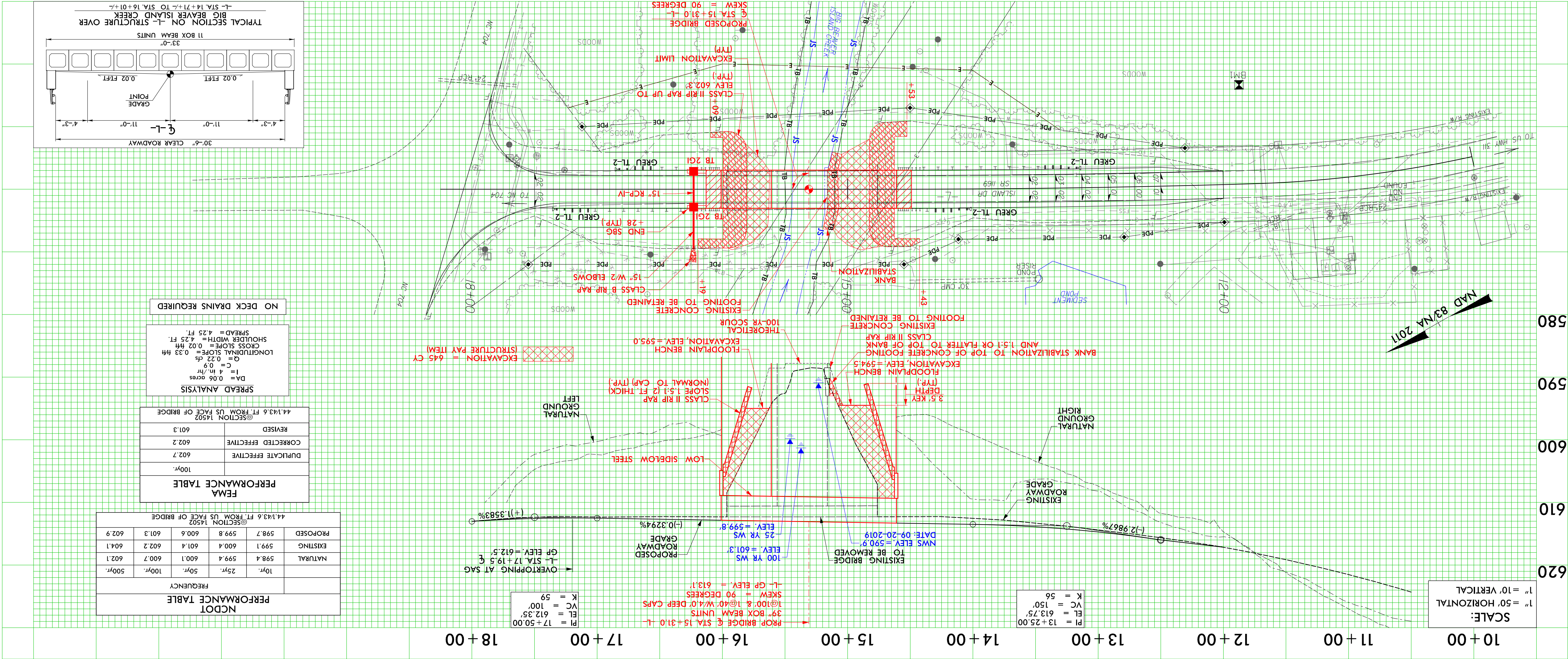


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INFORMATION TO BE SHOWN ON PLANS

WS EL. Taken @ River Station 14502

Design:	Discharge	3,540	c.f.s.	Frequency	25	yr.	Elev.	599.8	ft.
Base Flood:	Discharge	4,930	c.f.s.	Frequency	100	yr.	Elev.	601.3	ft.
Overtopping:	Discharge	24,000	c.f.s.	Frequency	500+	yr.	Elev.	612.5	ft.

OT OCCURS AT SAG AT -L- STA. 17+19.5 Q

ADDITIONAL INFORMATION AND COMPUTATIONS

USGS RURAL REGRESSION EQUATIONS FROM SCIENTIFIC INVESTIGATIONS REPORT 2009-5158

DA = 22.5 SQ. MI.

REGION 1 - PIEDMONT

RURAL RIDGE and VALLEY-PIEDMONT (SIR 2009-5158)	SAY	PRELIMINARY FEMA DISCHARGES
$Q_{10} = 398 (22.5)^{0.617} = 2,718$	2,700 cfs	2,720 cfs
$Q_{25} = 537 (22.5)^{0.606} = 3,543$	3,500 cfs	3,540 cfs
$Q_{50} = 661 (22.5)^{0.600} = 4,281$	4,300 cfs	4,280 cfs
$Q_{100} = 776 (22.5)^{0.594} = 4,932$	4,900 cfs	4,930 cfs
$Q_{500} = 1,072 (22.5)^{0.583} = 6,584$	6,600 cfs	6,580 cfs

AFTER COMPARISON, THE DISCHARGES FROM THE PRELIMINARY HEC-RAS MODEL SHOULD

BE USED TO DESIGN THE PROPOSED BRIDGE.

LIVE-BED CONTRACTION SCOUR: (HEC-18, 5TH ED., APRIL 2012)

$$Y_s = Y_1 [Q_2 / Q_1]^{0.67} [W_1 / W_2]^{0.5}$$
$$Y_s = Y_2 - Y_o \quad Y_o = 11.09$$

$$RS 14606: W_1 = 40.57 \quad Q_1 = 3748.65 \quad Y_1 = 11.18 \quad K1 = 0.69$$

$$RS 14442 BR: W_2 = 38.15 \quad Q_2 = 3811.98$$
$$Y_s = 11.18 [3811.98 / 3748.65]^{0.67} [40.57 / 38.15]^{0.69} = 11.83$$

$$Y_{s_{100-yr}} = 11.83 - 11.09 = 0.7 \text{ ft.}$$

LOCAL SCOUR (CSU EQUATION)

$$Y_{s_{100}} = 2.0(K1)(K2)(K3)(a) \quad (Y1) \quad (FR) = 2.0(1.0)(1.0)(1.1)(3) \quad 10.60 \quad 0.34 = 6.5 \text{ FT}$$

NOTES:

- NO UPSTREAM OR DOWNSTREAM STRUCTURES THAT WERE IN PLACE AT THE TIME THIS PROJECT WAS DESIGNED WILL BE ADVERSELY AFFECTED BY THE PROPOSED BRIDGE.
- STREAM BED MATERIAL IS COARSE SAND WITH EXPOSED ROCK.

SITE DATA

Drainage Area 22.5 SQ. MI. Source USGS STEAM STATS /USGS QUAD MAP  
River Basin ROANOKE Character RURAL: REGION 1-PIEDMONT  
Stream Classification (Such as Trout, High Quality Water, etc.) CLASS C  
Data on Existing Structure 3 SPANS, 3@40'-0" PRESTRESSED CONCRETE CORED SLABS, OAL = 120'-0"  
30.7' OUT TO OUT, 24' CROWN TO BED Total Waterway Opening 1614 s.f.  
Waterway Opening Below 100yr. WS EL. 616 s.f.  
Debris Potential: Low Moderate X High

Data on Structures Up and Down Stream UPSTREAM STR. NO. 780048 ON NC 704, 0.2 MILES UPSTREAM;  
1@50'-8.5", 1@50', 1@50'-8.5"; RC DECK ON I-BEAMS; 23' BED TO CROWN. DOWNSTREAM STR. NO. 780095  
ON US 311; 1.9 MILES DOWNSTREAM; 1@100'-0"; RC DECK ON I-BEAMS; 17' BED TO CROWN.

Design Control Elev. 602.4 ft. (CORRECTED EFFECTIVE @ RS 14502 - FEMA 100-YR)  
Gage Station No. NA Period of Records N/A yrs.  
Max. Discharge NA c.f.s. Date NA Frequency NA

Historical Flood Information:  
NO KEITH HOWERTON (NCDOT DIV. 7 Period of  
Date Elev. OT ft. Est. Freq. yr. Source BRIDGE MAINTENANCE SUPERVISOR) Knowledge N/A yrs.  
Date Elev. 600.1 ft. Est. Freq. +/-25 yr. Source RECENT HIGH WATER Period of  
(SURVEYED ON 9/20/2019) Knowledge N/A yrs.  
Date Elev. ft. Est. Freq. yr. Source Period of  
Knowledge yrs.  
Historical Scour Info. : General NA ft. Contraction NA ft. Local NA ft.  
Channel Slope 0.001 ft/ft Source FIELD SURVEY Normal Water Surface Elev. 590.9 ft.  
Manning's n: Left O.B. 0.05-0.14 Channel 0.05 Right O.B. 0.05-0.14 Source FIELD SURVEY  
FEMA PRELIMINARY DETAILED STUDY -  
Flood Study /Status ZONE AE, PANEL #7906 Floodway Established? YES  
With Floodway 602.8 ft. Without Floodway 602.7 ft.  
Flood Study 100yr. Discharge 4,930 c.f.s. WS Elev.: @ River Station 14502

DESIGN DATA

Hydrological Method USGS RURAL REGRESSION EQUATIONS COMPARED WITH FEMA PRELIMINARY DISCHARGES  
Hydraulic Design Method HEC-RAS 5.0.6 FILENAME: B5722\_BigBeaversIslandCreek\_SR1169.prj

Floods Evaluated:	Freq. (yr.)	Q (c.f.s.)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
@ River Station 14502	10-YR	2,720	598.7	0.3	4.7
	25-YR	3,540	599.8	0.4	5.2
	50-YR	4,280	600.6	0.5	5.9
	100-YR (FEMA)	4,930	601.3	0.6	6.3
	500-YR	6,580	602.9	0.8	7.1

Waterway Opening Provided Below Design W.S. Elev. 687 s.f., 100yr W.S. Elev. 787 s.f., Total 1881 s.f.,  
LT = 1.3  
Average Channel Velocity (Design) 7.9 f.p.s. Average Overbank Velocity (Design) RT = 1.3 f.p.s.  
Computed Scour : General NA ft. Contraction 0.7 ft. Local 6.5 ft.  
Is a Floodway Revision Required? MOA TYPE 2B (MAXIMUM DECREASE = 0.9')

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

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

I.D. No. B-5722 Project No. 4567.1.1 Proj. Station 15+31.0 -L-  
County ROCKINGHAM Bridge Over BIG BEAVER ISLAND CREEK Bridge Inv. No. 0277  
SR 1169  
On Highway (ISLAND DRIVE) Between US HWY 311 and NC 704  
Recommended Structure 2 SPANS, 39" PCBB, 1@100' AND 1@40' w/4' DEEP CAPS

Recommended Width of Roadway 30'-6" CLEAR ROADWAY Skew 90'  
Recommended Location is (Up/At/Down)-Stream-from Existing Crossing.

Latitude 36.40645 Longitude -79.98619  
Statewide Tier Regional Tier Sub-Regional Tier X  
Bench Mark is BM1, -L- STA. 11+85.23, 79.25' RT, 60d NAIL IN A 12" POPLAR  
Northing 967975 Easting 1709660 Elev. 614.75 ft. Datum: NAVD 88  
Temporary Crossing ON-SITE DETOUR, DETOUR BRIDGE APPROXIMATELY 37.5' DOWNSTREAM



Designed by: MOTT MACDONALD  
Assisted by: MORGAN K. MOREFIELD, EI  
Project Engineer: ELENI M. RIGGS, PE  
Reviewed by: Erik Seiler Date

