STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33439.1.1 (B-4077)	1	9
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33439.1.1	BRSTP-130 (2)	P.E.	
		CONST.	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33439.1.1 I.D. NO. B-4077

F.A. PROJECT BRSTP-130 (2)

COUNTY COLUMBUS

PROJECT DESCRIPTION BRIDGE NO. 25 ON NC 130 OVER WACCAMAW RIVER OVERFLOW AT -L- STA. 31+69.02

PROJECT 33439.1.1 ID: B-4077

CONTENTS:

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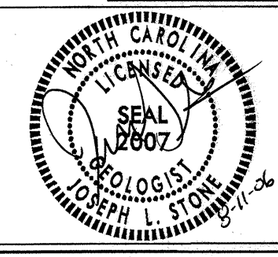
INVESTIGATED BY J. L. STONE PERSONNEL O.B.O.

CHECKED BY D.N. ARGENBRIGHT R.E.S.

SUBMITTED BY D.N. ARGENBRIGHT W.N.C.

DATE AUGUST 2006



DRAWN BY: C. M. KENT

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ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-4077	33439.1.1	2	9

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤35% PASSING #200)						SILT-CLAY MATERIALS (>35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2			A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6 A-2-7				A-7-5 A-7-6			
SYMBOL													
% PASSING • 10 • 40 • 200	50 MX 30 MX 15 MX	25 MX	51 MN 10 MX	35 MX	35 MX	35 MX 35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 41 MN 11 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX	8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND			SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F. SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12"	3"				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

- ▽ — WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.
- ▼ — STATIC WATER LEVEL AFTER 24 HOURS.
- ▽PW — PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA
- SPRING OR SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

S- BULK SAMPLE
SS- SPLIT SPOON SAMPLE
ST- SHELBY TUBE SAMPLE
RS- ROCK SAMPLE
RT- RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☒ CME-45C
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☐ OTHER_____
- ☐ OTHER_____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☐ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☒ CASING ☐ W/ ADVANCER
- ☒ TRICONE 2 15/16 " STEEL TEETH
- ☐ TRICONE_____" TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER_____

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V. SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS 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 GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS WHICH 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 IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 IN OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-4 STA 27+03.16

ELEVATION: 35.70

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
MICHAEL F. EASLEY
GOVERNOR
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LYNDO TIPPETT
SECRETARY

August 11, 2006

STATE PROJECT: 33439.1.1 B-4077
F.A. PROJECT: BRSTP-130 (2)
COUNTY: Columbus
DESCRIPTION: Bridge No. 25 on NC 130 over Waccamaw River Overflow

SUBJECT: Geotechnical Report - Bridge Foundation Investigation for NC 130 over Wacamaw River Overflow at -L- Sta. 31+69.02

Site Description

The proposed bridge site is located at the existing NC 130 bridge over the Waccamaw River overflow, approximately 20 miles south of Whiteville. The replacement structure will be built along the existing alignment. Based on the proposed design, the new structure will have one span totaling 90 feet. Additionally, a temporary detour bridge will be built approximately 55 feet northeast of the existing structure.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. These borings were made with ATV mounted CME-45C drill machine and advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent alluvial deposits of the nearby Waccamaw River and Cretaceous marine sediments of the Peedee Formation. Topography along the project is nearly flat with elevations ranging from 21± feet beneath the existing structure to 35± feet along the NC 130 embankment.

Ground water elevations and the surface of the Waccamaw River Overflow were found to be at 25± feet.

Soil Description

Soils within this area have been divided into three categories, roadway embankment soils, alluvial soils, and formational soils.

Alluvial deposits are composed of 7 to 12 feet of very soft to medium stiff sandy silt (A-4), with 6± feet of medium dense sand (A-3) at End Bent 1.

These alluvial soils are underlain by the marine sediments of the Cretaceous age Peedee Formation at an elevation of 15 to 17 feet. The Peedee Formation consists of medium stiff to hard sandy clayey silt (A-4).

Based on the proposed design, the existing grade will be raised less than 1 foot at the bridge site. The existing embankment material primarily consists of 5± feet of soft to medium stiff sandy silt (A-4). The proposed end bent slopes will be mainly constructed within the existing embankment. Some additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Temporary Detour Structure

A temporary detour structure will be built approximately 55 feet northeast of the existing bridge at -DET- Sta. 27+53.73. This structure will have a total length of 180 feet. Subsurface conditions in this area are consistent, and thus can be correlated directly to the main structure.

Notice

This Geotechnical Foundation Report is based on the Bridge Survey and Hydraulic Design Report for Waccamaw River Overflow dated January 20, 2002. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

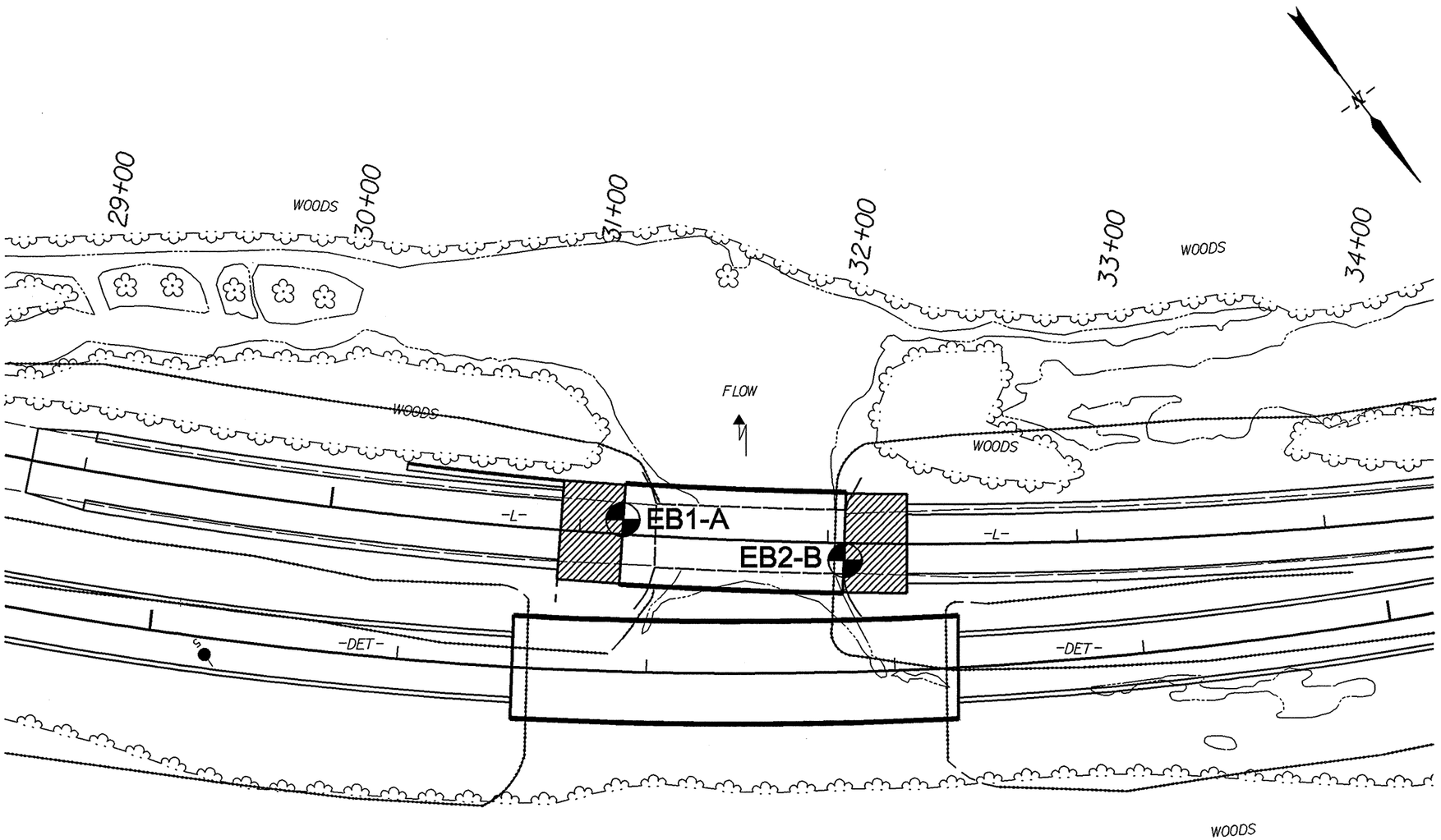
Prepared By:

Joseph L Stone, L.G.
Engineering Geologist II

0	50	100
FEET		

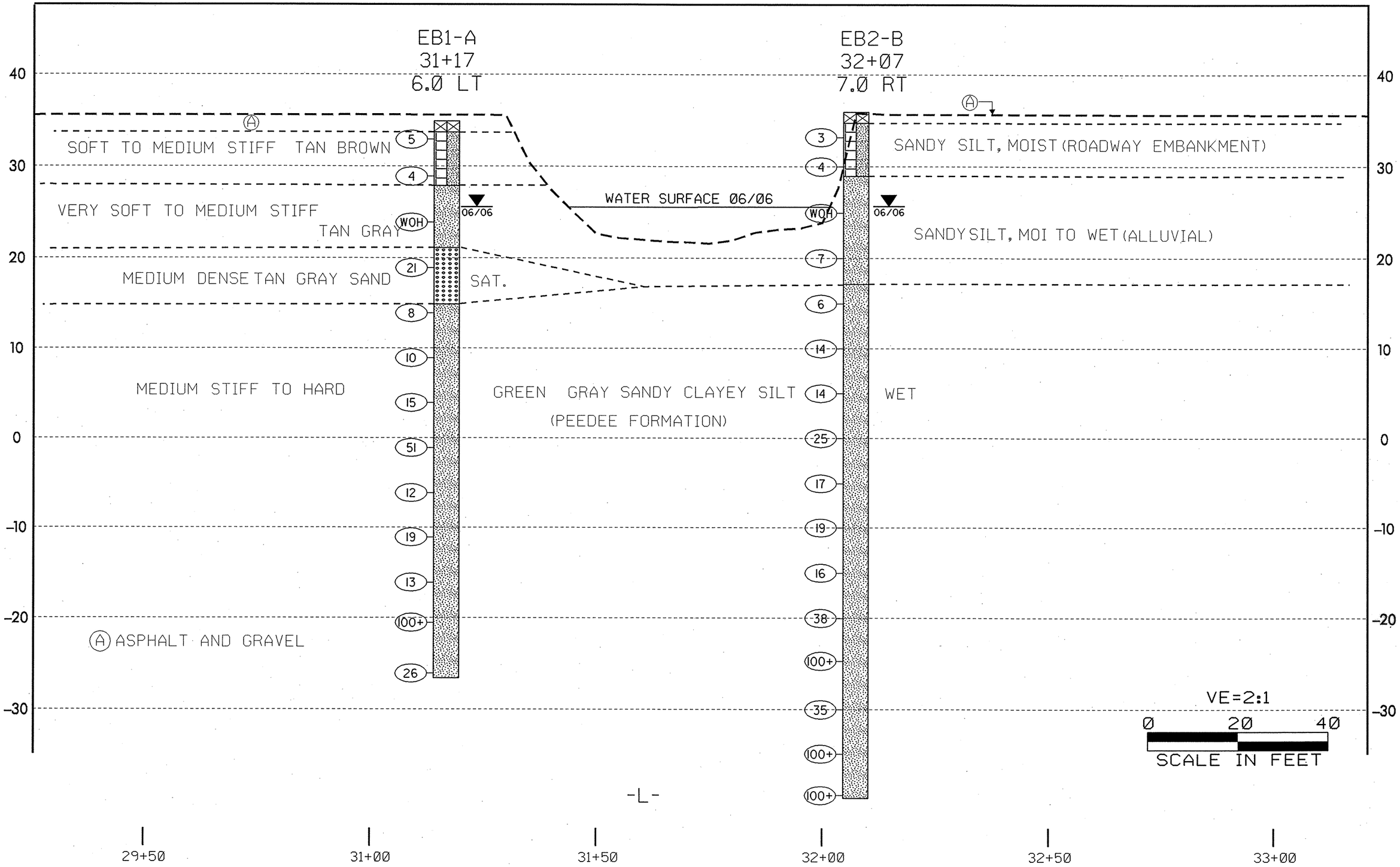
PROJECT REFERENCE NO.	SHEET
33439.1.1 (B-4077)	4

SITE PLAN



SKEW = 90°

PROFILE THROUGH BORINGS PROJECTED ALONG -L-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33439.1.1	ID. B-4077	COUNTY COLUMBUS	GEOLOGIST O.B.OTI
SITE DESCRIPTION BRIDGE NO. 25 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			GROUND WATER
BORING NO. EB1-A	BORING LOCATION 31+17	OFFSET 6' LT	ALIGNMENT -L-
COLLAR ELEVATION 34.9'	NORTHING 135228	EASTING 2132740	0 HR. N.M. / 24 HR. 9.2
TOTAL DEPTH 61.5'	DRILL MACHINE CME-45C	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 6/20/06	COMPLETION DATE 6/20/06	SURFACE WATER DEPTH N.A.	DEPTH TO ROCK N.A.

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
	1.2	2	2	3	1.0	5	SS-9			ASPHALT AND GRAVEL
30.0	5.0	2	2	2	1.0	4				TAN BROWN SANDY SILT, WET. (ROADWAY EMBANKMENT)
25.0	10.0	WOH	WOH	WOH	1.0	0	SS-10	▼		TAN GRAY SANDY SILT, MOI. TO WET. (ALLUVIAL)
20.0	15.0	6	10	11	1.0	21	SS-11			TAN TO GRAY SAND, SATURATED.
15.0	20.0	2	4	4	1.0	8	SS-12			
10.0	25.0	4	5	5	1.0	10				
5.0	30.0	5	6	9	1.0	15				
0.0	35.0	9	26	25	1.0	51	SS-13			GREEN GRAY SANDY CLAYEY SILT, WET. (PEEDEE FORMATION)
-5.0	40.0	5	5	7	1.0	12				
-10.0	45.0	7	9	10	1.0	19	SS-14			
-15.0	50.0	6	6	7	1.0	13				
-20.0	55.0	34	66		0.7	100+				
-25.0	60.0	26	11	15	1.0	76	SS-15			
-30.0						BORING TERMINATED AT ELEVATION -26.6 FEET IN VERY STIFF SANDY SILT.				
-35.0										
-40.0										
-45.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33439.1.1	ID. B-4077	COUNTY COLUMBUS	GEOLOGIST O.B.OTI
SITE DESCRIPTION BRIDGE NO. 25 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			GROUND WATER
BORING NO. EB2-B	BORING LOCATION 32+07	OFFSET 7' RT	ALIGNMENT -L-
COLLAR ELEVATION 35.9'	NORTHING 135292	EASTING 2132676	0 HR. N.M. / 24 HR. 10.0
TOTAL DEPTH 75.7'	DRILL MACHINE CME-45C	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 6/19/06	COMPLETION DATE 6/19/06	SURFACE WATER DEPTH N.A.	DEPTH TO ROCK N.A.

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
35.0	1.8	2	2	1	1.0	3	SS-1			ASPHALT AND GRAVEL
30.0	5.0	1	2	2	1.0	4				TAN SANDY SILT, MOIST. (ROADWAY EMBANKMENT)
25.0	10.0	WOH	WOH	WOH	1.0	0	SS-2	▼		TAN TO GRAY SANDY SILT, WET. (ALLUVIAL)
20.0	15.0	1	1	6	1.0	7				
15.0	20.0	1	1	5	1.0	6	SS-3			
10.0	25.0	5	6	8	1.0	14				
5.0	30.0	5	6	8	1.0	14	SS-4			
0.0	35.0	10	10	15	1.0	25				
-5.0	40.0	5	7	10	1.0	17	SS-5			GREEN GRAY SANDY SILT, WET. (PEEDEE FORMATION)
-10.0	45.0	5	8	11	1.0	19				
-15.0	50.0	7	8	8	1.0	16	SS-6			
-20.0	55.0	6	8	30	1.0	38	SS-7			
-25.0	60.0	75	25		0.7	100+				
-30.0	65.0	10	20	15	1.0	35	SS-8			
-35.0	70.0	15	60	40	0.8	100+				BORING TERMINATED AT ELEVATION -39.8 FEET IN HARD SANDY SILT.
-40.0	75.0	80	20		0.7	100+				

B-4077
BRIDGE NO. 25 ON NC 130 OVER WACCAMAW RIVER OVERFLOW

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH
EB2-B	SS-1	100	99	46	2.8	62.0	19.0	16.2	20	3	A-4(0)	1.8-3.3
	SS-2	100	99	48	4.4	58.2	19.2	18.2	20	2	A-4(0)	5.0-6.5
	SS-3	100	100	62	0.6	65.1	18.2	16.2	25	NP	A-4(0)	20.0-21.5
	SS-4	100	100	60	0.4	59.8	17.6	22.2	27	5	A-4(1)	30.0-31.5
	SS-5	100	100	61	0.4	56.6	18.8	24.2	26	7	A-4(2)	40.0-41.5
	SS-6	100	100	61	0.2	60.4	15.2	24.2	24	3	A-4(0)	50.0-51.5
	SS-7	100	99	60	1.8	61.2	14.7	22.2	22	NP	A-4(0)	55.0-56.5
	SS-8	100	98	60	3.0	62.2	16.6	18.2	27	4	A-4(1)	65.0-66.5
EB1-A	SS-9	100	95	47	11.9	48.9	19	20.2	21	5	A-4(0)	1.2-2.7
	SS-10	100	90	39	22.8	42.8	18.2	16.2	24	7	A-4(0)	10.0-11.5
	SS-11	99	89	8	23.5	71.0	3.4	2.0	22	NP	A-3(0)	15.0-16.5
	SS-12	100	100	62	0.4	64.6	12.7	22.2	28	4	A-4(1)	20.0-21.5
	SS-13	97	92	60	7.9	40.6	19.2	32.3	26	9	A-4(3)	35.0-36.5
	SS-14	100	100	59	0.4	58.4	14.9	26.3	28	6	A-4(2)	45.0-46.5
	SS-15	100	99	57	1.8	52.1	17.8	28.3	25	6	A-4(1)	60.0-61.5

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33439.1.1 TIP: B-4077 COUNTY: Columbus

DESCRIPTION(1): Bridge No. 25 on NC 130 over the Waccamaw River Overflow

EXISTING BRIDGE

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

Bridge No.: 25 Length: 77 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: none noted

Interior Bents: none noted

Channel Bed: none noted

Channel Bank: none noted

EXISTING SCOUR PROTECTION

Type(3): wooden end walls

Extent(4): 8 feet outside edge of bridge

Effectiveness(5): appears satisfactory

Obstructions(6): none noted

DESIGN INFORMATION

Channel Bed Material(7): sandy silt

Channel Bank Material(8): sandy silt

Channel Bank Cover(9): grass

Floodplain Width(10): 3.5 miles

Floodplain Cover(11): trees and shrubs

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

Channel Migration Tendency(13): very low

Observations and Other Comments: no flow under bridge structure at the time of investiagion

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS										
B1	B2	B3	B4							
NA	NA	NA	NA							

Comparison of DSE to Hydraulics Unit theoretical scour:
Geotechnical analysis agrees with a maximum theoretical scour elevation of 14.0 feet as outlined in the Bridge Survey and Hydraulic Report.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank						
Sample No.						
Retained #4						
Passed #10						
Passed #40						
Passed #200						
Coarse Sand						
Fine Sand						
Silt						
Clay						
LL						
PI						
AASHTO						
Station						
Offset						
Depth						

See Sheet 7, "Soil Test Results", for samples:
Channel Bank: SS-10
Channel Bed:SS-2

Template Revised 02/07/06

Reported by: [signature] Date: 8-11-06

INSTRUCTIONS

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

33439.1.1 (B-4077)
Columbus Co.
Bridge No. 25 on NC 130 Over Waccamaw River Overflow

Looking Northwest toward End Bent 2.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33440.1.1 (B-4078)	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33440.1.1 (B-4078) F.A. PROJ. _____

COUNTY COLUMBUS

PROJECT DESCRIPTION BRIDGE NO. 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW AT -L- STATION 15+53

ID: B-4078

PROJECT: 33440.1.1

CONTENTS

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.

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PERSONNEL
J.R. SWARTLEY
W.N. CHERRY
R.E. SMITH

INVESTIGATED BY F.M. WESCOTT III

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE JUNE, 2007

DRAWN BY: C.P. TURNER

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 INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT REFERENCE NO.	SHEET NO.
33440.1.1 (B-4078)	2 OF 11

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45B
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-50
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " 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
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM #81RR SPIKE IN 24" PINE, -BL- STA. 23+22 124' LT

ELEVATION: 30.54' FT.

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 4, 2007

STATE PROJECT: 33440.1.1 B-4078
F. A. PROJECT:
COUNTY: Columbus
DESCRIPTION: Bridge No. 10 on NC 130 over Waccamaw River Overflow

SUBJECT: Geotechnical Report - Bridge Foundation Investigation for NC 130 over Waccamaw River Overflow at -L- Station 15+53

Site Description

The proposed bridge site is located at the existing NC 130 bridge over Waccamaw River Overflow approximately 2± miles south of Old Dock. The replacement structure will be constructed along the existing alignment. Based on the proposed design, the new structure will have three spans with a total length of 130 feet. The bents will have a skew of 90 degrees. A detour bridge will be constructed northeast of the existing structure.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. The borings were made with ATV mounted CME-45B and Diedrich D-50 drill machines and were advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by Recent alluvial deposits and Cretaceous age soils of the Peedee Formation. Topography at the site is nearly flat to gentle sloping. Elevations at the site range from 19± feet along the channel bed to 36± feet along the existing NC 130 roadway. During this investigation, water levels within the boreholes and the surface of Waccamaw River Overflow were measured at elevations ranging from 27± to 29± feet.

MAILING ADDRESS:
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RALEIGH NC 27699-1589

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FAX: 919-250-4237

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC

Soil Description

Subsurface conditions at the site are relatively uniform. Surficial alluvial soils generally consist of up to 9± feet of very soft to soft sandy and clayey silt (A-4) and silty clay (A-6) with little organic matter underlain by loose sand (A-1-b, A-3). Soils belonging to the Cretaceous age Peedee Formation underlie the alluvial deposits at elevations ranging from 18± to 21± feet. Soils of the Peedee Formation consist of stiff to hard clayey sandy silt (A-4).

Detour Structure at –DET- Sta. 15+82.5

Conditions along the detour alignment are relatively uniform. Surficial alluvial soils consists of 4 to 5.5 feet of medium stiff to stiff sandy silt (A-4) with little organic matter underlain by loose sand (A-2-4). It is anticipated that subsurface conditions along the detour structure closely match that of the mainline structure.

Based on the proposed design, the existing grade will be raised 1± foot at the bridge site. The existing roadway embankment at the end bents consists of 5± to 6± feet of loose to medium dense sand (A-2-4). The proposed end bent slopes will be mainly constructed within the existing embankment. Some additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Note

The Geotechnical foundation report is based on the Bridge Survey and Hydraulic Design Report dated April 17, 2007. 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:

Fred M. Wescott III
Project Geological Engineer

PROJECT REFERENCE NO.	SHEET
33440.1.1 (B-4078)	4 OF 11

SITE PLAN

0 50 100

FEET

SKEW = 90°

WOODS

TOP OF WATER
ELEV. = 27.38

WOODS

EB1-B

EB2-C

-DET-

14-L-

B1-A

EB2-A

17-L-

TO WHITEVILLE

-L-

NC 130 26' BST

EB1-B

TO SHALLOTTE

B2-B

EXISTING BRIDGE NO. 10

EB1 BENT LINE

B1 BENT LINE

WACCAMAW
RIVER
OVERFLOW

B2 BENT LINE

EB2 BENT LINE

WOODS

5/14/99

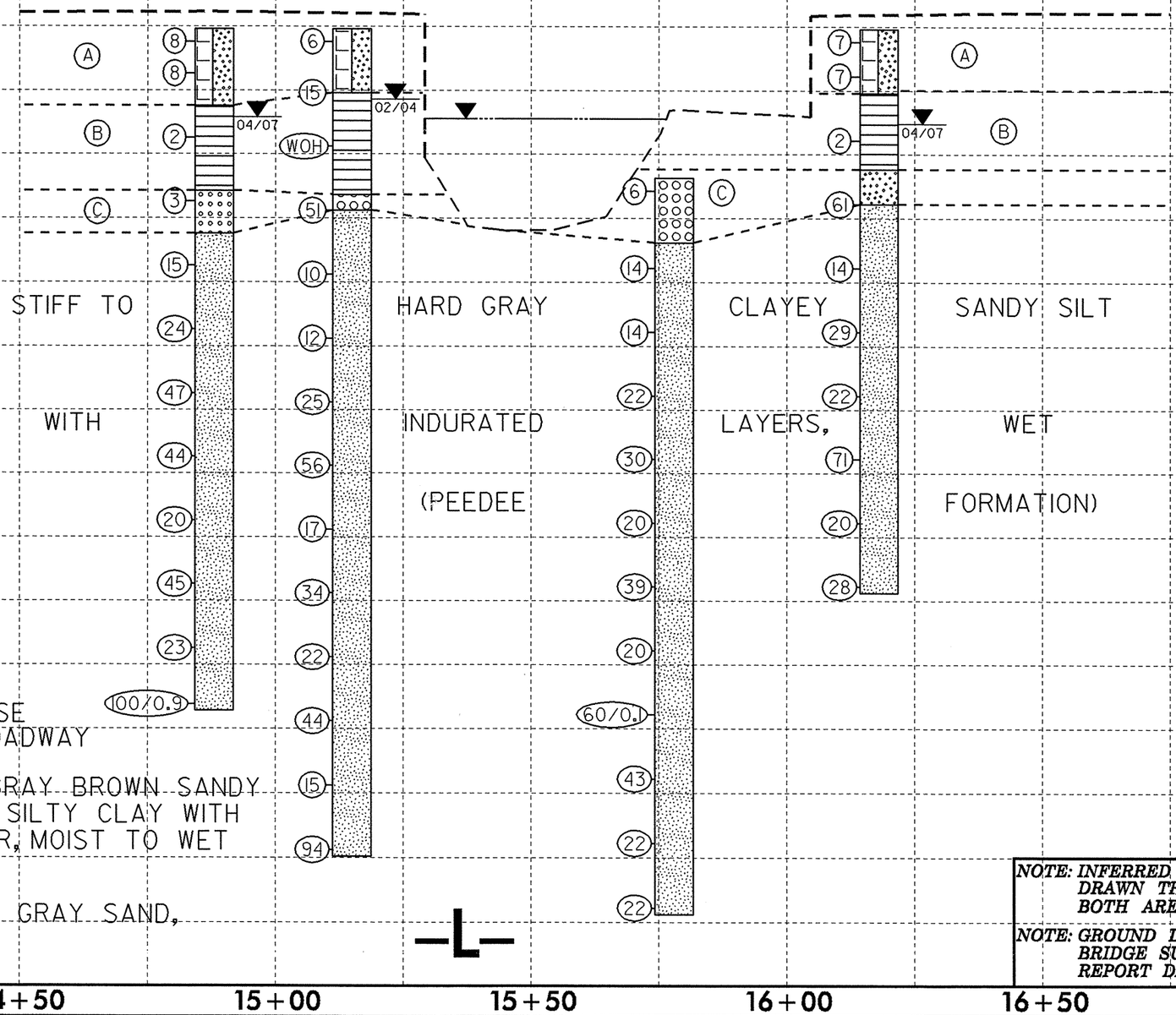
PROJECT REFERENCE NO.	SHEET NO.
33440JJ (B-4078)	5 OF 11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROFILE THROUGH BORINGS PROJECTED ALONG -L-

HORIZONTAL SCALE: 1" = 25'
VERTICAL SCALE: 1" = 10'



Ⓐ LOOSE TO MEDIUM DENSE BROWN SAND, MOIST (ROADWAY EMBANKMENT)

Ⓑ VERY SOFT TO SOFT GRAY BROWN SANDY AND CLAYEY SILT AND SILTY CLAY WITH LITTLE ORGANIC MATTER, MOIST TO WET (ALLUVIUM)

Ⓒ VERY LOOSE TO LOOSE GRAY SAND, SATURATED (ALLUVIUM)

-L-

NOTE: INFERRED STRATIGRAPHY DRAWN THROUGH BORINGS AND BOTH ARE PROJECTED ON TO PROFILE

NOTE: GROUND LINE PROFILE DERIVED FROM BRIDGE SURVEY AND HYDRAULIC DESIGN REPORT DATED 4/7/07

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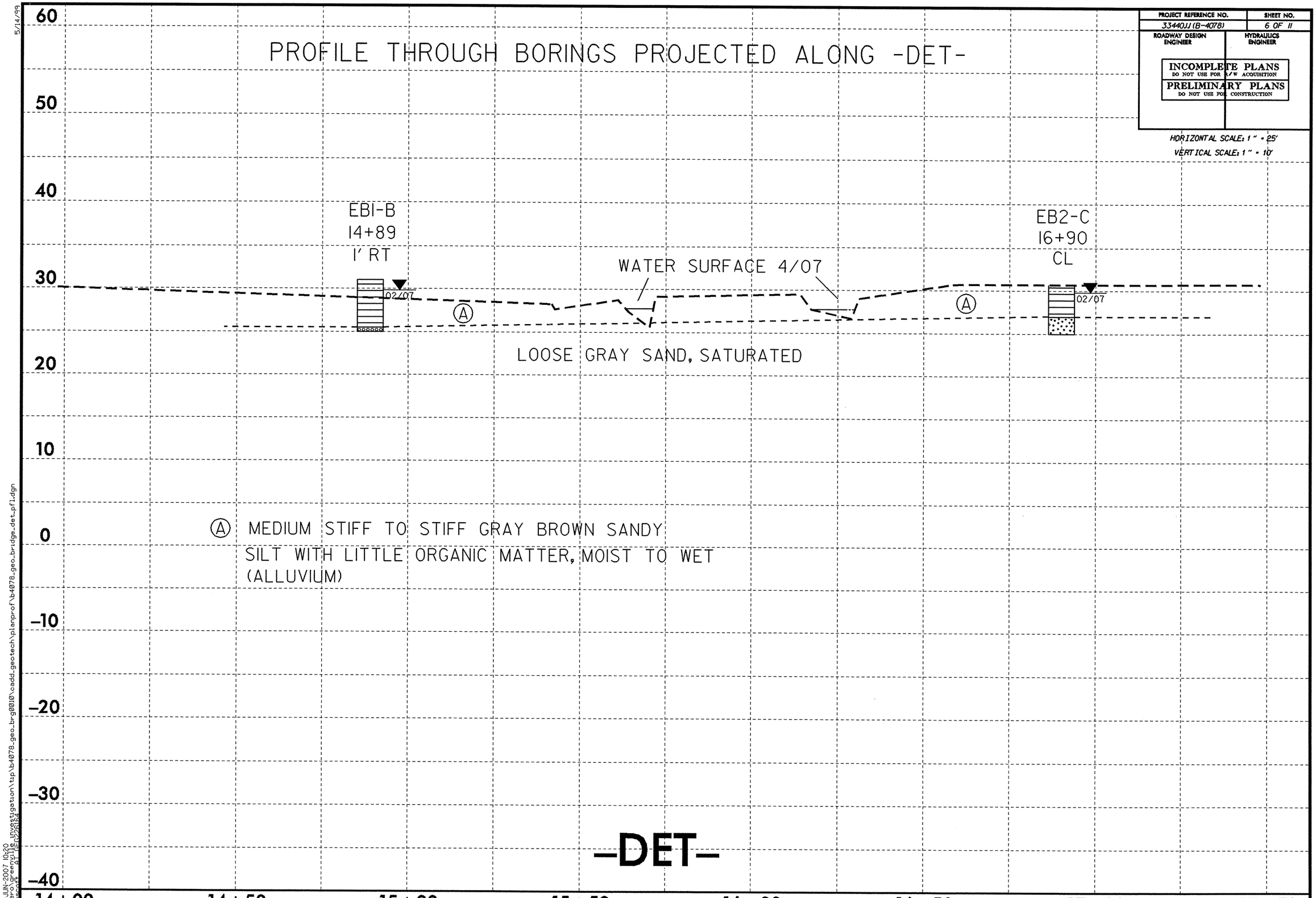
5/14/99

PROJECT REFERENCE NO.	SHEET NO.
33440JJ (B-4078)	6 OF 11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROFILE THROUGH BORINGS PROJECTED ALONG -DET-

HORIZONTAL SCALE: 1" = 25'
VERTICAL SCALE: 1" = 10'



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 14+88	**OFFSET** 17ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 34.8 ft	**TOTAL DEPTH** 53.4 ft	**NORTHING** 136,582	**EASTING** 2,128,151 — **24 HR.** 6.9
DRILL MACHINE DIEDRICH D-50	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 04/24/07	**COMP. DATE** 04/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
									ELEV. (ft) DEPTH (ft)
35									
34.8	0.0	2	4	4	8	SS-11			34.8 GROUND SURFACE 0.0
32.3	2.5								BROWN SAND, MOIST (ROADWAY EMBANKMENT)
		3	4	4	8	SS-12			
27.3	7.5								28.8 6.0
		WOH	1	1	2	SS-13	43%		BROWN SANDY CLAYEY SILT WITH LITTLE ORGANIC MATTER, MOIST TO WET (ALLUVIUM)
22.3	12.5								22.1 12.7
		7	2	1	3				GRAY SAND, SATURATED
17.3	17.5								18.8 16.0
		4	7	8	15	SS-14			
12.3	22.5								
		7	13	11	24				
7.3	27.5								
		7	31	16	47				GRAY CLAYEY SANDY SILT WITH INDURATED LAYERS, WET (PEEDEE FORMATION)
2.3	32.5								
		17	16	28	44				
-2.7	37.5								
		8	9	11	20				
-7.7	42.5								
		18	18	27	45				
-12.7	47.5								
		8	10	13	23				
-17.7	52.5								
		24	76/0.4		100/0.9				-18.6 53.4
									Boring Terminated at Elevation -18.6 ft in hard clayey sandy silt

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 15+15	**OFFSET** 20ft LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 34.8 ft	**TOTAL DEPTH** 64.7 ft	**NORTHING** 136,611	**EASTING** 2,128,186 — **24 HR.** 5.5
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 02/19/04	**COMP. DATE** 02/19/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
									ELEV. (ft) DEPTH (ft)
35									
34.8	0.0	WOH	2	4	6				34.8 GROUND SURFACE 0.0
30.8	4.0								BROWN SAND, MOIST (ROADWAY EMBANKMENT)
		6	7	8	15	SS-1			
26.6	8.2								29.8 5.0
		WOH	WOH	WOH	0	SS-2			GRAY BROWN CLAYEY SANDY SILT WITH LITTLE ORGANIC MATTER, MOIST (ALLUVIUM)
21.6	13.2								21.8 13.0
		1	1	50	51				GRAY SAND, SATURATED
16.6	18.2								20.6 14.2
		4	4	6	10	SS-3			
11.6	23.2								
		4	6	6	12				
6.6	28.2								
		74	11	14	25	SS-4			GRAY CLAYEY SANDY SILT WITH INDURATED LAYERS, WET (PEEDEE FORMATION)
1.6	33.2								
		7	40	16	56				
-3.4	38.2								
		6	7	10	17	SS-5			
-8.4	43.2								
		7	8	26	34				
-13.4	48.2								
		9	9	13	22	SS-6			
-18.4	53.2								
		14	19	25	44				
-23.4	58.2								
		7	6	9	15	SS-7			
-28.4	63.2								
		7	9	85	94				-29.9 64.7
									Boring Terminated at Elevation -29.9 ft in hard clayey sandy silt

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 15+78	**OFFSET** 6ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 23.1 ft	**TOTAL DEPTH** 57.5 ft	**NORTHING** 136,570	**EASTING** 2,128,240 — **24 HR.** N/A
DRILL MACHINE DIEDRICH D-50	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 04/23/07	**COMP. DATE** 04/23/07	**SURFACE WATER DEPTH** 4.5ft	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft) / DEPTH (ft)
30									
23.1	0.0								WATER SURFACE (04/23/07)
									23.1 GROUND SURFACE 0.0
17.1	6.0	2	4	2	6 14	SS-8			GRAY SAND, SATURATED (ALLUVIUM)
12.1	11.0	4	7	7	14	SS-9			18.1 5.0
7.1	16.0	5	6	8	14				
2.1	21.0	12	11	11	22				
-2.9	26.0	7	10	20	30				
-7.9	31.0	5	8	12	20				
-12.9	36.0	8	16	23	39				
-17.9	41.0	6	10	10	20	SS-10			GRAY CLAYEY SANDY SILT WITH INDURATED LAYERS, WET (PEEDEE FORMATION)
-22.9	46.0	60/0.1			60/0.1				
-27.9	51.0	12	18	25	43				
-32.9	56.0	7	9	13	22				
		11	13	9	22				-34.4 57.5
									Boring Terminated at Elevation -34.4 ft in very stiff clayey sandy silt

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 16+18	**OFFSET** 17ft LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 34.8 ft	**TOTAL DEPTH** 44.2 ft	**NORTHING** 136,582	**EASTING** 2,128,285 — **24 HR.** 7.4
DRILL MACHINE DIEDRICH D-50	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 04/24/07	**COMP. DATE** 04/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
35									
34.8	0.0	2	4	3	7 7	SS-15			34.8 GROUND SURFACE 0.0
32.1	2.7	1	3	4	7	SS-16			BROWN SAND, MOIST (ROADWAY EMBANKMENT)
27.1	7.7	WOH	1	1	2	SS-17			29.8 5.0
22.1	12.7	4	1	60	61				BROWN SILTY CLAY WITH LITTLE ORGANIC MATTER, MOIST TO WET (ALLUVIUM)
17.1	17.7	5	7	7	14				23.8 11.0
12.1	22.7	47	13	16	29				GRAY SAND, SATURATED
7.1	27.7	31	11	11	22	SS-18			21.1 13.7
2.1	32.7	8	26	45	71				
-2.9	37.7	7	9	11	20				GRAY CLAYEY SANDY SILT WITH INDURATED LAYERS, WET (PEEDEE FORMATION)
-7.9	42.7	11	12	16	28				-9.4 44.2
									Boring Terminated at Elevation -9.4 ft in very stiff clayey sandy silt

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Swartley, J. R.
SITE DESCRIPTION BRIDGE NO 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 14+89	**OFFSET** 1ft RT	**ALIGNMENT** -DET- — **0 HR.** N/A
COLLAR ELEV. 31.0 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 136,666	**EASTING** 2,128,133 — **24 HR.** 1.2
DRILL MACHINE N/A	**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
START DATE 02/22/07	**COMP. DATE** 02/22/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
35									GROUND SURFACE	31.0	0.0
						S-4			MEDIUM STIFF TO STIFF GRAY BROWN SANDY SILT WITH LITTLE ORGANIC MATTER, MOIST TO WET		
									LOOSE GRAY SAND, SATURATED	25.5	5.5
									Boring Terminated at Elevation 25.0 ft in loose sand	25.0	6.0

PROJECT NO. 33440.1.1	**ID.** B-4078	**COUNTY** Columbus	**GEOLOGIST** Swartley, J. R.
SITE DESCRIPTION BRIDGE NO 10 ON NC 130 OVER WACCAMAW RIVER OVERFLOW			**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 16+90	**OFFSET** 0ft CL	**ALIGNMENT** -DET- — **0 HR.** N/A
COLLAR ELEV. 31.0 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 136,615	**EASTING** 2,128,328 — **24 HR.** 1.2
DRILL MACHINE N/A	**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
START DATE 02/22/07	**COMP. DATE** 02/22/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
35									GROUND SURFACE	31.0	0.0
									MEDIUM STIFF TO STIFF GRAY BROWN SANDY SILT WITH LITTLE ORGANIC MATTER, MOIST TO WET	27.0	4.0
									LOOSE GRAY SAND, SATURATED	25.0	6.0
									Boring Terminated at Elevation 25.0 ft in loose sand		

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
B1-A	SS-1	100	99	17	2.8	86.2	9.4	1.6	23	NP	A-2-4(0)	4.0-5.0		
L	SS-2	100	97	75	6.4	21.4	32.6	39.6	37	5	A-4(4)	8.2-9.7		
	SS-3	100	100	55	0.2	67.0	5.2	27.6	30	2	A-4(0)	18.2-19.7		
	SS-4	100	100	55	0.4	60.8	19.2	19.6	32	3	A-4(0)	28.7-29.7		
	SS-5	100	100	54	1.2	61.8	13.4	23.6	29	2	A-4(0)	38.2-39.7		
	SS-6	100	100	56	0.8	62.8	12.8	23.6	28	4	A-4(0)	48.2-49.7		
	SS-7	100	100	51	0.2	66.2	12.0	21.6	28	4	A-4(0)	58.2-59.7		
B2-B	SS-8	78	48	13	47.9	38.2	3.8	10.1	20	NP	A-1-b(0)	1.0-1.5		
L	SS-9	100	100	62	0.4	61.6	13.9	24.1	27	3	A-4(0)	6.0-7.5		
	SS-10	100	100	57	0.2	62.4	13.3	24.1	24	NP	A-4(0)	36.0-37.5		
EB1-B	SS-11	100	99	25	2.0	78.9	9.1	10.1	22	NP	A-2-4(0)	1.0-1.5		
L	SS-12	98	96	26	3.0	78.1	10.9	8.0	24	NP	A-2-4(0)	2.5-4.0		
	SS-13	100	97	81	5.2	16.9	31.6	46.3	33	14	A-6(10)	7.5-9.0	42.6	
	SS-14	100	100	59	0.4	63.6	13.9	22.1	27	NP	A-4(0)	17.5-19.0		
EB2-A	SS-15	100	97	27	4.8	73.6	9.5	12.1	18	NP	A-2-4(0)	1.0-1.5		
L	SS-16	98	95	32	6.4	66.8	14.7	12.1	21	NP	A-2-4(0)	2.7-4.2		
	SS-17	100	99	84	1.8	16.3	27.6	54.3	34	14	A-6(11)	7.7-9.2		
	SS-18	100	87	54	15.3	44.3	18.3	22.1	23	3	A-4(0)	27.7-29.2		
EB1-B DET	S-4	100	93	66	12.3	26.9	44.7	16.1	35	8	A-4(4)	1.0-5.5		9.3

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33440.1.1 TIP: B-4078 COUNTY: Columbus

DESCRIPTION(1): Bridge No. 10 on NC 130 over Waccamaw River Overflow

EXISTING BRIDGE

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

Bridge No.: 10 Length: 50.9 ft. Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: Timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Bottom of end wall at End Bent 1 is undermined. Embankment eroded behind northeast wingwall.

Interior Bents: 2 foot deep scour pocket under bridge at Bent 2

Channel Bed: None

Channel Bank: Approximately 25 feet of channel bank removed under bridge to a depth of 2 feet from Bent 2 to End Bent 2

EXISTING SCOUR PROTECTION

Type(3): 1)Wooden end and wing walls 2) Rip Rap

Extent(4): 1) 15 feet outside edge of bridge 2) Approx. 20 feet along NE side slope

Effectiveness(5): 1) Not effective at End Bent 1 2) Somewhat effective

Obstructions(6): None

DESIGN INFORMATION

Channel Bed Material(7): Gray brown clayey sandy silt with little organic matter(SS-2) and sand (SS-8)

Channel Bank Material(8): Brown sandy clayey silt and silty clay with little organic matter (SS-13, SS-17)

Channel Bank Cover(9): Woods and brush

Floodplain Width(10): 500+/- feet

Floodplain Cover(11): Woods and brush

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

Channel Migration Tendency(13): Slight tendency toward the northwest and End Bent 1

Observations and Other Comments: ____

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS B1	B2									
21	18									

Comparison of DSE to Hydraulics Unit theoretical scour:
Based on the presence of formation soils, the Design Scour Elevation is 23 and 21 feet higher at bent 1 and 2, respectively, than the 100 yr theoretical scour proposed by the Hydraulics Unit.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

See Sheet 10, "Soil Test Results", for samples:
SS-2, SS-8 Channel bed
SS-13, SS-17 Channel Bank

Template Revised 02/07/06

Reported by: Fred M Wesnitzer Date: 6/5/07

INSTRUCTIONS

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