FINAL CULVERT INSPECTION REPORT – EAST FERRIS

Project No.: EF – 2023-03
Culvert Evaluation/Survey

Prepared for:

Municipality of East Ferris
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McINTOSH PERRY

Executive Summary

McIntosh Perry Consulting Engineers Ltd. has been retained by the Municipality of East Ferris to complete an evaluation and survey of all centreline culverts maintained by the municipality. As part of the assignment, McIntosh Perry assessed the existing conditions and collected location data in GIS format of the drainage infrastructure along 60 roads within the municipality. The remaining service life and preliminary cost estimates for culverts identified for replacement are also provided. Of the 60 roads, 58 had drainage infrastructure. These roads are a mixture of paved, surface treated, and gravel with varying amounts of traffic.

The drainage infrastructure inspected during the field visits included 431 culverts spanning 58 roads and 110 km. After analyzing the existing condition of the culverts, the following actions are recommended:

- Eighteen (18) are recommended for replacement;
- Sixty-Five (65) are recommended for cleanout;
- Ten (10) are recommended for ditch cleanout;
- One (1) is recommended for repair;
- One (1) is recommended to be abandoned;
- Five (5) are submerged and need to be reassessed at a later date;
- Five (5) were not found, and
- Three-Hundred-Twenty-Six (326) are recommended for no action.

The breakdown of the estimated remaining service life is shown below:

- Eighteen (18) are recommended for replacement now;
- Twelve (12) are currently no action or cleanout and have a remaining service life of 1-2 years;
- Forty-Eight (48) are currently no action or cleanout and have a remaining service life of 3-5 years;
- Sixty-One (61) are currently no action or cleanout and have a remaining service life of 6-10 years;
- Two-Hundred-Seventy-Four (274) are currently no action or cleanout and have a remaining service life of greater than 11 years;
- Seventeen (17) were not fully inspected as they were submerged, buried, or were not found, and
- One (1) was previously removed so there is no remaining service life.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

McIntosh Perry Consulting Engineers Ltd. (MP) has been retained by the Municipality of East Ferris to complete the culvert evaluation and survey of all centreline culverts maintained by the municipality. As part of the drainage component of the assignment, McIntosh Perry has assessed the existing condition of the drainage infrastructure and collected location data in a GIS format. The remaining service life as well as preliminary cost estimates for culverts identified for replacement are also provided.

The project limits included 60 roads spanning 110 km. The roads are a mixture of paved, surface treated and gravel with varying amounts of traffic. All culverts inspected were non-structural (spans less than 3 m). A map including culvert points is shown in Figure 1 below.

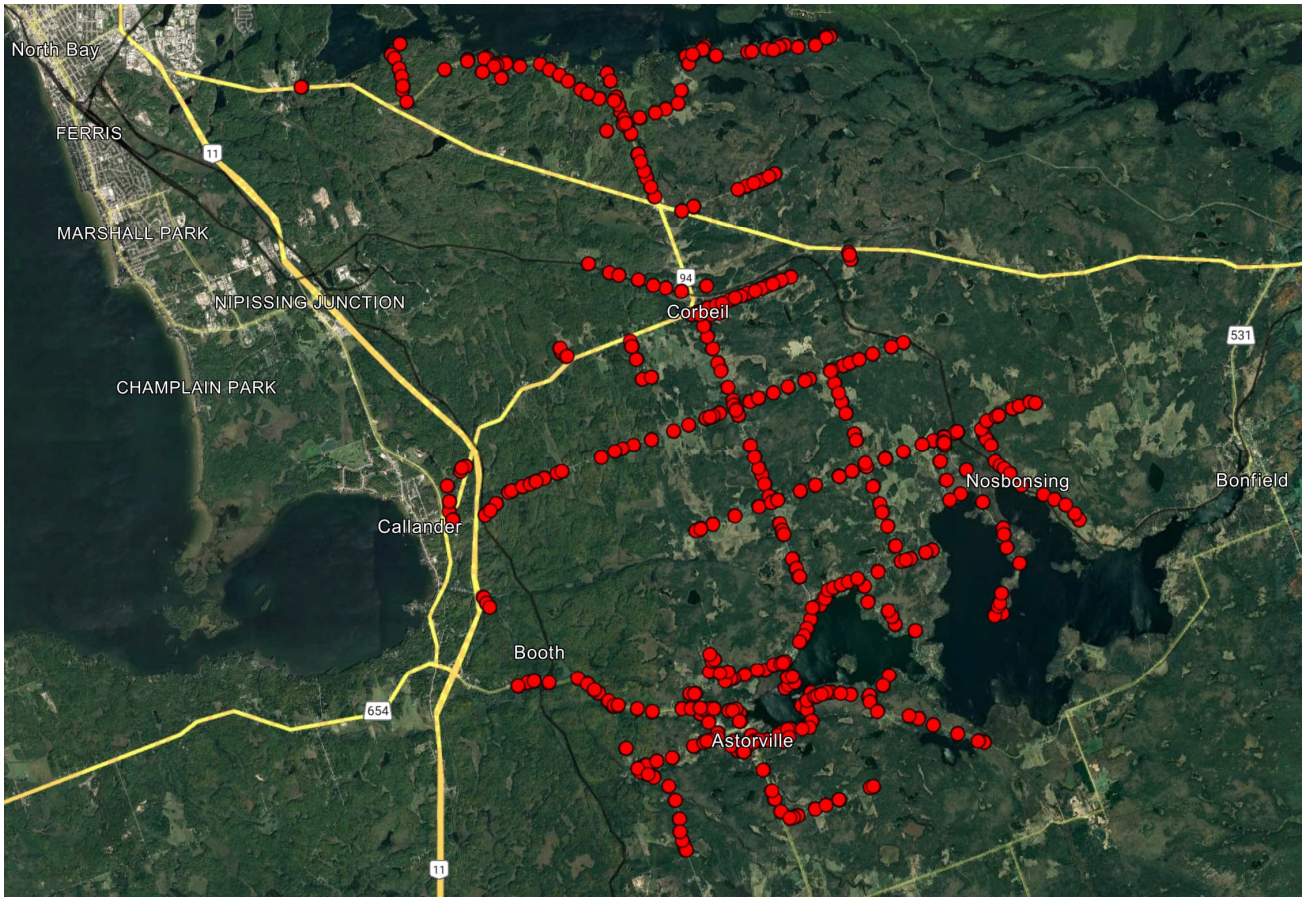

Figure 1 – East Ferris Culvert Evaluation Map

The purpose of this *Final Culvert Inspection Report* is to summarize the findings of the field investigations completed by the MP Drainage team between May 8th and May 19th, 2023. The investigations included the inspection of 431 centreline culverts, on 58 roads.

2.0 PROJECT METHODOLOGY

The following section documents the methodology used to complete the culvert inspections throughout the limits of the Assignment.

2.1 Culvert Inventory Assessment

Culverts were assessed using field review, datasheets, and photos. The field review sheets include ratings for material, capacity, invert, shape, scour, settlement, and slope erosion, as well as culvert information and additional notes. Photos were taken of the inlet, outlet, surrounding environment, interior conditions from both ends, and the road directly above the culvert. The *Culvert Summary Sheets* including recommendations for culverts on all 58 roads can be found in Appendix A. The *Culvert Photo Tables* have been tabulated from our field investigations and can be found in Appendix B.

All of the culverts were inspected and documented following the *Culvert Collection Guide (April 2014).*

3.0 FIELD INVESTIGATION RESULTS

3.1 Summary

All culverts were assessed using the *MTO Culvert Condition Rating Guide*. The culverts were inspected and rated with respect to the existing condition, functionality, erosion control, and grading, with a recommended course of action as required.

After analyzing the existing condition of the culverts, the following actions are recommended:

- Eighteen (18) are recommended for replacement;
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- Ten (10) are recommended for ditch cleanout;
- One (1) is recommended for repair;
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- Seventeen (17) were not fully inspected as they were submerged, buried, or were not found, and
- One (1) was previously removed so there is no remaining service life.

Note that the remaining service life is an estimate and may not reflect the exact remaining life of the culvert. Some culverts may deteriorate more quickly or more slowly than others based on several factors including water and soil chemistry, traffic volumes, material type, culvert size, etc.

During the field investigations, seventeen (17) centerline culverts were not fully assessed as five (5) were not located, 5 (five) were submerged and are required to be reassessed, six (6) had at least one end buried and are recommended for cleanout and reassessment, and one (1) outlet was located on private property.

3.2 Replacements

The following eighteen (18) centreline culverts located within the project limits are recommended for full replacement: Astor (S) CL 1, Astorville CL 1, Catherine CL 1, CL 2, CL 3, Centennial CL 1, CL 2, CL 6, CL 9, CL 19, Corbeil CL 20, CL 24, Dugas CL 3, Eglinton (N) CL 2, Lake Nosbonsing CL 6, CL 7, CL 14 and Treadlightly CL 1. For the purposes of this inspection report, all culverts recommended for replacement are recommended to be replaced at the same location.

Astor (S) CL 1 is a 600 mm CSP with a poor material condition rating (rusting along the sides of the culvert with section loss along the invert), poor settlement (significant sags, bumps, and potholes above the culvert), and poor slope erosion. Please note that this culvert could fall into the 3-5 Year remaining service life range, however since the area is being reconstructed, it should be replaced.

Astorville CL 1 is a 600 mm CSP and is recommended for replacement due to poor material condition (rusting of the entire culvert), poor capacity (the inlet was buried, and the outlet was submerged) and poor invert locations with the outlet being previously paved over and cut out. Based on these conditions, the replacement culvert should be installed to better match the existing ditches, and away from the shoulder.

Catherine CL 1 is a single catch basin structure with a 375 mm CSP outlet. The material condition is fair (flaking along the sides), with poor settlement above the pipe and around the catch basin inlet (significant sags, bumps, and potholes), and poor slope erosion into the downstream ditch. This system is within the approved reconstruction limits and is therefore recommended for replacement. Consideration should be given to replacing the catch basin structure with a sloped ditch inlet and deepening the inlet ditching to improve the capturing of surface runoff upstream.

Catherine CL 2 is a 600 mm CSP with a poor material condition rating at the inlet (rusting along the sides of the culvert with section loss along the invert). The existing culvert outlets into a ravine on private property and was not inspected. There is also a ditch inlet into this pipe in the north ditch. Please note that the visible end of this culvert could fall into the 3-5 Year remaining service life range, however since the area is being reconstructed, it should be replaced.

Catherine CL 3 is a 600 mm CSP with a poor material condition rating (rusting along the sides of the culvert with section loss along the invert). Please note that this culvert could fall into the 3-5 Year remaining service life range, however since the area is being reconstructed, it should be replaced.

Centennial CL 1 is a 600 mm CSP and is recommended for replacement due to poor material condition (rusting pitting, flaking throughout with section loss along the invert).

Centennial CL 2 is a 600 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, and flaking with section loss along the invert), and poor shape (sags and bends in the culvert with a crushed and broken outlet).

Centennial CL 6 is a 600 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, with section loss along the sides of the inlet, and along the invert), poor inverts and scour (perched on both ends due to scouring and undermining with the outlet bent upwards). Based on these conditions, the culvert is no longer functioning properly and is recommended for replacement.

Centennial CL 9 is a 900 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, with section loss along the sides of the inlet, and along the invert at the outlet), poor inverts and scour (perched on both ends due to scouring and undermining). Based on these conditions, the culvert is no longer functioning properly and is recommended for replacement.

Centennial CL 19 is a 1200 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss with granular infiltration). Since the severe rusting is along the springline, the culvert is at a greater risk of collapsing and warrants replacement.

Corbeil CL 20 is a 600 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss), poor capacity, poor shape (joint separations with possible sediment infiltration) and poor settlement (sagging and cracking above the culvert). Based on these conditions, the culvert is at risk to collapse and warrants replacement.

Corbeil CL 24 is a 375 mm HDPE liner and is recommended for replacement due to poor shape (joint separations with host CSP pipe visible), poor capacity, and poor settlement (significant cracking above the culvert).

Dugas CL 3 is a 400 mm CSP and is recommended for replacement due to poor material condition (rusting along the invert with section loss), poor shape (bent and deformed ends) and poor settlement (shallow cover with a large bump and potholes above the culvert).

Eglinton (N) CL 2 is a 400 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss with sediment infiltration), and poor settlement (shallow cover with a large bump and cracks above the culvert).

Lake Nosbonsing CL 6 is a 2200 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss). With the severe rusting along the springline, this culvert is at a greater risk of collapsing and warrants replacement. A trenchless liner could be considered as a replacement alternative since Lake Nosbonsing Road has relatively high levels of traffic, and the depth of fill will create some challenges if replaced by standard open-cut methodologies. Please note that a liner would require hydrologic and hydraulic analyses and is considered outside the scope of this assignment.

Lake Nosbonsing CL 7 is a 750 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss). With the severe rusting along the springline, this culvert is at a greater risk of collapsing and warrants replacement.

Lake Nosbonsing CL 14 is a 750 mm CSP and is recommended for replacement due to poor material condition (rusting, pitting, flaking, and section loss). With the severe rusting along the springline, this culvert is at a greater risk of collapsing and warrants replacement.

Treadlightly CL 1 is a 375 mm CSP and is recommended for replacement due to poor shape (joint separations with sediment infiltration).

4.0 PRELIMINARY COST ESTIMATE

Preliminary cost estimates for the recommended replacement options have been included in the Centreline Culvert Inspection Summary found in Appendix A. It should be noted that the preliminary estimates are based on average costs obtained from the MTO's Highway Costing System (HiCo) and do not include site-specific costs such as property, roadway classification, cover, utility relocation, staging, fisheries impacts, temporary flow passage, dewatering, clearing and grubbing, etc. Please note that 20% has been added to these cost estimates as a contingency.

Additionally, construction duration estimates were completed using the *Production Rates Manual (MTO 2011)* as well as engineering judgment. Smaller culverts are estimated to take two to three days. Medium-sized culverts ranging from 800 mm to 1200 mm in diameter are estimated to take one to two weeks. Larger culverts are estimated to take two to three weeks to replace. Please note that construction duration is just an estimate and will vary depending on similar factors to the pricing.

5.0 LOCATION DATA COLLECTION

Location data was collected at each culvert using a Trimble R2 unit. Points were taken at each culvert end and were then connected to create culvert lines in a shapefile format. These points and lines were used to get the latitudinal and longitudinal coordinates as well as the length of the culverts. Due to the limitations of the GPS unit, the data should be used as a reference point and not for final design.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the field investigations and recommendations of all centreline culverts maintained by the Municipality of East Ferris within the limits provided in the RFP.

All culverts were assessed using the *MTO Culvert Condition Rating Guide*. The culverts were inspected and rated with respect to the existing condition, functionality, erosion control, and grading, with a recommended course of action as required.

The results from the 431 centreline culvert assessments concluded the following recommendations:

- Eighteen (18) are recommended for replacement;
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7.0 DISCLAIMERS

The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

This *Final Culvert Inspection Report – East Ferris* is respectfully submitted by,

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