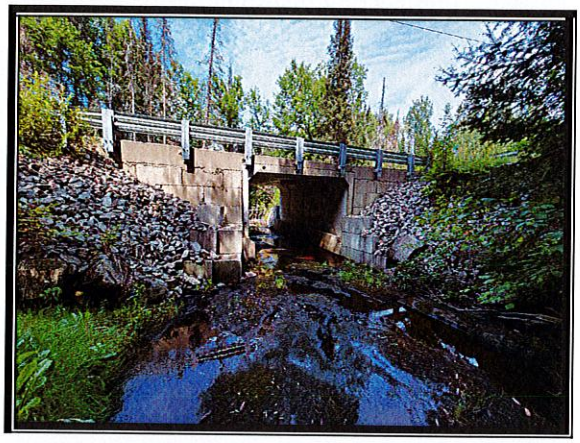
THE TOWNSHIP OF CALVIN



BRIDGE MANAGEMENT STUDY REPORT

6 BRIDGES

NOVEMBER 2024

Report Submitted By:

HP Engineering Inc.

400-2039 Robertson Road, Ottawa, Ontario, K2H 8R2

Office: 613-695-3737 ~ Fax: 613-680-3636

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1.0 INTRODUCTION

The Township of Calvin (the Township) has retained HP Engineering to perform inspections and develop a bridge management study for 6 structures owned and maintained by the Township.

Each structure in the Township's inventory was visually inspected using the Ministry of Transportation of Ontario's (MTO) Structure Inspection Manual. HP Engineering has entered the data from the inspections into individual inspection forms. The data for each structure present visual observations, suggested rehabilitation, further required investigation and budget cost information. Refer to the appendices for individual inspection sheets for bridges and culverts.

The following report summarizes the suggested rehabilitation / replacement costs, engineering investigation costs and replacement values for each structure based on benchmark budget costs.

Appendix A presents summary tables for all structures. The structures are listed in numerical order of structure number, and the rehabilitation / replacement costs (determined from benchmark budget costs) for each structure.

2.0 STRUCTURE INSPECTIONS

A total of 6 structures owned and maintained by the Township were visually inspected in accordance with the MTO Structure Inspection Manual. The inspections were performed during the summer of 2024.

For each structure, components were screened for visual signs of deterioration. The components were then given a rating (on the inspection forms) using the MTO extent and severity method, whereby the components are proportioned (in units of m^2, %, m, etc.) based on their observed conditions (excellent, good, fair, poor). This provides quantitative data as to the extent of the observed deterioration for each component. Explanatory statements accompany each of the components' ratings where deemed applicable by the inspector.

The inspection forms also provide information regarding suggested engineering investigation and repairs and associated budgetary estimates of expected costs. Suggested engineering investigations are subdivided based on time of need. Repairs and associated budgetary estimates are subdivided based on time of need. The basis of selection for budget costs is further discussed in Section 3.0 of this report.

Photographs of each inspected structure are included with the inspection sheets including a minimum of 2 photographs for each structure (approach and elevation). Additional photographs depicting the details of the structure, observed defects or deterioration have also been included.

Individual inspection forms for the structures are included as an attachment where the structures are separated into alphabetical order.

3.0 DETERMINATION OF COSTS

3.1 Repair, Rehabilitation and Replacement

Given the cursory information obtained during the visual inspections and without the benefit of detailed design information, it is impractical to develop detailed cost estimates for each structure. For these reasons, benchmark budget costs were developed for categories of repair, rehabilitation and replacement. Traditionally, benchmark costs do not necessarily provide accurate costs for individual repairs /

replacement, but have proven to provide sufficient accuracy for global budgeting purposes when dealing with a large number of structures.

For the purpose of this study, benchmark costs for the rehabilitation and replacement of structures are based on maintaining the existing width, length and alignment of each structure. However, the costs to replace the existing structures with structures meeting current geometric standards are included for comparison. For this purpose, an overall roadway width of 10 metres was used for both bridges and culverts. More accurate costs for each structure would be provided upon further engineering study and design based on exact repair, rehabilitation and replacement needs (including change in geometry). The following benchmark costs have been established for this study following the requirements of the inspection forms.

Bridge and Culvert Replacement Costs

Budget costs for the replacement of bridges are usually based on the deck surface area of individual structures (m^2). Therefore, benchmark replacement costs for this study were determined using the following unit costs including approaches, administration and design costs, based on the spans of individual bridges and taking into account approach roadway costs (which do not vary with bridge span). In addition, the varying widths of bridges were taken into account to provide more realistic unit costs and to avoid large discrepancies in the replacement cost between bridges of different lengths, but similar surface areas.

Total Bridge Replacement Unit Costs		
Bridge Length (m)	**Width (m)**	**Unit Replacement Cost ($/m²)**
3-10	<10 m	$8,000.00
	≥10 m	$7,500.00
10-20	<10 m	$7,500.00
	≥10 m	$6,500.00
20-30	<10 m	$6,500.00
	≥10 m	$5,500.00
>30	<10 m	$5,500.00
	≥10 m	$4,500.00

In the case of culverts, the plan area (or deck surface area) used in the calculation was ('length of spans' + 1 m) x ('width of roadway' + 1 m). The purpose of using the Total Bridge Replacement Unit Costs table for culverts is to normalize the replacement cost figures. Although culverts are generally less expensive to construct than bridges, it is generally accepted that the expected life span is approximately 50% of a bridge. It is valid therefore, on a life cycle cost basis, to utilize the Total Bridge Replacement Unit Costs table for all structures, whether they are bridge type or culvert type.

HP Engineering Inc.
Suite 400, 2039 Robertson Road, Ottawa, Ontario, K2H 8R2
Phone: 613-695-3737 ~ Fax: 613-680-3636

Bridge Repair / Rehabilitation Costs

For budgeting purposes, costs for the rehabilitation of bridges are typically expressed as a percentage of the total replacement costs. Rehabilitation costs for this study are separated into four categories as presented in the table below (including administration and design costs).

Bridge Rehabilitation Costs		
Category		**% of Replacement Cost**
1.	Major Bridge Rehabilitation	50-60
2.	Minor Bridge Rehabilitation	25-50
3.	Major Item Repair	5-25
4.	Minor Item Repair	5 or less

Culvert Repair / Rehabilitation Costs

It is generally not practical to undertake major rehabilitation work to culvert crossings where significant deterioration or deficiencies exist in the metal liner (barrel). Culvert replacement is normally planned in these circumstances. Repair work identified generally included repairs to the inlet and outlet structures such as headwalls, cut-off walls, retaining walls, restoration of backfill, slope protection at the culvert ends and installation / upgrading of guiderail. In the case of concrete barrels, some repair work to the barrels may be included if the opening is large enough to permit construction access.

Approach Roadway Repair / Rehabilitation Costs

For this study, approaches are considered to be 30m of roadway from the centre of each individual culvert (60 m total per culvert) and 6m of roadway from the end of the deck for each individual bridge (12m total per bridge). Repair / rehabilitation costs for approach roadways have been separated into three categories as presented in the table below (including administration and design costs).

Separate costs for Approach Roadway Repair / Rehabilitation have been included for Bridge Rehabilitation. For structure replacement costs and repairs, the approach roadway repair / rehabilitation costs have been included in the recommended work costs if applicable.

Approach Roadway Repair/Rehabilitation Costs		
Category		**Cost**
1.	Capital Projects (Partial / Complete Paving, Guiderail)	$40,000.00
2.	Minor Repairs / Maintenance (Crack Sealing, Surface Sealing, Guiderail Repairs)	$14,000.00
3.	Crack Sealing Only	$7,000.00

Construction Detour Costs

Several alternatives exist to maintain the flow of traffic when a bridge or culvert undergoes major rehabilitation or replacement. These include the construction of a detour structure adjacent to the existing structure, a detour route around (avoiding) the structure, and the staging of the construction to allow traffic on the structure during construction. The construction of a detour structure is the most costly option and is usually recommended only when the other options are not possible. The detour route is the least expensive option, but is often not practical due to the length of the detour route and the inconvenience to residents near the structure. The most frequently recommended option is the staging of rehabilitation work to allow the passage of traffic.

Since most bridge projects would consist of rehabilitation and not replacement, the staging of work would be the most frequently used option to maintain traffic during construction. Therefore, the benchmark costs for detours are based on staging of the work as per the following. These costs are based on additional costs incurred from staging of the work during construction (extra effort, time). Traffic control costs would be separate from detour costs and are presented later in this section.

Detour During Construction Costs		
Category		Cost
1.	Detour - Minor Rehabilitation / Major Rehabilitation of Bridges Less than 10m Long / Culvert Replacement	$30,000.00
2.	Detour - Major Rehabilitation / Bridge Replacement	$100,000.00

Traffic Control Costs

In addition to performing the work in stages to accommodate traffic, the safety of traffic passing on the bridge or over the culvert during construction must also be ensured. The costs of traffic control during staged projects would be as follows:

Traffic Control Costs		
Category		Cost
1.	Traffic Control- Minor Rehabilitation	$30,000.00
2.	Traffic Control - Major Rehabilitation	$50,000.00

Utilities / Right of Way Costs

Most bridge or culvert rehabilitation / replacement projects do not require substantial expenses for the installation or modification of existing utilities. Similarly, most of these projects do not require an increase in right of way. Therefore, specific benchmark budget costs for these items were not developed.

HP Engineering Inc.
Suite 400, 2039 Robertson Road, Ottawa, Ontario, K2H 8R2
Phone: 613-695-3737 ~ Fax: 613-680-3636

Environmental Study Costs

Since bridge or culvert replacements / rehabilitations typically do not involve a change in alignment or a reduction in clearances under the structure, these projects usually fall under the Schedule A or A+ Environmental Assessment for Ontario Highways. This type of environmental assessment does not require detailed environmental and mitigation plans, but typically requires written application with, and permission from, the appropriate environmental agencies (Ontario Ministry of Natural Resources, Ontario Ministry of the Environment, Local Conservation Authorities (Permit To Take Water)). Therefore, the benchmark budget cost for environmental study would be as follows (based on the requirement of Schedule A or A+ Environmental Assessment):

Environmental Study Costs		
Category		**Cost**
1.	Bridge / Culvert Replacement, Minor and Major Rehabilitation	$9,500.00

Other Costs

Any other costs not specified in the above (site specific requirements) are deemed to be covered in the total benchmark costs. Therefore, no specific amount for other work is specified in this report.

Contingency Costs

The benchmark costs used for budgeting purposes are based only on information obtained from visual inspections. Because of this, contingency allowances are already built into the benchmark costs. Therefore, specific amounts for contingencies will not be included in this report.

Recommended Replacement Costs

For the purposes of this report, when a structure (bridge or culvert) replacement has been recommended, all associated costs (approaches, detours, traffic control, utilities, right of way, environmental studies and contingency) have been included in the replacement cost provided in the 'Repair and Rehabilitation Required' table on the inspection forms.

3.2 Engineering Investigation

Further engineering investigation is recommended for several of the bridges and culverts as indicated on individual inspection forms. Benchmark budget costs for engineering investigation work are presented in the table below:

Engineering Investigation			
Category		**Type of Structure**	**Cost**
1.	Detailed Inspection / Rehabilitation Study - Full Bridge	Truss	$27,500.00
		Others	$22,000.00
		Traffic Barrier Only *	$5,500.00
2.	Detailed Deck Condition Survey	Exposed Deck	$5,500.00
		Asphalt Paved Deck	$8,800.00
		Concrete Culvert with Height of Fill Less than 500 mm **	$5,500.00
3.	Structure Evaluation	Truss	$16,500.00
		Others	$11,000.00
4.	Underwater Investigation	All Bridges	$11,000.00

* Requirements for traffic barriers on bridges and culverts were determined using the Canadian Highway Bridge Design Code, MTO Standards and good engineering practice. The evaluation of existing traffic barriers was based on assumed values of AADT and good engineering practice. For structures with existing approach guiderail, a review of the required approach / leaving end length of guiderail and end treatments (as per the MTO's Roadside Safety Manual) was not carried out.

** Deck condition survey on concrete culvert includes cores with no corrosion potential survey. Deck condition surveys on concrete culverts with a height of fill greater than 500 mm are not practical.

The benchmark budget costs for a Structure Evaluation and Detailed Deck Condition Survey would be reduced to 50% of that shown in the table above when any one these are performed simultaneously with a Detailed Inspection / Rehabilitation Study.

Other investigations such as fatigue and seismic investigations would be included with the Detailed Inspection and Structure Evaluation (respectively), if deemed necessary by the engineer. Detailed coating condition surveys are typically only required where a failure of coating systems have occurred other than normal deterioration. A DART (Deck Assessment by Radar Technology) survey is not a commonly used investigation method. Detailed deck condition surveys are the most commonly used method of deck inspection. Therefore, individual costs for the various types of investigation described above are not provided.

4.0 BRIDGE CONDITION INDICES (BCI)

Bridge Condition Index (BCI) values were derived using MTO's standard methods as outlined in their document entitled '*Bridge Condition Index, an Overall Measure of Bridge Condition*' (July 2009). Based on this document, we utilize an excel spreadsheet (developed based on the parameters outlined in the document) that, after inputting the inspection data for each element (condition ratings), automatically calculates the BCI value.

With the calculated BCI values for each structure, an *overall* picture of the general condition of the Municipality's structures inventory as a whole can then be presented by summarizing BCI ranges (good, fair, poor) and counting the overall percentage of structures in each category. This is the methodology that the MTO currently utilizes and it is generally an effective tool to determine where the Township stands in terms of the overall condition and maintenance needs for their structure inventory. This information can be used to compare the overall condition of various structures, to assist in prioritizing structures for future rehabilitation and assist in the funding application process.

The BCI ranges that are normally included in this summary table are as follows:

- Good (BCI Range 70-100); for this range, maintenance is not usually required with the next five years.
- Fair (BCI Range 60-70); for this range, maintenance work is usually required / scheduled within the next five years. Carrying out work within this timeframe (next five years) is typically considered the ideal time to get the most out of bridge spending.
- Poor (BCI Less than 60); for this range, maintenance work is usually required / schedule with the next year.

For the Township's inventory (6 structures total), the current summary of BCI ranges is presented as follows (individual structure BCI values are presented in the tables in ***Appendix A***):

BCI Range	***Number of Structures in Range***	***Percent of Structures in Range***
70-100	5	83.3
60-70	1	16.7
Less than 60	0	0.0

5.0 ROUTINE MAINTENANCE

As part of the Township's overall bridge management program, a program of routine maintenance should be implemented and up-kept for all structures. Maintaining this program will assist in minimizing the potential for premature deterioration of structural elements; and, when combined with a program of bridge rehabilitation, will assist in maximizing the useful service life of the Township's structure inventory.

Overall routine maintenance needs will vary depending on the type of structure, location, traffic volumes, winter maintenance procedures (sanding vs. salting, etc.), size of the structure, vintage and previous maintenance / rehabilitation carried out on the structure in the past. The following presents a general summary of routine maintenance operations that are considered applicable for the structures present within the Township's inventory:

- Periodic bridge cleaning; this would include power-washing of all components exposed to roadway traffic and areas where debris accumulation is prevalent. This would include asphalt wearing surfaces, expansion joint gaps, edges of roadway, bearing seats, truss bottom chords, etc. Typically this operation would be carried out on an annual basis, most likely each spring after winter sanding / salting operations have ceased; however, in some cases (i.e. gravel approach roadways, etc.), an increase in the number of cleanings per year may be required.

- Concrete spot repairs; this would generally include localized patching of small concrete spalls and delaminations located in areas within the roadway splash zones (top of deck, curbs, expansion joint block-outs, etc.). Completing these repairs will assist in preventing accelerated deterioration of concrete in these areas by reducing the ingress of chlorides, etc. There is no specific timing for these types of repairs and they are generally performed on an as-needed basis.

- Steel spot repairs / spot coating; this would generally include localized touch-ups to steel coatings located in areas within the roadway splash zones (truss bottom chords, exterior floor beams / stringers, etc.) as well as localized spot repairs in areas of appreciable section loss / corrosion. There is no specific timing for these types of repairs and they are generally performed on an as-needed basis.

- Clearing of debris in waterway; this would include clearing of trapped debris in the vicinity of the structure (upstream / downstream). This operation would typically be carried out on an annual basis, after the spring run-off period.

- Asphalt surface repairs / rout and seal; this would include cold patch asphalt repairs, routing and sealing of wide cracks in asphalt. This operation would typically be carried out an annual basis, after winter clearing operations have ceased.

- Re-grading of approach roadways (gravel roadway surfaces); this would include placing and grading fresh granular material on roadway surfaces. The timing of this work would depend on the overall volume and type of traffic typically traversing the roadway (truck haul route, summer cottage traffic route, etc.). Typically this work would be carried out on an annual or bi-annual basis.

- Bridge deck drainage; this would include maintaining existing deck drains free of debris and maintaining them in an un-plugged condition. This operation would typically be carried out an annual basis, after winter clearing operations have ceased.

- Clearing of debris / vegetation from approach guiderail; this would involve removing debris and vegetation from in front of approach guiderail. Although this is mainly a safety measure (to ensure proper performance of the guiderail), it also assists in prolonging the lifespan of the guiderail (accumulation of debris can accelerate rot on wooden posts, corrosion on steel guiderail, etc.).

- Surface sealing of exposed concrete surfaces; this would include cleaning and applying a concrete sealer on concrete surfaces exposed within the splash zone (exposed concrete decks, curbs, sidewalks and barrier walls); this operation is not typically required on an annual basis and would typically be completed in 3-5 year intervals. Sealing concrete surfaces periodically assists in minimizing the migration of chlorides into the concrete.

6.0 ASSET MANAGEMENT INFORMATION

As previously mentioned, all structures were visited and inspected in conformance with the requirements of the Ontario Structure Inspection Manual (2008 Revision). Based on the results of the inspections, repair / rehabilitation needs and budgetary costs for these were identified. In addition, additional engineering inspections and studies were also recommended.

Although OSIM inspections (generally performed every 2 years) are a useful screening tool to identify upcoming bridge maintenance needs and costs, these inspections solely rely on visual evidence of deterioration and do not take into account the age (life cycles) of individual structures, nor do they take into account the potential for hidden deterioration (which could be revealed with further investigations such as detailed bridge condition surveys, rehabilitation studies, etc.).

In order to provide the Township with a more useful planning tool for structure maintenance, rehabilitation and replacement, all of the information gathered from the OSIM inspections was summarized in an Asset Information Summary table.

Asset Management Summary

This set of tables presents basic asset information for the structures such as structure name, type of structure and basic geometry. The replacement value for each structure (based on current and widened geometry, in the case where the width of the existing structures are deficient) is also provided. These values are presented in 2024 dollars. The BCI calculated for each structure is also provided.

The BCI values were calculated using the method established by the Ministry of Transportation of Ontario. This method takes into account the quantities for poor, fair, good and excellent for each of the elements and determines the cost of the rehabilitation needs. The BCI is determined by dividing the remaining value of the bridge (value of the bridge less cost of the rehabilitation needs) by its initial value (in new condition).

7.0 DISCUSSION

This Bridge Management Asset Study was developed to provide the Township of Calvin with the necessary information required to project budgets and set priorities for future bridge and culvert rehabilitation / replacement programs. The attached inspection sheets should be updated accordingly as repairs and rehabilitations are carried out.

Replacement, rehabilitation and engineering investigation budget costs were provided for 6 of the Township's structure based on visual biennial inspections performed by HP Engineering (during the summer of 2024).

The costs for individual structures are presented on inspection forms and were based on benchmark costs developed for this study. These should be used for budgeting purposes only. More accurate cost estimates for each structure's needs would be provided based on more detailed scopes of work developed during the design engineering stages.

The estimated replacement value of the Township's bridge and culvert inventory (based on 6 structures in the inventory) is approximately ***5.8*** million dollars. The estimated value of all the bridges and culverts (based on 6 structures in the inventory) if reconstructed to current geometric standards would be approximately ***7.5*** million dollars.

Immediate repair / rehabilitation costs for the 6 structures inspected are estimated to be a total of approximately ***130*** thousand dollars. The longer term repair / rehabilitation costs (1-5 years or 6-10 years) for the 6 structures inspected are estimated to be ***161*** thousand dollars.

The costs associated with recommended further Engineering Investigations for the 6 structures inspected was estimated to be a total of approximately ***40*** thousand dollars.

Respectfully Submitted,
November 8, 2024

ENGINEERING
HP ENGINEERINC INC.

LICENSED PROFESSIONAL ENGINEER
V. K. T. DWIVEDI
100073709
12-11-2024
PROVINCE OF ONTARIO

Tashi Dwivedi, P.Eng.
Principal

APPENDIX A

ASSET MANAGEMENT SUMMARY
(6 STRUCTURES)

Appendix A : Asset Information Summary - Bridges

Site No	Bridge Name	Bridge Type	Year Built (Age)	Year of Last Rehab	Number of Spans	Total Length (Parallel to Roadway) (m)	Width (Perpendicular to roadway) (m)	Roadway Width (m)	Existing Surface Area (m^2)	Replacement Cost - Existing Geometry ($000)	Replacement Cost - Current Geometric Standards ($000)	BCI	Benchmark Budget Costs				Prioritization of Major / Minor Capital Work					
													Rehabilitation Costs ($000)			Engineering Investigation Costs ($000)	Prioritize Year of Need - Major/Minor Capital Works	Estimated Major / Minor Capital Work Expenditure per Year ($000)				
													< 1 year	1-5 Years	6-10 Years	Normal		2025	2026	2027	2028	Total ($000)
B1	Hackenbroke Bridge	Concrete Rigid Frame	2018	-	1	4.60	6.30	5.50	29	232	373	74	0	0	0	0	N/A					0.00
B2	Walley Bridge	Steel Girder	-	-	3	51.80	5.60	4.50	290	1,595	2,587	72	0	161	0	10	3			162.0		162.00
B3	Crothers Bridge	Steel Girder	1988	-	1	42.50	10.10	8.60	429	1,932	2,199	75	0	0	0	10	N/A					0.00
B4	Stewarts Bridge	Timber Girder	-	-	1	4.90	5.30	4.75	26	208	388	68	82	0	0	5.0	2		86.5			86.50
B5	Pautois Bridge	Steel Girder	2012	-	1	18.48	8.70	7.90	161	1,206	1,297	75	0	0	0	0	N/A					0.00
B6	Crosses Bridge	Concrete Rigid Frame	1983	-	1	8.00	10.00	8.50	80	600	690	70	48	0	0	15	1	63.0				63.00
TOTALS										5,772	7,534		130	161	0	40		63	87	162	0	312

NOTES:

1. BCI as calculated by HP Engineering.

ATTACHMENT 1

OSIM INSPECTION REPORTS & BCI FORMS

BRIDGES

Structure Condition Summary Form

Structure Name Hackenbroke Bridge
Structure Number B1
Date of Inspection August 9, 2024
Project No.
Consultant HP Engineering Inc.

Element Group	Element Name	Unit (Qty.)	Unit Price (MTO)	Total Element Quantity	Element Qty. in Excellent Condition (1.00)	Element Quantity in Good Condition (0.75)	Element Quantity in Fair Condition (0.4)	Element Quantity in Poor Condition (0)	Total Replacement Value (TRV)	Current Element Value (CEV)	Element Condition Index	Performance Deficiency	Maintenance Need
Abutment	Abutment Walls	Sq.m	900.00	47.00	0.00	47.00	0.00	0.00	42300	31725	75	00	00
Approaches	Wearing Surface	Sq.m	6.00	102.00	0.00	102.00	0.00	0.00	612	459	75	00	00
Barriers	Railing Systems	m	200.00	25.00	0.00	25.00	0.00	0.00	5000	3750	75	00	00
Decks	Deck Top - Thick Slab	Sq.m	350.00	40.50	0.00	40.50	0.00	0.00	14175	10631	75	00	00
	Soffit - Thick Slab	Sq.m	350.00	37.40	0.00	37.40	0.00	0.00	13090	9817	75	00	00
	Wearing Surface	Sq.m	25.00	40.50	0.00	40.50	0.00	0.00	1013	759	75	00	00
Retaining Walls	Walls	Sq.m	350.00	85.50	0.00	75.50	10.00	0.00	29925	21219	71	00	00
									106115	78361			

Bridge Condition Index (BCI) 74

I_t	0	Importance Factor for Traffic
I_c	0	Importance Factor for Economic Impacts
I_w	0	Importance Factor for Bridge Width
I_p	0	Importance Factor for Bridge Profile or Alignment

Bridge Sufficiency Index (BSI) 74

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B1**

INVENTORY DATA:

Structure Name	Hackenbroke Bridge		
Main Hwy/Road #	Peddlers Drive	**Under Structure:**	Navigable Water ☐ Non-Navigable Water ☒ Rail ☐ Road ☐ Pedestrian ☐ Other ☐
Road Name:	Peddlers Drive	**On Structure:**	Rail ☐ Road ☒ Pedestrian ☐ Other ☐
Structure Location	0.96 km West of Beckett Ln		
Latitude	46° 14' 10" N	Longitude	78° 56' 31" W
Owner(s)	Township of Calvin	Heritage Designation	Not Cons. ☒ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	-	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ☒
MTO District	-	Posted Speed	- No. of Lanes 2
Old County	-	AADT	- % Trucks -
Geographic Twp.	-	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Rigid Frame	Detour Length Around Structure	- (km)
Total Deck Length	4.6 (m)	Fill on Structure	- (m)
Overall Str. Width	6.3 (m)	Skew Angle	- (Degrees)
Total Deck Area	29 (m^2)	Direction of Structure	East/West
Roadway Width	5.5 (m)	No. of Spans	1
Span Lengths	3.6 (m)		

HISTORICAL DATA

Year Built	2018	Last OSIM Inspection	June 04, 2022
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-

Rehabilitation History: (Date / Description)

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B1**

FIELD INSPECTION INFORMATION		
Date of Inspection:	August 7, 2024	Type of Inspection: ☒ OSIM ☐ Enhanced OSIM
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering	
Others in Party:	Derick Battrick, P.Eng., HP Engineering	
Access Equipment Used:	Measuring Tape, Digital Camera and Hammer	
Weather:	Sun and Cloud	
Temperature:	24 °C	

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study:	X			$ -
Material Condition Survey	X			$ -
Detailed Deck Condition Survey:	X			$ -
Non-destructive Delamination Survey of Asphalt- Covered Deck:	X			$ -
Concrete Substructure Condition Survey:	X			$ -
Detailed Coating Condition Survey:	X			$ -
Detailed Timber Investigation:	X			$ -
Underwater Investigation:	X			$ -
Fatigue Investigation:	X			$ -
Seismic Investigation:	X			$ -
Structure Evaluation:	X			$ -
Monitoring	X			$ -
Monitoring of Deformations, Settlement and Movements:	X			$ -
Monitoring Crack Widths:	X			$ -
Load Posting – Estimated Load Limit			**Total Cost**	$ -

Investigation Notes:

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	☒ None ☐ Minor Rehab. ☐ Major Rehab. ☐ Replace
Timing of Recommended Work:	☐ 1 to 5 years ☐ 6 to 10 years
Overall Comments: Structure is overall in good condition. The southeast, southwest and northeast retaining wall parallel to the stream is leaning towards the stream. Light honeycombing noted at northeast corner of exterior deck soffit.	
Date of Next Inspection:	June 2026

Suspected Performance Deficiencies

00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotation)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surfaces
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other

Maintenance Needs

01 Lift and swing bridge maintenance
02 Bridge cleaning
03 Bridge handrail maintenance
04 Painting steel bridge structures
05 Bridge deck joint repair
06 Bridge bearing maintenance
07 Repair of structural steel
08 Repair of bridge concrete
09 Repair of bridge timber
10 Bailey bridges maintenance
11 Animal/pest control
12 Bridge surface repair
13 Erosion control at bridges
14 Concrete sealing
15 Rout and seal
16 Bridge deck drainage
17 Scaling (loose Concrete or ACR Steel)
18 Other

ELEMENT DATA					
Element Group:	Approaches		**Length:**	NE 75.7m, NW 9.5m, SE 13.3m, SW 75.7m	
Element Name:	Barrier		**Width:**	-	
Location:	NE, NW, SE, & SW of structure		**Height:**	-	
Material:	-		**Count:**	4	
Element Type:	-		**Total Quantity:**	174.2 m	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m	-	174.2	-	-

Comments:
Approach barrier is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Approaches	**Length:**	6 m	
Element Name:	Wearing Surface	**Width:**	8.5 m	
Location:	East & West of Structure	**Height:**	-	
Material:	Gravel / Asphalt	**Count:**	2	
Element Type:	Gravel / Asphalt Wearing Surface	**Total Quantity:**	102 m^2	
Environment:	Severe	**Limited Inspection:**	☐	
Protection System	None			

Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	102	-	-

Comments:
Wearing surface appears to be generally in good condition with some loose gravel at edges.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA						
Element Group:	Accessories			**Length:**	-	
Element Name:	Signs			**Width:**	-	
Location:	NE, NW, SE & SW of Structure			**Height:**	-	
Material:	Steel			**Count:**	6	
Element Type:	Hazard/Narrow Structure Signs			**Total Quantity:**	6	
Environment:	Severe			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	Each	-	6	-	-	

Comments:
4 - hazard signs are generally in good condition.
2 - narrow bridge ahead signs are not required for this structure. Roadway width is maintained over the structure and approaches.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Barriers			**Length:**	12.5 m	
Element Name:	Railing Systems			**Width:**	-	
Location:	North & South Sides of Structure			**Height:**	-	
Material:	Steel			**Count:**	2	
Element Type:	Steel Thrie Beam Railing			**Total Quantity:**	25 m	
Environment:	Severe			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	m^2	-	25	-	-	

Comments:
Deck barrier is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA					
Element Group:	Decks		**Length:**	8.5 m	
Element Name:	Wearing Surface		**Width:**	4.77 m	
Location:	Top of Deck		**Height:**	-	
Material:	Asphalt		**Count:**	1	
Element Type:	Asphalt Wearing Surface		**Total Quantity:**	40.5 m^2	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	40.5	-	-

Comments:
Wearing surface is generally in good condition with some loose gravel noted on the edges of the deck.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks		**Length:**	8.5 m	
Element Name:	Deck Top (Covered)		**Width:**	4.77 m	
Location:	Top of Deck		**Height:**	-	
Material:	Concrete		**Count:**	1	
Element Type:	Thick Slab		**Total Quantity:**	40.5 m^2	
Environment:	Moderate		**Limited Inspection:**	☒	
Protection System	Gravel Wearing Surface				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	40.5	-	-

Comments:
Based on condition of wearing surface and soffit, deck top was determined to be generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Decks		**Length:**	4.3 m	
Element Name:	Soffit – Thick Slab (Exterior)		**Width:**	1.0 m	
Location:	North & South Underside of Deck		**Height:**	-	
Material:	Concrete		**Count:**	2	
Element Type:	Thick Slab		**Total Quantity:**	8.6 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	8.6	-	-

Comments:
Exterior soffit is generally in good condition with light honeycombing noted at northeast corner.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks		**Length:**	4.3 m	
Element Name:	Soffit – Thick Slab (Interior)		**Width:**	6.7 m	
Location:	Underside of the Deck		**Height:**	-	
Material:	Concrete		**Count:**	1	
Element Type:	Thick Slab		**Total Quantity:**	28.8 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	28.8	-	-

Comments:
Interior deck soffit is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Abutments		**Length:**	-	
Element Name:	Abutment Walls		**Width:**	8.7 m	
Location:	East & West Underside of Structure		**Height:**	2.7 m	
Material:	Cast-in-Place Concrete		**Count:**	2	
Element Type:	Reinforced Concrete Wall		**Total Quantity:**	47.0 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	47.0	-	-

Comments:
Abutment walls are generally in good condition. Narrow vertical cracks with efflorescence observed on exposed footing.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Foundations		**Length:**	-	
Element Name:	Foundation (Below Ground Level)		**Width:**	-	
Location:	Below Abutment Walls		**Height:**	-	
Material:	Concrete		**Count:**	-	
Element Type:	Strip Footing		**Total Quantity:**	-	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	N/A	-	-	-	-

Comments:
No visible evidence of foundation instability observed at time of inspection.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Retaining Walls			**Length:**	4.8 m
Element Name:	Walls			**Width:**	-
Location:	NE, NW, SE & SW of Structure			**Height:**	3.1 m
Material:	Pre-cast Concrete Blocks			**Count:**	4
Element Type:	Pre-cast Concrete Block Walls			**Total Quantity:**	59.5 m^2
Environment:	Benign			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	59.5	-	-

Comments:
Walls are generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Retaining Walls			**Length:**	3.6 m
Element Name:	Walls			**Width:**	0.6 m
Location:	NE, NW, SE & SW of Structure (Parallel to Stream)			**Height:**	1.8 m
Material:	Pre-cast Concrete Blocks			**Count:**	4
Element Type:	Pre-cast Concrete Block Walls			**Total Quantity:**	26 m^2
Environment:	Benign			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	16	10	-

Comments:
Southwest, southeast and northeast retaining wall is leaning towards stream, all walls are generally in good condition. Some undermining and flowing water noted at southeast and north east walls.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Embankments and Streams		**Length:**		-
Element Name:	Embankments		**Width:**		-
Location:	NE, NW, SE & SW of Structure		**Height:**		-
Material:	Native Soil		**Count:**		4
Element Type:	Embankment		**Total Quantity:**		4
Environment:	Moderate		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	4	-	-

Comments:
Embankments are steeply sloped and covered in rock slope protection.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Embankments and Streams		**Length:**		-
Element Name:	Slope Protection		**Width:**		-
Location:	NE, NW, SE & SW of Structure		**Height:**		-
Material:	Rock		**Count:**		4
Element Type:	Rock Slope Protection		**Total Quantity:**		4
Environment:	Moderate		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	each	-	4	-	-

Comments:
Slope protection is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Embankments and Streams		**Length:**	-	
Element Name:	Streams and Waterways		**Width:**	-	
Location:	Below Structure		**Height:**	-	
Material:	Native		**Count:**	-	
Element Type:	Streams		**Total Quantity:**	All	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	All	-	All	-	-

Comments:
Low volume, low flow from south to north.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B1**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	$

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		
Traffic Control		
Utilities		
Right of Way		
Environmental Study		
Other		
Contingencies		
	Total Cost	

JUSTIFICATION

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE

Site No.: B1

INVENTORY DATA:

Structure Name	Hackenbroke Bridge		
Main Hwy/Road #	Peddlers Drive	**Under Structure:**	Navigable Water ☐ Non- Navigable Water ☒ Rail ☐ Road ☐ Pedestrian ☐ Other ☐
Road Name:	Peddlers Drive	**On Structure:**	Rail ☐ Road ☒ Pedestrian ☐ Other ☐
Structure Location	0.96 km West of Beckett Ln		
Latitude	46° 14' 10" N	Longitude	78° 56' 31" W
Owner(s)	Township of Calvin	Heritage Designation	Not Cons. ☒ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	-	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ☒
MTO District	-	Posted Speed	- No. of Lanes 2
Old County	-	AADT	- % Trucks -
Geographic Twp.	-	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Rigid Frame	Detour Length Around Structure	- (km)
Total Deck Length	4.6 (m)	Fill on Structure	- (m)
Overall Str. Width	6.3 (m)	Skew Angle	- (Degrees)
Total Deck Area	29 (m^2)	Direction of Structure	East/West
Roadway Width	5.5 (m)	No. of Spans	1
Span Lengths	3.6 (m)		

HISTORICAL DATA

Year Built	2018	Last OSIM Inspection	June 04, 2022
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-

Rehabilitation History: (Date / Description)

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B1**

FIELD INSPECTION INFORMATION		
Date of Inspection:	August 9, 2024	Type of Inspection: ☒ OSIM ☐ Enhanced OSIM
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering	
Others in Party:	Derick Battrick, P.Eng., HP Engineering	
Access Equipment Used:	Measuring Tape, Digital Camera and Hammer	
Weather:	Sun and Cloud	
Temperature:	24 °C	

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study:	X			$ -
Material Condition Survey	X			$ -
Detailed Deck Condition Survey:	X			$ -
Non-destructive Delamination Survey of Asphalt- Covered Deck:	X			$ -
Concrete Substructure Condition Survey:	X			$ -
Detailed Coating Condition Survey:	X			$ -
Detailed Timber Investigation:	X			$ -
Underwater Investigation:	X			$ -
Fatigue Investigation:	X			$ -
Seismic Investigation:	X			$ -
Structure Evaluation:	X			$ -
Monitoring	X			$ -
Monitoring of Deformations, Settlement and Movements:	X			$ -
Monitoring Crack Widths:	X			$ -
Load Posting – Estimated Load Limit			**Total Cost**	$ -

Investigation Notes:

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	☒ None ☐ Minor Rehab. ☐ Major Rehab. ☐ Replace
Timing of Recommended Work:	☐ 1 to 5 years ☐ 6 to 10 years
Overall Comments: Structure is overall in good condition. The southeast, southwest and northeast retaining wall parallel to the stream is leaning towards the stream. Light honeycombing noted at northeast corner of exterior deck soffit.	
Date of Next Inspection:	June 2026

1Suspected Performance Deficiencies

00	None	06	Bearing not uniformly loaded/unstable	12	Slippery surfaces
01	Load carrying capacity	07	Jammed expansion joint	13	Flooding/channel blockage
02	Excessive deformations (deflections & rotation)	08	Pedestrian/vehicular hazard	14	Undermining of foundation
03	Continuing settlement	09	Rough riding surface	15	Unstable embankments
04	Continuing movements	10	Surface ponding	16	Other
05	Seized bearings	11	Deck drainage		

Maintenance Needs

01	Lift and swing bridge maintenance	07	Repair of structural steel	13	Erosion control at bridges
02	Bridge cleaning	08	Repair of bridge concrete	14	Concrete sealing
03	Bridge handrail maintenance	09	Repair of bridge timber	15	Rout and seal
04	Painting steel bridge structures	10	Bailey bridges maintenance	16	Bridge deck drainage
05	Bridge deck joint repair	11	Animal/pest control	17	Scaling (loose Concrete or ACR Steel)
06	Bridge bearing maintenance	12	Bridge surface repair	18	Other

ELEMENT DATA					
Element Group:	Approaches		**Length:**		NE 75.7m, NW 9.5m, SE 13.3m, SW 75.7m
Element Name:	Barrier		**Width:**		-
Location:	NE, NW, SE, & SW of structure		**Height:**		-
Material:	-		**Count:**		4
Element Type:	-		**Total Quantity:**		174.2 m
Environment:	Severe		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m	-	174.2	-	-

Comments:
Approach barrier is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Approaches		**Length:**		6 m
Element Name:	Wearing Surface		**Width:**		8.5 m
Location:	East & West of Structure		**Height:**		-
Material:	Gravel / Asphalt		**Count:**		2
Element Type:	Gravel / Asphalt Wearing Surface		**Total Quantity:**		102 m^2
Environment:	Severe		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	102	-	-

Comments:
Wearing surface appears to be generally in good condition with some loose gravel at edges.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

ELEMENT DATA					
Element Group:	Accessories		**Length:**	-	
Element Name:	Signs		**Width:**	-	
Location:	NE, NW, SE & SW of Structure		**Height:**	-	
Material:	Steel		**Count:**	6	
Element Type:	Hazard/Narrow Structure Signs		**Total Quantity:**	6	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	6	-	-

Comments:
4 - hazard signs are generally in good condition.
2 - narrow bridge ahead signs are not required for this structure. Roadway width is maintained over the structure and approaches.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Barriers		**Length:**	12.5 m	
Element Name:	Railing Systems		**Width:**	-	
Location:	North & South Sides of Structure		**Height:**	-	
Material:	Steel		**Count:**	2	
Element Type:	Steel Thrie Beam Railing		**Total Quantity:**	25 m	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	25	-	-

Comments:
Deck barrier is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA					
Element Group:	Decks		**Length:**		8.5 m
Element Name:	Wearing Surface		**Width:**		4.77 m
Location:	Top of Deck		**Height:**		-
Material:	Asphalt		**Count:**		1
Element Type:	Asphalt Wearing Surface		**Total Quantity:**		40.5 m^2
Environment:	Severe		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	40.5	-	-

Comments:
Wearing surface is generally in good condition with some loose gravel noted on the edges of the deck.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks		**Length:**		8.5 m
Element Name:	Deck Top (Covered)		**Width:**		4.77 m
Location:	Top of Deck		**Height:**		-
Material:	Concrete		**Count:**		1
Element Type:	Thick Slab		**Total Quantity:**		40.5 m^2
Environment:	Moderate		**Limited Inspection:**		☒
Protection System	Gravel Wearing Surface				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	40.5	-	-

Comments:
Based on condition of wearing surface and soffit, deck top was determined to be generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA					
Element Group:	Decks		**Length:**	4.3 m	
Element Name:	Soffit – Thick Slab (Exterior)		**Width:**	1.0 m	
Location:	North & South Underside of Deck		**Height:**	-	
Material:	Concrete		**Count:**	2	
Element Type:	Thick Slab		**Total Quantity:**	8.6 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	8.6	-	-

Comments:
Exterior soffit is generally in good condition with light honeycombing noted at northeast corner.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks		**Length:**	4.3 m	
Element Name:	Soffit – Thick Slab (Interior)		**Width:**	6.7 m	
Location:	Underside of the Deck		**Height:**	-	
Material:	Concrete		**Count:**	1	
Element Type:	Thick Slab		**Total Quantity:**	28.8 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	28.8	-	-

Comments:
Interior deck soffit is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2

☐ 1 – 5 Years ☐ 6 – 10 Years	Years

ELEMENT DATA					
Element Group:	Abutments		**Length:**	-	
Element Name:	Abutment Walls		**Width:**	8.7 m	
Location:	East & West Underside of Structure		**Height:**	2.7 m	
Material:	Cast-in-Place Concrete		**Count:**	2	
Element Type:	Reinforced Concrete Wall		**Total Quantity:**	47.0 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	47.0	-	-

Comments:
Abutment walls are generally in good condition. Narrow vertical cracks with efflorescence observed on exposed footing.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Foundations		**Length:**	-	
Element Name:	Foundation (Below Ground Level)		**Width:**	-	
Location:	Below Abutment Walls		**Height:**	-	
Material:	Concrete		**Count:**	-	
Element Type:	Strip Footing		**Total Quantity:**	-	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	N/A	-	-	-	-

Comments:
No visible evidence of foundation instability observed at time of inspection.

Performance Deficiencies: 00	**Maintenance Needs:** 00

BRIDGE **Site No.: B1**

Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA						
Element Group:	Retaining Walls			**Length:**	4.8 m	
Element Name:	Walls			**Width:**	-	
Location:	NE, NW, SE & SW of Structure			**Height:**	3.1 m	
Material:	Pre-cast Concrete Blocks			**Count:**	4	
Element Type:	Pre-cast Concrete Block Walls			**Total Quantity:**	59.5 m^2	
Environment:	Benign			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	m^2	-	59.5	-	-	

Comments:
Walls are generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Retaining Walls			**Length:**	3.6 m	
Element Name:	Walls			**Width:**	0.6 m	
Location:	NE, NW, SE & SW of Structure (Parallel to Stream)			**Height:**	1.8 m	
Material:	Pre-cast Concrete Blocks			**Count:**	4	
Element Type:	Pre-cast Concrete Block Walls			**Total Quantity:**	26 m^2	
Environment:	Benign			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	m^2	-	16	10	-	

Comments:
Southwest, southeast and northeast retaining wall is leaning towards stream, all walls are generally in good condition. Some undermining and flowing water noted at southeast and north east walls.

BRIDGE **Site No.: B1**

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA						
Element Group:	Embankments and Streams			**Length:**	-	
Element Name:	Embankments			**Width:**	-	
Location:	NE, NW, SE & SW of Structure			**Height:**	-	
Material:	Native Soil			**Count:**	4	
Element Type:	Embankment			**Total Quantity:**	4	
Environment:	Moderate			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	Each	-	4	-	-	

Comments:
Embankments are steeply sloped and covered in rock slope protection.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Embankments and Streams			**Length:**	-	
Element Name:	Slope Protection			**Width:**	-	
Location:	NE, NW, SE & SW of Structure			**Height:**	-	
Material:	Rock			**Count:**	4	
Element Type:	Rock Slope Protection			**Total Quantity:**	4	
Environment:	Moderate			**Limited Inspection:**	☐	
Protection System	None					
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**	
	each	-	4	-	-	

BRIDGE **Site No.: B1**

Comments:
Slope protection is generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA					
Element Group:	Embankments and Streams		**Length:**		-
Element Name:	Streams and Waterways		**Width:**		-
Location:	Below Structure		**Height:**		-
Material:	Native		**Count:**		-
Element Type:	Streams		**Total Quantity:**		All
Environment:	Benign		**Limited Inspection:**		☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	All	-	All	-	-

Comments:
Low volume, low flow from south to north.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B1**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		
Traffic Control		
Utilities		
Right of Way		
Environmental Study		
Other		
Contingencies		
	Total Cost	

JUSTIFICATION

Structure Condition Summary Form

Structure Name Walley Bridge
Structure Number B2
Date of Inspection August 7, 2024
Project No.
Consultant HP Engineering Inc.

Element Group	Element Name	Unit (Qty.)	Unit Price (MTO)	Total Element Quantity	Element Qty. in Excellent Condition (1.00)	Element Quantity in Good Condition (0.75)	Element Quantity in Fair Condition (0.4)	Element Quantity in Poor Condition (0)	Total Replacement Value (TRV)	Current Element Value (CEV)	Element Condition Index	Performance Deficiency	Maintenance Need
Abutment	Abutment Walls	Sq.m	900.00	5.60	0.00	5.60	0.00	0.00	5040	3780	75	00	00
	Ballast Walls	Sq.m	350.00	8.40	0.00	8.30	0.10	0.00	2940	2193	75	00	00
	Bearings	Each	1000.00	8.00	0.00	0.00	6.00	2.00	8000	2400	30	00	00
	Wingwalls	Sq.m	350.00	7.10	0.00	7.10	0.00	0.00	2485	1864	75	00	00
Approaches	Wearing Surface	Sq.m	6.00	63.00	0.00	56.00	7.00	0.00	378	269	71	00	00
Barriers	Posts (Steel/Concrete)	Each	200.00	56.00	0.00	56.00	0.00	0.00	11200	8400	75	00	00
	Railing Systems	m	200.00	104.00	0.00	104.00	0.00	0.00	20800	15600	75	00	00
Decks	Girders -Steel	Sq.m	420.00	579.20	0.00	578.20	1.00	0.00	243264	182301	75	00	00
	Deck Top - Thin Slab	Sq.m	120.00	234.00	0.00	227.50	5.50	1.00	28080	20739	74	00	08
	Soffit - Thin Slab	Sq.m	120.00	325.90	0.00	319.90	4.00	2.00	39108	28983	74	00	08
Joints	Armouring / Retaining Devices	m	1.00	11.20	0.00	6.00	5.20	0.00	11	7	59	00	00
	Bearings	Each	1000.00	16.00	0.00	0.00	13.00	3.00	16000	5200	33	00	00
Piers	Caps	Sq.m	900.00	79.90	0.00	78.40	1.00	0.50	71910	53280	74	00	00
	Shafts/ Columns/ Pier Bents	Sq.m	900.00	2.00	0.00	2.00	0.00	0.00	1800	1350	75	00	00
Sidewalks/ Curbs	Curbs	Sq.m	40.00	84.40	0.00	71.50	11.90	1.00	3376	2335	69	00	08
									454392	328700			

Bridge Condition Index (BCI) 72

I_t	0	Importance Factor for Traffic
I_c	0	Importance Factor for Economic Impacts
I_w	0	Importance Factor for Bridge Width
I_p	0	Importance Factor for Bridge Profile or Alignment

Bridge Sufficiency Index (BSI) 72

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B2**

INVENTORY DATA:

Structure Name	Walley Bridge		
Main Hwy/Road #	Peddlers Drive	**Under Structure:**	Navigable Water ☐ Non- Navigable Water ☒ Rail ☐ Road ☐ Pedestrian ☐ Other ☐
Road Name:	Peddlers Drive	**On Structure:**	Rail ☐ Road ☒ Pedestrian ☐ Other ☐
Structure Location	1.65 km West of Graham Road		
Latitude	46° 14' 33" N	Longitude	78° 55' 07" W
Owner(s)	Township of Calvin	Heritage Designation	Not Cons. ☒ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	-	Road Class:	Freeway ☐ Arterial ☒ Collector ☐ Local ☐
MTO District	-	Posted Speed	- No. of Lanes 1
Old County	-	AADT	- % Trucks -
Geographic Twp.	-	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Slab on Steel I-Girders	Detour Length Around Structure	- (km)
Total Deck Length	51.8 (m)	Fill on Structure	- (m)
Overall Str. Width	5.6 (m)	Skew Angle	- (Degrees)
Total Deck Area	290.1 (m^2)	Direction of Structure	East/West
Roadway Width	4.5 (m)	No. of Spans	3
Span Lengths	13.1, 26, 12.7 (m)		

HISTORICAL DATA

Year Built	-	Last OSIM Inspection	August 7, 2024
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-

Rehabilitation History: (Date / Description)

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: B2**

FIELD INSPECTION INFORMATION	
Date of Inspection:	August 7, 2024 Type of Inspection: ☒ OSIM ☐ Enhanced OSIM
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Derick Battrick, P.Eng., HP Engineering
Access Equipment Used:	Measuring Tape, Digital Camera and Hammer
Weather:	Overcast
Temperature:	24 °C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study:	X			$ -
Material Condition Survey	X			$ -
Detailed Deck Condition Survey:		X		$ 10,000.00
Non-destructive Delamination Survey of Asphalt- Covered Deck:	X			$ -
Concrete Substructure Condition Survey:	X			$ -
Detailed Coating Condition Survey:	X			$ -
Detailed Timber Investigation:	X			$ -
Underwater Investigation:	X			$ -
Fatigue Investigation:	X			$ -
Seismic Investigation:	X			$ -
Structure Evaluation:	X			$ -
Monitoring	X			$ -
Monitoring of Deformations, Settlement and Movements:	X			$ -
Monitoring Crack Widths:	X			$ -
Load Posting – Estimated Load Limit			**Total Cost**	**$ 10,000.00**

Investigation Notes:
A deck condition survey is recommended due to the assumed age of the structure and the available rehabilitation history.

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	☐ None ☒ Minor Rehab. ☐ Major Rehab. ☐ Replace
Timing of Recommended Work:	☒ 1 to 5 years ☐ 6 to 10 years
Overall Comments: Approach barrier and deck barrier have been replaced since previous inspection (design by others). Missing barrier posts at transition rail to deck barrier at all 4 corners of deck. Seals at piers exhibit bulging, splits and severe damage at curb edges. Abutment and pier bearings appear to have medium to severe bulging throughout. Spall with exposed reinforcement noted at northeast end of curb. Spall with exposed corroded reinforcement and horizonal and vertical medium to wide cracks noted at south of west pier cap. Medium to wide horizontal crack at east pier and at south end.	
Date of Next Inspection:	June 2026

Suspected Performance Deficiencies

00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotation)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surfaces
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other

Maintenance Needs

01 Lift and swing bridge maintenance
02 Bridge cleaning
03 Bridge handrail maintenance
04 Painting steel bridge structures
05 Bridge deck joint repair
06 Bridge bearing maintenance
07 Repair of structural steel
08 Repair of bridge concrete
09 Repair of bridge timber
10 Bailey bridges maintenance
11 Animal/pest control
12 Bridge surface repair
13 Erosion control at bridges
14 Concrete sealing
15 Rout and seal
16 Bridge deck drainage
17 Scaling (loose Concrete or ACR Steel)
18 Other

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Approaches		**Length:**	14m (NW), 29m (SW), 31m (NE), 29m (SE)	
Element Name:	Barrier		**Width:**	-	
Location:	East & West of Structure		**Height:**	-	
Material:	Steel		**Count:**	4	
Element Type:	Steel Flex Beam on Wood Posts		**Total Quantity:**	130 m	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m	-	99	-	4

Comments:
Generally in good condition. Transition rail from approach barrier to deck barrier is missing a post; this condition is present at all 4 corners of deck.

Performance Deficiencies: 01	**Maintenance Needs:** 18 – Install missing posts
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☒ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Approaches		**Length:**	6 m	
Element Name:	Wearing Surface		**Width:**	5.25 m	
Location:	East & West Approaches		**Height:**	-	
Material:	Asphalt		**Count:**	2	
Element Type:	Asphalt Wearing Surface		**Total Quantity:**	63 m^2	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	56	7	-

Comments:
Moderate ravelling observed throughout the approach. Asphalt polishing and tire rutting on west approach.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Accessories		**Length:**	-	
Element Name:	Signs		**Width:**	-	
Location:	NE, NW, SE & SW of Structure		**Height:**	-	
Material:	Steel		**Count:**	6	
Element Type:	Hazard and One Lane Signs		**Total Quantity:**	6	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	Hot Dip Galvanizing				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	6	-	-

Comments:
Signs are generally in good condition. Northeast hazard sign has a bent corner.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Barriers		**Length:**	52 m	
Element Name:	Railing Systems		**Width:**	-	
Location:	North & South Sides of Structure		**Height:**	-	
Material:	Steel		**Count:**	2	
Element Type:	Steel Thrie Beam		**Total Quantity:**	104 m	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m	-	104	-	-

Comments:
Generally in good condition. Adequacy of deck barrier configuration (thrie beam railing face mounted on exterior of existing raised concrete curb) has not been reviewed by HP Engineering for adequacy.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Barriers			**Length:**	-
Element Name:	Posts			**Width:**	-
Location:	North & South Sides of Structure			**Height:**	-
Material:	Steel			**Count:**	56
Element Type:	HSS Steel Posts			**Total Quantity:**	56
Environment:	Severe			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	56	-	-

Comments:
Barrier posts are generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Joints			**Length:**	5.6 m
Element Name:	Armouring / Retaining Devices			**Width:**	-
Location:	East & West Ends of Structure			**Height:**	-
Material:	Steel			**Count:**	2
Element Type:	Armouring / Retaining Devices			**Total Quantity:**	11.2 m
Environment:	Severe			**Limited Inspection:**	☒
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m	-	6	5.2	-

Comments:
Joints have been paved over at the ends of deck.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

ELEMENT DATA					
Element Group:	Joints		**Length:**	5.6 m	
Element Name:	Seals / Sealants		**Width:**	-	
Location:	East & West Ends of Structure & At Piers		**Height:**	-	
Material:	Neoprene / Rubber		**Count:**	2	
Element Type:	Strip Seal		**Total Quantity:**	11.2	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	-	5.6	5.6

Comments:
Joint seals are generally in fair to poor condition with medium to severe splits and bulges throughout. Seals appear overly compressed.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☒ Replace ☒ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Sidewalks / Curbs		**Length:**	52.1 m	
Element Name:	Curbs		**Width:**	0.56 m	
Location:	North & South Sides of Structure		**Height:**	0.25 m	
Material:	Concrete		**Count:**	2	
Element Type:	Concrete Curb		**Total Quantity:**	84.4 m^2	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	71.5	11.9	1.0

Comments:
Top surface of curb is generally in good condition with narrow cracks and small spalls at ends. Moderate scaling and abrasions from snow removal equipment noted at lower half of the curb face throughout. Spall with exposed reinforcement noted at northeast end of curb.

Performance Deficiencies: 00	**Maintenance Needs:** 08 – Repair of Bridge Concrete
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☒ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Decks		**Length:**	-	
Element Name:	Drainage System		**Width:**	-	
Location:	North & South of Deck		**Height:**	-	
Material:	Steel		**Count:**	4	
Element Type:	Round Pipe Deck Drains		**Total Quantity:**	4	
Environment:	Severe		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	4	-	-

Comments:
Generally in good condition with minor corrosion observed.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks	**Length:**	52 m	
Element Name:	Deck Top	**Width:**	4.5 m	
Location:	Top of Deck	**Height:**	-	
Material:	Concrete	**Count:**	1	
Element Type:	Thin Slab	**Total Quantity:**	234 m^2	
Environment:	Severe	**Limited Inspection:**	☐	
Protection System	None			

Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	227.5	5.5	1

Comments:
Exposed deck top is generally in good condition with light scaling and minor abrasion throughout and is partially covered in asphalt at the ends of deck. Few small spalls at east end along north curb. Few patched spalls near west end along south curb and few small, exposed spalls noted.

Performance Deficiencies: 00	**Maintenance Needs:** 08 – Repair of Bridge Concrete
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☒ 2 Years

ELEMENT DATA					
Element Group:	Decks		**Length:**	2 m	
Element Name:	Soffit – Thin Slab (End)		**Width:**	5.6 m	
Location:	Underside of Deck		**Height:**	-	
Material:	Concrete		**Count:**	6	
Element Type:	Thin Slab		**Total Quantity:**	67.2 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	67.2	-	-

Comments:
Generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Decks		**Length:**	39.8 m	
Element Name:	Soffit – Thin Slab (Exterior)		**Width:**	1 m	
Location:	Underside of Deck		**Height:**	-	
Material:	Concrete		**Count:**	2	
Element Type:	Thin Slab		**Total Quantity:**	79.6 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	73.6	4	2

Comments:
Generally in good condition with light spalls along drip groove, narrow cracks and damp stains noted.

Performance Deficiencies: 00	**Maintenance Needs:** 08 – Repair of Bridge Concrete
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☒ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Decks		**Length:**	39.8 m	
Element Name:	Soffit – Thin Slab (Interior)		**Width:**	4.5 m	
Location:	Underside of Deck		**Height:**	-	
Material:	Concrete		**Count:**	1	
Element Type:	Thin Slab		**Total Quantity:**	179.1 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	179.1	-	-

Comments:
Generally in good condition with narrow cracks.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Beams / MLEs		**Length:**	2 m	
Element Name:	Girders (End Spans – End)		**Width:**	0.23 m	
Location:	Underside of Structure		**Height:**	0.6 m	
Material:	Steel		**Count:**	16	
Element Type:	Steel I-Girders		**Total Quantity:**	60.5 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	59.5	1	-

Comments:
Generally in good condition with localized light corrosion. Localized moderate corrosion and some corrosion jacking noted on bottom flange at girder ends.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Beams / MLEs			**Length:**	17.8 m
Element Name:	Girders (End Spans – Middle)			**Width:**	0.23 m
Location:	Underside of Structure			**Height:**	0.6 m
Material:	Steel			**Count:**	8
Element Type:	Steel I-Girders			**Total Quantity:**	269.1 m^2
Environment:	Benign			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	269.1	-	-

Comments:
Generally in good condition with light localized corrosion.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Beams / MLEs			**Length:**	2 m
Element Name:	Girders (Middle Span – End)			**Width:**	0.3 m
Location:	Underside of Deck			**Height:**	0.75 m
Material:	Steel			**Count:**	8
Element Type:	Steel I-Girders			**Total Quantity:**	38.4 m^2
Environment:	Moderate			**Limited Inspection:**	☒
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	38.4	-	-

Comments:
Visible portions are generally in good condition with light localized corrosion noted. Rating based on visible condition only.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Beams / MLEs		**Length:**	22 m	
Element Name:	Girders (Middle Span – Middle)		**Width:**	0.3 m	
Location:	Underside of Deck		**Height:**	0.75 m	
Material:	Steel		**Count:**	4	
Element Type:	Steel I-Girders		**Total Quantity:**	211.2 m^2	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	211.2	-	-

Comments:
Generally in good condition with light localized corrosion observed.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Beams / MLEs		**Length:**	-	
Element Name:	Diaphragms (End Spans – End)		**Width:**	-	
Location:	East & West Underside of Structure		**Height:**	-	
Material:	Steel		**Count:**	12	
Element Type:	Steel I-Beam Diaphragms		**Total Quantity:**	12	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	12	-	-

Comments:
Generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Beams / MLEs			**Length:**	-
Element Name:	Diaphragms (End Spans – Middle)			**Width:**	-
Location:	East & West Underside of Structure			**Height:**	-
Material:	Steel			**Count:**	6
Element Type:	Steel I-Beam Diaphragms			**Total Quantity:**	6
Environment:	Benign			**Limited Inspection:**	☒
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	6	-	-

Comments:
Generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Beams / MLEs			**Length:**	-
Element Name:	Diaphragms (Middle Span – End)			**Width:**	-
Location:	Underside of Structure			**Height:**	-
Material:	Steel			**Count:**	6
Element Type:	Steel I-Beam Diaphragms			**Total Quantity:**	6
Environment:	Moderate			**Limited Inspection:**	☒
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	6	-	-

Comments:
Generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Beams / MLEs		**Length:**	-	
Element Name:	Diaphragms (Middle Span – Middle)		**Width:**	-	
Location:	Underside of Structure		**Height:**	-	
Material:	Steel		**Count:**	9	
Element Type:	Steel I-Beam Diaphragms		**Total Quantity:**	9	
Environment:	Moderate		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	9	-	-

Comments:
Generally in good condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Abutments		**Length:**	2.1 m	
Element Name:	Wingwalls		**Width:**	-	
Location:	NE, NW, SE & SW of Structure		**Height:**	0.85 m	
Material:	Concrete		**Count:**	4	
Element Type:	Reinforced Concrete Wingwall		**Total Quantity:**	7.1 m^2	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	7.1	-	-

Comments:
Limited inspection, wingwalls at west side are mostly buried. Generally in good condition

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Abutments		**Length:**	-	
Element Name:	Ballast Walls		**Width:**	5.62 m	
Location:	East & West Underside of Structure		**Height:**	0.75 m	
Material:	Concrete		**Count:**	2	
Element Type:	Reinforced Concrete Wall		**Total Quantity:**	8.4 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	8.3	0.1	-

Comments:
Generally in good condition with honeycombing noted at West ballast wall. Signs of failed joint seal on east ballast wall.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Abutments		**Length:**	-	
Element Name:	Bearings		**Width:**	-	
Location:	On Abutment Walls		**Height:**	-	
Material:	Neoprene / Rubber / Steel		**Count:**	8	
Element Type:	Elastomeric Bearing / Steel Plate		**Total Quantity:**	8	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	-	6	2

Comments:
Abutment bearings are moderately to severely compressed and bulging. Light to localized moderate corrosion / corrosion scale noted at bearings.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☒ Replace ☒ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Abutments		**Length:**	-	
Element Name:	Abutment Walls		**Width:**	5.62 m	
Location:	East & West Underside of Structure		**Height:**	0.5 m	
Material:	Concrete		**Count:**	2	
Element Type:	Reinforced Concrete Abutment		**Total Quantity:**	5.6 m^2	
Environment:	Benign		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	5.6	-	-

Comments:
Generally in good condition. Water stains noted at east and west abutment walls. Light map cracks noted at east abutment wall.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Piers		**Length:**	-	
Element Name:	Bearings		**Width:**	-	
Location:	On Piers Caps		**Height:**	-	
Material:	Neoprene / Rubber / Steel		**Count:**	16	
Element Type:	Elastomeric Bearing / Steel Plate		**Total Quantity:**	16	
Environment:	Moderate		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	-	13	3

Comments:
Limited inspection due to height. Neoprene component of pier bearings appear to be moderately to severely compressed and bulging. Some corrosion scaling noted on base plates.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☒ Replace ☒ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Piers		**Length:**	8.12 m	
Element Name:	Caps		**Width:**	1 m	
Location:	On Piers		**Height:**	1.3 m	
Material:	Concrete		**Count:**	2	
Element Type:	Rectangular Pier Caps		**Total Quantity:**	79.9 m^2	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	m^2	-	78.4	1	0.5

Comments:
Generally in good condition with narrow cracks, some light rust and water stains. Spall with exposed corroded reinforcement and horizonal and vertical medium to wide cracks noted at south of west pier cap. Medium to wide horizontal crack at east pier and at south end.

Performance Deficiencies: 00	**Maintenance Needs:** 08 – Repair of Bridge Concrete
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☒ 2 Years

Element Group:	Piers		**Length:**	-	
Element Name:	Shafts/Columns/Pile Bents		**Width:**	-	
Location:	Underside of Structure		**Height:**	-	
Material:	Steel		**Count:**	2	
Element Type:	Pier Column		**Total Quantity:**	2	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	2	-	-

Comments:
Steel piles covered in timber crib (piles are inaccessible). Timber sheathing and steel nosing are generally in good condition. Exact number of piles could not be verified due to presence of sheathing. Timber on west pier appears to be coming off. Some separation and weathering of timber crib noted throughout.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Foundations		**Length:**	-	
Element Name:	Foundation (Below Ground Level)		**Width:**	-	
Location:	Below Abutment Walls & Piers		**Height:**	-	
Material:	Concrete		**Count:**	-	
Element Type:	Strip Footing		**Total Quantity:**	-	
Environment:	Benign		**Limited Inspection:**	☒	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	N/A	-	-	-	-

Comments:
No visible evidence of foundation instability noted at the time of inspection.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Embankments and Streams		**Length:**	-	
Element Name:	Embankments		**Width:**	-	
Location:	NE, NW N, S, SE, & SW of Structure		**Height:**	-	
Material:	Native Soil		**Count:**	6	
Element Type:	Embankment		**Total Quantity:**	6	
Environment:	Moderate		**Limited Inspection:**	☐	
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	6	-	-

Comments:
Embankments are well vegetated with some large random rocks and rock protection in front of abutment walls. Old bridge abutments to north of current bridge.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

ELEMENT DATA					
Element Group:	Embankments and Streams			**Length:**	-
Element Name:	Slope Protection			**Width:**	-
Location:	East and West Underside of Structure			**Height:**	-
Material:	Rock			**Count:**	2
Element Type:	Slope Protection			**Total Quantity:**	2
Environment:	Moderate			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	Each	-	2	-	-

Comments:
Large rocks placed along the embankments directly in front of both the East and West abutments. Generally in fair condition.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

Element Group:	Embankments and Streams			**Length:**	-
Element Name:	Streams and Waterways			**Width:**	-
Location:	Below Structure			**Height:**	-
Material:	Native			**Count:**	-
Element Type:	Streams			**Total Quantity:**	All
Environment:	Benign			**Limited Inspection:**	☐
Protection System	None				
Condition Data:	**Units**	**Excellent**	**Good**	**Fair**	**Poor**
	All	-	All	-	-

Comments:
Water flows from south to north with moderate volume and flow; there are no visible flow obstructions.

Performance Deficiencies: 00	**Maintenance Needs:** 00
Recommended Work: ☐ Rehab. ☐ Replace ☐ 1 – 5 Years ☐ 6 – 10 Years	**Maintenance Needs:** ☐ Urgent ☐ 1 Year ☐ 2 Years

BRIDGE **Site No.: B2**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Joint	Joint Seal Replacement		X		$ 28,000.00
Bearings	Abutment and Pier Bearing Replacement		X		$ 98,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 126,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		$ -
Detours		$ -
Traffic Control	Traffic control	$ 35,000.00
Utilities		$ -
Right of Way		$ -
Environmental Study		$ -
Other		$ -
Contingencies		$ -
	Total Cost	**$ 35,000.00**

JUSTIFICATION