WEST MOUNT VERNON BRIDGE (POND ROAD) OVER TAYLOR POND OUTLET/ECHO LAKE INLET

MOUNT VERNON, MAINE

WIN 021689.00

HYDROLOGIC AND HYDRAULIC REPORT

October 2018

PREPARED FOR

MAINE DEPARTMENT OF TRANSPORTATION

PREPARED BY

HNTB Corporation
340 County Road, Suite 6-C
Westbrook, ME 04092
Phone: (207) 774-5155

HNTB

The following is a report of the hydrologic and hydraulic analysis of the existing and proposed bridges at West Mount Vernon Bridge (Bridge No. 2930) over the outlet of Taylor Pond and the inlet of Echo Lake in the town of Mt. Vernon in Kennebec County, ME.

1.0 Introduction

The Mt. Vernon Bridge crosses over the outlet of Taylor Pond and the inlet of Echo Lake. The bridge carries Pond Road from Sandy River Road across Taylor Pond and Echo Lake to Desert Pond Road in Mt. Vernon. In addition, the Mt. Vernon Bridge is approximately 70 feet downstream of the Taylor Pond Dam that was rehabbed in 1991 to control Taylor Pond, Upstream of the Mt. Vernon Bridge. Rehab of the dam included the construction of new embankment, spillway, overflow crest, and an emergency spillway. Riprap was also redistributed at the toe of the dam and the eastern side of the outlet immediately downstream of the dam.

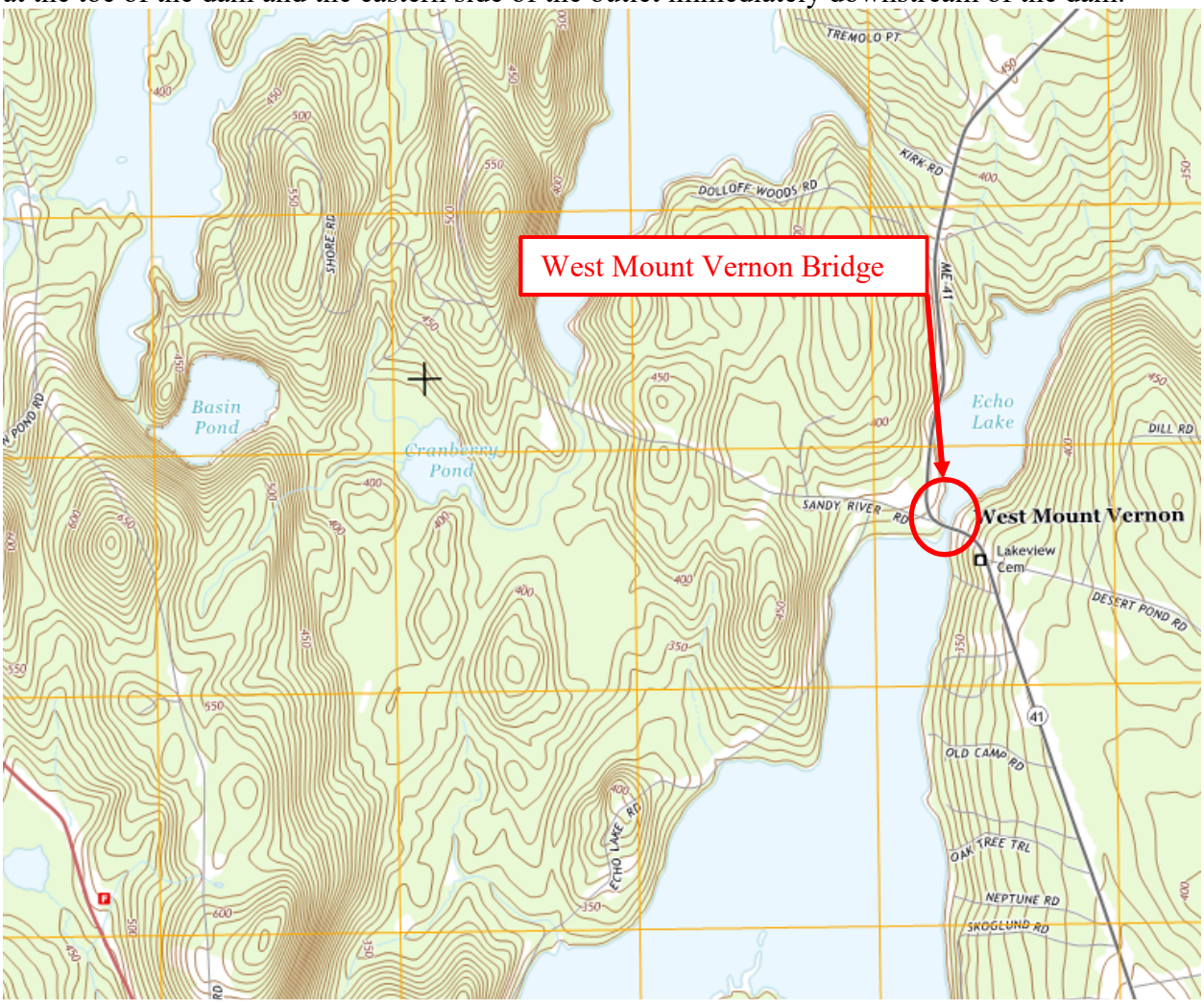


Figure 1 – Project Location Map (USGS Quadrangle – Fayette, ME)

West Mount Vernon Bridge is located just downstream of the Taylor Pond Dam. There are no structures downstream of the Bridge on Echo Lake.

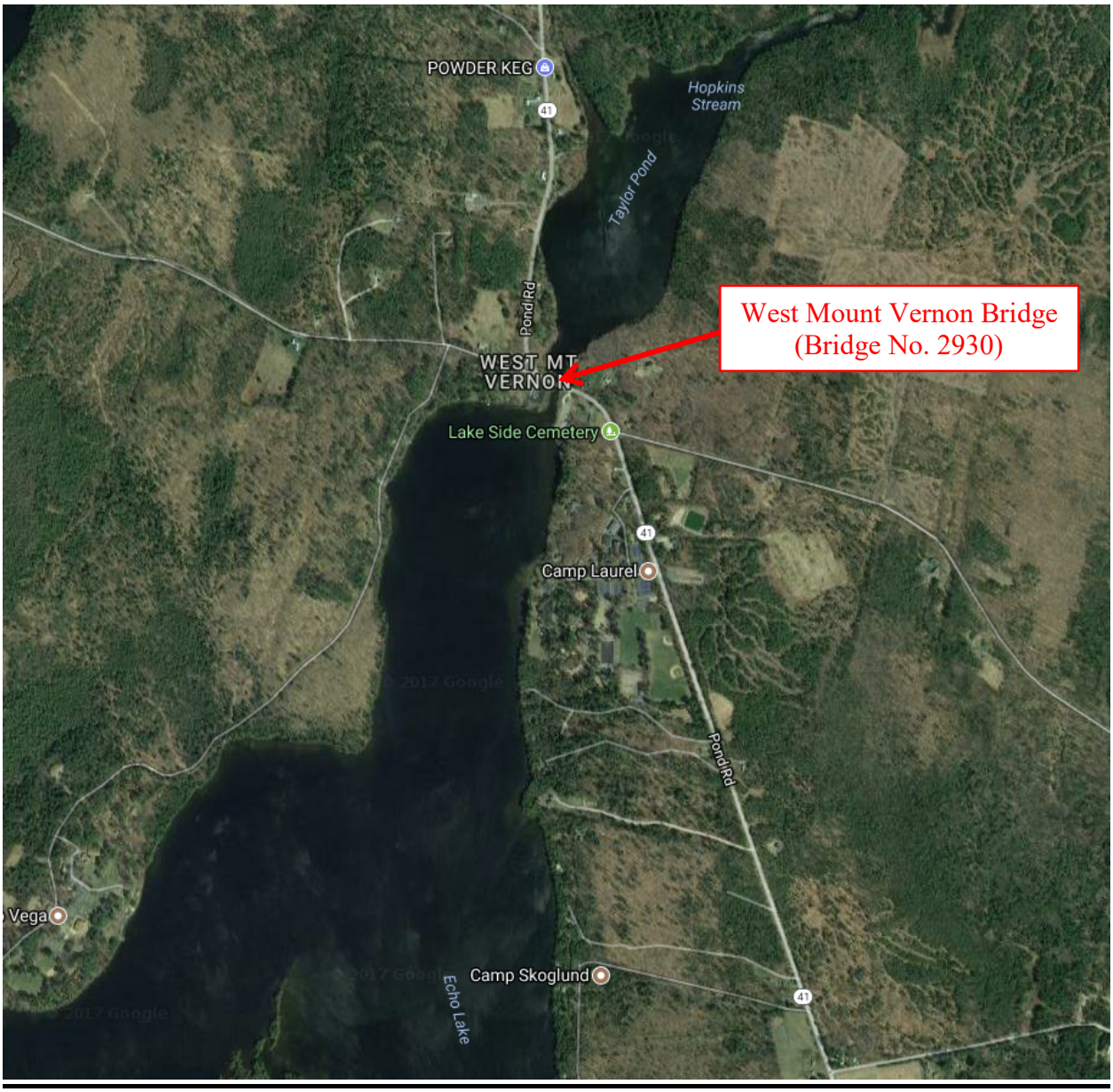


Figure 2 – Aerial image showing project site

2.0 Existing Data Review

- Site Photographs are provided in **Appendix A**.
- Immediately upstream of the project site lies the Taylor Pond Dam. The dam features a 25-foot spillway at an elevation of 324.80' and a 67-foot overflow crest at an elevation of 325.20'. The dam also features a 25-foot wide emergency spillway with an overtopping height of 328.50'.
- Residents of Mt. Vernon indicated that, in March/April of 1987, the bridge was overtopped. By a combination of warming temperatures, melting snowpack, and heavy precipitation, the nearest stream gage at North Sidney was reporting a recurrence interval of greater than 100 years. Many of the communities within the Kennebec River Basin reported their greatest flood of record, especially in the lower portion of the Basin. The flooding in the Kennebec River Basin totaled an estimated $34 million in losses.
- FEMA Flood Insurance Rate Map (see **Appendix B**). Kennebec 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 327 upstream at Taylor Pond (outlet) and 317 downstream at Echo Lake (inlet) of the project bridge. There was no flood profile provided in the FEMA Flood Insurance Study.

3.0 Hydrology

Peak stream flows for Taylor Pond Outlet/ Echo Lake Inlet were determined from USGS Regression Equations (Hodgkins, 1999 & Lombard/Hodgkins, 2015). The USGS Regression Equations are calculated based on the USGS SIR 08-5102 method. The drainage area at the location of the bridge replacement project is 35.4 square miles. The bridge is located within the Androscoggin River watershed. The USGS SIR 08-5102 Regression method is used to find the peak flows of ungauged streams for drainage basins ranging from 1 mi^2 to 2000 mi^2. The regression method then separates the state into different flow regions in which flood-flow magnitudes and basin characteristics are generalized. That information is then compared to nearby gaged stream flow data to determine the peak flow rates. The flows can be found in **Table 1**. The hydrology report can be found in **Appendix C**.

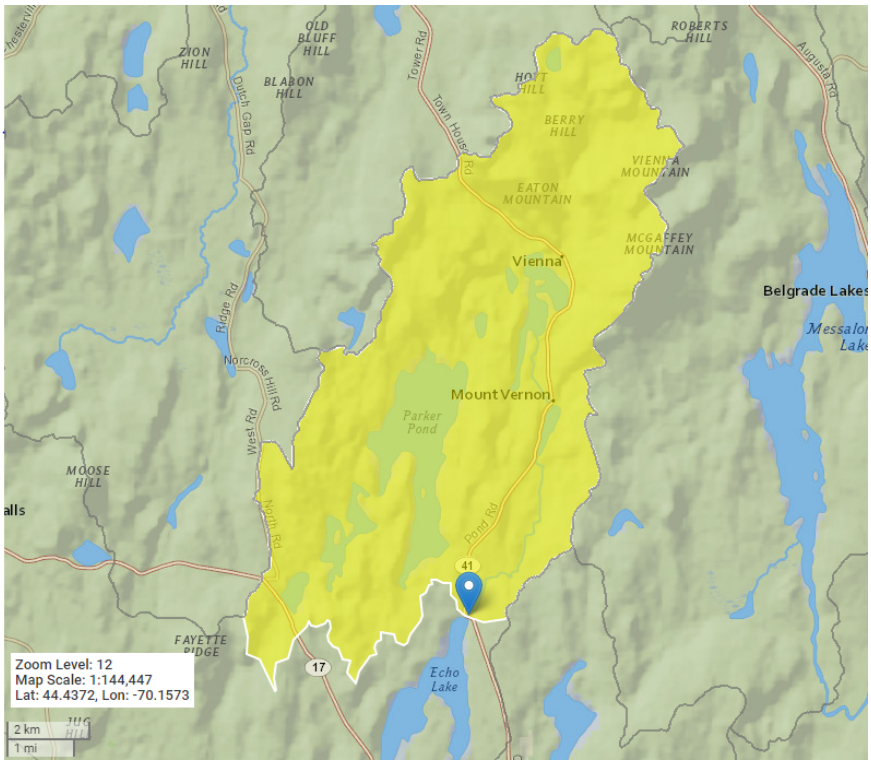


Figure 3 – Watershed above Mt. Vernon Bridge over Taylor Pond/ Echo Lake

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

Year Storm	**USGS SIR 08-5102 (cfs)**
Drainage Area	**35.4 sq. mi.**
$Q_{1.1}$	**331.1**
Q_2	**612.2**
Q_5	**898.0**
Q_{10}	**1101.2**
Q_{25}	**1366.5**
Q_{50}	**1569.0**
Q_{100}	**1785.9**
Q_{500}	**2302.6**

The hydraulic analysis was completed using the peak flows resulting from the USGS SIR 08-5102 regression equations. In the 1987 flood, the roadway was overtopped and was estimated to be greater than the 100-year storm, but less than the 500-year storm. In the existing HEC-RAS

model, the 100-year flow nearly overtops the roadway, which is consistent with the 1987 flood validating the flows for the model.

4.0 Hydraulic Analysis

Hydraulic calculations for the existing and proposed conditions along Taylor Pond/Echo Lake 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 existing bridge was constructed in 1929. The bridge is a two-span structure with a total length of approximately 49 feet from abutment to abutment. The existing structure features a 3-foot wide pier at the superstructure then widens to approximately 4.7 feet at the stream. The pier also features a 90^{o} triangular nose at the upstream end of the structure. Therefore, the coefficient of drag (Cd) for the momentum equation in low flow scenarios is 1.6. The low chord elevation of the existing bridge is 321.93 feet. The existing structure has a hydraulic opening of approximately 239.42 square feet. The existing model indicates that the existing structure is not under pressure flow or energy flow, but rather it uses the momentum equation due to the presence of a pier within the stream. In the proposed condition, the model only utilizes the energy flow equation as there is no pier and the flow passes under the low chord of the structure.

The MaineDOT Bridge Design Guide (BDG) states that bridges that are not major riverine bridges shall have a minimum depth of 2 feet of freeboard over the 50-year storm event. The BDG also states that the proposed bridge should clear the flood of record when possible. The proposed structure maintains the low chord (Elev. 321.93) from existing condition, but in order to clear the flood of record (1987 flood was greater than the 100-yr storm) the span length of the proposed structure increased to 70 feet from abutment to abutment. The increased opening lowered the water surface elevations of all the design storms with the exception of the 1.1-yr storm. The structure will feature integral abutments with sloping embankments. The proposed structure offers approximately 329.90 square feet of hydraulic opening, which equates to a 38% increase over the existing condition. In order to meet the minimum 2-foot required freeboard the existing low chord would need to be raised by approximately 0.7 feet, but would require the profile of the roadway to be raised by approximately 1.75 feet. This would cause significant impacts to the intersection at the west end of the bridge as well as increase the overall cost of the project. A memorandum with additional discussion of the hydraulic clearance can be found in **Appendix I**.

The HEC-RAS model was run using known stillwater surface elevations for Echo Lake for the downstream boundary condition. From the Kennebec County FEMA FIS study stillwater elevations were provided for the 10-, 50-, 100-, and 500-year events (see **Appendix D**). The water surface elevations for the other events were estimated from USGS mapping.

The model was run using "subcritical" flow due to the Froude numbers at all cross-sections below 1.0. The model covers approximately 290 feet of Taylor Pond and Echo Lake with approximately 95 feet upstream of the bridge and 150 feet downstream of the bridge. Cross-sections were provided upstream of the Taylor Pond Dam and immediately downstream and upstream of the Mt. Vernon bridge.

There are no known water surface elevations at the project site; however, in the existing structure model, the 100-yr flow nearly overtops the roadway which matches the description of the flood of 1987 where the design year was estimated to be greater than the 100-yr storm, but less than the 500-year storm.

Manning's n numbers were estimated from ground cover within the project site. The channel's Manning's n value was estimated to be 0.03 and it was assumed to be a clean and straight stream with no riffs or deep pools. The overbanks have areas of mowed grass and heavy brush which equates to Manning's n values of 0.03 and 0.1 respectively. Ineffective flow areas were set upstream and downstream of the bridge based on contraction and expansion.

The analysis found that the existing structure/roadway is impacted by the 100-yr storm and the 500-year storm event overtops the roadway. The 50-year storm is approximately 0.01 feet below the low chord. The clearances and hydraulic information are provided in Table 2.

The proposed project raises the profile of the roadway and increases the span length to increase the clearance between the water surface and the low chord of the structure. The proposed structure offers 1.29 feet of clearance between the 50-year water surface elevation and the low chord of the bridge. As a result of the proposed bridge replacement, the water surface elevation for higher intensity storm events have been decreased and all storm events pass under the low chord of the proposed structure. The outlet velocities have also been decreased with the proposed structure.

Table 2 provides a summary of the hydraulic analysis of existing and proposed conditions at the West Mount Vernon Bridge over Taylor Pond and Echo Lake.

Table 2: Hydraulic Analysis Summary

Summary of Hydraulic Data – Mt. Vernon Bridge over Taylor Pond/Echo Lake	Existing Bridge	Proposed Bridge
Low Chord	321.93	321.93
Floodplain width at Q100, ft	207.23	65.13
Floodplain width at Q500, ft	235.59	81.37
Width at Banks, ft	52.6	52.6
Headwater at Upstream face of bridge, Q25, ft	321.43	320.28
Headwater at Upstream face of bridge, Q50, ft	321.92	320.64
Headwater at Upstream face of bridge, Q100, ft	323.59	321.00
Headwater at Upstream face of bridge, Q500, ft	324.43	321.76
Discharge Velocity at Q25, fps	4.85	5.99
Discharge Velocity at Q50, fps	5.09	6.32
Discharge Velocity at Q100, fps	4.47	6.65
Discharge Velocity at Q500, fps	4.69	7.37
Ordinary High Water Elevation (Q1.1) (US face), ft	317.41	317.97
Discharge Velocity at Q1.1, fps	5.57	3.26
Clearance at Q25, ft	0.50	1.65
Clearance at Q50, ft	0.01	1.29
Clearance at Q100, ft	0.00	0.93
Clearance at Q500, ft	0.00	0.17
Bridge Opening Area, ft^2	239.42	329.90
Flow area at Q100, ft^2	238.91	282.42
Flow area at Q500, ft^2	322.51	332.35

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 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 West Mount Vernon Bridge crossing. The D_{50} of the streambed material was taken from boring samples at depths between 15 and 17 feet. The D_{50} of the material at the depth of 15 to 17 feet was found to be 0.14 mm or 0.00046 feet. This number was used to determine whether clear water or live bed scour analysis was to be performed. At West Mount Vernon Bridge, live bed scour was required

to be calculated. In addition, local scour was calculated per HEC-18 for the near and far abutments.

The total scour depths can be found in Table 4 and the scour analysis can be found in the **Appendix G**.

Table 4: Scour Depths

	100 - year storm	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	3.01	4.19
Pressure Flow Scour (ft)	---	---
TOTAL SCOUR (ft)	***3.01***	***4.19***

	500-year storm	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	3.48	5.09
Pressure Flow Scour (ft)	---	---
TOTAL SCOUR (ft)	***3.48***	***5.09***

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

6.0 Summary

The existing West Mount Vernon Bridge over the outlet of Taylor Pond and the inlet of Echo Lake in Kennebec County is proposed to be replaced. The low chord of the existing structure is at 321.93 feet and the Q100 (Elev. 323.69) impacts the existing structure and the Q500 (Elev. 324.52) overtops the existing structure. The existing structure provides approximately 239 square feet of hydraulic opening.

The profile of the roadway is proposed to be raised while also maintaining the existing low chord elevation. The span length from abutment to abutment is proposed to be lengthened to 70 feet in order to provide more hydraulic clearance from the low chord to the 50-yr water surface elevation. The proposed conditions allow for all design storms to pass under the low chord elevation. Lengthening the span of the structure has increased the hydraulic opening to approximately 330 square feet.

The proposed structure will decrease the water surface elevations for all storm events with the exception of the 1.1-year storm which increases slightly (0.33 feet). In addition, the increased span length allows for approximately 1.3 feet of clearance between the low chord of the structure and the 50-year water surface elevations. The proposed structure also allows the flood of record and the 500-year storm to pass under the low chord of the structure. Although the proposed

clearance is less than required by the MaineDOT Bridge Design Guide (minimum 2-foot clearance over the 50-year storm or 1-foot clearance over the 100-year storm event), a balance between site impacts and hydraulic clearance was considered and the resulting bridge configuration was deemed acceptable.

Appendix Contents

APPENDIX A

Site Photographs

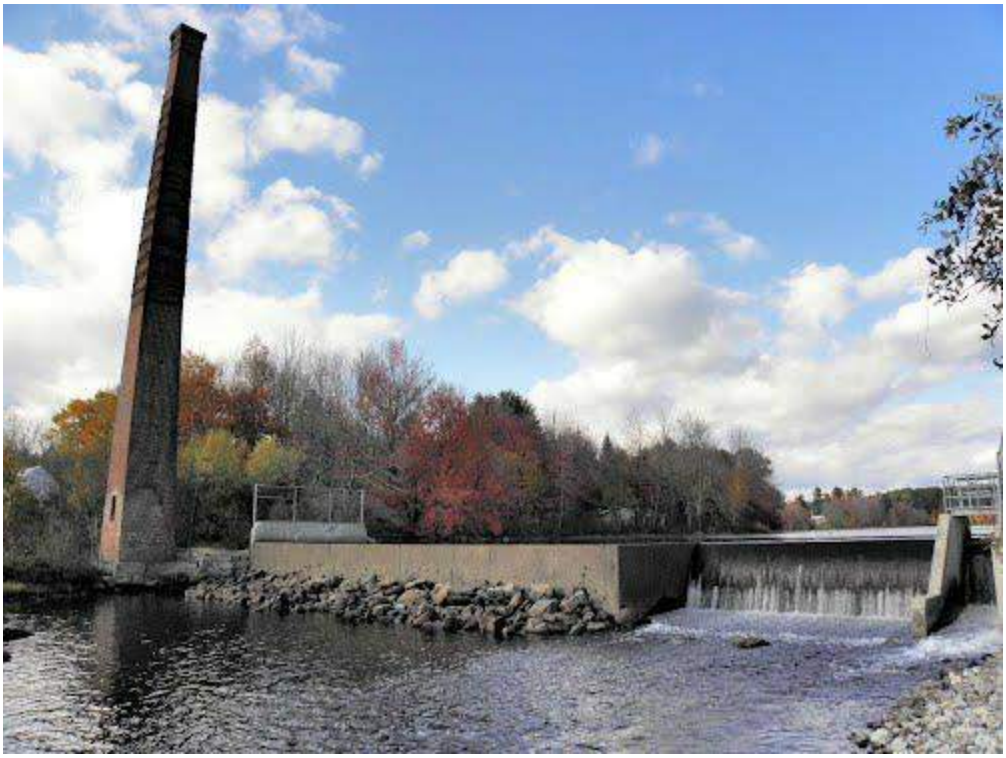


Photo 1 – Taylor Pond Dam– Looking Upstream

Photo 2 – Echo Lake – Looking Downstream

Photo 3 – Pond Road – East Approach

Photo 4 – Pond Road – West Approach

APPENDIX B

FEMA FIRM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 19N. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from Main GIS. Base map files were provided in digital form by the Office of Maine GIS.Orthophoto images were produced at a scale of 1:2,400 and 1:4,800 dated spring of 2003 to spring of 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

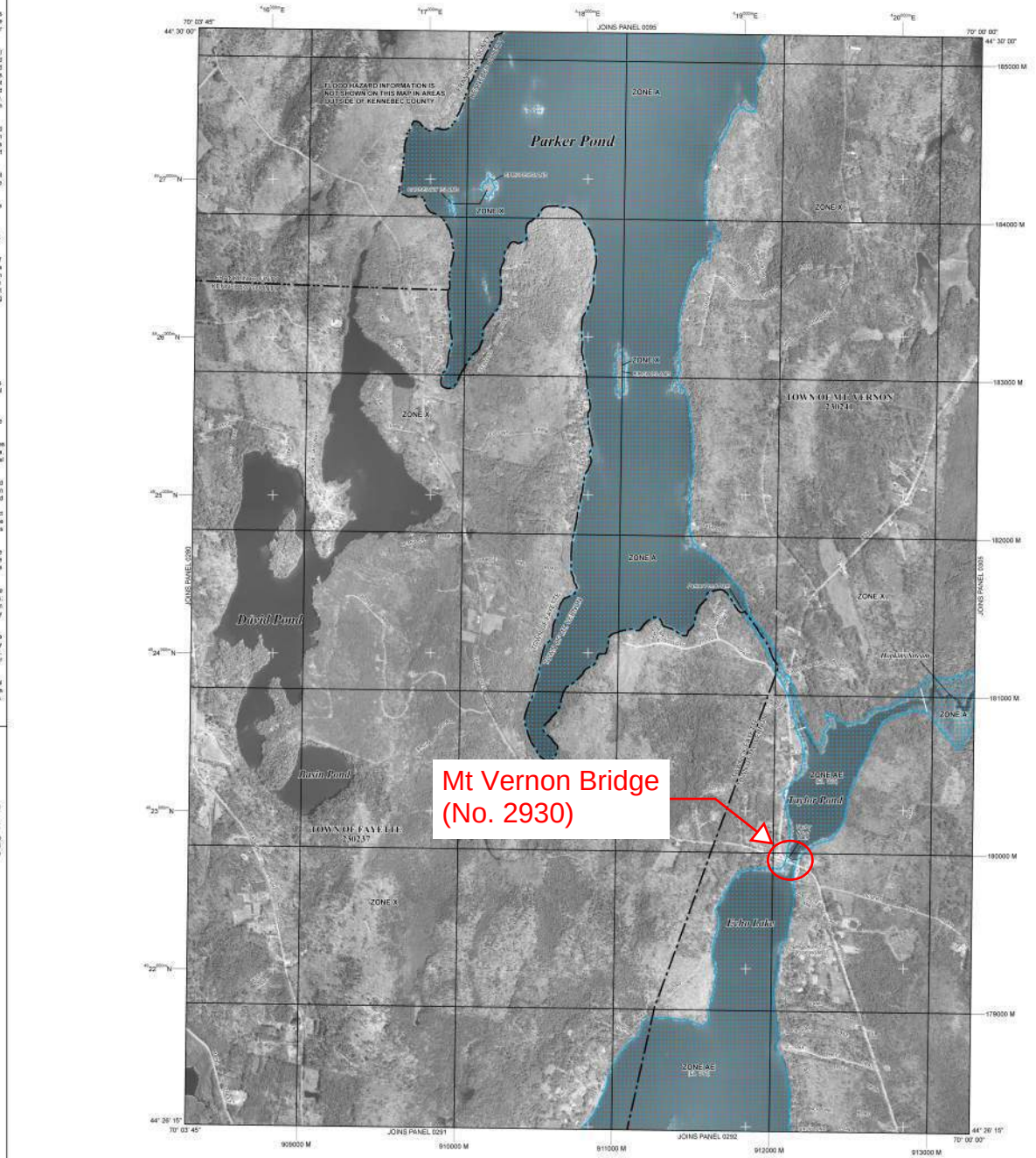
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

State of Maine Floodway Note: Under the Maine Revised Statutes Annotated (M.R.S.A.) Title 38 § 439-A. 7C where the floodway is not designated on the Flood Insurance Rate Map, the floodway is considered to be the channel of a river or other water course and the adjacent land areas to a distance of one-half the width of the floodplain, as measured from the normal high water mark to the upland limit of the floodplain, unless a technical evaluation certified by a registered professional engineer is provided demonstrating the actual floodway based upon approved FEMA modeling methods.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.
ZONE AE — Base Flood Elevations determined.
ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line
23 — 23 — Transect line
Cutoff
Bridge
43° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4980000 M — 1000-meter ticks: Maine State Plane West Zone (FIPS Zone 1802), Transverse Mercator projection
5000000 N — 1000-meter Universal Transverse Mercator grid values, zone 19N
CR3513 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 16, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
150 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0285D

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

PANEL 285 OF 775
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FAYETTE, TOWN OF	230237	0285	D
MT. VERNON, TOWN OF	230241	0285	D

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
23011C0285D
EFFECTIVE DATE
JUNE 16, 2011

Federal Emergency Management Agency

APPENDIX C

Hydrology

WIN:	21698.00	**Project Name:**	Mt Vernon Bridge
Town:	Mt Vernon	**Stream Name:**	Taylor Pd Outlet / Echo Lk Inlet
Route No.	ME 41	**Bridge Name:**	Mt Vernon Bridge
Asset ID:	2930	**Analysis by:**	CSH
Lat:	44.4527 **Long:** -70.0142	**Date:**	1/6/2017

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

Enter data in blue cells only!

	km^2	mi^2	ac	***Enter data in [mi^2]***
A	91.69	35.40	22656.0	Watershed Area *DRNAREA*
W	15.73	6.1	3887.8	Wetlands area (by NWI)
P_c	419413	4928734		watershed centroid (E, N; UTM 19N; meters)
County	Androscoggin			*choose county from drop-down menu*
pptA	45.3			mean annual precipitation (inches; by look-up)
SG	0.00			sand & gravel aquifer as decimal fraction of watershed A

A (km^2)	91.69	**Conf Lvl**	0.67
W (%)	17.16		NWI Wetlands % *STORNWI*

Ret Pd	**Peak Flow Estimate**			
T (yr)	**Lower**	**Q_T (m^3/s)**	**Upper**	**Q_T (ft^3/s)**
1.1		9.38		331.1
2		17.34		612.2
5		25.43		898.0
10		31.19		1101.2
25		38.70		1366.5
50		44.43		1569.0
100		50.58		1785.9
500		65.21		2302.6

Worksheet prepared by:
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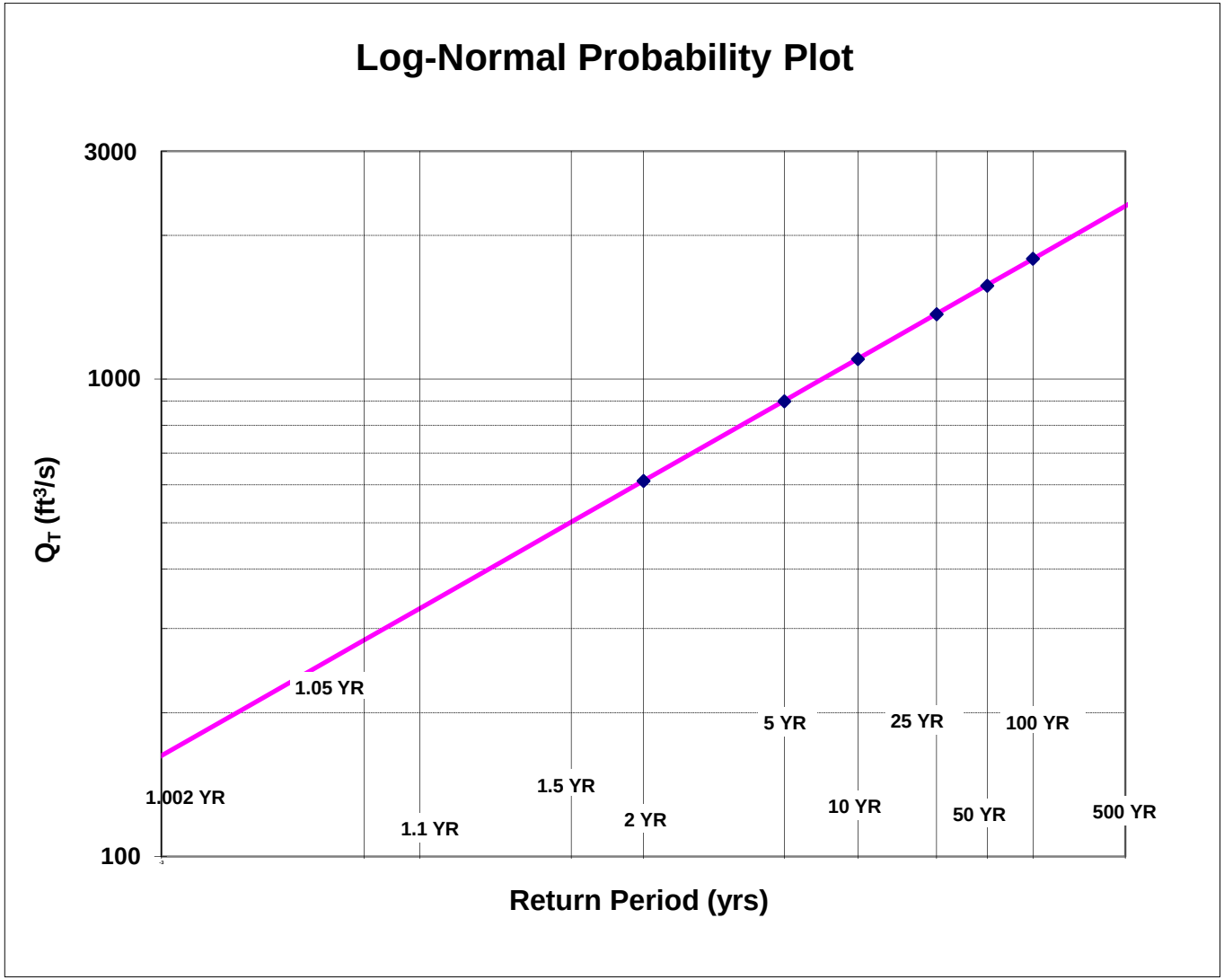
ver. 2016 Feb 05

References:

Hodgkins, G.A., 1999.
Estimating the magnitude of peak flows for streams in Maine for selected recurrence intervals
WRIR 99-4008, USGS Augusta, ME

Lombard, P.J. & G.A. Hodgkins, 2015.
Peak flow regression equations for small, ungaged streams in Maine - Comparing map-based to field-based variables
SIR 2015-4059, USGS, Augusta, ME

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


Log-Normal Probability Plot
3000
1000
100
Q_T (ft³/s)
1.05 YR
1.002 YR
1.1 YR
1.5 YR
2 YR
5 YR
10 YR
25 YR
50 YR
100 YR
500 YR
Return Period (yrs)

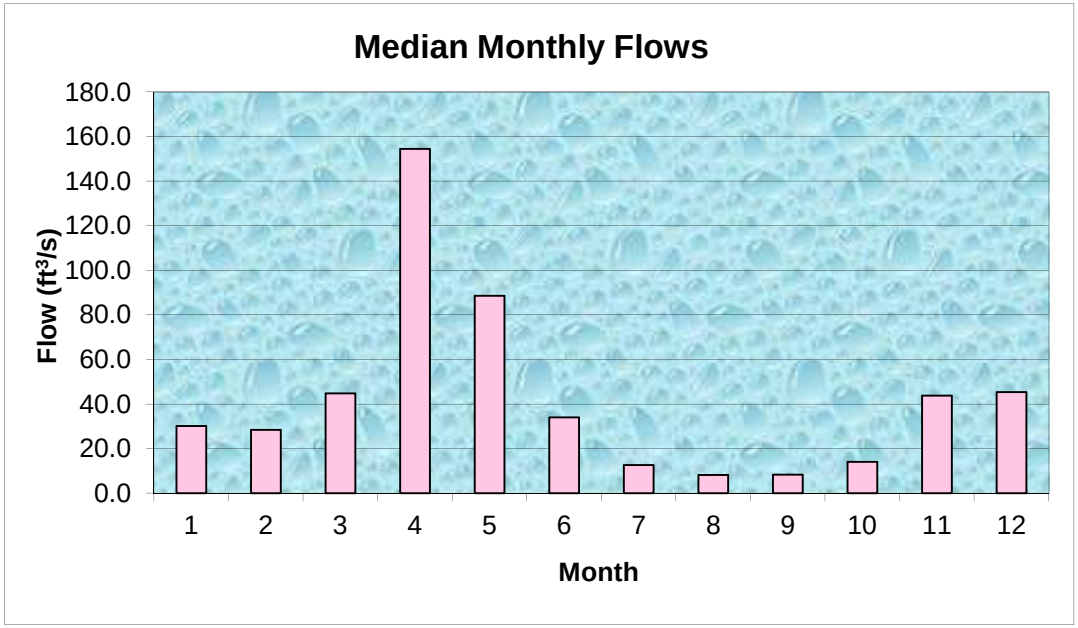
WIN:	21698.00	**Project Name:**	Mt Vernon Bridge
Town:	Mt Vernon	**Stream Name:**	Taylor Pd Outlet / Echo Lk Inlet
Route No.	ME 41	**Bridge Name:**	Mt Vernon Bridge
Asset ID:	2930	**Analysis by:**	CSH
Lat:	44.45270 **Long:** -70.0142	**Date:**	1/6/2017

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

MAINE MONTHLY MEDIAN FLOWS and HYDRAULIC GEOMETRY BY USGS REGRESSION EQUATIONS (2004)

	Value	Variable	Explanation
	35.40	*A*	Area (mi^2)
419412.5	4928734	P_c	Watershed centroid (E,N; UTM; Zone 19; meters)
	77.90	*DIST*	Distance from Coastal reference line (mi)
	45.3	*pptA*	Mean Annual Precipitation (inches)
	0.00	*SG*	Sand & Gravel Aquifer (decimal fraction of watershed area)

Month	Q_{median} (ft3/s)	(m^3/s)
Jan	**30.17**	0.8550
Feb	**28.49**	0.8073
Mar	**44.82**	1.2700
Apr	**154.50**	4.3782
May	**88.66**	2.5125
Jun	**34.07**	0.9656
Jul	**12.65**	0.3584
Aug	**8.26**	0.2339
Sep	**8.34**	0.2362
Oct	**14.15**	0.4010
Nov	**43.88**	1.2435
Dec	**45.48**	1.2889



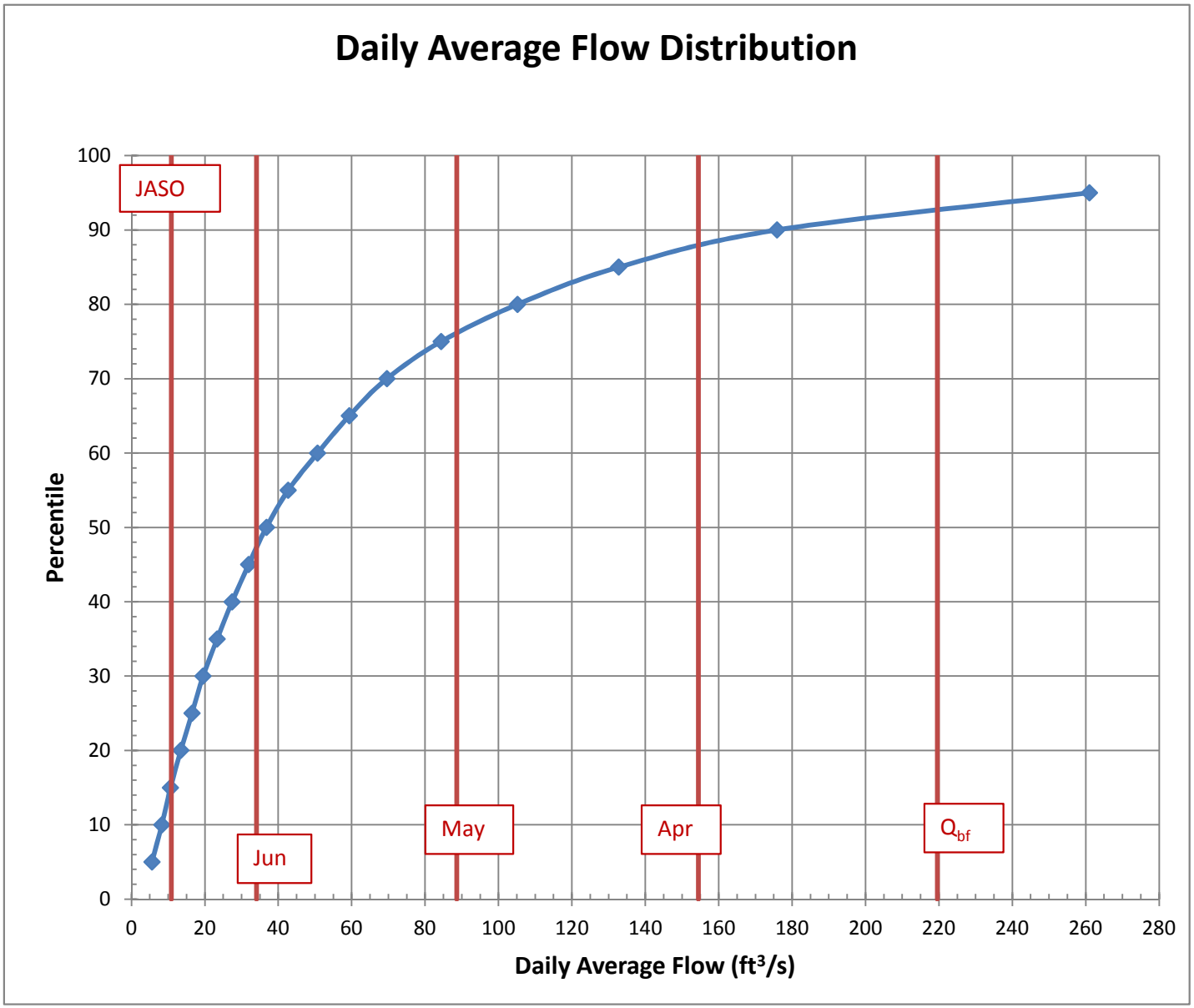
Q_{bf}	**219.6**	
ann avg	**71.9**	
ann med	**38.2**	
$Q_{1.002}$	**162.6**	
$Q_{1.01}$	**209.3**	
$Q_{1.05}$	**283.8**	
Q_{bf}	**391.5**	assume v = 4ft/s

W_{bf}	**49.0**	estimated bankfull width (ft)
d_{bf}	**2.0**	estimated bankfull depth (ft)
A_{bf}	**97.8**	estimated bankfull flow area (ft^2)

References

Dudley, R.W., 2004. Hydraulic Geometry Relations ..., SIR 2004-5042

Dudley, R.W., 2004. Estimating Monthly Streamflows … , SIR 2004-5026



Daily Avg Flow Dist	
A_{ws} = (mi^2)	35.4

Q (ft^3/s)		
Pctl	Median	84th pctl
5	5.57	8.97
10	8.28	12.44
15	10.64	15.54
20	13.47	18.84
25	16.48	22.09
30	19.50	25.16
35	23.37	28.75
40	27.40	33.07
45	31.94	37.39
50	36.77	44.14
55	42.70	51.38
60	50.72	60.31
65	59.33	70.26
70	69.59	81.97
75	84.37	98.58
80	105.22	117.69
85	132.76	150.82
90	175.86	202.52
95	260.99	314.94

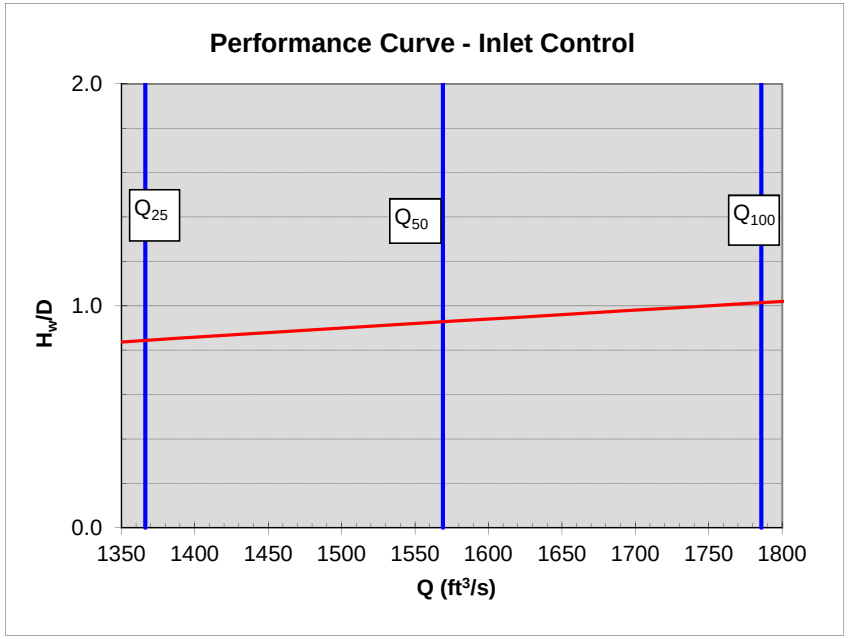
Q_{bf}	219.6
$Q_{1.002}$	162.6
$Q_{1.1}$	331.1
Q_2	612.2

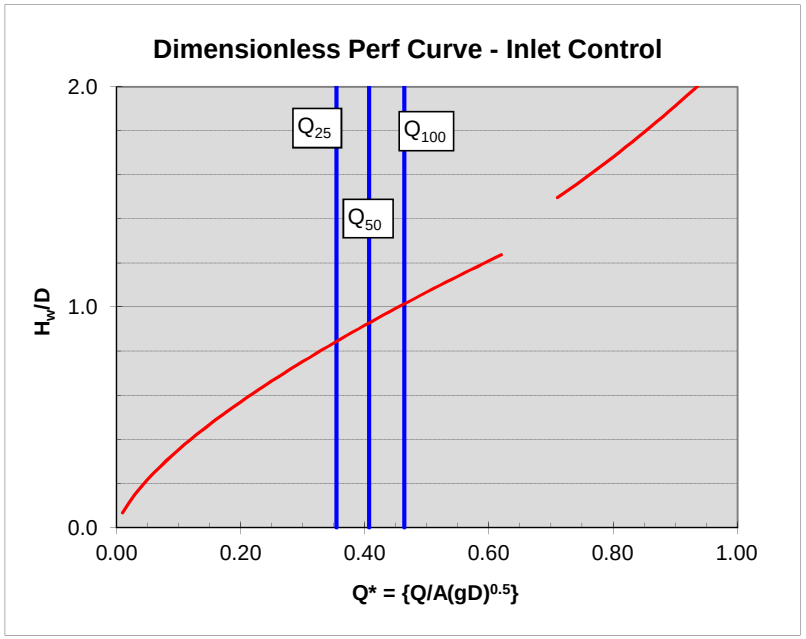
NOTE: ***This page is for preliminary sizing only.***
Final design should be done with HY8 or HDS-5

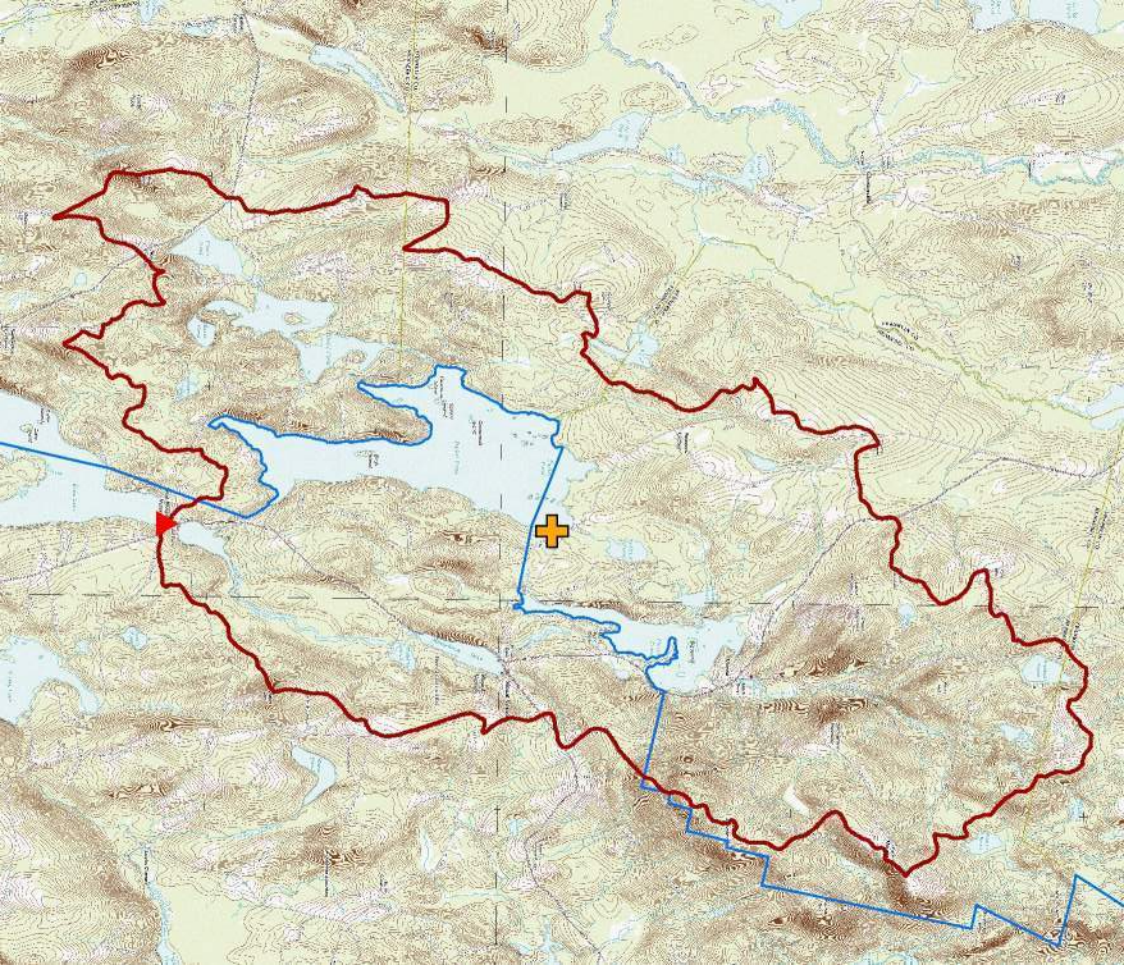
Preliminary Culvert Sizing - Round & Box Culverts

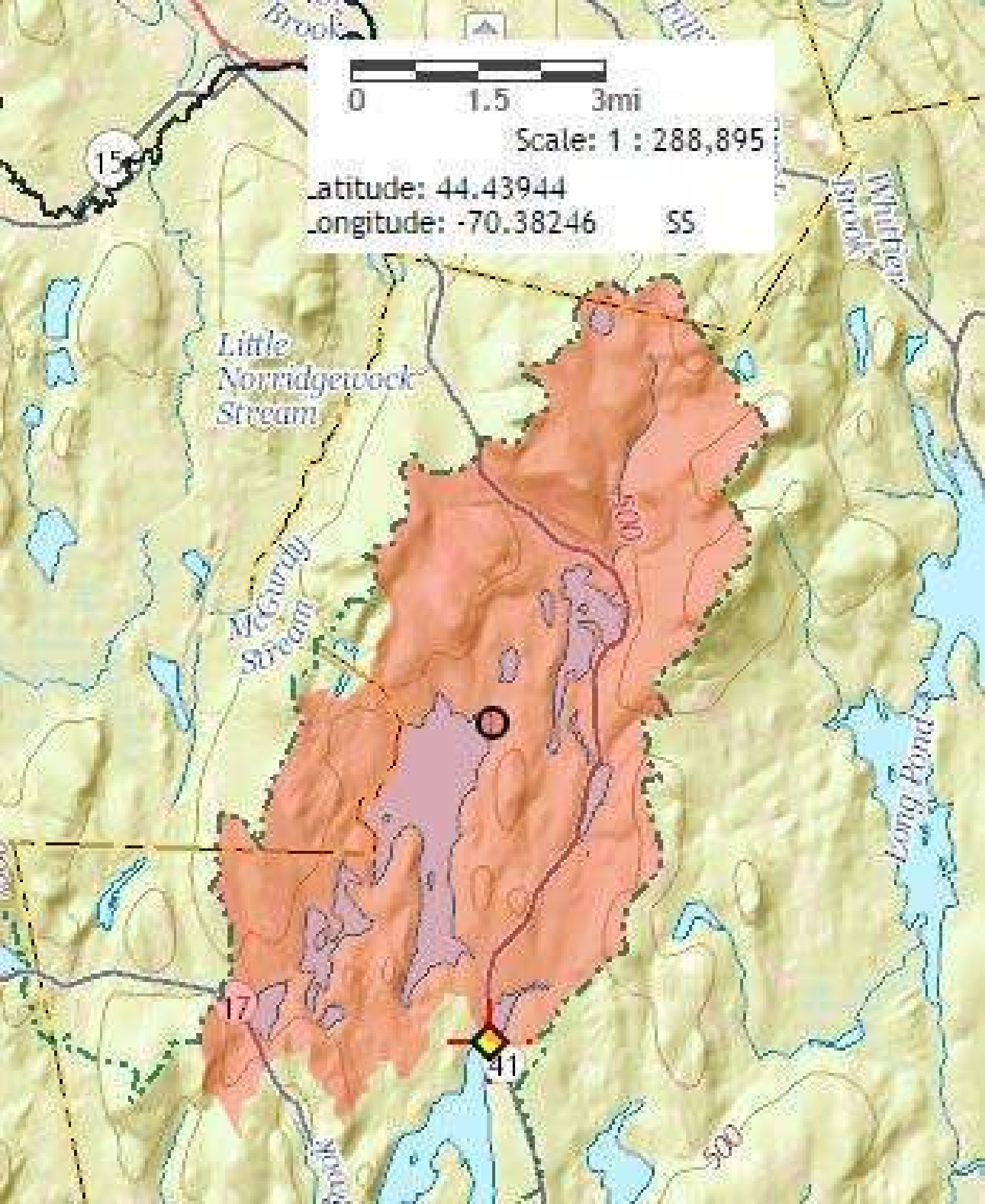
Shape:	Box						
Type:	Box 0 ww		Q_{25}	1366.5			
D or R (ft)	8		Q_{50}	1569.0	trial D / R =	15.6	
w (ft)	*30*	*box width*	Q_{100}	1785.9	trial w: BFW =	49.0	
Slope (ft/ft)	0.02						
A (ft^2)	240.00						
g (ft/s^2)	32.2						

Note: culvert dimensions are for open flow area; adjust for lost capacity due to embedding / backfilling (min {2' / 25% rise} embedment).
This is hydraulic sizing only; check for other requirements.








0 1.5 3mi
Scale: 1 : 288,895
Latitude: 44.43944
Longitude: -70.38246
Little Norridgewock Stream
McGurdy Stream
15
17
41
500

StreamStats Version 3.0

Basin Characteristics Ungaged Site Report

Date: Thurs Jan 5, 2017 4:25:56 PM GMT-5
Study Area: Maine
NAD 1983 Latitude: 44.4527 (44 27 10)
NAD 1983 Longitude: -70.0142 (-70 00 51)

Label	Value	Units	Definition
DRNAREA	35.4	square miles	Area that drains to a point on a stream
STORNWI	17.16	percent	Percentage of storage (combined water bodies and wetlands) from the National Wetlands Inventory
ELEV	553.1	feet	Mean Basin Elevation
PRECIP	44.9	inches	Mean Annual Precipitation
SANDGRAVAP	0	percent	Percentage of land surface underlain by sand and gravel aquifers
COASTDIST	79	miles	Shortest distance from the coastline to the basin centroid
CENTROIDX	419412.51	State plane coordinates	Basin centroid horizontal (x) location in state plane coordinates
CENTROIDY	4928734.03	State plane coordinates	Basin centroid vertical (y) location in state plane units
SANDGRAVAF	0	dimensionless	Fraction of land surface underlain by sand and gravel aquifers
LC11IMP	0.52	percent	Average percentage of impervious area determined from NLCD 2011 impervious dataset
LC11DEV	3.83	percent	Percentage of developed (urban) land from NLCD 2011 classes 21-24
LC06WATER	12.02	percent	Percent of open water, class 11, from NLCD 2006
ELEVMAX	1311.6	feet	Maximum basin elevation
BSLDEM10M	9.44	percent	Mean basin slope computed from 10 m DEM
STATSGOA	2.43	percent	Percentage of area of Hydrologic Soil Type A from STATSGO

APPENDIX D

FEMA Information

TABLE 7 – SUMMARY OF STILLWATER ELEVATIONS – (continued)

FLOODING SOURCE AND LOCATION	ELEVATION (FEET NAVD) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
ECHO LAKE				
Town of Readfield	316.1	316.9	317.1	317.5
GREAT POND				
Entire shoreline within the Town of Belgrade	*	*	248.4	*
Entire shoreline within the Town of Rome	*	*	248.4	*
JIMMY POND				
Town of Litchfield	*	*	177.7	*
LITTLE COBBOSSEECONTEE LAKE				
Town of Winthrop	168.1	169.1	169.6	170.8
LITTLE PURGATORY POND				
Town of Litchfield	*	*	177.7	*
LONG POND				
Entire shoreline within the Town of Belgrade	*	*	241.2	*
Entire shoreline within the Town of Rome	*	*	241.2	*
LOVEJOY POND				
Town of Readfield	303.4	304.1	304.4	305
Entire shoreline within the Town of Wayne	*	*	304.4	*
LOWER TOGUS POND				
Town of Chelsea	198.1	183.5	183.7	184.1

*Data not computed

APPENDIX E

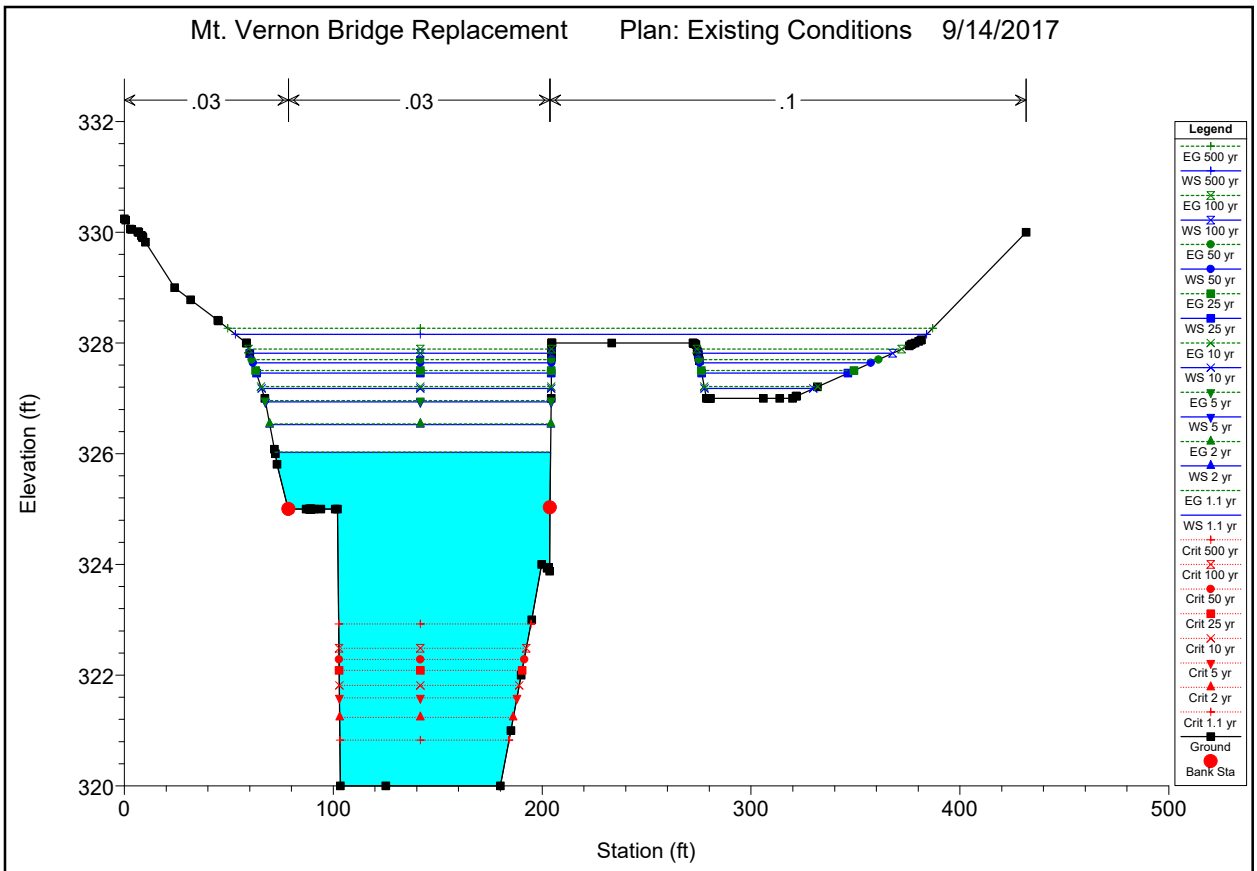
Existing HEC-RAS Analysis

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

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	296.6891	1.1 yr	331.10	320.00	326.03	320.82	326.03	0.000018	0.57	582.12	131.94	0.05
Reach	296.6891	2 yr	612.20	320.00	326.52	321.23	326.54	0.000044	0.95	648.66	134.56	0.07
Reach	296.6891	5 yr	898.00	320.00	326.93	321.59	326.96	0.000073	1.29	704.22	136.72	0.10
Reach	296.6891	10 yr	1101.20	320.00	327.18	321.81	327.21	0.000095	1.51	745.93	190.77	0.11
Reach	296.6891	25 yr	1366.50	320.00	327.45	322.09	327.50	0.000124	1.79	801.52	211.10	0.13
Reach	296.6891	50 yr	1569.00	320.00	327.64	322.29	327.70	0.000148	1.99	842.15	224.83	0.14
Reach	296.6891	100 yr	1785.90	320.00	327.81	322.49	327.89	0.000174	2.19	882.31	237.61	0.15
Reach	296.6891	500 yr	2302.60	320.00	328.15	322.93	328.26	0.000241	2.67	978.17	330.89	0.18
Reach	269		Inl Struct									
Reach	243.1470	1.1 yr	331.10	315.20	318.09	316.52	318.14	0.000381	1.68	197.35	121.96	0.20
Reach	243.1470	2 yr	612.20	315.20	319.11	316.94	319.18	0.000380	2.14	288.97	144.33	0.21
Reach	243.1470	5 yr	898.00	315.20	319.97	317.29	320.06	0.000372	2.47	369.34	157.71	0.21
Reach	243.1470	10 yr	1101.20	315.20	321.02	317.51	321.11	0.000260	2.40	469.37	164.00	0.19
Reach	243.1470	25 yr	1366.50	315.20	321.74	317.79	321.84	0.000257	2.60	538.80	167.33	0.19
Reach	243.1470	50 yr	1569.00	315.20	322.25	317.98	322.37	0.000255	2.74	589.37	169.78	0.19
Reach	243.1470	100 yr	1785.90	315.20	323.88	318.19	323.93	0.000098	1.93	1147.70	178.14	0.12
Reach	243.1470	500 yr	2302.60	315.20	324.71	318.63	324.78	0.000114	2.23	1299.04	188.59	0.13
Reach	234.5943	1.1 yr	331.10	315.00	318.08	316.41	318.13	0.000406	1.82	182.30	122.86	0.20
Reach	234.5943	2 yr	612.20	315.00	319.08	316.87	319.17	0.000439	2.38	261.24	144.47	0.22
Reach	234.5943	5 yr	898.00	315.00	319.94	317.27	320.05	0.000446	2.78	330.46	157.21	0.23
Reach	234.5943	10 yr	1101.20	315.00	320.99	317.52	321.10	0.000318	2.71	417.76	172.91	0.21
Reach	234.5943	25 yr	1366.50	315.00	321.70	317.82	321.83	0.000319	2.95	477.91	179.49	0.21
Reach	234.5943	50 yr	1569.00	315.00	322.22	318.04	322.36	0.000318	3.11	521.80	183.92	0.21
Reach	234.5943	100 yr	1785.90	315.00	323.88	318.27	323.93	0.000090	1.87	1214.13	199.22	0.12
Reach	234.5943	500 yr	2302.60	315.00	324.72	318.76	324.78	0.000105	2.16	1381.70	209.35	0.13
Reach	222.8647	1.1 yr	331.10	315.29	318.05	316.66	318.12	0.000647	2.18	152.86	99.27	0.25
Reach	222.8647	2 yr	612.20	315.29	319.04	317.14	319.16	0.000650	2.78	223.79	104.48	0.27
Reach	222.8647	5 yr	898.00	315.29	319.89	317.55	320.04	0.000639	3.21	285.83	110.22	0.28
Reach	222.8647	10 yr	1101.20	315.29	320.95	317.81	321.09	0.000437	3.10	365.87	117.44	0.24
Reach	222.8647	25 yr	1366.50	315.29	321.66	318.15	321.83	0.000433	3.36	420.35	131.67	0.24
Reach	222.8647	50 yr	1569.00	315.29	322.17	318.37	322.35	0.000429	3.53	460.21	188.07	0.25
Reach	222.8647	100 yr	1785.90	315.29	323.85	318.60	323.92	0.000137	2.30	1011.56	207.04	0.14
Reach	222.8647	500 yr	2302.60	315.29	324.68	319.13	324.78	0.000157	2.63	1185.38	229.03	0.16
Reach	201.4599	1.1 yr	331.10	315.04	317.90	317.08	318.09	0.002102	3.46	95.93	53.69	0.44
Reach	201.4599	2 yr	612.20	315.04	318.84	317.66	319.12	0.001856	4.25	145.46	58.64	0.44
Reach	201.4599	5 yr	898.00	315.04	319.64	318.16	320.00	0.001732	4.84	188.32	61.86	0.45
Reach	201.4599	10 yr	1101.20	315.04	320.75	318.48	321.06	0.001048	4.50	249.61	65.63	0.36
Reach	201.4599	25 yr	1366.50	315.04	321.43	318.85	321.79	0.001021	4.85	287.21	73.40	0.37
Reach	201.4599	50 yr	1569.00	315.04	321.92	319.12	322.31	0.001001	5.09	314.35	85.08	0.37
Reach	201.4599	100 yr	1785.90	315.04	323.59	319.40	323.89	0.000554	4.47	406.87	205.11	0.29
Reach	201.4599	500 yr	2302.60	315.04	324.43	320.01	324.75	0.000538	4.69	759.57	235.59	0.29
Reach	178		Bridge									
Reach	156.0762	1.1 yr	331.10	316.00	317.41	317.32	317.89	0.009929	5.57	59.54	52.05	0.89
Reach	156.0762	2 yr	612.20	316.00	317.89	317.89	318.73	0.011158	7.37	83.37	54.76	1.00
Reach	156.0762	5 yr	898.00	316.00	318.38	318.38	319.46	0.010184	8.36	108.20	57.19	1.00
Reach	156.0762	10 yr	1101.20	316.00	318.69	318.69	319.93	0.009831	8.97	123.81	58.52	1.00
Reach	156.0762	25 yr	1366.50	316.00	319.09	319.09	320.51	0.009167	9.57	144.18	60.13	0.99
Reach	156.0762	50 yr	1569.00	316.00	319.36	319.36	320.92	0.008946	10.04	157.94	62.96	1.00
Reach	156.0762	100 yr	1785.90	316.00	319.64	319.64	321.35	0.008707	10.49	172.23	65.51	1.00
Reach	156.0762	500 yr	2302.60	316.00	320.28	320.28	322.29	0.008212	11.41	204.43	72.79	1.00
Reach	135.1468	1.1 yr	331.10	316.00	317.29	317.09	317.65	0.007277	4.83	68.51	55.29	0.77
Reach	135.1468	2 yr	612.20	316.00	317.71	317.62	318.40	0.009501	6.66	91.97	56.57	0.92
Reach	135.1468	5 yr	898.00	316.00	318.06	318.06	319.07	0.010718	8.05	112.04	58.14	1.00
Reach	135.1468	10 yr	1101.20	316.00	318.37	318.37	319.50	0.009992	8.55	130.40	61.54	0.99
Reach	135.1468	25 yr	1366.50	316.00	318.72	318.72	320.03	0.009500	9.18	152.53	65.53	0.99
Reach	135.1468	50 yr	1569.00	316.00	318.97	318.97	320.41	0.009264	9.62	168.21	69.28	0.99
Reach	135.1468	100 yr	1785.90	316.00	319.25	319.25	320.79	0.008871	9.99	185.55	73.77	0.99
Reach	135.1468	500 yr	2302.60	316.00	319.82	319.82	321.64	0.008420	10.88	222.73	84.20	0.99
Reach	120.2832	1.1 yr	331.10	315.80	317.00	317.00	317.50	0.013381	5.66	58.46	59.06	1.00
Reach	120.2832	2 yr	612.20	315.80	317.52	317.52	318.24	0.011641	6.81	89.89	61.89	1.00
Reach	120.2832	5 yr	898.00	315.80	317.94	317.94	318.87	0.010740	7.74	116.40	63.91	1.00
Reach	120.2832	10 yr	1101.20	315.80	318.21	318.21	319.27	0.010266	8.28	134.17	67.58	1.00
Reach	120.2832	25 yr	1366.50	315.80	318.55	318.55	319.76	0.009575	8.83	158.13	73.14	0.99
Reach	120.2832	50 yr	1569.00	315.80	318.80	318.80	320.12	0.009249	9.23	175.11	77.01	0.99
Reach	120.2832	100 yr	1785.90	315.80	319.03	319.03	320.47	0.009022	9.65	192.19	80.93	0.99
Reach	120.2832	500 yr	2302.60	315.80	319.57	319.57	321.27	0.008558	10.50	231.23	90.87	0.99

HEC-RAS Plan: Existing River: Stream Reach: Reach (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	110.5870	1.1 yr	331.10	315.09	316.88	316.40	317.09	0.003657	3.68	90.04	65.86	0.55
Reach	110.5870	2 yr	612.20	315.09	317.44	316.90	317.79	0.004158	4.78	128.02	69.35	0.62
Reach	110.5870	5 yr	898.00	315.09	317.88	317.32	318.37	0.004423	5.66	158.90	71.68	0.66
Reach	110.5870	10 yr	1101.20	315.09	318.15	317.58	318.74	0.004556	6.20	178.79	75.19	0.69
Reach	110.5870	25 yr	1366.50	315.09	318.47	317.89	319.19	0.004693	6.81	204.20	81.46	0.71
Reach	110.5870	50 yr	1569.00	315.09	318.70	318.11	319.51	0.004767	7.23	223.13	85.98	0.72
Reach	110.5870	100 yr	1785.90	315.09	318.94	318.34	319.84	0.004830	7.64	242.49	90.60	0.74
Reach	110.5870	500 yr	2302.60	315.09	319.46	318.86	320.57	0.004920	8.49	286.21	100.93	0.76
Reach	84.4051	1.1 yr	331.10	315.00	316.85	316.22	316.99	0.002394	3.03	109.13	77.68	0.45
Reach	84.4051	2 yr	612.20	315.00	317.43	316.68	317.67	0.002593	3.94	156.09	82.56	0.50
Reach	84.4051	5 yr	898.00	315.00	317.90	317.06	318.24	0.002733	4.66	195.38	86.22	0.53
Reach	84.4051	10 yr	1101.20	315.00	318.19	317.30	318.59	0.002802	5.09	221.26	91.05	0.54
Reach	84.4051	25 yr	1366.50	315.00	318.54	317.56	319.03	0.002860	5.58	254.69	98.54	0.56
Reach	84.4051	50 yr	1569.00	315.00	318.80	317.77	319.34	0.002887	5.91	280.18	103.90	0.57
Reach	84.4051	100 yr	1785.90	315.00	319.05	317.98	319.65	0.002902	6.23	307.58	109.36	0.58
Reach	84.4051	500 yr	2302.60	315.00	319.63	318.46	320.35	0.002885	6.86	370.98	121.60	0.59
Reach	63.5432	1.1 yr	331.10	315.00	316.81	316.13	316.94	0.002154	2.85	116.28	84.15	0.43
Reach	63.5432	2 yr	612.20	315.00	317.40	316.59	317.61	0.002287	3.65	168.37	90.56	0.46
Reach	63.5432	5 yr	898.00	315.00	317.88	316.95	318.17	0.002336	4.27	212.66	94.71	0.49
Reach	63.5432	10 yr	1101.20	315.00	318.18	317.19	318.52	0.002359	4.65	241.87	99.71	0.50
Reach	63.5432	25 yr	1366.50	315.00	318.55	317.46	318.95	0.002373	5.07	279.52	107.34	0.51
Reach	63.5432	50 yr	1569.00	315.00	318.81	317.65	319.25	0.002373	5.36	308.17	112.81	0.52
Reach	63.5432	100 yr	1785.90	315.00	319.07	317.84	319.56	0.002367	5.63	338.88	118.38	0.52
Reach	63.5432	500 yr	2302.60	315.00	319.67	318.28	320.26	0.002326	6.19	413.09	130.86	0.53
Reach	41.0263	1.1 yr	331.10	315.00	316.74	316.10	316.88	0.002378	3.00	110.29	79.42	0.45
Reach	41.0263	2 yr	612.20	315.00	317.32	316.57	317.55	0.002750	3.88	157.94	86.36	0.51
Reach	41.0263	5 yr	898.00	315.00	317.79	316.95	318.10	0.002778	4.51	199.67	90.63	0.53
Reach	41.0263	10 yr	1101.20	315.00	318.09	317.20	318.46	0.002770	4.89	227.14	94.54	0.54
Reach	41.0263	25 yr	1366.50	315.00	318.45	317.47	318.88	0.002755	5.32	262.64	103.27	0.55
Reach	41.0263	50 yr	1569.00	315.00	318.70	317.66	319.19	0.002732	5.60	290.17	109.56	0.55
Reach	41.0263	100 yr	1785.90	315.00	318.97	317.87	319.50	0.002704	5.88	320.01	115.98	0.56
Reach	41.0263	500 yr	2302.60	315.00	319.56	318.31	320.20	0.002613	6.42	393.75	131.74	0.56
Reach	7.6141	1.1 yr	331.10	315.00	316.26	316.26	316.70	0.013811	5.30	62.43	71.69	1.00
Reach	7.6141	2 yr	612.20	315.00	316.71	316.71	317.34	0.011980	6.36	96.48	76.63	0.99
Reach	7.6141	5 yr	898.00	315.00	317.09	317.09	317.89	0.011165	7.20	125.43	78.74	1.00
Reach	7.6141	10 yr	1101.20	315.00	317.32	317.32	318.24	0.010796	7.69	144.20	80.02	1.00
Reach	7.6141	25 yr	1366.50	315.00	317.62	317.62	318.66	0.010209	8.21	167.98	81.61	1.00
Reach	7.6141	50 yr	1569.00	315.00	317.82	317.82	318.97	0.009923	8.60	184.52	82.69	1.00
Reach	7.6141	100 yr	1785.90	315.00	318.03	318.03	319.28	0.009588	8.96	202.14	83.87	1.00
Reach	7.6141	500 yr	2302.60	315.00	318.50	318.50	319.97	0.008993	9.73	242.28	86.93	0.99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Elevation (ft)
Station (ft)
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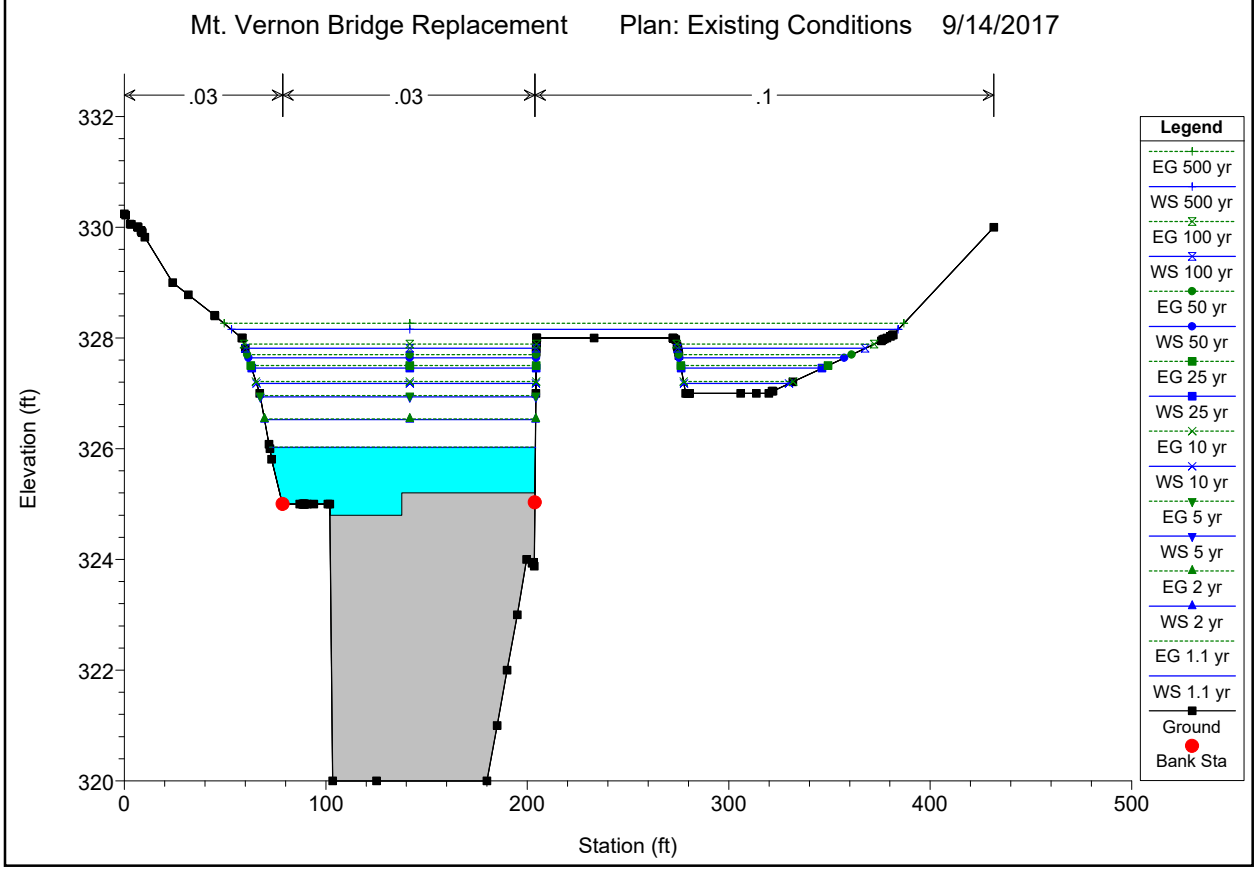
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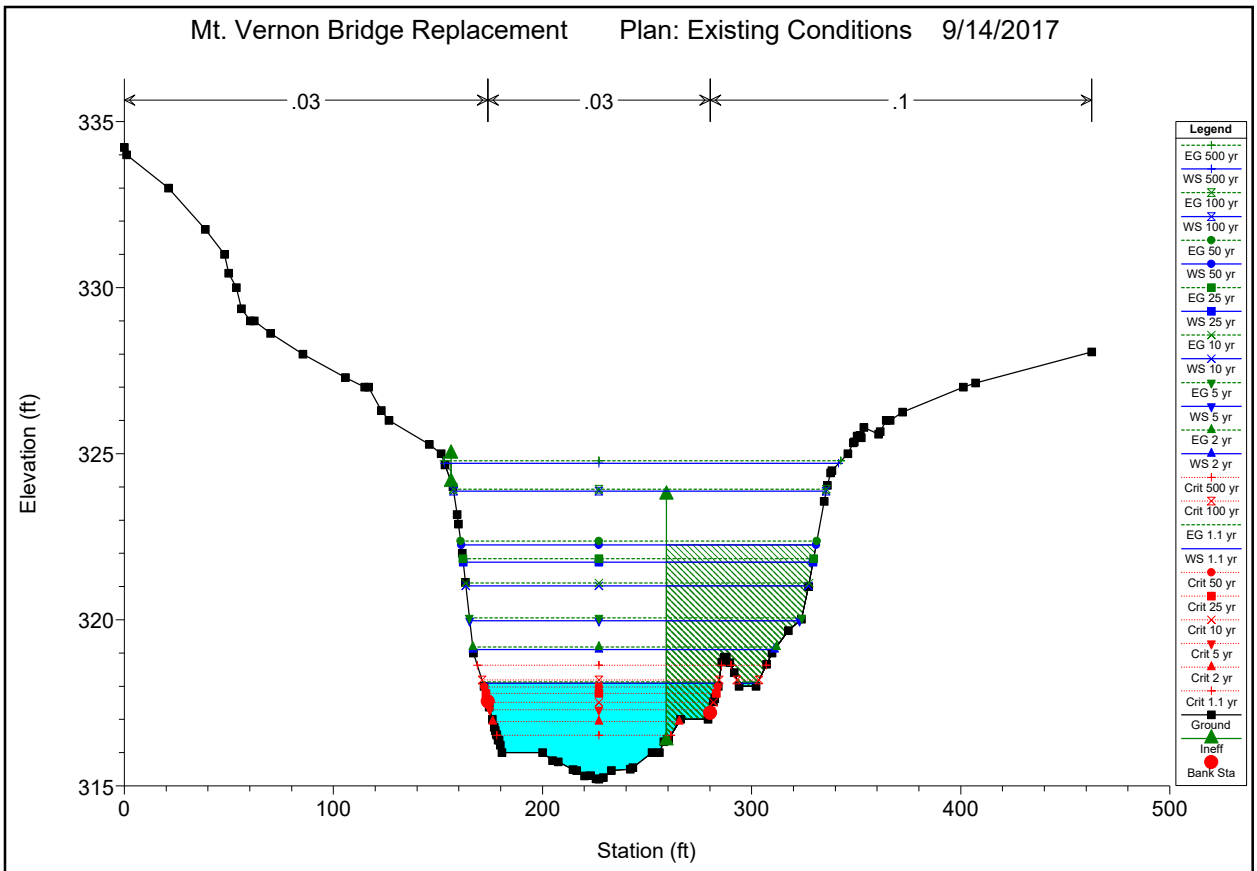
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Ground
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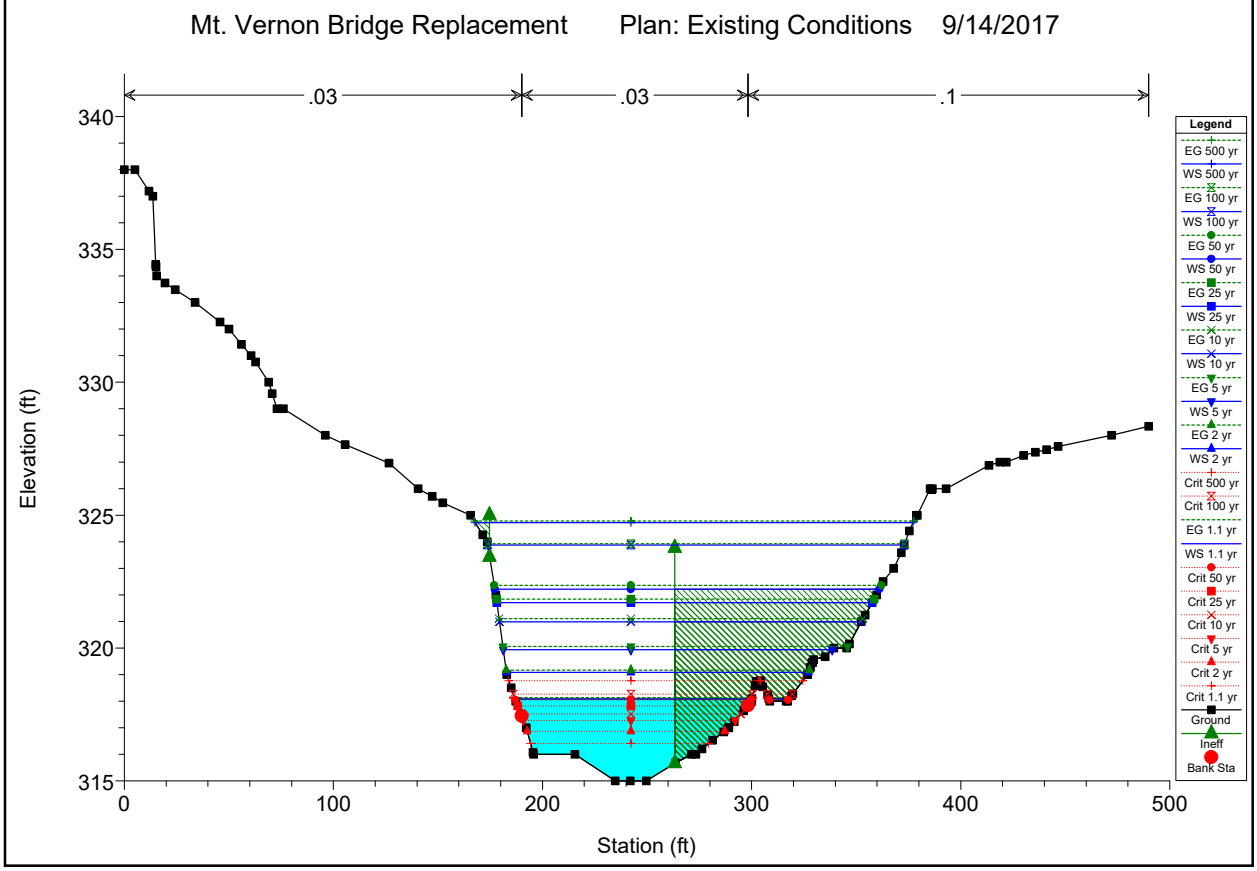
Bank Sta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Elevation (ft)
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Station (ft)
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EG 2 yr
WS 2 yr
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Ground
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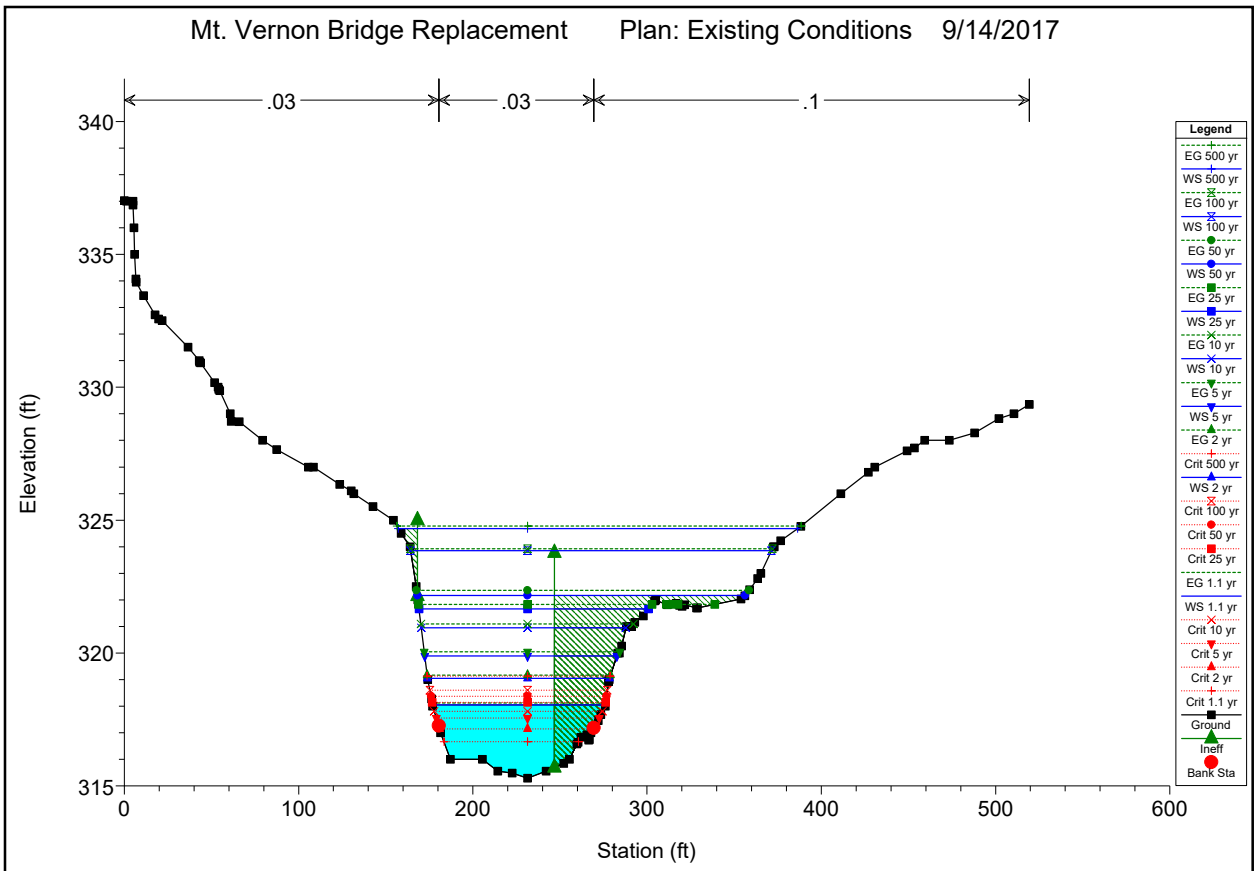
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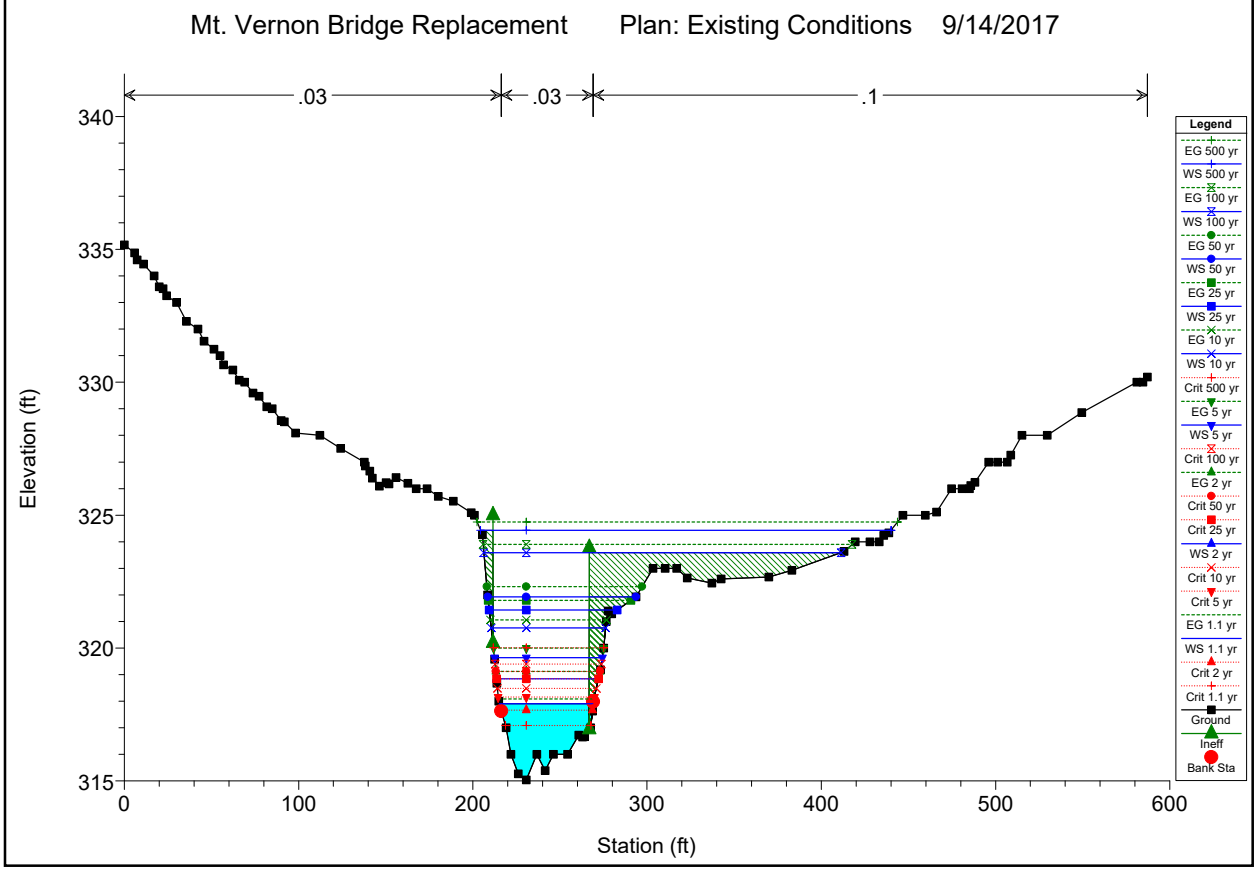
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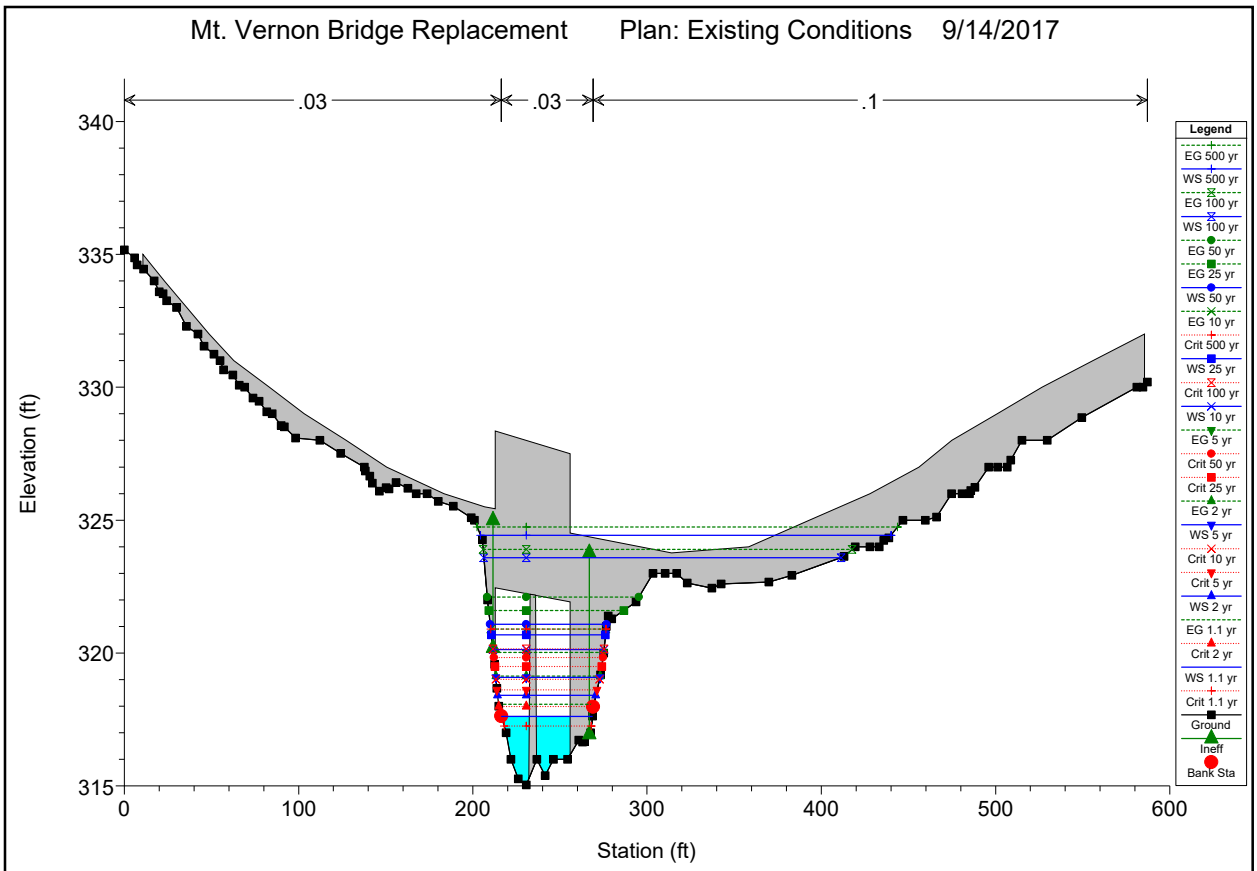
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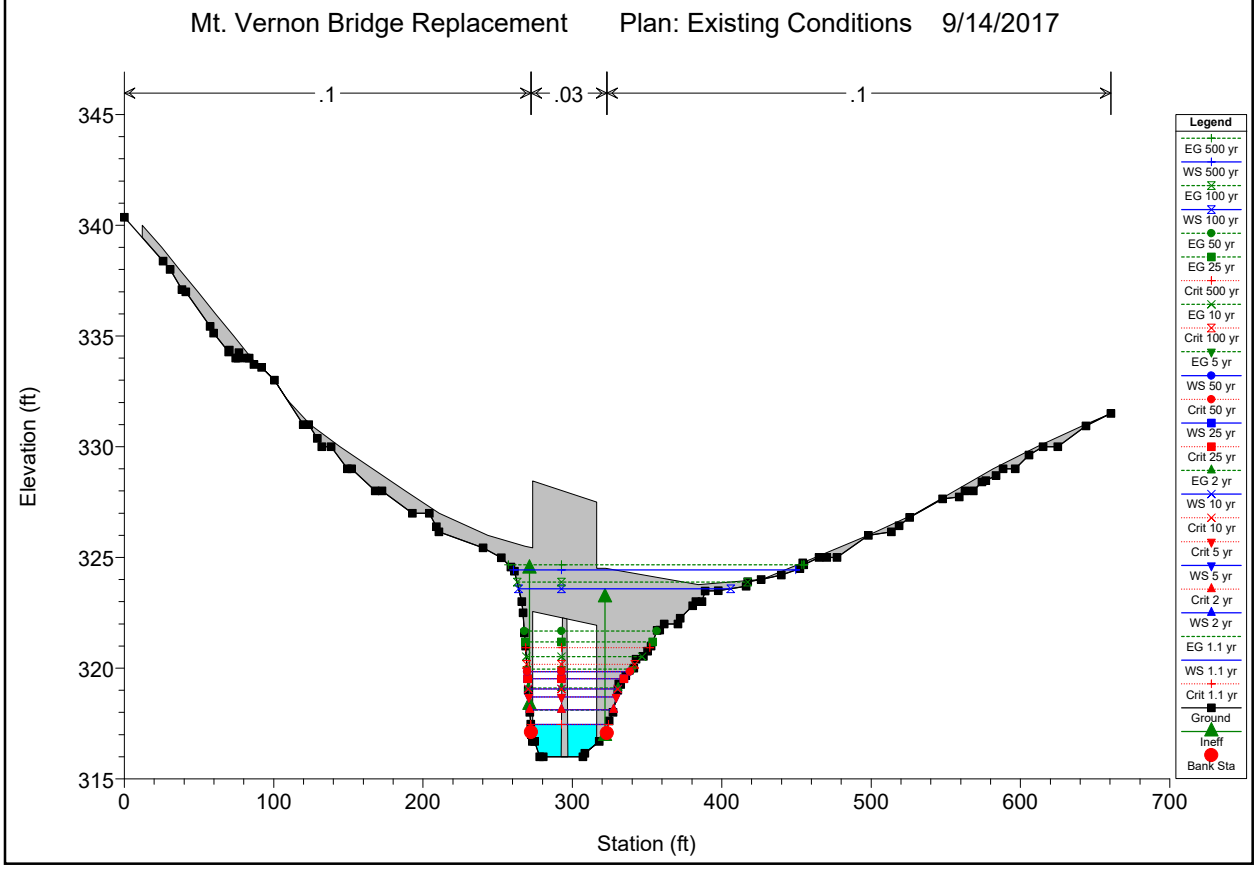
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EG 2 yr
WS 10 yr
Crit 10 yr
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WS 2 yr
EG 1.1 yr
WS 1.1 yr
Crit 1.1 yr
Ground
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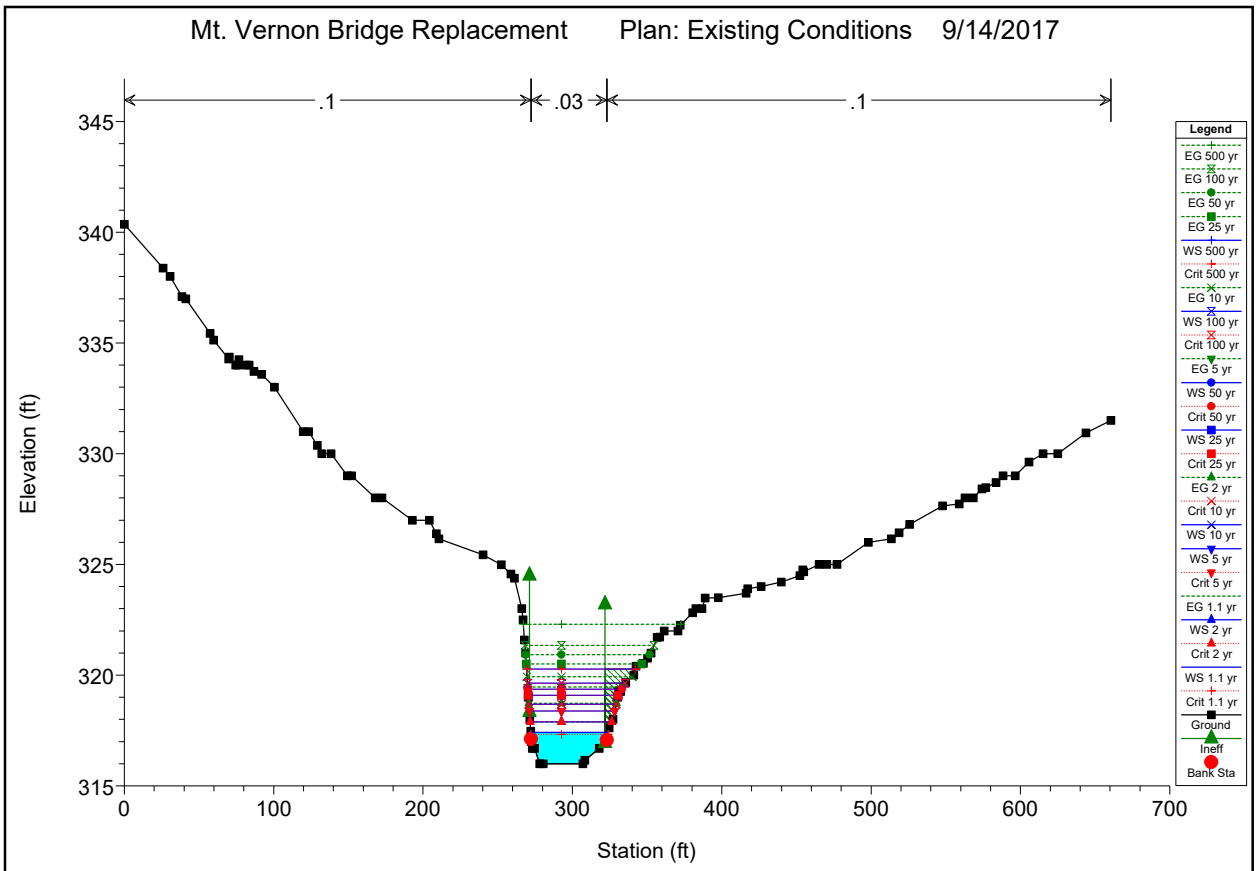
Bank Sta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Elevation (ft)
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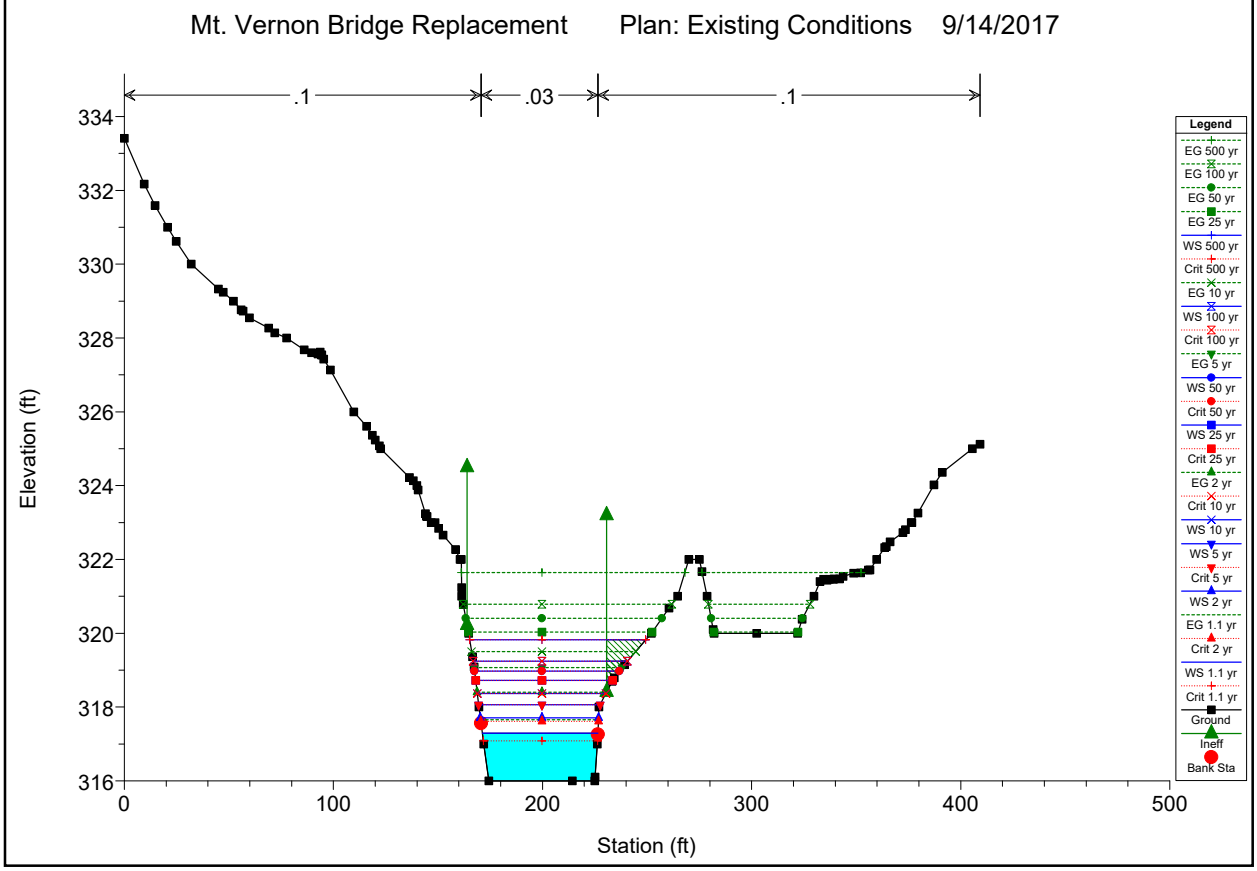
EG 1.1 yr
WS 2 yr
Crit 2 yr
WS 1.1 yr
Crit 1.1 yr
Ground
Ineff
Bank Sta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Elevation (ft)
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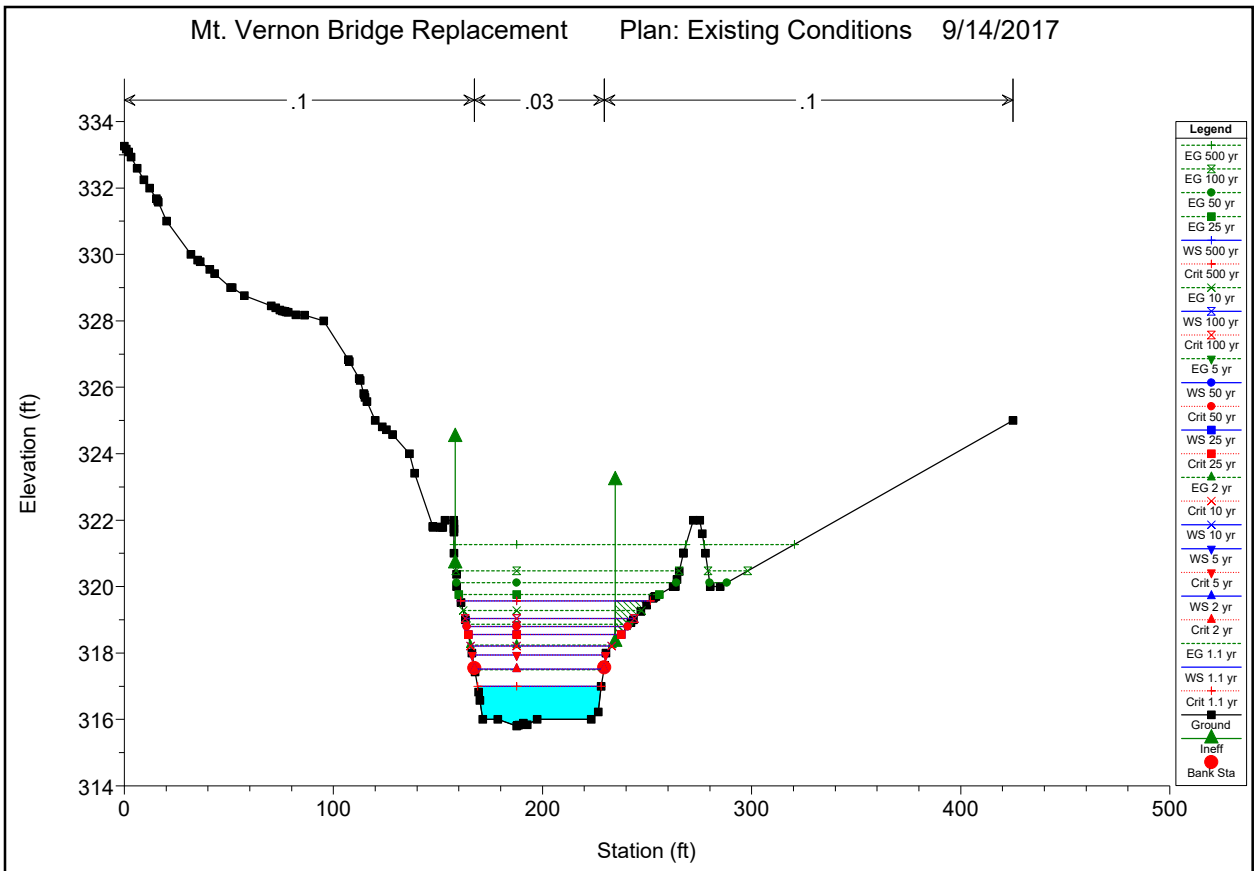
Bank Sta


Mt. Vernon Bridge Replacement Plan: Existing Conditions 9/14/2017
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Elevation (ft)
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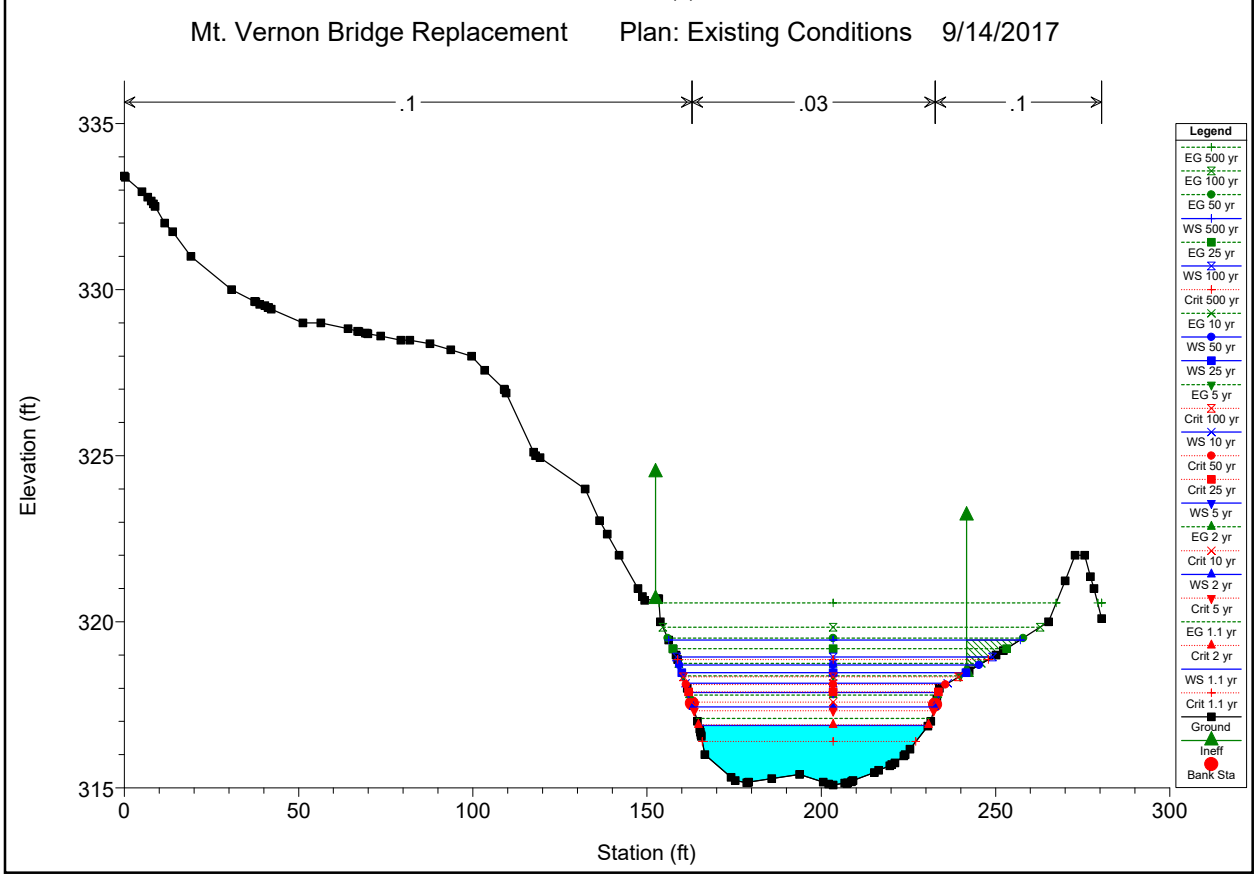
Mt. Vernon Bridge Replacement Plan: Existing Conditions 9/14/2017
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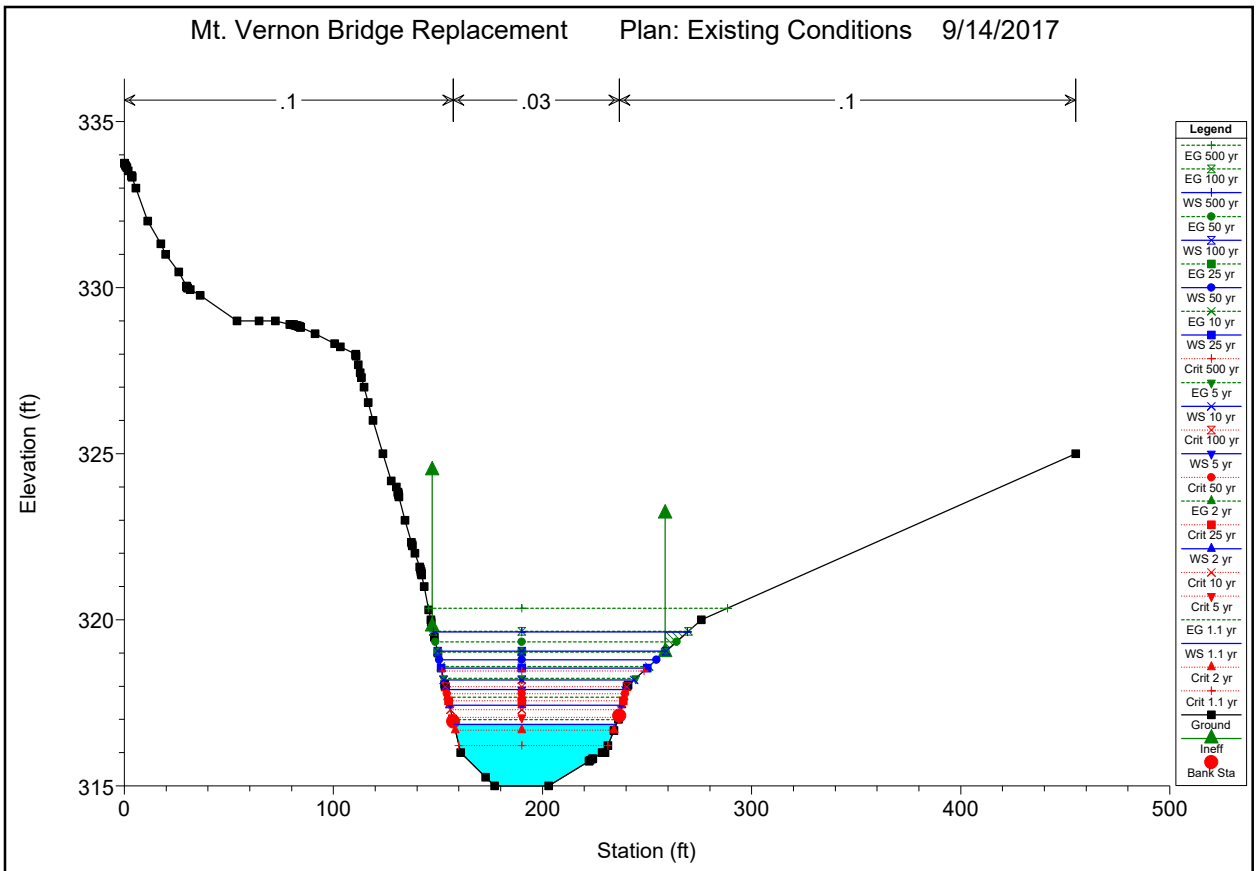
Mt. Vernon Bridge Replacement Plan: Existing Conditions 9/14/2017
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Elevation (ft)
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EG 50 yr
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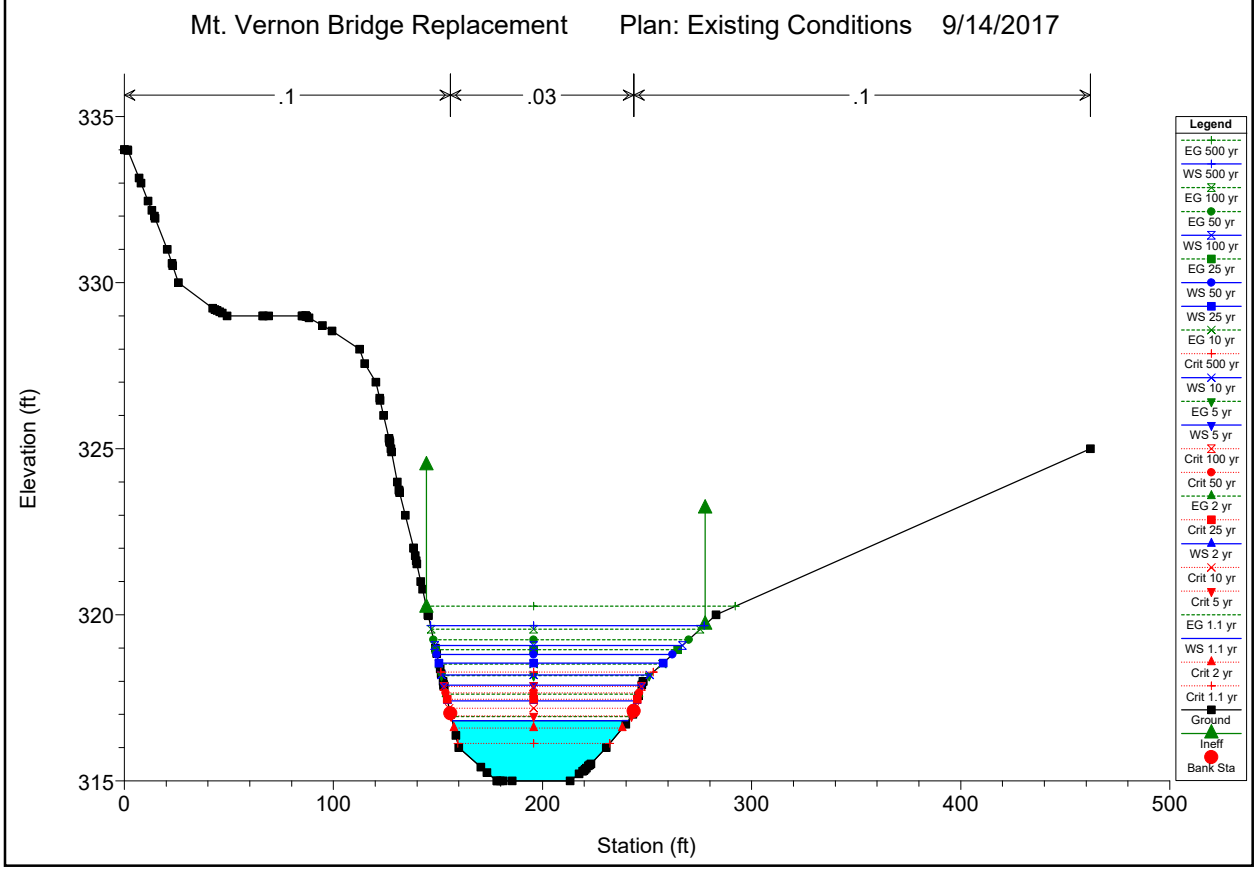
Bank Sta


Mt. Vernon Bridge Replacement Plan: Existing Conditions 9/14/2017
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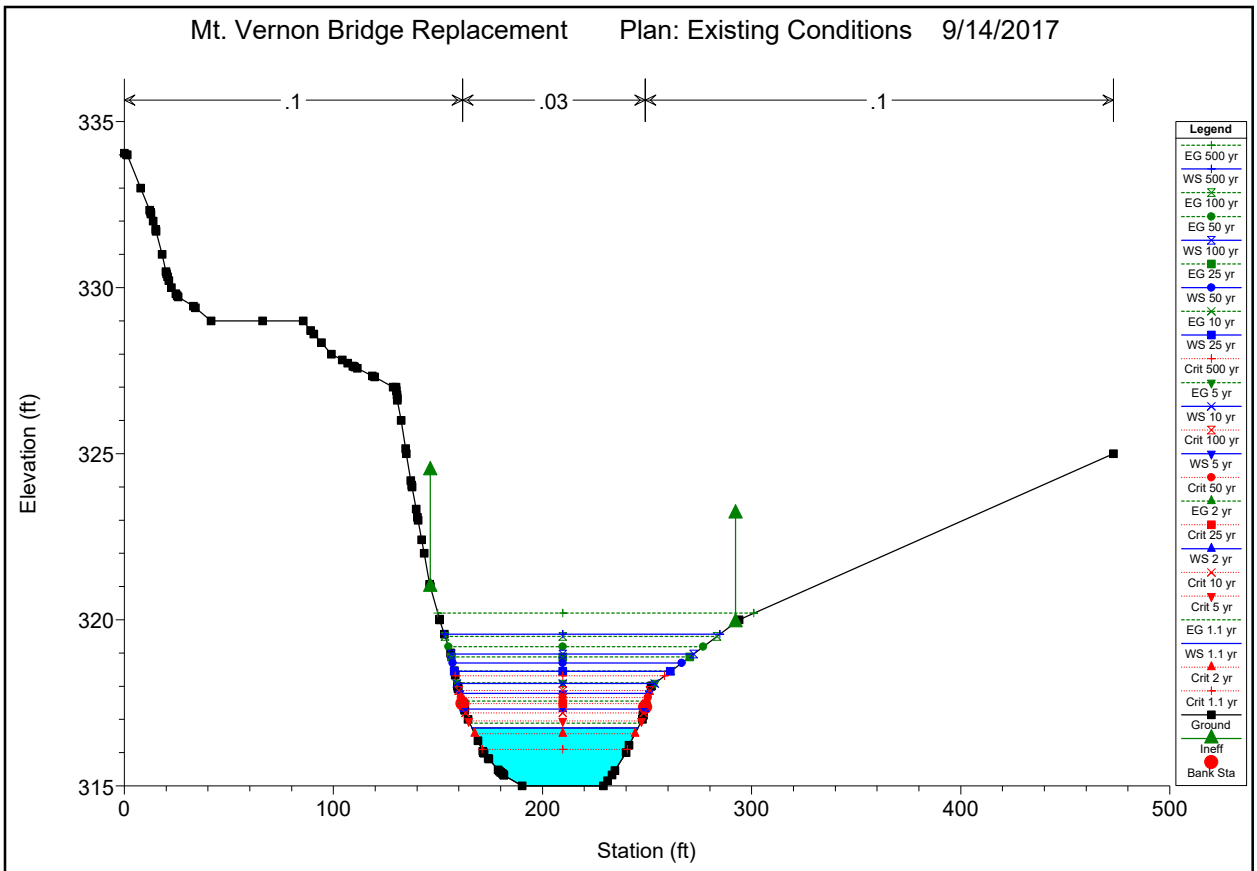
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Station (ft)
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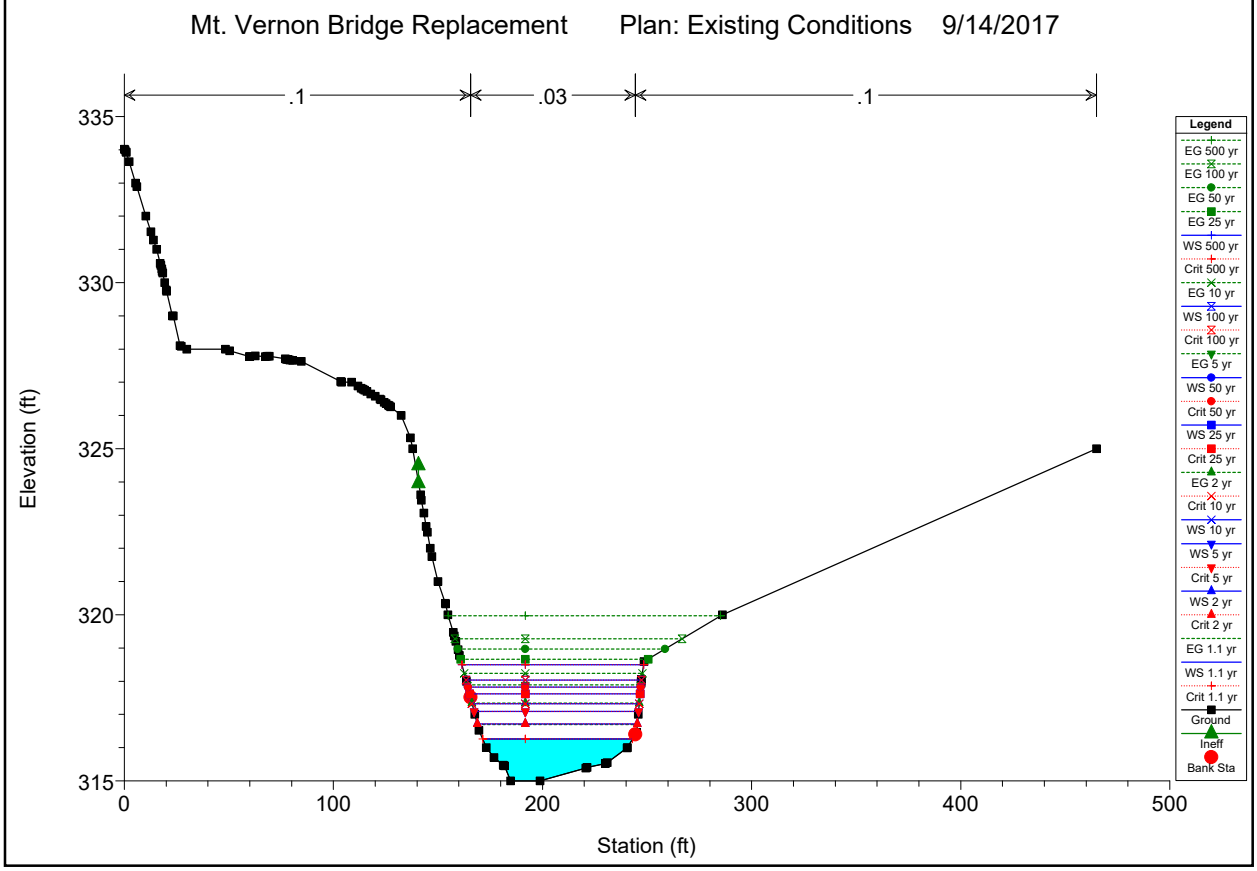
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Elevation (ft)
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Station (ft)
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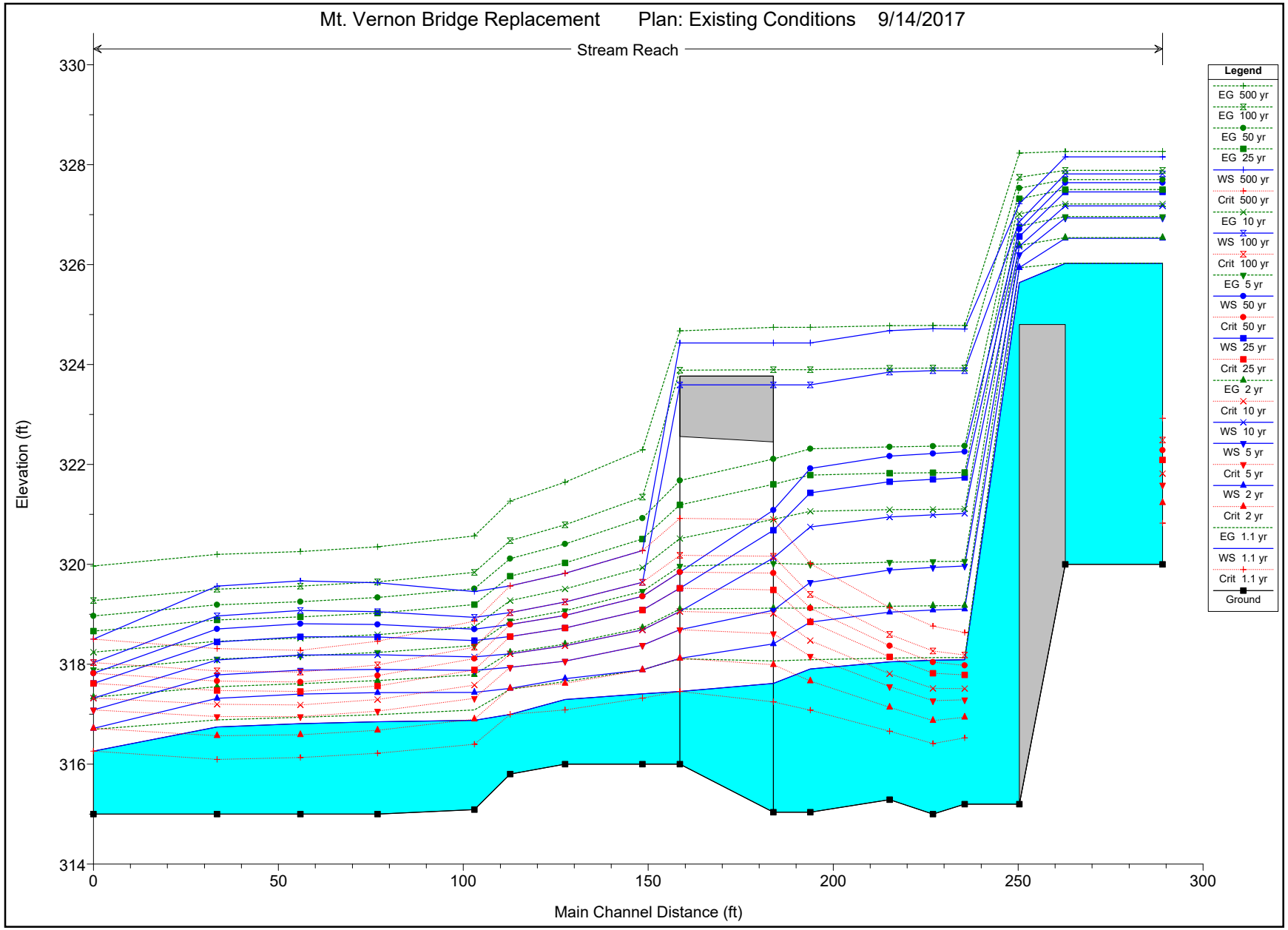
Mt. Vernon Bridge Replacement
Plan: Existing Conditions
9/14/2017
Stream Reach
Elevation (ft)
Main Channel Distance (ft)
330
328
326
324
322
320
318
316
314
0
50
100
150
200
250
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Legend
EG 500 yr
EG 100 yr
EG 50 yr
EG 25 yr
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WS 5 yr
Crit 5 yr
WS 2 yr
Crit 2 yr
EG 1.1 yr
WS 1.1 yr
Crit 1.1 yr
Ground

APPENDIX F

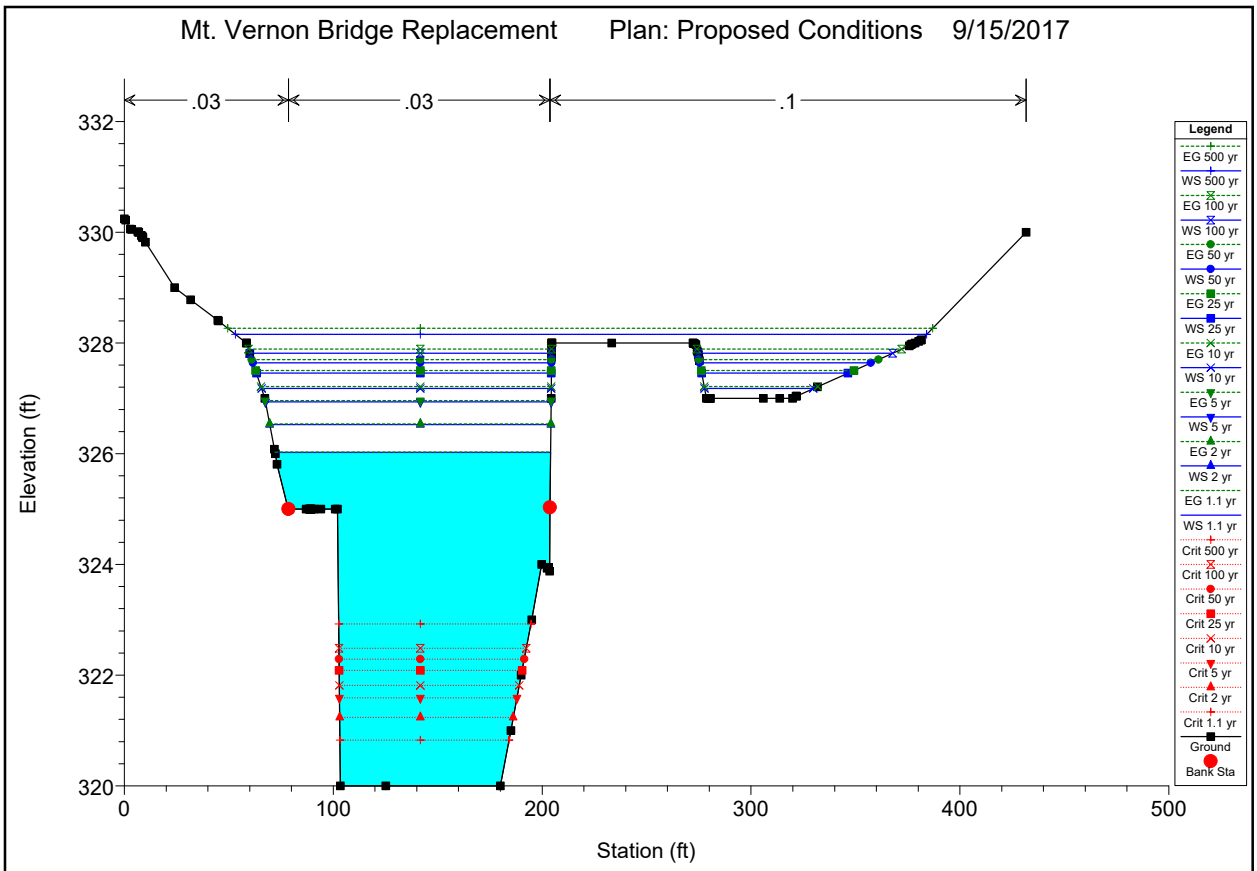
Proposed HEC-RAS Analysis

HEC-RAS Plan: Proposed Structure River: Stream Reach: Reach

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	296.6891	1.1 yr	331.10	320.00	326.03	320.82	326.03	0.000018	0.57	582.12	131.94	0.05
Reach	296.6891	2 yr	612.20	320.00	326.52	321.24	326.54	0.000044	0.95	648.66	134.56	0.07
Reach	296.6891	5 yr	898.00	320.00	326.93	321.59	326.96	0.000073	1.29	704.22	136.72	0.10
Reach	296.6891	10 yr	1101.20	320.00	327.18	321.81	327.21	0.000095	1.51	745.93	190.77	0.11
Reach	296.6891	25 yr	1366.50	320.00	327.45	322.09	327.50	0.000124	1.79	801.52	211.10	0.13
Reach	296.6891	50 yr	1569.00	320.00	327.64	322.29	327.70	0.000148	1.99	842.15	224.83	0.14
Reach	296.6891	100 yr	1785.90	320.00	327.81	322.49	327.89	0.000174	2.19	882.31	237.61	0.15
Reach	296.6891	500 yr	2302.60	320.00	328.15	322.93	328.26	0.000241	2.67	978.17	330.89	0.18
Reach	269		Inl Struct									
Reach	243.1470	1.1 yr	331.10	315.20	318.13	316.52	318.18	0.000358	1.65	201.03	122.83	0.19
Reach	243.1470	2 yr	612.20	315.20	319.01	316.94	319.08	0.000421	2.21	279.97	143.03	0.22
Reach	243.1470	5 yr	898.00	315.20	319.74	317.29	319.84	0.000452	2.63	347.64	153.13	0.23
Reach	243.1470	10 yr	1101.20	315.20	320.20	317.51	320.33	0.000464	2.87	391.57	159.73	0.24
Reach	243.1470	25 yr	1366.50	315.20	320.77	317.79	320.92	0.000474	3.14	445.26	162.69	0.25
Reach	243.1470	50 yr	1569.00	315.20	321.17	317.98	321.34	0.000478	3.32	484.06	164.72	0.25
Reach	243.1470	100 yr	1785.90	315.20	321.58	318.19	321.77	0.000482	3.50	523.53	166.60	0.26
Reach	243.1470	500 yr	2302.60	315.20	322.47	318.63	322.69	0.000491	3.88	610.11	170.81	0.27
Reach	234.5943	1.1 yr	331.10	315.00	318.12	316.41	318.17	0.000384	1.79	185.53	123.76	0.20
Reach	234.5943	2 yr	612.20	315.00	318.99	316.87	319.08	0.000484	2.45	253.30	143.74	0.23
Reach	234.5943	5 yr	898.00	315.00	319.70	317.27	319.83	0.000540	2.94	311.26	153.86	0.26
Reach	234.5943	10 yr	1101.20	315.00	320.16	317.52	320.32	0.000564	3.23	348.89	166.05	0.27
Reach	234.5943	25 yr	1366.50	315.00	320.72	317.82	320.91	0.000585	3.55	394.90	170.65	0.28
Reach	234.5943	50 yr	1569.00	315.00	321.11	318.04	321.33	0.000596	3.77	428.16	174.11	0.28
Reach	234.5943	100 yr	1785.90	315.00	321.52	318.27	321.76	0.000606	3.98	462.01	177.81	0.29
Reach	234.5943	500 yr	2302.60	315.00	322.38	318.76	322.68	0.000629	4.44	536.26	185.29	0.30
Reach	222.8647	1.1 yr	331.10	315.29	318.09	316.66	318.16	0.000607	2.14	155.93	99.45	0.25
Reach	222.8647	2 yr	612.20	315.29	318.94	317.14	319.07	0.000724	2.87	216.30	103.60	0.28
Reach	222.8647	5 yr	898.00	315.29	319.64	317.55	319.82	0.000787	3.42	267.73	108.56	0.31
Reach	222.8647	10 yr	1101.20	315.29	320.09	317.81	320.31	0.000812	3.74	301.20	112.53	0.32
Reach	222.8647	25 yr	1366.50	315.29	320.64	318.15	320.89	0.000833	4.10	342.21	115.72	0.33
Reach	222.8647	50 yr	1569.00	315.29	321.03	318.37	321.31	0.000842	4.34	371.91	121.13	0.33
Reach	222.8647	100 yr	1785.90	315.29	321.42	318.60	321.74	0.000851	4.58	402.16	128.48	0.34
Reach	222.8647	500 yr	2302.60	315.29	322.27	319.13	322.66	0.000871	5.09	468.58	189.63	0.35
Reach	201.4599	1.1 yr	331.10	315.04	317.97	317.06	318.13	0.001834	3.26	101.85	54.04	0.41
Reach	201.4599	2 yr	612.20	315.04	318.74	317.64	319.03	0.002016	4.28	145.36	58.15	0.46
Reach	201.4599	5 yr	898.00	315.04	319.38	318.14	319.77	0.002119	5.05	183.32	60.95	0.49
Reach	201.4599	10 yr	1101.20	315.04	319.79	318.44	320.25	0.002152	5.49	208.48	62.43	0.50
Reach	201.4599	25 yr	1366.50	315.04	320.28	318.81	320.83	0.002168	5.99	239.88	64.14	0.51
Reach	201.4599	50 yr	1569.00	315.04	320.64	319.08	321.25	0.002169	6.32	262.92	65.28	0.52
Reach	201.4599	100 yr	1785.90	315.04	321.00	319.36	321.67	0.002171	6.65	286.52	66.42	0.53
Reach	201.4599	500 yr	2302.60	315.04	321.76	319.95	322.58	0.002203	7.37	340.34	81.37	0.54
Reach	178		Bridge									
Reach	156.0762	1.1 yr	331.10	316.00	317.42	317.32	317.88	0.009794	5.49	60.56	52.07	0.89
Reach	156.0762	2 yr	612.20	316.00	317.88	317.88	318.70	0.011117	7.28	85.30	54.72	1.00
Reach	156.0762	5 yr	898.00	316.00	318.37	318.37	319.42	0.010014	8.22	112.77	57.16	0.99
Reach	156.0762	10 yr	1101.20	316.00	318.68	318.68	319.87	0.009595	8.80	130.54	58.48	0.99
Reach	156.0762	25 yr	1366.50	316.00	319.05	319.05	320.43	0.009151	9.44	152.74	60.03	0.99
Reach	156.0762	50 yr	1569.00	316.00	319.33	319.33	320.83	0.008812	9.86	169.59	62.70	0.99
Reach	156.0762	100 yr	1785.90	316.00	319.60	319.60	321.23	0.008575	10.30	187.12	65.17	0.99
Reach	156.0762	500 yr	2302.60	316.00	320.25	320.25	322.12	0.007875	11.08	230.63	72.64	0.97
Reach	135.1468	1.1 yr	331.10	316.00	317.29	317.09	317.65	0.007277	4.83	68.51	55.29	0.77
Reach	135.1468	2 yr	612.20	316.00	317.71	317.62	318.40	0.009501	6.66	91.97	56.57	0.92
Reach	135.1468	5 yr	898.00	316.00	318.06	318.06	319.07	0.010718	8.05	112.04	58.14	1.00
Reach	135.1468	10 yr	1101.20	316.00	318.37	318.37	319.50	0.009992	8.55	130.40	61.54	0.99
Reach	135.1468	25 yr	1366.50	316.00	318.72	318.72	320.03	0.009500	9.18	152.53	65.53	0.99
Reach	135.1468	50 yr	1569.00	316.00	318.97	318.97	320.41	0.009264	9.62	168.21	69.28	0.99
Reach	135.1468	100 yr	1785.90	316.00	319.25	319.25	320.79	0.008871	9.99	185.55	73.77	0.99
Reach	135.1468	500 yr	2302.60	316.00	319.82	319.82	321.64	0.008420	10.88	222.73	84.20	0.99
Reach	120.2832	1.1 yr	331.10	315.80	317.00	317.00	317.50	0.013381	5.66	58.46	59.06	1.00
Reach	120.2832	2 yr	612.20	315.80	317.52	317.52	318.24	0.011641	6.81	89.89	61.89	1.00
Reach	120.2832	5 yr	898.00	315.80	317.94	317.94	318.87	0.010740	7.74	116.40	63.91	1.00
Reach	120.2832	10 yr	1101.20	315.80	318.21	318.21	319.27	0.010266	8.28	134.17	67.58	1.00
Reach	120.2832	25 yr	1366.50	315.80	318.55	318.55	319.76	0.009575	8.83	158.13	73.14	0.99
Reach	120.2832	50 yr	1569.00	315.80	318.80	318.80	320.12	0.009249	9.23	175.11	77.01	0.99
Reach	120.2832	100 yr	1785.90	315.80	319.03	319.03	320.47	0.009022	9.65	192.19	80.93	0.99
Reach	120.2832	500 yr	2302.60	315.80	319.57	319.57	321.27	0.008558	10.50	231.23	90.87	0.99

HEC-RAS Plan: Proposed Structure River: Stream Reach: Reach (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	110.5870	1.1 yr	331.10	315.09	316.88	316.40	317.09	0.003657	3.68	90.04	65.86	0.55
Reach	110.5870	2 yr	612.20	315.09	317.44	316.90	317.79	0.004158	4.78	128.02	69.35	0.62
Reach	110.5870	5 yr	898.00	315.09	317.88	317.32	318.37	0.004423	5.66	158.90	71.68	0.66
Reach	110.5870	10 yr	1101.20	315.09	318.15	317.58	318.74	0.004556	6.20	178.79	75.19	0.69
Reach	110.5870	25 yr	1366.50	315.09	318.47	317.89	319.19	0.004693	6.81	204.20	81.46	0.71
Reach	110.5870	50 yr	1569.00	315.09	318.70	318.11	319.51	0.004767	7.23	223.13	85.98	0.72
Reach	110.5870	100 yr	1785.90	315.09	318.94	318.34	319.84	0.004830	7.64	242.49	90.60	0.74
Reach	110.5870	500 yr	2302.60	315.09	319.46	318.86	320.57	0.004920	8.49	286.21	100.93	0.76
Reach	84.4051	1.1 yr	331.10	315.00	316.85	316.22	316.99	0.002394	3.03	109.13	77.68	0.45
Reach	84.4051	2 yr	612.20	315.00	317.43	316.68	317.67	0.002593	3.94	156.09	82.56	0.50
Reach	84.4051	5 yr	898.00	315.00	317.90	317.06	318.24	0.002733	4.66	195.38	86.22	0.53
Reach	84.4051	10 yr	1101.20	315.00	318.19	317.30	318.59	0.002802	5.09	221.26	91.05	0.54
Reach	84.4051	25 yr	1366.50	315.00	318.54	317.56	319.03	0.002860	5.58	254.69	98.54	0.56
Reach	84.4051	50 yr	1569.00	315.00	318.80	317.77	319.34	0.002887	5.91	280.18	103.90	0.57
Reach	84.4051	100 yr	1785.90	315.00	319.05	317.98	319.65	0.002902	6.23	307.58	109.36	0.58
Reach	84.4051	500 yr	2302.60	315.00	319.63	318.46	320.35	0.002885	6.86	370.99	121.60	0.59
Reach	63.5432	1.1 yr	331.10	315.00	316.81	316.13	316.94	0.002154	2.85	116.28	84.15	0.43
Reach	63.5432	2 yr	612.20	315.00	317.40	316.59	317.61	0.002287	3.65	168.37	90.56	0.46
Reach	63.5432	5 yr	898.00	315.00	317.88	316.95	318.17	0.002336	4.27	212.66	94.71	0.49
Reach	63.5432	10 yr	1101.20	315.00	318.18	317.19	318.52	0.002359	4.65	241.87	99.71	0.50
Reach	63.5432	25 yr	1366.50	315.00	318.55	317.46	318.95	0.002373	5.07	279.52	107.34	0.51
Reach	63.5432	50 yr	1569.00	315.00	318.81	317.65	319.25	0.002373	5.36	308.17	112.81	0.52
Reach	63.5432	100 yr	1785.90	315.00	319.07	317.84	319.56	0.002367	5.63	338.88	118.38	0.52
Reach	63.5432	500 yr	2302.60	315.00	319.67	318.28	320.26	0.002326	6.19	413.10	130.86	0.53
Reach	41.0263	1.1 yr	331.10	315.00	316.74	316.10	316.88	0.002378	3.00	110.29	79.42	0.45
Reach	41.0263	2 yr	612.20	315.00	317.32	316.57	317.55	0.002750	3.88	157.94	86.36	0.51
Reach	41.0263	5 yr	898.00	315.00	317.79	316.95	318.10	0.002778	4.51	199.67	90.63	0.53
Reach	41.0263	10 yr	1101.20	315.00	318.09	317.20	318.46	0.002770	4.89	227.15	94.54	0.54
Reach	41.0263	25 yr	1366.50	315.00	318.45	317.47	318.88	0.002755	5.32	262.64	103.27	0.55
Reach	41.0263	50 yr	1569.00	315.00	318.70	317.66	319.19	0.002732	5.60	290.17	109.56	0.55
Reach	41.0263	100 yr	1785.90	315.00	318.97	317.87	319.50	0.002704	5.88	320.01	115.98	0.56
Reach	41.0263	500 yr	2302.60	315.00	319.56	318.31	320.20	0.002613	6.42	393.76	131.75	0.56
Reach	7.6141	1.1 yr	331.10	315.00	316.26	316.26	316.70	0.013811	5.30	62.43	71.69	1.00
Reach	7.6141	2 yr	612.20	315.00	316.71	316.71	317.34	0.011980	6.36	96.48	76.63	0.99
Reach	7.6141	5 yr	898.00	315.00	317.09	317.09	317.89	0.011165	7.20	125.43	78.74	1.00
Reach	7.6141	10 yr	1101.20	315.00	317.32	317.32	318.24	0.010796	7.69	144.20	80.02	1.00
Reach	7.6141	25 yr	1366.50	315.00	317.62	317.62	318.66	0.010209	8.21	167.98	81.61	1.00
Reach	7.6141	50 yr	1569.00	315.00	317.82	317.82	318.97	0.009923	8.60	184.52	82.69	1.00
Reach	7.6141	100 yr	1785.90	315.00	318.03	318.03	319.28	0.009588	8.96	202.14	83.87	1.00
Reach	7.6141	500 yr	2302.60	315.00	318.50	318.50	319.97	0.008993	9.73	242.28	86.93	0.99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Ground
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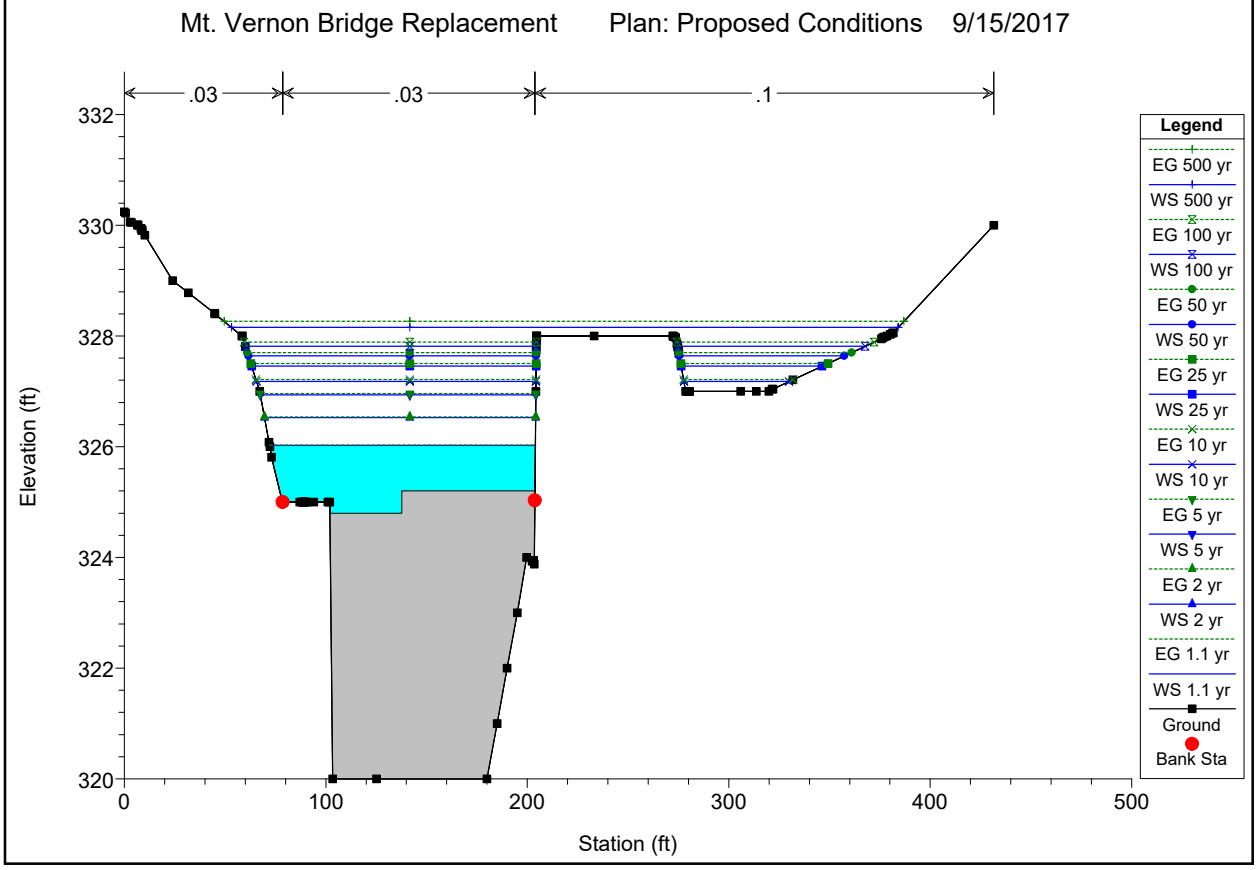
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Plan: Proposed Conditions
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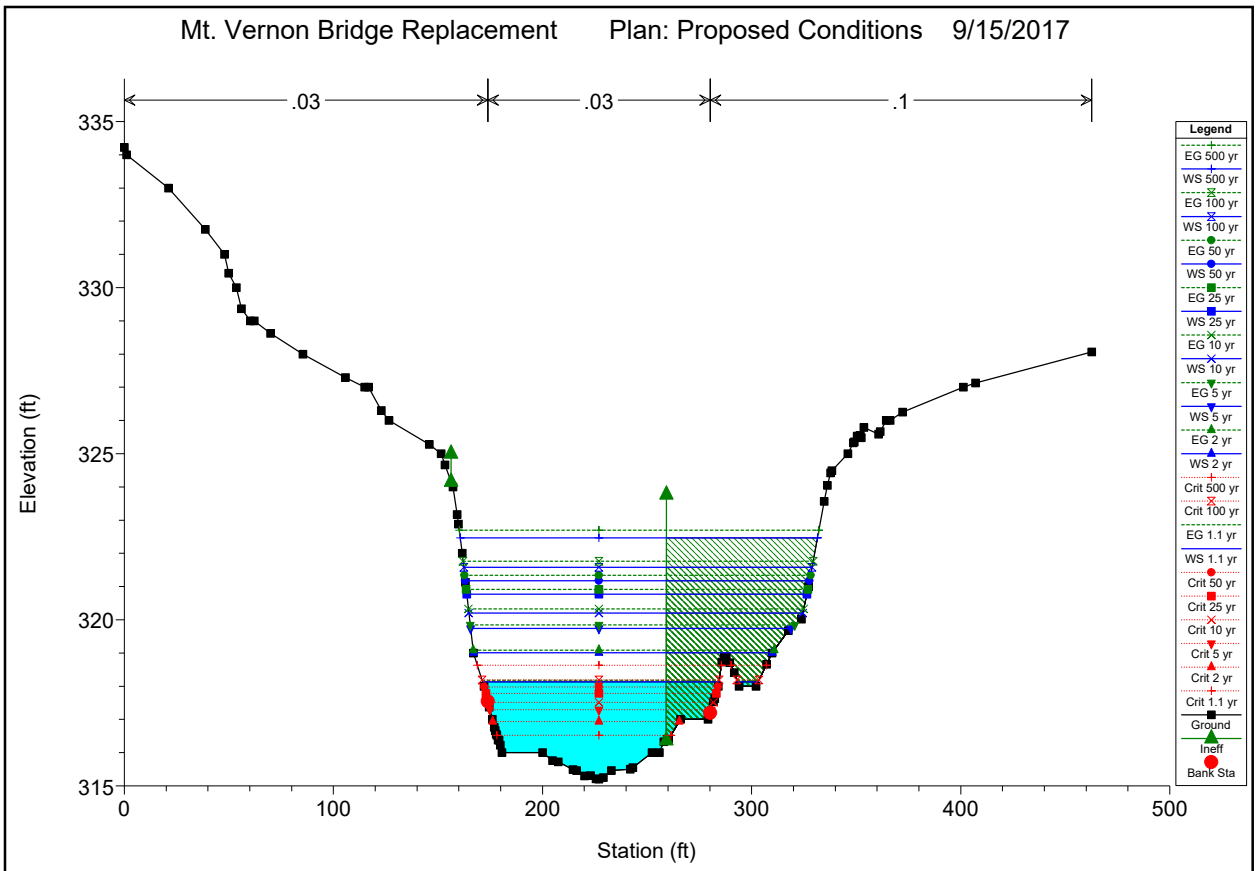
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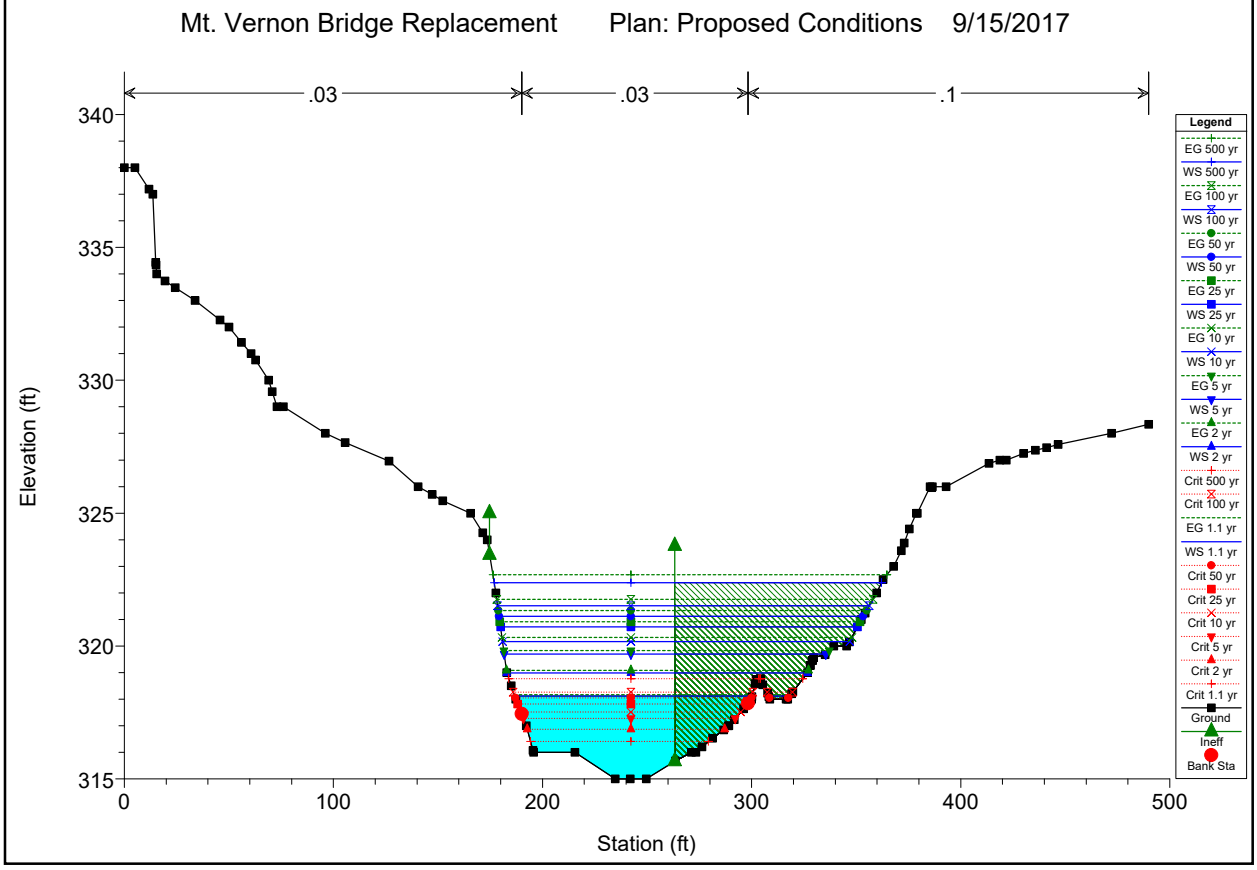
Mt. Vernon Bridge Replacement Plan: Proposed Conditions 9/15/2017
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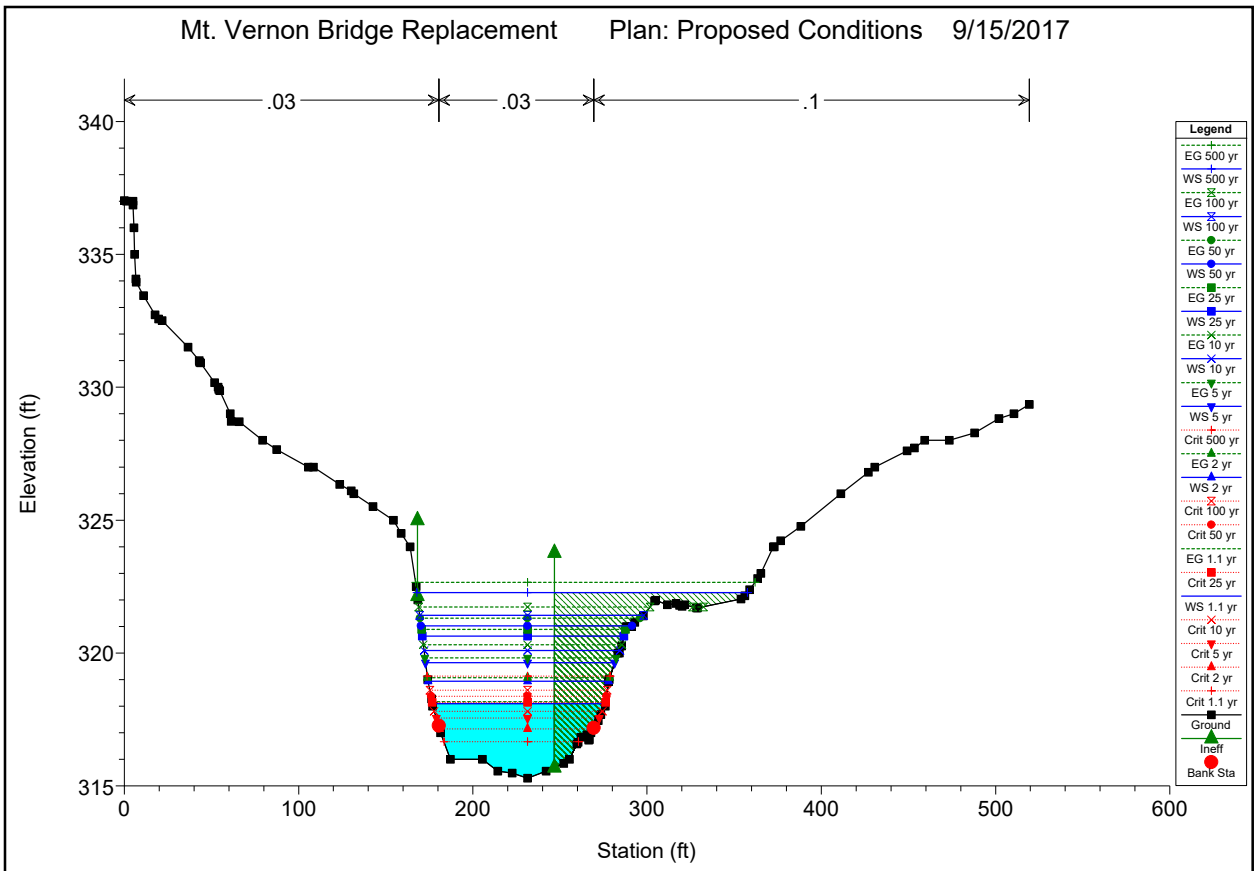
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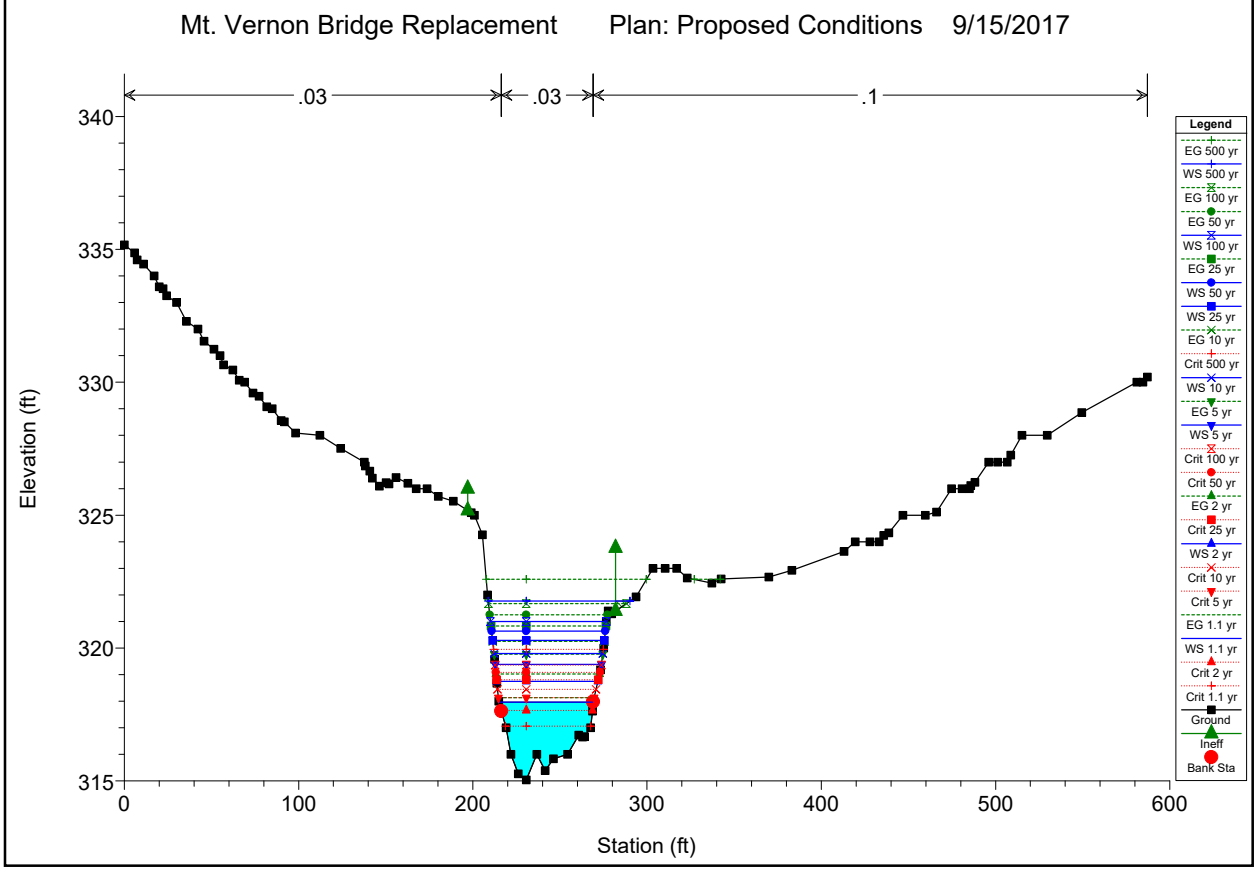
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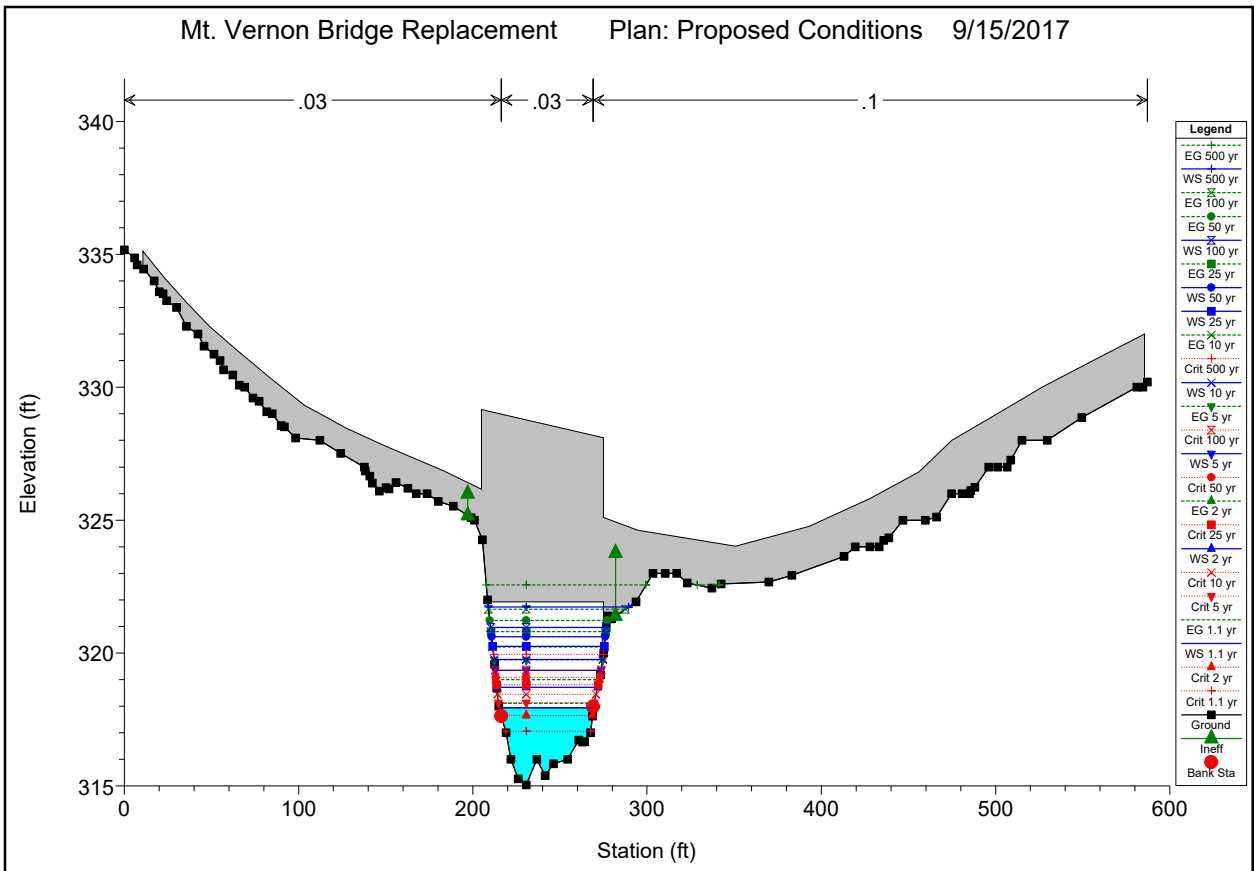
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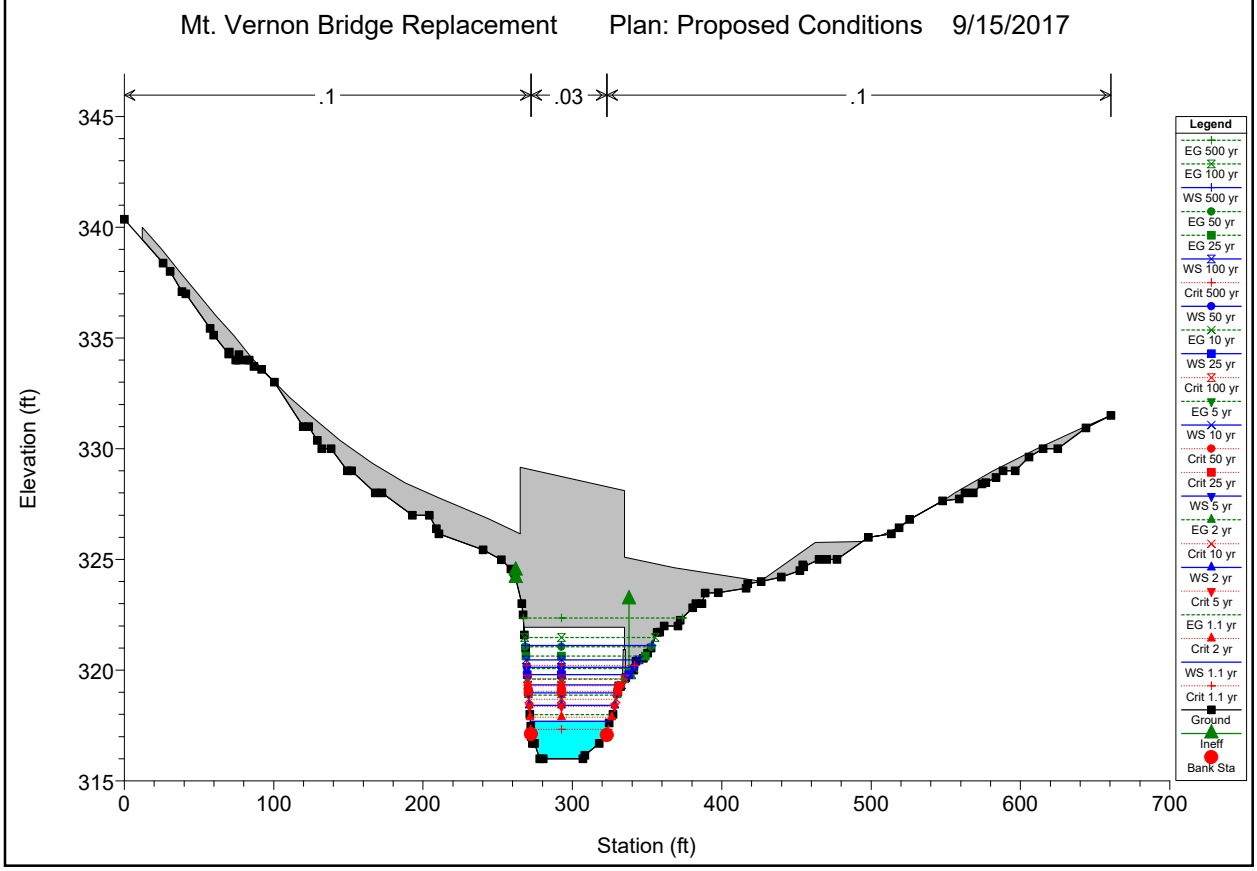
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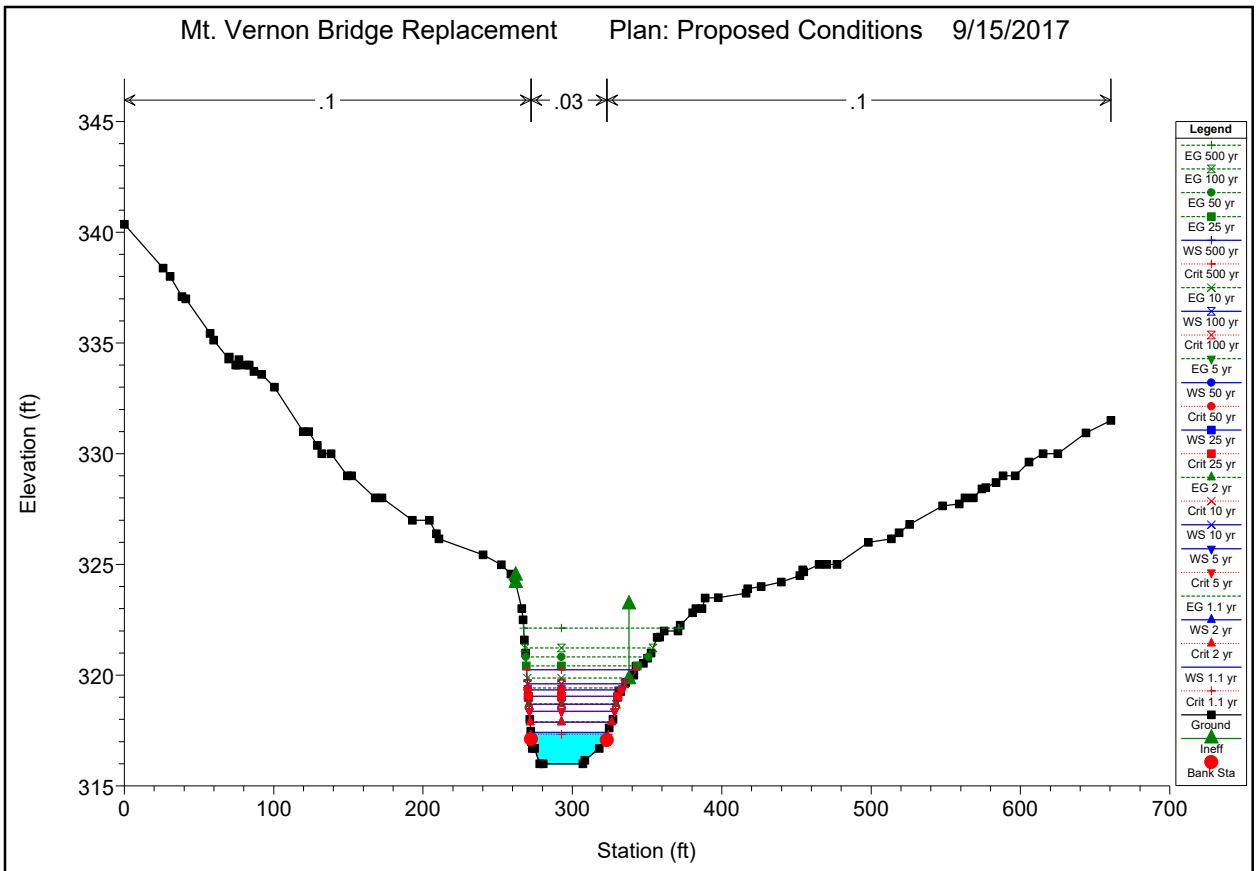
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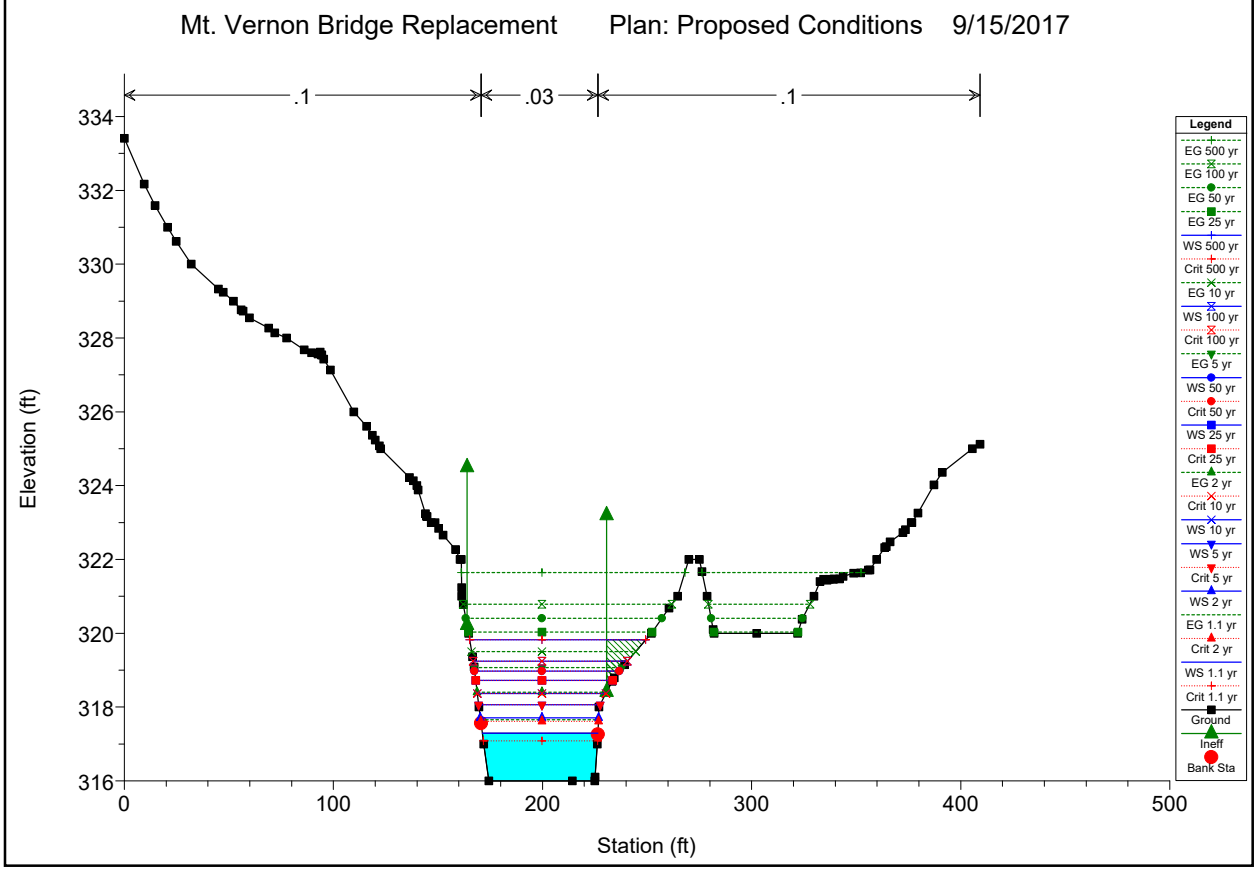
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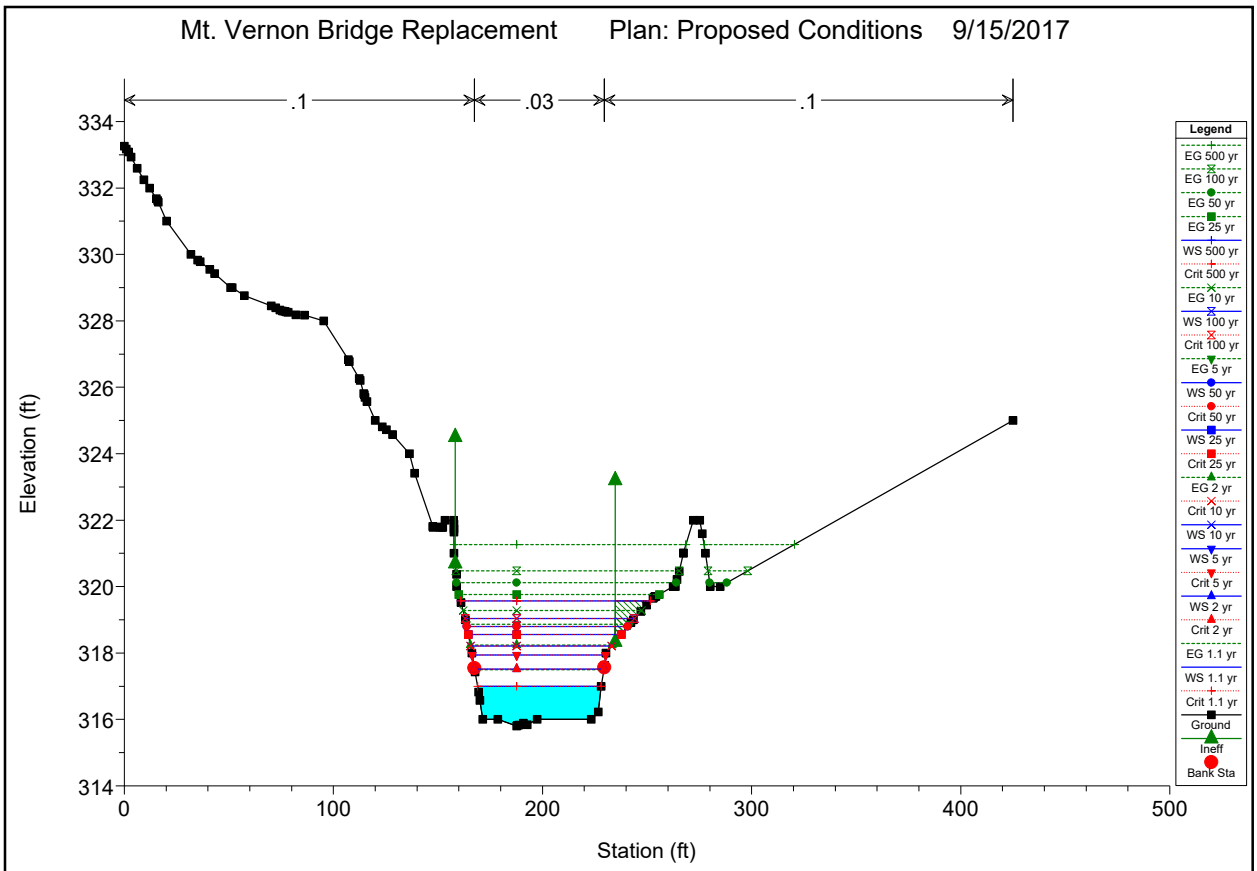
Mt. Vernon Bridge Replacement
Plan: Proposed Conditions
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Elevation (ft)
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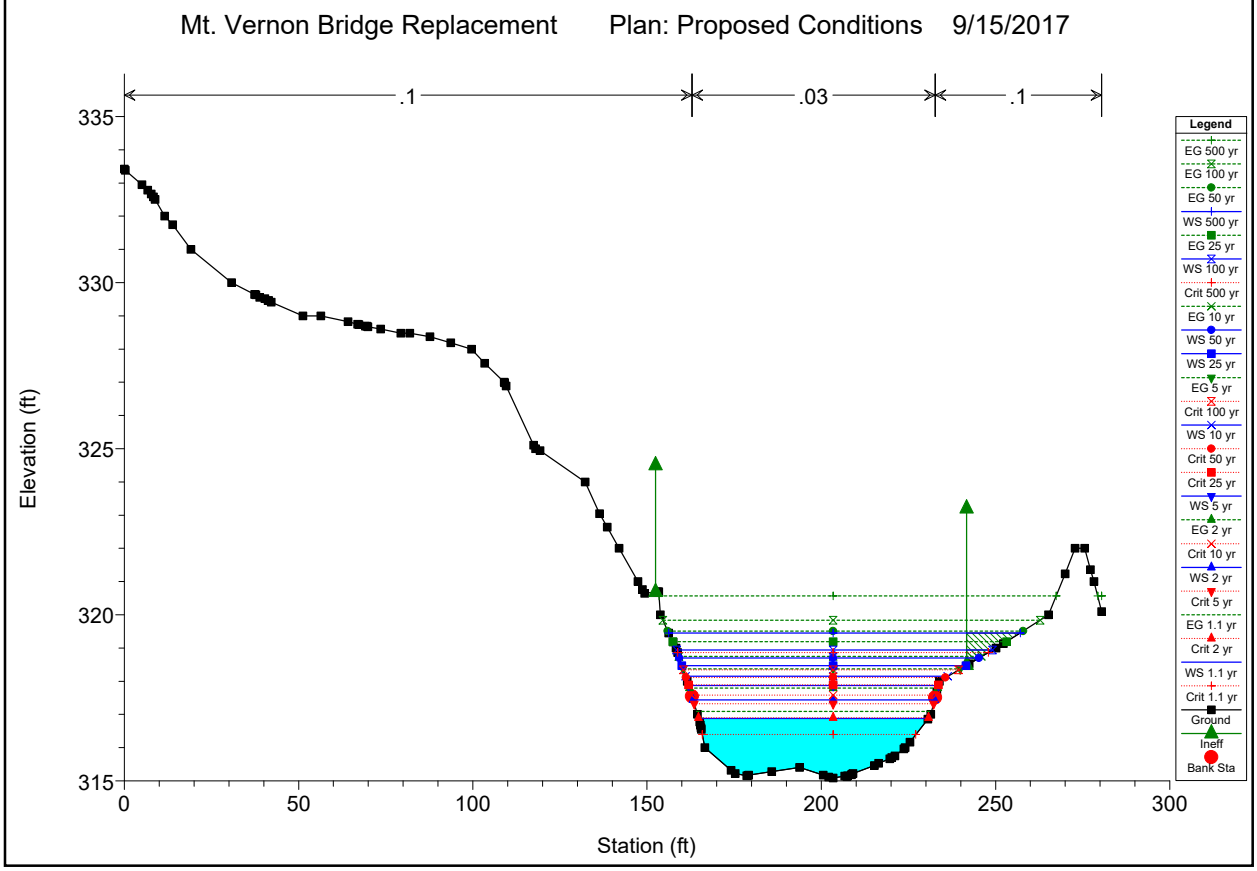
Mt. Vernon Bridge Replacement
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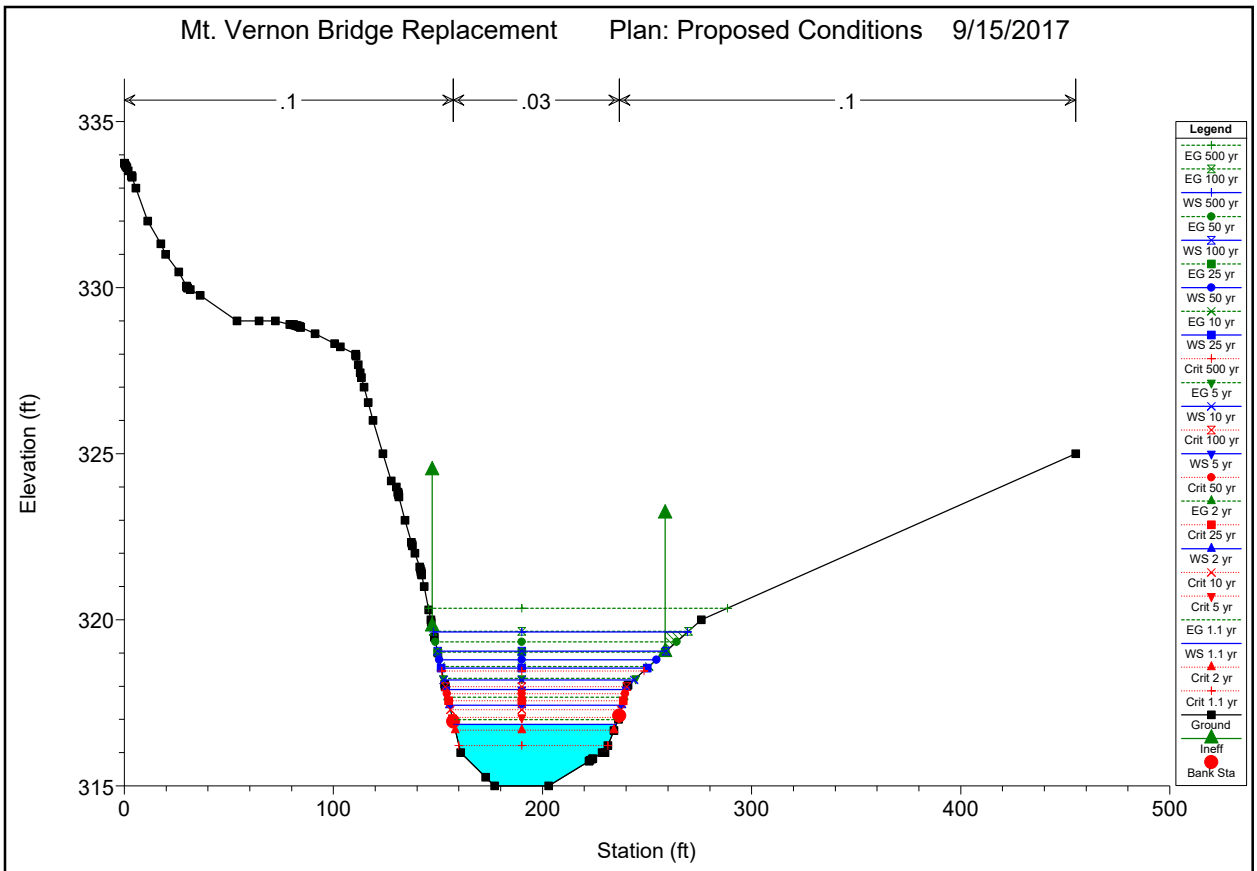
Mt. Vernon Bridge Replacement
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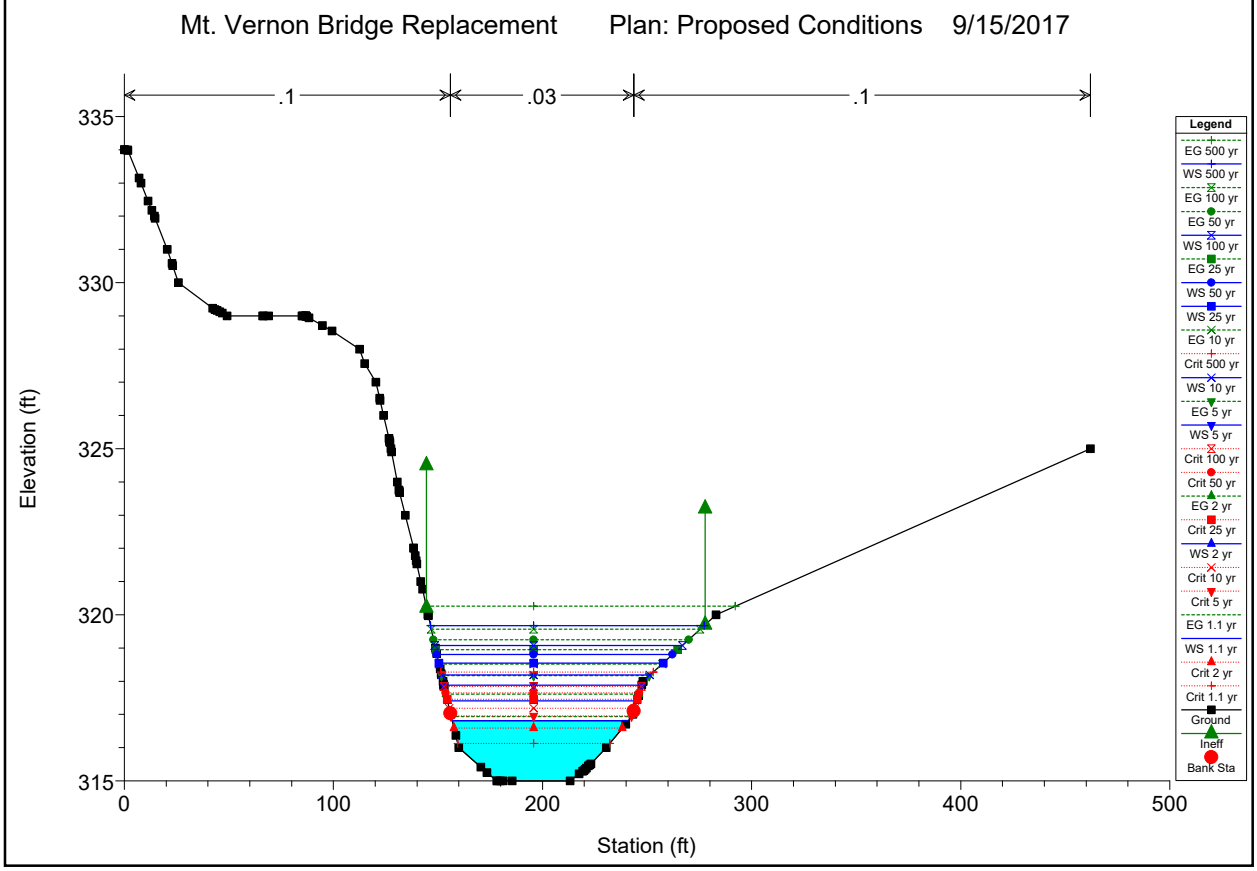
Elevation (ft)
335
330
325
320
315
0
100
200
300
400
500
Station (ft)
Legend
EG 500 yr
EG 100 yr
WS 500 yr
EG 50 yr
WS 100 yr
EG 25 yr
WS 50 yr
EG 10 yr
WS 25 yr
Crit 500 yr
EG 5 yr
WS 10 yr
Crit 100 yr
WS 5 yr
Crit 50 yr
EG 2 yr
Crit 25 yr
WS 2 yr
Crit 10 yr
Crit 5 yr
EG 1.1 yr
WS 1.1 yr
Crit 2 yr
Crit 1.1 yr
Ground
Ineff
Bank Sta


Mt. Vernon Bridge Replacement
Plan: Proposed Conditions
9/15/2017
.1
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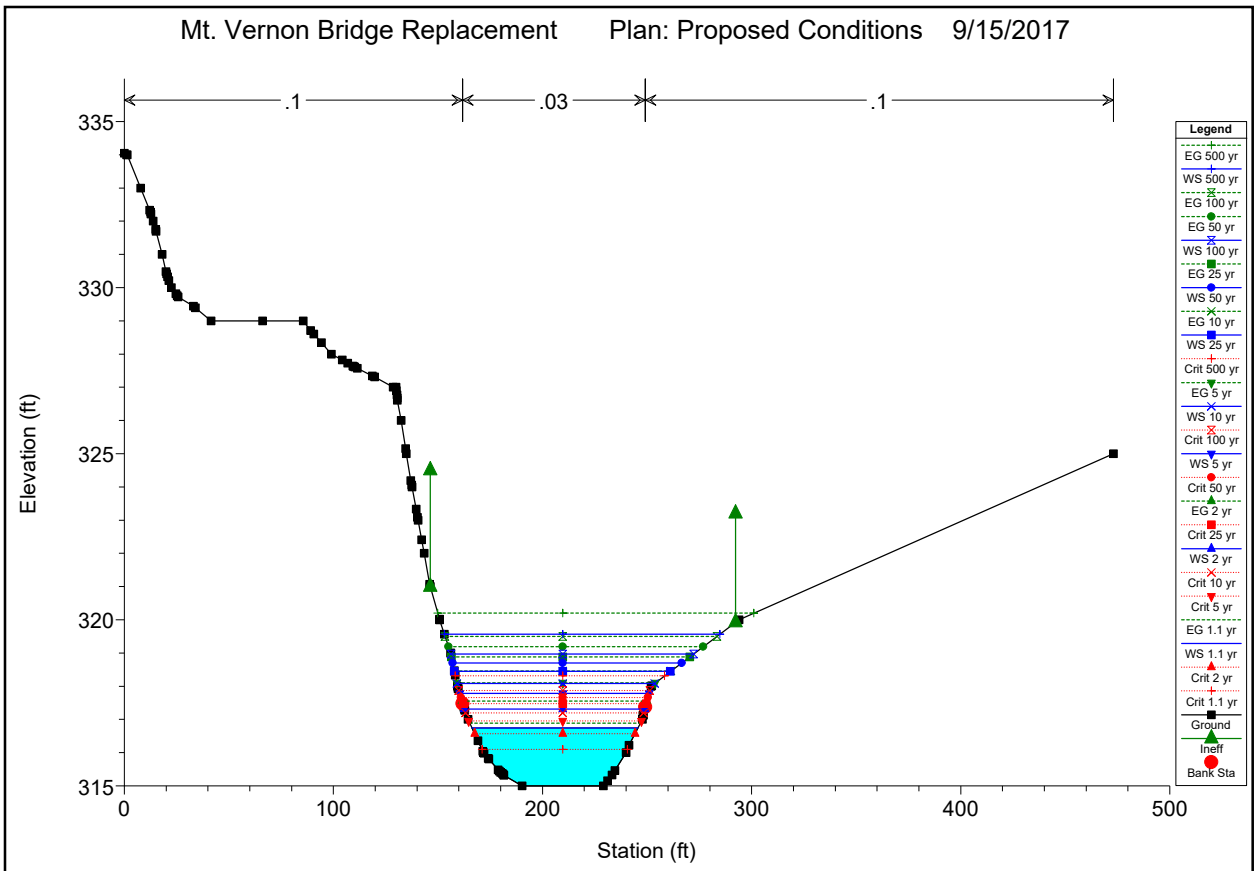
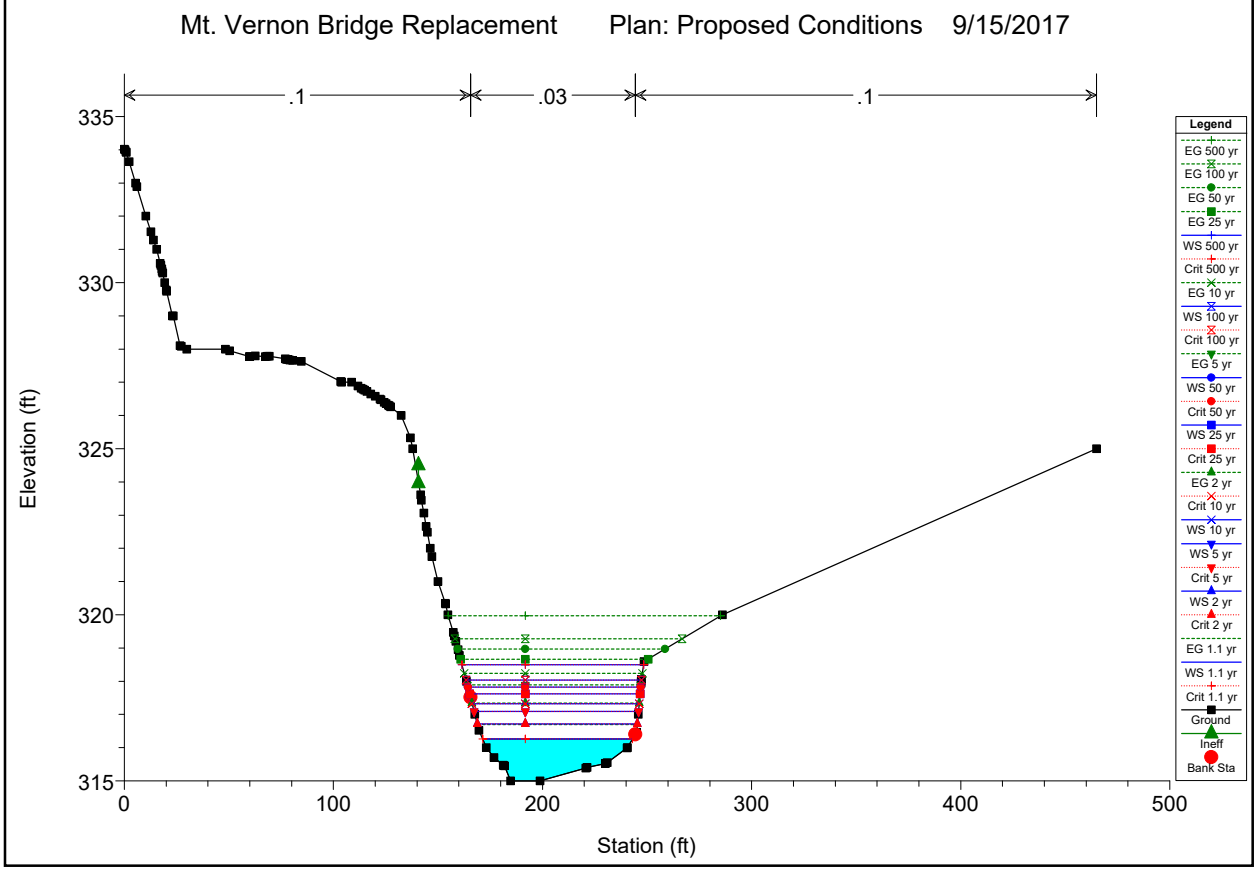
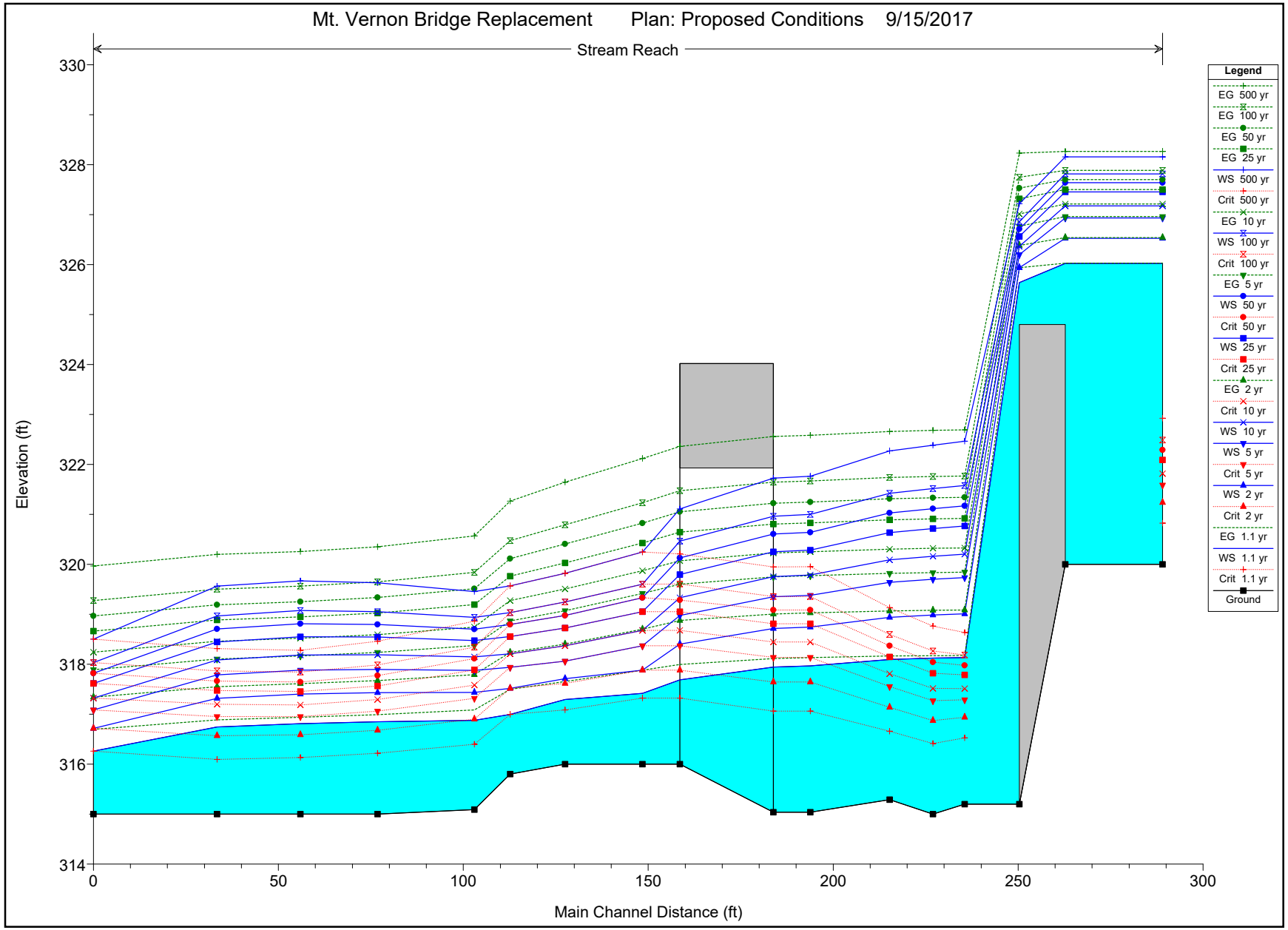
.1
Elevation (ft)
335
330
325
320
315
0
100
200
300
400
500
Station (ft)
Legend
EG 500 yr
WS 500 yr
EG 100 yr
EG 50 yr
WS 100 yr
EG 25 yr
WS 50 yr
WS 25 yr
EG 10 yr
Crit 500 yr
WS 10 yr
EG 5 yr
WS 5 yr
Crit 100 yr
Crit 50 yr
EG 2 yr
Crit 25 yr
WS 2 yr
Crit 10 yr
Crit 5 yr
EG 1.1 yr
WS 1.1 yr
Crit 2 yr
Crit 1.1 yr
Ground
Ineff
Bank Sta


Mt. Vernon Bridge Replacement
Plan: Proposed Conditions
9/15/2017
.1
.03
.1
Elevation (ft)
335
330
325
320
315
0
100
200
300
400
500
Station (ft)
Legend
EG 500 yr
WS 500 yr
EG 100 yr
EG 50 yr
WS 100 yr
EG 25 yr
WS 50 yr
EG 10 yr
WS 25 yr
Crit 500 yr
EG 5 yr
WS 10 yr
Crit 100 yr
WS 5 yr
Crit 50 yr
EG 2 yr
Crit 25 yr
WS 2 yr
Crit 10 yr
Crit 5 yr
EG 1.1 yr
WS 1.1 yr
Crit 2 yr
Crit 1.1 yr
Ground
Ineff
Bank Sta


Mt. Vernon Bridge Replacement
Plan: Proposed Conditions
9/15/2017
.1
.03
.1
Elevation (ft)
335
330
325
320
315
0
100
200
300
400
500
Station (ft)
Legend
EG 500 yr
EG 100 yr
EG 50 yr
EG 25 yr
WS 500 yr
Crit 500 yr
EG 10 yr
WS 100 yr
Crit 100 yr
EG 5 yr
WS 50 yr
Crit 50 yr
WS 25 yr
Crit 25 yr
EG 2 yr
Crit 10 yr
WS 10 yr
WS 5 yr
Crit 5 yr
WS 2 yr
Crit 2 yr
EG 1.1 yr
WS 1.1 yr
Crit 1.1 yr
Ground
Ineff
Bank Sta


Mt. Vernon Bridge Replacement Plan: Proposed Conditions 9/15/2017
Stream Reach
Elevation (ft)
330
328
326
324
322
320
318
316
314
0
50
100
150
200
250
300
Main Channel Distance (ft)
Legend
EG 500 yr
EG 100 yr
EG 50 yr
EG 25 yr
WS 500 yr
Crit 500 yr
EG 10 yr
WS 100 yr
Crit 100 yr
EG 5 yr
WS 50 yr
Crit 50 yr
WS 25 yr
Crit 25 yr
EG 2 yr
Crit 10 yr
WS 10 yr
WS 5 yr
Crit 5 yr
WS 2 yr
Crit 2 yr
EG 1.1 yr
WS 1.1 yr
Crit 1.1 yr
Ground

APPENDIX G

Scour Analysis

Proj.	Mt Vernon Bridge	Job No.	63738	Sheet No.	1 OF 4
Made by	KAR	Checked by	SPA	Backchecked by	CMV
Date	9/8/2017	Date		Date	

HNTB

Scour Analysis: 100-year storm U/S face of Mt Vernon Bridge

Aggradation/Degradation ***ft***

Live Bed Vs. Clear Water

Depth of flow, y1	4.96	ft
Particle size in a mix of which 50% are smaller, D50 (m)	0.00014	m
Particle size in a mix of which 50% are smaller, D50 (ft)	0.00046	ft
Velocity of main Channel, V	6.65	ft/s
Critical Velocity, Vc	1.13	ft/s

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

Ku = 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	4.96	ft
Ex depth in the contracted section before scour, yo	4.39	ft
Flow in the U/S channel transporting sediment Q1	1734.3	ft^3/s
Flow in the contracted channel, Q2	1785.9	ft^3/s
Top width of U/S main channel, W1	52.6	ft
Top width of the main channel in the contracted section, W2	70	ft
Fall Velocity, ω	0.03	ft/s
Slope of energy grade line of main channel, S1	0.002171	ft/ft
Shear Velocity, Vα	0.59	
Vα/ω	18.99	
Exponent, k1	0.64	
Avg depth in contracted section, y2	4.24	
Scour depth, ys	-0.15	***ft***

$$V_\alpha = (g y_1 S_1)^{1/2}$$

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

$$y_s = y_2 - y_0$$

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

Clear Water Scour

Discharge through the bridge, Q	1734.30	
Median diameter of bed material, D50	0.00046	ft
Diameter of smallest nontrasportable particle, Dm	0.00057	
Bottom width of the contracted section, W	70.00	
Existing depth in the contracted Section, yo	4.39	
Avg depth in the contracted section after contraction scour, y2	16.41	
Scour depth, ys	12.02	***ft***

$$y_2 = \left[\frac{K_u Q^2}{D_m{}^{2/3} W^2}\right]^{3/7}$$

$$y_s = y_2 - y_0$$

(HEC-18, 5th Edition, April 2012, Equation 6.4)

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

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

HNTB

Scour Analysis: 100-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'	7.54	ft
Average depth of flow on embankment, ya	1.82	ft
Velocity on embankment, Ve	0.97	ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.127	
Length of embankment projected to normal flow, L	80.00	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 **3.01** ***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'	6.28	ft
Average depth of flow on embankment, ya	1.89	ft
Velocity on embankment, Ve	3.22	ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.413	
Length of embankment projected to normal flow, L	205.00	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 **4.19** ***ft***

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

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

HNTB

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

Aggradation/Degradation ***ft***

Live Bed Vs. Clear Water

Depth of flow, y1	5.73	ft
Particle size in a mix of which 50% are smaller, D50 (m)	0.00014	m
Particle size in a mix of which 50% are smaller, D50 (ft)	0.00046	ft
Velocity of main Channel, V	7.37	ft/s
Critical Velocity, Vc	1.15	ft/s

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

Ku = 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	5.73	ft
Ex depth in the contracted section before scour, yo	5.03	ft
Flow in the U/S channel transporting sediment Q1	2218.9	ft^3/s
Flow in the contracted channel, Q2	2302.6	ft^3/s
Top width of U/S main channel, W1	52.6	ft
Top width of the main channel in the contracted section, W2	70	ft
Fall Velocity, ω	0.03	ft/s
Slope of energy grade line of main channel, S1	0.002203	ft/ft
Shear Velocity, Vα	0.64	
Vα/ω	20.57	
Exponent, k1	0.64	
Avg depth in contracted section, y2	4.93	
Scour depth, ys	-0.10	***ft***

$$V_\alpha = (g y_1 S_1)^{1/2}$$

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

$$y_s = y_2 - y_0$$

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

Clear Water Scour

Discharge through the bridge, Q	2218.90	
Median diameter of bed material, D50	0.00046	ft
Diameter of smallest nontrasportable particle, Dm	0.00057	
Bottom width of the contracted section, W	70.00	
Existing depth in the contracted Section, yo	5.73	
Avg depth in the contracted section after contraction scour, y2	20.27	
Scour depth, ys	14.54	***ft***

$$y_2 = \left[\frac{K_u Q^2}{D_m^{2/3} W^2}\right]^{3/7}$$

$$y_s = y_2 - y_0$$

(HEC-18, 5th Edition, April 2012, Equation 6.4)

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

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

HNTB

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'	21.17	ft
Average depth of flow on embankment, ya	1.69	ft
Velocity on embankment, Ve	0.95	ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.129	
Length of embankment projected to normal flow, L	80.00	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 3.48 ***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'	7.59	ft
Average depth of flow on embankment, ya	2.26	ft
Velocity on embankment, Ve	3.65	ft/s
Froude Number of approach flow = $V_e/(gy_a)^{1/2}$	0.428	
Length of embankment projected to normal flow, L	205.00	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 5.09 ***ft***

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

HNTB

Scour Summary

	100 - year storm	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	3.01	4.19
Pressure Flow Scour (ft)	---	---
TOTAL SCOUR (ft)	***3.01***	***4.19***

	500-year storm	
	Near Abutment	Far Abutment
Aggradation/ Degradation (ft)	0.00	0.00
Contraction/Expansion Scour (ft) *	0.00	0.00
Local Scour (ft)	3.48	5.09
Pressure Flow Scour (ft)	---	---
TOTAL SCOUR (ft)	***3.48***	***5.09***

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

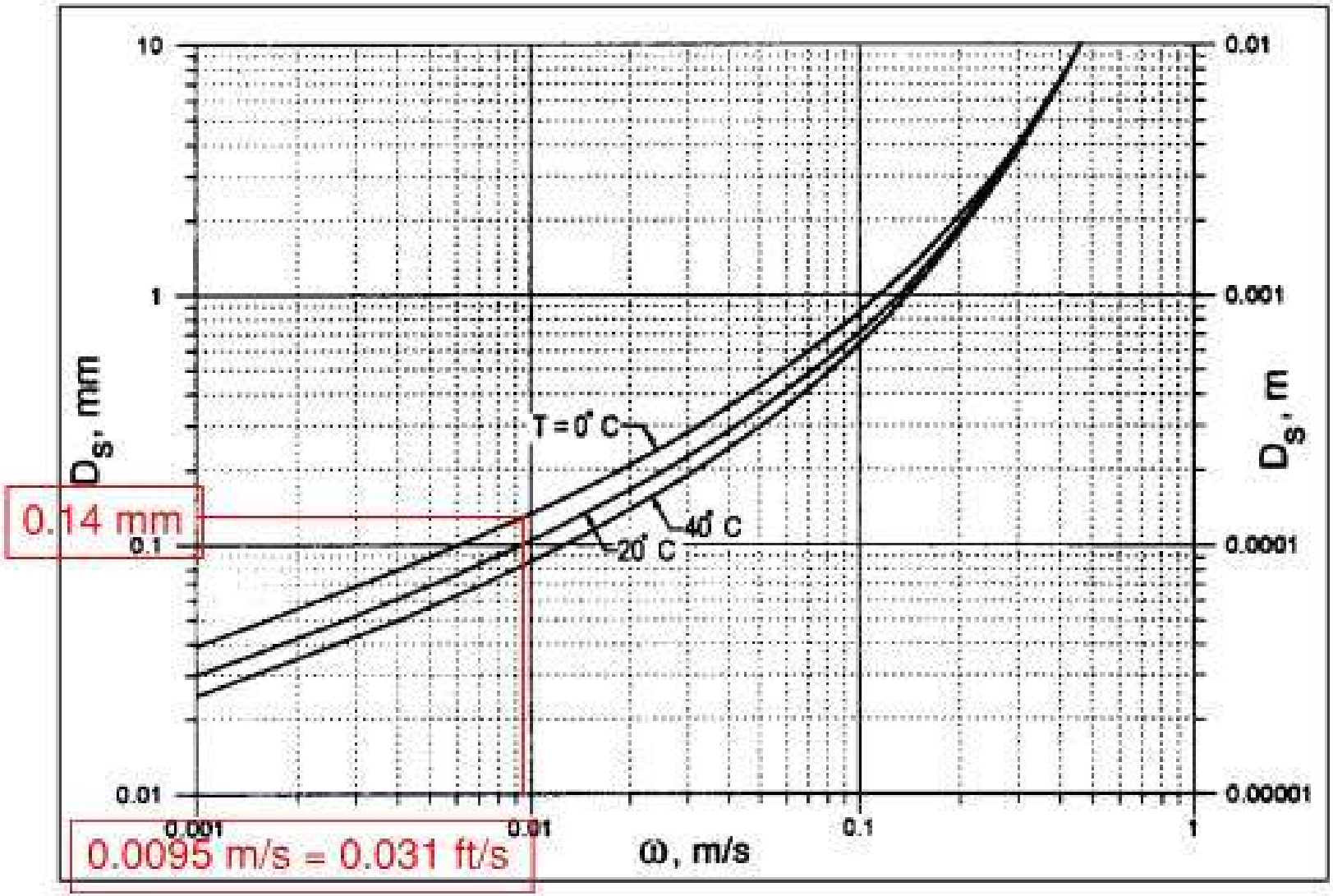


Figure 6.8. Fall velocity of sand-sized particles with specific gravity of 2.65 in metric units.

Uncontracted Section

Plan: Proposed Structure Stream Reach RS: 201.4599 Profile: 100 yr

E.G. Elev (ft)	321.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.	0.030	0.030	0.100
W.S. Elev (ft)	321.00	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	319.36	Flow Area (sq ft)	11.88	260.95	13.68
E.G. Slope (ft/ft)	0.002171	Area (sq ft)	11.88	260.95	13.68
Q Total (cfs)	1785.90	Flow (cfs)	38.26	1734.30	13.34
Top Width (ft)	66.42	Top Width (ft)	6.28	52.60	7.54
Vel Total (ft/s)	6.23	Avg. Vel. (ft/s)	3.22	6.65	0.97
Max Chl Dpth (ft)	5.96	Hydr. Depth (ft)	1.89	4.96	1.82
Conv. Total (cfs)	38325.7	Conv. (cfs)	821.1	37218.4	286.2
Length Wtd. (ft)	10.00	Wetted Per. (ft)	7.21	53.40	8.19
Min Ch El (ft)	315.04	Shear (lb/sq ft)	0.22	0.66	0.23
Alpha	1.11	Stream Power (lb/ft s)	0.72	4.40	0.22
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.02	1.08	0.12
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	0.31	0.16

Plan: Proposed Structure Stream Reach RS: 201.4599 Profile: 500 yr

E.G. Elev (ft)	322.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.82	Wt. n-Val.	0.030	0.030	0.100
W.S. Elev (ft)	321.76	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	319.95	Flow Area (sq ft)	17.20	301.23	21.91
E.G. Slope (ft/ft)	0.002203	Area (sq ft)	17.20	301.23	23.43
Q Total (cfs)	2302.60	Flow (cfs)	62.81	2218.90	20.89
Top Width (ft)	81.37	Top Width (ft)	7.59	52.60	21.17
Vel Total (ft/s)	6.77	Avg. Vel. (ft/s)	3.65	7.37	0.95
Max Chl Dpth (ft)	6.72	Hydr. Depth (ft)	2.26	5.73	1.69
Conv. Total (cfs)	49062.2	Conv. (cfs)	1338.2	47278.8	445.2
Length Wtd. (ft)	10.00	Wetted Per. (ft)	8.73	53.40	13.70
Min Ch El (ft)	315.04	Shear (lb/sq ft)	0.27	0.78	0.22
Alpha	1.15	Stream Power (lb/ft s)	0.99	5.71	0.21
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.03	1.27	0.25
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	0.31	0.25

Contracted Section

Plan: Proposed Structure Stream Reach RS: 178 Profile: 100 yr

E.G. US. (ft)	321.67	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	321.00	E.G. Elev (ft)	321.64	321.47
Q Total (cfs)	1785.90	W.S. Elev (ft)	320.96	320.46
Q Bridge (cfs)	1785.90	Crit W.S. (ft)	319.35	319.61
Q Weir (cfs)		Max Chl Dpth (ft)	5.92	4.46
Weir Sta Lft (ft)		Vel Total (ft/s)	6.32	7.38
Weir Sta Rgt (ft)		Flow Area (sq ft)	282.42	242.10
Weir Submerg		Froude # Chl	0.53	0.70
Weir Max Depth (ft)		Specif Force (cu ft)	1042.50	933.31
Min El Weir Flow (ft)	324.03	Hydr Depth (ft)	4.39	3.74
Min El Prs (ft)	321.93	W.P. Total (ft)	67.26	67.42
Delta EG (ft)	0.44	Conv. Total (cfs)	37830.8	28375.1
Delta WS (ft)	1.39	Top Width (ft)	64.28	64.68
BR Open Area (sq ft)	339.30	Frctn Loss (ft)	0.07	0.06
BR Open Vel (ft/s)	7.38	C & E Loss (ft)	0.10	0.19
BR Sluice Coef		Shear Total (lb/sq ft)	0.58	0.89
BR Sel Method	Energy only	Power Total (lb/ft s)	3.69	6.55

Plan: Proposed Structure Stream Reach RS: 178 Profile: 500 yr

E.G. US. (ft)	322.58	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	321.76	E.G. Elev (ft)	322.56	322.36
Q Total (cfs)	2302.60	W.S. Elev (ft)	321.73	321.11
Q Bridge (cfs)	2302.60	Crit W.S. (ft)	319.95	320.21
Q Weir (cfs)		Max Chl Dpth (ft)	6.69	5.11
Weir Sta Lft (ft)		Vel Total (ft/s)	6.93	8.10
Weir Sta Rgt (ft)		Flow Area (sq ft)	332.35	284.15
Weir Submerg		Froude # Chl	0.50	0.70
Weir Max Depth (ft)		Specif Force (cu ft)	1431.83	1295.24
Min El Weir Flow (ft)	324.03	Hydr Depth (ft)	5.03	4.27
Min El Prs (ft)	321.93	W.P. Total (ft)	70.04	70.00
Delta EG (ft)	0.46	Conv. Total (cfs)	48455.1	36041.3
Delta WS (ft)	1.52	Top Width (ft)	66.10	66.49
BR Open Area (sq ft)	339.30	Frctn Loss (ft)	0.08	0.06
BR Open Vel (ft/s)	8.10	C & E Loss (ft)	0.13	0.19
BR Sluice Coef		Shear Total (lb/sq ft)	0.67	1.03
BR Sel Method	Energy only	Power Total (lb/ft s)	4.63	8.38

APPENDIX H

Plans

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

SPECIFICATIONS

Design: Load and Resistance Factor Design per AASHTO LRFD Bridge Design Specifications, Eighth Edition 2017.

DESIGN LOADING

Live Load ..... HL - 93 Modified for Strength I

TRAFFIC DATA

Current (2018) AADT	860
Future (2038) AADT	1030
DHV - % of AADT	13%
Design Hour Volume	134
Heavy Trucks (% of AADT)	15%
Heavy Trucks (% of DHV)	10%
Directional Distribution (% of DHV)	60%
18 kip Equivalent P 2.0	62
18 kip Equivalent P 2.5	59
Design Speed (mph)	35

HYDROLOGIC DATA

Drainage Area	35.4 sq mi
Design Discharge (Q50)	1569.0 cfs
Check Discharge (Q100)	1785.9 cfs
Headwater Elevation (Q1.1)	317.97 ft
Headwater Elevation (Q25)	320.28 ft
Headwater Elevation (Q50)	320.64 ft
Headwater Elevation (Q100)	321.00 ft
Discharge Velocity (Q1.1)	3.26 fps
Discharge Velocity (Q25)	5.99 fps
Discharge Velocity (Q50)	6.32 fps
Discharge Velocity (Q100)	6.65 fps

MATERIALS

Concrete:	
Curbs & Transition Barriers	Class "LP"
Precast	Class "P"
All Other	Class "A"
Plain Reinforcing Steel	ASTM A615, Grade 60
Stainless Reinforcing	ASTM A955, Grade 75
GFRP Reinforcing Bars	CSA S807-10, ACI 440.1r-15
Prestressing Strands	ASTM A882, Grade 270, Low Relaxation

BASIC DESIGN STRESSES

Concrete:	
Class "LP"	f 'c = 5,000 psi
Class "A"	f 'c = 4,000 psi
Class "P"	f 'c = 8,000 psi
	f 'ci = 6,000 psi
Plain Reinforcing Steel	f y = 60,000 psi
Stainless Reinforcing Steel	f y = 75,000 psi
Prestressing Strand	F μ = 270,000 psi
Glass Fiber Reinforced Polymer:	
#5	f_{fu} = 100,000 psi
#6	f_{fu} = 100,000 psi
Minimum Elastic Modulus	Ef = 6,150,00 psi

MOUNT VERNON
KENNEBEC
W. MT. VERNON BRIDGE
OVER
ECHO LAKE STREAM
STATE ROUTE 41
FEDERAL AID PROJECT NO. STP-2169(800)
PROJECT LENGTH 0.047 mi.
BRIDGE NO. 2930

LIST OF DRAWINGS

UTILITIES

Emera Maine — Spectrum (Cable)
Consolidated Communications

MAINTENANCE OF TRAFFIC

Maintain one lane of alternating one - way traffic using a single lane temporary bridge and temporary traffic signals.

PROJECT LOCATION	West Mount Vernon Bridge #2930 in Mount Vernon carrying State Route 41 over Echo Lake Stream, located 0.17 miles east of Echo Lake Rd. Lat./Long. 44° 27' 10" N 70° 0' 51" W
PROGRAM AREA	Bridge
OUTLINE OF WORK	Replacement of West Mount Vernon Bridge #2930 in Mount Vernon with 430' of approach work.

WIN 021698.00

STP-2169(800)

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

DATE

APPROVED

COMMISSIONER:

CHIEF ENGINEER:

STATE OF MAINE · JOSHUA K. OLUND No. 12130 · LICENSED PROFESSIONAL ENGINEER

SIGNATURE

P.E. NUMBER 12130

DATE 10/18/2018

PROJECT INFORMATION

PROGRAM	BRIDGE	
PROJECT MANAGER	DEVAN EATON, P.E.	
DESIGNER	JOSH OLUND, P.E.	
CONSULTANT	HNTB	
PROJECT RESIDENT		
CONTRACTOR		
PROJECT COMPLETION DATE		

MOUNT VERNON
W. MT. VERNON BRIDGE

TITLE SHEET

SHEET NUMBER

1

OF 28

HNTB

Date:10/18/2018

Username:

Division:

Filename: 001_Title.dgn

ESTIMATED QUANTITIES			
ITEM NO.	DESCRIPTION	QUANTITY	UNIT
202.19	Removing Existing Bridge (250 CY)	1	LS
202.202	Removing Pavement Surface	560	SY
203.20	Common Excavation	500	CY
203.24	Common Borrow	50	CY
203.25	Granular Borrow	360	CY
206.082	Structural Earth Excavation - Major Structures	420	CY
304.10	Aggregate Subbase Course - Gravel	670	CY
403.208	Hot Mix Asphalt, 12.5 mm Nominal Maximum Size	140	Ton
403.209	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Sidewalks, Drives, Incidentals)	5	Ton
403.211	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Shimming)	12	Ton
403.213	Hot Mix Asphalt, 12.5 mm Nominal Maximum Size (Base and Intermediate Base Course)	200	Ton
409.15	Bituminous Tack Coat, Applied	110	Gal
411.09	Untreated Aggregate Surface Course	17	CY
461.131	Temporary Pavement	150	Ton
501.239	Dynamic Loading Tests -Providing For	2	EA
501.50	Steel H-Beam Piles, 89 lb/ft delivered	850	LF
501.501	Steel H-Beam Piles, 89 lb/ft in-place	850	LF
501.90	Pile Tips	8	EA
501.91	Pile Splices	24	EA
501.92	Pile Driving Equipment Mobilization	1	LS
502.219	Structural Concrete, Abutments and Retaining Walls (78 CY)	1	LS
502.261	Structural Concrete Roadway and Sidewalk Slab on Concrete Bridges (76 CY)	1	LS
502.291	Saw Cut Grooving (2016 SF)	1	LS
502.31	Structural Concrete Approach Slab (21 CY)	1	LS
502.49	Structural Concrete Curbs and Sidewalks (7 CY)	1	LS
503.12	Reinforcing Steel, Fabricated and Delivered	14400	LB
503.13	Reinforcing Steel, Placing	14400	LB
503.26	Stainless Steel Reinforcement, Fabricated and Delivered	9100	LB
503.27	Stainless Steel Reinforcement, Placing	9100	LB
507.0821	Steel Bridge Railing, 3 Bar (123 LF)	1	LS
510.10	Special Detour, 14 foot Roadway Width Vehicular and Pedestrian Traffic Not Separated	1	LS
511.07	Cofferdam: Abutment No. 1	1	LS
511.07	Cofferdam: Abutment No. 2	1	LS
514.06	Curing Box for Concrete Cylinders	1	EA
515.21	Protective Coating for Concrete Surfaces (340 SY)	1	LS
526.301	Temporary Concrete Barrier, Type 1 (520 LF)	1	LS
526.34	Permanent Concrete Transition Barrier	4	EA
527.34	Work Zone Crash Cushions	4	UN
530.30	GFRP, Reinforcement Bars, Fabricated and Delivered	16500	LF
530.31	GFRP, Reinforcement Bars, Placing	16500	LF
535.622	Prestressed Structural Concrete NEXT Beam (77 CY)	1	LS
603.179	18 inch Culvert Pipe Option III	72	LF
606.1301	31" W-Beam Guardrail - Mid-Way Splice (Steel Post, 8" Offset Blocks, Single Faced)	150	LF
606.1303	31" W-Beam Guardrail - Mid-Way Splice (Steel Post, 8" Offset Blocks, 15' Radius and Less)	50	LF
606.1305	31" W-Beam Guardrail - Mid-Way Splice Flared Terminal (31" Height)	2	EA
606.1307	Bridge Transition (Asymmetrical) - Type 1	4	EA
606.353	Reflectorized Flexible Guardrail Marker	6	EA
610.08	Plain Riprap	270	CY
613.319	Erosion Control Blanket	13	SY
615.07	Loam	31	CY
618.14	Seeding Method Number 2	5.5	UN
619.12	Mulch	5.5	UN
619.14	Erosion Control Mix	31	CY
620.58	Erosion Control Geotextile	84	SY
620.661	Drainage Geocomposite	81	SY
627.7333	4" White or Yellow Painted Pavement Marking Line	1900	LF
627.75	White or Yellow Pavement & Curb Marking	75	SF
627.77	Removing Existing Pavement Marking	130	SF
627.78	Temporary 4" Painted Pavement Marking Line, White or Yellow	800	LF
629.05	Hand Labor, Straight Time	35	HR
631.12	All Purpose Excavator (including operator)	20	HR
631.14	Grader (including operator)	20	HR
631.15	Roller, earth and base Course (including operator)	20	HR
631.172	Truck-large (including operator)	20	HR
637.071	Dust Control	0.5	LS
639.18	Field Office, Type A	0.5	EA
643.72	Temporary Traffic Signal: West Mount Vernon Bridge	1	LS
652.312	Type III Barricades	4	EA
652.33	Drum	50	EA
652.34	Cone	50	EA
652.35	Construction Signs	380	SF
652.361	Maintenance of Traffic Control Devices	1	LS
652.38	Flaggers	480	HR
656.75	Temporary Soil Erosion and Water Pollution Control	1	LS
659.10	Mobilization	1	LS

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-21169(800)

WIN 021698.00

BRIDGE NO. 2930 BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	H. Walton	P. Bishop	10/18
CHECKED-REVIEWED	J. Waugh	J. Olund	10/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

ESTIMATED QUANTITIES

SHEET NUMBER

2

OF 28

Filename: 002_Estimated Quantities.dgn Division: Username: Date:10/18/2018

GENERAL NOTES

1. For easements, construction limits and right of way lines, refer to the Right of Way Map.

2. The clearing limits as shown on the Plans are approximate. The exact limits will be established in the field by the Resident. Payment for clearing will be considered incidental to Contract Items.

3. All utility facilities shall be adjusted by the respective utilities unless otherwise noted.

4. Do not excavate for Aggregate Subbase Course where existing material is suitable as determined by the Resident.

5. In areas where the Resident directs the Contractor not to excavate to the subgrade line shown on the Plans, payment for removing existing pavement, grubbing, shaping, ditching, and compacting the existing subbase and layers of new subbase 6 inches or less thick will be made under appropriate equipment rental items.

6. All embankment material, except as otherwise shown, placed below EL. 320.64 shall be Granular Borrow meeting the requirements of Subsection 703.19, Material for Underwater Backfill.

7. Construct the riprap shelf at Abutment No. 1 at EL. 318.75 and at Abutment No. 2 at EL. 319.80.

8. Place loam 2 inches deep on all new or reconstructed sideslopes or as directed by the Resident.

9. Erosion Control Mix may be substituted in those areas normally receiving loam and seed as directed by the Resident. Placement shall be in accordance with Standard Specifications Section 619, Mulch. Payment will be made under Item No. 619.14, Erosion Control Mix.

10. Place a 24-in. wide strip of Temporary Erosion Control Blanket on the sideslopes along the top of the riprap and behind the wingwalls.

11. An NCHRP350 or MASH compliant guardrail end treatment shall be installed concurrently with the placement of each section of beam guardrail. End treatments shall be chosen from the Department's Qualified Products List.

12. Extended-use Erosion Control Blanket, seeded gutters, and riprap downspouts, shall be constructed after paving and shoulder work is completed, where it is apparent that runoff will cause continual erosion. Payment will be made under the appropriate Contract Items.

13. A 3' paved lip shall be placed at all unpaved entrances.

14. Gravel entrances shall be constructed with 14" Aggregate Subbase Course-Gravel or 11" Aggregate Subbase Course-Gravel and 3" Untreated Aggregate Surface Course unless otherwise noted in the plans or directed by the Resident.

15. Protective Coating for Concrete Surfaces shall be applied to the following areas:

All exposed surfaces of concrete curbs,
Fascias down to the drip notch,
All exposed surfaces of Concrete Transition Barriers,
Concrete wearing surfaces,
Top of abutment backwalls and to one foot below the top of backwalls on the back side.

16. Project information referred to below may be accessed at the following MaineDOT web address: http://www.maine.gov/mdot/contractors/.

17. The existing bridge plans may be accessed at the MaineDOT web address. The plans are reproductions of the original drawings as prepared for the construction of the bridge. It is very unlikely that the plans will show any construction field changes or any alterations which may have been made to the bridge during its life span.

18 The hydrologic report of the bridge site may be accessed at the MaineDOT web address. The hydrologic report is based on MaineDOT's interpretation of the information obtained for the subject site. No assurance is given that the information or the conclusions of the report or values provided on these Plans will be representative of actual conditions at the time of construction.

19. The project geotechnical report titled: Geotechnical Design Report, Replacement of West Mount Vernon Bridge No. 2390, Route 41 over Echo Lake Stream, MaineDOT WIN 21698.00, Mount Vernon, Maine, October 2018 may be accessed at the MaineDOT web address.

20. Geotechnical information furnished or referred to in this plan set is for the use of the Bidders and the Contractor. No assurance is given that the information or interpretations will be representative of actual subsurface conditions at the construction site. MaineDOT will not be responsible for the Bidders' or Contractor's interpretations of, or conclusions drawn from, the geotechnical information. The boring logs contained in the plan set present factual and interpretive subsurface information collected at discrete locations. Data provided may not be representative of the subsurface conditions between the boring locations.

21. Quantities included for Pay Items measured and paid for by Lump Sum are estimated quantities and are provided by MaineDOT for informational purposes only. Lump Sum pay items will be paid for at the Contract Bid amount, with no addition or reduction in payment to the Contractor if the actual final quantities are different from the MaineDOT provided estimated quantities, except as follows:

a. If a Lump Sum pay item is eliminated, the requirements of Standard Specifications Section 109.2, Elimination of Items, will take precedence.

b. If other Contract Documents specifically allow a change in payment for a Lump Sum pay item, those requirements will be followed.

c. If a design change results in changes to estimated quantities for Lump Sum pay items, price adjustments will be made in accordance with Standard Specifications Section 109.7, Equitable Adjustments to Compensation and Time.

22. Boulders along the northeast quadrant of the project are to remain property of the landowner and shall be relocated or stacked as directed by the Resident. Payment will be made under appropriate labor and rental items.

23. Removing and resetting of all regulatory, warning, confirmation, and route marker assembly signs required for construction shall be performed in accordance with Section 645, Highway Signing. Payment will be incidental to Contract Items.

24. Separation geotextile shall be placed on-grade without grubbing, prior to placing temporary fill materials on the Parry/Harker property. Separation geotextile shall be removed after the removal of temporary detour, and the area shall be reseeded in accordance with the plans. Payment will be made under Item 210.10, Special Detour.

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON	BY	DATE
DESIGN-DETAILED	H. Walton	P. Bishop	10/18
CHECKED-REVIEWED	J. Waugh	J. Olund	10/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

GENERAL NOTES

SHEET NUMBER

3

OF 28

Username:

Division:

Date:10/18/2018

Filename: 003_GeneralNotes.dgn

CURVE DATA #1
PI = 11+28.01
D = 16°51'06.1"
Δ = 41°15'47.8" Lt.
R = 340.00'
L = 244.86'
T = 128.01'
E = 23.30'

Taylor Pond Dam
Brick Chimney
Proposed Pole Location Sta. 12+30.00, 26' Lt. (By Others)
Existing Utility Pole (Relocated By Others)
PT = STA. 12+44.86
℄ Brg. Abut No. 1 Sta. 12+75.08
℄ Brg. Abut No. 2 Sta. 13+45.08
70'-0" Span
Install Sediment Trap
Install 18" - 72" Option III
Remove Culvert
Proposed Pole Location Sta. 13+93.00, 21' Lt. (By Others)
Existing Utility Pole (Relocated By Others)
Remove and Reset Boulders (Typ.)
R=10'
Remove Culvert
PC = STA. 10+00.00
To Mount Vernon
RTE 41
STOP
FLOWERS
STOP SANDY RIVER RD
Sandy River Road
Route 41 (Pond Road)
S 70°13'14.05" E
To Readfield
Note:
2" Mill, Variable Depth Shim, and 1 1/2" Surface along Sandy River Road, right of Baseline.
Trees Relocated by Others (Typ.)
W-Beam Guardrail Mid-way Splice, Flared Terminal (Typ.)
Sta. 11+57.77 Route 41 (Pond Road) ℄ = Sta. 30+00.00 Sandy River Road ℄
Remove and Reset Sign
Flow
Echo Lake Stream
R=15'
Remove and Reset Signs
PC = STA. 14+82.37
PT = STA. 16+11.44
W-Beam Guardrail Mid-way Splice (Typ.)
Remove Existing Guardrail (Typ.)
Bridge Transition Type "IA" (Typ.)
Plain Riprap (Typ.)
CLL
DRY HYDRANT
ACCESS
DRIVEWAY
6" PINE
10" PINE
12" PINE
16" PINE
18" PINE
24" PINE
30" PINE
36" PINE
CURVE DATA #2
PI = 15+47.04
D = 7°09'43.1"
Δ = 9°14'36.6" Rt.
R = 800.00'
L = 129.06'
T = 64.67'
E = 2.61'

PLAN
25 0 25 50
Scale of Feet

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
STP-2169(800)
WIN 21698.00
BRIDGE NO. 2930
BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A. Sweet	A. Sweet	10/18
CHECKED-REVIEWED	R. Hanf	J. Olund	10/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

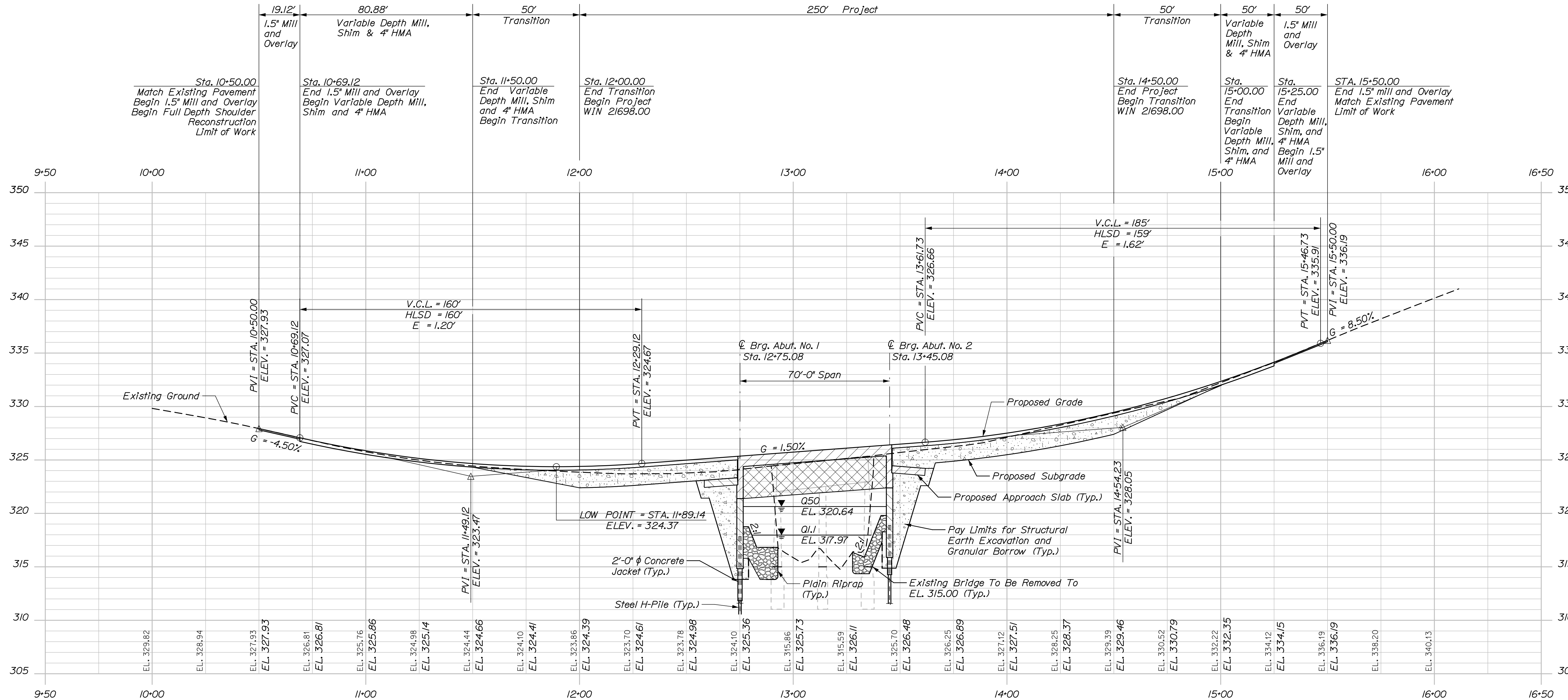
SIGNATURE
P.E. NUMBER
DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

GENERAL PLAN

SHEET NUMBER
4
OF 28

Date:10/18/2018
Username:
Division:
Filename: 004_BDPlan1.dgn



PROFILE

Horiz. 25 0 25 50

Vert. 5 0 5 10

Scale of Feet

HNTB

Date:10/18/2018

Username:

Division:

Filename: 005_Profile.dgn

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 21698.00

BRIDGE PLANS

BRIDGE NO. 2930

SIGNATURE

P.E. NUMBER

DATE

	BY	DATE
PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	A. Sweet	10/18
CHECKED-REVIEWED	R. Hanf	10/18
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

PROFILE

SHEET NUMBER

5

OF 28

CURVE DATA #1
PI = 11+28.01
D = 16°51'06.1"
Δ = 41°15'47.8" Lt.
R = 340.00'
L = 244.86'
T = 128.01'
E = 23.30'

MAG. 19½°

To Mount Vernon

PC = STA. 10+00.00

10+00

11+00

Pavement Sawcut

Variable Depth Mill and 4" HMA

CLL

Taylor Pond Dam

Brick Chimney

Anticipated Proposed Pole Location Sta. 12+30.00, 26' Lt.

Existing Utility Pole (Relocated By Others)

PT = STA. 12+44.86

℄ Brg. Abut No. 1 Sta. 12+75.08

℄ Brg. Abut No. 2 Sta. 13+45.08

70'-0" Span

Install Sediment Trap

Install 18" - 72" CMP Option III

Remove Culvert

Anticipated Proposed Pole Location Sta. 13+93.00, 21' Lt.

Existing Utility Pole (Relocated By Others)

Remove and Reset Boulders (Typ.)

R=10'

Remove Culvert

Variable Depth Mill and 4" HMA

32+87

32+00

31+00

30+00

12+00

13+00

14+00

15+00

16+

Sandy River Road

S 70°13'14.05" E

Route 41 (Pond Road)

To Readfield

BB-WEL-101

BB-WEL-101B

BB-WEL-101A

BB-WEL-102

BB-WEL-102B

BB-WEL-102A

R=15'

2" Mill, Variable Depth Shim, and 1½" Surface

LEGEND
CASED WASH BORING
PROBE

PLAN

25 0 25 50
Scale in Feet

Sta. 11+57.77 Route 41 (Pond Road) ℄ = Sta. 30+00.00 Sandy River Road ℄

Remove and Reset Sign

W-Beam Guardrail Mid-way Splice, Flared Terminal (Typ.)

Flow

Echo Lake Stream

Remove Existing Guardrail (Typ.)

Remove and Reset Signs

W-Beam Guardrail Mid-way Splice (Typ.)

PC = STA. 14+82.37

PT = STA. 16+11.44

Bridge Transition Type "IA" (Typ.)

Plain Riprap (Typ.)

ECHO LAKE

CURVE DATA #2
PI = 15+47.04
D = 7°09'43.1"
Δ = 9°14'36.6" Rt.
R = 800.00'
L = 129.06'
T = 64.67'
E = 2.61'

POE = STA. 32+86.61

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 21698.00

BRIDGE NO. 2930

BRIDGE PLANS

	D.E.ATON	BY	DATE
PROJ. MANAGER	D.E.ATON	A.SWEET	JUN 2018
DESIGN-DETAILED	A.SWEET	A.SWEET	-----
CHECKED-REVIEWED	L.KRUSINSKI	L.KRUSINSKI	-----
DESIGN2-DETAILED2	A.BLASDELL	T.WHITE	JUN 2018
DESIGN3-DETAILED3	----------	----------	----------
REVISIONS 1	------	------	------
REVISIONS 2	------	------	------
REVISIONS 3	------	------	------
REVISIONS 4	------	------	------
FIELD CHANGES	------	------	------

SIGNATURE

P.E. NUMBER

DATE

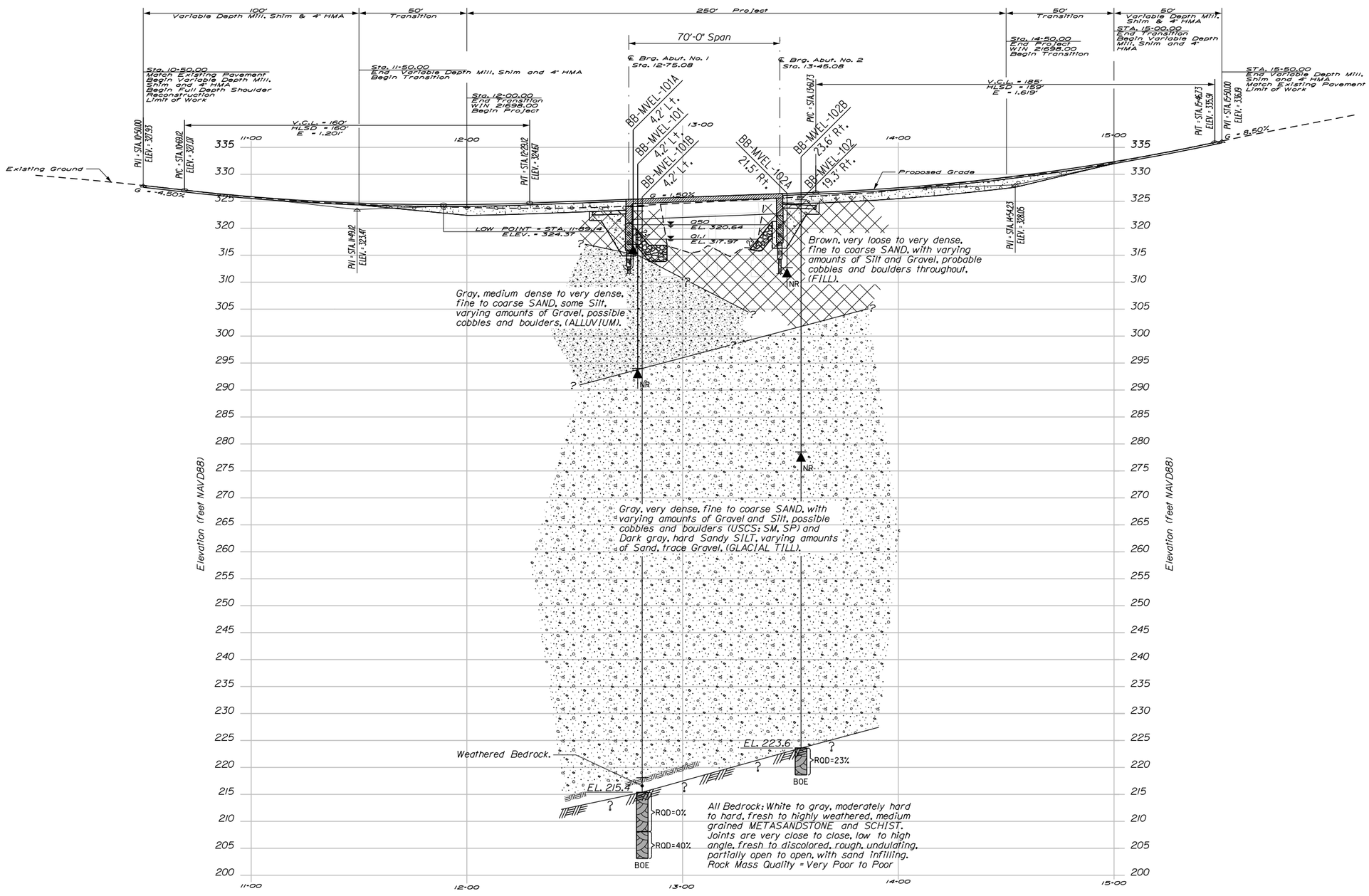
W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC COUNTY

BORING LOCATION PLAN

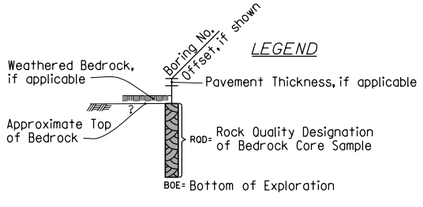
SHEET NUMBER

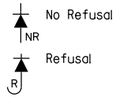
6

OF 28



LEGEND





PROFILE

Vertical Scale has been reduced by ½ its original.

Note: This generalized interpretive soil profile is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretations of widely spaced explorations and samples. Actual soil and bedrock transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 21698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D.EATON		
DESIGN-DETAILED	A.SWEET	JUN 2018	SIGNATURE
CHECKED-REVIEWED	L.KRUSINSKI	-----	
DESIGN2-DETAILED2	A.BLASDELL	JUN 2018	P.E. NUMBER
DESIGN3-DETAILED3	T.WHITE	-----	
REVISIONS 1	------	------	DATE
REVISIONS 2	------	------	
REVISIONS 3	------	------	
REVISIONS 4	------	------	
FIELD CHANGES	------	------	

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC COUNTY

INTERPRETIVE SUBSURFACE PROFILE

SHEET NUMBER

7

OF 28

Maine Department of Transportation — BB-MVEL-101

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Project: Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Location: Mt. Vernon, Maine

Boring No.: BB-MVEL-101
WIN: 21698.00

Driller:	MaineDOT	Elevation (ft.):	324.0	Auger ID/OD:	5" Solid Stem
Operator:	Doggett/James	Datum:	NAVD88	Sampler:	Standard Split Spoon
Logged By:	B. Wilder	Rig Type:	CME 45C	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish:	4/5/2017: 08:00-14:00	Drilling Methods:	Cased Wash Boring	Core Barrel:	N/A
Boring Location:	12+79.2, 4.2 feet Lt.	Casing ID/OD:	NW-3"	Water Level*:	4.6 feet bgs.
Hammer Efficiency Factor:	0.854	Hammer Type:	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions: D = Split Spoon Sample; ST = Shelby Tube Sample Attempt; W = Unsuccessful Thin Wall Tube Sample Attempt; U = Thin Wall Tube Sample; WS = Unsuccessful Split Spoon Sample Attempt; V = Field Vane Shear Test; PP = Pocket Penetrometer; W = Unsuccessful Field Vane Shear Test Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR = Weight of Rods or Casing; WOP = Weight of 1 Person; q_u = Peak/Remolded Field Vane Unrealined Shear Strength (psf); q_u(qp) = Lab Vane Unrealined Shear Strength (psf); q_p = Unconfined Compressive Strength (tsf); N-value = Raw Field SPT N-value; N$_{60}$ = SPT N-value Corrected for Hammer Efficiency; T_p = Pocket Torvane Shear Strength (psf); T_v = Field Vane Shear Test Attempt; MC = Water Content, percent; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test; Hammer Efficiency Factor/ASTM=uncorrected

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#'s in) Pen. Resistance Strength or RQD (%)	N-uncorrected	N$_{60}$	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
							5" SA				
								323.2		9.5-inches HMA. 0.8	
										Brown, damp, medium dense, fine to coarse SAND, little gravel, trace silt. (fill).	
	1D	24/14	1.00 - 3.00	6/9/5/6	14	20					
	2D	24/9	5.00 - 7.00	18/19/12/9	31	44					
								315.0		Brown, moist, dense, Gravelly fine to coarse SAND, trace silt. (fill). 9.0	
	3D	24/10	10.00 - 12.00	18/19/18/17	37	53					
								310.0		Grey, wet, dense, Gravelly fine to coarse SAND, some silt. 14.0	
	4D	24/14	15.00 - 17.00	9/10/9/11	19	27					GM271163 A-2-4, SM WC=10.5%
										Grey, wet, medium dense, fine to coarse SAND, some silt, trace gravel.	
	5D	24/10	20.00 - 22.00	10/12/16/17	28	40					
										Grey, wet, dense, fine to coarse SAND, some silt, some gravel.	
	6D	24/10	25.00 - 27.00	17/21/24/22	45	64					
								294.0		Bottom of Exploration at 30.0 feet below ground surface. Drove NW Casing at 30.0 feet bgs.. Moved to BB-MVEL-101A. 30.0	

Remarks:
-Left 20.0 feet of NW Casing in bore hole.

Stratification lines represent approximate boundaries between soil typesat transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1
Boring No.: BB-MVEL-101

Maine Department of Transportation — BB-MVEL-101A

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Project: Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Location: Mt. Vernon, Maine

Boring No.: BB-MVEL-101A
WIN: 21698.00

Drilling Contractor:	MaineDOT	Elevation (ft.):	324.0	Auger ID/OD:	5" Dia.
Operator:	Doggett/James	Datum:	NAVD88	Sampler:	N/A
Logged By:	B. Wilder	Rig Type:	CME 45C	Hammer Wt./Fall:	N/A
Date Start/Finish:	4/5/2017: 14:00-14:30	Drilling Methods:	Solid Stem Auger	Core Barrel:	N/A
Boring Location:	12+77.1, 4.2 feet Lt.	Casing ID/OD:	N/A	Water Level*:	4.8 feet bgs.
Hammer Efficiency Factor:	0.854	Hammer Type:	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions: S = Split Spoon Sample; B = Bucket Sample off Auger Flights; WS = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; W = Unsuccessful Field Vane Shear Test attempt; V = Field Vane Shear Test; RPA Pocket Penetrometer; WOH = Weight of Hammer; WOR = Weight of Rods or Casing; WOP = Weight of 1 Person; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; q_u = Peak/Remolded Field Vane Unrealined Shear Strength (psf); q_u(qp) = Lab Vane Unrealined Shear Strength (psf); q_p = Unconfined Compressive Strength (tsf); N-value = Raw Field SPT N-value; N$_{60}$ = SPT N-value Corrected for Hammer Efficiency; T_p = Pocket Torvane Shear Strength (psf); MC = Water Content, percent; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#'s in) Pen. Resistance Strength or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
0						5" SA				
									No material description given.	
5										
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil typesat transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1
Boring No.: BB-MVEL-101A

Maine Department of Transportation — BB-MVEL-101B

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Project: Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Location: Mt. Vernon, Maine

Boring No.: BB-MVEL-101B
WIN: 21698.00

Drillers:	MaineDOT	Elevation (ft.):	324.1	Auger ID/OD:	5" Solid Stem
Operator:	Doggett/James	Datum:	NAVD88	Sampler:	Standard Split Spoon
Logged By:	B. Wilder	Rig Type:	CME 45C	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish:	4/5,7,10,12/2017	Drilling Methods:	Cased Wash Boring	Core Barrel:	N/A
Boring Location:	12+81.3, 4.2 feet Lt.	Casing ID/OD:	NW-3"	Water Level*:	6.8 feet bgs.
Hammer Efficiency Factor:	0.854	Hammer Type:	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions: D = Split Spoon Sample; ST = Shelby Tube Sample Attempt; W = Unsuccessful Thin Wall Tube Sample Attempt; U = Thin Wall Tube Sample; WS = Unsuccessful Split Spoon Sample Attempt; V = Field Vane Shear Test; PP = Pocket Penetrometer; W = Unsuccessful Field Vane Shear Test Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR = Weight of Rods or Casing; WOP = Weight of 1 Person; q_u = Peak/Remolded Field Vane Unrealined Shear Strength (psf); q_u(qp) = Lab Vane Unrealined Shear Strength (psf); q_p = Unconfined Compressive Strength (tsf); N-value = Raw Field SPT N-value; N$_{60}$ = SPT N-value Corrected for Hammer Efficiency; T_p = Pocket Torvane Shear Strength (psf); MC = Water Content, percent; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test; Hammer Efficiency Factor/ASTM=uncorrected

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#'s in) Pen. Resistance Strength or RQD (%)	N-uncorrected	N$_{60}$	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
0							5" SA				
										Augered to 30.0 feet bgs. No material description given.	
5											
10											
15											
20											
25											
										Set in NW Casing at 25.0 feet bgs.	
	1D	12/10	30.00 - 31.00	35/55	---		OPEN HOLE	294.1		Grey, wet, very dense, fine to coarse SAND, some silt, little gravel. Roller Coned ahead to 35.0 feet bgs. 30.0	GM271163 A-2-4, SM WC=8.7%
	2D	3.6/3.6	35.00 - 35.30	40(3.6")	---					Roller Coned ahead to 36.0 feet bgs.	
	R1	60/8	36.00 - 41.00							R1: Cobbles. Roller Coned ahead to 41.0 feet bgs.	
	3D	9.6/9.6	41.00 - 41.80	46/60(3.6")	---					Similar to above. Roller Coned ahead to 45.0 feet bgs. drove casing back down to 45.0 feet bgs.	
	4D	18/18	45.00 - 46.50	34/59/55	114	162				Grey, wet, very dense, Silty SAND, little gravel. Roller Coned ahead to 50.0 feet bgs.	GM271164 A-4, SM WC=10.3%
	5D	10.8/10	50.00 - 50.90	26/55(4.8")	---					Similar to above. Roller Coned ahead to 60.0 feet bgs.	GM271165 A-4, SM WC=9.5%
	6D	6/6	60.00 - 60.50	60	---					Similar to above. Drove casing to 55.0 feet bgs.	
										Similar to above. Roller Coned ahead to 70.0 feet bgs. Drove casing to 65.0 feet bgs for the weekend.	
	WD	2.4/2.4	70.00 - 70.20	40(2.4")	---					Similar to above in wash water. Roller Coned ahead to 73.0 feet bgs.	
75											

Remarks:

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Page 1 of 2
Boring No.: BB-MVEL-101B

Maine Department of Transportation — BB-MVEL-101B

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Project: Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Location: Mt. Vernon, Maine

Boring No.: BB-MVEL-101B
WIN: 21698.00

Drillers:	MaineDOT	Elevation (ft.):	324.1	Auger ID/OD:	5" Solid Stem
Operator:	Doggett/James	Datum:	NAVD88	Sampler:	Standard Split Spoon
Logged By:	B. Wilder	Rig Type:	CME 45C	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish:	4/5,7,10,12/2017	Drilling Methods:	Cased Wash Boring	Core Barrel:	N/A
Boring Location:	12+81.3, 4.2 feet Lt.	Casing ID/OD:	NW-3"	Water Level*:	6.8 feet bgs.
Hammer Efficiency Factor:	0.854	Hammer Type:	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions: D = Split Spoon Sample; ST = Shelby Tube Sample Attempt; W = Unsuccessful Thin Wall Tube Sample Attempt; U = Thin Wall Tube Sample; WS = Unsuccessful Split Spoon Sample Attempt; V = Field Vane Shear Test; PP = Pocket Penetrometer; W = Unsuccessful Field Vane Shear Test Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR = Weight of Rods or Casing; WOP = Weight of 1 Person; q_u = Peak/Remolded Field Vane Unrealined Shear Strength (psf); q_u(qp) = Lab Vane Unrealined Shear Strength (psf); q_p = Unconfined Compressive Strength (tsf); N-value = Raw Field SPT N-value; N$_{60}$ = SPT N-value Corrected for Hammer Efficiency; T_p = Pocket Torvane Shear Strength (psf); MC = Water Content, percent; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test; Hammer Efficiency Factor/ASTM=uncorrected

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#'s in) Pen. Resistance Strength or RQD (%)	N-uncorrected	N$_{60}$	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
75											
								247.1		Casing installed in Open Hole to 80.0 ft. Then continued Open Hole below. 77.0	
80											
	8D	24/24	80.00 - 82.00	13/17/23/31	40	57	NW			Dark grey, wet, hard, fine to medium Sandy SILT, little clay, trace gravel. (Glacial Till).	GM271168 A-4, ML WC=9.7%
85											
90											
	9D	24/20	90.00 - 92.00	12/15/22/30	37	53				Dark grey, wet, hard, Sandy SILT, trace gravel. (Glacial Till).	GM271166 A-4, ML WC=11.1%
95											
								228.1		Casing driven 80 to 95 ft. Then continued with Open Hole. 96.0	
100											
	10D	12/10	100.00 - 101.00	30/66	---					Grey, wet, very dense, Silty fine to coarse SAND, with seams of white, weathered bedrock. (Glacial Till).	
105											
										Drove casing through open hole to 105.5	
								218.1		Weathered Bedrock, Roller Coned ahead 108.7 feet bgs.	
110											
	R2	87.6/32	108.70 - 116.00	RQD = 0%			NQ-2	215.4		R2: Bedrock: White, medium grained, METASANDSTONE, moderately hard to soft, very weathered, joints at low angle, open with sand infilling. Parkman Hill Formation. Rock Mass Quality = Very Poor. R2: Core Times (min/sec) 108.7-108.9 feet (0:32) 108.9-110.7 feet (0:50) 110.7-111.7 feet (0:55) 111.7-112.7 feet (0:42) 112.7-113.7 feet (0:42) 113.7-114.7 feet (1:42) 114.7-115.7 feet (1:55) 115.7-116.0 feet (2:00) 36% Recovery 108.7	
115											
								208.1			
	R3	60/47	116.00 - 121.00	RQD = 40%						R3: Bedrocks White, medium grained, METASANDSTONE/ SCHIST, moderately hard, fresh to slightly weathered, joint sets at low angles and vertical, open, sand infilling. Parkman Hill Formation. Rock Mass Quality = Poor R3: Core Times (min:sec) 116.0-117.0 feet (1:21) 117.0-118.0 feet (1:17) 118.0-119.0 feet (1:15) 119.0-120.0 feet (1:28) 120.0-121.0 feet (1:59) 78% Recovery Possible 12-inch core in bottom of bore hole. 116.0 121.0	
120								203.1			
										Bottom of Exploration at 121.0 feet below ground surface.	
125											

Remarks:

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Page 2 of 2
Boring No.: BB-MVEL-101B

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-21691(800)

WIN 21698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D.EATON	BY	DATE
DESIGN-DETAILED	J.OLUND	HNTB	JUN 2018
CHECKED-REVIEWED	L.KRUSINSKI	-----	-----
DESIGN2-DETAILED2	A.BLAISDELL	T.WHITE	JUN 2018
DESIGN3-DETAILED3	-----	-----	-----
REVISIONS 1	-----	-----	-----
REVISIONS 2	-----	-----	-----
REVISIONS 3	-----	-----	-----
REVISIONS 4	-----	-----	-----
FIELD CHANGES	-----	-----	-----

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC COUNTY

BORING LOGS

SHEET NUMBER
8
OF 28

Filename: ...\MSTA\009_BORING LOGS2.dgn Division: GEOTECH Username: Terry.White Date:8/28/2018

Maine Department of Transportation — BB-MVEL-102

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Projects W. Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Locations Mt. Vernon, Maine

Boring No.: BB-MVEL-102
WIN: 21698.00

Drillers: Maine Test Boring	Elevation (ft.): 325.3	Auger ID/OD:	5" Hollow Stem
Operators: Nadeau	Datum: NAVD88	Samplers:	Standard Split Spoon
Logged By: B. Cardall	Rig Type: Diedrich D50 Turbo	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish: 5/2/2017-5/3/2017	Drilling Methods: Cased Wash Boring	Core Barrels:	N/A
Boring Location: 13+54.9, 19.3 feet Rt.	Casing ID/OD: HW-4"	Water Level(ft):	7.9 feet bgs.
Hammer Efficiency Factors: 0.979	Hammer Type: Automatic ☒ Hydraulic ☐	Rope & Cathead ☐	

Definitions:
S = Split Spoon Sample
B = Bucket Sample of Auger Flights
U = Thin Wall Tube Sample
WS = Unsuccessful Split Spoon Sample Attempt
WU = Unsuccessful Thin Wall Tube Sample Attempt
WH = Unsuccessful Hand Vane Shear Test Attempt
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lbs. Hammer
WOR = Weight of Rods or Casing
WOP = Weight of One Person
q_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$q_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_c = Unconfined Compressive Strength (ksf)
N-value = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-value Corrected for Hammer Efficiency
N_{60} = Hammer Efficiency Factor*60/Sum-Uncorrected
T_v = Pocket Torvane Shear Strength (psf)
RC = Roller Cone, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#/6 in.) Pen. Resistance (Cohesive Strength or RQD (%))	Uncorrected N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
						324.8		Brown, moist, loose, fine to coarse SAND, little silt with organics. (Topsoil).	
								-0.5-	
10	24/7	0.00 - 2.00	1/2/4/5	6	10	HSA		Brown, moist, dense, Silty fine to coarse SAND, little gravel, with probable cobbles and boulders. (Till).	
20	24/5	4.50 - 6.50	11/27/9/9	36	59				
30	24/13	9.00 - 11.00	1/1/1/2	2	3			(30) Top 3-inches: Light brown, wet, very loose, fine to medium SAND, some silt, trace gravel. (Fill). Bottom 10-inches: Apparent horizontal grained wood.	
40	24/10	14.00 - 16.00	2/4/5/8	9	15			Light brown, wet, medium dense, fine to medium SAND, some silt, trace gravel, with probable cobbles and boulders. (Till).	GM271155 A-2-4, SM WC=13.4%
					26				
					73				
					88				
50	24/12	20.00 - 22.00	17/21/19/15	40	65			Light brown, wet, very dense, fine to medium SAND, some silt, little gravel, with probable cobbles and boulders. (Till).	SM
					71				
					144				
					236	301.8			
					RC			-23.5- Roller Coned ahead to 47.0 feet bgs.	
60	24/19	25.00 - 27.00	32/35/41/46	76	124			Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel. (Glacial Till).	GM271156 A-2-4, SM WC=10.9%
70	24/18	30.00 - 32.00	20/44/49/43	93	152			Grey, wet, very dense, Silty fine to coarse SAND, little gravel. (Glacial Till).	GM271157 A-4, SM WC=9.6%
80	19.2/ 19.2	35.00 - 36.60	47/78/196/50(1")	274	447			Grey, wet, very dense, fine to medium SAND, some silt, little gravel. (Glacial Till).	
90	9.6/9.6	40.00 - 40.80	61/209(3.6")	---				Grey, wet, very dense, fine to coarse SAND, little silt, little gravel. (Glacial Till).	
100	24/24	45.00 - 47.00	19/68/88/106	156	255	278.3		Grey, wet, very dense, fine to coarse SAND, some silt, little gravel. (Glacial Till).	
								-47.0- Bottom of Exploration at 47.0 feet below ground surface. Broke Casing, moved to BB-MVEL-102A.	

Remarks:
- Auto Hammer #377.
- During advancement of 4-inch casing from 45.0-50.0 ft bgs, the casing broke. Twenty feet of casing left in hole. Moved to BB-MVEL-102A.
- Water level was taken approximately 15 minutes after casing was removed.

Stratification lines represent approximate boundaries between soil typest transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1
Boring No.: BB-MVEL-102

Maine Department of Transportation — BB-MVEL-102A

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Projects W. Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Locations Mt. Vernon, Maine

Boring No.: BB-MVEL-102A
WIN: 21698.00

Drilling Contractor: Maine Test Boring	Elevation (ft.): 324.7	Auger ID/OD:	5" Dia.
Operators: Nadeau	Datum: NAVD88	Samplers:	N/A
Logged By: B. Cardall	Rig Type: Diedrich D50 Turbo	Hammer Wt./Fall:	N/A
Date Start/Finish: 5/3/2017-5/5/2017	Drilling Methods: Solid Stem Auger	Core Barrels:	N/A
Boring Location: 13+48.4, 21.5 feet Rt.	Casing ID/OD: N/A	Water Level(ft):	7.9 feet bgs.
Hammer Efficiency Factors: 0.979	Hammer Type:		

Definitions:
S = Split Spoon Sample
B = Bucket Sample of Auger Flights
U = Thin Wall Tube Sample
WS = Unsuccessful Split Spoon Sample Attempt
WU = Unsuccessful Thin Wall Tube Sample Attempt
WH = Unsuccessful Hand Vane Shear Test Attempt
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lbs. Hammer
WOR = Weight of Rods or Casing
WOP = Weight of 1 Person
q_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$q_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_c = Unconfined Compressive Strength (ksf)
N-value = Raw Field SPT N-value
T_v = Pocket Torvane Shear Strength (psf)
RC = Roller Cone, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#/6 in.) Pen. Resistance (Cohesive Strength or RQD (%))	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
					S4			No material description given: see BB-MVEL-102.	
						312.7		-12.0- Bottom of Exploration at 12.0 feet below ground surface. Large cobble Kicked auger, moved to BB-MVEL-102B.	

Remarks:
- Multiple attempts were made between BB-MVEL-102A and BB-MVEL-102B1 Casing broke during attempts ranging from 23.0 to 35.0 feet bgs. A 10.0 foot rod with roller cone and an auger head were left in attempts at approximately 30.0 feet and 20.0 feet respectively.

Stratification lines represent approximate boundaries between soil typest transitions may be gradual.
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Page 1 of 1
Boring No.: BB-MVEL-102A

Maine Department of Transportation — BB-MVEL-102B

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Projects W. Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Locations Mt. Vernon, Maine

Boring No.: BB-MVEL-102B
WIN: 21698.00

Drillers: Maine Test Boring	Elevation (ft.): 324.7	Auger ID/OD:	5" Solid Stem
Operators: Nadeau	Datum: NAVD88	Samplers:	Standard Split Spoon
Logged By: B. Cardall	Rig Type: Diedrich D50 Turbo	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish: 5/5/2017-5/8/2017	Drilling Methods: Cased Wash Boring	Core Barrels:	NX-2"
Boring Location: 13+54.9, 23.6 feet. Rt.	Casing ID/OD: HW-4" & NW-5"	Water Level(ft):	7.8 feet bgs.
Hammer Efficiency Factors: 0.979	Hammer Type: Automatic ☒ Hydraulic ☐	Rope & Cathead ☐	

Definitions:
S = Split Spoon Sample
B = Bucket Sample of Auger Flights
U = Thin Wall Tube Sample
WS = Unsuccessful Split Spoon Sample Attempt
WU = Unsuccessful Thin Wall Tube Sample Attempt
WH = Unsuccessful Hand Vane Shear Test Attempt
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lbs. Hammer
WOR = Weight of Rods or Casing
WOP = Weight of One Person
q_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$q_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_c = Unconfined Compressive Strength (ksf)
N-value = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-value Corrected for Hammer Efficiency
N_{60} = Hammer Efficiency Factor*60/Sum-Uncorrected
T_v = Pocket Torvane Shear Strength (psf)
RC = Roller Cone, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#/6 in.) Pen. Resistance (Cohesive Strength or RQD (%))	Uncorrected N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
					S5A			No samples taken from 0.0-50.0 feet bgs. refer to BB-MVEL-102 for material descriptions.	
					RC			Roller Coned ahead to 101.2 feet bgs.	
10	24/16	50.00 - 52.00	41/52/71/72	123	201	274.8		-50.0- Grey, wet, very dense, fine to medium SAND, some silt, little gravel. (Glacial Till).	
20	24/22	54.00 - 56.00	29/39/58/36	97	158			Grey, wet, very dense, Silty fine to coarse SAND, little gravel. (Glacial Till).	GM271158 A-4, SM WC=8.8%
30	24/24	59.00 - 61.00	25/35/44/53	79	129			Grey, wet, very dense, Silty fine SAND, little gravel. (Glacial Till).	
40	24/24	64.00 - 66.00	21/32/52/54	84	137			Grey, wet, very dense, Sandy SILT, trace gravel. (Glacial Till).	GM271160 A-4, ML WC=10.0%
50	9.6/8	69.00 - 69.80	25/62(3.6")	---				Grey, wet, very dense, fine to medium SAND, some silt, little gravel. (Glacial Till).	
						252.8		-72.0-	
60	15.6/ 15.6	74.00 - 75.30	25/44/50(3.6")	---				Light brown, wet, very dense, Silty SAND. (Glacial Till).	GM271159 A-4, SM

Remarks:
- Auto Hammer #377.
- Second 5.0 foot core run could not be taken due to broken casing and running sands within 3-inch casing.
- 4-inch casing to 32.0 feet bgs. then 3-ich casing to 101.2 feet bgs.

Stratification lines represent approximate boundaries between soil typest transitions may be gradual.
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Page 1 of 2
Boring No.: BB-MVEL-102B

Maine Department of Transportation — BB-MVEL-102B (continued)

Soil/Rock Exploration Log — US CUSTOMARY UNITS

Projects W. Mt. Vernon Bridge #2930 carries Route 41 over Echo Lake
Locations Mt. Vernon, Maine

Boring No.: BB-MVEL-102B
WIN: 21698.00

Drillers: Maine Test Boring	Elevation (ft.): 324.8	Auger ID/OD:	5" Solid Stem
Operators: Nadeau	Datum: NAVD88	Samplers:	Standard Split Spoon
Logged By: B. Cardall	Rig Type: Diedrich D50 Turbo	Hammer Wt./Fall:	140-lbs/30-inches
Date Start/Finish: 5/5/2017-5/8/2017	Drilling Methods: Cased Wash Boring	Core Barrels:	NX-2"
Boring Location: 13+54.9, 23.6 feet. Rt.	Casing ID/OD: HW-4" & NW-5"	Water Level(ft):	7.8 feet bgs.
Hammer Efficiency Factors: 0.979	Hammer Type: Automatic ☒ Hydraulic ☐	Rope & Cathead ☐	

Definitions:
S = Split Spoon Sample
B = Bucket Sample of Auger Flights
U = Thin Wall Tube Sample
WS = Unsuccessful Split Spoon Sample Attempt
WU = Unsuccessful Thin Wall Tube Sample Attempt
WH = Unsuccessful Hand Vane Shear Test Attempt
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140 lb. Hammer
WOR = Weight of Rods or Casing
WOP = Weight of One Person
q_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$q_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_c = Unconfined Compressive Strength (ksf)
N-value = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-value Corrected for Hammer Efficiency
N_{60} = Hammer Efficiency Factor*60/Sum-Uncorrected
T_v = Pocket Torvane Shear Strength (psf)
RC = Roller Cone, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (#/6 in.) Pen. Resistance (Cohesive Strength or RQD (%))	Uncorrected N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
									WC=21.5%
70	13.2/ 13.2	79.00 - 80.10	28/68/50(1.2")	---				Light brown, wet, very dense, fine to medium SAND, little silt, trace gravel. (Glacial Till).	
80	10.8/ 10.8	84.00 - 84.90	25/50(4.8")	---				Light brown, wet, very dense, fine to medium SAND, little silt. (Glacial Till).	
90	14.4/ 14.4	89.00 - 90.20	28/51/50(2.4")	---				Light brown, wet, very dense, fine to coarse SAND, little silt. (Glacial Till).	GM271161 A-2-4, SM WC=15.0%
100	14.4/ 14.4	94.00 - 95.20	25/51/50(2.4")	---				Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel. (Glacial Till).	GM271162 A-2-4, SM WC=16.2%
110	14.4/10	99.00 - 100.20	40/54/50(2.4")	---				Light brown, wet, very dense, fine to coarse SAND, some gravel, trace silt. (Glacial Till).	
R1	60/60	101.20 - 106.20	RQD = 23%		NX-2	223.6		-101.2- Top of Bedrock at Elev. 223.6 feet. R1: Bedrock: Grey, medium-grained, SCHIST, hard, fresh to slightly weathered, Primary joints are very close to close, low angle, fresh to discolored, rough, undulating, partially open to open. Secondary joints are very close to close, high angle, rough, planar, discolored with sand infilling. One per vertical joint. Rock Mass Quality = very Poor R1: Core Times (minutes): 101.2-102.2 feet (2:01) 102.2-103.2 feet (1:52) 103.2-104.2 feet (2:52) 104.2-105.2 feet (2:12) 105.2-106.2 feet (1:30) 100% Recovery	
						218.6		-106.2- Bottom of Exploration at 106.2 feet below ground surface.	

Remarks:
- Auto Hammer #377.
- Second 5.0 foot core run could not be taken due to broken casing and running sands within 3-inch casing.
- 4-inch casing to 32.0 feet bgs. then 3-ich casing to 101.2 feet bgs.

Stratification lines represent approximate boundaries between soil typest transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 2 of 2
Boring No.: BB-MVEL-102B

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 21698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D.EATON	BY	DATE
DESIGN-DETAILED	J.OLUND	HNTB	JUN 2018
CHECKED-REVIEWED	L.KRUSINSKI	_____	_____
DESIGN2-DETAILED2	A.BLAISDELL	T.WHITE	JUN 2018
DESIGN3-DETAILED3	_____	_____	_____
REVISIONS 1	_____	_____	_____
REVISIONS 2	_____	_____	_____
REVISIONS 3	_____	_____	_____
REVISIONS 4	_____	_____	_____
FIELD CHANGES	_____	_____	_____

SIGNATURE

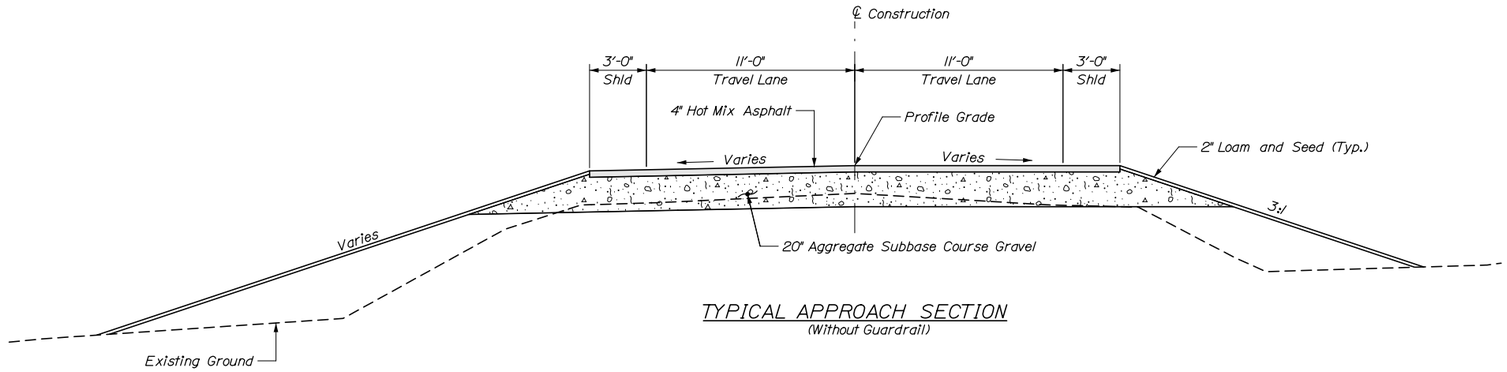
P.E. NUMBER

DATE

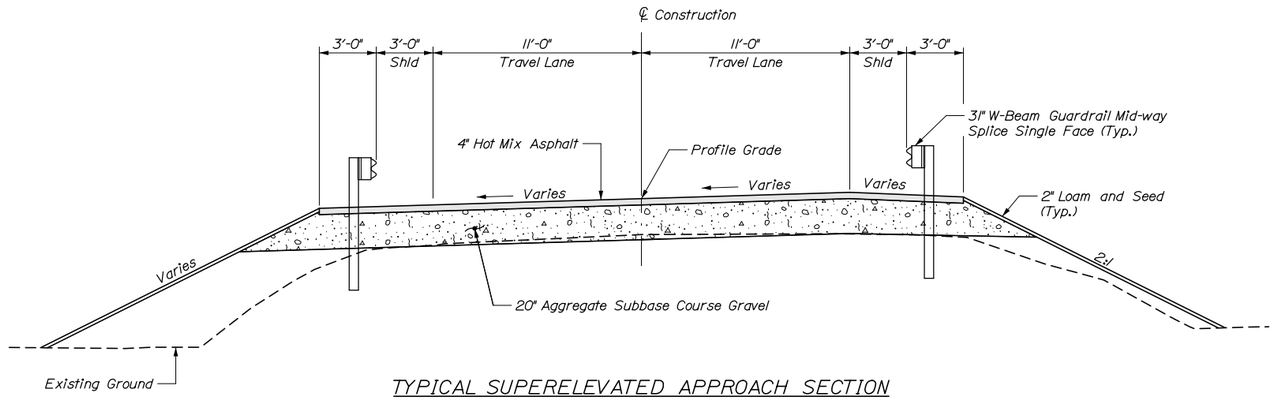
W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC COUNTY

BORING LOGS

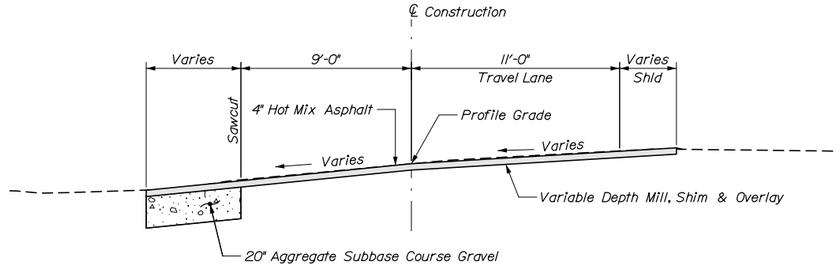
SHEET NUMBER
9
OF 28



TYPICAL APPROACH SECTION
(Without Guardrail)



TYPICAL SUPERELEVATED APPROACH SECTION
(With Guardrail)



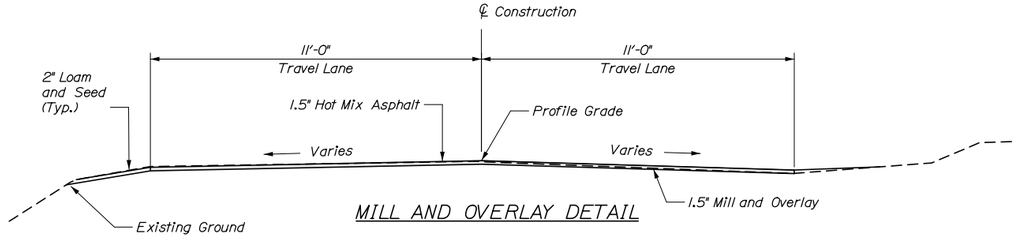
SHOULDER WIDENING DETAIL

Route 41 (Pond Road) Super (e)				
Left % Shoulder	Left % Travelway	Station	Right % Travelway	Right % Shoulder
Match Existing		10+50.00	Match Existing	
-12.0%	-12.0%	10+75.00	6.0%	-1.88%*
-11.0%	-11.0%	11+00.00	6.0%	-2.67%*
-10.0%	-10.0%	11+25.00	6.0%	6.0%*
-9.0%	-9.0%	11+50.00	6.0%	6.0%*
-8.0%	-8.0%	11+75.00	6.0%	-2.0%
-7.0%	-7.0%	12+00.00	6.0%	-2.0%
-6.0%	-6.0%	12+25.00	6.0%	-2.0%
-5.0%	-5.0%	12+50.00	5.0%	1.0%
-4.0%	-4.0%	12+75.00	4.0%	4.0%
-4.0%	-4.0%	13+00.00	4.0%	4.0%
-4.0%	-4.0%	13+25.00	4.0%	4.0%
-4.0%	-4.0%	13+50.00	4.0%	4.0%
-3.0%	-3.0%	13+75.00	3.0%	0.0%
-2.0%	-2.0%	14+00.00	2.0%	-4.0%
-2.0%	-2.0%	14+25.00	1.0%	-4.0%
-2.0%	-2.0%	14+50.00	0.0%	-4.0%
-2.0%	-2.0%	14+75.00	-1.0%	-1.0%
-2.0%	-2.0%	15+00.00	-2.0%	-2.0%
-2.0%	-2.0%	15+25.00	-3.0%	-3.0%
Match Existing		15+50.00	Match Existing	

* Shoulder cross slopes vary as a result of intersection grading/paving

Notes:

1. See cross sections for limits of existing pavement removal.
2. The shoulder break location shall transition near the bridge in accordance with Standard Detail 801(10).
3. The pavement, base and subbase depths as shown on the plans are intended to be nominal.
4. When superelevated exceeds the slope of the low side shoulder, the low side shoulder pavement shall have the same cross slope as the travelway.
5. Crowns for both normal and superelevated sections for all courses of subbase and pavement shall be straight.



MILL AND OVERLAY DETAIL

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 21698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	A. Sweet	10/18
CHECKED-REVIEWED	R. Hanf	10/18
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

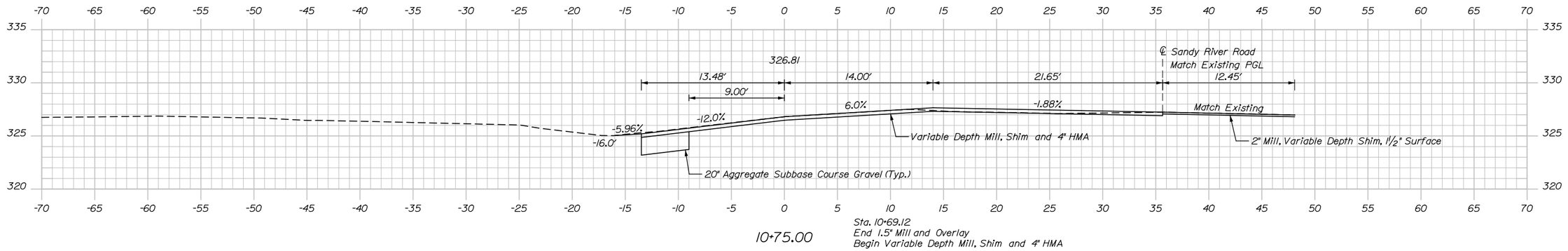
W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

TYPICAL SECTIONS

SHEET NUMBER
10
OF 28

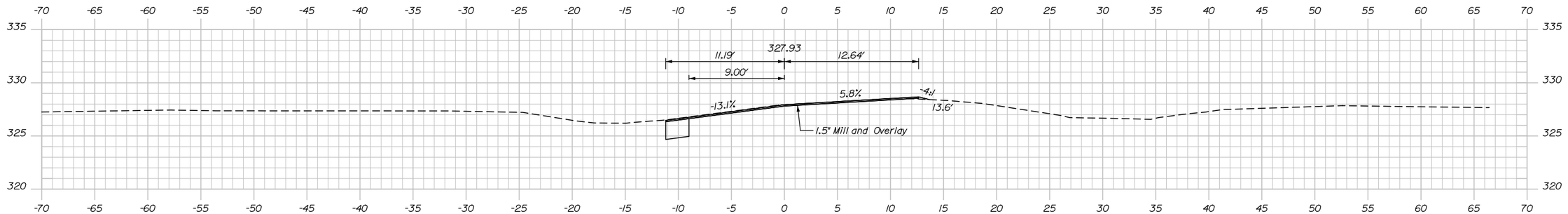
HNTB

Date:10/18/2018
Username:
Division:
Filename: 010_Typical_Sections.dgn



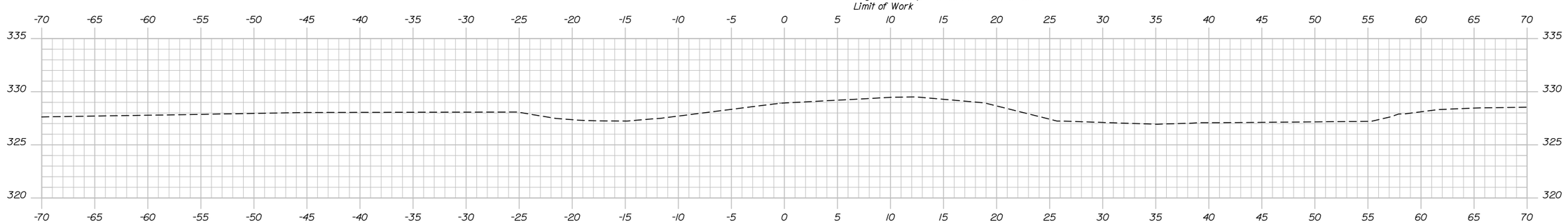
10+75.00

Sta. 10+69.12
End 1.5" Mill and Overlay
Begin Variable Depth Mill, Shim and 4" HMA



10+50.00

Sta. 10+50.00
Match Existing Pavement
Begin 1.5" Mill and Overlay
Begin Full Depth Shoulder Reconstruction
Limit of Work



10+25.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A.Sweet	S.Scribner	10\18
CHECKED-REVIEWED	R.Hanf	J.Olund	10\18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

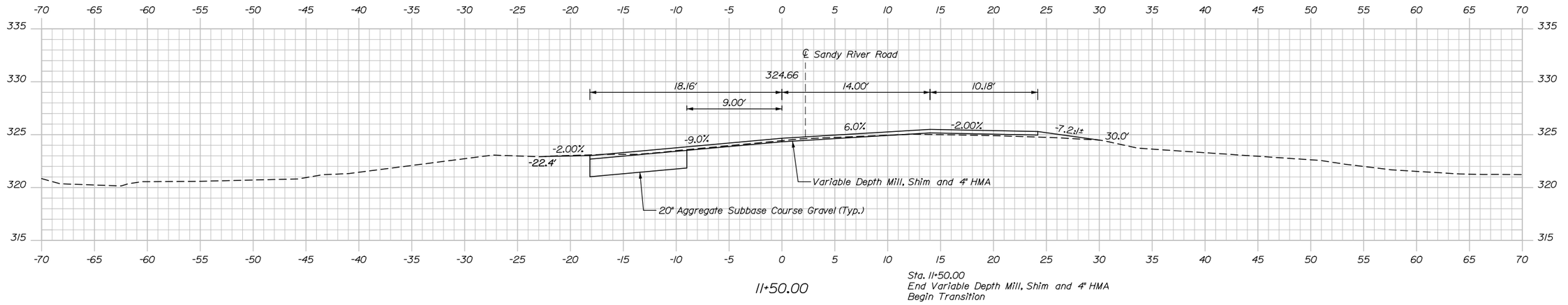
11

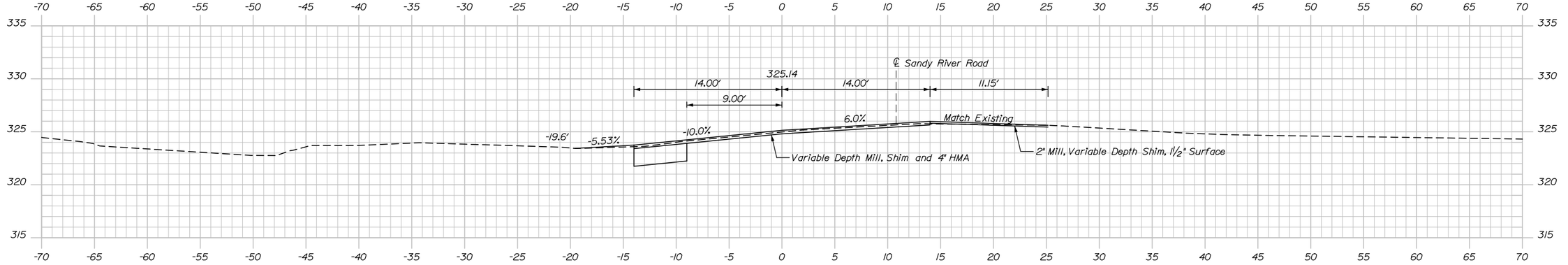
OF 28

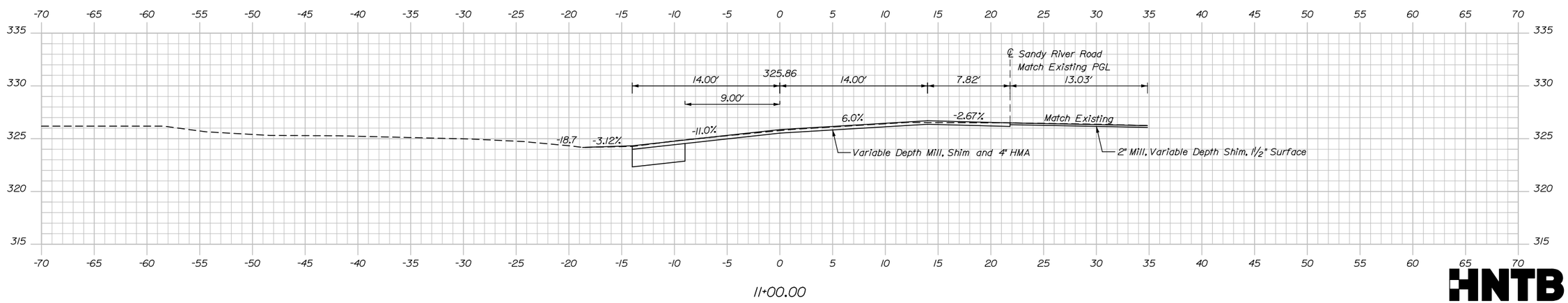
HNTB

Sta. 10+25.00 to Sta. 10+75.00

Filename: 011_Xsect1.dgn Division: Username: Date:10/18/2018







STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A.Sweet	S.Scribner	10\18
CHECKED-REVIEWED	R.Hoerl	J.Olund	10\18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

P.E. NUMBER

SIGNATURE

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

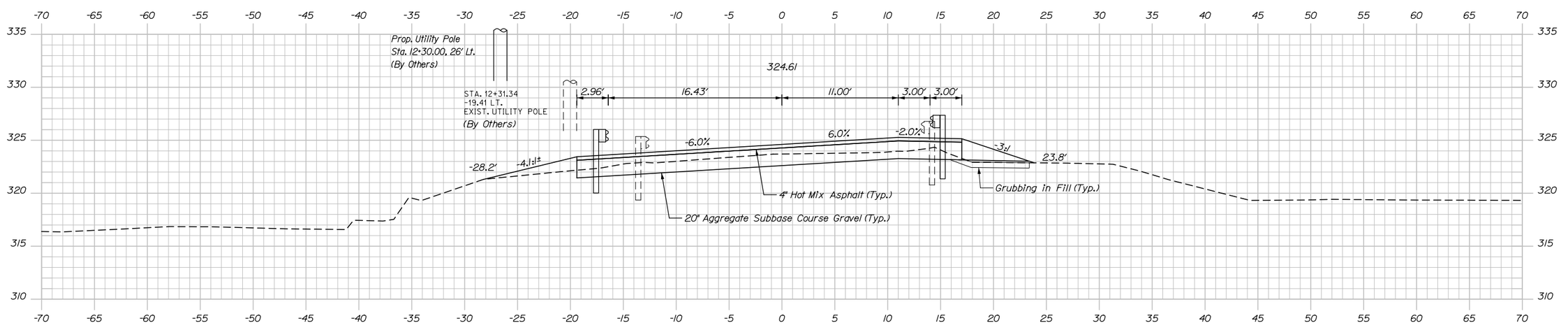
12

OF 28

HNTB

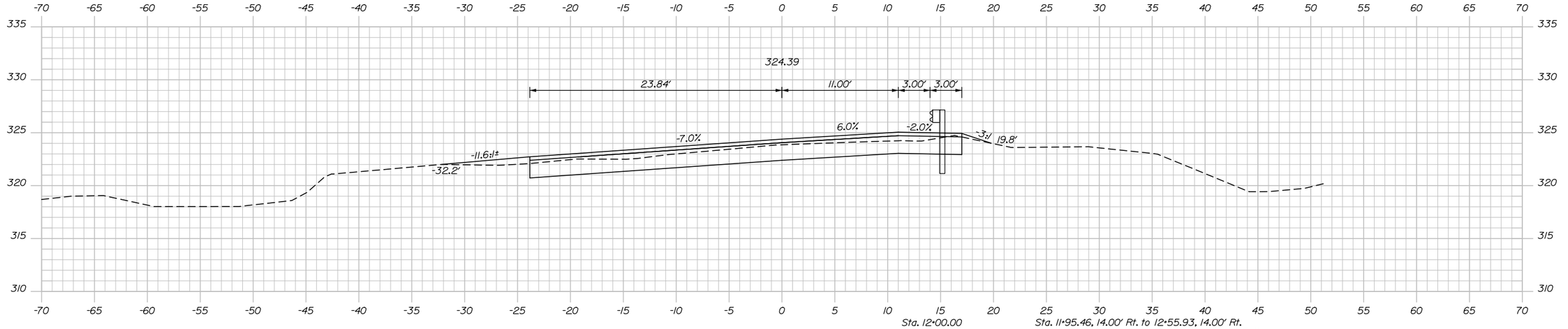
Sta. 11+00.00 to Sta. 11+50.00

Date:10/18/2018
Username:
Division:
Filename: 012_Xsec12.dgn



Sta. 12+04.22, 18.00' Lt. to Sta. 12+43.37, 14.00' Lt.
Install W-Beam Guardrail Mid-way Splice, Flared Terminal

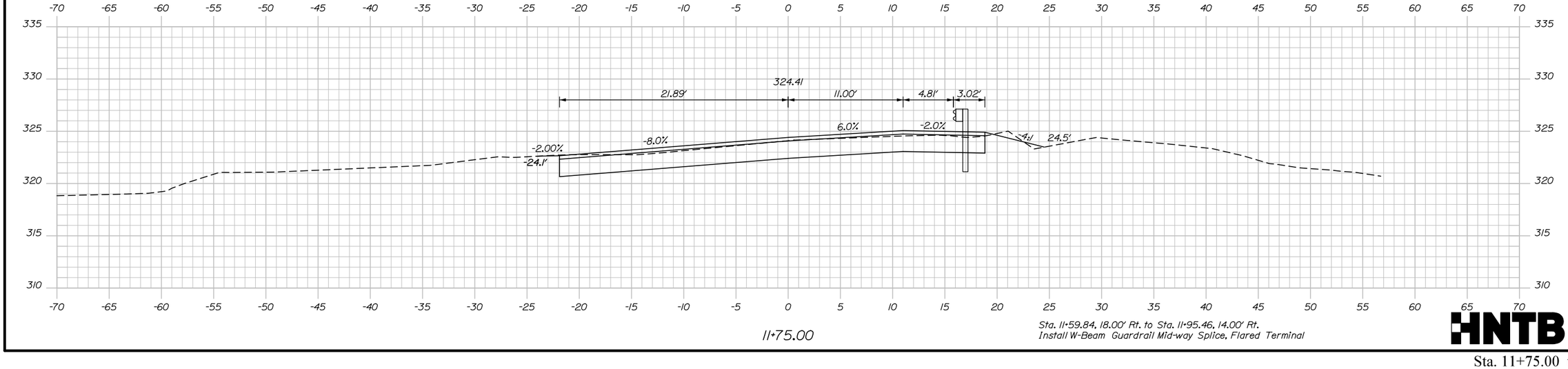
12+25.00



12+00.00

Sta. 12+00.00
End Transition
Begin Project
WIN 21698.00

Sta. 11+95.46, 14.00' Rt. to 12+55.93, 14.00' Rt.
Install 62.5 LF W-Beam Guardrail Mid-way Splice



11+75.00

Sta. 11+59.84, 18.00' Rt. to Sta. 11+95.46, 14.00' Rt.
Install W-Beam Guardrail Mid-way Splice, Flared Terminal

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A.Sweet	S.Scribner	10\18
CHECKED-REVIEWED	R.Hanf	J.Olund	10\18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

13

OF 28

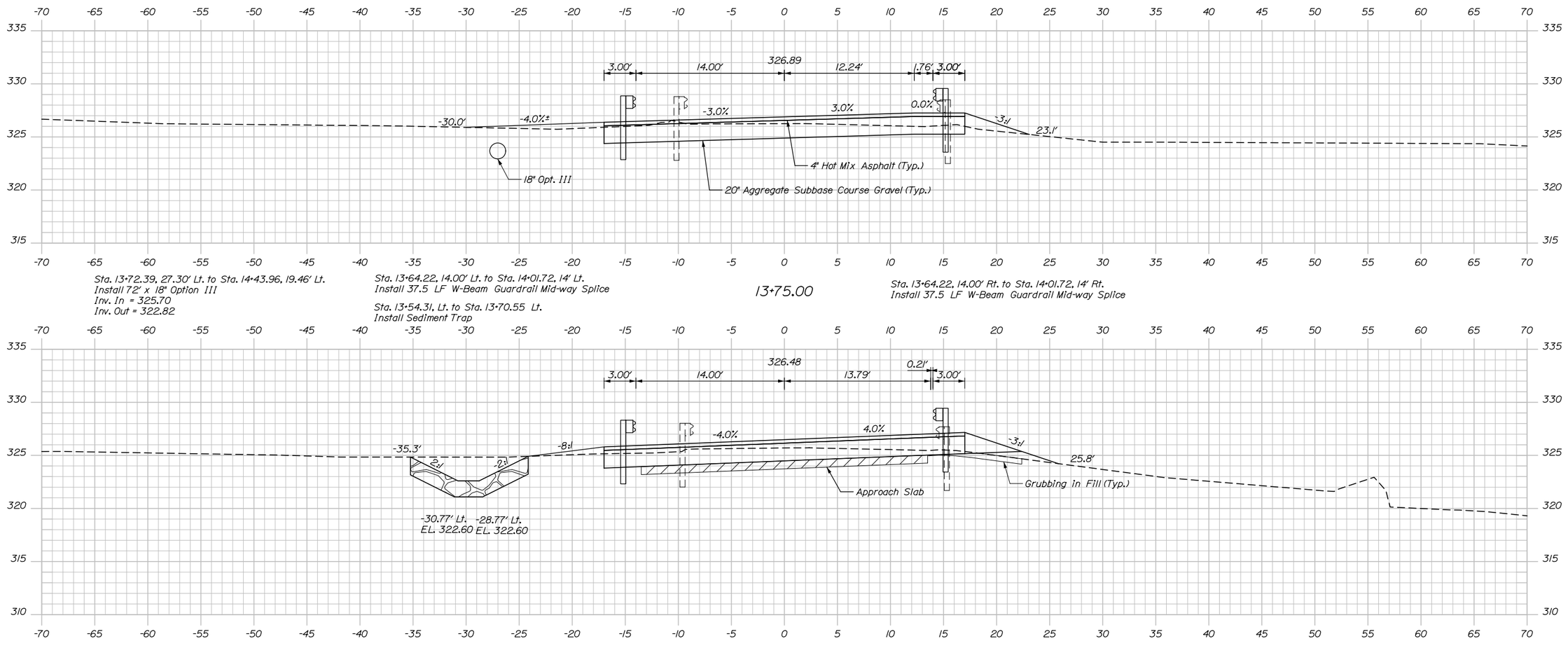
Date:10/18/2018

Username:

Division:

Filename: 013_Xsect3.dgn

Sta. 11+75.00 to Sta. 12+25.00



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	S.Scribner	10\18
CHECKED-REVIEWED	A.Sweet	10\18
DESIGN2-DETAILED2	R.Hanf	
DESIGN3-DETAILED3	J.Olund	
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

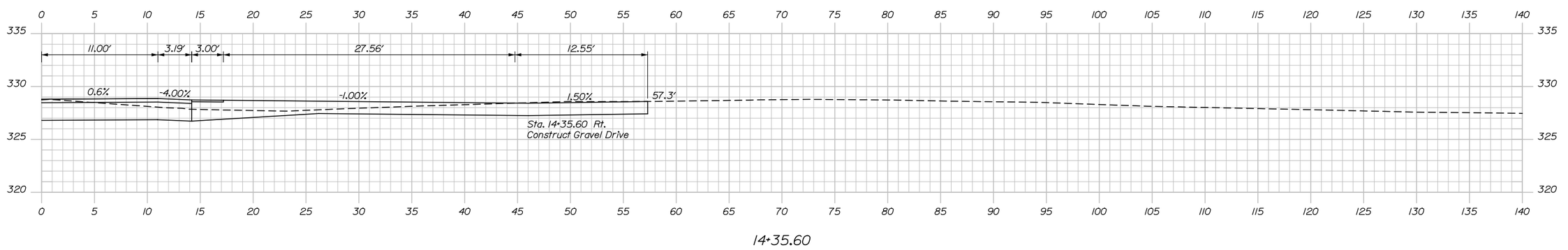
14

OF 28

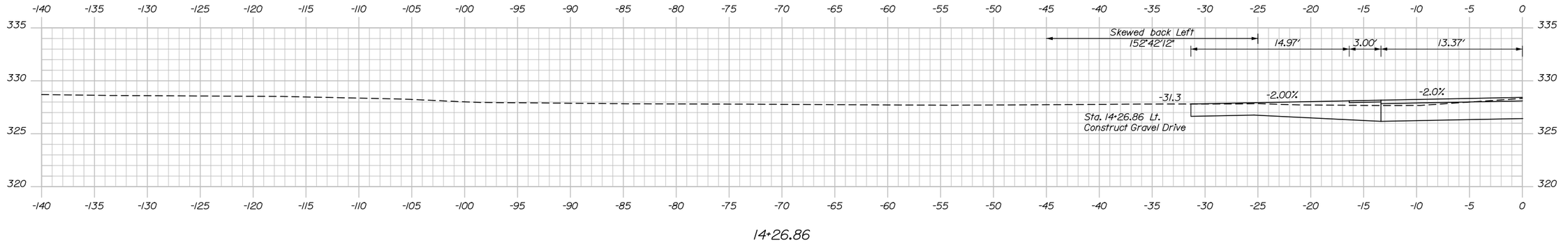
HNTB

Sta. 12+50.00 to Sta. 13+75.00

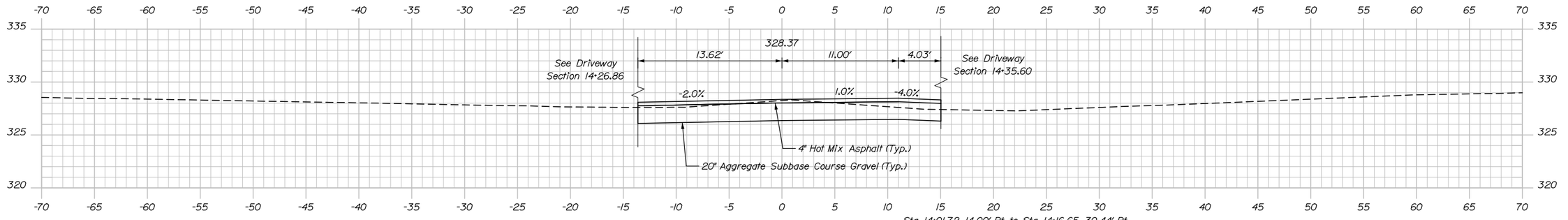
Date:10/18/2018
Username:
Division:
Filename: 014_Xsect14.dgn



14+35.60



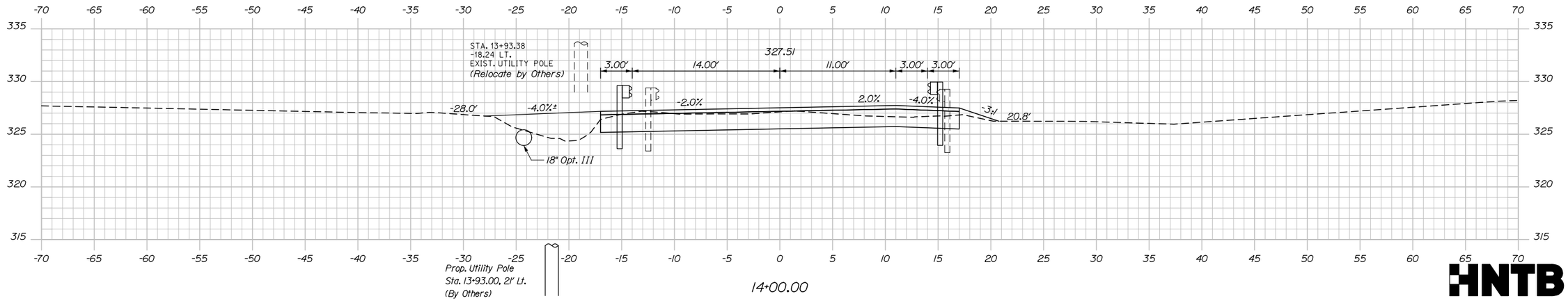
14+26.86



Sta. 14+01.72, 14.00 Lt. to Sta. 14+07.71, 32.01 Lt.
Install W-Beam Guardrail Mid-way Splice
10' Radius with Terminal End, 25 LF

14+25.00

Sta. 14+01.72, 14.00' Rt. to Sta. 14+16.65, 30.44' Rt.
Install W-Beam Guardrail Mid-way Splice
15' Radius with Terminal End, 25 LF



14+00.00

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

SIGNATURE

P.E. NUMBER

DATE

PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	A.Sweet	10\18
CHECKED-REVIEWED	R.Herf	10\18
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

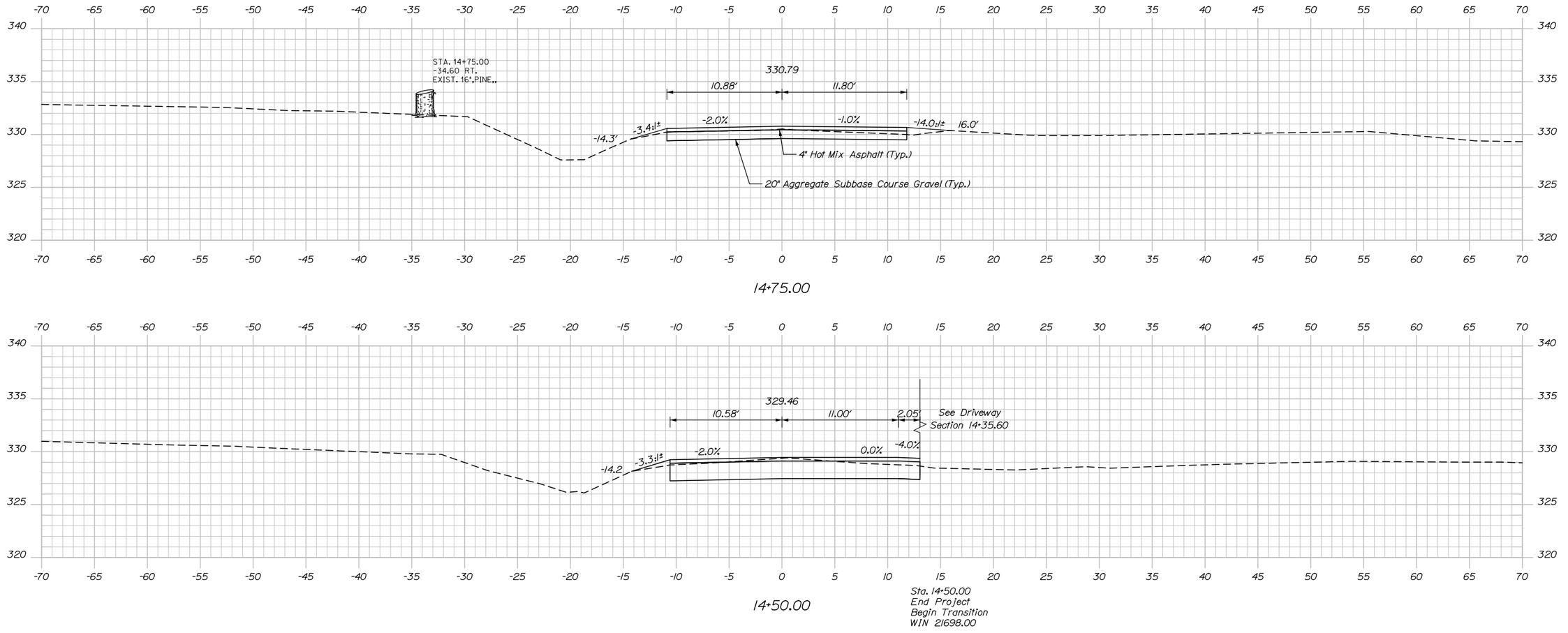
SHEET NUMBER

15

OF 28

Sta. 14+00.00 to Sta. 14+35.60

Date:10/18/2018
Username:
Division:
Filename: 015_Xsect5.dgn



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930 — BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A.Sweet	S.Scribner	10\18
CHECKED-REVIEWED	R.Hanf	J.Olund	10\18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

16

OF 28

HNTB

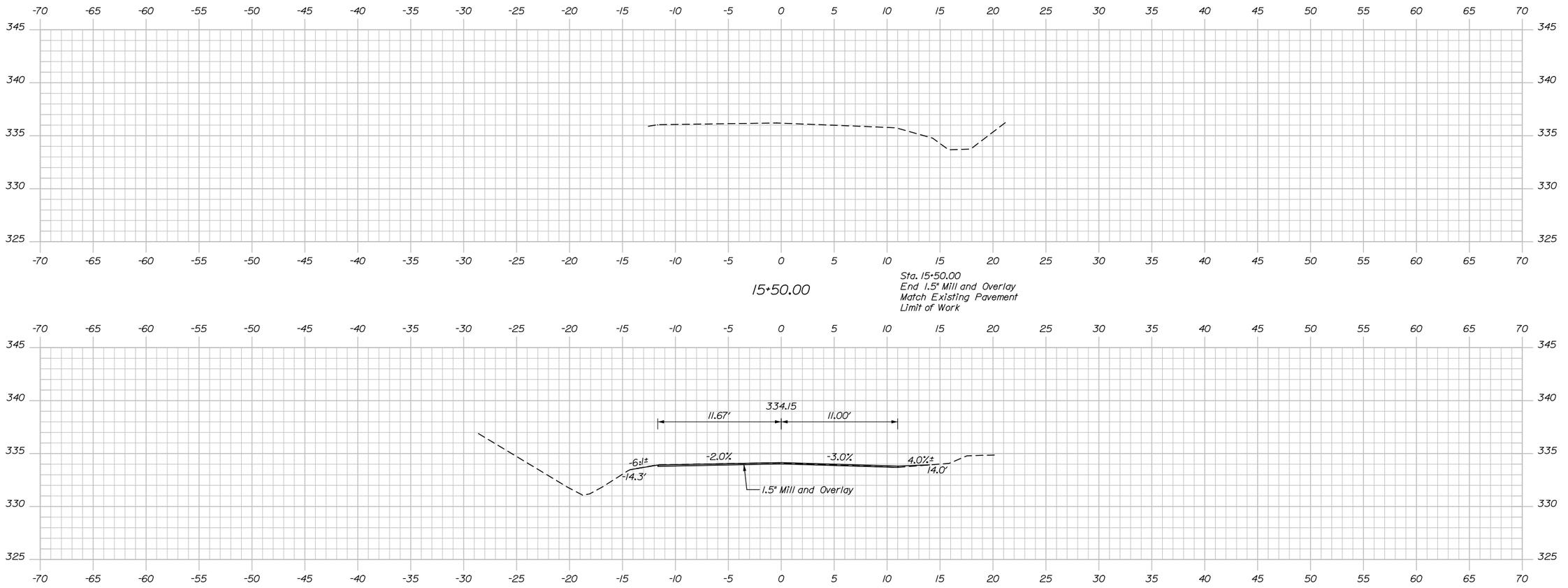
Sta. 14+50.00 to Sta. 14+75.00

Date:10/18/2018

Username:

Division:

Filename: 016_Xsect16.dgn



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930 — BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	A.Sweet	S.Scribner	10\18
CHECKED-REVIEWED	R.Hanf	J.Olund	10\18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

CROSS SECTIONS

SHEET NUMBER

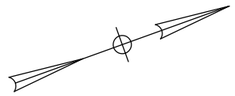
17

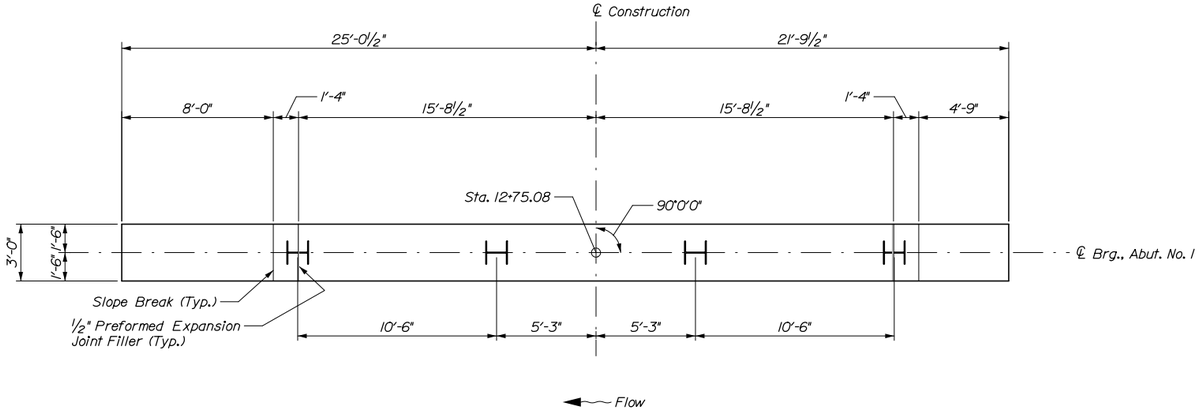
OF 28

HNTB

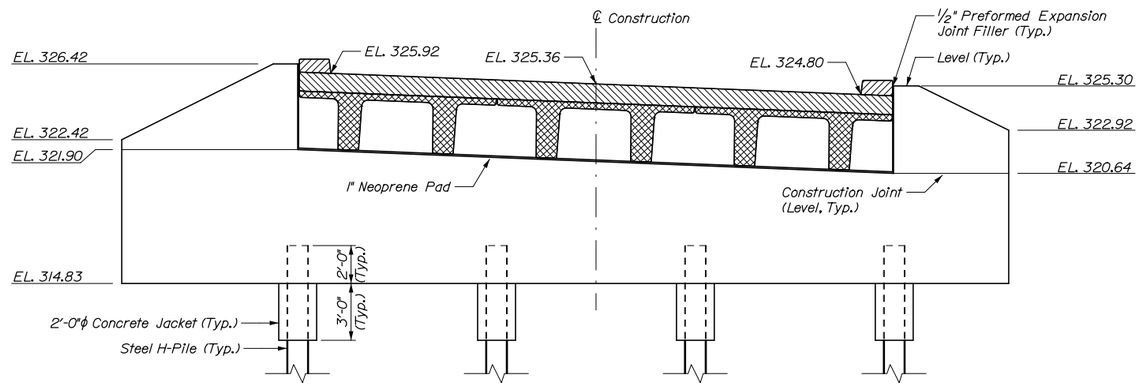
Sta. 15+00.00 to Sta. 15+50.00

Date:10/18/2018
Username:
Division:
Filename: 017_Xsect17.dgn





ABUTMENT NO. 1 PLAN



ABUTMENT NO. 1 ELEVATION

ABUTMENT NOTES

1. Reinforcing steel shall have a minimum concrete cover of 2 inches unless otherwise noted.

2. Cover joints where waterstops are not required in accordance with Standard Detail 502(01).

3. Place 4 inch diameter drains in abutment and wingwalls at 10 feet maximum spacing. The exact location will be determined by the Resident.

4. All elevations are provided at centerline of bearing unless otherwise noted.

5. Payment for concrete jacket around the tops of the H-piles will not be paid for directly. Payment shall be incidental to Item 502.219, Structural Concrete Abutment and Retaining Walls. Fill concrete may be used for the concrete jackets.

6. Anchor dowels (bars A90ISS and B90ISS) shall be installed plumb and may either be cast-in or drilled and anchored in accordance with Subsection 503.06. See sheets 20 and 26 for additional information.

7. Place the parapet portions of the wingwalls after erection of the precast units to ensure an accurate match with the superstructure.

PILE NOTES

1. The maximum factored pile load is 365 kips (Strength I Load Combination).

2. Estimate of Piles required (includes 5'-0" contingency):

   Abutment No. 1: 4 - HP 14x89 @ 108 ft
   Abutment No. 2: 4 - HP 14x89 @ 101 ft

3. H-pile material shall be ASTM A572, Grade 50.

4. Piles shall be driven to the required resistance on or within bedrock in accordance with Standard Specification Section 501.

5. All piles shall be equipped with a pile tip in accordance with Standard Specifications Subsections 501.048, Prefabricated Pile Tips and 711.10 H-Beam Piles, Spliced and Tips.

6. The Contractor shall submit to the Department, for review and acceptance, their proposed pile driving equipment with a completed "Pile and Driving Equipment Data Form", Figure 1, of Standard Section 501 - Foundation Piles. Approval of the proposed pile driving equipment by the Department will be based on Department - conducted wave equation analyses and the criteria specified in Section 501 and Subsection 501.042, Equipment for Driving Piles. If the Department - conducted wave equation analyses show that the proposed driving system(s) is inacceptable, the Contractor shall modify or replace the proposed driving equipment in an amendment of the QCP, at their own expense, until subsequent wave equation analyses by the Department indicate the pile can be driven to the required resistance, without damage or excessive blows.

7. The Contractor shall provide access for the agents of the Department to perform (2) dynamic load tests with signal matching and 24-hour (minimum) restrike, one at each Abutment, as specified in Special Provision 501 - Dynamic Loading Test, to confirm the nominal resistance of the piles. The first dynamic pile load test at each abutment will be completed on the first production pile driven and will include a minimum 24 - hour restrike test. The required nominal resistance for the pile is the factored axial pile load divided by a resistance factor of 0.65 per LRFD Specifications. The Contractor may drive production piles to the preliminary driving criteria, however pile cut-off will not be permitted until completion of restrike testing and establishment of final driving criteria.

8. The Contractor shall preauger each pile location to a depth 20 feet below the top of pile elevation using the following procedures:

   Excavate to the bottom of the integral abutment backwall elevation, or deeper if preferred;

   Drill a minimum 24-inch diameter hole to a depth of 20 feet at each pile location using a continuous flight auger that is withdrawn while being spun in the opposite direction (having the effect of loosening the material) or using a drilling auger operated by Kelly bar attachment;

   Place temporary casing as needed to prevent hole cave-in;

   Place sand or pea stone in the excavation;

   Drive the piles.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON	BY	DATE
DESIGN-DETAILED	H. Walton	P. Bishop	10/18
CHECKED-REVIEWED	J. Waugh	J. Olund	10/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

ABUTMENT NO. 1

SHEET NUMBER

18

OF 28

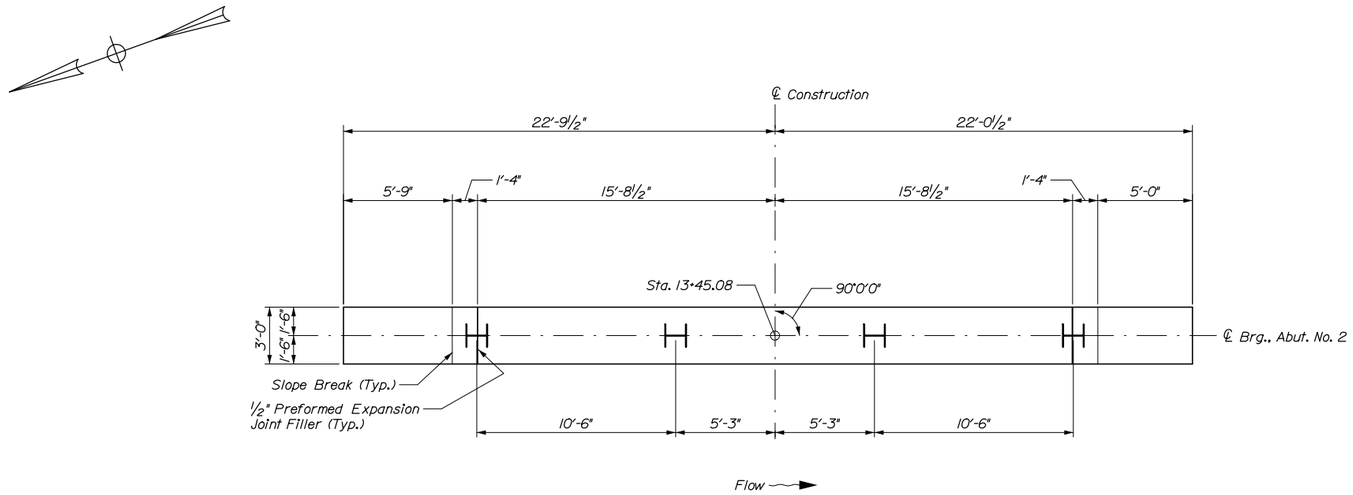
HNTB

Username:

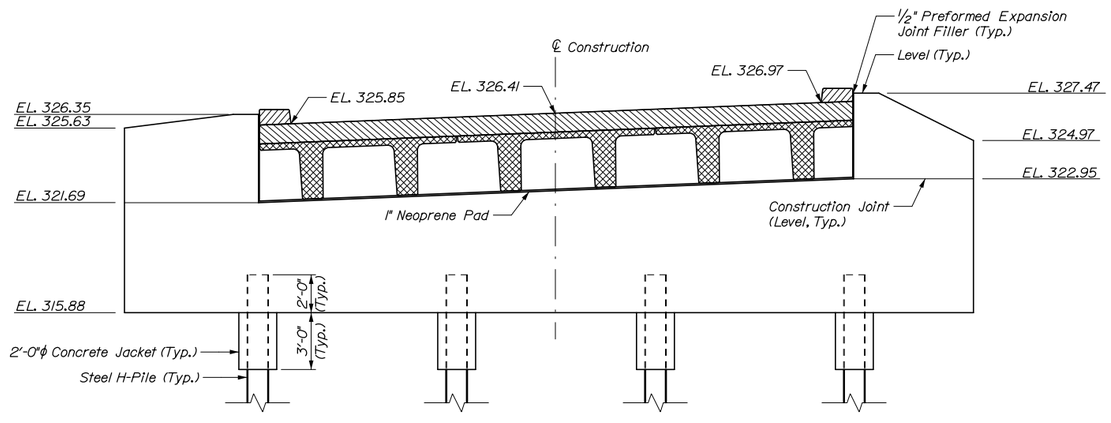
Division:

Date:10/18/2018

Filename: 018_Abut_01.dgn



ABUTMENT NO. 2 PLAN



ABUTMENT NO. 2 ELEVATION

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930 BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	H. Walton	P. Bishop	08/18
CHECKED-REVIEWED	J. Waugh	J. Olund	08/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

ABUTMENT NO. 2

SHEET NUMBER

19

OF 28

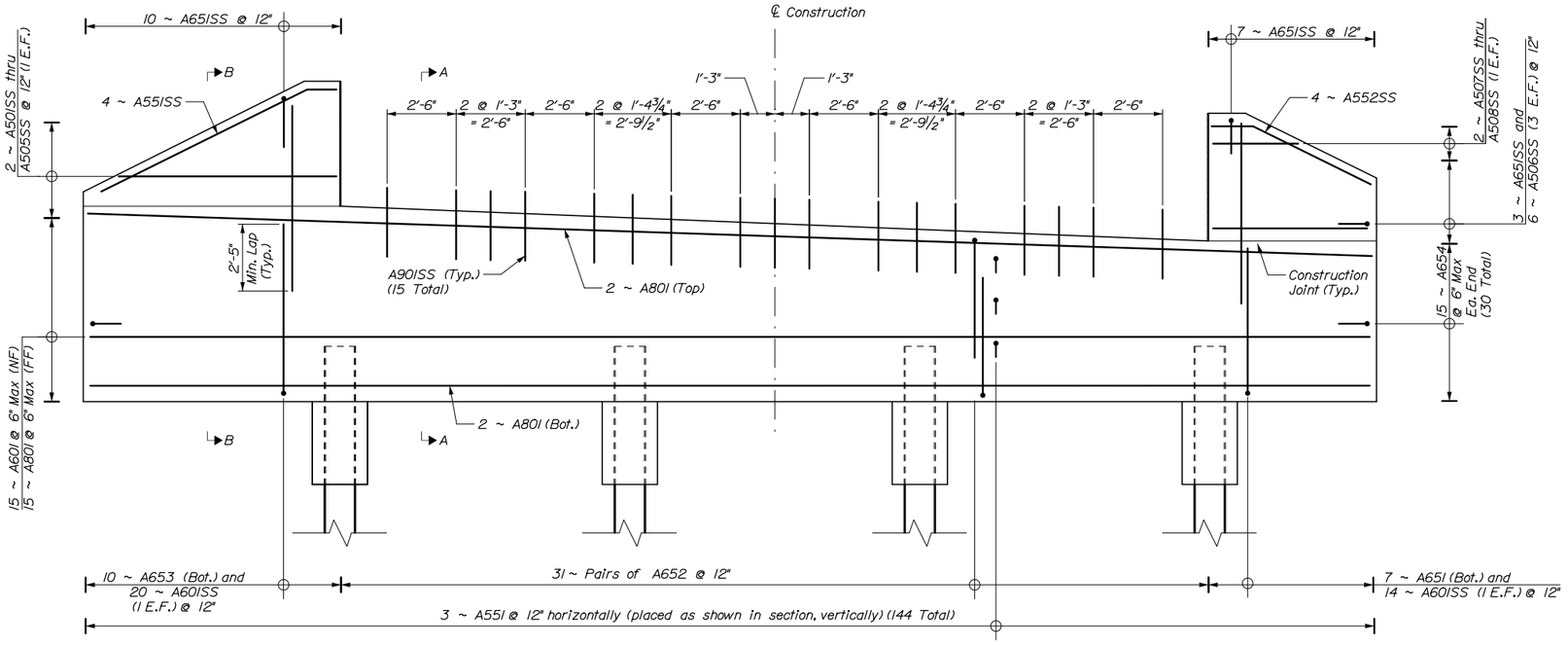
HNTB

Username:

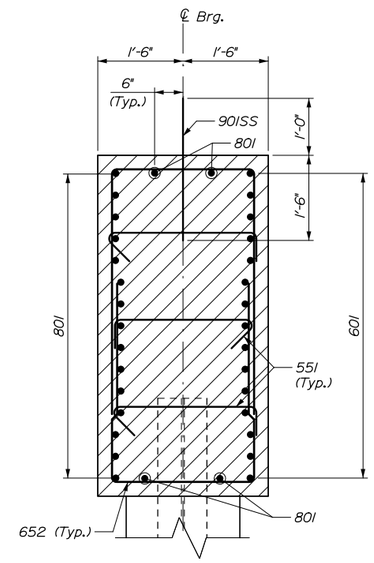
Division:

Filename: 019_Abut_02.dgn

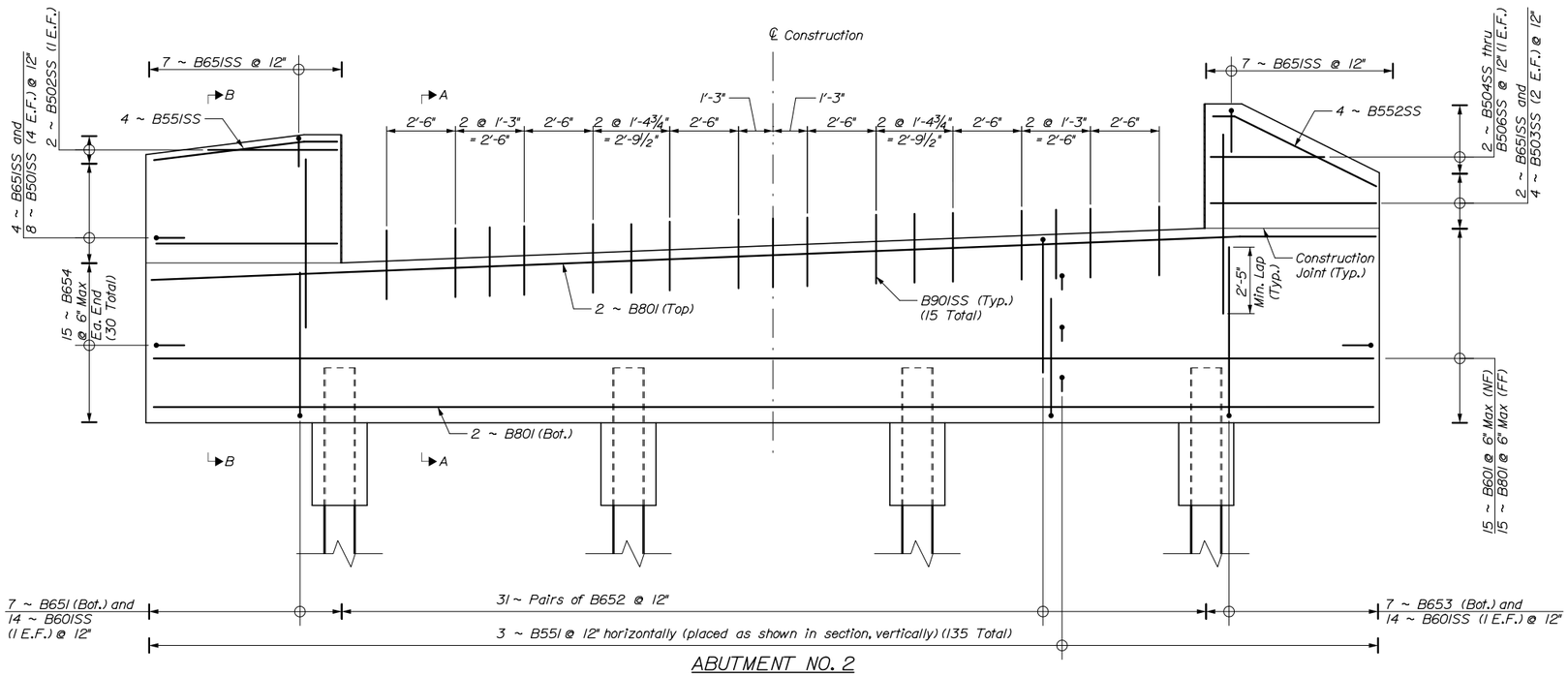
Date:10/18/2018



ABUTMENT NO. 1



SECTION A-A
ABUTMENT SECTION
("A" and "B" prefixes omitted from bar marks)



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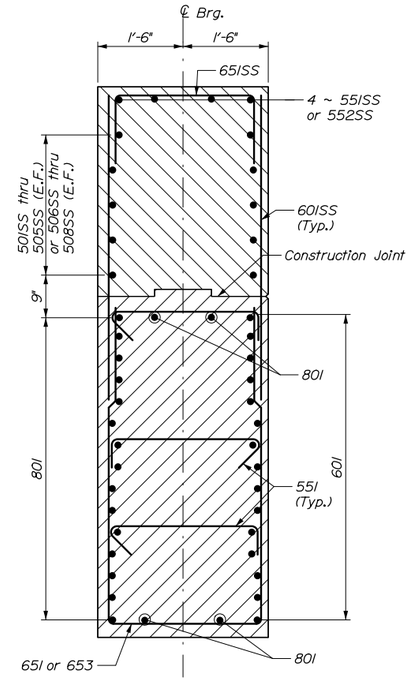


SECTION B-B
WINGWALL SECTION
("A" and "B" prefixes omitted from bar marks)

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
D. EATON		
H. Walton	P. Bishop	08/18
J. Waugh	J. Olund	08/18

SIGNATURE

P.E. NUMBER

DATE

PROJ. MANAGER	
DESIGN-DETAILED	
CHECKED-REVIEWED	
DESIGN2-DETAILED2	
DESIGN3-DETAILED3	
REVISIONS 1	
REVISIONS 2	
REVISIONS 3	
REVISIONS 4	
FIELD CHANGES	

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

ABUTMENT REINFORCING

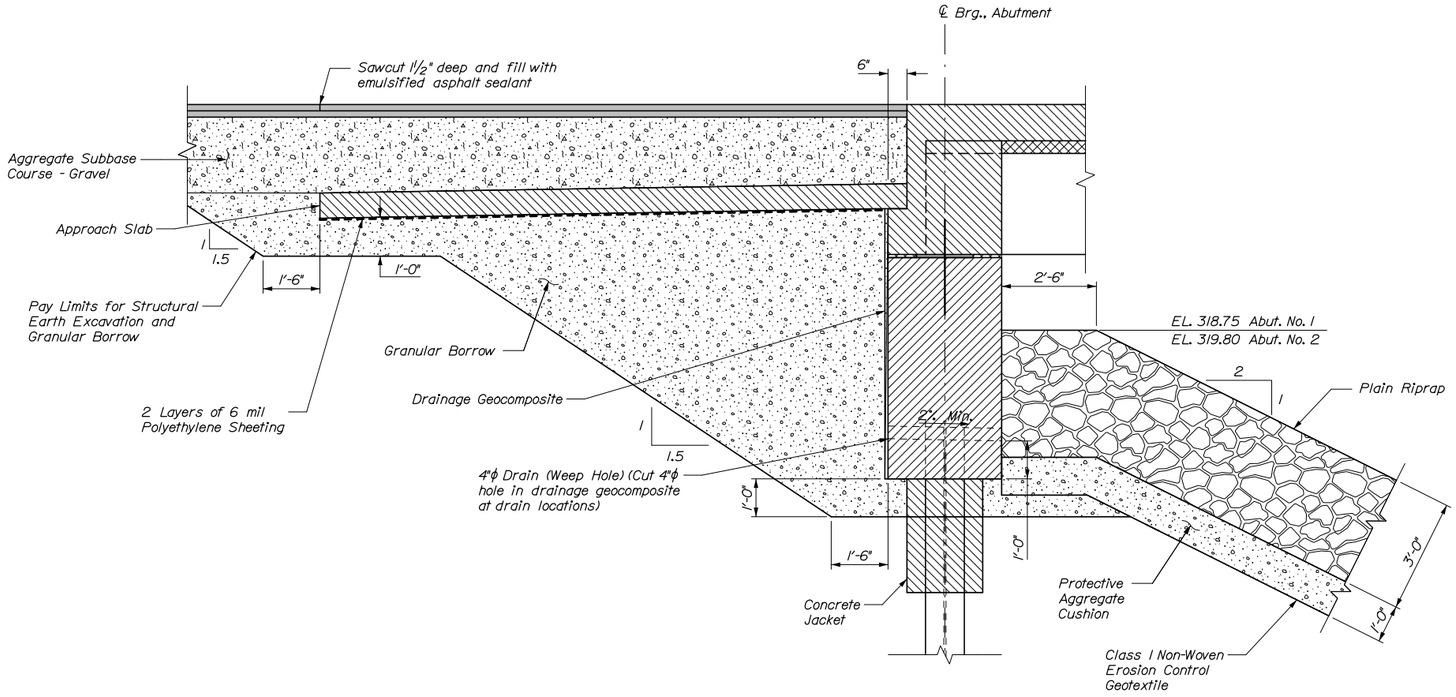
SHEET NUMBER
20
OF 28

Date:10/18/2018
Username:
Division:
Filename: 020_Abut_03.dgn

NOTES:

1. Transverse saw cuts in the pavement at the ends of approach slabs shall be sealed with emulsified asphalt sealing compound conforming to Specification 702.12. The sawcut and emulsified asphalt sealing shall not be paid for directly, but considered incidental to related Contract Items.

2. Install two layers of 6 mil polyethylene sheeting under approach slabs. Payment will be considered incidental to Item No. 502.31, Structural Concrete Approach Slab.



ABUTMENT BACKFILL DETAIL

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-21169(800)

WIN 021698.00

BRIDGE NO. 2930 BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	H. Walton	08/18	
CHECKED-REVIEWED	J. Waugh	08/18	
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

BY | DATE

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

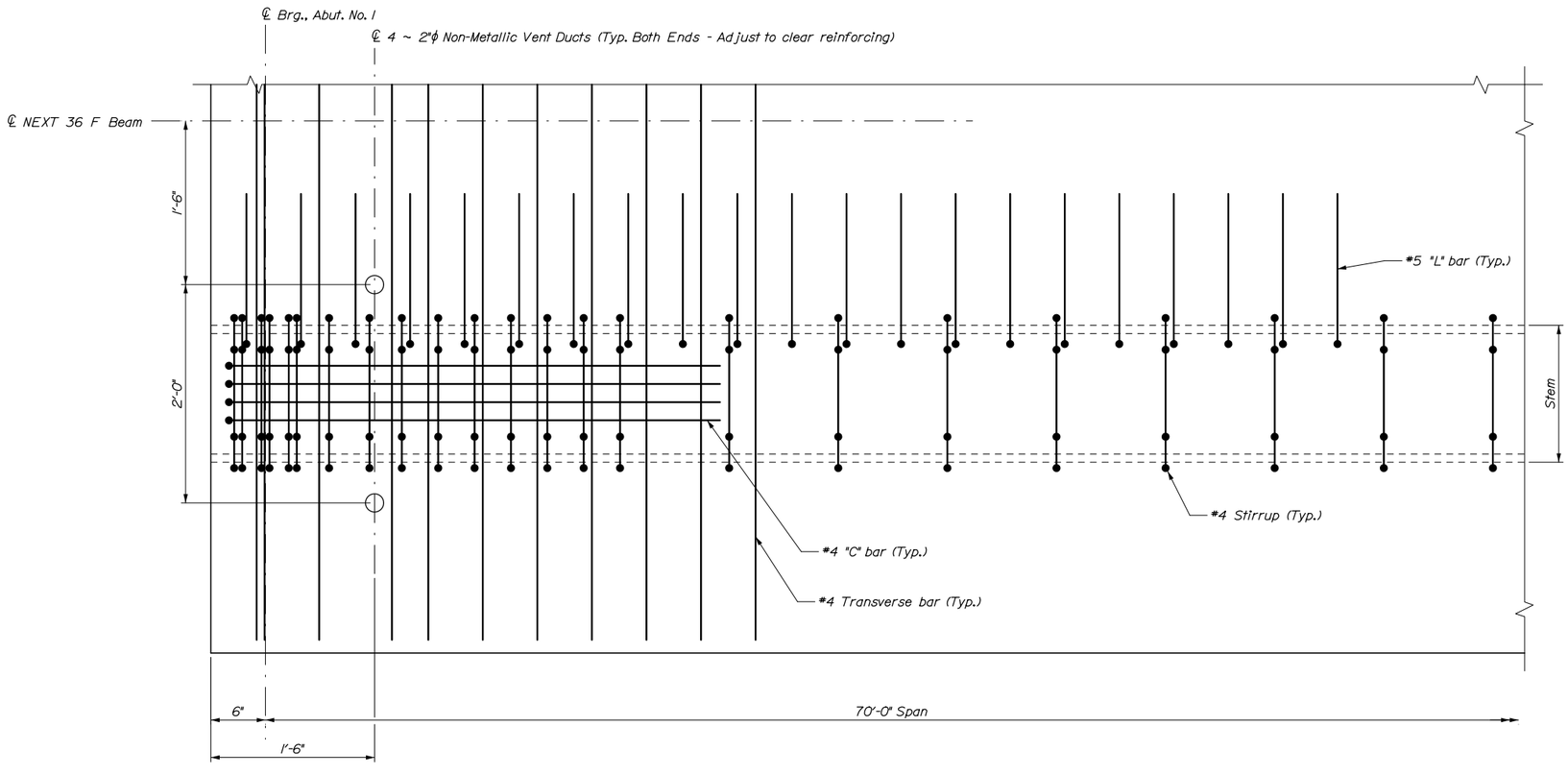
ABUTMENT DETAILS

SHEET NUMBER

21

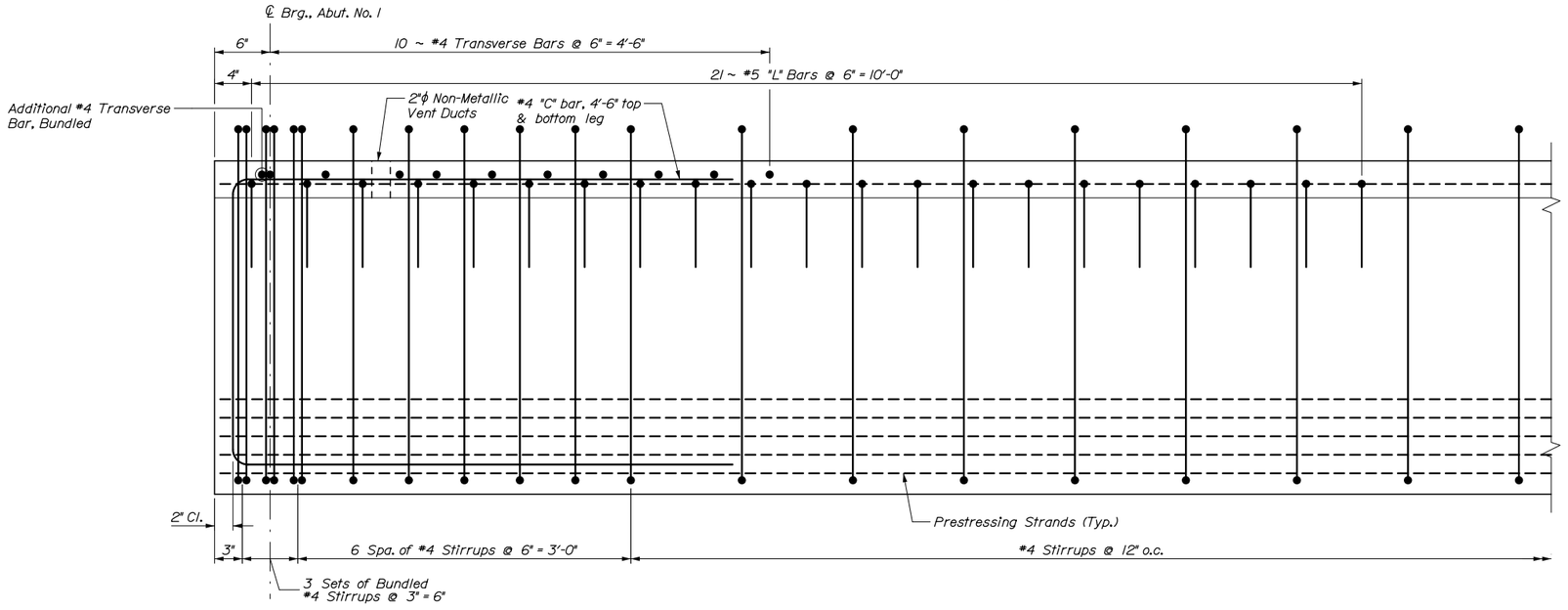
OF 28

HNTB



NEXT 36 F BEAM PLAN

(Strands and WWF not shown for clarity)



NEXT 36 F BEAM ELEVATION

(WWF not shown for clarity)

PRECAST NEXT BEAM NOTES

1. NEXT F Beams are a non - proprietary shape developed by PCI Northeast (PCINE). Standardized section properties and details may be found at http://www.pcine.org.

2. The estimated camber at release is 1.74 inches; the estimated camber at erection is 3.09 inches, and; the estimated final camber at completion of the project is 2.19 inches.

3. Prestressing strands shall be 0.6 inch diameter, epoxy-coated in accordance with ASTM A882. The tensioning force is 44 kips per prestressing strand, including the top strands.

4. Reinforcing steel shall have a minimum concrete cover of 2 inches unless otherwise noted.

5. The drilling of holes in the prestressed beams and the use of power - actuated tools on the beams will not be permitted.

6. A mat of mild reinforcing steel, #4 bars @ 12 inches in both directions, may be substituted for the welded wire fabric shown on Sheet 23. Reinforcing steel shall be ASTM A955, Grade 75.

7. Girder reinforcement detailed in plan and elevation is typical about the midspan and centerline of each girder.

8. Concrete retarding admixture shall be applied to the form surfaces of the NEXT beam stems that will come in contact with the cast in-place concrete end diaphragms. All such surfaces shall be power washed with water prior to installation to provide a nominal 1/8-inch roughened surface with exposed aggregate. Alternate methods of achieving an equivalent roughened surface may be proposed. Payment for achieving the surface finish will be considered incidental to related Contract Items.

9. Neoprene pads shall be either polychloroprene or natural polyisoprene with a shear modulus of 115 psi, and shall conform to the requirements of Section 18.2 of the LRFD Bridge Construction Specifications, Third Edition. Neoprene pads will not be paid for directly but will be considered incidental to related Contract Items.

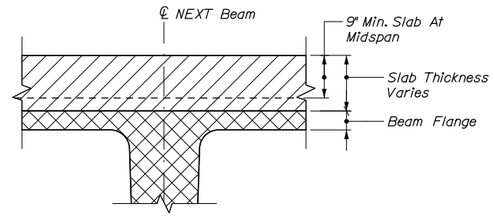
10. Neoprene Pad seams perpendicular to the centerline of bearing will be allowed, provided that the seams are located approximately half way between NEXT Beam stems.

11. A maximum of 12 additional strands per beam (6 per stem) may be debonded for a distance of 6-inches within the bottom 5 rows to reduce the potential for end cracking during release. All 4 top row strands shall be fully bonded.

12. All mild reinforcing bars shall conform to ASTM A955 and all welded fabric shall conform to ASTM A1022.

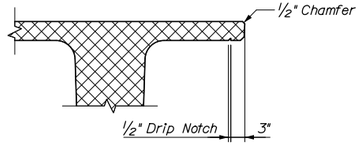
13. Screed rails shall be installed to the elevation shown on the profile adjusted for cross slope.

14. The incorporation of corrosion inhibitor is not required within the concrete mix design.



DECK THICKNESS DETAIL

Not to Scale



FASCIA OVERHANG DETAIL

Not to Scale

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
D. EATON		
PROJ. MANAGER	P. Bishop	08/18
DESIGN-DETAILED	J. Olund	08/18
CHECKED-REVIEWED	H. Walton	
DESIGN2-DETAILED2	J. Waugh	
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

GIRDER DETAILS I

SHEET NUMBER

22

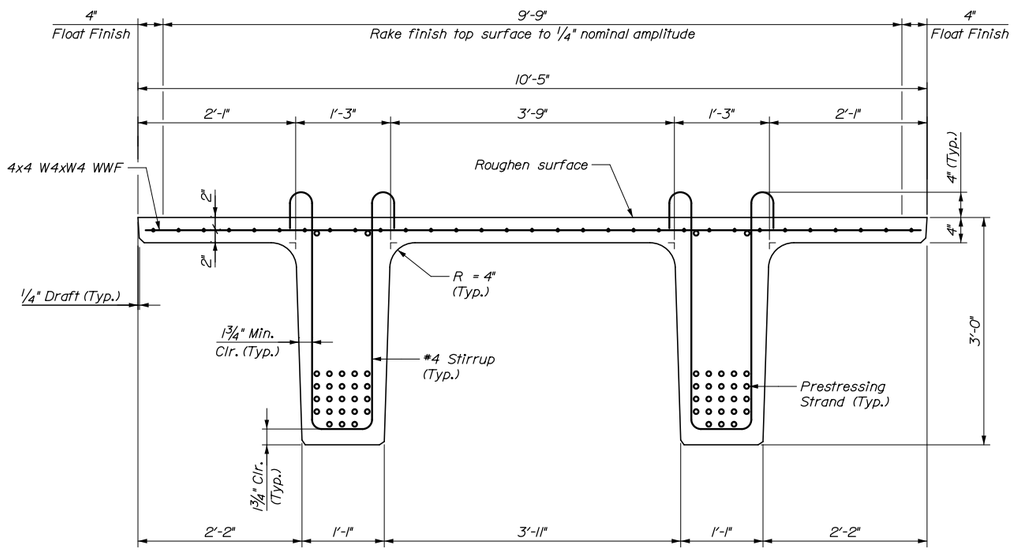
OF 28

Date:10/18/2018

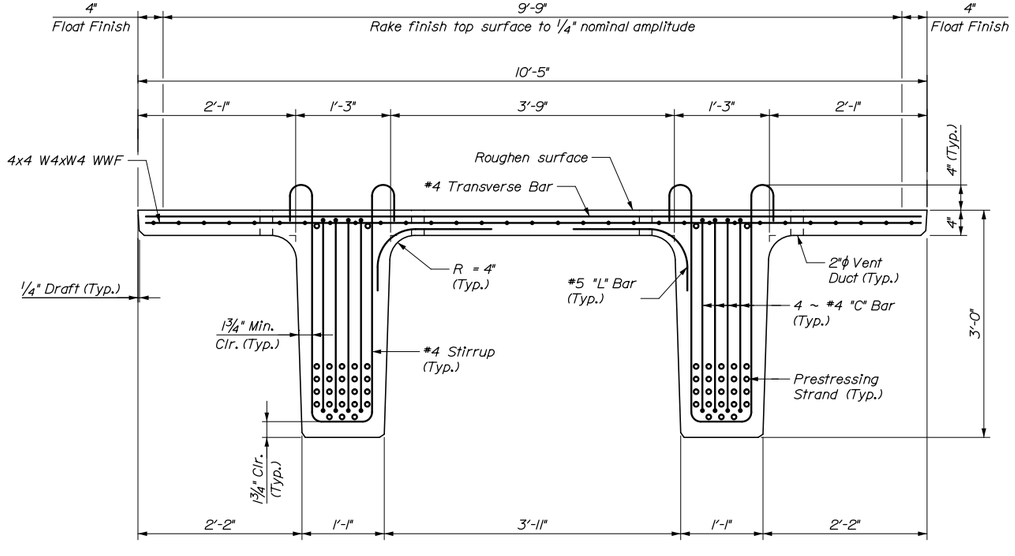
Username:

Division:

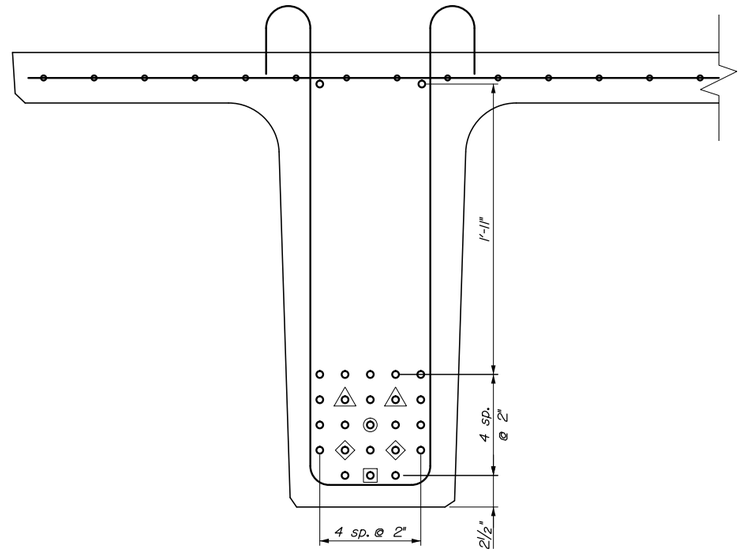
Filename: 022_Framing_01.dgn



NEXT 36 F BEAM TYPICAL SECTION - AT MIDSPAN



NEXT 36 F BEAM TYPICAL SECTION - AT ENDS



NEXT 36 F BEAM STRAND PATTERN

- Strands debonded 25ft
- Strands debonded 20ft
- Strands debonded 15ft
- Strands debonded 10ft

DEAD LOAD DEFLECTIONS (INCH)
(Deck, Rail, and Curbs)

℄ Brg. Abut. 1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	℄ Brg. Abut. 2
0.00	0.27	0.52	0.73	0.86	0.90	0.86	0.73	0.52	0.27	0.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	P. Bishop	08/18
CHECKED-REVIEWED	J. Olund	08/18
DESIGN2-DETAILED2	H. Walton	
DESIGN3-DETAILED3	J. Waugh	
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

GIRDER DETAILS II

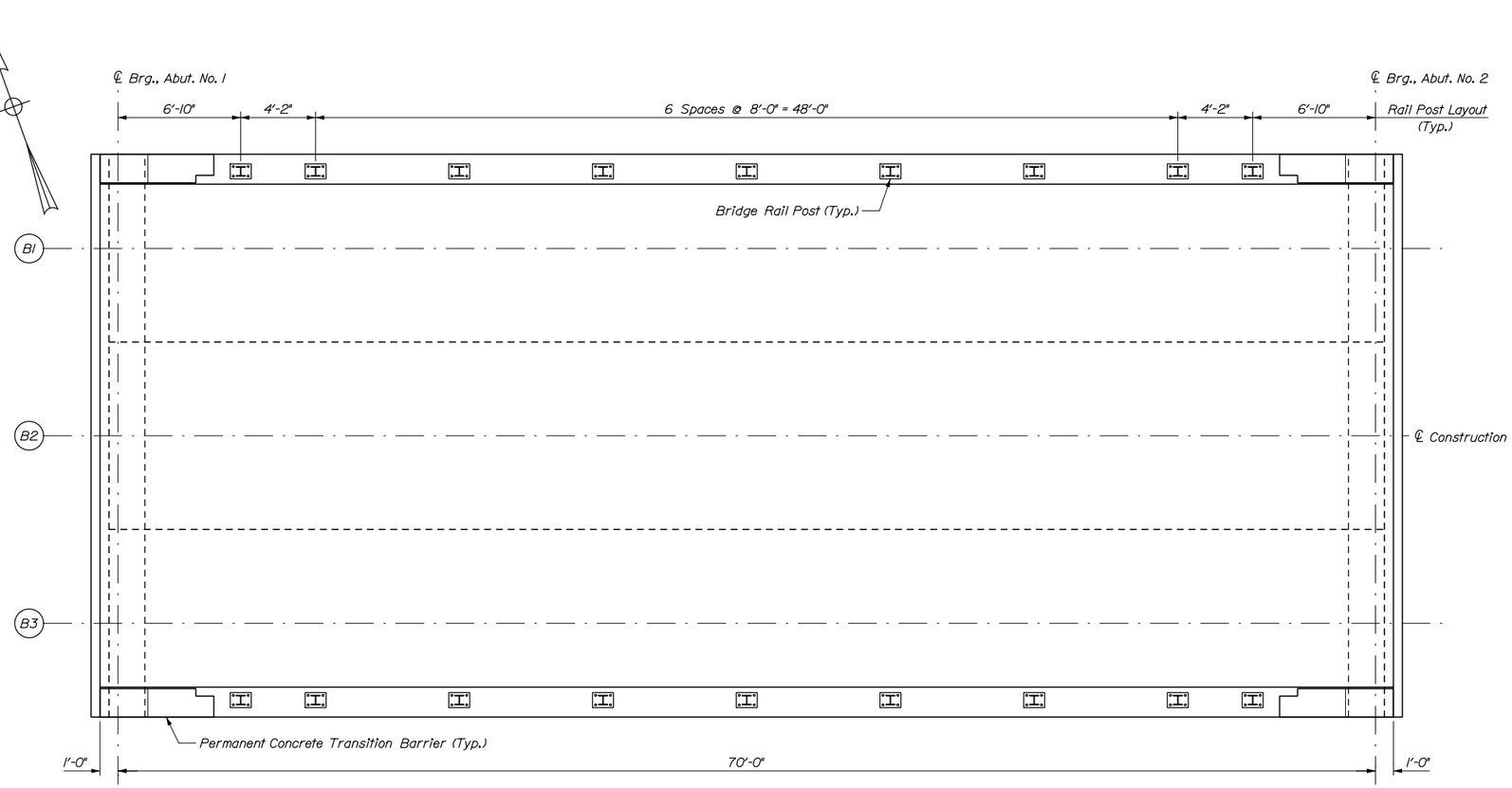
SHEET NUMBER

23

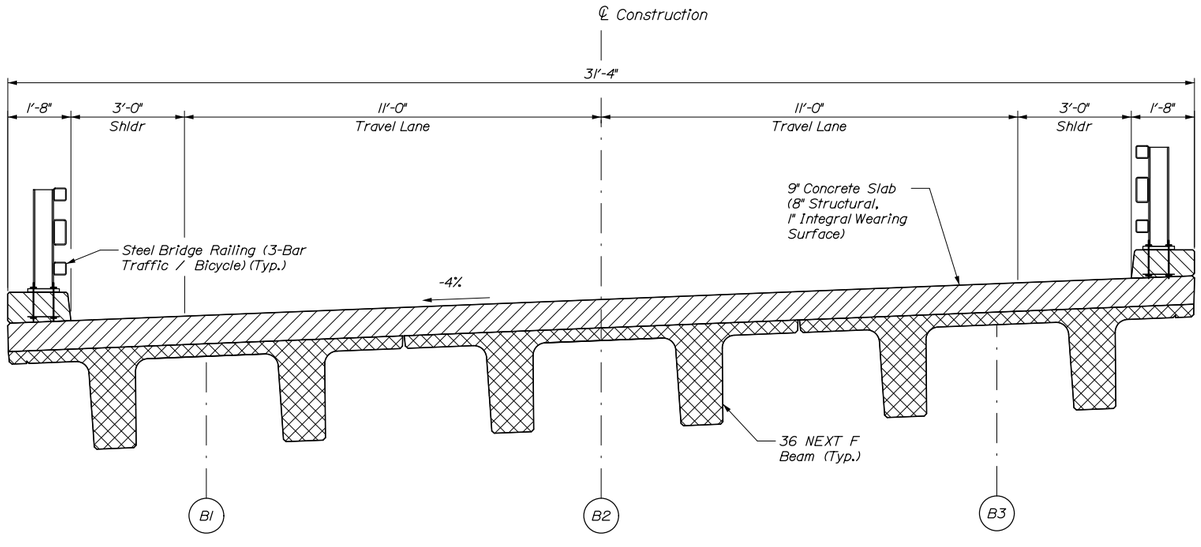
OF 28

HNTB

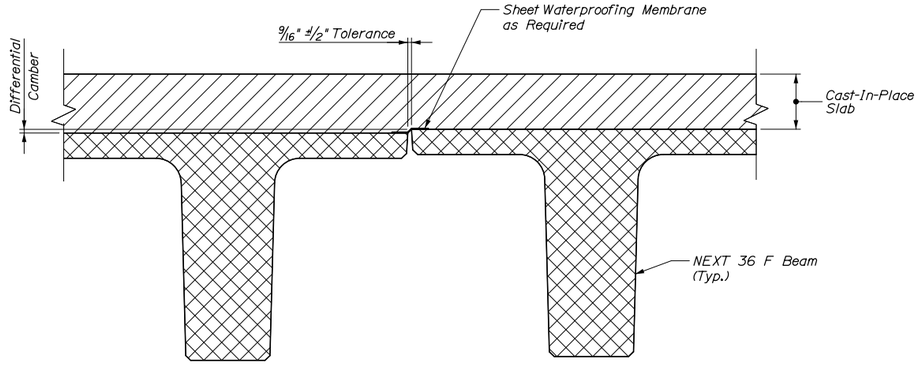
Filename: 023_Framing_02.dgn Division: Username: Date:10/18/2018



DECK PLAN



TRANSVERSE SECTION



NEXT BEAM GAP FORM DETAIL

SUPERSTRUCTURE NOTES

1. Form a one inch V-groove on the fascias at the horizontal joint between the curb and slab.

2. Reinforcing bars shall have a minimum concrete cover of 2 inches unless otherwise noted.

3. The superstructure slab and end diaphragm concrete shall be placed in one continuous operation and shall be kept plastic until the entire placement has been made.

4. Payment for End Diaphragm Concrete will be made under Item No. 502.261 Structural Concrete Roadway and Sidewalk Slabs on Concrete Bridges.

5. The Contractor shall install Permanent Concrete Transition Barrier vertical closed stirrups as shown in Standard Details Section 526, prior to the placement of curb concrete.

6. Payment for Sheet Waterproofing Membrane over joints between adjacent NEXT Beams will not be made directly, but will be considered incidental to related Contract Items. Alternate methods of sealing the gap between the flanges may be submitted to the Resident for approval.

7. Payment for Sheet Waterproofing Membrane and mortared chamfer at the joint between the Approach Slab and the End Diaphragm will not be made directly, but will be considered incidental to related Contract Items. See Sheet 26, Section A-A for details.

8. Payment for closed cell foam between the Abutment and End Diaphragm will not be made directly, but will be considered incidental to related Contract Items. See Sheet 26, Section A-A for details.

9. Bars TB651 and TB652 detailed in Standard Detail 526(37) shall be reduced in height by 3-inches to account for the difference in curb height between a bare deck and one with an HMA overlay. The corrected dimensions are provided on the Reinforcing Schedule sheet.

10. All Transition Barrier reinforcing bars shall be stainless steel.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

			DATE
PROJ. MANAGER	D. EATON	BY	
DESIGN-DETAILED	H. Walton	P. Bishop	08/18
CHECKED-REVIEWED	J. Waugh	J. Olund	08/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

SUPERSTRUCTURE PLAN

SHEET NUMBER

24

OF 28

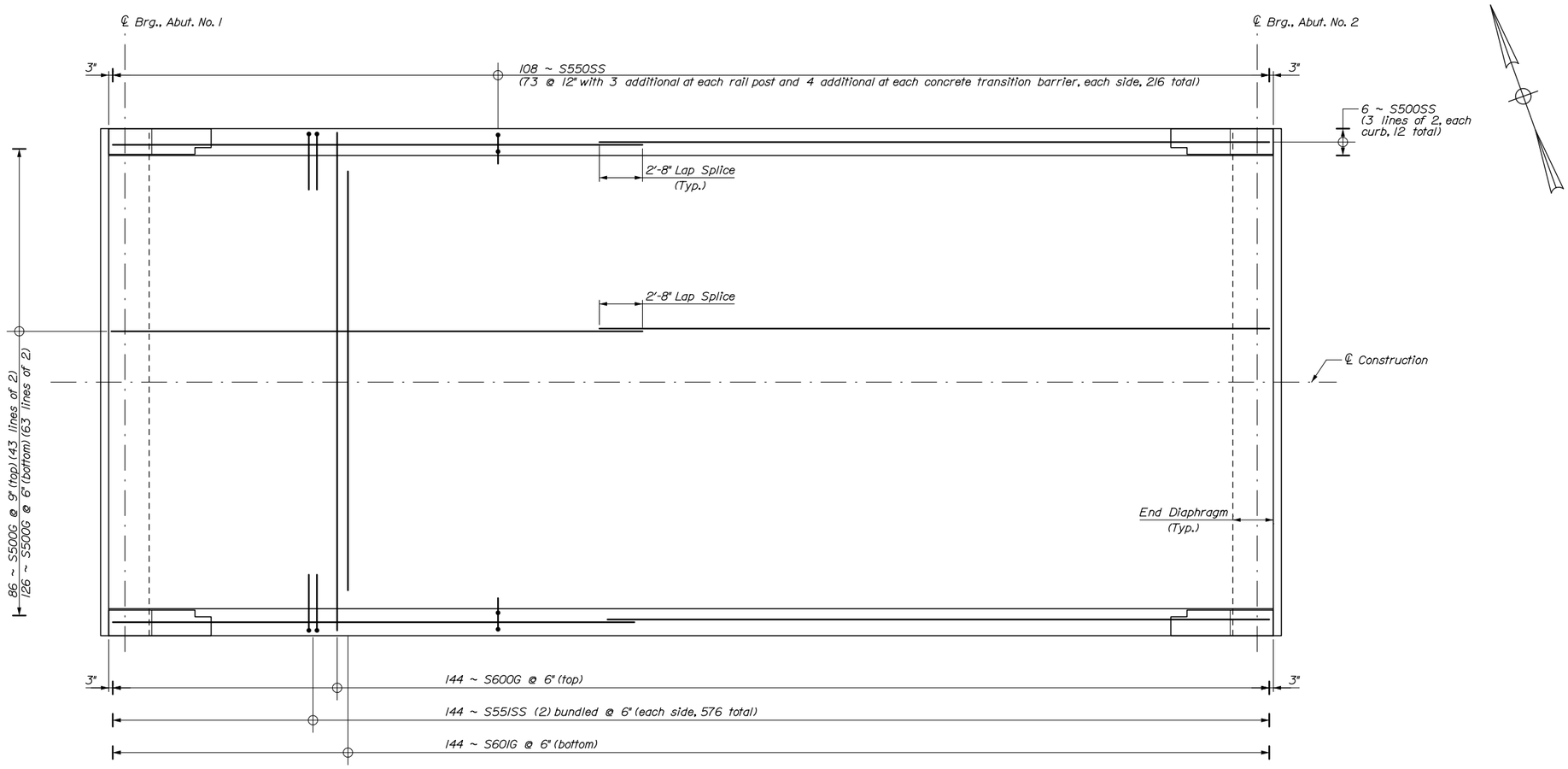
HNTB

Username:

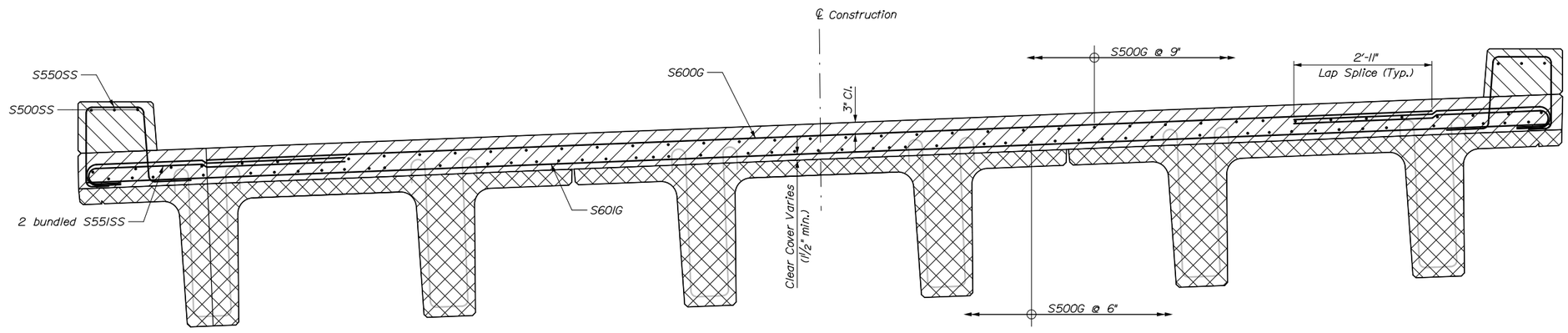
Division:

Date:10/18/2018

Filename: 024_Sup_01.dgn



SUPERSTRUCTURE REINFORCING PLAN



TRANSVERSE REINFORCING SECTION

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

PROJ. MANAGER	D. EATON		
DESIGN-DETAILED	H. Walton	P. Bishop	08/18
CHECKED-REVIEWED	J. Waugh	J. Olund	08/18
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

SUPERSTRUCTURE REINFORCING

SHEET NUMBER

25

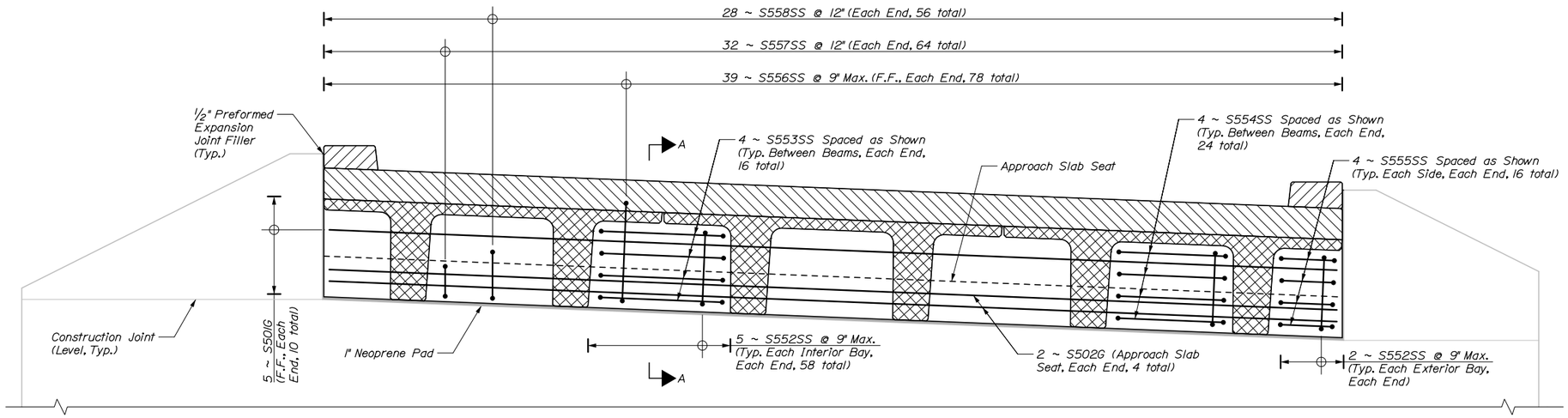
OF 28

Username:

Division:

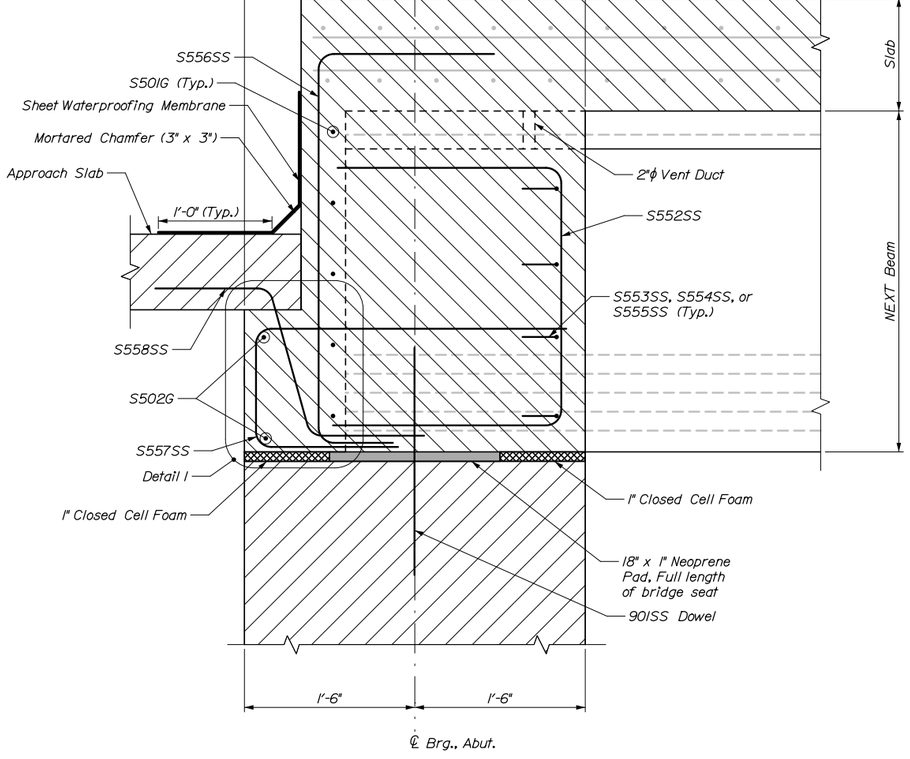
Date:10/18/2018

Filename: 025_Sup_02.dgn

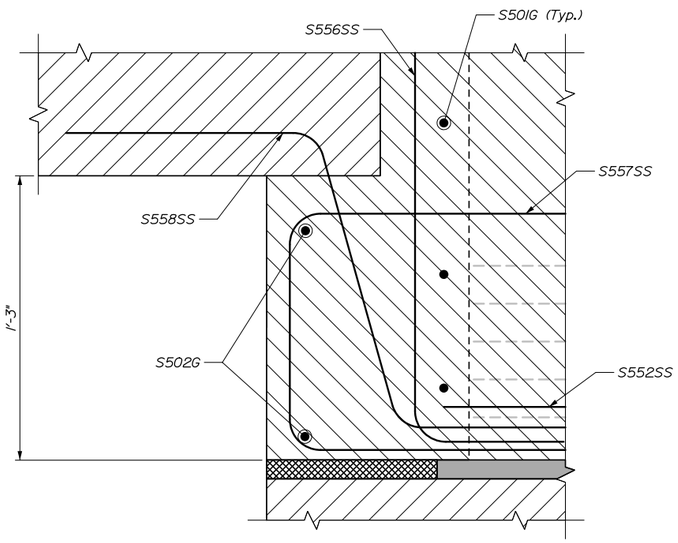


END DIAPHRAGM REINFORCEMENT ELEVATION

(Abutment No. 1 Shown Looking Downstation: Abutment No. 2 Opposite Hand)
(90ISS Dowels Not Shown For Clarity)



SECTION A-A



DETAIL 1

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE NO. 2930

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER	D. EATON	
DESIGN-DETAILED	H. Walton	08/18
CHECKED-REVIEWED	J. Waugh	08/18
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

END DIAPHRAGM REINFORCING

SHEET NUMBER

26

OF 28

HNTB

Filename: 026_End_Diaphragm Reinforcing.dgn Division: Username: Date:10/18/2018

STRAIGHT BARS

MARK	QTY.	LENGTH	LOCATION
			Abutment No. 1 (Plain Rebar)
A601	15	46'-4"	*Horizontal, Near Face*
A801	19	46'-4"	*Horizontal, Far Face*
			Abutment No. 1 (Stainless Steel)
A501SS	2	9'-0"	*Right Wingwall, Horizontal*
A502SS	2	7'-9"	*Right Wingwall, Horizontal*
A503SS	2	5'-9"	*Right Wingwall, Horizontal*
A504SS	2	3'-9"	*Right Wingwall, Horizontal*
A505SS	2	1'-9"	*Right Wingwall, Horizontal*
A506SS	6	5'-8"	*Left Wingwall, Horizontal*
A507SS	2	3'-10"	*Left Wingwall, Horizontal*
A508SS	2	1'-10"	*Left Wingwall, Horizontal*
A601SS	34	7'-1"	*Wingwalls, Vertical*
A901SS	17	2'-6"	*Bridge Seat, Vertical*
			Abutment No. 2 (Plain Rebar)
B601	15	44'-4"	*Horizontal, Near Face*
B801	19	44'-4"	*Horizontal, Far Face*
			Abutment No. 2 (Stainless Steel)
B501SS	8	6'-9"	*Left Wingwall, Horizontal*
B502SS	2	5'-0"	*Left Wingwall, Horizontal*
B503SS	4	6'-0"	*Right Wingwall, Horizontal*
B504SS	2	5'-9"	*Right Wingwall, Horizontal*
B505SS	2	3'-9"	*Right Wingwall, Horizontal*
B506SS	2	1'-9"	*Right Wingwall, Horizontal*
B601SS	30	7'-1"	*Wingwalls, Vertical*
B901SS	17	2'-6"	*Bridge Seat, Vertical*
			Superstructure (Glass Fiber Reinforced Polymer)
S500G	212	37'-2"	*Deck Slab, Primary Longitudinal Top and Bottom*
S501G	10	30'-10"	*End Diaphragm, Primary Longitudinal*
S502G	4	30'-10"	*Approach Slab Seat*
S600G	144	25'-11"	*Deck Slab, Primary Transverse Top*
S601G	144	31'-0"	*Deck Slab, Primary Transverse Bottom*
			Superstructure (Stainless Steel)
S500SS	12	37'-2"	*Curb Top Reinforcing, Primary Longitudinal Curb*
			Approach Slabs (Plain Rebar)
AS501	32	26'-6"	*Approach Slab Transverse*
AS601	108	15'-0"	*Approach Slab Longitudinal*

BENT BARS

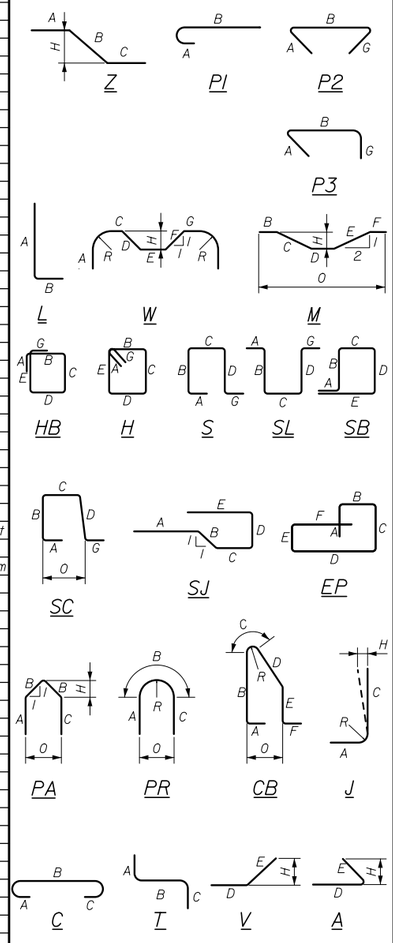
MARK	QTY.	LENGTH	TYPE	A	B	C	D	E	F	G	H	O	R	LOCATION
								Abutment No. 1 (Plain Rebar)						
A551	144	3'-7 1/2"	P3	5 1/2"	2'-8"					6"				*Abutment Ties*
A651	7	13'-4"	S	0"	5'-4"	2'-8"	5'-4"			0"				*Left Wingwall Bottom*
A652	62	11'-10"	S	0"	4'-7"	2'-8"	4'-7"			0"				*Abutment Stirrups*
A653	10	15-10"	S	0"	6'-7"	2'-8"	6'-7"			0"				*Right Wingwall Bottom*
A654	30	4'-8"	S	0"	1'-0"	2'-8"	1'-0"			0"				*Wingwall, Horizontal End Stirrup*
								Abutment No. 1 (Stainless Steel)						
A55ISS	4	10'-0"	V				1'-2"	8'-10"			4'-0"			*Right Wingwall Tops, Sloped*
A552SS	4	6'-4"	V				1'-2"	5'-2"			2'-4"			*Left Wingwall Tops, Sloped*
A65ISS	20	6'-8"	S	0"	2'-0"	2'-8"	2'-0"			0"				*Wingwall Tops*
								Abutment No. 2 (Plain Rebar)						
B551	138	3'-7 1/2"	P3	5 1/2"	2'-8"					6"				*Abutment Ties*
B651	8	13'-4"	S	0"	5'-4"	2'-8"	5'-4"			0"				*Left Wingwall Bottom*
B652	62	11'-10"	S	0"	4'-7"	2'-8"	4'-7"			0"				*Abutment Stirrups*
B653	7	15-10"	S	0"	6'-7"	2'-8"	6'-7"			0"				*Right Wingwall Bottom*
B654	30	4'-8"	S	0"	1'-0"	2'-8"	1'-0"			0"				*Wingwall, Horizontal End Stirrup*
								Abutment No. 2 (Stainless Steel)						
B55ISS	4	6'-10"	V				1'-2"	5'-8"			8"			*Left Wingwall Tops, Sloped*
B552SS	4	6'-8"	V				1'-2"	5'-6"			2'-6"			*Right Wingwall Tops, Sloped*
B65ISS	21	6'-8"	S	0"	2'-0"	2'-8"	2'-0"			0"				*Wingwall Tops*
								Superstructure (Stainless Steel)						
S550SS	216	5'-4"	SC	10"	1'-2 1/2"	1'-3"	1'-2 1/2"			10"			1'-4"	*Curb (bridge) stirrup*
S551SS	576	6'-3"	C	7"	5'-8"	0"								*Deck Overhang, Primary Transverse*
S552SS	58	6'-2"	S	0	2'-0"	2'-2"	2'-0"			0"				*End Diaphragm Vertical Stirrup*
S553SS	16	5'-6"	S	0	10"	3'-10"	10"			0"				*End Diaphragm, Horizontal Stirrup Between Stems at Joint*
S554SS	24	5'-1"	S	0	10"	3'-5"	10"			0"				*End Diaphragm, Horizontal Stirrup Between Stems*
S555SS	16	3'-6"	S	0	10"	1'-10"	10"			0"				*End Diaphragm, Horizontal Stirrup Between End and Stem*
S556SS	84	7'-6"	S	0	10"	3'-6"	3'-2"			0"				*End Diaphragm, Vertical Hook*
S557SS	64	4'-10"	S	0	2'-8"	11"	1'-3"			0"				*End Diaphragm, Approach Slab Seat Stirrup*
S558SS	56	4'-10"	Z	2'-0"	1'-7"	1'-3"					1'-4"			*End Diaphragm, Approach Slab Pin*
								Transition Barriers (Stainless Steel)						
TB651*	8	7'-5"	H	6"	8 1/2"	2'-6"	8 1/2"	2'-6"		6"				
TB652*	20	8'-3"	H	6"	1'-11 1/2"	2'-6"	1'-11 1/2"	2'-6"		6"				

* Bar is incidental to Item 526.34, Permanent Concrete Transition Barrier

MARK	QTY.	LENGTH	LOCATION

MARK	QTY.	LENGTH	TYPE	A	B	C	D	E	F	G	H	O	R	LOCATION

TYPE - BENDING DIAGRAMS



All dimensions are out-to-out of bar.

Bending details and hooks shall conform to the recommendations of the current revision of ACI Standard 315 and ACI Standard 318.

Reinforcing Bar: ASTM A615/A615M, Grade 60
ASTM A955, GRADE 75
CSA S807-10, AC1 440.1r-15

GENERAL NOTES

1. The first two digits following the letter(s) of the mark indicate the size ofthe bar:

   Mark 'A502' = bar size #5
   Mark 'P805' = bar size #8
   Mark 'S650' = bar size #6
   Mark 'S650SS' = bar size #6 Stainless Steel
   Mark 'S600G' = bar size #6 GFRP

2. Each crank bar, Type B, may be replaced by two (2) straight bars (one top and one bottom) of the same bar size as the crank bar. Payment in either case shall be based on crank bars as schedule on the plans.

3. Bar marks ending with 'G' indicate GFRP. Bar marks ending with 'SS' indicate stainless steel. All other bars are plain (uncoated).

HNTB

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2169(800)

WIN 021698.00

BRIDGE PLANS

BRIDGE NO. 2930

		SIGNATURE	P.E. NUMBER	DATE
PROJ. MANAGER	D. EATON			
DESIGN-DETAILED	H. Walton	P. Bishop	08/18	
CHECKED-REVIEWED	J. Waugh	J. Olund	08/18	
DESIGN2-DETAILED2				
DESIGN3-DETAILED3				
REVISIONS 1				
REVISIONS 2				
REVISIONS 3				
REVISIONS 4				
FIELD CHANGES				

W. MT. VERNON BRIDGE
ECHO LAKE STREAM
MOUNT VERNON KENNEBEC

REINFORCING SCHEDULE

SHEET NUMBER

27

OF 28

Date:10/18/2018

Username:

Division:

Filename: 027_Rebar.dgn

PLAN LEGEND

Town, County, State	New R/W Along Existing R/W	Sanitary Sewer	Traveled Way	Cut Line	Fill Line
Approx. Property Lines P.L.	Building / Clearing Limit Line CLL	Telephone Line	Ditch	Stonewall	Retaining Wall
Existing Right of Way	Trees Conifer / Deciduous	Electric Line	Catch Basin	Baseline 10+00 11+00 12+00	
Limits of Wrought Portion L.O.W.P.	Tree Line / Bush Line	Water Line	Manhole	Monument	Traverse Point
Control Of Access C.O.A.	Water Edge	Underdrain Line	Sewer Manhole	Iron Rod Found ● IRF	Pipe Found ● IPF
New Right of Way	Ledge / Rock/Boulder / Flag Pole	Gas Line	Utility Pole	Replacement Pin Set	
New Easement	Fence CHAIN LINK / BARB WIRE / STOCKADE	Guardrail	Fire Hydrant		
New Temporary Rights	Sign / Well / Mailbox	Culvert	Curbing		
New R/W Within Existing R/W					

Existing / Proposed

STATE OF MAINE
REGISTRY OF DEEDS
COUNTY _____
RECEIVED _____, _____
at _____h _____m _____M and recorded In
Plan Book _____, Page _____
Attest: _____
REGISTER

THIS PLAN WAS PREPARED IN CONNECTION WITH THE DEPARTMENT'S ACQUISITION OF REAL PROPERTY FOR TRANSPORTATION PURPOSES. IT CANNOT BE USED TO ESTABLISH LEGAL BOUNDARIES BETWEEN ABUTTING PROPERTY OWNERS.

25 0 25 50 75 100
Scale of Feet

CURVE DATA #1
PI = 11+28.01
D = 16°51'06.1"
Δ = 41°15'48" Lt.
R = 340.00'
L = 244.86'
T = 128.01'
E = 23.30'

HORIZONTAL DATUM: NAD83 (2011)
ZONE: MAINE 2000 WEST
VERTICAL DATUM: NAVD88
COMBINED FACTOR: 0.99997877

MAINE 2000 WEST ZONE GRID NORTH

RTE 41 TO VIENNA
S.H. "189" / ROUTE 41 / POND ROAD
LIMITS OF WROUGHT
L.O.W.P.
PC = STA. 10+00.00
BEGIN B.L. 10+80
STOP
FLOWERS
STOP SANDY RIVER RD
TO FAYETTE
SANDY RIVER ROAD
47/84/R490A
905 /1133
STOP
40" MAPLE
47S/84S
RTE 41
CRANBERRY CREATION
4" CHERRY
4" CHERRY
4" PEAR
BLUE BERRY
4" PEAR
AZALEA BUSH
4" APPLE
TEMP.
ROAD
TEMP. CONST. LIMITS CLL PORTION 1,189± S.F.
CLL CLI CLL CLL CLL
+70 11+00 244.86' 30+00 31+00 32+00
+55 12+00 +20 +35 35' 50' +25 +95 13+00 +25 +82± +11± 45' 45' 45' 45' 50' +85 +60 14+00 +48± 15+00 16+00
PT = STA. 12+44.86
TAXLOT 48/44/A
TAXLOT 49/42
TAXLOT 48/43/A
DAM
TALL BRICK CHIMNEY
TAYLOR POND
DRY HYDRANT
NOTICE
DRAINAGE STRUCTURE STA. 13+25 TO STA. 13+85
SLOPE EASE. 402± S.F.
DRAINAGE EASE. 919± S.F.
TEMP. CONST. 294± S.F.
LTS
STREAM
CMP
REFLECTOR
S.H. "189" / ROUTE 41 / POND ROAD
S 70°13'14" E
237.51'
129.07'
TO KENTS HILL
18" CMP
1" DIA IRON PIPE
END B.L.
BOAT ACCESS
0.15± AC.
0.16± AC.
756± S.F.
486± S.F.
SLOPE EASE.
LIMITS
LAKE (A/K/A THIRTY MILE RIVER)
P.L.
ECHO
Flow
ECHO LAKE
TEMPORARY
16" PINE
36" PINE
IPF 1/4" DIA REBAR

NOTE: PRESCRIPTIVE EASEMENT FOR HIGHWAY PURPOSES WITHIN LIMITS OF WROUGHT PORTION (L.O.W.P.)

STATE OF MAINE
DEPARTMENT OF AGRICULTURE,
CONSERVATION & FORESTRY
ITEM NO. (1)
SLOPE EASE. = 402± S.F. (1)
TEMP. CONST. RIGHTS = 1,189± S.F. (1)
TOTAL AREA = 1.51± AC. (TOWN)

STATE OF MAINE
DEPARTMENT OF AGRICULTURE,
CONSERVATION & FORESTRY
ITEM NO. (3)
DRAINAGE EASE. = 919± S.F. (1)
TEMP. CONST. RIGHTS = 294± S.F. (1)
TOTAL AREA = 0.73± AC. (TOWN)

MARYELLEN CONEFRY
JOHN J. CONEFRY, JR.

PLAN OF SURVEY
VOL. 1507, PG. 149
FOR JAMES L. FAULKNER
BY REDDINGTON ROBBINS ASSOCIATES
DATED OCTOBER 1983
K.C.R.D. PLAN FILE D-83119

DEBRA L. PARRY
JOHN R. HARKER
ITEM NO. (2)
SLOPE EASE. = 756± S.F. (1)
TEMP. ROAD RIGHTS = 0.15± AC. (1)
TOTAL AREA = 0.47± AC. (TOWN)

CURVE DATA #2
PI = 15+47.04
D = 7°09'43.1"
Δ = 9°14'37" Rt.
R = 800.00'
L = 129.06'
T = 64.67'
E = 2.61'
PC = STA. 14+82.37
PT = STA. 16+11.44

RICHARD H. SMITH
AMANDA DOW SMITH

STATE OF MAINE
DEPARTMENT OF AGRICULTURE,
CONSERVATION & FORESTRY
ITEM NO. (4)
SLOPE EASE. = 486± S.F. (1)
TEMP. ROAD RIGHTS = 0.16± AC. (1)
TOTAL AREA = 2.1± AC. (TOWN)

R/W REFERENCES

ROUTE 41
EASTERLY OF SANDY RIVER ROAD
(INCLUDING BRIDGE)
KENNEBEC COUNTY COMMISSIONERS RECORDS
VOL. 7, PAGE 94
1835
4 RODS

ROUTE 41
NORTHERLY OF SANDY RIVER ROAD
KENNEBEC COUNTY COMMISSIONERS RECORDS
VOL. 6, PAGE 389
1832
4 RODS

NOTE: PRESCRIPTIVE EASEMENT FOR HIGHWAY PURPOSES WITHIN LIMITS OF WROUGHT PORTION (L.O.W.P.)

WEST MOUNT VERNON BRIDGE
OVER
ECHO LAKE STREAM
BRIDGE NO. 2930 WIN 021698.00

ITEM	TECH	CHECKED
EXISTING CONDITION PLAN	D.W.B.	-
FINAL RIGHT OF WAY	B.S.	G.L.L.
AREAS	B.S.	G.L.L.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION - AUGUSTA, ME 04333-0016 - 207-624-3460
MOUNT VERNON
RIGHT OF WAY MAP

REVISIONS NO.	DATE	DESCRIPTION	BY

PLAN FILED IN PLAN BOOK PAGE COUNTY RECORD

NO.	GRANTOR	INSTRUMENT	DATE	BOOK	PAGE

DAVID BERNHARDT
COMMISSIONER
JOYCE NOEL TAYLOR
CHIEF ENGINEER
DATE

To the best of my knowledge and belief, this map constitutes an accurate graphical representation of the Highway Right of Way lines shown hereon. Other boundary lines, including lines between abutters, are approximate and for general reference only. See sheet 2 of this plan set for reference coordinates.

STATE HIGHWAY "189"
ROUTE 41 / POND ROAD
MOUNT VERNON KENNEBEC COUNTY
FEDERAL AID PROJECT NO. STP-2169(800)

AUGUST 2018 | RIGHT-OF-WAY MAP | D.O.T. FILE NO. 6-478
SCALE 1" = 25' | SHEET 1 OF 1

SHEET NUMBER
28
OF 28

Filename: ...\00\ROW\MSTA\028_RWPLAN1.dgn Division: ROW Username: Benjamin.Singer Date:8/27/2018

APPENDIX I

Hydraulic Clearance Memo

Date	To
September 20, 2017	Mark Parlin, MaineDOT
Project Correspondence	**From** Timothy Cote, P.E., HNTB
	Subject WIN 21698.00 – Mt. Vernon West Mt. Vernon Bridge Hydraulic Clearance

HNTB

HNTB is preparing a preliminary design report for replacement of the West Mount Vernon Bridge. As part of this effort the hydraulics of the existing and proposed bridge have been evaluated. This memo outlines the findings of the project preliminary hydraulic evaluations and summarizes the agreed-upon structure freeboard that will be used for the project.

The West Mount Vernon Bridge spans a short waterway linking two waterbodies and is located a small distance downstream from a nearby dam. Therefore, based on guidance from MaineDOT's environmental group, the bridge will be sized based on the required hydraulic opening; the new bridge does not need to provide a specified minimum stream width.

Anecdotal information from the initial public meeting indicates the existing bridge was overtopped during the flood of 1987 and is assumed to be the flood of record. A USGS report prepared for the Androscoggin River following the 1987 event estimates the flood was greater than a 100-year event, but less than a 500-year event. The West Mount Vernon Bridge is located within the Androscoggin River watershed.

A HEC-RAS model was prepared for the existing condition using ground survey and the original bridge design drawings. The projected existing condition flood elevations were as follows:

- 50-year event: 321.92 feet
- 100-year event: 323.59 feet
- 500-year event: 324.43 feet

Based on the original bridge design drawings the low chord elevation and top of roadway elevation are 321.93 feet and 324.51 feet respectively. Therefore, the HEC-RAS model projects the bridge will be slightly overtopped during the 500-year event, and passes the 50-year event by only a small margin. This correlates reasonably well with anecdotal information received during the public meeting. While some modifications were made to the dam spillway and overflow crest in 1993, these changes were not judged to have a significant effect on floodwater elevations.

The proposed project will include construction of a 70-foot single span bridge with a NEXT beam superstructure. Because the proposed bridge is longer than the existing structure it will provide a significantly larger hydraulic opening. This will lower floodwater elevations.

The recommended freeboard clearance stated in MaineDOT's Bridge Design Guide (BDG) is either two feet over Q50 or one foot over Q100. The BDG also states the bridge should pass the flood of record when feasible. Satisfying these clearances would require raising the roadway profile by approximately 1.75 feet and cause the project limits to extend into the adjacent intersection west of the bridge. It would also result in additional project impacts to adjacent properties and natural resources. Because these impacts are undesirable, and because the bridge is a relatively minor structure, the project team evaluated an option that would maintain the low chord elevation of the existing structure.

The HEC-RAS model was subsequently updated to reflect a proposed condition where the low chord of the proposed bridge matches the low chord elevation of the existing bridge. The resulting preliminary water surface elevations, and the available freeboard, are shown in Table 1.

Table 1: Preliminary Water Surface Elevations and Available Freeboard

	Q50	Q100	Q500
Water Surface Elevation	320.64	321.00	321.76
Available Freeboard (ft)	1.29	0.93	0.17

To accommodate the above clearances the roadway profile will be raised by approximately one foot to offset the increased structure depth of the new structure (the existing bridge is a flat slab structure).

The above information was discussed between Tim Cote, P.E. of HNTB and Jeff Folsom, P.E. of MaineDOT on September 15, 2017. Both agreed that maintaining the low chord elevation of the existing bridge was a pragmatic and reasonable solution that would minimize impacts while still allowing the structure to pass the flood of record. Therefore, the HNTB team is advancing the project design such that the approximate clearances presented in Table 1 will be provided in the proposed condition.