



Municipality of  
**Hastings Highlands**

**2016 Asset Management Plan  
Hastings Highlands**

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## Executive Summary

The Municipality of Hastings Highlands (the Municipality) is primarily a rural municipality, with the main urban/semi-urban hamlet of Maynooth. The Asset Management Plan (Plan) was prepared with the intent to maintain and improve the existing inventory of municipal infrastructure consisting of 486 km of roads, 13 bridges and 2 structural culverts, approximately 50 vehicles, other machinery and equipment, approximately 30 buildings or facilities, and 9 municipal solid waste landfill sites.

The estimated current (December 2016) Net Book Value of the Municipality's infrastructure, excluding the solid waste management sites is approximately \$ 21.6 M. Roads, Bridges, Buildings and Vehicles represent \$ 20.4 M of the total net book value as detailed in the table below. Road, Bridges, Buildings and Vehicles are captured under this asset management plan, as are the Municipality's Solid Waste Management Assets (landfills).

Asset	Net Book Value (PSAB 2015*)	Replacement Cost (2016)
	\$ M	\$ M
Roads	10.8	56.1
Bridges	2.5	10.3
Vehicles and equipment	1.9	8.8
Buildings, Facilities, & Lands	5.2	12.0
Solid Waste Management	0.0**	17
<b>TOTAL</b>		

\* Not listed in PSAB reporting

The Plan provides a detailed inventory of the assets, the current book value, an evaluation of the state of infrastructure and recommended improvements and the associated costs for sustaining and improving the existing infrastructure.

The intent of the Plan is to support the Municipality in maintaining prescribed standards for maintenance and repair and provide guidance for initiating and budgeting capital improvement activities. The standards are set out in Appendix B as the Levels of Service.

As detailed in the Plan, the annual requirement to maintain current capital assets and finance the amortization of current capital assets ranges from \$6.0 to 6.6 million, including reserve transfers and long-term debt repayment, over the period of the Plan (2017-2026).

The annual expenditures to maintain current capital assets ranges from \$4.6 to 5.5 million, excluding reserve transfers, long-term debt repayment, and funding of amortization, over the period of the Plan (2017-2026).

The Municipality's recent practice includes funding planned capital expenditures from Reserves. Reserve funds used for capital expenditures (covered under this Plan) have averaged \$ 449,271 per year, in the period 2014-2016. Transfers into Reserves over the same period have averaged \$ 399,166.

In light of the noted deficit between funding sources (Reserve contributions) and capital expenditure requirements, the Municipality intends to initiate a "Self-Funding Capital Program" derived from available tax levies, to fund a planned sustained investment toward its capital infrastructure needs. The Self-Funding Capital Program will assign 3% of the annual tax levy to capital expenditures throughout the duration of this Plan. The Municipality will also give consideration to a gradually increase in the annual taxation level with a goal of not to exceed **2%** per annum; however it is recognized that extenuating circumstances may require more significant tax increases.

The Municipality's capital assets will be maintained through a financial strategy that optimizes the application of local financial resources. The Plan targets to address current deficiencies with respect to roads and bridges based on priorities established through the roads management studies and Biennial structure inspections with a focus to extending the useful service life of the assets as opposed to a "worst first" replacement strategy. Other capital requirements will be funded on an as needed basis in order to meet the prescribed Levels of Service with due consideration for available source funding. The Municipality has employed debt financing to supplement municipal funds derived from property taxation and will continue to do so.

***This Asset Management Plan is recognized as a dynamic plan for consideration and implementation with the annual budgeting practices. The Plan has been endorsed by Municipality of Hastings Highlands council as a starting point for a holistic approach to asset management within the Hasting Highlands. As such, the Plan will be subject to revision as the Municipality begins to work within the Plan and identify specific challenges and/or opportunities for improvements. The Plan will receive a comprehensive review every four years, with each new term of council, however, it is anticipated that in the first two years of application the Plan may be subject to revision on an as required basis.***

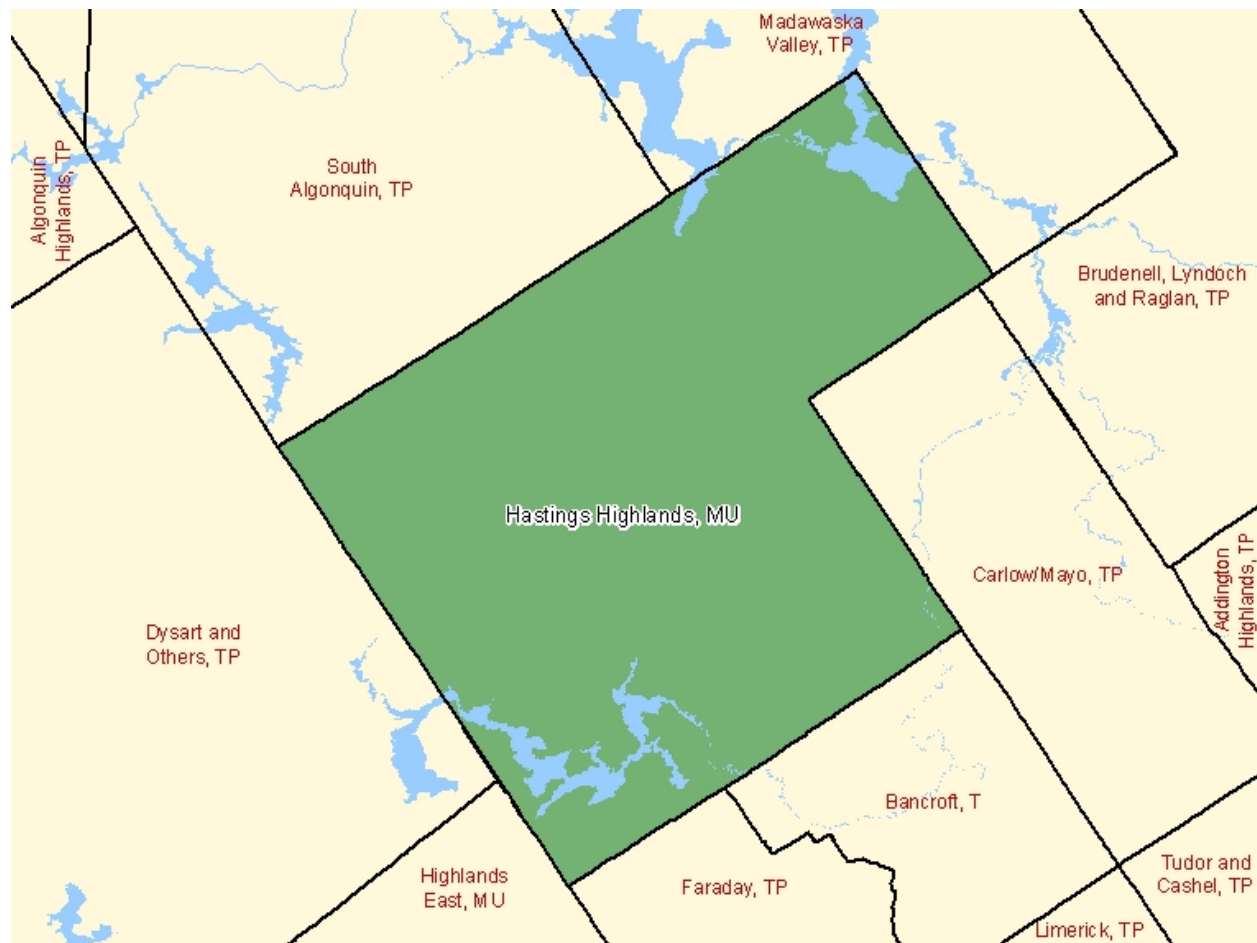
***Further, updates to the Plan shall be undertaken to incorporate updated infrastructure condition assessments and expenditure requirements.***

## 1.0 Introduction

### 1.1 Location

The Municipality of Hastings Highlands is located east of Algonquin Park and west of the City of Ottawa, in Hastings County. The Municipality is largely rural with several semiurban and urban settlement areas within the Municipality. A map showing the location of Hastings Highlands is located below.<sup>1</sup>

**Figure 1: Location of Hastings Highlands**



<sup>1</sup> Statistics Canada. 2012. GeoSearch. 2011 Census. Statistics Canada Catalogue no. 92-142-XWE. Ottawa, Ontario. Data updated November 27, 2015.  
<https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3512076&Data=Count&SearchText=Hastings%20Highlands&SearchType=Begins&SearchPR=01&A1=All&B1=All&GeoLevel=PR&GeoCode=3512076&TABID=1>  
(accessed 2016-06-28)

## 1.1 Population

The population of Hastings Highlands is relatively stable with no significant growth expected over the next census period (see **Table 1.2**). The population has in fact increased over the last 10-year period.

2011 Population	4,168
2006 Population	4,033
2001 Population	3992
2006-2011 Population Change (%)	3.3
2001-2006 Population Change (%)	1.0
2001-2011 Population Change (%)	4.4

## 1.2 Purpose of an Asset Management Plan

The quality of life residents enjoy is directly related to the condition of municipal infrastructure. All taxpayers and residents are in fact, shareholders of the assets that make up municipal infrastructure and therefore have an interest in how they are maintained. Asset management planning allows municipalities to inventory and assess the condition of their assets and plan for their long-term maintenance and replacement. The Province has mandated the preparation of asset management plans as a prerequisite to seeking provincial capital funding. This Plan will aid the Municipality in making appropriate financial decisions and investments as part of their annual municipal budget decisions. Financial planning will require municipalities to examine a full range of financing and revenue generation tools including user fees.

This Plan is to serve as a guidance document for the Municipality's use in developing its annual budgets and long-range financing requirements as well as in the development of tax levy rates, development charges and other related revenue generators. This Plan is not intended to replace normal budgeting procedures but rather to support budgeting decisions and assist in ensuring the long-term viability and financing of the Municipality's largest and most costly assets.

Well-maintained infrastructure is important to the growth and development of the Municipality as set out in the vision and policies of the Municipality's strategic plan.

Good roads and bridges facilitate the movement of goods, the provision of services, notably emergency services and the transportation of people to work, school, recreation and other facilities. Good roads and bridges are essential to attracting economic development in the transport of commodities to market or providing access to tourism and other amenities the Municipality has to offer.

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<sup>2</sup> Statistics Canada. 2012. *Hastings Highlands, Ontario (Code 3512076) and Hastings, Ontario (Code 3512) (table). Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012.*  
<http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E> (accessed December 6, 2016).

Sustainable solid waste management practices are essential to ensure the health of a municipalities residents, now and into the future. Effective waste management is critical to any municipality.

The state of local infrastructure also reflects on the image of the Municipality to its residents and visitors. Poorly maintained infrastructure conjures a negative image and may detract from investment in the Municipality as people question the value for money they receive in the poor quality services.

This Plan appropriately focuses on those assets of the Municipality that represent the greatest financial demand on the Municipality and its residents. The following asset categories are included in this Plan for Hastings Highlands:

- roads,
- bridges,
- vehicles, machinery and equipment,
- buildings and facilities, and
- solid waste sites (landfills).

The Plan for the Municipality is intended to cover the period 2017-2026. The document will be used as a working tool for capital expenditure decisions on an ongoing basis, particularly in the preparation of the municipal capital budget. The Plan identifies key expenditures that are anticipated in each year of the 10-year period of the Plan.

### **1.3 Evaluation of the Asset Management Plan**

As part of the Plan, Levels of Service have been developed for each of the asset groups identified in the Plan. The Levels of Service are considered the 'expectation' or 'target' for management of the various assets. The Levels of Service also provide a measuring stick for which the Municipality can assess the relative success of their management practices, financial investment and overall the suitability and outcomes of the Plan.

A comprehensive review of the Plan shall be undertaken every four years, as a minimum, or on an as required basis. Review of the Plan will include an update to the existing state of infrastructure inventory and condition through such activities as the regular OSIM reporting and Road Needs Studies, or other asset reviews as detailed in the Plan. The updated condition information will be used to both update the Plan's financial forecasts relative to capital expenditure needs as well as assess the assets' condition against the specified Levels of Service.

As an example, the average road network condition rating shall be calculated with each Road Needs Study. The calculated average condition rating will be compared against the Levels of Service expectations or 'target' value and an assessment made as to whether revisions to the Plan are required to meet the required Levels of Service.



Alternatively, adjustments to the Levels of Service may be contemplated where insufficient funding or alternate priorities exist. The Plan must remain flexible for the Municipality to respond to the changing needs of its constituents and the infrastructure itself.

Asset condition updates will be completed on the frequency as detailed in the Plan, e.g. Roads Needs Study every five years, OSIM inspections every two years, building reviews every 2 years, etc. Comparisons to Levels of Service and resulting revisions to the Plan will therefore not necessarily be undertaken for all assets, on the same cycle.

## 1.4 Approach

The development of the Asset Management Plan builds on the policies and practices of the Municipality such as:

- PSAB 3150 Inventory
- 2016 Road Needs Study
- 2016 Buildings, Lands, and Facilities Study
- 2016 Solid Waste Management Report
- 2015 OSIM Report
- previous solid waste studies,
- general financial policies of the municipality, and
- current practices and technologies used in management and maintenance of capital assets.

The steps used in developing this Asset Management Plan are summarized in **Figure 2** on the following page. The process was intended to be broad enough to capture the essential ingredients of asset management planning to ensure that the Municipality benefits from the experience of others, while developing a plan that is best suited to local needs.

Development of the Plan followed the framework provided by the Ministry of Infrastructure document, Building Together Guide for Municipal Asset Management Plans. Phase's 1a-1d are components of the State of Infrastructure Report; Phases 2a-2b comprises the Desired Level of Services; while Phases 3a-3c are the components of the Asset Management Strategy/Financing Strategy.



## Phase 1

**Phase 1** of the work program involved a review of the infrastructure and assets including but not limited to:

- Liaison with representatives of the Municipality.
- Classification of asset types (e.g. roads, bridges, etc.).
- Collection of asset information (from PSAB records, and various asset inventory reports) including:
  - asset age,
  - historical costs,
  - replacement cost, and
  - current condition.

## Phase 2

**Phase 2** of the work program focused on establishing the desired Levels of Service.

Specifically:

- A review of current performance standards and practices in the Municipality.
- Compliance or lack thereof with regulatory requirements.
- Establishing performance standards, targets and timeframes where they do not exist.
- Establishing the useful life in the context of a planning period. The overall planning period is ten (10) years, with the understanding that the plan will be updated every four years and reviewed annually.
- Provisions for monitoring.
- Review of the current financial strategies for maintenance and replacement of capital assets.
- Comparisons or take advantage of best practices used by other municipalities.
- Creating a desired Level of Service for each of the asset groups based on best management practices and comparative municipal practices in Ontario.

## Phase 3

**Phase 3** of the work program involved the design and establishment of a financial model for the Municipality that provided a financial strategy for Council to consider as part of the municipal budgeting process. The model indicates the cost implications for the maintenance and ongoing upgrades, improvements and/or replacement of assets over the planning period.

The output of the third phase was the preparation of an Asset Management Strategy replete with a corresponding financial strategy. The Strategy outlines the measures required to maintain, improve or add to the inventory (new assets) of infrastructure and where necessary, to examine options or trade-offs where municipal financial constraints may limit achieving the desired levels of service or performance targets. The associated financing strategy focuses on the following components:

- Yearly expenditure forecasts for capital planning that addresses maintenance, renewal or rehabilitation, replacement of assets as required, disposal, if required and the addition of new assets.
- Sources of financing.
- Alternative scenarios where appropriate and the correlation of funding (revenue) sources to capital expenditures.

To ensure the consistent evaluation of assets, the inventory assessments were completed in accordance with the most current editions of the Inventory Manual for Municipal Roads and the Ontario Structure Inspection Manual, in the case of roads and bridges. Solid Waste Management sites were reviewed against current regulations and best management practices. The Plan gives the Municipality an understanding of the current condition of the infrastructure assets; the current 'value' for accounting purposes and the rehabilitation requirements of these assets. In addition, an understanding of the period for rehabilitation with a priorities listing is provided.

The completed infrastructure assessments enables the Municipality to protect and prolong the useful life of its infrastructure, identify maintenance, repair and rehabilitation needs and provide a basis for a management system for the planning and funding of the necessary maintenance and rehabilitation of each system, in accordance with Ministry of Infrastructure (MOI) requirements.

## 2.0 State of Local Infrastructure

The following primary assets are included in this Plan:

- roads,
- bridges,
- vehicles, machinery, and equipment
- buildings and facilities, and
- solid waste sites.

A summary of the Municipality's primary assets are illustrated in below.

### Roads

- 52 km Paved
- 183 km Surface Treated
- 251 km Gravel / Earth



### Bridges

- 13 Bridges
- 2 Structural Culverts



### Buildings and Facilities

- Amenities
- Public Works
- Emergency Services
- Municipal Offices



### Vehicles, Machinery and Equipment

- 50 pieces including:
  - Public Works
  - Emergency Services
  - Recreation

### Solid Waste Site

- 9 Solid Waste Sites
  - 7 Active
  - 242,100 m<sup>3</sup> capacity



## 2.1 Roads

The Municipality employed Wills to complete a 2016 Road Needs Study as part of the overall 2016 Asset Manage Plan. The Municipality's complete road infrastructure system spans a total of approximately 486 km primarily within a rural setting. The road network includes surfaces ranging from gravel to high class bituminous (HCB) (asphalt). The Municipality has approximately 5 km of earth roads, 246 km of gravel roads, 183 km of surface treated roads (low class bituminous (LCB)), and 52 km of asphalt paved roads (HCB), as summarized in **Table 2.1** below.

**Table 2.1: Road System Summary**

Road Type	Length*	Current Replacement Value (2016)**	Net Book Value (PSAB 2015) ***	Average Asset Age / Useful Service Life (Years)****
Earth	5 km	0.0	0.0	-
Gravel (Loose Top Gravel)	246 km	\$ 21.2 M	\$ 3.9 M	27/40
Low Class Bituminous (LCB)	183 km	\$ 22.5 M	\$ 6.9 M	9/15
Hot Mix (HCB)	52 km	\$ 12.4 M		
<b>Total</b>	<b>486</b>	<b>\$ 56.1 M</b>	<b>\$ 10.8 M</b>	

\* From 2016 Road Needs Study

\*\* Calculated based on MTO Road Design Standard for applicable road classification and represents new sub-base, base and surface.

\*\*\* Inflated to 2016 \$

\*\*\*\*Estimated using the structural adequacy from the 2016 Road Needs Report (Structural Adequacy / 20 x amortization period)

An overall road system adequacy, in accordance with the MTO Inventory Manual for Municipal Roads, 1991, has been calculated based on a number of road characteristics including:

- Capacity
- Geometrics
- Surface Condition
- Shoulder and Road Widths
- Structural Adequacy
- Drainage
- Maintenance Demand

The evaluation of the roads is set out in the Road Needs Study.

**The overall system adequacy for the 2016 Road Needs Assessment is 82%.** Stated another way, only 18% of the Municipality's roads are considered deficient in their

current state. Work on the Municipality's road system should focus primarily on preventative maintenance and planned replacement.

## 2.2 Bridges

The Municipality has fifteen (15) bridges and structural culverts in its network. The Bridges have a PSAB 2015 net book value of \$2.5 million. As per 2015 OSIM report methodology, the replacement cost for the entire bridge network is \$ 11.3 million. Currently three (3) bridges have load limits.

**Table 2.2A: Bridge Inventory Summary**

Structure	Structure Type	Year Built	Age	Age / Useful Service Life	Net Book Value (PSAB)	Estimated Replacement Cost	Estimated Year of Replacement
Boulter Road Bridge	Concrete T-Beam w/ Concrete Deck	1940	76	76/50	\$0 (not listed)	\$1,030,994	2000
Cassidy Creek Bridge	Cast-in-Place Concrete Box Culvert	unknown	unknown	NA/50	\$0 (not listed)	\$986,388	unknown
Filip Road Bridge	Modular Steel Bridge (Lessard)	1950	66	66/50	\$28,149	\$265,016	2010
Frantz Road Bridge	Precast Concrete Arch	1993	23	23/50	\$0 (not listed)	\$656,918	2053
Grant Road Bridge	Steel Beams w/ Laminated Timber Deck	unknown	unknown	NA/50	\$0 (not listed)	\$245,178	unknown
High Falls Trail Culvert	Open Footing SPCSPA	unknown	unknown	NA/30	\$0 (not listed)	\$540,290	unknown
Little Papineau Creek Bridge	Glulam Timber Beams w/ Laminated Timber Deck	unknown	unknown	NA/50	\$0 (not listed)	\$768,722	unknown
Mink Lake Road Bridge	Steel Girder, Steel Pan Deck and Timber Wearing Surface	2012	4	4/75	\$469,034	\$114,055	2072
Musclow-Greenvew Road Bridge	Concrete T-Beam w/ Concrete Deck	1930	86	86/50	\$0 (not listed)	\$398,948	1990
Papineau Creek Bridge	Concrete Arch Bridge	unknown	unknown	NA/50	\$0 (not listed)	\$1,286,505	unknown
Papineau Lake Road Bridge	Steel Beam w/ Concrete Deck	1956	60	60/50	\$0 (not listed)	\$374,175	2016
Parks Road Bridge	Concrete T-Beam w/ Concrete Deck	unknown	unknown	NA/50	\$0 (not listed)	\$346,044	unknown
Siberia Road Bridge	Steel Girder, w/ Concrete Deck	2009	7	7/75	\$1,852,326	\$1,726,713	2069
Soble Road Bridge	Steel Beams w/ Laminated Timber Deck	2008	8	8/75	\$114,427	\$463,549	2038
York River Bridge	Precast Box Beam w/ Concrete Deck	1971	45	45/50	\$0	\$2,052,322	2031

The average known age of the Municipality's Bridges is 42 years, however, the age was often not known and likely older than average.



The estimated service life for each bridge varies depending on bridge type and age, with culverts having a much lower expected life than a bridge. Bridges designed and constructed prior to 2000 are anticipated to be designed to a 50-year design life in accordance with the Ontario Highway Bridge Design Code. Newer structures, designed in accordance with the Canadian Highway Bridge Design Code would have a 75-year design life assigned to them.

### 2.3 Vehicles, Machinery and Equipment

The Municipality owns a fleet of vehicles as well as machinery and equipment generally dedicated to public works, recreation and emergency services functions. A listing of these assets are included below along with the reported 2015 PSAB values and amortization rates.

**Table 2.3: Vehicles Inventory**

Vehicle/Equipment (Garage)	In Service Year	Original Cost	Years in Use (Age)	Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value (NBV 2015)**
<b>Fire Department</b>							
2010 Ford 4x4 Truck (Herschel South)	2010	\$30,564	6	10	\$34,420	2020	\$9,325
2005 GMC Van (Herschel South)	2005	\$38,375	11	10	\$47,714	-	\$0
1990 Ford F800 Pumper (Herschel South)	1990	\$160,000	26	10	\$267,747	-	\$0
1990 Ford Tanker (Herschel South)	1990	\$85,000	26	10	\$142,241	-	\$0
1990 International Tanker (Herschel South)	1990	\$85,000	26	10	\$142,241	-	\$0
1975 GMC Pumper (Herschel North)	1975	\$85,000	41	10	\$191,437	-	\$0
1983 International Tanker (Herschel North)	1983	\$85,000	33	10	\$163,390	-	\$0
2008 Ford Van (Bangor)	2008		8				NA
1980 International Fire Truck (Monteagle)	1980	\$160,000	36	10	\$326,382	-	\$0
<b>2002 Chevrolet Equipment Van (Maynooth)</b>	<b>2002</b>		<b>14</b>		<b>\$34,285</b>		<b>NA</b>
1983 International Tanker (Lake St. Peter)	1983	\$160,000	33	10	\$307,557	-	\$0



Vehicle/Equipment (Garage)	In Service Year	Original Cost	Years in Use (Age)	Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value (NBV 2015)**
<b>1978 Ford Pumper/Tanker (Bangor)</b>	<b>1978</b>		<b>38</b>				<b>NA</b>
2002 GMC C8500 Pumper (Maynooth)	2002	\$342,577	14	10	\$452,024	-	\$0
<b>1995 Ford LN-8000 Tanker (Maynooth)</b>	<b>1995</b>		<b>21</b>		<b>\$70,888</b>		<b>NA</b>
<b>1995 Ford LN-8000 Tanker (Monteagle)</b>	<b>1995</b>		<b>21</b>		<b>\$70,888</b>		<b>NA</b>
2002 GMC Van (Monteagle)	2002	\$39,349	14	10	\$51,920	-	\$0
1980 GMC Pumper (Monteagle)	1980	\$160,000	36	10	\$326,382	-	\$0
<b>1991 Ford Pumper (Lake St. Peter)</b>	<b>1991</b>		<b>25</b>	<b>10</b>	<b>\$0</b>		<b>NA</b>
1988 Ford Van (Lake St. Peter)	1988	\$38,800	28	10	\$67,552	-	\$0
<b>1999 Polaris ATV (Herschel South)</b>	<b>1999</b>		<b>17</b>				<b>NA</b>
<b>1999 Trailer (Herschel South)</b>	<b>1999</b>		<b>17</b>				<b>NA</b>
<b>1992 Polaris ATV (Maynooth)</b>	<b>1992</b>		<b>24</b>				<b>NA</b>
<b>1988 International Dump</b>	<b>1988</b>		<b>28</b>				<b>NA</b>
2015 Fire Pumper	2015	\$225,195	1	10	\$229,699		\$206,121
2011 Air Compressor	2011	\$21,926	5	10	\$24,208		\$11,149
2014 Bunker Suits	2014	\$26,974	2	10	\$28,064		\$21,946
<b>Public Works</b>							
2000 International Dump 20S	2000	\$175,000	16	10	\$240,237	-	\$0
2000 Sterling Tandem Dump	2007	\$175,000	9	10	\$209,141	2017	\$0
2006 International Tandem 7600	2005	\$192,298	11	10	\$239,099	-	\$0
2006 International 70S	2006	\$190,480	10	10	\$232,194	2016	\$0
2007 International 70S	2007	\$193,972	9	10	\$231,815	2017	\$19,727
2008 International	2009	\$191,727	7	10	\$220,234	2019	\$38,997
2010 International 70S	2010	\$203,147	6	10	\$228,777	2020	\$78,776
2011 International 70S	2010	\$203,147	6	10	\$228,777	2020	\$78,776
2012 International 70S	2011	\$173,284	5	10	\$191,319	2021	\$88,115

Vehicle/Equipment (Garage)	In Service Year	Original Cost	Years in Use (Age)	Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value (NBV 2015)**
2012 International – Single Axel	2011	\$168,559	5	10	\$186,103	2021	\$85,712
2013 International 70S	2012	\$191,942	4	10	\$207,764	2022	\$117,123
2013 International 7600SBA	2013	\$202,785	3	10	\$215,197	2023	\$144,363
2015 International 7600SBA	2015	\$201,336	1	10	\$205,363	2025	\$163,807
2009 Chevrolet Silverado 2500	2010	\$41,650	6	5	\$46,904	-	\$0
2009 GMC 2500	2010	\$41,650	6	5	\$46,904	-	\$0
2010 Ford/with plow	2010	\$41,650	6	5	\$46,904	-	\$0
2010 Ford/with plow	2010	\$41,650	6	5	\$46,904	-	\$0
2010 Ford SRW	2010	\$41,650	6	5	\$46,904	-	\$0
2014 Dodge 4 WD	2014	\$26,721	2	10	\$27,800	2024	\$19,022
2014 Dodge 4 WD	2014	\$26,721	2	10	\$27,800	2024	\$19,022
2014 Dodge 4 WD	2014	\$26,721	2	10	\$27,800	2024	\$19,022
<b>2012 Float Trailer</b>	<b>2012</b>		<b>4</b>				<b>\$0</b>
2015 John Deere 544 K Loader	2015	\$172,788	1	10	\$176,244	2025	\$158,153
2015 John Deere Sweepster	2015	\$26,142	1	10	\$26,665	2025	\$23,928
1985 Grader (205)	1985	\$130,300	31	20	\$240,741	-	\$0
1989 Loader (303)	1989	\$117,442	27	20	\$200,460	-	\$0
1990 Grader (304)	1990	\$168,620	26	20	\$282,172	-	\$0
1990 Backhoe (306)	1990	\$70,260	26	20	\$117,574	-	\$0
1991 Grader (402)	1991	\$175,656	25	20	\$288,182	-	\$0
1993 Loader (407)	1993	\$131,300	23	20	\$207,047	-	\$0
1999 Loader (206)	1999	\$143,600	17	20	\$201,075	2019	\$29,208
2007 Grader (311)	2007	\$225,674	9	20	\$269,701	2027	\$126,230
2010 Loader	2010	\$159,662	6	20	\$179,805	2030	\$121,782
2012 excavator	2012	\$239,637	4	20	\$259,390	2032	\$194,968
<b>Waste Management</b>							
BOMAG	2006	\$51,243	10	10	\$62,465	2016	\$0
Dozer 2012	2012	\$61,056	4	20	\$66,089	2032	\$49,675
Trailer 2012	2012	\$33,283	4	20	\$36,026	2032	\$27,079
Recycling Bins 2014	2012	\$48,183	4	20	\$52,155	2032	\$44,102

**These Items are listed under the insurance information for Hasting Highlands, but not the PSAB Records**

\*Where in service year not known, model year is substituted

\*\*Net Book Value based 2015 PSAB reports inflated to 2016 \$.

The Net Book Value of the Municipality's vehicles and equipment is approximately \$ 1.9 M as per 20515 PSAB reporting.

A detailed review of each vehicle was not undertaken as part of the state of local infrastructure review. For the purpose of this Plan, generally accepted accounting principles, with respect to depreciation of equipment, has been used to assign amortization periods. It is noted that some vehicles experience relatively infrequent use and as such their actual service life is expected to exceed the expected useful life (amortization).

Vehicles shall be evaluated annually to assess the residual lifespan of the vehicle and compare to the expected useful life. Results of the evaluation shall be used to update the Plan as part of the regular Plan review. A significant portion of the municipalities vehicles/equipment have already surpassed their expected useful life or will during the Plan period, 2017 – 2026. In other words, the Municipality's fleet is aging and may require significant replacements in the next five years.

## **2.4 Buildings**

The Municipality owns several buildings used for the purposes of public works, recreational, and emergency services functions. A listing of the buildings is included below along with the reported 2016 PSAB values and amortization rates.

A visual assessment of all municipal buildings was undertaken in support of development of the Plan. The primary purpose of the assessment was to confirm the previously stated replacement values based on type of building and construction material.

A secondary goal of the visual inspection was to confirm any immediate (within the next 10 years) major capital improvements necessary e.g. new roof, foundation repairs, etc. Building equipment i.e. HVAC, and interior finishes/fixtures were not considered as part of the review.

An estimate of building values was provided by the Municipality's insurance company, as part of their annual premium assessment, for the period ending January 1, 2016. 2015 insurance replacement were provided by the Municipality, for the purposes of this report the values have been adjusted to account for inflation.

A summary of the Municipality's buildings inventory is provided in Table 2.4 below.

**Table 2.4: Buildings and Facilities Inventory/Needs Summary**

<b>Building (Location)</b>	<b>Replacement Value (2016)</b>	<b>Needs \$ 0-5 Year</b>	<b>Needs \$ 5-10 Year</b>	<b>Amoritization Rate</b>	<b>Actual Cost of Amoritization</b>	<b>Net Book Value (2016)</b>
Bangor Community Centre (786 Centreview Rd., Combermere, ON K0J 1L0)	\$397,100	\$7,000	\$40,000	40	\$9,928	\$0
Lake St. Peter Community Centre (5 Boulter Lake Rd., Lake St. Peter, ON K0L 2K0)	\$336,300	\$120,000	\$40,000	40	\$8,408	\$0
Rink Change House - Herchel (160 South Baptiste Rd., Bancroft, ON K0L 1C0)	\$400,000	\$400,000	\$25,000	40	\$10,000	\$133,600
Maynooth Community Centre, (33090 Highway 62 North, Maynooth, ON K0L 2S0)	\$545,700	\$200,000	\$80,000	40	\$13,643	\$0
Musclow Community Centre (10 McCormick Rd., Harcourt, ON K0L 2S0)	\$227,400	\$300,000	\$30,000	40	\$5,685	\$0
Fire Hall, Lake St. Peter (2356 Highway 127, Lake St. Peter, ON K0L 2K0)	\$156,300	\$250,000	\$30,000	40	\$3,908	\$7,000
Fire Hall, Bangor Twp (785 Centreview Rd., Combermere, ON K0J 1L0)	\$307,100	\$5,000	\$1,000	40	\$7,678	\$119,700
Fire Hall, North Baptiste Road (9 Paradise Landing, North Baptiste Lake Rd., Maynooth, ON K0L 2S0)	\$119,100	\$10,000	\$2,000	40	\$2,978	\$6,300
Fire Hall, South Baptiste Road (573 South Baptiste Lake Rd., Bancroft, ON, K0L 1C0)	\$252,400	\$500	\$2,000	40	\$6,310	\$16,000
Fire Hall, Maynooth (41 Old Hastings Rd., Maynooth, ON K0L 2S0)	\$268,500	\$500	\$2,000	40	\$6,713	\$30,500
Fire Hall, Part Lot 10, Monteagle Valley (3205 Musclow- Greenview Rd., Bancroft, ON., K0L 1C0)	\$269,300	\$750	\$2,000	40	\$6,733	\$10,900

Building (Location)	Replacement Value (2016)	Needs \$ 0-5 Year	Needs \$ 5-10 Year	Amoritzation Rate	Actual Cost of Amoritzation	Net Book Value (2016)
Municipal Offices/Council Chambers/Library (33011 Highway 62 North, Maynooth, ON K0L 2S0)	\$5,060,084	\$8,000	\$5,000	40	\$126,502	\$3,648,400
Community Centre - Herschel (168 South Baptiste Lake Rd., Bancroft, ON K0L 1C0)	\$353,700	\$200,000	\$2,000	40	\$8,843	\$0
Rink Change House/Boards, Purdy Hamlet (Centreview Rd. Combermere, ON K0J 1L0)	\$0	\$125,000	\$2,000	40	\$0	\$0
Ball Diamond Bleachers, Herschel (168 South Baptiste Lake Rd., Bancroft, ON K0L 1C0)	\$15,000	\$7,000	\$500	40	\$375	\$0
New Building - Kitchen, Change Area, washrooms, storage area (168 South Baptiste Lake Rd., Bancroft, ON K0L 1C0)	\$252,200	\$75,000	\$5,000	40	\$6,305	\$83,400
Equipment Depot, E/S Highway 62, Maple Leaf (35523 Highway 62, Combermere, ON K0J 1L0)	\$640,400	\$2,000	\$2,000	40	\$16,010	\$0
Equipment Storage Shed - Bangor (35523 Highway 62, Combermere, ON K0J 1L0)	\$283,000	\$2,000	\$1,000	40	\$7,075	\$0
Equipment Depot/Herschel (334 Y-Road, Bancroft, ON K0L 1C0)	\$732,300	\$100,000	\$2,000	40	\$18,308	\$20,100
Equipment Depot/Office, Monteagle Hamlet (3187 Musclow- Greenview Rd., Bancroft, ON K0L 1C0)	\$680,400	\$2,000	\$2,000	40	\$17,010	\$0
Sand Dome 35523 Hwy 62 (35523 Highway 62, Combermere, ON K0J 1L0)	\$336,400	\$1,000	\$1,000	40	\$8,410	\$428,000
Sand Dome Herschel (334 Y-Road, Bancroft, ON K0L 1C0)	\$163,400	\$1,000	\$1,000	40	\$4,085	\$321,000

Building (Location)	Replacement Value (2016)	Needs \$ 0-5 Year	Needs \$ 5-10 Year	Amoritization Rate	Actual Cost of Amoritization	Net Book Value (2016)
Sand Dome & Furnace 3187 Musclow (3187 Musclow-Greenview Rd., Bancroft, ON K0L 1C0)	\$224,000	\$1,000	\$1,000	40	\$5,600	\$334,400
Graphite Tower						\$22,300
<b>Total</b>	<b>\$12,020,084</b>	<b>\$1,817,750</b>	<b>\$278,500</b>	<b>-</b>	<b>\$300,502</b>	<b>\$5,159,300</b>

In general, the Municipality's building are in fair condition with some major capital requirements envisioned over the next 5 years. The anticipated major capital requirements are;

- Lake St. Peter Community Centre has been assigned a \$120,000 expenditure to repair / replace damaged roof shingles, and to upgrade inadequate accessibility throughout the building.
- Rink Change House - Herschel has been assigned a \$400,000 expenditure to replace the building.
- Maynooth Community Centre has been assigned a \$200,000 expenditure to repair / replace damaged roof, and to upgrade inadequate accessibility throughout the building.
- Musclow Community Centre has been assigned a \$300,000 expenditure to replace the building.
- Lake St. Peter Fire Hall has been assigned a \$250,000 expenditure to replace the building.
- Herschel Community Centre has been assigned a \$200,000 expenditure for major reconstruction to upgrade inadequate accessibility throughout the building.
- Purdy Rink Change House has been assigned a \$125,000 expenditure to replace the building.
- Herschel Equipment Depot has been assigned a \$100,000 expenditure to repair / replace damaged standing seam metal roof.

The estimated replacement values as reported for PSAB are compared to the 2015 Insurance evaluations of replacement value. It is recommended that the Municipality adopt the insurance valuations as replacement values as these represent a higher (more detailed) level of estimation and should better reflect the true replacement costs.

The condition of the Municipality's buildings shall be reviewed and documented at least once every two years (biennial) to identify the need for repairs or upgrades. An inspection of the structural integrity of the buildings shall be undertaken by a qualified person every 10 years or as otherwise deemed necessary based on biennial inspection.

Results of the inspections shall be used to update the Plan as part of the regular Plan review.

## 2.5 Solid Waste Sites

The Municipality currently operates nine (9) solid waste landfills. Visual assessments and site surveys for each site were undertaken to support the development of the Plan. The primary purpose of the assessments was to:

- Review current designs and operations
- Complete topographic surveys to determine remaining capacities and life spans.
- Assess environmental and operational compliance of each site.
- Propose recommendations for site utilization and development.

A summary of the Municipality's landfill inventory is provided in Table 2.5 below.

**Table 2.5: Solid Waste Site Summary**

Site	Total Capacity (m <sup>3</sup> )	Existing Waste (m <sup>3</sup> )	Annual Usage (m <sup>3</sup> )	Remaining Capacity (m <sup>3</sup> )	Lifespan (years)	Annual Operating Costs	Closure Date	Closure Cost	Annual Post Closure Costs
East Lake	92,000	33,804	750	58,196	77	\$74,956	2092	\$620,000	\$8,000
Hickey Road*	100,000	32,335	1,550	67,665	42	\$74,956	2057	\$320,000	\$8,000
Lake St Peter	56,285	36,285	320	20,000	62	\$74,956	2077	\$430,000	\$8,000
Musclow Greenview	28,500	N/A	315	27,250	34	\$74,956	2049	\$270,000	\$8,000
North Baptiste	12,040	12,040	N/A	0	0	\$74,956	2017	\$220,000	\$8,000
Papineau Lake	N/A	N/A	580	7,600	10	\$74,956	2025	\$250,000	\$8,000
Sand Bay	22,000	22,000	N/A	-	-	\$74,956	2017	\$180,000	\$8,000
South Baptiste	82,785	28,175	1,135	54,610	59	\$74,956	2074	\$550,000	\$8,000
Wolfe Creek	8,000	1,220	160	6,780	50	\$74,956	2065	\$50,000	\$8,000

### 3.0 Levels of Service

The Municipality of Hastings Highlands has adopted Levels of Service standards as part of the development of the Plan. The Levels of Service standards build from the Minimum Maintenance Standards for Municipal Highways, Ontario Reg. 239/02 and various applicable solid waste site legislation and will guide the program for the maintenance of roads, bridges, buildings, vehicles and solid waste management infrastructure and related facilities in the Municipality. Appendix B sets out the Municipality's Levels of Service with the intent of addressing all of the infrastructure classes in this Plan.

The Levels of Service provides a comprehensive approach to the maintenance of municipal infrastructure by setting out the objectives (or expectations) to be achieved and level of service standards for each class of infrastructure (e.g. roads, vehicles, buildings, and solid waste). An overall Level of Service Target has been assigned for each asset group. The Target will be used as the measure to assess how the Municipality is doing in meeting the Plan with respect to each of the primary asset groups.

Levels of service provide a measuring stick to ensure that municipal infrastructure is maintained to a standard that protects the municipal investment and sustains or prolongs the life of roads, buildings, vehicles and other infrastructure. By establishing a level of service, the Municipality will be able to identify the condition of all infrastructure on an ongoing basis and undertake measures to repair, upgrade or better all municipal assets over their lifespan. The intent of establishing levels of service is also to ensure that regulatory requirements are met, notably, the minimum maintenance standards for municipal highways (Ontario Regulation 239/02) and relevant Solid Waste Laws such as Environmental Protection Act.

The levels of service set out a written series of procedures that will guide Council in making financial decisions designed to maintain all of the Municipality's capital assets to the level appropriate for the Municipality given its relative priorities and minimum legislated requirements. The service level standards will ensure the delivery of a quality level of services and an appropriate measure of accountability to municipal taxpayers.

The levels of service are organized by the type of asset or infrastructure and a series of objectives to be achieved through adherence to specific standards or levels of service. In a rural Municipality, the most significant assets are typically roads and bridges as they are crucial to the conveyance of people and goods and services. Council has taken measures to improve the condition of the road network through better ditching, brushing, graveling and grading; however, careful capital programming will be required to sustain the road system over the coming years. Performance targets require the Municipality to maintain capital assets by undertaking repairs immediately or on an as needed basis where required and by ditching, brushing and resurfacing roads on a



regular cycle. Council intends to provide adequate funding of road and bridge improvements to maintain these facilities. Similarly, Council intends to fund their solid waste management assets to ensure compliance with all related legislative requirements and maintain the existing service to the community.

The Level of Service document is attached as Appendix B to this Asset Management Plan and has been prepared as a standalone supplement in a convenient booklet form that can be used by a department head.

The following summarizes the Target Levels of Service for each of the Municipality's primary Assets:

**Roads – Minimum Overall System Adequacy Rating of 82%.**

The Municipality's goal is to maintain, as a minimum, an overall system adequacy rating of 82%. Road Condition ratings are assigned in accordance with the MTO Inventory Condition Manual, 1991.

**Bridges – No Additional Load Limited Bridges**

The Municipality currently has 3 load limited bridges in its network. With timely bridge maintenance and rehabilitation, no additional load limits should be required.

**Vehicles, Machinery, and Equipment – Utilization Meets or Exceeds Expected Service Life**

Vehicles shall be maintained and operated to ensure they are available for use up to and beyond their expected service life. In other words, vehicles will be utilized over their related amortization period, as a minimum.

**Buildings – Building Use Exceeds Expected Service Life**

Building maintenance and upgrades shall be undertaken to ensure, as a minimum, the expected useful service life of the building is realized, with the goal of using the building beyond its useful service life.

**Solid Waste Infrastructure - Meet All Applicable Regulations**

Waste Disposal Site investments shall be as required to ensure long-term sustainability (available capacity) of the assets and ensure compliance with the Environmental Protection Act and other applicable legislation.

### **3.1 Issues and External Trends Affecting Levels of Service**

Various potential and real external trends will put pressure on the Municipality in meeting their desired Levels of Service. The following external trends are noted as potentially influencing future decision making with regard to infrastructure investments and Levels of Service. These shall be considered as the Plan is further developed.

**Accessibility Standards:** Existing and future requirements with respect to accessibility standards may require upgrades to buildings and facilities which are not currently anticipated under the Plan.

**Limited Population Growth:** The limited growth in development and population of the Municipality makes it difficult to increase the tax base over time.

**Recreational Development:** Increased demand and related assessment value for waterfront vacation property within the Municipality could have a positive influence on the overall municipal assessment (tax base). However, with increased recreational demands come an increased demand on maintenance of infrastructure and potentially providing new/upgraded infrastructure.

Also, an increased municipal assessment puts a financial pressure on existing residents as their tax bills continue to rise in the absence of a tax rate increase.

**Highway Download:** Provincial Highways 62 and 127 run through the Municipality. Hastings Road 62, formerly Highway 62 from Maynooth to the Municipality's eastern border. The Highway was previously downloaded to the Municipality and represents a significant portion of Hastings Highlands Road Needs. As of 2016, there is no committed county, provincial, or federal funding available to support municipalities with these specific downloaded highways. This puts an increased financial pressure on the Municipality's Plan.

As detailed in the Road Needs Study, Former Highway 62, now Hastings Highlands Road 62 (H.H. Road 62), represents a significant portion of the Municipality's projected capital needs over the next ten years (\$7.7 Million of \$18.9 Million, or over 40% of the capital road expenditure). Given the traffic demand on H.H. Road 62, and its current poor condition, it has been identified as a priority for rehabilitation. H.H. Road 62 is arguably the most important transportation link through the Municipality and easily demands the most of the Municipality's limited funds. H.H. Road 62 has been identified as a priority asset for the Municipality and similarly has been identified as one of the top priorities with the current 2016 Road Needs Study update.

**Regulatory Requirements:** The Municipality's Level of Service for its solid waste infrastructure is directly related to meeting applicable regulatory requirements. As regulatory requirements are subject to change, so too are the Municipality's Levels of Service for this asset. The costs associated with such changes to regulatory requirements would impose financial pressure on this Plan, both positively or negatively, as the case may be.

### 3.2 Current Performance

A summary of the Municipality's current performance against the previously noted Levels of Service Targets is included below:

#### **Roads – Minimum Overall System Adequacy Rating of 82%.**

As of 2016 the Municipality's overall road system adequacy rating is 82%. Road Condition ratings are assigned in accordance with the MTO Inventory Condition Manual, 1991.

#### **Vehicles – Utilization Meets or Exceeds Expected Service Life**

The Municipality currently has eighteen (18) vehicles which have exceeded their expected useful life. Several of these vehicles have long surpassed their expected lives, and are suspected to be used only infrequently. Replacement of these vehicles may not be a priority.

An additional five (5) vehicles will reach their expected useful life over the period covered by this Plan, 2016 – 2027.

Assessment and revision of the expected service life, or modified use or maintenance activities, are required to ensure the expected service life is realized and appropriately accounted for in the Plan. This should be considered early in the life of this Plan.

#### **Buildings – Building Use Exceeds Its Expected Service Life**

The Municipality of Hastings Highlands's building infrastructure is currently in fair condition overall. Eight (8) of the Township's buildings have reached their theoretical expected life (amortization).

#### **Solid Waste - Meet All Applicable Regulations**

The Municipality should continue to engage the Ministry of Environment and Climate Change for several pending approvals. One site, Lake St Peter, may require property acquisition.

The Municipality has a projected capacity of 76 years based on current demand, and is not anticipated to require investment in capacity over the Plan horizon.

## 4.0 Asset Management Strategy (Best Management Practices)

The asset management strategy is a series of planned actions designed to sustain the prescribed levels of service of the Municipality. The strategy takes into consideration the lifecycle costs of each asset with the intent to ensure that capital funds are available to replace the asset by the end of its lifespan. The strategy also provides measures to increase the lifespan of the asset and to maintain the value of the asset through its lifespan. Best management practices such as a “preservation management approach” for roads form part of the strategy.

### 4.1 Roads

#### 4.1.1 Roads Best Management Practices

The key to managing a pavement network is the timing of maintenance and rehabilitation activities. This idea evolves from the fact that a pavement’s structural integrity does not fall constantly with time. A pavement generally provides a constant, acceptable condition for the first part of its service life and then begins to deteriorate very rapidly. In many cases, maintenance and rehabilitation measures are not taken until structural failure or noticeable changes in ride quality become apparent. This is the “fix it once it is already broken” approach.

The unfortunate consequence of this decision is that maintenance and rehabilitation becomes exponentially more expensive over the life of the pavement and is often overlooked until the pavement condition reaches a severe state of distress. There is opportunity for substantial cost savings when intervention is made *before* the pavement becomes severely compromised; i.e. “fix it before it breaks”. **Figure 4** illustrates the underlying principle in support of a preservation management approach to pavement infrastructure. The principle also has application to each of the classes of roads maintained by the Municipality. Significant cost savings will result from proactive intervention rather than simply waiting as long as possible before performing maintenance. The Municipality of Hastings Highlands, consequently will adopt a preservation management approach as a key component to the asset management plan for each class of road described as follows.

Examples of approaches to road maintenance with their associated cost implications over the lifecycle of a road are set out in Appendix C to this report and are provided as an illustration of the benefit of a “preservation management approach”.

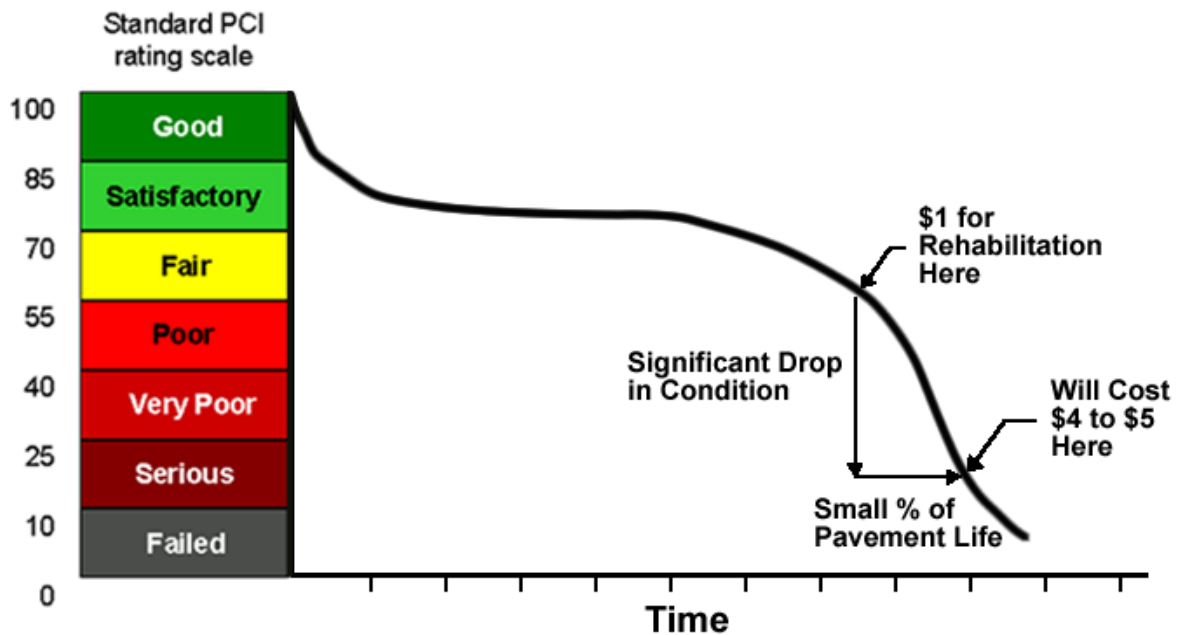


Figure 4. Typical Service Life of an Asphalt Pavement

#### 4.1.2 Preservation Management Approach

##### A. Gravel Roads

Gravel roads are the most significant and visible asset in the Municipality. The proposed preservation management approach for this class of road is outlined in the following Tables.

Table 4.1.2 A-Preservation Management Approach- Gravel Surface

Action	Frequency
Regrade surfaces to maintain smooth/safe driving surface and proper crossfall.	As needed. Generally 2-3 times per year for higher volume gravel; 1-2 for lower volume.
Add calcium to tighten surface, retain aggregate and reduce dust	Each spring on all roads or higher volume and as needed during summer months
Ditching and brushing of right-of-ways to improve roadbed drainage and safety	Complete road network every 10 years.

**Table 4.1.2 B - Capital Activities – Gravel Roads**

Action	Frequency
Add layer (75mm) of granular material to road surface	Every 5 years for gravel roads
Base and sub-base improvements	As needed or as dictated by traffic volumes
Reconstruct/convert to hard top	As dictated by traffic volumes

### B. Surface Treated Roads

Surface treated roads have a hard wearing surface that must be preserved in order to be effective. Unlike gravel roads, a significant investment has been made in the surface and consequently these roads must be managed properly to obtain the longest possible service life from the surface. The Municipality will employ the following preservation management strategy for surface treated roads.

**Table 4.1.2 C – Preservation Management Approach – Surface Treated Roads**

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Slurry seal	3	8	4
Slurry seal	6	7	3
Double surface treatment	10	6	5
Pulverize and DST	14	<4	8

In addition to the above noted preservation approach, the following best management practices will be employed to preserve the surface, extend the service life and reduce life cycle costs of surface treated roads:

1. Surface treatment shall be applied to the entire road platform, from “grass to grass”, including any shoulders. This will eliminate grading on surface treated roads, which has a tendency to damage the edge of the surface treatment and cause premature failure of the surface.
2. Suitable new technologies will be utilized where they can be demonstrated to reduce life cycle costs, such as fibre-reinforced surface treatment. This technology can be used to mitigate reflective cracking when a single or double surface treatment is applied over an aging surface. It can eliminate the need for pulverizing the underlying surface in certain situations and can reduce overall costs.
3. Assess drainage and culvert needs prior to any significant renewal or rehabilitation strategy and complete any improvements concurrently. This will eliminate the need to cut/excavate a relatively new surface to replace a culvert.

4. Ditching and clearing (brushing) of the right-of-ways to improve roadbed drainage and safety.

### C. Asphalt Roads

Asphalt surfaces are the smoothest and most durable hard top surface used by the Municipality however; they are also the most expensive. Asphalt provides a constant, acceptable condition for the initial portion of its service life but then begins to deteriorate rapidly as it ages. Surface defects such as cracking and raveling are the first signs of the deterioration. If left untreated, the pavement will rapidly deteriorate to the point where reconstruction is the only option. A preservation management strategy can mitigate this by applying renewal treatments earlier in the pavements life before the conditions begin to deteriorate too far. **Table 4.1.2D** below summarizes preservation management activities to be considered for asphalt roads:

**Table 4.1.2 D - Rural Asphalt Roads**

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Crack seal	2-6	9	2
Slurry seal/ Microsurface*	4-8	8	4-6
Overlay	12-15	6-7	10
Pulverize and Pave	20-25	<5	20
Reconstruct	30	<4	30

\*Slurry seal can be used on lower volume paved roads (less than 1000 vehicles per day). For roads with volumes in excess of 1000 vpd, microsurfacing should be used.

In addition to the above noted preservation approach, the following best management practices will be employed to extend the service life and reduce life cycle costs of asphalt roads:

1. Review the condition of other infrastructure, particularly underground infrastructure prior to implementing any major renewal or rehabilitation of the pavement. Any repairs or capital upgrades to other infrastructure should be coordinated (refer to Section 4.6 for discussion on Integrated Capital Planning). This should reduce utility cuts in newer asphalt.
2. Repair potholes in the surface in a timely fashion to prevent saturation and weakening of road base.
3. Undertake regular shouldering program of rural paved roads to promote proper drainage. Poorly maintained shoulders allow surface water to pond and saturate the road base, which weakens the base and leads to cracking at the edge of pavements.

4. Undertake a ditching program to ensure there is adequate drainage for road base on rural roads. This will reduce the likelihood of structural distresses caused by softening of the road base due to poor drainage.
5. Specify the appropriate type of performance graded asphalt cement for the location.
6. Undertake a clearing program to reduce shading of the roadbed and remove roots/vegetation from the road base.

#### 4.1.3 Application of Preservation Management Approach - Roads

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every road. Road deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the road asset for the lowest overall lifecycle cost while maintaining the highest overall condition. As detailed in the life cycle costs analysis presented in Appendix C, the preservation management approach to roads is proven to yield the lowest overall life-cycle costs.

Each of the preservation management activities for gravel, surface treatment and asphalt roads identified above, including route and seal, slurry seal, resurfacing etc. shall be considered as part of the regular Road Needs Study every 5 years. Recommendations on the specific treatments required shall be documented and prioritized in the Road Needs Study. A 10-year plan for road expenditures shall be developed as part of the regular Road Needs Study updates.

#### 4.1.4 Capital Expenditures for Roads

Prioritization and recommendations for planned capital improvements have been developed based on condition rating and traffic demands on each road. Those roads having a "NOW", "1-5" or "6-10" year capital reconstruction requirement have been included in the 10-year capital requirement. Roads with less than 50 AADT are generally deemed to be acceptable with only regular maintenance activities. However, regardless of traffic volumes, roads with failing structural adequacies (a 14/20 or lower rating) have been considered for improvements within the 10-year plan. The total length of approximately 202 km of road was identified for capital reconstruction works at an estimated cost of approximately \$ 18.9 M, over the next 10 years.

Expenditure of this nature over a 10-year plan represent a significant commitment of municipal resources, however, it is important to identify the overall need. The Municipality will endeavor to undertake those activities which it can reasonably finance and will endeavor to partner with senior levels of government wherever possible to offset costs.



The focus of the Municipality will be to “keep the good roads good” by investing in those actions which result in the lowest life-cost and highest overall road network condition. Work has been prioritized within the Road Needs Study using the Road Condition Rating and traffic volumes. This means that a road in poor condition with a high traffic volume is prioritized ahead of a road in poor condition with a low traffic volume.

**A re-investment of approximately \$ 1.9 M (2016) per year in capital expenditures is recommended based on the 2016 Road Needs Study.**

Additionally the Road Needs Study recommends an annual investment of approximately \$ 2.2 M for the regular resurfacing of roads, as follows:

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a resurfacing program/budget is recommended as follows:

Hot Mix Paved Roads:

- 52.7 km of paved roads (HCB)
- Degradation rate 0.25/year (rating drops from “10” to “5” over a 20 year period)
- Annual Resurfacing 2.6 km/year
- Annual Budget \$598,000 (2.6 km/yr. x \$230,000/ln **RMP1** x 2 lanes)

Surface Treated Roads:

- 182.6 km of surface treated roads (LCB)
- Degradation rate 0.625/year (rating drops from “10” to “5” over a 8 year period)
- Annual Resurfacing 26.1 km/year
- Annual Budget \$730,800 (26.1 km/yr. x \$28,000/km **ST1 with localized repairs**)

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. 75mm of new gravel is recommended every 3-5 years.

Gravel Roads:

- 245.9 km of earth/gravel roads
- 75mm gravel every 3-5 years
- Annual Gravelling of 82 km/year
- Granular A (\$11,000/ km)
- Annual Budget \$ 902,000 (82 km/yr.\* x \$11,000/km **G**)\*\*

\*Based on a 5-year gravel resurfacing cycle.

\*\* Cost based on supply and application of gravel by external forces.

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at \$2,230,800 per year.

In order to consistently realize the above service lives, it is essential that a proactive preservation program is implemented.

Route and Seal:

- Applied once for each new HCB surface.
- Annual budget to maintain existing HCB, \$10,400: (2.6 km / year x \$4,000 / RS).

Slurry Seal / Microsurfacing

- Applied once for every new HCB and LCB surface, on average.
- Annual budget to maintain existing HCB, \$361,620: (28.7 km / year x \$12,600 / SS).

The total preservation program (route and seal, slurry seal) is estimated at \$ 372,020 / year.

**The annual roads expenditures required under the Plan (\$ 2016) are therefore:**

**Capital Reconstruction - \$ 1.9 M**  
**Capital Resurfacing - \$ 2.2 M (incl. \$ 902 K for Gravel Resurfacing)**  
**Preservation – \$ 372 K**

For the purposes of the Plan, the above expenditures are deemed to include all non-maintenance related expenditures and therefore include actions such as routing and sealing, slurry sealing, resurfacing, reconstruction etc. Ditching and brushing are considered strictly maintenance activities which may be completed by Municipality forces or otherwise subcontracted out. A separate budget for ditching and brushing is included below.

It is recommended that an updated Road Needs Study be undertaken every five years to further assess the structural adequacy and condition of the roads and update the prioritized plan for road reconstruction and resurfacing activities.

#### 4.1.5 Maintenance Expenditures for Roads

It is recommended that regular maintenance in the form of grading, roadside ditch cleanout and clearing be undertaken in order to extend the useful service life of the existing roads. A commitment of resources is necessary to ensure a viable annual ditching and clearing program. Both activities are considered two of the least expensive and most beneficial preventative maintenance activities to facilitate realizing the full pavement service life.

A ditching and brushing maintenance budget is calculated and recommended as follows:

- Ditch/Brush the entire road network on a 10-year cycle.
- 469.6 km of road – 47.0 km of ditching/brushing annually
- Assume \$4000/km for contractor (incl. excavator w/ bucket/brush head).
- Assume Municipal forces will provide dump trucks and operators as required.

**Total Annual Brushing/Ditching Cost: \$188,800**

Alternatively, the Municipality may use its own forces and equipment and realize substantial savings in undertaking this work. Using production rates of 0.5 km/day to ditch both sides of a road and 1.0 km/day to brush both sides of the R.O.W., it would take 141 person days to completely ditch and brush the network. Assuming the Municipality dedicated one public works person to this task, at an estimate rate of \$70/hr. including payroll burden, the resulting cost would be \$78,960. The cost of the equipment and dump truck drivers has been omitted to permit direct comparison to the above Contractor costing. It is understood that the Municipality already has the necessary ditching/brushing equipment to undertake the work and therefore capital expenditure for equipment has not been factored in.

**Total Annual Brushing/Ditching Allowance:      External Forces \$ 188,800**  
**Internal Forces \$ 78,960**

It is assumed that regular road grading activities will be undertaken by Municipality forces and with existing Municipality equipment, as such, a separate road grading maintenance budget has not been prepared.

#### 4.1.6 Road Ownership

The Municipality lacks a definitive by-law that discretely defines its road network. As such there are some roads in which it is ambiguous if they are publicly or privately maintained, or if they are seasonal or year round roads. In particular, there are 5 km of earth and 246 km of gravel roads in the network as per the RNS, but 12 km and 255 km respectively are listed under PSAB Reporting.

It would be prudent for the Municipality to pass a by-law that discretely defines its public road network. Any earth roads under the responsibility of the Municipality should be upgraded to gravel as funds become available.

## **4.2 Bridges Best Management Practices**

### **4.2.1 Preservation Management Approach for Bridges and Culverts**

When infrastructure is built, there becomes a need for maintenance, rehabilitation and eventually replacement. Given the significant cost to rebuilding bridges and culverts, strategic asset management and preservation becomes increasingly important to operating the asset network at a prescribed level of service over its full service life.

Similar to the roads network, it is more economical to manage the structure network rather than simply maintain it. In the case of bridges and culverts, waiting for serious signs of structural failure can lead to substantial costs for maintenance and rehabilitation, and ultimately cost the Municipality and the end users more money.

The key to managing both bridges and culverts is the timing and type of maintenance and rehabilitation activities. This idea evolves from the fact that a bridge's structural integrity does not fall constantly with time. A new bridge or culvert generally provides a constant, acceptable level of service and condition for the first part of its service life and then begins to deteriorate more rapidly as time progresses. In some cases, maintenance and rehabilitation measures are ignored until early signs of structural failure become noticeable.

### **4.2.2 Best Management Practices for Bridges and Culverts**

The Municipality will use a preservation management strategy for managing its bridge assets (including culverts larger than 3 m). The approach will be based on more frequent, less costly treatments applied over the life span of a bridge or culvert. Careful timing of maintenance will extend the service life of the structure significantly versus a more traditional approach.

Bridges and culverts are different types of structures. Generally, bridges transmit live loads directly through their structure to a foundation whereas culverts transmit loads through fill to a foundation. Because these structures are different in construction and maintenance requirements, separate strategies have been identified for each type of infrastructure.

Examples of approaches to bridge maintenance with their associated cost implications over the lifecycle of a bridge are set out in Appendix C to this report and are provided as an illustration of the benefit of a "preservation management approach".

### **Bridge Management Strategy**

Bridges are complex structures made up of several elements including the foundation, the substructure (abutments or ballast walls) and the superstructure (deck). Bridges are designed with a 75-year service life. However, in order to achieve the life span,

intervention at periodic times is required. **Table 4.2.2A** summarizes the preservation management strategy that will be applied to bridges:

**Table 4.2.2A - Bridge Preservation Management Strategy**

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Minor Repairs	10-20	80-90	2-5
Minor Rehabilitation	30	65-70	20
Major Rehabilitation	50-60	50-60	40
Replacement	75	<40	75

### Structural Culvert Management Strategy

Structural Culverts are typically designed with a 75-year service life similar to a bridge. However, in order to achieve the life span, careful selection of culvert material considering the site chemistry and culvert exposure is required. Intervention at periodic times is also required. **Table 4.2.2B** summarizes the preservation management strategy that will be applied to culverts:

**Table 4.2.2B - Culvert Preservation Management Strategy**

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Culvert material/ coating Selection	at Design		
Minor Repairs (patching, re-coating - partial or full, cleanout etc.)	10-20	80-90	2-5
Minor Rehabilitation (e.g. waterproofing, coating)	25	65-70	20
Major Rehabilitation (overlay, invert paving, lining etc.)	35 - 50	50-60	40
Replacement	75	<40	75

In addition to the above noted preservation approaches, the following best management practices will be employed to extend the service life and reduce life cycle costs of bridges and culverts:

1. Implement an annual Minor Bridge Repair program via the Operations or Capital budget. Utilize specific recommendations from the OSIM Inspection report to select which repairs on which structures. Minor repairs are critical as they address the problem while it is still small and cost effective to repair. Repairs may include, hand rail repair, pothole patching, concrete patches, repair to joint armoring, tightening steel bridge hardware, regrading of approaches or embankments, erosion prevention, crack sealing, etc.

2. Sweep and clean bridge decks and deck drains each spring. This will allow for inspection of the bridge surface and will promote positive drainage on the deck. This will eliminate standing water that has the potential to penetrate the wearing surface and cause premature deterioration of the deck.
3. Replace expansion joints AS SOON AS THEY ARE DAMAGED or worn. Expansion joints are flexible joints between the bridge deck and the approach slabs on a large bridge. Once they are damaged, they allow water to penetrate down to the abutments and bearing seats, which causes premature deterioration of these areas. Expansion joints are (relatively) inexpensive and their timely replacement can delay very costly rehabilitation work on the sub-structure.
4. Ensure OSIM inspections are completed on a biennial basis; not only because they are a legislative requirement but because they form the basis of the bridge inventory and contain recommendations for required improvements.
5. Complete deck condition assessments (DCA) on any larger structures as outlined in the OSIM reports. DCA's involve exploratory work to properly assess the extent of deterioration of the deck. They will help define the extent of rehabilitation required on a bridge deck.
6. Undertake localized or complete painting of steel girders, truss members or other steel members as recommended by OSIM inspections.
7. Cleanout culverts as need to prevent standing water or sediment collection in the culvert.
8. Stabilize embankments and inlet/outlet to prevent erosion and "piping" around the culvert. Ensure appropriate headwall/cutoff walls or clay seals are in place.

#### 4.2.3 Application of Preservation Management Approach – Bridges

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every structure. Bridge deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the bridge asset for the lowest overall lifecycle cost while maintaining the highest overall condition and **maintaining the bridge in a non-load posted state**. As detailed in the life cycle costs analysis presented in Appendix C, the preservation management approach to bridges is proven to yield the lowest overall life-cycle costs, similar to roads.

Each of the preservation management activities identified above shall be considered as part of the biennial structure inspections. Recommendations on the specific treatments required shall be documented and prioritized in the OSIM Inspection. A 10-year plan for bridge expenditures shall be developed as part of the regular OSIM updates.

#### 4.2.4 Capital Expenditures for Bridges

Based on the condition assessment of each structure, a ten-year structures work plan was developed for the Municipality with the goal of maintaining their current bridge network asset. A summary of the work activities and estimated reinvestment costs are provided in the table below.

A total reinvestment cost to maintain the current bridge asset is estimated at \$ 2.0 M over the next 10-year period with priorities as identified in the table below. This cost has been projected as being evenly distributed as per the 2015 OSIM Report.

The Plan should be revisited after each biennial structure inspection and updated every two years. In some cases, through preventative maintenance or rehabilitation activities, structures have outlived their expected useful service life. Given the limited available funding, extending the use of the Municipality's structures beyond their useful services lives is required.

The reinvestment costs are intended to maintain the bridge network asset in its current state and represent near term expenditures while the replacement costs and estimated replacement year are included to facilitate long-range financing plans.

#### 4.2.4 Bridge Needs Summary

Structure	Recommended Investigation or Rehabilitation	Cost Estimates		Time of Need
		Plan/Eng.	Construction	
Boulter Road Bridge	Rehabilitation/Replacement Study	\$15,255		1 - 5 Years
	Environmental Study	\$7,119		1 - 5 Years
	Structural Replacement		\$640,710	1 - 5 Years
Cassidy Creek Bridge	Rehabilitation/Replacement Study (Traffic Barrier Only)	\$5,085		Urgent
	Install New Traffic Barrier		\$30,510	1 - 5 Years
	Concrete Repairs - End of Culvert		\$40,680	1 - 5 Years
Grand Bridge Road	Structural Evaluation	\$5,085		1 Year
	Rehabilitation/Replacement Study	\$10,170		1 - 5 Years
	Install LVPL1 Traffic Barrier		\$20,340	Urgent
	Replace Steel Beams		\$20,340	Urgent
High Falls Trail Culvert	Timber Deck Repairs		\$10,170	1 Year
	Rehabilitation/Replacement Study (Traffic Barrier Only)	\$5,085		1 - 5 Years
	Install New Traffic Barrier		\$30,510	1 - 5 Years
Little Papineau Creek Bridge	Detailed Deck Condition Survey	\$8,136		1 - 5 Years
	Resurface Asphalt Deck		\$40,680	1 - 5 Years
	Resurface Asphalt Approaches		\$40,680	1 - 5 Years
	Replace Bearings		\$50,850	1 - 5 Years



Structure	Recommended Investigation or Rehabilitation	2015 Estimates		Time of Need
		Plan/Eng.	Construction	
Musclow-Greenview Road Bridge	Rehabilitation/Replacement Study (Traffic Barrier Only)	\$5,085		Urgent
	Detailed Deck Condition Survey	\$8,136		1 - 5 Years
	Install New Approach to Traffic Barrier		\$30,510	Urgent
	Concrete Repairs in Deck		\$76,275	1 - 5 Years
	Waterproof and Pave Deck		\$15,255	1 - 5 Years
	Pave Approach Wearing Surface		\$30,510	1 - 5 Years
Papineau Creek Bridge	Rehabilitation/Replacement Study (Traffic Barrier Only)	\$5,085		Urgent
	Install New Traffic Barrier		\$30,510	Urgent
	Concrete Repairs to Arch		\$30,510	1 - 5 Years
	Install Curb and Gutter		\$30,510	1 - 5 Years
	Repave Approaches		\$40,680	6 - 10 Years
Papineau Lake Road Bridge	Rehabilitation/Replacement Study	\$15,255		1 - 5 Years
	Detailed Deck Condition Survey	\$4,068		1 - 5 Years
	Abutments - Concrete Repairs		\$40,680	1 - 5 Years
	Wingwalls - Concrete Repairs		\$20,340	1 - 5 Years
	Replace Traffic Barrier		\$30,510	1 - 5 Years
	Rehabilitate Expansion Joints		\$61,020	1 - 5 Years
	Re-Coat Girders and Diaphragms		\$76,275	1 - 5 Years
	Install Traffic Barrier on Approaches		\$30,510	Urgent
	Pave Deck & Approaches		\$50,850	6 - 10 Years
	Traffic Control		\$30,510	6 - 10 Years
Parks Road Bridge	Rehabilitation/Replacement Study	\$15,255		Urgent
	Detailed Deck Condition Survey	\$4,068		1 - 5 Years
	Structural Evaluation	\$5,085		Urgent
	Concrete Repairs - Abutments/Wingwalls		\$40,680	Urgent
	Replace Traffic Barrier		\$30,510	Urgent
	Install Approach Traffic Barrier		\$30,510	Urgent
	Concrete Repairs - Deck/Soffit		\$40,680	1 - 5 Years
	Concrete Repairs - Girders		\$40,680	1 - 5 Years
	Waterproof and Pave Deck		\$40,680	1 - 5 Years
Pave Approaches		\$30,510	1 - 5 Years	
Soble Road Bridge	Rehabilitation/Replacement Study	\$15,255		1 - 5 Years
	Timber Crib Abutment Repairs		\$50,850	1 - 5 Years
York River Bridge	Detailed Deck Condition Survey	\$8,136		1 - 5 Years
	Replace Approach Traffic Barrier		\$30,510	Urgent
	Replace Seals		\$20,340	1 - 5 Years
	Concrete Repairs - Curbs		\$5,085	1 - 5 Years



### 4.3 Building Best Management Practices

The Municipality will employ the following best management practices in maintaining their buildings with a view to ensuring and extending the full service life (or more):

- Program the inspection of buildings on a regular basis, preferably no less than once every two years by a qualified professional.
- Maintain exterior sealants and flashing to ensure no water penetration.
- Ensure grading is such that surface water (drainage) is directed away from the building or into soak away pits.
- Repair damaged exterior elements, e.g. steel sheathing, roofing, cladding as soon as the damage occurs to prevent further deterioration.
- Annually inspect and remove debris from roof drains, gutters, downspouts.
- Enact or maintain service contracts for building systems such as HVACs per manufacturer recommendations or as otherwise deemed necessary.
- Retrofit buildings to enhance energy conservation.
- Pump-out septic tanks on a regular basis.

### Alternative Approaches to Building Management

Discussion of alternatives for management of the Municipality's building assets included:

- Disposal of current building assets and renting of space.
- Transferring ownership of community halls/facilities to local community groups.
- Renting additional space as opposed to building new space.

Risks to the above alternative approaches included the availability of sufficient and appropriate rental space.

For the purposes of the initial Plan the Municipality has adopted the above best management practices and intends to manage their buildings assets as they have in the past, with consideration for the alternative strategies presented above, as required in the future. Additionally, there are several buildings noted as non-repairable i.e. reconstruction is required as opposed to upgrading. The Municipality shall consider removal of these assets from their inventory altogether i.e. demolition.

It is recognized by the Municipality that given the high costs associated with replacement of their building assets, it is imperative that the Municipality realize building lives in excess of their expected useful service lives. As such, this is reflected in the Municipality's Levels of Service Document.

#### 4.3.1 Capital Expenditures for Buildings

Based on the estimated replacement cost of each building, and their respective amortization period (or expected useful lives) an annual contribution to reserves of \$ 300,502 is appropriate to finance replacement of buildings at the end of their amortization period. This of course assumes the Municipality is starting with all new buildings, and also assumes that each building will require replacement immediately upon reaching its theoretical life (amortization). The offsetting effect of these two factors is difficult to estimate.

Where possible, the Municipality shall strive to allocate funds to a building reserve fund for future capital improvements or ultimate replacement of their building assets. **An annual investment of \$ 300,502 will be used as a guide for contributions.**

Annual allocations of this level represent a significant burden to the municipality financially and may require debt financing. Buildings will be expected to outlive their expected useful lives (amortization) as detailed in the Municipality Level of Service expectations. Therefore, replacements will be undertaken on a priority needs basis and reserve contributions may be revised (reduced) accordingly.

**Current building replacement needs, anticipated in the next five years total \$1,075,000.**

An additional requirement of **\$742,750 is estimated for building repairs over the next five years** with an additional **\$278,500 estimated in the 5-10 year period**. For the purpose of the Financial Strategy portion of the plan, these costs have been allocated evenly throughout the 0-5 and 5-10 years plan horizons.

There are several buildings which the Municipality may consider for removal from their asset inventory, i.e. demolish or transfer ownership. An assessment of their use/need within the Municipality is recommended. These include:

- Maynooth Community Centre, (33090 Highway 62 North, Maynooth, ON K0L 2S0)
- Musclow Community Centre (10 McCormick Rd., Harcourt, ON K0L 2S0)
- Rink Change House/Boards, Purdy Hamlet (Centreview Rd. Combermere, ON K0J 1L0)

#### 4.4 Vehicles, Machinery, & Equipment Best Management Practices

The Municipality shall employ the following best management practices in maintaining their vehicles with a view to ensuring the full service life (or more) from their vehicle assets):

- Vehicles to be serviced on a regular basis, as per manufacturer recommendations or as otherwise deemed necessary by the manager of the fleet.

- Vehicles failures shall be repaired at the earliest opportunity to prevent undue wear and tear related to faulty equipment in disrepair.
- Vehicles shall be used with care.
- Vehicles shall be stored indoors whenever possible
- Winter sanding/salting equipment will be washed after use to remove salt/sand residue.
- Operators shall be properly trained on the use and care of the equipment.
- Vehicles shall be locked and parked in a safe location, when not parked at its home facility, to prevent the potential for vandalism and theft.
- Vehicles shall be replaced after it has met or surpassed its expected useful life, on a priority needs basis.

### **Alternative Approaches to Vehicle Management**

Discussion of alternatives for management of the Municipality's vehicle assets included:

- Disposal of current vehicle assets and leasing.
- Contract select maintenance tasks to eliminate need for specialized equipment.
- Joint use of infrequently-used equipment with neighboring municipalities.

Risks associated with the above alternative approaches included concern over response time for maintenance given Hastings Highlands's location and geographic size.

For the purposes of the initial Plan the Municipality has adopted the above best management practices and intends to manage their vehicle assets as they have in the past, with consideration for the alternative strategies presented above, as required in the future.

As stated previously in the Plan, the Municipality's Level of Service for their vehicle assets is to realize their full expected service lives. It is important that the Municipality assess the historic service lives of their equipment and either revise the expected service life, or modify the use or vehicle maintenance activities to ensure the expected service life documented in the Plan is realized. This should be considered early in the life of this Plan.

#### **4.4.1 Capital Expenditures for Vehicles and Equipment**

The Municipality currently has fifty-nine (59) vehicle and equipment assets that have already reached, or will have reached, their useful service life within the scope of the Plan, 2017 - 2026. Vehicle expenditures have been included in the Plan in the year they reach their useful service life, with the exception of "past due" vehicles, unless otherwise noted specifically in Table 2.4.

Where possible, the Municipality shall strive to allocate funds to a vehicle reserves for future replacement. **An annual investment of \$ 768,952 would be required for the Municipality to replace each of their existing vehicles/equipment upon reaching its useful service life (amortization). This will be used as a guide for contributions representing the investment level required to fully fund replacements upon reaching their amortization period.**

Annual allocations of this level represent a significant burden to the municipality financially and may require debt financing. As noted previously, it is intended that vehicle replacements will be undertaken on a priority needs basis and reserve contributions may be revised (reduced) accordingly. Reserve contributions shall be allocated pro rata based on respective vehicle asset values by department, as follows:

- Road Services – 81%
- Fire Protection Services – 13%
- Waste Disposal Services - 6%

Vehicle reserve allocations may be adjusted to reflect near term replacement requirements.

As stated, the above cost represents replacement of all vehicles/equipment, many of which have already exceeded their useful service lives and while listed as an asset, may no longer be required. The following is a summary of those specific vehicles assets which are required for replacement within the time horizon of the Plan:

Vehicle/Equipment	In Service Year	Original Cost	Years in Use (Age)	Expected Useful Life	Replacement Cost	Desired Replacement Year
2017 7600 SFA 6x4 Viking-Cives Plow*	2017		0	10	\$0	2016*
2000 International Dump 20S	2000	\$175,000	16	10	\$240,237	2017
1985 Grader (205)	1985	\$130,300	31	20	\$240,741	2017
2000 Sterling Tandem Dump	2007	\$175,000	9	10	\$209,141	2018
2006 International Tandem 7600	2005	\$192,298	11	10	\$239,099	2019
1991 Grader (402)	1991	\$175,656	25	20	\$288,182	2021

\* On order, to arrive January 2017

It is recommended that the the Municipality continue to review its inventory and identify those assets that will not require replacement, thus reducing its estimated annual investment requirement. Additionally, consideration will be given to extending the

expected useful service life to 12 or 15 years, from the current 10 years, recognizing the financial limitations to replacement.

#### 4.5 Solid Waste Sites

It is recommended that the Municipality employ the following best management practices in maintaining the nine (9) waste disposal sites with a view to prolonging the life of each existing site, to its full service life and beyond, and to maximize the value of new investments.

- A lockable gate and fencing should be installed at the entrance to all nine (9) sites to discourage illegal dumping.
- Fencing should extend far enough into the bush to discourage access.
- There may be an opportunity move the entrance gate further back at Hickey Road, Sand Bay and Wolfe Creek to further discourage illegal dumpers.
- Additional effort will be required at East Lake, Lake St Peter, Papineau and Wolfe Creek Sites to block ATV trails.
- All but two (2) sites (Papineau and South Baptiste) require Design and Operation Plans. The new plans for North Baptiste and Sand Bay will be for closure of the sites. The new plan for Musclow Greenview has already been submitted to the Ministry of Environment and Climate Change (MOECC) for review.
- After the Design and Operation Plans have been prepared they should be submitted to MOECC for amendment of the Environmental Compliance Approval (ECA) for each site.
- With respect to current available capacity for East Lake, Hickey and Lake St. Peter; there is an opportunity to improve capacities at these sites through submission of an ECA application.
- Submission of ECA applications create an opportunity to align property sizes as determined by legal survey with the site approvals and correct the location of the Wolfe Creek Waste Disposal Site, which is currently incorrect on the ECA.
- For all sites except North Baptiste and Sand Bay, the boundaries of the waste area should be established through the approved Design and Operation Plan and clearly marked in the field.
- The Municipality should plan to close and cap the North Baptiste and Sand Bay Waste Disposal Sites in 2017, following approval of the submitted closure plans.
- The attendant's facilities at all sites, except the Lake St. Peter and Papineau Waste Disposal Sites, should be replaced in the foreseeable future, at the suggested rate of one (1) per year. Replacement of facilities at North Baptiste and Sand Bay could be deferred until the long-term use of those sites as waste transfer stations is confirmed.
- Improvements to the sites' environmental monitoring programs are recommended for East Lake, Lake St. Peter, Musclow Greenview, and Papineau and should be implemented as soon as possible, especially for sites that require amendment of their ECA.
- Install a weatherproof lockable casing on the groundwater monitoring well at the South Baptiste Waste Disposal Site.

- Ongoing maintenance of monitoring wells should be a requirement of the Municipality's groundwater monitoring program.
- Five (5) of the Municipality's nine (9) Waste Disposal Sites have Fill Beyond Approved Limits. Efforts to correct the FBAL should be given priority:
  - Confirm Municipal staff's opinion that the approved landfill and site property size at Hickey Road are larger than recorded on the site's ECA.
  - Endeavor to acquire additional land at the Lake St Peter Waste Disposal Site to take advantage of the approved waste area.
  - Amend the ECA and Land Use Permit for the Papineau Waste Disposal Site to increase the property size.
  - FBAL issues at the North Baptiste and Sand Bay Waste Disposal Sites may be corrected by submission of an ECA amendment to permit site closure.
- Address the discrepancies between the area of the Land Use Permit and the area stated on the site's ECA through a minor amendment to the ECA.
- Address the issue where the Land Use Permit for the Lake St. Peter Waste Disposal Site has been issued for less than the approved waste area.
- Household Hazardous Waste stored at all Waste Disposal Sites should be removed and properly disposed of as soon as possible.
- Site attendants should take time every day to clean up litter.
- Consideration should be given to using sea containers at all sites for e-waste storage. These containers should be kept closed and locked during off hours.

#### 4.5.1 Alternative Approaches to Waste Management

The Municipality could consider, as an alternative to managing its own waste, to export waste. Based on recent numbers obtained from other local municipal waste management plans, the cost to export waste from the Municipality is estimated to be approximately \$600 per tonne. The Municipality currently generates approximately 5,000 cubic metres of waste annually which equates to approximately 2,000 tonnes. Based on the annual waste tonnage, the cost to export waste from the Municipality would be approximately \$1.2M annually.

In order to accommodate waste export, the Municipality would be required to convert one or more existing waste disposal sites to a transfer station at a cost of about \$250,000 each, including engineering and approvals.

#### 4.5.2 Waste Disposal Site Optimization

Considering that the Municipality's estimated 225,000 cubic metres of remaining capacity is filling at a rate of approximately 2,940 cubic metres per year, the remaining lifespan is estimated to be about 76 years.

On the above basis, it would appear that the Municipality's waste disposal requirements are well served by its existing sites. However, it must also be noted that the sites may close before they are full for environmental reasons.

Accordingly, it would be in the Municipality's interest to increase its remaining capacity where possible. East Lake, Hickey Road and Lake St. Peter have been identified as sites that may have more capacity than estimated depending on past approvals. Updating the ECA at these three (3) sites may prove beneficial for the Municipality.

Consideration could also be given to reducing the number of active waste disposal sites/waste transfer stations in the Municipality. Three (3) sites in close proximity to major roads should be sufficient to serve residents. Three (3) sites that fit this description are:

- Hickey Road, just off Highway 62 to the south;
- East Lake, off Highway 127 on the northeast; and,
- Papineau, off Highway 62 in the northwest.

The Municipality could implement a Waste Disposal Site Optimization Program by reducing the number of active waste disposal facilities and not converting sites to waste transfer stations when they are full (i.e. North Baptiste and Sand Bay).

The Municipality could accelerate the Waste Disposal Site Optimization Program by diverting collected wastes to some of the smaller sites – like Wolfe Lake, Musclow Greenview, and Lake St. Peter to utilize the available remaining capacity.

The Waste Disposal Site Optimization Program described above would help the Municipality to manage medium-term costs and address illegal dumping issues – other municipalities have found that illegal dumping is less prevalent, and easier to enforce, at closed sites versus active sites.

#### 4.5.3 Waste Disposal Sites Capital Expenditures

##### **Waste Disposal Service Life**

The total remaining available waste disposal capacity for the municipality (from all nine sites) has been estimated to be 225,000 cubic metres. The current waste generation rate for the total municipality has been estimated to be approximately 2,940 cubic metres annually. Based on the estimated available capacity and current waste generation rate, the remaining waste disposal service life is estimated to be seventy-six (76) years.

##### **Replacement Cost**

Typical landfill replacement costs, based on an average for rural municipalities in Ontario, would equate to approximately \$235 per cubic meter. The current waste generation rate for the total municipality has been estimated to be about 2,940 cubic metres annually. Based on provincial requirements, the landfill planning period is



twenty-five (25) years. Therefore, in order to accommodate waste disposal for twenty-five (25) years, the Municipality would require a site with 73,500 cubic metres capacity.

**This equates to a replacement cost of about \$ 17M for a site to accept waste generated by the Municipality for the twenty-five (25) year planning period.**

As noted, the Municipality currently has an estimated 76 years of capacity through its existing landfills, or stated differently, the Municipality has 76 years to save/allocate funds for future replacement of their current landfills, representing an annual allocation of \$223,684.

#### **4.6 Prioritization of Projects**

The Municipality has developed Levels of Service (LOS) for each of the respective classes of assets included within this Plan. The respective LOS sets the benchmark or expectations of the Municipality and its constituents/ratepayers. The prioritization of projects within each class of asset and across the various classes of assets may still be required where financing limitations or emergency activities are required. In general, project prioritization shall be undertaken using the following criteria:

- User safety
- Risk management
- Levels of Service
- Life-cycle cost and remaining service life
- Size of User Group (e.g. Volume of traffic for roads, number of bridge users)
- Economic Development
- Recreation
- Aesthetics

#### **4.7 Integrated Capital Planning**

While it is important to manage each asset group as a system, e.g. road network, bridge network etc., it is also important to understand and implement an integrated capital planning approach to realize maximum value for money and economies of scale, and ensure the full service life is realized from each capital asset investment. As an example, it is not economical or feasible to replace a road in Year 1, only to go back and replace services beneath the road, and have to replace the road again on 5 years later. The scheduling and prioritizing of projects should be an integrated approach across related assets.

The following integrated capital planning practices shall be adopted by the Municipality in scheduling work priorities:



- Replacement of underground services beneath a road surface shall be coordinated with renewal of the road base and/or surface, wherever feasible, and vice versa.
- Road rehabilitation work adjacent to structures planned for replacement shall be considered for tender with the structure replacement work or after structure work is complete.
- Culvert replacements shall be done in conjunction with road rehabilitations wherever possible.
- Road priorities shall give due consideration to short and long term development plans. E.g. turning lane requirements, utility cuts etc.

#### 4.8 Procurement Methods

The Municipality has in place and shall adhere to its current Purchasing By-Law in retaining services to manage, maintain and improve its infrastructure assets under this Plan.

Alternative procurement methods shall be explored as opportunities for such arise including:

**Joint Tendering** - e.g. line painting, gravel/salt bulk purchase to realize potential economies of scale.

**Retainer Services** - e.g. engineering/consultant retainers to minimize procurement costs.

**Shared Services** – pooled services with other municipalities.

#### 4.9 Risks to the Asset Management Plan

As with the development of any plan there are inherent risks that may jeopardize the partial or full execution of the plan or may challenge the ability of the plan to meet its respective targets. The following summarizes those risks, associated with the Plan, known to exist today.

- Inadequate levels of funding.
- Non-commitment by Municipality Council or Staff to the Plan.
- Emergency activities which direct funds away from the Plan.
- Change to legislative requirements which may influence Levels of Service.
- Premature failure of an asset.
- Unforeseen development pressures.

- Risk to Public Health and Safety (relating to asset failure due to inadequate funding).
- The Plan is “Brand New” and as such will require refinement.

Identification of the above potential risks is an important step in moving forward with the Plan. As is the case in many small rural municipalities, the simple reality is that there is a limited availability of funds, and a related limited ability to grow funding, in order to manage the Municipality’s infrastructure. While this Plan sets out to manage the competing infrastructure priorities at the lowest combined lifecycle costs, the plan will be subject to revision and refinement as new approaches/technologies are developed, new funding strategies are found, and the expectations of the Municipality (council, staff, and ratepayers) evolve.

## 5.0 Financing Strategy

### 5.1 Overview

In 2011 the province adopted its long-term infrastructure plan for Ontario, “Building Together”. One of the guiding principles of this Plan is that *those who benefit directly from municipal infrastructure should pay for the service, whenever feasible*. While the province appears to be continuing to recognize its obligation to assist municipalities with their infrastructure challenges, it is clear that every municipality is expected to move towards the sustainable management of its own capital assets: to ensure that as assets need to be repaired and replaced, each municipality will be able to finance its own requirements.

#### 5.1.1 Sources of Funding

The Municipality’s recent practice includes funding planned capital expenditures from Reserves. Reserve funds used for capital expenditures (covered under this Plan) have averaged \$ 449,271 per year, in the period 2014-2016. Transfers into Reserves over the same period have averaged \$ 399,166. In addition to Reserves, the Municipality directs its Federal Gas Tax funds to eligible capital expenditures. The Federal Gas Tax Funding for 2017 is estimated to be \$ 247,407. The total current available funds for capital expenditures (2017) is estimated at approximately \$ 646,573.

#### 5.1.2 Funding Amortization Method

The Municipality of Hastings Highlands, as with many rural and small urban municipalities, is faced with sustaining a substantial inventory of capital assets. As part of the development of this Plan, a commonly-cited sustainability measure—the annual amortization of the current replacement cost of assets—was estimated based on the Municipality's 2015 PSAB reports and the estimated replacement costs identified in this Plan. Contributions to reserves or re-investment of an equivalent amount was considered as a proposed long-term municipal target. The resulting funding requirement so far exceeded any reasonable potential funding level for the Municipality, from increased taxation, debt financing, and all other known funding sources/strategies, that this target was felt not to be feasible.

In the case of the Municipality of Hastings Highlands the “funding of amortization” alone would cost an average of \$1.4 M annually over the life of the Plan.

A summary of Capital Expenditures versus Sources of Funding, for the Fully Funded Plan, including amortization costs, is presented in **Appendix A- Table 1 General Revenues and Expenditures – Fully Funded Amortization Method**.

As detailed in **Table 1 General Revenues and Expenditures – Fully Funded Amortization Method**, the annual requirement to maintain current capital assets and finance the amortization of current capital assets ranges from \$6.0 M to 6.6 M (General Capital and Landfill), including reserve transfers and long-term debt repayment, over the period of the Plan (2017-2026).

The annual expenditures to maintain current capital assets ranges from \$4.6 M to 5.5 M (General Capital), excluding reserve transfers and long-term debt repayment, and funding of amortization, over the period of the Plan (2017-2026).

### 5.1.3 Self-Funding Capital Program

In light of the noted deficit between funding sources (Reserve contributions and Gas Tax) and capital expenditure requirements, ranging from \$ 5.4 M to \$ 6.1 M, the Municipality intends to initiate a “Self-Funding Capital Program” (the Program) derived from available tax levies, to fund a sustained investment toward its capital infrastructure needs. The Self-Funding Capital Program will assign 3% of the annual tax levy to capital expenditures throughout the duration of this Plan. In addition to the revenue from the “Self-Funded Capital Program” the Federal Gas Tax funds will continue to be dedicated toward eligible capital expenditures.

The Municipality will also give consideration to a gradual increase in the annual taxation level with a goal of not to exceed **2%** per annum. The balance of any increase over and above inflation, will go toward the “Self-Funding Capital Program”. Assuming an overall inflation rate of 1% annually, an additional approximately \$66,000 will be

added to the Program each year. It is recognized that despite the introduction of this significant contribution to capital source funding, the Municipality is still not able to fully fund amortization of their assets.

#### 5.1.4 Funding Needs Method

Even with the dedicated “Self-Funding Capital Program” it is recognized that a “fully funded amortization” approach is well beyond the Municipalities current means within the context of the 10-year Plan. Therefore, as a more practical and feasible long-term objective, the Municipality has focused on funding its needs, as dictated by its desired Levels of Service, in the period covered by this Plan, with a concerted effort towards funding reserves to the maximum extent possible while extending the useful service life of their assets. An outline of how these revenues and expenditures were estimated, and a discussion of the estimates and other considerations factored into these estimates, is presented in the sections that follow and detailed in **Appendix A- Table 2 General Revenues and Expenditures – Needs Method**.

In the period covered by the Plan, annual investment in capital asset refurbishment and replacement requirements of the assets, net of reserve transfers and long-term debt repayments is estimated to range from \$1.8 M to \$2.0 M.

**An annual funding shortfall remains of between \$ 1.2 M and \$1.5 M over the ten-year period covered by the Plan**, significantly reduced from the noted \$ 5.4 M to \$ 6.1 M deficit noted above.

The revised “Needs Approach” recognizes the need to invest in a sustained plan for infrastructure but recognizes that the optimum investment levels, as outlined in this Plan, are targets to work towards over the life of this Plan, and likely the next.

The following key consideration have been adopted in development of the Needs Method Approach:

1. For the purposes of the initial asset management plan, the Municipality has focussed on maintaining, renewing/rehabilitating and replacing its existing asset base. Consequently, expenditures associated with non-infrastructure solutions are not anticipated in the planning period.
2. Additional maintenance requirements resulting from the adoption of a preservation management approach have been discussed in the plan. However, since existing and additional maintenance expenditures are considered in the annual operating budgets, they are not identified in the capital expenditures above.
3. There are no significant disposal expenditures anticipated in the planning period.

4. Population growth over the planning period is expected to be minimal. Consequently, no significant expansion activity expenditures are anticipated.
5. Roads Expenditures are focused on resurfacing only. The road allocation is set and the increased by 2% annually to meet requirements of the Plan in 20 years.
6. Vehicle replacements represent only those noted specifically by Municipality for replacement, as noted in Plan.
7. Gravel resurfacing expenditures have been reduced to have all gravel roads resurfaced over 15 years, on a priority basis, instead of over 5 years as recommended in Road Needs Study.
8. No reserve allocation has been assigned for future replacement of landfill operations in ~76 years.
9. Bridge priorities are addressed over 10 year period, versus 5 as noted in the OSIM reports, as condition permits.
10. Assumes no repair/replacement of the following buildings:
  - Maynooth Community Centre, (33090 Highway 62 North, Maynooth, ON K0L 2S0)
  - Musclow Community Centre (10 McCormick Rd., Harcourt, ON K0L 2S0)
  - Rink Change House/Boards, Purdy Hamlet (Centreview Rd. Combermere, ON K0J 1L0)
  - Rink Change House - Herchel (160 South Baptiste Rd., Bancroft, ON K0L 1C0)
11. Fire Hall, Lake St. Peter, is the only building included for replacement within the Plan horizon.
12. 5-year building repair priorities have been spread over 10 year period of Plan.
13. Taxation increased at 2% / year over the life of the Plan.

It should be noted that this section of the Plan is not intended to replace the Municipality's standard budgeting practices, and with minor exceptions only, does not prescribe specific work to be undertaken to achieve the Municipality's desired Levels of Service. Rather, the focus of the revenue and expenditure estimates is to provide an snapshot of the funding shortages that are currently expected to result if the work required to achieve the desired Levels of Service is actually undertaken, and the prescribed approach to tax rate increases, and debt and other sources of financing are followed.

Further work is required to align the desired Levels of Service with the actual available funding. As a first step, Council will consider the feasibility of higher tax rate increases, increased debt financing, or levies specifically earmarked to finance capital improvements when it begins its next round of annual budget deliberations.

## 5.2 Alternative Financing Strategy

The municipality has previously and is currently taking on debt, within the Ministry of Municipal Affairs and Housing's acceptable limits, to assist in funding their current capital expenditures.

It is important to note that the above noted deficits do include transfers to reserves for future purchases. It may be possible to reduce or eliminate an annual deficit by reducing reserve transfers; the ultimate result of the reduction in reserve transfers being a significant future deficit at the time of a major asset replacement. Consideration of a smaller amount of debt annually versus a large debenture periodically is required.

It is noted that the Municipality will have repaid their long-term debts as of year 9 of the Plan. Consideration may be given to additional debt financing to assist with funding capital expenditures, e.g. loans for future equipment, bridge replacements etc.

It is important to reiterate that the "Needs Method" outlined above is focused on resurfacing activities only, with respect to road works, in an effort to extend the useful service life of the road network overall. Alternative funding approaches must be sought to fund full road reconstruction project, such as Federal/Provincial Grants.

## 5.3 Assumptions

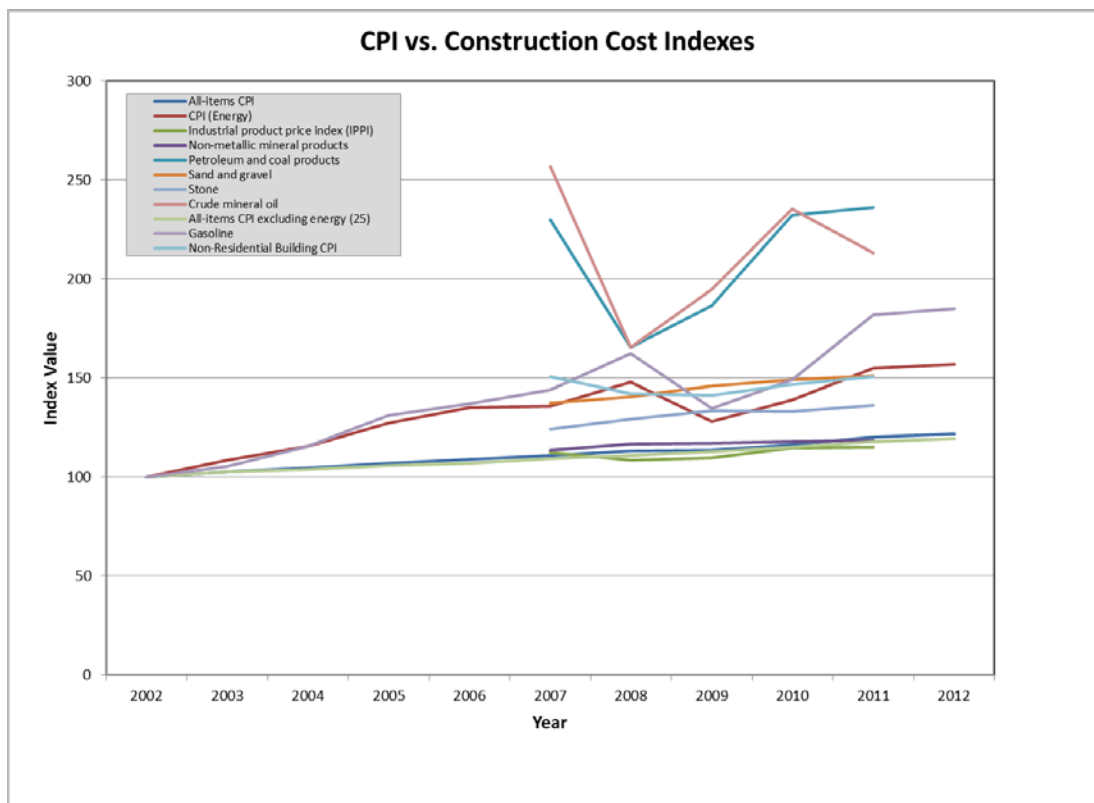
The following summarizes the assumptions that have been incorporated into the expenditure and revenue forecast:

1. The focus of the Municipality will be on maintaining its current inventory of capital assets rather than expanding its current asset base.
2. The Levels of Service set out in Appendix 'B' for sustaining the quality of assets at their current state, and the level of expenditures dictated by the resulting asset preservation strategy, will be incorporated into the plan as a reasonable level of expenditures by the final year of the Plan.
3. The timing for replacement of roads, bridges, and buildings shall be determined based on independent reporting (e.g., building reviews, and road needs assessments).
4. Limited growth will lead to only modest growth in the assessment base over the planning period (2017-2026). Consequently, a reasonable maximum increase in the taxes available to fund capital expenditures is 1%.

5. The valuation of the replacement cost for all assets will increase by a rate of inflation forecasted to be 1% annually (see Section 5.3).
6. The Town will not assume debt that would place it in a “moderate risk” category, as measured by the MMAH’s “Financial Indicator Review”.

#### 5.4 Consumer Price Index versus Construction Cost Indexes

In assessing the future replacement costs of the various assets within the Asset Management Plan, it is important to consider the appropriate rates of inflation to ensure forecasting is as accurate as possible. The figure below illustrates the Ontario Consumer Price Index (2003-2012) against various recent (5 years) construction and material price indexes.



In general, the rates of inflation for various material and construction indexes have remained comparable to the overall rate of inflation in Ontario. While gasoline, oil and overall energy rates have fluctuated more significantly over the 10-year period (2002-2012), the overall impact in the Non-Residential Building CPI (NRBCPI) has been buffered. The Overall Rate of Inflation (Ontario) grew from 113.3 in 2007 to 121.8 in 2012, an increase of 8.5 points. The NRBCPI fell from 150.8 to 141.4 and back to 150.7 over the period 2008 -2012; remaining generally unchanged over the period. While material indexes generally grew at similar rates to the overall CPI, gas/energy rates fell substantially in 2008, potentially resulting in the generally unchanged NRBCPI.

For the purpose of this Asset Management Plan, given the potential for relative short-term instability in energy and fuel rate indexes, and resulting potential influence on NRBCPI, **an inflation rate of 1% has been adopted.**

## 5.5 Financial Strategy and Capital Expenditure Notes

1. The useful lifespan of the asset, in particular vehicles, was based on the PSAB report. Consideration may be given to extending the expected service life (an amortization period) of vehicles to 12/25 years, where it is currently 10/20 years.
2. Capital funding will be drawn from property taxes, committed grants, and transfers from reserves.
3. The Road Needs Study established a list of priority projects to be addressed in a 1-10 year time horizon. The roads management study will be updated every five years as a measure to reassess road conditions and to determine deficiencies. The report will be used as a monitoring tool in assessing past expenditure patterns in the maintenance of the road network. Capital expenditures on roads will be increase at 2% per year, over the 10-year Plan period.

Capital expenditures will be monitored on an annual basis. The Asset Management Plan will be subject to a comprehensive review every four years and shall be updated as updated asset condition/needs information is available.



## **Appendix A**

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**Table 1 General Revenues and Expenditures – Fully  
Funded Amortization Method**

**Table 2 General Revenues and Expenditures – Needs  
Method**



Appendix A  
**Table 2: NEEDS METHOD - REVISED**  
**Yearly Revenue and Expenditure Summary**

Estimated Annual Rate of Inflation **1.00%**

	Anticipated 2016	1	2	3	4	5	6	7	8	9	10
		Forecast									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
<b>Capital Expenditures</b>											
Non-infrastructure solutions <sup>1</sup>		0	0	0	0	0	0	0	0	0	0
Maintenance activities <sup>2</sup>		0	0	0	0	0	0	0	0	0	0
Renewal/Rehabilitation activities -											
Paved and Surface Treated Roads <sup>5</sup>		716,000	737,623	759,899	782,848	806,490	830,846	855,938	881,787	908,417	935,851
Gravel Roads <sup>7</sup>		300,000	306,030	312,181	318,456	324,857	331,387	338,048	344,842	351,774	358,844
Bridges <sup>9</sup>		350,000	300,000	350,000		350,000		350,000		350,000	
Buildings <sup>10,12</sup>		108,550		110,732		112,958		115,228		117,544	
Replacement activities -	Funded from Reserves										
Buildings <sup>10,11</sup>		240,237	250,000		248,036		219,809		256,346		315,180
Vehicles (rolling stock) <sup>6</sup>											
Other asset types not included in asset management plan (land & land improvements, equipment, computer hardware&software)											
Solid Waste Management		0	0	0	0	0	0	0	0	0	0
Disposal Activities <sup>3</sup>		0	0	0	0	0	0	0	0	0	0
Expansion Activities <sup>4</sup>		0	0	0	0	0	0	0	0	0	0
<b>Total Capital Expenditures</b>		<b>1,714,787</b>	<b>1,593,653</b>	<b>1,532,813</b>	<b>1,349,340</b>	<b>1,594,305</b>	<b>1,382,042</b>	<b>1,659,213</b>	<b>1,482,976</b>	<b>1,727,735</b>	<b>1,609,876</b>
<b>Reserves and Reserve Funds</b>											
Balance, beginning of year	4,487,539	4,200,719	3,926,932	3,806,182	3,778,993	3,968,835	3,948,133	4,175,003	4,160,921	4,360,233	4,352,903
Transfers to reserves :											
Roads	100,000	0	0	0	0	0	0	0	0	0	0
Bridges		300,000	303,000	306,030	309,090	312,181	315,303	318,456	321,641	324,857	328,106
Buildings		25,000	25,250	25,503	25,758	26,015	26,275	26,538	26,803	27,071	27,342
Vehicles (rolling stock)	180,000	50,000	50,500	51,005	51,515	52,030	52,551	53,076	53,607	54,143	54,684
Fire	87,779	50,000	50,500	51,005	51,515	52,030	52,551	53,076	53,607	54,143	54,684
Landfill <sup>8</sup>	60,000	0	0	0	0	0	0	0	0	0	0
Not dedicated/operating purposes											
Transfers from reserves	(714,599)	(698,787)	(550,000)	(460,732)	(248,036)	(462,958)	(219,809)	(465,228)	(256,346)	(467,544)	(315,180)
<b>Net increase (decrease) in Reserves and Reserve Funds</b>	<b>(286,820)</b>	<b>(273,787)</b>	<b>(120,750)</b>	<b>(27,190)</b>	<b>189,842</b>	<b>(20,701)</b>	<b>226,870</b>	<b>(14,082)</b>	<b>199,311</b>	<b>(7,330)</b>	<b>149,636</b>
<b>Long-term Debt Repayment</b>											
<b>Debt Principal and Interest Repayments</b>	<b>449,443</b>	<b>449,443</b>	<b>449,443</b>	<b>449,443</b>	<b>449,443</b>	<b>269,565</b>	<b>269,565</b>	<b>269,565</b>	<b>269,565</b>	<b>269,565</b>	<b>0</b>
New Long-Term Debt											
<b>Total Net Capital, Reserve, and Long-term Debt Funding Requirements</b>		<b>1,890,443</b>	<b>1,922,346</b>	<b>1,955,066</b>	<b>1,988,625</b>	<b>1,843,170</b>	<b>1,878,478</b>	<b>1,914,697</b>	<b>1,951,852</b>	<b>1,989,970</b>	<b>1,759,512</b>
	Anticipated 2016	Forecast									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Taxation (Estimate) <sup>13</sup>	6,621,691	6,687,908	6,754,787	6,822,335	6,890,558	6,959,464	7,029,058	7,099,349	7,170,343	7,242,046	7,314,466
Additional 1% Tax to Self Funding Capital Program		66,879	67,548	68,223	68,906	69,595	70,291	70,993	71,703	72,420	73,145
<b>Total Taxation</b>		<b>6,754,787</b>	<b>6,822,335</b>	<b>6,890,558</b>	<b>6,959,464</b>	<b>7,029,058</b>	<b>7,099,349</b>	<b>7,170,343</b>	<b>7,242,046</b>	<b>7,314,466</b>	<b>7,387,611</b>
<b>Sources of Funding (for Capital Expenditures)</b>											
3% of Property Taxation + additional 1% (Self Funding Capital Program)		267,516	270,191	272,893	275,622	278,379	281,162	283,974	286,814	289,682	292,579
Other Grants		0									
Federal Gas tax		247,407	249,881	252,380	254,904	257,453	260,027	262,628	265,254	267,906	270,585
<b>Total Sources of Funding</b>	<b>0</b>	<b>514,923</b>	<b>520,073</b>	<b>525,273</b>	<b>530,526</b>	<b>535,831</b>	<b>541,190</b>	<b>546,601</b>	<b>552,067</b>	<b>557,588</b>	<b>563,164</b>
<b>Funding Shortfall Relative to Financial Requirements</b>	<b>0</b>	<b>(1,375,520)</b>	<b>(1,402,274)</b>	<b>(1,429,793)</b>	<b>(1,458,099)</b>	<b>(1,307,338)</b>	<b>(1,337,288)</b>	<b>(1,368,095)</b>	<b>(1,399,785)</b>	<b>(1,432,382)</b>	<b>(1,196,348)</b>

**Notes:**

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- Additional maintenance requirements resulting from the adoption of a preservation management approach have been discussed in the plan. However, since existing and additional maintenance expenditures are considered in the annual operating budgets, they are not identified in the capital expenditures above.
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- No reserve allocation for replacement of landfill operations in ~76 years.
- Bridge priorities addressed over 10 year period, vs. 5, if condition permits.
- Assumes no repair/replacement of the following buildings:
  - Maynooth Community Centre, (33090 Highway 62 North, Maynooth, ON K0L 2S0)
  - Musclow Community Centre (10 McCormick Rd., Harcourt, ON K0L 2S0)
  - Rink Change House/Boards, Purdy Hamlet (Centreview Rd. Combermere, ON K0J 1L0)
  - Rink Change House - Herchel (160 South Baptiste Rd., Bancroft, ON K0L 1C0)
- Fire Hall, Lake St. Peter is the only building included for replacement within the Plan horizon.
- 5-year building repair priorities spread over 10 year period of Plan.
- Taxation increased at 2% / year over the life of the Plan.

## **Appendix B**

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### **Level of Service**

**Asset Management Plan**

**Appendix B**

**Levels of Service**

**Municipality of Hastings Highlands**

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# Levels of Service

Levels of service provide a measuring stick to ensure that municipal infrastructure is maintained to a standard that protects the municipal investment and sustains or prolongs the life of bridges, roads, buildings, equipment and other infrastructure. By establishing a level of service, the municipality will be able to identify the condition of all infrastructure on an ongoing basis and undertake measures to repair, upgrade or better all municipal assets over their lifespan. The intent of establishing levels of service is also to ensure that regulatory requirements are met, notably, the minimum maintenance standards for municipal highways (Ontario Regulation 239/02).

The levels of service set out in the following pages provide a written series of procedures that will guide Council in making financial decisions designed to maintain all of the municipality's capital assets to the level appropriate for the municipality given its relative priorities, available financing and minimum legislated requirements. The service level standards are meant to ensure the delivery of a quality level of services and an appropriate measure of accountability to municipal taxpayers.

The levels of service are organized by the type of asset or infrastructure and a series of objectives to be achieved through adherence to specific standards or levels of service.

## **Roads – Minimum Overall System Adequacy Rating of 90%.**

The Township's goal is to maintain, as a minimum, an overall system adequacy rating of 90%. Road Condition ratings are assigned in accordance with the MTO Inventory Condition Manual, 1991.

## **Vehicles – Utilization Meets or Exceeds Expected Service Life**

Vehicles shall be maintained and operated to ensure they are available for use up to and beyond their expected service life. In other words, vehicles will be utilized over their related amortization period, as a minimum.

## **Buildings – Building Use Exceeds Expected Service Life**

Building maintenance and upgrades shall be undertaken to ensure, as a minimum, the expected useful service life of the building is realized, with the goal of using the building beyond its useful service life.

## **Solid Waste Sites - Meet All Applicable Regulations**

Waste Disposal Site investments shall be as required to ensure long-term sustainability (available capacity) of the assets and ensure compliance with the Environmental Protection Act and other applicable legislation.

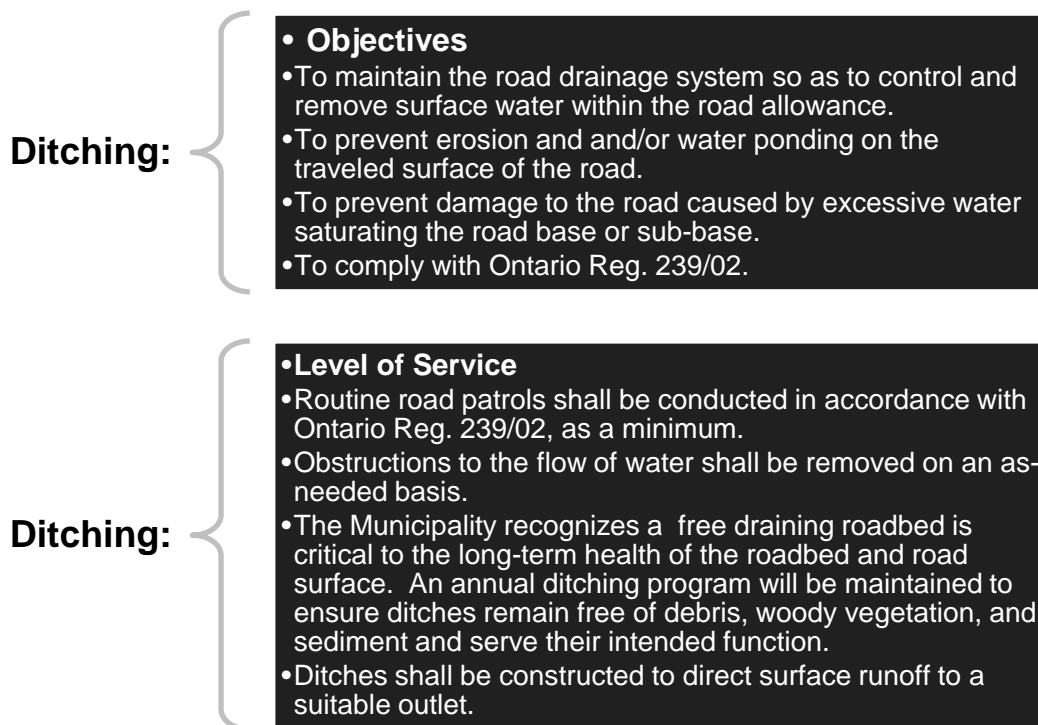
These performance targets will serve as the starting point for ongoing reviews and improvements to the plan. By monitoring the municipality's ability to achieve these targets through the implementation of its existing asset management plan, required

revisions to the plan (including any required revisions to the targets and levels of service themselves) will become apparent.



## Section 1: Roads - Maintenance

Asset Type: Roadside Maintenance - Ditching
Category No. 1-1: Ditching
Effective Date: January 31, 2017



**\*\*OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

Asset Type: Roadside Maintenance - Brushing
Category No. 1-2: Brushing
Effective Date: January 31, 2017

**Brushing:**

- **Objectives**
- To maintain safe sightline distances
- To reduce or eliminate snow drifting conditions and reduce or eliminate road frosting by reducing road shading.
- To protect the road base structure by removing brush and trees rooting in the sub-base
- To comply with Ontario Reg. 239/02

**Brushing:**

- **Level of Service**
- Trees, brush and limbs on or overhanging the right-of-way will be removed where they present a traffic hazard.
- Brush growing in such a manner that restricts drainage or sight lines shall be removed. Priority will be given to brushing on curves, at intersections/entrances, and locations prone to wildlife crossing.
- Stumps will be removed or cut at the ground line.
- Permission shall be obtained from a property owner to enter onto private property to remove encroaching trees or limbs.
- An annual brushing program shall be maintained to provide safe sight lines, road base drainage, and road exposure to the sun.
- Brushing shall be a priority in those locations which are prone to road frosting due to shading.

**\*\*OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

Asset Type: Loose Top - Grading
Category No. 1-3: Grading Loose Top
Effective Date: January 31, 2017

**Loose Top Surfaces:**

- **Objectives**
- To provide a smooth, safe riding surface.
- To protect the investment in the road.
- To comply with Ontario Reg. 239/02

**Loose Top Surfaces:**

- **Level of Service**
- All gravel surfaces will be graded at least once annually, as required, and more frequently on higher traffic volume roads as needed.
- Gravel will be added to resurface gravel roads when there is a general loss of surface material, as required.
- Grading and gravelling will be undertaken prior to any dust control.
- Potholes will be repaired in accordance with Ontario Reg. 239/02.

**\*\*OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

## Section 2 – Roads - Resurfacing

Asset Type: Road Surface
Category No. 2-1: Road Resurfacing
Effective Date: January 31, 2017

### Bituminous Surfaces:

- **Objectives**

- To provide a smooth, safe riding surface.
- To protect the investment in the road surface and minimize life cycle cost of the road network while maximizing asset value.
- To comply with Ontario Reg. 239/02

### Bituminous Surfaces:

- **Level of Service**

- The Municipality adopts a preservation management approach to road infrastructure management.
- The Township shall strive to maintain a minimum individual road surface condition rating of **5 out of 10**, as defined in the **MTO Inventory Manual for Municipal Roads, February 1991**. Road surfaces less than a rating of 5 will be programmed for resurfacing or reconstruction, as the case may be, as finances permit.
- Gravel roads with AADT > 50 shall be considered for resurfacing every 5 years, as required.
- Surface Treated roads shall be considered for resurfacing every 8 years, as required.
- Hot Mix Asphalt roads shall be considered for resurfacing every 20 years, as required.
- Road resurfacing priorities shall be based on road condition, traffic volumes and related underground infrastructure replacement requirements.
- Road surfaces shall be maintained in accordance with Ontario Reg. 239/02.

**\*\* OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

## Section 3: Roads - Repairs

Asset Type: Road Base Repairs (Hard Top)
Category No. 3-1: Road Base Repairs (Hard Top)
Effective Date: January 31, 2017

### Road Base Repairs:

- **Objectives**

- To provide a free draining road base suitable to carry the expected traffic volumes and loads for the class of road.
- To support the road surface and prevent premature deterioration of the surface.
- To protect the investment in the road.
- To comply with Ontario Reg. 239/02

### Road Base Repairs:

- **Level of Service**

- Upon reconstruction of a road, the road base will be improved to the level required to support the expected traffic loading over the life of the overlying hard top surface.
- Frequent or extensive areas of pavement deterioration or distress shall be investigated to confirm the root cause.
- Localized areas of deterioration or distress will be repaired where feasible, by municipal forces.
- Road sections exhibiting severe deterioration or distress along more than 15% of its length i.e. a structural adequacy score of less than **12/20 as per the MTO Inventory Manual for Municipal Roads, February 1991**, shall be programmed for reconstruction, as finances permit.

**\*\* OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

Asset Type: Road Base Repairs – Loose Top
Category No. 3-2: Road Base Repairs (Loose Top)
Effective Date: September 30, 2013

**Road Base Repairs:**

- **Objectives**
- To provide a free draining road base suitable to carry the expected traffic volumes and loads for the class of road.
- To protect the investment in the road.
- To comply with Ontario Reg. 239/02

**Road Base Repairs:**

- **Level of Service**
- Frequent or extensive areas of deterioration or distress shall be investigated to confirm the root cause.
- Localized areas of deterioration or distress will be repaired where feasible, by municipal forces.
- Road sections exhibiting severe deterioration or distress along more than 15% of its length i.e. a structural adequacy score of less than 12/20 as per the MTO Inventory Manual for Municipal Roads, February 1991, shall be programmed for reconstruction, as finances permit.
- Areas subject to the percolating of mud and water shall be repaired.

**\*\* OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

## Section 4: Roads - Capital Improvements

Asset Type: Roads Capital Improvements (Reconstruction or Upgrades)
Category No. 4-1 Capital Improvements
Effective Date: January 31, 2017

### Capital Improvements for Roads:

- **Objectives**
- To maintain the municipal road network in a safe and functional condition.
- To support land accessibility and economic development.
- To comply with Ontario Reg. 239/02

### Capital Improvements for Roads:

- **Level of Service**
- A roads needs assessment will be prepared by a qualified professional at least every 5 years.
- Roads with the highest traffic volumes will receive priority for capital improvements. The Municipality shall endeavor to maintain a road and road surface consistent with the volume of traffic carried by the road, as follows:  
AADT 0 to 199 - Gravel  
AADT 200 to 399 - Low Class Bituminous (Surface Treated)  
AADT 400+ - High Class Bituminous (Hot Mix Asphalt)
- Roads shall not be reconstructed strictly due to surface width or type deficiencies provided there is no history of safety or operational concerns.
- Road replacement or upgrading shall only be undertaken once the full service life of the existing road has been realized, as finances permit, and provided there is no history of safety or operational concerns.
- Consideration shall be given to the age and condition of underground services associated with a road and coordinated with road reconstruction, where feasible.
- Upon reconstruction of a road, the road base will be improved to the level required to support the expected traffic loading over the life of the overlying hard top surface.
- Consideration shall be given to HCB adjacent to drainage infrastructure, e.g. curb and gutter, and in semi-urban/urban areas, regardless of AADT.
- Consideration for loading, during development or in the future, will be considered when determining pavement surface type.

**\*\* OVERALL ROADS LOS TARGET: Maintain 82% System Adequacy \*\***

## Section 5 – Municipal Vehicles

Asset Type: Public Works, Fire, Recreation and Other Municipal Vehicles
Category No. 5-1: Municipal Vehicles
Effective Date: January 31, 2017

### Municipal Vehicles:

#### • Objectives

- To maintain and prolong the lifespan of all municipal vehicles.
- To ensure the readiness of municipal vehicles for their intended use including emergency use.
- To comply with Provincial legislation for the licensing and operation of vehicles.

### Municipal Vehicles:

#### • Level of Service

- All vehicles will be maintained in accordance with the applicable vehicle maintenance manual issued by the dealership or manufacturer, as a minimum.
- The appropriate department head shall organize for regularly scheduled maintenance (i.e. oil changes, fluids, tire pressure etc.)
- Drivers and operators shall report any equipment problems to their supervisor or mechanic.
- Major refits or equipment modifications shall be carried out in the off-season except for emergency repairs
- Operational records or logs shall be kept on vehicle usage.
- All vehicles shall be fueled and left in a "ready-to-go" state after each shift or emergency operation.
- All vehicles shall be maintained in a clean condition and washed on a regular basis to remove dirt or road salt.
- The residual lifespan of a vehicle shall be evaluated annually and a report shall be submitted to the clerk.
- All vehicles shall be operated in accordance with the relevant provincial legislation.

**\*\* OVERALL Vehicles LOS TARGET: Utilization Exceeds Useful Service Life \*\***



## Section 6 – Municipal Buildings and Equipment

Asset Type: Municipal Buildings
Category No. 6-1: Municipal Buildings
Effective Date: January 31, 2017

### Municipal Buildings:

- **Objectives**
- To maintain municipal buildings in a good state of repair.
- To ensure the useful service life of municipal buildings is obtained.

### Municipal Buildings:

- **Level of Service**
- Review and document the condition of buildings at least once every two years to identify the need for upgrades or betterments to energy conservation, building systems, foundations, accessibility standards and exterior weatherproofing (i.e. doors and windows, roofing, cladding).
- Carry out repairs immediately for incidental damage caused by fire, water, infestation or mould).
- Schedule annual maintenance/repairs of HVAC systems, septic tanks and water supply systems.
- Maintain smoke, carbon dioxide and security alarm systems.
- Inspect structural integrity of buildings on 10 year cycle.

**\*\* OVERALL BUILDINGS/FACILITIES LOS TARGET:  
Building Use Exceeds Expected Service Life \*\***

Asset Type: Municipal Facilities
Category No. 6-2 Municipal Facilities
Effective Date: January 31, 2017



**\*\* OVERALL BUILDINGS/FACILITIES LOS TARGET:  
Building Use Exceeds Expected Service Life \*\***

## Section 7 – Waste Disposal Sites

Asset Type: Solid Waste Sites
Category No. 7-1 Operating Landfill Sites
Effective Date: January 31, 2017

### Waste Disposal Sites:

- **Objectives**
- To ensure continuous and effective waste disposal service in accordance and compliance with applicable acts, regulations and supporting documents thereby minimizing the risk of off-site groundwater and surface water contamination.
- To ensure that at all times that the waste disposal sites are operated in accordance with requirements under the Environmental Protection Act and the regulations and supporting documents thereunder including design, operations, sampling, testing and monitoring requirements identified under the applicable Environmental Compliance Approvals for the sites.
- To ensure that the waste disposal sites are operated by individuals having the necessary training, expertise and qualifications required under regulations governing the site operation and the approvals and permits issued for each site.

**\*\* OVERALL SOLID WASTE SITES LOS TARGET:  
Meet All Applicable Regulations \*\***

**Solid Wastes  
Sites:**

- **Level of Service**
- Ensure gates, fencing and access roads are maintained to ensure site security and access control.
- All waste disposal sites will be operated in accordance with their respective Design and Operations Plans.
- All waste deposited in the sites will be placed within the approved footprint.
- Waste disposal sites that have reached their approved capacity will be closed in accordance with the ECA requirements and supporting documentation.
- Ensure that attendant's facilities are constructed and maintained to ensure the safety of workers and the general public.
- Ensure that weekly litter inspection and pick-up is completed to maintain the cleanliness of the waste disposal sites.
- Maintain accurate records of materials and volumes accepted at each waste disposal site.

**\*\* OVERALL SOLID WASTE SITES LOS TARGET:  
Meet All Applicable Regulations \*\***

## **Appendix C**

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### **Example Life Cycle Cost Analysis**

## Example Life Cycle Cost Analysis

The following life cycle costs analysis compares three different municipalities Municipality 1, Municipality 2 and Municipality 3, each with three distinct approaches to pavement management. For this analysis we will assume each of the three municipalities have 7000 m<sup>2</sup> of pavement i.e. 1km of asphalt paved road that is 7m wide. In each scenario, the road is assumed to have been constructed in 2013 and will operate under normal traffic loading.

The Life Cycle Cost Analysis (LCCA) assumes no user costs. The LCCA uses a discount rate of 2.5% / year.

The LCCA shows the three different municipalities and tracks their pavement management decisions and related condition over the specified time period. Municipality 1 represents decisions made based on strategic preventive maintenance and rehabilitation (M&R), Municipality 2 represents decisions based on no preventive M&R and Municipality 3 represents decisions based on resurfacing only.

The figure below illustrates a time- pavement condition plot for each municipality.

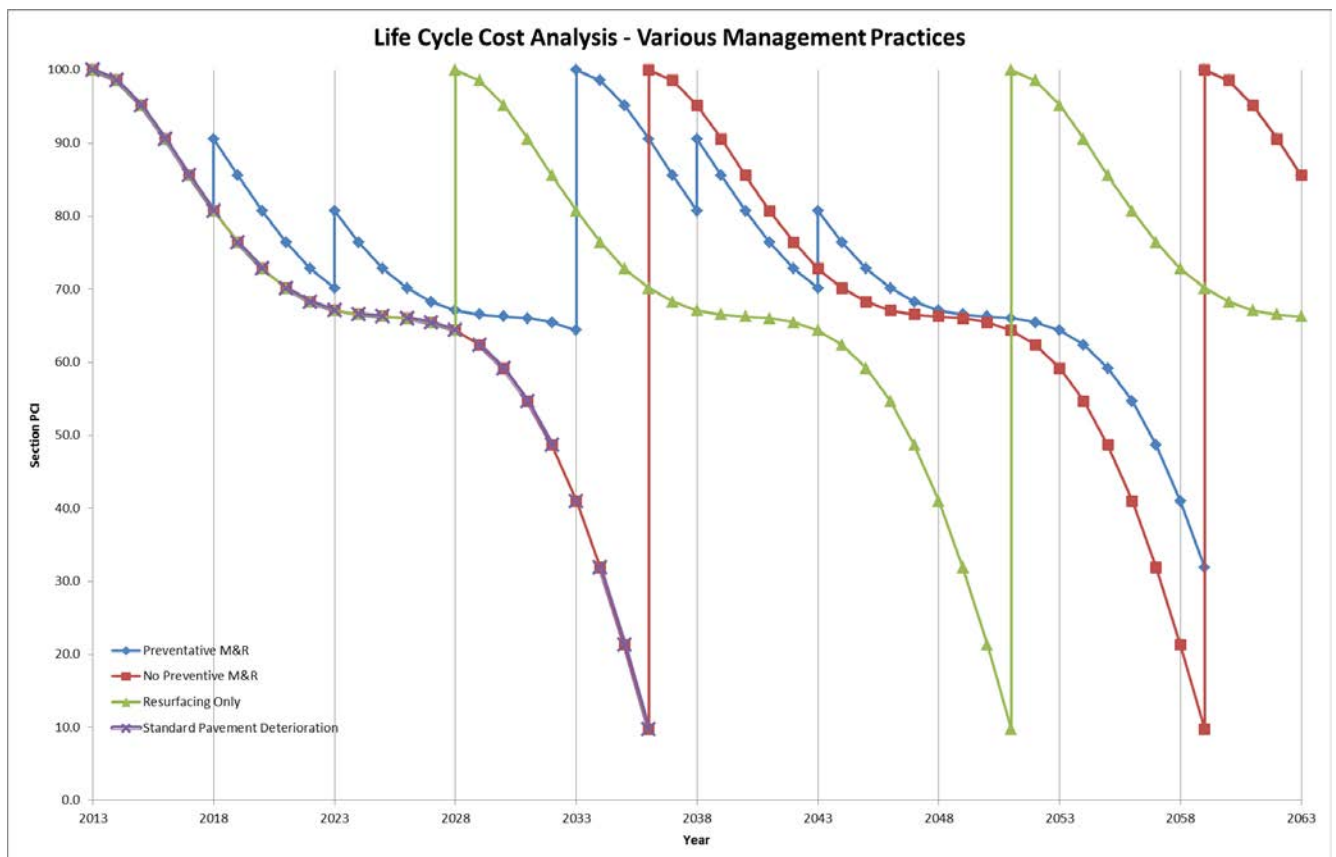


Figure 8.2. Time-Condition Plot for 3 Municipalities

The costs associated with the corresponding maintenance and rehabilitation decisions are outlined in the following tables:

Preventive M&R									
Year	Age	Treatment	Δ PCI	PCI <sub>q</sub>	Quantity	Unit	Unit Cost	Total Cost	Present Worth
		-- Annual Ditching/Clearing --							
2018	5	Localized Preventive - Rout and Seal	81-90	Satisfactory-Good	1000	m	\$1.50	\$1,500.00	\$1,325.78
2023	10	Global Preventive - Slurry Seal	70-81	Satisfactory-Good	7000	m <sup>2</sup>	\$6.50	\$45,500.00	\$35,544.53
2033	20	Surface Course	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m <sup>2</sup>	\$12.00	\$84,000.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$204,487.50	\$124,792.78	
2038	25	Localized Preventive - Rout and Seal	81-88	Satisfactory-Good	4500	m	\$1.50	\$6,750.00	\$3,640.89
2043	30	Global Preventive - Slurry Seal	68-78	Satisfactory-Good	7000	m <sup>2</sup>	\$6.50	\$45,500.00	\$21,691.79
2048	35	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	5%	m <sup>2</sup>	\$30.00	\$10,500.00	\$4,424.40
2053	40	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	10%	m <sup>2</sup>	\$30.00	\$21,000.00	\$7,821.04
2058	45	Full Reconstruction	32-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m <sup>2</sup>	\$15.00	\$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	\$35.00	\$14,700.00	
		40mm Base Course			686	t	\$125.00	\$85,750.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$325,937.50	\$107,290.28	
2063	5	Localized Preventive - Rout and Seal	81-90	Satisfactory-Good	1000	m	\$1.50	\$1,500.00	\$436.41
<b>Final PCI in 2063:</b>			<b>90</b>	<b>Good</b>				<b>Net:</b>	<b>\$306,967.90</b>
								<b>Residual Value:</b>	<b>\$85,346.08</b>
								<b>Total Cost:</b>	<b>\$221,621.82</b>

The policy of Municipality 1 is to strategically intervene with preventative maintenance measures over the course of the pavement's service life. Two significant maintenance measures are performed on the pavement at various times and ultimately extend the service life of the pavement, prorating the total cost of the pavement over a longer period of time. Eventually, a full reconstruction is required and this cycle repeats. The total life cycle costs are substantially less when compared to Municipality 2 and 3, at a total of \$221,622 over 50 years.

No Preventive M&R									
Year	Age	Treatment	Δ PCI	PCI <sub>q</sub>	Quantity	Unit	Unit Cost	Total Cost	Present Worth
2023	10	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	5%	m <sup>2</sup>	\$30.00	\$10,500.00	\$8,202.58
2028	15	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	10%	m <sup>2</sup>	\$30.00	\$21,000.00	\$14,499.78
2030	17	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	20%	m <sup>2</sup>	\$30.00	\$42,000.00	\$27,602.19
2036	23	<b>Full Reconstruction</b>	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m <sup>2</sup>	\$15.00	\$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	\$35.00	\$14,700.00	
		40mm Base Course			686	t	\$125.00	\$85,750.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$325,937.50	\$184,707.88	
2043	7	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	5%	m <sup>2</sup>	\$30.00	\$10,500.00	\$5,005.80
2048	12	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	10%	m <sup>2</sup>	\$30.00	\$21,000.00	\$8,848.79
2053	17	Safety/Stopgap Maintenance - AC Patching/Leveling	N/A	N/A	20%	m <sup>2</sup>	\$30.00	\$42,000.00	\$15,642.09
2059	23	<b>Full Reconstruction</b>	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m <sup>2</sup>	\$15.00	\$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	\$35.00	\$14,700.00	
		40mm Base Course			686	t	\$125.00	\$85,750.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$325,937.50	\$104,673.45	
<b>Final PCI in 2063:</b>			<b>86</b>	<b>Good</b>				<b>Net:</b>	<b>\$369,182.56</b>
							<b>Residual Value:</b>	<b>\$81,552.92</b>	
							<b>Total Cost:</b>	<b>\$287,629.64</b>	

The policy of Municipality 2 is to simply construct the pavement and wait until serious deficiencies begin to appear before acting. This approach unfortunately remains common still today. Over the last period of the pavement's life, maintenance is required to ensure safety and operation until the pavement is completely destroyed. Once the pavement has failed, a complete reconstruction is carried out restoring the pavement to new condition. This cycle repeats again until a second reconstruction is required. The total costs are substantial and total \$287,630 over 50 years.



Resurfacing Only									
Year	Age	Treatment	Δ PCI	PCI <sub>q</sub>	Quantity	Unit	Unit Cost	Total Cost	Present Worth
2028	15	Surface Course	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m <sup>2</sup>	\$12.00	\$84,000.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$204,487.50	\$141,191.58	
2051	23	Full Reconstruction	10-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m <sup>2</sup>	\$15.00	\$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	\$35.00	\$14,700.00	
		40mm Base Course			686	t	\$125.00	\$85,750.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$325,937.50	\$127,534.43	
2067	15	Surface Course	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m <sup>2</sup>	\$12.00	\$84,000.00	
		50mm Surface Course			892.5	t	\$135.00	\$120,487.50	
							\$204,487.50	\$53,898.67	
Final PCI in 2063:			66	Good				Net:	\$322,624.67
								Residual Value:	\$62,587.12
								Total Cost:	\$260,037.55

The policy of Municipality 3 is periodic resurfacing. The pavement is constructed and time passes until early signs of serious distress are observed. This occurs after the time when preventive maintenance is neither appropriate nor possible, but before the pavement is completely destroyed. Resurfacing is performed and restores the pavement to almost new condition. The pavement then deteriorates for the remainder of its life, requiring significant maintenance in the last years before it is completely destroyed. A full reconstruction is then carried out and the cycle continues. The total costs are in between that of Municipality 1 and 2 at \$260,038 over 50 years.

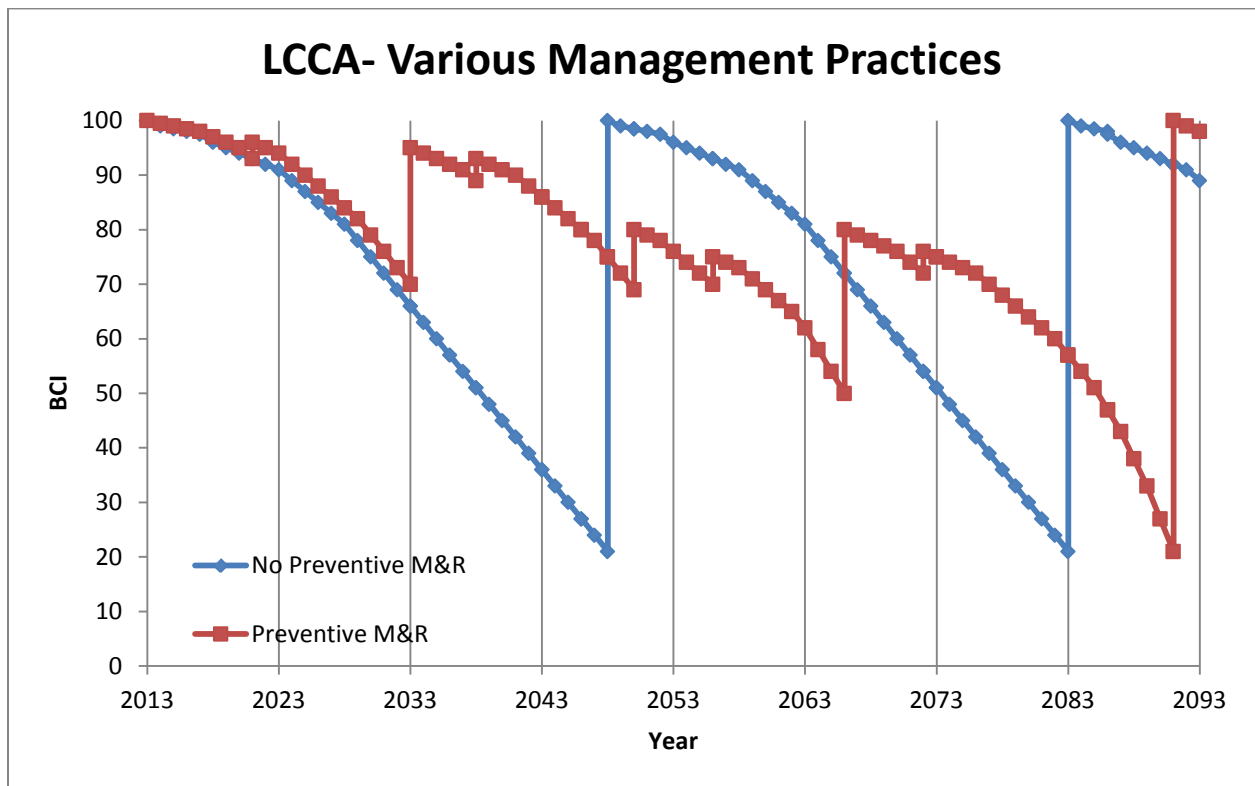
It may be easy to see upfront cost savings by understanding that as long as any costs associated with maintaining the pavement are deferred as long as possible, money will be saved. The reality is that extending a pavements service life prorates the total cost of the pavement over a longer period of time and ultimately becomes more economical in the long run. If preventive maintenance measures are strategically planned and carried out then the service life of the pavement can be maximized and substantial reconstruction costs can be deferred for longer periods of time. In a time when economy and efficiency are becoming more and more important, this type of proactive management is essential in the management of infrastructure.

## Life Cycle Cost Analysis

The following life cycle costs analysis compares two different management practices for municipalities managing their structure inventory. For the analysis we will assume each of the municipalities have an identical bridge as a part of their inventory. The bridges both have the same initial construction cost, and are identical in terms of structure type and construction.

For the analysis, each municipality has in their inventory a two-lane, single span bridge with concrete barrier walls and deck supported by prestressed concrete girders on concrete abutments. The bridge has expansion joints at either end and a paved deck. The road maintenance policy of each municipality is to use salt as a winter roadway de-icer. The Life Cycle Cost Analysis (LCCA) assumes no user costs.

The LCCA shows the municipalities and tracks their structure management decisions over a 90-year time period. Municipality 1 represents decisions made based on strategic preventive M&R and Municipality 2 represents decisions based on no preventive M&R. Refer to the figure below for a time-condition plot for each municipality.



Time-Condition Plot for 2 Municipalities

The costs associated with the corresponding maintenance and rehabilitation decisions are outlined in the following table:

Year	Treatment	PreventiveM&R					
		$\Delta$ BCI	Quantity	Unit	UnitCost	TotalCost	PresentWorth
2021	RoutandSealCracks	93-96	250	m	\$2.50	\$625.00	\$512.97

2033	<b>First Rehabilitation</b>	70-95					
	Patch, Waterproof and Pave Deck		480	m2	\$600.00	\$288,000.00	
	Misc Concrete Patching		50	m2	\$2,000.00	\$100,000.00	
						\$388,000.00	<b>\$236,785.13</b>
2038	<b>Rout and Seal Cracks</b>	89-93	250	m	\$2.50	\$625.00	<b>\$337.12</b>
2050	<b>Barrier Wall Replacement</b>	69-80	39	m3	\$2,500.00	\$97,500.00	<b>\$39,104.04</b>
2056	<b>Rout and Seal Cracks</b>	70-75	200	m	\$2.50	\$500.00	<b>\$172.92</b>
2066	<b>Second Rehabilitation</b>	50-80					
	Patch, Waterproof and Pave Deck		480	m2	\$600.00	\$288,000.00	
	Misc. Concrete Patching		100	m2	\$2,000.00	\$200,000.00	
	Bearing Replacement		10	ea.	\$5,000.00	\$50,000.00	
	New Barrier Walls		39	m3	\$1,450.00	\$56,550.00	
						\$594,550.00	<b>\$160,628.84</b>
2072	<b>Rout and Seal Cracks</b>	72-76	350	m	\$2.50	\$875.00	<b>\$203.84</b>
2091	<b>Structure Replacement</b>	21-100					
	Piles		1500	m	\$350.00	\$525,000.00	
	Abutments and Wingwalls		300	m3	\$1,100.00	\$330,000.00	
	Girders		450	m	\$1,000.00	\$450,000.00	
	New Concrete Deck		300	m3	\$1,250.00	\$375,000.00	
	New Barrier Walls		39	m3	\$1,450.00	\$56,550.00	
	Approach Slabs		56	m3	\$575.00	\$32,200.00	
							\$1,768,750.00
<b>Final BCI in 2093:</b>		<b>98</b>					<b>Net: \$695,498.58</b>
							<b>Residual Value: \$240,427.03</b>
							<b>Total Cost: \$455,071.54</b>

**No Preventive M&R**

Year	Treatment	ΔBCI	Quantity	Unit	Unit Cost	Total Cost	Present Worth
2048	<b>Structure Replacement</b>	21-100					
	Piles		1500	m	\$350.00	\$525,000.00	
	Abutments and Wingwalls		300	m3	\$1,100.00	\$330,000.00	
	Girders		450	m	\$1,000.00	\$450,000.00	
	New Concrete Deck		300	m3	\$1,250.00	\$375,000.00	
	New Barrier Walls		39	m3	\$1,450.00	\$56,550.00	
	Approach Slabs		56	m3	\$575.00	\$32,200.00	
							\$1,768,750.00
2083	<b>Structure Replacement</b>	21-100					
	Piles		1500	m	\$350.00	\$525,000.00	
	Abutments and Wingwalls		300	m3	\$1,100.00	\$330,000.00	
	Girders		450	m	\$1,000.00	\$450,000.00	
	New Concrete Deck		300	m3	\$1,250.00	\$375,000.00	
	New Barrier Walls		39	m3	\$1,450.00	\$56,550.00	
	Approach Slabs		56	m3	\$575.00	\$32,200.00	
							\$1,768,750.00
<b>Final BCI in 2093:</b>		<b>64</b>					<b>Net: \$1,059,347.96</b>
							<b>Residual Value: \$157,013.57</b>
							<b>Total Cost: \$902,334.39</b>

\*Costs are for materials only and do not include construction costs

The policy of Municipality 1 is to strategically intervene with maintenance measures over the course of the structure's service life. Maintenance measures are performed on the structures at various times and ultimately extend the service life of the structure, prorating the total cost of the structure over a longer period of time. Eventually, a full reconstruction is required and this cycle repeats. The total costs are fractional compared to those of Municipality 1. This difference in decision making introduces significant savings throughout the cycle.

The policy of Municipality 2 is to simply build the structure and wait until serious deficiencies become evident. Once the structure condition has deteriorated, a complete reconstruction is carried out restoring the structure to perfect condition. This cycle repeats again until a second reconstruction is required. The total costs are substantial. Unfortunately this approach still remains common today as municipalities are faced with an aged structure network and limited funds for maintenance.

It may be easy to see upfront cost savings by understanding that as long as any costs associated with maintaining the structure are deferred as long as possible, money will be saved. The reality is that extending a bridge or culvert's service life prorates the total cost of the structure over a longer period of time and ultimately becomes more economical in the long run. If preventive maintenance measures are strategically planned and carried out then the service life can be maximized and substantial reconstruction costs can be deferred for longer periods of time. In a time when economy and efficiency are becoming more and more important, this type of proactive management is essential in the management of our resources.

The difficulty faced by most municipalities is related to "breaking the cycle." With an aged infrastructure and many structures with condition beyond the point of preservation management techniques, substantial funds are required to address those most significantly deteriorated structures leaving little funds for keeping the good bridges good.