

TOWNSHIP OF FRONTENAC ISLANDS
2022 OSIM INSPECTIONS FINAL SUMMARY REPORT
6 STRUCTURES



July, 2022

Prepared by John Landry, P.Eng



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1 Introduction

The Township of Frontenac Islands (The Township) engaged Jewell Engineering Inc. (JE) to undertake detailed visual biennial OSIM inspections of bridges and culverts throughout its jurisdiction in accordance with Part 2 of the Ontario Structure Inspection Manual (OSIM). As part of the assignment, the Township also required the completion of this Summary Report including a bridge capital priority program to be completed with the 2022 biennial inspections and reporting.

The Township maintains an inventory of 6 structures, each inspected as part of this assignment. The Bridge Condition Index was also calculated for all structures in the inventory.

The Township's main objectives of this assignment were:

- To protect and prolong the useful life of all structures;
- To identify maintenance, repair, and rehabilitation needs of the structures;
- To provide a basis for a structure asset management system for the planning and funding of the maintenance, rehabilitation and replacement of structures.

2 Categorization of Structures

The following definitions were used when classifying the structures in the inventory:

Bridge – a structure carrying a travelled path above a road, railroad, river, ravine, or any other impassable obstacle.

Culvert – A structure that forms an opening through soil.

3 Inspections and Procedure

A total of 6 culverts, owned and maintained by the Township were visually inspected in accordance with Part 2 of the Ontario Structure Inspection Manual using OSIM forms. Although only 3 of the 6 culverts require OSIM inspections based on a span length greater than 3.0 meters, all 6 culverts have been included in this report. The inspections were performed in May of 2022 by a three-person inspection team led by John Landry, P.Eng.

For each structure, elements were screened for visual signs of deterioration. The components were then given a rating (on the inspection forms) using the MTO extent and severity philosophy, whereby the components are proportioned (m, m², %, etc.) based on their observed deterioration for each component. Explanatory statements accompany each of the component's ratings, where deemed applicable by the lead 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 as either None, Normal (required between now and the next visual inspection, scheduled in 2 years) and Urgent (required immediately). Repairs and associated budgetary estimates are subdivided based on time of need as either none, 6 to 10 years, 1 to 5 years or less than 1

year. The basis of selection for budget costs are further discussed in section Determination of Costs found below.

Photographs of each inspected structure are included with the inspection sheets including one photograph of an approach, an elevation as well as any significant deterioration. Individual inspection forms for the structures are included in Appendix B.

3.1 – Summary

Generally the Township’s inventory is in good condition with a few exceptions. The 5th Line road culvert has started to display perforations. This is an early indication of severe section loss in the steel. Jewell Engineering recommends planning to replace this culvert within 10 years’ time.

Two structures could not be thoroughly inspected due to high water levels, at the time of our reviews. Structure #1 is a corrugated steel pipe and exhibits light to moderate corrosion at the waterline. It is recommended that an underwater inspection take place within the next 5 years to confirm structure condition. The second structure, Structure #3 (4th Line Road Culvert) could not be thoroughly inspected due to high water but based on the age and condition of the culvert does not require an underwater inspection.

JE recommends the Township conduct a review of guide rail needs over their highway structure assets. This assessment would be to determine if barrier systems are warranted over the structures.

4 Determination of Costs

4.1 Replacement and Rehabilitation

Given the cursory information obtained during the visual inspections and without the benefit of detailed investigation (deck survey, etc.) design information, it is impractical to develop detailed cost estimates for each structure. For these reasons, benchmark budget costs were developed for the replacement value of each structure. Traditionally, benchmark costs do not necessarily provide accurate costs for individual repairs/replacement but have proven to provide sufficient accuracy for budgeting purposes when dealing with a large number of structures.

For the purpose of this study, benchmark costs are based on maintaining the existing width, length and alignment of each structure. 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).

It is important to note to that all estimated costs provided in each OSIM report and as described below are for construction only. Other associated costs that may be applicable and not included herein are: fees related to design and administration, advertising fees, costs needed to obtain permits and approvals, and the expense associated with paying HST.

4.1.1 Bridge and Culvert Replacement Costs

Budget costs for the replacement of bridges are usually based on the deck surface area of individual structures (m²). Therefore, benchmark replacement costs for this study were determined using the following unit costs which take into account approach roadway costs.

Table 4- 1. Structure Replacement Cost per Square Meter of Deck Area.

Deck Area (m ²)	2020 Unit Cost (\$/m ²)
< 50	\$14,400.00
51 - 80	\$11,900.00
81 - 150	\$10,500.00
> 150	\$8,250.00

These unit costs were used to populate the estimated replacement values of each structure in the Culvert Summary Table found in Appendix A.

4.1.2 Rehabilitation Costs

It is impractical to generalize rehabilitation costs as each structure is unique in terms of its condition, amount of traffic, and the amount of water that has to be addressed as part of the construction scope. It is recommended that the Township undertake further study and/or complete preliminary design prior to arriving at a budget figure for any rehabilitation. Some anticipated additional costs are also shown in each OSIM report as separate items and these are discussed below.

It is generally not practical to undertake major rehabilitation work to culvert crossings where significant deterioration or deficiencies exist in the steel (barrel). Culvert replacement is normally planned in these circumstances. However, the possibility of using liners to repair the culvert exists. The installation cost of liners is usually 50% less than the replacement cost of the culvert. Repair work identified generally includes 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.

4.3 Additional Investigations

On the second sheet of each attached OSIM form there is a table in which further engineering investigation can be recommended for a structure. Benchmark budget cost ranges for engineering investigation work are presented in the table below for the Township's information:

Table 4- 2. Cost for Additional Investigations.

Additional Investigation	Cost Range
Detailed Inspection/Rehab/Replacement Study	\$5,000 - \$10,000
Detailed Deck Condition Survey	\$10,000 - \$20,000
Enhanced OSIM	\$5,000 - \$10,000
Structural Evaluation	\$5,000 - \$ 10,000
Underwater Investigation	± \$10,000

4 Barrier and Approach Barrier Discussion

Throughout the attached OSIM reports, there are several instances where the type of barrier system is questioned and highlighted as needing review to determine its adequacy. There are also other cases highlighted in the reports where small structures and culverts over water do not currently have a barrier system installed. These comments are made as the scope within OSIM is to review and report on the current condition of existing structure elements, not comment on the adequacy of an element.

The Township is advised that structure barriers and approach barriers should be in accordance with the Canadian Highway Bridge Design Code and the Ontario Roadside Safety Manual. Factors that may affect the type of barrier required and the length of need required for each structure location are: posted speed limit, distance to water hazard, and distance from the edge of roadway to the barrier.

5 Maintenance Recommendations

Detailed below is a general recommendation of maintenance procedure for all structures.

5.1 Structure Inspection

The Township currently undertakes biennial structure inspections in accordance with the Ontario Structure Inspection Manual (OSIM). The OSIM inspection manual defines Routine Maintenance and Structural Maintenance as follows:

Routine Maintenance - preventative maintenance and minor repair work to an element that can be performed without engineering direction. Routine maintenance is an important part of prolonging bridge life. It also includes some urgent safety items that are not structural issues. It is usually carried out by bridge crews or road maintenance personnel.

Structural Maintenance Work – is work to improve the structural capacity of a select element, and not part of a larger construction project to improve the entire bridge. It generally requires engineering design drawings to complete the work, but the work must be done in a timeframe that precludes a conventional capital construction contract from being used. Structural Maintenance Work includes emergency repairs to restore structural capacity as well as holding strategy repairs to select elements to maintain the structure in a safe condition until a capital construction contract is carried out.

5.2 Structure Cleaning

JE recommends that all structures are cleaned at least once every two (2) years, preferably in the spring. Structure cleaning is to remove de-icing salt (which will prevent corrosion), remove debris, and to allow for all structure components to function properly such as deck drains, bearings...etc.

Cleaning can typically be accomplished by use of sweeping/vacuum equipment, pressuring washing, etc. Some brush/tree trimming shall also be completed as necessary.

Cleaning of the structures may require coordination and approvals from the railway authorities and the local Conservation Authority. Specialized access equipment will be required to access the piers and abutment seats of some structures.

6 Conclusions

The complete inspection of all six (6) structures has resulted in the creation of a complete and accurate database of the structures in the Township of Frontenac Islands. Recommendations for maintenance, rehabilitation, and replacement have been provided for the Township's reference.

The bridge and culvert database will require updating on an ongoing basis to ensure the continued accuracy and safety of the structures. Any maintenance, rehabilitation, or replacement of structures should be recorded for future reference.

It is recommended that all structures be re-inspected by a qualified structural engineer biennially, and the Township re-evaluate maintenance plans.

In the attached summary table (Appendix A), JE has provided the Township of Frontenac Islands with a separate listing for all culverts included as part of this assignment. The summary lists include the structure name and type, along with an estimated replacement value in 2022 dollars. Appendix B contains the bound OSIM Reports and Photo Files for reference.

Prepared and Submitted by:



John Landry, P.Eng

Jewell Engineering Inc.

Appendix A

Culverts Summary Table

2022 SUMMARY OF ALL CULVERT STRUCTURES

Site ID	Name	Type	Number of Barrels	Span Length (m)	Structure Width (m)	Platform Width (m)	Total Deck Area (m ²)	Estimated Replacement Value (2022)	Bridge Condition Index
1	2nd Line Road Culvert	Corrugated Steel Pipe	1	2.7	12.3	6.4	17.28	\$249,000.00	64
2	3rd Line Road Culvert	Twin Pipe Arch	2	4.02	14	6.4	25.73	\$370,000.00	100
3	4th Line Road Culvert	Pre-Cast Concrete Box	1	4.8	18.2	6.4	30.72	\$442,000.00	75
4	5th Line Road Culvert	Multiplate Steel Pipe Arch	1	2.5	21.6	6.4	16.00	\$230,000.00	64
5	95-Highway 95 Culvert	Pre-Cast Concrete Box	1	2.8	20	6.4	17.92	\$258,000.00	99
6	18th Line Road Culvert	Multiplate Steel Pipe	1	4.2	10.5	6.4	26.88	\$387,000.00	74

Total Number of Structures	6
Average Span Length (m)	3.503
Average Deck Area (m ²)	22.42
Total Estimated Replacement Value	\$1,936,000.00

Appendix B

Bound OSIM Reports and Photo Files

MUNICIPAL STRUCTURE INSPECTION FORM

2nd LINE ROAD

Structure No.: 1

INVENTORY DATA:			
Structure Name	<u>2nd Line Road Culvert</u>		
Main Hwy/Road #	<u>2</u>	Under Structure:	Navigable Water <input type="checkbox"/> Non- Navigable Water <input checked="" type="checkbox"/>
		Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>	
Road Name:	<u>2nd Line Road</u>	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	<u>1.2 km South of 96-County Road 96</u>		
Latitude	<u>44.155291°</u>	Longitude	<u>-76.497276°</u>
Owner(s)	<u>Township of Frontenac Islands</u>	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/>
			Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	<u>Eastern</u>	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	<u>Kingston</u>	Posted Speed	<u>Not Posted</u> No. of Lanes <u>2.0</u>
Old County	<u>Frontenac County</u>	AADT	<u>No Data</u> % Trucks <u>No Data</u>
Geographic Twp.	<u>Wolfe Island</u>	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	<u>Corrugated Pipe</u>		
Structure Material	<u>Steel</u>	Detour Length Around Structure	<u>5.4</u> (km)
Total Deck Length	<u>2.700</u> (m)	Fill on Structure	<u>0.5</u> (m)
Overall Str. Width	<u>12.30</u> (m)	Skew Angle	<u>0</u> (Degrees)
Total Deck Area	<u>17.55</u> (m ²)	Direction of Structure	<u>North/South</u>
Roadway Width	<u>6.500</u> (m)	No. of Barrels	<u>1</u>
Span Lengths	<u>2.700</u> (m)		

HISTORICAL DATA			
Year Built	<u>-</u>	Last OSIM Inspection	<u>2020/06/06</u>
Year of Last Major Rehab.	<u>-</u>	Last Enhanced OSIM Inspection	<u>-</u>
Current Load Limit	<u>-</u> (tonnes)	Last Bridge Master Inspection	<u>-</u>
Load Limit By-Law #	<u>-</u>	Last Evaluation	<u>-</u>
By-Law Expiry Date	<u>-</u>	Last Underwater Inspection	<u>-</u>
Min. Vertical Clearance	<u>-</u> (m)	Last Condition Survey	<u>-</u>
Rehabilitation History: (Date / Description)			

MUNICIPAL STRUCTURE INSPECTION FORM

2nd LINE ROAD

Structure No.: 1

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Jacob Ethier, Liam Farquhar
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16 °C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:		X		\$ 10,000
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	N/A			Total Cost \$ 10,000

Special Notes: BCI 62.6
Corrosion at waterline and lack of clearance through the culvert indicate that an underwater investigation would be prudent within the next 10 years.

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input type="checkbox"/> 6 to 10 years
Overall Comments:	No traffic barrier system in place, a review should be undertaken to determine traffic barrier system requirements. Additional routine maintenance should be conducted.
Date of Next Inspection:	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

2nd LINE ROAD

Structure No.: 1

ELEMENT DATA					
Element Group:	Approaches		Length:	6.0 m	
Element Name:	Wearing Surface		Width:	6.5 m	
Location:	North and South Approaches		Height:	-	
Material:	Granular		Count:	2	
Element Type:	Approach Wearing Surface		Total Quantity:	78 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	78	0	0
Comments: Gravel recently added.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Culvert		Length:	12.30 m	
Element Name:	Barrel		Width:	2.7 m	
Location:	Under Roadway		Height:	2.7 m	
Material:	Corrugated Steel		Count:	1	
Element Type:	Culvert Barrel		Total Quantity:	70.4 m ²	
Environment:	Severe		Limited Inspection:	<input checked="" type="checkbox"/>	
Protection System	Galvanization				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	45	25.4	0
Comments: Could not wade through structure due to water level and lack of clearance. Condition based on light to moderate corrosion noted at waterline.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

2nd LINE ROAD

Structure No.: 1

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Embankments		Width:	-	
Location:	North East/West, South East/West Quadrants		Height:	-	
Material:	Granular with Some Vegetation		Count:	4	
Element Type:	Embankment		Total Quantity:	4	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each	0	4	0	0
Comments: Embankments are steep. Light to moderate erosion noted on approaches.					
Performance Deficiencies: 00			Maintenance Needs: 02 - Erosion Control		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input checked="" type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	Through Structure		Height:	-	
Material:	Native		Count:	1	
Element Type:	Waterway		Total Quantity:	1	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each		1		
Comments: Water level high at time of inspection. High volume of flow noted.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

2nd LINE ROAD

Structure No.: 1

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

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



West elevation



Looking north over culvert

Township of Frontenac Islands
2022 OSIM



Looking south over culvert



Wearing surface over culvert

Township of Frontenac Islands
2022 OSIM



Looking through culvert from west



Looking through culvert from east

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

INVENTORY DATA:			
Structure Name	<u>3rd Line Road Culvert</u>		
Main Hwy/Road #	<u>3</u>	Under Structure:	Navigable Water <input type="checkbox"/> Non- Navigable Water <input checked="" type="checkbox"/>
			Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Road Name:	<u>3rd Line Road</u>	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	<u>1.15 km N of Base Line Road</u>		
Latitude	<u>44.160695°</u>	Longitude	<u>-76.483354°</u>
Owner(s)	<u>Township of Frontenac Islands</u>	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/> Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	<u>East</u>	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	<u>Kingston</u>	Posted Speed	<u>Not Posted</u> No. of Lanes <u>2.0</u>
Old County	<u>Frontenac County</u>	AADT	<u>No Data</u> % Trucks <u>No Data</u>
Geographic Twp.	<u>Wolfe Island</u>	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	<u>Twin Pipe Arch</u>	Detour Length Around Structure	<u>6.4 km</u> (km)
Structure Material	<u>Corrugated Steel</u>	Fill on Structure	<u>.3</u> (m)
Total Deck Length	<u>4.2</u> (m)	Skew Angle	<u>10</u> (Degrees)
Overall Str. Width	<u>14</u> (m)	Direction of Structure	<u>North/South</u>
Total Deck Area	<u>40</u> (m ²)	No. of Barrels	<u>2</u>
Roadway Width	<u>5</u> (m)		
Span Lengths	<u>2.1m; 2.1m</u> (m)		

HISTORICAL DATA			
Year Built	<u>2020</u>	Last OSIM Inspection	<u>2020/06/6</u>
Year of Last Major Rehab.	<u>-</u>	Last Enhanced OSIM Inspection	<u>-</u>
Current Load Limit	<u>-</u> (tonnes)	Last Bridge Master Inspection	<u>-</u>
Load Limit By-Law #	<u>-</u>	Last Evaluation	<u>-</u>
By-Law Expiry Date	<u>-</u>	Last Underwater Inspection	<u>-</u>
Min. Vertical Clearance	<u>-</u> (m)	Last Condition Survey	<u>-</u>
Rehabilitation History: (Date / Description)			
Structure Replaced in 2020.			

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Jacob Ethier, Liam Farquhar
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16°C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:	X			\$ -
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	N/A			Total Cost \$ -
Special Notes:				

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input type="checkbox"/> 6 to 10 years
Overall Comments: BCI 99.8 Structure replaced in 2020.	
Date of Next Inspection:	2024

Suspected Performance Deficiencies

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> 00 None 01 Load carrying capacity 02 Excessive deformations (deflections & rotation) 03 Continuing settlement 04 Continuing movements 05 Seized bearings | <ul style="list-style-type: none"> 06 Bearing not uniformly loaded/unstable 07 Jammed expansion joint 08 Pedestrian/vehicular hazard 09 Rough riding surface 10 Surface ponding 11 Deck drainage | <ul style="list-style-type: none"> 12 Slippery surfaces 13 Flooding/channel blockage 14 Undermining of foundation 15 Unstable embankments 16 Other |
|---|--|---|
-
- | | | |
|---|--|---|
| <p>Maintenance Needs</p> <ul style="list-style-type: none"> 01 Lift and swing bridge maintenance 02 Bridge cleaning 03 Bridge handrail maintenance 04 Painting steel bridge structures 05 Bridge deck joint repair 06 Bridge bearing maintenance | <ul style="list-style-type: none"> 07 Repair of structural steel 08 Repair of bridge concrete 09 Repair of bridge timber 10 Bailey bridges maintenance 11 Animal/pest control 12 Bridge surface repair | <ul style="list-style-type: none"> 13 Erosion control at bridges 14 Concrete sealing 15 Rout and seal 16 Bridge deck drainage 17 Scaling (loose Concrete or ACR Steel) 18 Other |
|---|--|---|

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

ELEMENT DATA					
Element Group:	Culverts	Length:	14 m		
Element Name:	Barrels	Width:	2.1 m		
Location:	Below Roadway	Height:	1.4 m		
Material:	Corrugated Steel	Count:	2		
Element Type:	Pipe Arch	Total Quantity:	155.7 m ²		
Environment:	Benign	Limited Inspection:	<input type="checkbox"/>		
Protection System	Hot Dip Galvanized				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	155.7	0	0	0
Comments: Replaced in 2020, slight rotation in North barrel.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Signs	Length:	-		
Element Name:	Hazard Markers	Width:	-		
Location:	All four quadrants	Height:	-		
Material:	Steel	Count:	4		
Element Type:	Hazard Markers	Total Quantity:	4		
Environment:	Severe	Limited Inspection:	<input type="checkbox"/>		
Protection System					
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	4	0	0	0
Comments:					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

ELEMENT DATA					
Element Group:	Approaches	Length:	10 m		
Element Name:	Wearing Surface	Width:	4.3 m		
Location:	North and South Approaches	Height:	-		
Material:	Granular	Count:	1		
Element Type:	Approach Wearing Surface	Total Quantity:	43 m ²		
Environment:	Benign	Limited Inspection:	<input type="checkbox"/>		
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	23	20	0
Comments: Erosion noted on both approaches. Wearing surface over culvert is a local high point with low points on both approaches.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams	Length:	-		
Element Name:	Embankments	Width:	-		
Location:	North East/West, South East/West Quadrants	Height:	-		
Material:	Stone	Count:	4		
Element Type:	Embankment	Total Quantity:	4		
Environment:	Benign	Limited Inspection:	<input type="checkbox"/>		
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each	4	0	0	0
Comments:					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	East/West, Beneath Structure		Height:	-	
Material:	Native		Count:	1	
Element Type:	Stream		Total Quantity:	1	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	All	0	1	0	0
Comments:					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

3rd LINE ROAD CULVERT

Structure No.: 2

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

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



Looking south over culvert



Looking north over culvert

Township of Frontenac Islands
2022 OSIM



Wearing Surface over culverts



Looking through north barrel

Township of Frontenac Islands
2022 OSIM



Looking through south barrel



West Elevation

Township of Frontenac Islands
2022 OSIM



East elevation

MUNICIPAL STRUCTURE INSPECTION FORM

4th LINE ROAD CULVERT

Structure No.: 3

INVENTORY DATA:			
Structure Name	4 th Line Road Culvert		
Main Hwy/Road #	4	Under Structure:	Navigable Water <input type="checkbox"/> Non- Navigable Water <input checked="" type="checkbox"/>
		Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>	
Road Name:	4 th Line Road	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	0.6 km N of Reeds Bay Road		
Latitude	44.145553°	Longitude	-76.4493014
Owner(s)	Township of Frontenac Islands	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/>
			Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	East	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	Kingston	Posted Speed	Not Posted No. of Lanes 2.0
Old County	Frontenac County	AADT	No Data % Trucks No Data
Geographic Twp.	Wolfe Island	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	Pre-Cast Box		
Structure Material	Concrete	Detour Length Around Structure	5.2 (km)
Total Deck Length	4.800 (m)	Fill on Structure	0.8 (m)
Overall Str. Width	18.20 (m)	Skew Angle	0 (Degrees)
Total Deck Area	87.36 (m ²)	Direction of Structure	North/South
Roadway Width	5.800 (m)	No. of Barrels	1
Span Lengths	4.800 (m)		

HISTORICAL DATA			
Year Built	-	Last OSIM Inspection	2020/06/6
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-
Rehabilitation History: (Date / Description)			

MUNICIPAL STRUCTURE INSPECTION FORM

4th LINE ROAD CULVERT

Structure No.: 3

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th , 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Jacob Ethier, Liam Farquhar
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16 °C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:	X			\$ -
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	N/A			Total Cost \$ -
Special Notes:				

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input type="checkbox"/> 6 to 10 years
<p>Overall Comments: BCI 74.8 Structure appears to be in good condition from visible elements. Could not wade through culvert due to high water level and lack of clearance. No traffic barrier system in place, a review should be undertaken to determine traffic barrier system requirements. Additional routine maintenance should be conducted.</p>	
Date of Next Inspection:	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

4th LINE ROAD CULVERT

Structure No.: 3

ELEMENT DATA					
Element Group:	Approaches		Length:	6.0 m	
Element Name:	Wearing Surface		Width:	5.8 m	
Location:	North and South Approaches		Height:	-	
Material:	Granular		Count:	2	
Element Type:	Approach Wearing Surface		Total Quantity:	69.6 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	61.6	8	0
Comments: No concerns. Light rutting.					
Performance Deficiencies: 09			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Approach		Length:	-	
Element Name:	Guiderail		Width:	-	
Location:	West Side of Roadway		Height:	-	
Material:	Wood Posts		Count:	1	
Element Type:	Soldier posts		Total Quantity:	Each	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m	0	0	1	0
Comments: Soldier posts on approaches. Recommend reviewing railing requirements for this structure.					
Performance Deficiencies: 08 – Pedestrian/ vehicular hazard			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

4th LINE ROAD CULVERT

Structure No.: 3

ELEMENT DATA					
Element Group:	Culverts		Length:	4.8 m	
Element Name:	Barrels		Width:	5.8 m	
Location:	Under Roadway		Height:	1.6 m	
Material:	Concrete		Count:	1	
Element Type:	Pre-Cast Box		Total Quantity:	123 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	122.5	0.5	0
Comments: Wide gap in joints at west end. Could not wade through due to lack of freeboard and high water levels. Assumed to be in good condition based on age and condition of visible elements.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Embankments		Width:	-	
Location:	North East/West, South East/West Quadrants		Height:	-	
Material:	Vegetation		Count:	4	
Element Type:	Embankment		Total Quantity:	4	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each		4		
Comments: Element in good condition, no erosion present.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

4th LINE ROAD CULVERT

Structure No.: 3

Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	East/West, Below Structure		Height:	-	
Material:	Native		Count:	2	
Element Type:	Stream		Total Quantity:	2	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
Comments: Clear of debris.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

4th LINE ROAD CULVERT

Structure No.: 3

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

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



Looking south over culvert



Looking north over culvert

Township of Frontenac Islands
2022 OSIM



Wearing surface over culvert



North wall from west end

Township of Frontenac Islands
2022 OSIM



Typical soffit detail



South wall west from west end

Township of Frontenac Islands
2022 OSIM



North wall from east end



Soffit

Township of Frontenac Islands
2022 OSIM



South wall from east end



Wide gap at east joint

MUNICIPAL STRUCTURE INSPECTION FORM

5th LINE ROAD CULVERT

Structure No.: 4

INVENTORY DATA:			
Structure Name	5 th Line Road Culvert		
Main Hwy/Road #	-	Under Structure:	Navigable Water <input type="checkbox"/> Non- Navigable Water <input checked="" type="checkbox"/>
			Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Road Name:	5 th Line Road	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	0.3 km N of Reeds Bay Road		
Latitude	44.149961°	Longitude	-76.433274°
Owner(s)	Township of Frontenac Islands	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/>
			Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	East	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	Kingston	Posted Speed	Not Posted No. of Lanes 2.0
Old County	Frontenac County	AADT	No Data % Trucks No Data
Geographic Twp.	Wolfe Island	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	Multiplate Pipe Arch	Detour Length Around Structure	5.2 (km)
Structure Material	Corrugated Steel	Fill on Structure	0.2 (m)
Total Deck Length	2.500 (m)	Skew Angle	0.0 (Degrees)
Overall Str. Width	21.60 (m)	Direction of Structure	North/South
Total Deck Area	54 (m ²)	No. of Barrels	1
Roadway Width	6.400 (m)		
Span Lengths	2.500 (m)		
Span Height	1.800 (m)		

HISTORICAL DATA			
Year Built	-	Last OSIM Inspection	2020-06,6
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-
Rehabilitation History: (Date / Description)			

MUNICIPAL STRUCTURE INSPECTION FORM

5th LINE ROAD CULVERT

Structure No.: 4

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th , 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Liam Farquhar, Jacob Either
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16°

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:	X			\$ -
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	Total Cost			\$ -
Special Notes:				

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input checked="" type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input checked="" type="checkbox"/> 6 to 10 years
<p>Overall Comments: BCI 62.2 Culvert is in fair condition. Pinhole perforations noted in floor of culvert. Pinhole perforations are indicators of severe section loss in steel culverts. Recommend planning to replace the culvert in 10 years. No traffic barrier system in place, a review should be undertaken to determine traffic barrier system requirements.</p>	
Date of Next Inspection:	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

5th LINE ROAD CULVERT

Structure No.: 4

ELEMENT DATA					
Element Group:	Approaches		Length:	6.0 m	
Element Name:	Wearing Surface		Width:	6.4 m	
Location:	North and South Approaches		Height:	-	
Material:	Granular		Count:	2	
Element Type:	Approach Wearing Surface		Total Quantity:	76.8 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²		76.8		
Comments: Some wheel track rutting present.					
Performance Deficiencies: 00			Maintenance Needs: 18		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input checked="" type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Culvert		Length:	21.6 m	
Element Name:	Barrel		Width:	2.5 m	
Location:	Under Roadway		Height:	1.8 m	
Material:	Steel		Count:	1	
Element Type:	Multiplate Pipe Arch		Total Quantity:	145.9 m ²	
Environment:	Severe		Limited Inspection:	<input type="checkbox"/>	
Protection System	Galvanization				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	99.7	39.45	6.75
Comments: perforations noted at each end of barrel. Perforations are indicators of severe section loss in barrel. Moderate to severe corrosion noted at and below waterline.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input checked="" type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input checked="" type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

5th LINE ROAD CULVERT

Structure No.: 4

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Embankments		Width:	-	
Location:	North East/West, South East/West Quadrants		Height:	-	
Material:	Granular		Count:	4	
Element Type:	Embankment		Total Quantity:	4	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	All		3	1	
Comments: Erosion noted at Southwest embankment.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	East/West, Through Structure		Height:	-	
Material:	Native		Count:	2	
Element Type:	Waterway		Total Quantity:	2	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each		2		
Comments: Clear of debris.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

5th LINE ROAD CULVERT

Structure No.: 4

REPAIR AND REHABILITATION REQUIRED		Priority			Estimated Cost
Element	Repair and Rehabilitation Required	6 - 10 Years	1 - 5 Years	< 1 year	
General	Replace Culvert	X			\$ 210,000
					\$ -
					\$ -
					\$ -
					\$ -
					\$ -
					\$ -
					\$ -
					\$ -
Total Cost					\$ 210,000

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



West elevation



East elevation

Township of Frontenac Islands
2022 OSIM



Looking north over Culvert



Looking south over culvert

Township of Frontenac Islands
2022 OSIM



Wearing surface over culvert



Erosion in South West

Township of Frontenac Islands
2022 OSIM



North wall (typ)



South wall (typ)

Township of Frontenac Islands
2022 OSIM



Looking through culvert



Perforation in floor at east end

MUNICIPAL STRUCTURE INSPECTION FORM

95 – Highway 95 Culvert

Structure No.: 5

INVENTORY DATA:			
Structure Name	95-Highway 95 Culvert		
Main Hwy/Road #	95	Under Structure:	Navigable Water <input type="checkbox"/> Non- Navigable Water <input checked="" type="checkbox"/>
			Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Road Name:	95-Highway 95	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	0.4 km N of Reeds Bay Road		
Latitude	44.157985°	Longitude	-76.419519°
Owner(s)	Township of Frontenac Islands	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/>
			Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	East	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	Kingston	Posted Speed	Not Posted No. of Lanes 2.0
Old County	Frontenac County	AADT	No Data % Trucks No Data
Geographic Twp.	Wolfe Island	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	Pre-Cast Box		
Structure Material	Concrete	Detour Length Around Structure	5.2 (km)
Total Deck Length	2.800 (m)	Fill on Structure	0.3 (m)
Overall Str. Width	20.00 (m)	Skew Angle	0 (Degrees)
Total Deck Area	56.00 (m ²)	Direction of Structure	North/South
Roadway Width	6.250 (m)	No. of Barrels	1
Span Lengths	2.800 (m)		

HISTORICAL DATA			
Year Built	2008	Last OSIM Inspection	2020/06/6
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-
Rehabilitation History: (Date / Description)			

MUNICIPAL STRUCTURE INSPECTION FORM

95 – Highway 95 Culvert

Structure No.: 5

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Jacob Ethier, Liam Farquhar
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16 °C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:	X			\$ -
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	N/A			Total Cost \$ -
Special Notes:				

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input type="checkbox"/> 6 to 10 years
Overall Comments: BCI 99 Good Condition. No traffic barrier system in place, a review should be undertaken to determine traffic barrier system requirements. Additional routine maintenance should be conducted.	
Date of Next Inspection:	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

95 – Highway 95 Culvert

Structure No.: 5

ELEMENT DATA					
Element Group:	Approaches		Length:	6.0 m	
Element Name:	Wearing Surface		Width:	6.25 m	
Location:	North and South Approaches		Height:	-	
Material:	Asphalt		Count:	2	
Element Type:	Wearing Surface		Total Quantity:	75.0 m ²	
Environment:	Severe		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	75	0	0
Comments: No concerns.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Culvert		Length:	20 m	
Element Name:	Barrels		Width:	2.8 m	
Location:	Under Roadway		Height:	2.6 m	
Material:	Concrete		Count:	1	
Element Type:	Pre-Cast Box		Total Quantity:	216 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	211.4	3	1.6	0
Comments: 8 precast box sections. Narrow stained cracks at soffit centerline in two sections. Lack of cover noted over culvert.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

95 – Highway 95 Culvert

Structure No.: 5

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Embankments		Width:	-	
Location:	North East/West, South East/West Quadrant		Height:	-	
Material:	Granular with Vegetation		Count:	4	
Element Type:	Embankment		Total Quantity:	4	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each		4		
Comments: Steep embankments.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	East/West, Through Structure		Height:	-	
Material:	Native		Count:	1	
Element Type:	Waterway		Total Quantity:	1	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	All		X		
Comments: Clear of debris.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

95 – Highway 95 Culvert

Structure No.: 5

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

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



West elevation



East elevation

Township of Frontenac Islands
2022 OSIM



Looking north over Culvert



Looking south over culvert

Township of Frontenac Islands
2022 OSIM



Wearing surface over culvert



North wall (typ)

Township of Frontenac Islands
2022 OSIM



South wall (typ)



Looking through culvert

Township of Frontenac Islands
2022 OSIM



Narrow moisture crack in soffit



Typical soffit detail

MUNICIPAL STRUCTURE INSPECTION FORM

18th Line Road Culvert

Structure No.: 6

INVENTORY DATA:			
Structure Name	18 th Line Road Culvert		
Main Hwy/Road #	-	Under Structure:	Navigable Water <input checked="" type="checkbox"/> Non- Navigable Water <input type="checkbox"/>
			Rail <input type="checkbox"/> Road <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Road Name:	18 th Line Road	On Structure:	Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Other <input type="checkbox"/>
Structure Location	0.3 km S of Limlaugh Lane		
Latitude	44.224494°	Longitude	-76.233506°
Owner(s)	Township of Frontenac Islands	Heritage Designation	Not Cons. <input checked="" type="checkbox"/> Cons./Not App. <input type="checkbox"/> List/Not Desig. <input type="checkbox"/>
			Desig./not List <input type="checkbox"/> Desig. & List <input type="checkbox"/>
MTO Region	East	Road Class:	Freeway <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local <input type="checkbox"/>
MTO District	Kingston	Posted Speed	Not Posted No. of Lanes 2.0
Old County	Frontenac County	AADT	No Data % Trucks No Data
Geographic Twp.	Wolfe Island	Special Routes	Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle <input type="checkbox"/>
Structure Type	Multiplate Pipe Culvert		
Structure Material	Steel	Detour Length Around Structure	4.3 (km)
Total Deck Length	4.200 (m)	Fill on Structure	0.2 (m)
Overall Str. Width	10.50 (m)	Skew Angle	0 (Degrees)
Total Deck Area	44.52 (m ²)	Direction of Structure	North/South
Roadway Width	4.800 (m)	No. of Barrels	1
Span Lengths	4.200 (m)		

HISTORICAL DATA			
Year Built	-	Last OSIM Inspection	2020/06/6
Year of Last Major Rehab.	-	Last Enhanced OSIM Inspection	-
Current Load Limit	- (tonnes)	Last Bridge Master Inspection	-
Load Limit By-Law #	-	Last Evaluation	-
By-Law Expiry Date	-	Last Underwater Inspection	-
Min. Vertical Clearance	- (m)	Last Condition Survey	-
Rehabilitation History: (Date / Description)			

MUNICIPAL STRUCTURE INSPECTION FORM

18th Line Road Culvert

Structure No.: 6

FIELD INSPECTION INFORMATION	
Date of Inspection:	May 6 th , 2022 Type of Inspection: <input checked="" type="checkbox"/> OSIM <input type="checkbox"/> Enhanced OSIM
Inspector:	John Landry, P.Eng
Others in Party:	Jacob Ethier, Liam Farquhar
Access Equipment Used:	Tape Measure, Hammer, Steel Tape
Weather:	Sunny
Temperature:	16 °C

ADDITIONAL INVESTIGATION REQUIRED	Priority			Estimated Cost
	None	Normal	Urgent	
Rehabilitation/Replacement Study	X			\$ -
Bridge Master Inspection	X			\$ -
Underwater Investigation:	X			\$ -
Detailed Condition Survey	X			\$ -
Fatigue Investigation:	X			\$ -
Seismic Investigation:	X			\$ -
Structural Evaluation:	X			\$ -
Coating Condition Survey	X			\$ -
Substructure Condition Survey	X			\$ -
Monitor Settlement/Movements	X			\$ -
Load Posting – Estimated Load Limit	N/A			Total Cost
Special Notes:				

OVERALL STRUCTURAL NOTES:	
Recommended Work on Structure:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Minor Rehab. <input type="checkbox"/> Major Rehab. <input type="checkbox"/> Replace
Timing of Recommended Work:	<input type="checkbox"/> 1 to 5 years <input type="checkbox"/> 6 to 10 years
Overall Comments: BCI 73.7 Overall structure in good condition. Routine maintenance should be conducted.	
Date of Next Inspection:	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

18th Line Road Culvert

Structure No.: 6

ELEMENT DATA					
Element Group:	Approaches		Length:	6.0 m	
Element Name:	Wearing Surface		Width:	4.8 m	
Location:	North and South Approaches		Height:	-	
Material:	Granular		Count:	2	
Element Type:	Approach Wearing Surface		Total Quantity:	57.6 m ²	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²		57.6		
Comments: Southwest erosion at base of guiderail					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Approaches		Length:	-	
Element Name:	Signs		Width:	-	
Location:	North East/West, South East/West Quadrants		Height:	-	
Material:	Steel		Count:	4	
Element Type:	Hazard Markers		Total Quantity:	4	
Environment:	Severe		Limited Inspection:	<input type="checkbox"/>	
Protection System	Galvanization				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each		4		
Comments: Element in good condition.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

18th Line Road Culvert

Structure No.: 6

ELEMENT DATA					
Element Group:	Approach		Length:	6 m	
Element Name:	Guiderail		Width:	-	
Location:	East and West of Roadway		Height:	-	
Material:	Steel		Count:	4	
Element Type:	Steel Beam		Total Quantity:	24 m	
Environment:	Severe		Limited Inspection:	<input type="checkbox"/>	
Protection System	Galvanization				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m		24		
Comments: Element in good condition.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Culvert		Length:	10.5 m	
Element Name:	Barrel		Width:	4.2 m	
Location:	Under Roadway		Height:	4.2 m	
Material:	Steel		Count:	1	
Element Type:	Culvert Barrel		Total Quantity:	145.5 m ²	
Environment:	Benign		Limited Inspection:	<input checked="" type="checkbox"/>	
Protection System	Galvanization				
Condition Data:	Units	Excellent	Good	Fair	Poor
	m ²	0	140	5.5	0
Comments: Could not wade through due to water depth. Viewed from ends. Holes in top of barrel on western side of the structure. Light corrosion at waterline.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

18th Line Road Culvert

Structure No.: 6

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Embankments		Width:	-	
Location:	North East/West, South East/West Quadrants		Height:	-	
Material:	Rockfill		Count:	4	
Element Type:	Embankment		Total Quantity:	4	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	Each	0	4	0	0
Comments: Embankments are steep, erosion noted in southwest					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

ELEMENT DATA					
Element Group:	Embankments and Streams		Length:	-	
Element Name:	Streams & Waterways		Width:	-	
Location:	East/West, Beneath Structure		Height:	-	
Material:	Native		Count:	1	
Element Type:	Waterway		Total Quantity:	1	
Environment:	Benign		Limited Inspection:	<input type="checkbox"/>	
Protection System	None				
Condition Data:	Units	Excellent	Good	Fair	Poor
	All	0	X	0	0
Comments: Clear of debris.					
Performance Deficiencies: 00			Maintenance Needs: 00		
Recommended Work: <input type="checkbox"/> Rehab. <input type="checkbox"/> Replace <input type="checkbox"/> 1 – 5 Years <input type="checkbox"/> 6 – 10 Years			Maintenance Needs: <input type="checkbox"/> Urgent <input type="checkbox"/> 1 Year <input type="checkbox"/> 2 Years		

MUNICIPAL STRUCTURE INSPECTION FORM

18th Line Road Culvert

Structure No.: 6

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

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

JUSTIFICATION

Township of Frontenac Islands
2022 OSIM



East elevation



West elevation

Township of Frontenac Islands
2022 OSIM



Looking north over culvert



Looking south over culvert

Township of Frontenac Islands
2022 OSIM



Wearing surface over culvert



Railing system over culvert (typ)

Township of Frontenac Islands
2022 OSIM



North wall (typ)



South wall (typ)

Township of Frontenac Islands
2022 OSIM



Looking through culvert