



TOWNSHIP OF SOUTH FRONTENAC
ASSET MANAGEMENT PLAN

December 2016

TOWNSHIP OF SOUTH FRONTENAC ASSET MANAGEMENT PLAN

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1 Provincial Guideline	2
1.2 Vision for Infrastructure in the Township of South Frontenac	2
1.3 Goals of Asset Management.....	3
1.4 Scope of Asset Management Plan.....	4
1.5 Development of the Asset Management Plan.....	4
1.6 Refinement of the AMP	5
2.0 STATE OF INFRASTRUCTURE	6
2.1 Asset Inventory.....	6
2.2 Asset Value	6
2.3 Asset Condition	7
2.4 Asset Risk	10
2.5 Refinements by Township Staff	14
3.0 LEVELS OF SERVICE	15
3.1 Condition Levels of Service.....	15
3.2 Capacity Levels of Service.....	15
3.3 Existing Levels of Service.....	16
4.0 ASSET MANAGEMENT STRATEGY.....	19
4.1 Asset Management Strategy Overview	19
4.2 Managing Risk	19
4.3 Long Term Infrastructure Capital Investment Needs.....	22
4.4 Asset Management Strategies to Reduce Infrastructure Costs.....	24
5.0 FINANCING STRATEGY	25
5.1 Sources of Funding	25
5.2 Short Term Financing Strategy.....	25
5.3 Long Term Financing Strategy	28
6.0 CONCLUSIONS AND RECOMMENDATIONS.....	31

LIST OF FIGURES

Figure 1 – Township of South Frontenac.....	1
Figure 2 – Asset Replacement Value Distribution.....	6
Figure 3 – Distribution of Asset Condition	8
Figure 4 – Preventative Maintenance Impact	10
Figure 5 – Risk Matrix	13
Figure 6 – Distribution of Asset Risk	14
Figure 7 – 10 Year Capital Investment Needs.....	21
Figure 8 – 100 Year Capital Investment Needs	23

LIST OF TABLES

Table 1 – Inventory of Assets.....	5
Table 2 – Value of Assets by Asset Class	5
Table 3 - Estimated Condition Based on Useful Life Remaining.....	7
Table 4 – Value of Assets by Condition Score.....	8
Table 5 – Probability of Failure Score.....	11
Table 6 – Consequence of Failure Score Information.....	12
Table 7 - Risk Score by Asset Value	13
Table 8 – Typical Service Levels and Performance Metrics for Small Municipalities	17
Table 9 – Renewal Strategy based on Risk.....	20
Table 10 – Short Term Capital Expenditures (Water Assets).....	26
Table 11 – Short Term Capital Expenditures (Tax Supported Assets).....	26
Table 12 – Long Term Capital Expenditures (Water Assets)	28
Table 13 – Long Term Capital Expenditures (Tax Supported Assets)	29

LIST OF APPENDICES

APPENDIX A – Township of South Frontenac Map
APPENDIX B – Information and Assumptions used to Develop Long Term and Prioritized Short Term Renewal Needs
APPENDIX C – Sample Road Segment Decision Tree
APPENDIX D – Detailed State of the Infrastructure Analysis

EXECUTIVE SUMMARY

Municipalities throughout Ontario own a diverse portfolio of infrastructure assets that in turn provide a varied number of services to their citizens. The infrastructure, in essence, is a conduit for the various public services the township provides, e.g., the roads supply a transportation network service; the water infrastructure supplies a clean drinking water service. A community's prosperity, economic development, competitiveness, image, and overall quality of life are inherently and explicitly tied to the performance of its infrastructure.

Since 2013, the Province requires that any municipality seeking provincial capital funding for infrastructure projects prepare an Asset Management Plan (AMP) to demonstrate the need of each project within its social, economic or environmental priorities.

This report represents the Township's updated strategic AMP based on current infrastructure information. The asset inventory currently includes roads, bridges and culverts(over 3m)* , facilities, water treatment and storage facilities, water mains, and storm sewers. The Township currently owns and operates approximately \$350 million of infrastructure, and other assets will be added to the plan as more data is gathered. For example, the inventory and figure does not include rolling stock.

Like most municipalities across Ontario, a portion of assets are in poor or critical condition. These assets should be addressed on a priority basis. Over the next 100 years, the Township should spend an average of \$8.3 million per year for asset rehabilitation and replacement.

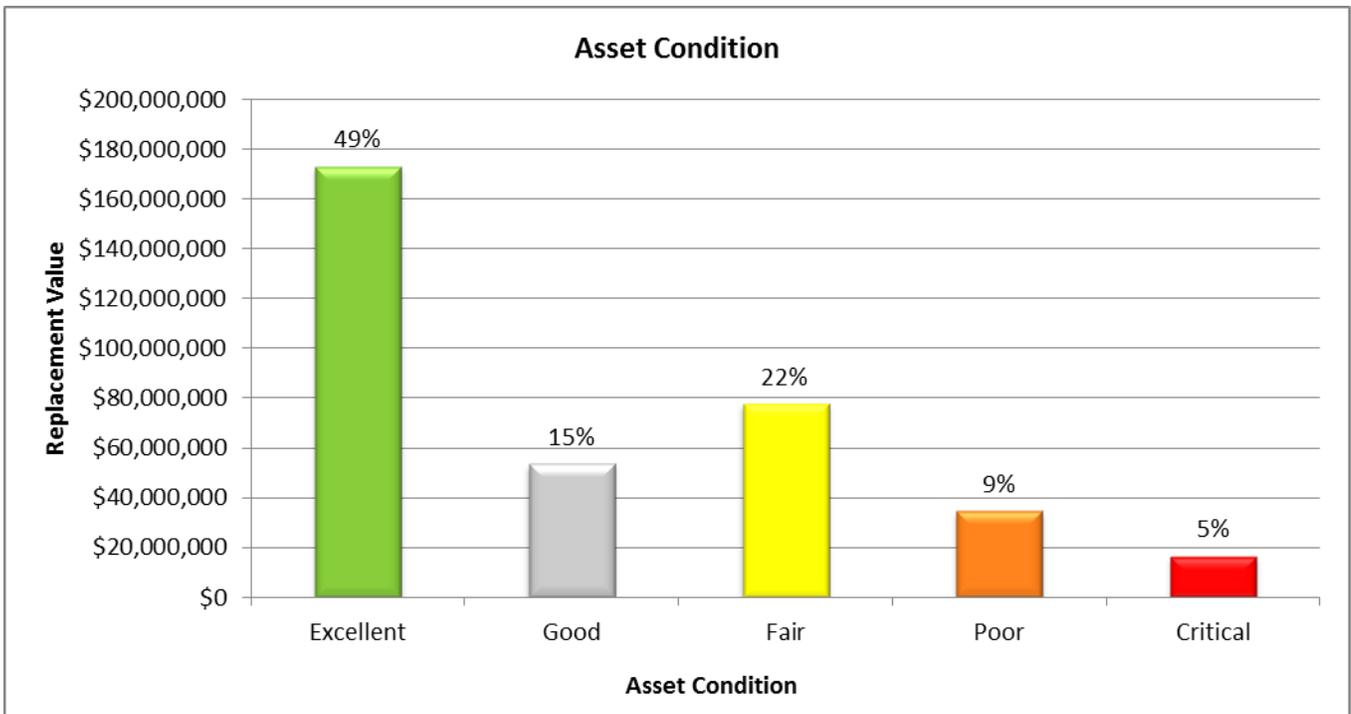
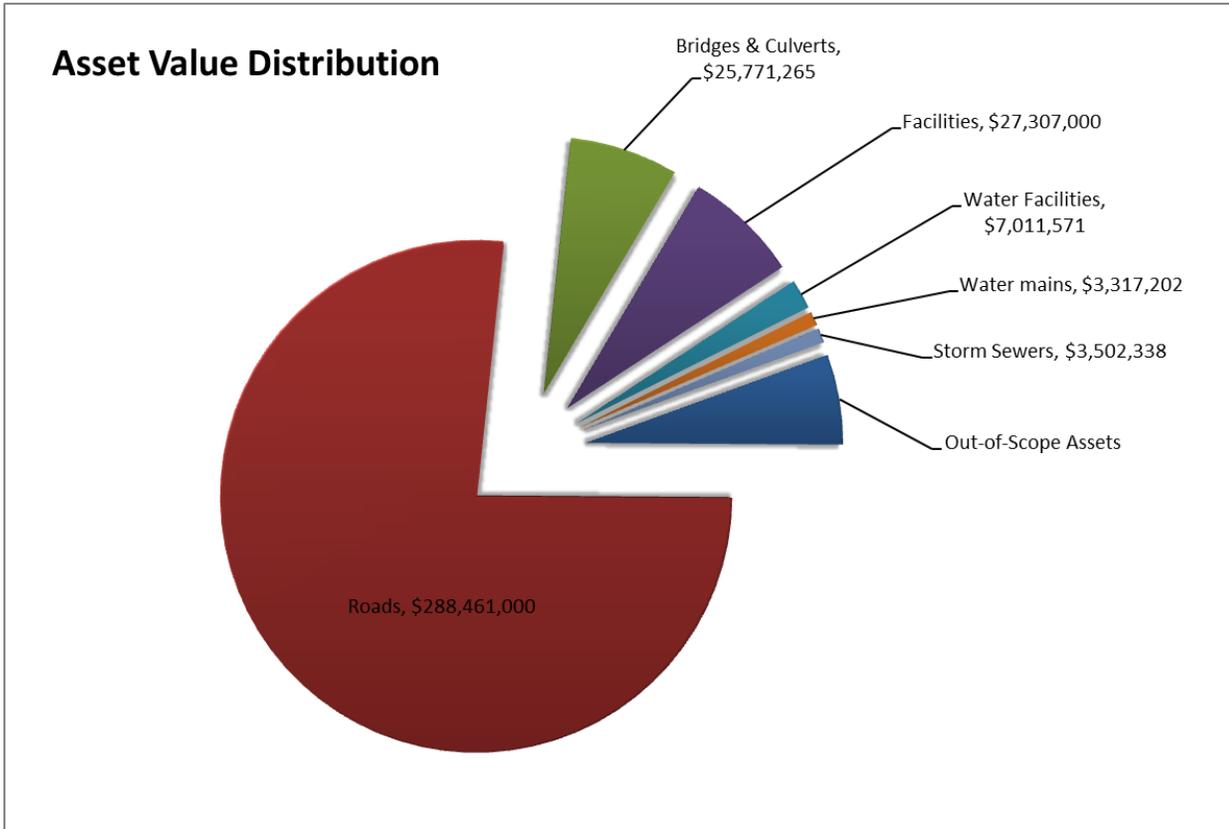
For water assets, there will be sufficient funds to cover capital expenditures through Water User Fees in the short term (10 years) and a shortfall of \$290,000 over 100 years. Future financial plans will continue to monitor and ensure the sustainability of the water assets.

Based on a 10 year forecast and looking at assets on a like for like replacement, the current Municipal Tax Levy is insufficient to finance forecasted expenditures in the short term for tax supported assets. However, strategies such as joint tendering and preventative maintenance are not yet reflected in this plan but are factored when using Cartegraph and developing Capital plans for budgeting. By taking a longer term view, over the next 100 years, the Tax Supported Capital Levy coupled with the use of Reserves is sufficient to finance AMP expenditures.

The Township has taken a proactive approach in addressing infrastructure needs by setting aside reserve funds to minimize deficits and by investing in Cartegraph to better understand asset condition, risk and replacement needs. This strategy positions the Township on a path to sound asset management.

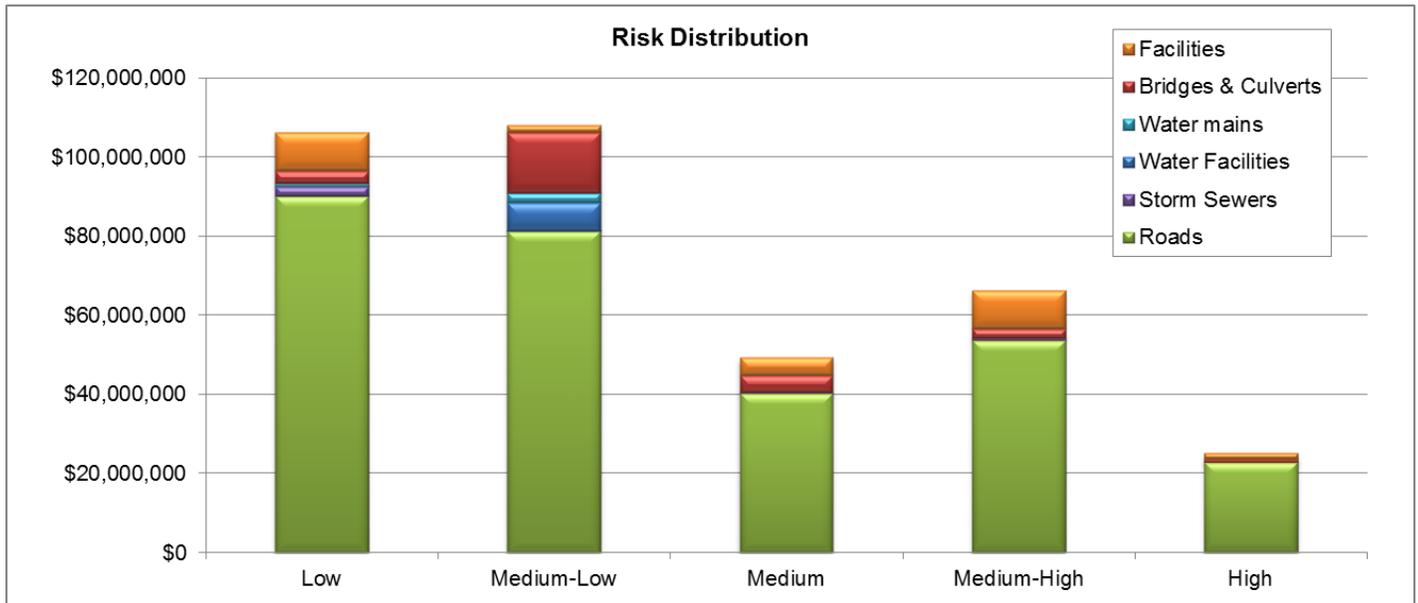
*future references to bridges and culverts also only refer to culverts 3m or greater

Asset Condition



Asset Risk

			Risk Distribution				
	Replacement Cost	Distribution	Low	Medium-Low	Medium	Medium-High	High
Roads	\$288,461,000	81.2%	\$90,163,000	\$81,230,500	\$40,225,000	\$53,832,500	\$23,010,000
Bridges & Culverts	\$25,771,265	7.3%	\$3,099,513	\$15,207,265	\$4,364,063	\$2,396,225	\$704,200
Facilities	\$27,307,000	7.7%	\$9,663,000	\$1,892,000	\$4,535,000	\$9,717,000	\$1,500,000
Water Facilities	\$7,011,571	2.0%	\$0	\$7,011,571	\$0	\$0	\$0
Water mains	\$3,317,202	0.9%	\$807,881	\$2,509,321	\$0	\$0	\$0
Storm Sewers	\$3,502,338	1.0%	\$2,557,666	\$212,809	\$259,353	\$472,510	\$0
Total	\$355,370,376	100%	\$106,291,059	\$108,063,466	\$49,383,416	\$66,418,235	\$25,214,200
% of Total			29.9%	30.4%	13.9%	18.7%	7.1%



1.0 INTRODUCTION

This report represents the Township of South Frontenac's updated Asset Management Plan (AMP), based on current data and information on the Township's transportation, facilities and water infrastructure. The Township intends to continually improve this AMP over the coming years as additional information is collected and as its knowledge of asset condition increases. It is anticipated that at a minimum, the AMP will come for Council approval every 3 years.

The Township of South Frontenac is located in Eastern Ontario in Frontenac County, bounded by the City of Kingston and the Townships of Stone Mills, Tay Valley, Central Frontenac and Rideau Lakes (Figure 1). The Township has a population of 18,100¹ and covers an area of 972 km². Sydenham is the only area in which water servicing is available. Refer to Appendix A for a detailed map of the Township.



Figure 1 – Township of South Frontenac

¹ Statistics Canada. (2012). *Focus on Geography Series, 2011 Census*.

1.1 Provincial Guideline

In 2010, Ontario's Ministry of Infrastructure released a guide titled *Building Together: Guide for Municipal Asset Management Plans*. This guide forms part of a comprehensive strategy called the Municipal Infrastructure Investment Initiative (MIII) intended to develop a cooperative relationship between municipalities and the Province of Ontario to address our deteriorating infrastructure. The Province seeks to achieve standardization and consistency in the management of municipal infrastructure by requiring any municipality applying for provincial capital funding to prepare an AMP that demonstrates the particular need of the project within the social, economic or environmental priorities of the community.

Since the introduction of the *Building Together: Guide for Municipal Asset Management Plans*, many funding agencies are requiring an asset management plan which shows the Townships priorities in order to apply for funding or to use existing funding. Projects must be listed within the asset management plan and must support or reflect that the selected projects are priorities. This includes for example the Federal Gas Tax Program and Ontario Communities Infrastructure Fund, both for its base funding and application based top-up funding.

1.2 Vision for Infrastructure in the Township of South Frontenac

As part of the Township's Official Plan², a Vision Statement was developed to guide the growth of the Township:

"South Frontenac is an amalgamation of communities whose common goals have brought them together for mutual co-operation. The Official Plan provides a framework for directing South Frontenac's growth in a manner which will preserve the Township's environmental integrity while enhancing both its rural character and its long-term economic viability."

Although the Plan was primarily developed to guide new development in the Township, the same principles are also relevant to the management of South Frontenac's infrastructure. The following points highlight some of the key goals and objectives presented in the Official Plan relating to asset management:

- Require adequate and efficient systems of water supply, sanitary sewage disposal, storm drainage and waste disposal to all areas of development in the Township and to co-ordinate development with the Township's ability to provide adequate physical and community services; and

- Provide an efficient and cost-effective transportation network that optimizes the movement of people and goods throughout the Township.

The Township's Strategic Plan³ provides a clear directive to provide high quality services to residents through a series of priorities. One of the guiding principles is to take a long-term perspective to pro-actively plan for future infrastructure. The following priorities provide a vision for the management of the Township's infrastructure and have helped to guide the development of this Plan:

1. Be a catalyst to support and help build vibrant communities.
 - As a first priority, begin by supporting efforts to build vibrant hamlets that are friendly to residents of all ages, sustained by community and economic development, beautification plans, municipal services and facilities, social safety nets, housing options, and appropriate social, recreation and cultural opportunities.
2. Continually improve how the Township conducts its business.
 - Develop an infrastructure master plan to identify and guide where the Township should be going over the long term in terms of water, waste, sewage, gas, Hwy 38, service levels, budget requirements, meeting increasing needs and so on.
 - Continue to enhance practices that help ensure financial responsibility, effective capital asset management, prudent planning, decision-making, transparency and accountability.

1.3 Goals of Asset Management

Asset Management strives to continually improve the Township's infrastructure. The following are a list of goals that asset management programs and processes aim to achieve:

- Optimize life cycle costs (i.e. total operating, maintenance and capital resources) of providing services to residents;
- Reduce risk exposure by ensuring that assets are managed by recognizing the risk that their failure represents to the delivery of services;
- Informed and transparent decision making processes integrating capital expenditures, operating costs and revenue requirements (i.e. rate and tax levels); and
- Mechanisms to ensure that the infrastructure services are delivered at a sustainable and affordable level to residents.

² Township of South Frontenac. (2003). *Official Plan, Updated 2013*

³ Township of South Frontenac. (2015). *Strategic Plan*.

1.4 Scope of Asset Management Plan

This AMP developed for South Frontenac covers a period of 100 years and reports on the following assets owned by the Township:

- Roads;
- Bridges and culverts;
- Facilities;
- Water treatment and storage facilities;
- Water mains and water distribution system appurtenances; and
- Storm sewers.

The Township is responsible for other assets including fleet, sidewalks, street lighting, land, sports fields among others, which will be added to the AMP as data gathered for these assets becomes more complete. The Township does not own any wastewater infrastructure or social housing assets.

1.5 Development of the Asset Management Plan

This AMP was updated by Township staff. The following documents were reviewed and incorporated throughout the development of this AMP:

- Township of South Frontenac Official Plan (2003)
- Township of South Frontenac Strategic Plan
- Municipal Budgets and other Financial Documents
- South Frontenac Township By-Law 2013-30
- O/Reg 239/02 for the Minimum Maintenance Standards for Municipal Highways

The Township's investment in Cartegraph, an asset management system has helped to guide the decisions for roads, bridges and culverts. Information on these assets, including condition, age and value, was sourced from this database. However, currently not all the components provided by Cartegraph are incorporated in this version of the asset management plan. This includes asset preservation and the sub-categorizing of road infrastructure. The current version provides for a like for like replacement and does not incorporate upgrades, improvements or growth.

Water asset information was based on historical records from the Township.

Facilities asset information is primarily based on historical records with replacement values being used from the consultant as initial presentation. On-going discussions with the consultant are taking place to finalize the data received and update the asset management plan.

Storm sewers data is based on useful life along with visual inspections as available.

1.6 Refinement of the AMP

The AMP is continually a work in progress as the Township continues to improve its data and processes in achieving the Township's goals.

Initial data has been included for facilities. However, the full data received from the consultant is still under review and as it is finalized, the data will be updated.

The Township will further improve the data within the asset management plan by better streamlining the output of the Cartegraph data into the AMP document. The intent is to fully integrate the AMP within Cartegraph so that it fully provides the data and statistics within the AMP.

It is also the intent to incorporate other assets such as vehicles, equipment, sidewalks, and streetlights for example.

The Township will develop an Implementation Strategy that will improve subsequent iterations of the AMP.

2.0 STATE OF INFRASTRUCTURE

This section summarizes the state of the Township's infrastructure, including:

- Inventory of all assets;
- Value of the assets; and
- Risk assessment, based on probability of failure and consequence of failure.

2.1 Asset Inventory

The asset inventory for South Frontenac includes transportation assets (roads, bridges and culverts), facilities, water assets (water treatment plant, storage, facility, and water mains), and storm sewers.

Table 1 provides a summary of the assets included in the scope of this study. Other assets including fleet, sidewalks, street lighting, land and other equipment will be added to the asset management inventory over the coming years as additional information is collected and as knowledge of the condition of assets increases.

Table 1 – Inventory of Assets

Asset Class	Inventory
Roads	804 km
Bridges & Culverts	60
Water Mains	6.4 km
Storm Sewers	7.9 km
Facilities	40

2.2 Asset Value

Asset value was based on both historical costs and typical unit costs provided by the Township, detailed in Appendix B. Asset valuation is summarized in Table 2.

Table 2 – Value of Assets by Asset Class

Asset Class	Replacement Cost	Distribution
Roads	\$288,461,000	81%
Bridges & Culverts	\$25,771,265	7%
Facilities	\$27,307,000	8%
Water Facilities	\$7,011,571	2%
Water mains	\$3,317,202	1%
Storm Sewers	\$3,502,338	1%
Total	\$355,370,376	100%

The Township currently owns and operates \$355 million of transportation, facilities and water assets. Roads represent 81% of the total value of the Township's in-scope assets, followed by

facilities (8%) and bridges & culverts (7%). A graphical depiction of asset distribution is shown in Figure 2. Out of scope assets are estimated 6% or \$21 million which includes for example, rolling stock.

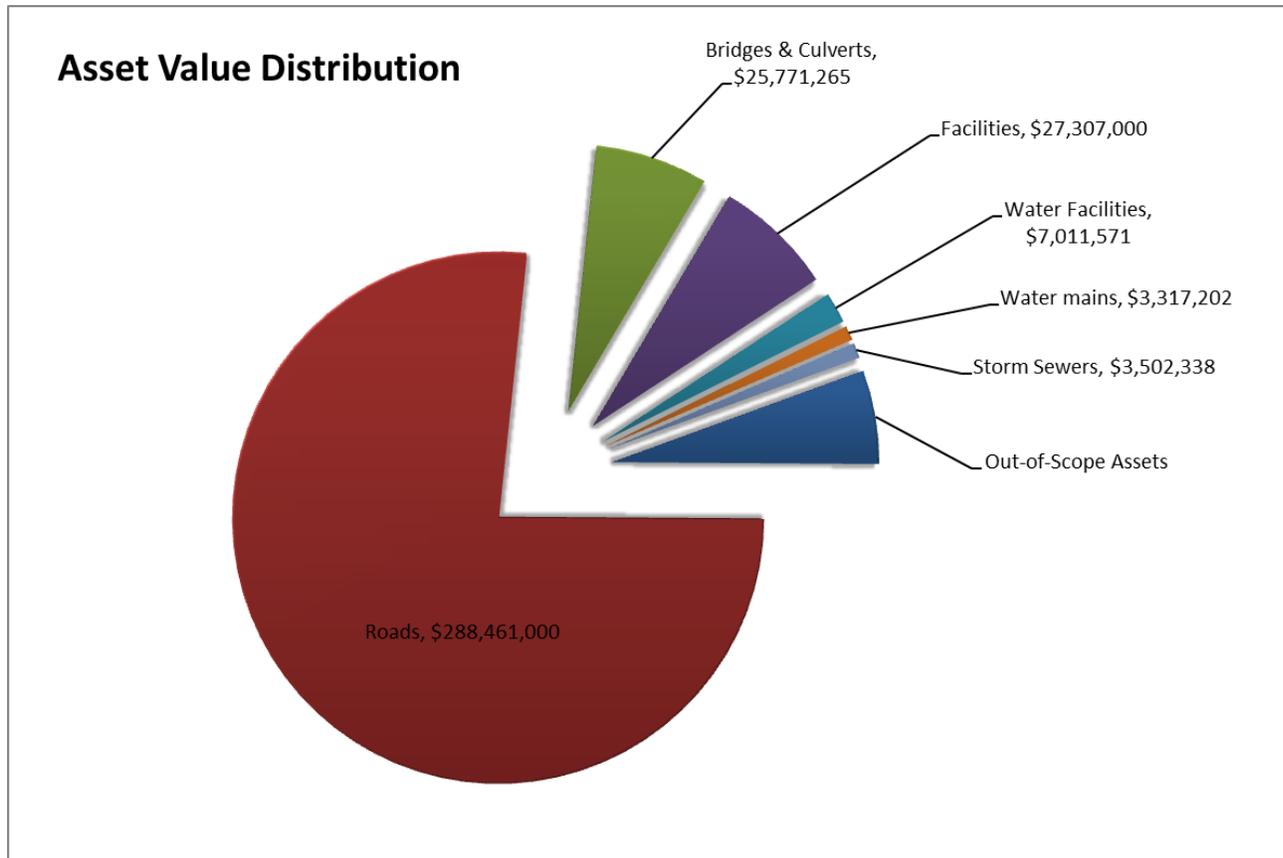


Figure 2 – Asset Replacement Value Distribution

Note that the Township is responsible for other assets that were not included in the AMP but will be incorporated in future updates to the plan as more information is gathered. Total replacement value of these assets is unknown at this time.

2.3 Asset Condition

Understanding the condition of the Township's assets is an essential component in an AMP. Ideally, condition information is based on assessment activities that provide first-hand knowledge of the infrastructure. Condition information was available for transportation assets, and storm sewers in South Frontenac. Water assets are relatively new, and more information will be collected over time as inspections are conducted. Both water assets and facilities use historical information to estimate a condition rating.

2.3.1 Transportation and Stormwater Assets

Actual condition information was available for roads, bridges and culverts, and storm sewers in South Frontenac. The Township tracks transportation assets using Cartegraph, including asset condition, historical and current value, and location. Asset condition for roads was based on the Overall Condition Index (OCI) evaluated during the road inspections conducted in 2015. Asset condition for bridges and culverts was based on the Bridge Condition Index (BCI) from the most recent Ontario Structure Inspection Manual (OSIM) reports from inspections conducted in 2015. Asset condition for storm sewers was based on structural grade evaluated during sewer inspections conducted in 2013 and 2015. Appendix B details how the condition assessment information for these asset types was converted to a condition score.

2.3.2 Water Assets

Condition information was not available for the water treatment plant, the water storage facility or water mains. Therefore, asset condition was estimated by evaluating the amount of useful life remaining. The water treatment plant, storage tower and water mains were all constructed in 2005 with plant upgrades completed in 2010. The amount of useful life remaining was based on present age and typical useful life, summarized in Table 3. All of these assets were found to have over 75% of useful life remaining; therefore, it was assumed that they are all in excellent condition.

Table 3 - Estimated Condition Based on Useful Life Remaining

Asset Description	Year Constructed	Typical Useful Life (Years)	Percent of Useful Life Remaining	Estimated Condition
Raw Water Intake	2005	100	89%	Excellent
Elevated Water Storage Tower	2005	100	89%	Excellent
Treatment Plant	2005	50	78%	Excellent
Plant Upgrades (UV & GAC contactors)	2010	25	76%	Excellent
Water Mains	2005	100	89%	Excellent

This approach provides sufficient condition information for analysis, and can be updated as knowledge of these assets increases.

2.3.3 Asset Condition Summary

Table 4 summarizes the condition of the Township’s infrastructure. Approximately \$16 million worth of assets are nearing the end of their useful life and are considered in critical condition.

Table 4 – Value of Assets by Condition Score

Condition Score	Replacement Cost	% of Total Assets
Excellent	\$172,990,143	49%
Good	\$53,421,106	15%
Fair	\$77,744,634	22%
Poor	\$34,657,331	10%
Critical	\$16,557,162	5%
Total	\$307,385,082	100%

Approximately 15% of assets are in poor or critical condition. Figure 3 shows the value distribution of assets by condition graphically. Assets in critical and poor condition include a portion of the roads, bridges and culverts, and storm sewers.

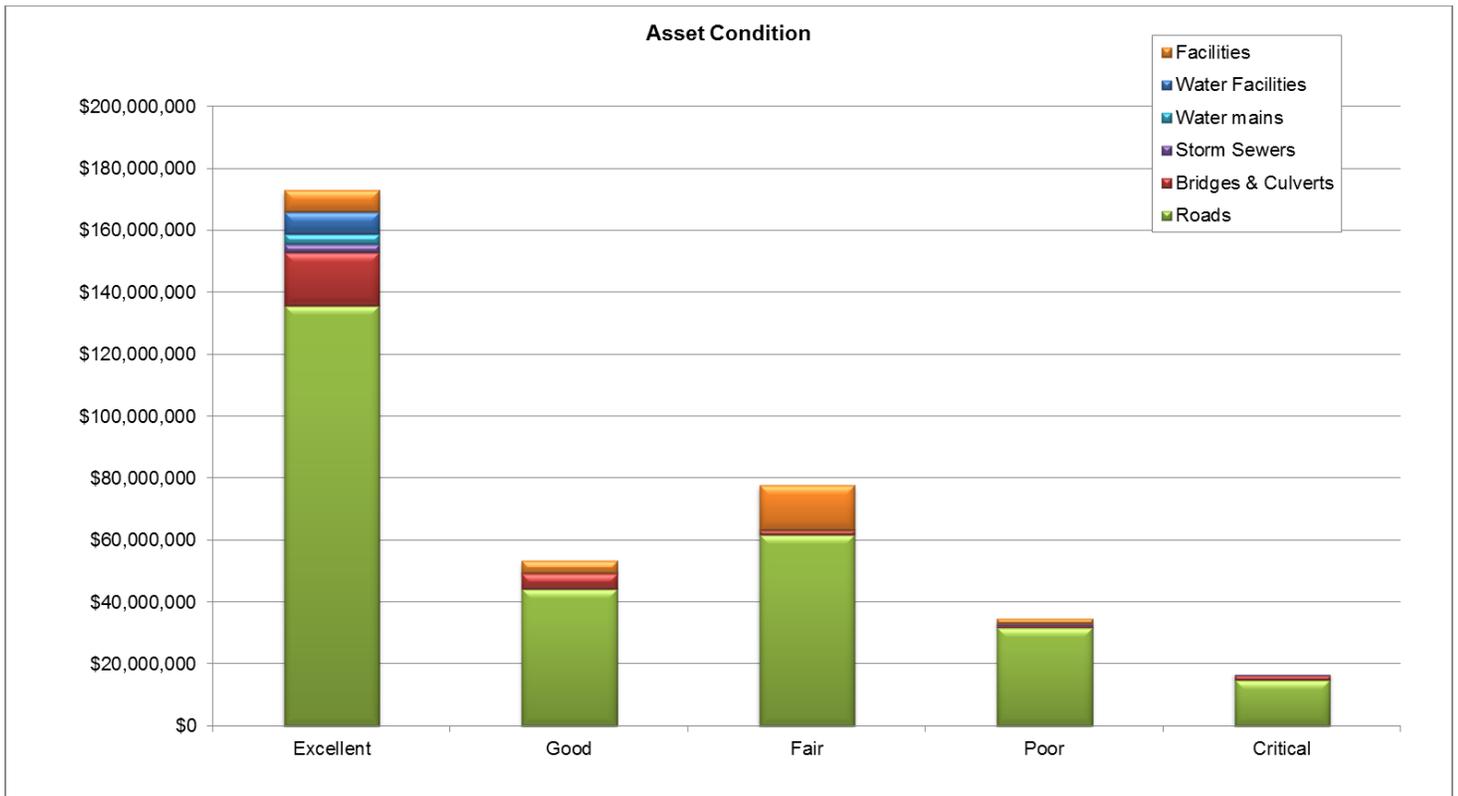


Figure 3 – Distribution of Asset Condition

2.4 Asset Risk

The state of infrastructure is not only defined by its physical condition but also by its function and the consequence of failure. To achieve a better understanding of the Township's needs, a risk score was calculated for each asset. For example, an asset with a low consequence of failure can be managed such that it remains in the listing of priorities but is ranked accordingly. However, assets that have a high consequence of failure should be managed in a proactive manner. For the purposes of this AMP report, risk was defined as the product of the probability of failure and the consequence of failure, with additional consideration for Health and Safety risk.

The Township currently tracks risk of transportation assets through Cartegraph. The system incorporates parameters to evaluate the condition of assets and includes a preventative strategy to extend the life of assets, such as crack sealing, microsurfacing, seal coats and ultrathin overlay. It also considers related assets including sidewalks and storm sewers in planning replacement work. The Township will continue to optimize the strategy used in this system to extend useful life of assets and employ a preventative maintenance strategy.

The chart below provides an overview of the benefits of preventative maintenance strategies where the life of an asset is extended beyond its original useful life.

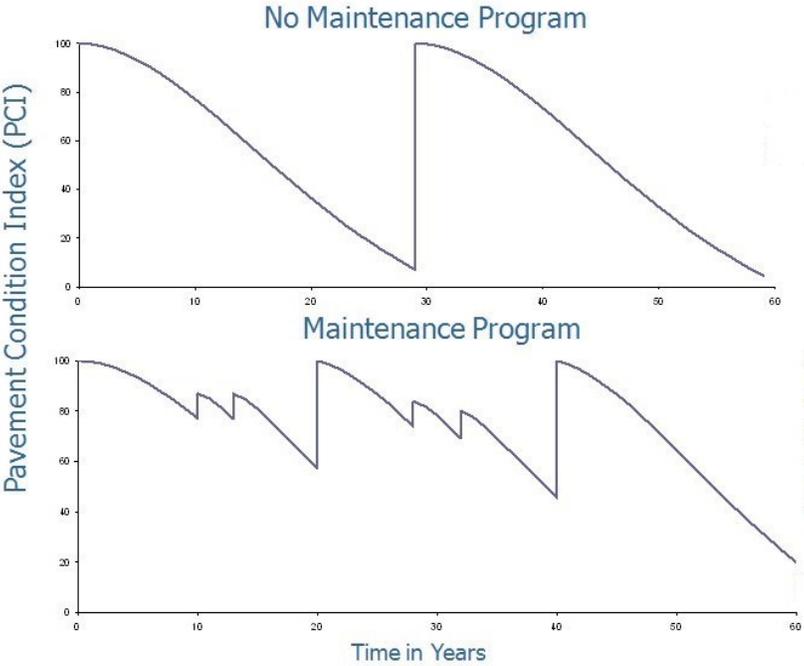


Figure 4 – Preventative Maintenance Impact

⁴ <http://www.canadainfrastructure.ca/en/>

2.4.1 Probability of Failure

A probability of failure score was given to each asset based on the condition rating in Section 2.3. The probability of an asset failing is not necessarily indicative of its age (e.g. some newer water mains can fail more frequently than older water mains due to their production methods), and inspections where available are used to assess its condition. Where inspections aren't available, age and remaining useful life is considered. This can also be addressed in future updates of the AMP in trying to build a database that tracks failure history of assets. Table 5 summarizes the probability of failure score that was assigned to each asset based on the estimate of its physical condition and age.

Table 5 – Probability of Failure Score

Estimated Condition	Probability of Failure Description	Probability of Failure Score
Excellent	Improbable	1
Good	Unlikely	2
Fair	Possible	3
Poor	Likely	4
Critical	Highly Probable	5

2.4.2 Consequence of Failure

The consequence of failure score for each asset was based on a review of information that was provided by the Township, such as:

- Size/capacity/cost of the asset;
- Location of the asset;
- The use of the asset; and
- The importance of the asset to the operation of the system/facility.

Table 6 summarizes the approach used to establish consequence of failure scores.

Table 6 – Consequence of Failure Score Information

Consequence of Failure Description	Consequence of Failure Score
Very low measurable effect of any kind	1
Low/ seldom/marginal impact on the function, serviceability, or capacity of the asset and (or) effect on public safety and the environment	2
Moderate/ regular impact on the function, serviceability, or capacity of the asset and (or) effect on public safety and the environment	3
Major/ regular impact on the function, serviceability, or capacity of the asset and (or) effect on public safety and the environment	4
Catastrophic loss of infrastructure affecting public safety or having severe environmental consequences.	5

Roads were assigned consequence of failure scores based on the type of road. Arterial roads were given a score of 5, collector roads were given a score of 4, and local roads were given a score of 3.

Bridges and culverts located along arterial roads were given a higher score than those along local and collector roads.

The water treatment plant was assigned a score of 5 as failure at the plant would affect water quality in the distribution system and a treated water supply would not be available. Refer to Appendix B for further detail.

2.4.3 Risk Assessment

A risk score between 1 and 25 was calculated for each asset by multiplying consequence of failure scores and probability of failure scores. A third factor, *Health & Safety Risk*, was also considered. Assets with known safety risks were noted and given higher priority for replacement. This could include consideration for roads with high pedestrian traffic where no sidewalks exist, and roads with high vehicle collisions counts due to poor sightlines, among others. The Township will continue to update this rating as priority areas become known.

A risk category was established for each asset based on risk score. Figure 5 summarizes the process that was used to categorize risk score into the following categories:

- 1 - 3 represents low level risk;
- 4 - 6 represents medium-low level risk;
- 8 - 9 represents medium level risk;
- 10 - 15 represents medium-high level risk;
- 16 - 25 represents a high level of risk.

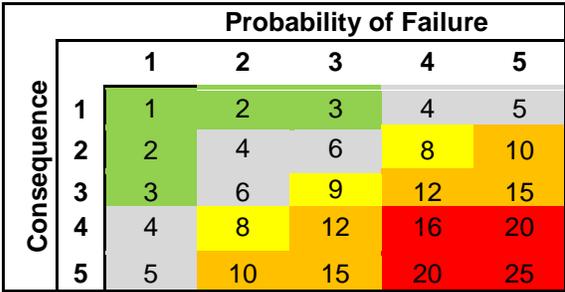


Figure 5 – Risk Matrix

Table 7 summarizes the risk scores of the assets in the Township. Approximately 7% (\$25 million) of assets have a high level of risk. Another 19% (\$66 million) of the Township’s assets have a risk score of medium-high.

Table 7 - Risk Score by Asset Value

Risk	Replacement Cost	% of Assets
Low	\$106,291,059	30%
Medium-Low	\$108,063,466	30%
Medium	\$49,383,416	14%
Medium-High	\$66,418,235	19%
High	\$25,214,200	7%
Total	\$355,370,376	100%

High risk assets should be addressed in the near term (5 years) to reduce the risk exposure to the Township and medium-high risk assets should be addressed in the short term (5-10 years). Some assets may require early upgrading if health and safety factors pose a risk. Similarly, the Township may be able to delay the replacement of other assets if a higher level of risk can be accepted. The Township will consider a number of factors when prioritizing asset replacement and upgrades.

Section 4 of this report describes the Asset Management Strategy suggested for addressing assets that represent elevated levels of risk. Risk distribution is summarized in Figure 6.

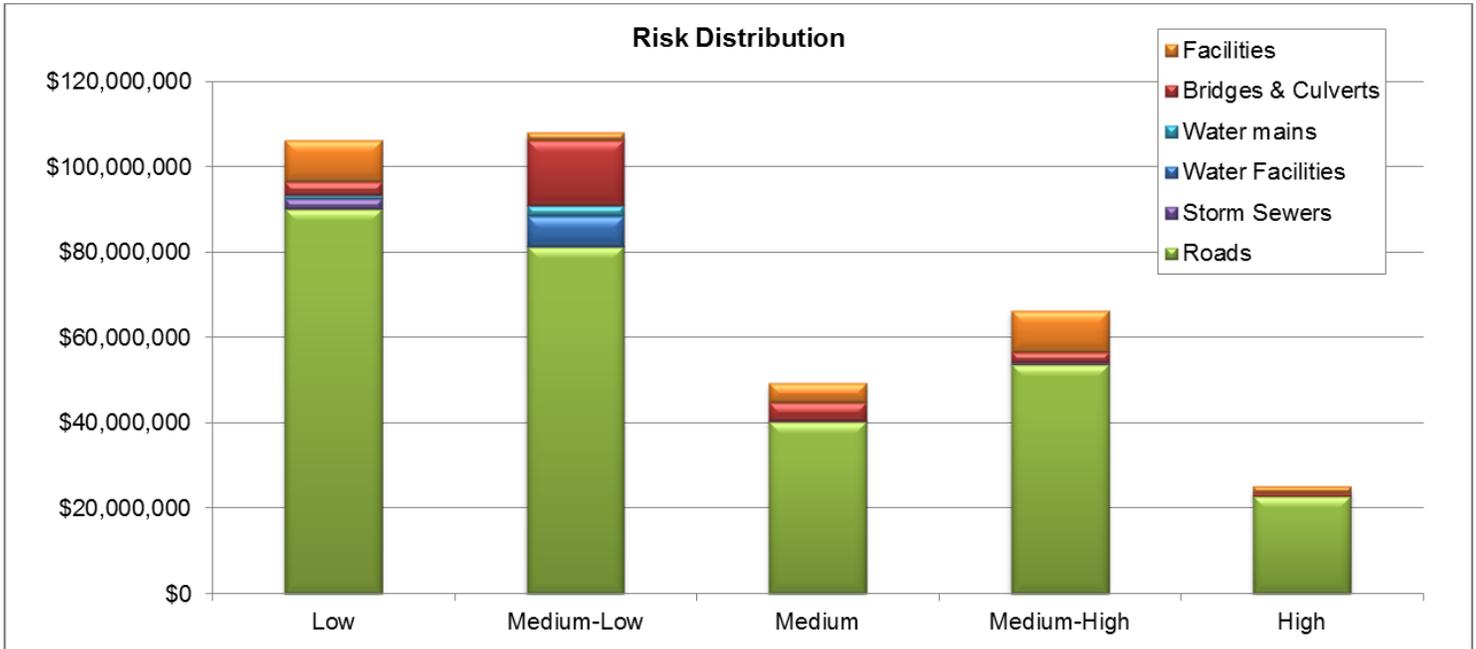


Figure 6 – Distribution of Asset Risk

2.5 Refinements by Township Staff

The condition, consequence of failure, and risk scores were reviewed with Township staff who utilized their knowledge of the Township’s infrastructure to refine the scores as much as possible. The Township recognizes that the general approach and individual risk scores for each asset will continue to be refined over the coming years as more information becomes available.

3.0 LEVELS OF SERVICE

A “level of service” is a term that is used to describe *how much* of a service is being provided or *the quality* of a service that is being provided. In the context of asset management, levels of service are established as a way to guide the management of infrastructure in a manner that aims to achieve a level of service goal.

Levels of service in townships can vary widely related to finances, federal/provincial regulations, customer expectations, and/or corporate vision. In terms of Township infrastructure, the services provided are especially related to operation and maintenance cost and/or development and growth consideration. This section of the AMP gives an overview of service levels based on the Township’s existing documentation and current infrastructure management practices. The levels of service are often informal and undocumented.

3.1 Condition Levels of Service

The most basic level of service is to maintain infrastructure in an acceptable state of repair and minimize the risk exposure of the Township to an acceptable level. The capital works planning process usually addresses the infrastructure that is in the worst state of repair along with the highest risk meaning it would result in significant consequences if it were to fail, based on coordination among department managers and Council. The current capital planning process used by the Township does represent a risk-based approach to managing infrastructure and this AMP provides a high level summary of this process.

3.2 Capacity Levels of Service

Provincial policies and regulations define some minimum levels of service for water and transportation, including Ontario Regulation 239/02 (Minimum Maintenance Standards for Municipal Highways)⁵ and Ontario Regulation 170/03 (Drinking Water Systems)⁶. Similar to most municipalities in Ontario, a comprehensive set of service levels to support more intensive asset management activities has not yet been prepared.

⁵ http://www.e-laws.gov.on.ca/html/reg/english/elaws_regs_020239_e.htm

⁶ http://www.e-laws.gov.on.ca/html/reg/english/elaws_regs_030170_e.htm

3.3 Existing Levels of Service

The primary resource to help define service levels was Ontario regulations. Majority of the levels of service documented are informal and are based on discussions with Township staff. These can be revisited and expanded upon as part of the AMP refinement process in the future.

3.3.1 Township Official Plan

The Official Plan provides some direction on the levels of services of the asset groups in the Township at a strategic level, based on the economic, social and environmental considerations for growth in the Township. Section 4.0 of the Official Plan lays out general goals and objectives related to servicing and transportation. This translates to a general level of service requiring adequate, efficient and cost effective services and transportation throughout the Township. The Official Plan does not document specific service targets or criteria.

3.3.2 Documented Service Levels

The Township strives towards to Ontario Regulation 239/02 which sets minimum standards of repair for roads and bridges under municipal jurisdiction. Through Cartegraph, the Township tracks and assesses their transportation assets and has a preventative strategy in place with an overall road overall condition index target of 70. This encompasses the Township's desired level of service for road assets through a decision making process which considers road class, surface type, and roadside environment.

At this time, the Township does not have documented levels of service for storm sewers, facilities, water mains or water treatment facilities. Table 8 provides a set of typical service levels and performance metrics that the Township can consider in future updates of its AMP . A sample for facilities will also be provided in the next version of the AMP.

Table 8 – Typical Service Levels and Performance Metrics for Small Municipalities

Department	Typical Levels of Service	Suggested Performance Metric
Water Mains & Water Facilities	<ol style="list-style-type: none"> 1. Provide services to Settlement Areas to accommodate growth on a cost recovery basis 2. Water system designed for maximum day + fire flow or maximum hour; Normal operating pressure between 350 to 480 kPa, 280 kPa to 700 kPa is allowable 3. Services at least 19 mm; Water mains at least 150 mm in diameter 4. Meet all regulated drinking water quality targets 	<ol style="list-style-type: none"> 1. Number of development applications that are delayed due to a lack of adequate water infrastructure 2. Locations with inadequate pressure or flows confirmed through hydraulic modeling or field testing 3. Locations with inadequate infrastructure (small mains or services) 4. Number of times the regulated drinking water quality targets are not achieved 5. Number of customer complaints
Storm Sewers	<ol style="list-style-type: none"> 1. Provide services to Settlement Areas to accommodate growth on a cost recovery basis 2. Level of protection established based on nature of area drained (risk/loss/damage of life/property): Major system - overland flooding less than 150 mm during 100 year event; Minor system – 5 year storm, 10 year storm in select high value commercial area; Culverts, major sewers designed for the 25 to 50 year depending on road classification; 50 year storm for overland flow, some flooding permitted to below depth of 100 mm. 3. Discourage the use of small isolated wet ponds with no environmental or aesthetic or recreational benefit 	<ol style="list-style-type: none"> 1. Number of development applications that are delayed due to a lack of adequate storm water infrastructure 2. Number of locations where infrastructure does not meet protection target 3. Number of resident complaints
Roads & Bridges	<ol style="list-style-type: none"> 1. Provide services to Settlement Areas to accommodate growth on a cost recovery basis 2. Level of Service D on all roads in peak hour 3. Urban Arterial roads have bike lanes and transit 4. Sidewalks on two sides of urban arterial and residential collector, one side on all other urban roads. 5. All new roads are paved 6. Concrete curb & gutter (and storm sewer) on all urban roads 7. Volume to capacity ratios should not exceed 0.85 to 1 at intersections 8. Provide maintenance standards in accordance with O/Reg 239/02 	<ol style="list-style-type: none"> 1. Number of development applications that are delayed 2. Number of roads less than level of service D during peak hour 3. Number of urban arterial roads with bike lanes and transit services 4. Number of roads that meet sidewalk level of service 5. Number of roads that are currently gravel that should be paved 6. Number of roads that do not meet curb/gutter/storm sewer level of service 7. Number of intersections that do not meet capacity level of service 8. Number of times road maintenance is not in accordance with O/Reg 239/02 9. Number of user complaints

4.0 ASSET MANAGEMENT STRATEGY

4.1 Asset Management Strategy Overview

The asset management strategy component of the AMP represents the set of planned activities to ensure that the state of the infrastructure achieves the level of service goals. The strategy is generally related to optimizing decisions with respect to:

- The replacement or rehabilitation of assets;
- The optimal level of maintenance investment required to minimize the long term costs of the assets (i.e. does more maintenance result in a longer useful life?);
- Disposing of assets that are not required to meet service levels; and
- Addressing Township policies that impact the infrastructure intervention that is used (i.e. does the asset size/design need to change to meet a certain policy).

4.2 Managing Risk

This AMP establishes the management of risk as the primary method for developing an asset management strategy. This strategy is to prioritize the renewal of infrastructure that represents a high risk to the Township. However, these priorities are also adjusted or shifted for financial efficiencies, to create capacity, optimize asset life, as well as external influences. This risk management strategy develops a renewal plan that is based on addressing the highest risk assets first according to the risk categories that were established in Section 2 of this report.

The renewal of assets in the short term should be prioritized primarily based on risk. High risk assets should be replaced in the next 5 years (between 2018 and 2021), and medium-high risk assets should be replaced in the next ten years (between 2022 and 2026). To quantify the replacement value in each individual year, a random value in the corresponding replacement year period was generated for each asset. Medium, medium-low, and low risk assets should be replaced according to their remaining expected useful life over the long term (next 100 years). This strategy is summarized in Table 9.

Table 9 – Renewal Strategy based on Risk

Risk Category	Risk Score	Replacement Term	Replacement Year
High	16 – 25	Near Term (next 5 years)	2017 – 2021
Medium-High	10 – 15	Short Term (next 5-10 years)	2022 – 2026
Medium Medium-Low Low	7 – 9 4 – 6 1 – 3	Long Term - regular planned renewal based on condition, age of asset and expected useful life or when asset reaches a higher risk level (i.e. probability or consequence of failure increases)	

The strategy to prioritize the renewal of infrastructure that represents a high risk to the Township should be continued and expanded. The Township should continue to consider other factors when prioritizing asset replacement, such as health and safety, accessibility, complimentary asset replacement (road reconstruction, storm sewer and water main replacement at the same time) as well as upgrades/improvements including intersections, public safety, growth or capacity related demands (traffic volumes and developments). The replacement strategy established through Cartegraph that the Township currently uses for roads considers complimentary asset replacement to optimize use of resources and minimize disruption to the community. Appendix C provides the sample decision tree for road segments.

Figure 6 illustrates 10 year capital investment needs for the Township’s infrastructure using the risk-based asset management strategy. Over the next ten years, the Township should spend an average of \$9.1 million per year to address the infrastructure needs (in constant 2016 dollars).

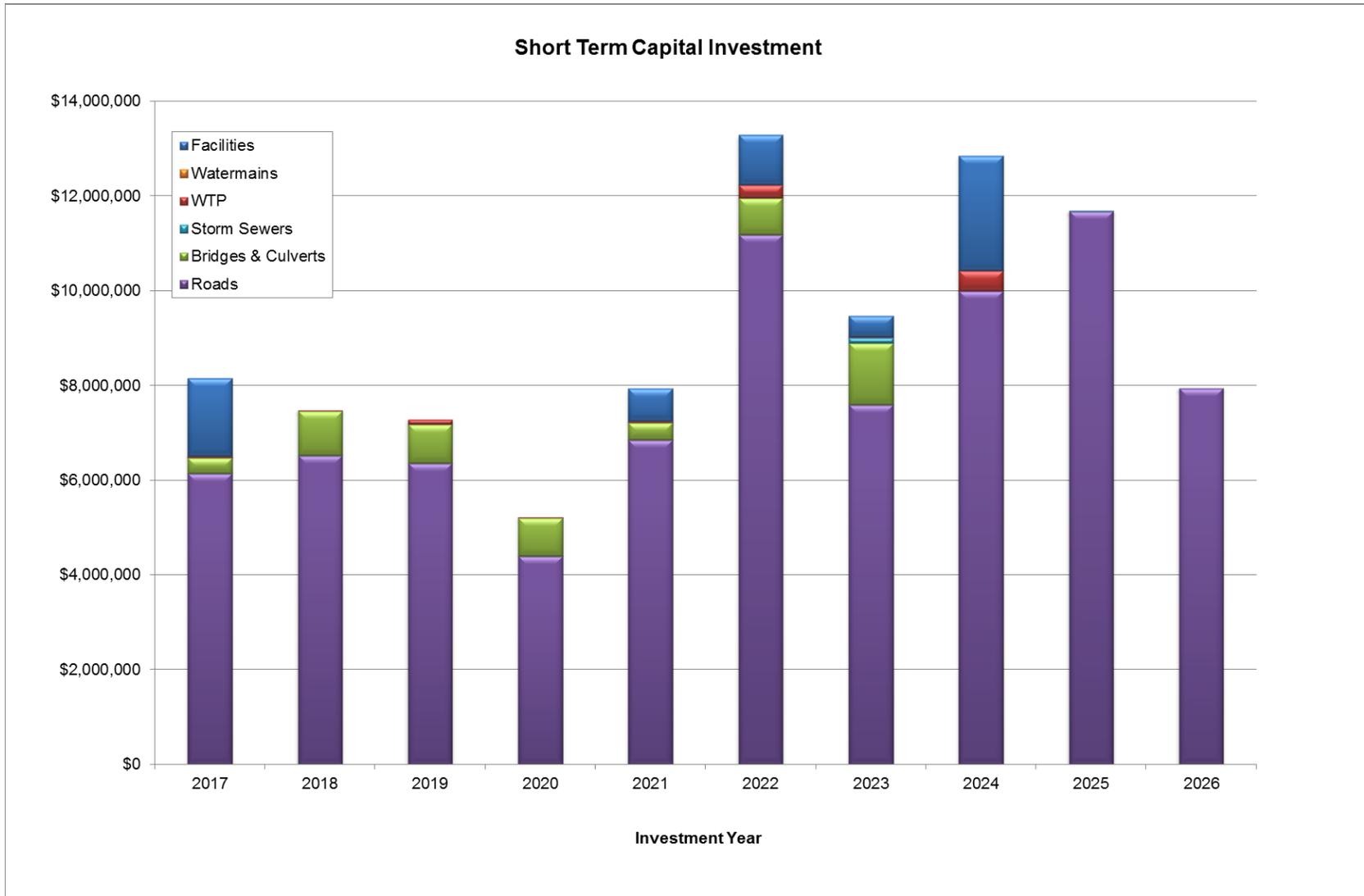


Figure 7 – 10 Year Capital Investment Needs

4.3 Long Term Infrastructure Capital Investment Needs

Long-term investment over the next 100 years must be considered to plan for replacement of assets with longer life cycles. Buried infrastructure such as storm sewers and water mains are expected to have a useful life of 80 – 100 years, and may last even longer. Similarly, newly constructed water facilities have expected useful lives of 100 years. In order to capture replacement of all assets the full life cycle period must be considered.

Long-term investment associated with replacement needs for first, second, and third replacements over the next 100 years were based on condition, age and remaining useful life.

For example, culverts are assumed to have a useful life of 50 years. A culvert that was constructed in 1995 has 58% of its useful life remaining, or 29 years (more than half its useful life). The first replacement of this bridge should be scheduled for 2045. The second replacement would occur in 2095. The third replacement would occur in 2145, beyond the study scope. Further, where condition information is available, the replacement schedule is adjusted based on current condition.

Figure 7 provides the long term capital investment needs for the renewal of the Township's existing infrastructure based on a strategic review of the replacement cost and theoretical useful life of each asset.

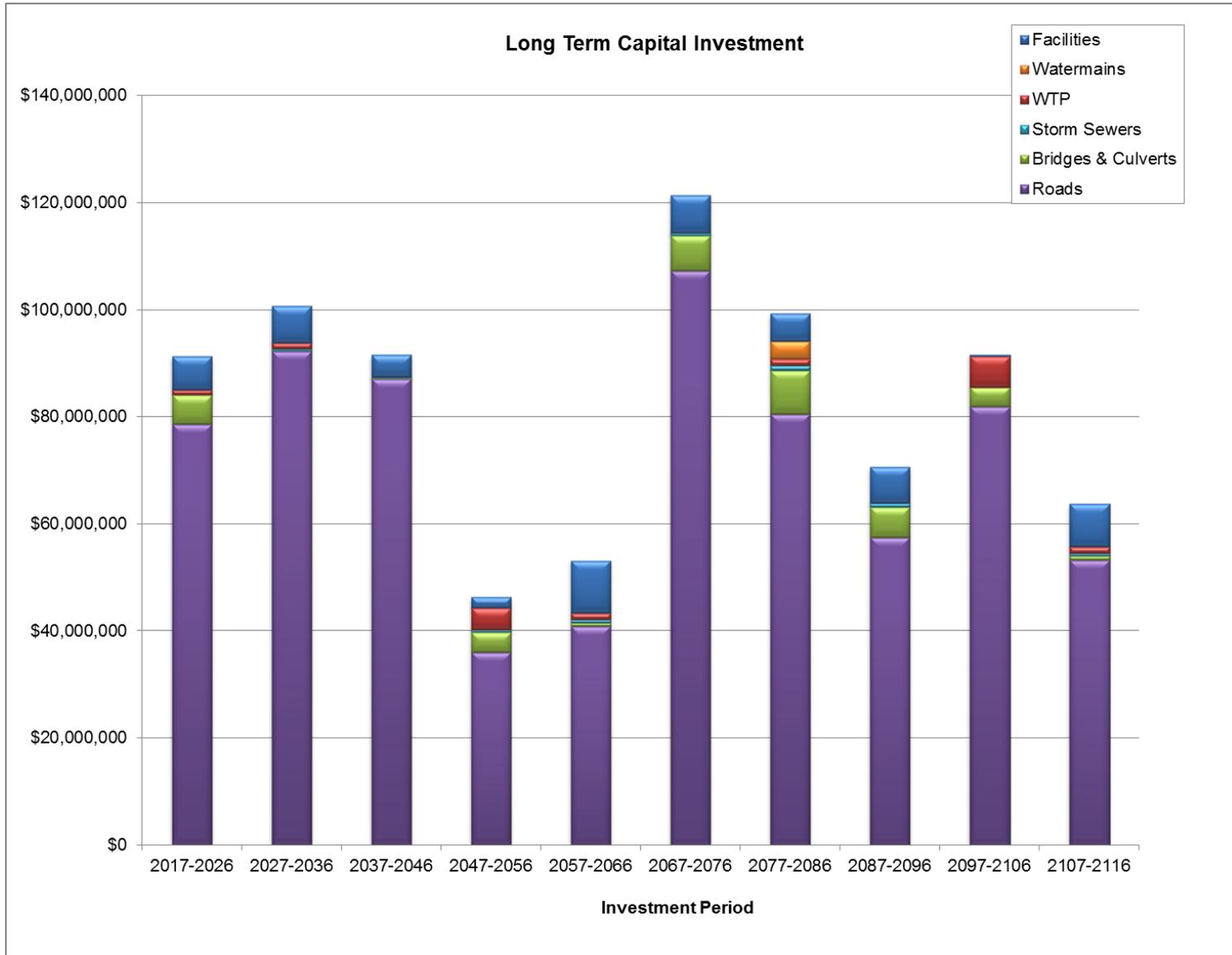


Figure 8 – 100 Year Capital Investment Needs

Based on this review, the existing in-scope infrastructure needs are approximately \$8.3 million per year (in constant 2016 dollars), to be sustained using this strategic approach. This represents an overall lifecycle cost of approximately 3% on top of routine O&M costs, which usually are in the range of 3-5% for municipal infrastructure.

Over the coming years, the Township will continually review the infrastructure needs as more information becomes available and as technological improvements reduce the cost of renewing infrastructure.

4.4 Asset Management Strategies to Reduce Infrastructure Costs

The Township intends to continue advancing its asset management practices over the next several years. The infrastructure needs presented in Figure 6 and Figure 7 are based on the assumption that the Township will replace existing infrastructure with an identical asset and therefore uses replacement costs indicated. As previously mentioned, currently the AMP does not reflect other strategies currently being used such as preventative maintenance strategies and partnerships with neighboring municipalities. It is the Township's intent to update future versions with the inclusion of these strategies and their impact. Currently condition would be the primary data that would reflect the impact of the strategies.

Further, it may be feasible to replace infrastructure at a lower cost by using alternative procurement methods, new technologies, or rehabilitating the existing assets. The following is a list of strategies that the Township will continue to consider and improve upon to reduce the costs of addressing the immediate infrastructure needs:

- Review the potential cost savings of multi-year contracts to renew infrastructure (i.e. road resurfacing, water main replacement, etc.);
- Review operational practices to seek optimization of current assets.
- Including interrelated assets when assessing a construction project

5.0 FINANCING STRATEGY

The financing strategy is the final component of the AMP and provides the plan to move forward. For the purposes of this report, it was assumed that all expenditures are in 2016 dollars, levies will be maintained in future years, and assets are replaced at the end of their useful life. This strategy does not account for inflation; typical increases and adjustments to address inflation are still required.

5.1 Sources of Funding

The Township of South Frontenac provides funding for assets through two sources of revenue: Water User Fees and Municipal Tax Levy. Further, assets are also funded through existing reserves. The financing strategy supports this method of operating by addressing Water and other assets separately. Note that this financing strategy assumes zero change to the existing funding received through senior government programs, including the Federal Gas Tax.

In 2012, South Frontenac approved a 1% tax levy increase, compounded yearly, which goes into the Asset Investment Reserve. This strategy is a proactive way to deal with infrastructure deficit, and is a best practice recommended by all regulatory agencies. This will help to offset capital expenditures for tax supported assets.

5.2 Short Term Financing Strategy

5.2.1 Water Assets

The water treatment plant, water storage facility and water mains were constructed in the past 10 years; as such, these assets are not expected to require major capital replacement in the short term. Utilities Kingston operates the facility and has developed a short term capital investment forecast for the next 10 years. This forecast has been included in short term expenditures.

The Township is currently in a position of deficit from accumulated depreciation of the water treatment plant and water mains constructed in 2005. In 2014, The Township implemented a rate change which in the last 3 years has already reduced the deficit. The Revenues and Capital Expenditures for water infrastructure over the next 10 years are displayed in Table 11.

Table 10 – Short Term Capital Expenditures (Water Assets)

Year	Opening Balance	Expenditures	Capital Levy	Ending Balance
2017	451,920	26,300	165,949	591,569
2018	591,569	31,680	166,298	726,187
2019	726,187	3,500	166,626	889,314
2020	889,314	11,860	166,931	1,044,385
2021	1,044,385	110,500	167,213	1,101,098
2022	1,101,098	10,000	167,213	1,258,311
2023	1,258,311	29,830	167,213	1,395,693
2024	1,395,693	275,500	167,213	1,287,406
2025	1,287,406	23,500	167,213	1,431,119
2026	1,431,119	436,000	167,213	1,162,332
Total		958,670		

This table illustrates that over the course of the next 10 years, the current proposed Water Capital Levy is sufficient to finance the Asset Management Plan expenditures. The surplus at the end of 2025 will be used to finance future year's expenditures.

5.2.2 Tax Supported Assets

Tax supported infrastructure includes roads, bridges, culverts and storm sewers. The Revenues and Capital Expenditures for tax supported infrastructure over the next 10 years are displayed in Table 12.

Table 11 – Short Term Capital Expenditures (Tax Supported Assets)

Year	Opening Balance	Expenditures	Tax Levy	Reserves & Funding	Ending Balance
2017	739,314	6,477,000	4,205,339	1,294,661	-237,686
2018	-237,686	7,463,500	4,415,606	1,359,394	-1,926,186
2019	-1,926,186	7,177,025	4,636,386	1,427,364	-3,039,461
2020	-3,039,461	5,199,175	4,868,205	1,498,732	-1,871,699
2021	-1,871,699	7,219,600	5,111,615	1,573,669	-2,406,015
2022	-2,406,015	11,963,500	5,367,196	1,652,352	-7,349,967
2023	-7,349,967	9,009,366	5,635,556	1,734,970	-8,988,807
2024	-8,988,807	9,997,500	5,917,334	1,821,719	-11,247,254
2025	-11,247,254	11,674,408	6,213,201	1,912,805	-14,795,656
2026	-14,795,656	7,935,000	6,523,861	2,008,445	-14,198,350
TOTAL		84,116,074			

Over the course of the next 10 years the current Tax Supported Capital Levy is insufficient to finance the Asset Management Plan expenditures. At the end of 2026 there is a deficit of \$14.1 million. However, the AMP presents yearly capital expenditures based on their priorities from condition and risk and further does not reflect the savings from strategies already being used such as pavement preservation and joint tendering.

5.2.3 Addressing the Short-Term Financial Requirements

The following list of alternatives should be considered to reduce the financing requirements over the next ten years:

1. The Township will develop an Implementation Strategy to improve this Plan over the next few years. This would include optimizing the current service levels and continuing to update condition, risk, and health and safety information. Further incorporating strategies already being used rather a like for like replacement calculation will be beneficial in future presentations to better reflect the Township's position.
2. Continue to raise reserve funds through taxation to offset accumulating depreciation costs.
3. Some municipalities rely on debt to decrease to reduce tax rate increases. This may be viewed as a feasible option, but it must be recognized that debt offers short term relief but long term pain. Money borrowed today must be paid back in the future with interest.
4. Continue to pursue Provincial and Federal grants whenever possible. Apart from Federal Gas Tax and OCIF, the Plan assumes no grant funding from the Provincial and Federal Governments. This is a conservative approach that is recommended in the Provincial government's asset management guide. Both senior levels of government have acknowledged that they should share in addressing the infrastructure deficit. It is reasonable to assume that funds will become available in the future from both senior levels of government.

Over the past few years, the Township has undertaken a proactive approach to addressing their financial position, and should continue to do so. Setting aside reserves to address future expenditures puts the Township in a good position financially. The Township should continue to employ proactive financing strategies to minimize deficit and keep this infrastructure in good condition well into the future.

5.3 Long Term Financing Strategy

5.3.1 Water Assets

The Capital Expenditures over the 100 years indicate that the asset replacements for water assets are grouped in large amounts. Water assets were all constructed around the same time, and as such, are expected to need replacement in the same year, according to expected useful life. The Revenues and Capital Expenditures on water infrastructure over the next 100 years are displayed in Table 13.

Table 12 – Long Term Capital Expenditures (Water Assets)

Investment Period	Opening Balance	Expenditures	Capital Levy	Ending Balance
2017-2026	451,920	958,670	1,669,082	1,162,332
2027-2036	1,162,332	1,205,851	1,702,463	1,658,944
2037-2046	1,658,944	0	1,736,513	3,395,457
2047-2056	3,395,457	4,112,802	1,771,243	1,053,897
2057-2066	1,053,897	1,205,851	1,806,668	1,654,714
2067-2076	1,654,714	0	1,842,801	3,497,515
2077-2086	3,497,515	4,523,052	1,879,657	854,120
2087-2096	854,120	0	1,917,250	2,771,370
2097-2106	2,771,370	5,805,720	1,955,595	-1,078,756
2107-2116	-1,078,756	1,205,851	1,994,707	-289,899
Total		19,017,797		

Over the course of the next 100 years the current Water Capital Levy is insufficient to finance the Asset Management Plan expenditures. By the end of the 100 years, additional financing of \$290,000 will need to be applied to the Water User Fees Supported capital program. The existing rates and long term plan will continue to be reviewed from a long term perspective to ensure the long term sustainability of the water assets.

5.3.2 Tax Supported Assets

The Revenues and Capital Expenditures for tax supported infrastructure over the next 100 years, separated into decades, are displayed in Table 15.

Table 13 – Long Term Capital Expenditures (Tax Supported Assets)

Year	Opening Balance	Expenditures	Tax Levy	Reserves & Funding	Ending Balance
2017-2026	739,314	84,116,074	52,894,299	16,284,111	-14,198,350
2027-2036	-14,198,350	92,634,162	54,216,656	16,691,214	-35,924,642
2037-2046	-35,924,642	87,411,314	55,572,072	17,108,494	-50,655,390
2047-2056	-50,655,390	40,160,599	56,961,374	17,536,206	-16,318,410
2057-2066	-16,318,410	42,060,706	58,385,408	17,974,611	17,980,904
2067-2076	17,980,904	114,377,867	59,845,043	18,423,976	-18,127,944
2077-2086	-18,127,944	89,572,917	61,341,169	18,884,575	-27,475,117
2087-2096	-27,475,117	63,850,214	62,874,698	19,356,689	-9,093,944
2097-2106	-9,093,944	85,507,750	64,446,565	19,840,606	-10,314,523
2107-2116	-10,314,523	54,534,401	66,057,729	20,336,621	21,545,426
TOTAL		754,226,004			

The Township has approved a 1% tax levy increase, compounded yearly. This is a good step in addressing the necessary financing. Over the course of the next 100 years the current Tax Supported Capital Levy, coupled with the 1% Asset Investment Reserve is sufficient to finance the Asset Management Plan expenditures. The surplus at the end of the last two decades will be needed to offset the effects of inflation. It is important to note the financing shortfall in most decades. If additional financing becomes available then it should be applied to the early years of this financing scenario.

5.3.3 Addressing the Long-Term Financial Requirements

The best strategy to address the long-term financing is to continue to develop improved asset management tools and processes. These strategies include the following:

- Continue to establish appropriate levels of service and associated performance metrics to track how well the infrastructure is meeting the service levels. This may result in some higher-risk assets being renewed at a later time and/or some lower-risk assets becoming a priority for renewal at an earlier time than expected. For example, a road asset that is identified as low risk may need to be replaced because it poses a health and safety risk.

- Maintain an up-to-date database of asset condition based on regular inspections.
- Collect and review additional condition/performance information for the Township's infrastructure to better assess the probability of failure. For example, tracking and reviewing water main break records is a much better indicator for the future probability of failure of the asset. This analysis can then be used to adjust the infrastructure needs.
- Consider non-infrastructure solutions to achieve service levels. For example, promoting a cycling-friendly community could be accomplished by improved signage, reducing speed limits or undertaking educational campaigns, without additional infrastructure.
- Consider consolidating or eliminating redundant infrastructure. For example, removing bridges that are under-utilized or have alternate bridges that can be used will reduce the long term infrastructure needs while maintaining service levels.

The Township has already taken a good first step by investing in the Cartegraph asset management system to prioritize asset repair, rehabilitation and replacement. An extensive database has been developed to manage road assets and the Township is dedicated to updating and maintaining this as new or more up-to-date information becomes available. The Township should continue to assess and prioritize asset replacement needs by incorporating appropriate levels of service, risk tolerance, and updated condition assessment as new technologies and methods for assessing assets become available.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The Township's Asset Management Plan identifies a long-term need of \$8.3 million/year to renew the Township's infrastructure for assets in the scope of this study. Asset renewal in the short term should be prioritized to minimize risk and address health and safety concerns.

The Township has taken a proactive approach in addressing infrastructure needs by setting aside reserve funds to minimize deficits, approving levy increases to cover future deficits and investing in Cartegraph to better understand transportation asset condition, risk and replacement needs. The Township is committed to maintaining an up-to-date asset management database including levels of service, risk tolerance, and condition to improve the process for assessing and prioritizing asset repair, rehabilitation and replacement. Further it is committed to using strategies such as pavement preservation and joint tendering as well as investigating future opportunities or strategies. The Township is in a better position financially than many municipalities in Ontario and should continue to engage in forward thinking financial planning.

The Township provides funding for assets through two sources of revenue: Water User Fees and Municipal Tax Levy. Reserves are also used as a source of funding. Both in the short term and in the long term, the financing strategies being used including the use of a long range financial plan puts the Township in a position to meet future requirements

Over the coming years, the Township will continually review the infrastructure needs as more information is gathered. The Township will continue to set aside funds for asset replacement, build appropriate depreciation costs into future water rate adjustments, and continue to pursue Provincial and Federal infrastructure grants. This strategy positions the Township on a path to ultimately reach a point where the infrastructure needs equal the available revenues.