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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33385.1.1 B-4018 ___ F.A. PROJ. <u>BRSTP</u>-32(2) COUNTY **BEAUFORT** PROJECT DESCRIPTION BRIDGE NO. 104 ON NC 32 OVER BROAD CREEK AT -L- STATION 16+85

STATE PROJECT REFERENCE NO. N.C. 33385.1.1 1 | 11

CAUTION NOTICE

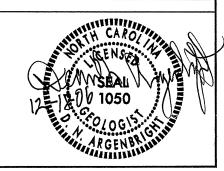
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRAINSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088, NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A CEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUSBURFACE DATA AND MAY NOT INCESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNOS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE, THE LABORATORY SAMPLE DATA AND THE IN STUI ON-PLACED TEST DATA CAN BE RELIED ON ONLY TO THE DESCRIE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSITURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS AND 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 MARY 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 DEPEARTMENT 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 SATISTY HUNSELF 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 FRASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE MOLICATED IN THE SUBSURFACE INFORMATION. THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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SUBMITTED BY D. N. ARGENBRIGHT

DECEMBER, 2006

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION TERMS AND DEFINITIONS MELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO ARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRE 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 1808 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASARTO TEDE, ASTIM D-1986), SOIL CLASSIFICATION IS BASED ON THE ARAPITO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE, CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SYT 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 ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER PODRLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE THE ANGULARITY OR ROUNDNESS OF ϕ OIL GRAINS IS DESIGNATED BY THE TERMS: <u>ANGULAR</u>, R HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. SUBANGULAR, SUBROUNDED, OR ROUNDED. NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 VERY STIFF, GRAY, SUTY CLAY, MOIST WITH INTERREDOED FINE SAND LAVERS, HIGHLY PLASTIC, A-7-6. BLOWS PER FOOT IF TESTED. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICAT MINERALOGICAL COMPOSITION FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE CRYSTALLINE ROCK (CR) GENERAL GRANIII AR MATERIAI S STI T-CLAY MATERIALS MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS ORGANIC MATERIALS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE (≤ 35% PASSING *200 (> 35% PASSING #200 CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. GREISS, GABBRO, SCHIST, ETC.
FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN
SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE
INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD COMPRESSIBILITY A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-1 A-3 A-2 NON-CRYSTALLINE ROCK (NCR) COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50 CLASS. SYMBOL SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED 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. SHELL BEDS, ETC PASSING PERCENTAGE OF MATERIAL SILT-WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT SILT - CLAY CLAY ORGANIC MATERIAL OTHER MATERIAL ROCKS OR CUTS MASSIVE ROCK. SOILS PEAT SITIES SOILS SOU S ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER FRESH * 200 ACE OF ORGANIC MATTER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 3 - 5% TRACE 1 - 10% HAMMER IF CRYSTALLINE. LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 40 MX 41 MN 40 MX 41 MN 48 MX 41 MN 48 MX 41 MN 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 ODERATELY ORGANIC VERY SLIGHT SOME 20 - 35% DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HOR)ZONTAL TRACE OF PLASTIC INDEX 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN HIGHLY ORGANIC LITTLE OR >10% >20% 35% AND ABOVE HIGHL' OF A CRYSTALLINE NATURE. GROUP INDEX 8 0 4 MX 8 MX 12 MX 16 MX No M GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE ROCK GENERALLY FRESH. JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO AMOUNTS OF SOILS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. DRGANTO WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR OF MAJOR RAVEL, AND FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. GRAVEL AND SAND SOILS SOILS CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MOTERIAI S SAND STATIC WATER LEVEL AFTER 24 HOURS SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS IN MODERATE GEN. RATING FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM VPW. PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS PARENT MATERIAL. POOR DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED POOR FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. SUBGRADI \bigcirc SPRING OR SEEP WITH FRESH ROCK. PI OF A-7-5 SUBGROUP IS ≤ LL - 30 : PI OF A-7-6 SUBGROUP IS > LL - 30 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DUL MODERATE! Y CONSISTENCY OR DENSENES MISCELLANEOUS SYMBOLS DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN (MDD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK COMPACTNESS OR SAMPLE DESIGNATIONS ROADWAY EMBANKMENT (RE) POPT ONT TEST BORING PRIMARY SOIL TYPE PENETRATION RESISTENCE COMPRESSIVE STRENGTH IF TESTED, WOULD YIELD SPT REFUSAL CONSISTENCY JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. (TONS/FT2) WITH SOIL DESCRIPTION ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED SEVERE S - BULK SAMPLE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. VERY LOOSE \oplus IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. GENERALLY AUGER BORING LOOSE 4 TO 10 SS - SPLIT SPOON GRANULAR MEDIUM DENSE N/A MATERIAL ARTIFICIAL FILL (AF) OTHER SAMPLE IF TESTED, YIELDS SPT N VALUES > 100 BPF LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. CORE BORING 30 TO 50 (NON-COHESIVE) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS UBUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST - SHELBY TUBE VERY DENSE >50 THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG BOCK INFERRED SOIL BOUNDARY REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN O" MONITORING WELL 2 TO 4 4 TO 8 GENERAL! Y RS - ROCK SAMPLE INTERVENING IMPERVIOUS STRATUM. VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF 0.25 TO 0.50 INFERRED ROCK LINE MEDIUM STIFF SILT-CLAY Ø.5 TO 1.0 ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND Δ RT - RECOMPACTED TRIAXIA COMPLETE RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. MATERIAL STIFF 8 TO 15 INSTALLATION ALLUVIAL SOIL BOUNDARY SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS VERY STIFF 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 SLOPE INDICATOR \bigcirc ALSO AN EXAMPLE. CBR - CALIFORNIA BEARING INSTALLATION ROCK HARDNESS EXPRESSED AS A PERCENTAGE. TEXTURE OR GRAIN SIZE RATIO SAMPLE - SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES U.S. STD. SIEVE SIZE SOUNDING ROD (REF)- SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED ABBREVIATIONS RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. COARSE FINE TO DETACH HAND SPECIMEN. BOULDER COBBLE GRAVEL SILT AR - AUGER REFUSAL w - MOISTURE CONTENT SAND (COB.) CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (GRJ) (SL.) (CL.) BT - BORING TERMINATED MED. - MEDILIM V - VFRY SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR VST - VANE SHEAR TEST EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED MICA. - MICACEOUS 2.0 0.25 0.05 0.005 CPT - CONE PENETRATION TEST MOD. - MODERATELY WEA - WEATHERED SIZE 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 Y - UNIT WEIGHT CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. NP - NON PLASTIC RE - CORRELAT DMT - DILATOMETER TEST ORG. - ORGANIC %- DRY UNIT WEIGHT HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS POINT OF A GEOLOGIST'S PICK. DPT - DYNAMIC PENETRATION TEST PRESSUREMETER TEST SOIL MOISTURE SCAL FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION THAN 0.1 FOOT PER 60 BLOWS. CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS - VOID BATTO SAP. - SAPROLITIC SOFT (ATTERBERG LIMITS) DESCRIPTION <u>STRATA CORE RECOVERY (SPEC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. SD. - SAND, SANDY FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN FOSS. - FOSSILIFEROUS SL. - SILT, SILTY PIECES CAN BE BROKEN BY FINGER PRESSURE. - SATURATED USUALLY LIQUID: VERY WET, USUALLY FRAC. - FRACTURED, FRACTURES (SAT.) FROM BELOW THE GROUND WATER TABLE SLI. - SLIGHTLY STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH FRAGS. - FRAGMENTS .TCR - TRICONE REFUSAL 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. LIQUID LIMIT SDFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY LASTIC SEMISOLID: REQUIRES DRYING TO RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. FRACTURE SPACING ATTAIN OPTIMUM MOISTURE PLASTIC LIMIT TERM THICKNESS TERM SPACING HAMMER TYPE: BENCH MARK: BL-4 = II+04.89 -BL DRILL UNITS ADVANCING TOOLS: VERY THICKLY BEDDED > 4 FEET VERY WIDE ORE THAN 10 FEET - MOIST - (M) SOLIDEAT OR NEAR OPTIMUM MOISTURE X AUTOMATIC MANUAL THICKLY BEDDED 1.5 - 4 FEET CLAY BITS WIDE 3 TO 10 FFFT MOBILE B-___ SHRINKAGE LIMIT ELEVATION: 7.91' MODERATELY CLOSE 1 TO 3 FEET 6 CONTINUOUS FLIGHT AUGER VERY THINLY BEDDED 0.03 - 0.16 FEET REQUIRES ADDITIONAL WATER TO CORE SIZE: 0.16 TO 1 FEET NOTES: 0.008 - 0.03 FFFT - DRY - (D) BK-51 THICKLY LAMINATED LESS THAN 0.16 FEET VERY CLOSE ATTAIN OPTIMUM MOISTURE X 8" HOLLOW AUGERS ____-B_____ < 0.008 FEET THINLY LAMINATED INDURATION PLASTICI' X CME-45B HARD FACED FINGER BITS -N____ FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI DRY STRENGTH TUNG.-CARBIDE INSERTS NONPLASTIC X CME-550 0-5 VERY LOW RUBBING WITH FINGER FREES NUMEROUS GRAINS FRIABLE X CASING W/ ADVANCER LOW PLASTICITY SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MEDIUM 16-25 PORTABLE HOIST X TRICONE 215/6 STEEL TEETH POST HOLE DIGGER GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; HIGH PLASTICITY 26 OR MORE HIGH MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. TRICONE TUNG.-CARB. HAND AUGER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE INDURATED SOUNDING ROD CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YELLOW-BROWN, BLUE-GRAY). DIFFICULT TO BREAK WITH HAMMER. VANE SHEAR TEST MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: SAMPLE BREAKS ACROSS GRAINS.

PROJECT REFERENCE NO.

33385.1.1

SHEET NO.



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY **G**OVERNOR

LYNDO TIPPETT SECRETARY

December 18, 2006

STATE PROJECT:

33385.1.1 B-4018

F. A. PROJECT:

BRSTP-32(2)

COUNTY:

Beaufort

DESCRIPTION:

Bridge No. 104 on NC 32 over Broad Creek

SUBJECT:

Geotechnical Report - Bridge Foundation Investigation for

NC 32 over Broad Creek at -L- Station 16+85

Site Description

The proposed bridge site is located at the existing NC 32 bridge over Broad Creek approximately 10± miles southeast of Washington. The replacement structure will be constructed along the existing alignment. Based on the proposed design, the new structure will have four spans with a total length of 200 feet. The bents will have a skew of 90 degrees.

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 CME-550 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, Pliocene age soils of the Yorktown Formation and Eocene age soils of the Castle Hayne Formation. Topography at the site is nearly flat to gentle sloping. Elevations at the site range from $-12\pm$ feet along the channel bed to $9\pm$ feet along the existing NC 32 roadway. During this investigation, water levels within the boreholes and the surface of Broad Creek were measured at elevations ranging from -1± to 1± feet.

MAILING ADDRESS:

NC DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT 1589 MAIL SERVICE CENTER RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088 FAX: 919-250-4237

WERSITE! WWW DOH DOT STATE NO US

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

Sheet 3

Soil Description

Subsurface conditions at the site are relatively uniform. Surficial alluvial soils generally consist of 8 to 22 feet of very loose to dense sand (A-3). Soils belonging to the Pliocene age Yorktown Formation underlie the alluvial deposits at elevations ranging from -18± to -20± feet. Soils of the Yorktown Formation consist of loose to medium dense sand (A-2-4). Shell fragments were noted throughout the Yorktown deposits. The Yorktown soils are underlain at elevations ranging from -44± to -46± feet by the Eocene age Castle Hayne Formation which consists of sandy phosphatic limestone with some sand layers and shell fragments.

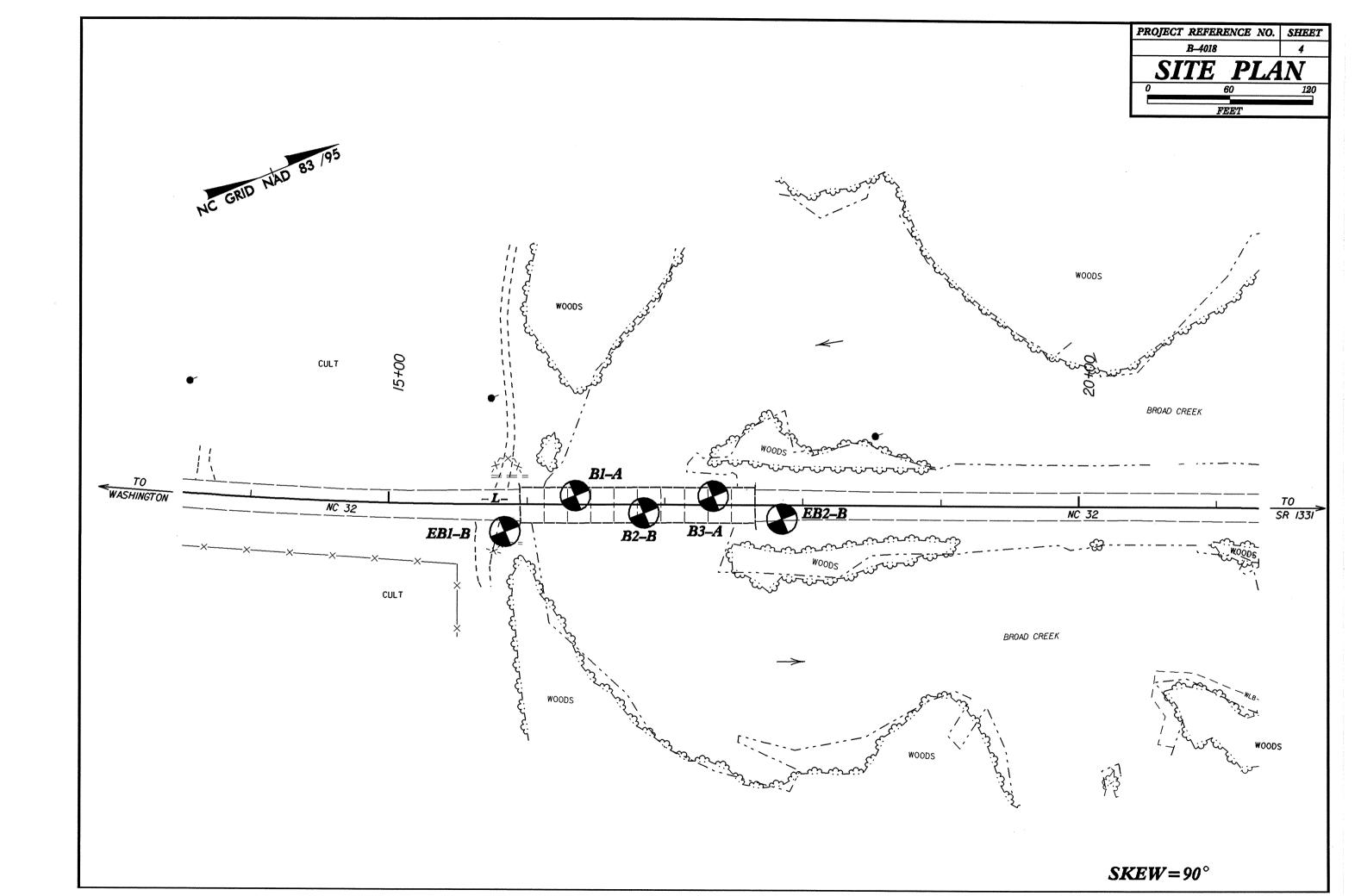
Based on the proposed design, the existing grade will be raised $1\pm$ foot at the bridge site. The existing roadway embankment at the end bents consists of $6\pm$ feet of loose sand (A-2-4. A-3). The proposed end bent slopes will be mainly constructed within the existing embankment. Some additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

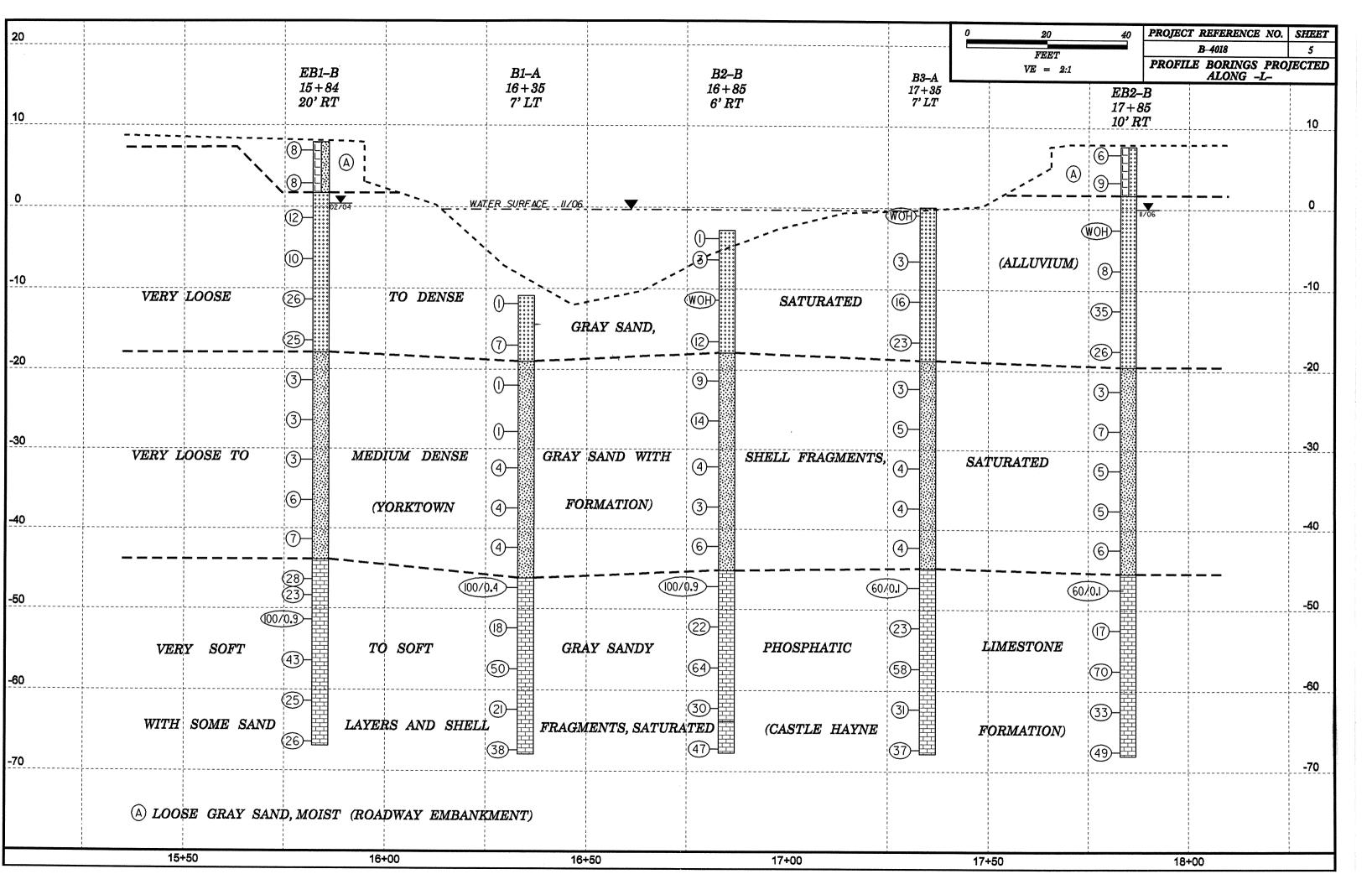
The Geotechnical foundation report is based on the Bridge Survey and Hydraulic Design Report dated August 23, 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared By:

Fred M. Wescott III

Project Geological Engineer





| PROJECT N | | | | D. B-4018 | | | COUNT | Y Beau | ufort | | | GEOLOGIST Ha | ager, M. M. | PR | OJEC | CT NO. | 33385 | 5.1.1 | ID | . B-401 | B-4018 COUNTY Beaufort | | | | | | GEOLOGIST Swartley, J. R. | | | |
|----------------------|----------------|----------------|--------|----------------------------|--------------|--|--------------|--|-------|----------|-------------------|--|--------------------------------------|---------|-----------|--------|---------|--------|--------|--|------------------------|------------------|--|-----------------------------------|----------|------|-------------------------------------|--|-------------------|---|
| SITE DESCR | RIPTION | Bridge | No. 10 | 4 on NC 3 | 2 over Bro | ad Creek | | | | | | | GROUND WTR | (ft) SI | TE DE | SCRIF | TION | Bridge | No. 10 | 4 on NC | 32 over Br | oad Creek | | | | | | | GROUND | WTR (fi |
| BORING NO | . EB1-l | В | | STATION | 15+84 | | OFFSE | r 20ft F | RT | | ALIGI | NMENT -L- | 0 HR. N | I/A BC | RING | NO. | B1-A | | | STATIO | N 16+35 | | OFFSET | Γ 7ft LT | | | ALIC | SNMENT -L- | 0 HR. | N/A |
| COLLAR EL | EV. 7.9 | ft | | TOTAL D | EPTH 74 | .8 ft | NORTH | ING 64 | 6,951 | | EAST | ING 2,605,262 | 24 HR. 7 | 7.5 CC | DLLAF | R ELEV | /10.9 |) ft | | TOTAL | DEPTH 5 | 7.0 ft | NORTH | ING 647 | 7,008 | | EAS | TING 2,605,257 | 24 HR. | N/A |
| DRILL MAC | HINE C | ME-45E | | DRILL MI | THOD M | lud Rotary | | | | | | HAMMER TYP | E Automatic | DF | RILL N | /ACHII | NE CM | E-550 | | DRILL N | ETHOD I | Mud Rotary | ······ | | | | | HAMMER TY | PE Automatic | |
| START DAT | E 02/06 | 6/04 | | COMP. D. | ATE 02/0 | 6/04 | SURFA | CE WAT | TER D | EPTH I | N/A | DEPTH TO RO | CK 51.8 ft | ST | ART | DATE | 10/31/0 | 06 | | COMP. I | DATE 10/ | 31/06 | SURFA | CE WAT | ER DE | EPTH | PTH 10.8ft DEPTH TO ROC | | OCK 35.3 ft | |
| ELEV DEPT | ·· | LOWCO | | | | PER FOOT | | SAMP | 17 | 0 | | SOIL AND ROCK DES | CRIPTION | EL | EV [| DEPTH | | ow cor | | | | S PER FOO | | SAMP | | | | SOIL AND ROCK DE | SCRIPTION | *************************************** |
| (ft) (ft) | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 100 | NO. | MC |) G | ELEV. (ft) | | DEPT | H (ft) | 11) | (ft) | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 100 | NO. | МОІ | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 + | | | | | | | | | | <u> </u> | | | | -1 | 10 0.9 | 0.0 | | | | | | | | | | 1 } | -10.9 | GROUND SUF | RFACE | . 0. |
| 7.9 I 0.0 | 2 | 4 | 4 | | Τ | | T | | ╁ | | 7.9 | GROUND SURF | ACE | 0.0 | I | | WOH | WOH | 1 | 1 | | | 1 | | | 0000 | - - - - - - -19.0 | | | |
| l I | | | | | | | |] | | | | Gray sand, mo | oist | | \pm | | | | | <i>i</i> | | | | | | | - | | | |
| 3.9 4.0 | 5 | 4 | 4 | | 1:::: | | | SS-1 | - | | | (Roadway Emban | | -1 | 6.0 | 5.1 | 1 | 2 | 5 | 1 | : : : : | | | SS-1A | | | - | Gray sand, sat (Alluvium | turated | |
| 1 ± | | | | :":::: | 1 : : : : | | | | ┪_ | | 1.7 | | | 6.2 | Ī | | | | | i' | | | | 1 | Ì | | -19.0 | (/ tha vian | '/ | 8. |
| -0.4 + 8.3 | 5 | 6 | 6 | | | | - | ┤ ┃ | | | | | | -2 | 1.0 | 10.1 | | | | $ \frac{I}{I} $ | | | | $\left\{ \left[\right] \right\}$ | | | _ | | | |
| 1 ± | | | | 112 | 1 | | | | | - | | | | | ł | | WOH | WOH | 1 | 1 | | | | SS-2A | | | - | | | |
| -5.4 + 13.3 | | | | .] | | | | | | | _ | | | | Ī | | | | | | | | :::: | | | | - | | | |
| | 6 | 6 | 4 | 10 | | | | SS-2 | | | | Gray sand, satur | | -2 | 6.8 | 15.9 | | | | | | | | | | F | - | | | |
| 1 ‡ | | | | ::\: | | | : : : : | | | | | (Alluvium) | | | ‡ | | WOH | WOH | 1 | 1 | : : : : | | | | | | - | | | |
| -10.4 + 18.3 | 4 | 16 | 10 | | \ | | | 11 | | | | | | -3 | 1.4 | 20.5 | | | | | . | . | + | 1 | | | _ | Gray sand with shell frag | monto acturated | |
| 1 ‡ | | | | | 20 | | : : : : | | 1 | - | | N. | | | Ŧ | | 1 | 2 | 2 | 4 :: | : : : : | | 1 | SS-3A | | | | (Yorktown For | | |
| -15.4 23.3 | | | | | | | 1 | 1 | | | | | | 11. | 1 | | | | | • • • | | | <u> </u> | | | | <u>.</u> | | | |
| 1 | 9 | 11 | 14 |]]:::: | 25 : : | | | SS-3 | | | -17.9 | | | 25.8 | 6.4 | 25.5 | 2 | 2 | 2 | ¦_:: | | | | | | | - | | | |
| | | | | ::;/ | :::: | | : : : : | 11 . | | | -17.5 | | , | 25.6 | ‡ | | | | | | | | | | | | - | | | |
| -20.4 - 28.3 | 2 | 1 | 2 | 3 | † | | 1 | SS-4 | _ | | • | ** | | -4 | 1.4 🕇 | 30.5 | | | | | . | | | 1 | | | - - | | | |
| ‡ | | | | Ĭ::::: | | | | | 7 | | | , | | | ‡ | | 2 | 2 | 2 | • 4 | | | | SS-4A | | | - | | | |
| -25.4 - 33.3 | | | |] | ļ · · · · | 1 | | - | | | - | • | | | ‡ | | | | | | • • • • | | <u> </u> | 11 | | | <u>.</u> | • | | |
| ‡ | 3 | 2 | 1 | 4 3 : : | :::: | | | | | | | | | -4 | 6.4 | 35.5 | 100/0.4 | | | | | | | SS-5A | 1 | | 46.2 - | | | 35. |
| -30.4 = 38.3 | | | | | | | | 11 . | | | | | | | ŧ | | | | | | 1 | 1 | 100/0.4 | T | 1 | | - | | | |
| 1 30.4 | 1 | 1 | 2 | 4 3 · · · | 1:::: | | | SS-5 | 1 | | • | Gray sand with shell fragn (Yorktown Forma | nents, saturated ation) | -5 | 1.4 | 40.5 | | | 10 | | [· | | T | 1 | | 田 | - | | | |
| l I | | | | $ i_{k} \cdots i_{k} $ | | | | | | | | | | | Ŧ | | 9 | 8 | 10 | | 18 | | | SS-6A | 4 | 耳 | - | | | |
| -35.4 - 43.3 | 2 | 3 | 3 | 11- | | | 1 | $\{ \}$ | | | • | | | -5 | 6.4 | 45.5 | | | | | - | | <u> </u> | | | | | Gray sandy phosphatic lin sand layers and shell fra | aments, saturated | e J |
| 1 1 | - | " | | 9 6 | | | | | | Œ | | | | - | Ī | 43.3 | 22 | 25 | 25 | | | 50 | | SS-7A | <u>d</u> | 井 | - | (Castle Hayne F | ormation) | |
| 40.4 48.3 | | | | 1 1 | 1 | • • • • | | | | III. | | | | | Ŧ | | | | | | 1 . | | | | | 臣 | - | | | |
| | 2 | 3 | 4 |] 🛂 🗀 | 1:::: | | : : : : | SS-6 |] | | | | | -6 | 1.4 | 50.5 | 13 | 11 | 10 | | ٠ : ٠ . | | | | 1 | 田 | - | | | |
| | | | | | 1 : : : : | | : : : : | | | | -43.9 | | *** | 51.8 | <u> </u> | | | | | | | | 1 : | | | 田 | - | | | |
| -45.4 - 53.3 | 2 | 7 | 21 | ∤├ ` | | | | 11 | | 井 | - | • | | -6 | 6.4 | 55.5 | | | | <u> </u> | | | | | | | _ | | | • |
| -47.4 + 55.3 + | 10 | + 7 | 16 | : : : : | 20 | | : : : : | SS-7 | - | 岸 | | | | | | | 17 | 16 | 22 | <u> </u> | · · 🎾 | 8 | | | | 国 | -67.9 | | | 57. |
| 50.4 + 58.3 | | | | | 1 | <u> </u> | | | 1 | 串 | | | | | ± | | | | | | | | | | | 1 } | <u>-</u> | Boring Terminated at Elev limeston | |)ft |
| | 24 | 50 | 50/0.4 |] :::: | : : : : | | 100/0.9 | lack | 1 | 岸 | | | | | ‡ | | | | | | | | | | | 1 } | <u>-</u> | | | |
| [| | | | | | ا | | | | 串 | | • | | | ‡ | | | | | | | | | | | | <u>-</u> L | | | ÷ |
| -55.4 - 63.3 | 18 | 22 | 21 | - | <u> </u> | 40 | | 11 | | 串 | - | Gray sandy phosphatic lime sand layers and shell fragr | estone with some ments, saturated | | + | | | | | | | | | | | | - | | | |
| | | | | | / . | 43 | | | | 井 | | (Castle Hayne For | mation) | | <u></u> | | | | | | | | | | | | _ - | | | |
| 68.3 -60.4 68.3 | | | |] | ./ | | | 11 | | 岸 | • | | | | ‡ | | | | | | | | | | | | - - | | | |
| | 14 | 12 | 13 |] :::: | 25 | | | | | 田 | | | | | ‡ | | | | | | | | | | | | <u>-</u> | | | |
| -65.4 73.3 | | | | | | | : : : : | | | | | | | | ‡ | | | | | • | | | | | | | Ī | | | |
| 65.4 73.3 | 19 | 15 | 11 | 1 | 26 | | 1 | 1 | | | - -66.9 | | | 74.8 | + | | | | | | | | | | | | _ F | | | |
| | 1 | | | | T 20 | | | 1 | | 朮 | | Boring Terminated at Elevat | | 14.0 | ‡ | | | | | | | | | | | } | Ē | | | |
| <u> </u> | ŀ | 1 | 1 | | | | | | 1 | 1 + | | limestone | | | + | | l | | | 1 | | | | 1 | | | г | | | |

| | U | JB | BOR | ELC | G RE | POR | T | | | | | | • | | | | | | | | | | | | | | | | | | |
|--------------|---------------|---------|---------|--------|------------------|--------------|----------------|----------------|--------|-------|----------|------------|---|-----------------------|-----------|--------------|---------------|-----------------|-----------------|---------|--------------|------------------|-----------------------------|-------------|-----------------------|--------|------|--------------------------|--|-----------------------------|------------|
| | ECT NO | | | | . В-4018 | | | COUNTY | . Beau | ıfort | | | GEOLOGIST Sw | /artley, J. R. | | PROJ | ECT NO | . 3338 | 5.1.1 | ID. | . B-4018 | } | | COUNT | Υ Beau | ufort | | | GEOLOGIST | Swartley, J | . R. |
| SITE | ESCRI | PTION | Bridge | No. 10 | on NC 3 | 2 over Bro | ad Creek | | | | | | | GROUND V | VTR (ft | SITE | DESCRI | PTION | Bridge N | No. 104 | 4 on NC 3 | 2 over I | Broad Cree | k | | | | | | GROU | JND WTR (f |
| | IG NO. | | | | STATION | | | OFFSET | | | | | MENT -L- | 0 HR. | N/A | BORII | NG NO. | В3-А | | | STATION | 17+35 | 5 | OFFSE | 7ft L1 | Γ | | ALIGN | IMENT -L- | 0 Н | IR. N/A |
| | AR ELE | | | - | TOTAL DI | | | NORTHI | NG 647 | 7,049 | | EASTI | NG 2,605,288 | 24 HR. | N/A | COLL | AR ELE | /. 0.1 f | <u> </u> | 1 | TOTAL D | EPTH | 67.9 ft | NORTH | I NG 64 | 7,100 | | EASTING 2,605,296 | | 24 H | IR. N/A |
| DRILL | MACH | NE CI | /IE-550 | | DRILL ME | THOD M | ud Rotary | | | | | | HAMMER TYPI | E Automatic | | | MACHI | | | | | | Mud Rota | у | | | | | HAMMER T | YPE Autom | natic |
| STAR | DATE | , | | | COMP. DA | | | SURFAC | | | PTH 2 | 2.6ft | DEPTH TO RO | CK 42.4 ft | | STAR | TDATE | | | | COMP. D | ATE 1 | /02/06 | SURFA | CE WA | TER DI | EPTH | PTH 0.1ft DEPTH TO | | ROCK 45.0 |) ft |
| ELEV (ft) | DEPTH (ft) | | OW CO | | 0 | | PER FOOT 50 | 75 100 | SAMP. | 1 7 1 | 0 | | SOIL AND ROCK DES | | | ELEV (ft) | DEPTH (ft) | | 0.5ft | | | | WS PER FO | | SAMF | 1/ | o | | SOIL AND ROCK [| ESCRIPTION | N |
| (-7 | (17) | 0.511 | 0.511 | 0.511 | | 1 | <u> </u> | 70 100 | NO. | MOI | G I | ELEV. (ft) | | | DEPTH (ft | | (1.5) | 0.5π | 0.5π | 0.5π | 10 | 25 | 50 | 75 100 | NO. | МО | l G | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0. | <u> </u> | | | | | | | | | | <u> </u> | | | | | 5. | ł | | ŀ | | | | | | | | 1 } | _ | | | |
| -2.8 | 0.0 | 14/0/1 | l wou | | | | | , | | | | -2.8 | GROUND SURF | ACE | 0.0 | | ł | | | | | | | | | | | - | | | |
| -5.4 - | 2.6 | WOH | WOH | 1 | 1 | <u> </u> | <u> </u> | <u> </u> | | | | | | | | 0.1 | 0.0 | | | | | | | | | | | 0.1 | GROUND S | JRFACE | 0. |
| | | WOH | 2 | 1 | 3 : : : | : : : : | | : : : : | | | | | | | | | ‡ | WOH | WOH | WOH | 0 | | | | | | 0000 | - | | | |
| | ‡ | | | | 1:::: | : : : : | : : : : | | . [| | | | • | | | | ‡ | | | | 1 | | | | | | 0000 | - | | | |
| -10.4 - | 7.6 | WOH | WOH | WOH | | | | | SS-8 | - | | | Gray sand, satur | rated | | -5.5 - | 5.6 | 2 | 1 | 2 | | | | - | 1 | | | _ | | | |
| | <u> </u> | | | | N ::::: | : : : : | | | 33-0 | - | | | (Alluvium) | | | | ‡ | 2 | ' | - | ● 3 | | | | SS-24 | 4 | 0000 | - | Gray sand, s (Alluviu | aturated m) | |
| -15.5 | 12.7 | | | | 7 | | | • • • • | | | - | | | | | -10.5 | 10.6 | | | | . \ | | | |] | | | - - | () mavic | , | |
| | ļ | 5 | 5 | 7 | <u>j</u> 2 | | | | SS-9 |] | | -17.9 | | | 15.1 | | ‡ | 1 | 6 | 10 | 1 : : •1 | 6 : : | | : : : : : | | | 0000 | - . | | | |
| | ‡ | | | | 1:1:: | :::: | | | | | | -17.9 | | | 15.1 | 11 | ‡ | | | | : : : \ | | : : : : | | | | | - - | | | |
| -20.4 | 17.6 | 4 | 4 | 5 | 1.40 | 1 | | | | | | | | | | -15.5 | 15.6 | 2 | . 8 | 15 | | | | | SS-25 | _ | | | | | |
| | ‡ | | | · | · · 🎖 : : | | | | | | * | | | | | | ‡ | _ | | | : : : / | . ■23 | | | 33-23 | 4 | 0000 | - - _{-18.8} | | | 40 |
| -25.4 | 22.6 | | | | 1 1 1 | <u> </u> | | 1 | | | 料 | | | | | l | ‡ | | | | /: | | - | |] | | | -10.0 | | | 10. |
| | ţ | 6 | 8 | 6 | 9 14 | | | | SS-10 | 식 | | | | | 4 | -21.3 | 21.4 | 1 | 1 | 2 | y | | :: ::: | | | | | - | | | |
| | ‡ | | | | :/:: | | :::: | | 1 | | | | • | | | | ‡ | | . : | | | | :: ::: | | | | | - | | • | |
| -31.2 | 28.4 | <u></u> | | | 1 | 1 | 1 | 1 | | | - | . (| Gray sand with shell fragm Yorktown Forma) | | | -26.3 | 26.4 | | | | 1 | | | | | | | <u>-</u> | | | |
| | ‡ | 1 | 2 | 2 | 4 4 · · · | :::: | | | SS-11 | | | | | | | | ‡ | 2 | 3 | 2 | 5 | | | | SS-26 | 6 | | - - | | | |
| -36.2 | 33.4 | | | | ļi | 1 | <u> </u> | <u> </u> | | | - | | | | | | ‡ | | , | | 1 | | - | | 1 | ŀ | | - | Gray sand with shell fr (Yorktown Fo | agments, satu ormation) | urated |
| -30.2 | - 33.4 | 2 | 1 | 2 | 3 | | | 1 1 | | | | | | | | -31.3 | 31.4 | 2 | 2 | 2 | 4 | | $\cdot \cdot \cdot \cdot$ | | | | | - - | | | |
| | Ē | | | | | : : : : | | | | | | | | | | | ŧ | | | | | | 1 | I | | | | - - | | | |
| -41.2 | 38.4 | 2 | 3 | 3 | 1 | | | | SS-12 | | F | | | | | -36.3 | 36.4 | , | | | 1 | . | | | 1 | | | - - | | | |
| 1 | E | _ | | | 6 | | | | 33-12 | | Œ | | | | | | Ŧ | 2 | 2 | 2 | 9 4 | | | | SS-2 | 7 | | - - | | | • |
| -46.2 | 43.4 | | | | 1 | + | + | + | | | | -45.2 | | | 42.4 | -41.3 | I 41.4 | | | | | | | | | | | _ | | | |
| | | 50 | 50/0.4 | | 1:::: | 1:::: | | 1:::: | SS-13 | | 렆 | | | | | | Ī | 2 | 2 | 2 | 4 | | | | | | | - | | | |
| à. | <u> </u> | | | | | <u> </u> | + | + | | | 莊 | | | | | | Ŧ | | | | <u> </u> | | | | | | | -44.9 | | | 45. |
| -51.2 | 48.4 | 8 | 11 | 11 | | | : : : : | : : : : | SS-14 | | 莊 | | | | | -46.3 | 46.4 | 60/0.1 | ľ | | | | 1 | | | | 田 | | | | |
| 2 | ‡ | | | | | | | | | 1 | 丑 | G | iray sandy phosphatic lime sand layers and shell fragn | estone with some | • | | ‡ | | | | | : : : | | .60/0.1 | T | | 出 | | | | |
| -56.2 | 53.4 | | | | | | \ | 1 | | | | | (Castle Hayne For | mation) | | -51.3 | 51.4 | | | | | . | | | $\parallel \parallel$ | | 田 | | Gray sandy phosphatic | limestone witl | h some |
| Z Z | ‡ | 23 | 39 | 25 | : : : : | | -64 | | SS-15 | | 計 | | • | | | | ‡ | 8 | 11 | 12 | | 23 | | | SS-2 | 8 | 崩 | _ | sand layers and shell f (Castle Hayne | ragments, sat Formation) | turated |
| | ļ ,, . | | | | | · · · · · | 1 | <u> </u> | | | 타 | | | | | | ‡ | | | | | . ;/ | | | 11 | | 田 | <u>-</u> | , ,,,,, | , | |
| -61.2 | 58.4 | 9 | 11 | 19 | | •30 · · | :::: | :::: | | | 开 | | | | | -56.3 | 56.4 | 21 | 28 | 30 | | : : : | | | SS-2 | | 坩 | _ | | | |
| 2 | ‡ | | | | : : : : | : . : : | | | | | | -63.8 | * | | 61.0 | | ‡ | | | | | : : : | 1 300 | | 00-2 | 1 | 田 | - | | | |
| -66.2 | 63.4 | | | | | 1 | | † | | | 旪 | | | | | -61.3 | 61.4 | | | | | . | / | | 11 | | | _ | | | |
| <u></u> | <u> </u> | 13 | 23 | 24 | 1 | 1 4 | 47 | 1 · · · · | SS-16 | 3 | | -67.7 | oring Terminated at Elevati | ion -67 7 ft in cot | 64.9 | | ‡ | 12 | 16 | 15 | | 31 | | | | | 田 | <u>-</u> | | | |
| . B401 | ‡ | | | | | | | | | | <u> </u> | | limestone | 1011 -07.7 IL III SOI | | | ‡ | | | | | · · j· | | 1 |] | | 崫 | _ | | zz. | |
| BLE | ‡ | | | | | | • | | | | | | | | | -66.3 | 66.4 | 11 | 20 | 17 | | $: \mid : '_{I}$ | | | | | 田 | 67.0 | | ** | 67 |
| DOUBL | ‡ | | | | * | | | | | | | | | | | | ‡ | l — | | | | | io/ | | + | - | Ħ | | Boring Terminated at El | | ft in soft |
| S H | ‡ | | | į | | | | | | | F | | | | | | ‡ | | | | | | | | | | | <u> </u> | limesto | one | |
| 100 | ‡ | | | | | | | | | | | | | | | | ‡ | | | | | | | | | | | - | | | |
| ğ | <u> </u> | L | 1 | | | | | | | | L | | | | | | + | | | | | | | | | | | ŀ | | | |

| PROJECT N | IO. 3338 | 5.1.1 | IE | D. B-401 | 8 | | COUNT | Y Beauf | ort | | | GEOLOGIST S | wartley, J. R. | |
|---------------------|----------|----------|-------|--------------------|------------------|--------------|--|---------------|-----------|----------|-----------|--|------------------------------|---------|
| SITE DESC | RIPTION | Bridge N | o. 10 | 04 on NC | 32 over Broa | ad Creek | | | | | | | GROUND | VTR (fi |
| BORING NO |). EB2-B | | | STATIO | N 17+85 | | OFFSET | 10ft R | Т | | ALIGNMEN | T -L- | 0 HR. | N/A |
| COLLAR EL | .EV. 7.7 | ft | | TOTAL I | DEPTH 75. | 7 ft | NORTH | NG 647 | ,140 | | EASTING | 2,605,330 | 24 HR. | 7.7 |
| DRILL MAC | HINE C | /IE-550 | | DRILL N | IETHOD M | ud Rotary | | | | | | HAMMER TYP | E Automatic | |
| START DAT | E 11/01 | /06 | | COMP. | DATE 11/01 | /06 | SURFAC | CE WAT | ER DE | PTH N | I/A | DEPTH TO RO | OCK 53.2 ft | |
| ELEV DEP | TH BL | OW COUN | IT | | BLOWS | PER FOOT | | SAMP. | \bigvee | L O | 0.0 | OIL AND ROCK DES | COUDTION | |
| (ft) (ft) | 0.5ft | 0.5ft (| 0.5ft | 0 | 25 1 | 50 7 | 75 100 L | NO. | МОІ | | LEV. (ft) | TE AND ROCK DE | | DEPTH (|
| | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 7.7 1 0.0 | | | | | | | | | | 7 | .7 | GROUND SUR | FACE | 0 |
| ŧ | 2 | 2 | 4 | 6. | | 1 : | T : : : : | | | | | | | |
| 4.2 + 3.5 | | | | | | | | | | | | Gray sand, m (Roadway Embar | oist okment) | |
| ŧ | 4 | 4 | 5 | 9. | | | | SS-17 | | | .7 | (Noadway Embar | ikinong | 6. |
| <u> </u> | | | | 1 | | | | | | 0000 | A | · | | |
| -1.5 - 9.2 | WOH | WOH V | NOH | 1/ | | | | | | | | Cross and mainte | | |
| Ŧ | WOH | VVOH | WOH | • | | | : : : : | | | 0000 | | Gray sand, moist to (Alluvium) | | |
| a = + ,,, | | | | 1 | - | + | | | | | • | • | | |
| -6.5 + 14.2 + | 2 | 5 | 3 | | | | : : : : | SS-18 | | 0000 | | | | |
| Ŧ | | | | :::: | | | | | | | | | | |
| -11.5 - 19.2 | | | |] | | 1 | | | | | | | | |
| Ŧ | 11 | 16 | 19 | | 35 | | | | | | | | | |
| ‡ | | | | | | ļ | <u> </u> | | | | | 1 1 1 | | |
| -16.5 + 24.1 + | 7 | 12 | 14 | { ::: | | | | SS-19 | | - | | | | |
| ‡ | | | | ::: | | | | | | - | 19.5 | | | 27 |
| -21.5 + 29.2 | | | | 1./. | | | | | | - | | • | | |
| ‡ | 1 | 2 | 1 | ₹3 : : | | | | | | | | | | |
| ‡ | | | | | | | | | | | | | | |
| <u>-26.5</u> + 34.2 | 3 | 3 | 4 | 1 1 : : | | | | SS-20 | • | | | | | |
| ‡ | | | | $ \tilde{I} $: | | : : : : | | | | | Gray | sand with shell fragr Yorktown Form | | |
| -31.5 - 39.2 | | | |] | | 1 | | | | - | | (TOIRIOWITT OIJII | ation | |
| ‡ | 1 . | 2 | 3 | \$ 5 | | | | | , | | • | ÷ | | |
| ‡ | | | | - | | | | | | | | - | | |
| -36.5 + 44.2 | 2 2 | 2 | 3 | | | | | SS-21 | | ** | | | | |
| ‡ | | | | [] | | | | | | | | | | |
| -41.5 + 49.2 | | | |] 1 | | 1 | | | | | | | | |
| ‡ | 2 | 3 | 3 | 6. | | | | | | ** | | | | |
| ‡ | | | | 1 | | <u> </u> | | | | <u></u> | 45.5 | | | 53 |
| <u>-46.5</u> + 54.2 | 60/0.1 | 1 1 | | | | T : : : : : | | | | 井 | | | | |
| ‡ | | | | | | | 60/0.1 | | | 井 | | | | |
| -51.5 - 59.2 | 2 | | |] | -+ | | | | | 耳 | | | | |
| # | 4 | 6 | 11 |] ::: | 17 | | : : : : | SS-22 |] | 田 | Gray s | andy phosphatic lim | estone with som | Э |
| # | | | | | | | | | | 旪 | sand I | ayers and shell frag (Castle Hayne Fo | ments, saturated rmation) | |
| -56.5 + 64.2 | 36 | 42 | 28 | ::: | : : : : : | 7:52: | | | | 丑 | | | | |
| ţ | 30 | 72 | 20 | | | 7 | | | | 計 | | | | |
| -61.5 + 69.2 | , | | | | | * | | | | 进 | | | | |
| - J.J T 09.2 | 15 | 13 | 20 | | . 33 | | : : : : | SS-23 | | 計 | | | | |
| Ŧ | | | | | | | : : : : | | | 异 | | | | |
| -66.5 74.2 | | | | | | | | | | 耳 | | | | |
| | 13 | 29 | 20 | Н | | 49 | T | Ц | ļ | 中 | 68.0 | Formingted of Fla | tion 60 0 # ! | 75. |
| | | | | | | | | | | <u> </u> | Boring | Ferminated at Eleva limestone | uon -68.0 ft in sc | 11 |

B-4018 Bridge No. 104 on NC 32 over Broad Creek

| HOLE# | SAMPLE# | PASS 10 | PASS 40 | PASS 200 | CSESAND | FINESAND | SI | CL | LL I | PI | CLASS | DEPTH | MOIST. | ORG. |
|-------|---------|---------|---------|----------|---------|----------|------|-------------------|------|----|--------|-----------|--------|----------|
| EB1-B | SS-1 | 100 | 98 | 21 | 13.1 | 70.0 | 6.8 | | | | A24(0) | 4.0-5.5 | | : |
| | SS-2 | 95 | 53 | 5 | 77.7 | 19.1 | 1.2 | | | | A3(0) | 13.3-14.8 | | |
| | SS-3 | 90 | 56 | 4 | 79.3 | 16.9 | 1.8 | | | | A3(0) | 23.3-24.8 | | |
| | SS-4 | 100 | 97 | 15 | 9.9 | 75.9 | 4.2 | | | | A24(0) | 28.3-29.8 | | |
| | SS-5 | 100 | 87 | 21 | 47.9 | 33.0 | 7.0 | | | | A24(0) | 38.3-39.8 | | |
| | SS-6 | . 88 | 79 | 28 | 29.0 | 50.1 | 10.9 | | | | A24(0) | 48.3-49.8 | | |
| | SS-7 | 73 | 44 | 20 | 58.4 | 15.5 | | | | | A1b(0) | 55.3-56.8 | | |
| B1-A | SS-1A | 99 | 84 | 2 | 65.5 | 32.5 | 2.0 | 0.0 | 21 | NP | A3(0) | 5.1-6.6 | | |
| | SS-2A | 100 | 98 | 15 | 9.0 | 76.8 | 8.2 | | | | A24(0) | 10.1-11.6 | | |
| | SS-3A | 100 | 86 | 23 | 46.1 | 31.9 | 12.0 | | | | A24(0) | 20.5-22.0 | | |
| | SS-4A | 100 | 79 | 28 | 39.7 | 39.5 | 10.8 | | | | A24(0) | 30.5-32.0 | | |
| | SS-5A | 100 | 78 | 27 | 58.7 | 15.2 | | | | | A24(0) | 35.5-35.7 | | |
| | SS-6A | 36 | 23 | 9 | 60.7 | 15.2 | 14.0 | | | | A1a(0) | 40.5-42.0 | | |
| | SS-7A | 100 | 53 | 8 | 73.1 | 19.6 | 5.2 | | | | A3(0) | 45.5-47.0 | | |
| B2-B | SS-8 | 100 | 66 | 2 | 80.8 | 17.6 | 1.6 | 0.0 | 21 | NP | A3(0) | 7.6-9.1 | | |
| | SS-9 | 100 | 81 | 4 | 39.5 | 57.1 | 3.4 | | | | A3(0) | 12.7-14.2 | | |
| | SS-10 | 100 | 87 | 22 | 45.9 | | 10.4 | | | | A24(0) | 22.6-24.1 | | <u>.</u> |
| • • | SS-11 | 100 | 91 | 34 | 30.5 | | 12.8 | | | | A24(0) | 28.4-29.9 | | |
| | SS-12 | 65 | 54 | 31 | 25.7 | 41.7 | 22.6 | the second second | | | A24(0) | 38.4-39.9 | | |
| | SS-13 | 100 | 61 | 27 | 59.3 | 14.8 | 9.8 | | | | A24(0) | 43.4-44.3 | | |
| | SS-14 | 25 | 12 | 5 | 65.7 | 17.2 | 7.0 | 10.0 | 24 | NP | A1a(0) | 48.4-49.9 | | |
| | SS-15 | 42 | 24 | 10 | 57.3 | 21.4 | 9.2 | | | | A1a(0) | 58.4-59.9 | | |
| | SS-16 | 100 | 86 | 19 | 27.7 | 56.8 | 7.4 | 8.0 | 17 | NP | A24(0) | 63.4-64.9 | | |
| EB2-B | SS-17 | 100 | 95 | 5 | 33.7 | 62.9 | 3.4 | 0.0 | 16 | NP | A3(0) | 3.5-5.0 | | |
| | SS-18 | 100 | 81 | 4 | 60.6 | 35.7 | 3.6 | 0.0 | 16 | NP | A3(0) | 14.2-15.7 | | • |
| | SS-19 | 100 | 66 | 4 | 63.7 | 35.7 | 0.6 | | | | A3(0) | 24.2-25.7 | | •. |
| • | SS-20 | 100 | 88 | 15 | 34.5 | 51.0 | 6.4 | 8.0 | 22 | NP | A24(0) | 34.2-35.7 | | |
| | SS-21 | 100 | 72 | 35 | 48.4 | 18.5 | 17.1 | 16.1 | 28 | NP | A24(0) | 44.2-45.7 | | |
| | SS-22 | 100 | 49 | 15 | 65.5 | 21.1 | 9.4 | 4.0 | 23 | NP | A1b(0) | 59.2-60.7 | | |
| | SS-23 | 100 | 50 | 2 | 82.1 | 15.9 | 2.0 | 0.0 | 17 | NP | A1b(0) | 69.2-70.7 | | ٠. |
| В3-А | SS-24 | 100 | 75 | 3 | 66.5 | 30.5 | 3.0 | 0.0 | 16 | NP | A3(0) | 5.6-7.1 | | • . |
| | SS-25 | 100 | 71 | 7 | 58.6 | 34.1 | 5.2 | 2.0 | 19 | NP | A3(0) | 15.6-17.1 | | |
| | SS-26 | 100 | 88 | 15 | 33.9 | 51.4 | 7.0 | | | | A24(0) | 26.4-27.9 | | |
| | SS-27 | 100 | 70 | 30 | 53.2 | 18.7 | 14.1 | | | | A24(0) | 36.4-37.9 | • | |
| | SS-28 | NOT | ENOUGH | SAMPLE | | | | • | | | | 51.4-52.9 | | |
| | SS-29 | 83 | 57 | 25 | 53.6 | 18.1 | 12.2 | 16.1 | 21 | NP | A24(0) | 56.4-57.9 | | |



FIELD SCOUR REPORT

| WBS:_ | 33385.1.1 | _ TIP: | B-4018 | co | OUNTY: Beauf | ort | *************************************** | | 1. 39 . |
|--|-----------------------------|-----------------------------|-------------------------------|-------------------|----------------|--|--|---------------|---------|
| DESCRIPTION(1): E | Bridge No. 104 | on NC 32 (| over Broad Ci | reek | | | | | |
| | | | EXISTIN | G BRIDG | | | | | |
| Information from: | Field I | nspection _ (explain) _ | <u>X</u> | /licrofilm | (reel | pos | |) | |
| Bridge No.: 10 Foundation Type: \(\) | 04 Length Wooden Pile wi | : <u>136'</u> th some re | Total Bents: enforced stee | 11 Ben I piles | ts in Channel: | 7 | Bents in | Floodplain: _ | 4 |
| EVIDENCE OF Some Abutments or Experience | • • | : None No | ted | | | | | | |
| Interior Bents: 1 | None Noted | | | | | | | | - |
| Channel Bed: <u>I</u> | None Noted | | | | | | | | |
| Channel Bank: N | None nNoted | | | | | | | | |
| EXISTING SCOU | R PROTECTION | ON | | | | | | | |
| | Nooded wing w | | | | | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | |
| Extent(4): | 10' from outside | e edge of b | ridge | | | tagen and a supplied of the su | | | |
| Effectiveness(5): | Appears satisfa | ctory | | | | | | | |
| Obstructions(6): I | None Noted | | | | | | | | |

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 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.

| | | | | | | | | ne de la companya de | : | | | SHEET |
|-------------------------|----------------|-------------|-----------|---|---|--------------------------------|---|--|--|---|---|---|
| , | | | DES | SIGN IN | FORM | ATIO | N | | | | | |
| Channel Red Ma | otorial/7): | Crov.oo | | | | | | | | | | |
| Channel Bed Ma | iteriai(1). | Gray Sai | | | | | | | | | | |
| | | | | | *************************************** | | | | ······································ | | | |
| Channel Bank Ma | aterial(8): | Grav sa | nd | | | | | | | | | |
| | , , | | | | ····· | | | | | ······································ | *************************************** | *************************************** |
| | | | | ······································ | | | | | | | | |
| Channel Bank (| Cover(9): | Wooded | t | | | white terms and the second and | | | | | | |
| | | | | | | | | | | | | |
| Floodplain W | /idth(10): | 800+/- fo | eet | | | | *************************************** | | | | *************************************** | |
| Floodplain C | over/11). | South ci | de wood | led North | eide far | mland | | | | | | |
| Floodplaili | over(11). | South Si | ue wood | ieu, ivoiti | i Siuc iai | manu | | | | · · · · · · · · · · · · · · · · · · · | | |
| Strea | m is(12): | Ad | agrading | | Dear | adina | Х | | Sta | tic | | |
| | , | | 00 | *************************************** | | | | | | | - | |
| Channel Migration Tende | ency(13): | Likely w | est towa | rds End E | Bent 1 | | | | | | | |
| | | | | | | | | | | | | |
| Observations and Oth | er Comn | nents: | | | | | | | | | | |
| | | | | · | | | | | | | | |
| | | | | | | | | | | | | |
| DESIGN SCOUR EL | EVATION | IS(14) | | | | Fe | et X | | Mete | ers | | |
| | | (, | | | | . • | | | | | | |
| | BENTS | | | | | | | | | | | |
| | B1 | B2 | B3 | | | | | | | | | |
| | -12.5 | -8 | -2 | | *************************************** | | | | | | | |
| | | | | | *************************************** | | | | | | | |
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| | L | <u> </u> | <u> </u> | 1 | | <u> </u> | | | | <u> </u> | | |
| Comparison of DSE t | o Hvdrau | lics Unit t | theoretic | al scour: | | | | | | | | |
| Design Scour Elevation | | | | | 100 yr. t | heoret | ical scou | r | | | | |
| | | A | | | | | | | | | | |
| | | | | | | | | | | | | |
| SOIL ANALYSIS RE | <u>SULTS F</u> | ROM CH | IANNEL | BED AN | D BANK | MAT | ERIAL | | | | | |
| Bed or Bank | | | | | | | | | | | | |
| Sample No. Retained #4 | | | | | | | | | | | + | |
| Passed #10 | | , | | | <u> </u> | لسسميس | | T | | | - | |
| Passed #40 | | | | | | | | | l | *************************************** | 1 | |
| Passed #200 | | · | 一 _ | | | | | | | | 1 | |
| Coarse Sand | | | | e Sheet 9 | | | | | | | 1 | |
| Fine Sand | | ····· | 1 | oil Test Re | | | | | | | | |
| Silt | | | | samples: -1A Char | | | | | | | | |
| Clay | | | 1 | -18 Chan | | | | | | | | |
| | | | 33 | io Oriali | iici Dailr | • | | <u></u> | | | | |
| PI | | | | | | | | | | | - | |
| AASHTO | | | | *************************************** | | | | | | | | |
| Station Offset | | | | | | | | | - | | + | |
| Olised | | | I | | i . | | 1 | | Į. | | 1 | 1 |

Template Revised 02/07/06

| Reported by: | Date: | 12/18/2006 |
|--------------|-------|------------|
| | | |

Depth

33385.1.1 B-4018
Beaufort Co.
Bridge No. 104 on NC 32 over Broad Creek



View Looking Northeast Toward End Bent 2