

## Scoping Report

Swanton BF 036-1(16)

To determine the necessary beam end repairs, an in-depth inspection will need to be performed to measure the section loss in the beams at the support locations. The latest inspection report notes "minor rust scaling" at the beam ends; however, detailed measurements are needed to analyze the as-inspected load-carrying capacity of these beams properly. After calculating the remaining capacity, the appropriate repairs can be designed and detailed.

With these repairs being made as stated above, the rest of the components of the existing Superstructure (rated 6—Satisfactory) and Substructure (rated 6—Satisfactory) will be able to be reused as part of this alternative.

For this alternative, the existing bridge footprint will be maintained. This will address the deterioration issues of the existing bridge. However, the bridge will continue to be classified as Functionally Deficient and Functionally Obsolete due to the substandard travel lane widths and shoulder widths.

### **Alternative 2: Ultra High-Performance Concrete (UHPC) Overlay Full Width and Miscellaneous Repairs**

This alternative is similar to Alternative 1, but will apply the deck demolition and repairs, partial removal of the top of deck, and UHPC overlay to the full width of the existing deck. This option is intended to be a more robust rehabilitation than Alternative 1, so cathodic protection of the exposed top layer of deck reinforcing will also be considered. Since the full width is being addressed, new sidewalks and new bridge railing will be included. The proposed railing will be a combination concrete and steel tubing railing, and the sidewalk will be concrete without a separate curb and a slight overhang of the deck to provide a 5'-0" clear sidewalk width. The deck drains will be replaced, and the bridge joints will be shifted off of the bridge and reconstructed along with the backwalls as needed. The repairs to the existing superstructure and substructure will include beam end repairs, replacing the bearings, and cleaning the abutment bridge seats.

To determine the necessary beam end repairs, an in-depth inspection will need to be performed to measure the section loss in the beams at the support locations. The latest inspection report notes "minor rust scaling" at the beam ends; however, detailed measurements are needed to analyze the as-inspected load-carrying capacity of these beams properly. After calculating the remaining capacity, the appropriate repairs can be designed and detailed.

With these repairs being made as stated above, the rest of the components of the existing Superstructure (rated 6—Satisfactory) and Substructure (rated 6—Satisfactory) will be able to be reused as part of this alternative.

For this alternative, the existing bridge footprint will be maintained. This will address the deterioration issues of the existing bridge. However, the bridge will continue to be classified as Functionally Deficient and Functionally Obsolete due to the substandard travel lane widths and shoulder widths.

*Advantages:* Traffic flow will be maintained through the project corridor during construction. The detour routes do not have any significantly restricted turning radii, and truck turning movements have been tested to confirm there is no encroachment into opposing lanes or beyond the edge of pavement. This option also avoids directing freight traffic to the City of St. Albans, improving safety on city roadways, reducing delays caused by detour volumes, and avoiding excess vehicle emissions.

*Disadvantages:* Truck movements would not be maintained through the project corridor during construction. The local businesses and time-sensitive deliveries may be negatively impacted by the long-distance detour and resulting delays.

#### **IV. Alternatives Discussion**

Bridge 6 is Functionally Deficient due to being designed for H20 loading and Functionally Obsolete due to substandard travel lane widths, shoulder widths, and bridge railing. In order to meet the required 8'-0" shoulder widths to remove the Functionally Obsolete classification, the bridge would need to be widened by approximately 4'-0" on each side. This is not considered feasible due to the site constraints and the two (2) existing sidewalks on either side of the bridge. Therefore, all alternatives considered will keep 4'-0" shoulders.

The deck, superstructure, and substructure are rated 6 - Satisfactory. The existing channel is rated 7 - Good. The alternatives presented here are based on improvement of the condition of the bridge.

##### **Alternative 1: Ultra High-Performance Concrete (UHPC) Overlay Curb to Curb and Miscellaneous Repairs**

The first alternative with the most limited structural scope would be to repair the existing deck deficiencies, remove the top of the existing deck surface, and apply a UHPC overlay. FHWA (Publication No. FHWA-RC-24-0008 & FHWA-HRT-17-097) reviewed the application of UHPC on existing decks, and hydromilling is the recommended approach to achieve a roughened surface to form a strong bond between the existing concrete deck and the UHPC layer. Hydro demolition will remove unsound concrete, and partial depth and full depth repairs will be applied to the deck as needed. The existing wearing surface and top 1.5" of the existing concrete deck will be removed, and a 2" UHPC layer will be applied. The UHPC provides increased durability with less material than conventional concrete overlays. It has high strength and stiffness, low permeability, high resistance to freeze-thaw damage, and less tendency for cracking. This approach provides comparable dead load for the deck and surface layer relative to the original design, so the original capacity can be restored. The UHPC layer will only be applied within the limits of the roadway and underneath the existing curbs to be replaced. The existing sidewalk and bridge railings will remain, and minor repairs will be performed on these elements. The deck drains will be replaced, and the bridge joints will be shifted off of the bridge and reconstructed along with the backwalls as needed. The repairs to the existing superstructure and substructure will include beam end repairs, replacing the bearings, and cleaning the abutment bridge seats.

## VII. Conclusion

We recommend **Alternative 2a**; UHPC Overlay Full Width and Miscellaneous Repairs with Traffic Maintained by Staged Construction. It is recommended for the following reasons:

- The recommended bridge alternative was estimated to have the lowest annualized cost for the anticipated additional service life provided.
- The Village of Swanton provided feedback that maintaining eastbound traffic during construction as much as possible will greatly benefit business owners; however, they were open to short duration closures as needed by the Contractor which will be included. Allowance of the bridge closure will decrease their Town Share of the project to 2.5%.
- The proposed bridge cross section will be consistent with the approaches, providing 11' lanes, 4' shoulders and 5'-0" clear sidewalks. VT Route 78 is classified as a Rural Principal Arterial which requires 8'-0" shoulders per VSS Table 3.3; however, this for this section of the roadway, the 4' shoulders and 5'-0" sidewalks on both sides are more appropriate.

### Structure

The proposed superstructure will have a lane and shoulder configuration of 4'-11'-11'-4' and two 5'-0" clear sidewalks with combination concrete and steel tubing railing (Vermont Standard Detail S-352A). The abutments and piers will be re-used, and the existing four span configuration will remain unchanged. The alignment of the approach roadways and over the bridge will match existing.

This recommended alternative addresses the on-going deterioration issues of the existing bridge and removes the Functionally Deficient classification. Due to the site constraints of this bridge, it will not be feasible to remove the Functionally Obsolete classification.

### Traffic Control

The preferred method of traffic control is staged construction using a one-way detour to maintain eastbound traffic through the Village of Swanton. The westbound direction will be detoured for the duration of construction, and there are anticipated to be two (2) short term full closures of the bridge for the installation of the UHPC overlay.

There are three potential detour routes, one to accommodate local traffic, one to accommodate regional traffic and one to accommodate truck traffic. The off-site detour is anticipated to remain in place within one construction season. Short-term closure during mid-week or long weekend are anticipated to minimize the impacts on local businesses. During the full closure, emergency vehicle access will be maintained at all times. Coordination with schools will be necessary, as the detour may impact schedules if construction occurs during the school year. Trash Services and mail delivery will be maintained and will follow the detour route during the closure. A map of all detour routes is shown in Appendix N.

## **VIII. Appendices**

- A: Site Photos
- B: Town Map
- C: Bridge Inspection Report
- D: Geotechnical Scoping Report Data Form
- E: Natural Resources Memo
- F: Environmental Specialist Resource Memo
- G: Archeological Resource Memo
- H: Historic Resource Memo
- I: Stormwater Resource Memo
- J: Landscape Resource Memo
- K: Community Input
- L: Crash Data
- M: Level of Service Analysis
- N: Detour Routes
- O: Plans

# Scoping Report

Swanton

## VI. Cost Matrix

| Swanton BF 036-1(16)    | Do Nothing                                | Deck Replacement and Miscellaneous Repairs          |                    |                                                   |                    |                                                   |                    | Superstructure Replacement                        |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                   |
|-------------------------|-------------------------------------------|-----------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|---------------------------------------------------|--------------------|-------------------|
|                         |                                           | Alt 1a                                              |                    | Alt 1b                                            |                    | Alt 2a                                            |                    | Alt 2b                                            |                    | Alt 3a                                            |                    | Alt 3b                                            |                    | Alt 3c                                            |                    | Alt 4a                                            |                    | Alt 4b                                            |                    | Alt 4c                                            |                    |                   |
|                         |                                           | UHPC Overlay Curb to Curb and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    | UHPC Overlay Full Width and Miscellaneous Repairs |                    |                   |
|                         |                                           | a. Staged                                           | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour | a. Staged                                         | b. Off-Site Detour |                   |
| COST                    | Bridge Cost                               | \$0                                                 | \$1,688,700        | \$1,994,800                                       | \$2,466,100        | \$1,970,300                                       | \$2,139,200        | \$2,558,900                                       | \$1,789,200        | \$3,503,600                                       | \$3,046,600        | \$3,046,600                                       | \$3,046,600        | \$3,503,600                                       | \$3,046,600        | \$3,046,600                                       | \$3,503,600        | \$3,046,600                                       | \$3,046,600        | \$3,503,600                                       | \$3,046,600        |                   |
|                         | Removal of Structure                      | \$0                                                 | \$20,700           | \$18,000                                          | \$28,290           | \$18,000                                          | \$28,865           | \$23,100                                          | \$23,100           | \$86,595                                          | \$75,300           | \$86,595                                          | \$75,300           | \$86,595                                          | \$75,300           | \$86,595                                          | \$75,300           | \$86,595                                          | \$75,300           | \$86,595                                          | \$75,300           |                   |
|                         | Roadway                                   | \$0                                                 | \$582,000          | \$398,000                                         | \$577,000          | \$450,000                                         | \$632,000          | \$426,000                                         | \$398,000          | \$627,000                                         | \$436,000          | \$627,000                                         | \$436,000          | \$627,000                                         | \$436,000          | \$627,000                                         | \$436,000          | \$627,000                                         | \$436,000          | \$627,000                                         | \$436,000          |                   |
|                         | Maintenance of Traffic                    | \$0                                                 | \$221,600          | \$90,300                                          | \$221,600          | \$90,300                                          | \$221,600          | \$90,300                                          | \$221,600          | \$21,744,040                                      | \$22,794,040       | \$22,794,040                                      | \$22,794,040       | \$22,794,040                                      | \$22,794,040       | \$22,794,040                                      | \$22,794,040       | \$22,794,040                                      | \$22,794,040       | \$22,794,040                                      | \$22,794,040       |                   |
|                         | Construction Costs                        | \$0                                                 | \$2,513,000        | \$1,901,100                                       | \$3,292,990        | \$2,528,600                                       | \$3,021,665        | \$3,100,300                                       | \$4,686,340        | \$4,438,795                                       | \$3,648,200        | \$4,438,795                                       | \$3,648,200        | \$4,438,795                                       | \$3,648,200        | \$4,438,795                                       | \$3,648,200        | \$4,438,795                                       | \$3,648,200        | \$4,438,795                                       | \$3,648,200        |                   |
|                         | Construction Engineering & Contingencies  | \$0                                                 | \$753,900          | \$475,275                                         | \$823,248          | \$632,150                                         | \$755,416          | \$620,060                                         | \$1,171,585        | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          |                   |
|                         | Accelerated Premium                       | \$0                                                 | \$0                | \$627,363                                         | \$0                | \$834,438                                         | \$0                | \$1,023,099                                       | \$0                | \$0                                               | \$1,203,906        | \$0                                               | \$1,203,906        | \$0                                               | \$0                | \$1,203,906                                       | \$0                | \$0                                               | \$1,203,906        | \$0                                               | \$0                |                   |
|                         | Total Construction Costs w/CEC            | \$0                                                 | \$3,266,900        | \$3,003,738                                       | \$4,116,238        | \$3,995,188                                       | \$3,777,081        | \$4,743,459                                       | \$5,857,925        | \$5,104,614                                       | \$5,999,336        | \$6,926,731                                       | \$5,999,336        | \$6,926,731                                       | \$5,999,336        | \$6,926,731                                       | \$5,999,336        | \$6,926,731                                       | \$5,999,336        | \$6,926,731                                       | \$5,999,336        |                   |
|                         | Preliminary Engineering <sup>2</sup>      | \$0                                                 | \$251,300          | \$190,110                                         | \$263,439          | \$252,860                                         | \$241,733          | \$248,024                                         | \$374,907          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          | \$665,819                                         | \$547,230          |                   |
|                         | Right of Way                              | \$0                                                 | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           | \$15,000                                          | \$15,000           |                   |
| SCHEDULING              | Total Project Costs                       | \$0                                                 | \$3,533,200        | \$3,208,848                                       | \$4,394,677        | \$4,263,048                                       | \$4,033,814        | \$5,006,483                                       | \$6,382,832        | \$5,785,434                                       | \$5,961,566        | \$7,991,522                                       | \$5,961,566        | \$7,991,522                                       | \$5,961,566        | \$7,991,522                                       | \$5,961,566        | \$7,991,522                                       | \$5,961,566        | \$7,991,522                                       | \$5,961,566        |                   |
|                         | Annualized Costs                          | \$0                                                 | \$176,660          | \$160,442                                         | \$109,866.92       | \$106,576                                         | \$100,845          | \$123,162                                         | \$159,571          | \$115,709                                         | \$119,231          | \$159,830                                         | \$119,231          | \$159,830                                         | \$119,231          | \$159,830                                         | \$119,231          | \$159,830                                         | \$119,231          | \$159,830                                         | \$119,231          |                   |
|                         | Town Share                                | N/A                                                 | \$176,660          | \$80,221                                          | \$109,867          | \$106,576                                         | \$201,691          | \$123,162                                         | \$319,142          | \$289,272                                         | \$149,039          | \$399,576                                         | \$149,039          | \$399,576                                         | \$149,039          | \$399,576                                         | \$149,039          | \$399,576                                         | \$149,039          | \$399,576                                         | \$149,039          |                   |
|                         | Town %                                    | N/A                                                 | 5.0%               | 2.5%                                              | 2.5%               | 2.5%                                              | 5.0%               | 2.5%                                              | 5.0%               | 5.0%                                              | 2.5%               | 5.0%                                              | 2.5%               | 5.0%                                              | 5.0%               | 2.5%                                              | 5.0%               | 5.0%                                              | 2.5%               | 5.0%                                              | 5.0%               |                   |
|                         | Project Development Duration <sup>1</sup> | N/A                                                 | 2 years            | 2 years                                           | 2 years            | 2 years                                           | 2 years            | 2 years                                           | 2 years            | 4 years                                           | 2 years            | 2 years                                           | 4 years            | 2 years                                           | 2 years            | 4 years                                           | 2 years            | 2 years                                           | 4 years            | 2 years                                           | 4 years            |                   |
|                         | Construction Duration (If Applicable)     | N/A                                                 | 12 months          | 4 months                                          | 12 months          | 4 months                                          | 12 months          | 4 months                                          | 12 months          | 18 months                                         | 18 months          | 18 months                                         | 18 months          | 18 months                                         | 18 months          | 18 months                                         | 18 months          | 18 months                                         | 18 months          | 18 months                                         | 18 months          |                   |
|                         | Typical Section - Roadway (feet)          | 30'-0"                                              | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             | 30'-0"                                            | 30'-0"             |                   |
|                         | Typical Section - Bridge (feet)           | 4'-11-1/4                                           | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          | 4'-11-1/4                                         | 4'-11-1/4          |                   |
|                         | ENGINEERING                               | Geometric Design Criteria                           | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width                                 | Substandard Width  | Substandard Width |
|                         |                                           | Traffic Safety                                      | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change         |
| Alignment Change        |                                           | No                                                  | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                |                    |                   |
| Bicycle Access          |                                           | No Change                                           | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          |                   |
| Hydraulics <sup>4</sup> |                                           | -                                                   | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 | -                  | -                                                 |                    |                   |
| Pedestrian Access       |                                           | No Change                                           | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          |                   |
| Utilities               |                                           | No Change                                           | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          | No Change                                         | No Change          |                   |
| ROW Acquisition         |                                           | No                                                  | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                | No                 | No                                                |                    |                   |
| Road Closure            |                                           | No                                                  | No                 | Yes                                               | No                 | Yes                                               | No                 | Yes                                               | No                 | No                                                | Yes                | No                                                | Yes                | No                                                | No                 | Yes                                               | No                 | Yes                                               | No                 | Yes                                               | No                 |                   |
| Design Life             |                                           | <10                                                 | 20                 | 20                                                | 40                 | 40                                                | 40                 | 40                                                | 40                 | 50                                                | 50                 | 50                                                | 50                 | 50                                                | 50                 | 50                                                | 50                 | 50                                                | 50                 | 50                                                | 50                 |                   |
| OTHER                   |                                           |                                                     |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                                                   |                    |                   |

Notes: (1) Costs are estimates only, used for comparison purposes; (2) Preliminary Engineering costs include costs associated with environmental, utility and archaeological mitigation. It is assumed that alternatives utilizing a temporary bridge will have a lower cost associated with archaeological impacts as the areas can be protected and no excavation is required. Alternatives 3c, 4c, and 5c would have permanent impacts and excavation within the archaeological areas and therefore have a higher cost for mitigation under Preliminary Engineering; (3) Project Development Durations are starting from the end of the Project Definition Phase; (4) Hydraulic analysis is pending from VTRANS; (5) Proposed TMR includes short duration full bridge closures so 2.5% is applicable.

# Scoping Report

Svanton

## VI. Cost Matrix (cont'd)

| Swanton BR 036-1(16)             |                                          | Full Bridge Replacement                   |                    |                     |
|----------------------------------|------------------------------------------|-------------------------------------------|--------------------|---------------------|
|                                  |                                          | Alt 5a                                    | Alt 5b             | Alt 5c              |
| COST                             | Bridge Cost                              | a. Staged                                 | b. Off-Site Detour | c. Temporary Bridge |
|                                  | Removal of Structure                     | \$12,908,200                              | \$11,224,500       | \$11,224,500        |
|                                  | Roadway                                  | \$54,122                                  | \$47,063           | \$47,063            |
|                                  | Maintenance of Traffic                   | \$1,153,000                               | \$802,000          | \$802,000           |
|                                  | Construction Costs                       | \$221,600                                 | \$84,300           | \$2,474,040         |
|                                  | Construction Engineering & Contingencies | \$14,336,922                              | \$12,157,863       | \$14,547,603        |
|                                  | Accelerated Premium                      | \$2,867,384                               | \$1,823,679        | \$2,182,140         |
|                                  | Total Construction Costs w/ CREC         | \$0                                       | \$4,012,095        | \$0                 |
|                                  | Preliminary Engineering <sup>2</sup>     | \$17,204,306                              | \$17,993,637       | \$16,729,743        |
|                                  | Right of Way                             | \$2,867,384                               | \$1,215,786        | \$2,909,521         |
|                                  | Total Project Costs                      | \$15,000                                  | \$15,000           | \$150,000           |
|                                  | Annualized Costs                         | \$20,086,691                              | \$19,224,423       | \$19,789,263        |
|                                  | Town Share                               | \$267,823                                 | \$256,326          | \$263,857           |
|                                  | Town %                                   | \$2,008,669                               | \$961,221          | \$1,978,926         |
|                                  |                                          | 10.0%                                     | 5.0%               | 10.0%               |
|                                  | SCHEDULING                               | Project Development Duration <sup>1</sup> | 4 years            | 4 years             |
| Construction Duration            |                                          | 30 months                                 | 16 months          | 24 months           |
| Closure Duration (if Applicable) |                                          | N/A                                       | 120 days           | N/A                 |
| Typical Section - Roadway (feet) |                                          | 30'-0"                                    | 30'-0"             | 30'-0"              |
| Typical Section - Bridge (feet)  |                                          | 4-11-11-4                                 | 4-11-11-4          | 4-11-11-4           |
| ENGINEERING                      | Geometric Design Criteria                | Substandard Width                         | Substandard Width  | Substandard Width   |
|                                  | Traffic Safety                           | No Change                                 | No Change          | No Change           |
|                                  | Alignment Change                         | No                                        | No                 | No                  |
|                                  | Bicycle Access                           | No Change                                 | No Change          | No Change           |
|                                  | Hydraulics <sup>4</sup>                  | -                                         | -                  | -                   |
|                                  | Pedestrian Access                        | No Change                                 | No Change          | No Change           |
| OTHER                            | Utilities                                | Temp Relocation                           | Temp Relocation    | Temp Relocation     |
|                                  | ROW Acquisition                          | No                                        | No                 | Yes                 |
|                                  | Road Closure                             | No                                        | Yes                | No                  |
|                                  | Design Life                              | 75                                        | 75                 | 75                  |

Notes: (1) Costs are estimates only, used for comparison purposes; (2) Preliminary Engineering costs include costs associated with environmental, utility and archeological mitigation. It is assumed that alternatives utilizing a temporary bridge will have a lower cost associated with archeological impacts as the areas can be protected and no excavation is required. Alternatives 3c, 4c and 5c would have permanent impacts and therefore have a higher cost for mitigation under Preliminary Engineering; (3) Project Development Durations are starting from the end of the Project Definition Phase; (4) Hydraulic analysis is pending from VTtrans.