

## HYDROLOGY/HYDRAULIC REPORT

### General

The Wild River Bridge carries State Route 2 over the Wild River in Gilead.

### Hydrology

The drainage basin characteristics shown below were described in the USGS gage and basin reports. (USGS Sta. 01054200) The basin drains 180km<sup>2</sup> (69.4mi<sup>2</sup>), of mountainous terrain that ranges from elevation 208m at the gage station to 1,478m at the summit of Carter Dome. The main channel is perennial, and mean monthly discharge ranges from 1.53m<sup>3</sup>/s (54cfs) under low flow conditions in September to 14.7m<sup>3</sup>/s (519cfs) in April, when snow melt combines with spring rains. The basin has a long history of logging activity. The basin is composed of mixed forest and 5% of the basin is covered in bare rock.

<b>Summary of Hydrologic Data</b>	
	Gilead
Drainage Area	108km <sup>2</sup> (69.4 mi <sup>2</sup> )
Wetlands Area	Not described

<b>Summary of Peak Flow Estimates</b>		
Return Period (Years)	Flow Estimate and Source	
1.1 (ordinary high water) 2	219 m <sup>3</sup> /s (2734cfs)	BDG
	242 m <sup>3</sup> /s (8543cfs)	G
	84.1 m <sup>3</sup> /s (2969cfs)	R
	234 m <sup>3</sup> /s (8260cfs)	WA
50 (design discharge)	685 m <sup>3</sup> /s (24,181cfs)	G
	253 m <sup>3</sup> /s (8931cfs)	R
	632 m <sup>3</sup> /s (22,310cfs)	WA
100 (check discharge)	782 m <sup>3</sup> /s (27,605cfs)	G
	293 m <sup>3</sup> /s (10,343cfs)	R
	715 m <sup>3</sup> /s (25,240cfs)	WA
1959 Flood of Record	801 m <sup>3</sup> /s (28,000cfs)	USGS

G=Gage Records, R=Regression Equation, WA=Weighted Average, BDG=Bridge Design Guide estimated by multiplying 0.32 times Q<sub>50</sub>

The USGS gage station is based on real field data gathered over the last 38 years. In general the gage records indicate higher flows than the regression equation. The selected design flows are based on these gage records.

### Hydraulics

The Wild River was modeled using HEC-RAS for the design flow of  $Q_{50}$  and a check design flow at  $Q_{100}$ . The river was modeled under steady state flow conditions. The Wild River is tail water controlled as evident when looking at the proximity of the structure to the Androscoggin River and FEMA flood plain map overlay.

To maximize the upstream water surface elevations the tail water elevation was held at the flood of record elevation 213m. To maximize the velocity outputs the tail water elevation is held at the estimated normal water elevation of the Androscoggin River 208m.

### Hydraulic Opening

The existing bridge opening area as compared to the proposed will be increased by  $115\text{m}^2$  (1240sf).

### Freeboard

The existing freeboard during a check flow event of  $Q_{100}$  as compared to the proposed structure will be decreased by 0.7m (2.3ft). Some of this decrease can be attributed to the fact that the proposed alignment moves the structure down stream, hence down hill into the existing flood plain. During a  $Q_{100}$  event the proposed structure will have between 2.7 to 3.5m (8.9ft-11.5ft) of freeboard, which on average will be 2m (6ft) greater than the minimum required by the Bridge Design Guide at  $Q_{50}$ .

### River Velocities

The proposed condition having an increase in hydraulic opening will have channel velocities that will be less than the existing condition.

### Ice

Ice jams have been reported in this stretch of river, however the existing structures appears to be passing these ice flows sufficiently. There is a side channel on the east side of the river with evidence of tree scaring. During the preliminary drilling operations the east side channel filled with ice behind the location of the proposed abutment 2. This side channel starts during high-water events after the ice passes through the existing structure. The channel area will need to be graded such that the ice is channeled efficiently through the proposed structure. It is recommended that heavy rip be used on the fill slope up to elevation 213m.

### Scour

A full scour evaluation will be performed during final design. It is not anticipated that the evaluation will require significant changes to this preliminary design. The abutments and pier foundations will be pile supported. The stability of the piles will be evaluated during a scour event.

Hydraulics Continued

The table below summarizes the outputs from the HEC-RAS model.

<b>Hydraulic Summary</b>		
	<b>Existing Condition</b> 4-50ft Spans Equaling 200ft	<b>Proposed Condition</b> 2- 130ft Spans Equaling 260ft
Area of Opening	418.3m <sup>2</sup> (4500 ft <sup>2</sup> )	533.5m <sup>2</sup> (5740 ft <sup>2</sup> )
Freeboard @ Bridge Q <sub>100</sub>	3.8m (12.5ft)	2.7 to 3.5m (8.9ft to 11.5ft)
Velocity @ Bridge Q <sub>100</sub>	3.82m/s	2.84m/s
Velocity @ Prop. Bridge Q <sub>500</sub>	-	3.11m/s
<b>River Station =190 or 4m US from the Existing Bridge</b>		
Headwater Elevation (Q <sub>2</sub> )	213.03m	210.62m
Headwater Elevation (Q <sub>50</sub> )	213.33m	213.34m
Headwater Elevation (Q <sub>100</sub> )	213.47m	213.46m
<b>River Station =106 or 12m US from the Proposed Bridge</b>		
Headwater Elevation (Q <sub>2</sub> )	213.01m	210.78m
Headwater Elevation (Q <sub>50</sub> )	213.10m	213.30m
Headwater Elevation (Q <sub>100</sub> )	213.14m	213.40m