual soils derived from metamorphic rock (pyllonite) of the Raleigh Belt. The area is rural in nature consisting of wetlands and wooded land.

Soil Properties

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

Roadway embankment soils were encountered at all bent locations. The roadway embankment soils range in thickness from 3.0 to 7.0 feet. These soils consist of red-brown and tan, loose, moist, clayey sand (A-2-6). Alluvial soils underlie roadway embankment soils.

Alluvial soils range from 4.2 to 11.0 feet in thickness. These soils predominantly consist of dark gray and brown, moist to wet, very loose, silty sand (A-2-4) and gray and brown, wet, very soft, sandy clay (A-6).

Other soils present in smaller quantities are gray, moist, medium stiff, sandy silt (A-4) and tan, wet, loose, coarse sand and gravel (A-1-b). The alluvial soils were deposited on coastal plain soil.

Coastal Plain soils of the Middendorf formation were encountered in all boring locations and are 5.3 to 14.8 feet thick. These soils consist primarily of light gray to gray, moist, medium dense to very dense, silty sand (A-2-4). A basal layer of gray, moist, very dense, gravel (A-1-a) was encountered at B1-B.

Residual soils were encountered at all bent locations and are 4.0 to 6.8 feet thick. The residual soil consists of green-gray, moist, hard, sandy silt (A-4). The residual soils are underlain by weathered rock.

Rock Properties

Weathered rock was derived from the underlying metamorphic rock. Weathered rock was encountered in all of the borings. The top of weathered rock ranges in elevation from 162.0 feet at EB1-A to 166.8 feet at EB2-B.

Crystalline rock was only encountered at EB1-A with standard penetration test refusal and consists of green-gray phyllonite with recrystallized chlorite smeared out along schistosity surfaces. The crystalline rock was encountered at elevation 156.3 feet.

Groundwater

Groundwater was encountered at each of the boring locations. The groundwater elevations range from 182.6 feet at B1-B to 184.0 feet at EB1-A. The normal water surface elevation of Jumping Run Creek is 181.4 feet according to the Bridge Survey & Hydraulic Design Report (12-06).


Temporary Detour Structure

A temporary detour structure will be constructed approximately 44 feet downstream of the existing bridge at -DET- Station 14+21. The structure has a total length of 60 feet and is on a 60° skew. Borings DET EB1-B and DET EB2 were drilled along the -DET- alignment to provide additional information for the detour structure. Geologic conditions along the detour alignment correlate directly to those encountered along the main-line structure.

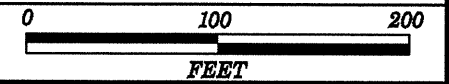
Notice

This Geotechnical foundation report is based on the Preliminary General Drawing dated January 2007 and the Bridge Survey and Hydraulic Design Report dated December 19, 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,


Doug Czajka
Engineering Geologist

SITE PLAN



SKREW ANGLE = 60



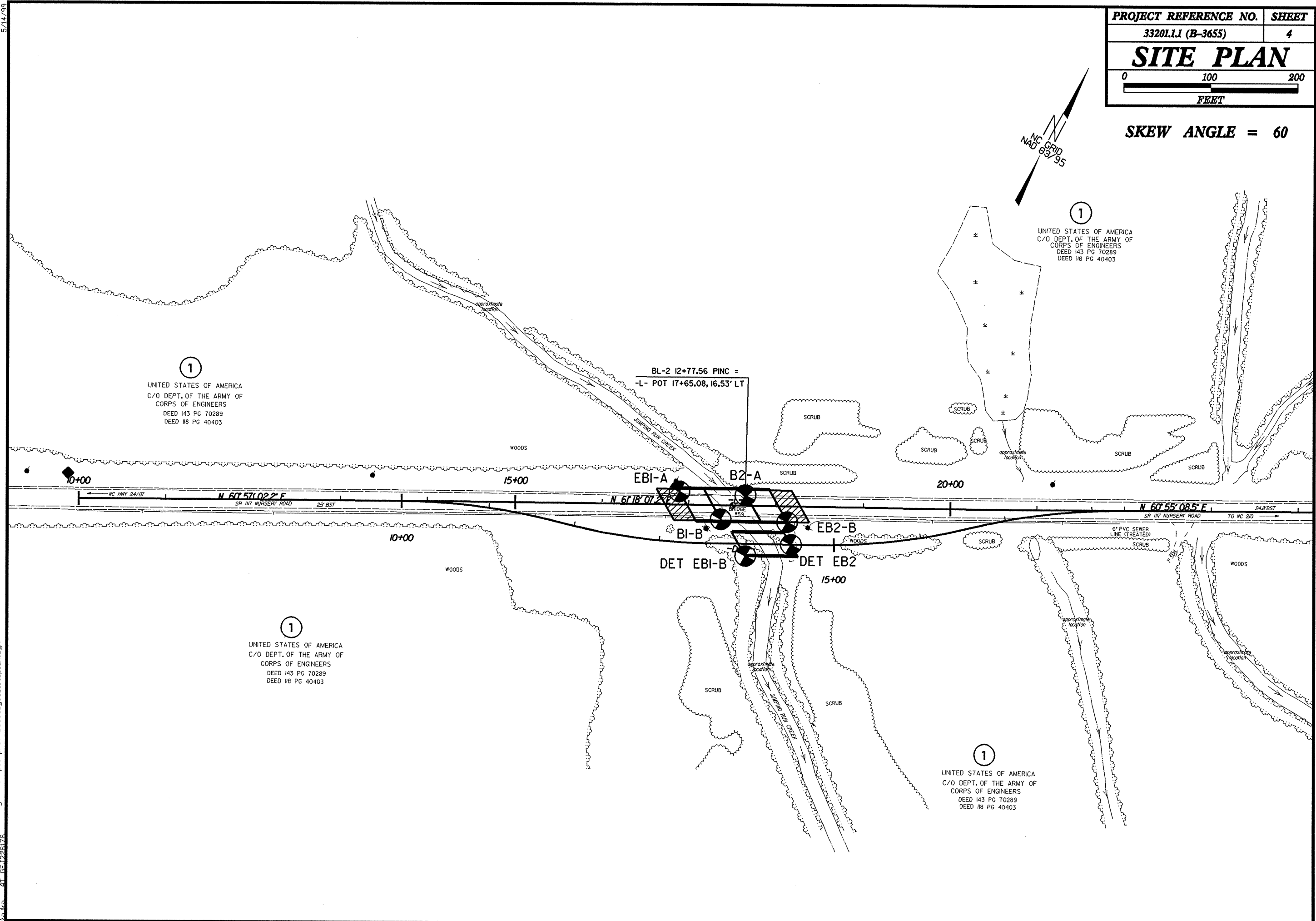
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C/O DEPT. OF THE ARMY OF
CORPS OF ENGINEERS
DEED 143 PG 70289
DEED 118 PG 40403

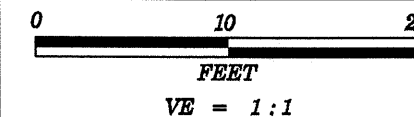
①
UNITED STATES OF AMERICA
C/O DEPT. OF THE ARMY OF
CORPS OF ENGINEERS
DEED 143 PG 70289
DEED 118 PG 40403

BL-2 12+77.56 PINC =
-L- POT 17+65.08, 16.53' LT



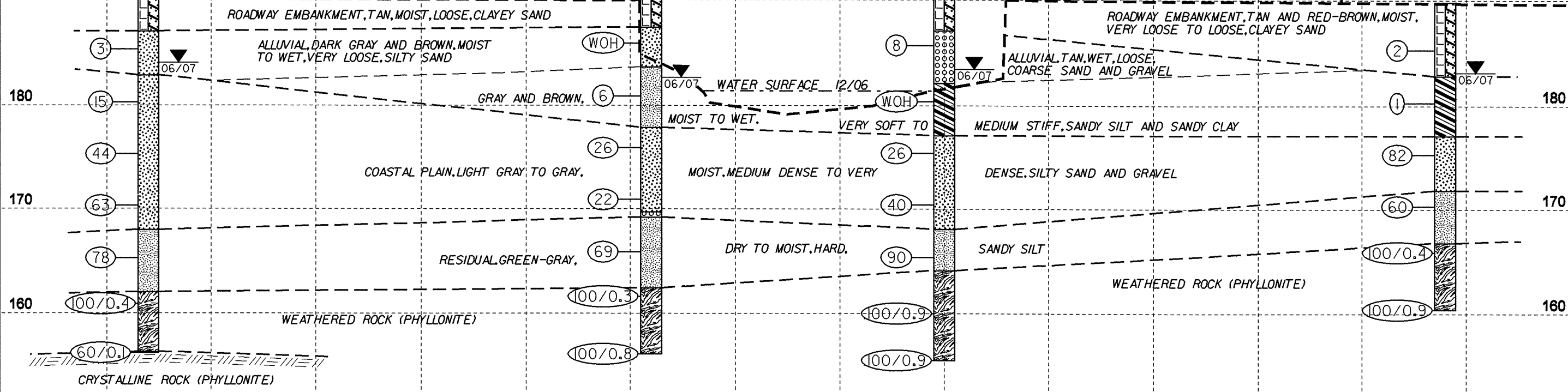
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 33201.1.1 (B-3655)



EB1-A 16+89 15' RT B1-B 17+37 16' RT B2-A 17+65 12' LT EB2-B 18+13 18' RT

END BENT 1 BENT 1 BENT 2 END BENT 2

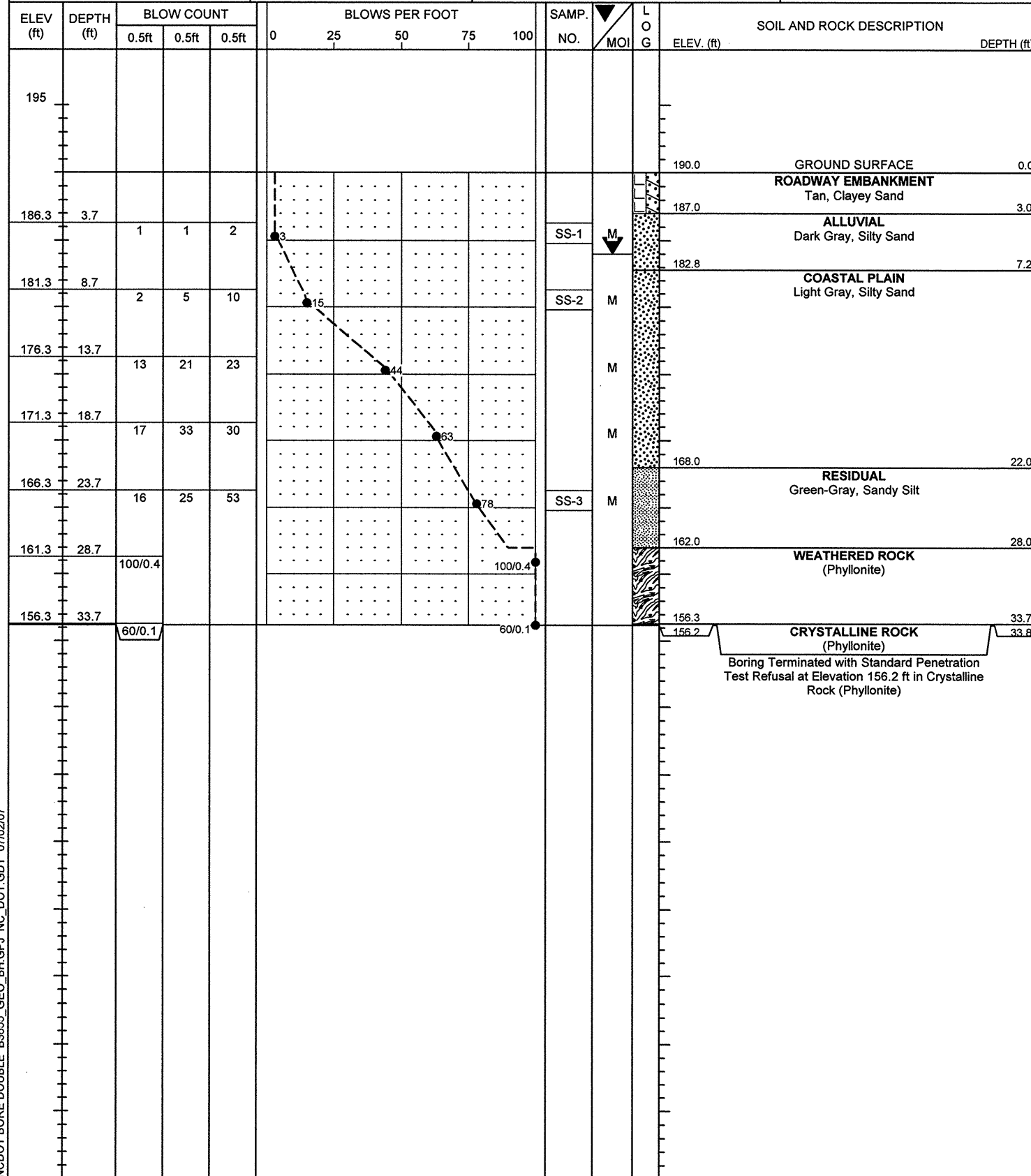


GROUNDLINE PROFILE AT CENTERLINE OF -L- TAKEN FROM ROADWAY DESIGN PLANS AS OF 04/04/2006

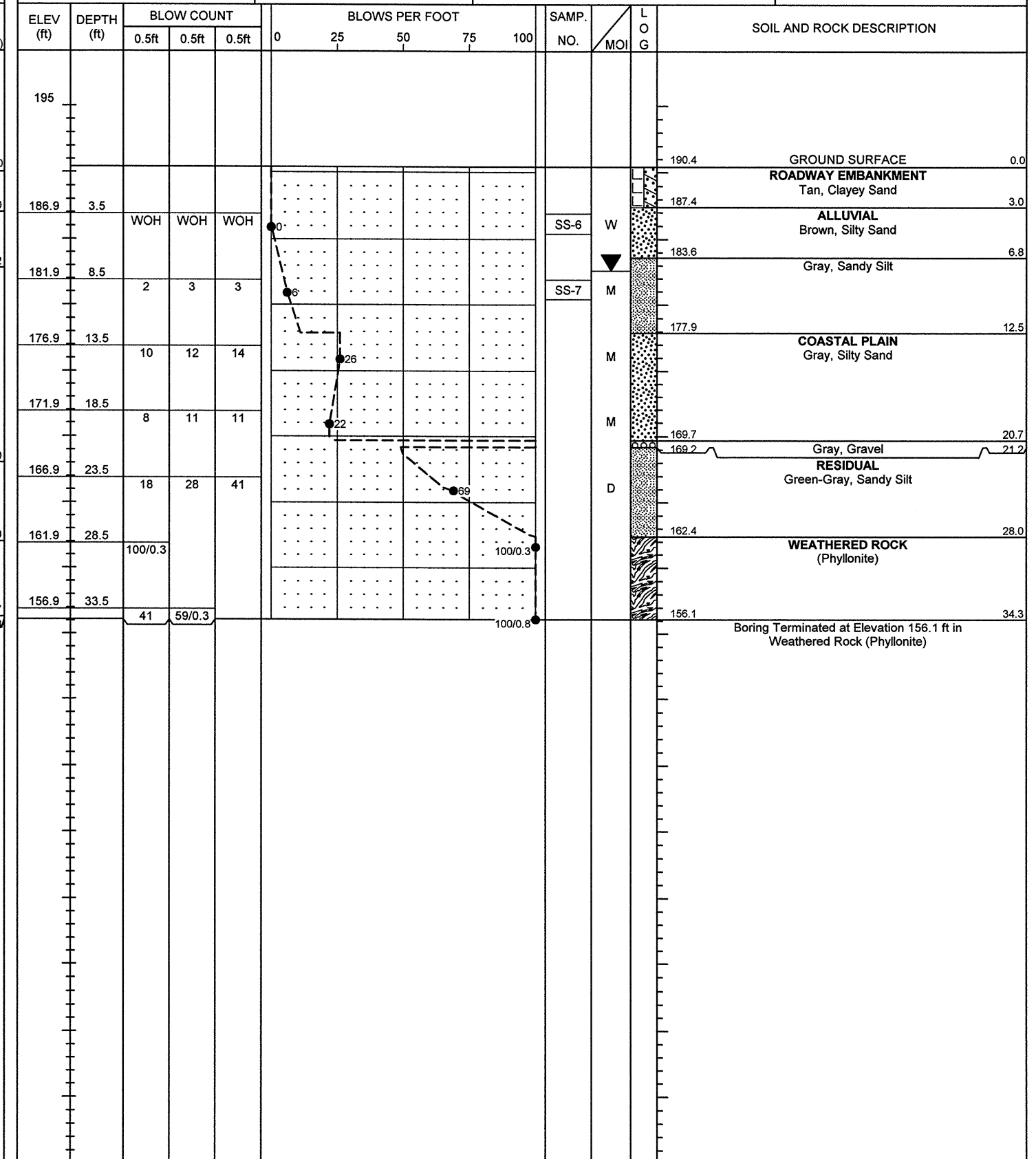
-L-

16+85 16+95 17+05 17+15 17+25 17+35 17+45 17+55 17+65 17+75 17+85 17+95 18+05 18+15

PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 16+89	OFFSET 15ft LT	ALIGNMENT -L-
COLLAR ELEV. 190.0 ft	TOTAL DEPTH 33.8 ft	NORTHING 547,822	EASTING 2,000,949
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/07/07	COMP. DATE 06/07/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 33.7 ft



PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. B1-B	STATION 17+37	OFFSET 16ft RT	ALIGNMENT -L-
COLLAR ELEV. 190.4 ft	TOTAL DEPTH 34.3 ft	NORTHING 547,817	EASTING 2,001,006
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/08/07	COMP. DATE 06/08/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B3655_GEO_BH.GPJ NC_DOT.GDT 07/02/07

PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. B2-A	STATION 17+65	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 190.1 ft	TOTAL DEPTH 34.6 ft	NORTHING 547,855	EASTING 2,001,017
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/07/07	COMP. DATE 06/07/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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				
195												GROUND SURFACE	0.0
186.7	3.4											ROADWAY EMBANKMENT Tan, Clayey Sand	3.0
181.4	8.7	5	3	5						SS-4	W	ALLUVIAL Tan, Coarse Sand and Gravel	
176.4	13.7	WOH	WOH	WOH						SS-5	W	Brown, Sandy Clay	8.0
171.4	18.7	2	13	13								COASTAL PLAIN Light Gray, Silty Sand	13.0
166.4	23.7	11	19	21								RESIDUAL Green-Gray, Sandy Silt	22.0
161.4	28.7	20	37	53								WEATHERED ROCK (Phyllonite)	26.0
156.4	33.7	6	31	69/0.4								Boring Terminated at Elevation 155.5 ft in Weathered Rock (Phyllonite)	34.6

PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 18+13	OFFSET 18ft RT	ALIGNMENT -L-
COLLAR ELEV. 189.8 ft	TOTAL DEPTH 29.4 ft	NORTHING 547,852	EASTING 2,001,074
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/11/07	COMP. DATE 06/11/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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				
195												GROUND SURFACE	0.0
186.3	3.5											ROADWAY EMBANKMENT Red-Brown, Clayey Sand	3.0
181.3	8.5	1	1	1						SS-8	M	ALLUVIAL Gray, Sandy Clay	7.0
176.3	13.5	28	44	38								COASTAL PLAIN Gray, Silty Sand	12.7
171.3	18.5	15	28	32								RESIDUAL Green-Gray, Sandy Silt	18.0
166.3	23.5	100/0.4								SS-9	M	WEATHERED ROCK (Phyllonite)	23.0
161.3	28.5	35	65/0.4									Boring Terminated at Elevation 160.4 ft in Weathered Rock (Phyllonite)	29.4

NCDOT BORE DOUBLE B3655_GEO_BH.GPJ NC_DOT.GDT 07/02/07



PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. DET EB1-B	STATION 13+99	OFFSET 14ft RT	ALIGNMENT -DET-
COLLAR ELEV. 188.2 ft	TOTAL DEPTH 25.0 ft	NORTHING 547,794	EASTING 2,001,052
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/12/07	COMP. DATE 06/12/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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				
190												GROUND SURFACE	0.0
184.5	3.7	1	2	2							M	ALLUVIAL Gray, Silty Sand	
179.5	8.7	15	26	43							M	COASTAL PLAIN Gray, Silty Sand	7.7
174.5	13.7	21	33	50							M	Gray and Orange, Silty Clay	12.5
169.5	18.7	18	15	39						SS-11	M	RESIDUAL Green-Gray, Sandy Silt	17.0
164.5	23.7	29	63	37/0.3							M	WEATHERED ROCK (Phyllonite)	23.0
													25.0
Boring Terminated at Elevation 163.2 ft in Weathered Rock (Phyllonite)													

PROJECT NO. 33201.1.1	ID. B-3655	COUNTY Harnett	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek			GROUND WTR (ft)
BORING NO. DET EB2	STATION 14+51	OFFSET CL	ALIGNMENT -DET-
COLLAR ELEV. 187.1 ft	TOTAL DEPTH 24.6 ft	NORTHING 547,832	EASTING 2,001,091
DRILL MACHINE CME-550	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 06/12/07	COMP. DATE 06/12/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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				
190												GROUND SURFACE	0.0
183.3	3.8	1	1	1							M	ALLUVIAL Brown and Gray, Silty Sand	
178.3	8.8	WOH	WOH	WOH							W	COASTAL PLAIN White, Sandy Silt	11.3
173.3	13.8	38	31	31						SS-10	M	RESIDUAL Green-Gray, Sandy Silt	17.1
168.3	18.8	27	73/0.4									WEATHERED ROCK (Phyllonite)	18.8
163.3	23.8	38	62/0.3										24.6
Boring Terminated at Elevation 162.5 ft in Weathered Rock (Phyllonite)													

NCDOT BORE DOUBLE B3655_GEO_BH.GPJ NC_DOT_GDT 07/02/07

EB1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	15' LT	16+89	3.7-5.2	A-2-4(0)	19	NP	25.6	48.0	14.2	12.1	100	92	35	-	-
SS-2	15' LT	16+89	8.7-10.2	A-2-4(0)	21	1	65.4	7.8	8.7	18.2	99	48	27	-	-
SS-3	15' LT	16+89	23.7-25.2	A-4(1)	35	4	4.6	55.7	35.6	4.0	100	98	52	-	-

BI-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	16' RT	17+37	3.5-5.0	A-2-4(0)	19	1	47.0	28.7	10.2	14.1	95	67	28	-	-
SS-7	16' RT	17+37	8.5-10.0	A-4(0)	19	1	16.9	54.2	20.9	8.1	100	93	40	-	-

B2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	12' LT	17+65	3.4-4.9	A-1-b(0)	21	NP	63.8	26.0	4.1	6.1	73	49	9	-	-
SS-5	12' LT	17+65	8.7-10.2	A-6(5)	31	14	18.6	28.1	15.0	38.3	100	91	57	-	-

EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-8	18' RT	18+13	3.5-5.0	A-2-7(2)	44	24	51.3	12.7	5.8	30.3	82	49	30	-	-
SS-9	18' RT	18+13	18.5-20.0	A-4(0)	30	NP	2.0	66.4	27.5	4.0	100	100	40	-	-

DETEB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-11	14' RT	13+99	13.7-15.2	A-7-6(15)	41	20	7.3	19.8	46.7	26.2	100	96	79	-	-

DETEB2

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	CL	14+51	13.8-15.3	A-4(0)	27	NP	10.1	59.9	23.9	6.1	96	91	39	-	-



FIELD SCOUR REPORT

WBS: 33201.1.1 TIP: B-3655 COUNTY: Harnett

DESCRIPTION(1): Bridge No. 59 on -L- (SR 1117, Nursery Rd.) over Jumping Run Creek

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
 Other (explain) Bridge Survey & Hydraulic Design Report

Bridge No.: 59 Length: 35.2' Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 2
 Foundation Type: Timber Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Bank Scoured at Abutment Walls

Interior Bents: One Timber Pile Reinforced with Concrete

Channel Bed: None

Channel Bank: Exposed Roots Along Bank

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): Two Large Rootballs Between B1 and EB2

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Coarse Sand and Gravel (A-1-b)

Channel Bank Material(8): Coarse Sand and Gravel (A-1-b), Silty Sand (A-2-4), Sandy Silt (A-4), and Sandy Clay (A-6)

Channel Bank Cover(9): Shrubs and Trees

Floodplain Width(10): 150-200'

Floodplain Cover(11): Shrubs, Trees and Grass

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): West

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

LOCATION	DSE
Interior Bent 1	180.0
Interior Bent 2	179.2

Comparison of DSE to Hydraulics Unit theoretical scour:

The Geotechnical Engineering Unit agrees with the Hydraulic Unit's theoretical Scour elevations as noted above.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bank	Bank	Bank	Bank
Sample No.	SS-1	SS-4	SS-5	SS-6	SS-7
Retained #4	-	13	-	-	-
Passed #10	100	73	100	95	100
Passed #40	92	49	91	67	93
Passed #200	35	9	57	28	40
Coarse Sand	25.6	63.8	18.6	47.0	16.9
Fine Sand	48.0	26.0	28.1	28.7	54.2
Silt	14.2	4.1	15.0	10.2	20.9
Clay	12.1	6.1	38.3	14.1	8.1
LL	19	21	31	19	19
PI	NP	NP	14	1	1
AASHTO	A-2-4(0)	A-1-b(0)	A-6(5)	A-2-4(0)	A-4(0)
Station	16+89	17+65	17+65	17+37	17+37
Offset	15' LT	12' LT	12' LT	16' RT	16' RT
Depth	3.7'-5.2'	3.4'-4.9'	8.7'-10.2'	3.5'-5.0'	8.5'-10.0'

Template Revised 02/07/06

Reported by: C. Doug Czajka

Date: 5/22/2007

SITE PHOTOGRAPH

Bridge No. 59 on -L- (SR 1117, Nursery Rd.) Over Jumping Run Creek



Looking North