

WIN 18749.00  
NORTH PARISH BRIDGE  
(N. PARISH RD/RTE 117)  
OVER NEZINSCOT  
RIVER

TURNER, MAINE

FINAL  
HYDROLOGIC AND HYDRAULIC  
REPORT

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November 2017

PREPARED FOR

**MaineDOT**

16 State House Station  
Augusta, ME 04333

PREPARED BY

**HNTB Corporation**

4507 North Front Street  
Suite 300  
Harrisburg, PA 17110  
Phone: (717) 540-2660

**HNTB**

# Final Hydrologic and Hydraulic Report

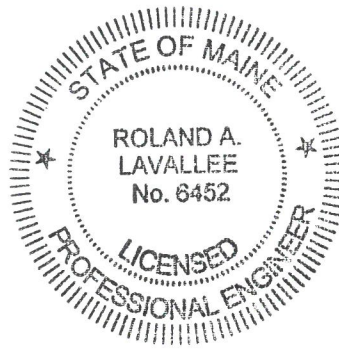
North Parish Bridge over Nezinscot River

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Roland Lavallee, P.E., P.L.S.

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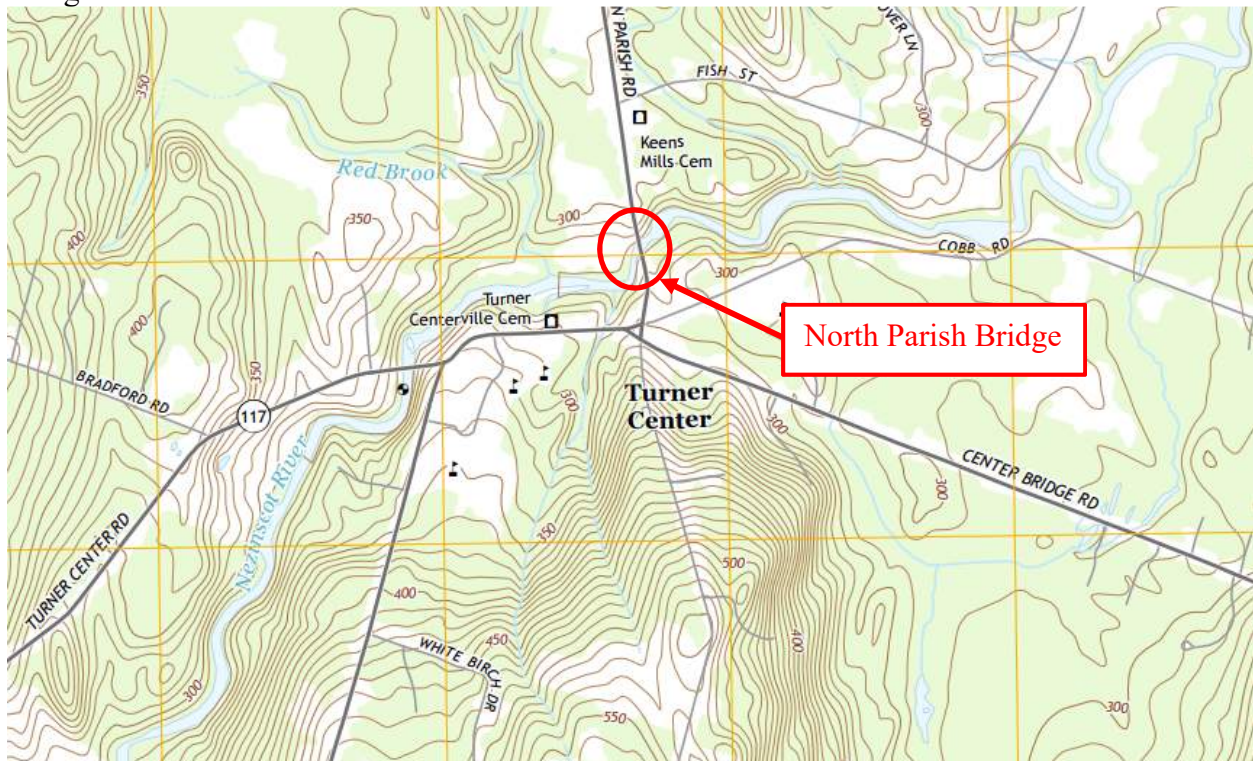
# Final Hydrologic and Hydraulic Report

## North Parish Bridge over Nezinscot River

The following is a draft final report of the hydrologic and hydraulic analysis of the existing and proposed bridges at the North Parish Bridge (Bridge No. 2619) over Nezinscot River in the town of Turner in Androscoggin County, ME.

### 1.0 Introduction

The North Parish Bridge carries State Route 117 over the Nezinscot River. The bridge carries North Parish Road/Route 117 from Cobb Rd/Upper St across the Nezinscot River to Fish St. In addition, the North Parish Bridge is approximately 3500 feet downstream of the Turner Center Bridge.



**Figure 1 – Project Location Map (USGS Quadrangle – Turner Center ME)**

North Parish Bridge is located 3500 feet downstream from the Turner Center Bridge. The Androscoggin River is approximately 3.5 miles downstream of the North Parish Bridge.

# Final Hydrologic and Hydraulic Report

## North Parish Bridge over Nezinscot River



**Figure 2 – Aerial image showing project site**

### 2.0 Existing Data Review

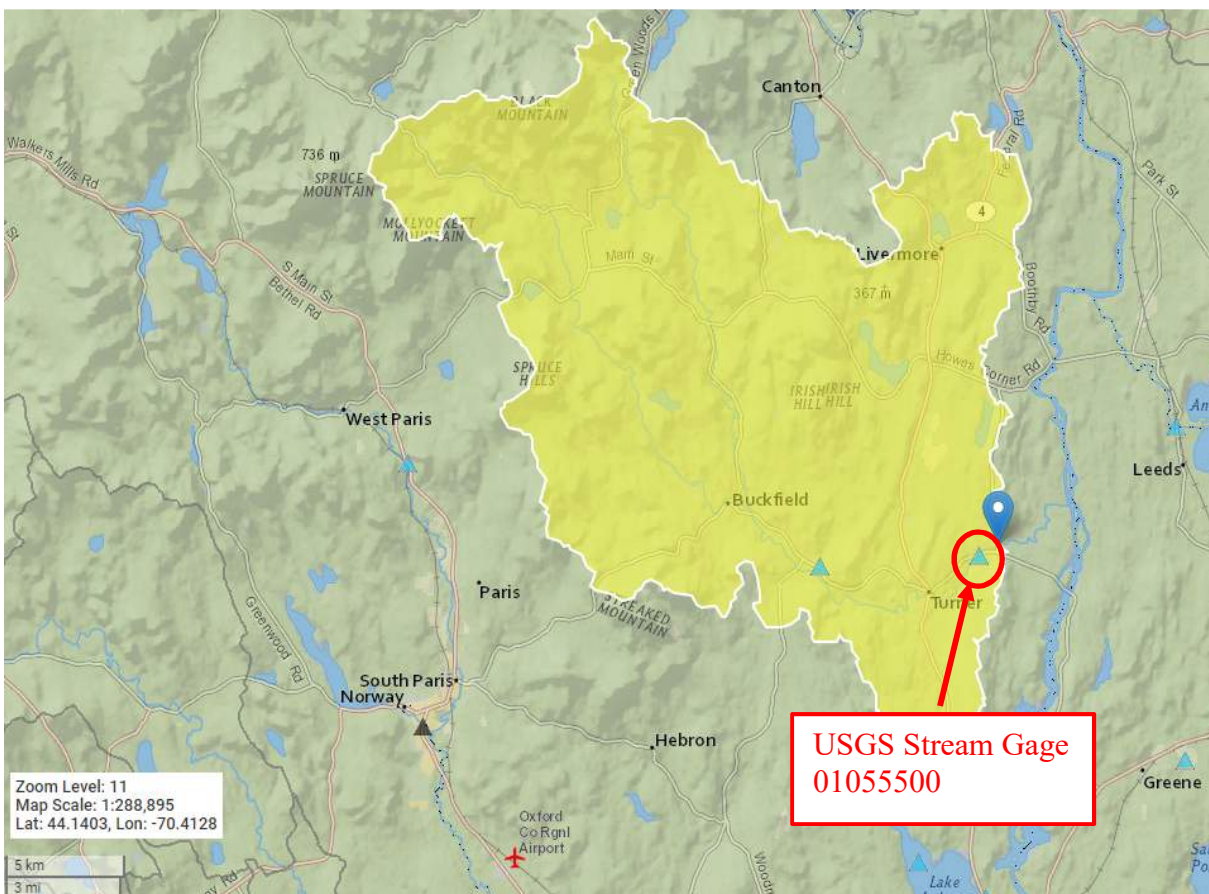
- Site Photographs are provided in **Appendix A**.
- USGS Gage record, Gage Number 01055500, Nezinscot River in Turner Center, Maine. The gage is located upstream of the project bridge location. The project's watershed is 173 square miles while the gage watershed is 169 square miles.
- The gage has been in use since 1942 and has recorded two significant floods since 1942. In 1953 and 1987 the 300-yr and slightly greater than the 100-yr flood were recorded respectively.
- FEMA Flood Insurance Rate Map (see **Appendix B**). Androscoggin County, ME. June 16, 2011. The FEMA flood insurance rate map shows the project in Zone AE. Zone AE means that base flood elevations have been determined. The base flood elevation shown on the FIRM is an elevation of 279 upstream and downstream of the project bridge. The FEMA flood profile in the FEMA Flood Insurance Study indicated that the water surface elevation of the 100-yr flood was approximately 280 feet at the North Parish Bridge.

# Final Hydrologic and Hydraulic Report

## North Parish Bridge over Nezinscot River

### 3.0 Hydrology

MaineDOT provided a hydrology report with the peak flows recommended for design for the Nezinscot River at the location of the bridge replacement. Stream flows were based on the Nezinscot River gage approximately 3500 feet upstream from the project site. Flows were transposed for the difference in the project watershed (173 sq. miles) and the gage watershed (169 sq. miles). The stream flows for the project site were then compared to flows determined by USGS regression equations (Hodgkins, 1999 & Lombard/Hodgkins, 2015). The flows from the gage transposed on the project site can be found in **Table 1**. The hydrology report from MaineDOT can be found in **Appendix C**.



**Figure 3 – Watershed above N. Parish Bridge over Nezinscot River**

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North Parish Bridge over Nezinscot River

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**Table 1: Flood Information**  
(For calculations see **Appendix C**)

Year Storm	USGS Stream Gage Transposed to Project Watershed (cfs)
Drainage Area	173 sq. mi.
Q <sub>1.1</sub>	1,900
Q <sub>2</sub>	3,600
Q <sub>5</sub>	5,500
Q <sub>10</sub>	6,800
Q <sub>25</sub>	8,700
Q <sub>50</sub>	10,150
Q <sub>100</sub>	11,700
Q <sub>500</sub>	15,500

The analysis was completed using the peak flows provided by MaineDOT from the nearby USGS stream gage. Comparing the regression calculations and the gage data provided by the USGS, there is little difference. A graph comparing the results can be found in **Appendix C** of the report.

## 4.0 Hydraulic Analysis

Hydraulic calculations for the existing and proposed conditions along the Nezinscot River were performed using the U.S. Army Corps of Engineers' software HEC-RAS, version 5.0.3. HEC-RAS supports one-dimensional, steady flow, water surface profiles calculations. Cross-sections were cut from survey gathered for this project.

The HEC-RAS model was run using the normal depth downstream boundary condition of the Nezinscot River. The slope of the stream downstream was measured using the survey data. The stream slope on the downstream of the structure was taken to be 0.0002 ft/ft. After multiple iterations using different downstream slopes and running the model it was determined that a slope of 0.0002 ft/ft produced results closest to the FEMA 100-yr floodplain. The base flood elevation shown on the FIRM is an elevation of 279 immediately upstream and downstream of the project bridge. The FEMA flood profile in the FEMA Flood Insurance Study indicated that the water surface elevation of the 100-yr flood was approximately 280 feet at the North Parish Bridge. Results produced in the HEC-RAS model using the boundary condition for the downstream slope produced results closest to the FEMA study. See **Appendix E** and **Appendix F** for the full results of the HEC-RAS model.

The model was run using "subcritical" flow due to the Froude numbers at all cross-sections below 1.0. The model covers approximately 540 feet upstream of the structure and 430 feet downstream of the bridge.

Manning's n numbers were estimated from ground cover within the project site and from values provided the FEMA FIS. The channel's Manning's n value was estimated to be 0.04 and it was

# Final Hydrologic and Hydraulic Report

## North Parish Bridge over Nezinscot River

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assumed to be a sluggish stream with deep pools. The overbanks were estimated to have Manning's  $n$  between 0.03 and 0.06 based on the ground cover varying from pasture ( $n=0.03$ ) and thick brush ( $n=0.06$ ) at the banks of the river. Ineffective flow areas were set upstream and downstream of the bridge based on contraction and expansion.

The existing bridge was constructed in 1941. The bridge consists of three 70-foot spans with a total length of approximately 210 feet from abutment to abutment. The existing structure features two piers that are 5-feet wide at the superstructure and widen to approximately 6.8 feet at the footing. The piers feature a 90° triangular nose at the upstream end of the structure. Therefore, the coefficient of drag ( $C_d$ ) for the momentum equation in low flow scenarios is 1.6. The low chord elevation of the existing bridge is 285 feet. The existing structure has a hydraulic opening of approximately 2959.46 square feet. The existing model indicates that the existing structure is not under pressure flow, but rather the existing model is under energy flow because the river does not impact the low chord of the structure. Previous field views and analysis reveal that the existing structure also creates localized contraction in the river due to the abutment locations. The contraction causes flow to curve under the structure and into the existing piers at a skew of 25°.

The proposed structure is being constructed on a new alignment slightly downstream of the existing bridge. The proposed bridge consists of a 190-foot span and no piers. The proposed structure will also feature integral abutments with sloping embankments. The low chord elevation is proposed to be lowered to 283.27 feet. The proposed bridge provides a hydraulic opening of 2807.42 square feet. In the proposed condition, the model utilizes the energy flow equation as there is no pier and all storm events pass under the low chord of the structure.

The MaineDOT Bridge Design Guide (BDG) states that bridges that are major riverine bridges shall have a minimum depth of 4 feet of freeboard over the 50-year storm event. The BDG also states that the proposed bridge should clear the flood of record or the 100-year event whichever is greater, when possible. The proposed structure does have a lower low chord (Elev. 283.27) than the existing structure (Elev. 285.00), but does pass the 50-year event (Elev. 278.10) and the 100-year event (Elev. 279.36). The structure has a freeboard of 5.17 feet for the 50-yr event and a freeboard of 3.91 feet for the 100-year event. The span length of the proposed structure decreased by 20 feet from abutment to abutment, but was designed without any piers. Even though the hydraulic opening decreased from the existing condition, the water surface elevations decreased immediately upstream and downstream of the structure. Although the water surface elevation for all storm events decreased, the velocity of the river increased for all storm events. The minimal increases are located immediately upstream and downstream of the structure. The structure will feature integral abutments with sloping embankments. The proposed structure offers approximately 2807.42 square feet of hydraulic opening, which equates to a 5% decrease from the existing condition. As mentioned previously, the proposed structure meets the MaineDOT Bridge Design Guide requirements for minimum freeboard and passing the 100-year event.

**Table 2** provides a summary of the hydraulic analysis of existing and proposed conditions at the North Parish Bridge over the Nezinscot River.

# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

**Table 2: Hydraulic Analysis Summary**

Summary of Hydraulic Data – N. Parish Bridge over	Existing Bridge	Proposed Bridge
Low Chord	285.00	283.27
Floodplain width at Q100, ft	171.59	195.64
Floodplain width at Q500, ft	182.57	207.74
Width at Banks, ft	136.47	104.43
Headwater at Upstream face of bridge, Q25, ft	277.11	276.85
Headwater at Upstream face of bridge, Q50, ft	278.35	278.10
Headwater at Upstream face of bridge, Q100, ft	279.59	279.36
Headwater at Upstream face of bridge, Q500, ft	282.34	282.15
Discharge Velocity at Q25, fps	5.35	6.77
Discharge Velocity at Q50, fps	5.62	6.96
Discharge Velocity at Q100, fps	5.88	7.14
Discharge Velocity at Q500, fps	6.45	7.54
Ordinary High Water Elevation (Q1.1) (US face), ft	270.22	269.99
Discharge Velocity at Q1.1, fps	2.90	4.16
Clearance at Q25, ft	7.89	6.42
Clearance at Q50, ft	6.65	5.17
Clearance at Q100, ft	5.41	3.91
Clearance at Q500, ft	2.66	1.12
Bridge Opening Area, ft <sup>2</sup>	2959.46	2807.42
Flow area at Q100, ft <sup>2</sup>	2111.33	1957.44
Flow area at Q500, ft <sup>2</sup>	2597.63	2519.92

The HEC-RAS model was reviewed for errors, warnings, and notes. There were several notes produced by HEC-RAS for the existing and proposed models about multiple critical depths found at several cross-sections. While there were no errors produced, some warnings stated there might be a need for more cross-sections. These warnings were reviewed and were deemed acceptable for this analysis. HEC-RAS outputs including cross-sections and profiles are provided for existing conditions in **Appendix E** and proposed conditions in **Appendix F**.

## 5.0 Scour Analysis

A scour analysis was performed based on equations from FHWA publication HEC-18 (Fifth Edition). The 100-year and 500-year events were analyzed for scour at the proposed North Parish Bridge crossing. The  $D_{50}$  of the streambed material was taken from boring samples at depths between 0 and 2 feet. See **Appendix G** for the boring test results. The  $D_{50}$  of the material at the depth of 0 to 2 feet was found to be 0.0692 mm or 0.00206 feet. This number was used to determine whether clear water or live bed scour analysis was to be performed. At the North Parish Bridge, live bed scour was required to be calculated. In addition, local scour was calculated per HEC-18

# Final Hydrologic and Hydraulic Report

## North Parish Bridge over Nezinscot River

for the near and far abutments. From the scour analysis it was found that there was no live bed scour at the proposed project site, only local scour at the near and far abutments.

The total scour depths can be found in **Table 3** and the scour analysis can be found in **Appendix G**.

**Table 3: Scour Depths**

	<b>100 - year storm</b>	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	12.04	12.92
Pressure Flow Scour (ft)	---	---
<b><u>TOTAL SCOUR (ft)</u></b>	<b><u>12.04</u></b>	<b><u>12.92</u></b>

	<b>500-year storm</b>	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	14.53	16.94
Pressure Flow Scour (ft)	---	---
<b><u>TOTAL SCOUR (ft)</u></b>	<b><u>14.53</u></b>	<b><u>16.94</u></b>

\* If calculated  $y_s$  returns negative answer, the scour depth equals zero

Note that local scour is known to be conservative and the calculations do not account for any proposed scour protection such as riprap.

## 6.0 Summary

In summary, the existing North Parish Bridge over the Nezinscot River in Androscoggin County is proposed to be replaced. The low chord of the existing structure is at 285.00 feet and the Q100 and Q500-year storm events do not impact the structure. The existing structure offers approximately 2960 square feet of hydraulic opening.

The proposed bridge is designed to be on a new alignment, while lowering the existing low chord elevation and removing the piers. The span length from abutment to abutment is proposed to be shortened to 190 feet in order to remove the need for a pier. Reducing the span and lowering the low chord elevation reduces the hydraulic opening to approximately 2807 square feet. The structure passes all storm events under the low chord.

The proposed structure will decrease the water surface elevations for all storm events. The proposed structure meets the clearance requirements set forth in the MaineDOT Bridge Design Guide as the bridge provides more than 4 feet of clearance from the Q50 (5.17 feet of clearance) storm and also passes the 100-year event. Finally, the structure also passes the Q500-yr event under the new low chord (1.12 feet of clearance).

# **Final Hydrologic and Hydraulic Report**

North Parish Bridge over Nezinscot River

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## **Appendix Contents**

Appendix A – Site Photographs

Appendix B – FEMA FIRM

Appendix C – MaineDOT Hydrology

Appendix D – FEMA Information

Appendix E – Existing HEC-RAS Analysis

Appendix F – Proposed HEC-RAS Analysis

Appendix G – Scour Analysis

Appendix H – Drawings

# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

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## APPENDIX A

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Site Photographs



North Approach (Inspection Photo (10-5-2015))



South Approach (Inspection Photo (10-5-2015))



Downstream bridge view (Group Site Visit 6-4-15)

# Final Hydrologic and Hydraulic Report

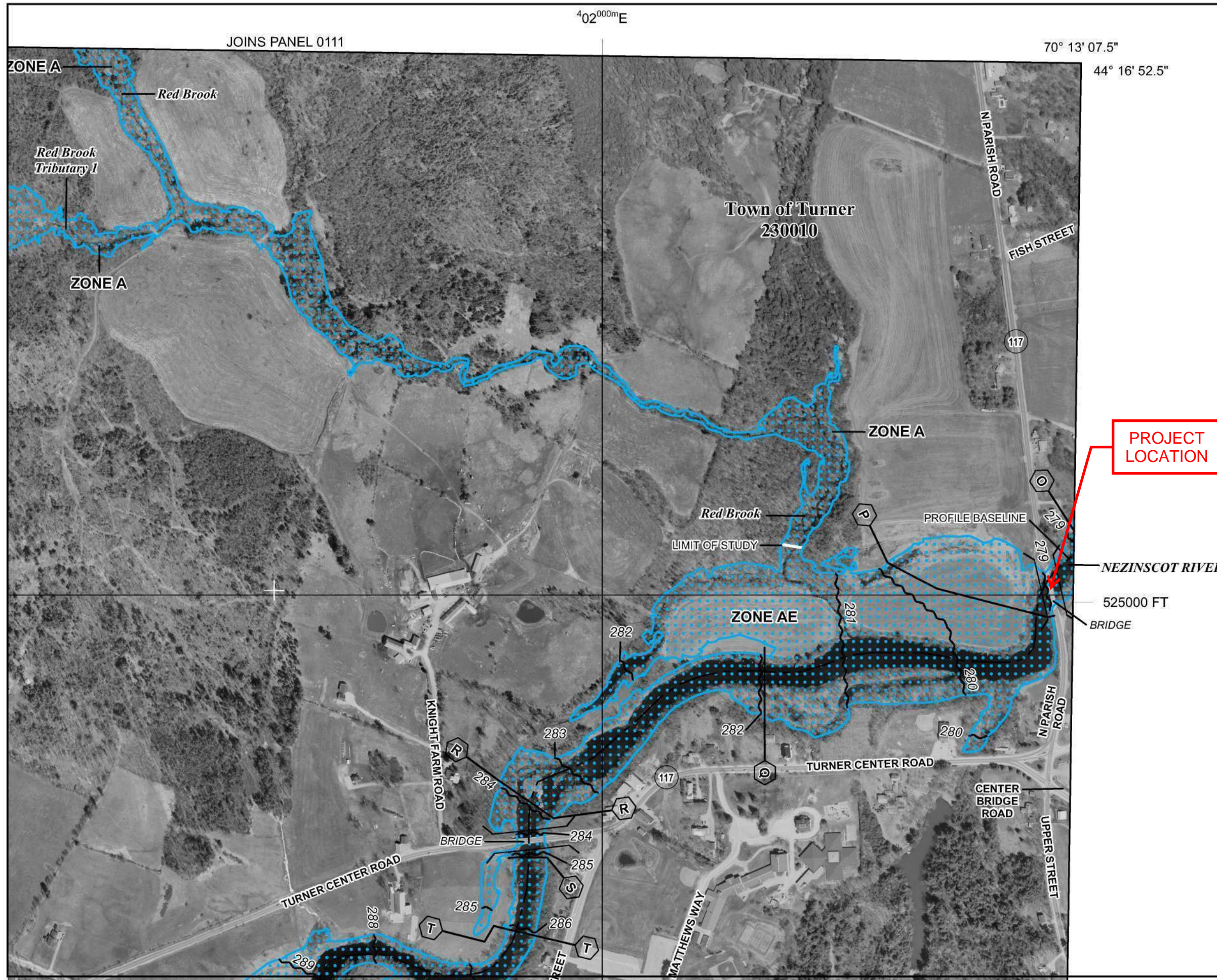
North Parish Bridge over Nezinscot River

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## APPENDIX B

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FEMA FIRM



JOINS PANEL 0111

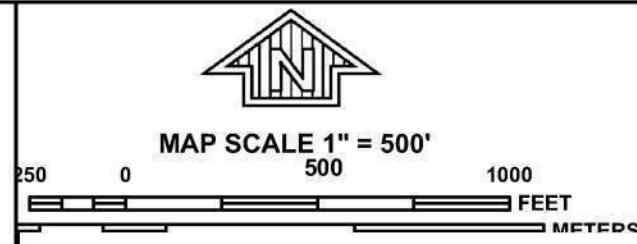
402<sup>000</sup>m E

70° 13' 07.5"

44° 16' 52.5"

Town of Turner  
230010

**PROJECT  
LOCATION**



PANEL 0113E

**FIRM**  
FLOOD INSURANCE RATE MAP  
ANDROSCOGGIN  
COUNTY, MAINE  
(ALL JURISDICTIONS)

PANEL 113 OF 470  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TURNER, TOWN OF	230010	0113	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
23001C0113E  
**EFFECTIVE DATE**  
JULY 8, 2013

Federal Emergency Management Agency

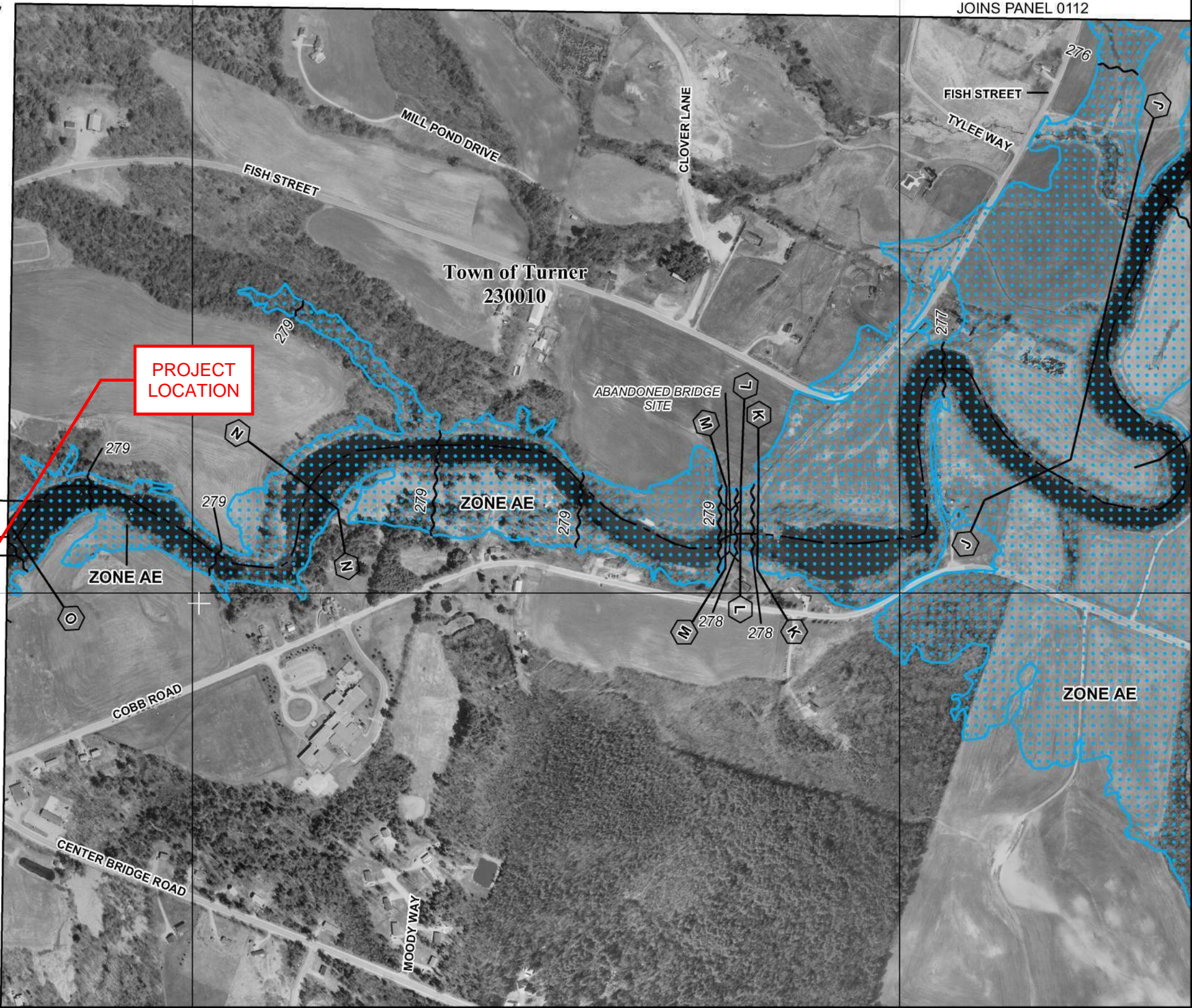
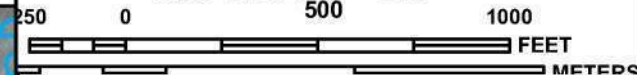
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

70° 13' 07.5"  
44° 16' 52.5"

403<sup>000m</sup>E  
404<sup>000m</sup>E



MAP SCALE 1" = 500'



PROFILE BASELINE  
NEZINSCOT RIVER  
49° 03' 00.00m N

**PROJECT  
LOCATION**

Town of Turner  
230010

JOINS PANEL 0112

PANEL 0114E

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP  
ANDROSCOGGIN  
COUNTY, MAINE  
(ALL JURISDICTIONS)

PANEL 114 OF 470  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TURNER, TOWN OF	230010	0114	E

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**MAP NUMBER**  
23001C0114E  
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# Final Hydrologic and Hydraulic Report

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## APPENDIX C

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MaineDOT Hydrology

# Memo

**To:** Joe Stilwell  
**From:** Charles Hebson  
**CC:**  
**Date:** 2016 November 22  
**Re:** 18749 - Turner – North Parish Bridge #2619

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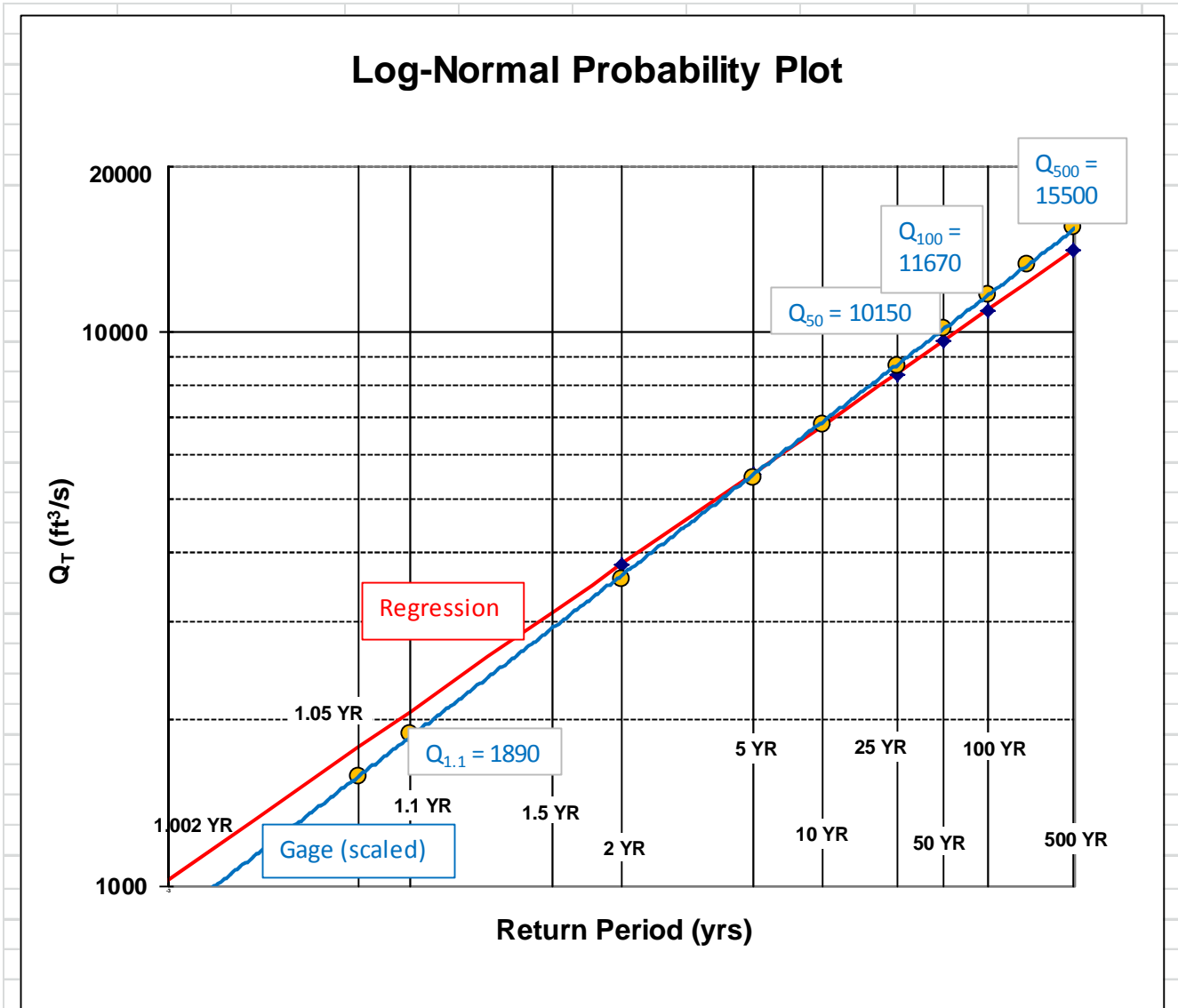
## Summary

.Design peak flows for the North Parish Bridge are listed in Table 1. These values are based on the Nezinscot River gage that is operated by the U.S Geological Survey, adjusted for the slight difference between the gage watershed (169 mi<sup>2</sup>) and the project watershed (173 mi<sup>2</sup>). The frequency analysis of the gage data was performed with the USGS program PeakFQ, with output in Appendix A. The results are showed graphically in Figure 1. There is very little difference between the regression calculations and the gage analysis. The regression hydrology report is included in Appendix B.

**Table 1: Peak Flows Recommended for Design**

Return Period (yrs)	Peak Flow Value (ft <sup>3</sup> /s)
1.1	1 900
2	3 600
10	6 800
25	8 700
50	10 150
100	11 700
500	15 500

Figure 1: Probability Plot for Mill Stream peak flows; Mill Stream Gage values (in red) recommended for design.



## **Appendix A**

### **PeakFQ Output for Nezinscot River Gage, Turner, Maine**

Version 7.1

Annual peak flow frequency analysis

Run Date / Time

3/14/2014

10/12/2016 10:18

## --- PROCESSING OPTIONS ---

Plot option = Graphics &amp; Printer

Basin char output = None

Print option = Yes

Debug print = No

Input peaks listing = Long

Input peaks format = WATSTORE peak file

## Input files used:

peaks (ascii) - C:\ProgFils\PeakFQ\data\NEZINSCOTT-QP.TXT

specifications - C:\ProgFils\PeakFQ\data\PKFQWPSF.TMP

## Output file(s):

main - C:\ProgFils\PeakFQ\data\NEZINSCOTT-QP.PRT

Station - 01055500 Nezinscot River at Turner Center, Maine

I N P U T   D A T A   S U M M A R Y

Number of peaks in record	=	69
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	69
Historic peaks in analysis	=	0
Beginning Year	=	1942
Ending Year	=	2015
Historical Period Length	=	0
Generalized skew	=	0.029
Standard error	=	0.297
Mean Square error	=	0.088
Skew option	=	GENERALIZED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied PILF (LO) criterion	=	--
Plotting position parameter	=	0.00
Type of analysis		BULL.17B
PILF (LO) Test Method		GBT
Perception Thresholds	=	Not Applicable
Interval Data	=	Not Applicable

\*\*\*\*\* NOTICE -- Preliminary machine computations. \*\*\*\*\*

\*\*\*\*\* User responsible for assessment and interpretation. \*\*\*\*\*

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.			0.0	
WCF198I-LOW OUTLIERS BELOW FLOOD BASE WERE DROPPED.	1		740.3	
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.			16097.8	
*WCF151I-17B WEIGHTED SKEW REPLACED BY USER OPTION.	0.193		0.029	1

Kendall's Tau Parameters

	TAU	P-VALUE	MEDIAN SLOPE	No. of PEAKS
SYSTEMATIC RECORD	0.136	0.098	17.610	69

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	EXCEEDANCE	DISCHARGE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.5387	0.2317	-0.011
BULL.17B ESTIMATE	740.3	0.9855	3.5449	0.2181	0.029

BULL.17B ESTIMATE OF MSE OF AT-SITE SKEW 0.0986

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL		<-- FOR BULLETIN 17B ESTIMATES -->			
EXCEEDANCE	BULL.17B	SYSTEMATIC	VARIANCE	95% CONFIDENCE	INTERVALS
PROBABILITY	ESTIMATE	RECORD	OF EST.	LOWER	UPPER
0.9950		869.7	--	--	--
0.9900		994.7	--	--	--
0.9500	1542.	1435.	----	1298.0	1771.0
0.9000	1845.	1743.	----	1589.0	2088.0
0.8000	2296.	2207.	----	2024.0	2561.0
0.6667	2819.	2749.	----	2526.0	3118.0
0.5000	3498.	3460.	----	3164.0	3867.0
0.4292	3826.	3805.	----	3464.0	4241.0
0.2000	5347.	5418.	----	4795.0	6064.0
0.1000	6683.	6845.	----	5906.0	7764.0
0.0400	8488.	8780.	----	7348.0	10160.0
0.0200	9911.	10310.	----	8453.0	12120.0
0.0100	11400.	11910.	----	9585.0	14220.0
0.0050	12960.	13590.	----	10750.0	16470.0
0.0020	15140.	15940.	----	12350.0	19700.0

I N P U T    D A T A    L I S T I N G

WATER	PEAK	PEAKFQ	
YEAR	VALUE	CODES	REMARKS
1942	3290.0		
1943	1660.0		
1944	3050.0		
1945	2550.0		
1946	1750.0		
1947	2180.0		
1948	2970.0		

1949	3300.0
1950	3810.0
1951	6920.0
1952	3560.0
1953	13900.0
1954	6260.0
1955	2720.0
1956	2550.0
1957	668.0
1958	3000.0
1959	4430.0
1960	4090.0
1961	2600.0
1962	2810.0
1963	2430.0
1964	4170.0
1965	1380.0
1966	2390.0
1967	3450.0
1968	3520.0
1969	4170.0
1970	5500.0
1971	3240.0
1972	2390.0
1973	3280.0
1974	4770.0
1975	2130.0
1976	4280.0
1977	8530.0
1978	3850.0
1979	3950.0
1980	4500.0

1981	2340.0
1982	2720.0
1983	4470.0
1984	7790.0
1985	1640.0
1986	5740.0
1987	11600.0
1988	1630.0
1989	6300.0
1990	1970.0
1991	2420.0
1992	3420.0
1993	5240.0
1994	2850.0
1995	1270.0
1996	5280.0
2002	2180.0
2003	1750.0
2004	3790.0
2005	8630.0
2006	3220.0
2007	7630.0
2008	4210.0
2009	4870.0
2010	4090.0
2011	4310.0
2012	8010.0
2013	2250.0
2014	4220.0
2015	3000.0

Explanation of peak discharge qualification codes

PeakFQ	NWIS	
CODE	CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

- Minus-flagged discharge -- Not used in computation

-8888.0 -- No discharge value given

- Minus-flagged water year -- Historic peak used in computation

Station - 01055500 Nezinscot River at Turner Center, Maine

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER	RANKED	SYSTEMATIC	B17B
YEAR	DISCHARGE	RECORD	ESTIMATE
1953	13900.0	0.0143	0.0143
1987	11600.0	0.0286	0.0286
2005	8630.0	0.0429	0.0429
1977	8530.0	0.0571	0.0571
2012	8010.0	0.0714	0.0714
1984	7790.0	0.0857	0.0857
2007	7630.0	0.1000	0.1000
1951	6920.0	0.1143	0.1143
1989	6300.0	0.1286	0.1286
1954	6260.0	0.1429	0.1429
1986	5740.0	0.1571	0.1571

1970	5500.0	0.1714	0.1714
1996	5280.0	0.1857	0.1857
1993	5240.0	0.2000	0.2000
2009	4870.0	0.2143	0.2143
1974	4770.0	0.2286	0.2286
1980	4500.0	0.2429	0.2429
1983	4470.0	0.2571	0.2571
1959	4430.0	0.2714	0.2714
2011	4310.0	0.2857	0.2857
1976	4280.0	0.3000	0.3000
2014	4220.0	0.3143	0.3143
2008	4210.0	0.3286	0.3286
1964	4170.0	0.3429	0.3429
1969	4170.0	0.3571	0.3571
1960	4090.0	0.3714	0.3714
2010	4090.0	0.3857	0.3857
1979	3950.0	0.4000	0.4000
1978	3850.0	0.4143	0.4143
1950	3810.0	0.4286	0.4286
2004	3790.0	0.4429	0.4429
1952	3560.0	0.4571	0.4571
1968	3520.0	0.4714	0.4714
1967	3450.0	0.4857	0.4857
1992	3420.0	0.5000	0.5000
1949	3300.0	0.5143	0.5143
1942	3290.0	0.5286	0.5286
1973	3280.0	0.5429	0.5429
1971	3240.0	0.5571	0.5571
2006	3220.0	0.5714	0.5714
1944	3050.0	0.5857	0.5857
1958	3000.0	0.6000	0.6000
2015	3000.0	0.6143	0.6143

1948	2970.0	0.6286	0.6286
1994	2850.0	0.6429	0.6429
1962	2810.0	0.6571	0.6571
1955	2720.0	0.6714	0.6714
1982	2720.0	0.6857	0.6857
1961	2600.0	0.7000	0.7000
1945	2550.0	0.7143	0.7143
1956	2550.0	0.7286	0.7286
1963	2430.0	0.7429	0.7429
1991	2420.0	0.7571	0.7571
1966	2390.0	0.7714	0.7714
1972	2390.0	0.7857	0.7857
1981	2340.0	0.8000	0.8000
2013	2250.0	0.8143	0.8143
1947	2180.0	0.8286	0.8286
2002	2180.0	0.8429	0.8429
1975	2130.0	0.8571	0.8571
1990	1970.0	0.8714	0.8714
1946	1750.0	0.8857	0.8857
2003	1750.0	0.9000	0.9000
1943	1660.0	0.9143	0.9143
1985	1640.0	0.9286	0.9286
1988	1630.0	0.9429	0.9429
1965	1380.0	0.9571	0.9571
1995	1270.0	0.9714	0.9714
1957	668.0	0.9857	0.9857

End PeakFQ analysis.

Stations processed :	1
Number of errors :	0
Stations skipped :	0
Station years :	69

Data records may have been ignored for the stations listed below.

(Card type must be Y, Z, N, H, I, 2, 3, 4, or \*.)

(2, 4, and \* records are ignored.)

For the station below, the following records were ignored:

FINISHED PROCESSING STATION: 01055500          USGS Nezinscot River at Turner Cen

**Appendix B**  
**Regression Hydrology Report**

Project Name: Turner - N Parish Bridge  
 Stream Name: Nezinscot River  
 Bridge Name: North Parish Bridge  
 Route No. ME 117  
 Analysis by: CSH

PIN: 18749  
 Town: Turner Center  
 Bridge No. 2619  
 USGS Quad:  
 Date: 10/31/2016

### Peak Flow Calculations by USGS Regression Equations (Hodgkins, 1999 & Lombard/Hodgkins, 2015)

*Enter data in blue cells only!*

	km <sup>2</sup>	mi <sup>2</sup>	ac
A	448.07	173.00	110720.0
W	41.67	16.09	10297.0
P <sub>c</sub>	391990	4910310	
County	Androscoggin		
pptA	45.3		
SG	0.01		
A (km <sup>2</sup> )	448.07		
W (%)	9.30		

*Enter data in [mi<sup>2</sup>]*

Watershed Area  
 Wetlands area (by NWI)

watershed centroid (E, N; UTM 19N; meters)  
*choose county from drop-down menu*  
 mean annual precipitation (inches; by look-up)  
 sand & gravel aquifer as decimal fraction of watershed A

**Worksheet prepared by:**  
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 207-557-1052  
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Conf Lvl 0.67

Ret Pd T (yr)	Peak Flow Estimate		
	Lower	Q <sub>T</sub> (m <sup>3</sup> /s)	Upper
1.1		58.68	
2		107.74	
5		157.31	
10		192.82	
25		238.38	
50		273.33	
100		310.06	
500		399.12	

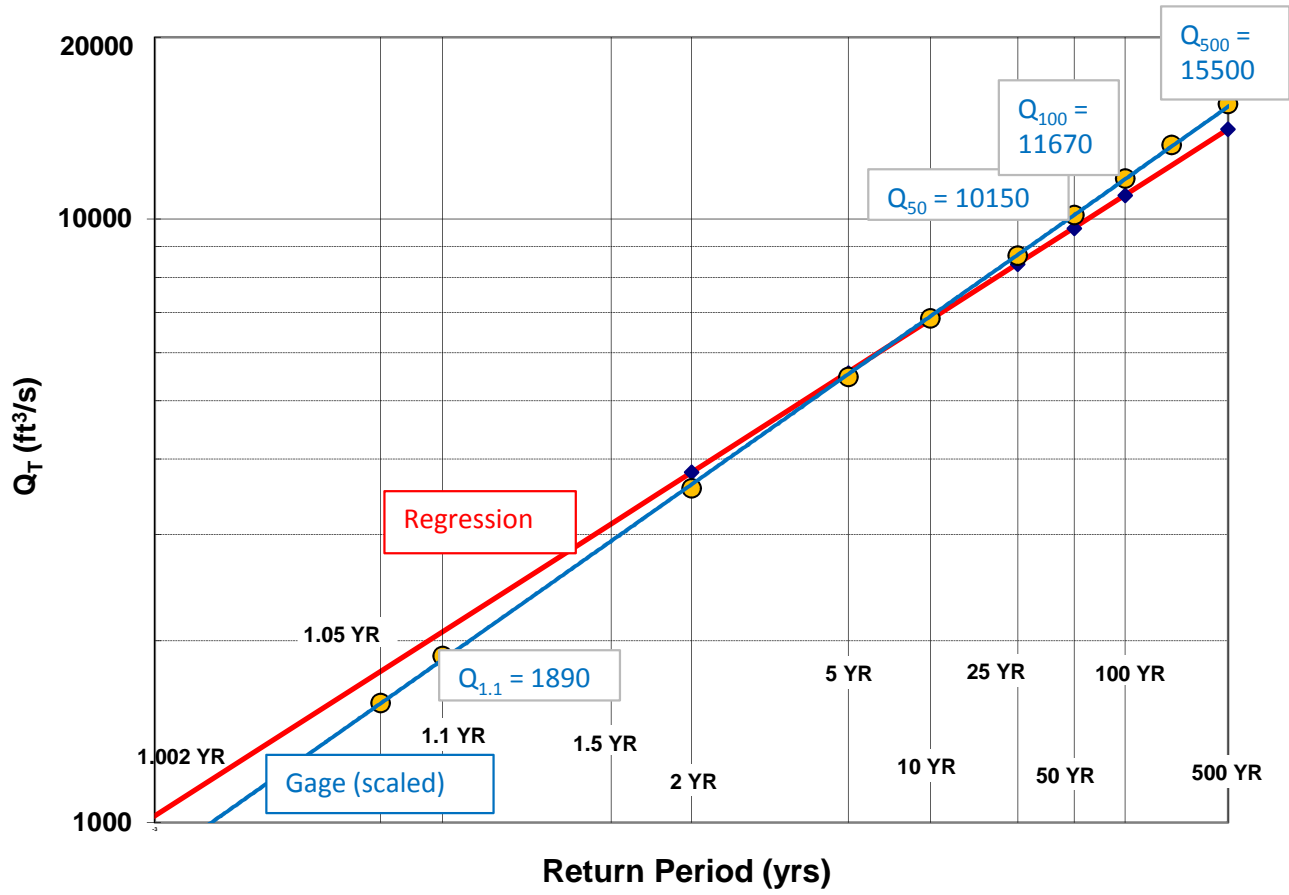
Regression Q <sub>T</sub> (ft <sup>3</sup> /s)	Nezinscot Gage Scaled	
2072		1889
3804		3581
5554		5474
6808		6841
8417		8689
9651		10146
10948		11670
14093		15498

**Reference:**

Hodgkins, G., 1999.  
 Estimating the magnitude of peak flows for streams  
 in Maine for selected recurrence intervals  
*Water-Resources Investigations Report 99-4008*  
 US Geological Survey, Augusta, Maine

$$Q_T = b \times A^a \times 10^{-wW}$$

# Log-Normal Probability Plot



**Project Name:** Turner - N Parish Bridge  
**Stream Name:** Nezinscot River  
**Bridge Name:** North Parish Bridge  
**Route No.:** ME 117  
**Analysis by:** CSH

**PIN:** 18749  
**Town:** Turner Center  
**Bridge No.:** 2619  
**USGS Quad:** 0  
**Date:** 10/31/2016

**DO NOT ENTER ANY DATA ON THIS PAGE; EVERYTHING IS CALCULATED**

**MAINE MONTHLY MEDIAN FLOWS BY USGS REGRESSION EQUATIONS (2004)**

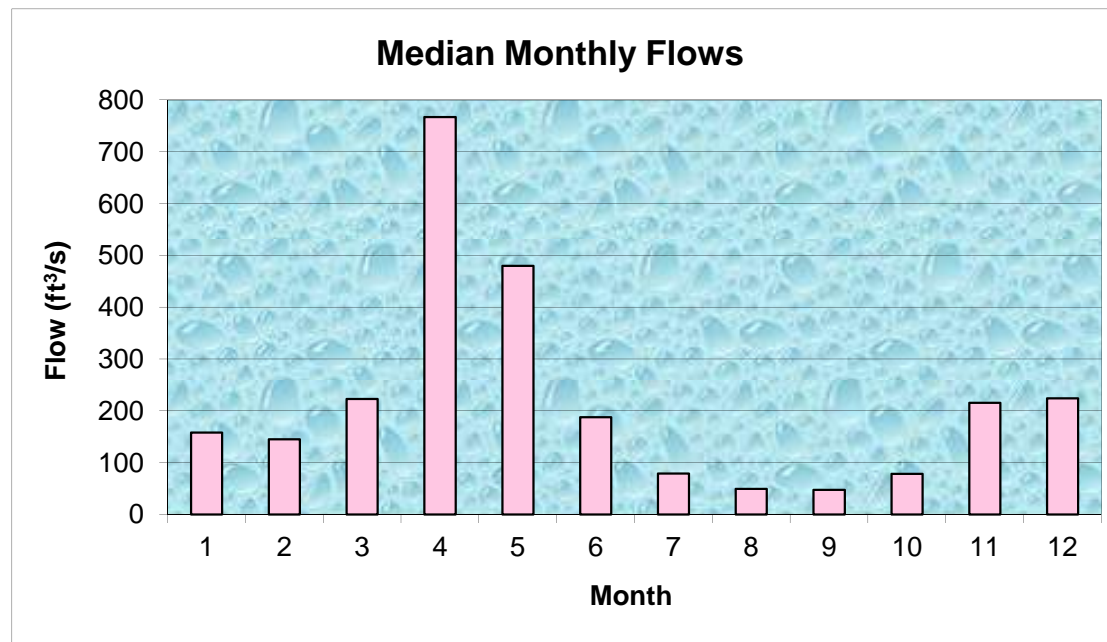
**Worksheet prepared by:**  
 Charles S. Hebson, PE  
 Chief Hydrologist  
 Maine Dept. Transportation  
 Augusta, ME 04333-0016  
 207-624-3073  
[Charles.Hebson@maine.gov](mailto:Charles.Hebson@maine.gov)

Value	Variable	Explanation
173.000	A	Area (mi <sup>2</sup> )
391990.3	P <sub>c</sub>	Watershed centroid (E,N; UTM; Zone 19; meters)
76.52	DIST	Distance from Coastal reference line (mi)
45.3	pptA	Mean Annual Precipitation (inches)
0.01	SG	Sand & Gravel Aquifer (decimal fraction of watershed area)

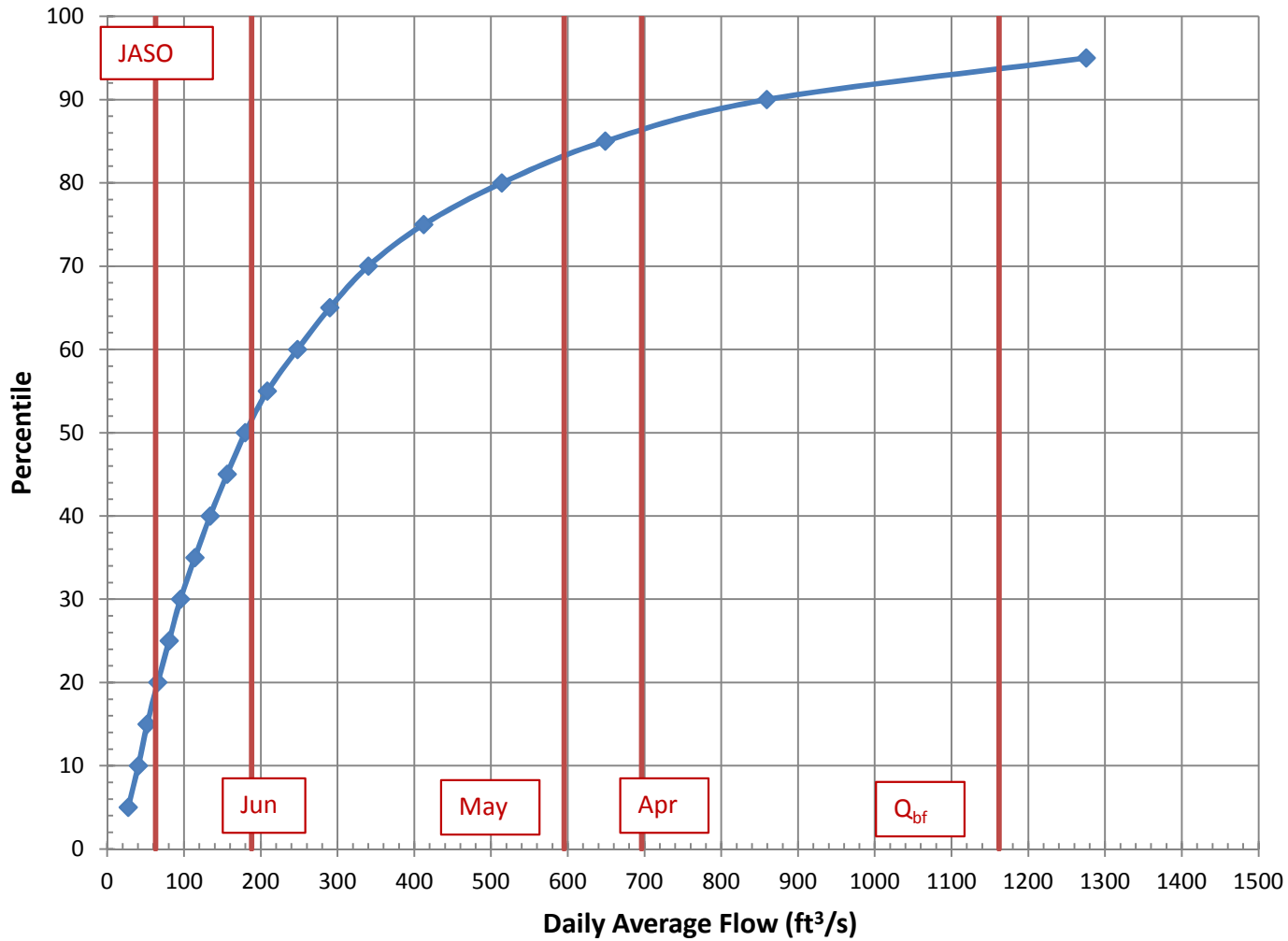
Month	Q <sub>median</sub> (ft <sup>3</sup> /s)	(m <sup>3</sup> /s)
Jan	158.26	4.4848
Feb	145.32	4.1180
Mar	223.18	6.3247
Apr	767.10	21.7386
May	480.20	13.6083
Jun	187.86	5.3237
Jul	79.41	2.2503
Aug	49.70	1.4083
Sep	48.04	1.3613
Oct	78.97	2.2379
Nov	215.81	6.1157
Dec	224.31	6.3568

Q <sub>bf</sub>	1161.8
ann avg	346.3
ann med	188.5
Q <sub>1.002</sub>	1025.9
Q <sub>1.01</sub>	1316.8
Q <sub>1.05</sub>	1779.5

W <sub>bf</sub>	111.8	estimated bankfull width
d <sub>bf</sub>	8.7	
Q <sub>bf</sub>	3874.4	assume v = 4ft/s



# Daily Average Flow Distribution



## Daily Avg Flow Dist

$A_{ws} = (mi^2)$  173.0

Q (ft³/s)

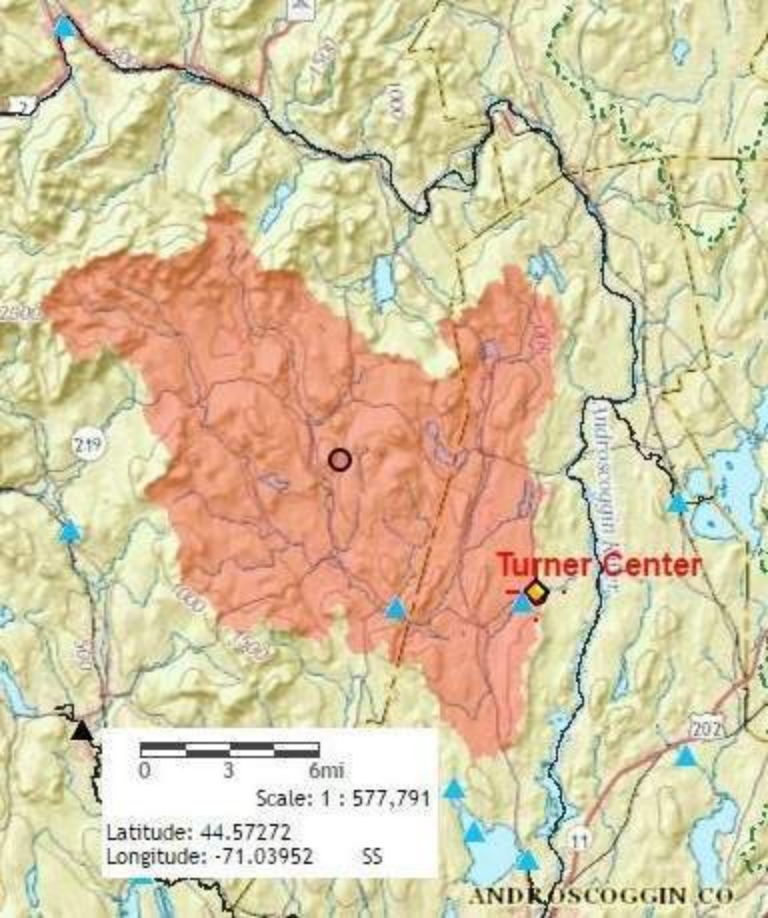
Pctl	Median	84 <sup>th</sup> pctl
5	27.23	43.82
10	40.45	60.82
15	51.99	75.94
20	65.84	92.09
25	80.55	107.96
30	95.32	122.95
35	114.19	140.52
40	133.91	161.60
45	156.09	182.72
50	179.70	215.72
55	208.69	251.07
60	247.85	294.73
65	289.96	343.37
70	340.11	400.60
75	412.30	481.74
80	514.19	575.17
85	648.79	737.08
90	859.43	989.73
95	1275.48	1539.12

$Q_{bf}$  1161.8

$Q_{1.002}$  1240.7

$Q_{1.1}$  2606.4

$Q_2$  4950.5



Turner Center



Scale: 1 : 577,791

Latitude: 44.57272  
Longitude: -71.03952 SS

ANDROSCOGGIN CO

# StreamStats Version 3.0

## Basin Characteristics Ungaged Site Report

Date: Mon Oct 31, 2016 10:23:53 AM GMT-4

Study Area: Maine

NAD 1983 Latitude: 44.2739 ( 44 16 26)

NAD 1983 Longitude: -70.2191 (-70 13 09)

Label	Value	Units	Definition
DRNAREA	172.7	square miles	Area that drains to a point on a stream
STORNWI	9.3	percent	Percentage of storage (combined water bodies and wetlands) from the National Wetlands Inventory
ELEV	617.1	feet	Mean Basin Elevation
PRECIP	45.3	inches	Mean Annual Precipitation
SANDGRAVAP	8.88	percent	Percentage of land surface underlain by sand and gravel aquifers
COASTDIST	77.6	miles	Shortest distance from the coastline to the basin centroid
CENTROIDX	391990.34	State plane coordinates	Basin centroid horizontal (x) location in state plane coordinates
CENTROIDY	4910310.19	State plane coordinates	Basin centroid vertical (y) location in state plane units
SANDGRAVAF	0.089	dimensionless	Fraction of land surface underlain by sand and gravel aquifers
LC11IMP	1.06	percent	Average percentage of impervious area determined from NLCD 2011 impervious dataset
LC11DEV	5.41	percent	Percentage of developed (urban) land from NLCD 2011 classes 21-24
LC06WATER	1.41	percent	Percent of open water, class 11, from NLCD 2006
ELEVMAX	2189.8	feet	Maximum basin elevation
BSLDEM10M	11.7	percent	Mean basin slope computed from 10 m DEM
STATSGOA	16.9	percent	Percentage of area of Hydrologic Soil Type A from STATSGO

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U.S. Department of the Interior | U.S. Geological Survey

URL: [http://streamstatsags.cr.usgs.gov/v3\\_beta/BCreport.htm](http://streamstatsags.cr.usgs.gov/v3_beta/BCreport.htm)

Page Contact Information: [StreamStats Help](#)

Page Last Modified: 01/26/2016 11:44:09 (Web2)

[Streamstats Status](#)   [News](#)



# StreamStats Version 3.0

## Flow Statistics Ungaged Site Report

Date: Mon Oct 31, 2016 10:26:45 AM GMT-4  
 Study Area: Maine  
 NAD 1983 Latitude: 44.2739 ( 44 16 26)  
 NAD 1983 Longitude: -70.2191 (-70 13 09)  
 Drainage Area: 172.7 mi2

### Regional Hydraulic Geometry Basin Characteristics

100% Central and Coastal Bankfull 2004 5042 (173 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	2.92	298

### Regional Median Flow Basin Characteristics

100% Undefined Region (172.7 mi2)

*The selected watershed is entirely in an area for which flow equations were not defined.*

### Peak Flow Basin Characteristics

100% Statewide Peak Flow Full GT 12sqmi WRI 99 4008 (173 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	0.93	1653
Percentage of Storage from NWI (percent)	9.30	0.7	26.7

### Annual Flow Basin Characteristics

100% Statewide LowFlow SIR 2004 5026 (173 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	9.79	1418
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.455

### Peak Small Basin Flow Basin Characteristics

100% Statewide Peak Flow DA LT 12sqmi 2015 5049 (173 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173 (above max value 12)	0.31	12
Percentage of Storage from NWI (percent)	9.30	0	22.2

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Statewide Annual Flow Basin Characteristics			
100% Statewide Annual SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.212
Mean Basin Elevation (feet)	617.1	239	2120

Statewide January Flows Basin Characteristics			
100% Statewide January SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
STATSGO Percent Hydrologic Soil Type A (percent)	16.9	0	31.5

Statewide February Flows Basin Characteristics			
100% Statewide February SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Distance From Coast To Basin Centroid (miles)	77.6	46.6	193
Mean Basin Slope from 10m DEM (percent)	11.7	1.5	26.6

Statewide March Flows Basin Characteristics			
100% Statewide March SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Distance From Coast To Basin Centroid (miles)	77.6	46.6	193

Percent Water from NLCD2006 (percent)	1.41	0	6.2
---------------------------------------	------	---	-----

Statewide April Flows Basin Characteristics			
100% Statewide April SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Distance From Coast To Basin Centroid (miles)	77.6	46.6	193
Percent Water from NLCD2006 (percent)	1.41	0	6.2

Statewide May Flows Basin Characteristics			
100% Statewide May SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Mean Basin Slope from 10m DEM (percent)	11.7	1.5	26.6
Percent Water from NLCD2006 (percent)	1.41	0	6.2

Statewide June Flows Basin Characteristics			
100% Statewide June SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Mean Basin Slope from 10m DEM (percent)	11.7	1.5	26.6
Percent Water from NLCD2006 (percent)	1.41	0	6.2

Statewide July Flows Basin Characteristics			
100% Statewide July SIR 2015 5151 (173 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.212
Mean Basin Elevation (feet)	617.1	239	2120

**Statewide August Flows Basin Characteristics**

**100% Statewide August SIR 2015 5151 (173 mi2)**

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.212
Mean Basin Elevation (feet)	617.1	239	2120

**Statewide September Flows Basin Characteristics**

**100% Statewide September SIR 2015 5151 (173 mi2)**

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.212
Mean Basin Elevation (feet)	617.1	239	2120

**Statewide October Flows Basin Characteristics**

**100% Statewide October SIR 2015 5151 (173 mi2)**

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Fraction of Sand and Gravel Aquifers (dimensionless)	0.089	0	0.212
Mean Basin Elevation (feet)	617.1	239	2120

**Statewide November Flows Basin Characteristics**

**100% Statewide November SIR 2015 5151 (173 mi2)**

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
Maximum Basin Elevation (feet)	2189.8	633	6290

**Statewide December Flows Basin Characteristics**

**100% Statewide December SIR 2015 5151 (173 mi2)**

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	173	14.9	1419
STATSGO Percent Hydrologic Soil Type A (percent)	16.9	0	31.5

Regional Hydraulic Geometry Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
BFFLOW	1160	ft3/s	54			
BFWDTH	112	ft	33			
BFDPTH	3.42	ft	26			
BFAREA	382	ft2	57			

<http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf> (<http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf>)

Dudley\_ R.W.\_ 2004\_ Hydraulic-Geometry Relations for Rivers in Coastal and Central Maine: U.S. Geological Survey Scientific Investigations Report 2004-5042\_ 30 p

Peak Flow Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PK2	3800	ft3/s	35	1.8	2130	6790
PK5	5550	ft3/s	36	2.5	3080	10000
PK10	6800	ft3/s	37	3.2	3720	12400
PK25	8410	ft3/s	39	4.1	4490	15700
PK50	9640	ft3/s	40	4.8	5050	18400
PK100	10900	ft3/s	41	5.4	5610	21300
PK500	14100	ft3/s	45	6.4	6830	29000

<http://me.water.usgs.gov/99-4008.pdf> (<http://me.water.usgs.gov/99-4008.pdf>)

Hodgkins\_ G. A.\_ 1999\_ Estimating the Magnitude of Peak Flows for Streams in Maine for Selected Recurrence Intervals: U.S. Geological Survey Water-Resources Investigations Report 99-4008\_ 45 p.

Annual Flow Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
M7D10Y	16.3	ft3/s	44	2.9		

<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf> (<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf>)

Dudley\_ R.W.\_ 2004\_ Estimating Monthly\_ Annual\_ and Low 7-Day\_ 10-Year Streamflows for Ungaged Rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2004-5026\_ 22 p.

Peak Small Basin Flow Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max

Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	Min	Max
PK1 01	763	ft3/s				
PK2	2910	ft3/s				
PK5	4700	ft3/s				
PK10	5960	ft3/s				
PK25	7910	ft3/s				
PK50	9300	ft3/s				
PK100	10900	ft3/s				
PK250	12400	ft3/s				
PK500	14900	ft3/s				

<http://dx.doi.org/10.3133/sir20155049> (<http://dx.doi.org/10.3133/sir20155049>)

Lombard\_ P.J.\_ and Hodgkins\_ G.A.\_ 2015\_ Peak flow regression equations for small\_ ungaged streams in Maine– Comparing map-based to field-based variables: U.S. Geological Survey Scientific Investigations Report 2015-5049\_ 12 p.

Statewide Annual Flow Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
D1	13.6	ft3/s	140			
D5	26.6	ft3/s	62			
D10	39.3	ft3/s	41			
D25	80.2	ft3/s	22			
D50	182	ft3/s	20			
D75	418	ft3/s	17			
D90	851	ft3/s	17			
D95	1270	ft3/s	18			
D99	2500	ft3/s	29			
QA	358	ft3/s	16			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide January Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
JAND1	52.5	ft3/s	49			
JAND5	67.8	ft3/s	37			
JAND10	83.6	ft3/s	35			
JAND25	121	ft3/s	28			

JAND50	170	ft3/s	35			
JAND75	266	ft3/s	39			
JAND90	482	ft3/s	40			
JAND95	777	ft3/s	45			
JAND99	1820	ft3/s	79			
Q1	271	ft3/s	32			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley, R.W., 2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_35 p.

Statewide February Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
FEBD1	45.2	ft3/s	50			
FEBD5	59.7	ft3/s	37			
FEBD10	75.6	ft3/s	33			
FEBD25	107	ft3/s	27			
FEBD50	149	ft3/s	23			
FEBD75	239	ft3/s	16			
FEBD90	404	ft3/s	22			
FEBD95	640	ft3/s	31			
FEBD99	1390	ft3/s	46			
Q2	222	ft3/s	17			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley, R.W., 2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_35 p.

Statewide March Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
MARD1	58.3	ft3/s	48			
MARD5	78.2	ft3/s	41			
MARD10	96.7	ft3/s	31			
MARD25	155	ft3/s	23			
MARD50	329	ft3/s	20			
MARD75	640	ft3/s	25			
MARD90	1180	ft3/s	29			
MARD95	1650	ft3/s	37			
MARD99	3160	ft3/s	33			

Q3	533	ft3/s	21			
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<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide April Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
APRD1	165	ft3/s	38			
APRD5	259	ft3/s	37			
APRD10	327	ft3/s	28			
APRD25	478	ft3/s	24			
APRD50	750	ft3/s	22			
APRD75	1280	ft3/s	22			
APRD90	2110	ft3/s	20			
APRD95	2820	ft3/s	19			
APRD99	4830	ft3/s	32			
Q4	1060	ft3/s	18			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide May Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
MAYD1	93.4	ft3/s	43			
MAYD5	138	ft3/s	34			
MAYD10	169	ft3/s	31			
MAYD25	252	ft3/s	26			
MAYD50	402	ft3/s	22			
MAYD75	643	ft3/s	24			
MAYD90	1040	ft3/s	30			
MAYD95	1410	ft3/s	31			
MAYD99	2580	ft3/s	27			
Q5	549	ft3/s	23			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

**Statewide June Flows Statistics**

Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
JUND1	45.7	ft3/s	69			
JUND5	60.3	ft3/s	52			
JUND10	74.4	ft3/s	46			
JUND25	113	ft3/s	34			
JUND50	179	ft3/s	27			
JUND75	335	ft3/s	28			
JUND90	652	ft3/s	34			
JUND95	1020	ft3/s	34			
JUND99	2500	ft3/s	47			
Q6	323	ft3/s	21			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

**Statewide July Flows Statistics**

Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
JULD1	20.5	ft3/s	96			
JULD5	29.5	ft3/s	78			
JULD10	35.4	ft3/s	64			
JULD25	48	ft3/s	49			
JULD50	76.9	ft3/s	37			
JULD75	137	ft3/s	31			
JULD90	292	ft3/s	28			
JULD95	465	ft3/s	33			
JULD99	978	ft3/s	60			
Q7	145	ft3/s	22			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

**Statewide August Flows Statistics**

Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
AUGD1	9.76	ft3/s	320			

AUGD5	14.4	ft3/s	160			
AUGD10	18.3	ft3/s	130			
AUGD25	31.6	ft3/s	60			
AUGD50	49.5	ft3/s	40			
AUGD75	102	ft3/s	35			
AUGD90	220	ft3/s	36			
AUGD95	364	ft3/s	34			
AUGD99	907	ft3/s	59			
Q8	107	ft3/s	34			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide September Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
SEPD1	7.8	ft3/s	300			
SEPD5	11.2	ft3/s	320			
SEPD10	16.9	ft3/s	110			
SEPD25	26.1	ft3/s	65			
SEPD50	45.6	ft3/s	36			
SEPD75	88.5	ft3/s	26			
SEPD90	178	ft3/s	38			
SEPD95	299	ft3/s	44			
SEPD99	886	ft3/s	67			
Q9	95.6	ft3/s	33			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide October Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
OCTD1	15.2	ft3/s	130			
OCTD5	21.4	ft3/s	110			
OCTD10	29	ft3/s	64			
OCTD25	53.4	ft3/s	28			
OCTD50	105	ft3/s	33			
OCTD75	250	ft3/s	39			

OCTD90	546	ft3/s	47			
OCTD95	876	ft3/s	45			
OCTD99	2150	ft3/s	61			
Q10	245	ft3/s	35			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide November Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
NOVD1	30.9	ft3/s	140			
NOVD5	48.9	ft3/s	91			
NOVD10	81	ft3/s	45			
NOVD25	153	ft3/s	32			
NOVD50	290	ft3/s	24			
NOVD75	523	ft3/s	21			
NOVD90	886	ft3/s	26			
NOVD95	1240	ft3/s	37			
NOVD99	2170	ft3/s	58			
Q11	424	ft3/s	23			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley\_ R.W.\_ 2015\_ Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151\_ 35 p.

Statewide December Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
DECD1	63	ft3/s	110			
DECD5	93.3	ft3/s	33			
DECD10	111	ft3/s	26			
DECD25	159	ft3/s	27			
DECD50	259	ft3/s	35			
DECD75	450	ft3/s	39			
DECD90	815	ft3/s	39			
DECD95	1210	ft3/s	38			
DECD99	2840	ft3/s	61			
Q12	416	ft3/s	29			

<http://dx.doi.org/10.3133/sir20155151> (<http://dx.doi.org/10.3133/sir20155151>)

Dudley, R.W., 2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015-5151, 35 p.

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# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

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## APPENDIX D

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FEMA Flood Insurance Study Information

**Table 5 – Summary of Discharges (Continued)**

<b><u>FLOODING SOURCE AND LOCATION</u></b>	<b><u>DRAINAGE AREA (sq. miles)</u></b>	<b>PEAK DISCHARGES (cfs)</b>			
		<b><u>10%- ANNUAL- CHANCE</u></b>	<b><u>2%- ANNUAL- CHANCE</u></b>	<b><u>1%- ANNUAL- CHANCE</u></b>	<b><u>0.2%- ANNUAL- CHANCE</u></b>
<b>NEWELL BROOK</b>					
At confluence with Androscoggin River	6.5	341	514	596	798
Approximately 485 feet upstream of Swamp Road	5.4	280	424	492	660
Approximately 180 feet upstream of the confluence with Newell Brook Tributary 1	5.0	252	380	441	591
Approximately 0.55 mile downstream of Old Brunswick Road	4.2	233	356	414	558
Approximately 115 feet upstream of the confluence with Newell Brook Tributary 2	3.4	237	367	430	587
Approximately 205 feet downstream of Quaker Meeting Road	3.1	235	368	431	592
Approximately 0.40 mile downstream of the confluence with Newell Brook Tributary 2	2.5	197	309	363	500
At confluence with Newell Brook Tributary 2	1.6	149	238	281	391
Approximately 1.14 miles upstream of the confluence with Newell Brook Tributary 2	1.0	114	186	221	312
<b>NEZINSCOT RIVER</b>					
At confluence with Androscoggin River	180	*	*	12,100	*
At the gaging station at Turner Center	169	*	*	11,500	*
At the dam in the Town of Turner	120	*	*	8,730	*
<b>NO NAME BROOK</b>					
At the confluence with Sabattus River	15.7	786	1,168	1,347	1,787
Approximately 0.97 mile upstream of Littlefield Road	15.0	737	1,096	1,264	1,677

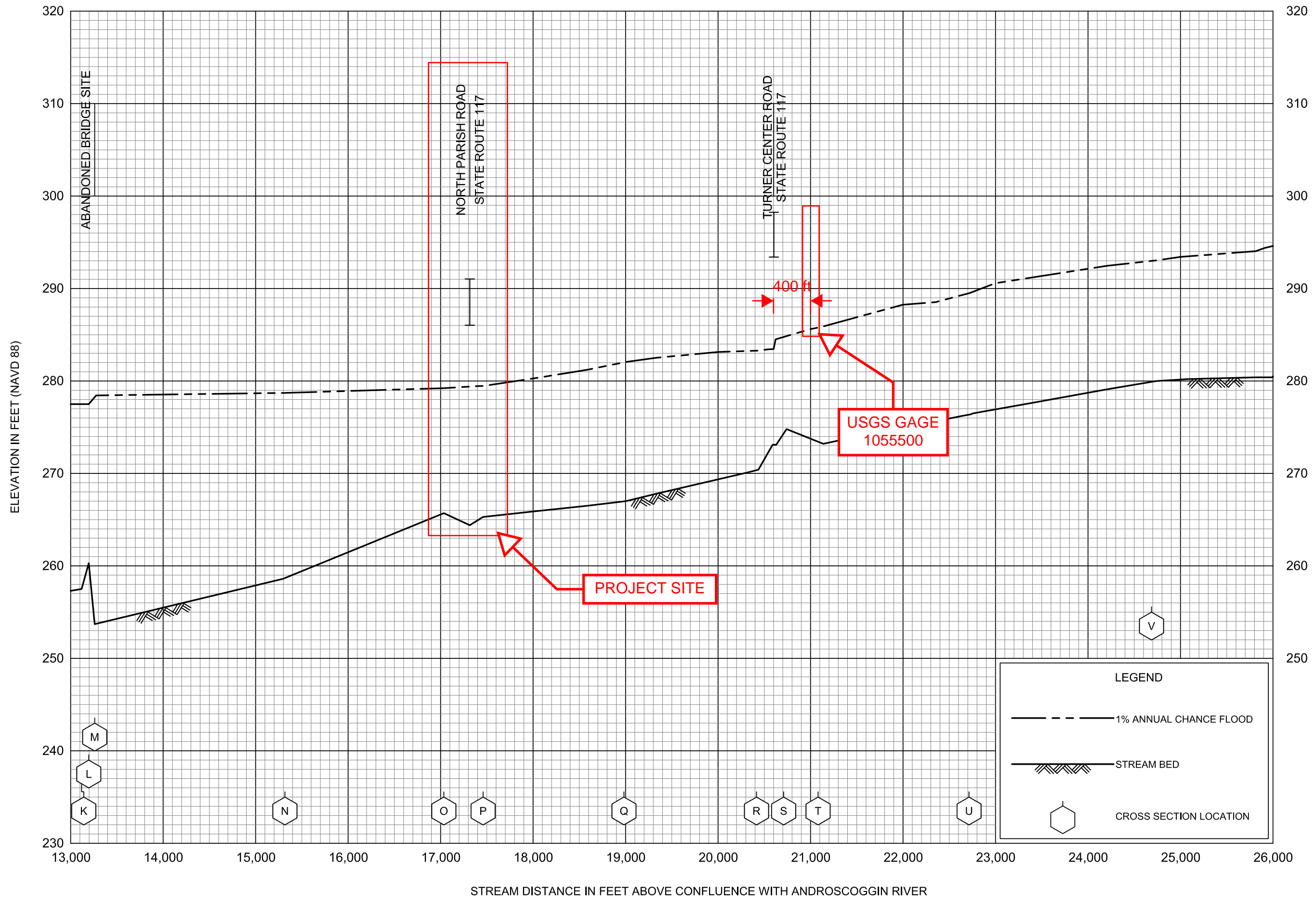
\*Data not available

**Table 7 – Manning’s “n” Values (Continued)**

<b><u>Stream</u></b>	<b><u>Channel</u></b>	<b><u>Overbank</u></b>
Hart Brook	0.045-0.060	0.040-0.120
Hooper Brook	0.040-0.065	0.078-0.095
Hooper Brook Tributary 1	0.065-0.067	0.078-0.095
House Brook	0.045	0.045-0.150
Jepson Brook	0.013-0.050	0.032-0.120
Lake Auburn	0.032-0.040	0.032-0.120
Lapham Brook	0.035-0.045	0.035-0.090
Little Androscoggin River	0.050	0.035-0.110
Lively Brook	*	*
Lower Range Pond	0.032	0.032-0.090
Martin Stream	*	*
Maxwell Brook	0.060-0.075	0.080-0.085
Meadow Brook	0.045	0.035-0.150
Moody Brook	0.035-0.045	0.050-0.080
Newell Brook	0.050	0.032-0.130
<b>Nezinscot River</b>	<b>0.040-0.052</b>	<b>0.060-0.080</b>
No Name Brook	0.040-0.045	0.030-0.150
No Name Brook Tributary A	0.045-0.050	0.040-0.120
Potash Brook	0.032-0.055	0.032-0.150
Range Brook	0.032-0.060	0.035-0.090
Redwater Brook	0.032-0.055	0.032-0.150
Sabattus River	0.015-0.062	0.017-0.092
Salmon Brook	0.040	0.040-0.150
Soper Mill Brook	0.045	0.040-0.090
Stetson Brook	0.065	0.035-0.150
Taylor Brook	0.035-0.070	0.030-0.120
Taylor Brook Tributary 1	0.050	0.100
The Basin	0.032	0.032-0.120
Tributary A to Little Androscoggin River	0.045	0.032-0.090
Tributary A to Soper Mill Brook	0.045	0.032-0.150
Waterhouse Brook	0.060	0.040-0.090
Winter Brook	0.035-0.060	0.060-0.105
Worthley Brook	0.055	0.035-0.150
Worthley Pond	0.032-0.055	0.055-0.120

\*Data not available

All qualifying benchmarks within a given jurisdiction that are catalogued by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.



FLOOD PROFILES  
NEZINSCOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY  
ANDROSCOGGIN COUNTY, ME  
(ALL JURISDICTIONS)

# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

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## APPENDIX E

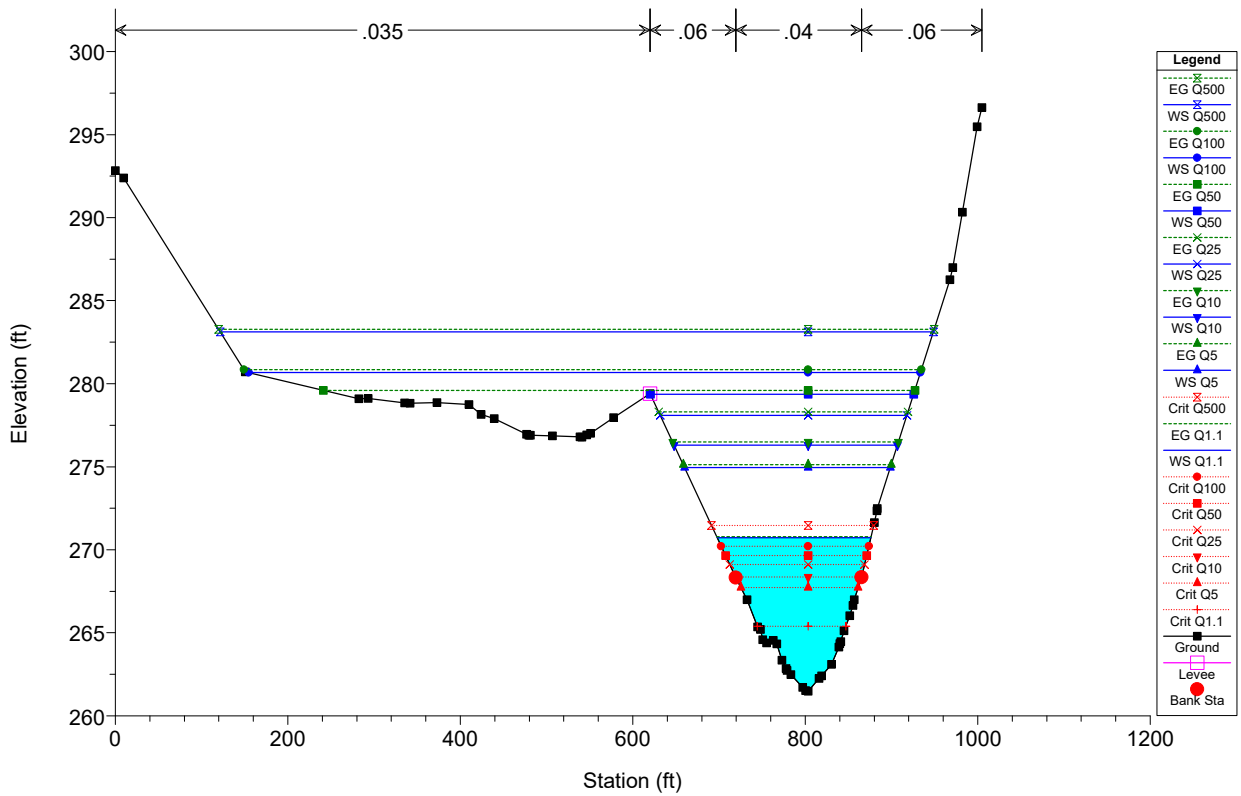
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Existing HEC-RAS Analysis

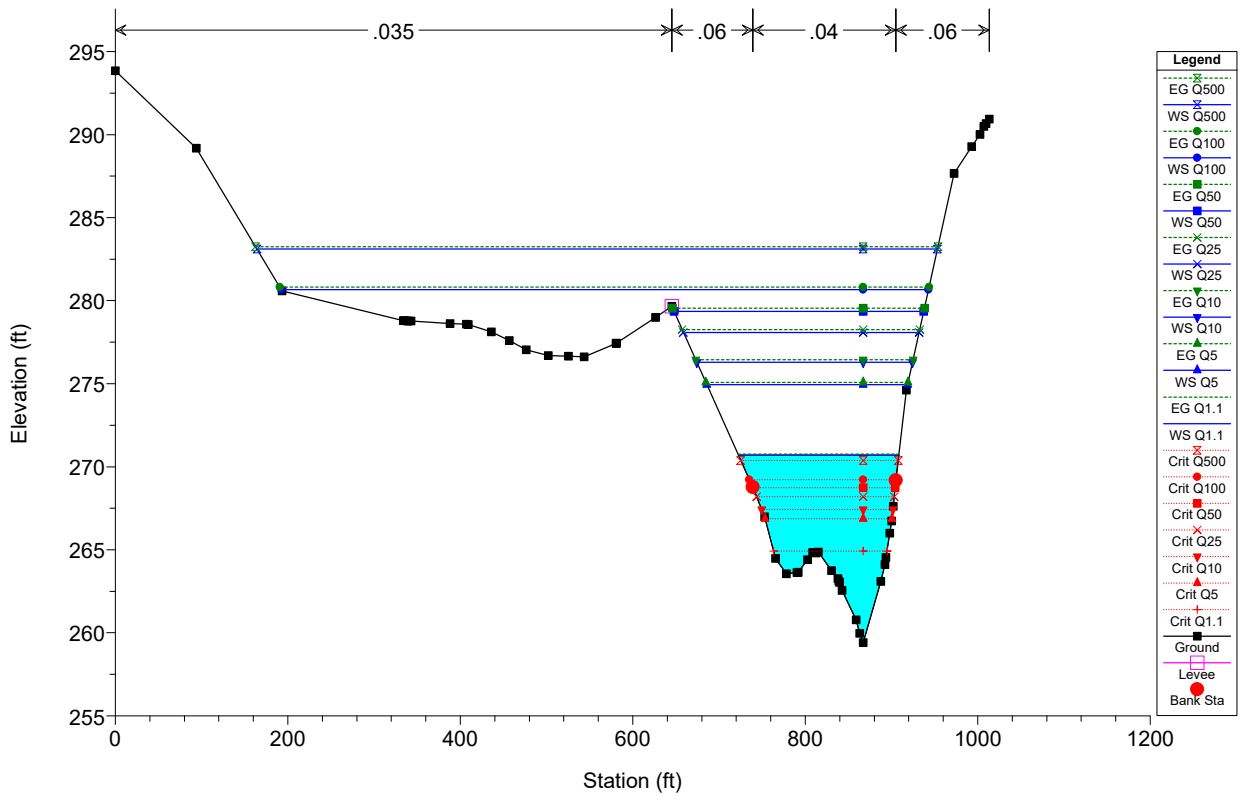
HEC-RAS Plan: Plan 01 River: Stream Reach: Reach

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach	1168.564	Q1.1	1900.00	261.48	270.73	265.39	270.79	0.000247	2.01	976.16	178.02	0.14
Reach	1168.564	Q5	5500.00	261.48	274.96	267.73	275.13	0.000348	3.34	1854.95	238.73	0.18
Reach	1168.564	Q10	6800.00	261.48	276.30	268.37	276.49	0.000345	3.60	2188.79	258.95	0.18
Reach	1168.564	Q25	8700.00	261.48	278.09	269.12	278.31	0.000336	3.90	2677.28	285.98	0.19
Reach	1168.564	Q50	10150.00	261.48	279.37	269.66	279.60	0.000327	4.08	3054.02	305.19	0.19
Reach	1168.564	Q100	11700.00	261.48	280.67	270.21	280.86	0.000258	3.83	4429.66	779.11	0.17
Reach	1168.564	Q500	15500.00	261.48	283.12	271.47	283.27	0.000194	3.64	6402.59	827.14	0.15
Reach	1032.467	Q1.1	1900.00	259.41	270.71	264.92	270.76	0.000158	1.67	1155.61	186.22	0.11
Reach	1032.467	Q5	5500.00	259.41	274.95	266.86	275.07	0.000251	2.90	2041.57	232.83	0.15
Reach	1032.467	Q10	6800.00	259.41	276.29	267.43	276.44	0.000256	3.16	2365.63	250.11	0.16
Reach	1032.467	Q25	8700.00	259.41	278.08	268.20	278.26	0.000258	3.47	2834.72	273.20	0.16
Reach	1032.467	Q50	10150.00	259.41	279.36	268.74	279.55	0.000257	3.67	3193.28	289.60	0.16
Reach	1032.467	Q100	11700.00	259.41	280.66	269.23	280.82	0.000209	3.49	4581.34	750.49	0.15
Reach	1032.467	Q500	15500.00	259.41	283.10	270.38	283.24	0.000166	3.41	6466.17	789.13	0.14
Reach	951.3712	Q1.1	1900.00	262.60	270.61	266.43	270.73	0.000545	2.70	707.64	135.08	0.20
Reach	951.3712	Q5	5500.00	262.60	274.73	268.85	275.03	0.000688	4.39	1336.76	170.70	0.25
Reach	951.3712	Q10	6800.00	262.60	276.05	269.51	276.39	0.000671	4.72	1571.02	184.26	0.25
Reach	951.3712	Q25	8700.00	262.60	277.82	270.35	278.21	0.000645	5.11	1912.69	202.41	0.25
Reach	951.3712	Q50	10150.00	262.60	279.08	270.94	279.50	0.000624	5.35	2175.68	215.34	0.25
Reach	951.3712	Q100	11700.00	262.60	280.49	271.55	280.78	0.000434	4.75	3411.71	661.17	0.21
Reach	951.3712	Q500	15500.00	262.60	283.01	272.92	283.21	0.000281	4.23	5134.66	700.11	0.18
Reach	798.3884	Q1.1	1900.00	262.48	270.28	267.07	270.58	0.001545	4.39	434.24	84.25	0.33
Reach	798.3884	Q5	5500.00	262.48	273.94	270.17	274.80	0.002224	7.45	767.52	97.66	0.44
Reach	798.3884	Q10	6800.00	262.48	275.16	271.00	276.15	0.002196	8.05	891.63	108.18	0.44
Reach	798.3884	Q25	8700.00	262.48	276.82	272.09	277.97	0.002109	8.72	1077.09	115.30	0.45
Reach	798.3884	Q50	10150.00	262.48	278.02	272.88	279.26	0.002030	9.12	1218.27	120.44	0.44
Reach	798.3884	Q100	11700.00	262.48	279.23	273.67	280.55	0.001952	9.49	1366.27	124.81	0.44
Reach	798.3884	Q500	15500.00	262.48	282.58	275.61	283.11	0.000778	6.89	3145.55	483.68	0.29
Reach	673.6070	Q1.1	1900.00	263.50	270.22	266.89	270.35	0.000763	2.90	656.60	138.24	0.23
Reach	673.6070	Q5	5500.00	263.50	274.09	269.04	274.42	0.000880	4.61	1220.83	152.58	0.28
Reach	673.6070	Q10	6800.00	263.50	275.38	269.65	275.75	0.000840	4.94	1420.00	156.50	0.28
Reach	673.6070	Q25	8700.00	263.50	277.11	270.43	277.55	0.000796	5.35	1696.67	162.61	0.28
Reach	673.6070	Q50	10150.00	263.50	278.35	270.98	278.83	0.000768	5.62	1901.08	167.10	0.28
Reach	673.6070	Q100	11700.00	263.50	279.59	271.53	280.12	0.000744	5.88	2111.33	171.59	0.28
Reach	673.6070	Q500	15500.00	263.50	282.34	272.82	282.97	0.000708	6.45	2597.63	182.57	0.28
Reach	665.107		Bridge									
Reach	617.1206	Q1.1	1900.00	264.66	270.03	267.75	270.22	0.001546	3.58	530.33	133.67	0.32
Reach	617.1206	Q5	5500.00	264.66	273.83	269.80	274.26	0.001366	5.25	1067.45	148.96	0.33
Reach	617.1206	Q10	6800.00	264.66	275.13	270.39	275.60	0.001237	5.54	1262.74	152.79	0.32
Reach	617.1206	Q25	8700.00	264.66	276.87	271.15	277.40	0.001112	5.91	1541.24	166.76	0.32
Reach	617.1206	Q50	10150.00	264.66	278.12	271.71	278.69	0.001036	6.13	1754.11	173.64	0.31
Reach	617.1206	Q100	11700.00	264.66	279.37	272.29	279.98	0.000975	6.35	1976.05	180.53	0.31
Reach	617.1206	Q500	15500.00	264.66	282.15	273.58	282.85	0.000877	6.84	2499.04	195.80	0.30
Reach	461.6797	Q1.1	1900.00	264.95	268.25	268.25	269.35	0.019894	8.42	225.60	104.64	1.01
Reach	461.6797	Q5	5500.00	264.95	273.07	273.83	273.83	0.003286	7.06	816.43	141.46	0.48
Reach	461.6797	Q10	6800.00	264.95	274.46	275.23	275.23	0.002615	7.14	1018.15	148.52	0.44
Reach	461.6797	Q25	8700.00	264.95	276.29	277.09	277.09	0.002101	7.32	1298.35	157.92	0.41
Reach	461.6797	Q50	10150.00	264.95	277.58	278.40	278.40	0.001864	7.47	1506.33	165.93	0.39
Reach	461.6797	Q100	11700.00	264.95	278.85	279.71	279.71	0.001702	7.67	1725.34	179.18	0.38
Reach	461.6797	Q500	15500.00	264.95	281.69	282.61	282.61	0.001429	8.04	2278.85	211.20	0.36
Reach	313.6574	Q1.1	1900.00	261.98	268.44	263.07	268.50	0.000385	1.92	987.61	228.73	0.16
Reach	313.6574	Q5	5500.00	261.98	273.45	273.54	273.54	0.000246	2.53	2188.06	251.28	0.15
Reach	313.6574	Q10	6800.00	261.98	274.84	274.95	274.95	0.000233	2.71	2542.81	257.51	0.15
Reach	313.6574	Q25	8700.00	261.98	276.68	276.81	276.81	0.000220	2.94	3025.03	266.25	0.15
Reach	313.6574	Q50	10150.00	261.98	277.98	278.13	278.13	0.000213	3.08	3375.23	272.26	0.15
Reach	313.6574	Q100	11700.00	261.98	279.27	279.43	279.43	0.000208	3.23	3730.41	278.22	0.15
Reach	313.6574	Q500	15500.00	261.98	282.14	282.33	282.33	0.000198	3.55	4566.79	308.27	0.15
Reach	198.8351	Q1.1	1900.00	259.84	268.42	263.07	268.47	0.000200	1.65	1153.11	206.10	0.12
Reach	198.8351	Q5	5500.00	259.84	273.42	265.31	273.52	0.000200	2.48	2237.16	228.02	0.14
Reach	198.8351	Q10	6800.00	259.84	274.82	265.91	274.93	0.000200	2.70	2559.10	234.26	0.14
Reach	198.8351	Q25	8700.00	259.84	276.65	266.54	276.79	0.000200	2.97	2997.05	242.50	0.14
Reach	198.8351	Q50	10150.00	259.84	277.95	266.99	278.10	0.000200	3.16	3315.34	248.31	0.14
Reach	198.8351	Q100	11700.00	259.84	279.24	267.43	279.41	0.000200	3.34	3638.49	254.08	0.15
Reach	198.8351	Q500	15500.00	259.84	282.09	268.42	282.30	0.000200	3.72	4409.86	290.05	0.15

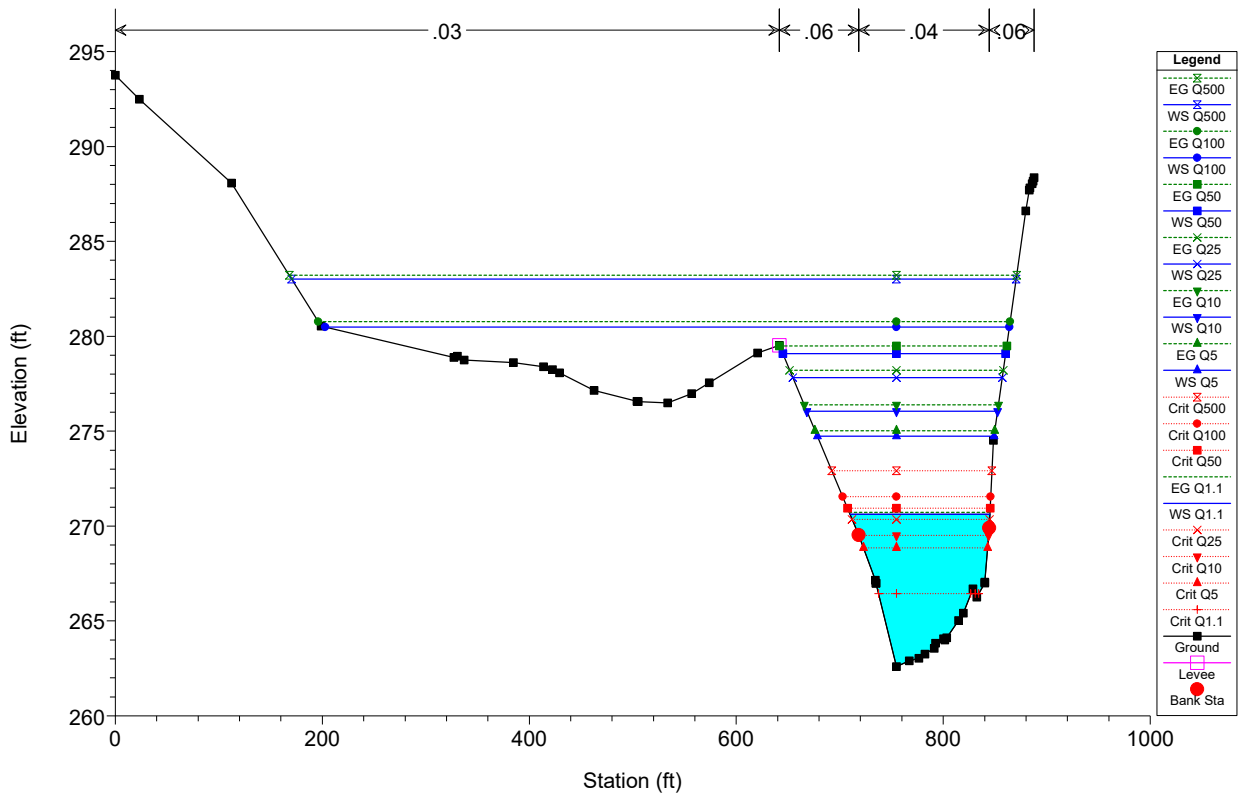
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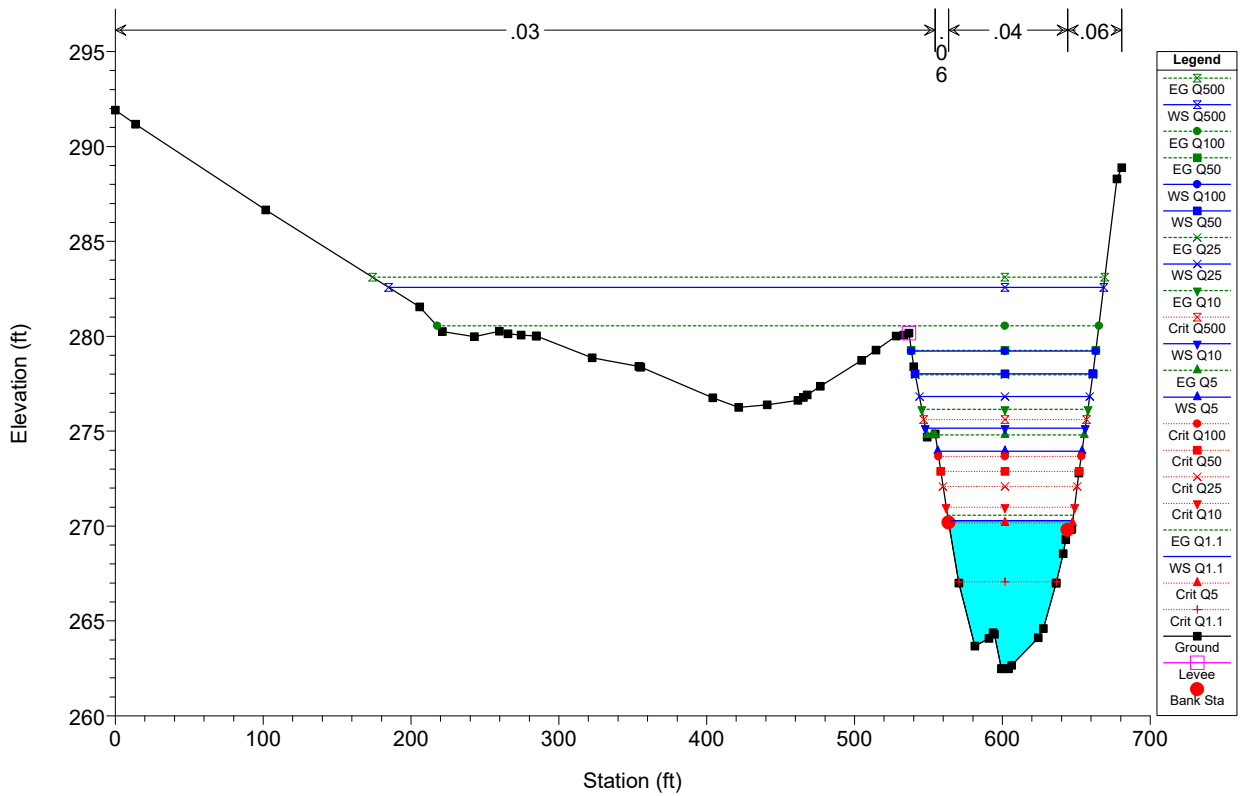
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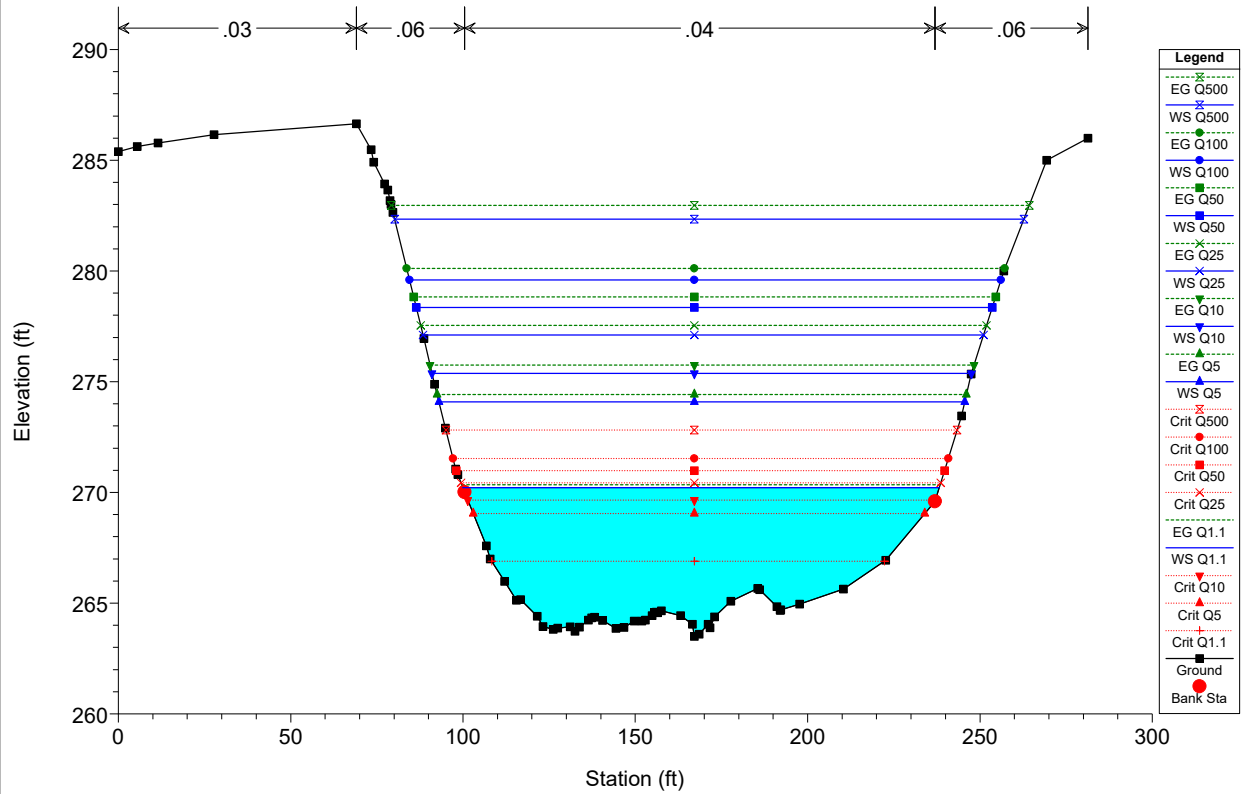
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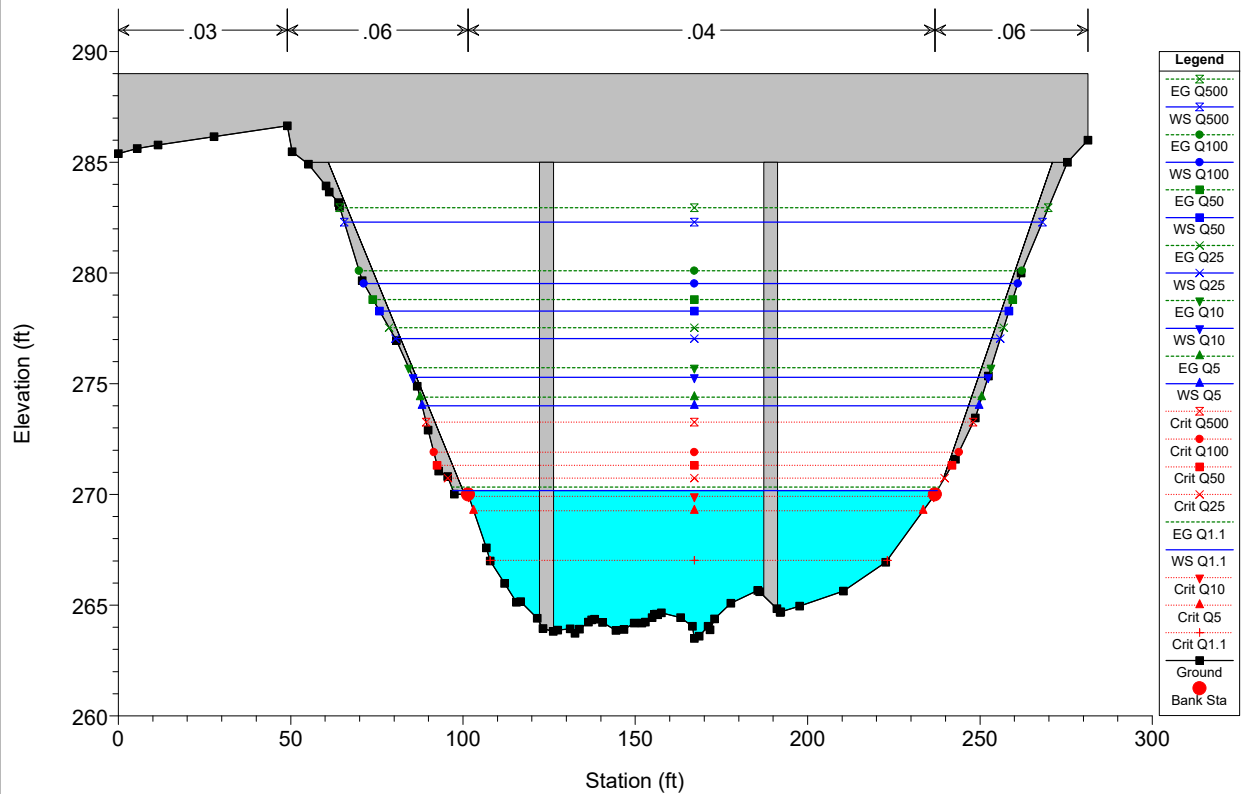
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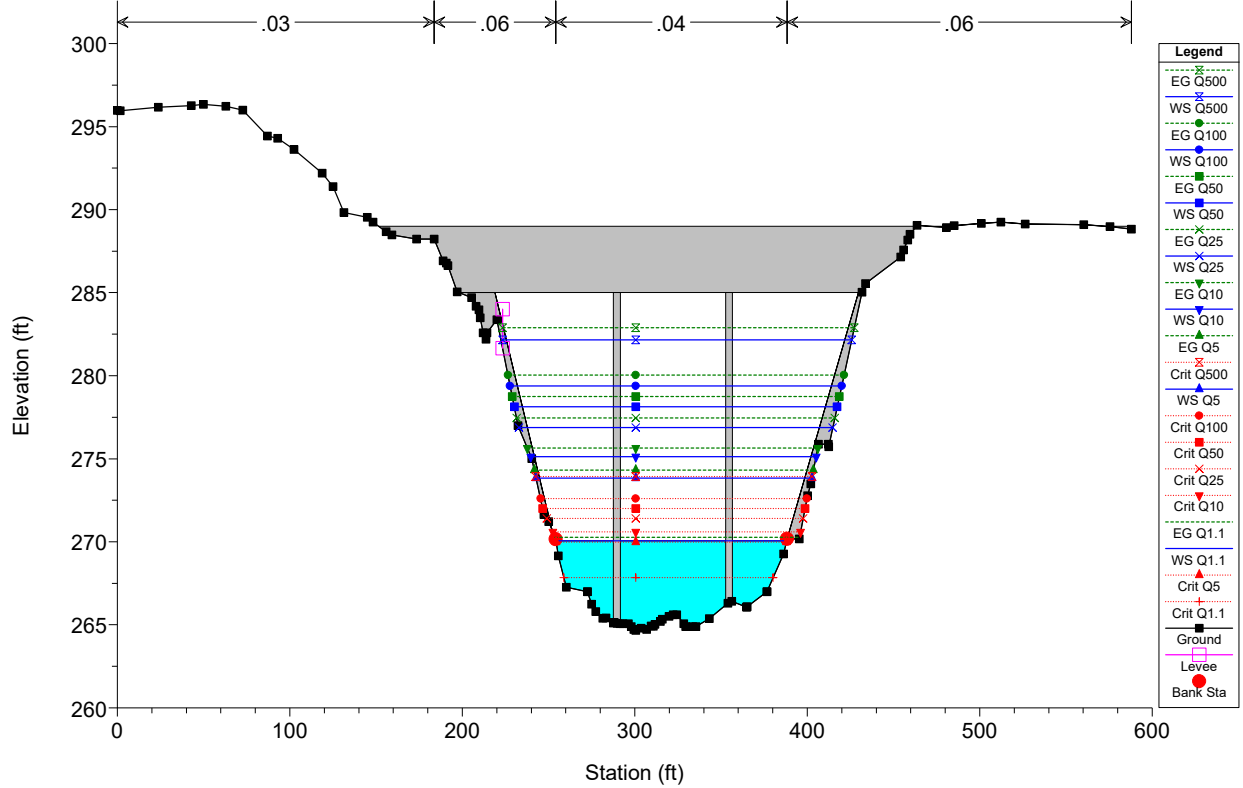
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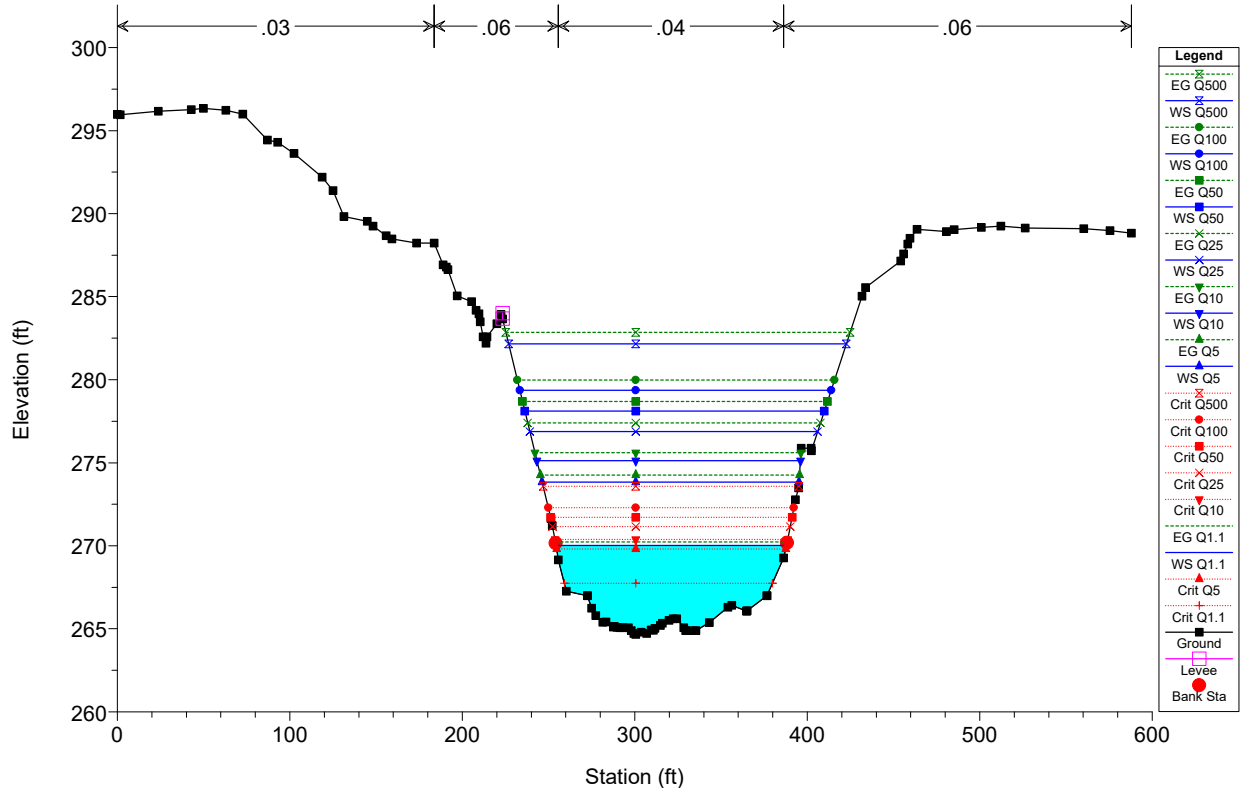
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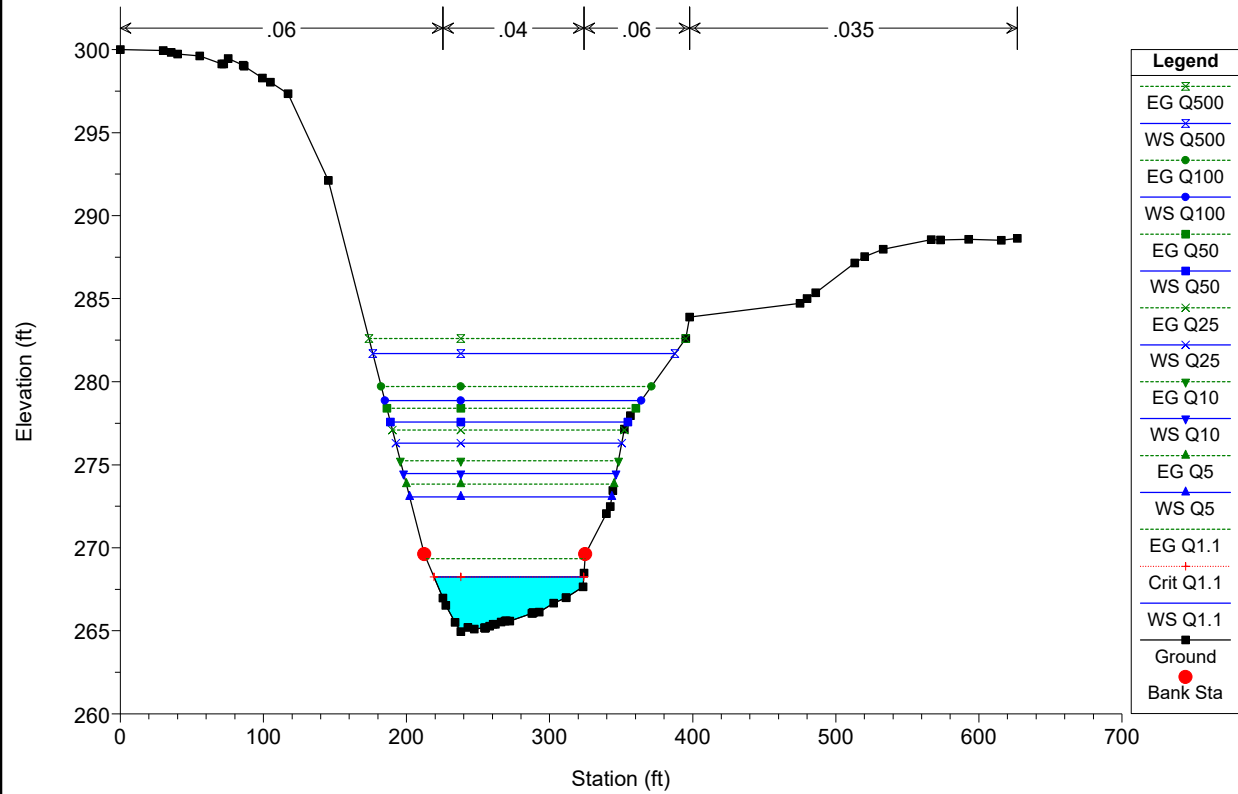
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Existing Bridge Plan: Plan 01 8/30/2017

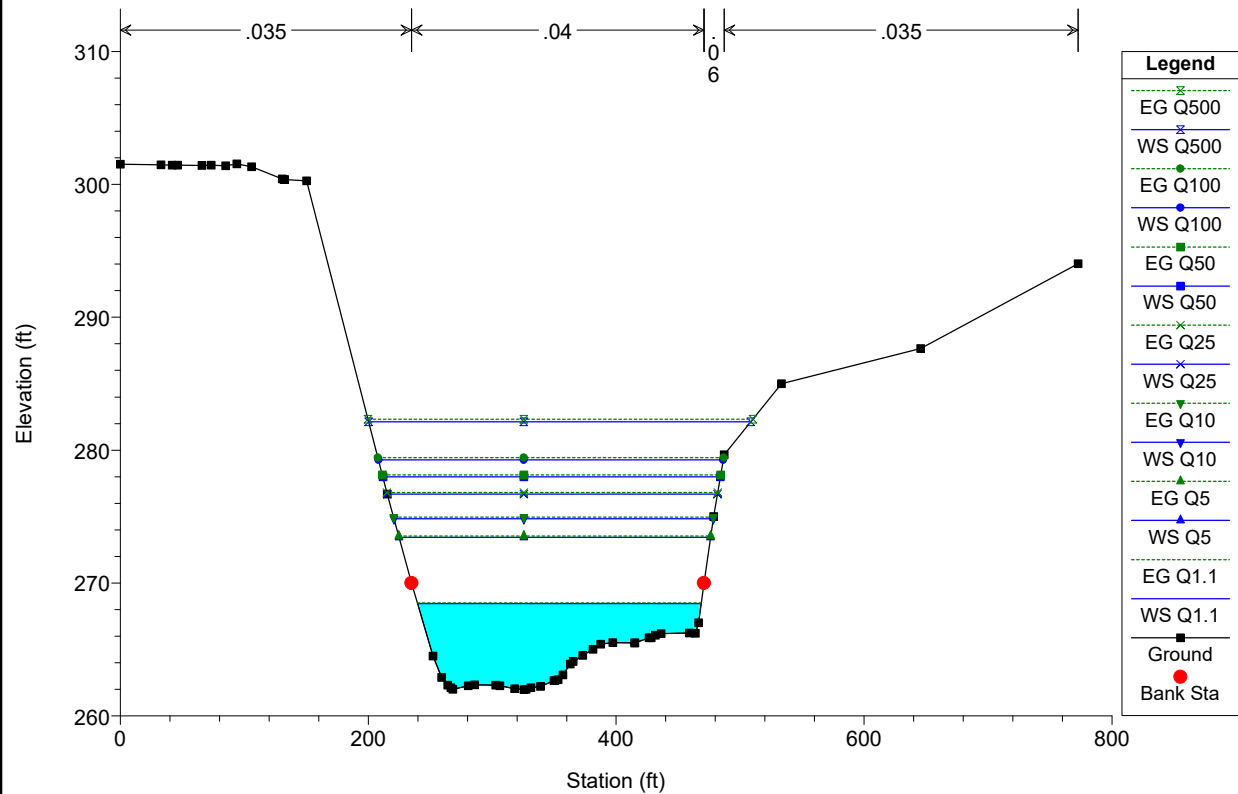


Existing Bridge Plan: Plan 01 8/30/2017



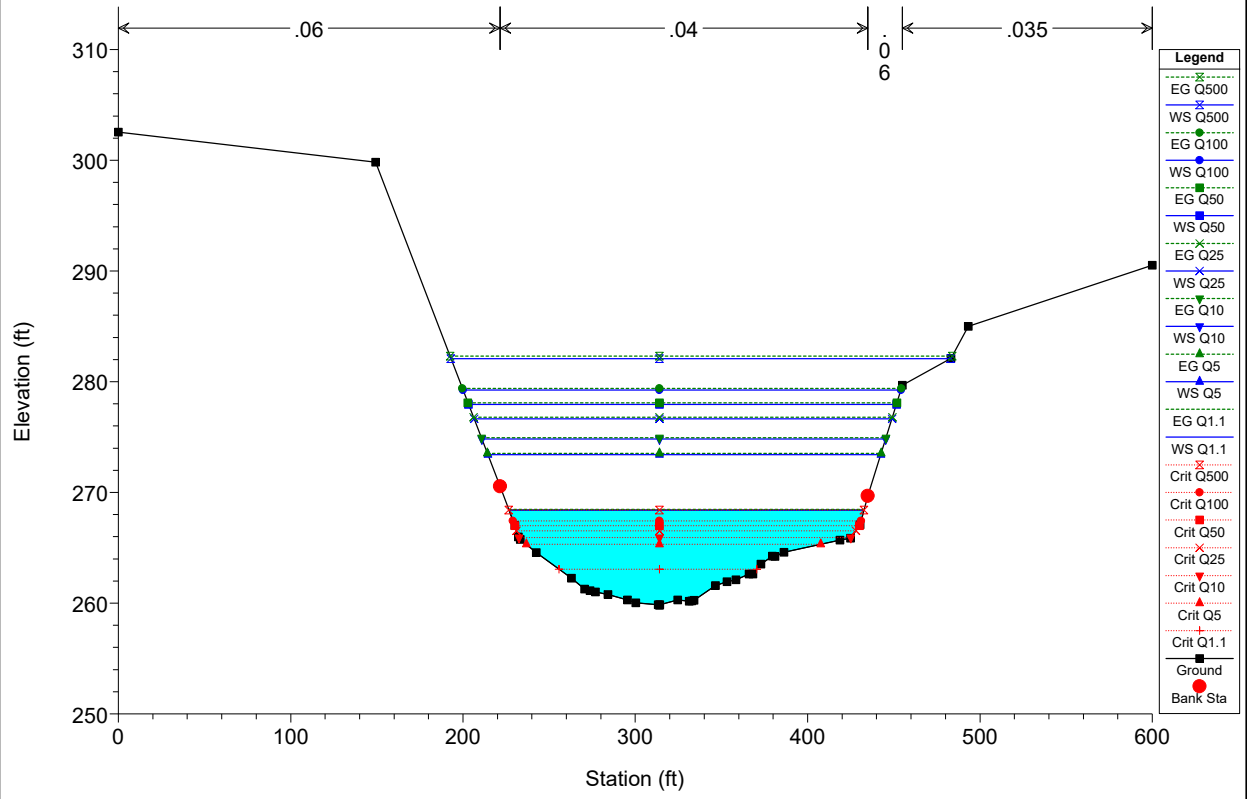
Legend	
EG Q500	Green dashed line with 'x' markers
WS Q500	Blue solid line with 'x' markers
EG Q100	Green dashed line with circle markers
WS Q100	Blue solid line with circle markers
EG Q50	Green dashed line with square markers
WS Q50	Blue solid line with square markers
EG Q25	Green dashed line with 'x' markers
WS Q25	Blue solid line with 'x' markers
EG Q10	Green dashed line with inverted triangle markers
WS Q10	Blue solid line with inverted triangle markers
EG Q5	Green dashed line with triangle markers
WS Q5	Blue solid line with triangle markers
EG Q1.1	Green dashed line with '+' markers
Crit Q1.1	Red dotted line with '+' markers
WS Q1.1	Blue solid line with '+' markers
Ground	Black solid line with square markers
Bank Sta	Red solid line with circle markers

Existing Bridge Plan: Plan 01 8/30/2017



Legend	
EG Q500	Green dashed line with 'x' markers
WS Q500	Blue solid line with 'x' markers
EG Q100	Green dashed line with circle markers
WS Q100	Blue solid line with circle markers
EG Q50	Green dashed line with square markers
WS Q50	Blue solid line with square markers
EG Q25	Green dashed line with 'x' markers
WS Q25	Blue solid line with 'x' markers
EG Q10	Green dashed line with inverted triangle markers
WS Q10	Blue solid line with inverted triangle markers
EG Q5	Green dashed line with triangle markers
WS Q5	Blue solid line with triangle markers
EG Q1.1	Green dashed line with '+' markers
WS Q1.1	Blue solid line with '+' markers
Ground	Black solid line with square markers
Bank Sta	Red solid line with circle markers

Existing Bridge Plan: Plan 01 8/30/2017





# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

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## APPENDIX F

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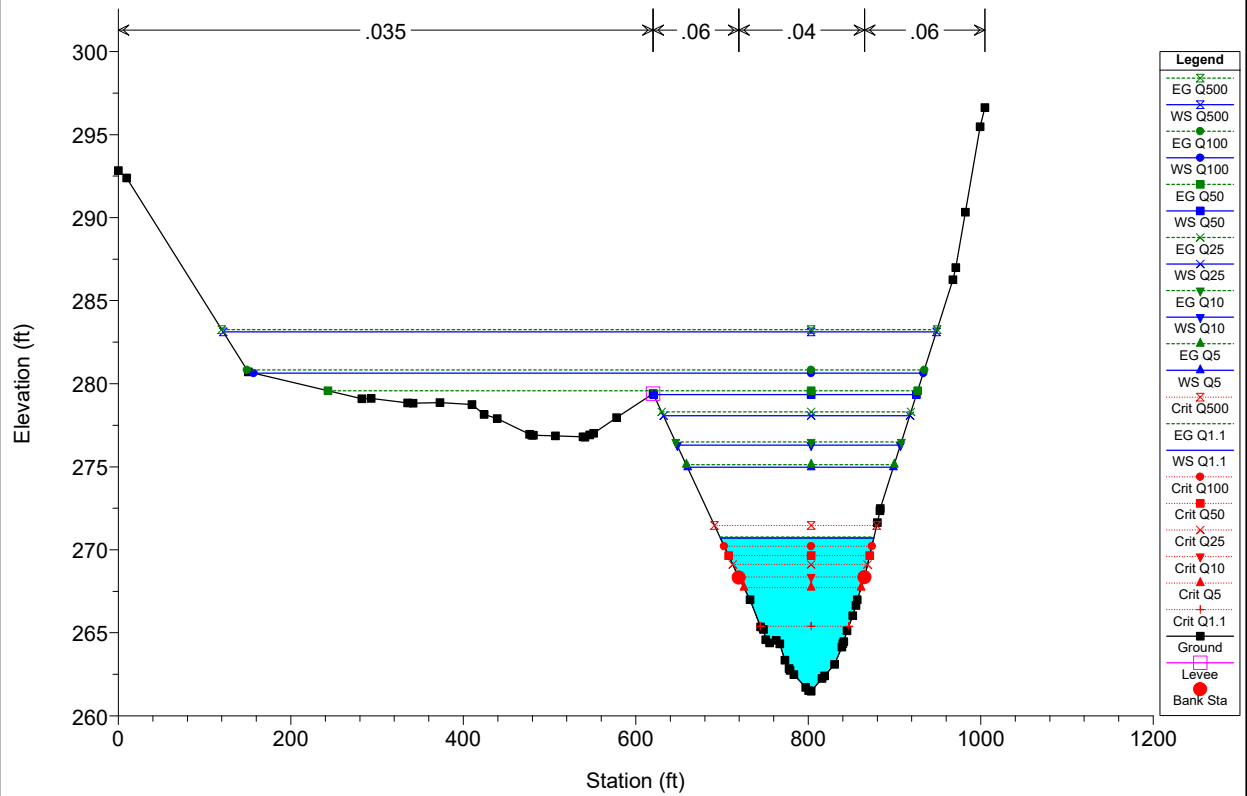
Proposed HEC-RAS Analysis

HEC-RAS Plan: Plan 03 River: Stream Reach: Reach

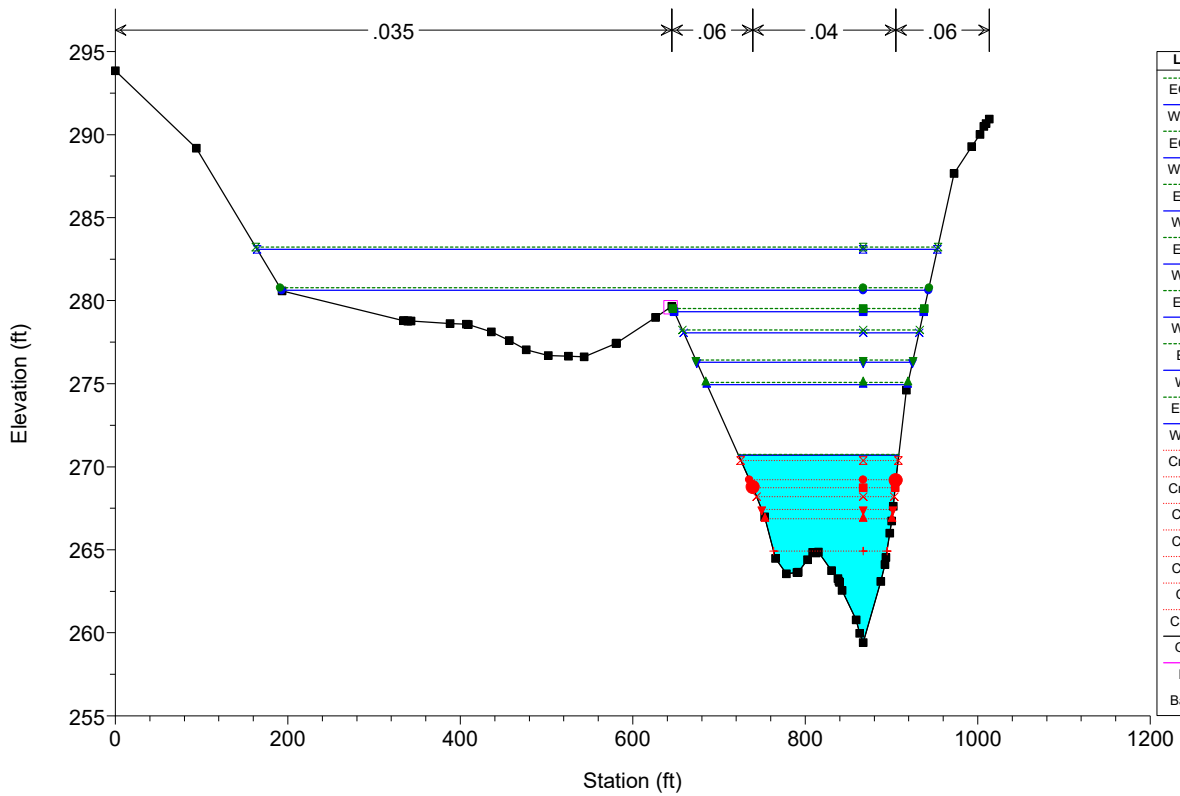
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach	1168.564	Q1.1	1900.00	261.48	270.71	265.39	270.77	0.000248	2.01	973.83	177.84	0.14
Reach	1168.564	Q5	5500.00	261.48	274.96	267.73	275.13	0.000347	3.34	1855.62	238.77	0.18
Reach	1168.564	Q10	6800.00	261.48	276.30	268.37	276.49	0.000345	3.60	2187.39	258.87	0.18
Reach	1168.564	Q25	8700.00	261.48	278.08	269.12	278.30	0.000337	3.91	2672.58	285.73	0.19
Reach	1168.564	Q50	10150.00	261.48	279.35	269.66	279.58	0.000329	4.09	3046.85	304.84	0.19
Reach	1168.564	Q100	11700.00	261.48	280.64	270.21	280.83	0.000261	3.85	4406.31	776.50	0.17
Reach	1168.564	Q500	15500.00	261.48	283.11	271.47	283.26	0.000194	3.65	6395.45	826.98	0.15
Reach	1032.467	Q1.1	1900.00	259.41	270.70	264.92	270.74	0.000159	1.67	1153.15	186.07	0.11
Reach	1032.467	Q5	5500.00	259.41	274.95	266.86	275.08	0.000251	2.90	2042.22	232.86	0.15
Reach	1032.467	Q10	6800.00	259.41	276.28	267.43	276.43	0.000257	3.16	2364.26	250.04	0.16
Reach	1032.467	Q25	8700.00	259.41	278.07	268.20	278.24	0.000259	3.48	2830.23	272.98	0.16
Reach	1032.467	Q50	10150.00	259.41	279.33	268.74	279.53	0.000258	3.67	3186.46	289.30	0.16
Reach	1032.467	Q100	11700.00	259.41	280.63	269.23	280.79	0.000211	3.50	4558.70	750.01	0.15
Reach	1032.467	Q500	15500.00	259.41	283.10	270.38	283.23	0.000166	3.41	6459.33	788.99	0.14
Reach	951.3712	Q1.1	1900.00	262.60	270.60	266.43	270.71	0.000550	2.71	705.78	134.96	0.20
Reach	951.3712	Q5	5500.00	262.60	274.74	268.85	275.03	0.000687	4.39	1337.27	170.73	0.25
Reach	951.3712	Q10	6800.00	262.60	276.05	269.51	276.38	0.000672	4.72	1569.95	184.20	0.25
Reach	951.3712	Q25	8700.00	262.60	277.80	270.35	278.19	0.000648	5.12	1909.15	202.23	0.25
Reach	951.3712	Q50	10150.00	262.60	279.05	270.94	279.47	0.000628	5.36	2170.31	215.08	0.25
Reach	951.3712	Q100	11700.00	262.60	280.46	271.55	280.75	0.000439	4.78	3390.19	658.55	0.21
Reach	951.3712	Q500	15500.00	262.60	283.00	272.92	283.20	0.000281	4.23	5128.33	699.98	0.18
Reach	798.3884	Q1.1	1900.00	262.48	270.26	267.07	270.56	0.001561	4.40	432.86	84.19	0.34
Reach	798.3884	Q5	5500.00	262.48	273.95	270.17	274.80	0.002220	7.44	767.89	97.68	0.44
Reach	798.3884	Q10	6800.00	262.48	275.16	271.00	276.15	0.002202	8.06	890.82	108.15	0.44
Reach	798.3884	Q25	8700.00	262.48	276.80	272.09	277.95	0.002124	8.74	1074.48	115.21	0.45
Reach	798.3884	Q50	10150.00	262.48	277.99	272.88	279.23	0.002048	9.15	1214.38	120.30	0.45
Reach	798.3884	Q100	11700.00	262.48	279.19	273.67	280.52	0.001973	9.52	1361.21	124.68	0.44
Reach	798.3884	Q500	15500.00	262.48	282.57	275.60	283.10	0.000782	6.90	3140.27	483.44	0.29
Reach	631.3659	Q1.1	1900.00	264.12	269.99	267.67	270.26	0.002017	4.16	461.60	114.42	0.35
Reach	631.3659	Q5	5500.00	264.12	273.80	270.07	274.37	0.001922	6.17	971.76	154.31	0.38
Reach	631.3659	Q10	6800.00	264.12	275.09	270.77	275.71	0.001729	6.46	1179.56	166.52	0.37
Reach	631.3659	Q25	8700.00	264.12	276.85	271.71	277.50	0.001516	6.77	1484.01	180.08	0.36
Reach	631.3659	Q50	10150.00	264.12	278.10	272.33	278.79	0.001391	6.96	1715.30	188.55	0.35
Reach	631.3659	Q100	11700.00	264.12	279.36	273.00	280.07	0.001288	7.14	1957.44	195.64	0.34
Reach	631.3659	Q500	15500.00	264.12	282.15	274.48	282.91	0.001121	7.54	2519.92	207.74	0.33
Reach	630	Bridge										
Reach	578.8313	Q1.1	1900.00	264.02	269.85		270.12	0.002055	4.17	455.82	113.85	0.37
Reach	578.8313	Q5	5500.00	264.02	273.56		274.16	0.001936	6.24	911.92	136.50	0.39
Reach	578.8313	Q10	6800.00	264.02	274.86		275.51	0.001729	6.54	1117.50	166.08	0.38
Reach	578.8313	Q25	8700.00	264.02	276.62		277.32	0.001484	6.82	1422.44	178.64	0.37
Reach	578.8313	Q50	10150.00	264.02	277.89		278.61	0.001346	6.99	1655.06	187.66	0.35
Reach	578.8313	Q100	11700.00	264.02	279.17		279.91	0.001235	7.16	1899.68	196.70	0.35
Reach	578.8313	Q500	15500.00	264.02	281.98		282.78	0.001069	7.57	2481.90	221.18	0.33
Reach	461.6797	Q1.1	1900.00	264.95	268.26	268.26	269.35	0.019450	8.36	227.27	104.73	1.00
Reach	461.6797	Q5	5500.00	264.95	273.07		273.84	0.003240	7.09	815.95	141.44	0.48
Reach	461.6797	Q10	6800.00	264.95	274.46		275.23	0.002582	7.16	1017.62	148.50	0.44
Reach	461.6797	Q25	8700.00	264.95	276.29		277.09	0.002076	7.35	1297.75	157.90	0.41
Reach	461.6797	Q50	10150.00	264.95	277.58		278.40	0.001843	7.50	1505.67	165.89	0.39
Reach	461.6797	Q100	11700.00	264.95	278.85		279.71	0.001684	7.70	1724.59	179.13	0.38
Reach	461.6797	Q500	15500.00	264.95	281.68		282.61	0.001415	8.08	2277.81	211.15	0.36
Reach	313.6574	Q1.1	1900.00	261.98	268.44		268.50	0.000385	1.92	987.63	228.73	0.16
Reach	313.6574	Q5	5500.00	261.98	273.45		273.54	0.000246	2.53	2188.07	251.28	0.15
Reach	313.6574	Q10	6800.00	261.98	274.84		274.95	0.000233	2.71	2542.81	257.51	0.15
Reach	313.6574	Q25	8700.00	261.98	276.68		276.81	0.000220	2.94	3025.05	266.25	0.15
Reach	313.6574	Q50	10150.00	261.98	277.98		278.13	0.000213	3.08	3375.24	272.26	0.15
Reach	313.6574	Q100	11700.00	261.98	279.27		279.43	0.000208	3.23	3730.42	278.22	0.15
Reach	313.6574	Q500	15500.00	261.98	282.14		282.33	0.000198	3.55	4566.80	308.27	0.15
Reach	198.8351	Q1.1	1900.00	259.84	268.42	263.07	268.47	0.000200	1.65	1153.11	206.10	0.12
Reach	198.8351	Q5	5500.00	259.84	273.42	265.31	273.52	0.000200	2.48	2237.16	228.02	0.14
Reach	198.8351	Q10	6800.00	259.84	274.82	265.91	274.93	0.000200	2.70	2559.10	234.26	0.14
Reach	198.8351	Q25	8700.00	259.84	276.65	266.54	276.79	0.000200	2.97	2997.05	242.50	0.14
Reach	198.8351	Q50	10150.00	259.84	277.95	266.99	278.10	0.000200	3.16	3315.34	248.31	0.14
Reach	198.8351	Q100	11700.00	259.84	279.24	267.43	279.41	0.000200	3.34	3638.49	254.08	0.15
Reach	198.8351	Q500	15500.00	259.84	282.09	268.42	282.30	0.000200	3.72	4409.86	290.05	0.15

No Data for Plot

New Bridge Plan: Plan 03 8/31/2017

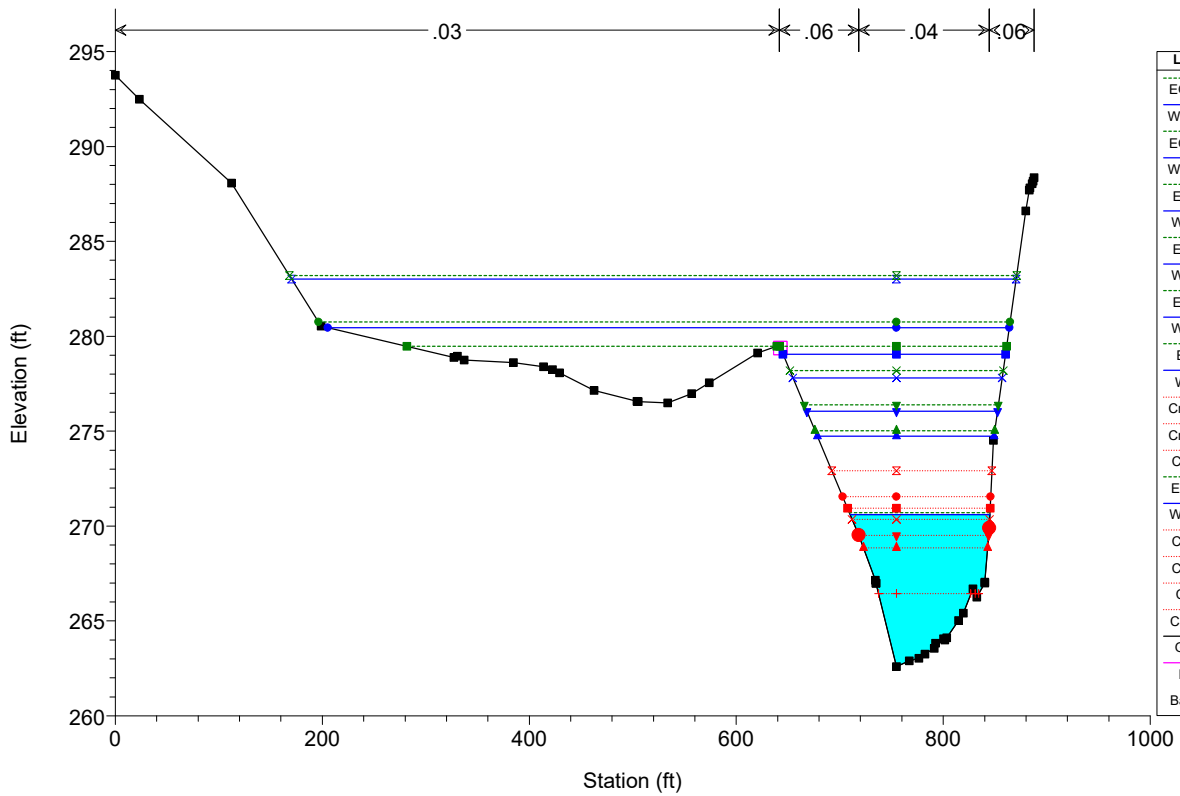


New Bridge Plan: Plan 03 8/31/2017



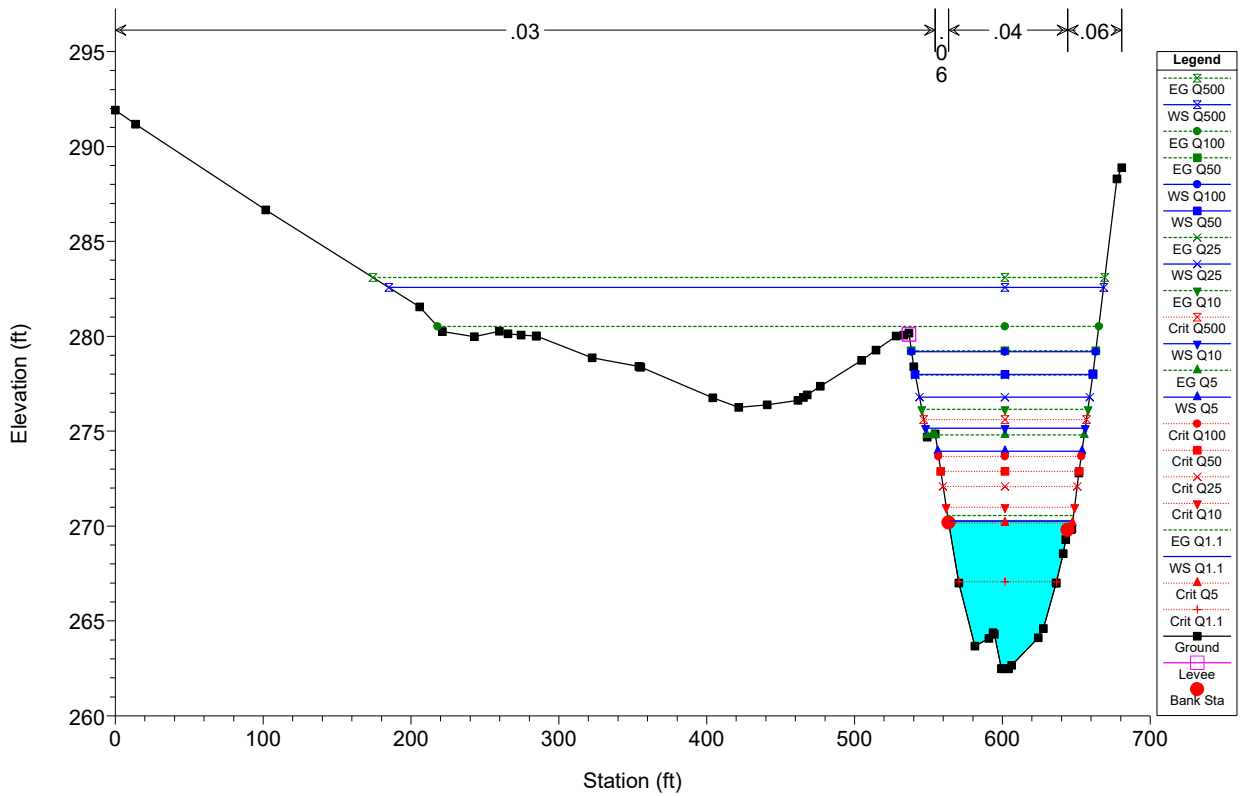
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WS Q500	WS Q500
EG Q100	EG Q100
WS Q100	WS Q100
EG Q50	EG Q50
WS Q50	WS Q50
EG Q25	EG Q25
WS Q25	WS Q25
EG Q10	EG Q10
WS Q10	WS Q10
EG Q5	EG Q5
WS Q5	WS Q5
EG Q1.1	EG Q1.1
WS Q1.1	WS Q1.1
Crit Q500	Crit Q500
Crit Q100	Crit Q100
Crit Q50	Crit Q50
Crit Q25	Crit Q25
Crit Q10	Crit Q10
Crit Q5	Crit Q5
Crit Q1.1	Crit Q1.1
Ground	Ground
LeVee	LeVee
Bank Sta	Bank Sta

New Bridge Plan: Plan 03 8/31/2017

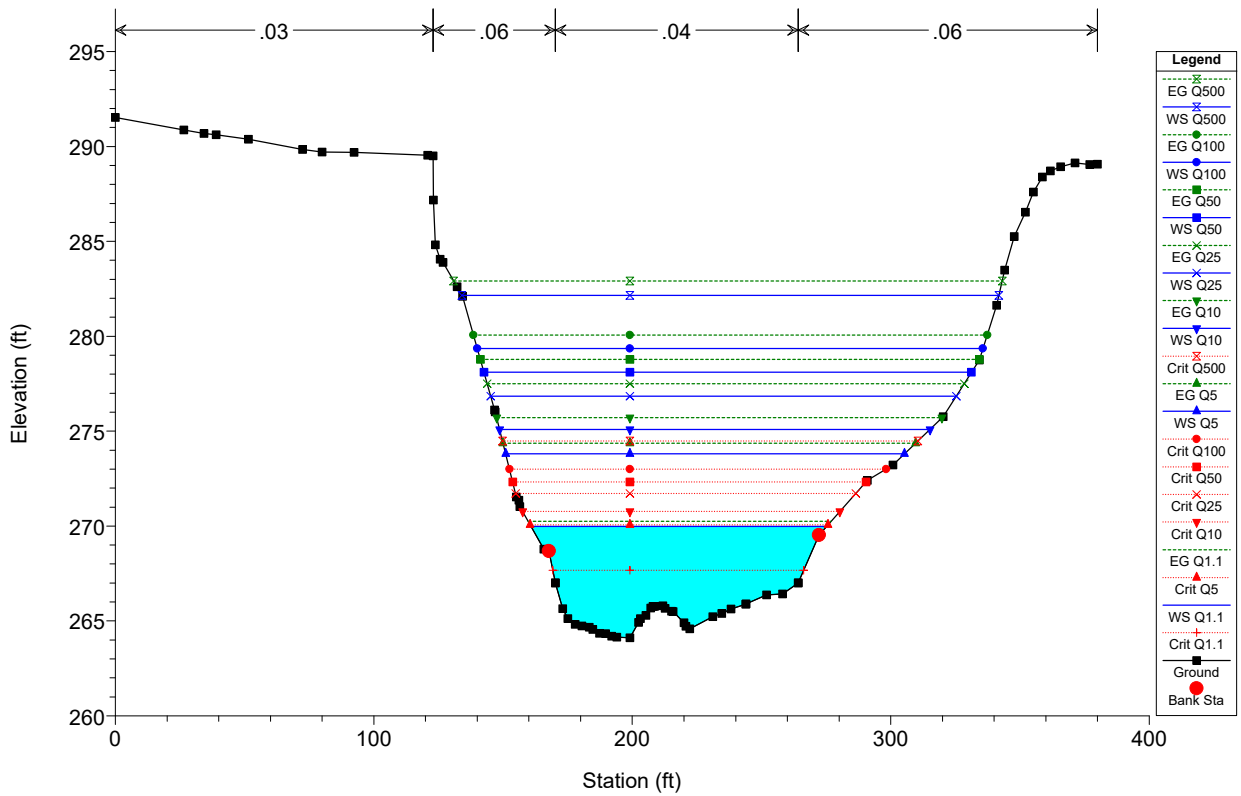


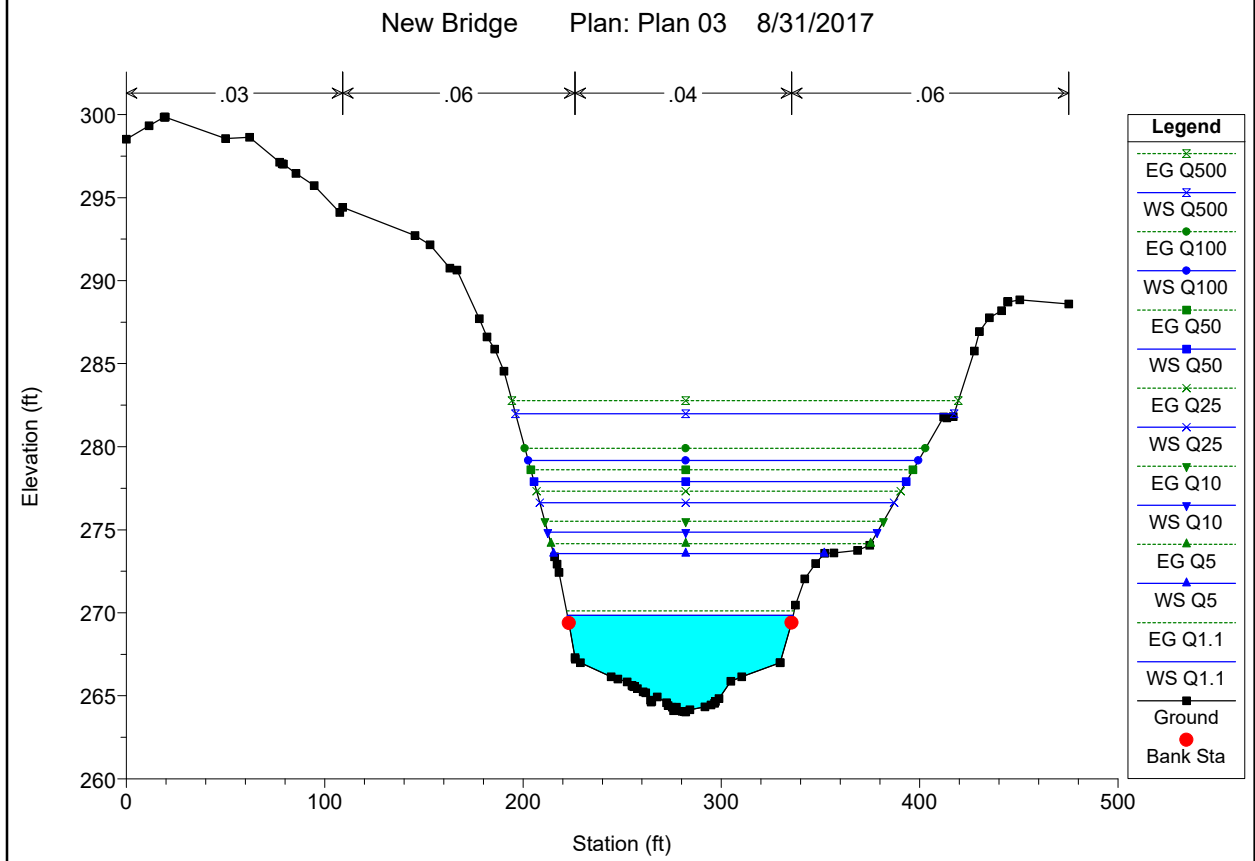
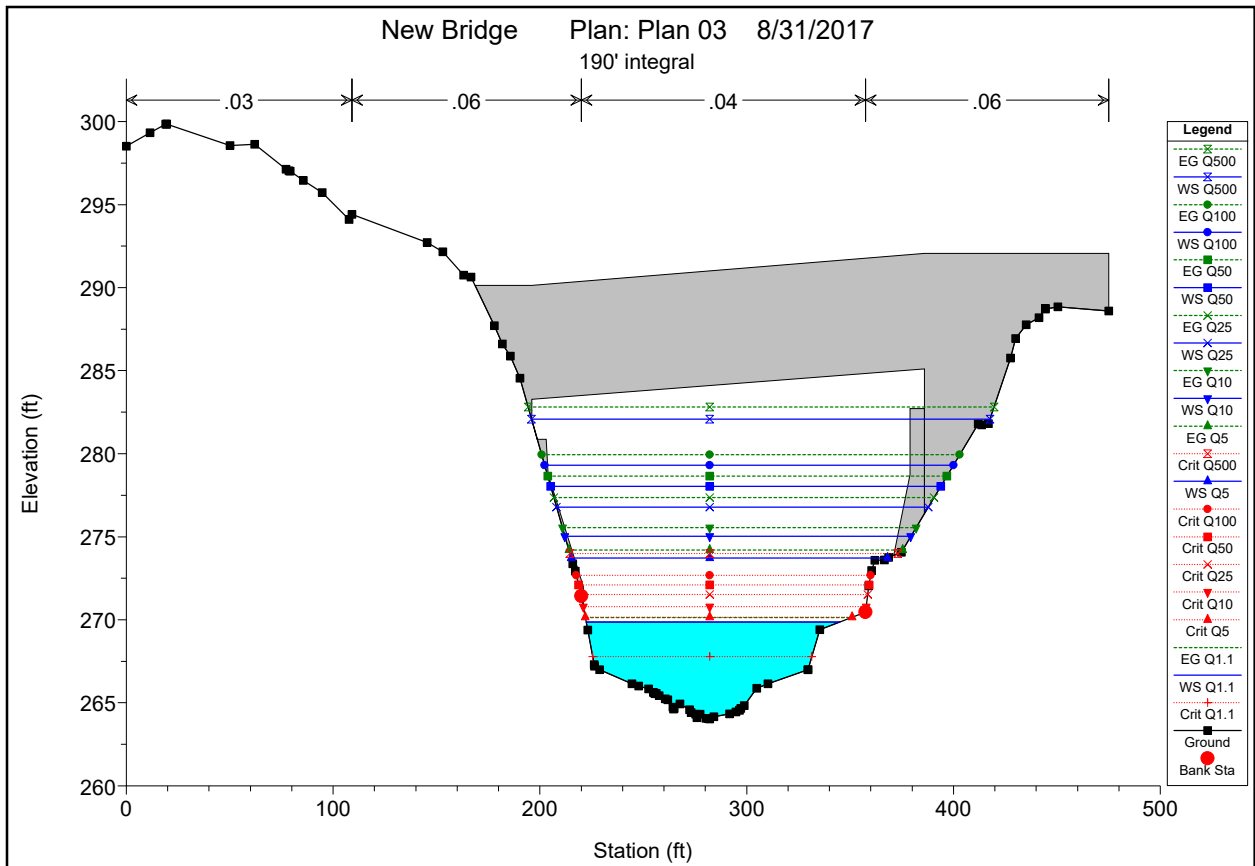
Legend	
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WS Q500	WS Q500
EG Q100	EG Q100
WS Q100	WS Q100
EG Q50	EG Q50
WS Q50	WS Q50
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WS Q25	WS Q25
EG Q10	EG Q10
WS Q10	WS Q10
EG Q5	EG Q5
WS Q5	WS Q5
EG Q1.1	EG Q1.1
WS Q1.1	WS Q1.1
Crit Q500	Crit Q500
Crit Q100	Crit Q100
Crit Q50	Crit Q50
EG Q1.1	EG Q1.1
WS Q1.1	WS Q1.1
Crit Q25	Crit Q25
Crit Q10	Crit Q10
Crit Q5	Crit Q5
Crit Q1.1	Crit Q1.1
Ground	Ground
LeVee	LeVee
Bank Sta	Bank Sta

New Bridge Plan: Plan 03 8/31/2017

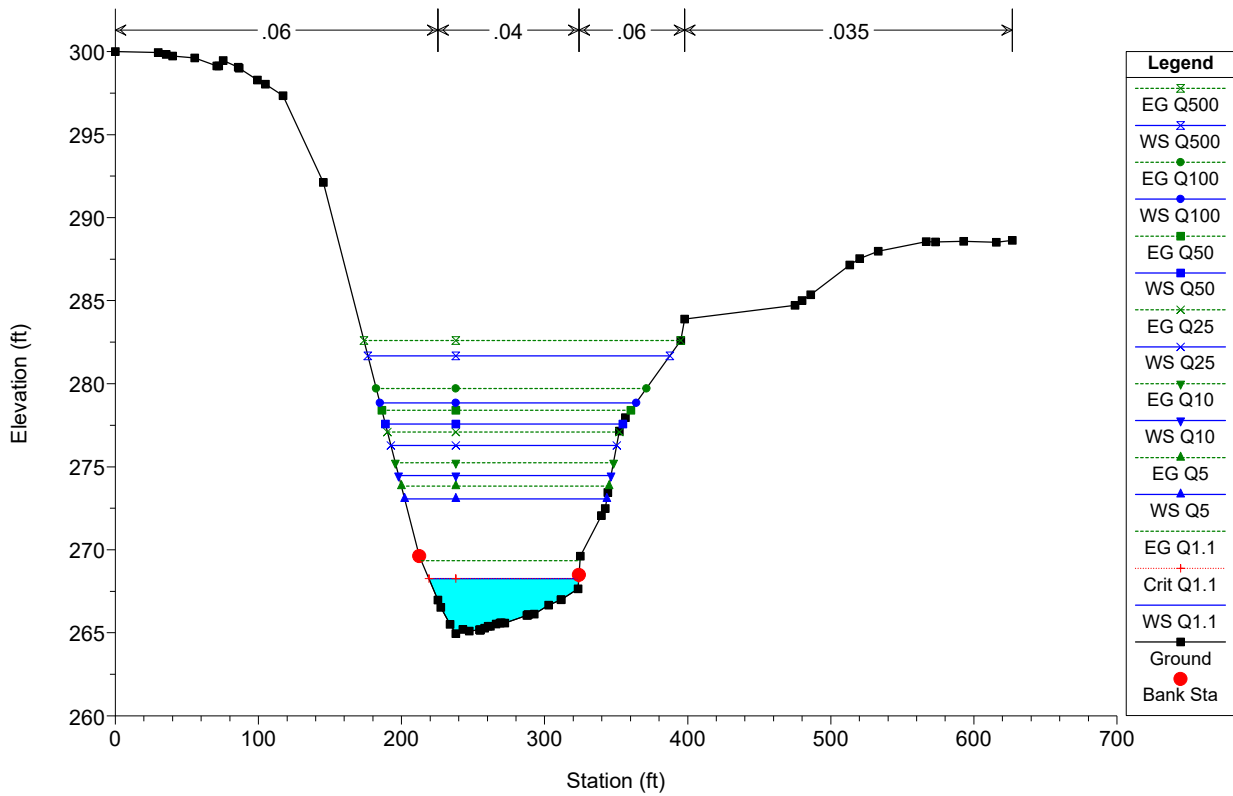


New Bridge Plan: Plan 03 8/31/2017

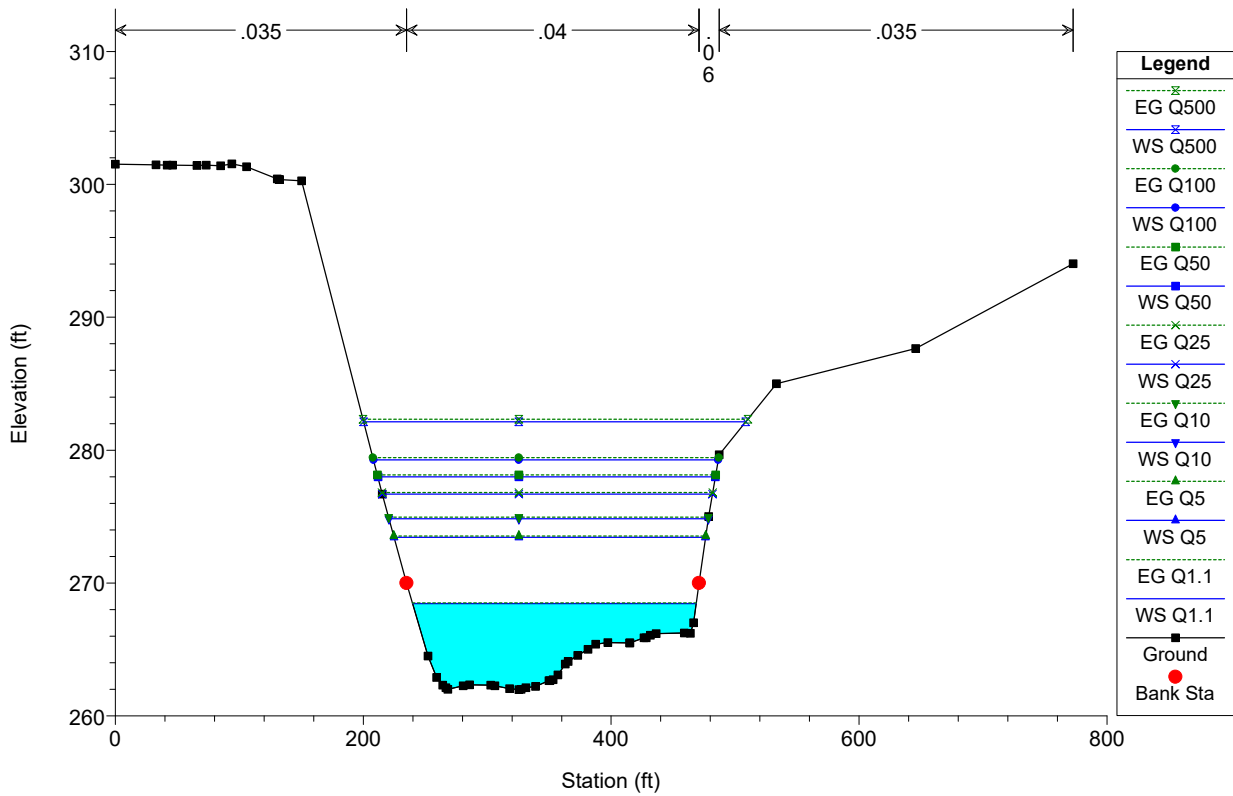




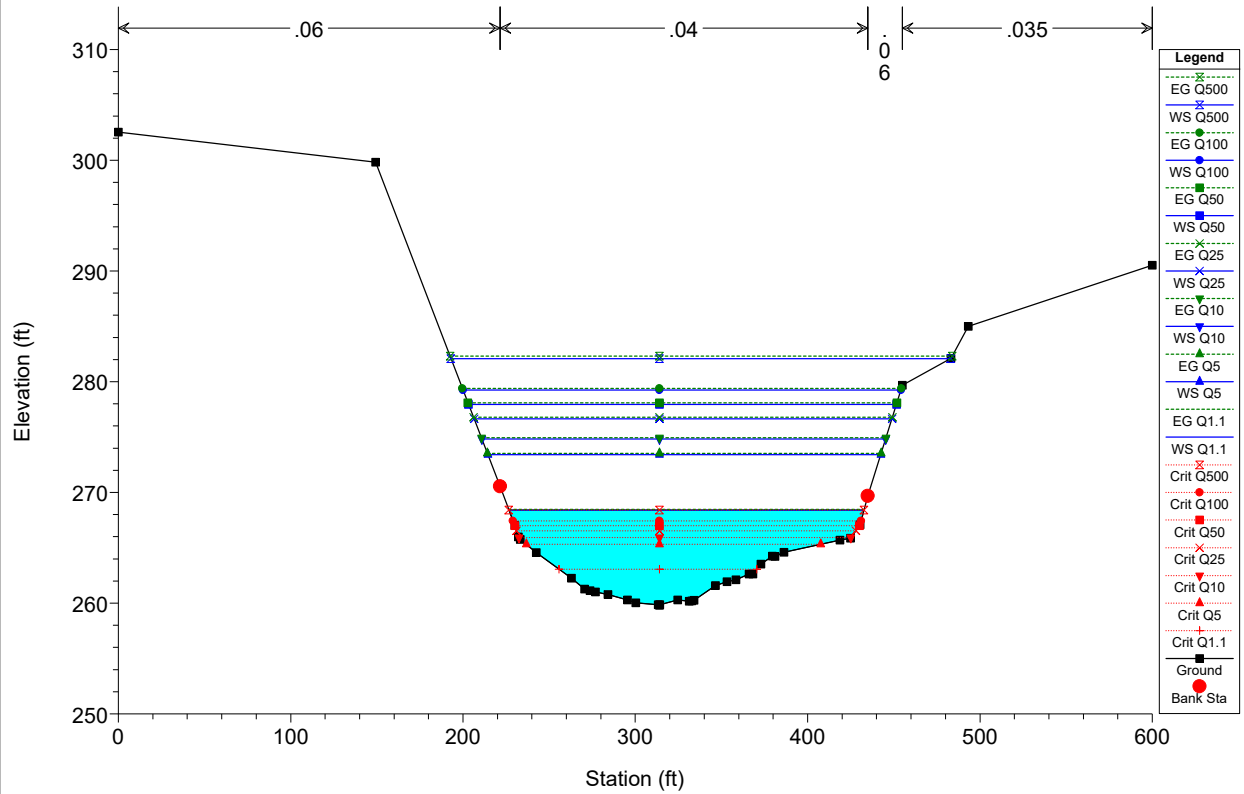
New Bridge Plan: Plan 03 8/31/2017



New Bridge Plan: Plan 03 8/31/2017

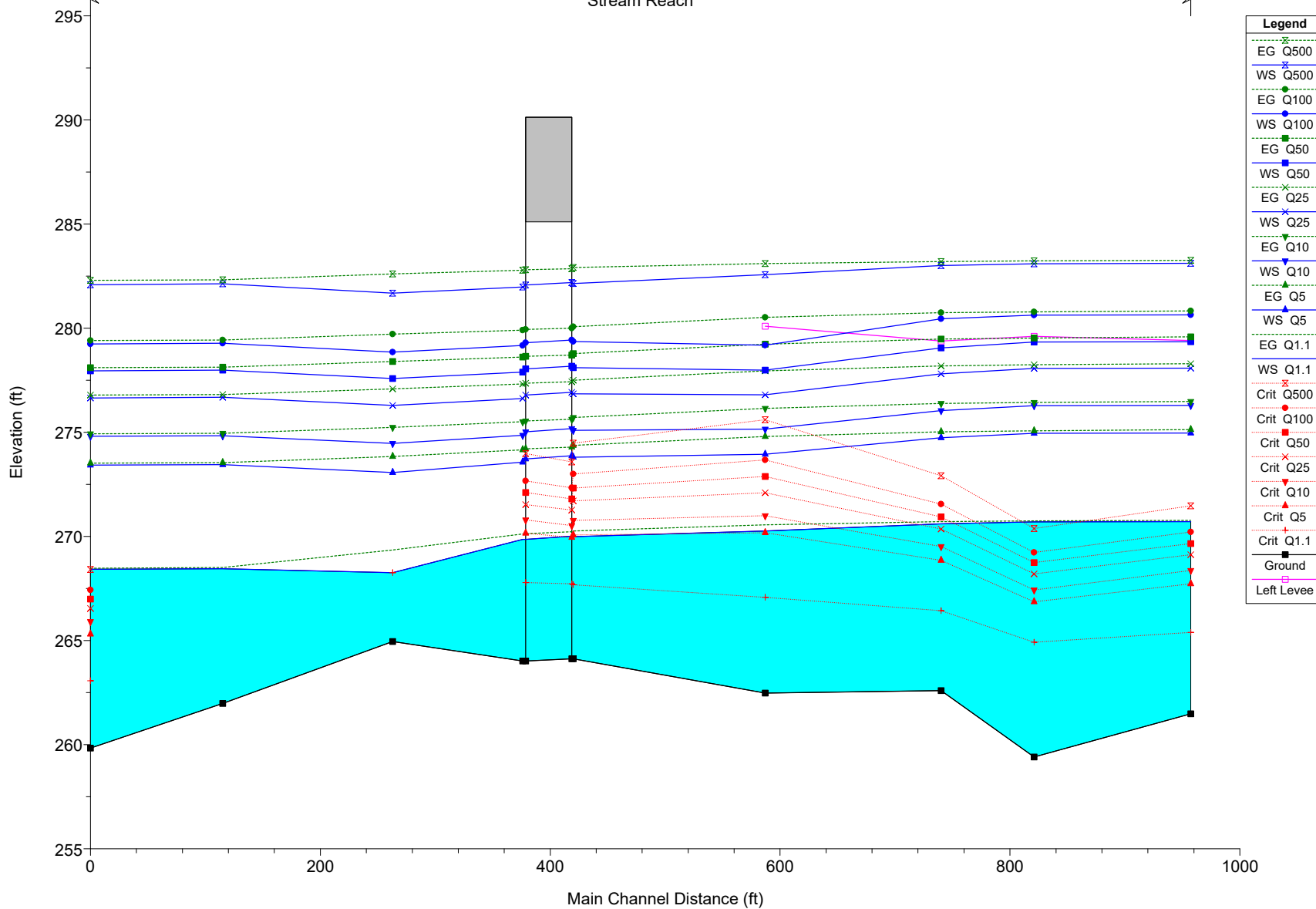


New Bridge Plan: Plan 03 8/31/2017



New Bridge Plan: Plan 03 8/31/2017

Stream Reach



# Final Hydrologic and Hydraulic Report

North Parish Bridge over Nezinscot River

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## APPENDIX G

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### Scour Analysis

Proj.	N. Parish Bridge	Job No.	63738	Sheet No.	1 OF 4
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	10/11/2017	Date		Date	



**Scour Analysis: 100-year storm U/S face of North Parish Bridge**

Aggradation/Degradation  ft

**Live Bed Vs. Clear Water**

Depth of flow, y1	<input type="text" value="13.73"/>	ft
Particle size in a mix of which 50% are smaller, D50 (m)	<input type="text" value="0.00063"/>	m
Particle size in a mix of which 50% are smaller, D50 (ft)	<input type="text" value="0.00206"/>	ft
Velocity of main Channel, V	<input type="text" value="7.14"/>	ft/s
Critical Velocity, Vc	<input type="text" value="2.20"/>	ft/s

$$V_c = K_{tu} y^{1/6} D^{1/3}$$

$$K_u = 11.17$$

(HEC-18, 5th Edition, April 2012, Equation 6.1)

**Live Bed vs. Clear Water**

← Type of Contraction Scour Analysis to be completed

**Live Bed Scour**

Avg depth in U/S main channel, y1	<input type="text" value="13.73"/>	ft
Ex depth in the contracted section before scour, yo	<input type="text" value="11.47"/>	ft
Flow in the U/S channel transporting sediment Q1	<input type="text" value="10240.76"/>	ft <sup>3</sup> /s
Flow in the contracted channel, Q2	<input type="text" value="11700"/>	ft <sup>3</sup> /s
Top width of U/S main channel, W1	<input type="text" value="104.43"/>	ft
Top width of the main channel in the contracted section, W2	<input type="text" value="175.32"/>	ft

Fall Velocity, ω	<input type="text" value="0.01"/>	ft/s
Slope of energy grade line of main channel, S1	<input type="text" value="0.001288"/>	ft/ft
Shear Velocity, Va	<input type="text" value="0.75"/>	
Va/ω	<input type="text" value="88.78"/>	
Exponent, k1	<input type="text" value="0.69"/>	

$$V_a = (g y_1 S_1)^{1/2}$$

$$\frac{y_2}{y_1} = \left( \frac{Q_2}{Q_1} \right)^{\frac{6}{7}} \left( \frac{W_1}{W_2} \right)^{k_1}$$

(HEC-18, 5th Edition, April 2012, Equations 6.2 and 6.3)

Avg depth in contracted section, y2	<input type="text" value="10.76"/>	
<b>*Scour depth, ys</b>	<input type="text" value="-0.71"/>	ft

$$y_s = y_2 - y_0$$

**\* If calculated y<sub>s</sub> returns negative answer, the scour depth equals zero**

Proj.	N. Parish Bridge	Job No.	63738	Sheet No.	2 OF 4
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	9/8/2017	Date		Date	



**Scour Analysis: 100-year storm U/S face of North Parish Bridge**

**Local Scour at Abutments**

**Near Abutment**

Coefficient for Abutment Shape, K1	0.55
Coefficient for angle of embankment to flow, K2	1.00
Length of active flow obstructed by embankment, L'	27.80 ft
Average depth of flow on embankment, ya	6.38 ft
Velocity on embankment, Ve	2.90 ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.202
Length of embankment projected to normal flow, L	100.00 ft

$$\frac{y_s}{y_a} = 2.27K_1K_2 \left(\frac{L'}{y_a}\right)^{0.43} (Fr)^{0.61} + 1$$

**Near Abutment Scour Depth, ys**

12.04 ft

(HEC-18, 5th Edition, April 2012, Equation 8.1)

**Far Abutment**

Coefficient for Abutment Shape, K1	0.55
Coefficient for angle of embankment to flow, K2	1.00
Length of active flow obstructed by embankment, L'	63.41 ft
Average depth of flow on embankment, ya	5.46 ft
Velocity on embankment, Ve	2.73 ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.206
Length of embankment projected to normal flow, L	105.00 ft

$$\frac{y_s}{y_a} = 2.27K_1K_2 \left(\frac{L'}{y_a}\right)^{0.43} (Fr)^{0.61} + 1$$

**Far Abutment Scour Depth, ys**

12.92 ft

(HEC-18, 5th Edition, April 2012, Equation 8.1)

Proj.	N. Parish Bridge	Job No.	63738	Sheet No.	3 OF 4
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	9/8/2017	Date		Date	



**Scour Analysis: 500-year storm U/S face of Mt. Vernon Bridge**

Aggradation/Degradation            ft

**Live Bed Vs. Clear Water**

Depth of flow, y1	16.52	ft
Particle size in a mix of which 50% are smaller, D50 (m)	0.00063	m
Particle size in a mix of which 50% are smaller, D50 (ft)	0.00206	ft
Velocity of main Channel, V	7.54	ft/s
Critical Velocity, Vc	2.27	ft/s

$$V_c = K_u V^{1/6} D^{1/3}$$

$$K_u = 11.17$$

(HEC-18, 5th Edition, April 2012, Equation 6.1)

**Live Bed vs. Clear Water**

Live Bed ← Type of Contraction Scour Analysis to be completed

**Live Bed Scour**

Avg depth in U/S main channel, y1	16.52	ft
Ex depth in the contracted section before scour, yo	13.71	ft
Flow in the U/S channel transporting sediment Q1	13001.25	ft <sup>3</sup> /s
Flow in the contracted channel, Q2	15500	ft <sup>3</sup> /s
Top width of U/S main channel, W1	104.43	ft
Top width of the main channel in the contracted section, W2	183	ft

Fall Velocity, ω	0.01	ft/s
Slope of energy grade line of main channel, S1	0.001121	ft/ft
Shear Velocity, Va	0.77	
Va/ω	90.85	
Exponent, k1	0.69	

$$V_a = (g y_1 S_1)^{1/2}$$

$$\frac{y_2}{y_1} = \left( \frac{Q_2}{Q_1} \right)^{\frac{6}{7}} \left( \frac{W_1}{W_2} \right)^{k_1}$$

(HEC-18, 5th Edition, April 2012, Equations 6.2 and 6.3)

Avg depth in contracted section, y2	13.04	
<b>*Scour depth, ys</b>	-0.67	ft

$$y_s = y_2 - y_0$$

**\* If calculated y<sub>s</sub> returns negative answer, the scour depth equals zero**

Proj.	N. Parish Bridge	Job No.	63738	Sheet No.	4 OF 4
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	9/8/2017	Date		Date	



**Scour Analysis: 500-year storm U/S face of Mt. Vernon Bridge**

**Local Scour at Abutments**

**Near Abutment**

Coefficient for Abutment Shape, K1	0.55
Coefficient for angle of embankment to flow, K2	1.00
Length of active flow obstructed by embankment, L'	33.69 ft
Average depth of flow on embankment, ya	7.80 ft
Velocity on embankment, Ve	3.08 ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.194
Length of embankment projected to normal flow, L	100.00 ft

$$\frac{y_s}{y_a} = 2.27K_1K_2 \left(\frac{L'}{y_a}\right)^{0.43} (Fr)^{0.61} + 1$$

**Near Abutment Scour Depth, ys** **14.53 ft**

**Far Abutment**

Coefficient for Abutment Shape, K1	0.55
Coefficient for angle of embankment to flow, K2	1.00
Length of active flow obstructed by embankment, L'	69.62 ft
Average depth of flow on embankment, ya	7.64 ft
Velocity on embankment, Ve	3.17 ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.202
Length of embankment projected to normal flow, L	105.00 ft

$$\frac{y_s}{y_a} = 2.27K_1K_2 \left(\frac{L'}{y_a}\right)^{0.43} (Fr)^{0.61} + 1$$

**Far Abutment Scour Depth, ys** **16.94 ft**

Proj.	N. Parish Bridge	Job No.	63738	Sheet No.	
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	9/11/2017	Date		Date	



## Scour Summary

	<b>100 - year storm</b>	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	12.04	12.92
Pressure Flow Scour (ft)	---	---
<b><u>TOTAL SCOUR (ft)</u></b>	<b><u>12.04</u></b>	<b><u>12.92</u></b>

	<b>500-year storm</b>	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	14.53	16.94
Pressure Flow Scour (ft)	---	---
<b><u>TOTAL SCOUR (ft)</u></b>	<b><u>14.53</u></b>	<b><u>16.94</u></b>

\* If calculated  $y_s$  returns negative answer, the scour depth equals zero

## Uncontracted Section

Plan: Plan 03 Stream Reach RS: 631.3659 Profile: Q100

E.G. Elev (ft)	280.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.060	0.042	0.060
W.S. Elev (ft)	279.36	Reach Len. (ft)	1.34	1.34	1.34
Crit W.S. (ft)	273.00	Flow Area (sq ft)	177.31	1433.93	346.20
E.G. Slope (ft/ft)	0.001288	Area (sq ft)	177.31	1433.93	346.20
Q Total (cfs)	11700.00	Flow (cfs)	513.79	10240.76	945.44
Top Width (ft)	195.64	Top Width (ft)	27.80	104.43	63.41
Vel Total (ft/s)	5.98	Avg. Vel. (ft/s)	2.90	7.14	2.73
Max Chl Dpth (ft)	15.24	Hydr. Depth (ft)	6.38	13.73	5.46
Conv. Total (cfs)	326044.0	Conv. (cfs)	14317.9	285379.3	26346.7
Length Wtd. (ft)	1.34	Wetted Per. (ft)	30.12	106.09	64.27
Min Ch El (ft)	264.12	Shear (lb/sq ft)	0.47	1.09	0.43
Alpha	1.28	Stream Power (lb/ft s)	1.37	7.76	1.18
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.98	23.19	1.53
C & E Loss (ft)	0.07	Cum SA (acres)	0.22	1.61	0.32

Plan: Plan 03 Stream Reach RS: 631.3659 Profile: Q500

E.G. Elev (ft)	282.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.	0.060	0.042	0.060
W.S. Elev (ft)	282.15	Reach Len. (ft)	1.34	1.34	1.34
Crit W.S. (ft)	274.48	Flow Area (sq ft)	262.90	1725.02	532.00
E.G. Slope (ft/ft)	0.001121	Area (sq ft)	262.90	1725.02	532.00
Q Total (cfs)	15500.00	Flow (cfs)	811.02	13001.25	1687.73
Top Width (ft)	207.74	Top Width (ft)	33.69	104.43	69.62
Vel Total (ft/s)	6.15	Avg. Vel. (ft/s)	3.08	7.54	3.17
Max Chl Dpth (ft)	18.03	Hydr. Depth (ft)	7.80	16.52	7.64
Conv. Total (cfs)	462961.1	Conv. (cfs)	24223.8	388327.3	50410.0
Length Wtd. (ft)	1.34	Wetted Per. (ft)	36.63	106.09	71.08
Min Ch El (ft)	264.12	Shear (lb/sq ft)	0.50	1.14	0.52
Alpha	1.30	Stream Power (lb/ft s)	1.55	8.58	1.66
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.69	27.78	2.72
C & E Loss (ft)	0.05	Cum SA (acres)	0.29	1.61	0.54

## Contracted Section

Plan: Plan 03 Stream Reach RS: 630 Profile: Q100

E.G. US. (ft)	280.07	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	279.36	E.G. Elev (ft)	280.00	279.94
Q Total (cfs)	11700.00	W.S. Elev (ft)	279.43	279.30
Q Bridge (cfs)	11700.00	Crit W.S. (ft)	272.34	272.67
Q Weir (cfs)		Max Chl Dpth (ft)	15.31	15.28
Weir Sta Lft (ft)		Vel Total (ft/s)	5.82	6.11
Weir Sta Rgt (ft)		Flow Area (sq ft)	2011.74	1915.74
Weir Submerg		Froude # Chl	0.30	0.32
Weir Max Depth (ft)		Specif Force (cu ft)	14964.26	14156.37
Min El Weir Flow (ft)	290.14	Hydr Depth (ft)	11.47	10.93
Min El Prs (ft)	285.11	W.P. Total (ft)	183.10	183.05
Delta EG (ft)	0.16	Conv. Total (cfs)	386490.4	359147.2
Delta WS (ft)	0.19	Top Width (ft)	175.32	175.26
BR Open Area (sq ft)	2807.42	Frctn Loss (ft)	0.04	0.00
BR Open Vel (ft/s)	6.11	C & E Loss (ft)	0.02	0.03
BR Sluice Coef		Shear Total (lb/sq ft)	0.63	0.69
BR Sel Method	Energy only	Power Total (lb/ft s)	3.66	4.23

Plan: Plan 03 Stream Reach RS: 630 Profile: Q500

E.G. US. (ft)	282.91	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	282.15	E.G. Elev (ft)	282.86	282.81
Q Total (cfs)	15500.00	W.S. Elev (ft)	282.20	282.08
Q Bridge (cfs)	15500.00	Crit W.S. (ft)	273.58	273.98
Q Weir (cfs)		Max Chl Dpth (ft)	18.08	18.06
Weir Sta Lft (ft)		Vel Total (ft/s)	6.18	6.43
Weir Sta Rgt (ft)		Flow Area (sq ft)	2508.09	2410.80
Weir Submerg		Froude # Chl	0.29	0.31
Weir Max Depth (ft)		Specif Force (cu ft)	22146.12	21107.73
Min El Weir Flow (ft)	290.14	Hydr Depth (ft)	13.71	13.17
Min El Prs (ft)	285.11	W.P. Total (ft)	195.80	194.81
Delta EG (ft)	0.13	Conv. Total (cfs)	538294.3	505742.6
Delta WS (ft)	0.17	Top Width (ft)	183.00	183.00
BR Open Area (sq ft)	2807.42	Frctn Loss (ft)	0.04	0.00
BR Open Vel (ft/s)	6.43	C & E Loss (ft)	0.02	0.02
BR Sluice Coef		Shear Total (lb/sq ft)	0.66	0.73
BR Sel Method	Energy only	Power Total (lb/ft s)	4.10	4.67

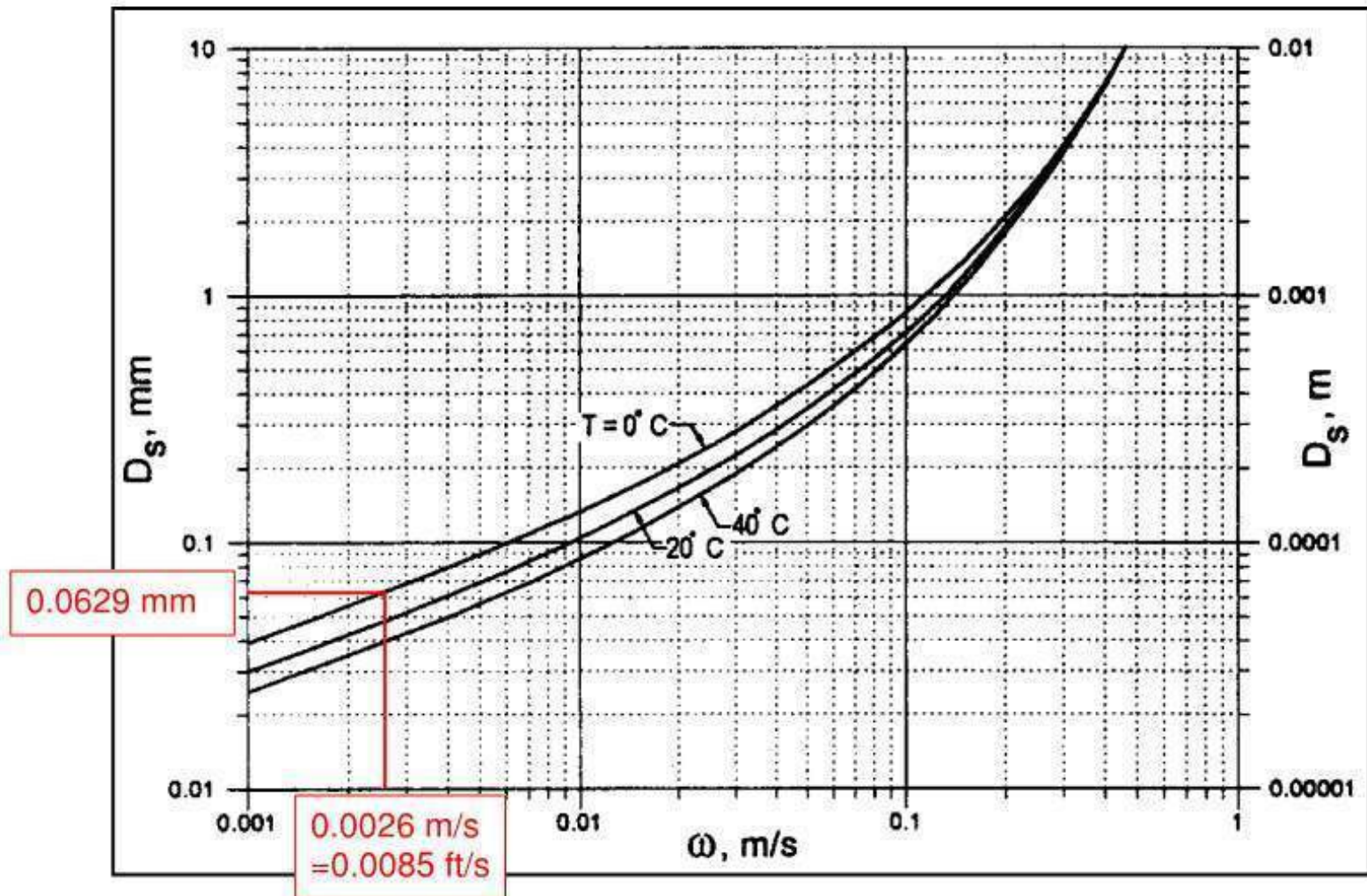
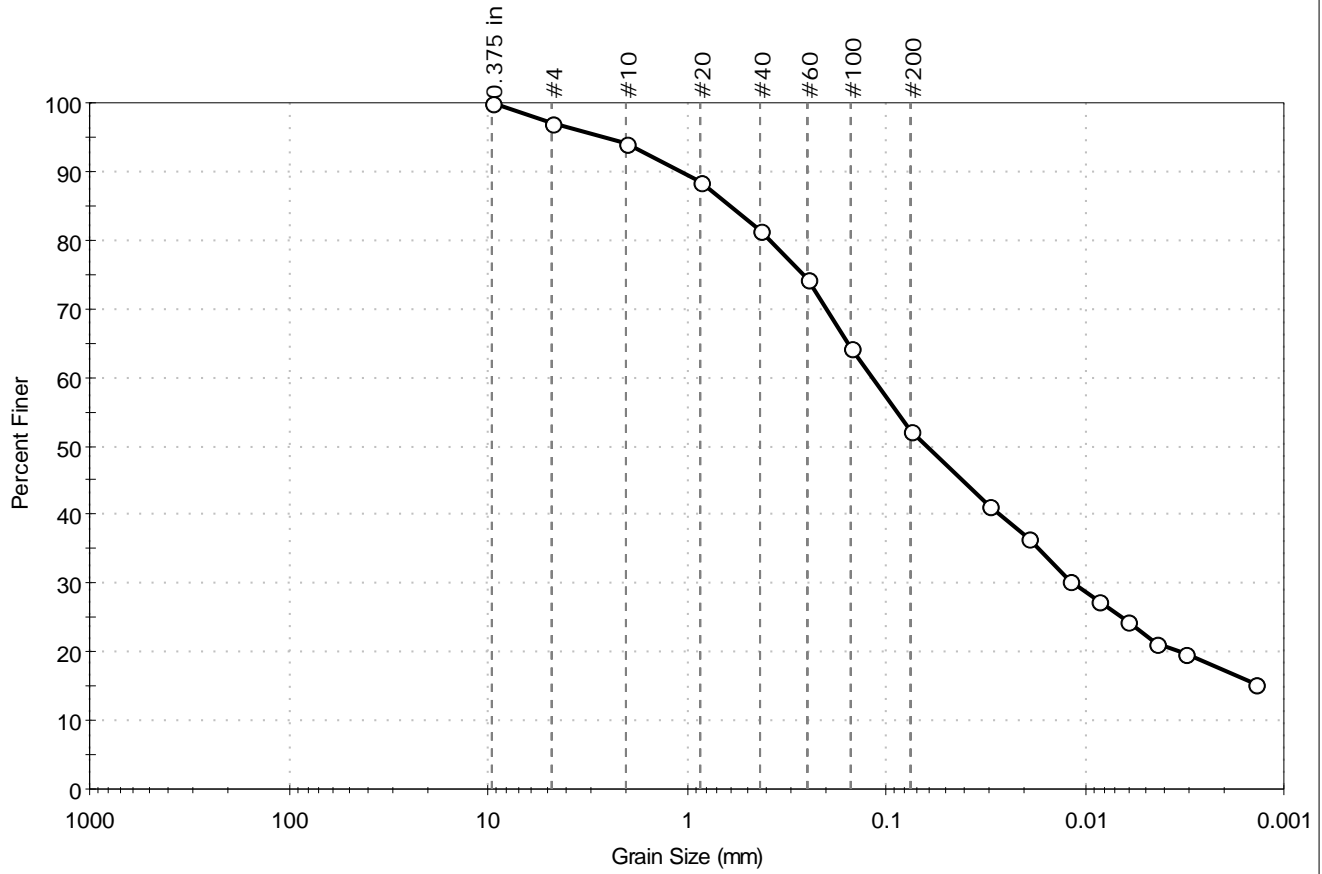


Figure 6.8. Fall velocity of sand-sized particles with specific gravity of 2.65 in metric units.



Client:	Nobis Engineering, Inc.		
Project:	N Parish Rd over Nezinscot River		
Location:	Turner, ME	Project No:	GTX-306635
Boring ID:	BB-TNR-104	Sample Type:	jar
Sample ID:	S-1D	Test Date:	06/28/17
Depth :	0-2 ft	Test Id:	415171
Test Comment:	---		
Visual Description:	Moist, dark gray sandy silty clay		
Sample Comment:	---		

## Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	3.0	44.8	52.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	97		
#10	2.00	94		
#20	0.85	89		
#40	0.42	81		
#60	0.25	74		
#100	0.15	64		
#200	0.075	52		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0304	41		
---	0.0192	37		
---	0.0120	30		
---	0.0085	27		
---	0.0062	24		
---	0.0044	21		
---	0.0031	20		
---	0.0014	15		

<u>Coefficients</u>	
D <sub>85</sub> = 0.6016 mm	D <sub>30</sub> = 0.0113 mm
D <sub>60</sub> = 0.1171 mm	D <sub>15</sub> = N/A
<b>D<sub>50</sub> = 0.0629 mm</b>	D <sub>10</sub> = N/A
C <sub>u</sub> = N/A	C <sub>c</sub> = N/A

<u>Classification</u>	
<u>ASTM</u>	Sandy Silty clay (CL-ML)
<u>AASHTO</u>	Silty Soils (A-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ---	
Sand/Gravel Hardness : ---	
Dispersion Device : Apparatus A - Mech Mixer	
Dispersion Period : 1 minute	
Specific Gravity : 2.65	
Separation of Sample: #200 Sieve	

# Final Hydrologic and Hydraulic Report

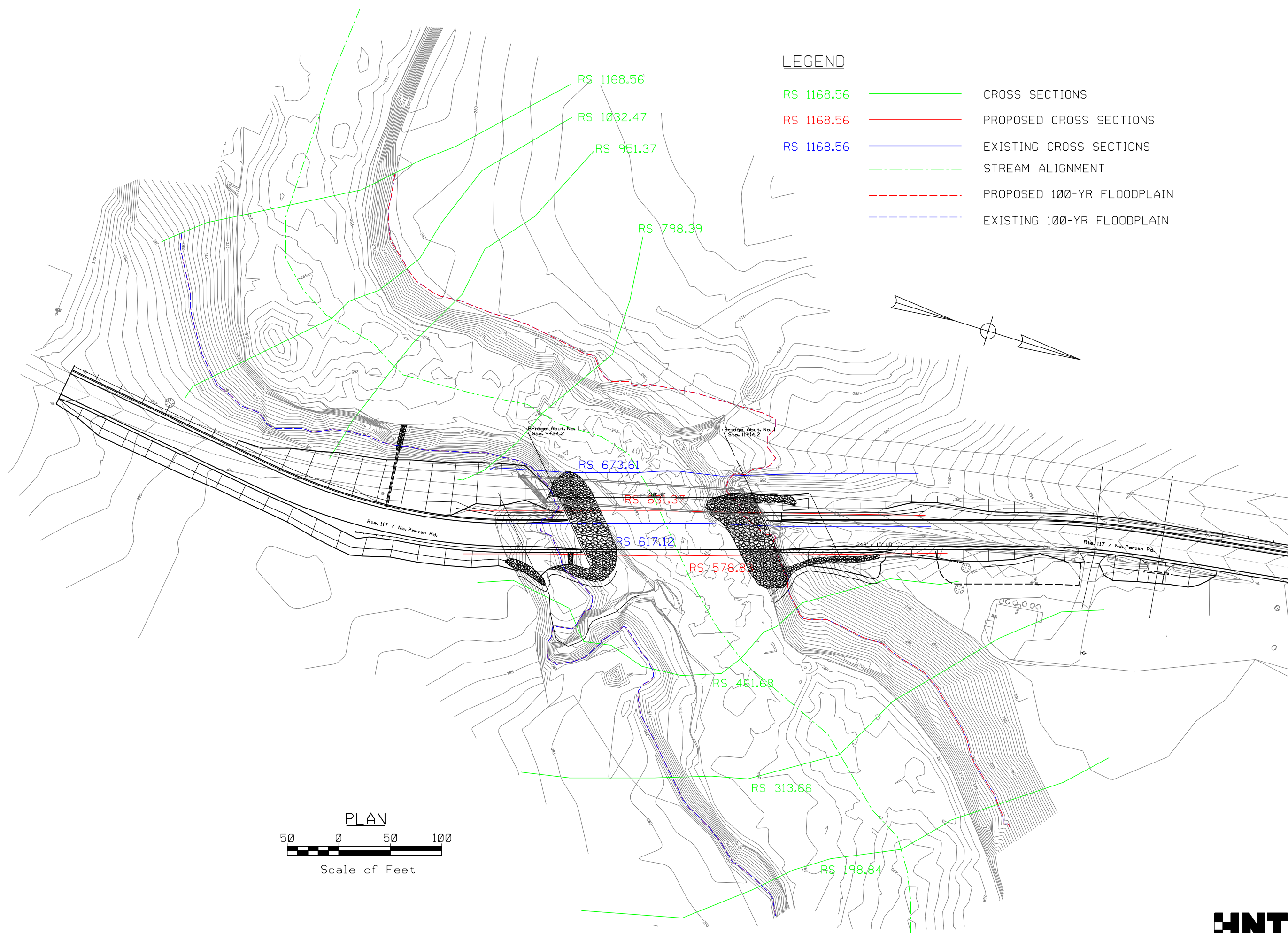
North Parish Bridge over Nezinscot River

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## APPENDIX H

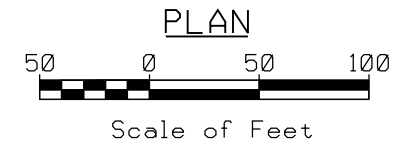
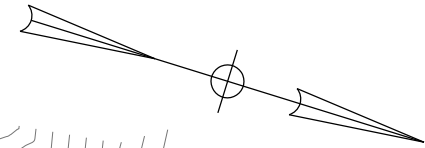
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Drawings



**LEGEND**

- RS 1168.56 — CROSS SECTIONS
- RS 1168.56 — PROPOSED CROSS SECTIONS
- RS 1168.56 — EXISTING CROSS SECTIONS
- - - STREAM ALIGNMENT
- - - PROPOSED 100-YR FLOODPLAIN
- - - EXISTING 100-YR FLOODPLAIN



NORTH PARISH BRIDGE NEZINSCOT RIVER ANDROSCOGGIN	TURNER <b>HEC-RAS GENERAL PLAN</b>	STATE OF MAINE DEPT. OF TRANSPORTATION 63738 WIN 18749.00 2619 H&H PLANS
		1 OF 1