CULVERT FOUNDATION RECOMMENDATIONS REPORT
REPLACMENT OF BRIDGE 890366 ON SR 1153
(FLOYD MOORE ROAD) OVER BEAVER DAM CREEK (WEST)

WBS No.: 17BP.10.R.19
Tip No.: NA
County: UNION

Prepared by:

AMEC Environment and Infrastructure, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, North Carolina 27703
(Project No. 6469-12-1040)

Prepared for:

NCDOT

July 25, 2012

July 25, 2012

Division Bridge Program Manager
NCDOT Division 10 Office
716 W. Main Street
Albemarle, North Carolina 28001

Attention: Mr. James Wally, E.I.:

Subject: **Culvert Foundation Recommendation Report**
Replacement of Bridge No. 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek (West)
WBS No.: 17BP.10.R.19
TIP No.: NA
County: Union
AMEC Project Number: 6469-12-1040

Dear Mr. Wally:

AMEC Environment and Infrastructure, Inc. (AMEC) is pleased to transmit the Culvert Foundation Recommendations Report in association with the replacement of Bridge No. 366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek (West). The recommended structure type is two Reinforced Concrete Box Culverts (2 @ 12' x 5'). The Structure Subsurface Investigation Report provided by NCDOT and the additional Structure Subsurface Report performed by AMEC are provided in the Appendix of this report. The Foundation Recommendations Report has been prepared using boring data obtained by AMEC and others.

INCLUDE AS NOTE ON PLANS

RECOMMENDATIONS

- Excavate 1 foot below culvert and footings and replace with foundation conditioning material in accordance with Article 414 of the Standard Specifications.
- Recommend including 25 cubic yards of undercut of soft foundation soils as a contingency item to be used at the discretion of the Engineer.
- Recommend including 25 cubic yards of Select Material Class VI to be used as backfill as a contingency item to be used at the discretion of the Engineer.

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENG. UNIT-WRO

___ ACCEPTED
X ACCEPTED AS NOTED
___ RETURNED FOR CORRECTIONS
___ SEE LETTER

BY: Dean Hardister, PE
DATE: 08/20/2012

Correspondence:
AMEC E&I, 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

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., P.G.
Senior Geotechnical Engineer
Registered, North Carolina 037422

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

NORTH CAROLINA PROFESSIONAL SEAL 037422 7/25/12 ENGINEER J. SHANE JOHNSON

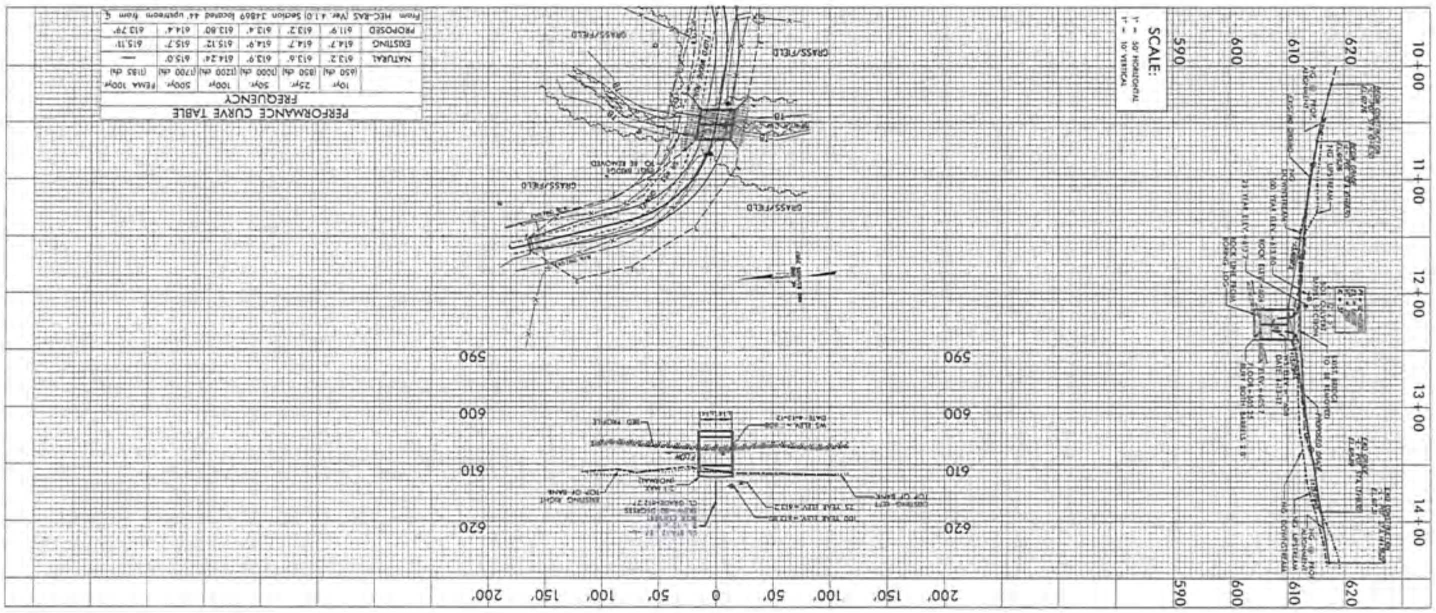
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENG. UNIT-WRO

___ ACCEPTED
X ACCEPTED AS NOTED
___ RETURNED FOR CORRECTIONS
___ SEE LETTER

BY: Dean Hardister, PE
DATE: 08/20/2012

APPENDIX

PROVIDED INFORMATION



PERFORMANCE CURVE TABLE						
	FREQUENCY					
	10yr. (650 cfs)	25yr. (850 cfs)	50yr. (1000 cfs)	100yr. (1200 cfs)	500yr. (1700 cfs)	FEMA 100yr. (1185 cfs)
NATURAL	613.2'	613.6'	613.9'	614.24'	615.0'	—
EXISTING	614.7'	614.7'	614.9'	615.12'	615.7'	615.11'
PROPOSED	611.9'	613.2'	613.4'	613.80'	614.4'	613.79'
From HEC-RAS (Ver. 4.1.0) Section 34869 located 44' upstream from ℄						

ADDITIONAL INFORMATION AND COMPUTATIONS

USGS Rural Regression (2009-5158)

REGION 1 — FEMA FIS DISCHARGES

10 YEAR
$Qn = 298\ A^{0.617} = 298\ (2.1)^{0.617} = 629cfs$ — USE = 650 cfs — ---

25 YEAR
$Qn = 537\ A^{0.606} = 537\ (2.1)^{0.606} = 842cfs$ — USE = 850 cfs — ---

50 YEAR
$Qn = 661\ A^{0.600} = 661\ (2.1)^{0.600} = 1032cfs$ — USE = 1000 cfs — ---

100 YEAR
$Qn = 776\ A^{0.594} = 776\ (2.1)^{0.594} = 1206cfs$ — USE = 1200 cfs — 1185 cfs

500 YEAR
$Qn = 1072\ A^{0.583} = 1072\ (2.1)^{0.583} = 1652cfs$ — USE = 1700 cfs — ---

HISTORIC HIGHWATER INFO=

SPOKE WITH BRETT HILDRETH OF NCDOT.

BRIDGE OVERTOPS OFTEN IN STORM EVENT EQUAL TO OR GREATER THAN 2" (APPROX. 1 YR.-6 HOUR EVENT)

FEMA DISCHARGES (used in HEC-RAS Models)

100-YEAR = 1185cfs

SITE DATA

Drainage Area 2.1 sq. mi. Source FEMA FIS

River Basin Yadkin Character RURAL

Stream Classification (Such as Trout, High Quality Water, etc.) WS-IV

Data on Existing Structure Timber deck on timber joists low water type; EBTS: Timber caps, post & sills, with timber post & sill (crutched), i.e. 8'-6".

Debris Potential Low ... Moderate X ... High ...

Data on Structures Up and Down Stream Upstream: 195.2 lines 10'x75' CM Pipe Arch; 50'-9" along centerline of pipe. Downstream: Non-comparable.

Gage Station No. N/A Period of Records N/A

Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:

Date -- Elev. -- Est. Freq. 1 Yr. Source BRETT HILDRETH - NCDOT BRIDGE MAINTENANCE Period of Knowledge 15 yr.

Date ... Elev. ... Est. Freq. ... Source ... Period of Knowledge ...

Allowable HW Elev. 616.12' (Exist. 100 yr. WSEL @ Section 34869) Normal Water Surface Elev. ~609'

Manning's n: Left O.B. 0.12 Channel 0.045 Right O.B. 0.12 Obtained from FEMA FIS

Flood Study / Status Limited Detail Study Floodway Established? NO.

Flood Study 100 yr. Discharge 1185 c.f.s. W.S. Elev.: With Floodway 614.32', Without Floodway 614.1'

DESIGN DATA

Hydrological Method USGS Rural Regression (2009-5158)

Hydraulic Design Method HEC-RAS 4.1.0 FILENAME: SF890366.PRJ

Design Tailwater: D_{10} 5.8' ; D_{25} 6.2' ; D_{50} 6.5' ; D_{100} 6.8' ; D_{500} 7.7' ; $D_{100\ FEMA}$ 6.8'

Size & Type	D	Ke	Inlet Control HW/D	Inlet Control H.W.	Outlet Control dc	Outlet Control $\frac{dc+D}{2}$	Outlet Control h_o	Outlet Control H	Outlet Control LS_o	Outlet Control H.W.	Remarks
		COMPUTATIONS		FROM		HEC-RAS					

Is a Floodway Revision Required? ... MOA TYPE 2B 0.32' DECREASE HEC-RAS SECTION 34869

Outlet Velocity (V_0) 5.1 ft/s Natural Channel Velocity (V_0) 5.1 ft/s

Required Outlet Protection CLASS I RIP RAP

INFORMATION TO BE SHOWN ON PLANS

Design: Discharge 850 c.f.s. Frequency 25 yr. Elev. 613.2'

Base Flood: Discharge 1200 c.f.s. Frequency 100 yr. Elev. 613.80'

Overtopping: Discharge 850 c.f.s. Frequency 25 yr. Elev. 613.2'

Stream Branch Beaverdam Creek (West) Struc. Inv. No. 890366 I.D. No. SF-890366 Project No. [illegible] PDF File 890366 2012 SF890366 Branch Beaverdam Creek, West SHRS.pdf

CULVERT SURVEY & HYDRAULIC DESIGN REPORT

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

FEMA LIMITED DETAILED STUDY
ZONE AE
YADKIN RIVER BASIN

I.D. No. [illegible] Project No. [illegible] Proj. Station [illegible]

County [illegible] Stream Branch Beaverdam Creek (West) Struc. No. 890366

On Highway [illegible] Between (S.Rocky River Rd) and Dead End

Recommended Structure [illegible]

Recommended Width of Roadway 20' (EOP to EOP) Skew 90 DEGREES

Recommended Location is On/Upstream/Downstream Stream from Existing Crossing.

Bench Mark is Monument BL-2 -BL- Sta. 11+78.53 10.24' Right

"BL-2" N 433907.073 E 1564.036 Elev. 617.27' Datum NAVD 88

Temporary Crossing Dead end road, existing bridge to remain open during phased construction.

Designed by: AMEC E&I, Inc. Date 07/20/2012

Assisted by: Matt McLaren, P.E.

Project Engineer: Richard L. Miner, P.E.

Reviewed by:

50' 0 50' 100' 150' 200'

SITE DATA

Source FEMA FIS

Character RURAL

Trout, High Quality Water, etc.) WS-IV

iber deck on timber joists (low water type) EBTS: Timber caps, st & sills, with timber post & sill (crutched). I @ 18'-6".

grate X High

n Stream Upstream: 199.2 lines 112"x75" CM Pipe Arch; 50'-9" along centerline of pipe. Downstream: Non-comparable.

Period of Records N/A

.....c.f.s Date N/A Frequency N/A

t. Freq. 1 yr. Source BRETT HILDRETH* NCDOT BRIDGE MAINTENANCE Period of Knowledge 15 yr.

it. Freq. ..... Source ..... Period of Knowledge .....

) yr. WSEL @ Section 34869) Normal Water Surface Elev. ~609'

. Channel 0.045 Right O.B. 0.12 Obtained From FEMA FIS

Limited Detail Study Floodway Established? NO

1185 c.f.s.: W.S. Elev.: With Floodway 614.92' Without Floodway 614.17'

DESIGN DATA

USGS Rural Regression (2009-5158)

HEC-RAS 4.1.0 FILENAME: SF890366.PRJ

Q_{25} 6.2' : Q_{50} 6.5' : Q_{100} 6.9' : Q_{500} 7.7' : Q_{100} FEMA 6.9'

	Inlet Control		Outlet Control						Remarks
Ke	HW/D	H.W.	dc	$\frac{dc+D}{2}$	h_o	H	LS_o	H.W.	
COMPUTATIONS FROM HEC-RAS									

? MOA TYPE 2B (1.32' DECREASE HEC-RAS SECTION 34869)

ft/s Natural Channel Velocity, (V_{10}) 5.1 ft/s

CLASS II RIP RAP

FORMATION TO BE SHOWN ON PLANS

Frequency 25 yr. Flow 613.2'

n Beaverdam
ek (West) Struc. Inv. No. 890366 I.D. No. SF-890366 Project No. 17BP.10.R.19 890366 2012 SF890366 Branch Beaverdam Creek-West SR1153.pdf PDF File

CULVERT SURVEY & HYDRAULIC DESIGN REPORT

FEMA LIMITED DETAILED STUDY
ZONE AE
YADKIN RIVER BASIN

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

I.D. No. SF-890366 Project No. 17BP.10.R.19 Proj. Station Sta. 12+27 -L-

County Union Stream Branch Beaverdam Creek (West) Stru. No. 890366

On Highway SR1153 (Floyd Moore Rd) Between (S.Rocky River Rd) and Dead End

Recommended Structure 2 - 12' x 5' BOX CULVERT BARREL SECTION

Recommended Width of Roadway 20' (EOP to EOP) Skew 80 DEGREES

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

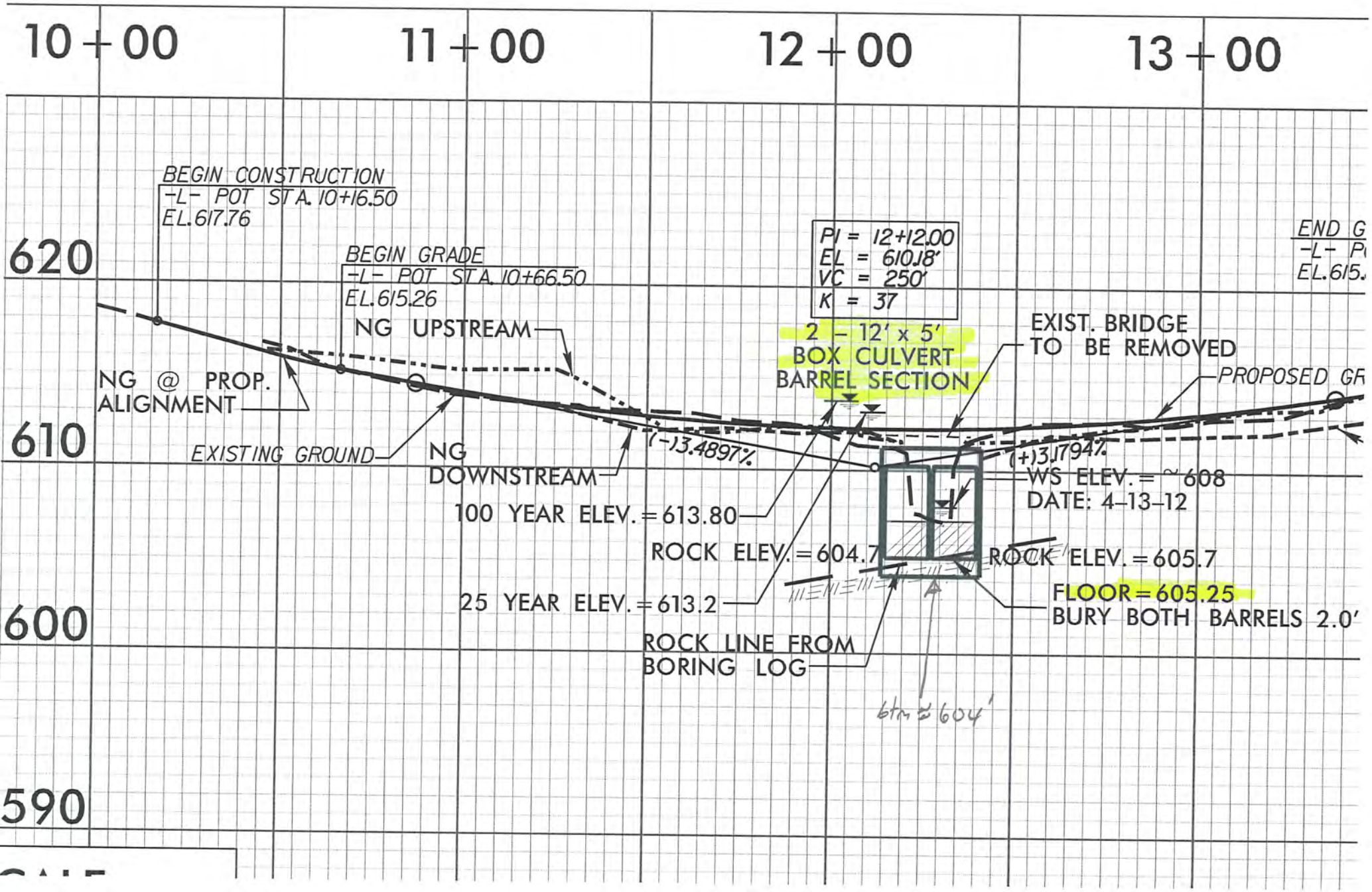
Bench Mark is Monument BL-2 -EL- Sta. 11+78.53 10.24' Right

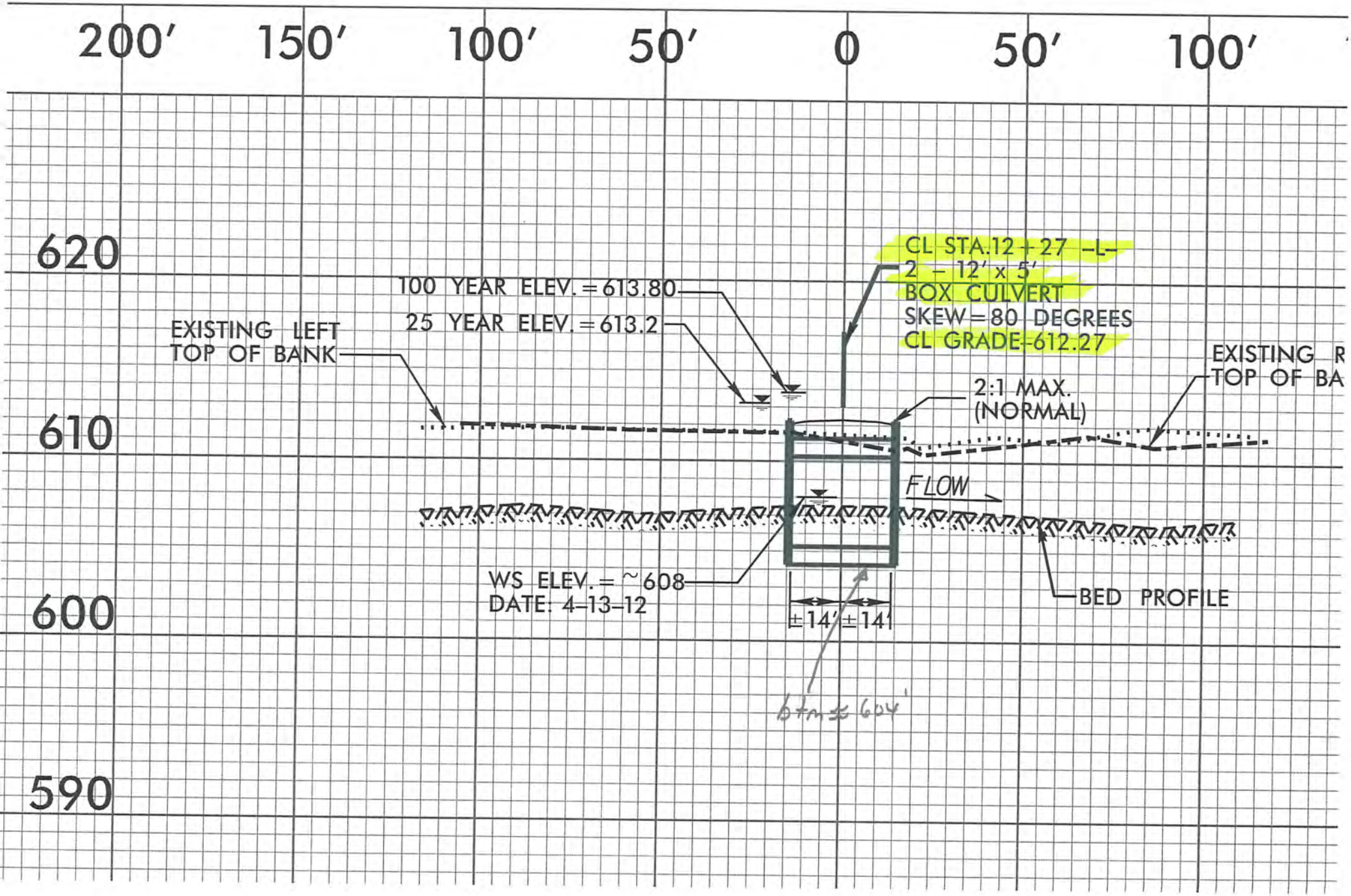
"BL-3" N: 433407.073 E: 1515111.036 Elev. 617.27' Datum: NAVD 88

Temporary Crossing Dead end road, existing bridge, to remain open during phased construction.

Designed by: AMEC E&I, Inc. Date 07/20/2012

Assisted by: Matt Melgren P.E.


10 + 00
11 + 00
12 + 00
13 + 00
620
610
600
590
BEGIN CONSTRUCTION
-L- POT STA. 10+16.50
EL. 617.76
BEGIN GRADE
-L- POT STA. 10+66.50
EL. 615.26
NG UPSTREAM
NG @ PROP. ALIGNMENT
EXISTING GROUND
NG DOWNSTREAM
(-13.489%
PI = 12+12.00
EL = 610.18'
VC = 250'
K = 37
2 - 12' x 5' BOX CULVERT BARREL SECTION
EXIST. BRIDGE TO BE REMOVED
PROPOSED GR
END G
-L- P
EL. 615.
(+13.179%
WS ELEV. = ≈ 608
DATE: 4-13-12
100 YEAR ELEV. = 613.80
ROCK ELEV. = 604.7
ROCK ELEV. = 605.7
25 YEAR ELEV. = 613.2
FLOOR = 605.25
BURY BOTH BARRELS 2.0'
ROCK LINE FROM BORING LOG
6tm ≈ 604'


200′
150′
100′
50′
0
50′
100′
620
610
600
590
100 YEAR ELEV. = 613.80
25 YEAR ELEV. = 613.2
EXISTING LEFT
TOP OF BANK
CL STA.12 + 27 –L–
2 – 12′ x 5′
BOX CULVERT
SKEW = 80 DEGREES
CL GRADE-612.27
2:1 MAX.
(NORMAL)
EXISTING R
TOP OF BA
FLOW
WS ELEV. = ~608
DATE: 4-13-12
BED PROFILE
±14′
±14′
btm ± 604′

PROJECT: WBS 17BP.10.R.19

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.10.R.19	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
17BP.10.R.19		PE
		ROW/UTIL.
		CONST.

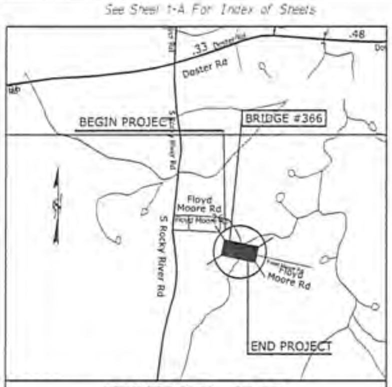
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UNION COUNTY

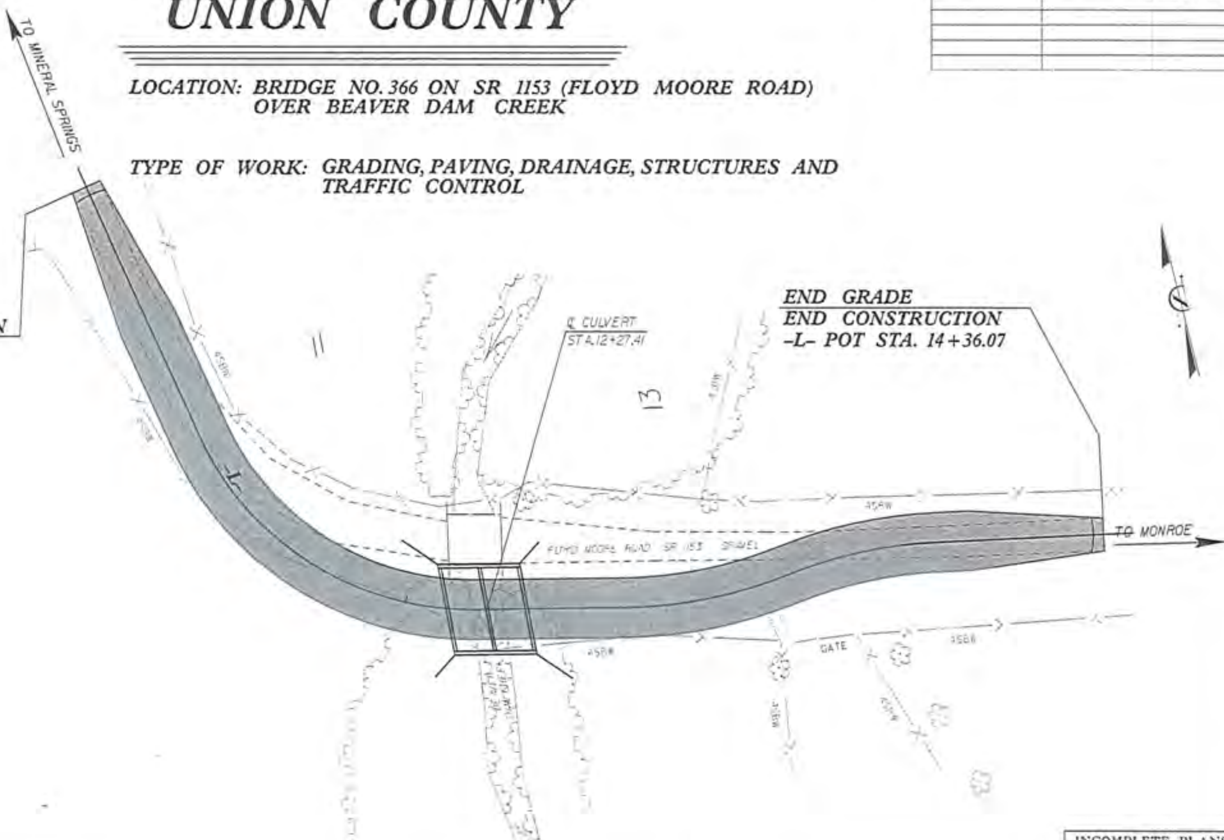
LOCATION: BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE ROAD) OVER BEAVER DAM CREEK

TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURES AND TRAFFIC CONTROL

See Sheet 1-A For Index of Sheets



VICINITY MAP



BEGIN CONSTRUCTION
-L- POT STA. 10+16.50

END GRADE
END CONSTRUCTION
-L- POT STA. 14+36.07

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

GRAPHIC SCALES
PLANS (20 10 0 20 40)
PROFILE (HORIZONTAL) (20 10 0 20 40)
PROFILE (VERTICAL) (4 2 0 4 8)

DESIGN DATA
ADT 2000 = 70
ADT 2020 = 115
DHV = NA %
D = NA %
T = NA % *
V = 15 MPH

FUNC CLASS = LOCAL SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY T.I.P. PROJECT 17BP.10.R.5 = 0.079 MI.
LENGTH OF STRUCTURE T.I.P. PROJECT 17BP.10.R.5 = 0.000 MI
TOTAL LENGTH OF T.I.P. PROJECT 17BP.10.R.5 = 0.079 MI

NCDOT CONTACT: LOUIS L. MITCHELL, PE
DIVISION CONSTRUCTION MANAGER

PREPARED IN THE OFFICE OF:
AMEC Environment & Infrastructure, Inc. 4021 Stirrup Creek Drive, Suite 100 Durham, North Carolina, 27703 NC Eng. License #: F-1253
amec
Tel. (919) 381-9900 Fax. (919) 381-9901 www.amec.com
FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
PROJECT ENGINEER

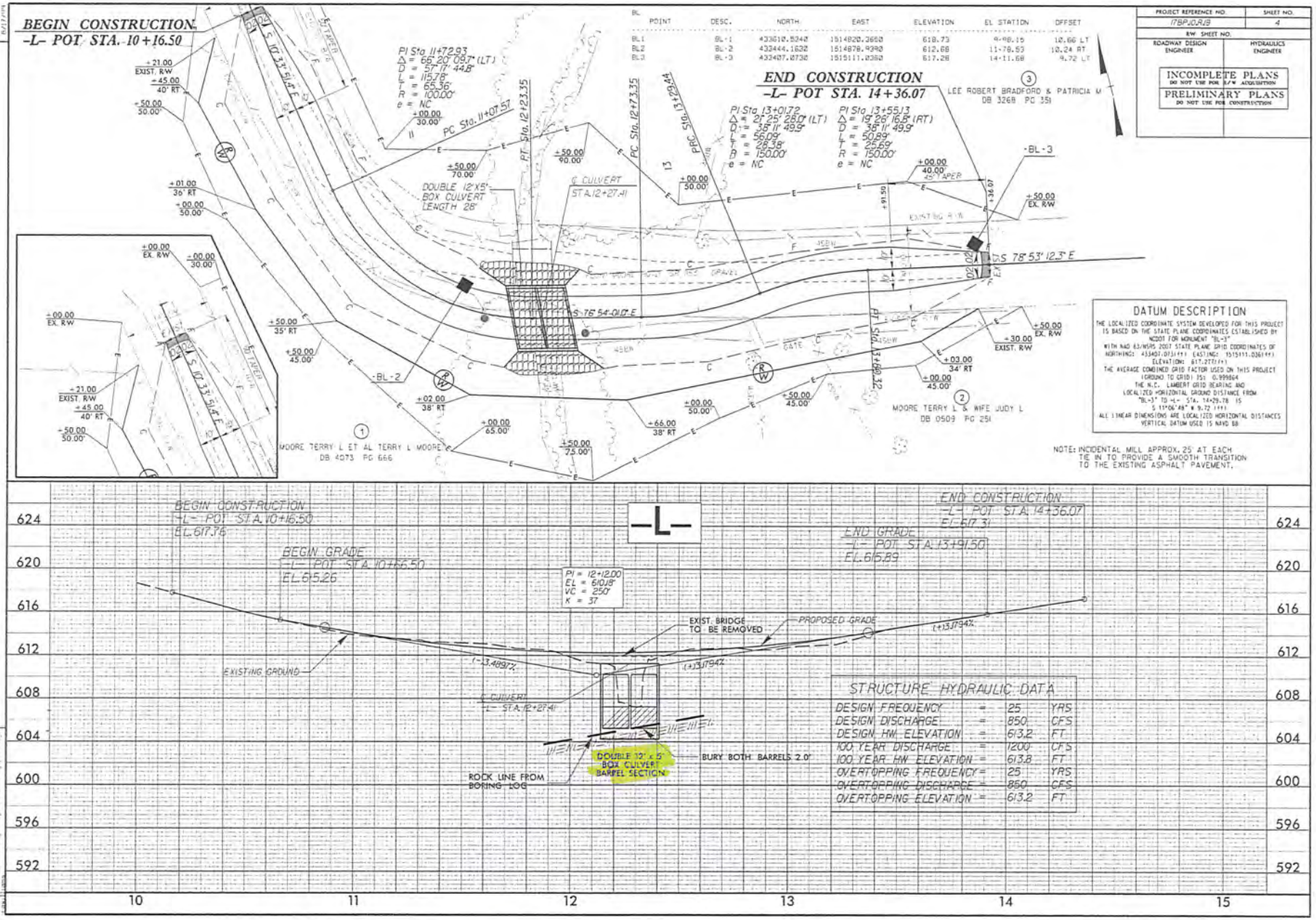
LETTING DATE:
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

CONTRACT:

7/24/2012
U:\Union366\Roadway\Proj\B890366_rdy_tsh.dgn
rowilliams



POINT	DESC.	NORTH	EAST	ELEVATION	EL STATION	OFFSET
BL1	BL-1	433610.8242	1514820.2660	618.73	9+88.15	12.66 LT
BL2	BL-2	433444.1632	1514878.9390	612.68	11+78.53	10.24 RT
BL3	BL-3	433487.8732	1515111.8360	617.28	14+11.68	9.72 LT

PROJECT REFERENCE NO.	SHEET NO.
17BP.00.R.9	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

DATUM DESCRIPTION

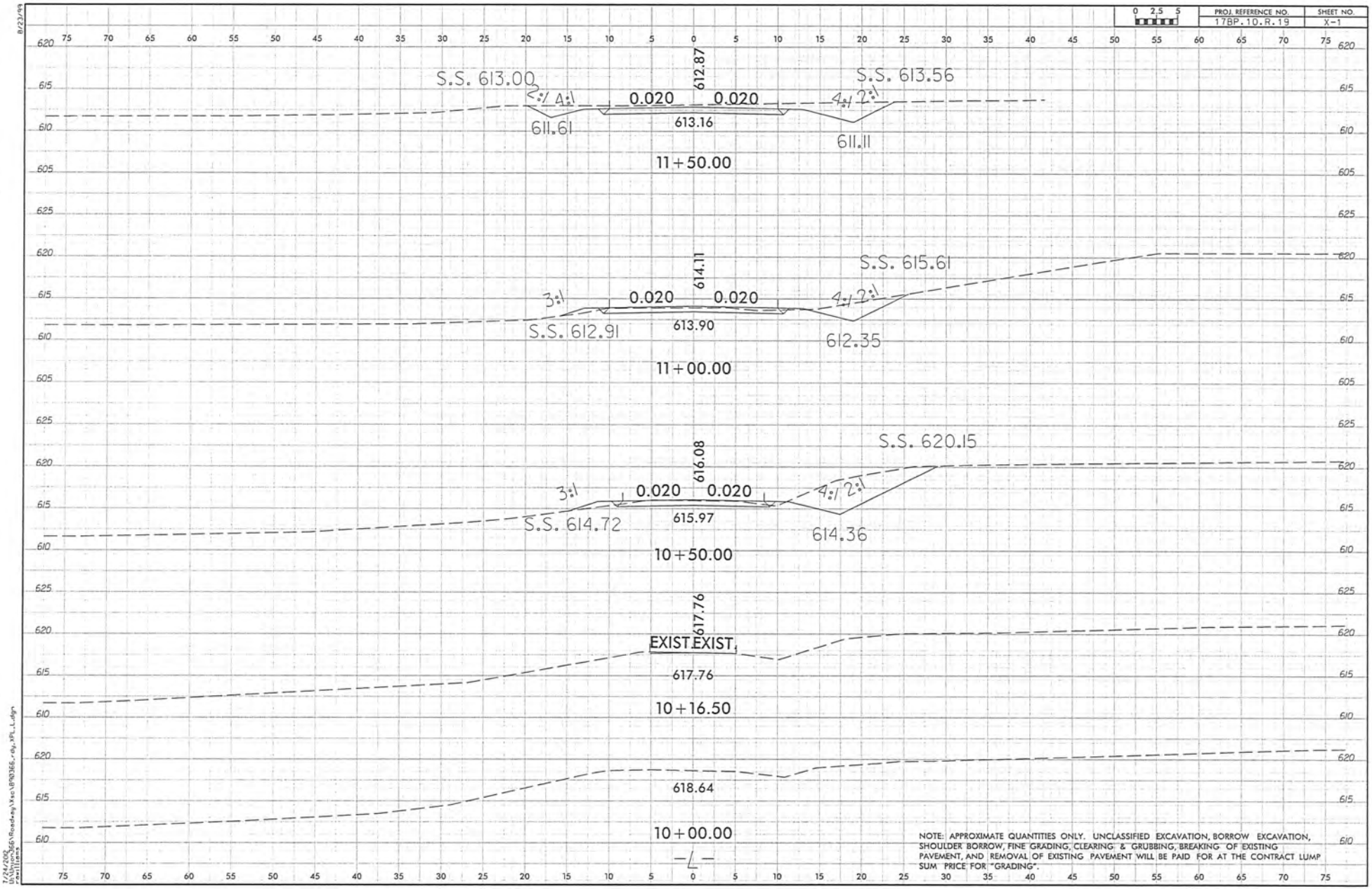
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "BL-3" WITH NAD 83/WGS 2007 STATE PLANE GRID COORDINATES OF NORTHING: 433407.0731(ft) EASTING: 1515111.0361(ft) ELEVATION: 617.277(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999864
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "BL-3" TO -L- STA. 14+29.78 IS S 11°06'48" W 9.72 (ft)
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88

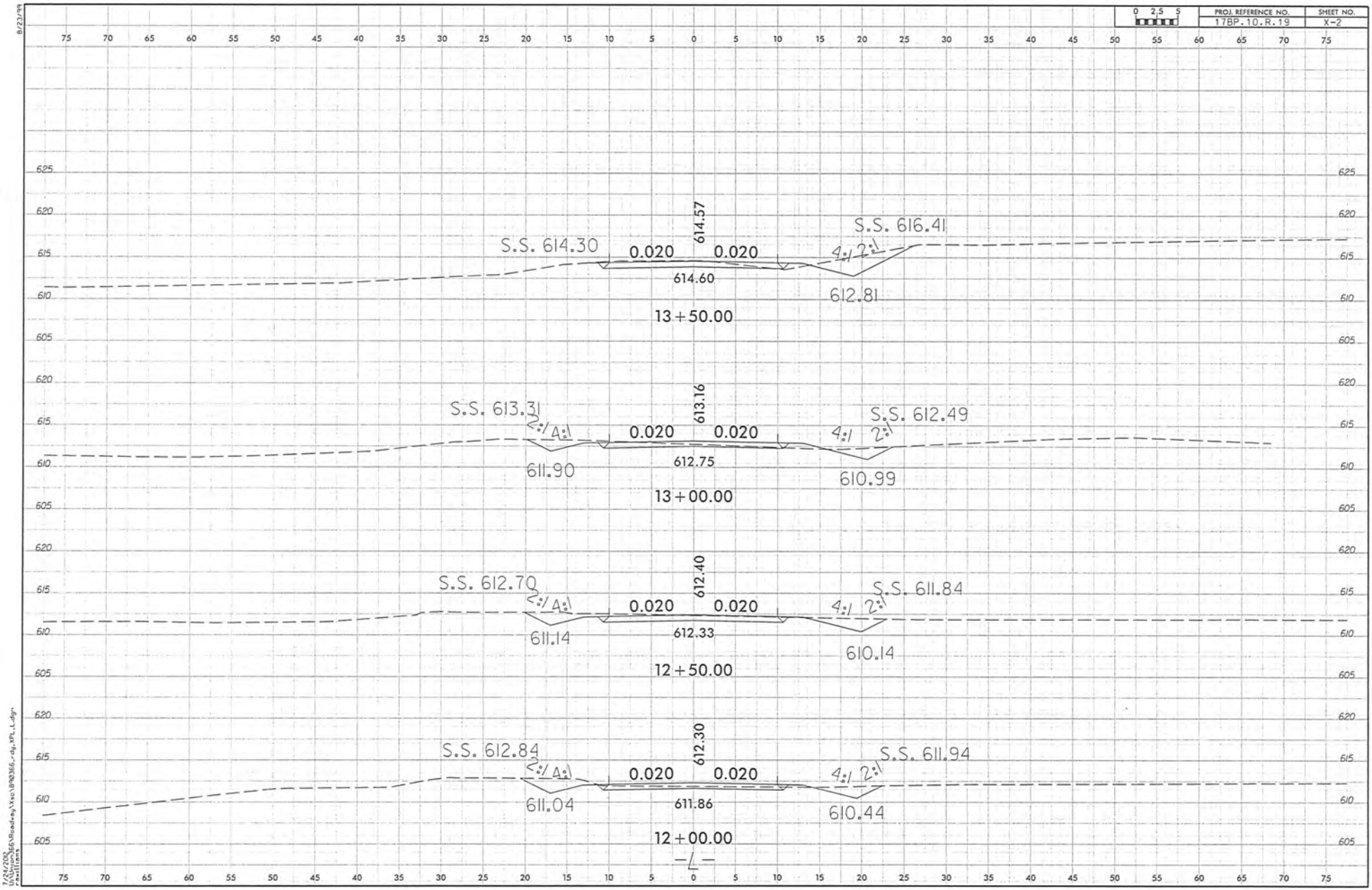
NOTE: INCIDENTAL MILL APPROX. 25' AT EACH TIE IN TO PROVIDE A SMOOTH TRANSITION TO THE EXISTING ASPHALT PAVEMENT.

STRUCTURE HYDRAULIC DATA

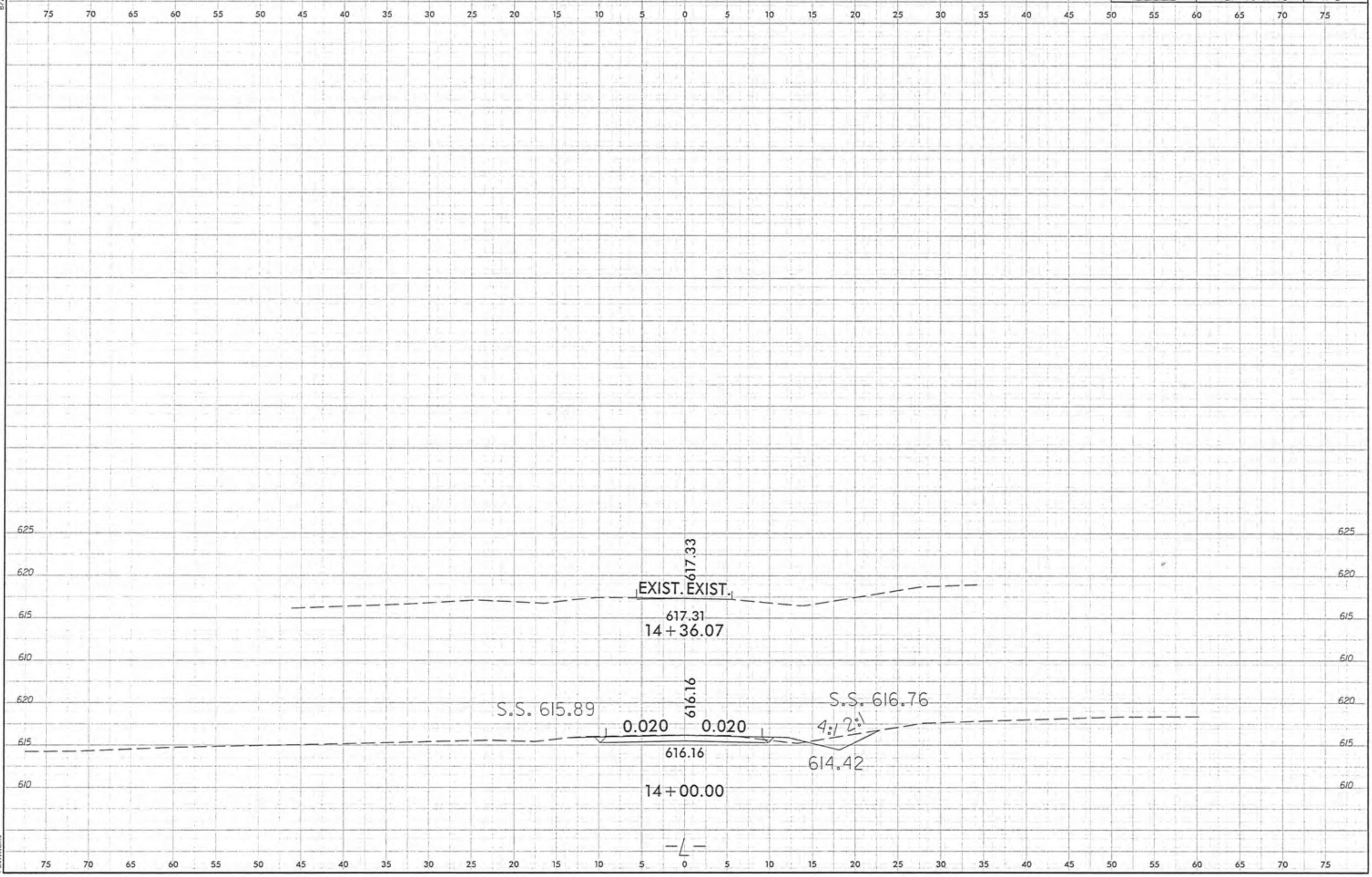
DESIGN FREQUENCY	=	25	YRS
DESIGN DISCHARGE	=	850	CFS
DESIGN HW ELEVATION	=	613.2	FT
100 YEAR DISCHARGE	=	1200	CFS
100 YEAR HW ELEVATION	=	613.8	FT
OVERTOPPING FREQUENCY	=	25	YRS
OVERTOPPING DISCHARGE	=	850	CFS
OVERTOPPING ELEVATION	=	613.2	FT

REVISIONS


0 2.5 5
PROJ. REFERENCE NO.
17BP.10.R.19
SHEET NO.
X-1
S.S. 613.00
612.87
S.S. 613.56
4:1
0.020
0.020
4:1
2:1
611.61
613.16
611.11
11+50.00
614.11
S.S. 615.61
3:1
0.020
0.020
4:1
2:1
S.S. 612.91
613.90
612.35
11+00.00
616.08
S.S. 620.15
3:1
0.020
0.020
4:1
2:1
S.S. 614.72
615.97
614.36
10+50.00
617.76
EXIST.
EXIST.
617.76
10+16.50
618.64
10+00.00
NOTE: APPROXIMATE QUANTITIES ONLY. UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, SHOULDER BORROW, FINE GRADING, CLEARING & GRUBBING, BREAKING OF EXISTING PAVEMENT, AND REMOVAL OF EXISTING PAVEMENT WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING".


0 2.5 5
PROJ. REFERENCE NO.
17BP.10.R.19
SHEET NO.
X-2
S.S. 614.30
614.57
0.020
0.020
4:1
2:1
S.S. 616.41
614.60
612.81
13+50.00
S.S. 613.31
613.16
2:1
4:1
S.S. 612.49
611.90
612.75
610.99
13+00.00
S.S. 612.70
612.40
S.S. 611.84
611.14
612.33
610.14
12+50.00
S.S. 612.84
612.30
S.S. 611.94
611.04
611.86
610.44
12+00.00

PROJ. REFERENCE NO.	SHEET NO.
17BP.10.R.19	X-3



8/23/99

7/24/2012

FOUNDATION CALCULATIONS

amec

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

JOB NO. 6469-12-1040 SHEET 1 OF 15 X
PHASE GROUP N BRIDGES TASK X
JOB NAME UNION Co. Br. 366 X
BY JSJ DATE 7/25/12 X
CHECKED BY SG DATE 7/26/12 X

BR. 366 UNION Co.

- Recommended Structure = 2 @ 12' X 5' RCBC ✓
- Culvert Invert = 605.25 ft ✓
- Btm of structure = ≈ 604 ft ✓
- Existing Btm of creek = ≈ 607' ✓
- PROPOSED GRADE = @ ℄ 612.27' ✓
- Existing Grade near creek Banks "abutments" ≈ 611' - 612' ✓
- Amount of fill on top of culvert ≈ 1'
- Amount of fill at abutments = < 2' (minimal change)

preliminary CSR & preliminary Roadway drawings

- NCDOT Provided 2 borings to Refusal on each side of the Creek (4 total borings by NCDOT) at the existing Bridge location. AMEC Provided 1 - Boring w/ Rock coring on each side of the creek (2 - Borings) at the existing bridge location. Due to the new culvert being planned adjacent the existing structure, AMEC went BACK to site and perform 4 Hand augers / Rod soundings to confirm rock elevations in the footprint of the proposed culvert.
- Collar Elevations of Borings were determined by using NCDOT Benchmarks.

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

JOB NO. 6469-12-1040 SHEET 2 OF 15 X
PHASE Group N Bridges TASK X
JOB NAME UNION Co. Br. 366 X
BY JSJ DATE 7/25/12 X
CHECKED BY SG DATE 7/26/12 X

B.R. 366

END BENT 1 SIDE OF CULVERT (Down station of creek)

BORING	Collar Elev.	WR Elev.	HR Elev.	Btm of culvert elev.	Dep. Th to WR/HR
B-3	613.0'	605.3'	604.5'	≈ 604'	-1.3'
B-4	612.6'	604.9'	604.5'	≈ 604'	-0.9'
AMEC B-6	612.9'	604.7'	604.1'	≈ 604'	-0.7'
SR-1	611.7'	605.7'	-	≈ 604'	-1.7'
SR-2	611.1'	606.6'	-	≈ 604'	-2.4'

END BENT 2 side of culvert (Upstation of creek)

B-1	612.6'	606.4'	606.4	≈ 604'	-2.4'
B-2	612.9'	607.2'	606.9	≈ 604'	-3.2'
AMEC B-5	612.4'	605.7'	605.7	≈ 604'	-1.7'
SR-3	607.9'	604.9'	-	≈ 604'	-0.9'
SR-4	606.8'	603.3'	-	≈ 604'	0.7'

Summary

- The Btm of culvert on the EB1 side is Approx. 1-2 ft. into WR/HR
- The Btm of culvert on the EB2 side is Approx. 1 ft above WR/HR OR approx. 1-3' ft. into WR/HR.
- Based on the Boring / Rod soundings, The proposed btm of culvert is in WR/HR OR near WR/HR.

amec

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

JOB NO. 6469-12-1040 SHEET 3 OF 15 X
PHASE Group N Bridges TASK X
JOB NAME Union Co. Bridge 366 X
BY JSJ DATE 7/25/12 X
CHECKED BY SG DATE 7/26/12 X

BR. 766

- Recommendations

- Excavate 1-ft below culvert and footings and replace with foundation conditioning material in accordance with Article 414 of the Standard Specification.
  * foundation conditioning material = Class VI (No. 57 stone).
  * Culvert should not bear on wet/MR (per 414 of Standard Specification.

- Significant long term or short term settlements are not anticipated due to Culvert btm. being near or in wet/MR.

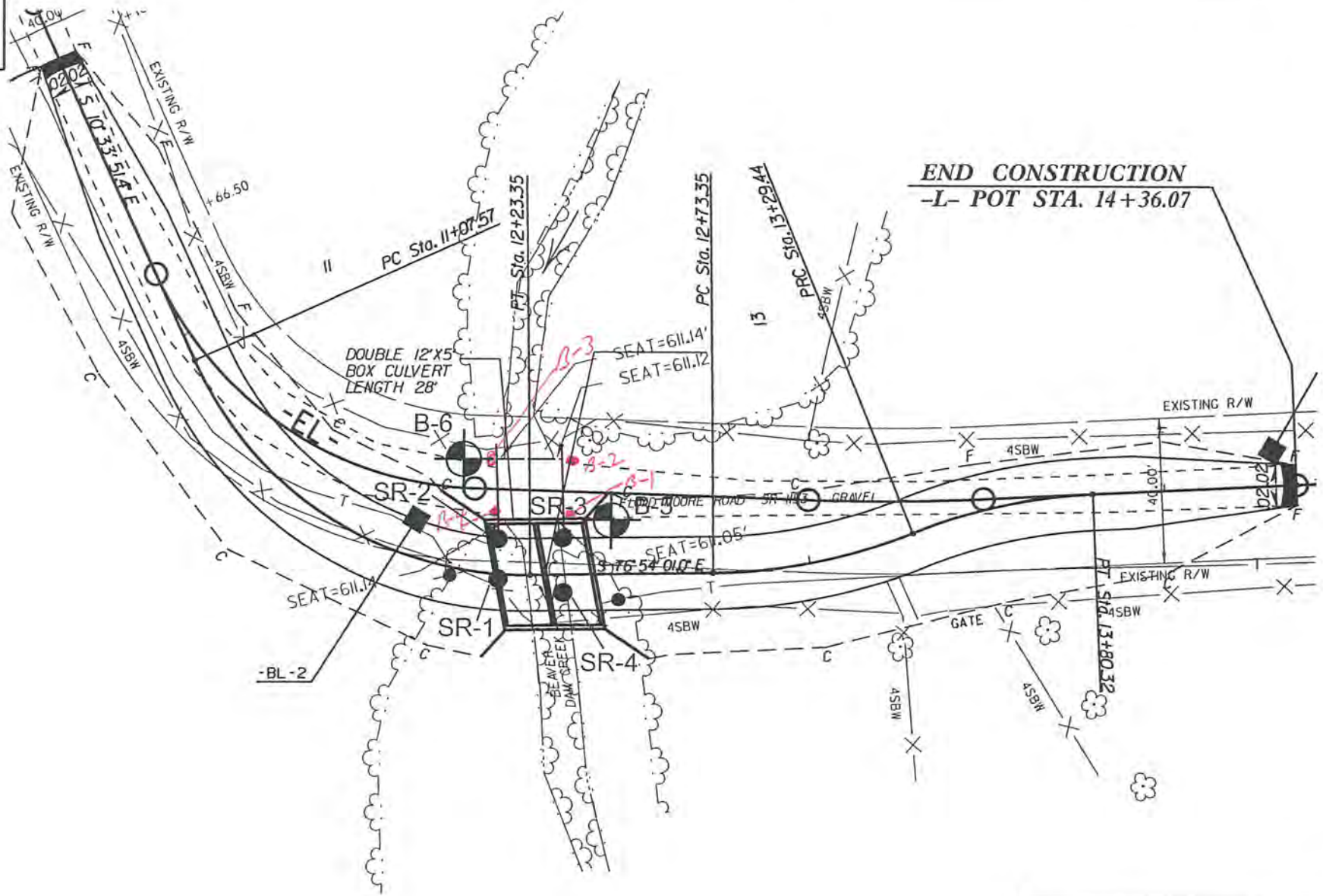
- Due to minimal grade change at the approaches, we do not anticipate significant long-term settlements at the approaches.

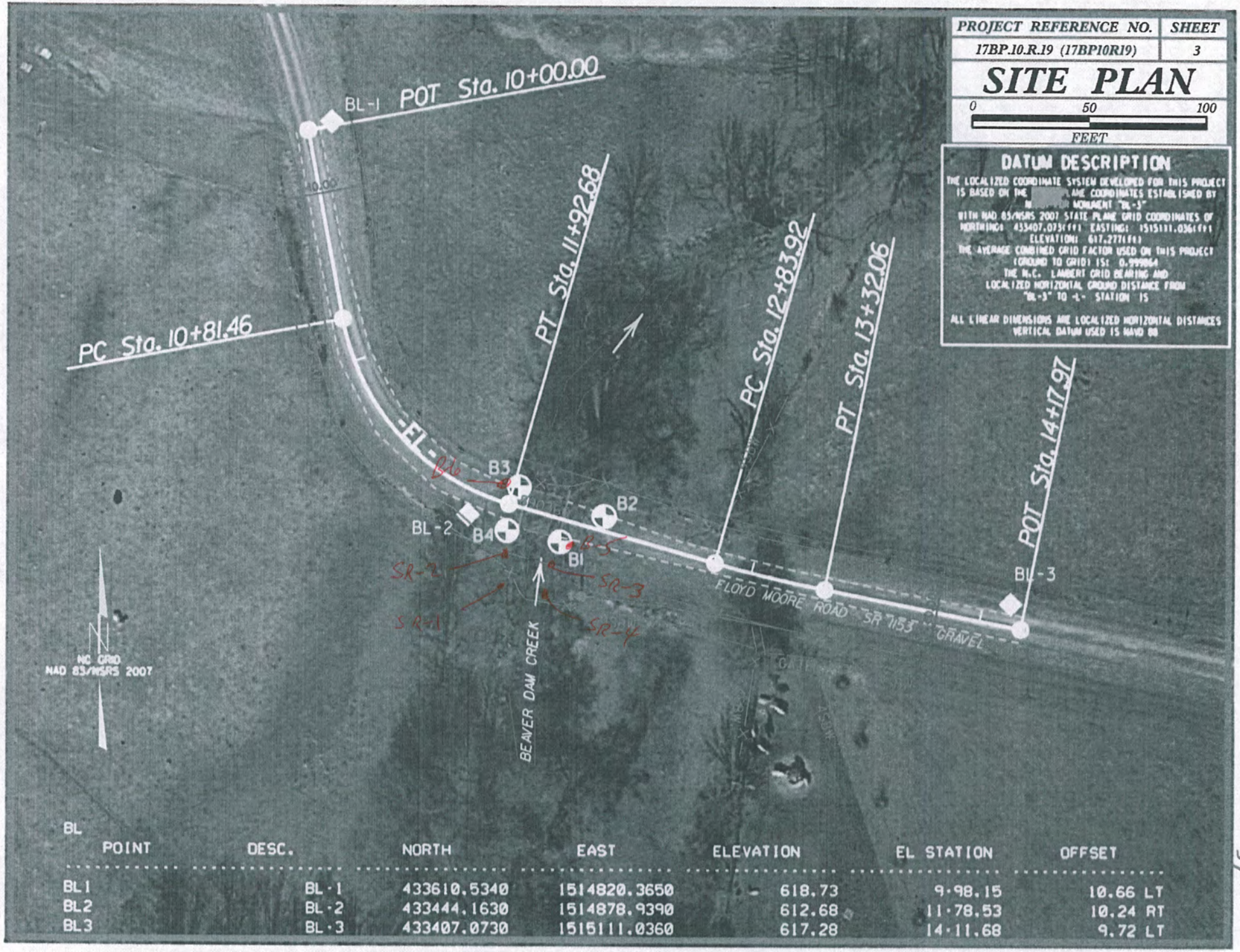
- If soft foundation soils are encountered at the bearing surface, they should be undercut and replaced w/ Class VI Select Material.

* (Quantity of undercut and Backfill (Class VI)) = (0.5' x ≈25' x ≈30')
= 375 ft³ → 13.9 cy ≈ say 25 cy

* This quantity should be a contingency.

DESCRIPTION:	ENGLISH	SHEET NO.	3
REPLACE BRIDGE 890366 ON SR 1153 (FLOYD MOORE ROAD) OVER BEAVER DAM CREEK WEST		W.B S. NO.: 17BP.10.R.19	
		T.I.P. NO.:	N/A
		COUNTY:	UNION





BL

POINT	DESC.	NORTH	EAST	ELEVATION	EL STATION	OFFSET
BL1	BL-1	433610.5340	1514820.3650	618.73	9+98.15	10.66 LT
BL2	BL-2	433444.1630	1514878.9390	612.68	11+78.53	10.24 RT
BL3	BL-3	433407.0730	1515111.0360	617.28	14+11.68	9.72 LT

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

6/15

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 11+95	**OFFSET** 8 ft LT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 613.0 ft	**TOTAL DEPTH** 8.5 ft	**NORTHING** 433,456	**EASTING** 1,514,901	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615										613.0 GROUND SURFACE	0.0
610	609.0	4.0	1	2	3	5	SS-3	M		**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6) 610.0	3.0
605										**ALLUVIAL** TAN-GRAY MED. STIFF LOW (PI=15) PLASTIC SANDY SILTY CLAY (A-6) 606.5	6.5
										RESIDUAL 605.3 TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4) 604.5	7.7 8.5
										WEATHERED ROCK SEV. WEATH. NON-CRYSTALLINE ROCK	
										Boring Terminated BY AUGER REFUSAL at Elevation 604.5 ft ON NON-CRYSTALLINE ROCK	

Btm. of culvert ≈ 604'

NCDOT BORE SINGLE 090&000_GEO_BH_BRDG0366_UNION.GPJ NC_DOT.GDT 11/22/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

7/15

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 11+95	**OFFSET** 11 ft RT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.6 ft	**TOTAL DEPTH** 8.1 ft	**NORTHING** 433,437	**EASTING** 1,514,896	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.6 GROUND SURFACE	0.0
610										**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6) 609.6	3.0
	608.9	3.7	1	2	2	4		M		**ALLUVIAL** TAN-GRAY SOFT TO MED. STIFF SANDY SILTY CLAY (A-6) 607.1	5.5
605										**RESIDUAL** 604.9 TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4) 604.5	7.7 / 8.1
										WEATHERED ROCK SEV. WEATH. NON-CRYSTALLINE ROCK	
										Boring Terminated BY AUGER REFUSAL at Elevation 604.5 ft ON NON-CRYSTALLINE ROCK	

Btm of culvert ≈ 604'

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

8/15

WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-6	**STATION** 11+97	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 612.9 ft	**TOTAL DEPTH** 19.8 ft	**NORTHING** 433,457	**EASTING** 1,514,895	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/15/12	**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)
615										
	612.9	0.0	4	5	4	9				612.9 GROUND SURFACE 0.0
610	609.4	3.5	2	2	5	7		W		610.4 **ROADWAY EMBANKMENT** Brownish red, stiff, moist, fine sandy SILT (A-4) with little gravel 2.5
										ALLUVIAL Yellowish brown, medium stiff, wet, silty CLAY (A-6) with trace coarse sand and gravel
605	604.7	8.2								604.7 8.2
	604.1	8.8	100/0.3			100/0.3				604.1 **WEATHERED ROCK** 8.8
			60/0.0			60/0.0				Gray-tan, METAVOLCANIC ROCK
600										**NON-CRYSTALLINE ROCK** Greenish gray, METAVOLCANIC ROCK
						Bt. of Colluvit ≈ 604'				
595										593.1 19.8
										Boring Terminated at Elevation 593.1 ft in Non-Crystalline Rock: METAVOLCANIC ROCK
										Auger refusal at 8.8 feet.

9/15

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-1	STA	12+15	OFFSET	1 FT RT	ALIGN-MENT	L
ELEVATION	611.7 FT	TOTAL DEPTH	6.0 FT	NORTH	433,423	EAST	1,514,897
DRILL METHOD	Sounding Rod/Hand Auger					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	6.0 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0			17	X	S-1 0.0 - 4.0 ft	D	Residual	Elev. 611.7 ft Brown, fine sandy SILT (A-4)
			15	X				
			17	X				
			28	X				Hand Auger refusal at 4.0 feet
			25	X				
			31	X				Elev. 605.7 ft
6.0								Sounding Rod refusal at 6.0 feet

Btm of culvert ≈ 604'

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

10/15

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-2	STA	12+14	OFFSET	10 FT LT	ALIGN-MENT	L
ELEVATION	611.1 FT	TOTAL DEPTH	4.5 FT	NORTH	433,434	EAST	1,514,899
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	4.5 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0			8	X		D-M	Residual	Elev. 611.1 ft Brown, fine sandy SILT (A-4)
			11	X				
			16	X				
			27	X				Elev. 606.6 ft
4.5			26	X				Sounding Rod refusal at 4.5 feet

Btm of culvert @ 604'

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

11/15

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 12+18	**OFFSET** 10 ft RT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.6 ft	**TOTAL DEPTH** 6.2 ft	**NORTHING** 433,433	**EASTING** 1,514,918	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.6 GROUND SURFACE	0.0
610										**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6)	
	608.7	3.9	2	2	3	5	SS-1	M		609.6	3.0
										ALLUVIAL TAN-GRAY MED. STIFF MOIST MED. (PI=20) PLASTIC SILTY SANDY CLAY (A-6)	
										607.3	5.3
										RESIDUAL TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4)	
										606.4 Boring Terminated BY AUGER REFUSAL at Elevation 606.4 ft ON NON-CRYSTALLINE ROCK	6.2

Btm of culvert ≈ 604'

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 12+33	**OFFSET** 6 ft LT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.9 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 433,444	**EASTING** 1,514,937	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.9 GROUND SURFACE	0.0
610										**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6)	
	609.0	3.9	14	13	7	20	SS-2	M		609.9	3.0
										RESIDUAL TAN-BRN-GRAY V. STIFF MOIST CLAYEY SANDY SILT (A-4)	
										607.2	5.7
										WEATHERED ROCK SEV. WEATH. NON-CRYSTALLINE ROCK	
										606.9	6.0
										Boring Terminated BY AUGER REFUSAL at Elevation 606.9 ft ON NON-CRYSTALLINE ROCK	

Btm of Culvert ≈ 604'

13/15

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-5	**STATION** 12+46	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.2
COLLAR ELEV. 612.4 ft	**TOTAL DEPTH** 14.8 ft	**NORTHING** 433,431	**EASTING** 1,514,931	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/16/12	**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)
615										
	612.4	0.0								612.4 GROUND SURFACE 0.0
			2	3	3	6		M		**ROADWAY EMBANKMENT** Brownish red, medium stiff, moist, fine sandy
610										SILT (A-4) with trace gravel
	608.9	3.5								609.4 3.0
			3	3	5	8		M		**ALLUVIAL** Yellowish brown, medium stiff, moist, silty
										CLAY (A-6) with little fine sand
605	605.7	6.7	60/0.1			60/0.1				605.7 6.7
										605.6 **NON-CRYSTALLINE ROCK** 6.8
										Greenish gray, METAVOLCANIC ROCK
600						Btm of culvert = 600'				
										597.6 14.8

Boring Terminated at Elevation 597.6 ft in Non-Crystalline Rock: METAVOLCANIC ROCK

Auger refusal at 6.7 feet.

14/15

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-3	STA	12+32	OFFSET	10 FT LT	ALIGN-MENT	L
ELEVATION	607.9 FT	TOTAL DEPTH	3.0 FT	NORTH	433,430	EAST	1,514,917
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	3.0 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0			4	X		M	Residual	Elev. 607.9ft Brown, fine sandy SILT (A-4)
			12	X				
			30	X				Elev. 604.9 ft
3.0								Sounding Rod refusal at 3.0 feet

Btm. of Culvert ± 604'

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

15/15

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-4	STA	12+32	OFFSET	5 FT RT	ALIGN-MENT	L
ELEVATION	606.8 FT	TOTAL DEPTH	3.5 FT	NORTH	433,415	EAST	1,514,913
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	3.5 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0								Elev. 606.8ft
			5	X		M	Residual	Brown, fine sandy SILT (A-4)
			15	X				
			26	X				
			20	X				
								Elev. 603.3 ft
3.5								Sounding Rod refusal at 3.5 feet

Btm. of culvert ≈ 604'

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

STRUCTURE SUBSURFACE INVESTIGATION PROVIDED BY NCDOT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.10.R.19	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *17BP.10.R.19 (17BP10R19)* F.A. PROJ. _____

COUNTY *UNION*

PROJECT DESCRIPTION *REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST*

SITE DESCRIPTION _____

CONTENTS

PERSONNEL

J.K. STICKNEY

C.L. SMITH

INVESTIGATED BY *J.E. BEVERLY*

CHECKED BY *C.B. LITTLE*

SUBMITTED BY *C.B. LITTLE*

DATE *NOVEMBER 2011*

CAUTION NOTICE

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

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.

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: *J.K. McCLURE*

PROJECT REFERENCE NO.	SHEET NO.
17BP.10.R.19 (17BP10R19)	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 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- 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
γ - UNIT WEIGHT
γ_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
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET NO.
I78P.10.R.19 (I78P10R19)	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. SHALL, 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.

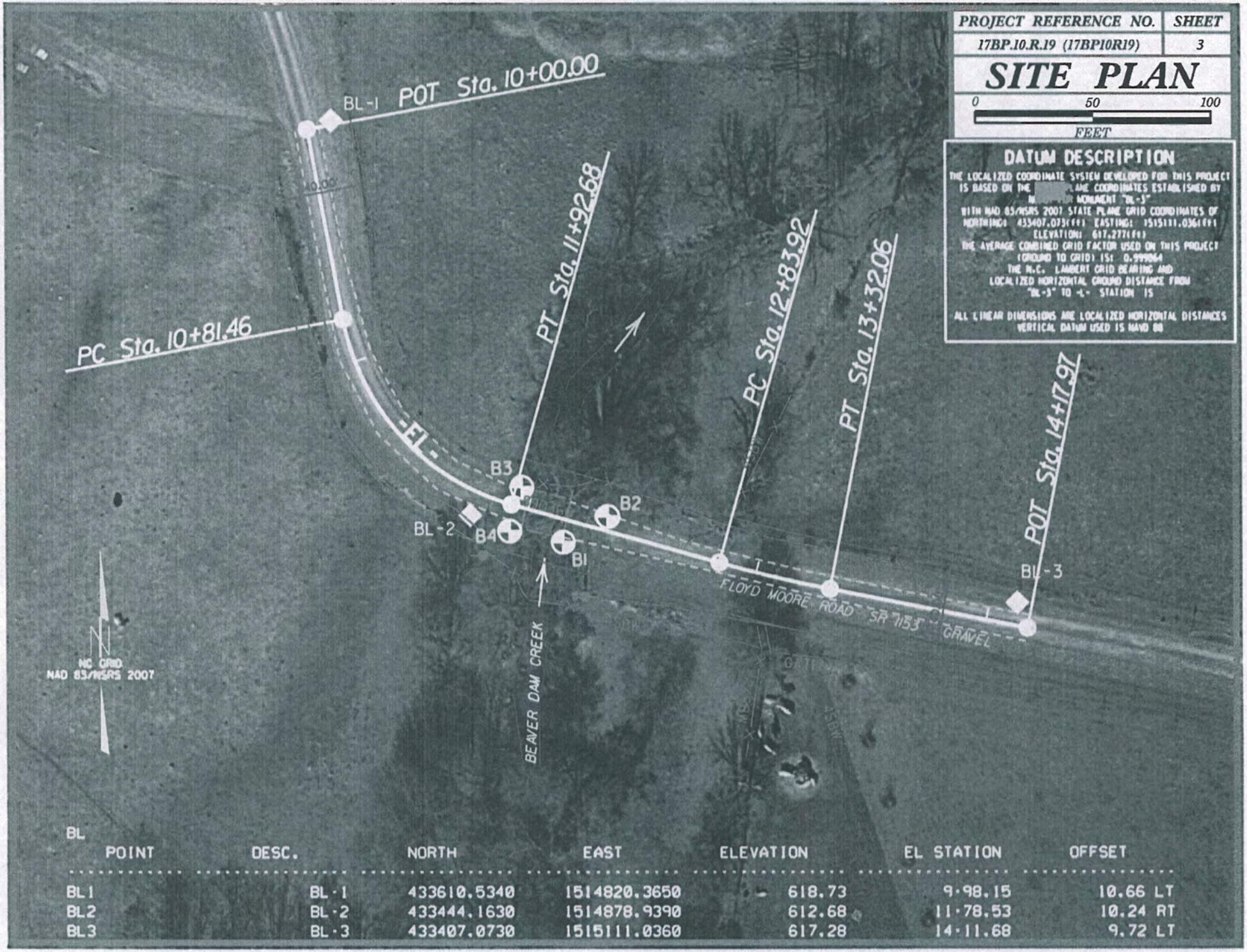
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-1
STA. 9+98.15 -EL- 10.66 LT.
N 433610.5340 E 1514820.3650 ELEVATION: 618.73 FT.

NOTES:

REVISED 09/23/09



BL

POINT	DESC.	NORTH	EAST	ELEVATION	EL STATION	OFFSET
BL1	BL-1	433610.5340	1514820.3650	618.73	9+98.15	10.66 LT
BL2	BL-2	433444.1630	1514878.9390	612.68	11+78.53	10.24 RT
BL3	BL-3	433407.0730	1515111.0360	617.28	14+11.68	9.72 LT

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 12+18	**OFFSET** 10 ft RT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.6 ft	**TOTAL DEPTH** 6.2 ft	**NORTHING** 433,433	**EASTING** 1,514,918	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.6 GROUND SURFACE	0.0
610										**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6) 609.6	3.0
	608.7	3.9	2	2	3	5	SS-1	M		**ALLUVIAL** TAN-GRAY MED. STIFF MOIST MED. (PI=20) PLASTIC SILTY SANDY CLAY (A-6) 607.3	5.3
										RESIDUAL TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4) 606.4	6.2
										Boring Terminated BY AUGER REFUSAL at Elevation 606.4 ft ON NON-CRYSTALLINE ROCK	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 12+33	**OFFSET** 6 ft LT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.9 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 433,444	**EASTING** 1,514,937	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.9 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6)	
610										609.9	3.0
	609.0	3.9	14	13	7	20	SS-2	M		**RESIDUAL** TAN-BRN-GRAY V. STIFF MOIST CLAYEY SANDY SILT (A-4)	
										607.2	5.7
										606.9 **WEATHERED ROCK** SEV. WEATH. NON-CRYSTALLINE ROCK	6.0
										Boring Terminated BY AUGER REFUSAL at Elevation 606.9 ft ON NON-CRYSTALLINE ROCK	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 11+95	**OFFSET** 8 ft LT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 613.0 ft	**TOTAL DEPTH** 8.5 ft	**NORTHING** 433,456	**EASTING** 1,514,901	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615												
										GROUND SURFACE	613.0	0.0
										ROADWAY EMBANKMENT RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6)	610.0	3.0
610	609.0	4.0	1	2	3	5	SS-3	M		**ALLUVIAL** TAN-GRAY MED. STIFF LOW (PI=15) PLASTIC SANDY SILTY CLAY (A-6)	606.5	6.5
605										**RESIDUAL** TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4)	605.3	7.7
										WEATHERED ROCK SEV. WEATH. NON-CRYSTALLINE ROCK	604.5	8.5
										Boring Terminated BY AUGER REFUSAL at Elevation 604.5 ft ON NON-CRYSTALLINE ROCK		

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP10R19	**COUNTY** UNION	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION REPLACE BRIDGE NO. 366 ON SR 1153 (FLOYD MOORE RD.) OVER BEAVER DAM CREEK WEST				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 11+95	**OFFSET** 11 ft RT	**ALIGNMENT** -EL-	**0 HR.** Dry
COLLAR ELEV. 612.6 ft	**TOTAL DEPTH** 8.1 ft	**NORTHING** 433,437	**EASTING** 1,514,896	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, C. L.	**START DATE** 10/24/11	**COMP. DATE** 10/24/11	**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)
615											
										612.6 GROUND SURFACE	0.0
610										**ROADWAY EMBANKMENT** RED-BRN SOFT TO MED. STIFF MOIST SILTY CLAY (A-6) 609.6	3.0
	608.9	3.7	1	2	2	4		M		**ALLUVIAL** TAN-GRAY SOFT TO MED. STIFF SANDY SILTY CLAY (A-6) 607.1	5.5
605										**RESIDUAL** TAN-BRN-GRAY STIFF TO V. STIFF MOIST CLAYEY SANDY SILT (A-4) 604.9	7.7
										604.5	8.1
										WEATHERED ROCK SEV. WEATH. NON-CRYSTALLINE ROCK	
										Boring Terminated BY AUGER REFUSAL at Elevation 604.5 ft ON NON-CRYSTALLINE ROCK	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAY
MATERIALS & TESTS UNIT
SOILS LABORATORY

T. I. P. No. 17BP10R19

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 17BP.10.R.19 **County** UNION **Owner**

Date: Sampled 10/26/11 **Received** 11/1/11 **Reported** 11/3/11

Sampled from BRIDGE **By** J E BEVERLY

Submitted by N WAINAINA 1995 **Standard Specifications**

775235 TO 775237
11/22/11

TEST RESULTS

Proj. Sample No.		SS-1	SS-2	SS-3			
Lab. Sample No.		775235	775236	775237			
Retained #4 Sieve	%	-	-	-			
Passing #10 Sieve	%	96	98	99			
Passing #40 Sieve	%	81	83	96			
Passing #200 Sieve	%	61	51	87			

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	24.0	30.7	5.2			
Fine Sand Ret - #270	%	16.1	20.6	10.7			
Silt 0.05 - 0.005 mm	%	23.5	20.5	39.7			
Clay < 0.005 mm	%	36.3	28.3	44.4			
Passing #40 Sieve	%	-	-	-			
Passing #200 Sieve	%	-	-	-			

L. L.		37	22	34			
P. I.		20	7	15			
AASHTO Classification		A-6(9)	A-4(1)	A-6(12)			
Station		12+18	12+33	11+95			
Offset		9.5 RT.	6.0 LT.	8.2 LT.			
Alignment		EL	EL	EL			
Location		B1	B2	B3			
Depth (Ft)		4.40	4.40	4.50			
	to	5.40	5.40	5.50			

cc: J E BEVERLY

Soils Engineer

SUPPLEMENTAL STRUCTURE SUBSURFACE INVESTIGATION PROVIDED BY AMEC

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.10.R.19	1	14

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *17BP.10.R.19* F.A. PROJ. *N/A*

COUNTY *UNION*

PROJECT DESCRIPTION *DIVISION 10 GROUP N BRIDGE REPLACEMENT*

SITE DESCRIPTION *REPLACE BRIDGE 890366 ON SR 1153 (FLOYD MOORE ROAD) OVER BEAVER DAM CREEK WEST*

CONTENTS

PERSONNEL

F. Cox

D. Rhodes

R. Clark

INVESTIGATED BY *AMEC E&I, Inc.*

CHECKED BY *S. Johnson, P.G. P.E.*

SUBMITTED BY *M. Lear, P.G.*

DATE *July 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 4/26/2012 SEAL 1927 GEOLOGIST MICHAEL B. LEAR SEAL

amec

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

SIGNATURE

NC Engineering F-1253 NC Geology C-247

PROJECT REFERENCE NO.	SHEET NO.
17BP.10.R.19	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	6 MX		NP	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 FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / OPT / 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
γ - UNIT WEIGHT
γ_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-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 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.10.R.19	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 IN 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.

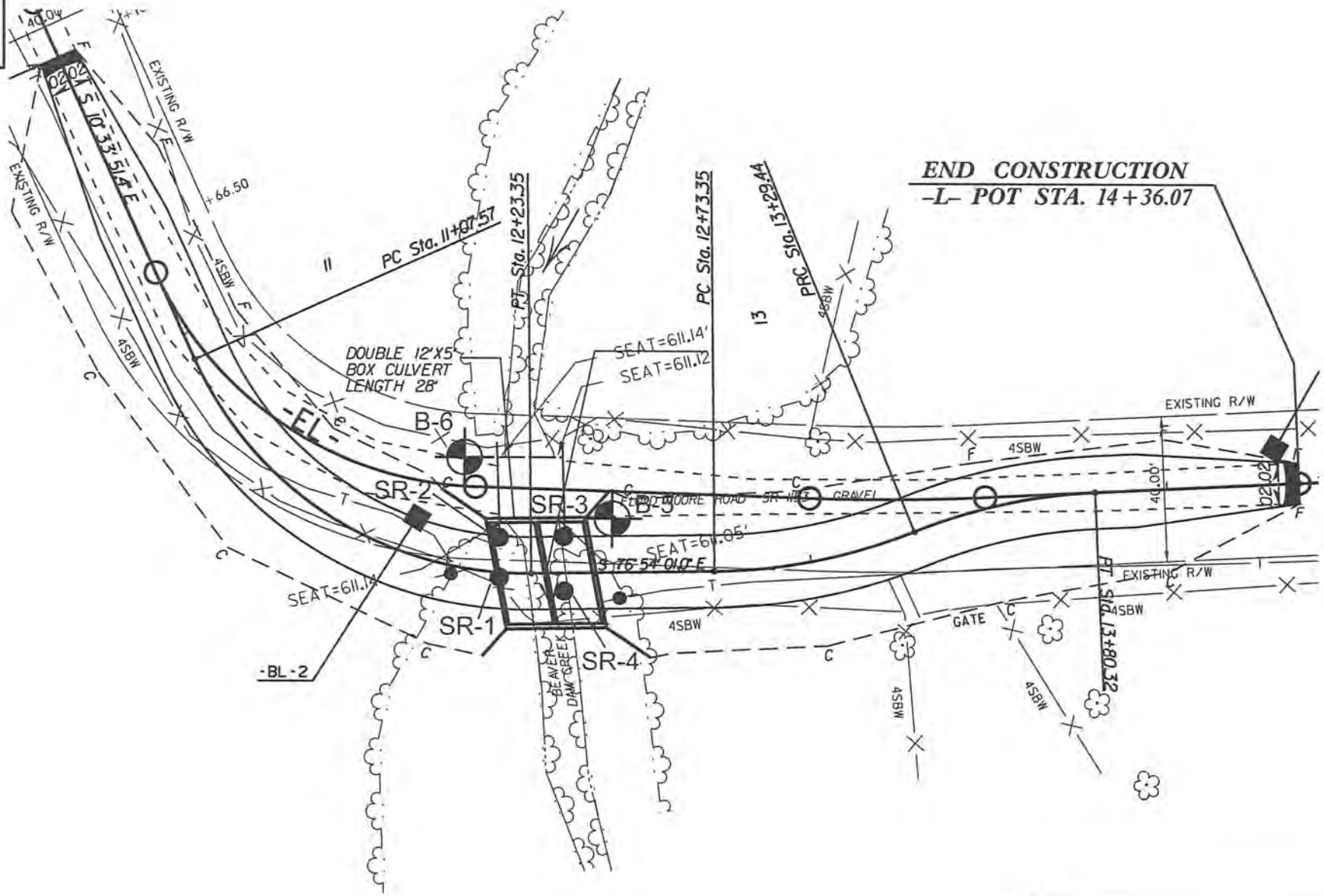
BENCH MARK: NCDOT REBAR & CAP STAMPED BL-3 LOCATED AT STATION 14+11.68 (-EL-), 9.72 LT

ELEVATION: 617.28 FT.

NOTES:

REVISED 09/23/09

DESCRIPTION: REPLACE BRIDGE 890366 ON SR 1153 (FLOYD MOORE ROAD) OVER BEAVER DAM CREEK WEST	ENGLISH
	SHEET NO. 3
	W.B S. NO.: 17BP.10.R.19
	T.I.P. NO.: N/A
	COUNTY: UNION



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-5	**STATION** 12+46	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.2
COLLAR ELEV. 612.4 ft	**TOTAL DEPTH** 14.8 ft	**NORTHING** 433,431	**EASTING** 1,514,931	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/16/12	**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
615										
	612.4	0.0								612.4 GROUND SURFACE 0.0
610			2	3	3	6		M		**ROADWAY EMBANKMENT** Brownish red, medium stiff, moist, fine sandy SILT (A-4) with trace gravel
	608.9	3.5								609.4 3.0
			3	3	5	8		M		**ALLUVIAL** Yellowish brown, medium stiff, moist, silty CLAY (A-6) with little fine sand
605	605.7	6.7	60/0.1			60/0.1				605.7 6.7
										605.6 **NON-CRYSTALLINE ROCK** 6.8 Greenish gray, METAVOLCANIC ROCK
600										
										597.6 14.8
										Boring Terminated at Elevation 597.6 ft in Non-Crystalline Rock: METAVOLCANIC ROCK
										Auger refusal at 6.7 feet.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

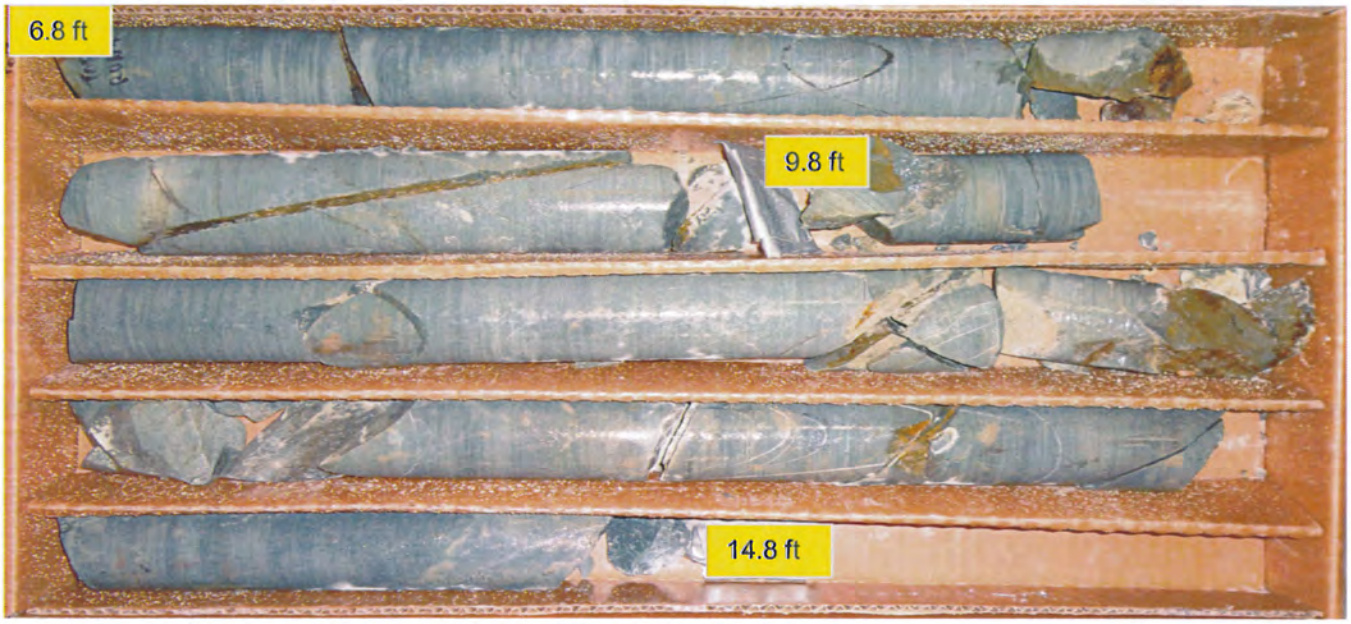
WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-5	**STATION** 12+46	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.2
COLLAR ELEV. 612.4 ft	**TOTAL DEPTH** 14.8 ft	**NORTHING** 433,431	**EASTING** 1,514,931	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/16/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 8.0 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
605.6											ELEV. (ft) / DEPTH (ft)
											Begin Coring @ 6.8 ft
605	605.6	6.8	3.0	3:31 3:48 4:05	(2.9) 97%	(1.4) 47%		(7.8) 98%	(3.5) 44%		605.6 — Greenish gray, moderately to slightly weathered, moderately hard to hard, close fracture spacing, METAVOLCANIC ROCK (6.8) Joint sets at 45° - 65°
	602.6	9.8	5.0	3:30 4:25 3:45 4:15 4:55	(4.9) 98%	(2.1) 42%					
600	597.6	14.8									597.6 (14.8) Boring Terminated at Elevation 597.6 ft in Non-Crystalline Rock: METAVOLCANIC ROCK Auger refusal at 6.7 feet.

CORE PHOTOGRAPHS

B-5

BOX 1: 6.8 - 14.8 FEET



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-6	**STATION** 11+97	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 612.9 ft	**TOTAL DEPTH** 19.8 ft	**NORTHING** 433,457	**EASTING** 1,514,895	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/15/12	**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)
615										
	612.9	0.0								612.9 GROUND SURFACE 0.0
			4	5	4	9		M		**ROADWAY EMBANKMENT** Brownish red, stiff, moist, fine sandy SILT (A-4) with little gravel
610	609.4	3.5								610.4 2.5
			2	2	5	7		W		**ALLUVIAL** Yellowish brown, medium stiff, wet, silty CLAY (A-6) with trace coarse sand and gravel
605	604.7	8.2								604.7 8.2
	604.1	8.8	100/0.3			100/0.3				604.1 8.8 **WEATHERED ROCK** Gray-tan, METAVOLCANIC ROCK
			60/0.0			60/0.0				**NON-CRYSTALLINE ROCK** Greenish gray, METAVOLCANIC ROCK
600										
595										593.1 19.8
										Boring Terminated at Elevation 593.1 ft in Non-Crystalline Rock: METAVOLCANIC ROCK
										Auger refusal at 8.8 feet.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

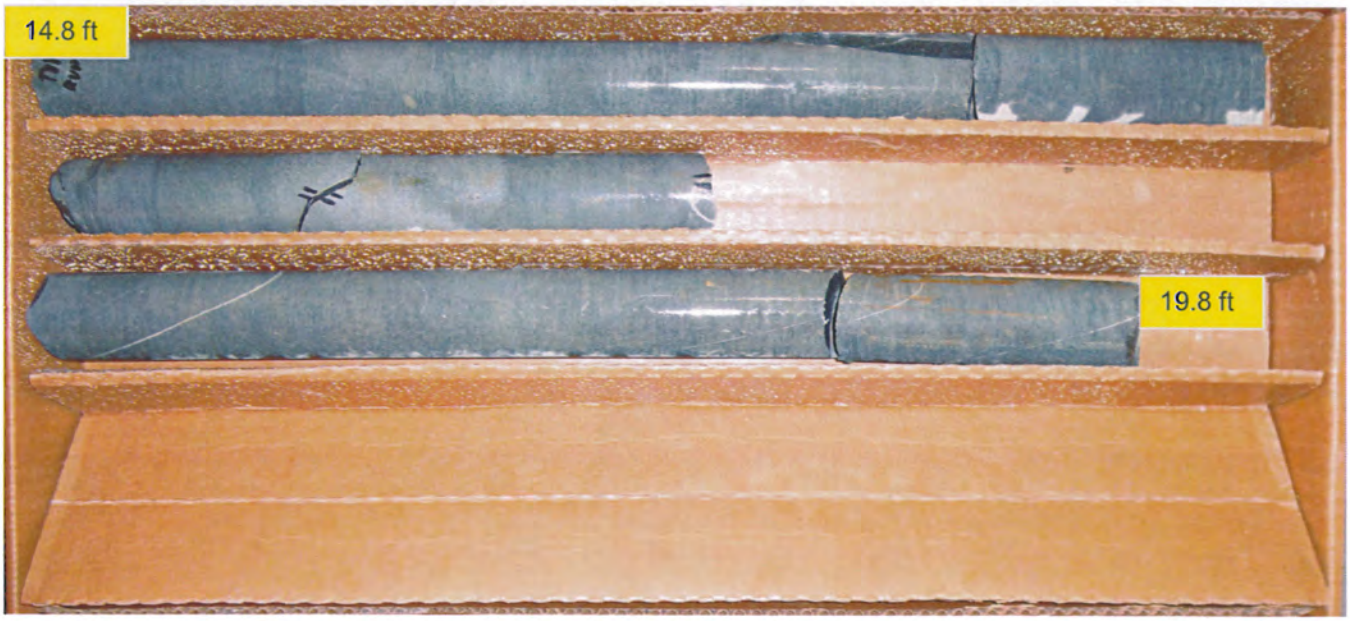
WBS 17BP.10.R.19	**TIP** 17BP.10.R.19	**COUNTY** UNION	**GEOLOGIST** R. Clark	
SITE DESCRIPTION Replace Bridge 890366 on SR 1153 (Floyd Moore Road) over Beaver Dam Creek				**GROUND WTR (ft)**
BORING NO. B-6	**STATION** 11+97	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 612.9 ft	**TOTAL DEPTH** 19.8 ft	**NORTHING** 433,457	**EASTING** 1,514,895	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 81% 03/01/11		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER F. Cox	**START DATE** 05/15/12	**COMP. DATE** 05/15/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 11.0 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
604.1											Begin Coring @ 8.8 ft
	604.1 / 603.1	8.8 / 9.8	1.0	*N=60/0.0*	(0.9)	(0.0)		(10.9)	(7.1)		604.1 ELEV. (ft) — **NON-CRYSTALLINE ROCK** — 8.8 DEPTH (ft)
			5.0	3:50	90%	0%		99%	65%		Greenish gray, moderately to slightly weathered, moderately hard to hard, very close to moderately close fracture spacing, METAVOLCANIC ROCK
				3:13							Joint sets at 45° - 65° with some staining in fractures
600				2:47	(5.0)	(2.3)					
				3:18	100%	46%					
	598.1	14.8		3:05							
			5.0	3:31							
				3:27	(5.0)	(4.8)					
				3:38	100%	96%					
595				3:51							
				3:41							
	593.1	19.8		4:02							593.1 ELEV. (ft) — 19.8 DEPTH (ft)
											Boring Terminated at Elevation 593.1 ft in Non-Crystalline Rock: METAVOLCANIC ROCK
											Auger refusal at 8.8 feet.

CORE PHOTOGRAPHS

B-6

BOXES 1 & 2: 8.8 - 19.8 FEET



0 1 2

FEET

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union
GEO	C. Baldwin				
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West				
BORING NUMBER	SR-1	STA	12+15	OFFSET	1 FT RT
ALIGN-MENT	L				
ELEVATION	611.7 FT	TOTAL DEPTH	6.0 FT	NORTH	433,423
EAST	1,514,897				
DRILL METHOD	Sounding Rod/Hand Auger				
DRILLER	N/A				
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT
DEPTH TO ROCK	6.0 FT				

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0								Elev. 611.7 ft
			17	X	S-1 0.0 - 4.0 ft	D	Residual	Brown, fine sandy SILT (A-4)
			15	X				
			17	X				
			28	X				
			25	X				Hand Auger refusal at 4.0 feet
			31	X				
								Elev. 605.7 ft
6.0								Sounding Rod refusal at 6.0 feet

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-2	STA	12+14	OFFSET	10 FT LT	ALIGN-MENT	L
ELEVATION	611.1 FT	TOTAL DEPTH	4.5 FT	NORTH	433,434	EAST	1,514,899
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	4.5 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0								**Elev. 611.1 ft**
			8	X		D-M	Residual	Brown, fine sandy SILT (A-4)
			11	X				
			16	X				
			27	X				**Elev. 606.6 ft**
			26	X				
4.5								Sounding Rod refusal at 4.5 feet

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-3	STA	12+32	OFFSET	10 FT LT	ALIGN-MENT	L
ELEVATION	607.9 FT	TOTAL DEPTH	3.0 FT	NORTH	433,430	EAST	1,514,917
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	3.0 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0			4	X		M	Residual	Elev. 607.9ft Brown, fine sandy SILT (A-4)
			12	X				
			30	X				Elev. 604.9 ft
3.0								Sounding Rod refusal at 3.0 feet

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES

NCDOT GEOTECHNICAL ENGINEERING UNIT

FIELD PENETROMETER LOG (ENGLISH)

PROJECT NUMBER	17BP.10.R.19	ID	17BP.10.R.19	CO	Union	GEO	C. Baldwin
SITE DESC	Bridge No. 366 on SR 1153 over Beaver Dam Creek West						
BORING NUMBER	SR-4	STA	12+32	OFFSET	5 FT RT	ALIGN-MENT	L
ELEVATION	606.8 FT	TOTAL DEPTH	3.5 FT	NORTH	433,415	EAST	1,514,913
DRILL METHOD	Sounding Rod					DRILLER	N/A
START DATE	07/09/12	COMP DATE	07/09/12	SURFACE WTR DEPTH	N/A FT	DEPTH TO ROCK	3.5 FT

DEPTH (ft)	BLOW COUNT 0.5 ft	0.5 ft	TOTAL	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION (SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))
0.0			5	X		M	Residual	Elev. 606.8ft Brown, fine sandy SILT (A-4)
			15	X				
			26	X				
			20	X				Elev. 603.3 ft
3.5								Sounding Rod refusal at 3.5 feet

NOTES

DECK TO DATUM DISTANCE N/A FT

RED LINE

SIGNATURE DATE

NOTES