BECKWITH TOWNSHIP
ASSET MANAGEMENT PLAN

Project No.: PM-18-9593

Prepared for:

Beckwith Township
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McINTOSH PERRY

Executive Summary

The Township of Beckwith (Township) recognizes that in order to sustain services for its residents and for the competitiveness of its businesses, agriculture and industry, it must manage the Township's assets cost effectively. McIntosh Perry Consulting Engineers Ltd. (McIntosh Perry) was retained by the Township to develop the Asset Management Plans for the road network, bridges and large culverts, equipment, and the buildings and facilities.

The findings for the individual infrastructure varied, as follows:

The **road network** requires additional spending to avoid further deterioration of the network. The network has an overall condition rating of 5.91 as of 2018, and is generally described as "Fair", while the desired level of service is to have a network condition greater than 6.00.

The Township's **bridges and large culverts** would benefit from additional funding placed in reserves to account for future rehabilitation or reconstruction works. The Township's two bridges are generally considered to be in "Good" condition while the large culverts have an overall average condition of "Fair". The desired level of service for bridges is for at least seventy-two percent of structures to have a condition rating of at least "Good" to "Very Good" based on the 2017 Municipal Benchmarking Network of Canada's Performance statistic median. This suggests the Township's bridges are operating at the desired level of service, however additional funding should be set in reserves to fund the replacement of the Township's larger culverts over the next 5-15 years and to account for future needs that may arise with the Township's two bridge structures.

The Township's **vehicles and equipment** would also benefit from additional funding. Based on the estimated condition by useful life remaining (Section 3.3), five of the Township's vehicles and equipment are considered "Very Poor", one is considered "Poor", three are considered "Fair" and two are considered "Good". This would suggest that the Township should be setting aside funds to account for replacement of their vehicles and equipment, as needed, in the immediate and near future.

The Township's overall plan takes a long-view perspective which focuses on timely maintenance and rehabilitation to save money in the long term.

It is important to note that the overall Asset Management Strategy (Section 4.0) states the biggest risk to the Township is inadequate spending. The consequences of underfunding include the deterioration of assets and service levels. It is recommended that the Township explore a variety of procurement methods to ensure the most economical allocation of the Township's resources (Section 4.6).

In addition, the plan suggests strategies to help mitigate some of the spending shortfall, including adoption of a 10-Year Capital Plan for Road Reconstruction and completing additional work included in the report as funds become available.

TABLE OF CONTENTS

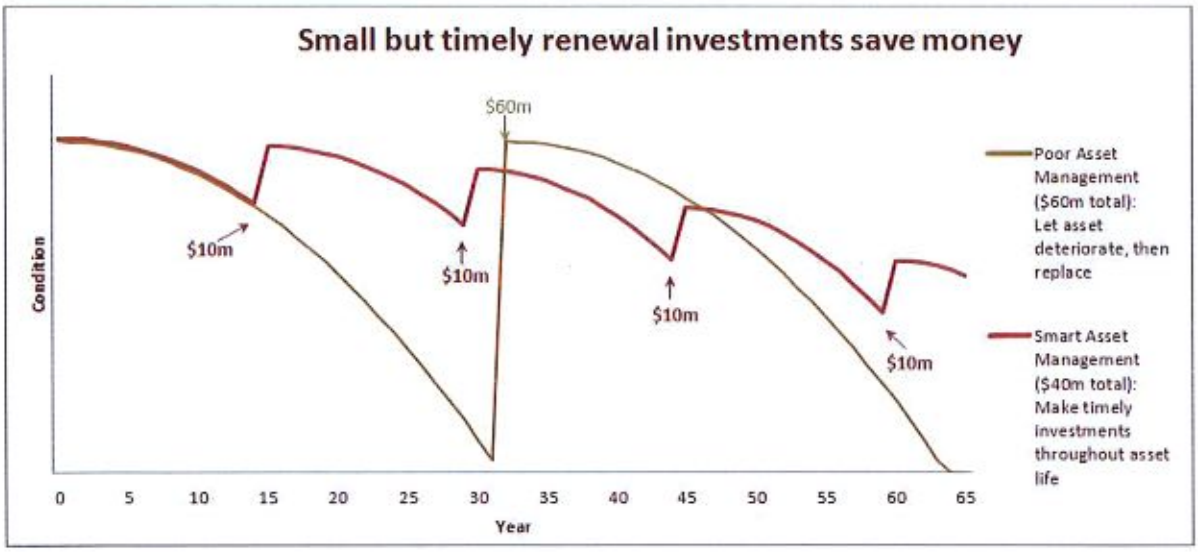
APPENDICES

1.0 INTRODUCTION

The Township recognizes that in order to sustain services for its residents and for the competitiveness of its businesses, agriculture and industry, it must manage the Township's assets cost effectively. In 2014 the Township developed an informal Asset Management Plan Report to guide future economic prosperity for the region that is both appropriate and sustainable, providing a "road map" for employees, a reference document for taxpayers and community volunteers, and a decision-making template for Council. This report prepared by McIntosh Perry looks to formalize the works previously prepared by the Township, build upon the previous plan and provide an update where appropriate.

The Asset Management Plan is a comprehensive plan that inventories and assesses the infrastructure and develops a plan to best maintain it. The plan outlines how to sustain the infrastructure and provides strategies on how to finance the operation, maintenance, renewal and expansion of the system. In doing so, it takes into account timely maintenance and capital repairs in order to best preserve the asset, while maintaining the desired levels of service to the public. The plan takes a long-view perspective on managing the asset through life cycle cost analysis which can save money in the long term. For example, Figure 1 shows two ways to manage an asset.

FIGURE 1 – LIFE CYCLE OF TWO RENEWAL OPTIONS



(Resource from "Building Together, Guide for Municipal Asset Management Plans", Ministry of Infrastructure, Ontario)

The first option in Figure 1 allows the asset to deteriorate until it needs to be replaced, while the second option shows timely rehabilitation. At the end of the 64-year life cycle, Option 1 costs $120 million (the initial investment plus the cost to replace the asset) and Option 2 costs $100 million. Even so, the asset's condition in Option 2 is in far better shape than in Option 1.

McIntosh Perry was commissioned by the Township to work with Municipal Staff to develop the asset management plans for the following municipal assets:

- Road network;
- Bridges and large culverts;
- Vehicles and equipment; and
- Buildings and facilities;

The final report is to be presented to Council and will also be made available to the public for information and input. The Asset Management Plan covers a period of ten years in which the document is to be updated every five years. The update will be an opportunity to evaluate the assumptions made in this study and how the plan is maintaining and improving these systems and meeting service-level targets.

This Asset Management Plan has been prepared in reference to a number of external studies, including the following studies performed specifically as a review of Beckwith Township infrastructure:

- Road Needs Study, McIntosh Perry Consulting Engineers Ltd., September 2019
- 2019 OSIM Inspection Report, McIntosh Perry Consulting Engineers Ltd., May 2, 2019

In addition to the above studies, this report also includes reference to applicable Federal and Provincial standards. Information pertaining to inventory of equipment, vehicles, large culverts and housing has been provided by Township staff.

1.1 STUDY METHODOLOGY

1.1.1 Road Network

The Ministry of Transportation of Ontario "Inventory Manual for Municipal Roads for Small Lower Tier Municipalities" has been used in preparing this study and is briefly outlined in the sections below. A detailed Road Needs Study was prepared by McIntosh Perry dated September 2019, key summaries of which have been included in this report for ease of reading, however the entire report is available under separate cover.

1. All road sections are listed with their condition rating by road type:
    a) Gravel Roads
    b) Surface Treated or Low Class Bituminous (LCB) Roads
    c) Hot Mix Paved or High Class Bituminous (HCB) Roads
2. Future condition ratings are calculated for each road and from this, predicted maintenance and capital expenditures can be produced. Newly reconstructed roads have a ten-point condition rating, and roads requiring partial reconstruction are assigned three points. Roads should not be allowed to go below three points due to the severity of the road conditions, e.g. very poor ride, difficult to maintain, usually a safety hazard.

Generally speaking, the Township roads have low traffic volumes, which are consistent throughout its road network. It has been assumed that asphalt roads will need to be resurfaced within fifteen years and if not resurfaced, then reconstructed in thirty years. Note that roads cannot perpetually be resurfaced and at some point the road must be reconstructed. It has been assumed that a surface treated road has a life expectancy of approximately fifteen years before reconstruction is required.

The above-noted life cycle assumptions should not have a great impact on the overall assessment of the road network, but some roads may experience slower or faster rates of deterioration. The capital program may need to be adjusted to account for this and other factors such as variations in pavement structure, sub-surface conditions, drainage and truck traffic. For example, a street scheduled for reconstruction in year five may have to be moved up in the Ten Year Capital Program. On the other hand, a street scheduled for year three could be pushed back if its condition has not deteriorated as fast as earlier predicted.

Through regularly measuring the performance of its road system (e.g. Road Needs Study every five years, traffic counts, etc.), the Township will be able to better predict the deterioration rates of individual segments and therefore the overall network.

The condition rating for each road type will decrease every year unless maintenance and/or rehabilitation are performed. For gravel roads it is assumed that the condition of the road will be maintained with regular gravel resurfacing. Hard surface roads with no maintenance and/or no rehabilitation (which is not recommended) will need reconstruction within fifteen years for surface treated roads and thirty years for asphalt roads. The following calculations show the expected rate of deterioration of the three surface types.

Asphalt: $$\frac{10 - 3 \text{ point conditions rating}}{30 \text{ year life cycle before reconstructing}} = 0.23 \text{ pt/yr}$$

Surface Treatment: $$\frac{10 - 3 \text{ point condition rating}}{15 \text{ year life cycle before reconstructing}} = 0.47 \text{ pt/yr}$$

Gravel: No change in rating with regular maintenance.

Based on the foregoing discussion, Table 1 provides an example of how the condition rating is forecasted for each surface type. In this example, it is assumed that road reconstruction was performed in the Base Year for each road type.

Table 1: Forecasting Condition Rating (Example)

SURFACE TYPE	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
GRAVEL[1]	10.00	10.00	10.00	10.00	10.00	10.00
SURFACE TREATMENT	10.00	9.53	9.06	8.59	8.12	7.65
APHALT	10.00	9.77	9.54	9.31	9.08	8.85

[1]Gravel Roads have a stable unchanging life expectancy, as long as routine loose top maintenance is performed. Gravel roads will remain this way until improvements are made.

3. The average condition rating is determined for each road type by summing the product of length multiplied by the condition rating and then dividing by the total length of the road system. This will result in an average condition rating for the three road surface types. An example is demonstrated in Table 2 below.

Table 2: Average Condition Rating by Surface Type (Example)

STREET	LENGTH (L) (Km)	CONDITION RATING (CR)	PRODUCT L x CR
1	1.00	7.00	7.00
2	2.00	3.00	6.00
3	3.00	5.00	15.00
TOTAL	6.00		28.00

$$\text{Average Condition Rating} = \frac{\text{SUM (L} \times \text{CR)}}{\text{Total Length}} = \frac{28.00}{6.00} = 4.67$$

An overall condition rating can be calculated for the total Municipal system by combining the three surface types.

4. The above noted analysis will determine if and when a road requires improvements within the next ten years.

5. To estimate the cost of construction, benchmark costs are used and are associated with the type of capital improvement. Average unit costs have been developed based on recent local construction projects.

   Fixed costs are costs associated with maintenance of the existing road system and include overhead, salaries, etc. Fixed costs are generally met from the Township's budget prior to capital construction funds being allocated. Fixed costs for forecast requirements were derived from historical expenditures.

   For the Road Needs Study, the report presents cost estimates in 2019 dollars. At the time of budgeting, the Township should adjust capital expenditure by an appropriate cost of inflation.

   The Ten Year Capital Program presented in the Road Needs Study is a tool for Municipal Staff and Council to reference when consider future capital projects. As mentioned above, there may be other factors that must be considered and/or adjusted in order to reflect changes not foreseen at the time of writing the report.

1.1.2 Bridges and Large Culverts

Detailed visual inspections are done in accordance with the Ontario Structure Inspection Manual (OSIM). The thorough visual inspection is performed regularly and is a "close-up" visual assessment (with estimation of some remaining inaccessible parts) of each element for material defects, performance deficiencies and maintenance needs of the structure. The inspection may involve some non-destructive testing such as using hammers to sound concrete. The inspector – under the direction of the engineer – measures and records information on prescribed forms, in which the engineer develops a program for rehabilitation and/or replacement for the municipal infrastructure.

All bridges with a span of three metres or greater must be inspected biennially. The inspection frequency identified above is the maximum interval for structures in good condition and/or repair. The engineer may require more frequent inspections for some of the reasons listed below:

- Structure with a high proportion of elements in poor condition;
- Structure with a load limit;
- Single load path structures;
- Structures with fatigue-prone details; and/or
- Structures with fractured critical components.

In addition, some structures may require a more thorough inspection by actually getting within arm's reach of all areas of the structure. This type of inspection is referred to as an Enhanced OSIM inspection and requires the following:

- Determine areas of delamination and spalling in concrete elements by tapping with a hammer;
- Determine limits of rot in wood elements by tapping with a hammer and selective wood coring;
- Cleaning and wire brushing all areas of steel to examine section loss.

Typically an enhanced inspection is required on all structures over thirty years of age with critical components in poor condition and should be completed a maximum of every six years.

The Township has decided to also include their larger culverts as important assets, as replacement costs for these can become quite costly. While they do not meet the definition of a structure (i.e. < 3m), it is important to account for rehabilitation or replacement of these culverts, to ensure that appropriate funds are available at the time of need.

1.2 BENCHMARK COSTING

The estimated cost for identified improvements is calculated on an approximate basis, using average unit prices for roads. For bridges, replacement costs have established in consultation with a qualified structural engineer. Benchmark prices are in 2019 dollars and adjustments should be made for inflation each budget year. Also, please note that the costs below exclude HST.

1.2.1 *Road Network*

Table 3: Unit Prices

ITEM	2019 Avg. unit price	
Earth Excavation, Grading	$ 11.00	per cubic metre
Earth Excavation, Ditching	$ 13.00	per metre
Road Widening per Shoulder	$ 50.00	per metre
Removal – Pulverize	$ 1.50	per square metre
Removal – Asphalt	$ 2.00	per square metre
Remove and Replace 16m x 600mm Diameter CSP	$ 6,550.00	each
Granular A	$ 17.50	per tonne
Granular B	$ 16.50	per tonne
Single Surface Treatment (SST)	$ 5.25	per square metre
Double Surface Treatment (DST)	$ 8.25	per square metre
Asphalt – Wear Course	$ 100.00	per tonne
Asphalt – Base Course	$ 100.00	per tonne
Topsoil & Sod	$ 12.00	per square metre
Topsoil & Seed	$ 7.50	per square metre

Typical types of reconstruction for hard surfaced roads (resurfacing, partial reconstruction and full depth reconstruction) are presented in Tables 4 and 5 on the following pages. Full depth reconstruction includes an allowance for geotechnical investigation, testing, engineering design and construction supervision. In some instances, the Township may also use an engineering consultant for resurfacing and/or partial reconstruction projects due to the complexity of the project or workload.

Table 4: Surface Treatment or Low Cost Bituminous (LCB) Rural Roads

CODE	DESCRIPTION	UNIT PRICE ($ per km)
LCB-R1	**Resurfacing** Single surface treatment 6.0m wide	$34,000
LCB-R2	**Partial Depth Reconstruction** Pulverize or scarify, 50-150mm G.A., double surface treatment, 10% spot drainage improvements, culvert replacement & 10% contingency	$139,000
LCB-R3	**Full Depth Reconstruction** Earth exc., 150mm G.A., 300mm G.B., DST, culvert replacement, engineering, geotechnical and 10% contingency	$464,000

Table 5: Asphalt or High Cost Bituminous (HCB) Rural Roads

CODE	DESCRIPTION	UNIT PRICE ($ per km)
HCB-R1	**Resurfacing** 40mm lift of HL3 asphalt by 6.0m and 10% contingency	$69,000
HCB-R2	**Partial Depth Reconstruction** Pulverize, 50-150mm G.A., 50mm lift of HL4 asphalt, shouldering, 10% spot drainage improvements, culvert replacement & 10% contingency	$166,000
HCB-R3	**Full Depth Reconstruction** Remove asphalt, earth exc., 150mm G.A., 450mm G.B., 50mm Lift of HL4 asphalt, shouldering, culvert replacement, engineering, geotechnical and 10% contingency	$512,000

2.0 DESIRED LEVEL OF SERVICE

This section identifies targets in order to achieve the desired level of service, and also identifies which targets are not currently being met.

2.1 ROADS AND BRIDGES

The desired levels of service for maintenance are based on Ontario Regulation 239/02, Minimum Maintenance Standards for Municipal Highways. The Regulations classifies roads from 1 to 6 based on the volume of traffic and the posted or statutory speed limit. The standards outline the minimum maintenance standards for the following activities:

1. Patrolling;
2. Plowing, salting, and/or applying abrasive materials to the roadway for snow accumulation;
3. Salting and/or applying abrasive materials to icy roads and ice formation prevention;
4. Pothole repairs;
5. Shoulder drop repairs;
6. Crack repairs;
7. Debris removal;
8. Maintaining illumination;
9. Maintaining traffic control signals;
10. Repairing bridge spalls;
11. Sign replacement and repairs; and
12. Road and sidewalk surface discontinuities.

The desired level of service for maintaining the road system is based on the optimum life cycle of the road structure, i.e. the reconstruction strategy presented in Table 20, Section 4.3. Over the life cycle for the surface type the average condition rating for each surface type is as follows:

Surface Type	Average Condition Rating
Gravel	6.00
Surface Treatment	6.45
Asphalt	7.17 – 7.52

The measure for the desired level of service for the road system will be based on the optimum average condition rating by surface type, which can be measured against the existing inventory of the road system.

The desired level of service for bridges and structural culverts is for at least seventy-two percent (72%) of structures to have a condition rating of at least "Good" to "Very Good", in which 72% is the 2017 Municipal Benchmarking Network of Canada's Performance statistic median. Similarly, per the 2017 Municipal Benchmarking Network of Canada's Performance statistics, the desired level of service for roads is to have at least fifty-one percent (51%) with a rating of good or very good.

2.2 VEHICLES AND EQUIPMENT

Upon use, a visual inspection report should be completed to assess the condition of the vehicle and/or equipment. This will be a daily exercise for vehicles and/or equipment that are used often and should be done periodically for seasonal vehicles and/or equipment.

3.0 STATE OF THE LOCAL INFRASTRUCTURE

This section summarizes (1) the asset types, (2) asset condition and (3) asset valuation. The asset types, conditions and replacement valuations have generally been assembled based on information provided in the applicable studies.

3.1 ROAD NETWORK

3.1.1 Asset Types

The Township has an approximate 40/60 split between gravel roads and hard surface roads. See Table 6 for the lengths of the various surface types; Gravel, Low Class Bituminous (LCB or surface treatment) and High Class Bituminous (HCB or asphalt).

Table 6: 2018 Road Inventory

SURFACE TYPE	LENGTH (km)	LENGTH (%)
GRAVEL	71.87	42
LCB	39.80	24
HCB	57.62	34
TOTAL	**169.29 km**	**100%**

3.1.2 Asset Condition Rating

The condition of each road has been categorized as "Very Poor", "Poor", "Fair", "Good" and "Excellent" based on the condition rating assigned for the road segment. See Table 7 for the rating system used to assess the condition.

Table 7: Condition Rating

VERY POOR	POOR	FAIR	GOOD	EXCELLENT
1-2	3-4	5-6	7-8	9-10

Table 8 provides a summary of the weighted average condition ratings for the Township, current as of 2018.

Table 8: Weighted Average Condition Rating

CATEGORY	2018
CONDITION RATING (OVERALL)	5.91
CONDITION RATING (HARD SURFACE ONLY)	6.19
CONDITION RATING (GRAVEL ONLY)	5.53

As is evident in Table 8, the Township's road condition network has a weighted average condition rating in the "Fair" category. The 2018 road condition assessments show only thirty-eight percent (38%) of the Township roads have a condition assessment of 7 or higher (i.e. good or very good). Given the desired levels of service for roads as described in previous Section 2.1, it is evident the Township's road network is operating below the desired level of service and appears to be generally underfunded.

3.1.3 Financial Accounting and Replacement Cost Valuation

The replacement value of the road infrastructure estimated at approximately $77 million in 2019 dollars. Appropriate construction inflation should be added each year when budgeting. Table 9 presents the replacement value. Appendix A shows the inventory for each road segment including the replacement value.

Table 9: Asset Replacement Cost ($1,000s)

SURFACE TYPE	RURAL
GRAVEL	$ 29,494
LCB	$ 18,467
HCB	$ 29,501
TOTAL	$ 77,462

3.2 BRIDGES AND LARGE CULVERTS

3.2.1 Asset Types & Condition Rating

The Ministry of Transportation of Ontario defines a structure as a bridge or culvert with a span of three metres or greater. The Township has two structures that meet this definition.

Table 10 summarized the general condition of each bridge and structural culvert, respectively, as taken from the 2019 OSIM Inspection Report prepared by McIntosh Perry. The overall bridge condition of Beckwith Township's bridges is "Good", and the overall condition rating of the large culverts is "Fair".

Table 10: Bridges Inventory

No.	Description	Condition
15-082	Jock River Bridge	Good
15-133	McGibbon Creek Bridge	Good