Report 2022-147
Appendix B - Asset Management Plan

PORT COLBORNE

2022 Asset Management Plan

Foreword

The City of Port Colborne is a waterfront community on the south shore of Niagara Region with a unique culture and history and increasing appeal to residents and tourists. As an area poised for growth, it is essential to manage and plan the City's infrastructure efficiently to ensure residents' good quality of life is maintained into the future. The City's core infrastructure provides the foundation for all other activities and supports a healthy community through the provision of safe drinking water, collection of wastewater, management of stormwater, and effective movement of people and goods.

To preserve the value of its infrastructure assets, the City must take a proactive and systematic approach to managing asset lifecycles, which requires balancing costs, opportunities, and risks against expectations for asset performance. This Asset Management Plan documents the current state of City assets, their desired levels of service, the lifecycle activities required to maintain them, and potential strategies for financing full asset lifecycles.

The Plan provides a framework which can help City staff and Council make infrastructure decisions while considering long-term community objectives and aspirations. It can lead to development of standard policies to ensure that City infrastructure assets are maintained and sustainable within the realities of budgetary limitations. This Plan reflects the community's needs and priorities and through its implementation, the City will be best prepared to manage opportunities and challenges as they arise in the future.

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Abbreviations

The tables below provide a summary of the abbreviations referenced in this document.

Acronym	Definition
AM	Asset Management
AMP	Asset Management Plan
BCI	Bridge Condition Assessment
CCTV	Closed Circuit Television Camera
ESL	Estimated Service Life
LOS	Level of Service

Acronym	Definition
OSIM	Ontario Structure Inspection Manual
NRBCPI	Non-Residential Building Construction Price Index
PACP	Pipeline Assessment and Certification Program
PCI	Pavement Condition Index

Glossary of Terms

The table below provides a summary of the definitions referenced in this document.

Term	Definition
Asset	An item, thing or entity that has potential or actual value or benefit to an organization.
Asset Management	Coordinated activity of an organization to realize value from assets.
Asset Management Plan (AMP)	Long-term plans (usually 10-20 years or more for infrastructure assets) that outline the asset activities and programs for each service area and resources applied to provide a defined level of service in the most cost-effective way.
Asset Management Policy	A high-level statement of an organization's principles and approach to asset management (IIMM, 2015).
Bridge Condition Index (BCI)	A numerical index generally utilized for the assessment of the condition & structural reliability of bridges and culverts.

Term	Definition
Connection Days	The number of properties connected to a municipal system that are affected by a service issue, multiplied by the number of days on which those properties are affected by the service issue.
Estimated Service Life (ESL)	An estimate of the duration of time that an asset is forecasted to be in service.
Infrastructure	The system of fundamental facilities and structures necessary for a public works of a country, state or region to function. Examples include roads, railway, bridges, tunnels, water supply, sewers, electrical, telecommunications, signs, equipment, fleet, etc.
Level of Service (LOS)	Parameter or combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers. Levels of service statements describe the outputs or objectives an organization or activity intends to deliver to customers.
Lifecycle Activity	An activity undertaken to sustain asset integrity and service levels over the life of an asset, such as demand management or rehabilitation.
Lifecycle Cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
Lifecycle Management Strategy	The set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost.
LOS Framework	A set of tables which outlines the Levels of Service developed for each service category.
Ontario Regulation O.Reg. 588/17	Ontario Regulation 588/17 under the Infrastructure for Jobs and Prosperity Act 2015, as amended. Principles are set out in this regulation by the provincial government to regulate asset management planning for municipalities.
Performance Measure	Parameters / metrics that can be measured and monitored to assess the delivery of a service that is being provided.
Pipeline Assessment and Certification Program (PACP)	A standardized protocol for coding pipeline condition information from CCTV inspection footage.
Replacement Cost/Value	The cost of acquiring an asset to replace an existing asset with a new modern equivalent asset.
Reserves	A reserve is an allocation of accumulated net revenue. The Town’s current strategy is to contribute fixed amounts to capital reserves which supports capital spending together with grants, development charges, debt, etc.

Executive Summary

The City of Port Colborne's infrastructure supports a variety of municipal services that residents and businesses rely on every day including roads and bridges which facilitate travel, watermains which deliver clean drinking water, and sewer and storm systems which manage waste and excess rainfall.

The City owns approximately $847 million in core infrastructure assets and requires a comprehensive plan for managing these assets to maximize service delivery while balancing costs to the community. An asset management plan (AMP) can help guide the City in making the best decisions in the management of its infrastructure assets and is designed to:

- Meet regulatory requirements.
- Outline the current state of the City's core infrastructure assets.
- Describe the current levels of service provided by these assets.
- Identify the lifecycle activities used to manage these assets.
- Forecast the infrastructure spending required to maintain the current levels of service.
- Develop a plan for improving AM planning for future iterations of the plan.

The plan aligns with the guidelines set out by the Ontario Ministry of Infrastructure's Building Together Guide for Municipal Asset Management Plans as well as Ontario Regulation 588/17 under the Infrastructure for Jobs and Prosperity Act which help to standardize asset management planning across the province.

ES-1 Asset Management Plan Scope

This AMP was developed in accordance with the City's Strategic Asset Management Policy (2019) and other corporate planning documents. The AMP includes the following core services and associated assets:

- Road Network
- Storm Water Network: Mains, Forcemains, Culverts, Inlets, Manholes, Outlets
- Water Network: Mains, Chambers, Hydrants, Stations, Valves, Meters
- Wastewater Network: Forcemains, Gravity mains, Manholes, Cleanouts
- Bridges & Culverts

Of note, the next AMP in 2024 will include all non-core City assets following the same process. Each asset section of this report includes details of the state of local infrastructure, level of service, lifecycle management strategy, and data confidence, which are summarized below for all assets.

ES-1.1 State of Local Infrastructure

For each asset group, a high-level inventory of all assets was compiled, and an approximate replacement value was determined, along with the asset's age and estimated service life. Figure ES-1 illustrates an overview of the replacement value of the City's core assets, of which the wastewater and water networks comprise over half of the total core infrastructure value.

Condition ratings for each asset were assigned using the best available information, which may range from physical inspection data to estimates based on age and estimated service life. Figure ES-2 shows a summation of the relative conditions of all assets based on replacement value, showing that half the value of core assets is in Good or better condition, while the remaining value of core assets have deteriorated, and a portion is below standard and may require imminent improvements.

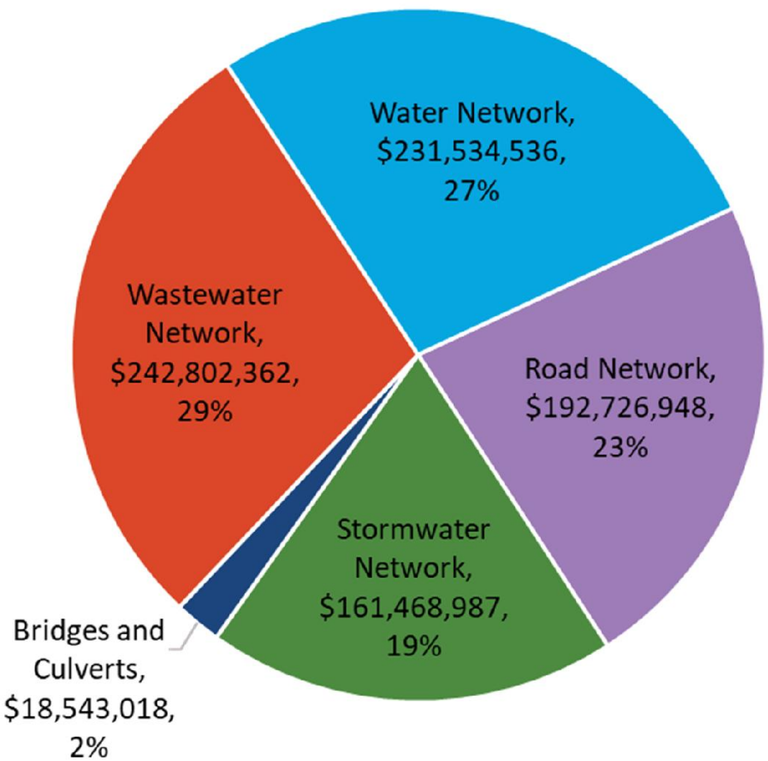


Figure ES-1: City Core Infrastructure Replacement Value

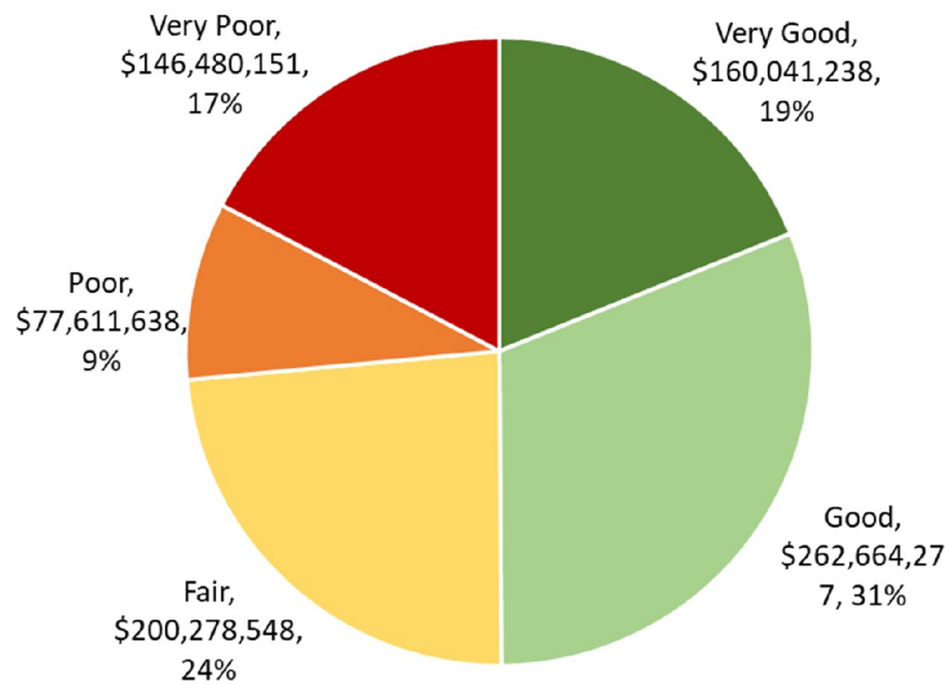


Figure ES-2: Condition by Replacement Value

This categorization is further clarified in Figure ES-3 which shows the condition rating within each asset group based on replacement value. The water network has the highest proportion of assets in Poor or worse condition while the road network has the least. As may be intuited, perhaps issues with those assets that are most visible may be more likely to be addressed than those that are underground and more challenging or costly to inspect and maintain.

Conversely, some assets may be in better shape than the condition ratings indicate as some conditions are based on estimates of age and service life which may not be accurate. Physical inspection data provides the highest confidence in results so future work plans and policies which include improvements in data collection and tracking may result in modifications to condition results.

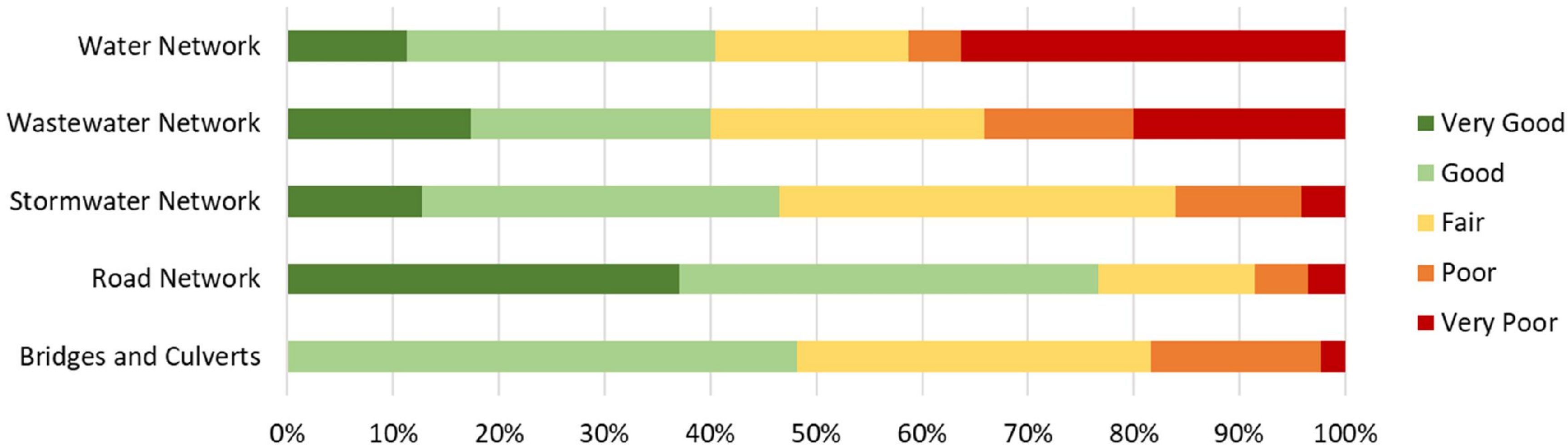


Figure ES-3: City Core Infrastructure Condition by Asset (Replacement Value)

ES-1.2 Levels of Service

Level of service metrics have been developed to describe the capacity, function and quality of the City services being provided. These parameters will reflect improvements or reductions in services as they are updated in the future and other metrics may be added as AMP policies are more thoroughly developed.

ES-1.3 Lifecycle Management Strategy

Asset lifecycle management strategies help maintain current levels of service and include the maintenance, rehabilitation, replacement, disposal, and expansion of assets. These activities are funded through City operating and capital budgets and are detailed for each asset in the AMP. The forecasted lifecycle investment requirements based on these current activities are included in in the financial strategy.

ES-2 Financial Strategy

A critical component of this AMP is the City's strategy for long term infrastructure funding requirements. The City developed forecasting models based on the AMP data and lifecycle strategies which account for the current condition of each asset and its projected deterioration based on estimated service life. When an asset reaches Very Poor condition (or 20% of estimated service life), it is triggered for replacement and the replacement value of that asset is either applied to that year or deferred to a future year if adequate funding is not available. Two main scenarios are considered as follows:

1. **Unconstrained** – The year an asset is triggered for some type of work, the work is completed that year, regardless of cost.
2. **Constrained** – A budget is applied to the forecast so that triggered work on an asset is only completed if there is enough funding that year, otherwise it will be deferred until more funding is available.

These scenarios are based on capital costs for existing infrastructure, thus do not consider any potential growth of the systems. The constrained scenario uses the current (2022) capital funding levels for replacement and renewal work, including both capital and reserve balances and exclusive of one-off funding sources such as some grants and previously approved unspent funding.

Figure ES-4 shows the forecasted infrastructure spending needs over the next 25 years for all core assets for the Unconstrained scenario. The first year has a large jump in spending which represents the backlog of assets that, based on the condition/age and lifecycle strategies of the assets, should have been triggered for replacement before 2023.

In contrast, Figure ES-5 shows the forecasted spending results when the spending is limited by current funding levels. As these figures demonstrate, maintaining current funding levels will result in more and more assets falling into Poor and Very Poor condition. There is a gap between current funding levels and the funding levels required to meet infrastructure needs based on the data and lifecycle strategies used in the model.

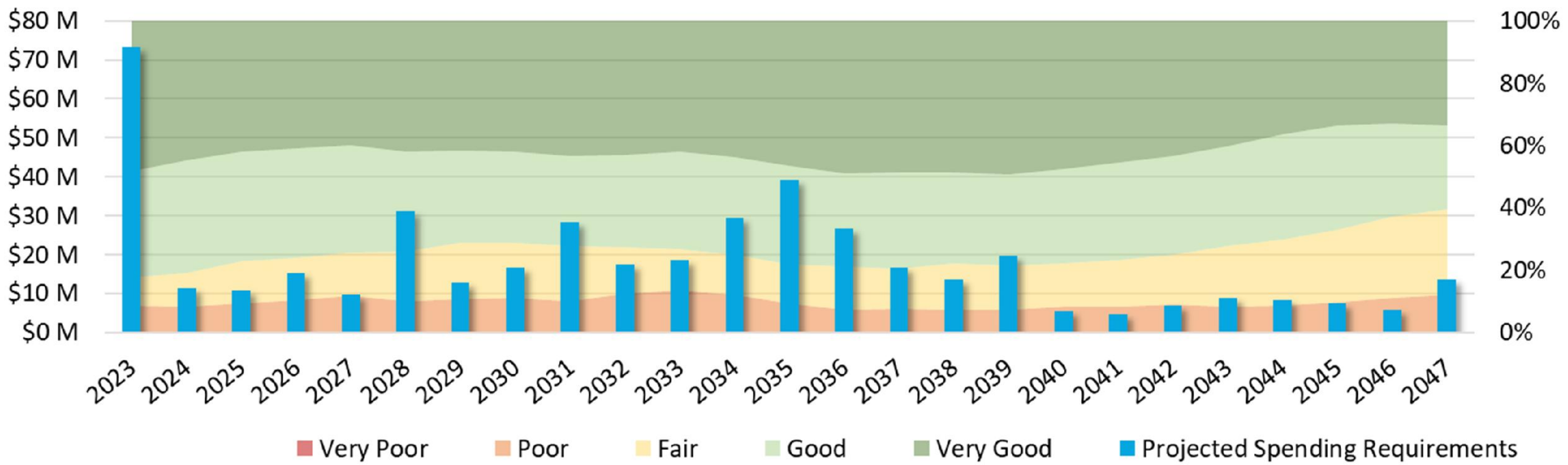


Figure ES-4: Financial Strategy – Condition Breakdown Forecast – Unconstrained Scenario

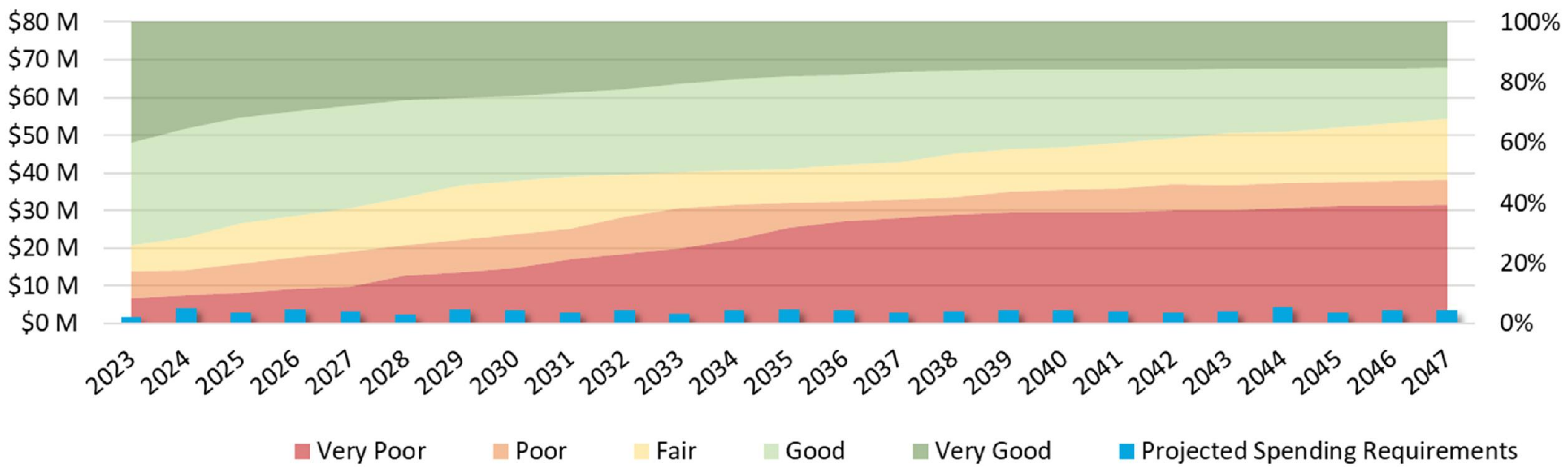


Figure ES-5: Financial Strategy – Condition Breakdown Forecast – Constrained Scenario

While these numbers help to provide a basic understanding of future spending requirements for these asset categories, these numbers are based on the replacement values of the assets, which more closely represent material costs for the assets, rather than the full project costs that would be required to replace them. Projects often end up costing more than anticipated due to implementation costs such as design and project management, as well as the introduction of new technologies and service improvements that are often included in the project, rather than just replacing like-for-like.

In addition, these forecasted spending numbers only include costs for replacement and renewal projects and do not account for other types of capital projects such as non-infrastructure activities (e.g., studies, master plans, etc.) or grouped maintenance projects that may be of large enough scope to complete under the capital budget. They also do not account for inflation in construction, which is likely to increase significantly over the next few years. To account for these additional costs, an assumed 20% surcharge was added for design and project management, 20% for service improvements, and $200,000 per year was assumed for additional non-infrastructure activities. An estimated 5% for inflation was also included to demonstrate potential future spending requirements.

Table ES-1 summarizes the funding gap between these scenarios. It is also illustrated in Figure ES-6 which shows the forecasted spending for each scenario as a cumulative number, meaning that the value for each year represents the total amount spent from 2023 until that year, rather than just the amount spent in that year. In this way it is possible to understand the difference in the total amount of spending over 10 and 25 years between the different scenarios.

Table ES-1: Financial Strategy – Funding Gap

	Total (Cumulative) Spending		Current Funding Gap	
Scenario	**10 Years**	**25 Years**	**10 Years**	**25 Years**
Constrained/Budget (Current Funding)	$31,706,256	$81,325,084	-	-
Unconstrained	$227,216,650	$452,930,729	$195,510,394	$371,605,646
Unconstrained + Additional Costs	$320,103,310	$639,103,021	$288,397,054	$557,777,938
Unconstrained + Additional Costs + Inflation	$394,666,366	$1,071,804,805	$362,960,110	$990,479,721

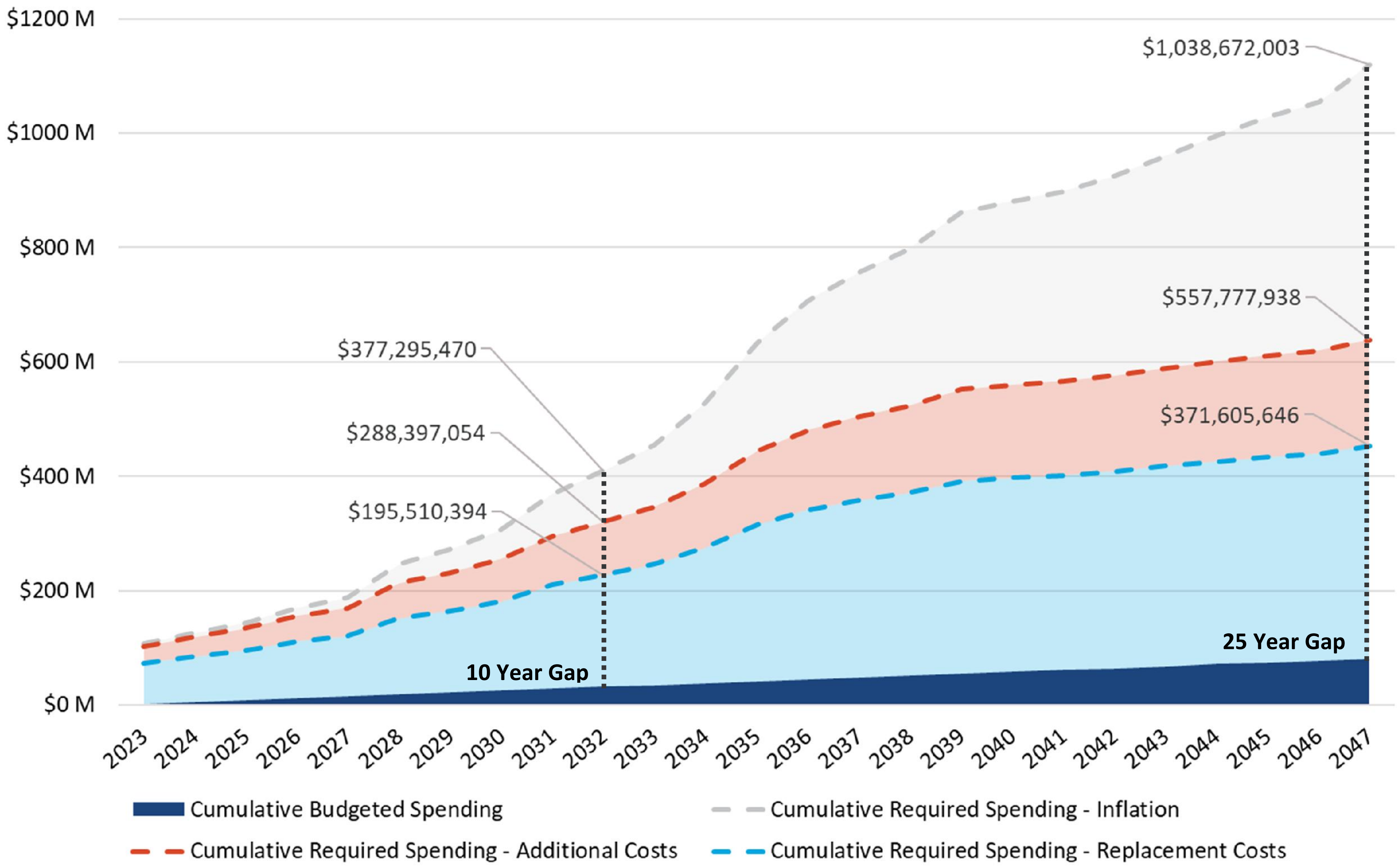


Figure ES-6: Financial Strategy – Funding Gap

ES-2.1 Addressing the Gap

To address the gap between the currently projected infrastructure needs and current funding levels, the City will need to explore options to increase funding, reduce the projected infrastructure costs or a combination of the two. This can be done by adjusting funding levels/costs, levels of service and the risks related to the selected lifecycle strategies, though there are tradeoffs that must be considered.

Some potential options for consideration are outlined here, but further details can be found within the body of the AMP:

Lifecycle Strategies

- Optimize strategies to help balance levels of service and costs (e.g. incorporate more renewal or rehabilitation activities to help extend the service life of assets and defer full replacement costs).
- Focus more on proactive activities rather than reactive work to address failures to reduce overall costs.
- Allow low-risk assets to run to failure before they are replaced.

Levels of Service

- Reduce LOS or adjust how they are measured, taking into account impacts to risk levels.
- Consider the minimum cost required to maintain current LOS.

Funding Options

- Increase funding to meet infrastructure needs. Sources may include, taxes, rates, grants, reserves, debentures, growth, divestitures, etc.

Other Considerations

- Increase efficiencies in operating over time.
- Use developer support to pay for growth and any necessary upsizing or replacements required for new developments.
- Strategic growth planning to take advantage of any areas with existing infrastructure that can support greater density.

In terms of increasing funding, Figure ES-7 shows the cumulative spending requirement scenarios in comparison to some example budget scenario. This figure demonstrates how incremental increases to the budget over a number of years can eventually meet the cumulative needs of the infrastructure based on example funding scenarios outlined in Table ES-2.

Table ES-2: Financial Strategy – Example Budget Scenarios

	Annual Increase	
Budget Scenario	**2023 – 2035**	**2035 – 2047**
Scenario 1	20% increase / year	5% increase / year
Scenario 2	25% increase / year	5% increase / year

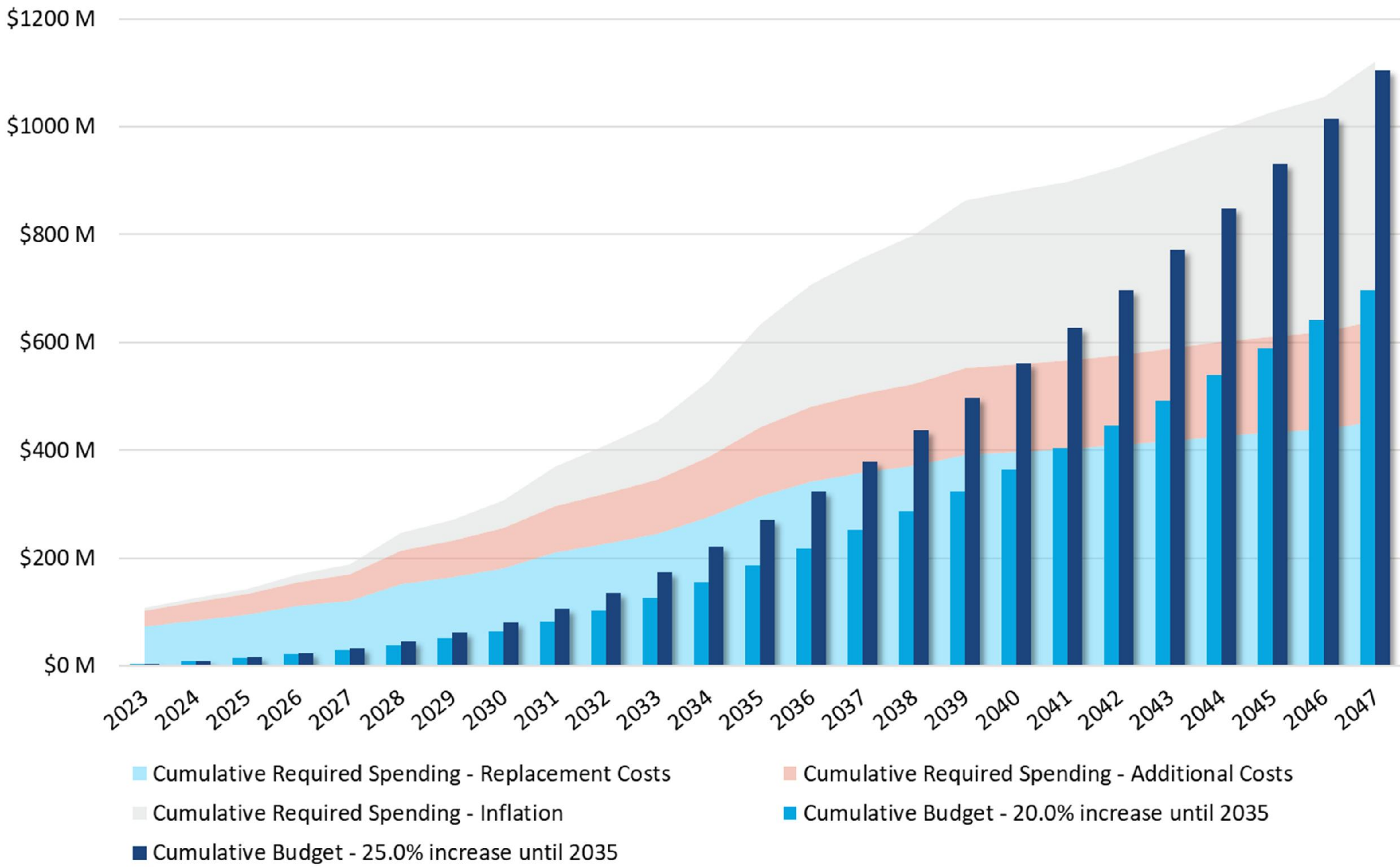


Figure ES-7: Financial Strategy – Example Budget Scenarios

As these scenarios demonstrate, major increases may be required to meet spending requirements and current City reserves are not where they need to be in order to fund this gap. This is why it is important for the City to consider ways of reducing spending requirements as discussed above. The City will consider all of these approaches and tradeoffs in order to develop plans and strategies for managing assets that aim to balance costs to residents and businesses, the level of service provided to users and any potential risks.

ES-3 Improvement Plan

Asset Management Plans are designed to be "living" documents which require continuous updates and improvements. This allows the City to understand the ever changing state and needs of the system, while utilizing new information and processes to improve decision-making around these assets. In addition, to meeting current requirements under O. Reg 588/17, the City will need to update the AMP to meet 2024 and 2025 deadlines.

Upon the completion of these updates, the City is required to review their asset management progress every year and update the AMP every 5 years; however, the City is aiming to complete the full update every 4 years to align with City Council cycles.

Beyond simply updating the AMP with the latest information, the AMP will require continuous improvements to better support decision-making. This will range from establishing more comprehensive asset hierarchies to better collect and track data and performance metrics to refining lifecycle activities and risk frameworks for each asset group.

An understanding of asset management principles and benefits amongst all staff will enable implementation of business processes that support strategic and data-driven decisions. Consistent management of data is critical and the foundation of all aspects of this work. Practices which establish clear roles and responsibilities will ensure data is improved and maintained over time.

1.0 Introduction

1 Introduction

1.1 Asset Management Plan Purpose

The City of Port Colborne's infrastructure supports a variety of municipal services that residents and businesses rely on every day. This includes infrastructure such as roads and bridges which facilitate travel, watermains which deliver clean drinking water, and sewer and storm systems which manage waste and excess rainfall.

The City owns approximately $847 million in core infrastructure assets which support these services. Because of the importance of these services and the costs of maintaining them, the City requires a comprehensive plan for managing these assets in a way that maximizes service delivery to customers while balancing costs to the community. Asset management (AM) practices are tools and processes that municipalities can use to understand the trade-offs between levels of service, asset lifecycle costs and risk, in order to manage these assets effectively.

An asset management plan (AMP) is one of the tools that help to guide the City in making the best decisions in the management of its infrastructure assets and is designed to:

- Meet regulatory requirements.
- Outline the current state of the City's core infrastructure assets.
- Describe the current levels of service provided by these assets.
- Identify the lifecycle activities used to manage these assets.
- Forecast the infrastructure spending required to maintain the current levels of service.
- Develop a plan for improving AM planning for future iterations of the plan.

The plan aligns with the guidelines set out by the Ontario Ministry of Infrastructure's Building Together Guide for Municipal Asset Management Plans as well as Ontario Regulation 588/17 under the Infrastructure for Jobs and Prosperity Act. These documents help to standardize asset management planning across the province, with O.Reg 588/17 regulating the development of AMPs with specific requirements phased in over a 6 year period.

1.2 The City's Vision, Mission and Strategic Pillars

The City has developed the 2020-2023 Strategic Plan to illustrate the City's priorities and the actions planned to achieve these priorities. This includes the following statements and values:

Vision Statement

A vibrant waterfront community embracing growth for future generations

Mission Statement

To provide an exceptional small-town experience in a big way

Corporate Values

Integrity, Respect, Inclusion, Responsibility, Collaboration

To support these statements, the City developed Strategic Pillars which outline specific actions the City will take to achieve their goals in each area. This AMP supports the Community Pillar: **City-Wide Investments in Infrastructure and Recreation/ Cultural Spaces** by helping to guide decisions around infrastructure investment planning.

1.3 The City's Asset Management Policy & Other Planning Documents

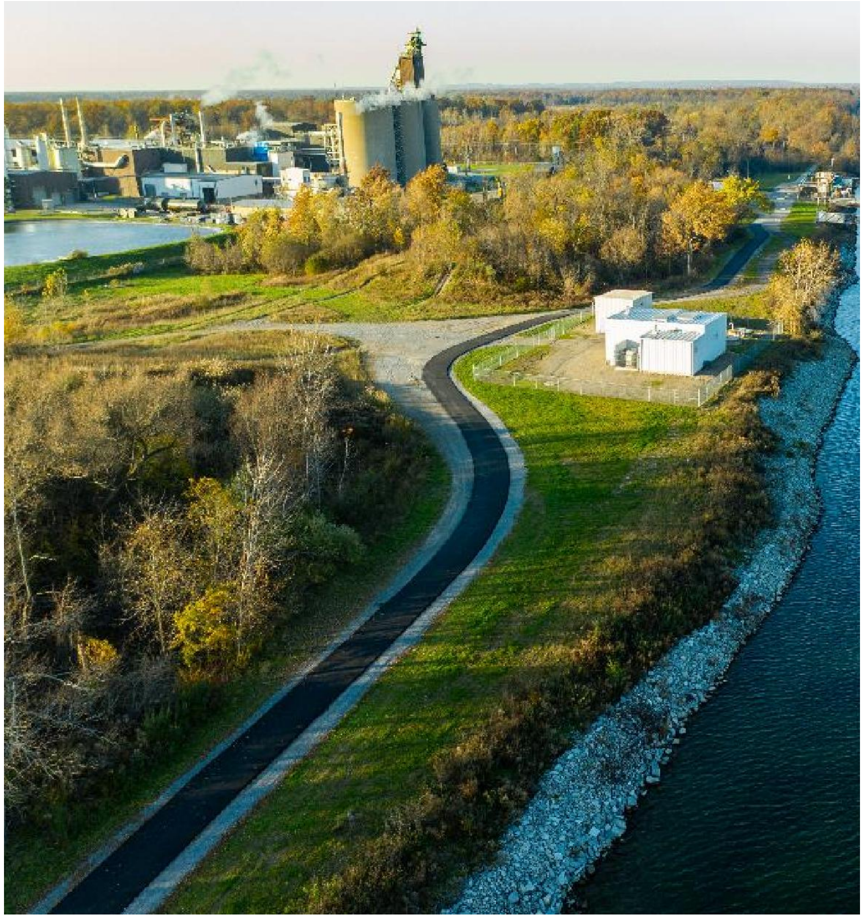
This AMP was developed in accordance with the City's **Strategic Asset Management Policy** (2019).

This policy was developed to guide the consistent use of asset management across the organization, to facilitate logical and evidence-based decision-making for the management of municipal infrastructure assets, and to support the delivery of sustainable community services now and into the future.

The AMP also relates to the following corporate planning documents:

- **The Official Plan:** The AMP should utilize and influence the land use policy directions for long-term growth and development as provided through the Official Plan.
- **Long Term Financial Plan:** The AMP should both utilize and conversely influence the financial forecasts within the long term financial plan.
- **Capital Budget:** The infrastructure needs identified in the AMP and decision framework form the basis on which future capital budgets are prepared.
- **Infrastructure Master Plans:** The AMP will utilize goals and projections from infrastructure master plans and in turn will influence future master plan recommendations.
- **By-Laws, standards, and policies:** The AMP will influence and utilize policies and by-laws related to infrastructure management practices and standards.

- **Regulations:** The AMP must recognize and abide by industry and senior government regulations.
- **Business Plans:** The service levels, policies, processes, and budgets defined in the AMP are incorporated into business plans as activity budgets, management strategies, and performance measures.



1.4 Developing the Asset Management Plan

1.4.1 Asset Management Stakeholders

Key stakeholders are an integral part of the asset management planning process. They will aid in facilitating logical and evidence-based decision-making for the management of municipal infrastructure assets and to support the delivery of sustainable community services now and in the future. Having various key stakeholders will improve accountability and transparency to the community.

A wide range of duties and responsibilities are undertaken by the following key stakeholders:

- **Council** approves the AM policy and direction of the AM program. They maintain adequate organizational capacity and prioritize effective stewardship of assets.
- The **CAO** provides oversight to the AM policy to ensure the AM program aligns with the City's strategic plan and provincial and federal regulations.
- The **Executive Lead** (Director of Corporate Services or Designate) manages the policy and any updates, provides leadership in AM concepts and practices organization-wide, coordinates department staff and AM program implementation, and monitors levels of service.
- The **Asset Management Team** develops policy and provides corporate oversight to goals and directions of the AM program to ensure it aligns with the City's strategic plan. They also develop and monitor levels of service,

provide recommendations to Council and track AM program progress and results.

- **Departmental Staff** participate in implementation task teams to carry out AM activities, and implement and maintain levels of service. Staff provide support and direction for AM practices within their department, as well as track and analyze AM program progress and results.

1.4.2 Asset Management Plan Scope

The AMP includes the following services and associated assets:

Road Network: Roads

Storm Water Network: Mains, Forcemains, Culverts, Inlets, Manholes, Outlets

Water Network: Mains, Chambers, Hydrants, Stations, Valves, Meters

Wastewater Network: Forcemains, Gravity mains, Manholes, Cleanouts

Bridges & Culverts: Bridges, Culverts

This varies from the previous AMP which included several non-core asset types and assets owned and operated by the Region. This will result in the overall value of the portfolio being less than previous documents, however, it is anticipated that future AMP iterations will have an increased overall asset valuation as all non-core assets are eventually included.

1.4.3 Asset Management Plan Structure

The AMP is divided into the following sections to answer key questions about the City's assets and its asset management practices.

Introduction

What is the purpose and structure of the AMP and how does it relate to other strategic documents?

Asset Category

Multiple sections for each asset category, including:

State of the Infrastructure

What assets are included and what is their current condition and value?

Levels of Service

How does the City measure the level of service delivered for this asset category and how are they currently performing?

Lifecycle Management Strategies

What activities does the City perform on these assets to support service delivery?

Data Confidence

What data was used in the AMP and what is the level of confidence in this data?

Financial Strategy

How do forecasted infrastructure investment needs compare to current funding projections and how does this affect service delivery?

Implementation Plan

How is the City planning to improve asset management planning going forward?

The following sections explain the methodology for developing each of the asset category sections.

1.4.4 State of Local Infrastructure

The State of Local Infrastructure is outlined for each service area and includes the following:

1. A high level inventory of assets which support the service area.
    - The current AMP includes core assets only. Future iterations will be developed to include all City-owned assets.
2. The approximate replacement value of assets.
    - Some assets are continually rehabilitated rather than replaced. The estimated replacement value serves as a benchmark to highlight the significance of the infrastructure.
3. A comparison of the estimated service life (ESL) of the assets and their average age.
    - Age is not always indicative of condition, however, age is used to estimate condition when this information is unavailable.
4. Condition rating breakdown by replacement value for each asset category.

For comparison across asset categories, condition ratings were identified for each asset using the five-point rating scale shown in Table 1. The best available information for each asset category was used to assign this score, ranging from inspected condition values to age-based estimates.

Table 1: Condition Scale and Definition

Grade	Definition
1	**Very Good** - Fit for the future The infrastructure in the system or network is generally in very good condition, typically new or recently rehabilitated.
2	**Good** - Adequate for now The infrastructure in the system or network is in good condition; some elements show general signs of deterioration that require attention.
3	**Fair** - Requires attention The infrastructure in the system or network is in fair condition; it shows general signs of deterioration and requires attention.
4	**Poor** - At risk The infrastructure in the system or network is in poor condition and mostly below standard, with many elements approaching the end of their ESL.
5	**Very Poor** - Unfit for sustained service The infrastructure in the system or network is in unacceptable condition with widespread signs of advanced deterioration.
-	**Not Assessed** This category is reserved for assets where data is either missing, not updated, or cannot be considered reliable.

1.4.5 Levels of Service

Levels of Service (LOS) describe the capacity, function and quality of the City services being provided. This section of the AMP details the measures used to determine LOS in each service area. LOS measures for each service area are determined through consultation with City staff or are mandatory metrics as described in O. Reg. 588/17. The LOS tables follow the same structure for each service area and contain the following major factors:

- **Key Service Attribute:** summarizes the type of service provided to residents, businesses, and the broader community.
- **Level of Service Statement:** the key corporate performance standards, based upon core values.
- **Performance Measures:**
  - Customer – communicates service outcomes from the perspective of the customer.
  - Technical – Describes service inputs or outputs in technical terminology.
- **Current Performance:** The current performance of the metric quantified through the best available information.

1.4.6 Lifecycle Management Strategy

The lifecycle management strategies section outlines a set of planned activities that will performed on the assets in order to help maintain the current levels of service. These activities are split into the following categories:

- **Non-Infrastructure:** Actions or policies that can lower costs or extend asset life
- **Maintenance:** Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.
- **Rehabilitation:** Significant repairs designed to extend the life of the asset.
- **Replacement:** Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehabilitation is no longer an option.
- **Disposal:** The activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.
- **Expansion:** Planned activities required to extend services to previously unserviced areas or expand services to meet growth demands.

1.4.7 Data Confidence

Data confidence levels are based on the reliability of data sources and the number of assumptions required. Data which requires no assumptions to be made is collected from reliable sources such as recent condition assessments, and therefore results in a high confidence level. On the other hand, low confidence data requires many assumptions and is collected from less reliable sources such as age-based condition assessments. In some cases, data may have a lower confidence score, even if all data is available, if the data cannot be directly linked to the assets or is not in a format required for the AMP analysis.

1.5 Growth Planning

As per the projections completed by Niagara Region, Port Colborne's population was recorded to be at 19,300 in 2006 and was anticipated to reach 24,100 people by the year 2031. This results in a population increase of 5,000 people over the course of 25 years. This represents an employment increase of 2,270 over the course of 25 years from 6,800 to 9,070.

With an increase in population growth, it is anticipated that there will be a greater demand on the City's infrastructure. While this increase in population will provide an increase in revenue that can be put towards asset renewal, the increase in demand will likely result in increased infrastructure expenditures on maintenance, renewal and replacement activities due to higher deterioration rates of the existing infrastructure. In addition, the increase in demand will likely require expansion of the current systems for new development, which will result in further expenditures to build and maintain these assets.

The AMP's forecasts do not factor in population growth as it is largely focused on expenditures to address the state of good repair of existing infrastructure. Strategic documents, such as the Niagara Region Water and Wastewater Master Servicing Plan, address infrastructure needs to support growth. As new or upgraded infrastructure comes online from these capital programs, these assets will be incorporated into future iterations of the AMP.

1.6 Asset Management Plan Assumptions and Limitations

The current AMP and forecasts use the information available at the time of development and make assumptions where necessary to fill any data gaps, as detailed within each asset category section. As the City collects more data and improves data confidence, it is anticipated that future iterations of the AMP will be able to leverage this information to improve the accuracy of the analysis.

In addition, this AMP does not fully reflect the impacts of the COVID-19 pandemic. The City acknowledges that there may be economic impacts that will have to be fully assessed at a later date.

1.7 Continuous Improvements

The implementation plan developed for this AMP outlines key next steps for improving asset management planning at the City of Port Colborne. As these projects are completed, the results can be incorporated into future iterations of the AMP to improve its overall value and utility. To track this progress, the City will complete regular updates and reviews, as required by Ontario Regulation 588/17 and outlined below.

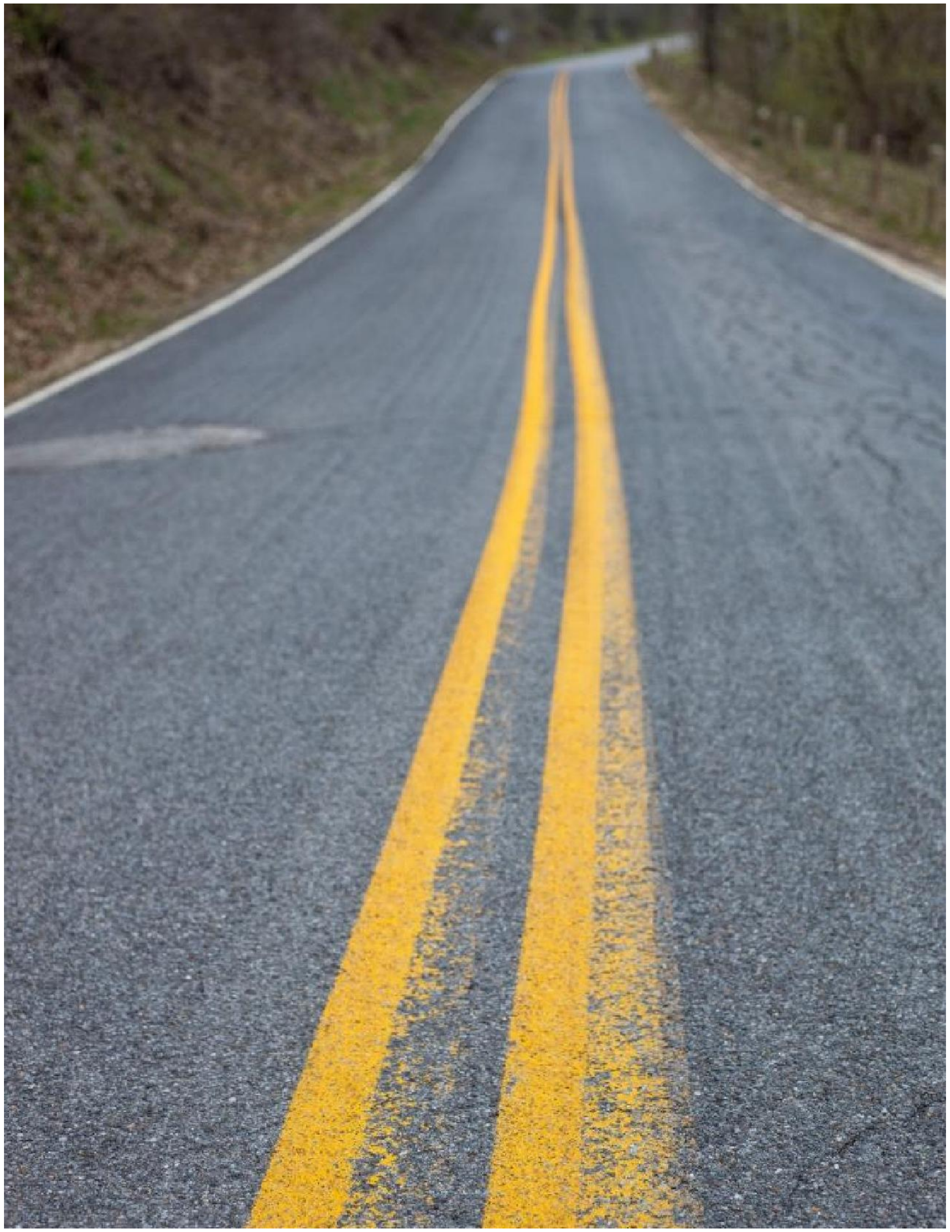
- **5 Year AM Policy Review**
  - Review the AM policy every 5 years and update as necessary
- **Annual Review of AM Practices**
  - Outline the City's progress in implementing the AMP
  - Describe any factors impeding the implementation of the AMP
  - Develop strategies to address any impediments
- **4 Year AMP Update**
  - Complete a comprehensive update of the AMP every 4 years

2.0 Road Network

2 Road Network

The City's road network allows for the movement of people, goods, and services to support residents' lifestyles and economic activity. The urban area of the City contains about 110 km (44%) of the City's 251 km of roads, all of which must be inspected and maintained regularly to provide safe and reliable service. The frequency of inspection and maintenance is mandated by provincial regulations depending on the type of road and average traffic volumes. Municipal roads connect to regional and provincial roads for convenient accessibility to other areas of the Region.

Related infrastructure which also require maintenance includes all features within the road right-of-way such as signage, traffic signals, streetlights, ditches, adjacent trees and grass, and sidewalks.



2.1 State of Local Infrastructure

2.1.1 Network Inventory & Valuation

The Road network includes the roads, curb and gutters, guiderails, sidewalks, as well as traffic assets such as signs, traffic signals and streetlights with a total replacement value of $193 million. Table 2 summarizes the inventory and estimated replacement value of the road network.

Table 2: Road Network – Inventory Valuation

Asset Type	Count	Unit	Replacement Value
Roads	250,677	metres	$178,239,394
Curb and Gutters	75,312	metres	Costs included with Road
Sidewalks	135,653	metres	Costs included with Road
Guiderails	4,504	metres	$625,967
Signs	15	Each	$1,298
Streetlights	2,153	Each	$12,999,814
Traffic Signals	11	Each	$860,475
Total Road Network Value			**$192,726,948**

In addition, Figure 1 demonstrates the breakdown of replacement value between the different asset types. Roads, which include sidewalks and curb and gutters, make up the vast majority of the network's worth.

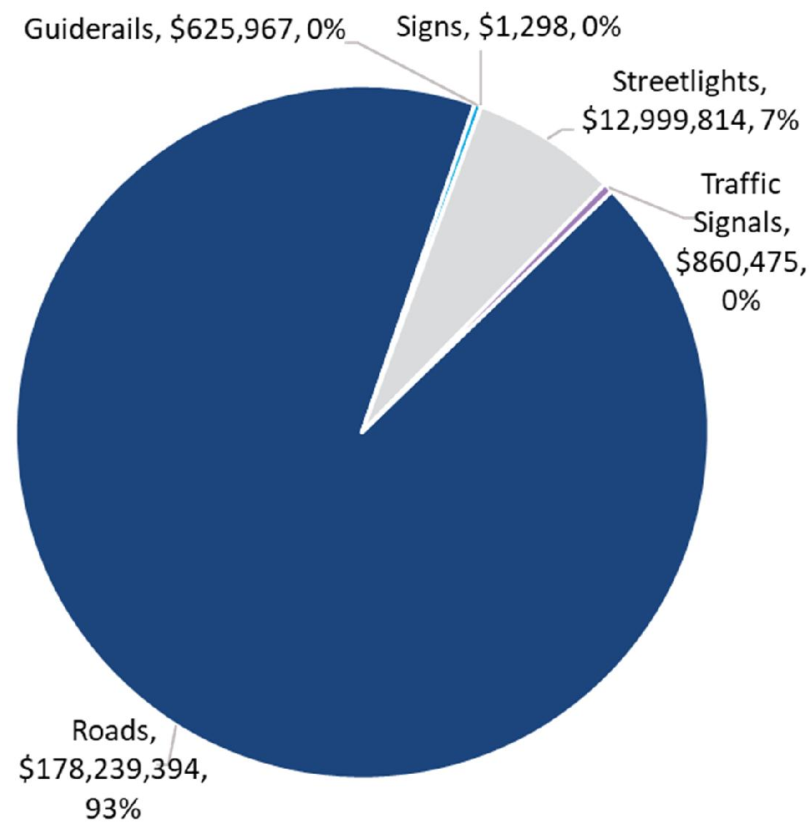


Figure 1: Road Network – Breakdown of Replacement Costs

2.1.2 Network Age & Condition

To make informed decisions on the management of road network assets, it's important to understand the condition of the network. One method for estimating the condition of assets is to look at the age of the assets in comparison to the estimated service life (ESL), or in other words, the number of years you would expect the asset to remain in service under normal circumstances.

Figure 2 compares the average age of the road network assets in comparison to the average ESL. It can be seen that all of the non-traffic assets have an average age greater than the ESL. While this could suggest that a number of these assets need to be replaced, it should be noted that they are inspected and maintained regularly and are therefore likely in better condition than their age would suggest.

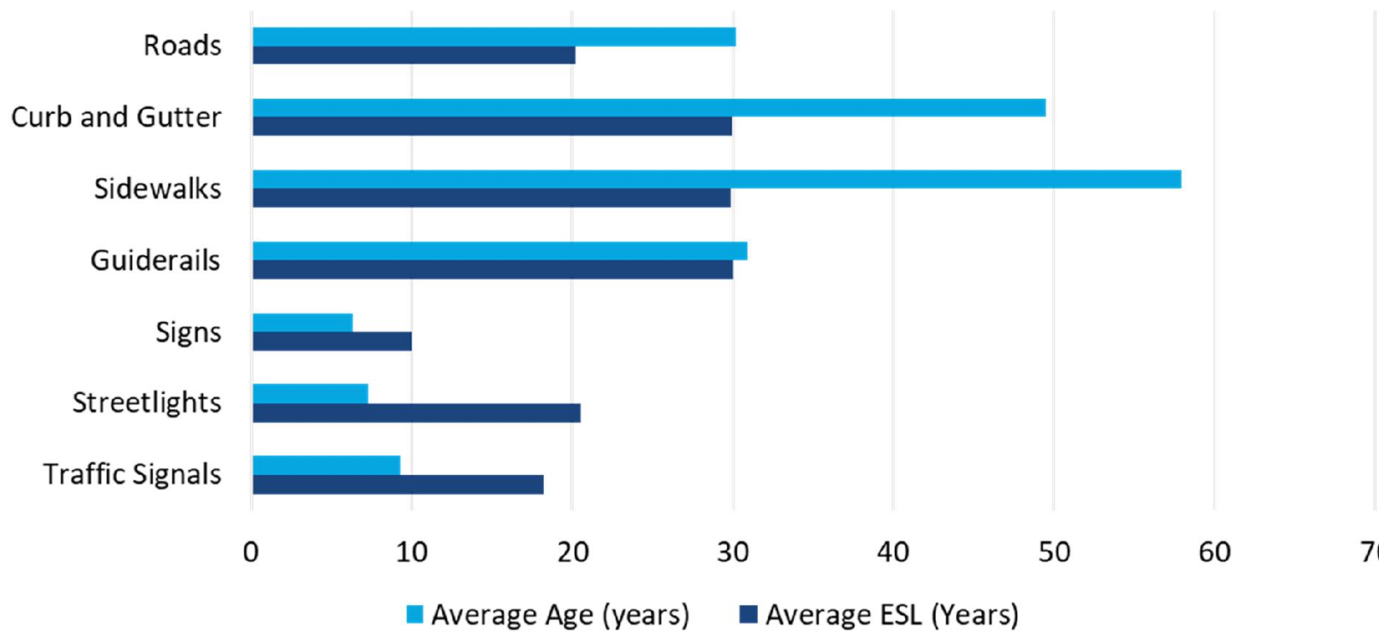


Figure 2: Road Network – Age vs. ESL

In order to compare between every type of asset, a condition score was assigned to each asset and grouped into five condition categories ranging from Very Good to Very Poor. In some cases, this condition score was based on the age of the asset, however, assessed condition values were used where possible. For the road network, Table 3 outlines how the different condition values were grouped into each condition category.

Table 3: Road Network – Condition Categories

Condition Category	Roads: PCI	Remaining Assets: Age/ESL
Very Good	>80 PCI	>80% life remaining
Good	67-80 PCI	60 – 80% life remaining
Fair	55-67 PCI	40 – 60% life remaining
Poor	35-55 PCI	20 - 40% life remaining
Very Poor	<35 PCI	<20% life remaining

As this table shows, Road condition is based on the Pavement Condition Index (PCI), a standard measurement which measures the general condition of pavement on a scale from 0-100 based on a manual review of each road. Based on these condition scores, the road network can be broken down into the total replacement cost in each condition category, as shown in Figure 3.

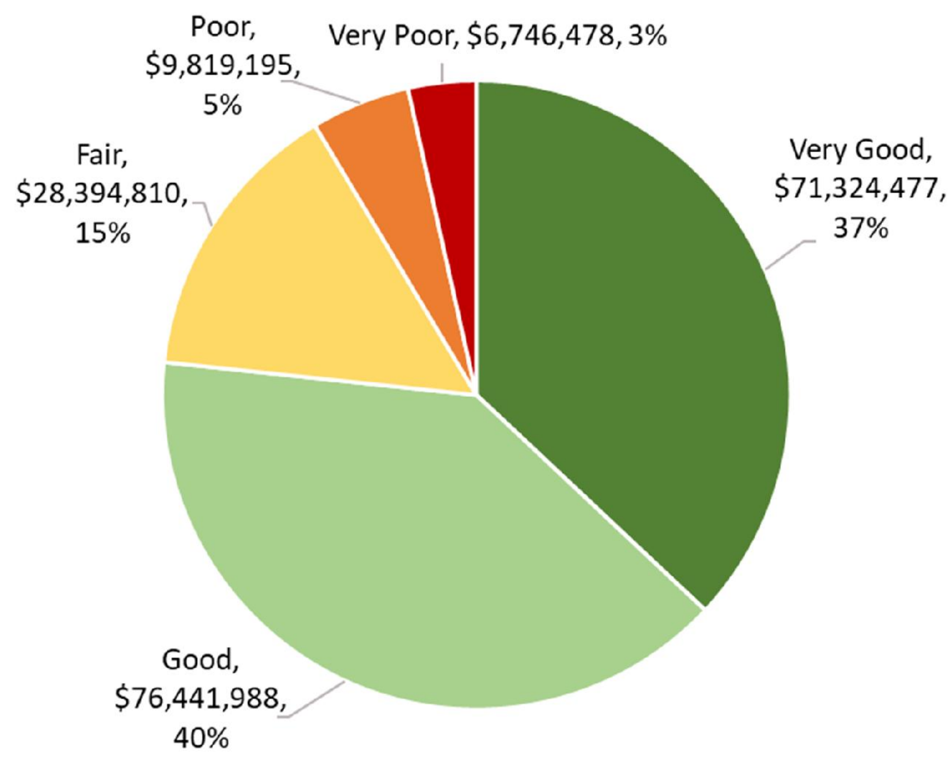


Figure 3: Road Network – Condition Breakdown

This can be further broken down to understand the condition of each road network asset type, as shown in Figure 4.

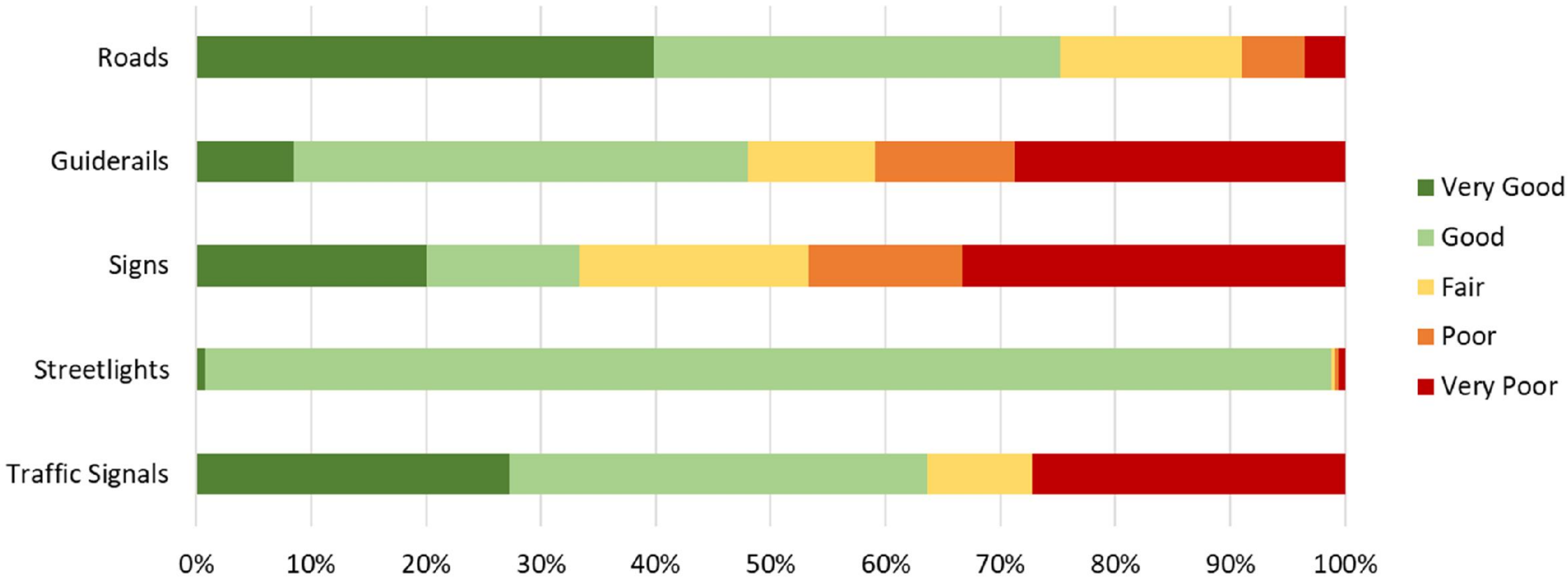


Figure 4: Road Network – Condition Breakdown by Asset Type

As these figures demonstrate, the majority of the replacement value of the road network is in Very Good or Good condition. While some asset classes, such as guiderails and signs do have a significant portion of their replacement value in Very Poor condition, it is important to note that the condition for these assets are estimated based on age and are likely in better condition than their age would imply. Not only can assets continue to function beyond their ESL, but age information is not always tracked accurately and these assets are inspected and maintained on a regular basis. The roadways, which use the most up-to-date and reliable data source for condition, show that the system is generally in good condition. In addition, the City is currently completing guiderail inspections and will be reviewing the entire inventory of City signs to determine where updated signage is necessary.

2.2 Levels of Service

The City strives to ensure the road system provides adequate Levels of Service in a safe and efficient manner to meet customer expectations. To help assess the performance of the road system, the following level of service framework was developed.

Table 4: Road Network – Level of Service Attributes

Core Value	Level of Service Statement
Accessible & Reliable	The road network is convenient and available to the whole community with minimal service disruptions; service requests are responded to promptly.
Safe & Regulatory	The road network meets all minimum maintenance standards.
Cost-Efficient	The road network is managed cost efficiently for the provided level of service.
Sustainable	There are long-term plans in place for the sustainability of the road network.

In addition to the mandatory parameters under O. Reg 588/17, various other parameters are assessed and tracked by the City to gauge the performance of the road system.

2.2.1 Customer Levels of Service

The City's Community Level of Service evaluates how well customer expectations are being met, as summarized in Table 5. These criteria are a mix of qualitative descriptions of provided service and quantitative measures. The minimum maintenance standards mentioned are established under O. Reg. 239/02 Minimum Standards for Municipal Highways.

Table 5: Road Network – Community Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	Description, which may include maps, of the road network in the municipality and its level of connectivity. [1]	The road network in the City of Port Colborne includes provincial, regional, and municipal roads. The 251km of City owned roads are classified as arterial, collector, or local, in decreasing order of size and capacity.
Safe & Regulatory	Description of minimum maintenance standards for road network (road surfaces and sidewalks) .	Follow O. Reg. 239/02 Ontario Minimum Maintenance Standards for Municipal Highways
Cost-Efficient	The operating and maintenance cost to maintain the road network per household.	$144.84
Sustainable	Description or images that illustrate the different levels of road class pavement condition. [1]	The City follows the American Society for Testing Materials Pavement Condition Index (PCI) rating system to define pavement condition. A PCI of 100 indicates a perfect surface while zero represents a surface that has completely deteriorated.

[1]Mandatory under O.Reg. 588/17

2.2.2 Technical Levels of Service

Technical Level of Service records quantifiable performance measures to show the quality of service provided by the road system as detailed in Table 6.

Table 6: Road Network – Technical Level of Service

Core Value	Technical Level of Service	2021 Performance
Accessible & Reliable	Lane-km of arterial roads (MMS classes 1 and 2) per land area in the municipality (km/km^2). [1]	0.06
	Lane-km of collector roads (MMS classes 3 and 4) per land area in the municipality (km/km^2). [1]	2.3
	Lane-km of local roads (MMS classes 5 and 6) per land area in the municipality (km/km^2).[1]	1
	Percentage of the road network in Fair or better condition.	74%
	Percentage of roads in Poor or Very Poor condition.	9%
	Length of roads in Poor or Very Poor condition.	32km
	Percentage of roads that are paved.	72%
	Length of off-road trails.	15.7km
	% of local roads with sidewalks.	60%
Safe & Regulatory	% of sidewalks inspected.	100% each year
	% of road network inspected.	100% each year
Cost-Efficient	Operating and Maintenance costs for paved roads / km (excluding winter control).	$1,306
	Operating and Maintenance costs for paved roads / km (winter control only).	$907
	Capital investment vs sustainable investment forecast.[2]	6%
	25-year sustainable investment average annual cost. [2]	$24,951,811

Core Value	Technical Level of Service	2021 Performance
Sustainable	Average pavement condition index for paved roads in the municipality. [1]	76.9
	Average surface condition for unpaved roads in the municipality.*	70.8
	Percentage of LED (energy efficient) streetlights	100%
	Road Network AMP reviewed every 4 years.	AMP will be reviewed in 2024 and 2025 as part of O.Reg. 588/17 timelines to identify all assets and proposed levels of service

[1]Mandatory under O.Reg. 588/17

[2]Sustainable investment is based on a forecast of spending needs and includes additional costs and inflation as detailed in Section 7

2.3 Lifecycle Management Strategy

Levels of service are maintained through completing a variety of lifecycle activities, as grouped by similar type and detailed in Table 7. These activities aim to extend asset life through appropriately timed interventions which will typically reduce overall lifecycle costs. The table also includes a summary of the risks associated with not following these strategies.

The City's road maintenance activities meet or exceed the provincially mandated Minimum Standards for Municipal Highways. This includes weekly routine patrols, depending on the road classification, to identify system deficiencies and night inspections as required to observe luminaries, safety devices, pavement markings and monitor sign replacement. Every five years, pavement condition is assessed to identify and prioritize road rehabilitation and renewal requirements and are coordinated with other underground infrastructure projects. Resurfacing and dust suppression treatments for rural roads and other minor improvements are conducted annually.

Table 7: Road Network – Lifecycle Activities and Associated Risks

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Maintenance	***Roads:***
	• Road Inspections & Maintenance as per Minimum Maintenance Standards
	• Road sweeping
	• Pavement Condition Assessment
	• Visual inspections by road patrol
	• Winter maintenance - snow plowing, salt/sand, etc.
	• Asphalt patching
	• Line painting
	• Crack sealing
	• Dust suppression
	• Culvert Inspections
	• Roadside shouldering
		• Improper or insufficient maintenance can lead to:
		  • Increased lifecycle costs
		  • Decreased asset life
		  • Unplanned failures
		  • Service disruptions, congestion, reduced accessibility
		  • Unsafe road and sidewalk conditions
		• Resource limitations to conduct unplanned work

Lifecycle Activity Type	Asset Management Practice	Associated Risks
	Other Road Assets: • Catchbasin cleanouts • Sidewalk maintenance • Guiderail maintenance • Roadside ditching • Roadside lawnmowing • Road grading (stone, clay roads) • Roadside Tree work • Signage - Retroreflectivity inspection	

Renewal/ Rehab	• Road resurfacing	• Improper or insufficient rehabilitation can lead to:
		  • Increased lifecycle costs
		  • Service disruptions and congestion
		• Unplanned failures if the activities do not extend the service life as much as expected

Replacement/ Construction	• Guiderail replacement
	• Sidewalk replacement
	• Curb Replacement
	• Major Road Reconstruction
		• Delays in replacement can lead to:
		  • Cost overruns
		  • Increased lifecycle costs
		  • Unplanned failures
		  • Service disruptions, congestion, reduced accessibility
		  • Unsafe road and sidewalk conditions
		• Coordination with other asset classes, if applicable, might delay timeframe of construction activities

Non-Infrastructure	• Traffic Studies/Counts	• Inadequate planning can lead to:
		  • Poor information available for decision-making
		  • Reduced ability to manage public health and safety risks
		  • Reduced quality of service and citizen experience

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Expansion/Growth	• Widening
	• New sections of road
	• Addition of new sidewalks
	• On demand changes as per development
		• Lack of expansion activities can lead to:
		  • Congestion on roads
		  • Limited accessibility for pedestrians
		  • System unable to accommodate for population and employment growth
		  • Increased lifecycle costs
		• Master plans may over or underestimate expansion requirements

Disposal	• Asphalt reuse as backfill from milling
	• Reuse of asphalt in granular A and B in reconstruction
	• Contaminated soils disposal
		• Improper disposal can lead to:
		  • Environmental impacts
		  • Cost overruns

Service Improvements	• Convert streetlight heads to energy efficient components	• Lack of improvements can lead to:
		  • Decreased accessibility across the City
		  • Reduced ability to manage public health & safety risks
		• Increased service expectations come with increased cost implications.

2.3.1 Prioritization of Work and Additional Lifecycle Considerations

When considering road replacements a number of factors are taken into account in order to prioritize the work.

- **Age and condition of the road:** While the age and condition of a road are generally the driving factors for major road reconstruction, there are other factors that may cause the advancement or deferral of projects. Arterial roads with high amounts of traffic, or those that provide essential routes for emergencies, for example, would be prioritized above local roads with limited traffic.
- **Coordination with other infrastructure:** Road right-of-ways typically contain a variety of underground linear infrastructure (watermains, sewers, etc.). It is much more cost-efficient and practical to replace any linear infrastructure that is relatively close to end-of-life at the same time as any significant road reconstruction to avoid later digging up a road that is in good condition. Similarly, at the time of road reconstruction it is essential to review the requirements for any above-ground infrastructure within the road corridor. This is an opportune time to evaluate the need for a sidewalk where there is none currently or if a sidewalk is no longer warranted on both sides of a road where one side will suffice.
- **Future Development:** Areas proposed for development may often warrant road replacement or replacement of assets buried under roads, particularly if a development will bring increased population density.
- **Community Beautification:** Roads of prominence, such as those that lead into the downtown core of the City, are more likely to be prioritized for improvements to contribute to the City's visual appeal to both residents and visitors.

2.4 Data Confidence

The data sources for the City's road network include:

- The City's GIS inventory & associated attributes
- The City's Citywide financial inventory & associated attributes
- 2022 Road Inspections

Where discrepancies were found between the inventories, the information from the GIS database was used. Table 8 outlines the main data sources and overall confidence in the data used for this AMP. Data confidence is based on how many assumptions needed to be made and the reliability of the data sources.

Overall, there is moderate confidence in the data due to having condition scores for the road, but still having many of the condition estimates being based on age. As the City continues to collect more condition information, future AMPs will incorporate this data to help improve estimates. For example, the City is currently completing Guiderail inspections which will help to improve the accuracy of future plans and strategies.

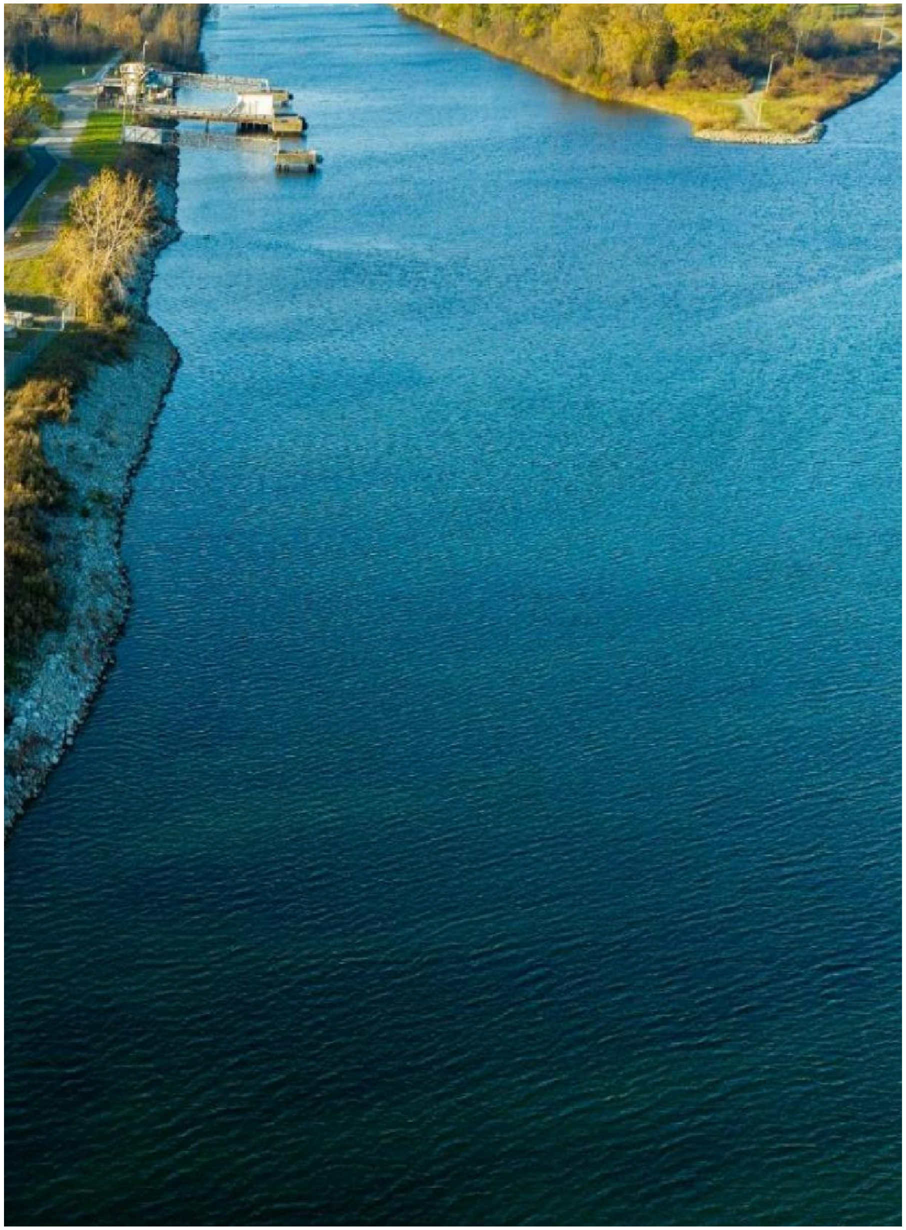
Table 8: Road Network – Data Confidence

Asset Class	Data Source			Data Confidence
	Age	Condition	Replacement Value	
Roads	Citywide Financial Database	Road Inspections 2022	Engineering Staff Review	High
Curb and Gutters	GIS Inventory	Assumed replaced with Road	Engineering Staff Review	Moderate
Sidewalks	GIS Inventory	Assumed replaced with Road	Engineering Staff Review	Moderate
Guiderails	GIS Inventory	Age-based	Engineering Staff Review	Low
Signs	Citywide Financial Database	Age-based	Engineering Staff Review	Low
Streetlights	Citywide Financial Database	Age-based	Engineering Staff Review	Low
Traffic Signals	Citywide Financial Database	Age-based	Engineering Staff Review	Low

3.0 Stormwater Network

3 Storm Water Network

Rain and snowmelt result in stormwater which either infiltrates into the ground or becomes surface runoff. The City's stormwater network is in the urban area, mainly comprised of sewer pipes as well as swales and roadside ditches. The storm sewer system collects runoff via catchbasins and conveys it to the nearest water body, mostly Welland Canal or Lake Erie, to reduce the risk of property flooding. Particularly in urban areas where development and increased impervious surfaces have decreased natural drainage and infiltration, stormwater management is increasingly important as climate change causes more frequent and intense storms. Storm systems which were built decades ago generally were not designed with adequate capacity to handle the increased flows from these extreme events. Less than half of the City's urban area is currently serviced by storm sewers and some older parts of the system were installed without the more comprehensive design standards that are currently in place. The infrastructure in these areas will be upgraded over time as opportunities and funding become available.



3.1 State of Local Infrastructure

3.1.1 Network Inventory & Valuation

The Stormwater network is made up of gravity mains and forcemains, including chambers, maintenance holes, inlets, outlets and leads, as well as culverts, ditches and swales, with a total replacement value of $161 million. Table 9 summarizes the inventory and estimated replacement value of the stormwater network.

Table 9: Stormwater Network – Inventory Valuation

Asset Type	Count	Unit	Replacement Value
Gravity Mains	103,184	metres	$129,931,532
Forcemains	1,567	metres	$1,474,754
Chambers	7	Each	$261,541
Maintenance Holes	724	Each	$2,029,517
Inlets	2,631	Each	$6,656,430
Outlets	58	Each	$1,484,974
Leads	19,995	metres	$16,733,776
Culverts	5,163	metres	$2,896,463
Swales	3,598	metres	-
Ditches	36,633	metres	-
Total Stormwater Network Value			**$161,468,987**

Notes:

- Replacement costs have not been determined for ditches and swales. These assets are typically not replaced as they can continue to function just with ongoing maintenance and clearing as necessary.

In addition, Figure 5 demonstrates the breakdown of replacement value between the different asset types. As shown, gravity mains make up the vast majority of the network's worth.

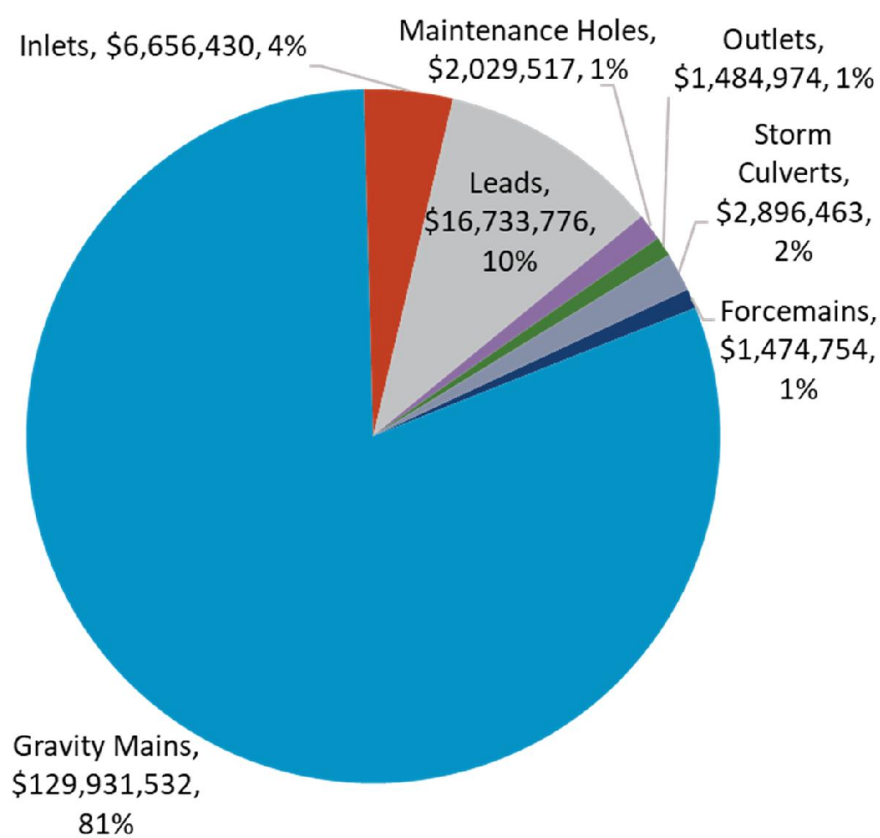


Figure 5: Stormwater Network – Breakdown of Replacement Costs

3.1.2 Network Age & Condition

To make informed decisions on the management of stormwater network assets, it's important to understand the condition of the network. One method for estimating the condition of assets is to look at the age of the assets in comparison to the estimated service life (ESL), or in other words, the number of years the asset is expected to remain in service under normal circumstances.

Figure 6 compares the average age of the stormwater network assets in comparison to the average ESL. It can be seen that all assets have an average age less than the ESL,.

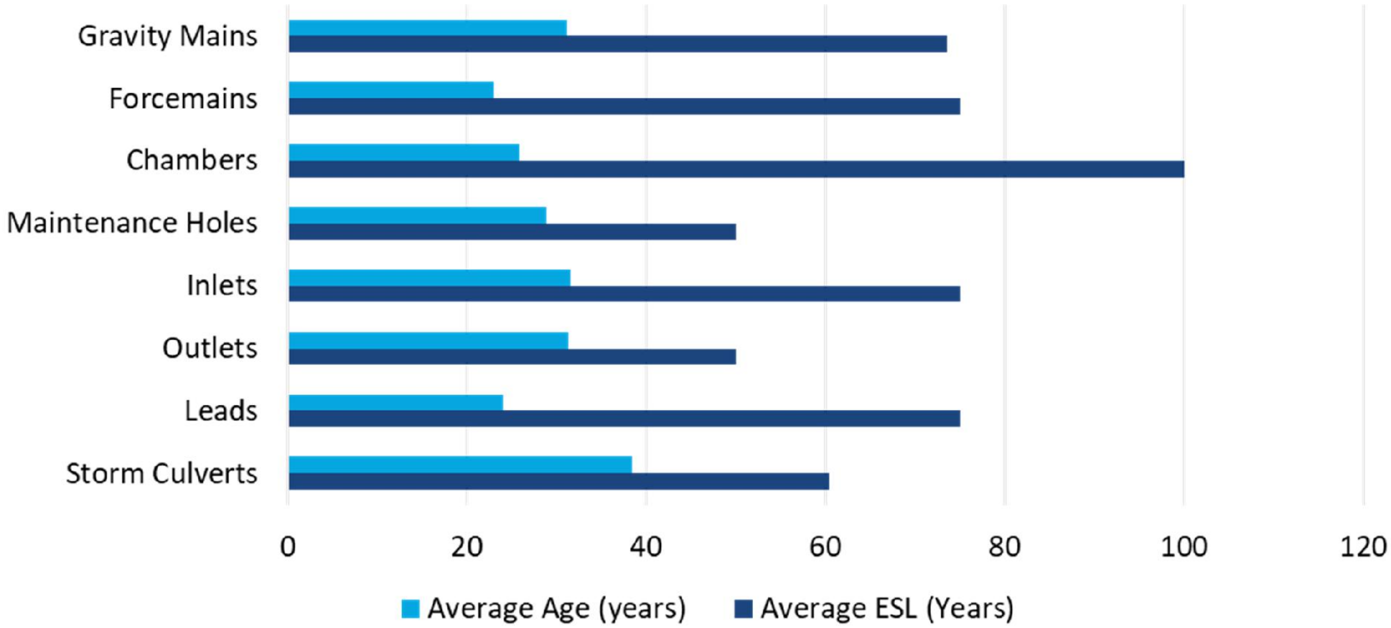


Figure 6: Stormwater Network – Age vs. ESL

In order to compare between every type of asset, a condition score was assigned to each asset and grouped into five condition categories ranging from Very Good to Very Poor. In some cases, this condition score was based on the age of the asset, however, assessed condition values were used where possible. For the stormwater network, Table 10 outlines how the different condition values were grouped into each condition category.

Table 10: Stormwater Network – Condition Categories

Condition Category	All Stormwater Assets: Age/ESL
Very Good	>80% life remaining
Good	60 – 80% life remaining
Fair	40 – 60% life remaining
Poor	20 - 40% life remaining
Very Poor	<20% life remaining

Based on these condition scores, the stormwater network can be broken down into the total replacement cost in each condition category, as shown in Figure 7.

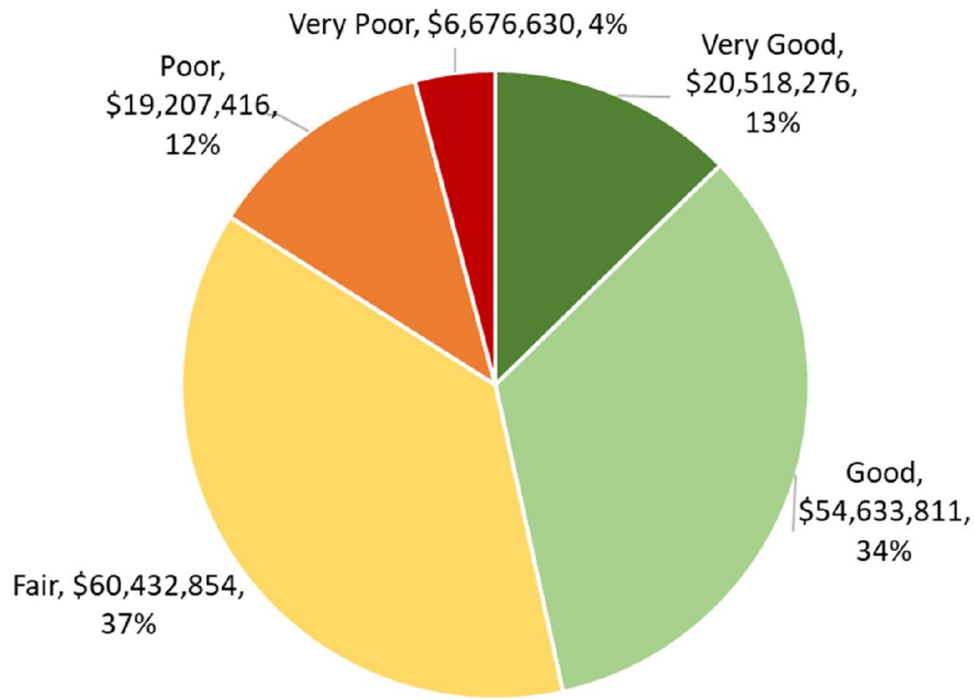


Figure 7: Stormwater Network – Condition Breakdown

This can be further broken down to understand the condition of each stormwater network asset type, as shown in Figure 8.

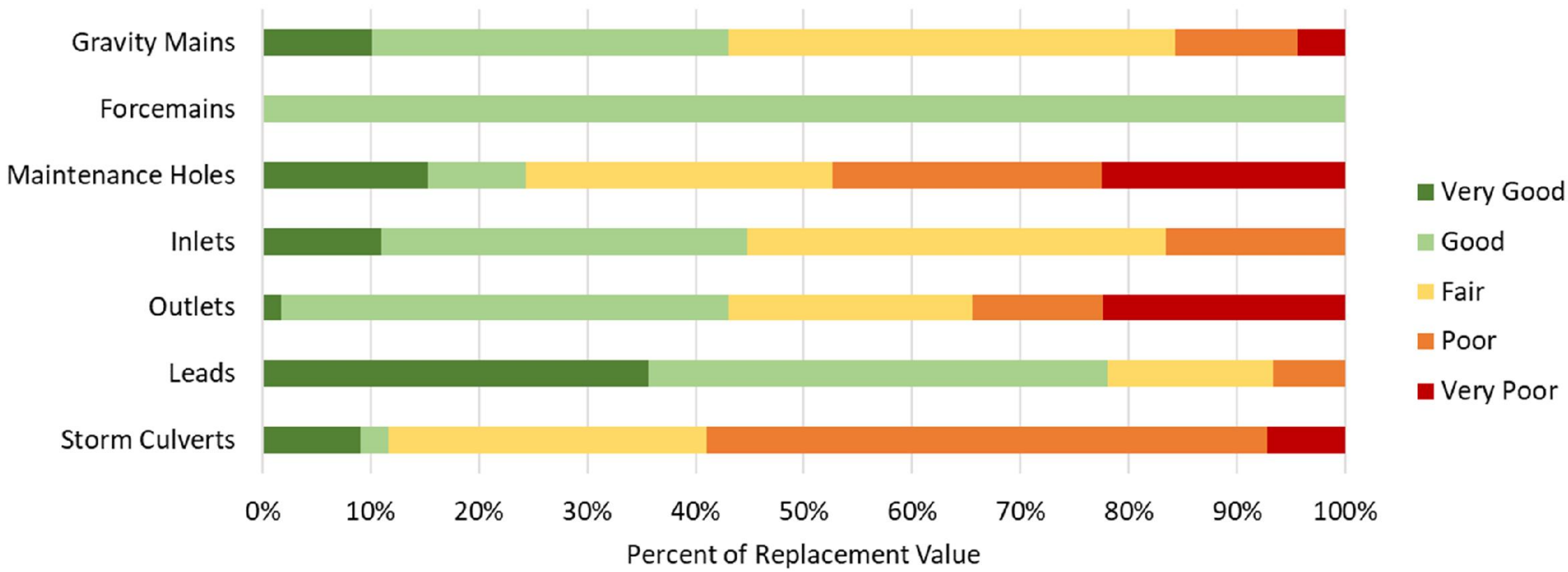


Figure 8: Stormwater Network – Condition Breakdown by Asset Type

As these figures demonstrate, the majority of the stormwater network's value is in Fair to Good condition, with culverts, maintenance holes and outlets having the greatest proportion of their value falling into Poor or Very Poor condition.

3.2 Levels of Service

The stormwater system aims to protect the community from the impacts of flooding and can be used to help manage erosion and support source water protection plans. Table 11 summarizes the level of service framework that was developed to help evaluate the performance of the stormwater network.

Table 11: Stormwater Network – Level of Service Attributes

Core Value	Level of Service Statement
Safe & Regulatory	Stormwater system protects property and people from the impacts of flooding and minimizes exposure to risk.
Accessible & Reliable	Stormwater system is reliable and provided with minimal service disruptions; service requests are responded to promptly within the municipal stormwater network.
Cost-Efficient	Stormwater system is managed cost-efficiently for the provided level of service.

To measure these values, various parameters are assessed and tracked by the City. Some of these parameters are mandatory under O. Reg 588/17 while others were established by the City to help determine the relationship between the level of service provided and the associated operating and capital costs required to achieve that level of service.

3.2.1 Customer Levels of Service

The City's Community Level of Service assesses how well customer expectations are being met, as summarized in Table 12. These criteria use a qualitative description of provided service as well as some quantifiable measures and City cost expenditures.

Table 12: Stormwater Network – Community Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of protection provided by the municipal stormwater management system. [1]	In the urban area, stormwater is conveyed via 109 km of City storm sewers, as well as over 5 km of culverts and 40 km of managed ditches and swales. Throughout the entire city, overland drainage routes and natural watercourses contribute to the conveyance of surface stormwater. See Figure 9.
	Number of customer complaints of surface flooding.	11
Safe & Regulatory	Percentage of stormwater management system designed to current standards.	35%
Cost-Efficient	Annual Operating and Maintenance budget per urban property to maintain the stormwater network (includes urban ditches).	$28.78

[1] Mandatory under O.Reg. 588/17

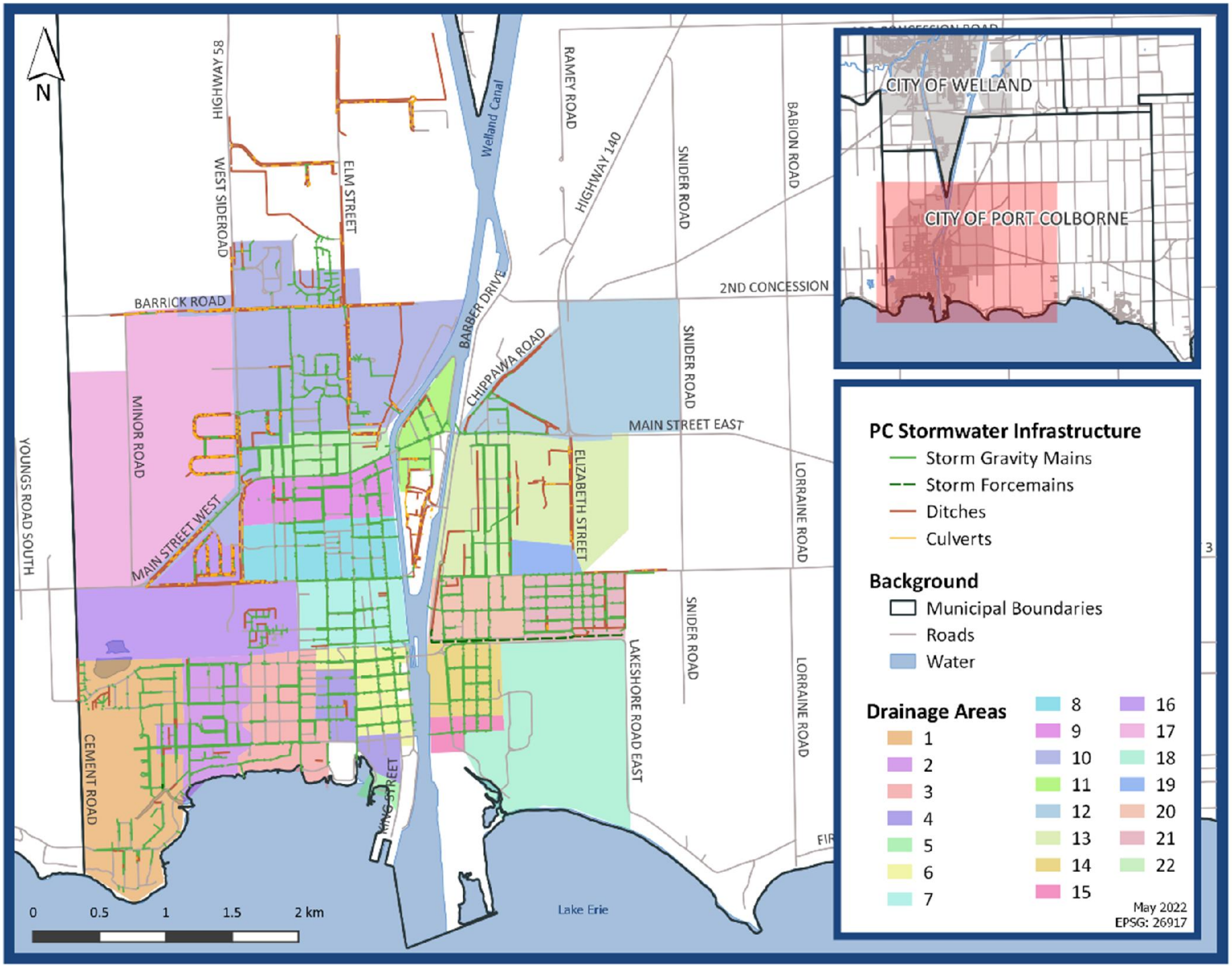


Figure 9: Stormwater Network – Port Colborne Infrastructure Map

3.2.2 Technical Levels of Service

Technical Level of Service uses quantifiable performance measures to indicate the quality of service provided by the stormwater system as detailed in Table 13.

Table 13: Stormwater Network – Technical Level of Service

Core Value	Technical Level of Service	2021 Performance
Accessible & Reliable	Percentage of stormwater assets in Fair or better condition.	84%
	Percentage of catchbasins cleaned annually.	33%
Safe & Regulatory	% of properties in municipality resilient to a 100-year storm. [1]	Currently Unkown[3]
	% of the municipal stormwater management system resilient to a 5-year storm.[1]	85%
Cost-Efficient	Annual Operating and Maintenance budget per km of storm sewer and urban ditches.	$1,274
	Capital investment vs sustainable investment forecast.[2]	14%
	25-year sustainable investment average annual cost. [2]	$3,613,638

[1]Mandatory under O.Reg. 588/17

[2]Sustainable investment is based on a forecast of spending needs and includes additional costs and inflation as detailed in Section 7

[3]The City does not have enough data available at this time to report on this metric with any level of certainty

3.3 Lifecycle Management Strategy

Levels of service are maintained through completing a variety of lifecycle activities, as grouped by similar type and detailed in Table 14. These activities aim to extend asset life through appropriately timed interventions which will typically reduce overall lifecycle costs. The table also includes a summary of the risks associated with not following these strategies.

Table 14: Stormwater Network – Lifecycle Activities and Associated Risks

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Maintenance	• Storm Sewer CCTV Inspection / Zoom Camera Inspections
	• Storm Sewer Flushing/Cleaning
	• Catchbasin & Lead flushing
	• Urban ditch cleaning
	• Outlet cleaning
	• Lead Inspections
	• Storm Sewer Spot Repair
		• Improper or insufficient maintenance can lead to:
		  ◦ Increased lifecycle costs
		  ◦ Decreased asset life
		  ◦ Unplanned failures
		  ◦ Excessive erosion or flooding
		  ◦ Excessive overland flow during stormwater events
		  ◦ Contaminants and water quality issues
		  ◦ Health and safety risks
		• Resource limitations to conduct unplanned work

Renewal/ Rehab	No Renewal Activities	• No renewal activities can lead to: ◦ Increased lifecycle costs

Replacement/ Construction	• Replacement	• Delays in replacement can lead to:
		  ◦ Cost overruns
		  ◦ Increased lifecycle costs
		  ◦ Unplanned failures
		  ◦ Excessive erosion or flooding
		  ◦ Excessive overland flow during stormwater events
		  ◦ Contaminants and water quality issues
		  ◦ Health and safety risks
		• Coordination with other asset classes, if applicable, might delay timeframe of construction activities

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Non-Infrastructure	• Infrastructure Needs Study (INS)
	• Consolidated Linear Infrastructure Environmental Compliance Approvals
		• Inadequate planning can lead to:
		  • Poor information available for decision-making
		  • Reduced ability to manage public health and safety risks
		  • Reduced quality of service and citizen experience
		  • Reduced ability to understand the impacts of climate change on the infrastructure
		  • Not meeting regulatory requirements
		• Asset deterioration is over or underestimated

Expansion/Growth	• Pipe upsizing
	• Expansion to support growth
		• Lack of expansion activities can lead to:
		  • Increased lifecycle costs
		  • Reduced ability to adapt to increased intensity rainfall events
		• Master plans may over or underestimate expansion requirements

Disposal	• Removals through standard construction practices	• Improper disposal can lead to:
		  • Environmental impacts
		  • Cost overruns

3.3.1 Prioritization of Work and Additional Lifecycle Considerations

When considering storm system replacements, a number of factors are taken into account in order to prioritize the work.

- **Age and condition of the storm main:** Older storm sewer pipes are more likely to be in poor condition or in need of upgrades as design standards have been changing to accommodate more runoff due to the increasing likelihood of intense rainstorms associated with climate change. Well-maintained systems perform better under these conditions.
- **Coordination with other infrastructure:** Many different types of linear infrastructure (e.g. watermains, sewermains, storm mains, etc.) follow corridors, usually along road right of ways. In order to reduce costs and service interuptions/ congestion, all of the assets along a corridor are typically replaced at the same time. Storm sewer construction or replacements are typically driven by the other infrastructure in the corridor such as watermains or sanitary sewers. Due to the nature of the services, provision of drinking water and sewage collection are considered a higher priority for limited funding. Unless it is outside of a road corridor, stormwater needs are usually a secondary consideration during prioritization of work.
- **Future Development:** Work may be prioritized in order to support areas proposed for development which will require stormwater management. Exisiting infrastructure may require upgrades to improve capacity or condition and to align with current design standards.

See Figure 10 for the current condition of the system and anticipated development areas.

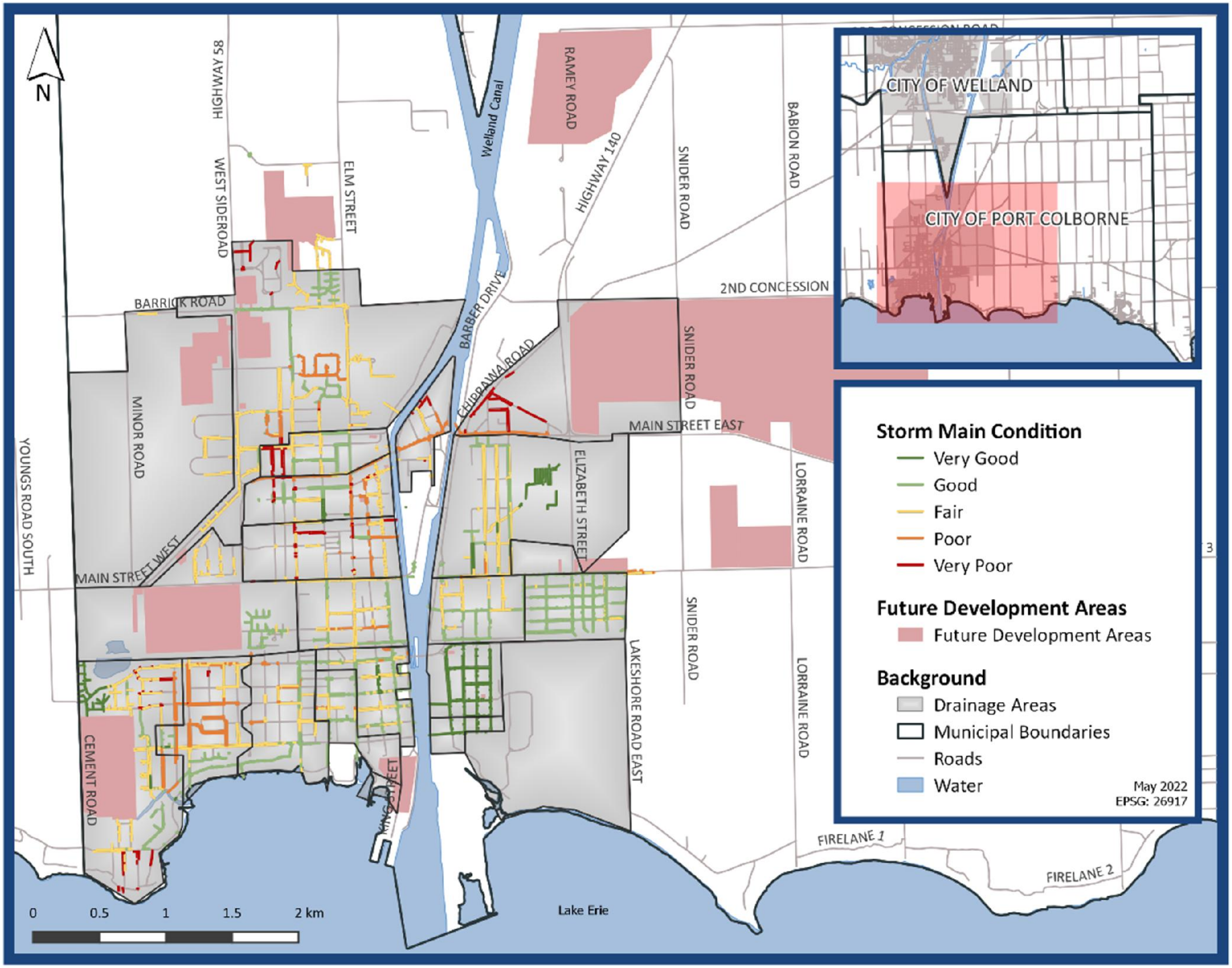


Figure 10: Stormwater Network – Storm Main Condition Map

3.4 Data Confidence

The data sources for the City's stormwater network include:

- The City's GIS inventory & associated attributes
- The City's Citywide financial inventory & associated attributes

Where discrepancies were found between the inventories, the information from the GIS database was used. Table 15 outlines the main data sources and overall confidence in the data used for this AMP. Data confidence is based on how many assumptions needed to be made and the reliability of the data sources.

Overall, there is low confidence in the data due to most of the condition estimates being based on age, which in itself has a low confidence due to the number of gaps or data ranges provided which required general assumptions to be made. As the City continues to collect more condition information, future AMPs will incorporate this data to help improve estimates. For example, the City is currently compiling a list of priority areas to complete CCTV inspections of stormwater mains.

Table 15: Stormwater Network – Data Confidence

Asset Class	Data Source			Data Confidence
	Age	Condition	Replacement Value	
Gravity mains	GIS Inventory	Age-based	Engineering Staff Review	Low
Forcemains	GIS Inventory	Age-based	Engineering Staff Review	Low
Chambers	Citywide Financial Database	Age-based	Engineering Staff Review	Low
Maintenance Holes	GIS Inventory	Age-based	Engineering Staff Review	Low
Inlets	GIS Inventory	Age-based	Engineering Staff Review	Low
Outlets	Citywide Financial Database	Age-based	Engineering Staff Review	Low
Leads	GIS Inventory	Age-based	Engineering Staff Review	Low
Culverts	GIS Inventory	Age-based	Engineering Staff Review	Low
Swales	No age data	N/A	Engineering Staff Review	Low
Ditches	No age data	N/A	Engineering Staff Review	Low

4.0 Water Network

4 Water Network

Water is provided to the City under a "two-tier" system whereby the Region of Niagara is responsible for the operation and maintenance of the Port Colborne Water Treatment Plant, two storage facilities, and supply trunk watermains, and the City operates and maintains roughly 112km of distribution watermains. Water is drawn from the Welland Canal, treated to be drinkable, and sent via the trunk watermains to storage and the City's water distribution system.

The Region and City water systems are strictly regulated by the Ontario Ministry of Environment, Conservation and Parks (MECP) under the Safe Drinking Water Act (2002) and extensive testing and annual inspections ensure compliance to numerous standards and requirements for the protection and safety of users of the system.

4.1 State of Local Infrastructure

4.1.1 Network Inventory & Valuation

The City's water network is made up of mains, including services, valves, chambers and curb stops, as well as hydrants, meters and bulk water stations with a total replacement value of $232 million. Table 16 summarizes the inventory and estimated replacement value of the water network.

Table 16: Water Network – Inventory Valuation

Asset Type	Count	Unit	Replacement Value
Mains	110,379	metres	$222,685,322
Services	58,621	metres	Costs included with Mains
Valves	1,826	Each	Costs included with Mains
Chambers	36	Each	Costs included with Mains
Curb Stops	6,038	Each	Costs included with Mains
Hydrants	622	Each	$5,513,408
Meters	5,730	Each	$3,203,070
Stations	32	Each	$132,736
Total Water Network Value			**$231,534,536**

Notes:

- Services, valves, chambers and curb stops are typically replaced with their associated watermain.

In addition, Figure 11 demonstrates the breakdown of replacement value between the different asset types. Watermains, including all appurtenances such as valves and chambers, make up the vast majority of the network's worth.

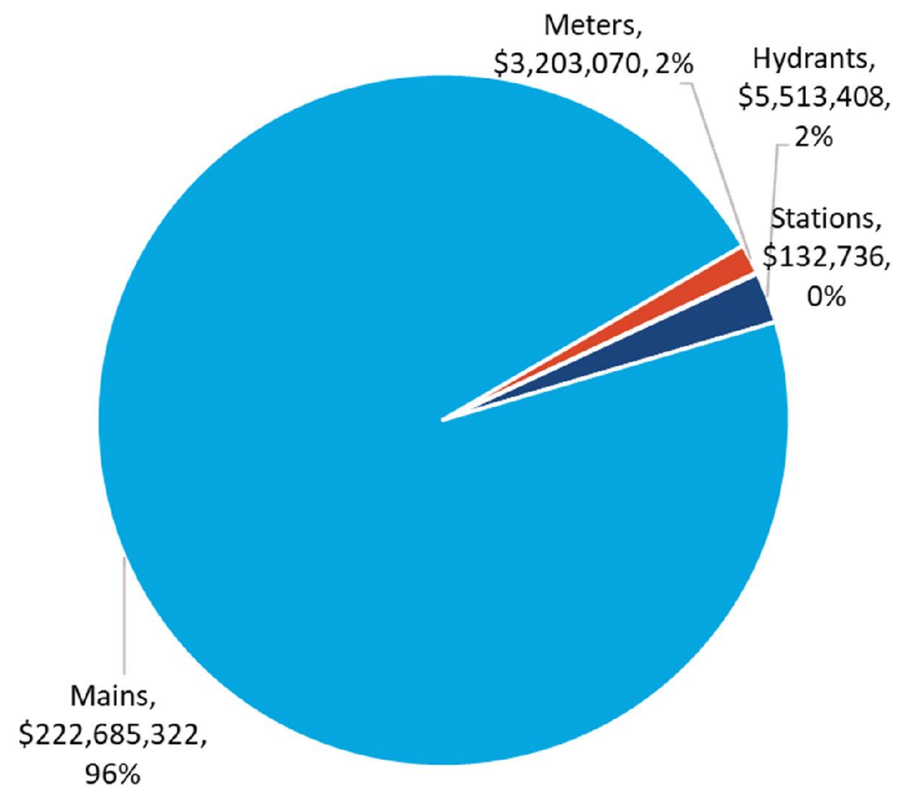


Figure 11: Water Network – Breakdown of Replacement Costs

4.1.2 Network Age & Condition

To make informed decisions on the management of water network assets, it is important to understand the condition of the network. One method for estimating the condition of assets is to look at the age of the assets in comparison to the estimated service life (ESL), or in other words, the number of years the asset is expected to remain in service under normal circumstances.

Figure 12 compares the average age of the water network assets in comparison to the average ESL. It can be seen that all assets have an average age less than the ESL, except for hydrants which have a higher average age in comparison to their ESL. While this could suggest that a number of hydrants need to be replaced, it should be noted that they are inspected regularly and are therefore likely in better condition than their age would suggest.

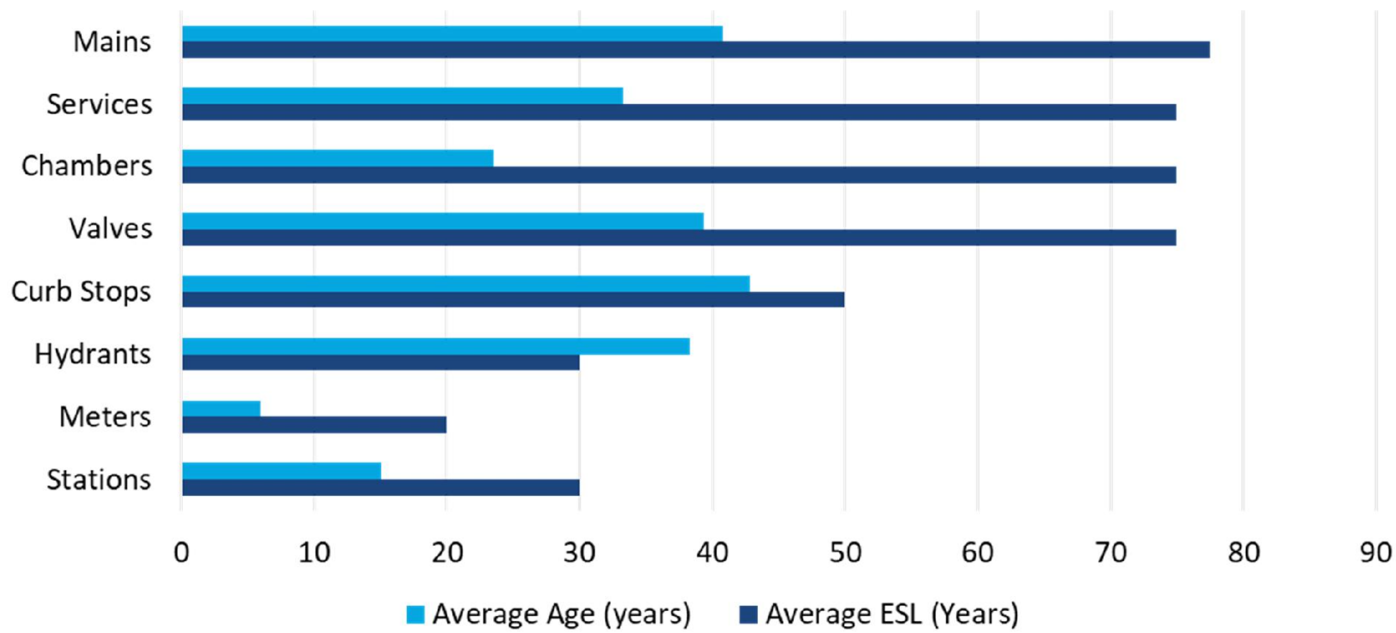


Figure 12: Water Network – Age vs. ESL

In order to compare between every type of asset, a condition score was assigned to each asset and grouped into five condition categories ranging from Very Good to Very Poor. In some cases, this condition score was based on the age of the asset, however, assessed condition values were used where possible. For the water network, Table 17 outlines how the different condition values were grouped into each condition category.

Table 17: Water Network – Condition Categories

Condition Category	Age/ESL
Very Good	>80% life remaining
Good	60 – 80% life remaining
Fair	40 – 60% life remaining
Poor	20 - 40% life remaining
Very Poor	<20% life remaining

Based on these condition scores, the water network can be broken down into the total replacement cost in each condition category, as shown in Figure 13.

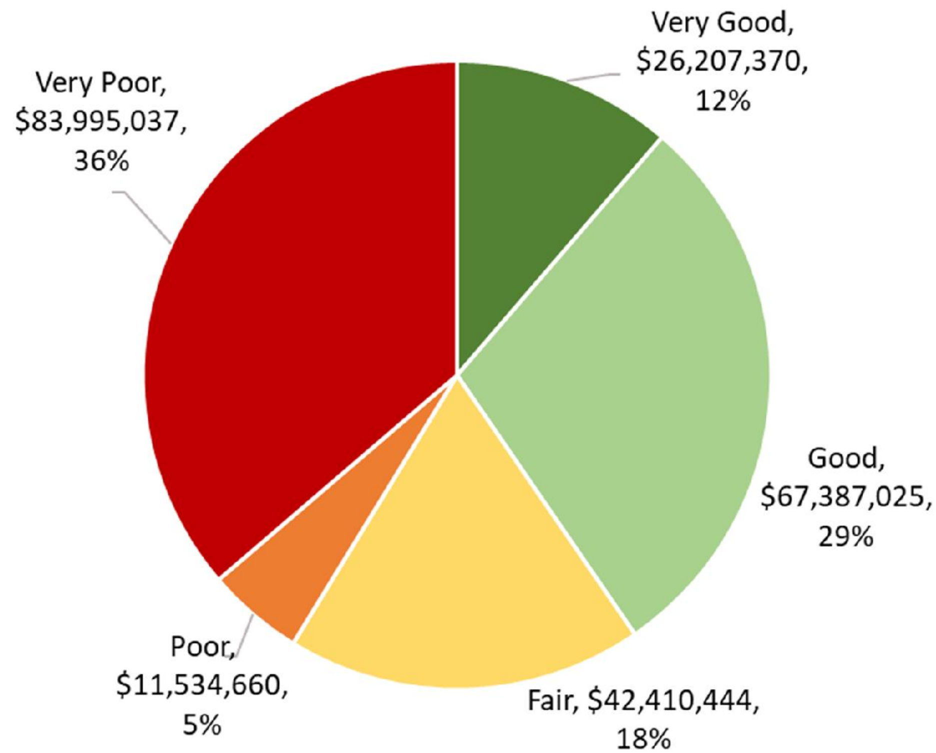


Figure 13: Water Network – Condition Breakdown

This can be further broken down to understand the condition of each water network asset type, as shown in Figure 14.

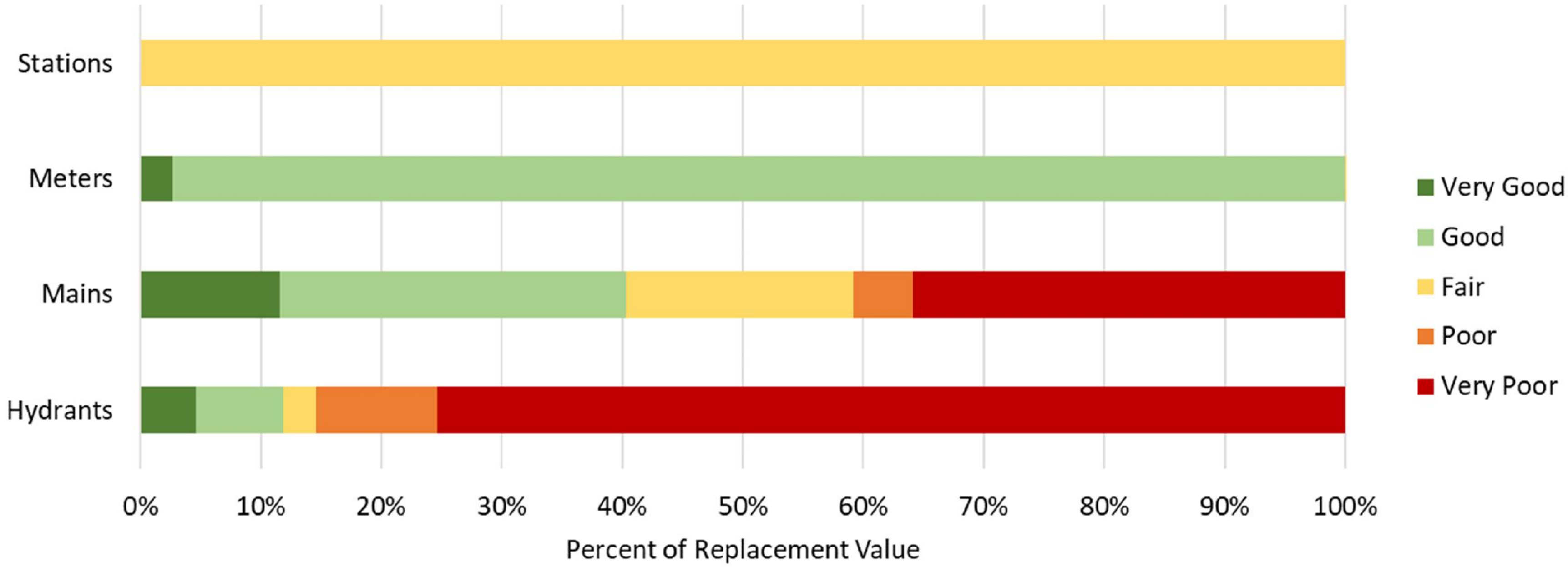


Figure 14: Water Network – Condition Breakdown by Asset Type

As these figures demonstrate, the majority of the water network (by replacement value) falls into Fair or better condition, however, there is a large percentage that fall into Very Poor. This large percentage of assets in Very Poor condition represent assets that are continuing to work beyond their ESL. For hydrants, these assets are inspected and maintained regularly so are likely in better condition than their age would suggest. Watermains are more difficult to inspect and maintain as they are buried infrastructure so this data may suggest that a number of the City's watermains are in need of replacement. In particular, the City has a number of aging cast iron watermains which should be replaced with newer, more reliable materials such as PVC pipes.

4.2 Levels of Service

The City is committed to providing a sustainable and reliable supply of safe, high-quality drinking water in accordance with regulatory requirements. To help assess the performance of the water system and its ability to meet customer expectations, the following level of service framework was developed.

Table 18: Water Network – Level of Service Attributes

Core Value	Level of Service Statement
Accessible & Reliable	A reliable water supply is provided with minimal service disruptions; system failures and service requests are responded to promptly; water connections are available and accessible to all properties within the public water network.
Safe & Regulatory	Water supply is safe to drink and meets all regulatory requirements.
Cost-Efficient	Infrastructure is managed cost-efficiently for the provided level of service.
Sustainable	Water resources are used efficiently, and long-term plans are in place for the sustainability of the water supply and all water infrastructure.

To measure these attributes, various parameters are assessed and tracked by the City. Some of these parameters are mandatory under O. Reg 588/17 while others were established by the City to help determine the relationship between the level of service provided and the associated operating and capital costs required to achieve that level of service.

4.2.1 Customer Levels of Service

The City's Community Level of Service assesses how well customer expectations are being met, as summarized in Table 19. These criteria use a qualitative description of provided service as well as some related metrics.

Table 19: Water Network – Community Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system. [1]	Drinking water is supplied to the urban area of the City via 112 km of watermains as illustrated in Figure 15. This Class 1 distribution system conveys water purchased from the Region who draws water from the Welland Canal and treats it to meet regulatory requirements.
	Description, which may include maps, of the user groups or areas of the municipality that have fire flow. [1]	Fire flow is provided by 622 hydrants within the urban area of the City. See Figure 15.
Safe & Regulatory	Description of boil water advisories and service interruptions. [1]	There were no boil water advisories.
	Number of confirmed water quality customer complaints.	19

[1]Mandatory under O.Reg. 588/17

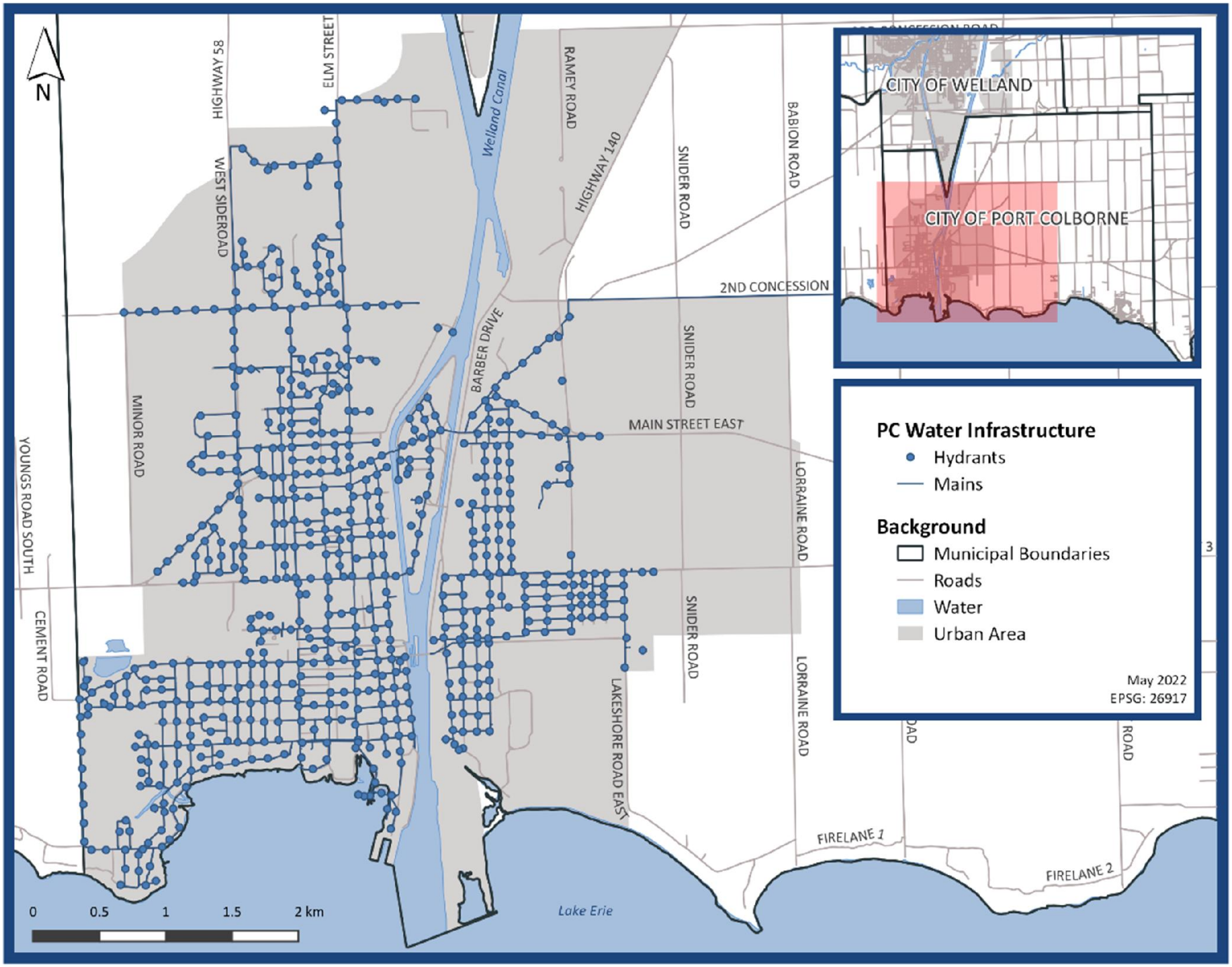


Figure 15: Water Network – Port Colborne Infrastructure Map

4.2.2 Technical Levels of Service

Technical Level of Service uses quantifiable performance measures to indicate the quality of service provided by the water system as detailed in Table 20.

Table 20: Water Network – Technical Level of Service

Core Value	Technical Level of Service	2021 Performance
Accessible & Reliable	% of properties connected to the municipal water system. [1]	65%
	% of properties where fire flow is available. [1]	65%
	# of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system. [1]	4%
	Percentage of water network assets in Fair or better condition.	54%, See Figure 12
	Total number of water main breaks.	10
	Watermain breaks per 100km.	8.9
	5-year average number of water main breaks.	19.8
	Percentage of customers where service is interrupted due to a water main break.	1%
Safe & Regulatory	# 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. [1]	0
	Percentage of water sampling meeting Safe Drinking Water Standards.	99.96%
Cost-Efficient	Annual Operating and Maintenance budget per km of water main.	$26,816
	Water loss as a percentage of Water Purchased.	28%
	Capital investment vs sustainable investment forecast.[2]	5%
	25-year sustainable investment average annual cost. [2]	$7,618,194

Core Value	Technical Level of Service	2021 Performance
Sustainable	Water AMP reviewed every 4 years.	AMP will be reviewed in 2024 and 2025 as part of O.Reg. 588/17 timelines to identify all assets and proposed levels of service

[1]Mandatory under O.Reg. 588/17

[2]Sustainable investment is based on a forecast of spending needs and includes additional costs and inflation as detailed in Section 7

4.3 Lifecycle Management Strategy

Levels of service are maintained through completing a variety of lifecycle activities, as grouped by similar type and detailed in Table 21. These activities aim to extend asset life through appropriately timed interventions which will typically reduce overall lifecycle costs. The table also includes a summary of the risks associated with not following these strategies.

Preventative maintenance programs are in place to ensure reliable operation of the system and high-quality water and include watermain flushing, valve and hydrant maintenance, leak detection and regular inspection programs for facilities. Where possible, replacement projects are combined with others such as road resurfacing or sewer replacement to minimize project costs and construction impacts on residents.

Table 21: Water Network – Lifecycle Activities and Associated Risks

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Maintenance	***Watermains:***
	• Flushing
	• Valve Turning
	• Break repairs
	• Hydrants:
	• Inspection
	• Fire flow testing
	• Painting
	• Repairs
	• Leak detection
	Other Assets:
	• Station Inspections
	• Valve Turning
	• Curb Stop Repairs
	• Large Industrial Meter Calibrations
		• Improper or insufficient maintenance can lead to:
		  • Increased lifecycle costs
		  • Decreased asset life
		  • Unplanned failures/watermain breaks
		  • Service disruptions and road congestion from watermain breaks
		  • Limited fire flow access from hydrant failures
		  • Inability to isolate parts of the system due to valve failure
		  • Revenue loss due to water meter failure, leaks, and water main breaks
		  • Health and safety risks
		• Resource limitations to conduct unplanned work

Lifecycle Activity Type	Asset Management Practice	Associated Risks
Renewal/ Rehab	• Trenchless Relining	• Improper or insufficient rehabilitation can lead to: ◦ Increased lifecycle costs ◦ Service disruptions and congestion when watermains are under roads ◦ Unplanned failures if the activities do not extend the service life as much as expected ◦ Water loss to the environment
Replacement/ Construction	• Replacement	• Delays in replacement can lead to: ◦ Cost overruns ◦ Increased lifecycle costs ◦ Unplanned failures ◦ Limited fire flow access from hydrant failures ◦ Inability to isolate parts of the system due to valve failure ◦ Revenue loss due to water meter failure, leaks, and water main breaks ◦ Service disruptions
Non- Infrastructure	• Water quality complaint tracking • Water Loss Reports • AWWA Audits • Hydraulic Analysis • Water Financial Plan • Drinking Water Quality Management Standard Audits (DWQMS)	• Inadequate planning can lead to: ◦ Poor information available for decision-making ◦ Reduced ability to manage public health and safety risks ◦ Reduced quality of service and citizen experience ◦ Not meeting regulatory requirements • Asset deterioration is over or underestimated.

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Expansion/Growth	• Upsizing
	• Expansion to support growth
	• Local Improvements
		• Lack of expansion activities can lead to:
		  ◦ System unable to accommodate for population and employment growth
		  ◦ Increased lifecycle costs
		  ◦ Limited fire flow access for new developments
		  ◦ Loss of compensation through Development Charges
		• Master plans may over or underestimate expansion requirements

Disposal	• Removal through standard construction practices or abandoned in place
	Hydrants:
	  ◦ Decommission and Store Parts
	  ◦ Decommission and Scrap
		• Improper disposal can lead to:
		  ◦ Environmental impacts
		  ◦ Cost overruns

4.3.1 Prioritization of Work and Additional Lifecycle Considerations

When considering watermain replacements, a number of factors are taken into account in order to prioritize the work.

- **Age and material of the watermain:** Older watermains, particularly those made of ductile or cast iron, are more prone to leaks and breaks due to aging and corrosion. Replacing these mains can help to improve levels of service by reducing disruptions to customers and the ability to upsize where necessary to support growth. In addition, these pipes are typically replaced with PVC pipe which provides many advantages over these older materials including being less susceptible to corrosion. Figure 16 shows the breakdown of different material types in the water system and how this relates to the condition/age of the system.
- **Coordination with other infrastructure:** Many different types of linear infrastructure (e.g. watermains, sewermains, storm mains, etc.) follow corridors, usually along road right of ways. In order to reduce costs and service interuptions/congestion, all of the assets along a corridor are typically replaced at the same time. This means that some watermains will be replaced earlier or later in their lifecycle than initially forecast in order to meet the overall needs of the infrastructure within that corridor.
- **Future Development:** Areas proposed for development may require upgrades due to increased demand, including fireflow.

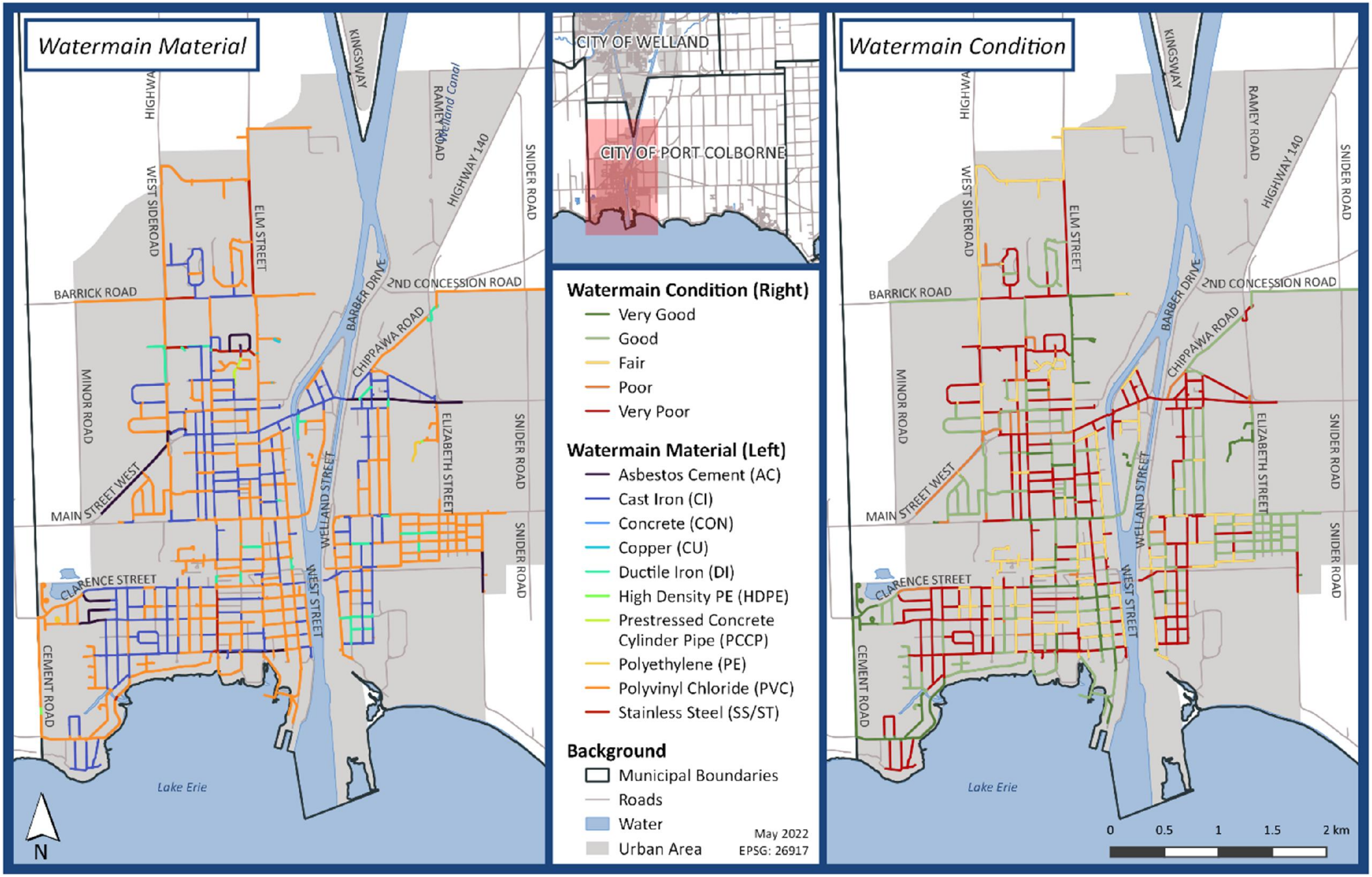


Figure 16: Water Network – Watermain Condition Map

4.4 Data Confidence

The data sources for the City's water network include:

- The City's GIS inventory & associated attributes
- The City's Citywide financial inventory & associated attributes

Where discrepancies were found between the inventories, the information from the GIS database was used. Table 22 outlines the main data sources and overall confidence in the data used for this AMP. Data confidence is based on how many assumptions needed to be made and the reliability of the data sources.

Overall, there is low confidence in the data due to most of the condition estimates being based on age, which in itself has a low confidence due to the number of gaps or data ranges provided which required general assumptions to be made. As the City continues to collect more condition information, future AMPs will incorporate this data to help improve estimates.

Table 22: Water Network – Data Confidence

Asset Class	Data Source			Data Confidence
	Age	Condition	Replacement Value	
Mains	GIS Inventory	Age-based	Engineering Staff Review	Low
Services	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Low
Valves	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Low
Chambers	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Low
Curb Stops	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Low
Hydrants	GIS Inventory	Age-based	Engineering Staff Review	Low
Meters	GIS Inventory	Age-based	Engineering Staff Review	Low
Stations	Citywide Financial Database	Age-based	Engineering Staff Review	Low

5.0 Wastewater Network

5 Wastewater Network

Wastewater collection services are provided to the City under a "two-tier" system whereby the Region of Niagara is responsible for the operation and maintenance of the Seaway Wastewater Treatment Plant, 17 pump stations and related forcemains, and some trunk sanitary sewer mains, and the City operates and maintains a system of roughly 90 km of sanitary sewer mains. Wastewater is collected from properties within the City's urban area which flow by gravity to the Region's pump stations which direct flow to the treatment plant where flow is treated then discharged to the Welland Canal.

Similar to many other municipalities, the City's wastewater collection system is greatly impacted by wet weather which causes extraneous flow to leak or enter into the system through defects in the infrastructure and direct or indirect connections. Less than half of the City's urban centre is serviced by storm sewers, which normally collect runoff from precipitation. Thus, when many areas were developed, some private infrastructure such as downspouts and sump pump discharges were directed to the sanitary sewer system. Finding and repairing system defects and separating storm flow from the sanitary network are two of the priority issues for the City to improve the reliability and efficiency of the system. Less stormwater flow entering the sanitary system reduces the likelihood of basement flooding, system overflows, and the cost of treating the flow.

5.1 State of Local Infrastructure

5.1.1 Network Inventory & Valuation

The Wastewater network is made up of gravity mains and forcemains, including appurtenances such as manholes, cleanouts and laterals, with a total replacement value of $243 million. Table 23 summarizes the inventory and estimated replacement value of the wastewater network.

Table 23: Wastewater Network – Inventory Valuation

Asset Type	Count	Unit	Replacement Value
Gravity Mains	89,525	metres	$238,880,058
Forcemains	1,686	metres	$3,922,304
Manholes	1,144	Each	Costs included with Mains
Cleanouts	6,074	Each	Costs included with Mains
Laterals	6,093	Each	Costs included with Mains
Total Network Value			**$242,802,362**

Notes:

- Manholes, cleanouts and laterals are typically replaced with their associated sewer main.

In addition, Figure 17 demonstrates the breakdown of replacement value between the different asset types. Gravity mains, including all appurtenances such as manholes and cleanouts, make up the vast majority of the network's worth.

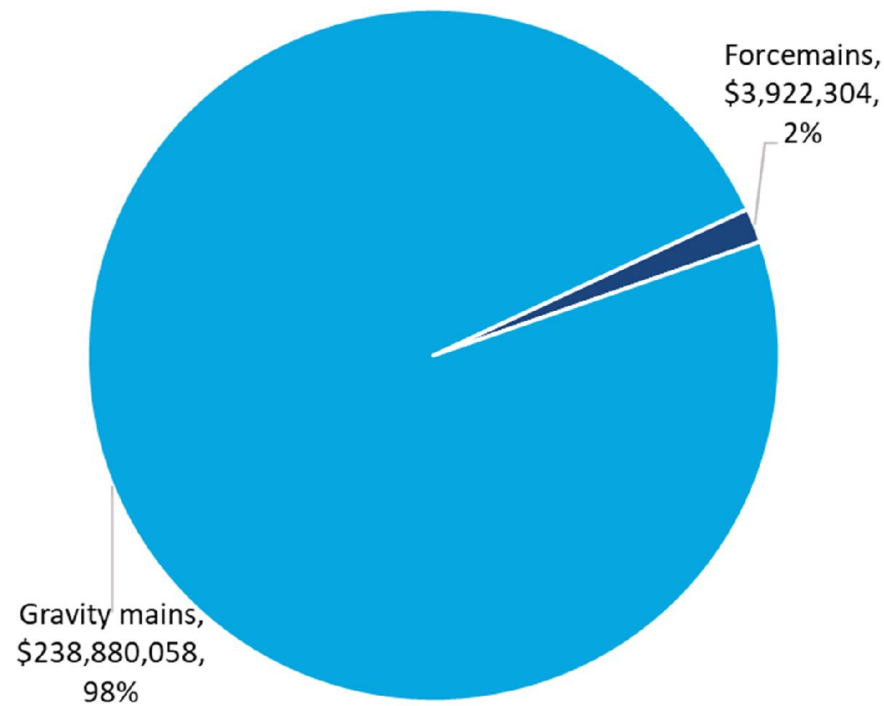


Figure 17: Wastewater Network – Breakdown of Replacement Costs

5.1.2 Network Age & Condition

To make informed decisions on the management of wastewater network assets, it's important to understand the condition of the network. One method for estimating the condition of assets is to look at the age of the assets in comparison to the estimated service life (ESL), or in other words, the number of years the asset is expected to remain in service under normal circumstances.

Figure 18 compares the average age of the wastewater network assets in comparison to the average ESL. It can be seen that all assets have an average age less than the ESL

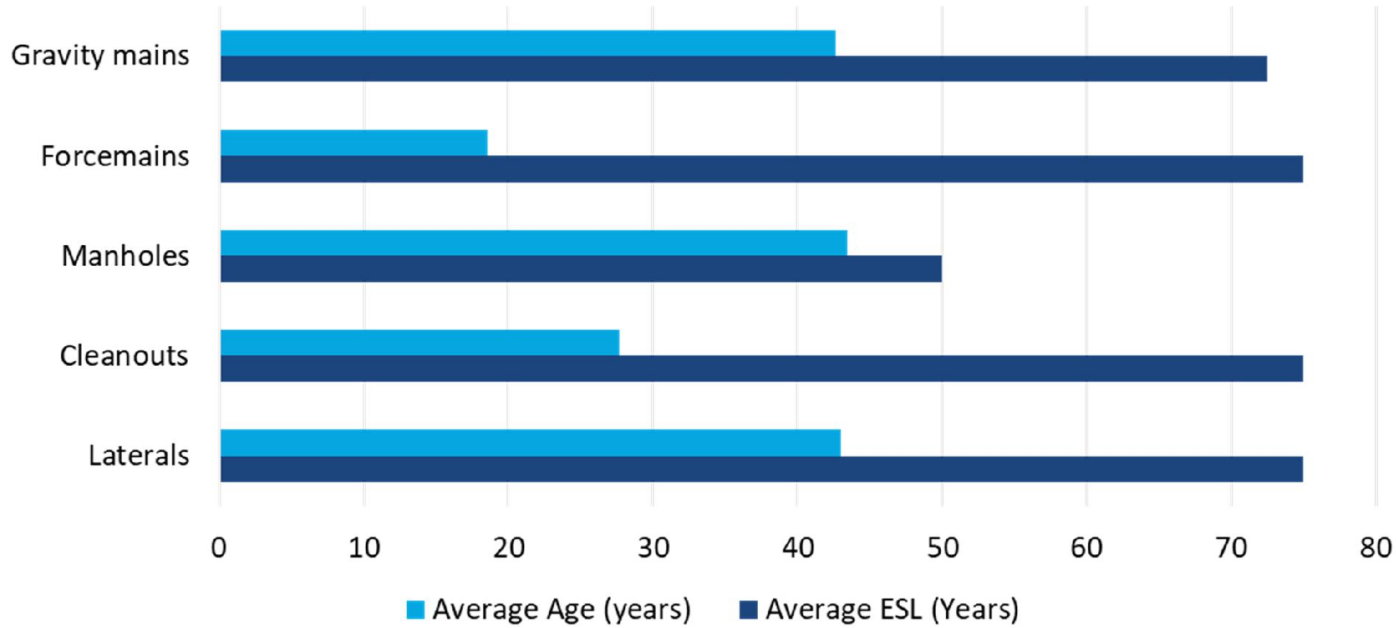


Figure 18: Wastewater Network – Age vs. ESL

In order to compare between every type of asset, a condition score was assigned to each asset and grouped into five condition categories ranging from Very Good to Very Poor. In some cases, this condition score was based on the age of the asset, however, assessed condition values were used where possible. For the wastewater network, Table 24 outlines how the different condition values were grouped into each condition category.

Table 24: Wastewater Network – Condition Categories

Condition Category	Gravity Mains: PACP Scores	Remaining Assets: Age/ESL
Very Good	0 – No Defects. 1 - Excellent	>80% life remaining
Good	2 - Good	60 – 80% life remaining
Fair	3 - Fair	40 – 60% life remaining
Poor	4 - Poor	20 - 40% life remaining
Very Poor	5 – Immediate Attention Required	<20% life remaining

As this table shows, gravity main condition is based on PACP scores, in particular the structural grade, a standard scale which measures the structural condition of a pipeline on a scale from 0-5 based on a review of CCTV inspection footage. However, PACP scores were not available for the majority of gravity mains, so any without these scores were estimated based on age.

Based on these condition scores, the wastewater network can be broken down into the total replacement cost in each condition category, as shown in Figure 19.

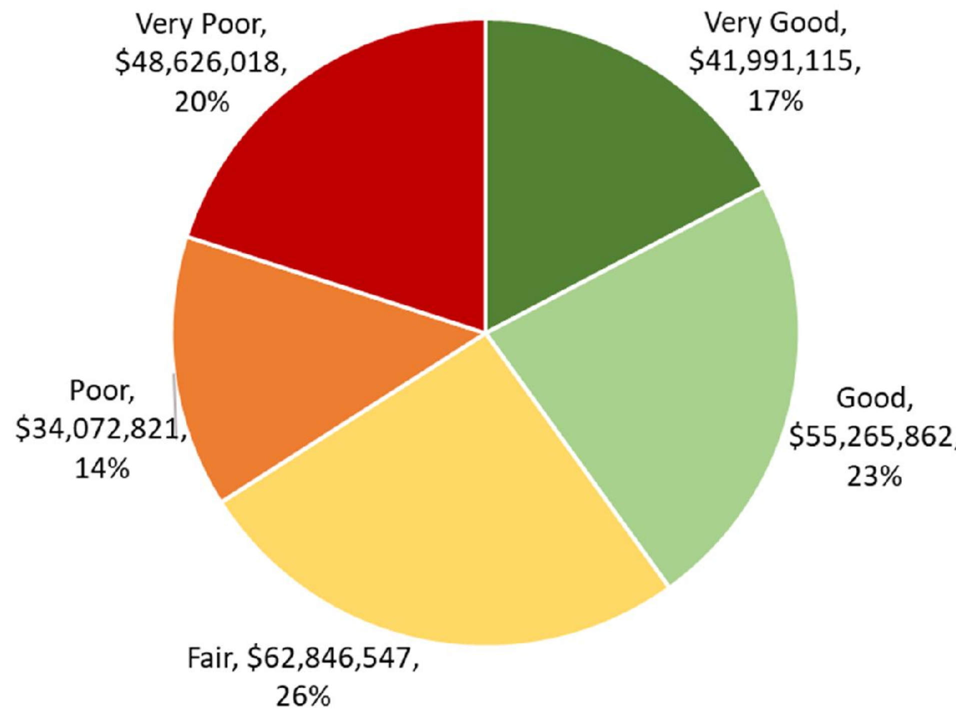


Figure 19: Wastewater Network – Condition Breakdown

This can be further broken down to understand the condition of each wastewater network asset type, as shown in Figure 20.

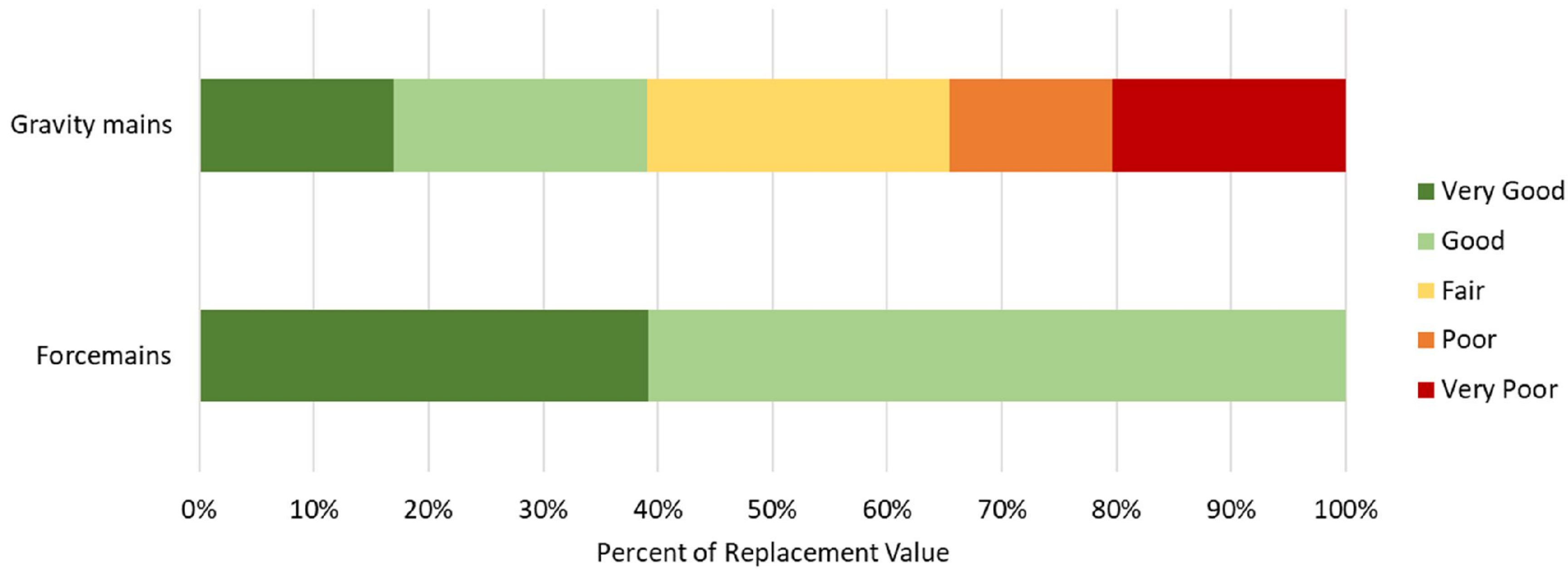


Figure 20: Wastewater Network – Condition Breakdown by Asset Type

As these figures demonstrate, the majority of the wastewater network's value is in Fair or better condition, however there is still a significant portion in Very Poor to Poor condition. While this may suggest that there are a number of gravity mains in need of immediate replacement, it is important to note that the majority of these assets used age as an estimate for condition. For mains with PACP scores, the proportion that fell into Poor and Very Poor condition were significantly less than those based on age. As the City continues to collect data and work to align their current data with their inventory, more accurate estimates of condition will be available for prioritizing work.

5.2 Levels of Service

The wastewater system aims to protect the environment through pollution prevention and control and ensure community health and safety through provision of collection and treatment services. The following level of service framework was developed to help evaluate the performance of the wastewater system.

Table 25: Wastewater Network – Level of Service Attributes

Core Value	Level of Service Statement
Accessible & Reliable	A reliable wastewater service is provided with minimal service disruptions; system failures and service requests are responded to promptly; sanitary connections are available and accessible to all properties within the public sewer network.
Safe & Regulatory	Wastewater is managed without risk of hazard to public health; there is full compliance with all regulatory requirements.
Cost-Efficient	Infrastructure is managed efficiently for the provided level of service.
Sustainable	Wastewater resources are used efficiently, and long-term plans are in place for the sustainability of wastewater treatment and infrastructure.

To measure these attributes, various parameters are assessed and tracked by the City. Some of these parameters are mandatory under O. Reg 588/17 while others were established by the City to help determine the relationship between the level of service provided and the associated operating and capital costs required to achieve that level of service.

5.2.1 Customer Levels of Service

The City's Community Level of Service assesses how well customer expectations are being met, as summarized in Table 26. These criteria use a qualitative description of provided service as well as some quantifiable measures and City cost expenditures.

Table 26: Wastewater Network – Community Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system. [1]	The wastewater collection system is comprised of 90 km of sewer mains within the urban area which drain to the Region's pump stations for conveyance to the Seaway Wastewater Treatment Plant. The Region owns and maintains 17 pump stations within the City. See Figure 21.
Safe & Regulatory	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes. [1]	Stormwater enters the sanitary system through cracks, offset joints, maintenance hole covers, and private lateral defects. Parts of the system have connected downspouts and sump pump discharges.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events such as those listed above. [1]	Sanitary sewer design follows the Ontario Design Guidelines for Sewer Works. CCTV is used to identify sources of infiltration and inflow and guide repairs.
	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system. [1]	This regulatory metric is not applicable to the City as the sewage treatment plants are owned and operated by the Regional Municipality of Niagara.

[1]Mandatory under O.Reg. 588/17

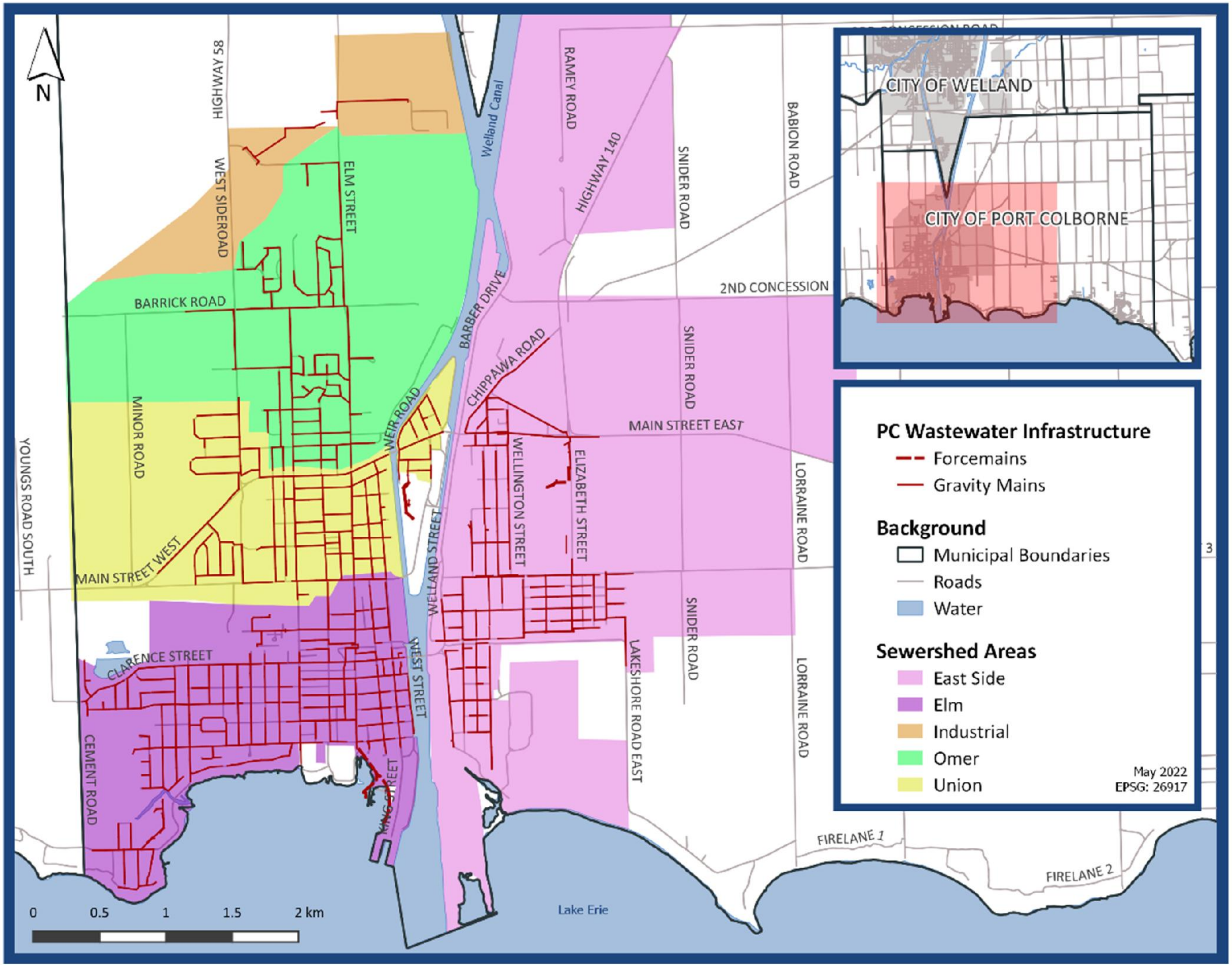


Figure 21: Wastewater Network – Port Colborne Infrastructure Map

5.2.2 Technical Levels of Service

Technical Level of Service uses quantifiable performance measures to indicate the quality of service provided by the wastewater system as detailed in Table 27.

Table 27: Wastewater Network – Technical Level of Service

Core Value	Technical Level of Service	2021 Performance
Accessible & Reliable	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. [1]	n/a
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches. [1]	n/a
	The number 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. [1]	n/a
	% of properties connected to the municipal wastewater system. [1]	61%
	% of properties in urban area connected to the municipal wastewater system.	92%
	% of wastewater systems flushed and CCTV inspected annually.	16.7%
	Percent of wastewater assets in Fair or better condition.	49%
	Percentage of inflow and infiltration in the sanitary sewer system (estimated using difference between billed wastewater volumes and wastewater received at treatment plant).	66%

Core Value	Technical Level of Service	2021 Performance
Safe & Regulatory	# of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system. [1]	0
	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system. [1]	n/a
Cost-Efficient	Annual Operating and Maintenance cost (includes treatment and collection) / km pipe length.	$54,146
	Annual Operating and Maintenance cost per urban property to maintain the wastewater network.	$736
	Capital investment vs sustainable investment forecast.[2]	13%
	25-year sustainable investment average annual cost. [2]	$5,673,895
Sustainable	Wastewater AMP reviewed every 4 years.	AMP will be reviewed in 2024 and 2025 as part of O.Reg. 588/17 timelines to identify all assets and proposed levels of service

[1]Mandatory under O.Reg. 588/17

[2]Sustainable investment is based on a forecast of spending needs and includes additional costs and inflation as detailed in Section 7

5.3 Lifecycle Management Strategy

Levels of service are maintained through completing a variety of lifecycle activities, as grouped by similar type and detailed in Table 28. These activities aim to extend asset life through appropriately timed interventions which will typically reduce overall lifecycle costs. The table also includes a summary of the risks associated with not following these strategies.

Various maintenance activities such as spot repairs and grouting most commonly extend asset life to reduce inflow and infiltration which in turn helps to maintain an acceptable level of service. Where possible, replacement projects are combined with others such as road resurfacing or watermain replacement to minimize project costs and construction impacts on residents.

Table 28: Wastewater Network – Lifecycle Activities and Associated Risks

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Maintenance	***Sewer Mains:***
	• CCTV Inspection and Flushing Cleaning
	• Spot Repairs / Grouting
	Manholes:
	• Inspection
	• Spot Repairs / Grouting
		• Improper or insufficient maintenance can lead to:
		  ◦ Increased lifecycle costs
		  ◦ Decreased asset life
		  ◦ Unplanned failures
		  ◦ Collapsed sewers, sinkholes, third party damage, and environmental contamination from sewer main failure
		  ◦ Health and safety risks
		  ◦ Increased inflow and infiltration
		• Resource limitations to conduct unplanned work

Renewal/ Rehab	• Trenchless Relining	• Improper or insufficient rehabilitation can lead to: ◦ Increased lifecycle costs • Unplanned failures if the activities do not extend the service life as much as expected

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Replacement/ Construction	• Replacement	• Delays in replacement can lead to:
		  • Cost overruns
		  • Increased lifecycle costs
		  • Unplanned failures
		  • Collapsed sewers, sinkholes, third party damage, and environmental contamination from sewer main failure
		• Coordination with other asset classes, if applicable, might delay or advance the timeframe of construction activities.

Non- Infrastructure	• Pollution Prevention Control Plan (PPCP)
	• Smoke testing
	• Flow monitoring
	• Update/review of design standards
	• Inflow & infiltration
		• Inadequate planning can lead to:
		  • Poor information available for decision-making
		  • Reduced ability to manage public health and safety risks
		  • Reduced quality of service and citizen experience
		  • Potential risk of sewer backup and basement flooding.
		• Asset deterioration is over or underestimated.

Expansion/Growth	• Pipe upsizing
	• Expansion to support growth
		• Lack of expansion activities can lead to:
		  • System unable to accommodate for population and employment growth
		  • Increased lifecycle costs
		  • Reduced capacity in system to accommodate new developments without upgrades, leading to an increased risk of sewer backups
		• Master plans may over or underestimate expansion requirements

Disposal	• Removal through standard construction practices	• Improper disposal can lead to:
		  • Environmental impacts
		  • Cost overruns

5.3.1 Prioritization of Work and Additional Lifecycle Considerations

When considering sanitary sewer replacements, a number of factors are taken into account in order to prioritize the work.

- **Age and condition of the sanitary main:** Older sanitary sewer pipes and manholes are more likely to be in poor structural condition which leads to increased inflow and infiltration of surface flow and groundwater to the sanitary system. This decreases the capacity available for sewage conveyance, particularly during rain storms, and greatly increases flow and treatment costs at the wastewater treatment plant. Wastewater collection areas, or sewersheds, can be used to group sanitary mains and determine areas that should be priortized, as shown in Figure 22.
- **Coordination with other infrastructure:** Sanitary sewer construction or replacements are often driven by new development or other system improvements. As sanitary sewers usually follow road corridors along with other linear infrastructure, all of the assets may be replaced at the same time to minimize costs and service disruptions. This can lead to some infrastructure being replaced earlier or later in their lifecycle than initially estimated. All appurtenances associated with the sewer are typically also replaced such as manholes and sewer connection leads.
- **Future Development:** New sanitary sewers may be needed for areas proposed for development or if the existing system does not have the required capacity and a larger sewer is necessary.
- **Wet Weather Flows:** Some areas of the City are prioritized to target removal of extraneous wet weather flow from the sanitary sewer system. Inflow is rainwater that enters the system via connected private downspouts and sump pumps that should be connected to the storm sewer system, while infiltration is groundwater that leaks in through cracks and pipe defects. This extraneous flow uses up system capacity and is expensive to unecessarily treat at the wastewater treatment plant.

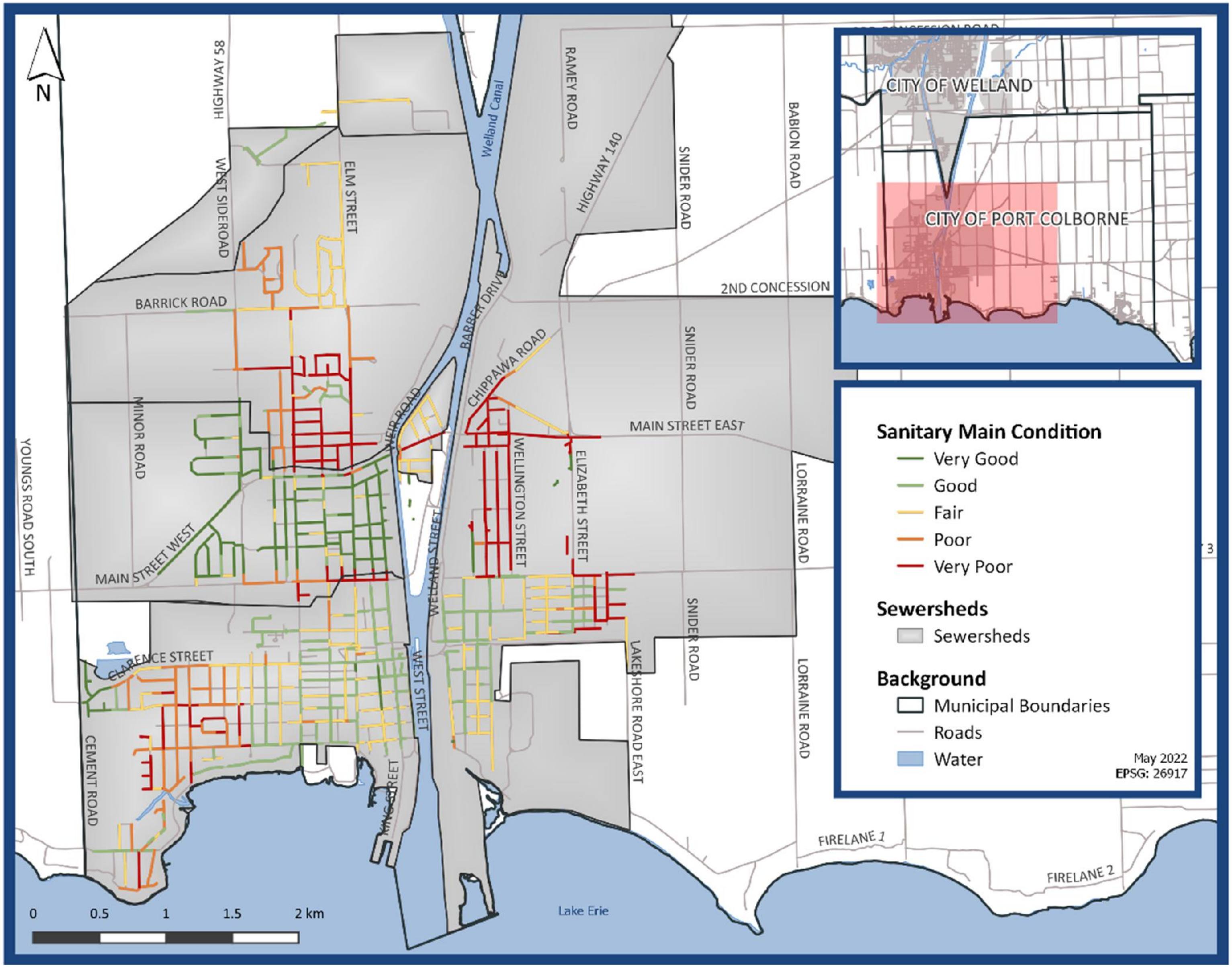


Figure 22: Wastewater Network – Sewer Main Condition Map

5.4 Data Confidence

The data sources for the City's wastewater network include:

- The City's GIS inventory & associated attributes
- The City's Citywide financial inventory & associated attributes
- CCTV Inspections

Where discrepancies were found between the inventories, the information from the GIS database was used. Table 29 outlines the main data sources and overall confidence in the data used for this AMP. Data confidence is based on how many assumptions needed to be made and the reliability of the data sources.

Overall there is a moderate level of confidence in the data due to some of the condition estimates being based on PACP scores, with the remaining being based on age. While gravity mains have CCTV inspections completed on ~17% of the system annually, some of the inspections are in the process of being completed and some data requires further work to incorporate it into the rest of the asset data. As the City continues to collect more condition information, future AMPs will incorporate this data to help improve estimates.

Table 29: Wastewater Network – Data Confidence

Asset Class	Data Source			Data Confidence
	Age	Condition	Replacement Value	
Gravity Mains	GIS Inventory	CCTV Inspections, Age-based	Engineering Staff Review	Moderate
Forcemains	GIS Inventory	Age-based	Engineering Staff Review	Low
Manholes	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Moderate
Cleanouts	GIS Inventory	Assumed replaced with Main	Engineering Staff Review	Moderate
Laterals	Citywide Financial Database	Assumed replaced with Main	Engineering Staff Review	Moderate

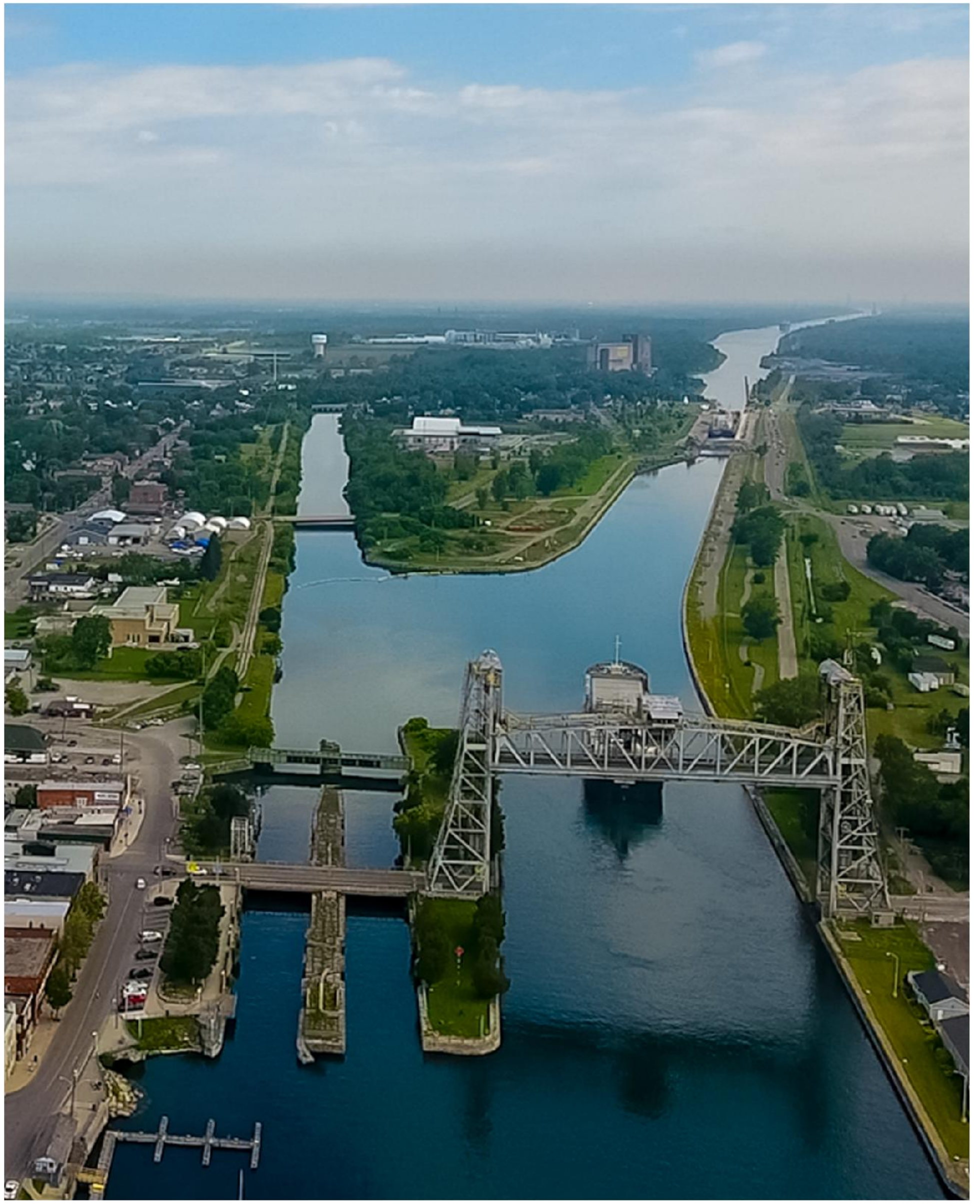
6.0 Bridges & Culverts

6 Bridges & Culverts

The City's transportation network is supported by bridges and culverts which primarily provide crossings over waterways or allow for passage of drainage. The City ensures the provision of safe and reliable structures in accordance with regulatory requirements and community expectations. Of the City's 27 structures, only two are defined as bridges, while the others are considered culvert structures. All were built prior to 1970, with the oldest culvert constructed in 1920, shortly after Port Colborne became a town.

All bridges and major structures are inspected every two years in conformance with the Ontario Structure Inspection Manual (OSIM) which provides a standardized, systematic assessment in accordance with O. Reg. 104/97. These inspections ensure the structural integrity, safety, and condition of these structures through renewal and rehabilitation recommendations.

Of note, this asset class does not include small drainage culverts (less than 1m in diameter) or driveway culverts.



6.1 State of Local Infrastructure

6.1.1 Inventory & Valuation

The City's structures include bridges and culverts over three metres in length with a total replacement value of $18.5 million. Table 30 summarizes the inventory and estimated replacement value of the City's bridges and culverts.

Table 30: Bridges & Culverts – Inventory Valuation

Asset Type	Count	Unit	Replacement Value
Bridges	4	Each	$4,542,207
Culverts	27	Each	$14,000,812
Total Road Network Value			**$18,543,018**

Note:

- 2 pedestrian bridges and 1 culvert have been included in the counts but are not included in the valuation or analysis as not enough asset data was available.

In addition, Figure 23 demonstrates the breakdown of replacement value between the different asset types. As shown, culverts make up about 76% of the value.

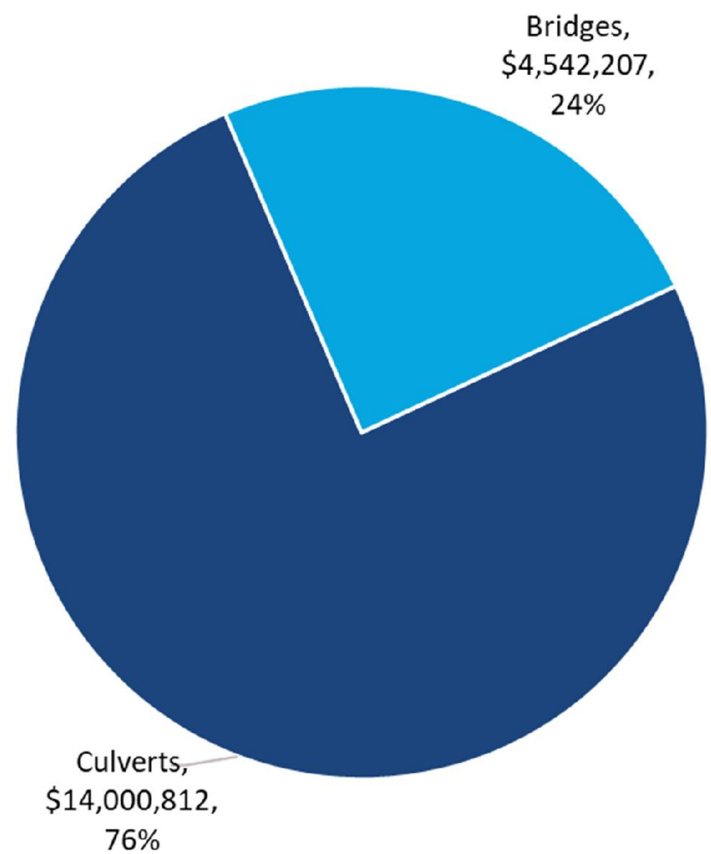


Figure 23: Bridges & Culverts – Breakdown of Replacement Costs

6.1.2 Age & Condition

To make informed decisions on the management of bridges and culverts, it is important to understand their condition. One method for estimating the condition of assets is to look at the age of the assets in comparison to the estimated service life (ESL), or in other words, the number of years the asset is expected to remain in service under normal circumstances.

Figure 24 compares the average age of the bridges and culverts in comparison to the average ESL. It can be seen that all of the assets have an average age greater than the ESL. While this could suggest that a number of these assets need to be replaced, it should be noted that they are inspected and maintained regularly and are therefore likely in better condition than their age would suggest.

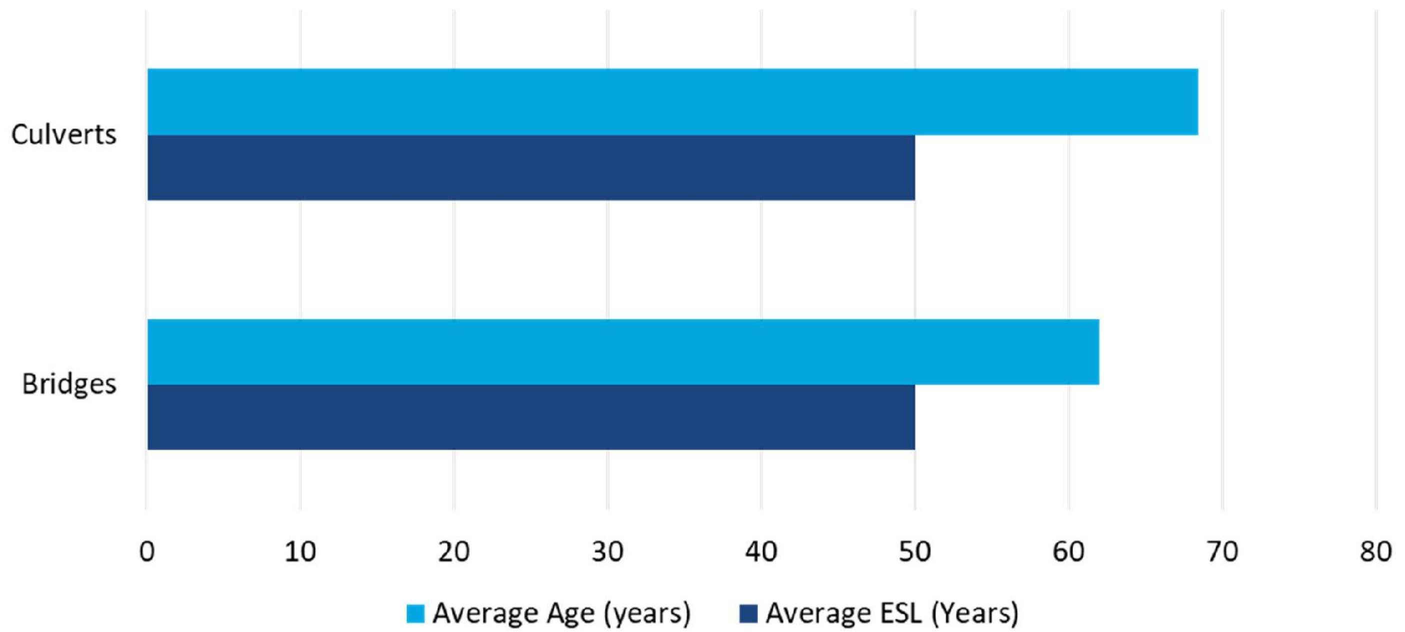


Figure 24: Bridges & Culverts – Age vs. ESL

In order to compare between every type of asset, a condition score was assigned to each asset and grouped into five condition categories ranging from Very Good to Very Poor. In some cases, this condition score was based on the age of the asset, however, assessed condition values were used where possible. For bridges and culverts, Table 31 outlines how the different condition values were grouped into each condition category.

Table 31: Bridges & Culverts – Condition Categories

Condition Category	Bridges & Culverts: Bridge Condition Index (BCI)
Very Good	>86 BCI
Good	70-86 BCI
Fair	61-70 BCI
Poor	41-61 BCI
Very Poor	<41 BCI

As this table shows, bridge and culvert condition is based on the Bridge Condition Index (BCI), a standard measurement based on the Ontario Structure Inspection Manual (OSIM) which measures the general condition of bridges and culverts on a scale from 0-100 based on a manual review of each structure. Based on these condition scores, the bridges and culverts can be broken down into the total replacement cost in each condition category, as shown in Figure 25.

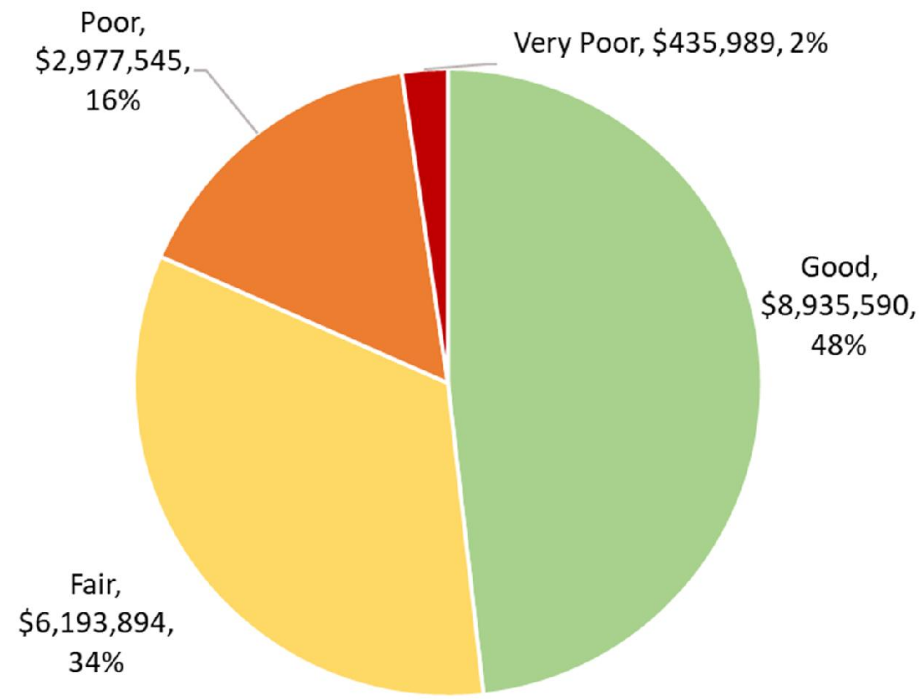


Figure 25: Bridges & Culverts – Condition Breakdown

This can be further broken down to understand the condition of each asset type, as shown in Figure 26.

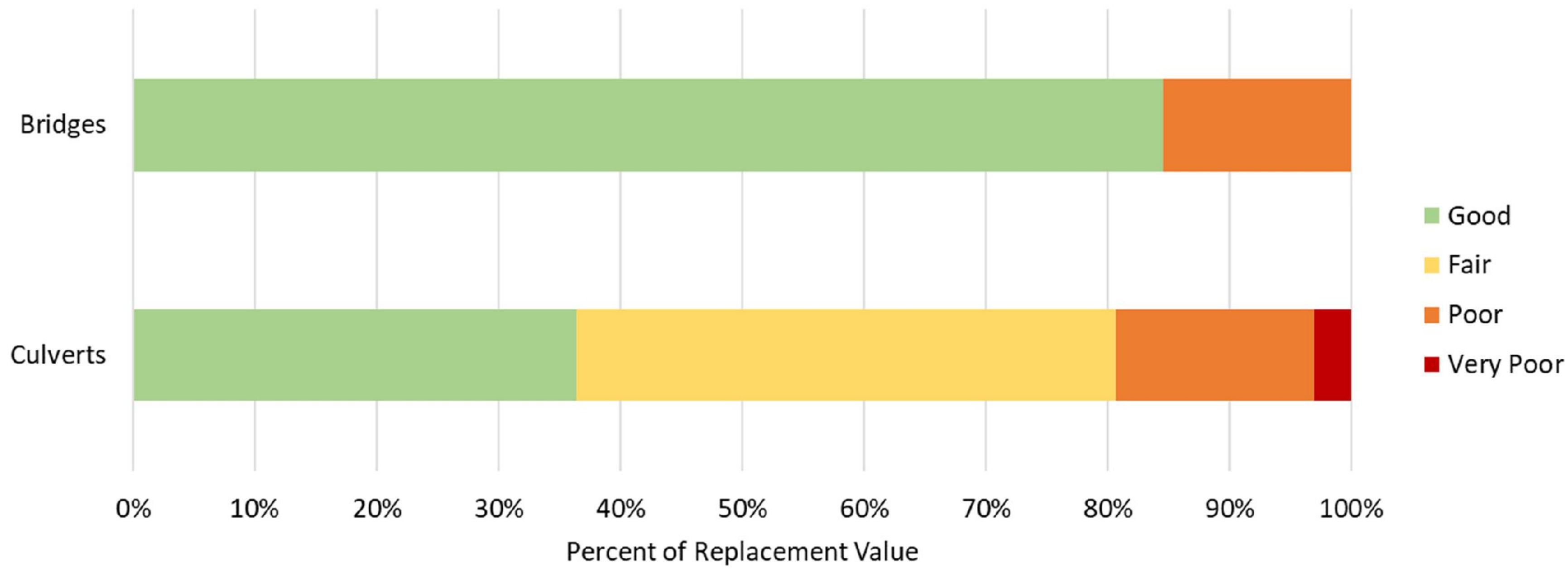


Figure 26: Bridges & Culverts – Condition Breakdown by Asset Type

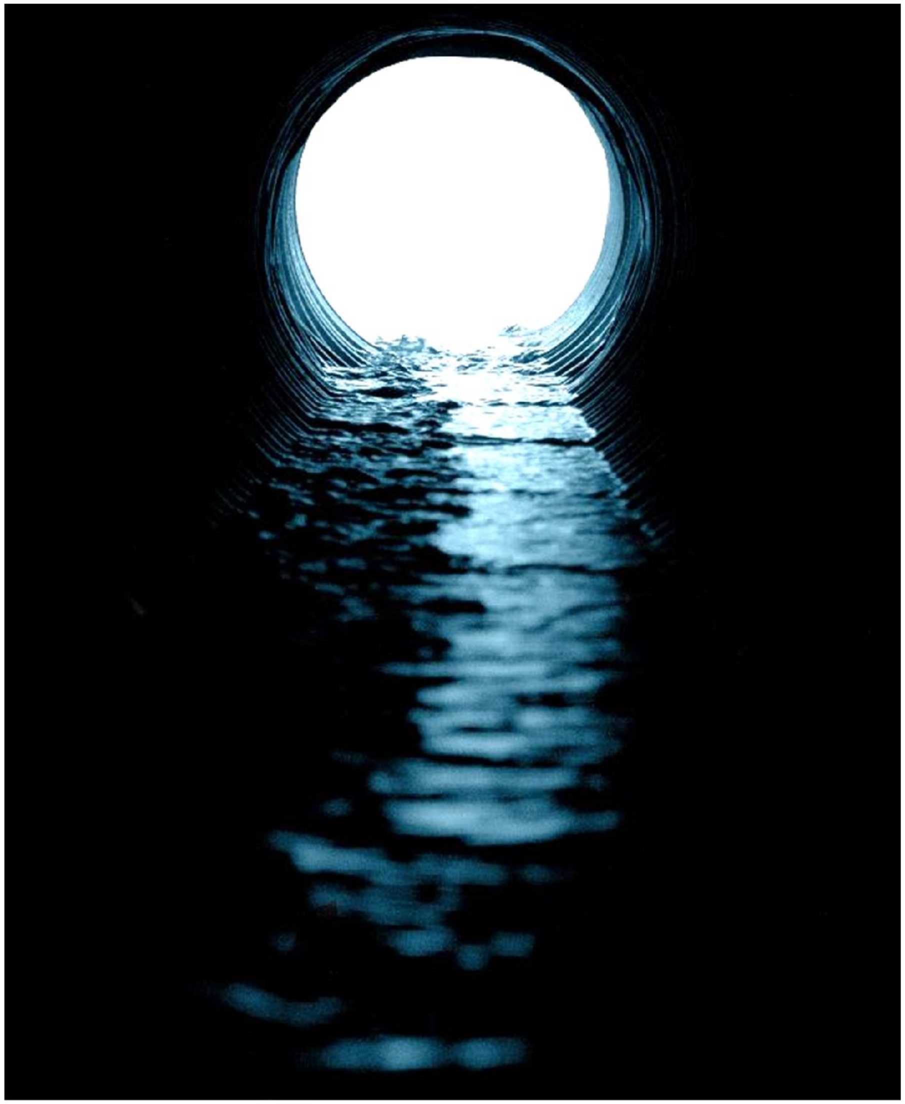
As these figures demonstrate, the majority of bridges and culverts (by replacement value) are in Fair to Good condition. These values are based on draft BCIs of recent inspections which, once finalized, will also provide recommended renewals and repairs to help improve the condition of these assets.

6.2 Levels of Service

Core values and associated statements were developed to assess the performance of bridge and culvert structures as follows.

Table 32: Bridges & Culverts – Level of Service Attributes

Core Value	Level of Service Statement
Accessible & Reliable	Bridges provide reliable access to the road network for vehicles and/or pedestrians.
Safe & Regulatory	Bridges and culverts provide safe vehicular and/or pedestrian passage, and all structures are fully compliant with regulatory requirements.
Cost-Efficient	Bridges and culverts are managed cost-efficiently for the provided level of service.
Sustainable	There are long-term plans in place for the sustainability of all bridges and culverts.



The following Community and Technical parameters are used to measure these attributes. O. Reg. 588/17 has set requirements for both Community and Technical Levels of Service; the Community measures use qualitative descriptions to describe the scope and quality of the service being provided while the technical use quantifiable performance measures.

OSIM (Ontario Structure Inspection Manual) inspections provide a standardized, systematic assessment of all bridges and major structures in accordance with O. Reg. 104/97 and are conducted every two years.

6.2.1 Customer Levels of Service

The City's Community Level of Service describes how well customer expectations are being met, as summarized in Table 33.

Table 33: Bridges & Culverts – Community Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists). [1]	Bridges & Culverts on roads support all classes of vehicles including motor vehicles, heavy transport vehicles, buses, and emergency vehicles, as well as pedestrians and cyclists.
Safe & Regulatory	How often do OSIM inspections occur?	All structures inspected every two years.
Sustainable	Description or images of the condition of bridges and how this would affect use of the bridges. [1]	The City follows the standards and best practices in the Ontario Structure Inspection Manual to determine the condition of bridges and culverts. Third party consultants who are experts in the design and assessment of bridges are engaged to complete these assessments.
	Description or images of the condition of culverts and how this would affect use of the culverts. [1]	

[1]Mandatory under O.Reg. 588/17

6.2.2 Technical Levels of Service

Technical Level of Service uses quantifiable performance measures to indicate the quality of service provided by the water system as detailed in Table 34.

Table 34: Bridges & Culverts – Technical Level of Service

Core Value	Community Level of Service	2021 Performance
Accessible & Reliable	% of non-pedestrian bridges in the municipality with loading or dimensional restrictions. [1]	50% (1 of 2)
	Percentage of structures in Fair or better condition.	82%
	Number of structures in Poor or Very Poor condition.	8
	Total number of bridges and culverts with a span of 3 metres or greater.	24
	Total number of bridges and culverts with a span less than 3 metres.	5
	Number of pedestrian bridges with a span of 3 metres or greater.	2
Safe & Regulatory	% of bridges and culverts inspected every two years.	100%
Cost Efficient	Capital investment vs sustainable investment forecast.[2]	4.08%
	25-year sustainable investment average annual cost. [2]	$2,942,345
Sustainable	Average bridge condition index value for bridges in the municipality.[1]	65
	Average bridge condition index value for structural culverts in the municipality. [1]	66
	Bridges and Culverts AMP reviewed every 4 years.	AMP will be reviewed in 2024 and 2025 as part of O.Reg. 588/17 timelines to identify all assets and proposed levels of service

[1]Mandatory under O.Reg. 588/17

[2]Sustainable investment is based on a forecast of spending needs and includes additional costs and inflation as detailed in Section 7

6.3 Lifecycle Management Strategy

Levels of service are maintained through completing a variety of lifecycle activities, as grouped by similar type and detailed in Table 35. These activities aim to extend asset life through appropriately timed interventions which will typically reduce overall lifecycle costs. The table also includes a summary of the risks associated with not following these strategies.

Table 35: Bridges & Culverts – Lifecycle Activities and Associated Risks

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Maintenance	• Inspection in accordance with Minimum Maintenance Standards
	• Sweeping (part of Road program)
		• Improper or insufficient maintenance can lead to:
		  ◦ Increased lifecycle costs
		  ◦ Decreased asset life
		  ◦ Unplanned failures
		  ◦ Service disruptions and congestion
		  ◦ Load restrictions, closure, or collapse
		  ◦ Erosion to road bases and sink holes, particularly during extreme storm events
		• Resource limitations to conduct unplanned work

Renewal/ Rehab	• Activities instigated by OSIM inspection findings	• Improper or insufficient rehabilitation can lead to:
		  ◦ Increased lifecycle costs
		  ◦ Service disruptions and congestion
		• Unplanned failures if the activities do not extend the service life as much as expected

Lifecycle Activity Type	Asset Management Practice	Associated Risks

Replacement/ Construction	• Replacement of deteriorated structures	• Delays in replacement can lead to:
		  • Cost overruns
		  • Increased lifecycle costs
		  • Unplanned failures
		  • Service disruptions and congestion
		  • Load restrictions, closure, or collapse
		  • Erosion to road bases and sink holes, particularly during extreme storm events
		• Coordination with other asset classes, if applicable, might delay timeframe of construction activities

Non- Infrastructure	• Condition inspection (following OSIM – Ontario Structure Inspection Manual)	• Inadequate planning can lead to:
		  • Poor information available for decision-making
		  • Reduced ability to manage public health and safety risks
		  • Reduced quality of service and citizen experience
		  • Not meeting regulatory requirements

Expansion/Growth	• Additions to support changes in demand as per local developments	• Lack of expansion activities can lead to:
		  • Congestion
		  • Unplanned failures from increased demand
		  • Increased lifecycle costs
		• Master plans may overestimate or underestimate expansion requirements

Disposal	• Decommission at end of useful life.
	• Disposal of abandoned or obsolete structures during construction projects.
		• Improper disposal can lead to:
		  • Environmental impacts
		  • Cost overruns

6.3.1 Prioritization of Work and Additional Lifecycle Considerations

When considering bridge rehabilitation or replacement, a number of factors are taken into account in order to prioritize the work.

- **Age and condition:** As mentioned previously, many of the bridge and culvert structures have exceeded their expected service life, however, the majority are in Good or Fair condition. This illustrates that timely maintenance and repairs can extend the life of assets and must be considered when prioritizing work projects. Most assets will eventually reach a point where continued repairs may not be as cost-effective as a reconstruction.
- **OSIM Inspections:** Bridge and culvert repairs are primarily driven by the OSIM inspections which occur every two years. This ensures that any required corrective action can be implemented in a timely manner

6.4 Data Confidence

The data sources for the City's bridges and culverts include:

- The City's GIS inventory & associated attributes
- The City's Citywide financial inventory & associated attributes
- Draft OSIM 2022 Inspections

Where discrepancies were found between the inventories, the information from the GIS database was used. Table 36 outlines the main data sources and overall confidence in the data used for this AMP. Data confidence is based on how many assumptions needed to be made and the reliability of the data sources.

Overall there is high confidence in the data due to most of the condition estimates being based on very recent inspections. However, it should be noted that the BCI values used within this report are draft values available at the time of AMP development and may have been adjusted slightly before finalization.

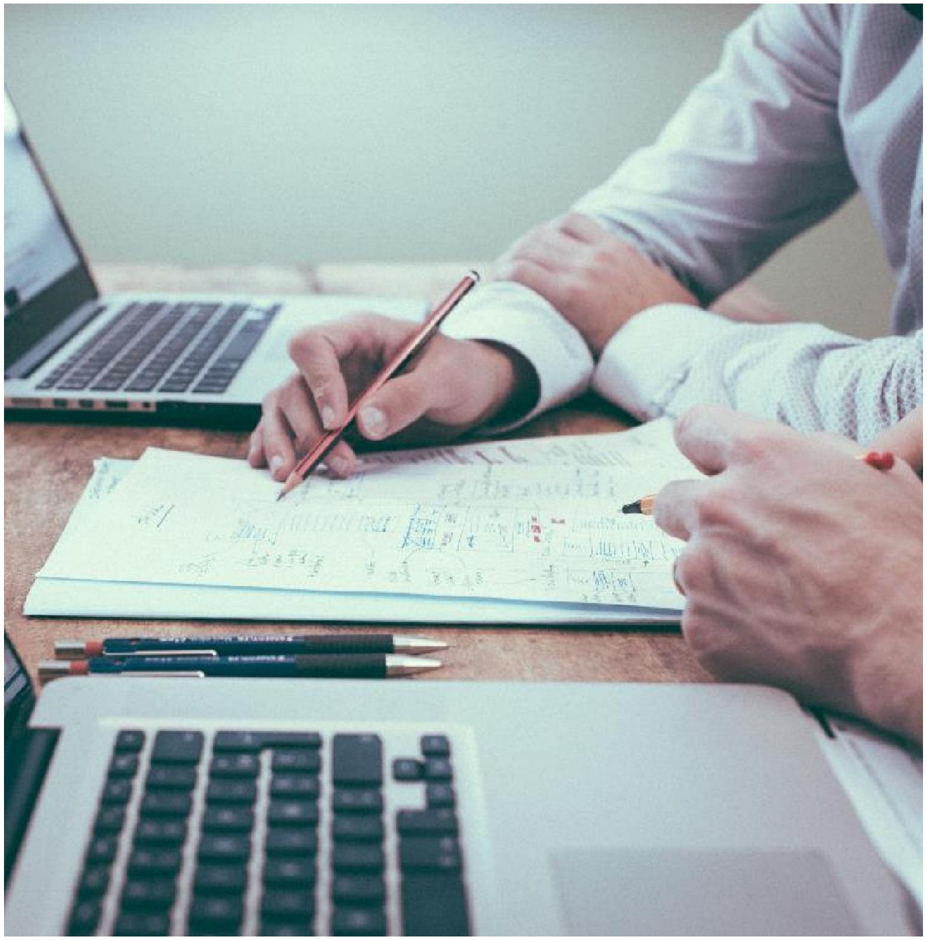
Table 36: Bridges & Culverts – Data Confidence

Asset Class	Data Source			Data Confidence
	Age	Condition	Replacement Value	
Bridges	GIS Inventory	OSIM Inspections 2022 [Draft]	Citywide Financial Database	High
Culverts	GIS Inventory	OSIM Inspections 2022 [Draft]	Citywide Financial Database	High

7.0 Financial Strategy

7 Financial Strategy

This section outlines the City's strategy for understanding long term infrastructure funding requirements and the frameworks and considerations that will be used to develop a financial strategy to address these needs.



7.1 Forecasting Approach & Assumptions

In order to understand future funding requirements and the impact of different strategies on levels of service over the long term, the City developed forecasting models based on the data and lifecycle strategies as outlined within this report. These forecasts take the current condition (or condition estimate based on age) for each asset and deteriorate that condition each year based on the asset's estimated service life. When an asset reaches Very Poor condition it is triggered for replacement and the replacement value of that asset is either applied to that year or deferred to a future year when more funding is available.

There are two main types of scenarios that can be forecasted:

1. **Unconstrained** – This type of scenario has no budget applied, meaning that the year an asset is triggered for some type of work, the work is completed that year.
2. **Constrained** – This type of scenario applies a budget to the forecast so that if an asset is triggered for work, that work may not be completed if there is not enough funding available that year and it will be deferred until more funding is available.

In order to develop these forecasts, a number of assumptions have to be made. The following list outlines some of the key assumptions and important details for understanding these forecasts:

- The forecasts are based on capital costs, particularly **replacement and renewal costs only**, operating budgets and other lifecycle activities such as maintenance and non-infrastructure activities are not included.
- **Growth has not been factored into the forecasts** as the AMP is largely focused on expenditures to address the state of good repair of existing infrastructure. As discussed in Section 1.5, it is anticipated that population growth will bring an increase in revenue but also an increase in expenditures to address expansion and increasing demands on current infrastructure. Strategic documents, such as the Niagara Region Water and Wastewater Master Servicing Plan address infrastructure needs to support growth.
- Assets are typically replaced once they reach Very Poor condition which is estimated to be when the asset reaches 20% of its condition or remaining service life.
- Each asset category has a separate budget limit for constrained scenarios. If there is any budget remaining after all asset needs that can fit within that limit are applied, that dollar value is added to the following year's budget and is not used by assets from another asset category. In cases where there is an asset with a very high replacement value up for replacement, it will be deferred until enough budget has built up over time to afford to complete the work.
- Age-based condition grades were based on a non-linear degradation curve for the financial models.

The following sections outline the results of the forecasted scenarios and discuss next steps for addressing these results.

7.2 Infrastructure Needs

In order to understand infrastructure spending needs based on the City's current lifecycles strategies, an unconstrained scenario was used to forecast spending requirements. This means that no budget was applied and any spending required based on the lifecycle strategies built into the model is applied the year it is required.

Figure 27 shows the forecasted infrastructure spending needs over 25 years broken down by each core asset category. The first year has a large jump in spending which represents a backlog of assets that, based on the condition/age and lifecycle strategies of the assets, should have been triggered for replacement before 2023.

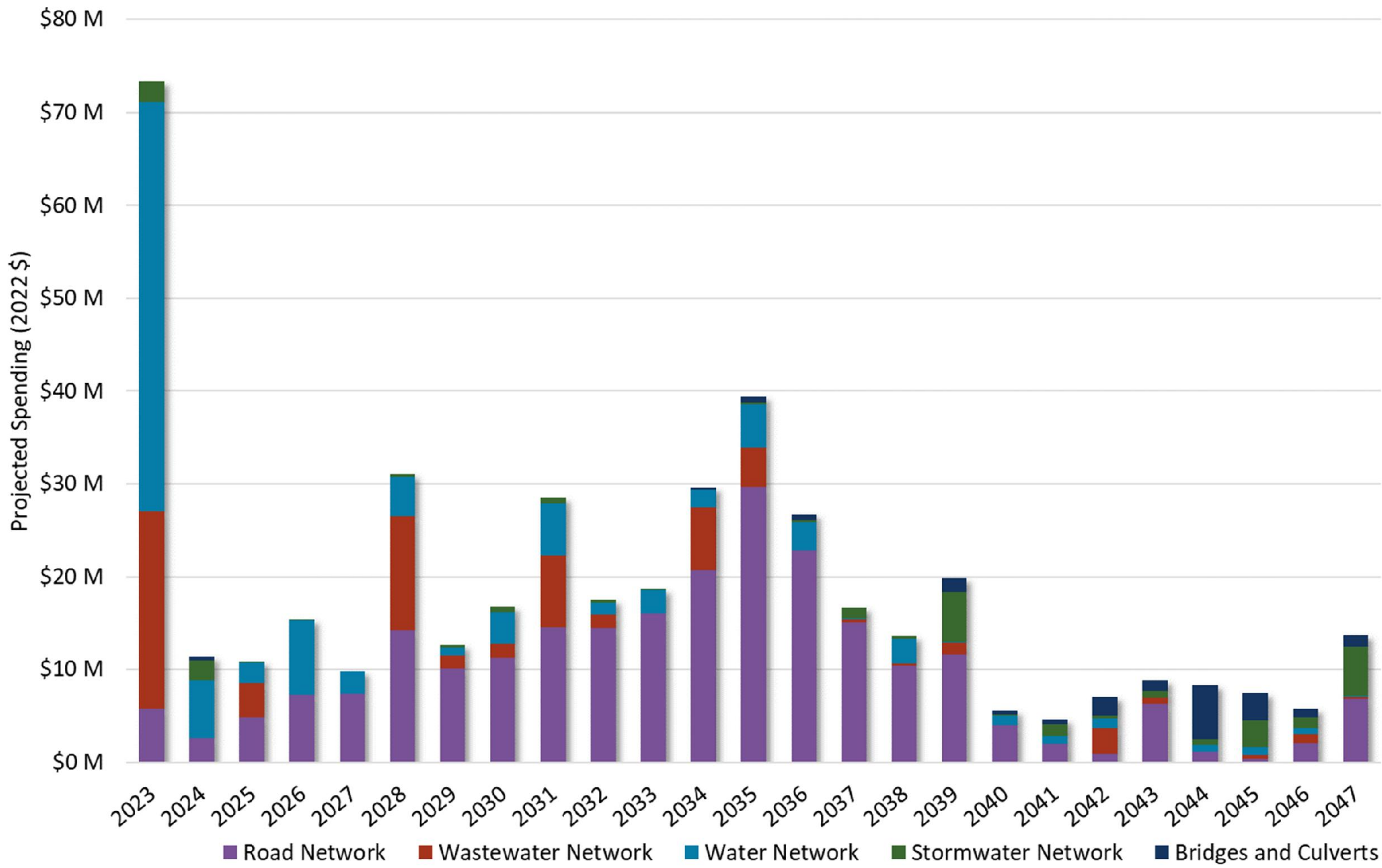


Figure 27: Financial Strategy – Forecasted Infrastructure Spending Needs (Unconstrained Scenario)

While these numbers help to provide a basic understanding of future spending requirements for these asset categories, these numbers are based on the replacement values of the assets, which more closely represent material costs for the assets, rather than the full project costs that would be required to replace them. Projects often end up costing more than anticipated due to implementation costs such as design and project management, as well as the introduction of new technologies and service improvements that are often included in the project, rather than just replacing like-for-like.

In addition, these forecasted spending numbers only include costs for replacement and renewal projects and do not account for other types of capital projects such as non-infrastructure activities (e.g., studies, master plans, etc.) or grouped maintenance projects that may be of large enough scope to complete under the capital budget. They also do not account for inflation in construction, which is likely to increase significantly over the next few years.

In order to understand how these factors may impact future spending requirements, Table 37 outlines assumptions that have been applied to the forecasted spending requirements.

Figure 28 shows how these additional costs and the inclusion of inflation may suggest that the spending requirements are even higher than the replacement values alone would suggest.

Table 37: Financial Strategy – Additional Project Cost Assumptions

Additional Costs	Included	Assumption
Implementation Costs	Design, project management, etc.	20%
Service Improvements	New technologies and materials, level of service improvements, etc.	20%
Additional Activities	Non-Infrastructure, Capital Maintenance projects, etc.	$200,000 per year
Inflation	--	5% increase per year

Notes:

- Additional activity costs based on the costs for other activities in the 2022 capital budget for the core asset categories.
- 5% inflation based on NRBCPI

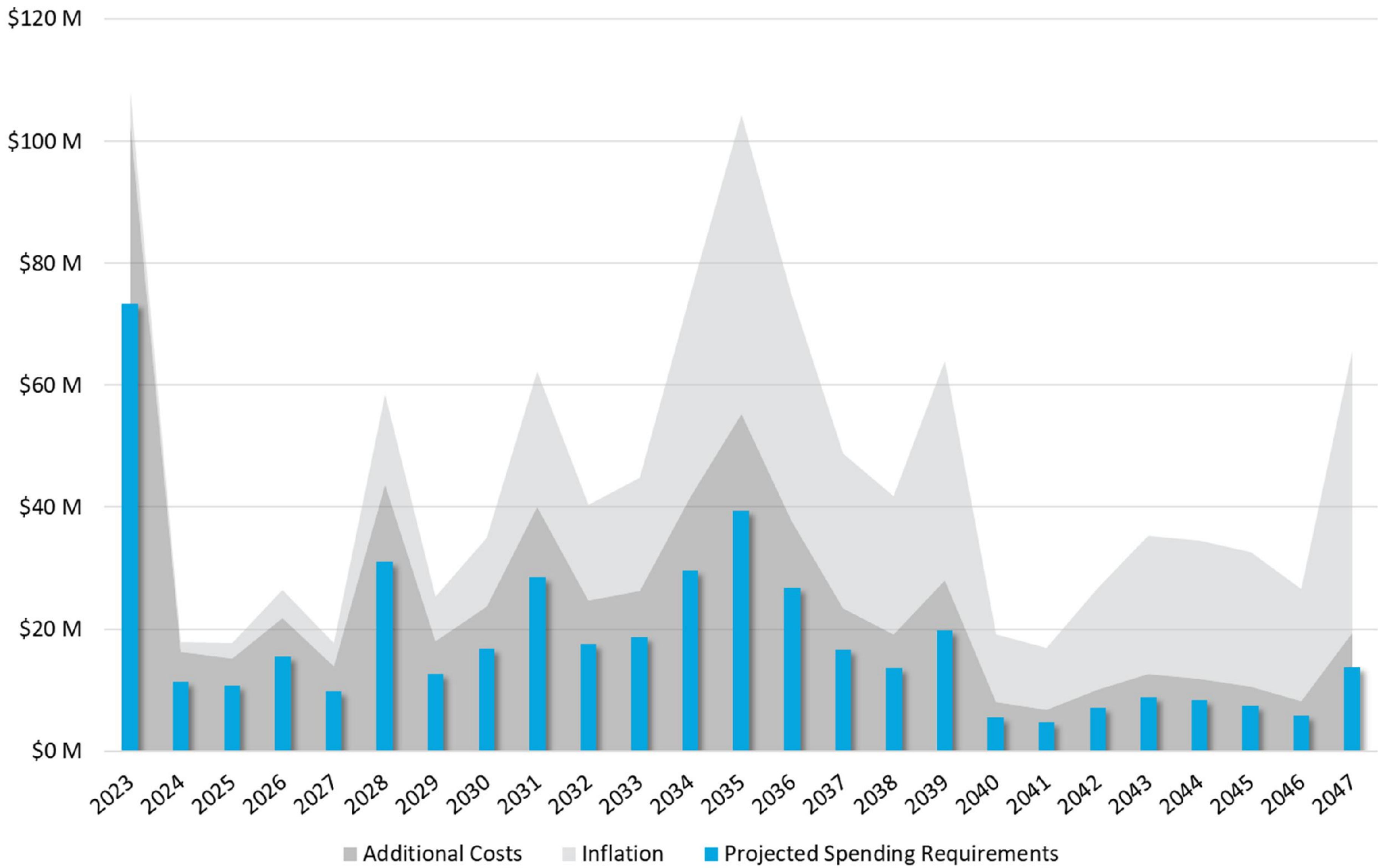


Figure 28: Financial Strategy – Forecasted Infrastructure Spending Needs with Additional Costs

7.3 Current Funding Forecast

In contrast to the infrastructure needs scenario, a constrained scenario was forecasted using the current (2022) capital funding levels for replacement and renewal work (see Table 38). This budget was applied to every year of the forecast to understand the impacts of maintaining current funding levels on the condition of the City's assets over time.

Table 38: Financial Strategy – 2022 Capital Budget

Asset Category	2022 Budget
Road Network	$1,505,000
Bridges & Culverts	$120,000
Stormwater Network	$500,944
Water Network	$400,195
Wastewater Network	$738,088
Total:	**$3,264,227**

Notes:

- Exclusive of one-off funding sources such as some grants and previously approved unspent funding.
- Includes combined capital and reserve balances.

Figure 29 shows the forecasted spending results when the spending is limited by current funding levels. As the figure demonstrates, actual spending each year varies, and in some cases may go above, the yearly budget limit where work for more expensive assets was deferred and the remaining budget left over was added to the following year's budget so that enough could be saved up to complete the work.

The following figures show the impact of the spending forecasts on the condition breakdown of the asset inventory for the unconstrained/infrastructure needs scenario (Figure 30) and the constrained/budget scenario (Figure 31). As these figures demonstrate, maintaining current funding levels will result in more and more assets falling into Poor and Very Poor condition.

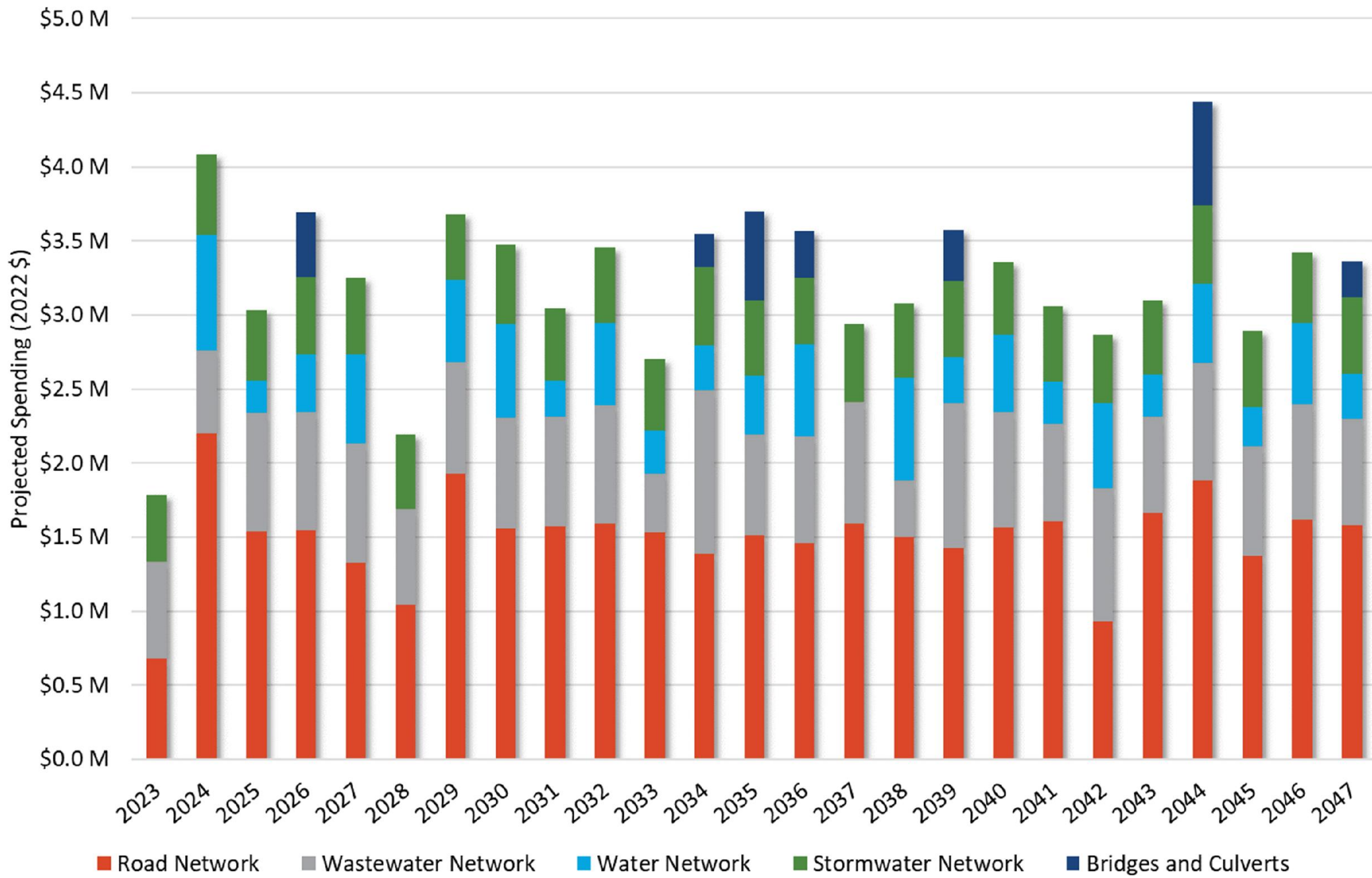


Figure 29: Financial Strategy – Forecasted Spending Maintaining Current Funding Levels (Constrained Scenario)

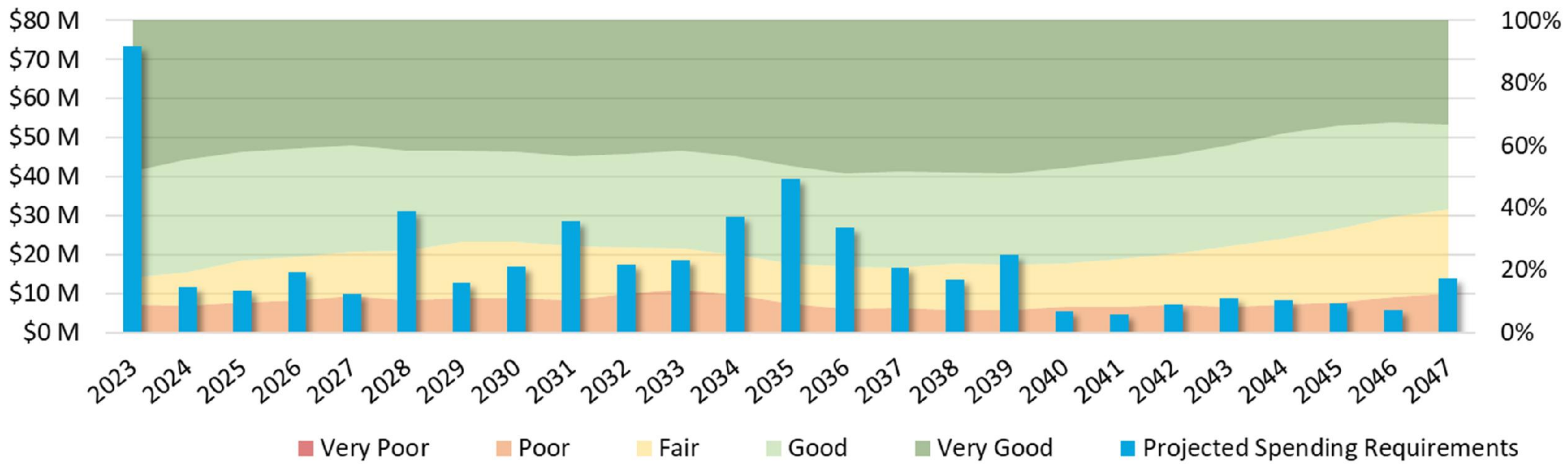


Figure 30: Financial Strategy – Condition Breakdown Forecast – Unconstrained Scenario

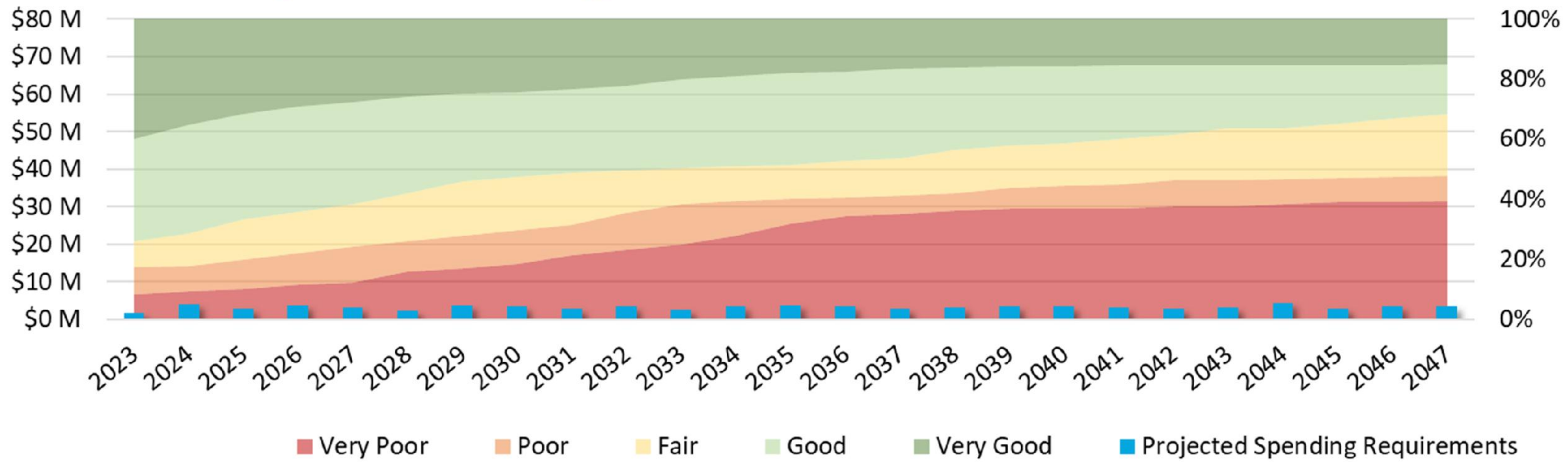


Figure 31: Financial Strategy – Condition Breakdown Forecast – Constrained Scenario

As these figures demonstrate, there is a gap between current funding levels and the funding levels required to meet infrastructure needs based on the data and lifecycle strategies used in the model. Table 39 defines the funding gap between these two scenarios, including adjustments for the additional costs discussed above, as well as inflation.

This is further demonstrated by Figure 32 which shows the forecasted spending for each scenario as a cumulative number, meaning that the value for each year represents the total amount spent from 2023 until that year, rather than just the amount spent in that year. In this way it is possible to understand the difference in the total amount of spending over 10 and 25 years between the different scenarios.

Table 39: Financial Strategy – Funding Gap

	Total (Cumulative) Spending		Current Funding Gap	
Scenario	**10 Years**	**25 Years**	**10 Years**	**25 Years**
Constrained/Budget (Current Funding)	$31,706,256	$81,325,084	-	-
Unconstrained (Base Replacement Costs)	$227,216,650	$452,930,729	$195,510,394	$371,605,646
Unconstrained + Additional Costs	$320,103,310	$639,103,021	$288,397,054	$557,777,938
Unconstrained + Additional Costs + Inflation	$409,001,726	$1,119,997,087	$377,295,470	$1,038,672,003

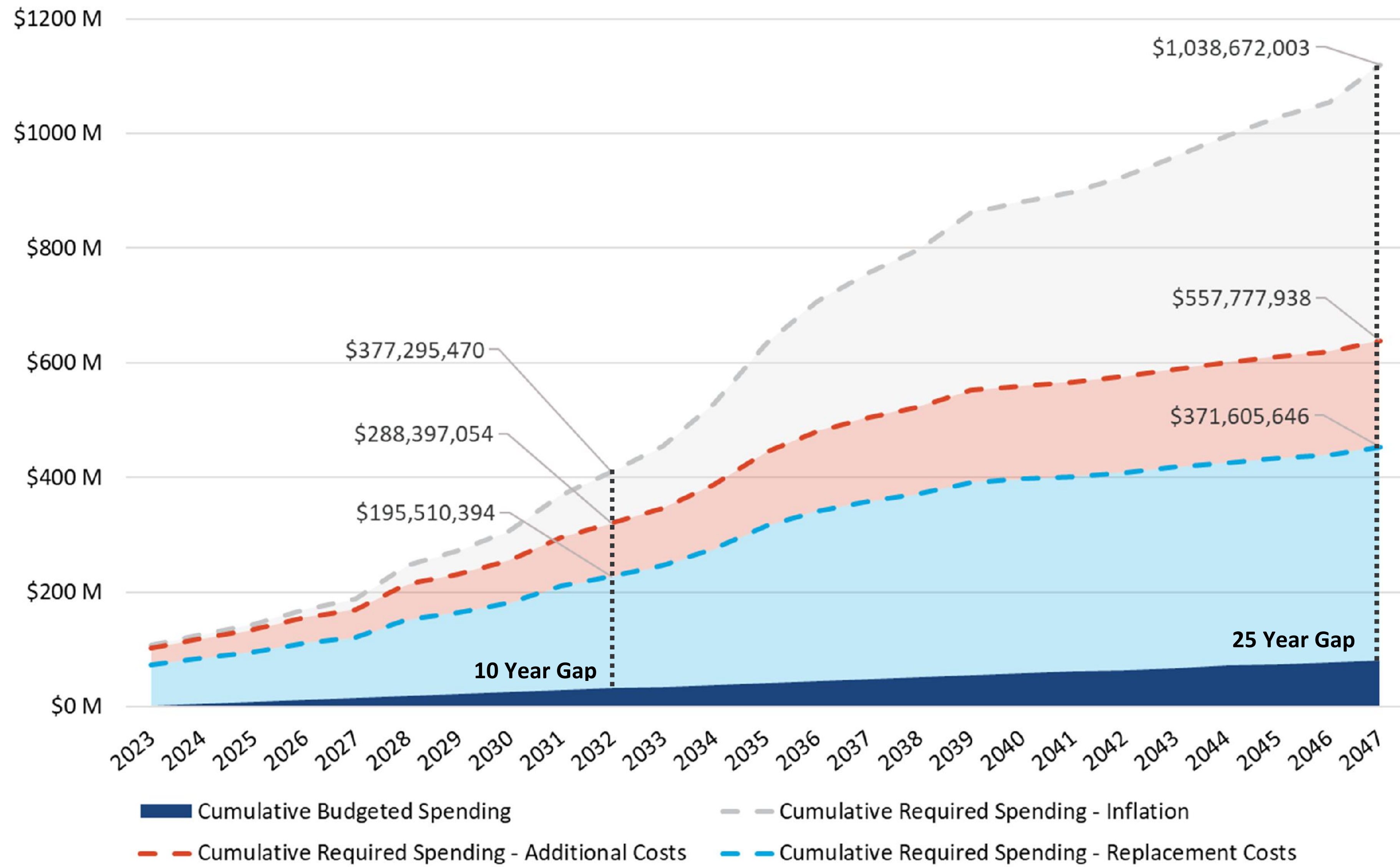


Figure 32: Financial Strategy – Funding Gap

7.4 Addressing the Gap

As the previous section demonstrates, there is a significant gap between the currently projected infrastructure needs and current funding levels. In order to address this gap, the City will need to explore options to increase funding, reduce the projected infrastructure costs or a combination of the two. This can be done by adjusting funding levels/costs, levels of service and the risks related to the selected lifecycle strategies. It is important to understand and take into consideration the linkages and tradeoffs between these options, as demonstrated through a common AM framework shown in Figure 33. The following paragraphs outline some of the options that may be considered in order to develop a strategy to address the infrastructure needs gap.

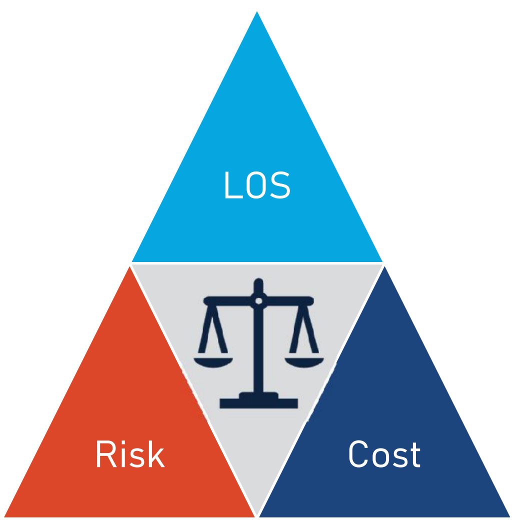


Figure 33: Financial Strategy – AM Fundamental Framework

7.4.1 Lifecycle Strategies & Risk

Lifecycle strategies are continuously being improved to better reflect how the City manages their assets and can be optimized over time to help balance levels of service and costs. For example, more renewal or rehabilitation activities may be considered to help extend the service life of assets, improving their condition and deferring full replacement costs. In addition, focusing more on proactive activities rather than just reactive work to address failures can help to reduce overall costs.

Furthermore, incorporating risk considerations into lifecycle management strategies can help to prioritize spending. For example, if an asset is low risk (i.e., failure will have little impact on the service) they may be allowed to run to failure before they are replaced, allowing the asset to potentially continue to function beyond its estimated service life. On the other hand, high risk assets may be scheduled for replacement or renewal activities earlier in their lifecycle to help reduce risk and provide a greater level of service by reducing impacts to customers.

7.4.2 Levels of Service

Reducing LOS or adjusting how LOS is measured can help to reduce forecasted spending requirements. This could include options such as divesting assets in order to have fewer assets to maintain (e.g., removing sidewalks from one side of a road when the road is replaced, replacing a paved road with a gravel road, etc.) or adjusting LOS metrics or targets (e.g. allowing low risk assets to run to failure, allowing more assets to fall below Fair condition, etc.). In some cases, this may just mean adjusting LOS to better align with current management practices or organizational capabilities. For example, it is unrealistic to expect the City to maintain all assets in Very Good condition because of limitations in resources such as funding and workforce, or the willingness of the public to deal with increased congestion and delays due to continuous construction. However, it should be noted that any changes to LOS could impact risks to public safety, services to customers and organizational reputation and these all must be considered as a part of this decision making process.

The City may also want to consider the minimum cost required to maintain the current LOS, a cost that needs to be reported based on the requirements under O. Reg 588/17. In this case, the City considers the most easily forecasted LOS to be based on maintaining the percentage of assets that fall into Fair or greater condition each year, limiting the number of assets falling into Poor or Very Poor. Table 40 outlines the average annual cost to maintain the current percentage of asset replacement value in Very Poor for all core assets over ten years, exclusive of additional costs to address project implementation, improvements and inflation. The LOS at the asset category level focuses on the percent of assets falling into Very Poor but manages to keep the overall LOS for all core assets falling into Poor and Very Poor consistent over the next ten years.

While these costs may maintain current levels of service, they would not be enough to address the backlog of work in any meaningful way or meet longer term funding needs and are therefore considered inadequate for addressing the City's infrastructure gap.

Table 40: Financial Strategy – Average Annual Cost to Maintain Current LOS

Core Asset Category	Average Annual Cost to Maintain LOS ($2022)
Road Network	$8.5M
Stormwater Network	$0.49M
Water Network	$3.7M
Wastewater Network	$3.5M
Bridges & Culverts	$43K
Total:	**$16.2M**

7.4.3 Funding Options

Another option for addressing the gap is to increase funding to meet infrastructure needs. This can be done through a number of sources including:

- **Tax Levies:** Taxes such as property and land transfer taxes are collected by the City and used to fund the day to day costs of running the City including wages, materials, supplies, debt payments and funding for the capital budget.
- **Rates:** The City charges user fees for services such as water distribution and wastewater removal which are typically used to fund water, wastewater and stormwater operating and capital costs.
- **Grants:** Grants from the Federal and Provincial governments can be used to support municipal budgets. These grants can be a one-time assistance or an ongoing funding program and may or may not require the City to apply for the funding directly.
- **Reserves:** The City may contribute some revenue each year to save up and create a buffer for years with unexpected expenditures. These reserves are funded by sources such as taxes, user fees, grants, etc., taking away from available funding in years where reserve funds are not used.
- **Debentures:** The City may take a loan for building or acquiring an asset, which involves repayment annually with interest. Similar to reserves, these payments are funded by the annual revenues from taxes, user fees and grants. The City has a self-imposed annual repayment limit of 15%, while the Province has an official limit of 25% of the municipality's source revenue.
- **Growth:** Increasing density and new developments can provide additional revenue produced from taxes and rates, particularly if new growth is focused in areas where the costs to service the development are less than the additional revenues.
- **Divestitures:** In some cases the City may choose to sell off assets, providing revenue from the proceeds and reducing future operating and maintenance costs. These types of decisions are not easy and may be less possible with linear assets but may be considered if the opportunity arises.

In order to understand the magnitude of increases necessary to meet the currently forecasted needs, Figure 34 shows the cumulative spending requirement scenarios in comparison to some example funding scenarios. This figure demonstrates how incremental increases to the budget over a number of years can eventually meet the cumulative needs of the infrastructure based on the example funding scenarios outlined in Table 41.

Table 41: Financial Strategy – Example Budget Scenarios

	Annual Increase	
Budget Scenario	**2023 – 2035**	**2035 – 2047**
Scenario 1	20% increase / year	5% increase / year
Scenario 2	25% increase / year	5% increase / year

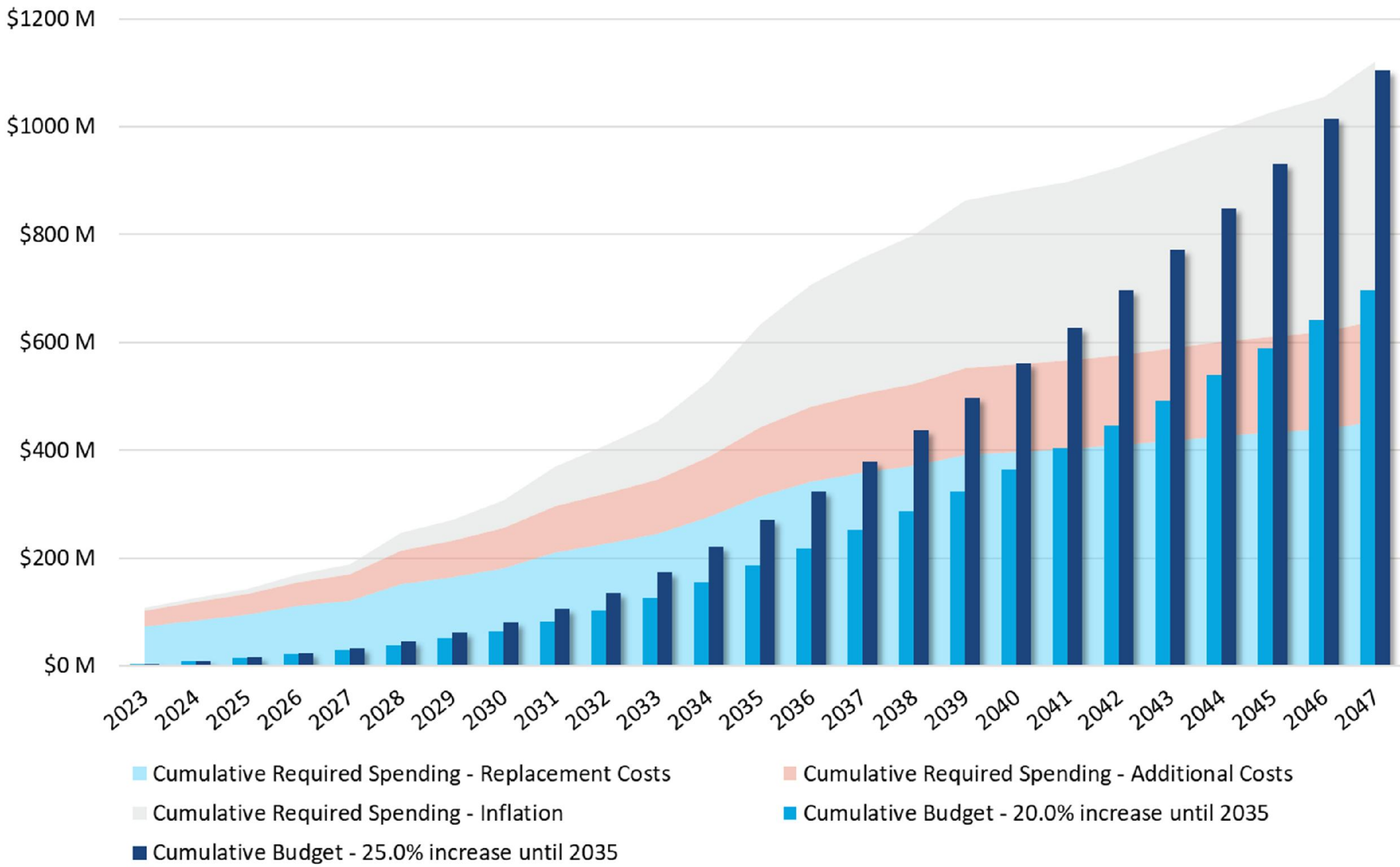


Figure 34: Financial Strategy – Example Budget Scenarios

These scenarios are based on having an accelerated budget increase of 20 to 25% per year until 2035 in order to catch up with the backlog of funding needs, then reducing the budget increases to 5% per year to keep up with inflation assumptions. While the spending requirements each year will go up and down as different amounts of assets are scheduled for work, using the cumulative numbers (total spending up to that year) helps to illustrate when the total budgeted spending will meet the total spending requirements regardless of yearly differences in infrastructure needs.

As these scenarios demonstrate, major increases may be required to meet spending requirements and current City reserves are not where they need to be in order to fund this gap. This is why it is important for the City to consider ways of reducing spending requirements as discussed above. There are also opportunities to look at ways to increase efficiencies in operating over time, using developer support to pay for growth and any necessary upsizing or replacements required for new developments, and strategic growth planning to take advantage of any areas with existing infrastructure that can support greater density.

The City will consider all of these approaches and tradeoffs in order to develop plans and strategies for managing assets that aim to balance costs to residents and businesses, the level of service provided to users and any potential risks. To support this goal, the following section outlines an improvement plan to help the City become more mature in asset management planning.

8.0 Improvement Plan

8 Improvement Plan

8.1 Improving Future Asset Management Plans

Asset Management Plans are designed to be "living" documents which require continuous updates and improvements. This allows the City to understand the ever changing state and needs of the system, while utilizing new information and processes to improve decision-making around these assets. In addition, O.Reg 588/17 outlines requirements for what should be included in the AMP and how often AMPs should be updated.

In order to meet the requirements under this regulation, the City will need to update the AMP at least once over the next few years to meet the following timelines:

July 1, 2024: The AMP will be required to document the current levels of service and the costs to sustain the current levels of service provided by all infrastructure systems in the City. The current plan includes only core assets.

July 1, 2025: The AMP will be required to document the current levels of service, the costs to sustain the current levels of service, the proposed levels of service, the costs to achieve the proposed levels of service, and the financial strategy to fund the expenditures.

Upon the completion of these updates, the City is required to review their asset management progress every year and update the AMP every 5 years; however, the City is aiming to complete the full update every 4 years to align with City Council cycles.

Beyond simply updating the AMP to align with updated information, the AMP will require continuous improvements to better support decision-making. This will include:

- **State of the Infrastructure**
  - Improvements to asset hierarchy and inventories and refinement of the processes for managing them.
  - Continue to improve knowledge of asset replacement costs and current conditions of the assets.
- **Levels of Service**
  - Further refine current level of service statements and add advanced metrics.
  - Improve how the data is collected and tracked.
- **Lifecycle Management Strategies**
  - Refinements to forecasted lifecycle activities.
  - Define deterioration curves based on current lifecycles.
  - Risk framework for non-core assets.
- **Financial Strategy**
  - Overall improvements to data confidence and lifecycle activities will improve forecast reliability.
  - Incorporate growth into future AMPs.

8.2 Advancing Corporate Asset Management Capabilities

In addition to making ongoing improvements to the asset management plan, the City will work towards advancing their overall asset management capabilities as an organization. The following section outlines key asset management enablers and the initiatives that can be completed to improve the City's overall AM maturity.

8.2.1 Asset Management Resources

The first step in building AM capabilities within an organization is to foster an understanding of AM including its purpose and benefits and develop a commitment to putting AM practices in place. To support this, it is recommended that the City dedicate a champion, personnel or team to implement the AMP, report its progress to Council and lead AM initiatives.

8.2.2 Business Processes

Another AM enabler is developing business processes that support data-driven, defensible and strategic decision-making. This not only applies to asset management processes, but data, work and lifecycle management as well. This includes reviewing current processes and explicitly defining tasks, decision points, inputs and outputs, as well as roles and responsibilities.

8.2.3 Information Systems

The City maintains two main asset inventories within their GIS and Citywide systems. While these inventories serve different purposes, finding a way to better align these inventories will help to improve consistency of data across the organization.

8.2.4 Asset Data

Maintaining organized and reliable asset data is fundamental to AM as it is the basis that drives decision-making. Some opportunities to improve confidence in the asset data include:

1. Asset hierarchy development
2. Asset data improvements
    - Review and develop consistent methods for determining data fields that may change over time (e.g. replacement value).
    - Review and update asset data to better represent engineering-based estimates as opposed to financial-based estimates used for amortization.
    - Review and update basic asset information where possible, such as installation dates to improve accuracy and precision. This may include reviewing historic documents to determine values or developing consistent

strategies for addressing gaps and understanding how these assumptions may impact decision-making.

3. Condition assessment programs
    - Review condition assessment / data collection business processes, protocols, schedules, and roles and responsibilities to ensure data collected from these programs can be linked to the inventory and used to drive decision-making.
4. Public availability of data
    - Currently there is no open data for City owned infrastructure. As a requirement of O.Reg 588/17, background data used for the AMP should be made available to the public.