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December 6, 2013

RVA 132830

The Municipality of Port Hope
56 Queen Street
Port Hope, ON
L1A 3Z9

Attention: David Baxter, CMA, Director of Finance

Dear Sir:

Re: Municipality of Port Hope Asset Management Plan

We are pleased to submit our final Asset Management Plan report for the Municipality of Port Hope. The report represents the Municipality's first AMP. It is a strategic planning document designed to assist in the development of a long term strategy for the management of Port Hope's infrastructure.

A side benefit in preparing this report is giving the Municipality access to the Province of Ontario's Municipal Infrastructure Investment Initiative. The Province has made this funding available to municipalities that have prepared an AMP that meets their guidelines. The Province, and indeed all levels of government, have recognized the benefit of asset management processes to the long term well-being of municipalities and to Canada.

The accompanying report reviews the level of investment needed to sustain the infrastructure such that it delivers the expected level of service throughout its life cycle. This need is then compared to the level of investment in the Municipality's annual budget.

The review of needs versus available funding identifies an investment gap. The challenge for the Municipality is to commit to a strategic plan to address the investment gap. The commitment relates to undertaking further refinements summarized in the plan to identify strategies to reduce the investment need and increase the available funding until the need and funding are essentially equal. This is the essence of the report to be considered by the Municipality.

We appreciate the opportunity to assist the Municipality of Port Hope with this strategic undertaking. We look forward to the opportunity to present and discuss the report with all stakeholders in the Municipality. Please contact the undersigned should you have any questions.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED



Nick Larson, MEPP, P.Eng.
Project Manager



Calvin Hawke, CA
TCA Consulting Limited

Encls.



THE MUNICIPALITY OF PORT HOPE ASSET MANAGEMENT PLAN

FINAL REPORT

Prepared for:

The Municipality of Port Hope

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EXECUTIVE SUMMARY

In 2012, 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) which aims to develop a strong and cooperative relationship between municipalities and the Province of Ontario to address the significant challenges that currently face our deteriorating infrastructure.

The Province is seeking to achieve standardization and consistency in the management of municipal infrastructure. To achieve this, they are requiring that any municipality seeking provincial capital funding for infrastructure projects be required to prepare an Asset Management Plan (AMP) to demonstrate the particular need of a project to the social, economic or environmental priorities of the community.

This report represents the Municipality of Port Hope's first iteration of a strategic AMP that has been completed based on readily available information in the Municipality. It establishes a framework that supports an informed decision making process that is used to improve the management of the Municipality's infrastructure. The Municipality has committed to continually improving this AMP over the coming years as additional information is collected and as knowledge of asset management in the Municipality increases.

The Corporate Strategic Plan previously established by Council provides a strong and comprehensive strategy to provide high quality services to residents. The following Goals from the Strategic Plan provide a vision for the management of the Municipality's infrastructure and have helped to guide the development of this Plan:

- Goal 5: Develop an Asset Management Plan;
- Goal 6: Adequately fund existing infrastructure; and
- Goal 7: Leverage the use of technology.

This AMP is structured to achieve the above noted goals from the Strategic Plan, and includes the following sections:

- Section 1 introduces asset management and establishes goals for the long term vision of infrastructure management in the Municipality.
- Section 2 summarizes the state of the infrastructure in the Municipality, including the distribution of both the physical condition and risk of the assets.
- Section 3 summarizes the existing levels of service of the Municipality's infrastructure and provides a series of suggested performance metrics that the Municipality can use to track the performance of their assets.
- Section 4 establishes the average long term (100 year) capital investment needs to sustain the Municipality's existing infrastructure and uses a risk-based asset management strategy to prioritize the asset that should be renewed in the short term (next 10 years). Section 4 also provides a list of activities that the Municipality should consider implementing over the short term to advance asset management in the organization.
- Section 5 reviews the Municipality's finances and provides a strategy to achieve a sustainable level of investment to renew the existing infrastructure in perpetuity.
- Section 6 summarizes the analysis that was completed to prepare this.

This first iteration of the AMP identifies a long-term need of approximately \$4.8 million per year to renew the Municipality's existing infrastructure for the assets that are in the scope of this study. A cursory review of the out-of-scope assets indicates that this infrastructure requires an additional \$2.2 million per year to be renewed over the long term.

This long-term need has been established based on a strategic review of the Municipality's asset inventory. It is important to recognize that the Municipality is striving to reach a position where the infrastructure needs equal the available revenues. Over the coming years, the Municipality will continually review the infrastructure needs as better information becomes available and as technological improvements reduce the cost of renewing infrastructure. The Municipality will also consider approaches to increase the revenue that is available to fund the renewal of existing infrastructure, including pursuing Provincial or Federal infrastructure grants. This strategy positions the Municipality on a path to ultimately reach a point where the infrastructure needs equal the available revenues.

MUNICIPALITY OF PORT HOPE ASSET MANAGEMENT PLAN

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1.0 INTRODUCTION

This report represents the first strategic Asset Management Plan (AMP) for the Municipality of Port Hope. It establishes a framework that supports an informed decision making process that is used to improve the management of the Municipality's infrastructure.

1.1 Provincial Guideline

In 2012, 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) which aims to develop a strong and cooperative relationship between municipalities and the Province of Ontario to address the significant challenges that currently face our deteriorating infrastructure.

The Province is seeking to achieve standardization and consistency in the management of municipal infrastructure. To achieve this, they are requiring that any municipality seeking provincial capital funding for infrastructure projects be required to prepare an AMP to demonstrate the particular need of a project to the social, economic or environmental priorities of the community.

This report represents the Municipality of Port Hope's first iteration of the AMP that has been completed based on readily available information in the Municipality. The Municipality has committed to continually improving this AMP over the coming years as additional information is collected and as knowledge of asset management in the Municipality increases.

1.2 Vision for Infrastructure in the Municipality of Port Hope

The Corporate Strategic Plan previously established by Council provides a strong and comprehensive strategy to provide high quality services to residents through a series of Goals¹. The following Goals from the Strategic Plan provide a vision for the management of the Municipality's infrastructure and have helped to guide the development of this Plan:

- Goal 5: Develop an Asset Management Plan;
- Goal 6: Adequately fund existing infrastructure; and
- Goal 7: Leverage the use of technology.

¹ <http://porthope.ca/en/residentservices/resources/APPROVED-STRATPLANAmendedFEB2013.pdf>

This AMP has been structured to develop processes that can be used to achieve the Municipality's vision for the management of their infrastructure.

1.3 Goals of Asset Management

Asset management strives to continually improve the management of infrastructure. The following is a list of goals that asset management programs and processes aim to achieve:

- Reduced life cycle cost (i.e. total operating, maintenance and capital resources) of providing services to residents.
- Reduced risk exposure to the Municipality by ensuring that assets are managed in a manner that matches the risk that their failure represents to the delivery of services.
- An informed and transparent decision making process that provides elected officials with the knowledge that they need to make decisions regarding capital expenditures, operating costs and revenue requirements (i.e. rate and tax levels).
- A mechanism to ensure that the services that are delivered through infrastructure can be provided at a sustainable level at a cost that is affordable to residents.

1.4 Scope of the AMP

This AMP covers a period of 100 years with a focus on the next 10 years, and reports on the following assets owned by the Municipality:

- Water mains and water distribution system appurtenances
- Water treatment, storage and pumping facilities
- Sanitary sewer and wastewater collection system appurtenances
- Wastewater treatment and pumping facilities
- Roads and associated works yards
- Bridges and culverts
- Storm sewers and storm water management infrastructure

It should be noted that the Municipality of Port Hope does not own any social housing related assets. The Municipality has established the scope of assets based on the minimum requirements of the Provincial Guide. In the short term, the Municipality will develop an asset management plan that covers the assets that are not in the scope of this report.

1.5 Development of the AMP

This AMP was developed with a project team from the Municipality and RVA. The following documents were reviewed and incorporated throughout the development of this AMP:

- The Municipality of Port Hope Official Plan (2009)
- Strategic Financial Plan (2012)
- Water and Wastewater Rate Study (2009)
- The Municipality of Port Hope Corporate Strategic Plan (2013)
- The Municipality of Port Hope Development Guide (2013)
- Urban Roads PCI Assessment (2011)
- Sidewalk Needs Study (2013)
- O/Reg 239/02 for the Minimum Maintenance Standards for Municipal Highways
- Ganaraska Conservation Authority GIS inventory
- TCA Documentation
- Municipality Budgets and other Financial Documents
- Other Relevant Municipality Correspondence

1.6 Refinement of the AMP

The Municipality is realistic in recognizing that this AMP is a first step along a pathway that will be able to achieve the goals outlined above. Section 4 describes a series of activities that will improve subsequent iterations of the AMP.

2.0 STATE OF INFRASTRUCTURE

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

- Inventory of all assets
- Value of assets
- Condition of assets
- Risk of assets supported by estimates of both the probability of failure (i.e. condition) and consequences of failure

2.1 Asset Inventory

The Municipality of Port Hope maintains several asset inventories at varying levels of detail, summarized as follows:

1. A Tangible Capital Asset (TCA) Register that includes every asset owned by the municipality: This Asset Register was developed to achieve the requirements of the Public Sector Accounting Board (PSAB) 3150 regarding full accrual accounting of assets in municipalities. While this Asset Register is comprehensive, the level of detail on the linear assets (roads, water mains, sidewalks, sewers) is not ideal to complete the analysis in this report. This is because the linear assets have been pooled to simplify the tracking of transactions and to reduce the work required to perform the annual updates of the Asset Register. Better sources of information on the asset inventory were used if available.
2. GIS inventories of the Municipality's water mains, sanitary sewers and storm sewers maintained by the Ganaraska Region Conservation Authority (GRCA): The GIS inventories provide pipe-by-pipe information and are a much better source of information compared to the information contained in the Asset Register.
3. The Roads Needs, Bridge Needs, and Sidewalk Needs studies that have been completed by the Municipality: These studies provide the best inventory of the respective asset types, in addition to providing information on the current physical condition of the assets. These inventories are also a much better source of information compared to the Asset Register.

Table 1 provides a summary of the assets that are included in the scope of this study.

Table 1 – Inventory of Assets included in this AMP

Asset Class	Type of Assets Included	Inventory
Bridge and Culverts	Bridges and culverts with a span over 3 meters	22 bridges, 32 culverts
Water/Wastewater Facilities	Water and wastewater facilities that treat, pump or store water or wastewater	1 Water treatment plant, 1 wastewater treatment plant, 9 pumping stations or storage facilities
Other Facilities	Public Works buildings associated with road maintenance	3 works yards
Water mains & appurtenances	Water mains, hydrants and valves	99 km
Sanitary Sewers & appurtenances	Sanitary sewers and manholes	76 km
Roads	Roads, sidewalks, streetlights and traffic signals	88 km urban roads, 11 km sidewalks, 6 traffic lights, 1570 streetlights
Storm Sewer	Storm sewers, manholes, catchbasins	49 km

2.2 Asset Value

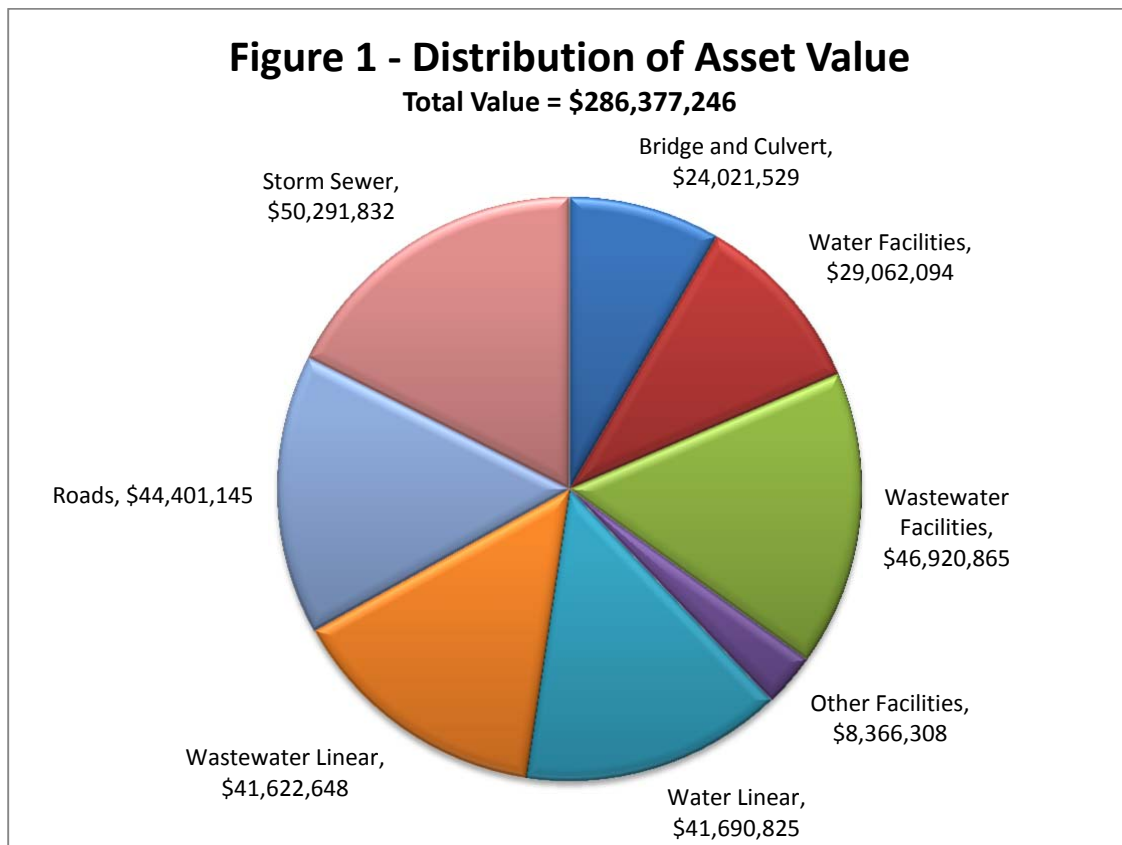
The value of the assets that are included in the scope of this Plan is summarized in Table 2 and Figure 1. The value was developed using one of two approaches applicable to the asset type, including:

- Using a cost index to bring the historical acquisition cost to a current replacement cost; or
- Estimating unit replacement costs for linear assets or complete replacement costs for discrete vertical assets based on the available information such as size and material.

It is apparent from Table 2 and Figure 1 that the replacement value of the assets that are in the scope of this study is approximately \$286 million. According to the Municipality's year ending 2012 TCA Register, the historical cost of these assets is approximately \$156 million and the current book value is approximately \$119 million.

Table 2 – Value of Assets

Asset Class	Replacement Value
Bridge and Culverts	\$24,021,529
Water Facilities	\$29,062,094
Wastewater Facilities	\$46,920,865
Other Facilities	\$8,366,308
Water Linear	\$41,690,825
Sanitary Linear	\$41,622,648
Roads	\$44,401,145
Storm Sewer	\$50,291,832
Total	\$286,377,246



2.3 Asset Condition

Understanding the condition of the Municipality’s assets is an essential component to an AMP. Ideally the condition information is based on assessment activities that provide first-hand knowledge of the condition of the infrastructure. However, for a significant portion of the assets in the Municipality condition information based on visual observations or first-hand knowledge is not readily available, especially for buried assets. This is very common

in municipalities in Ontario and across Canada. Therefore, in most cases the condition of the assets had to be estimated.

The best practice to estimate the condition of an asset where assessment activities have not been completed is to evaluate the amount of its useful life that has been consumed. For example, an asset that has a useful life of 10 years would be considered to be in excellent condition if it is 1 year old and poor condition if it is 9 years old. Although this approach does not always provide an accurate condition of the asset, particularly in cases of buried linear infrastructure (i.e. water mains and sewers), it is a reasonable starting point where actual condition information is not easily accessible. The Municipality's inventories contain information on the asset age and the useful life that has been estimated based on industry standards, and therefore it is possible to estimate the condition of the assets using this approach.

For the purposes of this report, the condition of the assets where condition information was not available was estimated based on Table 3. It should be noted that there was actual condition information readily available for the following asset types:

- Roads
- Bridges and culverts
- Sidewalks

Appendix A details how the condition assessment information on the above noted asset types were converted to a condition score for the purposes of the analysis performed in this report. Appendix A also provides an indication of the source of any condition information that was used in the analysis. It should be noted that Port Hope routinely collects information on the road structures in accordance with Provincial Regulations.

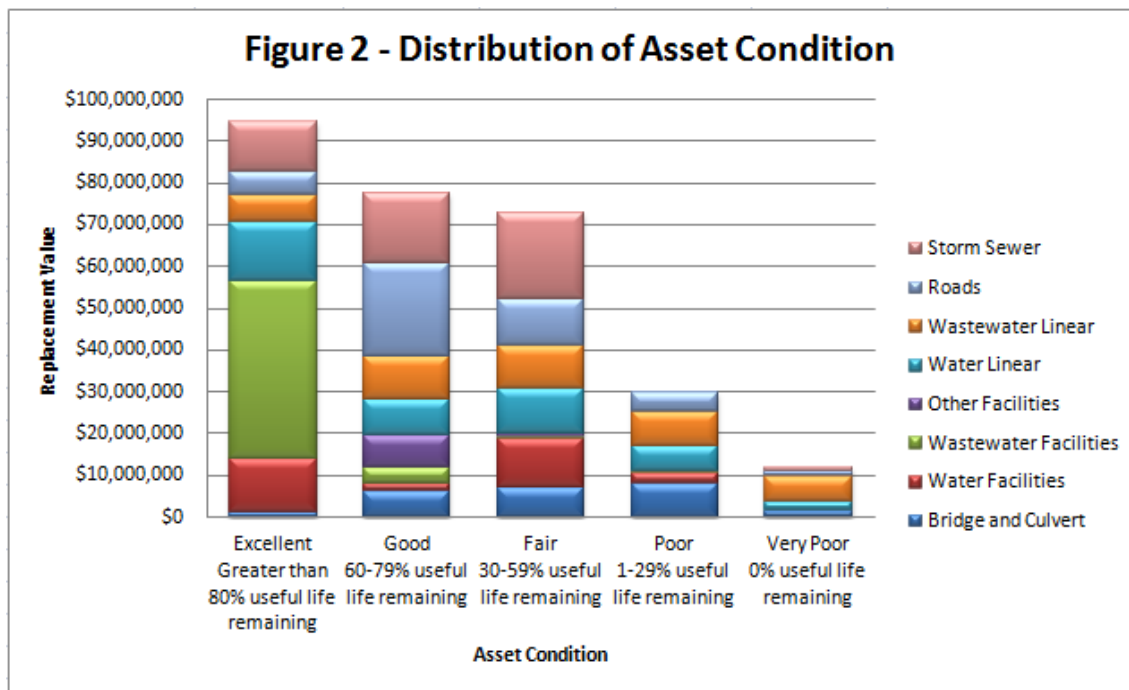
Table 3 – Estimated Condition based on Useful Life Remaining

Percent of Useful Life Remaining	Estimated Condition
80% or above	Excellent
60-79%	Good
30-59%	Fair
1-29%	Poor
0%	Very Poor

Table 4 and Figure 2 summarize the condition of the Municipality's infrastructure. It is apparent that approximately \$12 million worth of assets have a condition that is considered very poor (i.e. the asset age exceeds the useful life). It should be noted that the approach of using the combination of the asset age and useful life can produce condition results that appear worse than what would be observed with actual condition assessment because of the theoretical assumption that any asset which has reached the end of its useful life is in very poor condition.

Table 4 – Value of Assets by Condition Score

Condition Score	Replacement Cost	% of Total
Excellent	\$94,517,667	33%
Good	\$77,440,555	27%
Fair	\$72,297,243	25%
Poor	\$29,825,412	10%
Very Poor	\$11,796,368	4%
Total	\$286,377,246	100%



2.4 Risk of Assets

The state of the Municipality's infrastructure is not only limited to the physical condition. To achieve a better understanding of the needs of the infrastructure a risk score was calculated for each asset. For example, an asset with a low consequence of failure can be managed such that it is replaced only after it fails (i.e. condition falls below poor or very poor). However, assets that have a high consequence of failure should be managed in a proactive manner that does not permit the condition to fall below fair.

For the purposes of the risk assessment completed in this report, risk is defined as the product of the probability of failure and the consequence of failure. Appendix A contains a full description of the probability and consequence of failure scores that were assigned to each asset type in the Municipality.

2.4.1 Probability of Failure

A probability of failure score was given to each asset based on the condition information. As discussed in the previous section, the condition information has been estimated based on the asset age and useful life in cases where field observations were not available. Table 5 summarizes the probability of failure score that was assigned to each asset based on the estimate of its physical condition.

It should be noted that the probability of an asset failing is not necessarily indicative of its age (i.e. some newer water mains can fail more frequently than older water mains due to their materials or production methods), however for the purposes of the analysis completed in this study it was not feasible to complete a detailed assessment of the probability of failure for each individual asset.

Table 5 – Probability of Failure Score Information

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

2.4.2 Consequence of Failure

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

- Size/capacity of the asset
- The use of the asset
- The importance of the asset to the operation of the system/facility

Table 6 summarizes the approach to establishing the consequence of failure score for each asset.

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 change in the function, serviceability, or capacity of the asset and (or) effect on public safety and the environment	2
Moderate/ regular change in the function, serviceability, or capacity of the asset and (or) effect on public safety and the environment	3
Major/ regular change in 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

2.4.3 Risk Assessment

The final step in the risk assessment is to multiply the consequence of failure score and the probability of failure score for each asset. This results in a risk score for each asset of between 1 and 25. A risk category was then established for each asset based on the risk score. Figure 3 summarizes the process that was used to categorize the risk scores for each asset. The risk score of the assets are categorized as follows:

- Risk score equal to 25 represent a high level of risk to the Municipality
- Risk score of between 16 and 20 represent a medium-high level of risk to the Municipality

- Risk score of between 10 and 15 represent a medium level of risk to the Municipality
- Risk score of between 5 and 9 represent a medium-low of risk to the Municipality
- Risk score of 4 or less represent a low level of risk to the Municipality

Figure 3 – Risk Matrix

		Probability of Failure				
		1	2	3	4	5
Consequence of Failure	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

2.5 Prioritization based on Risk

In the context of this AMP, the Risk scores are used to prioritize the renewal of the existing assets. Table 7 and Figure 4 summarize the risk scores of the assets in the Municipality. It is apparent that approximately \$19 million worth of assets are in a medium-high or high risk level. Addressing the needs of these assets is a priority over renewing other assets. Section 4 of this report describes the Asset Management Strategy for prioritizing the renewal of assets that represent elevated levels of risk to the Municipality.

Table 7 – Risk Score by Asset Value

Risk	Replacement Cost
Low (assets with the last priority for renewal)	\$111,608,223
Medium-Low	\$90,718,186
Medium	\$63,944,429
Medium-High	\$17,154,786
High (assets with the first priority for renewal)	\$1,951,622
Total	\$286,377,246

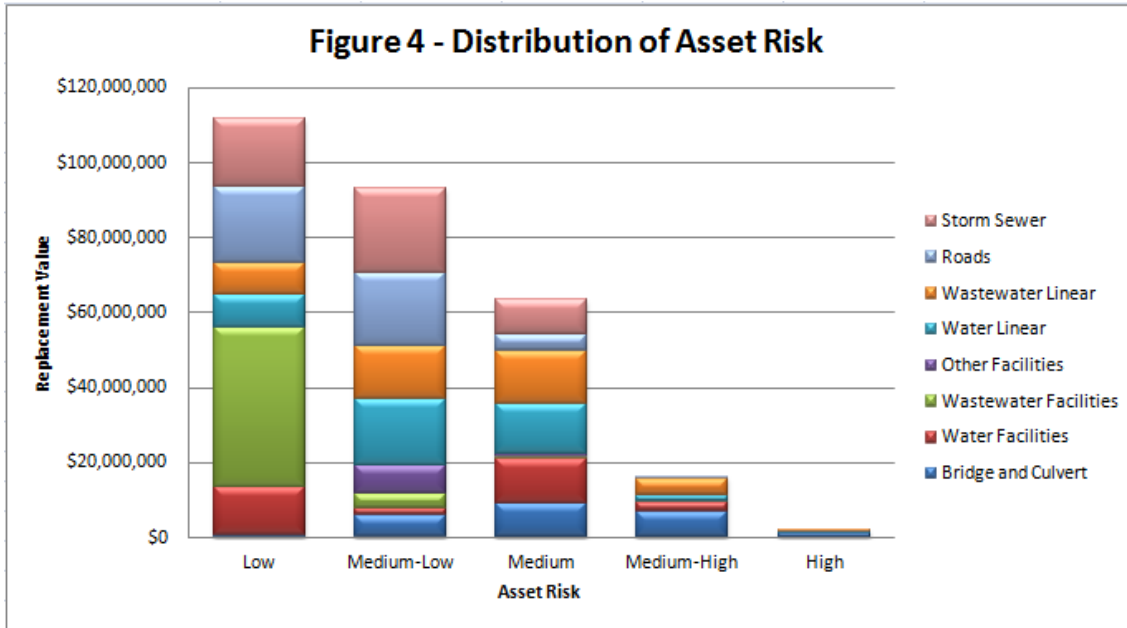


Figure 5 and Table 8 provide more information on the assets that make up the medium-high and high risk levels in the Municipality. The highest risk assets in Port Hope are the Barret Street Bridge and some sections of water main and sanitary sewer.

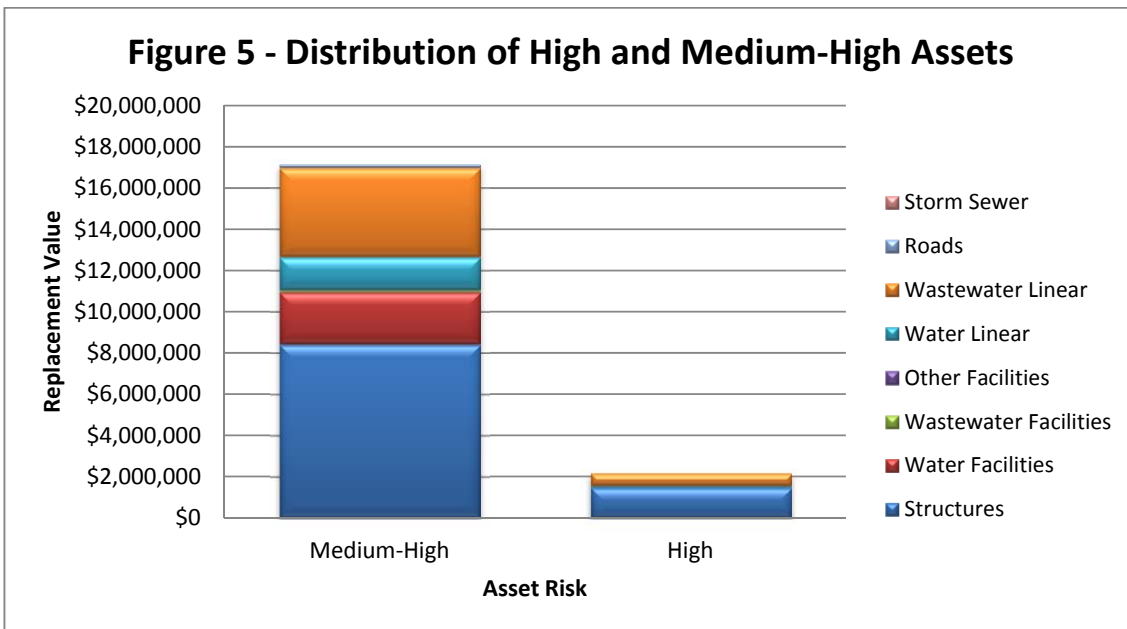


Table 8 – Summary of High Risk and Medium-High Risk Assets

Type	Asset	Replacement Cost
High Risk		
Structures	Barrett Street Bridge	\$1,476,000
Water main	Mains on Marsh St. and servicing Cameco.	\$68,500
Sanitary Sewer	Sanitary sewer on Ward St	\$620,000
Medium-High Risk		
Structures	Various bridges & culverts throughout the Municipality	\$8,500,000
Public Works Buildings	Hope St PS Pumps	\$83,000
Public Works Buildings	Dorset St Standpipe	\$983,000
Public Works Buildings	Jocelyn St Reservoir and Pumps	\$1,560,000
Water main	Various water mains throughout the Municipality	\$1,611,941
Sanitary Force main	Mill St PS force main	\$1,337,000
Sanitary Sewer	Various sanitary sewers throughout the Municipality	\$2,951,000
Roads	Traffic Lights at Peter and Hamilton	\$88,000
Roads	Various roads throughout the Municipality	\$82,000

2.6 Engagement of Port Hope Staff

Port Hope staff members were fully engaged with the project team throughout this report to provide their understanding of the infrastructure systems to the project. The Municipality recognizes that the general approach and individual risk scores for each asset will be refined over the coming years as better 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 plans, levels of service are established as a way to guide the management of infrastructure in a manner that aims to achieve the level of service goal. This develops a systematic process for:

1. Deciding the appropriate level at which to provide each service.
2. Tracking the current level of service.
3. Preparing a strategy to achieve the service level goal if the tracking process in step (2) shows that the goal is not being met.
4. Establishing a clear linkage between the costs of higher service levels.
5. Discussing the willingness to pay for higher service levels.

3.1 Types of Levels of Service

Levels of service vary widely depending on the level of sophistication of an organization. They can be related to regulations, customer expectations, or corporate vision. In terms of municipal infrastructure, the services that they provide are generally related to either condition or capacity. Levels of service can also be based on managing the risk that the failure of the asset has on the service that it provides. This section of the AMP includes a summary table that provides the current levels of services that have been defined in the Municipality's existing documentation and current infrastructure management practices.

3.2 Condition Levels of Service

The most basic level of service for the Municipality is established around maintaining infrastructure in an acceptable state of repair or minimizing the risk exposure of the Municipality to a specified level. The levels of service that the Municipality has been practicing are relatively informal and are not structured in a framework to support an integrated asset management strategy.

The levels of service that have been established in the capital works planning process address the infrastructure that is in the worst state of repair and would result in large consequences if it were to fail. This process has been based on coordination with Municipality staff and Council.

Although undocumented, the current capital planning process that the Municipality is practicing represents a risk-based approach to managing their infrastructure. As described in Section 2, the State of Local Infrastructure Analysis was completed using a risk based approach. The analysis completed in this AMP provides a more formalized approach to managing the infrastructure using a comprehensive risk-based methodology that includes all of the assets in the Municipality.

3.3 Capacity Levels of Service

As described in Section 3.2, the Municipality has an established practice that is used to drive decision making with respect to the renewal of asset according to their condition. However, similar to most municipalities in Ontario, the Municipality does not have many specific levels of service that are used to address the renewal of existing infrastructure based on capacity issues.

3.4 Existing Levels of Service

Table 9 summarizes the existing levels of service in Port Hope. The majority of the levels of service documented in Table 9 are informal and based on discussions with Port Hope staff.

3.5 Performance Metrics

Performance metrics are used to assess how well the infrastructure is achieving the service levels. Table 9 also provides a series of suggested performance metrics that the Municipality can use in future reviews of its infrastructure. Subsequent AMPs can complete the State of Local Infrastructure analysis by comparing levels of service to performance metric goals.

Table 9 – Existing Service Levels in the Municipality and Suggested Performance Metrics

Department	Levels of Service	Suggested Performance Metric
Water mains & Water Facilities	<ol style="list-style-type: none"> 1. Provide services to accommodate new growth 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 in diameter; Water mains at least 150 mm in diameter 4. Provide reliable water service 5. Provide clear drinking water 6. Meet all regulated drinking water quality goals (i.e. meet MOE Drinking Water Systems Regulation O. Reg. 170/03 and Certificate of Approval) 	<ol style="list-style-type: none"> 1. Number of development applications that are delayed due to insufficient water infrastructure 2. Locations with pressure or flows that do not meet the goals confirmed through hydraulic modeling or field testing 3. Locations with mains or services that are smaller than the minimum sizes 4. Number of water main failures per km of water main per year 5. Number of rusty water complaints 6. Number of times the regulated drinking water quality goals are not achieved
Sanitary Sewers & Wastewater Facilities	<ol style="list-style-type: none"> 1. Provide services to accommodate new growth 2. Sanitary sewer system designed per guidelines; 200 mm minimum size 3. Discourage the use of force mains and sewage pumping stations 4. Repair critical sections of sewer identified in CCTV assessments 5. Meet all regulated wastewater quality goals 6. Minimize the number of sewer backups that occur due to infrastructure failures 7. Minimize the number of emergency sewer bypass events that occur 	<ol style="list-style-type: none"> 1. Number of development applications that are delayed due to insufficient wastewater infrastructure 2. Locations with sub-standard infrastructure (size, slope) confirmed through review of designs 3. Number of force mains/sewage pumping stations in the Municipality 4. Number of locations identified as being in critical condition that have not been addressed 5. Number of times the regulated wastewater quality goals are not achieved 6. Number of sewer backups that occur due to infrastructure failures 7. Number of emergency sewer bypass events that occur
Storm Sewers/ Storm Water Management Facilities	<ol style="list-style-type: none"> 1. Develop must not result in increased flooding, erosion, or degradation to water quality. Post development flows cannot be increased from the pre-development peak flow and water velocity. 2. Adequately control the 1:100 year storm event, as well as other requirements established by the GRCA 	<ol style="list-style-type: none"> 1. Number of development applications that achieve the targets 2. Number of locations where infrastructure does not adequately control storm event or does not meet requirements of the GRCA
Roads & Bridges	<ol style="list-style-type: none"> 1. Provide maintenance standards in accordance with O/Reg 239/02 2. Road should be maintained in an acceptable state of repair 3. All bridges should be maintained to be safe for use 	<ol style="list-style-type: none"> 1. Number of times road maintenance is not in accordance with O/Reg 239/02 2. Number of roads that are in an unacceptable state of repair 3. Number of recommended repairs completed in accordance with timing identified in the biannual bridge (OSIM) inspections

Department	Levels of Service	Suggested Performance Metric
Sidewalks	<ol style="list-style-type: none">1. Displacement in sidewalks should not exceed 3/4 inch2. Sidewalks on two sides of urban arterial and residential collector roads	<ol style="list-style-type: none">1. Number of locations where displacement exceeds 3/4 inch2. Number of roads that meet sidewalk level of service
Streetlights	<ol style="list-style-type: none">1. Street lighting shall be in full accordance with ESA 22/04 regulations	<ol style="list-style-type: none">1. Number of street lights that do not meet regulations

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
- Addressing policies that impact the strategy for how to renew the asset (i.e. does the asset size/design need to change to meet a certain policy)

The items summarized above are the goals for an AMP (and the associated systems that support the plan) to achieve through an analysis of readily available information. In this first iteration of the Municipality's AMP, achieving a process that optimizes these goals is difficult due to a lack of readily available information and established processes to support the decisions.

For example, the decision to rehabilitate a sanitary sewer is dependent on knowing if the size is sufficient or should be increased to provide adequate service to accommodate future growth. If the pipe is too small then rehabilitation is not an option. Therefore, the Municipality needs to have the data in place (i.e. functioning hydraulic model of their sanitary sewer collection system with growth projections) in order to determine if the sanitary sewer is too small.

4.2 Asset Management Framework

RVA uses a framework to guide the improvement of asset management systems. This Framework is summarized in Appendix B. The Framework shows how all of the current and future asset management activities that will be described in the following sections of this report align with each other.

4.3 Existing Asset Management Strategies in the Municipality

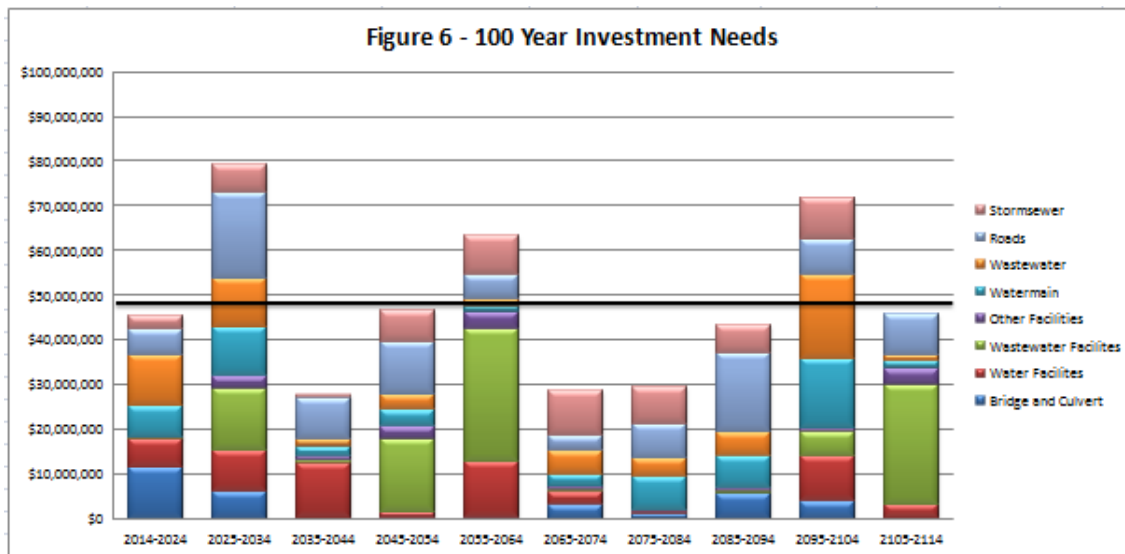
An asset management strategy can take many forms, such as formalized Needs studies or less formal activities such as coordination meetings between departments. Discussions were held with the Municipality to determine the asset management strategies and practices that are currently employed by Staff. The following paragraphs summarize the current asset management strategies that are practiced in Port Hope:

- The strategy for the bridge assets are supported by the regular inspections that are mandated by the Province. The inspections are performed on all bridges and any culvert with a span greater than three meters. The inspections are completed by qualified personnel who develop recommendations with respect to the optimal renewal strategy, including minor repairs, rehabilitation or replacement of the assets. The results of these assessments are used to develop the Municipality's annual bridge/culvert capital program.
- The strategy for the water mains is based on a Needs Study that was completed in 2002. This Study provided immediate, short term, and long term needs of work based on the break history, water quality (i.e. rusty water) and hydraulic deficiencies. The study determined that there was approximately \$11 million of work, with \$3.5 million being required in the immediate and short term. The Municipality currently uses the results from the study to prioritize the capital water main projects. The majority of the work identified in the immediate needs and approximately half of the work identified in the short term needs has been completed.
- The strategy for the sidewalks is based on a sidewalk needs study that was completed by the Municipality. The study provided information on the condition of the sidewalks and provided a prioritized list of needs based on the road classification and the size of the displacements. The municipality uses the results of the sidewalk assessment to develop the annual sidewalk replacement program.

These three established asset management strategies are seen as best practices in the municipal asset management industry and should be continued by the Municipality. However, they can be refined over subsequent iterations to ensure that they align with the Municipality's asset management goals.

4.4 Long Term Infrastructure Needs

Figure 6 provides the long term (100 year) capital investment needs for the renewal of the Municipality's existing infrastructure based on a strategic review of the replacement cost and theoretical useful life of each asset. It is apparent that on average the existing **in-scope** infrastructure needs approximately \$4.8 million per year to be sustained (in constant 2013 dollars) using this strategic approach. Over the coming years, the Municipality will continually review the infrastructure needs as better information becomes available and as technological improvements reduce the cost of renewing infrastructure.



A cursory review of the out-of-scope assets indicates that they have a replacement cost of approximately \$56 million and require an additional \$2.2 million per year to be renewed over the long term. This increases the total annual investment need for all assets in the Municipality to approximately \$7 million.

For comparison purposes, the following is noted:

- The Strategic Financial Plan that was prepared for the Municipality in 2012 identified an average annual investment need of approximately \$6 million based for **all** tax supported assets.
- The 2009 Water and Wastewater Rate Study identified investment needs of approximately \$1.6 million per year in non-growth related projects.

It should be noted that the needs from the Strategic Financial Plan were based on doubling the annual amortization of the assets, as compared to the asset-by-asset analysis using

replacement costs that was completed in this report. The different approaches to developing the annual needs make a direct comparison not possible. However, it is apparent that this report and the two previous reports mentioned above are indicating infrastructure needs that are in the same general range.

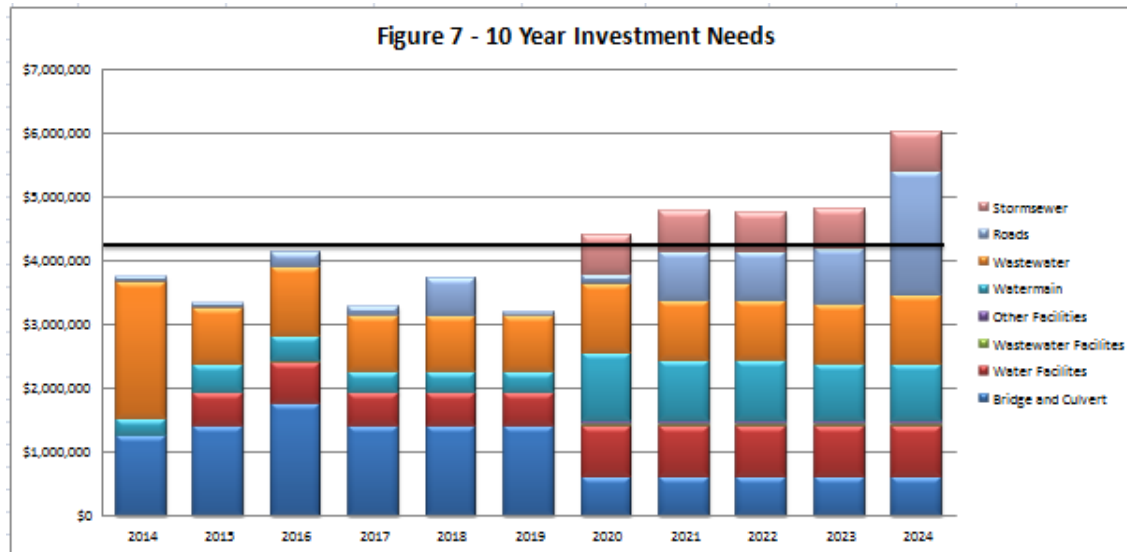
4.5 Short Term Infrastructure Needs - Managing Risk

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 Municipality – essentially assets that are in poor condition and would have a significant impact on service levels or cause other significant consequences if they were to fail. 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 and three scenarios for the renewal timing summarized in Table 10.

Table 10 – Renewal Strategy based on Risk Category

Risk Category	Renewal Time Period
High	Immediate
Medium-High	Short Term (next 5 years)
Medium	Medium Term (next 15 years)
Medium-Low and Low	Long Term - regular planned renewal based on age of asset and expected useful life or when asset reaches a higher risk level (i.e. probability or consequence of failure increases)

Figure 7 provides the prioritized (10 year) capital investment needs for the Municipality's infrastructure using the risk-based asset management strategy summarized in Table 10. It is apparent that over the next 10 years there are priority assets in all of the infrastructure groups in the Municipality.



4.6 Asset Management Strategies to Reduce the Cost of Infrastructure Needs

The Municipality has committed to advancing asset management practices in the organization. However, some of these processes will take several years to develop. The infrastructure needs provided in Figures 6 and 7 are based on the assumption that the Municipality will replace the existing infrastructure with an identical asset. However, it may be feasible to replace infrastructure at a lower cost by using alternative procurement methods, rehabilitating assets, or by taking advantage of other technological advancements that reduce the cost of asset renewal activities.

The following is a list of strategies that the Municipality should consider to reduce the costs of addressing the infrastructure needs:

- Review the potential cost savings of multi-year contracts to renew infrastructure (i.e. road resurfacing, water main replacement, etc.). This may reduce the unit costs of the capital construction projects.
- Review the potential cost savings of undertaking partnerships with neighbouring municipalities to achieve greater economies of scale with respect to infrastructure replacement contracts. This may reduce the unit costs of the capital construction projects.
- Review the potential cost savings of undertaking structural rehabilitation of water mains or sewers. However, it is recognized that it may not be cost-effective to complete these types of rehabilitation activities in smaller municipalities where the

cost of replacement is lower than in large municipalities and the cost of the rehabilitation is often more expensive due to quantities of scale and the availability of qualified contractors.

- Review the feasibility of rehabilitating some assets instead of replacing them. Rehabilitation can result in lower long term costs of owning and operating some assets.
- Collect and review additional condition/performance information for the Municipality'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, providing a safe bicycling environment could be accomplished by installing improved signage or undertaking educational campaigns rather than constructing new bicycle lanes.
- Consider consolidating or eliminating redundant infrastructure. For example, closing some facilities that are under-utilized and which have alternate facilities that can be used by the community will reduce the long term infrastructure needs while maintaining service levels.
- Complete detailed investigations into the operating and maintenance costs of the Municipality's infrastructure, and complete analyses to determine if they are within industry standards or if they can be optimized to reduce the long term costs. For example, this may demonstrate that the construction of a new, energy efficient facility to replace an old facility will have a long term financial savings to the Municipality.

4.7 Short Term Implementation Activities

To support the strategies listed in Section 4.5, Table 11 provides a series of recommended activities that the Municipality should consider undertaking to advance Asset Management across the organization. Some of the recommendations are general and can apply to all assets in the Municipality, while others are specific to one asset type. The recommendations are listed in a prioritized sequence with an estimated cost for completing each activity.

Table 11 – Short Term Implementation Activities

Project Number	Description	Estimated Cost
1	<p>Continue to Develop the Municipality's GIS Database of Assets</p> <p>Over the past few years, the Municipality has started the process to develop a Geographic Information System (GIS) database to store asset information. A GIS is an ideal system for storing information that can be used to manage the Municipality's asset, particularly for linear assets. The Municipality should consider continuing to develop and populate the asset portfolios in their GIS.</p> <p>Through this process, the Municipality will determine how the linear assets are broken down into segments (i.e. from intersection to intersection) and what pieces of information should be collected for each asset type. These two elements will establish the data hierarchy for each linear asset type. The following points summarize some of the factors to consider when updating the GIS:</p> <ul style="list-style-type: none"> • The information that is required to complete the Tangible Capital Asset reporting should be included for each asset in the GIS (i.e. acquisition cost, year of installation & amortization period/useful life). • The information that is required for modeling water distribution or sanitary sewer collection systems should be included for each relevant asset in the GIS. • Water main break records should be tracked with the specific asset from the GIS noted. <p>It is recognized that the Municipality has limited internal GIS capabilities that can be used for the purposes of implementing this recommendation. Therefore, the Municipality should seek opportunities to develop and populate asset portfolios in combination with completing some of the other activities recommended in the following projects listed in this Table.</p>	<p>\$30,000 per year (Some work may be done by internal staff)</p>

2	<p>Update the Needs Study for the Water Distribution System in the Municipality</p> <p>A Needs Study for a water distribution system reviews and compares the available system performance (typically through the use of a hydraulic model of the system) with a set of target service levels (i.e. target water pressures or fire flow rates) to establish a list of prioritized needs in the system. The list of needs will indicate which water mains need to be larger, where additional looping may be required, if there are any concerns with the layout of pressure zones, and other improvements that may be required to the system. A Needs Study may also consider the condition of the water mains (through break records or material/age) and other system performance concerns, such as water quality complaints. The previous Needs Study was completed in 2002. The municipality should considering updating the Needs Study.</p>	\$25,000
3	<p>Continue with the Bi-Annual Bridge Inspection Program</p> <p>The Municipality conducts bi-annual inspections of the bridges and large culverts in accordance with Provincial regulations. The information is collected in a spreadsheet and used by the Municipality to establish the renewal needs. This process needs to be continued to comply with Provincial regulations. The Municipality should also map the locations of the bridges and large culverts in the GIS when the internal resources are available or include this as part of the scope during the next round of inspections.</p>	\$75,000 every 2 years

<p>4</p>	<p>Update the Asset Inventory/State of Infrastructure Database on an Ongoing Basis</p> <p>On an ongoing basis, the Municipality should consider updating the database that houses the Asset Inventory and State of Infrastructure analysis. The updating process will include:</p> <ul style="list-style-type: none"> • Adding or removing assets. • Updating the inventory information such as year of construction and replacement value. • Updating the probability of failure scores based on condition assessment information (when available). • Updating the consequence of failure scores based on an improved understanding of the assets or infrastructure systems (when available). <p>It is recognized that the Municipality may have limited internal resources to complete this updating process internally. If the Municipality decides to complete the updating of the database using external assistance, then staff should develop a process to monitor and track any information that is received that could be useful to update the database (i.e. any new condition information that is available, any experiences that would suggest that the consequence of failure scores for a particular asset group should be revised, etc.).</p>	<p>\$10,000 per year (Some work may be done by internal staff)</p>
<p>5</p>	<p>Update the Asset Management Plan Report on a Routine Basis</p> <p>The first Asset Management Plan (AMP) Report was prepared in 2013. This Implementation Strategy has been developed based on the understanding of the Asset Management tools and processes that were in place during the development of the AMP. The Municipality should consider updating the AMP on a routine basis (i.e. every 5 years).</p>	<p>\$40,000 per update</p>
<p>6</p>	<p>Develop a Storm Water Facility Management Plan</p> <p>The Municipality has assumed storm water facilities over the past 20 years, most notably storm water ponds. These facilities are typically constructed by developers, after which their operation, maintenance and renewal needs are turned over to the Municipality. The Municipality should consider developing a Storm Water Facility Management Plan that includes the following:</p> <ul style="list-style-type: none"> • What will be assessed (condition of infrastructure, depth of sediment in ponds, effluent quality, etc.) • How often the facilities will be assessed • Where will the data be stored (i.e. GIS) 	<p>\$20,000</p>

<p>7</p>	<p>Conduct 1 Pilot Assessments and Develop a Data Hierarchy for the Facilities in the Municipality</p> <p>The Municipality should consider conducting a pilot assessment of one water/wastewater facility. The assessment should review the condition and performance of the various components in the facility, including a review of operating and maintenance costs benchmarked against industry average values. The assessment should establish immediate maintenance issues, as well as short term and long term capital needs. Through this project a data hierarchy will be established for the facilities that will be used as the basis for the Asset Portfolio. A data hierarchy is the structure of how the assets will be tracked in the Asset Management databases in the Municipality. Establishing the data hierarchy for the facilities will determine:</p> <ol style="list-style-type: none"> 1. How the facilities will be broken down into individual components. 2. The information that will be collected for each component (i.e. specific condition and performance data). <p>The following points summarize some factors to consider when establishing the data hierarchy for facilities:</p> <ul style="list-style-type: none"> • Where possible the data hierarchy should be consistent across all facilities. • The data hierarchy should be at a level of detail that matches the renewal activities from a practical perspective. • The data hierarchy should be able to house all of the information described in the Asset Management Framework discussion from Appendix B. • The data hierarchy should be structured to be able to track information on the O&M needs of the various components that make up a larger asset. • The data hierarchy should be structured so that the information from the individual components can be “rolled up” to provide information at the level of the entire facility. • The information that is required for Tangible Capital Asset reporting should be collected for each component. 	<p>\$100,000</p>
<p>8</p>	<p>Conduct Assessments of the Water/Wastewater Facilities</p> <p>The Municipality owns 11 water and wastewater facilities. These facilities are vital to the treatment and distribution/collection of water and wastewater. After the pilot assessment described in Project #7 is complete, the Municipality should consider conducting assessments of all of its water/wastewater facilities using the same approach. The assessments should be prioritized based on the age, current condition and criticality of each facility.</p>	<p>\$10,000 to \$75,000 per facility depending on size and complexity</p>

4.8 Long Term Implementation Activities

To support the strategies listed in Section 4.5, the following points provide a series of long term activities that the Municipality should consider undertaking. These activities are more general than those listed in Section 4.6, and therefore specific costs have not been assigned to each item:

- Public engagement

The Municipality should develop a program to engage the public with infrastructure decisions. This could include:

- Developing an annual satisfaction survey that can be administered to the public in either random telephone surveys, web-based surveys, in a town-hall environment, etc. Effort should be made to ensure that the survey mechanism also serves to educate residents on the relationship between service levels and the cost of the infrastructure.
- Establishing a process for registering complaints that are received by the Municipality. This could include establishing a formal 3-1-1 call system, or simply logging the calls that are received in a database that tracks information such as where the complaint is, what asset it refers to, and the nature of the complaint.

- Develop a reporting process to communicate the state of infrastructure in the Municipality

A periodic reporting process should be established to communicate to stakeholders in the Municipality how well the infrastructure is meeting the target service levels. This should be a transparent and open process that provides clear results of the performance monitoring and customer satisfaction feedback.

- Consider employing a software application to manage the AM data

There are a number of software applications that will help the Municipality to manage the data that is generated in in the various asset management systems and processes. However, it is strongly recommended that the Municipality complete the short term recommendations from Section 4 before purchasing a software application. This will make sure that the Municipality understands what they want the software applications to do and how they want the system to be designed. These programs can be upwards of \$100,000 for the initial set up, and then require an annual payment in the order of 20% of the initial set up cost.

Through this process, the Municipality should consider the opportunity to expand the use of their existing computerized maintenance management system to store additional asset information and to complete asset management analyses.

- Revise the TCA register

After the data hierarchy is established for each asset type and some (or all) of the Asset Portfolio information has been populated, the Municipality should revise the TCA Register to match the structure of the Asset Portfolio. As described in Section 2, the TCA reporting should eventually be an output of the Asset Portfolio.

5.0 FINANCING STRATEGY

The financing strategy is the final component of the AMP. It provides a plan to move forward with the asset management strategy that was provided in Section 4 of this report.

5.1 Review of Municipality Revenues and Capital Expenditures

Section 4 indicated that that on average the Municipality's existing in-scope infrastructure needs approximately \$4.8 million per year to be sustained (refer to Figure 6). The review of infrastructure needs in Section 4 also recognized that over the coming years the Municipality will continually review the infrastructure needs.

Table 12 summarizes the Municipality's 2013 budget for expenditures on the renewal of existing infrastructure. It is apparent that the Municipality planned to spend a total of approximately \$2.9 million in 2013 to renew existing infrastructure for the in-scope assets. It should be noted that all of the out-of-scope assets are financed by tax support General Capital.

Table 12 – 2013 Budgeted Financing for Renewal of Existing Infrastructure in Port Hope

Total General Capital Financing – In-scope assets	\$1,159,670
Total General Capital Financing – Out-of-scope assets	\$143,330
Water Rates Capital Financing	\$1,093,000
Wastewater Rates Capital Financing	\$680,000

5.2 Comparison of Expenditures and Revenues

Table 13 summarizes the 2013 planned expenditures compared to the long term needs. Table 13 also identifies the Municipality's 2013 anticipated revenues from the water/wastewater rate and the general tax levy for in-scope assets. It is apparent that there is a shortfall of approximately \$1.9 million per year.

It should be noted that a cursory review of the out-of-scope assets indicates that they require an additional \$2.2 million per year to be renewed over the long term. This compares to the available financing for the out-of-scope assets of \$143,000 (refer to Table 12). This indicates that there is a shortfall in the out-of-scope assets of approximately \$2.0 million. This is greater than the shortfall that is identified for the in-scope assets.

Table 13 – Review of Financing Shortfall for In-Scope Assets

	2013 Planned Expenditures	Long Term Needs	Shortfall	Anticipated 2013 Tax/Rate Levy Revenue
General Capital Financing for In-scope Assets	\$1,159,670	\$2,052,240	\$892,570	\$14,636,400
Water Rates Capital Financing	\$1,093,000	\$1,172,899	\$78,899	\$3,119,600
Wastewater Rates Capital Financing	\$680,000	\$1,578,135	\$898,135	\$3,976,200
Total	\$2,932,670	\$4,803,274	\$1,870,604	\$21,732,200

As discussed in Section 4.4, the Strategic Financial Plan and Water and Wastewater Rate Study have similar conclusions with respect to the long term needs of the infrastructure and the fact that a shortfall exists when the needs are compared to the available funding. Due to the different approaches, a direct comparison of the magnitude of the shortfall is not possible. However all of the documents identify a shortfall in the same approximate range.

5.3 Addressing the Financing Shortfall over the Short Term

The following is a list of options that should be considered to address the financing shortfall:

1. Implement the asset management activities described in Section 4.7 of this AMP
Asset Management is not something that is done once. It is a series of policies, processes and systems that are continually refined. The Municipality is realistic in their understanding that it will take several years to complete all of the activities that are recommended in Section 4.7 of this report. As the Municipality advances formalized Asset Management processes and systems, Staff, Council and citizens will become more engaged in the administration of infrastructure and the services that it provides. This AMP should be viewed as the first step in a long range plan to achieve the strategies to improve the management of the Municipality's infrastructure that are listed in Section 4.6.

2. Increase tax/rate revenues

The following table identifies the year at which the revenues will equal the expenditure needs for the in-scope assets for a range of taxation/rate increases.

Annual Taxation/ Rate Levy % Inc.	Year Capital Levy Equals Expenditures		
	Tax Supported	Water Rate	Wastewater Rate
1%	2019	2016	2034
2%	2016	2015	2024
3%	2016	2014	2020
4%	2015	2014	2019
5%	2015	2014	2018

3. Pursue Provincial and Federal grants whenever possible

The Capital Budget assumes only Gas Tax 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 funding gap. It is reasonable to assume that funds will become available in the future from both senior levels of government. Port Hope should develop a methodology to secure a share of these funds.

5.4 Addressing the Financing Shortfall over the Long Term

The best approach to address the long-term financing shortfall is committing to the strategies summarized in Section 4.6 and implementing the specific activities summarized in Section 4.7. This will allow the Municipality to prepare a more refined estimate of the infrastructure needs that is not simply based on replacing infrastructure when it is at the end of its useful life.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This first iteration of the AMP identifies a long-term need of approximately \$4.8 million per year to renew the Municipality's existing infrastructure for the assets that are in the scope of this study. A cursory review of the out-of-scope assets indicates that this infrastructure requires an additional \$2.2 million per year to be renewed over the long term.

This long-term need has been established based on a strategic review of the Municipality's asset inventory. It is important to recognize that the Municipality is striving to reach a position where the infrastructure needs equal the available revenues. Over the coming years, the Municipality will continually review the infrastructure needs as better information becomes available and as technological improvements reduce the cost of renewing infrastructure. The Municipality will also consider approaches to increase the revenue that is available to fund the renewal of existing infrastructure, including pursuing Provincial or Federal infrastructure grants. This strategy positions the Municipality on a path to ultimately reach a point where the infrastructure needs equal the available revenues.

Appendix A

Information and Assumptions used to Develop Long Term and Prioritized Short Term Renewal Needs

Asset Group	Probability of Failure Score (1 = low, 5 = high) ¹	Consequence of Failure Score (1 = low, 5 = high) ²	Useful Life (Years)	Cost								
Public Works – Linear Assets – Water mains	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	Pipe Diameter: <100mm = 1 150 mm to 100 mm = 2 200 mm = 3 250 mm = 4 >300 mm = 5 Assumptions: <ul style="list-style-type: none"> Larger diameter mains (300 mm and larger) service water facilities, and are therefore already flagged as high consequence. 	Water main = 80	$\$/m = \text{Pipe Dia. (mm)} \times 2$ <table border="1" data-bbox="1579 521 1864 727"> <thead> <tr> <th>Pipe (mm)</th> <th>\$/m</th> </tr> </thead> <tbody> <tr> <td>100mm</td> <td>\$200/m</td> </tr> <tr> <td>250mm</td> <td>\$500/m</td> </tr> <tr> <td>300mm</td> <td>\$600/m</td> </tr> </tbody> </table>	Pipe (mm)	\$/m	100mm	\$200/m	250mm	\$500/m	300mm	\$600/m
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Notes:

- Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
- Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Asset Group	Probability of Failure Score (1 = low, 5 = high) ¹	Consequence of Failure Score (1 = low, 5 = high) ²	Useful Life (Years)	Cost										
Public Works – Linear Assets Sanitary Sewers	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	Pipe Diameter: Gravity Mains: <150 mm = 1 200 mm = 2 250 mm = 3 300 mm to 375 mm = 4 >450 mm = 5 Force Mains: <300 mm = 4 >300 mm = 5	Sanitary sewer = 80	$\$/m = \text{Pipe Dia. (mm)} \times 2$ <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Pipe (mm)</th> <th>\$/m</th> </tr> </thead> <tbody> <tr> <td>150mm</td> <td>\$300/m</td> </tr> <tr> <td>200mm</td> <td>\$400/m</td> </tr> <tr> <td>300mm</td> <td>\$600/m</td> </tr> <tr> <td>450mm</td> <td>\$900/m</td> </tr> </tbody> </table>	Pipe (mm)	\$/m	150mm	\$300/m	200mm	\$400/m	300mm	\$600/m	450mm	\$900/m
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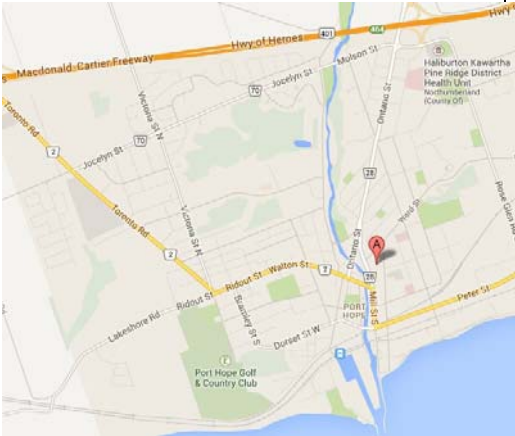
Notes:

1. Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
2. Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Asset Group	Probability of Failure Score (1 = low, 5 = high) ¹	Consequence of Failure Score (1 = low, 5 = high) ²	Useful Life (Years)	Cost												
Public Works – Linear Assets Storm Sewers	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	Pipe Diameter: Gravity Mains 200 mm = 1 250 mm to 375 mm = 2 450 mm to 600 mm = 3 675 mm to 900 mm = 4 >1050 mm = 5	Storm sewer = 80	$\$/m = \text{Pipe Dia. (mm)} \times 2$ <table border="0"> <thead> <tr> <th><u>Pipe (mm)</u></th> <th><u>\$/m</u></th> </tr> </thead> <tbody> <tr> <td>200mm</td> <td>\$400/m</td> </tr> <tr> <td>250mm</td> <td>\$500/m</td> </tr> <tr> <td>600mm</td> <td>\$1200/m</td> </tr> <tr> <td>900mm</td> <td>\$1800/m</td> </tr> <tr> <td>1050mm</td> <td>\$2100/m</td> </tr> </tbody> </table>	<u>Pipe (mm)</u>	<u>\$/m</u>	200mm	\$400/m	250mm	\$500/m	600mm	\$1200/m	900mm	\$1800/m	1050mm	\$2100/m
<u>Pipe (mm)</u>	<u>\$/m</u>															
200mm	\$400/m															
250mm	\$500/m															
600mm	\$1200/m															
900mm	\$1800/m															
1050mm	\$2100/m															
Public Works – Bridges and Large Culverts	Based on 2006 OSIM inspection summary and updated provided by Port Hope staff based on updated assessments.	All bridges = 5 All culverts = 4 All footbridges = 4	Bridges = 75 Culverts = 50	From replacement costs in 2006 Bridge Needs Study												

Notes:

1. Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
2. Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Asset Group	Probability of Failure Score (1 = low, 5 = high) ¹	Consequence of Failure Score (1 = low, 5 = high) ²	Useful Life (Years)	Cost
Public Works – Linear Assets	Based on 2010/2011 Urban Roads PCI Assessment – Pavement Condition Index: Condition > 75 = 1 Condition 55 to 74 = 2 Condition 35 to 54 = 3 Condition 20 – 34 = 4 Condition <20 = 5	Major Roads (yellow) = 5 Arterial Roads (white) = 4 Other = 2 	Surface of paved roads = 30 Base of paved roads = 60	Total = \$450/m Surface = \$110/m Base = \$340/m

Notes:

1. Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
2. Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Asset Group	Probability of Failure Score (1 = low, 5 = high)¹	Consequence of Failure Score (1 = low, 5 = high)²	Useful Life (Years)	Cost
Public Works – Unpaved Roads	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	All unpaved roads = 1	Unpaved roads = 40	From TCA database
Public Works –Traffic Lights	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	All traffic lights = 4	Traffic lights = 20	From TCA database
Public Works – Streetlights	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	All streetlights = 3	Streetlights = 50	From streetlight inventory Wooden pole = \$600 Separate pole and base = \$2900 Decorative light = \$8700

Notes:

1. Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
2. Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Asset Group	Probability of Failure Score (1 = low, 5 = high) ¹	Consequence of Failure Score (1 = low, 5 = high) ²	Useful Life (Years)	Cost
Public Works – Sidewalks	Based on 2013 Sidewalk Needs Study – Rating: Rating A = 5 Rating B = 3 Rating C = 1	All sidewalks = 2	Sidewalk = 50	Sidewalk = \$125/m
Public Works – Buildings	Based on Age only – Refer to Tables 3 & 5 in Section 2 of the AMP	Joint Operation Centre = 5 Water treatment plant mechanical and electrical equipment = 5 All other water building assets = 4 All wastewater building assets = 4 Transportation and other garages/storage = 3	M&E = 20 Structural = 50	From TCA database

Notes:

1. Probability of Failure and Consequence of Failure scores are a first iteration completed during the development of this AMP and will be adjusted by staff on an ongoing basis to refine the prioritization of asset to renewal.
2. Useful life and Replacement Costs are theoretical industry standards based on the Municipality's TCA information and generalizations within each asset group and will be adjusted by staff on an ongoing basis to refine the long term renewal needs.

Appendix B

Overview of the Asset Management Framework

1.0 OVERVIEW OF THE ASSET MANAGEMENT FRAMEWORK

1.1 RVA’s Asset Management Framework

RVA uses a framework to guide the improvement of asset management systems. This Framework is shown in Figure B1. The Framework shows how all of the asset management activities that will be described in the following sections of this report align with the AMP. Figure B1 also shows how the major sections of the AMP align with the Framework.

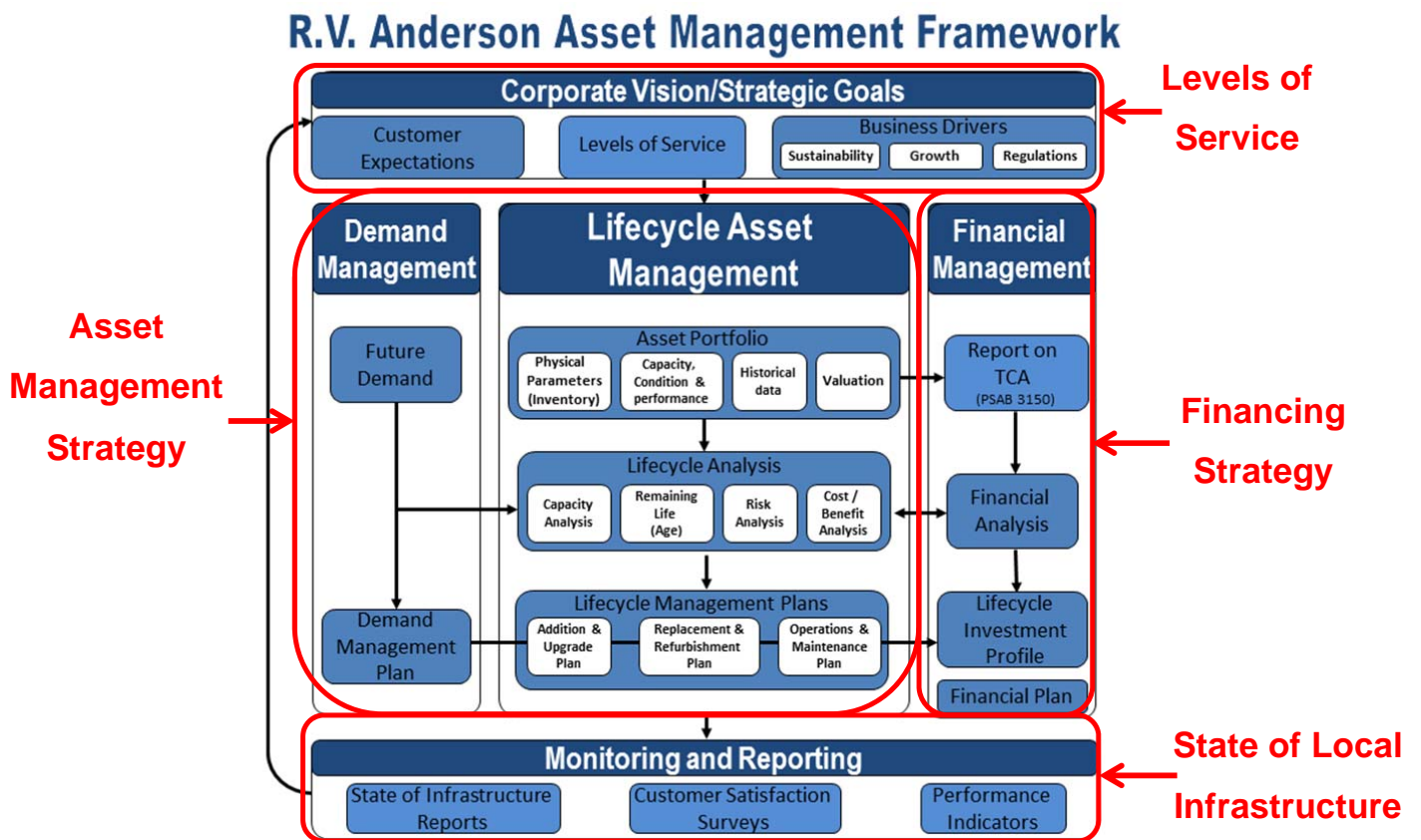


Figure B1 – RVA Asset Management Framework

1.2 Corporate Vision/Strategic Goals

The first section of the AM Framework is related to establishing the Corporate Vision or Strategic Goals of the Municipality. This section is referred to as the Levels of Service in the Provincial Guide. It includes all of the policies and goals of the organization as it relates to meeting the expectations of its customers (residents), establishing levels of service and setting other drivers for business in the Municipality, such as accommodating growth.

1.2.1 Customer Expectations

Customer expectations are one of the most important considerations when developing plans to manage the Municipality's infrastructure. They are used to determine how much of each type of infrastructure is needed to meet the expectations of the community. Most municipalities try to predict what their customers expect, and then manage the feedback they receive to change their service level targets. The Municipality currently uses an informal feedback mechanism of responding to direct citizen complaints or using direction from Council to understand customer expectations.

1.2.2 Levels of Service

Levels of service define the end goal of the asset management plan. They are used to drive the information that is collected and the decisions that are made with respect to the construction or renewal of infrastructure in the Municipality. Levels of service can be related to corporate goals, regulations or customer expectations (described above). It is important to establish levels of service that relate to both condition and capacity of the infrastructure in a format that can be tracked using associated performance measures. The first iteration of the Municipality's AMP included a summary of the existing service levels for the various asset groups.

1.2.3 Business Drivers

It is also important to establish other goals of the Municipality that will impact infrastructure. Some of these are related to regulations, such as the Accessibility for Ontarians with Disabilities Act (AODA). Other business drivers are based on encouraging various types of development or decreasing the impact that the Municipality has on the natural environment. These drivers will have a corresponding impact on how infrastructure is planned, designed and constructed.

1.3 Life Cycle Asset Management and Demand Management

The second section of the AM Framework houses the primary "hands on" asset management tools and processes. This section is referred to as the Asset Management Strategy in the Provincial Guide. It includes all of the information and processes that are required to optimize the decision making process with respect to infrastructure renewal or new construction.

1.3.1 Asset Portfolio

The asset portfolio is the most significant component of an asset management system. It houses all of the data that is used to make life cycle investment decisions regarding asset renewal, expansion/new construction or decommissioning. The asset portfolio should include the following information:

- The physical parameters of each asset, such as the age, size and location.
- Information on the capacity, condition or performance of each asset.
- Historical data for each asset, such as the condition ratings from previous assessments or the historical maintenance records.
- The value of the asset for use in renewal planning or for accounting purposes (i.e. TCA reporting).

The Municipality maintains several separate inventories of their assets. The Finance Department manages a TCA register with individual assets. The Public Works Department maintains a series of databases on the roads, bridges, sidewalks and facilities. The Ganaraska Region Conservation Authority maintains a GIS database on the water mains, sanitary sewers, and storm sewers.

In coordination with the asset portfolio, the data hierarchy for each asset type is an essential component to managing the Municipality's infrastructure. A data hierarchy is the structure of how the assets will be tracked in the Asset Management databases in the Municipality. A data hierarchy defines two important elements of the asset portfolio:

1. Establishing how each asset class is broken down into individual assets, such as the segmentation of linear assets and how large facilities are broken down into smaller components.
2. Establishing the type of information that is collected for each asset.

It should be recognized that the Municipality's TCA inventory is not structured in a way that can be used as part of an asset management program.

1.3.2 Lifecycle Analysis

The Lifecycle Analysis section of the Framework uses the information contained in the Asset Portfolio to make an optimized decision. Some of the information that is used to make these decisions are listed as follows, however it should be noted that there are other pieces of information that can be used in this process:

- Analysis of the capacity of the infrastructure, supported through studies based on engineering or planning fundamentals (i.e. Master Plans, Needs Studies, Provision Plans, etc.).
- The amount of remaining life for each asset supported by condition assessments or growth projections that could result in the remaining life being limited due to capacity concerns.
- Risk assessments that are supported by a review of both the consequence and probability of failure.
- A review of options using a structured cost/benefit analysis.

The Municipality has limited information on the capacity deficiencies of the majority of the assets. The TCA register does contain the asset age and estimates of the useful life that are used for accounting purposes. This information is sufficient for the purposes of estimating remaining life in lieu of estimates that are derived from condition assessment activities. The TCA register also contains information that can be used to complete a basic risk analysis, such as sizes/descriptions of assets that can be used to estimate the consequence of failure and the age of the asset that can be used to estimate the probability of failure. The Municipality does not have any other risk information of the assets that are derived from a full review of individual systems (i.e. water distribution system risk assessments).

1.3.3 Lifecycle Management Plans

Lifecycle Management Plans take the results of the various Lifecycle Analyses that can be made using the information in the Asset Portfolio to develop infrastructure plans, including:

- The construction of new infrastructure.
- The renewal (replacement or rehabilitation) of existing infrastructure.
- The refinement of O&M strategies (i.e. increased preventative maintenance).

The combined set of plans establishes the prioritized series of infrastructure activities that are used to prepare the capital and operating budgets. In the first AMP, the lifecycle management plan was to address the highest risk infrastructure over the next 15 years.

1.3.4 Demand Management

Demand management refers to using growth projections to determine the future infrastructure needs, and then preparing a plan, in combination with the lifecycle

management plans, to construct new or expand existing infrastructure. The Municipality has an understanding of the infrastructure needs to service new development through the Development Change background studies that have been prepared for the various areas in the Municipality.

1.4 Financial Management

The third section of the AM Framework is related to the Financial Management of the infrastructure in the Municipality. This section is referred to as the Financing Strategy in the Provincial Guide. It includes all of the information and processes that are required to understand the financial needs of the infrastructure and to develop a plan to financially sustain the infrastructure over the long term.

1.4.1 Report of Tangible Capital Assets

The Asset Portfolio should contain all of the information that is necessary to prepare the mandated annual accounting statements (i.e. TCA reporting). This includes the year of installation, historical cost and useful life of each asset. The Municipality does have all of this information in the TCA register. However, as previously mentioned in the “Asset Portfolio” section, the TCA register should be able to “pull out” the financial statement information from the asset portfolio. In other words, the TCA reporting should be an output of the lifecycle asset management systems. Over the short term the Municipality can continue to produce the TCA reports using the current asset register.

1.4.2 Financial Analysis, Lifecycle Investment Profiles and Financial Plan

The other sections of the Financial Management portion of the AM Framework reviews the infrastructure needs and establishes a plan to finance the activities. These processes are well established in the Municipality and will be refined as the infrastructure needs are better understood. They include processes such as revenue projections, the development of capital plans, establishing operating budgets and setting tax and rate increases.

1.5 Monitoring and Reporting

The final section of the AM Framework is related to the Monitoring and Reporting of how well the infrastructure is meeting the levels of service established in the Corporate Vision/ Strategic Goals section of the Framework. This section is referred to as the State of Local Infrastructure in the Provincial Guide.

1.5.1 State of Infrastructure Reports

State of Infrastructure Reports are one form of monitoring that is often used to communicate how well the assets are doing at achieving the target service levels. The results provide Municipality staff, customers and decisions makers with the information they need to adjust the target service levels or to alter the Lifecycle Asset Management Strategy. In the first iteration of the AMP, the State of Local Infrastructure was analyzed based on the condition of the infrastructure and the risk of failure of each asset.

1.5.2 Customer Satisfaction Surveys

Customer satisfaction surveys are another common tool that can be used to monitor how customers feel about the services that they receive through the infrastructure systems. A simple version of a customer satisfaction survey is a database of 3-1-1 calls. The advantage of customer satisfaction surveys is that they engage the community in the planning and decision making process of their municipality.

1.5.3 Performance Indicators

Performance indicators (also referred to as performance measures) are factors that are used to determine how well each level of service is being achieved. Ideally, each level of service will have an associated performance indicator. The first AMP that was prepared by the Municipality included a series of suggested performance indicators for each level of service.