

HYDROLOGY AND HYDRAULICS REPORT

The Douglas Brook drainage basin characteristics produced by the Hydrology Section of the MaineDOT Environmental Office are as follows:

Drainage Area	12.01 mi ²
Wetlands	4.16 %

In accordance with MaineDOT policy, the USGS regression equations (Hodgkins, 1999) were used to compute the peak discharges as follows:

Ordinary High Water (Q_{1.1})	108.2 ft ³ /s
Design Discharge (Q₅₀)	837.5 ft ³ /s
Check Discharge (Q₁₀₀)	988.5 ft ³ /s
Check Discharge (Q₅₀₀)	1375.8 ft ³ /s

The existing bridge is a 99'-9" long 13'-6" span galvanized steel culvert. The hydraulic performance of the existing structure was examined using FHWA's HY-8, culvert hydraulic software.

The analysis of the existing culvert indicates that the culvert is adequately sized to carry the design flow. MaineDOT policy stipulates that the headwater depth to structure depth ratio (HW/D) must be no greater than 0.9. The HW/D ratio of the existing structure is approximately .69.

The scope of work for the Tannery Bridge rehabilitation project is to place a 5" thick concrete lining onto the deteriorated steel culvert invert. Adding a concrete lining will alter the hydraulic properties of the culvert therefore the proposed condition was also evaluated using HY-8.

The proposed HW/D ratio is .73 meaning the 5" thick concrete lining will have a minimal effect on the hydraulic performance of the culvert. FEMA regulations require that the backwater at Q100 increase no more than 1'. The Q100 backwater increase for the Tannery Bridge culvert lining will be .4'. Hydraulics of the proposed and existing conditions are summarized in the table below.

	Existing Culvert	Lined Culvert (Proposed)
Area of Opening	143 ft ²	136 ft ²
Headwater El. @ Q₅₀	327.4 ft	327.6 ft
Headwater El. @ Q₁₀₀	328.4 ft	328.8 ft
Velocity @ Q₅₀	11.20 ft/s	12.11 ft/s
Velocity @ Q₁₀₀	11.29 ft/s	12.2 ft/s
Ordinary High Water Q_{1.1}	321.1 ft	321.4 ft
Velocity @ Q_{1.1}	6.68 ft/s	7.75 ft/s
HW/D @ Q₅₀	.69	.73