



BURNSIDE

2023 OSIM Bridge Inspections Report

**Township of Amaranth
374028 6th Line
Amaranth, ON L9W 0M6**



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2023 OSIM Bridge Inspections Report

**Township of Amaranth
374028 6th Line
Amaranth, ON L9W 0M6**

**R.J. Burnside & Associates Limited
15 Townline
Orangeville ON L9W 3R4 Canada**

**November 2023
300057065.0000**



Township of Amaranth
November 2023

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Record of Revisions

Revision	Date	Description
-	October 2023	Draft Report
1	November 2023	Final Report

R.J. Burnside & Associates Limited

Report Prepared By:

Mack Chiasson

Mack Chiasson
Engineering Assistant
MC:jh

Report Reviewed By:



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2023

Chris Knechtel, P.Eng.
Senior Vice President, Municipal Services and Structures

Township of Amaranth
November 2023

Executive Summary

R.J. Burnside & Associates Limited (Burnside) was engaged by the Township of Amaranth to undertake the inspection of 20 bridge and culvert structures as part of the original scope for this assignment. The Township subsequently requested Burnside to complete a visual inspection of an additional 23 structures that previously had not been included on the Township's bridge and culvert OSIM inventory, which would bring the Township's structure inventory up to 43 bridges and culverts. The visual inspections of the original 20 structures were carried out on an element by element basis in accordance with the Ministry of Transportation - Ontario Structure Inspection Manual (OSIM), however the Township requested that the visual inspection of the additional 23 structures be completed only to identify any serious structural or safety defects, but a full OSIM inspection and calculation of the Bridge Condition Index (BCI) was not to be completed for these additional structures at this time. All of the inspections were completed under the direction of a Professional Engineer to assess their condition and identify any material defects, performance deficiencies, maintenance needs, additional studies and/or repairs/rehabilitation work required on a structure by structure basis.

It should be noted that this report references only the original 20 full OSIM inspection structures, with the exception of Appendix B which summarizes the findings from each of the additional 23 structures.

Following the field inspections, recommendations were made based on the data collected and the review of the previous inspection reports. Depending on the condition of each structure, the remedial needs have been provided in three classifications; routine maintenance, additional investigations and repairs and rehabilitations (Capital Works).

The routine maintenance work often requires a minimal scope of work, and in most cases can be carried out by Township staff. The items included in the maintenance needs include recurring items that should be completed each year, i.e., cleaning winter sand/salt off bridge decks, and one-time costs such as placing rip-rap in washouts on slopes adjacent to bridge wingwalls. The total estimated value of the work to be completed by the Township is **\$41,000.00**. We recommend that a general allowance to complete the works described above be included in the Township's annual road budget.

Additional studies, investigations, and monitoring programs, as summarized in the report, are recommended to structures currently demonstrating severe material defects or performance deficiencies which may necessitate an inspector to require more detailed information. These investigations have been identified based on a "normal" or "urgent" priority.

Township of Amaranth
November 2023

The Capital Works needs include any repair, rehabilitation or replacement work which would typically be completed by a Township hired Contractor, to assist in extending the service life of a structure and increasing the Bridge Condition Index (BCI). In accordance with the OSIM, the capital works required are based on a priority of six to ten years, one to five years, within one year, and urgent and have been estimated as follows:

Capital Works Costs and Timeframes

Time Frame	Capital Cost
< 1 year	\$6,266,000.00
1 – 5 years	\$952,000.00
6 – 10 years	\$2,133,000.00
TOTAL	\$9,351,000.00

It should be noted that these costs include recommended replacement costs for structures in need.

Taking into consideration the structures calculated BCI's, several structures have been identified for replacement or rehabilitation. Within the next year, two (2) structures have been identified for replacement. Within the next one to five years, two (2) structures have been identified as requiring rehabilitation.

Current roadside safety needs include costs for new/replacement guide rail and/or end treatments at structure locations as required or an investigation where the need for a guide rail system was not evident based on high level review. The total estimated cost for current roadside safety needs is **\$481,500.00**.

It should be noted that all of the aforementioned estimated costs throughout this summary and the report do not include property acquisition costs, utility relocation costs or engineering fees associated with road work beyond the wingwalls, unless specifically identified within the individual OSIM forms. All costs are also exclusive of HST.

Township of Amaranth
November 2023

Table of Contents

1.0	Introduction	1
2.0	Inspection Observations and Recommendations	2
2.1	Routine Maintenance	2
2.2	Additional Studies/Investigations	3
2.3	Roadside Safety.....	4
2.3.1	Pedestrian and Inspector Safety	5
2.4	Repair, Rehabilitation or Replacement	6
2.5	Load Postings and Recommendations	7
3.0	Bridge Condition Index	8
4.0	Structure Inventory Trends	10
5.0	Prioritization and Recommended Work	13
6.0	Additional Structures	16
6.1	Additional Investigations for Additional Structures	16
6.2	Load Postings and Recommendations	17
7.0	Summary	18

Figures

Figure 1:	Types of Structures	2
Figure 2:	Bridge Condition Index Distribution (2023)	10
Figure 3:	Bridge Condition Index Historical Trend	11

Tables

Table 1:	Additional Investigations (OSIM Structures).....	4
Table 2:	Capital Works Costs and Timeframes.....	7
Table 3:	Load Postings	7
Table 4:	Top Priority Structures based on Condition Rating (BCI) (Within 5 Years).....	13
Table 5:	10-Year Capital Plan	14
Table 6:	Top Priority Additional Structures (Within 5 Years).....	16
Table 7:	Additional Investigations (Additional Structures).....	17
Table 8:	Load Postings	17

Appendices

Appendix A	Summary Reports
Appendix B	Additional Structures Summary Reports
Appendix C	Structure Inventory and Cost Summaries
Appendix D	Structure Location Map
Appendix E	Photo Summary Sheets
Appendix F	OSIM Forms and Photos (Provided Digitally)

Township of Amaranth
November 2023

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Township of Amaranth
November 2023

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) was engaged by the Township of Amaranth to undertake the inspection of 20 bridge and culvert structures as part of the original scope for this assignment. The Township subsequently requested Burnside to complete a visual inspection of an additional 23 structures that previously had not been included on the Township's bridge and culvert OSIM inventory, which would bring the Township's structure inventory up to 43 bridges and culverts. The visual inspections of the original 20 structures were carried out on an element by element basis in accordance with the Ministry of Transportation - Ontario Structure Inspection Manual (OSIM), however the Township requested that the visual inspection of the additional 23 structures be completed only to identify any serious structural or safety defects, but a full OSIM inspection and calculation of the Bridge Condition Index (BCI) was not to be completed for these additional structures at this time. All of the inspections were completed under the direction of a Professional Engineer to assess their condition and identify any material defects, performance deficiencies, maintenance needs, additional studies and/or repairs/rehabilitation work required on a structure by structure basis.

It should be noted that this report references only the original 20 full OSIM inspection structures, with the exception of Appendix B which summarizes the findings from each of the additional 23 structures.

It is noted that all costs referenced within this report are based on the year of most recent inspection and do not account for changes in unit costs (due to inflation, material availability, labour rates, etc.).

The inspections have been completed in accordance with the Ministry of Transportation - Ontario Structure Inspection Manual (OSIM). Inspection of the Township's bridges and culverts are required every two years as per Ontario Regulation 104/97 which states *"The structural integrity, safety and condition of every bridge shall be determined through the performance of at least one inspection in every second calendar year under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual."* These inspections assess the condition of the structure and identify any additional studies or repairs required. A map showing the location of all structures has been provided in Appendix D.

Burnside staff conducted a detailed element by element visual assessment of each bridge/culvert in order to identify any material defects, performance deficiencies and maintenance needs on a structure by structure basis. All data collected has been documented on the OSIM forms and provided in digital format in Appendix F. In addition, a brief written overview has been provided to clarify the OSIM data.

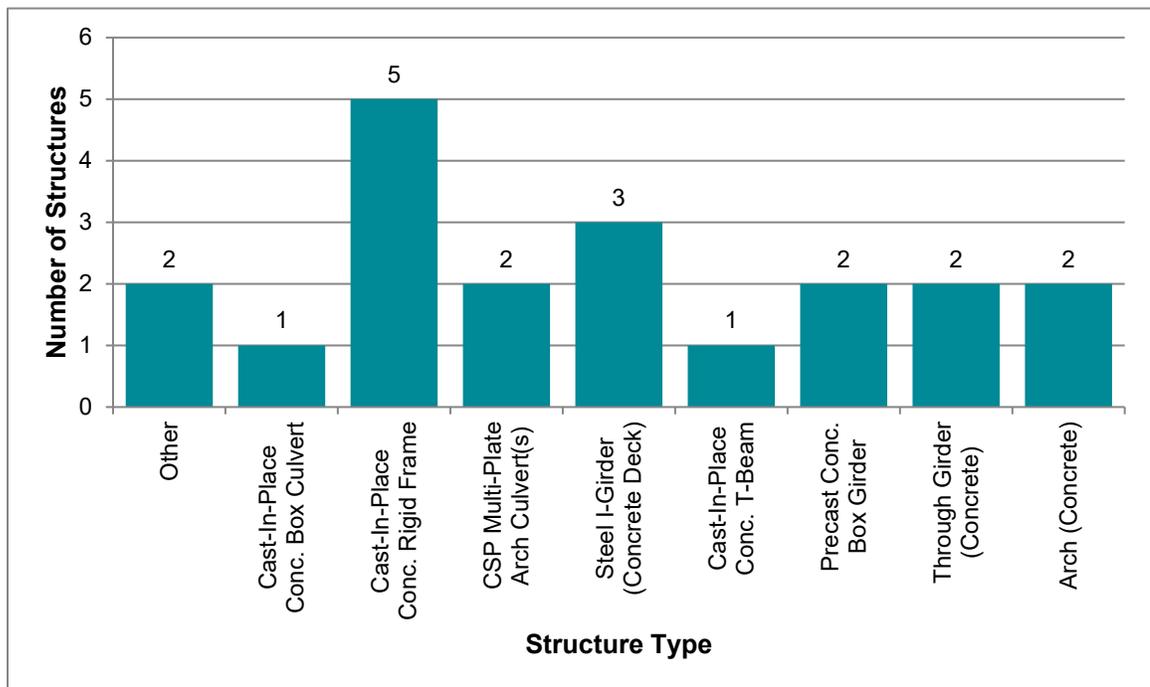
Township of Amaranth
November 2023

2.0 Inspection Observations and Recommendations

The following observations and recommendations were made during our recent inspection of the Township’s structures. These inspections, along with a review of the previous reports have contributed to the recommendations provided.

The Township of Amaranth has an original inventory of 20 structures (the additional 23 structures have not been included in the summarized information below), which is comprised of a variety of structure types. Figure 1 below summarizes the number and types of structures within the inventory.

Figure 1: Types of Structures



Depending on the condition of each structure, some level of remedial action is usually required. The recommendations for remedial work are provided in three classifications, routine maintenance, additional investigations, and repair, rehabilitation, or replacement.

2.1 Routine Maintenance

Routine maintenance needs often require minimal effort to extend the service life of the structure. In most cases, routine maintenance can be undertaken by Township staff or locally contracted out. It is desirable to ensure that all maintenance needs identified at each structure be completed within the calendar year of receiving this Report.

Township of Amaranth
November 2023

Common structure defects were noted, to varying degrees, at most of the structures inspected. These common defects include:

- Minor erosion of slopes on culvert embankments and adjacent to bridge wingwalls.
- Excessive sand/granular material on deck surface due to winter maintenance or vehicle tracking.
- Clogged deck drains or lack of drainage.
- Erosion of stream banks at the water level.
- Debris collection and heavy vegetation at culvert and bridge openings.
- Lack of, damaged or non-code-conforming guide rail.
- Minor asphalt defects (potholes, cracking).
- Lack of or missing hazard warning signs.

These general defects can be addressed within the Township's routine maintenance program and these issues can be added to the Township's in-house road and structure inspection routine.

Routine bridge sweeping, washing of decks, drains, joints, bearing seat areas and girders will improve a structures service life. Removal or trimming of vegetation and addressing minor erosion concerns regularly will pre-empt more serious issues.

The total estimated value of the work to be completed by the Township is approximately **\$41,000.00**. We recommend that a general allowance to complete the works described above be included in the Township's annual road maintenance budget.

A summary of maintenance needs is provided in Appendix C, along with estimated costs to complete the work.

2.2 Additional Studies/Investigations

As per the OSIM, additional investigations or surveys may be required to further assess the condition of certain elements that may not be fully determined by a visual inspection. In many cases, where a major rehabilitation of a structure is required or planned, the completion of additional studies or investigations will assist in developing appropriate rehabilitation programs. Studies or investigations may also be required where performance deficiencies are suspected. Typical investigations that may be required include:

- Deck condition surveys.
- Structure evaluations (Load Capacity).
- Monitoring of deformations, settlements, and movement.
- Monitoring crack widths.

Township of Amaranth
November 2023

A summary of the additional investigations recommended for the Township are summarized in Table 1 below:

Table 1: Additional Investigations (OSIM Structures)

Structure No./Name	Additional Investigation	Reasoning	Estimated Cost
4	Monitoring of Deformations, Settlements and Movements	Monitor rotation of retaining walls during future biennial inspections to determine if actively progressing	\$0.00
10	Monitoring of Deformations, Settlements and Movements	Establish a monitoring program to determine if the south abutment is actively rotating	\$2,500.00
11	Monitoring of Deformations, Settlements and Movements	Establish a monitoring program to determine if the north wingwalls are actively rotating	\$2,500.00
13	Monitoring of Deformations, Settlements and Movements	Establish a monitoring program to determine if the abutments are actively rotating	\$2,500.00
20	Monitoring of Deformations, Settlements and Movements	Monitor cusping/deformations during future biennial inspections to determine if actively progressing	\$0.00
Total			\$7,500.00

A summary of recommended studies and costs is also included in Appendix C.

2.3 Roadside Safety

During our inspections, Burnside makes note of the condition and effectiveness of roadside safety measures on the approaches to the structures. Where no roadside safety systems are present, Burnside has a responsibility to identify that there should be consideration given to installing roadside safety systems, i.e., guide rail and end treatments.

Roadside safety system requirements are set out in the MTO - Roadside Safety Manual which is a guideline provided to be used as a risk assessment tool in establishing the need, type and extent of roadside safety measures.

As is discussed in more detail in the Manual, risk management is critical in assessing the need for roadside safety installations. At some structures, and on some roadways, the installation of guide rail systems may be seen as more of a hazard than not having a system. This may be a result of a reduction in road platform width, the ability to remove

Township of Amaranth
November 2023

snow effectively, and the space available to place and anchor end treatments. Section 4.2.2.1 from the MTO - Roadside Design Manual states *that guide rail systems must be offset a minimum of 4.25 m from the roadway centerline, to provide clearance to snowplowing operations*. In addition, local use of a roadway by farm equipment and the location of driveway and field entrances around structures should also be considered in determining the need and effectiveness of guide rail systems.

In consideration of the above, costs to install guide rail on narrow Township roads with a platform width of 8.0 m or narrower have not been included in this report under the rehabilitation plan, unless bridge/road widening to 8.5 m or wider has been recommended as part of the rehabilitation plan. Installation of steel beam guide rail for replacement options is included within the replacement cost estimate.

For the purpose of this Report, where a high level review indicated that guide rail or guiderail components would be required (apparent substandard length of need, substandard end treatments, rigid barriers on the structure, small clear zone between the edge of road and edge of structure, etc.) a general allowance for a typical guide rail system installation has been provided, however, site specific and detailed assessments of need at each structure is not included in this Report. Where the need for a guiderail system was not evident based on high level review, an allowance for an investigation into the need for guiderail was provided. The total estimated cost relating to guide rail installation or investigation is **\$481,500.00**.

Where recommendations have been made for installation or corrective measures, Burnside has identified that the work is to be completed within one to five years. However, as each site has unique characteristics relating to the requirements of guiderail, Burnside also recommends that a further investigation and risk analysis of each of the identified sites be completed by the Township within one year to classify the structures as high, medium, or low priority for guide rail installation or improvements. The study may also outline a timeline for guide rail upgrades based on annual guide rail budget.

2.3.1 Pedestrian and Inspector Safety

During inspections, Burnside makes note of the condition and effectiveness of the pedestrian barricades installed at bridges and culverts. MTO Bulletin, BO2020-03 Guards on Structures, was issued on April 7, 2020 and provides recommendations for the installation of guards on culvert ends and retaining walls for the safety of the public and inspectors.

The bulletin recommends that where an area is accessible to the public and an exposed height of greater than 0.6 m is present, a guard meeting the Ontario Building Code requirements shall be installed to protect the public from fall hazards. Additionally, in areas not accessible to the public and where exposed heights greater than 2.4 m are

Township of Amaranth
November 2023

present, a guard shall be installed on culvert ends, or on top of retaining walls to protect inspectors from fall hazards.

It is further noted in the bulletin that a fall hazard risk assessment is to be completed and the need for guards determined by the MTO, or the Owner as appropriate. Installation of guards is recommended to be included as part of any major capital program, and in unique situations may be completed as a standalone installation if warranted.

Burnside has identified locations that could be considered high risk for pedestrians where the lack of guards, or poor condition of existing guards exist. Costs for replacement / installation of guards have been included in the recommended work programs.

2.4 Repair, Rehabilitation or Replacement

Recommended repair, rehabilitation or replacement work is provided on the OSIM form for each bridge and culvert. The recommended work is indicated for each element and outlines the priority and estimated construction cost. The priorities for the specified rehabilitation or replacement plans are typically identified on the OSIM forms as six to ten years, one to five years, within one year, and urgent.

The costs associated with the recommended work are based on the measured quantities of fair and poor element conditions and unit costs for similar and recent works. In many instances, where only minor works are required, the costs for mobilization, site access and or waterway control items (as required) are difficult to assess and may skew the costs of small scale works. This work is often best completed by grouping similar efforts together.

For repair programs that require a number of prolonged on-site activities, we have assigned a variable general cost that may range from \$40,000.00 to \$125,000.00, to address some of the mobilization, insurance, bonding, and related costs of being on-site.

Where the recommended work is the replacement of the structure, these general costs are assumed to be included in the overall replacement cost.

Construction cost estimates do not include property acquisition, utilities relocation or support, or engineering fees associated for the works beyond the structure limits, unless specifically identified within the individual OSIM forms.

The total estimated cost for the capital works for all 20 structures within the Township, (including rehabilitation/repair and replacement costs) has been estimated as follows:

Township of Amaranth
November 2023

Table 2: Capital Works Costs and Timeframes

Time Frame	Capital Cost
< 1 year	\$6,266,000.00
1 – 5 years	\$952,000.00
6 – 10 years	\$2,133,000.00
TOTAL	\$9,351,000.00

The total, 10-year estimated capital costs, which includes the above as well as all other associated costs including maintenance, additional investigations, and roadside protection costs, is \$9,881,000.00. It should be noted that all costs are based on 2023 prices and do not account for inflation. A summary of the capital works needs can be found in Appendix C.

2.5 Load Postings and Recommendations

Load postings may be recommended for structures based on age, condition, noted performance deficiencies or based on the findings of a structural evaluation. A summary of the load postings for the Township's inventory is provided in Table 3 below.

Table 3: Load Postings

Structure No.	Load Posting (tonnes)	Recommendations
10	16	No change
11	12	No change
12	12	No change
13	14	No change

In accordance with Section 123(2) of the Highway Traffic Act and Regulation 103/97 made under the Act, we recommend that the Township enact an appropriate By-law for the maximum allowable gross weight crossing over the structures identified in the table above.

Further, we recommend that any such By-law established shall be considered valid for a period of two (2) years, or until the completion the next bridge inspection report.

It should be noted that a summary of load limit postings on the Additional Structures can be found in Section 6.2 of this report.

Township of Amaranth
November 2023

3.0 Bridge Condition Index

The Bridge Condition Index (BCI) for each structure has been determined based on the Ministry of Transportation Ontario (MTO) methodology followed in the MTO Document, MTO Bridge Condition index and Overall Measure of Bridge Condition, July 2009.

A new structure would have a BCI value of 100 and the value will decline over time. Monitoring the rate of decline in the BCI and comparing this with an anticipated rate of decline will provide the Township with valuable, long-term planning and asset management information. The reduction in BCI, in theory, is a function of many factors, including traffic volume, truck use, use of de-icing chemicals, exposure to the elements and the type of structure. Each bridge will decline at its own rate, but it is reasonable to expect that the decline begins slowly and accelerates as the structure gets older.

In addition, determining an individual BCI value at any point in time will allow the Township to make estimates of expected remaining service life and or establish target BCI criteria for major rehabilitations or replacements.

The Canadian Highway Bridge Design Code has a target service life of approximately 75 years, but it is recognized that maintenance, repair, and rehabilitations will be required along the way to reach or exceed this target.

As indicated, the BCI for a structure can range from 0 to 100 and a municipal bridge and culvert infrastructure can be organized into several ranges.

Good – BCI Range 70 to 100

A bridge with a BCI greater than 70 is generally considered to be in good to excellent condition, and repair or rehabilitation work is not usually required within the next five years. Routine maintenance, such as sweeping, cleaning, and washing are still recommended.

Fair – BCI Range 50 to 70

A bridge with a BCI between 50 and 70 is generally considered to be in good to fair condition. Repair or rehabilitation work recommended is ideally scheduled to be completed within the next five years. This is the ideal time to schedule major bridge repairs for larger and/or critical structures from an economic perspective. The most effective improvement in a structure's service life can be achieved by completing repairs while in this range.

Township of Amaranth
November 2023

Poor – BCI Less than 50

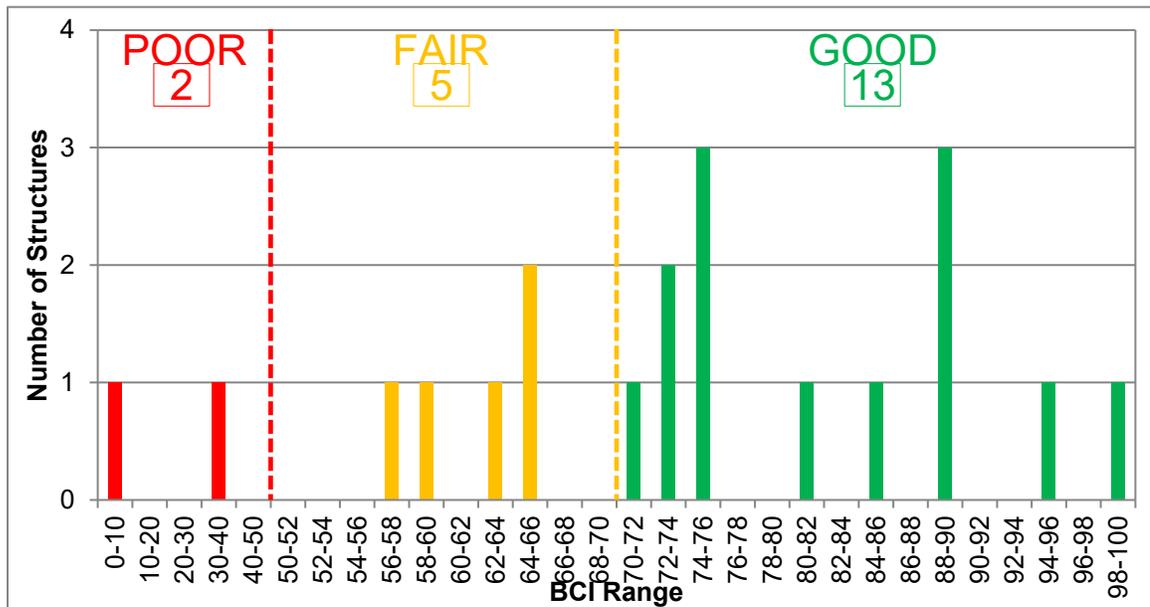
A bridge with a BCI rating of less than 50 is generally considered poor with lower numbers representing structures nearing the end of their service life. The repair or rehabilitation of these structures is ideally best scheduled to be completed within approximately one year. However, if it is determined that the replacement of the structure would be a more viable, practical, or economical solution than repairing the structure, the structure can be identified for continued monitoring and scheduled for replacement within a one to ten year range. The lower the BCI the more of a priority, within the one to ten year range the replacement becomes.

Township of Amaranth
November 2023

4.0 Structure Inventory Trends

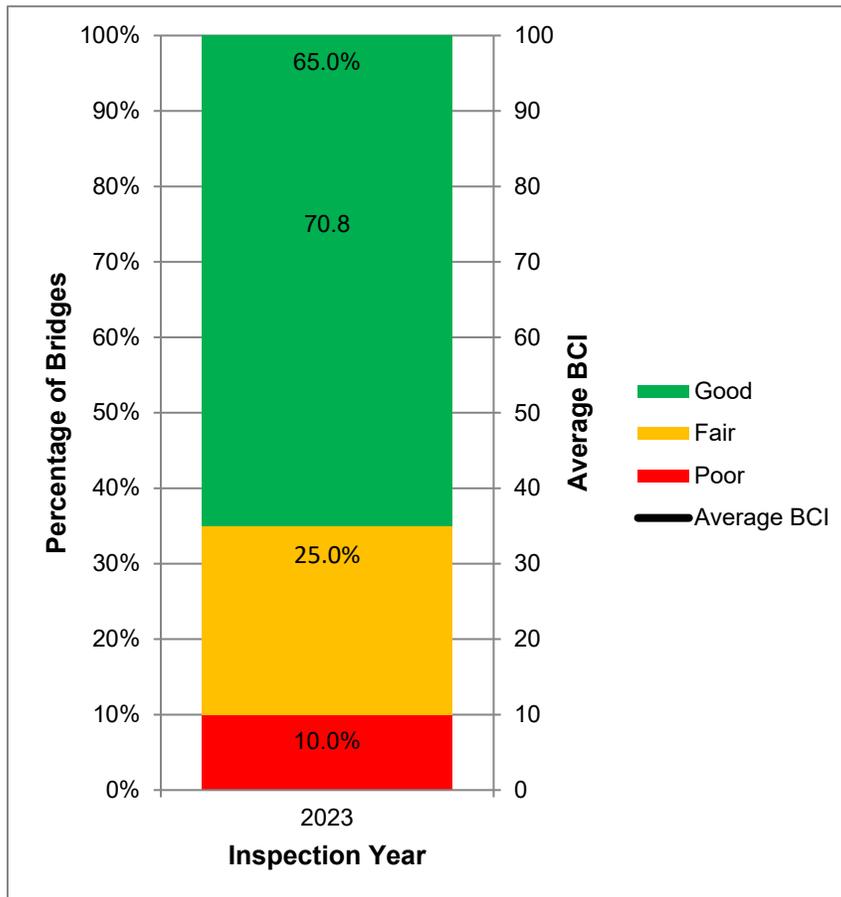
Based on the biennial inspection of each structure, the Bridge Condition Index (BCI) is calculated for each structure. The Bridge Condition Index Distribution graph, shown in Figure 2 below, provides a summary of the current state of the Township's original 20 OSIM structures (the additional 23 structures have not been included as BCI's were not calculated at the request of the Township), and Figure 3 shows the historical trend of the state of the structures over past inspections where BCI information was available.

Figure 2: Bridge Condition Index Distribution (2023)



Township of Amaranth
November 2023

Figure 3: Bridge Condition Index Historical Trend



Currently, approximately 65.0% of the Township’s structures are within the “good” range, with 25.0% of the structures classified as “fair” and 10.0% classified as “poor”, as illustrated in Figure 3 above. Of interest, the MTO has established a goal of maintaining 85% of their structures in “good” condition (BCI \geq 70) by addressing rehabilitations and replacements as necessary. Burnside recognizes that the above goal was not established by the Township, but it is noted that, based on the current state of the inspected structures, the Township is underperforming on the management of their bridge assets when compared to the MTO’s established goal.

The recently completed and upcoming capital works projects help to improve the overall BCI of the Township’s inventory, which include the following:

- Bridge 2 – 7th Line Replacement (2022/2023); and
- Bridge 6 – 10th Line Rehabilitation (2020).

Projects currently in preliminary stages of design include:

- Bridge 10 – 7th Line Replacement.

Township of Amaranth
November 2023

Continued maintenance and completion of rehabilitative or replacement works as recommended in this report will help contribute to the overall improvement of the Township's bridge assets.

The MTO has also developed theoretical deterioration curves which can be used as a backdrop to estimate the remaining service life of a structure before replacement, or to establish a time frame for future rehabilitations. Burnside has adjusted the MTO theoretical deterioration curve to more accurately reflect the deterioration curve of the structures that are being inspected. It has been observed after inspecting structures for over 10 years, that the structures are deteriorating slower than anticipated based on the MTO theoretical deterioration curve, and therefore the timeline for the rehabilitation / replacement of the structure has been adjusted to reflect this slower deterioration rate.

For the purposes of this report, culverts and bridges less than 4.5 m in span are assumed not to have a rehabilitation cycle. These structures will be monitored and planned for replacement when their BCI drops below a lower limit of 40. However, even though our recommendation is to replace a structure, the costs to repair identified defects are included on the OSIM forms should the Township wish to repair these structures.

For structures with spans greater than 4.5 m, it has been assumed that a structure will be rehabilitated once during its lifetime. The rehabilitations are scheduled when the structures reach a target BCI of 60. However, for certain larger, more significant bridges, rehabilitation options may still be viable for BCI's lower than 60, but these will be considered on a site by site basis.

The estimated time until replacement or rehabilitation is required has been provided and the costs for all works required in the next ten years are identified.

Township of Amaranth
November 2023

5.0 Prioritization and Recommended Work

As an initial measure for prioritizing any required work, the structures have been ranked using their BCI values. A summary of the structures, in ascending order of BCI, along with their associated preliminary construction costs has been included in Appendix C. Two separate summary tables have been created to identify replacement and rehabilitation priority structures.

It should be noted that although the BCI is a good measure of the overall condition of the bridge, and therefore relative construction need, other factors are often considered when programming and prioritizing bridge work. Other factors that may be considered include:

- Traffic volume and number of trucks that regularly use the road.
- Load capacity restrictions at the site.
- Geometric restrictions (alignment or width).
- Pedestrian or cycling requirements.
- History of accidents or traffic conflicts.
- History of flooding or ice problems.
- Area growth and development.
- In conjunction with already planned road improvements.

The prioritized capital works plan and associated construction costs can be used for estimating future capital budgets. The budgets and rehabilitation work plans have been provided for the Township's highest priority structures. The structures provided below have been identified as requiring rehabilitation work or replacement in the next five years. The structures have been identified for rehabilitation or replacement based on their condition during the latest completed inspection.

Table 4: Top Priority Structures based on Condition Rating (BCI) (Within 5 Years)

Structure No.	Road Name	Recommended Work	Estimated Cost	Years to Rehabilitation / Replacement
15	7 th Line	Replace	\$2,018,000.00	0
10	7 th Line	Replace	\$2,230,000.00	0
11	15 th Sideroad	Replace	\$2,018,000.00	0
3	8 th Line	Rehabilitate	\$492,500.00	3
12	6 th Line	Rehabilitate	\$459,500.00	4
Total			\$7,218,000.00	

The structures in the 10-year Capital Plan shown below in Table 5, have been ordered for rehabilitation or replacement based on their condition during the latest completed inspection, but also take into account additional factors through recent discussions with

Township of Amaranth
November 2023

Township staff, such as low traffic volume roads, schedule reconstruction projects, close proximity of priority structures, etc. and the Township's estimated **\$500,000 - \$700,000** annual capital works budget for bridges and culverts. This does not account for any funding assistance the Township is able to secure for these projects.

Costing breakdown for planning and engineering design has been provided in the 10-year capital plan below which includes the Additional Structures inspected this year. It should be noted that the priorities listed may change and will need to be re-assessed during each OSIM inspection cycle.

Table 5: 10-Year Capital Plan

Structure No./Name	Road Name	Recommended Work	Estimated Cost
2024			
0011 0036 0039 0040	15 th Sideroad Sideroad 30 8 th Line 9 th Line	Engineering – Confirm if Bridge 0011 substructure is actively rotating and monitor Structures 0036, 0039 and 0040 until Replacement	\$5,000
0022 0023	2 nd Line	Engineering – Design (Replacement)	\$40,000 \$25,000
*0022 *0023	2 nd Line	Construction – Replacement	\$450,000 \$350,000
2025			
0039	8 th Line	Engineering – Design (Replacement)	\$25,000
0036	Sideroad 30	Engineering – Design (Replacement)	\$65,000
0039	8 th Line	Construction – Replacement	\$250,000
2026			
0040	9 th Line	Engineering – Design (Replacement)	\$30,000
0036	Sideroad 30	Construction – Replacement	\$800,000
2027			
0010	7 th Line	Engineering – Finalize Design/Tender (Replacement)	\$10,000
0040	9 th Line	Construction – Replacement	\$350,000
2028			
0038	Sideroad 25	Engineering – Design (Replacement)	\$45,000
0010	7 th Line	Construction – Replacement	\$1,900,000

Township of Amaranth
November 2023

Structure No./Name	Road Name	Recommended Work	Estimated Cost
2029			
0012	6 th Line	Engineering – Design (Rehabilitation)	\$40,000
0038	Sideroad 25	Construction – Replacement	\$450,000
2030			
0003	8 th Line	Engineering – Design (Rehabilitation)	\$40,000
0012	6 th Line	Construction – Rehabilitation	\$400,000
2031			
0011	15 th Sideroad	Engineering – Design (Replacement)	\$100,000
0003	8 th Line	Construction – Rehabilitation	\$440,000
2032			
0037	Sideroad 30	Engineering – Design (Replacement)	\$20,000
0011	15 th Sideroad	Construction – Replacement	\$1,750,000
2033			
0037	Sideroad 30	Construction – Replacement	\$200,000
Total			\$7,785,000

* Construction cost estimates are provided if Structure 0022 & 0023 are replaced on their own, if combined into one tender there will likely be cost savings to be realized

Note: The Township has requested that Structure 0015 and 0021 be omitted from the 10-year Capital Plan for the time being as they are currently closed to through traffic.

Structure 0011 replacement may need to be moved up the 10-year priority depending on the results of the recommended monitoring program.

The cost estimates above do not include contingencies, utility relocation work or property acquisition.

Township of Amaranth
November 2023

6.0 Additional Structures

As previously noted, The Township requested Burnside to complete a visual inspection of an additional 23 structures that previously had not been included on the Township's bridge and culvert OSIM inventory. Summaries of each structure can be found in Appendix B. Formal BCI calculations were not conducted for these structures and therefore, the recommendations are based solely on the severity of the defects noted for the key structural elements during the visual inspections conducted in the field.

The prioritized capital works plan and associated construction costs can be used for estimating future capital budgets. The structures provided below have been identified as requiring replacement in the next five years.

Table 6: Top Priority Additional Structures (Within 5 Years)

Structure No.	Road Name	Recommended Work	Estimated Construction Cost*	Priority
21	9 th Line	Replace	\$600,000.00	Closed
36	Sideroad 30	Replace	\$800,000.00	Within 1 year
39	8 th Line	Replace	\$350,000.00	Within 1 year
22	2 nd Line	Replace	\$450,000.00	Within 1 year
40	9 th Line	Replace	\$350,000.00	Within 1 year
23	2 nd Line	Replace	\$350,000.00	1 to 5 years
38	Sideroad 25	Replace	\$450,000.00	1 to 5 years
37	Sideroad 30	Replace	\$300,000.00	1 to 5 years
Total			\$3,650,000.00	

* The Estimated Construction Cost does not account for Geotechnical Investigation fees, Environmental Assessment fees, Engineering Design fees, Roadside Protection fees, Utility Relocation or Property costs, Contract Administration fees, or Contingency Allowance.

6.1 Additional Investigations for Additional Structures

As per the OSIM, additional investigations have been identified for the additional structures to further assess the condition of certain elements that may not be fully determined by a visual inspection.

A summary of the additional investigations recommended for the Township are summarized in Table 7:

Township of Amaranth
November 2023

Table 7: Additional Investigations (Additional Structures)

Structure No.	Additional Investigation	Reasoning	Estimated Cost
22	Monitor movement of abutment and wingwall	To determine if movement is active and unstable	\$2,500.00
23	Monitor movement of abutment	To determine if movement is active and unstable	\$2,500.00
29	Structure Evaluation	Determine if culvert was designed to withstand additional fill	\$5,000.00
36	Monitor movement of abutment	To determine if movement is active and unstable	\$2,500.00
38	Monitor crack width	To determine if actively progressing	\$2,500.00
39	Monitor movement of abutment	To determine if movement is active and unstable	\$2,500.00
40	Monitor crack width	To determine if actively progressing	\$2,500.00
Total			\$20,000.00

6.2 Load Postings and Recommendations

Load postings may be recommended for structures based on age, condition, noted performance deficiencies or based on the findings of a structural evaluation. A summary of the load postings for the Township's inventory is provided in Table 8 below.

Table 8: Load Postings

Structure No.	Load Posting (tonnes)	Recommendations
22	10	No change
36	10	No change
39	10	No change

Structure 22, 36, and 39 were recommended to be load posted at 10 tonnes until replacement can occur based on the condition and movement noted in the substructures during Burnside's 2023 inspections.

In accordance with Section 123(2) of the Highway Traffic Act and Regulation 103/97 made under the Act, we recommend that the Township enact an appropriate By-law for the maximum allowable gross weight crossing over the structures identified in the table above.

Further, we recommend that any such By-law established shall be considered valid for a period of two (2) years, or until the completion the next bridge inspection report.

Township of Amaranth
November 2023

7.0 Summary

The 2023 OSIM inspections were carried out by Burnside on behalf of the Township of Amaranth to identify the current condition of all the structures within the Township's inventory. The Summary Reports provided in Appendix A summarize the maintenance needs, additional investigations, and capital works requirements for each structure. The capital works for each structure has been given a priority of six to ten years, one to five years, within one year and urgent, based on the current BCI.

It is recommended the Township add all structures with a span of 3.0 m or greater to their structure inventory with full OSIM inspections completed in 2024, or 2025 at the latest, in conjunction with establishing a monitoring program on the applicable structures in the meantime, as noted in this report. We trust the summary report provides all the information that you require at this time. If you have any questions or comments, please do not hesitate to contact us.



BURNSIDE

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Appendix A

Summary Reports

1.1 Structure No. 1

<u>Structure Name:</u>	Bridge 1	2023 BCI =89.06
<u>Road Name:</u>	6th Line	
<u>Location:</u>	Concessions 5 & 6, Lot 1	
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 12.4 m
<u>Overall Structure Width:</u>	9.95 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	2007	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	27.1	37.1

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 01 is generally in excellent condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation in close proximity to structure	\$1,000.00
Handrail Maintenance	Replace missing end cap SE	\$250.00
Maintenance Needs Total		\$1,250.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper end treatments	\$30,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$25,000.00
Replace deck end joints	N/A	\$100,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$25,000.00
Rehabilitation Cost Subtotal		\$150,000.00

Estimate Value of Replacement Structure	\$1,300,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$165,000.00	\$1,315,000.00
Roadside Protection:	\$30,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$17,000.00	\$116,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$116,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$66,000.00
Total Capital Work Cost	\$249,500.00	\$1,738,000.00

1.2 Structure No. 2

<u>Structure Name:</u>	Bridge 2	2023 BCI =100
<u>Road Name:</u>	7th Line	
<u>Location:</u>	Concession 6 & 7, Lot 3	
<u>Structure Type:</u>	Other - Steel I-Girder (GFRP Deck)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 16.4 m
<u>Overall Structure Width:</u>	8 m	<u>Roadway Width:</u> 8 m
<u>Year of Construction:</u>	2022	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	35.0	45.0

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 02 was replaced in 2022 and is in excellent condition.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	
	\$1,400,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$1,400,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$120,000.00
Environmental Assessment:	N/A	\$60,000.00
Engineering Design:	N/A	\$120,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$70,000.00
Total Capital Work Cost	N/A	\$1,885,000.00

1.3 Structure No. 3

<u>Structure Name:</u>	Bridge 3	2023 BCI =63.16
<u>Road Name:</u>	8th Line	
<u>Location:</u>	Concessions 7 & 8, Lot 3	
<u>Structure Type:</u>	Cast-In-Place Concrete T-Beam	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 9.25 m
<u>Overall Structure Width:</u>	7 m	<u>Roadway Width:</u> 6 m
<u>Year of Construction:</u>	1920 (Estimated)	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	3.2	13.2

Recommendation: Major Rehabilitation is recommended within 3 years.

Justification:

Structure 03 is generally in fair condition with some moderate spalling and disintegration of concrete throughout.

Maintenance Need	Element and Comments	Estimated Cost
Erosion Control	Install rock protection along north abutment and wingwalls	\$2,500.00
Hazard Signs	Raise hazard warning signs at structure	\$250.00
Maintenance Needs Total		\$2,750.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Narrow structure - Install guide rail if structure widened during rehabilitation / replacement	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top,	1 to 5 years	\$20,000.00
Type B concrete repairs to Girders, soffit,	1 to 5 years	\$30,000.00
Type C concrete repairs to abutment walls, wingwalls,	1 to 5 years	\$5,000.00
Widen deck platform (cantilever)	1 to 5 years	\$50,000.00
Install side mounted barrier and approach guide rail	1 to 5 years	\$95,000.00
Waterproof and pave	1 to 5 years	\$35,000.00
Add slope stabilization	1 to 5 years	\$5,000.00
General Items - Insurance, Mobilization, Access etc.	1 to 5 years	\$140,000.00
Rehabilitation Cost Subtotal		\$380,000.00

Estimate Value of Replacement Structure	\$1,100,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$395,000.00	\$1,115,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$40,000.00	\$106,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$40,000.00	\$106,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$56,000.00
Total Capital Work Cost	\$492,500.00	\$1,508,000.00

1.4 Structure No. 4

<u>Structure Name:</u>	Bridge 4	2023 BCI =71
<u>Road Name:</u>	9th Line	
<u>Location:</u>	Concessions 8 & 9, Lot 3	
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 10.5 m
<u>Overall Structure Width:</u>	19 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	1995	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	N/A	15.6

Recommendation:	No Capital Works is estimated to be required within the next 10 years.
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Justification:

Structure 04 is generally in good to fair condition with only minor defects noted.

Maintenance Need	Element and Comments	Estimated Cost
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	\$0.00

Current Roadside Protection Needs	Estimated Cost
Replace Guide Rail, end treatments	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,100,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$1,100,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$105,000.00
Environmental Assessment:	N/A	\$10,000.00
Engineering Design:	N/A	\$105,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$55,000.00
Total Capital Work Cost	N/A	\$1,490,000.00

1.5 Structure No. 5

<u>Structure Name:</u>	Bridge 5	2023 BCI =74.4
<u>Road Name:</u>	10th Line	
<u>Location:</u>	Concession 9 & 10, Lot 4	
<u>Structure Type:</u>	Precast Concrete Box Girder	
<u>Number of Spans:</u>	2	<u>Span Lengths:</u> 20.8, 20.8 m
<u>Overall Structure Width:</u>	10.8 m	<u>Roadway Width:</u> 8 m
<u>Year of Construction:</u>	1980	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	14.4	24.4

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 05 is generally in good condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Flush joints, remove vegetation in close proximity to structure, remove graffiti	\$2,500.00
Handrail Maintenance	Replace missing end caps	\$250.00
Maintenance Needs Total		\$2,750.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Investigate Need for Replacing with Longer Guide Rail	\$500.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$55,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Modify/Replace Expansion Joint	N/A	\$50,000.00
Rehabilitation Cost Subtotal		\$120,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$3,100,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$120,000.00	\$3,100,000.00
Roadside Protection:	\$500.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$12,000.00	\$205,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$205,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$155,000.00
Total Capital Work Cost	\$170,000.00	\$3,790,000.00

1.6 Structure No. 6

<u>Structure Name:</u>	Bridge 6	2023 BCI =74.83
<u>Road Name:</u>	10th Line	
<u>Location:</u>	Concessions 9 & 10, Lot 4	
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)	
<u>Number of Spans:</u>	3	<u>Span Lengths:</u> 20.5, 28.1, 20.5 m
<u>Overall Structure Width:</u>	10.6 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	1968	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	20.0	31.4

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 06 is generally in good condition with only minor defects noted.

Maintenance Need	Element and Comments	Estimated Cost
Other	Tighten loose end treatment cables	\$250.00
Maintenance Needs Total		\$250.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	
	\$5,100,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$5,100,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$300,000.00
Environmental Assessment:	N/A	\$10,000.00
Engineering Design:	N/A	\$300,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$255,000.00
Total Capital Work Cost	N/A	\$6,080,000.00

1.7 Structure No. 7

<u>Structure Name:</u>	Bridge 7	2023 BCI =74.5
<u>Road Name:</u>	5th Sideroad	
<u>Location:</u>	Concession 9, Lots 5 & 6	
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 19.5 m
<u>Overall Structure Width:</u>	9.4 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	1991	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	14.5	24.5

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 07 is generally in good condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top,	\$1,000.00
Deck Drainage	Flush deck drains	\$250.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Maintenance Needs Total		\$2,250.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper guide rail end treatments	\$30,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Rehabilitation Cost Subtotal		\$45,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$1,500,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$45,000.00	\$1,500,000.00
Roadside Protection:	\$30,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$5,000.00	\$125,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$125,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$75,000.00
Total Capital Work Cost	\$117,500.00	\$1,950,000.00

1.8 Structure No. 8

<u>Structure Name:</u>	Bridge 8	2023 BCI =73.92
<u>Road Name:</u>	9th Line	
<u>Location:</u>	Concessions 8 & 9, Lot 6	
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 18 m
<u>Overall Structure Width:</u>	9.35 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	1993	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	13.9	23.9

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 08 is generally in good condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top,	\$1,000.00
Hazard Signs	Raise hazard warning signs at structure	\$250.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Maintenance Needs Total		\$2,250.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper guide rail end treatment and structure connections	\$45,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Rehabilitation Cost Subtotal		\$45,000.00

Estimate Value of Replacement Structure	\$1,800,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$60,000.00	\$1,815,000.00
Roadside Protection:	\$45,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$6,000.00	\$141,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$141,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$91,000.00
Total Capital Work Cost	\$148,500.00	\$2,313,000.00

1.9 Structure No. 9

<u>Structure Name:</u>	Bridge 9	2023 BCI =89.47
<u>Road Name:</u>	County Road 10	
<u>Location:</u>	Concessions 7 & 8, Lot 11	
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 26 m
<u>Overall Structure Width:</u>	9.95 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	2008	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	27.0	37.0

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 09 is generally in excellent condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Remove vegetation in close proximity to structure	\$2,500.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Other	Place utility in conduit	\$1,000.00
Maintenance Needs Total		\$4,500.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper guide rail end treatment	\$30,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and Pave	N/A	\$40,000.00
Modify Deck End Joint	N/A	\$50,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$40,000.00
Rehabilitation Cost Subtotal		\$130,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$2,200,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$145,000.00	\$2,215,000.00
Roadside Protection:	\$30,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$15,000.00	\$161,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$161,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$111,000.00
Total Capital Work Cost	\$227,500.00	\$2,773,000.00

1.10 Structure No. 10

<u>Structure Name:</u>	Bridge 10	2023 BCI =35.23
<u>Road Name:</u>	7th Line	
<u>Location:</u>	Concessions 6 & 7, Lot 14	
<u>Structure Type:</u>	Through Girder (Concrete)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 15.2 m
<u>Overall Structure Width:</u>	6.4 m	<u>Roadway Width:</u> 6 m
<u>Year of Construction:</u>	1900 (Estimated)	<u>Current Load Limit:</u> 16 tonnes



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	0.0	0.0

Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

Structure 10 is generally in poor condition with severe defects noted to key structural elements and possible rotation of the substructure. Replacement of this structure is currently in design phase with an unknown year of construction. If the monitoring program reveals the substructure is actively rotating the Township should consider closure of the structure until it can be replaced.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top,	\$1,000.00
Hazard Signs	Raise hazard warning signs at structure	\$250.00
Maintenance Needs Total		\$1,250.00

Additional Investigations	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	\$2,500.00

Current Roadside Protection Needs	Estimated Cost
	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	
	\$1,700,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$1,700,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$135,000.00
Environmental Assessment:	N/A	\$60,000.00
Engineering Design:	N/A	\$135,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$85,000.00
Total Capital Work Cost	N/A	\$2,230,000.00

1.11 Structure No. 11

<u>Structure Name:</u>	Bridge 11	2023 BCI =56.95
<u>Road Name:</u>	15th Sideroad	
<u>Location:</u>	Concession 6, Lot 15	
<u>Structure Type:</u>	Through Girder (Concrete)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 15.2 m
<u>Overall Structure Width:</u>	6.2 m	<u>Roadway Width:</u> 4.6 m
<u>Year of Construction:</u>	1900 (Estimated)	<u>Current Load Limit:</u> 12 tonnes



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	0.0	0.0

Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

Structure 11 is generally in poor to fair condition with severe defects noted to key structural elements and possible rotation of the substructure. Due to the separation of the wingwalls the replacement timeline should be expedited. If the monitoring program reveals the substructure is actively rotating the Township should consider closure of the structure until it can be replaced.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top,	\$1,000.00
Hazard Signs	Raise hazard warning signs at structure, install narrow structure signs on both approaches	\$750.00
Maintenance Needs Total		\$1,750.00

Additional Investigations	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	\$2,500.00

Current Roadside Protection Needs	Estimated Cost
Install Guide Rail, end treatments	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	N/A	\$10,000.00
Type B concrete repairs to Girders, soffit,	N/A	\$180,000.00
Type C concrete repairs to abutment walls, wingwalls,	N/A	\$100,000.00
Steel repairs to signs,	N/A	\$10,500.00
Waterproof and Pave	N/A	\$30,000.00
Add slope stabilization	N/A	\$16,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$125,000.00
Rehabilitation Cost Subtotal		\$471,500.00

Estimate Value of Replacement Structure	\$1,500,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$486,500.00	\$1,515,000.00
Roadside Protection:	\$95,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$49,000.00	\$126,000.00
Environmental Assessment:	\$2,500.00	\$60,000.00
Engineering Design:	\$49,000.00	\$126,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$76,000.00
Total Capital Work Cost	\$697,000.00	\$2,018,000.00

1.12 Structure No. 12

<u>Structure Name:</u>	Bridge 12	2023 BCI =65.75
<u>Road Name:</u>	6th Line	
<u>Location:</u>	Concessions 5 & 6, Lot 15	
<u>Structure Type:</u>	Arch (Concrete)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 15.2 m
<u>Overall Structure Width:</u>	6.63 m	<u>Roadway Width:</u> 5.5 m
<u>Year of Construction:</u>	1910 (Estimated)	<u>Current Load Limit:</u> 12 tonnes



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	4.8	15.7

Recommendation:	Major Rehabilitation is recommended within 5 years.
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Justification:

Structure 12 is generally in fair condition with severe defects noted to key structural elements.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Deck Drainage,	\$1,000.00
Hazard Signs	Raise hazard warning signs at structure, install narrow structure signs on both approaches	\$750.00
Maintenance Needs Total		\$1,750.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Narrow structure - Install guide rail if structure widened during replacement	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to end post, posts, deck top, curbs,	1 to 5 years	\$20,000.00
Type B concrete repairs to floor beams, soffit,	1 to 5 years	\$115,000.00
Type C concrete repairs to abutment walls, wingwalls, bottom chords, top chords, verticals / diagonals,	1 to 5 years	\$30,000.00
Waterproof and pave	1 to 5 years	\$30,000.00
Add slope stabilization	1 to 5 years	\$8,000.00
General Items - Insurance, Mobilization, Access etc.	1 to 5 years	\$150,000.00
Rehabilitation Cost Subtotal		\$353,000.00

Estimate Value of Replacement Structure	
	\$1,500,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$368,000.00	\$1,515,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$37,000.00	\$126,000.00
Environmental Assessment:	\$2,500.00	\$60,000.00
Engineering Design:	\$37,000.00	\$126,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$76,000.00
Total Capital Work Cost	\$459,500.00	\$2,018,000.00

1.13 Structure No. 13

<u>Structure Name:</u>	Bridge 13	2023 BCI =58.93
<u>Road Name:</u>	6th Line	
<u>Location:</u>	Concession 5 & 6, Lot 16	
<u>Structure Type:</u>	Arch (Concrete)	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 15.2 m
<u>Overall Structure Width:</u>	5.02 m	<u>Roadway Width:</u> 5 m
<u>Year of Construction:</u>	1910 (Estimated)	<u>Current Load Limit:</u> 14 tonnes



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	0.0	9.5

Recommendation:	Forgo rehabilitation and replace structure within 9 years.
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Justification:

Structure 13 is generally in poor to fair condition with severe defects noted to key structural elements and possible rotation of the substructure. If the monitoring program reveals the substructure is actively rotating the replacement timeline should be expedited.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Deck Drainage,	\$1,500.00
Hazard Signs	Install narrow structure signs on both approaches	\$500.00
Maintenance Needs Total		\$2,000.00

Additional Investigations	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	\$2,500.00

Current Roadside Protection Needs	Estimated Cost
Narrow structure - Install guide rail if structure widened during replacement	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	N/A	\$15,000.00
Type B concrete repairs to floor beams, soffit,	N/A	\$60,000.00
Type C concrete repairs to abutment walls, wingwalls, bottom chords, top chords, verticals / diagonals,	N/A	\$60,000.00
Waterproof and pave	N/A	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$150,000.00
Rehabilitation Cost Subtotal		\$315,000.00

Estimate Value of Replacement Structure	\$1,600,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental - Bird Nests noted during inspection	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$330,000.00	\$1,615,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$33,000.00	\$131,000.00
Environmental Assessment:	\$2,500.00	\$60,000.00
Engineering Design:	\$33,000.00	\$131,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$81,000.00
Total Capital Work Cost	\$413,500.00	\$2,133,000.00

1.14 Structure No. 14

<u>Structure Name:</u>	Bridge 14	2023 BCI =80.66
<u>Road Name:</u>	6th Line	
<u>Location:</u>	Concessions 5 & 6, Lot 17	
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 14 m
<u>Overall Structure Width:</u>	10 m	<u>Roadway Width:</u> 6 m
<u>Year of Construction:</u>	2000	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	20.7	30.7

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 18 is generally in excellent condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Remove vegetation in close proximity to structure	\$2,500.00
Hazard Signs	Raise hazard warning signs at structure	\$250.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Maintenance Needs Total		\$3,750.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install Guide Rail, end treatments and structure connections	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$25,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Rehabilitation Cost Subtotal		\$40,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$1,500,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$55,000.00	\$1,515,000.00
Roadside Protection:	\$95,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$6,000.00	\$126,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$126,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$76,000.00
Total Capital Work Cost	\$193,500.00	\$1,968,000.00

1.15 Structure No. 16

<u>Structure Name:</u>	Bridge 16	2023 BCI =73.94
<u>Road Name:</u>	7th Line	
<u>Location:</u>	Concessions 6 & 7, Lot 20	
<u>Structure Type:</u>	Cast-In-Place Conc. Box Culvert	
<u>Number of Spans:</u>	2	<u>Span Lengths:</u> 8.0, 8.0 m
<u>Overall Structure Width:</u>	14.6 m	<u>Roadway Width:</u> 3 m
<u>Year of Construction:</u>	1988	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	13.9	23.9

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 16 is generally in good condition and only minor maintenance recommended at this time.

Maintenance Need	Element and Comments	Estimated Cost
Erosion Control	Repair washouts NE and SW	\$2,000.00
Hazard Signs	Replace hazard warning signs at structure	\$1,000.00
Other	Replace missing bolts in guide rail	\$500.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type C concrete repairs to wingwalls, barrels, outlet,	N/A	\$15,000.00
Add slope stabilization	N/A	\$8,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$125,000.00
Rehabilitation Cost Subtotal		\$148,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$600,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$163,000.00	\$615,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$17,000.00	\$62,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$62,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$31,000.00
Total Capital Work Cost	\$217,500.00	\$895,000.00

1.16 Structure No. 17

<u>Structure Name:</u>	Bridge 17	2023 BCI =95.52
<u>Road Name:</u>	20th Sideroad	
<u>Location:</u>	Concession 6, Lots 20 & 21	
<u>Structure Type:</u>	Precast Concrete Box Girder	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 23.2 m
<u>Overall Structure Width:</u>	9.9 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	2018	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	30.5	40.5

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 17 is generally in excellent condition however the bearing pads are already showing signs of bulging.

Maintenance Need	Element and Comments	Estimated Cost
Other	Tighten end treatment cables	\$250.00
Other	Replace missing bolt in hand railing	\$250.00
Maintenance Needs Total		\$500.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	
	\$1,800,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$1,800,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$140,000.00
Environmental Assessment:	N/A	\$10,000.00
Engineering Design:	N/A	\$140,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$90,000.00
Total Capital Work Cost	N/A	\$2,295,000.00

1.17 Structure No. 18

<u>Structure Name:</u>	Bridge 18	2023 BCI =88.62
<u>Road Name:</u>	25th Sideroad	
<u>Location:</u>	Concession 6, Lot 25	
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 12 m
<u>Overall Structure Width:</u>	9.95 m	<u>Roadway Width:</u> 7 m
<u>Year of Construction:</u>	2007	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	26.6	36.6

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 18 is generally in excellent condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Remove vegetation in close proximity to structure	\$2,500.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper guide rail end treatments	\$30,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Rehabilitation Cost Subtotal		\$45,000.00

Estimate Value of Replacement Structure	\$1,200,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$45,000.00	\$1,200,000.00
Roadside Protection:	\$30,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$5,000.00	\$110,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$110,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$60,000.00
Total Capital Work Cost	\$117,500.00	\$1,605,000.00

1.18 Structure No. 19

<u>Structure Name:</u>	Bridge 19	2023 BCI =85.93
<u>Road Name:</u>	6th Line	
<u>Location:</u>	Concessions 5 & 6, Lot 27	
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame	
<u>Number of Spans:</u>	1	<u>Span Lengths:</u> 8 m
<u>Overall Structure Width:</u>	9.95 m	<u>Roadway Width:</u> 6 m
<u>Year of Construction:</u>	2002	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	25.9	35.9

Recommendation:	No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.
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Justification:

Structure 19 is generally excellent condition with only minor defects noted. The costs for waterproofing and paving the exposed deck can be reduced if grouped with other bridges.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Top, Remove vegetation in close proximity to structure	\$2,500.00
Hazard Signs	Replace north hazard warning signs at structure	\$500.00
Other	Replace joint sealant in parapet walls	\$1,000.00
Maintenance Needs Total		\$4,000.00

Additional Investigations	Estimated Cost
	\$0.00

Current Roadside Protection Needs	Estimated Cost
Install proper guide rail end treatments	\$30,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and pave	N/A	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$15,000.00
Rehabilitation Cost Subtotal		\$45,000.00

Estimate Value of Replacement Structure	Estimated Cost
	\$950,000.00

Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$15,000.00	\$15,000.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$15,000.00	\$15,000.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	\$60,000.00	\$965,000.00
Roadside Protection:	\$30,000.00	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	\$6,000.00	\$97,000.00
Environmental Assessment:	\$2,500.00	\$10,000.00
Engineering Design:	\$20,000.00	\$97,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	\$15,000.00	\$49,000.00
Total Capital Work Cost	\$133,500.00	\$1,333,000.00

1.19 Structure No. 20

<u>Structure Name:</u>	Bridge 20	2023 BCI =64.19
<u>Road Name:</u>	4th Line	
<u>Location:</u>	Concessions 3 & 4, Lot 14	
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)	
<u>Number of Spans:</u>		<u>Span Lengths:</u> 3.8, 3.8 m
<u>Overall Structure Width:</u>	13.5 m	<u>Roadway Width:</u> 6 m
<u>Year of Construction:</u>	2018 (Estimated)	<u>Current Load Limit:</u> N/A



	Rehabilitation	Replacement
Estimated Capital Works Timelines (Years):	N/A	12.1

Recommendation:	No Capital Works is estimated to be required within the next 10 years.
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Justification:

Structure 20 is generally in fair condition with cusping/deformations along the midspans of the culverts due to poor joint placement and low cover.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove dam at outlet	\$1,000.00
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$2,000.00

Additional Investigations	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	\$0.00

Current Roadside Protection Needs	Estimated Cost
Investigate need for Guide Rail	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$850,000.00
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Associated Work	Rehabilitation	Replacement
Approaches -	\$0.00	\$0.00
Detours -	\$0.00	\$0.00
Traffic Control -	\$0.00	\$0.00
Utilities -	\$0.00	\$0.00
Right of Way -	\$0.00	\$0.00
Environmental -	\$0.00	\$0.00
Other -	\$0.00	\$0.00
Total Associated Work Cost	\$0.00	\$0.00

Total Capital Works Costs		
Cost	Rehabilitation	Replacement
Rehab / Replacement Works:	N/A	\$850,000.00
Roadside Protection:	N/A	\$95,000.00
Staging Costs:	N/A	N/A
Construction Contingencies:	N/A	\$85,000.00
Environmental Assessment:	N/A	\$10,000.00
Engineering Design:	N/A	\$85,000.00
Geotechnical Investigation:	N/A	\$20,000.00
Contract Administration:	N/A	\$43,000.00
Total Capital Work Cost	N/A	\$1,188,000.00



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Appendix B

Additional Structures Summary Reports

1.1 Structure No. 21

Location: 9th Line, 1.1 km north of Sideroad 25
Structure Type: Cast-in-Place Concrete Rigid Frame
Number of Spans: 1 Span Lengths: 4.5 m
Overall Structure Width: 8.0 m Roadway Width: 5.0 m
Current Load Limit: N/A



Recommendation:	Keep structure closed until replacement can occur.
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Justification:

Structure 21 has experienced global failure and is closed to through traffic.

Maintenance Need	Comments	Estimated Cost
N/A	N/A	N/A
Maintenance Needs Total		N/A
Estimated Construction Cost		\$600,000

1.2 Structure No. 22

<u>Location:</u>	2 nd Line, 1.1 km south of Sideroad 10		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.0 m
<u>Overall Structure Width:</u>	8.0 m	<u>Roadway Width:</u>	7.0 m
<u>Current Load Limit</u>	10 tonnes		



Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

Structure 22 is generally in poor condition with some severe defects and movement noted. Concrete blocks placed adjacent to SW wingwall to mitigate the effects of the wingwall failing. This repair was considered a temporary measure and the structure should be replaced as soon as possible. Closure of this structure should be considered if replacement cannot occur within two years.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Maintenance Needs Total		\$500

Estimated Construction Cost	\$450,000
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1.3 Structure No. 23

<u>Location:</u>	2 nd Line, 0.35 km south of Sideroad 10		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	2.4 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation: Structure replacement is recommended in 1-5 years.

Justification:

The north footing is fully separated from the structure limiting its ability to properly transfer loads to the founding soils. The footing also appears to be rotating up/into the culvert. Consideration could be given to investigating the feasibility of installing struts as a temporary repair measure if replacement is not an option in the near future.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in all quadrants	\$2,000
Maintenance Needs Total		\$2,500

Estimated Construction Cost	\$350,000
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1.4 Structure No. 24

<u>Location:</u>	Mono-Amaranth Towline, 1.2 km north of Sideroad 20		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.0 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	Structure replacement is recommended in 6-10 years.
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Justification:

Structure 24 is generally in fair condition with some severe defects noted. There are wide cracks all corners of the abutments. Delaminations and spalls with exposed corroded rebar are present in the soffit. The west wingwalls and exterior soffit are severely disintegrated and delaminated. Alternatives such as constructing a structural slab could be considered as a cost-effective option.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Raise existing signs	\$250
Erosion Control	Place rock protection in SW and NE quadrants	\$1,000
Maintenance Needs Total		\$1,250

Estimated Construction Cost	\$450,000
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1.5 Structure No. 25

Location: 10th Line, 1.3 km south of Sideroad 30
Structure Type: Cast-in-Place Concrete Rigid Frame
Number of Spans: 1 Span Lengths: 3.0 m
Overall Structure Width: 7.0 m Roadway Width: 5.0 m
Current Load Limit: N/A



Recommendation: No Capital Work estimated to be required within 10 years.

Justification:

Structure 25 is generally in good condition with only minor defects noted. The exposed footings are severely eroded.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise east sign	\$500
Erosion Protection	Place rock protection in SW and SE quadrants	\$1,000
Maintenance Needs Total		\$1,500
Estimated Construction Cost		\$450,000

1.6 Structure No. 26

<u>Location:</u>	10 th Line, 900m south of Side Road 20		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.8 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	Structure replacement is recommended in 6-10 years.
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Justification:

Structure 26 is generally in fair condition with some severe defects noted. There are wide cracks at all corners of the abutments (except NE). Delaminations and spalls with exposed corroded rebar are present in the soffit. The west wingwalls are severely disintegrated and delaminated.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in all quadrants	\$2,000
Maintenance Needs Total		\$2,500
Estimated Construction Cost		\$550,000

1.7 Structure No. 27

<u>Location:</u>	Intersection of 25 Sideroad and 9 th Line		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.1 m
<u>Overall Structure Width:</u>	6.2 m	<u>Roadway Width:</u>	5.4 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	No Capital Work estimated to be required within 10 years.
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Justification:

Structure 27 is generally in fair to good condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit, which are generally a result of low concrete cover. The north abutment has a full height wide crack.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at approach ends and raise east signs	\$500
Maintenance Needs Total		\$2,500
Estimated Construction Cost		\$450,000

1.8 Structure No. 29

<u>Location:</u>	8 th Line, 550m north of Sideroad 5		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	4.9 m
<u>Overall Structure Width:</u>	9.0 m	<u>Roadway Width:</u>	7.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation: No Capital Work estimated to be required within 10 years.

Justification:

Structure 29 is generally in fair to good condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit, which are generally a result of low concrete cover.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in all quadrants	\$2,000
Roadwork	Remove excessive fill if deemed necessary after Structure Evaluation	\$1,500
Maintenance Needs Total		\$4,000
Estimated Construction Cost		\$600,000

1.9 Structure No. 30

Location: 8th Line, 950m south of Sideroad 20
Structure Type: Cast-in-Place Concrete Rigid Frame
Number of Spans: 1 Span Lengths: 3.5 m
Overall Structure Width: 7.0 m Roadway Width: 6.0 m
Current Load Limit: N/A



Recommendation:	No Capital Work estimated to be required within 10 years.
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Justification:

Structure 30 is generally in fair to good condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. The exposed footings are severely eroded.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in NE and NW quadrants	\$1,000
Maintenance Needs Total		\$1,500
Estimated Construction Cost		\$500,000

1.10 Structure No. 31

<u>Location:</u>	8 th Line, 1km south of Sideroad 25		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.0 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	No Capital Work estimated to be required within 10 years.
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Justification:

Structure 31 is generally in fair to good condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. The west exterior soffit is severely disintegrated and delaminated. The exposed footings are severely eroded.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in NE and SW quadrants	\$1,000
Maintenance Needs Total		\$1,500

Estimated Construction Cost	\$450,000
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1.11 Structure No. 32

Location: 7th Line, 850m north of County Road 109
Structure Type: Cast-in-Place Concrete Rigid Frame
Number of Spans: 1 Span Lengths: 3.6 m
Overall Structure Width: 7.0 m Roadway Width: 6.0 m
Current Load Limit: N/A



Recommendation: Structure replacement is recommended in 6-10 years.

Justification:

Structure 32 is generally in poor to fair condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. All wingwalls and both exterior soffits are severely disintegrated and delaminated.

Maintenance Need	Comments	Estimated Cost
N/A	N/A	N/A
Maintenance Needs Total		N/A
Estimated Construction Cost		\$550,000

1.12 Structure No. 33

<u>Location:</u>	7 th Line, 350m north of Sideroad 5		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.9 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	No Capital Work estimated to be required within 10 years.
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Justification:

Structure 33 is generally in fair condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. The curbs are severely disintegrated. The exposed footings are severely eroded.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Erosion Control	Place rock protection in NE and SW quadrants	\$1,000
Maintenance Needs Total		\$1,500
Estimated Construction Cost		\$550,000

1.13 Structure No. 34

<u>Location:</u>	6 th Line, 300m north of Sideroad 20		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	4.0 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.5 m
<u>Current Load Limit:</u>	N/A		



Recommendation: No Capital Work estimated to be required within 10 years.

Justification:

Structure 34 is generally in fair condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. The west wingwalls and west end of the abutments are severely disintegrated and delaminated.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends	\$500
Erosion Control	Place rock protection in all quadrants	\$2,000
Maintenance Needs Total		\$2,500
Estimated Construction Cost		\$550,000

1.14 Structure No. 35

<u>Location:</u>	Sideroad 15, 600m west of 10 th Line		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.0 m
<u>Overall Structure Width:</u>	6.0 m	<u>Roadway Width:</u>	5.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	No Capital Work estimated to be required within 10 years.
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Justification:

Structure 35 is generally in fair condition with some severe defects noted. Delaminations and spalls with exposed corroded rebar are present in the soffit. The south wingwalls and exterior soffit are severely disintegrated and delaminated. Severe erosion is present along the waterline.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Roadwork	Remove excessive fill	\$1,000
Maintenance Needs Total		\$1,500
Estimated Construction Cost		\$450,000

1.15 Structure No. 36

<u>Location:</u>	Sideroad 30, 550m east of 9 th Line		
<u>Structure Type:</u>	Cast-in-Place Concrete T-Beam		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.5 m
<u>Overall Structure Width:</u>	5.5 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	10 tonnes		



Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

The east abutment is separating from the superstructure and rotating however struts were installed in 2023 installed to temporarily brace the structure. A restrictive 10 tonne load posting has also been placed on the structure to limit large vehicles from crossing the bridge. Closure of this structure should be considered if replacement cannot occur within one year.

Maintenance Need	Comments	Estimated Cost
N/A	N/A	N/A
Maintenance Needs Total		N/A
Estimated Construction Cost		\$800,000

1.16 Structure No. 37

Location: Sideroad 30, 350m east of 6th Line
Structure Type: CSP Arch Culvert (s)
Number of Spans: 1 Span Lengths: 2.2 m
Overall Structure Width: 14.0 m Roadway Width: 5.0 m
Current Load Limit: N/A



Recommendation: Structure replacement is recommended in 1-5 years.

Justification:

Structure 37 is generally in poor condition with some severe defects noted. Severe surface corrosion and global deformations are present throughout.

Maintenance Need	Comments	Estimated Cost
N/A	N/A	N/A
Maintenance Needs Total		N/A
Estimated Construction Cost		\$300,000

1.17 Structure No. 38

<u>Location:</u>	Sideroad 25, 120m west of 8 th Line		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.0 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	5.0 m
<u>Current Load Limit:</u>	N/A		



Recommendation:	Structure replacement is recommended in 1-5 years.
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Justification:

Structure 38 is generally in poor condition with some severe defects and movement noted. The west abutment is undermined up to 300mm with a 20mm wide full height vertical crack. The east abutment has a wide diagonal crack.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends and raise existing signs	\$500
Maintenance Needs Total		\$500
Estimated Construction Cost		\$450,000

1.18 Structure No. 39

<u>Location:</u>	8 th Line, 200m north of Sideroad 25		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	2.4 m
<u>Overall Structure Width:</u>	6.0 m	<u>Roadway Width:</u>	5.0 m
<u>Current Load Limit:</u>	10 tonnes		



Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

The exposed footings are severely eroded. The south abutment is separating from the superstructure and rotating however struts were installed in 2023 to temporarily brace the structure. A restrictive 10 tonne load posting has been placed on the culvert to limit heavy vehicles from crossing the structure. Closure of this structure should be considered if replacement cannot occur within one year.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends.	\$500
Maintenance Needs Total		\$500
Estimated Construction Cost		\$350,000

1.19 Structure No. 40

<u>Location:</u>	9 th Line, 125m north of Dufferin Road 109		
<u>Structure Type:</u>	Cast-in-Place Concrete Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	2.4 m
<u>Overall Structure Width:</u>	7.0 m	<u>Roadway Width:</u>	6.0 m
<u>Current Load Limit:</u>	10 tonnes		



Recommendation:	Structure replacement is recommended as soon as possible.
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Justification:

Structure 40 is generally in poor condition with some severe defects and movement noted. The structure has completely separated in two with crack widths up to 200mm. There is currently spray foam in the abutment cracks and a steel plate over the soffit crack as a temporary repair.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends.	\$500
Maintenance Needs Total		\$500
Estimated Construction Cost		\$350,000

1.20 Structure No. 41

Location: 10th Line, 450m north of Sideroad 25
Structure Type: Cast-in-Place Concrete Rigid Frame
Number of Spans: 1 Span Lengths: 4.0 m
Overall Structure Width: 8.0 m Roadway Width: 6.0 m
Current Load Limit: N/A



Recommendation: No Capital Work estimated to be required within 10 years.

Justification:

Structure 41 is generally in good condition with only minor defects noted.

Maintenance Need	Comments	Estimated Cost
Hazard Signs	Install 2 additional signs at leaving ends.	\$500
Erosion Control	Place rock protection in all quadrants	\$2,000
Maintenance Needs Total		\$2,500
Estimated Construction Cost		\$550,000



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Appendix C

Structure Inventory and Cost Summaries

TOWNSHIP OF AMARANTH - STRUCTURE INVENTORY

Structure No.	Inspect. Year	Structure Name	Road Name	Location	Structure Type	Span(s) (m)	Width (m)	Deck Area (m2)	Deterioration Curve	BCI
1	2023	Bridge 1	6th Line	Concessions 5 & 6, Lot 1	Steel I-Girder (Concrete Deck)	12.4	9.95	122.4	BR-1	89.06
2	2023	Bridge 2	7th Line	Concession 6 & 7, Lot 3	Other - Steel I-Girder (GFRP Deck)	16.4	8	149.2	BR-1	100.00
3	2023	Bridge 3	8th Line	Concessions 7 & 8, Lot 3	Cast-In-Place Concrete T-Beam	9.25	7	70	BR-1	63.16
4	2023	Bridge 4	9th Line	Concessions 8 & 9, Lot 3	CSP Multi-Plate Arch Culvert(s)	10.5	19	199.5	CS	71.00
5	2023	Bridge 5	10th Line	Concession 9 & 10, Lot 4	Precast Concrete Box Girder	20.8, 20.8	10.8	337	BR-2	74.40
6	2023	Bridge 6	10th Line	Concessions 9 & 10, Lot 4	Steel I-Girder (Concrete Deck)	20.5, 28.1, 20.5	10.6	732.46	BR-2	74.83
7	2023	Bridge 7	5th Sideroad	Concession 9, Lots 5 & 6	Cast-In-Place Conc. Rigid Frame	19.5	9.4	183.3	BR-1	74.50
8	2023	Bridge 8	9th Line	Concessions 8 & 9, Lot 6	Cast-In-Place Conc. Rigid Frame	18	9.35	87	BR-1	73.92
9	2023	Bridge 9	County Road 10	Concessions 7 & 8, Lot 11	Steel I-Girder (Concrete Deck)	26	9.95	237.2	BR-2	89.47
10	2023	Bridge 10	7th Line	Concessions 6 & 7, Lot 14	Through Girder (Concrete)	15.2	6.4	80	BR-1	35.23
11	2023	Bridge 11	15th Sideroad	Concession 6, Lot 15	Through Girder (Concrete)	15.2	6.2	78.1	BR-1	56.95
12	2023	Bridge 12	6th Line	Concessions 5 & 6, Lot 15	Arch (Concrete)	15.2	6.63	90.9	BR-1	65.75
13	2023	Bridge 13	6th Line	Concession 5 & 6, Lot 16	Arch (Concrete)	15.2	5.02	66.3	BR-1	58.93
14	2023	Bridge 14	6th Line	Concessions 5 & 6, Lot 17	Cast-In-Place Conc. Rigid Frame	14	10	158	BR-1	80.66
15	2023	Bridge 15	7th Line	Concessions 6 & 7, Lot 20	Other - Abutments	15.2	N/A	N/A	BR-1	0.00
16	2023	Bridge 16	7th Line	Concessions 6 & 7, Lot 20	Cast-In-Place Conc. Box Culvert	8.0, 8.0	14.6	242.4	BR-1	73.94
17	2023	Bridge 17	20th Sideroad	Concession 6, Lots 20 & 21	Precast Concrete Box Girder	23.2	9.9	246.5	BR-2	95.52
18	2023	Bridge 18	25th Sideroad	Concession 6, Lot 25	Cast-In-Place Conc. Rigid Frame	12	9.95	135.32	BR-1	88.62
19	2023	Bridge 19	6th Line	Concessions 5 & 6, Lot 27	Cast-In-Place Conc. Rigid Frame	8	9.95	91.54	BR-1	85.93
20	2023	Bridge 20	4th Line	Concessions 3 & 4, Lot 14	CSP Multi-Plate Arch Culvert(s)	3.8, 3.8	13.5	124.2	CS	64.19

TOWNSHIP OF AMARANTH - CAPITAL WORKS BY BCI

Structure No.	Inspect. Year	Road Name	Deterioration Curve	BCI	Years to Rehab	Years to Replace	Total Cost of Rehabilitation	Total Cost of Replacement	Recommended Work	Maintenance Needs	Additional Investigations	Current Roadside Protection Needs	Capital Works Within 1 year	Capital Works 1 - 5 Years	Capital Works 6 - 10 Years	10-Year Capital Works Cost
15	2023	7th Line	BR-1	0.00	0.00	0.00	N/A	\$ 2,018,000.00	Replace	\$ -	\$ -	\$ -	\$ 2,018,000.00	\$ -	\$ -	\$ 2,018,000.00
10	2023	7th Line	BR-1	35.23	0.00	0.00	N/A	\$ 2,230,000.00	Replace	\$ 1,250.00	\$ 2,500.00	\$ -	\$ 2,230,000.00	\$ -	\$ -	\$ 2,230,000.00
11	2023	15th Sideroad	BR-1	56.95	0.00	0.00	\$ 697,000.00	\$ 2,018,000.00	Replace	\$ 1,750.00	\$ 2,500.00	\$ 95,000.00	\$ 2,018,000.00	\$ -	\$ -	\$ 2,018,000.00
13	2023	6th Line	BR-1	58.93	0.00	9.47	\$ 413,500.00	\$ 2,133,000.00	Replace	\$ 2,000.00	\$ 2,500.00	\$ -	\$ -	\$ -	\$ 2,133,000.00	\$ 2,133,000.00
3	2023	8th Line	BR-1	63.16	3.16	13.16	\$ 492,500.00	\$ 1,508,000.00	Rehabilitate	\$ 2,750.00	\$ -	\$ -	\$ -	\$ 492,500.00	\$ -	\$ 492,500.00
20	2023	4th Line	CS	64.19	N/A	12.09	N/A	\$ 1,188,000.00	Replace	\$ 2,000.00	\$ -	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -
12	2023	6th Line	BR-1	65.75	4.80	15.75	\$ 459,500.00	\$ 2,018,000.00	Rehabilitate	\$ 1,750.00	\$ -	\$ -	\$ -	\$ 459,500.00	\$ -	\$ 459,500.00
4	2023	9th Line	CS	71.00	N/A	15.55	N/A	\$ 1,490,000.00	Replace	\$ 1,000.00	\$ -	\$ 95,000.00	\$ -	\$ -	\$ -	\$ -
8	2023	9th Line	BR-1	73.92	13.92	23.92	\$ 148,500.00	\$ 2,313,000.00	Rehabilitate	\$ 2,250.00	\$ -	\$ 45,000.00	\$ -	\$ -	\$ -	\$ -
16	2023	7th Line	BR-1	73.94	13.94	23.94	\$ 217,500.00	\$ 895,000.00	Rehabilitate	\$ 3,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5	2023	10th Line	BR-2	74.40	14.40	24.40	\$ 170,000.00	\$ 3,790,000.00	Rehabilitate	\$ 2,750.00	\$ -	\$ 500.00	\$ -	\$ -	\$ -	\$ -
7	2023	5th Sideroad	BR-1	74.50	14.50	24.50	\$ 117,500.00	\$ 1,950,000.00	Rehabilitate	\$ 2,250.00	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
6	2023	10th Line	BR-2	74.83	19.96	31.37	N/A	\$ 6,080,000.00	Rehabilitate	\$ 250.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14	2023	6th Line	BR-1	80.66	20.66	30.66	\$ 193,500.00	\$ 1,968,000.00	Rehabilitate	\$ 3,750.00	\$ -	\$ 95,000.00	\$ -	\$ -	\$ -	\$ -
19	2023	6th Line	BR-1	85.93	25.93	35.93	\$ 133,500.00	\$ 1,333,000.00	Rehabilitate	\$ 4,000.00	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
18	2023	25th Sideroad	BR-1	88.62	26.62	36.62	\$ 117,500.00	\$ 1,605,000.00	Rehabilitate	\$ 3,500.00	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
1	2023	6th Line	BR-1	89.06	27.06	37.06	\$ 249,500.00	\$ 1,738,000.00	Rehabilitate	\$ 1,250.00	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
9	2023	County Road 10	BR-2	89.47	26.97	36.97	\$ 227,500.00	\$ 2,773,000.00	Rehabilitate	\$ 4,500.00	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
17	2023	20th Sideroad	BR-2	95.52	30.52	40.52	N/A	\$ 2,295,000.00	Rehabilitate	\$ 500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	2023	7th Line	BR-1	100.00	35.00	45.00	N/A	\$ 1,885,000.00	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Sub Totals										\$ 41,000.00	\$ 7,500.00	\$ 481,500.00	\$ 6,266,000.00	\$ 952,000.00	\$ 2,133,000.00	\$ 9,351,000.00

TOWNSHIP OF AMARANTH - REHABILITATION CAPITAL WORKS

Structure No.	Inspect. Year	Road Name	BCI	Years to Rehab	Years to Replace	Recommended Work	Construction Cost - Rehabilitation ⁽¹⁾	Contingency - Rehabilitation	E.A. - Rehabilitation	Engineering - Rehabilitation	Geotechnical - Rehabilitation	Contract Admin. - Rehabilitation	Capital Works Within 1 year	Capital Works 1 - 5 Years	Capital Works 6 - 10 Years	10-Year Capital Works Cost
3	2023	8th Line	63.16	3.16	13.16	Rehabilitate	\$ 395,000.00	\$ 40,000.00	\$ 2,500.00	\$ 40,000.00	\$ -	\$ 15,000.00	\$ -	\$ 492,500.00	\$ -	\$ 492,500.00
12	2023	6th Line	65.75	4.80	15.75	Rehabilitate	\$ 368,000.00	\$ 37,000.00	\$ 2,500.00	\$ 37,000.00	\$ -	\$ 15,000.00	\$ -	\$ 459,500.00	\$ -	\$ 459,500.00
8	2023	9th Line	73.92	13.92	23.92	Rehabilitate	\$ 105,000.00	\$ 6,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
16	2023	7th Line	73.94	13.94	23.94	Rehabilitate	\$ 163,000.00	\$ 17,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
5	2023	10th Line	74.40	14.40	24.40	Rehabilitate	\$ 120,500.00	\$ 12,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
7	2023	5th Sideroad	74.50	14.50	24.50	Rehabilitate	\$ 75,000.00	\$ 5,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
6	2023	10th Line	74.83	19.96	31.37	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14	2023	6th Line	80.66	20.66	30.66	Rehabilitate	\$ 150,000.00	\$ 6,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
19	2023	6th Line	85.93	25.93	35.93	Rehabilitate	\$ 90,000.00	\$ 6,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
18	2023	25th Sideroad	88.62	26.62	36.62	Rehabilitate	\$ 75,000.00	\$ 5,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
9	2023	County Road 10	89.47	26.97	36.97	Rehabilitate	\$ 175,000.00	\$ 15,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
1	2023	6th Line	89.06	27.06	37.06	Rehabilitate	\$ 195,000.00	\$ 17,000.00	\$ 2,500.00	\$ 20,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ -	\$ -
17	2023	20th Sideroad	95.52	30.52	40.52	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	2023	7th Line	100.00	35.00	45.00	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Sub Totals							\$ 1,911,500.00	\$ 166,000.00	\$ 27,500.00	\$ 257,000.00	\$ -	\$ 165,000.00	\$ -	\$ 952,000.00	\$ -	\$ 952,000.00

(1) - Construction Cost includes cost of rehabilitation / replacement works, associated works, roadside protection, and construction staging (where applicable). See individual OSIM forms for breakdown of construction cost

TOWNSHIP OF AMARANTH - REPLACEMENT CAPITAL WORKS

Structure No.	Inspect. Year	Road Name	BCI	Years to Rehab	Years to Replace	Recommended Work	Construction Cost - Replacement ⁽¹⁾	Contingency - Replacement	E.A. - Replacement	Engineering - Replacement	Geotechnical - Replacement	Contract Admin. - Replacement	Capital Works Within 1 year	Capital Works 1 - 5 Years	Capital Works 6 - 10 Years	10-Year Capital Works Cost
15	2023	7th Line	0.00	0.00	0.00	Replace	\$ 1,610,000.00	\$ 126,000.00	\$ 60,000.00	\$ 126,000.00	\$ 20,000.00	\$ 76,000.00	\$ 2,018,000.00	\$ -	\$ -	\$ 2,018,000.00
10	2023	7th Line	35.23	0.00	0.00	Replace	\$ 1,795,000.00	\$ 135,000.00	\$ 60,000.00	\$ 135,000.00	\$ 20,000.00	\$ 85,000.00	\$ 2,230,000.00	\$ -	\$ -	\$ 2,230,000.00
11	2023	15th Sideroad	56.95	0.00	0.00	Replace	\$ 1,610,000.00	\$ 126,000.00	\$ 60,000.00	\$ 126,000.00	\$ 20,000.00	\$ 76,000.00	\$ 2,018,000.00	\$ -	\$ -	\$ 2,018,000.00
13	2023	6th Line	58.93	0.00	9.47	Replace	\$ 1,710,000.00	\$ 131,000.00	\$ 60,000.00	\$ 131,000.00	\$ 20,000.00	\$ 81,000.00	\$ -	\$ -	\$ 2,133,000.00	\$ 2,133,000.00
20	2023	4th Line	64.19	N/A	12.09	Replace	\$ 945,000.00	\$ 85,000.00	\$ 10,000.00	\$ 85,000.00	\$ 20,000.00	\$ 43,000.00	\$ -	\$ -	\$ -	\$ -
4	2023	9th Line	71.00	N/A	15.55	Replace	\$ 1,195,000.00	\$ 105,000.00	\$ 10,000.00	\$ 105,000.00	\$ 20,000.00	\$ 55,000.00	\$ -	\$ -	\$ -	\$ -
Sub Totals							\$ 8,865,000.00	\$ 708,000.00	\$ 260,000.00	\$ 708,000.00	\$ 120,000.00	\$ 416,000.00	\$ 6,266,000.00	\$ -	\$ 2,133,000.00	\$ 8,399,000.00

(1) - Construction Cost includes cost of rehabilitation / replacement works, associated works, roadside protection, and construction staging (where applicable). See individual OSIM forms for breakdown of construction cost

TOWNSHIP OF AMARANTH - MAINTENANCE NEEDS

Structure Name	Road Name	Maintenance Need	Estimated Maintenance Costs
1	6th Line	Remove vegetation in close proximity to structure; Replace missing end cap SE	\$1,250.00
3	8th Line	Install rock protection along north abument and wingwalls; Raise hazard warning signs at structure	\$2,750.00
4	9th Line	Install hazard warning signs at structure	\$1,000.00
5	10th Line	Flush joints, remove vegetation in close proximity to structure, remove graffiti; Replace missing end caps	\$2,750.00
6	10th Line	Tighten loose end treatment cables	\$250.00
7	5th Sideroad	Clean Deck Top; Flush deck drains; Replace joint sealant in parapet walls	\$2,250.00
8	9th Line	Clean Deck Top; Raise hazard warning signs at structure; Replace joint sealant in parapet walls	\$2,250.00
9	County Road 10	Clean Deck Top, Remove vegetation in close proximity to structure; Replace joint sealant in parapet walls; Place utility in conduit	\$4,500.00
10	7th Line	Clean Deck Top; Raise hazard warning signs at structure	\$1,250.00
11	15th Sideroad	Clean Deck Top; Raise hazard warning signs at structure, install narrow structure signs on both approaches	\$1,750.00
12	6th Line	Clean Deck Top, Deck Drainage; Raise hazard warning signs at structure, install narrow structure signs on both approaches	\$1,750.00
13	6th Line	Clean Deck Top, Deck Drainage; Install narrow structure signs on both approaches	\$2,000.00
14	6th Line	Clean Deck Top, Remove vegetation in close proximity to structure; Raise hazard warning signs at structure; Replace joint sealant in parapet walls	\$3,750.00
16	7th Line	Repair washouts NE and SW; Replace hazard warning signs at structure; Replace missing bolts in guide rail	\$3,500.00
17	20th Sideroad	Tighten end treatment cables; Replace mising bolt in hand railing	\$500.00
18	25th Sideroad	Clean Deck Top, Remove vegetation in close proximity to structure; Replace joint sealant in parapet walls	\$3,500.00
19	6th Line	Clean Deck Top, Remove vegetation in close proximity to structure; Replace north hazard warning signs at structure; Replace joint sealant in parapet walls	\$4,000.00
20	4th Line	Rmeove dam at outlet; Install hazard warning signs at structure	\$2,000.00
Total			\$41,000.00

TOWNSHIP OF AMARANTH - ADDITIONAL INVESTIGATIONS REQUIRED

Priority	Structure Name	Road Name	Additional Investigations Required	Estimated Cost
Normal	4	9th Line	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	10	7th Line	Monitoring of Deformations, Settlements and Movements,	\$2,500
Normal	11	15th Sideroad	Monitoring of Deformations, Settlements and Movements,	\$2,500
Normal	13	6th Line	Monitoring of Deformations, Settlements and Movements,	\$2,500
Normal	20	4th Line	Monitoring of Deformations, Settlements and Movements,	\$0

Total				\$7,500.00
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TOWNSHIP OF AMARANTH - CURRENT ROADSIDE SAFETY NEEDS

Structure Name	Road Name	CURRENT Roadside Safety Need	Estimated Cost
1	6th Line	Install proper end treatments	\$30,000.00
3	8th Line	Narrow structure - Install guide rail if structure widened during rehabilitation / replacement	\$0.00
4	9th Line	Replace Guide Rail, end treatments	\$95,000.00
5	10th Line	Investigate Need for Replacing with Longer Guide Rail	\$500.00
7	5th Sideroad	Install proper guide rail end treatments	\$30,000.00
8	9th Line	Install proper guide rail end treatment and structure connections	\$45,000.00
9	County Road 10	Install proper guide rail end treatment	\$30,000.00
11	15th Sideroad	Install Guide Rail, end treatments	\$95,000.00
12	6th Line	Narrow structure - Install guide rail if structure widened during replacement	\$0.00
13	6th Line	Narrow structure - Install guide rail if structure widened during replacement	\$0.00
14	6th Line	Install Guide Rail, end treatments and structure connections	\$95,000.00
18	25th Sideroad	Install proper guide rail end treatments	\$30,000.00
19	6th Line	Install proper guide rail end treatments	\$30,000.00
20	4th Line	Investigate need for Guide Rail	\$1,000.00
Total			\$481,500.00

TOWNSHIP OF AMARANTH - STRUCTURE LOAD LIMITS

Structure Name	Year Inspected	Road Name	Existing Load Limit (Tonnes)	Recommendation
10	2023	7th Line	16	No Change
11	2023	15th Sideroad	12	No Change
12	2023	6th Line	12	No Change
13	2023	6th Line	14	No Change

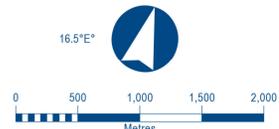


BURNSIDE

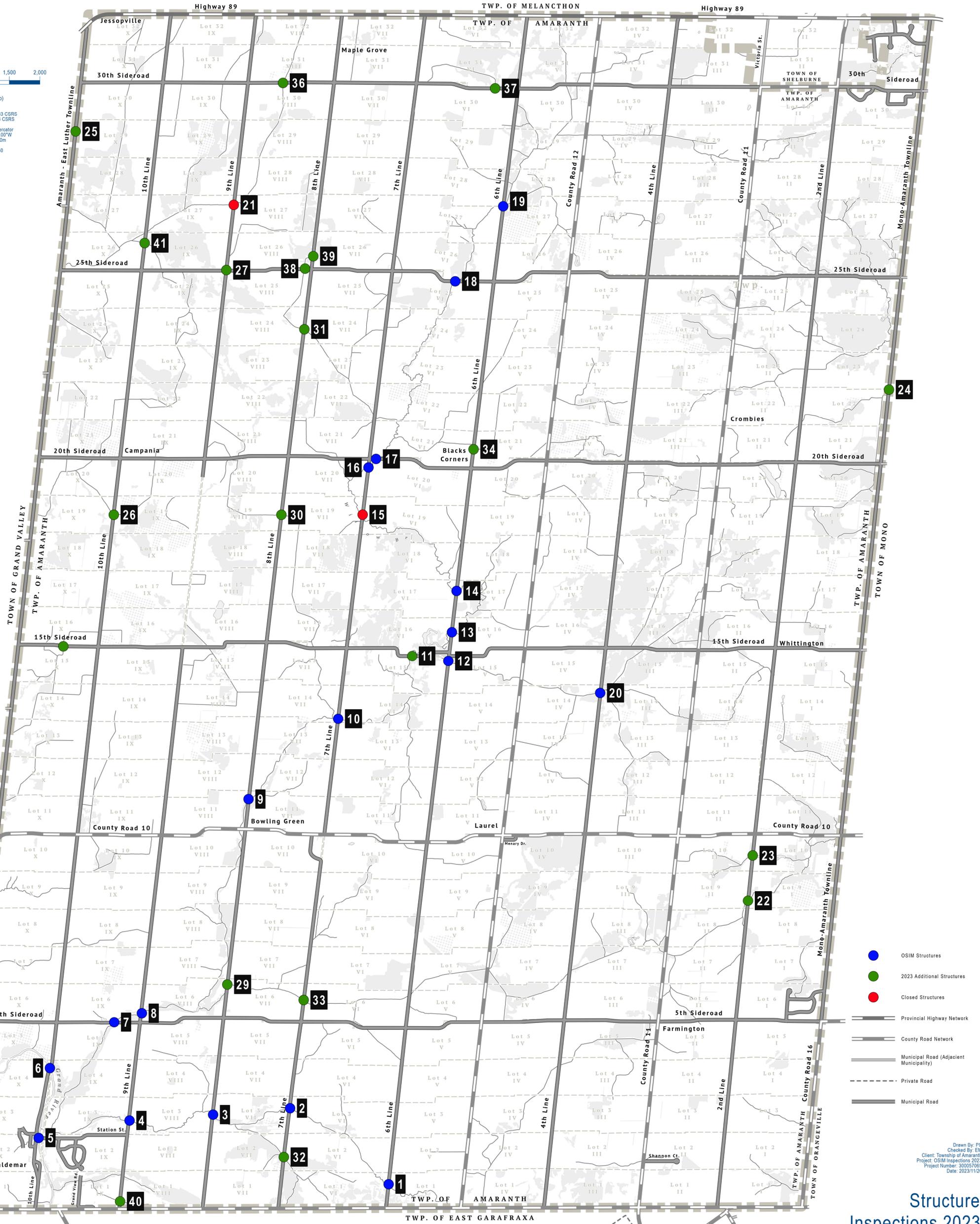
[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Structure Location Map



Datum: North American 1983 CSRS
Coord. System: NAD 1983 CSRS
UTM Zone 17N
Projection: Transverse Mercator
Central Meridian: 81°00'00"W
False Easting: 500,000m
False Northing: 0m
Scale Factor: 0.99960



- OSIM Structures
- 2023 Additional Structures
- Closed Structures
- Provincial Highway Network
- County Road Network
- Municipal Road (Adjacent Municipality)
- Private Road
- Municipal Road

Drawn By: PS
Checked By: EM
Client: Township of Amaranth
Project: OSIM Inspections 2023
Project Number: 300057065
Date: 2023/11/20



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Photo Summary Sheets

057065: Structure 1: 6th Line



UTM Coordinates (WGS84)

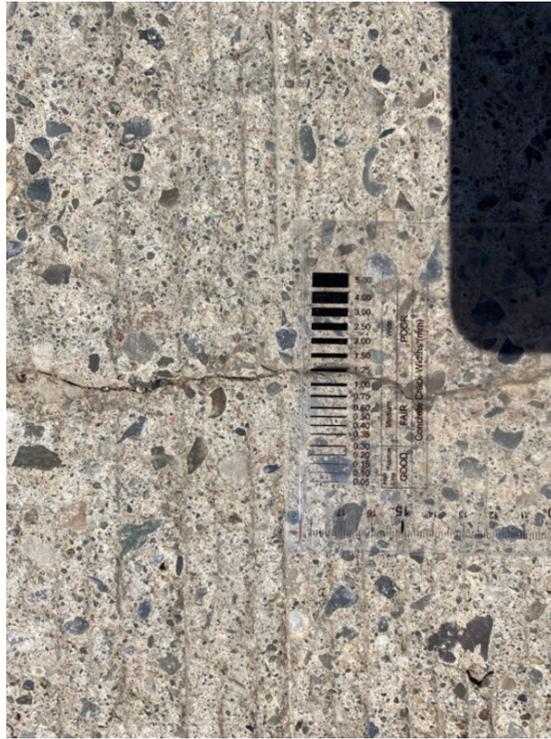
| 17-563229m.E 4860904m.N

Road or Location Description

| 6th Line

Approach Slabs (South)

Photo



Comments

| Wide crack

Hand Railings (South East)

Photo



Comments

| Missing end cap

Soffit - Thin Slab - Ext (South East)

Photo



Comments

| Formwork left in place

Soffit - Thin Slab - Int (East)

Photo

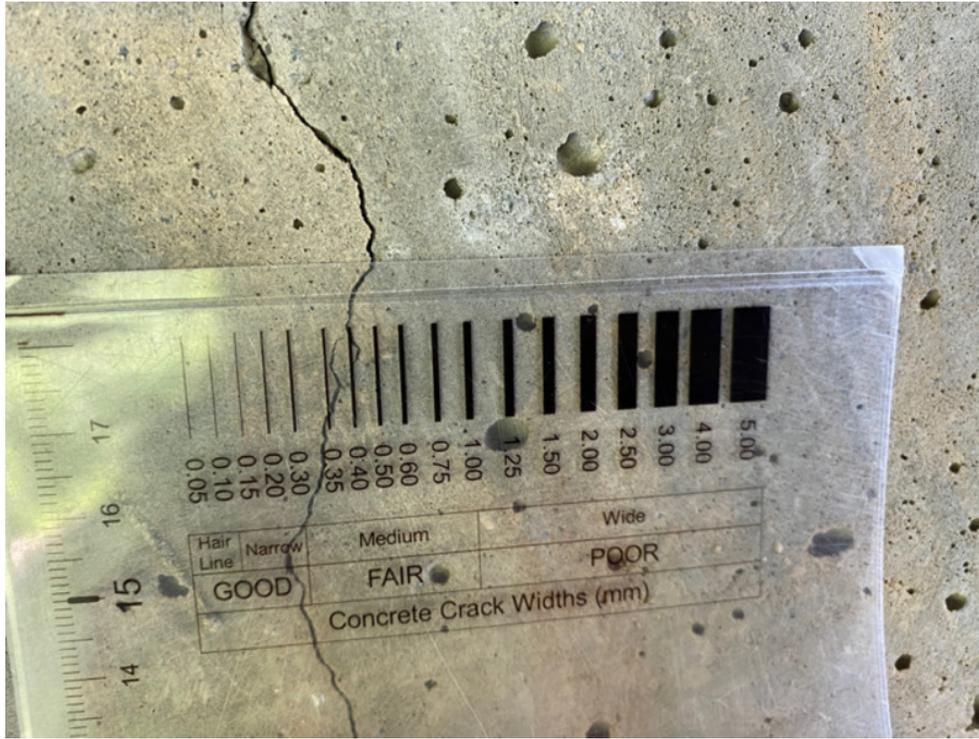


Comments

| Efflorescence staining

Abutment Walls (North)

Photo



Comments

Medium crack

Approach Guide Rail (North)

Photo



Comments

-

Soffit - Thin Slab - Ext (North)

Photo



Comments

| -

Abutment Walls (South)

Photo



Comments

| -

057065: Structure 2: 7th Line



UTM Coordinates (WGS84) | 17-561334m.E 4861635m.N

Road or Location Description | 7th Line

Deck Wearing Surface (North)

Photo



Comments

| Light cracking

Approach Wearing Surface (North)

Photo



Comments

| -

Wingwalls (North East)

Photo



Comments

| -

Diaphragms - End (East)

Photo



Comments

| -

Abutment Walls (North)

Photo



Comments

| -

Soffit - Thin Slab - Ext (East)

Photo



Comments

| -

057065: Structure 3: 8th Line



UTM Coordinates (WGS84) | 17-560158m.E 4861178m.N

Road or Location Description | 8th Line

Railing System (East)

Photo



Comments

| Separation of railing from post

Wingwalls (North East)

Photo



Comments

| Wide crack

Soffit - Thin Slab - Ext (West)

Photo



Comments

| Section loss of exposed steel

Abutment Walls (North)

Photo



Comments

| Severe erosion

Soffit - Thin Slab - Int (North East)

Photo



Comments

| Spalls with exposed corroded rebar

Girders - Middle (West)

Photo



Comments

| Spalls with exposed corroded rebar

Approach Wearing Surface (South)

Photo



Comments

| -

Soffit - Thin Slab - Ext (West)

Photo



Comments

| -

057065: Structure 4: 9th Line



UTM Coordinates (WGS84) | 17-558877m.E 4860699m.N

Road or Location Description | 9th Line

Wall (South East)

Photo



Comments

| Vegetation growing through wall

Barrels (South)

Photo



Comments

| Efflorescence

Barrels (North)

Photo



Comments

| Section loss

Wall (South West)

Photo



Comments

| Void under wall

Approach Wearing Surface (South)

Photo



Comments

| -

Inlet (South East)

Photo



Comments

| -

057065: Structure 5: Station Street



UTM Coordinates (WGS84) | 17-557534m.E 4860006m.N

Road or Location Description | Station Street

Armouring/Retaining Device (West)

Photo



Comments

| Missing and separated sections

Hand Railings (North West)

Photo



Comments

| Missing end cap

Sidewalk (South West)

Photo

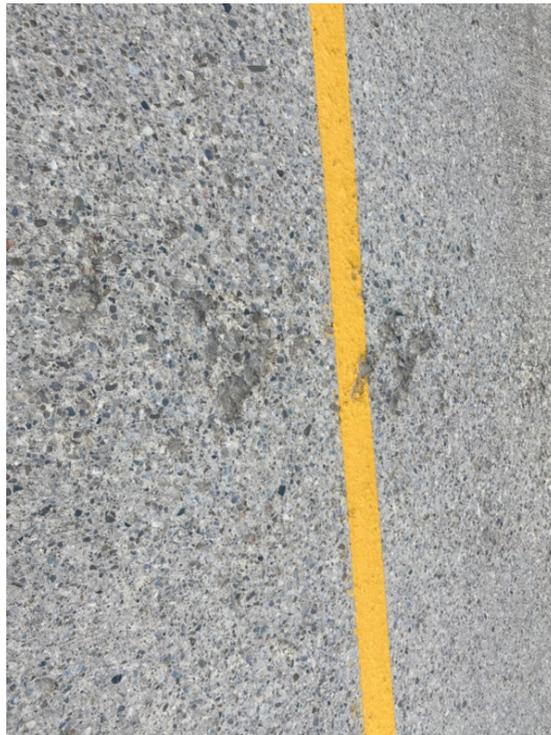


Comments

| Spall with exposed corroded rebar

Deck Top (East)

Photo



Comments

| Severe abrasion/pop outs

Wingwalls (South East)

Photo



Comments

| Moisture leakage from joint

Approach Wearing Surface (East)

Photo



Comments

| -

Abutment Walls (West)

Photo



Comments

| -

Shaft / Bents (North)

Photo



Comments

| -

057065: Structure 6: 10th Line



UTM Coordinates (WGS84) | 17-557387m.E 4861150m.N

Road or Location Description | 10th Line

Approach Wearing Surface (North)

Photo



Comments

| -

Curbs (North East)

Photo



Comments

| Small spall

Wingwalls (North West)

Photo



Comments

| -

Abutment Walls (West)

Photo



Comments

| Medium crack

Soffit - Thin Slab - Ext (South)

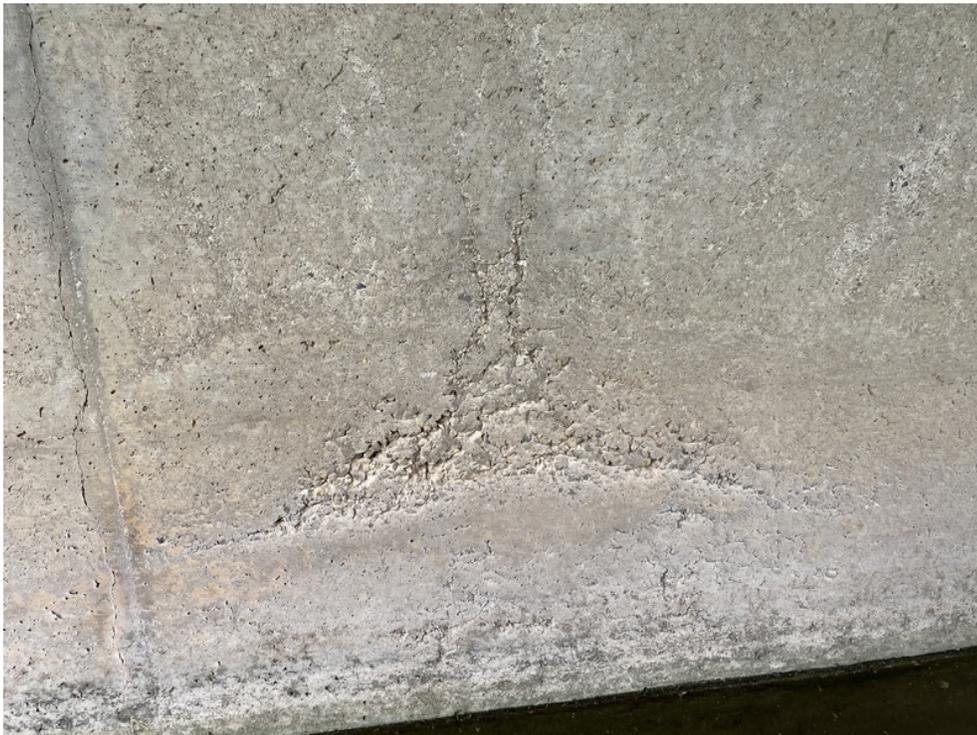
Photo



Comments | Exposed corroded rebar and efflorescence staining

Shaft / Bents (South East)

Photo



Comments | Medium cracks

Seals / Sealants (South West)

Photo



Comments

| Evidence of water leakage

Girders - Middle (North)

Photo



Comments

| -

057065: Structure 7: Sideroad 5



UTM Coordinates (WGS84) | 17-558182m.E 4862164m.N

Road or Location Description | Sideroad 5

Deck Top (Midspan centreline)

Photo



Comments

| Delamination

Barrier/Parapet Walls Interior (All Quadrants)

Photo



Comments

| Missing sealant

Soffit - Thin Slab - Ext (North)

Photo



Comments

| Water staining around parapet joints

Wingwalls (North West)

Photo



Comments

| Spall

Approach Guide Rail (South East)

Photo



Comments

| -

Wingwalls (North East)

Photo



Comments

| -

057065: Structure 8: Ninth Line



UTM Coordinates (WGS84) | 17-558573m.E 4862434m.N

Road or Location Description | Ninth Line

Barrier/Parapet Walls Interior (West)

Photo



Comments

Medium crack

Barrier/Parapet Walls Interior (All Quadrants)

Photo



Comments

Missing sealant

Abutment Walls (North)

Photo



Comments

| Wide crack

Wingwalls (South East)

Photo



Comments

| -

Approach Wearing Surface (North)

Photo



Comments

| -

Soffit - Thick Slab - Ext (East)

Photo



Comments

| -

057065: Structure 9: 8th Line



UTM Coordinates (WGS84) | 17-559253m.E 4866271m.N

Road or Location Description | 8th Line

Barrier/Parapet Walls Interior (All Quadrants)

Photo



Comments

| Missing sealant

Approach Slabs (South West)

Photo



Comments

| Wide crack

Girders - Middle (Throughout)

Photo



Comments

| Minor pitting

Abutment Walls (North)

Photo



Comments

| Wide crack

Utilities (West)

Photo



Comments

| Detached

Soffit - Thin Slab - Int (East)

Photo



Comments

| Efflorescence

Wall (South West)

Photo



Comments

Moderate washout

Approach Wearing Surface (North)

Photo



Comments

-

057065: Structure 10: 7th Line



UTM Coordinates (WGS84) | 17-560284m.E 4867943m.N

Road or Location Description | 7th Line

Deck Top (Throughout)

Photo



Comments

| Large spalls

Wingwalls (South West)

Photo



Comments

| Severe erosion

Approach Wearing Surface (North)

Photo



Comments

| -

Soffit - Thin Slab - Ext (East)

Photo



Comments

| Exposed corroded rebar

057065: Structure 11: Sideroad 15



UTM Coordinates (WGS84) | 17-561154m.E 4869269m.N

Road or Location Description | Sideroad 15

Deck Top (West)

Photo



Comments

| Wide crack

Girders - Ends (North East)

Photo



Comments

| Spalls

Girders - Middle (North)

Photo



Comments

| Wide diagonal crack

Signs (North East)

Photo



Comments

| -

Wingwalls (North West)

Photo



Comments

| Severe disintegration

Soffit - Thin Slab - Int (North)

Photo



Comments

| Exposed corroded rebar (low cover)

057065: Structure 12: 6th Line



UTM Coordinates (WGS84) | 17-561744m.E 4869360m.N

Road or Location Description | 6th Line

Railing System (East)

Photo



Comments

| Spalls with exposed corroded rebar

End Post (North East)

Photo



Comments

| Impact damage

Floor Beams (Throughout)

Photo



Comments

| Spalled ends

Soffit - Thin Slab - Int (Throughout)

Photo



Comments

| Spalls with exposed corroded rebar

Bottom Chords (West)

Photo

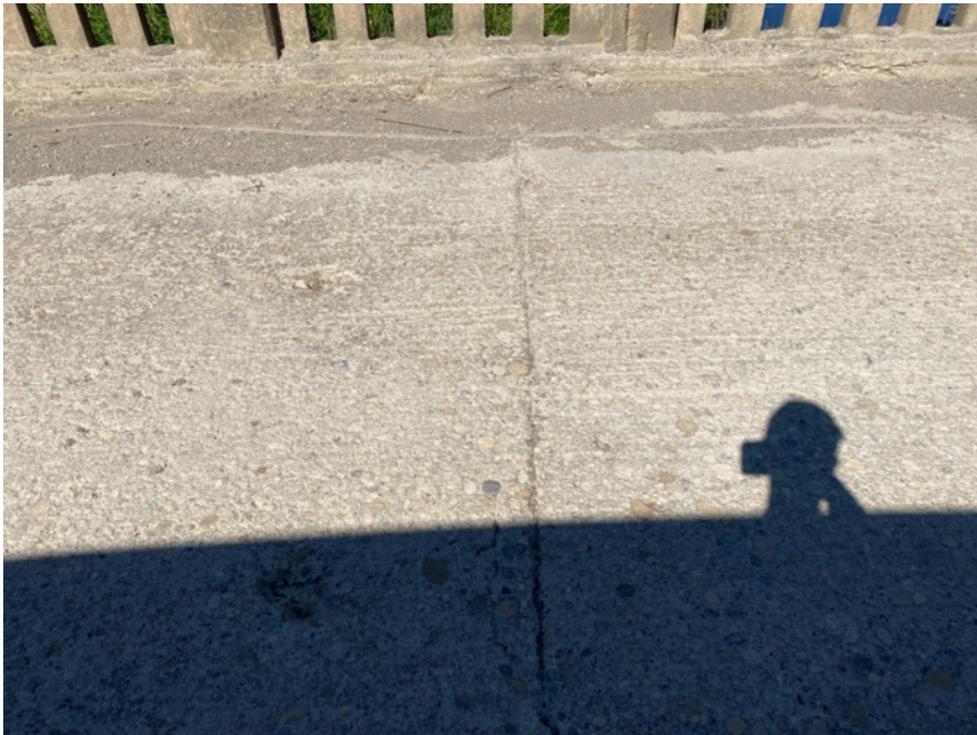


Comments

| Severe disintegration

Deck Top (Midspan)

Photo



Comments

| Wide crack

057065: Structure 13: 6th Line



UTM Coordinates (WGS84) | 17-561668m.E 4869826m.N

Road or Location Description | 6th Line

Deck Top (North)

Photo



Comments

| Wide cracks

Railing System (Throughout)

Photo



Comments

| Spalls with exposed corroded rebar

Top Chords (North West)

Photo



Comments

| Spall with exposed corroded rebar

Wingwalls (North West)

Photo



Comments

| Severe disintegration

Abutment Walls (South)

Photo



Comments

Rotation

Abutment Walls (North)

Photo



Comments

Rotation

057065: Structure 14: 6th Line



UTM Coordinates (WGS84) | 17-561549m.E 4870494m.N

Road or Location Description | 6th Line

Barrier/Parapet Walls Interior (All quadrants)

Photo



Comments

| Deteriorated sealant

Deck Top (North)

Photo



Comments

| Delamination

Soffit - Thin Slab - Ext (South West)

Photo



Comments

| Efflorescence staining

Abutment Walls (South)

Photo



Comments

| Moisture penetration

Approach Wearing Surface (North)

Photo



Comments

| -

Wingwalls (South West)

Photo



Comments

| -

057065: Structure 16: 7th Line



UTM Coordinates (WGS84) | 17-559595m.E 4872015m.N

Road or Location Description | 7th Line

Approach Guide Rail (Throughout)

Photo



Comments

| Missing bolts

Barrels (South East)

Photo



Comments

| Moisture staining

Wingwalls (South West)

Photo



Comments

| Small spall

Outlet (West)

Photo



Comments

| Efflorescence

Barrels (North)

Photo



Comments

| Efflorescence

Signs (South East)

Photo



Comments

| Low reflectivity

057065: Structure 17: Sideroad 20



UTM Coordinates (WGS84) | 17-559673m.E 4872183m.N

Road or Location Description | Sideroad 20

Hand Railings (North West)

Photo



Comments

| Missing bolt

Approach Wearing Surface (South)

Photo



Comments

| Light longitudinal crack

Girders - Middle (North)

Photo



Comments

| Moisture penetration with efflorescence

Approach Wearing Surface (East)

Photo



Comments

| -

Soffit - Thin Slab - Ext (North)

Photo



Comments

| -

A. Bearings (West)

Photo



Comments

| -

057065: Structure 18: Sideroad 25



UTM Coordinates (WGS84) | 17-560094m.E 4875329m.N

Road or Location Description | Sideroad 25

Barrier/Parapet Walls Interior (All Quadrants)

Photo



Comments

| Missing sealant

Deck Top (West)

Photo



Comments

| Wide crack

Wingwalls (South West)

Photo



Comments

| Efflorescence staining

Soffit - Thin Slab - Int (East)

Photo



Comments

| Efflorescence staining

Abutment Walls (West)

Photo



Comments

Narrow stained crack

Approach Guide Rail (South East)

Photo



Comments

-

Barrier/Parapet Walls Exterior (South West)

Photo



Comments

| -

Soffit - Thick Slab - Int (South)

Photo



Comments

| -

057065: Structure 19: (6th Line)



UTM Coordinates (WGS84) | 17-560498m.E 4876724m.N

Road or Location Description | 6th Line

Barrier/Parapet Walls Interior (All Quadrants)

Photo



Comments

| Missing sealant

Deck Top (West)

Photo



Comments

| Water ponding

Abutment Walls (North)

Photo



Comments

| Efflorescence staining

Soffit - Thin Slab - Int (West)

Photo



Comments

| Efflorescence staining

Deck Top (West)

Photo



Comments

| Wide crack

Approach Wearing Surface (South)

Photo



Comments

| -

Wingwalls (South East)

Photo



Comments

| -

Soffit - Thick Slab - Int (South)

Photo



Comments

| -

057065: Structure 20: 4th Line

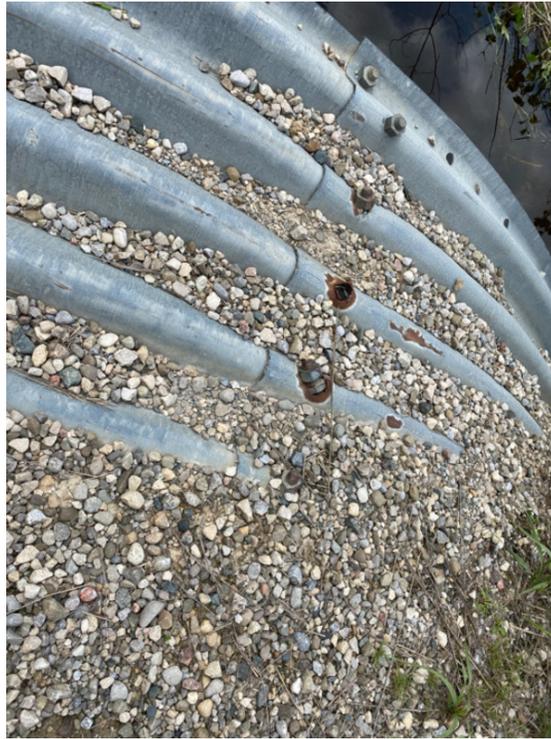


UTM Coordinates (WGS84) | 17-564269m.E 4869564m.N

Road or Location Description | 4th Line

Barrels (South West)

Photo



Comments

| Damaged bolts

Approach Wearing Surface (South)

Photo

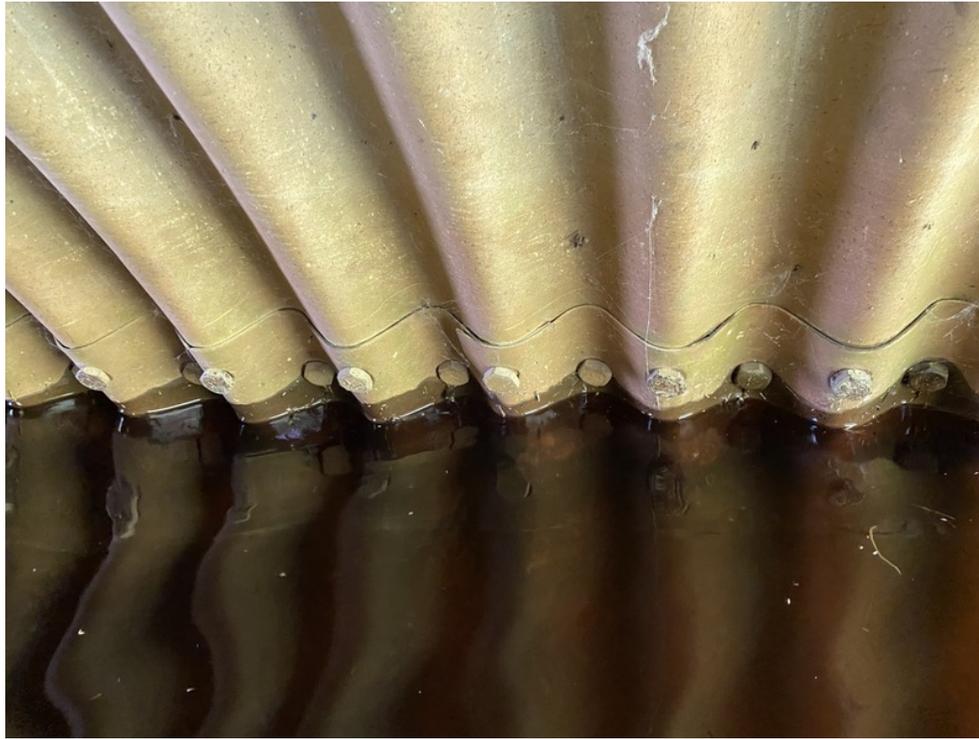


Comments

| -

Barrels (South barrel, North)

Photo



Comments

| Incorrect lapping

Barrels (South barrel)

Photo



Comments

| Cusping

Outlet (West)

Photo

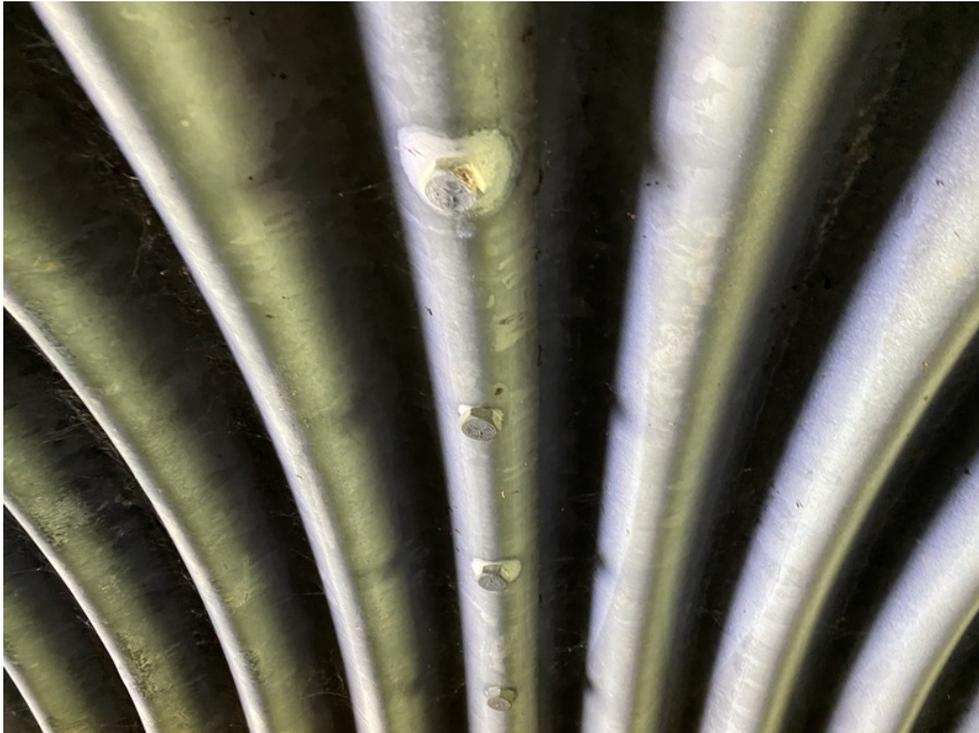


Comments

Moderate honeycombing

Barrels (North barrel)

Photo



Comments

Efflorescence staining



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

OSIM Forms and Photos

(Provided Digitally)

