# FOUNDATION RECOMMENDATIONS REPORT
# BRIDGE NO. 121 ON SR 1103 (SILVERMINE CREEK ROAD) OVER SILVERMINE CREEK

**WBS No.: 17BP.14.R.36**
**Tip No.: NA**
**County: SWAIN**

**Prepared by:**

**AMEC Environment and Infrastructure, Inc.**
**4021 Stirrup Creek Drive, Suite 100**
**Durham, North Carolina 27703**
**(Project No. 6468-12-1103)**

**Prepared for:**

**STANTEC**

**August 29, 2012**

August 29, 2012

Stantec Consulting Services, Inc.
801 Jones Franklin Road, Suite 300
Raleigh, North Carolina 27606

Attention: Mr. Mike Lindgren, P.E.:

Subject: **Foundation Recommendations Report**
**Bridge No. 121 on SR 1103 (Silvermine Creek Road) over Silvermine Creek**
**WBS No.: 17BP.14.R.36**
**TIP No.: NA**
**Federal Aid No.: NA**
**County: Swain**
**AMEC Project Number: 6468-12-1103**

Dear Mr. Lindgren:

AMEC Environment and Infrastructure, Inc. (AMEC) is pleased to transmit the attached Foundation Recommendations Report associated with Bridge No. 121 on SR 1103 (Silvermine Creek Road) over Silvermine Creek between SR 1104 and SR 1105. The Structure Subsurface Exploration Report performed by AMEC is provided in the Appendix.

This Foundation Recommendations Report has been prepared using boring data obtained by AMEC. The recommendations for the Bridge foundations are based upon AASHTO LRFD bridge design procedures as required by the NCDOT.

If you have any questions regarding recommendations contained in this report, please contact us at 919-381-9900.

Sincerely,

**AMEC Environment and Infrastructure, Inc.**

J. Shane Johnson, P.E.
Senior Geotechnical Engineer
Registered, North Carolina 037422

Gary R. Taylor, P.E.
Geotechnical Department Manager
Registered, North Carolina 18580

NORTH CAROLINA PROFESSIONAL SEAL 037422 ENGINEER J. SHANE JOHNSON
8/29/12

**Correspondence:**
AMEC Environment & Infrastructure, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, North Carolina 27703
Tel (919) 381-9900
Fax (919) 381-9901
Licensure: NC Engineering F-1253 NC Geology C-247

# FOUNDATION RECOMMENDATIONS

STATE NO. 17BP.14.R.36
T.I.P. NO. NA
COUNTY Swain
STATION 12+66.48 -L-

DESCRIPTION Bridge 121 on SR 1103 (Silvermine Creek Road) over Silvermine Creek

| | INITIALS | DATE |
|---|---|---|
| DESIGN | JSJ | 8/29/2012 |
| CHECK | SG | 8/29/12 |
| APPROVAL | | |

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 037422 ENGINEER J. SHANE JOHNSON
8/29/12
SIGNATURE J. Shane Johnson

| BENT | STATION | FOUNDATION TYPE | FACTORED RESISTANCE | MISCELLANEAOUS DETAILS |
|---|---|---|---|---|
| END BENT 1 | 12+49.72 -L- | Spread Footings | 4 TSF | Bottom of Footing Elevation = 2011.5 feet |
| END BENT 2 | 12+83.01 -L- | Spread Footings | 4 TSF | Bottom of Footing Elevation = 2010.5 feet |

## FOUNDATION RECOMMENDATION NOTES ON PLANS

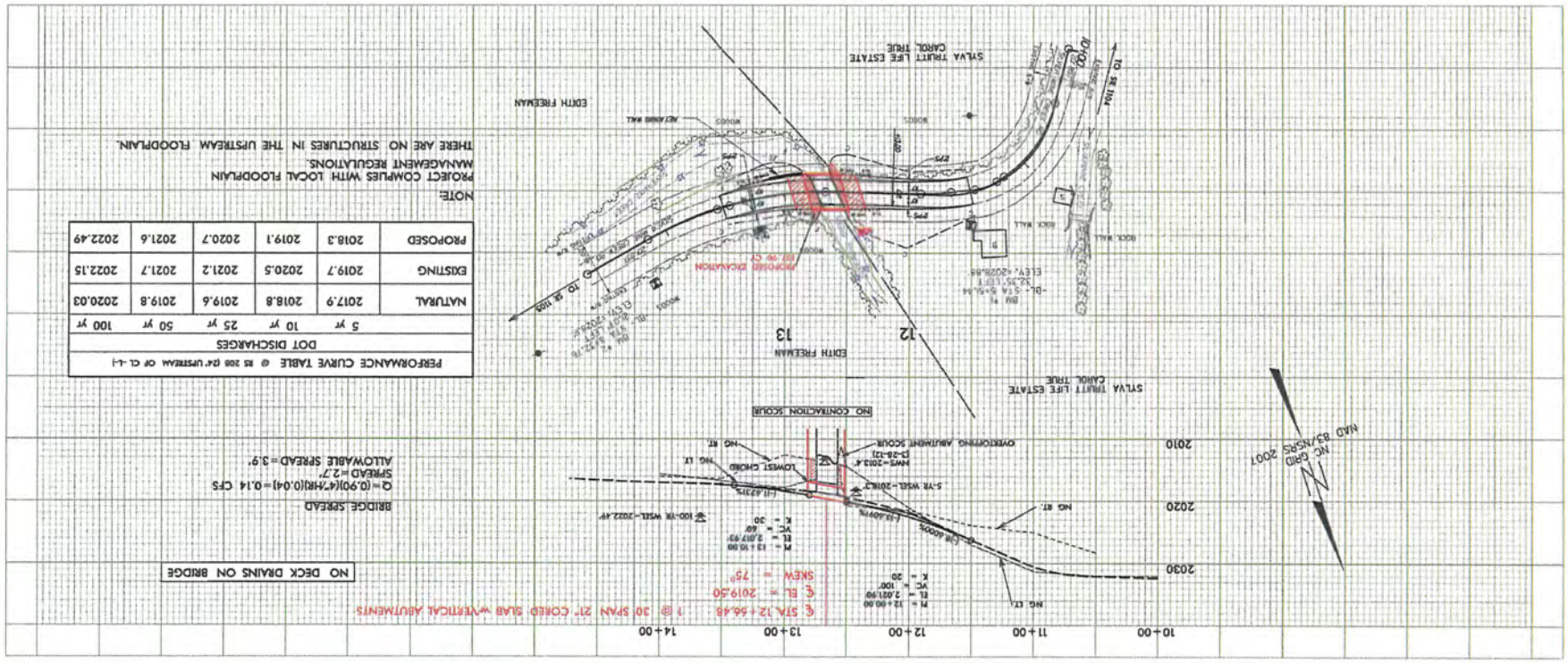
1. THE SCOUR CRITICAL ELEVATION FOR END BENT NO. 1 AND END BENT NO. 2 IS THE BOTTOM OF FOOTING ELEVATION. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF STRUCTURE.
2. THE SPREAD FOOTINGS AT END BENT NO. 1 AND END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 4 TSF. CHECK FIELD CONDITIONS FOR THE REQUIRED RESISTANCE OF 9 TSF JUST BEFORE PLACING CONCRETE.
3. TO PROVIDE PROTECTION FROM POSSIBLE SCOUR, DO NOT CONSTRUCT SPREAD FOOTINGS AT END BENT NO. 1 AND END BENT NO. 2 AT AN ELEVATION HIGHER THAN SHOWN ON THE PLANS.
4. KEY IN SPREAD FOOTINGS AT END BENT NO. 1 AND END BENT NO. 2 AT LEAST 12 INCHES INTO ROCK WITH MINIMUM THICKNESS AS SHOWN ON THE PLANS.

## FOUNDATION RECOMMENDATIONS COMMENTS

1. THE BOTTOM OF THE FOOTING ELEVATIONS MAY BE LOWERED IN ORDER TO SATISIFY THE REQUIRED BEARING RESISTANCE, FOOTING THICKNESS AND MINIMUM ROCK EMBEDMENT REQUIREMENTS.
2. THE PROJECT STRUCTURAL ENGINEER SHOULD SIZE THE SPREAD FOOTINGS TO ACCOUNT FOR SLIDING AND OVERTURNING WITH AN EQUIVALENT FLUID PRESSURE OF 40 PSF.

# APPENDIX

# PROVIDED INFORMATION




PERFORMANCE CURVE TABLE @ RS 208 (2' UPSTREAM OF CL -L-)

| DOT DISCHARGES | | | | | |
|---|---|---|---|---|---|
| | 5 yr | 10 yr | 25 yr | 50 yr | 100 yr |
| NATURAL | 2017.9 | 2018.8 | 2019.6 | 2019.8 | 2020.03 |
| EXISTING | 2019.7 | 2020.5 | 2021.2 | 2021.7 | 2022.15 |
| PROPOSED | 2018.3 | 2019.1 | 2020.7 | 2021.6 | 2022.49 |

## INFORMATION TO BE SHOWN ON PLANS

Design: Discharge 480 c.f.s. Frequency 5 YR. Elev. 2018.3

Base Flood: Discharge 1280 c.f.s. Frequency 100 yr. Elev. 2022.49

Overtopping: Discharge 900 c.f.s. Frequency 25 YR. Elev. 2020.7

* NOTE: DESIGN FOLLOWS SUB-REGIONAL TIER GUIDELINES.
EXISTING HYDRAULIC LEVEL OF SERVICE IS MAINTAINED.

## ADDITIONAL INFORMATION AND COMPUTATIONS

DA = 3.07 SQ. MI.

USGS RURAL REGRESSION EQUATIONS (SIR 2009-5158) 100% REGION 2

Q(5) = 480 CFS

Q(10) = 660 CFS

Q(25) = 900 CFS

Q(50) = 1070 CFS

Q(100) = 1280 CFS

**OVERTOPPING (25-YR) CONTRACTION SCOUR**

$Y_o = Y_1(Q_o/Q_1)\ [W_1/W_o]$ $Y_o = 5.13\ [775/859]\ [17.6/17.6]^{0.67} = 4.70$

$Y_s = Y_o - Y_o$ $Y_s = Y_o - Y_o = 4.70 - 5.13 = -0.43$ **NO CONTRACTION SCOUR**

**OVERTOPPING (25-YR) ABUTMENT SCOUR**

$Y_s = Y_o\ [2.27\ K_1 K_2]\ [B/Y_o]^{0.43}\ [Fr]^{0.61} + 1$

$Y_s = 1.09\ [2.27\ (1)]\ [2.50/1.09]^{0.43}\ [0.21]^{0.61} + 1$

$Y_s = 2.83$ **EB#1 ABUTMENT SCOUR=2.8'**

$Y_s = Y_o\ [2.27\ K_1 K_2]\ [B/Y_o]^{0.43}\ [Fr]^{0.61} + 1$

$Y_s = 9\ [2.27\ (1)]\ [0/9]^{0.43}\ [0.12]^{0.61} + 1$

$Y_s = 9$ **EB#2 NO ABUTMENT SCOUR**

## SITE DATA

Drainage Area 3.07 SQ. MI. Source USGS QUAD MAP "WEBSER"

River Basin LITTLE TENNESSEE Character RURAL MOUNTAINS

Stream Classification (Such as Trout, High Quality Water, etc.) "C"

Data on Existing Structure 1 @ 18'4" TIMBER FLOOR ON TIMBER JOISTS, CAPS, POSTS, ABUTMENTS

Waterway Opening 58 SQ. FT.

Debris Potential Low X Moderate High

Data on Structures Up and Down Stream 300 FT. U/S 1 @ 24' TIMBER FLOOR ON I-BEAMS #860114
0.5 MI D/S 2 @ 95" X 67" CMPA #860128

Design Control Elev. 2022.15' (EXISTING 100-YR. WSEL @ RS 208)

Gage Station No. NA Period of Records NA

Max. Discharge NA c.f.s. Date NA Frequency NA

Historical Flood Information: REQUESTED INFO. FROM BRIDGE MAINTENANCE SUPERVISOR BUT NO RESPONSE
LOCAL RESIDENT NOT AVAILABLE

Date Elev. Est. Freq. Source Period of Knowledge

Date Elev. Est. Freq. Source Period of Knowledge

Date Elev. Est. Freq. Source Period of Knowledge

Historical Scour Info.: General NONE Contraction NONE Local NONE

Channel Slope 0.0298 FT/FT Source USGS QUAD Normal Water Surface Elev. 2013.4 (3/2812)

Manning's n: Left O.B. 0.10 Channel 0.05 Right O.B. 0.10 Source FIELD SURVEY

Flood Study / Status NONE Floodway Established? NA

Flood Study 100 yr. Discharge NA c.f.s.; W.S. Elev.: With Floodway NA Without Floodway NA

## DESIGN DATA

Hydrological Method USGS RURAL REGRESSION EQUATIONS (SIR 2009-5158) 100% REGION 2

Hydraulic Design Method HEC-RAS VER. 4.1.0 (860121) SWAIN CO. SILVERMINE CRK PB.0

| Floods Evaluated | Freq. | Q | Elev. | Backwater | Bridge Opening Velocity |
|---|---|---|---|---|---|
| | 5-YR | 480 | 2018.3 | 0.4 | 5.2 fps |
| | 10-YR | 660 | 2019.1 | 0.3 | 7.1 fps |
| | 25-YR | 900 | 2020.7 | 1.1 | 9.6 fps |
| | 50-YR | 1070 | 2021.6 | 1.8 | 10.8 fps |
| | 100-YR | 1280 | 2022.49 | 2.5 | 11.9 fps |

Waterway Opening Provided Below Design W.S. Elev. 93 sf 100yr W.S. Elev. 93 sf

Average Channel Velocity (Design) 4.4 fps Average Overbank Velocity (Design) 1.4 fps

Computed Scour: General NA Contraction NONE Local EB#1 VERTICAL ABUT.=2.8'

Is a Floodway Revision Required? NA

Stream SILVERMINE CREEK, Struc. Inv. No. 00121, I.D. No. SF-0860121 Project No. 17BP.14.R.36 PDF File SF-860121 2012 SF-860121 SILVERMINE Cr. SR1103.PDF

## BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

ATN

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N.C.

I.D. No. SF-860121 Project No. 17BP.14.R.36 Proj. Station 12+66.48 -L-

County SWAIN Bridge Over SILVERMINE CREEK SR 1104 Bridge Inv. No. 121 SR 1105
SR 1103
On Highway (SILVERMINE RD.) Between (TAYLOR RD.) and (EAST SILVERMINE RD.)

Recommended Structure 1 @ 30' SPAN 21" CORED SLAB w/VERT. ABUTS; STAGED CONSTRUCTION

Recommended Width of Roadway 27'-10" CLEAR WIDTH; 30'-0" OUT TO OUT Skew 75°

Recommended Location is (Up, At, Down) Stream from Existing Crossing AT

Nearest Shipping Point WEBSER On GSM R.R. 1.9 Miles From Bridge

Bench Mark is BM. 1 22.35' LT. BL STA. 5+51.44 8" SPIKE IN 12" WALNUT TREE

Elev. 2028.88 Datum NAVD 88

Temporary Crossing ONE-LANE TWO-WAY TRAFFIC TO BE MAINTAINED ON WIDENED EXISTING BRIDGE

Designed by WK Ritchell Engineering

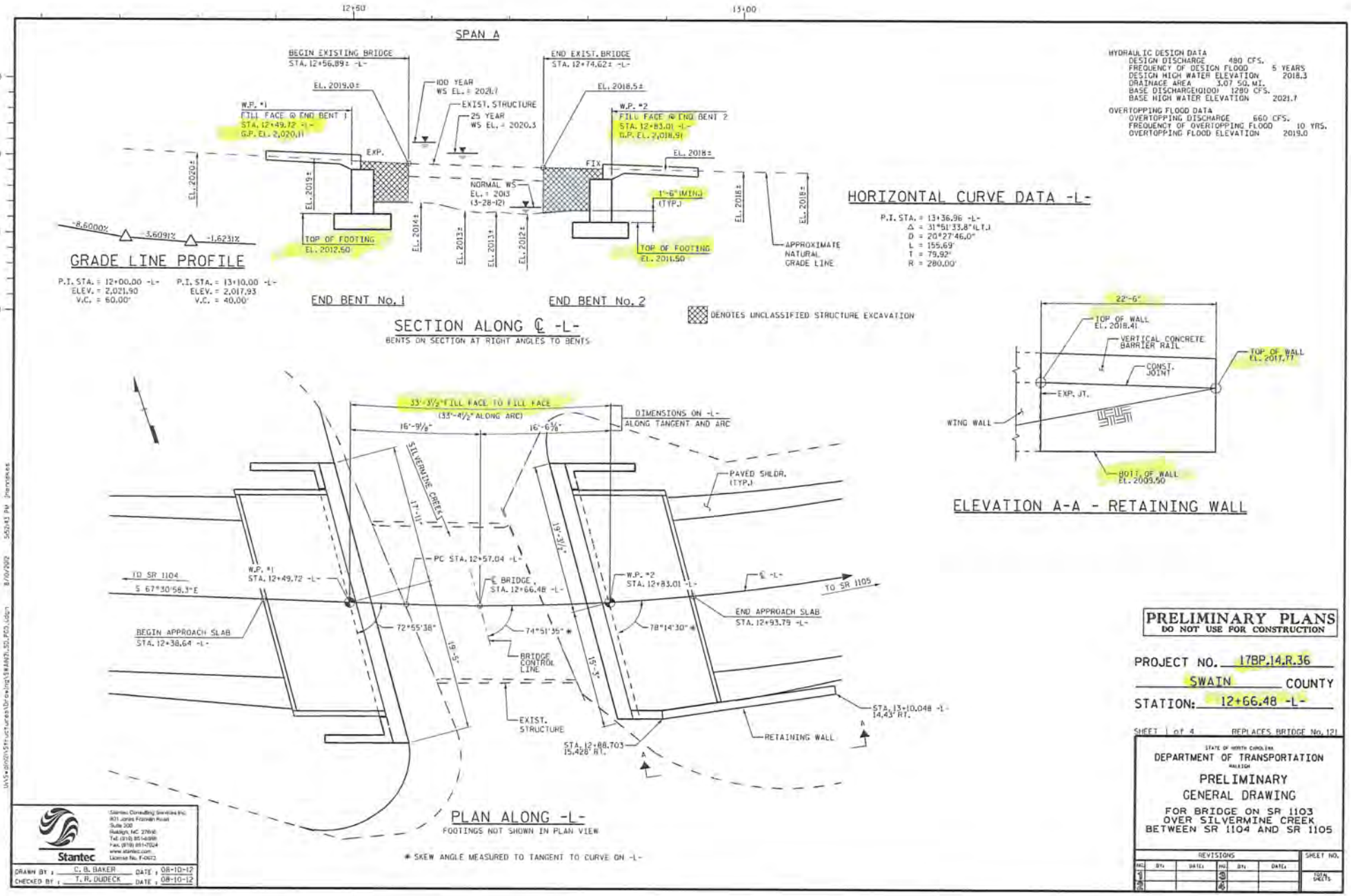
Assisted by PAUL SHEPARD Date JUNE 5, 2012

Project Engineer JAMES C. DAVIS, PE

Reviewed by 7/20/12

NORTH CAROLINA PROFESSIONAL SEAL 18462 ENGINEER JAMES C. DAVIS

7/20/12




**PRELIMINARY PLANS**
**DO NOT USE FOR CONSTRUCTION**

PROJECT NO. 17BP.14.R.36

SWAIN COUNTY

STATION: 12+66.48 -L-

SHEET 1 of 4 REPLACES BRIDGE No. 121

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRELIMINARY
GENERAL DRAWING

FOR BRIDGE ON SR 1103
OVER SILVERMINE CREEK
BETWEEN SR 1104 AND SR 1105

| REVISIONS | | | | | | | | SHEET NO. |
|---|---|---|---|---|---|---|---|---|
| NO. | BY: | DATE: | NO. | BY: | DATE: | | | TOTAL SHEETS |
| | | | | | | | | |

Stantec

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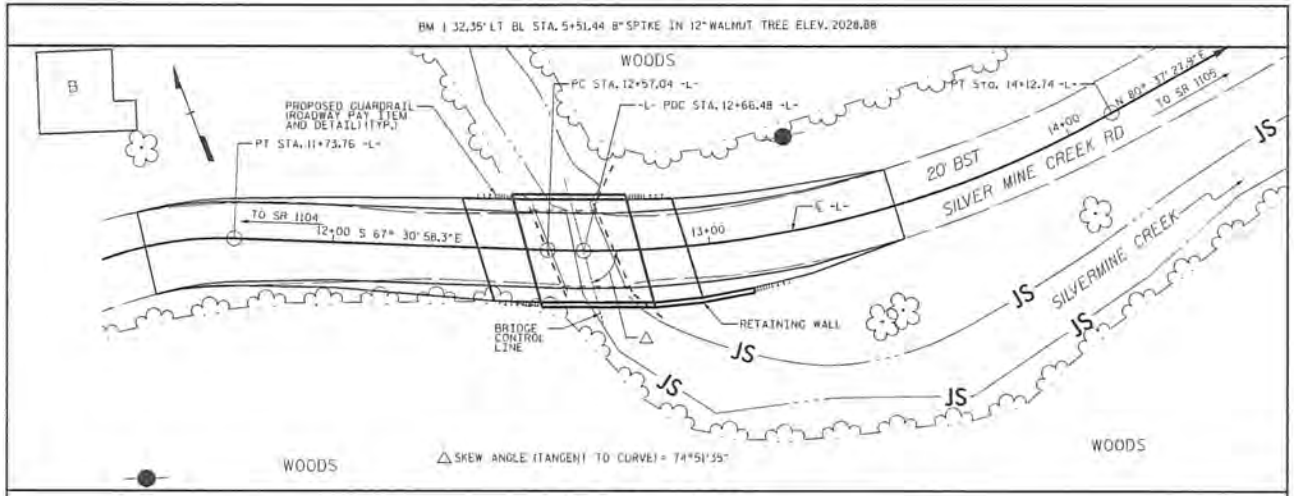
www.stantec.com
License No. F-0672

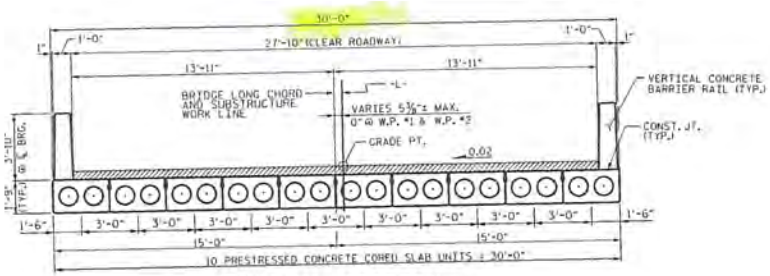
DRAWN BY : C. B. BAKER DATE : 08-10-12
CHECKED BY : T. R. DUDECK DATE : 08-10-12

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

THIS BRIDGE HAS BEEN DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR SEISMIC PERFORMANCE ZONE 1.




LOCATION SKETCH




TYPICAL SECTION

SPAN IS 10 SIMPLY SUPPORTED 21" CORED SLAB UNITS W/ ASPHALT WEARING SURFACE

**PRELIMINARY PLANS**
**DO NOT USE FOR CONSTRUCTION**

PROJECT NO. 17BP.14.R.36

SWAIN COUNTY

STATION: 12+66.48 -L-

SHEET 2 of 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRELIMINARY
GENERAL DRAWING

FOR BRIDGE ON SR 1103
OVER SILVERMINE CREEK
BETWEEN SR 1104 AND SR 1105

| REVISIONS | | | | | | | | SHEET NO. |
|---|---|---|---|---|---|---|---|---|
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DRAWN BY : J. L. HENNEKES DATE : 08-10-12
CHECKED BY : T. R. DUDECK DATE : 08-10-12

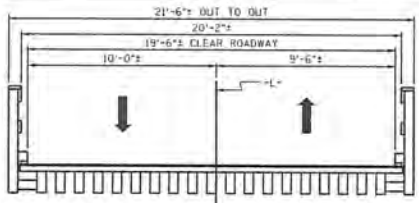
U:\Swain\015\Structures\Drawings\STARRS_SB_PRO_2.dgn 8/10/2012 3:30:46 PM jhennekes

NOTES:

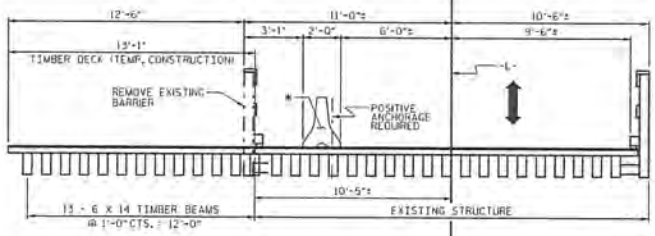
* DENOTES PORTABLE CONCRETE BARRIER PER NCDOT STANDARD 1170.01.

** SAW CUT EXISTING BRIDGE. REMOVE EXISTING DECK AND BEAMS RIGHT OF THIS LINE.

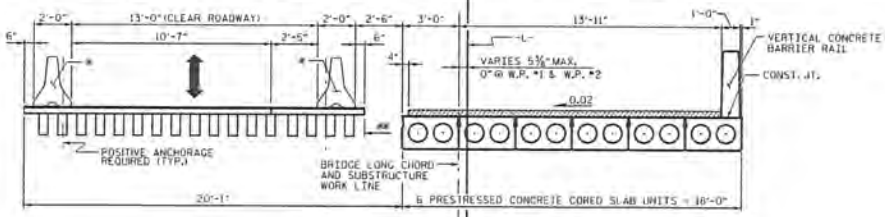
EXISTING TYPICAL SECTION



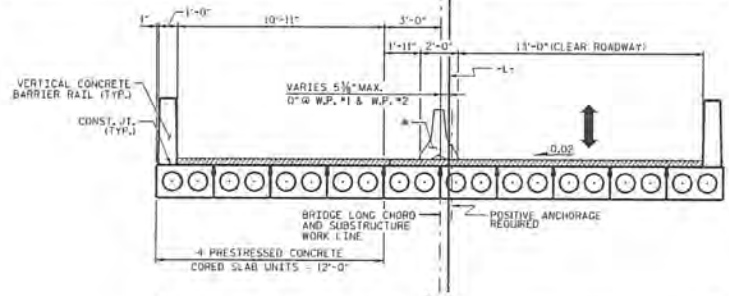

STAGE I TYPICAL SECTION



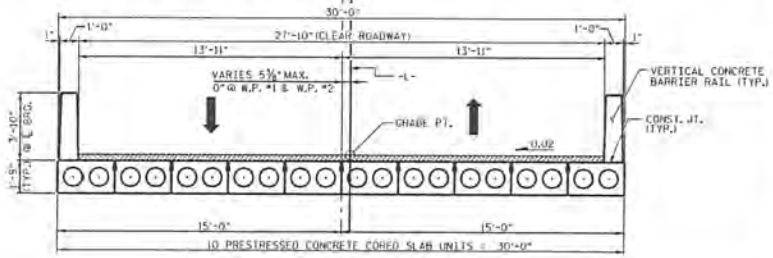

STAGE II TYPICAL SECTION




STAGE III TYPICAL SECTION




FINAL CONSTRUCTION




**PRELIMINARY PLANS**
**DO NOT USE FOR CONSTRUCTION**

PROJECT NO. 17BP.14.R.36

SWAIN COUNTY

STATION: 12+66.48 -L-

SHEET 4 of 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRELIMINARY

STAGING DRAWING

| REVISIONS | | | | | | | SHEET NO. |
|---|---|---|---|---|---|---|---|
| NO. | BY: | DATE: | NO. | BY: | DATE: | | TOTAL SHEETS |
| | | | | | | | |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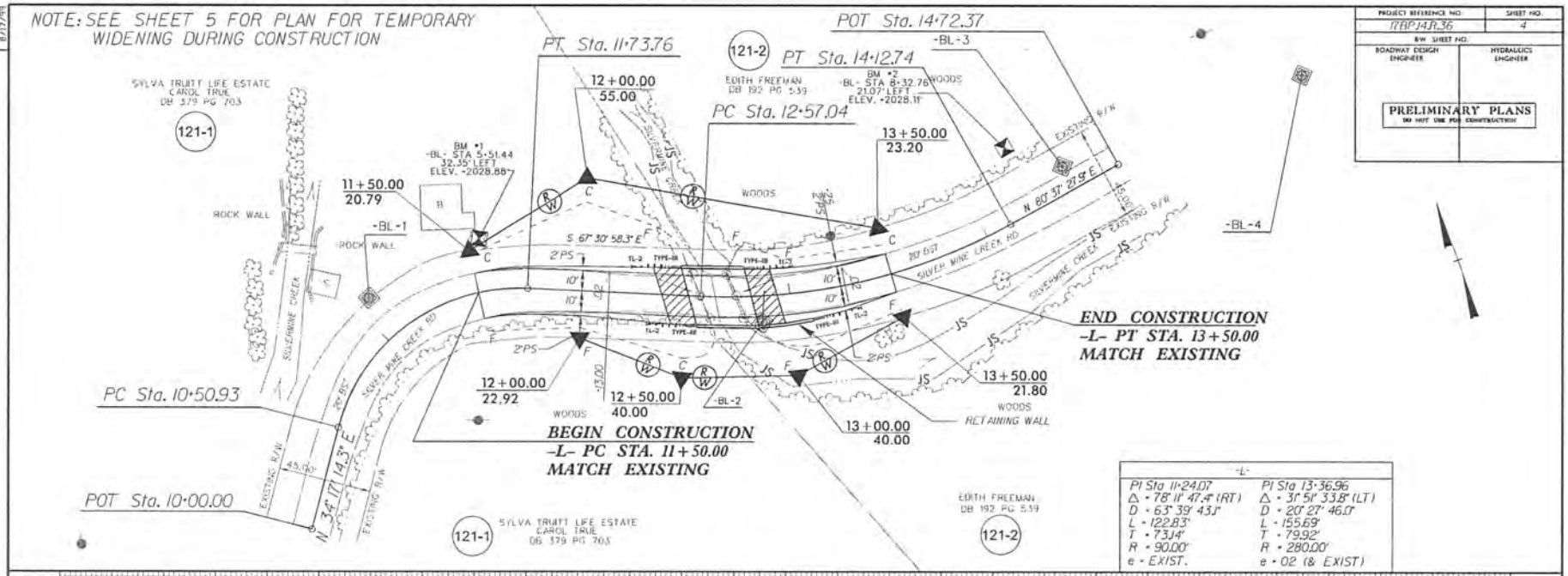
DRAWN BY : C. B. BAKER DATE : 08-10-12

CHECKED BY : T. H. OUDECK DATE : 08-10-12

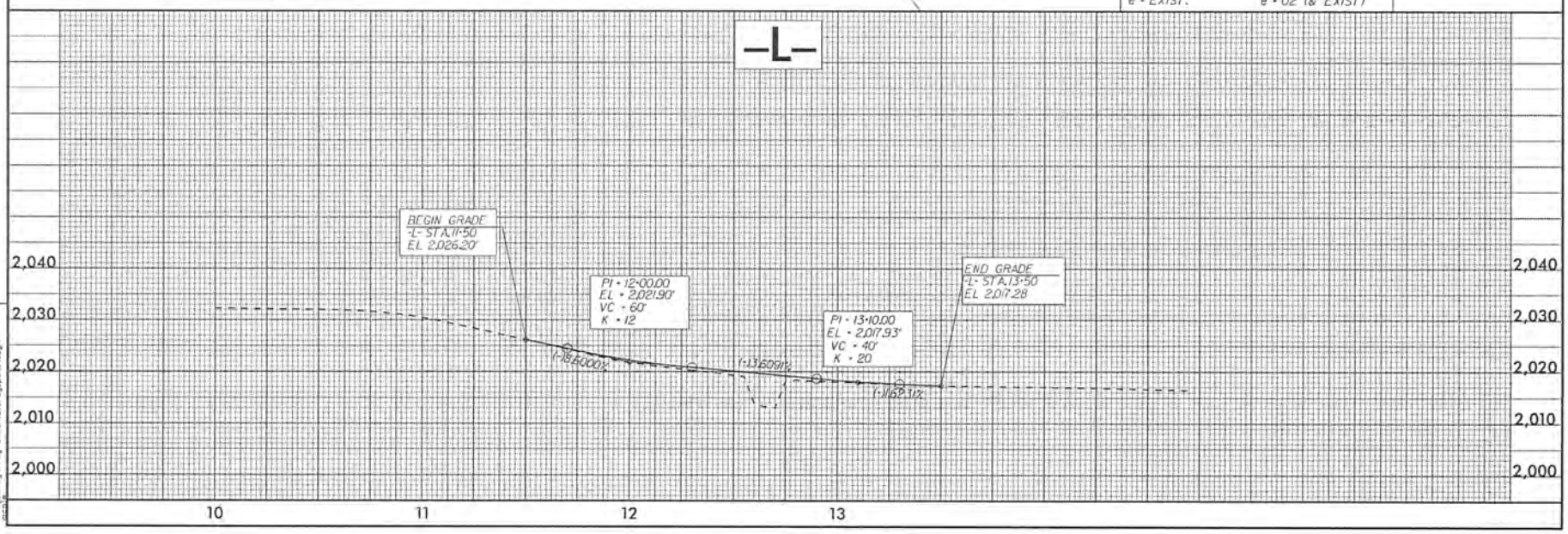
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| TRP14R36 | 4 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

**PRELIMINARY PLANS**
DO NOT USE FOR CONSTRUCTION

NOTE: SEE SHEET 5 FOR PLAN FOR TEMPORARY WIDENING DURING CONSTRUCTION




| -L- | |
|---|---|
| PI Sta 11+24.07 | PI Sta 13+36.96 |
| Δ = 78° 11' 47.4" (RT) | Δ = 31° 51' 33.8" (LT) |
| D = 63° 39' 43.1" | D = 20° 27' 46.0" |
| L = 122.83' | L = 155.69' |
| T = 73.14' | T = 79.92' |
| R = 90.00' | R = 280.00' |
| e = EXIST. | e = .02 (& EXIST) |




REVISIONS

8/17/99

8/1/2012
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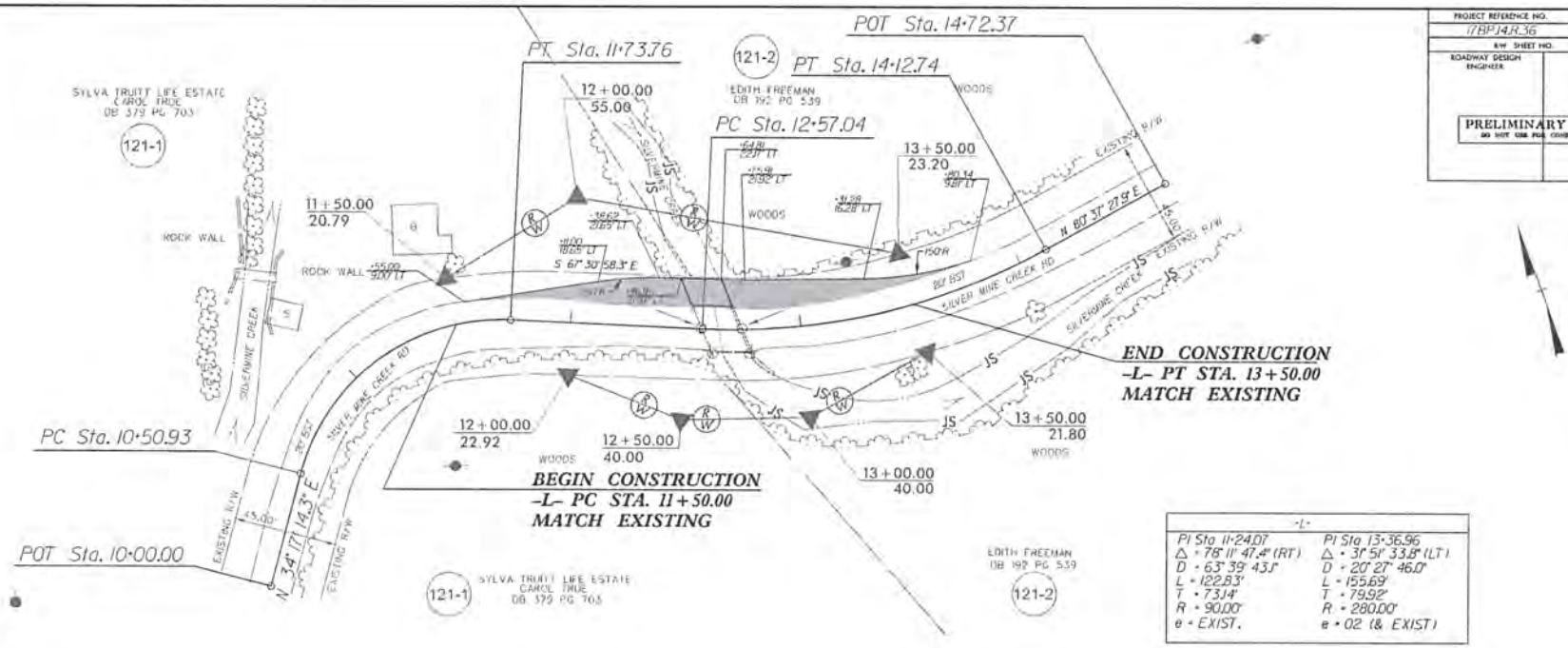
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| 17BP.14.R.36 | 5 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

**PRELIMINARY PLANS**
DO NOT USE FOR CONSTRUCTION




| -L- | |
|---|---|
| PI Sta 11+24.07 | PI Sta 13+36.96 |
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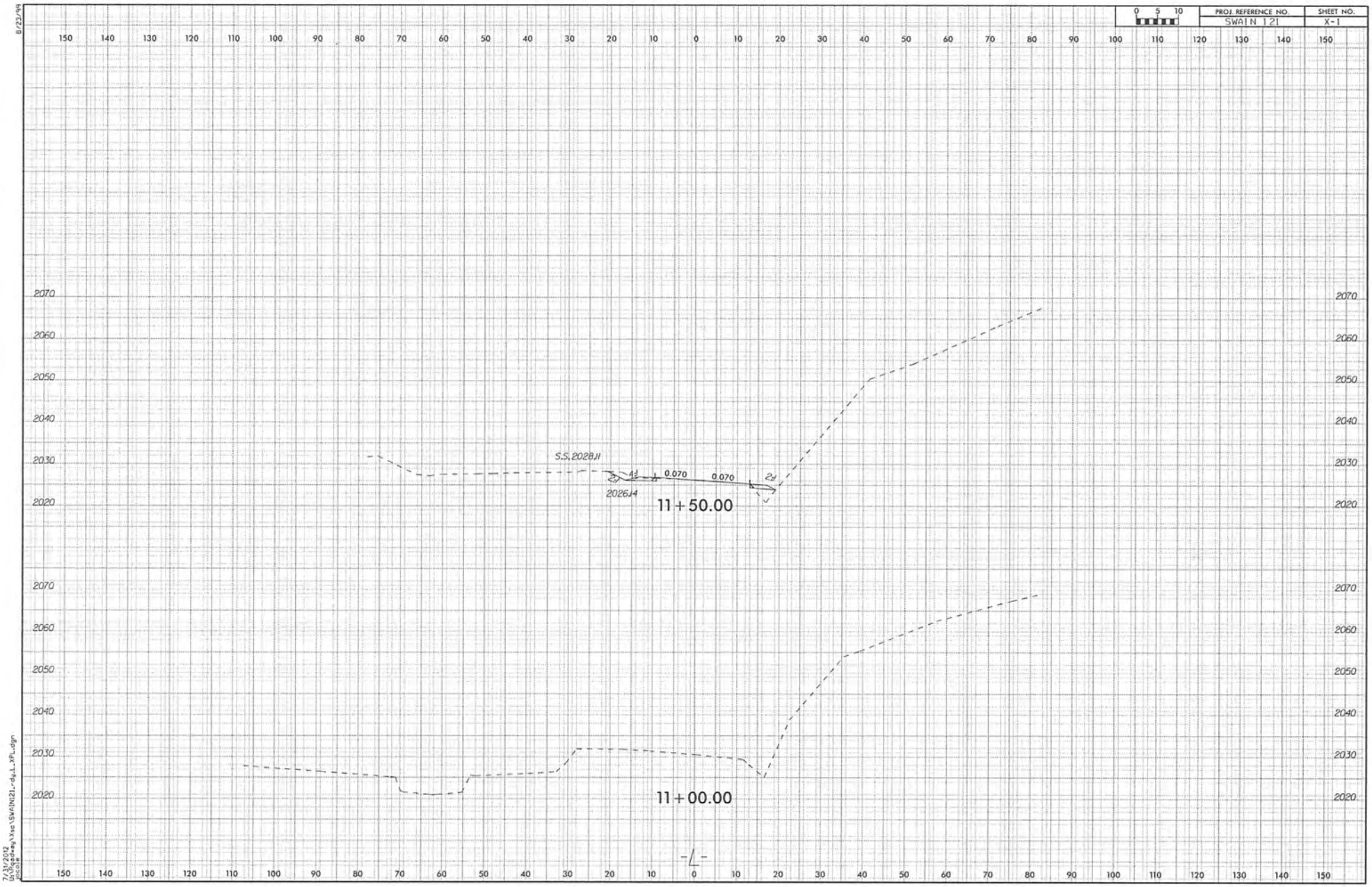
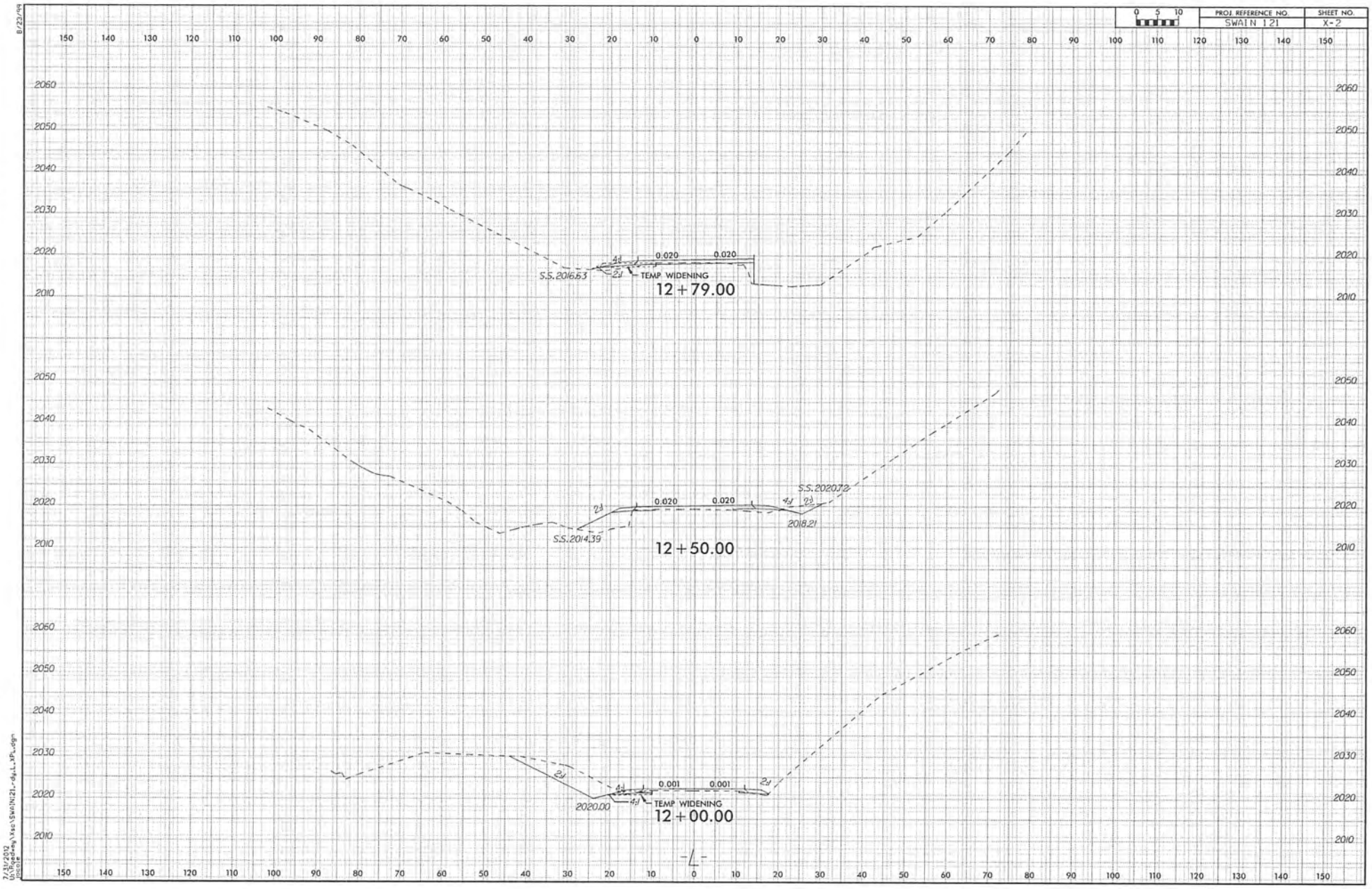
| T = 73.14' | T = 79.92' |
| R = 90.00' | R = 280.00' |
| e = EXIST. | e = .02 (& EXIST) |

PLAN OF PAVEMENT WIDENING FOR MAINTENANCE OF TRAFFIC

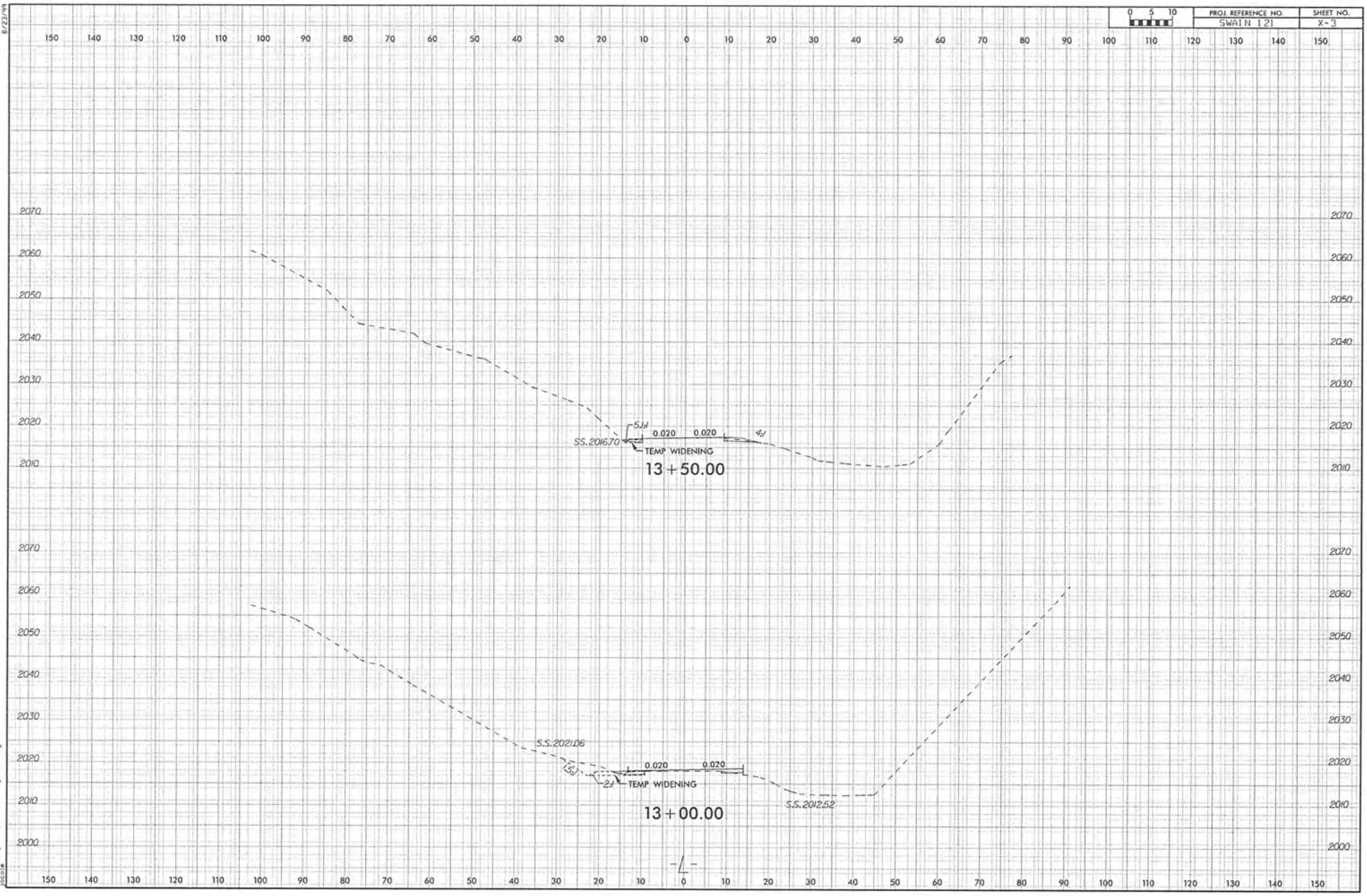
TEMPORARY CONSTRUCTION LIMITS SHOWN

NOTE: SEE SHEET 4 FOR FINAL PLAN

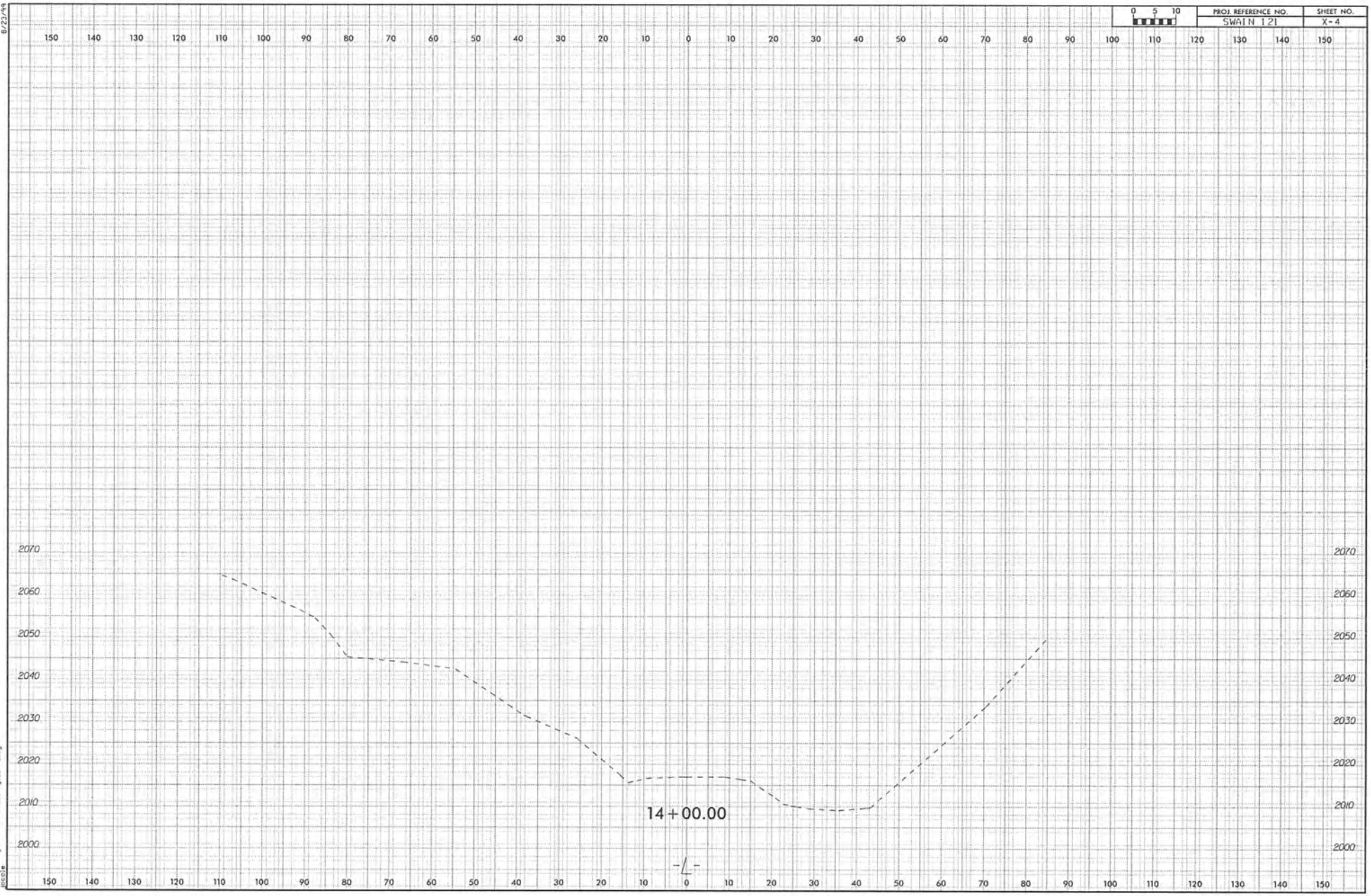

0 5 10
PROJ. REFERENCE NO.
SWAIN 121
SHEET NO.
X-1
S.S. 2028J1
2026J4
0.070
0.070
11+50.00
11+00.00
2070
2060
2050
2040
2030
2020
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



PROJ. REFERENCE NO.
SWAIN 121
SHEET NO.
X-2
0 5 10
S.S. 2016.63
0.020
0.020
TEMP. WIDENING
12+79.00
S.S. 2014.39
0.020
0.020
S.S. 2020.72
2018.21
12+50.00
2020.00
0.001
0.001
TEMP. WIDENING
12+00.00
-L-



PROJ. REFERENCE NO.
SWAIN 121
SHEET NO.
X-3
0 5 10
SS.2016.70
5:1
0.020
0.020
4:1
TEMP WIDENING
13+50.00
S.S.2021.06
1.5:1
2:1
0.020
0.020
TEMP WIDENING
S.S.2012.52
13+00.00
-L-



PROJ. REFERENCE NO.
SWAIN 121
SHEET NO.
X-4
0 5 10
14+00.00
-L-
2070
2060
2050
2040
2030
2020
2010
2000
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
8/23/99
7/31/2012

# FOUNDATION CALCULATIONS

# FOR END BENT NO. 1

# AND

# END BENT NO. 2

amec

AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6468-12-1103 SHEET ____ OF ____ X
PHASE ____ TASK ____ X
JOB NAME GROUP 7 BR. 121 X
BY JSJ DATE 8/28/12 X
CHECKED BY ____ DATE ____ X

BRIDGE NO. 121, SWAIN COUNTY

- BEGIN BRIDGE AT STATION 12+49.72 -L- ✓
- END BRIDGE AT STATION 12+83.01 -L-
- Length of Bridge ALONG -L- = (33' 4 1/2" Along Arc).
- Recommended Structure = 1 @ 30' SPAN CORED SLAB w/ Vertical Abutments.
- Width = 30 Ft
- FOUNDATION TYPE = Spread Footings.
- Top of Footing for EB1 = El. 2012.5' (Preliminary General Drawings)

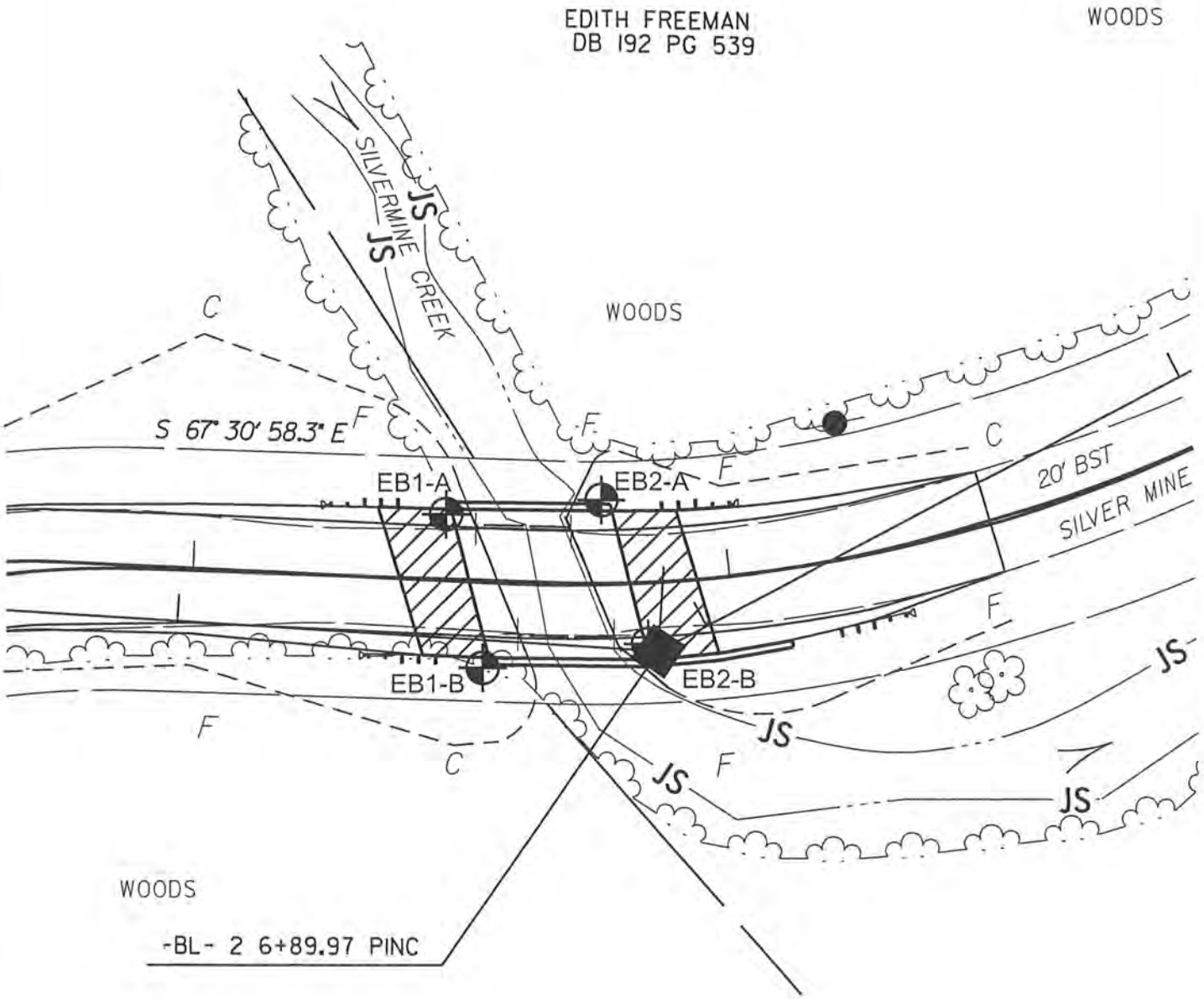
SUMMARY OF CONDITIONS AT EB1

| BORING NO. | Top of Footing | Top of NCR | Bearing Elev. | TOF to NCR |
|---|---|---|---|---|
| EB1-A | 2012.5' ✓ | 2012.4 ≈ 2012.5' ✓ | 2011.5' | 0.1' ≈ 0' ✓ |
| EB1-B | 2012.5 ✓ | 2014.1 ✓ | 2011.5' | -1.6' ✓ |

- Recommend Bottom of footing Elev. No higher than 2011.5'
- Recommend $R_R$ = 4 TSF

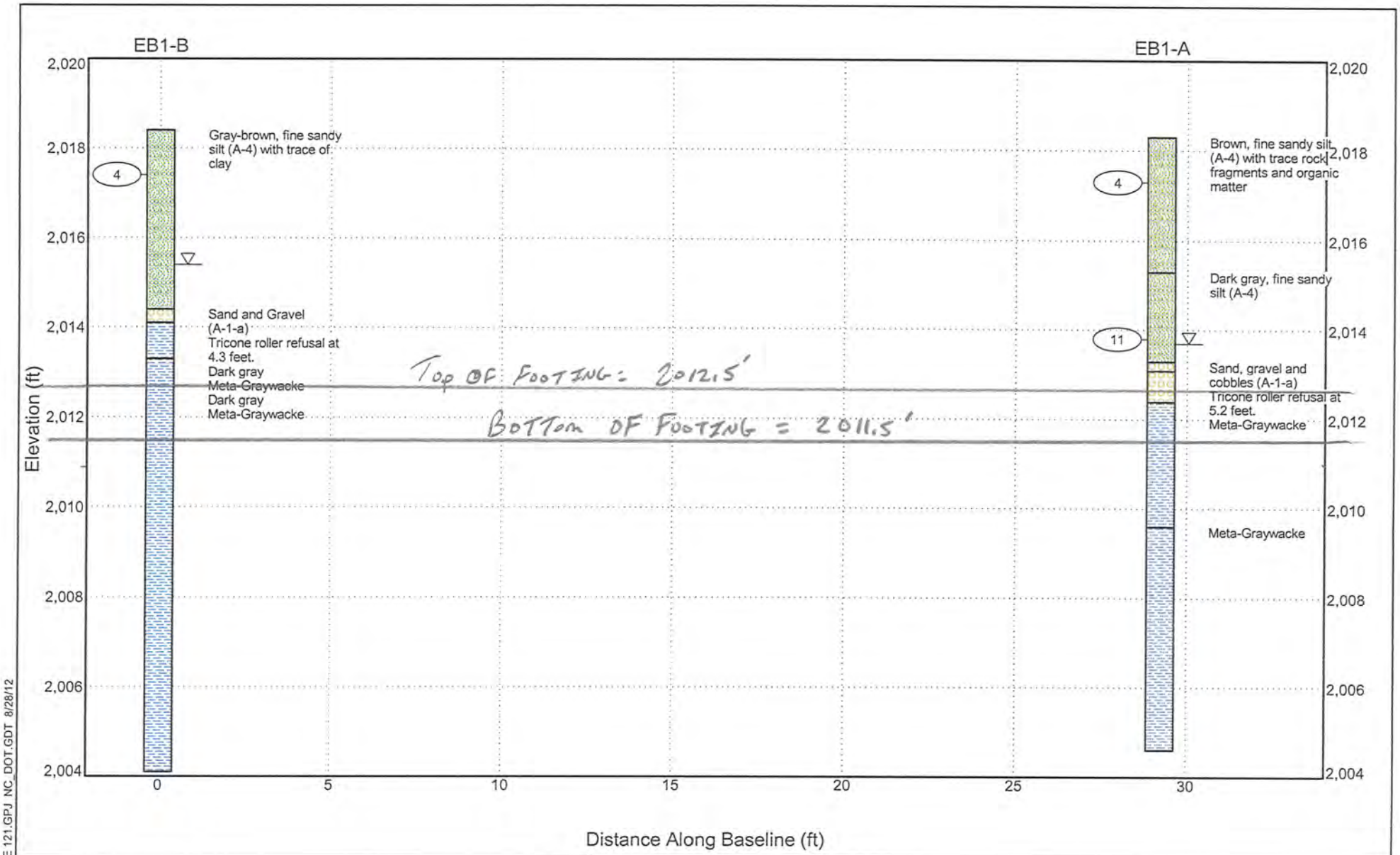
  $R_n$ = 4 TSF / 0.45 = 8.85 TSF ≈ 9 TSF
- BASED ON INSPECTION, A FACTORED BEARING Resistance of 4 TSF IS Recommended For footing Bearing IN NCR.
- Footing must Be "Keyed In" to Rock 12" (min). ✓
- By Inspection, Settlement of structure should be negligible if footing Bear in Rock. ✓

| DESCRIPTION: | | SHEET NO. | 3 |
|---|---|---|---|
| BRIDGE No. 121 ON SR 1103 (SILVERMINE CREEK ROAD) OVER SILVERMINE CREEK | ENGLISH | W.B S. NO.:17BP.14.R.36 | |
| | | T.I.P. NO.: | N/A |
| | | COUNTY: | SWAIN |




30' 0 30'

GRAPHIC SCALE - IN FEET




NCDOT PRINTER BRIDGE 121.GPJ NC_DOT.GDT 8/28/12

**NCDOT GEOTECHNICAL ENGINEERING UNIT**
**BORELOG REPORT**

**PROJECT NO.** 17BP.14.R.36
**ID.** 17BP.14.R.36
**COUNTY** SWAIN

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 12+47 | **OFFSET** 12 ft LT | **ALIGNMENT** -L- — **0 HR.** 4.6 |
| **COLLAR ELEV.** 2,018.3 ft | **TOTAL DEPTH** 13.7 ft | **NORTHING** 601,558 | **EASTING** 625,703 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,018.3 | 0.0 | | | | | | | | 2,018.3 GROUND SURFACE | 0.0 |
| | | | 1 | 2 | 2 | 4 | | M | | **ROADWAY EMBANKMENT** Brown, fine sandy silt (A-4) with trace rock fragments and organic matter | |
| 2015 | | | | | | Top of Footing = 2012.5' | | | | 2,015.3 | 3.0 |
| | 2,014.8 | 3.5 | 4 | 3 | 8 | 11 | | W | | **ALLUVIAL** Dark gray, fine sandy silt (A-4) | |
| | | | | | | | | | | 2,013.3 ≈ 2012.5' | 5.0 |
| | | | | | | | | | | 2,013.1 Sand, gravel and cobbles (A-1-a) | 5.2 |
| | | | | | | | | | | 2,012.4 Tricone roller refusal at 5.2 feet. | 5.9 |
| | | | | | | Bottom of Footing = 2011.5' | | | | **NON-CRYSTALLINE ROCK** Meta-Graywacke | |
| 2010 | | | | | | | | | | 2,009.6 | 8.7 |
| | | | | | | | | | | Meta-Graywacke | |
| 2005 | | | | | | | | | | 2,004.6 | 13.7 |
| | | | | | | | | | | Boring Terminated at Elevation 2,004.6 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 12+47 | **OFFSET** 12 ft LT | **ALIGNMENT** -L- — **0 HR.** 4.6 |
| **COLLAR ELEV.** 2,018.3 ft | **TOTAL DEPTH** 13.7 ft | **NORTHING** 601,558 | **EASTING** 625,703 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 8.5 ft | | |

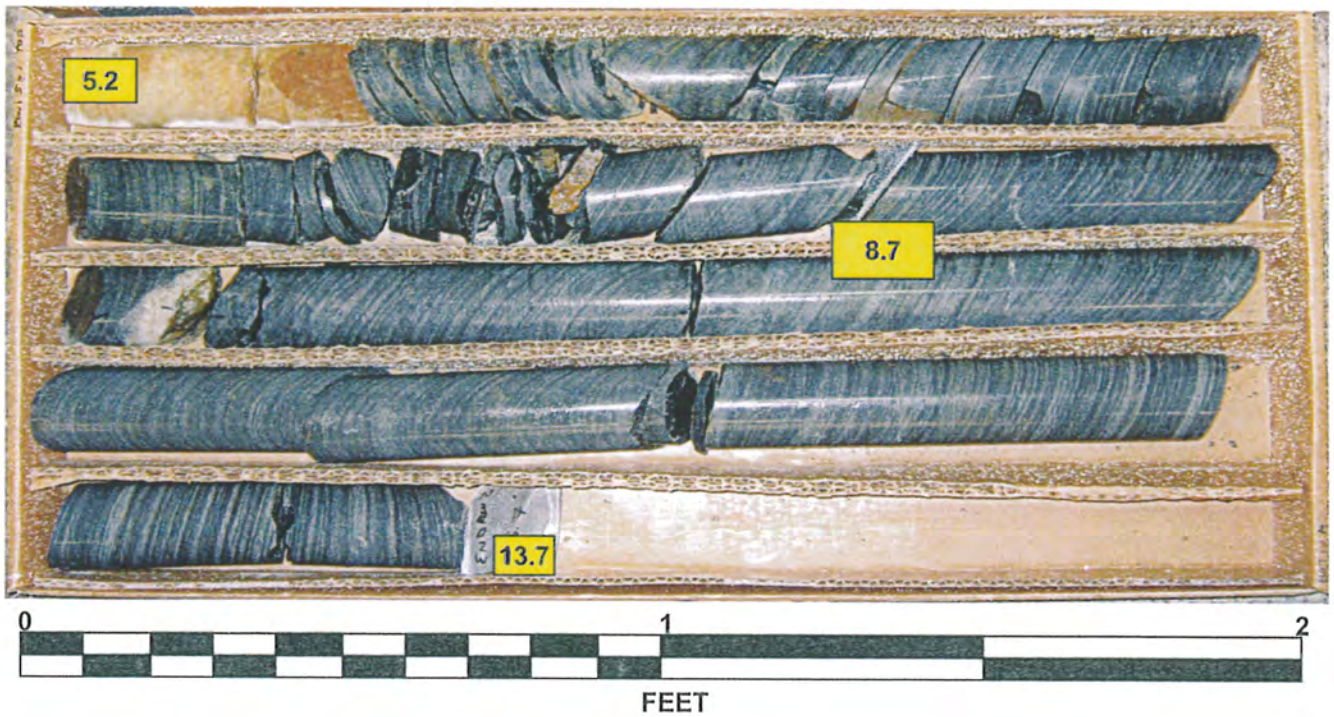
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013.1 | | | | | | | | | | | Begin Coring @ 5.2 ft |
| | 2,013.1 | 5.2 | 3.5 | 4:38 | (3.2) 91% | (2.3) 66% | | (0.4) 57% | NA | | 2,013.1 — 5.2 **ALLUVIAL** |
| | | | | 3:41 | | | | (2.8) 100% | (2.3) 82% | | 2,012.4 — 5.9 Sand, gravel and cobbles (A-1-a) |
| | | | | 3:42 | | | | | | | **NON-CRYSTALLINE ROCK** Dark Gray, moderate to very slightly weathered, medium hard to hard, very close to close fracture spacing, Meta-Graywacke |
| 2010 | 2,009.6 | 8.7 | | 1:45/0.5 | | | | | | | 2,009.6 — 8.7 |
| | | | 5.0 | 2:39 | (5.0) 100% | (5.0) 100% | | (5.0) 100% | (5.0) 100% | | Dark Gray, very slightly weathered to fresh, hard, close to moderately close fracture spacing, Meta-Graywacke |
| | | | | 3:01 | | | | | | | |
| | | | | 3:12 | | | | | | | |
| | | | | 2:02 | | | | | | | |
| 2005 | | | | 2:08 | | | | | | | |
| | 2,004.6 | 13.7 | | | | | | | | | 2,004.6 — 13.7 |
| | | | | | | | | | | | Boring Terminated at Elevation 2,004.6 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB1-A

**BOX 1 of 1: 5.2 - 13.7 FEET**



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 12+55 | **OFFSET** 16 ft RT | **ALIGNMENT** -L- — **0 HR.** 3.0 |
| **COLLAR ELEV.** 2,018.4 ft | **TOTAL DEPTH** 14.3 ft | **NORTHING** 601,529 | **EASTING** 625,700 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,018.4 | 0.0 | | | | | | | | 2,018.4 GROUND SURFACE | 0.0 |
| | | | 1 | 2 | 2 | | | M | | **ROADWAY EMBANKMENT** Gray-brown, fine sandy silt (A-4) with trace of clay | |
| 2015 | | | | | | | | | | | |
| | | | | | | Top of Footing = 2012.5' | | | | 2,014.4 | 4.0 |
| | | | | | | | | | | 2,014.1 | 4.3 |
| | | | | | | | | | | 2,013.3 **ALLUVIAL** Sand and Gravel (A-1-a) Tricone roller refusal at 4.3 feet. | 5.1 |
| | | | | | | Bottom of Footing = 2011.5' | | | | **NON-CRYSTALLINE ROCK** Dark gray Meta-Graywacke | |
| | | | | | | | | | | Dark gray Meta-Graywacke | |
| 2010 | | | | | | | | | | | |
| 2005 | | | | | | | | | | | |
| | | | | | | | | | | 2,004.1 | 14.3 |
| | | | | | | | | | | Boring Terminated at Elevation 2,004.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 12+55 | **OFFSET** 16 ft RT | **ALIGNMENT** -L- — **0 HR.** 3.0 |
| **COLLAR ELEV.** 2,018.4 ft | **TOTAL DEPTH** 14.3 ft | **NORTHING** 601,529 | **EASTING** 625,700 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 10.0 ft | | |

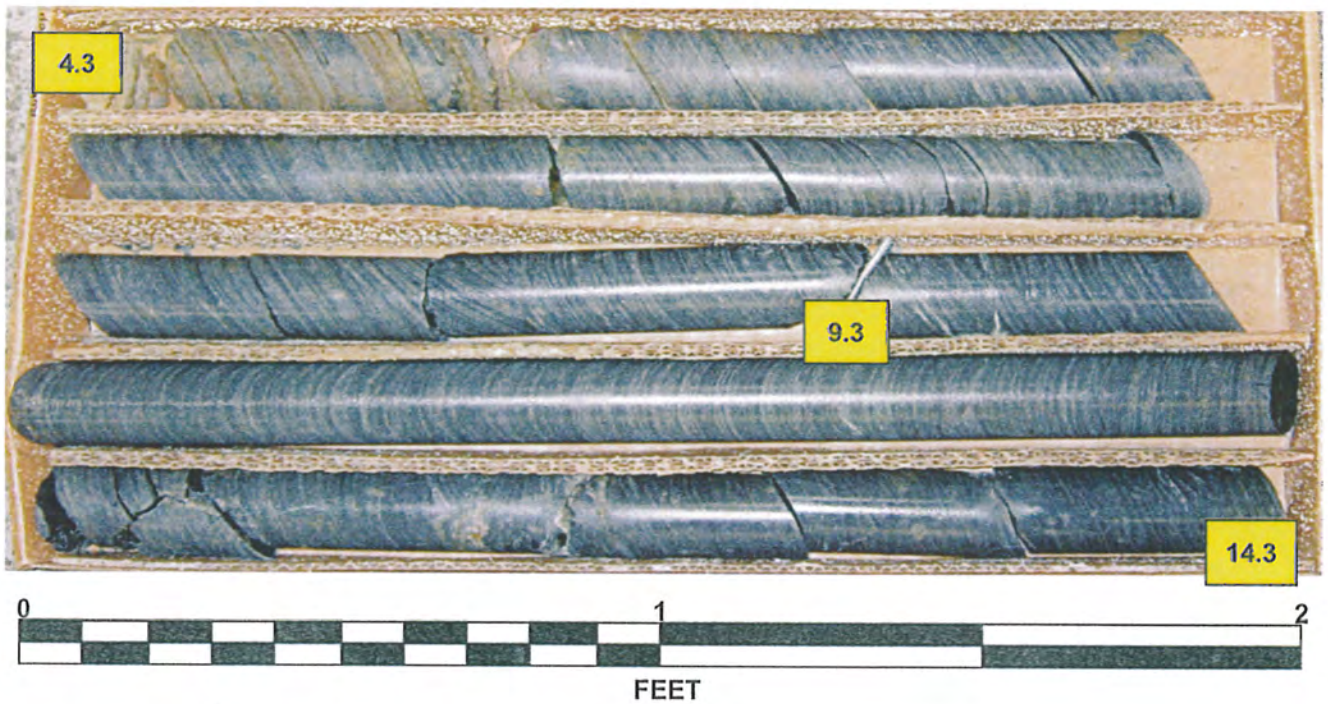
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014.1 | | | | | | | | | | | Begin Coring @ 4.3 ft |
| | 2,014.1 | 4.3 | 5.0 | 4:16 | (4.9) 98% | (3.5) 70% | | (0.8) 100% | (0.0) 0% | | 2,014.1 — 4.3 **NON-CRYSTALLINE ROCK** |
| | | | | 3:45 | | | | (8.7) 95% | (7.8) 85% | | 2,013.3 — 5.1 Dark gray, moderately severe weathered, medium hard, very close fracture spacing, Meta-Graywacke |
| | | | | 3:26 | | | | | | | Dark gray, slightly weathered to fresh, hard, close to moderalety close fracture spacing, Meta-Graywacke |
| | | | | 4:15 | | | | | | | |
| 2010 | | | | 3:27 | | | | | | | |
| | 2,009.1 | 9.3 | | | | | | | | | |
| | | | 5.0 | 2:24 | (4.6) 92% | (4.3) 86% | | | | | |
| | | | | 2:27 | | | | | | | |
| | | | | 2:32 | | | | | | | |
| | | | | 2:11 | | | | | | | |
| 2005 | | | | 2:40 | | | | | | | |
| | 2,004.1 | 14.3 | | | | | | | | | 2,004.1 — 14.3 Boring Terminated at Elevation 2,004.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB1-B

**BOX 1 of 1: 4.3 - 14.3 FEET**



amec

AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6468-12-1103 SHEET ____ OF ____ X
PHASE ____ TASK ____ X
JOB NAME Group T, Br. 121 X
BY JSJ DATE 8/28/12 X
CHECKED BY ____ DATE ____ X

BRIDGE No. 121, Swain County

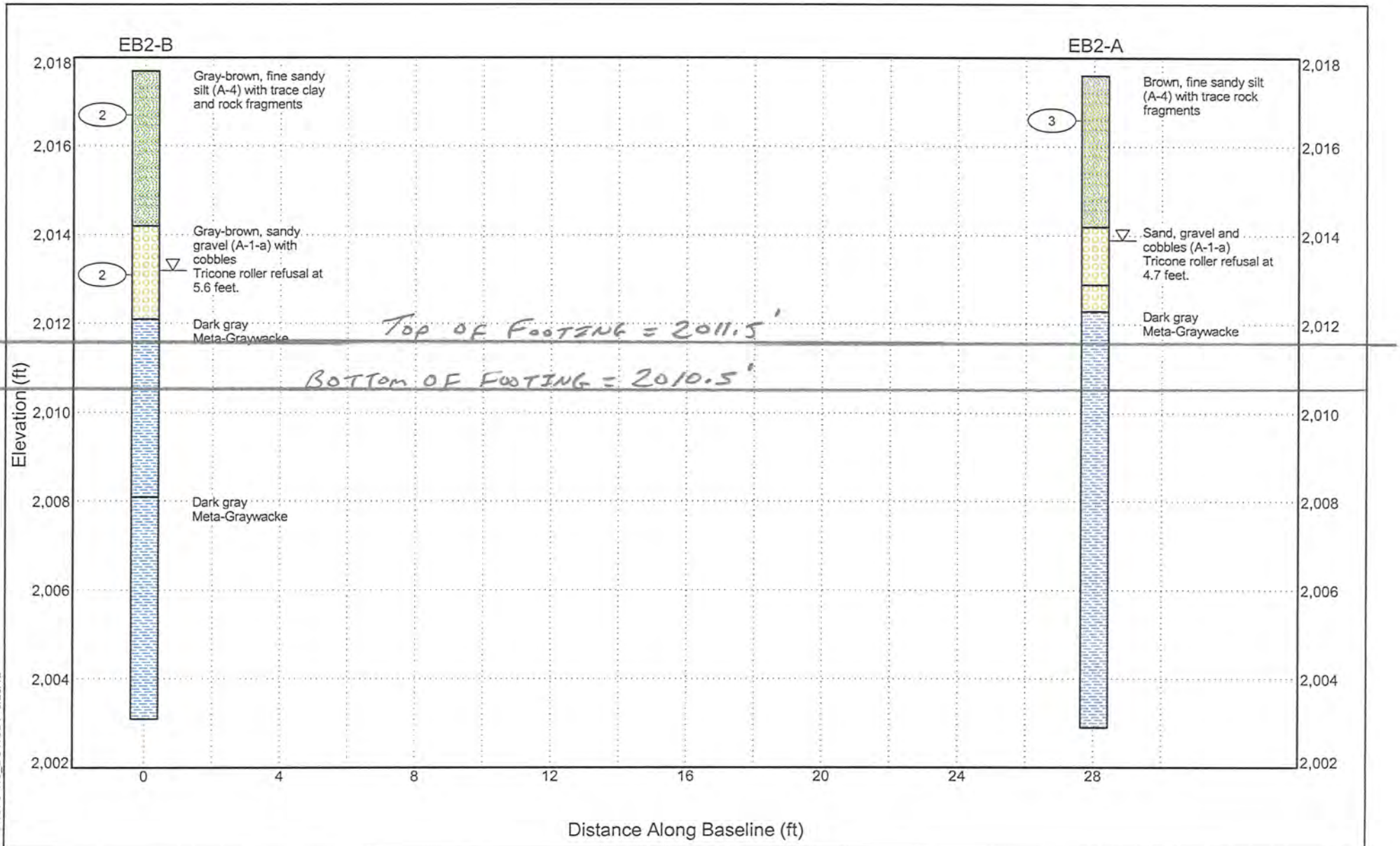
SUMMARY OF CONDITIONS AT EB2

| BORING No. | TOP OF FOOTING | TOP OF NCR | MIN Bearing Elev. | TOF to NCR |
|---|---|---|---|---|
| EB2-A | 2011.5' | 2012.3' | 2010.5' | -0.8' |
| EB2-B | 2011.5' | 2012.1' | 2010.5' | -0.6' |

- Recommend Btm of Footing Elev. No. higher than 2010.5'
- Recommend $R_R = 4$ TSF

$R_A = 4 \text{ TSF} / 0.45 = 8.89 \text{ TSF} \approx 9 \text{ TSF}$

- Based on Inspection, A Factored Bearing Resistance of 4 TSF Is Recommended for Footing Bearing in NCR.
- Footings must Be "Keyed In" 12" (min)
- By Inspection, Settlement of structure should be Negligible if footing Bear In Rock.




**NCDOT GEOTECHNICAL ENGINEERING UNIT**
**BORELOG REPORT**

**PROJECT NO.** 17BP.14.R.36
**ID.** 17BP.14.R.36
**COUNTY** SWAIN

NCDOT PRINTER BRIDGE 121.GPJ NC_DOT.GDT 8/28/12

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 12+77 | **OFFSET** 16 ft LT | **ALIGNMENT** -L- — **0 HR.** 3.7 |
| **COLLAR ELEV.** 2,017.6 ft | **TOTAL DEPTH** 14.7 ft | **NORTHING** 601,550 | **EASTING** 625,731 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,017.6 | 0.0 | | | | | | | | 2,017.6 GROUND SURFACE | 0.0 |
| | | | 2 | 2 | 1 | 3 | | M | | **ROADWAY EMBANKMENT** Brown, fine sandy silt (A-4) with trace rock fragments | |
| 2015 | | | | | | | | | | 2,014.2 | 3.4 |
| | | | | | | Top of Footing = 2011.5' | | | | **ALLUVIAL** Sand, gravel and cobbles (A-1-a) Tricone roller refusal at 4.7 feet. 2,012.9 | 4.7 |
| | | | | | | | | | | 2,012.3 | 5.3 |
| | | | | | | Bottom of Footing = 2010.5' | | | | **NON-CRYSTALLINE ROCK** Dark gray Meta-Graywacke | |
| 2010 | | | | | | | | | | | |
| 2005 | | | | | | | | | | 2,002.9 | 14.7 |
| | | | | | | | | | | Boring Terminated at Elevation 2,002.9 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 12+77 | **OFFSET** 16 ft LT | **ALIGNMENT** -L- — **0 HR.** 3.7 |
| **COLLAR ELEV.** 2,017.6 ft | **TOTAL DEPTH** 14.7 ft | **NORTHING** 601,550 | **EASTING** 625,731 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 10.0 ft | | |

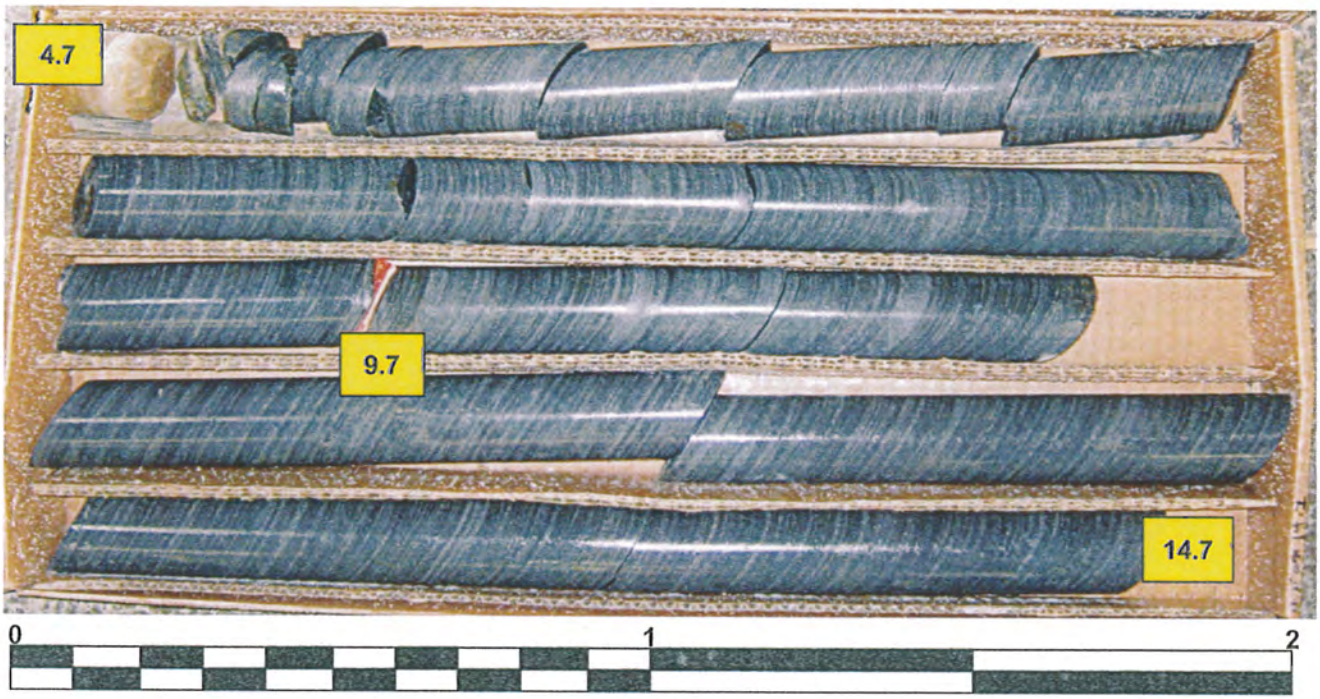
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012.9 | | | | | | | | | | | Begin Coring @ 4.7 ft |
| | 2,012.9 | 4.7 | 5.0 | 3:09 | (4.4) 88% | (3.8) 76% | | (0.3) 50% | NA | | 2,012.9 — **ALLUVIAL** — 4.7 |
| | | | | 3:47 | | | | (9.1) 97% | (8.8) 94% | | 2,012.3 — Sand, gravel and cobbles (A-1-a) — 5.3 |
| | | | | 2:47 | | | | | | | **NON-CRYSTALLINE ROCK** Dark gary, very slightly weathered to fresh, medium hard to hard, close to wide fracture spacing, Meta-Graywacke |
| 2010 | | | | 3:08 | | | | | | | Closely fractured zone from 5.3 to 5.7 feet. |
| | | | | 3:35 | | | | | | | |
| | 2,007.9 | 9.7 | | | | | | | | | |
| | | | 5.0 | 3:50 | (5.0) 100% | (5.0) 100% | | | | | |
| | | | | 2:58 | | | | | | | |
| | | | | 2:16 | | | | | | | |
| 2005 | | | | 2:02 | | | | | | | |
| | | | | 2:26 | | | | | | | |
| | 2,002.9 | 14.7 | | | | | | | | | 2,002.9 — 14.7 |
| | | | | | | | | | | | Boring Terminated at Elevation 2,002.9 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

17BP.14.R.36 / Bridge 121

# CORE PHOTOGRAPHS

## EB2-A

BOX 1 of 1: 4.7 - 14.7 FEET



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| WBS 17BP.14.R.36 | TIP 17BP.14.R.36 | COUNTY SWAIN | GEOLOGIST K. Lloyd |
| SITE DESCRIPTION Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | GROUND WTR (ft) |
| BORING NO. EB2-B | STATION 12+85 | OFFSET 11 ft RT | ALIGNMENT -L- / 0 HR. 4.5 |
| COLLAR ELEV. 2,017.7 ft | TOTAL DEPTH 14.6 ft | NORTHING 601,522 | EASTING 625,731 / 24 HR. FIAD |
| DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER F. Cox | START DATE 05/01/12 | COMP. DATE 05/01/12 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,017.7 | 0.0 | | | | | | | | 2,017.7 GROUND SURFACE | 0.0 |
| | | | 2 | 1 | 1 | 2 | | M | | ROADWAY EMBANKMENT Gray-brown, fine sandy silt (A-4) with trace clay and rock fragments | |
| 2015 | | | | | | | | | | | |
| | 2,014.1 | 3.6 | | | | | | | | 2,014.2 | 3.5 |
| | | | 3 | 1 | 1 | 2 Top of Footing: 2011.5' | | M | | ALLUVIAL Gray-brown, sandy gravel (A-1-a) with cobbles Tricone roller refusal at 5.6 feet. | |
| | | | | | | Bottom of Footing: 2010.5' | | | | 2,012.1 NON-CRYSTALLINE ROCK Dark gray Meta-Graywacke | 5.6 |
| 2010 | | | | | | | | | | | |
| | | | | | | | | | | 2,008.1 Dark gray Meta-Graywacke | 9.6 |
| 2005 | | | | | | | | | | | |
| | | | | | | | | | | 2,003.1 Boring Terminated at Elevation 2,003.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | 14.6 |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 12+85 | **OFFSET** 11 ft RT | **ALIGNMENT** -L- — 0 HR. 4.5 |
| **COLLAR ELEV.** 2,017.7 ft | **TOTAL DEPTH** 14.6 ft | **NORTHING** 601,522 | **EASTING** 625,731 — 24 HR. FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 9.0 ft | | |

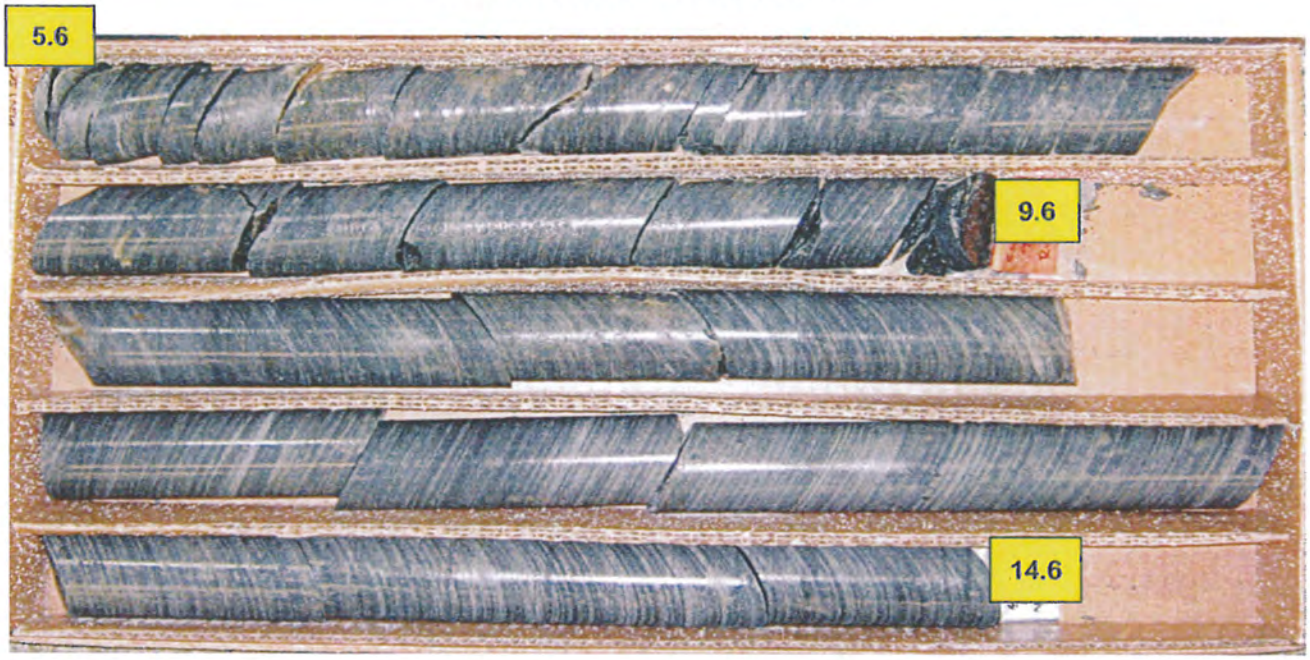
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012.1 | | | | | | | | | | | Begin Coring @ 5.6 ft |
| | 2,012.1 | 5.6 | 4.0 | 4:25 | (3.4) 85% | (2.8) 70% | | (3.4) 85% | (2.8) 70% | | 2,012.1 — 5.6 **NON-CRYSTALLINE ROCK** Dark gray, slightly weathered to fresh, moderately hard to hard, close to moderately close fracture spacing, Meta-Graywacke |
| | | | | 5:21 | | | | | | | |
| 2010 | | | | 4:36 | | | | | | | |
| | | | | 3:32 | | | | | | | |
| | 2,008.1 | 9.6 | | | | | | | | | 2,008.1 — 9.6 |
| | | | 5.0 | 3:12 | (5.0) 100% | (5.0) 100% | | (5.0) 100% | (5.0) 100% | | Dark gray, fresh, hard, wide fracture spacing, Meta-Graywacke |
| | | | | 3:13 | | | | | | | |
| | | | | 3:09 | | | | | | | |
| 2005 | | | | 2:47 | | | | | | | |
| | | | | 3:25 | | | | | | | |
| | 2,003.1 | 14.6 | | | | | | | | | 2,003.1 — 14.6 |
| | | | | | | | | | | | Boring Terminated at Elevation 2,003.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

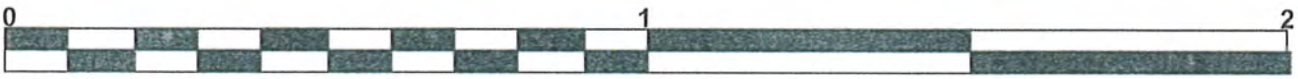
*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB2-B

**BOX 1 of 1: 5.6 - 14.6 FEET**



amec

AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

| | | | |
|---|---|---|---|
| JOB NO. | 6466-12-1103 | SHEET | OF X |
| PHASE | | TASK | X |
| JOB NAME | Group T, Br. 121 | | X |
| BY | JSJ | DATE | 8/28/12 X |
| CHECKED BY | | DATE | X |

SETTLEMENT + SLOPE STABILITY

Settlement : No significant grade changes are planned for the approaches based on the provided X-Sections from roadway drawings.

SLOPE STABILITY : Vertical Abutments WALLS, No Spill Slopes.

# STRUCTURE SUBSURFACE INVESTIGATION PROVIDED BY AMEC

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | 17BP.14.R.36 | 1 | 16 |

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

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *17BP.14.R.36* F.A. PROJ. *N/A*

COUNTY *SWAIN*

PROJECT DESCRIPTION *DIVISION 14 GROUP T BRIDGE REPLACEMENT*

SITE DESCRIPTION *BRIDGE No. 121 ON SR 1103 (SILVERMINE CREEK ROAD) OVER SILVERMINE CREEK*

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2-2A | LEGEND SHEETS |
| 3 | SITE PLAN |
| 4-15 | BORING LOGS |


PERSONNEL

*F. Cox*

*D. Rhodes*

*K. Lloyd*

INVESTIGATED BY *AMEC E&I, Inc.*

CHECKED BY *J. Shane Johnson, P.G P.E.*

SUBMITTED BY *M. Lear P.G.*

DATE *August 2012*

## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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 DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION 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 THE 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.

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.

DRAWN BY: *R. RAHIE*

NORTH CAROLINA LICENSED SEAL 1927 GEOLOGIST MICHAEL B. LEAR 8/29/12

amec


AMEC E&I, Inc.
4021 STIRRUP CREEK DRIVE, SUITE 100
DURHAM, NORTH CAROLINA 27703
(919) 381-9900


SEAL

SIGNATURE

NC Engineering F-1253 NC Geology C-247

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| 17BP.14.R.36 | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT
# SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

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

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

## SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

## CONSISTENCY OR DENSENESS

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

## TEXTURE OR GRAIN SIZE

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

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

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
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<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

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

## COLOR

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

## GRADATION

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

## ANGULARITY OF GRAINS

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

## MINERALOGICAL COMPOSITION

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

## COMPRESSIBILITY

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

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

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

## MISCELLANEOUS SYMBOLS

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

## ABBREVIATIONS

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

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

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [ ] CME-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 7/8" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N 0
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

REVISED 09/23/09

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| 17BP.14.R.36 | 2A |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT
# SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

### ROCK DESCRIPTION

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

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

### WEATHERING

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

### ROCK HARDNESS

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

### FRACTURE SPACING

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

### BEDDING

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

### INDURATION

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

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

### TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

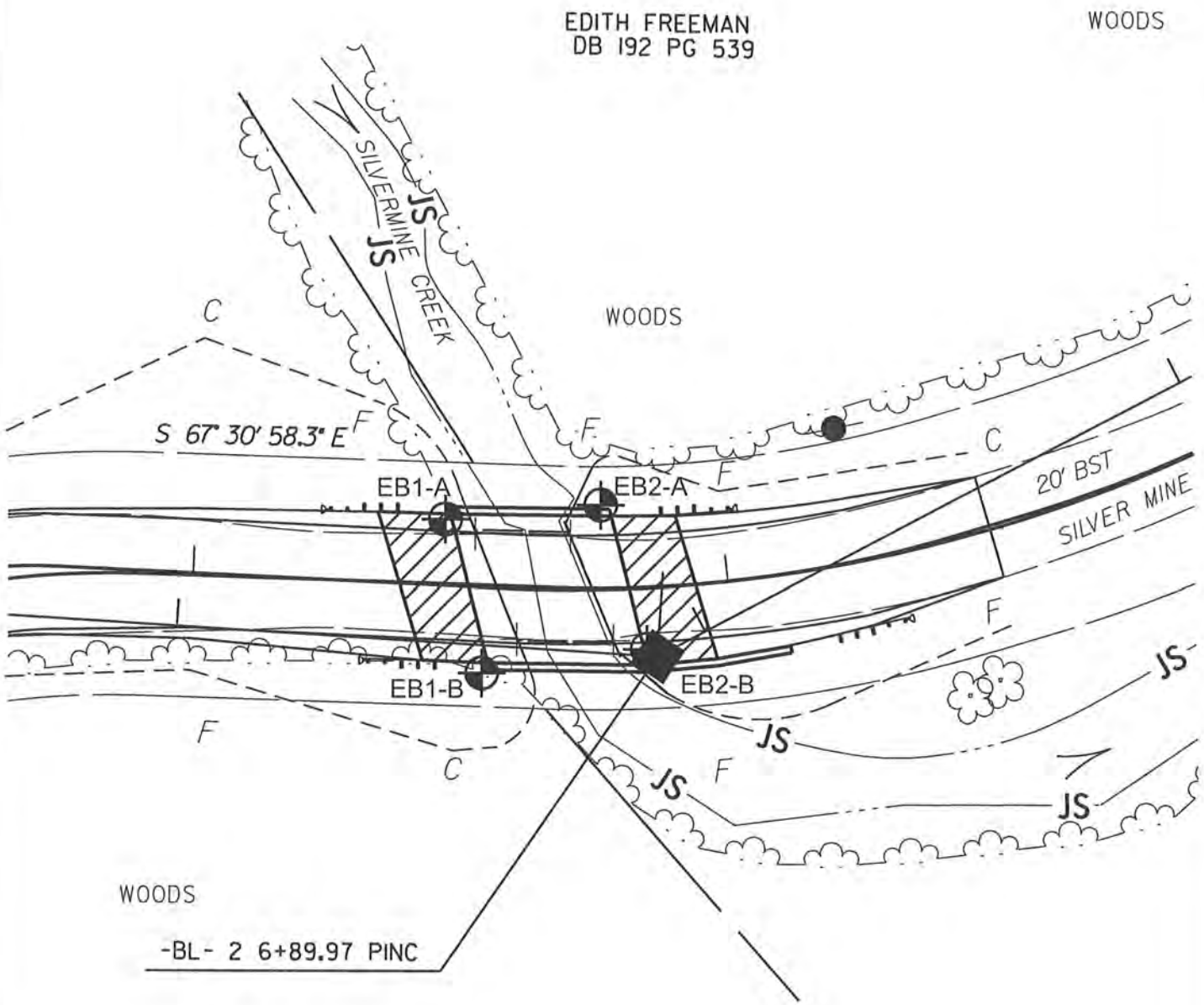
BENCH MARK: NCDOT REBAR & CAP STAMPED BL-2 LOCATED AT STATION 12+84.65 (-EL-), 12.9 RT

ELEVATION: 2017.39 FT.

NOTES:

REVISED 09/23/09

| DESCRIPTION: | | SHEET NO. | 3 |
|---|---|---|---|
| BRIDGE No. 121 ON SR 1103 (SILVERMINE CREEK ROAD) OVER SILVERMINE CREEK | ENGLISH | W.B S. NO.:17BP.14.R.36 | |
| | | T.I.P. NO.: | N/A |
| | | COUNTY: | SWAIN |




30' 0 30'

GRAPHIC SCALE - IN FEET

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 12+47 | **OFFSET** 12 ft LT | **ALIGNMENT** -L- — **0 HR.** 4.6 |
| **COLLAR ELEV.** 2,018.3 ft | **TOTAL DEPTH** 13.7 ft | **NORTHING** 601,558 | **EASTING** 625,703 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,018.3 | 0.0 | | | | | | | | 2,018.3 GROUND SURFACE | 0.0 |
| | | | 1 | 2 | 2 | 4 | | M | | **ROADWAY EMBANKMENT** Brown, fine sandy silt (A-4) with trace rock fragments and organic matter | |
| 2015 | | | | | | | | | | 2,015.3 | 3.0 |
| | 2,014.8 | 3.5 | 4 | 3 | 8 | 11 | | W | | **ALLUVIAL** Dark gray, fine sandy silt (A-4) | |
| | | | | | | | | | | 2,013.3 | 5.0 |
| | | | | | | | | | | 2,013.1 Sand, gravel and cobbles (A-1-a) | 5.2 |
| | | | | | | | | | | 2,012.4 Tricone roller refusal at 5.2 feet. | 5.9 |
| | | | | | | | | | | **NON-CRYSTALLINE ROCK** Meta-Graywacke | |
| 2010 | | | | | | | | | | 2,009.6 | 8.7 |
| | | | | | | | | | | Meta-Graywacke | |
| 2005 | | | | | | | | | | 2,004.6 | 13.7 |
| | | | | | | | | | | Boring Terminated at Elevation 2,004.6 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 12+47 | **OFFSET** 12 ft LT | **ALIGNMENT** -L- — **0 HR.** 4.6 |
| **COLLAR ELEV.** 2,018.3 ft | **TOTAL DEPTH** 13.7 ft | **NORTHING** 601,558 | **EASTING** 625,703 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 8.5 ft | | |

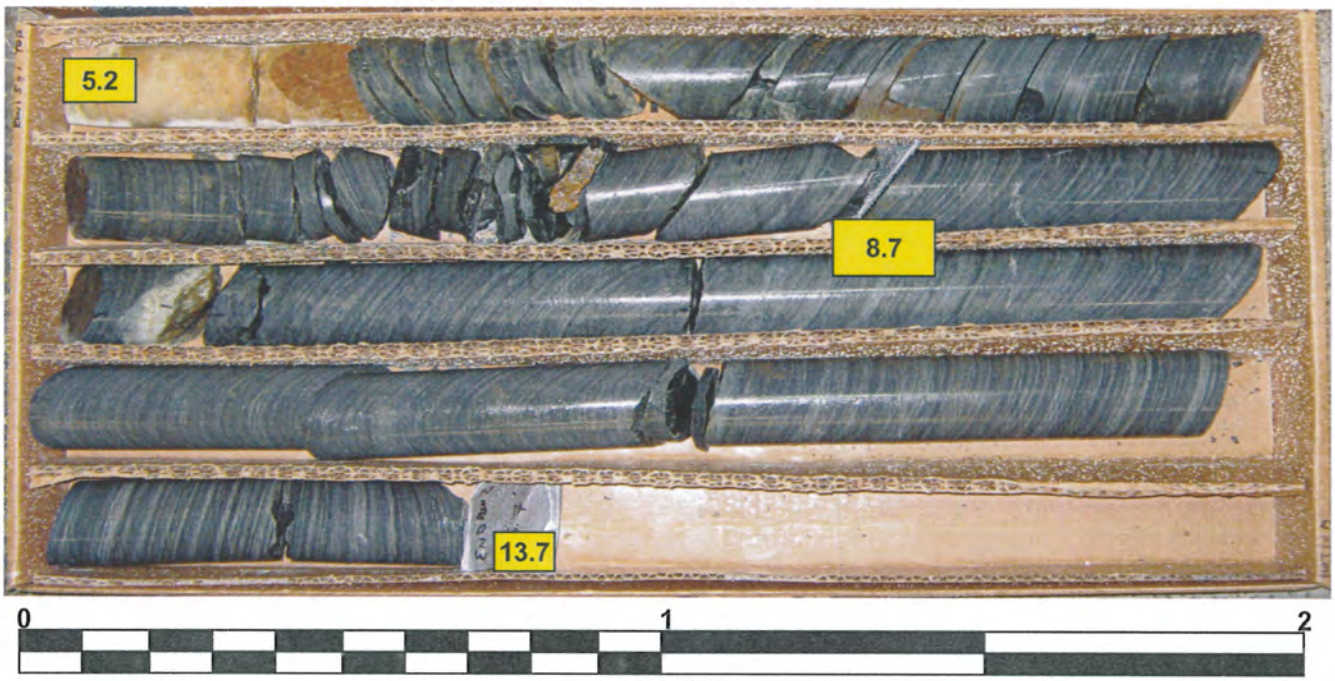
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013.1 | | | | | | | | | | | Begin Coring @ 5.2 ft |
| | 2,013.1 | 5.2 | 3.5 | 4:38 | (3.2) 91% | (2.3) 66% | | (0.4) 57% | NA | | 2,013.1 — 5.2 **ALLUVIAL** Sand, gravel and cobbles (A-1-a) 2,012.4 — 5.9 |
| | | | | 3:41 | | | | (2.8) 100% | (2.3) 82% | | **NON-CRYSTALLINE ROCK** Dark Gray, moderate to very slightly weathered, medium hard to hard, very close to close fracture spacing, Meta-Graywacke |
| | | | | 3:42 | | | | | | | |
| 2010 | 2,009.6 | 8.7 | | 1:45/0.5 | | | | | | | 2,009.6 — 8.7 |
| | | | 5.0 | 2:39 | (5.0) 100% | (5.0) 100% | | (5.0) 100% | (5.0) 100% | | Dark Gray, very slightly weathered to fresh, hard, close to moderately close fracture spacing, Meta-Graywacke |
| | | | | 3:01 | | | | | | | |
| | | | | 3:12 | | | | | | | |
| | | | | 2:02 | | | | | | | |
| 2005 | | | | 2:08 | | | | | | | |
| | 2,004.6 | 13.7 | | | | | | | | | 2,004.6 — 13.7 |
| | | | | | | | | | | | Boring Terminated at Elevation 2,004.6 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB1-A

**BOX 1 of 1: 5.2 - 13.7 FEET**



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 12+55 | **OFFSET** 16 ft RT | **ALIGNMENT** -L- |
| **COLLAR ELEV.** 2,018.4 ft | **TOTAL DEPTH** 14.3 ft | **NORTHING** 601,529 | **EASTING** 625,700 |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| GROUND WTR (ft) | |
|---|---|
| 0 HR. | 3.0 |
| 24 HR. | FIAD |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,018.4 | 0.0 | 1 | 2 | 2 | 4 | | M | | 2,018.4 GROUND SURFACE | 0.0 |
| | | | | | | | | | | **ROADWAY EMBANKMENT** Gray-brown, fine sandy silt (A-4) with trace of clay | |
| 2015 | | | | | | | | | | 2,014.4 | 4.0 |
| | | | | | | | | | | 2,014.1 **ALLUVIAL** Sand and Gravel (A-1-a) Tricone roller refusal at 4.3 feet. | 4.3 |
| | | | | | | | | | | 2,013.3 **NON-CRYSTALLINE ROCK** Dark gray Meta-Graywacke | 5.1 |
| 2010 | | | | | | | | | | Dark gray Meta-Graywacke | |
| 2005 | | | | | | | | | | 2,004.1 | 14.3 |
| | | | | | | | | | | Boring Terminated at Elevation 2,004.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 12+55 | **OFFSET** 16 ft RT | **ALIGNMENT** -L- | **0 HR.** 3.0 |
| **COLLAR ELEV.** 2,018.4 ft | **TOTAL DEPTH** 14.3 ft | **NORTHING** 601,529 | **EASTING** 625,700 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 10.0 ft | | |

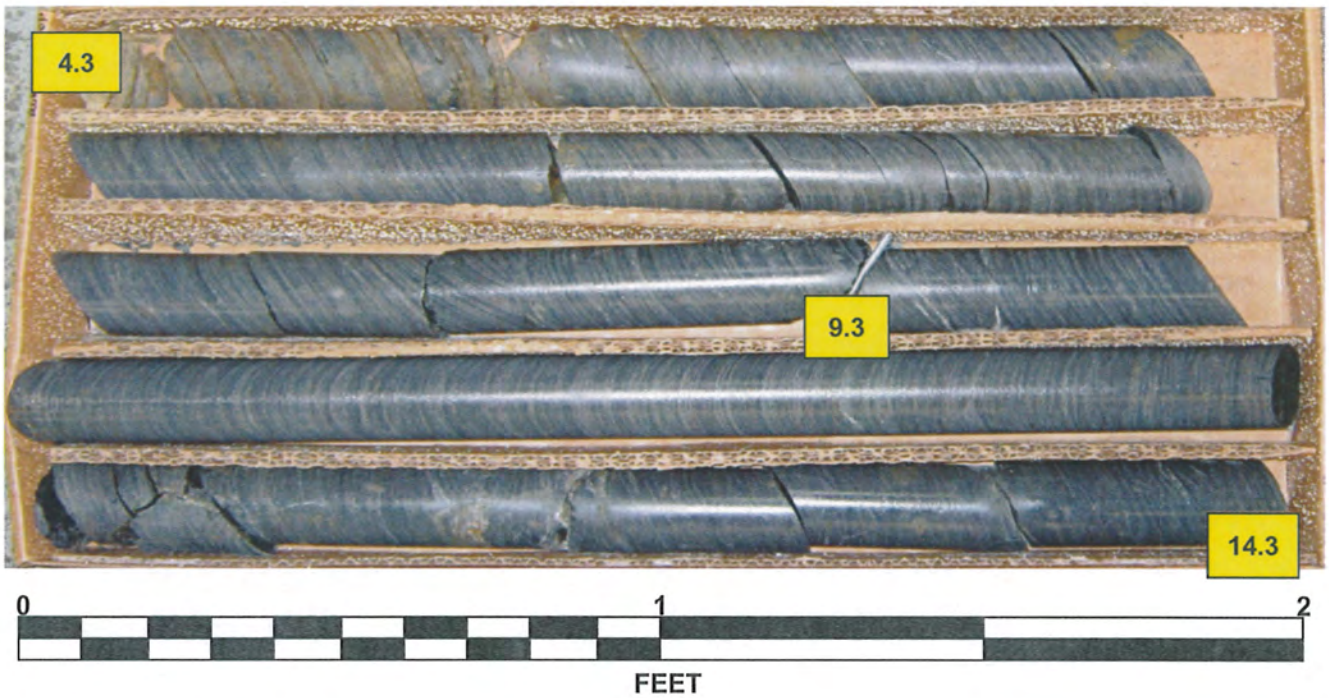
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014.1 | | | | | | | | | | | Begin Coring @ 4.3 ft |
| | 2,014.1 | 4.3 | 5.0 | 4:16 | (4.9) 98% | (3.5) 70% | | (0.8) 100% | (0.0) 0% | | 2,014.1 / 4.3 **NON-CRYSTALLINE ROCK** |
| | | | | 3:45 | | | | (8.7) 95% | (7.8) 85% | | 2,013.3 / 5.1 Dark gray, moderately severe weathered, medium hard, very close fracture spacing, Meta-Graywacke |
| | | | | 3:26 | | | | | | | Dark gray, slightly weathered to fresh, hard, close to moderalety close fracture spacing, Meta-Graywacke |
| | | | | 4:15 | | | | | | | |
| 2010 | | | | 3:27 | | | | | | | |
| | 2,009.1 | 9.3 | | | | | | | | | |
| | | | 5.0 | 2:24 | (4.6) 92% | (4.3) 86% | | | | | |
| | | | | 2:27 | | | | | | | |
| | | | | 2:32 | | | | | | | |
| | | | | 2:11 | | | | | | | |
| 2005 | | | | 2:40 | | | | | | | |
| | 2,004.1 | 14.3 | | | | | | | | | 2,004.1 / 14.3 Boring Terminated at Elevation 2,004.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB1-B

**BOX 1 of 1: 4.3 - 14.3 FEET**



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 12+77 | **OFFSET** 16 ft LT | **ALIGNMENT** -L- — **0 HR.** 3.7 |
| **COLLAR ELEV.** 2,017.6 ft | **TOTAL DEPTH** 14.7 ft | **NORTHING** 601,550 | **EASTING** 625,731 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,017.6 | 0.0 | | | | | | | | 2,017.6 GROUND SURFACE | 0.0 |
| | | | 2 | 2 | 1 | 3 | | M | | **ROADWAY EMBANKMENT** Brown, fine sandy silt (A-4) with trace rock fragments | |
| 2015 | | | | | | | | | | 2,014.2 | 3.4 |
| | | | | | | | | | | **ALLUVIAL** Sand, gravel and cobbles (A-1-a) Tricone roller refusal at 4.7 feet. | |
| | | | | | | | | | | 2,012.9 | 4.7 |
| | | | | | | | | | | 2,012.3 | 5.3 |
| | | | | | | | | | | **NON-CRYSTALLINE ROCK** Dark gray Meta-Graywacke | |
| 2010 | | | | | | | | | | | |
| 2005 | | | | | | | | | | | |
| | | | | | | | | | | 2,002.9 | 14.7 |
| | | | | | | | | | | Boring Terminated at Elevation 2,002.9 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 12+77 | **OFFSET** 16 ft LT | **ALIGNMENT** -L- / **0 HR.** 3.7 |
| **COLLAR ELEV.** 2,017.6 ft | **TOTAL DEPTH** 14.7 ft | **NORTHING** 601,550 | **EASTING** 625,731 / **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 10.0 ft | | |

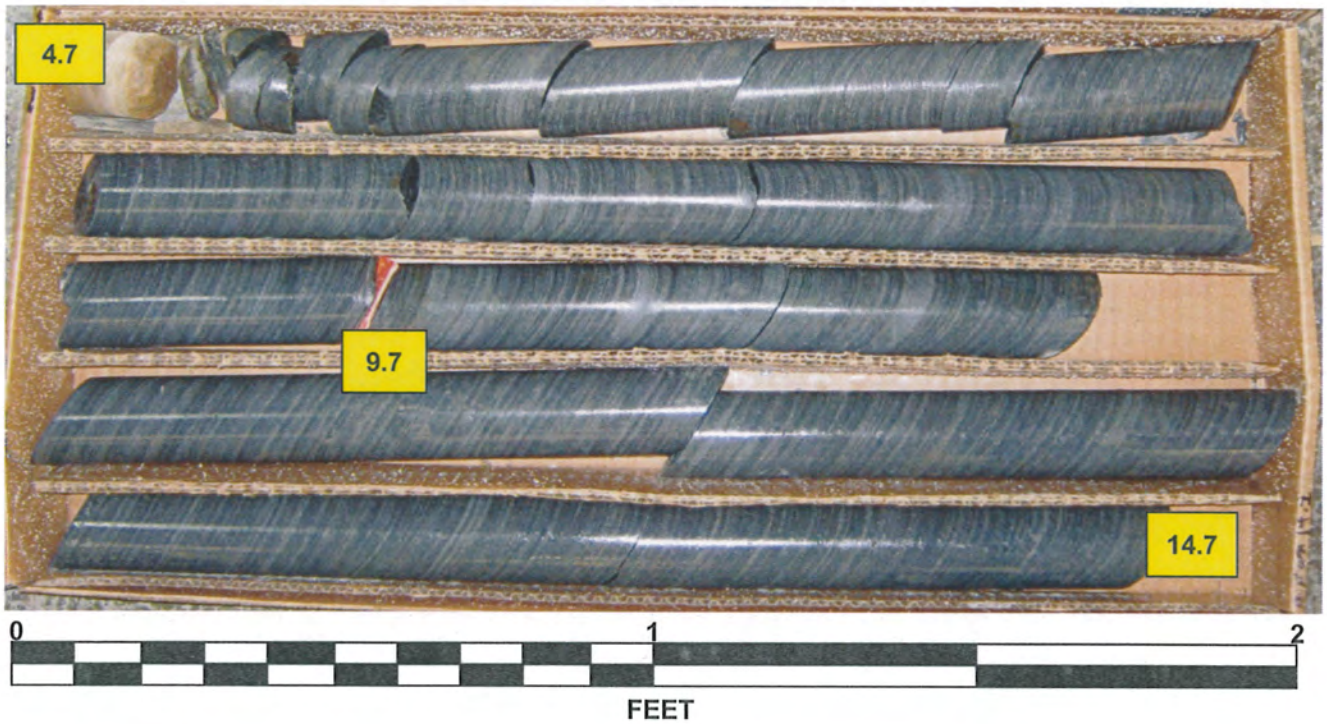
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012.9 | | | | | | | | | | | Begin Coring @ 4.7 ft |
| | 2,012.9 | 4.7 | 5.0 | 3:09 | (4.4) 88% | (3.8) 76% | | (0.3) 50% | NA | | 2,012.9 / 4.7 **ALLUVIAL** |
| | | | | 3:47 | | | | (9.1) 97% | (8.8) 94% | | 2,012.3 / 5.3 Sand, gravel and cobbles (A-1-a) |
| | | | | 2:47 | | | | | | | **NON-CRYSTALLINE ROCK** Dark gary, very slightly weathered to fresh, medium hard to hard, close to wide fracture spacing, Meta-Graywacke |
| 2010 | | | | 3:08 | | | | | | | |
| | | | | 3:35 | | | | | | | Closely fractured zone from 5.3 to 5.7 feet. |
| | 2,007.9 | 9.7 | | | | | | | | | |
| | | | 5.0 | 3:50 | (5.0) 100% | (5.0) 100% | | | | | |
| | | | | 2:58 | | | | | | | |
| | | | | 2:16 | | | | | | | |
| 2005 | | | | 2:02 | | | | | | | |
| | | | | 2:26 | | | | | | | |
| | 2,002.9 | 14.7 | | | | | | | | | 2,002.9 / 14.7 Boring Terminated at Elevation 2,002.9 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB2-A

**BOX 1 of 1: 4.7 - 14.7 FEET**



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 12+85 | **OFFSET** 11 ft RT | **ALIGNMENT** -L- | **0 HR.** 4.5 |
| **COLLAR ELEV.** 2,017.7 ft | **TOTAL DEPTH** 14.6 ft | **NORTHING** 601,522 | **EASTING** 625,731 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | | | | | | | | | | | |
| | 2,017.7 | 0.0 | | | | | | | | 2,017.7 GROUND SURFACE | 0.0 |
| | | | 2 | 1 | 1 | 2 | | M | | **ROADWAY EMBANKMENT** Gray-brown, fine sandy silt (A-4) with trace clay and rock fragments | |
| 2015 | | | | | | | | | | | |
| | 2,014.1 | 3.6 | | | | | | | | 2,014.2 | 3.5 |
| | | | 3 | 1 | 1 | 2 | | M | | **ALLUVIAL** Gray-brown, sandy gravel (A-1-a) with cobbles | |
| | | | | | | | | | | 2,012.1 Tricone roller refusal at 5.6 feet. | 5.6 |
| | | | | | | | | | | **NON-CRYSTALLINE ROCK** Dark gray Meta-Graywacke | |
| 2010 | | | | | | | | | | | |
| | | | | | | | | | | 2,008.1 | 9.6 |
| | | | | | | | | | | Dark gray Meta-Graywacke | |
| 2005 | | | | | | | | | | | |
| | | | | | | | | | | 2,003.1 | 14.6 |
| | | | | | | | | | | Boring Terminated at Elevation 2,003.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke | |

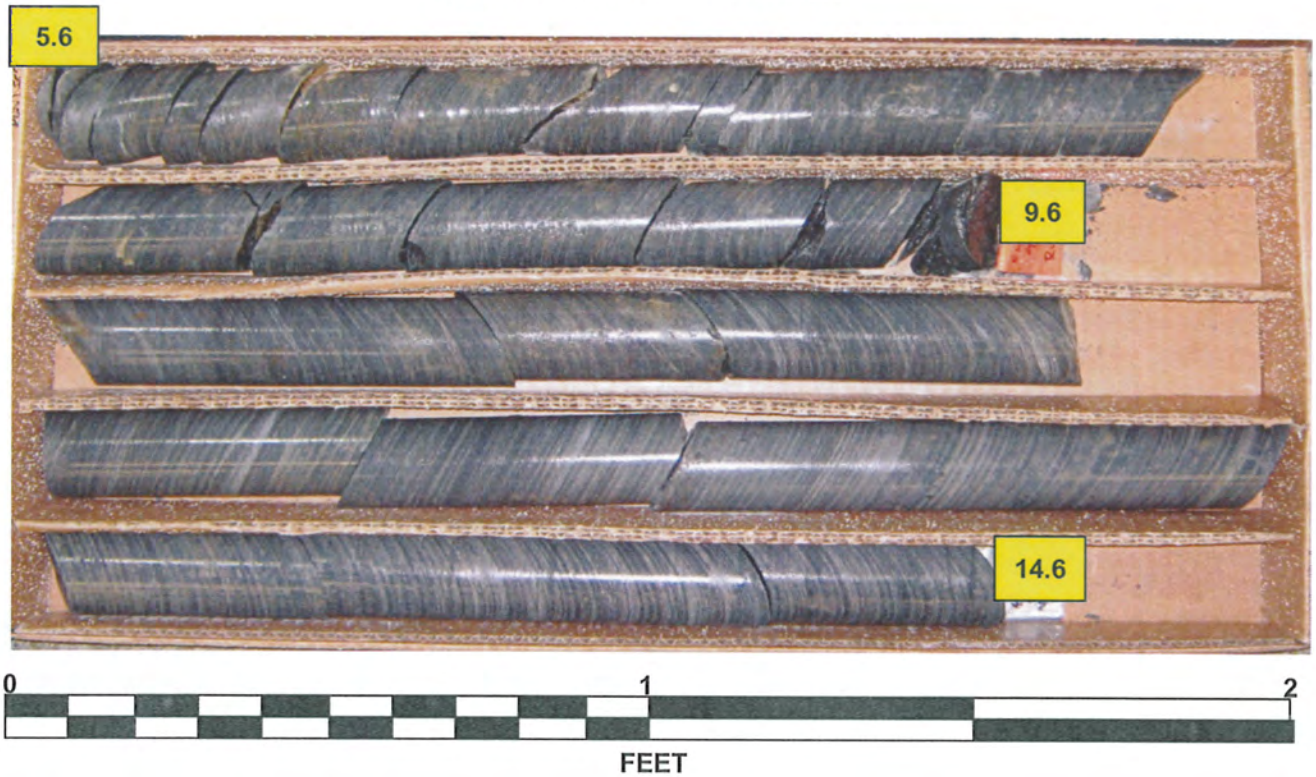
# NCDOT GEOTECHNICAL ENGINEERING UNIT
# CORE BORING REPORT

| | | | |
|---|---|---|---|
| **WBS** 17BP.14.R.36 | **TIP** 17BP.14.R.36 | **COUNTY** SWAIN | **GEOLOGIST** K. Lloyd |
| **SITE DESCRIPTION** Bridge No. 121 on SR 1103 (Silver Mine Creek Rd.) over Silvermine Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 12+85 | **OFFSET** 11 ft RT | **ALIGNMENT** -L- — **0 HR.** 4.5 |
| **COLLAR ELEV.** 2,017.7 ft | **TOTAL DEPTH** 14.6 ft | **NORTHING** 601,522 | **EASTING** 625,731 — **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** MAC9354 CME-45C 86% 10/3/2010 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** F. Cox | **START DATE** 05/01/12 | **COMP. DATE** 05/01/12 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ | **TOTAL RUN** 9.0 ft | | |

| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012.1 | | | | | | | | | | | Begin Coring @ 5.6 ft |
| | 2,012.1 | 5.6 | 4.0 | 4:25 | (3.4) 85% | (2.8) 70% | | (3.4) 85% | (2.8) 70% | | 2,012.1 — 5.6 **NON-CRYSTALLINE ROCK** Dark gray, slightly weathered to fresh, moderately hard to hard, close to moderately close fracture spacing, Meta-Graywacke |
| | | | | 5:21 | | | | | | | |
| 2010 | | | | 4:36 | | | | | | | |
| | | | | 3:32 | | | | | | | |
| | 2,008.1 | 9.6 | | | | | | | | | 2,008.1 — 9.6 |
| | | | 5.0 | 3:12 | (5.0) 100% | (5.0) 100% | | (5.0) 100% | (5.0) 100% | | Dark gray, fresh, hard, wide fracture spacing, Meta-Graywacke |
| | | | | 3:13 | | | | | | | |
| | | | | 3:09 | | | | | | | |
| 2005 | | | | 2:47 | | | | | | | |
| | | | | 3:25 | | | | | | | |
| | 2,003.1 | 14.6 | | | | | | | | | 2,003.1 — 14.6 |
| | | | | | | | | | | | Boring Terminated at Elevation 2,003.1 ft In Non-Crystalline Rock: Dark Gray Meta-Graywacke |

*17BP.14.R.36 / Bridge 121*

# CORE PHOTOGRAPHS

## EB2-B

**BOX 1 of 1: 5.6 - 14.6 FEET**