PROJECT: 33444.1.1 ID: B-4085

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | B-4085 | 1 | 21 |
| STATE PROJ. NO. | F. A. PROJ. NO. | DESCRIPTION | |
| 33444.1.1 | BRSTP-1005(7) | P.E. | |
| | | CONST. | |

CONTENTS: SHEET No.:



# STATE OF NORTH CAROLINA

## DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS

## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33444.1.1 I.D. NO. B-4085

F.A. PROJECT BRSTP-1005(7)

COUNTY CRAVEN

PROJECT DESCRIPTION N/A

SITE DESCRIPTION BRIDGE #212 OVER BACHELOR CREEK ON SR 1005

### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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

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

**For Letting**

INVESTIGATED BY TERRACON PERSONNEL M. POTRATZ

CHECKED BY B. HALE, PE J. EZZELL

SUBMITTED BY TERRACON R. JORDAN

DATE 8/2005 J. MOON

S. COOLEY

DRAWN BY: M. Potratz

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.

NORTH CAROLINA PROFESSIONAL SEAL 025955 ENGINEER MARK R POTRATZ

SIGNATURE MARK R. POTRATZ, PE

| ID | STATE PROJECT NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| B-4085 | 33444.1.1 | 2 | 207 |

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 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 LAMINAE, 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<br>A-3 | A-4, A-5<br>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<br>#10<br>#40<br>#200 | 50 MX<br>30 MX<br>15 MX | | 50 MX<br>25 MX | 51 MN | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| LIQUID LIMIT | 6 MX | | N.P. | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAG. 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/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 0.5 |
| | 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
GRAIN SIZE (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 / PMT / VST — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- WOH — 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
BRN. - BROWN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
CT - CORING TERMINATED
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
ROAD EMBANK. - ROADWAY EMBANKMENT
SD. - SAND
SDY. - SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γd - DRY UNIT WEIGHT
w - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

### EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☒ CME-550 ATV
- ☐ 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 ____" STEEL TEETH
- ☐ TRICONE ____" TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER _____

HAMMER TYPE:
- ☐ AUTOMATIC ☒ MANUAL

CORE SIZE:
- ☐ -B-____
- ☒ -N-(3)____
- ☐ -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 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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY 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 (OR 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 (N 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 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: -BL- 5 PINC 10+28.89, -L- 12+98.68 (15.49' LT) ELEV = 14.51'.

ELEVATION: 29.67'

NOTES:

REVISED 09/15/00

September 2, 2005

North Carolina Department of Transportation
Geotechnical Engineering Unit
P.O. Box 25201
Raleigh, NC 27611-5201

Attention: Mr. Njoroge Wainaina, PE
State Geotechnical Engineer

Subject: Bridge Foundation Investigation
Bridge No. 212 Over Bachelor Creek on SR 1005
Craven County, North Carolina
State Project No. 33444.1.1
I.D. No. B-4085
F.A. Number BRSTP-1005(7)
Terracon Project No. 70055051

Dear Mr. Wainaina:

Terracon Consultants, Inc. (Terracon), formerly Titan Atlantic Group, Inc. is pleased to present the attached geotechnical report for the above-referenced project. A Geotechnical Report Review Checklist for site investigations, the original field boring logs, and the original field level notes are also provided with the attached Supportive Documents.

Our services were provided in accordance with Terracon's Confirming Proposal No. P05-0261, and performed under the terms and conditions of the Limited Services Agreement made and entered into on December 6, 2004, between the NCDOT and Terracon.

We are available to discuss our comments with you and to provide additional studies or services as necessary to complete the project. We have enjoyed assisting you and look forward to serving as your geotechnical consultant on the remainder of this project and future projects.

Sincerely,

**Terracon**

Mark R. Potratz, PE
Geotechnical Project Manager
Registered, NC 25955

Barney C. Hale, PE
Principal
Registered, NC 11285

Attachments



## PROJECT DESCRIPTION

Project information has been provided by the Geotechnical Unit of the North Carolina Department of Transportation. This information included the following documents:

1. Preliminary Site Boring.
2. Bridge Survey & Hydraulic Design Report dated 6/8/05.
3. Electronic file of baseline survey information.
4. Electronic files on ftp site.

We understand that a new bridge will be constructed to replace the existing Bridge #212. The preliminary plans indicate a new structure 115 feet long and 36 feet wide. The bridge will have three spans supported by two end bents and two interior bents.

The purpose of this geotechnical investigation was to explore the general subsurface conditions at the bridge site and to evaluate these conditions with respect to the general foundation design. Our scope of services included drilling 8 borings, performing laboratory tests and preparing this report of our findings for the proposed construction of a new bridge over Bachelor Creek on SR 1005, Craven County, North Carolina.

### Field Testing

Eight borings were drilled at the project site for this investigation; two along End Bent 1, two along Bent 1, two along Bent 2, and two along End Bent 2. The boring locations were located in the field by a survey crew supplied by McKim & Creed relative to NCDOT baseline survey information. After the completion of drilling operations, the boring locations and their corresponding ground surface elevations were measured by a McKim & Creed survey crew relative to the located survey stakes using the NCDOT benchmark near the southeast corner of the bridge. The boring locations are shown on Drawing No. 2 in the Appendix.

A CME 550 drilling rig mounted on an all-terrain-vehicle was used to perform the borings. Drilling techniques included wash rotary procedures. Standard Penetration Tests (SPT's) were performed at approximate 2.5 to 5 foot intervals in general accordance with ASTM D 1586, as well as requirements stated in the NCDOT Division of Highways, Geotechnical Unit's "Guidelines & Procedures Manual For Subsurface Investigations". Split-spoon soil samples were visually classified in the field and sealed in plastic bags or glass jars for transportation to our laboratory. A Shelby tube sample was obtained and submitted to NCDOT for scour testing.

At the completion of the borings, the boreholes at the end bent locations were left open to allow for stabilized groundwater measurements. Groundwater levels were generally measured in the open boreholes soon after drilling and after at least 24 hours. These water levels were measured in the field using a 100 foot tape. After stabilized groundwater levels were measured, the open boreholes were backfilled with on-site soil and capped with bentonite.

### Laboratory Testing

Laboratory analysis was conducted on representative soil samples to aid in classification of

the on-site soils. AASHTO Test Procedures T-87-86, T-88-94, T-89-90, T-90-94, T-265-86 were conducted on the soil samples that were considered representative of the embankment fill, alluvial and coastal plain soils encountered in the borings.

All testing was performed in general accordance with applicable AASHTO and ASTM specifications as modified by the NCDOT Materials and Testing Unit. A summary table of the test results is included with this report.

## PHYSIOGRAPHY AND GEOLOGY

### Site Description

The bridge is located on SR 1005 in Craven County. Bridge No. 212 crosses Bachelor Creek at this location. The project site is shown at the approximate location on Drawing No. 1 in the Appendix. SR 1005 is a paved, two-lane road. The road shoulders and approach embankment slopes are grass covered and slope towards heavily wooded areas. The road shoulders and embankment form a grassed covered strip approximately 15 feet wide.

### Site Geology

The project site is located in the Coastal Plain Physiographic Province. The Coastal Plain consists mainly of marine sediments which were deposited during successive periods of fluctuating sea level and moving shoreline. The soils in this province are typical of those laid down in a shallow sloping sea bottom; sands, silts, and clays with irregular deposits of shells. Alluvial sands, silts, and clays are typically present near rivers and creeks. According to the 1985 Geologic Map of North Carolina, the site lies within the River Bend Formation. The River Bend formation consists of limestone and calcarenite.

According to the Soil Survey of Craven County, North Carolina, the surficial soils belong to the Lenoir – Craven – Leaf Map Unit. More specifically, the soils at the project site belong to the Masontown Series. These soils are nearly level, very poorly to poorly drained fine sandy loam.

Fluctuations in the groundwater table on the order of 2 to 3 feet are typical in the Coastal Plain, depending on variations in precipitation, evaporation, and surface water runoff. Seasonal high groundwater levels are expected to occur during or just after the typically wetter months of the year (November through April).

## FOUNDATION MATERIALS

The general subsurface conditions at the site consist of roadway embankment fill soils (at the end bent locations) overlying alluvial soils and limestone interbedded with sand. The interior bent locations did not encounter the embankment fill. The embankment fill soils consist primarily of sandy clay (A-6 & A-7) and generally extend from elevation ±15.0 to between elevations ±5.0 to ±3.0 feet. Underlying the embankment fill, alluvial soils were encountered in the borings. The alluvial soils primarily consist of sandy silt (A-4) and silty sand (A-2-4), and generally extend to an elevation of about ±-8.0 feet. River Bend





Formation Limestone interbedded with sand generally extends from elevations ±-8.0 to between ±-17.0 and ±-38.0 feet. Castle Hayne Formation sand (A-3) and Silty sand (A-2-4) was encountered beneath the River Bend formation limestone from elevations of between ±-34.0 and ±-38.0 feet to ±-59.0 feet. The borings were terminated in either the limestone or sand underlying the limestone.

A profile showing graphical descriptions of the subsurface conditions is included in the Appendix as Drawing No. 3. Cross sections showing graphical representations of the general subsurface conditions encountered at each proposed bent are included in the Appendix of this report as Drawing Nos. 4 through 7.

## GROUNDWATER

Groundwater was encountered in all borings. The stabilized groundwater depths measured in the borings varied from 5.0 to 7.0 feet below the existing ground surface. These depths correspond to elevations of approximately ±10.0 to ±8.0 feet. These elevations are slightly above the Bachelor Creek elevation of 8.0, which was measured at the time of drilling.

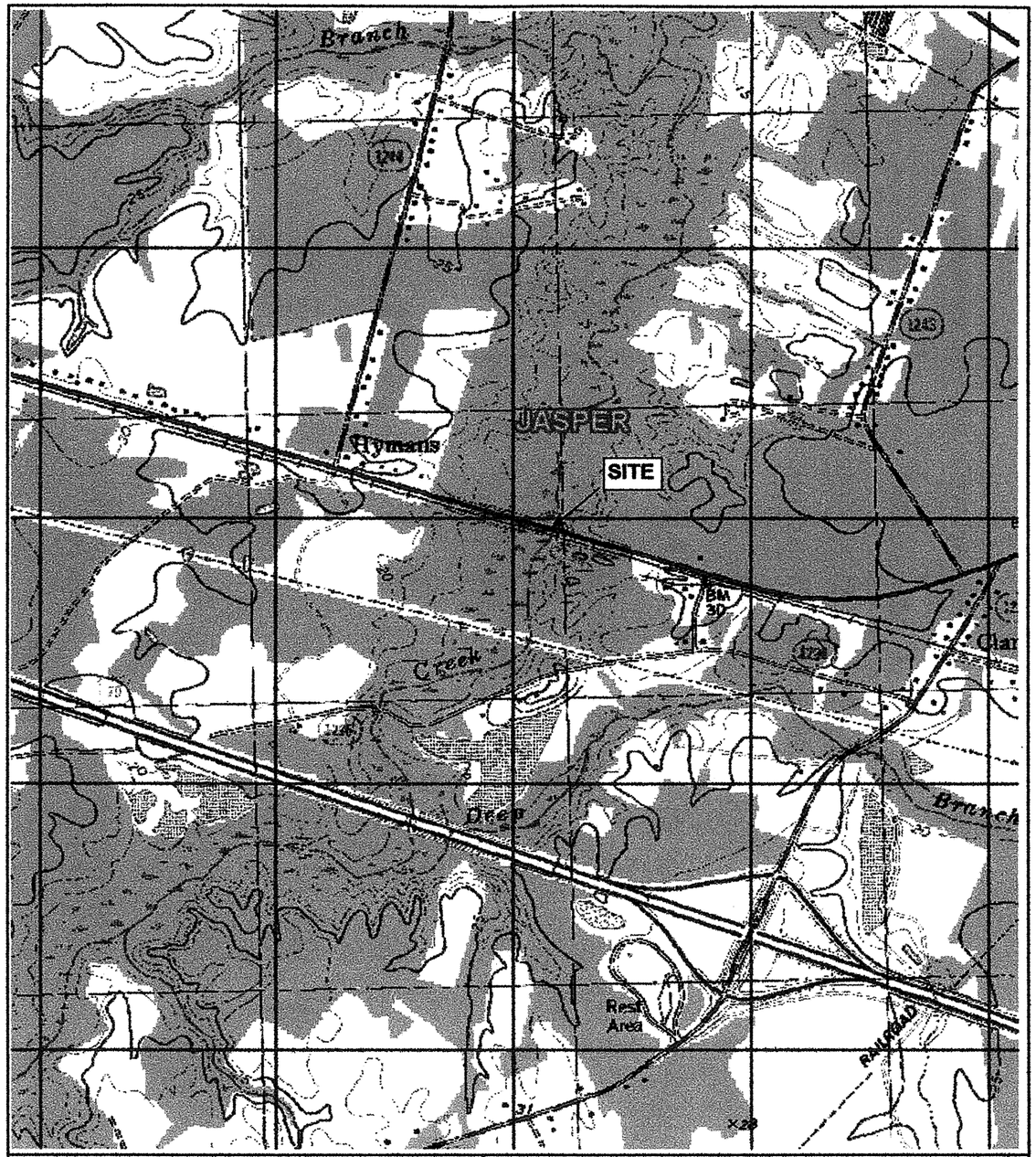
## NOTES TO DESIGNER

None to report.

## CLOSING STATEMENT

The geotechnical investigation and results described in this report are based on the information provided by the NCDOT and on the general drawings and boring logs created by Terracon. The information provided by the NCDOT included a preliminary soil boring performed on October 6, 2003 and a Bridge Survey & Hydraulic Design Report dated 6/8/05.

If any significant changes are made in the design or location of the proposed bridge, the subsurface information will have to be reviewed and modified as necessary.

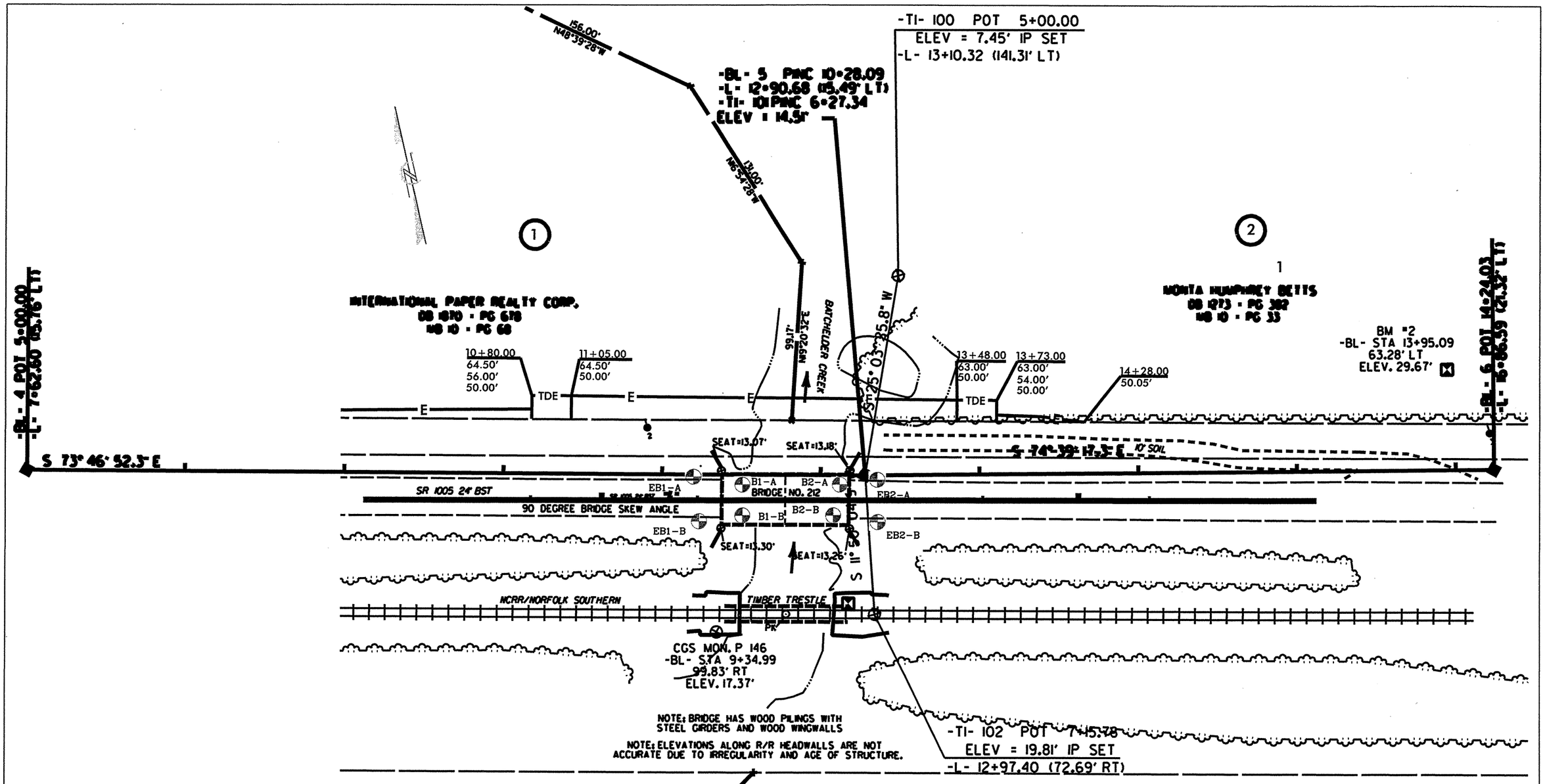



**SITE VICINITY MAP**
**BRIDGE 212 OVER BACHELOR CREEK**
**ON SR 1005**
**CRAVEN COUNTY, NORTH CAROLINA**

**Adapted from DeLorme TopoQuads**

Terracon

| | |
|---|---|
| PROJECT NO.: | 70055051 |
| DATE: | 7/12/2005 |
| DRAWN BY: | MRP |
| SCALE: 1 : 25,000 | DRAWING NO. 1 |



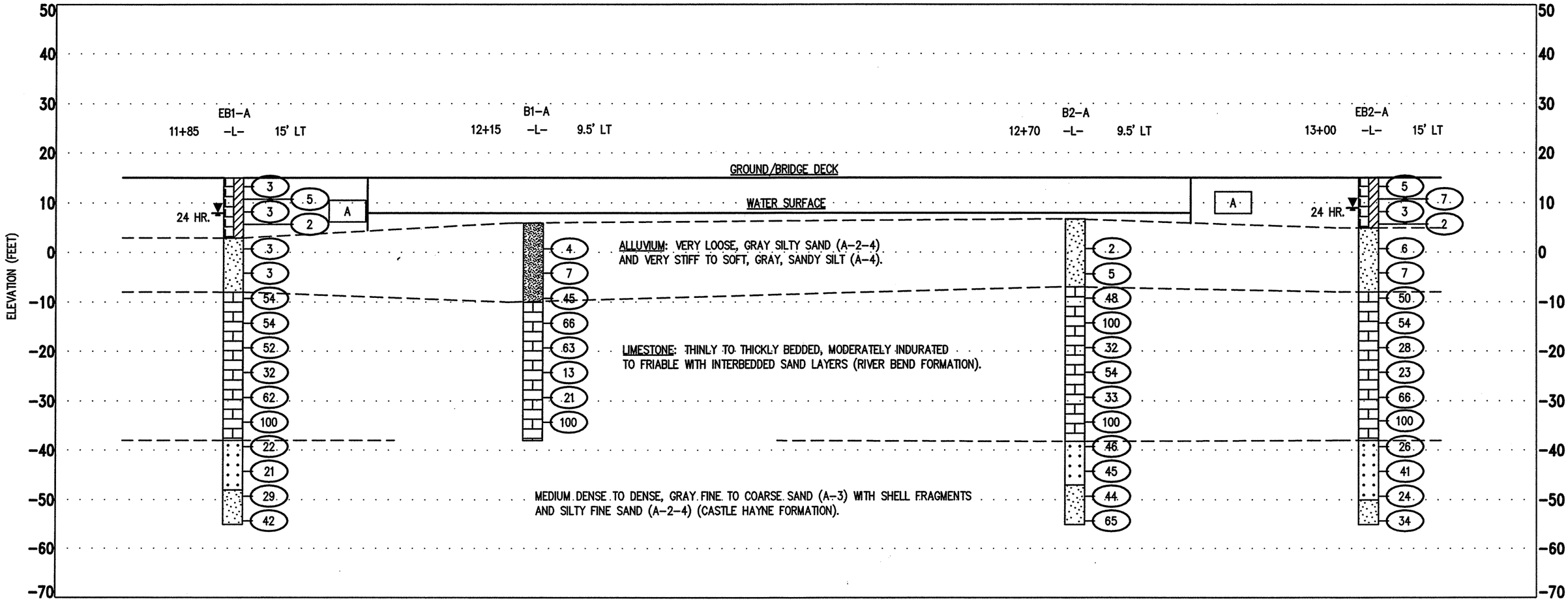

REFERENCE: BASE DRAWING PROVIDED BY NCDOT.

TERRACON CONSULTANTS, INC.
5240 GREEN'S DAIRY ROAD
RALEIGH,N.C.27616
PHONE: (919) 873-2211
FAX: (919) 873-9555

SITE PLAN
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: 1 : 60 | DWG. NO. 3 | SHEET NO. 6 |
|---|---|---|---|---|---|




A ROADWAY EMBANKMENT FILL: SOFT TO MEDIUM STIFF, LIGHT BROWN TO BROWN, FINE SANDY CLAY (A-6 AND A-7).

GRAPHIC SCALES (FEET)

HORIZONTAL 1 : 10 — 0 1 10

VERTICAL 1 : 20 — 0 2 20

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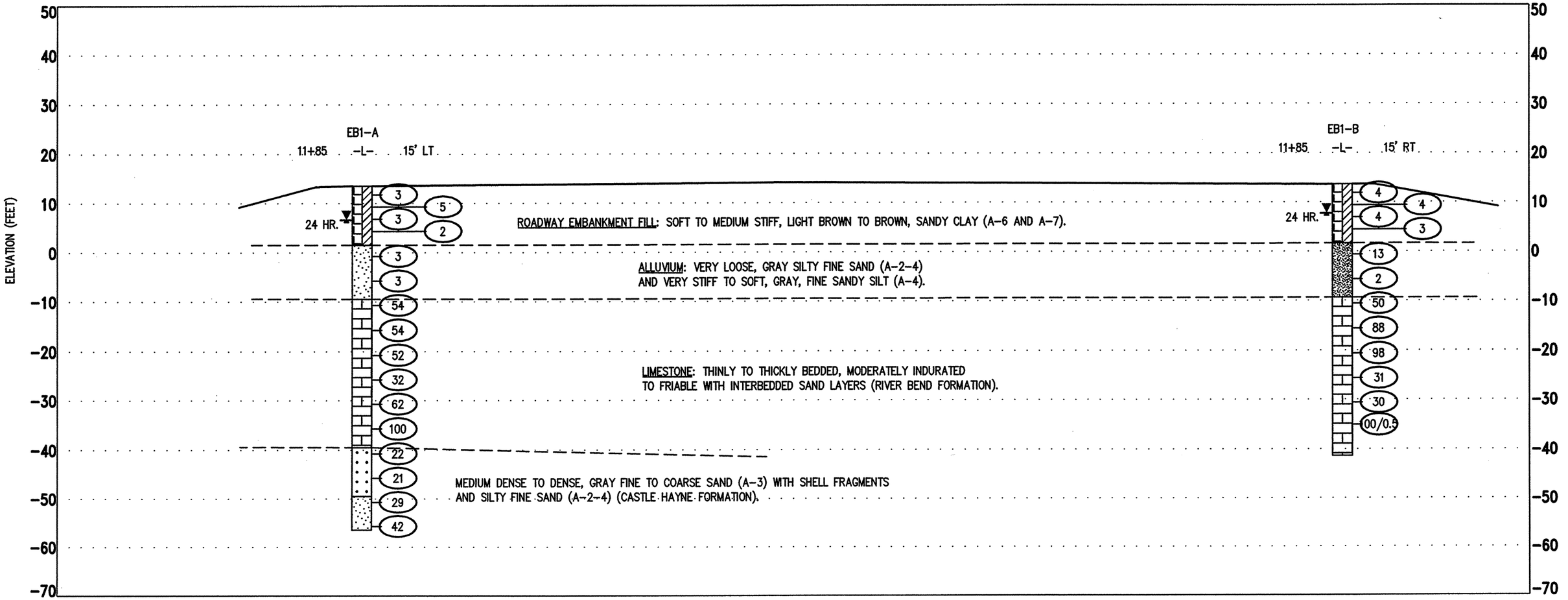
PROFILE 15 FEET LEFT OF CENTERLINE
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: AS SHOWN | DWG. NO. 3 | SHEET NO. 7 |
|---|---|---|---|---|---|




GRAPHIC SCALES
(FEET)

HORIZONTAL 1 : 3 — 0 0.3 3

VERTICAL 1 : 20 — 0 2 20

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CROSS SECTION THROUGH STA. 11+85 (END BENT 1)
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: AS SHOWN | DWG. NO. 4 | SHEET NO. 8 |
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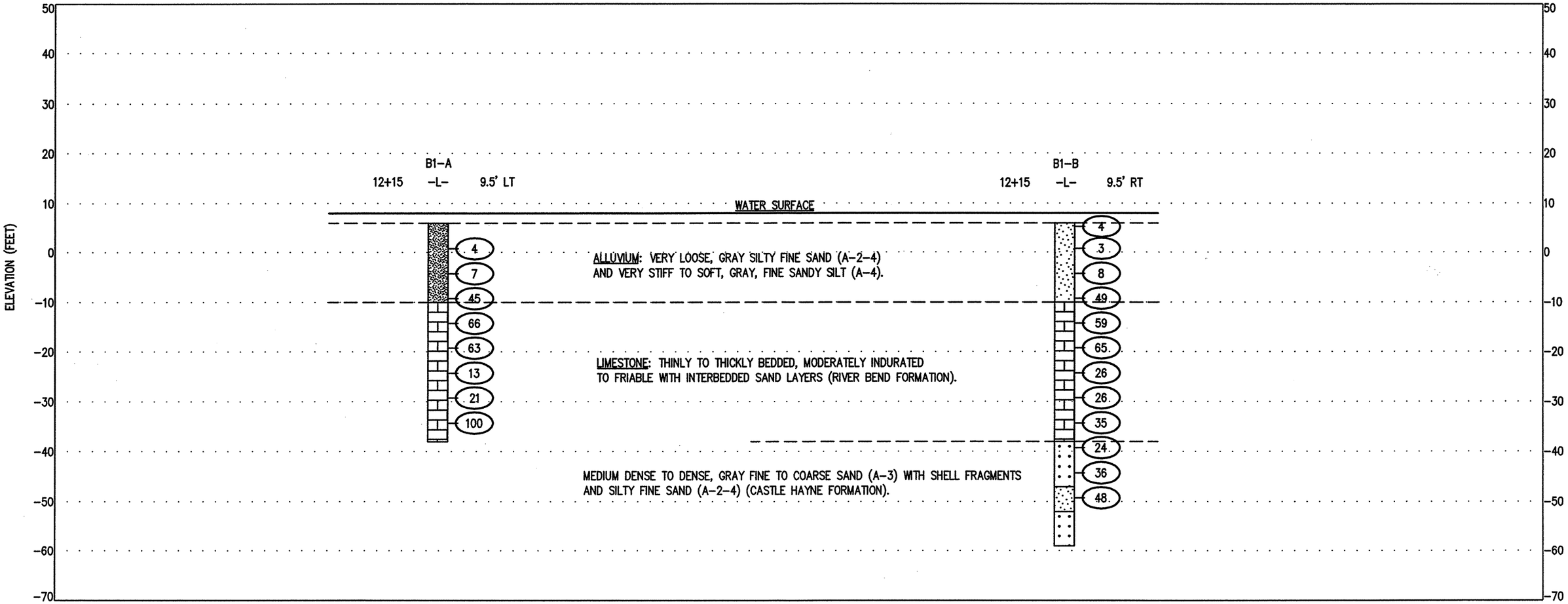


GRAPHIC SCALES
(FEET)

HORIZONTAL
1 : 3
0 0.3 3

VERTICAL
1 : 20
0 2 20

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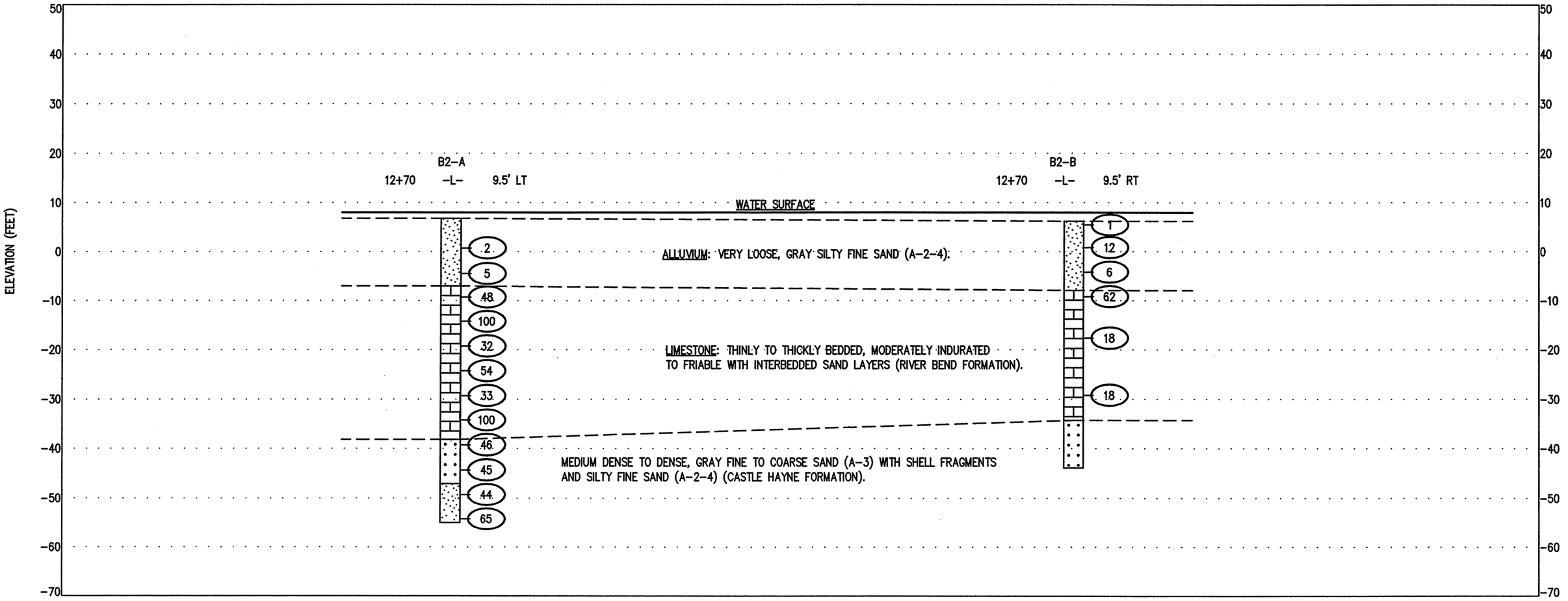
CROSS SECTION THROUGH STA. 12+15 (BENT 1)
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: AS SHOWN | DWG. NO. 5 | SHEET NO. 9 |
|---|---|---|---|---|---|




GRAPHIC SCALES
(FEET)

HORIZONTAL 1 : 3 — 0 0.3 3

VERTICAL 1 : 20 — 0 2 20

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RALEIGH,N.C.27616
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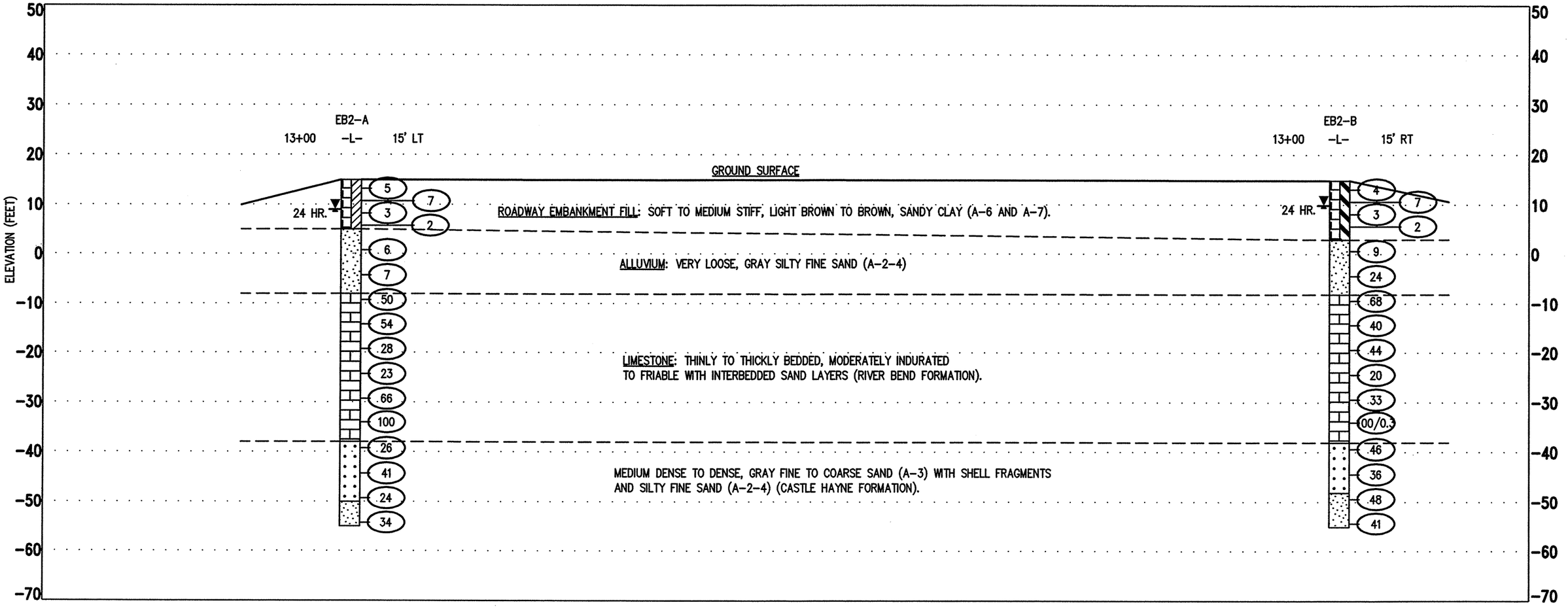
FAX: (919) 873-9555

CROSS SECTION THROUGH STA. 12+70 (BENT 2)
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: AS SHOWN | DWG. NO. 6 | SHEET NO. 10 |
|---|---|---|---|---|---|




GRAPHIC SCALES
(FEET)

HORIZONTAL
1 : 3
0 0.3 3

VERTICAL
1 : 20
0 2 20

TERRACON CONSULTANTS, INC.

5240 GREEN'S DAIRY ROAD
RALEIGH,N.C.27616
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FAX: (919) 873-9555

CROSS SECTION THROUGH STA. 13+00 (END BENT 2)
BRIDGE #212 OVER BACHELOR CREEK ON SR 1005
CRAVEN COUNTY, NORTH CAROLINA
PROJ.# 33444.1.1
ID. B-4085
FA NO. BRSTP-1005(7)

TERRACON PROJ. NO. 70055051

| CHECK: BCH | DRAWN: MRP | DATE: 8/2/05 | SCALE: AS SHOWN | DWG. NO. 7 | SHEET NO. 11 |
|---|---|---|---|---|---|

NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** EB1-A | **BORING LOCATION** 11+85 | **OFFSET** 15' LT | **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 15.0 ft | **NORTHING** 514,393.5 | **EASTING** 2,545,894.1 | | **24 HR.** 7 |
| **TOTAL DEPTH** 70.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 7/12/05 | **COMPLETED** 7/12/05 | **SURFACE WATER DEPTH** | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 15.00 | | | | | Grass | | | | 15.0 0.0 |
| | 1.00 | | | | | | M | | **ROADWAY EMBANKMENT FILL:** Soft to medium stiff, light brown to brown, fine sandy CLAY (A-6 (7)). |
| | 3.50 | 2 | 1 | 2 | 3 | | M | | |
| 10 | 6.00 | 2 | 2 | 3 | 5 | | | | |
| | 8.50 | WOH | 2 | 1 | 3 | | | | |
| | 13.50 | 1 | 1 | 1 | 2 | | S | | 3.0 12.0 |
| 5 | | | | | | | | | **ALLUVIUM:** Very loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| | 18.50 | WOH | 2 | 1 | 3 | SS-1 | 74.9 | | |
| 0 | | | | | | | | | |
| | 23.50 | 3 | 2 | 1 | 3 | | S | | -8.0 23.0 |
| -5 | | | | | | | | | **LIMESTONE:** Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| | 28.50 | 25 | 26 | 28 | 54 | | S | | |
| -10 | | | | | | | | | |
| | 33.50 | 64 | 29 | 25 | 54 | | S | | |
| -15 | | | | | | | | | |
| | 38.50 | 16 | 25 | 27 | 52 | | S | | |
| -20 | | | | | | | | | |
| | 43.50 | 15 | 19 | 13 | 32 | | S | | |
| -25 | | | | | | | | | |
| | 48.50 | 15 | 26 | 36 | 62 | | S | | |
| -30 | | | | | | | | | |
| | 53.50 | 13 | 17 | 100/0.42 | 100 | | S | | -38.0 53.0 |
| -35 | | | | | | | | | **Medium dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation).** |
| | 58.50 | 17 | 9 | 13 | 22 | | S | | |
| -40 | | | | | | | | | |
| | 63.50 | 14 | 9 | 12 | 21 | | S | | -48.0 63.0 |
| -45 | | | | | | | | | **Medium dense to dense, gray, silty fine sand (A-2-4(0)) (Castle Hayne Formation).** |
| | 68.50 | 14 | 14 | 15 | 29 | | S | | |
| -50 | | | | | | | | | |
| | | 15 | 18 | 24 | 42 | SS-2 | 29.3 | | -55.0 70.0 |
| -55 | | | | | | | | | **Boring terminated at elevation -55.0 feet in dense sand.** |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** EB1-B | **BORING LOCATION** 11+85 | **OFFSET** 15' RT | **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 15.1 ft | **NORTHING** 514,416.6 | **EASTING** 2,545,900.8 | | **24 HR.** 6 |
| **TOTAL DEPTH** 55.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 7/12/05 | **COMPLETED** 7/12/05 | **SURFACE WATER DEPTH** | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 15.10 | | | | | Grass | | | | 15.1 0.0 |
| | 1.00 | | | | | | M | | **ROADWAY EMBANKMENT FILL:** Soft to medium stiff, light brown to brown, fine sandy CLAY (A-6 (7)). |
| | 3.50 | 1 | 1 | 3 | 4 | | M | | |
| 10 | 6.00 | 2 | 2 | 2 | 4 | SS-3 | 26.7 | | |
| | 8.50 | 1 | 2 | 2 | 4 | | M | | |
| | 13.50 | 1 | 1 | 2 | 3 | | S | | 3.1 12.0 |
| 5 | | | | | | | | | **ALLUVIUM:** Very stiff to soft, dark brown to gray, fine sandy SILT (A-4(0)). |
| | 18.50 | 2 | 4 | 9 | 13 | SS-4 | 25.0 | | |
| 0 | | | | | | | | | |
| | 23.50 | 3 | 1 | 1 | 2 | | S | | -7.9 23.0 |
| -5 | | | | | | | | | **LIMESTONE:** Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| | 28.50 | 19 | 22 | 28 | 50 | | S | | |
| -10 | | | | | | | | | |
| | 33.50 | 42 | 43 | 45 | 88 | | S | | |
| -15 | | | | | | | | | |
| | 38.50 | 11 | 17 | 81 | 98 | | S | | Lost drilling fluid circulation at about 35 feet depth, limited circulation below 35 feet. |
| -20 | | | | | | | | | |
| | 43.50 | 11 | 13 | 18 | 31 | SS-5 | 18.4 | | |
| -25 | | | | | | | | | |
| | 48.50 | 7 | 15 | 15 | 30 | | S | | |
| -30 | | | | | | | | | |
| | | 100 | N/A | N/A | 100/0.5 | | S | | -39.9 55.0 |
| -35 | | | | | | | | | **Boring terminated at elevation -39.9 feet in Limestone. Could not advance drilling rods due to blockages from limestone and sand particles in rods.** |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** B1-A | **BORING LOCATION** 12+15 | **OFFSET** 9.5' LT **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 6.0 ft | **NORTHING** 514,388.7 | **EASTING** 2,545,920.4 | **24 HR.** N.M |
| **TOTAL DEPTH** 44.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual |
| **DATE STARTED** 7/18/05 | **COMPLETED** 7/18/05 | **SURFACE WATER DEPTH** 2 | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 8.00 | | | | | Surface Water () | | ▼ | | |
| | | | | | Creek Bed | | | | |
| | | | | | | | | | 6.0 / 0.0 **ALLUVIUM**: Medium stiff to stiff, dark brown to gray, fine sandy SILT (A-4(0)). |
| | 4.50 | WOH | 2 | 2 | 4 | SS-6 | 111.4 | | |
| | 9.50 | 3 | 4 | 3 | 7 | | S | | |
| | 14.50 | 43 | 25 | 20 | 45 | | S | | -10.0 / 16.0 **LIMESTONE**: Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| | 19.50 | 24 | 42 | 24 | 66 | | S | | |
| | 24.50 | 13 | 13 | 50 | 63 | | S | | |
| | 29.50 | 8 | 8 | 5 | 13 | SS-7 | 16.5 | | |
| | 34.50 | 17 | 10 | 11 | 21 | | S | | |
| | 39.50 | 27 | 15 | 50/0.2 | 100 | | S | | -38.0 / 44.0 Boring terminated by tri-cone refusal at elevation -38.0 in Limestone. |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** B1-B | **BORING LOCATION** 12+15 | **OFFSET** 9.5' RT **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 6.0 ft | **NORTHING** 514,406.6 | **EASTING** 2,545,924.9 | **24 HR.** N.M |
| **TOTAL DEPTH** 65.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual |
| **DATE STARTED** 8/1/05 | **COMPLETED** 8/1/05 | **SURFACE WATER DEPTH** 1.1 | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 8.00 | | | | | Surface Water () | | ▼ | | |
| | 0.00 | | | | Creek Bed | | | | |
| | | | | | | | | | 6.0 / 0.0 **ALLUVIUM**: Very loose to loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| | 4.50 | WOH | 1 | 3 | 4 | SS-8 | 40.4 | | |
| | 9.50 | WOH | 1 | 2 | 3 | | S | | |
| | 14.50 | 3 | 5 | 3 | 8 | | S | | |
| | 19.50 | 22 | 28 | 21 | 49 | | S | | -10.0 / 16.0 **LIMESTONE**: Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| | 24.50 | 47 | 37 | 22 | 59 | | S | | |
| | 29.50 | 18 | 13 | 52 | 65 | SS-9 | 24.1 | | |
| | 34.50 | 11 | 9 | 17 | 26 | | S | | |
| | 39.50 | 12 | 14 | 12 | 26 | | S | | |
| | 44.50 | 14 | 23 | 12 | 35 | | S | | |
| | 49.50 | 12 | 12 | 12 | 24 | | S | | -38.0 / 44.0 Medium dense to dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). |
| | 54.50 | 20 | 15 | 21 | 36 | | S | | -47.0 / 53.0 Dense to very dense, gray, silty fine sand (A-2-4(0)) (Castle Hayne Formation). |
| | | 20 | 22 | 26 | 48 | | S | | -52.0 / 58.0 Medium dense to dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). Classification based on drilling cuttings. -59.0 / 65.0 Boring terminated at elevation -59.0 feet in sand. |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** B2-A | **BORING LOCATION** 12+70 | **OFFSET** 9.5' LT | **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 6.8 ft | **NORTHING** 514,372.8 | **EASTING** 2,545,975.0 | | **24 HR.** N.M |
| **TOTAL DEPTH** 61.80 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 7/18/05 | **COMPLETED** 7/18/05 | **SURFACE WATER DEPTH** 1.2 | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 8.00 | | | | | Surface Water () | | ▼ | | |
| | | | | | Creek Bed | | | | |
| | | | | | | | | | 6.8 / 0.0 **ALLUVIUM:** Very loose to loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| 5 | 5.30 | 1 | 1 | 1 | 2 | SS-10 | 34.0 | | |
| 0 | 10.50 | 4 | 3 | 2 | 5 | SS-11 | 31.3 | | |
| -5 | 15.30 | 18 | 26 | 22 | 48 | | | S | -7.0 / 13.8 **LIMESTONE:** Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| -10 | 20.30 | 100 | N/A | N/A | 100 | | | S | |
| -15 | 25.30 | 12 | 18 | 14 | 32 | | | S | |
| -20 | 30.30 | 23 | 25 | 29 | 54 | | | S | |
| -25 | 35.30 | 18 | 12 | 21 | 33 | | | S | |
| -30 | 40.30 | 18 | 50 | 100/0.4 | 100 | | | S | |
| -35 | 45.30 | 14 | 20 | 26 | 46 | | | S | -38.2 / 45.0 Dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). |
| -40 | 50.30 | 20 | 25 | 20 | 45 | | | S | |
| -45 | 55.30 | 14 | 20 | 24 | 44 | | | S | -47.0 / 53.8 Dense to very dense, gray, silty fine sand (A-2-4(0)) (Castle Hayne Formation). |
| -50 | 60.30 | 22 | 30 | 35 | 65 | SS-12 | 24.4 | | -55.0 / 61.8 Boring terminated at elevation -55.0 feet in sand. |
| -55 | | | | | | | | | |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** B2-B | **BORING LOCATION** 12+70 | **OFFSET** 9.5' RT | **ALIGNMENT** -L- | **0 HR.** N.M |
| **ELEV.** 6.2 ft | **NORTHING** 514,389.6 | **EASTING** 2,545,984.5 | | **24 HR.** N.M |
| **TOTAL DEPTH** 50.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 8/2/05 | **COMPLETED** 8/2/05 | **SURFACE WATER DEPTH** 0.9 | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 8.00 | | | | | Surface Water () | | ▼ | | |
| | | | | | Creek Bed | | | | |
| | 0.00 | | | | | | | | 6.2 / 0.0 **ALLUVIUM:** Very loose to loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| 5 | 4.60 | WOH | WOH | 1 | 1 | SS-13 | 33.7 | | |
| 0 | 9.60 | 3 | 6 | 6 | 12 | SS-14 | 36.7 | | |
| -5 | 14.60 | 3 | 3 | 3 | 6 | SS-15 | 33.1 | | |
| -10 | 23.10 | 25 | 29 | 33 | 62 | | | S | -7.9 / 14.1 **LIMESTONE:** Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| -15 | 34.60 | 4 | 6 | 12 | 18 | | | S | |
| -20 | | 14 | 8 | 10 | 18 | | | S | |
| -25 | | | | | | | | | |
| -30 | | | | | | | | | -34.3 / 40.5 Medium dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). Classification based on drilling cuttings. |
| -35 | | | | | | | | | |
| -40 | | | | | | | | | -43.8 / 50.0 Boring terminated at elevation -43.8 feet in sand. |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
# DIVISION OF HIGHWAYS
# GEOTECHNICAL UNIT CORE BORING REPORT

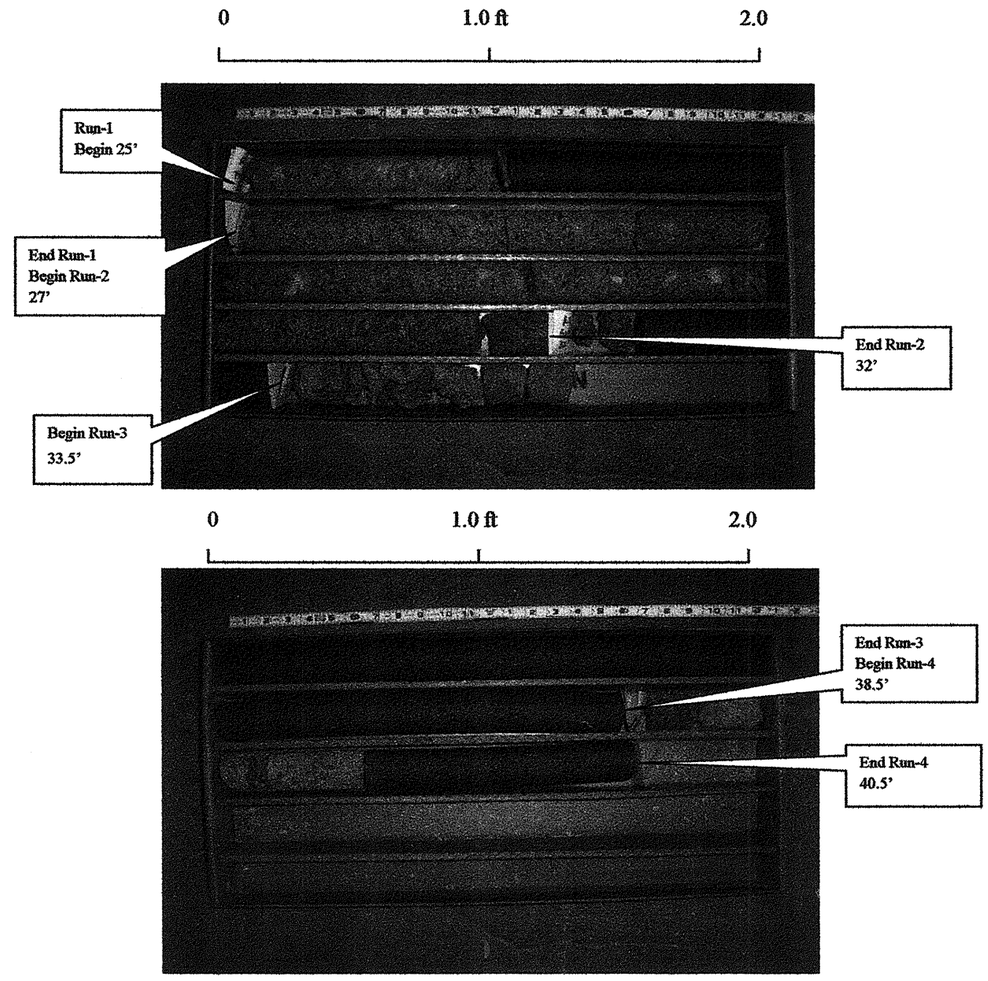
**PROJECT NO.:** 33444.1.1 **I.D. NO.:** B-4085 **BORING NO.:** B2-B
**SITE DESCRIPTION:** Bridge #212 over Bachelor Creek on SR 1005
**COLLAR ELEVATION:** 6.2 **CORE SIZE:** NQ **EQUIPMENT:** CME 550
**DRILLER:** Terracon **GEOLOGIST:** M. Potratz **PERSONNEL:** Jordan / Moon
**TOTAL DEPTH:** 40.5 **TOTAL RUN:** 15.5 **DATE:** 8/2/05

| ELEV. (ft) | DEPTH (ft) | DRILL RATE (MIN/ft) | RUN # (ft) | * REC (ft) (%) | RQD (ft) (%) | SAMP. NO. | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|---|
| -18.8 | 25 | 2 | 1 | .83 | NA | | **LIMESTONE:** Thinly to thickly bedded, moderately indurated to friable with interbedded sand layers. (River Bend Formation) |
| | | | | | | | |
| -20.8 | 27 | 3 | 2 | 42% | NA | | |
| -20.8 | 27 | 3 | 2 | 5 | NA | | |
| | | 5 | | | | | |
| | | | | | | | |
| | | 3 | | | | | |
| | | | | | | | |
| | | 4 | | | | | |
| | | | | | | | |
| -25.8 | 32 | 3 | 5 | 100% | NA | | |
| -25.8 | 32 | SPT | N = 18 | | | | |
| -27.3 | 33.5 | | | | | | |
| -27.3 | 33.5 | 2 | 3 | 1 | NA | | |
| | | 4 | | | | | |
| | | | | | | | |
| | | 1 | | | | | |
| | | | | | | | |
| | | 4 | | | | | |
| | | | | | | | |
| -32.3 | 38.5 | 2 | 5 | 20% | NA | | |
| -32.3 | 38.5 | 2 | 4 | .25 | NA | | |
| | | | | | | | |
| -34.3 | 40.5 | 7 | 2 | 13% | NA | | |
| | | | | | | | |

Coring Terminated @ 40.5 feet.
Elevation -34.5 feet.

## CORE PHOTOGRAPHS (B2-B)

Bridge # 212 over Bachelor Creek on SR 1005
State Project 33444.1.1 (B-4085)
Scale 1"=0.5'



NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** EB2-A | **BORING LOCATION** 13+00 | **OFFSET** 15' LT | **ALIGNMENT** -L- | **0 HR.** N.M. |
| **ELEV.** 15.0 ft | **NORTHING** 514,362.7 | **EASTING** 2,546,000.1 | | **24 HR.** 6 |
| **TOTAL DEPTH** 70.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 7/11/05 | **COMPLETED** 7/11/05 | **SURFACE WATER DEPTH** | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 15.00 | | | | | Crushed Stone | | | | 15.0 0.0 |
| | 1.00 | | | | | | | | |
| | 3.50 | 1 | 3 | 2 | 5 7 | | M | | **ROADWAY EMBANKMENT FILL**: Soft to medium stiff, light brown to brown, fine sandy CLAY (A-6 (7)). |
| 10 | 6.00 | 12 | 4 | 3 | 3 | | M | | |
| | 8.50 | 1 | 1 | 2 | 2 | | S | | |
| | | 1 | 1 | 1 | | SS-16 | 42.3 | | 5.0 10.0 |
| 5 | 13.50 | | | | | | | | **ALLUVIUM**: Very loose to loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| | | 2 | 2 | 4 | 6 | | S | | |
| 0 | 18.50 | | | | | | | | |
| | | 5 | 4 | 3 | 7 | | S | | |
| -5 | 23.50 | | | | | | | | -8.0 23.0 |
| | | 13 | 26 | 24 | 50 | | S | | **LIMESTONE**: Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| -10 | 28.50 | | | | | | | | |
| | | 32 | 24 | 30 | 54 | SS-17 | 12.4 | | |
| -15 | 33.50 | | | | | | | | |
| | | 12 | 15 | 13 | 28 | | S | | |
| -20 | 38.50 | | | | | | | | |
| | | 10 | 12 | 11 | 23 | | S | | |
| -25 | 43.50 | | | | | | | | |
| | | 42 | 42 | 24 | 66 | | S | | |
| -30 | 48.50 | | | | | | | | |
| | | 17 | 100 | N/A | 100 | | S | | |
| -35 | 53.50 | | | | | | | | -38.0 53.0 |
| | | 17 | 14 | 12 | 26 | | S | | Medium dense to dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). |
| -40 | 58.50 | | | | | | | | |
| | | 21 | 21 | 20 | 41 | | S | | |
| -45 | 63.50 | | | | | | | | |
| | | 14 | 15 | 9 | 24 | | S | | -50.0 65.0 |
| -50 | 68.50 | | | | | | | | Dense, dark brown to gray, silty fine sand (A-2-4(0)) (Castle Hayne Formation). |
| | | 10 | 14 | 20 | 34 | SS-18 | 27.1 | | -55.0 70.0 |
| -55 | | | | | | | | | Boring terminated at elevation -55.0 feet in dense sand. |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

NCDOT
BORING LOG
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33444.1.1 | **ID.** B-4085 | **COUNTY** Craven | **GEOLOGIST** A. Ezzell |
| **SITE DESCRIPTION** Bridge #212 over Bachelor Creek on SR 1005 | | | **GROUND WATER (ft)** |
| **BORING NO.** EB2-B | **BORING LOCATION** 13+00 | **OFFSET** 15' RT | **ALIGNMENT** -L- | **0 HR.** N.M. |
| **ELEV.** 14.9 ft | **NORTHING** 514,385.8 | **EASTING** 2,546,006.8 | | **24 HR.** 5 |
| **TOTAL DEPTH** 70.00 ft | **DRILL MACHINE** CME 550 | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Manual | |
| **DATE STARTED** 7/13/05 | **COMPLETED** 7/13/05 | **SURFACE WATER DEPTH** | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 14.90 | | | | | Grass | | | | 14.9 0.0 |
| | 1.00 | | | | | | | | |
| | 3.50 | 1 | 2 | 2 | 4 | SS-19 | 29.3 | | **ROADWAY EMBANKMENT FILL**: Soft to medium stiff, light brown to brown, fine sandy CLAY (A-7-6 (21)). |
| 10 | 6.00 | 4 | 4 | 3 | 7 | | S | | |
| | 8.50 | 1 | 1 | 2 | 3 | | S | | |
| | | 1 | 1 | 1 | 2 | | | | 2.9 12.0 |
| 5 | 13.50 | | | | | | | | **ALLUVIUM**: Very loose to loose, dark brown to gray, silty fine sand (A-2-4(0)). |
| | | 2 | 4 | 5 | 9 | SS-20 | 77.6 | | |
| 0 | 18.50 | | | | | | | | |
| | | 10 | 11 | 13 | 24 | | S | | |
| -5 | 23.50 | | | | | | | | -8.1 23.0 |
| | | 17 | 18 | 50 | 68 | | S | | **LIMESTONE**: Thinly to thickly bedded, moderately indurated to friable, LIMESTONE with interbedded sand layers (River Bend Formation). |
| -10 | 28.50 | | | | | | | | |
| | | 27 | 12 | 28 | 40 | | S | | |
| -15 | 33.50 | | | | | | | | |
| | | 14 | 20 | 24 | 44 | | S | | |
| -20 | 38.50 | | | | | | | | |
| | | 14 | 10 | 10 | 20 | | S | | |
| -25 | 43.50 | | | | | | | | |
| | | 17 | 15 | 18 | 33 | | S | | |
| -30 | 48.50 | | | | | | | | |
| | | 12 | 100/0.3 | N/A | 100/0.3 | | S | | |
| -35 | 53.50 | | | | | | | | -38.1 53.0 |
| | | 15 | 17 | 29 | 46 | | S | | Dense, gray, fine to coarse sand (A-3) with shell fragments (Castle Hayne Formation). |
| -40 | 58.50 | | | | | | | | |
| | | 30 | 18 | 18 | 36 | | S | | |
| -45 | 63.50 | | | | | | | | |
| | | 25 | 25 | 23 | 48 | | S | | -48.1 63.0 |
| -50 | 68.50 | | | | | | | | Dense, gray, silty fine sand (A-2-4(0)) (Castle Hayne Formation). |
| | | 18 | 16 | 25 | 41 | | S | | -55.1 70.0 |
| -55 | | | | | | | | | Boring terminated at elevation -55.1 feet in dense sand. |

NCDOT_BORE 70055051.GPJ NCDOT.GDT 9/2/05

Terracon

5240 Green's Dairy Road • Raleigh, North Carolina 27616
Phone (919) 873-2211 • Fax (919) 873-9555

# REPORT ON SOIL TEST RESULTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 70055051 – NCDOT Bridge 212 | | | | COUNTY: | Craven | |
| DATE SAMPLED: | July 12-28, 2005 | DATE RECEIVED: | July 14-29, 2005 | DATE REPORTED: | | August 8, 2005 | |
| SAMPLED FROM: | Bridge Soil Borings | | SAMPLED BY: | Terracon | | | |
| SUBMITTED BY: | Mark Potratz | | | | STANDARD SPECIFICATION | | |
| LABORATORY: | Terracon | | | | | | |

## TEST RESULTS

| Sample No. | SS-5 | SS-16 | SS-2 | SS-5 | SS-1 | SS-1 | SS-1 | SS-2 |
|---|---|---|---|---|---|---|---|---|
| Boring No. | EB 1-A | EB 1-A | EB 1-B | EB 1-B | B 1-A | B 1-B | B 2-A | B 2-A |
| Laboratory ID No. | SS-1 | SS-2 | SS-3 | SS-4 | SS-6 | SS-8 | SS-10 | SS-11 |
| Retained #4 Sieve % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Passing #10 Sieve % | 95 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Passing #40 Sieve % | 91 | 100 | 96 | 100 | 97 | 93 | 98 | 100 |
| Passing #200 Sieve % | 11 | 16 | 53 | 40 | 44 | 23 | 25 | 6 |

## MINUS #10 FRACTION

| Soil Mortar - 100% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coarse Sand -Ret. #60 | 14 | 1 | 12 | 5 | 5 | 31 | 12 | 9 |
| Fine Sand - Ret. #270 | 77 | 90 | 40 | 66 | 58 | 49 | 66 | 87 |
| Silt 0.05-0.005 mm % | 2 | 4 | 15 | 16 | 11 | 8 | 7 | 0 |
| Clay < 0.005 mm % | 7 | 5 | 33 | 13 | 26 | 12 | 15 | 4 |
| Passing # 40 Sieve % | | | | | | | | |
| Passing # 200 Sieve % | | | | | | | | |

| Liquid Limit | 30 | 25 | 33 | 21 | 53 | 21 | 22 | 26 |
|---|---|---|---|---|---|---|---|---|
| Plastic Index | NP | NP | 20 | 1 | 31 | NP | 3 | NP |
| AASHTO Classification | A-2-4 (0) | A-2-4 (0) | A-6 (7) | A-4 (0) | A-7-6 (9) | A-2-4 (0) | A-2-4 (0) | A-3 (0) |
| Select Granular Class | | | | | | | | |
| Type | | | | | | | | |
| In Place Moisture (%) | 74.9 | 27.2 | 26.7 | 25.0 | 111.4 | 40.4 | 34.0 | 31.3 |
| Hole No. | | | | | | Creek Bed | | |
| Depth (ft) From: | 13.5 | 68.5 | 3.5 | 13.5 | 4.5 | 0 | 5.3 | 10.5 |
| To: | 15.0 | 70.0 | 5.0 | 15.0 | 6.0 | 1.5 | 6.8 | 12.0 |

**Remarks:**

Terracon

5240 Green's Dairy Road • Raleigh, North Carolina 27616
Phone (919) 873-2211 • Fax (919) 873-9555

# REPORT ON SOIL TEST RESULTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 70055051 – NCDOT Bridge 212 | | | | COUNTY: | Craven | |
| DATE SAMPLED: | July 12-28, 2005 | DATE RECEIVED: | July 14-29, 2005 | DATE REPORTED: | | August 8, 2005 | |
| SAMPLED FROM: | Bridge Soil Borings | | SAMPLED BY: | Terracon | | | |
| SUBMITTED BY: | Mark Potratz | | | | STANDARD SPECIFICATION | | |
| LABORATORY: | Terracon | | | | | | |

## TEST RESULTS

| Sample No. | SS-1 | SS-2 | SS-3 | SS-4 | SS-1 | SS-5 | | |
|---|---|---|---|---|---|---|---|---|
| Boring No. | B 2-B | B 2-B | B 2-B | EB 2-A | EB 2-B | EB 2-B | | |
| Laboratory ID No. | SS-13 | SS-14 | SS-15 | SS-16 | SS-19 | SS-20 | | |
| Retained #4 Sieve % | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Passing #10 Sieve % | 100 | 99 | 100 | 98 | 100 | 96 | | |
| Passing #40 Sieve % | 97 | 94 | 99 | 95 | 98 | 89 | | |
| Passing #200 Sieve % | 28 | 5 | 9 | 42 | 71 | 20 | | |

## MINUS #10 FRACTION

| Soil Mortar - 100% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coarse Sand -Ret. #60 | 19 | 24 | 5 | 12 | 8 | 17 | | |
| Fine Sand - Ret. #270 | 56 | 72 | 90 | 49 | 24 | 65 | | |
| Silt 0.05-0.005 mm % | 8 | 2 | 1 | 13 | 23 | 6 | | |
| Clay < 0.005 mm % | 17 | 2 | 4 | 26 | 45 | 12 | | |
| Passing # 40 Sieve % | | | | | | | | |
| Passing # 200 Sieve % | | | | | | | | |

| Liquid Limit | 24 | 26 | 26 | 28 | 47 | 28 | | |
|---|---|---|---|---|---|---|---|---|
| Plastic Index | 5 | NP | NP | 13 | 32 | NP | | |
| AASHTO Classification | A-2-4 (0) | A-3 (0) | A-3 (0) | A-6 (2) | A-7-6 (21) | A-2-4 (0) | | |
| Select Granular Class | | | | | | | | |
| Type | | | | | | | | |
| In Place Moisture (%) | 33.7 | 36.7 | 33.1 | 42.3 | 29.3 | 77.6 | | |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 0 | 4.6 | 9.6 | 8.5 | 1.0 | 13.5 | | |
| To: | 1.5 | 6.1 | 11.1 | 10.0 | 2.5 | 15.0 | | |

**Remarks:**

Terracon

5240 Green's Dairy Road • Raleigh, North Carolina 27616
Phone (919) 873-2211 • Fax (919) 873-9555

# REPORT ON SOIL TEST RESULTS

| | | | | | |
|---|---|---|---|---|---|
| **PROJECT:** | **70055051 – NCDOT Bridge 212** | | | **COUNTY:** | **Craven** |
| **DATE SAMPLED:** | **July 12-28, 2005** | **DATE RECEIVED:** | **July 14-29, 2005** | **DATE REPORTED:** | **August 8, 2005** |
| **SAMPLED FROM:** | **Bridge Soil Borings** | **SAMPLED BY:** | **Terracon** | | |
| **SUBMITTED BY:** | **Mark Potratz** | | | **STANDARD SPECIFICATION** | |
| **LABORATORY:** | **Terracon** | | | | |

## TEST RESULTS

| **Sample No.** | SS-11 | SS-6 | SS-10 | SS-12 | SS-8 | SS-16 | Creek Bank | |
|---|---|---|---|---|---|---|---|---|
| **Boring No.** | EB 1-B | B 1-A | B 1-B | B 2-A | EB 2-A | EB 2-A | - | |
| **Lab ID No.** | SS-5 | SS-7 | SS-9 | SS-12 | SS-17 | SS-18 | SS-21 | |
| | | | | | | | | |
| | | | | | | | | |
| **Passing #3/8 Sieve %** | 96 | 99 | 96 | 100 | 83 | 100 | 100 | |
| **Passing #4 Sieve %** | 87 | 88 | 89 | 100 | 70 | 100 | 100 | |
| **Passing #8 Sieve %** | 55 | 63 | 81 | 100 | 48 | 100 | 100 | |
| **Passing #16 Sieve %** | 32 | 43 | 74 | 100 | 34 | 100 | 99 | |
| **Passing #30 Sieve %** | 23 | 32 | 67 | 100 | 26 | 99 | 98 | |
| **Passing #50 Sieve %** | 18 | 24 | 60 | 99 | 21 | 98 | 90 | |
| **Passing #100 Sieve %** | 13 | 18 | 41 | 71 | 16 | 77 | 33 | |
| **Passing #200 Sieve %** | 6.8 | 9.2 | 11.9 | 9.2 | 8.0 | 10.8 | 14.6 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **In Place Moisture (%)** | 18.4 | 16.5 | 24.1 | 24.4 | 12.4 | 27.1 | 37.5 | |
| | | | | | | | | |
| **Depth (ft) From:** | 38.5 | 29.5 | 24.5 | 60.3 | 28.5 | 68.5 | 0 | |
| **To:** | 40.0 | 31.0 | 26.0 | 61.8 | 30.0 | 70.0 | 1.0 | |

**Remarks:**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

# FIELD SCOUR REPORT

WBS: 33444.1.1 TIP: B-4085 COUNTY: Craven

DESCRIPTION(1): Bridge #212 over Bachelor Creek on SR 1005

## EXISTING BRIDGE

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

Bridge No.: 212 Length: 61 Total Bents: 5 Bents in Channel: 3 Bents in Floodplain: 5
Foundation Type: Timber Piles

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: None Visible

Interior Bents: None visible, water too murkey

Channel Bed: None Visible

Channel Bank: None Visible

**EXISTING SCOUR PROTECTION**

Type(3): Wooden Wingwalls

Extent(4): Wingwalls at both end bents

Effectiveness(5): No scour observed above waterline

Obstructions(6): Tree against western end bent on upstream side.

**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 geotechnically adjusted scour elevation (GASE) 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 GASE. If the GASE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The GASE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

## DESIGN INFORMATION

Channel Bed Material(7): Dark brown, very moist to wet, silty sand.

Channel Bank Material(8): Dark brown, very moist to wet, silty sand.

Channel Bank Cover(9): Trees, grass, weeds

Floodplain Width(10): about 200 feet.

Floodplain Cover(11): Trees, grass, weeds.

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

Channel Migration Tendency(13): None observed, appears to have little or no tendency to migrate.

Observations and Other Comments: ____

**Reported by:** Mark Potratz **Date:** 9/2/2005

**GEOTECHNICALLY ADJUSTED SCOUR ELEVATIONS(14)** Feet ✓ Meters ____

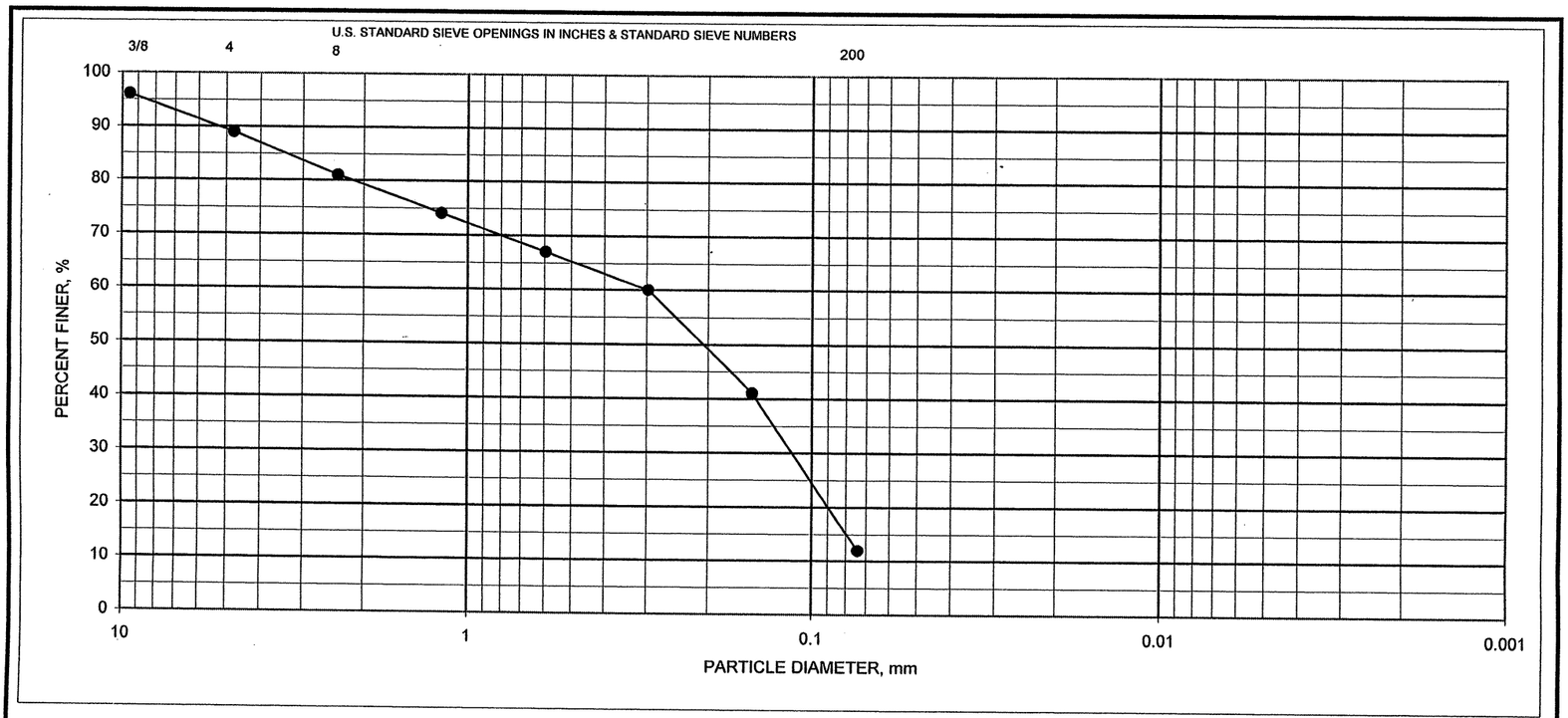
| | BENTS B1 | B2 | B3 | B4 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 year | -9.2 | -9.2 | -7.7 | -8.4 | | | | | | | |
| 500 year | -12.9 | -12.9 | -11 | -11.7 | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Comparison of GASE to Hydraulics Unit theoretical scour:

**GASE determined by:** Clark McNeely **Date:** 8/19/05

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

| Bed or Bank | bed | bank | | | | | |
|---|---|---|---|---|---|---|---|
| Sample No. | SS-13 | SS-21 | | | | | |
| Retained #4 | 0 | 0 | | | | | |
| Passed #10 | 100 | 100 | | | | | |
| Passed #40 | 97 | 93 | | | | | |
| Passed #200 | 28 | 14.6 | | | | | |
| Coarse Sand | 19 | 1 | | | | | |
| Fine Sand | 56 | 79 | | | | | |
| Silt | 8 | nm | | | | | |
| Clay | 17 | nm | | | | | |
| LL | 24 | nm | | | | | |
| PI | 5 | nm | | | | | |
| AASHTO | A-2-4 (0) | A-2-4 | | | | | |
| Station | 12+70 | 12+95 | | | | | |
| Offset | 9.5 RT | 40 LT | | | | | |
| Depth | 0-1.5' | 0-1' | | | | | |




## GRAIN SIZE DISTRIBUTION CURVE

| BORING NO. | SAMPLE NO. | DEPTH | LABORATORY ID # | AASHTO SYMBOL | NAT. WC, % | ATTERBERG LIMITS LL | PL | PI |
|---|---|---|---|---|---|---|---|---|
| B 1-B | SS-8 | 0-1.5' | **SS-8 - CREEK BED** | A-2-4 | 14.6 | 24 | 19 | 5 |

PROJECT NCDOT Bridge 212

Craven County JOB NO. 70055051 DATE 8/8/2005

N:\40\Lab\Projects\PROJECTS\NCDOT Bridge 212\[SS-10 B 1-B Plot.xls]ACT DATA

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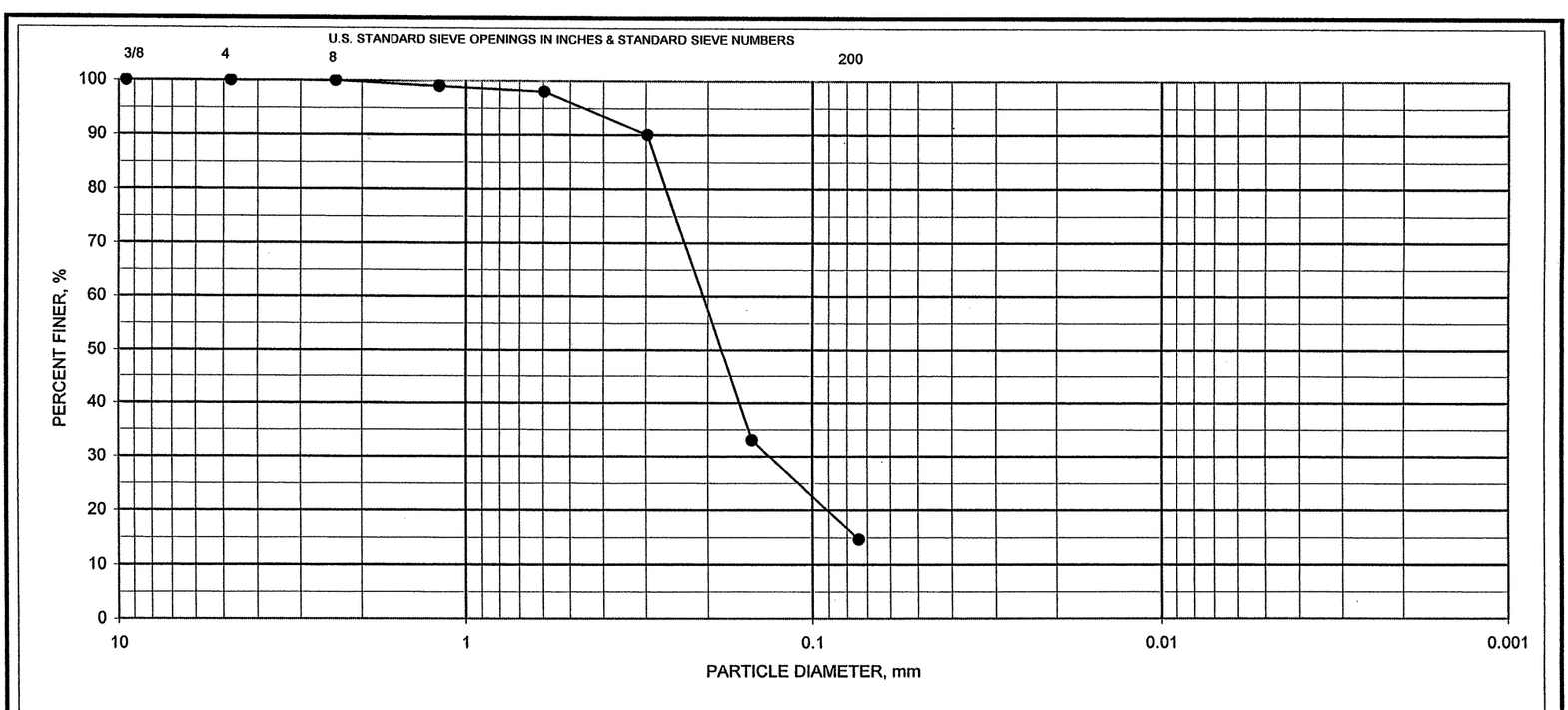


## GRAIN SIZE DISTRIBUTION CURVE

| BORING NO. | SAMPLE NO. | DEPTH | LABORATORY ID # | AASHTO SYMBOL | NAT. WC, % | ATTERBERG LIMITS LL | PL | PI |
|---|---|---|---|---|---|---|---|---|
| Creek Bank | SS-21 | 0 - 1.0 | **SS-21 - CREEK BANK** | A-2-4 | 37.5 | nm | nm | nm |

PROJECT NCDOT Bridge 212

Craven County JOB NO. 70055051 DATE 8/8/2005

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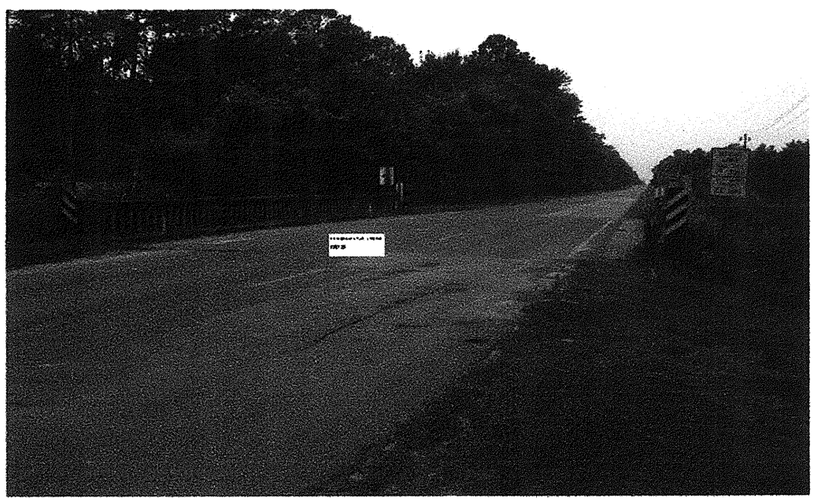
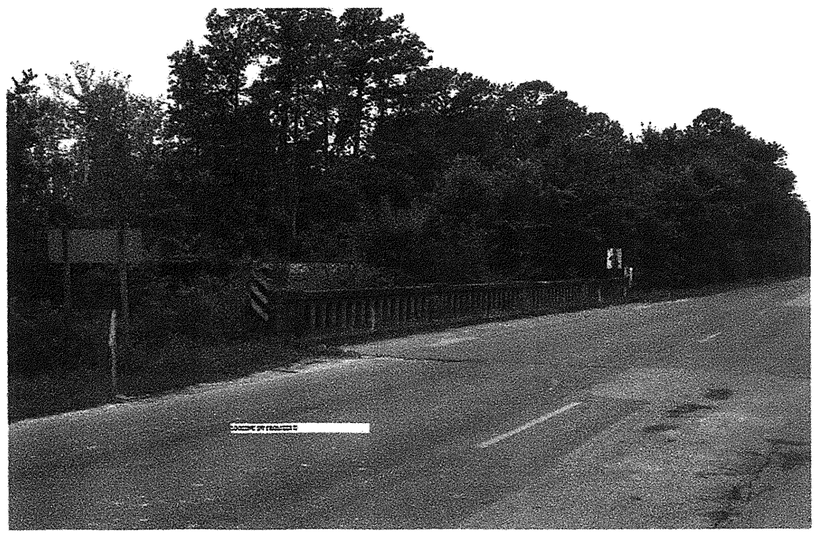
**SITE PHOTOGRAPHS**
Bridge # 212 over Bachelor Creek on SR 1005
NCDOT Project 833444.1.1 (B-4085)



**View along "B" borings from End Bent 2 towards End Bent 1**



**View along "A" Borings from End Bent 2 towards End Bent 1**

**SITE PHOTOGRAPHS**
Bridge # 212 over Bachelor Creek on SR 1005
NCDOT Project 833444.1.1 (B-4085)

**View along end bent 2 looking south**

**View of Interior bents 1 and 2 looking North**