Summary of Hydrology

Hall Bridge #3287
over
Nezinscot River
Buckfield, Maine

STP-2187(600)
WIN 021876.00

Maine Department of Transportation
Bridge Program

Hydrology Report

Watershed Description

The bridge is located on the Nezinscot River, just downstream of the confluence of the West Branch and East Branch Nezinscot Rivers. The approximately 99 square mile watershed has a small percentage of wetlands and no significant bodies of water for storage.
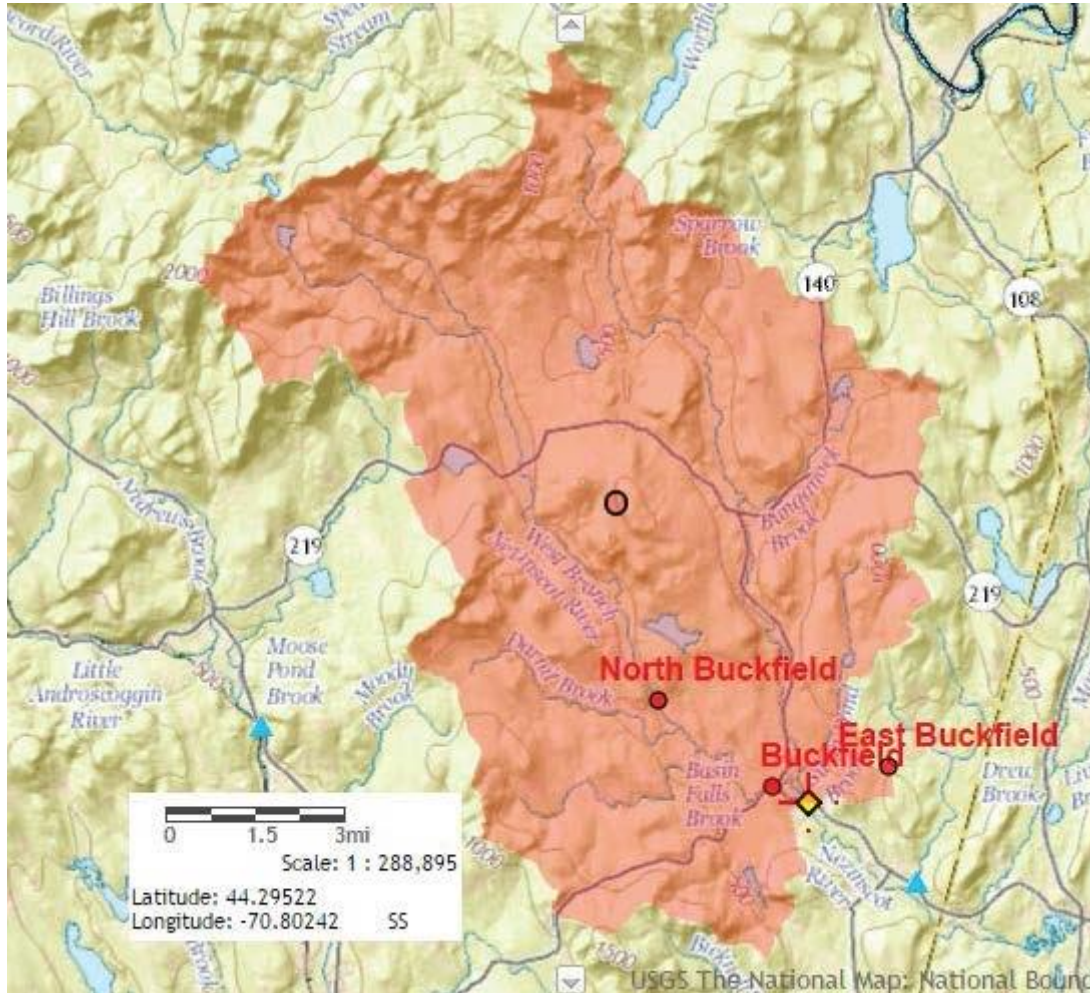

Figure 1: Watershed map from MaineDOT Hydrology Report

Nature of Flood Risk

Periodic seasonal flooding is typical for the region. The existing bridge plans note a higher flood elevation due to ice jams in the river.

Previous Hydrologic Studies in Watershed

The FEMA Flood Insurance Study for Oxford County, Maine (FIS number 23017CV001A, dated July 7, 2009) gives 1% recurrence flood flows for both the West

Branch Nezinscot River and East Branch Nezinscot River at their confluence, which is approximately 1000 feet upstream of the bridge. Adding the East and West Branch drainage areas and flows together yields a flow value for the Nezinscot River upstream of the bridge. Since the difference in drainage area between this summed value and the calculated drainage area at the bridge is minor (0.2 square miles), the FIS flow can be used to evaluate hydraulics at the bridge. According to the FIS, flows for the East and West Branch Nezinscot River in Buckfield were calculated using a prior version of the U.S.G.S. regression equations (Morrill 1975), and adjusted based on the ratio of the regression equation results at the Turner Center gage and the actual log-Pearson Type III results from the gage. The Flood Insurance Rate Map 23017C1115D, prepared in conjunction with the FIS, identifies a 1% recurrence flood elevation just upstream of the bridge. The analysis for Buckfield in the FIS and FIRM was done in 1990 and documented in a FIS dated September 3, 1992.

Current Flow Data

Flow data was calculated by the Maine DOT Environmental Office Hydrology Section using a combination of the data from the Nezinscot River (Turner Center, #01055500) U.S.G.S. flow gage and the U.S.G.S. regression equations (Hodgkins 1999). The gage data estimate was adjusted for the difference in watersheds between the bridge and gage site and combined with the regression equation estimate using the weighting method recommended by Hodgkins.

Summary of watershed and flows

Drainage Area	99.3	mi^2
Q1.1	1250	ft^3/s
Q10	4830	ft^3/s
Q25	6145	ft^3/s
Q50	7175	ft^3/s
Q100	8260	ft^3/s
Q500	10970	ft^3/s
Estimated Flow of Record (1953)	10400	ft^3/s
FIS Drainage Area	99.1	mi^2
FIS 1% Recurrence Total Flow	9770	ft^3/s
FIS West Branch Flow	5370	ft^3/s
FIS East Branch Flow	4400	ft^3/s
FIRM 1% Recurrence Elevation	321	ft

Note: All elevations based on North American Vertical Datum (NAVD) of 1988.

Summary of Results

		Existing Structure	Recommended Structure
		150' Three Simple Span Steel	150' Single Span Steel
Total Area of Waterway Opening	ft^2	11327	11380
Headwater elevation @ $Q_{1.1}$	ft	311.3	311.2
Headwater elevation @ Q_{10}	ft	317.4	317.3
Headwater elevation @ Q_{25}	ft	318.9	318.7
Headwater elevation @ Q_{50}	ft	319.9	319.7
Headwater elevation @ Q_{100}	ft	320.8	320.6
Headwater elevation @ Q_{500}	ft	322.8	322.4
Freeboard @ Q_{50}	ft	3.5	3.0
Freeboard @ Q_{500}	ft	0.6	0.3
Outlet Velocity @ $Q_{1.1}$	ft/s	2.5	2.3
Outlet Velocity @ Q_{10}	ft/s	5.1	4.8
Outlet Velocity @ Q_{25}	ft/s	5.7	5.4
Outlet Velocity @ Q_{50}	ft/s	6.2	5.8
Outlet Velocity @ Q_{100}	ft/s	6.7	6.4
Outlet Velocity @ Q_{500}	ft/s	7.8	7.4

Reported by: Joshua Hasbrouck
Date: February 28, 2019

Note: All elevations based on North American Vertical Datum (NAVD) of 1988.