Asset Management Plan 2024

Municipality of North Middlesex

April 2025

psdcitywide

This Asset Management Plan was prepared by:

Empowering your organization through advanced asset management, budgeting & GIS solutions

Key Statistics

$1.1 b	2023 Replacement Cost of Asset Portfolio
$461 k	Replacement Cost of Infrastructure Per Household
83%	Percentage of Assets in Fair or Better Condition
4%	Percentage of Assets with Assessed Condition Data
1.8%	Target Investment Rate
$20.2 m	Target Annual Capital Spending

Table of Contents

1. Executive Summary

Municipal infrastructure delivers critical services that are foundational to the economic, social, and environmental health and growth of a community. The goal of asset management is to enable infrastructure to deliver an adequate level of service in the most cost-effective manner. This involves the ongoing review and update of infrastructure information and data alongside the development and implementation of asset management strategies and long-term financial planning.

1.1 Scope

This Asset Management Plan (AMP) identifies the current practices and strategies that are in place to manage public infrastructure and makes recommendations where they can be further refined. Through the implementation of sound asset management strategies, the Municipality of North Middlesex can ensure that public infrastructure is managed to support the sustainable delivery of municipal services.

This AMP include the following asset categories:

Core Assets

- Road Network
- Bridges & Culverts
- Water Network
- Sanitary Sewer Network
- Stormwater Network

Non-Core Assets

- Buildings & Facilities
- Land Improvements
- Vehicles & Heavy Equipment
- Machinery & Equipment

Figure 1 Core and Non-Core Asset Categories

1.2 Compliance

With the development of this AMP the Municipality of North Middlesex has achieved compliance with July 1, 2024, requirements under O. Reg. 588/17. This includes requirements for levels of service and inventory reporting for all asset categories.

1.3 Findings

The overall replacement cost of the asset categories included in this AMP totals $1.1 billion. 83% of all assets analyzed in this AMP are in fair or better condition and assessed condition data was available for 4% of assets. For the remaining 96% of assets, assessed condition data was unavailable, and asset age was used to approximate condition – a data gap that persists in most municipalities. Generally, age misstates the true condition of assets, making assessments essential to accurate asset management planning, and a recurring recommendation in this AMP.

The development of a long-term, sustainable financial plan requires an analysis of whole lifecycle costs. This AMP uses a combination of proactive lifecycle strategies (paved roads) and replacement only strategies (all other assets) to determine the lowest cost option to maintain the current level of service.

To meet capital replacement and rehabilitation needs for existing infrastructure, prevent infrastructure backlogs, and achieve long-term sustainability, the Municipality's average annual capital requirement totals $20.2 million.

It is important to note that this AMP represents a snapshot in time and is based on the best available processes, data, and information at the Municipality. Strategic asset management planning is an ongoing and dynamic process that requires continuous improvement and dedicated resources.

2. Introduction & Context

2.1 Community Profile

Census Characteristic	Municipality of North Middlesex	Ontario
Population 2021	6,307	14,223,942
Population Change 2016-2021	-0.7%	+5.8%
Total Private Dwellings	2,481	5,929,250
Population Density	10.5/km^2	15.9/km^2
Land Area	598.65 km^2	892,411.76 km^2

Table 1 Municipality of North Middlesex Community Profile

The Municipality of North Middlesex is a lower-tier municipality, part of Middlesex County, which is located within southern Ontario. It is situated on the southeastern side of Lake Huron with the City of London to the southeast.

North Middlesex was incorporated as a Municipality in 2001. This incorporation was part of a municipal restructuring that amalgamated the former Townships of East Williams, West Williams, McGillivray, and the villages of Parkhill and Ailsa Craig into one municipality. The formation of the Municipality of North Middlesex was intended to create a stronger, more sustainable governance structure capable of meeting the needs of its communities in a more coordinated and cost-effective manner.

North Middlesex is predominantly characterized by its extensive agricultural landscapes, with much of its land dedicated to dairy, livestock, and crop production. The region's flat to gently rolling terrain is not only ideal for farming but also contributes to its rural lifestyle. Small villages and communities are spread throughout the landscape, providing a peaceful and natural setting that is highly valued by residents. Additionally, the Ausable River enhances the region's appeal, offering scenic views and serving as a habitat for local wildlife, which are integral to the area's identity.

The local economy in North Middlesex is heavily driven by agriculture, which not only involves farming but also stimulates related industries like equipment sales and food processing. The area's serene, rural setting is particularly appealing to families and retirees seeking a peaceful life, contributing to steady demand for housing. The natural surroundings, including the Ausable River and open spaces, promote outdoor activities such as fishing, hiking, and boating, attracting both visitors and new residents, which in turn supports the local economy and small businesses.

The Municipality of North Middlesex focuses on expanding and maintaining municipal services like water and sewage, especially in urban areas poised for growth. It emphasizes strategic zoning and planning to manage development across all settlement areas efficiently, ensuring infrastructure aligns with growth and environmental sustainability.

2.2 Climate Change

Climate change can cause severe impacts on human and natural systems around the world. The effects of climate change include increasing temperatures, higher levels of precipitation, droughts, and extreme weather events. In 2019, Canada's Changing Climate Report (CCCR 2019) was released by Environment and Climate Change Canada (ECCC).

The report revealed that between 1948 and 2016, the average temperature increase across Canada was 1.7°C; moreover, during this time period, Northern Canada experienced a 2.3°C increase. The temperature increase in Canada has doubled that of the global average. If emissions are not significantly reduced, the temperature could increase by 6.3°C in Canada by the year 2100 compared to 2005 levels. Observed precipitation changes in Canada include an increase of approximately 20% between 1948 and 2012. By the late 21st century, the projected increase could reach an additional 24%. During the summer months, some regions in Southern Canada are expected to experience periods of drought at a higher rate. Extreme weather events and climate conditions are more common across Canada. Recorded events include droughts, flooding, cold extremes, warm extremes, wildfires, and record minimum arctic sea ice extent.

The changing climate poses a significant risk to the Canadian economy, society, environment, and infrastructure. The impacts on infrastructure are often a result of climate-related extremes such as droughts, floods, higher frequency of freeze-thaw cycles, extended periods of high temperatures, high winds, and wildfires. Physical infrastructure is vulnerable to damage and increased wear when exposed to these extreme events and climate variabilities. Canadian Municipalities are faced with the responsibility to protect their local economy, citizens, environment, and physical assets.

2.2.1 North Middlesex Climate Profile

The Municipality of North Middlesex is located in southern Ontario within Middlesex County. The Municipality is expected to experience notable effects of climate change which include higher average annual temperatures, an increase in total annual precipitation, and an increase in the frequency and severity of extreme events. According to Climatedata.ca – a collaboration supported by Environment and Climate Change Canada (ECCC) – the Municipality of North Middlesex may experience the following trends:

Higher Average Annual Temperature

- Between the years 1971 and 2000 the annual average temperature was 8.0 ºC
- Under a high emissions scenario, the annual average temperatures are projected to increase by 4.6 ºC by the year 2050 and over 6.4 ºC by the end of the century.

Increase in Total Annual Precipitation

- Under a high emissions scenario, North Middlesex is projected to experience an 12% increase in precipitation by the year 2051 and a 15% increase by the end of the century.

Increase in Frequency of Extreme Weather Events

- It is expected that the frequency and severity of extreme weather events will change.
- In some areas, extreme weather events will occur with greater frequency and severity than others especially those impacted by Great Lake winds.

2.2.2 Lake Huron

The Great Lakes are one of the largest sources of fresh water on earth, containing 21 percent of the world's surface freshwater. There are 35 million people living in the Great Lakes watershed and Lake Huron is the second largest of the Great Lakes. The area of Lake Huron Watershed is approximately 131,100 km2. The physical impacts of climate change are most noticeable from: flooding, extreme weather events such as windstorms and tornados, and/or rising water levels eroding shorelines and natural spaces. Erosion and flooding pose a threat to the surrounding built infrastructure such as park assets, bridges, and roads. Communities located in the Great Lakes region may experience more severe windstorms or tornados as a result of climate change, causing damage to both the natural and built environment.

Public health and safety depend on the stability and predictability of the ecosystem in the Great Lakes watershed. The quality of water is threatened by anthropogenic climate change as a result of blue-green algae blooms, soil erosion, and agricultural, stormwater, and wastewater runoff. These phenomena put undue stress on regional water filtering and treatment systems. The safety of the public is threatened by the physical impacts of flooding such as flooding and erosion. In some cases, homeowners located near the lakeshore are already at risk of losing their homes.

2.2.3 Integration of Climate Change and Asset Management

Asset management practices aim to deliver sustainable service delivery - the delivery of services to residents today without compromising the services and well-being of future residents. Climate change threatens sustainable service delivery by reducing the useful life of an asset and increasing the risk of asset failure. Desired levels of service can be more difficult to achieve as a result of climate change impacts such as flooding, high heat, drought, and more frequent and intense storms.

In order to achieve the sustainable delivery of services, climate change considerations should be incorporated into asset management practices. The integration of asset management and climate change adaptation observes industry best practices and enables the development of a holistic approach to risk management.

2.3 Asset Management Overview

Municipalities are responsible for managing and maintaining a broad portfolio of infrastructure assets to deliver services to the community. The goal of asset management is to minimize the lifecycle costs of delivering infrastructure services, manage the associated risks, while maximizing the value ratepayers receive from the asset portfolio.

The acquisition of capital assets accounts for only 10-20% of their total cost of ownership. The remaining 80-90% comes from operations and maintenance. This AMP focuses its analysis on the capital costs to maintain, rehabilitate and replace existing municipal infrastructure assets.

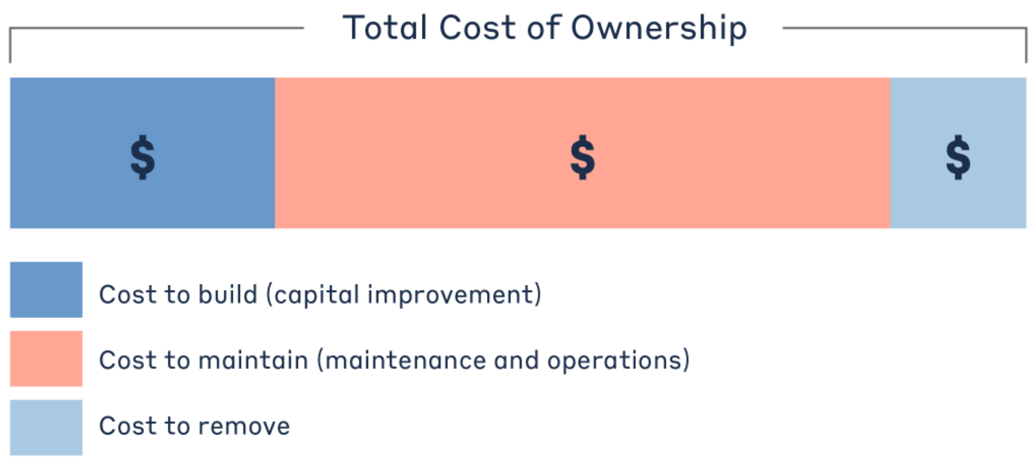

Figure 2 Total Cost of Asset Ownership

These costs can span decades, requiring planning and foresight to ensure financial responsibility is spread equitably across generations. An asset management plan is critical to this planning, and an essential element of broader asset management program. The industry-standard approach and sequence to developing a practical asset management program begins with a Strategic Plan, followed by an Asset Management Policy and an Asset Management Strategy, concluding with an Asset Management Plan.

This industry standard, defined by the Institute of Asset Management (IAM), emphasizes the alignment between the corporate strategic plan and various asset management documents. The strategic plan has a direct, and cascading impact on asset management planning and reporting.

2.3.1 Foundational Asset Management Documentation

The industry-standard approach and sequence to developing a practical asset management program begins with a Strategic Plan, followed by an Asset Management Policy and an Asset Management Strategy, concluding with an Asset Management Plan.

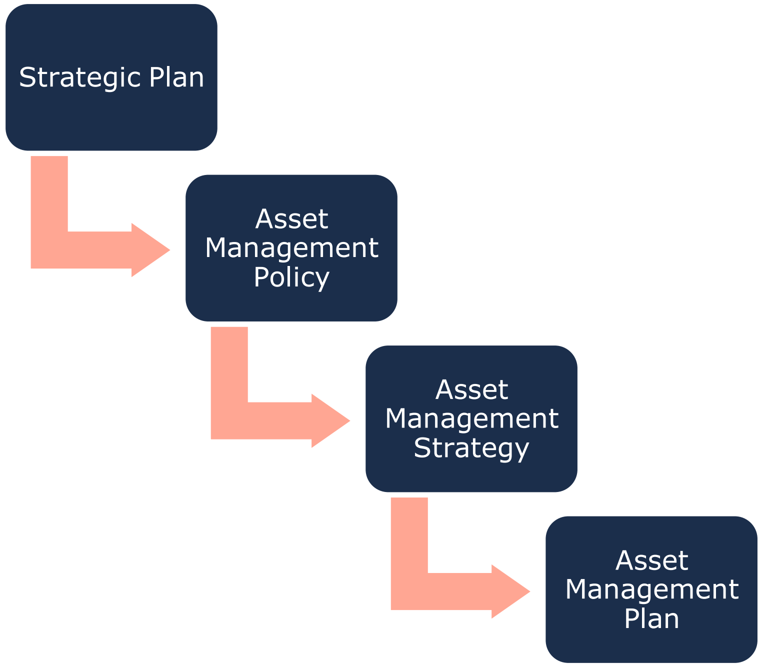

Figure 3 Foundational Asset Management Documents

This industry standard, defined by the Institute of Asset Management (IAM), emphasizes the alignment between the corporate strategic plan and various asset management documents. The strategic plan has a direct, and cascading impact on asset management planning and reporting.

Asset Management Policy

An asset management policy represents a statement of the principles guiding the Municipality's approach to asset management activities. It aligns with the organizational strategic plan and provides clear direction to municipal staff on their roles and responsibilities as part of the asset management program.

The Municipality of North Middlesex adopted policy number FP.05 "Asset Management Policy" on August 14, 2019, in accordance with Ontario Regulation 588/17. The Municipality will implement best practices in asset management with the following principles:

- Forward looking
- Budgeting and planning
- Prioritizing
- Economic development
- Transparency
- Consistency
- Environmental conscious
- Health and safety
- Community focused
- Innovation

Asset Management Strategy

An asset management strategy outlines the translation of organizational objectives into asset management objectives and provides a strategic overview of the activities required to meet these objectives. It provides greater detail than the policy on how the Municipality plans to achieve asset management objectives through planned activities and decision-making criteria.

The Municipality's Asset Management Policy contains many of the key components of an asset management strategy and may be expanded on in future revisions or as part of a separate strategic document.

Asset Management Plan

The asset management plan (AMP) presents the outcomes of the Municipality's asset management program and identifies the resource requirements needed to achieve a defined level of service. The AMP typically includes the following content:

- State of Infrastructure
- Asset Management Strategies
- Levels of Service
- Financial Strategies

The AMP is a living document that should be updated regularly as additional asset and financial data becomes available. This will allow the Municipality to re-evaluate the state of infrastructure and identify how the organization's asset management and financial strategies are progressing.

2.3.2 Key Concepts in Asset Management

Effective asset management integrates several key components, including lifecycle management, risk & criticality, and levels of service. These concepts are applied throughout this asset management plan and are described below in greater detail.

Lifecycle Management Strategies

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. Asset deterioration has a negative effect on the ability of an asset to fulfill its intended function, and may be characterized by increased cost, risk and even service disruption.

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

There are several field intervention activities that are available to extend the life of an asset. These activities can be generally placed into one of three categories: maintenance, rehabilitation, and replacement. The following table provides a description of each type of activity and the general difference in cost.

Depending on initial lifecycle management strategies, asset performance can be sustained through a combination of maintenance and rehabilitation, but at some point, replacement is required. Understanding what effect these activities will have on the lifecycle of an asset, and their cost, will enable staff to make better recommendations.

Lifecycle Activity	Cost	Typical Associated Risks
Maintenance Activities that prevent defects or deteriorations from occurring	$	♦ Balancing limited resources between planned maintenance and reactive, emergency repairs and interventions; ♦ Diminishing returns associated with excessive maintenance activities, despite added costs; ♦ Intervention selected may not be optimal and may not extend the useful life as expected, leading to lower payoff and potential premature asset failure;
Rehabilitation/ Renewal Activities that rectify defects or deficiencies that are already present and may be affecting asset performance	$$$	♦ Useful life may not be extended as expected; ♦ May be costlier in the long run when assessed against full reconstruction or replacement; ♦ Loss or disruption of service, particularly for underground assets;
Replacement/ Reconstruction Asset end-of-life activities that often involve the complete replacement of assets	$$$$$	♦ Incorrect or unsafe disposal of existing asset; ♦ Costs associated with asset retirement obligations; ♦ Substantial exposure to high inflation and cost overruns; ♦ Replacements may not meet capacity needs for a larger population; ♦ Loss or disruption of service, particularly for underground assets;

Table 2 Lifecycle Management: Typical Lifecycle Interventions

The Municipality’s approach to lifecycle management is described within each asset category outlined in this AMP. Staff will continue to evolve and innovate current practices for developing and implementing proactive lifecycle strategies to determine which activities to perform on an asset and when they should be performed to maximize useful life at the lowest total cost of ownership.

Risk & Criticality

Asset risk and criticality are essential building blocks of asset management, integral in prioritizing projects and distributing funds where they are needed most based on a variety of factors. Assets in disrepair may fail to perform their intended function, pose substantial risk to the community, lead to unplanned expenditures, and create liability for the municipality. In addition, some assets are simply more important to the community than others, based on their financial significance, their role in delivering essential services, the impact of their failure on public health and safety, and the extent to which they support a high quality of life for community stakeholders.

Risk is a product of two variables: the probability that an asset will fail, and the resulting consequences of that failure event. It can be a qualitative measurement, (i.e. low, medium, high) or quantitative measurement (i.e. 1-5), that can be used to rank assets and projects, identify appropriate lifecycle strategies, optimize short- and long-term budgets, minimize service disruptions, and maintain public health and safety.

Figure 4 Risk Equations

The approach used in this AMP relies on a quantitative measurement of risk associated with each asset. The probability and consequence of failure are each scored from 1 to 5, producing a minimum risk index of 1 for the lowest risk assets, and a maximum risk index of 25 for the highest risk assets.

Probability of Failure

Several factors can help decision-makers estimate the probability or likelihood of an asset's failure, including its condition, age, previous performance history, and exposure to extreme weather events, such as flooding and ice jams—both a growing concern for municipalities in Canada.

Consequence of Failure

Estimating criticality also requires identifying the types of consequences that the organization and community may face from an asset's failure, and the magnitude of those consequences. Consequences of asset failure will vary across the infrastructure portfolio; the failure of some assets may result primarily in high direct financial cost but may pose limited risk to the community. Other assets may have a relatively minor financial value, but any downtime may pose significant health and safety hazards to residents.

Table 3 illustrates the various types of consequences that can be integrated in developing risk and criticality models for each asset category and segments within. We note that these consequences are common, but not exhaustive.

Type of Consequence	Description
Direct Financial	Direct financial consequences are typically measured as the replacement costs of the asset(s) affected by the failure event, including interdependent infrastructure.
Economic	Economic impacts of asset failure may include disruption to local economic activity and commerce, business closures, service disruptions, etc. Whereas direct financial impacts can be seen immediately or estimated within hours or days, economic impacts can take weeks, months and years to emerge, and may persist for even longer.
Socio-political	Socio-political impacts are more difficult to quantify and may include inconvenience to the public and key community stakeholders, adverse media coverage, and reputational damage to the community and the Municipality.
Environmental	Environmental consequences can include pollution, erosion, sedimentation, habitat damage, etc.
Public Health and Safety	Adverse health and safety impacts may include injury or death, or impeded access to critical services.
Strategic	These include the effects of an asset's failure on the community's long-term strategic objectives, including economic development, business attraction, etc.

Table 3 Risk Analysis: Types of Consequences of Failure

This AMP includes a preliminary evaluation of asset risk and criticality. Each asset has been assigned a probability of failure score and consequence of failure score based on available asset data. These risk scores can be used to prioritize maintenance, rehabilitation, and replacement strategies for critical assets.

These models have been built in Citywide for continued review, updates, and refinements.

Levels of Service

A level of service (LOS) is a measure of the services that the Municipality is providing to the community and the nature and quality of those services. Within each asset category in this AMP, technical metrics and qualitative descriptions that measure both technical and community levels of service have been established and measured as data is available.

The Municipality measures the level of service provided at two levels: Community Levels of Service, and Technical Levels of Service.

Community Levels of Service

Community levels of service are a simple, plain language description or measure of the service that the community receives. For core asset categories as applicable (Roads, Bridges & Culverts, Water, Wastewater, Stormwater) the province, through O. Reg. 588/17, has provided qualitative descriptions that are required to be included in this AMP. For non-core assets, the community levels of service were left to the municipality's discretion.

Technical Levels of Service

Technical levels of service are a measure of key technical attributes of the service being provided to the community. These include mostly quantitative measures and tend to reflect the impact of the Municipality's asset management strategies on the physical condition of assets or the quality/capacity of the services they provide.

For core asset categories as applicable the province, through O. Reg. 588/17, has also provided technical metrics that are required to be included in this AMP. For non-core assets, the technical metrics were left to the municipality's discretion.

Current and Proposed Levels of Service

This AMP focuses on measuring the current level of service provided to the community. Once current levels of service have been measured, the Municipality plans to establish proposed levels of service over a 10-year period, in accordance with O. Reg. 588/17.

Proposed levels of service should be realistic and achievable within the timeframe outlined by the Municipality. They should also be determined with consideration of a variety of community expectations, fiscal capacity, regulatory requirements, corporate goals and long-term sustainability. Once proposed levels of service have been established, and prior to July 2025, the Municipality must identify a lifecycle management and financial strategy which allows these targets to be achieved.

2.4 Scope & Methodology

2.4.1 Asset Categories for this AMP

This asset management plan for the Municipality of North Middlesex is produced in compliance with O. Reg. 588/17. The July 2024 deadline under the regulation—the second of three AMPs—requires analysis of core and non-core asset categories.

The AMP summarizes the state of the infrastructure for the Municipality's asset portfolio, establishes current levels of service and the associated technical and customer oriented key metrics, outlines lifecycle strategies for optimal asset management and performance, and provides financial strategies to reach sustainability for the asset categories listed below.

Tax Funded Assets

- Road Network
- Bridges & Culverts
- Stormwater Network
- Buildings & Facilities
- Land Improvements
- Vehicles & Heavy Equipment
- Machinery & Equipment

Rate Funded Assets

- Water Network
- Sanitary Sewer Network

Figure 5 Tax Funded and Rate Funded Asset Categories

2.4.2 Data Effective Date

It is important to note that this plan is based on data as of **December 2023**; therefore, it represents a snapshot in time using the best available processes, data, and information at the Municipality. Strategic asset management planning is an ongoing and dynamic process that requires continuous data updates and dedicated data management resources.

2.4.3 Deriving Replacement Costs

There are a range of methods to determine the replacement cost of an asset, and some are more accurate and reliable than others. This AMP relies on two methodologies:

User-Defined Cost and Cost Per Unit

Based on costs provided by municipal staff which could include average costs from recent contracts; data from engineering reports and assessments; staff estimates based on knowledge and experience.

Cost Inflation / CPI Tables

Historical costs of the assets are inflated based on Consumer Price Index or Non-Residential Building Construction Price Index.

User-defined costs based on reliable sources are a reasonably accurate and reliable way to determine asset replacement costs. Cost inflation is typically used in the absence of reliable replacement cost data. It is a reliable method for recently purchased and/or constructed assets where the total cost is reflective of the actual costs that the Municipality incurred. As assets age, and new products and technologies become available, cost inflation becomes a less reliable method.

2.4.4 Estimated Service Life & Service Life Remaining

The estimated useful life (EUL) of an asset is the period over which the Municipality expects the asset to be available for use and remain in service before requiring replacement or disposal. The EUL for each asset in this AMP was assigned according to the knowledge and expertise of municipal staff and supplemented by existing industry standards when necessary.

By using an asset's in-service data and its EUL, the Municipality can determine the service life remaining (SLR) for each asset. Using condition data and the asset's SLR, the Municipality can more accurately forecast when it will require replacement. The SLR is calculated as follows:

$$\text{Service Life Remaining (SLR)} = \text{In Service Date} + \text{Estimated Useful Life (EUL)} - \text{Current Year}$$

Figure 6 Service Life Remaining Calculation

2.4.5 Reinvestment Rate

As assets age and deteriorate they require additional investment to maintain a state of good repair. The reinvestment of capital funds, through asset renewal or replacement, is necessary to sustain an adequate level of service. The reinvestment rate is a measurement of available or required funding relative to the total replacement cost.

By comparing the actual vs. target reinvestment rate the Municipality can determine the extent of any existing funding gap. The reinvestment rate is calculated as follows:

$$\text{TARGET Reinvestment Rate} = \frac{\text{Annual Capital Requirement}}{\text{Total Replacement Cost}}$$

Figure 7 Target Reinvestment Rate Calculation

$$\text{ACTUAL Reinvestment Rate} = \frac{\text{Annual Capital Funding}}{\text{Total Replacement Cost}}$$

Figure 8 Actual Reinvestment Rate Calculation

2.4.6 Deriving Asset Condition

An incomplete or limited understanding of asset condition can mislead long-term planning and decision-making. Accurate and reliable condition data helps to prevent premature and costly rehabilitation or replacement and ensures that lifecycle activities occur at the right time to maximize asset value and useful life.

A condition assessment rating system provides a standardized descriptive framework that allows comparative benchmarking across the Municipality's asset portfolio. The table below outlines the condition rating system used in this AMP to determine asset condition. This rating system is aligned with the Canadian Core Public Infrastructure Survey which is used to develop the Canadian Infrastructure Report Card. When assessed condition data is not available, service life remaining is used to approximate asset condition.

Condition	Description	Criteria	Service Life Remaining (%)
Very Good	Fit for the future	Well maintained, good condition, new or recently rehabilitated	80-100
Good	Adequate for now	Acceptable, generally approaching mid-stage of expected service life	60-80
Fair	Requires attention	Signs of deterioration, some elements exhibit significant deficiencies	40-60
Poor	Increasing potential of affecting service	Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration	20-40
Very Poor	Unfit for sustained service	Near or beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable	0-20

Table 4 Standard Condition Rating Scale

The analysis in this AMP is based on assessed condition data only as available. In the absence of assessed condition data, asset age is used as a proxy to determine asset condition.

2.5 Ontario Regulation 588/17

As part of the Infrastructure for Jobs and Prosperity Act, 2015, the Ontario government introduced Regulation 588/17 - Asset Management Planning for Municipal Infrastructure (O. Reg 588/17)[1]. Along with creating better performing organizations, more liveable and sustainable communities, the regulation is a key, mandated driver of asset management planning and reporting. It places substantial emphasis on current and proposed levels of service and the lifecycle costs incurred in delivering them.

Figure 9 below outlines key reporting requirements under O. Reg 588/17 and the associated timelines.

[1] O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure https://www.ontario.ca/laws/regulation/170588

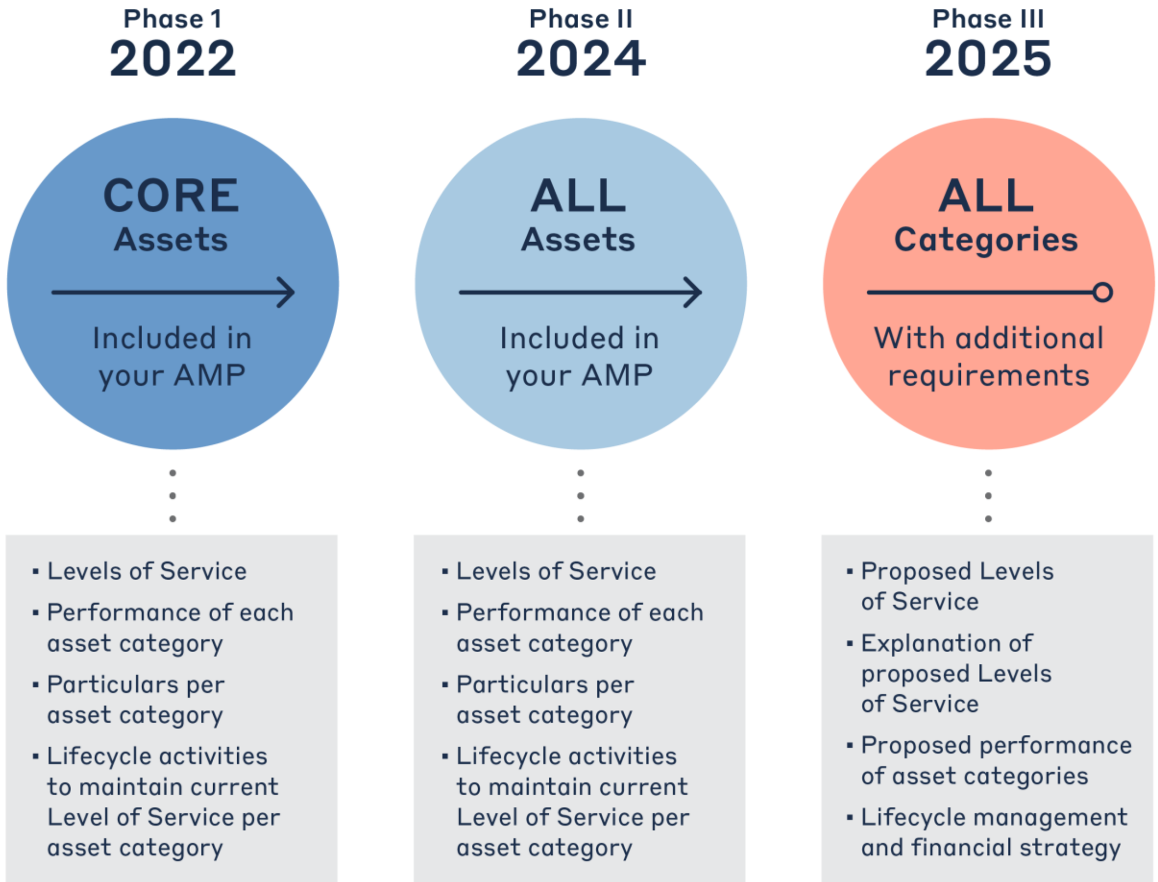

Figure 9 O. Reg. 588/17 Requirements and Reporting Deadlines

2.5.1 O. Reg. 588/17 Compliance Review

Requirement	O. Reg. 588/17 Section	AMP Section Reference	Status
Summary of assets in each category	S.5(2), 3(i)	4.1 – 12.1	Complete
Replacement cost of assets in each category	S.5(2), 3(ii)	4.1 – 12.1	Complete
Average age of assets in each category	S.5(2), 3(iii)	4.3 – 12.3	Complete
Condition of core assets in each category	S.5(2), 3(iv)	4.2 – 12.2	Complete
Description of municipality's approach to assessing the condition of assets in each category	S.5(2), 3(v)	4.4 – 12.4	Complete
Current levels of service in each category	S.5(2), 1(i-ii)	4.7 – 12.7	Complete

Requirement	O. Reg. 588/17 Section	AMP Section Reference	Status
Current performance measures in each category	S.5(2), 2	4.7 – 12.7	Complete
Lifecycle activities needed to maintain current levels of service for 10 years	S.5(2), 4	4.4 – 12.4	Complete
Costs of providing lifecycle activities for 10 years	S.5(2), 4	Appendix B	Complete
Growth assumptions	S.5(2), 5(i-ii) S.5(2), 6(i-vi)	13.1 – 13.2	Complete

Table 5 O. Reg. 588/17 Compliance Review

3. Portfolio Overview – State of the Infrastructure

The state of the infrastructure (SOTI) summarizes the inventory, condition, age profiles, and other key performance indicators for the Municipality's infrastructure portfolio. These details are presented for all core and non-core asset categories.

3.1 Asset Hierarchy & Data Classification

Asset hierarchy explains the relationship between individual assets and their components, and a wider, more expansive network and system. How assets are grouped in a hierarchy structure can impact how data is interpreted. Assets were structured to support meaningful, efficient reporting and analysis. Key category details are summarized at asset segment level.

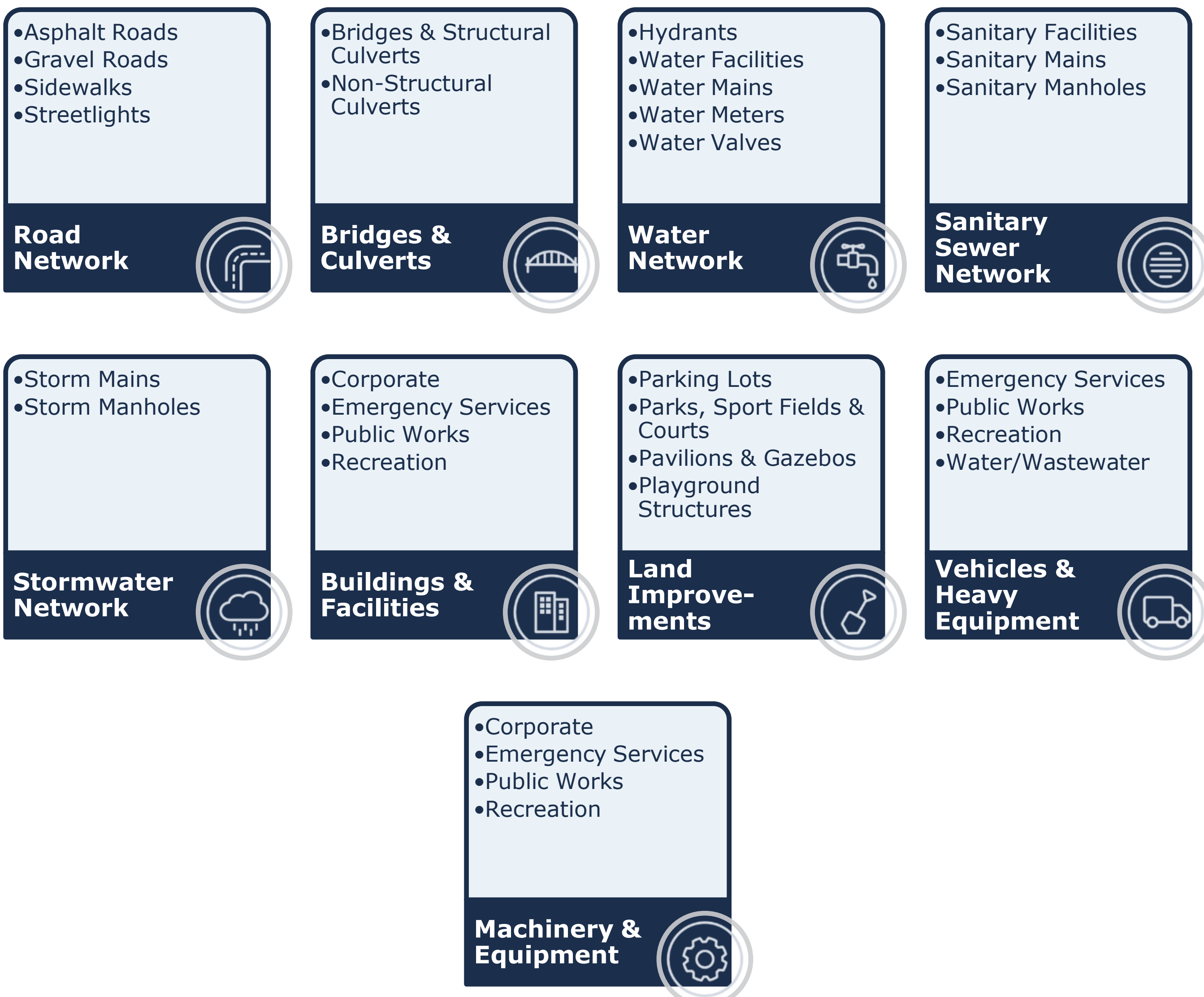

Figure 10 Asset Hierarchy and Data Classification

3.2 Portfolio Overview

3.2.1 Total Replacement Cost of Asset Portfolio

The nine asset categories analyzed in this Asset Management Plan have a total current replacement cost of $1.1 billion. This estimate was calculated using user-defined costing, as well as inflation of historical or original costs to current date. This estimate reflects replacement of historical assets with similar, not necessarily identical, assets available for procurement today. Figure 11 illustrates the replacement cost of each asset category; at 44% of the total portfolio, the water network forms the largest share of the Municipality's asset portfolio, followed by roads at 39%.

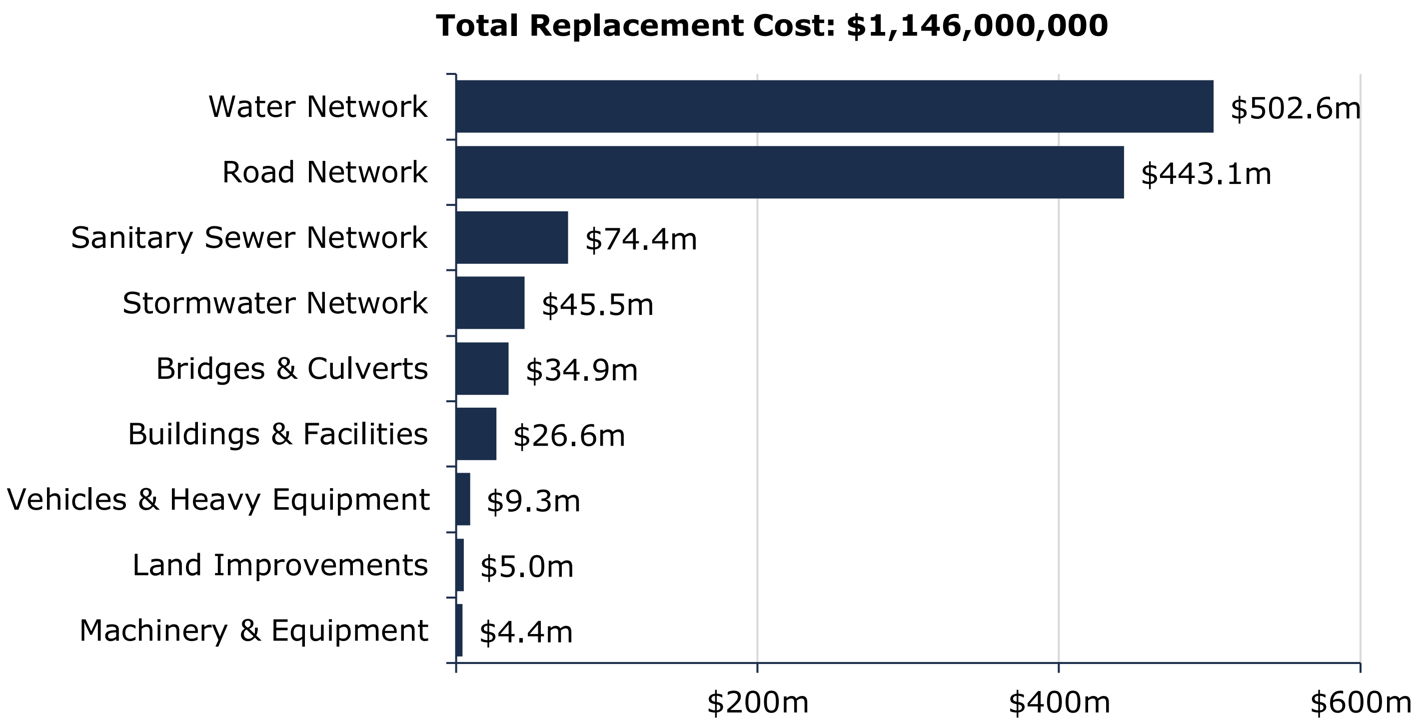

Figure 11 Current Replacement Cost by Asset Category

3.2.2 Condition of Asset Portfolio

Figure 12 and Figure 13 summarize asset condition at the portfolio and category levels, respectively. Based on both assessed condition and age-based analysis, 83% of the Municipality's infrastructure portfolio is in fair or better condition, with the remaining 17% in poor or worse condition. Typically, assets in poor or worse condition may require replacement or major rehabilitation in the immediate or short-term. Targeted condition assessments may help further refine the list of assets that may be candidates for immediate intervention, including potential replacement or reconstruction.

Similarly, assets in fair condition should be monitored for disrepair over the medium term. Keeping assets in fair or better condition is typically more cost-effective than addressing assets needs when they enter the latter stages of their lifecycle or decline to a lower condition rating, e.g., poor or worse.

Condition data was available for majority of the bridges and culverts, and most emergency services vehicles. For all remaining assets, including major infrastructure such as road network, storm mains and buildings, age was used as an approximation of condition for these assets. Age-based condition estimations can skew data and lead to potential under- or overstatement of asset needs.

Further, when assessed condition data was available, it was projected to current year-end (2023). This 'projected condition' can generate lower condition ratings than those established at the time of the condition assessment. The rate of this deterioration will also depend on lifecycle curves used to project condition over time.

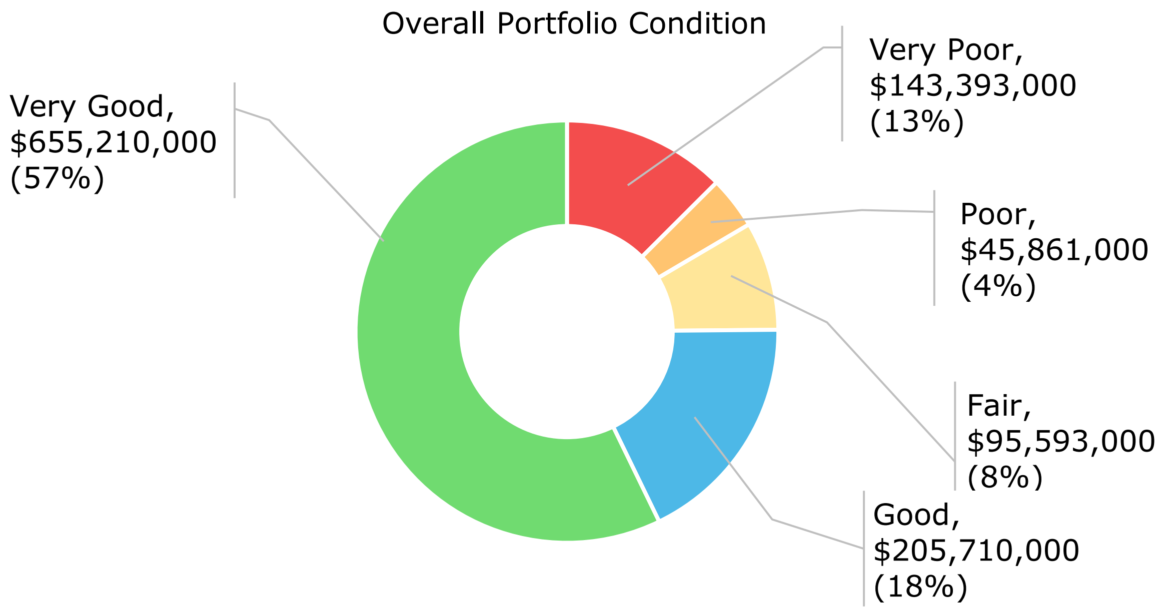

Figure 12 Asset Condition: Portfolio Overview

As further illustrated in Figure 13 at the category level, the majority of major, core infrastructure including roads, water and sanitary networks are in fair or better condition, based on in-field condition assessment data or age-based projections. Most vehicles are in poor or very poor condition, based on age-based estimates. See Table 6 for details on how condition data was derived for each asset segment.

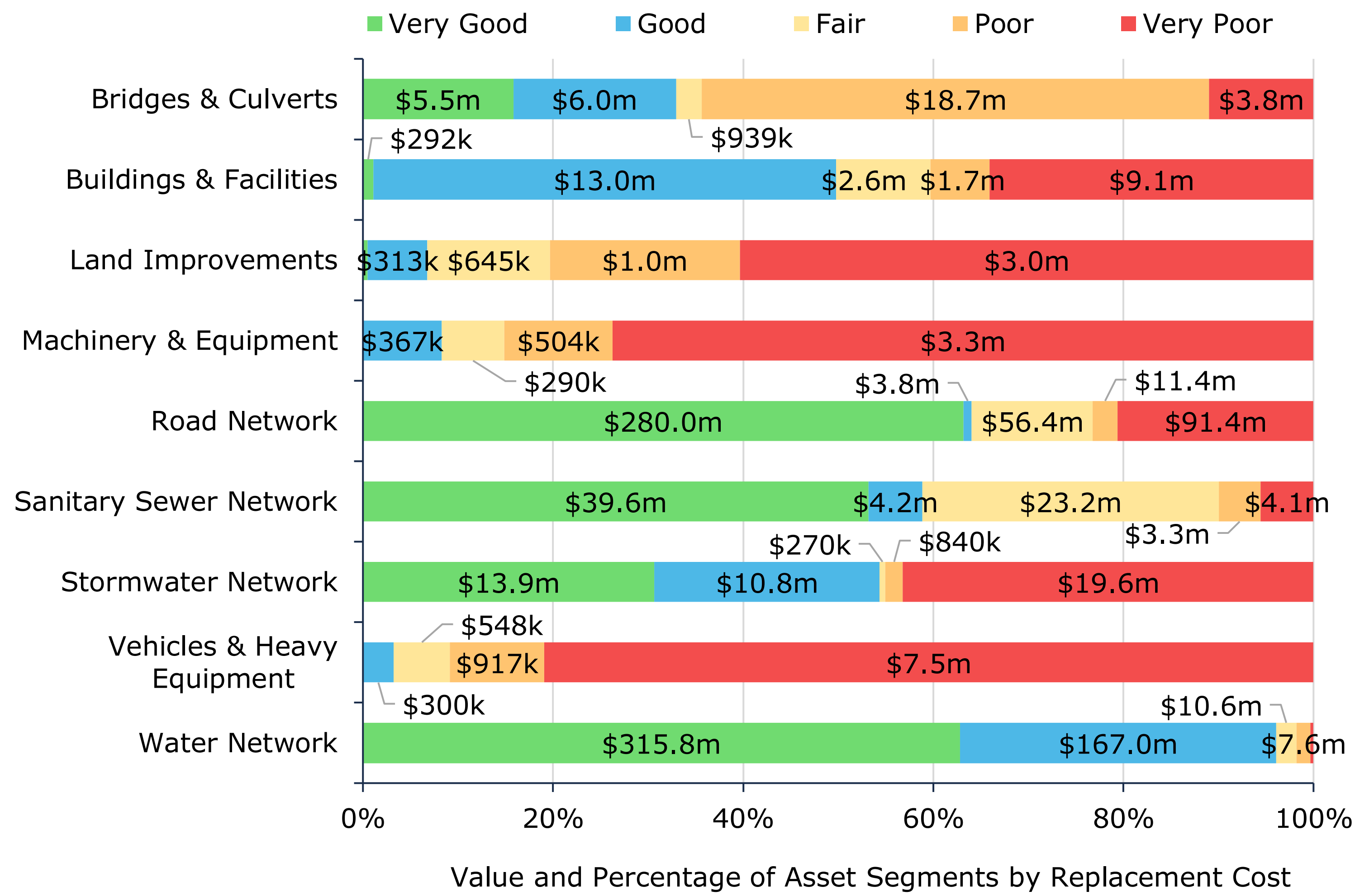

Figure 13 Asset Condition by Asset Category

Source of Condition Data

This AMP relies on assessed condition for 4% of assets, based on and weighted by replacement cost. For the remaining assets, age is used as an approximation of condition. Assessed condition data is invaluable in asset management planning as it reflects the true condition of the asset and its ability to perform its functions. Table 6 below identifies the source of condition data used throughout this AMP.

Asset Category	Asset Segment(s)	% of Assets with Assessed Conditions	Source of Condition Data
Road Network	All	0%[2]	N/A
Bridges & Culverts	Bridges & Structural Culverts	100%	2020 OSIM Report[3]
	Non-Structural Culverts	0%	N/A
Water Network	Water Valves	7%	Staff Assessments
	All Other Water Assets	0%	N/A
Sanitary Sewer Network	Sanitary Facilities	0%	N/A
	Sanitary Mains	16%	CT Environmental
	Sanitary Manholes	19%	CT Environmental
Stormwater Network	All	0%	N/A
Buildings & Facilities	All	0%[4]	N/A
Land Improvements	All	7%	Just for Tennis (Tennis Court Only)
Vehicles & Heavy Equipment	Emergency Services	60%	Staff Assessments
	Public Works	4%	Staff Assessments
	Recreation	0%	N/A
	Water/Wastewater	0%	N/A
Machinery & Equipment	All	<1%	Stubb Communications (Recreation Sound System Only)

Table 6 Source of Condition Data

3.2.3 Service Life Remaining

Based on asset age, available assessed condition data and estimated useful life, 15% of the Municipality's assets will require replacement within the next 10 years. Refer to Appendix B – 10-Year Capital Requirements.

[2] The Municipality conducted a Road Needs Assessment, however, condition ratings provided were determined to not accurately reflect the state of road infrastructure and were excluded.
[3] The Municipality conducted additional OSIM inspections in 2023, however, the report did not include Condition Rating values usable in an asset management plan context.
[4] The Municipality completed Building Condition Assessments in 2021, however, condition data was not aligned with asset registry and therefore could not be utilized within the Municipality's asset management software.

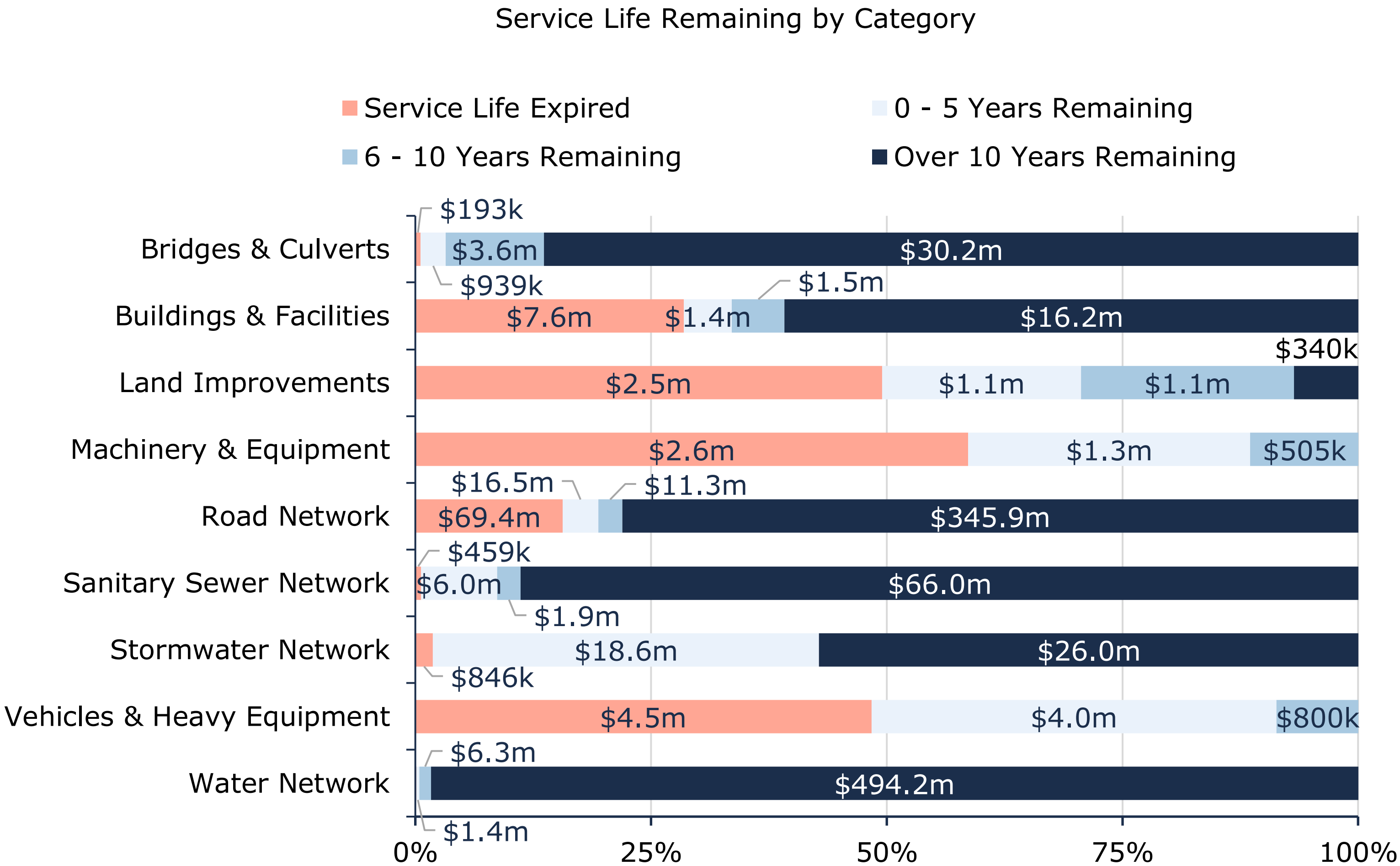

Figure 14 Service Life Remaining by Asset Category

3.2.4 Risk Matrix

Using the risk equation and preliminary risk models, Figure 15 shows how assets across the different asset categories are stratified within a risk matrix.

1 - 4 Very Low	**5 - 7 Low**	**8 - 9 Moderate**	**10 - 14 High**	**15 - 25 Very High**
$807,221,367 (70%)	$77,084,449 (7%)	$47,352,681 (4%)	$150,245,245 (13%)	$63,862,495 (6%)

Figure 15 Risk Matrix: All Assets

The analysis shows that based on current risk models, approximately 6% of the Municipality's assets, with a current replacement cost of approximately $64 million, carry a risk rating of 15 or higher (red) out of 25. Assets in this group may have a high probability of failure based on available condition data and age-based estimates and were considered to be most essential to the Municipality.

As new asset attribute information and condition assessment data are integrated with the asset register, asset risk ratings will evolve, resulting in a redistribution of assets within the risk matrix. Staff should also continue to calibrate risk models.

We caution that since risk ratings rely on many factors beyond an asset's physical condition or age, assets in a state of disrepair can sometimes be classified as low-risk, despite their poor condition rating. In such cases, although the probability of failure for these assets may be high, their consequence of failure ratings were determined to be low based on the attributes used and the data available.

Similarly, assets with very high condition ratings can receive a moderate to high-risk rating despite a low probability of failure. These assets may be deemed as highly critical to the Municipality based on their costs, economic importance, social significance, and other factors. Continued calibration of an asset's criticality and regular data updates are needed to ensure these models more accurately reflect an asset's actual risk profile.

3.2.5 Forecasted Capital Requirements

Aging assets require maintenance, rehabilitation, and replacement. Figure 16 below illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for all asset categories analyzed in this AMP over a 105-year time horizon. On average, $20.2 million is required each year to remain current with capital replacement needs for the Municipality's asset portfolio (red dotted line). Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise. This figure relies on age and available condition data.

The chart also illustrates a backlog of more than $88.6 million, comprising assets that remain in service beyond their estimated useful life. It is unlikely that all such assets are in a state of disrepair, requiring immediate replacements. This makes continued and expanded targeted and consistent condition assessments integral. Risk frameworks, proactive lifecycle strategies, and levels of service targets can then be used to prioritize projects, continuously refine estimates for both backlogs and ongoing capital needs, and help select the right treatment for each asset. In addition, more effective componentization of buildings will improve these projections, including backlog estimates.

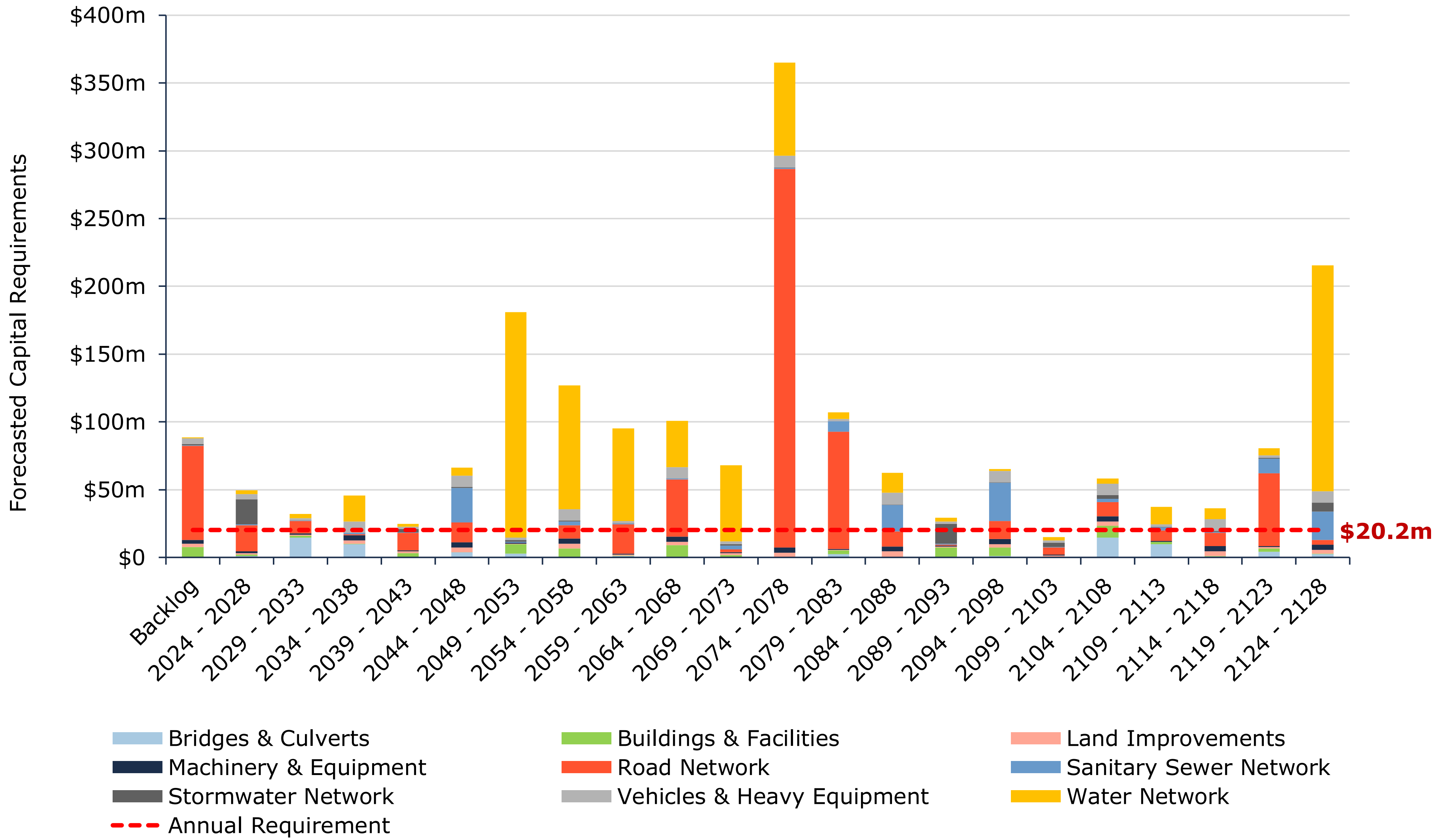

Figure 16 Capital Replacement Needs: Portfolio Overview 2024-2128

Core Assets

4. Road Network

The Municipality's road network comprises the largest share of its infrastructure portfolio, with a current replacement cost of more than $443 million, primarily comprised of asphalt roads. The Municipality also owns and manages other supporting infrastructure and capital assets, including sidewalks, and streetlights.

4.1 Inventory & Valuation

Table 7 summarizes the quantity and current replacement cost of the Municipality's various road network assets as managed in its primary asset management register, Citywide.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Asphalt Roads	289	Length (km)	$439,092,000	Cost/Unit
Gravel Roads	366	Length (km)	Not Planned for Replacement[5]	
Sidewalks	18	Length (km)	$2,420,000	Cost/Unit
Streetlights	269	Assets	$1,603,000	User-Defined
TOTAL			**$443,115,000**	

Table 7 Detailed Asset Inventory: Road Network

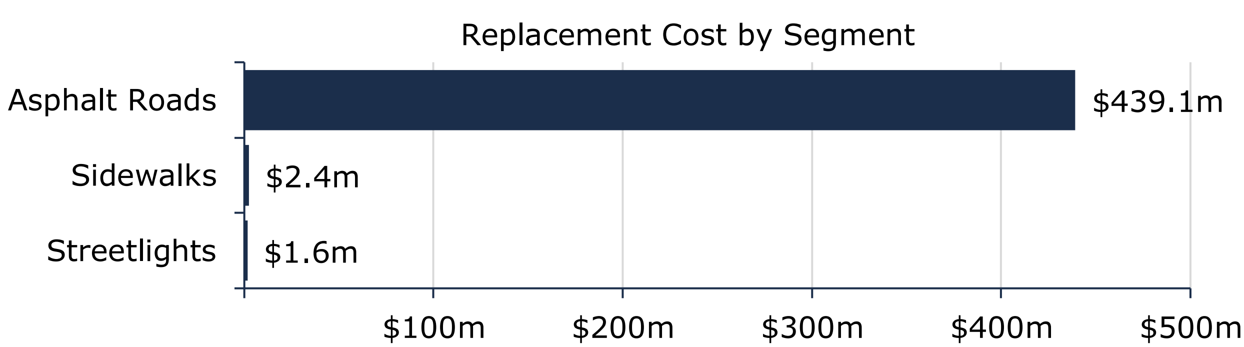

Figure 17 Portfolio Valuation: Road Network

4.2 Asset Condition

Figure 18 summarizes the replacement cost-weighted condition of the Municipality's road network. Based on age data, 77% of assets are in fair or better condition; the remaining 23% of assets are in poor to very poor condition. While condition data was available for a portion of the asphalt road portfolio, it was determined to be inaccurate by Municipal staff and therefore excluded from analysis. No condition data was available for the remaining asset types.

[5] Gravel roads are not considered for replacement, as they are perpetually maintained within the Municipality's operating budget.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 18, the majority of the Municipality's road network assets are in fair or better condition.

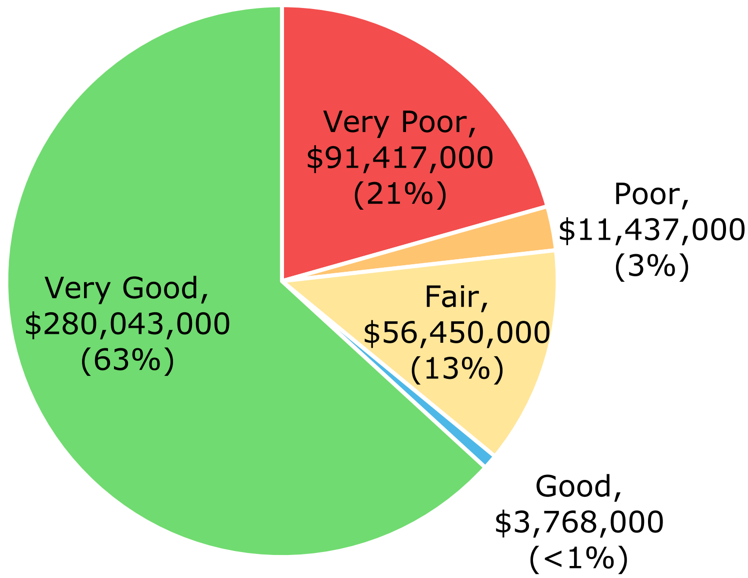

Figure 18 Asset Condition: Road Network Overall

As illustrated in Figure 19, based on age projected conditions, the majority of the Municipality's asphalt road network is in fair or better condition; and only, 23% of roads are in poor or worse condition.

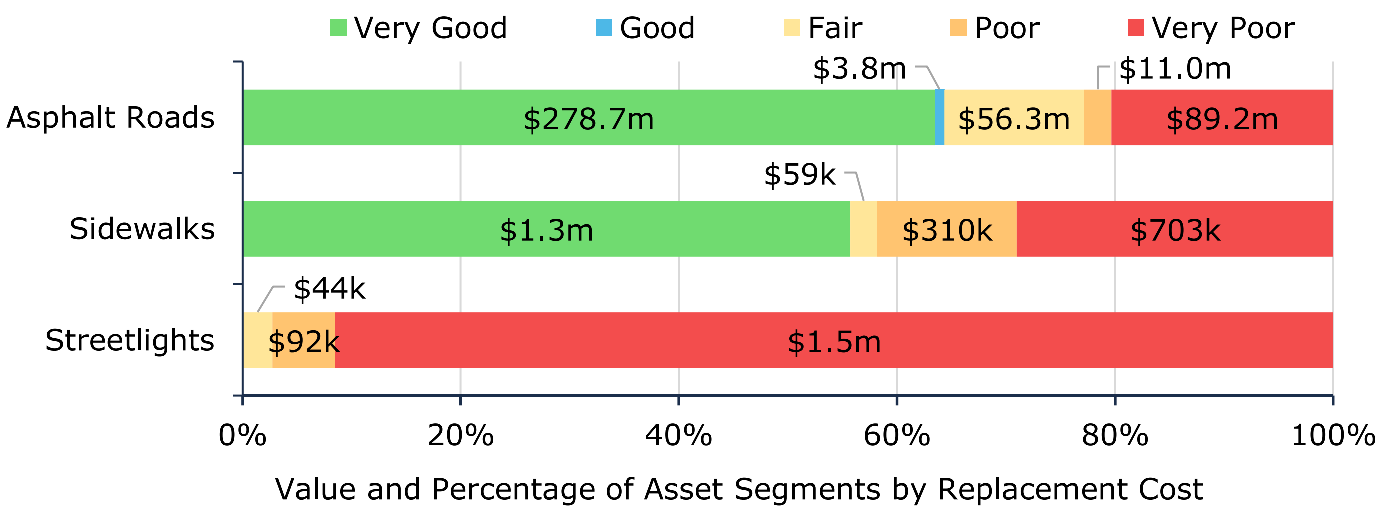

Figure 19 Asset Condition: Road Network by Segment

4.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 20 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

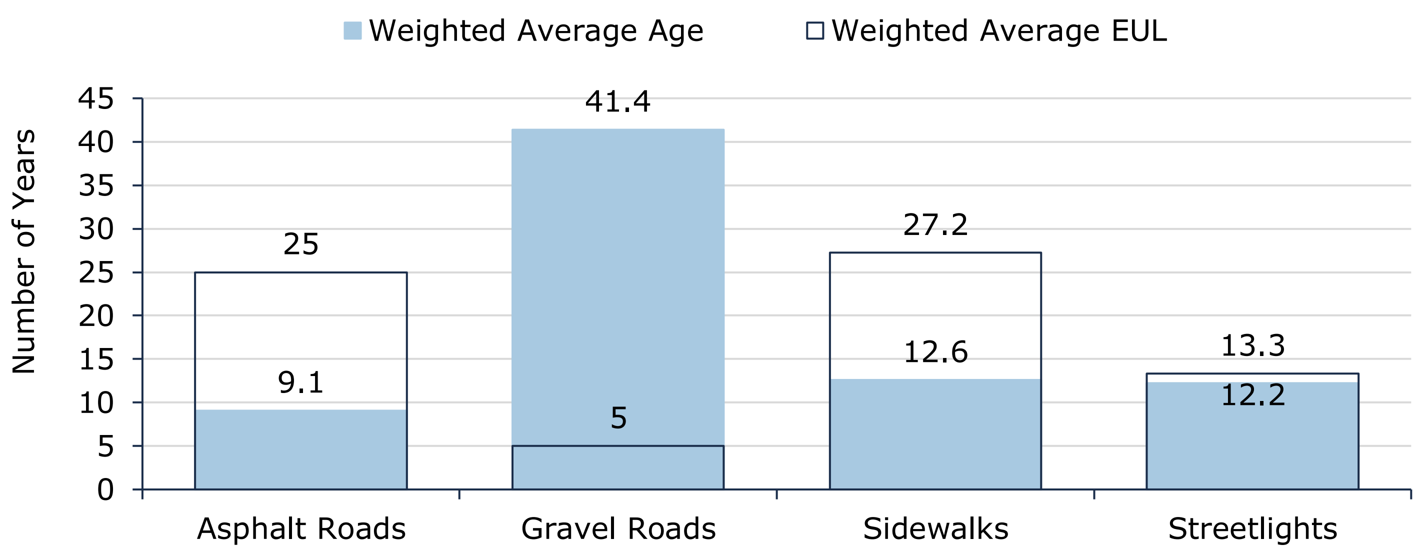

Figure 20 Estimated Useful Life vs. Asset Age: Road Network

Age analysis shows that the majority of paved roads have entered the moderate stages of their expected useful life, with an average age of 9.1 years against a design life of 25 years. Unpaved roads continue to remain in service well beyond their expected useful life. However, unpaved roads can be maintained on a perpetual cycle through the operational maintenance budget with a regular roadway granular replacement program.

It is important to acknowledge that the data used to generate the information for asphalt roads in the figure above requires improvement. Some assets with an in-service date of 2022 are skewing the results, likely because this date reflects when assets were added to the inventory rather than when they were constructed. As a result, the dataset includes incorrect in-service dates, leading to potentially misleading representations of the actual condition, age, and lifecycle stage of asphalt roads.

Although asset age is an important measurement for long-term planning, condition assessments provide a more accurate indication of actual asset needs. Further, useful life estimates established as part of the PSAB 3150 implementation may not be accurate and may not reflect in-field asset performance.

4.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following lifecycle strategies have been developed as a proactive approach to managing the lifecycle of HCB and Gravel roads. Instead of allowing the roads to deteriorate until replacement is required, strategic rehabilitation is expected to extend the service life of roads at a lower total cost.

Asphalt Roads (HCB)		
Event Name	**Event Class**	**Event Trigger**
Crack Sealing	Maintenance	85% - 95% Condition
Single Lift Overlay	Rehabilitation	50% - 60% Condition
Mill & Pave	Rehabilitation	40% - 50% Condition
Full Reconstruction	Replacement	0% Condition

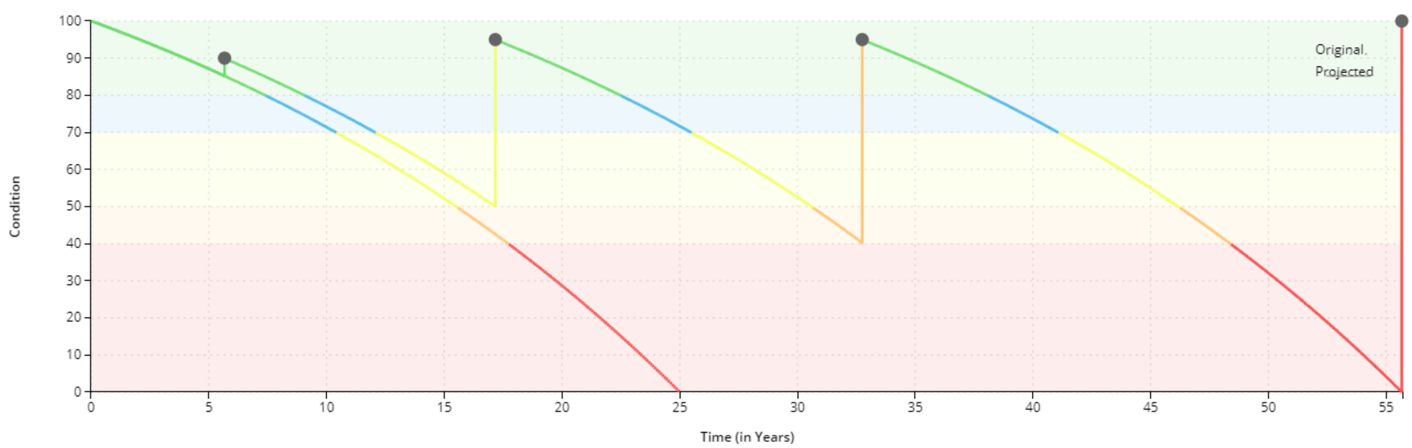

Table 8 Lifecycle Management Strategy: Road Network (HCB Roads)

Gravel Roads		
Event Name	**Event Class**	**Event Trigger**
Ditching/Mowing/Brushing	Maintenance	Every 5 years
Dust Suppressant - Calcium Chloride	Maintenance	Annually
Grading	Maintenance	Annually
Gravelling	Preventative Maintenance	Every 2 years

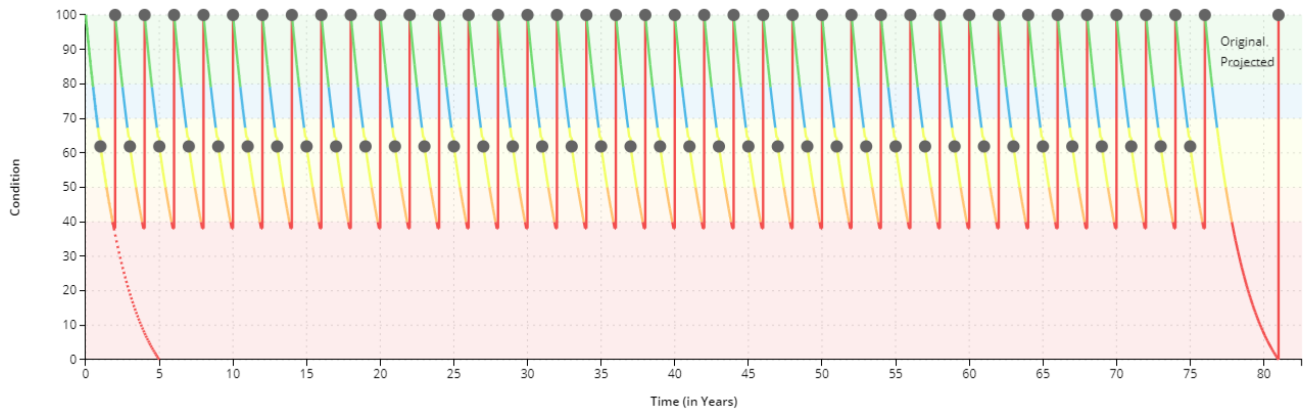

Table 9 Lifecycle Management Strategy: Road Network (Gravel Roads)

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Repairs are completed annually based on deficiencies identified through monthly road patrols and feedback from the public.
	Annual summer maintenance activities include sidewalk repairs, grading, re-gravelling (every 2 years), pothole filling, roadside mowing, tree trimming, brush cleanup, road sign installation/maintenance, line painting and street sweeping.
	Winter maintenance activities include snow plowing, slating, and snow removal.
Rehabilitation/ Replacement	Road replacement prioritization is determined by consideration of growth, risk, condition, health and safety, and social impact.
	Road reconstruction projects (that include road base & surface components) are identified based on road condition, risk, and sub-surface asset requirements (water/sanitary/stormwater).
Inspection	The most recent formal assessment completed was conducted in 2019 in accordance with the Pavement Condition Index (PCI). Roads (including signage) are patrolled monthly per MMS (Minimum Maintenance Standards) requirements with a Roads Needs Study to be completed in 2024/2025 and at 5-year increments beyond that.
	Supporting infrastructures such as sidewalks and streetlights are assessed annually. Streetlights assessments are completed by Entegrus and Sidewalks undergo inspection by internal staff.

Table 10 Lifecycle Management Strategy: Road Network

4.5 Forecasted Long-Term Replacement Needs

Figure 21 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the Municipality's road network. This analysis was run until 2078 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $8.6 million for all assets in the road network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs through the forecast period. It also shows a backlog $69.4 million, dominated by asphalt roads, however, since asphalt roads contain no assessed condition data and inaccuracies exist regarding in-service dates, this estimate may not be entirely accurate. These projections are based on asset replacement costs, age analysis, and condition data (when available), as well as lifecycle modeling (roads only). They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

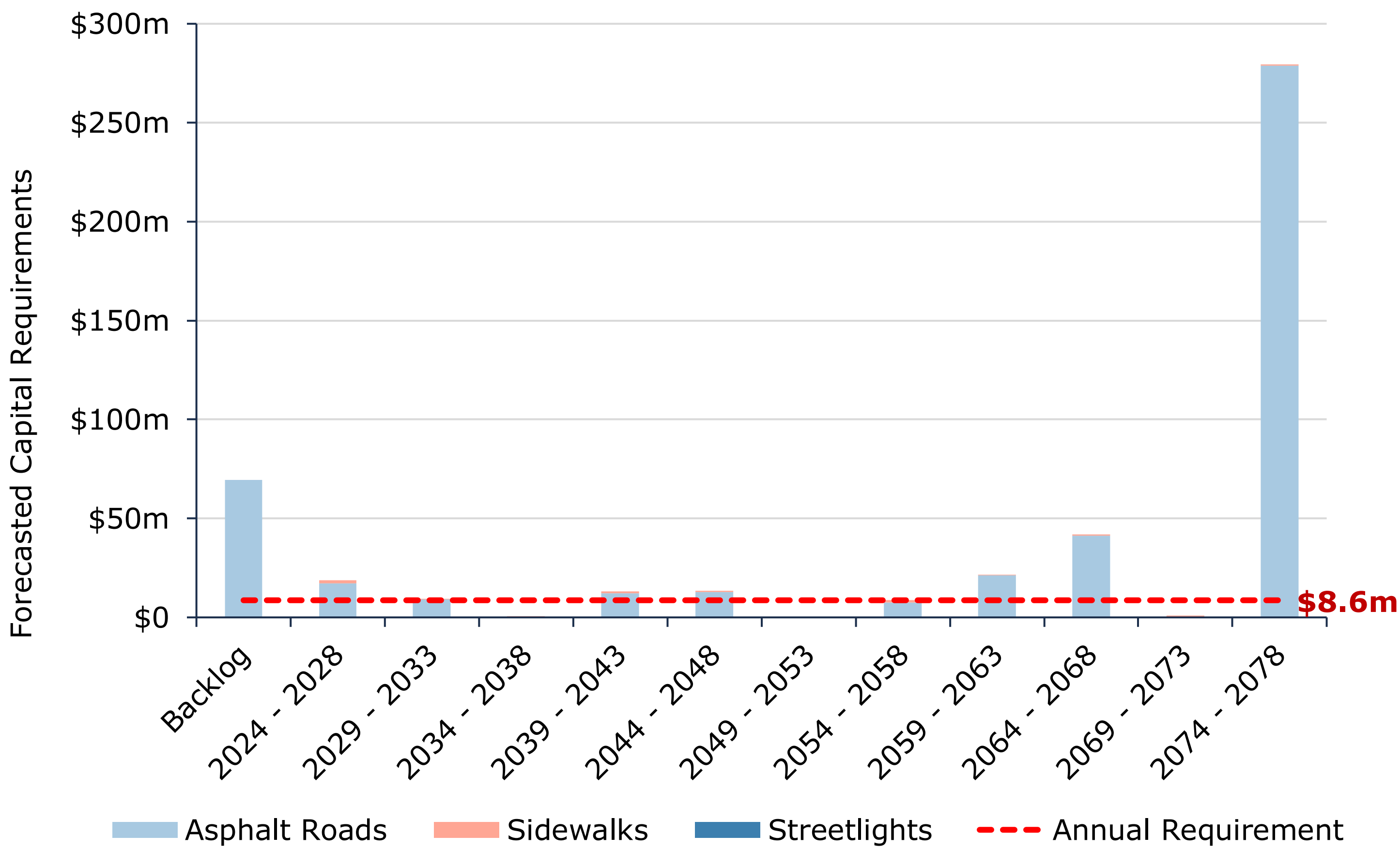

Figure 21 Forecasted Capital Replacement Needs: Road Network 2024-2078

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular pavement condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

4.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, traffic data, and road class. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4	**5 - 7**	**8 - 9**	**10 - 14**	**15 - 25**
Very Low	**Low**	**Moderate**	**High**	**Very High**
$280,215,580	$38,125,390	$19,750,899	$92,536,403	$12,486,515
(63%)	(9%)	(4%)	(21%)	(3%)

Figure 22 Risk Matrix: Road Network

4.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17, as well as any additional performance measures that the Municipality selected for this AMP.

4.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity	See Appendix C – Level of Service Maps & Photos
Quality	Description or images that illustrate the different levels of road class pavement condition	The Municipality completed a Road Management Study in 2019 in coordination with Dillon Consulting. Every road section received a surface condition rating (1-100). (1-50) Road surface exhibits moderate to significant deterioration and requires renewal or full replacement in less than a year. (51-65) Road surface is in fair condition and requires major rehabilitation within 1-5 years (66-80) Road surface is in good condition or has been recently re-surfaced. Renewal or reconstruction is required in 6-10 years. However, greater than 80 requires rehabilitation strategies beyond 10 years.

Table 11 O. Reg. 588/17 Community Levels of Service: Road Network

4.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	Lane-km of arterial roads (MMS classes 1 and 2) per land area (km/km^2)	0 km/km^2
	Lane-km of collector roads (MMS classes 3 and 4) per land area (km/km^2)	0 km/km^2
	Lane-km of local roads (MMS classes 5 and 6) per land area (km/km^2)	1.56 km/km^2
Quality	Average pavement condition index for paved roads in the Municipality	72%
	Average surface condition for unpaved roads in the Municipality (e.g. excellent, good, fair, poor)	Not Available
Performance	% of paved roads in Poor or Very Poor Condition	23%
	Target capital reinvestment rate	2.0% $8.6m/year

Table 12 O. Reg. 588/17 Technical Levels of Service: Road Network

5. Bridges & Culverts

The Municipality's transportation network also includes bridges and structural culverts, with a current replacement cost of $34.9 million.

5.1 Inventory & Valuation

Table 13 summarizes the quantity and current replacement cost of bridges and culverts. The Municipality owns and manages 78 bridges and structural culverts and 32 non-structural culverts.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Bridges & Structural Culverts	78	Assets	$33,094,187	User-Defined
Non-Structural Culverts	32	Assets	$1,853,809	CPI
TOTAL			**$34,947,996**	

Table 13 Detailed Asset Inventory: Bridges & Culverts

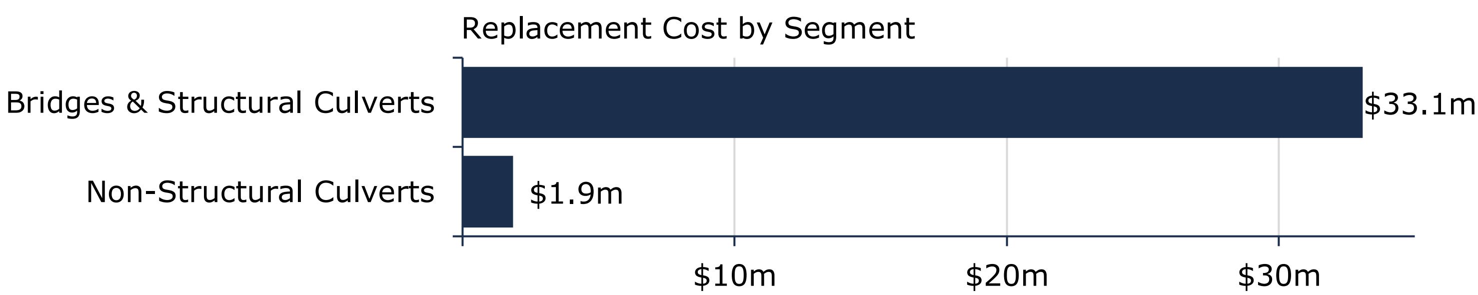

Figure 23 Portfolio Valuation: Bridges & Culverts

5.2 Asset Condition

Figure 24 summarizes the replacement cost-weighted condition of the Municipality's bridges and culverts. Based on the Municipality's recent Ontario Structures Inspection Manual (OSIM) assessments, 36% of bridges and culverts are in fair or better condition. Some elements or components of these structures may be candidates for replacement or rehabilitation in the medium term and should be monitored for further degradation in condition. At 64% of the total bridges and culverts portfolio, assets in poor or worse condition may require replacement in the immediate or short term.

It is important to note that because of the nature and importance of bridge assets, condition ratings are categorized as follows:

- Very Good: BCI >80
- Good: BCI 70-80
- Fair: BCI 60-70
- Poor: BCI 50-60
- Very Poor: BCI <50

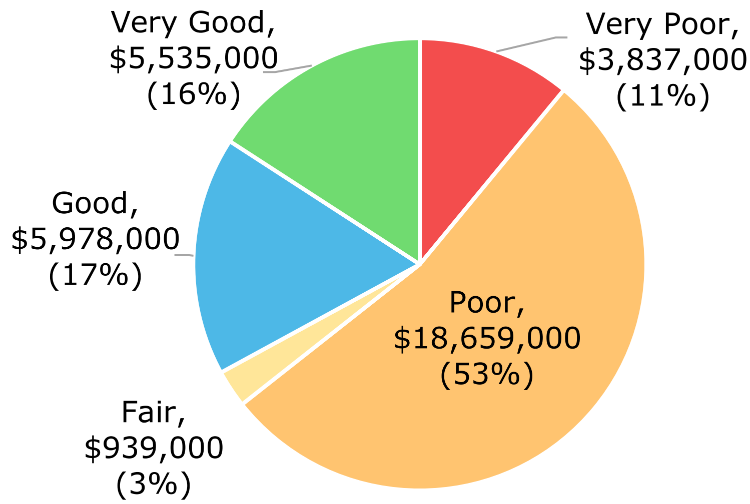

Figure 24 Asset Condition: Bridges & Culverts Overall

As further detailed in Figure 25, based on in-field condition assessments, $22.3 million of bridge assets were assessed as being in poor or worse condition. Additionally, 90% of non-structural culverts, with a current replacement cost of $1.6 million were identified as fair or better. Bridges and structures with a poor or worse rating (i.e., a bridge condition index of less than 60) are not necessarily unsafe for regular use. The OSIM ratings are designed to identify repairs needed to elevate condition ratings to a fair or higher.

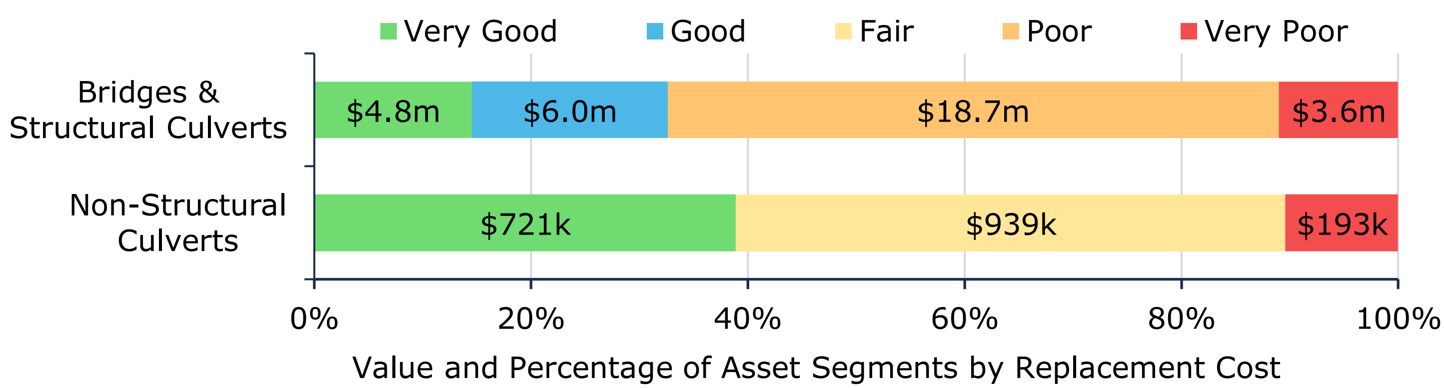

Figure 25 Asset Condition: Bridges & Culverts by Segment

5.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 26 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

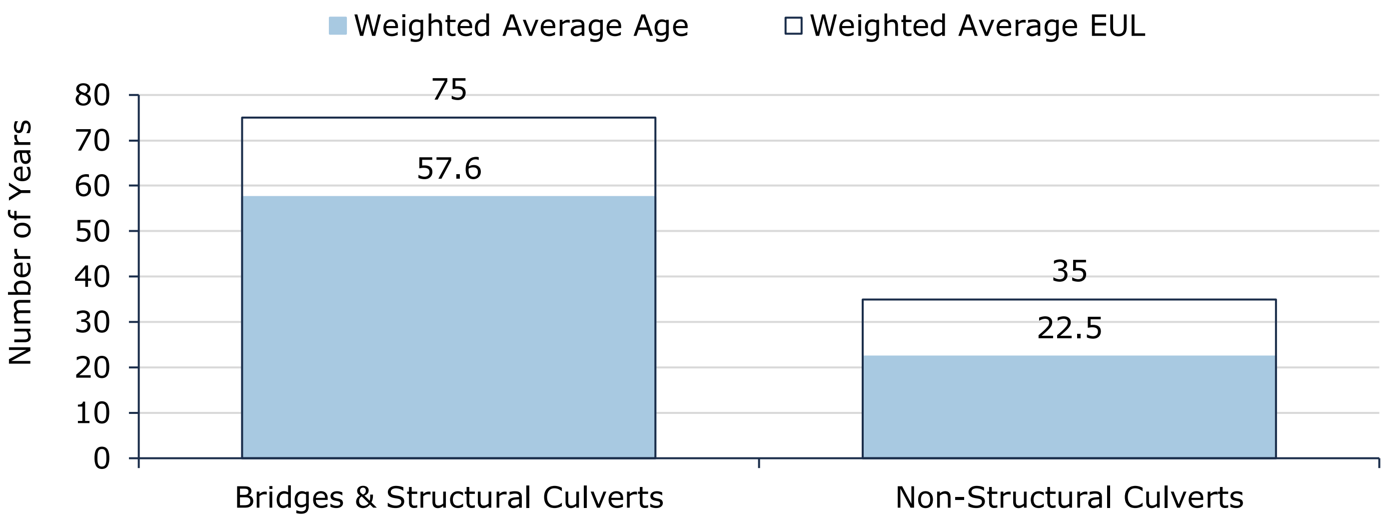

Figure 26 Estimated Useful Life vs. Asset Age: Bridges & Culverts

Age analysis reveals that on average, bridges and structural culverts have consumed just over 75% of their estimated useful life, with an average age of 57.6 years against an average EUL of 75 years. On average, non-structural culverts are also in the latter stages of their lifecycle, with an average age of 22.5 years, against an average EUL of 35 years. OSIM assessments should continue to be used in conjunction with age and asset criticality to prioritize capital and maintenance expenditures.

5.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the Municipality’s current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Typical maintenance includes: ♦ Obstruction removal ♦ Cleaning/sweeping ♦ Erosion control ♦ Brush/tree removal
	Biennial OSIM inspection reports include a list of recommended maintenance activities that the Municipality considers and completes according to cost and urgency.
Rehabilitation / Replacement	Biennial OSIM inspection reports include a Capital Needs List identifying recommended rehabilitation and replacement activities with estimated costs.
	Bridges are currently excluded from the Municipality's 10-year capital plans, and are indicated to not be well integrated into asset management practices.
Inspection	The most recent Bridge and Culvert inspection report was prepared in 2023 by Spriet Associates as per OSIM guidelines.
	Non-structural culverts are typically part of routine patrols and are inspected as a part of road replacement projects.

Table 14 Lifecycle Management Strategy: Bridges & Culverts

5.5 Forecasted Long-Term Replacement Needs

Figure 27 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the Municipality's bridges and culverts. This analysis was run until 2063 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) for bridges and culverts total $530,000. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

A significant surge in replacements is expected over the next 10 years, reaching a peak of $14.5 million between 2029-2033. Following this period, capital requirements will gradually decline between 2034 and 2038 before tapering off after this point as the majority of assets will have undergone necessary replacements. These projections and estimates are based on asset replacement costs, age analysis, and condition data. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

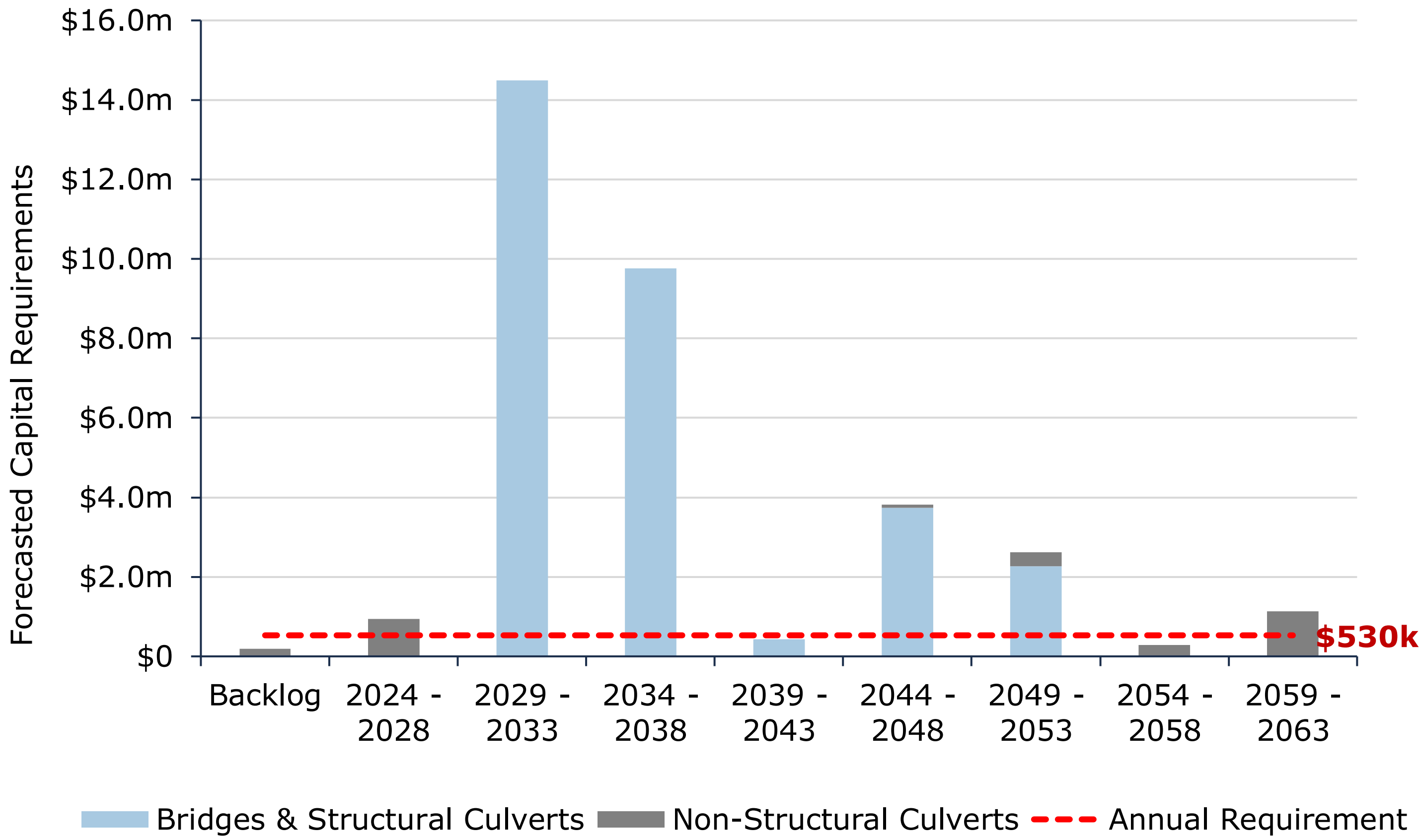

Figure 27 Forecasted Capital Replacement Needs: Bridges & Culverts 2024-2063

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. OSIM condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

5.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining and replacement costs. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 Very Low	**5 - 7 Low**	**8 - 9 Moderate**	**10 - 14 High**	**15 - 25 Very High**
$913,096 (3%)	$4,945,592 (14%)	$5,060,961 (14%)	$6,849,963 (20%)	$17,178,384 (49%)

Figure 28 Risk Matrix: Bridges & Culverts

5.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

5.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists)	Bridges and structural culverts are a key component of the municipal transportation network. In total, 4 bridge and structural culvert assets have loading or dimensional restrictions. The remaining assets can accommodate all vehicle types including heavy transport, and emergency vehicles.

Service Attribute	Qualitative Description	Current LOS (2023)

Quality	Description or images of the condition of bridges & culverts and how this would affect use of the bridges & culverts	As part of the 2023 OSIM inspection, repairs were categorized into the following prioritization:
		♦ Urgent:
		  ♦ Structural repairs
		  ♦ Road Safety issues
		♦ <1 Year:
		  ♦ Signage
		  ♦ Load limit analysis to ensure correct load limit posting
		  ♦ Maintenance, power washing, cleaning of deck drains, brushing
		♦ 1 to 5 years:
		  ♦ General Maintenance or repairs
		  ♦ Replacements of failed culverts
		  ♦ Concrete repairs
		  ♦ Structural replacements
		  ♦ Guiderail installation dependent on traffic volume
		♦ 6 to 10 years:
		  ♦ Long term structure issues such as trusses replacements
		  ♦ Guiderail installation dependent on traffic volume

Table 15 O. Reg. 588/17 Community Levels of Service: Bridges & Culverts

5.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of bridges in the Municipality with loading or dimensional restrictions	5%
	% of structural culverts in the Municipality with loading or dimensional restrictions	0%
Quality	Average bridge condition index value for bridges in the Municipality	64%
	Average bridge condition index value for structural culverts in the Municipality	69%
Performance	% of bridges and culverts in poor or very poor condition	64%[6]
	Target capital reinvestment rate	1.5% $530k/year

Table 16 O. Reg. 588/17 Technical Levels of Service: Bridges & Culverts

[6] Bridges and structural culverts have a distinctly different condition rating scale than other asset categories, with assessments under 60% being considered poor, and assessments under 50% being considered very poor.

6. Water Network

The Municipality's water network is overseen by OCWA and is managed collaboratively with the Municipality. The water network has a total current replacement cost of approximately $502 million and is comprised of the following:

- Parkhill Reservoir
- West Williams Booster
- Mount Carmel Reservoir
- McGillivray Booster
- Ailsa Craig Water Tower
- Distribution system (hydrants, mains, meters, valves, etc.)

6.1 Inventory & Valuation

Table 17 summarizes the quantity and current replacement cost of the Municipality's various water network assets as managed in its primary asset management register, Citywide Assets.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Hydrants	158	Assets	$1,422,000	User-Defined
Water Facilities	18	Assets	6,453,000	Cost per Unit
Water Mains	474	Length (km)	$491,694,000	Cost per Unit
Water Meters	36	Assets	$809,000	User-Defined
Water Valves	826	Assets	$2,716,000	Cost per Unit
TOTAL			**$502,554,000**	

Table 17 Detailed Asset Inventory: Water Network

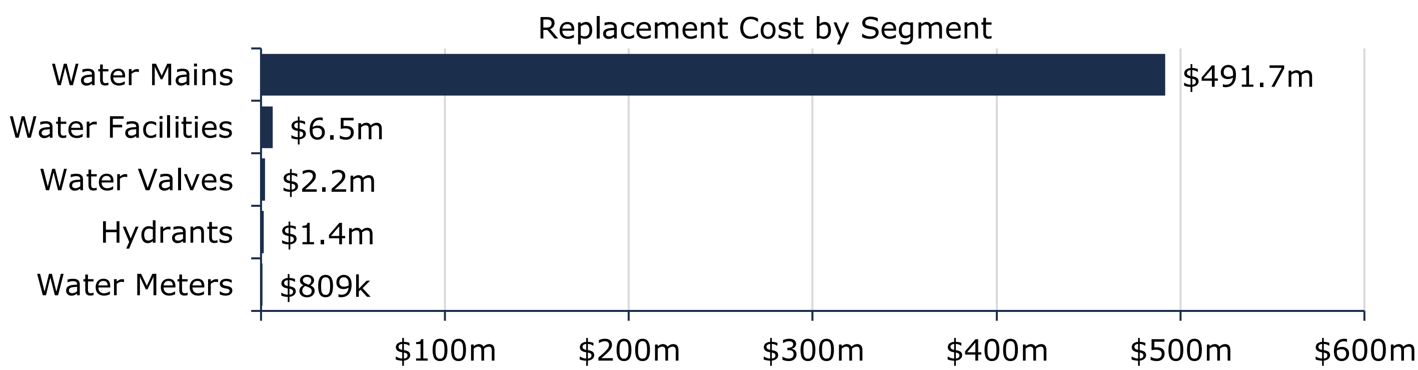

Figure 29 Portfolio Valuation: Water Network

6.2 Asset Condition

Figure 30 summarizes the replacement cost-weighted condition of the Municipality's water network. Based on a combination of field inspection data and age, 98% of assets are in fair or better condition; the remaining 2% of assets are in poor to very poor condition. Condition assessments were only available for 7% of water valves. This condition data was projected from inspection date to current year to estimate their condition today. No condition data was available for water network assets.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 30, the majority of the Municipality's water network assets are in fair or better condition.

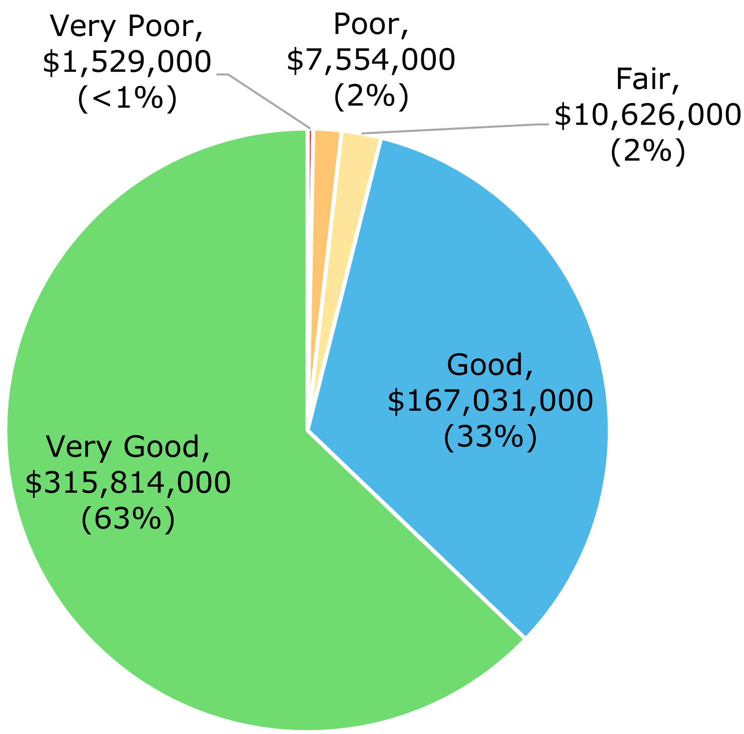

Figure 30 Asset Condition: Water Network Overall

As illustrated in Figure 31, based on condition assessments and age-based conditions, the majority of the Municipality's water mains are in very good condition; however, 95% of water buildings are in poor or worse condition.

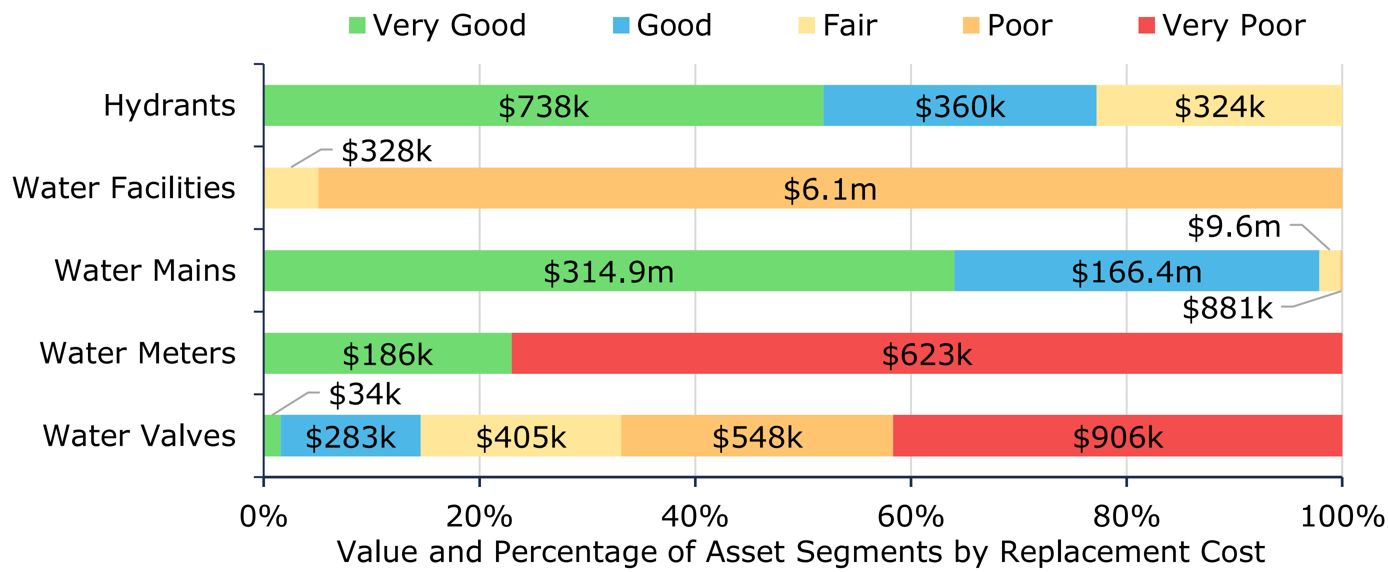

Figure 31 Asset Condition: Water Network by Segment

6.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 32 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

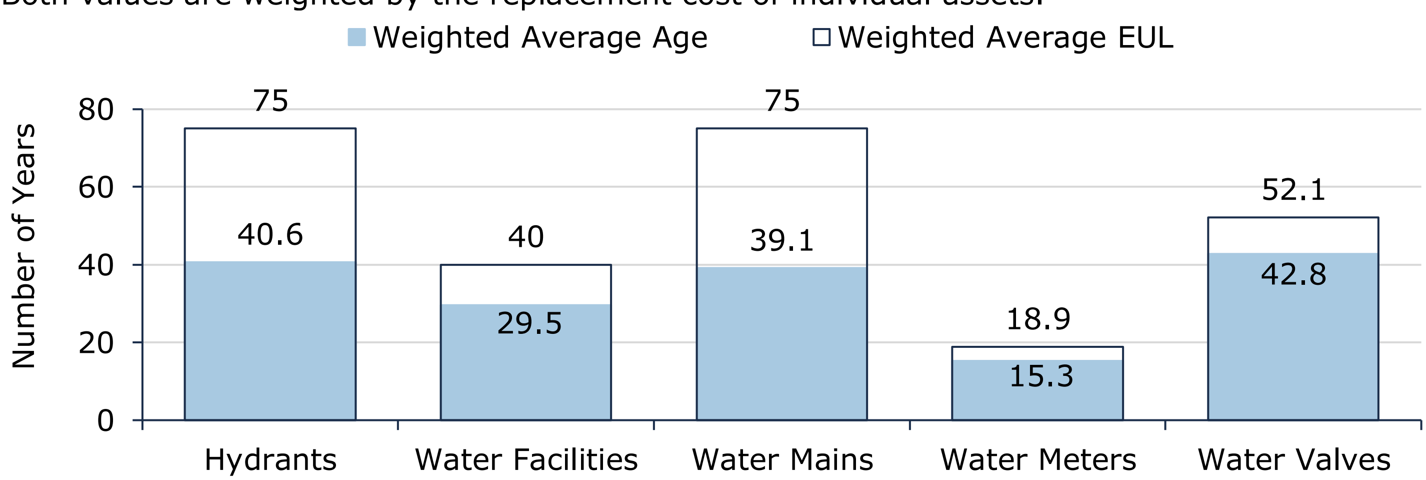

Figure 32 Estimated Useful Life vs. Asset Age: Water Network

6.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Watermain breaks are managed and repaired on a reactive basis when they occur.
	Valves undergo annual maintenance as part of preventative maintenance initiatives.
	Hydrants are regularly tested and flushed by OCWA.
	Watermain flushing and valve exercising are undertaken as regular maintenance activities.
Rehabilitation/ Replacement	In the absence of mid-lifecycle rehabilitative events, mains are maintained with the goal of full replacement at asset end-of-life.
	Other replacement activities are identified based on an analysis of the main break rate, asset functionality, and design capacity related to growth, as well as any issues identified during regular maintenance activities
Inspection	Watermains do not have a routine inspection program. Watermains may be inspected on an ad-hoc basis during repairs or other maintenance operations by the OCWA.

Table 18 Lifecycle Management Strategy: Water Network

6.5 Forecasted Long-Term Replacement Needs

Figure 33 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the Municipality's water network. This analysis was run until 2088 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $6.9 million for all assets in the water network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs throughout the forecast period. It also shows a backlog $644 thousand, dominated by water valves. These projections are based on asset replacement costs, age analysis, and condition data when available. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

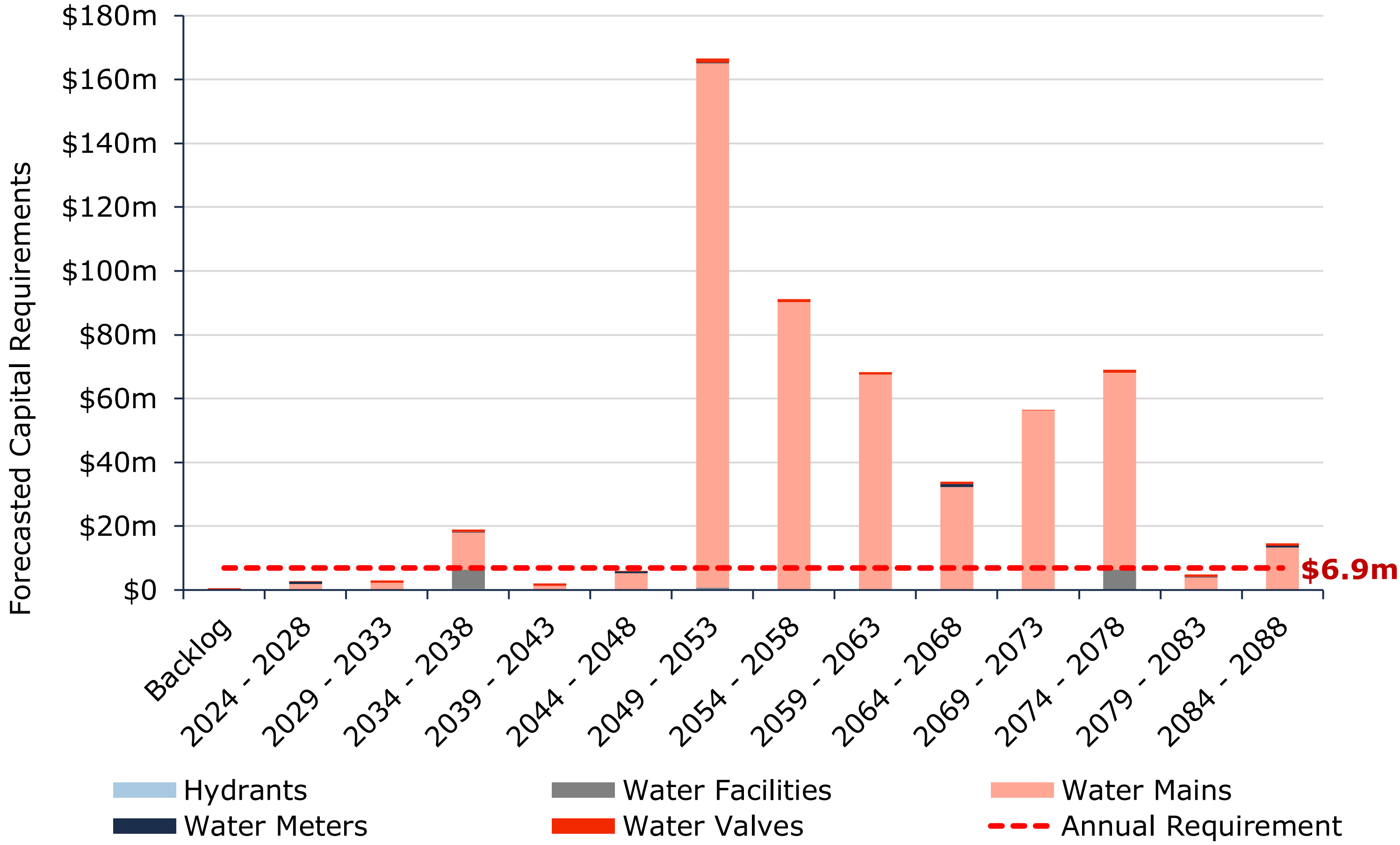

Figure 33 Forecasted Capital Replacement Needs: Water Network 2024-2088

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

6.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, traffic data, and road class. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 **Very Low** $462,645,280 (92%)	**5 - 7** **Low** $19,129,765 (4%)	**8 - 9** **Moderate** $3,632,083 (<1%)	**10 - 14** **High** $9,144,250 (2%)	**15 - 25** **Very High** $8,003,081 (2%)

Figure 34 Risk Matrix: Water Network

6.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

6.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	North Middlesex has wide reaching extents for watermain access throughout the Municipality. While distribution main lines are available in the majority of areas, only 36% of properties are connected to the water system mostly comprised of the urban areas of Parkhill, Alisa Craig, and Nairn. See Appendix C – Level of Service Maps & Photos
	Description, which may include maps, of the user groups or areas of the municipality that have fire flow	While watermains extend throughout the Municipality, fire flow and hydrant access is concentrated to the urban areas of Parkhill, Alisa Craig, and Nairn. See Appendix C – Level of Service Maps & Photos
Reliability	Description of boil water advisories and service interruptions	The municipality experienced no boil water advisories in 2023. However, water service interruptions may occur due to main breaks, maintenance activities or reconstruction projects. Staff attend to these interruptions in a timely manner, when possible.

Table 19 O. Reg. 588/17 Community Levels of Service: Water Network

6.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties connected to the municipal water system	61%[7]
	% of properties where fire flow is available	4%
Reliability	# of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	0
	# of connection-days per year where water is not available due to water main breaks compared to the total number of properties connected to the municipal water system	0.0002[8]
Quality	Average condition of water network assets	82%
Performance	% of Water Network in poor or very poor condition	2%
	Target capital reinvestment rate	1.4% $6.9m/year

Table 20 O. Reg. 588/17 Technical Levels of Service: Water Network

[7] 2,145 water connections compared to 3,536 properties.
[8] 34 water disruptions, each averaging approximately 1 day, for a total of 271 properties affected.

7. Sanitary Sewer Network

The sanitary sewer network provides the essential service of wastewater collection, disposal, and treatment for the community, and has a current replacement value of over $74 million.

7.1 Inventory & Valuation

Table 21 summarizes the quantity and current replacement cost of the Municipality's various sanitary sewer network assets as managed in its primary asset management register, Citywide Assets.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Sanitary Facilities	16	Assets	$20,239,000	CPI
Sanitary Mains	28	Length (km)	$50,052,000	Cost per Unit
Sanitary Manholes	271	Assets	$4,065,000	User-Defined
TOTAL			**$74,356,000**	

Table 21 Detailed Asset Inventory: Sanitary Sewer Network

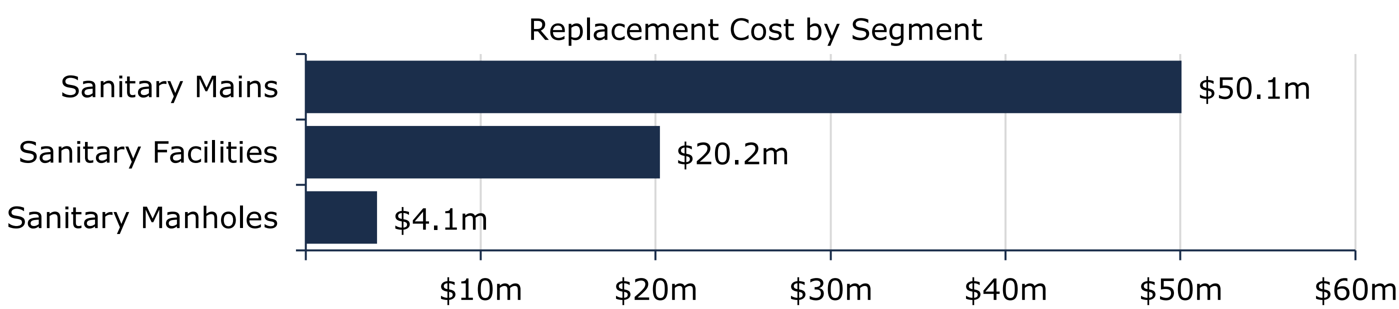

Figure 35 Portfolio Valuation: Sanitary Sewer Network

7.2 Asset Condition

Figure 36 summarizes the replacement cost-weighted condition of the Municipality's sanitary sewer network. Based on a combination of field inspection data and age, 90% of assets are in fair or better condition; the remaining 10% of assets are in poor to very poor condition. Condition assessments were available for 19% of sanitary manholes, and 16% of sanitary mains, based on replacement cost. This condition data was projected from inspection date to current year to estimate their condition today. No condition data was available for sanitary equipment.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 36 the majority of the Municipality's sanitary sewer network assets are in fair or better condition.

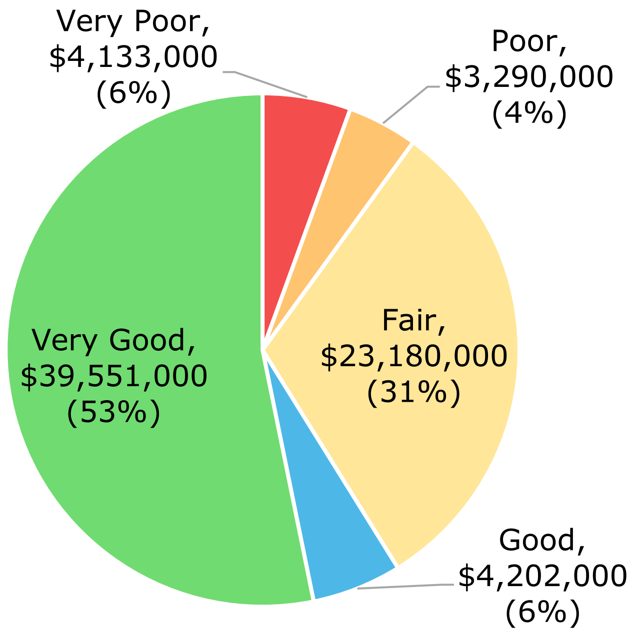

Figure 36 Asset Condition: Sanitary Sewer Network Overall

As illustrated in Figure 37, based on condition assessments and age-based conditions, the majority of the Municipality's sanitary mains are in very good condition.

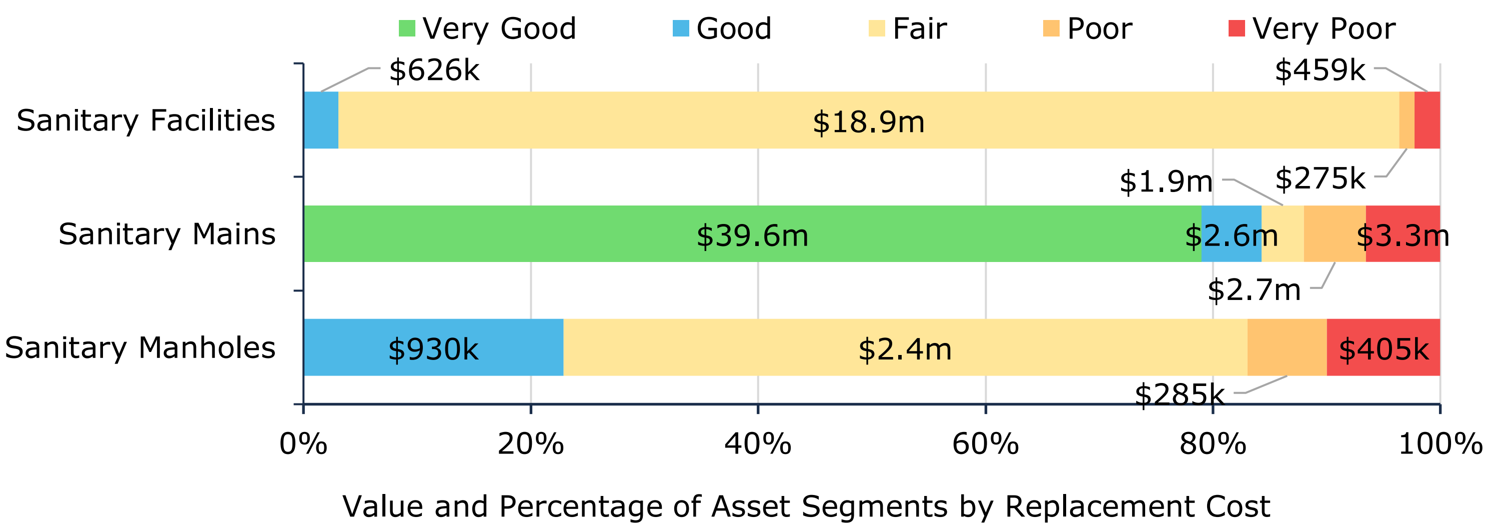

Figure 37 Asset Condition: Sanitary Sewer Network by Segment

7.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 38 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

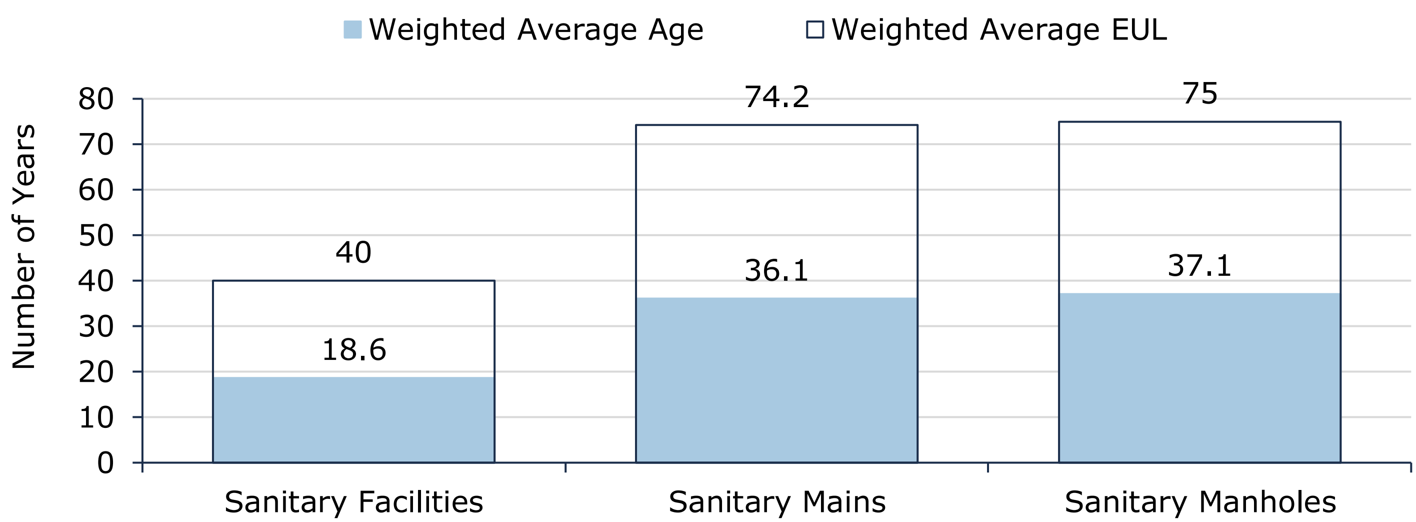

Figure 38 Estimated Useful Life vs. Asset Age: Sanitary Sewer Network

7.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following lifecycle strategy has been developed as a proactive approach to maintaining the lifecycle of sanitary sewer mains. A trenchless re-lining strategy is expected to extend the service life of sanitary sewer mains at a lower total cost of ownership.

Sanitary Sewer Mains		
Event Name	**Event Class**	**Event Trigger**
Flushing	Maintenance	Every 4 Years
Trenchless Re-Lining	Rehabilitation	50% - 60% Condition
Full Reconstruction	Replacement	0% Condition

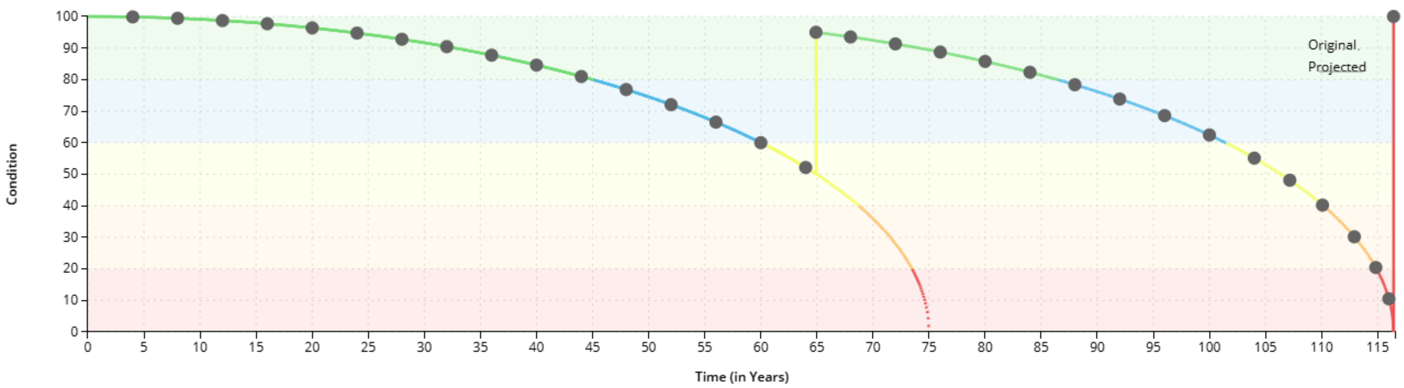

Table 22 Lifecycle Management Strategy: Sanitary Sewer Network (Sanitary Sewer Mains)

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	The Municipality recently finished a flushing program which saw all sanitary sewer mains flushed within the last 4 years. Ongoing flushing frequency has not yet been determined by the Municipality.
	Pump station wet wells are regularly cleaned out to maintain optimal efficiency.
Rehabilitation/ Replacement	In the absence of mid-lifecycle rehabilitative events, mains are maintained with the goal of full replacement at asset end-of-life.
	Project prioritization is based on CCTV inspections, asset age, material, environmental risks, health and safety risks, and social impact. Additional considerations include asset functionality and design capacity.
Inspection	CCTV inspections have been completed for all sanitary sewer mains within the municipality within the last 4 years. These inspections have not yet resulted in applicable conditions for use in asset management planning, however, the Municipality plans to enlist the services of a consultant to provide these condition ratings.

Table 23 Lifecycle Management Strategy: Sanitary Sewer Network

7.5 Forecasted Long-Term Replacement Needs

Figure 39 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the Municipality's sanitary sewer network. This analysis was run until 2128 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $1.1 million for all assets in the sanitary sewer network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs throughout the forecast period. It also shows a backlog of $459,000 for sanitary facilities. These projections are based on asset replacement costs, age analysis, and condition data when available. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

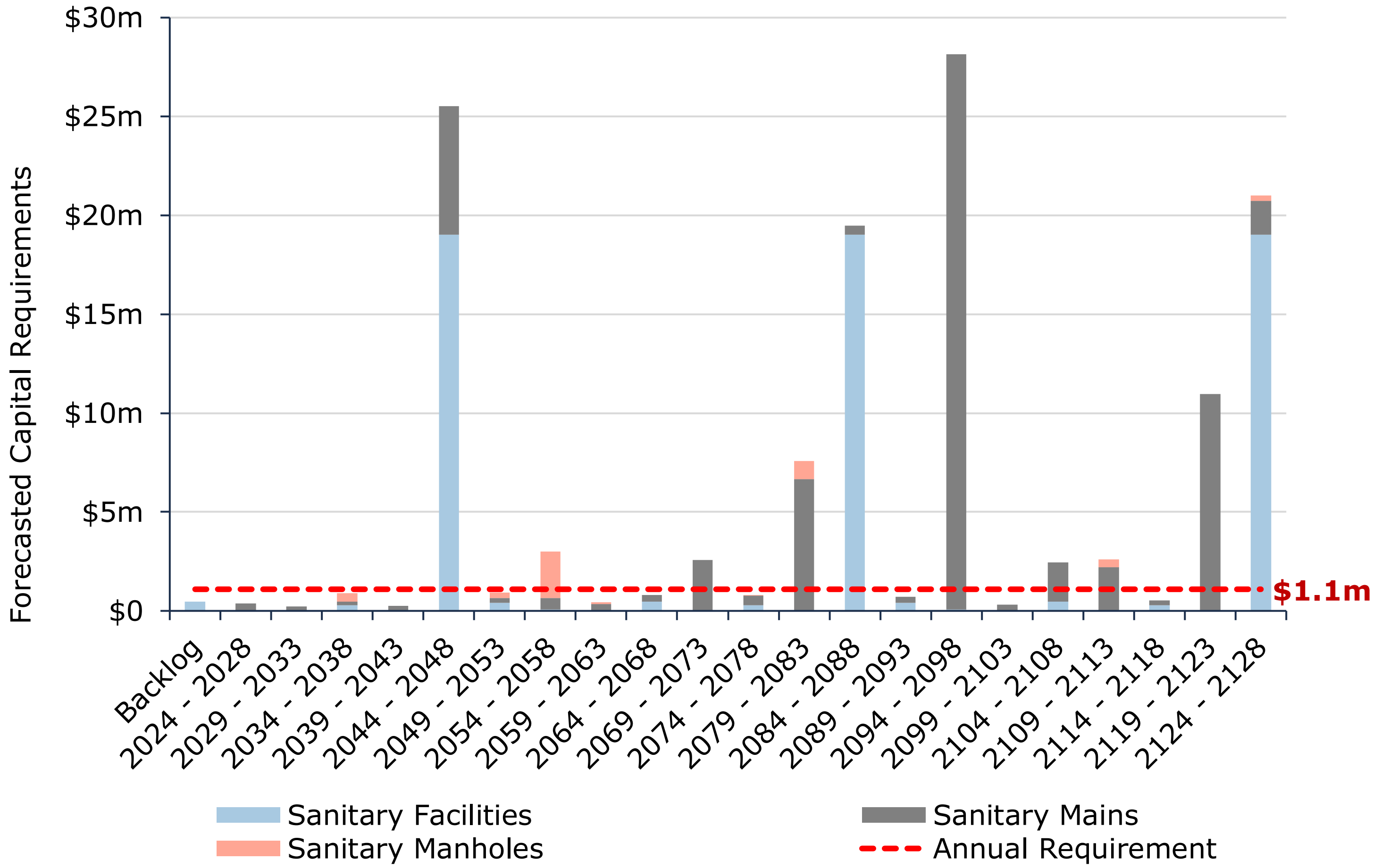

Figure 39 Forecasted Capital Replacement Needs: Sanitary Sewer Network 2024-2128

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

7.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, traffic data, and road class. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4	**5 - 7**	**8 - 9**	**10 - 14**	**15 - 25**
Very Low	**Low**	**Moderate**	**High**	**Very High**
$42,730,121	$3,207,167	$4,977,720	$22,088,558	$1,352,805
(57%)	(4%)	(7%)	(30%)	(2%)

Figure 40 Risk Matrix: Sanitary Sewer Network

7.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

7.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	Sanitary services are not commonly available to rural properties, resulting in only 19% of the North Middlesex being connected to the municipal wastewater system, concentrated in Parkhill, Alisa Craig, and Nairn.Appendix C – Level of Service Maps & Photos

Service Attribute	Qualitative Description	Current LOS (2023)
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes	The Municipality does not own any combined sewers.
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	The Municipality does not own any combined sewers.
	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	Stormwater can enter sanitary sewers due to cracks in sanitary mains or through indirect connections (e.g., weeping tiles). In the case of heavy rainfall events, sanitary sewers may experience a volume of water and sewage that exceeds its designed capacity. In some cases, this can cause water and/or sewage to overflow backup into homes. the disconnection of weeping tiles from sanitary mains and the use of sump pumps and pits directing storm water to the storm drain system can help to reduce the chance of this occurring
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to stormwater infiltration	The municipality follows a series of design standards that integrate servicing requirements and land use considerations when constructing or replacing sanitary sewers. These standards have been determined with consideration of the minimization of sewage overflows and backups
	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system	Effluent refers to water pollution that is discharged from a wastewater treatment plant, and may include suspended solids, total phosphorous and biological oxygen demand. The Environmental Compliance Approval (ECA) identifies the effluent criteria for municipal wastewater treatment plants

Table 24 O. Reg. 588/17 Community Levels of Service: Sanitary Sewer Network

7.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties connected to the municipal wastewater system	35%[9]
Reliability	# of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system	2 / 1,244
	# of connection-days per year having wastewater backups compared to the total number of properties connected to the municipal wastewater system	0 / 1,244
	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	1 / 1,244
Quality	Average condition of sanitary sewer network assets	68%
Performance	% of Sanitary Sewer network in poor or very poor condition	10%
	Target capital reinvestment rate	1.5% $1.1m/year

Table 25 O. Reg. 588/17 Technical Levels of Service: Sanitary Sewer Network

[9] 1,244 sanitary connections compared to 3,536 properties.

8. Stormwater Network

The Municipality's stormwater network is comprised of sewer mains and other critical supporting capital assets with a total current replacement cost of approximately $45 million. The Municipality is responsible for 24 kilometers of storm mains.

8.1 Inventory & Valuation

Table 26 summarizes the quantity and current replacement cost of all stormwater network assets available in the Municipality's asset register.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Storm Mains	24	Length (km)	$43,561,000	Cost/Unit
Storm Manholes	128	Assets	$1,920,000	User-Defined
TOTAL			**$45,481,000**	

Table 26 Detailed Asset Inventory: Stormwater Network

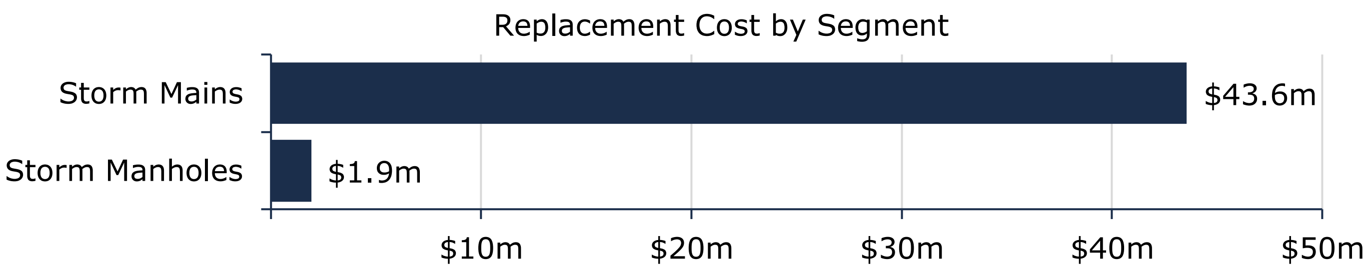

Figure 41 Portfolio Valuation: Stormwater Network

8.2 Asset Condition

Figure 42 summarizes the replacement cost-weighted condition of the Municipality's stormwater network assets. Based on age data only, approximately 45% of assets are in poor to very poor condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

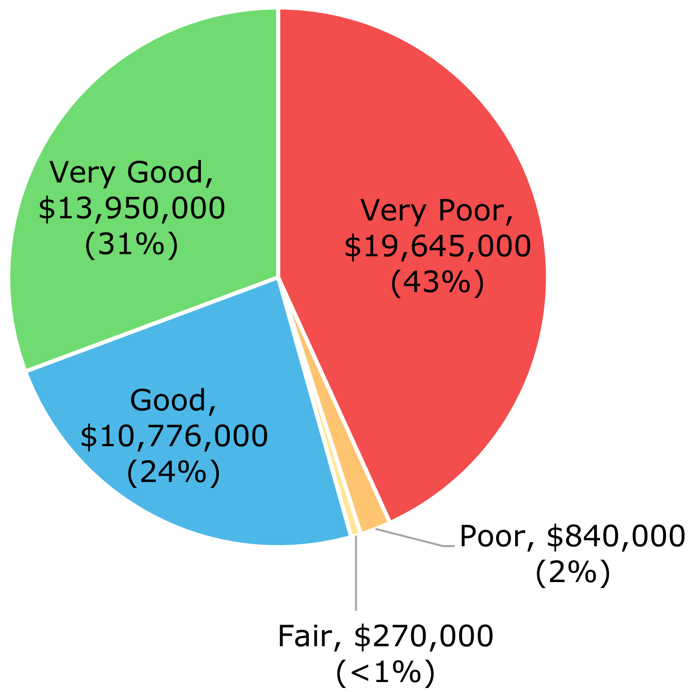

Figure 42 Asset Condition: Stormwater Network Overall

Figure 43 summarizes the age-based condition of stormwater network assets by category. The analysis illustrates that just over half of stormwater mains are in fair or better condition. However, 44% of mains, with a current replacement cost of $19.3 million, are in very poor condition.

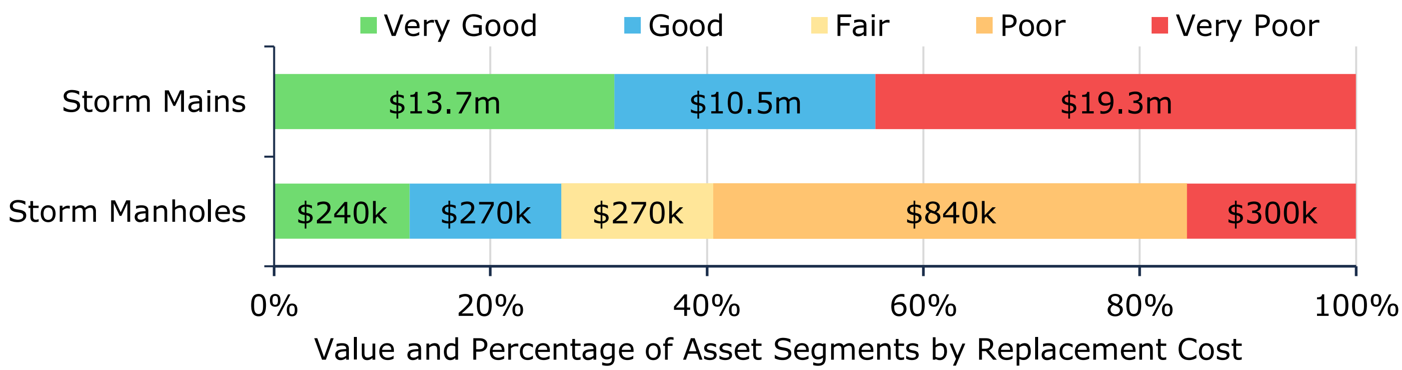

Figure 43 Asset Condition: Stormwater Network by Segment

8.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 44 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

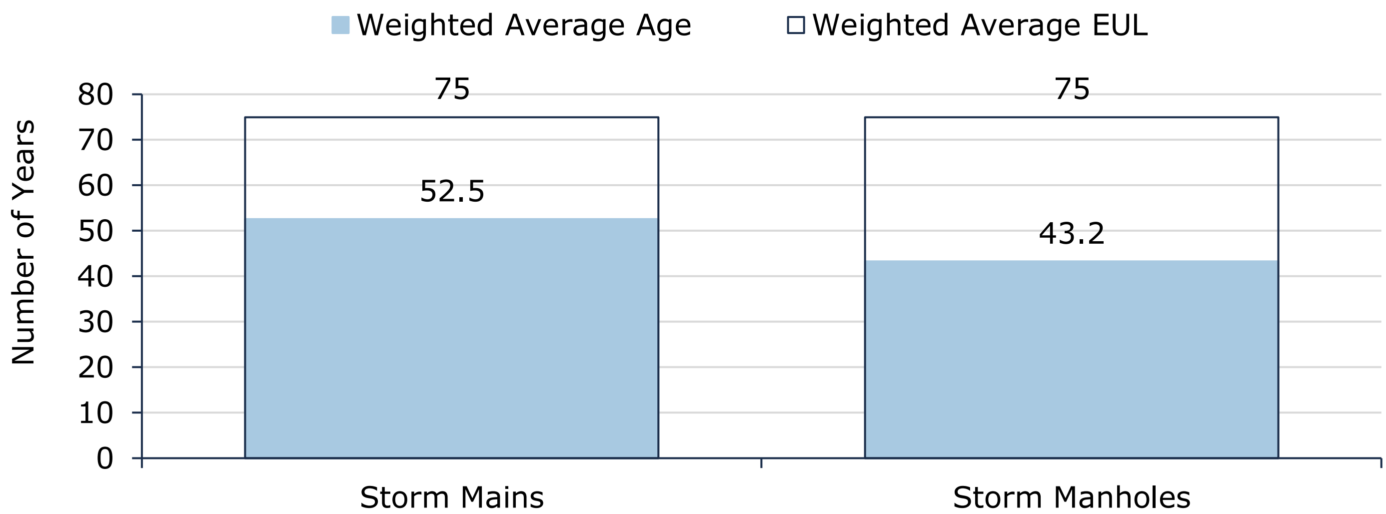

Figure 44 Estimated Useful Life vs. Asset Age: Stormwater Network

The age analysis indicates that, on average, storm mains have reached the final third of their expected lifecycle, while manholes are approaching this stage and are expected to enter it within the next five years. Age profiles and CCTV inspections will help to identify mains in need of replacements and/or upgrades. Extensions to EULs for mains may also be considered based on performance history to date.

8.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following lifecycle strategy has been developed as a proactive approach to maintaining the lifecycle of stormwater mains. A trenchless re-lining strategy is expected to extend the service life of stormwater mains at a lower total cost of ownership.

Stormwater Mains		
Event Name	**Event Class**	**Event Trigger**
Trenchless Re-Lining	Rehabilitation	50% - 60% Condition
Full Reconstruction	Replacement	0% Condition

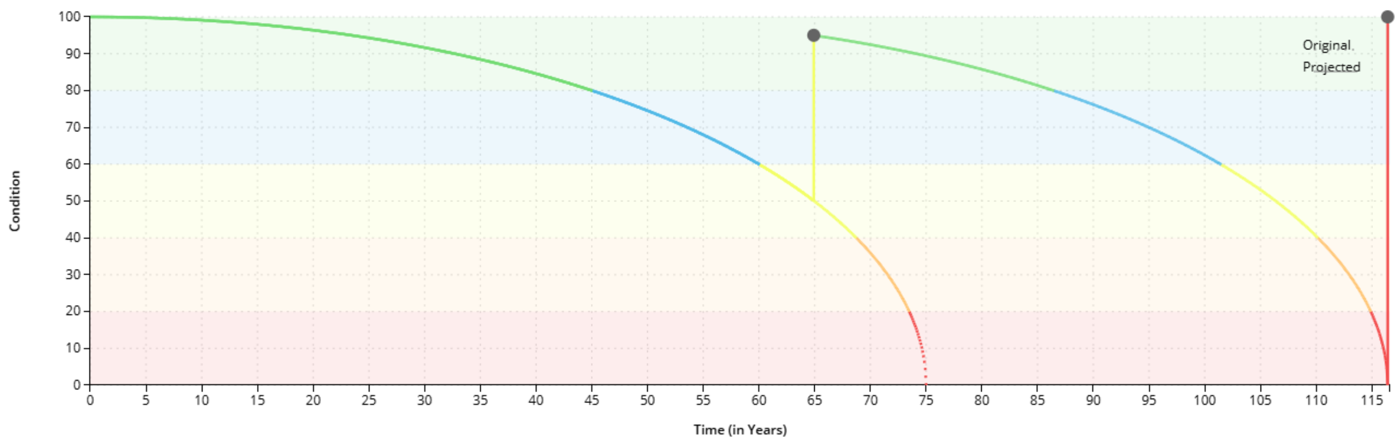

Table 27 Lifecycle Management Strategy: Stormwater Network (Stormwater Mains)

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Maintenance activities are completed to a lesser degree compared to other underground utility infrastructure.
	Primary maintenance activities include manhole cleaning, winter sand build-up removal, and storm main flushing, however, only a small percentage of the network is completed each year.
Rehabilitation/ Replacement	Reactive rehabilitation is the most widely adopted approach for the stormwater network.
	Trenchless re-lining is being considered as it has the potential to reduce total lifecycle costs, however, would require a formal condition assessment program to determine viability.
	Without the availability of up-to-date condition assessment information, replacement activities are purely reactive in nature.
Inspection	CCTV inspection and cleaning is completed as budget becomes available and information is used to drive rehabilitation and replacement plans.

Table 28 Lifecycle Management Strategy: Stormwater Network

8.5 Forecasted Long-Term Replacement Needs

Figure 45 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the Municipality's stormwater network assets. This analysis was run until 2133 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $483,000 for all assets in the stormwater network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates an age-based backlog of $864,000, dominated by storm mains. The largest replacement spike is forecasted in 2024-2028 followed by 2089-2093 as mains reach the end of their expected design life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

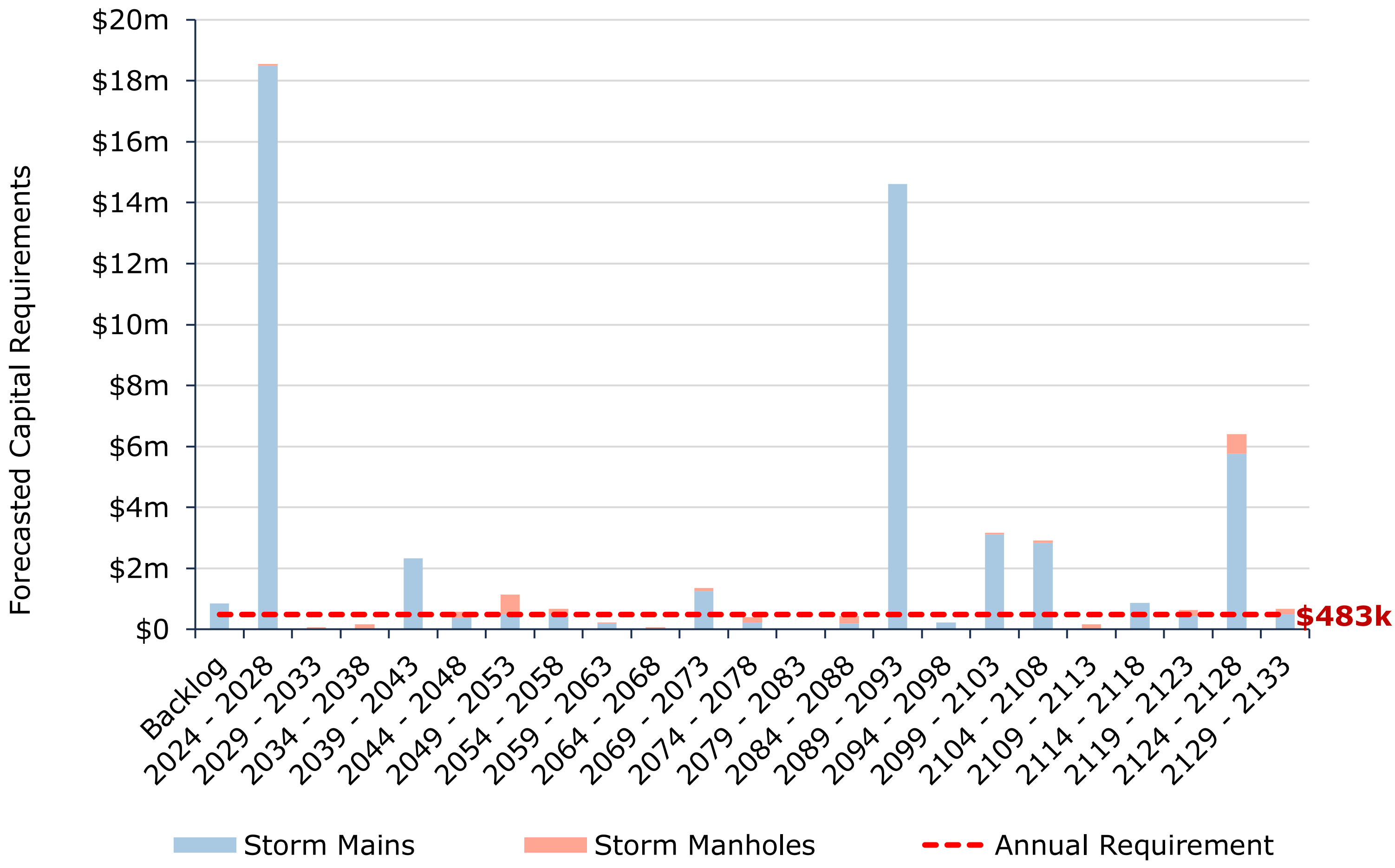

Figure 45 Forecasted Capital Replacement Needs Stormwater Network 2024-2133

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. CCTV inspections may reveal a higher or lower backlog. The inspections may also help reduce long-term projections by providing more accurate condition data for mains than age. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

8.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, and replacement costs. As no attribute data was available for storm assets, the risk ratings for assets were calculated using only these required, minimum asset fields.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4	**5 - 7**	**8 - 9**	**10 - 14**	**15 - 25**
Very Low	**Low**	**Moderate**	**High**	**Very High**
$20,150,054	$9,355,793	$1,125,487	$12,787,706	$2,061,511
(44%)	(21%)	(2%)	(28%)	(5%)

Figure 46 Risk Matrix: Stormwater Network

8.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

8.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include map, of the user groups or areas of the Municipality that are protected from flooding, including the extent of protection provided by the municipal stormwater system	Stormwater piping systems are only available in the urban areas of Parkhill, Alisa Craig, and Nairn. Ditches facilitate stormwater flow through rural areas, however, there is minimal overland flood protection. *More information on Flood Plain Management is available through the Ausable Bayfield Conservation Authority.*

Table 29 O. Reg. 588/17 Community Levels of Service: Stormwater Network

8.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties in municipality resilient to a 100-year storm	5%
	% of the municipal stormwater management system resilient to a 5-year storm	75%
Quality	Average condition of stormwater network assets	47%
Performance	% of Storm Network in poor or very poor condition	45%
	Target capital reinvestment rate	1.1% $483k/year

Table 30 O. Reg. 588/17 Technical Levels of Service: Stormwater Network

Non-Core Assets

9. Buildings & Facilities

The Municipality's buildings and facilities portfolio includes fire stations, various administrative and public works facilities, and recreational assets. The total current replacement of buildings and facilities is estimated at more than $26.6 million.

9.1 Inventory & Valuation

Table 31 summarizes the quantity and current replacement cost of all buildings assets available in the Municipality's asset register. The majority of buildings and facilities are not componentized. The quantity listed represents the number of asset records currently available for each department.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Corporate	4	Assets	$6,660,000	CPI
Emergency Services	3	Assets	$1,437,000	CPI
Public Works	20	Assets	$3,225,000	CPI
Recreation	36	Assets	$15,326,000	CPI
TOTAL			**$26,647,000**	

Table 31 Detailed Asset Inventory: Buildings & Facilities

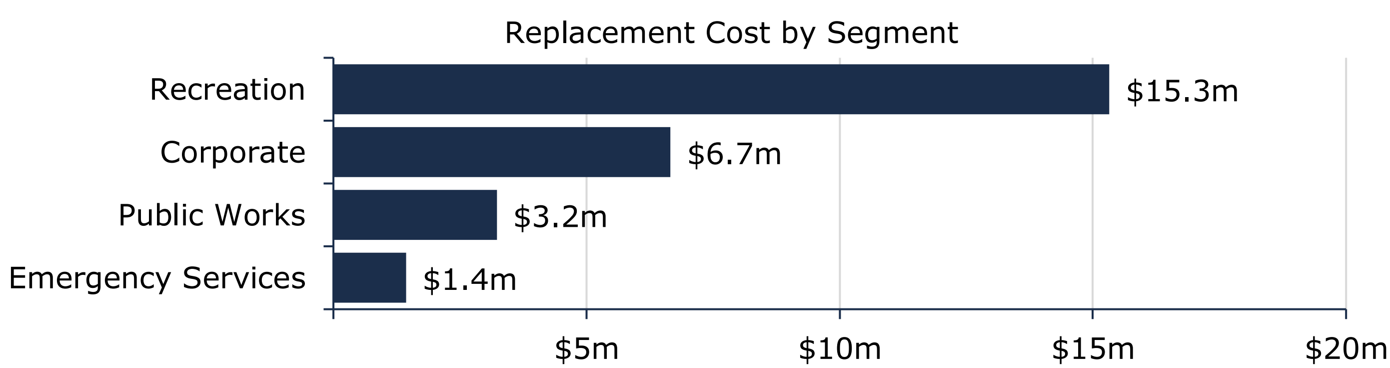

Figure 47 Portfolio Valuation: Buildings & Facilities

9.2 Asset Condition

Figure 53 summarizes the replacement cost-weighted condition of the Municipality's buildings and facilities portfolio. The Municipality completed Building Condition Assessments in 2021, however, condition data was not aligned with the asset registry and therefore could not be utilized within the Municipality's asset management software. Based only on age data, 60% of buildings and facilities assets are in fair or better condition; however, 40%, with a current replacement cost of $10.7 million are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As buildings and facilities are not componentized, condition data is presented only at the site level, rather than at the individual element or component level within each building. This drawback is further compounded by the lack of assessed condition data, requiring the use of age-based estimates only.

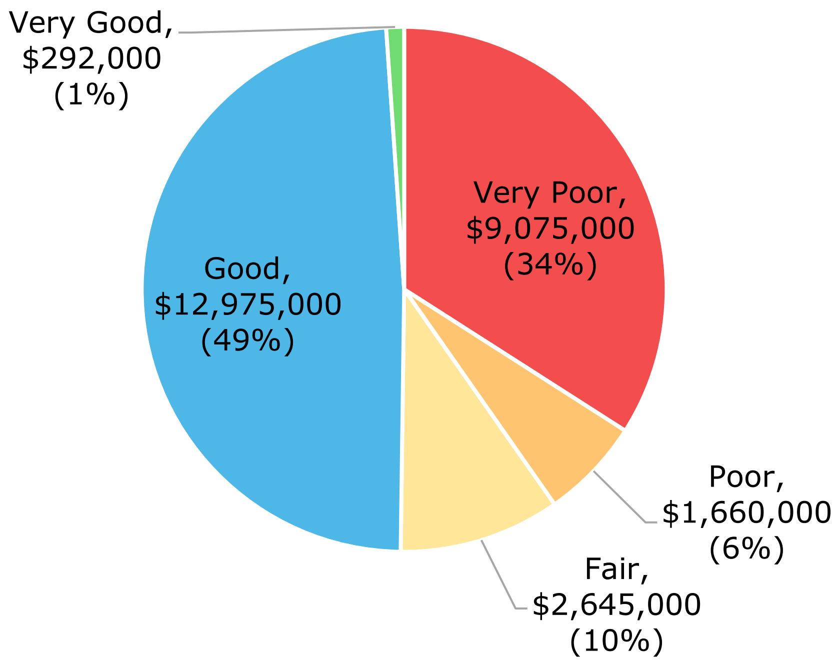

Figure 48 Asset Condition: Buildings & Facilities Overall

Figure 49 summarizes the age-based condition of buildings and facilities by each department. A substantial portion of recreation, public works and emergency services assets are in poor to worse condition. However, in the absence of componentization, this data doesn’t provide an entirely accurate reflection of the condition of buildings and facilities. Componentization of assets and integration of condition assessments will provide a more accurate and reliable estimation of the condition of various facilities.

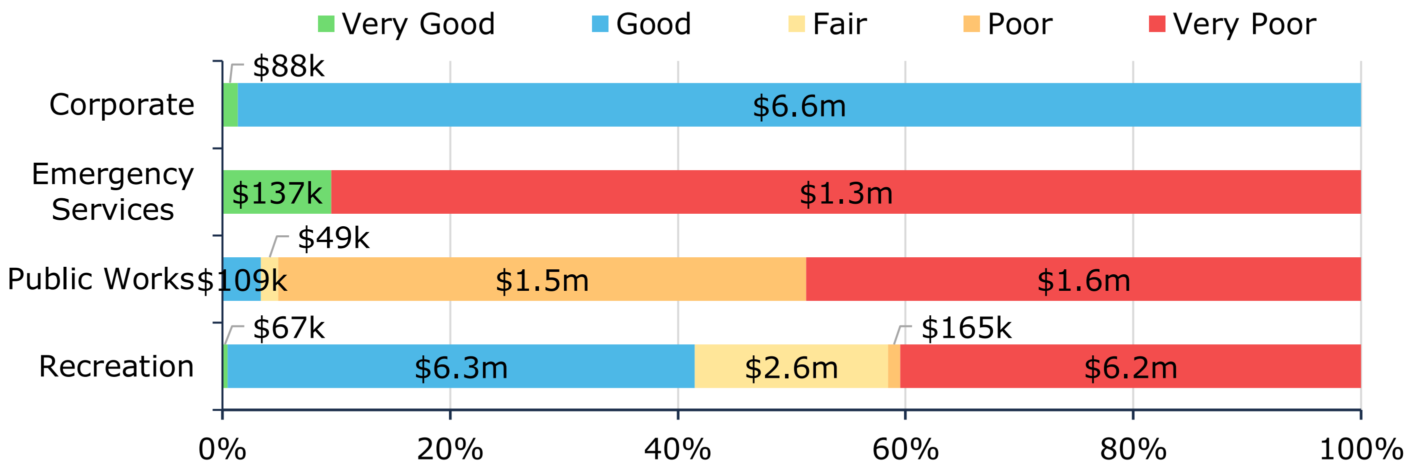

Figure 49 Asset Condition: Buildings & Facilities by Segment

9.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 50 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

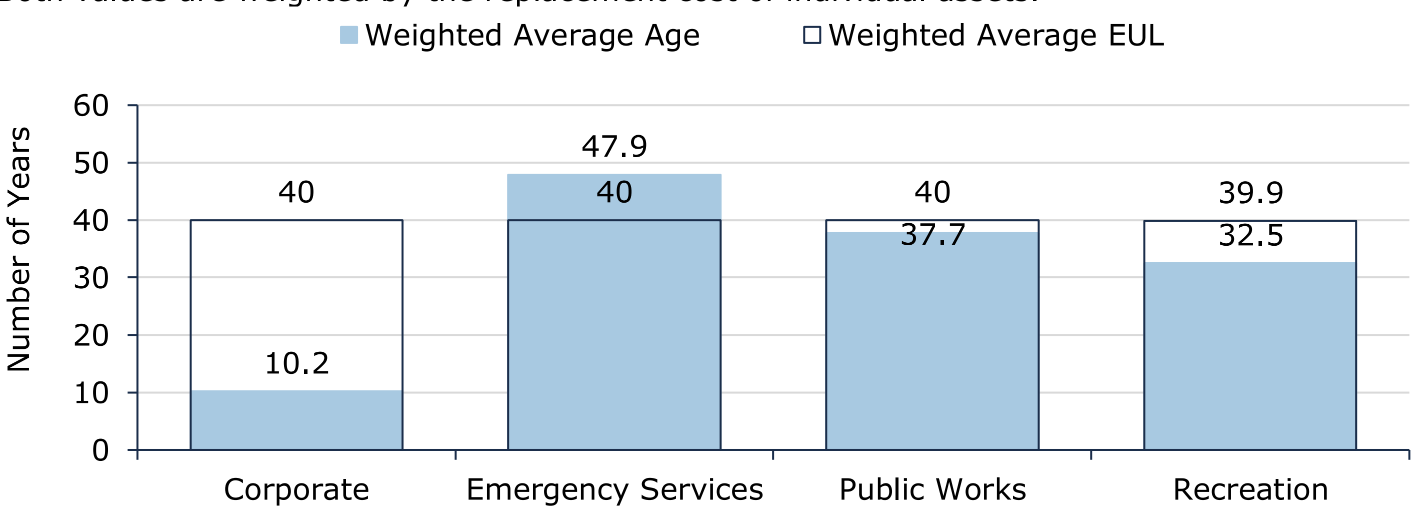

Figure 50 Estimated Useful Life vs. Asset Age: Buildings & Facilities

Age analysis reveals that, on average, the majority of buildings and facilities assets are in the latter stages of their serviceable life with corporate assets being the exception. Emergency Services, based on acquisition years, have consumed over 100% of their established useful life. Once again, this analysis presented only at the site level, rather than at the individual element or component level. Useful and meaningful age analysis for buildings is entirely predicated on effective componentization.

9.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Table 32 outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Maintenance is triggered by inspections identifying safety, accessibility, functionality, and structural issues.
	Routine/preventative maintenance is performed on assets such as HVAC equipment.
	All other maintenance activities are completed on a reactive basis when operational issues are identified through complaints and service requests.
Rehabilitation/ Replacement	Rehabilitations such as roof replacements or HVAC component replacements are considered on an as needed basis.
	The primary considerations for asset replacement are asset age and/or failure, excessive maintenance costs, safety issues, and volume of use.
Inspections	Building Condition Assessments are completed every 5 years, with the most recent being completed in 2022 by Dillon Consulting.
	Monthly facility checks are conducted by internal staff to identify maintenance or safety concerns.

Table 32 Lifecycle Management Strategy: Buildings & Facilities

9.5 Forecasted Long-Term Replacement Needs

Figure 51 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the Municipality's buildings and facilities portfolio. This analysis was run until 2058 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $671,000 for all buildings and facilities. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to rise consistently over the next 20 years, reaching $7.1 million between 2049 and 2053. The chart also illustrates a backlog of more than $7.6 million, dominated by recreation facilities, and comprising assets that have reached the end of their useful life but still remain in operation. These projections and estimates are based on current asset records, their replacement costs, and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

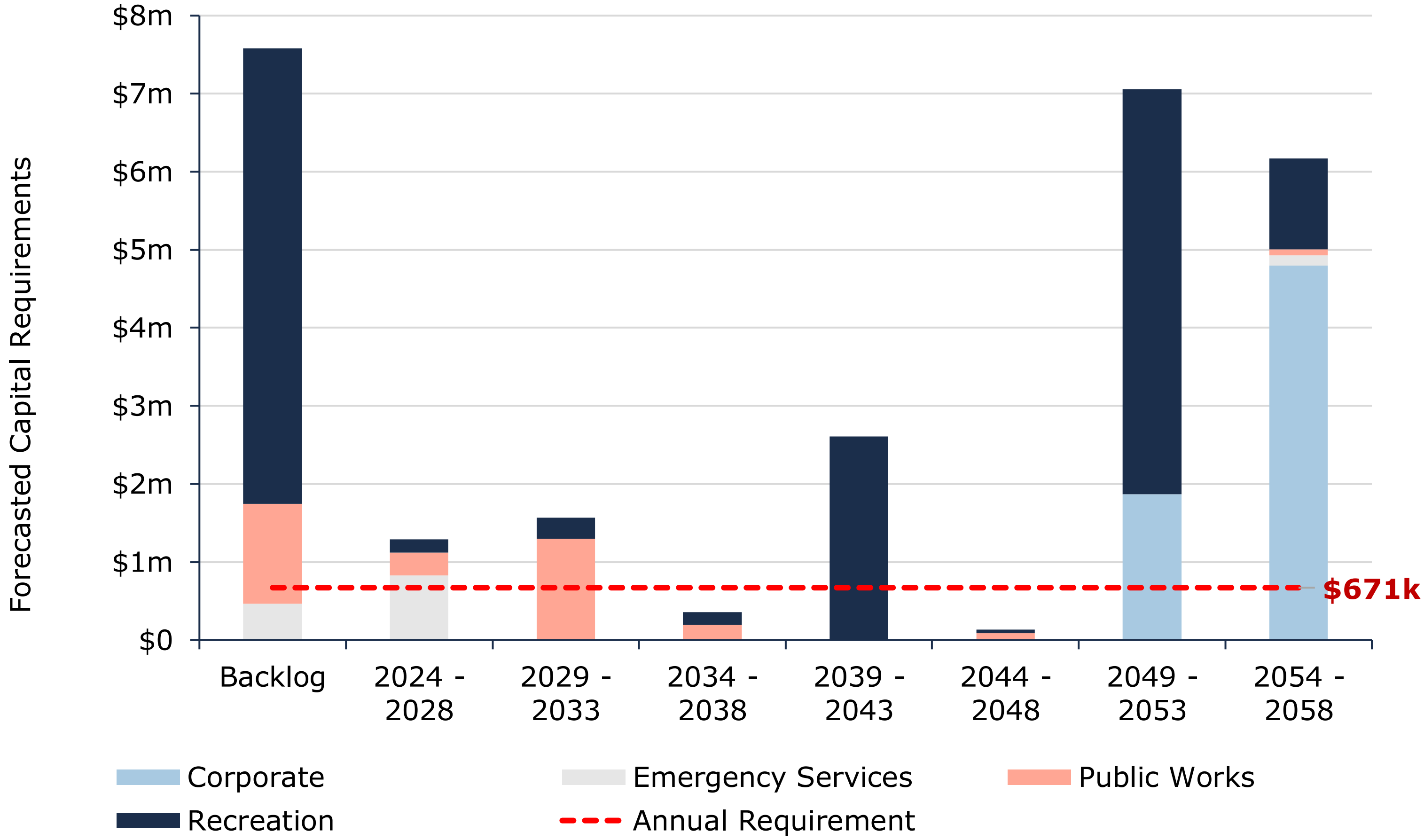

Figure 51 Forecasted Capital Replacement Needs Buildings & Facilities 2054-2058

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements. In the case of buildings and facilities, detailed componentization is necessary to develop more reliable lifecycle forecasts that reflect the needs of individual elements and components.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

9.6 Risk Analysis

The risk matrix below is generated using available asset data, including service life remaining, replacement costs, and building department. The risk ratings for assets without useful attribute data were calculated using only age, service life remaining, and their replacement costs.

The matrix classifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 **Very Low** $313,809 (1%)	**5 - 7** **Low** $713,529 (3%)	**8 - 9** **Moderate** $12,361,798 (46%)	**10 - 14** **High** $3,728,810 (14%)	**15 - 25** **Very High** $9,529,242 (36%)

Figure 52 Risk Matrix: Buildings & Facilities

9.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the Municipality has selected for this AMP.

9.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the types of facilities that the municipality operates and maintains	Buildings and facilities within North Middlesex include those dedicated to corporate services, such as the North Middlesex Shared Services Centre. Emergency services are supported by two fire halls. Public works is supported by various equipment and storage garages, salt/sand protection facilities and the department office. Recreation provides its services through a variety of facilities such as arenas, community/leisure centers, and library.

Table 33 Community Levels of Service: Buildings & Facilities

9.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Quality	Average facility condition index value for facilities in the Municipality	40%
Performance	% of buildings in poor or very poor condition	40%
	Target capital reinvestment rate	2.5% $671k/year

Table 34 Technical Levels of Service: Buildings & Facilities

10. Land Improvements

The Municipality's land improvements portfolio includes parking lots, various sports fields and courts, pavilions and gazebos and playground structures. The total current replacement of land improvements is estimated at approximately $5 million.

10.1 Inventory & Valuation

Table 35 summarizes the quantity and current replacement cost of all land improvements assets available in the Municipality's asset register. Parks, sports fields and courts accounts for the largest share of the land improvements asset group.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Parking Lots	1	Assets	$25,000	User-Defined
Parks, Sport Fields & Courts	33	Assets	$2,198,000	CPI
Pavilions & Gazebos	17	Assets	$1,335,000	CPI
Playground Structures	22	Assets	$1,439,000	CPI
TOTAL			**$4,997,000**	

Table 35 Detailed Asset Inventory: Land Improvements

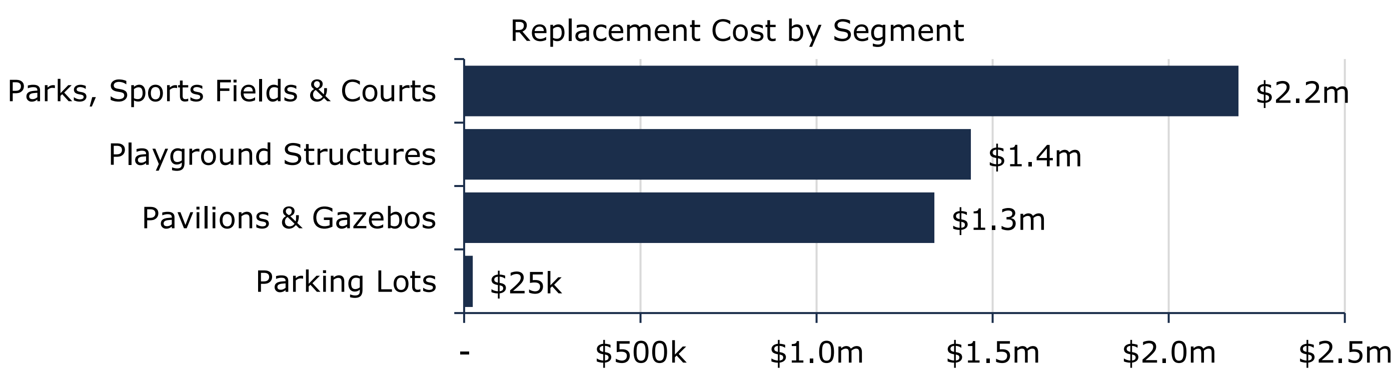

Figure 53 Portfolio Valuation: Land Improvements

10.2 Asset Condition

Figure 54 summarizes the replacement cost-weighted condition of the Municipality's land improvements portfolio. Based on age data only, 20% of assets are in fair or better condition, the remaining 80% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

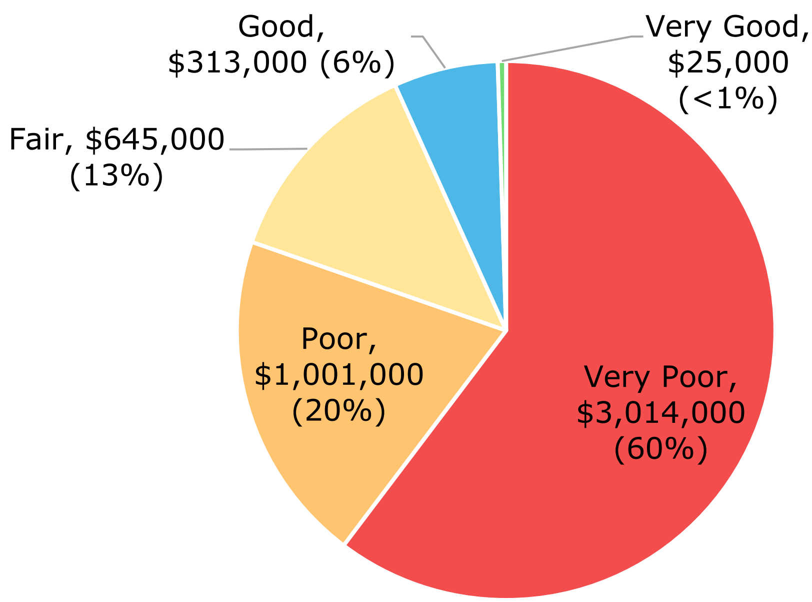

Figure 54 Asset Condition: Land Improvements Overall

Figure 55 illustrates that the majority of assets in poor or very poor condition are concentrated in playground structures and parks, sports fields, and courts. Playground structures have the highest proportion of assets classified as very poor, while parks, sports fields, and courts are also show significant deterioration.

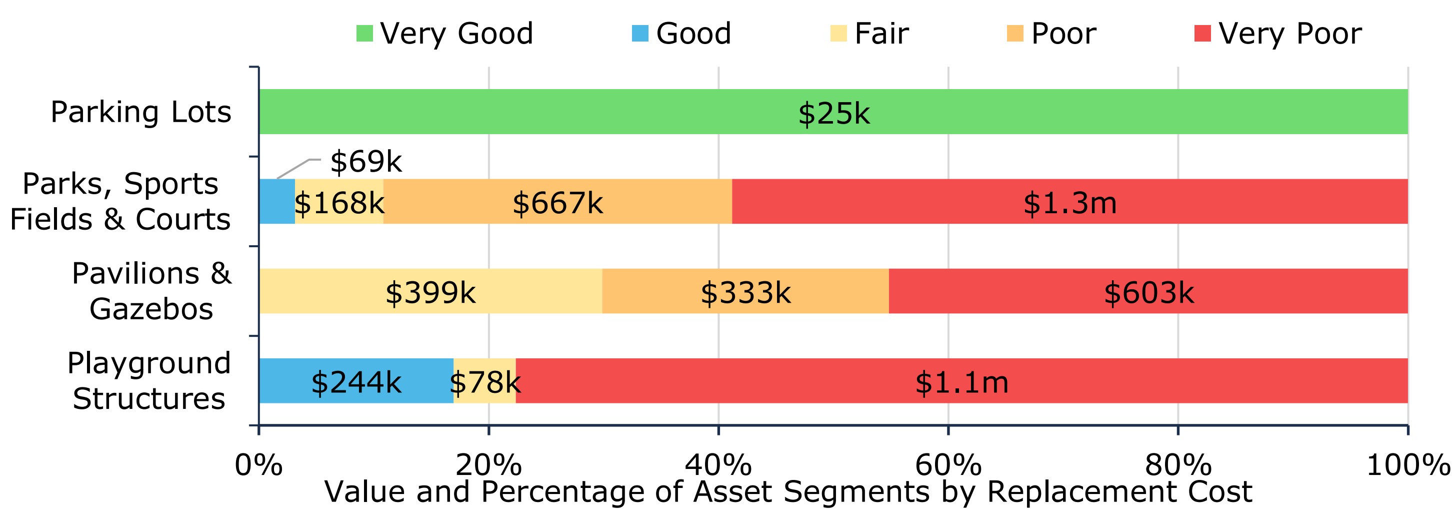

Figure 55 Asset Condition: Land Improvements by Segment

10.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 56 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

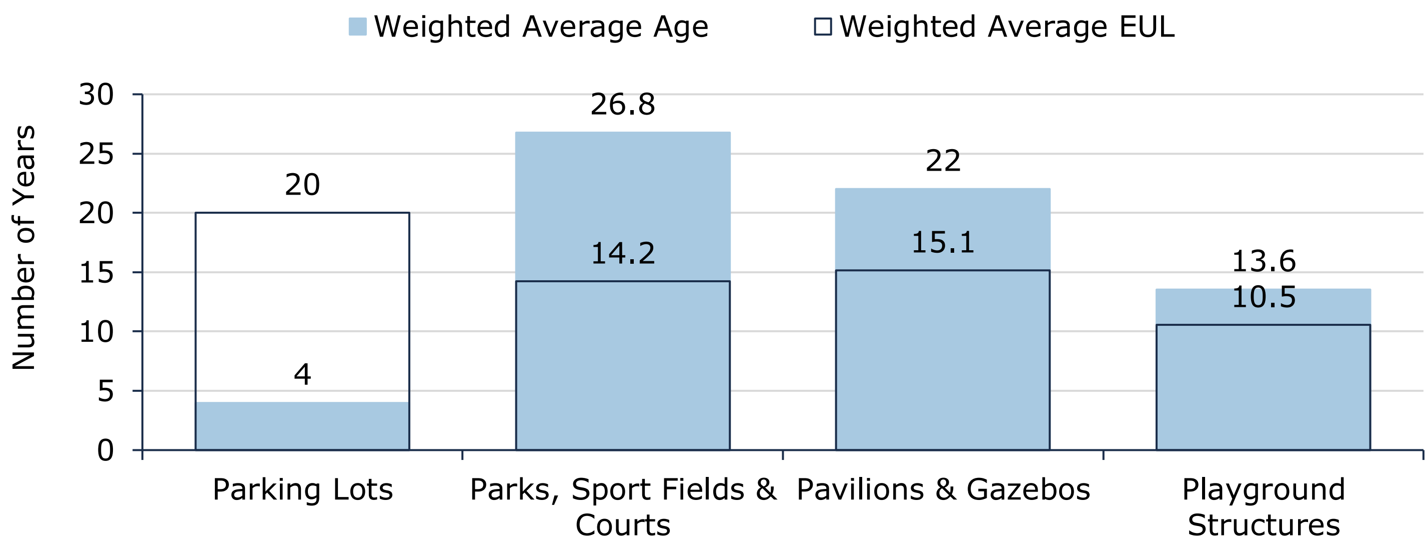

Figure 56 Estimated Useful Life vs. Asset Age: Land Improvements

Most land improvement assets have exceeded their expected useful life (EUL), with parks/sports fields/courts and pavilions/gazebos being the most affected. Parking lots are the exception, with an average age of 4 years, significantly below their 20-year EUL. Playground structures have also exceeded their estimated useful life, with an average age of 13.6 years compared to an EUL of 10.5 years. Overall, land improvements are in the latter stages of their expected design life, with most categories already surpassing their projected lifespan.

10.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Table 36 outlines the Township's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Maintenance activities are completed on a reactive basis when operational issues are identified, through complaints, service requests, or ad-hoc inspections
Rehabilitation / Replacement	Without the availability of up-to-date condition assessment information replacement activities are purely reactive in nature
Inspections	Inspections are conducted on an ad-hoc basis

Table 36 Lifecycle Management Strategy: Land Improvements

10.5 Forecasted Long-Term Replacement Needs

Figure 57 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the Municipality's land improvements portfolio. This analysis was run until 2043 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $401,000 for all land improvements. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to fluctuate over the 20-year time horizon, totaling nearly $4.3 million in the current decade (including the existing backlog), and peaking at $2.6 million between 2034 and 2038 as assets reach the end of their useful life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

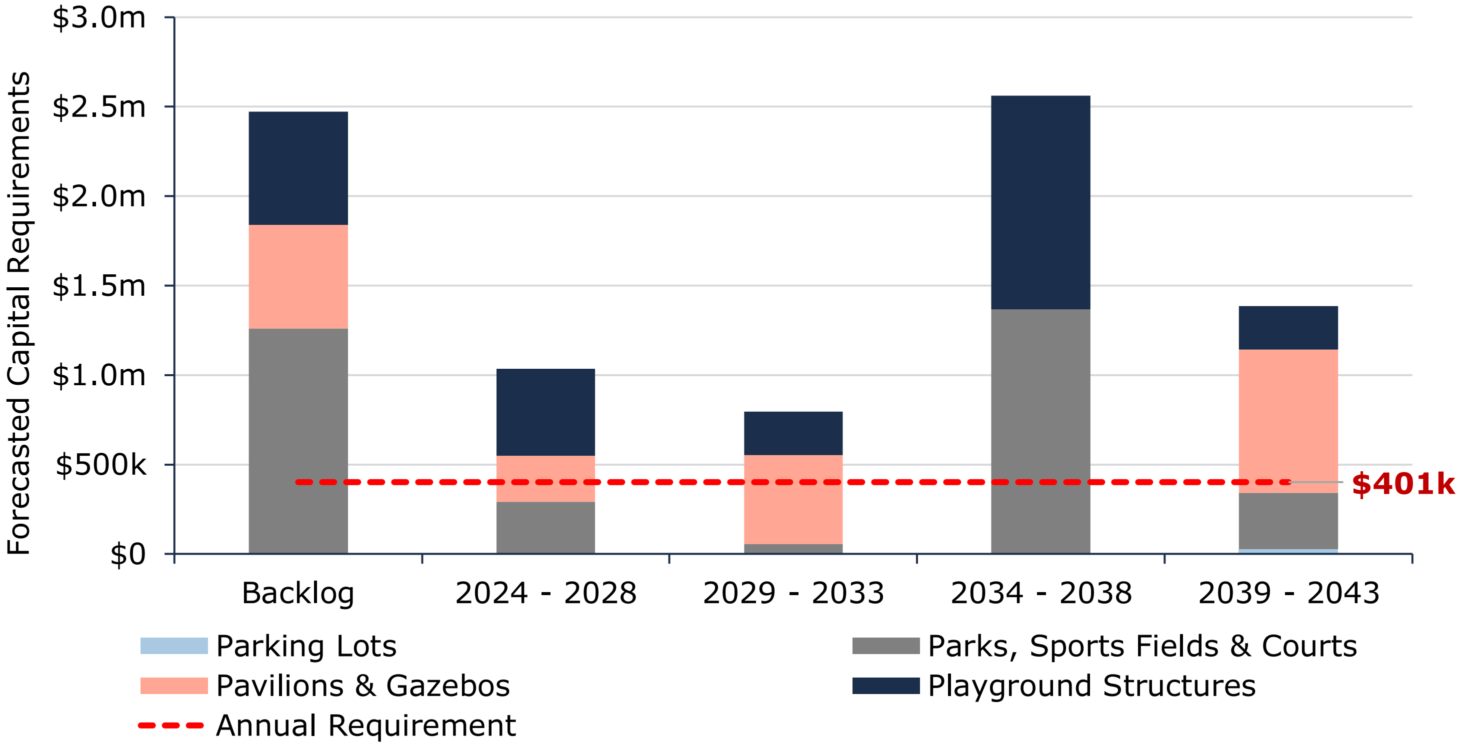

Figure 57 Forecasted Capital Replacement Needs: Land Improvements 2024-2043

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

10.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, and replacement costs. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 **Very Low**	5 - 7 **Low**	8 - 9 **Moderate**	10 - 14 **High**	15 - 25 **Very High**
$61,273 (1%)	$647,875 (13%)	$36,571 (<1%)	$1,178,682 (24%)	$3,072,835 (61%)

Figure 58 Risk Matrix: Land Improvements

10.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the Municipality has selected for this AMP.

10.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the outdoor recreational facilities that the municipality operates and maintains	The Municipality operates a variety of outdoor supporting infrastructure such as parking lots, fencing, playgrounds, monuments, pavilions & gazebos as well as recreational infrastructure (i.e. baseball diamonds/training equipment).

Table 37 Community Levels of Service: Land Improvements

10.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Quality	Average condition of outdoor recreation facilities and land improvements in the municipality	15%
Performance	% of land improvement assets in poor or very poor condition	80%
	Target capital reinvestment rate	8.0% $401k/year

Table 38 Technical Levels of Service: Land Improvements

11. Vehicles & Heavy Equipment

The Municipality's vehicles and heavy equipment portfolio includes 52 assets that support a variety of general and essential services, including public works, recreation and water/wastewater, and emergency services. The total current replacement of vehicles and heavy equipment is estimated at approximately $9.2 million.

11.1 Inventory & Valuation

Table 39 summarizes the quantity and current replacement cost of all vehicles and heavy equipment assets available in the Municipality's asset register. Public works and emergency services account for the largest shares of the vehicles and heavy equipment portfolio.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Emergency Services	10	Assets	$3,322,534	User-Defined
Public Works	31	Assets	$5,462,254	CPI
Recreation	9	Assets	$398,317	CPI
Water/Wastewater	2	Assets	$67,288	CPI
TOTAL			**$9,250,393**	

Table 39 Detailed Asset Inventory: Vehicles & Heavy Equipment

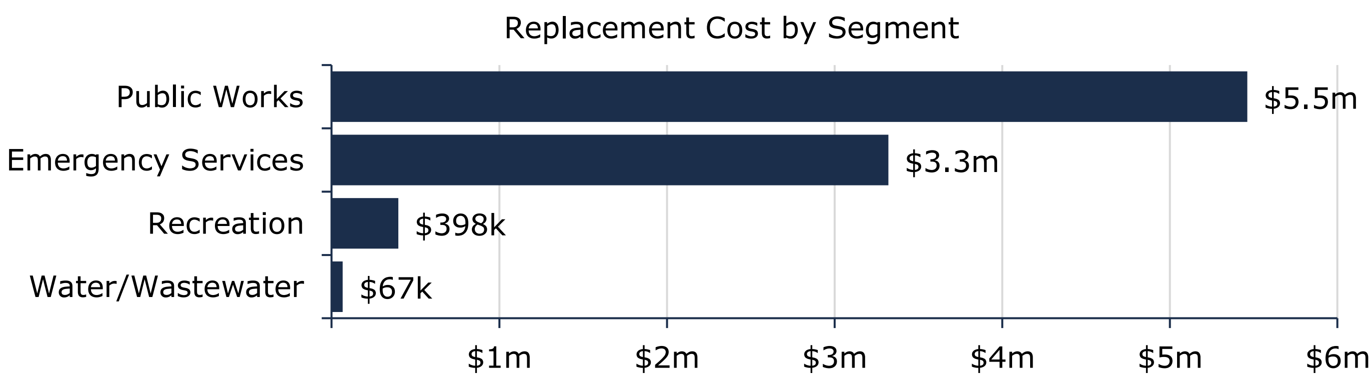

Figure 59 Portfolio Valuation: Vehicles & Heavy Equipment

11.2 Asset Condition

Figure 60 summarizes the replacement cost-weighted condition of the Municipality's vehicles and heavy equipment portfolio. Based primarily on assessed condition data, 9% of vehicles and heavy equipment are in fair or better condition, with the remaining 91% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. Condition data was available for 24% of vehicles and heavy equipment, based on replacement costs; age was used to estimate condition for the remaining 76% of assets. This is likely contributing to the data being skewed to worse condition than is observed in reality.

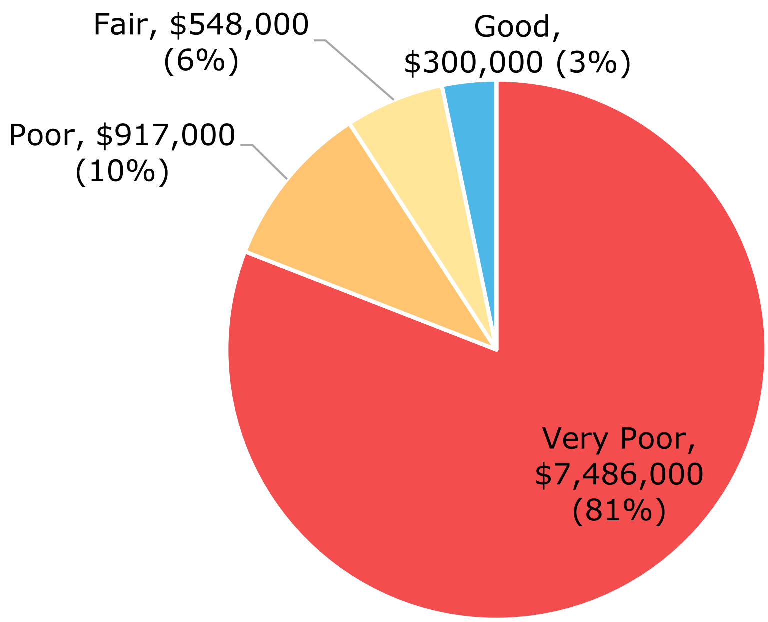

Figure 60 Asset Condition: Vehicles & Heavy Equipment Overall

Figure 61 summarizes the condition of vehicles and heavy equipment by each department. The vast majority of vehicles are in poor or worse condition. Assets in fair or better condition are concentrated primarily in water/wastewater services.

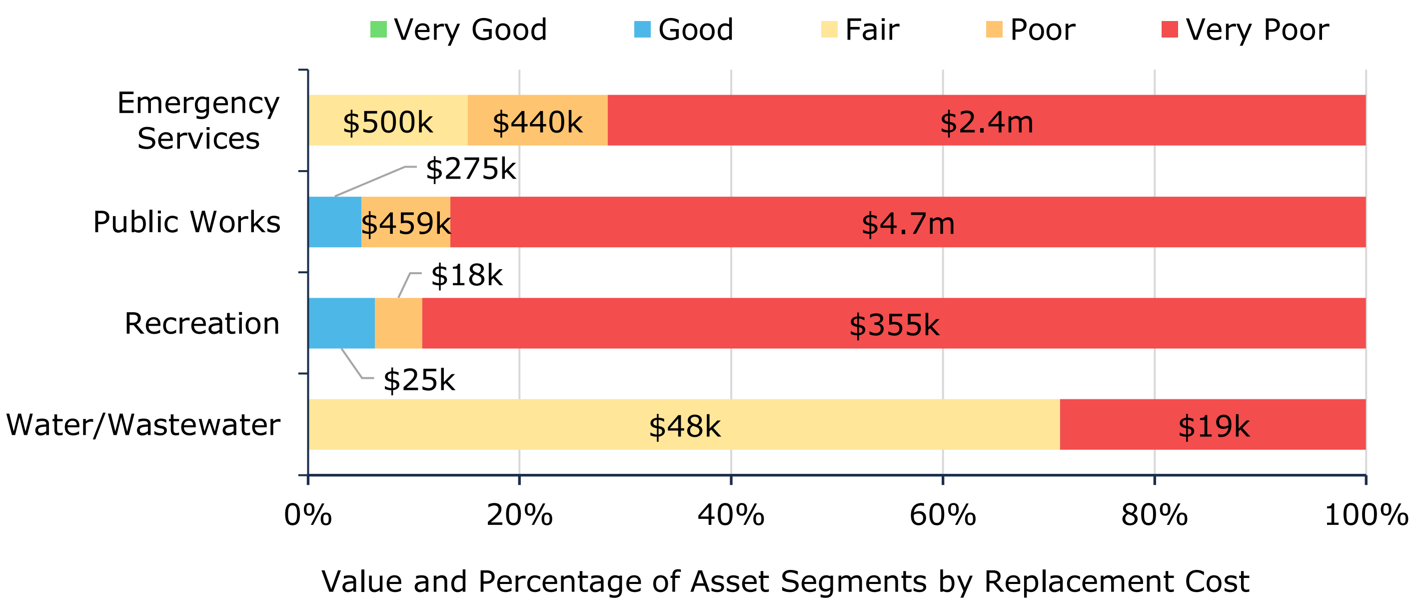

Figure 61 Asset Condition: Vehicles & Heavy Equipment by Segment

11.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 62 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

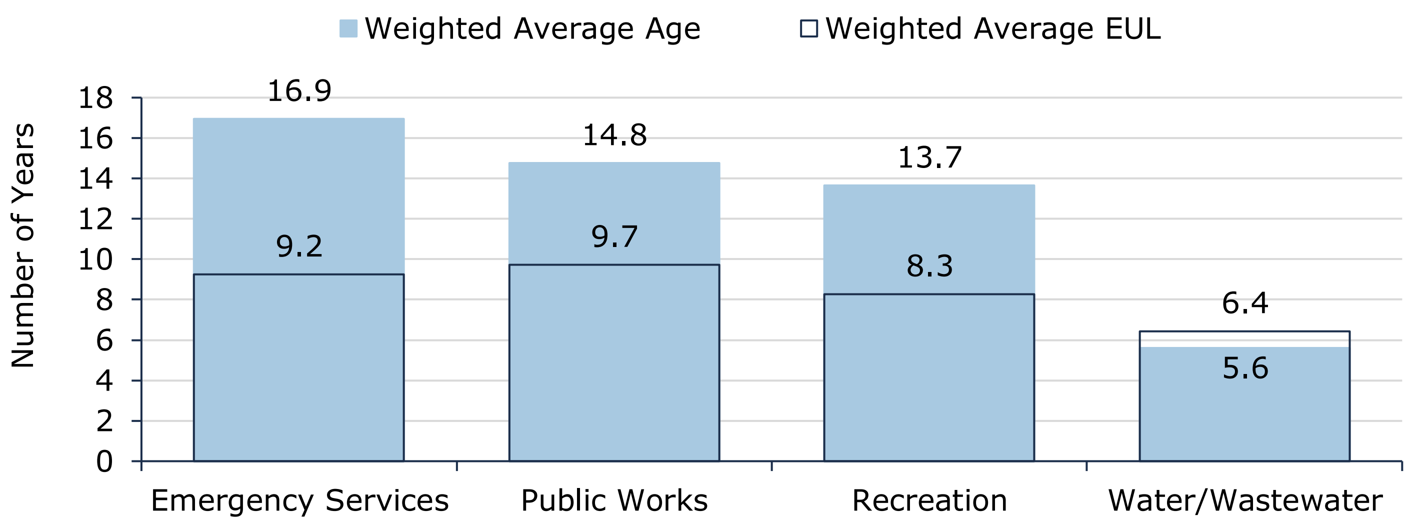

Figure 62 Estimated Useful Life vs. Asset Age: Vehicles & Heavy Equipment

Age analysis indicates that most vehicles and heavy equipment have surpassed their expected useful life, with the exception of water and wastewater vehicles, which are within a year of their stated EUL. Emergency services, public works, and recreation vehicles have significantly exceeded their EULs.

11.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Oil changes and routine maintenance is completed as per manufacturer recommendations
	All other maintenance activities are completed on a reactive basis when operational issues are identified (e.g., mechanical breakdown, deficiencies identified during daily inspections)
Replacement	Replacement is prioritized on an assets perceived remaining useful life or if annual maintenance costs become too high as asset ages
Inspections	Vehicles are inspected by the operator daily before use, however, these inspections identify deficiencies but do not provide overall condition ratings

Table 40 Lifecycle Management Strategy: Vehicles & Heavy Equipment

11.5 Forecasted Long-Term Replacement Needs

Figure 63 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the Municipality's vehicles and heavy equipment portfolio. This analysis was run until 2033 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $1 million for all vehicles. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to rise considerably in the current decade, peaking at $4 million by 2028 as vehicles reach the end of their useful life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

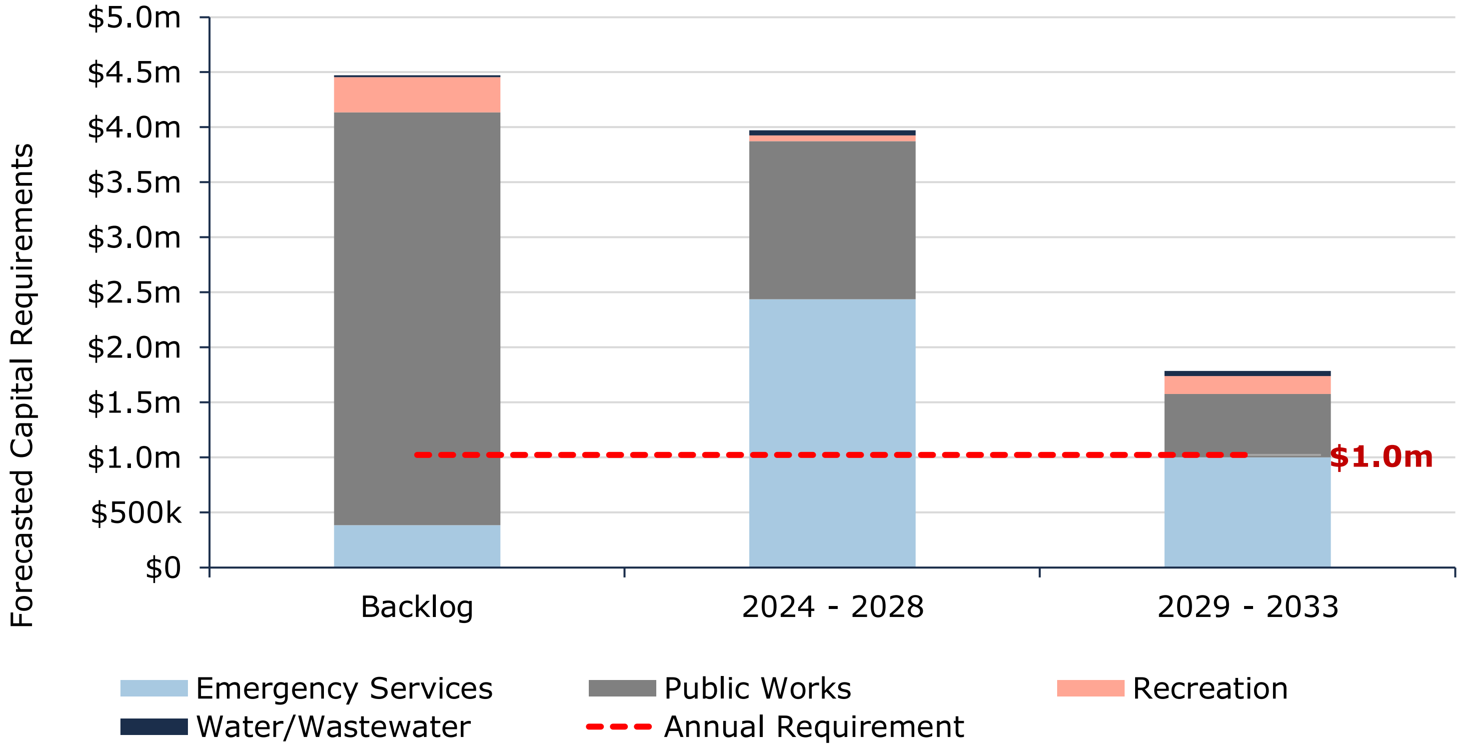

Figure 63 Forecasted Capital Replacement Needs: Vehicles & Heavy Equipment 2024-2033

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

11.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, and department or service area. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 Very Low	5 - 7 Low	8 - 9 Moderate	10 - 14 High	15 - 25 Very High
- (0%)	$97,097 (1%)	$298,251 (3%)	$920,488 (10%)	$7,934,557 (86%)

Figure 64 Risk Matrix: Vehicles & Heavy Equipment

11.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the Municipality has selected for this AMP.

11.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include images, of the types of vehicles (i.e. light, medium, and heavy duty) that the municipality operates and the services that they help to provide to the community	Emergency Services vehicles include water tankers, pumpers, service trucks, and rescue trucks. Recreation vehicles include light duty pick-up trucks, mowers, tractors and ice machines/surfacers for services such as arena and park maintenance. Public Works vehicles include light and heavy duty trucks ranging from mowers, pick-up trucks, graders, backhoe to snow plows in order to ensure safe road conditions and managing infrastructure projects. Water & Wastewater services vehicles includes a light duty pick-up truck and utility vehicle, to facilitate water and wastewater systems inspections and maintenance.

Table 41 Community Levels of Service: Vehicles & Heavy Equipment

11.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Quality	Average condition of vehicles and heavy equipment	7%
Performance	% of vehicle and heavy equipment assets in poor or very poor condition	91%
	Target capital reinvestment rate	11.1% $1.0m/year

Table 42 Technical Levels of Service: Vehicles & Heavy Equipment

12. Machinery & Equipment

The Municipality's machinery and equipment portfolio includes 148 pooled assets that support a variety of corporate and public works services, including recreation and emergency services. The total current replacement of machinery and equipment is estimated at approximately $4.4 million.

12.1 Inventory & Valuation

Table 43 summarizes the quantity and current replacement cost of all machinery and equipment assets available in the Municipality's asset register.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Corporate	3	Assets	$75,000	User-Defined
Emergency Services	8	Assets	$254,389	User-Defined
Public Works	3	Assets	$100,000	User-Defined
Recreation	134	Assets	$3,987,867	CPI
TOTAL			**$4,417,256**	

Table 43 Detailed Asset Inventory: Machinery & Equipment

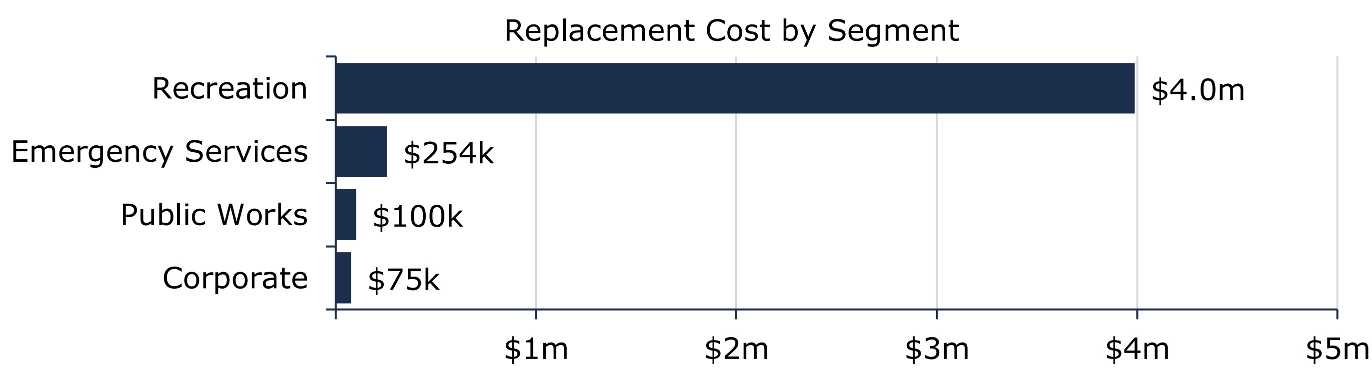

Figure 65 Portfolio Valuation: Machinery & Equipment

12.2 Asset Condition

Figure 66 summarizes the replacement cost-weighted condition of the Municipality's machinery and equipment portfolio. Based only on age data, 15% of assets are in fair or better condition; the remaining 85% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

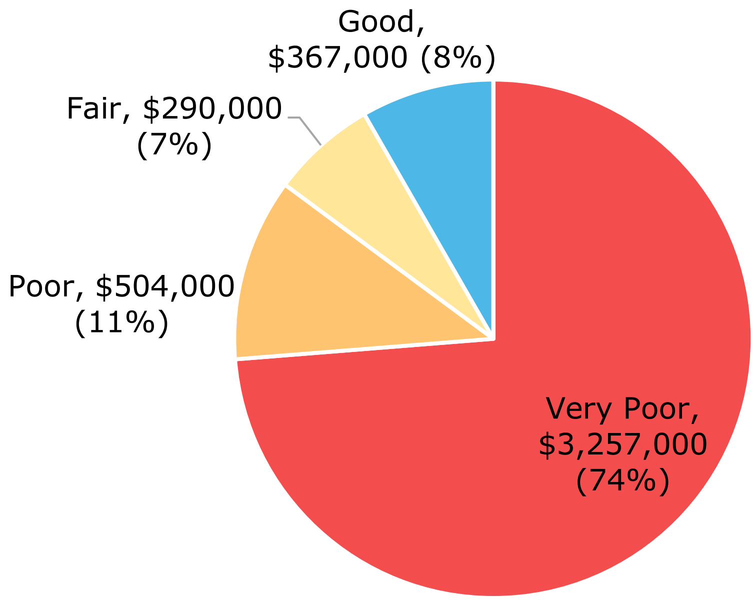

Figure 66 Asset Condition: Machinery & Equipment Overall

Figure 67 summarizes the age-based condition of machinery and equipment by each department. The majority of assets that support fire services are in fair or better condition. Assets in poor or worse condition are concentrated primarily in corporate and recreation.

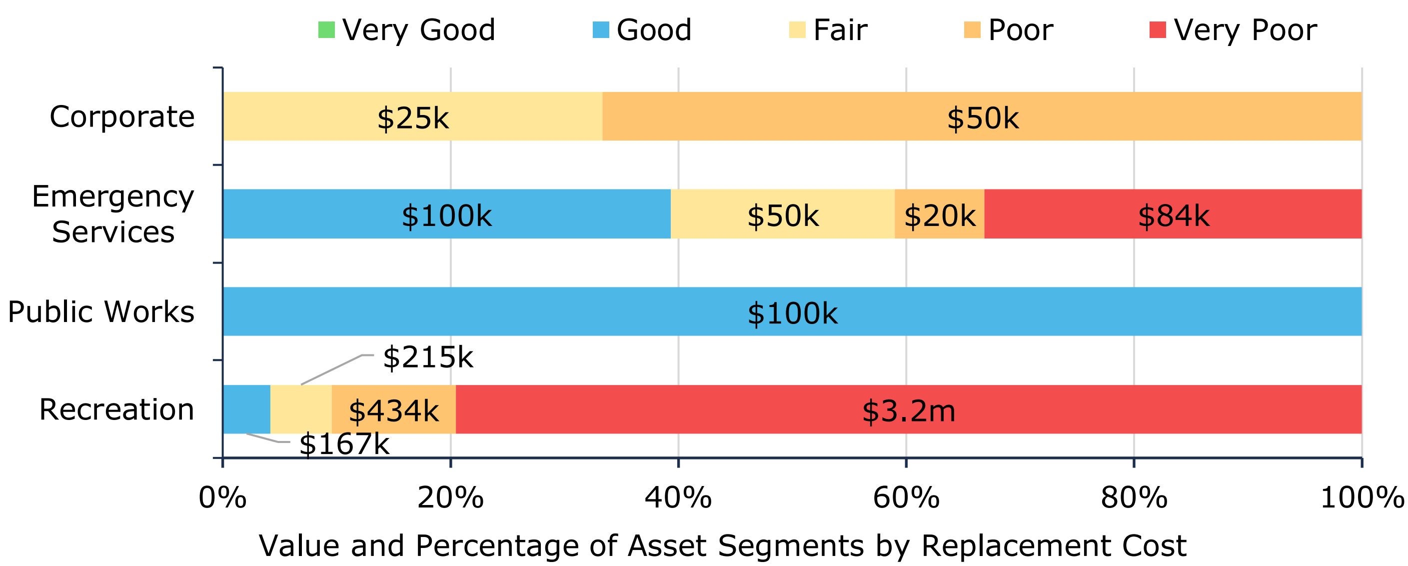

Figure 67 Asset Condition: Machinery & Equipment by Segment

12.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 68 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

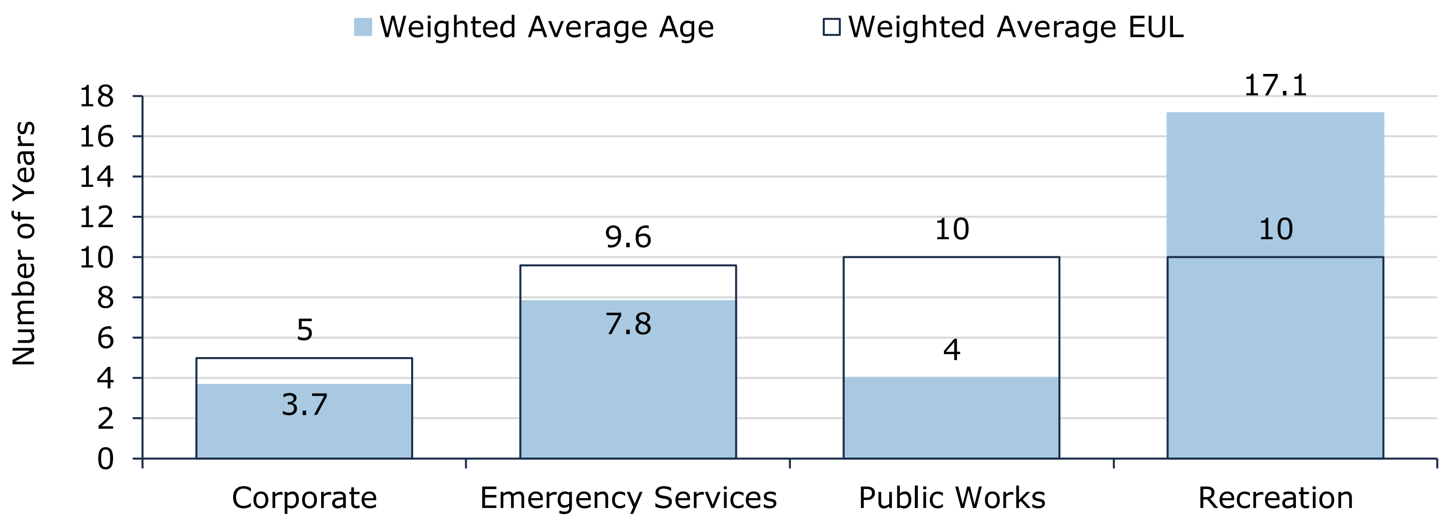

Figure 68 Estimated Useful Life vs. Asset Age: Machinery & Equipment

Age analysis reveals that, on average, with the exception of public works, most machinery and equipment assets are in the latter stages of their expected life, or well surpassed in the case of recreation assets.

12.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the Municipality's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Routine maintenance is completed as per manufacturer recommendations; which is generally triggered by usage (operating hours)
	All other maintenance activities are completed on a reactive basis when operational issues are identified (e.g., mechanical breakdown, deficiencies identified during daily inspections)
Replacement	Replacement is considered when an asset's condition has degraded to poor, and its annual cost of maintenance is no longer cost-effective.
	Replacement is also prioritized in accordance with an assets criticality to its respective department
Inspections	Equipment is inspected daily as part of the equipment's circle check. Ratings (Good, Fair, Poor) are inferred from daily inspections.

Table 44 Lifecycle Management Strategy: Machinery & Equipment

12.5 Forecasted Long-Term Replacement Needs

Figure 69 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the Municipality's machinery and equipment portfolio. This analysis was run until 2033 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the Municipality's primary asset management system and asset register. The Municipality's average annual requirements (red dotted line) total $451,000 for all machinery and equipment. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to remain consistent over the indicated projection period, peaking at $1.1 million in the next five years. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

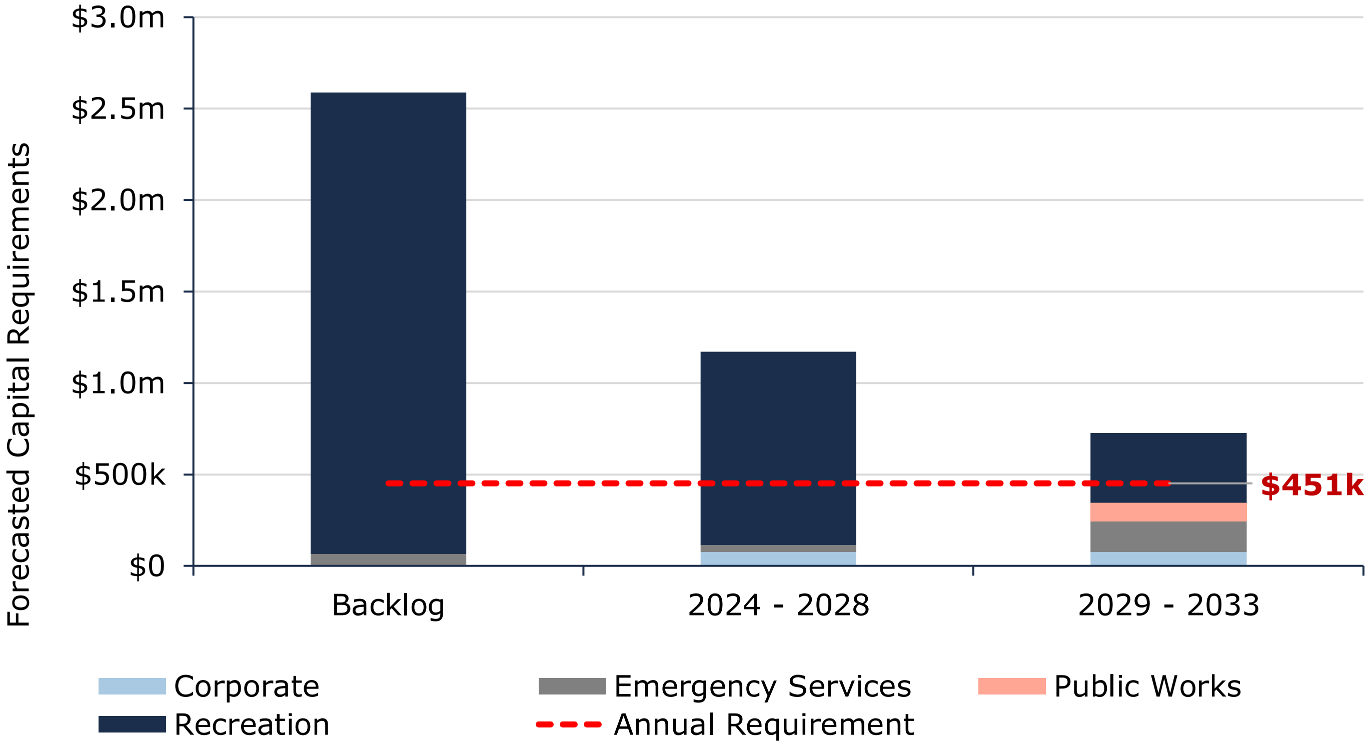

Figure 69 Forecasted Capital Replacement Needs: Machinery & Equipment 2024-2033

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

12.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, and replacement costs. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the Municipality may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the Municipality's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

1 - 4 Very Low	5 - 7 Low	8 - 9 Moderate	10 - 14 High	15 - 25 Very High
$192,154 (4%)	$862,241 (20%)	$108,911 (2%)	$1,010,385 (23%)	$2,243,565 (51%)

Figure 70 Risk Matrix: Machinery & Equipment

12.7 Levels of Service

The tables that follow summarize the Municipality's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the Municipality has selected for this AMP.

12.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include images, of the types of equipment that the municipality operates and the services that they help to provide to the community	Corporate is supported by equipment such as computer hardware and software systems. Emergency Services is supported by equipment such as thermal imaging cameras, washers, extractors, spreaders and cutters. Public Works machinery and equipment is supported by varying types of mowers. Recreation is supported by equipment such as kitchen appliances, lighting, generators, lawnmowers, recreation and entertainment equipment, HVAC systems and furniture.

Table 45 Community Levels of Service: Machinery & Equipment

12.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Quality	Average condition of machinery and equipment assets	11%
Performance	% of machinery and equipment assets in poor or very poor condition	85%
	Target capital reinvestment rate	10.2% $451k/year

Table 46 Technical Levels of Service: Machinery & Equipment

Strategies

13. Growth

The demand for infrastructure and services will change over time based on a combination of internal and external factors. Understanding the key drivers of growth and demand will allow the Municipality to plan for new infrastructure more effectively, and the upgrade or disposal of existing infrastructure. Increases or decreases in demand can affect what assets are needed and what level of service meets the needs of the community.

13.1 North Middlesex Official Plan (June 2003)

The Municipality adopted an Official Plan to ensure conformance with the County of Middlesex and establish an appropriate planning framework. The purpose of the Official Plan is to establish a comprehensive policy framework aimed at guiding its maintenance, growth, and development over a 20-year period. This plan is designed to ensure a sustainable living environment that meets the needs of the community, promotes orderly growth and economic development through efficient land use, and preserves the natural environment.

The Official Plan for North Middlesex sets clear policies and land use designations to guide future development, reduce uncertainty, and balance residential, economic, and agricultural needs. It emphasizes the maintenance of service levels, agricultural viability, and the integrity of natural and built environments. The plan provides guidance for council on physical changes, enhances community facilities, and fosters community centers as cultural hubs. Strategic zoning and planning strategies, alongside periodic reviews, ensure protection against inappropriate development and support a sustainable municipal growth.

The Municipality of North Middlesex organizes its settlements into a three-tier hierarchy as established by the Middlesex County Official Plan, comprising Urban Settlement Areas, Community Settlement Areas, and Hamlet Settlement Areas. Urban areas are fully serviced and designated for high-density land use and significant growth. Community areas offer a mix of piped water and private sewage systems, serving agricultural surroundings with moderate development. Hamlets provide limited services and are intended for minimal growth, primarily through infill. This structure supports planned, phased development, with strict boundaries and provisions for future expansions requiring official amendments and thorough studies to ensure suitability and sustainability.

Table 47 outlines the recorded population and private dwellings for North Middlesex, based on 2021 Census data.

Historical Figures	1996	2001	2006	2011	2016	2021
Population	6,978	6,901	6,740	6,658	6,352	6,307
Population Change	N/A	-1.1%	-2.3%	-1.2%	-4.6%	-0.7%
Private Dwellings	N/A	2,436	2,421	2,342	2,399	2,481

Table 47 North Middlesex Historical Growth

The population target of around 7,600 by 2022 was set based on historical trends and projections from the Middlesex County Official Plan. However, census data from 2021 shows that the municipality's growth rate is not meeting these expectations.

13.2 Impact of Growth on Lifecycle Activities

By July 1, 2025, the Municipality's asset management plan must include a discussion of how the assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management and financial strategy.

Planning for forecasted population growth may require the expansion of existing infrastructure and services. As growth-related assets are constructed or acquired, they should be integrated into the Municipality's AMP. While the addition of residential units will add to the existing assessment base and offset some of the costs associated with growth, the Municipality will need to review the lifecycle costs of growth-related infrastructure. These costs should be considered in long-term funding strategies that are designed to, at a minimum, maintain the current level of service.

14. Recommendations & Key Considerations

14.1 Financial Strategies

1. In order to maintain the current levels of service and to fulfill the currently outlined lifecycle strategies, the Municipality of North Middlesex should aim to spend an average of $20.2 million per year on capital infrastructure (not including expansion or services).

2. As part of the 2025 iteration of the Asset Management Plan, historical funding should be analyzed to provide a financial strategy for appropriately funding municipally owned infrastructure.

14.2 Asset Data

1. To ensure data consistency and accuracy, implementation of a data governance policy and procedures is recommended.

2. Continuously review, refine, and calibrate lifecycle and risk profiles to better reflect actual practices and improve capital projections. In particular:
    a. the timing of various lifecycle events, the triggers for treatment, anticipated impacts of each treatment, and costs
    b. the various attributes used to estimate the likelihood and consequence of asset failures, and their respective weightings

3. Asset management planning is highly sensitive to replacement costs. Periodically update replacement costs based on recent projects, invoices, or estimates, as well as condition assessments, or any other technical reports and studies. Material and labour costs can fluctuate due to local, regional, and broader market trends, and substantially so during major world events. Accurately estimating the replacement cost of like-for-like assets can be challenging. Ideally, several recent projects over multiple years should be used. Staff judgement and historical data can help attenuate extreme and temporary fluctuations in cost estimates and keep them realistic.

4. Like replacement costs, an asset's established serviceable life can have dramatic impacts on all projections and analyses, including condition, long-range forecasting, and financial recommendations. Periodically reviewing and updating these values to better reflect in-field performance and staff judgement is recommended.

5. To enhance the accuracy of asset condition analysis, it is crucial to improve data quality, particularly regarding in-service dates. Discrepancies, such as assets being recorded based on inventory entry dates rather than actual construction dates, can skew results and misrepresent asset condition and lifecycle stage. Establishing more precise data validation processes and ensuring that historical asset records accurately reflect construction timelines will help provide a more reliable basis for decision-making and long-term asset management planning.

6. Currently only 4% of assets within the inventory have assessed condition data. It is strongly recommended to implement a condition assessment program for capital assets to increase reliability of long-term cost forecasting.
    a. A Buildings Condition Assessment was completed in 2021, however, does not match the inventory within the Municipality's asset register. Staff should discuss opportunities for this information to be better utilized within the Municipality's asset management software.

14.3 Risk & Levels of Service

1. Risk models and matrices can play an important role in identifying high-value assets, and developing an action plan which may include repair, rehabilitation, replacement, or further evaluation through condition assessments. As a result, project selection and the development of multi-year capital plans can become more strategic and objective. Initial models have been built into Citywide for all asset groups. These models reflect current data, which was limited. As the data evolves and new attribute information is obtained, these models should also be refined and updated.

2. Available data on current performance should be centralized and tracked to support any calibration of service levels ahead of O. Reg. 588's 2025 requirements on proposed levels of service.

3. Staff should monitor evolving local, regional, and environmental trends to identify factors that may shape the demand and delivery of infrastructure programs. These can include population growth, and the nature of population growth; climate change and extreme weather events; and economic conditions and the local tax base. This data can also be used to review service level targets.

Appendices

Appendix A – Infrastructure Report Card

Asset Category	Replacement Cost	Average Condition	Financial Requirements	
Road Network	**$443.1 m**	**Good**	Annual Requirement:	$8,648,000
Bridges & Culverts	**$34.9 m**	**Good**	Annual Requirement:	$530,000
Water Network	**$502.5 m**	**Very Good**	Annual Requirement:	$6,915,000
Sanitary Sewer Network	**$74.4 m**	**Good**	Annual Requirement:	$1,093,000
Stormwater Network	**$45.5 m**	**Fair**	Annual Requirement:	$483,000
Buildings & Facilities	**$26.6 m**	**Poor**	Annual Requirement:	$671,000
Land Improvements	**$4.9 m**	**Very Poor**	Annual Requirement:	$401,000
Vehicles & Heavy Equipment	**$9.2 m**	**Very Poor**	Annual Requirement:	$1,024,000
Machinery & Equipment	**$4.4 m**	**Very Poor**	Annual Requirement:	$451,000
Total Portfolio	**$1.1 b**	**Good**	**Annual Requirement:**	**$20,214,000**

Appendix B – 10-Year Capital Requirements

The tables below summarize the projected cost of lifecycle activities (rehabilitation and replacements) that may be undertaken over the next 10 years to support current levels of service.

These projections are generated in Citywide software and rely on the data available in the Municipality's asset listing. Assessed condition data and replacement costs were used to assist in forecasting replacement needs for roads. For all remaining assets, only age was used to determine forthcoming replacement needs.

The projections can be different from actual capital forecasts. Consistent data updates, particularly condition, replacement costs, and regular upkeep of lifecycle models, will improve the alignment between the system generated expenditure requirements, and the Municipality's capital expenditure forecasts.

Road Network

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Asphalt Roads	$69.4m	$636k	$5.4m	$2.0m	$8.5m	$652k	$3.1m	$3.6m	$2.2m	-	-
Sidewalks	-	-	$703k	-	-	-	-	-	-	$310k	-
Streetlights	-	$533k	$935k	-	-	-	$92k	-	-	$44k	-
Total	**$69.4m**	**$1.2m**	**$7.0m**	**$2.0m**	**$8.5m**	**$652k**	**$3.2m**	**$3.6m**	**$2.2m**	**$354k**	**-**

Table 48 System Generated 10-Year Capital Replacement Forecast: Road Network

Bridges & Culverts

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Bridges & Structural Culverts	-	-	-	-	-	-	-	-	-	-	$3.6m
Non-Structural Culverts	$193k	-	-	-	-	$939k	-	-	-	-	-
Total	**$193k**	**-**	**-**	**-**	**-**	**$939k**	**-**	**-**	**-**	**-**	**$3.6m**

Table 49 System Generated 10-Year Capital Replacement Forecast: Bridges & Culverts

Water Network

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hydrants	-	-	-	-	-	-	-	-	-	-	-
Water Facilities	-	-	-	-	-	-	-	-	-	-	-
Water Mains	-	-	-	-	-	-	$701k	$179k	-	-	-
Water Meters	-	-	$623k	-	-	-	-	-	-	-	-
Water Valves	$644k	$22k	$44k	-	$11k	-	$38k	$644k	$66k	-	$11k
Total	**$644k**	**$22k**	**$667k**	**-**	**$11k**	**-**	**$739k**	**$823k**	**$66k**	**-**	**$11k**

Table 50 System Generated 10-Year Capital Replacement Forecast: Water Network

Sanitary Sewer Network

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Sanitary Facilities	$459k	-	-	-	-	-	-	-	-	-	-
Sanitary Mains	-	-	-	-	-	-	-	-	$588k	-	-
Sanitary Manholes	-	-	-	-	-	-	-	-	-	-	-
Total	**$459k**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**$588k**	**-**	**-**

Table 51 System Generated 10-Year Capital Replacement Forecast: Sanitary Sewer Network

Stormwater Network

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Storm Mains	$846k	-	$18.5m	-	-	-	-	-	-	-	-
Storm Manholes	-	-	$60k	-	-	-	$75k	-	-	-	-
Total	**$846k**	**-**	**$18.6m**	**-**	**-**	**-**	**$75k**	**-**	**-**	**-**	**-**

Table 52 System Generated 10-Year Capital Replacement Forecast: Stormwater Network

Buildings & Facilities

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Corporate	-	-	-	-	-	-	-	-	-	-	-
Emergency Services	$469k	$831k	-	-	-	-	-	-	-	-	-
Public Works	$1.3m	$292k	-	-	-	-	-	-	-	$972k	$329k
Recreation	$5.8m	-	$168k	-	-	-	$78k	-	$189k	-	-
Total	**$7.6m**	**$1.1m**	**$168k**	**-**	**-**	**-**	**$78k**	**-**	**$189k**	**$972k**	**$329k**

Table 53 System Generated 10-Year Capital Replacement Forecast: Buildings & Facilities

Land Improvements

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Parking Lots	-	-	-	-	-	-	-	-	-	-	-
Parks, Sports Fields & Courts	$1.3m	$32k	-	-	$259k	-	$21k	$352k	-	-	$35k
Pavilions & Gazebos	$580k	-	-	$24k	-	$235k	$99k	$370k	$29k	-	-
Playground Structures	$632k	$124k	$348k	$13k	-	-	-	-	$244k	-	-
Total	**$2.5m**	**$156k**	**$348k**	**$37k**	**$259k**	**$235k**	**$120k**	**$722k**	**$273k**	**-**	**$35k**

Table 54 System Generated 10-Year Capital Replacement Forecast: Land Improvements

Vehicles & Heavy Equipment

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Emergency Services	$383k	$2.0m	$440k	-	-	-	$560k	$440k	-	-	-
Public Works	$3.8m	-	$975k	$228k	$231k	-	$301k	$275k	-	-	-
Recreation	$320k	$35k	-	-	$18k	-	$137k	-	$25k	-	-
Water/Wastewater	$19k	-	-	$48k	-	-	-	-	$48k	-	-
Total	**$4.5m**	**$2.0m**	**$1.4m**	**$276k**	**$249k**	**-**	**$999k**	**$715k**	**$73k**	**-**	**-**

Table 55 System Generated 10-Year Capital Replacement Forecast: Vehicles & Heavy Equipment

Machinery & Equipment

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Corporate	-	-	$50k	$25k	-	-	-	$50k	$25k	-	-
Emergency Services	$65k	-	$39k	-	-	-	$50k	$70k	$50k	-	-
Public Works	-	-	-	-	-	-	-	$100k	-	-	-
Recreation	$2.5m	$300k	$215k	$293k	$275k	-	$215k	$60k	$107k	-	-
Total	**$2.6m**	**$300k**	**$304k**	**$318k**	**$275k**	**-**	**$265k**	**$280k**	**$182k**	**-**	**-**

Table 56 System Generated 10-Year Capital Replacement Forecast: Machinery & Equipment

Appendix C – Level of Service Maps & Photos

Road Network

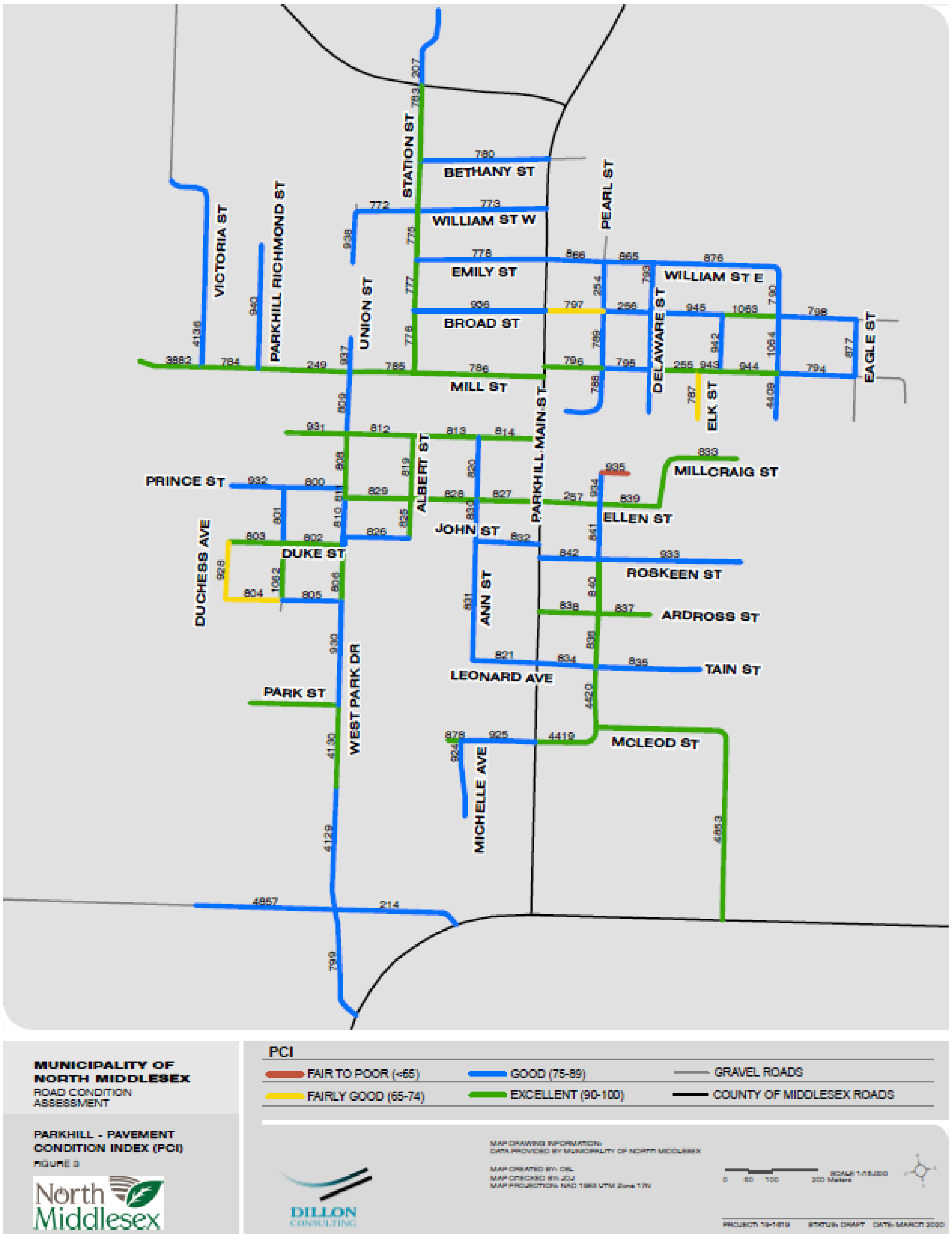

Figure 71 Road Network Extents (Parkhill)

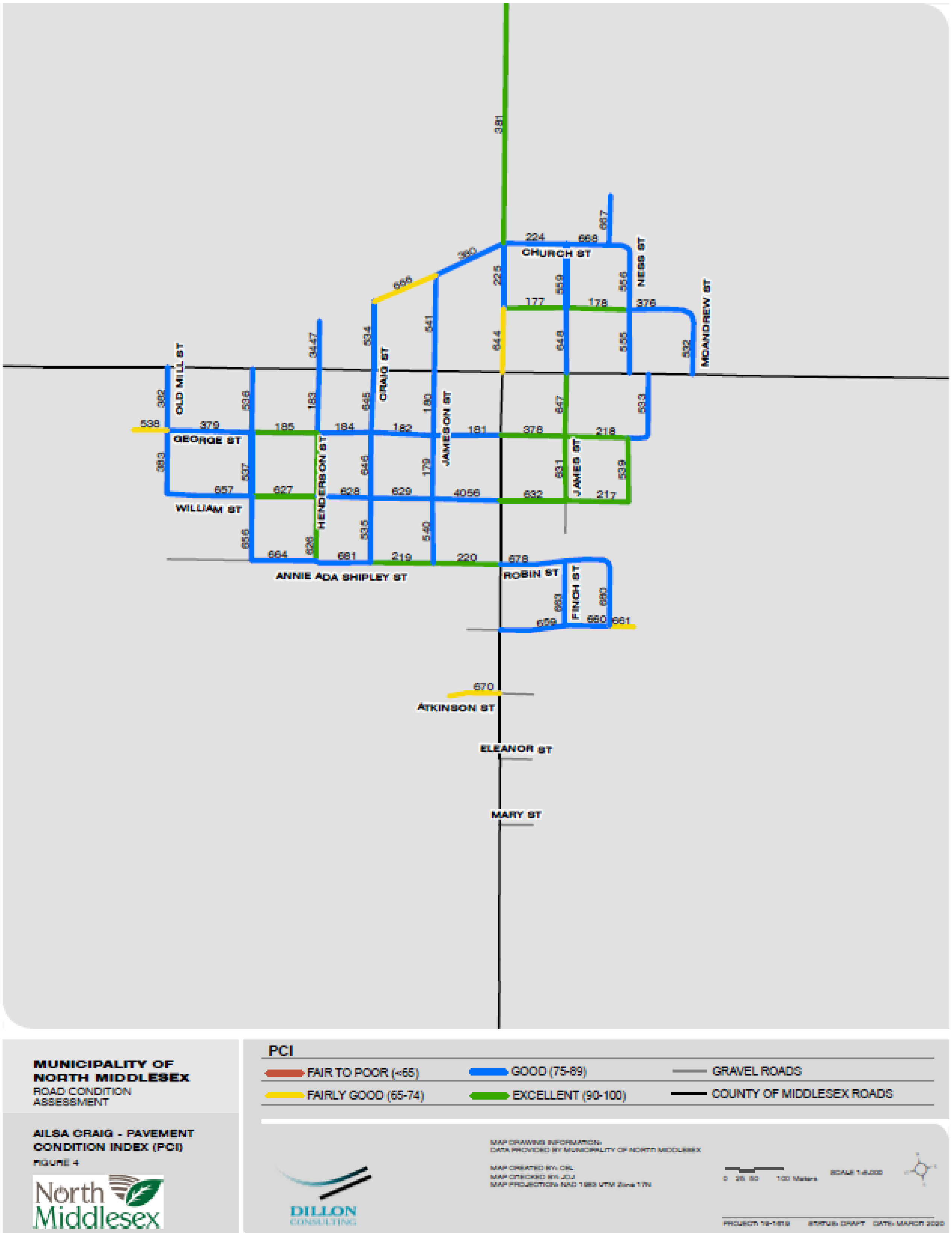

Figure 72 Road Network Extents (Alisa Craig)

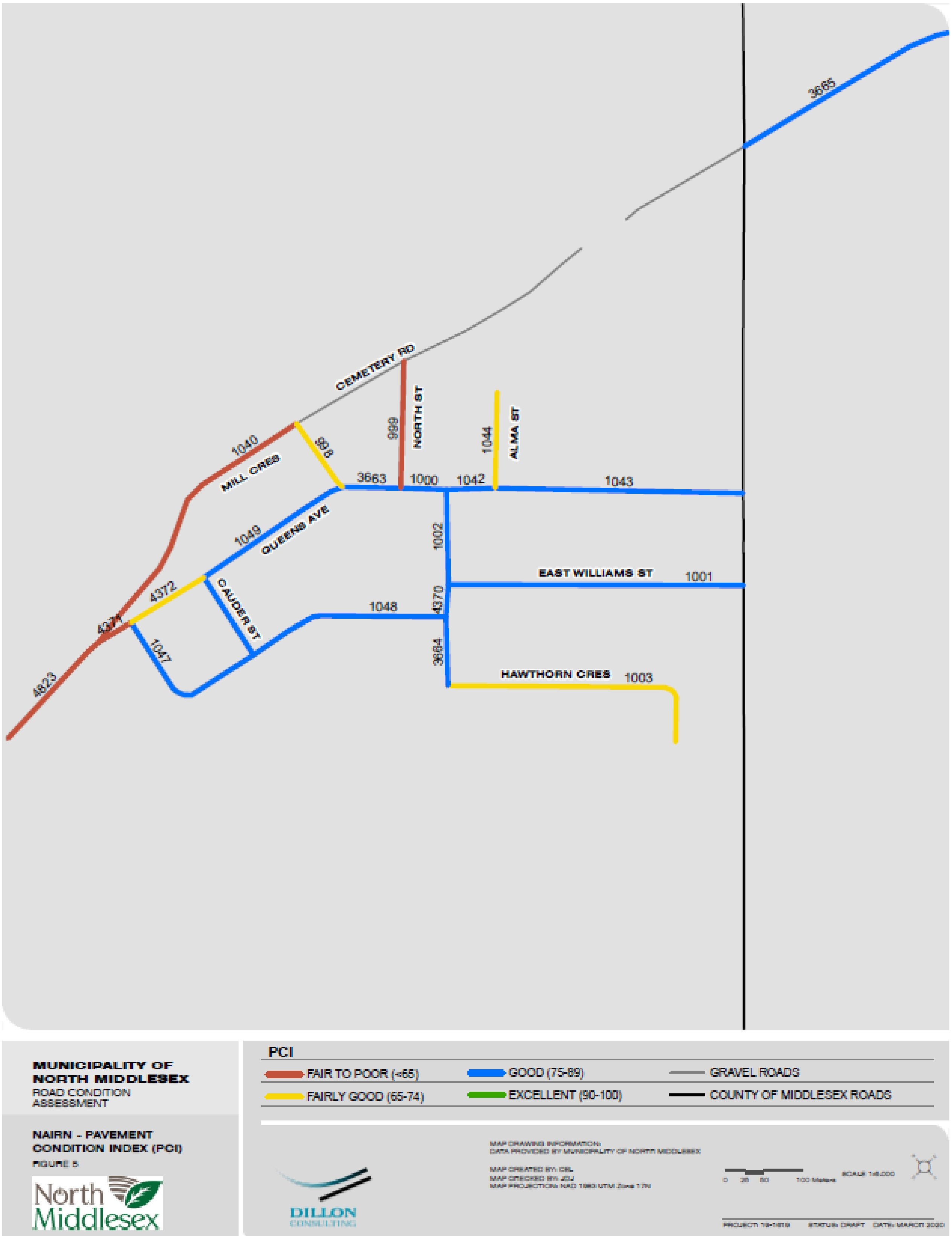

Figure 73 Road Network Extents (Nairn)

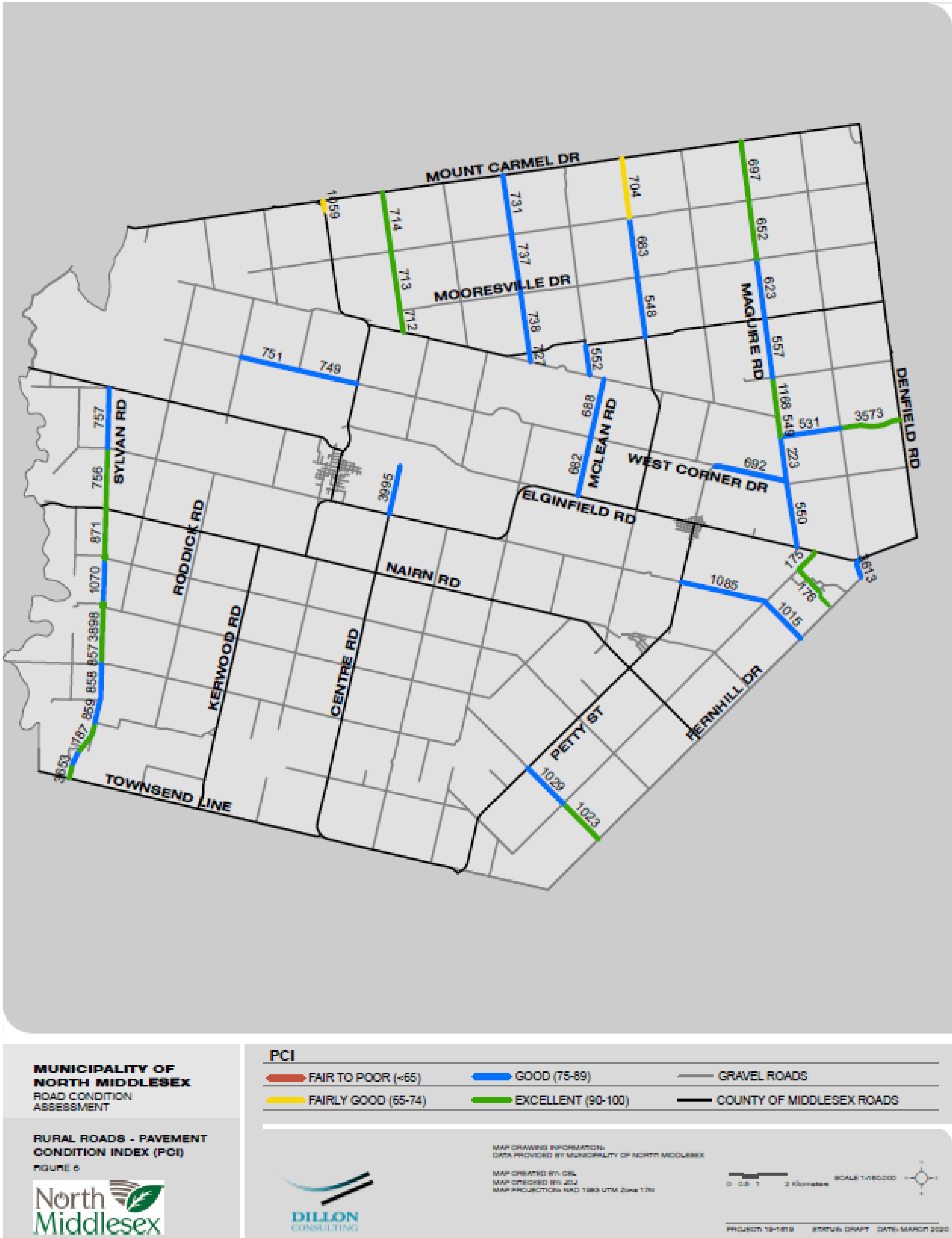

Figure 74 Road Network Extents (Rural Roads)

Bridges & Culverts

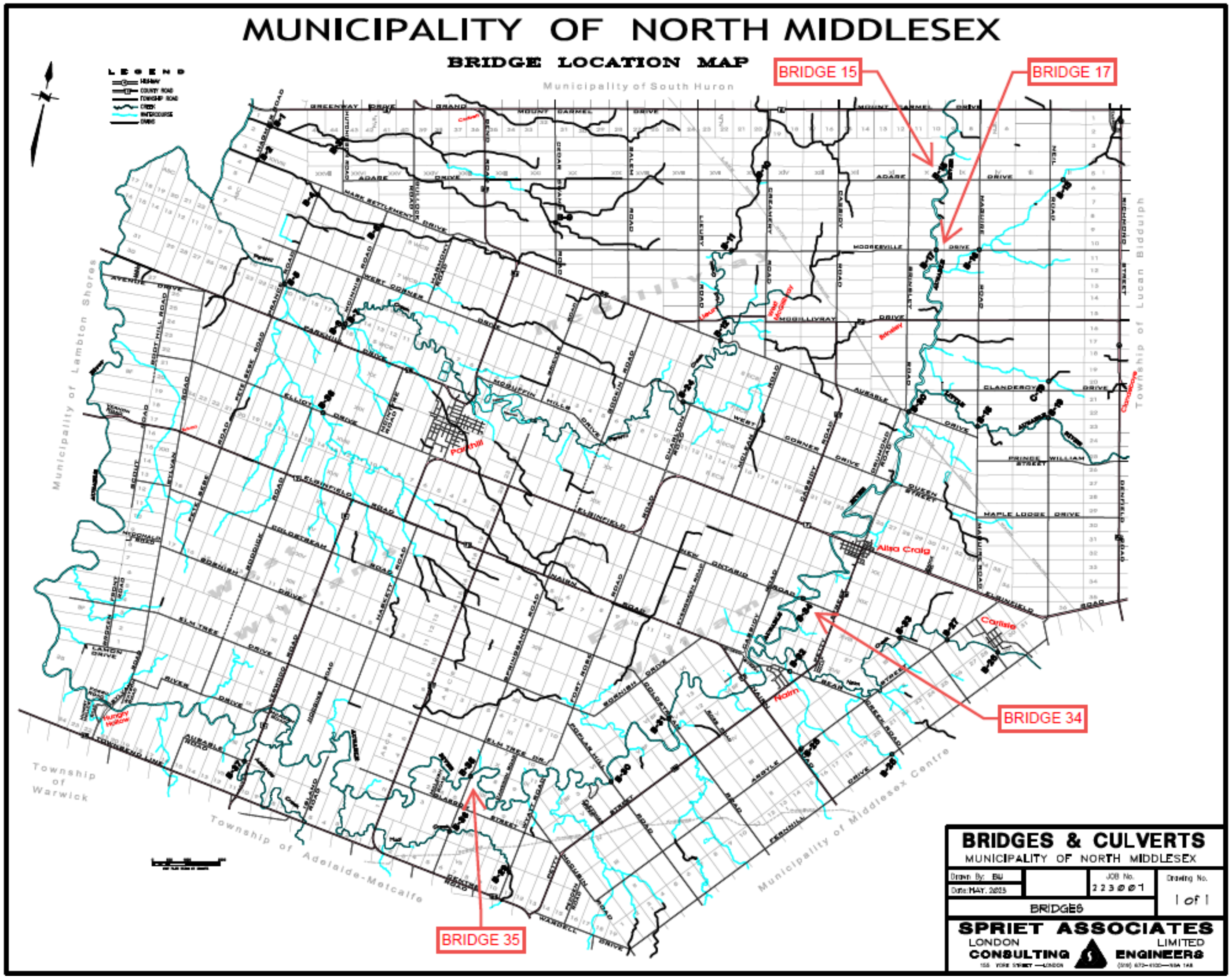

Figure 75 Bridge Locations

Water Network

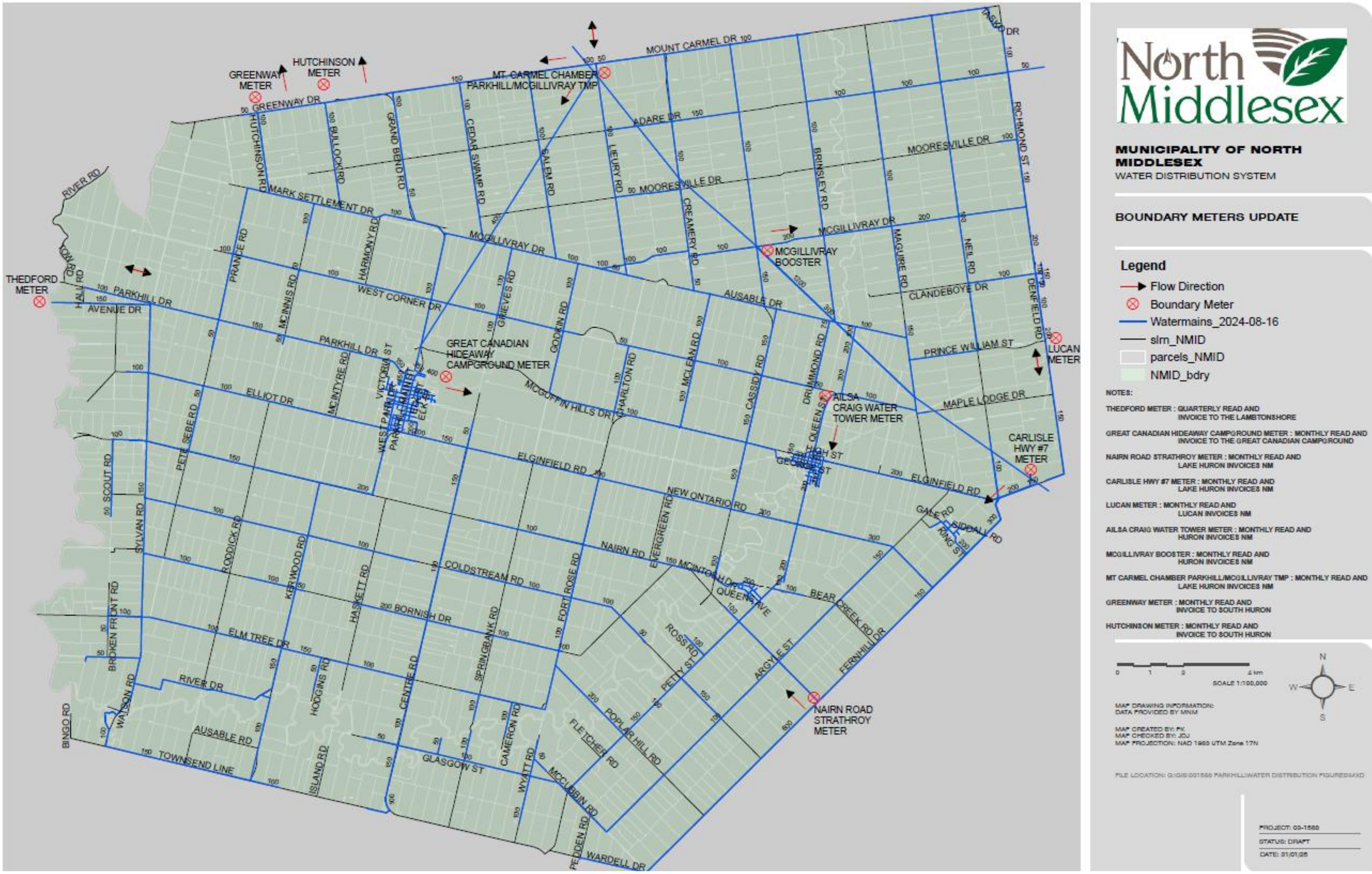

Figure 76 Watermain Extents

Appendix D – Risk Rating Criteria

Probability of Failure

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
Road Network (Asphalt Roads)	Condition	68%	80-100	1
			70-79	2
			50-69	3
			40-49	4
			0-39	5
	Service Life Remaining (%)	12%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	AADT	20%	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	5
Road Network (Gravel Roads)	Condition	68%	80-100	1
			70-79	2
			50-69	3
			40-49	4
			0-39	5
	Service Life Remaining (%)	12%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	AADT	20%	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	5
Bridges & Structural Culverts	Condition	68%	80-100	1
			70-79	2
			60-69	3

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			50-59	4
			0-49	5
	Service Life Remaining (%)	12%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	AADT	20%	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	5
Non-Structural Culverts	Condition	68%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
	Service Life Remaining (%)	12%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	AADT	20%	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	5
Storm Sewer Network (Mains)	Condition	59%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
	Service Life Remaining (%)	13%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	Material	13%	CSP	4
			Concrete	3

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			PVC	2
	Slope	15%	1+	1
			0.75-1	2
			0.50-0.74	3
			0.25-0.49	4
			0-0.24	5
Sanitary Sewer Network (Mains)	Condition	59%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
	Service Life Remaining (%)	13%	40+	1
			30-39	2
			20-29	3
			10-19	4
			0-9	5
	Material	13%	Steel	4
			Concrete, AC CL4000, AC CL3000	3
			HDPE	2
			PVC	1
	Slope	15%	1+	1
			0.75-1	2
			0.50-0.74	3
			0.25-0.49	4
			0-0.24	5
Water Network (Mains)	Condition	65%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
	Service Life Remaining (%)	10%	40+	1
			30-39	2
			20-29	3
			10-19	4

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			0-9	5
	# of Watermain Breaks	15%	8+	1
			6-7	2
			4-5	3
			2-3	4
			0-1	5
	Material	10%	Cast Iron	4
			Ductile Iron	3
			PVC	2

Consequence of Failure

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
Road Network (Asphalt Roads)	Economic (70%)	Curb (15%)	No	1
			Yes	3
		Gutter (15%)	No	1
			Yes	3
		Replacement Cost Per Sq. M. (70%)	0-59	1
			60-61	2
			62-63	3
			64-69	4
			70+	5
	Social (15%)	Road Class (100%)	C6	1
			C5	2
			C4,C3	3
			C2	4
			C1	5
	Health & Safety (15%)	Speed (100%)	0-39	1
			40-49	2
			50-59	3
			60-79	4
			80-100	5
	Economic (70%)	Replacement Cost Per Sq.M (100%)	0-9	1
			10-14	2
			15-19	3
			20-24	4

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
Road Network (Gravel Roads)			25+	5
	Social (15%)	Road Class (100%)	C6	1
			C5	2
			C4,C3	3
			C2	4
			C1	5
	Health & Safety (15%)	Speed (100%)	0-39	1
			40-49	2
			50-59	3
			60-79	4
			80-100	5
Bridges & Structural Culverts	Economic (55%)	Replacement Cost (100%)	$0-$70,000	1
			$70,000-$150,000	2
			$150,000-$250,000	3
			$250,000-$800,000	4
			$800,000+	5
	Social (30%)	Road Class (40%)	C6	1
			C5	2
			C4,C3	3
			C2	4
			C6	1
		Detour Distance (60%)	Less than 1	1
			1-5	2
			6-10	3
			11-15	4
			15+	5
	Health & Safety (15%)	Speed (100%)	0-39	1
			40-49	2
			50-59	3
			60-79	4
			80-100	5
Non-Structural Culverts	Economic (70%)	Replacement Cost (100%)	$0-$5,000	1
			$5,000-$20,000	2
			$20,000-$30,000	3
			$30,000-$50,000	4
			$50,000+	5
	Social (15%)	Road Class (100%)	C6	1
			C5	2
			C4,C3	3

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
			C2	4
			C6	1
	Health & Safety (15%)	Speed (100%)	0-39	1
			40-49	2
			50-59	3
			60-79	4
			80-100	5
Storm Sewer Network (Mains)	Economic (55%)	Replacement Cost Per Meter (100%)	$0-$450	1
			$451-$700	2
			$701-$5,000	3
			$5,001-$20,000	4
			$20,000+	5
	Operational (15%)	Diameter (100%)	0-100	1
			101-254	2
			255-300	3
			301-675	4
			676-1350	5
	Social (15%)	AADT (100%)	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	1
	Health & Safety (15%)	Proximity to Critical Services (100%)	Rural	1
			Residential	2
			Commercial/Industrial	3
			Schools	4
			Emergency Services	5
Sanitary Sewer Network (Mains)	Economic (45%)	Replacement Cost Per Meter (100%)	$0-$500	1
			$501-$1000	2
			$1,001-$1,300	3
			$1,301-$1,400	4
			$1,400+	5
	Operational (25%)	Diameter (50%)	0-100	1
			101-150	2
			151-200	3
			201-300	4
			300+	5
		#Surcharge/ Blockage Events	Less than 2	1
			2-3	2

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
		(50%)	4-5	3
			6-7	4
			8+	5
	Social (15%)	AADT (100%)	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	1
	Health & Safety (15%)	Proximity to Critical Services (100%)	Rural	1
			Residential	2
			Commercial/Industrial	3
			Schools	4
			Emergency Services	5
Water Network (Mains)	Economic (55%)	Replacement Cost Per Meter (100%)	$0-$300	1
			$301-$500	2
			$501-$600	3
			$601-$950	4
			$950+	5
	Operational (15%)	Diameter (100%)	0-75	1
			76-100	2
			101-150	3
			151-200	4
			201-500	5
	Social (15%)	AADT (100%)	0-49	1
			50-199	2
			200-499	3
			500-999	4
			1000+	1
	Health & Safety (15%)	Proximity to Critical Services (100%)	Rural	1
			Residential	2
			Commercial/Industrial	3
			Schools	4
			Emergency Services	5