Jamaica Weathering Steel Update

DEPOT STREET BRIDGE
JAMAICA BO 1442(42)
TH 19, BRIDGE NO. 32 OVER WEST RIVER

HOYLE TANNER

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Purpose of Meeting

- Discuss the Feasibility of Weathering Steel
- Discuss the Feasibility of Raising the Grade
- Discuss Metalizing Maintenance Costs

VTrans Structures Design Manual

- VTrans Prohibits the use of Weathering Steel where the difference in elevation between the low chord and Ordinary High Water (OHW) is less than 10 feet

6.2.1.1 Weathering Steel

Use FHWA's Technical Advisory 5140.22 to determine if AASHTO M270 unpainted weathering structural steel should be utilized in a steel structure.

FHWA Weathering Steel Guidelines

a. Environment
- (1) Marine Coastal Areas.
- (2) Frequent High Rainfall, High Humidity or Persistent Fog (Condensing Conditions).
- (3) Industrial Areas where concentrated chemical fumes may drift directly onto the structure.

b. Location
- (1) Grade Separations in "Tunnel-Like" Conditions.
- (2) Low Level Water Crossings.
  - (a) Ten feet or less over stagnant, sheltered water.
  - (b) Eight feet or less over moving water.

c. Design Details. For uncoated steel in bridges and other highway structures, the following items should receive careful consideration:
- (1) Eliminate bridge joints where possible.
- (2) Expansion joints must be able to control water that is on the deck. Consider the use of a trough under the deck joint to divert water away from vulnerable elements.
- (3) Paint all superstructure steel within a distance of 1 1/2 times the depth of girder from bridge joints.
- (4) Do not use welded drip bars where fatigue stresses may be critical.
- (5) Minimize the number of bridge deck scuppers.
- (6) Eliminate details that serve as water and debris "traps".
- (7) "Hermetically seal" box members when possible, or provide weep holes to allow proper drainage and circulation of air.
- (8) Cover or screen all openings in boxes that are not sealed.
- (9) Consider protecting pier caps and abutment walls to minimize staining.
- (10) Seal overlapping surfaces exposed to water (to prevent capillary penetration action).

d. Maintenance Actions
- (1) Implement maintenance and inspection procedures designed to detect and minimize corrosion.
- (2) Control roadway drainage:
  - (a) Divert roadway drainage away from the bridge structure.
  - (b) Clean troughs or reseal deck joints.
  - (c) Maintain deck drainage systems.
  - (d) Periodically clean and, when needed, repaint all steel with in a minimum distance of 1 1/2 times the depth of the girder from bridge joints.
- (3) Regularly remove all dirt, debris and other deposits that trap moisture.
- (4) Regularly remove all vegetation which can prevent the natural drying of wet steel surfaces.
- (5) Maintain covers and screens over access holes.

Environmental Guidelines

a. Environment
   (1) Not in Marine Costal Areas. OK.
   (2) Doesn't have Frequent High Rainfall, High Humidity or Persistent Fog (Condensing Conditions). OK.
   (3) Not in Industrial Areas where concentrated chemical fumes may drift directly onto the structure. OK.

Environmental Guidelines are met.

Location Guidelines

b. Location

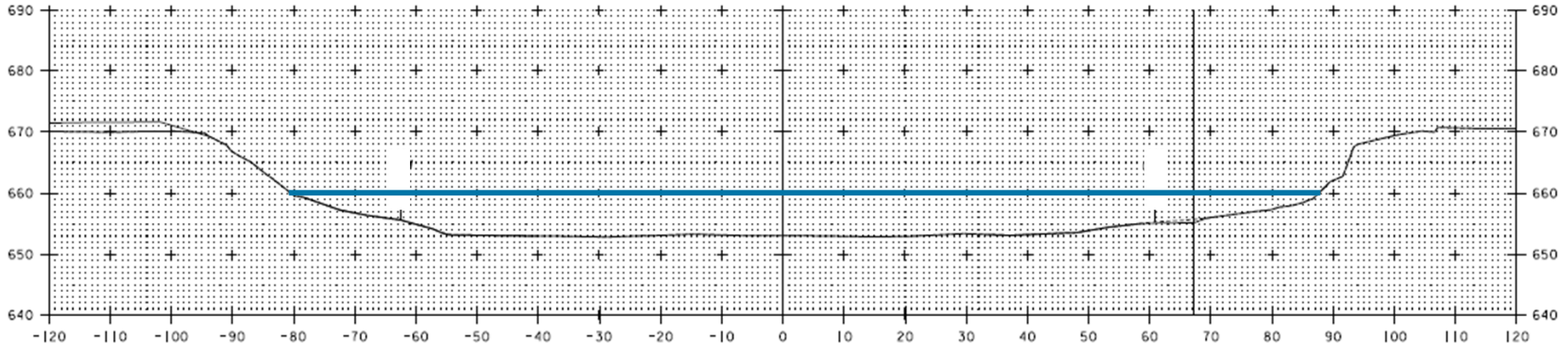
(1) Doesn't have Grade Separations in "Tunnel-Like" Conditions. OK.

(2) Doesn't have Low Level Water Crossings.

(a) Should be more than ten feet over stagnant, sheltered water. N/A

(b) Should be more than eight feet over moving water. Not Controlling

(c) VTrans requires 10 feet or more over OHW



Water Elevation

- 43% Annual Exceedance Probability (AEP) Storm: 2.33 year storm
- From VTrans Hydraulics Manual:

> The 43% AEP event is used to approximate the mean annual flow rate in a channel.

Vermont Rivers and Roads Field Manual

Existing Morphology

Bankfull Channel Dimensions

Bankfull Stage

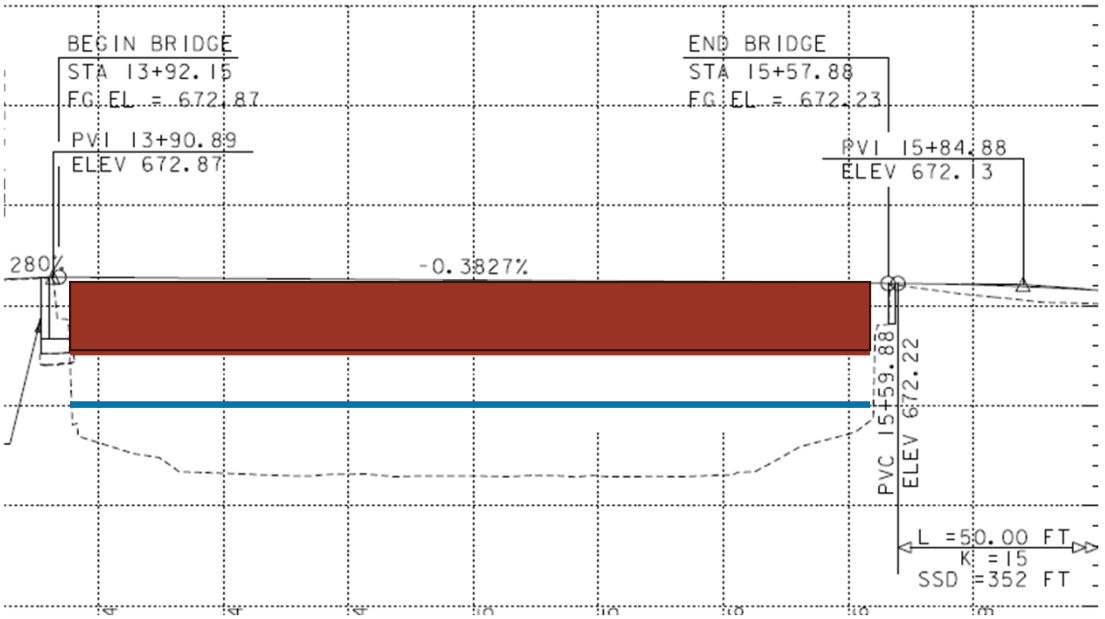
- The discharge that shapes and maintains the channel over the long term is called the bankfull discharge because it typically fills a stable channel to the top of its banks. The height of the bankfull discharge is called the bankfull stage.
- The bankfull discharge is a moderate size flow that occurs every-other year on average, typically during spring runoff.
- The bankfull discharge creates visual evidence of its height that remains long after the water has receded.
- The bankfull stage provides a consistent benchmark for measuring width and depth that is independent of the water surface.
- The bankfull stage is synonymous with the Army Corps of Engineers' Ordinary High Water Elevation (OHW).

Determining the Limits of the Bankfull Channel

1. Find 3-5 bankfull indicators along the channel and measure the height of each above the water surface.
2. If the height of most of the indicators are within half a foot of each-other, calculate their average. This is height of the bankfull discharge.
3. If the heights of the indicators are not within half a foot of each other continue identifying indicators until you find at least three that have the same height.
4. Use the bankfull height above water surface as a benchmark for measuring bankfull width and depth of the channel.

Height Above Water Calculations

- Water Elevation: 660.4ft
  - 43% AEP storm/Bank Full Width used per Vtrans Guidance
- Low Chord Elevation: 665.9ft
  - Roughly 6’-4” preliminary Superstructure depth
- Distance Above Water: 5.5ft
  - 665.9ft – 660.4ft = 5.5ft



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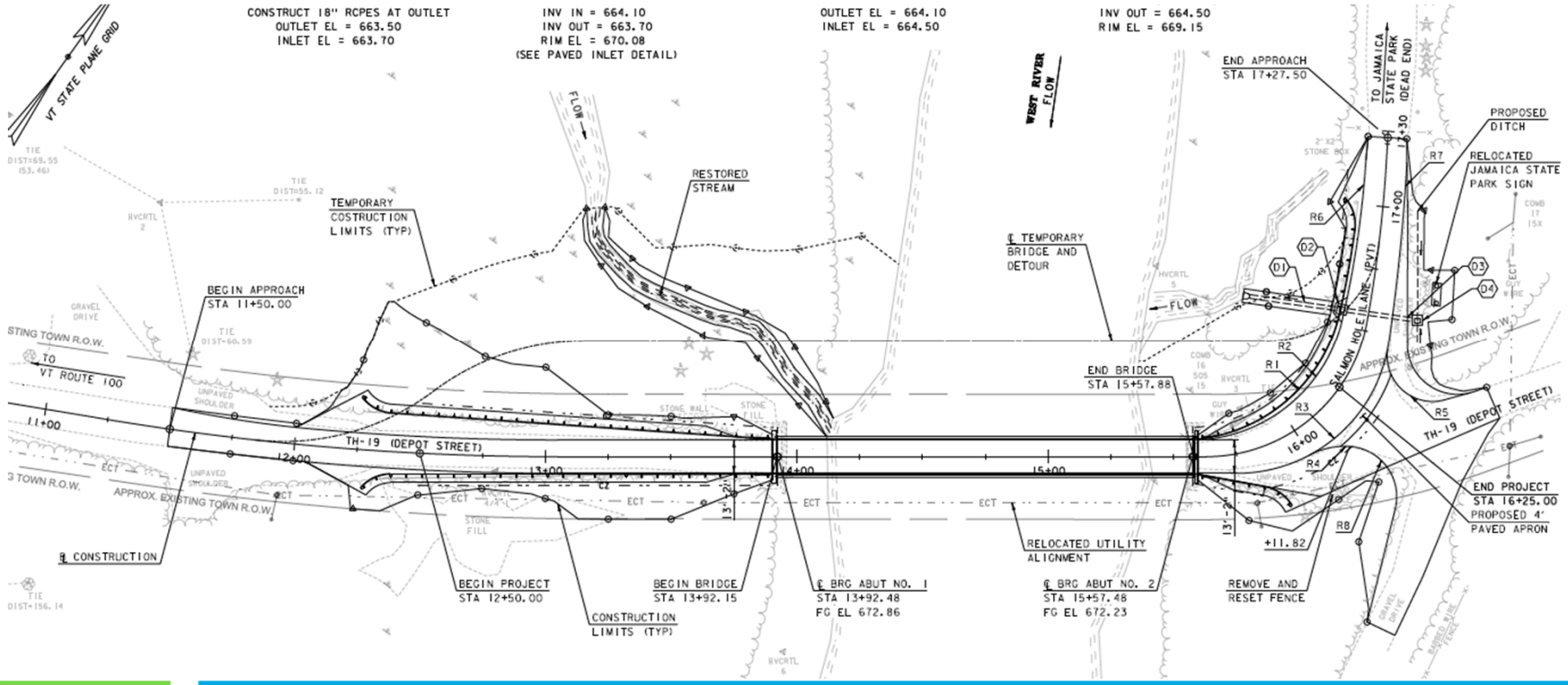
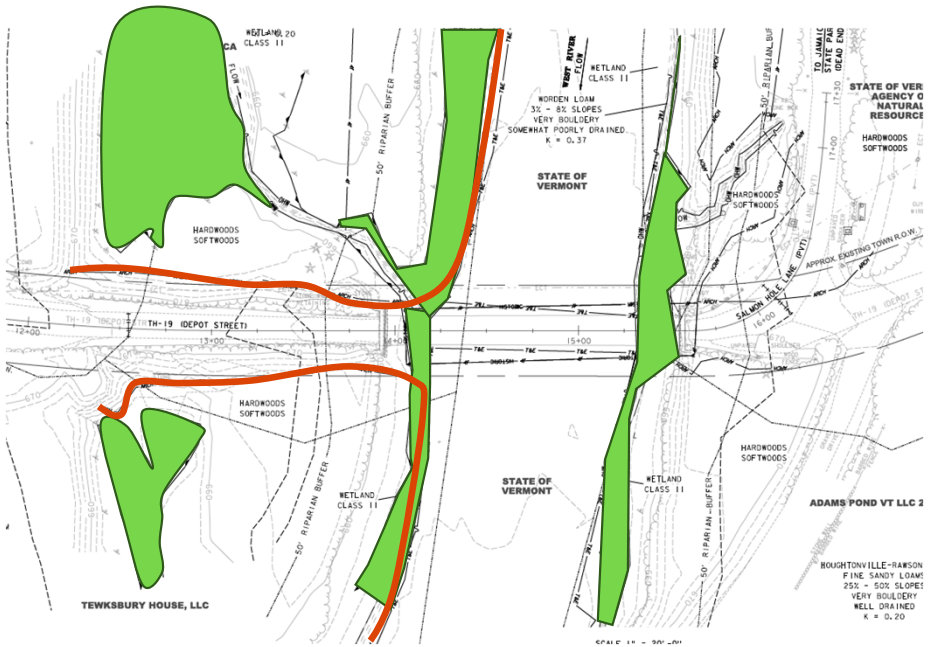
Raising the Grade

- Can we raise the grade 4.5ft to meet the 10ft minimum requirement?



Raising the Grade

- Can we raise the grade 4.5ft to meet the 10ft minimum requirement?
  - Wetlands
  - Archeological Impacts
  - Driveways to tie into
  - Minimum Grade requirements coming off the bridge
  - Filling a Floodplain, increasing headwater elevations



Weathering Steel Truss

- VTrans Won't Use Weathering Steel for Vehicular Truss Bridges
  - Due to Salt Corrosion Issues and overall performance history
- There is one known Weathering Steel Vehicular Truss in Vermont
  - VT100 Over the Lamoille River

Weathering Steel Truss

- VT100 Over the Lamoille River
  - Built in 2009- 16 Years old
  - Superstructure Rated a 6 or Satisfactory

GENERAL OBSERVATION

Structure is in fairly good to satisfactory condition. The A588 treated welded pony truss has areas of rust scaling forming along multiple verticals and diagonals and along the bottom chord with light to minor pitting present in areas of progressive rust scaling. Floorbeams also have progressing rust scaling along the lower flanges and lower portions of web that is the heaviest near the bottom chord and extends into structure. Superstructure should be cleaned and have a protection layer installed such as grease coating or even painted along the lower portions to help prevent further corrosion. Both abutments have areas of scaling along the lower portions and should be cleaned and patched.

Floorbeam #10 on Upstream Side

Weathering Steel Truss

VERMONT
AGENCY OF TRANSPORTATION

Route VT100 /
Structure #00215 / (Routine, Fracture Critical)
VT 00100 ML over LAMOILLE RIVER
Team Lead: Stephen Piro, **Inspection Date:** 09/20/2023

Maintenance Needs

Date Reported: 09/20/2023

Priority:	4 - Maintenance Finding - Next Inspection Cycle	**Status:**	Open
Type of Work:	27 - Superstructure - Clean and paint superstructure	**Component:**	Superstructure

Deficiency Description

The A588 treated welded pony truss has areas of rust scaling forming along multiple verticals and diagonals and along the bottom chord with light to minor pitting present in areas of progressive rust scaling. Floorbeams also have progressing rust scaling along the lower flanges and lower portions of web that is the heaviest near the bottom chord and extends into structure. Superstructure should be cleaned and have a protection layer installed such as grease coating or even painted along the lower portions to help prevent further corrosion.

Conclulsions

- Weathering Steel would not be permitting in this location based on shallow clearance to water
- Metalizing or Painting Girders is Recommended
  - Metalizing: $200,000 construction cost + relatively no maintenance cost
  - Painting: $100,000 construction cost +$250,000-$300,000 maintenance cost

Questions

HOYLE TANNER

THANK YOU!