

PIN 15100.00

Hydrology & Hydraulics Report

A hydrologic study was performed. The drainage basin characteristics for the Sabattus River above the King Road Crossing are as follows:

Area= 50.6 mi²
NWI % area = 16.1%

The drainage basin is very low lying and has significant storage, the Sabattus river drains several swamps upstream, and of course Sabattus pond. The Flood insurance study performed in 1984 is mostly regurgitated data from a USDA Soil Conservation Service report dated 1975. The runoff calculations used in the FIS & USDA reports are based on an SCS TR-20 method, and appear to be overly conservative. The USGS Hodgkins method was used and is recommended to be used as the design flow and check flow values. There are (2) dams downstream on the Sabattus River, and a dam at the outlet of Sabattus Pond, used to control the water level in the pond. The dam owners were contacted, and the furthest dam downstream is very likely to be removed at some future date, as the regulatory agencies would like to see it removed, and the owner would as well. The dam downstream of the bridge however is in good condition, is owned by the city and is expected to remain indefinitely. Removal of either dam will have an effect on the hydraulic performance of the structure, and should be analyzed both with and without the downstream dam. Backwater from the Androscoggin is not anticipated to affect the water levels at the King road bridge. Scour is not expected to be an issue because integral abutments are recommended and they will be supported off bedrock.

Recurrence interval	Flow from Flood Insurance Study	Flow from USGS Hodgkins eqn/
2	n/a	900
10	2890	1610
50	4340	2300
100	4880	2600
500	5500	3400

Because the water elevations at the bridge are dictated by backwater from the Downstream dam increasing the Flow values to the levels indicated in the Flood insurance study result in water overtopping the King Road Bridge at both the 500 and 100 year flood elevations and being very close to the roadway surface if not over it at the 50 year elevation, with water up on the beams at the 10 year flood elevation. MaineDOT bridge maintenance personnel were contacted and asked specifically about the hydraulic performance of the structure and they could not recall any issues with that. Town of Lisbon public works was also contacted to find out if there were ever any reports of water over the roadway or up on the bridge. They had no reports of that nature. Local residents were interviewed, and Lorraine Lemay who lives less than 500 ft from the bridge, and has for over 50 years reports that the water has never been over the roadway. The Bridge maintenance inspection reports indicate they waterway adequacy as being a 9.

Based on these reports & the high storage area and flat gradients of the watershed, this report recommends to use the flow values from the USGS Hodgkins equation as listed in the table above. A Hec Ras model of the Sabattus stream was developed and the recommended flows were used in it, the results of the model for the existing bridge geometry correspond with what residents and maintenance personnel have reported and thus help to corroborate the hydrologic data.

Results of the model for each of the alternates given in the summary of preliminary design are listed below.

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	Q50 Velocity	Freeboard @ Q50	Q100 Velocity	Freeboard @ Q100	Q500 Velocity	Freeboard @ Q500
	(fps)	Ft	(fps)	Ft	(fps)	Ft
Existing Bridge	3.5	0.1	3.9	-0.2	5.0	-1.7
Proposed 90' span Steel Alt 1	2.9	1.3	3.1	1.0	3.8	0.2
Proposed 90' Pony Truss alt 2	2.9	2.0	3.1	1.3	3.8	0.5
Proposed 52.5' precast conc. Alt 3	4.2	1.8	4.6	1.4	5.8	1.0
Proposed 90' span Concrete Box Alt 4	3.5	2.0	3.9	1.3	3.8	0.5

1947 plan sheets indicate that the stream is governed by backwater from the dam, this is still the case, and the calculated flood elevations given above are the ones recommended for use during design as they best reflect the recorded and observed past performance of the existing structure. Additionally the Hec-Ras model was modified to include the removal of the downstream dam structures. That removal will result in a significant reduction in water level elevation and very slight increases in expected velocities. That data will not be summarized in this report for the sake of simplicity, and because with increases in velocity of approximately 0.3 fps at the Q500 it is not expected to be of any realistic concern. The Upstream Bridge, Webster Corner road over the Sabattus River consists of (3) 24'+/- spans approximately 8' rise for a total waterway opening of approximately 580 square feet, piers & abutments appear to be founded on bedrock, and the river takes a sharp drop of about 10' over the next 100' downstream, thereafter it remains flat through the structure at King road all the way to the downstream dam, a distance of about 4 miles. The bridge immediately downstream of the dam is the next downstream Crossing, and it consists of (2) concrete arches visually estimated at 64' span by 10' rise for a total hydraulic opening of approximately 1750 square feet. King road crossing is midway between the two bridges and the proposed alternate has a total hydraulic opening of 980 square feet. Because of the tailwater effect from the dam the water levels do not vary significantly at the King Road Bridge, and because of the adequate past performance of the existing structure, the anticipated performance of the proposed structure after being galvanized and raising the bottom flange elevation by 1'-4" +/- is expected to be adequate for the site in question, and any additional raise in grade is considered to be unnecessary.