THE TOWNSHIP OF BONFIELD

BRIDGE MANAGEMENT STUDY REPORT (DRAFT)

6 BRIDGES / 10 CULVERTS

DECEMBER 2022

Report Submitted By:

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Appendices

1.0 INTRODUCTION

The Township of Bonfield (the Township) has retained HP Engineering to perform inspections and develop a bridge management study for 16 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 16 structures owned and maintained by the Township were visually inspected in accordance with the MTO Structure Inspection Manual. The inspections were performed during the early summer of 2022.

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 ($/m^2)**
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.

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.

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 (10 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	2 (bridges) / 3 (culverts) / 5 total	31.2
60-70	2 (bridges) / 2 (culverts) / 4 total	25.0
Less than 60	2 (bridges) / 5 (culverts) / 7 total	43.8

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 2022 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 Bonfield 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 16 of the Township's structure based on visual biennial inspections performed by HP Engineering (during the early summer of 2022).

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 16 structures in the inventory) is approximately ***7.53*** million dollars. The estimated value of all the bridges and culverts (based on *16* structures in the inventory) if reconstructed to current geometric standards would be approximately ***9.53*** million dollars.

Immediate repair / rehabilitation costs for the 16 structures inspected are estimated to be a total of approximately ***361*** thousand dollars broken down as ***151*** and ***210*** thousand dollars for bridges and culverts respectively. Similarly, the longer term repair / rehabilitation costs (1-5 years) for the 16 structures inspected are estimated to be a total of approximately ***2.295*** million dollars broken down as ***409*** thousand dollars and ***1.886*** million dollars for bridges and culverts respectively. The 6-10 year repair / rehabilitation costs for the 16 structures inspected are estimated to be a total of approximately ***1.4*** million dollars broken down as ***1.11*** million dollars and ***290*** thousand dollars for bridges and culverts respectively.

The costs associated with recommended further Engineering Investigations for the 16 structures inspected was estimated to be a total of approximately ***250*** thousand dollars broken down as ***125*** thousand dollars for each of bridges and culverts. It is noted that the majority of the costs associated with these recommended further Engineering Investigations are related to deficient and / or non-existing barriers over the structures and on the approaches to the structures.

Respectfully Submitted,
December 14, 2022

ENGINEERING
HP ENGINEERINC INC.

Tashi Dwivedi, P.Eng.
Principal

APPENDIX A

ASSET MANAGEMENT SUMMARY

APPENDIX A-1

BRIDGES
(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		2023	2024	2025	2026	2027	2028	Total ($000)
01	Maple Road Bridge	Concrete Girder	1917	1989	1	11.10	5.00	4.30	56	416	772	60	0	0	586	20.0	3			606.0				606.0
02	Sunnyside Road Bridge	Concrete Rigid Frame	1982	-	1	12.50	9.40	7.10	118	881	999	72	103	0	0	20.0	5					123.0		123.00
07	Boxwell Road Bridge	Concrete Girder	1916	-	1	7.20	4.60	4.40	33	265	551	57	0	0	524	30.0	2		554.0					554.0
08	Trunk Road Bridge	Concrete Rigid Frame	1930 (est.)	-	1	3.60	6.00	5.50	22	173	284	37	0	409	0	35.0	1	444.0						444.00
10	Pine Lake Road Bridge	Concrete Rigid Frame	1983	-	1	13.28	9.70	8.70	129	966	950	68	24	0	0	15.0	4				39.0			39.0
12	Line 3 North Road Bridge	Steel Girder	Unknown	-	1	16.00	8.40	7.15	134	1,008	1,170	75	24	0	0	5.0	6						29.0	29.00
TOTALS										**3,709**	**4,725**		**151**	**409**	**1,110**	**125**		**444**	**554**	**606**	**39**	**123**	**29**	**1795**

NOTES:

1. BCI as calculated by HP Engineering.

APPENDIX A-2

CULVERTS
(10 STRUCTURES)

Appendix A-2 : Asset Information Summary - Culverts

Culvert No.	Culvert Name	Culvert Type	Year Built (Age)	Year of Last Rehab	Number of Barrels	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		2023	2024	2025	2026	2027	2028	2029	Total ($000)
03	Grand Desert Road Culvert	Concrete Arch	2009	-	1	9.28	5.52	4.75	59	443	735	74	24	0	0	5.0	7						29		29
04	Grand Desert Road Culvert	CSP	1970 (est)	-	1	3.00	27.40	7.80	35	282	330	23	0	452	0	20.0	1	472							472
05	Boundry Road Culvert	CSP	1980 (est)	-	2	4.00	11.90	6.20	36	288	413	69	57	0	0	5.0	8						62		62
06	Boxwell Road Culvert	Horizonral Ellipse CSP	1970 (est)	-	1	4.60	14.10	7.00	45	358	462	24	0	528	0	20.0	3			548					548
09	McNutt Road Culvert	Horizonral Ellipse CSP	1989	-	2	8.20	16.40	8.50	87	699	759	69	24	0	0	5.0	6					29			29
11	Grand Desert Road Culvert	CSP	1980 (est)	-	1	1.00	8.40	6.50	15	120	165	31	0	0	290	20.0	9							310	310
13	Trunk Road Culvert	Horizonral Ellipse CSP	2017	-	2	10.20	21.30	8.30	104	781	801	74	57	0	0	5.0	5					62			62
14	Trout Pond Road Culvert	Horizonral Ellipse CSP	1970 (est)	-	1	2.40	8.70	6.60	26	207	281	29	0	377	0	20.0	2		397						397
15	Development Road Culvert	Horizonral Ellipse CSP	2019	-	1	3.55	21.30	6.80	35	284	375	75	48	0	0	5.0	10							53	53
16	Development Road Culvert	Horizonral Ellipse CSP	1980 (est)	-	1	4.90	22.50	6.60	45	359	487	58	0	529	0	20.0	4				549				549
TOTALS										**3,821**	**4,807**		**210**	**1,886**	**290**	**125.0**		**472**	**397**	**548**	**549**	**91**	**91**	**363**	**2511**

NOTES:

1. BCI as calculated by HP Engineering.

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ATTACHMENT 1

OSIM INSPECTION REPORTS & BCI FORMS

BRIDGES

Structure Condition Summary Form

Structure Name Maple Road Bridge
Structure Number 01
Date of Inspection June 03, 2022
Project No. 22035
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	24.70	0.00	15.70	7.00	2.00	22230	13118	59	14	08
	Wingwalls	Sq.m	350.00	6.72	0.00	5.55	0.67	0.50	2352	1551	66	00	08
Approaches	Wearing Surface	Sq.m	6.00	258.00	0.00	229.00	25.00	4.00	1548	1091	70	00	12
Barriers	Barrier/ Parapet Walls	Sq.m	100.00	24.20	0.00	0.00	14.20	10.00	2420	568	23	00	08
Beams / Main	Girders	Sq.m	200.00	70.29	0.00	51.69	17.60	1.00	14058	9162	65	00	08
Decks	Soffit - Thick Slab	Sq.m	350.00	79.92	0.00	50.49	26.65	2.78	27972	16985	61	00	08
	Wearing Surface	Sq.m	25.00	47.73	0.00	46.00	1.00	0.73	1193	873	73	00	02, 15
									71773	**43345**			

Bridge Condition Index (BCI) **60**

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) **60**

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 01**

INVENTORY DATA:

Structure Name	Maple Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Maple Road		
Structure Location	200m west of trunk road , Lot 10, Con 8 Bonfield Ontario over Kaibuskong River		
Latitude	46° 14' 20.4" N	Longitude	79° 9' 7.7" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 1
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Slab on Concrete Girders	Detour Length Around Structure	_____ (km)
Total Deck Length	11.1 (m)	Fill on Structure	_____ (m)
Overall Str. Width	5 (m)	Skew Angle	_____ (Degrees)
Total Deck Area	55.5 (m^2)	Direction of Structure	E-W
Roadway Width	4.3 (m)	No. of Spans	1 (m)
Span Lengths	11.1 (m)		

HISTORICAL DATA

Year Built	1917	Last Biennial Inspection	August 6, 2020
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)

- 1988-1989 Rehabilitation

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 01**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	20 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:

A rehabilitation / replacement study is recommended due to the age of the structure and the condition of the soffit and girders; it is recommended that the structure be replaced in 6-10 years.
Approach Barrier length appears to be substandard and should be further reviewed. Approach barrier end treatments and connections to structure are substandard and should be replaced with code compliant components. Narrow diagonal cracks observed on concrete girders adjacent to abutments. Light undermining noted at both abutments. Small spall with exposed corroded reinforcement at intermediate girder west end.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 01**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	4 m	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	4	
Element Type:	Steel Flex Beam on Wood Posts				**Total Quantity:**	16 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	8	4	4		08	-
Comments:	Wood posts are weathered with some checks. Dent from vehicular impact at northwest barrier. Approach Barrier length appears to be substandard and should be reviewed. Some posts of the current barrier are loose. Approach barrier end treatments and connections to structure are substandard and should be replaced with code compliant components.						
None ☐	6 – 10 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	4.3 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Asphalt				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	258 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	229	25	4		-	12
Comments:	Narrow longitudinal cracks with light to moderate ravelling throughout. Potholes observed on east approach. Gravel covering on west approach and abrasions noted on the east approach.						
None ☐	1 – 5 years ■	< 1 year ☐	Urgent ☐				

Element Group:	Accessories				**Length:**	-	
Element Name:	Signs				**Width:**	-	
Location:	NE, NW, SE, SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	4	
Element Type:	Hazard Signs				**Total Quantity:**	4	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	2	2	-		-	18
Comments:	Abrasions observed on the Northeast signs and Northwest sign is rotated.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

BRIDGE **Site No.: 01**

Element Group:	Barrier	**Length:**	11.1 m
Element Name:	Parapet Wall	**Width:**	0.16 m
Location:	North & South of Structure	**Height:**	1.09 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	24.2 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	-	14.2	10	-	08

Comments: Traffic barrier is substandard and should be replaced with a code compliant barrier. Spalls at top of wall, minor scaling, medium to wide longitudinal and transverse cracks and minor spalls observed on barrier. Moderate to severe scaling and spalls noted on base o end columns. Spalls throughout the base of the North barrier.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Deck	**Length:**	-
Element Name:	Drainage System	**Width:**	-
Location:	North & South Edges of Structure	**Height:**	-
Material:	Plastic	**Count:**	4
Element Type:	Plastic Drain Pipes	**Total Quantity:**	4
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	4	-	-	-	02

Comments: Debris accumulation at all drains that require cleaning.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Deck	**Length:**	11.1 m
Element Name:	Wearing Surface	**Width:**	4.3 m
Location:	Top of Deck	**Height:**	-
Material:	Asphalt	**Count:**	1
Element Type:	Wearing Surface	**Total Quantity:**	47.73 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	46	1	0.73	-	02 & 15

Comments: Medium to wide transverse crack observed at west approach and light raveling throughout. Sand/gravel on north and south sides that require cleaning.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	11.1 m
Element Name:	Soffit - Thick Slab (Exterior)	**Width:**	-
Location:	Underside	**Height:**	1.1m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	24.42 m²
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	14.42	10	-	-	-

Comments: Narrow cracks and light scaling observed throughout.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	11.1 m
Element Name:	Soffit - Thick Slab (Interior)	**Width:**	5 m
Location:	Underside	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	55.5 m²
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	36.07	16.65	2.78	-	08

Comments: Interior has moderate to locally severe scaling, narrow transverse cracks and damp stains. Delaminations noted on west end.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Beams/MLE's	**Length:**	9.2 m
Element Name:	Girder	**Width:**	0.37 m
Location:	Underside of Structure	**Height:**	0.77 m
Material:	Concrete	**Count:**	4
Element Type:	Concrete Beams	**Total Quantity:**	70.29 m^2
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	51.69	17.60	1.0	-	08

Comments: Previous repairs to underside of girder observed. Small spalls at soffit girder interface and light with locally moderate scaling throughout. Small spall with exposed corroded reinforcement at intermediate girder west end. Narrow diagonal cracks on interior beams at supports to abutment walls. Cracks should be monitored. Stalactites noted on exterior girders.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

BRIDGE **Site No.: 01**

Element Group:	Abutments	**Length:**	1.6 m
Element Name:	Wingwalls	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	2.1 m
Material:	Concrete	**Count:**	4
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	6.72 m^2
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	5.55	0.67	0.5	-	08

Comments: Narrow longitudinal and transverse cracks, damp stains, and moss growth. Small spalls at northeast, southeast and southwest.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	5 m
Element Name:	Abutment Walls	**Width:**	-
Location:	East & West	**Height:**	2.47 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	24.7 m^2
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	15.7	7	2	14	08

Comments: Localized area of moderate scaling and minor transverse cracks throughout. Scour at east abutment wall. Light undermining noted at both abutments.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Abutments	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

Comments: No evidence of instability, moderate scaling noted on exposed east footing.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 01**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE / NW / SE / SW	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Embankment	**Total Quantity:**	-
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
%	-	100	-	-	-	-

Comments: Embankments are **m**oderately sloped, well vegetated and appear stable.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Main Span	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
%	-	100	-	-	-	-

Comments: Moderate volume and high flow from south to north with no visible obstructions noted in the stream at the time of inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 01**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Barrier (Approaches)	Replace guiderail		X		$ -
Barrier (Deck)	Replace Deck Barrier		X		$ -
Abutments	Abutment Walls		X		$ -
Deck Soffit	Concrete repairs		X		$ -
Structure	Replace Structure	X			$ 416,000.00
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 416,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		
Other		$ 10,000.00
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Moderate scaling, tire rutting and gravel accumulation in approach wearing surface (Typical)

Photo 8 Typical approach barrier at northeast corner with collision damage

Photo 9 Substandard connection at northwest approach barrier (Typical)

Photo 10 Moderate to severe scaling along base of north parapet wall

Photo 11 Medium to wide transverse crack noted on parapet wall (Typical)

Photo 12 Light scaling on interior deck soffit

Photo 13 Narrow crack on girder

Photo 14 Moderate to severe scaling, narrow cracks and delamination noted on deck soffit

Photo 15 West underside of Structure

Photo 16 Stalactites observed on previous concrete repairs at girders

Photo 17 Narrow longitudinal and transverse cracks, damp stains and moos grown at wingwalls (Typical)

Structure Condition Summary Form

Structure Name Sunnyside Road Bridge
Structure Number 02
Date of Inspection June 03, 2022
Project No. 22035
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	58.28	0.00	56.28	2.00	0.00	52452	38709	74	00	02
	Wingwalls	Sq.m	350.00	57.66	0.00	55.66	2.00	0.00	20181	14891	74	00	02
Approaches	Curb and Gutters	m	25.00	7.92	0.00	2.00	4.42	1.50	198	82	41	00	08
	Wearing Surface	Sq.m	6.00	426.00	0.00	341.00	75.00	10.00	2556	1715	67	09	12
Barriers	Barrier/ Parapet Walls	Sq.m	100.00	62.50	0.00	60.70	1.60	0.20	6250	4617	74	08	02
	Hand Railings	m	100.00	46.00	0.00	46.00	0.00	0.00	4600	3450	75	08	00
Decks	Deck Top - Thick Slab	Sq.m	350.00	88.75	0.00	83.75	5.00	0.00	31063	22684	73	00	00
	Soffit - Thick Slab	Sq.m	350.00	147.50	0.00	122.00	25.50	0.00	51625	35595	69	00	00
	Wearing Surface	Sq.m	25.00	88.75	0.00	58.75	25.00	5.00	2219	1352	61	09	12
Sidewalks/ Curbs	Curbs	Sq.m	40.00	15.63	0.00	10.63	4.00	1.00	625	383	61	00	02, 08
	Sidewalks and Medians	Sq.m	150.00	30.63	0.00	25.13	5.00	0.50	4595	3127	68	00	02, 08
									176363	126603			

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.: 02**

INVENTORY DATA:

Structure Name	Sunnyside Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Sunnyside Road		
Structure Location	100m west of Mark street , Lot 9, Con 8 Bonfield Ontario over Kaibuskong River		
Latitude	46° 13' 55.7" N	Longitude	79° 8' 56.6" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Rigid Frame	Detour Length Around Structure	_____ (km)
Total Deck Length	12.5 (m)	Fill on Structure	_____ (m)
Overall Str. Width	9.4 (m)	Skew Angle	_____ (Degrees)
Total Deck Area	117.5 (m^2)	Direction of Structure	East / West
Roadway Width	7.1 (m)	No. of Spans	1 (m)
Span Lengths	12.5 (m)		

HISTORICAL DATA

Year Built	1982	Last Biennial Inspection	August 6, 2020
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.: 02**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	18 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:		X		$ 15,000.00
Bridge Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:

Rehabilitation/replacement study is for traffic barrier only.
A detailed deck condition survey is recommended due to the age of the structure.
Approach barrier end treatments and connections to structure are substandard and should be replaced with code compliant components. Deck barrier does not meet current standard and should be replaced with a code compliant traffic barrier. Wide longitudinal crack observed at centreline of deck wearing surface. Wide transverse cracks observed on both approaches and deck wearing surface.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

ELEMENT DATA							
Element Group:	Approaches			**Length:**	32 m (E), 23 m (W)		
Element Name:	Barrier			**Width:**	-		
Location:	NE, NW, SE & SW of Structure			**Height:**	-		
Material:	Steel			**Count:**	4		
Element Type:	Steel Flex Beam on Wood Posts			**Total Quantity:**	110 m		
Environment:	Severe			**Not Inspected:**	☐		
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	98	10	2		08	-
Comments:	Approach barrier end treatments and connections to deck barrier are substandard and should be replaced with code compliant end treatments and connections. Generally in good condition with few checks and weathering of wood posts. One rotted post at northwest. Small dent to steel barrier on north side at west. Broken post at southeast approach; replace damages timber posts.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches			**Length:**	6 m		
Element Name:	Curbs			**Width:**	0.13 m		
Location:	East & West of Structure			**Height:**	0.2 m		
Material:	Concrete			**Count:**	4		
Element Type:	Curb			**Total Quantity:**	7.92 m^2		
Environment:	Severe			**Not Inspected:**	☐		
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	2.0	4.42	1.5		-	08
Comments:	Small spalls and abrasions noted throughout. Significant abrasion at northwest corner.						
None ☐	1 – 5 years ■	< 1 year ☐	Urgent ☐				

Element Group:	Approaches			**Length:**	-		
Element Name:	Drainage System			**Width:**	-		
Location:	Northeast of Structure			**Height:**	-		
Material:	Cast Iron			**Count:**	1		
Element Type:	Catch Basin			**Total Quantity:**	1		
Environment:	Severe			**Not Inspected:**	■		
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	-	1	-		-	02
Comments:	Limited inspection, could not inspect the catch basin. Rating based on comments from previous inspection report. Municipal drain on east approach is completely blocked and overgrown.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

BRIDGE **Site No.: 02**

Element Group:	Approaches	**Length:**	30 m
Element Name:	Wearing Surface	**Width:**	7.1 m
Location:	East & West of Structure	**Height:**	-
Material:	Asphalt	**Count:**	2
Element Type:	Wearing Surface	**Total Quantity:**	426 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	341	75	10	09	12

Comments: Large centerline longitudinal crack and medium to wide transverse cracks throughout both approaches. Potholes noted on both approaches.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Barrier	**Length:**	12.5 m
Element Name:	Parapet Wall (Interior)	**Width:**	-
Location:	North & South Sides of Structure	**Height:**	1.25 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	31.25 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	31.05	0.1	0.1	08	02

Comments: Narrow transverse and map cracks, damp stains and efflorescence noted. Barrier is substandard and should be replaced with a code compliant traffic barrier. Large spall was observed on top face of north wall. Graffiti noted on both walls.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Barrier	**Length:**	12.5 m
Element Name:	Parapet Wall (Exterior)	**Width:**	-
Location:	North & South Sides of Structure	**Height:**	1.25 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	31.25 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	29.65	1.5	0.1	08	-

Comments: Exterior of barrier wall is generally in good condition with some light scaling and a few narrow cracks with efflorescence observed. Barrier is substandard and should be replaced with a code compliant traffic barrier.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Barrier	**Length:**	11.5 m
Element Name:	Hand Railing	**Width:**	-
Location:	North & South Sides of Structure	**Height:**	-
Material:	Steel	**Count:**	4
Element Type:	Double Railing	**Total Quantity:**	46 m
Environment:	Severe	**Not Inspected:**	☐
Protection System	Hot-Dip Galvanized	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m	-	46	-	-	08	-

Comments: Generally in good condition with rust stains on northwest and southwest rails. Barrier is substandard and should be replaced with a code compliant traffic barrier.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Sidewalks/Curbs	**Length:**	12.5 m
Element Name:	Sidewalk	**Width:**	2.3 m
Location:	North Side of Structure	**Height:**	0.15 m
Material:	Concrete	**Count:**	1
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	30.63 m²
Environment:	Severe	**Not Inspected:**	■
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	25.13	5	0.5	-	02, 08

Comments: Limited inspection due to sand covered on sidewalk. Rating based on visible portion and comments from previous inspection report. Medium transverse cracks, moderate scaling, small spalls on face of sidewalk and abrasions from snow removal equipment noted.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Sidewalks/Curbs	**Length:**	12.5 m
Element Name:	Curbs	**Width:**	1.1 m
Location:	South Side of Structure	**Height:**	0.15 m
Material:	Concrete	**Count:**	1
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	15.63 m²
Environment:	Severe	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	10.63	4	1	-	02, 08

Comments: Generally in good to fair condition with medium transverse cracks, abrasions, and small spalls from snow removal equipment. Debris accumulation observed on curb.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Deck	**Length:**	-
Element Name:	Drainage System	**Width:**	-
Location:	North Side of Structure	**Height:**	-
Material:	Steel	**Count:**	1
Element Type:	Metal drain pipes	**Total Quantity:**	1
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	1	-	-	-	-

Comments: Deck drain at north is in good condition.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Deck	**Length:**	12.5 m
Element Name:	Wearing Surface	**Width:**	7.1 m
Location:	Top of Deck	**Height:**	-
Material:	Asphalt	**Count:**	1
Element Type:	Wearing Surface	**Total Quantity:**	88.75 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	58.75	25	5	09	12

Comments: Wide centerline longitudinal crack and medium longitudinal and transverse cracks throughout. Abrasions noted on the wearing surface.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Deck	**Length:**	12.5 m
Element Name:	Deck Top (Covered)	**Width:**	7.1 m
Location:	Top of Deck	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Thick Slab	**Total Quantity:**	88.75 m²
Environment:	Moderate	**Not Inspected:**	■

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	83.75	5	-	-	-

Comments: Condition of deck top based on condition of wearing surface and deck soffit.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

BRIDGE **Site No.: 02**

Element Group:	Decks	**Length:**	12.5 m
Element Name:	Soffit - Thick Slab (Exterior)	**Width:**	-
Location:	North & South Underside of Structure	**Height:**	1.2 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	30 m²
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	20	10	-	-	-

Comments: Narrow longitudinal and transverse cracks, efflorescence and damp stains noted. Stained map cracks noted on soffit slab.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	12.5 m
Element Name:	Soffit - Thick Slab (Interior)	**Width:**	9.4 m
Location:	Underside of Structure	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	117.5 m²
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	102	15.5	-	-	-

Comments: Generally in good condition with area of several narrow longitudinal cracks with origins at the abutment walls noted.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	4.65 m
Element Name:	Wingwalls	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	3.1 m
Material:	Concrete	**Count:**	4
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	57.66 m²
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	55.66	2	-	-	02

Comments: Generally in good condition with narrow cracks with efflorescence and damp stains noted. Graffiti observed on southeast wall.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

BRIDGE **Site No.: 02**

Element Group:	Abutments	**Length:**	9.4 m
Element Name:	Abutment Walls	**Width:**	-
Location:	East & West of Structure	**Height:**	3.1m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	58.28 m²
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	56.28	2	-	-	02

Comments: Full vertical height narrow to medium crack at centre of each abutment wall extending part way into soffit. Graffiti on both abutments.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■

Protection System	Unknown				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐

Protection System	Rock Protection				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
each	-	4	-	-	-	-

Comments: Moderate to steep slope, well vegetated and appear stable with rocks for slope protection at base of embankment.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 02**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Slope Protection	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Rocks	**Count:**	4
Element Type:	Slope Protection	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	-	4	-	-	-

Comments: Generally in fair condition. Few rocks on slope, mainly at base.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
All	-	All	-	-	-	-

Comments: High volume and low flow from south to north with no visible obstructions.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 02**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Barrier	Install a code compliant barrier			X	$ 55,000.00
Approach	Install code compliant end treatments & Connections			X	$ 48,000.00
				Total Cost	**$ 103,000.00**

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

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Typical buried end treatment and rotted post at southeast corner

Photo 8 Collision damage noted on approach barrier at southwest corner

Photo 9 Medium transverse cracks with potholes in west approach

Photo 10 Significant abrasion noted on approach curb at northwest corner

Photo 11 Narrow map cracks with efflorescence and stains with spall on parapet wall

Photo 12 Narrow map cracks with efflorescence and stains with spall on parapet wall

Photo 13 Narrow longitudinal and transverse cracks and damp stains on fascia.

Photo 14 Narrow cracks, damp stains with efflorescence, & graffiti on southeast wingwall.

Photo 15 Typical deck soffit

Photo 16 Narrow longitudinal cracks noted with origins at abutment wall

Photo 17 Minor washout noted at southwest corner near deck end

Photo 18 Typical southwest wingwall with graffiti and damp map cracks throughout

Photo 19 Typical northwest embankment with rock protection at base

Photo 20 Narrow full length vertical cracks and graffiti noted on abutment walls (Typical)

Structure Condition Summary Form

Structure Name Boxwell Road Bridge
Structure Number 07
Date of Inspection June 3, 2022
Project No. 22035
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	9.20	0.00	5.60	2.60	1.00	8280	4716	57	00	08
	Wingwalls	Sq.m	350.00	7.00	0.00	3.00	2.00	2.00	2450	1068	44	00	08
Approaches	Wearing Surface	Sq.m	6.00	264.00	0.00	144.00	100.00	20.00	1584	888	56	09	12
Barriers	Barrier/ Parapet Walls	Sq.m	100.00	14.40	0.00	0.00	12.90	1.50	1440	516	36	08	00
Beams / Main	Girders	Sq.m	200.00	21.60	0.00	15.60	3.00	3.00	4320	2580	60	00	08
Decks	Deck Top - Thick Slab	Sq.m	350.00	33.12	0.00	13.12	18.00	2.00	11592	5964	51	00	08, 02
	Soffit - Thick Slab	Sq.m	350.00	36.00	0.00	29.00	5.00	2.00	12600	8313	66	00	08
									42266	**24044**			

Bridge Condition Index (BCI) **57**

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) **57**

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 07**

INVENTORY DATA:

Structure Name	Boxwell Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Boxwell Road		
Structure Location	900 m east of grand desert road , Lot 22, Con 5 Bonfield Ontario over Sharpes Creek		
Latitude	46° 13' 26.0" N	Longitude	79° 4' 18.5" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	40 km/h No. of Lanes 1
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Slab on Concrete Girders	Detour Length Around Structure	_____ (km)
Total Deck Length	7.2 (m)	Fill on Structure	_____ (m)
Overall Str. Width	4.6 (m)	Skew Angle	0 (Degrees)
Total Deck Area	33.1 (m^2)	Direction of Structure	E-W
Roadway Width	4.4 (m)	No. of Spans	1 (m)
Span Lengths	7.2 (m)		

HISTORICAL DATA

Year Built	1916	Last Biennial Inspection	August 7, 2020
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.: 07**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	16 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:		X		$ 10,000.00
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 30,000.00**

Special Notes:

A detailed deck condition survey is recommended due to the age of the structure.
It is recommended that the bridge be replaced in the next 6 to 10 years due to the condition and vintage of structure.
Deck barrier is substandard and should be replaced with a code compliant barrier.
No approach barrier was present at the time of the inspection; a code compliant approach barrier and end treatments should be installed.
Some localized medium to large potholes and settlement observed at deck ends. Concrete slope protection failed at southwest corner.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

ELEMENT DATA							
Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	4.4 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	264 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	144	100	20		09	12
Comments:	Generally in fair condition with unmaintained roadway. Some localized medium to large potholes and settlement observed at deck ends.						
None ☐	1 – 5 years ■		< 1 year ☐		Urgent ☐		

Element Group:	Approaches				**Length:**	-	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE & SW of structure				**Height:**	-	
Material:	-				**Count:**	-	
Element Type:	-				**Total Quantity:**	-	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	-	-	-		08	-
Comments:	No approach barrier present at the time of inspection. A code compliant approach barrier with end treatments should be installed.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Barrier				**Length:**	7.2 m	
Element Name:	Parapet Wall				**Width:**	-	
Location:	North & South of Structure				**Height:**	1.05 m	
Material:	Concrete				**Count:**	2	
Element Type:	Cast-in-Place Concrete				**Total Quantity:**	14.4 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	-	12.9	1.5		08	-
Comments:	Minor to moderate scaling and discoloration/moss on surface of concrete noted. Barrier is substandard and should be replaced with a code compliant barrier.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

BRIDGE **Site No.: 07**

Element Group:	Deck	**Length:**	-
Element Name:	Drainage	**Width:**	-
Location:	North & South Side of Deck	**Height:**	-
Material:	Steel	**Count:**	4
Element Type:	Deck Drains	**Total Quantity:**	4
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	-	2	2	-	02

Comments: Perforations noted at all drains and drains on north side of structure. Two drains at north are blocked with sand.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Deck	**Length:**	7.2 m
Element Name:	Deck Top (Exposed)	**Width:**	4.6 m
Location:	Top of Deck	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Thick Slab	**Total Quantity:**	33.12 m²
Environment:	Severe	**Not Inspected:**	■

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	13.12	18.0	2.0	-	08, 02

Comments: Limited inspection due to gravel accumulation from approaches. Moderate scaling, concrete deterioration and small surface spalls noted on exposed sections of deck. Gravel accumulation observed on edges.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	7.2 m
Element Name:	Soffit - Thick Slab (Exterior)	**Width:**	-
Location:	North & South Underside of Deck	**Height:**	0.2 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	2.88 m²
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	0.88	1	1	-	08

Comments: Large spalls with exposed corroded reinforcement observed on north and south fascia.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

BRIDGE **Site No.: 07**

Element Group:	Decks	**Length:**	7.2 m
Element Name:	Soffit - Thick Slab (Interior)	**Width:**	4.6 m
Location:	Underside of Deck	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	33.12 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	28.12	4	1	-	08

Comments: Light scaling and honeycombing. Some spalls with efflorescence noted.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Beams/MLE's	**Length:**	7.2 m
Element Name:	Girders	**Width:**	0.25 m
Location:	Underside of Deck	**Height:**	0.25 m
Material:	Concrete	**Count:**	4
Element Type:	Girder	**Total Quantity:**	21.6 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	15.6	3	3	-	08

Comments: Moderate scaling and spalls with exposed corroded reinforcement noted.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Beams/MLE's	**Length:**	1.2 m
Element Name:	Diaphragms	**Width:**	0.25 m
Location:	Underside of Deck	**Height:**	0.2 m
Material:	Concrete	**Count:**	3
Element Type:	Diaphragm	**Total Quantity:**	2.52 m²
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	2.27	0.25	-	-	-

Comments: Light to moderate scaling.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

BRIDGE **Site No.: 07**

Element Group:	Abutments	**Length:**	1.75 m
Element Name:	Wingwalls	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	1 m
Material:	Concrete	**Count:**	4
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	7 m^2
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m^2	-	3	2	2	-	08

Comments: Generally in good condition with minor scaling, narrow cracks and efflorescence. Area of concrete deterioration observed on northwest wingwall. Undermining observed on southwest wingwall.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	4.6 m
Element Name:	Abutment Walls	**Width:**	-
Location:	East & West Underside of Structure	**Height:**	1 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	9.2 m^2
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m^2	-	5.6	2.6	1.0	-	08

Comments: Moderate scaling, narrow longitudinal cracks and efflorescence noted on abutment walls. Concrete footings have narrow transverse cracks, minor undermining, and spalls at northeast corner. Some exposed rebar on east footing was also noted.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	-	**Height:**	-
Material:	-	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	-	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
N/A	-	-	-	-	-	-

Comments: No evidence of instability.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 07**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Embankment	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
%	-	100	-	-	-	-

Comments: Moderately sloped, well vegetated and appear stable. Concrete slope protection failed at southwest corner.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Roadway	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
All	-	All	-	-	-	-

Comments: Moderate volume and high flow from south to north observed at the time inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 07**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install guiderail			X	$ -
Deck & Girders	Concrete repairs to deck top, Abutment walls, deck soffit, & girders		X		$ -
Structure	Replacement	X			$ 354,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 354,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		$ 10,000.00
Other		
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Large potholes on east approach.

Photo 8 Moderate scaling, small spalls and dirt accumulation on exposed deck top.

Photo 9 Light to moderate scaling and discoloration noted on parapet wall

Photo 10 Large spall with exposed corroded reinforcing on north fascia.

Photo 11 Spalls with exposed corroded reinforcement on face of exterior girder

Photo 12 Corrosion and perforation noted at deck drain (Typical)

Photo 13 Typical east underside of structure

Photo 14 Spall with exposed corroded reinforcing steel on abutment wall

Photo 15 Moderate scaling and efflorescence stains noted on abutment wall

Photo 16 Severe scaling on ballast wall and cracks with efflorescence noted on deck soffit

Photo 17 Spall and longitudinal cracks noted on girders

Photo 18 Concrete slope protection at southwest corner failed

Structure Condition Summary Form

Structure Name Trunk Road Bridge
Structure Number 08
Date of Inspection June 03, 2022
Project No. 22035
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	26.40	0.00	6.60	13.20	6.60	23760	9207	39	01	00
	Wingwalls	Sq.m	350.00	9.90	0.00	0.00	4.95	4.95	3465	693	20	01	00
Approaches	Wearing Surface	Sq.m	6.00	360.00	0.00	240.00	70.00	50.00	2160	1248	58	09	00
Barriers	Barrier/ Parapet Walls	Sq.m	100.00	8.00	0.00	0.00	0.00	8.00	800	0		08	00
Decks	Deck Top - Thick Slab	Sq.m	350.00	19.80	0.00	11.80	5.00	3.00	6930	3798	55	00	02, 08
	Soffit - Thick Slab	Sq.m	350.00	24.00	0.00	0.00	12.00	12.00	8400	1680	20	00	08
									45515	**16626**			

Bridge Condition Index (BCI)	**37**	
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)	**37**	

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 08**

INVENTORY DATA:

Structure Name	Trunk Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Trunk Road		
Structure Location	1.1 km east of trout pond road , Lot 23, Con 9 Bonfield Ontario over Blueseal Creek		
Latitude	46° 15' 26.0" N	Longitude	79° 5' 7.6" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	_____ No. of Lanes 1
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ■ School ■ Bicycle ■
Structure Type	Concrete Slab	Detour Length Around Structure	_____ (km)
Total Deck Length	3.6 (m)	Fill on Structure	_____ (m)
Overall Str. Width	6.0 (m)	Skew Angle	0 (Degrees)
Total Deck Area	21.6 (m^2)	Direction of Structure	E-W
Roadway Width	5.5 (m)	No. of Spans	1 (m)
Span Lengths	3.6 (m)		

HISTORICAL DATA

Year Built	1930 (est)	Last Biennial Inspection	August 6, 2020
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.: 08**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Overcast
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$ 5,000.00
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:		X		$ 10,000.00
Load Posting - Estimated Load			Total Cost	**$ 35,000.00**

Special Notes:

Due to the vintage and condition of the structure, it is recommended a detailed deck condition survey and a rehabilitation / replacement study be performed for load posting and that the structure be replaced in 1 – 5 years. The structural evaluation is to calculate a load posting for the current state of the structure. A code compliant approach barrier should be installed. The deck barrier is missing 2 posts and exposed corroded reinforcement is observed throughout. A code compliant deck barrier should be installed. Spalls with exposed corroded reinforcement and delaminations throughout deck soffit.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

BRIDGE **Site No.: 08**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	-	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE, & SW of Structure				**Height:**	-	
Material:	-				**Count:**	-	
Element Type:	-				**Total Quantity:**	-	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
-	-	-	-	-		08	-
Comments:	No approach barrier was present at the time of inspection; a code compliant barrier with end treatments should be installed.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	6 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Surface Treatment				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	360 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	240	70	50		09	-
Comments:	Patched potholes on west approach where a pothole had been previously patched and light to moderate ravelling observed. Patches and potholes observed on both approaches. Patched areas appear to be depressed.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Accessories				**Length:**	-	
Element Name:	Signs				**Width:**	-	
Location:	NE, NW, SE, & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	4	
Element Type:	Hazard signs				**Total Quantity:**	4	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	-	4	-		-	-
Comments:	Localized damages on all signs. Southeast and southwest hazard sign leaning slightly away from roadway.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

BRIDGE **Site No.: 08**

Element Group:	Barrier	**Length:**	4 m
Element Name:	Parapet Wall	**Width:**	-
Location:	North & South Sides of Structure	**Height:**	1m
Material:	Concrete	**Count:**	2
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	8 m^2
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	-	-	8	08	-

Comments: Medium map cracks, efflorescence, damp stains, exposed corroded reinforcement and narrow to large cracks throughout. Two missing left posts with steel placed in front at north. End post at south was detached. Top rail at northwest corner was not present at the time of inspection. Barrier is substandard and should be replaced with a code compliant barrier.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Deck	**Length:**	-
Element Name:	Drainage System	**Width:**	-
Location:	North & South of Structure	**Height:**	-
Material:	Steel	**Count:**	4
Element Type:	Metal Drainpipes	**Total Quantity:**	4
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	-	3	1	-	02

Comments: Generally in good condition. One deck drains covered by gravel/sand.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Deck	**Length:**	3.6 m
Element Name:	Deck Top	**Width:**	5.5 m
Location:	Top of Deck (Exposed)	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	19.8 m^2
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	11.8	5	3	-	02,08

Comments: Minor scaling and medium cracks were observed. Some debris accumulation noted. Spalls, medium to wide cracks with gravel accumulation noted on sides.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

BRIDGE **Site No.: 08**

Element Group:	Decks	**Length:**	4 m
Element Name:	Soffit - Thick Slab (Exterior)	**Width:**	0.3 m
Location:	Underside of Structure	**Height:**	-
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	2.4 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	-	1.2	1.2	-	08

Comments: Narrow crack with damp and rust stains noted on north fascia. Some severe localized efflorescence observed on south fascia. Large area of deterioration noted at south.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	3.6 m
Element Name:	Soffit - Thick Slab (Interior)	**Width:**	6.0 m
Location:	Underside of Structure	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	21.6 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	-	10.8	10.8	-	-

Comments: Spalls with exposed corroded reinforcement and severe delamination observed throughout soffit. Efflorescence, damp stains and narrow longitudinal and transverse cracks noted on fascias.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	1.65 m
Element Name:	Wingwalls	**Width:**	-
Location:	NE, NW, SE, SW of Structure	**Height:**	1.5 m
Material:	Concrete	**Count:**	4
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	9.9 m²
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	-	4.95	4.95	01	-

Comments: Narrow cracks and efflorescence at north wingwalls. Some wide cracks at both wingwalls were also noted.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	6 m
Element Name:	Abutment Walls	**Width:**	-
Location:	East & West Underside of Structure	**Height:**	2.2 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	26.4 m²
Environment:	Benign	**Not Inspected:**	■
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	6.6	13.2	6.6	01	-

Comments: Medium to wide crack with efflorescence. Some Moderate scaling was also noted. Limited inspection due to high water levels. Wide vertical cracks noted. Spall observed on haunches.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	-	**Height:**	-
Material:	-	**Count:**	2
Element Type:	Unknown	**Total Quantity:**	2
Environment:	Benign	**Not Inspected:**	☐
Protection System	-	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	-	-	-	01	-

Comments: Unable to confirm condition due to high water levels Large spalls noted on east footing. Displacement observed at northeast corner of footing.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, SW of Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Embankment	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
%	-	100	-	-	-	-

Comments: Moderate slope, well vegetated and appear stable. Wide crack noted at southeast wingwall and abutment.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 08**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Roadway	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	all
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	**Excellent**	**Good**	**Fair**	**Poor**	**Performance Deficiencies**	**Maintenance Needs**
all	-	all	-	-	-	18

Comments: Low volume, low flow with some branches blocking the waterways.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 08**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 – 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install guiderail			X	$ -
Barrier	Install code compliant traffic barrier			X	$ -
Structure	Replace Structure		X		$ 239,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 239,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		$ 10,000.00
Other		
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Asphalt patches and small pothole on west approach wearing surface

Photo 8 Exposed corroded reinforcement and steel beam on barrier

Photo 9 Severe spall and cracks with efflorescence noted on south fascia

Photo 10 Spalls with exposed corroded reinforcement and severe delamination on soffit.

Photo 11 Minor scaling, medium spall and debris noted on deck top

Photo 12 Narrow cracks with efflorescence noted on northwest wingwall.

Photo 13 Medium crack with efflorescence observed on abutment wall

Photo 14 Small spall and longitudinal cracks noted at haunches

Photo 15 Large spall with crack noted on southeast wingwall

Photo 16 Moderate scaling, narrow cracks with efflorescence noted on west abutment wall

Structure Condition Summary Form

Structure Name Pine Lake Road Bridge
Structure Number 10
Date of Inspection June 03, 2022
Project No. 22035
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	115.53	0.00	114.53	1.00	0.00	103977	77668	75	00	02
	Wingwalls	Sq.m	350.00	182.44	0.00	177.44	5.00	0.00	63854	47278	74	00	00
Approaches	Wearing Surface	Sq.m	6.00	104.40	0.00	46.20	52.20	6.00	626	333	53	00	02, 12
Barriers	Posts - Timber	Each	50.00	30.00	0.00	23.00	7.00	0.00	1500	1003	67	08	00
	Railing Systems	m	200.00	26.00	0.00	18.00	4.00	4.00	5200	3020	58	08	00
Decks	Deck Top - Thick Slab	Sq.m	350.00	115.54	0.00	0.00	115.54	0.00	40439	16176	40	00	00
	Soffit-Inside Boxes	Sq.m	125.00	128.82	0.00	123.82	5.00	0.00	16103	11858	74	00	00
	Wearing Surface	Sq.m	25.00	115.54	0.00	50.54	55.00	10.00	2889	1498	52	09	12
									234587	**158833**			

Bridge Condition Index (BCI)	**68**	
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)	**68**	

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 10**

INVENTORY DATA:

Structure Name	Pine Lake Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Pine Lake Road		
Structure Location	Lot 31, Con 9 Bonfield Ontario over Sheedy Lake, 1.35 m north of highway 17		
Latitude		Longitude	
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	_____ No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ■ School ■ Bicycle ■
Structure Type	Concrete Rigid Frame	Detour Length Around Structure	_____ (km)
Total Deck Length	13.28 (m)	Fill on Structure	_____ (m)
Overall Str. Width	9.7 (m)	Skew Angle	0 (Degrees)
Total Deck Area	128.82 (m^2)	Direction of Structure	N-S
Roadway Width	8.7 (m)	No. of Spans	1 (m)
Span Lengths	13.28 (m)		

HISTORICAL DATA

Year Built	1983	Last Biennial Inspection	August 6, 2020
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.: 10**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Overcast
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:		X		$ 10,000.00
Bridge Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 15,000.00**

Special Notes:

Rehabilitation/replacement study is for traffic barrier only.
A detailed deck condition survey is recommended due to the age of the structure.

Some collision damage was noted on southeast and southwest approach barriers. Adequacy of deck barrier should be verified. Approach barrier end treatments are substandard and should be replaced with code compliant end treatment. Hazard signs should be installed. Medium to wide longitudinal and transverse cracks noted in approach and deck wearing surface.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

ELEMENT DATA							
Element Group:	Approaches				**Length:**	17 m	
Element Name:	Barrier				**Width:**	-	
Location:	North & South of Structure				**Height:**	-	
Material:	Steel				**Count:**	2	
Element Type:	Steel Flex Beam on Wood Post				**Total Quantity:**	34 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	28	3	3		08	-
Comments:	Localized rust on steel and few checks on wood posts. Some damage was also noted on southeast and southwest approach barriers. Existing buried end treatments are substandard and should be replaced with code compliant end treatment. Hazard signs should be installed at guiderail ends.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	6 m	
Element Name:	Wearing Surface				**Width:**	8.7 m	
Location:	North & South of Structure				**Height:**	-	
Material:	Asphalt				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	104.4 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	46.2	52.2	6		-	02, 12
Comments:	Medium to wide longitudinal and transverse cracks. Light to moderate ravelling and abrasion noted throughout and sunken pavement at the east side of the north approach. Potholes observed on the north approach. Sand builds up at edge of roadway.						
None ☐	1 – 5 years ■	< 1 year ☐	Urgent ☐				

Element Group:	Barrier				**Length:**	13 m	
Element Name:	Railing System				**Width:**	-	
Location:	East & West side of Structure				**Height:**	-	
Material:	Steel				**Count:**	2	
Element Type:	Traffic Barrier				**Total Quantity:**	26 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Paint					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	18	4	4		08	-
Comments:	Localized rust and some collision damage noted on east end west barrier. Barrier adequacy over structure should be verified to ensure it meets current standards.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

BRIDGE **Site No.: 10**

Element Group:	Barrier	**Length:**	-
Element Name:	Barrier post	**Width:**	-
Location:	East & West side of Structure	**Height:**	-
Material:	Timber	**Count:**	30
Element Type:	Timber posts	**Total Quantity:**	30
Environment:	Severe	**Not Inspected:**	☐
Protection System	Paint	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
each	-	23	7	-	08	-

Comments: Generally in good condition with a few checks and moderate rotting on wood posts.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Deck	**Length:**	13.28 m
Element Name:	Wearing Surface	**Width:**	8.7 m
Location:	Top of Deck	**Height:**	-
Material:	Asphalt	**Count:**	1
Element Type:	Wearing Surface	**Total Quantity:**	115.54 m²
Environment:	Severe	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	50.54	55	10	09	12

Comments: Medium to wide longitudinal and transverse cracks, map cracks and abrasion noted throughout.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Decks	**Length:**	13.28 m
Element Name:	Soffit - Thick Slab (exterior)	**Width:**	-
Location:	Underside of Structure	**Height:**	0.4 m
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	10.63 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m²	-	10.63	-	-	-	-

Comments: Some localized efflorescence noted near abutment walls.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

BRIDGE **Site No.: 10**

Element Group:	Decks	**Length:**	13.28 m
Element Name:	Soffit - Thick Slab (Interior)	**Width:**	9.7 m
Location:	Underside of Structure	**Height:**	-
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	128.82 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	123.82	5	-	-	-

Comments: Narrow cracks and previously patched spalls noted on soffit. Some damp stains also noted near both abutment walls. Stalactites noted on near the abutment walls.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	7.5 m
Element Name:	Wingwalls	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	6.31 m (N), 5.6 m (S)
Material:	Concrete	**Count:**	4
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	182.44 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	177.44	5	-	-	-

Comments: Minor scaling, efflorescence and narrow horizontal cracks noted.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Abutments	**Length:**	9.7 m
Element Name:	Abutment Walls	**Width:**	-
Location:	North & South of Structure	**Height:**	6.31 m (N), 5.6 m (S)
Material:	Concrete	**Count:**	2
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	115.53 m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m²	-	114.53	1	-	-	02

Comments: Narrow full height vertical crack observed at centre drainage hole of both abutment walls and water stains at the edges of abutment walls. Some graffiti are also present on walls.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 10**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	-	**Height:**	-
Material:	-	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, N, SE, SW, & S of Structure	**Height:**	-
Material:	Native	**Count:**	6
Element Type:	Embankment	**Total Quantity:**	6
Environment:	Benign	**Not Inspected:**	□

Protection System	Rock Protection				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
each	-	6	-	-	-	-

Comments: Moderately sloped, well vegetated and appear stable. Rock slope protection was observed at the embankments in front of the north and south abutments.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Slope Protection	**Width:**	-
Location:	North & South Underside of Structure	**Height:**	-
Material:	Rocks	**Count:**	2
Element Type:	Slope Protection	**Total Quantity:**	2
Environment:	Benign	**Not Inspected:**	□

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
each	-	2	-	-	-	-

Comments: Slope protection in good condition.

None ■ 1 – 5 years □ < 1 year □ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 10**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Roadway	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
%	-	100	-	-	-	-

Comments: Medium volume and high flow from west to east with no visible flow obstructions noted in the stream at the time of inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 10**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 – 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Replace end treatments with code compliant end treatment, replace damaged sections of guiderail			X	$ 24,000.00
				Total Cost	**$ 24,000.00**

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

JUSTIFICATION

Photo 1 Structure from north approach

Photo 2 Structure from south approach

Photo 3 North approach from centre of structure

Photo 4 South approach from centre of structure

Photo 5 East elevation

Photo 6 West elevation

Photo 7 Wide longitudinal and transverse cracks noted on wearing surface

Photo 8 Damage observed on steel beam at southwest corner

Photo 9 Narrow crack with efflorescence on north deck soffit

Photo 10 Typical deck soffit with previous concrete repairs

Photo 11 Typical northeast wingwall

Photo 12 Typical north abutment wall

Photo 13 Graffiti on south abutment wall

Structure Condition Summary Form

Structure Name Line 3 North Road Bridge
Structure Number 12
Date of Inspection June 03, 2022
Project No. 22035
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	95.47	0.00	95.47	0.00	0.00	85923	64442	75	00	00
Approaches	Wearing Surface	Sq.m	6.00	42.90	0.00	25.90	15.00	2.00	257	153	59	00	02, 12
Barriers	Posts - Timber	Each	50.00	22.00	0.00	22.00	0.00	0.00	1100	825	75	00	00
	Railing Systems	m	200.00	33.00	0.00	32.00	0.50	0.50	6600	4840	73	08	00
Beams / Main	Girders -Steel	Sq.m	420.00	90.63	0.00	90.63	0.00	0.00	38065	28548	75	00	00
Decks	Deck Top - Thin Slab	Sq.m	120.00	138.60	0.00	138.60	0.00	0.00	16632	12474	75	00	00
	Soffit - Thin Slab	Sq.m	120.00	145.20	0.00	145.20	0.00	0.00	17424	13068	75	00	00
	Wearing Surface	Sq.m	25.00	117.98	0.00	111.98	5.00	1.00	2950	2150	73	00	12
Sidewalks/ Curbs	Curbs	Sq.m	40.00	23.10	0.00	23.10	0.00	0.00	924	693	75	00	00
									169875	**127193**			

Bridge Condition Index (BCI) **75**

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) **75**

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 12**

INVENTORY DATA:

Structure Name	Line 3 North Road Bridge		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Line 3 North Road		
Structure Location	250m North of Highway 17, Lot 17, Con 12 Bonfield Ontario over Kaibuskong River		
Latitude	46º 16' 19" N	Longitude	79º 8' 15" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	- No. of Lanes 1
Old County	Nipissing	AADT	- % Trucks -
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ■ School ■ Bicycle ■
Structure Type	Concrete Slab on Steel Girders	Detour Length Around Structure	(km)
Total Deck Length	16.5 (m)	Fill on Structure	(m)
Overall Str. Width	8.4 (m)	Skew Angle	(Degrees)
Total Deck Area	138.6 (m^2)	Direction of Structure	N-S
Roadway Width	7.15 (m)	No. of Spans	1 (m)
Span Lengths	16.5 (m)		

HISTORICAL DATA

Year Built		Last Biennial Inspection	August 6, 2020
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.: 12**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Overcast
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:			X	$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:
Rehabilitation / replacement study is for barrier only.

Structure is generally in good condition. Code compliant end treatment should be installed. Adequacy of deck barrier should be verified. Washout noted in approach wearing surface at northeast and northwest corners.

Next Detailed Inspection:	June 2024

Suspected 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

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	10.1 m	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Steel and Timber				**Count:**	2	
Element Type:	Steel Flex Beam on Timber Posts				**Total Quantity:**	20.2 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	6.2	10	4		08	-
Comments:	Multiple rotated and loose spacers observed on approach barrier. Section of flex beam on northeast barrier not connected to post due to bend in flex beam. Buried end treatments are not code compliant. Code compliant end treatments should be installed. Rating is based on condition only.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	6 m	
Element Name:	Wearing Surface				**Width:**	7.15 m	
Location:	North & South of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	42.9 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	25.9	15	2		-	02, 12
Comments:	Generally in fair condition with tire rutting on south approach near the deck. Some debris accumulation noted on the deck. Washout noted at northeast and northwest corner. Depression observed in wearing surface at south approach.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Accessories				**Length:**	-	
Element Name:	Hazard Signs, Narrow Lane Signs				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	6	
Element Type:	Steel Hazard Signs, Narrow Lane Signs				**Total Quantity:**	6	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot Dip Galvanizing					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	5	1	-		-	-
Comments:	Generally in good condition with some abrasions noted on signs. Northeast hazardous sign is leaning.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Barrier				**Length:**	16.5 m	
Element Name:	Railing System				**Width:**	-	
Location:	East & West Sides of Structure				**Height:**	-	
Material:	Steel				**Count:**	2	
Element Type:	Steel Flex Beam on Wood Posts				**Total Quantity:**	33 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	32	0.5	0.5		08	-
Comments:	Vehicle damage observed on barrier at southeast and northwest corners of deck. Multiple rotated and loose spacers on deck barrier. Adequacy of deck barrier should be verified.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Barriers				**Length:**	-	
Element Name:	Posts				**Width:**	-	
Location:	East & West Sides of Structure				**Height:**	-	
Material:	Timber				**Count:**	22	
Element Type:	Timber Posts				**Total Quantity:**	22	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	22	-	-		-	-
Comments: Many rotated spacers observed on deck barrier. Checks and splits observed in timber posts. Posts are generally in good condition.							
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Sidewalks/Curbs				**Length:**	16.5 m	
Element Name:	Curbs				**Width:**	0.6 m	
Location:	East & West Sides of Structure				**Height:**	0.1 m	
Material:	Concrete				**Count:**	2	
Element Type:	Concrete Curb				**Total Quantity:**	23.1 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	23.1	-	-		-	-
Comments:	Narrow cracks observed on horizontal face and vertical face of curb. Small spall noted at southeast corner.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Deck				**Length:**	16.5 m	
Element Name:	Wearing Surface				**Width:**	7.15 m	
Location:	Top of Deck				**Height:**	-	
Material:	Asphalt				**Count:**	1	
Element Type:	Asphalt Wearing Surface				**Total Quantity:**	117.98 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	111.98	5.0	1		-	12
Comments:	Generally in good condition with minor scaling and some small gouges in the middle of roadway. Small potholes observed on the deck.						
None ☐	1 – 5 years ■		< 1 year ☐		Urgent ☐		

Element Group:	Decks				**Length:**	16.5 m	
Element Name:	Deck Top (Covered)				**Width:**	8.4 m	
Location:	Top of Deck				**Height:**	-	
Material:	Concrete				**Count:**	138.6 m²	
Element Type:	Thick Slab				**Total Quantity:**	m²	
Environment:	Moderate				**Not Inspected:**	■	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	138.6	-	-		-	-
Comments:	Deck top not visible due to asphalt wearing surface; rating is based on condition of deck wearing surface and soffit.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Decks				**Length:**	16.5 m	
Element Name:	Soffit - Thin Slab (Exterior)				**Width:**	0.8 m	
Location:	East & West Underside of Deck				**Height:**	0.5 m	
Material:	Concrete				**Count:**	2	
Element Type:	Cast-In-Place Concrete				**Total Quantity:**	42.9 m²	
Environment:	Moderate				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	42.9	-	-		-	-
Comments:	Generally in good condition with damp stains, narrow transverse cracks and map cracks. Efflorescence and narrow longitudinal cracks with damp stains noted on fascias.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Decks			**Length:**	16.5 m		
Element Name:	Soffit - Thin Slab (Interior)			**Width:**	6.2 m		
Location:	Underside of Deck			**Height:**	-		
Material:	Concrete			**Count:**	1		
Element Type:	Thick Slab			**Total Quantity:**	102.3 m²		
Environment:	Benign			**Not Inspected:**	☐		
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	102.3	-	-		-	-
Comments: Generally in good condition with damp stains, narrow transverse and map cracks							
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Beams/MLE's			**Length:**	15.9 m		
Element Name:	Girders			**Width:**	0.20 m		
Location:	Underside of Structure			**Height:**	0.65 m		
Material:	Weathering Steel			**Count:**	3		
Element Type:	Steel I Girders			**Total Quantity:**	90.63 m²		
Environment:	Moderate			**Not Inspected:**	☐		
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	90.63	-	-		-	-
Comments: Girders are in good condition with some localized light corrosion observed.							
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Beams/MLE's			**Length:**	2.1 m		
Element Name:	Diaphragms			**Width:**	0.102 m		
Location:	Underside of Structure			**Height:**	0.33 m		
Material:	Weathering Steel			**Count:**			
Element Type:	Diaphragm			**Total Quantity:**	6		
Environment:	Moderate			**Not Inspected:**	☐		
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	6	-	-		-	-
Comments: Diaphragms are in good condition with some localized light corrosion.							
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Abutments				**Length:**	0.9 m	
Element Name:	Abutment Walls				**Width:**	8.05 m	
Location:	North & South Underside of Structure				**Height:**	5.93 m	
Material:	Concrete				**Count:**	2	
Element Type:	Cast-in-Place Concrete				**Total Quantity:**	95.47 m^2	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m^2	-	95.47	-	-		-	-

Comments: Visible portion is generally in good condition with narrow transverse cracks and damp stains. Rust stains originating from girders on north abutment wall.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Abutments				**Length:**	1.5 m	
Element Name:	Wingwalls				**Width:**	-	
Location:	NE, NW, SW & SW of Structure				**Height:**	5.25 m	
Material:	Concrete				**Count:**	4	
Element Type:	Cast-in-Place Concrete				**Total Quantity:**	31.5 m^2	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m^2	-	31.5	-	-		-	-

Comments: **G**enerally in good condition with narrow horizontal cracks.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Foundations				**Length:**	-	
Element Name:	Foundations (below ground level)				**Width:**	-	
Location:	Below Abutments				**Height:**	-	
Material:	Unknown				**Count:**	-	
Element Type:	Unknown				**Total Quantity:**	-	
Environment:	Benign				**Not Inspected:**	■	
Protection System	Unknown					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
N/A	-	-	-	-		-	-

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

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 12**

ELEMENT DATA							
Element Group:	Embankment and Streams				**Length:**	-	
Element Name:	Embankments				**Width:**	-	
Location:	NE, NW, N, SE, SW & S of Structure				**Height:**	-	
Material:	Native				**Count:**	6	
Element Type:	Embankment				**Total Quantity:**	6	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	Rock Protection					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	6	-	-		-	-
Comments:	Moderately sloped, no vegetation and stable with rocks for slope protection. Drainage pipes noted at embankments.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Embankment and Streams				**Length:**	-	
Element Name:	Slope Protection				**Width:**	-	
Location:	NE, NW, N, SE, SW & S of Structure				**Height:**	-	
Material:	Rocks				**Count:**	6	
Element Type:	Rock Slope Protection				**Total Quantity:**	6	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	6	-	-		-	-
Comments:	Rock protection is in good condition.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Embankment and Streams				**Length:**	-	
Element Name:	Streams and Waterways				**Width:**	-	
Location:	Below Structure				**Height:**	-	
Material:	Native				**Count:**	-	
Element Type:	Stream				**Total Quantity:**	All	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	All	-	-		-	-
Comments:	Moderate volume and moderate flow from west to east with no visible flow obstructions.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

MUNICIPAL STRUCTURE INSPECTION FORM

BRIDGE **Site No.: 12**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install Code Compliant End Treatment			X	$ 24,000.00
				Total Cost	**$ 24,000.00**

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

JUSTIFICATION

Photo 1 Structure from north approach

Photo 2 Structure from south approach

Photo 3 North approach from centre of structure

Photo 4 South approach from centre of structure

Photo 5 East elevation

Photo 6 West elevation

Photo 7 Collision damage noted on approach barrier at northeast corner

Photo 8 Checks and splits on barrier post with damaged and rotated spacer block

Photo 9 Vehicle damaged noted on deck barrier at southeast corner

Photo 10 Washout noted in wearing surface at north approach

Photo 11 Minor scaling and small gouges noted in middle of deck wearing surface

Photo 12 Small spall noted in curb at southeast corner

Photo 13 North underside of structure

Photo 14 Typical northwest wingwall

Photo 15 North abutment wall

Photo 16 South abutment wall

ATTACHMENT 2

OSIM INSPECTION REPORTS & BCI FORMS

CULVERTS

Structure Condition Summary Form

Structure Name Grand Desert Road Culvert
Structure Number 03
Date of Inspection June 03, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	303.00	0.00	253.00	50.00	0.00	1818	1259	69	00	00
Culvert	Barrel	Sq.m	350.00	96.63	0.00	94.63	2.00	0.00	33821	25120	74	00	00
Retaining Walls	Walls	Sq.m	350.00	12.00	0.00	12.00	0.00	0.00	4200	3150	75	00	00
									39839	**29529**			

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

CULVERT **Site No.: 03**

S

INVENTORY DATA:

Structure Name	Grand Desert Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Grand Desert Road		
Structure Location	Creek 2.8 km south of Boxwell road , Lot 23, Con 3 Bonfield Ontario over Sharpes		
Latitude	46° 12' 18.7" N	Longitude	79° 3' 34.6" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	40 km/h No. of Lanes 1
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Concrete Culvert	Detour Length Around Structure	_____ (km)
Total Deck Length	9.28 (m)	Fill on Structure	_____ (m)
Overall Str. Width	5.52 (m)	Skew Angle	0 (Degrees)
Total Deck Area	51.23 (m^2)	Direction of Structure	E-W
Roadway Width	4.75 (m)	No. of Spans	1 (m)
Span Lengths	9.28 (m)		

HISTORICAL DATA

Year Built	2009	Last Biennial Inspection	August 7, 2020
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)

- Structure replaced in 2009

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 03**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P. Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	16 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:

Rehabilitation / replacement study is for barrier only.

Approach barrier end treatments are substandard and should be replaced with code compliant end treatments. Some medium potholes and longitudinal grooves on the east approach. Some localized map cracks were observed on the north and south ends of the barrel. Bug holes observed in barrel.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

CULVERT **Site No.: 03**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	27 m	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE, & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	4	
Element Type:	Steel Flex Beam on Wood Posts				**Total Quantity:**	108 m	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	108	-	-		08	18- Fix Wood spots
Comments:	Generally in good condition with few checks and splits noted on wood posts. Barrier end treatments are substandard and should be replaced with code compliant end treatments. Rotated spacer blocks noted on barriers. Impact noted at southwest end.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	4.75 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel/ Asphalt				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	285 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	235	50	0		00	00
Comments:	Generally in good to fair condition with some medium potholes and longitudinal grooves on the east approach.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Signs				**Length:**	-	
Element Name:	Signs				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	7	
Element Type:	Narrow Road Signs & hazard signs				**Total Quantity:**	7	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
Each	-	6	1	-		-	-
Comments:	Narrow road sign at east approaches is in good condition. Hazard sign at west is deformed. Northeast hazard sign is damaged. A 2nd narrow road sign is present further on the east approach						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 03**

Element Group:	Culvert	**Length:**	9.28 m
Element Name:	Barrel	**Width:**	5.52 m
Location:	Below roadway	**Height:**	2.17 m
Material:	Concrete	**Count:**	1
Element Type:	Cast-In-Place Concrete	**Total Quantity:**	96.63m²
Environment:	Moderate	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m^2	-	94.63	2	-	-	-

Comments: Generally in good condition with some small spalls. Some localized map cracks were observed on the north and south ends of the barrel. Bug holes observed in barrel.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	Unknown		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Retaining walls	**Length:**	3 m
Element Name:	Walls	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Stones	**Count:**	4
Element Type:	Gabion Baskets	**Total Quantity:**	12 m
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
m	-	12	-	-	-	-

Comments: Gabion baskets are in good condition.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 03**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐

Protection System	Rock Protection				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	4	-	-	-	-

Comments: Moderately sloped and appear stable with rock slope protection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Slope Protection	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Rocks	**Count:**	4
Element Type:	Slope Protection	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	4	-	-	-	-

Comments: Generally in good condition.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	all
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
All	-	all	-	-	-	-

Comments: Moderate volume and low flow from south to north with no visible obstructions noted in the stream at the time of inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 03**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install code compliant end treatments			X	$ 24,000.00
				Total Cost	**$ 24,000.00**

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

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Tire rutting and loose gravel on east approach.

Photo 8 Longitudinal grooves on structure wearing surface

Photo 9 Stained map cracks noted on exterior face of soffit

Photo 10 Narrow transverse crack noted in centre of soffit at south end

Photo 11 Typical view gabion basket wall and slope protection at southwest corner

Photo 12 Bug holes noted throughout barrel soffit

Structure Condition Summary Form

Structure Name Grand Desert Road Culvert
Structure Number 04
Date of Inspection June 03 , 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	468.00	0.00	438.00	20.00	10.00	2808	2019	72	09	13
	Barrel	Sq.m	350.00	258.24	0.00	0.00	129.12	129.12	90384	18077	20	01	00
Culvert	Inlet Components	Sq.m	350.00	4.00	0.00	4.00	0.00	0.00	1400	1050	75	00	00
	Outlet Components	Sq.m	350.00	4.00	0.00	4.00	0.00	0.00	1400	1050	75	00	00
									95992	**22196**			

Bridge Condition Index (BCI)	**23**	
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)	**23**	

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 04**

INVENTORY DATA:

Structure Name	Grand Desert Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Grand Desert Road		
Structure Location	1.9 km west of boundary road , Lot 26, Con 2 Bonfield Ontario over Sharpes Creek		
Latitude	46° 12' 31.5" N	Longitude	79° 2' 33.6" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	40 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Circular CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	3 (m)	Fill on Structure	2.4 (m)
Overall Str. Width	27.4 (m)	Skew Angle	21 (Degrees)
Total Deck Area	82.2 (m^2)	Direction of Structure	N-S
Roadway Width	7.8 (m)	No. of Spans	1 (m)
Span Lengths	3 (m)		

HISTORICAL DATA

Year Built	1970 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 04**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	20 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:

Rehabilitation / replacement study is for culvert barrier and barrel.
Low barrier with 4 buried ends does not conform to current standards and should be replaced.
Moderate to severe corrosion and perforations at water level; it is recommended the structure be replaced in 1-5 years. Deformation at south end of barrel.
Separation of plates noted along most of the west side of pipe. It is recommended to monitor the barrel movement.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

CULVERT **Site No.: 04**

ELEMENT DATA							
Element Group:	Approach				**Length:**	35 m	
Element Name:	Barrier				**Width:**	-	
Location:	North & South of Structure				**Height:**	-	
Material:	Steel				**Count:**	2	
Element Type:	Steel Beam Guiderail on Wood Posts				**Total Quantity:**	70 m	
Environment:	Moderate				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	59	10	1		08	-
Comments:	Posts are weathered with some checks and rot. Steel barrier has few dents from vehicular impact with an area of localized rust. Low barrier with 4 buried ends does not conform to current standards and should be replaced.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	7.8 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	468 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	468	-	-		-	-
Comments:	Generally in good condition with some loose gravel and localized washout on north side. Gravel accumulation noted at side of the road.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Culvert				**Length:**	-	
Element Name:	Inlet Components				**Width:**	-	
Location:	South of Structure				**Height:**	-	
Material:	Concrete				**Count:**	4	
Element Type:	Cast-in-Place Concrete				**Total Quantity:**	4	
Environment:	Moderate				**Not Inspected:**	■	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	4	-	-		-	-
Comments:	Not visible at time of inspection. Beaver dam obstructing flow through barrel at inlet.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

CULVERT **Site No.: 04**

Element Group:	Culvert	**Length:**	-
Element Name:	Outlet Components	**Width:**	-
Location:	North of Structure	**Height:**	-
Material:	Concrete	**Count:**	-
Element Type:	Cast-in-Place Concrete	**Total Quantity:**	4 m^2
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	4	-	-	-	-

Comments: Visible portion is in good condition with moderate scaling. Moss grown at outlet of the culvert barrel.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Culvert	**Length:**	27.4 m
Element Name:	Barrel	**Width:**	3 m
Location:	Below Roadway	**Height:**	3 m
Material:	Corrugated Steel	**Count:**	1
Element Type:	Structural Plate CSP	**Total Quantity:**	258.24 m^2
Environment:	Benign	**Not Inspected:**	☐

Protection System	Hot-Dip Galvanized				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	-	129.123	129.12	01	-

Comments: Moderate to severe corrosion and perforations at water level; it is recommended the structure be replaced in 1-5 years. Deformation at south end of barrel. Perforation noted at south end of barrel. Separation of plates noted along most of the west side of pipe. It is recommended to monitor the barrel movement.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐

Protection System	Unknown				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 04**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	4	-	-	-	-

Comments: Embankments noted steeply sloped, heavily vegetated and appear stable at the time of inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
all	-	-	all	-	00	00

Comments: Moderate volume and high flow from south to north through barrel. High volume upstream obstructed by large beaver dam downstream.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 04**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Barrier	Replace substandard end treatments with code compliant end treatments			X	$ -
Culvert	Replace Barrel		X		$ 282,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 282,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		$ 10,000.00
Other		
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

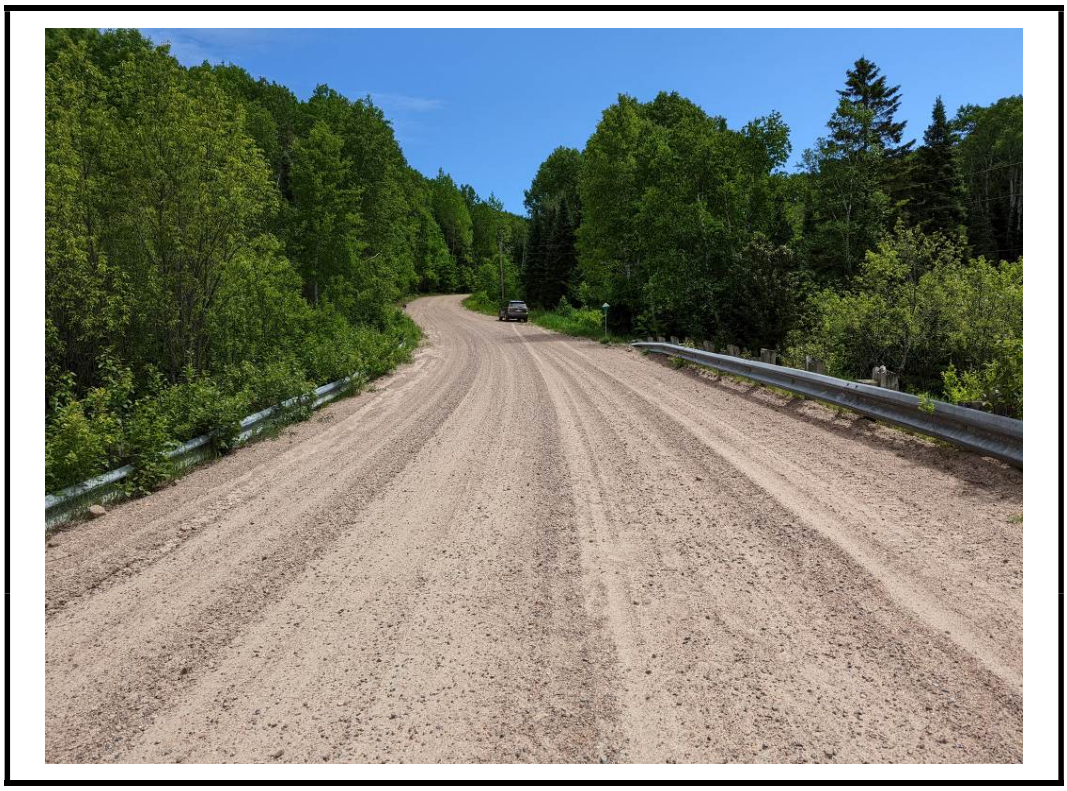

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South Elevation

Photo 7 Collision damage noted on steel beam at north barrier

Photo 8 Moderate corrosion noted along bottom of barrel

Photo 9 Typical view of interior barrel looking south

Photo 10 Accumulation of branches noted at south end of culvert.

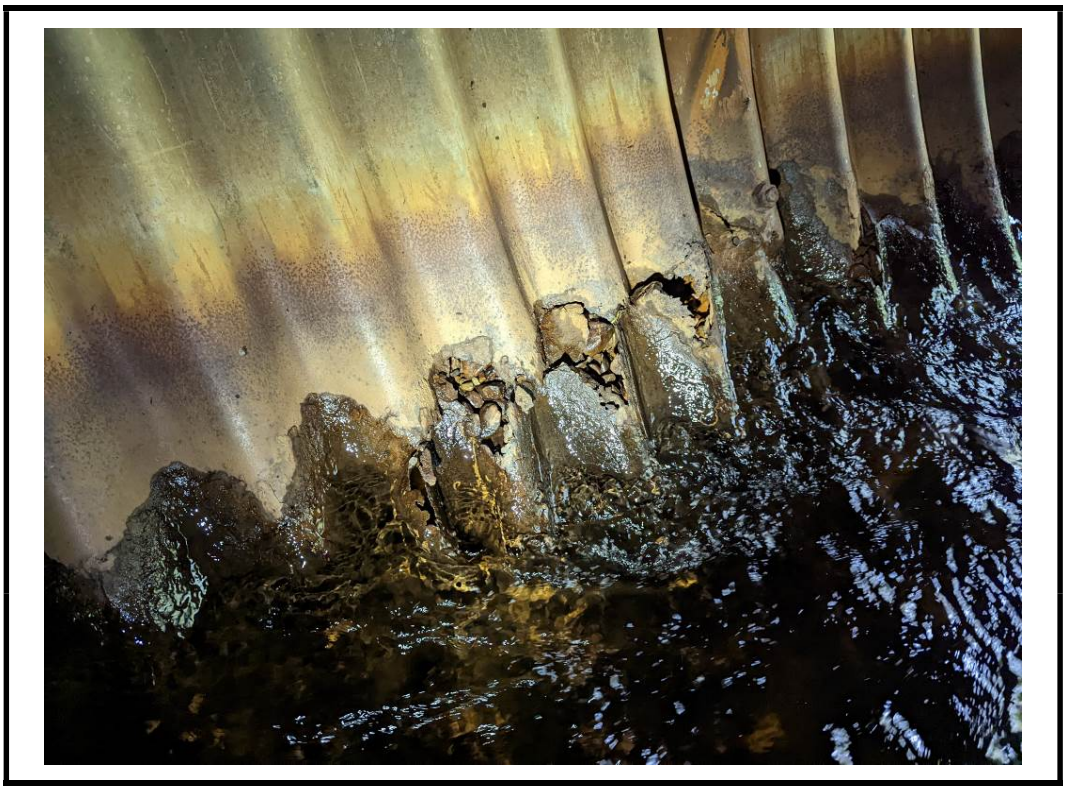

Photo 11 Localized perforation at bottom of barrel, near north end of barrel

Structure Condition Summary Form

Structure Name Boundry Road Culvert
Structure Number 05
Date of Inspection June 03, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	372.00	0.00	372.00	0.00	0.00	2232	1674	75	00	00
Culvert	Barrel	Sq.m	350.00	112.16	0.00	92.16	20.00	0.00	39256	26992	69	00	00
									41488	**28666**			

Bridge Condition Index (BCI) **69**

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) **69**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 05**

INVENTORY DATA:

Structure Name	Boundary Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Boundary Road		
Structure Location	1.3 km west of boundary road (3.5 km south of grand desert rd)		
Latitude	46° 11' 36.6" N	Longitude	79° 1' 46.9" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 1
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Circular CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	1.5 (m)	Fill on Structure	0.6 (m)
Overall Str. Width	11.9 (m)	Skew Angle	0 (Degrees)
Total Deck Area	17.85 (m^2)	Direction of Structure	E-W
Roadway Width	6.2 (m)	No. of Spans	2 (m)
Span Lengths	1.5, 1.5 (m)		

HISTORICAL DATA

Year Built	1980 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 05**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	21 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:

Rehabilitation/replacement study is for traffic barrier only.
No barrier was present at the time of inspection; a code compliant barrier with end treatments should be installed.
Beaver dam observed at inlets of east barrel and local moderate corrosion noted below waterline. Vegetation at upstream and some rocks at outlet causing minor flow obstruction.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

CULVERT **Site No.: 05**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	-	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE, & SW of Structure				**Height:**	-	
Material:	None				**Count:**	-	
Element Type:	None				**Total Quantity:**	-	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m^2	-	-	-	-		-	-
Comments:	No barrier was present at the time of inspection; a code compliant barrier should be installed.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	6.2 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	372 m^2	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m^2	-	372	-	-		-	-
Comments:	Generally in good condition with some loose gravel noted.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Culvert				**Length:**	11.9 m	
Element Name:	Barrel				**Width:**	1.5 m	
Location:	Below Roadway				**Height:**	1.5 m	
Material:	Corrugated Steel				**Count:**	2	
Element Type:	Corrugated Steel Pipe				**Total Quantity:**	112.16 m^2	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m^2	-	92.16	20	-		-	-
Comments:	Light corrosion at and below water line. Light rust stains on a few joints. Beaver dam observed at inlets of east barrel and local moderate corrosion noted below waterline.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 05**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	Unknown	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
N/A	-	-	-	-	-	-

Comments: No evidence of instability.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
Each	-	4	-	-	-	-

Comments: Moderate slope, well vegetated and stable. Small rocks present at embankments and between the two barrels.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	All
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
All	-	All	-	-	-	-

Comments: Moderate to high volume and high flow from south to north. Vegetation at upstream and some rocks at outlet causing minor flow obstruction. Beaver dam noted at south side of east barrel.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 05**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 – 10 Years**	**1 - 5 Years**	**< 1 year**	
Barrier	Install code compliant barrier			X	$ 57,000.00
				Total Cost	**$ 57,000.00**

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

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Typical view of east interior barrel looking south

Photo 8 Light to moderate corrosion noted below waterline

Photo 9 Beaver dam observed at south end of east barrel

Photo 10 Localized moderate corrosion noted above waterline.

Structure Condition Summary Form

Structure Name Boxwell Road Culvert
Structure Number 06
Date of Inspection June 03, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	420.00	0.00	420.00	0.00	0.00	2520	1890	75	00	00
Culvert	Barrel	Sq.m	350.00	129.84	0.00	0.00	64.92	64.92	45444	9089	20	01	00
	Inlet Components	Sq.m	350.00	4.00	0.00	2.50	1.00	0.50	1400	796	57	00	08
									49364	**11775**			

Bridge Condition Index (BCI)	**24**	
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)	**24**	

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 06**

INVENTORY DATA:

Structure Name	Boxwell Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Boxwell Road		
Structure Location	500 m west of farmers line , Lot 29, Con 4 Bonfield Ontario over Sparks Creek		
Latitude	46° 13' 52.0" N	Longitude	79° 2' 11.3" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	4.6 (m)	Fill on Structure	0.3 - 0.6 (m)
Overall Str. Width	14.1 (m)	Skew Angle	0 (Degrees)
Total Deck Area	_____ (m^2)	Direction of Structure	N-S
Roadway Width	7.0 (m)	No. of Spans	1 (m)
Span Lengths	4.6 (m)		

HISTORICAL DATA

Year Built	1970 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 06**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Sagar Chhayani, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	$ 20,000.00

Special Notes:

Rehabilitation/replacement study is for culvert barrel and barrier.
No approach barrier presents at structure. A code compliant approach barrier and end treatment should be installed.
Culvert Barrel has splitting at bolt locations and localized deformations; it is recommended that the barrel be replaced in 1 – 5 years. Light to localized moderate corrosion form middle of barrel to below waterline. It is recommended to monitor the barrel movement.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

CULVERT **Site No.: 06**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	-	
Element Name:	Barrier				**Width:**	-	
Location:	-				**Height:**	-	
Material:	-				**Count:**	-	
Element Type:	-				**Total Quantity:**	-	
Environment:	-				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	-	-	-		08	-
Comments:	No barrier present at the time of the inspection. It is recommended that a code compliant barrier be installed.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	7 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	420 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	420	-	-		-	-
Comments:	Generally in good condition with loose gravel accumulated at the edges of wearing surface.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Culvert				**Length:**	-	
Element Name:	Inlet Components				**Width:**	-	
Location:	South of Structure				**Height:**	-	
Material:	Concrete				**Count:**	-	
Element Type:	Cast-in-Place Concrete				**Total Quantity:**	4 m²	
Environment:	Moderate				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	2.5	1	0.5		-	08
Comments:	Visible portion is in good condition with moderate scaling and small spalls. Fence attached to either side of south end of culvert.						
None ☐	1 – 5 years ■	< 1 year ☐	Urgent ☐				

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 06**

Element Group:	Culvert	**Length:**	14.1 m
Element Name:	Barrel	**Width:**	4.6 m
Location:	Below Roadway	**Height:**	3.5 m
Material:	Corrugated Steel	**Count:**	1
Element Type:	Structural Plate CSP	**Total Quantity:**	129.84 m^2
Environment:	Benign	**Not Inspected:**	☐
Protection System	Hot-Dip Galvanized	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
m^2	-	-	64.92	64.92	01	-

Comments: Light to localized moderate corrosion form middle of barrel to below waterline. Salt stains at bolts and seams throughout. Minor deflection also observed along with splitting along 2/3 bolt line at east side of barrel. It is recommended that barrel be replaced in 1 – 5 years. It is recommended to monitor the barrel movement.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐
Protection System	Unknown	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
N/A	-	-	-	-	-	-

Comments: Possible instability suspected due to splitting and deflection of barrel.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	☐
Protection System	None	**Performance Deficiencies**	**Maintenance Needs**

Units	Excellent	Good	Fair	Poor		
Each	-	4	-	-	-	-

Comments: Embankments noted moderately sloped, well vegetated and appear stable at the time of inspection.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 06**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Roadway	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Streams	**Total Quantity:**	All
Environment:	Benign	**Not Inspected:**	☐
Protection System	None		

Units	**Excellent**	**Good**	**Fair**	**Poor**	**Performance Deficiencies**	**Maintenance Needs**
All	-	-	All	-	-	18

Comments: Moderate volume and flow from south to north. Dam in centre of barrel to be removed.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 06**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install a code compliant barrier			X	$ -
Barrel	Replace Culvert Barrel		X		$ 358,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 358,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		$ 10,000.00
Other		
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

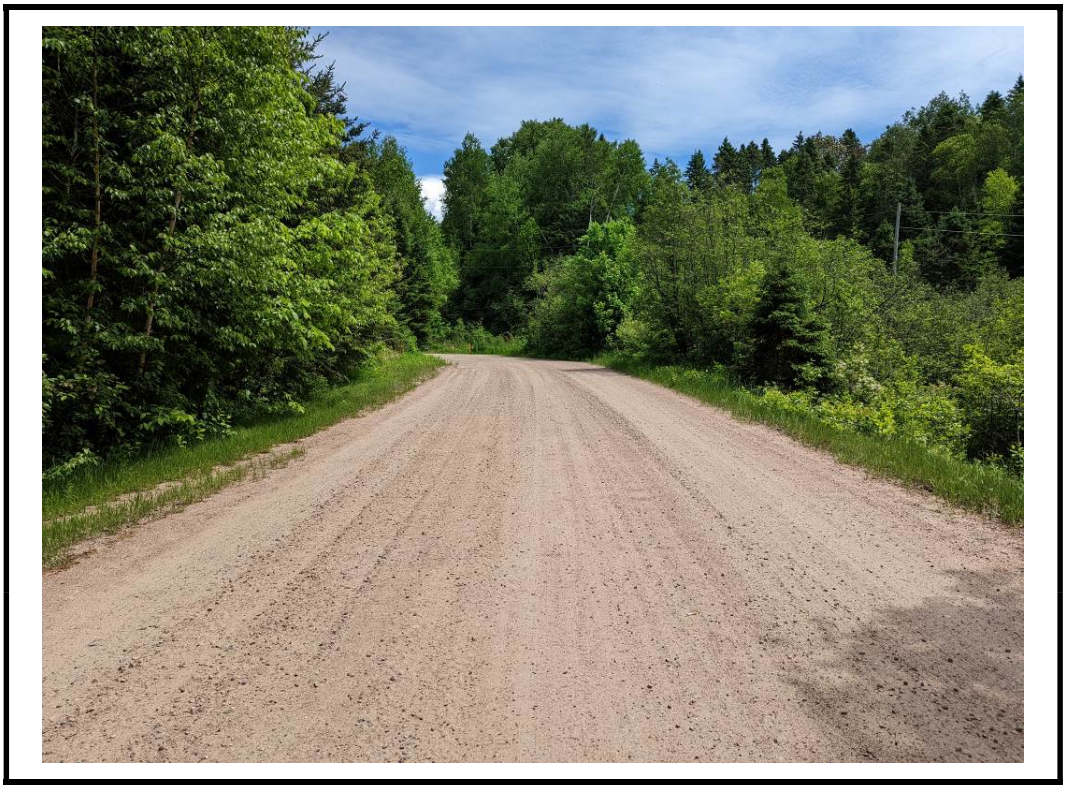

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Debris noted in middle of barrel obstructing stream flow

Photo 8 Light to localized moderate corrosion noted at and below waterline

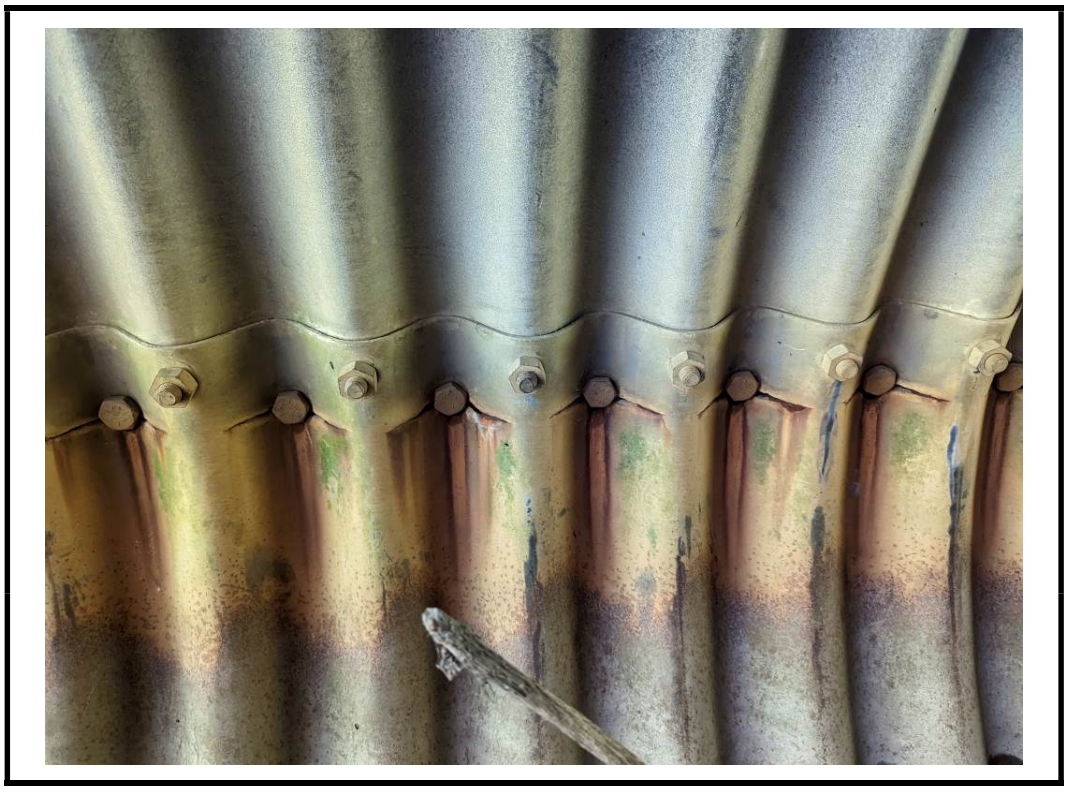

Photo 9 Medium cracking noted along bolt line

Photo 10 Light to moderate scaling noted on concrete inlet at south end

Structure Condition Summary Form

Structure Name McNutt Road Culvert
Structure Number 09
Date of Inspection June 03, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	510.00	0.00	510.00	0.00	0.00	3060	2295	75	00	00
Culvert	Barrel	Sq.m	350.00	262.69	0.00	212.69	50.00	0.00	91942	62831	68	00	00
									95002	**65126**			

Bridge Condition Index (BCI) **69**

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) **69**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 09**

INVENTORY DATA:

Structure Name	McNutt Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	McNutt Road		
Structure Location	400 m north of development road, Lot 31, Con 7 Bonfield Ontario over Sharpes Creek		
Latitude	46° 15' 9.8" N	Longitude	79° 2' 31.1" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	3.6 (m)	Fill on Structure	1.2 (m)
Overall Str. Width	16.4 (m)	Skew Angle	0 (Degrees)
Total Deck Area	59.0 (m^2)	Direction of Structure	North - South
Roadway Width	8.5 (m)	No. of Spans	2 (m)
Span Lengths	3.6, 3.6 (m)		

HISTORICAL DATA

Year Built	1989	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 09**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Partly Cloudy
Temperature:	23 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:

Rehabilitation/replacement study is for traffic barrier only.
Barrier buried end treatments are substandard and should be replaced with code compliant end treatments.
Limited inspection due to dams and fences installed at inlet. Light corrosion noted at and below water line at both barrels and some missing bolts. Beaver dam and fallen tree obstructing the waterway should be removed.

Next Detailed Inspection:	June 2024

Suspected 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	Other
06	Bridge bearing maintenance	12	Bridge surface repair		

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 09**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	24 m	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE, & SW of Structure				**Height:**	-	
Material:	Steel				**Count:**	2	
Element Type:	Steel Beam Guiderail on Wood Posts				**Total Quantity:**	48 m	
Environment:	Moderate				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	40	8	-		08	-
Comments:	Wood posts are weathered with some checks and rot. Rating is based on condition only. Barrier buried end treatments are substandard and should be replaced with code compliant end treatments. Impact damage noted at southeast corner. Some rotated spacer observed on approach barrier.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	8.5 m	
Location:	North & South of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	510 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	510	-	-		-	-
Comments:	Generally in good condition with some loose gravel observed in wearing surface at approaches.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Culvert				**Length:**	16.4 m	
Element Name:	Barrel				**Width:**	3.6 m	
Location:	Below Roadway				**Height:**	3.2 m	
Material:	Corrugated Steel				**Count:**	2	
Element Type:	Structural Plate CSP				**Total Quantity:**	262.69 m²	
Environment:	Benign				**Not Inspected:**	■	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	212.69	50	-		-	-
Comments:	Limited inspection due to dams and fences installed at inlet. Light corrosion noted at and below water line at both barrels and some missing bolts. Beaver dam at inlet of both barrels.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 09**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Barrels	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE, & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	□

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
Each	-	4	-	-	-	-

Comments: Embankments are moderate to steeply sloped, heavily vegetated and appear stable.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Under Roadway	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	all
Environment:	Benign	**Not Inspected:**	□

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
all	-	-	all	-	-	18 - Remove obstruction

Comments: High volume and low flow from west to east. Beaver dam and fallen tree at inlet of both barrels.

None □ 1 – 5 years □ < 1 year ■ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 09**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approach Barrier	Install code compliant end treatments			X	$ 24,000.00
				Total Cost	**$ 24,000.00**

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

JUSTIFICATION

Photo 1 Structure from north approach

Photo 2 Structure from south approach

Photo 3 North approach from centre of structure

Photo 4 South approach from centre of structure

Photo 5 East elevation

Photo 6 West elevation

Photo 7 Rot, splits and checks on timber barrier posts

Photo 8 Substandard buried end treatment at approach barrier

Photo 9 Gravel approach wearing surface

Photo 10 Obstruction at west end of north culvert.

Photo 11 Typical view of south culvert barrel looking west

Photo 12 Light corrosion noted at waterline in north culvert barrel (Typical)

Structure Condition Summary Form

Structure Name Grand Desert Road Culvert
Structure Number 11
Date of Inspection June 03, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	384.00	0.00	373.00	10.00	1.00	2304	1703	74	00	00
Culvert	Barrel	Sq.m	350.00	26.40	0.00	0.00	13.20	13.20	9240	1848	20	01	00
									11544	**3551**			

Bridge Condition Index (BCI) **31**

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) **31**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 11**

INVENTORY DATA:

Structure Name	Grand Desert Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Grand Desert Road		
Structure Location	1.1km east of Bluesea Road, Lot 13, Con 5 Bonfield Ontario over Blueseal Creek		
Latitude	46º 12' 33" N	Longitude	79º 6' 56" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	40 km/h No. of Lanes 2
Old County	Nipissing	AADT	- % Trucks -
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Twin Circular CSP	Detour Length Around Structure	- (km)
Total Deck Length	1.0 (m)	Fill on Structure	±0.4 (m)
Overall Str. Width	8.5 (m)	Skew Angle	0 (Degrees)
Total Deck Area	8.5 (m^2)	Direction of Structure	East / West
Roadway Width	6.5 (m)	No. of Spans	1 (m)
Span Lengths	1.0 (m)		

HISTORICAL DATA

Year Built	-	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 11**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	20 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:		X		$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:

Rehabilitation/replacement study is recommended for the structure. Limited inspection of barrel due to barrel size. Moderate corrosion was observed at and below water line and dents at south and north ends of barrel were also observed. It is recommended that the structure be replaced in 1 - 5 years. Apparent deformation noted inside barrel. No barrier is present at the structure; it is recommended that code compliant barrier with end treatments be installed.

Next Detailed Inspection:	June 2024

Suspected 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

CULVERT **Site No.: 11**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	-	
Element Name:	Barriers				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	-				**Count:**	-	
Element Type:	-				**Total Quantity:**	-	
Environment:	-				**Not Inspected:**	☐	
Protection System	-					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	-	-	-		08	-
Comments:	No approach barrier observed at time of inspection. Code compliant traffic barrier including end treatments should be installed.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	6.4 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	384 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	373	10	1		-	-
Comments:	Generally in good condition with light tire rutting. Loose gravel noted at the edges. Medium potholes observed at west approach.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Culvert				**Length:**	8.4 m	
Element Name:	Barrel				**Width:**	1.0 m	
Location:	Below Roadway				**Height:**	1.0 m	
Material:	Corrugated Steel				**Count:**	1	
Element Type:	Corrugated Steel Pipe				**Total Quantity:**	26.4 m²	
Environment:	Benign				**Not Inspected:**	■	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	-	13.2	13.2		01	-
Comments:	Limited inspection of barrel due to barrel size. Moderate corrosion was observed at and below water line and dents at south and north ends of barrel were also observed. It is recommended that the structure be replaced in 1 - 5 years. Apparent deformation noted inside barrel.						
None ☐	1 – 5 years ■	< 1 year ☐	Urgent ☐				

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 11**

ELEMENT DATA							
Element Group:	Foundations				**Length:**	-	
Element Name:	Foundations (below ground level)				**Width:**	-	
Location:	Below Barrel				**Height:**	-	
Material:	Unknown				**Count:**	-	
Element Type:	Unknown				**Total Quantity:**	-	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	Unknown					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
N/A	-	-	-	-		-	-
Comments:	No visible evidence of foundation instability observed at time of inspection.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Embankment and Streams				**Length:**	-	
Element Name:	Embankments				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Native				**Count:**	4	
Element Type:	Embankment				**Total Quantity:**	4	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
each	-	1	2	1		-	13
Comments:	Moderately sloped and well vegetated appear stable. Minor erosion noted at culvert ends.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Embankment and Streams				**Length:**	-	
Element Name:	Streams and Waterways				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	Native				**Count:**	1	
Element Type:	Stream				**Total Quantity:**	All	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
All	-	All	-	-		-	-
Comments:	Low volume and flow from south to north with no visible obstruction noted in the stream at the time of inspection.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 11**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 – 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install code compliant guiderail			X	$ -
Barrel	Replace barrel	X			$ 120,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 120,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours	Culvert Replacement	$ 100,000.00
Traffic Control	Culvert Replacement	$ 60,000.00
Utilities		
Right of Way		
Environmental Study	Culvert Replacement	$ 10,000.00
Other		
Contingencies		
	Total Cost	$ 170,000.00

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 Heavy vegetation grown at north side of barrel

Photo 6 South elevation

Photo 7 Several small potholes on west approach

Photo 8 Minor erosion of embankment noted at south end of structure

Photo 9 Dents noted at south end of barrel

Photo 10 Apparent deformation noted inside barrel

Structure Condition Summary Form

Structure Name Trunk Road Culvert
Structure Number 13
Date of Inspection June 3, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	498.00	0.00	96.00	398.00	2.00	2988	1387	46	09	00
Culvert	Barrel	Sq.m	350.00	335.12	0.00	335.12	0.00	0.00	117292	87969	75	00	00
Retaining Walls	Walls	Sq.m	350.00	27.00	0.00	27.00	0.00	0.00	9450	7088	75	00	00
									129730	**96444**			

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

CULVERT **Site No.: 13**

INVENTORY DATA:

Structure Name	Trunk Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Trunk Road		
Structure Location	200m west of McNutt Road , Lot 31, Con 9 Bonfield Ontario over Sharpes Creek		
Latitude	46º 16' 5" N	Longitude	79º 2' 51" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	- No. of Lanes 2
Old County	Nipissing	AADT	- % Trucks -
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	- (km)
Total Deck Length	4.6 (m)	Fill on Structure	2 (m)
Overall Str. Width	21.3 (m)	Skew Angle	33.5 (Degrees)
Total Deck Area	196 (m^2)	Direction of Structure	East/West
Roadway Width	8.3 (m)	No. of Spans	2 (m)
Span Lengths	4.6, 4.6 (m)		

HISTORICAL DATA

Year Built	2017	Last Biennial Inspection	August 6, 2020
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)
Structure replaced in 2017.

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 13**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Partly Cloudy
Temperature:	24 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:			X	$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:

Rehabilitation/replacement study is for culvert barrier.
Install code complaint traffic barrier including code compliant end treatments. Patched potholes and moderate to severe ravelling noted on approach wearing surface. Broken post noted on north barrier and loose cable observed on both barriers.
Beaver dam observed at south end of east barrel.
Barrel is generally in good condition.

Next Detailed Inspection:	June 2024

Suspected 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 of ACR steel)
06	Bridge bearing maintenance	12	Bridge surface repair	18	Other

CULVERT **Site No.: 13**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	28 m	
Element Name:	Barrier				**Width:**	-	
Location:	North & South Sides of Structure				**Height:**	0.75 m	
Material:	Steel				**Count:**	2	
Element Type:	Three Steel Cables on Wood Posts				**Total Quantity:**	56 m	
Environment:	Moderate				**Not Inspected:**	☐	
Protection System	Hot-Dipped Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	50	6	-		08	18
Comments:	Generally in fair condition. Posts are weathered with some checks. Existing approach barrier is substandard, and a code compliant barrier should be installed. Some damaged posts noted. Some new post observed at the time of inspection. Broken post noted on north barrier and loose cable observed on both barriers.						
None ☐	1 – 5 years ☐	< 1 year ■	Urgent ☐				

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	8.3 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Surface Treatment				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	498 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	96	398	2		09	-
Comments:	Patched potholes and moderate ravelling observed on wearing surface. Small potholes forming in wearing surface at east approach. Heavy washout noted at southwest corner.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

Element Group:	Culvert				**Length:**	21.3 m	
Element Name:	Barrel				**Width:**	4.6 m	
Location:	Below Roadway				**Height:**	2.7 m	
Material:	Corrugated Steel				**Count:**	2	
Element Type:	Structural Plate CSP				**Total Quantity:**	335.12 m²	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	Polymer Coating					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	335.12	-	-		-	-
Comments:	Barrels are generally in good condition. Beaver dam observed at south end of east barrel.						
None ■	1 – 5 years ☐	< 1 year ☐	Urgent ☐				

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 13**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Barrel	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■

Protection System	Unknown				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Retaining Walls	**Length:**	4.5m
Element Name:	Walls	**Width:**	0.75 m
Location:	NE, NW, SE & SW of Structure	**Height:**	1.5 m
Material:	Pre-cast Concrete Block	**Count:**	4
Element Type:	Pre-cast Block Retaining Wall	**Total Quantity:**	27 m^2
Environment:	Moderate	**Not Inspected:**	■

Protection System	Unknown				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m^2	-	27	-	-	-	-

Comments: Retaining walls are generally in good condition.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	□

Protection System	Concrete Walls				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
each	-	3	-	1	-	13

Comments: Moderate to steep slope, well vegetated and appear stable. Light erosion noted at the northwest embankment. Severe erosion observed at southwest corner.

None ■ 1 – 5 years □ < 1 year □ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 13**

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Slope Protection	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	Rock	**Count:**	-
Element Type:	Rock Slope Protection	**Total Quantity:**	4
Environment:	Moderate	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
each	-	4	-	-	-	-

Comments: Slope protection on embankments and over culvert is generally in good condition.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Barrels	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Streams	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
%	-	100	-	-	-	18

Comments: Moderate volume and moderate flow from south to north. Beaver dam observed at south end of east barrel.

None ■ 1 – 5 years ☐ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 13**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install approach guiderail			X	$ 57.000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 57,000.00**

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

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Broken post observed in north barrier

Photo 8 Moderate ravelling, patched potholes noted in east approach wearing surface

Photo 9 Interior of east culvert barrel looking south

Photo 10 Typical west culvert barrel looking north

Photo 11 Heavy washout noted at southwest corner over structure

Photo 12 Typical pre-cast concrete block retaining wall at southwest corner of culvert

Structure Condition Summary Form

Structure Name Trout Pond Road Culvert
Structure Number 14
Date of Inspection June 3, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	396.00	0.00	380.00	16.00	1.00	2376	1748	74	00	12
Culvert	Barrel	Sq.m	350.00	57.69	0.00	2.69	30.00	25.00	20192	4906	24	01	00
									22568	**6655**			

Bridge Condition Index (BCI) **29**

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) **29**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 14**

INVENTORY DATA:

Structure Name	Trout Pond Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Trout Pond Road		
Structure Location	400m North of Development Road, Lot 21, Con 7 Bonfield Ontario over Blueseal Creek		
Latitude	46º 14' 24" N	Longitude	79º 5' 29" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	50 km/h No. of Lanes 1
Old County	Nipissing	AADT	- % Trucks -
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	- (km)
Total Deck Length	2.4 (m)	Fill on Structure	0.1 (m)
Overall Str. Width	8.7 (m)	Skew Angle	10 (Degrees)
Total Deck Area	20.9 (m^2)	Direction of Structure	E-W
Roadway Width	6.6 (m)	No. of Spans	1 (m)
Span Lengths	2.4 (m)		

HISTORICAL DATA

Year Built	1970 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 14**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:			X	$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:
Rehabilitation/replacement study is for traffic barrier and structure. Monitoring of barrel deformation is recommended.
No traffic barrier observed at structure. Code complaint approach barrier should be installed.
Severe corrosion and perforations observed in barrel and efflorescence noted at bolts and seams.
Posts installed around structure at west in an effort to restrict erosion.
It is recommended that the culvert barrel be replaced in 1-5 years.

Next Detailed Inspection:	June 2024

Suspected 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

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 14**

Element Group:	Approaches	**Length:**	-
Element Name:	Barriers	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	-	**Count:**	-
Element Type:	-	**Total Quantity:**	-
Environment:	-	**Not Inspected:**	☐

Protection System	-				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m	-	-	-	-	08	-

Comments: No approach barrier observed at time of inspection. A code compliant barrier including end treatments should be installed.

None ☐ 1 – 5 years ☐ < 1 year ■ Urgent ☐

Element Group:	Approaches	**Length:**	30 m
Element Name:	Wearing Surface	**Width:**	6.6 m
Location:	North & South of Structure	**Height:**	-
Material:	Gravel	**Count:**	2
Element Type:	Gravel Wearing Surface	**Total Quantity:**	396 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	380	16	1	-	12

Comments: Generally in good condition with loose gravel observed on edges approach roadway. Washout observed at east and west sides of wearing surface near culvert.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Culvert	**Length:**	8.7 m
Element Name:	Barrel	**Width:**	2.4 m
Location:	Below Roadway	**Height:**	1.8 m
Material:	Corrugated Steel	**Count:**	1
Element Type:	Structural Plate CSP	**Total Quantity:**	57.69 m²
Environment:	Benign	**Not Inspected:**	☐

Protection System	Hot-Dip Galvanized				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	2.69	30	25	01	-

Comments: Severe corrosion and perforations at and below water line with the bottom of the barrel having partially separated from the structure. Efflorescence at seams and a dent was noted at inlet (west). Debris build up observed in structure. Barrel is deformed. It is recommended that the structure be replaced from 1 – 5 years. A piece of CSP from a different structure was found in the barrel, obstructing flow. Dents noted at west end of barrel. Monitoring of barrel deformation is recommended.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 14**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	Below Barrel	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■
Protection System	Unknown		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
N/A	-	-	-	-	-	-

Comments: Barrel appears deformed; deformation may be a result of foundation settlement / movement. No signs of structure settlement from top of roadway.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	All
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
All	-	-	All	-	-	18 - Remove Channel Blockage

Comments: Low volume and moderate flow from west to east with trees and debris located in barrel.

None □ 1 – 5 years □ < 1 year ■ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	-	2	2	-	13

Comments: Steep slope, well vegetated and some erosion noted on embankments. Posts installed around structure at west in an effort to restrict erosion.

None □ 1 – 5 years □ < 1 year ■ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 14**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches	Install Code Compliant Approach Barrier			X	$ -
Barrel	Replace barrel		X		$ 207,000.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 207,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours	Culvert Replacement	$ 100,000.00
Traffic Control	Culvert Replacement	$ 60,000.00
Utilities		
Right of Way		
Environmental Study	Culvert Replacement	$ 10,000.00
Other		
Contingencies		
	Total Cost	$ 170,000.00

JUSTIFICATION

Photo 1 Structure from north approach

Photo 2 Structure from south approach

Photo 3 North approach from centre of structure

Photo 4 South approach from centre of structure

Photo 5 East elevation

Photo 6 West elevation

Photo 7 Erosion of edge of shoulder at west end of structure

Photo 8 Dents noted at west end of barrel

Photo 9 Typical view of culvert barrel looking west

Photo 10 Efflorescence noted at seams and along boltline

Photo 11 Severe perforation noted at and below waterline

Photo 12 Damaged section of CSP in barrel, does not appears to be from this structure

Structure Condition Summary Form

Structure Name Development Road Culvert
Structure Number 15
Date of Inspection June 3, 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	408.00	0.00	386.00	20.00	2.00	2448	1785	73	00	00
Culvert	Barrel	Sq.m	350.00	200.94	0.00	200.94	0.00	0.00	70329	52747	75	00	00
									72777	**54532**			

Bridge Condition Index (BCI) **75**

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) **75**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 15**

INVENTORY DATA:

Structure Name	Development Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Development Road		
Structure Location	Lot 16, Con 6 Bonfield Ontario over Blueseal Creek, 300m east of Line 3 S.		
Latitude	46º 13' 52" N	Longitude	79º 6' 35" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	80 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	3.55 (m)	Fill on Structure	0.9 (m)
Overall Str. Width	21.3 (m)	Skew Angle	51.7 (Degrees)
Total Deck Area	75.15 (m^2)	Direction of Structure	N-S
Roadway Width	6.8 (m)	No. of Spans	1 (m)
Span Lengths	3.55 (m)		

HISTORICAL DATA

Year Built	1970 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 15**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	23 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Rehabilitation / Replacement Study:		X		$ 5,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 5,000.00**

Special Notes:

Overall, structure is appeared to be generally in good condition.
No approach barrier observed at time of inspection. Code compliant barrier including end treatments should be installed.
Approach wearing surface at west appear to be paved. Surface treatment at east approach has medium to wide longitudinal cracks with patches throughout.
Some small potholes forming at east side. Electric fence noted at inlet.

Next Detailed Inspection:	June 2024

Suspected 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

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 15**

ELEMENT DATA							
Element Group:	Approaches				**Length:**	-	
Element Name:	Barrier				**Width:**	-	
Location:	NE, NW, SE & SW of Structure				**Height:**	-	
Material:	-				**Count:**	-	
Element Type:	-				**Total Quantity:**	-	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m	-	-	-	-		08	-
Comments:	No approach barrier observed at time of inspection. A code compliant barrier including end treatments should be installed.						
None ☐	1 – 5 years ☐		< 1 year ■		Urgent ☐		

Element Group:	Approaches				**Length:**	30 m	
Element Name:	Wearing Surface				**Width:**	6.8 m	
Location:	East & West of Structure				**Height:**	-	
Material:	Gravel wearing surface				**Count:**	2	
Element Type:	Wearing Surface				**Total Quantity:**	408 m²	
Environment:	Severe				**Not Inspected:**	☐	
Protection System	None					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	386	20	2		-	-
Comments:	Generally in good condition. Approach wearing surface at west appear to be paved. Surface treatment at east approach has medium to wide longitudinal cracks with patches throughout. Some small potholes forming at east side.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

Element Group:	Culvert				**Length:**	21.3 m	
Element Name:	Barrel				**Width:**	3.55 m	
Location:	Below Roadway				**Height:**	2.4 m	
Material:	Corrugated Steel				**Count:**	1	
Element Type:	Structural Plate CSP				**Total Quantity:**	200.94 m²	
Environment:	Benign				**Not Inspected:**	☐	
Protection System	Hot-Dip Galvanized					**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**			
m²	-	200.94	-	-		-	-
Comments:	Culvert barrel appears to be generally in good condition. Electric fence noted at inlet.						
None ■	1 – 5 years ☐		< 1 year ☐		Urgent ☐		

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 15**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	-	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■
Protection System	Unknown		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Structure	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	All
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
All	-	All	-	-	-	-

Comments: Moderate volume and low flow from south to north with some vegetation noted at upstream. Sediment buildup in the barrel.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	4	-	-	-	-

Comments: Moderately sloped, well vegetated and appear stable. Rock slope protection at all corners appears to be generally good condition.

None ■ 1 – 5 years □ < 1 year □ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 15**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**6 - 10 Years**	**1 - 5 Years**	**< 1 year**	
Approaches- Barrier	Install code compliant barrier and end treatments			X	$ 48,000.00
					$
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				Total Cost	**$ 48,000.00**

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

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Medium to wide longitudinal cracks and patches noted at east approach

Photo 8 Typical view of culvert barrel looking south

Structure Condition Summary Form

Structure Name Development Road Culvert
Structure Number 16
Date of Inspection June 3 2022
Project No. 22035
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
Approaches	Wearing Surface	Sq.m	6.00	396.00	0.00	331.00	60.00	5.00	2376	1634	69	00	12
Culvert	Barrel	Sq.m	350.00	289.44	0.00	169.44	100.00	20.00	101304	58478	58	01	18
									103680	**60112**			

Bridge Condition Index (BCI) **58**

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) **58**

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 16**

INVENTORY DATA:

Structure Name	Development Road Culvert		
Main Hwy/Road #	_____ On ■ Under ☐	Crossing Type:	Navigable Water ☐ Non- Navigable Water ■ Rail ☐ Road ■ Ped ☐ Other ☐
Road Name:	Development Road		
Structure Location	Lot 27, Con 7 Bonfield Ontario over Sharpes Creek, 600m east of Fichault Road		
Latitude	46º 14' 42" N	Longitude	79º 3' 27" W
Owner(s)	Township of Bonfield	Heritage Designation	Not Cons. ■ Cons./Not App. ☐ List/Not Desig. ☐ Desig./not List ☐ Desig. & List ☐
MTO Region	Northeastern	Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ■
MTO District	Sudbury	Posted Speed	80 km/h No. of Lanes 2
Old County	Nipissing	AADT	_____ % Trucks _____
Geographic Twp.	Bonfield	Special Routes	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Structure Type	Horizontal Ellipse CSP	Detour Length Around Structure	_____ (km)
Total Deck Length	4.9 (m)	Fill on Structure	1.5 (m)
Overall Str. Width	22.5 (m)	Skew Angle	0 (Degrees)
Total Deck Area	110.25 (m^2)	Direction of Structure	East/West
Roadway Width	6.6 (m)	No. of Spans	1 (m)
Span Lengths	4.9 (m)		

HISTORICAL DATA

Year Built	1980 (est)	Last Biennial Inspection	August 7, 2020
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

CULVERT **Site No.: 16**

FIELD INSPECTION INFORMATION	
Date of Inspection:	June 03, 2022
Inspector:	Tashi Dwivedi, P.Eng., HP Engineering
Others in Party:	Nicholas Brown, HP Engineering
Equipment Used:	Digital camera, measuring tape, hammer
Weather:	Sunny
Temperature:	22 ºC

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	X			$
Bridge Rehabilitation / Replacement Study:			X	$ 20,000.00
Detailed Coating Condition Survey:	X			$
Underwater Investigation:	X			$
Fatigue Investigation:	X			$
Seismic Investigation:	X			$
Structural Evaluation:	X			$
Load Posting - Estimated Load			Total Cost	**$ 20,000.00**

Special Notes:

Rehabilitation/replacement study is for traffic barrier and structure
No approach barrier observed at time of inspection. Code compliant barrier including end treatments should be installed. Efflorescence and salt stains observed at bolts and seams of culvert. Cracks at the bolt line above waterline on west side of culvert. Structure should be replaced in 1 - 5 years.

Next Detailed Inspection:	June 2024

Suspected 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

CULVERT **Site No.: 16**

ELEMENT DATA			
Element Group:	Approaches	**Length:**	-
Element Name:	Barrier	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	-	**Count:**	-
Element Type:	-	**Total Quantity:**	-
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m	-	-	-	-	08	-

Comments: No approach barrier observed at time of inspection. Code compliant approach barrier including end treatments should be installed.

None ☐ 1 – 5 years ☐ < 1 year ☐ Urgent ■

Element Group:	Approaches	**Length:**	30 m
Element Name:	Wearing Surface	**Width:**	6.6 m
Location:	East & West of Structure	**Height:**	-
Material:	Surface Treatment	**Count:**	2
Element Type:	Wearing Surface	**Total Quantity:**	396 m²
Environment:	Severe	**Not Inspected:**	☐

Protection System	None				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	331	60	5	-	12

Comments: Narrow longitudinal cracks on north edge of the road to the west of the structure and moderate to severe ravelling noted on wearing surface. Numerous small potholes and edge deterioration noted on both approach wearing surfaces. Patched potholes noted throughout wearing surface.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

Element Group:	Culvert	**Length:**	22.5 m
Element Name:	Barrel	**Width:**	4.9 m
Location:	Below Roadway	**Height:**	3.2 m
Material:	Corrugated Steel	**Count:**	1
Element Type:	Structural Plate CSP	**Total Quantity:**	289.44 m²
Environment:	Benign	**Not Inspected:**	☐

Protection System	Hot-Dip Galvanized				**Performance Deficiencies**	**Maintenance Needs**
Units	**Excellent**	**Good**	**Fair**	**Poor**		
m²	-	169.44	100	20	01	18 – Install Bolts

Comments: Light corrosion at and below water line. Corrosion on exposed exterior steel and bolts on the south side with few missing bolts. Efflorescence and salt stains observed at bolts and seams of culvert. South side (inlet) is perched. Cracks at the bolt line above waterline on west side of culvert.

None ☐ 1 – 5 years ■ < 1 year ☐ Urgent ☐

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 16**

Element Group:	Foundations	**Length:**	-
Element Name:	Foundations (below ground level)	**Width:**	-
Location:	-	**Height:**	-
Material:	Unknown	**Count:**	-
Element Type:	Unknown	**Total Quantity:**	-
Environment:	Benign	**Not Inspected:**	■
Protection System	Unknown		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
N/A	-	-	-	-	-	-

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

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Embankments	**Width:**	-
Location:	NE, NW, SE & SW of Structure	**Height:**	-
Material:	Native	**Count:**	4
Element Type:	Embankment	**Total Quantity:**	4
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
each	-	4	-	-	-	-

Comments: Steep sloped, well vegetated, and stable. Fence tied to north end of barrel.

None ■ 1 – 5 years □ < 1 year □ Urgent □

Element Group:	Embankment and Streams	**Length:**	-
Element Name:	Streams and Waterways	**Width:**	-
Location:	Below Barrel	**Height:**	-
Material:	Native	**Count:**	-
Element Type:	Stream	**Total Quantity:**	All
Environment:	Benign	**Not Inspected:**	□
Protection System	None		

Units	Excellent	Good	Fair	Poor	Performance Deficiencies	Maintenance Needs
All	-	-	All	-	-	18 - Remove Obstruction

Comments: Low to medium volume and moderate flow from south to north through the barrel with rocks in the channel. Old bridge and large beaver dam located upstream causing a major flow obstruction.

None □ 1 – 5 years □ < 1 year ■ Urgent □

MUNICIPAL STRUCTURE INSPECTION FORM

CULVERT **Site No.: 16**

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	**Repair and Rehabilitation Required**	**1 - 5 Years**	**< 1 year**	**Urgent**	
Approaches	Install guiderail		X		
Barrel	Replace Structure	X			$ 359,000.000
				Total Cost	**$ 359,000.00**

ASSOCIATED WORK	Comments	Estimated Cost
Approaches		
Detours		$ 100,000.00
Traffic Control		$ 60,000.00
Utilities		
Right of Way		
Environmental Study		$ 10,000.00
Other		
Contingencies		
	Total Cost	**$ 170,000.00**

JUSTIFICATION

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Previous patches, moderate raveling and potholes forming at west approach

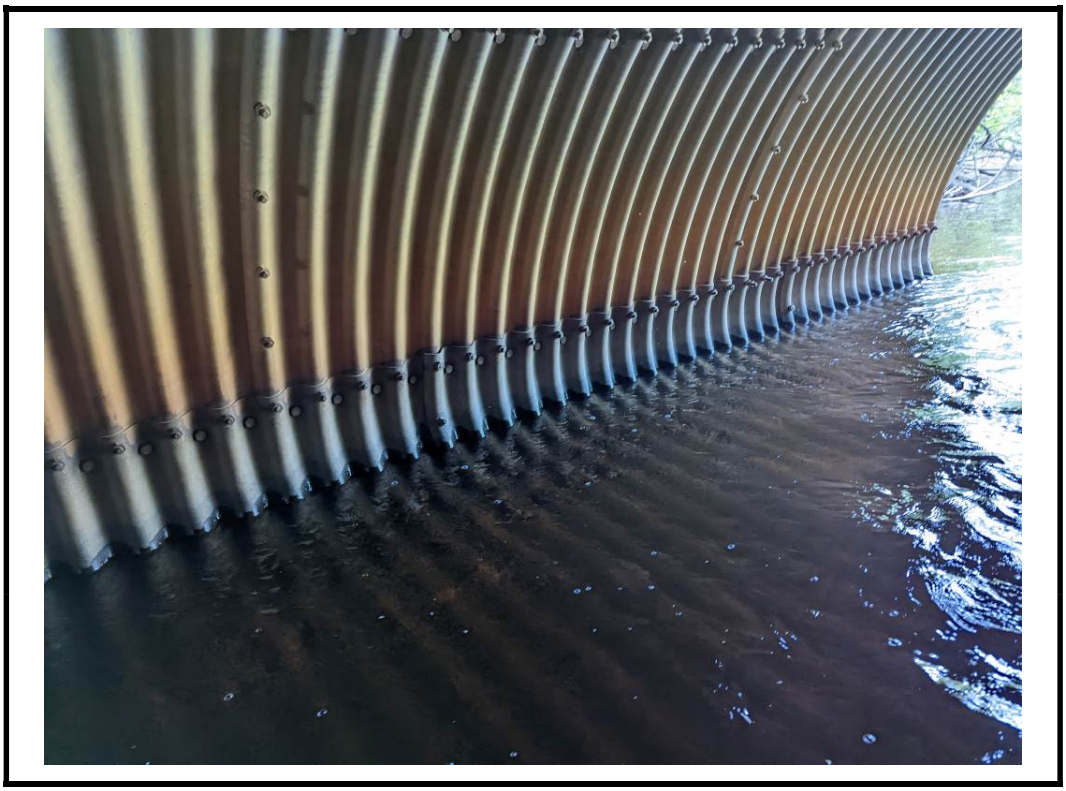

Photo 8 Light to moderate corrosion noted at waterline

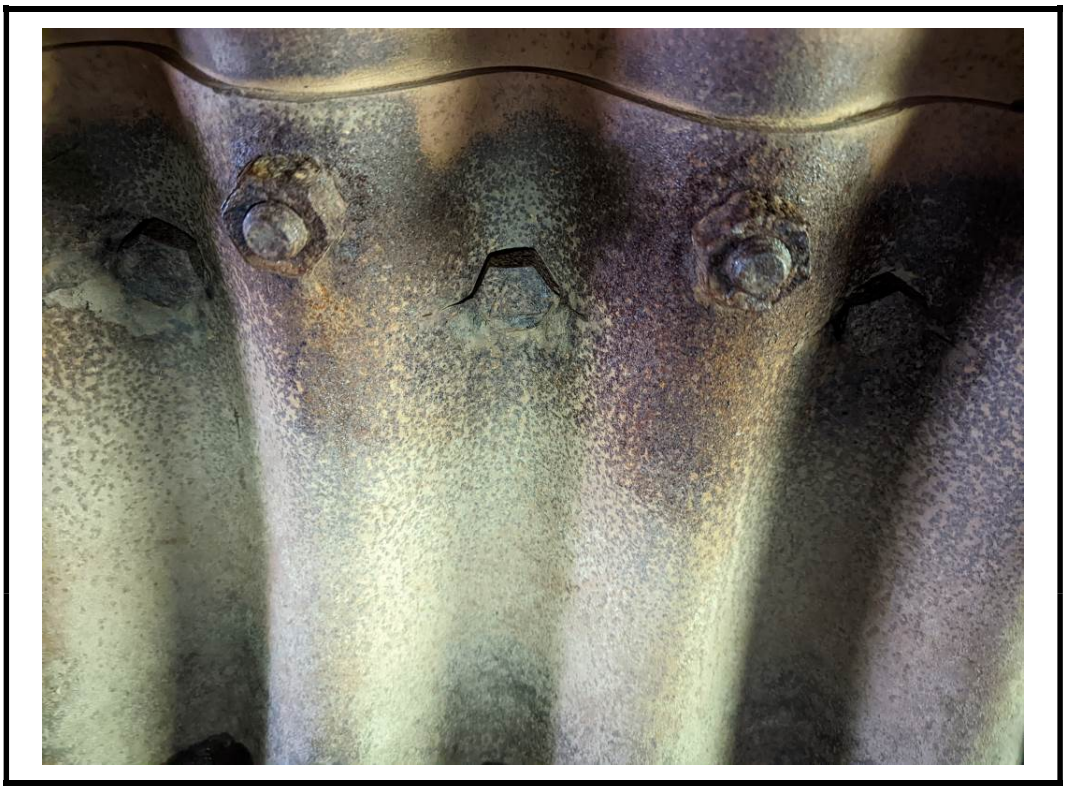

Photo 9 Cracks at bolt line at the west side of structure

Photo 10 Typical view of culvert barrel looking south