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FINAL HYDRAULIC REPORT - BRIDGE NO. 7

PLAN SHEETS

STANDARDS LIST

HYDROLOGIC DATA

Date: 7 January 2014

DRAINAGE AREA : 2.03 sq. mi.
 CHARACTER OF TERRAIN : Hilly to mountainous; forested with some clearings; small pond
 STREAM CHARACTERISTICS : Moderate slope, perennial, sinuous
 NATURE OF STREAMBED : Gravelly sand; scour susceptible

PEAK FLOW DATA

Q 2.33 = 100 cfs Q 50 = 380 cfs
 Q 10 = 230 cfs Q 100 = 450 cfs
 Q 25 = 300 Q 500 = 675 cfs

DATE OF FLOOD OF RECORD : Unknown
 ESTIMATED DISCHARGE : Unknown
 WATER SURFACE ELEV. : Unknown
 NATURAL STREAM VELOCITY : @ Q50 (without tailwater) = 8.0 cfs
 ICE CONDITIONS : Light
 DEBRIS : Moderate
 DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? No
 IS ORDINARY RISE RAPID? No
 IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? Yes
 IF YES, DESCRIBE : The tailwater of the adjacent downstream Black River creates an outlet control condition in the subject culvert.

WATERSHED STORAGE : <1% HEADWATERS :
 UNIFORM : X
 IMMEDIATELY ABOVE SITE :

EXISTING STRUCTURE INFORMATION

STRUCTURE TYPE : 8' diameter multi-plate pipe (CGMP)
 YEAR BUILT : 1923
 CLEAR SPAN(NORMAL TO STREAM): 8.0'
 VERTICAL CLEARANCE ABOVE STREAMBED: 8.0'
 WATERWAY OF FULL OPENING: 50.2 sq. ft.
 DISPOSITION OF STRUCTURE: Remove and replace
 TYPE OF MATERIAL UNDER SUBSTRUCTURE: See borings

WATER SURFACE ELEVATIONS AT:

Q2.33 = 797.4' VELOCITY = 12.4 fps
 Q10 = 799.8' " 15.2 fps
 Q25 = 800.9' " 16.1 fps
 Q50 = 802.2' " 17.0 fps
 Q100 = 803.2' " 17.7 fps

LONG TERM STREAMBED CHANGES: None noted

IS THE ROADWAY OVERTOPPED BELOW Q100: No
 FREQUENCY: N/A
 RELIEF ELEVATION: 803.7'
 DISCHARGE OVER ROAD @Q100: None

UPSTREAM STRUCTURE

TOWN: Irasburg DISTANCE: 6800'
 HIGHWAY # : TH 4 STRUCTURE #: BR 12
 CLEAR SPAN: 3.0' CLEAR HEIGHT: 3.0'
 YEAR BUILT: FULL WATERWAY:
 STRUCTURE TYPE: (2) 3' Dia. pipes

DOWNSTREAM STRUCTURE

TOWN: Irasburg DISTANCE: 100'
 HIGHWAY # : STRUCTURE #:
 CLEAR SPAN: CLEAR HEIGHT:
 YEAR BUILT: FULL WATERWAY:
 STRUCTURE TYPE: Confluence w/ Black River

LRFR LOAD RATING FACTORS

LOADING LEVELS	TRUCK						
	H-20	HL-93	3S2	6 AXLE	3A. STR.	4A. STR.	5A. SEM
TONNAGE	20	36	36	66	30	34.5	38
INVENTORY							
POSTING							
OPERATING							
COMMENTS:							

AS BUILT "REBAR" DETAIL		
LEVEL I	LEVEL II	LEVEL III
TYPE:	TYPE:	TYPE:
GRADE:	GRADE:	GRADE:

★ SEE GEOTECHNICAL REPORT

PROPOSED STRUCTURE

STRUCTURE TYPE: Precast Concrete Box Culvert
 CLEAR SPAN(NORMAL TO STREAM): 20.0'
 VERTICAL CLEARANCE ABOVE STREAMBED: 7.0'
 WATERWAY OF FULL OPENING: 140 sq. ft.

WATER SURFACE ELEVATIONS AT:

Q2.33 = 797.0' VELOCITY= 6.5 fps
 Q10 = 797.1' " 9.0 fps
 Q25 = 797.1' " 10.0 fps
 Q50 = 797.2' " 11.0 fps
 Q100 = 797.4' " 11.7 fps

IS THE ROADWAY OVERTOPPED BELOW Q100: No
 FREQUENCY: N/A
 RELIEF ELEVATION: 803.9'
 DISCHARGE OVER ROAD @Q100: None

AVERAGE LOW ELEVATION OF SUPERSTRUCTURE: 798.70'
 VERTICAL CLEARANCE: @ Q50 = 1.5'

SCOUR: Replacement structure is a box culvert so scour is not a concern.

REQUIRED CHANNEL PROTECTION: Stone Fill, Type III

PERMIT INFORMATION

AVERAGE DAILY FLOW: 4.0 cfs DEPTH OR ELEVATION:
 ORDINARY LOW WATER: 2.0 cfs Depth = 0.5'
 ORDINARY HIGH WATER: 60 cfs Depth = 1.0'

TEMPORARY BRIDGE REQUIREMENTS

STRUCTURE TYPE: Temporary Bridge not Required
 CLEAR SPAN (NORMAL TO STREAM): N/A
 VERTICAL CLEARANCE ABOVE STREAMBED: N/A
 WATERWAY AREA OF FULL OPENING: N/A

ADDITIONAL INFORMATION

The Black River tailwater was considered in the hydraulic analyses of the ex./prop. structures by applying a tailwater at elevation 797.0 for all storm events to determine headwater elevations; this represents flood stage elevation for the Black River based on nearby USGS gauging stage information. Normal tailwater depth of flow was used to determine stream velocities.

TRAFFIC MAINTENANCE NOTES

1. MAINTAIN ONE-WAY TRAFFIC UNDER PHASED CONSTRUCTION.
2. TRAFFIC SIGNALS ARE NECESSARY.
3. SIDEWALKS ARE NOT NECESSARY

DESIGN VALUES

1. DESIGN LIVE LOAD	HL-93
2. FUTURE PAVEMENT	d _p : 3.0 INCH
3. DESIGN SPAN	L: 20.0 FT
4. MIN. MID-SPAN POS. CAMBER @ RELEASE (PRESTRESSED UNITS)	Δ _r : ---
5. PRESTRESSING STRAND (0.60 INCH DIAMETER - LOW RELAX)	f _y : ---
6. PRESTRESSED CONCRETE STRENGTH	f' _c : ---
7. PRESTRESSED CONCRETE RELEASE STRENGTH	f' _{cr} : ---
8. CONCRETE, HIGH PERFORMANCE CLASS AA	f' _c : ---
9. CONCRETE, HIGH PERFORMANCE CLASS A	f' _c : ---
10. CONCRETE, HIGH PERFORMANCE CLASS B	f' _c : 3.5 KSI
11. CONCRETE, CLASS C	f' _c : ---
12. REINFORCING STEEL	f _y : 60 KSI
13. STRUCTURAL STEEL AASHTO M270	f _y : ---
14. SOIL UNIT WEIGHT	γ: 0.140 KCF
15. NOMINAL BEARING RESISTANCE OF SOIL	q _n : ★ 3.3 KSF
16. SOIL BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: 0.45
17. NOMINAL BEARING RESISTANCE OF ROCK	q _n : ---
18. ROCK BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: ---
19. NOMINAL AXIAL PILE RESISTANCE	q _p : ---
20. PILE YIELD STRENGTH ASTM A572	f _y : ---
21. PILE SIZE	---
22. EST. PILE LENGTH	L _p : ---
23. PILE RESISTANCE FACTOR	φ: ---
24. LATERAL PILE DEFLECTION	Δ: ---
25. BASIC WIND SPEED	V _{3s} : ---
26. MINIMUM GROUND SNOW LOAD	p _g : ---
27. SEISMIC DATA	PGA: --- S _s : --- S ₁ : ---

PROJECT NAME: IRASBURG
 PROJECT NUMBER: STP CULV (30)

FILE NAME: z_irasburg_br7_pi.xls PLOT DATE: 10/20/2014
 PROJECT LEADER: M. CHENETTE DRAWN BY: L. BUXTON
 DESIGNED BY: A. LACHANCE CHECKED BY: J. HUNGERFORD
 PRELIMINARY INFORMATION SHEET - BR7 SHEET 3 OF 55

TRAFFIC DATA

YEAR	ADT	DHV	% D	% T	ADTT	ESAL
2013	2400	270	52	9.7	250	708,000
2023	2500	280	52	11.7	330	1,541,000

10 year ESAL for flexible pavement from 2013 to 2023 : 708,000
 20 year ESAL for flexible pavement from 2013 to 2033 : 1,541,000
 Design Speed : 30 mph