

HYDROLOGY AND HYDRAULICS REPORT

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

Drainage Area	11.22 mi ²
Wetlands	12.88 %

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})	150 ft ³ /s
Design Discharge (Q₅₀)	878 ft ³ /s
Check Discharge (Q₁₀₀)	1016 ft ³ /s
Check Discharge (Q₅₀₀)	1354 ft ³ /s

The existing structures are twin 52'-0" long 12'-0" diameter galvanized steel culverts. The hydraulic performance of the existing culverts was examined using FHWA's HY-8, culvert hydraulic software.

The analysis of the existing condition indicates that the culverts are adequately sized to carry the design flow (Q₅₀). MaineDOT Bridge Design Guide policy stipulates that the headwater depth to structure depth ratio (HW/D @ Q₅₀) must be no greater than 0.9. The HW/D ratio of the existing condition is approximately 0.5.

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

When analyzed, the proposed HW/D ratio is 0.5 indicating that the 5" thick concrete linings will have a minimal effect on the hydraulic performance of the culverts. FEMA regulations require that the backwater at Q₁₀₀ increase no more than 1'. Analysis results show that the Q₁₀₀ backwater elevation will not change with the rehabilitation of the twin culverts. Hydraulics of the proposed and existing conditions are summarized in the table below.

	Existing Culverts	Lined Culverts (Proposed)
Area of Opening	226 ft ²	212 ft ²
Headwater El. @ Q₅₀	50.2 ft	49.9 ft
Headwater El. @ Q₁₀₀	50.8 ft	50.7 ft
Velocity @ Q₅₀	13.5 ft/s	13.5 ft/s
Velocity @ Q₁₀₀	14.0 ft/s	14.0 ft/s
Ordinary High Water Q_{1.1}	45.9 ft	46.0 ft
Velocity @ Q_{1.1}	8.4 ft/s	8.5 ft/s
HW/D @ Q₅₀	.5	.5