AMP2016

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The 2016 Asset Management Plan for the

Township of Asphodel-Norwood

SUBMITTED BY THE PUBLIC SECTOR DIGEST INC. (PSD)
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Contents

List of Figures

List of Tables

Executive Summary

Infrastructure is inextricably linked to the economic, social and environmental advancement of a community. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada. As analyzed in this asset management plan (AMP), the Town of Asphodel-Norwood 's infrastructure portfolio comprises nine distinct infrastructure categories: road network, bridges & culverts, water, sanitary, storm, buildings & facilities, machinery & equipment, land improvements, and fleet. The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $67 million, of which roads comprised 28%, followed by buildings & facilities at 19%.

While major investments in infrastructure occurred in the 1970s, more consistent expenditures were made beginning in the mid-1980s, paralleling other municipalities in Ontario. Between 1985-1999, expenditures on the road network totaled nearly $11 million. Between 2000-2004, the period of the largest investments on infrastructure, expenditures totaled $15 million, including $7 million on buildings & facilities. Since 2010, expenditures have totalled more than $12 million.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. This AMP, the municipality's second following the completion of its first edition in 2013, details the state of infrastructure of the municipality's service areas and provides asset management and financial strategies designed to facilitate its pursuit of developing an advanced asset management program and mitigate long-term funding gaps.

Based on 2016 replacement cost, and a blend of age-based and assessment data, while 54% of assets are in good to very good condition, 21%, with a valuation of more than $14 million, are in poor to very poor condition. Nearly 80% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 6%, with a valuation of $4 million, remain in operation beyond their established useful life. An additional 3%, with a valuation of $1.8 million, will reach the end of their useful life within the next five years.

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the municipality to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

The average annual investment requirement for tax funded categories is $1,319,000. Annual revenue currently allocated to these assets for capital purposes is $682,000 leaving an annual deficit of $637,000. To put it another way, these infrastructure categories are currently funded at 52% of their long-term requirements. In 2016, Asphodel-Norwood has annual tax revenues of $2,621,000. Our strategy includes full funding being achieved over 20 years by:

- increasing tax revenues by 1.0% each year for the next 20 years solely for the purpose of phasing in full funding to the tax funded asset classes covered in this AMP.
- allocating the current gas tax and OCIF revenue as outlined in Table 35.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

The average annual investment requirement for sanitary services and water services is $502,000. Annual revenue currently allocated to these assets for capital purposes is $89,000 leaving an annual deficit of $413,000. To put it another way, these infrastructure categories are currently funded at 18% of their long-term requirements. In 2016, Asphodel-Norwood has annual sanitary revenues of $389,000 and annual water revenues of $381,000. We recommend a 15 year option that involves full funding being achieved by:

- when realized, reallocating the debt cost reductions of $41,000 for sanitary services and $0 for water services to the applicable infrastructure deficit.
- increasing rate revenues by 3.4% for sanitary services and 3.0% for water services each year for the next 15 years solely for the purpose of phasing in full funding to the rate funded asset categories in this AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

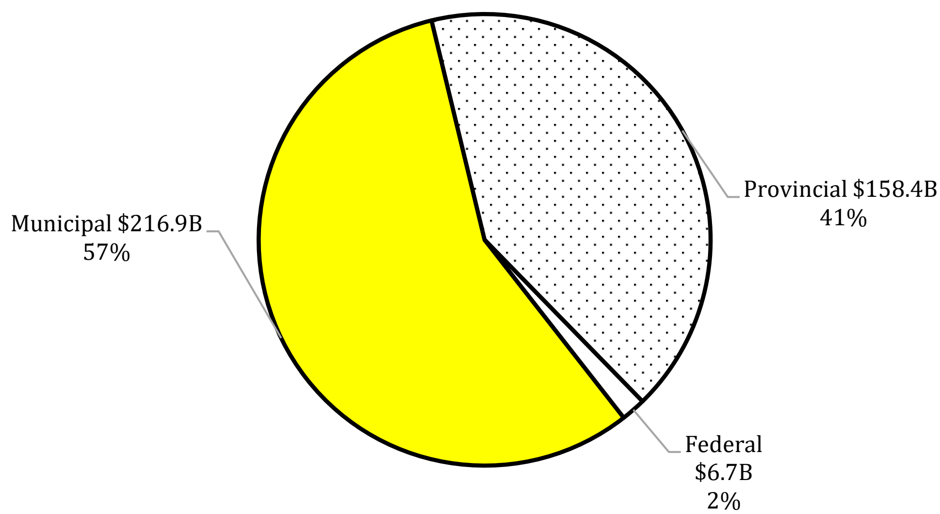
Although our financial strategies allow the municipalities to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

A critical aspect of this asset management plan is the level of confidence the municipality has in the data used to develop the state of the infrastructure and form the appropriate financial strategies. The municipality has indicated a very high degree of confidence in the accuracy, validity and completeness of the asset data for all categories analyzed in this asset management plan.

I. Introduction & Context

Across Canada, municipal share of public infrastructure increased from 22% in 1955 to nearly 60% in 2013. The federal government's share of critical infrastructure stock, including roads, water and wastewater, declined by nearly 80% in value since 1963.[1]

Figure 1 Distribution of Net Stock of Core Public Infrastructure



Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government. The asset portfolios managed by Ontario's municipalities are also highly diverse. The total replacement cost of capital assets analyzed in this document. The municipality relies on these assets to provide residents, businesses, employees and visitors with safe access to important services, such as transportation, recreation, culture, economic development and much more. As such, it is critical that the municipality manage these assets optimally in order to produce the highest total value for taxpayers. This asset management plan, (AMP) will assist the municipality in the pursuit of judicious asset management for its capital assets.

[1] Larry Miller, Updating Infrastructure In Canada: An Examination of Needs And Investments Report of the Standing Committee on Transport, Infrastructure and Communities, June 2015

II. Asset Management

Asset management can be best defined as an integrated business approach within an organization with the aim to minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service for present and future customers. It includes the planning, design, construction, operation and maintenance of infrastructure used to provide services. By implementing asset management processes, infrastructure needs can be prioritized over time, while ensuring timely investments to minimize repair and rehabilitation costs and maintain municipal assets.

Table 1 Objectives of Asset Management

Inventory	Capture all asset types, inventories and historical data.
Current Valuation	Calculate current condition ratings and replacement values.
Life Cycle Analysis	Identify Maintenance and Renewal Strategies & Life Cycle Costs.
Service Level Targets	Define measurable Levels of Service Targets
Risk & Prioritization	Integrates all asset classes through risk and prioritization strategies.
Sustainable Financing	Identify sustainable Financing Strategies for all asset classes.
Continuous Processes	Provide continuous processes to ensure asset information is kept current and accurate.
Decision Making & Transparency	Integrate asset management information into all corporate purchases, acquisitions and assumptions.
Monitoring & Reporting	At defined intervals, assess the assets and report on progress and performance.

1. Overarching Principles

The Institute of Asset Management (IAM) recommends the adoption of seven key principles for a sustainable asset management program. According to IAM, asset management must be:[2]

Table 2 Principles of Asset Management

Holistic	Asset management must be cross-disciplinary, total value focused
Systematic	Rigorously applied in a structured management system
Systemic	Looking at assets in their systems context, again for net, total value
Risk-based	Incorporating risk appropriately into all decision-making
Optimal	Seeking the best compromise between conflicting objectives, such as costs versus performance versus risks etc.
Sustainable	Plans must deliver optimal asset life cycles, ongoing systems performance, environmental and other long term consequences.
Integrated	At the heart of good asset management lies the need to be joined-up. The total jigsaw puzzle needs to work as a whole - and this is not just the sum of the parts.

[2] “Key Principles”, The Institute of Asset Management, *www.iam.org*

III. AMP Objectives and Content

This AMP is one component of the Town of Asphodel-Norwood ’s overarching corporate strategy. It was developed to support the municipality’s vision for its asset management practice and programs. It provides key asset attribute data, including current composition of the municipality’s infrastructure portfolio, inventory, useful life etc., summarizes the physical health of the capital assets, assess the municipality’s current capital spending framework, and outlines financial strategies to achieve fiscal sustainability in the long-term while reducing and eventually eliminating funding gaps.

As with the first edition of the municipality’s asset management plan in 2013, this AMP is developed in accordance with provincial standards and guidelines, and new requirements under the federal Gas Tax Fund stipulating the inclusion of all eligible asset classes. Previously, only core infrastructure categories were analyzed. The following asset classes are analysed in this document: road network; bridges & culverts; facilities; computer systems; equipment; fleet; and land improvements.

This AMP includes a detailed discussion of the state of local infrastructure and assets for each class; outlines industry standards levels of service and key performance indicators (KPIs); outlines asset management renewal strategy for major infrastructure; and provides financial strategy to mitigate funding shortfalls.

IV. Data and Methodology

The municipality's dataset for the asset classes analyzed in this AMP are maintained in PSD's CityWide® Tangible Assets module. This dataset includes key asset attributes and PSAB 3150 data, including historical costs, in-service dates, field inspection data (as available), asset health, replacement costs, etc.

1. Condition Data

Municipalities implement a straight-line amortization schedule approach to depreciate their capital assets. In general, this approach may not be reflective of an asset's actual condition and the true nature of its deterioration, which tends to accelerate toward the end of the asset's lifecycle. However, it is a useful approximation in the absence of standardized decay models and actual field condition data and can provide a benchmark for future requirements. We analyze each asset individually; therefore, while deficiencies may be present at the individual level, imprecisions are minimized at the asset-class level as the data is aggregated.

As available, actual field condition data was used to make recommendations more precise. The value of condition data cannot be overstated as they provide a more accurate representation of the state of infrastructure. The type of condition data used for each class is indicated in Chapter V, Section 2.

2. Financial Data

In this AMP, the average annual requirement is the amount based on current replacement costs that municipalities should set aside annually for each infrastructure class so that assets can be replaced upon reaching the end of their lifecycle.

To determine current funding capacity, all existing sources of funding are identified, aggregated, and an average for the previous three years is calculated, as data is available. These figures are then assessed against the average annual requirements, and are used to calculate the annual funding shortfall (surplus) and for forming the financial strategies.

In addition to the annual shortfall, the majority of municipalities face significant infrastructure backlogs. The infrastructure backlog is the accrued financial investment needed in the short-term to bring the assets to a state of good repair. This amount is identified for each asset class.

Only predictable sources of funding are used, e.g., tax and rate revenues, user fees, and other streams of income the municipality can rely on with a high degree of certainty. Government grants and other ad-hoc injections of capital are not enumerated in this asset management plan given their unpredictability. As senior governments make greater, more predictable and permanent commitments to funding municipal infrastructure programs, e.g., the federal Gas Tax Fund, future iterations of this asset management plan will account for such funding sources.

3. Infrastructure Report Card

The asset management plan is a complex document, but one with direct implications on the public, a group with varying degrees of technical knowledge. To facilitate communications, we've developed an Infrastructure Report Card that summarizes our findings in accessible language that municipalities can use for internal and external distribution. The report card is developed using two key, equally weighted factors:

Table 3 Infrastructure Report Card Description

Financial Capacity		A municipality's financial capacity is determined by how well it's meeting the average annual investment requirements (0-100%) for each infrastructure class.
Asset Health		Using either field inspection data as available or age-based data, the asset health provide a grades for each infrastructure class based on the portion of assets in poor to excellent condition (0-100%). We use replacement cost to determine the weight of each condition group within the asset class.
Letter Grade	**Rating**	**Description**
A	Very Good	The asset is functioning and performing well; only normal preventative maintenance is required. The municipality is fully prepared for its long-term replacement needs based on its existing infrastructure portfolio.
B	Good	The municipality is well prepared to fund its long-term replacement needs but requires additional funding strategies in the short-term to begin to increase its reserves.
C	Fair	The asset's performance or function has started to degrade and repair/rehabilitation is required to minimize lifecycle cost. The municipality is underpreparing to fund its long-term infrastructure needs. The replacement of assets in the short- and medium-term will likely be deferred to future years.
D	Poor	The asset's performance and function is below the desired level and immediate repair/rehabilitation is required. The municipality is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	The municipality is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The municipality may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.

4. Limitations and Assumptions

Several limitations continue to persist as municipalities advance their asset management practices.

1. As available, we use field condition assessment data to determine both the state of infrastructure and develop the financial strategies. However, in the absence of observed data, we rely on the age of assets to estimate their physical condition.

2. A second limitation is the use of inflation measures, for example using CPI/NRBCPI to inflate historical costs in the absence of actual replacement costs. While a reasonable approximation, the use of such multipliers may not be reflective of market prices and may over- or understate the value of a municipality's infrastructure portfolio and the resulting capital requirements.

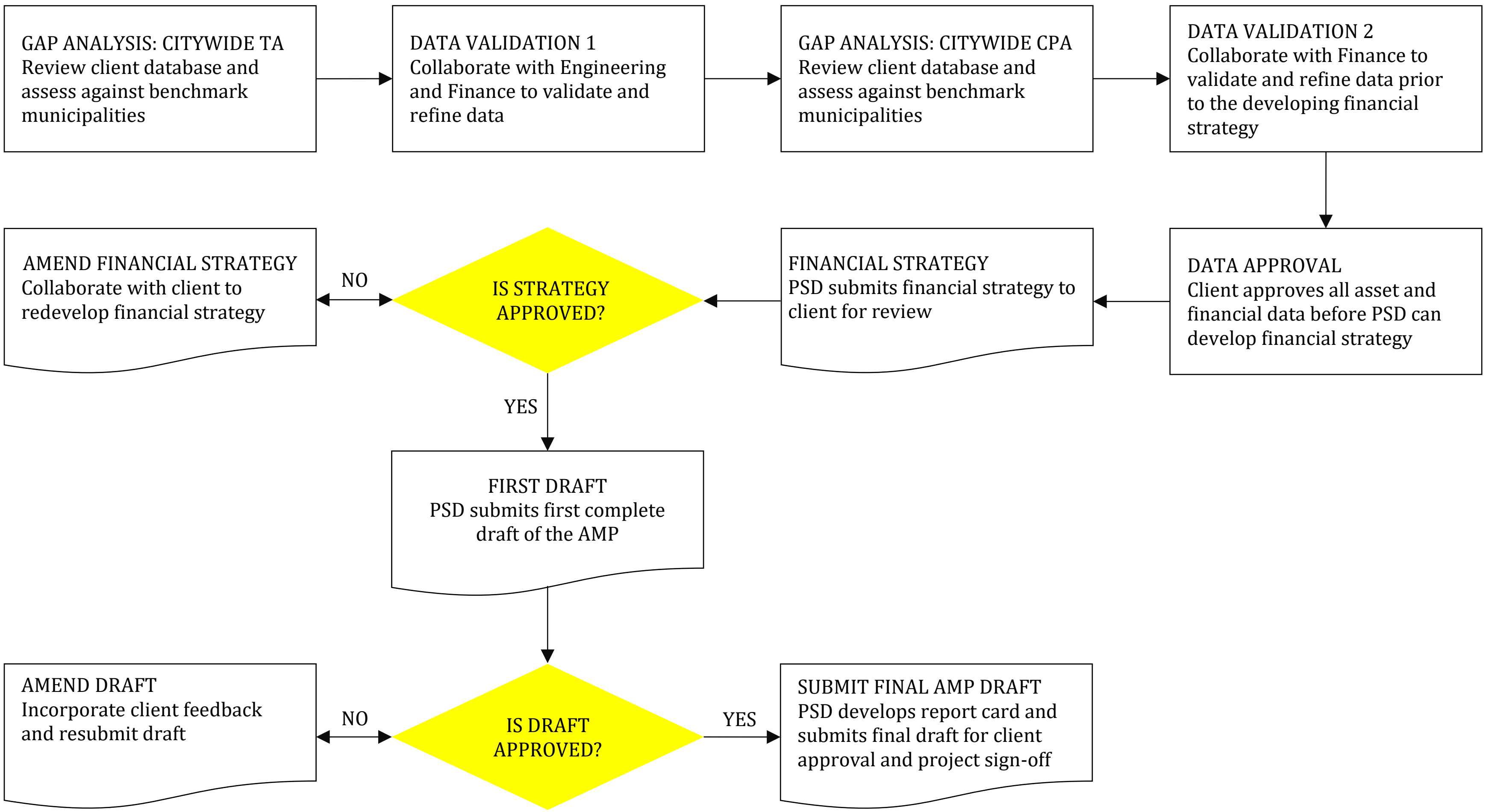
3. Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

4. The focus of this plan is restricted to capital expenditures and does not capture O&M expenditures on infrastructure.

5. Process

High data quality is the foundation of intelligent decision-making. Generally, there are two primary causes of poor decisions: Inaccurate or incomplete data, and the misinterpretation of data used. The figure below illustrates an abbreviated version of our work order/work flow process between PSD and municipal staff. It is designed to ensure maximum confidence in the raw data used to develop the AMP, the interpretation of the AMP by all stakeholders, and ultimately, the application of the strategies outlined in this AMP.

Figure 2 Developing the AMP – Work Flow and Process



6. Data Confidence Rating

Staff confidence in the data used to develop the AMP can determine the extent to which recommendations are applied. Low confidence suggests uncertainty about the data and can undermine the validity of the analysis. High data confidence endorses the findings and strategies, and the AMP can become an important, reliable reference guide for interdepartmental communication as well as a manual for long-term corporate decision-making. Having a numerical rating for confidence also allows the municipality to track its progress over time and eliminate data gaps.

Data confidence in this AMP is determined using five key factors and is based on the City of Brantford's approach. Municipal staff provide their level of confidence (score) in each factor for major asset classes along a spectrum, ranging from 0, suggesting low confidence in the data, to 100 indicative of high certainty regarding inputs. The five Factors used to calculate the municipality's data confidence ratings are:

F1	F2	F3	F4	F5
The data is up to date.	The data is complete and uniform.	The data comes from an authoritative source	The data is error free.	The data is verified by an authoritative source.

The municipality's self-assessed score in each factor is then used to calculate data confidence in each asset class using Equation 1 below.

$$Asset\ Class\ Data\ Confidence\ Rating = \sum Score\ in\ each\ factor \times \frac{1}{5}$$

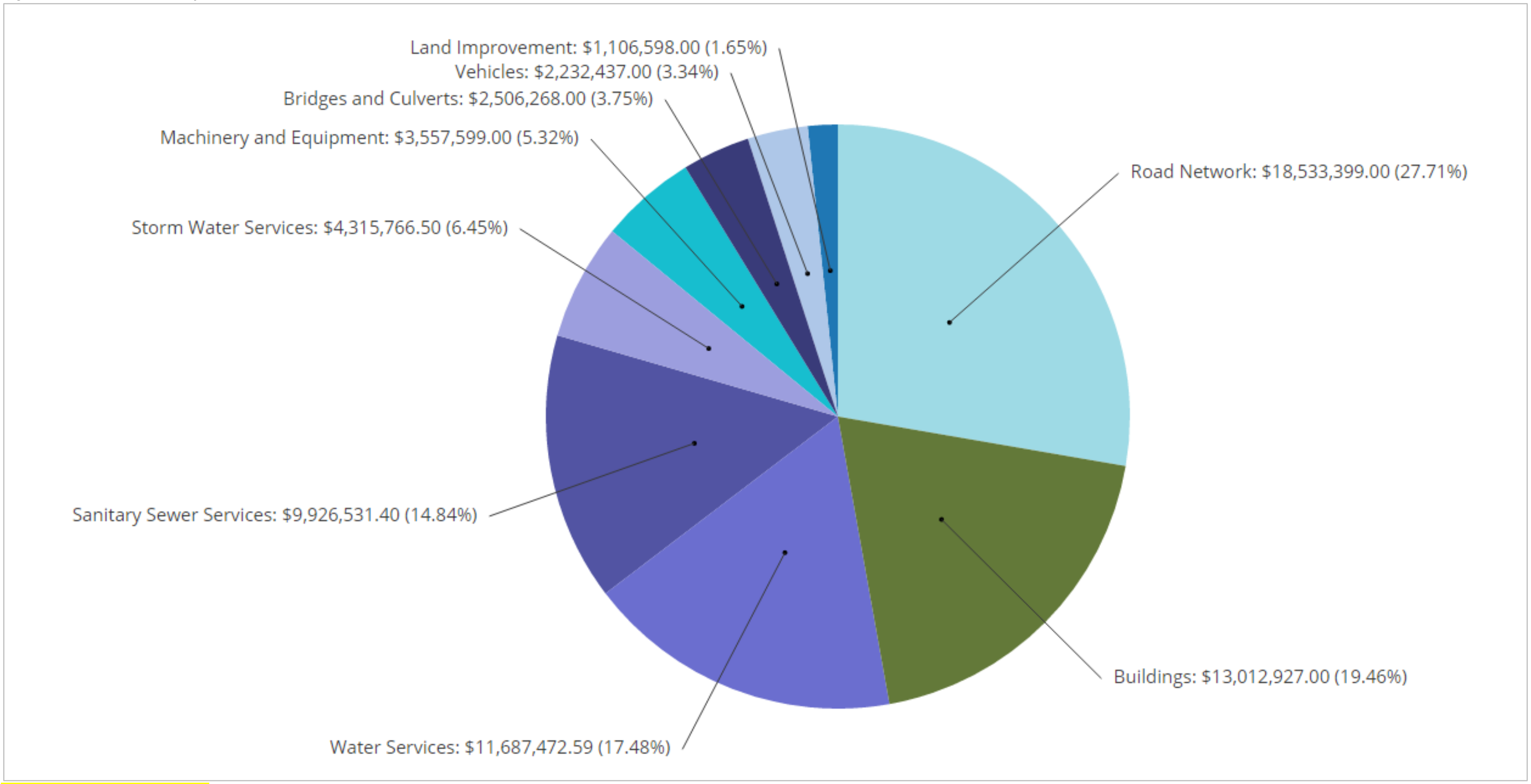
V. Summary Statistics

In this section, we aggregate technical and financial data across all asset classes analyzed in this AMP, and summarize the state of the infrastructure using key indicators, including asset condition, useful life consumption, and important financial measurements.

1. Asset Valuation

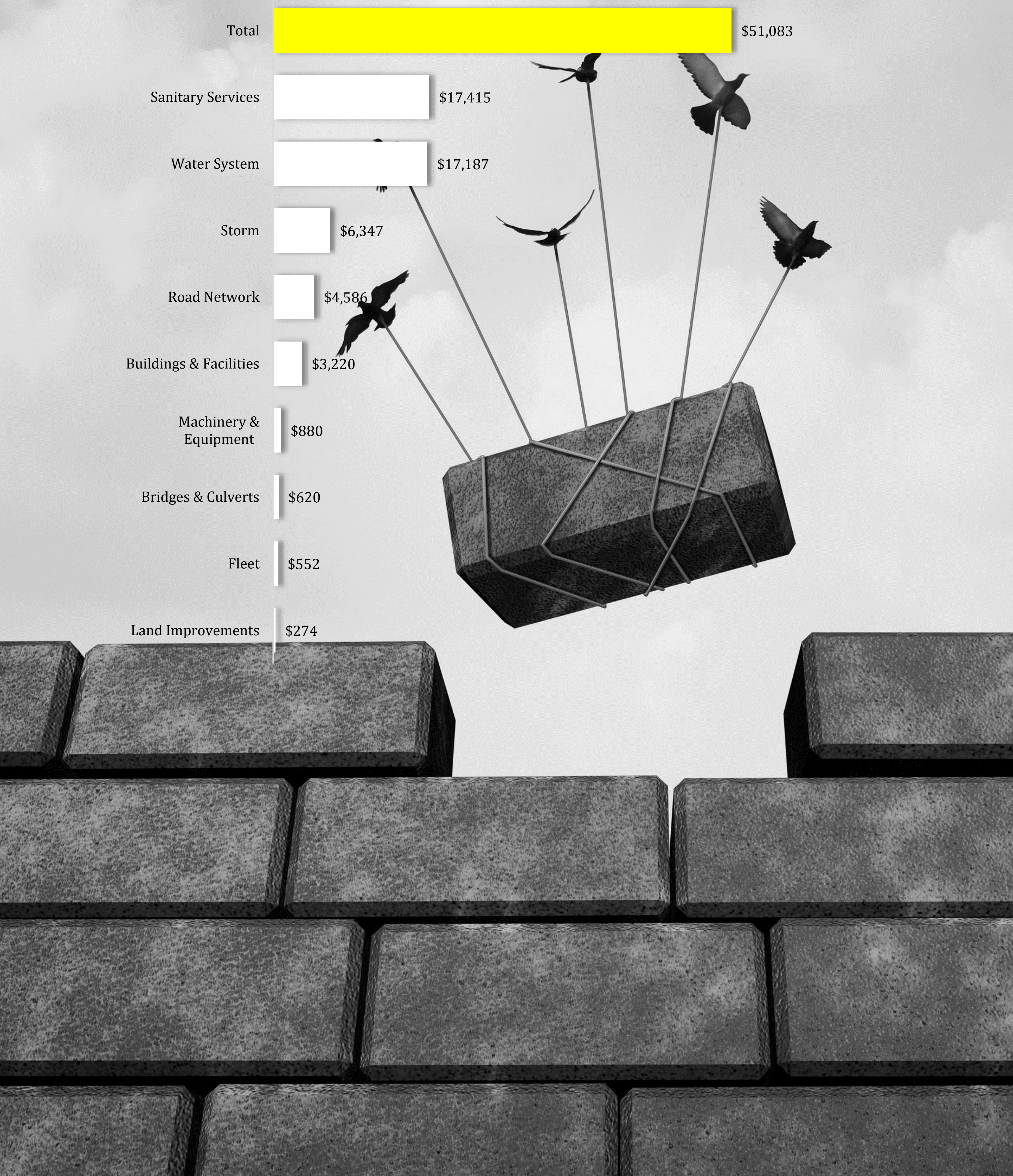
The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $67 million, of which roads comprised 28%, followed by buildings at 19%. The ownership per household (Figure 4) totaled $51,000.

Figure 3 Asset Valuation by Class



Total: $66,878,998

Figure 4 2016 Ownership Per Household



2. Source of Condition Data by Asset Class

Observed data will provide the most precise indication of an asset's physical health. In the absence of such information, age of capital assets can be used as a meaningful approximation of the asset's condition. Table 4 indicates the source of condition data used for each of the nine asset classes in this AMP.

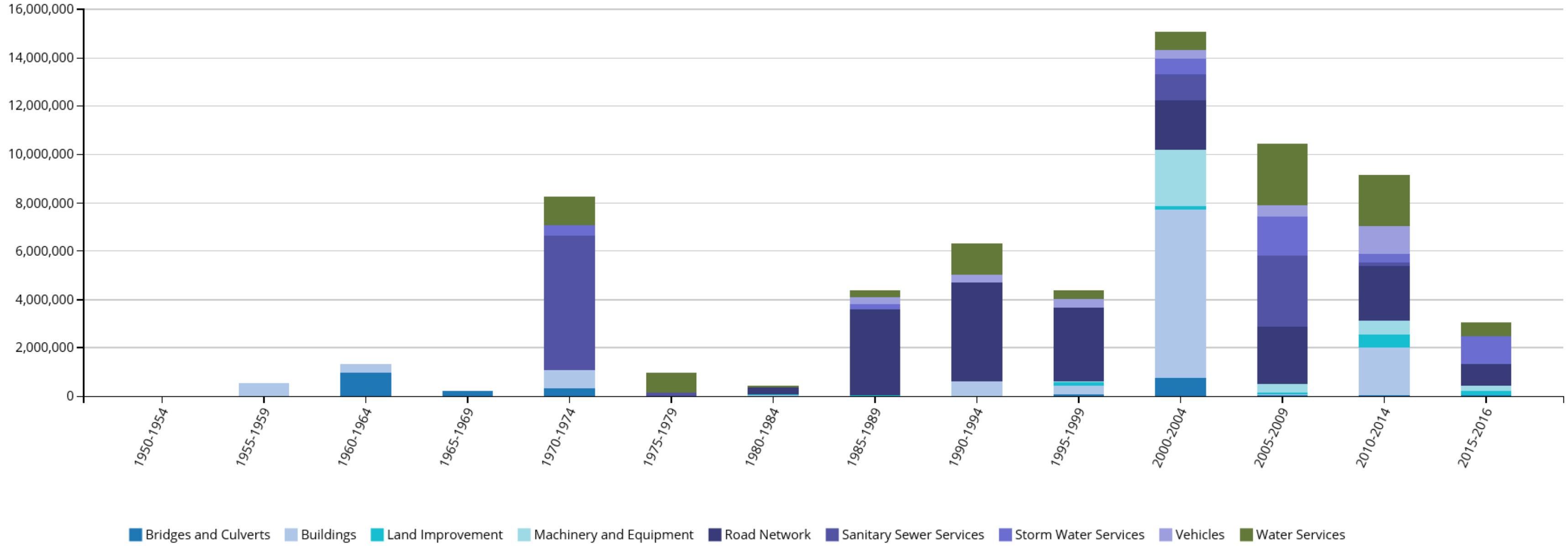
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Source of Condition Data
Roads Network	Road Base	46km assessed
	Surface - HCB	18.49km assessed
	Surface - LCB	33.55km assessed
	Sidewalks	All assessed
	Streetlights	All assessed
Bridges & Culverts	Bridges	Assessed
	Culverts (0.2m-0.9m)	1/813 assessed
	Culverts (10m+)	Assessed
	All other Culverts	Age-based
Water System	Hydrants	8/88 assessed
	Mains	1,420m assessed
	Pumping Stations	709/721 assessed
	Water Valves	12/83 assessed
	All other	Age-based
Sanitary Services	Manholes	4.5 assessed
	All other	Age-based
Storm	Catchbasins	6/131 assessed
	Connections	1/14 assessed
	Manholes	1/40 assessed
	Storm Culverts	195/1,095 assessed
	Mains (350mm-600mm)	146m/2397m
	All other	Age-based
Buildings & Facilities	Fire Hall	1/2 assessed
	Roads & Public Works Office/Storage	2/3 assessed
	All other Buildings	Age-based
Machinery & Equipment	Fire	36/39 assessed
	Parks and Recreation	5/25 assessed
	Signs and Decoration	22/23 assessed
	All other	Age-based
Land Improvements	Recreation	6/8 assessed
	All other	Age-based
Vehicles	Fire Trucks and Vehicles	7/8 assessed
	All other	Age-based

3. Historical Investment in Infrastructure – All Asset Classes

In conjunction with condition data, two other measurements can augment staff understanding of the state of infrastructure and impending and long-term infastructure needs: installation year profile, and useful life remaining. The installation year profile in Figure 5 illustrates the historical invesments in infrastructure across the asset classes analyzed in this AMP since 1950 using 2016 replacement costs. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

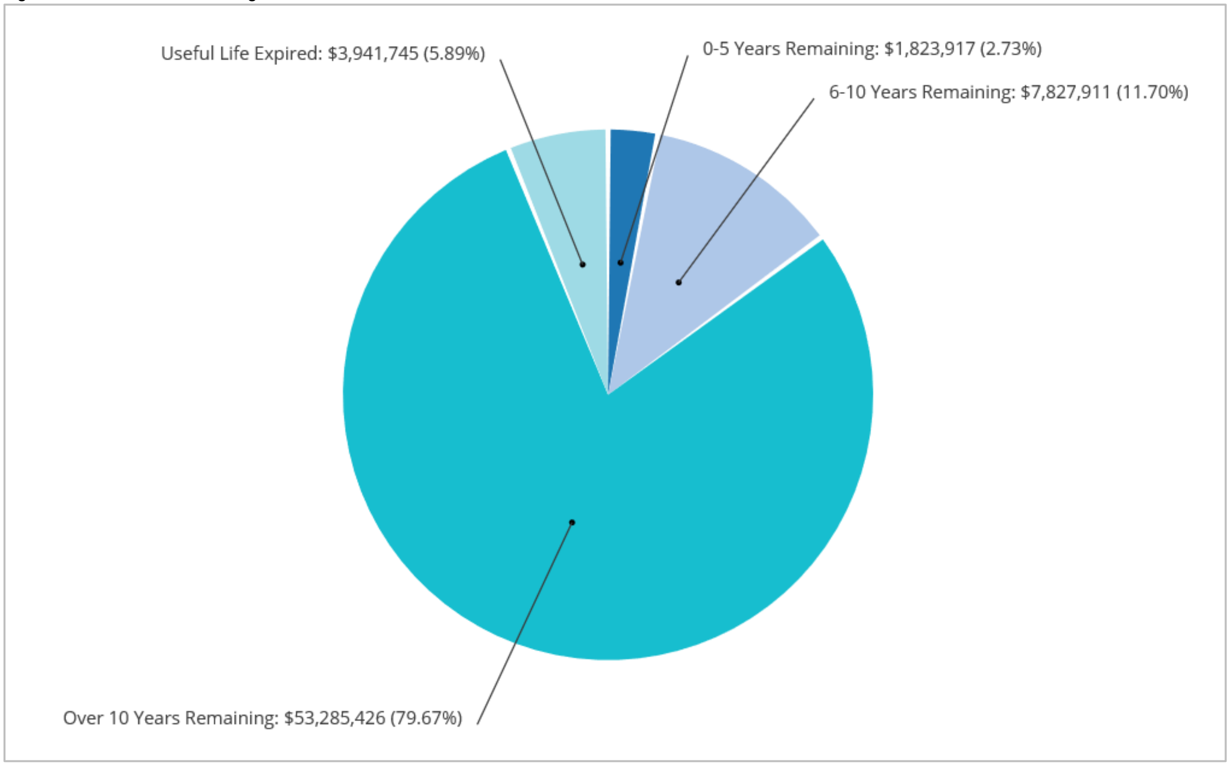


While major investments in infrastructure occurred in the 1970s, more consistent expenditures were made beginning in the mid-1980s, paralleling other municipalities in Ontario. Between 1985-1999, expenditures on the road network totaled nearly $11 million. Between 2000-2004, the period of the largest investments on infrastructure, expenditures totaled $15 million, including $7 million on buildings & facilities. Since 2010, expenditures have totalled more than $12 million.

4. Useful Life Consumption – All Asset Classes

While age is not a precise indicator of an asset's health, in the absence of observed condition assessment data, it can serve as a high-level, meaningful approxmiation and help guide replacement needs and facilitate strategic budgeting. Figure 6 shows the distibution of assets based on the percentage of useful life already consumed.

Figure 6 Useful Life Remaining as of 2015 – All Asset Classes

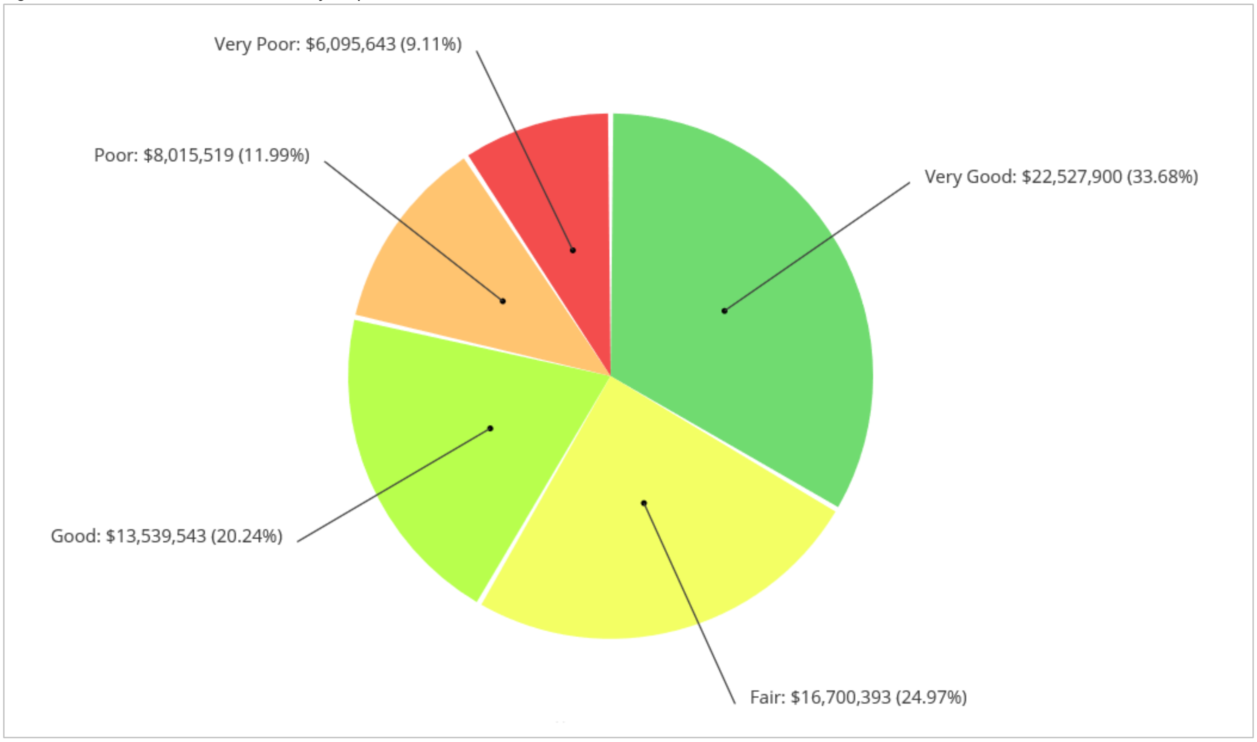


Nearly 80% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 6%, with a valuation of $4 million, remain in operation beyond their established useful life. An additional 3%, with a valuation of $1.8 million, will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and a blend of age-based and assessment data, while 54% of assets are in good to very good condition, 21%, with a valuation of more than $14 million, are in poor to very poor condition.

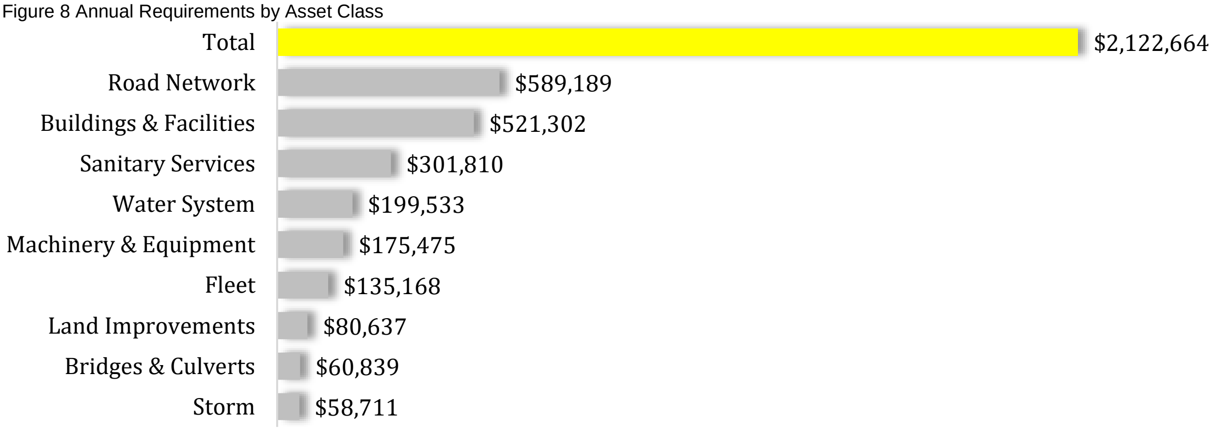
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes



6. Financial Profile

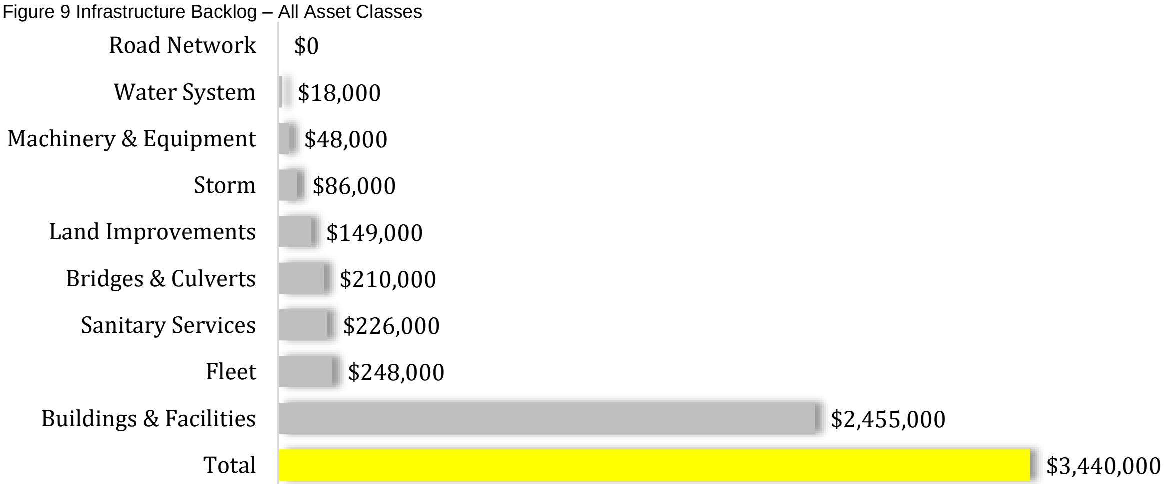
This section details key financial indicators related to the municipality's asset classes as analyzed in this asset management plan.

Figure 8 Annual Requirements by Asset Class



The annual requirements represent the amount the municipality should allocate annually to each of its asset classes to meet replacement need as they arise, prevent infrastructure backlogs and achieve long-term sustainability. In total, the municipality must allocate $2.1 million annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

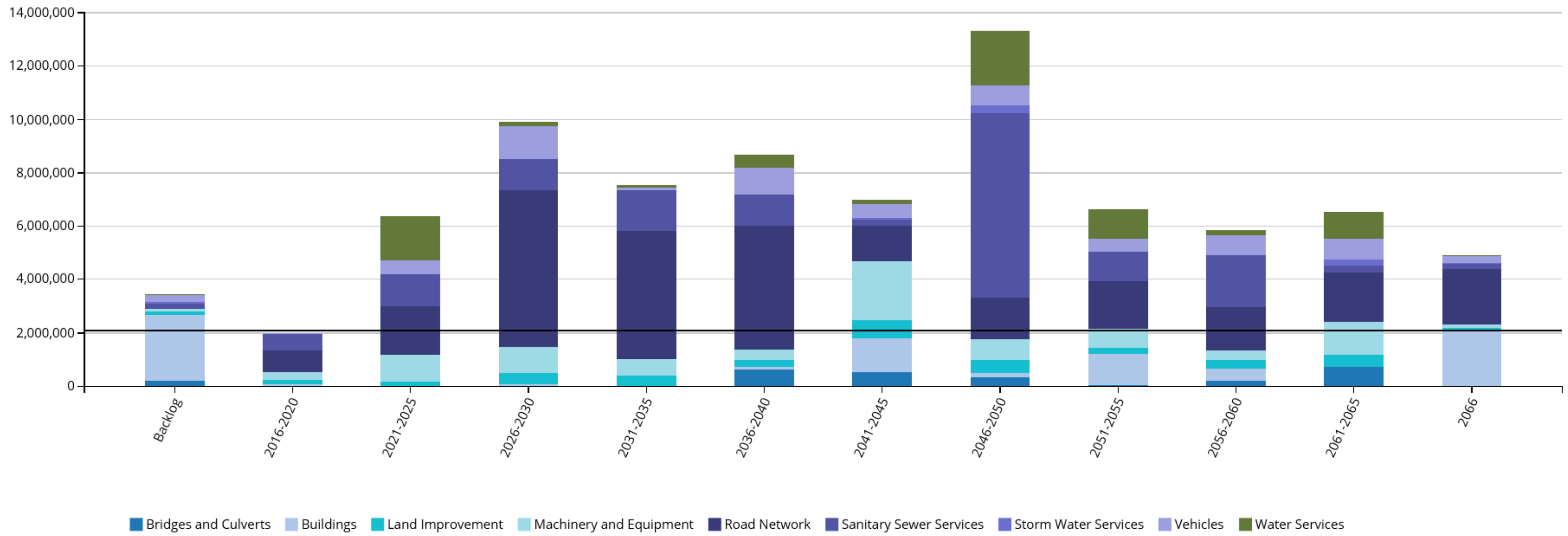


The municipality has a combined infrastructure backlog of $3.4 million, with buildings & facilities comprising 71%. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond their established useful life.

7. Replacement Profile – All Asset Classes

In this section, we illustrate the aggregate short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's asset classes as analyzed in this AMP. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 10 Replacement Profile – All Asset Classes



The municipality has a combined backlog of $3.4 million, of which buildings & facilities comprise $2.5 million. Aggregate replacement needs will total $2 million over the next five years. An additional $6.4 million will be required between 2021 and 2025. The municipality's aggregate annual requirements (indicated by the black line) total $2.1 million. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet the replacement needs for its various asset classes as they arise without the need for deferring projects and accruing annual infrastructure deficits. Currently, the municipality is funding 52% of the annual requirements for tax-funded assets and 18% for rate-funded assets. See the 'Financial Strategy' chapter for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

8. Data Confidence

The municipality has a very high degree of confidence in the data used to develop this AMP, receiving a weighted confidence rating of 80%. This is indicative of significant effort in collecting and refining its data set. The lowest data confidence rating was assigned to the municipality's storm assets.

Table 5 Data Confidence Ratings

Asset Class	The data is up-to-date.	The data is complete and uniform.	The data comes from an authoritative source.	The data is error free.	The data is verified by an authoritative source.	Average Confidence Rating	Weighted Average Data Confidence Rating
Road Network	80%	90%	80%	80%	75%	81%	22%
Bridges & Culverts	90%	90%	100%	90%	100%	94%	4%
Water System	75%	75%	75%	75%	75%	75%	13%
Sanitary Services	75%	75%	75%	75%	75%	75%	11%
Storm	75%	75%	75%	75%	75%	75%	5%
Buildings & Facilities	75%	75%	90%	80%	80%	80%	16%
Machinery & Equipment	90%	90%	90%	90%	90%	90%	5%
Land Improvements	90%	90%	90%	90%	90%	90%	1%
Fleet	90%	90%	90%	90%	90%	90%	3%
Overall Weighted Average Data Confidence Rating							80%

VI. State of Local Infrastructure

In this section, we detail key indicators for each class discussed in this asset management plan. The state of local infrastructure includes the full inventory, condition ratings, useful life consumption data, and the backlog and upcoming infrastructure needs for each asset class. As available, assessed condition data was used to inform the discussion and recommendations; in the absence of such information, age-based data was used as the next best alternative.

1. Road Network

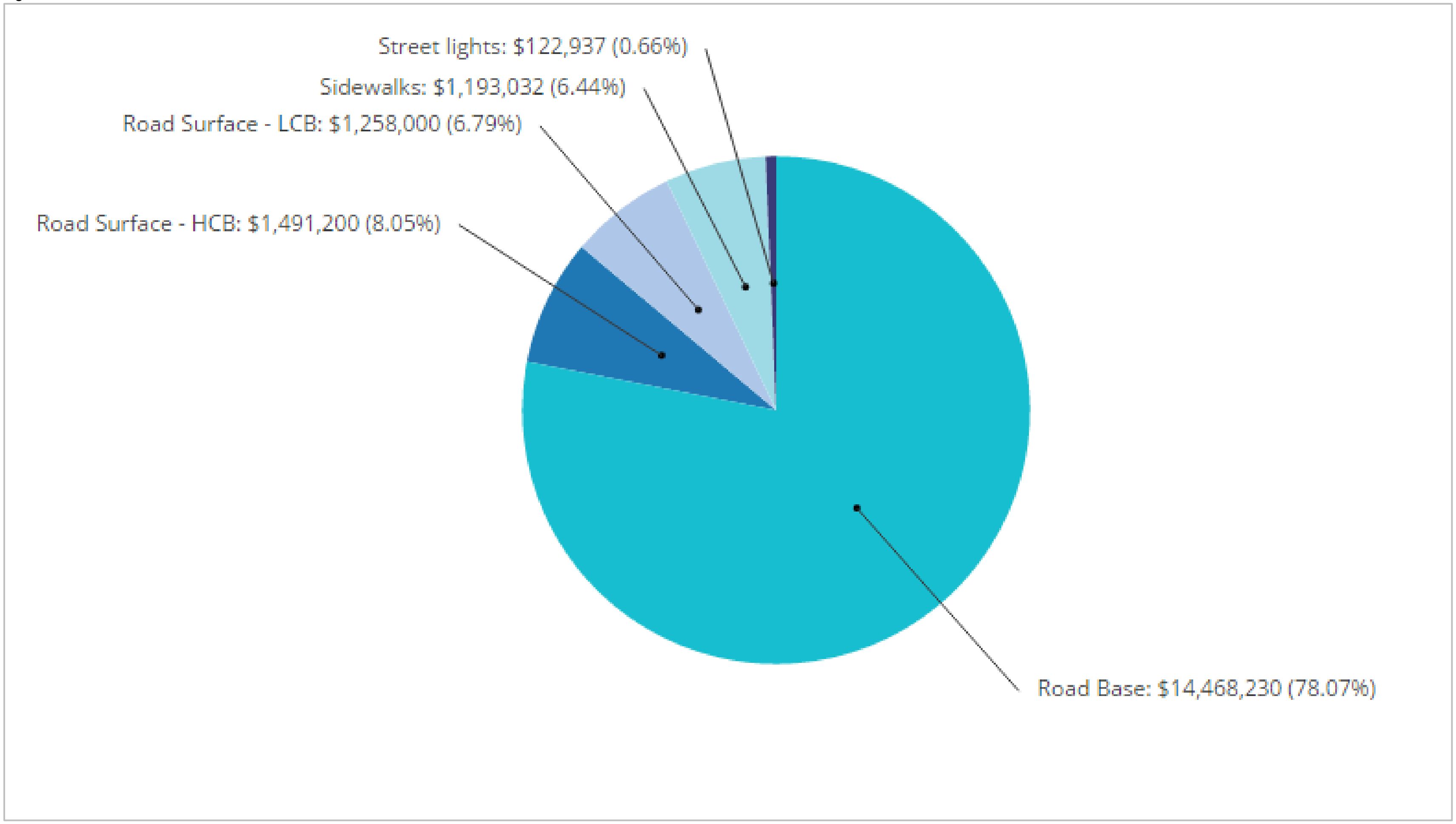
1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 6 illustrates key asset attributes for the municipality's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement cost were derived. In total, the municipality's roads assets are valued at $18.5 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

Table 6 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Road Network	Roads Base	152km	40, 100	$98,000/km	$14,468,230
	Road Surface – LCB	34km	10, 37	$40,000/km	$1,258,000
	Road Surface – HCB	19km	20, 25, 40, 50	$80,000/km	$1,491,200
	Sidewalks	14,184m^2	20, 25, 30	$80/m^2	$1,193,032
	Street Lights	215	20, 30	NRBCPI Quarterly (Toronto)	$122,937
				Total	$18,533,399

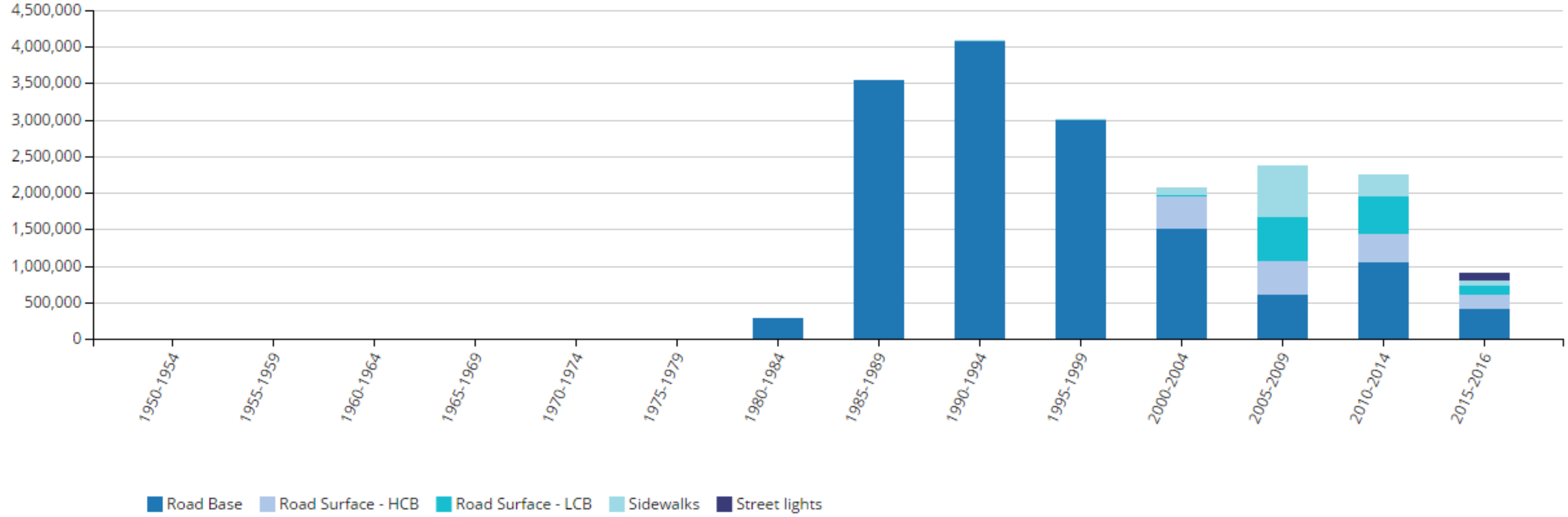
Figure 11 Asset Valuation – Road Network



1.2 Historical Investment in Infrastructure

Figure 12 shows the municipality's historical investments in its road network since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 1.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 12 Historical Investment – Road Network

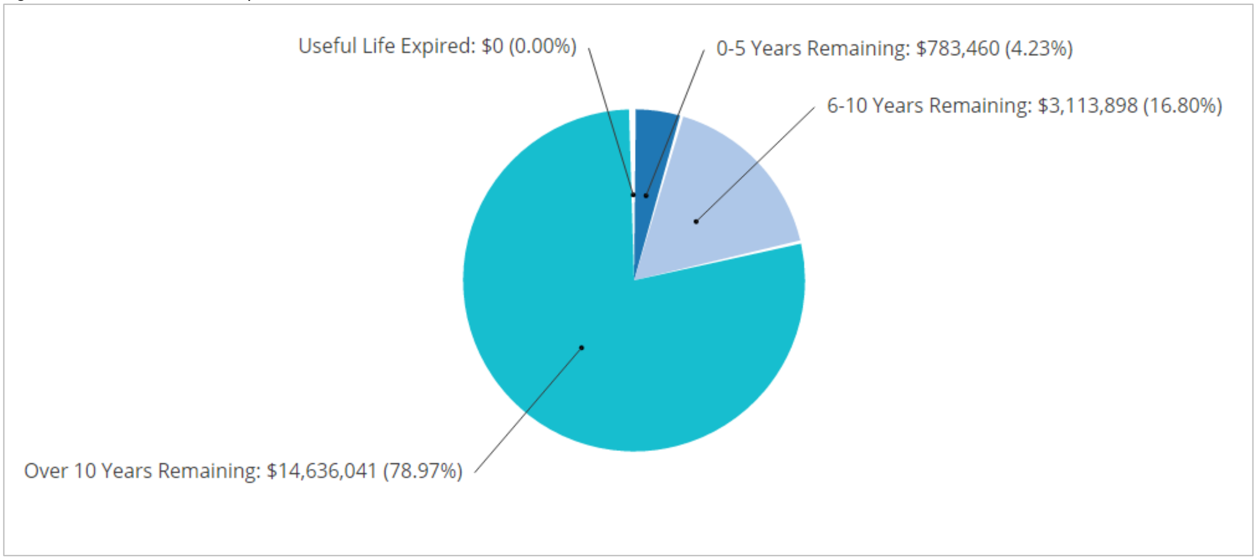


Investments in the municipality's road network grew rapidly starting in the 1980s. Major investments in road base were made in the late 1980s, totaling more than $3.5 million. Between 1990-1994, the period of the largest investments, expenditures on road base totaled $4 million. Since 2010, investments have totaled $3.1 million, with expenditures allocated to all segments.

1.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 13 illustrates the useful life consumption levels as of 2015 for the municipality's road network.

Figure 13 Useful Life Consumption - Road Network

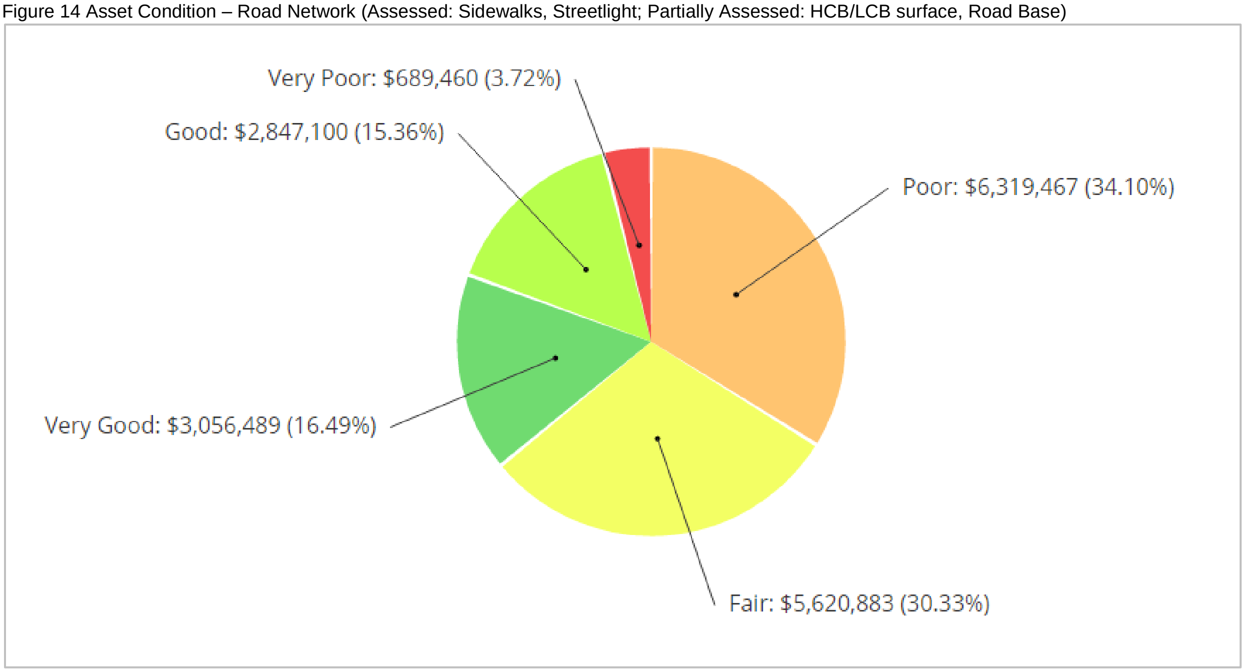


Approximately 80% of the municipality's road network has at least 10 years of useful life remaining; however, 4%, with a valuation of $783,000, will reach the end of their useful life within five years.

1.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's road network as of 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for the majority of its linear road assets.

Figure 14 Asset Condition – Road Network (Assessed: Sidewalks, Streetlight; Partially Assessed: HCB/LCB surface, Road Base)

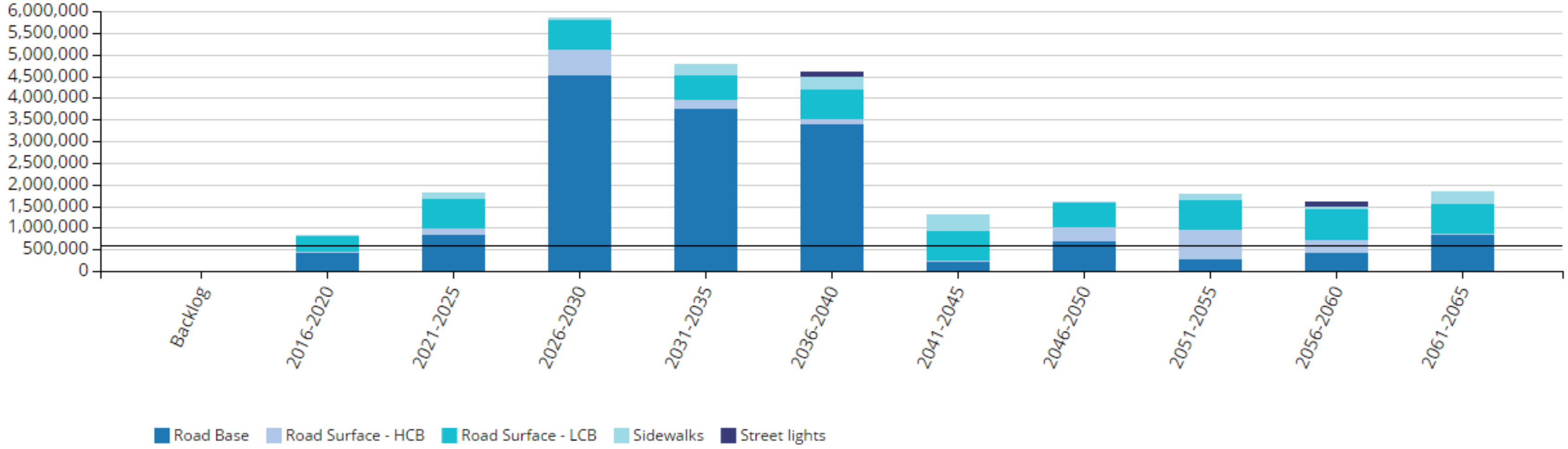


Based on a blend of age and assessed condition data, 37% of assets, with a valuation of $7 million are in poor to very poor condition; less than 32% are in good to very good condition.

1.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's road network assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 15 Forecasting Replacement Needs – Road Network



Data indicates no infrastructure backlog. Replacement needs are forecasted to be $822,000 in the next five years; an additional $1.8 million is forecasted in replacement needs between 2021-2025. The municipality's annual requirements (indicated by the black line) for its road network total $589,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $428,000, leaving an annual deficit of $161,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

1.6 Recommendations – Road Network

A comprehensive road base condition assessment program, including a falling weight deflectometer, should be incorporated across the road network. This device will determine which roads and road bases are actually in need of structural repair or replacement. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of the backlog as well as short, medium, and long term replacement needs. See Section 4, 'Risk' in the 'Asset Management Strategies' chapter for more information.
- In addition to the above, a tailored life cycle activity framework should also be developed to promote standard life cycle management of the road network as outlined further within the "Asset Management Strategy" section of this AMP.
- Road network key performance indicators should be established and tracked annually as part of an overall level of service model. See Section 7 'Levels of Service'.
- The municipality is funding 73% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

2. Bridges & Culverts

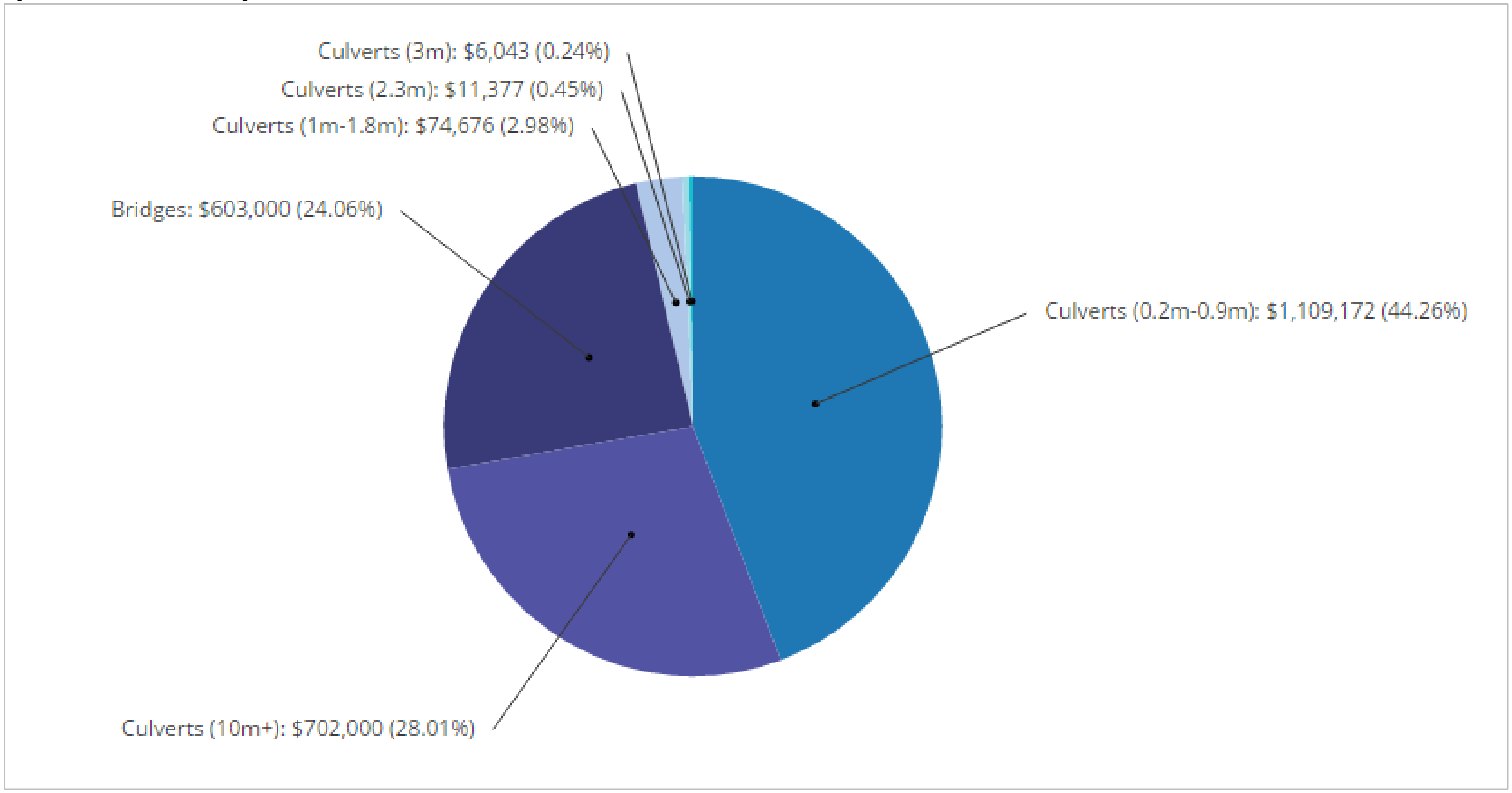
2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 7 illustrates key asset attributes for the municipality's bridges & culverts, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's bridges & culverts assets are valued at $2.5 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 7 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Culverts (0.2m-0.9m)	813	40	NRBCPI Quarterly (Toronto)	$1,109,172
	Culverts (1m-1.8m)	15	40	NRBCPI Quarterly (Toronto)	$74,676
	Culverts (2.3m)	1	40	NRBCPI Quarterly (Toronto)	$11,377
	Culverts (3m)	1	40	NRBCPI Quarterly (Toronto)	$6,043
	Culverts (10m+)	3	40	NRBCPI Quarterly (Toronto)	$702,000
	Bridges	2	45	NRBCPI Quarterly (Toronto)	$603,000
				Total	$2,506,268

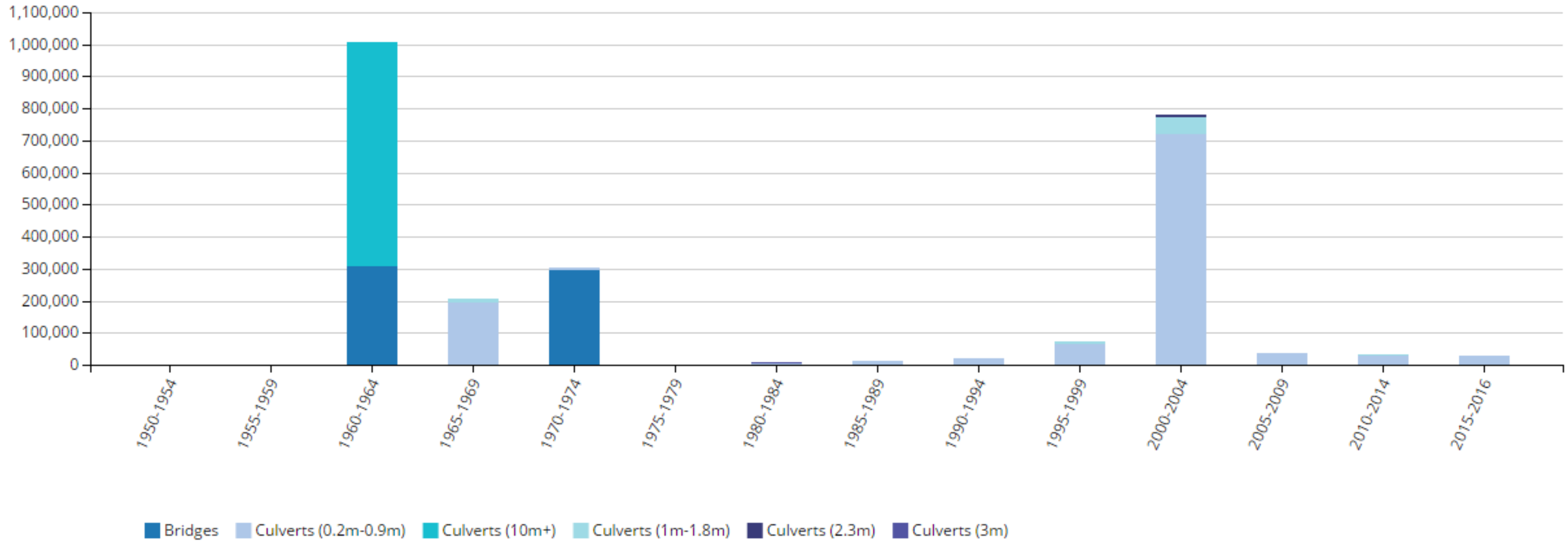
Figure 16 Asset Valuation – Bridges & Culverts



2.2 Historical Investment in Infrastructure

Figure 17 shows the municipality's historical investments in its bridges & culverts since 1950 based on 2016 replacement costs. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 2.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 17 Historical Investment – Bridges & Culverts

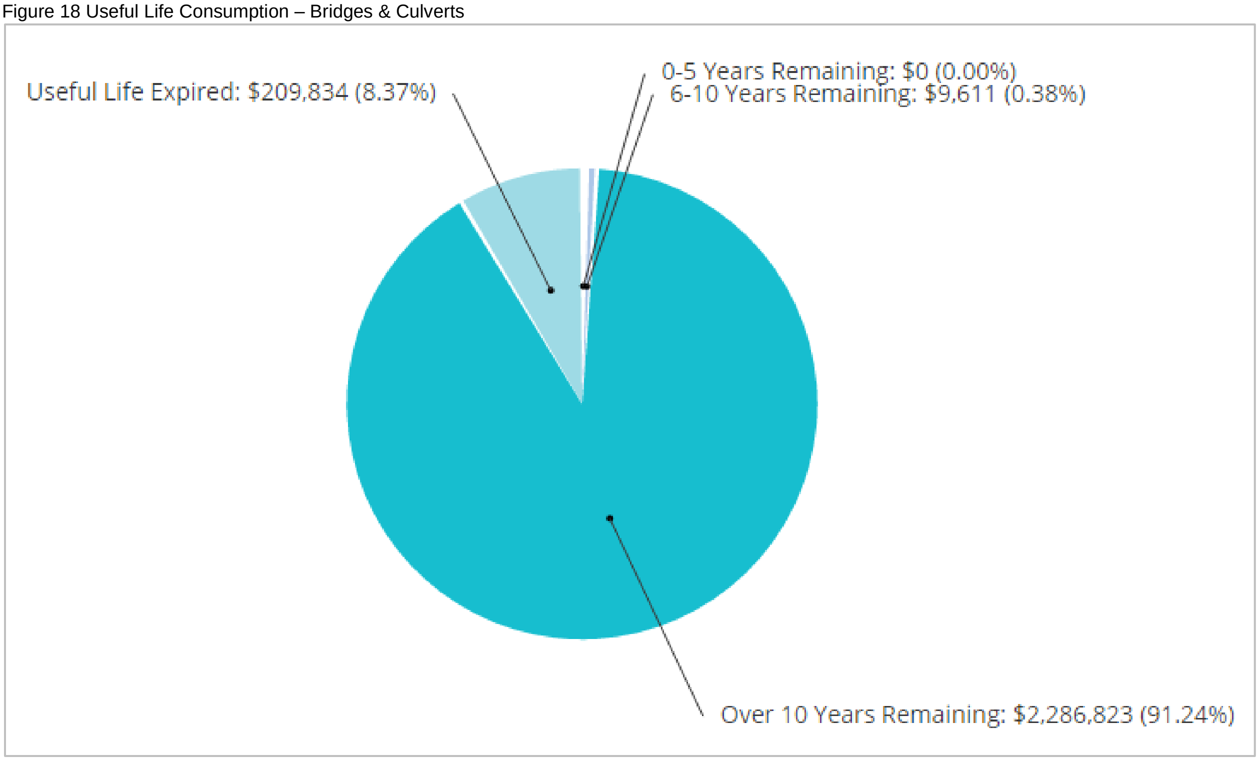


Major investments in bridges & culverts took place between 1960 and 1964, with expenditures totaling $1 million. Investments gradually began to rise again between 1980 and 1999. Since 2000, expenditures have totaled $878,000, allocated primarily to culverts.

2.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels as of 2015 for the municipality's bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

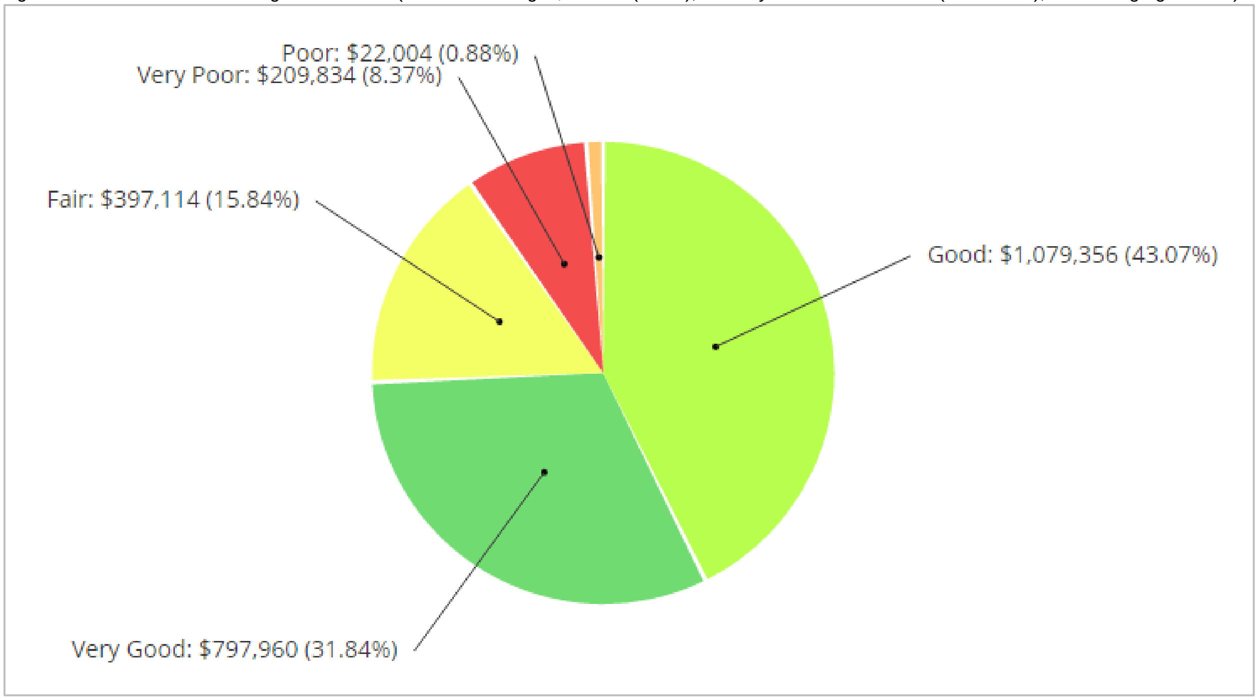


More than 90% of the assets have at least 10 years of useful life remaining; less than 9%, with a valuation of $209,000, remain in operation beyond their useful life.

2.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's bridges & culverts as of 2015. By default, we rely on observed field data adapted from OSIM inspections as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided its OSIM inspection data for the purpose of this AMP.

Figure 19 Asset Condition – Bridges & Culverts (Assessed: Bridges, Culvert (10m+); Partially Assessed: Culverts (0.2m-0.9m); Remaining age-based)

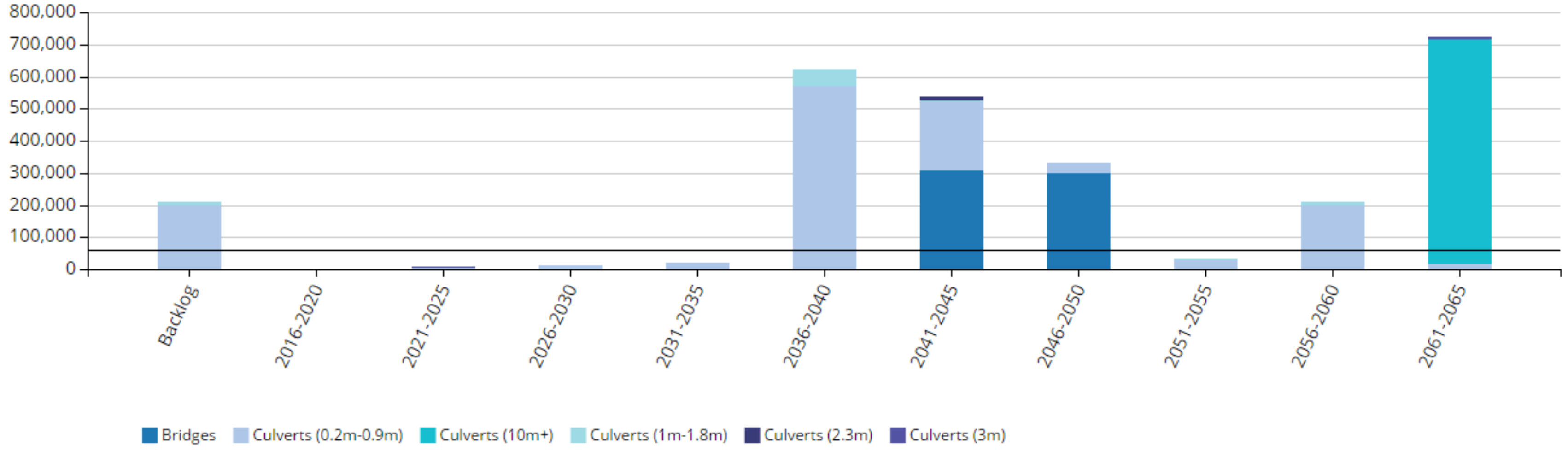


Based on a blend of age and assessed condition data, nearly 80% of the municipality's bridges & culverts are in good to very good condition; 9%, with a valuation of $231,000, are in poor to very poor condition.

2.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's bridges & culverts. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 20 Forecasting Replacement Needs – Bridges & Culverts



Data indicates that there is a backlog of $209,000. Replacement needs within the next 10 years will be less than $10,000. The municipality's annual requirements (indicated by the black line) for its bridges & culverts total $61,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $0, leaving an annual deficit of $61,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

2.6 Recommendations – Bridges & Culverts

- The results and recommendations from the OSIM inspections should be used to generate the short-and long-term capital and maintenance budgets for the bridge and large culvert structures. See Section VIII, ‘Asset Management Strategies’.

- Bridge & culvert structure key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII ‘Levels of Service’.

- The municipality is funding 0% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

3. Water

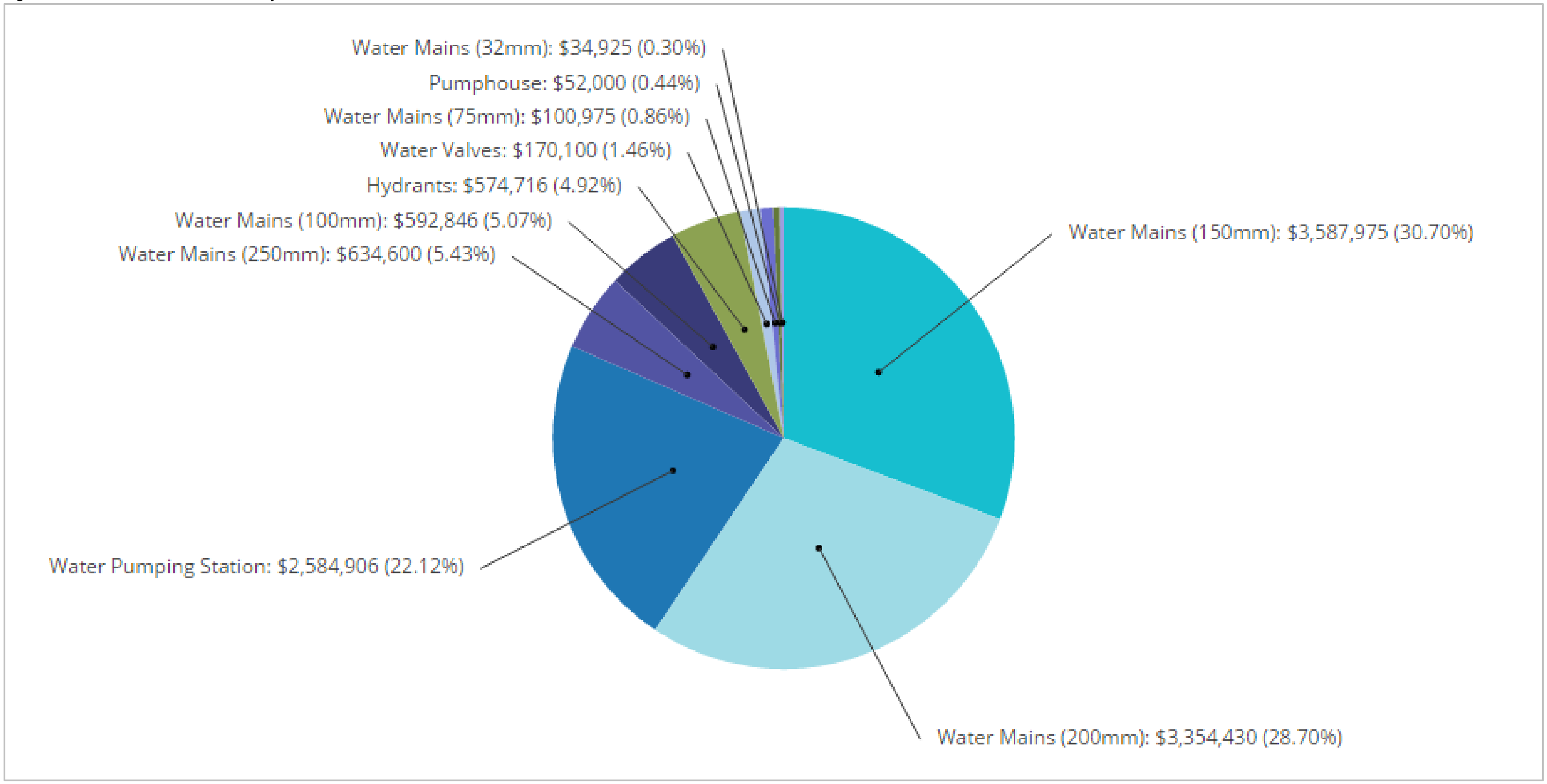
3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 8 illustrates key asset attributes for the municipality's water system assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's water system assets are valued at $11.7 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

Table 8 Key Asset Attributes – Water

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Water Services	Hydrants	88	75	$6,114/unit	$574,716
	Water Mains (32mm)	127m	75	$275/m	$34,925
	Water Mains (75mm)	354m	75	$285/m	$100,975
	Water Mains (100mm)	1,919m	75	$309/m	$592,846
	Water Mains (150mm)	7,817m	75	$459/m	$3,587,975
	Water Mains (200mm)	5,410m	75	$620/m	$3,354,430
	Water Mains (250mm)	835m	75	$760/m	$634,600
	Water Pumping Station	721	5, 7, 10, 15, 20, 25, 50, 75	NRBCPI Quarterly (Toronto)	$2,584,906
	Water Valve	83	50	$2,025/m	$170,100
	Pumphouse	1	25	$52,000/unit	$52,000
				Total	$11,687,473

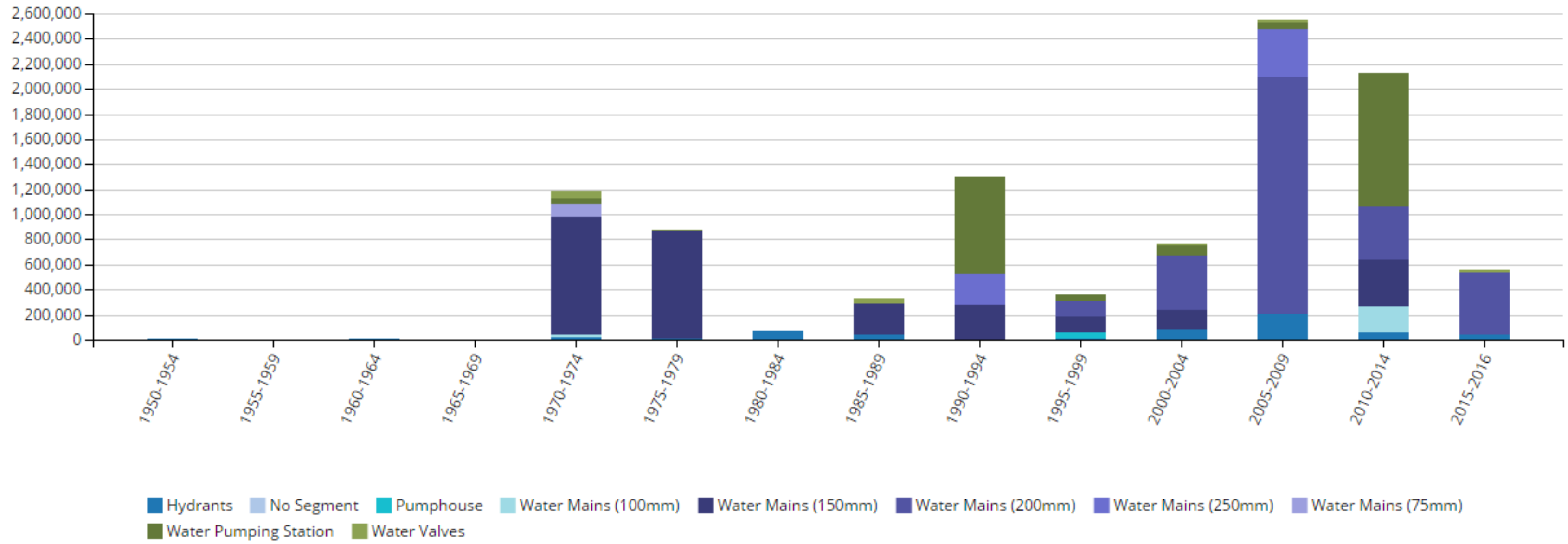
Figure 21 Asset Valuation – Water System



3.2 Historical Investment in Infrastructure

Figure 22 shows the municipality's historical investments in its water system since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 3.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 22 Historical Investment – Water System

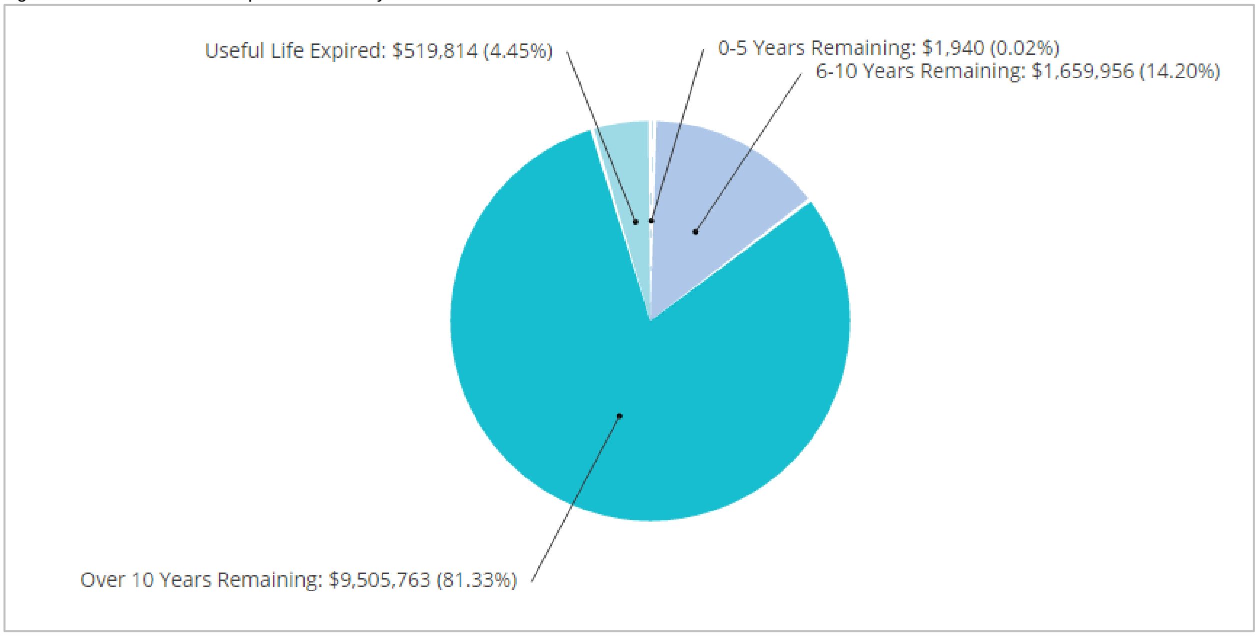


Major investments in water did not occur until the 1970s; $2 million was invested in the water system between 1970 and1979. Between 2005-2009, the period of the largest investment in water assets, expenditures totaled $2.5 million. Since 2010, expenditures have totaled $2.6 million.

3.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 23 illustrates the useful life consumption levels as of 2015 for the municipality's water system.

Figure 23 Useful Life Consumption – Water System

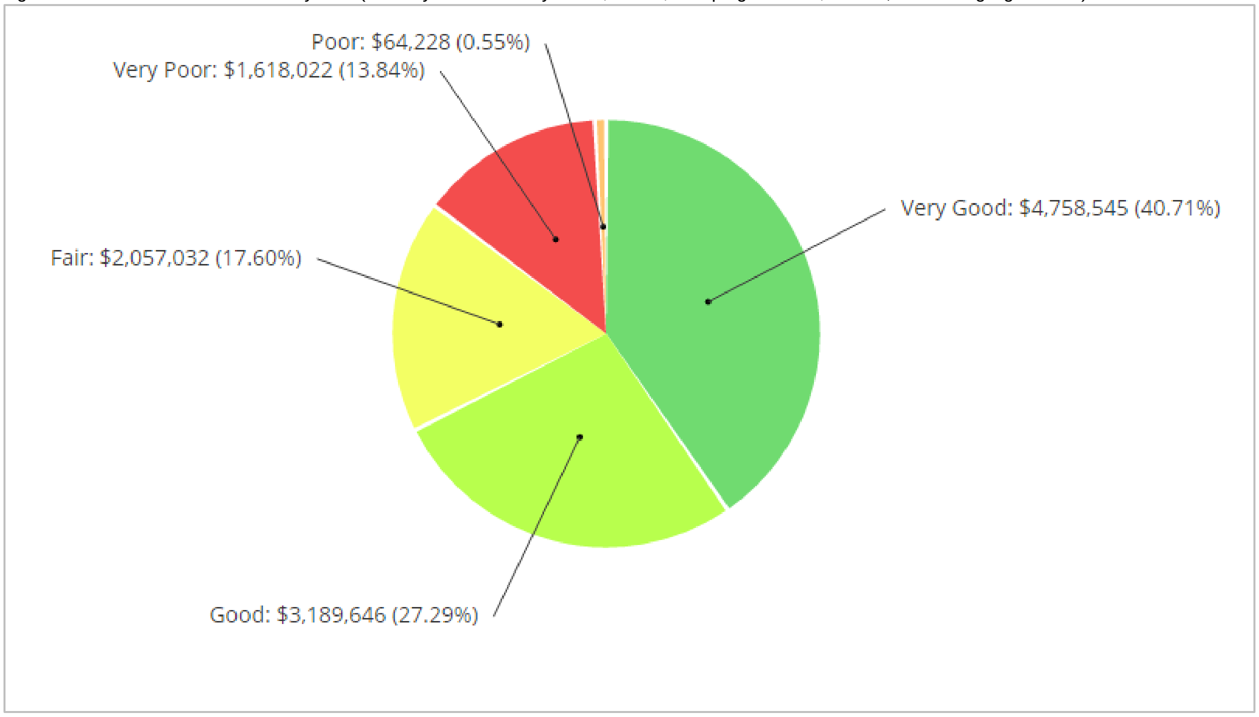


More than 80% of the assets have at least 10 years of useful life remaining; less than 5%, with a valuation of $520,000, remain in operation beyond their useful life.

3.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's water services. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for some of its water system assets.

Figure 24 Asset Condition – Water System (Partially Assessed: Hydrants, Mains, Pumping Stations, Valves; Remaining Age-based)

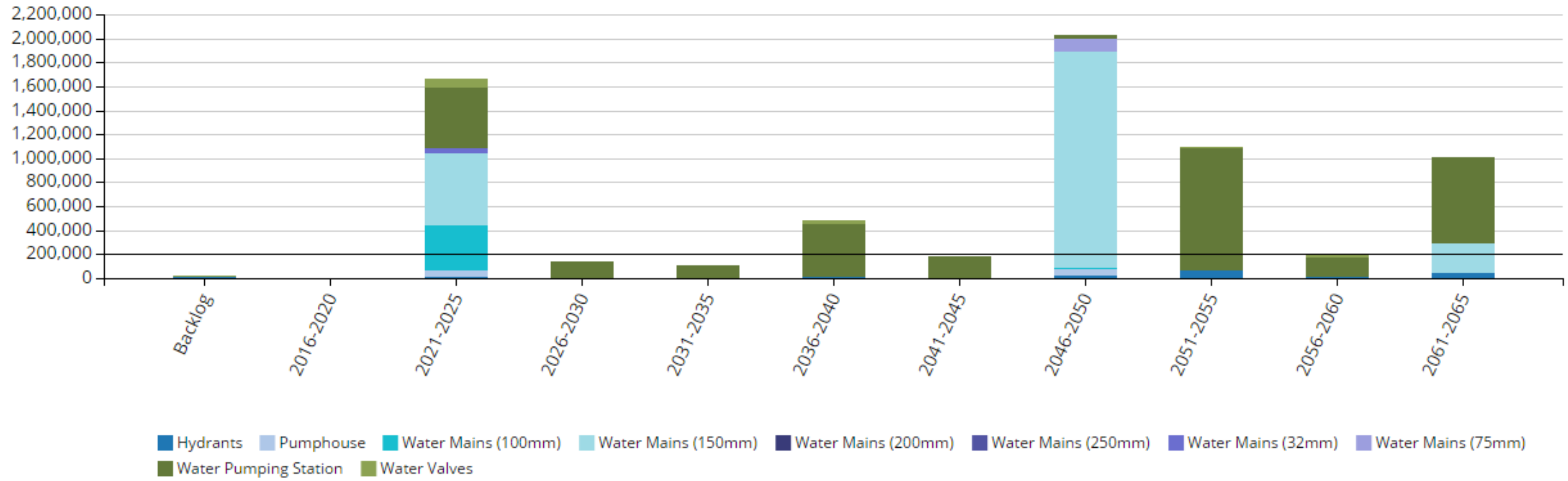


Based on a blend of age and assessed condition data, 68% of assets are in good to very good condition; 15%, with a valuation of $1.7 million, are in poor to very poor condition.

3.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's water system assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 25 Forecasting Replacement Needs – Water System



Data indicates a backlog of $18,000. No replacement needs will be required in the next five years; however, more than $1.6 million will be required between 2021 and 2025. The municipality's annual requirements (indicated by the black line) for its water system total $200,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $29,000, leaving an annual deficit of $171,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

3.6 Recommendations – Water System

- Similar to bridges & culverts, water services are uniquely consequential to a community's wellbeing. While age-based data shows the majority of assets to be in fair to very good condition, the municipality should augment its condition assessment program to more precisely estimate its financial requirements and field needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Water distribution system key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.

- The municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding only 15% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

4. Sanitary

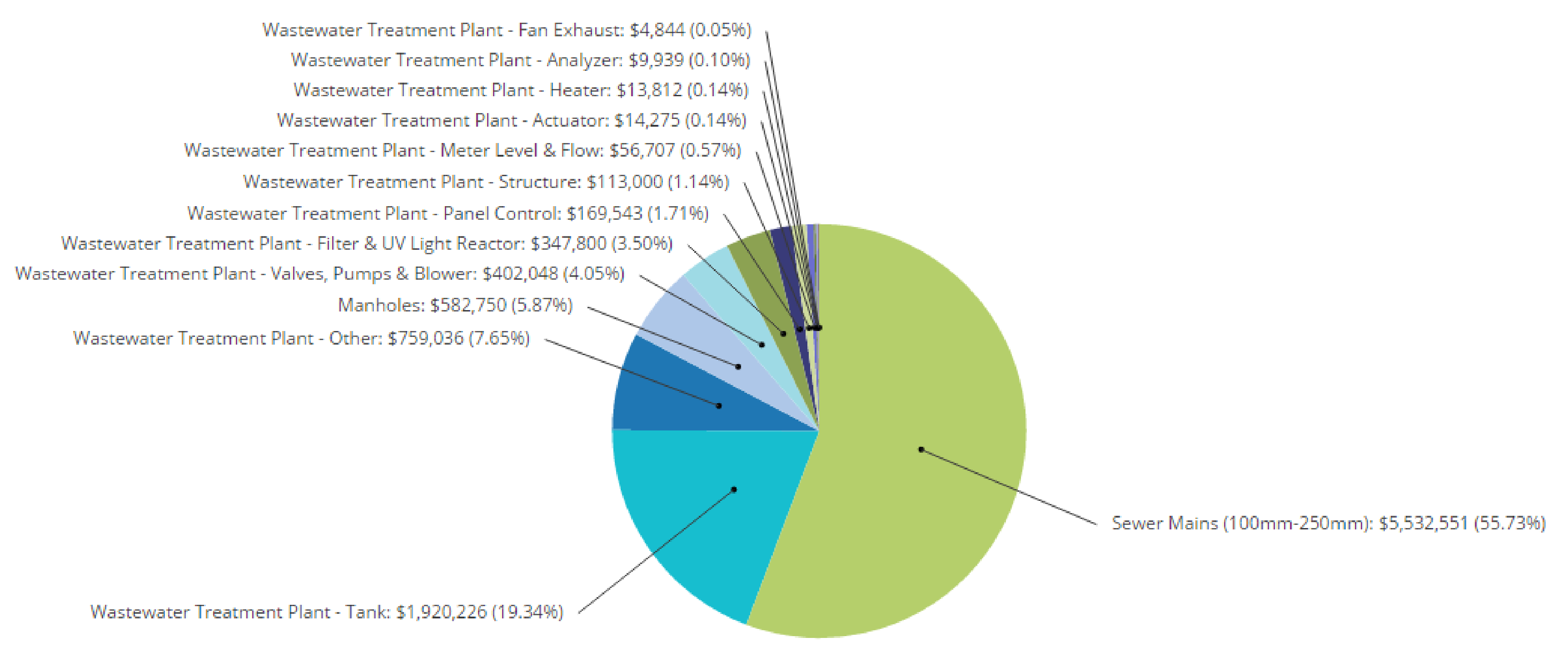
4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 illustrates key asset attributes for the municipality's sanitary assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's sanitary services assets are valued at $10 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 9 Asset Inventory – Sanitary Services

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Sanitary Services	Manholes	130	75	$4,500/unit	$582,750
	Sewer Mains (100mm)	130m	75	$264/m	$34,214
	Sewer Mains (200mm)	10,421m	75	$520/m	$5,418,972
	Sewer Mains (250mm)	122m	75	$650/m	$79,365
	Wastewater Treatment Plant – Actuator	5	1, 2, 5, 7, 8, 10, 15, 20, 25	NRBCPI Quarterly (Toronto)	$14,275
	Wastewater Treatment Plant – Analyzer	4		NRBCPI Quarterly (Toronto)	$9,939
	Wastewater Treatment Plant – Fan Exhaust	4		NRBCPI Quarterly (Toronto)	$4,844
	Wastewater Treatment Plant – Filter & UV Light Reactor	7		NRBCPI Quarterly (Toronto)	$347,800
	Wastewater Treatment Plant – Heater	3		NRBCPI Quarterly (Toronto)	$13,812
	Wastewater Treatment Plant – Meter Level & Flow	18		NRBCPI Quarterly (Toronto)	$56,707
	Wastewater Treatment Plant – Panel Control	11		NRBCPI Quarterly (Toronto)	$169,543
	Wastewater Treatment Plant – Structure	1		$113,000/unit	$113,000
	Wastewater Treatment Plant – Tank	18		NRBCPI Quarterly (Toronto)	$1,920,226
	Wastewater Treatment Plant – Valves, Pumps & Blower	59		NRBCPI Quarterly (Toronto)	$402,048
	Wastewater Treatment Plant – Other	16		NRBCPI Quarterly (Toronto)	$759,036
				Total	$9,926,531

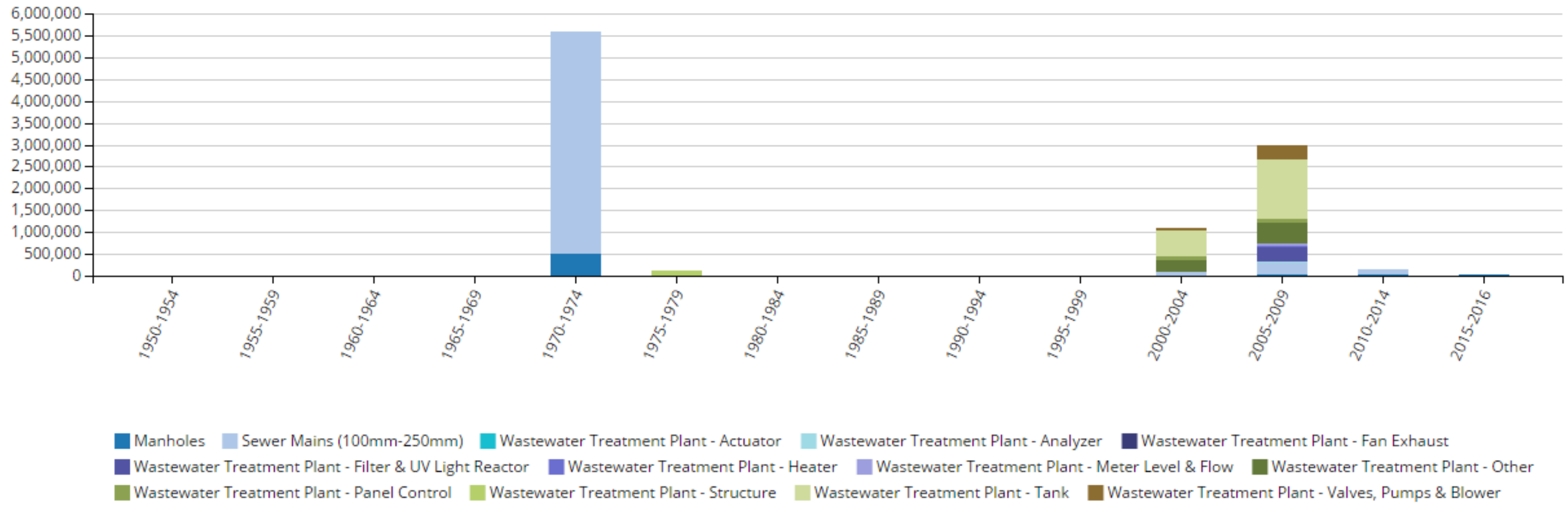
Figure 26 Asset Valuation – Sanitary Services



4.2 Historical Investment in Infrastructure

Figure 27 shows the municipality's historical investments in its sanitary services since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 4.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 27 Historical Investment – Sanitary Services

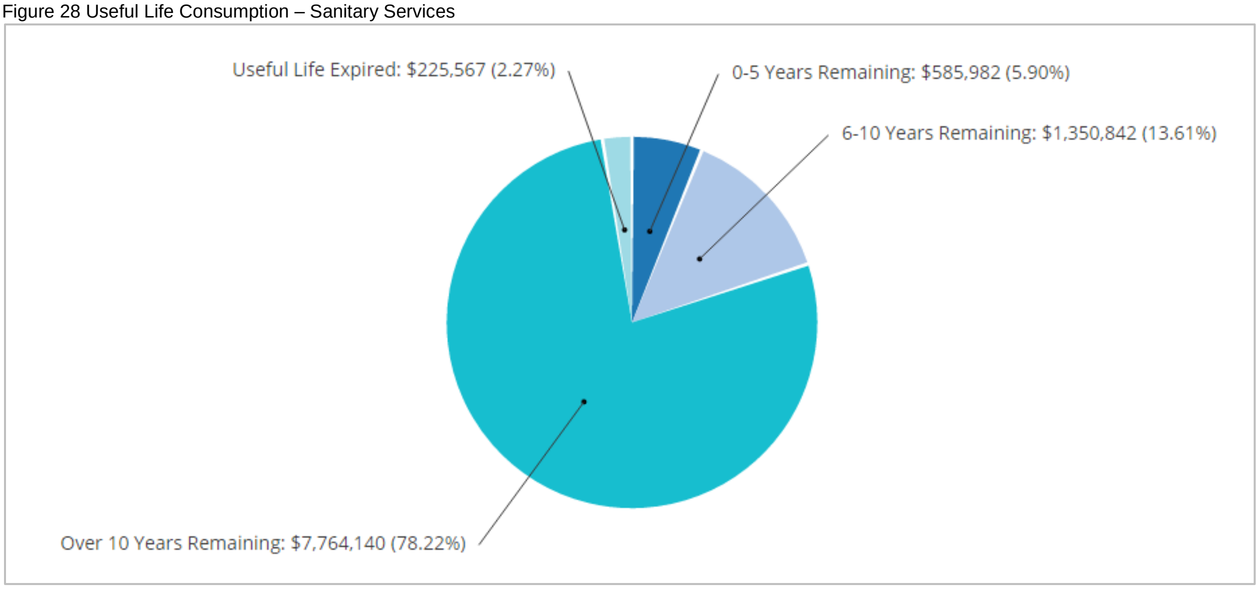


Between 1970-1974, the period of the largest investment in sanitary services, expenditures totaled $5.5 million, allocated primarily to sewer mains. Since 2000, expenditures have totaled $4.2 million.

4.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 28 illustrates the useful life consumption levels as of 2015 for the municipality's sanitary services .

Figure 28 Useful Life Consumption – Sanitary Services

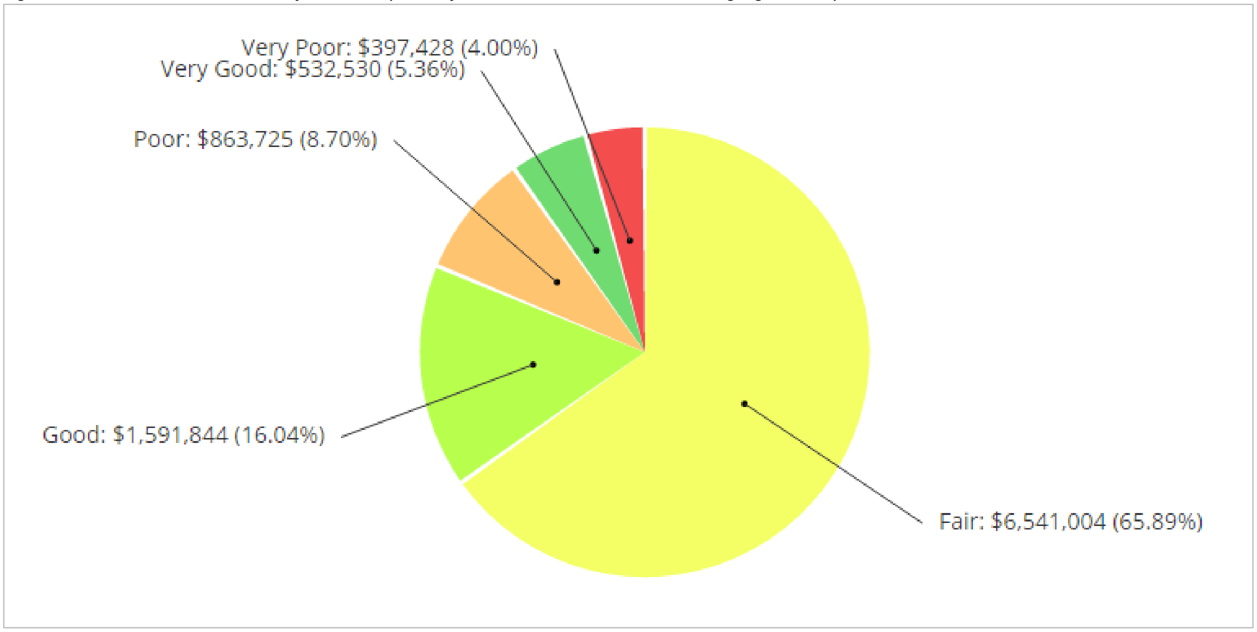


While more than 78% of the assets have at least 10 years of useful life remaining, 2%, with a valuation of $226,000 remain in operation beyond their useful life. An additional 5.9% will reach the end of their useful life in the next five years.

4.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's sanitary services as of 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for the majority of its sanitary assets.

Figure 29 Asset Condition – Sanitary Services (Partially Assessed: Manholes; Remaining Age-Based)

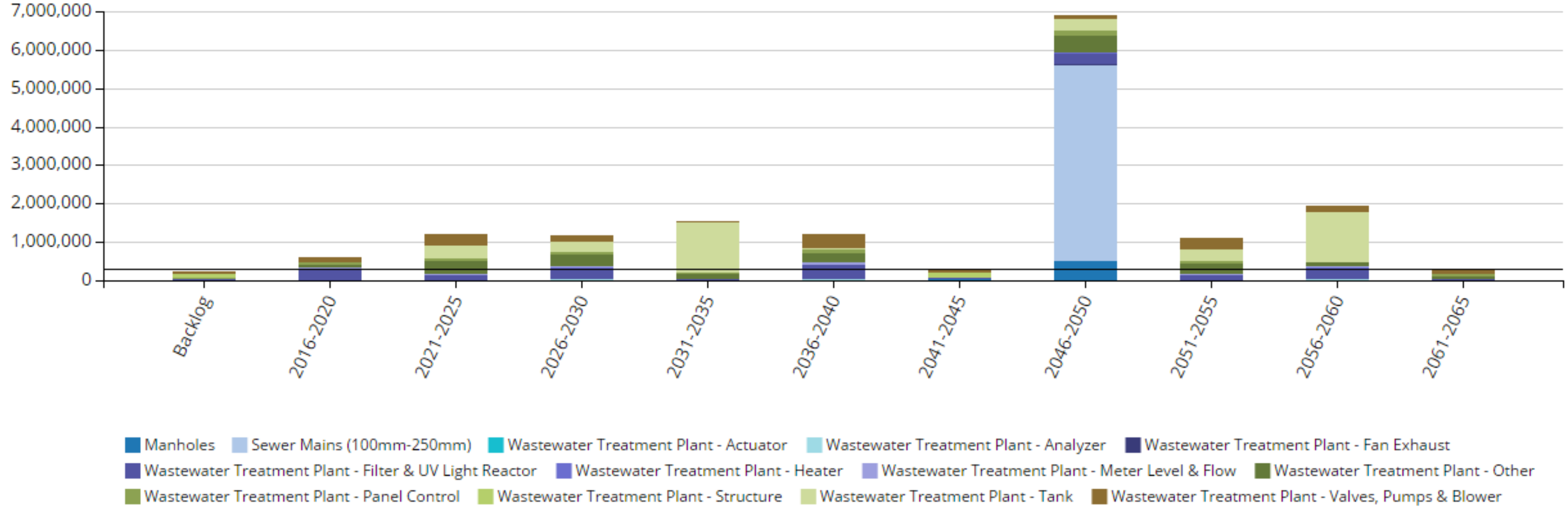


Based on a blend of age and assessed condition data, 21% of the assets are in good to very good condition; less than 13%, with a valuation of $1.2 million, are in poor to very poor condition.

4.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's sanitary services assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 30 Forecasting Replacement Needs – Sanitary Services



In addition to a backlog of $225,000, replacement needs are forecasted to be $610,000 in the next five years; an additional $1.1 million is forecasted between 2021-2025. The municipality's annual requirements (indicated by the black line) for its sanitary assets total $302,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is currently allocating $60,000, leaving an annual deficit of $242,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

4.6 Recommendations – Sanitary

- Age-based data shows that the vast majority of sanitary assets are in good to very good condition. The municipality should expand its condition assessment program to better define actual asset health and field needs; this will assist in the prioritization of the short- and long-term capital budget. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Over time, the municipality should establish a systematic lifecycle activity framework that reflects the consumption of its sanitary assets. See Section 3, 'Lifecycle Analysis Framework' in the 'Asset Management Strategies' chapter.

- Sanitary collection system key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding only 20% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

5. Storm

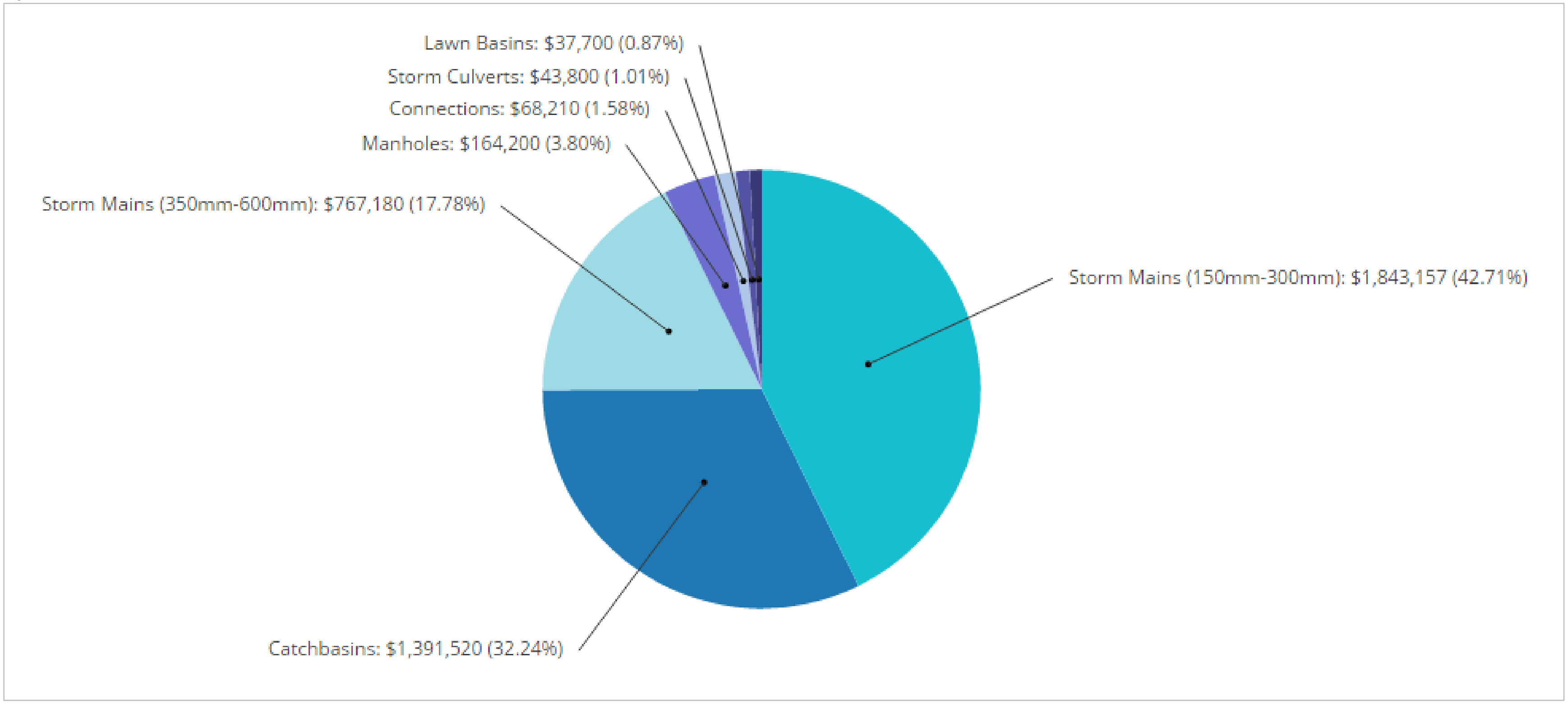
5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 illustrates key asset attributes for the municipality's storm assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's stormwater assets are valued at $4.3 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 10 Asset Inventory – Storm

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Storm	Catch Basins	131	75	$2,230/unit	$1,391,520
	Connections	14	75	NRBCPI Quarterly (Toronto)	$68,210
	Lawn Basins	29	75	$1,300/unit	$37,700
	Manholes	40	75	$4,105/unit	$164,200
	Storm Culverts	1,095	25	$40/unit	$43,800
	Storm Mains (150mm)	5,945m	75	$250/m	$1,486,125
	Storm Mains (200mm)	118m	75	$265/m	$31,244
	Storm Mains (250mm)	346m	75	$201/m	$69,586
	Storm Mains (300mm)	1,209m	75	$212/m	$256,202
	Storm Mains (350mm)	12m	75	$250/m	$3,000
	Storm Mains (375mm)	444m	75	$250/m	$111,075
	Storm Mains (400mm)	216m	75	$260/m	$56,160
	Storm Mains (450mm)	1,044m	75	$321/m	$335,060
	Storm Mains (500mm)	11m	75	$335/m	$3,685
	Storm Mains (525mm)	159m	75	$350/m	$55,650
	Storm Mains (550mm)	74m	75	$375/m	$27,750
	Storm Mains (600mm)	437m	75	$400/m	$174,800
				Total	$4,315,767

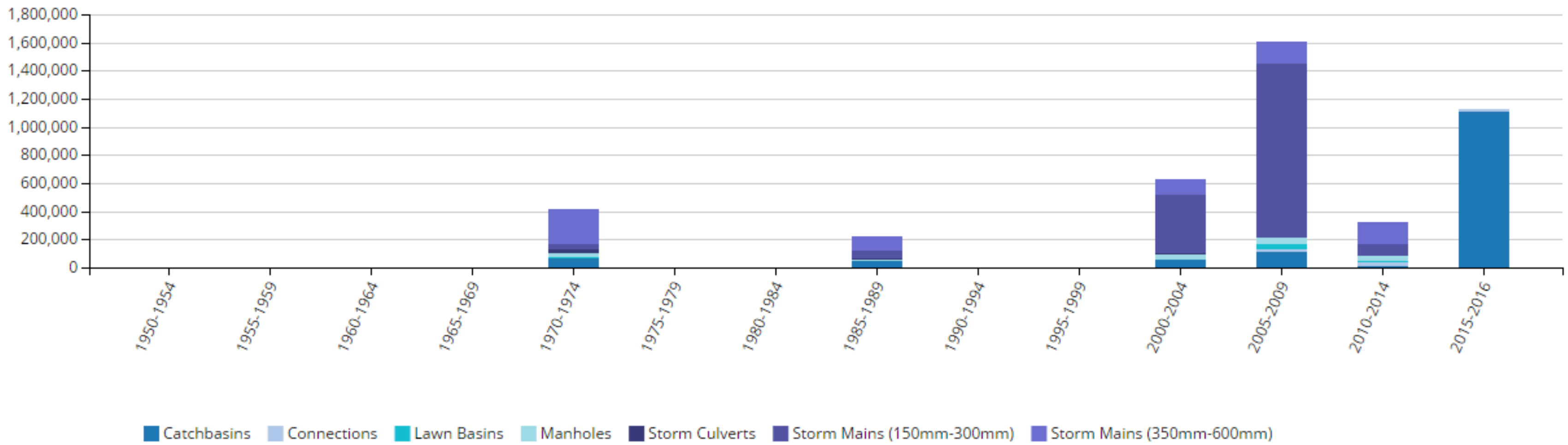
Figure 31 Asset Valuation – Storm



5.2 Historical Investment in Infrastructure

Figure 32 shows the municipality's historical investments in its storm system since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 5.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 32 Historical Investment – Storm

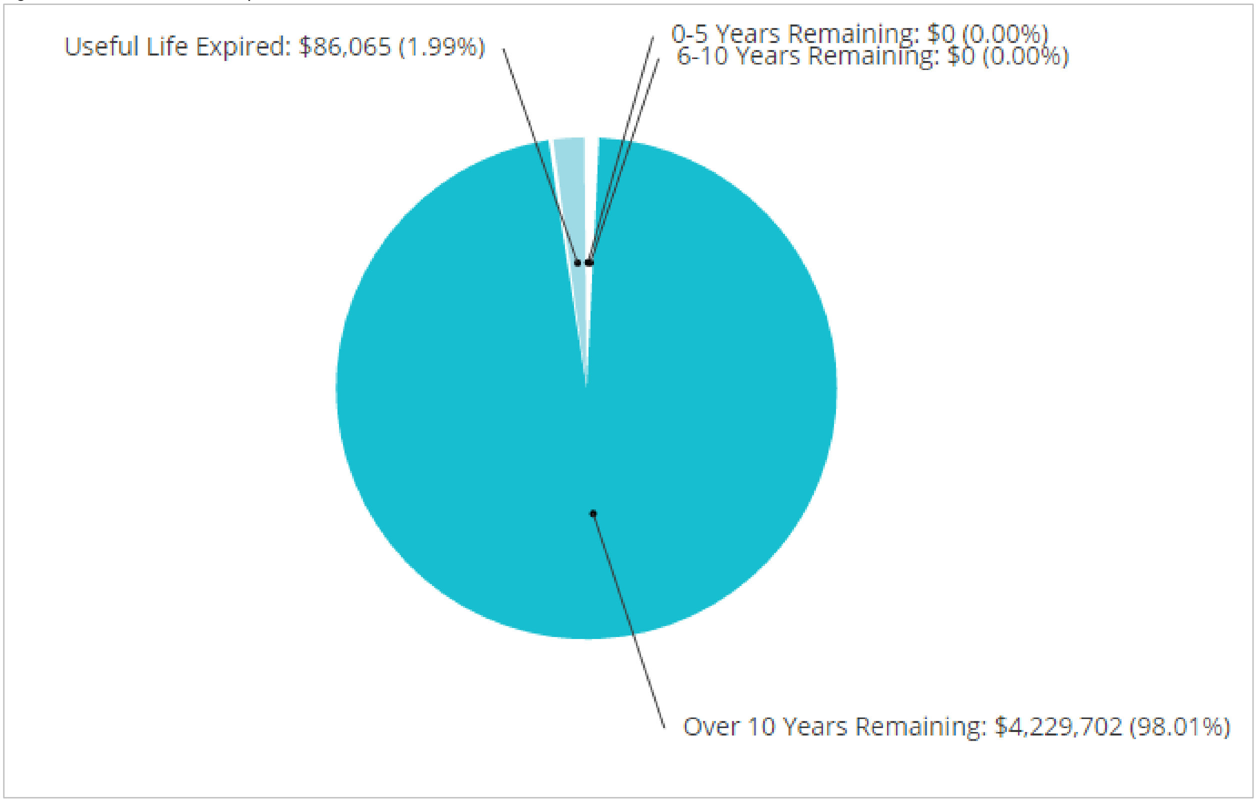


The municipality began investing consistently in its storm assets in the early 2000s. Between 2005-2009, the period of the largest investments in storm assets, expenditures totaled $1.6 million. Since 2010, the municipality has invested $1.4 million, primarily in catchbasins.

5.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 33 illustrates the useful life consumption levels as of 2015 for the municipality's storm assets.

Figure 33 Useful Life Consumption – Storm

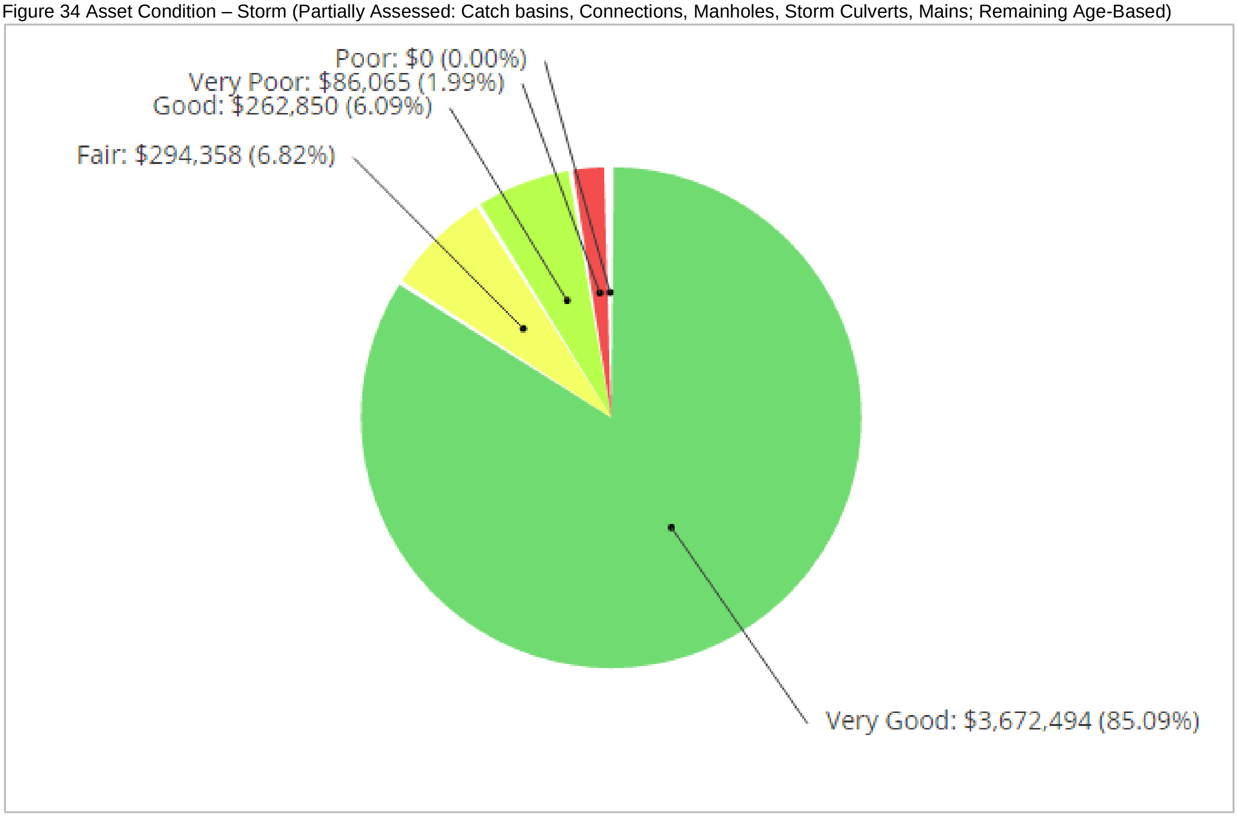


Virtually all assets have at least 10 years of useful life remaining.

5.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's storm services. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided partial condition data.

Figure 34 Asset Condition – Storm (Partially Assessed: Catch basins, Connections, Manholes, Storm Culverts, Mains; Remaining Age-Based)

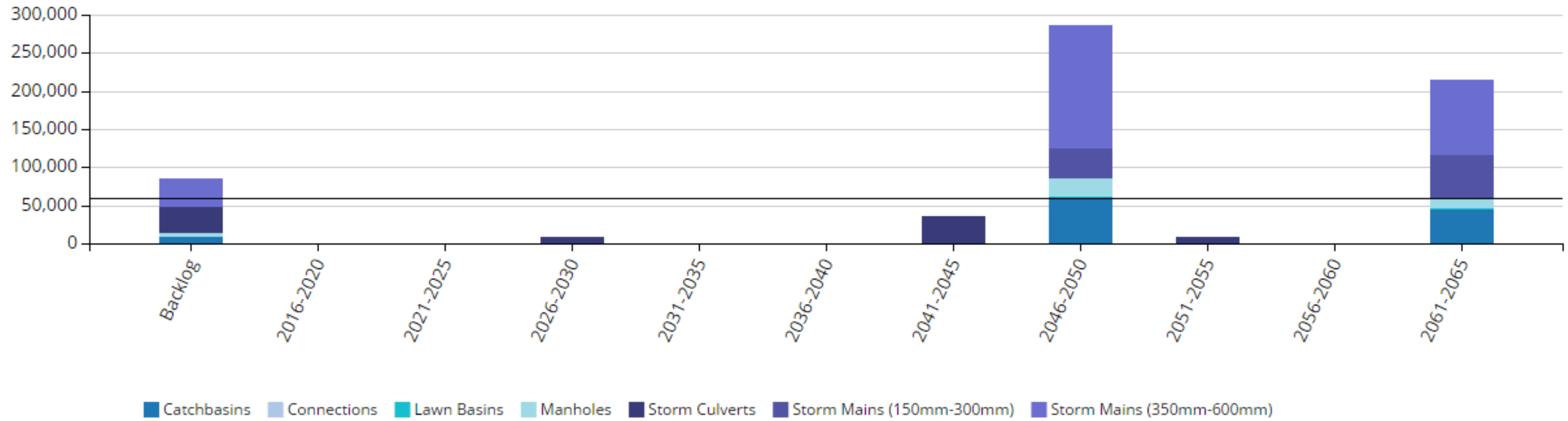


Based on a blend of age and assessed condition data, 91% of the assets, with a valuation of $3.9 million, are in good to very good condition; 2% are in very poor condition.

5.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's storm assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 35 Forecasting Replacement Needs – Storm



While there is a backlog of $86,000, the township has no short-term replacement needs for storm assets. The municipality's annual requirements (indicated by the black line) for storm assets total $59,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $0, leaving an annual deficit of $59,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

5.6 Recommendations – Storm

- In time, the municipality should implement a more comprehensive condition assessment program that covers all storm sewer assets to further define field needs and to assist the prioritization of the short and long term capital budget. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

- The municipality is 0% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

6. Buildings & Facilities

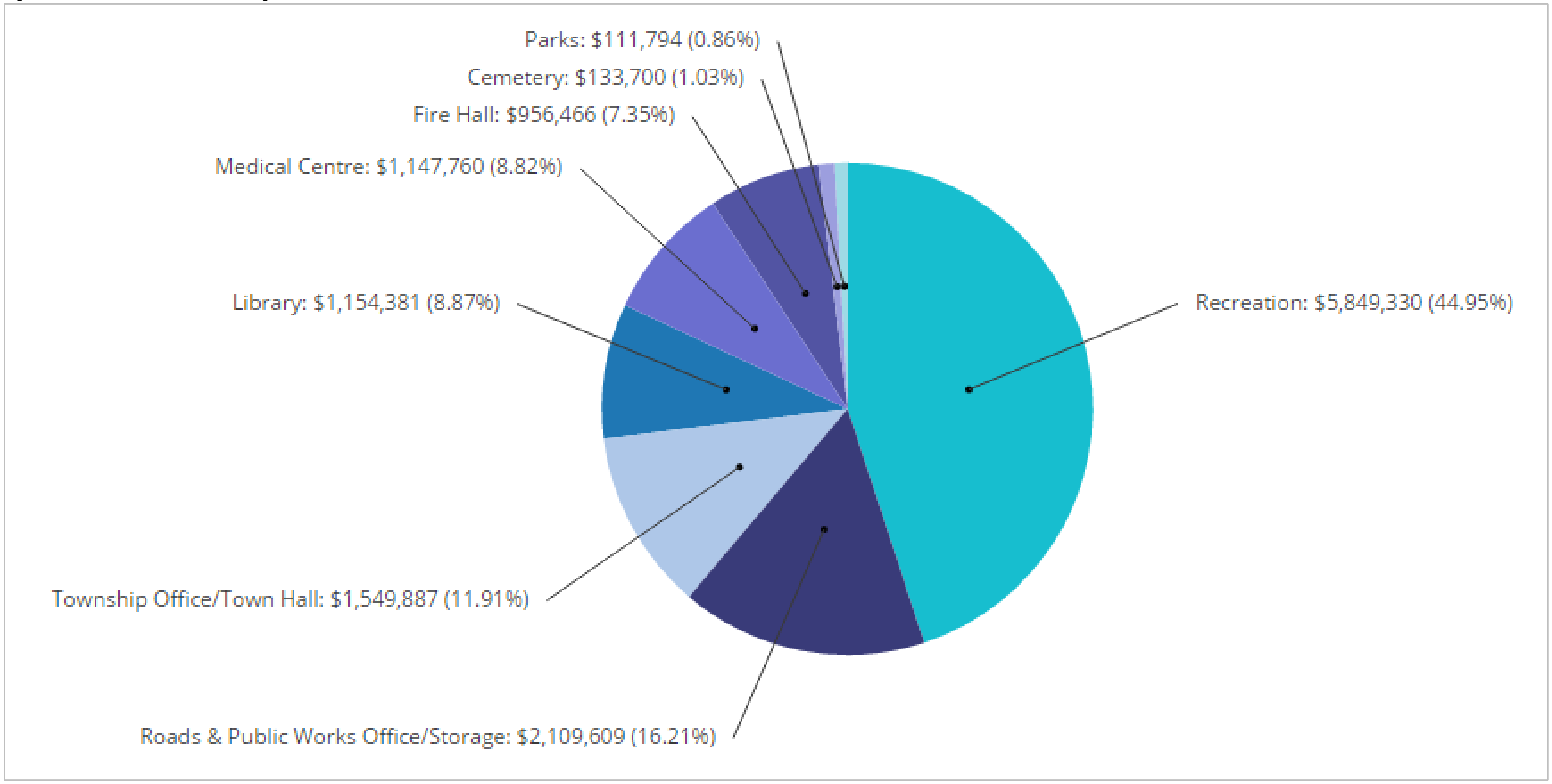
6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 11 illustrates key asset attributes for the municipality's buildings assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's buildings assets are valued at $13 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 11 Key Asset Attributes – Buildings & Facilities: Quantity, Valuation Method, and Replacement Cost

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Buildings	Library	2	50	User-Defined Cost	$1,154,381
	Township Office/Town Hall	1	50	User-Defined Cost	$1,549,887
	Fire Hall	2	40	User-Defined Cost	$956,466
	Medical Centre	1	50	User-Defined Cost	$1,147,760
	Cemetery	2	75	User-Defined Cost	$133,700
	Recreation	2	25, 75	User-Defined Cost	$5,849,330
	Parks	3	20	User-Defined Cost	$111,794
	Roads & Public Works Office, Storage Facilities	3	25, 40, 75	User-Defined Cost	$2,109,609
				Total	$13,012,927

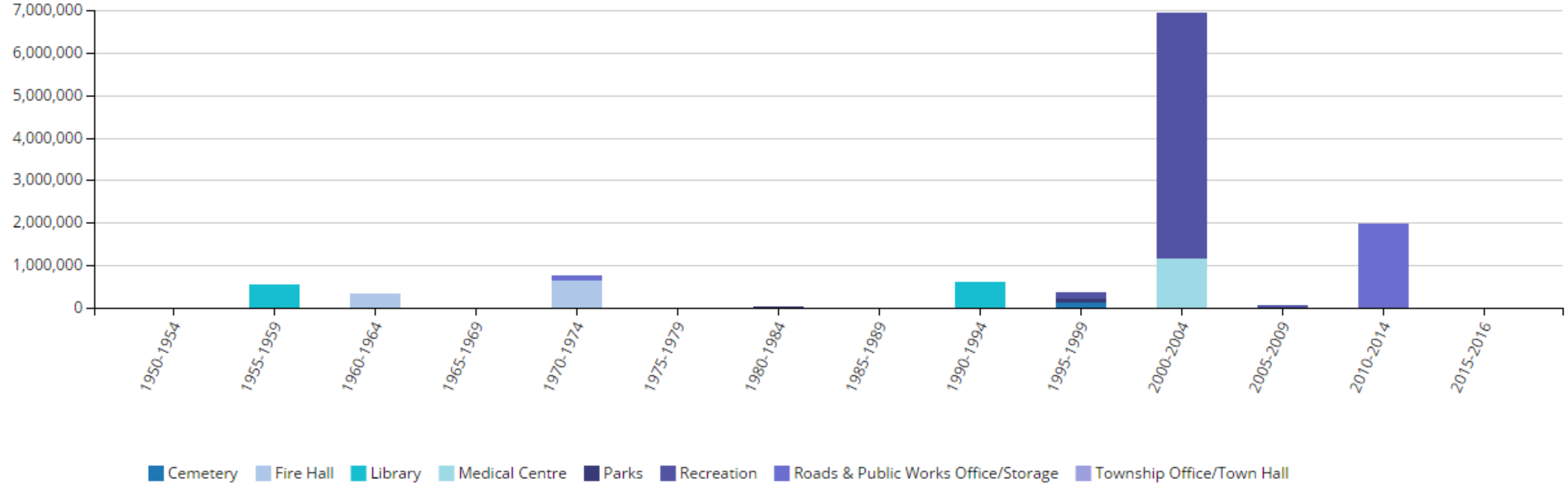
Figure 36 Asset Valuation – Buildings & Facilities



6.2 Historical Investment in Infrastructure

Figure 36 shows the municipality's historical investments in its buildings since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 6.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 36 Historical Investment – Buildings & Facilities

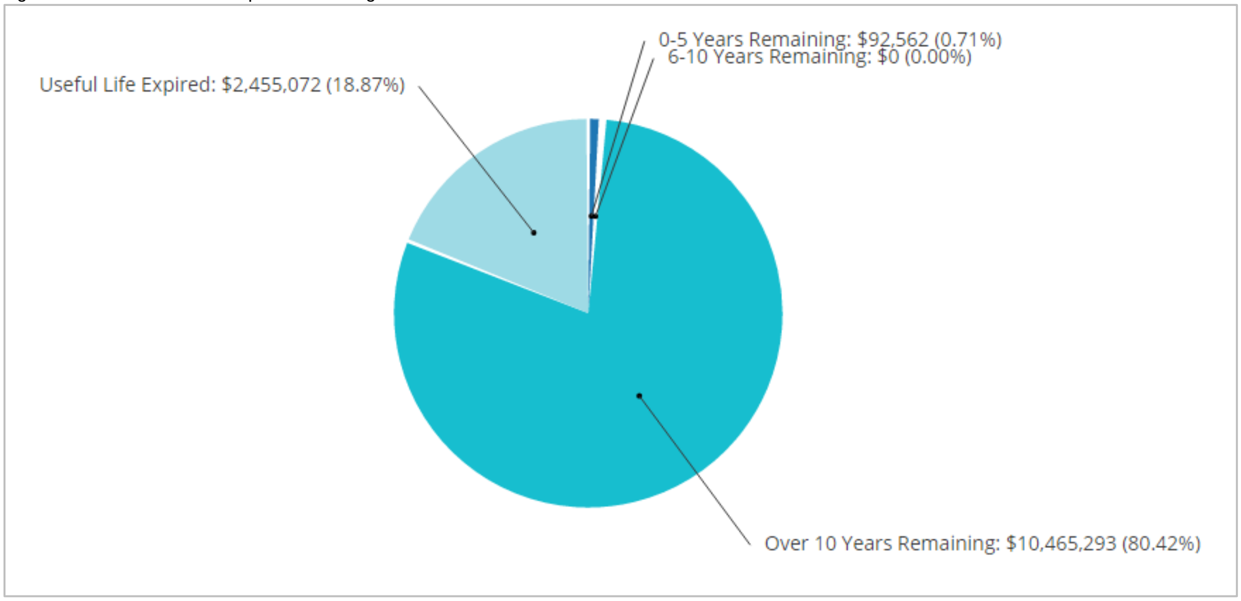


Investments in buildings have remained relatively flat since 1950. Between 2000-2004, the period of the largest investments in buildings, expenditures totaled $6.9 million. Since 2010, the municipality has invested $1.9 million.

6.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 37 illustrates the useful life consumption levels as of 2015 for the municipality's buildings assets.

Figure 37 Useful Life Consumption – Buildings & Facilities

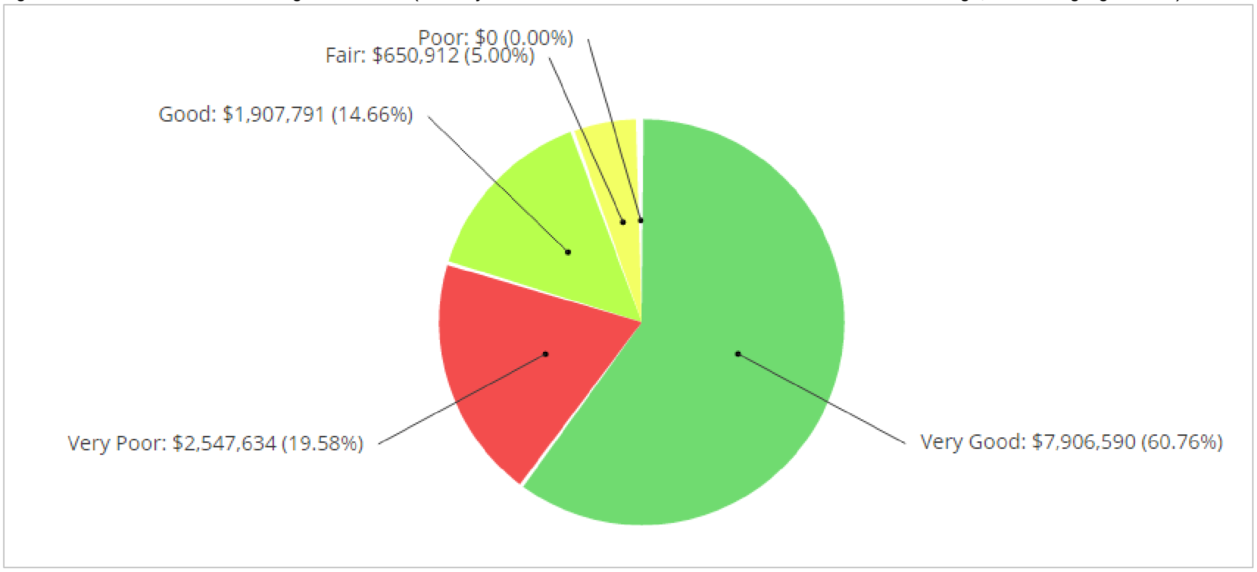


While more than 80% of the assets have at least 10 years of useful life remaining, approximately 19%, with a valuation of $2.5 million, remain in operation beyond their useful life.

6.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's buildings assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided partial condition data.

Figure 38 Asset Condition – Buildings & Facilities (Partially Assessed: Fire Halls, Roads & Public Works Office/Storage; Remaining Age-based)

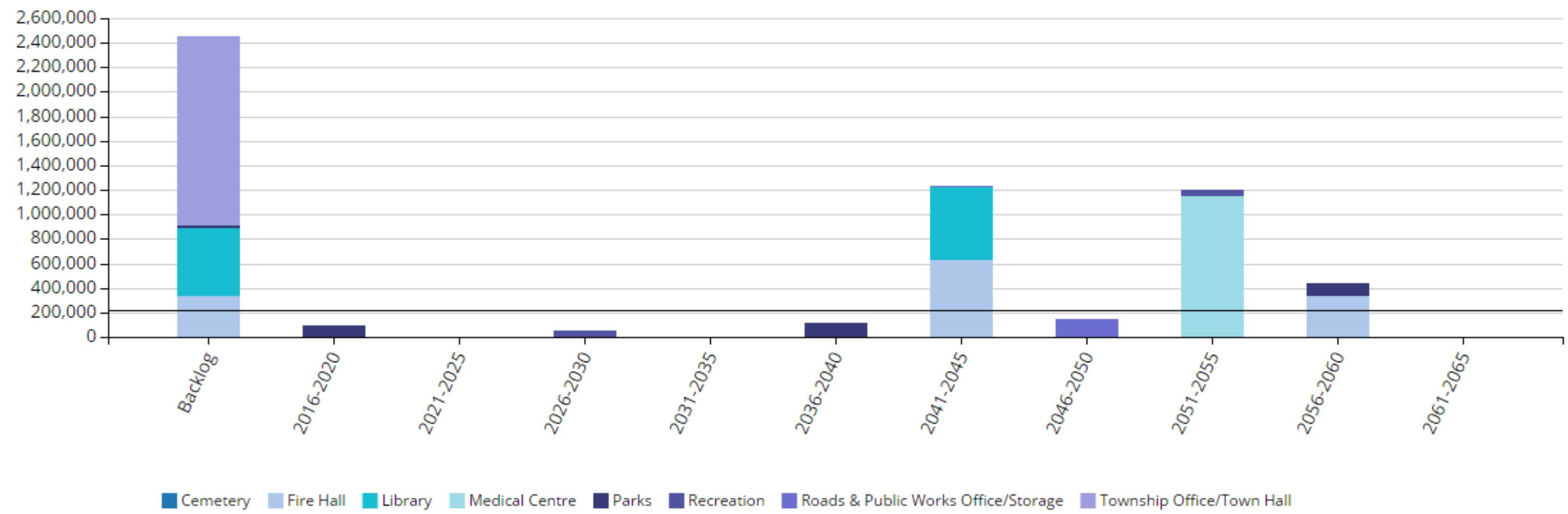


Based on a blend of age and assessed condition data, 19% of the buildings assets, with a valuation of $2.5 million, are in very poor condition; 75% are in good to very good condition.

6.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's buildings assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 39 Forecasting Replacement Needs – Buildings & Facilities



In addition to a backlog of $2.4 million, replacement needs are forecasted to be $92,000 in the next five years. The municipality's annual requirements (indicated by the black line) for its buildings total $218,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $4,000, leaving an annual deficit of $214,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

6.6 Recommendations – Buildings & Facilities

- The municipality should expand the condition inspection program for its facilities (component-based). See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- Facility key performance indicators should be established and tracked annually as part of an overall level of service model. See Chapter VII, 'Levels of Service'.

- The municipality is funding only 2% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

7. Machinery & Equipment

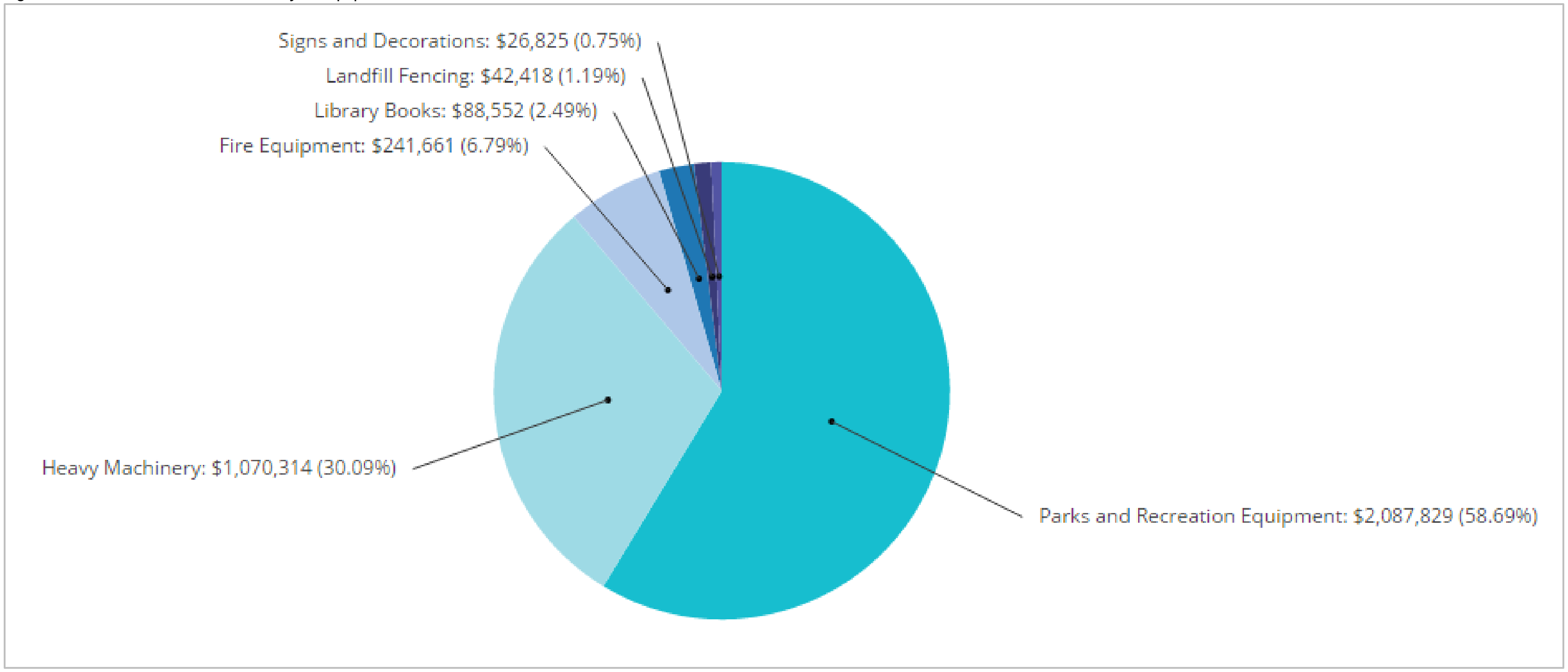
7.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 12 illustrates key asset attributes for the municipality's machinery & equipment assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's machinery & equipment assets are valued at $3.6 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

Table 12 Asset Inventory – Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Machinery & Equipment	Library Books	7	7	CPI Monthly (ON)	$88,552
	Equipment – Fire	39	10, 15, 17, 20, 25	CPI Monthly (ON)	$241,661
	Equipment – Parks & Recreation	25	5, 10, 15, 20, 25, 30, 40	CPI Monthly (ON)	$2,087,829
	Equipment – Landfill Fencing	1	20	CPI Monthly (ON)	$42,418
	Equipment – Signs & Decorations	23	15, 20	CPI Monthly (ON)	$26,825
	Heavy Machinery	11	10, 15, 20, 25	CPI Monthly (ON)	$1,070,314
				Total	$3,557,599

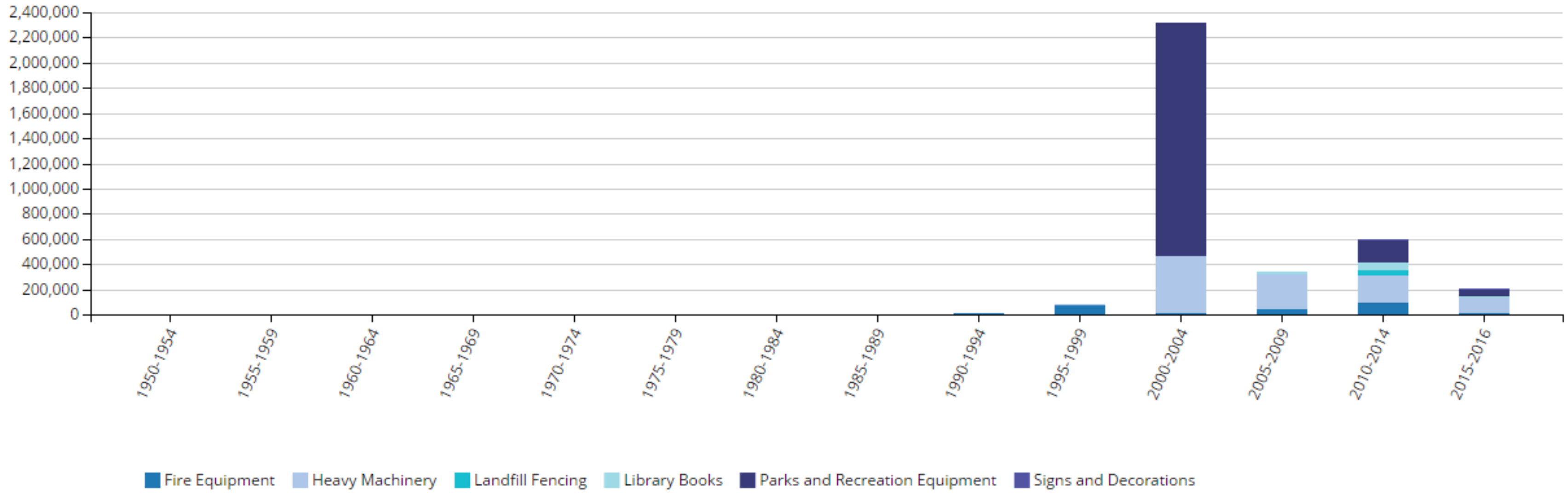
Figure 40 Asset Valuation – Machinery & Equipment



7.2 Historical Investment in Infrastructure

Figure 41 shows the municipality's historical investments in its machinery & equipment since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 7.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 41 Historical Investment – Machinery & Equipment

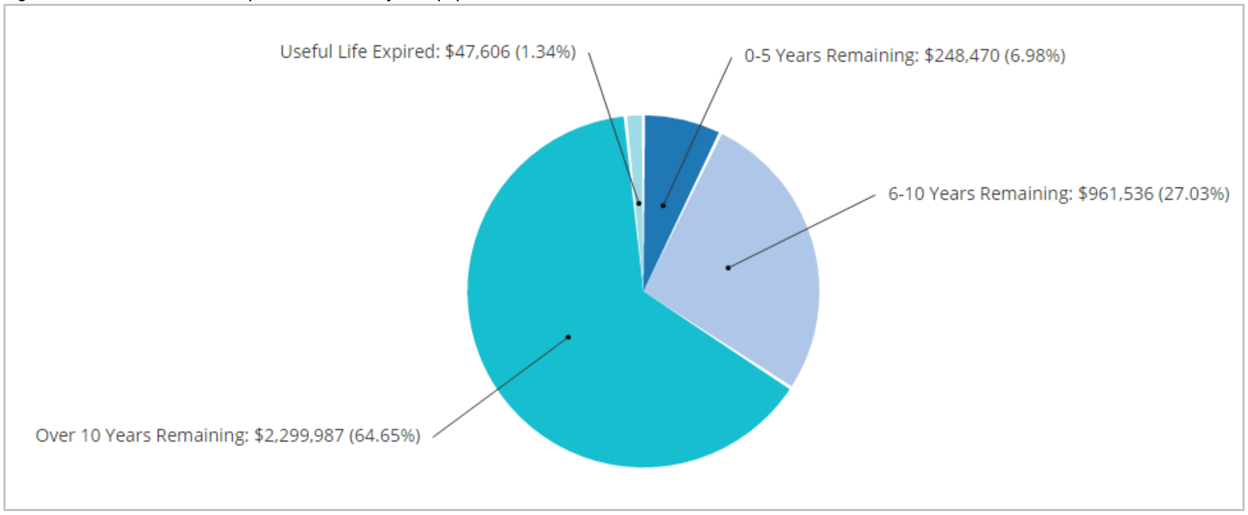


The municipality rapidly expanded its machinery & equipment portfolio beginning in the early 2000s. Between 2000-2004, the period of the largest investments in machinery & equipment, expenditures totaled $2.3 million. Since 2010, investments have totaled $809,000.

7.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 42 illustrates the useful life consumption levels as of 2015 for the municipality's machinery & equipment assets.

Figure 42 Useful Life Consumption – Machinery & Equipment

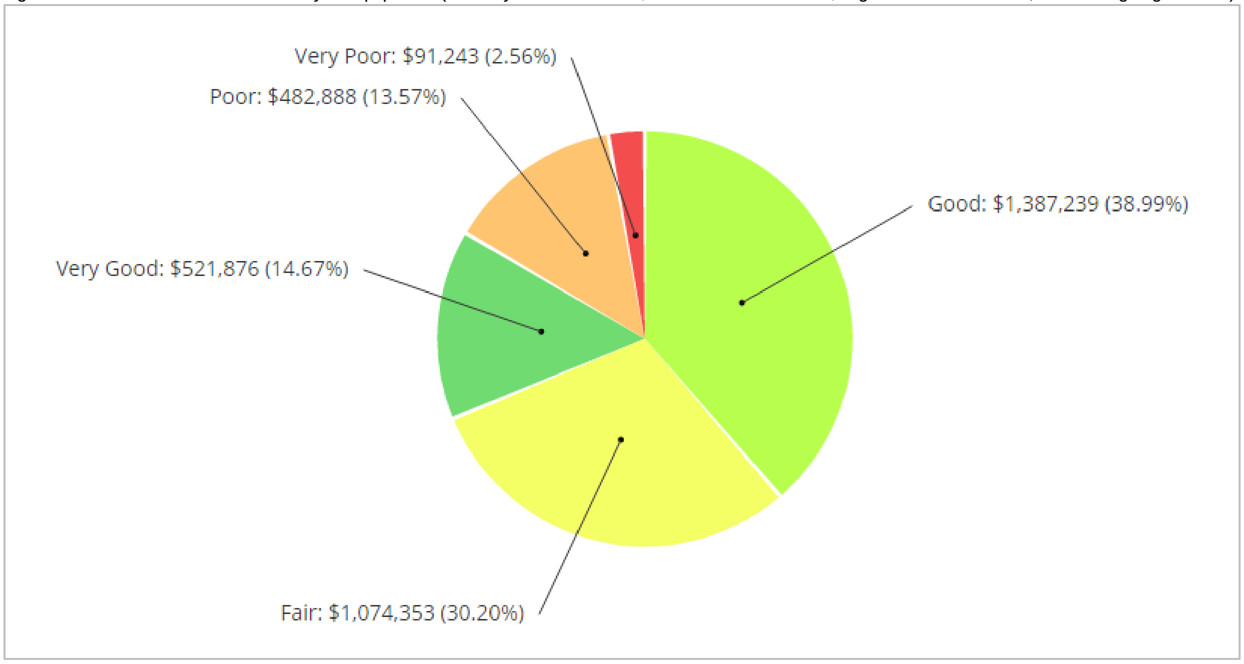


While 64% of assets have at least 10 years of useful life remaining, 7%, with a valuation of $248,000 will reach the end of their useful life in the next five years.

7.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's machinery & equipment assets as of 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided partial condition data.

Figure 43 Asset Condition – Machinery & Equipment (Partially Assessed: Fire, Parks and Recreation, Signs and Decorations; Remaining: Age-based)

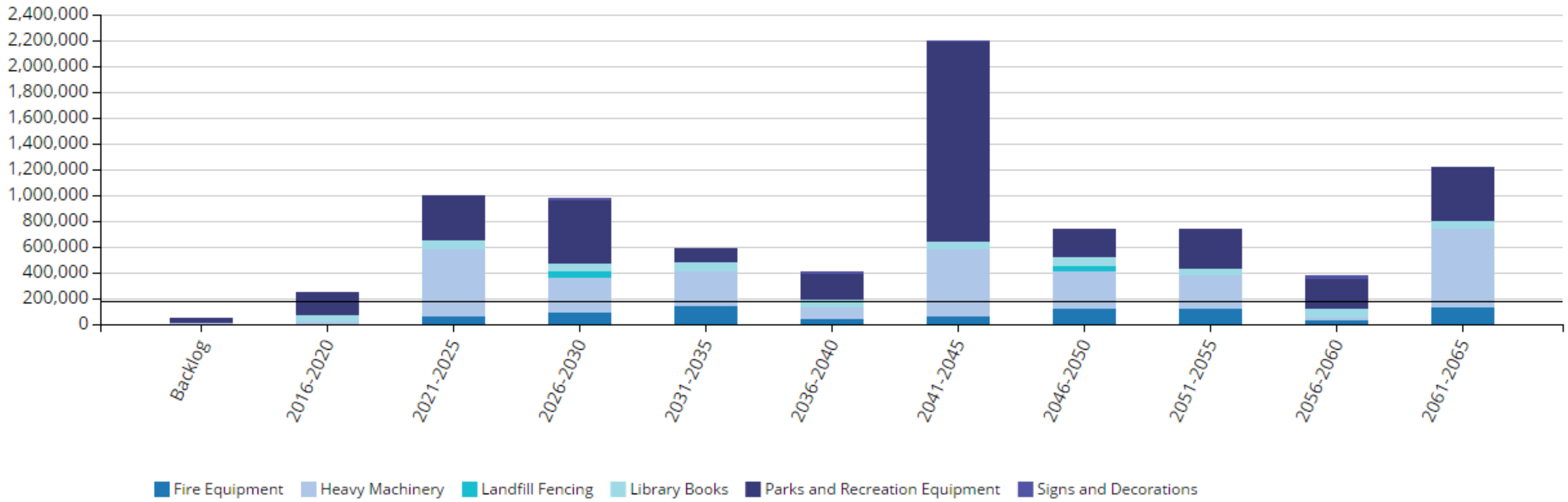


Based on a blend of age and assessed condition data, 16% of assets, with a valuation of $574,000, are in poor to very poor condition; 53% are in good to very good condition.

7.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's machinery & equipment assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 44 Forecasting Replacement Needs – Machinery & Equipment



In addition to a backlog of $47,000, replacement needs are forecasted to be $248,000 in the next five years; an additional $998,000 is forecasted between 2021-2025. The municipality's annual requirements (indicated by the black line) for its machinery & equipment total $176,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $151,000, leaving an annual deficit of $25,000. See the 'Financial Strategy' section for maintaining a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

7.6 Recommendations – Machinery & Equipment

- The municipality should expand the condition inspection program (component-based) to better define financial requirements for its machinery & equipment. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding 86% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to maintain sustainable and optimal funding levels.

8. Land Improvements

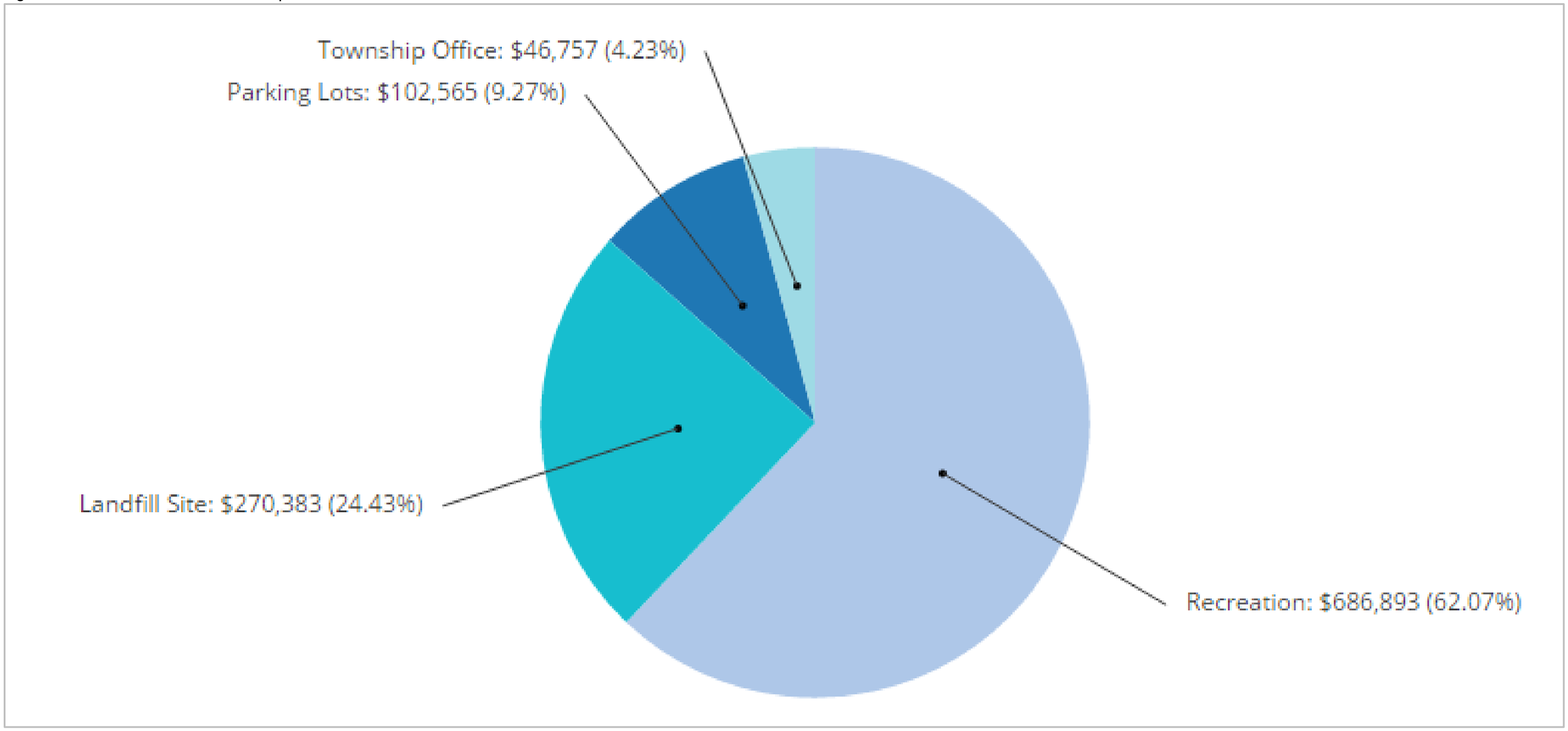
8.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 13 illustrates key asset attributes for the municipality's land improvement assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's land improvements assets are valued at $1.1 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 13 Asset Inventory – Land Improvements

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Land Improvements	Parking Lots	2	25	CPI Monthly (ON)	$102,565
	Landfill Site	3	1, 16	CPI Monthly (ON)	$270,383
	Recreation	8	15, 20, 25, 30	CPI Monthly (ON)	$686,893
	Township Office	2	25	CPI Monthly (ON)	$46,757
				Total	$1,106,598

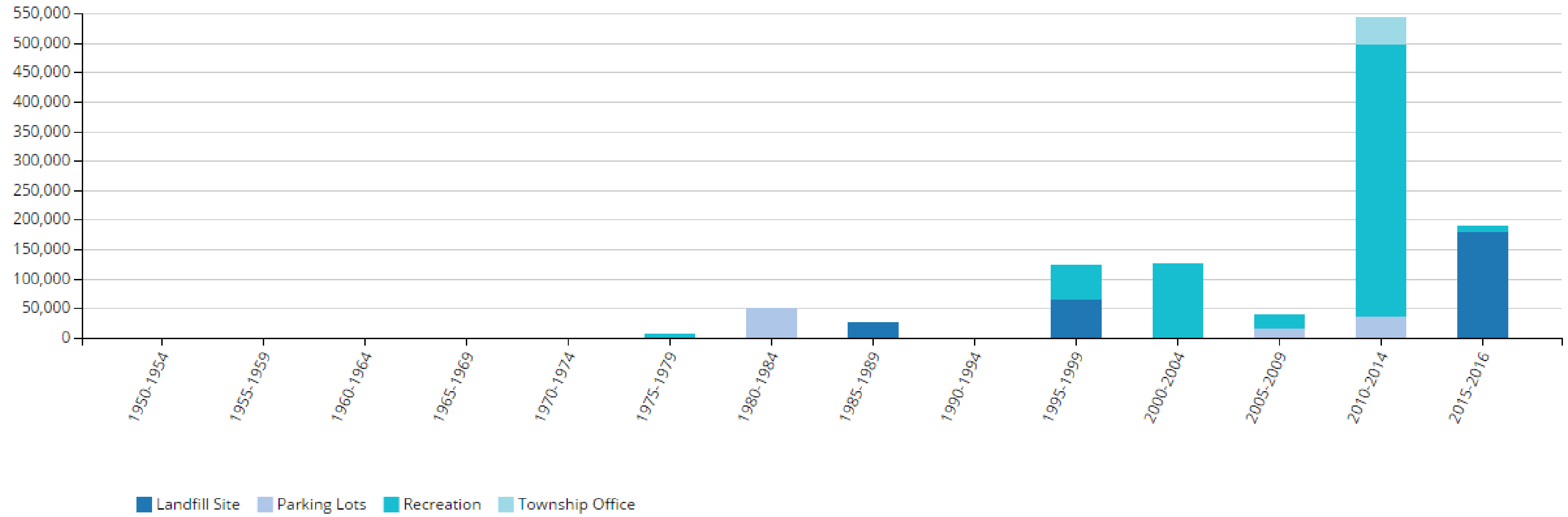
Figure 45 Asset Valuation – Land Improvements



8.2 Historical Investment in Infrastructure

Figure 46 shows the municipality's historical investments in its land improvements since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 8.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 46 Historical Investment – Land Improvements

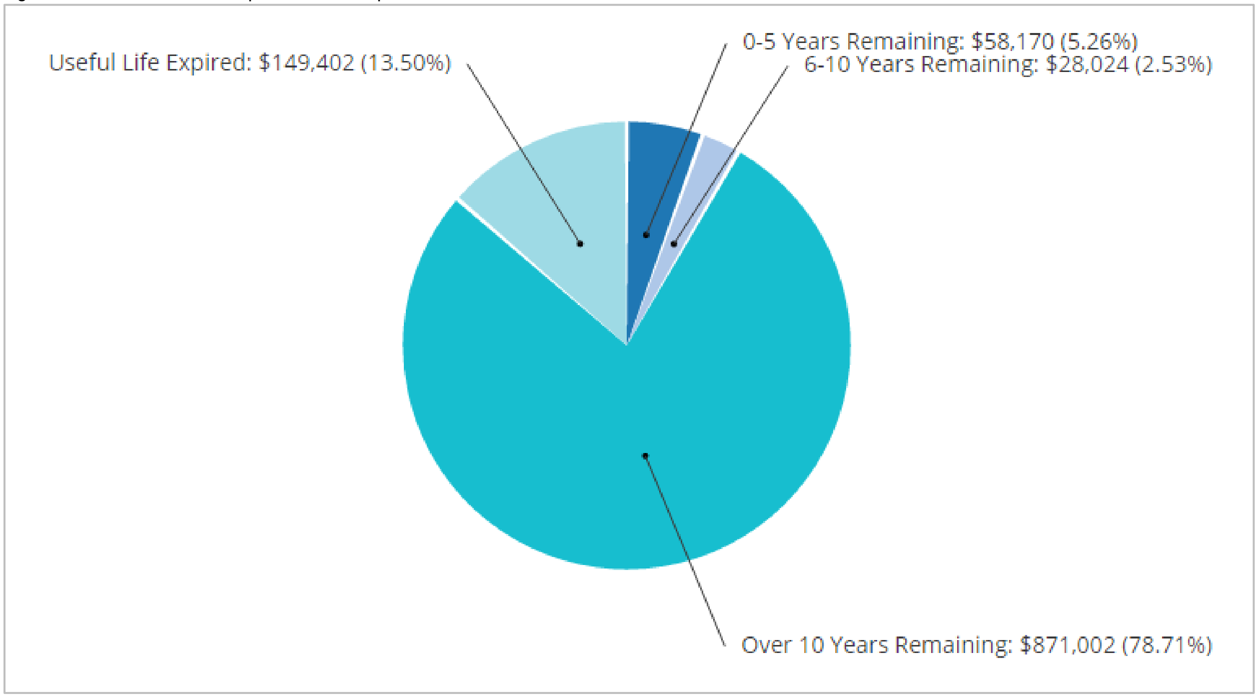


The municipality made periodic investments in machinery & equipment over the last several decades; major investments were made between 2010-2014, with expenditures totaling $543,000. Since 2015, investments have totaled $190,000.

8.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 47 illustrates the useful life consumption levels as of 2015 for the municipality's land improvement assets.

Figure 47 Useful Life Consumption – Land Improvements

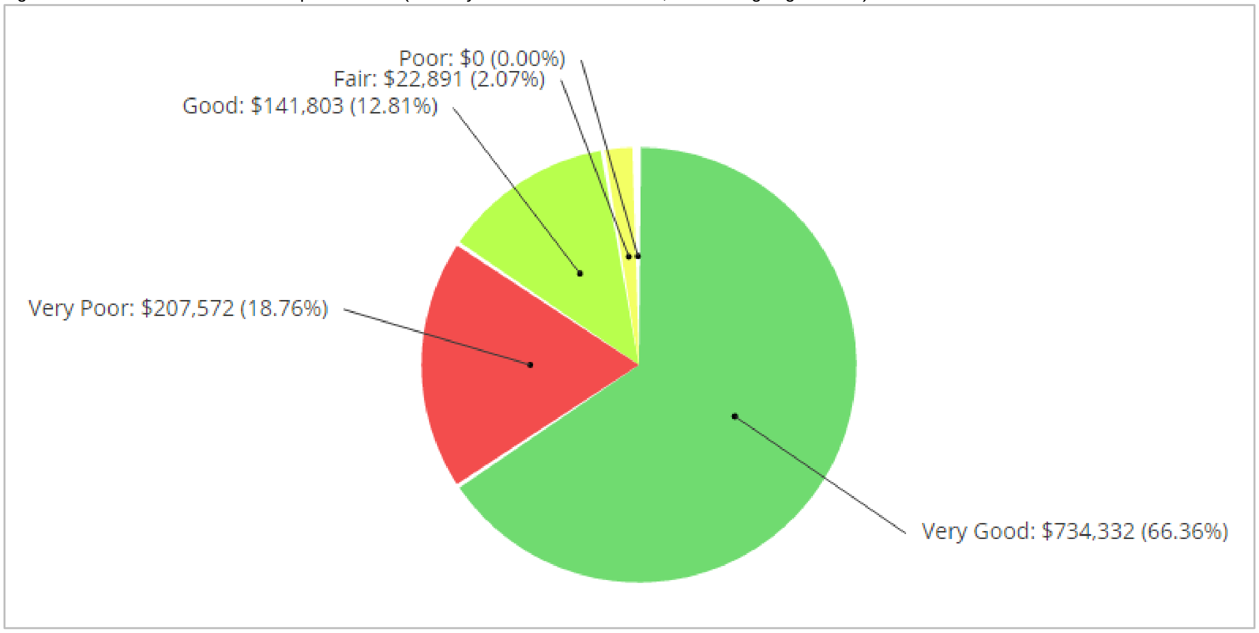


While 78% of the municipality's land improvement assets, with a valuation of $871,000, have at least 10 years of useful life remaining, more than 13% remain in operation beyond their useful life. An additional 5% will reach the end of their useful life in the next five years.

8.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's land improvement assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided partial condition data.

Figure 48 Asset Condition - Land Improvements (Partially Assessed: Recreation; Remaining: Age-based)

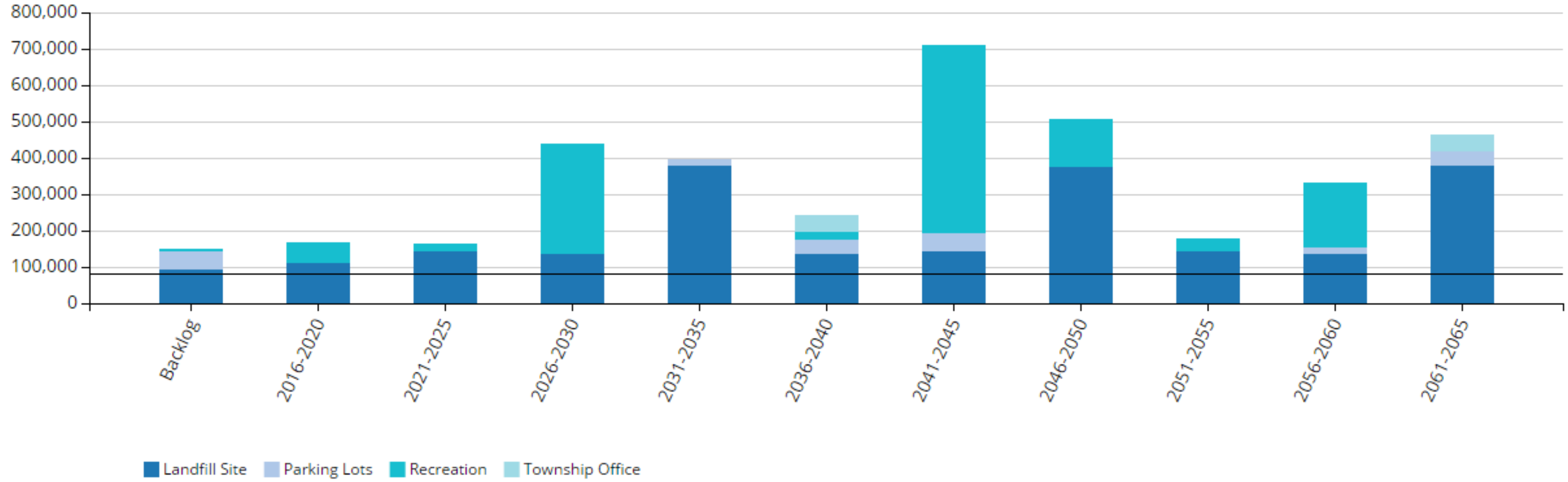


Based on a blend of age and assessed condition data, 18% of the municipality's land improvement assets, with a valuation of $141,000, are in very poor condition; 79% are in good to very good condition.

8.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's land improvements assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 49 Forecasting Replacement Needs – Land Improvements



In addition to a backlog of $149,000, replacement needs are forecasted to be $168,000 in the next five years; an additional $165,000 is forecasted between 2021-2025. The municipality's annual requirements (indicated by the black line) for its land improvements total $81,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $45,000, leaving an annual deficit of $36,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

8.6 Recommendations – Land Improvements

- The municipality should augment the condition assessment program for its land improvement assets to better estimate actual condition levels. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information the municipality should assess its short-, medium- and long-term capital and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding only 56% of its long-term replacement needs on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels

9. Fleet

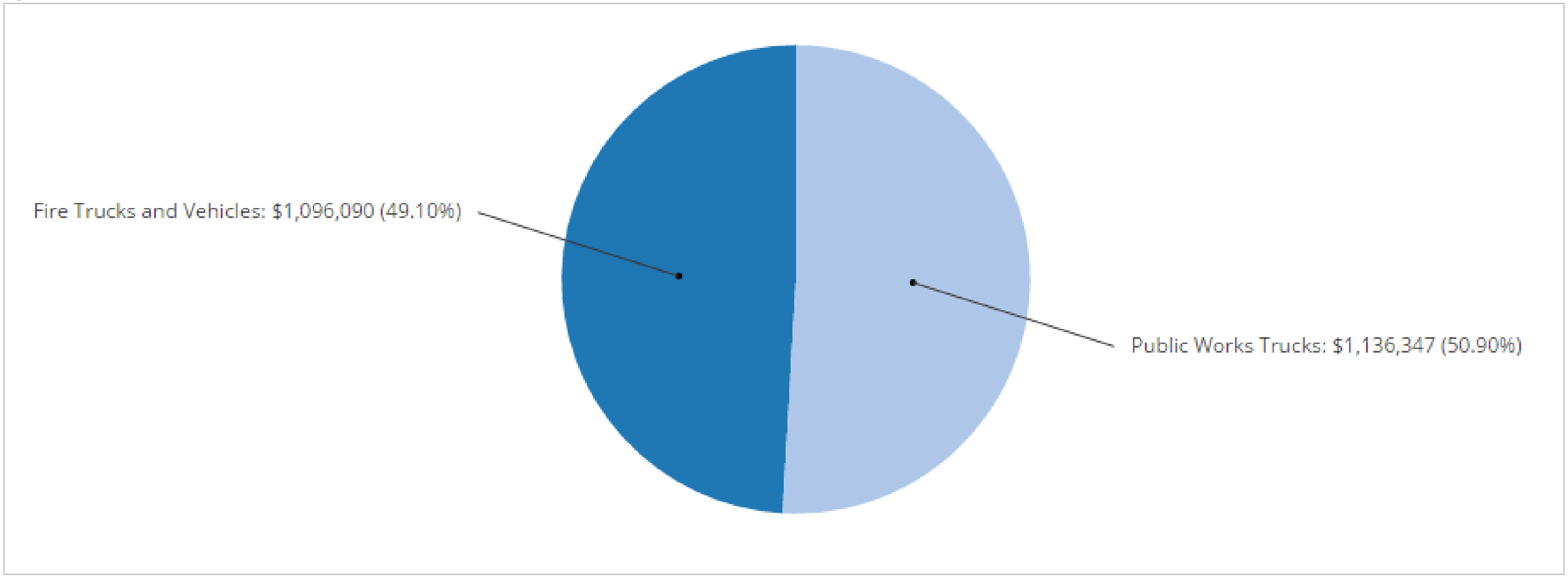
9.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14 illustrates key asset attributes for the municipality's fleet assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's fleet assets are valued at $2.2 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 14 Asset Inventory – Fleet

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Fleet	Fire Trucks & Vehicles	8	10, 15, 17, 19, 25	CPI Monthly (ON)	$1,096,090
	Public Works Trucks	9	10, 15, 20	CPI Monthly (ON)	$1,136,347
				Total	$2,232,437

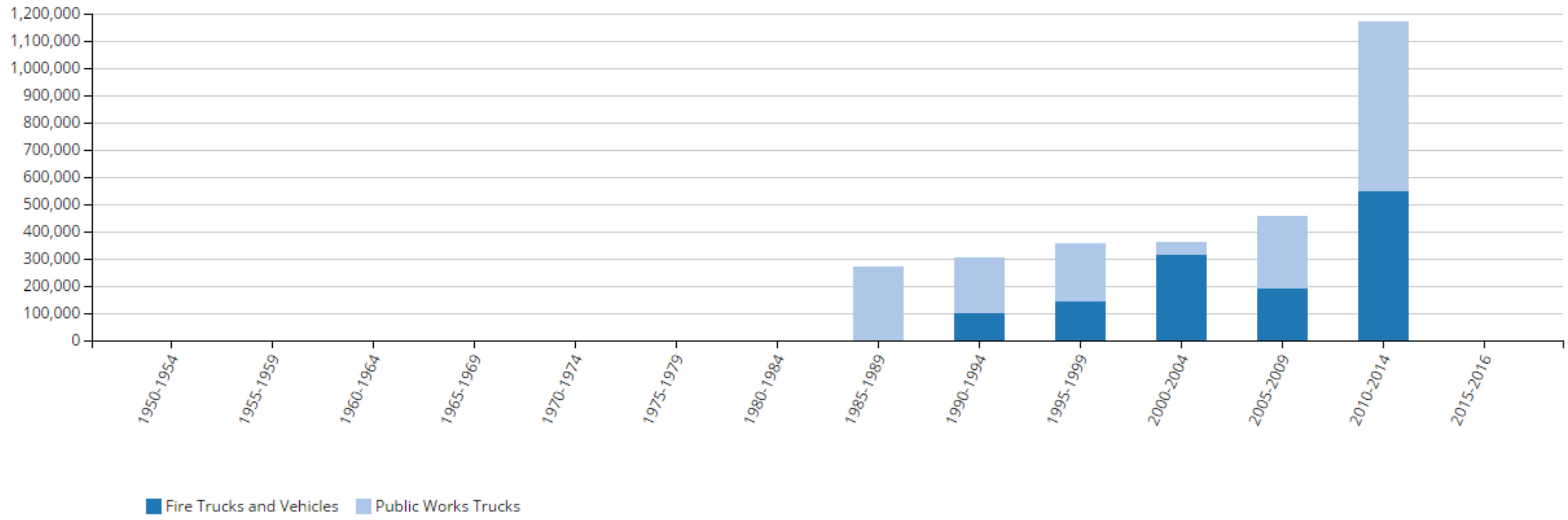
Figure 50 Asset Valuation – Fleet



9.2 Historical Investment in Infrastructure

Figure 51 shows the municipality's historical investments in its fleet since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 9.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 51 Historical Investment – Fleet

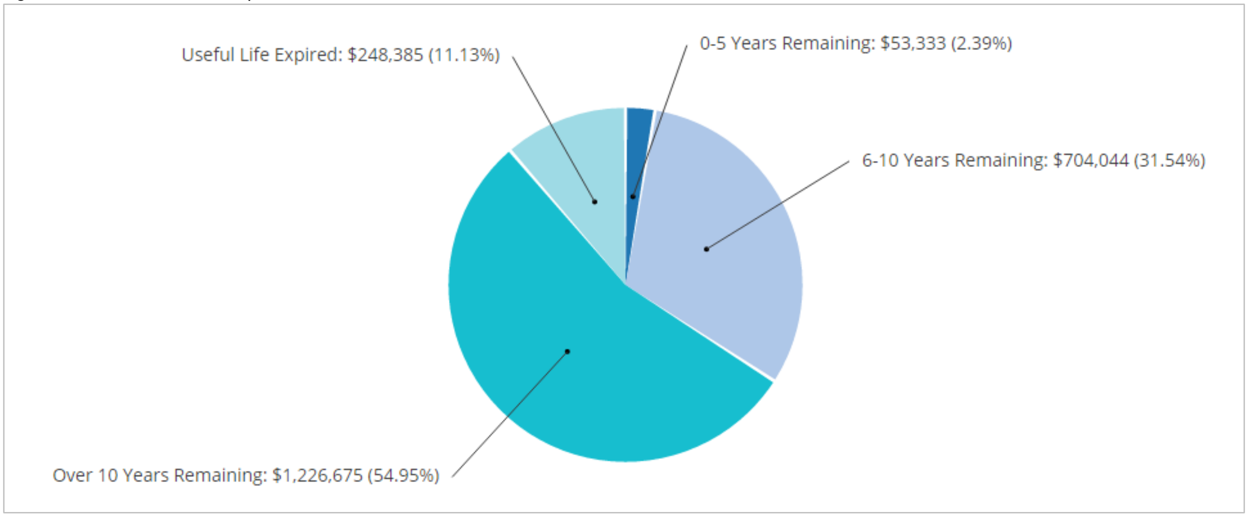


Investments in fleet increased consistently starting in 1985. Between 2010-2014, the period of the largest investments in fleet, expenditures totaled $1.1 million.

9.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 52 illustrates the useful life consumption levels as of 2015 for the municipality's fleet.

Figure 52 Useful Life Consumption – Fleet

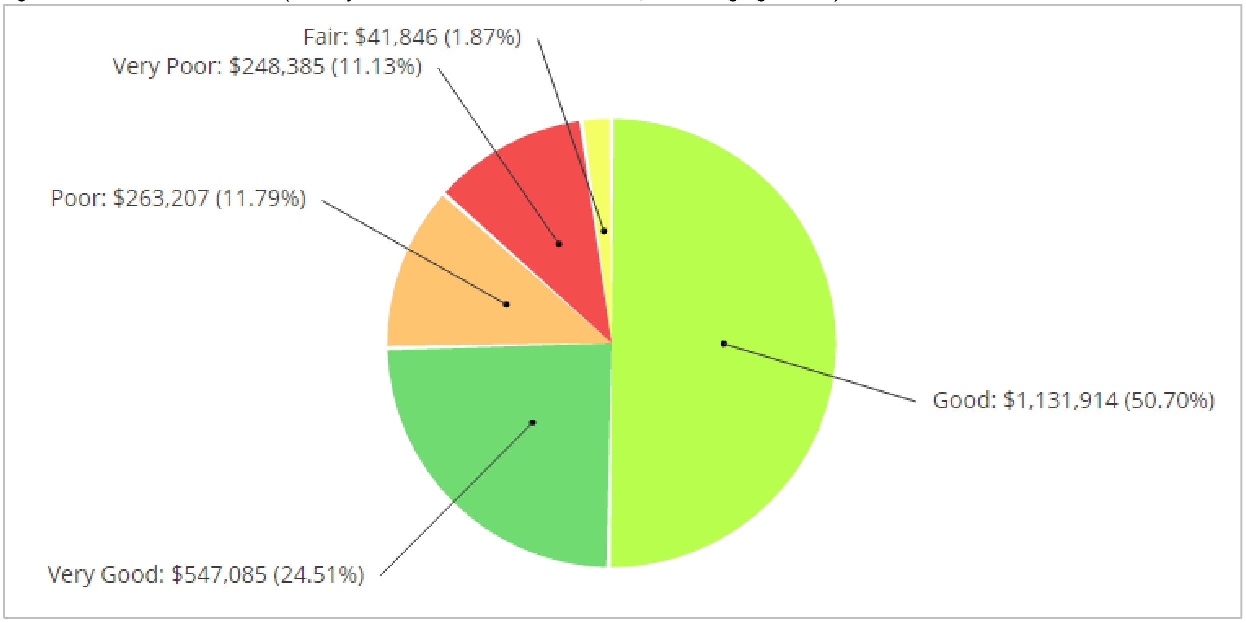


While 55% of assets have at least 10 years of useful life remaining; 11%, with a valuation of $284,000 remain in operation beyond their useful life. An additional 3% will reach the end of their useful life in the next five years.

9.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's fleet assets as of 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided partial condition data.

Figure 53 Asset Condition – Fleet (Partially Assessed: Fire Trucks & Vehicles; Remaining Age-based)

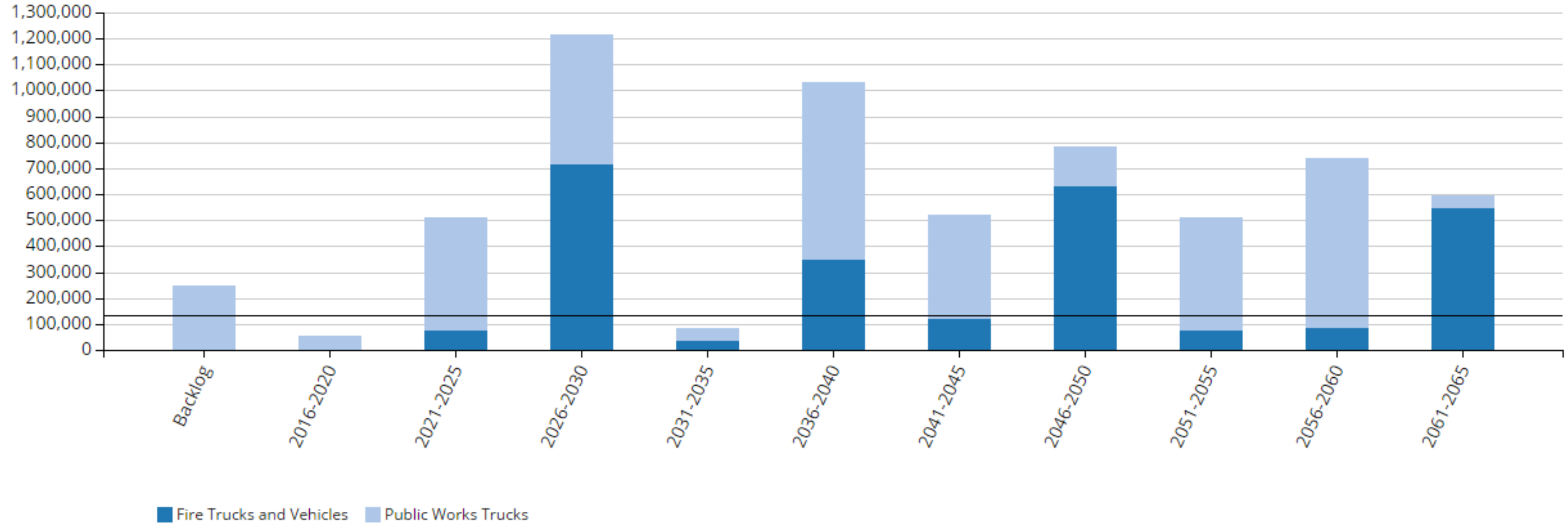


Based on a blend of age and assessment data, nearly 25% of the municipality's fleet assets are in poor to very poor condition; 75%, with a valuation of $1.6 million are in good condition.

9.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's fleet assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 54 Forecasting Replacement Needs – Fleet



In addition to a backlog of $248,000, replacement needs are forecasted to be $53,000 in the next five years; an additional $511,000 is forecasted between 2021-2025. The municipality's annual requirements (indicated by the black line) for its fleet total $135,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $54,000, leaving an annual deficit of $81,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

9.6 Recommendations – Fleet

- A preventative maintenance and life cycle assessment program should be established for the fleet class to gain a better understanding of current condition and performance as well as the short- and medium-term replacement needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information the municipality should assess its short-, medium- and long-term capital and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding 40% of its long-term replacement needs on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

VII. Levels of Service

The two primary risks to a municipality's financial sustainability are the total lifecycle costs of infrastructure, and establishing levels of service (LOS) that exceed its financial capacity. In this regard, municipalities face a choice: overpromise and underdeliver; underpromise and overdeliver; or promise only that which can be delivered efficiently without placing inequitable burden on taxpayers. In general, there is often a trade-off between political expedience and judicious, long-term fiscal stewardship.

Developing realistic LOS using meaningful key performance indicators (KPIs) can be instrumental in managing citizen expectations, identifying areas requiring higher investments, driving organizational performance and securing the highest value for money from public assets. However, municipalities face diminishing returns with greater granularity in their LOS and KPI framework. That is, the objective should be to track only those KPIs that are relevant and insightful and reflect the priorities of the municipality.

1. Guiding Principles for Developing LOS

Beyond meeting regulatory requirements, levels of service established should support the intended purpose of the asset and its anticipated impact on the community and the municipality. LOS generally have an overarching corporate description, a customer oriented description, and a technical measurement. Many types of LOS, e.g., availability, reliability, safety, responsiveness and cost effectiveness, are applicable across all service areas in a municipality. The following LOS categories are established as guiding principles for the LOS that each service area in the municipality should strive to provide internally to the municipality and to residents/customers. These are derived from the Town of Whitby's *Guide to Developing Service Area Asset Management Plans*.

Table 15 LOS Categories

LOS Category	Description
Reliable	Services are predictable and continuous; services of sufficient capacity are convenient and accessible to the entire community
Cost Effective	Services are provided at the lowest possible cost for both current and future customers, for a required level of service, and are affordable
Responsive	Opportunities for community involvement in decision making are provided; and customers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy and integrity
Safe	Services are delivered such that they minimize health, safety and security risks
Suitable	Services are suitable for the intended function (fit for purpose)
Sustainable	Services preserve and protect the natural and heritage environment.

While the above categories provide broad strategic direction to council and staff, specific and measurable KPIs related to each LOS category are needed to ensure the municipality remains steadfast in its pursuit of delivering the highest value for money to various internal and external stakeholders.

2. Key Performance Indicators and Targets

In this section, we identify industry standard KPIs for major infrastructure classes that the municipality can incorporate into its performance measurement and for tracking its progress over future iterations of its AMPs. The municipality should develop appropriate and achievable targets that reflect evolving demand on infrastructure, its fiscal capacity and the overall corporate objectives.

Table 16 Key Performance Indicators – Road Network and Bridges & Culverts

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related to right-of-way)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Cost per capita for roads, and bridges & culverts • Maintenance cost per square metre • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Overall Bridge Condition Index (BCI) as a percentage of desired BCI • Percentage of road network rehabilitated/reconstructed • Percentage of paved road lane km rated as poor to very poor • Percentage of bridges and large culverts rated as poor to very poor • Percentage of asset class value spent on O&M • Percentage of signage that pass reflectivity test. The remaining should be replaced
Operational Indicators	• Percentage of roads inspected within the last five years • Percentage of bridges and large culverts inspected within the last two years • Operating costs for paved lane per km • Operating costs for bridge and large culverts per square metre • Percentage of customer requests with a 24-hour response rate

Table 17 Key Performance Indicators – Buildings & Facilities

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related buildings and facilities)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Revenue required to meet growth related demand • Repair and maintenance costs per square metre • Energy, utility and water cost per square metre
Tactical	• Percentage of component value replaced • Overall facility condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of new facilities (square metre) • Percent of facilities rated poor or critical • Percentage of facilities replacement value spent on operations and maintenance Increase facility utilization rate by [x] percent by 2020. • $Utilization\ Rate = \frac{Occupied\ Space}{Facility\ Usable\ Area}$
Operational Indicators	• [x] sq.ft. of facilities per full-time employee (or equivalent), i.e., maintenance staff • Percentage of facilities inspected within the last five years • Number/type of service requests • Percentage of customer requests responded to within 24 hours

Table 18 Key Performance Indicators – Fleet

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Cost per capita for roads, and bridges & culverts • Maintenance cost per square metre • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Percentage of all fleet replaced • Average age of fleet • Percent of fleet rated poor or critical • Percentage of fleet replacement value spent on operations and maintenance
Operational Indicators	• Average downtime per fleet category • Average utilization per fleet category and/or each vehicle • Ratio of preventative maintenance repairs vs. reactive repairs • Percent of fleet that received preventative maintenance • Number/type of service requests • Percentage of customer requests responded to within 24 hours

Table 19 Key Performance Indicators – Water, Sanitary and Storm Networks

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related water/sanitary/storm)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Total cost of borrowing compared to total cost of service • Revenue required to maintain annual network growth • Lost revenue from system outages
Tactical	• Percentage of water/sanitary/storm network rehabilitated/reconstructed • Overall water/sanitary/storm network condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of growth in water/sanitary/storm network • Percentage of mains where the condition is rated poor or critical for each network • Percentage of water/sanitary/storm network replacement value spent on operations and maintenance
Operational Indicators	• Percentage of water/sanitary/storm network inspected • Operating costs for the collection of wastewater per kilometre of main. • Number of wastewater main backups per 100 kilometres of main • Operating costs for storm water management (collection, treatment, and disposal) per kilometre of drainage system. • Operating costs for the distribution/ transmission of drinking water per kilometre of water distribution pipe. • Number of days when a boil water advisory issued by the medical officer of health, applicable to a municipal water supply, was in effect. • Number of water main breaks per 100 kilometres of water distribution pipe in a year. • Number of customer requests received annually per water/sanitary/storm networks • Percentage of customer requests responded to within 24 hours per water/sanitary/storm network

Table 20 Key Performance Indicators – Machinery & Equipment

Level	KPI (Reported Annually)
Strategic	– Percentage of total reinvestment compared to asset replacement value – Completion of strategic plan objectives
Financial Indicators	– Annual revenues compared to annual expenditures – Annual replacement value depreciation compared to annual expenditures – Cost per capita for machinery & equipment – Revenue required to maintain annual network growth – Total cost of borrowing vs. total cost of service
Tactical	– Percentage of all machinery & equipment replaced – Average age of machinery & equipment assets – Percent of machinery & equipment rated poor or critical – Percentage of fleet replacement value spent on operations and maintenance
Operational Indicators	– Average downtime per machinery & equipment asset – Ratio of preventative maintenance repairs vs. reactive repairs – Percent of machinery & equipment that received preventative maintenance – Number/type of service requests

Table 21 Key Performance Indicators – Land Improvements

Level	KPI (Reported Annually)
Strategic	– Percentage of total reinvestment compared to asset replacement value – Completion of strategic plan objectives (related buildings and facilities)
Financial Indicators	– Annual revenues compared to annual expenditures – Annual replacement value depreciation compared to annual expenditures – Cost per capita for supplying parks, playgrounds, etc. – Repair and maintenance costs per square met
Tactical	– Overall park condition index as a percentage of desired condition index – Annual adjustment in condition indexes – Annual percentage of new parkland – Percent of park land and infrastructure rated poor or critical – Percentage of replacement value spent on operations and maintenance – Parkland per capita
Operational Indicators	– Percentage of park and infrastructure inspected within the last five years – Number/type of service requests – Percentage of customer requests responded to within 24 hours

3. Future Performance

In addition to the financial capacity, and legislative requirements, e.g., *Safe Drinking Water Act*, the Minimum Maintenance Standards for municipal highways, building codes and the *Accessibility for Ontarians with Disability Act*, many factors, internal and external, can influence the establishment of LOS and their associated KPIs, both target and actual, including the municipality's overarching mission as an organization, the current state of its infrastructure, and the municipality's financial capacity.

Strategic Objectives and Corporate Goals
The municipality's long-term direction is outlined in its corporate and strategic plans. This direction will dictate the types of services it aims to deliver to its residents and the quality of those services. These high level goals are vital in identifying strategic (long-term) infrastructure priorities and as a result, the investments needed to produce desired levels of service.

State of the Infrastructure
The current state of capital assets will determine the quality of service the municipality can deliver to its residents. As such, levels of service should reflect the existing capacity of assets to deliver those services, and may vary (increase) with planned maintenance, rehabilitation or replacement activities and timelines.

Community Expectations
The general public will often have qualitative and quantitative opinions and insights regarding the levels of service a particular asset should deliver, e.g., what a road in 'good' condition should look like or the travel time between destinations. The public should be consulted in establishing LOS; however, the discussions should be centered on clearly outlining the lifecycle costs associated with delivering any improvements in LOS.

Economic Trends
Macroeconomic trends will have a direct impact on the LOS for most infrastructure services. Fuel costs, fluctuations in interest rates, and the purchasing power of the Canadian dollar can impede or facilitate any planned growth in infrastructure services.

Demographic Changes
The type of residents that dominate a municipality can also serve as infrastructure demand drivers, and as a result, can change how a municipality allocates its resources (e.g., an aging population may require diversion of resources from parks and sports facilities to additional wellbeing centers). Population growth is also a significant demand driver for existing assets (lowering LOS), and may require the municipality to construct new infrastructure to parallel community expectations.

Environmental Change
Forecasting for infrastructure needs based on climate change remains an imprecise science. However, broader environmental and weather patterns have a direct impact on the reliability of critical infrastructure services.

4. Monitoring, Updating and Actions

The municipality should collect data on its current performance against the KPIs listed and establish targets that reflect the current fiscal capacity of the municipality, its corporate and strategic goals, and as feasible, changes in demographics that may place additional demand on its various asset classes. For some asset classes, e.g., minor equipment, furniture, etc., cursory levels of service and their respective KPIs will suffice. For major infrastructure classes, detailed technical and customer-oriented KPIs can be critical. Once this data is collected and targets are established, the progress of the municipality should be tracked annually.

VIII. Asset Management Strategies

The asset management strategy will develop an implementation process that can be applied to the needs identification and prioritization of renewal, rehabilitation, and maintenance activities. This will assist in the production of a 10-year plan, including growth projections, to ensure the best overall health and performance of the municipality's infrastructure. This section includes an overview of condition assessment; the life cycle interventions required; and prioritization techniques, including risk, to determine which priority projects should move forward into the budget first.

1. Non-Infrastructure Solutions & Requirements

The municipality should explore, as requested through the provincial requirements, which non-infrastructure solutions should be incorporated into the budgets for its infrastructure services. Non-Infrastructure solutions are such items as studies, policies, condition assessments, consultation exercises, etc., that could potentially extend the life of assets or lower total asset program costs in the future without a direct investment into the infrastructure.

Typical solutions for a municipality include linking the asset management plan to the strategic plan, growth and demand management studies, infrastructure master plans, better integrated infrastructure and land use planning, public consultation on levels of service, and condition assessment programs. As part of future asset management plans, a review of these requirements should take place, and a portion of the capital budget should be dedicated for these items in each programs budget.

It is recommended, under this category of solutions, that the municipality should develop and implement holistic condition assessment programs for all asset classes. This will advance the understanding of infrastructure needs, improve budget prioritization methodologies, and provide clearer path of what is required to achieve sustainable infrastructure programs.

2. Condition Assessment Programs

The foundation of good asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Municipalities need to have a clear understanding regarding performance and condition of their assets, as all management decisions regarding future expenditures and field activities should be based on this knowledge. An incomplete understanding about an asset may lead to its premature failure or premature replacement.

Some benefits of holistic condition assessment programs within the overall asset management process are listed below:

- Understanding of overall network condition leads to better management practices
- Allows for the establishment of rehabilitation programs
- Prevents future failures and provides liability protection
- Potential reduction in operation/maintenance costs
- Accurate current asset valuation
- Allows for the establishment of risk assessment programs
- Establishes proactive repair schedules and preventive maintenance programs
- Avoids unnecessary expenditures
- Extends asset service life therefore improving level of service
- Improves financial transparency and accountability
- Enables accurate asset reporting which, in turn, enables better decision making

Condition assessment can involve different forms of analysis such as subjective opinion, mathematical models, or variations thereof, and can be completed through a very detailed or very cursory approach.

When establishing the condition assessment of an entire asset class, the cursory approach (metrics such as good, fair, poor, very poor) is used. This will be a less expensive approach when applied to thousands of assets, yet will still provide up to date information, and will allow for detailed assessment or follow up inspections on those assets captured as poor or critical condition later.

2.1 Pavement Network

Typical industry pavement inspections are performed by consulting firms using specialized assessment fleet equipped with various electronic sensors and data capture equipment. The fleet will drive the entire road network and typically collect two different types of inspection data – surface distress data and roughness data.

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically, using sensing detection equipment mounted on the van, or visually, by the van's inspection crew. Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

Another option for a cursory level of condition assessment is for municipal road crews to perform simple windshield surveys as part of their regular patrol. Many municipalities have created data collection inspection forms to assist this process and to standardize what presence of defects would constitute a good, fair, poor, or critical score. Lacking any other data for the complete road network, this can still be seen as a good method and will assist greatly with the overall management of the road network. The CityWide Works software has a road patrol component built in that could capture this type of inspection data during road patrols in the field, enabling later analysis of rehabilitation and replacement needs for budget development.

It is recommended that the municipality continue to its pavement condition assessment program and that a portion of capital funding is dedicated to this. We also recommend expansion of this program to incorporate assessment of its road base condition through the use of falling weight deflectometer technologies.

2.2 Bridges & Culverts

Ontario municipalities are mandated by the Ministry of Transportation to inspect all structures that have a span of 3 metres or more, according to the OSIM (Ontario Structure Inspection Manual).

Structure inspections must be performed by, or under the guidance of, a structural engineer, must be performed on a biennial basis (once every two years), and include such information as structure type, number of spans, span lengths, other key attribute data, detailed photo images, and structure element by element inspection, rating and recommendations for repair, rehabilitation, and replacement.

The best approach to develop a 10-year needs list for the municipality's structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, and rehabilitation and replacement requirements report as part of the overall assignment. In addition to refining the overall needs requirements, the structural engineer should identify those structures that will require more detailed investigations and non-destructive testing techniques. Examples of these investigations are:

- Detailed deck condition survey
- Non-destructive delamination survey of asphalt covered decks
- Substructure condition survey
- Detailed coating condition survey
- Underwater investigation
- Fatigue investigation
- Structure evaluation

Through the OSIM recommendations and additional detailed investigations, a 10-year needs list will be developed for the municipality's bridges.

2.3 Buildings & Facilities

The most popular and practical type of buildings and facility assessment involves qualified groups of trained industry professionals (engineers or architects) performing an analysis of the condition of a group of facilities, and their components, that may vary in terms of age, design, construction methods, and materials. This analysis can be done by walk-through inspection, mathematical modeling, or a combination of both. But the most accurate way of determining the condition requires a walk-through to collect baseline data. The following asset classifications are typically inspected:

- **Site Components** – property around the facility and includes the outdoor components such as utilities, signs, stairways, walkways, parking lots, fencing, courtyards and landscaping.
- **Structural Components** – physical components such as the foundations, walls, doors, windows, roofs.
- **Electrical Components** – all components that use or conduct electricity such as wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical Components** – components that convey and utilize all non-electrical utilities within a facility such as gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- **Vertical Movement** – components used for moving people between floors of buildings such as elevators, escalators and stair lifts.

Once collected this type of information can be uploaded into the CityWide®, the municipality's asset management and asset registry software database in order for short- and long-term repair, rehabilitation and replacement reports to be generated to assist with programming the short- and long-term maintenance and capital budgets.

It is recommended that the municipality expand its condition assessment program to incorporate other facility types (e.g. medical centres, water and sanitary facilities) and assess the remaining components of facilities already under inspection protocols. It is also recommended that a portion of capital funding is dedicated to this.

2.4 Fleet

The typical approach to optimizing the maintenance expenditures of a corporate fleet of fleet is through routine vehicle inspections, routine vehicle servicing, and an established routine preventative maintenance program. Most, if not all, makes and models of fleet are supplied with maintenance manuals that define the appropriate schedules and routines for typical maintenance and servicing and also more detailed restoration or rehabilitation protocols.

The primary goal of good vehicle maintenance is to avoid or mitigate the consequence of failure of equipment or parts. An established preventative maintenance program serves to ensure this, as it will consist of scheduled inspections and follow up repairs of fleet and equipment in order to decrease breakdowns and excessive downtimes.

A good preventative maintenance program will include partial or complete overhauls of equipment at specific periods, including oil changes, lubrications, fluid changes and so on. In addition, workers can record equipment or part deterioration so they can schedule to replace or repair worn parts before they fail. The ideal preventative maintenance program would move further and further away from reactive repairs and instead towards the prevention of all equipment failure before it occurs.

It is recommended that a preventative maintenance routine is defined and established for all fleet and that a software application is utilized for the overall management of the program.

2.4 Water

Unlike sewer mains, it is very difficult to inspect water mains from the inside due to the high pressure flow of water constantly underway within the water system. Physical inspections require a disruption of service to residents, can be an expensive exercise, and are time consuming to set up. It is recommended practice that physical inspection of water mains typically only occurs for high risk, large transmission mains within the system, and only when there is a requirement. There are a number of high tech inspection techniques in the industry for large diameter pipes but these should be researched first for applicability as they are quite expensive. Examples include remote eddy field current (RFEC), ultrasonic and acoustic techniques, impact echo (IE), and Georadar.

For the majority of pipes within the distribution network gathering key information in regards to the main and its environment can supply the best method to determine a general condition. Key data that may be used, along with weighting factors, to determine an overall condition score include age, material type, breaks, hydrant flow inspections and soil condition.

It is recommended that the municipality expand its watermain assessment program to cover major components, e.g., water mains, and that funds are budgeted for this initiative.

2.4 Sewer Network Inspection (Sanitary and Storm)

The most popular and practical type of sanitary and storm sewer assessment is the use of Closed Circuit Television Video (CCTV). The municipality currently performs video inspections for its storm and sanitary mains. The process involves a small robotic crawler vehicle with a CCTV camera attached that is lowered down a maintenance hole into the sewer main to be inspected.

The vehicle and camera then travels the length of the pipe providing a live video feed to a truck on the road above where a technician/inspector records defects and information regarding the pipe. A wide range of construction or deterioration problems can be captured including open/displaced joints, presence of roots, infiltration & inflow, cracking, fracturing, exfiltration, collapse, deformation of pipe and more. Therefore, sewer CCTV inspection is a very good tool for locating and evaluating structural defects and general condition of underground pipes.

Even though CCTV is an excellent option for inspection of sewers it is a fairly costly process and does take significant time to inspect a large volume of pipes.

Another option in the industry today is the use of Zoom Camera equipment. This is very similar to traditional CCTV, however, a crawler vehicle is not used but in it's a place a camera is lowered down a maintenance hole attached to a pole like piece of equipment. The camera is then rotated towards each connecting pipe and the operator above progressively zooms in to record all defects and information about each pipe. The downside to this technique is the further down the pipe the image is zoomed, the less clarity is available to accurately record defects and measurement. The upside is the process is far quicker and significantly less expensive and an assessment of the manhole can be provided as well. Also, it is important to note that 80% of pipe deficiencies generally occur within 20 metres of each manhole.

It is recommended that, over time, the municipality continue and expand its sewer mains assessment program and that a portion of capital funding is dedicated to this.

2.5 Parks and open spaces

CSA standards provide guidance on the process and protocols in regards to the inspection of parks and their associated assets, e.g., play spaces and equipment. The park inspection will involve qualified groups of trained industry professionals (operational staff or landscape architects) performing an analysis of the condition of a group of Parks and their components. The most accurate way of determining the condition requires a walk-through to collect baseline data. The following key asset classifications are typically inspected:

- **Physical Site Components –** physical components on the site of the park such as: fences, utilities, stairways, walkways, parking lots, irrigation systems, monuments, fountains.
- **Recreation Components –** physical components such as: playgrounds, bleachers, back stops, splash pads, and benches.
- **Land Site Components** – land components on the site of the park such as: landscaping, sports fields, trails, natural areas, and associated drainage systems.
- **Minor Park Facilities –** small facilities within the park site such as: sun shelters, washrooms, concession stands, change rooms, storage sheds.

It is recommended that the municipality expand its land improvements and parks condition assessment program and that a portion of capital funding is dedicated to this.

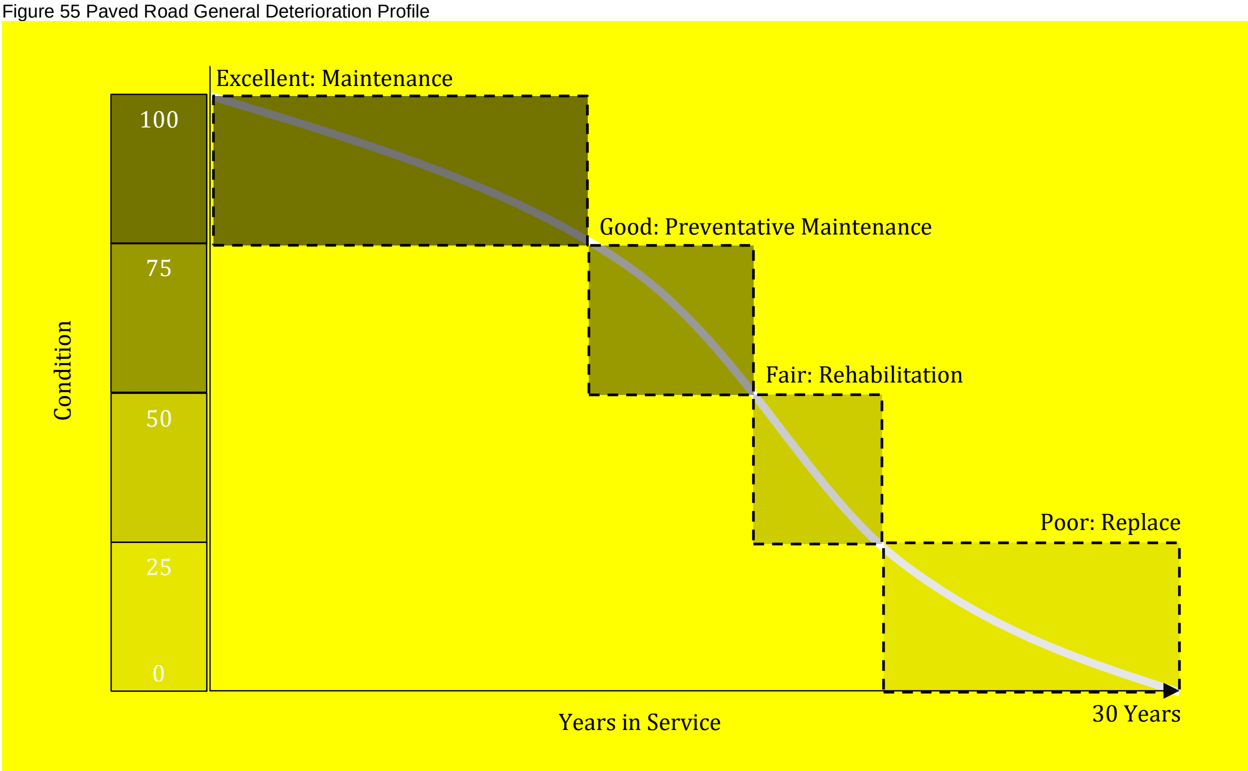
3. Life Cycle Analysis Framework

An industry review was conducted to determine which life cycle activities can be applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time. If these techniques are applied across entire asset networks or portfolios (e.g., the entire road network), the municipality could gain the best overall asset condition while expending the lowest total cost for those programs.

3.1 Paved Roads

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for paved roads. With future updates of this Asset Management Strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for roads and the associated local costs for those work activities. All of this information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available. The following diagram depicts a general deterioration profile of a road with a 30-year life.

Figure 55 Paved Road General Deterioration Profile



As shown above, during the road's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; preventative maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied to also coincide approximately with the condition state of the asset as shown below:

Table 22 Asset Condition and Related Work Activity – Paved Roads

Condition	Condition Range	Work Activity
Excellent (Maintenance only phase)	100-76	• Maintenance only
Good (Preventative maintenance phase)	75 - 51	• Crack sealing • Emulsions
Fair (Rehabilitation phase)	50 -26	• Resurface - mill & pave • Resurface - asphalt overlay • Single & double surface treatment (for rural roads)
Poor (Reconstruction phase)	25 - 1	• Reconstruct - pulverize and pave • Reconstruct - full surface and base reconstruction
Critical (Reconstruction phase)	0	• Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the 'poor' category above.

With future updates of this asset management strategy, the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These threshold and condition ranges can be easily updated and a revised financial analysis can be calculated. These adjustments will be an important component of future Asset Management Plans, as the province requires each municipality to present various management options within the financing plan.

It is recommended that the municipality establish a life cycle activity framework for the various classes of paved road within their transportation network.

3.2 Bridges & Culverts

The best approach to develop a 10 year needs list for the municipality's bridge structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, a rehabilitation and replacement requirements report and identify additional detailed inspections as required.

3.3 Buildings & Facilities

The best approach to develop a 10-year needs list for the municipality's facilities portfolio would be to have the engineers, operational staff or architects who perform the facility inspections to also develop a complete portfolio maintenance requirements report and rehabilitation and replacement requirements report, and also identify additional detailed inspections and follow up studies as required. This may be performed as a separate assignment once all individual facility audits/inspections are complete.

The above reports could be considered the beginning of a 10-year maintenance and capital plan, however, within the facilities industry there are other key factors that should be considered to determine over all priorities and future expenditures. Some examples would be functional/legislative requirements, energy conservation programs and upgrades, customer complaints and health and safety concerns, and also customer expectations balanced with willingness to pay initiatives.

It is recommended that the municipality establish a prioritization framework for the facilities asset class that incorporates the key components outlined above.

3.4 Fleet

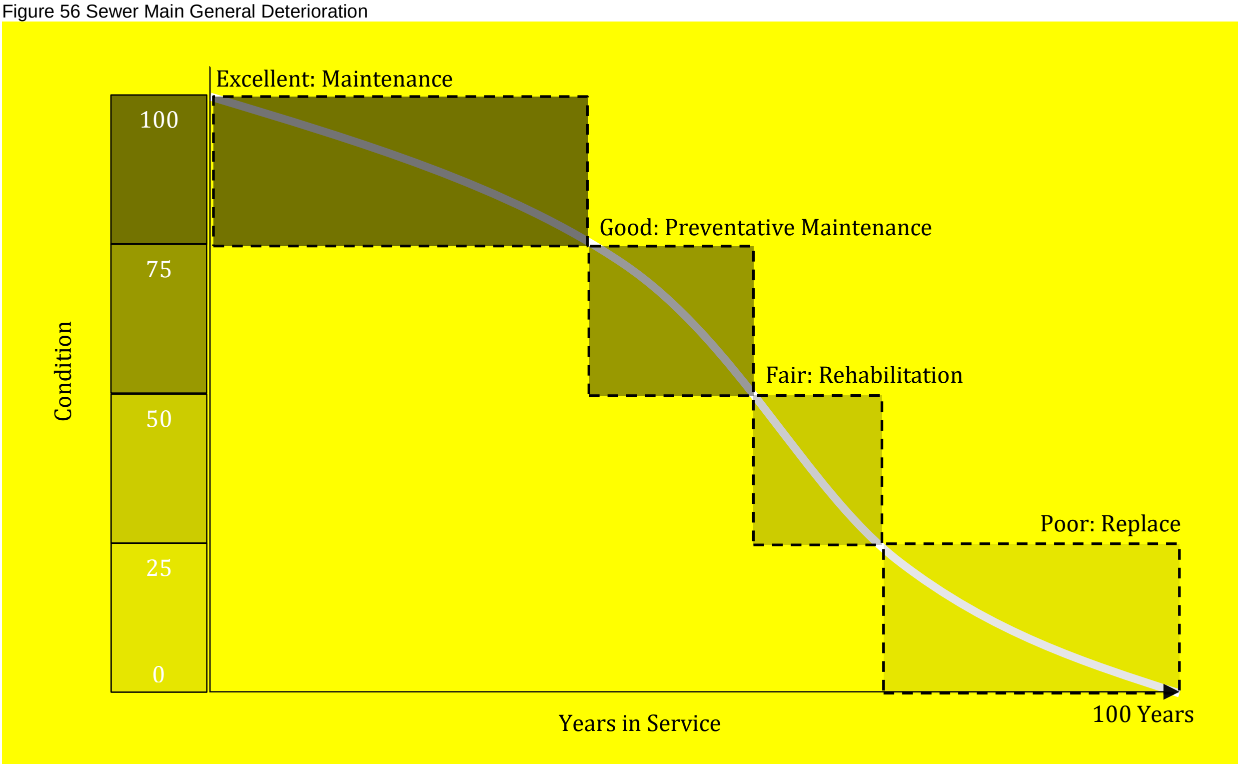
The best approach to develop a 10-year needs list for the municipality's fleet and vehicle portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized life cycle vehicle replacement schedule. The preventative maintenance program would serve to determine budget requirements for operating and minor capital expenditures for part renewal and major refurbishments and rehabilitations. An optimized vehicle replacement program will ensure a vehicle is replaced at the correct point in time in order to minimize overall cost of ownership, minimize costly repairs and downtime, while maximizing potential re-sale value. There is significant benchmarking information available within the fleet industry in regards to vehicle life cycles which can be used to assist in this process. Once appropriate replacement schedules are established the short and long term budgets can be funded accordingly.

There are, of course, functional aspects of fleet management that should also be examined in further detail as part of the long-term management plan, such as fleet utilization and incorporating green fleet, etc. It is recommended that the municipality establish a prioritization framework for the fleet asset class that incorporates the key components outlined above.

3.5 Sanitary and Storm Sewers

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for sanitary and storm sewer rehabilitation and replacement. With future updates of this asset management strategy, the municipality may wish to run the same analysis with a detailed review of activities used for sewer mains and the associated local costs for those work activities. This information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available. The following diagram depicts a general deterioration profile of a sewer main with a 100 year life.

Figure 56 Sewer Main General Deterioration



As shown above, during the sewer main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction. The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown below:

Table 23 Asset Condition and Related Work Activity for Sewer Mains

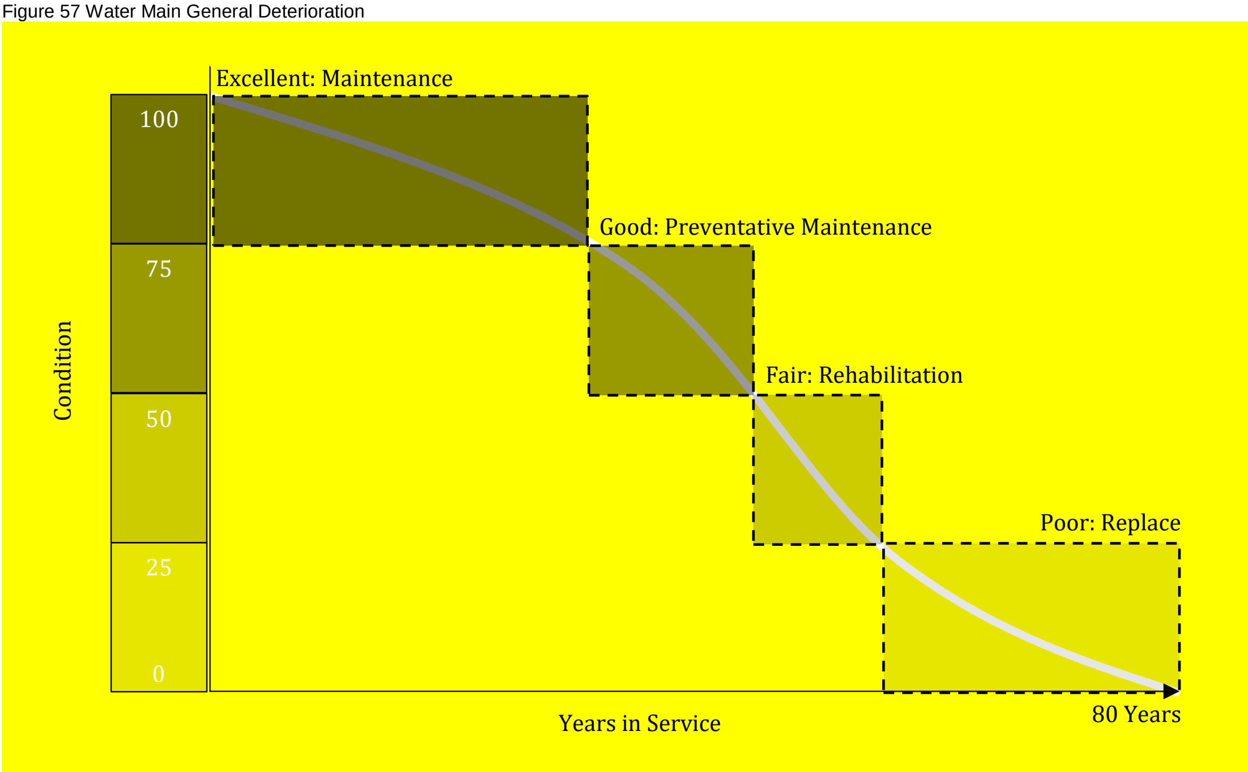
Condition	Condition Range	Work Activity
Excellent (Maintenance only phase)	100-76	• Maintenance only (cleaning & flushing etc.)
Good (Preventative maintenance phase)	75 - 51	• Mahhole repairs • Small pipe section repairs
Fair (Rehabilitation phase)	50 -26	• Structural relining
Poor (Reconstruction phase)	25 - 1	• Pipe replacement
Critical (Reconstruction phase)	0	• Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

With future updates of this Asset Management Strategy the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These adjustments will be an important component of future asset management plans, as the province requires each municipality to present various management options within the financing plan.

3.6 Water

As with roads and sewers above, the following analysis has been conducted at a fairly high level, using industry standard activities and costs for water main rehabilitation and replacement. The following diagram depicts a general deterioration profile of a water main with an 80 year life.

Figure 57 Water Main General Deterioration



As shown above, during the water main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction. The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown in Table 24.

Table 24 Asset Condition and Related Work Activity for Water Mains

Condition	Condition Range	Work Activity
Excellent (Maintenance only phase)	100-76	– Maintenance only (cleaning & flushing etc.)
Good (Preventative maintenance phase)	75 - 51	– Water main break repairs – Small pipe section repairs
Fair (Rehabilitation phase)	50 -26	– Structural water main relining
Poor (Reconstruction phase)	25 - 1	– Pipe replacement
Critical (Reconstruction phase)	0	– Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the “poor” category above.

4. Growth and Demand

Growth is a critical infrastructure demand driver for most infrastructure services. As such, the municipality must not only account for the lifecycle cost for its existing asset portfolio, but those of any anticipated and forecasted capital projects associated specifically with growth. The population for Asphodel-Norwood, currently 4,041, has fluctuated since 1996, experiencing a decrease of 4.9% since 2006.

Declining populations represent a catch-22 for municipalities: lower demand will place less burden on assets while also reducing the municipality's ability to maintain existing service levels due to lower revenues. As such, a comprehensive understanding of existing asset condition and thorough demographic analyses can be pivotal in informing decision-making. In addition to population changes, demographic shifts (e.g., aging population) can place disproportionate demand on certain asset categories such as housing and social services.

5. Project Prioritization and Risk Management

Generally, infrastructure needs exceed municipal capacity. As such, municipalities rely heavily on provincial and federal programs and grants to finance important capital projects. Fund scarcity means projects and investments must be carefully selected based on the state of infrastructure, economic development goals, and the needs of an evolving and growing community. These factors, along with social and environmental considerations will form the basis of a robust risk management framework.

5.1 Defining Risk Management

From an asset management perspective, risk is a function of the consequences of failure (e.g., the negative economic, financial, and social consequences of an asset in the event of a failure); and, the probability of failure (e.g., how likely is the asset to fail in the short- or long-term). The consequences of failure are typically reflective of:

– An asset's importance in an overall system:
  For example, the failure of an individual computer workstation for which there are readily available substitutes is much less consequential and detrimental than the failure of a network server or telephone exchange system.

– The criticality of the function performed:
  For example, a mechanical failure on a piece road construction equipment may delay the progress of a project, but a mechanical failure on a fire pumper truck may lead to immediate life safety concerns for fire fighters, and the public, as well as significant property damage.

– The exposure of the public and/or staff to injury or loss of life:
  For example, a single sidewalk asset may demand little consideration and carry minimum importance to The municipality's overall pedestrian network and performs a modest function. However, members of the public interact directly with the asset daily and are exposed to potential injury due to any trip hazards or other structural deficiencies that may exist.

The probability of failure is generally a function of an asset's physical condition, which is heavily influenced by the asset's age and the amount of investment that has been made in the maintenance and renewal of the asset throughout its life.

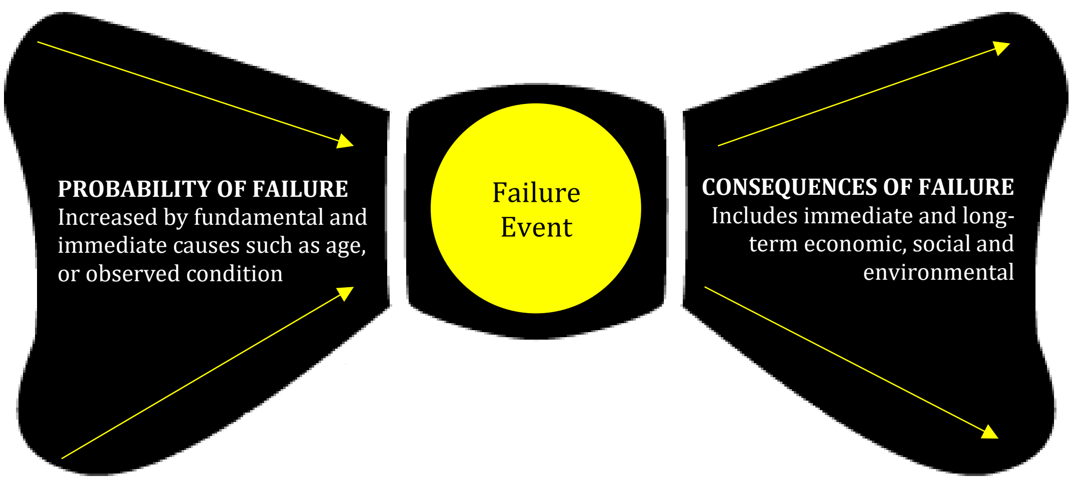
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

– The impact that actions (or inaction) on one asset will have on other related assets
– The opportunities for economic efficiency (realized or lost) relative to the actions taken

5.2 Risk Matrices

Using the logic above, a risk matrix will illustrate each asset's overall risk, determined by multiplying the probability of failure (PoF) scores with the consequence of failure (CoF) score, as illustrated in the table below. This can be completed as a holistic exercise against any data set by determining which factors (or attributes) are available and will contribute to the PoF or CoF of an asset. The following diagram (known as a bowtie model in the risk industry) illustrates this concept. The probability of failure is increased as more and more factors collude to cause asset failure.

Figure 58 Bow Tie Risk Model



Probability of Failure

In this AMP, the probability of a failure event is predicted by the condition of the asset.

Table 25 Probabilitiy of Failure – All Assets

Asset Classes	Condition Rating	Probability of Failure
ALL	0-20 Very Poor	5 – Very High
	21-40 Poor	4 – High
	41-60 Fair	3 – Moderate
	61-80 Good	2 – Low
	81-100 Excellent	1 – Very Low

Consequence of Failure

The consequence of failure for the asset classes analyzed in this AMP will be determined either by the replacement costs of assets, or their material types, classifications (or other attributes). Asset classes for which replacement cost is used include: bridges & culverts, buildings, land improvements, fleet, and machinery & equipment. This approach is premised on the assumption that the higher the replacement cost, the larger (and likely more important) the asset, requiring higher risk scoring.

Assets for which other attributes are used include: water, wastewater, storm, roads, and rate facilities. Attributes are selected based on their impact on service delivery. For linear infrastructure, pipe diameter is used to estimate a suitable consequence of failure score. Scoring for roads and rate-based facilities is based on classification or asset type.

Table 26 Consequence of Failure – Roads

Road Classification	Consequence of failure
Roads Surface - LCB	Score of 3
Roads Surface - HCB	Score of 5

Table 27 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to $5k	Score of 1
$5 to $10k	Score of 2
$11 to $50k	Score of 3
$51 to $200k	Score of 4
$200k and over	Score of 5

Table 28 Consequence of Failure – Water Mains

Pipe Diameter	Consequence of Failure
Less than 100mm	Score of 1
101–150mm	Score of 2
151–200mm	Score of 3
201–250mm	Score of 4
250mm and over	Score of 5

Table 29 Consequence of Failure – Sanitary Sewers

Pipe Diameter	Consequence of failure
Less than 100mm	Score of 1
101–150mm	Score of 2
151–200mm	Score of 3
201–250mm	Score of 4
250mm and over	Score of 5

Table 30 Consequence of Failure – Storm Sewers

Pipe Diameter	Consequence of Failure
Less than 200mm	Score of 1
201-300mm	Score of 2
301-400mm	Score of 3
401-500mm	Score of 4
500mm and over	Score of 5

Table 31 Consequence of Failure – Buildings & Facilities

Replacement Value	Consequence of failure
Up to $50k	Score of 1
$51k to $100k	Score of 2
$101k to $300k	Score of 3
$301k to $1 million	Score of 4
Over $1 million	Score of 5

Table 32 Consequence of Failure – Machinery & Equipment

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $25k	Score of 2
$26k to $50k	Score of 3
$51k to $100k	Score of 4
Over $100k	Score of 5

Table 33 Consequence of Failure – Land Improvements

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $100k	Score of 3
$101k to $150k	Score of 4
Over $150k	Score of 5

Table 34 Consequence of Failure – Fleet

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $60k	Score of 2
$61k to $100k	Score of 3
$101k to $200k	Score of 4
Over $300k	Score of 5

The risk matrices that follow show the distribution of assets within each asset class according to the probability and likelihood of failure scores as discussed above.

Figure 59 Distribution of Assets Based on Risk – All Asset Classes

Consequence \ Probability	1	2	3	4	5
5	51 Assets 226.59 unit(s), km, m $10,924,901.00	28 Assets 265.16 unit(s), km, m $4,300,037.00	32 Assets 282.92 km, m, unit(s) $1,702,361.00	17 Assets 5.54 unit(s), km $873,845.00	7 Assets 1.83 km, unit(s) $1,627,807.00
4	10 Assets 1,282.10 m, unit(s) $823,607.10	9 Assets 490.00 unit(s), m $1,493,836.00	11 Assets 255.80 m, unit(s) $1,174,016.70	0 Assets - $0.00	3 Assets 3.00 unit(s) $1,037,467.00
3	55 Assets 6,557.77 m, km, unit(s) $4,772,770.86	28 Assets 240.47 unit(s), km, m $3,418,448.00	138 Assets 10,526.57 km, m, unit(s), m2 $5,993,285.60	2 Assets 2.35 km $94,000.00	14 Assets 158.70 unit(s), km, m $783,753.00
2	35 Assets 3,541.01 unit(s), m, km, m2 $1,356,177.20	43 Assets 2,749.42 m, unit(s) $2,646,354.36	28 Assets 4,279.10 unit(s), m $2,003,512.40	4 Assets 9.00 unit(s), m $70,901.00	26 Assets 2,547.32 unit(s), m $1,263,190.74
1	202 Assets 19,083.86 unit(s), m, m2, km $4,650,444.10	576 Assets 5,930.94 unit(s), m, km, m2 $1,680,868.00	318 Assets 3,746.32 unit(s), m, km, m2 $5,827,217.23	97 Assets 2,027.24 unit(s), m, km, m2 $6,976,773.20	280 Assets 3,055.95 unit(s), m, m2 $1,383,425.00

Figure 60 Distribution of Assets Based on Risk – Road Network

Consequence \ Probability	1	2	3	4	5
5	38 Assets 12.31 km $1,097,300.00	20 Assets 10.06 km $932,600.00	26 Assets 10.42 km $885,980.00	14 Assets 2.54 km $214,360.00	6 Assets 0.83 km $77,920.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	18 Assets 14.10 km $767,000.00	21 Assets 21.07 km $1,725,560.00	12 Assets 902.47 km, m2 $841,765.60	2 Assets 2.35 km $94,000.00	10 Assets 9.70 km $588,100.00
2	3 Assets 600.81 km, m2 $202,317.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	37 Assets 8,168.96 m2, km, m, unit(s) $989,871.60	6 Assets 1,443.75 km, m2 $188,940.00	32 Assets 2,335.82 km, m2 $3,893,137.60	43 Assets 1,882.44 km, m2 $6,011,107.20	3 Assets 293.00 m2 $23,440.00

Figure 61 Distribution of Assets Based on Risk – Bridges & Culverts

Consequence \ Probability	1	2	3	4	5
5	3 Assets 36.28 m $702,000.00	1 Assets 5.10 m $297,000.00	1 Assets 4.50 m $306,000.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	3 Assets 4.00 m, unit(s) $40,658.00	1 Assets 14.40 m $11,377.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	1 Assets - m $5,309.00	16 Assets 362.70 m $97,190.00	0 Assets - $0.00	1 Assets 6.00 m $6,043.00	1 Assets 11.50 m $5,112.00
1	32 Assets 301.00 m $49,993.00	490 Assets 4,386.19 m $673,789.00	75 Assets 602.20 m $91,114.00	12 Assets 102.80 m $15,961.00	154 Assets 1,643.95 m $204,722.00

Figure 62 Distribution of Assets Based on Risk – Water System

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	1 Assets 500.00 m $380,000.00	3 Assets 335.00 m $254,600.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	24 Assets 5,210.37 m $3,230,429.86	4 Assets 203.00 unit(s), m $1,554,498.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	12 Assets 1,825.00 m $736,725.00	10 Assets 2,082.72 m, unit(s) $934,119.36	18 Assets 3,966.00 m $1,813,644.00	0 Assets - $0.00	17 Assets 2,527.82 m $980,179.74
1	60 Assets 82.00 unit(s) $411,390.00	60 Assets 60.00 unit(s) $446,429.00	39 Assets 390.30 unit(s), m $243,387.63	3 Assets 3.00 unit(s) $64,228.00	56 Assets 182.00 unit(s), m $637,842.00

Figure 63 Distribution of Assets Based on Risk – Sanitary Services

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	2 Assets 122.10 m $79,365.00	0 Assets - $0.00	0 Assets - $0.00
3	4 Assets 864.00 m $449,280.00	0 Assets - $0.00	121 Assets 9,557.10 m $4,969,692.00	0 Assets - $0.00	0 Assets - $0.00
2	0 Assets - $0.00	8 Assets 8.00 unit(s) $1,350,240.00	1 Assets 129.60 m $34,214.40	0 Assets - $0.00	0 Assets - $0.00
1	16 Assets 18.50 unit(s), km $83,250.00	5 Assets 5.00 unit(s) $241,604.00	155 Assets 155.00 unit(s) $1,457,733.00	38 Assets 38.00 unit(s) $863,725.00	51 Assets 51.00 unit(s) $397,428.00

Figure 64 Distribution of Assets Based on Risk – Storm

Consequence \ Probability	1	2	3	4	5
5	2 Assets 170.00 m $59,335.00	2 Assets 245.00 m $98,000.00	3 Assets 266.00 m $104,550.00	0 Assets - $0.00	0 Assets - $0.00
4	6 Assets 767.10 m $246,239.10	1 Assets 150.00 m $48,150.00	2 Assets 126.70 m $40,670.70	0 Assets - $0.00	0 Assets - $0.00
3	4 Assets 463.30 m $116,525.00	0 Assets - $0.00	1 Assets 63.00 m $15,750.00	0 Assets - $0.00	1 Assets 146.00 m $37,960.00
2	10 Assets 1,086.20 m $229,436.20	2 Assets 289.00 m $58,485.00	5 Assets 179.50 m $37,867.00	0 Assets - $0.00	0 Assets - $0.00
1	42 Assets 6,824.40 unit(s), m $3,020,958.50	5 Assets 24.00 unit(s) $58,215.00	12 Assets 258.00 m, unit(s) $95,520.00	0 Assets - $0.00	12 Assets 882.00 unit(s) $48,105.00

Figure 65 Distribution of Assets Based on Risk – Buildings & Facilities

Consequence \ Probability	1	2	3	4	5
5	2 Assets 2.00 unit(s) $7,762,365.00	1 Assets 1.00 unit(s) $1,147,760.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $1,549,887.00
4	0 Assets - $0.00	1 Assets 1.00 unit(s) $626,331.00	1 Assets 1.00 unit(s) $598,563.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $885,953.00
3	1 Assets 1.00 unit(s) $141,601.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	0 Assets - $0.00	2 Assets 2.00 unit(s) $133,700.00	1 Assets 1.00 unit(s) $52,349.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $55,537.00
1	1 Assets 1.00 unit(s) $2,624.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $56,257.00

Figure 66 Distribution of Assets Based on Risk – Machinery & Equipment

Consequence \ Probability	1	2	3	4	5
5	1 Assets 1.00 unit(s) $163,607.00	1 Assets 1.00 unit(s) $1,162,497.00	2 Assets 2.00 unit(s) $405,831.00	2 Assets 2.00 unit(s) $449,611.00	0 Assets - $0.00
4	3 Assets 15.00 unit(s) $197,368.00	1 Assets 1.00 unit(s) $54,074.00	6 Assets 6.00 unit(s) $455,418.00	0 Assets - $0.00	0 Assets - $0.00
3	1 Assets 1.00 unit(s) $27,277.00	1 Assets 1.00 unit(s) $42,418.00	4 Assets 4.00 unit(s) $166,078.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $34,773.00
2	6 Assets 26.00 unit(s) $85,832.00	5 Assets 5.00 unit(s) $72,620.00	2 Assets 2.00 unit(s) $23,592.00	2 Assets 2.00 unit(s) $33,277.00	3 Assets 3.00 unit(s) $48,008.00
1	10 Assets 3,686.00 unit(s), m2 $47,792.00	9 Assets 11.00 unit(s) $55,630.00	4 Assets 4.00 unit(s) $23,434.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $8,462.00

Figure 67 Distribution of Assets Based on Risk – Land Improvements

Consequence \ Probability	1	2	3	4	5
5	3 Assets 3.00 unit(s) $627,959.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	1 Assets 1.00 unit(s) $125,542.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $122,920.00
2	2 Assets 2.00 unit(s) $61,808.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $77,483.00
1	4 Assets 2.00 unit(s) $44,565.00	1 Assets 1.00 unit(s) $16,261.00	1 Assets 1.00 unit(s) $22,891.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $7,169.00

Figure 68 Distribution of Assets Based on Risk – Fleet

Consequence \ Probability	1	2	3	4	5
5	2 Assets 2.00 unit(s) $512,335.00	3 Assets 3.00 unit(s) $662,180.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $209,874.00	0 Assets - $0.00
4	0 Assets - $0.00	2 Assets 2.00 unit(s) $385,139.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $151,514.00
3	0 Assets - $0.00	1 Assets 1.00 unit(s) $84,595.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	1 Assets 1.00 unit(s) $34,750.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $41,846.00	1 Assets 1.00 unit(s) $31,581.00	2 Assets 2.00 unit(s) $96,871.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $21,752.00	0 Assets - $0.00

IX. Financial Strategy

1. General Overview

In order for an AMP to be effective and meaningful, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the municipality to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

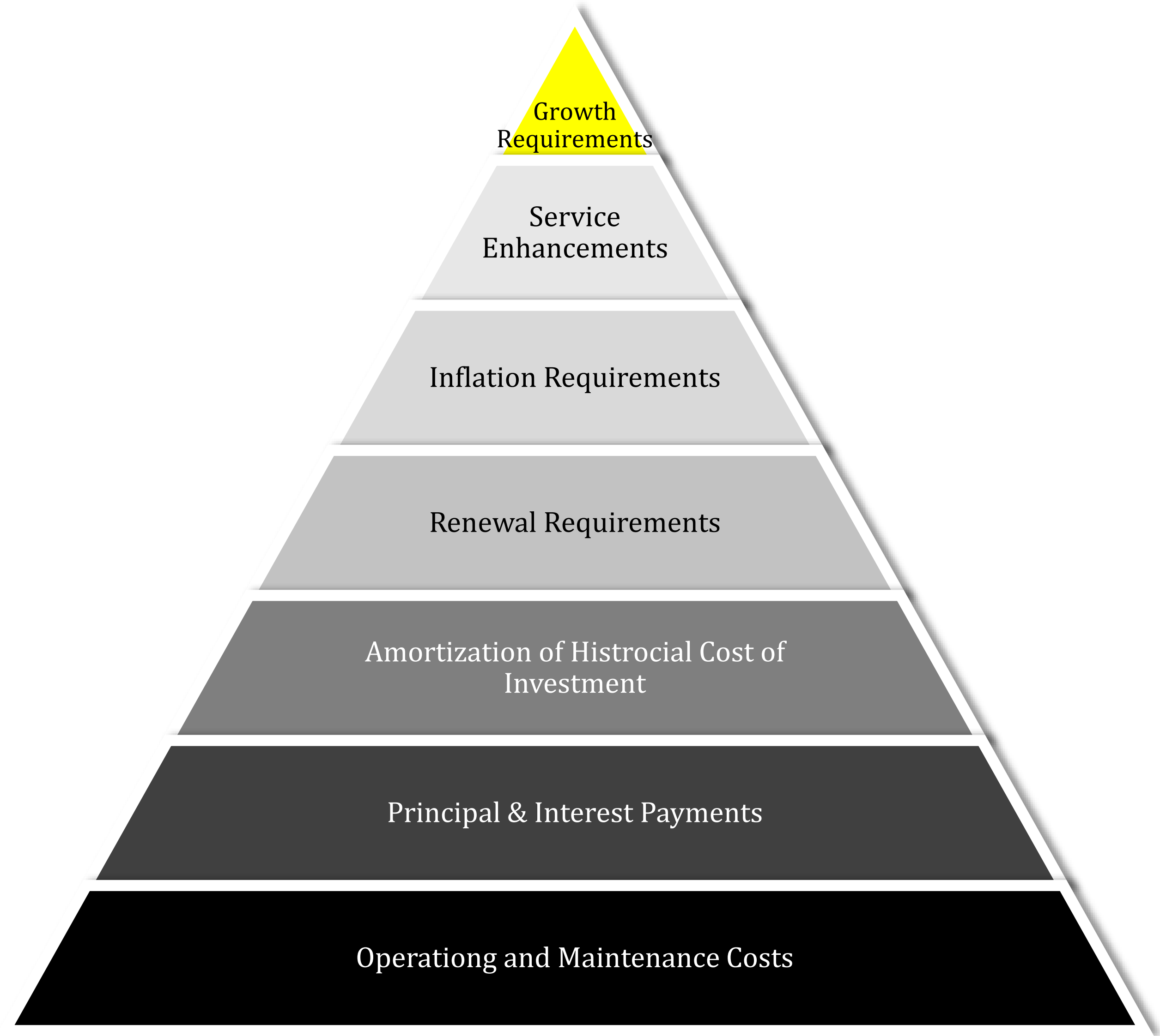


Figure 69 Cost Elements

Figure 69 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient in terms of lifecycle costs.

Meeting the annual amortization expense based on the historical cost of investment will ensure municipalities adhere to accounting rules implemented in 2009; however, funding is still deficient for long-term needs. As municipalities graduate to the next level and meet renewal requirements, funding at this level ensures that need and cost of full replacement is deferred. If municipalities meet inflation requirements, they're positioning themselves to meet replacement needs at existing levels of service. In the final level, municipalities that are funding for service enhancement and growth requirements are fiscally sustainable and cover future investment needs.

This report develops a financial plan by presenting several scenarios for consideration and culminating with final recommendations. It includes recommendations that avoid long-term funding deficits. As outlined below, the scenarios presented model different combinations of the following components:

- the financial requirements (as documented in the SOTI section of this report) for existing assets, existing service levels, requirements of contemplated changes in service levels (none identified for this plan), and requirements of anticipated growth (none identified for this plan)
- use of traditional sources of municipal funds including tax levies, user fees, reserves, debt, and development charges
- use of non-traditional sources of municipal funds, e.g., reallocated budgets
- use of senior government funds, such as the federal Gas Tax Fund, Ontario Community Infrastructure Fund (OCIF)

If the financial plan component of an AMP results in a funding shortfall, the province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the province may evaluate a municipality's approach to the following:

- In order to reduce financial requirements, consideration has been given to revising service levels downward.
- All asset management and financial strategies have been considered. For example:
    - If a zero debt policy is in place, is it warranted? If not, the use of debt should be considered.
    - Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

2. Financial Profile: Tax Funded Assets

2.1 Funding Objective

We have developed scenarios that would enable the municipality to achieve full funding within five to 20 years for the following assets: roads; bridges & culverts; storm sewers; buildings; machinery & equipment; fleet; and yard improvement. For each scenario developed we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

2.2 Current Funding Position

Table 35 and Table 36 outline, by asset class, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Table 35 Infrastructure Requirements and Current Funding Available: Tax Funded Assets

Asset class	Average Annual Investment Required	Total Funding Available in 2016					Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Taxes to Reserves	Total Funding Available	
Road Network	589,000	260,000	123,000	45,000	0	428,000	161,000
Bridges & Culverts	61,000	0	0	0	0	0	61,000
Storm	59,000	0	0	0	0	0	59,000
Buildings & Facilities	218,000	0	0	0	4,000	4,000	214,000
Machinery & Equipment	176,000	85,000	0	0	66,000	151,000	25,000
Land Improvements	81,000	0	0	0	45,000	45,000	36,000
Fleet	135,000	0	0	0	54,000	54,000	81,000
Total	1,319,000	345,000	123,000	45,000	169,000	682,000	637,000

2.3 Recommendations for Full Funding

The average annual investment requirement for tax funded categories is $1,319,000. Annual revenue currently allocated to these assets for capital purposes is $682,000 leaving an annual deficit of $637,000. To put it another way, these infrastructure categories are currently funded at 52% of their long-term requirements. In 2016, Asphodel-Norwood has annual tax revenues of $2,621,000. As illustrated in Table 36, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 36 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Road Network	6.1%
Bridges & Culverts	2.3%
Storm	2.3%
Buildings & Facilities	8.2%
Machinery & Equipment	1%
Land Improvements	1.4%
Fleet	3.1%
Total	24.4%

The following changes in costs and/or revenues over the next number of years should also be considered in the financial strategy:

- Asphodel-Norwood's formula based OCIF grant is scheduled to grow from $45,000 in 2016 to $169,000 in 2019.
- Normally our recommendations include allocating any decrease in debt costs to the infrastructure deficit. However, Asphodel-Norwood's debt payments for these asset categories is $0 so this option is not available.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 37 outlines this concept and presents a number of options.

Table 37 Effect of Changes in OCIF Funding and Reallocating Decreases in Debt Costs

	Without Capturing Changes				With Capturing Changes			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit	637,000	637,000	637,000	637,000	637,000	637,000	637,000	637,000
Change in OCIF Grant	NA	NA	NA	NA	-124,000	-124,000	-124,000	-124,000
Changes in Debt Costs	NA	NA	NA	NA	0	0	0	0
Resulting Infrastructure Deficit	637,000	637,000	637,000	637,000	513,000	513,000	513,000	513,000
Resulting Tax Increase Required:								
Total Over Time	24.4%	24.4%	24.4%	24.4%	19.6%	19.6%	19.6%	19.6%
Annually	4.9%	2.4%	1.6%	1.2%	3.9%	2.0%	1.3%	1.0%

Considering all of the above information, we recommend the 20 year option that includes capturing the changes. This involves full funding being achieved over 20 years by:

- increasing tax revenues by 1.0% each year for the next 20 years solely for the purpose of phasing in full funding to the tax funded asset classes covered in this AMP.
- allocating the current gas tax and OCIF revenue as outlined in Table 35.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

- As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula based funding, if applicable, since this funding is a multi-year commitment.
- We realize that raising tax revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.

Although this option achieves full funding on an annual basis in 20 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent up investment demand of $0 for paved roads, $210,000 for bridges & culverts, $86,000 for storm sewers, $48,000 for machinery & equipment, $2,455,000 for facilities, $149,000 for land improvements and $248,000 for vehicles. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

3. Financial Profile: Rate Funded Assets

3.1 Funding Objective

We have developed scenarios that would enable the municipality to achieve full funding within five to 20 years for the following assets: water, and sanitary. For each scenario developed we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

3.2 Current Funding Position

Table 38 and Table 39 outline, by asset class, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

Table 38 Summary of Infrastructure Requirements and Current Funding Available

Asset class	Average Annual Investment Required	Total Funding Available in 2016				Annual Deficit/Surplus
		Rates	To Operations	Other	Total Funding Available	
Water System	200,000	381,000	-352,000	0	29,000	171,000
Sanitary Services	302,000	389,000	-329,000	0	60,000	242,000
Total	502,000	770,000	-681,000	0	89,000	413,000

3.3 Recommendations for Full Funding

The average annual investment requirement for sanitary services and water services is $502,000. Annual revenue currently allocated to these assets for capital purposes is $89,000 leaving an annual deficit of $413,000. To put it another way, these infrastructure categories are currently funded at 18% of their long-term requirements. In 2016, Asphodel-Norwood has annual sanitary revenues of $389,000 and annual water revenues of $381,000. As illustrated in Table 39, without consideration of any other sources of revenue, full funding would require the following increases over time:

Table 39 Rate Change Required for Full Funding

Asset class	Rate Change Required for Full Funding
Water System	44.9%
Sanitary Services	62.2%

As illustrated in Table 44, Asphodel-Norwood's debt payments for sanitary services will be decreasing by $14,000 over the next five years and by $27,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $41,000 over the next 15 years. For water services, the amounts are $0, $0 and $0 respectively. Our recommendations include capturing those decreases in cost and allocating them to the applicable infrastructure deficit. Our recommendations include capturing those decreases in cost and allocating them to the applicable infrastructure deficit.

Table 40 Without Change in Debt Costs

	Sanitary Services			Water System		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit	242,000	242,000	242,000	171,000	171,000	171,000
Change in Debt Costs	NA	NA	NA	NA	NA	NA
Resulting Infrastructure Deficit/Surplus	242,000	242,000	242,000	171,000	171,000	171,000
Resulting Rate Increase Required:						
Total Over Time	62.2%	62.2%	62.2%	44.9%	44.9%	44.9%
Annually	12.4%	6.2%	4.1%	9.0%	4.5%	3.0%

Table 41 With Change in Debt Costs

	Sanitary Services			Water System		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit	242,000	242,000	242,000	171,000	171,000	171,000
Change in Debt Costs	-14,000	-27,000	-41,000	0	0	0
Resulting Infrastructure Deficit/Surplus	228,000	215,000	201,000	171,000	171,000	171,000
Resulting Rate Increase Required:						
Total Over Time	58.6%	55.3%	51.7%	44.9%	44.9%	44.9%
Annually	11.7%	5.5%	3.4%	9.0%	4.5%	3.0%

Considering all of the above information, we recommend the 15 year option. This involves full funding being achieved by:

- when realized, reallocating the debt cost reductions of $41,000 for sanitary services and $0 for water services to the applicable infrastructure deficit.
- increasing rate revenues by 3.4% for sanitary services and 3.0% for water services each year for the next 15 years solely for the purpose of phasing in full funding to the rate funded asset categories in this AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

- As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula based funding, if applicable, since this funding is a multi-year commitment.
- We realize that raising rate revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.
- Any increase in rates required for operations would be in addition to the above recommendations.

Although this option achieves full funding on an annual basis in 15 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent up investment demand of $226,000 for sanitary services and $18,000 for water services. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

4. Use of Debt

For reference purposes, Table 42 outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[3] over 15 years would result in a 26% premium or $260,000 of increased costs due to interest payments. For simplicity, the table does not take into account the time value of money or the effect of inflation on delayed projects.

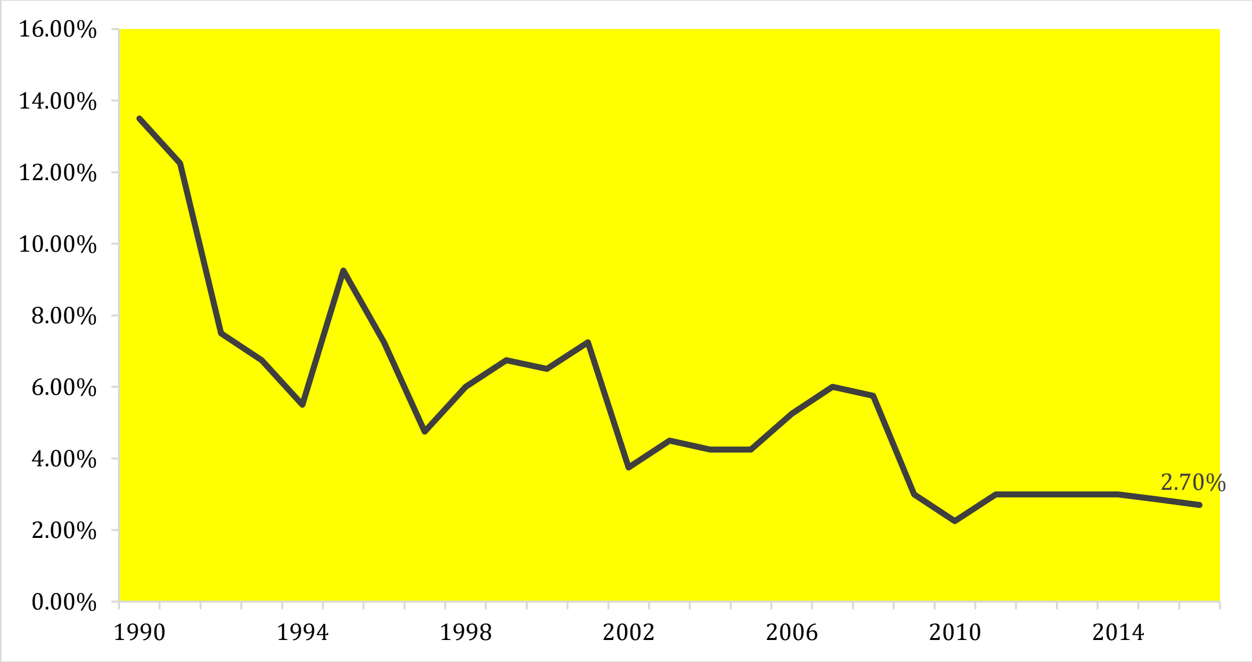
Table 42 Total Interest Paid as a Percentage of Project Costs

Interest Rate	Number of Years Financed					
	5	10	15	20	25	30
7.0%	22%	42%	65%	89%	115%	142%
6.5%	20%	39%	60%	82%	105%	130%
6.0%	19%	36%	54%	74%	96%	118%
5.5%	17%	33%	49%	67%	86%	106%
5.0%	15%	30%	45%	60%	77%	95%
4.5%	14%	26%	40%	54%	69%	84%
4.0%	12%	23%	35%	47%	60%	73%
3.5%	11%	20%	30%	41%	52%	63%
3.0%	9%	17%	26%	34%	44%	53%
2.5%	8%	14%	21%	28%	36%	43%
2.0%	6%	11%	17%	22%	28%	34%
1.5%	5%	8%	12%	16%	21%	25%
1.0%	3%	6%	8%	11%	14%	16%
0.5%	2%	3%	4%	5%	7%	8%
0.0%	0%	0%	0%	0%	0%	0%

[3] Current municipal Infrastructure Ontario rates for 15 year money is 3.2%.

It should be noted that current interest rates are near all-time lows. Sustainable funding models that include debt need to incorporate the risk of rising interest rates. The following graph shows where historical lending rates have been:

Figure 70 Historical Prime Business Interest Rates



As illustrated in Table 42 , a change in 15 year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

Table 43 and Table 44 outline how Asphodel-Norwood has historically used debt for investing in the asset classes as listed. There is currently $1,686,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $139,000, well within its provincially prescribed maximum of $1,018,000.

Table 43 Overview of Use of Debt

Asset class	Debt at December 31st, 2015	Use of Debt in Last Five Years				
		2011	2012	2013	2014	2015
Road Network	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Sewer Network	0	0	0	0	0	0
Buildings & Facilities	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Land Improvements	0	0	0	0	0	0
Fleet	0	0	0	0	0	0
Total Tax Funded	0	0	0	0	0	0
Sanitary Services	1,686,000	0	0	0	0	0
Water System	0	0	0	0	0	0
Total Rate Funded	1,686,000	0	0	0	0	0

Table 44 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2016	2017	2018	2019	2020	2021	2026
Road Network	0	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0	0
Storm	0	0	0	0	0	0	0
Buildings & Facilities	0	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0	0
Land Improvements	0	0	0	0	0	0	0
Fleet	0	0	0	0	0	0	0
Total Tax Funded	0	0	0	0	0	0	0
Sanitary Services	139,000	136,000	134,000	130,000	128,000	125,000	112,000
Water System	0	0	0	0	0	0	0
Total Rate Funded	139,000	136,000	134,000	130,000	128,000	125,000	112,000

The revenue options outlined in this plan allow Asphodel-Norwood to fully fund its long-term infrastructure requirements without further use of debt. However, project prioritization based on replacing age-based data with observed data for several tax funded and rate funded classes may require otherwise.

5. Use of Reserves

5.1 Available Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include: the ability to stabilize tax rates when dealing with variable and sometimes uncontrollable factors; financing one-time or short-term investments; accumulating the funding for significant future infrastructure investments; managing the use of debt; and, normalizing infrastructure funding requirements. By infrastructure class, Table 45 outlines the details of the reserves currently available to Asphodel-Norwood .

Table 45 Summary of Reserves Available

Asset class	Balance at December 31st, 2015
Road Network	74,000
Bridges & Culverts	20,000
Storm	20,000
Buildings & Facilities	136,000
Machinery & Equipment	209,000
Land Improvements	244,000
Fleet	145,000
Total Tax Funded	848,000
Water System	204,000
Sanitary Services	397,000
Total Rate Funded	601,000

There is considerable debate in the municipal sector as to the appropriate level of reserves that a municipality should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should take into account when determining their capital reserve requirements include: breadth of services provided, age and condition of infrastructure, use and level of debt, economic conditions and outlook, and internal reserve and debt policies.

The reserves in Table 45 are available for use by applicable asset classes during the phase-in period to full funding. This, coupled with Asphodel-Norwood ’s judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for high priority and emergency infrastructure investments in the short to medium-term.

5.2 Recommendation

As Asphodel-Norwood updates its AMP, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

X. 2016 Infrastructure Report Card

The following infrastructure report card illustrates the municipality's performance on the two key factors: Asset Health and Financial Capacity. Appendix 1 provides the full grading scale and conversion chart, as well as detailed descriptions, for each grading level.

Table 46 2016 Infrastructure Report Card

Asset class	Asset Health Grade	Funding Percentage	Financial Capacity Grade	Average Asset Class Grade	Comments
Road Network	C	73%	C	F	Based on 2016 replacement cost, and a blend of age-based and assessment data, while 54% of assets are in good to very good condition, 21%, with a valuation of more than $14 million, are in poor to very poor condition. The municipality is funding 52% of the long-term replacement needs for its tax funded assets and 18% for its rate funded assets.
Bridges & Culverts	C	0%	F	F	
Water System	C	15%	F	F	
Sanitary Services	C	20%	F	F	
Storm	B	0%	F	D	
Buildings & Facilities	C	2%	F	C	
Machinery & Equipment	C	86%	B	C	
Land Improvements	B	56%	D	C	
Fleet	C	40%	F	D	
		Average Asset Health Grade	C		
		Average Financial Capacity Grade	F		
		Overall Grade for the Municipality	D		

XI. Appendix: Grading and Conversion Scales

Table 47 Asset Health Scale

Letter Grade	Rating	Description
A	Excellent	Asset is new or recently rehabilitated
B	Good	Asset is no longer new, but is fulfilling its function. Preventative maintenance is beneficial at this stage.
C	Fair	Deterioration is evident but asset continues to full its function. Preventative maintenance is beneficial at this stage.
D	Poor	Significant deterioration is evident and service is at risk.
F	Very Poor	Asset is beyond expected life and has deteriorated to the point that it may no longer be fit to fulfill its function.

Table 48 Financial Capacity Scale

Letter Grade	Rating	Funding percent	Timing Requirements	Description
A	Excellent	90-100 percent	☑ Short Term ☑Medium Term ☑Long Term	The municipality is fully prepared for its short-, medium- and long-term replacement needs based on existing infrastructure portfolio.
B	Good	70-89 percent	☑Short Term ☑Medium Term ☒Long Term	The municipality is well prepared to fund its short-term and medium-term replacement needs but requires additional funding strategies in the long-term to begin to increase its reserves.
C	Fair	60-69 percent	☑Short Term ☒Medium Term ☒Long Term	The municipality is underpreparing to fund its medium- to long-term infrastructure needs. The replacement of assets in the medium-term will likely be deferred to future years.
D	Poor	40-59 percent	☒/☑ Short Term ☒Medium Term ☒Long Term	The municipality is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	0-39 percent	☒Short Term ☒Medium Term ☒Long Term	The municipality is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The municipality may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.