STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Putney STP DECK(38)

US Route 5, BRIDGE 15 OVER SACKETTS BROOK

February 1, 2016

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I. Site Information

Bridge 15 is a state owned bridge located on US Route 5 in the Town of Putney, approximately 0.5 miles north of the I-91 exit 4 interchange. The bridge has a sidewalk that provides pedestrian access through the site location. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	
Bridge 15	Major Collector
Bridge Type	Rolled Beam
Bridge Length	54 feet
Year Built	1954
Ownership	State Owned

Need

The following is a list of deficiencies of Bridge 15:

1. The deck is in fair condition with a deck rating of 5 'fair' with section loss at the fascia and efflorescence between girders.

2. The Bridge Rail including approach rail is substandard.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2016 and 2036.

	US Route 5	
TRAFFIC DATA	2016	2036
AADT	3000	3100
DHV	440	440
ADTT	180	290
%T	3.6	5.5
%D	56	56

Design Criteria

The design standards for this roadway are indicated below, however given this is a maintenance project some improvements to meet current design standards will be impractical.

1. AASHTO. *A Policy on Geometric Design of Highways and Streets.* Association of State Highway and Transportation Officials, Washington, DC, 2011. (The Green Book)

2. AASHTO. *Roadside Design Guide.* Association of State Highway and Transportation Officials, Washington, DC, 2011.

3. Minimum standards are based on commentary from the Vermont State Design Standards for Lane and Shoulder widths for Urban Collectors. http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/publications/VermontStateDesignStandards.pdf

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	3'-12'-12'-3'	3'-11'-11'-3'	Exceeds Standard
Speed		30 mph (Posted)	30 mph (Design)	
Bicycle/Pedestrian Criteria		5' Sidewalk	5' Sidewalk	
Bridge Railing	Structures Design Manual Section 13	Concrete/Steel Tube	TL-2	

Inspection Report Summary

Deck Rating	5 Fair
Superstructure Rating	7 Good
Substructure Rating	7 Good

5/29/2015 Structure is in fair to good condition. However the retaining wall on the downstream side should be stabilized and void between the wall and the roadway repaired. ~FRE/TJB

5/22/2013 Structure is in fair to good condition. Deck has areas of heavy saturation and cracking with efflorescence's. Wing/retaining wall on the downstream side at abutment #2 should be anchored. Sing hole at abutment #2 where the wall has moved should be repaired. ~ FRE/DAH

9/14/2011 Irene inspection, no significant changes. MJK/JM

4/28/2011 Abutment #1 could use some minor stone repair. Approach curb on the northeast corner needs to be repaired before it starts effecting the roadway. FRE/DCP

Utilities

The existing utilities are as follows:

Municipal Utilities

- A municipal sewer is attached to the girders. These will not be impacted by the bridge deck replacement.
- A municipal water is located well north of the bridge. These will not be impacted by the bridge deck replacement.

Public Utilities

Aerial:

- Adjacent to the bridge on the easterly side there is an existing 3 phase electric line owned by GMP with 6 communication cables attached to the poles. These cables are owned by Southern Vermont Cable, Sovernet, Comcast, Level 3 Communications and FairPoint. With the close proximity of the building on the east side of US 5 (at the southerly end of

the bridge) installing alley arms for temporary relocation is not feasible. Given the lack of relocation alternatives in this location the contractor will have to work around these aerial facilities, which will require temporarily severing the power.

There is one aerial communication cable which passes diagonally over the bridge; this cable will need to be relocated.

- The service lines to the Putney Store pass over US Route 5 at the southerly end of the bridge. These service lines will need to be relocated (at least temporarily).

Buried:

- There are several buried conduits which extend from the Water Street intersection to a telephone manhole in the Kimball Hill Road intersection. These conduits (approximately 6 of them) are attached to the underside of the bridge between the two outside beams on the westerly side (under the sidewalk portion of the bridge). If a decision is made to replace the sidewalk portion of the bridge as well, it will most likely mean that these conduits will need to be relocated (at least temporarily). FairPoint has indicated that they do not have accurate records on the location of these conduits at the bridge approaches. They indicate that actual location will have to be determined with test pits. It may be necessary to excavate around these conduits and support then during the construction of the back walls.

Right Of Way

The existing Right-of-Way is plotted on the Layout Sheet. No additional Right-of-Way acquisition will be necessary.

Historic

Bridge 15 is a historic structure. As requested for historic preservation, the new rail will feature a historic bridge rail that matches the character of existing site conditions and the downtown Putney community.

II. Alternatives Discussion

This Project was identified by Asset Management along with 9 other structures as a candidate for the 2016/2017 Bridge Deck Replacement Program. The objective of the program was to identify structures to apply a cost-effective treatment at the proper time to preserve and extend the useful life of the bridge. Preventative maintenance provides the biggest benefit for the smallest level of investment. By either repairing or replacing the bridge deck, the service life of the superstructure and substructure can be maximized by protecting them from exposure to the elements that have caused the deck to deteriorate to its current condition. Therefore, the alternatives analysis was limited to the bridge deck exclusively.

Alternative 1: No Action

This alternative leaves the bridge in its current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing bridge can stay in place without any work being performed on it during the next 10 years. Given the fair rating on the deck, this bridge will require work within the next 10 years. From the standpoint of safety, economics, and convenience, this alternative is not recommended and will not be considered further.

Alternative 2: Deck Patching

The existing deck is rated a 5 ("fair"). The superstructure, referring to the rolled steel beams, is rated a 7 ("good"), and the existing substructure is rated a 7 ("good"). Deck patching would include removal of loose and deteriorating concrete, cleaning and possibly supplementing reinforcing steel, application of patching material to cracks and areas of section loss, and paving on the bridge and for a short distance on each approach to the bridge. The Bridge Inspection Report (attached) indicates that the existing bridge and approach rail does not meet current safety standards. It would be reasonable to consider replacement of the existing bridge and approach rail to provide a bridge and approach rail that meets the current standard. Some characteristics of deck patching are as follows:

- Patching tends to accelerate the deterioration of the existing concrete that is in contact with the patching material, and thus offers a widely variable service life often 10 years or less.
- Much of the work would take place underneath the bridge with efforts required to avoid contamination of the river.
- In approximately 10 years, the condition of the bridge would be similar to its current condition and major work would be required again.

Disadvantages seem to outweigh the benefits to this short-term fix. Deck patching alone will not be considered further.

Alternative 3: Deck Replacement

This alternative would involve removing the existing deck in its entirety and placing a new deck on the existing steel beams. In addition, the future approach railing cannot be supported by the existing wingwall located in the North East quadrant of the bridge. Therefore, the top of the wingwall will be removed and a new concrete slab will be installed to support the new approach rail.

The existing substructure is rated a 7 and considered in 'good' condition, and it is reasonable to assume that it can safely carry anticipated traffic loads for an additional 40 years which is the anticipated service life of a new deck. Therefor no repairs would be recommended to the existing substructure at this time. However, future projects may consider repointing the existing substructure as needed at that time.

Advantages: This alternative would improve the carrying capacity of the bridge, with minimum upfront costs. This option would have the least impact to adjacent properties and resources.

Maintenance of Traffic: Traffic could be maintained on an offsite detour or with phased construction. It generally does not make economic sense to construct a temporary bridge for a rehabilitation project.

Given this is a maintenance project meeting new design standards may not be possible. However the scope of the project will be to improve the bridge as much as possible given the site constraints.

III. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects sooner. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

Putney Bridge 15:
This option would close the bridge and reroute traffic onto an offsite detour. Since the bridge is located on a State Highway, the State will design and manage a detour route and traffic control plan. The State will coordinate with emergency services to develop a plan for the closure period. The detour the State will sign is as follows:

1. From the intersection of US Route 5 and Kimball Hill Rd travel South on US Route 5, to Putney Landing Road, to I-91 North, Take Exit 5 to Westminster Street East towards US Route 5, turn right onto US Route 5 traveling South towards Putney. The end to – end distance is 22.3 miles and is 27 minutes of additional travel time.

A potential local bypass route is as follows:

1. From the intersection of US Route 5 and Kimball Hill Rd travel west on Kimball Hill Rd, take a right onto Sand Hill Rd, travel to the end of Sand Hill Rd. The end to end distance is 1.46 miles and only 3 additional minutes of travel time.

Pedestrian traffic through the construction site could be maintained on the existing sidewalk as the scope of work precludes the sidewalk. However once the bridge deck is demolished a temporary pedestrian railing would need to be installed. Given the accelerated construction schedule and the proximity of the sidewalk to the superstructure, pedestrian traffic cannot be maintained at all times. In addition, to reduce the onsite construction duration, accelerated bridge construction techniques including the use of prefabricated components will be used. These components are large and generally moved into place using large cranes. It is a safety hazard to have pedestrians inside the workzone. Therefore, it is recommended that we do not try and accommodate pedestrians for the duration of the closure.

One concern with the Off-Site Detour option is truck access for Water Street. The Vermont Agency of Transportation is aware that the company Soundview Vermont Holdings receives frequent deliveries from Semi Trucks towing 48 foot trailers. In order to determine if trucks could make the turn into Water St from the North (driving south) a model was created using Auto Track. From the analysis it was determined that it is possible to make the turn utilizing the commercial drive across from Water Street. However, several assumptions were made when running this analysis, the first was assuming no driver error, the second was assuming some small site modifications can be made, and the third was assuming the contractor or other private entities

would not be in conflict during the turning movement. A diagram showing the model results can be seen in the attachments. If Soundview can utilize shorter trailers during the closure or suspend delivers this option is very feasible.

Advantages: The costs associated with signing the detour are much lower than the construction costs associated with the other maintenance of traffic options. By detouring traffic away from construction activities, it creates a safer working environment for the construction workers. By not constructing the structure in phases, there will be no vibrations or deflections from adjacent traffic to affect the quality of the closure pours joining the phases. By not requiring the construction and removal of temporary approaches, temporary bridges and temporary crossovers, the length of construction can be reduced over those other options. This is the safest traffic control option since the traveling public is removed from the construction site.

Disadvantages: Traffic will not be maintained along the existing corridor for a limited portion of construction. Through traffic will see an increase in travel times during the closure period.

Option 2: Phasing

Another method of maintaining traffic along the corridor during construction is to build a new structure one lane at a time, or in phases. This allows the road to be kept open during construction, while having minimal impacts to adjacent property and environmental resources.

Advantages: Traffic would be maintained along the existing corridor during construction.

Disadvantages: While the time and cost required to construct a phased project may be less than that required to construct a project with a temporary bridge, the time required to construct a phased construction project is longer than a project constructed without phasing, because some of the construction tasks have to be performed multiple times and cannot be performed concurrently. The cost of construction also increases over un-phased work because of this increase in the length of time, the additional inconvenience of working around traffic, and the effort involved in coordinating the joints between the phases. Once again, while the corridor will be open to traffic during construction, traffic will still be delayed and disrupted by the reduction in the number of lanes and by construction vehicles and equipment entering and exiting the site. The construction workers and equipment will still be in close proximity to vehicular traffic increasing the probability of accidents.

Option 3: Temporary Bridge

A temporary bridge was not considered feasible for this site given the proximity of adjacent buildings.

Maintenance of Traffic Conclusion

Putney Bridge 15:
Due to the availability of a reasonable State signed detour and a short local bypass, an off-site detour is the preferred maintenance of traffic option at this location. The bridge deck will be replaced during a 10 day short term bridge closure while phased construction would take an entire construction season and produce a lower quality final product at the completion of construction. Thus an Off-Site Detour would be the best maintenance of traffic option at this location.

IV. Cost Matrix[1]

Putney B15 US Route 5		Do Nothing	**Alt 3** Deck Replacement
			a. Accelerated
COST	Bridge Cost	$0	$247,000
	Removal of Structure	$0	$37,000
	Roadway	$0	$201,000
	Maintenance of Traffic	$0	$67,000
	Construction Costs	$0	$552,000
	Construction Engineering + Contingencies	$0	$165,600
	Total Construction Costs w CEC	**$0**	**$717,600**
	Preliminary Engineering[2]	**$0**	**$100,000**
	Right of Way	**$0**	**$0**
	Total Project Costs	$0	$817,600
	Annualized Costs	$0	$0
SCHEDULING	Project Development Duration[3]		1 years
	Construction Duration		1 years
	Closure Duration (If Applicable)		10 Days
ENGINEERING	Typical Section –		
	Typical Section –		
	Typical Section – Bridge (feet)	3’-12’-12’-3’ (30’)	No Change
	Geometric Design Criteria	No Change	No Change
	Traffic Safety	No Change	No Change
	Alignment Change	No Change	No Change
	Bicycle Access	No Change	No Change
	Vertical Clearance	No Change	No Change
	Pedestrian Access	No Change	No Change
	Utility	No Change	Relocation Required
OTHER	ROW Acquisition	No	No
	Road Closure	No	Yes
	Design Life	<10 years	30+ years

[1] Costs are estimates only, used for comparison purposes.
[2] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.
[3] Project Development Durations are starting from the end of the Project Definition Phase.

V. Conclusion

Alternative 3 is recommended; to replace the existing deck during a 10 day short term road closure with traffic maintained on an offsite detour.

This alternative includes replacing the deck with full depth precast concrete deck panels. This construction method is an accelerated construction method that reduces project and traffic impacts and increases the safety of the traveling public and construction workers. In addition, new bridge and approach rail will be constructed. The new rail will feature a historic bridge rail that matches the character of existing site conditions and the downtown Putney community.

Traffic Maintenance:

The State of Vermont will include provisions in the contract that require the contractor to sign and maintain the detour route.

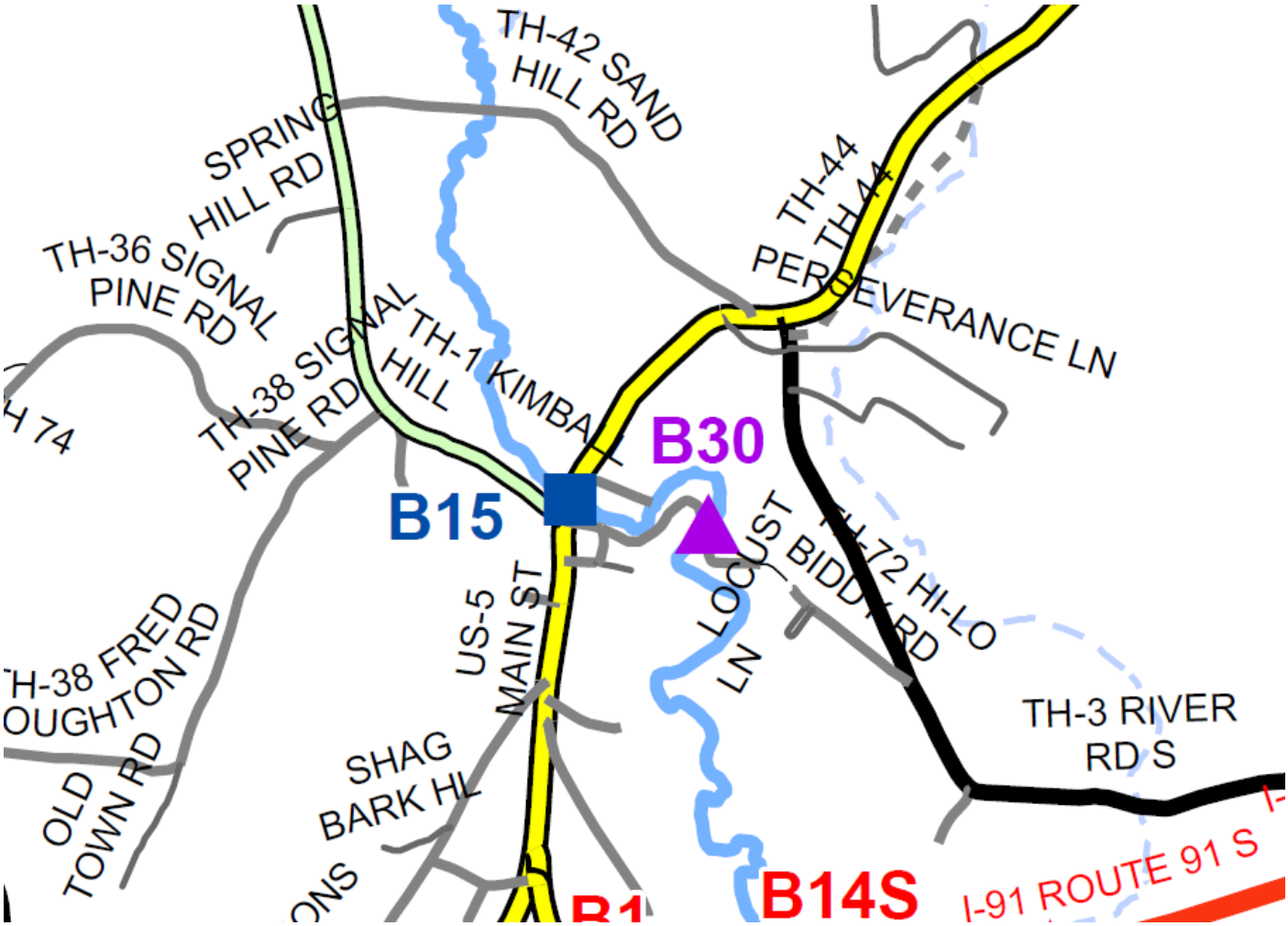
Design Criteria:

The existing bridge width meets the current standards. The Approach railing is substandard and will be improved as much as possible. Given this is a maintenance project meeting new design standards may not be feasible. However the scope of the project will be to improve the bridge's substandard features as much as possible given the site constraints.

VI. Appendices

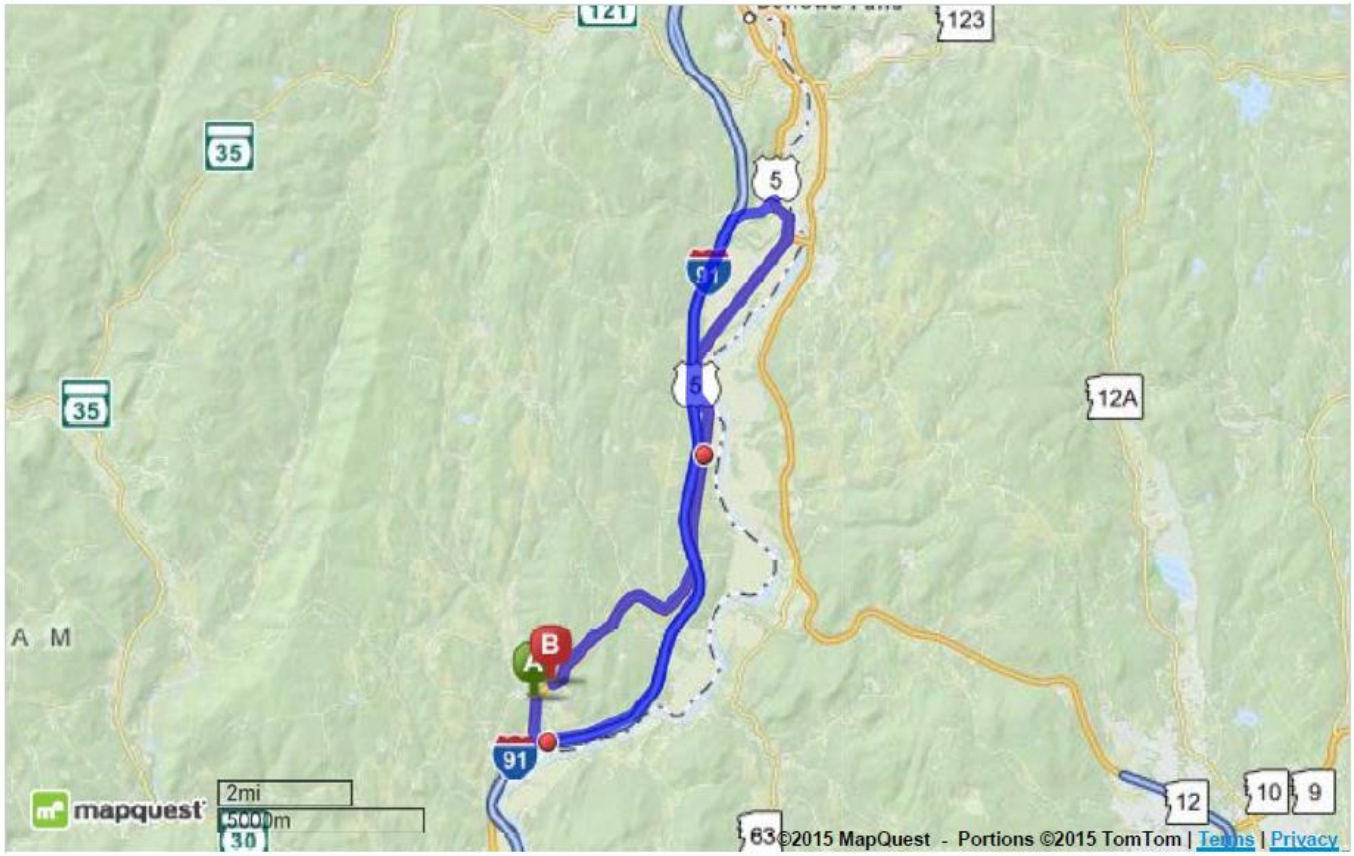
Site Pictures

Town Map


TH-42 SAND HILL RD
SPRING HILL RD
TH-36 SIGNAL PINE RD
TH-38 SIGNAL PINE RD
TH-1 KIMBALL HILL
TH-44
PER TH-44
EVERANCE LN
B30
B15
US-5 MAIN ST
LOCUST LN
TH-72 HI-LO
TH-3 RIVER RD S
SHAG BARK HL
OLD TOWN RD
B14S
I-91 ROUTE 91 S

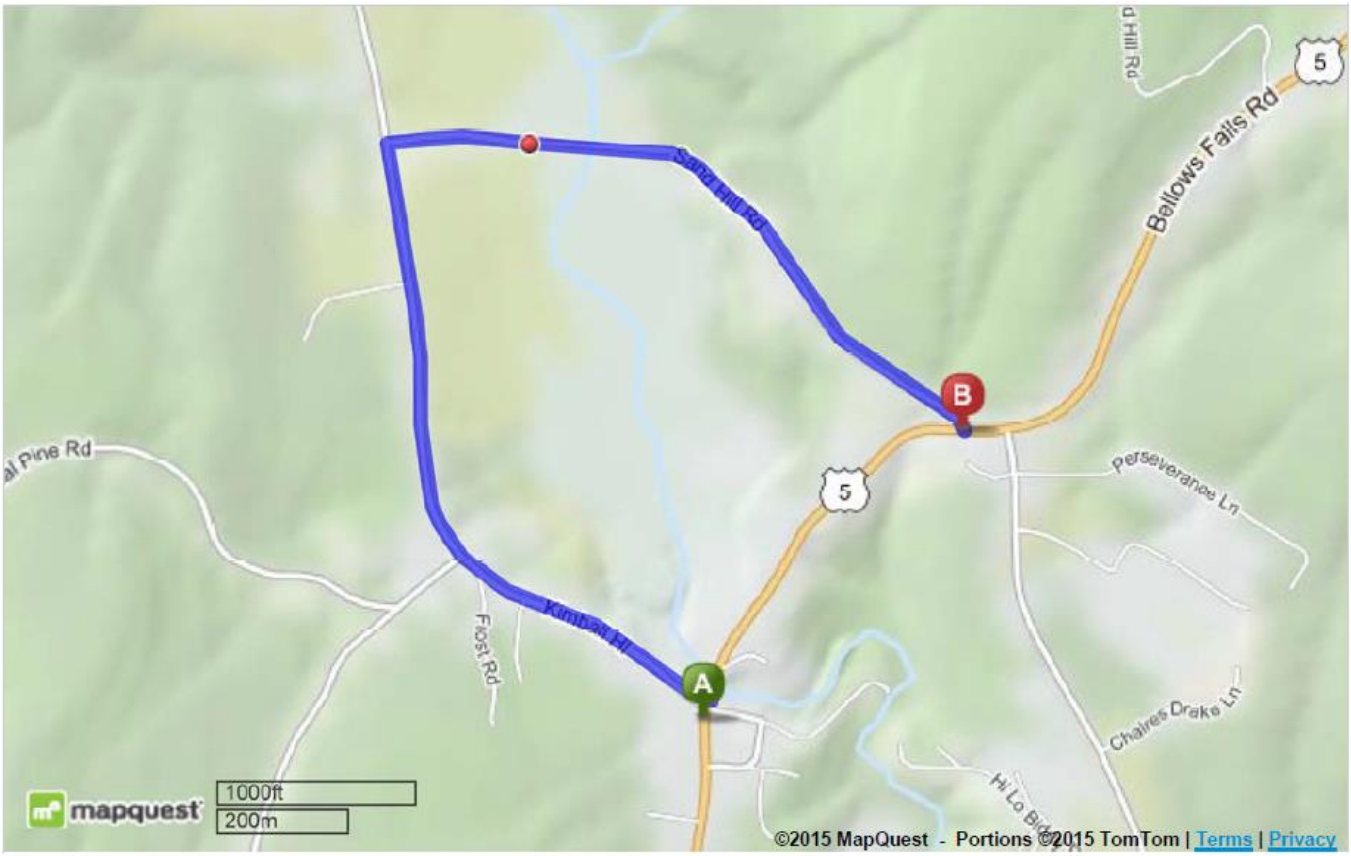
Detour

Total Travel Estimate: **22.30 miles - about 27 minutes**



Local Bypass

Total Travel Estimate: **1.46 miles - about 3 minutes**



Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

Vermont Agency of Transportation – Structures Section – Bridge Management and Inspection Unit

Inspection Report for **PUTNEY** *bridge no.:* **00015** *District:* **2**

Located on: **US 00005 ML** *ove* **SACKETTS BROOK** *approximately* **0.5 MI N I91 EXIT 4** *Owner:* **01 STATE-OWNED**

CONDITION

Deck Rating: **5 FAIR**

Superstructure Rating: **7 GOOD**

Substructure Rating: **7 GOOD**

Channel Rating: **8 VERY GOOD**

Culvert Rating: **N NOT APPLICABLE**

Federal Str. Number: **200113001513132**

Federal Sufficiency Rating: **081.9**

Deficiency Status of Structure: **ND**

AGE and SERVICE

Year Built: **1954** *Year Reconstructed:* **0000**

Service On: **5 HIGHWAY-PEDESTRIAN**

Service Under: **5 WATERWAY**

Lanes On the Structure: **02**

Lanes Under the Structure: **00**

Bypass, Detour Length (miles): **00**

ADT: **003600** *% Truck ADT:* **06**

Year of ADT: **1998**

GEOMETRIC DATA

Length of Maximum Span (ft): **0052**

Structure Length (ft): **000054**

Lt Curb/Sidewalk Width (ft): **5**

Rt Curb/Sidewalk Width (ft): **1**

Bridge Rdwy Width Curb-to-Curb (ft): **32**

Deck Width Out-to-Out (ft): **40.3**

Appr. Roadway Width (ft): **032**

Skew: **09**

Bridge Median: **0 NO MEDIAN**

Min Vertical Clr Over (ft): **99 FT 99 IN**

Feature Under: **FEATURE NOT A HIGHWAY OR RAILROAD**

Min Vertical Underclr (ft): **00 FT 00 IN**

STRUCTURE TYPE and MATERIALS

Bridge Type: **ROLLED BEAM**

Number of Approach Spans **0000** *Number of Main Spans:* **001**

Kind of Material and/or Design: **3 STEEL**

Deck Structure Type: **1 CONCRETE CIP**

Type of Wearing Surface: **6 BITUMINOUS**

Type of Membrane **0 NONE**

Deck Protection: **0 NONE**

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: **0 DOES NOT MEET CURRENT STANDARD**

Transitions: **0 DOES NOT MEET CURRENT STANDARD**

Approach Guardrail **0 DOES NOT MEET CURRENT STANDARD**

Approach Guardrail Ends: **0 DOES NOT MEET CURRENT STANDARD**

Structural Evaluation: **6 EQUAL TO MINIMUM CRITERIA**

Deck Geometry: **4 MEETS MINIMUM TOLERABLE CRITERIA**

Underclearances Vertical and Horizontal: **N NOT APPLICABLE**

Waterway Adequacy: **6 OCCASIONAL OVERTOPPING OF ROADWAY WITH INSIGNIFICANT TRAFFIC DELAYS**

Approach Roadway Alignment: **8 EQUAL TO DESIRABLE CRITERIA**

Scour Critical Bridges: **8 STABLE FOR SCOUR**

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): **1 LOAD FACTOR (LF)**

Posting Status: **A OPEN, NO RESTRICTION**

Bridge Posting: **5 NO POSTING REQUIRED**

Load Posting: **10 NO LOAD POSTING SIGNS ARE NEEDED**

Posted Vehicle: **POSTING NOT REQUIRED**

Posted Weight (tons):

Design Load: **4 H 20**

INSPECTION and CROSS REFERENCE

Insp. Date: **052015** *Insp. Freq. (months)* **24** *X-Ref. Route:* *X-Ref. BrNum:*

INSPECTION SUMMARY and NEEDS

5/29/2015 Structure is in fair to good condition. However the retainning wall on the downstream side should be stablized and void between the wall and the roadway repaired. –FRE/TJB

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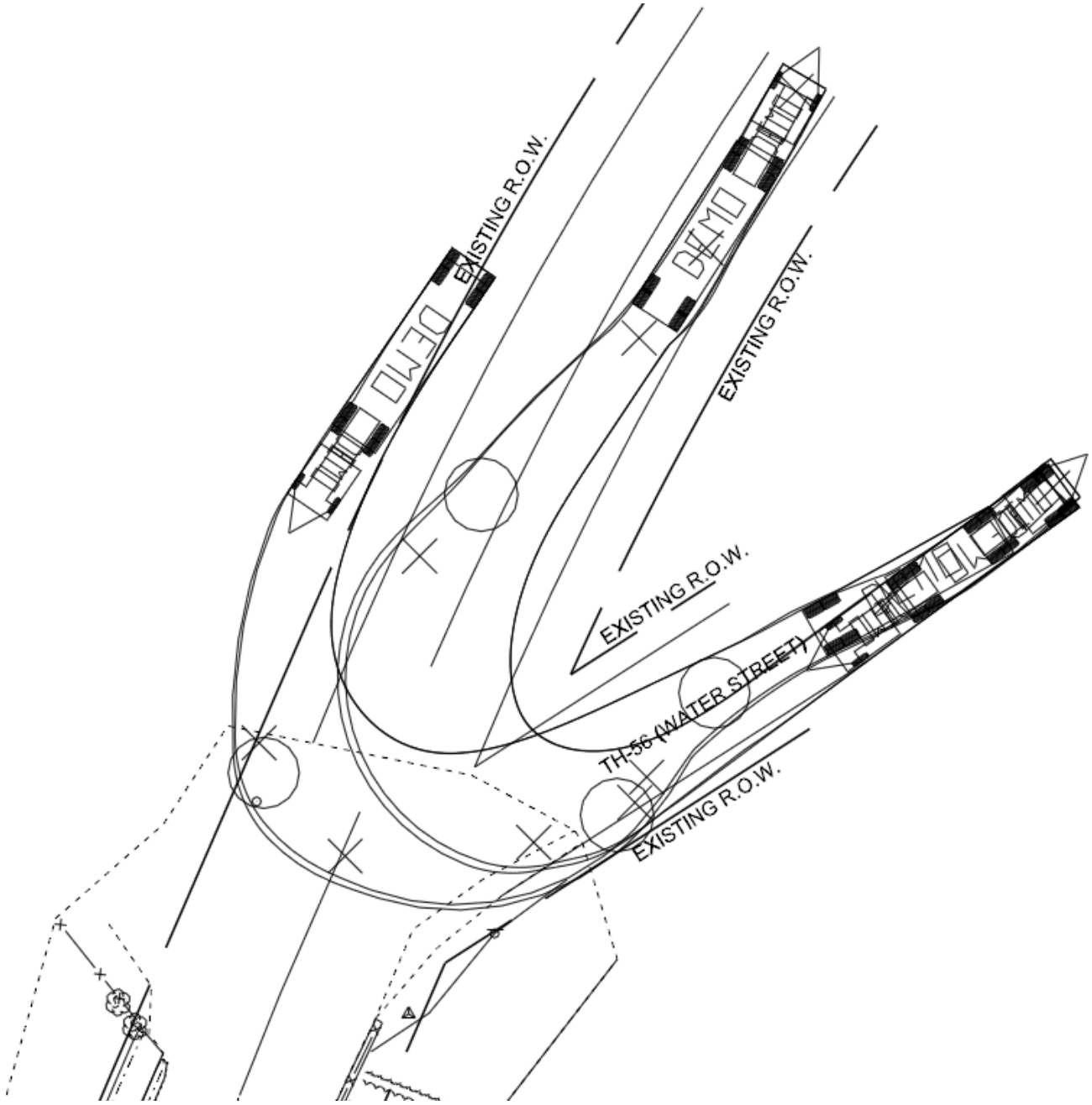
Friday, July 10, 2015

Turning Diagrams

Semi-Truck 48’ Trailer



Semi-Truck 33’ Trailer