Asset Management Plan

Municipality of North Middlesex

2021

This Asset Management Program was prepared by:

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

Key Statistics

Replacement cost of asset portfolio
$475 million

Replacement cost of infrastructure per household
$198,000 (2016 Census)

Percentage of assets in fair or better condition
83%

Percentage of assets with assessed condition data
15%

Annual capital infrastructure deficit
$3.3 million

Recommended timeframe for eliminating annual infrastructure deficit
15-20 Years

Target reinvestment rate
1.1%

Actual reinvestment rate
0.4%

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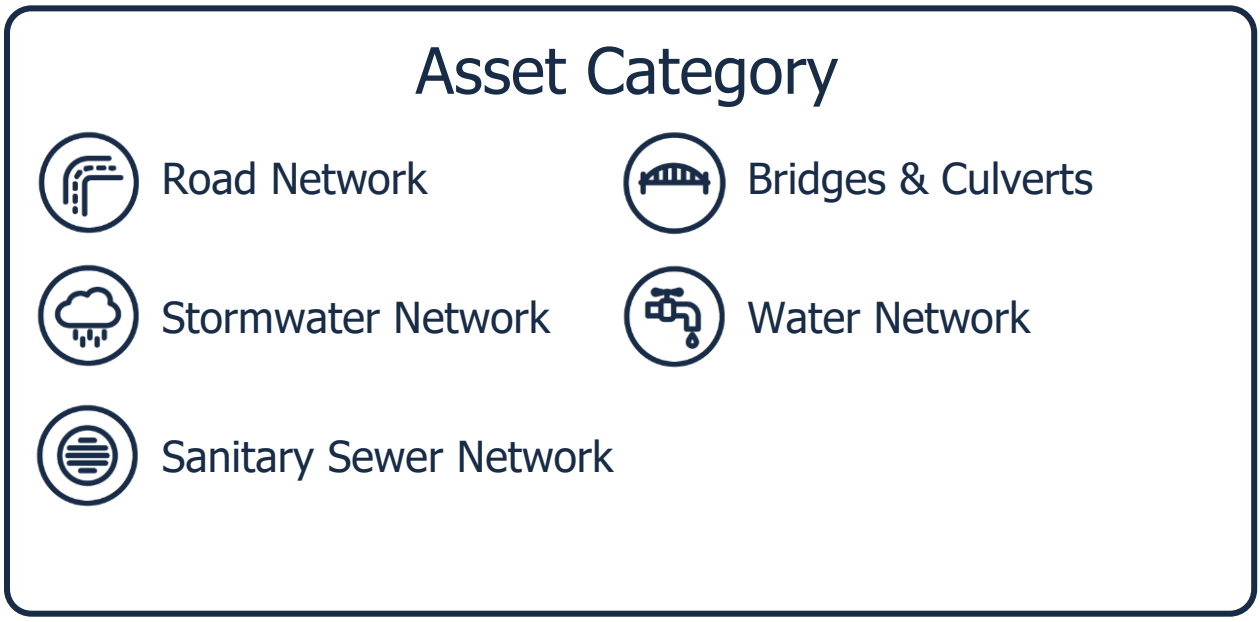
Executive Summary

Municipal infrastructure provides the foundation for the economic, social, and environmental health and growth of a community through the delivery of critical services. The goal of asset management is to deliver an adequate level of service in the most cost-effective manner. This involves the development and implementation of asset management strategies and long-term financial planning.

Scope

This 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 can ensure that public infrastructure is managed to support the sustainable delivery of municipal services.

This AMP include the following asset categories:



With the development of this AMP the Municipality has achieved compliance with O. Reg. 588/17 to the extent of the requirements that must be completed by July 1, 2022. There are additional requirements concerning proposed levels of service and growth that must be met by July 1, 2024 and 2025.

Findings

The overall replacement cost of the asset categories included in this AMP totals $475 million. 85% of all assets analysed in this AMP are in fair or better condition and assessed condition data was available for 15% of assets. For the remaining 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 (asphalt roads, storm sewer mains and sanitary sewer mains) and replacement only strategies (all other assets) to determine the lowest cost option to maintain the current level of service.

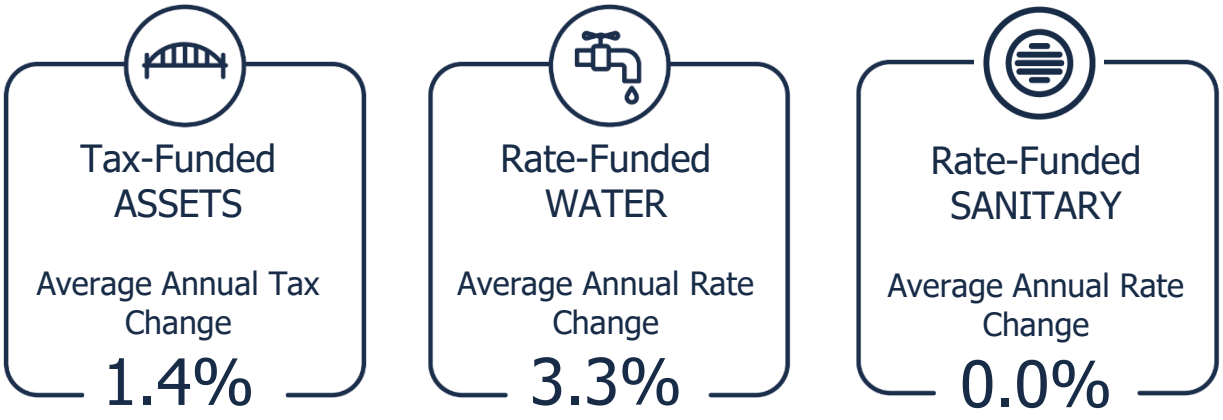
To meet capital replacement and rehabilitation needs for existing infrastructure, prevent infrastructure backlogs, and achieve long-term sustainability, the Municipality's average annual capital requirement totals $6.6 million. Based on a historical analysis of sustainable capital funding sources, the Municipality is committing approximately $3.3 million towards capital projects or reserves per year. As a result, there is currently an annual funding gap of $3.3 million.

Annual Increase Per Household

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.

Recommendations

A financial strategy was developed to address the annual capital funding gap. The following graphics shows annual tax/rate change required to eliminate the Municipality's infrastructure deficit based on a 15-year plan for tax funded assets and 20-year plan for rate funded water and maintain current rate for rate funded sanitary assets:



Recommendations to guide continuous refinement of the Municipality's asset management program. These include:

- Review data to update and maintain a complete and accurate dataset
- Develop a condition assessment strategy with a regular schedule
- Review and update lifecycle management strategies
- Development and regularly review short- and long-term plans to meet capital requirements
- Track current levels of service and identify sustainable proposed levels of service

1 Introduction & Context

Key Insights

- 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 Municipality's asset management policy provides clear direction to staff on their roles and responsibilities regarding asset management

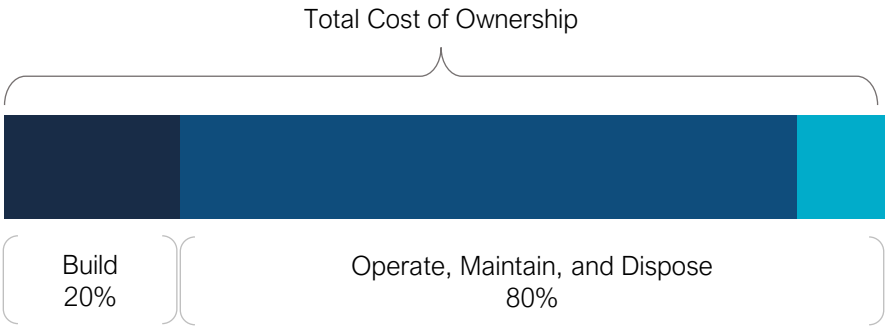
- An asset management plan is a living document that should be updated regularly to inform long-term planning

- Ontario Regulation 588/17 outlines several key milestone and requirements for asset management plans in Ontario between July 1, 2022, and 2025

An Overview of Asset Management

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% derives from operations and maintenance. This AMP focuses its analysis on the capital costs to maintain, rehabilitate and replace existing municipal infrastructure assets.



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.

1.1.1 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 have not developed an Asset Management Policy, However, municipality adopted "Tangible Capital Asset Policy" on September 2nd, 2020, which would be updated every 5 Years.

1.1.2 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 have not developed an Asset Management Strategy. However, the municipality is planning to develop referencing the asset management plan in the upcoming few years.

1.1.3 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.

Key Concepts in Asset Management

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

1.1.4 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.

Lifecycle Activity	Description	Example (Roads)	Cost
Maintenance	Activities that prevent defects or deteriorations from occurring	Crack Seal	$
Rehabilitation/ Renewal	Activities that rectify defects or deficiencies that are already present and may be affecting asset performance	Mill & Re-surface	$$
Replacement/ Reconstruction	Asset end-of-life activities that often involve the complete replacement of assets	Full Reconstruction	$$$

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.

The Municipality's approach to lifecycle management is described within each asset category outlined in this AMP. Developing and implementing a proactive lifecycle strategy will help staff 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.

1.1.5 Risk Management Strategies

Municipalities generally take a 'worst-first' approach to infrastructure spending. Rather than prioritizing assets based on their importance to service delivery, assets in the worst condition are fixed first, regardless of their criticality. However, not all assets are created equal. Some are more important than others, and their failure or disrepair poses more risk to the community than that of others. For example, a road with a high volume of traffic that provides access to critical services poses a higher risk than a low volume rural road. These high-value assets should receive funding before others.

By identifying the various impacts of asset failure and the likelihood that it will fail, risk management strategies can identify critical assets, and determine where maintenance efforts, and spending, should be focused.

This AMP includes a high-level 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.

1.1.6 Levels of Service

A level of service (LOS) is a measure of what the Municipality is providing to the community and the nature and quality of that service. 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.

These measures include a combination of those that have been outlined in O. Reg. 588/17 in addition to performance measures identified by the Municipality as worth measuring and evaluating. 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 (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 asset categories, the Municipality has determined the qualitative descriptions that will be used to determine the community level of service provided. These descriptions can be found in the Levels of Service subsection within each asset category.

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 (Roads, Bridges & Culverts, Water, Wastewater, Stormwater) the Province, through O. Reg. 588/17, has provided technical metrics that are required to be included in this AMP. These metrics can be found in the Levels of Service subsection within each asset category.

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.

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). 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.

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

2019

Strategic Asset Management Policy

2022

Asset Management Plan for Core Assets with the following components:

1. Current levels of service
2. Inventory analysis
3. Lifecycle activities to sustain LOS
4. Cost of lifecycle activities
5. Population and employment forecasts
6. Discussion of growth impacts

2024

Asset Management Plan for Core and Non-Core Assets (same components as 2022)

2025

Asset Management Policy Update and an Asset Management Plan for All Assets with the following additional components:

1. Proposed levels of service for next 10 years
2. Updated inventory analysis
3. Lifecycle management strategy
4. Financial strategy and addressing shortfalls
5. Discussion of how growth assumptions impacted lifecycle and financial

1.1.7 O. Reg. 588/17 Compliance Review

The following table identifies the requirements outlined in Ontario Regulation 588/17 for municipalities to meet by July 1, 2022. Next to each requirement a page or section reference is included in addition to any necessary commentary.

Requirement	O. Reg. Section	AMP Section Reference	Status
Summary of assets in each category	S.5(2), 3(i)	4.1.1 - 5.2.1	Complete
Replacement cost of assets in each category	S.5(2), 3(ii)	4.1.1 - 5.2.1	Complete
Average age of assets in each category	S.5(2), 3(iii)	4.1.3 - 5.2.3	Complete
Condition of core assets in each category	S.5(2), 3(iv)	4.1.2 – 5.2.2	Complete
Description of municipality's approach to assessing the condition of assets in each category	S.5(2), 3(v)	4.1.2 – 5.2.2	Complete
Current levels of service in each category	S.5(2), 1(i-ii)	4.1.6 - 5.2.6	Complete for Core Assets Only
Current performance measures in each category	S.5(2), 2	4.1.6 - 5.2.6	Complete for Core Assets Only
Lifecycle activities needed to maintain current levels of service for 10 years	S.5(2), 4	4.1.4 - 5.2.4	Complete
Costs of providing lifecycle activities for 10 years	S.5(2), 4	Appendix A	Complete
Growth assumptions	S.5(2), 5(i-ii) S.5(2), 6(i-vi)	6.1-6.2	Complete

2 Scope and Methodology

Key Insights

- This asset management plan includes 5 asset categories and is divided between tax-funded and rate-funded categories

- The source and accuracy of replacement costs impacts the accuracy and reliability of asset portfolio valuation

- 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

Asset categories included in this AMP

This asset management plan for the Municipality of North Middlesex is produced in compliance with Ontario Regulation 588/17. The July 2022 deadline under the regulation—the first of three AMPs—requires analysis of only core assets (roads, bridges & culverts, water, wastewater, and stormwater).

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 performance indicators (KPIs), outlines lifecycle strategies for optimal asset management and performance, and provides financial strategies to reach sustainability for the asset categories listed below.

Asset Category	Source of Funding
Road Network	Tax Levy
Bridges & Culverts	
Stormwater Network	
Water Network	User Rates
Sanitary Sewer Network	

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/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 cost of the asset is 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.

Estimated Useful Life and 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:

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

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:

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

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

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

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. Appendix E includes additional information on the role of asset condition data and provides basic guidelines for the development of a condition assessment program.

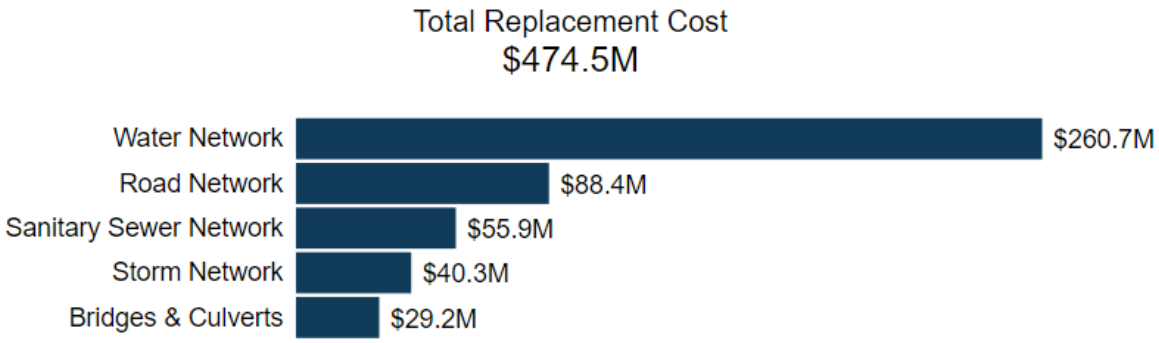
3 Portfolio Overview

Key Insights

- The total replacement cost of the Municipality's Core asset portfolio is $475 million
- The Municipality's target re-investment rate is 1.1%, and the actual re-investment rate is 0.4%, contributing to an expanding infrastructure deficit
- 83% of all assets are in fair or better condition
- 10% of assets are projected to require replacement in the next 10 years
- Average annual capital requirements total $6.6 million per year across all core assets

Total Replacement Cost of Asset Portfolio

The replacement cost of the asset portfolio of the Municipality, for core assets is $474.5 million based on inventory data from 2020. This total was determined based on a combination of user-defined costs and historical cost inflation. This estimate reflects replacement of historical assets with similar, not necessarily identical, assets available for procurement today.



Infrastructure Report Card

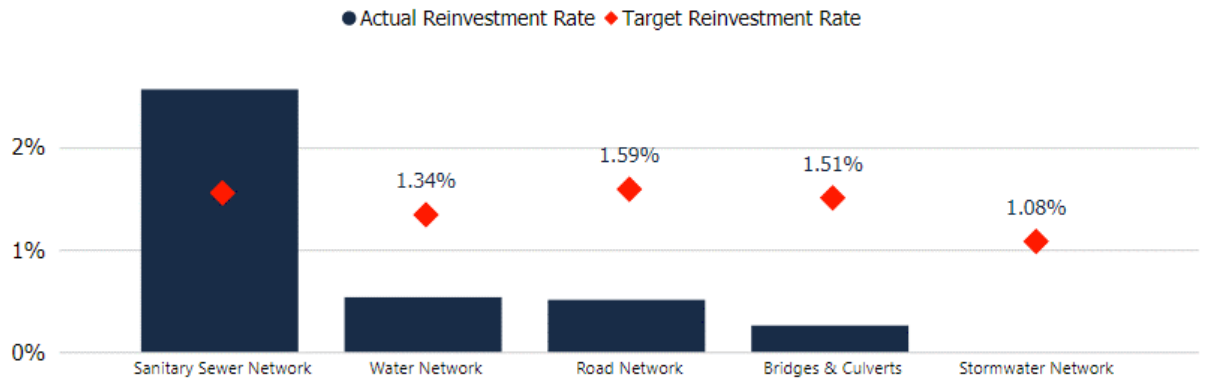
The average annual funding available from different revenue sources is compared against the average annual requirements to address the infrastructure deficit for each asset category.

Asset Category	Replacement Cost (millions)	Asset Condition	Financial Capacity[1]	
Road Network	$88	Fair	Annual Requirement:	$1,407,000
			Funding Available:	$450,000
			Annual Deficit:	**$957,000**
Bridges & Culverts	$29	Very Good	Annual Requirement:	$440,000
			Funding Available:	$75,000
			Annual Deficit:	**$365,000**
Stormwater Network	$40	Good	Annual Requirement:	$435,000
			Funding Available:	$0
			Annual Deficit:	**$435,000**
Water Network	$261	Good	Annual Requirement:	$3,496,000
			Funding Available:	$1,393,000
			Annual Deficit:	**$2,103,000**
Sanitary Sewer Network	$56	Fair	Annual Requirement:	$869,000
			Funding Available:	$1,436,000
			Annual Deficit:	**-$567,000**
Overall	$475	Fair	Annual Requirement:	$6,647,000
			Funding Available:	$3,354,000
			Annual Deficit:	**$3,293,000**

[1] Section 7.0 provides an in-depth analysis on the financial implications of the Municipality's annual deficit.

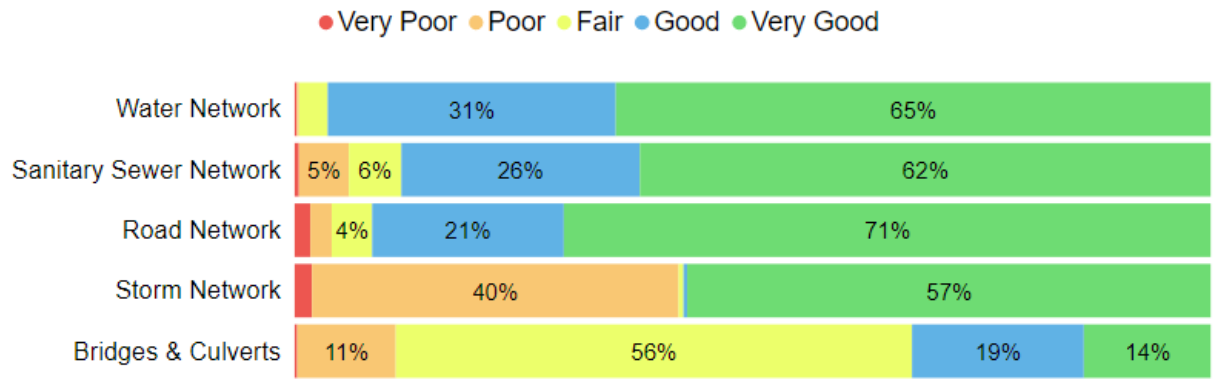
Target vs. Actual Reinvestment Rate

The graph below depicts funding gaps or surpluses by comparing target vs. actual reinvestment rate. To meet the long-term replacement needs, the Municipality should be allocating approximately $6.6 million annually, for a target reinvestment rate of 1.1%. Actual annual spending on infrastructure totals approximately $3.3 million, for an actual reinvestment rate of 0.4%.



Condition of Asset Portfolio

The current condition of the assets is central to all asset management planning. Collectively, 83% of assets in North Middlesex are in fair or better condition. This estimate relies on both age-based and field condition data.

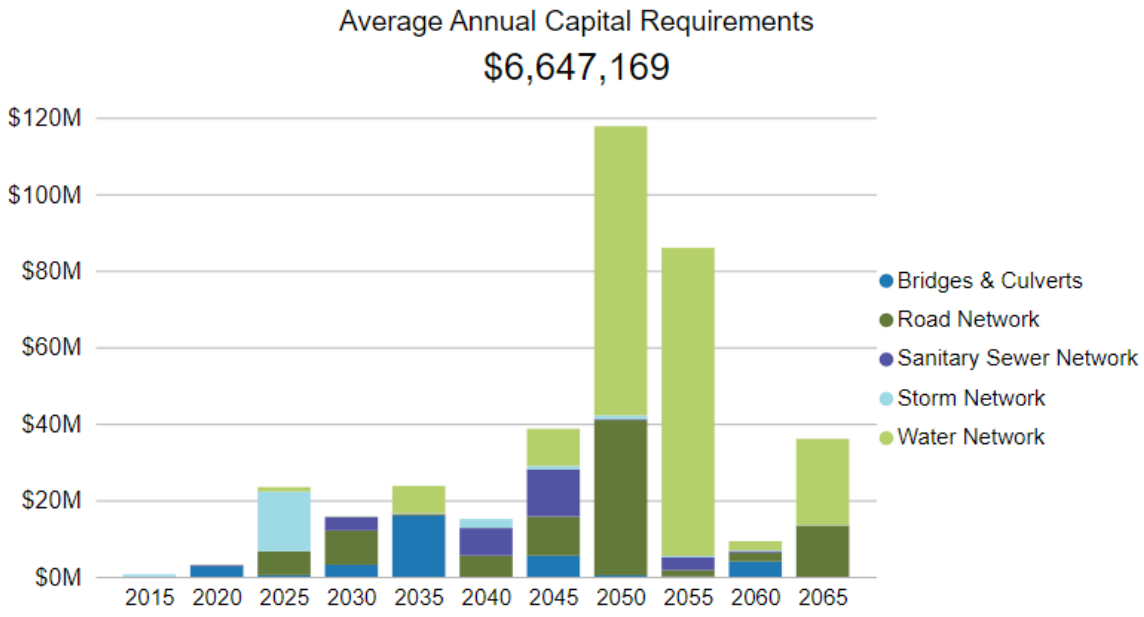


This AMP relies on assessed condition data for 7% of assets; for the remaining portfolio, age is used as an approximation of condition. Assessed condition data is invaluable in asset management planning as it reflects the true condition of the asset and its ability to perform its functions. The table below identifies the source of condition data used throughout this AMP.

Asset Category	Asset Segment	% of Assets with Assessed Condition	Source of Condition Data
Road Network	Asphalt Roads	98%	2019 Roads Need Study
	Gravel Roads	0%	Age Based
	Sidewalks	0%	Age Based
	Streetlights	0%	Age Based
Bridges & Culverts	Bridges & Structural Culverts	100%	2021 OSIM Report
	Non - Structural Culverts	0%	Age Based
Stormwater Network	All	0%	Age Based
Water Network	All	0%	Age Based
Sanitary Sewer Network	All	0%	Age Based

Forecasted Capital Requirements

The development of a long-term capital forecast should include both asset rehabilitation and replacement requirements. With the development of asset-specific lifecycle strategies that include the timing and cost of future capital events, the Municipality can produce an accurate long-term capital forecast. The following graph identifies capital requirements for core assets over the next 50 years.



4 Analysis of Tax-funded Assets

Key Insights

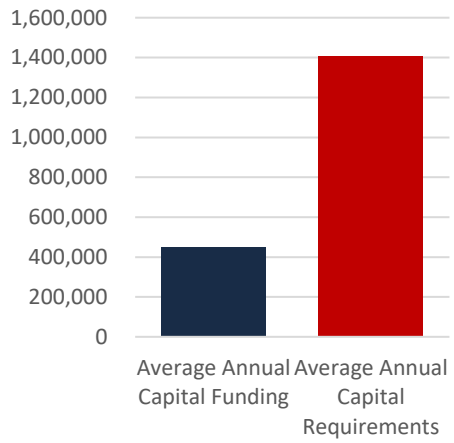
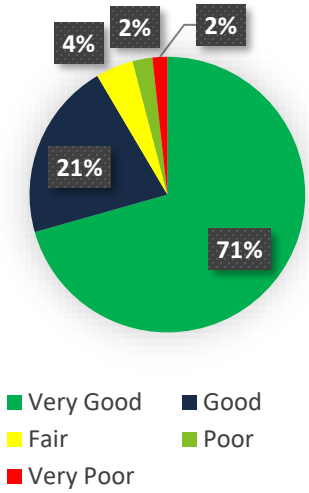
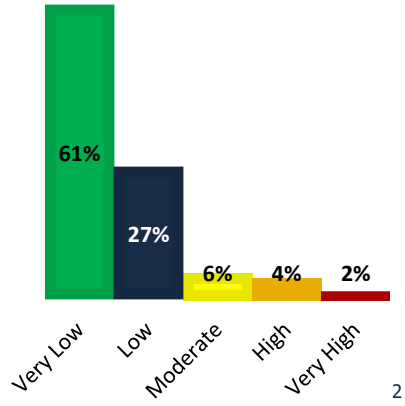
- Tax-funded assets are valued at $158 million
- 58% of tax-funded assets are in fair or better condition
- The average annual capital requirement to sustain the current level of service for tax-funded assets is approximately $2.3 million
- Critical assets should be evaluated to determine appropriate risk mitigation activities and treatment options

Road Network

The Road Network is a critical component of the provision of safe and efficient transportation services and represents the highest value asset category in the Municipality's asset portfolio. It includes all municipally owned and maintained roadways in addition to supporting roadside infrastructure including sidewalks, and streetlights.

The Municipality's roads and sidewalks are maintained by the Public Works department who is also responsible for winter snow clearing, ice control and snow removal operations.

The table below outlines high-level service indicators for Roads.

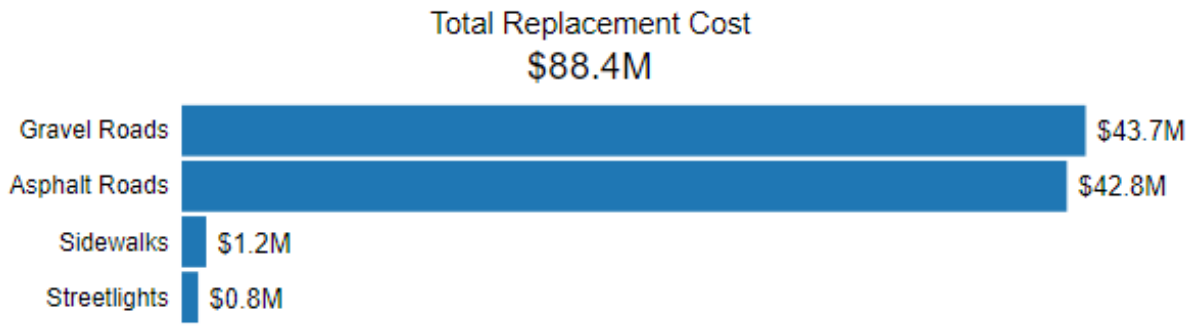
Cost	Performance (Average Condition)	Risk
		

[2] The bar graph showing the risk associated with the road network does not include gravel roads. They are maintained on an annual basis to a good/fair condition.

4.1.1 Asset Inventory & Replacement Cost

The table below includes the quantity, replacement cost method and total replacement cost of each asset segment in the Municipality's Road Network inventory.

Asset Segment	Quantity	Replacement Cost Method	Total Replacement Cost
Asphalt Roads	101,367 m	100% User-Defined	$42,774,852
Gravel Roads	365,485 m	100% User-Defined	$43,679,549[3]
Sidewalks	5951 m	Cost/Unit	$1,190,170
Streetlights	267	100% User-Defined	$801,000
			$88,445,572

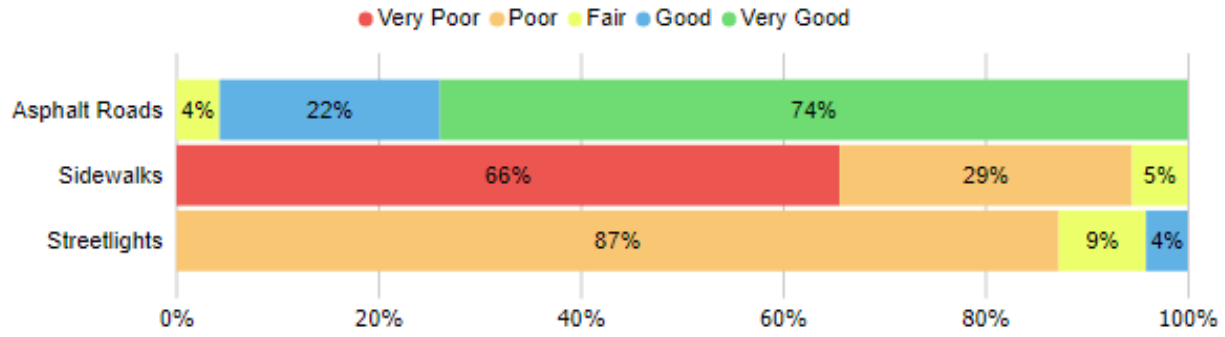


[3] Although labelled as a replacement cost, gravel roads undergo perpetual maintenance and repair events which encompass the associated cost. If managed effectively, gravel roads should not need to be replaced, theoretically.

4.1.2 Asset Condition

The table below identifies the current average condition and source of available condition data for each asset segment. The Average Condition (%) is a weighted value based on replacement cost.

Asset Segment[4]	Average Condition (%)	Average Condition Rating	Condition Source
Asphalt Roads	83%	Very Good	98% Assessed
Sidewalks	22%	Poor	Age-Based
Streetlights	35%	Poor	Age-Based
	80%	**Very Good**	**94% Assessed**



Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the municipality's current approach:

- A Road Needs Study was completed in 2019 that included a detailed assessment of the condition of each road segment
- The Road Needs Study is conducted on a cyclical basis of 10 years

[4] Gravel roads are maintained consistently and are at an adequate state of repair at all times.

4.1.3 Estimated Useful Life & Average Age

The Estimated Useful Life for Road Network assets has been assigned according to a combination of established industry standards and staff knowledge. The Average Age of each asset is based on the number of years each asset has been in-service. Finally, the Average Service Life Remaining represents the difference between the Estimated Useful Life and the Average Age, except when an asset has been assigned an assessed condition rating. Assessed condition may increase or decrease the average service life remaining.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Asphalt Roads	25 Years	20.6	18.6
Sidewalks	30 Years	24.1	5.9
Streetlights	15 Years	9.8	5.3
		15.5	**11.3**

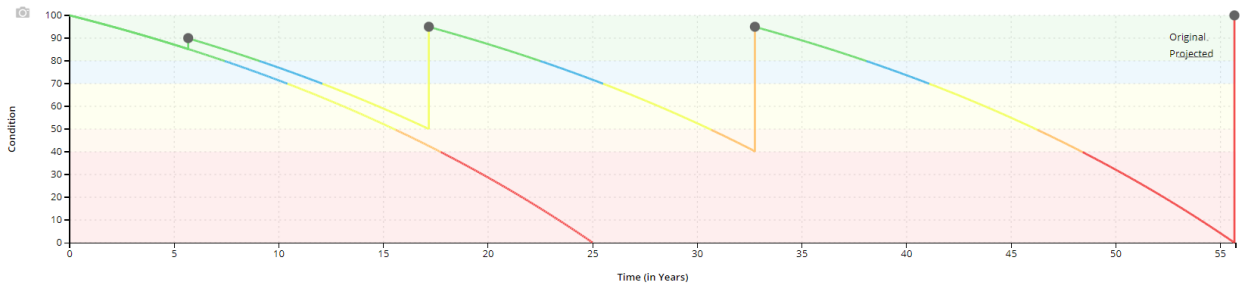
Each asset's Estimated Useful Life should be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

4.1.4 Lifecycle Management Strategy

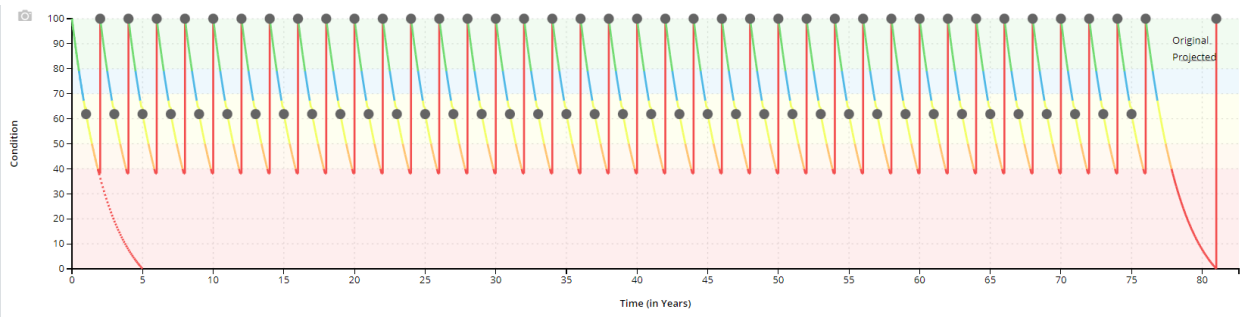
The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following lifecycle strategies have been developed as a proactive approach to managing the lifecycle of asphalt 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
Mill & Pave	Rehabilitation	40%-50% Condition
Single Lift Overlay	Rehabilitation	50%-60% Condition
Full Reconstruction	Replacement	0% Condition



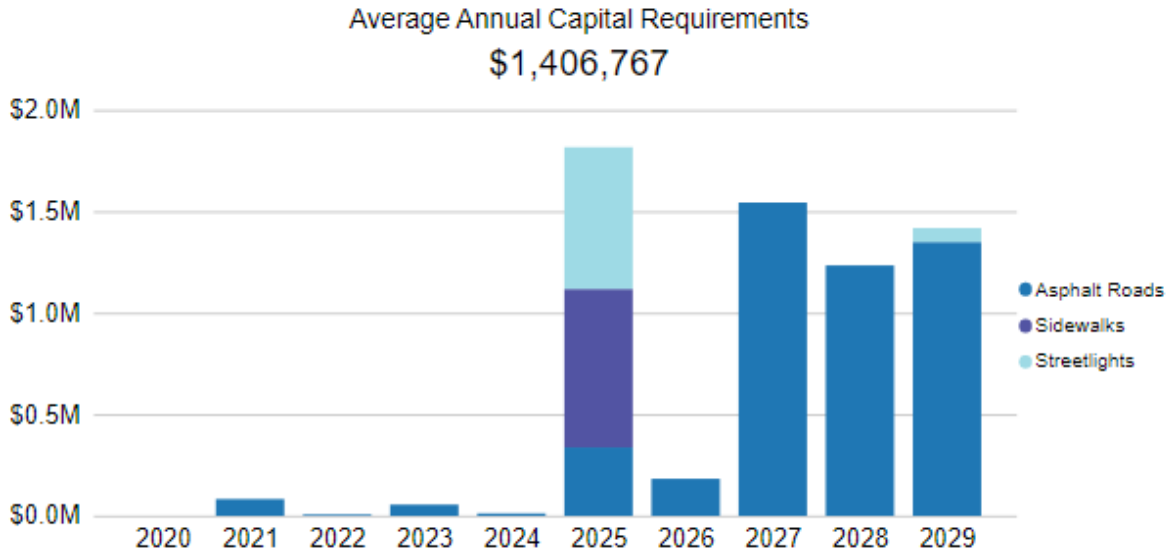
Gravel Roads		
Event Name	**Event Class**	**Event Trigger**
Ditching/Mowing/ Brushing	Maintenance	Every 5 years
Dust Suppressant - Calcium Chloride	Maintenance	Annually
Grading	Maintenance	Annually
Gravelling	Preventative Maintenance	Every 2 years



Forecasted Capital Requirements

Based on the lifecycle strategies identified previously for asphalt, and assuming the end-of-life replacement of sidewalks and streetlights in this category, the following graph forecasts capital requirements for the Road Network. These capital forecasts do not include the gravel roads as those are maintained by the municipality on an annual basis through the operating budget.

The annual capital requirement represents the average amount per year that the Municipality should allocate towards funding rehabilitation and replacement needs to meet future capital needs.



The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Appendix A.

4.1.5 Risk & Criticality

Risk Matrix

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on 2020 inventory data. See Appendix C for the criteria used to determine the risk rating of each asset.

Risks to Current Asset Management Strategies

The following section summarizes key trends, challenges, and risks to service delivery that the Municipality is currently facing:

Capital Funding Strategies

The Municipality struggles to develop asset management strategies with defined maintenance, rehabilitation, and replacement schedules due to limited capital funding. When grants are not available, major road rehabilitation projects may be deferred. An annual capital funding strategy can reduce dependency on grant funding and help prevent deferral of capital works.

4.1.6 Levels of Service

The following tables identify the Municipality's current level of service for the Road Network. These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by the Road Network.

Service Attribute	Qualitative Description	Current LOS (2020)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity	See Appendix B
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. However, 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.

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the Road Network.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	Lane-km of arterial roads (MMS classes 1 and 2) per land area (km/km^2)	0
	Lane-km of collector roads (MMS classes 3 and 4) per land area (km/km^2)	0
	Lane-km of local roads (MMS classes 5 and 6) per land area (km/km^2)	1.56
Quality	Average pavement condition index for paved roads in the municipality	83%
	Average surface condition for unpaved roads in the municipality (e.g., excellent, good, fair, poor)	Fair
Performance	Capital reinvestment rate	1.91%
	% of paved roads in Poor or Very Poor Condition[5]	4%
	Average Risk Rating of Road Network	5.35

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4.1.7 Recommendations

Asset Inventory

- Review sidewalk and streetlights and street poles inventory to determine whether all municipal assets within these asset segments have been accounted for.
- The municipality need to populate/validate the discrepancies in road class data utilizing the speed limit and average annual daily traffic based on O. Reg. 366/18: Minimum Maintenance Standards.

Condition Assessment Strategies

- The last comprehensive assessment of the road network was completed in 2019. Consider completing an updated assessment of all roads on a cyclical basis of 5 years.
- Consider adopting a formal condition assessment program to accurately estimate the condition of gravel roads

Lifecycle Management Strategies

- Implement the identified lifecycle management strategies for asphalt and gravel roads to realize potential cost avoidance and maintain a high quality of road pavement condition.
- Evaluate the efficacy of the Municipality's lifecycle management strategies at regular intervals to determine the impact cost, condition, and risk.
- The Municipality should also consider which roads may be potential candidates for upgrades from gravel to asphalt. Such considerations should include lifecycle costs, AADT, and desired levels of service (LOS).

Risk Management Strategies

- Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
- Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- The data gaps corresponding to AADT, Speed, and Road Class should be addressed for more robust risk frameworks.

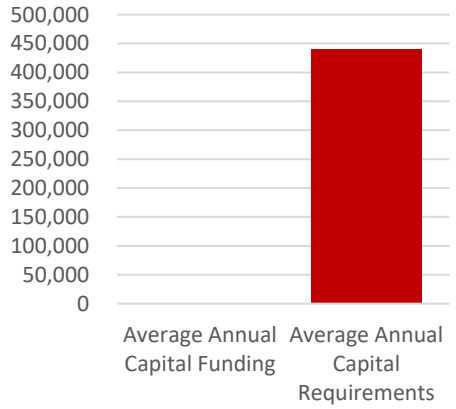
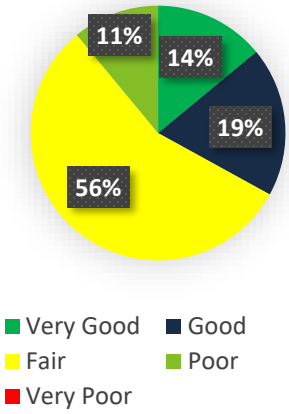
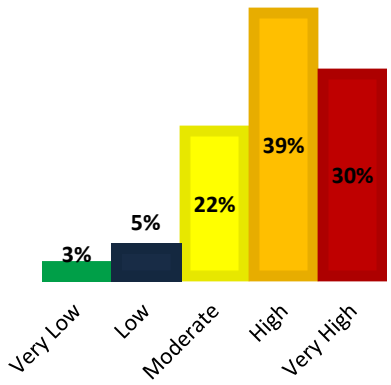
Levels of Service

- Continue to measure current levels of service in accordance with the metrics identified in O. Reg. 588/17 and those metrics that the Municipality believes to provide meaningful and reliable inputs into asset management planning.
- Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

Bridges & Culverts

Bridges & Culverts represent a critical portion of the transportation services provided to the community. The Department of Public Works is responsible for the maintenance of all bridges and culverts located across municipal roads with the goal of keeping structures in an adequate state of repair and minimizing service disruptions.

The table below outlines high-level service indicators for Bridges & Culverts.

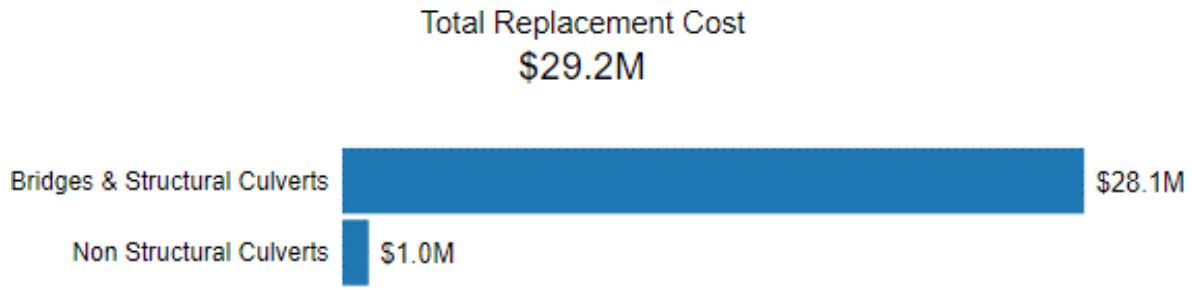
Cost[6]	Performance (Average Condition)	Risk
		

[6] North Middlesex does invest in its bridge and structural culvert assets, but currently does not have a dedicated capital budget. As there is no dedicated bridge and culvert capital budget, the average annual capital funding is represented at $0.

4.1.8 Asset Inventory & Replacement Cost

The table below includes the quantity, replacement cost method and total replacement cost of each asset segment in the Municipality's Bridges & Culverts inventory.

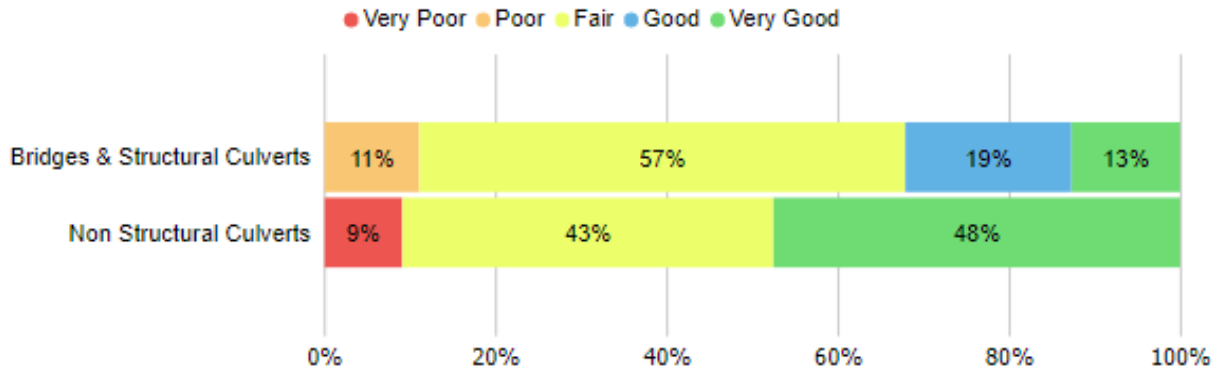
Asset Segment	Quantity	Replacement Cost Method	Total Replacement Cost
Bridges & Structural Culverts	34 Bridges & 44 Structural Culverts	76% CPI Tables 24% User-Defined Cost	$28,138,783
Non - Structural Culverts	32	100% CPI Tables	$1,015,213
			$29,153,996



4.1.9 Asset Condition

The table below identifies the current average condition and source of available condition data for each asset segment. The Average Condition (%) is a weighted value based on replacement cost.

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Bridges & Structural Culverts	69%	Good	100% Assessed
Non - Structural Culverts	73%	Good	Age-Based
	69%	**Good**	**97% Assessed**



To ensure that the Municipality's Bridges & Culverts continues to provide an acceptable level of service, the Municipality should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation, and replacement activities is required to increase the overall condition of the Bridges & Culverts.

Current Approach to Condition Assessment

Accurate and reliable condition data provides staff with greater confidence when determining the remaining service life of assets and identifying the most cost-effective approach to managing assets. The following describes the municipality's current approach:

- Condition assessments of all bridges and culverts with a span greater than or equal to 3 meters are completed every 2 years in accordance with the Ontario Structure Inspection Manual (OSIM)
- The condition of bridges and structural culverts is assessed by an external contractor (Spriet Associates) on the behalf of the Municipality and the most recent bridge inspection was conducted in 2021 which is utilized for the Asset Management Plan.

4.1.10 Estimated Useful Life & Average Age

The Estimated Useful Life for Bridges & Culverts assets has been assigned according to a combination of established industry standards and staff knowledge. The Average Age of each asset is based on the number of years each asset has been in-service. Finally, the Average Service Life Remaining represents the difference between the Estimated Useful Life and the Average Age, except when an asset has been assigned an assessed condition rating. Assessed condition may increase or decrease the average service life remaining.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Bridges & Structural Culverts	75 Years	82.8	22
Non - Structural Culverts	35 Years	21.7	13.3
		13.7	**19.5**

Each asset's Estimated Useful Life should be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

4.1.11 Lifecycle Management Strategy

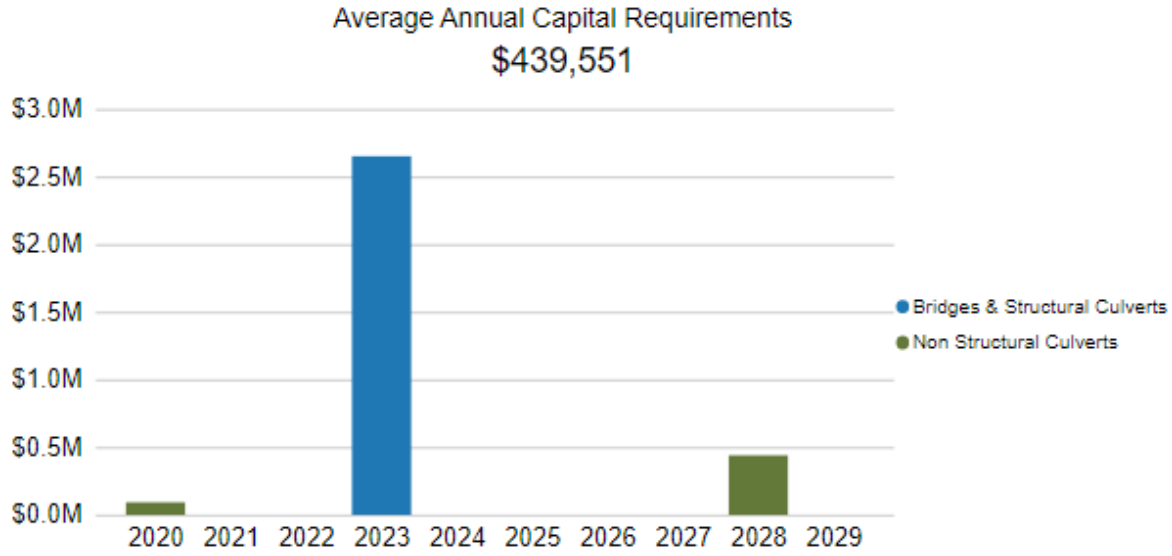
The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

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

Activity Type	Description of Current Strategy
Maintenance, Rehabilitation and Replacement	All lifecycle activities are driven by the recommendations of structural inspections according to Ontario Structure Inspection Manuals (OSIMs) Sweeping, mowing, and deck washing is completed annually every spring Non-structural Culverts are typically part of the routine patrols and inspected as a part of road replacement projects. Low hanging bridges are currently being replaced by culverts. A replacement program has been developed for culverts. The program focuses on wing-wall and guardrails related activities to improve the resilience of the culvert assets.
Inspection	The most recent inspection report was completed in 2021 by Spriet Associates

Forecasted Capital Requirements

The following graph forecasts long-term capital requirements. The annual capital requirement represents the average amount per year that the Municipality should allocate towards funding rehabilitation and replacement needs.



The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Appendix A.

4.1.12 Risk & Criticality

Risk Matrix

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on 2020 inventory data. See Appendix C for the criteria used to determine the risk rating of each asset.

Risks to Current Asset Management Strategies

The following section summarizes key trends, challenges, and risks to service delivery that the Municipality is currently facing:

Aging Infrastructure

As municipal bridges continue to age, there are a handful of structures that are approaching their original useful life. The lifecycle strategies for bridges are rather reactive than proactive and some low hanging bridges have been replaced by culverts in the past.

Capital Funding Strategies

Major capital rehabilitation projects for bridges and culverts are entirely dependant on the availability of grant funding opportunities. When grants are not available, bridge rehabilitation projects may be deferred. An annual capital funding strategy can reduce dependency on grant funding and help prevent deferral of capital works. The Municipality is highly dependent on grant funding for the major rehabilitation and replacement projects such as the one received for Poplar Hill Bridge.

4.1.13 Levels of Service

The following tables identify the Municipality's current level of service for Bridges & Culverts. These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Bridges & Culverts.

Service Attribute	Qualitative Description	Current LOS (2020)
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, 11 bridge and structural culvert assets have loading or dimensional restrictions. The remaining assets can accommodate all vehicle types including heavy transport, and emergency vehicles.
Quality	Description or images of the condition of bridges & culverts and how this would affect use of the bridges & culverts	See Appendix B

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by Bridges & Culverts.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	% of bridges in the Municipality with loading or dimensional restrictions	15%
	% of structural culverts in the Municipality with loading or dimensional restrictions	14%
Quality	Average bridge condition index value for bridges in the Municipality	67
	Average bridge condition index value for structural culverts in the Municipality	72
Performance	Capital re-investment rate	17%
	% of Bridges & Culverts in poor or very poor condition	11%
	Average Risk Rating of Bridges & Culverts	12.33

4.1.14 Recommendations

Data Review/Validation

- To ensure asset management decisions are founded on accurate data continue to review and validate inventory data, assessed condition data and replacement costs for all bridges and structural culverts upon the completion of OSIM inspections every 2 years. As the last assessment was completed in 2020, the next assessment should be completed in 2022.
- As a general asset management practice the lifecycle estimated useful life should be reviewed and modified based on industry standards, structure type, and performance in the field.

Risk Management Strategies

- Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
- Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- The data gaps corresponding to AADT, Speed, and Detour Distance should be addressed for more robust risk frameworks.

Lifecycle Management Strategies

- The Municipality should continue to incorporate projected capital rehabilitation events for bridges and culverts in Citywide to assist in accurate long-term planning.
- Consider adopting a formal preventative maintenance, rehabilitation, and replacement strategy for non-structural culverts.

Levels of Service

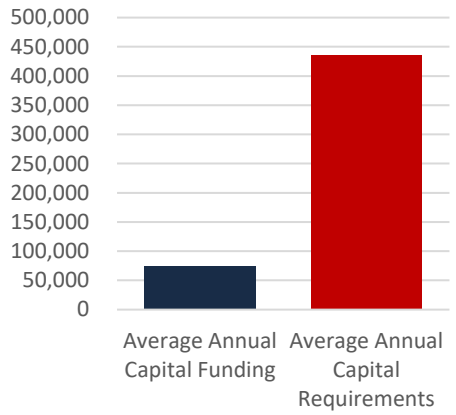
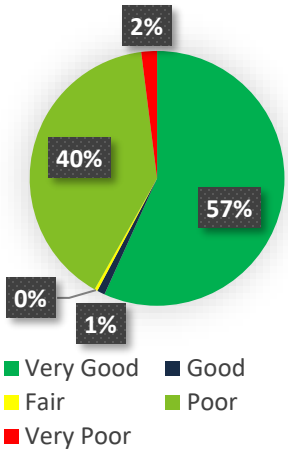
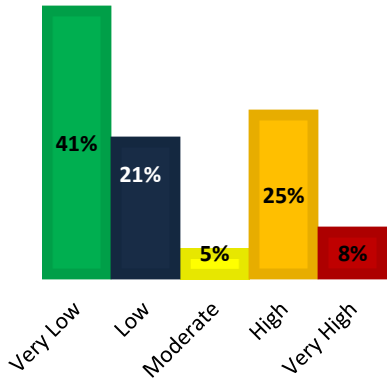
- Continue to measure current levels of service in accordance with the metrics identified in O. Reg. 588/17 and those metrics that the Municipality believe to provide meaningful and reliable inputs into asset management planning.
- Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

Stormwater Network

The Municipality is the owner of the stormwater network and responsible for its maintenance, rehabilitation, and replacement. The stormwater network is comprised of over 24 kilometers of storm sewer mains, in addition to storm manholes and other supporting infrastructure.

Currently there is no assessed condition information for the stormwater network, so the information in this section are solely age-based. However, staff are working towards a stormwater network condition assessment program. As more data becomes both available and increasingly accurate so too will asset-based decisions. This is all expected to assist with long-term asset management planning and improved asset performance.

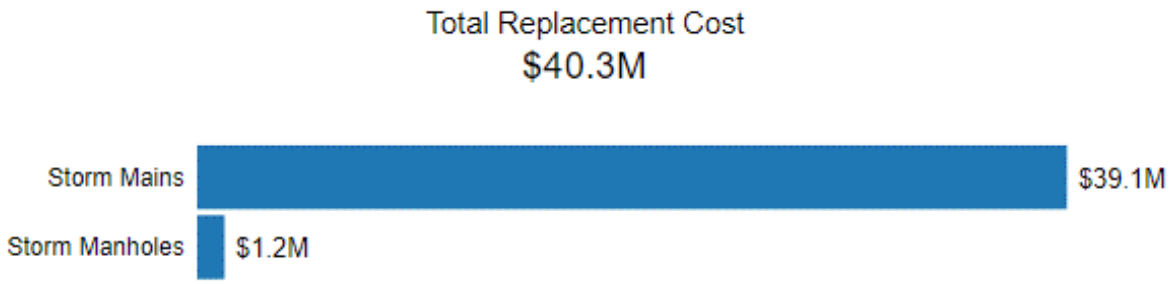
The table below outlines high-level service indicators for the Stormwater Network. As noted above, at this time asset condition information is age based.

Cost	Performance (Average Age-Based Condition)	Risk
		

4.1.15 Asset Inventory & Replacement Cost

The table below summarizes the quantity, replacement cost method and total replacement cost of the storm sewer mains and manholes in the Municipality's Stormwater Network inventory.

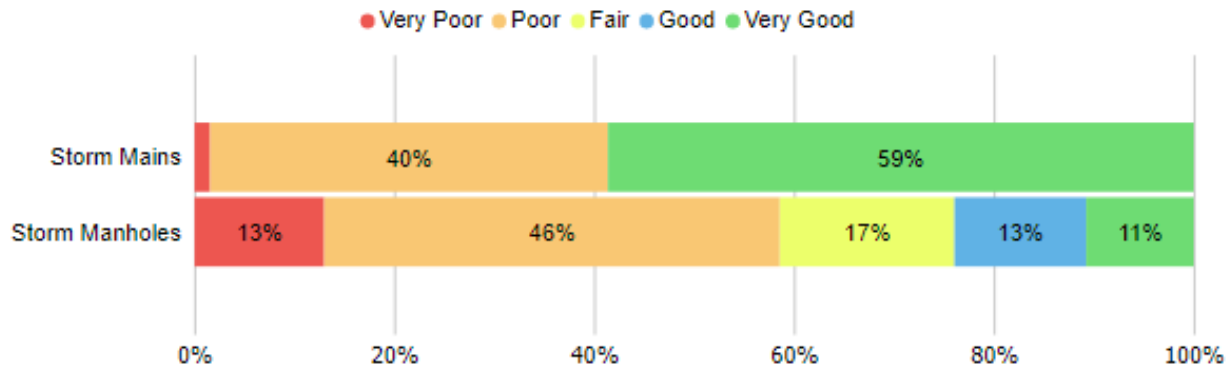
Asset Segment	Quantity	Replacement Cost Method	Total Replacement Cost
Storm Sewer Mains	24.2 km	87% Cost/Unit, 13% User-Defined Cost	$39,076,506
Storm Manholes	128	Cost/Unit	$1237,820
			$40,314,326



4.1.16 Asset Condition

The table below identifies the current average condition and source of available condition data for each asset segment. The Average Condition (%) is a weighted value based on replacement cost.

	Average Condition (%)	Average Condition Rating	Condition Source
Storm Sewer Mains	63%	Good	Age-based
Storm Manholes	46%	Fair	Age-based
	63%	**Good**	**Age-based**



To ensure that the Municipality's Stormwater Network continues to provide an acceptable level of service, the Municipality should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition of the Stormwater Network.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the municipality's current approach and the recommended approach:

- Currently the municipality uses age-based condition for all stormwater network assets; there are no formal condition assessment programs in place
- The Municipality should continue to regularly review and refine asset inventory and attribute information. An assessed condition program is recommended as a best approach; this could begin with a portion of the network (i.e., 10% a year) with problematic areas being the priority for inspection and data gathering.

4.1.17 Estimated Useful Life & Average Age

The Estimated Useful Life for Stormwater Network assets has been assigned according to a combination of established industry standards and staff knowledge. The Average Age of each asset is based on the number of years each asset has been in-service. Finally, the Average Service Life Remaining represents the difference between the Estimated Useful Life and the Average Age. Assessed condition may increase or decrease the average service life remaining.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Storm Sewer Mains	75 Years	48.8	26.2
Storm Manholes	75 Years	40.2	34.8
		47.0	**28**

Each asset's Estimated Useful Life should be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

4.1.18 Lifecycle Management Strategy

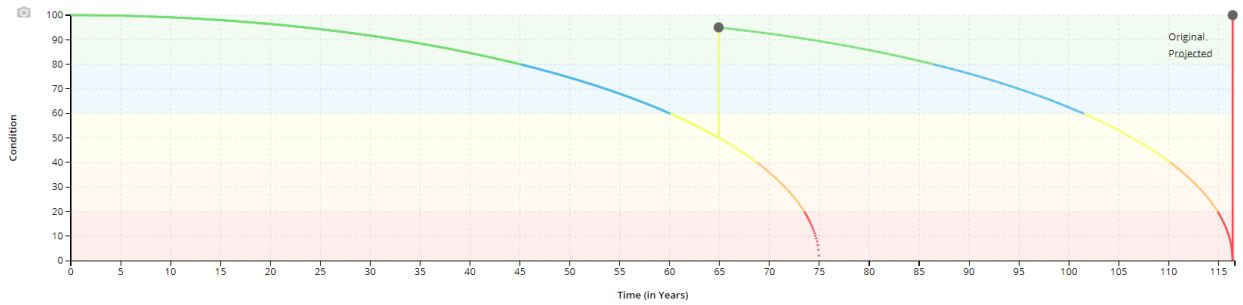
The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

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

Activity Type	Description of Current Strategy
Maintenance	Maintenance activities are completed to a lesser degree compared to other underground linear infrastructure
	Primary activities include manhole cleaning, winter sand build up removal, and storm main flushing, but only a small percentage of the entire network is completed per year
	CCTV inspections and cleaning is completed as budget becomes available and this information will be used to drive forward rehabilitation and replacement plans
Rehabilitation	Reactive rehabilitation is the most widely adopted approach for the storm network at this time as all the condition data is age-based Trenchless re-lining is being considered as it has the potential to reduce total lifecycle costs but would require a formal condition assessment program to determine viability
Replacement	Without the availability of up-to-date condition assessment information replacement activities are purely reactive in nature

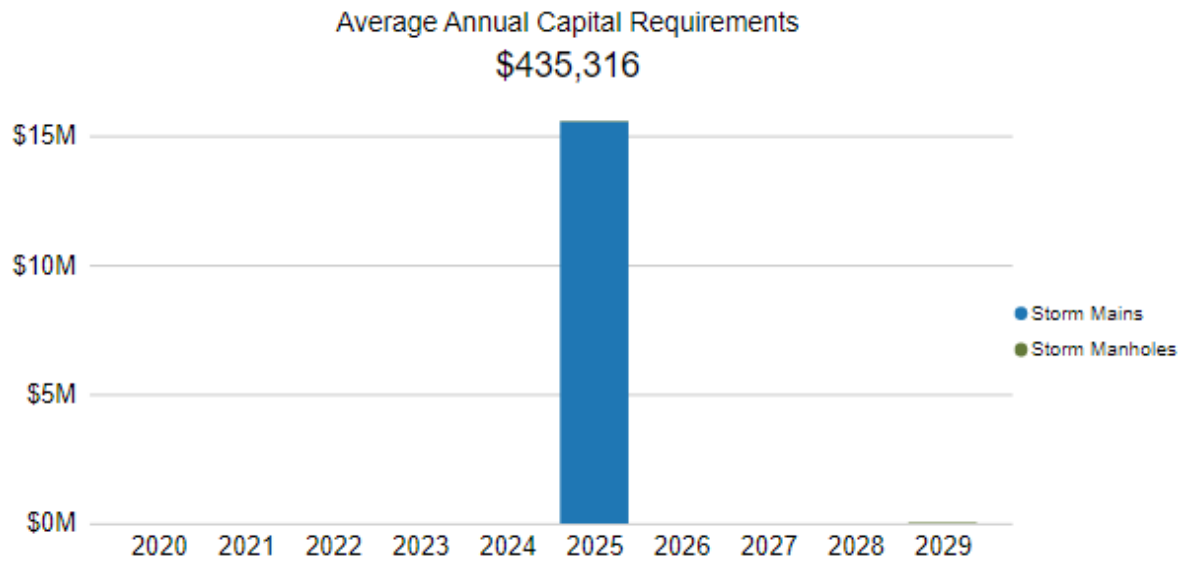
The following lifecycle strategy has been developed as a proactive approach to managing the lifecycle of storm mains. A trenchless re-lining strategy is expected to extend the service life of storm mains at a lower total cost of ownership.

Storm Mains		
Event Name	**Event Class**	**Event Trigger**
Trenchless Re-lining	Rehabilitation	50% to 60% Condition
Full Reconstruction	Replacement	0% condition



Forecasted Capital Requirements

The following graph forecasts long-term capital requirements for the stormwater network's mains and manholes. The annual capital requirement represents the average amount per year that the Municipality should allocate towards funding rehabilitation and replacement needs.

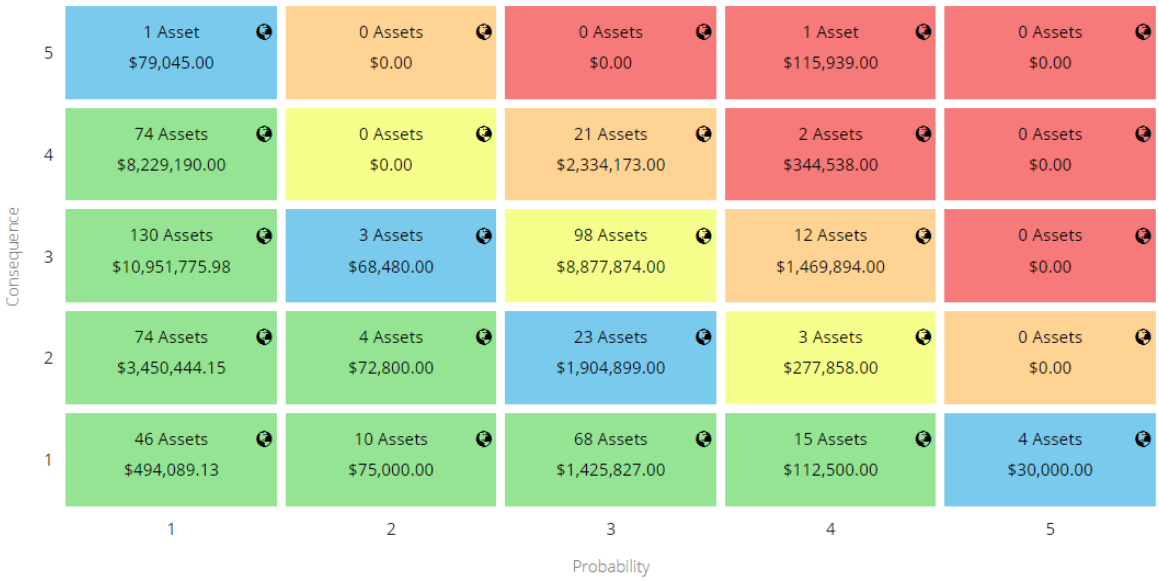


The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Appendix A.

4.1.19 Risk & Criticality

Risk Matrix

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the stormwater assets based on 2020 inventory data. See Appendix C for the criteria used to determine the risk rating of each asset.



Risks to Current Asset Management Strategies

The following section summarizes key trends, challenges, and risks to service delivery that the Municipality is currently facing:

Asset Data & Information

There is a lack of confidence in the available inventory data and condition data. The Municipality has not been successful with flushing storm mains as the size of main is variable and the material quality is questionable. It is worth noting that stormwater is an issue of concern for the Municipality, especially within urban areas

Organizational Capacity and Cognizance

Both short- and long-term planning requires the regular collection of infrastructure data to support asset management decision-making. Staff find it a continuous challenge to dedicate staff resource time towards data collection and condition assessments to ensure that storm network condition and asset attribute data is regularly reviewed and updated.

4.1.20 Levels of Service

The following tables identify the Municipality's current level of service for Stormwater Network. These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Stormwater Network.

Service Attribute	Qualitative Description	Current LOS (2020)
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	See Appendix B

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the Stormwater Network.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	% of properties in municipality resilient to a 100-year storm	100%
	% of the municipal stormwater management system resilient to a 5-year storm	100%
Performance	Capital reinvestment rate	0%
	% of Storm Network in poor or very poor condition	42%
	Average Risk Rating of Storm Network	7.7

4.1.21 Recommendations

Asset Inventory

- The Municipality's Stormwater Network inventory remains at a basic level of maturity and staff do not have a high level of confidence in its accuracy or reliability. The development of a comprehensive inventory of the stormwater network should be priority.
- The replacement costs should be updated on cyclical basis. Recommended is at least every 5 years.

Condition Assessment Strategies

- The development of a comprehensive inventory should be accompanied by a system-wide assessment of the condition of all assets in the Stormwater Network through CCTV inspections.
- Consider conducting CCTV inspections incrementally over a period of 5- to 10-years.

Risk Management Strategies

- Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
- Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- The data gaps corresponding to Slope, AADT, and Proximity to Critical Services should be addressed for more robust risk frameworks.

Lifecycle Management Strategies

- Document and review lifecycle management strategies for the Stormwater Network on a regular basis to achieve the lowest total cost of ownership while maintaining adequate service levels.
- The estimated useful life of storm mains should be refined based on the in-field performance, and industry standards to reflect the true service life of the assets.

Levels of Service

- Continue to measure current levels of service in accordance with the metrics that the Municipality has established as well as O. Reg. 588/17 mandated LOS. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.
- Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

5 Analysis of Rate-funded Assets

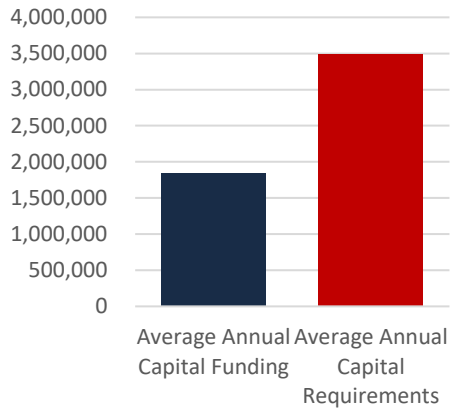
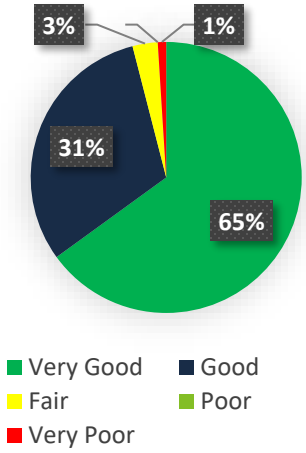
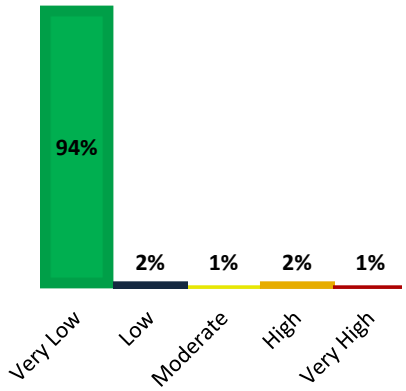
Key Insights

- Rate-funded assets are valued at $317 million
- 98% of rate-funded assets are in fair or better condition
- The average annual capital requirement to sustain the current level of service for rate-funded assets is approximately $4.4 million
- Critical assets should be evaluated to determine appropriate risk mitigation activities and treatment options

Water Network

The Ontario Clean Water Agency (OCWA) is responsible for the operations and maintenance (O&M) of the entire water network of the Municipality. The OCWA is responsible for maintaining the water distribution system that includes water mains, hydrants, valves, and water meters.

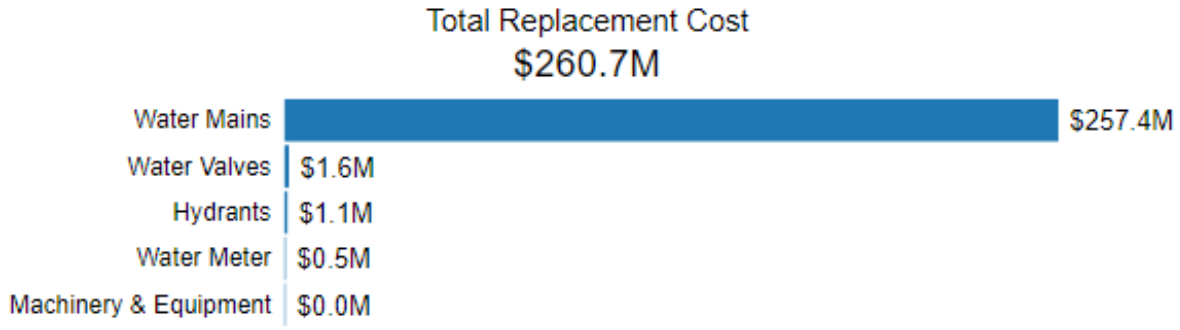
The table below outlines high-level service indicators for the Water Network.

Cost	Performance (Average Condition)	Risk
		

5.1.1 Asset Inventory & Replacement Cost

The table below includes the quantity, replacement cost method and total replacement cost of each asset segment in the Municipality's Water Network inventory.

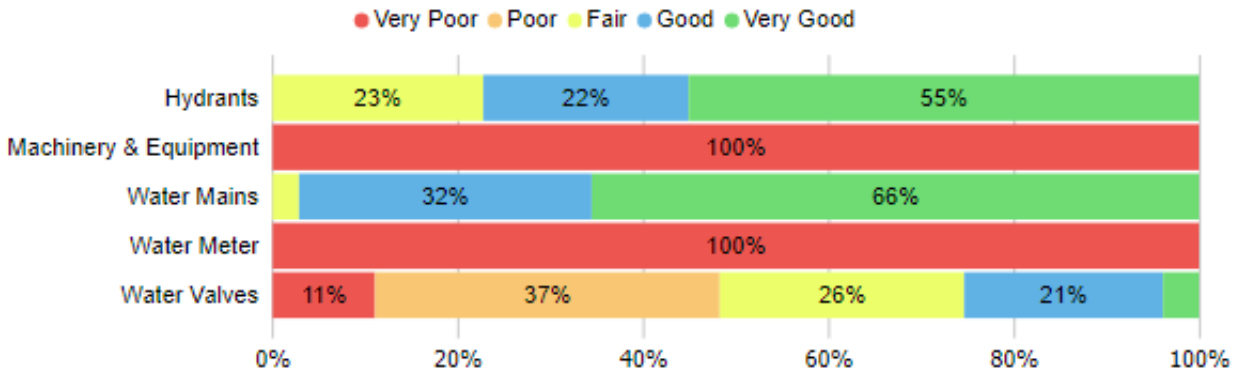
Asset Segment	Quantity	Replacement Cost Method	Total Replacement Cost
Hydrants	158	User-Defined Cost	$1,106,000
Machinery & Equipment	1	CPI Tables	$12,810
Water Mains	473,760 m	Cost/Unit	$257,421,400
Water Meters	1,035	User-Defined Cost	$519,500
Water Valves	735	Cost/Unit	$1,642,000
			$260,701,710



5.1.2 Asset Condition

The table below identifies the current average condition and source of available condition data for each asset segment. The Average Condition (%) is a weighted value based on replacement cost. For all assets, condition is based on age.

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Hydrants	82%	Very Good	Age-based
Machinery & Equipment	15%	Very Poor	Age-based
Water Mains	86%	Very Good	Age-based
Water Meters	20%	Poor	Age-based
Water Valves	46%	Fair	Age-based
	86%	**Very Good**	**Age-based**



To ensure that the Municipality's Water Network continues to provide an acceptable level of service, the Municipality should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition of the Water Network.

Current Approach to Condition Assessment

Accurate and reliable condition data provides staff greater confidence when determining the remaining service life of assets and identifying the most cost-effective approach to managing assets. The following describes the municipality's current approach:

- Staff rely on the age of water mains to estimate their condition.
- There are no formal condition assessment programs currently in place for the Water Network. However, OCWA conducts a comprehensive condition assessment of the water network in the first year of assuming operations. Based on these condition assessments a 10-year capital plan and an annual capital plan is prepared for lifecycle management, including maintenance and rehabilitation strategies. The plans are reviewed with the Municipality on annual basis and the plans are adjusted over time

5.1.3 Estimated Useful Life & Average Age

The Estimated Useful Life for Water Network assets has been assigned according to a combination of established industry standards and staff knowledge. The Average Age of each asset is based on the number of years each asset has been in-service. Finally, the Average Service Life Remaining represents the difference between the Estimated Useful Life and the Average Age, except when an asset has been assigned an assessed condition rating. Assessed condition may increase or decrease the average service life remaining.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Hydrants	75 Years	37.6	37.5
Machinery & Equipment	10 Years	8.5	1.5
Water Mains	75 Years	36.7	38.5
Water Meters	20 Years	16	4
Water Valves	75 Years	40.1	34.9
		38.8	**36**

Each asset's Estimated Useful Life should be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

5.1.4 Lifecycle Management Strategy

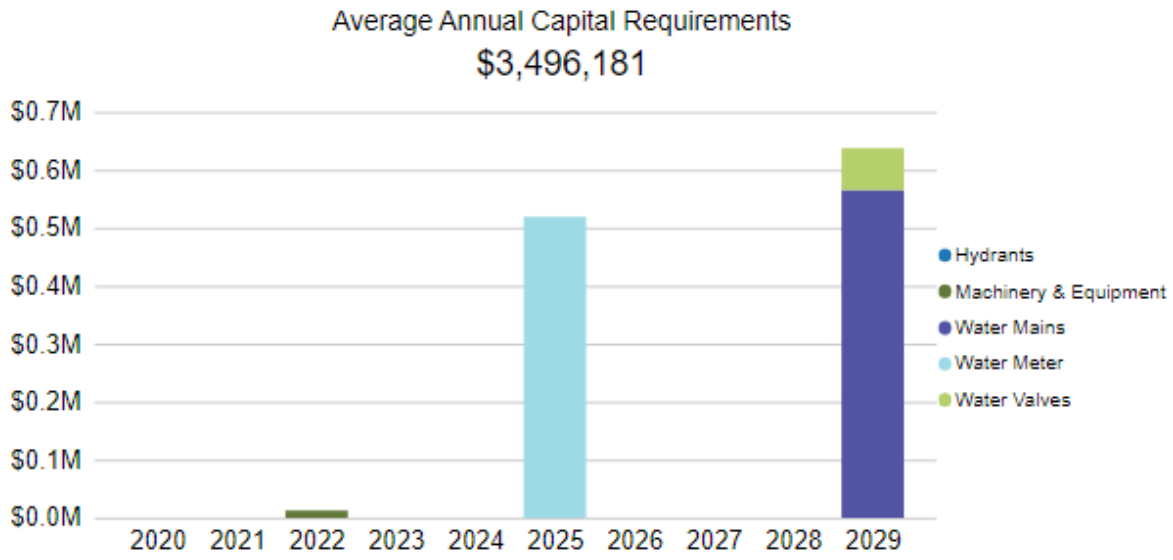
The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

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

Activity Type	Description of Current Strategy
Maintenance	Main flushing is completed as need basis with an average of 10% of water network annually.
	Periodic pressure testing to identify deficiencies and potential leaks
	Maintenance on water meters is undertaken annually in batches.
	The maintenance frequency on other components of the system is seen below: • Hydrants – 175 units annually • Blow Offs – 100 units annually • Valve Cycling- 100 units annually • Air Valve – 30 units annually • PRV – 30 units annually
Rehabilitation	Comparisons of the rehabilitation and replacement costs inform the rehabilitation and/or renewal strategies.
	Trenchless re-lining of water mains presents significant challenges and is not always a viable option
Replacement	In the absence of mid-lifecycle rehabilitative events, most mains are simply maintained with the goal of full replacement once it reaches its end-of-life
	Replacement activities are identified based on an analysis of the main break rate, age, condition as well as any issues identified during regular maintenance activities

Forecasted Capital Requirements

The following graph forecasts long-term capital requirements. The annual capital requirement represents the average amount per year that the Municipality should allocate towards funding rehabilitation and replacement needs.

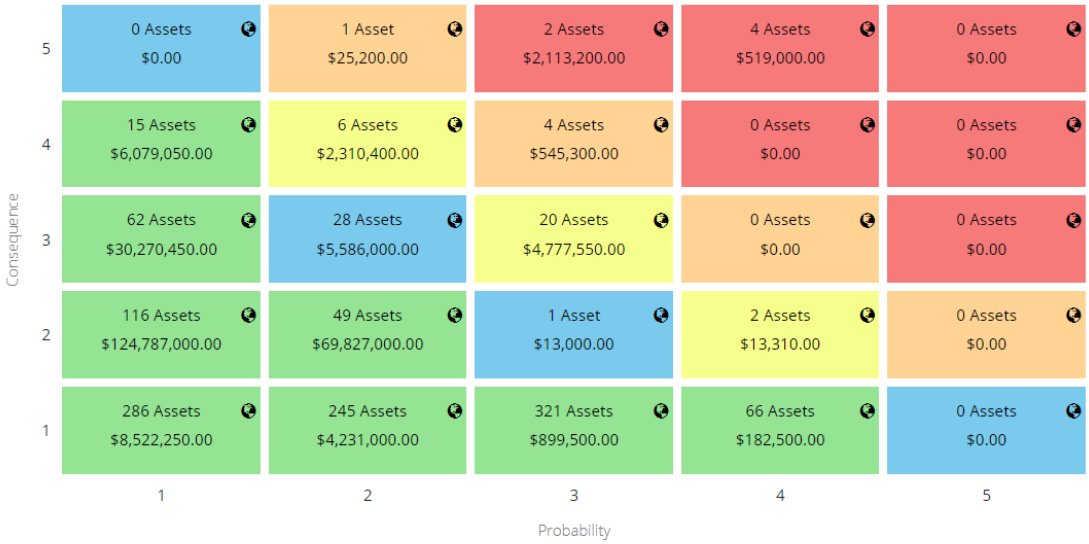


The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Appendix A.

5.1.5 Risk & Criticality

Risk Matrix

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for water network assets based on 2020 inventory data. See Appendix C for the criteria used to determine the risk rating of each asset.



Risks to Current Asset Management Strategies

The following section summarizes key trends, challenges, and risks to service delivery that the Municipality is currently facing:

Asset Data & Information

There is a lack of confidence in the available inventory data and condition data. The Municipality depends on renewal of assets and does not typically engage in relining of watermains as there is very limited information about condition. Staff plan to prioritize data refinement efforts to increase the accuracy and reliability of asset data and information. Once completed there will be greater confidence in the development of data-driven strategies to address infrastructure needs.

Community Growth

The water network experiences operational and growth risks. The quality of the water service represents a risk due to the unreliable capacity, pressure, and flow. The Municipality does not have enough pressure reducing valves, meters, and storage facilities to support the expected growth.

5.1.6 Levels of Service

The following tables identify the Municipality's current level of service for Water Network. These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Water Network.

Service Attribute	Qualitative Description	Current LOS (2020)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	See Appendix B
	Description, which may include maps, of the user groups or areas of the municipality that have fire flow	See Appendix B
Reliability	Description of boil water advisories and service interruptions	The municipality experienced no boil water advisories in 2020. 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.

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the Water Network.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	% of properties connected to the municipal water system	62%
	% 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
Performance	Capital re-investment rate	0%
	% of Water Network in poor or very poor condition	1%
	Average Risk Rating of Water Network	3.58

5.1.7 Recommendations

Asset Inventory

- Data refinement for the estimated useful life of water assets should be made based on the in-field performance, and industry standards to reflect the age-based condition of the assets more accurately.

Condition Assessment Strategies

- The Municipality should have a system wide condition inspection program instead of relying on age-based condition (recommended cycle is 5 years).
- Identify condition assessment strategies for high value and high-risk water network assets.

Risk Management Strategies

- Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
- Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- The data gaps corresponding to No. of Watermain Breaks, AADT and Proximity to Critical Services should be addressed for more robust risk frameworks.

Lifecycle Management Strategies

- Document and review lifecycle management strategies for the Water Network on a regular basis to achieve the lowest total cost of ownership while maintaining adequate service levels.
- Assess the suitability of corrosion protection for metallic mains, such as cathodic protection systems, zinc galvanization, and plastic coating.

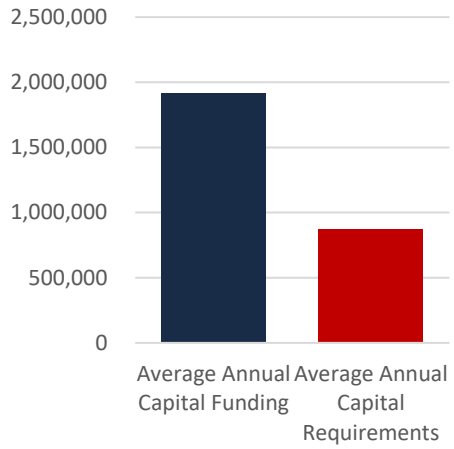
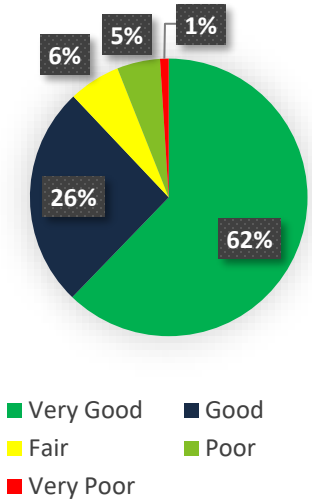
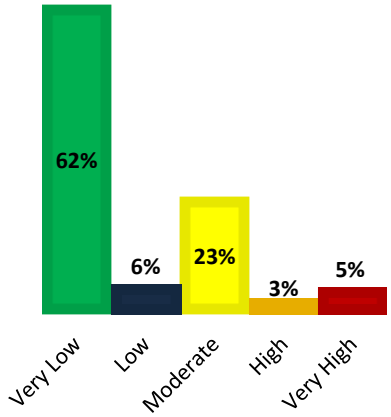
Levels of Service

- Continue to measure current levels of service in accordance with the metrics that the Municipality has established in this AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.
- Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

Sanitary Sewer Network

The Ontario Clean Water Agency (OCWA) is responsible for the operations and maintenance (O&M) of the entire Sanitary Sewer Network of the Municipality. The OCWA is responsible for maintaining sanitary mains, sewer manholes, wastewater treatment plan and pumping stations.

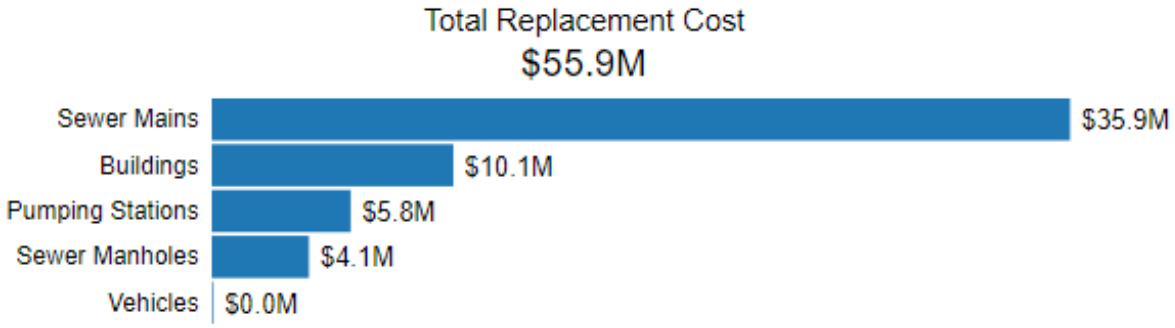
The table below outlines high-level service indicators for the Sanitary Sewer Network.

Cost	Performance (Average Condition)	Risk
		

5.1.8 Asset Inventory & Replacement Cost

The table below includes the quantity, replacement cost method and total replacement cost of each asset segment in the Municipality's Sanitary Sewer Network inventory.

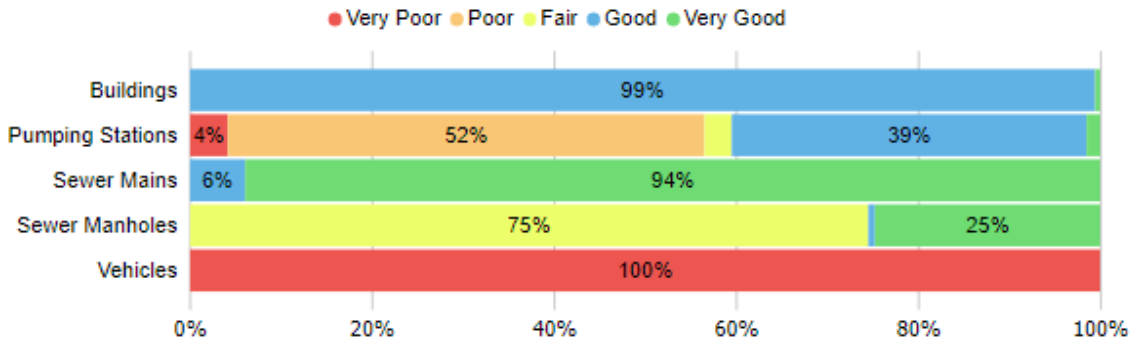
Asset Segment	Quantity	Replacement Cost Method	Total Replacement Cost
Buildings	4	CPI Tables	$10,105,954
Pumping Stations	30	CPI Tables	$5,812,292
Sewer Mains	27,807 m	Cost/Unit	$35,887,741
Sewer Manholes	271	Cost/Unit	$4,065,000
Vehicles	1	CPI Tables	$36,988
			$55,907,975



5.1.9 Asset Condition

The table below identifies the current average condition and source of available condition data for each asset segment. The Average Condition (%) is a weighted value based on replacement cost.

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Buildings	67%	Good	Age-based
Pumping Stations	46%	Fair	Age-based
Sewer Mains	87%	Very Good	Age-based
Sewer Manholes	54%	Fair	Age-based
Vehicles	0%	Very Poor	Age-based
	77%	**Good**	**Age-based**



To ensure that the Municipality's Sanitary Sewer Network continues to provide an acceptable level of service, the Municipality should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition of the Sanitary Sewer Network.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the municipality's current approach:

- Staff primarily rely on the age and material of sanitary sewer mains to determine the projected condition of sewer mains. A network wide CCTV program is being considered to proactively assess the condition of sanitary mains.
- OCWA conducts a comprehensive condition assessment of the Wastewater Network in the first year of assuming operations. Based on these condition assessments a 10-year capital plan and an annual capital plan is prepared for lifecycle management, including maintenance and rehabilitation strategies. The plans are reviewed with the Municipality on annual basis and the plans are adjusted over time.

5.1.10 Estimated Useful Life & Average Age

The Estimated Useful Life for Sanitary Sewer Network assets has been assigned according to a combination of established industry standards and staff knowledge. The Average Age of each asset is based on the number of years each asset has been in-service. Finally, the Average Service Life Remaining represents the difference between the Estimated Useful Life and the Average Age, except when an asset has been assigned an assessed condition rating. Assessed condition may increase or decrease the average service life remaining.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Buildings	40 Years	10.4	29.6
Pumping Stations	40 Years	22.7	17.3
Sewer Mains	60-75 Years	33	41.3
Sewer Manholes	75 Years	34.2	40.8
Vehicles	5 Years	7.5	-2.5
		32.8	**39.9**

Each asset's Estimated Useful Life should be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

5.1.11 Lifecycle Management Strategy

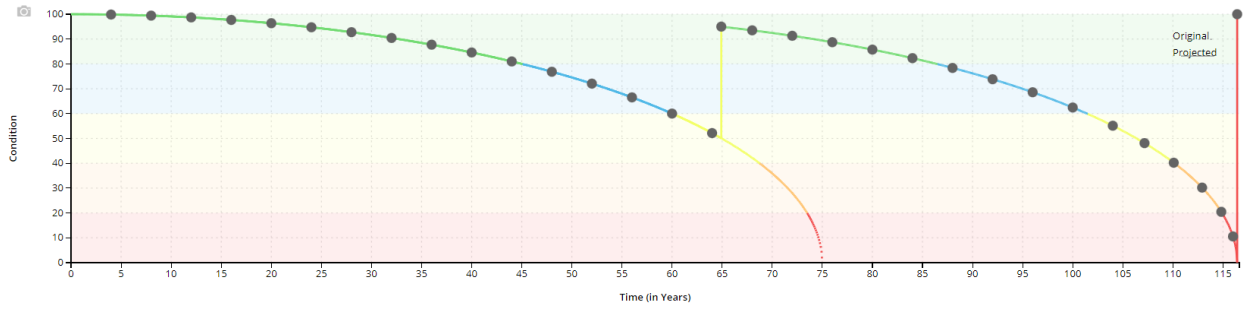
The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following 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 linear infrastructure
	The Municipality is starting the high velocity flushing program next year. Entire sewer network would be flushed over a period of 4 years.
	The wastewater treatment plant is inspected daily, as per the Ministry of Environment standards.
	A sanitary chamber inspection program was implemented for the first time in 2021.
Rehabilitation	Reactive rehabilitation is the most widely adopted approach for the storm network at this time as all the condition data is age-based Trenchless re-lining is being considered as it has the potential to reduce total lifecycle costs but would require a formal condition assessment program to determine viability
Replacement	Without the availability of up-to-date condition assessment information replacement activities are purely reactive in nature

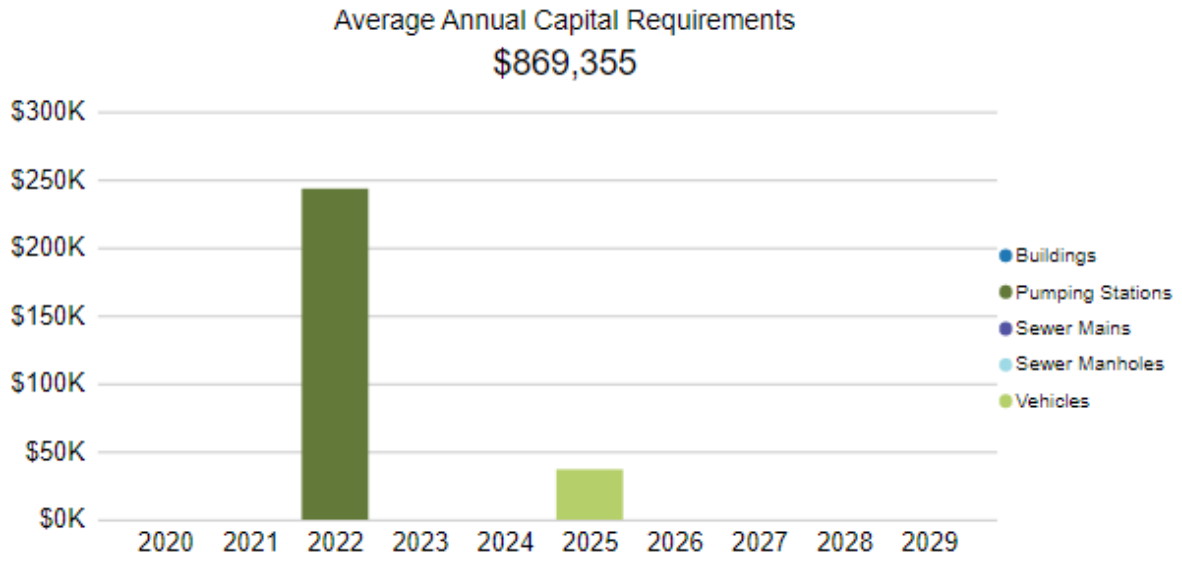
The following lifecycle strategy has been developed as a proactive approach to managing the lifecycle of sanitary mains. A trenchless re-lining strategy is expected to extend the service life of sanitary mains at a lower total cost of ownership.

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



Forecasted Capital Requirements

The following graph forecasts long-term capital requirements. The annual capital requirement represents the average amount per year that the Municipality should allocate towards funding rehabilitation and replacement needs.



The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Appendix A.

5.1.12 Risk & Criticality

Risk Matrix

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for sanitary sewer network assets based on 2020 inventory data. See Appendix C for the criteria used to determine the risk rating of each asset.

Risks to Current Asset Management Strategies

The following section summarizes key trends, challenges, and risks to service delivery that the Municipality is currently facing:

Asset Data & Information

There is a lack of confidence in the available inventory data and condition data. Staff plan to prioritize data refinement efforts to increase the accuracy and reliability of asset condition data and information. Once completed there will be greater confidence in the development of data-driven strategies to address infrastructure needs.

Community Growth

There are risks associated to expanding the system to cater for the expected growth and demand. However, staff is confident in the capacity to address growth and the required system expansion.

5.1.13 Levels of Service

The following tables identify the Municipality's current level of service for Sanitary Sewer Network. These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures that the Municipality has selected for this AMP.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Sanitary Sewer Network.

Service Attribute	Qualitative Description	Current LOS (2020)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	See Appendix B
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

Service Attribute	Qualitative Description	Current LOS (2020)
		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.

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the Sanitary Sewer Network.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	% of properties connected to the municipal wastewater system	57%
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	0
	# of connection-days per year having wastewater backups compared to the total number of properties connected to the municipal wastewater system	0
	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	0
Performance	Capital re-investment rate	0.001%
	% of Sanitary Sewer network in poor or very poor condition	6%
	Average Risk Rating of Sanitary Sewer Network	5.68

5.1.14 Recommendations

Asset Inventory

- Data refinement for the Estimated Useful Life of wastewater assets should be made based on in-field performance, and industry standards to reflect the age-based condition of the assets more accurately.
- The Estimated Useful Life for the wastewater assets should be revised to reflect the actual life in the field.

Condition Assessment Strategies

- Identify condition assessment strategies for high value and high-risk water network assets.
- The assessed condition of the assets should be populated in Citywide based on the condition assessments carried on cyclical basis (recommended cycle is 5 years).

Risk Management Strategies

- Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
- Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- The data gaps corresponding to Slope, AADT, No. of Surcharge/Blockage events and Proximity to Critical Services should be addressed for more robust risk frameworks.

Lifecycle Management Strategies

- A trenchless re-lining strategy is expected to extend the service life of sanitary mains at a lower total cost of ownership and should be implemented to extend the life of infrastructure at the lowest total cost of ownership.
- Evaluate the efficacy of the Municipality's lifecycle management strategies at regular intervals to determine the impact cost, condition, and risk.

Levels of Service

- Continue to measure current levels of service in accordance with the metrics that the Municipality has established in this AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.
- Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

6 Impacts of Growth

Key Insights

- Understanding the key drivers of growth and demand will allow the Municipality to more effectively plan for new infrastructure, and the upgrade or disposal of existing infrastructure

- Moderate population and employment growth is expected

- The costs of growth should be considered in long-term funding strategies that are designed to maintain the current level of service

Description of Growth Assumptions

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 more effectively plan for new infrastructure, 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.

6.1.1 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 Official Plan guides the maintenance, rehabilitation, growth, and development of the Municipality of North Middlesex over a 20-year planning horizon (2003 to 2022) with a goal of ensuring a sustainable living environment that meets the needs of the community.

The Official Plan has been approved at Municipal Council as of June 23rd, 2003 and consolidated this official plan in August 2018.

As per the plan objectives, the growth and development shall be focused and encouraged within the settlement areas to strengthen their role as economic, natural, land use, and cultural & heritage for the Municipality, as well as to enhance their function in providing services.

This plan includes the growth forecasts in terms of population and housing units for which the Municipality will be required to provide services. The following table outlines the population and housing unit forecasts allocated to North Middlesex utilizing the data from Statistics Canada and North Middlesex's Official Plan.

Year	Total Population	Private Dwellings
2006	6,740	2,305
2011	6,658	2,342
2016	6,352	2,399
2022	7,600	-

Impact of Growth on Lifecycle Activities

By July 1, 2025, the Municipality's asset management plan musts 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.

7 Financial Strategy

Key Insights

- The Municipality is committing approximately $3,354,000 towards capital projects per year from sustainable revenue sources

- Given the annual capital requirement of $6,647,000, there is currently a funding gap of $3,293,000 annually

- For tax-funded assets, we recommend increasing tax revenues by 1.4% each year for the next 15 years to achieve a sustainable level of funding

- For the Sanitary Sewer Sanitary Sewer Network as there is no annual infrastructure deficit, and as such, no user rate increases are required.

- For the Water Network, we recommend increasing rate revenues by 3.3% annually for the next 20 years to achieve a sustainable level of funding

Financial Strategy Overview

For an asset management plan to be effective and meaningful, it must be integrated with a long-term financial plan (LTFP). The development of a comprehensive financial plan will allow the Municipality of North Middlesex to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

This report develops such a financial plan by presenting several scenarios for consideration and culminating with final recommendations. As outlined below, the scenarios presented model different combinations of the following components:

1. The financial requirements for:
    a. Existing assets
    b. Existing service levels
    c. Requirements of contemplated changes in service levels (none identified for this plan)
    d. Requirements of anticipated growth (none identified for this plan)
2. Use of traditional sources of municipal funds:
    a. Tax levies
    b. User fees
    c. Reserves
    d. Debt
    e. Development charges
3. Use of non-traditional sources of municipal funds:
    a. Reallocated budgets
    b. Partnerships
    c. Procurement methods
4. Use of Senior Government Funds:
    a. Gas tax
    b. Annual grants

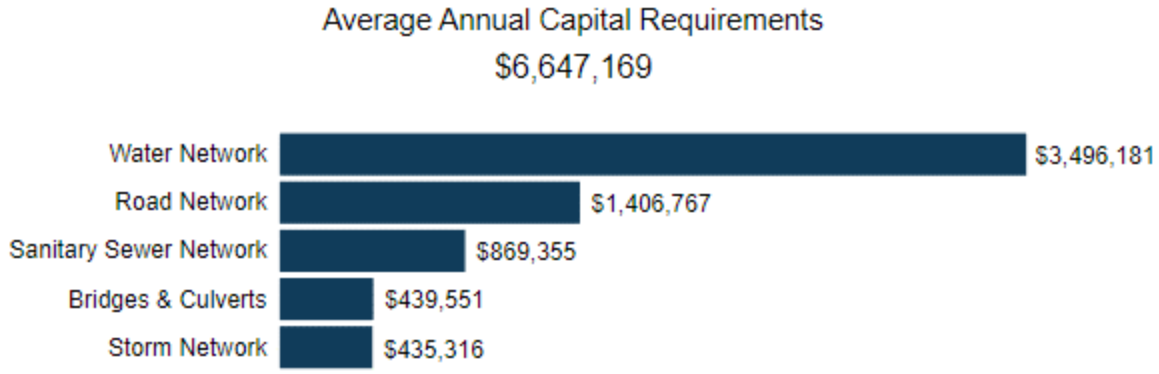
Note: Periodic grants are normally not included due to Provincial requirements for firm commitments. However, if moving a specific project forward is wholly dependent on receiving a one-time grant, the replacement cost included in the financial strategy is the net of such grant being received. If the financial plan component results in a funding shortfall, the Province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the Province may evaluate a Municipality's approach to the following:

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

7.1.1 Annual Requirements & Capital Funding

Annual Requirements

The annual requirements represent the amount the Municipality should allocate annually to each asset category to meet replacement needs as they arise, prevent infrastructure backlogs, and achieve long-term sustainability. In total, the Municipality must allocate approximately $6.6 million annually to address capital requirements for the assets included in this AMP.



For most asset categories the annual requirement has been calculated based on a "replacement only" scenario, in which capital costs are only incurred at the construction and replacement of each asset.

However, for the Road Network, Storm Water Network and Sanitary Sewer Network, lifecycle management strategies have been developed to identify capital costs that are realized through strategic rehabilitation and renewal of the Municipality's roads, storm sewers and sanitary sewer mains respectively. The development of these strategies allows for a comparison of potential cost avoidance if the strategies were to be implemented. The following table compares two scenarios for the Road Network, Stormwater Network, and Sanitary Sewer Network:

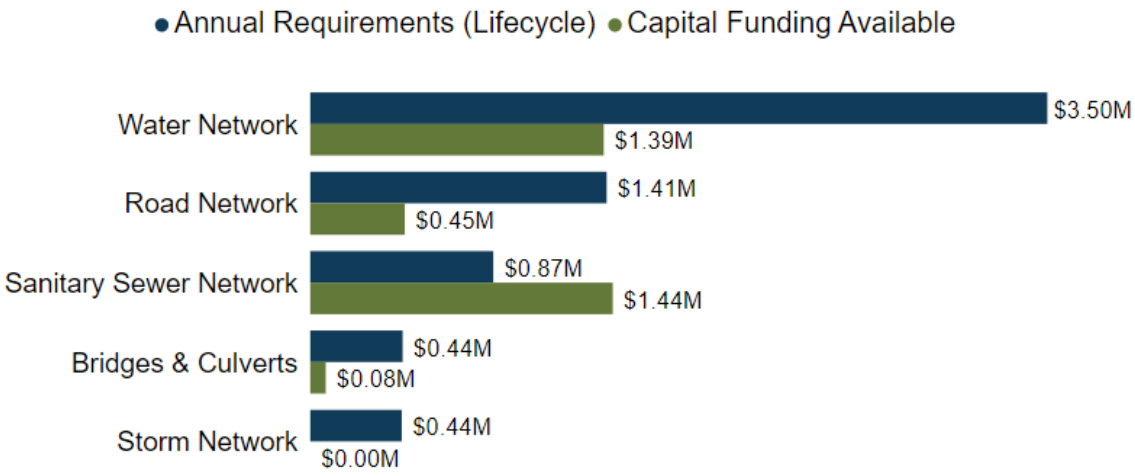
1. **Replacement Only Scenario**: Based on the assumption that assets deteriorate and – without regularly scheduled maintenance and rehabilitation – are replaced at the end of their service life.
2. **Lifecycle Strategy Scenario**: Based on the assumption that lifecycle activities are performed at strategic intervals to extend the service life of assets until replacement is required.

Asset Category	Annual Requirements (Replacement Only)	Annual Requirements (Lifecycle Strategy)	Difference
Road Network	$1,804,066	$1,406,767	$397,300
Storm Water Network	$537,524	$435,316	$102,209
Sanitary Sewer Network	$945,367	$869,355	$76,013

The implementation of a proactive lifecycle strategy for roads leads to a potential annual cost avoidance of $397,300 for the Road Network, $102,209 for storm water, and $76,013 for the Sanitary Sewer Network. This represents an overall reduction of the annual requirements for each category by 22%, 19% and 8% respectively. As the lifecycle strategy scenario represents the lowest cost option available to the Municipality, we have used these annual requirements in the development of the financial strategy.

Annual Funding Available

Based on a historical analysis of sustainable capital funding sources, the Municipality is committing approximately $3,354,000 towards capital projects per year from sustainable revenue sources. Given the annual capital requirement of $6,647,000, there is currently a funding gap of $3,293,000 annually.



Funding Objective

We have developed a scenario that would enable North Middlesex to achieve full funding within 20 years for the following assets:

1. **Tax Funded Assets:** Road Network, Stormwater Network, Bridges & Culverts
2. **Rate-Funded Assets:** Water Network, Sanitary Sewer Network

Note: For the purposes of this AMP, we have excluded gravel roads since they are a perpetual maintenance asset and end of life replacement calculations do not normally apply. If gravel roads are maintained properly, they can theoretically have a limitless service life.

For each scenario developed we have included strategies, where applicable, regarding the use of cost containment and funding opportunities.

Financial Profile: Tax Funded Assets

7.1.2 Current Funding Position

The following tables show, by asset category, North Middlesex's average annual asset investment requirements (CapEx), current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Asset Category	Avg. Annual Requirement	Annual Funding Available			Annual Deficit
		Taxes	Gas Tax	Total Available	
Road Network	1,407,000	200,000	250,000	450,000	957,000
Stormwater Network	435,000	-	-	-	435,000
Bridges & Culverts	440,000	75,000	-	75,000	365,000
	2,282,000	**275,000**	**250,000**	**525,000**	**1,757, 000**

The average annual investment requirement for the above categories is $2.3 million. Annual revenue currently allocated to these assets for capital purposes is $525k leaving an annual deficit of $1.7 million. Put differently, these infrastructure categories are currently funded at 23% of their long-term requirements.

7.1.3 Full Funding Requirements

In 2021, Municipality of North Middlesex has annual tax revenues of 8.1 million. As illustrated in the following table, without consideration of any other sources of revenue or cost containment strategies, full funding would require the following tax change over time:

Asset Category	Tax Change Required for Full Funding
Road Network	11.8%
Stormwater Network	5.4%
Bridges & Culverts	4.5%
Total	**21.7%**

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

a) North Middlesex's formula based OCIF grant should be considered for the tax funded assets.
b) North Middlesex currently has no debt payments for these asset categories.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit outlined above. The table below outlines this concept and presents several options:

Tax Funded Assets				
	5 Years	**10 Years**	**15 Years**	**20 Years**
Infrastructure Deficit:	1,757,000	1,757,000	1,757,000	1,757,000
Change in Debt Costs	-	-	-	-
Change in OCIF Grants	-	-	-	-
Resulting Infrastructure Deficit	**1,757,000**	**1,757,000**	**1,757,000**	**1,757,000**
Tax Increase Required	21.7%	21.7%	21.7%	21.7%
Annually	**4.3%**	**2.2%**	**1.4%**	**1.1%**

7.1.4 Financial Strategy Recommendations

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

a) increasing tax revenue by 1.4% each year for the next 15 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
b) allocating current gas tax and OCIF revenue as outlined previously.
c) allocating, if any, scheduled OCIF grant increases to the infrastructure deficit as they occur.
d) reallocating appropriate revenue from categories in a surplus position to those in a deficit position.
e) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

1. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included any applicable OCIF formula-based funding since this funding is a multi-year commitment[7].
2. We realize that raising tax revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.

Although this option achieves full CapEx funding on an annual basis in 15 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $613k for the Stormwater Network.

Prioritizing future projects will require the current data to be replaced by condition-based data. Although our recommendations include no further use of debt, the results of the condition-based analysis may require otherwise.

[7] The Municipality should take advantage of all available grant funding programs and transfers from other levels of government. While OCIF has historically been considered a sustainable source of funding, the program is currently undergoing review by the provincial government. This review may impact its availability.

Financial Profile: Rate Funded Assets

7.1.5 Current Funding Position

The following tables show, by asset category, North Middlesex's average annual CapEx requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

Asset Category	Avg. Annual Requirement	Annual Funding Available				Annual Deficit
		Rates	To Operations	OCIF	Total Available	
Water Network	3,496,000	3,218,000	-1,825,000	-	1,393,000	2,103,000
Sanitary Sewer Network	869,000	1,744,000	-596,000	288,000	1,436,000	-567,000
	4,365,000	**4,962,000**	**-2,421,000**	**288,000**	**2,829,000**	**1,536,000**

The average annual investment requirement for the above categories is $4.37 million. Annual revenue currently allocated to these assets for capital purposes is $2.83 million leaving an annual deficit of $1.54 million. Put differently, these infrastructure categories are currently funded at 65% of their long-term requirements.

7.1.6 Full Funding Requirements

In 2021, North Middlesex had annual budgeted water revenues of $3.22 million and annual budgeted sanitary revenues of $1.74 million. As illustrated in the table below, without consideration of any other sources of revenue, full funding would require the following changes over time:

Asset Category	Rate Change Required for Full Funding
Water Network	65.4%
Sanitary Sewer Network	-

In the following table, we have expanded the above scenario to present multiple options. Due to the significant increases required, we have provided phase-in options of up to 20 years:

Water Assets				
	5 Years	**10 Years**	**15 Years**	**20 Years**
Infrastructure Deficit	2,103,000	2,103,000	2,103,000	2,103,000
Change in Debt Costs	-	-	-	-
Resulting Infrastructure Deficit:	**2,103,000**	**2,103,000**	**2,103,000**	**2,103,000**
Tax Increase Required	65.4%	65.4%	65.4%	65.4%
Annually	**13.1%**	**6.5%**	**4.4%**	**3.3%**

We have not included a table for the Sanitary Sewer Network as there is no annual infrastructure deficit, and as such, no user rate increases are required.

7.1.7 Financial Strategy Recommendations

Considering all the above information, we recommend maintaining the current status quo funding model for the Sanitary Sewer Network based on the asset category having achieved full annual average CapEx requirement funding for existing infrastructure. We recommend the 20-year funding option for the Water Network. This involves full CapEx funding being achieved over 20 years by:

a) maintaining the current rates (i.e., no rate hikes recommended at this time) and revenue allocations for CapEx for the Sanitary Sewer Network.
b) increasing Water Network rate revenues by 3.3% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
c) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.
d) adjusting the Water Network rate revenue increase for changes in debt costs resulting from any on-going projects funded by debt

Notes:

1. We acknowledge that raising rate revenues consistently for the next twenty years to invest in infrastructure purposes is not necessary for the Sanitary Sewer Network.
2. Assumption is that no new debt will be taken on to pay for existing infrastructure.
3. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. This periodic funding should not be incorporated into an AMP unless there are firm commitments in place.

4. We realize that raising Water Network rate revenues for CapEx purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.
5. Also, the Municipality could choose to implement a potential rate increase at any time during the next twenty years for one of the following reasons: new technical information/data amends the infrastructure investment requirement, and/or the Municipality wishes to fund specific Water or Sanitary Sewer Capital Reserves for future infrastructure needs.
6. Any increase in rates required for operations would be in addition to the above recommendations.

Although this strategy achieves full CapEx funding for rate-funded assets over 20 years, the recommendation does require prioritizing capital projects to fit the annual funding available. Current data shows a pent-up investment demand of $37k for the Sanitary Sewer Network.

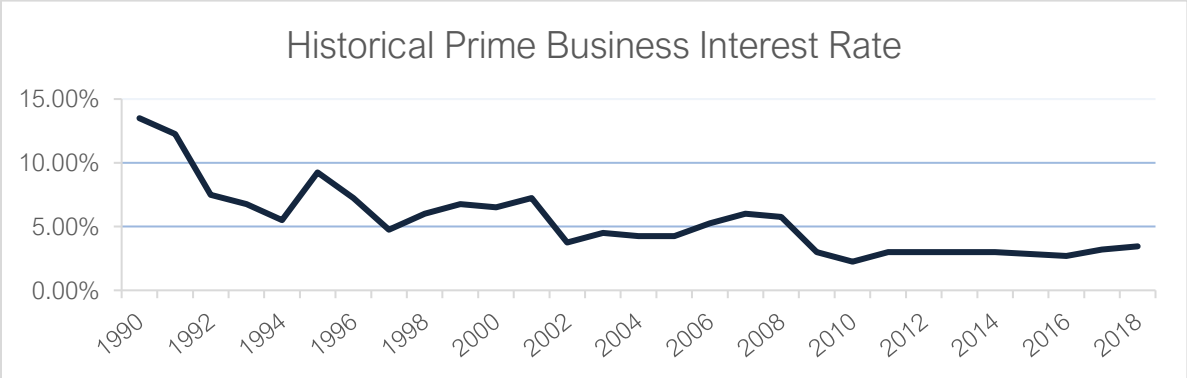
Prioritizing future projects will require the current data to be replaced by condition-based data. Although our recommendations include no further use of debt, the results of the condition-based analysis may require otherwise.

Use of Debt

For reference purposes, the following table outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[8] over 15 years would result in a 26% premium or $260,000 of increased costs due to interest payments. For simplicity, the table does not consider the time value of money or the effect of inflation on delayed projects.

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

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



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

A change in 15-year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

The following tables outline how North Middlesex has historically used debt for investing in the asset categories as listed. There is currently $532,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $74,000, well within its provincially prescribed maximum of $3,095,000.

Asset Category	Current Debt Outstanding	Use of Debt in the Last Five Years				
		2015	2016	2017	2018	2019
Road Network	0	0	0	0	0	0
Stormwater Network	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Total Tax Funded:	**0**	**0**	**0**	**0**	**0**	**0**
Water Network	0	0	0	0	0	0
Sanitary Sewer Network	532,000	0	0	0	0	0
Total Rate Funded:	**532,000**	**0**	**0**	**0**	**0**	**0**

Asset Category	Principal & Interest Payments in the Next Ten Years						
	2020	2021	2022	2023	2024	2025	2030
Road Network	0	0	0	0	0	0	0
Stormwater Network	0	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0	0
Total Tax Funded:	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Water Network	0	0	0	0	0	0	0
Sanitary Sewer Network	74,000	74,000	74,000	72,000	74,000	74,000	12,000
Total Rate Funded:	**74,000**	**74,000**	**74,000**	**72,000**	**74,000**	**74,000**	**12,000**

The revenue options outlined in this plan allow North Middlesex to fully fund its long-term infrastructure requirements without further use of debt.

Use of Reserves

7.1.8 Available Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include:

a) the ability to stabilize tax rates when dealing with variable and sometimes uncontrollable factors
b) financing one-time or short-term investments
c) accumulating the funding for significant future infrastructure investments
d) managing the use of debt
e) normalizing infrastructure funding requirement

By asset category, the table below outlines the details of the reserves currently available to North Middlesex

Asset Category	Balance at December 31, 2020
Road Network	371,000
Stormwater Network	313,000
Bridges & Culverts	1,021,000
Total Tax Funded:	**1,705,000**
Water Network	2,238,000
Sanitary Sewer Network	625,000
Total Rate Funded:	**2,863,000**

There is considerable debate in the municipal sector as to the appropriate level of reserves that a Municipality should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should consider when determining their capital reserve requirements include:

a) breadth of services provided
b) age and condition of infrastructure
c) use and level of debt
d) economic conditions and outlook
e) internal reserve and debt policies.

These reserves are available for use by applicable asset categories during the phase-in period to full funding. This coupled with North Middlesex's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for high priority and emergency infrastructure investments in the short- to medium-term.

7.1.9 Recommendation

In 2025, Ontario Regulation 588/17 will require North Middlesex to integrate proposed levels of service for all asset categories in its asset management plan update. We recommend that future planning should reflect adjustments to service levels and their impacts on reserve balances.

8 Appendices

Key Insights

- Appendix A includes a one-page report card with an overview of key data from each asset category
- Appendix A identifies projected 10-year capital requirements for each asset category
- Appendix B includes several maps that have been used to visualize the current level of service
- Appendix C identifies the criteria used to calculate risk for each asset category
- Appendix E provides additional guidance on the development of a condition assessment program

Appendix A: 10-Year Capital Requirements

The following tables identify the capital cost requirements for each of the next 10 years in order to meet projected capital requirements and maintain the current level of service.

Road Network											
Asset Segment	Backlog	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Asphalt Roads	$0	$0	$82,822	$6,556	$55,393	$11,774	$337,444	$182,729	$1,544,125	$1,234,481	$1,349,417
Sidewalks	$0	$0	$0	$0	$0	$0	$780,570	$0	$0	$0	$0
Streetlights	$0	$0	$0	$0	$0	$0	$699,000	$0	$0	$0	$69,000
	$0	**$0**	**$82,822**	**$6,556**	**$55,393**	**$11,774**	**$1,817,014**	**$182,729**	**$1,544,125**	**$1,234,481**	**$1,418,417**

Bridges & Culverts											
Asset Segment	Backlog	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Bridges & Structural Culverts	$0	$0	$0	$0	$2,652,050	$0	$0	$0	$0	$0	$0
Non - Structural Culverts	$0	$92,708	$0	$0	$0	$0	$0	$0	$0	$440,269	$0
	$0	**$92,708**	**$0**	**$0**	**$2,652,050**	**$0**	**$0**	**$0**	**$0**	**$440,269**	**$0**

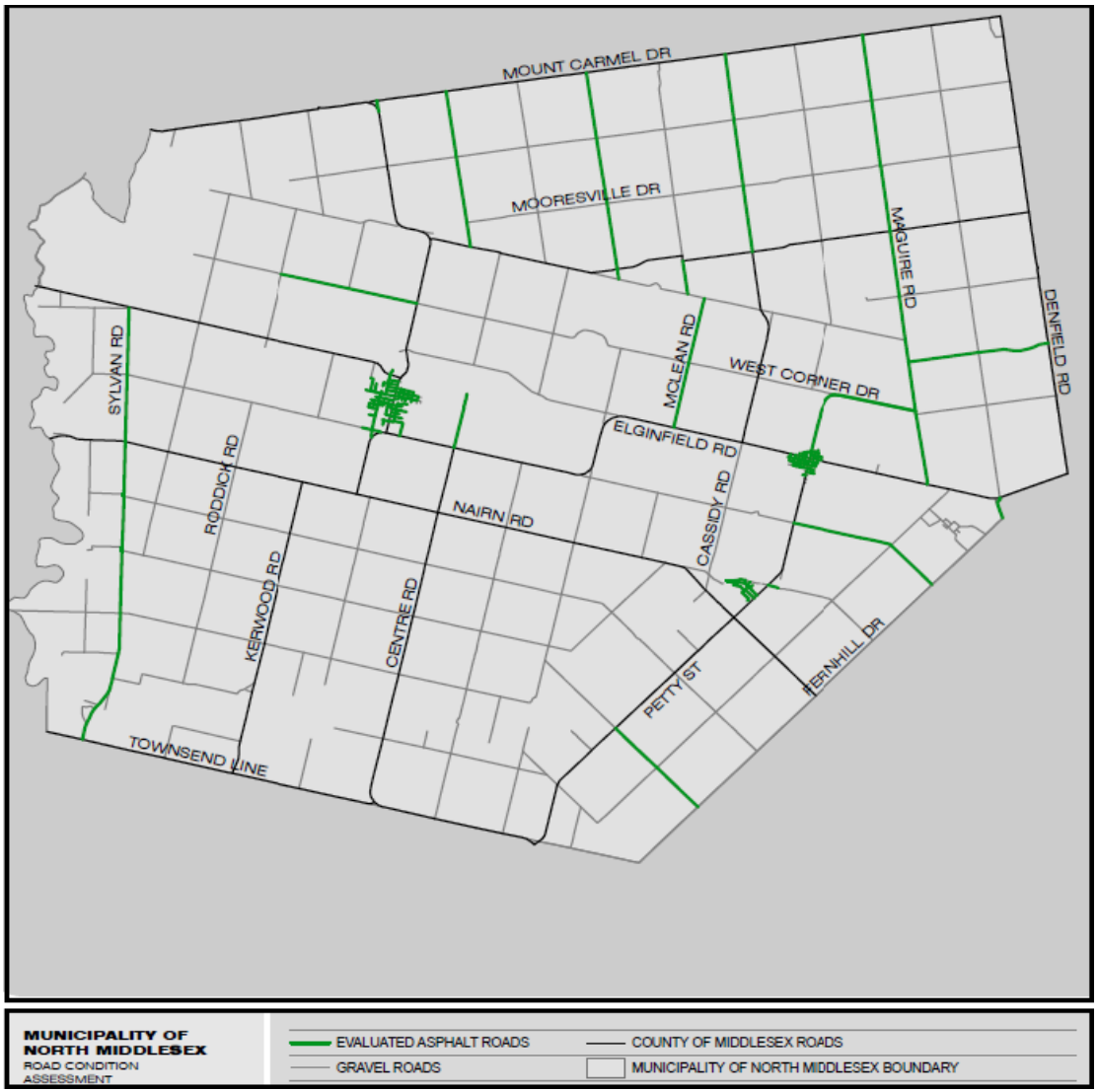
Stormwater Network											
Asset Segment	Backlog	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Storm Sewer Mains	$613,281	$0	$0	$0	$0	$0	$15,555,081	$0	$0	$0	$0
Storm Manholes	$0	$0	$0	$0	$0	$0	$30,000	$0	$0	$0	$37,500
	$613,281	**$0**	**$0**	**$0**	**$0**	**$0**	**$15,585,081**	**$0**	**$0**	**$0**	**$37,500**

Water Network											
Asset Segment	Backlog	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Hydrants	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Machinery & Equipment	$0	$0	$0	$12,810	$0	$0	$0	$0	$0	$0	$0
Water Mains	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$565,700
Water Meters	$0	$0	$0	$0	$0	$0	$519,500	$0	$0	$0	$0
Water Valves	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$72,000
	$0	**$0**	**$0**	**$12,810**	**$0**	**$0**	**$519,500**	**$0**	**$0**	**$0**	**$637,700**

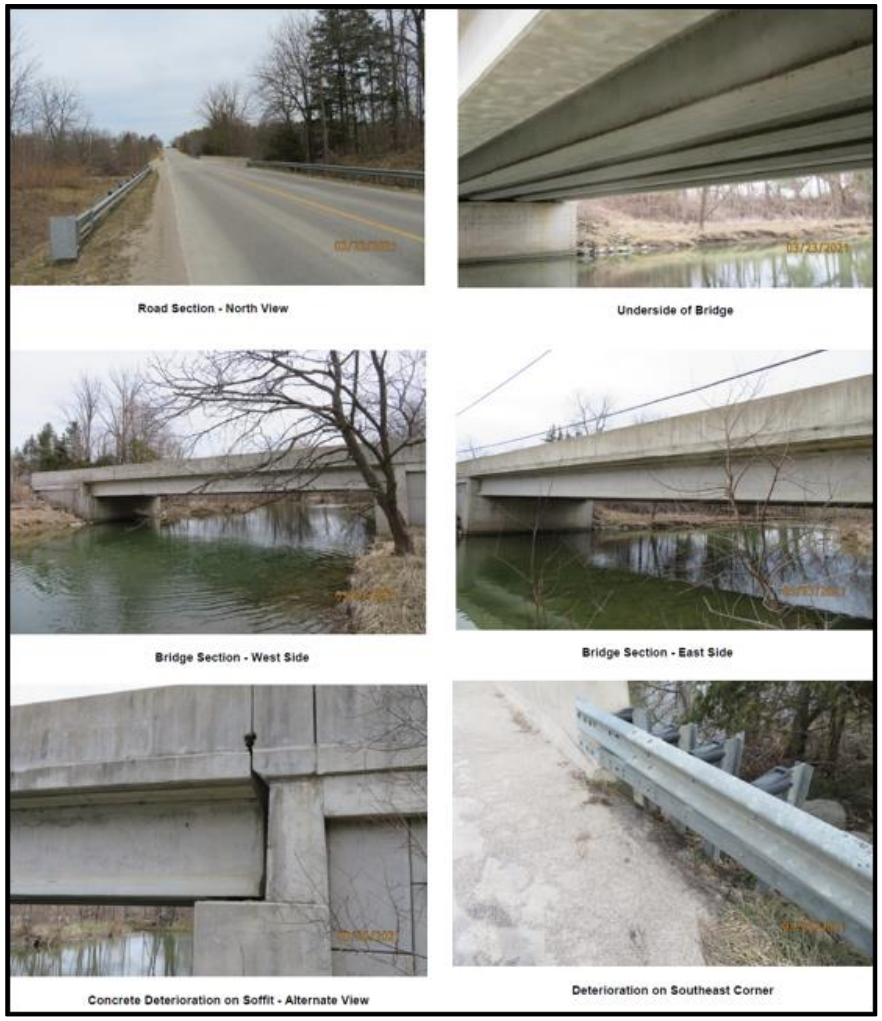
Sanitary Sewer Network											
Asset Segment	Backlog	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Buildings	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Pumping Stations	$0	$0	$0	$243,483	$3	$0	$0	$0	$0	$0	$0
Sewer Mains	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Sewer Manholes	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Vehicles	$36,988	$0	$0	$0	$0	$0	$36,988	$0	$0	$0	$0
	$36,988	**$0**	**$0**	**$243,483**	**$3**	**$0**	**$36,988**	**$0**	**$0**	**$0**	**$0**

Appendix B: Level of Service Maps

Road Network Map

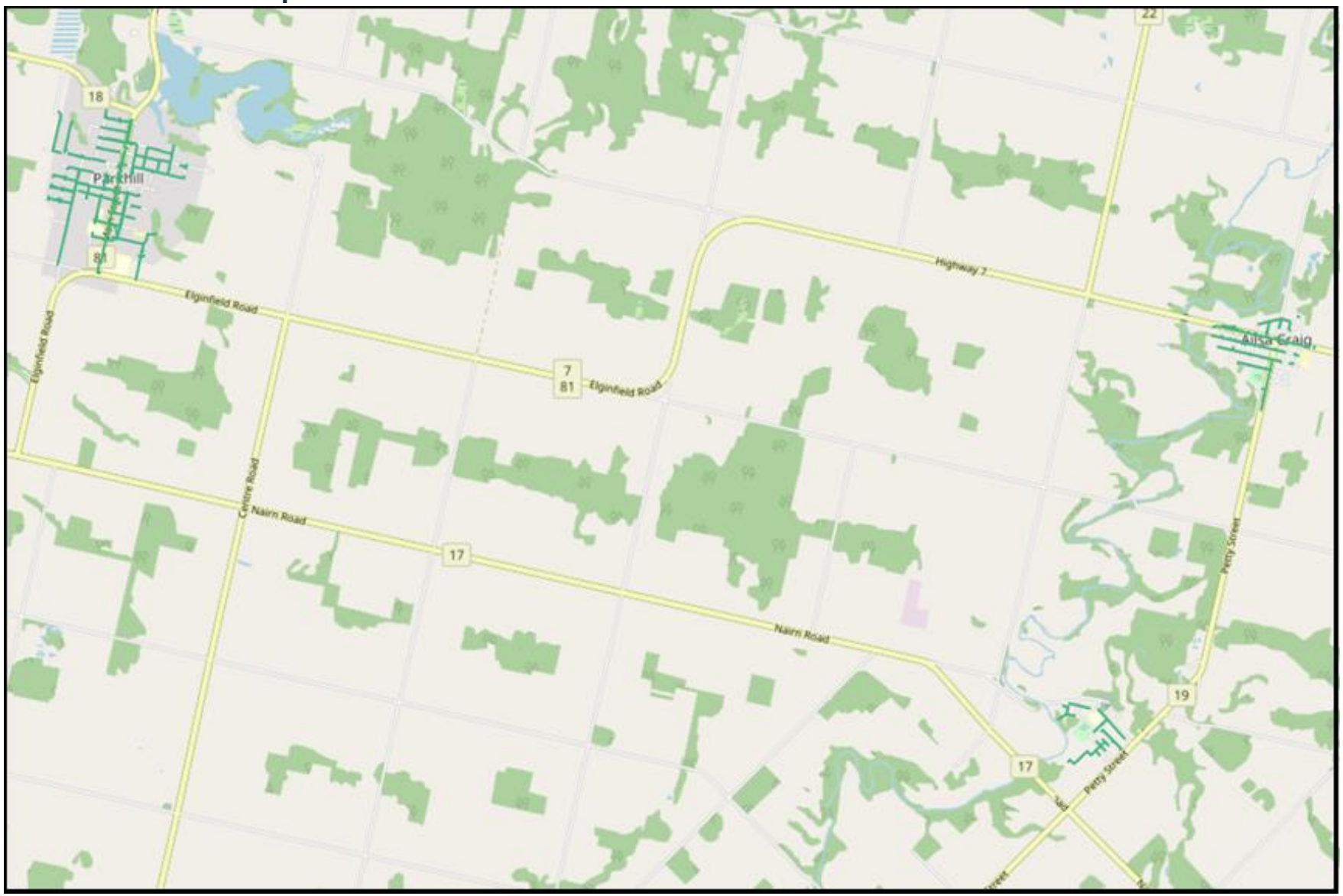


Bridges and Structural Culverts Condition
Images of Bridge in Good Condition
Bridge No: 18
Inspected: March 3rd, 2021

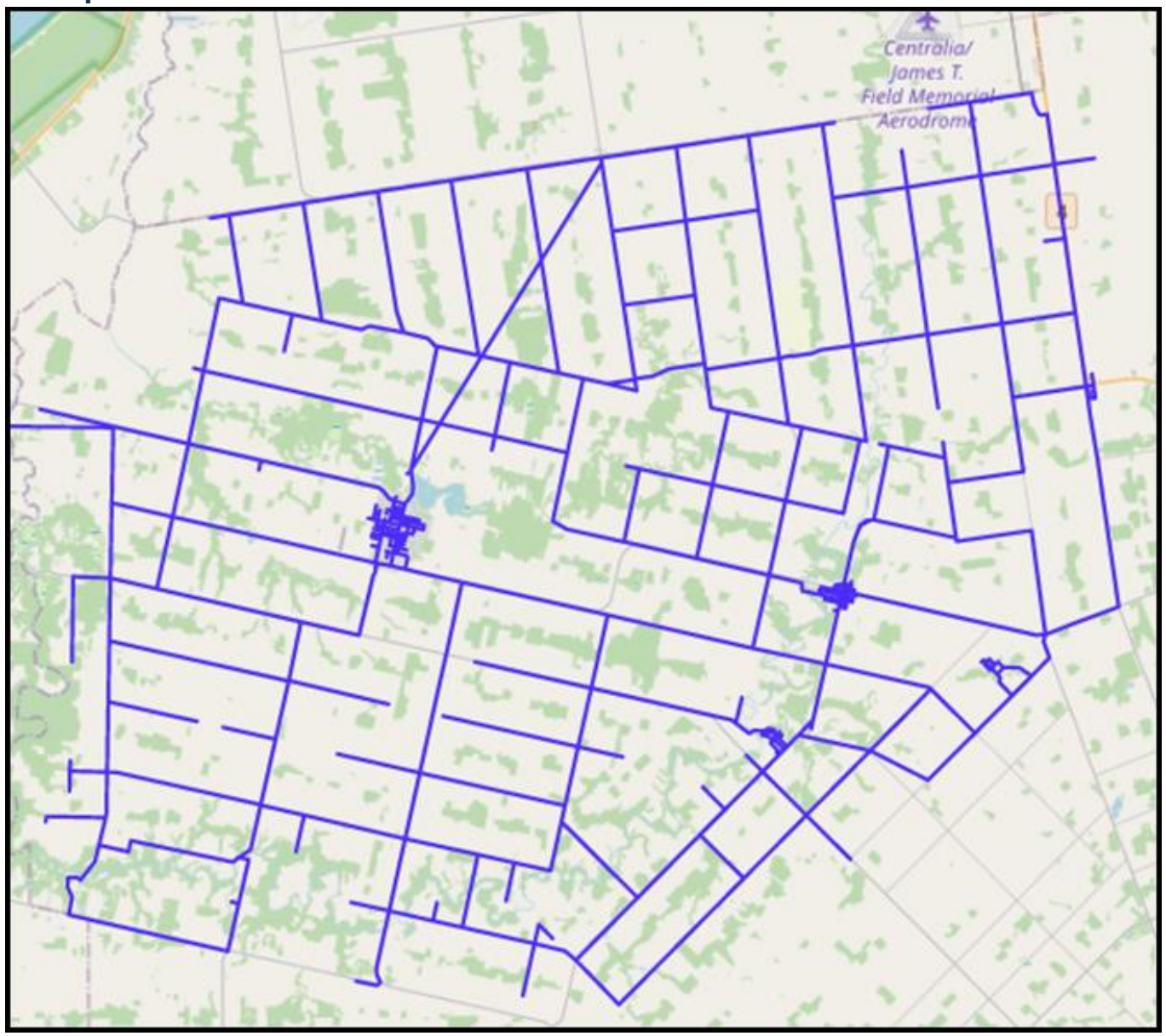


Images of Culvert in Fair Condition
Culvert No: 37
Inspected: April 5th, 2021

Stormwater Network Map

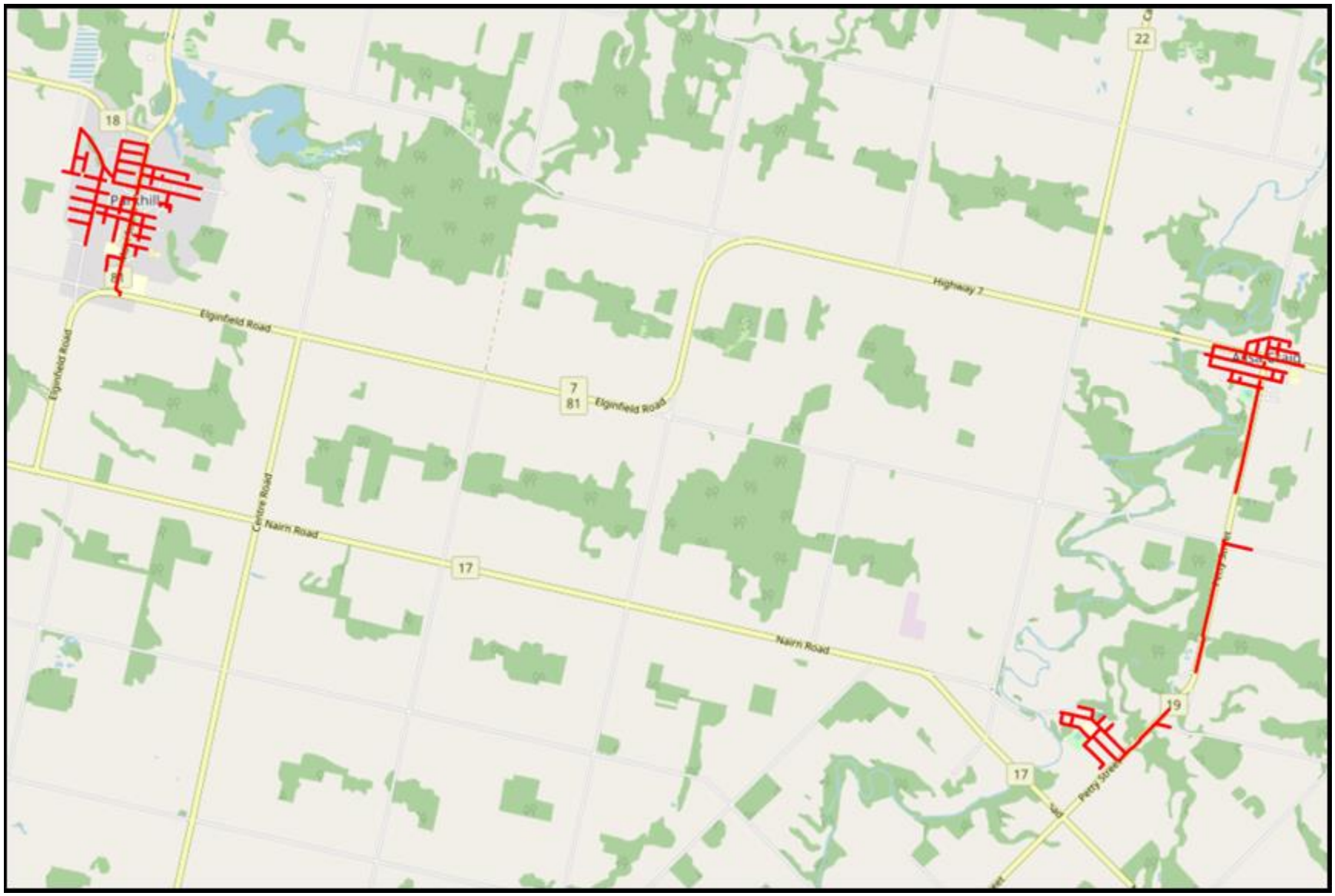


Water Network Map



Water Network – Fire Flow Available

Sanitary Sewer Network Map



Appendix C: Risk Rating Criteria

Probability of Failure

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
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
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

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			200-499	3
			500-999	4
			1000+	5
Bridges & Structural Culverts	Condition	68%	80-100	1
			70-79	2
			60-69	3
			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

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			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
			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

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			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
			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
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
Gravel Roads	Economic (70%)	Replacement Cost Per Sq.M (100%)	0-9	1
			10-14	2
			15-19	3
			20-24	4
			25+	5
	Social (15%)	Road Class (100%)	C6	1
			C5	2
			C4,C3	3
			C2	4
			C1	5
	Health & Safety	Speed	0-39	1

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
	(15%)	(100%)	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
		Derour 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

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
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 (50%)	Less than 2	1
			2-3	2
			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	Diameter	0-75	1

	(15%)	(100%)	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

Appendix E: Condition Assessment Guidelines

The foundation of good asset management practice is accurate and reliable data on the current condition of infrastructure. Assessing the condition of an asset at a single point in time allows staff to have a better understanding of the probability of asset failure due to deteriorating condition.

Condition data is vital to the development of data-driven asset management strategies. Without accurate and reliable asset data, there may be little confidence in asset management decision-making which can lead to premature asset failure, service disruption and suboptimal investment strategies. To prevent these outcomes, the Municipality's condition assessment strategy should outline several key considerations, including:

- The role of asset condition data in decision-making
- Guidelines for the collection of asset condition data
- A schedule for how regularly asset condition data should be collected

Role of Asset Condition Data

The goal of collecting asset condition data is to ensure that data is available to inform maintenance and renewal programs required to meet the desired level of service. Accurate and reliable condition data allows municipal staff to determine the remaining service life of assets, and identify the most cost-effective approach to deterioration, whether it involves extending the life of the asset through remedial efforts or determining that replacement is required to avoid asset failure.

In addition to the optimization of lifecycle management strategies, asset condition data also impacts the Municipality's risk management and financial strategies. Assessed condition is a key variable in the determination of an asset's probability of failure. With a strong understanding of the probability of failure across the entire asset portfolio, the Municipality can develop strategies to mitigate both the probability and consequences of asset failure and service disruption. Furthermore, with condition-based determinations of future capital expenditures, the Municipality can develop long-term financial strategies with higher accuracy and reliability.

Guidelines for Condition Assessment

Whether completed by external consultants or internal staff, condition assessments should be completed in a structured and repeatable fashion, according to consistent and objective assessment criteria. Without proper guidelines for the completion of condition assessments there can be little confidence in the validity of condition data and asset management strategies based on this data.

Condition assessments must include a quantitative or qualitative assessment of the current condition of the asset, collected according to specified condition rating criteria, in a format that can be used for asset management decision-making. As a result, it is important that staff adequately define the condition rating criteria that should be used and the assets that require a discrete condition rating. When engaging with external consultants to complete condition assessments, it is critical that these details are communicated as part of the contractual terms of the project.

There are many options available to the Municipality to complete condition assessments. In some cases, external consultants may need to be engaged to complete detailed technical assessments of infrastructure. In other cases, internal staff may have sufficient expertise or training to complete condition assessments.

Developing a Condition Assessment Schedule

Condition assessments and general data collection can be both time-consuming and resource intensive. It is not necessarily an effective strategy to collect assessed condition data across the entire asset inventory. Instead, the Municipality should prioritize the collection of assessed condition data based on the anticipated value of this data in decision-making. The International Infrastructure Management Manual (IIMM) identifies four key criteria to consider when making this determination:

1. **Relevance**: every data item must have a direct influence on the output that is required
2. **Appropriateness**: the volume of data and the frequency of updating should align with the stage in the assets life and the service being provided
3. **Reliability**: the data should be sufficiently accurate, have sufficient spatial coverage and be appropriately complete and current
4. **Affordability**: the data should be affordable to collect and maintain