STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report
FOR
Orwell STP Deck (41)

TH 3 (Route 73), BRIDGE 4 OVER NORTH FORK CREEK

November 17, 2015

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I. Site Information

Bridge 4 is a town owned bridge located on Route 73 (TH 3) in District 3, Addison County, Orwell VT. The Bridge is located approximately 2 miles west of the junction with VT 22A.

Roadway Classification	
Route 73	Major Collector
Bridge Type	Cast in Place Deck on Rolled Beam
Bridge Length	72 feet
Year Built	1946
Ownership	Town Owned

Need
The following is a list of deficiencies of Bridge 31:

1. The deck is rated a 5 (fair).

2. The width of the bridge is substandard.

3. The Bridge Rail including approach rail is substandard.

Traffic
Estimated AADT for 2015.

	Route 73	
TRAFFIC DATA	2016	2036
AADT	340	350
DHV	50	55
ADTT	25	35
%T	10.4	13.8
%D	53	53

Design Criteria

The design standards for this roadway are indicated below; for the situations that the Vermont State Standards do not apply.

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 the Vermont State Design Standards: http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/publications/VermontStateDesignStandards.pdf

Minimum standards are based on commentary from the Vermont State Design Standards for Lane and Shoulder widths for Urban Collectors.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	0'-10'-10'-0'	3'-11'-11'-3'	Substandard
Speed		40 mph (Posted)	40 mph (Design)	
Pedestrian Criteria		N/A	N/A	
Bridge Railing	Structures Design Manual Section 13	Concrete/Cable	TL-2	Substandard

Inspection Report Summary

Deck Rating 5 Serious
Superstructure Rating 6 Satisfactory
Substructure Rating 6 Satisfactory

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6/27/12 Deck continues to deteriorate mainly along bay 2 where a deep spall is that has rusted through rebar and 1st layer of rebar matting along top is in view. Deck should be replaced along with updated guardrail system. ~ MJK JM

7/19/10 The deck continues to deteriorate. The bridge and approach guard rail should be upgraded to meet standards. DCP

Utilities
The existing utilities are as follows:

Municipal Utilities

- N/A

Public Utilities

Aerial:

- There are aerial electric and telephone facilities which run near the edge of the entire project area. These facilities may need to be relocated in order to facilitate the placement of the new bridge deck and or approach rail.

Overhead utilities may have to be relocated for construction.

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

Resources

Historic:

Bridge 4 is a historic structure.

Safety

The bridge is not in a High Crash location.

II. Alternatives Discussion

This Project was identified by Asset Management along with 10 other structures as a candidate to go through a Bridge Deck Pilot program. The objective of the program was to identify structures that could benefit from a bridge deck rehabilitation or replacement in order to extend the years of service of the bridge's superstructure and substructure. The scope is limited to the decks exclusively, therefore only three alternatives were evaluated as follows:

Alternative 1: No Action

This alternative would involve leaving the bridge in its current condition. The deck condition would require some additional maintenance or replacement within the next 10 years, therefor the No Action alternative is not recommended.

Alternative 2: Deck Patching

It would not be cost effective to try and salvage this deck. Given the level of deterioration the repairs required would need to be full depth. Additionally any repairs made would not improve the functionality or structural deficiencies of the bridge, therefore this alternative is not recommended.

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.

The existing substructure is in satisfactory condition, and it is reasonable to assume that it can safely carry anticipated traffic loads for an additional 40 years. No repairs would be recommended to the existing substructure at this time. However future projects may entail cleaning and patching, or cleaning and encasing the existing substructure.

Advantages: This alternative would address the structural deficiencies of the existing bridge, with minimum upfront costs. This option would have minimal impacts 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.

Bridge Width

The existing bridge width is substandard. 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 width as much as possible given the site constraints. Additionally the current Bridge and Approach railing is substandard. The new railing will be a crash tested approved guardrail system.

III. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on expedited delivery of construction plans, permitting, Right-of-Way, and faster construction of projects in the field. One practice that helps this endeavor is to close bridges for portions of the construction period, rather than provide 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 also expedites construction schedules. This can apply to decks, superstructures, and substructures. Accelerated bridge construction and short term road closures creates a safer working environment for construction personnel while minimizing traffic impacts. The following maintenance of traffic options have been considered:

Option 1: Off-Site Detour

Route 73:

This option would close the bridge and reroute traffic onto an offsite detour. Since the bridge is located on a Town Highway, it would be the responsibility of the Town of Orwell to choose, design and manage the preferred detour route and traffic control plan. The Town would also be responsible for management of emergency services throughout the closure period. A possible detour that may be considered by the Town is as follows:

1. East on Route 73 (TH 3), right onto Old Foundry Rd (TH 14), right onto Route 73 East (TH 3) for approximately 5.75 miles end to end.

A map of this detour route can be found in the Appendix.

Advantages: The costs associated with signing the detour are much lower than the construction costs associated with 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 stay open to traffic during construction, while having minimal impacts to adjacent property and environmental resources.

While the time required to design a phased construction project would remain the same, the onsite time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. In addition to the increased design and construction costs mentioned above, the costs also increase for phased construction because of the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases. Another negative aspect of phased construction is the decreased safety of the workers and vehicular traffic, which is caused by increasing the proximity and extending the duration that workers and moving vehicles are operating in the same confined space. Phased construction is usually considered when the benefits include reduced impacts to resources and decreased costs and development time by not requiring the purchase of additional ROW.

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 still 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 costs 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 given the additional costs associated with a temporary bridge. Such costs would make a rehabilitation project no longer cost effective.

Maintenance of Traffic Conclusion

Route 73:
Due to the availability and close proximity of local roads to detour traffic phasing will not be considered further in this report. Phasing would be more expensive, take longer to construct, and produce a lower quality final product at the completion of construction. Thus an Off-Site Detour would be the recommended maintenance of traffic option at this location and will only be considered in the cost matrix.

IV. Cost Matrix[1]

Orwell STP Deck (41)		Alt 1 Do Nothing	Alt 3 Deck Replacement
			a. Conventional
COST	Bridge Cost	$0	$173,000
	Removal of Structure	$0	$65,000
	Roadway (Includes Mobilization)	$0	$153,000
	Traffic Control	$0	$24,000
	Construction Costs	$0	$415,000
	Construction Engineering + Contingencies	$0	$124,500
	Total Construction Costs w CEC	**$0**	**$539,500**
	Preliminary Engineering[2]	**$0**	**$84,000**
	Right of Way	**$0**	**$0**
	Total Project Costs	$0	$623,500
	Annualized Costs	$0	$0
TOWN SHARE	Towns total Share (2.5%)		**$15,587.50**
SCHEDULING	Project Development Duration[3]		1 years
	Construction Duration		1 years
	Closure Duration (If Applicable)		60 Days
ENGINEERING	Typical Section –		
	Typical Section –		
	Typical Section – Bridge (feet)	4”-10’-10’-4” (20’-8”)	6”-10’-10’-6” (21’)
	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 Possible
OTHER	ROW Acquisition	No	No
	Road Closure	No	Yes
	Design Life	<5 years	40 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

We recommend **Alternative 3**; to replace the existing deck using a road closure.

Structure:
The recommended alternative includes replacing the existing deck with a cast-in-place deck using conventional construction methods. The new structure will feature a composite concrete deck which allows the bridge to be widened slightly to improve the typical section. Crash tested approach and bridge rail will also be provided as part of this project which will be an improvement upon the current guardrail system. The proposed improvements should extend the life expectancy of this structure an additional 40 years.

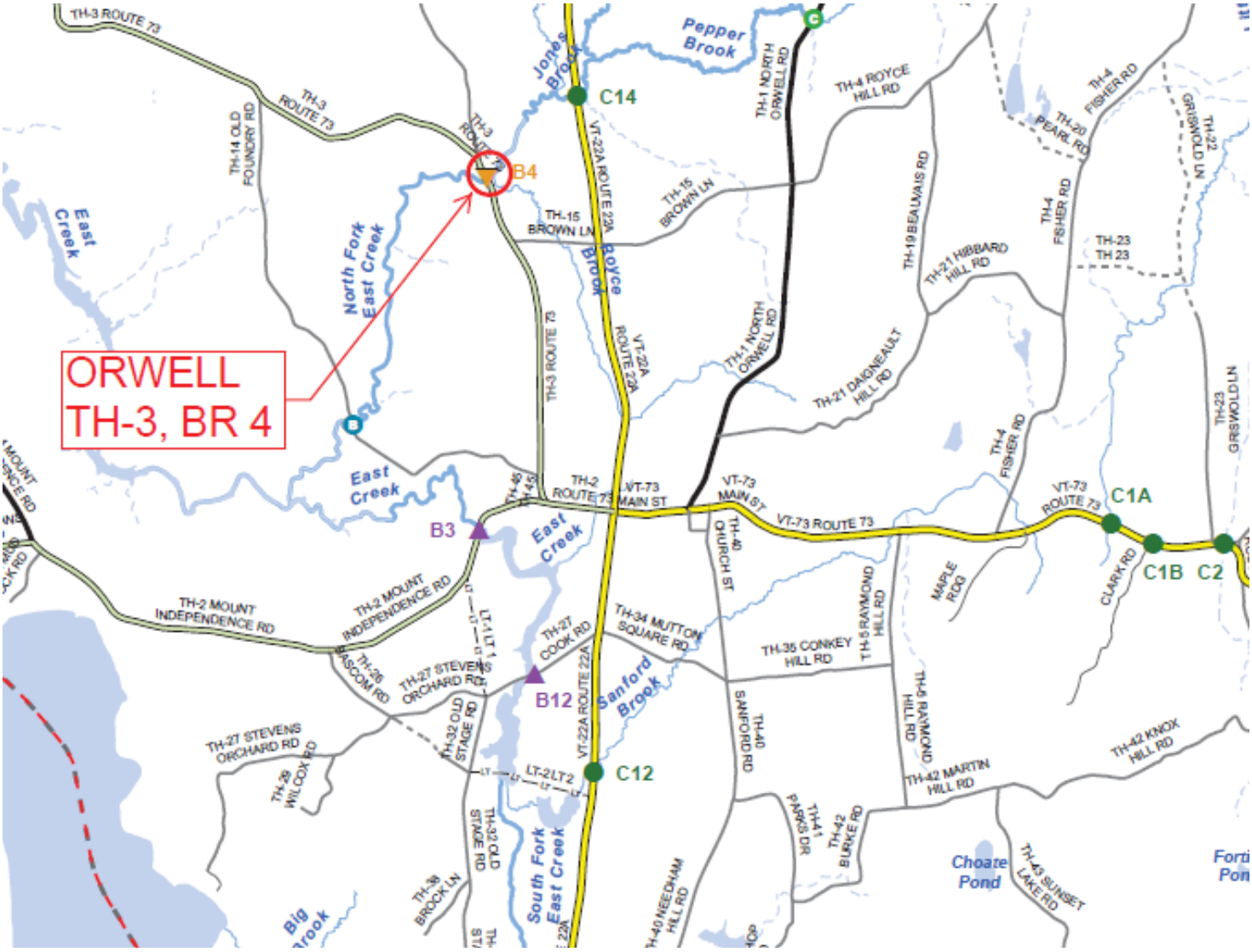
Traffic Maintenance:
It is recommended that traffic be maintained on an offsite detour. There are several reasonable detour routes that could be signed by the Town of Orwell. Therefore, it is reasonable to close the road and reroute traffic while the new bridge deck is constructed. By not providing a temporary bridge, both the project development time and the project cost are significantly reduced. Additionally, in accordance with Act 153, by closing the bridge to traffic during construction, the local share is reduced by 50% from a 5% town share to a share of only 2.5% of the project costs.

VI. Appendices

- Site Pictures
- Town Map
- Detour
- Bridge Inspection Report

Site Pictures

Town Map


ORWELL
TH-3, BR 4
B4
B3
B12
C14
C12
C1A
C1B
C2
TH-3 ROUTE 73
TH-14 OLD FOUNDRY RD
East Creek
North Fork East Creek
Jones Brook
Pepper Brook
TH-1 NORTH ORWELL RD
TH-4 ROYCE HILL RD
TH-4 FISHER RD
TH-20 PEARL RD
TH-22 GRISWOLD LN
TH-15 BROWN LN
VT-22A ROUTE 22A
Royce Brook
TH-19 BEAUVAIS RD
TH-21 HIBBARD HILL RD
TH-23 TH 23
TH-21 DAIGNEAULT HILL RD
VT-22A ROUTE 22A
TH-2 ROUTE 73
VT-73 MAIN ST
VT-73 ROUTE 73
TH-40 CHURCH ST
TH-2 MOUNT INDEPENDENCE RD
TH-27 COOK RD
TH-34 MUTTON SQUARE RD
TH-35 CONKEY HILL RD
TH-6 RAYMOND HILL RD
MAPLE ROG
CLARK RD
TH-27 STEVENS ORCHARD RD
TH-26 ASCOM RD
TH-32 OLD STAGE RD
TH-28 WILCOX RD
Sanford Brook
TH-40 SANFORD RD
TH-42 MARTIN HILL RD
TH-42 KNOX HILL RD
TH-41 PARKS DR
TH-42 BURKE RD
TH-43 SUNSET LAKE RD
Choate Pond
South Fork East Creek
TH-38 BROCK LN
TH-40 NEEDHAM HILL RD
Big Brook

Detour/Local Bypass

Total Travel Estimate: **5.24 miles - about 11 minutes**

Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for ORWELL *bridge no.: 00004* *District: 3*

Located on: TR 03 FAS 156 ove NORTH FORK CREEK approximately 2.0 MI W JCT VT 22A *Owner: 03 TOWN-OWNED*

CONDITION

Deck Rating: 5 FAIR
Superstructure Rating: 6 SATISFACTORY
Substructure Rating: 6 SATISFACTORY
Channel Rating: 8 VERY GOOD
Culvert Rating: N NOT APPLICABLE
Federal Str. Number: 200156000401142
Federal Sufficiency Rating: 054.8
Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1946 Year Reconstructed: 0000
Service On: 1 HIGHWAY
Service Under: 5 WATERWAY
Lanes On the Structure: 02
Lanes Under the Structure: 00
Bypass, Detour Length (miles): 00
ADT: 000340 % Truck ADT: 06
Year of ADT: 1995

GEOMETRIC DATA

Length of Maximum Span (ft): 0072
Structure Length (ft): 000074
Lt Curb/Sidewalk Width (ft): 0.4
Rt Curb/Sidewalk Width (ft): 0.4
Bridge Rdwy Width Curb-to-Curb (ft): 20.8
Deck Width Out-to-Out (ft): 22.5
Appr. Roadway Width (ft): 020
Skew: 00
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 2 PREFORMED FABRIC
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: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA
Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA
Underclearances Vertical and Horizontal: N NOT APPLICABLE
Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING ROADWAY
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: 2 H 15

INSPECTION and CROSS REFERENCE *X-Ref. Route:*

Insp. Date: 062015 *Insp. Freq. (months) 24* *X-Ref. BrNum:*

INSPECTION SUMMARY and NEEDS

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Friday, July 10, 2015